

Water Resources Data Michigan Water Year 1994



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MI-94-1
Prepared in cooperation with the State of Michigan
and with other agencies

CALENDAR FOR WATER YEAR 1994

1993

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1994

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			1	2	3	4	5			1	2	3	4	5
2	3	4	5	6	7	8	6	7	8	9	10	11	12	6	7	8	9	10	11	12
9	10	11	12	13	14	15	13	14	15	16	17	18	19	13	14	15	16	17	18	19
16	17	18	19	20	21	22	20	21	22	23	24	25	26	20	21	22	23	24	25	26
23	24	25	26	27	28	29	27	28						27	28	29	30	31		
30	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
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3	4	5	6	7	8	9	8	9	10	11	12	13	14	5	6	7	8	9	10	11
10	11	12	13	14	15	16	15	16	17	18	19	20	21	12	13	14	15	16	17	18
17	18	19	20	21	22	23	22	23	24	25	26	27	28	19	20	21	22	23	24	25
24	25	26	27	28	29	30	29	30	31					26	27	28	29	30		

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Water Resources Data Michigan Water Year 1994

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



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MI-94-1
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U.S. DEPARTMENT OF THE INTERIOR

BRUCE BABBITT, Secretary

U.S. GEOLOGICAL SURVEY

GORDON P. EATON, 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	D.M. Harig	J.C. Knudsen	M.F. Soper
A.J. Carter	D.L. Hubbell	G. Lansky	B.E. Thurston
R.M. Corey	G.C. Huffman	W.W. Larson	J.D. Wallace
T.A. DeWitt	D.A. James	R.G. Nettleton	J.S. Walters
R.R. Eagle	P.J. Klimek	C.E. Oberst	D.G. Wydra
C.L. Ebsch			

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

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13. ABSTRACT (Maximum 200 words) Water resources data for the 1994 water year for Michigan consists of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and ground water levels. This report contains discharge records for 145 streamflow-gaging stations; stage only records for 2 river-gaging stations and 11 lake-gaging stations; stage and contents for 4 lakes and reservoirs; water-quality records for 15 streamflow-gaging stations; water-level records for 44 ground-water wells. Also included are 32 crest-stage partial-record stations and 2 low-flow partial-record stations. Additional water data were collected at various sites not involved in the systematic data-collection program. Miscellaneous data were collected at 50 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.				
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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, (c) chemical, (e) elevation, gage heights, or contents, (m) microbiological, (p) pesticide, (r) radio-chemical, (s) sediment

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ST. LAWRENCE RIVER BASIN		
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Washington Creek at Windigo (d,c,m,r,s)	04001000	30
Middle Branch Ontonagon River near Paulding (d)	04033000	33
Bond Falls Reservoir:		
Bond Falls Canal near Paulding (d)	04033500	34
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Cisco Branch Ontonagon River at Cisco Lake Outlet (d)	04037500	41
Ontonagon River near Rockland (d,c,m,s)	04040000	42
Portage River (Portage Lake):		
Sturgeon River near Sidnaw (d)	04040500	45
Sturgeon River near Alston (d)	04041500	46
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Dead River:		
McClure Storage Basin Release near Marquette (d)	04043800	48
Sand River Wildlife Flooding at Sand River (e)	04044609	49
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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
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			
Black River near Garnet, MI (d)	04046000*	a28	1951-78
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

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			
Creighton River near Shingleton, MI (d)	04055500	a35	1938-42
West Branch Manistique River near Manistique, MI (d)	04056000	322	1938-56
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
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
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
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
South Branch Kalamazoo River near Albion, MI (d)	04102850	146	1972-76
Reed's Springs near Albion, MI (d)	04103000	--	1905-06

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			
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
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
Grand River near Eaton Rapids, MI (d)	04111000	661	1951-82
Red Cedar River near Williamston, MI (d)	04111379	163	1975-89
Sycamore Creek near Holt, MI (d)	04112850	80.6	1975-80, 1989-90
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
Fish Creek near Carson City, MI (d)	04115500	145	1936-38
Flat River at Smyrna, MI (d)	04116500*	528	1951-86
Quaker Brook near Nashville, MI (d)	04117000*	7.60	1954-75
Grand River at Eastmanville, MI (d)	04119300	a5,230	1976-77
Crockery Creek at Slocums Grove, MI (d)	04120000	--	1903
Higgins Lake Outlet (head of Muskegon River) near Roscommon, MI (d)	04120500	49.2	1942-50
Houghton Lake near Houghton Lake Heights, MI (e)	442400084472801	222	1942-91
Muskegon River near Merritt, MI (d)	04121000*	355	1947-74
Muskegon River at Nawaygo, MI (d)	04122000	a2,350	1908, 1909-20, 1931-93
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
Pine River near Hoxeyville, MI (d)	04125500	251	1952-82
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
STREAMS TRIBUTARY TO LAKE HURON			
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 Ocqueoc, 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

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			
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 near Red Oak, MI (d)	04136000	a1,000	1909-16, 1931
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 Byron, MI (d)	04144000	365	1948-83
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)	04147990	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 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
Chippewa River near Midland, MI (d)	04154500*	597	1948-73
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

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

Station name	Station number	Drainage area (mi ²)	Period of record
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
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 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
Huron River near Dexter, MI (d)	04173000*	522	1904, 1946-72, 1976-77
Mill Creek near Dexter, MI (d)	04173500	128	1952-83
Huron River at Dexter, MI (e)	04174000	--	1904-16
Stony Creek at Oakville, MI (d)	04175340	68.0	1970-81
Huron River at Flat Rock, MI (d)	04175500	851	1904-11
Huron River at Flat Rock, MI (e)	04175500	851	1912-22
River Raisin near Tecumseh, MI (d)	04175700	267	1956-80
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				
Black River near Bessemer, MI	04031000	200	Temp.	1955-71
Sturgeon River near Chassell, MI	04043004	723	Temp., S.C.	1978-81
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.	1976-81
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,
Middle Branch Escanaba River near Ishpeming, MI	04058000	128	Temp.	1962-68 1962-75, 1977-82
Green Creek near Palmer, MI	04058120	8.42	Temp., Sed.	1965, 1979-80
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.	1956-81 1975-81
Paint River near Alpha, MI	04062000	631	Temp.	1953-54, 1956-57
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.	1978-83
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,
Sand Creek at Litchfield, MI	04096312	20.6	Temp., Sed.	1976-77 1975-76, 1977
Soap Creek near Litchfield, MI	04096325	10.9	Temp., 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, Sed. 1977
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, Temp. 1972-73
Portage Creek at Kalamazoo, MI	04106500	46.8	S.C. Temp., S.C.	1968, 1972-75, Temp. 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
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
Boardman River near Mayfield, MI	04127000	182	Temp.	1962-77
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
Au Sable River at Grayling, MI	04135500	110	Temp.	1953-80
South Branch Au Sable River near Luzerne, MI	04135700	401	Temp.	1967-83
Au Sable River at Mio, MI	04136500	a1,100	Temp.	1952-66
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

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				
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.	 1966, 1970-72,
			Temp., S.C.	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 at Fargo, MI	04159500	480	Sed.	1966,
			Temp.	1979-82
STREAMS TRIBUTARY TO LAKE ST. CLAIR				
Clinton River near Drayton Plains, MI	04160900	79.2	Temp.	1962-74
Clinton River near Fraser, MI	04164000	444	Sed.	1966
STREAMS TRIBUTARY TO DETROIT RIVER				
Detroit River at Detroit, MI	04165700	a228,800	Temp., S.C.	1974-81

WATER RESOURCES DATA - MICHIGAN, 1994

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, 32 crest-stage partial-record stations, 2 low-flow partial-record stations, and 50 miscellaneous sites; (2) stage only records for 2 gaging stations and 11 lake-gaging stations; (3) stage and content records for 4 lakes and reservoirs; (4) water-quality records for 15 streamflow-gaging stations; and (5) water-level records for 44 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-94-1." 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. Beginning with the 1990 water year, all water-data reports will also be available on Compact Disc - Read Only Memory (CD-ROM). All data reports published for the current water year for the entire Nation, including Puerto Rico and the Trust Territories, will be reproduced on a single CD-ROM disc.

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. A limited number of CD-ROM discs will be available for sale by the Books and Open-File Reports Section, U.S. Geological Survey, Federal Center, Box 25425, Denver, Colorado 80225.

COOPERATION

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

Michigan Department of Natural Resources, Roland Harmes, Director, through Land and Water Management Division, Lawrence N. Witte, Chief.

Michigan Department of Transportation, Patrick M. Nowak, Director.

Assistance with funds or services was given by the U.S. Army Corps of Engineers in collecting records for 8 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; Delta Township (Eaton County); Antrim County; Huron County; Kalamazoo County; Otsego County; Wayne County; Huron-Clinton Metropolitan Authority; Cities of Adrian, Ann Arbor, Battle Creek, Cadillac, Clare, Coldwater, Flint, Imlay City, Kalamazoo, Lansing, Norway, Portage, Portland, Sturgis, and Ypsilanti; American Aggregates Co.; Consumers Power Co.; Cleveland Cliffs Iron Co.; Dow Chemical Co.; French Paper Co.; Mead Corporation; Indiana Michigan Power Co.; Michigan Sugar Co.; 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.

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SUMMARY OF HYDROLOGIC CONDITIONS

Surface Water

In the Upper Peninsula, streamflow at Sturgeon River near Sidnaw (fig. 1) began the year in the normal range, followed by seven months (except for normal streamflow in February) in the deficient range. July, with a monthly mean flow about 300 percent higher than the median, was the only month in the excessive range this water year. Normal range streamflow occurred in June, August, and September.

In the Lower Peninsula, streamflow at Muskegon River at Evart began the year in the excessive range, followed by eight months (except for below normal streamflow in January) in the normal range. Streamflow was in the excessive range in July, August, and September. The July mean streamflow of 1,143 ft³/s (cubic feet per second) was the third highest July mean for the period of record; the August mean streamflow of 983 ft³/s was the second highest August mean for the period of record. Streamflow at Red Cedar River at East Lansing was in the excessive range for October and November, followed by six months in the normal range. Streamflow returned to the excessive range in July, August, and September. The July mean streamflow of 578 ft³/s was the highest July mean for the period 1931 to present. No widespread flooding or droughts occurred in the State during the water year.

Although neither annual maximum or minimum discharges were noteworthy, air temperatures for extended periods of January and February were extremely low. The daily minimum temperature was below 0.0°F more than half the days in these two months except for the extreme southern part of the State and some lakeshore areas. The lowest recorded temperature in the State was -38°F and -35°F in January and February, respectively. Many rivers and streamflow stations unaffected in normal winters experienced cold temperature effects. Data users will note the large number of winter period estimated daily mean discharges related to the severely cold temperatures.

The water levels of Lake Superior, Lakes Michigan-Huron, Lake St. Clair, and Lake Erie were at or above the average and followed seasonal patterns during the 1994 water year. No new record high or low water levels were experienced during the year. The water levels for Lake Superior fluctuated less than 0.20 ft (feet) above or below the long-term average during the water year. Levels were similar to last year. The water levels for Lakes Michigan-Huron, for most of the year, were between 0.6 ft and 0.8 ft above the long-term average. Water levels during the 1994 water year varied from about 0.8 ft higher than last year to about 0.3 ft below levels experienced last year. For Lake St. Clair, water levels were slightly greater than 1.0 ft above the long-term average, except for the spring months when the levels were about 0.8 ft above the long-term average. Water levels during the 1994 water year were lower than those experienced during the 1993 water year. The water levels of Lake Erie were between 0.70 ft and 1.2 ft above the long-term average during the year. Levels during the 1994 water year varied between the same level as last year to about 1.2 ft lower than those experienced during the 1993 water year.

Water Quality

Surface-water-quality data were collected at 10 National Stream Quality Accounting Network stations and 1 Hydrologic Bench-Mark Network station, and 4 other sampling stations during the 1994 water year. Concentrations of dissolved solids and suspended sediments, analyzed from samples collected bimonthly or quarterly at the stations, generally fall within the range of concentrations in all previous samples.

Ground Water

Glacial deposits cover most of the State. The outwash sand and gravel in these deposits form the most productive aquifers in the State. Lacustrine sand also is very productive. Poorly sorted, relatively impermeable mixtures of clay, silt, sand, and gravel, that form some till deposits tend to be poor aquifers; clay deposits generally yield little or no water. In most areas of the State, glacial deposits are less than 200 ft thick. In some areas in the northern part of the Lower Peninsula, however, the deposits are greater than 800 ft thick. Sandstone, limestone, and dolomite are the principal bedrock aquifers. Where near enough to land surface to be recharged by precipitation, they yield freshwater. Where deeply buried, however, these rocks commonly yield brackish or salty water.

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

Ground-water levels were measured at 44 wells during the 1994 water year. This statewide network of ground-water wells (fig. 9) is designed to provide statewide areal coverage and to define ground-water conditions in the important aquifers in the State. Six index wells with long-term averages were used for this summary.

Ground-water levels for the 1994 water year generally followed seasonal patterns. In the eastern Upper Peninsula and southeastern Lower Peninsula, ground-water levels continued to remain below average. In the western Upper Peninsula, ground-water levels fluctuated slightly above and below the average for the first half of the year, followed by below average levels at the end of the year. In the northern and south-central Lower Peninsula, above average water levels were recorded. In Clinton County, a new high water level for October was measured, surpassing the previous maximum measured in 1986. The measured water level in November was the second highest reading for November; records have been kept for the last 45 years at this site. In the southwestern Lower Peninsula, ground-water levels fluctuated above and below the average throughout the year.

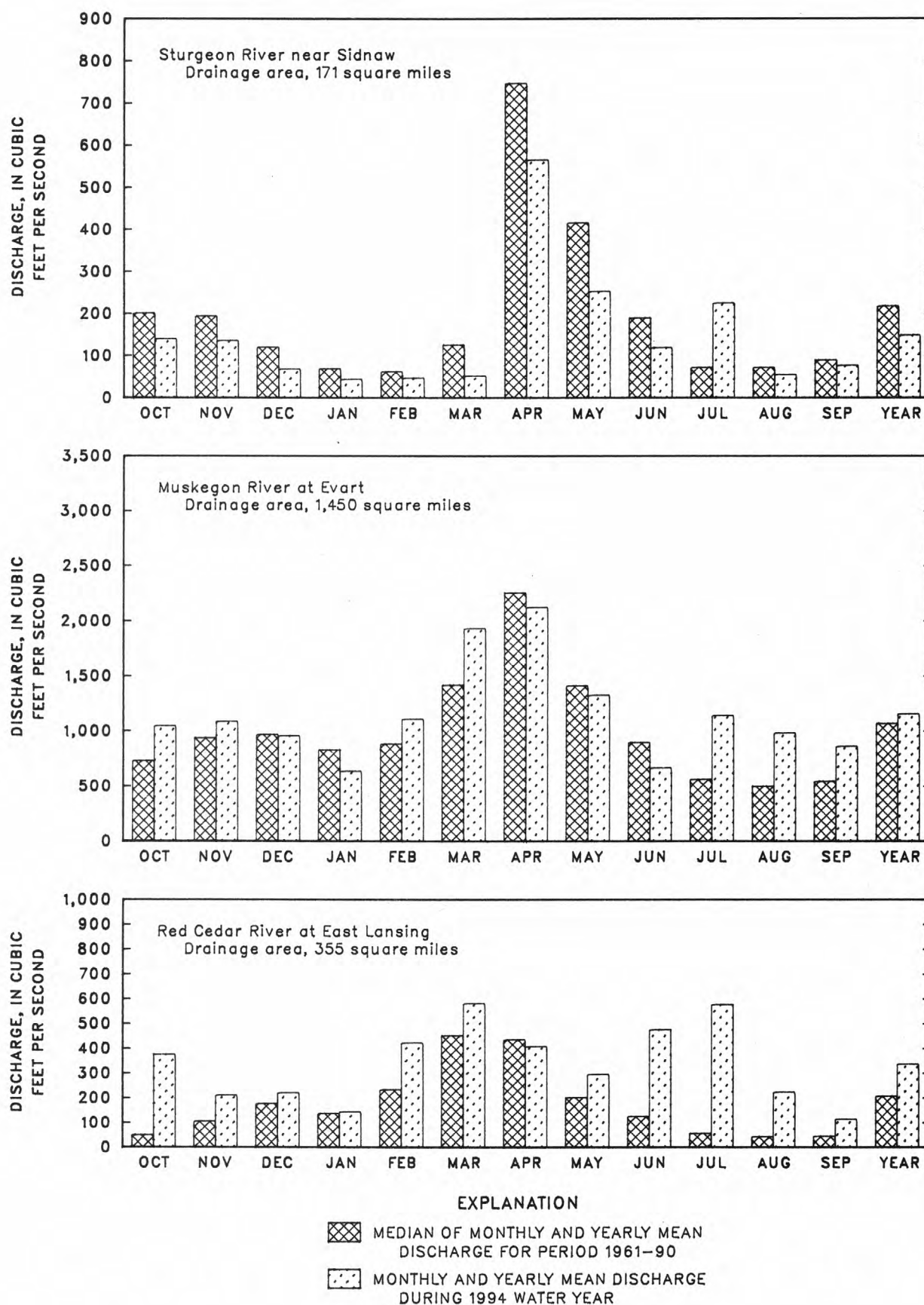


Figure 1.--Discharge during 1994 water year compared with median discharge for period 1961-90 for three representative stations.

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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.

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SPECIAL NETWORKS AND PROGRAMS

Hydrologic Bench-Mark Network is a network of 53 sites in small drainage basins around the country whose purpose is to provide consistent data on the hydrology, including water quality, and related factors in representative undeveloped watersheds nationwide, and to provide analyses on a continuing basis to compare and contrast conditions observed in basins more obviously affected by the activities of man.

National Stream Quality Accounting Network (NASQAN) is a nation-wide data-collection network designed by the U.S. Geological Survey to meet many of the information needs of government agencies and other groups involved in natural or regional water-quality planning and management. The 284 or so sites in NASQAN are generally located at the downstream ends of hydrologic accounting units designated by the U.S. Geological Survey Office of Water Data Coordination in consultation with the Water Resources Council. The objectives of NASQAN are (1) to obtain information on the quality and quantity of water moving within and from the United States through a systematic and uniform process of data collection, summarization, analysis, and reporting such that the data may be used for, (2) description of the areal variability of water quality in the Nation's rivers through analysis of data from this and other programs, (3) detection of changes or trends with time in the pattern of occurrence of water-quality characteristics, and (4) providing a nationally consistent data base useful for water quality assessment and hydrologic research.

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

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, diverse, and geographically distributed part of the Nation's ground- and surface-water resources, and to identify, describe, and explain the major natural and human factors that affect these observed conditions and trends.

Assessment activities have begun in more than two-thirds of the study units and ultimately will be conducted in 60 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.

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

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

EXPLANATION OF THE RECORDS

The surface-water and ground-water records published in this report are for the 1994 water year that began October 1, 1993, and ended September 30, 1994. A calendar of the water year is provided on the inside of the front cover. The records contain streamflow data, stage and content data for lakes and reservoirs, water-quality data for surface water, and ground-water level data. The locations of the stations and wells where the data were collected are shown in figures 4-9. The following sections of the introductory text are presented to provide users with a more detailed explanation of how the hydrologic data published in this report were collected, analyzed, computed, and arranged for presentation.

Station Identification Numbers

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

Downstream Order System

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

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

Latitude-Longitude System

The identification numbers for wells are assigned according to the grid system of latitude and longitude. The number consists of 15 digits. The first six digits denote the degrees, minutes, and seconds of latitude, the next seven digits denote degrees, minutes, and seconds of longitude, and the last two digits (assigned sequentially) identify the wells or other sites within a 1-second grid. This site-identification number, once assigned, is a pure number and has no locational significance. In the rare instance where the initial determination of latitude and longitude are found to be in error, the station will retain its initial identification number; however, its true latitude and longitude will be listed in the LOCATION paragraph of the station description. (See figure 2.)

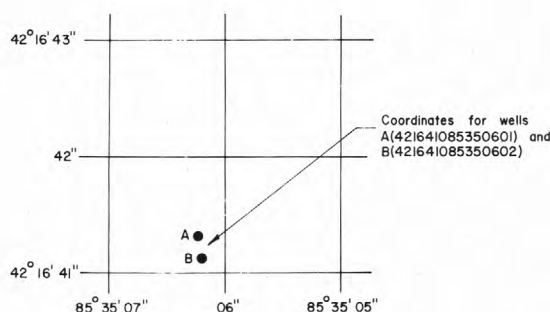


Figure 2.--System for numbering wells (latitude and longitude).

Local Well Numbering System

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

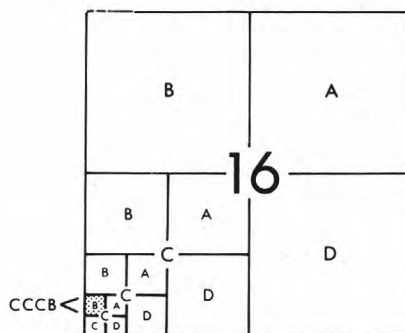


Figure 3.--Local well numbering system in Michigan.

Records of Stage and Water Discharge

Records of stage and water discharge may be complete or partial. Complete records of discharge are those obtained using a continuous stage-recording device through which either instantaneous or mean daily discharges may be computed for anytime, or any period of time, during the period of record. Complete records of lake or reservoir content, similarly, are those for which

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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.

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."

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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.

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.

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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 ____ - ____," 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.

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.)

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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.

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.

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Other Records Available

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

Records of Surface-Water Quality

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

Classification of Records

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

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

Arrangement of Records

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

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.

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.

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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 Lemoyne, Pennsylvania. 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.

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.

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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

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. Full implementation of the protocols will take place in the 1995 water year.

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.

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, from the graph or punched tape of a water-level recorder, 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,

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the elevation of the land-surface datum is given in the well description. The height of the measuring point (MP) above or below land-surface datum is given in each well description. Water levels in wells equipped with recording gages are reported for every fifth day and the end of each month (EOM).

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

Data Presentation

Each well record consists of 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 top of collar, notch in top of casing, plug in pump base and so on), and in relation to land surface (such as 1.3 ft above land-surface datum). The elevation of the land-surface datum is described in feet above (or below) 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; generally, only water-level lows are listed for every fifth day and at the end of the month (EOM). The highest and lowest water levels of the water year and their dates of occurrence are shown on a line below the abbreviated table. Because all values are not published for wells with recorders, the extremes may be values that are not listed in the table. Missing records are indicated by dashes in place of the water level. A hydrograph for a selected period of record follows each water-level table.

ACCESS TO WATSTORE DATA

The U.S. Geological Survey is the principal Federal water-data agency and, as such, collects and disseminates about 70 percent of the water data currently being used by numerous State, local, private, and other Federal agencies to develop and manage our water resources. As part of the Geological Survey's program of releasing water data to the public, a large-scale computerized system has been developed for the storage and retrieval of water data collected through its activities.

The National Water Data STORAGE and Retrieval System (WATSTORE) was established in 1972 to provide an effective and efficient means for the processing and maintenance of water data collected through the activities of the U.S. Geological Survey and to facilitate release of the data to the public. A variety of useful products, ranging from data tables to complex statistical analyses such as Log Pearson Type III, can be produced using WATSTORE. The system resides on the central computer facilities of the U.S. Geological Survey at its National Center in Reston, Virginia, and consists of related files and data bases.

- * Station Header File - Contains descriptive information on more than 440,000 sites throughout the United States and its territories where the U.S. Geological Survey collects or has collected data.

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- * Daily Values File - Contains more than 220 million daily values of stream flows, stages, reservoir contents, water temperatures, specific conductances, sediment concentrations, sediment discharges, and ground-water levels.
- * Peak Flow File - Contains approximately 500,000 maximum (peak) streamflow and gage-height values at surface-water sites.
- * Water Quality File - Contains approximately 2 million analyses of water samples that describe the chemical, physical, biological, and radio-chemical characteristics of both surface and ground water.
- * Ground-Water Site Inventory Data Base - Contains inventory data for more than 900,000 wells, springs, and other sources of ground water. The data includes site location, geohydrologic characteristics, well-construction history, and one-time field measurements such as water temperature.

In 1976, the U.S. Geological Survey opened WATSTORE to the public for direct access. The signing of a Memorandum of Agreement with the Survey is required to obtain direct access to WATSTORE. The system can be accessed either synchronously or asynchronously. The requestor will be expected to pay all computer costs he/she incurs. Direct access may be obtained by contacting:

U.S. Geological Survey
National Water Data Exchange
421 USGS National Center
Reston, Virginia 22092

In addition to providing direct access to WATSTORE, data can be provided in various machine-readable formats on magnetic tape or 5-1/4 inch floppy disk; and, as noted in the introduction, on CD-ROM discs. Beginning with the 1990 water year, all water-data reports will also be available on CD-ROM. All data reports published for the current water year for the entire Nation, including Puerto Rico and the Trust Territories, will be reproduced on a single CD-ROM disc. 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's District offices. (See address on the back of title page.) A limited number of CD-ROM discs will be available for sale by the Books and Open-File Reports Section, U.S. Geological Survey, Federal Center, Box 25425, Denver, Colorado 80225.

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.

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

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

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

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

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

Ash mass is the mass or amount of residue present after the residue from the dry mass determination has been ashed in a muffle furnace at a temperature of 500°C for 1 hour. The ash mass values of zooplankton and phytoplankton are expressed in grams per cubic meter (g/m^3), and periphyton and benthic organisms in grams per square meter (g/m^2).

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

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

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

Bottom material: See Bed material.

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

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

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

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

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

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

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

Cubic feet per second per square mile (CFSM) is the average number of cubic feet of water flowing per second from each square mile of area drained, assuming that the runoff is distributed uniformly in time and area.

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

Cubic foot per second-day [$(\text{ft}^3/\text{s})/\text{d}$] is the volume of water represented by a flow of 1 cubic foot per second for 24 hours. It is equivalent to 86,400 cubic feet, approximately 1.9835 acre-feet, about 646,000 gallons, or 2,445 cubic meters.

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

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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 um membrane filter. This is a convenient operational definition used by Federal agencies that collect water data. Determinations of "dissolved" constituents are made on subsamples of the filtrate.

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

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

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

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

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

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

Hydrologic 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 (ug/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 (UG/L, ug/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.

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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 computerized data system, WATSTORE, to uniquely identify a specific constituent. The codes used in WATSTORE are the same as those used in the U.S. Environmental Protection Agency data system, STORET. The Environmental Protection Agency assigns and approves all requests for new codes.

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

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

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

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

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

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

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

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

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

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

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

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

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

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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.

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

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) x discharge (ft^3/s) x 0.0027.

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

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

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

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

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

Solute is any substance that is dissolved in water.

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

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

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

Substrate is the physical surface upon which an organism lives.

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 emersed 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 planimetered. All areas shown are those for the stage when the planimetered map was made.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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, 1994, is called the "1994 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.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS

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

The reports listed below are for sale by the U.S. Geological Survey, Branch of 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 sent by check or money order payable to the U.S. Geological Survey. Prices are not included because they are subject to change. Current prices can be obtained by writing to the above address. When ordering or inquiring about prices for any of these publications, please give the title, book number, chapter number, and "U.S. Geological Survey Techniques of Water-Resources Investigations."

- 1-D1. *Water temperature--influential factors, field measurement, and data presentation*, by H. H. Stevens, Jr., J. F. Ficken, and G. F. Smoot: USGS--TWRI Book 1, Chapter D1. 1975. 65 pages.
- 1-D2. *Guidelines for collection and field analysis of ground-water samples for selected unstable constituents*, by W. W. Wood: USGS--TWRI Book 1, Chapter D2. 1976. 24 pages.
- 2-D1. *Application of surface geophysics to ground-water investigations*, by A. A. R. Zohdy, G. P. Eaton, and D. R. Mabey: USGS--TWRI Book 2, Chapter D1. 1974. 116 pages.
- 2-D2. *Application of seismic-refraction techniques to hydrologic studies*, by F. P. Haeni: USGS--TWRI Book 2, Chapter D2. 1988. 86 pages.
- 2-E1. *Application of borehole geophysics to water-resources investigations*, by W. S. Keys and L.M. McCary: USGS--TWRI Book 2, Chapter E1. 1971. 126 pages.
- 2-E2. *Borehole geophysics applied to ground-water investigations*, by W. S. Keys: USGS--TWRI Book 2, Chapter E2. 1990. 150 pages.
- 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, Chapter F1. 1989. 97 pages.
- 3-A1. *General field and office procedures for indirect discharge measurements*, by M. A. Benson and Tate Dalrymple: USGS--TWRI Book 3, Chapter A1. 1967. 30 pages.
- 3-A2. *Measurement of peak discharge by the slope-area method*, by Tate Dalrymple and M. A. Benson: USGS--TWRI Book 3, Chapter A2. 1967. 12 pages.
- 3-A3. *Measurement of peak discharge at culverts by indirect methods*, by G. L. Bodhaine: USGS--TWRI Book 3, Chapter A3. 1968. 60 pages.
- 3-A4. *Measurement of peak discharge at width contractions by indirect methods*, by H. F. Matthai: USGS--TWRI Book 3, Chapter A4. 1967. 44 pages.
- 3-A5. *Measurement of peak discharge at dams by indirect methods*, by Harry Hulsing: USGS--TWRI Book 3, Chapter A5. 1967. 29 pages.
- 3-A6. *General procedure for gaging streams*, by R. W. Carter and Jacob Davidian: USGS--TWRI Book 3, Chapter A6. 1968. 13 pages.
- 3-A7. *Stage measurements at gaging stations*, by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3, Chapter A7. 1968. 28 pages.
- 3-A8. *Discharge measurements at gaging stations*, by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3, Chapter A8. 1969. 65 pages.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS--Continued

- 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, Chapter A9. 1989. 27 pages.
- 3-A10. *Discharge ratings at gaging stations*, by E. J. Kennedy: USGS--TWRI Book 3, Chapter A10. 1984. 59 pages.
- 3-A11. *Measurement of discharge by moving-boat method*, by G. F. Smoot and C. E. Novak: USGS--TWRI Book 3, Chapter A11. 1969. 22 pages.
- 3-A12. *Fluorometric procedures for dye tracing*, by J. F. Wilson, Jr., E. D. Cobb, and F. A. Kilpatrick: USGS--TWRI Book 3, Chapter A12. 1986. 41 pages.
- 3-A13. *Computation of continuous records of streamflow*, by E. J. Kennedy: USGS--TWRI Book 3, Chapter A13. 1983. 53 pages.
- 3-A14. *Use of flumes in measuring discharge*, by F. A. Kilpatrick and V. R. Schneider: USGS--TWRI Book 3, Chapter A14. 1983. 46 pages.
- 3-A15. *Computation of water-surface profiles in open channels*, by Jacob Davidian: USGS--TWRI Book 3, Chapter A15. 1984. 48 pages.
- 3-A16. *Measurement of discharge using tracers*, by F. A. Kilpatrick and E. D. Cobb: USGS--TWRI Book 3, Chapter A16. 1985. 52 pages.
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- 3-A19. *Levels of streamflow gaging stations*, by E. J. Kennedy: USGS--TWRI Book 3, Chapter A19. 1990. 27 pages.
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- 3-B1. *Aquifer-test design, observation, and data analysis*, by R. W. Stallman: USGS--TWRI Book 3, Chapter B1. 1971. 26 pages.
- 3-B2. *Introduction to ground-water hydraulics, a programmed text for self-instruction*, by G. D. Bennett: USGS--TWRI Book 3, Chapter B2. 1976. 172 pages.
- 3-B3. *Type curves for selected problems of flow to wells in confined aquifers*, by J. E. Reed: USGS--TWRI Book 3, Chapter B3. 1980. 106 pages.
- 3-B4. *Regression modeling of ground-water flow*, by R. L. Cooley and R. L. Naff: USGS--TWRI Book 3, Chapter 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, Chapter B4. 1993. 8 pages.
- 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, Chapter 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, Chapter 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, Chapter B7. 1992. 90 pages.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS--Continued

- 3-C1. *Fluvial sediment concepts*, by H. P. Guy: USGS--TWRI Book 3, Chapter C1. 1970. 55 pages.
- 3-C2. *Field methods for measurement of fluvial sediment*, by H. P. Guy and V. W. Norman: USGS--TWRI Book 3, Chapter C2. 1970. 59 pages.
- 3-C3. *Computation of fluvial-sediment discharge*, by George Porterfield: USGS--TWRI Book 3, Chapter C3. 1972. 66 pages.
- 4-A1. *Some statistical tools in hydrology*, by H. C. Riggs: USGS--TWRI Book 4, Chapter A1. 1968. 39 pages.
- 4-A2. *Frequency curves*, by H. C. Riggs: USGS--TWRI Book 4, Chapter A2. 1968. 15 pages.
- 4-B1. *Low-flow investigations*, by H. C. Riggs: USGS--TWRI Book 4, Chapter B1. 1972. 18 pages.
- 4-B2. *Storage analyses for water supply*, by H. C. Riggs and C. H. Hardison: USGS--TWRI Book 4, Chapter B2. 1973. 20 pages.
- 4-B3. *Regional analyses of streamflow characteristics*, by H. C. Riggs: USGS--TWRI Book 4, Chapter B3. 1973. 15 pages.
- 4-D1. *Computation of rate and volume of stream depletion by wells*, by C. T. Jenkins: USGS--TWRI Book 4, Chapter D1. 1970. 17 pages.
- 5-A1. *Methods for determination of inorganic substances in water and fluvial sediments*, by M. J. Fishman and L. C. Friedman: USGS--TWRI Book 5, Chapter A1. 1989. 545 pages.
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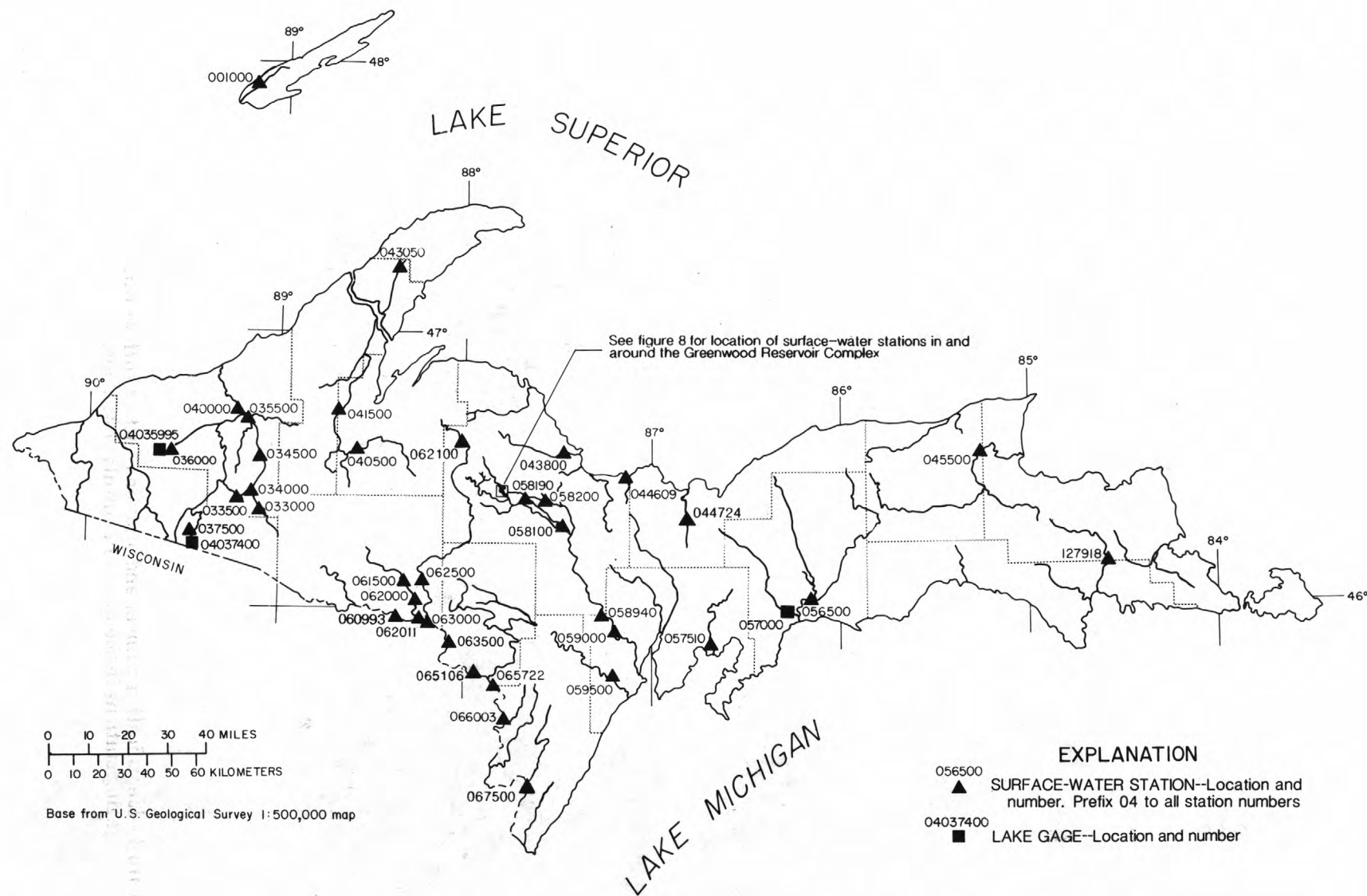


Figure 4.--Identification number and location of active surface-water gaging stations in the Upper Peninsula of Michigan.

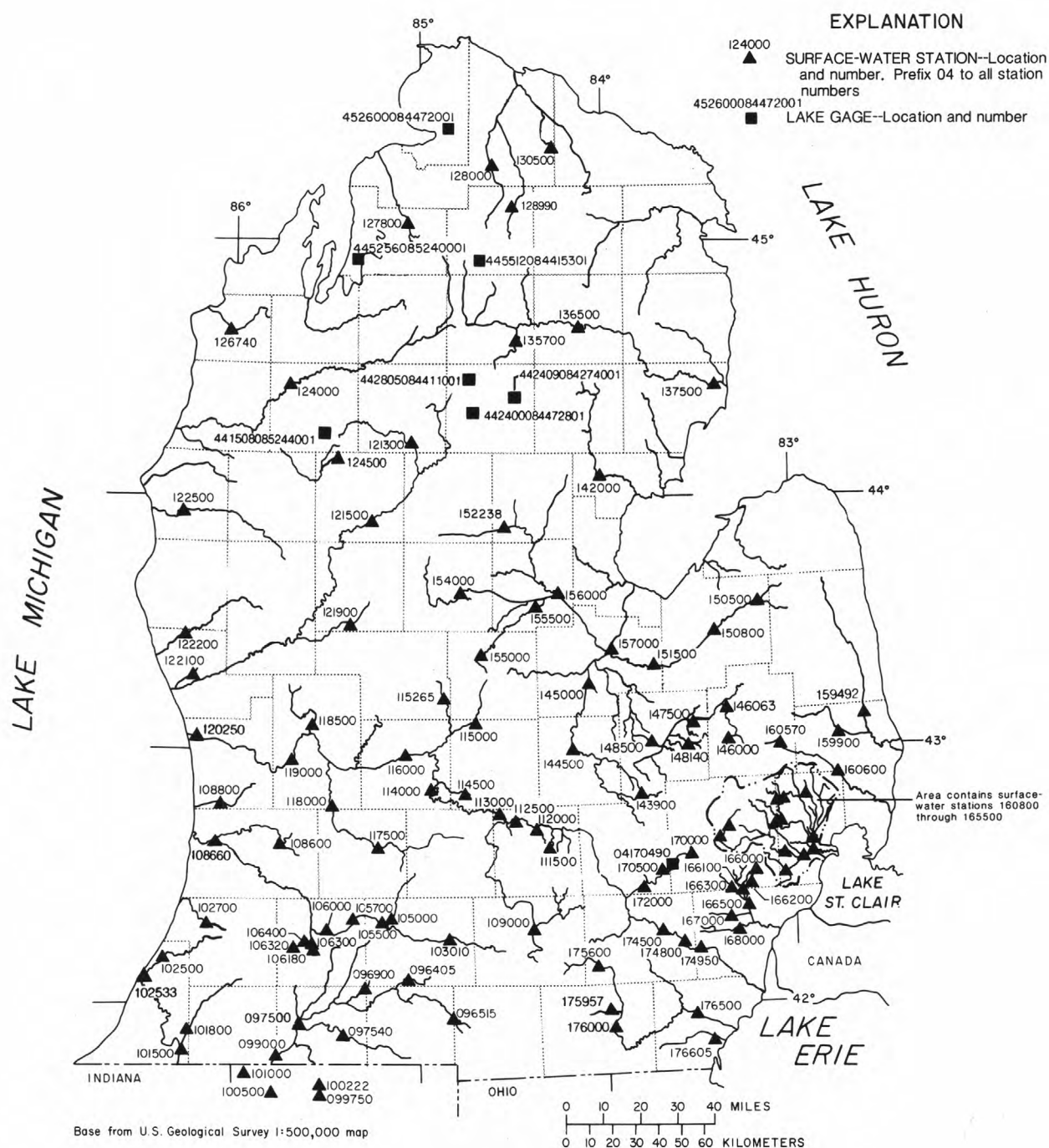


Figure 5.--Identification number and location of active surface-water gaging stations in the Lower Peninsula of Michigan.

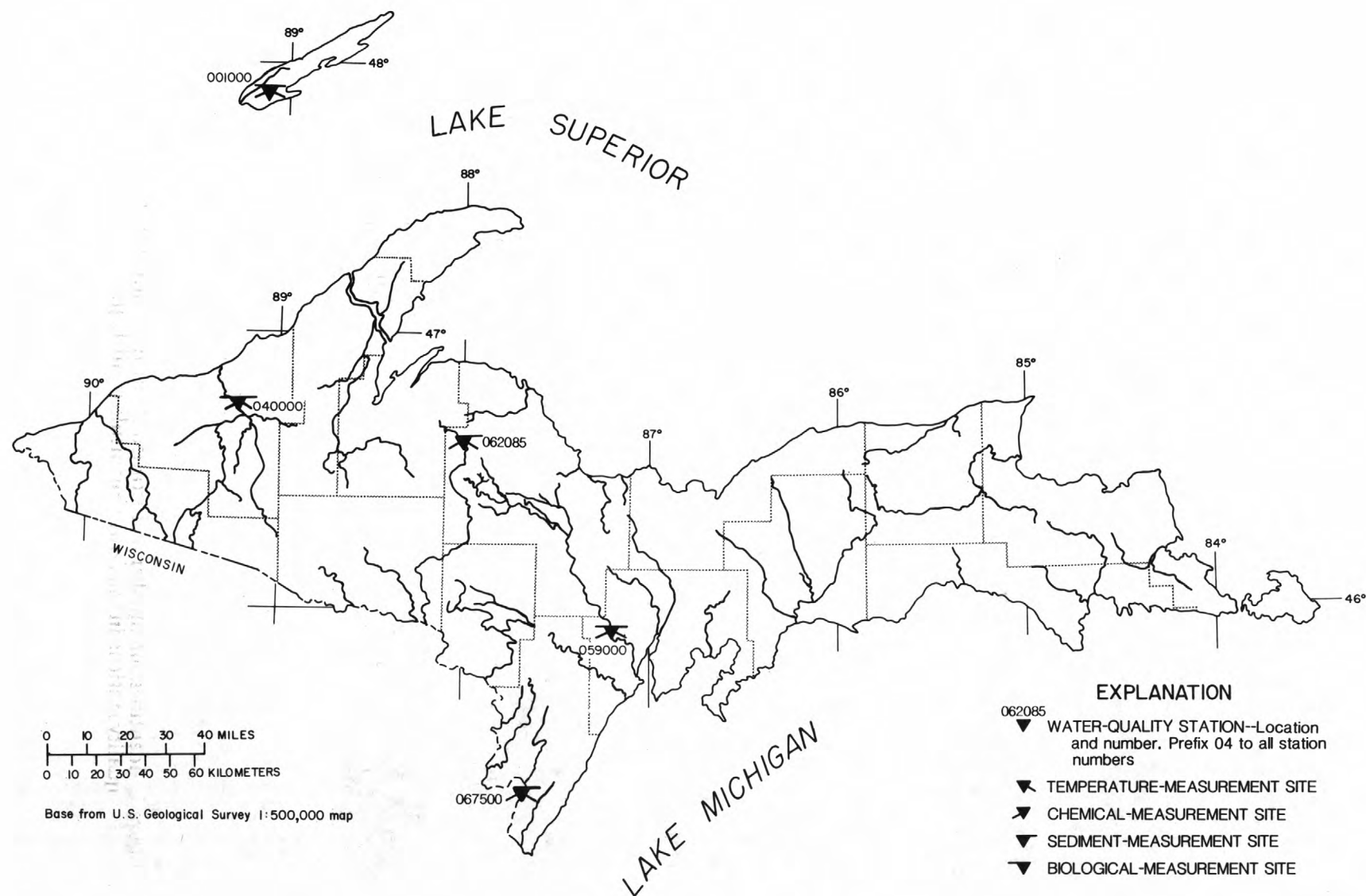


Figure 6.--Identification number and location of active surface-water-quality stations in the Upper Peninsula of Michigan.

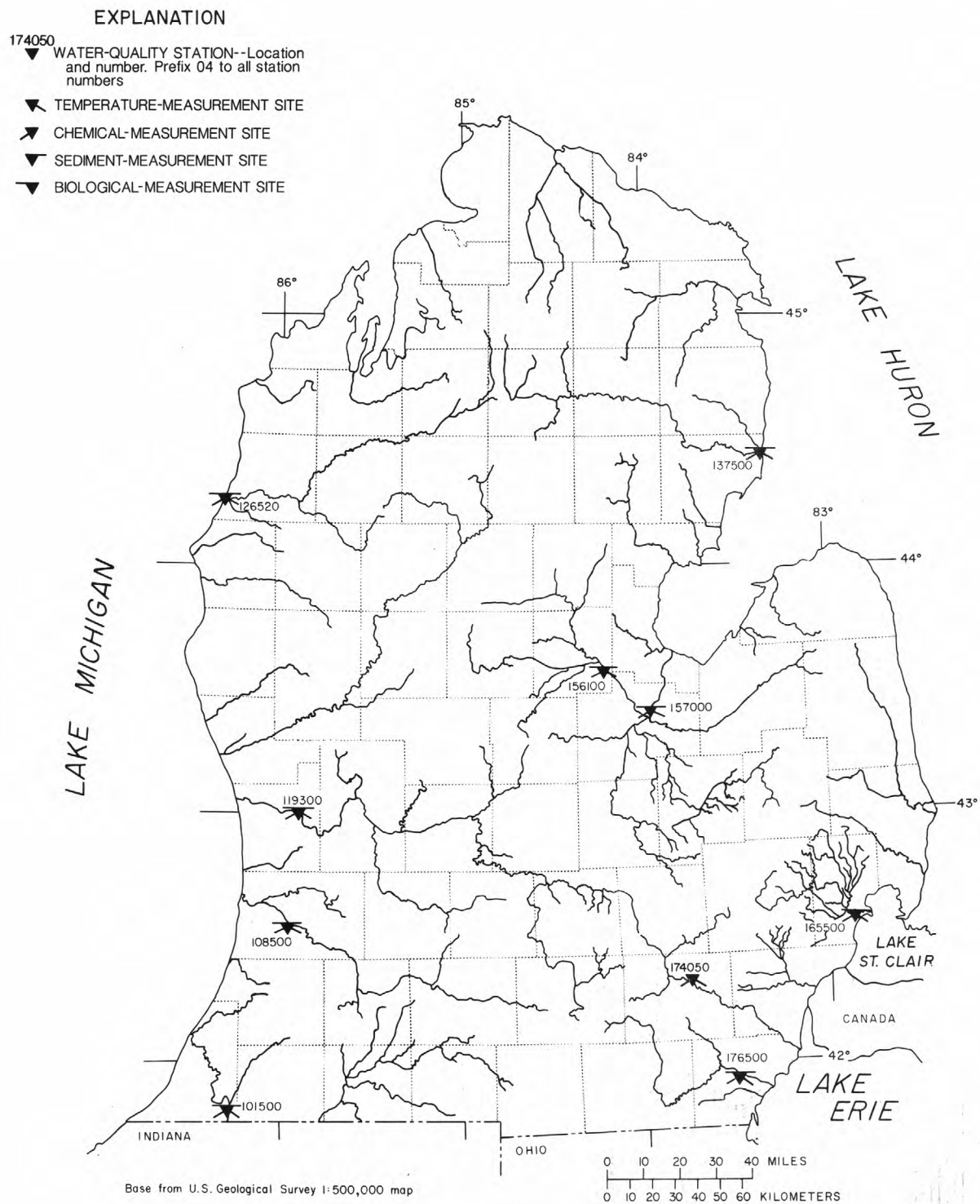


Figure 7.--Identification number and location of active surface-water-quality stations in the Lower Peninsula of Michigan.

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.

WATER-DISCHARGE RECORDS

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.--Water-discharge records good except for estimated daily discharges, which are poor.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.2	4.6	e4.6	e2.0	e1.4	e1.4	e4.0	84	27	6.3	3.9	9.3
2	3.2	4.4	e4.6	e1.9	e1.4	e1.3	e3.5	81	21	5.3	3.6	8.6
3	3.2	4.3	e4.8	e1.9	e1.4	e1.4	e2.5	90	18	4.4	6.2	7.9
4	3.1	4.0	e4.6	e1.8	e1.3	e1.4	e2.1	99	15	3.9	21	e8.4
5	2.9	3.9	e4.5	1.8	e1.3	e1.4	e2.1	88	14	3.8	10	e10
6	2.8	3.6	e4.2	1.8	e1.3	e1.5	e2.2	66	13	3.6	8.1	e13
7	3.0	3.4	e4.2	1.8	1.1	e1.5	e2.3	55	12	3.4	6.9	e11
8	5.3	3.3	e4.0	e1.8	.98	e1.5	e2.5	49	11	57	7.4	e10
9	5.4	3.2	e4.0	e1.8	e1.0	e1.4	e6.0	47	9.2	89	5.8	e9.0
10	4.5	3.4	e4.0	e1.8	e1.0	e1.3	e2.0	40	8.2	61	4.9	e8.5
11	4.2	3.3	e3.8	e1.8	e1.0	1.3	e4.5	37	8.0	37	4.3	e8.0
12	4.2	3.2	e3.8	e1.8	e1.0	1.3	e10.0	34	8.4	34	3.9	e7.5
13	3.7	5.9	e3.8	e1.8	e1.0	e1.3	e15.0	30	7.3	22	4.0	e7.5
14	3.4	12	e3.8	e1.8	e1.0	e1.3	e16.0	36	7.4	16	3.7	e7.5
15	3.5	8.8	e4.0	e1.8	e1.0	e1.4	e18.0	62	8.1	13	3.5	e8.0
16	3.5	7.9	e3.8	e1.7	e1.1	e1.4	e17.0	49	8.9	11	3.2	e21
17	3.6	e7.4	e3.6	e1.6	e1.1	1.4	e13.0	36	24	10	3.5	e17
18	3.5	e7.2	e3.6	e1.6	e1.2	1.4	e101	29	23	8.6	3.5	e14
19	3.3	e7.0	e3.8	e1.6	e2.5	1.4	e95	26	17	7.5	3.5	e12
20	3.3	e7.0	e3.8	e1.6	e5.0	1.4	e90	23	13	8.6	3.4	e10
21	6.2	5.7	e3.6	e1.6	e9.0	e2.5	86	21	9.9	8.4	3.1	e10
22	6.7	e6.0	e3.5	e1.6	e15	e4.0	73	19	8.2	7.1	2.8	e10
23	6.0	5.3	e3.4	e1.6	e9.0	e7.0	83	18	7.1	6.4	2.6	e12
24	5.3	4.7	e3.2	e1.6	e5.0	e6.0	121	19	6.0	5.8	5.4	e12
25	4.6	4.1	e3.0	e1.6	e2.0	e4.5	96	34	5.1	5.6	4.8	e12
26	4.3	4.7	e2.6	e1.5	1.5	e3.5	187	36	4.4	5.5	9.6	e13
27	4.1	e7.0	e2.3	e1.5	1.5	e2.5	149	28	3.9	4.9	9.8	e14
28	5.6	e5.8	e2.1	e1.5	e1.4	e2.3	92	23	7.2	4.3	26	e16
29	6.5	e5.2	e2.1	e1.5	---	e2.1	72	20	11	4.1	16	e14
30	5.7	e4.8	e2.0	e1.5	---	e1.9	73	19	7.6	3.8	11	e13
31	5.2	---	e2.0	e1.5	---	e2.0	---	31	---	3.6	9.8	---
TOTAL	133.0	161.1	111.1	52.5	72.48	66.0	2300.2	1329	343.9	464.9	215.2	334.2
MEAN	4.29	5.37	3.58	1.69	2.59	2.13	76.7	42.9	11.5	15.0	6.94	11.1
MAX	6.7	12	4.8	2.0	15	7.0	187	99	27	39	26	21
MIN	2.8	3.2	2.0	1.5	.98	1.3	2.1	18	3.9	8.4	2.6	7.5
CFSM	.33	.41	.27	.13	.20	.16	5.81	3.25	.87	1.14	.53	.84
IN.	.37	.45	.31	.15	.20	.19	6.48	3.75	.97	1.31	.61	.94

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1994, BY WATER YEAR (WY)

	MEAN	12.1	15.0	7.39	4.35	3.81	12.2	70.8	38.9	14.0	6.68	4.42	7.88
MAX	33.8	47.2	18.3	18.1	13.0	58.7	154	103	34.2	18.4	14.0	55.1	
(WY)	1986	1992	1966	1966	1966	1966	1967	1972	1968	1968	1966	1977	
MIN	.76	.88	.63	.60	.61	1.10	20.3	5.13	2.87	1.04	.71	.57	
(WY)	1977	1977	1977	1977	1977	1965	1987	1977	1988	1988	1976	1976	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1965 - 1994

ANNUAL TOTAL	4214.8	5583.58	
ANNUAL MEAN	11.5	15.3	
HIGHEST ANNUAL MEAN			16.4
LOWEST ANNUAL MEAN			33.1
HIGHEST DAILY MEAN	158	187	412
LOWEST DAILY MEAN	1.9	.98	.44
ANNUAL SEVEN-DAY MINIMUM	2.0	1.0	.47
INSTANTANEOUS PEAK FLOW		252	(a)480
INSTANTANEOUS PEAK STAGE		5.44	(b)6.88
INSTANTANEOUS LOW FLOW			.44
ANNUAL RUNOFF (CFSM)	.87	1.16	1.25
ANNUAL RUNOFF (INCHES)	11.88	15.74	16.92
10 PERCENT EXCEEDS	32	37	39
50 PERCENT EXCEEDS	4.6	4.7	6.0
90 PERCENT EXCEEDS	2.6	1.5	1.5

(a) From rating curve extended above 160 ft³/s based on runoff characteristics of nearby stations.

(b) Backwater from ice.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04001000 WASHINGTON CREEK AT WINDIGO, MI--Continued

WATER-QUALITY RECORDS

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

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: October 1964 to September 30, 1991.

INSTRUMENTATION.--Water-temperature recorder from Oct. 20, 1964 to Sept. 30, 1991.

REMARKS.--Quarterly samples were collected at or near gage.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURE (water years 1966-72, 1974-91): Maximum, 24.5°C, July 8, 1987; minimum, 0.0°C on many days during winter.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

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)
OCT 26...	1300	4.2	132	7.6	6.0	1.1	11.5	95	99
FEB 08...	1300	1.1	205	7.7	0.0	1.5	--	--	K2
MAY 10...	1245	40	68	7.2	6.0	1.7	12.2	100	K8
AUG 23...	1540	2.5	168	7.8	22.0	1.7	8.4	99	K1400

DATE	STREP- TOCOCCHI FECAL KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS TOTAL (MG/L AS CACO3) (00900)	HARD- NESS NONCARB DISSOLV FLD AS CACO3 (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 HCO3 (00453)	ALKA- LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
OCT 26...	30	66	4	18	5.1	2.8	0.50	76	62
FEB 08...	29	88	5	24	6.8	5.1	0.50	101	83
MAY 10...	44	30	6	8.0	2.5	1.4	0.40	30	25
AUG 23...	27	79	2	22	5.9	3.6	0.40	94	77

DATE	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (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, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)
OCT 26...	2.3	2.5	0.10	12	104	0.14	1.18	<0.010	<0.050
FEB 08...	5.1	7.0	<0.10	14	130	0.18	0.38	0.010	0.140
MAY 10...	3.5	0.60	<0.10	7.6	52	0.07	5.62	<0.010	0.060
AUG 23...	1.7	3.2	0.10	12	122	0.17	0.82	<0.010	0.066

STREAMS TRIBUTARY TO LAKE SUPERIOR

04001000 WASHINGTON CREEK AT WINDIGO, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	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)	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)
OCT 26...	0.030	0.40	<0.010	<0.010	<0.010	<10	5	<3
FEB 08...	0.040	0.30	0.020	0.010	<0.010	10	7	<3
MAY 10...	0.020	0.40	0.020	<0.010	0.010	70	4	<3
AUG 23...	0.010	0.60	0.020	<0.010	<0.010	50	8	<3

DATE	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)	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)
OCT 26...	320	5	10	<10	<1	<1	<1.0	32
FEB 08...	480	<4	34	<10	<1	<1	<1.0	48
MAY 10...	150	<4	7	<10	<1	<1	<1.0	14
AUG 23...	530	<4	20	<10	<1	<1	<1.0	44

DATE	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	RADIUM 226, DIS- SOLVED, RADON METHOD (PCI/L) (09511)	URANIUM NATURAL DIS- SOLVED (UG/L AS U) (22703)	URANIUM NATURAL 2 SIGMA WATER, DISS, (UG/L) (75990)	RA-226 2 SIGMA WATER, DISS, (PCI/L) (76001)	SEDI- MENT, SUS- PENDEED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 26...	<6	--	--	--	--	5	0.06	76
FEB 08...	<6	0.03	0.06	<1.0	0.010	8	0.02	87
MAY 10...	<6	<0.02	<0.01	<1.0	0.00	11	1.2	81
AUG 23...	<6	--	--	--	--	7	0.05	86

STREAMS TRIBUTARY TO LAKE SUPERIOR

04033500 BOND FALLS CANAL NEAR PAULDING, MI

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

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

GAGE.--Water-stage recorder and concrete control. Datum of gage is 1,441.59 ft above sea level. Prior to Oct. 1, 1968, nonrecording gage at same site and at datum 3.00 ft higher.

REMARKS.--Records good except for estimated daily discharges, which are fair and those below 5.0 ft³/s, which are poor. Canal diverts water from Bond Falls Reservoir (station 04034000) to South Branch Ontonagon River; water is used for power production at Victoria Dam near Rockland. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	100	9.4	10	92	240	107	15	61	55	161	211	8.5
2	99	9.4	10	e90	239	107	15	40	55	160	270	7.9
3	100	9.4	10	e90	238	106	15	14	109	160	325	7.6
4	100	9.5	10	e90	238	106	15	14	157	159	323	7.9
5	100	9.6	11	e90	238	105	15	14	158	184	321	8.2
6	99	9.4	11	91	238	105	15	33	157	209	319	62
7	100	9.4	11	92	238	104	15	62	157	208	318	124
8	101	9.4	11	e90	238	104	14	63	156	208	260	151
9	100	9.4	11	e90	238	104	14	40	156	106	213	151
10	100	9.4	11	90	238	104	14	13	156	10	212	151
11	100	9.4	11	88	238	104	14	14	156	10	211	151
12	118	9.4	11	e87	236	104	14	13	155	10	210	150
13	145	9.7	11	87	e232	104	14	21	216	9.8	209	150
14	177	9.4	47	e87	e230	133	11	46	257	9.9	209	150
15	204	9.4	97	85	e230	196	4.4	52	257	9.8	208	151
16	204	9.5	97	e85	e228	195	3.4	53	256	10	207	69
17	203	9.6	97	84	e226	195	3.5	53	255	10	206	9.1
18	202	9.8	97	85	225	194	4.1	53	144	10	205	9.2
19	201	9.7	97	e84	227	193	2.5	53	11	11	205	9.2
20	201	9.8	97	e83	227	192	.4	53	11	10	205	9.4
21	201	9.8	97	e82	125	191	.2	54	10	10	204	9.4
22	171	9.9	97	e82	16	191	.2	54	120	10	203	9.4
23	130	9.9	97	e82	15	108	.2	54	223	10	203	9.4
24	114	9.9	96	80	15	16	.3	54	214	11	202	9.4
25	111	10	96	113	58	15	.4	54	214	92	201	9.7
26	102	10	94	193	108	15	.9	54	213	166	200	9.7
27	102	10	95	194	108	15	.00	55	212	185	201	9.8
28	101	10	94	219	107	15	.00	55	212	214	200	9.8
29	61	10	e94	246	---	15	26	55	185	213	200	9.7
30	9.9	10	94	243	---	15	74	55	161	213	201	9.8
31	9.6	---	93	239	---	15	---	55	---	212	90	---
TOTAL	3866.5	289.5	1815	3533	5234	3273	320.50	1364	4798	3001.5	6952	1633.1
MEAN	125	9.65	58.5	114	187	106	10.7	44.0	160	96.8	224	54.4
MAX	204	10	97	246	240	196	74	63	257	214	325	151
MIN	9.6	9.4	10	80	15	15	.00	13	10	9.8	90	7.6

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1994, BY WATER YEAR (WY)

	MEAN	106	101	144	186	210	143	31.6	118	165	169	161	135
MAX	257	253	292	303	305	287	194	194	310	312	284	320	275
(WY)	1959	1972	1972	1986	1969	1984	1973	1986	1966	1993	1993	1947	1944
MIN	.000	6.24	10.2	55.2	88.7	2.21	.33	.92	3.37	14.5	2.98	1.37	1.37
(WY)	1965	1944	1948	1990	1991	1959	1962	1962	1943	1949	1966	1959	1959

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1942 - 1994
ANNUAL TOTAL	50464.9	36080.10	
ANNUAL MEAN	138	98.8	139
HIGHEST ANNUAL MEAN			206
LOWEST ANNUAL MEAN			55.9
HIGHEST DAILY MEAN	317	325	368
LOWEST DAILY MEAN	.30	.00	(a)
ANNUAL SEVEN-DAY MINIMUM	1.7	.29	Apr 22
10 PERCENT EXCEEDS	287	217	296
50 PERCENT EXCEEDS	144	90	139
90 PERCENT EXCEEDS	9.5	9.4	4.8

(a) Apr. 27, 28.

(b) No flow for several days in 1963-70, 1973-75, 1982, 1987, 1991, 1994.

(c) No flow in 1963-65, 1967, 1975, 1987, 1991.

(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, 31,560 acre-ft, May 31, June 1-3, gage height, 136.8 ft; minimum, 12,280 acre-ft, Mar. 22, 23, gage height, 127.2 ft.

MONTHEND GAGE HEIGHT AND CONTENTS AT 1030, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

Date	Gege height (feet)	Contents (acre-feet)	Change in contents	
			(acre- feet)	(equivalent in ft ³ /s)
Sept. 30	129.2	16,080	--	--
Oct. 31	128.9	15,510	-570	-9.3
Nov. 30	132.2	21,900	+6,390	+107.4
Dec. 31	133.0	23,500	+1,600	+26.0
CAL YR 1993			-6,300	-8.7
Jan. 31	131.7	20,900	-2,600	-42.3
Feb. 28	128.6	14,940	-5,960	-107.3
Mar. 31	128.0	13,800	-1,140	-18.5
Apr. 30	134.1	25,710	+11,910	+200.2
May 31	136.8	31,560	+5,850	+95.1
June 30	134.2	25,920	-5,640	-94.8
July 31	134.4	26,340	+420	+6.8
Aug. 31	130.0	17,600	-8,740	-142.1
Sept. 30	133.5	24,500	+6,900	+116.0
WTR YR 1994			+1,000	+1.4

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 excellent except for estimated daily discharges, which are 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	46	46	50	e46	e46	44	45	54	45	59	54	56
2	46	46	50	e46	e46	44	45	52	52	56	54	45
3	46	46	49	e46	e46	44	44	51	52	54	54	44
4	47	47	49	e47	e46	44	44	51	52	54	59	43
5	46	49	49	e48	e46	44	43	50	55	54	54	43
6	46	48	48	e46	e46	45	43	49	56	56	53	43
7	46	47	46	46	e45	44	44	49	53	54	53	43
8	55	46	46	e47	e45	43	46	48	52	63	53	42
9	49	46	49	e47	e45	44	49	48	52	68	54	42
10	47	46	47	e47	e45	43	52	44	51	57	53	43
11	46	47	45	48	e45	43	55	46	53	57	52	42
12	46	46	48	47	45	43	56	45	52	80	52	42
13	46	53	49	e47	45	43	56	45	53	60	52	44
14	46	54	49	e47	44	44	56	45	52	55	52	44
15	46	51	48	e47	45	44	64	48	51	54	52	78
16	46	49	48	e46	44	43	64	48	51	54	52	109
17	46	49	48	e46	44	43	60	50	56	54	52	57
18	46	48	48	e46	45	43	57	47	60	54	52	50
19	46	48	48	e46	e46	42	55	45	55	56	53	48
20	46	47	48	e46	e47	43	50	46	53	59	81	47
21	54	48	47	e46	45	45	48	43	53	60	59	48
22	48	47	44	e46	e46	46	47	42	52	59	55	51
23	47	47	45	e46	44	45	47	42	53	56	54	54
24	46	46	e46	46	44	45	48	42	53	55	53	49
25	46	45	e46	46	e44	43	48	44	53	55	52	54
26	46	49	e46	e46	e44	42	75	43	64	55	52	66
27	46	44	e46	46	e44	42	85	42	56	54	67	62
28	46	45	e46	46	44	43	59	42	61	54	63	58
29	46	49	e46	e46	---	43	56	43	60	54	55	55
30	47	47	e46	e46	---	43	55	43	56	54	66	52
31	46	---	e46	e46	---	44	---	44	---	55	69	---
TOTAL	1452	1426	1466	1438	1261	1351	1596	1431	1617	1769	1736	1554
MEAN	46.8	47.5	47.3	46.4	45.0	43.6	53.2	46.2	53.9	57.1	56.0	51.8
MAX	55	54	50	48	47	46	85	54	64	80	81	109
MIN	46	44	44	46	44	42	43	42	45	54	52	42

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1994, BY WATER YEAR (WY)

MEAN	55.4	56.7	48.5	47.1	46.6	50.8	82.3	106	98.7	71.4	58.1	54.0
MAX	221	239	102	84.7	76.7	118	297	422	461	253	105	216
(WY)	1943	1943	1943	1943	1943	1943	1943	1943	1943	1953	1952	1942
MIN	43.5	33.1	32.0	31.7	31.0	32.4	36.5	38.8	50.7	50.2	42.6	43.2
(WY)	1944	1949	1949	1949	1949	1949	1949	1949	1992	1989	1944	1967

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1942 - 1994
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ANNUAL TOTAL	22255		18097				
ANNUAL MEAN	61.0		49.6		64.2		
HIGHEST ANNUAL MEAN					187		1943
LOWEST ANNUAL MEAN					42.4		1949
HIGHEST DAILY MEAN	412	Jun 24	109	Sep 16	1550	May	2 1951
LOWEST DAILY MEAN	41	Mar 19	42	(a)	30	Dec	1 1948
ANNUAL SEVEN-DAY MINIMUM	42	Mar 15	42	May 22	31	Mar	6 1949
INSTANTANEOUS PEAK FLOW			237	Sep 15	1750	Nov	7 1951
INSTANTANEOUS PEAK STAGE			2.54	Sep 15	5.05	Nov	7 1951
INSTANTANEOUS LOW FLOW					14		(b)
10 PERCENT EXCEEDS	59		56		66		
50 PERCENT EXCEEDS	49		47		50		
90 PERCENT EXCEEDS	44		44		44		

(a) During several days in March, May, and September.

(b) Sometime during period Jan. 23 to Feb. 13, 1947, caused by 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 good except for estimated daily discharges, which are 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	243	255	e268	e220	e190	e260	e450	873	254	281	219	472
2	246	261	e280	e215	e190	e270	e600	696	239	268	216	327
3	247	260	e280	e210	e190	e280	e750	581	231	240	209	275
4	245	281	e275	e210	e190	e290	e620	515	224	223	264	243
5	247	339	e270	e215	e190	e315	e500	653	225	217	280	229
6	240	318	e260	e215	e190	e330	e395	577	316	227	249	227
7	235	264	e250	e220	e190	e350	e310	478	345	397	225	223
8	329	288	237	e220	e190	e330	e471	417	282	651	219	213
9	373	259	234	e230	e190	e315	e886	388	251	1380	215	207
10	319	253	263	e238	e190	e300	e1330	359	234	615	209	203
11	e500	255	233	e238	e190	e290	e1890	349	235	482	205	199
12	e530	256	243	e235	e190	e280	e1740	342	291	872	202	196
13	e670	618	276	e230	e190	e290	e1500	316	292	459	201	208
14	e510	1100	287	e230	e195	296	e1400	301	286	304	199	219
15	e420	759	280	e220	e200	365	1890	385	258	256	196	269
16	e480	549	291	e220	e200	474	1910	448	243	248	194	2040
17	e270	434	294	e210	e200	438	2070	388	1670	432	193	793
18	e330	373	299	e210	e200	315	1790	330	1710	305	196	441
19	e330	332	302	e190	e400	321	1660	290	721	255	197	321
20	e375	307	296	e185	e1000	278	1100	270	382	283	581	269
21	566	313	281	e185	e800	312	827	257	285	322	404	255
22	593	289	231	e190	e500	596	663	246	248	574	296	260
23	409	260	215	e190	e450	1090	614	237	229	452	251	497
24	289	242	e205	e195	e350	e920	654	233	290	333	231	415
25	267	232	e200	e200	e300	e800	588	252	253	278	223	383
26	245	254	e205	e200	e270	e680	1800	308	247	268	213	955
27	239	e270	e210	e200	e260	e540	2850	275	235	245	213	1090
28	247	e280	e210	e200	e250	e450	1390	247	325	225	461	801
29	245	279	e215	e200	---	e400	1000	234	410	214	309	726
30	256	e279	e220	e200	---	e340	996	233	324	207	319	555
31	257	---	e220	e195	---	e340	---	248	---	207	644	---
TOTAL	10752	10459	7830	6516	8045	12855	34644	11726	11535	11720	8233	13511
MEAN	347	349	253	210	287	415	1155	378	384	378	266	450
MAX	670	1100	302	238	1000	1090	2850	873	1710	1380	644	2040
MIN	235	232	200	185	190	260	310	233	224	207	193	196

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1994, BY WATER YEAR (WY)

MEAN	437	465	326	267	267	571	1554	752	555	368	333	359
MAX	1026	1145	618	378	634	1652	2919	1672	1396	1181	1091	1224
(WY)	1986	1989	1983	1946	1984	1973	1971	1973	1944	1949	1953	1942
MIN	191	214	209	199	187	183	385	245	189	182	173	175
(WY)	1949	1949	1990	1991	1949	1965	1987	1977	1992	1988	1976	1948

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1942 - 1994

ANNUAL TOTAL	164753	147826	
ANNUAL MEAN	451	405	518
HIGHEST ANNUAL MEAN			756
LOWEST ANNUAL MEAN			331
HIGHEST DAILY MEAN	3190	Apr 10	16300
LOWEST DAILY MEAN	200	Dec 25	145
ANNUAL SEVEN-DAY MINIMUM	209	Dec 23	163
INSTANTANEOUS PEAK FLOW			7180
INSTANTANEOUS PEAK STAGE			11.28
INSTANTANEOUS LOW FLOW			Jun 17
10 PERCENT EXCEEDS	1010		(b)27000
50 PERCENT EXCEEDS	264		(c)21.2
90 PERCENT EXCEEDS	219		(d)142
			1020
			290
			210

(a) Jan. 20, 21.

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

(c) From floodmarks.

(d) 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 Company 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.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily gage height, 4.30 ft, present datum, Apr. 22, 1971; minimum daily, 0.68 ft, present datum, Apr. 5, 6, 1970.

EXTREMES FOR CURRENT YEAR.--Maximum daily gage height, 3.32 ft, May 21; minimum daily, 1.07 ft, Mar. 21, 23.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.81	2.83	2.37	1.96	1.77	1.39	1.13	2.87	3.05	3.03	2.89	2.96
2	2.86	2.80	2.35	1.96	1.76	1.38	1.13	2.93	3.02	2.99	2.90	2.94
3	2.86	2.75	2.33	1.94	1.77	1.35	1.15	2.98	3.01	2.98	2.90	2.93
4	2.81	2.68	2.30	1.94	1.75	1.33	1.15	3.03	3.01	2.95	2.83	2.96
5	2.82	2.68	2.27	1.93	1.74	1.31	1.15	3.03	3.02	2.96	2.86	2.91
6	2.85	2.75	2.27	1.93	1.73	1.30	1.15	3.04	3.05	2.95	2.89	2.87
7	2.78	2.75	2.25	1.92	1.74	1.30	1.15	3.08	3.02	3.01	2.88	2.88
8	2.82	2.70	2.23	1.92	1.73	1.27	1.14	3.15	3.02	3.07	2.81	2.87
9	2.84	2.68	2.22	1.91	1.71	1.23	1.19	3.15	3.02	3.05	2.81	2.85
10	2.88	2.66	2.19	1.90	1.71	1.21	1.21	3.14	3.03	3.06	2.81	2.86
11	2.90	2.64	2.17	1.90	1.71	1.20	1.25	3.17	3.01	3.05	2.80	2.87
12	2.84	2.62	2.15	1.89	1.70	1.18	1.31	3.17	3.05	3.03	2.82	2.87
13	2.87	2.64	2.13	1.89	1.70	1.16	1.43	3.21	3.03	3.00	2.80	2.88
14	2.86	2.66	2.12	1.88	1.70	1.16	1.52	3.24	3.08	2.98	2.78	2.87
15	2.85	2.69	2.10	1.88	1.69	1.13	1.66	3.21	3.03	2.94	2.75	2.97
16	2.86	2.72	2.08	1.87	1.68	1.12	1.87	3.23	2.99	2.91	2.76	2.98
17	2.87	2.67	2.08	1.88	1.67	1.10	1.98	3.24	3.01	2.97	2.72	2.95
18	2.87	2.68	2.07	1.88	1.62	1.09	2.06	3.25	3.19	2.95	2.72	2.92
19	2.88	2.66	2.06	1.88	1.59	1.08	2.17	3.27	3.19	2.92	2.74	2.94
20	2.90	2.63	2.05	1.87	1.58	1.08	2.22	3.29	3.18	2.98	2.75	2.96
21	3.02	2.62	2.04	1.83	1.56	1.07	2.24	3.32	3.12	2.97	2.77	2.99
22	2.96	2.55	2.03	1.81	1.53	1.08	2.25	3.29	3.07	2.96	2.77	2.98
23	2.97	2.56	2.02	1.81	1.50	1.07	2.28	3.27	3.02	2.95	2.78	2.97
24	2.93	2.53	2.01	1.80	1.50	1.12	2.22	3.24	3.00	2.91	2.77	2.95
25	2.93	2.51	2.01	1.79	1.47	1.14	2.26	3.21	2.98	2.85	2.76	2.89
26	2.91	2.52	2.01	1.79	1.45	1.14	2.36	3.17	2.97	2.84	2.77	2.90
27	2.90	2.50	2.00	1.78	1.44	1.15	2.49	3.18	2.99	2.85	2.84	2.96
28	2.94	2.48	1.99	1.79	1.41	1.14	2.63	3.14	3.04	2.86	2.89	2.92
29	2.88	2.44	1.98	1.78	---	1.15	2.74	3.12	3.01	2.85	2.86	2.91
30	2.84	2.40	1.98	1.78	---	1.15	2.80	3.13	3.01	2.87	2.91	2.88
31	2.85	---	1.96	1.77	---	1.14	---	3.12	---	2.90	2.95	---
MEAN	2.88	2.63	2.12	1.87	1.64	1.18	1.78	3.16	3.04	2.95	2.82	2.92
MAX	3.02	2.83	2.37	1.96	1.77	1.39	2.80	3.32	3.19	3.07	2.95	2.99
MIN	2.78	2.40	1.96	1.77	1.41	1.07	1.13	2.87	2.97	2.84	2.72	2.85
CAL YR 1993	MEAN 2.47	MAX 3.48	MIN 1.04									
WTR YR 1994	MEAN 2.42	MAX 3.32	MIN 1.07									

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 about 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, 4.28 ft, Sept. 15; minimum, 3.39 ft, Apr. 2.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994 DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.00	3.68	3.47	3.51	3.50	3.49	3.42	4.04	3.94	4.03	4.04	4.03
2	3.99	3.67	3.47	3.51	3.50	3.48	3.40	4.08	3.95	4.03	4.06	4.01
3	4.00	3.65	3.47	3.50	3.50	3.47	3.42	4.09	3.96	4.04	4.06	3.99
4	4.01	3.64	3.48	3.50	3.49	3.47	3.45	4.08	4.01	4.03	4.04	3.99
5	4.02	3.65	3.49	3.50	3.49	3.46	3.47	4.05	4.02	4.04	4.03	3.94
6	4.04	3.67	3.49	3.51	3.49	3.45	3.49	4.03	4.02	4.03	4.03	3.92
7	4.04	3.68	3.50	3.51	3.49	3.44	3.50	4.02	4.02	4.02	4.00	3.93
8	4.13	3.67	3.51	3.52	3.49	3.45	3.52	4.01	4.03	4.03	3.97	3.93
9	4.12	3.64	3.51	3.52	3.49	3.45	3.52	3.96	4.03	4.06	3.98	3.94
10	4.07	3.62	3.51	3.52	3.49	3.46	3.51	4.01	4.03	4.04	3.98	3.95
11	4.02	3.61	3.52	3.51	3.49	3.47	3.51	4.01	4.03	4.03	3.96	3.95
12	3.93	3.60	3.53	3.51	3.50	3.48	3.51	4.02	4.05	3.97	3.97	3.96
13	3.90	3.63	3.53	3.50	3.50	3.49	3.53	4.05	3.97	3.97	3.94	3.99
14	3.88	3.63	3.53	3.49	3.52	3.51	3.54	4.08	3.95	3.98	3.92	4.01
15	3.87	3.63	3.53	3.49	3.51	3.50	3.58	4.06	3.97	3.97	3.93	4.10
16	3.84	3.62	3.53	3.49	3.51	3.51	3.59	4.07	4.02	3.99	3.93	4.23
17	3.84	3.59	3.53	3.49	3.50	3.52	3.61	4.07	4.03	3.99	3.92	4.16
18	3.83	3.59	3.53	3.50	3.50	3.50	3.59	4.05	4.03	3.99	3.93	4.10
19	3.82	3.55	3.52	3.50	3.52	3.48	3.55	4.05	4.00	4.01	3.95	4.05
20	3.80	3.55	3.52	3.50	3.52	3.45	3.54	4.04	3.99	4.04	4.00	4.02
21	3.78	3.53	3.53	3.50	3.51	3.42	3.53	4.03	4.00	4.01	4.01	4.06
22	3.78	3.51	3.52	3.50	3.51	3.40	3.53	3.98	3.99	3.98	4.03	4.13
23	3.78	3.50	3.52	3.49	3.50	3.41	3.56	3.97	3.98	3.94	4.05	4.15
24	3.76	3.48	3.53	3.48	3.50	3.47	3.56	3.94	4.00	3.94	4.03	4.11
25	3.76	3.48	3.52	3.48	3.50	3.49	3.60	3.93	4.01	3.96	4.04	4.08
26	3.72	3.49	3.52	3.48	3.50	3.50	3.71	3.89	---	3.97	4.04	4.10
27	3.72	3.49	3.52	3.48	3.50	3.50	3.82	3.89	4.03	3.96	4.06	4.08
28	3.72	3.48	3.51	3.49	3.49	3.50	3.92	3.89	4.03	3.98	4.07	4.02
29	3.67	3.47	3.51	3.49	---	3.48	3.97	3.93	4.02	3.99	4.07	4.01
30	3.67	3.47	3.51	3.49	---	3.46	4.02	3.93	4.04	4.00	4.07	4.01
31	3.68	---	3.50	3.49	---	3.43	---	3.94	---	4.02	4.05	---
MEAN	3.88	3.58	3.51	3.50	3.50	3.47	3.58	4.01	---	4.00	4.01	4.03
MAX	4.13	3.68	3.53	3.52	3.52	3.52	4.02	4.09	---	4.06	4.07	4.23
MIN	3.67	3.47	3.47	3.48	3.49	3.40	3.40	3.89	---	3.94	3.92	3.92

CAL YR 1993 MEAN 3.74 MAX 4.22 MIN 3.43

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 estimated daily discharges, which are fair and those 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	45	32	34	e35	31	70	1.3	.34	24	.41	65
2	9.4	44	32	34	e35	30	35	29	.31	24	.41	64
3	9.6	43	26	34	e35	30	2.6	59	.30	24	.35	63
4	9.6	42	18	34	e35	30	2.5	78	.30	23	.42	64
5	10	43	19	34	e20	30	2.7	89	.31	45	.25	61
6	11	45	19	35	e6	30	3.0	89	.32	65	.25	31
7	11	45	19	35	e6	15	3.0	87	.33	64	.24	4.7
8	49	55	19	36	e6	2.9	3.8	85	.35	65	.13	3.1
9	131	64	20	35	e6	3.1	26	43	.34	67	.5.9	1.4
10	166	62	20	35	e6	3.2	54	1.0	12	66	.4.9	.94
11	160	62	20	35	e20	3.4	54	.67	25	65	.4.4	.90
12	152	61	20	35	e34	3.6	54	.44	24	61	.4.0	.80
13	101	63	20	35	e34	3.9	54	.61	45	27	.3.7	.80
14	55	63	20	35	33	4.2	54	23	112	1.3	.3.6	.72
15	54	62	29	35	33	4.5	68	40	67	.70	.2.8	.71
16	53	62	35	34	33	4.6	79	40	1.5	.46	.2.5	161
17	52	60	35	34	32	21	80	41	.75	.42	.2.5	175
18	51	60	35	34	32	53	102	40	.60	.39	.2.1	170
19	51	58	35	34	33	76	107	40	.68	.39	.2.1	164
20	51	57	35	34	33	73	92	40	13	32	.2.1	101
21	51	56	35	34	33	71	87	40	23	64	.2.0	47
22	51	55	35	33	32	45	41	38	23	89	.1.7	77
23	51	54	35	33	32	23	.97	38	23	51	.1.6	109
24	50	53	35	e34	32	24	.40	37	22	1.2	.1.6	128
25	51	53	35	e34	32	25	.39	37	13	.83	.1.6	126
26	47	54	35	e34	32	25	.81	18	.50	.62	.1.9	129
27	47	54	35	e34	32	26	1.4	1.3	.42	.46	.2.0	150
28	47	53	35	e34	31	48	1.3	.61	12	.45	.2.1	164
29	44	44	35	e34	---	76	1.7	.39	24	.41	.41	105
30	44	32	35	e34	---	74	1.6	.38	24	.41	101	54
31	44	---	34	e34	---	72	---	.34	---	.41	104	---
TOTAL	1738.6	1604	892	1063	763	961.4	1083.17	1038.04	469.35	864.45	465.92	2292.36
MEAN	56.1	53.5	28.8	34.3	27.2	31.0	36.1	33.5	15.6	27.9	15.0	76.4
MAX	166	64	35	36	35	76	107	89	112	89	104	175
MIN	9.4	32	18	33	6.0	2.9	.39	.34	.30	.39	.41	.72

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1994, BY WATER YEAR (WY)

	MEAN	69.2	67.9	49.1	39.1	35.3	43.4	59.9	45.1	46.5	31.5	26.1	39.1
MAX	151	116	84.1	62.6	81.0	92.1	111	137	123	113	99.7	104	104
(WY)	1986	1968	1961	1983	1945	1973	1985	1960	1953	1953	1978	1977	1977
MIN	13.1	14.5	23.5	23.1	20.6	24.1	2.02	.17	.11	.25	.15	.23	.23
(WY)	1958	1945	1990	1959	1950	1956	1948	1977	1977	1977	1970	1976	1976

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1945 - 1994

ANNUAL TOTAL	15414.50	13235.29	
ANNUAL MEAN	42.2	36.3	46.0
HIGHEST ANNUAL MEAN			65.9
LOWEST ANNUAL MEAN			25.2
HIGHEST DAILY MEAN	181	175	288
LOWEST DAILY MEAN	.37	.30	.08
ANNUAL SEVEN-DAY MINIMUM	.51	.32	.09
INSTANTANEOUS PEAK FLOW		183	288
INSTANTANEOUS PEAK STAGE		5.61	(d)6.10
ANNUAL RUNOFF (CFSM)	.83	.72	.91
ANNUAL RUNOFF (INCHES)	11.31	9.71	12.33
10 PERCENT EXCEEDS	99	73	102
50 PERCENT EXCEEDS	35	34	37
90 PERCENT EXCEEDS	1.6	.74	1.0

(a) May 1-4, 1951.

(b) June 3, 4.

(c) July 21, Aug. 2, 3, 1988.

(d) Present datum.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

LOCATION.--Lat 46°43'15", long 89°12'25", in NE1/4 sec.20, T.50 N., R.39 W., Ontonagon County, Hydrologic Unit 04020102, on left bank 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.

WATER-DISCHARGE RECORDS

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

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

GAGE.--Water-stage recorder 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.--Water-discharge records good except for estimated daily discharges, which are fair. Flow regulated by Victoria powerplant on West Branch 5 mi upstream; Bond Falls Reservoir (station 04034000) 34 mi upstream; Lake Gogebic (station 04035995) and Cisco Lake (station 04037400), in headwaters. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	530	811	e860	e760	e770	e980	e1200	1900	635	984	775	1630
2	591	764	e860	e750	e760	e940	e1450	1740	606	788	597	1230
3	501	794	e850	e750	e750	e900	e1800	1570	611	904	645	856
4	515	848	e840	e740	e750	e900	1530	1430	638	719	806	819
5	498	998	e800	e730	e760	e1000	1380	1440	553	831	925	661
6	503	962	e760	e720	e780	e1050	1380	1390	708	627	1050	738
7	579	856	e720	e700	e800	e1000	1090	1160	740	948	819	647
8	631	904	e680	e710	e780	e1000	1360	1120	752	1250	788	624
9	638	956	e640	e720	e740	e940	1970	999	759	2850	634	620
10	838	879	e700	e730	e740	e860	3030	898	536	1940	614	486
11	665	781	e710	e740	e750	e820	4190	870	633	1590	689	507
12	867	988	e720	e750	e740	e900	4800	849	637	2370	502	503
13	710	1420	e705	e740	e700	e970	4580	725	919	2210	567	531
14	729	2170	e800	e720	e700	e850	4440	710	877	1670	559	442
15	712	2000	e880	e700	e710	e1000	5470	783	934	1010	486	590
16	702	1750	e870	e680	e720	e1200	5290	999	830	840	596	3160
17	662	1510	e880	e680	e800	e1100	5430	942	2900	1250	460	2730
18	623	1250	e870	e670	e950	e1000	4900	761	4630	1220	543	1930
19	692	1080	e850	e660	e1500	e950	4860	860	2730	1090	491	1260
20	743	1040	e800	e660	e2000	e950	3500	696	2120	965	882	999
21	1010	1040	e760	e650	e1800	e1150	2540	655	1390	1220	812	981
22	1160	1030	e740	e640	e1700	e1500	1860	486	891	1440	712	983
23	1090	982	e710	e640	e1300	e2200	1700	673	829	1140	683	1450
24	909	800	e680	e640	e1150	e1800	1830	615	1120	1060	638	1970
25	889	841	e660	e640	e1000	e1600	1760	877	859	916	638	1650
26	787	855	e650	e650	e900	e1300	3040	751	761	852	514	2110
27	889	872	e700	e660	e900	e1100	5230	832	962	792	510	2300
28	889	901	e750	e680	e900	e1000	3780	837	978	687	950	2360
29	866	e900	e780	e700	---	e970	2820	751	879	548	1060	1980
30	756	e875	e770	e720	---	e950	2210	607	995	571	966	1440
31	813	---	e770	e750	---	e1000	---	657	---	571	1400	---
TOTAL	22987	31857	23765	21680	26850	33880	90420	29583	33412	35853	22311	38187
MEAN	742	1062	767	699	959	1093	3014	954	1114	1157	720	1273
MAX	1160	2170	880	760	2000	2200	5470	1900	4630	2850	1400	3160
MIN	498	764	640	640	700	820	1090	486	536	548	460	442

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1994, BY WATER YEAR (WY)

	MEAN	1127	1259	945	840	853	1525	4049	2011	1500	1014	819	895
MAX	3767	3232	1683	1473	1525	4355	6912	4621	3309	2879	2563	2679	
(WY)	1986	1989	1983	1969	1984	1973	1971	1950	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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1942 - 1994

ANNUAL TOTAL	457786	410785	1394
ANNUAL MEAN	1254	1125	1901
HIGHEST ANNUAL MEAN			774
LOWEST ANNUAL MEAN			1948
HIGHEST DAILY MEAN	7730	5470	31200
LOWEST DAILY MEAN	318	442	170
ANNUAL SEVEN-DAY MINIMUM	439	526	246
INSTANTANEOUS PEAK FLOW		9660	(b)42000
INSTANTANEOUS PEAK STAGE		13.20	(c)28.6
ANNUAL RUNOFF (CFSM)	.94	.84	1.04
ANNUAL RUNOFF (INCHES)	12.71	11.40	14.14
10 PERCENT EXCEEDS	2780	1950	2780
50 PERCENT EXCEEDS	850	855	880
90 PERCENT EXCEEDS	537	622	522

(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

04040000 ONTONAGON RIVER NEAR ROCKLAND, MI--Continued

WATER-QUALITY RECORDS

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

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1974 to September 1981.

WATER TEMPERATURE: October 1974 to September 1981.

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

REMARKS.--Quarterly samples were collected at or near Victoria Road bridge.

EXTREMES FOR PERIOD OF DAILY RECORD.--

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

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

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)
OCT 27...	1500	943	133	8.1	7.0	16	11.5	97	K12
FEB 10...	1130	834	149	7.7	0.0	1.0	--	--	K3
MAY 11...	1530	762	119	7.8	11.0	31	10.2	96	K7
AUG 16...	1718	757	146	8.3	21.5	23	9.0	105	K11

DATE	STREP- TOCOC FECAL KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS TOTAL (MG/L AS CACO3) (00900)	HARD- NESS NONCARB DISSOLV FLD. AS CACO3 (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 HCO3 (00453)	ALKA- LITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
OCT 27...	38	65	4	18	4.9	2.4	1.1	75	61
FEB 10...	K2	72	3	20	5.3	2.5	0.90	84	69
MAY 11...	K1	53	1	15	3.8	2.1	1.0	63	52
AUG 16...	25	71	3	20	5.2	2.4	0.90	83	68

DATE	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SiO2) (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, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)
OCT 27...	4.2	2.2	0.10	8.3	98	0.13	250	<0.010	<0.050
FEB 10...	4.5	2.3	<0.10	10	92	0.13	207	<0.010	0.120
MAY 11...	4.6	1.9	<0.10	6.5	81	0.11	167	<0.010	<0.050
AUG 16...	3.4	2.7	<0.10	8.2	105	0.14	215	<0.010	<0.050

STREAMS TRIBUTARY TO LAKE SUPERIOR

04040000 ONTONAGON RIVER NEAR ROCKLAND, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	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)	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)
OCT 27...	0.010	0.30	0.040	<0.010	<0.010	60	23	<3	150	6
FEB 10...	0.040	0.30	0.050	0.020	<0.010	20	26	<3	130	<4
MAY 11...	0.020	0.40	0.050	0.010	0.020	130	21	<3	240	<4
AUG 16...	<0.010	0.30	0.030	<0.010	<0.010	30	24	<3	160	<4

DATE	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	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 27...	11	<10	<1	<1	<1.0	39	<6	63	160	94
FEB 10...	7	<10	<1	<1	<1.0	40	<6	--	--	--
MAY 11...	16	<10	<1	<1	<1.0	36	<6	39	80	98
AUG 16...	8	<10	<1	<1	<1.0	43	<6	15	31	87

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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	58	129	e82	e50	e40	e44	84	669	121	104	102	122
2	83	125	e80	e49	e38	e44	99	566	116	87	100	104
3	89	120	e78	e48	e37	e44	e100	485	102	71	93	85
4	100	124	e78	e48	e36	e44	87	424	88	60	89	72
5	88	131	e76	e47	e34	e46	e88	423	81	55	80	65
6	78	123	e76	e47	e33	e49	e88	397	95	53	76	63
7	80	122	e75	e46	e33	e52	e88	352	96	57	70	58
8	232	118	e74	e46	e33	e49	93	314	88	187	65	53
9	270	108	e73	e46	e33	e46	121	289	79	611	60	48
10	223	104	e72	e45	e33	e44	167	262	70	434	57	45
11	181	102	e71	e45	e33	e43	270	248	72	357	52	41
12	148	99	e72	e45	e33	e42	371	251	184	337	48	39
13	128	164	e72	e44	e33	e42	462	235	122	228	45	39
14	116	268	e71	e44	e33	e42	520	217	120	173	41	40
15	104	247	e70	e44	e33	e47	802	233	146	141	38	43
16	95	210	e70	e43	e34	e54	955	276	129	122	35	63
17	95	190	e70	e43	e34	e50	896	258	115	259	33	64
18	97	162	e70	e43	e42	e45	896	223	198	303	31	59
19	85	159	e70	e43	e70	e44	984	193	236	220	30	52
20	79	130	e70	e43	e105	e44	996	171	201	204	37	48
21	175	148	e68	e43	e100	e44	897	154	151	267	37	45
22	250	136	e66	e43	e90	e44	761	137	113	575	35	42
23	224	123	e64	e43	e75	e55	661	121	96	470	34	46
24	203	124	e62	e43	e61	e70	624	112	129	362	32	46
25	181	116	e60	e43	e55	e80	622	111	93	279	30	51
26	165	106	e58	e43	e50	e74	926	128	76	234	29	136
27	146	e105	e56	e43	e47	68	1290	136	64	198	32	174
28	141	e100	e55	e43	e44	66	1250	122	88	166	51	203
29	146	e90	e54	e43	---	66	990	107	175	142	56	196
30	141	e83	e52	e42	---	e66	803	100	121	123	75	167
31	137	---	e51	e41	---	e67	---	116	---	107	122	---
TOTAL	4338	4066	2116	1379	1322	1618	16991	7830	3565	6986	1715	2309
MEAN	140	136	68.3	44.5	47.2	52.2	566	253	119	225	55.3	77.0
MAX	270	268	82	50	105	80	1290	669	236	611	122	203
MIN	58	83	51	41	33	42	84	100	64	53	29	39
CFSM	.82	.79	.40	.26	.28	.31	3.31	1.48	.69	1.32	.32	.45
IN.	.94	.88	.46	.30	.29	.35	3.70	1.70	.78	1.52	.37	.50

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1913 - 1994, BY WATER YEAR (WY)

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924
MEAN	181	197	118	70.7	62.2	157	764	455	214	128	82.0	129
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	111	24.4	8.00	7.86	4.63
(WY)	1977	1977	1977	1977	1977	1956	1946	1977	1988	1988	1976	1976

SUMMARY STATISTICS FOR 1993 CALENDAR YEAR FOR 1994 WATER YEAR WATER YEARS 1913 - 1994

	1993	1994	1913-1994
ANNUAL TOTAL	62835	54235	212
ANNUAL MEAN	172	149	311
HIGHEST ANNUAL MEAN			104
LOWEST ANNUAL MEAN			1968
HIGHEST DAILY MEAN	1100	May 5	1948
LOWEST DAILY MEAN	19	Aug 27	4450
ANNUAL SEVEN-DAY MINIMUM	21	Aug 23	2.7
INSTANTANEOUS PEAK FLOW			3.2
INSTANTANEOUS PEAK STAGE			Aug 21
INSTANTANEOUS LOW FLOW			Apr 27
ANNUAL RUNOFF (CFSM)	1.01	.87	4630
ANNUAL RUNOFF (INCHES)	13.67	11.80	11.63
10 PERCENT EXCEEDS	440	283	2.7
50 PERCENT EXCEEDS	83	83	1.24
90 PERCENT EXCEEDS	34	42	16.86

(e) Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04041500 STURGEON RIVER NEAR ALSTON, MI

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

DRAINAGE AREA.--346 mi².

PERIOD OF RECORD.--February 1932 to June 1941, October 1942 to current year.

GAGE.--Water-stage recorder. Datum of gage is 709.64 ft above sea level. Prior to Jan. 5, 1948, nonrecording gage, and Jan. 5, 1948, to Sept. 30, 1963, water-stage recorder at same site at datum 39.34 ft lower.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	144	279	204	196	169	189	e190	1030	210	274	228	276
2	144	229	222	199	166	178	e190	1030	210	247	224	276
3	144	230	254	186	169	175	e190	947	196	246	223	244
4	164	230	268	173	166	178	e300	719	172	229	242	198
5	201	231	226	174	175	182	294	756	164	200	257	183
6	215	231	182	173	177	181	308	637	177	186	256	206
7	233	231	174	173	171	195	267	651	184	186	256	202
8	282	246	174	174	168	184	199	648	190	228	253	180
9	314	264	173	174	172	179	224	556	193	1600	224	168
10	315	264	174	183	165	202	286	575	193	1080	181	159
11	313	263	175	193	166	213	503	553	199	656	161	159
12	312	262	174	191	167	226	651	523	270	796	161	149
13	311	263	212	190	168	274	650	469	286	740	161	140
14	309	470	226	190	165	279	649	541	335	531	162	140
15	412	561	209	191	165	290	1050	543	256	409	139	140
16	544	473	209	182	164	311	1530	482	237	301	118	210
17	379	370	198	173	162	269	1590	544	263	430	119	281
18	161	302	170	174	161	216	1490	473	457	486	130	212
19	160	304	180	176	164	205	1420	484	375	665	140	176
20	237	305	167	178	180	202	1440	326	373	366	140	183
21	246	304	182	150	253	186	1390	241	317	354	154	183
22	501	302	191	150	250	197	1220	232	259	793	161	172
23	470	303	207	153	191	219	1030	259	198	1170	169	162
24	368	303	208	159	189	235	967	308	198	1090	177	162
25	318	302	202	165	190	217	918	309	199	485	177	175
26	270	302	184	171	189	203	957	252	199	563	175	449
27	293	251	167	193	183	204	1970	229	185	453	174	565
28	308	206	166	186	191	207	1940	231	178	245	173	626
29	324	225	169	183	---	e200	1760	232	217	246	170	562
30	326	225	184	183	---	e200	1300	232	279	238	225	507
31	324	---	196	178	---	e190	---	200	---	232	280	---
TOTAL	9042	8731	6027	5514	4996	6586	26873	15212	7169	15725	5810	7445
MEAN	292	291	194	178	178	212	896	491	239	507	187	248
MAX	544	561	268	199	253	311	1970	1030	457	1600	280	626
MIN	144	206	166	150	161	175	190	200	164	186	118	140
CFSM	.84	.84	.56	.51	.52	.61	2.59	1.42	.69	1.47	.54	.72
IN.	.97	.94	.65	.59	.54	.71	2.89	1.64	.77	1.69	.62	.80

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1932 - 1994, BY WATER YEAR (WY)

	MEAN	347	386	270	212	200	364	1162	791	439	305	229	279
MAX	973	1001	433	380	412	1255	2093	1750	973	894	595	1056	
(WY)	1986	1989	1988	1969	1984	1973	1960	1965	1944	1968	1978	1968	
MIN	99.4	120	101	111	133	164	420	265	138	94.2	100	70.9	
(WY)	1949	1949	1977	1977	1964	1940	1987	1988	1988	1988	1976	1976	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1932 - 1994

ANNUAL TOTAL	137343						119130						
ANNUAL MEAN	376						326			417			
HIGHEST ANNUAL MEAN										582		1960	
LOWEST ANNUAL MEAN										247		1948	
HIGHEST DAILY MEAN	1770				Apr 10		1970		Apr 27	6820		Apr 25 1960	
LOWEST DAILY MEAN	116				Sep 3		118		Aug 16	(a)1.0		(b)	
ANNUAL SEVEN-DAY MINIMUM	121				Aug 30		134		Aug 15	1.1		Aug 14 1960	
INSTANTANEOUS PEAK FLOW							2430		(c)	7360		Apr 24 1960	
INSTANTANEOUS PEAK STAGE							7.39		(c)	13.09		Apr 24 1960	
ANNUAL RUNOFF (CFSM)	1.09						.94			1.21			
ANNUAL RUNOFF (INCHES)	14.77						12.81			16.38			
10 PERCENT EXCEEDS	840						630			844			
50 PERCENT EXCEEDS	231						219			266			
90 PERCENT EXCEEDS	145						165			137			

(a) About; caused by draining of pond for dam repair.

(b) Aug. 14-19, 1960.

(c) April 20, 27.

(e) Estimated.

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 except for estimated daily discharges, which are fair. Small diversions for sprinkler irrigation. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e14	21	23	e18	e15	18	26	115	42	19	13	19
2	e13	20	23	e18	e15	18	26	104	34	17	13	16
3	e13	22	26	e18	e15	17	27	100	29	16	13	14
4	e13	25	26	e17	e15	17	24	100	25	15	12	13
5	e12	24	24	e17	e14	17	23	92	24	14	12	15
6	e12	21	24	e17	e14	17	24	73	34	14	11	21
7	e12	19	23	e17	e14	18	23	61	31	14	12	17
8	e13	19	23	e17	e14	19	28	55	26	16	11	14
9	e19	19	21	e17	e14	18	41	54	23	86	11	13
10	e16	19	21	e17	e14	17	68	50	20	63	11	12
11	e14	19	22	e17	e14	16	106	49	21	36	10	12
12	e13	19	20	e17	e14	16	156	57	32	26	10	11
13	e12	52	20	e17	e14	16	200	47	26	21	10	11
14	e12	112	19	e17	e14	17	241	42	29	19	10	11
15	e12	66	20	e17	15	20	342	70	53	17	10	12
16	e12	49	20	e16	16	28	304	63	34	16	10	33
17	e12	40	21	e16	16	18	222	48	26	15	9.7	25
18	e12	35	21	e16	16	18	253	40	26	15	9.8	20
19	e12	33	22	e16	16	18	397	35	24	14	9.8	17
20	12	32	22	e15	21	17	284	32	21	14	10	15
21	32	28	22	e15	23	17	213	29	19	15	10	14
22	37	27	21	e15	28	21	188	26	18	24	9.8	14
23	26	24	20	e15	29	26	224	25	16	19	9.9	19
24	22	31	19	e15	26	25	395	35	15	16	10	18
25	20	22	18	e15	24	29	282	94	15	15	12	17
26	18	24	e18	e15	22	23	426	148	14	14	10	19
27	17	39	e18	e16	19	24	371	75	13	14	11	20
28	18	31	e18	e16	19	25	175	54	16	14	56	24
29	24	27	e18	e16	---	24	144	41	29	12	34	23
30	22	24	e18	e15	---	23	135	36	21	12	23	19
31	22	---	e18	e15	---	23	---	38	---	12	21	---
TOTAL	518	943	649	505	490	620	5368	1888	756	634	425.0	508
MEAN	16.7	31.4	20.9	16.3	17.5	20.0	179	60.9	25.2	20.5	13.7	16.9
MAX	37	112	26	18	29	29	426	148	53	86	56	33
MIN	12	19	18	15	14	16	23	25	13	12	9.7	11
CFSM	.60	1.12	.75	.58	.62	.71	6.39	2.18	.90	.73	.49	.60
IN.	.69	1.25	.86	.67	.65	.82	7.13	2.51	1.00	.84	.56	.67

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1994, BY WATER YEAR (WY)

MEAN	32.8	41.2	27.0	21.0	20.4	42.2	182	75.6	38.1	21.8	18.1	23.6
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	1984	1973	1976	1972	1968	1968	1988	1968
MIN	8.71	9.66	9.28	9.03	9.00	16.1	70.3	22.0	11.7	11.4	9.78	9.57
(WY)	1977	1977	1977	1977	1977	1972	1987	1977	1977	1967	1970	1976

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1967 - 1994

ANNUAL TOTAL	13635	13304.0	
ANNUAL MEAN	37.4	36.4	45.2
HIGHEST ANNUAL MEAN			62.6
LOWEST ANNUAL MEAN			31.5
HIGHEST DAILY MEAN	280	426	1120
LOWEST DAILY MEAN	10	9.7	6.8
ANNUAL SEVEN-DAY MINIMUM	11	9.9	7.1
INSTANTANEOUS PEAK FLOW		661	1590
INSTANTANEOUS PEAK STAGE		8.70	10.72
INSTANTANEOUS LOW FLOW		9.4	(b)1.7
ANNUAL RUNOFF (CFSM)	1.33	1.30	1.62
ANNUAL RUNOFF (INCHES)	18.12	17.68	21.95
10 PERCENT EXCEEDS	93	62	91
50 PERCENT EXCEEDS	21	19	22
90 PERCENT EXCEEDS	13	12	13

(a) Aug. 17, 18, 23, 24.

(b) Caused by ice jam upstream.

(c) 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 those below 1.0 ft³/s, which are poor. Flow completely regulated by powerplant at station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	67	168	151	131	121	125	208	225	172	169	165	118
2	74	148	142	130	121	132	208	233	173	169	165	117
3	77	123	142	133	122	167	208	234	172	169	164	117
4	76	112	142	131	122	180	208	231	170	169	165	116
5	77	110	142	132	122	171	208	227	170	168	166	114
6	76	113	142	133	122	171	234	226	172	168	165	116
7	74	113	142	132	122	172	196	224	172	206	161	116
8	77	112	141	132	122	172	196	222	173	168	145	116
9	82	112	138	132	121	170	195	222	172	168	133	116
10	84	113	139	133	122	171	196	222	171	168	127	116
11	80	113	141	130	121	168	199	192	171	165	124	115
12	79	113	142	134	120	171	205	170	172	163	124	114
13	79	113	140	134	120	172	212	170	172	165	123	116
14	79	115	141	137	121	171	213	169	168	165	125	116
15	79	117	141	136	120	172	221	171	199	165	141	116
16	79	122	141	136	120	129	227	172	213	167	116	115
17	79	124	141	130	120	133	222	172	240	169	116	116
18	79	130	141	123	120	170	222	172	207	171	116	116
19	79	135	141	124	120	170	229	171	207	171	115	116
20	114	136	142	125	121	170	222	169	200	170	115	115
21	164	136	143	124	125	262	220	169	196	170	116	116
22	164	138	143	124	136	274	214	170	198	171	54	105
23	165	140	135	124	138	277	211	171	199	170	.00	97
24	163	140	132	124	138	272	212	172	200	170	.00	97
25	164	140	134	124	137	275	211	173	200	171	.00	98
26	164	140	135	123	137	210	277	173	199	171	52	83
27	164	140	134	119	137	210	285	171	200	171	120	70
28	166	140	133	120	130	275	303	169	187	171	120	71
29	163	140	133	120	---	254	319	168	182	166	120	71
30	168	137	133	121	---	269	217	169	175	165	120	71
31	168	---	131	121	---	275	---	170	---	163	121	---
TOTAL	3403	3833	4318	3972	3498	6110	6698	5869	5602	5252	3594.00	3196
MEAN	110	128	139	128	125	197	223	189	187	169	116	107
MAX	168	168	151	137	138	277	319	234	240	206	166	118
MIN	67	110	131	119	120	125	195	168	168	163	.00	70

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1990 - 1994, BY WATER YEAR (WY)

MEAN	133	203	219	164	163	224	276	245	176	154	73.0	83.9
MAX	213	295	304	190	181	256	323	347	262	235	116	109
(WY)	1991	1991	1992	1992	1993	1992	1991	1993	1990	1992	1994	1992
MIN	83.3	128	139	128	125	194	223	189	73.7	116	35.9	57.3
(WY)	1992	1994	1994	1994	1994	1991	1994	1994	1991	1991	1990	1993

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1990 - 1994

ANNUAL TOTAL	63978	55345.00	
ANNUAL MEAN	175	152	177
HIGHEST ANNUAL MEAN			194
LOWEST ANNUAL MEAN			152
HIGHEST DAILY MEAN	360	319	360
LOWEST DAILY MEAN	47	.00	.00
ANNUAL SEVEN-DAY MINIMUM	49	48	.11
10 PERCENT EXCEEDS	344	212	342
50 PERCENT EXCEEDS	164	141	171
90 PERCENT EXCEEDS	52	112	51

(a) Aug. 23-25.

(b) June 13-18, 1992, Aug. 23-25, 1994.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.90	9.59	5.16	4.98	4.85	4.90	5.21	9.20	9.11	8.96	8.30	8.08
2	8.91	9.59	5.18	4.98	4.84	4.89	5.22	9.41	9.16	8.91	8.28	8.11
3	8.94	9.57	5.19	4.98	4.84	4.89	5.22	9.56	9.18	8.88	8.26	8.13
4	8.94	9.56	5.20	4.97	4.83	4.90	5.23	9.66	9.18	8.85	8.24	8.15
5	8.94	9.64	5.19	4.96	4.82	4.93	5.20	9.68	9.16	8.81	8.23	8.16
6	8.95	9.75	5.19	4.96	4.82	5.00	5.16	9.69	9.13	8.79	8.21	8.17
7	8.93	9.75	5.17	4.95	4.81	5.03	5.17	9.61	9.10	8.76	8.18	8.16
8	9.01	9.34	5.14	4.95	4.80	5.02	5.23	9.55	9.07	8.75	8.14	8.16
9	9.12	6.87	5.11	4.95	4.79	5.00	5.32	9.46	9.04	8.72	8.11	8.14
10	9.25	5.30	5.11	4.94	4.79	4.98	5.52	9.39	9.02	8.70	8.09	8.13
11	9.34	5.23	5.09	4.94	4.78	4.96	5.75	9.35	8.99	8.69	8.07	8.13
12	9.36	5.21	5.08	4.94	4.79	4.95	6.02	9.35	8.99	8.64	8.05	8.11
13	9.39	5.37	5.09	4.94	4.79	4.95	6.31	9.36	8.99	8.59	8.02	8.10
14	9.41	5.65	5.11	4.93	4.79	4.96	6.44	9.35	9.04	8.56	7.99	8.09
15	9.40	5.65	5.11	4.92	4.79	4.98	6.73	9.35	9.07	8.52	7.96	8.11
16	9.46	5.53	5.11	4.92	4.79	4.96	7.25	9.46	9.07	8.49	7.95	8.10
17	9.52	5.43	5.10	4.91	4.80	4.94	6.82	9.58	9.07	8.48	7.92	8.07
18	9.57	5.37	5.11	4.90	4.82	4.92	6.36	9.61	9.12	8.48	7.90	8.06
19	9.60	5.33	5.13	4.90	5.05	4.91	6.23	9.59	9.22	8.46	7.89	8.05
20	9.60	5.28	5.14	4.88	5.06	4.91	6.07	9.39	9.30	8.44	7.90	8.04
21	9.63	5.26	5.12	4.86	5.02	4.96	5.86	9.20	9.32	8.43	7.91	8.04
22	9.68	5.24	5.09	4.86	5.02	5.10	5.70	9.02	9.30	8.45	7.89	8.02
23	9.71	5.19	5.08	4.86	5.00	5.16	5.61	8.87	9.27	8.45	7.88	8.01
24	9.69	5.16	5.06	4.87	5.00	5.13	5.55	8.74	9.23	8.44	7.87	7.99
25	9.67	5.12	5.03	4.87	4.98	5.13	5.50	8.65	9.18	8.42	7.85	7.99
26	9.63	5.20	5.04	4.87	4.95	5.13	5.63	8.61	9.14	8.41	7.83	8.06
27	9.61	5.32	5.03	4.87	4.92	5.11	6.27	8.69	9.09	8.37	7.84	8.15
28	9.61	5.27	5.01	4.87	4.91	5.13	7.67	8.77	9.06	8.34	7.91	8.30
29	9.58	5.20	4.99	4.87	---	5.13	8.39	8.83	9.02	8.31	7.90	8.41
30	9.58	5.17	4.99	4.87	---	5.12	8.87	8.89	8.99	8.30	7.92	8.49
31	9.59	---	4.98	4.86	---	5.16	---	9.02	---	8.30	8.01	---
MEAN	9.37	6.50	5.10	4.91	4.87	5.01	6.05	9.25	9.12	8.57	8.02	8.12
MAX	9.71	9.75	5.20	4.98	5.06	5.16	8.87	9.69	9.32	8.96	8.30	8.49
MIN	8.90	5.12	4.98	4.86	4.78	4.89	5.16	8.61	8.99	8.30	7.83	7.99

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 Company 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 September 1994.

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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	60	143	77	75	71	73	133	75	51	54	45	66
2	60	142	76	75	71	73	133	76	51	55	44	66
3	60	141	77	75	71	73	132	76	51	55	44	66
4	60	140	77	73	71	73	119	74	52	54	44	65
5	68	140	76	72	71	73	109	73	52	54	44	66
6	74	140	76	71	71	73	109	74	52	54	44	66
7	74	140	76	71	71	73	109	61	52	67	44	66
8	79	140	76	71	71	73	85	51	52	78	44	66
9	103	140	76	71	71	73	68	51	52	78	44	66
10	126	139	76	71	71	73	68	50	52	78	44	66
11	126	139	76	71	70	74	68	50	44	78	44	66
12	123	139	76	71	70	73	69	50	36	78	44	66
13	124	139	76	71	70	73	69	50	36	65	44	66
14	123	139	76	71	70	73	69	50	44	53	44	66
15	123	139	76	71	70	95	70	50	56	53	44	66
16	124	139	70	72	70	112	70	50	56	53	44	66
17	123	139	76	71	69	111	70	50	54	52	39	66
18	123	139	76	71	69	111	71	50	52	52	44	66
19	82	138	76	71	70	111	71	50	53	52	44	66
20	111	138	76	71	70	110	71	50	52	52	43	66
21	146	138	76	71	70	123	71	50	54	52	43	66
22	145	138	76	71	70	133	71	50	54	48	43	66
23	145	138	76	71	69	134	71	50	54	45	43	66
24	144	138	75	71	69	133	71	50	54	45	43	66
25	144	138	76	71	69	133	71	50	54	45	43	66
26	144	138	75	71	69	133	71	51	54	45	43	57
27	143	138	75	71	69	133	71	51	54	45	43	50
28	144	138	75	71	72	133	71	51	54	45	43	46
29	144	107	75	71	---	126	72	51	54	45	57	50
30	144	77	75	71	---	133	74	51	54	45	67	50
31	143	---	75	71	---	133	---	51	---	45	67	---
TOTAL	3532	4081	2346	2217	1965	3120	2477	1717	1540	1720	1410	1902
MEAN	114	136	75.7	71.5	70.2	101	82.6	55.4	51.3	55.5	45.5	63.4
MAX	146	143	77	75	72	134	133	76	56	78	67	66
MIN	60	77	70	71	69	73	68	50	36	45	39	46
CFSM	1.41	1.68	.93	.88	.87	1.24	1.02	.68	.63	.68	.56	.78
IN.	1.62	1.87	1.08	1.02	.90	1.43	1.14	.79	.71	.79	.65	.87

SUMMARY STATISTICS

FOR 1994 WATER YEAR

ANNUAL TOTAL	28027
ANNUAL MEAN	76.8
HIGHEST DAILY MEAN	146
LOWEST DAILY MEAN	36
ANNUAL SEVEN-DAY MINIMUM	43
INSTANTANEOUS PEAK FLOW	148
INSTANTANEOUS PEAK STAGE	3.86
ANNUAL RUNOFF (CFSM)	.95
ANNUAL RUNOFF (INCHES)	12.87
10 PERCENT EXCEEDS	138
50 PERCENT EXCEEDS	71
90 PERCENT EXCEEDS	45

(a) June 12, 13.

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 (Big) Falls, 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 good. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	543	1110	1080	394	e345	447	499	3150	1290	441	623	739
2	695	1090	1060	392	e340	426	543	3010	1360	446	688	841
3	821	1040	1060	393	e340	406	591	2840	1390	455	689	896
4	884	994	1060	394	e340	395	637	2660	1370	435	635	912
5	922	969	1040	395	e335	391	659	2440	1280	434	603	885
6	927	977	1030	394	e330	394	665	2240	1180	461	560	833
7	887	963	1010	395	e330	402	671	2070	1070	497	506	774
8	972	932	989	392	e325	415	695	1920	968	693	465	707
9	1160	907	957	389	e320	419	745	1740	865	946	466	640
10	1320	876	919	383	e310	421	853	1590	759	1070	462	587
11	1440	852	842	379	e310	418	1040	1490	656	1130	441	530
12	1450	833	848	376	e310	412	1260	1390	572	1070	429	477
13	1470	847	842	379	e310	404	1590	1340	539	983	404	445
14	1430	969	830	378	e310	400	2070	1270	656	889	418	448
15	1360	1090	816	379	e310	395	2700	1190	805	766	429	458
16	1320	1200	792	376	e305	393	3380	1160	856	662	421	468
17	1280	1240	750	373	e310	390	3710	1160	865	586	389	475
18	1250	1280	719	373	e315	383	3940	1130	813	582	376	489
19	1210	1270	703	377	344	377	4040	1100	770	625	365	483
20	1170	1240	688	373	400	375	4070	1050	706	646	363	462
21	1170	1230	666	365	459	377	3990	977	619	652	379	444
22	1240	1200	605	359	487	383	3880	884	558	641	383	419
23	1300	1160	592	358	507	404	3770	812	497	695	371	396
24	1300	1100	579	356	519	430	3630	756	439	712	349	376
25	1310	1040	557	353	516	441	3500	727	404	690	342	364
26	1280	985	525	e350	507	449	3430	733	374	649	380	362
27	1240	1050	494	e350	493	459	3450	776	352	619	464	369
28	1210	1100	469	e350	468	463	3430	762	334	591	511	387
29	1180	1100	445	e350	---	466	3380	752	333	557	531	436
30	1150	1090	422	e350	---	466	3280	1000	391	575	526	473
31	1130	---	405	e350	---	471	---	1180	---	597	592	---
TOTAL	36021	31734	23794	11575	10495	12872	70098	45299	23071	20795	14560	16575
MEAN	1162	1058	768	373	375	415	2337	1461	769	671	470	552
MAX	1470	1280	1080	395	519	471	4070	3150	1390	1130	689	912
MIN	543	833	405	350	305	375	499	727	333	434	342	362
CFSM	1.47	1.34	.97	.47	.47	.53	2.96	1.85	.97	.85	.59	.70
IN.	1.70	1.49	1.12	.55	.49	.61	3.30	2.13	1.09	.98	.69	.78

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1953 - 1994, BY WATER YEAR (WY)

	MEAN	857	1031	791	493	463	713	2766	1684	704	506	428	633
MAX	1768	2284	1756	983	809	1710	4575	4511	1736	1081	1126	1623	
(WY)	1979	1989	1967	1983	1984	1973	1976	1960	1974	1956	1973	1970	
MIN	256	420	339	303	279	335	1537	511	243	209	217	249	
(WY)	1964	1977	1977	1963	1963	1956	1987	1986	1988	1963	1991	1955	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1953 - 1994

ANNUAL TOTAL	373075	316889	922	
ANNUAL MEAN	1022	868	1294	1971
HIGHEST ANNUAL MEAN			616	1963
LOWEST ANNUAL MEAN			6820	May 10 1960
HIGHEST DAILY MEAN	3290	Apr 13	165	Jul 8 1988
LOWEST DAILY MEAN	320	Mar 2	172	Jul 6 1988
ANNUAL SEVEN-DAY MINIMUM	328	Feb 27	6990	May 10 1960
INSTANTANEOUS PEAK FLOW			10.26	May 10 1960
INSTANTANEOUS PEAK STAGE			157	(a)
INSTANTANEOUS LOW FLOW			1.17	
ANNUAL RUNOFF (CFSM)	1.29	1.10	15.87	
ANNUAL RUNOFF (INCHES)	17.57	14.92		
10 PERCENT EXCEEDS	1960	1360	1910	
50 PERCENT EXCEEDS	875	640	580	
90 PERCENT EXCEEDS	378	364	303	

(a) July 26, 1955, July 8, 1988.
(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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	979	1930	1880	e850	e750	e1000	e1000	4160	1310	731	531	637
2	1080	1860	1800	e850	e750	e950	e1020	3940	1320	704	559	723
3	1180	1770	1720	e850	e740	e920	e1050	3660	1260	657	585	731
4	1240	1680	1730	e850	e730	e880	e1140	3330	1160	631	595	685
5	1250	1640	1740	e850	e720	e850	e1200	3020	1080	632	557	636
6	1220	1680	1710	e850	e720	e850	e1240	2750	1050	646	530	614
7	1170	1700	1720	e850	e700	e880	e1280	2560	1030	661	520	594
8	1160	1660	1730	e830	e700	e910	1300	2410	996	664	533	577
9	1290	1620	1690	e820	e680	e900	1360	2290	955	692	561	560
10	1540	1580	1650	e820	e680	e900	1530	2170	916	716	559	534
11	1690	1550	1580	e820	e670	e900	1810	2080	877	704	559	510
12	1750	1530	1390	e820	e670	e880	2180	2050	848	670	531	493
13	1720	1560	1540	e820	e670	e870	2600	1990	856	633	510	488
14	1640	1770	1590	e820	e670	e860	3030	1920	941	599	500	496
15	1560	2040	1580	e820	e670	e850	3450	1850	1030	576	489	501
16	1530	2150	1560	e810	e660	e840	3950	1810	1050	560	487	516
17	1580	2180	1500	e810	e660	e840	4590	1770	1000	562	478	521
18	1640	2130	1430	e810	e680	e830	5280	1720	931	608	474	530
19	1660	2020	1430	e800	e730	e830	5690	1630	870	667	488	557
20	1630	1920	e1420	e800	e860	e820	5680	1480	834	717	483	552
21	1640	1840	e1400	e780	e1000	e830	5490	1380	813	695	475	519
22	1800	1810	e1300	e780	e1040	e840	5250	1300	776	659	469	499
23	1990	1790	e1200	e770	e1100	e850	5010	1240	760	652	460	483
24	2130	1690	e1180	e760	e1120	e860	4690	1180	726	678	457	469
25	2180	1480	e1100	e760	e1100	e890	4350	1150	695	691	459	465
26	2130	1530	e1050	e760	e1080	e920	4170	1160	673	669	443	487
27	2020	1790	e1020	e760	e1060	e950	4120	1210	652	629	437	521
28	1920	1900	e1000	e760	e1020	e960	4240	1220	634	599	439	591
29	1890	1870	e950	e760	---	e980	4350	1180	660	570	440	657
30	1910	1880	e900	e760	---	e980	4320	1160	719	548	449	687
31	1940	---	e860	e760	---	e980	---	1240	---	529	521	---
TOTAL	50059	53550	44350	24960	22630	27600	96370	62010	27422	19949	15578	16833
MEAN	1615	1785	1431	805	808	890	3212	2000	914	644	503	561
MAX	2180	2180	1880	850	1120	1000	5690	4160	1320	731	595	731
MIN	979	1480	860	760	660	820	1000	1150	634	529	437	465
CFSM	1.47	1.62	1.30	.73	.73	.81	2.92	1.82	.83	.59	.46	.51
IN.	1.69	1.81	1.50	.84	.77	.93	3.26	2.10	.93	.67	.53	.57

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1938 - 1994, BY WATER YEAR (WY)

MEAN	1150	1530	1273	954	854	1303	4036	2347	1321	899	684	821
MAX	2720	3777	2569	1777	1516	3358	6401	6963	4531	1783	1670	2657
(WY)	1979	1989	1966	1966	1966	1946	1976	1960	1943	1993	1973	1978
MIN	386	606	480	469	480	547	1962	907	602	402	384	350
(WY)	1949	1977	1977	1977	1963	1963	1946	1987	1988	1955	1963	1948

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1938 - 1994

ANNUAL TOTAL	617536	461311	1430
ANNUAL MEAN	1692	1264	2229
HIGHEST ANNUAL MEAN			806
LOWEST ANNUAL MEAN			1960
HIGHEST DAILY MEAN	5040	May 7	16500
LOWEST DAILY MEAN	720	Mar 1	290
ANNUAL SEVEN-DAY MINIMUM	727	Feb 27	294
INSTANTANEOUS PEAK FLOW			16900
INSTANTANEOUS PEAK STAGE			12.85
INSTANTANEOUS LOW FLOW			288
ANNUAL RUNOFF (CFSM)	1.54		1.30
ANNUAL RUNOFF (INCHES)	20.88		17.67
10 PERCENT EXCEEDS	3260	2060	2780
50 PERCENT EXCEEDS	1500	916	1000
90 PERCENT EXCEEDS	840	530	560

(a) Aug. 27, 28, 30.

(e) Estimated.

04057000 INDIAN LAKE NEAR MANISTIQUE, MI

DRAINAGE AREA.--302 mi².

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

REMARKS.--Indian lake is regulated by vertical lift gates in concrete dam 1.5 mi downstream from lake on outlet. Major inlets to Indian Lake are Silver Creek, Dufour Creek, Indian River, Dead Creek, Smith Creek and Big Spring. Streamflow records for Indian River at lake outlet, collected from March 1938 to September 1971, August 1992 to September 1993; annual peak discharge 1972-82. Established legal level; 613.27 ft, above sea level. Surface area of lake is 8,660 acres.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 7.79 ft, June 24, 1943; minimum, 3.01 ft, Feb. 20, 1948.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 5.34 ft, July 25; minimum, 3.22 ft, Feb. 18, 19.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.63	4.41	3.93	3.51	3.34	3.26	3.38	4.17	4.88	4.68	5.02	4.59
2	4.59	4.39	3.94	3.52	3.33	3.26	3.39	4.15	4.82	4.61	4.98	4.58
3	4.55	4.34	3.93	3.52	3.32	3.25	3.40	4.13	4.78	4.54	4.93	4.58
4	4.49	4.27	3.92	3.52	3.32	3.25	3.41	4.11	4.75	4.48	4.87	4.56
5	4.46	4.28	3.91	3.52	3.31	3.25	3.43	4.17	4.71	4.50	4.81	4.55
6	4.46	4.26	3.92	3.52	3.30	3.25	3.44	4.22	4.72	4.55	4.76	4.57
7	4.46	4.24	3.91	3.52	3.30	3.27	3.44	4.22	4.69	4.60	4.71	4.55
8	4.46	4.19	3.89	3.51	3.29	3.29	3.44	4.24	4.65	4.64	4.70	4.54
9	4.48	4.15	3.88	3.50	3.29	3.27	3.47	4.30	4.62	4.71	4.67	4.53
10	4.49	4.11	3.88	3.49	3.28	3.26	3.51	4.31	4.59	4.71	4.69	4.50
11	4.50	4.09	3.86	3.50	3.27	3.26	3.52	4.37	4.57	4.73	4.71	4.50
12	4.47	4.06	3.83	3.49	3.26	3.25	3.54	4.39	4.60	4.76	4.72	4.50
13	4.47	4.08	3.82	3.48	3.26	3.25	3.60	4.40	4.63	4.75	4.51	4.51
14	4.46	4.08	3.82	3.47	3.25	3.25	3.66	4.42	4.67	4.77	4.78	4.53
15	4.45	4.09	3.81	3.48	3.24	3.26	3.76	4.46	4.71	4.80	4.76	4.53
16	4.51	4.10	3.80	3.47	3.24	3.26	3.85	4.48	4.74	4.83	4.78	4.56
17	4.52	4.07	3.78	3.46	3.23	3.25	3.91	4.48	4.78	4.90	4.77	4.56
18	4.53	4.06	3.79	3.46	3.23	3.24	3.97	4.49	4.81	4.98	4.71	4.54
19	4.54	4.09	3.78	3.44	3.24	3.24	3.99	4.50	4.82	5.01	4.70	4.53
20	4.54	4.06	3.76	3.43	3.59	3.24	4.06	4.51	4.84	5.06	4.68	4.52
21	4.73	4.00	3.77	3.41	3.39	3.25	4.10	4.52	4.86	5.09	4.65	4.50
22	4.60	3.96	3.74	3.40	3.33	3.28	4.11	4.53	4.85	5.12	4.63	4.49
23	4.58	3.93	3.73	3.39	3.31	3.30	4.11	4.54	4.84	5.15	4.60	4.49
24	4.55	3.91	3.71	3.39	3.31	3.30	4.13	4.55	4.84	5.22	4.59	4.49
25	4.50	3.91	3.68	3.38	3.31	3.31	4.11	4.60	4.84	5.25	4.58	4.48
26	4.52	3.92	3.63	3.37	3.30	3.31	4.10	4.66	4.83	5.24	4.57	4.49
27	4.50	3.98	3.58	3.37	3.29	3.31	4.16	4.70	4.81	5.22	4.54	4.52
28	4.50	3.98	3.55	3.37	3.28	3.34	4.15	4.72	4.75	5.17	4.59	4.55
29	4.51	3.97	3.53	3.36	---	3.36	4.16	4.75	4.79	5.13	4.53	4.54
30	4.45	3.95	3.50	3.35	---	3.36	4.18	4.79	4.73	5.10	4.50	4.53
31	4.42	---	3.49	3.34	---	3.36	---	4.89	---	5.06	4.57	---
MEAN	4.51	4.10	3.78	3.45	3.30	3.28	3.78	4.44	4.75	4.88	4.70	4.53
MAX	4.73	4.41	3.94	3.52	3.59	3.36	4.18	4.89	4.88	5.25	5.02	4.59
MIN	4.42	3.91	3.49	3.34	3.23	3.24	3.38	4.11	4.57	4.48	4.50	4.48
CAL YR 1993	MEAN 4.18	MAX 5.02	MIN 3.21									
WTR YR 1994	MEAN 4.13	MAX 5.25	MIN 3.23									

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 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	128	194	239	e120	e64	e58	e110	339	155	64	64	109
2	150	184	199	e120	e62	e58	e120	305	137	60	64	92
3	145	178	188	e120	e62	e60	e130	278	123	57	60	80
4	139	173	180	e110	e62	e62	e130	267	113	56	60	71
5	130	201	172	e110	e62	e66	e130	255	106	59	57	67
6	122	215	172	e110	e60	e70	e120	247	104	62	53	75
7	117	201	179	e110	e58	e72	e120	233	102	75	51	71
8	118	188	169	e110	e56	e68	123	220	95	70	50	75
9	137	180	159	e110	e54	e64	139	222	89	71	52	66
10	145	173	156	e110	e54	e60	184	215	84	68	51	61
11	141	171	143	e110	e56	e58	234	223	81	62	49	56
12	136	170	154	e110	e58	e56	276	254	82	58	49	53
13	135	236	188	e110	e60	e58	409	232	121	54	47	56
14	130	383	170	e100	e60	e62	471	211	169	52	66	76
15	126	355	162	e95	e60	e66	561	209	149	51	60	83
16	173	310	159	e90	e60	e70	635	215	132	49	52	94
17	207	277	153	e85	e60	e66	587	203	116	58	47	90
18	202	248	153	e80	e62	e64	536	189	106	78	47	84
19	189	231	161	e75	e66	e62	504	176	103	68	48	78
20	176	213	165	e70	e72	e62	448	167	94	65	47	75
21	252	199	160	e70	e80	e66	396	158	91	63	46	70
22	322	189	146	e72	e90	e78	349	149	82	65	44	67
23	284	176	e145	e74	e80	e90	312	143	76	80	43	65
24	257	161	e140	e76	e70	e95	293	134	72	111	46	63
25	229	167	e130	e78	e66	e90	296	127	68	100	46	62
26	210	203	e120	e78	e62	e85	369	138	65	95	45	72
27	195	276	e120	e76	e60	e90	527	135	62	85	46	94
28	191	240	e120	e76	e58	e95	461	124	60	75	49	108
29	218	249	e120	e76	---	e100	413	121	70	68	45	115
30	210	290	e120	e72	---	e100	377	129	69	65	52	112
31	202	---	e120	e68	---	e100	---	154	---	62	112	---
TOTAL	5516	6631	4862	2871	1774	2251	9760	6172	2976	2106	1648	2340
MEAN	178	221	157	92.6	63.4	72.6	325	199	99.2	67.9	53.2	78.0
MAX	322	383	239	120	90	100	635	339	169	111	112	115
MIN	117	161	120	68	54	56	110	121	60	49	43	53
CFSM	.97	1.21	.86	.51	.35	.40	1.78	1.09	.54	.37	.29	.43
IN.	1.12	1.35	.99	.58	.36	.46	1.98	1.25	.60	.43	.34	.48

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1994, BY WATER YEAR (WY)

MEAN	180	232	174	110	97.4	174	555	290	187	120	107	133
MAX	337	532	369	182	181	378	847	524	411	254	330	354
(WY)	1983	1978	1971	1969	1984	1973	1979	1972	1979	1968	1978	1978
MIN	55.5	64.4	49.8	50.0	54.2	72.6	271	91.6	50.3	45.7	48.1	40.7
(WY)	1977	1977	1977	1977	1977	1994	1987	1987	1988	1988	1976	1976

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1967 - 1994

ANNUAL TOTAL	69127	48907	
ANNUAL MEAN	189	134	196
HIGHEST ANNUAL MEAN			289
LOWEST ANNUAL MEAN			121
HIGHEST DAILY MEAN	897	May 5	635
LOWEST DAILY MEAN	60	Feb 25	43
ANNUAL SEVEN-DAY MINIMUM	61	Mar 13	45
INSTANTANEOUS PEAK FLOW			642
INSTANTANEOUS PEAK STAGE			6.46
INSTANTANEOUS LOW FLOW			42
ANNUAL RUNOFF (CFSM)	1.03		.73
ANNUAL RUNOFF (INCHES)	14.05		9.94
10 PERCENT EXCEEDS	363		248
50 PERCENT EXCEEDS	150		106
90 PERCENT EXCEEDS	72		57

(e)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 and discharges above 60 ft³/s, 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	36	33	e18	e12	13	22	164	48	44	30	85
2	23	34	32	e18	e12	13	21	134	43	39	26	63
3	20	33	32	e18	e12	13	20	112	38	33	23	52
4	19	34	31	e18	e12	13	20	99	34	28	31	43
5	17	37	30	e17	e12	13	19	95	30	29	26	41
6	17	37	29	e17	e12	14	18	87	36	30	22	43
7	23	35	29	e17	e12	15	19	77	36	35	22	38
8	55	33	29	e17	e11	14	23	68	32	57	19	32
9	75	32	28	e17	e11	13	28	64	28	173	18	25
10	62	31	27	e17	e11	13	37	58	25	243	15	20
11	59	30	27	e17	e12	12	49	61	27	138	14	18
12	43	30	27	e17	e12	12	63	66	50	80	13	17
13	37	43	27	e17	e12	12	80	59	50	56	13	18
14	33	65	26	e17	e12	13	99	55	60	47	12	20
15	30	63	26	e16	e12	14	178	68	121	43	12	20
16	32	57	25	e15	13	14	261	73	98	39	12	22
17	30	51	25	e14	13	13	288	62	64	42	11	20
18	27	48	25	e13	13	13	262	54	89	45	11	18
19	26	47	25	e12	18	13	271	50	104	44	11	14
20	26	47	25	e12	25	13	305	47	73	49	16	13
21	53	45	25	e13	21	13	254	43	53	47	20	13
22	62	41	25	e13	20	16	204	41	44	84	16	17
23	51	39	25	e13	17	19	168	40	39	69	15	26
24	45	38	e24	e13	17	19	158	38	52	53	16	26
25	41	36	e22	e13	16	19	169	42	47	45	16	27
26	39	36	e20	e13	15	18	213	54	39	42	19	41
27	40	39	e19	e13	15	18	423	49	32	37	21	61
28	35	39	e18	e13	14	18	400	45	37	32	51	87
29	36	36	e18	e13	---	18	259	42	54	29	48	80
30	36	35	e18	e12	---	17	203	42	48	30	52	61
31	37	---	e18	e12	---	18	---	48	---	24	90	---
TOTAL	1147	1207	790	465	394	456	4534	2037	1531	1786	721	1061
MEAN	37.0	40.2	25.5	15.0	14.1	14.7	151	65.7	51.0	57.6	23.3	35.4
MAX	75	65	33	18	25	19	423	164	121	243	90	87
MIN	17	30	18	12	11	12	18	38	25	24	11	13
CFSM	.80	.87	.55	.33	.31	.32	3.29	1.43	1.11	1.25	.51	.77
IN.	.93	.98	.64	.38	.32	.37	3.67	1.65	1.24	1.44	.58	.86

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1959 - 1994, BY WATER YEAR (WY)

	MEAN	56.6	60.3	39.4	24.4	21.0	39.0	202	122	60.7	31.5	26.0	38.9
MAX	191	197	77.5	41.5	55.9	149	423	326	153	89.9	76.5	184	184
(WY)	1986	1989	1992	1966	1984	1973	1985	1972	1989	1968	1978	1978	1978
MIN	5.87	5.97	5.57	5.30	6.00	11.5	74.9	35.4	13.3	7.57	5.80	4.91	4.91
(WY)	1977	1977	1977	1977	1977	1964	1987	1977	1988	1988	1976	1976	1976

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1959 - 1994

ANNUAL TOTAL	18091.6	16129	60.0	
ANNUAL MEAN	49.6	44.2	95.3	
HIGHEST ANNUAL MEAN			33.8	1960
LOWEST ANNUAL MEAN				1987
HIGHEST DAILY MEAN	410	423	1830	Apr 20 1985
LOWEST DAILY MEAN	8.9	(e)11	4.2	Sep 12 1976
ANNUAL SEVEN-DAY MINIMUM	9.9	12	4.5	Sep 7 1976
INSTANTANEOUS PEAK FLOW		492	1930	Apr 20 1985
INSTANTANEOUS PEAK STAGE		5.57	9.21	Apr 20 1985
INSTANTANEOUS LOW FLOW		10	4.0	Sep 12 1976
ANNUAL RUNOFF (CFSM)	1.08	.96	1.30	
ANNUAL RUNOFF (INCHES)	14.63	13.04	17.72	
10 PERCENT EXCEEDS	124	80	129	
50 PERCENT EXCEEDS	28	29	32	
90 PERCENT EXCEEDS	12	13	11	

(e) Estimated.

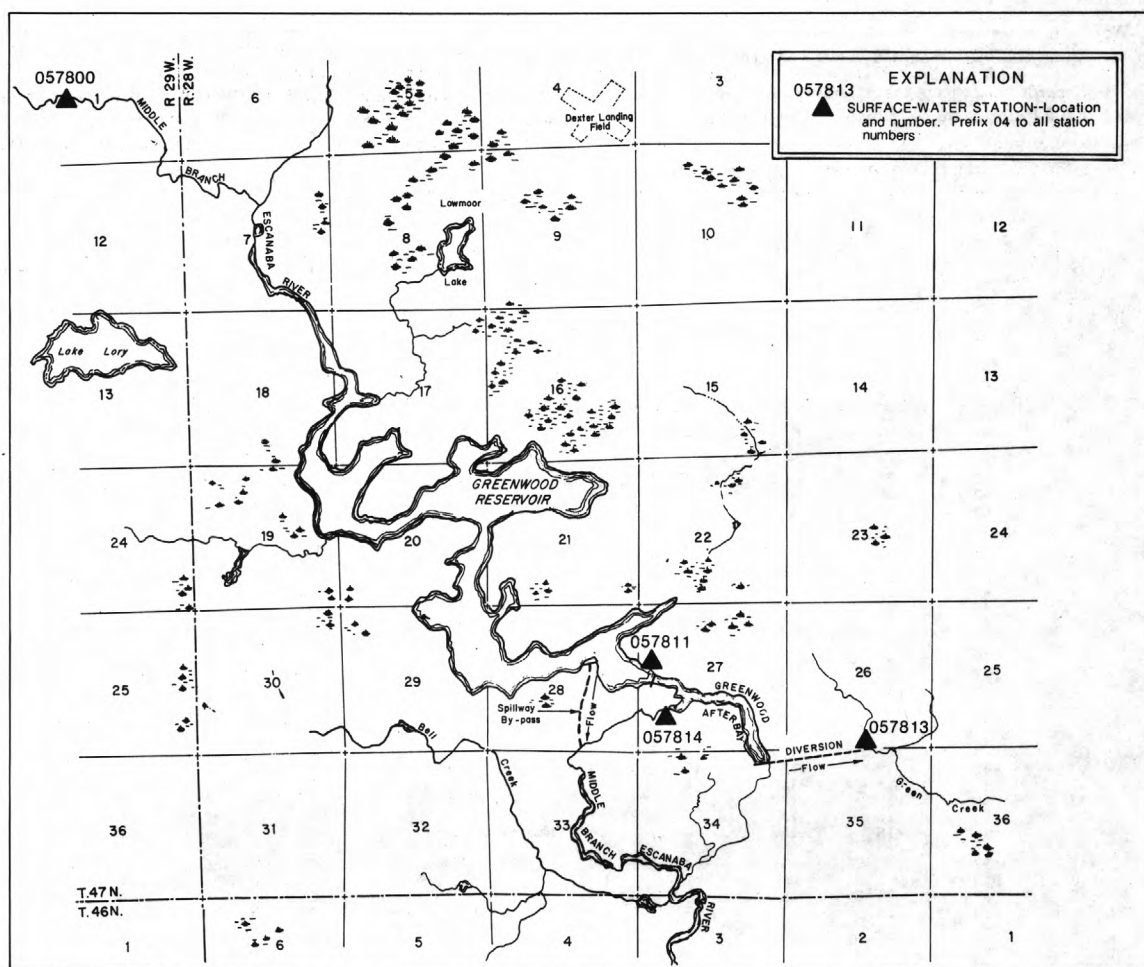


Figure 8.--Identification number and location of active surface-water gaging stations in and around the Greenwood Reservoir Complex.

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.

GAGE.--Water-stage recorder. Datum of gage is 1,400.00 ft above sea level (levels by Cleveland-Cliffs Iron Co.); gage readings 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 about 2,000 ft downstream from Greenwood Release (station 04057814). The main dam is equipped with an outlet structure with 4 valves to control flow to afterbay (conservation pool) which has a capacity of 420 acre-ft at elevation 1,480 ft. Two outlet systems from the afterbay provide for diversion and release flow. Diverted flow to Green Creek gaged at Greenwood Diversion (station 04057813); released flow to Middle Branch Escanaba River gaged at Greenwood Release (station 04057814). Reservoir impounds water for diversion to Schweitzer Reservoir (station 04058190), for use in iron ore processing.

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

EXTREMES FOR CURRENT YEAR.--Maximum contents recorded, 24,280 acre-ft, Apr. 29, elevation, 1,515.7 ft (but may have been more during period of no gage-height record Apr. 23-28.); minimum contents, 15,600 acre-ft, Apr. 8, 9, elevation, 1,508.6 ft.

MONTHEND ELEVATION, IN FEET ABOVE SEA LEVEL, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

Date	Elevation (feet)	Contents (acre-feet)	Change in contents	
			(acre- feet)	(equivalent in ft ³ /s)
Sept. 30	1,512.6	20,220	--	--
Oct. 31	1,513.0	20,700	+480	+7.8
Nov. 30	1,513.6	21,480	+780	+13.1
Dec. 31	1,513.2	20,960	-520	-8.5
CAL YR 1993			-2,480	-3.4
Jan. 31	1,511.6	19,020	-1,940	-31.6
Feb. 28	1,510.5	17,700	-1,320	-23.8
Mar. 31	1,509.0	16,000	-1,700	-27.6
Apr. 30	1,515.6	24,140	+8,140	+136.8
May 31	1,515.1	23,440	-700	-11.4
June 30	1,515.2	23,580	+140	+2.4
July 31	1,514.9	23,170	-410	-6.7
Aug. 31	1,513.5	21,350	-1,820	-29.6
Sept. 30	1,512.6	20,220	-1,130	-19.0
WTR YR 1994			0	0

STREAMS TRIBUTARY TO LAKE MICHIGAN

04057813 GREENWOOD DIVERSION NEAR GREENWOOD, MI

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

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

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

REMARKS.--Records excellent. Flow completely regulated. A pipeline, 0.7 mi long, diverts water from Greenwood Reservoir (station 04057811) into Green Creek, tributary to Schweitzer Reservoir (station 04058190). Water is used for iron ore processing, some returned to Middle Branch Escanaba River 27 mi downstream via another Green Creek, some returned 31 mi downstream via Goose Lake Outlet and East Branch Escanaba River. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	19	14	26	26	18	27	.03	15	10	29	28
2	20	19	14	26	26	15	27	.03	15	11	28	28
3	20	16	14	26	26	14	27	.03	15	14	29	28
4	20	14	14	26	26	14	20	.03	15	16	29	28
5	20	14	14	26	26	14	14	.03	15	18	29	28
6	20	14	14	26	26	14	14	.03	15	20	29	28
7	20	14	14	26	26	14	14	.03	15	21	29	28
8	20	14	14	26	26	14	14	.03	15	22	29	28
9	20	14	14	26	26	14	14	.03	15	22	29	28
10	20	14	14	26	26	14	14	3.6	15	22	29	28
11	20	14	14	26	26	14	14	5.9	15	22	29	28
12	20	14	14	26	26	14	14	5.9	15	22	29	28
13	20	14	14	26	26	14	14	5.9	15	23	29	28
14	20	14	14	26	26	14	14	5.9	15	25	29	28
15	20	14	18	26	26	14	6.9	5.9	15	27	29	28
16	20	14	26	26	26	14	.03	5.9	15	28	29	28
17	20	14	25	26	26	14	.03	5.9	15	28	29	28
18	20	14	24	26	26	14	.03	5.9	15	28	28	29
19	20	14	24	26	26	14	.03	5.9	15	28	28	29
20	20	14	24	26	27	14	.03	5.9	15	28	28	29
21	20	14	24	26	27	14	.03	5.9	15	28	28	28
22	20	14	24	26	27	14	.03	5.9	15	28	28	28
23	19	14	24	26	21	14	.03	5.9	15	28	28	28
24	19	14	24	26	18	14	.03	10	8.1	28	28	28
25	19	14	24	26	18	14	.03	15	3.3	28	28	28
26	19	14	24	26	18	13	.03	15	3.2	28	28	28
27	19	14	24	26	18	13	.03	15	3.2	29	28	28
28	19	14	25	26	18	16	.03	15	3.2	29	28	28
29	19	14	26	26	---	25	.03	15	3.2	29	28	28
30	19	14	26	26	---	27	.03	15	4.5	29	28	28
31	19	---	26	26	---	27	---	15	---	29	29	---
TOTAL	611	432	608	806	686	476	248.35	195.57	373.7	748	885	843
MEAN	19.7	14.4	19.6	26.0	24.5	15.4	8.28	6.31	12.5	24.1	28.5	28.1
MAX	20	19	26	26	27	27	27	15	15	29	29	29
MIN	19	14	14	26	18	13	.03	.03	3.2	10	28	28

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1973 - 1994, 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
MEAN	13.6	11.1	12.9	17.5	17.5	13.2	7.12	9.46	12.8	17.3	17.0	15.9										
MAX	25.0	24.4	25.0	26.0	25.8	25.8	17.2	22.7	26.0	26.1	28.5	28.1										
(WY)	1992	1979	1979	1994	1982	1982	1980	1980	1977	1988	1994	1994										
MIN	.046	.37	.19	.19	.28	.31	.11	.22	.28	1.63	1.20	.39										
(WY)	1978	1974	1974	1974	1974	1974	1977	1973	1974	1982	1977	1977										

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1973 - 1994

ANNUAL TOTAL	5352.8	6912.62	13.9	
ANNUAL MEAN	14.7	18.9	18.9	
HIGHEST ANNUAL MEAN			4.06	1994
LOWEST ANNUAL MEAN			30	1974
HIGHEST DAILY MEAN	28	29	(a)	(b)
LOWEST DAILY MEAN	1.8	.03	(c)	(f)
ANNUAL SEVEN-DAY MINIMUM	1.8	.03	Apr 16	
10 PERCENT EXCEEDS	25	28	26	Apr 11 1987
50 PERCENT EXCEEDS	14	20	14	
90 PERCENT EXCEEDS	1.9	5.9	.66	

(a) July 27 to Aug. 1, Aug. 3-17, 31, Sept. 18-20.

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

(c) Apr. 16 to May 9.

(d) Minimum daily discharge since diversion began Jan. 7, 1973. No flow Dec. 27, 1972 to Jan. 6, 1973.

(f) Apr. 16, 17, 1987.

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 04030110, on left bank at outlet of Greenwood Afterbay releasing to Middle Branch Escanaba River, 2.6 mi upstream from Bell Creek, and 3.8 mi southwest of Greenwood.

DRAINAGE AREA.--67.4 mi².

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

GAGE.--Water-stage recorder and concrete flume. Datum of gage is 1,473.77 ft above sea level (Cleveland-Cliffs Iron Co. bench mark). Prior to Nov. 7, 1973, nonrecording gage at same site and different datum.

REMARKS.--Records good. Since December 1972, flow from Greenwood Reservoir (station 04057811) below spillway elevation 1,515 ft is completely regulated by the afterbay release structure into the Middle Branch Escanaba River. Since January 1973, water diverted immediately upstream from station via Greenwood Diversion (station 04057813) to Green Creek for iron ore processing and some returned to Middle Branch Escanaba River 27 mi downstream via another Green Creek. Since October 1979, some of the diversion returned 31 mi downstream via Goose Lake Outlet and East Branch Escanaba River. Overflow from reservoir spillway bypasses and returns to the Middle Branch Escanaba River 0.5 mi downstream from station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	24	25	25	25	25	26	25	25	26	26	25
2	25	24	25	25	25	25	26	25	25	27	26	25
3	25	24	25	25	25	25	26	25	25	27	26	25
4	25	25	25	24	25	25	26	25	25	28	26	25
5	25	25	25	24	25	25	26	25	25	28	27	25
6	25	25	25	24	25	25	27	26	25	28	27	25
7	25	25	25	24	25	25	27	26	25	27	27	25
8	25	25	25	24	25	25	27	26	25	27	28	25
9	25	25	25	24	25	25	27	26	25	27	28	25
10	25	25	25	24	25	25	27	26	25	27	28	25
11	25	25	25	25	25	24	27	26	25	27	26	25
12	25	26	25	24	25	24	27	26	25	27	24	25
13	25	26	25	24	25	24	27	26	25	27	24	25
14	24	26	25	24	25	24	27	26	25	27	24	25
15	24	26	25	24	25	24	27	26	25	28	24	25
16	24	26	25	24	25	24	27	26	25	28	24	25
17	24	26	24	24	25	24	26	26	25	28	24	25
18	24	26	24	24	25	24	26	26	25	28	24	25
19	24	26	24	24	25	24	25	26	25	28	23	25
20	24	26	24	24	25	24	25	26	25	26	22	25
21	25	26	25	24	25	24	25	26	25	24	22	25
22	25	26	25	24	25	25	24	26	25	25	22	25
23	25	26	25	24	25	25	24	25	25	25	24	25
24	25	25	25	24	25	25	24	25	25	24	24	25
25	25	25	25	25	25	25	24	25	25	24	25	25
26	25	25	25	25	25	25	25	25	23	24	25	25
27	25	25	25	25	25	25	25	25	23	24	25	25
28	24	25	25	25	25	25	25	25	23	23	25	25
29	24	25	25	25	---	26	25	25	23	25	25	25
30	24	25	25	25	---	26	25	25	24	27	25	25
31	24	---	25	25	---	26	---	25	---	26	25	---
TOTAL	764	759	771	755	700	767	775	792	741	817	775	750
MEAN	24.6	25.3	24.9	24.4	25.0	24.7	25.8	25.5	24.7	26.4	25.0	25.0
MAX	25	26	25	25	25	26	27	26	25	28	28	25
MIN	24	24	24	24	25	24	24	25	23	23	22	25

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1973 - 1994, BY WATER YEAR (WY)

MEAN	31.2	30.6	26.4	25.6	26.3	29.1	29.2	27.5	27.6	26.8	25.8	26.0
MAX	141	122	35.6	32.6	35.9	56.3	44.9	40.3	42.2	42.2	29.1	30.2
(WY)	1973	1973	1974	1974	1986	1989	1989	1976	1975	1974	1982	1984
MIN	23.6	23.3	24.3	18.9	22.0	23.2	23.8	23.8	23.8	20.3	22.8	24.1
(WY)	1988	1988	1988	1973	1973	1987	1985	1985	1985	1973	1973	1987

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1973 - 1994

ANNUAL TOTAL	9384	9166	
ANNUAL MEAN	25.7	25.1	
HIGHEST ANNUAL MEAN			27.7
LOWEST ANNUAL MEAN			44.8
HIGHEST DAILY MEAN	31	Mar 2	28
LOWEST DAILY MEAN	24	Jul 24	22
ANNUAL SEVEN-DAY MINIMUM	24	Oct 14	23
10 PERCENT EXCEEDS	27		26
50 PERCENT EXCEEDS	25		25
90 PERCENT EXCEEDS	25		24

(a) July 4-6, 15-19, Aug. 8-10.

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

(c) Aug. 20-22.

(d) Release structure closed for trash rack cleaning and flume inspection.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04058100 MIDDLE BRANCH ESCANABA RIVER NEAR PRINCETON, MI

LOCATION.--Lat 46°19'02", long 87°30'07", in NW1/4 sec.12, T.45 N., R.26 W., Marquette County, Hydrologic Unit 04030110, on right bank 400 ft downstream from powerplant, 0.3 mi upstream from Green Creek, and 2.2 mi northwest of Princeton.

DRAINAGE AREA.--210 mi².

PERIOD OF RECORD.--July 1961 to September 1982, October 1989 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,102.68 ft above sea level.

REMARKS.--Records good except for estimated daily discharges, which are fair. Flow regulated by powerplant upstream from station. Since December 1972, additional regulation 27 mi upstream by Greenwood Release (station 04057814). Since January 1973, some flow diverted to Green Creek via Greenwood Diversion (station 04057813) 27 mi upstream by industry for iron ore processing and some returned 0.3 mi downstream via another Green Creek. Since October 1979, some of the diversion returned 5.0 mi downstream via Goose Lake Outlet and East Branch Escanaba River. From 1973 to 1991 annual mean discharge and runoff figures adjusted for diversion and change in contents in Greenwood Reservoir (station 04057811). Several measurements of water temperature were made during the year.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 22, 1985, reached a stage of 11.84 ft, from floodmark, discharge, 4,200 ft³/s, from rating curve extended above 2,400 ft³/s.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	110	154	136	108	e96	e86	108	657	203	166	99	101
2	112	146	136	105	e96	e86	108	579	207	173	99	101
3	119	145	136	105	e96	e87	108	504	176	164	99	101
4	126	142	136	105	e96	87	116	444	152	154	107	101
5	126	147	134	105	e96	87	132	409	128	141	114	101
6	126	165	124	105	e96	88	132	398	128	128	115	101
7	126	165	117	105	e96	89	130	387	138	145	114	101
8	151	165	125	107	e96	89	128	312	149	144	114	101
9	181	145	125	107	e96	93	129	296	149	136	111	101
10	209	130	123	103	e96	95	133	323	138	149	99	101
11	207	130	123	98	e96	95	162	308	128	238	86	101
12	170	130	112	98	e90	95	224	288	136	295	90	101
13	155	134	104	98	e86	95	260	274	161	270	90	101
14	148	168	112	e98	e100	94	293	276	184	196	90	99
15	134	210	112	e98	e100	94	360	264	231	156	90	97
16	134	219	109	e98	e92	95	402	255	209	144	90	96
17	134	217	107	e98	e86	96	428	273	179	128	85	97
18	134	200	114	e96	e86	96	437	292	245	128	89	97
19	138	190	114	e96	e86	95	416	290	424	117	89	97
20	143	182	114	e96	e86	94	396	252	415	110	89	97
21	136	167	114	e96	e86	95	390	212	397	111	89	97
22	198	156	114	e96	e86	96	311	192	297	112	89	98
23	243	147	114	e96	e86	115	255	194	184	115	89	99
24	239	136	114	e96	e86	112	244	179	159	134	89	99
25	221	136	114	e96	e86	114	234	156	224	139	89	99
26	194	136	e112	e96	e86	114	275	178	240	130	89	100
27	166	136	e112	e96	e86	114	434	218	188	121	89	101
28	154	136	e110	e96	e86	112	592	215	156	106	87	149
29	145	136	e110	e96	---	112	704	197	159	101	87	188
30	144	136	e108	e96	---	110	726	187	156	99	88	159
31	154	---	e108	e96	---	108	---	173	---	99	93	---
TOTAL	4877	4706	3643	3085	2556	3038	8767	9182	6040	4549	2937	3182
MEAN	157	157	118	99.5	91.3	98.0	292	296	201	147	94.7	106
MAX	243	219	136	108	100	115	726	657	424	295	115	188
MIN	110	130	104	96	86	86	108	156	128	99	85	96

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1994, BY WATER YEAR (WY)

	MEAN	179	186	142	108	98.5	147	531	438	246	154	122	158
MAX	376	349	235	196	162	348	917	1056	518	318	216	566	
(WY)	1973	1973	1992	1969	1969	1973	1976	1972	1968	1968	1978	1978	
MIN	54.4	70.0	79.4	61.0	56.1	71.0	179	111	101	63.5	53.0	60.4	
(WY)	1964	1977	1977	1964	1963	1964	1990	1977	1977	1965	1963	1963	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1961 - 1994

ANNUAL TOTAL	73035	56562	
ANNUAL MEAN	200	155	
HIGHEST ANNUAL MEAN			210
LOWEST ANNUAL MEAN			296
HIGHEST DAILY MEAN	948	May 5	1979
LOWEST DAILY MEAN	94	Jul 23	1977
ANNUAL SEVEN-DAY MINIMUM	95	Jul 23	2550
INSTANTANEOUS PEAK FLOW		726	Apr 30
INSTANTANEOUS PEAK STAGE		85	Aug 17
INSTANTANEOUS LOW FLOW		86	Feb 17
10 PERCENT EXCEEDS	384	738	Apr 30
50 PERCENT EXCEEDS	132	4.06	2580
90 PERCENT EXCEEDS	105	11	8.37
		(a)	(b)2.2
			412
			130
			74

(a) Nov. 4, Apr. 4.

(b) Recorded.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04058190 SCHWEITZER RESERVOIR NEAR PALMER, MI

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

DRAINAGE AREA.--23.1 mi².

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

GAGE.--Water-stage recorder. Datum of gage is 1,300.00 ft above sea level (Cleveland-Cliffs Iron Co. reference mark); gage readings 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). From Oct. 1 to May 22, an average of 1.7 ft³/s was diverted from the headwaters of basin by the City of Ishpeming for municipal supply (furnished by City of Ishpeming) and the effluent discharged to the Carp River basin. An average of 27 ft³/s was diverted from reservoir for iron ore processing (furnished by Cleveland Cliffs Iron Co.), 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 18.9 ft³/s for the year.

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

EXTREMES FOR CURRENT YEAR.--Maximum contents, 5,540 acre-ft, Apr. 16, elevation, 1,338.6 ft; minimum, 4,320 acre-ft, Sept. 8, elevation, 1,334.9 ft.

MONTHEND ELEVATION, IN FEET ABOVE SEA LEVEL, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)	(equivalent in ft ³ /s)
Sept. 30	1,337.6	5,160	--	--
Oct. 31	1,338.0	5,300	+140	+2.3
Nov. 30	1,337.9	5,260	-40	-0.7
Dec. 31	1,337.7	5,190	-70	-1.1
CAL YR 1993			-70	-0.1
Jan. 31	1,338.1	5,340	+150	+2.4
Feb. 28	1,337.9	5,260	-80	-1.4
Mar. 31	1,337.0	4,950	-310	-5.0
Apr. 30	1,338.1	5,340	+390	+6.6
May 31	1,337.3	5,050	-290	-4.7
June 30	1,336.9	4,920	-130	-2.2
July 31	1,335.7	4,560	-360	-5.9
Aug. 31	1,335.4	4,470	-90	-1.5
Sept. 30	1,335.3	4,440	-30	-0.5
WTR YR 1994			-720	-1.0

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 fair. Since August 1962, flow completely regulated by Schweitzer Reservoir (station 04058190) 1.0 mi upstream. From Oct. 1 to May 22, an average of 1.7 ft³/s was diverted from headwaters of basin by the City of Ishpeming for municipal supply (furnished by City of Ishpeming) and the effluent discharged to the Carp River basin. An average of 27 ft³/s was diverted from Schweitzer Reservoir by industry for iron ore processing (furnished by Cleveland Cliffs Iron Co.), 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.8	11	6.3	6.0	e5.0	6.0	6.4	19	6.2	6.3	4.9	4.2
2	6.3	10	6.6	6.0	e5.5	6.0	6.5	14	6.1	6.0	4.5	4.2
3	6.3	9.5	6.4	6.0	e6.0	6.1	6.3	11	6.2	6.0	4.6	4.1
4	6.3	8.6	6.3	6.0	e6.0	6.0	6.3	8.0	6.2	6.5	4.8	4.0
5	6.0	12	6.3	6.0	e6.0	6.1	6.3	7.1	6.3	6.4	4.6	4.2
6	6.1	11	6.3	6.0	e6.0	6.4	e6.3	6.6	6.3	6.2	4.7	4.1
7	6.2	9.3	6.3	6.0	e6.0	6.2	e6.6	6.0	6.3	6.2	4.6	4.1
8	7.0	8.2	6.3	6.0	e5.5	6.0	6.6	6.0	6.2	6.4	4.6	4.0
9	11	7.4	6.3	5.7	e5.5	6.0	6.8	6.3	6.1	6.3	4.6	4.0
10	15	6.7	6.2	6.0	e5.5	6.0	7.4	6.3	6.1	6.0	4.5	4.1
11	17	6.5	6.0	6.0	e6.0	6.1	7.5	6.6	6.4	6.0	4.5	4.1
12	16	6.3	6.1	6.0	e6.0	6.0	7.4	6.6	6.3	5.9	4.4	4.1
13	11	7.9	6.2	5.7	e6.0	6.2	7.4	6.3	6.7	5.9	4.4	4.3
14	10	16	6.2	4.8	e6.0	6.3	19	6.3	6.5	6.0	4.5	4.2
15	10	19	6.2	4.8	e6.0	6.3	64	6.8	6.2	6.0	4.5	4.4
16	13	17	6.6	5.3	e6.0	6.0	120	6.6	6.1	6.0	4.5	4.2
17	12	13	6.3	6.0	e6.0	6.1	76	6.3	6.4	6.0	4.6	4.2
18	11	11	6.2	5.9	e6.5	6.0	45	6.3	7.5	5.9	4.9	4.2
19	11	11	6.2	5.4	e6.5	6.1	42	6.3	6.4	6.0	4.8	4.2
20	11	9.3	6.2	5.7	e6.0	6.4	37	6.3	6.3	5.9	4.7	4.3
21	23	8.0	6.1	6.0	e6.0	6.7	25	6.3	6.2	5.2	4.9	4.2
22	25	7.4	6.0	6.0	e6.0	6.4	15	6.3	6.2	4.4	4.7	4.4
23	20	6.8	6.0	6.0	e6.0	6.5	8.8	6.3	6.2	4.4	4.4	4.3
24	15	6.4	e5.5	6.0	e6.0	6.3	7.2	6.3	6.2	4.3	4.3	4.3
25	12	6.3	e5.0	6.0	e5.5	6.4	6.9	6.8	6.1	4.3	4.2	4.7
26	11	6.6	e4.5	7.1	e5.5	6.3	24	6.5	6.1	4.4	4.1	4.9
27	10	6.5	e5.0	6.0	5.4	6.3	107	6.4	6.1	4.5	4.1	4.9
28	10	6.4	e5.5	6.0	6.0	6.2	61	6.3	6.5	4.5	4.2	4.8
29	11	6.3	e6.0	5.8	---	6.3	36	6.4	6.3	4.4	4.0	5.0
30	12	6.3	5.8	5.0	---	6.6	24	6.4	6.3	4.5	4.7	5.3
31	12	---	6.1	e5.0	---	6.4	---	6.5	---	4.8	4.5	---
TOTAL	360.0	277.7	187.0	180.2	164.4	192.7	805.7	225.2	189.0	171.6	140.3	130.0
MEAN	11.6	9.26	6.03	5.81	5.87	6.22	26.9	7.26	6.30	5.54	4.53	4.33
MAX	25	19	6.6	7.1	6.5	6.7	120	19	7.5	6.5	4.9	5.3
MIN	6.0	6.3	4.5	4.8	5.0	6.0	6.3	6.0	6.1	4.3	4.0	4.0

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1994, BY WATER YEAR (WY)

	MEAN	11.4	12.5	8.03	5.68	5.17	7.58	48.6	28.5	15.5	8.53	7.21	9.57
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	3.59	3.59	2.15	1.92	2.40	1.45	1.69	4.11	3.96	3.46	3.62	
(WY)	1964	1964	1990	1963	1963	1963	1963	1963	1977	1990	1963	1963	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1961 - 1994

ANNUAL TOTAL	3737.7	3023.8	
ANNUAL MEAN	10.2	8.28	14.0
HIGHEST ANNUAL MEAN			26.4
LOWEST ANNUAL MEAN			4.64
HIGHEST DAILY MEAN	110	Apr 25	699
LOWEST DAILY MEAN	3.8	Feb 20	1.0
ANNUAL SEVEN-DAY MINIMUM	3.8	Feb 20	1.0
INSTANTANEOUS PEAK FLOW			860
INSTANTANEOUS PEAK STAGE			6.50
INSTANTANEOUS LOW FLOW			.40
10 PERCENT EXCEEDS	18	11	31
50 PERCENT EXCEEDS	5.9	6.2	5.7
90 PERCENT EXCEEDS	4.0	4.4	4.0

(a) Aug. 29, Sep. 4, 8, 9.

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

(c) 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) about 40 mi upstream and Greenwood Reservoir (station 04057811) about 50 mi upstream. Gage-height telemeter at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height recorded, 5.53 ft, Apr. 22, 1992, but may have been higher during period of no gage-height record, Apr. 8-14, 1988; minimum daily, 1.89 ft, Sept. 2, 1991.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 3.98 ft, Apr. 28; minimum daily, 1.93 ft, Feb. 14.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.31	2.56	2.57	2.26	2.08	2.10	2.40	3.59	2.84	2.43	2.23	2.42
2	2.36	2.55	2.55	2.22	2.09	2.10	2.44	3.45	2.78	2.43	2.24	2.35
3	2.36	2.52	2.54	2.21	2.07	2.11	2.41	3.33	2.66	2.40	2.22	2.27
4	2.35	2.55	2.51	2.21	2.06	2.11	2.45	3.23	2.58	2.35	2.40	2.21
5	2.32	2.61	2.53	2.21	2.07	2.13	2.37	3.16	2.46	2.34	2.57	2.20
6	2.30	2.66	2.51	2.20	2.07	2.20	2.37	3.11	2.44	2.35	2.55	2.26
7	2.30	2.58	2.34	2.19	2.06	2.23	2.43	3.07	2.44	2.35	2.44	2.27
8	2.32	2.60	2.36	2.20	2.06	2.23	2.46	3.02	2.46	2.38	2.37	2.23
9	2.54	2.56	2.49	2.20	2.05	2.24	2.50	2.89	2.43	2.39	2.30	2.18
10	2.68	2.46	2.44	2.19	2.05	2.14	2.59	2.92	2.39	2.43	2.25	2.15
11	2.68	2.52	2.29	2.20	2.05	2.19	2.68	2.92	2.36	2.40	2.20	2.15
12	2.58	2.50	2.26	2.18	2.05	2.19	2.83	2.95	2.54	2.53	2.16	2.13
13	2.52	2.60	2.51	2.17	2.00	2.18	2.98	2.90	2.80	2.47	2.14	2.15
14	2.46	2.97	2.45	2.17	1.93	2.21	3.11	2.86	2.89	2.43	2.13	2.17
15	2.44	3.11	2.43	2.16	1.96	2.23	3.43	2.89	2.87	2.32	2.11	2.25
16	2.56	3.08	2.43	2.16	2.05	2.20	3.74	2.95	2.83	2.29	2.10	2.31
17	2.64	3.00	2.39	2.13	2.09	2.18	3.84	2.93	2.68	2.32	2.08	2.31
18	2.61	2.87	2.40	2.16	2.13	2.18	3.75	2.88	2.75	2.33	2.05	2.26
19	2.57	2.86	2.41	2.14	2.16	2.16	3.56	2.86	3.10	2.30	2.07	2.17
20	2.56	2.72	2.41	2.13	2.22	2.18	3.46	2.81	3.23	2.27	2.07	2.15
21	2.67	2.76	2.34	2.14	2.21	2.19	3.32	2.74	3.06	2.30	2.09	2.12
22	2.88	2.66	2.21	2.12	2.19	2.27	3.18	2.65	2.81	2.78	2.08	2.11
23	2.97	2.53	2.23	2.12	2.15	2.33	3.00	2.62	2.62	2.78	2.07	2.14
24	2.88	2.54	2.15	2.13	2.14	2.32	2.97	2.60	2.43	2.69	2.08	2.15
25	2.79	2.47	2.09	2.12	2.14	2.28	2.94	2.55	2.45	2.61	2.03	2.15
26	2.72	2.63	2.07	2.11	2.12	2.31	3.05	2.63	2.50	2.49	2.04	2.16
27	2.64	2.59	2.17	2.10	2.11	2.33	3.64	2.76	2.45	2.41	2.04	2.28
28	2.59	2.48	2.18	2.10	2.10	2.29	3.86	2.72	2.42	2.36	2.06	2.37
29	2.60	2.54	2.20	2.09	---	2.29	3.86	2.65	2.45	2.28	2.06	2.51
30	2.56	2.54	2.18	2.10	---	2.29	3.74	2.66	2.44	2.29	2.11	2.44
31	2.58	---	2.24	2.09	---	2.34	---	2.76	---	2.24	2.30	---
MEAN	2.56	2.65	2.35	2.16	2.09	2.22	3.05	2.91	2.64	2.41	2.18	2.23
MAX	2.97	3.11	2.57	2.26	2.22	2.34	3.86	3.59	3.23	2.78	2.57	2.51
MIN	2.30	2.46	2.07	2.09	1.93	2.10	2.37	2.55	2.36	2.24	2.03	2.11

CAL YR 1993 MEAN 2.68 MAX 5.17 MIN 2.07
WTR YR 1994 MEAN 2.45 MAX 3.86 MIN 1.93

STREAMS TRIBUTARY TO LAKE MICHIGAN

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

LOCATION.--Lat 45°54'31", long 87°12'49", in NW1/4 sec.32, T.41 N., R.23 W., Delta County, Hydrologic Unit 04030110, on right bank 50 ft downstream from bridge on County Road 519, 0.4 mi downstream from Bobs Creek, 0.7 mi northeast of Cornell, and 16 mi upstream from mouth.
DRAINAGE AREA.--870 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--August 1903 to December 1912, January 1913 to November 1915 (gage heights only), October 1950 to current year.

Monthly discharge only for some periods, published in WSP 1307. Published as "near Escanaba" 1903-15.

REVISED RECORDS.--WSP 1387: 1904. WDR MI-85-1: 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.--Water-discharge records good except for estimated daily discharges, which are fair. Since 1950, diurnal fluctuation and occasional slight regulation by Boney Falls powerplant 7 mi upstream. Since August 1962, some regulation by Schweitzer Reservoir (station 04058190) about 50 mi upstream. Since December 1972, some regulation by Greenwood Reservoir (station 04057811) about 60 mi upstream. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	426	622	e600	e300	e235	e250	e450	1800	827	535	367	509
2	461	604	e580	e310	e230	e280	e520	1640	797	519	367	463
3	473	583	e580	e310	e225	e280	e510	1490	668	470	347	400
4	456	592	e560	e305	e220	e250	e520	1360	597	431	462	352
5	440	671	e550	e295	e220	e280	e485	1290	512	415	582	348
6	422	724	e530	e290	e220	e300	e486	1230	492	422	578	379
7	420	699	e490	e290	e230	e320	513	1190	485	438	487	390
8	450	657	e450	e290	e220	e340	531	1120	491	453	429	354
9	626	606	e480	e290	e220	e340	554	990	465	456	383	318
10	748	559	e510	e295	e220	e300	644	1010	435	481	356	297
11	723	563	e470	e300	e220	e300	754	1000	411	456	324	289
12	648	562	e420	e290	e220	e300	876	1040	551	523	290	278
13	579	689	e470	e270	e180	e300	1040	977	868	500	282	310
14	529	1080	e500	e280	e150	e360	1150	922	996	465	272	324
15	500	1230	e490	e280	e165	e360	1510	971	957	386	263	399
16	639	1180	e480	e280	e210	e350	2040	1020	903	359	268	446
17	715	1080	e460	e270	e250	e310	2130	983	736	386	249	431
18	692	954	e460	e270	e290	e280	2020	922	798	398	227	371
19	652	925	e460	e265	e290	e250	1810	884	1130	375	233	331
20	631	952	e450	e260	e310	e255	1700	832	1260	350	246	302
21	743	819	e390	e260	e320	e300	1520	754	1070	344	258	289
22	942	e700	e300	e260	e290	e310	1360	686	832	705	248	280
23	1010	e540	e250	e250	e260	e400	1150	653	632	754	246	291
24	939	e560	e210	e260	e245	e430	1110	628	494	698	251	291
25	841	e600	e170	e250	e250	e430	1110	592	490	632	233	292
26	770	e640	e160	e250	e250	e425	1270	631	528	546	234	305
27	705	e640	e190	e240	e240	e425	1970	751	483	479	254	386
28	661	e580	e260	e240	e240	e380	2220	711	451	435	255	473
29	659	e590	e280	e240	---	e380	2190	657	568	380	258	560
30	637	e616	e290	e240	---	e420	2020	667	544	387	303	520
31	634	---	e300	e235	---	e425	---	780	---	375	458	---
TOTAL	19771	21817	12790	8465	6620	10330	36163	30181	20471	14553	10010	10978
MEAN	638	727	413	273	236	333	1205	974	682	469	323	366
MAX	1010	1230	600	310	320	430	2220	1800	1260	754	582	560
MIN	420	540	160	235	150	250	450	592	411	344	227	278
CFSM	.73	.84	.47	.31	.27	.38	1.39	1.12	.78	.54	.37	.42
IN.	.85	.93	.55	.36	.28	.44	1.55	1.29	.88	.62	.43	.47

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1903 - 1994, BY WATER YEAR (WY)

MEAN	723	802	556	376	346	569	2597	1698	960	614	499	635
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	481	255	222	194	194
(WY)	1964	1977	1977	1964	1959	1964	1990	1977	1988	1988	1963	1976

SUMMARY STATISTICS FOR 1993 CALENDAR YEAR FOR 1994 WATER YEAR WATER YEARS 1903 - 1994

ANNUAL TOTAL	311430	202149	
ANNUAL MEAN	853	554	(a)838
HIGHEST ANNUAL MEAN			1385
LOWEST ANNUAL MEAN			506
HIGHEST DAILY MEAN	5410	May 5	10400
LOWEST DAILY MEAN	160	Dec 26	(b)90
ANNUAL SEVEN-DAY MINIMUM	217	Dec 23	159
INSTANTANEOUS PEAK FLOW			10700
INSTANTANEOUS PEAK STAGE		(c)2.92	(c)6.40
INSTANTANEOUS LOW FLOW			(b)90
ANNUAL RUNOFF (CFSM)	.98	.64	.96
ANNUAL RUNOFF (INCHES)	13.32	8.64	13.09
10 PERCENT EXCEEDS	1770	1010	1900
50 PERCENT EXCEEDS	550	456	523
90 PERCENT EXCEEDS	339	250	258

(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) 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, 1975 to September 1994 (discontinued).

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: February 1975 to September 1981.

WATER TEMPERATURE: February 1975 to September 1981.

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

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

EXTREMES FOR PERIOD OF DAILY RECORD.--

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

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

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

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, KF AGAR (COLS. PER 100 ML) (31673)
NOV 03...	1115	604	185	8.3	3.0	1.6	14.2	109	K4	K3
JAN 04...	1250	274	314	7.0	0.0	1.1	12.9	91	K4	K3
MAY 04...	1230	1380	138	8.1	7.0	0.90	12.0	101	K3	<2
JUN 28...	1200	425	196	8.4	21.5	1.0	9.1	108	K6	250
SEP 08...	1200	356	199	8.5	15.0	1.0	10.6	108	K9	K18
DATE	HARD-NESS TOTAL (MG/L AS CaCO3) (00900)	HARD-NESS NONCARB DISSOLV FLD. AS CaCO3 (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 HCO3) (00453)	CAR-BONATE WATER DIS IT FIELD (MG/L AS CO3) (00452)	ALKA-LINITY WAT DIS TOT IT FIELD (MG/L AS CaCO3) (39086)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)
NOV 03...	84	3	20	8.2	6.2	3.9	99	--	81	8.3
JAN 04...	100	0	25	10	23	1.6	145	--	119	17
MAY 04...	61	1	15	5.6	3.8	1.1	72	--	59	7.2
JUN 28...	78	1	19	7.5	9.7	0.90	95	--	78	9.3
SEP 08...	96	6	23	9.3	5.1	0.70	107	1	90	6.5
DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS Cl) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SiO2) (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, NO2+NO3 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)
NOV 03...	4.3	0.10	7.4	121	0.16	197	<0.010	0.110	0.040	0.40
JAN 04...	8.9	<0.10	10	175	0.24	129	<0.010	0.200	0.040	0.30
MAY 04...	3.2	<0.10	4.2	95	0.13	354	<0.010	0.130	0.020	0.40
JUN 28...	3.8	<0.10	6.6	119	0.16	137	<0.010	0.120	0.030	0.50
SEP 08...	3.4	<0.10	7.7	137	0.19	132	<0.010	<0.050	0.040	0.40

STREAMS TRIBUTARY TO LAKE MICHIGAN

04059000 ESCANABA RIVER AT CORNELL, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

[illegible]

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 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	158	283	e240	e67	e44	e43	e160	1080	384	198	111	179
2	159	264	e230	e68	e43	e44	e175	973	357	189	104	206
3	159	253	e225	e68	e42	e45	e175	845	328	167	100	212
4	163	247	e220	e67	e41	e50	e170	732	293	149	108	183
5	165	330	e215	e66	e40	e56	e165	671	256	137	105	162
6	157	357	e190	e66	e39	e62	e180	647	231	130	108	155
7	146	316	e190	e66	e38	e65	e200	609	223	127	124	142
8	146	319	e190	e66	e37	e65	e225	570	209	123	118	131
9	165	308	e190	e65	e37	e57	233	543	199	129	103	122
10	186	286	e185	e64	e37	e55	276	509	181	133	89	110
11	197	271	e180	e63	e38	e52	317	494	166	136	79	98
12	210	266	e170	e62	e38	e52	364	494	184	138	73	88
13	198	397	e175	e62	e38	e55	493	480	313	125	67	100
14	181	591	e180	e61	e39	e58	537	468	482	114	62	128
15	169	666	e180	e57	e39	e62	688	478	531	107	58	191
16	266	669	e180	e55	e40	e68	911	492	500	99	55	264
17	328	638	e180	e54	e43	e65	927	481	432	105	51	276
18	339	574	e180	e50	e52	e61	919	454	391	106	53	281
19	340	509	e180	e48	e60	e59	940	418	379	103	50	258
20	327	420	e170	e48	e66	e59	888	377	378	99	53	219
21	386	375	e150	e48	e68	e70	771	346	333	94	50	184
22	475	374	e120	e49	e66	e100	661	329	274	98	48	158
23	500	e270	e100	e50	e55	e120	574	311	227	148	49	141
24	508	e215	e80	e50	e45	e145	536	288	194	145	51	132
25	485	e225	e65	e50	e42	e145	615	274	164	132	47	132
26	438	e250	e65	e49	e42	e140	775	263	144	118	45	174
27	392	e300	e65	e48	e42	e135	1020	266	131	105	51	227
28	353	e290	e65	e48	e43	e135	1080	267	127	96	78	273
29	335	e270	e65	e47	---	e130	1100	270	172	88	71	288
30	317	e260	e65	e46	---	e140	1120	286	199	92	80	273
31	300	---	e66	e45	---	e145	---	356	---	108	141	---
TOTAL	8648	10793	4756	1753	1254	2541	17195	15071	8382	3838	2382	5487
MEAN	279	360	153	56.5	44.8	82.0	573	486	279	124	76.8	183
MAX	508	669	240	68	68	145	1120	1080	531	198	141	288
MIN	146	215	65	45	37	43	160	263	127	88	45	88
CFSM	.62	.80	.34	.13	.10	.18	1.27	1.08	.62	.28	.17	.41
IN.	.71	.89	.39	.14	.10	.21	1.42	1.25	.69	.32	.20	.45

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1955 - 1994, BY WATER YEAR (WY)

MEAN	307	399	215	119	103	253	1305	802	413	208	164	261
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	204	52.4	34.7	38.8	26.2
(WY)	1977	1977	1977	1977	1977	1964	1990	1986	1988	1988	1970	1976

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1955 - 1994

ANNUAL TOTAL	155364	82100	
ANNUAL MEAN	426	225	
HIGHEST ANNUAL MEAN			379
LOWEST ANNUAL MEAN			640
HIGHEST DAILY MEAN			183
LOWEST DAILY MEAN			183
HIGHEST DAILY MEAN	3030	1120	6850
LOWEST DAILY MEAN	65	(e)37	19
ANNUAL SEVEN-DAY MINIMUM	65	38	22
INSTANTANEOUS PEAK FLOW		1120	7590
INSTANTANEOUS PEAK STAGE		3.87	8.27
INSTANTANEOUS LOW FLOW			18
ANNUAL RUNOFF (CFSM)	.95	.50	.84
ANNUAL RUNOFF (INCHES)	12.84	6.79	11.44
10 PERCENT EXCEEDS	1050	500	940
50 PERCENT EXCEEDS	229	160	180
90 PERCENT EXCEEDS	95	49	54

(a) Feb. 8-10.

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

(c) 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 04030106, 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 good except for estimated daily discharges, which are fair. Discharge includes some mine pumpage prior to August 1977. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	265	269	e270	e235	e202	e240	282	437	290	248	233	292
2	264	272	e285	e235	e200	e240	304	395	269	231	228	250
3	255	276	e290	e230	e200	e240	286	366	251	214	216	229
4	259	279	e280	e230	e200	e240	282	347	238	210	236	216
5	258	305	e275	e230	e200	e240	265	359	227	218	238	215
6	252	291	e270	e230	e195	e250	255	397	250	321	221	223
7	253	283	e260	e230	e190	e260	253	363	259	477	214	223
8	268	280	e250	e230	e190	e250	260	333	245	447	210	225
9	329	278	e250	e230	e190	e230	270	320	230	672	214	207
10	319	274	e250	e230	e190	e230	285	306	222	568	206	199
11	290	273	e250	e230	e190	e230	311	300	231	429	201	194
12	274	272	e250	e230	e195	e230	324	302	268	354	196	194
13	262	323	e250	e230	e195	e240	354	295	334	302	201	222
14	257	454	e260	e230	e195	e250	361	285	398	274	196	302
15	257	440	e285	e230	e195	e260	462	334	360	259	190	454
16	287	380	e295	e225	e195	e260	570	370	305	249	188	644
17	289	348	e300	e220	e195	e250	512	332	269	276	185	545
18	279	324	e295	e220	e215	e240	468	303	258	341	188	408
19	280	318	e290	e220	e240	e250	444	289	279	297	206	324
20	283	303	e280	e220	e270	e270	409	272	250	352	210	276
21	384	295	e255	e220	e310	e300	369	260	235	321	228	255
22	410	305	e220	e220	e290	e320	338	248	224	378	216	256
23	357	295	e210	e215	e275	e330	320	243	232	363	225	310
24	325	e295	e205	e190	e265	e320	319	241	243	313	210	334
25	306	e210	e190	e210	e260	e305	358	246	244	284	199	305
26	290	e260	e190	e220	e255	e300	483	281	273	275	195	321
27	286	e290	e190	e230	e250	e286	774	288	262	258	218	383
28	284	e220	e230	e230	e242	253	648	265	253	240	267	360
29	283	e280	e250	e230	---	248	523	255	286	230	236	333
30	280	e270	e250	e225	---	242	477	270	262	231	238	302
31	276	---	e240	e215	---	249	---	281	---	226	315	---
TOTAL	8961	8962	7865	6970	6189	8053	11566	9583	7947	9858	6724	9001
MEAN	289	299	254	225	221	260	386	309	265	318	217	300
MAX	410	454	300	235	310	330	774	437	398	672	315	644
MIN	252	210	190	190	190	230	253	241	222	210	185	194
CFSM	.79	.82	.69	.61	.60	.71	1.05	.84	.72	.87	.59	.82
IN.	.91	.91	.80	.71	.63	.82	1.18	.97	.81	1.00	.68	.91

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1914 - 1994, BY WATER YEAR (WY)

	MEAN	326	338	278	252	245	323	653	500	401	339	291	317
MAX	612	600	424	369	406	833	1235	1104	712	983	604	582	582
(WY)	1986	1916	1986	1986	1984	1973	1967	1965	1981	1953	1972	1959	1959
MIN	179	202	175	176	174	178	235	251	194	185	186	182	182
(WY)	1949	1990	1990	1959	1959	1965	1990	1988	1988	1989	1948	1948	1948

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1914 - 1994
ANNUAL TOTAL	122530	101679	
ANNUAL MEAN	336	279	354
HIGHEST ANNUAL MEAN			512
LOWEST ANNUAL MEAN			221
HIGHEST DAILY MEAN	1190	May 5	4420
LOWEST DAILY MEAN	190	Feb 28	130
ANNUAL SEVEN-DAY MINIMUM	193	Feb 22	151
INSTANTANEOUS PEAK FLOW			4700
INSTANTANEOUS PEAK STAGE			(a)8.60
INSTANTANEOUS LOW FLOW			(c)118
ANNUAL RUNOFF (CFSM)	.92	.76	.97
ANNUAL RUNOFF (INCHES)	12.45	10.33	13.16
10 PERCENT EXCEEDS	593	362	558
50 PERCENT EXCEEDS	275	260	290
90 PERCENT EXCEEDS	214	206	205

- (a) Backwater from ice; site and datum then in use.
 (b) Aug. 16, 17.
 (c) Discharge measurement.
 (e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04061500 PAINT RIVER AT CRYSTAL FALLS, MI

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

DRAINAGE AREA.--597 mi².

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

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

GAGE.--Water-stage recorder. Datum of gage is 1,306.1 ft above sea level (Wisconsin Electric Power Co. bench mark).

REMARKS.--Records good except for estimated daily discharges, which are fair. Diurnal fluctuation caused by powerplant immediately upstream; since storage capacity is small, daily flows are not affected appreciably. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	310	426	383	e290	e260	245	367	1460	386	344	361	637
2	318	423	408	e285	e260	251	401	1270	366	343	366	565
3	329	414	398	e285	e255	252	378	1110	366	311	345	469
4	343	413	390	e275	e250	268	395	988	332	290	390	424
5	360	447	396	e270	e250	275	370	918	316	277	513	397
6	354	431	385	e265	e245	295	357	868	330	292	523	375
7	369	388	365	e255	e240	297	355	803	339	375	430	359
8	390	424	357	e255	e240	294	360	747	333	573	397	331
9	551	405	e360	e250	e235	273	382	697	323	918	357	313
10	573	391	e360	e255	e235	269	420	622	302	1030	321	286
11	526	391	340	e255	e230	264	471	629	287	905	319	268
12	481	390	314	e260	e230	242	543	583	309	803	280	276
13	438	432	380	e260	e230	275	632	572	328	707	271	277
14	408	541	e370	e265	e230	276	717	550	362	615	253	316
15	408	608	374	e260	e230	302	847	572	363	534	248	406
16	387	579	374	e260	e230	297	1230	658	344	472	244	639
17	404	546	369	e255	e235	278	1380	640	331	450	235	651
18	392	514	370	e260	e245	270	1380	591	310	483	217	545
19	392	498	e360	e260	e260	270	1310	547	322	471	237	444
20	398	430	e350	e260	e300	264	1250	512	302	483	324	398
21	512	462	e335	e250	e350	286	1180	473	293	519	367	360
22	622	463	e310	e250	e300	351	1070	441	286	587	334	376
23	622	364	e280	e240	e280	380	977	414	279	690	347	445
24	581	386	e255	e230	e225	363	886	398	272	689	245	507
25	584	366	e245	e240	e260	338	879	387	273	621	252	455
26	542	378	e250	e255	e255	355	952	395	269	557	261	476
27	493	366	e260	e265	e245	337	1790	396	254	496	285	657
28	468	343	e275	e265	240	332	2090	391	263	451	382	692
29	468	382	e285	e265	---	318	1890	380	332	413	431	659
30	458	374	e290	e265	---	314	1690	372	332	383	438	643
31	448	---	e300	e260	---	339	---	389	---	353	594	---
TOTAL	13929	12975	10488	8065	7045	9170	26949	19773	9504	16435	10567	13646
MEAN	449	432	338	260	252	296	898	638	317	530	341	455
MAX	622	608	408	290	350	380	2090	1460	386	1030	594	692
MIN	310	343	245	230	225	242	355	372	254	277	217	268
CFSM	.75	.72	.57	.44	.42	.50	1.50	1.07	.53	.89	.57	.76
IN.	.87	.81	.65	.50	.44	.57	1.68	1.23	.59	1.02	.66	.85

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1994, BY WATER YEAR (WY)

MEAN	514	536	384	317	302	461	1557	1017	680	474	368	446
MAX	1516	1201	603	487	616	1818	2732	2549	1414	1657	811	1211
(WY)	1986	1986	1984	1983	1984	1973	1967	1965	1983	1953	1972	1959
MIN	172	230	222	208	202	210	521	371	220	185	181	163
(WY)	1949	1977	1977	1964	1964	1964	1990	1988	1988	1988	1976	1948

SUMMARY STATISTICS FOR 1993 CALENDAR YEAR FOR 1994 WATER YEAR WATER YEARS 1944 - 1994

ANNUAL TOTAL	206063	158546	
ANNUAL MEAN	565	434	
HIGHEST ANNUAL MEAN			588
LOWEST ANNUAL MEAN			882
HIGHEST DAILY MEAN	2660	May 5	1973
LOWEST DAILY MEAN	242	Jul 24	1948
ANNUAL SEVEN-DAY MINIMUM	256	Aug 20	1960
INSTANTANEOUS PEAK FLOW			10500
INSTANTANEOUS LOW FLOW			81
ANNUAL RUNOFF (CFSM)	.95		145
ANNUAL RUNOFF (INCHES)	12.84		10900
10 PERCENT EXCEEDS	1190		9.82
50 PERCENT EXCEEDS	374		7.7
90 PERCENT EXCEEDS	290		.99
			13.38
			657
			366
			388
			237

(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.

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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	92	89	91	e88	e88	e87	e82	287	83	92	96	92
2	92	89	89	e88	e88	e87	82	93	83	92	96	92
3	92	89	87	e88	e88	e87	e85	85	83	92	96	91
4	90	88	87	e88	e88	e87	81	85	83	92	96	90
5	89	89	87	e88	e88	e87	98	83	83	94	97	90
6	89	88	e87	e88	e87	e87	136	83	83	92	98	89
7	89	87	e87	e88	e87	e88	82	83	86	92	98	89
8	90	87	e87	e88	e87	e88	81	83	85	94	98	89
9	90	87	e87	e88	e87	e88	81	83	85	94	98	89
10	89	87	e87	e88	e87	90	82	83	85	94	98	89
11	90	87	e87	e88	e88	e88	82	82	85	94	97	92
12	89	87	e87	e88	e88	87	83	83	85	98	95	92
13	89	87	e87	e88	e88	e86	82	83	87	330	95	92
14	89	87	88	e88	e89	85	80	83	86	680	94	90
15	89	88	87	e88	e89	e85	85	84	86	422	94	90
16	89	87	87	e88	e88	e85	85	83	86	94	94	92
17	89	87	87	e88	e88	e85	85	83	85	94	98	91
18	89	87	87	e88	e88	e85	85	83	85	94	96	88
19	89	87	85	e88	e88	e85	84	83	86	92	96	87
20	90	87	86	e88	e90	e84	83	83	87	92	96	88
21	90	87	e87	e88	e91	e84	83	83	87	93	96	89
22	89	86	e87	e88	e91	85	86	83	87	97	94	89
23	89	87	e87	e87	e90	83	83	83	87	95	95	89
24	88	e87	e87	e87	e89	e83	83	85	87	96	96	89
25	89	e87	e87	e87	e89	e83	83	83	89	94	95	89
26	88	87	e87	e87	e88	e83	85	83	89	99	94	90
27	89	e87	e87	e88	e88	82	564	86	89	95	94	90
28	89	e87	e87	e88	e87	e82	937	85	185	96	94	90
29	89	89	e87	e88	---	e82	600	85	91	96	94	90
30	89	e89	e87	e88	---	e82	403	85	91	96	93	89
31	89	---	e88	e88	---	e82	---	84	---	95	92	---
TOTAL	2772	2624	2702	2724	2473	2642	4731	2803	2679	4070	2963	2696
MEAN	89.4	87.5	87.2	87.9	88.3	85.2	158	90.4	89.3	131	95.6	89.9
MAX	92	89	91	88	91	90	937	287	185	680	98	92
MIN	88	86	85	87	87	82	80	82	83	92	92	87

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1994, BY WATER YEAR (WY)

	MEAN	129	120	92.8	89.9	92.8	104	447	358	209	144	102	116
MAX	554	383	145	102	225	487	1389	1602	937	969	215	305	
(WY)	1986	1989	1983	1965	1984	1973	1954	1972	1983	1953	1978	1980	
MIN	85.0	82.0	84.5	71.4	85.1	84.0	81.4	83.5	85.4	86.9	87.0	66.8	
(WY)	1971	1992	1993	1955	1991	1956	1990	1992	1975	1983	1958	1962	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1952 - 1994

ANNUAL TOTAL	46511	35879	166	
ANNUAL MEAN	127	98.3	321	1954
HIGHEST ANNUAL MEAN			91.4	1990
LOWEST ANNUAL MEAN				
HIGHEST DAILY MEAN	898	Jun 1	937	Apr 28
LOWEST DAILY MEAN	84	May 16	80	Apr 14
ANNUAL SEVEN-DAY MINIMUM	86	Jan 1	82	Apr 8
INSTANTANEOUS PEAK FLOW			1210	Apr 27
INSTANTANEOUS PEAK STAGE			5.10	Apr 27
10 PERCENT EXCEEDS	96		95	
50 PERCENT EXCEEDS	89		88	
90 PERCENT EXCEEDS	86		83	

(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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	358	349	337	360	296	310	408	829	373	351	351	351
2	333	350	389	315	326	306	449	542	397	346	323	361
3	333	399	440	380	252	326	416	463	387	312	347	296
4	360	390	355	265	331	323	392	411	312	243	359	295
5	400	405	355	375	282	321	434	405	337	283	340	294
6	348	405	404	333	370	399	333	476	406	410	328	315
7	362	372	288	325	299	432	437	472	343	642	311	329
8	358	360	327	323	282	423	334	482	322	631	289	329
9	391	380	329	324	263	261	340	429	323	765	292	278
10	405	380	460	327	230	263	375	382	310	718	292	280
11	422	379	350	349	182	353	418	463	343	525	288	282
12	316	413	221	318	238	352	448	396	400	506	286	314
13	411	428	327	320	283	351	492	444	442	513	282	342
14	346	510	459	334	e450	319	512	421	564	961	303	388
15	334	518	426	342	439	433	561	421	566	826	301	579
16	376	482	339	320	282	314	770	489	309	361	291	681
17	409	424	383	315	301	406	631	505	356	366	262	651
18	399	440	383	296	310	251	553	401	314	432	257	499
19	349	429	388	317	315	336	610	369	398	401	274	393
20	388	386	354	337	443	347	519	476	347	446	364	358
21	551	376	332	321	460	442	467	380	376	463	332	377
22	502	443	268	313	403	427	482	347	315	464	332	338
23	433	413	284	304	398	462	461	347	305	467	262	370
24	404	350	268	258	332	443	423	295	333	405	311	425
25	409	275	242	306	355	338	433	367	477	303	283	437
26	408	340	242	313	322	410	652	388	376	344	268	352
27	423	393	247	351	316	396	1270	428	368	303	270	457
28	339	281	337	314	319	328	1580	379	461	355	451	477
29	362	385	342	320	---	349	1200	403	437	368	328	478
30	363	358	289	328	---	349	931	478	426	319	345	338
31	344	---	308	330	---	351	---	315	---	315	391	---
TOTAL	11936	11813	10483	10033	9079	11121	17331	13403	11423	14144	9713	11664
MEAN	385	394	338	324	324	359	578	432	381	456	313	389
MAX	551	518	460	380	460	462	1580	829	566	961	451	681
MIN	316	275	221	258	182	251	333	295	305	243	257	278

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1990 - 1994, BY WATER YEAR (WY)

	1990	1991	1992	1993	1994
MEAN	416	397	337	310	315
MAX	712	571	416	345	344
(WY)	1991	1993	1992	1993	1991
MIN	276	307	270	259	270
(WY)	1990	1990	1990	1991	1994

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1990 - 1994
ANNUAL TOTAL	173459	142143	
ANNUAL MEAN	475	389	422
HIGHEST ANNUAL MEAN			491
LOWEST ANNUAL MEAN			325
HIGHEST DAILY MEAN	2120	May 5	3060
LOWEST DAILY MEAN	221	Dec 12	182
ANNUAL SEVEN-DAY MINIMUM	269	Dec 21	254
INSTANTANEOUS PEAK FLOW			2080
INSTANTANEOUS PEAK STAGE			8.82
10 PERCENT EXCEEDS	797		485
50 PERCENT EXCEEDS	376		358
90 PERCENT EXCEEDS	303		285

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04062085 PESHEKEE RIVER NEAR MARTINS LANDING, MI
(National water quality assessment program station)

LOCATION.--Lat 46°36'35", long 88°01'20", in SW1/4 SE1/4 sec. 26, T.49 N., R.30 W., Marquette County, Hydrologic Unit 04030107, at bridge on Huron Bay Peshekee Grade Road, 0.8 mi upstream from Van Riper Lakes outlet, 5.4 mi northwest of Martins Landing, and 6.4 mi northeast of Michigamme.

DRAINAGE AREA.--43.9 mi².

PERIOD OF RECORD.--Water years 1993 to current year.

REMARKS.--Cross-sectional samples were collected at or near bridge.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATURATION) (00301)	HARDNESS TOTAL (MG/L AS CaCO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS Ca) (00915)
OCT 19...	1300	25	41	7.2	7.5	11.0	97	22	6.4
NOV 23...	1400	50	37	6.9	0.0	13.1	95	17	4.9
DEC 28...	1315	17	44	6.5	0.0	11.6	84	22	6.3
JAN 25...	1245	12	56	6.9	0.0	12.1	87	27	8.1
FEB 16...	1315	10	63	7.4	0.0	12.6	91	28	8.2
MAR 29...	1230	22	49	6.7	0.0	11.8	85	23	6.6
APR 21...	1240	508	24	6.5	3.0	12.9	101	9	2.6
APR 26...	1200	591	20	6.4	3.5	11.8	95	8	2.4
MAY 24...	1205	39	38	7.0	15.0	9.2	97	18	5.4
JUN 21...	1415	113	31	6.9	22.5	7.4	90	17	5.1
JUN 29...	1215	52	44	7.2	17.0	8.2	91	22	6.4
JUL 26...	1650	50	34	7.5	18.0	8.2	92	21	6.1
AUG 15...	1635	12	58	7.6	17.5	8.2	92	28	8.3
AUG 31...	1400	57	39	7.5	13.0	9.8	98	23	6.8
SEP 21...	1130	16	52	7.5	16.0	8.8	95	26	7.8

DATE	MAGNESIUM, DIS-SOLVED (MG/L AS Mg) (00925)	SODIUM, DIS-SOLVED (MG/L AS Na) (00930)	POTASSIUM, DIS-SOLVED (MG/L AS K) (00935)	BICARBONATE WATER TOT IT FIELD (MG/L AS HCO3) (00453)	ALKALINITY WAT DIS TOT IT FIELD (MG/L AS CaCO3) (39086)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE, DIS-SOLVED (MG/L AS Cl) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SiO2) (00955)
OCT 19...	1.4	0.30	0.40	21	18	2.8	0.70	<0.10	5.3
NOV 23...	1.2	0.60	0.40	15	12	3.6	0.70	<0.10	6.1
DEC 28...	1.4	0.70	0.40	19	16	3.4	0.40	<0.10	8.2
JAN 25...	1.7	1.0	0.50	23	19	3.0	0.40	<0.10	9.1
FEB 16...	1.9	0.90	0.50	28	23	2.9	0.30	<0.10	9.7
MAR 29...	1.5	0.80	0.50	20	17	3.1	0.30	<0.10	8.9
APR 21...	0.62	0.40	0.40	4	3	3.0	0.20	<0.10	4.3
APR 26...	0.57	0.40	0.40	4	3	2.9	0.20	<0.10	3.8
MAY 24...	1.2	0.70	0.40	17	14	2.8	0.20	<0.10	2.4
JUN 21...	1.1	0.50	0.20	9	8	1.3	0.10	<0.10	3.5
JUN 29...	1.4	0.70	0.30	17	14	1.8	0.70	0.20	4.8
JUL 26...	1.3	0.70	0.20	15	12	1.1	0.20	<0.10	5.4
AUG 15...	1.8	0.80	0.40	29	24	1.7	0.40	<0.10	6.6
AUG 31...	1.5	0.70	0.30	18	15	2.0	0.30	<0.10	6.9
SEP 21...	1.7	0.80	0.40	26	21	1.7	0.30	<0.10	6.1

STREAMS TRIBUTARY TO LAKE MICHIGAN

04062085 PESHEKEE RIVER NEAR MARTINS LANDING, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	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 TOTAL (MG/L AS N) (00625)	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)
OCT								
19...	50	<0.010	<0.050	0.050	0.60	0.50	0.050	<0.010
NOV								
23...	58	<0.010	0.073	0.060	0.40	0.40	<0.010	<0.010
DEC								
28...	47	<0.010	0.084	0.040	0.30	0.30	<0.010	<0.010
JAN								
25...	48	0.030	0.120	0.040	0.30	0.30	0.020	<0.010
FEB								
16...	52	0.020	0.110	0.050	0.30	0.20	<0.010	0.020
MAR								
29...	47	<0.010	0.200	0.040	0.30	0.30	0.010	<0.010
APR								
21...	37	0.020	0.170	0.040	0.30	0.40	<0.010	<0.010
26...	32	<0.010	0.120	0.030	0.40	0.20	<0.010	<0.010
MAY								
24...	43	<0.010	<0.050	0.020	0.30	0.30	<0.010	<0.010
JUN								
21...	64	<0.010	<0.050	0.050	0.70	0.60	0.020	<0.010
29...	47	<0.010	<0.050	0.050	0.60	0.50	<0.010	<0.010
JUL								
26...	69	<0.010	<0.050	0.060	0.70	0.70	0.020	<0.010
AUG								
15...	64	<0.010	<0.050	0.040	0.40	0.40	<0.010	<0.010
31...	61	<0.010	0.061	0.050	0.50	0.50	<0.010	<0.010
SEP								
21...	60	<0.010	<0.050	0.020	0.50	0.40	<0.010	<0.010

DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS- PENDEED TOTAL (MG/L AS C) (00689)	SEDI- MENT, SUS- PENDEED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT							
19...	<0.010	360	9	14	0.1	2	89
NOV							
23...	<0.010	330	11	13	0.1	--	--
DEC							
28...	<0.010	390	11	11	0.1	6	49
JAN							
25...	<0.010	420	12	8.9	0.2	1	100
FEB							
16...	<0.010	400	11	8.0	0.1	2	86
MAR							
29...	<0.010	340	8	9.5	0.1	2	100
APR							
21...	<0.010	170	28	10	0.3	3	92
26...	<0.010	170	13	10	0.3	7	44
MAY							
24...	<0.010	360	18	11	0.2	--	100
JUN							
21...	<0.010	530	27	20	0.3	7	97
29...	<0.010	780	29	16	0.3	4	97
JUL							
26...	<0.010	810	21	20	0.2	4	100
AUG							
15...	<0.010	620	17	12	0.1	1	100
31...	<0.010	540	15	17	--	2	88
SEP							
21...	<0.010	580	16	14	0.2	1	88

STREAMS TRIBUTARY TO LAKE MICHIGAN

04062100 PESHEKEE RIVER NEAR MICHIGAMME, MI

LOCATION.--Lat 46°34'55", long 87°59'51", in SW1/4 SE1/4 sec.1, T.48 N., R.30 W., Marquette County, Hydrologic Unit 04030107, on right bank 10 ft downstream from bridge on county highway, 0.2 mi downstream from Dishno Creek, 5 mi north of Champion, and 6 mi northeast of Michigamme.

DRAINAGE AREA.--66.5 mi².

PERIOD OF RECORD.--July 1961 to September 1968, May 1993 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,598.01 ft above sea level. Prior to Aug. 11, 1961, 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	26	60	e46	e25	e13	e15	e28	278	75	67	44	96
2	37	54	e46	e25	e13	e16	e30	243	75	57	42	78
3	42	50	e46	e24	e13	e17	e30	228	67	47	37	61
4	42	50	e44	e24	e12	e18	e28	223	56	39	37	48
5	39	50	e44	e23	e12	e20	e26	228	49	35	33	41
6	35	55	e42	e23	e12	e22	e24	221	54	33	28	41
7	33	63	e40	e23	e12	e23	e22	195	55	79	25	38
8	64	54	e38	e23	e11	e22	e25	174	54	142	24	34
9	98	51	e36	e23	e11	e20	e30	162	48	486	24	28
10	103	49	e36	e23	e11	e19	e40	146	42	466	22	24
11	87	48	e36	e23	e12	e18	e55	138	41	315	19	21
12	70	47	e36	e23	e12	e18	e80	146	54	192	17	18
13	57	59	e36	e23	e13	e19	e120	140	58	128	16	18
14	49	103	e37	e22	e13	e20	e200	123	92	96	15	18
15	43	128	e38	e21	e13	e22	e300	132	151	76	14	18
16	40	132	e38	e20	e13	e24	e420	156	132	61	14	22
17	38	110	e38	e18	e13	e22	e550	153	121	58	12	22
18	35	96	e38	e16	e15	e21	636	128	292	71	12	23
19	33	78	e38	e14	e20	e20	813	106	326	69	11	24
20	31	72	e38	e13	e30	e20	804	90	249	68	13	21
21	47	84	e37	e14	e40	e22	694	78	159	74	13	19
22	70	69	e36	e14	e32	e25	537	69	110	144	12	20
23	76	68	e34	e14	e25	e30	477	61	88	195	11	22
24	75	e64	e32	e15	e20	e35	619	58	80	143	11	22
25	69	e60	e30	e15	e17	e30	881	65	62	95	10	22
26	60	e60	e28	e15	e16	e26	927	84	50	71	14	48
27	54	e58	e26	e14	e15	e25	1210	83	41	57	23	99
28	51	e54	e24	e14	e15	e25	734	73	45	47	54	165
29	50	e50	e25	e14	---	e25	449	64	73	41	50	175
30	52	e48	e25	e13	---	e25	338	58	72	37	58	142
31	56	---	e25	e13	---	e26	---	65	---	35	93	---
TOTAL	1662	2024	1113	584	454	690	11127	4168	2871	3524	808	1428
MEAN	53.6	67.5	35.9	18.8	16.2	22.3	371	134	95.7	114	26.1	47.6
MAX	103	132	46	25	40	35	1210	278	326	486	93	175
MIN	26	47	24	13	11	15	22	58	41	33	10	18
CFSM	.81	1.01	.54	.28	.24	.33	5.58	2.02	1.44	1.71	.39	.72
IN.	.93	1.13	.62	.33	.25	.39	6.22	2.33	1.61	1.97	.45	.80

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1994, BY WATER YEAR (WY)

	MEAN	84.1	92.3	61.9	33.5	26.5	61.2	422	266	119	53.9	27.3	59.6
MAX	173	160	92.8	56.5	44.6	212	622	695	233	184	68.7	266	266
(WY)	1968	1968	1963	1966	1966	1968	1967	1965	1967	1968	1964	1968	1968
MIN	9.01	67.5	35.9	18.8	16.2	22.3	261	120	54.8	7.82	7.47	8.87	8.87
(WY)	1964	1994	1994	1994	1994	1994	1965	1968	1965	1966	1961	1967	1967

SUMMARY STATISTICS

FOR 1994 WATER YEAR

WATER YEARS 1961 - 1994

ANNUAL TOTAL	30453		
ANNUAL MEAN	83.4	111	
HIGHEST ANNUAL MEAN		145	1968
LOWEST ANNUAL MEAN		83.3	1962
HIGHEST DAILY MEAN	1210	2710	May 8 1965
LOWEST DAILY MEAN	10	3.9	Sep 9 1961
ANNUAL SEVEN-DAY MINIMUM	12	4.3	Sep 4 1961
INSTANTANEOUS PEAK FLOW	1310	3060	May 8 1965
INSTANTANEOUS PEAK STAGE	9.01	11.46	May 8 1965
INSTANTANEOUS LOW FLOW	10	3.6	Sep 1 1961
ANNUAL RUNOFF (CFSM)	1.25	1.67	
ANNUAL RUNOFF (INCHES)	17.04	22.65	
10 PERCENT EXCEEDS	160	236	
50 PERCENT EXCEEDS	40	47	
90 PERCENT EXCEEDS	14	11	

(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 1950.

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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1260	1040	1340	1130	1620	1460	1180	2700	1660	1380	1400	2080
2	625	1070	1510	1240	1740	1560	1440	2480	1430	1040	1170	2020
3	833	1040	1780	1680	1520	1260	1180	2530	1300	1130	1140	1890
4	1370	1020	1410	1330	1720	1370	985	2490	1060	980	1400	1890
5	1040	1110	1490	1590	1440	1100	845	1440	1210	1100	1390	1750
6	1230	1210	1560	1650	1520	1320	830	1230	1010	1180	940	1670
7	1140	1130	1160	1640	1740	1570	716	610	1180	1210	990	1530
8	1190	763	1340	1470	1510	1800	956	491	1230	1150	900	1400
9	1240	888	1510	1480	1520	1760	677	890	1250	1820	890	1340
10	1090	1000	1520	1520	1530	1750	710	980	1180	2530	960	1340
11	1470	938	1050	1520	1570	1830	838	860	650	2640	1010	1310
12	1720	1070	997	1490	1440	1760	713	980	720	2720	730	1200
13	1760	717	1520	1490	1520	1770	516	1220	1220	2690	790	1060
14	1720	1130	1320	1510	1180	1760	809	1080	1440	3180	970	1440
15	1360	1290	1430	1430	1600	1420	759	1460	1580	3050	820	1980
16	1120	1500	1240	1270	1700	1260	1230	1920	1470	2510	840	1980
17	897	1550	1460	1520	1390	1450	803	1700	1670	2470	800	1680
18	1300	1600	1740	1540	1520	1070	751	1610	940	2210	830	1470
19	1380	1410	1660	e1580	1440	970	918	1470	928	1730	880	1170
20	1490	1310	1730	e1580	1540	800	825	1380	1340	1860	840	1400
21	1830	1080	1790	e1500	2000	1250	1380	970	1910	1700	910	1360
22	1790	948	1710	1320	1910	1170	1380	486	1700	1490	1140	1010
23	1560	984	1540	1270	1900	1140	1410	1230	1280	1430	1530	980
24	1080	1000	1470	1560	1740	1340	1110	1060	970	1440	1560	1000
25	1100	1230	1480	1480	2020	1610	1400	1160	850	1650	1530	1030
26	1270	996	1320	1550	1670	1030	1370	1260	820	1800	1430	1030
27	1400	784	1450	e1500	1490	1400	1940	1320	970	1800	1300	1660
28	1180	737	1390	1510	1430	1330	2780	1710	1030	1770	1470	1840
29	972	1140	1300	1580	---	1230	2660	1690	1100	1760	1320	1840
30	599	1120	1310	1630	---	1100	3020	1750	1450	1650	1520	1510
31	698	---	1200	1690	---	1180	---	1580	---	1520	1950	---
TOTAL	38714	32805	44727	46250	44920	42820	36131	43737	36548	56590	35350	44860
MEAN	1249	1093	1443	1492	1604	1381	1204	1411	1218	1825	1140	1495
MAX	1830	1600	1790	1690	2020	1830	3020	2700	1910	3180	1950	2080
MIN	599	717	997	1130	1180	800	516	486	650	980	730	980

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1914 - 1994, BY WATER YEAR (WY)

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925
MEAN	1479	1612	1456	1391	1361	1582	3189	3036	2141	1594	1292	1408
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	1968
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	1925

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1914 - 1994

ANNUAL TOTAL	618516	503452	1795
ANNUAL MEAN	1695	1379	3069
HIGHEST ANNUAL MEAN			922
LOWEST ANNUAL MEAN			1916
HIGHEST DAILY MEAN	5130	3180	18800
LOWEST DAILY MEAN	554	486	57
ANNUAL SEVEN-DAY MINIMUM	804	717	277
INSTANTANEOUS PEAK FLOW		3820	19500
INSTANTANEOUS PEAK STAGE		6.17	(a)14.15
INSTANTANEOUS LOW FLOW		235	(a)38
10 PERCENT EXCEEDS	2680	1810	3050
50 PERCENT EXCEEDS	1590	1380	1460
90 PERCENT EXCEEDS	915	856	840

(a) Since July 1950.

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

(c) 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.

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. Oct. 1957 to Sept. 1989, water-stage recorder at site 10.4 mi upstream at different datum. Nov. 1989 to July 1993, water-stage recorder at site 150 ft upstream at same datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1240	1120	1430	1310	e1700	1530	1380	2830	1640	1360	1570	2090
2	745	1100	1670	1320	e1650	1490	1500	2640	1520	1220	1250	2150
3	972	1110	1680	1520	e1550	1380	1320	2800	1330	1160	1380	2030
4	1310	1080	1450	1480	e1500	1410	1200	2610	1150	1160	1300	1970
5	1210	1180	1540	1570	e1450	1170	813	1770	1240	1270	1320	1960
6	1330	1260	1710	1740	e1400	1310	1010	1380	1410	1250	1070	1740
7	1210	1170	1330	1680	e1620	1590	784	756	1350	1230	1030	1650
8	1320	964	1300	1550	e1500	1820	1010	635	1330	1410	1010	1480
9	1290	1010	1610	1570	e1520	1860	817	1200	1500	1840	1060	1450
10	1210	1060	1550	1610	e1550	1870	811	1060	1290	3020	1120	1190
11	1470	1010	1290	1590	e1550	1870	883	1050	837	2810	874	1460
12	1870	1170	1070	1570	e1480	1860	873	1050	842	2820	813	1220
13	1880	821	1380	1380	e1450	1860	830	1340	1460	2750	908	1470
14	1890	1060	1320	1580	e1400	1850	867	1240	1500	3380	1070	1320
15	1460	1520	1480	e1450	e1500	1390	975	1420	1810	3290	957	2070
16	1220	1590	1440	e1400	e1540	1430	1400	2080	1740	2870	927	2230
17	1140	1600	1480	e1420	e1530	1330	851	1830	1780	2700	815	1890
18	1250	1630	1730	e1550	e1510	1340	926	1800	990	2450	992	1560
19	1490	1580	1800	e1600	1480	924	1060	1510	1000	1670	950	1220
20	1540	1330	1730	e1600	1770	891	979	1570	1640	2150	947	1490
21	1940	1200	1890	e1650	1960	1270	1240	1150	2000	1670	1020	1400
22	2000	1020	1800	e1450	1930	1250	1560	717	1790	1660	1440	1100
23	1680	1190	1540	e1300	1920	1310	1490	1250	1400	1550	1630	1100
24	1300	1140	1640	e1450	1930	1450	1260	1150	1070	1640	1600	1090
25	1080	1190	1490	e1500	1880	1670	1430	1190	908	1670	1610	1180
26	1380	954	1350	e1530	1810	1140	1520	1390	901	1870	1580	1300
27	1410	827	1450	e1500	1480	1320	2120	1390	1150	1870	1410	1750
28	1340	804	1330	e1540	1450	1470	2870	1910	1090	1850	1530	1880
29	1130	1190	1390	e1540	---	1230	3040	1830	1390	1860	1320	1930
30	690	1120	1320	e1580	---	1250	2990	1820	1440	1850	1840	1670
31	671	---	1230	e1600	---	1230	---	1790	---	1560	2240	---
TOTAL	41668	35000	46420	47130	45010	44765	39809	48158	40498	60860	38583	48040
MEAN	1344	1167	1497	1520	1607	1444	1327	1553	1350	1963	1245	1601
MAX	2000	1630	1890	1740	1960	1870	3040	2830	2000	3380	2240	2230
MIN	671	804	1070	1300	1400	891	784	635	837	1160	813	1090

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1914 - 1994, BY WATER YEAR (WY)

	MEAN	1485	1622	1465	1400	1368	1594	3204	3046	2155	1605	1303	1418
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 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1914 - 1994
ANNUAL TOTAL	643780	535941	
ANNUAL MEAN	1764	1468	1806
HIGHEST ANNUAL MEAN			3069
LOWEST ANNUAL MEAN			922
HIGHEST DAILY MEAN	5190	May 6	18100
LOWEST DAILY MEAN	671	Oct 31	57
ANNUAL SEVEN-DAY MINIMUM	857	Jul 24	277
INSTANTANEOUS PEAK FLOW			19500
INSTANTANEOUS PEAK STAGE		8.73	(a)9.91
INSTANTANEOUS LOW FLOW		542	(a)399
10 PERCENT EXCEEDS	2750	1900	3070
50 PERCENT EXCEEDS	1680	1440	1470
90 PERCENT EXCEEDS	982	974	849

(a) Since October 1989.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04065106 MENOMINEE RIVER AT NIAGARA, WI

LOCATION.--Lat 45°46'04", long 87°58'50", in NE1/4 NE1/4 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. 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 of gage. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1550	1480	1640	1610	e1900	1750	1730	e3600	2710	1760	2010	2490
2	1180	1460	2030	1560	e1900	1700	1740	e3300	2510	1350	1670	2420
3	1190	1540	2040	1750	e1800	1700	1840	3570	2220	1430	1790	2500
4	1700	1490	1790	1730	e1900	1640	1570	3560	1870	1420	1740	2200
5	1540	1560	1850	1740	e1600	1570	1260	2470	1840	1700	1730	2260
6	1640	1700	2030	1710	e1700	1670	1190	2080	1930	1570	1370	2140
7	1590	1690	1860	1730	e1900	1960	1180	1320	1960	1620	1300	1980
8	1710	1470	1550	1710	e1600	2240	1300	1410	1820	1970	1310	1810
9	1550	1160	1860	1720	e1800	2250	1090	1770	1870	2610	1330	1640
10	1560	1220	2000	1770	e1700	2110	1140	e1600	1810	4090	1340	1450
11	1720	1250	1680	1740	e1700	2110	1230	1450	1160	3690	1180	1550
12	2210	1610	1470	1690	e1600	2040	1300	1570	1190	e3600	1220	1470
13	2250	1180	1590	1730	e1600	2200	1470	1760	1940	3480	1140	1870
14	2170	1760	1680	1580	e1700	2040	1470	1720	2530	3680	1090	2050
15	1950	2170	1800	1680	e1600	1730	1750	1940	2630	4060	1140	3550
16	1610	2240	1820	1590	e1900	1700	2190	2470	2560	3630	1080	4330
17	1600	2240	1850	1620	e1800	1750	1950	2440	2570	3430	1100	3490
18	1700	2190	2000	1800	e1700	1560	1840	2280	1660	3070	1140	2670
19	1860	2150	2100	1850	1680	1150	1980	2000	1480	2680	1140	1980
20	1970	1900	2080	1830	2130	1160	1680	2020	1890	2580	1110	2250
21	2420	1720	2030	1800	2380	1520	1760	1680	2520	2400	1110	2150
22	2990	1480	2100	1690	2510	1680	2080	1130	2240	2390	1730	1610
23	2090	1630	1820	1580	2370	1850	2190	1450	1810	2520	1460	1670
24	2110	1540	1960	1610	2410	1950	1890	1540	1360	2540	1930	1540
25	1560	1380	2050	1660	2160	2020	2120	1530	1170	2430	1900	1630
26	1830	1320	1800	1600	1980	1580	2460	1720	1210	2600	1800	1900
27	1990	1110	1700	1640	1890	1600	e3600	1720	1510	2400	1630	2390
28	1730	1140	1680	e1600	1850	1780	e3800	2070	1410	2620	1760	2820
29	1620	1540	1640	e1600	---	1600	e3900	2300	1700	2230	1820	2570
30	1140	1640	1630	e1800	---	1510	e3900	2230	1890	2450	1780	2360
31	1060	---	1550	e1800	---	1560	---	2590	---	1950	2490	---
TOTAL	54790	47960	56680	52520	52760	54680	58600	64290	56970	79950	46340	66740
MEAN	1767	1599	1828	1694	1884	1764	1953	2074	1899	2579	1495	2225
MAX	2990	2240	2100	1850	2510	2250	3900	3600	2710	4090	2490	4330
MIN	1060	1110	1470	1560	1600	1150	1090	1130	1160	1350	1080	1450

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1993 - 1994, BY WATER YEAR (WY)

	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994
MEAN	1700	2065	2143	1976	1983	1770	2674	3078	3041	2243	1431	2070
MAX	1767	2531	2458	2258	2082	1777	3395	4083	4184	2579	1495	2225
(WY)	1994	1993	1993	1993	1993	1993	1993	1993	1993	1994	1994	1994
MIN	1632	1599	1828	1694	1884	1764	1953	2074	1899	1906	1368	1916
(WY)	1993	1994	1994	1994	1994	1994	1994	1994	1994	1993	1993	1993

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1993 - 1994

ANNUAL TOTAL	855710		692280									
ANNUAL MEAN	2344		1897									
HIGHEST ANNUAL MEAN										2180		
LOWEST ANNUAL MEAN										2463		1993
HIGHEST DAILY MEAN	7770									1897		1994
LOWEST DAILY MEAN	1060									7770		May 6 1993
ANNUAL SEVEN-DAY MINIMUM	1180									1060		(a)
INSTANTANEOUS PEAK FLOW										1110		Aug 14 1994
INSTANTANEOUS PEAK STAGE										8070		May 7 1993
10 PERCENT EXCEEDS	4020									11.02		May 7 1993
50 PERCENT EXCEEDS	2040									3550		
90 PERCENT EXCEEDS	1310									1930		
										1320		

(a) July 25, Oct. 31, 1993.

(b) Maximum recorded, but may have been greater during period of no gage-height record, Apr. 27 to May 2.

(c) 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 excellent 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 station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1830	1770	1980	1770	e2100	1900	2020	4700	3330	2130	2100	2800
2	1490	1800	2350	1800	e2100	1810	2360	4270	3160	1540	1890	2570
3	1510	1780	2400	1910	e2100	1830	2420	4070	2650	1640	1820	2710
4	1950	1830	2170	2050	e2000	1800	2160	4040	2300	1670	1950	2420
5	1830	1950	2220	2090	e2000	1760	1800	3220	2250	1890	1740	2440
6	1960	2090	2310	2040	e2050	1800	1670	2890	2280	1810	1570	2360
7	1910	2060	2260	2160	e2050	2070	1530	1870	2330	1780	1390	2150
8	1950	1950	1860	2150	e2000	2460	1650	1990	2150	2150	1490	1950
9	1880	1540	2090	2030	e2000	2430	1570	2290	2190	2670	1450	1790
10	1860	1600	2360	2070	e2000	2370	1550	2150	2150	3980	1400	1620
11	1880	1560	1960	2190	e2000	2350	1720	1990	1420	3750	1290	1720
12	2410	1940	1750	2020	e2000	2290	1850	1980	1500	4030	1340	1660
13	2590	1640	1890	2020	1950	2400	2170	2320	2290	3400	1250	2010
14	2460	2260	1930	1960	1800	2280	2190	2190	3140	3660	1190	2240
15	2370	2710	2140	e1920	1890	2030	2420	2160	3410	4010	1220	3590
16	1920	2850	2170	e1800	1960	1940	3340	3130	3080	3660	1190	4710
17	2000	2810	2190	e1800	1990	1970	3170	2750	3090	3460	1180	3790
18	2080	2770	2310	e2000	1810	1900	2810	2870	2230	3330	1200	3190
19	2260	2660	2370	e2020	1760	1400	2900	2410	1910	2790	1330	2270
20	2370	2400	2490	e2050	2210	1420	2540	2460	2230	2700	1200	2520
21	2730	2260	2390	e1950	2440	1800	2420	2170	2700	2520	1230	2450
22	3430	1870	2440	e1850	2480	1890	2750	1570	2690	2590	1730	1870
23	2620	1990	2150	e1800	2530	2180	2790	1830	2100	2650	1550	1920
24	2610	1920	e2000	e1900	2450	2400	2570	1880	1660	2840	2000	1710
25	2060	1720	e1900	e2000	2260	2440	2720	1900	1440	2650	1950	1900
26	2220	1690	e1800	e2000	2150	1920	3160	1980	1500	2850	1940	2120
27	2430	1530	e1700	e2000	2070	1960	4050	2110	1730	2550	1730	2510
28	2240	1470	e1700	e2000	1940	2150	5140	2350	1680	2800	1860	3150
29	1960	1860	e1700	e2000	---	2030	4890	2680	1940	2300	2000	2860
30	1570	1960	e1700	e1950	---	1940	5060	2600	2070	2620	1870	2690
31	1420	---	e1700	e2000	---	1950	---	3020	---	2140	2570	---
TOTAL	65800	60240	64380	61300	58090	62870	79390	79840	68610	84560	49620	73690
MEAN	2123	2008	2077	1977	2075	2028	2646	2575	2287	2728	1601	2456
MAX	3430	2850	2490	2190	2530	2460	5140	4700	3410	4030	2570	4710
MIN	1420	1470	1700	1770	1760	1400	1530	1570	1420	1540	1180	1620

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1988 - 1994, BY WATER YEAR (WY)

MEAN	1833	2519	2369	2061	1950	2401	3734	3188	2869	2020	1499	1956
MAX	2510	4412	3008	2533	2378	2849	5756	4917	4832	2735	1692	2456
(WY)	1991	1989	1989	1993	1993	1991	1992	1993	1993	1992	1991	1994
MIN	1081	1382	1555	1689	1773	2028	1356	1720	1062	1100	1256	1223
(WY)	1990	1990	1990	1991	1990	1994	1990	1988	1988	1988	1989	1989

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1988 - 1994
ANNUAL TOTAL	1011730	808390	
ANNUAL MEAN	2772	2215	2434
HIGHEST ANNUAL MEAN			2920
LOWEST ANNUAL MEAN			1864
HIGHEST DAILY MEAN	9210	May 6	10300
LOWEST DAILY MEAN	1260	Jul 25	846
ANNUAL SEVEN-DAY MINIMUM	1400	Aug 22	932
INSTANTANEOUS PEAK FLOW			10700
INSTANTANEOUS PEAK STAGE		9.37	12.82
INSTANTANEOUS LOW FLOW			603
10 PERCENT EXCEEDS	4680		3970
50 PERCENT EXCEEDS	2400		2010
90 PERCENT EXCEEDS	1600		1260

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04066003 MENOMINEE RIVER BELOW PEMENE CREEK NEAR PEMBINE, WI

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

DRAINAGE AREA.--3,140 mi².

PERIOD OF RECORD.--October 1949 to current year. Published as "near Pembine, WI" (04066000) prior to August 1982. Monthly discharge only for some periods, published in WSP 1307.

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

REMARKS.--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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1810	1770	e2100	e2000	e2000	e1900	2060	5170	3540	2360	2210	3000
2	1680	1980	e2400	e1800	e2100	e1800	2480	4710	3440	1930	2010	2660
3	1520	1910	2480	e1900	e2000	e1900	2540	4350	2850	1730	1780	2870
4	1730	2020	2360	e2100	e2000	e1900	2310	4270	2560	1780	2080	2580
5	1950	2120	2270	e2100	e2000	e1800	2090	3710	2330	1840	1690	2480
6	1900	2360	2340	e2100	e1900	e1800	1710	3250	2340	1980	1810	2480
7	1970	2240	2490	e2200	e2000	e2000	1550	2310	2360	1860	1400	2180
8	1930	2180	1990	e2200	e1900	e2500	1690	2230	2260	2200	1560	2060
9	1990	1840	2190	e2100	e1900	e2500	1790	2350	2280	2670	1380	1850
10	1920	1620	2480	e2100	e1900	e2400	1630	2340	2210	3830	1470	1750
11	1890	1770	e2000	e2200	e2000	e2400	1780	2250	1750	3910	1490	1710
12	2410	1810	e1800	e2100	e2000	e2400	1990	2120	1570	4120	1390	1710
13	2590	2090	e1900	e2100	e1900	e2500	2300	2350	2090	3420	1370	1990
14	2540	2260	e2000	e2000	e1800	e2400	2440	2320	3250	3620	1300	2750
15	2460	2860	2120	e1800	e1900	2270	2640	2280	3550	4030	1260	3700
16	2050	3180	2300	e1900	e2000	2000	3560	3230	3240	3870	1310	5360
17	2190	3020	2300	e1700	e2000	2130	3800	2840	3240	3650	1260	4480
18	2190	2990	2480	e1900	e1900	1950	3170	3050	2630	3700	1270	3850
19	2340	2870	2510	e2200	e1800	1570	3180	2600	2040	3060	1310	2770
20	2420	2680	2560	e2100	e2200	1460	2820	2590	2170	2840	1330	2760
21	2690	2470	2490	e2100	e2500	1640	2700	2300	2770	2800	1280	2650
22	3650	1980	e2300	e2000	e2500	1950	2960	1940	2890	2710	1450	2150
23	2980	2040	e2100	e1900	e2600	2330	3010	1780	2200	2690	1850	1920
24	2740	2030	e1900	e1800	e2500	2510	2940	1950	1850	3000	1870	1910
25	2310	1840	e1900	e2000	e2300	2580	3120	2150	1620	2720	1970	1950
26	2220	1810	e2000	e1900	e2200	2090	3620	2110	1490	2910	2000	2300
27	2660	e1600	e1800	e1900	e2200	2080	4420	2280	1650	2700	1830	2720
28	2400	e1600	e1800	e2000	e2000	2180	5760	2460	1780	2900	1820	3330
29	2110	e1900	e2000	e1900	---	2170	5290	2840	2020	2410	2060	3190
30	2000	e2000	e2000	e1900	---	2050	5530	2770	2290	2640	1900	2880
31	1580	---	e2200	e2000	---	2010	---	3030	---	2390	2440	---
TOTAL	68820	64840	67560	62000	58000	65170	86880	85930	72260	88270	51150	79990
MEAN	2220	2161	2179	2000	2071	2102	2896	2772	2409	2847	1650	2666
MAX	3650	3180	2560	2200	2600	2580	5760	5170	3550	4120	2440	5360
MIN	1520	1600	1800	1700	1800	1460	1550	1780	1490	1730	1260	1710

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1950 - 1994, BY WATER YEAR (WY)

	MEAN	2507	2677	2335	2128	2075	2602	5597	4795	3426	2542	2096	2363
MAX	5659	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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1950 - 1994

ANNUAL TOTAL	1094430		850870										
ANNUAL MEAN	2998		2331										
HIGHEST ANNUAL MEAN													
LOWEST ANNUAL MEAN													
HIGHEST DAILY MEAN	10400		May 6	5760		Apr 28	26700		May 8 1960				
LOWEST DAILY MEAN	1390		Aug 26	1260		(a)	840		Aug 14 1977				
ANNUAL SEVEN-DAY MINIMUM	1470		Aug 22	1290		Aug 15	914		Aug 8 1977				
INSTANTANEOUS PEAK FLOW				(b)6300		Apr 28	26900		May 8 1960				
INSTANTANEOUS PEAK STAGE				(c)11.65		Dec 24	(d)13.90		May 8 1960				
10 PERCENT EXCEEDS	5070			3180			4980						
50 PERCENT EXCEEDS	2600			2150			2300						
90 PERCENT EXCEEDS	1690			1710			1450						

(a) Aug. 15, 17.

(b) Gage height, 10.35 ft.

(c) Ice jam.

(d) Site and datum then in use.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04067500 MENOMINEE RIVER NEAR McALLISTER, WI
(National water quality assessment program station)

LOCATION.--Lat 45°19'33", long 87°39'48", in SW1/4 SE1/4 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.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--March 1945 to September 1961, October 1961 to September 1979 (miscellaneous measurements and annual maximums only), October 1979 to September 1986, October 1986 to March 1987 (crest-stage partial-record station), April 1988 to September 1990, April 1993 to current year.

GAGE.--Water-stage recorder. 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, 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1720	1810	2430	e2140	e2240	e2350	2570	6580	4340	2970	2700	2820
2	1620	2230	2730	e2150	e2260	e2300	2510	6250	4370	2560	2470	3080
3	1810	2250	2910	e2170	e2280	e2250	2990	5620	3970	2120	2440	2770
4	1820	2260	3070	e2200	e2280	e2200	2820	5250	3300	2000	2080	3060
5	2020	2590	2610	e2230	e2280	e2200	2890	4940	2980	2020	2710	2670
6	2190	2760	2660	e2270	e2210	e2300	2300	4320	2700	2360	2040	2700
7	2200	2940	2580	e2290	e2110	e2390	2240	3850	2790	2210	1420	2700
8	2340	2840	2760	e2300	e2130	e2510	1890	2900	2690	2250	1690	2400
9	2350	2680	2650	e2380	e2150	e2900	2020	2900	2510	2690	1820	2130
10	2280	2230	2440	e2310	e2180	e2990	2240	3180	2680	3410	1570	1900
11	2520	2150	2130	e2320	e2200	e2980	2040	3060	2450	4140	1730	1870
12	2160	2230	1940	e2390	e2200	e2910	2140	2760	1880	4370	1510	1870
13	2790	2510	2250	e2390	e2180	e2900	2830	2810	2160	4400	1430	2250
14	2840	2680	2740	e2390	e2100	e2890	3000	2970	2850	3920	1500	3040
15	2740	3280	2960	e2290	e2120	e2820	3360	2860	4140	3970	1480	4040
16	2860	3790	2560	e2100	e2170	e2680	4270	3150	4130	3940	1460	6160
17	2540	3700	2550	e2200	e2210	2640	4900	3710	3650	4470	1370	7190
18	2640	3530	2580	e2150	e2220	2660	4830	3180	3470	4570	1440	5950
19	2810	3550	2770	e2020	e2240	2590	4210	3390	2580	4520	1480	4810
20	2760	3190	2980	e2100	e2300	2090	4390	2980	2350	3980	1550	3580
21	2930	3220	2750	e2210	e2500	1900	2890	2980	2660	3560	1530	3430
22	3570	2620	2600	e2210	e2700	e2620	3640	2620	2920	3270	1510	3210
23	4120	2460	2420	e2200	e2700	e3170	3540	2160	2970	3390	1770	2590
24	3200	2610	2180	e2150	e2700	e4300	e3480	2260	2450	3400	2020	2360
25	3190	2240	e2150	e2070	e2670	e4800	e3900	2340	2150	3360	2020	2300
26	2600	2200	e2050	e2000	e2550	e4400	e4200	2620	1970	3100	2210	2580
27	2750	2230	e1950	e2120	e2500	e4150	e5700	2650	1710	3310	2230	3270
28	3040	1810	e1950	e2190	e2430	e3150	e6000	2730	1830	3050	2090	3830
29	2570	1850	e2050	e2210	---	2620	7160	2890	2150	3280	1920	4330
30	2360	2290	e2080	e2210	---	2590	6680	3670	2560	2840	2280	3930
31	2250	---	e2120	e2210	---	2250	---	4120	---	2970	2620	---
TOTAL	79590	78730	76600	68570	64810	87500	107630	107700	85360	102400	58090	98820
MEAN	2567	2624	2471	2212	2315	2823	3588	3474	2845	3303	1874	3294
MAX	4120	3790	3070	2390	2700	4800	7160	6580	4370	4570	2710	7190
MIN	1620	1810	1940	2000	2100	1900	1890	2160	1710	2000	1370	1870

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1994, BY WATER YEAR (WY)

	MEAN	3029	3395	2666	2432	2400	2997	6711	5430	4047	3234	2399	2744
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	2257	1296	1374	1377	1390	
(WY)	1949	1990	1990	1949	1948	1956	1990	1988	1988	1988	1957	1989	

SUMMARY STATISTICS

FOR 1994 WATER YEAR

WATER YEARS 1945 - 1994

ANNUAL TOTAL	1015800												
ANNUAL MEAN	2783												
HIGHEST ANNUAL MEAN													
LOWEST ANNUAL MEAN													
HIGHEST DAILY MEAN	7190				Sep 17		31800			May 9 1960			
LOWEST DAILY MEAN	1370				Aug 17		810			Oct 26 1948			
ANNUAL SEVEN-DAY MINIMUM	1450				Aug 13		952			Oct 24 1948			
INSTANTANEOUS PEAK FLOW	7420				(a)		32500			May 9 1960			
INSTANTANEOUS PEAK STAGE	12.56				(a)		(b)20.0			May 9 1960			
INSTANTANEOUS LOW FLOW							(c)538			Oct 6 1946			
10 PERCENT EXCEEDS	4120						6230						
50 PERCENT EXCEEDS	2580						2700						
90 PERCENT EXCEEDS	1960						1660						

(a) Apr. 29, Sept. 17.

(b) From graph based on gage readings.

(c) Observed.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04067500 MENOMINEE RIVER NEAR McALLISTER, WI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1978-86, 1993 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: June 1979 to September 1980.

WATER TEMPERATURES: June 1979 to September 1980.

REMARKS.--Cross-sectional samples collected at bridge.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum daily, 250 microsiemens, Mar. 12, 16, 1980; minimum daily, 105 microsiemens, June 4, 1980.

WATER TEMPERATURES: Maximum daily, 26.0°C, July 11, 1980; minimum daily, 0.0°C, on many days during winter periods.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A specific conductance of 320 microsiemens was measured Mar. 24, 1978.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATURATION) (00301)	HARDNESS TOTAL (MG/L AS CaCO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS Ca) (00915)
OCT 21...	0930	3290	268	8.1	9.0	10.6	94	130	29
NOV 24...	1100	2560	258	8.1	1.0	14.6	104	120	27
DEC 21...	1100	2440	285	8.2	0.5	13.6	97	120	28
JAN 26...	1400	2000	282	7.7	0.0	12.3	84	120	28
FEB 17...	1230	2250	289	7.7	0.0	12.5	87	120	26
MAR 30...	1245	3010	269	7.8	3.5	13.2	100	120	27
APR 28...	1500	6290	245	8.1	8.5	11.8	103	120	27
MAY 27...	0900	2490	243	8.1	16.0	10.3	106	110	25
JUN 22...	1720	2690	242	8.4	25.5	7.4	93	110	25
JUL 28...	1230	2960	200	8.2	22.5	8.2	96	100	23
AUG 18...	1605	1670	259	8.3	22.0	7.5	88	110	24
SEP 20...	1100	3660	219	8.0	19.0	8.5	93	110	25

DATE	MAGNESIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTASSIUM, DIS-SOLVED (MG/L AS K) (00935)	BICARBONATE WATER DIS IT FIELD (MG/L AS HCO3) (00453)	ALKALINITY WAT DIS TOT IT FIELD (MG/L AS CaCO3) (39086)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SiO2) (00955)
OCT 21...	13	7.8	1.6	118	97	16	6.6	0.10	7.9
NOV 24...	13	6.5	1.2	118	97	16	5.4	<0.10	8.1
DEC 21...	13	12	1.5	124	102	17	11	<0.10	8.9
JAN 26...	13	11	1.8	116	95	18	7.8	<0.10	11
FEB 17...	13	10	1.5	124	102	18	7.4	<0.10	11
MAR 30...	12	8.2	1.7	127	104	16	6.9	<0.10	8.6
APR 28...	12	5.9	1.7	120	98	13	5.8	<0.10	5.6
MAY 27...	12	6.6	0.90	131	107	12	5.8	<0.10	4.3
JUN 22...	11	6.4	1.2	112	92	12	5.1	0.10	6.7
JUL 28...	11	6.1	1.2	98	80	--	--	<0.10	7.5
AUG 18...	11	10	1.6	124	102	15	7.6	<0.10	6.2
SEP 20...	11	4.1	1.3	115	94	11	3.9	<0.10	9.1

STREAMS TRIBUTARY TO LAKE MICHIGAN
04067500 MENOMINEE RIVER NEAR McALLISTER, WI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	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 TOTAL (MG/L AS N) (00625)	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)
OCT 21...	160	<0.010	<0.050	0.030	0.30	0.30	0.020	<0.010
NOV 24...	171	<0.010	0.092	0.020	0.30	0.30	<0.010	<0.010
DEC 21...	166	0.020	2.00	0.080	0.30	0.70	<0.010	<0.010
JAN 26...	170	<0.010	0.240	0.090	0.30	0.30	0.020	0.030
FEB 17...	170	0.020	0.290	0.080	0.30	0.40	0.030	0.030
MAR 30...	160	<0.010	0.220	0.020	<0.20	<0.20	<0.010	<0.010
APR 28...	155	<0.010	0.100	0.020	0.50	0.30	0.030	<0.010
MAY 27...	152	<0.010	0.052	<0.010	0.50	0.30	0.030	0.010
JUN 22...	151	<0.010	0.089	0.020	0.50	0.40	0.030	0.020
JUL 28...	140	<0.010	<0.050	0.020	0.50	0.40	0.030	<0.010
AUG 18...	164	<0.010	<0.050	0.010	0.40	0.30	0.030	0.010
SEP 20...	138	<0.010	0.086	0.020	0.70	0.50	0.020	0.010

DATE	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS- PENDEED TOTAL (MG/L AS C) (00689)	SEDI- MENT, SUS- PENDEED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 21...	<0.010	59	20	8.4	0.5	6	91
NOV 24...	<0.010	91	17	8.1	0.2	3	95
DEC 21...	0.030	110	20	7.4	0.2	3	94
JAN 26...	<0.010	110	15	6.6	0.2	4	82
FEB 17...	0.020	110	11	5.8	0.2	4	67
MAR 30...	<0.010	100	18	5.9	0.3	4	86
APR 28...	<0.010	100	20	8.8	0.7	29	36
MAY 27...	<0.010	38	14	8.1	0.3	6	99
JUN 22...	<0.010	710	47	9.6	0.7	9	95
JUL 28...	<0.010	72	7	9.8	0.5	6	96
AUG 18...	<0.010	35	7	9.0	0.5	3	100
SEP 20...	<0.010	110	30	13	0.8	9	98

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 Tekonsha 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 04096400).

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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	204	205	197	e145	e205	e255	233	261	112	164	61	71
2	187	197	197	e145	e200	e250	223	260	107	149	60	68
3	167	195	198	e140	e200	e250	215	254	104	137	57	66
4	152	192	198	e135	e195	e245	210	251	100	128	69	63
5	141	190	201	e130	e190	e245	206	244	96	143	73	62
6	133	187	206	e130	e185	e280	208	235	104	150	68	60
7	126	182	209	e125	e180	371	206	235	103	142	64	59
8	120	179	208	e120	e175	380	207	247	98	133	60	56
9	141	177	206	e120	e170	360	208	238	92	126	58	55
10	160	175	204	e115	e165	345	206	226	88	125	58	52
11	168	173	196	e115	e160	332	197	218	84	117	73	50
12	167	170	186	e110	e160	321	215	211	80	109	92	49
13	158	175	179	e110	e160	317	294	198	98	106	120	47
14	149	181	174	e110	e155	310	341	187	138	100	173	46
15	141	189	172	e105	e155	297	337	181	148	96	182	44
16	142	189	169	e105	e150	281	336	173	153	93	177	44
17	211	186	166	e105	e150	262	334	167	144	90	155	46
18	274	181	165	e100	e160	248	331	163	126	90	129	44
19	288	175	165	e100	e180	235	324	157	113	86	115	42
20	299	171	164	e100	e260	225	302	154	106	82	112	42
21	337	168	166	e100	e370	249	266	149	108	90	113	39
22	359	165	165	e100	e370	269	237	146	108	95	113	37
23	352	163	161	e100	e340	273	218	147	107	101	105	36
24	335	165	147	e100	e300	275	208	146	185	92	95	38
25	320	168	138	e100	e260	269	201	140	241	86	89	52
26	301	178	e125	e105	e260	259	197	136	262	85	83	50
27	280	194	e120	e140	e260	260	196	134	261	78	80	58
28	262	201	e120	e180	e255	257	201	134	242	74	77	60
29	243	203	e120	e220	---	253	221	128	212	70	74	65
30	227	202	e125	e215	---	246	232	121	185	67	72	66
31	216	---	e130	e210	---	241	---	116	---	64	72	---
TOTAL	6760	5476	5277	3935	5970	8660	7310	5757	4105	3268	2929	1567
MEAN	218	183	170	127	213	279	244	186	137	105	94.5	52.2
MAX	359	205	209	220	370	380	341	261	262	164	182	71
MIN	120	163	120	100	150	225	196	116	80	64	57	36
CFSM	1.06	.89	.83	.62	1.04	1.36	1.18	.90	.66	.51	.46	.25
IN.	1.22	.99	.95	.71	1.08	1.56	1.32	1.04	.74	.59	.53	.28

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1963 - 1994, BY WATER YEAR (WY)

	MEAN	105	140	183	183	205	314	315	224	190	117	87.9	86.7
MAX	357	378	308	508	428	668	567	426	640	308	270	237	237
(WY)	1987	1993	1983	1993	1968	1982	1982	1983	1989	1968	1981	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	14.5
(WY)	1964	1965	1964	1977	1963	1964	1964	1971	1964	1988	1964	1963	1963

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1963 - 1994
ANNUAL TOTAL	90301	61014	
ANNUAL MEAN	247	167	179
HIGHEST ANNUAL MEAN			270
LOWEST ANNUAL MEAN			47.6
HIGHEST DAILY MEAN	782	380	1330
LOWEST DAILY MEAN	73	36	8.0
ANNUAL SEVEN-DAY MINIMUM	81	40	9.4
INSTANTANEOUS PEAK FLOW		(e)390	1390
INSTANTANEOUS PEAK STAGE		(a)5.27	(b)5.82
INSTANTANEOUS LOW FLOW		35	8.0
ANNUAL RUNOFF (CFSM)	1.20	.81	.87
ANNUAL RUNOFF (INCHES)	16.31	11.02	11.81
10 PERCENT EXCEEDS	430	269	352
50 PERCENT EXCEEDS	197	164	145
90 PERCENT EXCEEDS	120	67	45

- (a) Backwater from ice.
 (b) Site and datum then in use.
 (c) Aug. 9, 10, 11, 1964.
 (e) Estimated.

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 fair 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	58	41	43	e24	e65	e55	49	80	15	27	6.1	6.6
2	49	38	42	e23	e55	e50	45	83	14	24	5.9	6.0
3	42	38	44	e22	e45	e47	42	77	13	21	5.8	5.6
4	37	39	46	e21	e39	e45	40	70	12	18	6.0	4.9
5	34	38	53	e20	e36	e43	38	65	12	18	6.2	4.5
6	31	36	54	e19	e34	e60	43	59	14	20	5.5	4.5
7	29	34	54	e18	e32	e90	47	56	13	18	5.1	4.5
8	28	31	51	e18	e30	e110	51	62	12	17	5.1	4.2
9	48	31	48	e17	e28	e90	52	58	11	18	6.0	4.4
10	64	30	45	e17	e27	e82	49	51	9.6	16	5.7	4.2
11	57	29	42	e17	e26	76	45	47	9.2	14	6.7	3.8
12	48	28	e37	e17	e25	71	59	47	9.2	12	8.0	3.7
13	42	30	34	e16	e24	72	103	42	14	12	14	3.8
14	38	33	34	e16	e24	70	155	39	31	11	40	3.7
15	36	36	34	e16	e23	68	158	38	25	11	36	3.6
16	47	36	34	e16	e24	65	139	36	19	9.6	20	3.6
17	83	34	32	e16	e26	e58	119	32	17	9.5	15	3.5
18	101	35	32	e16	e35	54	102	30	23	12	13	3.5
19	109	35	33	e16	e70	51	90	28	25	10	12	3.5
20	103	34	32	e17	e190	50	81	27	24	9.5	16	3.5
21	99	32	33	e17	e250	64	72	25	24	11	20	3.4
22	95	30	31	e17	e200	76	65	24	20	12	15	3.4
23	91	28	e30	e17	e170	73	59	22	17	11	13	3.5
24	84	32	e29	e17	e140	69	53	21	30	10	12	3.3
25	76	39	e27	e18	e110	64	48	20	58	9.5	11	5.7
26	70	42	e26	e20	e90	58	46	21	68	8.4	9.7	8.3
27	64	51	e25	e25	e75	61	49	21	59	7.7	9.1	11
28	58	53	e25	e40	e60	64	54	19	43	7.3	8.5	11
29	53	51	e26	e65	---	62	68	17	36	7.1	7.6	11
30	48	47	e26	e90	---	58	69	16	32	6.8	6.8	8.8
31	44	---	e25	e75	---	53	---	15	---	6.5	7.2	---
TOTAL	1866	1091	1127	763	1953	2009	2090	1248	709.0	404.9	358.0	155.0
MEAN	60.2	36.4	36.4	24.6	69.7	64.8	69.7	40.3	23.6	13.1	11.5	5.17
MAX	109	53	54	90	250	110	158	83	68	27	40	11
MIN	28	28	25	16	23	43	38	15	9.2	6.5	5.1	3.3
CFSM	1.24	.75	.75	.51	1.43	1.33	1.43	.83	.49	.27	.24	.11
IN.	1.43	.83	.86	.58	1.49	1.53	1.60	.95	.54	.31	.27	.12

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1970 - 1994, BY WATER YEAR (WY)

	MEAN	22.4	34.3	45.0	46.0	53.0	89.1	82.5	52.5	46.0	22.3	17.3	17.0
MAX	75.0	110	80.2	159	112	220	220	163	114	159	62.4	67.9	60.3
(WY)	1987	1993	1991	1993	1976	1982	1978	1983	1989	1981	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	3.08	3.08
(WY)	1972	1972	1977	1977	1972	1983	1971	1971	1988	1988	1988	1991	1991

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1970 - 1994
ANNUAL TOTAL	21859.7	13773.9	
ANNUAL MEAN	59.9	37.7	43.9
HIGHEST ANNUAL MEAN			67.4
LOWEST ANNUAL MEAN			23.8
HIGHEST DAILY MEAN	413	(e)250	629
LOWEST DAILY MEAN	9.0	3.3	.58
ANNUAL SEVEN-DAY MINIMUM	10	3.4	.84
INSTANTANEOUS PEAK FLOW		(a)	664
INSTANTANEOUS PEAK STAGE		(a)	6.20
INSTANTANEOUS LOW FLOW		3.1	.48
ANNUAL RUNOFF (CFSM)	1.23	.77	.90
ANNUAL RUNOFF (INCHES)	16.70	10.52	12.24
10 PERCENT EXCEEDS	105	74	95
50 PERCENT EXCEEDS	43	31	30
90 PERCENT EXCEEDS	19	6.7	6.9

(a) Not determined.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04096900 NOTTAWA CREEK NEAR ATHENS, MI

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

DRAINAGE AREA.--162 mi².

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

GAGE.--Water-stage recorder. Elevation of gage is 850 ft above 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	176	170	130	102	e155	155	186	224	78	150	86	96
2	174	157	131	96	e135	137	177	236	74	126	82	93
3	160	155	143	90	e130	129	171	258	74	116	80	92
4	145	158	153	86	e125	129	165	243	74	108	86	90
5	132	159	160	83	e120	143	160	213	72	109	91	89
6	121	157	163	80	e115	192	159	187	75	122	90	88
7	114	152	161	e82	e110	282	162	166	75	124	90	86
8	108	148	155	e84	e105	345	161	154	73	121	89	84
9	130	144	147	e85	e100	340	157	159	70	135	90	82
10	160	140	140	e84	e100	296	152	176	69	142	86	80
11	174	137	131	e84	e99	258	146	165	67	134	89	78
12	170	135	121	e86	e98	229	156	151	66	127	107	76
13	164	139	115	e88	e97	231	184	145	78	123	130	75
14	153	146	113	92	e96	247	223	138	139	118	177	71
15	145	150	113	80	e96	244	259	131	165	112	222	70
16	146	149	114	e80	e98	233	253	127	167	107	233	70
17	202	146	113	e80	e100	212	237	122	156	104	219	83
18	319	142	113	e79	104	196	203	117	136	102	194	84
19	416	140	115	e79	125	186	180	113	112	99	170	80
20	430	137	118	e78	252	180	166	110	99	96	155	79
21	420	133	119	e78	371	200	155	106	96	102	150	78
22	413	130	117	e79	e400	251	145	103	91	104	148	76
23	388	126	110	e80	e380	275	141	100	87	103	140	74
24	347	126	103	e81	e330	263	141	98	130	99	131	73
25	308	127	e98	e82	262	240	139	96	208	96	123	79
26	275	134	e93	e85	e230	214	135	94	256	94	116	81
27	247	147	88	e98	e200	204	137	92	263	90	111	82
28	223	153	95	143	e175	211	156	90	243	86	106	82
29	206	148	91	184	---	216	177	87	212	84	103	83
30	192	139	94	193	---	209	199	84	179	102	99	84
31	180	---	98	e170	---	197	---	82	---	92	99	---
TOTAL	6938	4324	3755	2971	4708	6844	5182	4367	3684	3427	3892	2438
MEAN	224	144	121	95.8	168	221	173	141	123	111	126	81.3
MAX	430	170	163	193	400	345	259	258	263	150	233	96
MIN	108	126	88	78	96	129	135	82	66	84	80	70
CFSM	1.38	.89	.75	.59	1.04	1.36	1.07	.87	.76	.68	.77	.50
IN.	1.59	.99	.86	.68	1.08	1.57	1.19	1.00	.85	.79	.89	.56

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1994, BY WATER YEAR (WY)

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
MEAN	102	131	159	153	171	252	244	180	165	111	87.4	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1
MAX	344	290	273	366	302	475	385	332	625	279	160	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163
(WY)	1987	1989	1991	1993	1985	1982	1985	1983	1989	1986	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980
MIN	41.9	43.9	56.7	49.3	71.3	135	119	91.1	55.9	41.7	37.5	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
(WY)	1967	1972	1977	1977	1977	1970	1971	1971	1977	1977	1977	1976	1976	1976	1976	1976	1976	1976	1976	1976	1976	1976	1976	1976	1976	1976	1976	1976

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1967 - 1994

ANNUAL TOTAL	70187	52530	
ANNUAL MEAN	192	144	153
HIGHEST ANNUAL MEAN			211
LOWEST ANNUAL MEAN			80.0
HIGHEST DAILY MEAN	649	Jan 6	430
LOWEST DAILY MEAN	77	Aug 18	66
ANNUAL SEVEN-DAY MINIMUM	80	Jul 31	71
INSTANTANEOUS PEAK FLOW			431
INSTANTANEOUS PEAK STAGE			4.03
INSTANTANEOUS LOW FLOW			21
ANNUAL RUNOFF (CFSM)	1.19	.89	.94
ANNUAL RUNOFF (INCHES)	16.12	12.06	12.84
10 PERCENT EXCEEDS	337	234	284
50 PERCENT EXCEEDS	157	130	121
90 PERCENT EXCEEDS	97	80	58

(a) July 28, 29, 30, Aug. 4, 6, 1977, Aug. 4, 1988.

(e) Estimated.

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 except for estimated daily discharges, which are fair. Flow regulated by powerplant upstream from station. Several measurements of water temperature were made during the year.

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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1370	1850	1480	1150	e1650	2120	1620	1640	642	1140	503	609
2	1320	1840	1510	1160	e1600	2160	1600	1720	525	1070	529	677
3	1320	1640	1510	1130	e1550	2000	1500	1780	634	934	504	517
4	1300	1630	1600	1000	e1500	1970	1460	1770	696	912	479	513
5	1220	1590	1580	1110	e1500	1880	1480	1690	518	859	722	508
6	1170	1530	1620	1070	e1450	1910	1460	1620	634	985	569	589
7	1130	1480	1620	919	e1400	2120	1440	1420	616	823	512	584
8	1130	1460	1580	923	e1350	2360	1450	1410	688	891	557	488
9	1150	1430	1500	1010	e1350	2580	1440	1470	580	903	584	618
10	1240	1460	1520	949	e1300	2580	1440	1530	602	920	568	535
11	1260	1530	1510	762	e1250	2400	1420	1480	523	914	644	481
12	1270	1500	1370	1030	e1300	2210	1520	1450	461	730	768	475
13	1230	1530	1390	1140	e1250	2090	1690	1380	652	792	835	469
14	1260	1600	1400	939	e1200	2080	1830	1340	889	777	1100	516
15	1280	1630	1320	1150	e1200	1980	2040	1340	800	720	1270	466
16	1270	1600	1280	e1300	e1200	2040	2160	1280	952	622	1340	461
17	1620	1550	1260	e1400	e1200	1950	2210	1270	929	563	1340	543
18	2080	1560	1300	e1500	e1250	1780	2080	1240	810	738	1290	599
19	2630	1550	1250	e1600	e1300	1770	1940	923	755	527	1220	493
20	2950	1530	1270	e1550	e1800	1710	1920	932	679	641	1120	568
21	3080	1490	1300	e1500	e2500	1680	1750	892	673	647	1230	473
22	3010	1440	1240	e1450	3000	1730	1640	1040	637	709	1140	470
23	3110	1410	1240	e1400	2980	1850	1620	1090	642	607	1160	561
24	3000	1320	1220	e1350	2860	1880	1480	869	939	603	830	508
25	2640	1330	1190	e1300	2730	1890	1410	784	1260	710	916	408
26	2550	1430	920	e1250	2140	1830	1370	830	1520	700	934	423
27	2550	1490	961	e1300	2030	1760	1340	872	1590	514	634	650
28	2330	1500	1000	e1450	2210	1760	1410	763	1560	559	707	607
29	2240	1540	794	e1600	---	1750	1510	741	1480	617	717	506
30	2100	1550	1020	e1650	---	1700	1480	726	1290	470	610	588
31	2020	---	942	e1650	---	1610	---	721	---	443	631	---
TOTAL	57830	45990	40697	38692	48050	61130	48710	38013	25176	23040	25963	15903
MEAN	1865	1533	1313	1248	1716	1972	1624	1226	839	743	838	530
MAX	3110	1850	1620	1650	3000	2580	2210	1780	1590	1140	1340	677
MIN	1130	1320	794	762	1200	1610	1340	721	461	443	479	408
CFSM	1.38	1.14	.97	.92	1.27	1.46	1.20	.91	.62	.55	.62	.39
IN.	1.59	1.27	1.12	1.07	1.32	1.68	1.34	1.05	.69	.63	.72	.44

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1953 - 1994, BY WATER YEAR (WY)

	MEAN	742	909	1114	1179	1301	1975	2060	1601	1156	807	644	624
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	293	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 1993 CALENDAR YEAR FOR 1994 WATER YEAR WATER YEARS 1953 - 1994

ANNUAL TOTAL	636489	469194	
ANNUAL MEAN	1744	1285	1180
HIGHEST ANNUAL MEAN			1850
LOWEST ANNUAL MEAN			365
HIGHEST DAILY MEAN	5140	Jan 7	3110
LOWEST DAILY MEAN	400	Aug 1	408
ANNUAL SEVEN-DAY MINIMUM	586	Aug 1	486
INSTANTANEOUS PEAK FLOW			3170
INSTANTANEOUS PEAK STAGE			6.75
INSTANTANEOUS LOW FLOW			325
ANNUAL RUNOFF (CFSM)	1.29		.95
ANNUAL RUNOFF (INCHES)	17.54		12.93
10 PERCENT EXCEEDS	3000		2020
50 PERCENT EXCEEDS	1540		1300
90 PERCENT EXCEEDS	784		566

(e) Estimated.

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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	93	124	111	90	e155	128	119	133	66	70	35	46
2	89	122	114	91	e140	123	116	137	65	64	33	44
3	85	122	118	90	e125	121	115	133	62	61	31	43
4	81	123	120	87	e115	122	113	126	58	55	36	42
5	77	121	122	86	e105	130	111	120	59	58	37	41
6	75	119	126	e86	e97	144	114	114	62	59	35	40
7	75	117	128	e84	e92	165	114	114	61	58	34	40
8	76	115	130	e82	e89	180	115	119	60	57	34	39
9	91	114	129	e80	e87	179	116	114	57	55	34	38
10	98	113	128	e78	e86	167	115	108	54	53	33	37
11	96	111	126	e77	e84	157	112	104	51	47	40	37
12	92	109	123	e76	e82	149	120	102	52	44	45	36
13	89	110	119	e75	e80	146	141	98	51	59	52	35
14	86	109	117	e74	e79	145	160	94	59	64	61	34
15	84	108	117	e73	e78	142	167	92	64	61	60	34
16	96	107	116	e72	e78	138	161	91	61	59	56	34
17	156	107	115	e71	e78	134	151	90	57	56	52	37
18	186	108	115	e70	86	130	141	90	55	54	49	37
19	191	108	114	e69	121	127	134	87	53	51	49	37
20	182	107	114	e68	180	125	128	84	50	46	53	38
21	186	106	114	e68	220	131	122	81	47	48	58	39
22	183	105	111	e67	220	138	118	79	44	52	58	38
23	176	103	107	e67	199	139	114	83	43	51	55	37
24	167	104	103	e69	177	136	110	80	56	50	52	39
25	158	105	101	e74	160	132	108	77	75	49	50	42
26	151	110	e92	e85	e150	128	106	75	90	48	48	42
27	145	113	e87	e100	e140	129	105	74	90	46	49	43
28	139	115	e84	147	e135	130	108	73	85	45	49	45
29	134	113	e84	177	---	129	117	71	80	42	47	44
30	130	112	e86	196	---	126	122	69	74	40	46	44
31	127	---	e90	e170	---	123	---	68	---	37	46	---
TOTAL	3794	3360	3461	2799	3438	4293	3693	2980	1841	1639	1417	1182
MEAN	122	112	112	90.3	123	138	123	96.1	61.4	52.9	45.7	39.4
MAX	191	124	130	196	220	180	167	137	90	70	61	46
MIN	75	103	84	67	78	121	105	68	43	37	31	34
CFSM	1.15	1.06	1.05	.85	1.16	1.31	1.16	.91	.58	.50	.43	.37
IN.	1.33	1.18	1.21	.98	1.21	1.51	1.30	1.05	.65	.58	.50	.41

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1963 - 1994, BY WATER YEAR (WY)

	MEAN	64.1	83.4	108	107	114	154	158	119	97.0	65.1	52.9	53.1
MAX	150	222	177	258	218	336	259	226	254	144	148	120	120
(WY)	1987	1993	1983	1993	1968	1982	1978	1983	1989	1986	1981	1980	1980
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	14.1
(WY)	1965	1965	1964	1963	1963	1964	1964	1963	1964	1988	1964	1964	1964

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1963 - 1994

ANNUAL TOTAL	50834	33897	
ANNUAL MEAN	139	92.9	97.8
HIGHEST ANNUAL MEAN			153
LOWEST ANNUAL MEAN			33.5
HIGHEST DAILY MEAN	436	Jan 6	782
LOWEST DAILY MEAN	43	Aug 20	5.7
ANNUAL SEVEN-DAY MINIMUM	45	Aug 17	7.9
INSTANTANEOUS PEAK FLOW		226	797
INSTANTANEOUS PEAK STAGE		(a)4.56	6.30
INSTANTANEOUS LOW FLOW		29	5.4
ANNUAL RUNOFF (CFSM)	1.31	.88	.92
ANNUAL RUNOFF (INCHES)	17.84	11.90	12.53
10 PERCENT EXCEEDS	219	143	175
50 PERCENT EXCEEDS	124	90	84
90 PERCENT EXCEEDS	75	42	34

(a) Backwater from ice.

(b) Aug. 4, 5, 1988.

(c) 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 except for estimated daily discharges, which are fair. Flow regulated by powerplants upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1980	2480	2000	1550	e2250	2820	2180	2060	999	1760	784	958
2	1920	2400	2090	1640	e2000	2870	2120	2280	914	1660	809	1030
3	1870	2320	2070	1650	e2150	2710	1990	2220	801	1400	772	866
4	1870	2190	2170	1530	e2100	2630	1890	2310	916	1400	852	819
5	1780	2150	2130	1580	e2050	2590	1950	2230	944	1260	1020	817
6	1690	2130	2210	1630	e2000	2570	1950	2160	964	1510	873	937
7	1650	2030	2020	1530	e1950	2710	1910	1990	959	1250	806	830
8	1630	2000	2340	1440	e1900	3000	1900	1910	987	1370	874	808
9	1740	1990	2100	1350	e1850	3230	1910	1960	908	1350	874	835
10	1770	1970	2110	1310	e1800	3310	1900	1980	902	1330	869	943
11	1790	2050	2070	1150	e1750	3150	1880	1940	854	1340	1050	777
12	1800	2040	1970	1420	e1800	2980	2050	1960	791	1130	1090	766
13	1750	2080	1920	1720	e1750	2830	2230	1860	987	1260	1230	755
14	1750	2130	1950	1610	e1700	2790	2430	1790	1320	1320	1510	814
15	1790	2180	1900	1210	e1650	2700	2640	1790	1070	1110	1540	743
16	1910	2150	1830	e1800	e1650	2700	2760	1750	1330	1080	1530	784
17	2350	2260	1800	e1950	e1700	2620	2880	1730	1240	937	1630	849
18	2820	2060	1820	e2050	e1730	2450	2800	1670	1220	1110	1570	940
19	3330	2210	1790	e2200	1770	2400	2630	1480	1080	945	1490	806
20	3790	1930	1780	e2150	2320	2330	2630	1310	979	862	1460	866
21	4030	2010	1810	e2100	3070	2340	2390	1290	971	1160	1600	727
22	3960	2160	1790	e2050	3800	2300	2120	1280	854	1060	1430	762
23	4000	1790	1750	e1950	3690	2480	2120	1490	989	1010	1520	816
24	3970	1920	1720	e1850	3690	2480	2020	1320	1300	982	1220	876
25	3670	1850	1640	e1800	3570	2530	1960	1250	1750	983	1180	705
26	3320	1970	1480	e1750	3050	2460	1890	1210	2020	1120	1470	739
27	3370	2040	1460	e1750	2800	2410	1830	1250	2190	848	1190	876
28	3030	2040	1520	e2000	2830	2300	1880	1250	2200	913	992	1020
29	2920	2050	1480	2280	---	2320	1920	1040	2140	952	1170	834
30	2740	2100	1410	2300	---	2280	2060	1250	1970	794	993	914
31	2640	---	1430	2310	---	2240	---	1120	---	723	1020	---
TOTAL	78630	62680	57560	54610	64370	81530	64820	52130	36549	35929	36418	25212
MEAN	2536	2089	1857	1762	2299	2630	2161	1682	1218	1159	1175	840
MAX	4030	2480	2340	2310	3800	3310	2880	2310	2200	1760	1630	1030
MIN	1630	1790	1410	1150	1650	2240	1830	1040	791	723	772	705
CFSM	1.36	1.12	1.00	.94	1.23	1.41	1.16	.90	.65	.62	.63	.45
IN.	1.57	1.25	1.15	1.09	1.28	1.63	1.29	1.04	.73	.72	.73	.50

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1924 - 1994, BY WATER YEAR (WY)

	MEAN	1111	1332	1569	1732	1860	2565	2697	2122	1669	1173	948	952
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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1924 - 1994

ANNUAL TOTAL	912709	650438	
ANNUAL MEAN	2501	1782	(a)1645
HIGHEST ANNUAL MEAN			2856
LOWEST ANNUAL MEAN			580
HIGHEST DAILY MEAN	6420	Jan 7	10700
LOWEST DAILY MEAN	818	Aug 1	39
ANNUAL SEVEN-DAY MINIMUM	956	Aug 15	278
INSTANTANEOUS PEAK FLOW			11400
INSTANTANEOUS PEAK STAGE		5.98	(b)10.76
INSTANTANEOUS LOW FLOW		340	Apr 27 1950
ANNUAL RUNOFF (CFSM)	1.34	.95	.88
ANNUAL RUNOFF (INCHES)	18.20	12.97	11.98
10 PERCENT EXCEEDS	3980	2700	3020
50 PERCENT EXCEEDS	2210	1790	1380
90 PERCENT EXCEEDS	1260	874	625

(a) Does not include water year 1924.

(b) Present datum.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04099750 PIGEON RIVER NEAR SCOTT, IN

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

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

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

REVISED RECORDS.--WSP 2111: Drainage area. WDR IN-92-1: 1991.

GAGE.--Water-stage recorder. Datum of gage is 815.00 ft above sea level.

REMARKS.--Records good except for estimated daily discharges, which are poor.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	260	315	342	e230	e680	531	342	500	197	e218	127	120
2	254	305	347	e225	e650	476	336	493	191	e210	119	119
3	249	305	356	e220	e610	435	329	471	184	e198	119	116
4	242	291	356	e225	e570	415	323	456	179	e183	119	113
5	237	285	390	e230	e520	440	319	444	181	e175	114	113
6	232	291	369	e245	e465	505	340	421	179	e165	109	111
7	226	291	376	e240	e430	602	349	392	173	e160	114	108
8	223	285	380	e237	e390	650	361	403	172	e160	114	107
9	255	279	371	e235	e365	627	370	389	159	e162	116	103
10	276	275	367	e230	e350	635	370	368	145	e154	114	107
11	262	271	360	e225	e325	620	374	351	148	e146	125	109
12	256	266	349	e220	e315	585	450	344	152	e140	138	106
13	252	279	340	e215	e305	559	670	314	171	e138	142	102
14	254	287	334	e215	e290	532	723	307	232	e133	177	99
15	255	300	329	e210	e280	494	755	308	200	e128	176	102
16	289	296	320	e210	e275	454	783	302	174	e128	163	100
17	484	299	299	e205	e280	433	793	289	164	e122	154	101
18	563	331	303	e200	e300	404	786	279	e150	e121	152	99
19	499	327	311	e190	e450	397	754	272	e147	e119	150	97
20	515	301	317	e185	594	389	684	263	e144	e122	172	99
21	544	287	318	e180	706	399	619	237	e141	e135	204	99
22	542	313	311	e175	722	400	540	232	e139	e145	177	95
23	502	312	299	e172	715	384	466	239	e143	e148	160	94
24	466	310	288	e175	e695	377	453	238	e153	e146	151	95
25	438	328	e280	e180	e665	371	432	231	e193	e144	145	99
26	415	338	e270	e200	e650	365	407	231	e225	e138	141	101
27	393	351	e263	e240	e630	383	389	230	e240	132	137	103
28	364	351	e260	e370	e585	387	393	224	e240	130	133	106
29	345	348	e255	e600	---	373	454	216	e238	130	129	103
30	338	345	e245	e720	---	359	448	211	e230	135	122	101
31	327	---	e240	e710	---	348	---	205	---	131	125	---
TOTAL	10757	9162	9945	8114	13812	14329	14812	9860	5384	4596	4338	3127
MEAN	347	305	321	262	493	462	494	318	179	148	140	104
MAX	563	351	390	720	722	650	793	500	240	218	204	120
MIN	223	266	240	172	275	348	319	205	139	119	109	94
CFSM	.96	.85	.89	.73	1.37	1.28	1.37	.88	.50	.41	.39	.29
IN.	1.11	.94	1.02	.84	1.42	1.48	1.53	1.02	.55	.47	.45	.32

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1968 - 1994, BY WATER YEAR (WY)

	MEAN	232	309	382	401	435	611	610	445	372	265	211	205
MAX	575	684	719	1169	836	1389	1089	811	1103	654	516	538	
(WY)	1987	1993	1983	1993	1969	1982	1978	1983	1981	1981	1981	1981	
MIN	96.3	96.7	157	173	143	311	324	233	132	104	92.5	85.8	
(WY)	1972	1972	1972	1977	1972	1970	1971	1971	1988	1988	1988	1971	

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1968 - 1994
ANNUAL TOTAL	184882	108236	
ANNUAL MEAN	507	297	371
HIGHEST ANNUAL MEAN			545
LOWEST ANNUAL MEAN			207
HIGHEST DAILY MEAN	1920	793	2340
LOWEST DAILY MEAN	198	94	42
ANNUAL SEVEN-DAY MINIMUM	205	97	69
INSTANTANEOUS PEAK FLOW		799	2370
INSTANTANEOUS PEAK STAGE		(a)4.97	7.85
ANNUAL RUNOFF (CFSM)	1.40	.82	1.03
ANNUAL RUNOFF (INCHES)	19.05	11.15	13.97
10 PERCENT EXCEEDS	1020	535	688
50 PERCENT EXCEEDS	376	271	300
90 PERCENT EXCEEDS	233	119	146

(a) Backwater from ice.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04100222 NORTH BRANCH ELKHART RIVER AT COSPERVILLE, IN

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

DRAINAGE AREA.--142 mi².

PERIOD OF RECORD.--October 1971 to current year.

GAGE.--Water-stage recorder. Datum of gage is 880.12 ft above sea level (levels by Indiana Department of Natural Resources).

REMARKS.--Records good except for estimated daily discharges, which are poor. Flow regulated at times by dam at Waldron Lake.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	72	110	131	e77	e196	208	131	211	36	39	21	16
2	70	104	131	e74	e190	199	128	204	34	38	19	16
3	68	99	135	e71	e180	191	127	194	32	36	19	16
4	65	95	142	e73	e170	188	125	185	33	33	19	16
5	63	91	154	e74	e158	199	124	181	33	30	22	16
6	61	88	157	e74	e150	210	130	178	34	30	20	14
7	59	85	157	e72	e143	228	133	171	32	30	17	14
8	56	82	155	68	135	238	141	163	30	31	16	14
9	70	78	152	e67	e131	238	147	155	27	33	15	14
10	85	75	149	e66	e128	230	152	149	26	31	15	19
11	90	72	145	e65	e123	224	156	143	29	28	19	21
12	92	72	141	e64	e120	217	215	135	35	26	24	19
13	93	75	137	e62	e118	213	287	130	37	28	27	17
14	91	81	134	e62	e116	208	318	123	37	26	36	15
15	89	89	131	e61	116	202	323	118	35	23	35	14
16	107	93	127	e60	119	194	320	113	33	23	33	13
17	156	100	125	e58	130	187	317	107	31	23	32	11
18	173	111	123	e56	149	179	308	102	30	22	30	11
19	173	115	121	e54	186	173	290	98	27	21	29	11
20	172	114	121	e53	233	169	279	82	25	19	31	9.9
21	171	114	119	e52	253	169	266	20	e25	21	35	9.8
22	171	113	118	e51	253	170	252	21	24	22	34	9.5
23	167	110	115	e50	246	167	238	33	23	21	37	9.3
24	163	114	111	e50	239	160	225	43	29	21	32	9.6
25	159	120	108	e53	234	156	212	47	35	20	29	12
26	153	126	92	e58	e225	151	209	45	41	23	27	14
27	145	133	e90	e64	e219	151	210	44	45	22	26	14
28	139	136	e89	e95	214	149	210	43	43	28	24	13
29	131	135	e85	e160	---	144	218	41	44	28	20	13
30	125	134	e80	e190	---	141	217	40	41	25	12	15
31	117	---	e78	e200	---	136	---	38	---	23	15	---
TOTAL	3546	3064	3853	2334	4874	5789	6408	3357	986	824	770	416.1
MEAN	114	102	124	75.3	174	187	214	108	32.9	26.6	24.8	13.9
MAX	173	136	157	200	253	238	323	211	45	39	37	21
MIN	56	72	78	50	116	136	124	20	23	19	12	9.3
CFSM	.81	.72	.88	.53	1.23	1.32	1.50	.76	.23	.19	.17	.10
IN.	.93	.80	1.01	.61	1.28	1.52	1.68	.88	.26	.22	.20	.11

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1972 - 1994, BY WATER YEAR (WY)

	MEAN	89.2	125	152	162	157	265	248	166	138	83.8	58.5	66.8
MAX	272	314	341	542	272	553	530	324	400	211	130	161	161
(WY)	1987	1973	1986	1993	1990	1985	1985	1981	1981	1981	1981	1972	1972
MIN	17.8	17.8	46.5	42.2	43.2	118	133	67.2	18.1	16.4	18.3	13.9	13.9
(WY)	1975	1972	1972	1977	1972	1989	1987	1988	1988	1988	1978	1994	1994

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1972 - 1994

ANNUAL TOTAL	72443	36221.1	
ANNUAL MEAN	198	99.2	143
HIGHEST ANNUAL MEAN			222
LOWEST ANNUAL MEAN			85.7
HIGHEST DAILY MEAN	837	Jan 7	916
LOWEST DAILY MEAN	35	Aug 19	(a)2.2
ANNUAL SEVEN-DAY MINIMUM	38	Aug 14	2.8
INSTANTANEOUS PEAK FLOW			919
INSTANTANEOUS PEAK STAGE			8.12
ANNUAL RUNOFF (CFSM)	1.40		1.00
ANNUAL RUNOFF (INCHES)	18.98		13.64
10 PERCENT EXCEEDS	414	209	302
50 PERCENT EXCEEDS	149	88	112
90 PERCENT EXCEEDS	55	19	31

(a) Caused by regulation.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04100500 ELKHART RIVER AT GOSHEN, IN

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

DRAINAGE AREA.--594 mi².

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

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

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

REMARKS.--Records good except for estimated daily discharges, which are fair. Occasional low-flow regulation at Goshen Dam, 3.4 mi upstream.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	426	548	655	430	e850	820	499	987	275	308	163	151
2	404	532	678	438	e805	768	487	947	264	278	154	160
3	385	521	756	428	e715	749	470	885	256	254	146	147
4	370	512	753	408	e700	767	454	854	244	234	142	144
5	355	501	910	402	e670	944	450	831	236	224	143	142
6	341	497	845	384	e660	1090	485	807	235	214	145	147
7	336	482	796	381	e640	1160	502	798	226	221	136	144
8	328	467	762	336	e610	1180	558	808	227	233	149	139
9	419	460	737	394	e600	1000	588	773	226	235	197	136
10	607	450	720	e390	e590	935	591	741	218	222	187	170
11	552	435	685	381	e560	896	594	717	201	213	190	172
12	513	410	653	364	e530	870	960	685	196	195	195	157
13	480	433	634	364	e510	858	1760	650	219	206	232	152
14	451	456	618	354	472	850	1660	618	246	200	285	140
15	441	550	605	343	473	827	1430	597	252	185	254	132
16	530	542	585	e340	512	788	1380	549	230	171	236	120
17	1400	553	569	e340	636	753	1330	495	223	168	222	112
18	1830	688	572	e340	888	734	1300	471	222	173	212	114
19	1360	651	569	e335	1190	702	1260	448	221	161	213	250
20	1030	607	572	e330	1420	655	1190	427	262	162	235	148
21	1070	572	589	e330	1330	634	1110	407	231	184	226	107
22	1100	556	565	330	1120	620	1040	390	207	196	218	147
23	880	557	535	336	991	603	971	372	200	188	211	132
24	793	608	498	372	905	584	914	314	271	185	204	121
25	746	666	470	365	882	560	866	297	339	179	196	126
26	718	764	383	359	832	547	822	303	338	187	188	180
27	674	909	404	366	859	575	809	306	617	187	182	120
28	641	792	454	1010	825	570	804	303	490	207	169	112
29	625	725	444	1640	---	546	856	294	382	194	161	67
30	586	680	435	1160	---	527	855	287	338	182	155	91
31	566	---	405	898	---	505	---	282	---	169	153	---
TOTAL	20957	17124	18856	14648	21775	23617	26995	17643	8092	6315	5899	4180
MEAN	676	571	608	473	778	762	900	569	270	204	190	139
MAX	1830	909	910	1640	1420	1180	1760	987	617	308	285	250
MIN	328	410	383	330	472	505	450	282	196	161	136	67
CFSM	1.14	.96	1.02	.80	1.31	1.28	1.51	.96	.45	.34	.32	.23
IN.	1.31	1.07	1.18	.92	1.36	1.48	1.69	1.10	.51	.40	.37	.26

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1932 - 1994, BY WATER YEAR (WY)

	MEAN	321	397	503	593	696	945	946	701	490	353	267	252
MAX	1652	1132	1276	2058	1657	2497	2424	2354	1516	1079	712	784	
(WY)	1955	1973	1983	1993	1959	1982	1950	1943	1981	1951	1958	1958	
MIN	75.9	95.9	122	122	108	301	363	222	101	94.0	73.0	58.5	
(WY)	1965	1965	1964	1963	1963	1964	1946	1958	1934	1934	1941	1941	

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1932 - 1994
ANNUAL TOTAL	313297	186101	
ANNUAL MEAN	858	510	
HIGHEST ANNUAL MEAN			538
LOWEST ANNUAL MEAN			1005
HIGHEST DAILY MEAN	4570	Jun 9	197
LOWEST DAILY MEAN	210	Aug 27	1964
ANNUAL SEVEN-DAY MINIMUM	224	Aug 22	6010
INSTANTANEOUS PEAK FLOW			67
INSTANTANEOUS PEAK STAGE			117
ANNUAL RUNOFF (CFSM)	1.45		1900
ANNUAL RUNOFF (INCHES)	19.62		5.53
10 PERCENT EXCEEDS	1550		.86
50 PERCENT EXCEEDS	674		11.65
90 PERCENT EXCEEDS	322		909
			454
			161
			6360
			11.94
			.91
			12.30
			1110
			388
			154

(a) Caused by regulation.

(e) Estimated.

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR		FOR 1994 WATER YEAR		WATER YEARS 1948 - 1994	
ANNUAL TOTAL	1763800		1197120			
ANNUAL MEAN	4832		3280		3292	
HIGHEST ANNUAL MEAN					5264	1950
LOWEST ANNUAL MEAN					1283	1964
HIGHEST DAILY MEAN	14000	Jan 6	6820	Oct 22	18500	Mar 21 1982
LOWEST DAILY MEAN	1780	Aug 19	1310	Sep 26	336	Aug 5 1964
ANNUAL SEVEN-DAY MINIMUM	1930	Aug 17	1420	Sep 11	561	Aug 2 1964
INSTANTANEOUS PEAK FLOW			7620	Oct 23	18800	Feb 27 1985
INSTANTANEOUS PEAK STAGE			22.22	Oct 23	27.91	Mar 21 1982
ANNUAL RUNOFF (CFSM)	1.43		.97		.98	
ANNUAL RUNOFF (INCHES)	19.47		13.21		13.27	
10 PERCENT EXCEEDS	8100		5220		5860	
50 PERCENT EXCEEDS	4060		3350		2800	
90 PERCENT EXCEEDS	2560		1630		1370	

STREAMS TRIBUTARY TO LAKE MICHIGAN

04101500 ST. JOSEPH RIVER AT NILES, MI
(National stream quality accounting network station)

LOCATION.--Lat 41°49'45", long 86°15'35", in SW1/4 sec.26, T.7 S., R.17 W., Berrien County, Hydrologic Unit 04050001, on right bank 100 ft upstream from Main Street Bridge 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.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1930 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1387: 1931, 1933-36, 1940-43, 1945-46(M). WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 633.02 ft above 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.--Water-discharge records good except for estimated daily discharges, which are fair. Flow regulated by powerplants upstream from station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3680	4600	4190	3330	e4300	6130	4060	4650	2270	2980	1450	1880
2	3580	4430	4320	3460	4660	5500	4000	4820	2160	2820	1890	1870
3	3500	4360	4500	3440	4330	5370	3990	4800	1970	2740	1770	1820
4	3360	4270	4550	3200	4380	5220	3710	4500	1950	2330	1770	1690
5	3220	4020	4780	3100	4140	5490	3700	4610	2050	2580	1810	1700
6	3250	3980	4850	3110	4140	6190	3710	4420	2100	2580	1860	1620
7	3050	3950	4850	3090	4170	6500	3690	4290	2050	2890	1730	1640
8	2960	3950	4290	2790	3760	6580	3680	4190	2140	2450	1700	1710
9	3260	3680	4720	2280	e3700	6680	3700	3940	2010	2670	1720	1520
10	3650	3760	4440	2580	e3500	6410	3960	3950	1950	2460	1810	2340
11	3460	3680	4300	3080	e3500	6160	3710	3930	1870	2500	1900	1900
12	3410	3720	4290	2840	3410	5870	4340	3870	1730	2470	2040	1670
13	3440	3960	3930	2960	3490	5720	6370	3740	2120	2500	2230	1650
14	3290	3830	3800	3570	3250	5670	6430	3560	2400	2440	2480	1550
15	3160	4100	4070	2370	3440	5330	6450	3530	2380	2440	2670	1380
16	3960	4170	3810	e3200	3420	5330	6290	3450	2320	2220	2510	1650
17	7580	4280	3830	e4100	3630	5150	6460	3270	2290	2080	2570	1900
18	8210	4390	3610	e4200	4250	5010	6160	3310	2280	1990	2500	1730
19	7830	4440	3830	e4300	5220	4460	6060	3200	2170	2190	2700	1810
20	7240	4440	3630	e4400	6590	4820	5920	2840	2040	1970	2850	1730
21	7660	3870	4210	e4400	7350	4420	5570	2790	2020	2020	2690	1770
22	7910	3880	3950	e4200	7250	4540	4970	2680	1810	2460	2810	1500
23	7250	4180	3490	e3900	7100	4300	4780	2690	1890	2120	2610	1800
24	7000	3590	3480	e3700	7220	4590	4490	2930	2770	2000	2420	2320
25	6630	4060	3470	e3400	6700	4390	4130	2400	2700	2140	2290	1900
26	6110	4370	3010	3050	5750	4570	4330	2490	3650	2200	2170	1670
27	5720	5010	2890	2750	5590	4490	5910	2530	4020	1990	2510	1610
28	5810	4720	3100	4330	5250	4570	3970	2590	3860	1910	2030	1760
29	5110	4350	2940	5980	---	4360	4260	2410	3520	1910	1870	1840
30	5160	4360	3050	5780	---	4210	4250	2220	3340	1910	2130	1760
31	4710	---	2770	4790	---	4190	---	2450	---	1810	1850	---
TOTAL	154160	124400	120950	111680	133490	162220	141070	107050	71830	71770	67340	52690
MEAN	4973	4147	3902	3603	4767	5233	4702	3453	2394	2315	2172	1756
MAX	8210	5010	4850	5980	7350	6680	6460	4820	4020	2980	2850	2340
MIN	2960	3590	2770	2280	3250	4190	3680	2220	1730	1810	1450	1380
CFSM	1.36	1.13	1.06	.98	1.30	1.43	1.28	.94	.65	.63	.59	.48
IN.	1.56	1.26	1.23	1.13	1.35	1.65	1.43	1.09	.73	.73	.68	.53

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1994, BY WATER YEAR (WY)

	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944
MEAN	2356	2733	3164	3569	3908	5260	5472	4369	3425	2525	2088	2038		
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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1931 - 1994

ANNUAL TOTAL	1944790		1318650									
ANNUAL MEAN	5328		3613									
HIGHEST ANNUAL MEAN												
LOWEST ANNUAL MEAN												
HIGHEST DAILY MEAN	16100	Jan 5	8210	Oct 18	19800							
LOWEST DAILY MEAN	1750	Aug 2	1380	Sep 15	420							
ANNUAL SEVEN-DAY MINIMUM	2080	Aug 18	1650	Sep 12	728							
INSTANTANEOUS PEAK FLOW			8800	Oct 17	20200							
INSTANTANEOUS PEAK STAGE			9.32	Oct 17	(a)15.10							
ANNUAL RUNOFF (CFSM)	1.45		.99		.93							
ANNUAL RUNOFF (INCHES)	19.73		13.38		12.62							
10 PERCENT EXCEEDS	8550		5730		6130							
50 PERCENT EXCEEDS	4540		3560		2800							
90 PERCENT EXCEEDS	2760		1870		1460							

(a) Present datum.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

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

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1972-75, 1979 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: February 1979 to September 1984.

WATER TEMPERATURE: February 1979 to September 1984.

INSTRUMENTATION.--Water-quality monitor from Oct. 9, 1980 to Sept. 30, 1984.

REMARKS.--Cross-sectional samples were collected at Grant Street bridge 0.2 mi upstream from gage.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1982, 1984): Maximum, 678 microsiemens, Feb. 16, 1982; minimum, 278 microsiemens, Mar. 19, 1982.

WATER TEMPERATURE (water years 1980, 1982-84): Maximum daily recorded (more than 20 percent missing record), 29.0°C, July 20, 21, 1980; minimum, 0.0°C on many days during winter.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

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, KF AGAR (COLS. PER 100 ML) (31673)
JAN 05...	1520	3080	598	--	0.5	--	15.3	108	560	100
MAR 30...	1355	4270	540	8.4	7.0	0.80	12.6	105	100	K66
MAY 24...	1500	3060	576	8.5	22.0	1.1	9.6	114	K10	210
JUL 13...	1625	2380	503	8.3	25.0	1.4	8.3	103	>600	K2100

DATE	HARD- NESS TOTAL (MG/L AS CACO3) (00900)	HARD- NESS NONCARB DISSOLV FLD. AS CACO3 (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 HCO3) (00453)	CAR- BONATE WATER DIS IT FIELD (MG/L AS CO3) (00452)	ALKA- LINITY WAT DIS TOT IT FIELD (MG/L AS CACO3) (39086)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)
JAN 05...	--	--	--	--	--	--	--	--	--	--
MAR 30...	260	54	73	19	12	2.0	246	3	206	41
MAY 24...	270	61	75	21	14	1.9	256	2	214	42
JUL 13...	240	48	64	20	15	2.0	237	--	194	43

DATE	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SiO2) (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, NO2+NO3 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)
JAN 05...	--	--	--	--	--	--	--	--	--	0.40
MAR 30...	23	0.10	5.4	326	0.44	3760	0.040	1.90	0.190	0.40
MAY 24...	28	0.10	2.6	324	0.44	2680	0.020	1.30	0.020	0.70
JUL 13...	29	0.20	8.7	329	0.45	2110	0.020	1.50	<0.010	0.60

STREAMS TRIBUTARY TO LAKE MICHIGAN

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	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)	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)
JAN 05...	0.030	--	--	--	--	--	--	--	--
MAR 30...	0.020	<0.010	<0.010	<10	48	<3	32	<4	12
MAY 24...	0.060	<0.010	<0.010	<10	55	<3	10	<4	2
JUL 13...	0.080	0.030	0.010	<10	54	<3	14	<4	1

DATE	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	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)
JAN 05...	--	--	--	--	--	--	--	--	--
MAR 30...	10	<1	<1	<1.0	120	<6	53	611	87
MAY 24...	10	<1	<1	<1.0	130	<6	73	603	77
JUL 13...	10	<1	<1	<1.0	110	<6	14	90	83

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 except for estimated daily discharges, which are fair. Flow regulated by millpond and lake-level control dam upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	467	376	357	286	e310	391	337	481	209	260	204	e260
2	413	370	388	305	e295	382	330	421	205	247	212	e255
3	374	379	402	297	e290	377	322	377	202	238	225	e250
4	351	378	382	287	e285	392	316	353	198	229	260	e245
5	332	373	373	279	e280	416	316	339	195	286	281	e240
6	320	402	371	278	e280	523	319	324	195	312	236	e235
7	310	412	374	283	e280	665	317	328	192	293	219	e230
8	304	395	355	261	e275	597	310	354	190	562	210	e225
9	393	387	341	273	e275	508	308	330	185	411	206	e220
10	433	374	333	271	e275	458	304	311	182	333	202	e250
11	390	363	323	281	e275	434	299	304	181	295	279	e245
12	366	356	314	275	e280	427	402	306	184	304	319	e240
13	345	407	310	e274	e285	474	519	292	216	541	365	e235
14	332	415	309	e270	e290	467	475	283	256	359	470	e230
15	326	407	305	e265	e290	448	452	283	232	304	372	e225
16	390	389	299	e260	e290	419	434	281	218	281	318	e220
17	885	384	295	e250	e300	393	384	270	208	270	290	e215
18	1050	383	302	e245	e350	389	358	261	198	267	269	e215
19	767	377	306	e240	e450	374	345	254	190	249	327	e210
20	618	369	310	e235	e700	376	327	250	188	252	539	e210
21	617	355	330	e230	e780	411	317	244	192	273	635	210
22	562	347	318	e230	e650	423	307	239	186	290	484	208
23	501	342	303	e230	e550	399	301	237	190	265	414	208
24	464	343	292	e230	489	382	296	234	390	259	e370	221
25	441	346	289	e235	453	364	293	231	452	249	e340	272
26	423	412	278	e245	426	355	293	228	406	234	e320	253
27	410	450	286	e280	407	386	392	228	365	223	e305	257
28	405	409	281	e400	398	384	378	224	321	218	e295	276
29	397	386	273	e360	---	366	441	219	299	210	e285	264
30	390	368	273	e340	---	353	409	214	278	233	e275	253
31	383	---	283	e325	---	343	---	211	---	213	e270	---
TOTAL	14159	11454	9955	8520	10508	13076	10601	8911	7103	8960	9796	7077
MEAN	457	382	321	275	375	422	353	287	237	289	316	236
MAX	1050	450	402	400	780	665	519	481	452	562	635	276
MIN	304	342	273	230	275	343	293	211	181	210	202	208
CFSM	1.79	1.50	1.26	1.08	1.47	1.65	1.39	1.13	.93	1.13	1.24	.93
IN.	2.07	1.67	1.45	1.24	1.53	1.91	1.55	1.30	1.04	1.31	1.43	1.03

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1994, BY WATER YEAR (WY)

	MEAN	261	307	335	313	333	412	407	332	267	220	196	213
MAX	530	490	513	548	508	629	552	490	404	333	326	401	401
(WY)	1987	1991	1992	1993	1985	1985	1993	1981	1981	1978	1992	1993	1993
MIN	132	179	179	166	177	251	297	205	142	133	101	112	112
(WY)	1964	1965	1964	1963	1963	1964	1971	1964	1964	1988	1964	1964	1964

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1961 - 1994

ANNUAL TOTAL	145829		120120										
ANNUAL MEAN	400		329										
HIGHEST ANNUAL MEAN													
LOWEST ANNUAL MEAN													
HIGHEST DAILY MEAN	1170		Apr 20		1050		Oct 18		1550		Feb 25 1985		
LOWEST DAILY MEAN	181		Aug 5		181		Jun 11		87		Sep 8 1964		
ANNUAL SEVEN-DAY MINIMUM	187		Jul 30		187		Jun 6		89		Aug 3 1964		
INSTANTANEOUS PEAK FLOW					1120		Oct 18		1590		Feb 24 1985		
INSTANTANEOUS PEAK STAGE					7.85		Oct 18		9.26		Feb 24 1985		
INSTANTANEOUS LOW FLOW					180		(a)		86		Sep 10 1964		
ANNUAL RUNOFF (CFSM)	1.57				1.29				1.17				
ANNUAL RUNOFF (INCHES)	21.27				17.52				15.95				
10 PERCENT EXCEEDS	556				444				460				
50 PERCENT EXCEEDS	370				306				277				
90 PERCENT EXCEEDS	243				217				163				

(a) June 10, 11, 12, 23.

(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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	802	555	531	e450	e540	e760	527	539	298	645	272	317
2	753	536	520	e460	e500	e700	513	572	291	489	282	303
3	711	533	513	e450	e480	e640	491	574	287	397	298	303
4	672	529	519	e440	e460	e610	475	564	290	364	358	299
5	623	523	517	e435	e450	e600	462	562	275	358	407	295
6	571	518	518	e430	e440	616	445	539	271	376	406	291
7	522	530	525	e425	e430	751	436	493	271	385	399	283
8	479	545	532	e420	e420	828	432	466	273	451	372	282
9	472	544	533	e420	e420	796	434	457	274	553	328	286
10	493	540	530	e415	e420	829	428	449	272	511	318	292
11	500	533	521	e415	e420	848	420	439	268	461	359	291
12	494	524	506	e410	e425	793	445	422	262	424	413	283
13	490	523	489	e405	e430	716	512	412	264	409	435	280
14	487	533	473	e400	e430	668	569	416	326	374	500	289
15	483	544	467	e390	e435	658	592	420	366	373	540	276
16	494	542	460	e380	e440	652	650	393	366	417	558	259
17	610	540	451	e370	e450	653	692	376	368	430	584	264
18	924	535	451	e365	e475	646	673	380	341	406	614	260
19	928	530	456	e360	e500	611	621	374	301	364	595	262
20	868	518	457	e355	e500	575	569	364	278	347	539	259
21	1150	504	464	e350	e1250	569	518	353	270	412	517	252
22	1280	491	472	e345	e1050	573	481	346	277	409	500	254
23	1120	476	471	e345	e1300	588	455	339	289	397	495	257
24	988	464	470	e350	e1700	589	438	333	362	400	506	258
25	890	457	466	e360	e1350	594	425	328	464	369	517	281
26	804	479	464	e375	e1150	590	425	323	520	333	486	303
27	743	534	e460	e400	e1000	581	444	317	548	309	416	324
28	692	574	e450	e440	e870	568	447	319	609	301	367	367
29	644	557	e440	e490	---	552	486	321	684	292	347	355
30	607	542	e430	e550	---	538	517	308	722	283	334	350
31	578	---	e440	e570	---	533	---	303	---	277	320	---
TOTAL	21872	15753	14996	12770	19085	20225	15022	12801	10687	12316	13382	8675
MEAN	706	525	484	412	682	652	501	413	356	397	432	289
MAX	1280	574	533	570	1700	848	692	574	722	645	614	367
MIN	472	457	430	345	420	533	420	303	262	277	272	252
CFSM	1.81	1.35	1.24	1.06	1.75	1.67	1.28	1.06	.91	1.02	1.11	.74
IN.	2.09	1.50	1.43	1.22	1.82	1.93	1.43	1.22	1.02	1.17	1.28	.83

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1994, BY WATER YEAR (WY)

MEAN	387	446	515	508	538	686	653	506	397	322	286	305
MAX	1217	826	906	1038	842	1234	961	799	686	581	557	569
(WY) 1987	1987	1989	1991	1952	1981	1979	1985	1974	1969	1982	1980	1975
MIN	178	223	232	226	256	390	361	287	200	180	163	158
(WY) 1964	1964	1954	1959	1959	1963	1957	1958	1958	1964	1963	1964	1963

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1952 - 1994

ANNUAL TOTAL	219871	177584	462	1991
ANNUAL MEAN	602	487	606	1964
HIGHEST ANNUAL MEAN			273	
LOWEST ANNUAL MEAN			3460	Oct 4 1986
HIGHEST DAILY MEAN	1660	Jan 5	120	Sep 8 1964
LOWEST DAILY MEAN	293	Aug 23	134	Sep 7 1964
ANNUAL SEVEN-DAY MINIMUM	314	Aug 17	3580	Oct 4 1986
INSTANTANEOUS PEAK FLOW			(a)9.90	Oct 4 1986
INSTANTANEOUS PEAK STAGE			251	Sep 21
INSTANTANEOUS LOW FLOW			1.25	1.18
ANNUAL RUNOFF (CFSM)	1.54		16.94	16.10
ANNUAL RUNOFF (INCHES)	20.97		760	404
10 PERCENT EXCEEDS	872		291	230
50 PERCENT EXCEEDS	533			
90 PERCENT EXCEEDS	397			

(b) Backwater from ice.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04102533 ST. JOSEPH RIVER AT ST. JOSEPH, MI

LOCATION.--Lat 42°06'48", long 86°29'07", in NE1/4 NW1/4 sec.23, T.4 S., R.19 W., Berrien County, Hydrologic Unit 04050001, on right bank at U.S. Coast Guard Station in St. Joseph, 0.1 mi upstream from mouth.

DRAINAGE AREA.--4,670 mi².

PERIOD OF RECORD.--April to September 1994.

GAGE.--Acoustical velocity meter system. Single-path transducer installation. Datum of gage 580.00 ft, International Great Lakes datum.

REMARKS.--Records good except for estimated daily discharges, which are fair.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	5100	5820	3000	3680	2160	2810
2	---	---	---	---	---	---	4760	e6100	2810	3460	2460	3210
3	---	---	---	---	---	---	5460	e6000	e2800	3290	2270	2720
4	---	---	---	---	---	---	5030	e5800	e2560	3120	2450	2620
5	---	---	---	---	---	---	4580	e5890	e2700	3100	e2600	2920
6	---	---	---	---	---	---	4810	e5640	e2730	3210	e2590	2750
7	---	---	---	---	---	---	4820	e5500	e2670	e3800	e2600	2940
8	---	---	---	---	---	---	4650	e5400	e2800	e3600	e2550	2460
9	---	---	---	---	---	---	4820	e5080	e2610	e3650	e2600	2340
10	---	---	---	---	---	---	4760	e5070	e2530	e3350	e2600	2730
11	---	---	---	---	---	---	4920	e5030	e2450	e3360	e2650	2830
12	---	---	---	---	---	---	5080	e4970	e2270	e3310	2620	2440
13	---	---	---	---	---	---	e8200	e4800	e2780	3200	2660	2400
14	---	---	---	---	---	---	e8300	e4570	e3170	3350	3220	2280
15	---	---	---	---	---	---	e8200	e4530	e3110	3050	3200	2230
16	---	---	---	---	---	---	e8000	e4440	e3020	2850	3280	2300
17	---	---	---	---	---	---	e8140	e4210	3000	2760	3100	2560
18	---	---	---	---	---	---	e7760	e4250	2970	2730	3270	2400
19	---	---	---	---	---	---	e7620	e4110	2850	2660	3060	2320
20	---	---	---	---	---	---	e7440	e3680	2700	2560	3110	2340
21	---	---	---	---	---	---	e7010	e3610	e2650	2730	3980	2310
22	---	---	---	---	---	---	e6280	e3470	e2300	3060	3410	2260
23	---	---	---	---	---	---	e6050	e3490	e2600	2560	3200	2220
24	---	---	---	---	---	---	e5700	e3670	e2900	2810	3150	2640
25	---	---	---	---	---	---	e5260	e3130	e3500	2640	2970	2590
26	---	---	---	---	---	---	5090	e3240	4310	2620	2650	2340
27	---	---	---	---	---	---	5150	e3280	5350	2690	2750	2530
28	---	---	---	---	---	---	4960	e3340	5200	e2550	2660	3050
29	---	---	---	---	---	---	5140	e3130	4380	e2500	2600	2770
30	---	---	---	---	---	---	5330	e2890	4000	e2450	2630	2660
31	---	---	---	---	---	---	---	e3170	---	e2350	2600	---
TOTAL	---	---	---	---	---	---	178420	137310	92520	93050	87650	76970
MEAN	---	---	---	---	---	---	5947	4429	3084	3002	2827	2566
MAX	---	---	---	---	---	---	8300	6100	5350	3800	3980	3210
MIN	---	---	---	---	---	---	4580	2890	2270	2350	2160	2220
CFSM	---	---	---	---	---	---	1.27	.95	.66	.64	.61	.55
IN.	---	---	---	---	---	---	1.42	1.09	.74	.74	.70	.61

(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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	160	86	103	e70	e97	e160	113	133	43	72	51	39
2	123	84	109	e70	e94	e145	107	146	42	64	53	37
3	103	87	136	e70	e90	e130	101	117	41	59	56	37
4	91	92	129	e70	e85	125	95	95	40	54	60	37
5	83	90	118	e70	e82	132	91	84	40	58	71	36
6	77	95	114	e70	e79	195	85	79	40	61	68	36
7	73	106	117	e70	e77	391	83	76	39	66	60	35
8	70	104	111	e70	e75	391	83	77	39	97	55	34
9	79	105	105	e71	e73	291	82	79	38	111	52	34
10	88	103	99	e71	e71	217	80	79	37	98	50	36
11	82	98	94	e71	e70	171	79	74	37	80	64	36
12	76	93	88	e70	e69	152	94	70	38	68	73	35
13	73	103	84	e69	e68	187	209	68	40	62	161	33
14	69	125	82	e68	e69	225	195	64	43	59	317	33
15	68	120	81	e67	e70	220	211	66	44	117	279	33
16	83	113	79	e66	e71	199	159	64	42	107	183	32
17	505	105	77	e65	e74	164	127	63	40	84	112	32
18	791	101	77	e64	e100	143	109	59	39	72	84	32
19	503	97	80	e63	e190	132	99	58	37	64	71	32
20	336	96	80	e62	788	128	92	56	38	59	75	31
21	276	92	88	e61	1020	217	87	55	41	157	74	31
22	255	88	90	e60	674	287	83	53	39	212	67	30
23	205	85	87	e60	499	227	82	52	39	157	60	30
24	162	83	84	e60	412	185	79	51	116	111	55	32
25	136	81	e78	e62	340	154	80	49	160	87	51	46
26	122	105	e74	e66	e275	134	76	49	179	74	48	42
27	113	161	e72	e70	e230	136	77	48	195	69	46	45
28	107	137	e70	e80	e190	150	91	47	151	67	44	50
29	101	120	e69	e95	---	142	92	46	105	60	42	46
30	95	109	e69	e105	---	134	107	45	83	55	40	44
31	90	---	e69	e100	---	122	---	43	---	52	40	---
TOTAL	5195	3064	2813	2186	6032	5786	3148	2145	1905	2613	2562	1086
MEAN	168	102	90.7	70.5	215	187	105	69.2	63.5	84.3	82.6	36.2
MAX	791	161	136	105	1020	391	211	146	195	212	317	50
MIN	68	81	69	60	68	122	76	43	37	52	40	30
CFSM	2.00	1.22	1.09	.84	2.58	2.23	1.26	.83	.76	1.01	.99	.43
IN.	2.31	1.36	1.25	.97	2.68	2.57	1.40	.95	.85	1.16	1.14	.48

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1994, BY WATER YEAR (WY)

	MEAN	71.4	97.1	137	122	140	193	170	104	83.3	61.8	46.8	61.9
MAX	362	282	272	244	263	389	327	182	248	181	141	329	
(WY)	1987	1991	1983	1973	1976	1979	1975	1975	1980	1986	1980	1986	
MIN	33.8	46.7	44.5	42.8	74.4	104	68.9	44.4	31.7	28.4	27.9	29.7	
(WY)	1975	1972	1977	1977	1987	1981	1971	1971	1971	1988	1988	1969	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1966 - 1994

ANNUAL TOTAL	48016	38535	
ANNUAL MEAN	132	106	107
HIGHEST ANNUAL MEAN			133
LOWEST ANNUAL MEAN			72.8
HIGHEST DAILY MEAN	868	Jan 5	1740
LOWEST DAILY MEAN	45	Aug 23	21
ANNUAL SEVEN-DAY MINIMUM	50	Aug 17	24
INSTANTANEOUS PEAK FLOW			1220
INSTANTANEOUS PEAK STAGE			11.90
INSTANTANEOUS LOW FLOW			29
ANNUAL RUNOFF (CFSM)	1.57		1.26
ANNUAL RUNOFF (INCHES)	21.37		17.15
10 PERCENT EXCEEDS	229	186	209
50 PERCENT EXCEEDS	95	79	75
90 PERCENT EXCEEDS	56	40	34

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

(b) Sept. 28 1966, Aug. 18, 19, 1984.

(c) 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	362	256	256	e200	e275	297	290	349	183	259	145	160
2	327	253	253	e205	e265	271	279	345	180	232	143	156
3	296	258	256	205	e255	262	267	324	176	216	143	151
4	273	259	257	193	e250	264	262	301	173	204	177	149
5	259	260	267	197	e245	275	257	283	170	317	165	148
6	247	255	272	e195	e240	321	266	266	179	277	156	150
7	241	254	269	e185	e230	391	269	274	179	245	151	151
8	234	249	262	e175	e220	400	272	295	175	222	146	148
9	288	245	254	e160	e210	363	274	285	170	220	143	145
10	313	242	247	e170	e205	329	265	269	165	210	143	143
11	322	242	236	e185	e200	306	257	260	157	200	255	141
12	306	237	229	e200	e200	298	303	251	156	190	260	140
13	289	248	221	e195	e200	309	401	244	210	185	322	140
14	271	247	218	e190	e200	315	420	237	275	180	355	139
15	255	252	219	e180	e200	308	412	231	294	177	338	138
16	256	246	221	e175	194	297	376	227	270	174	289	140
17	370	243	219	e175	198	282	336	224	239	171	250	160
18	417	240	219	e175	206	272	310	220	214	166	220	148
19	408	241	223	e175	271	265	293	214	193	160	205	149
20	453	236	224	e175	486	263	277	212	201	159	210	142
21	528	235	229	e175	584	361	267	209	201	185	219	140
22	464	229	225	e180	544	382	259	206	189	192	205	140
23	420	227	219	e185	453	381	252	199	183	189	195	138
24	380	232	212	e190	381	359	247	202	342	181	187	137
25	345	241	197	e190	341	326	246	202	464	183	179	153
26	316	266	e160	e190	292	306	247	202	484	176	174	181
27	305	291	e170	e200	322	308	267	202	457	166	172	165
28	294	296	e180	e250	304	313	278	197	392	161	172	170
29	280	286	e185	e300	---	319	316	192	340	156	166	173
30	271	272	e185	e295	---	321	322	182	296	151	162	169
31	264	---	e180	e285	---	306	---	182	---	148	164	---
TOTAL	10054	7538	6964	6150	7971	9770	8787	7486	7307	6052	6211	4504
MEAN	324	251	225	198	285	315	293	241	244	195	200	150
MAX	528	296	272	300	584	400	420	349	484	317	355	181
MIN	234	227	160	160	194	262	246	182	156	148	143	137
CFSM	1.21	.94	.84	.74	1.07	1.18	1.10	.90	.91	.73	.75	.56
IN.	1.40	1.05	.97	.86	1.11	1.36	1.22	1.04	1.02	.84	.87	.63

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1994, BY WATER YEAR (WY)

	1987	1988	1989	1990	1991	1992	1993	1994
MEAN	248	279	259	286	268	323	336	256
MAX	349	383	356	466	340	445	468	386
(WY)	1987	1988	1991	1993	1991	1990	1993	1990
MIN	153	167	184	198	187	225	225	177
(WY)	1988	1988	1990	1994	1987	1987	1987	1988

SUMMARY STATISTICS FOR 1993 CALENDAR YEAR FOR 1994 WATER YEAR WATER YEARS 1987 - 1994

	1993 CALENDAR YEAR	1994 WATER YEAR	WATER YEARS 1987 - 1994
ANNUAL TOTAL	118224	88794	
ANNUAL MEAN	324	243	257
HIGHEST ANNUAL MEAN			332
LOWEST ANNUAL MEAN			198
HIGHEST DAILY MEAN	758	584	1140
LOWEST DAILY MEAN	160	137	95
ANNUAL SEVEN-DAY MINIMUM	180	140	98
INSTANTANEOUS PEAK FLOW		594	1160
INSTANTANEOUS PEAK STAGE		(a)8.62	10.18
INSTANTANEOUS LOW FLOW		126	88
ANNUAL RUNOFF (CFSM)	1.21	.91	.96
ANNUAL RUNOFF (INCHES)	16.47	12.37	13.08
10 PERCENT EXCEEDS	463	339	388
50 PERCENT EXCEEDS	287	236	237
90 PERCENT EXCEEDS	212	158	147

(a) Backwater from ice.

(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 except for estimated daily discharges, which are fair. Occasional slight regulation prior to November 1943. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	418	253	202	e130	205	312	315	350	e105	353	87	134
2	398	233	197	e130	230	298	297	384	e100	279	87	126
3	357	220	202	130	240	284	282	399	e96	221	84	119
4	307	207	206	130	235	271	265	397	e92	177	94	108
5	264	208	213	128	223	272	252	363	e90	215	107	108
6	225	205	220	119	208	315	240	315	e88	283	106	106
7	194	199	227	119	192	412	229	278	e87	298	105	104
8	169	193	231	123	179	572	218	258	e86	291	99	103
9	168	187	228	126	164	685	209	247	e85	300	104	99
10	177	178	224	125	145	689	203	238	e83	296	105	95
11	182	171	210	123	142	576	196	227	e80	279	131	90
12	188	171	194	126	144	488	211	210	e78	252	172	84
13	188	175	182	128	142	437	258	197	e90	218	217	83
14	180	175	176	130	139	387	299	183	e110	184	395	75
15	171	182	169	127	140	368	350	e180	e150	154	693	77
16	174	193	167	122	143	363	402	e175	e170	140	1010	81
17	241	195	174	117	149	346	402	e170	e150	134	1030	79
18	344	191	173	115	145	323	388	e165	e130	133	879	83
19	639	189	169	115	176	e290	362	e160	e125	127	700	80
20	927	185	176	115	284	e260	318	e155	119	124	571	77
21	867	182	187	115	714	e300	278	e150	115	131	482	73
22	772	177	188	115	1160	e400	245	e145	111	140	406	70
23	704	173	e180	115	1140	e500	221	e140	108	133	366	72
24	650	165	e170	115	925	584	197	e135	182	125	336	73
25	574	168	e155	119	706	560	191	e135	270	120	292	84
26	494	184	e135	125	509	480	194	e135	355	126	241	89
27	430	197	e125	126	418	428	191	e130	492	116	199	97
28	379	202	e130	142	349	382	222	e125	565	109	172	104
29	339	211	e135	163	---	360	274	e120	520	103	154	112
30	304	211	e130	173	---	338	314	e115	437	98	143	110
31	276	---	e125	184	---	327	---	e110	---	95	141	---
TOTAL	11700	5780	5600	3970	9546	12607	8023	6491	5269	5754	9708	2795
MEAN	377	193	181	128	341	407	267	209	176	186	313	93.2
MAX	927	253	231	184	1160	689	402	399	565	353	1030	134
MIN	168	165	125	115	139	260	191	110	78	95	84	70
CFSM	1.57	.80	.75	.53	1.41	1.69	1.11	.87	.73	.77	1.30	.39
IN.	1.81	.89	.86	.61	1.47	1.95	1.24	1.00	.81	.89	1.50	.45

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1994, BY WATER YEAR (WY)

MEAN	126	161	195	207	242	416	398	262	191	110	88.5	98.8
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 1993 CALENDAR YEAR FOR 1994 WATER YEAR WATER YEARS 1931 - 1994

ANNUAL TOTAL	113859		87243			
ANNUAL MEAN	312		239		(a)211	
HIGHEST ANNUAL MEAN					394	1943
LOWEST ANNUAL MEAN					64.1	1964
HIGHEST DAILY MEAN	1720	Apr 22	1160	Feb 22	3560	Apr 7 1947
LOWEST DAILY MEAN	85	Aug 21	70	Sep 22	22	Aug 14 1934
ANNUAL SEVEN-DAY MINIMUM	88	Aug 19	75	Sep 18	25	Aug 10 1936
INSTANTANEOUS PEAK FLOW			1290	Feb 22	3640	Apr 7 1947
INSTANTANEOUS PEAK STAGE			2.46	Feb 22	(b)4.48	Apr 7 1947
INSTANTANEOUS LOW FLOW			69	(c)	22	Aug 14 1934
ANNUAL RUNOFF (CFSM)	1.29		.99		.88	
ANNUAL RUNOFF (INCHES)	17.57		13.47		11.91	
10 PERCENT EXCEEDS	563		429		424	
50 PERCENT EXCEEDS	217		183		136	
90 PERCENT EXCEEDS	130		99		60	

(a) Does not include water year 1931.

(b) From floodmark.

(c) Sept. 14, 15, 22, 23, 24.

(e) Estimated.

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 except for estimated daily discharges, which are fair. Diurnal fluctuation below 1,500 ft³/s caused by powerplants upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1140	791	712	559	774	915	915	1140	436	1040	435	537
2	1110	765	735	554	e720	868	867	1170	417	877	439	523
3	983	737	744	562	e680	819	839	1140	405	757	435	494
4	875	704	765	582	e690	801	808	1070	398	674	e580	483
5	784	737	773	549	e700	821	784	985	394	890	e580	480
6	731	709	798	504	e680	953	775	886	422	1070	e550	478
7	680	691	806	517	e650	1260	762	843	412	1030	e440	474
8	640	674	806	468	e600	1470	755	860	409	996	e420	462
9	721	668	786	450	555	1550	736	859	403	1020	e480	452
10	730	673	748	e480	536	1470	719	816	380	914	e430	459
11	745	645	717	542	562	1300	694	766	382	852	e550	434
12	750	654	680	562	569	1150	809	724	383	790	e900	417
13	740	672	663	555	569	1130	1010	679	591	746	e1200	425
14	701	670	650	536	575	1090	1160	646	781	691	e1500	419
15	680	675	645	e500	569	1050	1310	612	725	643	e1700	400
16	718	681	631	e450	552	1000	1260	601	684	621	e1800	446
17	1090	681	638	e470	566	942	1190	596	625	595	e1800	469
18	1450	704	655	e490	596	886	1120	577	560	592	e1750	459
19	1690	697	637	e490	747	832	1000	561	500	560	e1700	446
20	1930	673	658	486	1230	818	902	541	536	561	e1500	436
21	2000	682	669	498	1870	1050	837	528	547	610	e1250	423
22	1920	648	674	510	2350	1220	782	513	516	613	1060	413
23	1720	634	651	523	2270	1320	717	497	541	589	962	409
24	1590	642	616	542	1930	1420	664	480	1100	562	883	410
25	1460	633	544	555	1540	1390	665	480	1290	573	802	468
26	1280	699	412	542	1170	1220	693	480	1420	558	728	473
27	1140	730	455	536	1150	1130	784	485	1510	546	661	522
28	1060	771	507	734	993	1080	838	475	1520	521	621	547
29	1060	772	515	856	---	1030	966	466	1450	494	595	575
30	946	718	524	839	---	999	1030	451	1270	463	551	551
31	826	---	510	806	---	957	---	421	---	452	568	---
TOTAL	33890	20830	20324	17247	26393	33941	26391	21348	21007	21900	27870	13984
MEAN	1093	694	656	556	943	1095	880	689	700	706	899	466
MAX	2000	791	806	856	2350	1550	1310	1170	1520	1070	1800	575
MIN	640	633	412	450	536	801	664	421	380	452	420	400
CFSM	1.33	.84	.80	.68	1.14	1.33	1.07	.84	.85	.86	1.09	.57
IN.	1.53	.94	.92	.78	1.19	1.53	1.19	.96	.95	.99	1.26	.63

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1937 - 1994, BY WATER YEAR (WY)

	MEAN	495	583	653	673	767	1127	1111	844	679	488	420	433
MAX	1446	1284	1248	1557	1500	2183	2834	1998	1703	1000	899	855	
(WY)	1987	1993	1991	1993	1976	1948	1947	1943	1943	1943	1994	1975	
MIN	173	204	215	229	218	317	441	336	238	186	189	167	
(WY)	1964	1965	1964	1964	1964	1964	1946	1958	1964	1964	1964	1963	

SUMMARY STATISTICS FOR 1993 CALENDAR YEAR FOR 1994 WATER YEAR WATER YEARS 1937 - 1994

	ANNUAL TOTAL	351715	285125	
ANNUAL MEAN	964	781		
HIGHEST ANNUAL MEAN			689	
LOWEST ANNUAL MEAN			1081	1943
HIGHEST DAILY MEAN	2990	Apr 22	2350	Feb 22
LOWEST DAILY MEAN	412	Dec 26	380	Jun 10
ANNUAL SEVEN-DAY MINIMUM	445	Aug 17	399	Jun 6
INSTANTANEOUS PEAK FLOW			2450	Feb 23
INSTANTANEOUS PEAK STAGE			5.47	Feb 23
INSTANTANEOUS LOW FLOW			323	Jun 10
ANNUAL RUNOFF (CFSM)	1.17		.95	
ANNUAL RUNOFF (INCHES)	15.88		12.87	
10 PERCENT EXCEEDS	1580		1260	1240
50 PERCENT EXCEEDS	779		681	550
90 PERCENT EXCEEDS	551		452	292

(a) Site then in use.

(b) Site and datum then in use.

(e) 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 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	51	46	46	41	e43	e50	55	70	30	49	32	36
2	48	45	49	42	e41	e51	53	64	28	42	32	35
3	45	47	52	40	e40	e52	51	57	27	39	31	34
4	43	47	53	37	e39	53	48	52	26	36	41	33
5	43	47	52	36	e39	56	48	49	26	90	44	32
6	42	47	53	35	e39	65	47	46	26	110	41	32
7	41	46	53	e37	e38	74	46	46	26	108	39	32
8	41	48	51	36	e38	71	45	47	25	86	36	31
9	48	49	49	e36	e38	62	45	45	24	68	35	30
10	49	48	48	e36	e38	56	44	42	24	59	34	29
11	48	46	46	e35	e38	53	44	42	23	53	63	28
12	46	46	44	32	e38	52	61	42	23	48	65	28
13	46	51	44	37	e39	60	78	40	32	45	97	28
14	44	52	44	33	e40	62	74	39	40	42	121	30
15	44	52	45	e33	40	60	72	39	37	49	111	30
16	49	51	45	e32	39	58	69	39	33	44	87	29
17	93	50	45	e32	40	55	60	37	29	40	69	29
18	100	50	46	e31	42	53	53	36	27	39	59	28
19	95	49	48	e30	61	52	50	35	26	36	53	27
20	83	49	49	e30	95	52	46	31	29	38	57	27
21	81	47	51	e30	106	74	45	30	31	50	61	27
22	75	46	50	e30	94	81	43	29	29	47	57	27
23	67	46	46	e30	72	76	41	29	30	43	53	28
24	61	47	46	30	e62	70	41	29	86	39	48	26
25	57	46	43	e31	e55	64	41	31	101	39	44	30
26	54	52	39	e33	e52	60	47	31	103	38	43	31
27	52	57	e41	e36	e51	61	66	30	100	31	41	32
28	51	54	e40	e55	e50	63	61	26	85	30	40	35
29	50	48	e39	e52	---	62	66	25	71	29	38	44
30	48	48	39	e48	---	60	65	25	60	36	38	43
31	47	---	39	e45	---	57	---	26	---	34	36	---
TOTAL	1742	1457	1435	1121	1407	1875	1605	1209	1257	1537	1646	931
MEAN	56.2	48.6	46.3	36.2	50.2	60.5	53.5	39.0	41.9	49.6	53.1	31.0
MAX	100	57	53	55	106	81	78	70	103	110	121	44
MIN	41	45	39	30	38	50	41	25	23	29	31	26
CFSM	1.44	1.25	1.19	.93	1.29	1.55	1.38	1.00	1.08	1.27	1.36	.80
IN.	1.67	1.39	1.37	1.07	1.35	1.79	1.53	1.16	1.20	1.47	1.57	.89

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1994, BY WATER YEAR (WY)

	MEAN	41.3	46.2	48.7	43.9	46.5	58.1	60.3	47.9	43.5	36.4	34.2	37.3
MAX	85.2	67.3	65.3	66.3	66.3	81.3	86.9	81.8	73.2	51.4	53.8	70.7	
(WY)	1987	1986	1992	1993	1976	1985	1975	1975	1978	1986	1980	1986	
MIN	18.9	23.4	31.9	26.9	30.1	39.5	41.2	30.0	23.9	17.4	17.9	18.0	
(WY)	1965	1965	1965	1971	1970	1966	1971	1965	1988	1965	1984	1966	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1965 - 1994

ANNUAL TOTAL	20003	17222	
ANNUAL MEAN	54.8	47.2	45.3
HIGHEST ANNUAL MEAN			57.5
LOWEST ANNUAL MEAN			30.3
HIGHEST DAILY MEAN	157	Apr 21	121
LOWEST DAILY MEAN	35	Aug 5	23
ANNUAL SEVEN-DAY MINIMUM	37	Jul 30	24
INSTANTANEOUS PEAK FLOW			143
INSTANTANEOUS PEAK STAGE			2.41
INSTANTANEOUS LOW FLOW			22
ANNUAL RUNOFF (CFSM)	1.41	1.21	(a)8.9
ANNUAL RUNOFF (INCHES)	19.13	16.47	1.17
10 PERCENT EXCEEDS	74	68	15.84
50 PERCENT EXCEEDS	50	45	68
90 PERCENT EXCEEDS	42	29	42
			27

(a) Result of freezeup.

(e) 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. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1490	1260	1140	936	1080	1360	1330	1360	568	1390	623	791
2	1540	1200	1120	833	951	1490	1260	1450	549	1310	649	819
3	1430	1120	1130	858	969	1300	1180	1520	484	1150	572	840
4	1300	1130	1130	864	999	1170	1120	1350	641	950	629	703
5	1190	1120	1140	740	1020	1170	1090	1290	548	999	849	627
6	1080	1130	1140	844	1010	1230	1090	1210	499	1460	874	627
7	1060	1110	1160	829	1010	1480	1020	1060	562	1650	641	705
8	1020	1100	1170	729	977	1690	997	1200	567	1360	629	660
9	987	1080	1170	723	931	1830	994	1060	551	1310	707	651
10	984	1070	1150	605	965	1800	993	991	561	1320	634	701
11	1010	1040	1130	540	752	1730	990	1000	431	1200	770	649
12	1030	987	1080	736	830	1660	1010	1000	433	1090	1270	579
13	1040	1000	997	942	922	1540	1280	970	609	1060	1680	596
14	1030	1020	993	947	869	1510	1460	925	812	1010	2010	622
15	1020	1030	991	852	923	1430	1570	904	909	964	2000	634
16	1030	1040	987	780	894	1400	1620	882	898	949	2120	546
17	1390	1060	976	605	919	1390	1560	865	872	933	2180	658
18	1920	1060	973	576	918	1270	1440	861	842	924	2200	612
19	2060	1060	977	889	932	1230	1340	801	753	799	2130	630
20	2120	1060	977	887	1010	1220	1200	654	609	705	1940	635
21	2190	1050	982	1010	1640	1280	1100	782	733	835	1650	557
22	2400	1040	992	949	2440	1570	1020	735	632	863	1580	611
23	2480	1030	996	718	2570	1690	1020	649	640	830	1400	616
24	2320	1020	991	844	2530	1700	987	737	1100	865	1190	486
25	2080	1010	970	919	2360	1760	922	645	1970	705	1140	597
26	1880	1010	836	828	1900	1760	904	599	1880	832	1090	692
27	1620	1040	622	712	1610	1610	917	579	1690	797	980	692
28	1560	1110	536	853	1400	1470	1050	651	1710	705	945	649
29	1480	1170	694	987	---	1440	1240	648	1830	733	940	691
30	1400	1170	892	1050	---	1400	1350	645	1730	699	889	858
31	1380	---	941	1130	---	1330	---	585	---	598	813	---
TOTAL	46521	32327	30983	25715	35331	45910	35054	28608	26613	30995	37724	19734
MEAN	1501	1078	999	830	1262	1481	1168	923	887	1000	1217	658
MAX	2480	1260	1170	1130	2570	1830	1620	1520	1970	1650	2200	858
MIN	984	987	536	540	752	1170	904	579	431	598	572	486
CFSM	1.49	1.07	.99	.82	1.25	1.47	1.16	.91	.88	.99	1.20	.65
IN.	1.71	1.19	1.14	.95	1.30	1.69	1.29	1.05	.98	1.14	1.39	.73

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1994, BY WATER YEAR (WY)

MEAN	684	788	859	912	977	1376	1359	1054	871	675	573	582
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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1931 - 1994

ANNUAL TOTAL	482744		395515									
ANNUAL MEAN	1323		1084									
HIGHEST ANNUAL MEAN										893		
LOWEST ANNUAL MEAN										1387		1943
HIGHEST DAILY MEAN	3440									368		1964
LOWEST DAILY MEAN	486									6830		Apr 8 1947
ANNUAL SEVEN-DAY MINIMUM	667									185		Aug 7 1934
INSTANTANEOUS PEAK FLOW										217		Aug 1 1934
INSTANTANEOUS PEAK STAGE										6910		Apr 8 1947
INSTANTANEOUS LOW FLOW										(a)7.94		Apr 8 1947
ANNUAL RUNOFF (CFSM)	1.31									119		May 29 1958
ANNUAL RUNOFF (INCHES)	17.78									.88		
10 PERCENT EXCEEDS	2030									14.57		
50 PERCENT EXCEEDS	1130									1540		
90 PERCENT EXCEEDS	863									742		
										402		

(a) Datum then in use.

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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	19	18	17	17	19	19	23	14	17	16	16
2	18	19	19	17	16	19	18	20	13	16	16	16
3	17	20	19	16	16	19	18	19	13	16	16	16
4	17	20	19	16	16	20	18	18	13	16	20	16
5	17	20	19	16	16	21	18	18	13	16	18	15
6	17	20	20	17	16	25	18	17	14	16	16	15
7	16	20	19	16	16	27	18	18	13	16	16	15
8	16	19	19	16	16	25	18	18	13	18	16	15
9	24	19	18	16	16	22	18	17	13	19	17	15
10	21	19	18	16	e16	21	18	17	13	17	16	15
11	19	19	18	16	16	20	18	17	13	16	22	15
12	18	19	17	16	16	20	27	17	13	16	20	15
13	18	22	17	16	16	24	31	16	23	16	26	14
14	17	20	18	16	17	23	25	16	19	19	30	14
15	17	20	18	16	17	22	23	16	16	19	21	14
16	25	19	18	e16	17	21	21	16	15	17	18	14
17	62	20	17	e16	17	20	20	16	14	16	17	15
18	41	19	18	e15	18	19	19	15	14	16	17	14
19	29	20	18	e15	22	19	19	15	13	15	18	13
20	27	19	18	e15	36	19	18	15	14	16	35	13
21	29	19	19	15	31	27	18	15	14	18	29	13
22	24	19	18	15	25	23	17	15	13	16	21	13
23	22	19	17	15	23	21	17	14	17	16	19	14
24	21	19	17	15	21	20	17	15	54	16	18	16
25	21	19	17	15	21	19	17	14	53	15	17	18
26	20	22	17	15	20	19	19	15	33	15	17	16
27	20	21	17	15	19	21	22	15	23	15	17	16
28	20	19	17	23	19	21	21	14	20	15	17	17
29	20	19	17	20	---	20	22	14	18	16	17	17
30	20	18	17	18	---	19	22	14	17	21	16	e16
31	20	---	16	17	---	19	---	14	---	18	16	---
TOTAL	692	586	554	503	532	654	594	503	548	514	595	451
MEAN	22.3	19.5	17.9	16.2	19.0	21.1	19.8	16.2	18.3	16.6	19.2	15.0
MAX	62	22	20	23	36	27	31	23	54	21	35	18
MIN	16	18	16	15	16	19	17	14	13	15	16	13
CFSM	1.35	1.18	1.08	.98	1.15	1.28	1.20	.98	1.11	1.00	1.16	.91
IN.	1.56	1.32	1.25	1.13	1.20	1.47	1.34	1.13	1.24	1.16	1.34	1.02

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1983 - 1994, BY WATER YEAR (WY)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
MEAN	19.2	20.6	19.8	18.7	18.9	21.4	21.5	19.9	18.1	17.1	16.6	17.0
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	15.3	16.2	15.6	15.3	16.2	17.8	18.2	16.2	13.8	14.3	13.9	14.4
(WY)	1983	1988	1990	1984	1987	1984	1990	1994	1987	1987	1988	1985

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1983 - 1994

ANNUAL TOTAL	7385	6726	19.1
ANNUAL MEAN	20.2	18.4	21.2
HIGHEST ANNUAL MEAN			17.3
LOWEST ANNUAL MEAN			1991
HIGHEST DAILY MEAN	62	62	83
LOWEST DAILY MEAN	16	13	10
ANNUAL SEVEN-DAY MINIMUM	16	13	11
INSTANTANEOUS PEAK FLOW		74	118
INSTANTANEOUS PEAK STAGE		3.30	3.87
ANNUAL RUNOFF (CFSM)	1.23	1.12	1.16
ANNUAL RUNOFF (INCHES)	16.65	15.16	15.69
10 PERCENT EXCEEDS	24	22	24
50 PERCENT EXCEEDS	19	17	18
90 PERCENT EXCEEDS	17	15	15

(a) On several days in June and September.

(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 except for estimated daily discharges, which are fair. 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	45	49	e52	39	38	38	45	55	29	32	36	33
2	43	49	e53	41	37	41	46	48	27	32	38	32
3	42	52	e48	39	39	41	46	48	26	30	32	32
4	42	53	e52	40	40	47	46	46	26	29	52	30
5	42	51	e47	43	39	47	45	45	26	41	39	31
6	42	49	e53	44	39	56	46	43	31	32	34	33
7	41	47	e48	42	39	55	44	46	29	32	32	33
8	43	45	47	41	39	54	46	45	28	41	34	33
9	71	45	47	40	37	47	46	46	26	43	33	36
10	54	46	43	39	36	46	47	43	25	34	32	41
11	54	46	41	40	39	43	45	45	26	33	57	38
12	53	43	41	40	37	44	75	43	26	33	39	38
13	44	52	41	38	38	49	72	42	67	36	63	37
14	48	45	39	38	38	46	59	41	41	43	61	39
15	50	46	40	38	41	48	58	39	33	57	39	39
16	70	46	37	37	39	44	54	39	31	36	37	39
17	143	47	38	39	40	44	51	38	30	36	33	40
18	79	46	41	38	43	43	50	38	27	37	33	35
19	66	47	39	34	56	45	50	36	25	36	41	35
20	65	46	40	35	73	44	50	34	32	38	75	33
21	68	e46	40	34	58	67	49	33	29	44	56	33
22	56	e47	39	37	48	53	47	31	28	37	43	30
23	53	e46	37	38	46	54	47	30	36	36	37	17
24	53	e45	36	38	42	48	49	31	137	35	36	22
25	52	e46	31	38	42	47	51	31	89	34	34	33
26	53	e48	36	36	39	45	55	30	58	35	34	22
27	51	e50	36	35	38	54	61	30	44	34	36	28
28	51	e52	38	62	38	51	54	30	38	34	38	32
29	50	e48	39	46	---	47	55	29	37	39	35	35
30	48	e50	39	35	---	47	55	29	32	48	35	34
31	47	---	39	39	---	45	---	29	---	36	35	---
TOTAL	1719	1428	1297	1223	1178	1480	1544	1193	1139	1143	1259	993
MEAN	55.5	47.6	41.8	39.5	42.1	47.7	51.5	38.5	38.0	36.9	40.6	33.1
MAX	143	53	53	62	73	67	75	55	137	57	75	41
MIN	41	43	31	34	36	38	44	29	25	29	32	17

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1994, BY WATER YEAR (WY)

	MEAN	37.8	39.8	40.4	39.8	41.9	47.7	49.4	44.8	41.9	39.4	37.6	37.6
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	34.6	35.5	30.4	24.7	26.1	26.8	27.2	
(WY)	1965	1972	1977	1978	1972	1978	1977	1977	1988	1977	1977	1971	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1965 - 1994

ANNUAL TOTAL	16467		15596									
ANNUAL MEAN	45.1		42.7							41.5		
HIGHEST ANNUAL MEAN										51.5		1991
LOWEST ANNUAL MEAN										32.0		1977
HIGHEST DAILY MEAN	148		Apr 20		143		Oct 17		257		May 31	1989
LOWEST DAILY MEAN	31		Aug 22		17		Sep 23		17		Sep 23	1994
ANNUAL SEVEN-DAY MINIMUM	33		Aug 17		26		Sep 22		22		Jul 22	1977
INSTANTANEOUS PEAK FLOW					172		Jun 24		407		May 30	1989
INSTANTANEOUS PEAK STAGE					2.18		Jun 24		4.49		Jun 26	1978
INSTANTANEOUS LOW FLOW					16		(a)		(b)8.0		Jan 19	1965
10 PERCENT EXCEEDS	55				54							
50 PERCENT EXCEEDS	42				41							
90 PERCENT EXCEEDS	36				31							

(a) Sept. 23, 24.

(b) Result of bridge construction upstream.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04106320 WEST FORK PORTAGE CREEK NEAR OSHTIMO, MI

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

DRAINAGE AREA.--13.0 mi².

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

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

REMARKS.--Records 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.0	7.0	5.4	e6.3	e7.1	e5.0	8.6	e8.0	.89	4.7	e3.3	4.8
2	3.7	7.0	5.6	e6.2	e6.7	e5.0	7.5	e6.0	.81	4.3	e3.0	4.1
3	3.3	7.0	5.7	e6.1	e6.5	5.0	6.8	5.4	.94	3.9	e4.0	3.5
4	3.1	6.8	5.5	e6.0	e6.3	5.2	5.9	6.2	1.5	3.5	4.5	3.0
5	2.8	6.6	5.5	5.9	e6.1	5.4	4.7	5.9	2.0	e4.0	4.1	2.8
6	2.7	6.5	5.7	5.8	e6.0	6.0	3.9	5.3	2.3	e3.7	3.3	2.6
7	3.4	6.4	5.9	5.8	e5.9	6.4	3.3	11	2.3	e3.2	2.6	2.5
8	4.6	6.3	9.1	5.7	e5.8	6.2	2.9	12	2.0	e3.3	2.1	2.4
9	5.7	6.1	12	5.7	e5.7	5.6	2.7	9.1	1.7	e3.1	2.1	2.3
10	5.2	5.9	12	e5.6	e5.6	5.0	2.5	7.3	1.5	e2.9	3.3	2.2
11	4.5	5.1	12	e5.6	e5.5	4.6	2.2	6.5	1.3	e2.7	6.2	2.1
12	4.2	4.3	9.6	e5.5	e5.5	4.2	2.8	5.9	1.2	e2.5	8.0	2.1
13	4.4	4.3	8.0	e5.5	e5.5	4.0	3.7	5.3	2.1	e2.3	8.7	1.9
14	4.7	4.1	7.9	e5.5	e5.6	4.0	3.7	4.9	2.0	e4.5	8.3	1.7
15	5.5	3.9	8.9	e5.4	e5.8	4.8	3.5	4.7	2.4	e4.0	6.1	1.7
16	7.8	4.8	9.4	e5.4	e5.7	13	3.2	4.4	2.8	e3.4	5.8	1.7
17	14	6.5	9.0	e5.3	5.6	15	2.9	4.0	2.6	e2.7	6.7	1.6
18	16	6.7	8.5	e5.2	5.4	14	2.7	3.6	2.2	e2.4	7.5	1.6
19	15	6.3	8.2	e5.1	5.6	11	2.5	3.1	1.8	e2.8	9.6	1.5
20	14	5.7	7.9	e5.1	7.1	8.6	2.4	2.8	1.7	e3.8	11	1.5
21	13	5.1	8.0	e5.0	7.1	8.5	9.4	2.5	1.6	e3.5	10	1.5
22	12	4.7	7.8	e5.0	6.3	7.5	15	2.3	1.6	e3.2	7.4	1.5
23	11	4.8	7.4	e4.9	5.4	6.7	13	2.0	2.0	e2.9	6.0	1.4
24	9.4	5.0	7.2	e4.9	e5.3	5.7	11	1.8	4.7	e2.6	4.8	1.7
25	8.5	5.0	7.0	e5.0	e5.2	4.8	e11	1.7	6.9	e2.4	3.9	2.4
26	8.1	5.5	e6.8	e5.2	e5.1	4.7	e12	1.6	7.1	e2.3	3.8	2.4
27	7.8	5.9	e6.7	e5.7	e5.0	4.8	e10	1.6	6.5	e2.4	4.7	2.5
28	7.6	5.7	e6.6	7.5	e5.0	5.5	e9.5	1.5	6.0	e3.0	5.5	2.6
29	7.4	5.6	e6.5	8.3	---	12	e9.0	1.3	5.8	e5.0	6.1	2.7
30	7.2	5.5	e6.4	e8.0	---	13	e9.5	1.1	5.3	e4.0	6.1	2.6
31	7.1	---	e6.4	e7.5	---	11	---	1.0	---	e3.6	5.6	---
TOTAL	227.7	170.1	238.6	179.7	163.4	222.2	187.8	139.8	83.54	102.6	174.1	68.9
MEAN	7.35	5.67	7.70	5.80	5.84	7.17	6.26	4.51	2.78	3.31	5.62	2.30
MAX	16	7.0	12	8.3	7.1	15	15	12	7.1	5.0	11	4.8
MIN	2.7	3.9	5.4	4.9	5.0	4.0	2.2	1.0	.81	2.3	2.1	1.4
CFSM	.57	.44	.59	.45	.45	.55	.48	.35	.21	.25	.43	.18
IN.	.65	.49	.68	.51	.47	.64	.54	.40	.24	.29	.50	.20

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1972 - 1994, BY WATER YEAR (WY)

	MEAN	6.37	7.01	7.27	6.78	6.82	7.59	7.34	6.10	5.26	4.90	5.34	5.94
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	5.11	4.96	4.77	4.71	5.00	2.62	1.13	1.20	1.96	2.30	
(WY)	1993	1993	1982	1981	1982	1988	1988	1988	1988	1988	1988	1994	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1972 - 1994

ANNUAL TOTAL	2309.3		1958.44									
ANNUAL MEAN	6.33		5.37									
HIGHEST ANNUAL MEAN										6.36		
LOWEST ANNUAL MEAN										10.0		1975
HIGHEST DAILY MEAN	24	Sep 16	16	Oct 18	35	Dec 6 1992				3.87		1988
LOWEST DAILY MEAN	1.3	May 20	.81	Jun 2	.50	Jul 15 1988				.63		1988
ANNUAL SEVEN-DAY MINIMUM	1.9	Jun 1	1.1	May 28	.63	Jul 9 1988						
INSTANTANEOUS PEAK FLOW			16	(a)	36	Dec 5 1992						
INSTANTANEOUS PEAK STAGE			1.76	Oct 18	2.47	Dec 5 1992						
INSTANTANEOUS LOW FLOW			.75	(b)	.38							(c)
ANNUAL RUNOFF (CFSM)	.49		.41		.49							
ANNUAL RUNOFF (INCHES)	6.61		5.60		6.64							
10 PERCENT EXCEEDS	10		9.0		9.8							
50 PERCENT EXCEEDS	5.8		5.2		6.0							
90 PERCENT EXCEEDS	2.9		2.0		3.3							

(a) Oct. 18, Mar. 17.

(b) June 1, 2.

(c) July 14, 15, 1988.

(e) Estimated.

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 Jan. 6 to Feb. 19 and Feb. 22 to Mar. 5, 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	11	9.9	11	e11	e11	15	13	4.6	9.6	8.1	9.9
2	9.8	11	10	11	e11	e11	14	11	e4.4	8.9	7.9	9.1
3	9.1	11	11	11	e10	e11	12	9.7	e4.3	8.1	7.1	8.3
4	8.6	11	11	11	e10	e12	11	10	4.2	7.4	9.4	7.8
5	8.4	11	10	11	e9.8	e12	10	12	4.2	9.3	10	7.3
6	7.8	11	11	e10	e9.6	13	9.2	13	4.2	8.6	8.7	6.9
7	7.5	11	11	e10	e9.4	14	8.3	12	4.2	7.5	7.5	6.5
8	7.7	10	11	e9.8	e9.2	13	7.4	15	4.2	7.6	6.6	6.2
9	11	9.9	13	e9.6	e9.0	12	6.9	15	4.2	8.0	5.9	6.0
10	11	9.9	16	e9.4	e8.9	11	6.3	15	4.1	7.1	5.6	5.7
11	10	9.8	15	e9.2	e8.8	10	5.9	13	4.1	6.2	9.9	5.5
12	9.7	9.3	15	e9.1	e8.7	9.8	9.1	12	4.1	5.6	13	5.4
13	9.1	9.8	14	e9.0	e8.7	11	13	11	8.1	5.4	19	5.3
14	9.0	9.6	12	e8.9	e8.9	10	13	9.6	9.4	6.6	25	5.4
15	9.1	9.1	12	e8.8	e9.2	9.9	12	9.2	7.7	11	19	5.1
16	12	8.5	13	e8.7	e9.0	11	11	9.6	6.9	9.1	15	5.1
17	26	8.9	13	e8.6	e8.8	16	9.1	8.7	6.6	7.3	13	4.9
18	26	10	14	e8.5	e9.5	20	8.5	8.0	6.3	6.4	13	4.8
19	23	11	14	e8.4	e12	19	8.7	7.6	5.8	5.6	14	4.4
20	22	10	13	e8.3	20	17	8.0	7.2	5.9	6.1	19	4.6
21	22	9.9	13	e8.2	19	20	7.8	6.9	5.8	9.0	21	4.4
22	19	9.3	13	e8.1	e15	17	13	6.4	5.2	8.5	17	4.6
23	17	8.9	12	e8.0	e13	14	18	6.1	5.7	7.2	14	4.6
24	16	8.8	11	e8.0	e12	13	18	5.9	20	6.5	12	5.1
25	14	9.0	11	e8.2	e12	11	16	e5.6	23	6.0	10	8.1
26	13	10	11	e8.5	e11	10	15	e5.4	18	5.6	9.3	7.7
27	13	11	11	e9.5	e11	11	17	e5.2	14	5.5	8.7	7.5
28	12	11	11	e12	e11	11	14	5.1	12	5.5	8.8	7.7
29	12	10	11	e14	---	12	13	5.1	12	6.8	9.4	7.4
30	11	9.9	11	e13	---	16	12	e4.9	11	12	9.6	6.9
31	11	---	12	e12	---	16	---	e4.7	---	10	10	---
TOTAL	407.8	300.6	375.9	300.8	305.5	404.7	342.2	282.9	234.2	234.0	366.5	188.2
MEAN	13.2	10.0	12.1	9.70	10.9	13.1	11.4	9.13	7.81	7.55	11.8	6.27
MAX	26	11	16	14	20	20	18	15	23	12	25	9.9
MIN	7.5	8.5	9.9	8.0	8.7	9.8	5.9	4.7	4.1	5.4	5.6	4.4
CFSM	.70	.54	.65	.52	.58	.70	.61	.49	.42	.40	.63	.34
IN.	.81	.60	.75	.60	.61	.81	.68	.56	.47	.47	.73	.37

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1959 - 1994, BY WATER YEAR (WY)

MEAN	9.78	10.3	10.6	9.83	10.3	11.8	11.6	9.94	8.81	7.96	7.91	8.94
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
(WY)	1970	1986	1992	1993	1971	1971	1975	1975	1969	1970	1975	1975
MIN	3.39	3.54	5.04	5.16	6.25	7.43	7.32	4.18	2.36	2.35	2.49	3.17
(WY)	1965	1965	1965	1965	1965	1965	1963	1965	1988	1964	1964	1964

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1959 - 1994

ANNUAL TOTAL	4327.8	3743.3	9.81
ANNUAL MEAN	11.9	10.3	14.1
HIGHEST ANNUAL MEAN			4.85
LOWEST ANNUAL MEAN			1.1
HIGHEST DAILY MEAN	30	26	40
LOWEST DAILY MEAN	6.1	4.1	1.1
ANNUAL SEVEN-DAY MINIMUM	6.9	4.2	1.3
INSTANTANEOUS PEAK FLOW		29	41
INSTANTANEOUS PEAK STAGE		3.00	3.32
INSTANTANEOUS LOW FLOW		4.0	.91
ANNUAL RUNOFF (CFSM)	.63	.55	.52
ANNUAL RUNOFF (INCHES)	8.61	7.45	7.13
10 PERCENT EXCEEDS	15	15	14
50 PERCENT EXCEEDS	11	9.9	9.5
90 PERCENT EXCEEDS	8.3	5.6	5.3

(a) Apr. 19, 1975, Dec. 7, 1992.

(b) June 5, 10, 11, 12, 13.

(c) June 19, 20, 1988.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04108500 KALAMAZOO RIVER NEAR FENNVILLE, MI
(National stream quality accounting network station)

LOCATION.--Lat 42°35'36", long 85°59'03", in NE1/4 sec.5, T.2 N., R.14 W., Allegan County, Hydrologic Unit 04050003, on left bank 40 ft upstream from bridge on State Highway 89, 2.1 mi downstream from Swan Creek, 4.0 mi downstream from Calkins Dam, and 6.1 mi east of Fennville.

DRAINAGE AREA.--1,600 mi², approximately.

PERIOD OF RECORD.--Water years 1967, 1972-75, 1987 to October 1994 (discontinued).

REMARKS.--Cross-sectional samples were collected at bridge.

WATER-QUALITY DATA

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, KF AGAR (COLS. PER 100 ML) (31673)
NOV 1993										
19...	1325	1700	595	8.3	6.5	2.0	11.1	94	K18	K48
JAN 1994										
06...	1500	1300	--	--	0.0	--	18.0	--	K9	K20
MAR										
31...	1030	1980	521	8.5	6.0	1.5	12.6	103	K4	K79
MAY										
25...	1250	1080	560	8.3	22.0	1.3	11.9	141	K11	K2200
JUL										
14...	1300	1590	514	8.0	25.0	0.40	9.1	113	--	3600
OCT										
06...	1500	1520	582	8.6	15.5	3.6	12.6	129	K13	420
DATE	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	HARD-NESS NONCARB DISSOLV FLD. AS CACO3 (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 HCO3) (00453)	CAR-BONATE WATER DIS IT FIELD (MG/L AS CO3) (00452)	ALKA-LINITY WAT DIS TOT IT FIELD (MG/L AS CACO3) (39086)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)
NOV 1993										
19...	290	52	77	23	21	2.6	283	2	236	42
JAN 1994										
06...	--	--	--	--	--	--	--	--	--	--
MAR										
31...	240	32	67	18	16	2.3	--	--	210	34
MAY										
25...	250	46	63	22	25	2.1	246	--	202	41
JUL										
14...	240	34	64	19	17	2.1	249	--	204	35
OCT										
06...	290	70	75	24	28	2.7	259	2	216	43
DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (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, NO2+NO3 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)
NOV 1993										
19...	33	0.20	9.8	367	0.50	1680	0.010	1.30	0.080	0.50
JAN 1994										
06...	--	--	--	--	--	--	--	--	--	0.60
MAR										
31...	26	0.10	6.7	320	0.44	1710	0.030	1.20	0.330	0.50
MAY										
25...	39	0.20	2.9	337	0.46	983	0.020	0.320	0.110	0.80
JUL										
14...	27	0.20	9.3	317	0.43	1360	0.020	0.770	0.040	0.90
OCT										
06...	41	0.20	3.8	350	0.48	1440	0.020	0.870	<0.015	0.70

04108500 KALAMAZOO RIVER NEAR FENNVILLE, MI--Continued

WATER-QUALITY DATA

[illegible]

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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	76	68	66	e48	e66	e80	75	170	31	67	38	42
2	67	66	78	e48	e62	e76	69	123	30	54	40	40
3	61	70	89	e48	e60	e72	65	90	29	48	38	38
4	57	73	78	e48	e58	e71	61	76	28	44	74	37
5	53	71	71	e48	e56	e70	62	69	26	71	90	36
6	51	68	74	e48	e54	198	63	61	29	74	59	35
7	50	64	82	e48	e52	307	61	56	30	145	50	34
8	49	61	72	e48	e50	260	59	63	28	130	45	33
9	51	60	67	e48	e49	169	58	57	26	102	44	33
10	54	59	64	e48	e49	125	57	51	26	76	42	32
11	52	61	59	e48	e48	107	54	52	25	58	46	31
12	50	59	54	e48	e47	106	74	81	24	50	48	30
13	49	65	54	e47	e47	148	168	64	41	45	370	29
14	49	69	54	e47	e47	145	132	53	48	49	442	29
15	50	72	54	e46	e47	132	106	51	37	156	275	29
16	61	71	53	e45	e48	111	100	50	31	85	144	29
17	424	67	53	e44	e49	91	81	46	28	63	93	29
18	491	64	54	e43	e57	86	71	43	26	56	73	29
19	303	63	58	e43	e120	79	66	41	24	51	62	29
20	209	63	58	e43	e400	81	60	40	28	49	56	28
21	181	59	63	e42	e520	166	58	38	30	94	52	28
22	154	57	62	e42	e350	185	55	36	27	85	48	28
23	124	56	56	e42	e230	133	52	35	29	64	45	28
24	108	58	e54	e42	e180	110	51	35	258	54	42	29
25	96	57	e52	e43	e140	93	54	37	343	49	40	35
26	88	71	e50	e46	e120	84	147	37	364	45	64	49
27	85	102	e47	e50	e100	91	150	39	315	43	77	48
28	87	83	e48	e60	e85	102	114	36	195	42	57	51
29	83	73	e48	e73	---	95	135	34	114	40	49	70
30	76	69	e47	e72	---	87	118	33	85	39	44	56
31	71	---	e47	e70	---	80	---	32	---	38	44	---
TOTAL	3460	1999	1866	1516	3191	3740	2476	1729	2355	2066	2691	1074
MEAN	112	66.6	60.2	48.9	114	121	82.5	55.8	78.5	66.6	86.8	35.8
MAX	491	102	89	73	520	307	168	170	364	156	442	70
MIN	49	56	47	42	47	70	51	32	24	38	38	28
CFSM	1.56	.93	.84	.68	1.60	1.69	1.16	.78	1.10	.93	1.22	.50
IN.	1.80	1.04	.97	.79	1.66	1.95	1.29	.90	1.23	1.08	1.40	.56

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1994, BY WATER YEAR (WY)

	MEAN	41.7	58.0	74.4	64.8	75.5	111	96.9	61.1	52.9	33.4	29.2	34.7
MAX	119	171	131	146	152	227	152	124	138	99.0	86.8	123	
(WY)	1987	1991	1976	1993	1976	1979	1993	1981	1986	1986	1994	1978	
MIN	15.0	19.1	21.7	19.8	25.7	46.1	49.4	25.1	16.4	13.6	12.5	11.9	
(WY)	1969	1972	1977	1970	1970	1969	1968	1977	1987	1987	1970	1969	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1966 - 1994

ANNUAL TOTAL	31631	28163	
ANNUAL MEAN	86.7	77.2	61.1
HIGHEST ANNUAL MEAN			89.3
LOWEST ANNUAL MEAN			32.5
HIGHEST DAILY MEAN	686	Apr 20	1530
LOWEST DAILY MEAN	28	Aug 22	9.2
ANNUAL SEVEN-DAY MINIMUM	30	Aug 17	9.8
INSTANTANEOUS PEAK FLOW		(e)950	1860
INSTANTANEOUS PEAK STAGE		(b)9.19	(c)9.57
INSTANTANEOUS LOW FLOW		23	
ANNUAL RUNOFF (CFSM)	1.21	1.08	.86
ANNUAL RUNOFF (INCHES)	16.48	14.87	11.62
10 PERCENT EXCEEDS	153	134	116
50 PERCENT EXCEEDS	65	57	43
90 PERCENT EXCEEDS	37	33	19

(a) Aug. 27, 28, 1970, Sept. 18, 1971, Aug. 7, 1987.

(b) Backwater from ice.

(c) From floodmark.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04108660 KALAMAZOO RIVER AT NEW RICHMOND, MI

LOCATION.--Lat 42°39'06", long 86°06'28", in NE1/4 NW1/4 sec.17, T.3 N., R.15 W., Allegan County, Hydrologic Unit 04050003, on right bank 150 ft downstream from railroad bridge, and 300 ft downstream from bridge on Old Allegan Road in New Richmond.

DRAINAGE AREA.--1,980 mi², approximately.

PERIOD OF RECORD.--April to September 1994.

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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	e2700	2610	1490	3320	1490	1710
2	---	---	---	---	---	---	e2650	2860	1270	3120	1570	1560
3	---	---	---	---	---	---	e2500	2900	1250	2650	1390	1840
4	---	---	---	---	---	---	e2400	2700	1340	2170	1550	1570
5	---	---	---	---	---	---	e2450	2790	1240	2180	1900	1560
6	---	---	---	---	---	---	e2350	2610	1290	2720	1550	1720
7	---	---	---	---	---	---	e2200	2390	1410	3030	1730	1380
8	---	---	---	---	---	---	e2200	2390	1370	2880	1710	1290
9	---	---	---	---	---	---	e2250	2310	1230	3150	1520	1410
10	---	---	---	---	---	---	e2150	2140	1240	3060	1430	1550
11	---	---	---	---	---	---	e2050	2070	e1310	2660	1510	1340
12	---	---	---	---	---	---	e2050	2030	e1290	2330	1690	1390
13	---	---	---	---	---	---	e2640	2190	e1210	2200	2380	1420
14	---	---	---	---	---	---	e2820	2130	1290	2050	3240	1310
15	---	---	---	---	---	---	e3030	1950	1920	2010	4280	1350
16	---	---	---	---	---	---	e3200	1950	1340	2040	5190	1370
17	---	---	---	---	---	---	e3000	1890	1750	2080	4820	1300
18	---	---	---	---	---	---	e3000	1920	1480	1980	4190	1280
19	---	---	---	---	---	---	e2900	1820	1410	1630	e3900	1220
20	---	---	---	---	---	---	e2750	1660	1740	1970	e3660	1270
21	---	---	---	---	---	---	e2650	1600	1500	1770	e3740	1220
22	---	---	---	---	---	---	e2600	1570	1320	2060	e3500	1270
23	---	---	---	---	---	---	e2300	1600	1330	1910	e3010	1280
24	---	---	---	---	---	---	e1880	1770	2090	1860	2840	1290
25	---	---	---	---	---	---	e1940	1600	2840	1820	2600	1410
26	---	---	---	---	---	---	1990	1460	3610	1610	2320	1570
27	---	---	---	---	---	---	2030	1400	4560	1560	2190	1550
28	---	---	---	---	---	---	2170	1360	4580	1790	2140	1690
29	---	---	---	---	---	---	2350	1290	4160	1620	2030	1560
30	---	---	---	---	---	---	2390	1400	3680	1390	1750	1650
31	---	---	---	---	---	---	---	1480	---	1370	2040	---
TOTAL	---	---	---	---	---	---	73590	61840	57540	67990	78860	43330
MEAN	---	---	---	---	---	---	2453	1995	1918	2193	2544	1444
MAX	---	---	---	---	---	---	3200	2900	4580	3320	5190	1840
MIN	---	---	---	---	---	---	1880	1290	1210	1370	1390	1220
CFSM	---	---	---	---	---	---	1.24	1.01	.97	1.11	1.28	.73
IN.	---	---	---	---	---	---	1.38	1.16	1.08	1.28	1.48	.81

(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 poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	71	23	33	e30	e60	e72	33	60	7.4	25	12	6.4
2	49	22	174	e45	e43	e68	31	32	7.0	21	11	5.9
3	37	40	144	e60	e39	e66	28	23	6.6	18	9.1	5.8
4	32	42	69	e40	e36	e64	26	20	6.4	16	180	5.4
5	28	31	52	e34	e33	e62	28	19	6.1	311	140	5.2
6	25	28	105	e31	e30	324	27	17	8.6	214	31	5.1
7	23	25	113	e30	e29	748	24	22	7.4	511	20	5.1
8	22	23	58	e29	e28	713	22	30	6.4	374	16	5.1
9	22	22	44	e28	e28	289	22	22	5.8	243	14	5.3
10	22	21	40	e27	e27	149	21	18	5.2	71	12	4.8
11	21	21	32	e26	e27	132	19	77	5.4	41	15	4.6
12	19	20	26	e25	e27	194	32	82	5.0	30	15	4.5
13	19	29	25	e24	e26	395	66	33	18	25	1310	4.3
14	18	33	25	e24	e26	247	46	24	15	22	1240	4.3
15	18	38	25	e23	e26	253	144	26	8.6	29	386	4.5
16	68	36	24	e23	e26	134	102	25	6.3	19	98	4.3
17	678	28	23	e22	e26	72	39	19	5.7	17	51	4.4
18	756	25	24	e22	e29	65	30	17	5.0	15	38	4.4
19	282	24	29	e22	e150	57	27	15	4.7	12	31	4.4
20	120	23	29	e22	e500	81	23	14	8.3	32	28	4.5
21	228	21	39	e21	e2000	321	22	13	7.0	150	23	4.4
22	105	20	36	e21	e1000	192	20	12	5.4	67	19	4.5
23	60	19	e29	e21	e400	112	18	11	5.4	33	14	4.7
24	48	19	e26	e21	e200	77	17	11	760	21	11	5.6
25	40	19	e25	e21	e120	54	19	11	1110	16	11	24
26	35	149	e24	e22	e100	45	25	12	555	13	12	139
27	32	220	e24	e35	e86	64	21	11	269	12	12	29
28	31	61	e23	e90	e76	68	19	9.6	71	13	10	55
29	29	43	e23	e250	---	48	35	8.3	48	10	7.6	117
30	26	36	e23	e150	---	41	28	8.0	37	9.1	7.0	37
31	24	---	e25	e90	---	36	---	7.9	---	8.2	6.9	---
TOTAL	2988	1161	1391	1329	5198	5243	1014	709.8	3016.7	2398.3	3790.6	518.5
MEAN	96.4	38.7	44.9	42.9	186	169	33.8	22.9	101	77.4	122	17.3
MAX	756	220	174	250	2000	748	144	82	1110	511	1310	139
MIN	18	19	23	21	26	36	17	7.9	4.7	8.2	6.9	4.3
CFSM	1.46	.59	.68	.65	2.82	2.57	.51	.35	1.53	1.18	1.86	.26
IN.	1.69	.66	.79	.75	2.94	2.96	.57	.40	1.71	1.36	2.14	.29

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1994, BY WATER YEAR (WY)

	MEAN	32.0	75.5	103	78.4	110	178	108	56.7	39.4	23.5	18.5	34.8
MAX	152	333	328	278	398	499	206	288	217	185	122	252	
(WY)	1987	1991	1983	1974	1985	1979	1993	1981	1980	1982	1994	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	
(WY)	1964	1977	1977	1977	1963	1981	1986	1968	1987	1965	1962	1963	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1961 - 1994

ANNUAL TOTAL	36120.1	28757.9	71.2
ANNUAL MEAN	99.0	78.8	115
HIGHEST ANNUAL MEAN			24.6
LOWEST ANNUAL MEAN			1993
HIGHEST DAILY MEAN	1720	Apr 20	4600
LOWEST DAILY MEAN	5.0	Jul 31	1.2
ANNUAL SEVEN-DAY MINIMUM	6.1	Jul 28	1.2
INSTANTANEOUS PEAK FLOW			7220
INSTANTANEOUS PEAK STAGE			15.81
INSTANTANEOUS LOW FLOW			.83
ANNUAL RUNOFF (CFSM)	1.50		1.08
ANNUAL RUNOFF (INCHES)	20.42		14.71
10 PERCENT EXCEEDS	238		150
50 PERCENT EXCEEDS	33		20
90 PERCENT EXCEEDS	9.9		3.3

(a) Backwater from ice.

(b) Sept. 13, 14, 16.

(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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	253	174	133	84	140	224	240	220	96	230	77	71
2	246	165	166	85	146	183	218	223	90	208	78	67
3	235	164	176	86	149	175	205	222	72	188	75	64
4	228	160	183	89	145	176	199	220	67	172	107	62
5	186	157	177	89	140	170	197	239	64	238	77	62
6	167	150	200	86	136	191	200	235	80	200	67	65
7	158	145	213	95	134	211	234	245	72	188	64	66
8	145	149	237	121	115	225	241	228	68	168	67	64
9	166	147	231	126	132	237	222	222	66	179	65	61
10	134	144	184	123	126	238	211	213	64	172	63	59
11	136	142	160	132	124	233	209	206	61	163	162	55
12	132	140	154	130	119	225	254	190	59	118	129	59
13	130	144	151	130	117	230	280	125	135	102	192	61
14	130	140	149	125	115	225	276	113	125	96	165	60
15	127	145	146	109	105	223	279	109	149	92	161	61
16	154	138	140	119	103	217	287	102	154	87	157	59
17	188	148	139	127	116	217	280	98	154	83	159	59
18	183	143	145	124	126	201	273	95	148	84	156	55
19	241	145	142	120	152	190	239	100	143	81	149	58
20	277	137	145	119	193	185	226	116	163	112	167	56
21	289	134	150	115	222	292	217	113	147	142	149	55
22	280	131	153	115	253	313	203	108	130	121	140	55
23	258	98	148	115	264	334	185	104	96	117	132	54
24	239	115	139	120	294	326	171	111	172	108	125	53
25	236	104	129	120	290	318	167	132	146	128	112	52
26	232	130	109	116	255	310	176	118	136	117	107	61
27	225	142	147	124	260	318	189	109	150	92	104	75
28	226	131	138	238	272	311	190	103	193	90	104	69
29	220	131	91	191	---	312	192	101	220	84	99	64
30	207	139	84	187	---	302	212	99	232	78	77	73
31	189	---	83	179	---	289	---	99	---	75	74	---
TOTAL	6217	4232	4742	3839	4743	7601	6672	4718	3652	4113	3560	1835
MEAN	201	141	153	124	169	245	222	152	122	133	115	61.2
MAX	289	174	237	238	294	334	287	245	232	238	192	75
MIN	127	98	83	84	103	170	167	95	59	75	63	52
CFSM	1.15	.81	.88	.71	.97	1.41	1.28	.87	.70	.76	.66	.35
IN.	1.33	.90	1.01	.82	1.01	1.63	1.43	1.01	.78	.88	.76	.39

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1935 - 1994, BY WATER YEAR (WY)

	MEAN	78.6	102	113	121	144	223	227	165	126	85.3	64.6	65.1
MAX	214	305	210	343	301	501	589	484	433	349	164	222	
(WY)	1991	1993	1993	1993	1976	1976	1950	1943	1943	1968	1968	1975	
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	
(WY)	1964	1964	1964	1964	1964	1964	1935	1936	1936	1936	1936	1963	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1935 - 1994

ANNUAL TOTAL	72364						55924						
ANNUAL MEAN	198						153						
HIGHEST ANNUAL MEAN										127			
LOWEST ANNUAL MEAN										216			1993
HIGHEST DAILY MEAN										44.3			1964
LOWEST DAILY MEAN										971			Jun 3 1943
ANNUAL SEVEN-DAY MINIMUM	479			Apr 2			334		Mar 23	12			Aug 23 1936
INSTANTANEOUS PEAK FLOW	58			Aug 22			52		Sep 25	14			Aug 4 1936
INSTANTANEOUS PEAK STAGE	64			Aug 17			55		Sep 19	1070			Jun 25 1937
INSTANTANEOUS LOW FLOW							432		Jul 5	15.44			Jun 25 1968
ANNUAL RUNOFF (CFSM)							11.71		Jul 5	9.2			Aug 22 1936
ANNUAL RUNOFF (INCHES)							43		Sep 11	.73			
10 PERCENT EXCEEDS	1.14						.88			9.91			
50 PERCENT EXCEEDS	15.47						11.96			258			
90 PERCENT EXCEEDS	316						239			92			
	174						143			38			
	96						67						

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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e17	9.5	12	6.3	e17	e10	17	49	3.6	11	2.7	4.2
2	e14	8.9	14	6.2	e13	e9.5	16	33	3.2	8.7	2.9	3.7
3	e11	9.5	16	5.4	e11	10	15	25	3.1	7.4	2.6	3.4
4	e9.0	9.4	16	5.0	e9.0	12	14	20	2.9	6.2	11	3.1
5	7.9	9.1	19	4.5	e8.0	21	13	17	2.7	33	12	2.9
6	7.1	8.3	18	4.5	e7.2	107	12	14	2.9	21	6.6	2.9
7	6.7	7.8	18	e4.5	e6.4	92	11	16	2.7	17	4.9	2.9
8	6.0	7.5	16	e4.4	e5.9	47	11	26	2.5	12	4.0	2.5
9	15	7.3	14	e4.4	e5.6	29	10	18	2.3	9.4	3.5	2.3
10	16	7.1	14	e4.3	e5.3	22	9.8	15	2.2	7.7	3.4	2.1
11	13	7.1	11	e4.2	e5.0	19	8.9	14	2.0	6.5	5.3	2.0
12	11	6.9	e10	e4.1	e4.7	18	18	13	2.0	5.5	7.0	2.0
13	8.9	8.2	8.9	e4.0	e4.5	31	51	11	24	4.6	30	1.8
14	8.1	8.4	9.0	e3.9	e4.4	25	37	11	52	4.2	84	e8.0
15	7.7	8.7	9.3	e3.8	e4.3	24	59	10	25	7.0	41	2.2
16	8.4	8.3	9.4	e3.7	e4.2	e19	66	9.3	14	5.4	18	9.7
17	74	8.1	9.2	e3.5	e4.5	e16	34	8.6	9.2	4.5	12	11
18	89	8.0	9.2	e3.3	e7.0	14	24	7.9	7.0	4.1	8.9	7.2
19	42	8.3	8.9	e3.2	e150	13	20	7.4	5.4	3.4	7.2	5.2
20	31	7.8	8.9	e3.2	184	14	16	7.0	4.9	5.0	8.7	4.3
21	108	7.1	9.4	e3.3	94	100	14	6.7	4.7	54	12	3.7
22	57	6.9	8.4	e3.4	46	78	12	6.2	3.6	26	8.4	3.2
23	33	6.7	e7.1	e3.4	29	46	11	5.5	3.5	18	6.5	2.9
24	24	7.2	e6.0	e3.4	e22	35	10	5.7	102	11	5.5	2.7
25	19	7.7	e5.7	e3.5	e18	26	10	6.0	139	7.8	4.9	2.9
26	16	13	e5.1	e3.7	e15	21	11	5.9	73	6.4	4.4	3.3
27	15	34	e4.8	e4.0	e13	25	49	5.5	40	5.3	4.0	4.4
28	14	23	e4.6	e15	e11	30	33	4.9	25	4.7	7.7	6.3
29	12	17	5.0	e45	---	25	54	4.4	19	4.0	8.8	6.4
30	11	14	e6.0	e32	---	23	35	4.0	15	3.4	5.3	5.2
31	10	---	e6.4	e24	---	20	---	3.8	---	3.1	4.9	---
TOTAL	721.8	300.8	319.3	227.1	709.0	981.5	701.7	390.8	598.4	327.3	348.1	144.2
MEAN	23.3	10.0	10.3	7.33	25.3	31.7	23.4	12.6	19.9	10.6	11.2	4.81
MAX	108	34	19	45	184	107	66	49	139	54	84	22
MIN	6.0	6.7	4.6	3.2	4.2	9.5	8.9	3.8	2.0	3.1	2.6	1.8
CFSM	1.43	.62	.63	.45	1.55	1.94	1.43	.77	1.22	.65	.69	.29
IN.	1.65	.69	.73	.52	1.62	2.24	1.60	.89	1.37	.75	.79	.33

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1954 - 1994, BY WATER YEAR (WY)

	MEAN	5.60	9.08	12.1	10.7	16.5	30.0	24.6	12.2	8.65	4.11	2.54	3.11
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	1992	
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	1979	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1954 - 1994

ANNUAL TOTAL	7002.5	5770.0	11.5
ANNUAL MEAN	19.2	15.8	22.8
HIGHEST ANNUAL MEAN			1.86
LOWEST ANNUAL MEAN			1993
HIGHEST DAILY MEAN	240	184	720
LOWEST DAILY MEAN	1.8	1.8	.05
ANNUAL SEVEN-DAY MINIMUM	2.0	2.2	.09
INSTANTANEOUS PEAK FLOW		246	(a)962
INSTANTANEOUS PEAK STAGE		7.04	(b)12.18
INSTANTANEOUS LOW FLOW		1.7	.04
ANNUAL RUNOFF (CFSM)	1.18	.97	.71
ANNUAL RUNOFF (INCHES)	15.98	13.17	9.62
10 PERCENT EXCEEDS	39	33	26
50 PERCENT EXCEEDS	10	8.9	4.5
90 PERCENT EXCEEDS	3.8	3.4	.70

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

(b) From floodmark.

(c) Sept. 13, 14.

(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. 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.2	3.9	5.9	2.1	7.6	4.3	7.1	27	1.5	7.2	1.7	1.9
2	6.3	3.6	6.4	2.0	5.2	3.9	6.3	15	1.3	5.8	1.6	1.6
3	5.1	3.6	7.0	1.9	e4.3	3.8	5.8	9.7	1.3	4.8	1.5	1.4
4	4.3	3.5	7.6	1.8	e3.6	5.5	5.3	7.6	1.2	4.0	2.2	1.2
5	3.6	3.5	8.5	e1.7	3.2	14	4.9	6.5	e1.1	27	2.6	1.1
6	3.2	3.2	8.4	e1.7	2.9	68	4.5	5.5	e1.0	16	1.9	1.0
7	2.9	3.0	8.7	1.6	2.5	44	4.1	5.6	e.95	13	1.6	.98
8	2.7	2.9	7.4	1.6	2.3	27	3.8	7.3	e.88	26	1.4	.94
9	3.8	2.8	6.5	1.5	2.2	16	3.8	6.3	.83	13	1.3	.97
10	5.6	2.7	6.1	1.4	2.0	9.9	3.7	5.1	e.74	8.4	1.2	.95
11	4.5	2.7	5.0	1.6	1.9	7.9	3.3	4.8	.65	6.0	1.7	.96
12	4.0	2.6	4.3	1.6	1.8	7.3	8.4	4.6	.60	4.7	1.9	.93
13	3.3	3.0	4.0	1.6	1.8	12	4.2	4.0	117	3.8	5.0	.90
14	3.0	2.9	3.9	1.5	1.7	10	25	3.6	112	3.3	7.9	1.1
15	2.8	3.0	3.8	1.3	1.7	9.8	4.4	4.0	39	3.3	4.0	2.5
16	2.8	2.9	3.6	1.1	1.6	7.4	37	3.8	21	2.9	2.8	1.7
17	79	3.0	3.5	1.3	e1.7	5.9	19	3.4	13	2.6	2.2	1.9
18	55	3.0	3.6	1.3	e3.5	5.5	13	3.2	8.6	2.3	1.8	1.3
19	31	3.1	3.5	1.1	.86	4.9	8.8	2.9	6.5	2.0	1.5	1.0
20	24	2.9	3.4	1.1	.85	4.9	7.1	2.7	4.6	8.7	4.2	.87
21	50	2.7	3.5	1.1	45	50	6.0	2.5	3.9	59	5.0	.77
22	28	2.6	3.3	1.2	27	35	5.2	2.3	3.1	26	3.0	.68
23	18	2.5	2.9	1.4	17	23	4.7	2.0	3.0	14	2.3	.63
24	13	2.6	2.8	1.4	13	16	4.5	2.3	87	8.3	1.8	.63
25	8.9	2.6	2.7	1.3	7.5	11	4.3	2.5	107	5.7	1.5	.68
26	7.6	5.0	2.3	1.2	5.9	8.8	4.9	2.5	48	4.1	1.4	.75
27	6.7	21	e1.9	1.3	e5.1	9.9	7.8	2.1	30	3.3	1.3	1.2
28	6.0	13	e1.9	24	e4.5	13	7.6	1.9	20	2.9	6.9	1.9
29	5.4	8.4	1.9	27	---	11	17	1.8	16	2.5	5.0	1.9
30	4.7	6.7	1.8	17	---	9.6	13	1.6	11	2.1	2.9	1.5
31	4.3	---	1.9	12	---	7.9	---	1.6	---	1.8	2.4	---
TOTAL	407.7	128.9	138.0	119.7	347.5	467.2	331.9	155.7	662.75	294.5	83.5	35.84
MEAN	13.2	4.30	4.45	3.86	12.4	15.1	11.1	5.02	22.1	9.50	2.69	1.19
MAX	79	21	8.7	27	86	68	44	27	117	59	7.9	2.5
MIN	2.7	2.5	1.8	1.1	1.6	3.8	3.3	1.6	.60	1.8	1.2	.63
CFSM	1.41	.46	.48	.41	1.33	1.61	1.18	.54	2.37	1.02	.29	.13
IN.	1.62	.51	.55	.48	1.38	1.86	1.32	.62	2.64	1.17	.33	.14

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1954 - 1994, BY WATER YEAR (WY)

	MEAN	2.81	4.23	5.96	5.07	8.17	16.9	13.3	5.90	4.42	2.02	1.18	1.46
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	.10	.086	
(WY)	1964	1964	1964	1963	1963	1964	1963	1955	1988	1988	1987	1955	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1954 - 1994

ANNUAL TOTAL	3308.41		3173.19										
ANNUAL MEAN	9.06		8.69							5.94			
HIGHEST ANNUAL MEAN										10.5		(a)	
LOWEST ANNUAL MEAN										.72		1964	
HIGHEST DAILY MEAN	178			Apr 20		117	Jun 13		536		Apr 19 1975		
LOWEST DAILY MEAN	.50			Jul 24		.60	Jun 12		.02		Aug 3 1988		
ANNUAL SEVEN-DAY MINIMUM	.70			Aug 3		.72	Sep 20		.03		Jul 29 1988		
INSTANTANEOUS PEAK FLOW						474	Jun 13		(b)1290		Apr 18 1975		
INSTANTANEOUS PEAK STAGE						(c)6.00	Jun 13		9.99		Apr 18 1975		
INSTANTANEOUS LOW FLOW						.53	(d)		.01		(f)		
ANNUAL RUNOFF (CFSM)	.97					.93			.64				
ANNUAL RUNOFF (INCHES)	13.18					12.64			8.64				
10 PERCENT EXCEEDS	22					20			14				
50 PERCENT EXCEEDS	4.2					3.6			1.6				
90 PERCENT EXCEEDS	1.2					1.3			.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) From graph based on gage readings.

(d) June 12, Sept. 22.

(e) Estimated.

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

STREAMS TRIBUTARY TO LAKE MICHIGAN

04112500 RED CEDAR RIVER AT EAST LANSING, MI

LOCATION.--Lat 42°43'40", long 84°28'40", in SW1/4 sec.18, T.4 N., R.1 W., Ingham County, Hydrologic Unit 04050004, in left downstream bridge abutment of Farm Lane Bridge on Michigan State University Campus in East Lansing, 4.0 mi upstream from Sycamore Creek, and 5.6 mi upstream from mouth.

DRAINAGE AREA.--355 mi².

PERIOD OF RECORD.--August 1902 to December 1903, March 1931 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as Red Cedar River at Agricultural College, August 1902 to December 1903 and as Cedar River at East Lansing, March 1931 to September 1965. Gage-height records collected in this vicinity 1911-19, and 1920-28 (flood seasons only), are contained in reports of the National Weather Service.

REVISED RECORDS.--WSP 1307: 1936(M).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 824.39 ft above sea level. August 1902 to December 1903 nonrecording gage at site 0.8 mi downstream at different datum. March 1931 to November 1940 water-stage recorder at site 250 ft upstream at present datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Prior to April 1975, occasional regulation at low flow by mill at Williamston, 16 mi upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Mar. 24, 1904, reached a stage of 13.4 ft, discharge, 8,000 ft³/s.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	473	211	323	118	453	309	431	757	93	548	127	175
2	387	201	294	125	359	261	394	751	88	365	120	151
3	323	197	298	124	279	242	364	642	84	261	116	133
4	270	201	297	118	228	250	333	533	80	216	145	119
5	229	204	319	111	196	308	308	451	78	445	210	110
6	201	200	330	101	e170	677	287	378	97	690	231	104
7	182	190	337	102	e150	1270	269	332	84	696	187	101
8	169	182	327	104	e135	1300	253	350	78	1320	149	98
9	173	179	301	104	128	1030	239	386	74	1960	129	93
10	216	175	281	104	127	790	229	370	71	1910	118	88
11	230	175	262	105	126	625	215	340	68	1480	134	84
12	217	173	234	104	e125	514	249	328	65	1060	150	78
13	204	181	212	106	e125	493	578	285	237	750	233	76
14	185	184	207	107	e120	495	697	260	1200	540	404	87
15	178	191	204	106	e120	471	664	247	1290	432	514	125
16	175	189	203	e105	118	434	853	237	972	393	483	149
17	459	187	201	e105	119	369	811	225	644	340	376	153
18	958	186	200	e100	129	322	552	215	436	287	297	126
19	884	184	199	e100	318	288	408	209	279	238	230	106
20	653	183	197	e100	1080	268	331	203	193	248	260	94
21	655	176	201	e100	e1650	506	282	197	167	610	335	86
22	786	169	199	e100	1600	884	251	180	151	682	280	81
23	732	162	187	99	1260	982	230	165	141	516	224	76
24	573	163	159	98	889	893	217	160	553	425	187	73
25	451	167	120	100	675	762	232	162	1190	350	164	80
26	370	202	120	102	476	636	347	166	1530	286	148	87
27	318	319	137	102	366	565	416	161	1460	221	133	114
28	283	423	146	214	326	555	525	149	1170	189	164	170
29	260	413	132	420	---	546	628	130	950	168	246	208
30	239	366	120	504	---	513	673	110	767	152	248	212
31	223	---	116	519	---	472	---	98	---	138	211	---
TOTAL	11656	6333	6863	4507	11847	18030	12266	9177	14290	17916	6953	3437
MEAN	376	211	221	145	423	582	409	296	476	578	224	115
MAX	958	423	337	519	1650	1300	853	757	1530	1960	514	212
MIN	169	162	116	98	118	242	215	98	65	138	116	73
CFSM	1.06	.59	.62	.41	1.19	1.64	1.15	.83	1.34	1.63	.63	.32
IN.	1.22	.66	.72	.47	1.24	1.89	1.29	.96	1.50	1.88	.73	.36

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1902 - 1994, BY WATER YEAR (WY)

	MEAN	103	140	179	206	284	504	476	282	178	90.7	59.8	75.6
MAX	571	735	492	739	1024	1162	1494	1310	627	578	366	426	
(WY)	1982	1993	1976	1993	1938	1948	1947	1956	1968	1994	1992	1903	
MIN	14.8	21.2	20.5	29.0	28.6	58.6	62.3	52.9	20.4	5.70	9.24	14.6	
(WY)	1935	1964	1964	1940	1940	1934	1931	1931	1934	1934	1934	1939	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1902 - 1994

ANNUAL TOTAL	139124	123275	216
ANNUAL MEAN	381	338	431
HIGHEST ANNUAL MEAN			43.3
LOWEST ANNUAL MEAN			1993
HIGHEST DAILY MEAN	2050	1960	5720
LOWEST DAILY MEAN	80	65	3.0
ANNUAL SEVEN-DAY MINIMUM	90	77	3.9
INSTANTANEOUS PEAK FLOW		2040	5940
INSTANTANEOUS PEAK STAGE		7.17	11.95
INSTANTANEOUS LOW FLOW		64	3.0
ANNUAL RUNOFF (CFSM)	1.07	.95	.61
ANNUAL RUNOFF (INCHES)	14.58	12.92	8.26
10 PERCENT EXCEEDS	794	711	505
50 PERCENT EXCEEDS	253	223	103
90 PERCENT EXCEEDS	126	101	28

(a) June 12, 13.

(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. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1870	1130	1210	558	1400	1430	1900	2400	431	1650	378	661
2	1720	1050	1100	575	1320	1600	1770	2410	436	1160	429	547
3	1460	1100	1110	546	1080	1470	1730	2210	462	1000	439	507
4	1280	989	1200	488	979	1490	1610	1890	419	835	580	542
5	1280	1030	1160	499	876	1530	1520	1740	410	1590	592	469
6	995	985	1250	460	837	2330	1390	1580	383	1720	696	494
7	953	947	1300	424	769	3390	1410	1400	433	1770	631	452
8	878	868	1250	446	721	3570	1310	1550	415	2630	530	353
9	980	905	1230	503	638	3010	1220	1610	321	3050	449	495
10	936	712	1200	426	548	2490	1270	1520	394	3070	454	362
11	1060	922	1170	449	537	2170	1240	1530	290	2620	537	311
12	919	731	1050	523	613	1890	1410	1390	336	1890	482	412
13	873	876	1040	496	549	1890	1990	1200	915	1610	1290	309
14	860	890	940	511	557	1920	2480	1150	2430	1370	2130	470
15	697	825	923	501	572	1890	2470	1040	2370	1390	2600	706
16	790	941	921	471	549	1840	2670	994	2140	1080	2520	458
17	1710	773	911	438	578	1660	2560	914	1430	875	2290	527
18	2870	826	875	411	621	1580	2170	795	1050	712	1840	460
19	2910	838	889	452	1180	1430	1840	692	858	671	1360	389
20	2320	840	813	455	3190	1360	1590	735	638	805	1740	396
21	2410	793	891	436	4460	1990	1450	655	597	1150	1630	221
22	2510	758	858	459	4370	2750	1370	647	548	1500	1340	419
23	2330	735	846	432	3640	2900	1140	532	660	1450	1180	222
24	2130	771	776	506	2700	2860	1230	602	1990	1270	1000	349
25	1920	752	588	478	2320	2650	1120	591	2930	1070	957	285
26	1740	893	e530	492	1760	2260	1620	650	3540	807	833	436
27	1560	1140	e570	501	1730	2220	1480	620	3170	658	780	459
28	1440	1380	e500	1030	1390	2120	1780	608	3010	653	996	506
29	1290	1430	e480	1190	---	2130	2040	550	2450	550	836	562
30	1220	1290	e530	1430	---	2030	2130	516	1930	520	871	596
31	1180	---	609	1580	---	1980	---	537	---	480	708	---
TOTAL	47091	28120	28720	18166	40484	65830	50910	35258	37386	41606	33098	13375
MEAN	1519	937	926	586	1446	2124	1697	1137	1246	1342	1068	446
MAX	2910	1430	1300	1580	4460	3570	2670	2410	3540	3070	2600	706
MIN	697	712	480	411	537	1360	1120	516	290	480	378	221
CFSM	1.24	.76	.75	.48	1.18	1.73	1.38	.92	1.01	1.09	.87	.36
IN.	1.42	.85	.87	.55	1.22	1.99	1.54	1.07	1.13	1.26	1.00	.40

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1901 - 1994, BY WATER YEAR (WY)

	MEAN	MAX	MIN	(WY)
1901	462	1880	1987	88.5
1902	609	2559	1993	138
1903	728	1666	1976	124
1904	806	2669	1993	150
1905	1016	2550	1976	158
1906	1932	7242	1904	348
1907	1795	5113	1947	488
1908	1113	3815	1956	330
1909	831	2800	1905	168
1910	488	2204	1902	98.3
1911	349	1178	1992	61.1
1912	360	1277	1903	93.6
1913			1964	1963

SUMMARY STATISTICS FOR 1993 CALENDAR YEAR FOR 1994 WATER YEAR WATER YEARS 1901 - 1994

	FOR 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1901 - 1994
ANNUAL TOTAL	538015	440044	
ANNUAL MEAN	1474	1206	
HIGHEST ANNUAL MEAN			1638
LOWEST ANNUAL MEAN			232
HIGHEST DAILY MEAN	5910	4460	22700
LOWEST DAILY MEAN	363	221	20
ANNUAL SEVEN-DAY MINIMUM	430	326	44
INSTANTANEOUS PEAK FLOW		4780	(a)24500
INSTANTANEOUS PEAK STAGE		9.34	(b)18.60
INSTANTANEOUS LOW FLOW		53	2.8
ANNUAL RUNOFF (CFSM)	1.20	.98	.71
ANNUAL RUNOFF (INCHES)	16.27	13.31	9.63
10 PERCENT EXCEEDS	2620	2350	1920
50 PERCENT EXCEEDS	1160	989	539
90 PERCENT EXCEEDS	593	451	180

(a) From rating curve extended above 15,000 ft³/s.

(b) Datum then in use.

(c) Estimated.

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 downstream 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. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2160	1190	1250	e650	e1400	1290	1980	2630	615	1910	575	787
2	2020	1150	1200	e600	e1300	1350	1850	2660	533	1540	513	722
3	1840	1090	1140	e620	e1200	1370	1750	2500	538	1170	533	636
4	1600	1130	1160	e580	e1100	1430	1670	2110	553	1030	622	608
5	1430	1040	1220	e530	e1000	1580	1580	1910	515	1270	755	620
6	1370	1070	1200	e520	e940	2410	1440	1630	531	1870	701	562
7	1190	1000	1310	e490	e860	3530	1410	1560	499	1730	789	594
8	1100	983	1270	e460	e800	4130	1320	1450	520	2480	695	557
9	1030	907	1250	e490	e750	3550	1330	1560	508	3060	657	459
10	1080	959	1230	e530	e700	2950	1200	1550	432	3170	559	577
11	1060	852	1200	e460	e600	2420	1260	1540	482	2930	584	469
12	1130	931	1150	e500	e610	2110	1280	1640	393	2350	691	419
13	1060	857	1040	e550	e640	2020	1810	1350	467	1780	857	495
14	987	948	1060	e540	e600	1990	2440	1220	1690	1470	2030	416
15	961	956	971	e540	e600	2000	2530	1170	2470	1650	2540	729
16	859	904	969	e520	e600	1920	2710	1070	2070	1400	2610	726
17	1550	972	966	e500	e660	1800	2750	1020	1820	1120	2410	636
18	2970	865	954	e470	e800	1630	2420	950	1280	935	2070	588
19	3450	897	948	e440	e1500	1550	2060	858	932	845	1670	554
20	2980	924	928	e480	e3300	1400	1710	781	888	851	1260	494
21	2660	892	891	e490	4910	1730	1490	834	722	1070	2200	485
22	2680	866	964	e480	5070	2690	1420	745	682	1360	1560	330
23	2700	832	899	e480	4540	3060	1310	735	655	1500	1320	504
24	2330	844	905	e480	3490	3010	1130	641	1990	1330	1120	319
25	2160	845	819	e540	2630	2880	1310	715	3480	1220	1040	457
26	1920	885	e620	e520	2200	2490	1870	704	4120	1010	948	415
27	1650	1080	e580	e550	1910	2360	1840	753	3820	844	901	528
28	1550	1220	e620	e1000	1760	2230	1690	704	3430	743	870	571
29	1390	1410	e530	e1250	---	2240	2210	696	3140	740	1060	609
30	1270	1360	e520	e1500	---	2130	2230	634	2380	643	903	655
31	1230	---	e600	e1600	---	2040	---	622	---	615	872	---
TOTAL	53367	29859	30364	19360	46470	69290	53000	38942	42155	45636	35915	16521
MEAN	1722	995	979	625	1660	2235	1767	1256	1405	1472	1159	551
MAX	3450	1410	1310	1600	5070	4130	2750	2660	4120	3170	2610	787
MIN	859	832	520	440	600	1290	1130	622	393	615	513	319
CFSM	1.24	.72	.71	.45	1.20	1.61	1.28	.91	1.01	1.06	.84	.40
IN.	1.43	.80	.82	.52	1.25	1.86	1.42	1.05	1.13	1.23	.96	.44

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1994, BY WATER YEAR (WY)

	MEAN	557	767	908	935	1121	2061	1995	1279	836	571	432	434
MAX	1766	2743	1975	2989	2947	4202	3936	4676	2587	2268	1297	1433	
(WY)	1982	1993	1976	1993	1976	1974	1975	1956	1989	1968	1992	1975	
MIN	132	174	161	184	186	382	683	373	258	155	166	133	
(WY)	1964	1965	1964	1963	1963	1964	1964	1958	1988	1965	1965	1963	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1952 - 1994

ANNUAL TOTAL	606029		480879										
ANNUAL MEAN	1660		1317										
HIGHEST ANNUAL MEAN										987			
LOWEST ANNUAL MEAN										1830			1993
HIGHEST DAILY MEAN	7500	Apr 21	5070	Feb 22	12200					282			1964
LOWEST DAILY MEAN	488	Aug 18	319	Sep 24	58								Apr 21 1975
ANNUAL SEVEN-DAY MINIMUM	549	Aug 14	429	Sep 20	85								Oct 9 1963
INSTANTANEOUS PEAK FLOW			5300	Feb 22	12400								Aug 18 1963
INSTANTANEOUS PEAK STAGE			(a)10.36	Feb 20	12.98								Apr 21 1975
INSTANTANEOUS LOW FLOW			220	Sep 22	38								Oct 10 1963
ANNUAL RUNOFF (CFSM)	1.20		.95		.71								
ANNUAL RUNOFF (INCHES)	16.28		12.92		9.68								
10 PERCENT EXCEEDS	2920		2490		2160								
50 PERCENT EXCEEDS	1230		1070		619								
90 PERCENT EXCEEDS	743		520		230								

(a) Backwater from ice.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04114500 LOOKING GLASS RIVER NEAR EAGLE, MI

LOCATION.--Lat 42°49'45", long 84°46'40", in sec.10, T.5 N., R.4 W., Clinton County, Hydrologic Unit 04050004, on right bank at upstream side of former bridge site on Hinman Road, 1.5 mi northeast of Eagle, and 10 mi upstream from mouth.

DRAINAGE AREA.--281 mi².

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

REVISED RECORDS.--WSP 1387: 1946-47.

GAGE.--Water-stage recorder. Datum of gage is 747.09 ft above sea level (levels by Michigan Department of Natural Resources). Prior to June 2, 1962, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Small intermittent diversion at times into Lake Geneva when discharge is above 50 ft³/s. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	269	335	218	e105	e140	e1050	416	585	103	348	234	159
2	267	307	236	e105	e140	e900	392	599	97	349	206	147
3	270	285	249	e100	e145	e740	366	592	92	352	179	136
4	274	263	254	e98	e150	e650	343	586	88	353	203	125
5	270	242	255	e97	e150	e650	322	585	85	458	193	116
6	261	225	255	e96	e145	e800	299	572	86	451	170	107
7	243	210	253	e95	e140	e700	279	553	86	402	158	99
8	222	199	247	e94	e135	e600	257	534	82	523	153	93
9	206	190	243	e94	e125	e500	241	492	79	479	149	89
10	190	183	241	e94	e120	e450	227	439	76	427	137	84
11	169	176	234	e94	e115	e470	210	428	74	404	132	80
12	153	169	226	e94	e110	e500	227	425	71	411	124	76
13	143	170	218	e94	e110	e600	286	377	72	437	145	73
14	138	168	210	e93	e110	e620	296	340	83	467	377	77
15	134	180	201	e93	e110	e620	304	317	89	541	254	83
16	135	167	193	e93	e110	e560	336	297	85	534	191	75
17	378	166	184	e93	e120	e530	358	273	95	518	171	71
18	489	167	178	e93	e160	e500	381	251	99	489	168	78
19	383	169	174	e93	e550	478	401	230	92	448	163	74
20	325	168	172	e92	e1700	445	407	212	85	422	230	74
21	438	166	171	e92	e1200	533	404	193	80	425	316	73
22	424	164	168	e92	e500	562	390	176	73	394	286	70
23	420	162	e160	e92	e400	495	366	161	70	349	251	68
24	431	162	e150	e92	e500	464	344	149	288	324	256	66
25	438	159	e140	e94	e1200	458	336	140	407	327	247	65
26	438	174	e130	e97	e1500	468	375	135	309	339	244	83
27	434	207	e120	e100	e1250	494	422	128	268	346	233	100
28	425	207	e115	e130	e1200	509	375	123	253	344	232	93
29	409	202	e110	e230	---	497	453	128	321	327	216	91
30	386	207	e110	e200	---	475	472	117	358	299	189	87
31	362	---	e110	e170	---	444	---	110	---	267	173	---
TOTAL	9524	5949	5925	3299	12335	17762	10285	10247	4146	12554	6380	2712
MEAN	307	198	191	106	441	573	343	331	138	405	206	90.4
MAX	489	335	255	230	1700	1050	472	599	407	541	377	159
MIN	134	159	110	92	110	444	210	110	70	267	124	65
CFSM	1.09	.71	.68	.38	1.57	2.04	1.22	1.18	.49	1.44	.73	.32
IN.	1.26	.79	.78	.44	1.63	2.35	1.36	1.36	.55	1.66	.84	.36

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1994, BY WATER YEAR (WY)

	MEAN	MAX	(WY)	MIN	(WY)
1944	93.4	614	1987	15.3	1964
1945	124	414	1991	25.0	1964
1946	158	445	1976	21.6	1964
1947	170	505	1993	24.0	1963
1948	217	673	1976	24.3	1963
1949	440	1058	1985	47.0	1964
1950	419	1131	1947	85.9	1964
1951	251	910	1956	64.8	1958
1952	135	518	1986	31.3	1964
1953	85.8	405	1994	13.6	1965
1954	55.7	206	1994	16.9	1965
1955	73.5	532	1975	15.3	1963

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1944 - 1994

ANNUAL TOTAL	112561	101118	185
ANNUAL MEAN	308	277	321
HIGHEST ANNUAL MEAN			35.7
LOWEST ANNUAL MEAN			1993
HIGHEST DAILY MEAN	1800	Apr 20	2400
LOWEST DAILY MEAN	64	Jul 24	11
ANNUAL SEVEN-DAY MINIMUM	71	Jul 18	11
INSTANTANEOUS PEAK FLOW			(a)
INSTANTANEOUS PEAK STAGE			(c)6.92
INSTANTANEOUS LOW FLOW			64
ANNUAL RUNOFF (CFSM)	1.10	.99	.66
ANNUAL RUNOFF (INCHES)	14.90	13.39	8.95
10 PERCENT EXCEEDS	703	500	435
50 PERCENT EXCEEDS	220	216	98
90 PERCENT EXCEEDS	100	90	32

(a) Ice jam, discharge not determined.

(b) From rating curve extended above 1,900 ft³/s.

(c) Backwater from ice.

(d) From floodmark, backwater from ice.

(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 0.8 mi upstream from Hayworth Creek. Records include flow of Pine Creek.

DRAINAGE AREA.--434 mi².

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

REVISÉD 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 fair. Several measurements of water temperature were made during the year.

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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	370	443	260	e95	e175	e800	586	967	163	2130	254	315
2	359	420	258	e93	e180	e650	540	995	142	1640	235	287
3	338	385	260	e91	e170	e550	506	954	125	1270	217	262
4	319	359	260	e90	e160	e500	469	872	113	1010	295	237
5	295	348	259	e89	e150	e550	442	772	105	858	459	213
6	268	326	258	e88	e140	e700	416	685	100	774	539	189
7	242	302	263	e87	e135	e1000	385	612	99	819	575	171
8	222	284	266	e86	e130	e1200	361	553	93	4240	549	150
9	205	267	265	e87	e125	e1300	336	503	80	4870	493	129
10	184	251	262	e88	e120	e1300	321	469	76	4010	438	110
11	162	235	259	e89	e115	e1200	304	447	71	3040	395	94
12	139	224	248	e90	e110	e1000	296	466	68	2220	358	83
13	122	214	240	e90	e110	e850	341	469	76	1650	356	75
14	112	207	231	e90	e105	e750	415	460	104	1250	398	72
15	108	203	224	e89	e105	e700	503	442	109	982	402	71
16	115	198	214	e88	e105	e660	562	418	115	810	384	68
17	398	193	203	e88	e105	e630	592	394	107	685	357	67
18	987	187	196	e88	e105	e610	583	370	95	591	329	63
19	1440	180	190	e88	e140	542	545	347	83	510	301	62
20	1570	175	187	e88	593	496	502	325	70	468	284	61
21	1540	169	185	e89	1680	538	462	306	67	520	271	58
22	1510	163	183	e90	2180	736	424	286	61	558	265	55
23	1350	155	173	e91	2220	914	387	268	61	540	269	52
24	1170	149	158	e92	e2000	947	364	250	372	512	269	47
25	1020	141	e140	e93	e1850	931	363	236	1460	474	260	44
26	886	143	e125	e95	e1600	859	477	238	2860	432	291	55
27	796	184	e110	e98	e1300	785	687	241	3880	395	392	56
28	694	219	e105	e105	e1000	732	939	230	3700	361	424	64
29	613	244	e105	e120	---	695	988	217	3320	332	410	72
30	549	258	e100	e140	---	660	969	201	2760	303	377	73
31	487	---	e98	e160	---	620	---	181	---	278	345	---
TOTAL	18570	7226	6285	2955	16908	24405	15065	14174	20535	38532	11191	3355
MEAN	599	241	203	95.3	604	787	502	457	684	1243	361	112
MAX	1570	443	266	160	2220	1300	988	995	3880	4870	575	315
MIN	108	141	98	86	105	496	296	181	61	278	217	44
CFSM	1.38	1.55	.47	.22	1.39	1.81	1.16	1.05	1.58	2.86	.83	.26
IN.	1.59	.62	.54	.25	1.45	2.09	1.29	1.21	1.76	3.30	.96	.22

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1994, BY WATER YEAR (WY)

MEAN	158	183	259	255	289	721	649	358	190	116	61.4	137
MAX	1461	837	813	1035	980	2049	1582	1812	874	1243	361	1634
(WY)	1987	1991	1991	1973	1976	1985	1947	1956	1989	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 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1944 - 1994
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ANNUAL TOTAL	160785		179201			
ANNUAL MEAN	441		491		281	
HIGHEST ANNUAL MEAN					501	1976
LOWEST ANNUAL MEAN					65.1	1963
HIGHEST DAILY MEAN	2750	Mar 30	4870	Jul 9	6500	Mar 20 1948
LOWEST DAILY MEAN	43	Aug 5	44	Sep 25	4.8	Sep 10 1963
ANNUAL SEVEN-DAY MINIMUM	49	Aug 9	52	Sep 21	5.6	Sep 20 1979
INSTANTANEOUS PEAK FLOW			5610	Jul 8	(a)8770	Sep 12 1986
INSTANTANEOUS PEAK STAGE			10.27	Jul 8	(b)12.33	Sep 12 1986
INSTANTANEOUS LOW FLOW			43	Sep 25	4.4	Aug 13 1965
ANNUAL RUNOFF (CFSM)	1.01		1.13		.65	
ANNUAL RUNOFF (INCHES)	13.78		15.36		8.81	
10 PERCENT EXCEEDS	1080		1000		678	
50 PERCENT EXCEEDS	247		278		120	
90 PERCENT EXCEEDS	75		88		23	

(a) Caused by 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 left 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, which are fair. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	33	29	32	e24	e33	e42	43	65	26	42	26	33
2	30	29	38	e23	e32	e39	42	51	26	36	27	29
3	30	31	44	e23	e31	36	41	42	25	32	27	28
4	28	31	37	e23	e30	37	38	38	24	30	90	27
5	26	31	34	e23	e29	42	39	37	22	67	83	27
6	26	31	34	e23	e29	82	39	35	28	47	44	27
7	25	30	37	e23	e28	158	36	36	27	104	35	28
8	25	29	33	e22	e27	118	35	41	27	140	35	26
9	27	29	32	e22	e26	70	35	37	25	63	40	25
10	28	31	33	e22	e26	55	34	34	23	46	36	24
11	27	34	31	e22	e25	51	33	47	24	38	34	24
12	27	31	28	e22	e25	51	42	56	23	35	33	24
13	27	37	28	e21	e25	66	69	e38	26	32	70	25
14	27	36	29	e21	e25	59	53	35	28	38	72	24
15	27	40	30	e21	e25	53	47	38	24	117	42	27
16	32	36	30	e21	e24	46	45	35	22	54	36	24
17	34	33	30	e21	e24	39	38	33	21	43	35	24
18	117	31	30	e21	24	39	35	31	19	57	32	24
19	56	32	31	e21	31	38	35	30	17	38	33	23
20	43	31	31	e21	102	45	42	29	17	48	46	24
21	61	30	33	e21	271	78	35	29	18	91	38	24
22	48	30	30	e21	e200	94	33	28	15	63	33	22
23	39	29	27	e21	e150	73	32	27	19	52	32	22
24	36	30	26	e21	e120	66	31	27	136	45	29	23
25	34	30	e25	e21	e90	53	44	30	237	38	29	24
26	33	48	e24	e22	e70	48	89	69	115	35	52	28
27	32	70	e22	26	e50	51	96	58	74	33	60	28
28	32	42	e23	48	e45	55	49	35	54	30	42	37
29	31	36	e23	46	---	49	61	31	129	29	35	35
30	31	34	e24	e37	---	45	49	29	59	28	33	29
31	30	---	e24	e35	---	45	---	28	---	26	33	---
TOTAL	1162	1021	933	759	1617	1823	1340	1179	1330	1577	1292	789
MEAN	37.5	34.0	30.1	24.5	57.7	58.8	44.7	38.0	44.3	50.9	41.7	26.3
MAX	117	70	44	48	271	158	96	69	237	140	90	37
MIN	25	29	22	21	24	36	31	27	15	26	26	22
CFSM	.94	.86	.76	.62	1.45	1.48	1.13	.96	1.12	1.28	1.05	.66
IN.	1.09	.96	.87	.71	1.52	1.71	1.26	1.10	1.25	1.48	1.21	.74

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1988 - 1994, BY WATER YEAR (WY)

	MEAN	32.3	41.2	35.3	33.3	35.3	53.5	49.6	35.1	31.4	25.5	25.3	25.3
MAX	39.2	54.8	46.1	48.9	57.7	58.8	66.6	66.6	44.7	44.3	50.9	41.7	33.8
(WY)	1992	1993	1992	1993	1994	1994	1991	1991	1991	1994	1994	1994	1993
MIN	20.1	33.0	19.8	24.5	25.7	42.6	36.4	26.9	15.3	12.9	15.6	19.2	19.2
(WY)	1990	1988	1990	1994	1989	1988	1990	1988	1988	1988	1988	1988	1990

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1988 - 1994

ANNUAL TOTAL	14074		14822									
ANNUAL MEAN	38.6		40.6							35.2		
HIGHEST ANNUAL MEAN										40.7		1993
LOWEST ANNUAL MEAN										28.6		1990
HIGHEST DAILY MEAN	185		271	Jan 5				Feb 21		271		Feb 21 1994
LOWEST DAILY MEAN	16		15	Aug 3				Jun 22		8.1		Jul 9 1988
ANNUAL SEVEN-DAY MINIMUM	17		18	Jul 30				Jun 17		9.6		Jul 4 1988
INSTANTANEOUS PEAK FLOW			310					Feb 21		(a)		
INSTANTANEOUS PEAK STAGE			5.13					Feb 21		5.53		Mar 12 1990
INSTANTANEOUS LOW FLOW			13					Jun 23		7.0		(b)
ANNUAL RUNOFF (CFSM)	.97		1.02							.89		
ANNUAL RUNOFF (INCHES)	13.19		13.89							12.06		
10 PERCENT EXCEEDS	61		66							55		
50 PERCENT EXCEEDS	32		32							30		
90 PERCENT EXCEEDS	23		23							18		

(a) Not determined.

(b) July 10, 14, 1988.

(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 about 5,000 ft³/s caused by powerplants upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3730	2850	2350	e1300	e2900	e6000	3990	5680	1280	6830	1620	2050
2	3400	2710	2340	e1250	e2800	e5600	3800	5930	1110	5870	1420	1750
3	3150	2580	2300	e1250	e2500	e5300	3630	5740	1100	4850	1410	1610
4	2810	2480	2240	e1200	e2300	e5000	3280	5260	1000	3880	1970	1480
5	2650	2450	2280	e1150	e2100	e5000	3240	4440	959	4280	3110	1370
6	2490	2300	2370	e1100	e1900	e5600	3080	4210	1050	5050	2790	1340
7	2310	2210	2390	e1000	e1800	e8000	2760	3910	995	4820	2370	1260
8	2050	2070	2410	e950	e1700	9250	2740	3640	991	5550	2350	1170
9	2040	2050	2410	e1000	e1600	8780	2680	3330	945	8090	2100	1080
10	1940	1960	2390	e1100	e1500	7510	2490	3390	937	9560	1990	1040
11	1960	1930	2360	e1000	e1400	6540	2420	3430	893	9040	1800	1010
12	1900	1940	2140	e1000	e1300	5870	2460	3880	786	7870	1900	926
13	1890	1980	2100	e1100	e1300	5340	3160	3580	976	6420	1860	890
14	1690	1850	2020	e1100	e1250	5190	3690	3150	1480	5230	2770	873
15	1740	1910	2030	e1100	e1200	4950	4110	2780	2620	4460	3760	925
16	1720	1910	2090	e1100	e1200	4720	4190	2800	2660	4360	3810	1380
17	3410	1810	1850	e1050	e1250	4300	4210	2570	2410	3590	3610	1050
18	6270	1950	1920	e1000	e1300	4040	4230	2350	1990	3090	3290	1120
19	6930	1770	1990	e900	e1500	3710	3900	2130	1640	2710	2790	915
20	7110	1770	1790	e950	e3300	3430	3550	2100	1290	2760	2600	863
21	6610	1790	1910	e1000	e7000	3860	3180	1920	1270	3720	2760	859
22	6430	1680	1690	e1000	e11000	5160	2930	1820	1040	3650	2980	816
23	6140	1670	1770	e1000	e10000	5790	2830	1610	1020	3500	2450	760
24	5770	1670	1670	e1000	e9000	5940	2670	1430	3300	3360	2160	800
25	5130	1650	e1500	e1050	e8100	5720	2810	1240	7400	3010	1990	726
26	4670	1710	e1400	e1050	e7600	5350	5260	1250	9490	2680	2140	826
27	4200	1920	e1200	e1200	e7100	4990	6650	1380	10900	2430	2140	874
28	3750	2310	e1300	e1500	e6500	4780	5900	1250	10600	2160	2240	989
29	3510	2370	e1200	e2100	---	4610	5480	1450	9600	2020	2360	1110
30	3210	2480	e1100	e2700	---	4450	5450	1860	8350	1940	2170	1100
31	2980	---	e1200	e2800	---	4240	---	1050	---	1720	2190	---
TOTAL	113590	61730	59710	38000	102400	169020	110770	90560	90082	138500	74900	32962
MEAN	3664	2058	1926	1226	3657	5452	3692	2921	3003	4468	2416	1099
MAX	7110	2850	2410	2800	11000	9250	6650	5930	10900	9560	3810	2050
MIN	1690	1650	1100	900	1200	3430	2420	1050	786	1720	1410	726
CFSM	1.29	.72	.68	.43	1.29	1.92	1.30	1.03	1.06	1.57	.85	.39
IN.	1.49	.81	.78	.50	1.34	2.21	1.45	1.19	1.18	1.81	.98	.43

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1994, BY WATER YEAR (WY)

MEAN	1260	1583	1958	1974	2351	4432	4170	2522	1575	1082	774	952
MAX	7613	4931	4672	5715	6170	9398	7492	9715	4963	4468	2416	4613
(WY)	1987	1993	1991	1993	1976	1985	1993	1956	1989	1994	1994	1975
MIN	254	380	346	375	377	802	702	567	464	287	310	300
(WY)	1964	1965	1964	1963	1963	1964	1931	1931	1988	1965	1965	1963

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1931 - 1994

ANNUAL TOTAL	1196408	1082224	2063
ANNUAL MEAN	3278	2965	3482
HIGHEST ANNUAL MEAN			631
LOWEST ANNUAL MEAN			1993
HIGHEST DAILY MEAN	13900	(e)11000	21300
LOWEST DAILY MEAN	871	726	109
ANNUAL SEVEN-DAY MINIMUM	987	807	118
INSTANTANEOUS PEAK FLOW		(e)11200	21500
INSTANTANEOUS PEAK STAGE		(a)20.75	23.43
INSTANTANEOUS LOW FLOW		675	40
ANNUAL RUNOFF (CFSM)	1.15	1.04	.73
ANNUAL RUNOFF (INCHES)	15.67	14.18	9.87
10 PERCENT EXCEEDS	6240	5880	4500
50 PERCENT EXCEEDS	2370	2310	1280
90 PERCENT EXCEEDS	1290	1020	447

(a) Backwater from ice.
(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 at downstream side of bridge on McKeown Road, 0.6 mi downstream from Cedar Creek, 2.0 mi downstream from Thornapple Lake, and 3.2 mi southeast of Hastings.

DRAINAGE AREA.--385 mi².

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

GAGE.--Water-stage recorder. Datum of gage is 786.71 ft above sea level (levels by Michigan Department of Natural Resources). Prior to Oct. 1, 1965, 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. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	642	364	323	193	320	581	450	633	159	827	148	212
2	564	340	312	198	315	518	417	686	151	630	147	193
3	469	328	328	201	301	464	393	678	147	480	142	181
4	394	323	335	199	283	438	367	612	143	375	154	173
5	338	316	332	196	264	441	346	524	140	362	190	164
6	301	311	330	190	248	539	327	449	138	386	196	159
7	279	300	336	182	e235	856	310	397	139	397	182	160
8	261	290	333	186	e225	1140	298	372	135	384	166	155
9	259	280	325	187	e215	1220	283	357	128	385	157	149
10	268	275	313	185	e210	1180	279	339	126	433	151	143
11	272	272	302	e180	e205	1060	271	319	122	473	158	139
12	267	271	284	e180	e200	867	289	329	120	476	176	137
13	256	276	267	e175	195	725	408	336	132	416	314	134
14	243	289	259	e175	198	660	518	316	174	339	662	131
15	234	296	258	e175	200	629	561	296	231	301	882	128
16	237	298	260	e170	200	591	562	285	268	298	896	125
17	360	295	258	e170	202	534	534	271	239	306	786	128
18	687	292	258	e170	212	474	485	256	199	279	604	125
19	1010	287	261	e170	261	428	427	244	172	246	451	122
20	1220	285	265	e170	695	406	381	236	165	232	374	118
21	1310	278	271	e170	1560	441	344	232	178	261	395	116
22	1300	270	274	e170	2080	567	313	225	169	283	446	113
23	1200	262	263	169	2130	695	289	219	159	276	459	112
24	1070	259	248	e170	1750	752	273	208	370	241	406	111
25	938	258	224	e170	1450	744	277	209	860	212	335	124
26	805	271	196	e175	1110	662	321	215	1240	195	279	136
27	677	318	184	180	866	581	424	208	1350	179	244	140
28	576	352	200	197	692	537	503	198	1320	169	235	162
29	496	358	201	249	---	519	534	185	1210	161	241	176
30	441	346	195	292	---	506	575	173	1030	155	241	176
31	397	---	191	310	---	479	---	163	---	151	229	---
TOTAL	17771	8960	8386	5904	16822	20234	11759	10170	11114	10308	10446	4342
MEAN	573	299	271	190	601	653	392	328	370	333	337	145
MAX	1310	364	336	310	2130	1220	575	686	1350	827	896	212
MIN	234	258	184	169	195	406	271	163	120	151	142	111
CFSM	1.49	.78	.70	.49	1.56	1.70	1.02	.85	.96	.86	.88	.38
IN.	1.72	.87	.81	.57	1.63	1.96	1.14	.98	1.07	1.00	1.01	.42

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1994, BY WATER YEAR (WY)

	MEAN	207	261	329	351	393	700	656	396	271	163	130	149
MAX	1072	939	895	1049	959	1506	1914	1391	1011	410	385	357	
(WY)	1987	1991	1991	1973	1976	1948	1947	1956	1989	1968	1980	1992	
MIN	54.5	73.6	75.2	90.4	87.5	129	176	111	87.0	56.0	50.2	54.4	
(WY)	1964	1964	1964	1964	1963	1964	1946	1958	1964	1964	1946	1963	

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1945 - 1994
ANNUAL TOTAL	185749	136216	
ANNUAL MEAN	509	373	
HIGHEST ANNUAL MEAN			333
LOWEST ANNUAL MEAN			534
HIGHEST DAILY MEAN	3250	2130	6590
LOWEST DAILY MEAN	173	111	35
ANNUAL SEVEN-DAY MINIMUM	186	117	36
INSTANTANEOUS PEAK FLOW		2290	6810
INSTANTANEOUS PEAK STAGE		6.94	(a)10.20
INSTANTANEOUS LOW FLOW		110	33
ANNUAL RUNOFF (CFSM)	1.32	.97	.87
ANNUAL RUNOFF (INCHES)	17.95	13.16	11.76
10 PERCENT EXCEEDS	1070	693	698
50 PERCENT EXCEEDS	331	279	200
90 PERCENT EXCEEDS	214	153	90

(a) From graph based on gage readings.

(b) Sept. 23, 24.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04118000 THORNAPPLE RIVER NEAR CALEDONIA, MI

LOCATION.--Lat 42°48'40", long 85°29'00", in NW1/4 sec.22, T.5 N., R.10 W., Kent County, Hydrologic Unit 04050007, on right bank 200 ft downstream from LaBarge powerplant, 200 ft upstream from 84th Street, 2.3 mi northeast of Caledonia, and 3.3 mi downstream from Coldwater River.

DRAINAGE AREA.--773 mi².

PERIOD OF RECORD.--October 1930 to September 1938 (monthly discharge only, published in WSP 1307; figures of daily discharge for these years may be unreliable and should not be used), October 1951 to March 1982, October 1983 to September 1994 (discontinued as a continuous-record station; converted to a crest-stage partial-record station).

REVISED RECORDS.--WSP 1307: 1931-37.

GAGE.--Water-stage recorder. Datum of gage is 676.31 ft above sea level (Consumers Power Co. bench mark). Oct. 1, 1930 to Sept. 30, 1938, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Prior to Dec. 1, 1958, and since Oct. 1, 1983, large diurnal fluctuation at low and medium flow, and occasional regulation during high flow, caused by powerplant upstream from station; occasional fluctuation during the interim period. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 7, 1947, reached a stage of 14.4 ft, from information by powerplant operator.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1330	805	682	478	675	e1250	848	1430	371	1880	429	510
2	1180	710	647	501	668	e1100	852	1390	363	1460	422	474
3	989	707	709	507	656	e1000	762	1310	377	1050	406	432
4	904	688	703	491	610	e950	730	1190	375	847	422	429
5	764	673	675	453	581	e950	698	1050	373	846	629	415
6	705	699	680	427	e550	e1400	669	886	373	1310	564	398
7	651	597	706	415	e520	e2000	661	824	373	1200	492	398
8	605	635	692	e415	e490	e2400	644	765	356	1410	346	396
9	544	611	655	e415	e460	e2500	595	729	323	1170	399	394
10	568	596	652	e410	e450	e2400	556	694	314	928	460	314
11	564	568	605	e410	e445	e2200	567	670	351	819	422	359
12	591	594	600	e405	e520	e1800	637	886	344	864	453	379
13	547	594	576	e400	e440	e1500	911	713	381	841	884	352
14	549	667	561	e395	e440	e1400	986	718	488	685	1400	337
15	539	673	562	e390	e450	e1300	1040	673	421	644	1520	311
16	574	642	560	387	e450	e1200	1030	606	454	628	1510	371
17	1490	624	553	388	e460	e1100	965	606	481	512	1520	349
18	2380	614	541	e385	518	e1000	912	584	459	633	1230	352
19	2300	610	572	e385	624	e900	791	514	389	631	955	303
20	2270	605	586	e385	2010	e850	735	515	386	492	786	346
21	2250	594	585	e380	3080	e1000	670	510	428	800	798	310
22	2250	576	575	e380	3000	e1250	640	474	384	806	777	296
23	2200	565	560	e380	3000	1310	586	452	370	685	790	356
24	1950	566	e530	e380	3160	1410	567	447	1270	606	742	333
25	1790	525	e480	e380	e3000	1390	563	448	2460	575	680	305
26	1600	570	e450	e390	e2500	1350	998	475	2800	507	641	308
27	1350	709	e430	423	e2000	1200	1120	487	2700	486	645	338
28	1120	742	e450	632	e1500	1100	1060	440	2560	427	534	395
29	1040	722	e455	633	---	1020	1230	435	2370	389	569	461
30	937	704	462	598	---	933	1210	423	2060	394	532	415
31	848	---	459	610	---	937	---	407	---	410	510	---
TOTAL	37379	19185	17953	13628	33177	42100	24233	21751	25154	24935	22467	11136
MEAN	1206	639	579	440	1185	1358	808	702	838	804	725	371
MAX	2380	805	709	633	3160	2500	1230	1430	2800	1880	1520	510
MIN	539	525	430	380	440	850	556	407	314	389	346	296
CFSM	1.56	.83	.75	.57	1.53	1.76	1.04	.91	1.08	1.04	.94	.48
IN.	1.80	.92	.86	.66	1.60	2.03	1.17	1.05	1.21	1.20	1.08	.54

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1994, BY WATER YEAR (WY)

	MEAN	474	571	672	684	750	1282	1179	746	558	379	319	350
MAX	2068	1718	1707	2065	1853	2821	2281	2489	1657	804	725	813	
(WY)	1987	1991	1991	1973	1976	1985	1993	1956	1989	1994	1994	1993	
MIN	153	203	187	213	220	312	420	291	208	145	131	145	
(WY)	1964	1965	1964	1964	1964	1964	1964	1958	1964	1964	1964	1963	

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1952 - 1994
ANNUAL TOTAL	375416	293098	
ANNUAL MEAN	1029	803	(a)661
HIGHEST ANNUAL MEAN			1072
LOWEST ANNUAL MEAN			(b)232
HIGHEST DAILY MEAN	4600	3160	6490
LOWEST DAILY MEAN	354	296	4.7
ANNUAL SEVEN-DAY MINIMUM	379	321	87
INSTANTANEOUS PEAK FLOW		3500	6700
INSTANTANEOUS PEAK STAGE		8.11	11.43
INSTANTANEOUS LOW FLOW			(c)1.0
ANNUAL RUNOFF (CFSM)	1.33	1.04	.85
ANNUAL RUNOFF (INCHES)	18.07	14.11	11.62
10 PERCENT EXCEEDS	2190	1470	1320
50 PERCENT EXCEEDS	703	606	456
90 PERCENT EXCEEDS	478	380	226

(a) Annual mean including water years 1931-38 is 628 ft³/s.

(b) Estimated 230 ft³/s, water year 1931.

(c) Result of regulation during bridge construction.

(e) 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. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6860	5350	4730	e2900	e4700	10600	7160	8880	2690	13000	3540	4600
2	6480	5120	4810	e2900	e4800	9650	6780	8990	2760	11900	3370	4380
3	6020	5010	4810	e2900	e5000	8830	6480	9060	2650	10400	3180	3870
4	5570	4850	4710	e2900	e4800	8060	6100	8890	2580	8520	4770	3490
5	5120	4750	4640	e2800	e4500	7530	5800	8380	2500	8510	5890	3330
6	4840	4630	4730	e2650	e4100	7770	5620	7420	2550	8850	6370	3160
7	4710	4410	4800	e2500	e3800	9210	5350	6870	2590	8740	5900	3040
8	4670	4290	4780	e2400	e3600	11900	5050	6580	2560	9640	5190	2980
9	4050	4150	4750	e2400	e3400	13600	4940	6080	2460	9950	4800	2820
10	3880	4030	4700	e2500	e3200	13300	4750	5740	2360	10300	4480	2710
11	3720	3970	4610	e2400	e3100	12700	4470	6070	2310	11000	4310	2500
12	3410	3850	4460	e2400	e3000	11800	4490	6660	2340	11300	4010	2580
13	3530	4000	4260	e2500	e2900	10900	5260	6710	2420	11100	4680	2420
14	3600	4080	4090	e2500	e2850	10000	6480	6210	2850	10400	5660	2420
15	3440	4090	3970	e2500	e2800	9390	7080	5860	3200	8870	6630	2300
16	3680	4080	4070	e2500	e2800	8860	7310	5260	3910	7500	7400	2390
17	5820	4050	4080	e2450	e2900	8310	7140	5030	3980	6950	7470	2750
18	9350	3960	3750	e2400	e3100	7730	6830	4730	3840	6160	7060	2500
19	10100	4000	3820	e2350	e3500	7210	6680	4340	3300	5700	6360	2460
20	10600	3850	4070	e2300	6610	6770	6420	4060	2850	5540	5570	2360
21	11000	3800	3880	e2300	9880	7030	6260	3890	2790	6480	5100	2290
22	11000	3790	3820	e2300	11200	7980	5580	3610	2590	7310	5440	2300
23	10600	3660	3630	e2350	12900	8760	5060	3450	2500	7020	5400	2170
24	10200	3590	3690	e2400	14200	9290	4870	3270	5200	6550	4870	2230
25	9660	3550	3310	e2450	e14200	9490	4790	3050	9940	6140	4510	2200
26	8900	3720	2510	e2400	e13600	9400	5420	2970	12100	5500	4750	2170
27	8070	4090	e2800	e2700	12600	9100	7680	2970	13100	4940	5020	2330
28	7290	4320	e2900	e3000	11600	8600	8830	3000	13800	4530	5230	2520
29	6650	4660	e2800	e3500	---	8180	9160	2960	14000	4070	5240	2660
30	6160	4760	e2700	e4000	---	7790	8910	3130	13700	3870	5080	2810
31	5710	---	e2800	e4500	---	7490	---	3240	---	3700	4710	---
TOTAL	204690	126460	123480	83050	175640	287230	186750	167360	146420	244440	161990	82740
MEAN	6603	4215	3983	2679	6273	9265	6225	5399	4881	7885	5225	2758
MAX	11000	5350	4810	4500	14200	13600	9160	9060	14000	13000	7470	4600
MIN	3410	3550	2510	2300	2800	6770	4470	2960	2310	3700	3180	2170
CFSM	1.35	.86	.81	.55	1.28	1.89	1.27	1.10	1.00	1.61	1.07	.56
IN.	1.55	.96	.94	.63	1.33	2.18	1.42	1.27	1.11	1.86	1.23	.63

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1901 - 1994, BY WATER YEAR (WY)

	MEAN	2432	2867	3373	3667	4250	7700	7106	4651	3322	2183	1714	1990
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 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1901 - 1994
ANNUAL TOTAL	2167210	1990250	
ANNUAL MEAN	5938	5453	3766
HIGHEST ANNUAL MEAN			6314
LOWEST ANNUAL MEAN			1264
HIGHEST DAILY MEAN	18700	Apr 24	53300
LOWEST DAILY MEAN	2510	Dec 26	381
ANNUAL SEVEN-DAY MINIMUM	2730	Aug 15	2240
INSTANTANEOUS PEAK FLOW			14500
INSTANTANEOUS PEAK STAGE			13.62
INSTANTANEOUS LOW FLOW			2130
ANNUAL RUNOFF (CFSM)	1.21		1.11
ANNUAL RUNOFF (INCHES)	16.45		15.11
10 PERCENT EXCEEDS	10600		9900
50 PERCENT EXCEEDS	4750		4700
90 PERCENT EXCEEDS	3130		2500

(a) Aug. 9, 17, 1936.

(b) Sept. 23, 26.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04119300 GRAND RIVER AT EASTMANVILLE, MI
(National stream quality accounting network station)

LOCATION.--Lat 43°00'53", long 85°57'21", in NE1/4 NW1/4 sec.10, T.7 N., R.14 W., Ottawa County, Hydrologic Unit 04050006, at bridge on 68th Avenue in Eastmanville, 1.1 mi downstream from Deer Creek, and at mile 19.3.

DRAINAGE AREA.--5,230 mi², approximately.

PERIOD OF RECORD.--Water years 1979 to October 1994 (discontinued).

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: February 1979 to September 1983.

WATER TEMPERATURE: February 1979 to September 1983.

INSTRUMENTATION.--Water-quality monitor from Oct. 7, 1980 to Sept. 30, 1983.

REMARKS.--Cross-sectional samples were collected at bridge.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1979-82): Maximum daily recorded (more than 20 percent missing record), 1,100 microsiemens, Mar. 2, 1979; minimum measured, 324 microsiemens, Mar. 24, 1982.

WATER TEMPERATURE (water years 1980-81, 1983): Maximum, 28.5°C, July 21, 1983; minimum, 0.0°C on many days during winter.

WATER-QUALITY DATA

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-TOCOC- CI, FECAL, KF AGAR (COLS. PER 100 ML) (31673)
JAN 1994										
07...	1740	2970	760	--	0.0	--	15.3	107	K40	K58
APR 01...	1335	7850	557	8.3	7.0	1.9	12.4	105	K10	K30
MAY 26...	1330	3210	647	8.5	20.0	3.9	9.3	105	63	62
JUL 15...	1325	9950	507	8.2	22.5	6.3	6.5	77	--	--
OCT 07...	1442	4160	545	8.2	15.0	6.5	9.6	98	140	52
DATE		HARD-NESS TOTAL (MG/L AS CaCO3) (00900)	HARD-NESS NONCARB DISSOLV FLD. AS CaCO3 (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 HCO3 (00453)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CaCO3 (39086)	CHLO-RIDE, DIS-SOLVED (MG/L AS Cl) (00940)
JAN 1994										
07...	--	--	--	--	--	--	--	--	--	--
APR 01...	260	52	73	20	17	2.8	259	213	40	32
MAY 26...	300	66	81	24	26	2.6	--	236	48	53
JUL 15...	220	44	60	16	12	3.9	210	172	30	25
OCT 07...	280	75	74	22	24	3.9	244	200	43	40
DATE		FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SiO2) (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, NO2+NO3 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)
JAN 1994										
07...	--	--	--	--	--	--	--	--	--	0.90
APR 01...	0.10	5.1	336	0.46	7120	0.020	1.40	0.210	0.70	
MAY 26...	0.20	2.6	410	0.56	3550	0.030	0.770	0.160	1.2	
JUL 15...	0.20	8.8	306	0.42	8220	0.030	1.60	0.060	0.90	
OCT 07...	0.20	8.9	362	0.49	4070	0.030	1.40	0.290	1.0	

STREAMS TRIBUTARY TO LAKE MICHIGAN

04119300 GRAND RIVER AT EASTMANVILLE, MI--Continued

WATER-QUALITY DATA

DATE	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)	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)
JAN 1994 07...	0.030	--	--	--	--	--	--	--	--
APR 01...	0.050	0.020	0.010	20	37	<3	56	<4	13
MAY 26...	0.090	<0.010	<0.010	20	48	<3	25	<4	4
JUL 15...	0.130	0.090	0.070	<10	39	<3	54	<4	5
OCT 07...	0.070	0.030	0.030	--	--	--	--	--	--
DATE	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	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)
JAN 1994 07...	--	--	--	--	--	--	--	--	--
APR 01...	<10	2	<1	<1.0	180	<6	15	318	84
MAY 26...	<10	2	<1	<1.0	300	<6	31	269	89
JUL 15...	<10	1	<1	<1.0	170	<6	32	860	86
OCT 07...	--	--	--	--	--	--	18	202	87

STREAMS TRIBUTARY TO LAKE MICHIGAN

04120250 GRAND RIVER AT GRAND HAVEN, MI

LOCATION.--Lat 43°03'37", long 86°14'25", in SE1/4 SW1/4 sec.20, T.8 N., R.16 W., Ottawa County, Hydrologic Unit 04050006, on left bank at U.S. Coast Guard Station in Grand Haven, 0.55 mi upstream from mouth.

DRAINAGE AREA.--5,518 mi².

PERIOD OF RECORD.--April to September 1994.

GAGE.--Acoustical velocity meter system. Single-path transducer installation. Datum of gage is 578.00 ft, International Great Lakes datum.

REMARKS.--Records good except for estimated daily discharges, which are fair.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	e8060	e10000	e3200	e14100	4360	5270
2	---	---	---	---	---	---	e7630	e10100	e3000	14000	4400	4090
3	---	---	---	---	---	---	e7300	e10200	e2950	13300	4580	4740
4	---	---	---	---	---	---	e6870	e10000	e2900	10800	5130	4280
5	---	---	---	---	---	---	e6530	e9440	e2800	9060	7370	3990
6	---	---	---	---	---	---	e6330	e8360	e2850	8680	6690	3630
7	---	---	---	---	---	---	e6020	e7740	e2900	8410	6300	3390
8	---	---	---	---	---	---	e5690	e7410	e2800	8390	6130	3310
9	---	---	---	---	---	---	e5560	e6850	e2700	9460	6020	3140
10	---	---	---	---	---	---	e5350	e6850	e2600	11100	e5850	e3100
11	---	---	---	---	---	---	e5030	e6920	e2600	11700	e5700	e3090
12	---	---	---	---	---	---	e5060	e7660	e2600	11900	e5580	3070
13	---	---	---	---	---	---	e5920	e7750	e2800	12000	5530	2810
14	---	---	---	---	---	---	e7300	e7420	e3000	12200	6530	2790
15	---	---	---	---	---	---	e7970	e7050	e3500	11200	6800	e2900
16	---	---	---	---	---	---	e8230	e6550	e4200	8430	8020	3010
17	---	---	---	---	---	---	e8040	e6210	e4500	7080	9390	3400
18	---	---	---	---	---	---	e7690	e6010	e4200	6920	9490	3120
19	---	---	---	---	---	---	e7520	e5730	e3600	5770	6400	2810
20	---	---	---	---	---	---	e7230	e4570	e3300	5970	6090	e2700
21	---	---	---	---	---	---	e7050	e4380	e3100	6280	5800	2670
22	---	---	---	---	---	---	e6280	e4070	e2800	7980	5500	2750
23	---	---	---	---	---	---	e5700	e3890	e3000	8410	e5800	e2710
24	---	---	---	---	---	---	e5480	e3700	6360	6860	e5700	e2660
25	---	---	---	---	---	---	e5390	e3500	10300	e6400	e5200	2640
26	---	---	---	---	---	---	e6100	e3400	12900	6080	5050	2350
27	---	---	---	---	---	---	e8650	e3350	13500	5600	5340	e2400
28	---	---	---	---	---	---	e5940	e3350	e13800	5320	6250	e2650
29	---	---	---	---	---	---	e10300	e3350	14000	e5000	5610	e2780
30	---	---	---	---	---	---	e10000	e3500	14500	e4800	5160	e2950
31	---	---	---	---	---	---	---	e3600	---	e4600	5140	---
TOTAL	---	---	---	---	---	---	210220	192910	157260	267800	186910	95200
MEAN	---	---	---	---	---	---	7007	6223	5242	8639	6029	3173
MAX	---	---	---	---	---	---	10300	10200	14500	14100	9490	5270
MIN	---	---	---	---	---	---	5030	3350	2600	4600	4360	2350
CFSM	---	---	---	---	---	---	1.27	1.13	.95	1.57	1.09	.58
IN.	---	---	---	---	---	---	1.42	1.30	1.06	1.81	1.26	.64

(e) Estimated.

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.

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

GAGE.--Nonrecording gage. 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.

REMARKS.--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.

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 observed, 5.70 ft, July 12; minimum gage height observed, 4.92 ft, Dec. 20, 21, 29.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

[illegible]

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.--Nonrecording gage. 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.

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.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 10.18 ft, Apr. 23, 1985; minimum observed, 6.95 ft, Sept. 3, 5, Nov. 8, 1958.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 8.88 ft, Apr. 28, Aug. 24; minimum observed, 7.78 ft, Mar. 13, 14.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.50	8.28	8.24	---	---	---	8.30	8.78	8.36	8.20	8.48	8.68
2	8.42	8.32	8.24	---	---	---	8.30	8.80	8.42	8.08	8.48	8.70
3	8.48	8.34	8.24	---	---	---	8.32	8.78	8.44	7.98	8.46	8.72
4	8.35	8.30	8.24	---	---	---	8.34	8.80	8.42	8.18	8.58	8.74
5	8.40	8.26	---	---	---	---	8.36	8.80	8.40	8.18	8.58	8.68
6	8.51	8.26	8.20	8.06	---	---	8.39	8.76	8.34	8.16	8.60	8.66
7	8.42	8.30	8.24	---	---	---	8.41	8.74	8.32	8.22	8.60	8.64
8	8.40	8.26	8.22	---	---	---	8.42	8.72	8.36	8.26	8.64	8.64
9	8.24	8.24	8.22	---	---	---	8.40	8.52	8.36	8.30	8.60	8.60
10	8.36	8.25	8.16	8.02	---	---	8.36	8.66	8.38	8.30	8.60	8.58
11	8.40	8.30	8.20	---	---	---	8.46	8.74	8.34	8.32	8.60	8.58
12	8.30	8.25	8.20	8.03	---	---	8.50	8.68	8.28	8.34	8.60	8.54
13	8.34	8.34	8.18	---	---	7.78	8.52	8.70	8.24	8.30	8.58	8.54
14	8.36	8.25	8.16	---	---	7.78	8.56	8.70	8.32	8.32	8.46	8.58
15	8.30	8.20	8.15	8.01	---	8.02	8.64	8.58	8.36	8.30	8.54	8.62
16	8.30	8.28	8.14	---	---	8.05	8.62	8.60	8.32	8.34	8.58	8.62
17	8.31	8.18	8.18	---	---	---	8.44	8.58	8.32	8.36	8.58	---
18	8.38	8.29	---	8.00	---	---	8.60	8.56	---	8.36	8.60	8.54
19	8.38	8.10	8.14	---	---	---	8.64	8.60	8.32	8.40	8.64	8.53
20	8.38	8.12	8.14	8.00	---	---	8.62	8.62	8.30	8.40	8.76	---
21	8.30	---	8.13	---	---	8.08	8.64	8.60	8.18	8.44	8.74	8.56
22	8.32	8.19	---	---	---	8.10	8.74	8.46	8.18	8.36	8.78	8.58
23	8.44	8.20	---	---	---	8.12	8.76	8.58	8.24	8.38	8.80	8.50
24	8.38	8.18	---	---	---	8.16	8.74	8.60	8.22	8.36	8.88	---
25	8.46	8.26	---	---	---	8.18	8.74	8.64	8.06	8.40	8.76	8.48
26	8.36	---	---	---	---	8.20	8.80	8.56	8.22	8.48	8.82	8.48
27	8.36	8.24	8.00	---	---	8.22	8.68	8.52	8.22	8.46	8.83	---
28	8.48	8.28	---	8.00	---	8.22	8.88	8.52	8.22	8.46	8.64	---
29	8.26	8.24	---	---	---	8.26	8.72	8.54	8.13	8.44	8.72	8.30
30	8.28	8.24	---	---	---	8.28	8.76	8.56	8.16	8.47	8.78	---
31	8.26	---	---	---	---	8.29	---	8.40	---	8.48	8.74	---
MEAN	8.37	---	---	---	---	---	8.56	8.64	---	8.32	8.65	---
MAX	8.51	---	---	---	---	---	8.88	8.80	---	8.48	8.88	---
MIN	8.24	---	---	---	---	---	8.30	8.40	---	7.98	8.46	---

STREAMS TRIBUTARY TO LAKE MICHIGAN

441508085244001 LAKE MITCHELL-LAKE 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. 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, 6.88 ft, Aug. 26-28, Sept. 3; minimum observed, 5.50 ft, Feb. 17.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	5.82	5.76	5.70	---	---	6.04	6.70	6.62	6.40	6.40	6.74
2	6.22	5.82	5.78	5.70	---	---	6.04	6.70	6.62	6.40	6.44	6.70
3	---	5.84	5.78	5.70	---	---	6.04	6.70	6.60	6.40	6.46	6.88
4	---	5.84	5.78	5.70	5.60	---	6.08	6.68	6.58	6.40	6.46	6.64
5	---	5.84	5.76	5.70	5.60	5.74	6.08	6.66	6.54	6.68	6.44	6.62
6	---	5.84	5.76	5.70	5.60	5.74	6.12	6.62	6.58	6.72	6.44	6.54
7	6.08	5.84	5.76	5.70	5.60	5.76	6.12	6.58	6.58	6.78	6.42	6.54
8	---	5.80	5.76	5.66	5.60	5.76	6.14	6.58	6.58	6.84	6.44	6.50
9	---	5.80	5.76	5.66	5.60	5.76	6.16	6.56	6.58	6.86	6.44	6.48
10	6.04	5.80	5.76	5.66	---	5.78	6.16	6.54	6.58	6.84	6.42	6.44
11	---	5.78	5.76	5.64	---	5.78	6.18	6.60	6.58	6.78	6.42	6.38
12	6.00	5.78	5.76	5.62	---	5.80	6.22	6.60	6.52	6.78	6.44	6.36
13	---	5.80	5.76	5.62	---	5.80	6.30	6.62	6.52	6.74	6.46	6.36
14	5.96	5.80	5.76	5.62	---	5.80	6.36	6.64	6.48	6.72	6.52	6.40
15	---	5.80	5.76	5.62	---	5.80	6.38	6.64	6.48	6.70	6.56	6.44
16	---	5.80	5.74	5.62	---	5.80	6.38	6.66	6.50	---	6.54	6.46
17	5.94	5.80	5.74	5.62	5.50	5.80	6.44	6.66	6.48	---	6.54	6.44
18	5.94	5.80	5.74	---	---	5.80	6.56	6.68	6.46	---	6.52	6.40
19	---	5.80	5.72	---	---	5.82	6.54	6.68	6.46	---	6.52	6.36
20	5.94	5.80	5.72	5.60	5.60	5.84	6.54	6.68	6.46	---	6.70	6.30
21	---	5.78	5.70	5.60	5.64	5.86	6.56	6.68	6.46	---	6.70	6.24
22	---	5.78	5.70	5.60	5.68	5.90	6.56	6.68	6.44	---	6.70	6.20
23	5.92	5.78	5.70	5.58	5.70	5.90	6.58	6.68	6.42	---	6.68	6.20
24	5.92	5.78	5.70	5.58	5.74	5.92	6.60	6.68	6.44	6.50	6.64	6.20
25	5.92	5.76	5.70	5.58	---	5.94	6.66	6.68	6.46	6.50	6.64	6.22
26	5.90	5.76	5.70	5.58	---	5.94	6.74	6.68	6.42	6.46	6.88	6.30
27	5.90	5.76	5.70	5.58	5.74	5.96	6.74	6.68	6.42	6.46	6.88	6.34
28	5.86	5.78	5.70	5.60	---	5.96	6.74	6.68	6.42	6.44	6.88	6.36
29	5.86	5.78	5.70	5.60	---	5.98	6.76	6.64	6.40	6.44	6.84	6.34
30	5.84	5.76	5.70	5.60	---	6.00	6.78	6.64	6.40	6.42	6.82	6.32
31	5.84	---	5.70	---	---	6.02	---	6.62	---	6.40	6.78	---
MEAN	---	5.80	5.74	---	---	---	6.39	6.65	6.50	---	6.58	6.42
MAX	---	5.84	5.78	---	---	---	6.78	6.70	6.62	---	6.88	6.88
MIN	---	5.76	5.70	---	---	---	6.04	6.54	6.40	---	6.40	6.20

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. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	124	120	131	e100	e110	e152	211	186	96	78	105	194
2	123	118	135	e100	e110	e150	225	204	96	72	106	188
3	122	121	143	e100	e110	149	230	200	91	70	107	179
4	126	123	146	e100	e110	147	216	190	88	71	140	170
5	126	128	140	e100	e110	153	216	177	86	130	179	166
6	127	139	137	e100	e110	178	218	171	87	204	177	162
7	130	140	135	e100	e110	257	206	169	87	224	144	158
8	128	132	133	e100	e110	282	195	170	86	279	126	153
9	131	129	132	e100	e110	257	190	165	83	278	125	149
10	134	132	134	e100	e110	222	196	157	82	259	124	147
11	132	130	138	e100	e110	190	187	144	80	239	125	145
12	127	126	124	e100	e110	173	173	140	82	222	136	142
13	123	129	138	e100	e110	172	229	132	84	205	143	139
14	122	136	131	e100	e110	180	264	123	86	195	145	138
15	123	141	130	e96	e110	184	248	120	85	190	142	123
16	127	146	130	e92	e110	169	239	123	79	183	137	114
17	151	143	128	e90	e110	159	213	119	79	184	132	118
18	179	133	129	e90	111	158	180	114	75	193	119	133
19	162	129	129	e90	121	147	157	111	74	192	113	137
20	147	129	130	e90	244	146	144	108	76	191	151	136
21	157	126	129	e90	321	185	136	110	74	188	160	134
22	164	126	126	e90	398	247	132	104	72	180	132	133
23	158	124	106	e92	e310	336	126	102	70	175	110	131
24	150	123	e102	e94	e190	397	123	100	83	172	97	125
25	138	119	e98	e96	e175	339	156	104	104	171	99	103
26	133	126	94	e98	e165	276	223	142	98	167	143	97
27	129	155	e96	e100	e160	244	232	180	85	162	199	99
28	128	155	e100	e110	e155	227	185	143	81	138	244	100
29	126	145	e104	e110	---	216	176	122	81	118	246	104
30	124	136	e102	e110	---	207	181	108	80	109	215	106
31	122	---	e100	e110	---	205	---	101	---	104	204	---
TOTAL	4193	3959	3830	3048	4220	6504	5807	4339	2510	5343	4525	4123
MEAN	135	132	124	98.3	151	210	194	140	83.7	172	146	137
MAX	179	155	146	110	398	397	264	204	104	279	246	194
MIN	122	118	94	90	110	146	123	100	70	70	97	97
CFSM	.56	.54	.51	.40	.62	.86	.80	.58	.34	.71	.60	.57
IN.	.64	.61	.59	.47	.65	1.00	.89	.66	.38	.82	.69	.63

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1994, BY WATER YEAR (WY)

MEAN	118	137	141	122	121	195	245	153	112	91.6	83.9	103
MAX	275	248	259	187	194	389	396	245	195	238	185	281
(WY)	1987	1986	1992	1993	1988	1976	1976	1976	1967	1969	1969	1985
MIN	62.3	70.3	64.5	62.7	63.5	100	109	67.9	57.0	53.0	58.1	59.9
(WY)	1967	1977	1977	1977	1977	1978	1987	1977	1977	1977	1978	1981

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1966 - 1994

	1993	1994	1966-1994
ANNUAL TOTAL	59604	52401	
ANNUAL MEAN	163	144	136
HIGHEST ANNUAL MEAN			185
LOWEST ANNUAL MEAN			81.2
HIGHEST DAILY MEAN	599	Mar 29	1680
LOWEST DAILY MEAN	78	Aug 22	47
ANNUAL SEVEN-DAY MINIMUM	84	Aug 17	50
INSTANTANEOUS PEAK FLOW			1710
INSTANTANEOUS PEAK STAGE			7.31
INSTANTANEOUS LOW FLOW			(a)29
ANNUAL RUNOFF (CFSM)	.67	.59	.56
ANNUAL RUNOFF (INCHES)	9.12	8.02	7.58
10 PERCENT EXCEEDS	260	214	225
50 PERCENT EXCEEDS	136	131	110
90 PERCENT EXCEEDS	94	92	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.--1,450 mi², approximately.

PERIOD OF RECORD.--October 1930 to September 1931, October 1933 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1437: 1934, 1947(M).

GAGE.--Water-stage recorder. Datum of gage is 977.72 ft above 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 poor. Some regulation at low flow by dams upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1000	1010	1150	e660	e720	e1440	2150	1990	955	620	740	1120
2	998	994	1160	e660	e720	e1440	2110	1950	884	605	741	1110
3	982	999	1200	e650	e720	1400	2090	1870	840	595	728	1100
4	950	999	1200	e650	e720	1230	2020	1770	802	584	901	1070
5	925	991	1170	e650	e720	1310	2020	1680	764	646	1130	1020
6	939	1000	1140	e650	e720	1550	2030	1630	741	796	1100	976
7	949	1010	1140	e650	e720	2070	1990	1560	722	1100	1060	939
8	934	1010	1120	e650	e720	2370	1930	1510	702	1800	1020	903
9	932	1010	1100	e650	e720	2520	1860	1440	684	1850	1010	876
10	950	1020	1090	e650	e720	2340	1820	1370	664	1710	974	846
11	944	1030	1090	e650	e720	2150	1780	1400	646	1490	940	823
12	937	1040	1010	e650	e720	1990	1760	1420	625	1460	905	808
13	930	1060	1020	e650	e720	1940	2080	1330	621	1450	896	783
14	913	1090	1020	e640	e720	2090	2270	1260	623	1420	908	774
15	896	1140	1020	e620	e720	1900	2420	1210	611	1600	859	819
16	899	1180	1030	e600	e720	1610	2590	1200	596	1450	816	869
17	976	1170	1000	e590	e720	1440	2560	1160	579	1330	777	836
18	1140	1150	990	e590	e720	1440	2440	1130	562	1370	752	804
19	1180	1150	991	e580	e720	1300	2330	1100	546	1350	775	802
20	1160	1130	994	e580	e1100	1230	2260	1080	535	1260	818	801
21	1250	1110	998	e580	e1700	1520	2170	1060	529	1220	859	791
22	1290	1090	984	e590	e2700	2050	2050	1040	512	1150	906	777
23	1270	1070	e860	e600	e2650	2350	1910	1010	504	1140	917	762
24	1250	1060	e750	e600	2590	2510	1780	989	601	1080	905	751
25	1220	1030	e640	e620	e2150	2510	1970	967	767	1020	890	747
26	1180	1090	564	e640	e1650	2460	2460	1270	736	1000	1540	791
27	1140	1280	e620	e660	e1470	2400	2420	1280	705	979	1810	784
28	1130	1290	e640	e700	e1430	2390	2310	1210	664	922	1340	791
29	1090	1230	e660	e710	---	2380	2120	1130	655	863	1190	799
30	1070	1190	e660	e710	---	2320	1980	1080	642	803	1150	784
31	1040	---	e660	e710	---	2230	---	1020	---	760	1130	---
TOTAL	32464	32623	29671	19790	31120	59880	63680	41116	20017	35423	30487	25856
MEAN	1047	1087	957	638	1111	1932	2123	1326	667	1143	983	862
MAX	1290	1290	1200	710	2700	2520	2590	1990	955	1850	1810	1120
MIN	896	991	564	580	720	1230	1760	967	504	584	728	747
CFSM	.72	.75	.66	.44	.77	1.33	1.46	.91	.46	.79	.68	.59
IN.	.83	.84	.76	.51	.80	1.54	1.63	1.05	.51	.91	.78	.66

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1994, BY WATER YEAR (WY)

	MEAN	780	1000	979	859	883	1582	2254	1355	975	685	546	644
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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1931 - 1994

ANNUAL TOTAL	477445	422127	
ANNUAL MEAN	1308	1157	(a)1054
HIGHEST ANNUAL MEAN			1532
LOWEST ANNUAL MEAN			(b)613
HIGHEST DAILY MEAN	4490	2700	8770
LOWEST DAILY MEAN	564	504	252
ANNUAL SEVEN-DAY MINIMUM	627	538	274
INSTANTANEOUS PEAK FLOW		2790	9040
INSTANTANEOUS PEAK STAGE		(c)9.83	14.99
INSTANTANEOUS LOW FLOW		497	(d)164
ANNUAL RUNOFF (CFSM)	.90	.80	.73
ANNUAL RUNOFF (INCHES)	12.25	10.83	9.88
10 PERCENT EXCEEDS	2280	2050	1980
50 PERCENT EXCEEDS	1080	1010	800
90 PERCENT EXCEEDS	761	646	444

(a) Does not include water years 1931, 1934.

(b) Estimated 584 ft³/s, water year 1931.

(c) Backwater from ice.

(d) Result of freezeup.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04121900 LITTLE MUSKEGON RIVER NEAR MORLEY, MI

LOCATION.--Lat 43°30'09", long 85°20'33", in SW1/4 SW1/4 sec.24, T.13 N., R.9 W., Mecosta County, Hydrologic Unit 04060102, on right bank at upstream side of highway bridge on 130th Avenue, 0.5 mi downstream from Rustford Dam, and 5.2 mi east of Morley.

DRAINAGE AREA.--138 mi².

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

GAGE.--Water-stage recorder. Elevation of gage is 920 ft above sea level, from topographic map.

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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	110	103	129	e80	e86	e165	175	192	81	113	71	163
2	104	121	148	e80	e86	e160	175	178	77	102	75	132
3	99	128	160	e80	e86	e160	172	157	75	96	72	124
4	98	127	152	e80	e86	e170	162	145	73	92	212	116
5	95	130	144	e80	e86	e230	164	139	71	113	214	113
6	92	128	142	e78	e86	307	162	131	73	101	145	113
7	91	121	146	e80	e86	398	153	127	74	106	110	107
8	91	117	140	e80	e86	323	146	126	72	97	99	103
9	93	114	135	e80	e86	245	143	122	69	109	94	101
10	94	111	135	e80	e86	210	141	115	67	105	88	99
11	92	111	129	e80	e86	187	135	139	68	92	89	97
12	90	110	121	e80	e86	182	130	156	68	88	87	96
13	89	124	116	e80	e86	202	179	135	67	78	159	94
14	86	125	116	e78	e90	197	168	120	69	91	165	90
15	85	147	117	e76	e93	189	189	129	66	135	129	90
16	88	147	116	e74	e98	171	211	131	64	104	103	86
17	124	137	113	e72	e115	159	181	120	64	104	93	85
18	157	131	114	e70	e150	155	156	112	63	111	89	84
19	137	131	115	e70	194	148	149	107	62	93	93	82
20	123	127	116	e70	349	154	136	105	62	89	118	83
21	156	121	118	e70	e586	271	125	100	62	96	109	83
22	150	118	111	e70	426	300	118	97	59	91	101	83
23	131	118	111	e72	282	276	110	84	62	86	97	82
24	121	117	107	e74	e230	270	107	82	273	83	93	82
25	115	113	e95	e78	e210	243	210	85	411	81	90	85
26	114	140	e88	e80	e195	208	264	131	273	84	213	107
27	113	173	e82	e83	e185	199	230	136	223	81	298	95
28	112	154	e80	e85	e175	198	180	107	170	77	317	104
29	110	143	e80	e86	---	189	184	99	152	73	319	110
30	105	136	e80	e86	---	184	172	92	133	72	214	100
31	102	---	e80	e86	---	183	---	86	---	70	176	---
TOTAL	3367	3823	3636	2418	4496	6633	4927	3785	3203	2913	4332	2989
MEAN	109	127	117	78.0	161	214	164	122	107	94.0	140	99.6
MAX	157	173	160	86	586	398	264	192	411	135	319	163
MIN	85	103	80	70	86	148	107	82	59	70	71	82
CFSM	.79	.92	.85	.57	1.16	1.55	1.19	.88	.77	.68	1.01	.72
IN.	.91	1.03	.98	.65	1.21	1.79	1.33	1.02	.86	.79	1.17	.81

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1994, BY WATER YEAR (WY)

MEAN	121	140	142	123	124	200	208	148	120	84.3	82.6	107
MAX	363	274	265	206	200	438	344	286	198	212	170	455
(WY)	1987	1986	1983	1973	1976	1976	1967	1974	1989	1982	1972	1986
MIN	57.3	66.2	82.7	78.0	64.0	116	131	75.4	53.9	44.3	42.3	50.6
(WY)	1972	1972	1975	1994	1982	1978	1977	1977	1988	1988	1971	1971

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1967 - 1994

ANNUAL TOTAL	51443	46522	133
ANNUAL MEAN	141	127	196
HIGHEST ANNUAL MEAN			96.5
LOWEST ANNUAL MEAN			1986
HIGHEST DAILY MEAN	419	Mar 28	2190
LOWEST DAILY MEAN	58	Aug 3	36
ANNUAL SEVEN-DAY MINIMUM	61	Jul 30	37
INSTANTANEOUS PEAK FLOW			2300
INSTANTANEOUS PEAK STAGE			8.57
INSTANTANEOUS LOW FLOW			22
ANNUAL RUNOFF (CFSM)	1.02	.92	.97
ANNUAL RUNOFF (INCHES)	13.87	12.54	13.12
10 PERCENT EXCEEDS	233	197	229
50 PERCENT EXCEEDS	123	111	109
90 PERCENT EXCEEDS	80	76	64

(a) Not determined.

(b) June 22, 23.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04122100 BEAR CREEK NEAR MUSKEGON, MI

LOCATION.--Lat 43°17'19", long 86°13'22", in SW1/4 NW1/4 sec.4, T.10 N., R.16 W., Muskegon County, Hydrologic Unit 04060102, on left bank at upstream side of bridge on North Getty Street, 1.5 mi upstream from Little Bear Creek, and 3.9 mi northeast of Muskegon.

DRAINAGE AREA.--14.8 mi².

PERIOD OF RECORD.--October 1965 to current year.

REVISED RECORDS.--WDR MI-80-1: 1976(M), 1978(M), 1979(P).

GAGE.--Water-stage recorder. Datum of gage is 590.00 ft above 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 poor. Some regulation during low flow by dams and irrigation upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	10	15	e9.5	e11	e26	24	24	7.9	14	12	9.1
2	15	10	19	e9.5	e11	e26	23	20	7.7	12	12	8.3
3	13	17	19	e9.5	e11	26	22	18	7.7	11	10	7.8
4	12	15	17	e10	e11	28	21	17	7.5	11	17	7.6
5	11	14	16	e10	e11	32	22	16	7.4	35	15	7.2
6	10	13	16	e10	e11	51	22	15	8.6	21	12	7.4
7	9.8	12	16	e10	e11	67	20	15	7.9	17	11	6.9
8	9.6	12	15	e10	e11	53	20	15	7.3	17	9.5	7.1
9	11	11	14	e10	e11	38	20	14	7.1	25	9.3	6.9
10	11	11	14	e10	e11	34	19	13	6.9	19	9.3	6.5
11	10	11	13	e10	e11	30	18	19	7.1	15	9.7	6.4
12	10	11	12	e10	e11	30	20	19	7.0	13	9.2	6.6
13	10	14	12	e10	e11	32	25	16	11	12	15	6.3
14	10	13	12	e10	e11	32	24	15	9.8	23	18	6.5
15	10	17	12	e9.5	e11	33	26	15	8.3	27	14	6.2
16	11	15	11	e9.0	e11	29	27	14	7.2	18	11	6.2
17	15	14	11	e9.0	e12	26	22	13	7.0	15	9.9	6.1
18	15	13	12	e9.0	e12	26	20	12	6.4	13	9.0	6.2
19	13	13	12	e8.5	e16	25	19	12	6.3	12	10	6.2
20	13	13	12	e8.5	e50	26	18	11	6.6	38	9.9	6.0
21	18	12	12	e8.5	e75	50	17	11	6.4	32	9.0	5.9
22	15	12	12	e9.0	e50	51	16	10	5.7	22	8.5	5.9
23	13	11	e12	e9.5	e40	40	15	9.7	6.8	18	7.9	5.9
24	13	12	e11	e9.5	e35	35	15	11	33	20	7.5	6.0
25	12	11	e10	e10	e32	31	18	11	25	17	7.5	7.8
26	11	20	e9.5	e10	e30	29	30	11	16	14	11	8.1
27	11	23	e9.5	e10	e28	31	23	10	13	13	9.0	9.5
28	11	18	e9.5	e10	e26	29	20	9.5	20	12	13	12
29	11	17	e9.5	e10	---	27	22	9.3	25	11	11	9.3
30	10	16	e9.5	e11	---	25	20	8.7	17	10	9.2	8.3
31	10	---	e9.5	e11	---	24	---	8.5	---	9.6	11	---
TOTAL	372.4	411	394.0	300.5	582	1042	628	422.7	320.6	546.6	337.4	216.2
MEAN	12.0	13.7	12.7	9.69	20.8	33.6	20.9	13.6	10.7	17.6	10.9	7.21
MAX	18	23	19	11	75	67	30	24	33	38	18	12
MIN	9.6	10	9.5	8.5	11	24	15	8.5	5.7	9.6	7.5	5.9
CFSM	.81	.93	.86	.65	1.40	2.27	1.41	.92	.72	1.19	.74	.49
IN.	.94	1.03	.99	.76	1.46	2.62	1.58	1.06	.81	1.37	.85	.54

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1994, BY WATER YEAR (WY)

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
MEAN	14.5	18.9	21.4	18.4	20.8	31.7	28.8	18.8	11.9	7.05	8.44	9.27																	
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)	1987	1986	1992	1986	1976	1976	1982	1974	1993	1994	1980	1986																	
MIN	3.48	4.54	4.98	6.15	7.43	12.2	14.5	6.84	4.32	3.17	2.29	3.09																	
(WY)	1972	1972	1977	1977	1977	1980	1968	1977	1977	1971	1971	1971																	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1966 - 1994

ANNUAL TOTAL	6910.2	5573.4	
ANNUAL MEAN	18.9	15.3	
HIGHEST ANNUAL MEAN			17.5
LOWEST ANNUAL MEAN			27.4
HIGHEST DAILY MEAN	126	75	8.36
LOWEST DAILY MEAN	6.2	5.7	1.6
ANNUAL SEVEN-DAY MINIMUM	6.6	6.0	2.0
INSTANTANEOUS PEAK FLOW		(a)	930
INSTANTANEOUS PEAK STAGE		(b)16.61	(c)11.00
INSTANTANEOUS LOW FLOW		5.2	1.0
ANNUAL RUNOFF (CFSM)	1.28	1.03	1.18
ANNUAL RUNOFF (INCHES)	17.37	14.01	16.04
10 PERCENT EXCEEDS	36	27	33
50 PERCENT EXCEEDS	15	12	13
90 PERCENT EXCEEDS	8.6	7.5	4.6

(a) Ice jam, discharge not determined.

(b) Backwater from ice.

(c) Datum then in use.

(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 594.1 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 poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	460	377	424	e360	e440	e660	651	714	411	383	e335	402
2	431	376	432	e360	e430	e640	629	689	399	369	e320	378
3	409	412	493	e360	e420	e620	614	660	393	357	e340	358
4	392	456	500	e360	e410	e600	600	621	389	348	e370	343
5	380	441	471	e360	e400	e590	592	584	384	389	e550	336
6	371	425	451	e360	e400	e680	595	555	388	475	e500	328
7	364	410	443	e360	e400	e780	593	535	400	444	e450	321
8	361	398	445	e360	e400	e900	578	524	397	427	e410	311
9	361	388	432	e360	e400	e850	564	515	386	458	e390	305
10	373	382	423	e360	e400	e800	552	505	376	466	e370	299
11	378	381	416	e360	e400	e790	540	511	370	466	e360	294
12	379	379	404	e360	e400	e780	535	572	366	441	e370	292
13	380	388	392	e360	e400	757	567	609	368	406	e380	291
14	374	417	390	e360	e400	740	608	580	402	415	e430	289
15	370	441	389	e360	e400	749	624	550	401	496	e420	287
16	369	466	387	e345	e400	747	674	531	379	506	e410	287
17	387	457	384	e335	e400	718	731	520	363	492	e410	284
18	446	440	387	e330	e410	669	695	506	353	475	382	283
19	473	422	396	e325	e440	637	641	490	344	426	416	282
20	451	409	401	e320	e600	618	591	477	339	415	420	280
21	443	398	398	e320	e1000	663	557	467	336	431	422	280
22	456	396	400	e320	e1200	801	534	458	332	424	401	279
23	464	389	e360	e325	e1150	1010	517	447	329	404	369	278
24	445	381	e350	e330	e1050	1020	505	440	423	380	349	277
25	426	379	e340	e340	e1000	1010	518	440	530	368	334	278
26	411	401	e330	e350	e900	958	668	446	538	356	336	308
27	398	479	e340	e360	e800	887	854	458	496	354	371	313
28	398	518	e360	e380	e700	829	952	461	456	346	445	319
29	398	480	e360	e400	---	775	837	451	427	336	483	373
30	394	450	e360	e420	---	727	766	435	403	330	487	367
31	385	---	e360	e440	---	685	---	423	---	324	432	---
TOTAL	12527	12536	12418	11040	16150	23690	18882	16174	11878	12707	12462	9322
MEAN	404	418	401	356	577	764	629	522	396	410	402	311
MAX	473	518	500	440	1200	1020	952	714	538	506	550	402
MIN	361	376	330	320	400	590	505	423	329	324	320	277
CFSM	1.00	1.03	.99	.88	1.42	1.88	1.55	1.29	.98	1.01	.99	.77
IN.	1.15	1.15	1.14	1.01	1.48	2.17	1.73	1.48	1.09	1.16	1.14	.85

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1957 - 1994, BY WATER YEAR (WY)

MEAN	391	464	491	451	461	652	682	498	409	314	304	357
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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1957 - 1994

ANNUAL TOTAL	190967					169786						
ANNUAL MEAN	523					465				456		
HIGHEST ANNUAL MEAN										635		1976
LOWEST ANNUAL MEAN										288		1958
HIGHEST DAILY MEAN	1390				Apr 21	1200		Feb 22		4650		Sep 1 1975
LOWEST DAILY MEAN	324				Aug 3	277		Sep 24		164		Aug 18 1958
ANNUAL SEVEN-DAY MINIMUM	337				Jul 30	279		Sep 19		169		Aug 14 1958
INSTANTANEOUS PEAK FLOW						(a)				5400		Sep 1 1975
INSTANTANEOUS PEAK STAGE						(b)6.27		Feb 21		7.46		Sep 1 1975
INSTANTANEOUS LOW FLOW						273		Sep 24		163		(c)
ANNUAL RUNOFF (CFSM)	1.29					1.15				1.12		
ANNUAL RUNOFF (INCHES)	17.50					15.56				15.28		
10 PERCENT EXCEEDS	828					687				712		
50 PERCENT EXCEEDS	452					410				400		
90 PERCENT EXCEEDS	362					333				251		

(a) Ice jam, discharge not determined.

(b) Backwater from ice.

(c) 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 poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	765	684	759	e620	e660	e1050	1050	1120	614	546	650	716
2	740	679	783	e620	e660	e1000	1000	1070	598	529	686	700
3	713	714	797	e620	e660	e970	962	1050	589	515	851	678
4	686	732	830	e620	e660	e940	931	988	587	556	1020	662
5	671	777	843	e620	e660	e980	922	912	574	861	1160	643
6	672	783	819	e620	e660	e1100	912	858	580	847	1270	630
7	673	764	794	e620	e660	e1400	921	824	579	952	1170	618
8	684	743	786	e620	e660	1740	905	808	579	1230	934	607
9	681	719	783	e620	e660	1690	870	788	568	1550	839	594
10	674	713	769	e620	e660	1620	845	769	556	1360	823	582
11	687	710	752	e620	e660	1470	828	785	549	1110	808	572
12	674	705	731	e620	e660	1340	820	819	541	945	779	568
13	656	717	705	e620	e660	1250	841	883	560	843	758	569
14	647	725	692	e600	e660	1200	881	886	581	836	753	566
15	639	782	693	e580	e660	1180	934	833	590	829	795	578
16	662	799	689	e560	e660	1150	973	802	570	864	810	603
17	705	814	686	e560	e660	1100	1020	792	544	865	753	618
18	767	804	686	e560	e660	1030	1040	775	525	794	714	599
19	828	781	685	e560	e680	968	976	740	513	753	721	578
20	862	750	690	e550	e800	937	898	713	509	735	793	559
21	847	734	697	e560	e1100	1010	839	691	504	747	896	553
22	818	714	695	e560	e1900	1190	794	674	498	752	850	545
23	848	700	672	e560	e1800	1380	764	659	496	728	755	541
24	841	687	668	e560	e1800	1570	739	645	557	709	705	538
25	794	679	e580	e580	e1600	1600	885	637	625	682	679	553
26	759	706	e560	e600	e1300	1540	1130	685	698	679	699	552
27	742	749	e600	e630	e1200	1440	1320	723	693	666	737	562
28	728	811	e610	e660	e1100	1330	1370	745	628	650	832	609
29	719	844	e620	e660	---	1260	1380	714	586	633	839	647
30	709	799	e620	e660	---	1190	1230	667	562	630	783	671
31	699	---	e620	e660	---	1120	---	638	---	625	749	---
TOTAL	22590	22318	21914	18720	25160	38745	28980	24693	17153	25021	25611	18011
MEAN	729	744	707	604	899	1250	966	797	572	807	826	600
MAX	862	844	843	660	1900	1740	1380	1120	698	1550	1270	716
MIN	639	679	560	550	660	937	739	637	496	515	650	538
CFSM	1.07	1.09	1.04	.89	1.32	1.84	1.42	1.17	.84	1.19	1.21	.88
IN.	1.23	1.22	1.20	1.02	1.37	2.12	1.58	1.35	.94	1.37	1.40	.98

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1939 - 1994, BY WATER YEAR (WY)

	MEAN	606	708	736	695	706	970	1046	784	673	534	492	555
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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1939 - 1994

ANNUAL TOTAL	336365		288916										
ANNUAL MEAN	922		792										
HIGHEST ANNUAL MEAN													
LOWEST ANNUAL MEAN													
HIGHEST DAILY MEAN	2390		1900		Apr 22								
LOWEST DAILY MEAN	563		496		Dec 26								
ANNUAL SEVEN-DAY MINIMUM	583		513		Feb 19								
INSTANTANEOUS PEAK FLOW			(a)										
INSTANTANEOUS PEAK STAGE			(b)5.95										
INSTANTANEOUS LOW FLOW			491		Feb 21								
ANNUAL RUNOFF (CFSM)	1.35		1.16		(c)								
ANNUAL RUNOFF (INCHES)	18.37		15.78										
10 PERCENT EXCEEDS	1430		1120										
50 PERCENT EXCEEDS	783		714										
90 PERCENT EXCEEDS	668		567										

(a) Ice jam, discharge not determined.

(b) Backwater from ice.

(c) June 22, 23.

(e) Estimated.

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.

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. Elevation of gage is 804 ft above sea level, from river-profile map. Prior to Apr. 13, 1934, at various datums. Apr. 14, 1934 to Oct. 25, 1990, 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1070	888	986	e880	e920	e1250	1400	1580	1040	999	978	1160
2	1070	881	986	e880	e920	e1230	1470	1590	1010	995	973	1150
3	1030	895	993	e880	e920	e1200	1560	1550	990	938	997	1090
4	1000	896	986	e870	e920	1190	1600	1490	978	965	1120	1030
5	972	921	982	e870	e920	1210	1710	1460	969	1510	1380	979
6	963	975	977	e870	e920	1330	1740	1470	969	1920	1350	955
7	963	1010	974	e870	e920	1290	1690	1430	965	1910	1210	941
8	957	1020	965	e870	e920	1300	1610	1370	969	2160	1120	922
9	967	1010	957	e870	e920	1230	1550	1340	965	2210	1100	907
10	958	985	961	e860	e920	1170	1520	1300	951	2080	1070	887
11	938	989	972	e860	e920	1130	1520	1290	942	1760	1030	874
12	928	966	959	e860	e920	1110	1550	1300	953	1590	996	868
13	915	965	932	e860	e920	1110	1730	1280	962	1410	969	870
14	908	972	949	e860	e920	1120	1830	1250	969	1270	955	909
15	896	1000	954	e840	e920	1130	1880	1240	976	1200	945	1020
16	921	1030	940	e800	e920	1110	1960	1220	972	1140	956	1110
17	928	1020	933	e800	e920	1060	2010	1210	953	1110	940	1100
18	951	1010	934	e790	e920	1060	1940	1170	930	1160	911	1020
19	950	996	936	e790	e960	1070	1780	1150	908	1260	945	969
20	924	975	937	e780	e1200	1060	1610	1130	900	1260	1110	925
21	958	964	943	e790	1780	1170	1490	1110	892	1280	1260	902
22	982	959	936	e800	1430	1350	1410	1100	877	1270	1320	889
23	974	958	907	e800	1260	1490	1350	1080	867	1230	1270	886
24	960	960	866	e820	e1250	1670	1310	1070	902	1220	1180	881
25	942	950	e840	e840	e1250	1670	1560	1060	1010	1210	1060	882
26	921	959	e800	e860	e1250	1570	1920	1120	1010	1150	1140	972
27	908	997	e840	e900	e1250	1530	2060	1160	974	1100	1620	1160
28	907	1000	e860	e920	e1250	1510	2040	1140	932	1070	1340	1100
29	901	1010	e880	e920	---	1460	1910	1100	922	1030	1180	1180
30	893	1000	e880	e920	---	1430	1680	1080	943	1020	1090	1140
31	894	---	e880	e920	---	1400	---	1060	---	997	1120	---
TOTAL	29449	29161	28845	26450	29440	39610	50390	38900	28600	41424	34615	29678
MEAN	950	972	930	853	1051	1278	1680	1255	953	1336	1117	989
MAX	1070	1030	993	920	1780	1670	2060	1590	1040	2210	1620	1180
MIN	893	881	800	780	920	1060	1310	1060	867	938	911	868
CFSM	1.11	1.13	1.09	1.00	1.23	1.49	1.96	1.46	1.11	1.56	1.30	1.15
IN.	1.28	1.27	1.25	1.15	1.28	1.72	2.19	1.69	1.24	1.80	1.50	1.29

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1903 - 1994, BY WATER YEAR (WY)

	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914
MEAN	980	1055	1042	999	983	1203	1542	1207	1057	943	889	923
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 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1903 - 1994
ANNUAL TOTAL	417376	406562	
ANNUAL MEAN	1143	1114	(a)1068
HIGHEST ANNUAL MEAN			1261
LOWEST ANNUAL MEAN			888
HIGHEST DAILY MEAN	2260	2210	3500
LOWEST DAILY MEAN	800	780	540
ANNUAL SEVEN-DAY MINIMUM	852	793	549
INSTANTANEOUS PEAK FLOW		2230	(b)3570
INSTANTANEOUS PEAK STAGE		14.19	
INSTANTANEOUS LOW FLOW		(c)	(d)770
ANNUAL RUNOFF (CFSM)	1.33	1.30	1.25
ANNUAL RUNOFF (INCHES)	18.12	17.65	16.93
10 PERCENT EXCEEDS	1570	1550	1430
50 PERCENT EXCEEDS	1040	996	984
90 PERCENT EXCEEDS	903	880	824

(a) Does not include water years 1931, 1934.

(b) From graph based on gage readings.

(c) Less than 780 ft³/s, occurred during period of ice effect, Dec. 25 to Feb. 20.

(d) Does not include water years 1903-1990.

(e) Estimated.

(f) Sept. 2, 3, 1991.

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. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	45	29	31	22	25	52	74	61	29	17	24	28
2	43	27	42	22	24	49	81	66	24	9.9	22	26
3	35	33	48	22	24	47	84	55	21	13	21	23
4	32	34	44	22	24	46	77	52	19	15	93	21
5	27	36	38	22	24	50	84	44	16	89	91	20
6	30	37	38	21	24	75	75	43	17	86	60	19
7	32	32	38	22	24	112	66	41	16	126	44	18
8	29	30	35	22	24	111	59	39	16	96	41	17
9	48	30	33	22	24	92	58	37	15	104	38	17
10	32	33	37	21	23	76	58	35	14	69	33	16
11	33	36	35	21	23	64	54	47	14	51	30	15
12	30	35	30	22	23	58	56	49	13	50	26	14
13	27	37	28	22	23	59	92	42	15	42	25	14
14	27	39	28	21	24	63	90	38	15	36	23	16
15	32	45	29	21	24	61	87	41	14	32	24	27
16	34	43	29	19	24	53	88	41	12	27	19	30
17	55	37	29	19	24	48	77	36	11	48	18	28
18	57	32	29	19	24	45	66	33	9.9	84	16	26
19	45	32	30	19	36	41	58	31	9.4	54	35	26
20	40	33	30	18	183	44	53	28	9.5	45	32	23
21	59	29	30	18	212	75	48	26	9.4	40	29	18
22	55	29	26	19	156	102	44	25	9.0	34	25	16
23	50	29	24	19	138	141	40	21	9.3	30	22	15
24	50	28	24	20	99	151	38	20	22	31	19	15
25	41	27	23	21	82	111	71	20	29	31	18	18
26	39	36	23	20	69	97	89	91	22	33	64	26
27	38	54	22	20	63	92	76	65	16	26	61	24
28	34	44	21	23	56	82	65	47	14	23	47	32
29	32	39	21	25	---	77	62	41	12	22	38	33
30	29	35	21	25	---	71	54	37	13	18	32	29
31	30	---	21	25	---	72	---	29	---	16	33	---
TOTAL	1190	1040	937	654	1523	2317	2024	1281	465.5	1397.9	1103	650
MEAN	38.4	34.7	30.2	21.1	54.4	74.7	67.5	41.3	15.5	45.1	35.6	21.7
MAX	59	54	48	25	212	151	92	91	29	126	93	33
MIN	27	27	21	18	23	41	38	20	9.0	9.9	16	14
CFSM	.64	.58	.50	.35	.91	1.25	1.12	.69	.26	.75	.59	.36
IN.	.74	.64	.58	.41	.94	1.44	1.25	.79	.29	.87	.68	.40

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1994, BY WATER YEAR (WY)

MEAN	26.7	33.3	25.4	18.4	21.3	52.4	86.1	36.1	22.9	16.7	17.0	15.1
MAX	99.9	90.8	83.8	39.7	54.4	93.6	190	75.4	70.4	45.1	68.5	44.2
(WY)	1992	1993	1992	1993	1994	1992	1959	1960	1993	1994	1956	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
(WY)	1956	1954	1956	1956	1963	1956	1958	1958	1959	1959	1957	1955

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1952 - 1994

ANNUAL TOTAL	17436	14582.4	30.9	
ANNUAL MEAN	47.8	40.0	54.5	1992
HIGHEST ANNUAL MEAN			16.0	1958
LOWEST ANNUAL MEAN				
HIGHEST DAILY MEAN	350	212	753	Aug 4 1956
LOWEST DAILY MEAN	14	9.0	5.3	Aug 4 1958
ANNUAL SEVEN-DAY MINIMUM	15	9.6	5.5	Aug 1 1959
INSTANTANEOUS PEAK FLOW		255	(a)1410	Aug 4 1956
INSTANTANEOUS PEAK STAGE		4.00	6.23	Aug 4 1956
INSTANTANEOUS LOW FLOW		8.1	(b)	Mar 13 1958
ANNUAL RUNOFF (CFSM)	.80	.67	.51	
ANNUAL RUNOFF (INCHES)	10.81	9.04	7.00	
10 PERCENT EXCEEDS	95	76	66	
50 PERCENT EXCEEDS	33	32	16	
90 PERCENT EXCEEDS	18	17	7.8	

(a) From rating curve extended above 450 ft³/s.

(b) June 22, July 3.

(c) Result of freezeup.

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126520 MANISTEE RIVER AT MANISTEE, MI
(National stream quality accounting network station)

LOCATION.--Lat 44°15'02", long 86°19'09", in SW1/4 SW1/4 sec.1, T.21 N., R.17 W., Manistee County, Hydrologic Unit 04060103, at upstream side of bridge on U.S. Highway 31 in Manistee, and 1.3 mi upstream from mouth.

DRAINAGE AREA.--1,928 mi².

PERIOD OF RECORD.--Water years 1974 to September 1994 (discontinued).

REVISED RECORDS.--WDR MI-88-1: Drainage area.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: November 1974 to September 1981.

WATER TEMPERATURE: November 1974 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Mar. 18, 1977 to Sept. 30, 1981.

REMARKS.--Cross-sectional samples were collected at Washington Street Bridge. Water-discharge measurements were made at time of sampling.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975-81): Maximum daily, 1,680 microsiemens, Nov. 18, 1974; minimum, 226 microsiemens, Apr. 22, 1980.

WATER TEMPERATURE (water years 1975-81): Maximum, 26.5°C, July 8, 1981, minimum, 0.0°C on many days during winter.

WATER QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

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 KF AGAR (COLS. PER 100 ML) (31673)
OCT 22...	0930	2120	406	8.2	8.5	0.90	9.9	86	K36	K13
DEC 02...	0930	3050	439	8.1	2.0	0.40	13.5	100	K8	K17
FEB 23...	0930	4960	392	7.8	0.0	1.5	10.4	73	43	K29
APR 22...	1100	3610	363	8.1	9.0	1.0	10.8	95	K4	--
AUG 12...	1000	2140	480	8.1	18.5	2.1	8.2	89	K31	K45

DATE	HARD- NESS TOTAL (MG/L AS CACO3) (00900)	HARD- NESS NONCARB DISSOLV FLD. AS CACO3 (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 HCO3 (00453)	ALKA- LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)
OCT 22...	190	44	55	13	8.5	0.90	179	147	12	27
DEC 02...	190	61	57	12	9.3	1.3	160	131	13	40
FEB 23...	160	0	45	12	8.9	1.0	177	145	13	20
APR 22...	150	23	44	10	6.8	1.1	157	129	11	26
AUG 12...	200	64	61	12	9.3	1.4	168	138	11	57

DATE	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SiO2) (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, NO2+NO3 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 22...	0.20	7.7	235	0.32	1350	<0.010	0.190	0.020	<0.20	<0.010
DEC 02...	0.10	7.3	242	0.33	1990	<0.010	0.260	0.050	<0.20	0.020
FEB 23...	<0.10	8.2	204	0.28	2730	0.010	0.310	0.040	<0.20	0.020
APR 22...	0.10	6.4	202	0.27	1970	0.020	0.230	0.030	<0.20	<0.010
AUG 12...	<0.10	7.9	289	0.39	1670	0.010	0.170	0.060	0.30	0.030

STREAMS TRIBUTARY TO LAKE MICHIGAN

04126520 MANISTEE RIVER AT MANISTEE, MI--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

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 22...	0.010	<0.010	<10	19	<3	36	10	7	<10
DEC 02...	0.010	0.010	<10	16	<3	40	14	6	<10
FEB 23...	0.020	<0.010	20	18	<3	60	<4	18	<10
APR 22...	<0.010	<0.010	10	15	<3	44	7	8	<10
AUG 12...	0.020	<0.010	--	--	--	--	--	--	--

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 22...	<1	<1	<1.0	260	<6	7	40	70
DEC 02...	<1	<1	<1.0	330	<6	5	41	74
FEB 23...	<1	<1	<1.0	160	<6	--	--	--
APR 22...	<1	<1	<1.0	230	<6	10	97	91
AUG 12...	--	--	--	--	--	--	--	--

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. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	149	130	131	140	e130	143	156	174	131	123	126	138
2	146	132	153	138	e130	142	162	162	130	121	126	131
3	142	137	140	138	e130	141	156	155	129	120	125	131
4	140	137	136	138	e130	141	154	151	129	141	138	129
5	137	167	134	139	e130	140	169	155	128	170	131	129
6	141	151	140	e138	e130	154	154	151	132	141	126	131
7	139	141	140	138	e130	151	150	149	130	136	125	130
8	141	145	136	138	e130	144	150	146	128	158	135	128
9	145	139	136	137	e130	140	160	148	127	141	128	127
10	138	147	137	e137	e130	138	158	144	126	137	125	126
11	136	143	135	137	e130	136	153	150	125	132	124	125
12	136	140	134	136	e130	135	159	145	127	130	124	125
13	135	152	135	135	e130	136	183	143	143	128	124	129
14	134	144	134	e135	e130	137	163	141	135	129	127	141
15	134	161	133	e134	e130	137	177	144	131	129	125	205
16	145	146	132	e133	130	135	165	145	129	125	124	152
17	141	143	133	e133	131	133	157	141	128	127	123	143
18	138	141	134	e132	135	136	153	139	127	126	123	138
19	136	143	135	e132	169	134	150	138	125	126	125	134
20	136	139	135	e130	257	135	147	137	125	126	151	132
21	146	138	136	e130	176	177	145	136	124	183	136	132
22	138	136	134	e130	156	168	143	135	122	211	130	131
23	136	135	133	e130	156	168	142	134	123	152	129	131
24	135	134	138	e130	e156	170	146	133	129	143	127	130
25	134	132	e138	e130	e155	154	204	135	130	138	126	133
26	134	147	e138	e130	157	153	193	142	125	136	146	160
27	133	144	e138	e130	e150	156	170	137	122	133	135	151
28	133	138	e138	e130	147	153	160	135	122	131	136	171
29	131	135	139	e130	---	151	158	134	127	128	130	167
30	133	133	e138	e130	---	148	157	133	125	127	131	150
31	132	---	138	e130	---	150	---	133	---	126	155	---
TOTAL	4274	4250	4231	4148	4025	4536	4794	4445	3834	4274	4036	4180
MEAN	138	142	136	134	144	146	160	143	128	138	130	139
MAX	149	167	153	140	257	177	204	174	143	211	155	205
MIN	131	130	131	130	130	133	142	133	122	120	123	125
CFSM	1.17	1.20	1.16	1.13	1.22	1.24	1.35	1.22	1.08	1.17	1.10	1.18
IN.	1.35	1.34	1.33	1.31	1.27	1.43	1.51	1.40	1.21	1.35	1.27	1.32

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1990 - 1994, BY WATER YEAR (WY)

MEAN	133	140	141	139	137	150	159	145	142	139	128	138
MAX	148	150	151	147	144	164	169	150	165	152	135	158
(WY)	1992	1993	1992	1992	1992	1992	1992	1993	1993	1993	1991	1993
MIN	123	129	133	130	127	139	143	141	122	134	117	129
(WY)	1993	1991	1991	1991	1991	1993	1990	1992	1991	1992	1992	1990

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1990 - 1994

ANNUAL TOTAL	53494	51027	
ANNUAL MEAN	147	140	141
HIGHEST ANNUAL MEAN			147
LOWEST ANNUAL MEAN			135
HIGHEST DAILY MEAN	320	Sep 14	386
LOWEST DAILY MEAN	126	Aug 22	110
ANNUAL SEVEN-DAY MINIMUM	128	Aug 20	113
INSTANTANEOUS PEAK FLOW		(b)304	516
INSTANTANEOUS PEAK STAGE		(c)4.04	(c)4.04
INSTANTANEOUS LOW FLOW		99	79
ANNUAL RUNOFF (CFSM)	1.24	1.18	1.20
ANNUAL RUNOFF (INCHES)	16.86	16.09	16.27
10 PERCENT EXCEEDS	166	156	162
50 PERCENT EXCEEDS	141	136	137
90 PERCENT EXCEEDS	132	126	123

(a) Aug. 16, Oct. 7, 1992.

(b) Gage height, 2.41 ft.

(c) Backwater from ice.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE MICHIGAN

445256085240001 ELK LAKE NEAR ELK RAPIDS, MI

LOCATION.--Lat 44°50'43", long 85°23'33", in SW1/4 SW1/4 sec.3, T.28 N., R.9 W., Antrim and Grand Traverse Counties, Hydrologic Unit 04060105, at Gay Road, 3.5 mi south of Elk Rapids.

DRAINAGE AREA.--410 mi², approximately.

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

GAGE.--Water-stage recorder. Datum of gage is 586.25 ft above sea level (levels by Michigan Department of Natural Resources). Prior to June 20, 1952, nonrecording gage at same datum.

REMARKS.--Elk Lake is at the end of a long chain of interconnected lakes and is contiguous with Lake Skegemog. The major inlet to these lakes is Torch River. Smaller inlets include Williamsburg, Battle, Barker, and Desmond Creeks. The outlet of Elk Lake is Elk River. Lake elevation controlled by dam at Elk Rapids. Established legal level; summer, 589.50 ft, winter, 588.90 ft, above sea level.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 3.88 ft, Oct. 6, 1986; minimum, 2.08 ft, Dec. 30, 31, 1981.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 3.47 ft, Apr. 26; minimum, 2.34 ft, Feb. 15, 16.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.25	3.01	2.68	2.76	2.51	2.67	2.82	3.38	3.21	3.20	3.17	3.13
2	3.24	2.97	2.69	2.77	2.47	2.67	2.83	3.38	3.23	3.18	3.19	3.14
3	3.25	2.94	2.70	2.76	2.46	2.67	2.83	3.37	3.25	3.18	3.19	3.16
4	3.25	2.92	2.71	2.76	2.44	2.67	2.84	3.36	3.25	3.20	3.22	3.17
5	3.25	2.97	2.72	2.76	2.41	2.67	2.90	3.36	3.23	3.28	3.23	3.17
6	3.26	2.99	2.73	2.74	2.39	2.69	2.94	3.35	3.24	3.27	3.22	3.18
7	3.26	2.95	2.74	2.71	2.37	2.70	2.98	3.34	3.23	3.28	3.22	3.19
8	3.28	2.92	2.75	2.70	2.37	2.70	3.02	3.32	3.21	3.32	3.23	3.20
9	3.30	2.89	2.75	2.71	2.36	2.70	3.04	3.32	3.20	3.30	3.24	3.21
10	3.27	2.88	2.74	2.69	2.36	2.70	3.04	3.31	3.20	3.28	3.22	3.21
11	3.25	2.85	2.77	2.68	2.36	2.70	3.05	3.30	3.20	3.25	3.19	3.21
12	3.23	2.83	2.76	2.67	2.36	2.71	3.09	3.31	3.19	3.21	3.18	3.21
13	3.22	2.82	2.76	2.66	2.37	2.72	3.15	3.30	3.23	3.21	3.18	3.23
14	3.21	2.80	2.75	2.66	2.37	2.72	3.18	3.29	3.24	3.22	3.21	3.29
15	3.21	2.83	2.76	2.68	2.35	2.72	3.22	3.29	3.22	3.23	3.20	3.28
16	3.24	2.81	2.76	2.68	2.35	2.72	3.23	3.29	3.22	3.25	3.20	3.26
17	3.25	2.79	2.76	2.68	2.35	2.71	3.25	3.29	3.22	3.28	3.20	3.24
18	3.25	2.78	2.77	2.67	2.37	2.72	3.27	3.27	3.22	3.28	3.21	3.22
19	3.24	2.75	2.78	2.65	2.40	2.71	3.26	3.27	3.22	3.29	3.26	3.20
20	3.24	2.71	2.79	2.63	2.51	2.70	3.27	3.27	3.21	3.30	3.28	3.19
21	3.23	2.70	2.80	2.62	2.57	2.74	3.27	3.26	3.20	3.30	3.26	3.20
22	3.23	2.67	2.81	2.61	2.61	2.77	3.28	3.26	3.19	3.30	3.24	3.21
23	3.23	2.66	2.79	2.59	2.65	2.78	3.28	3.25	3.18	3.29	3.22	3.23
24	3.22	2.64	2.80	2.58	2.68	2.81	3.29	3.25	3.18	3.29	3.19	3.24
25	3.22	2.64	2.78	2.56	2.69	2.83	3.42	3.24	3.19	3.27	3.18	3.27
26	3.21	2.65	2.78	2.54	2.68	2.82	3.44	3.26	3.20	3.25	3.18	3.32
27	3.19	2.67	2.78	2.53	2.68	2.82	3.43	3.24	3.21	3.23	3.18	3.31
28	3.16	2.66	2.77	2.54	2.67	2.82	3.41	3.23	3.22	3.21	3.14	3.32
29	3.13	2.66	2.78	2.55	---	2.82	3.36	3.22	3.24	3.19	3.12	3.30
30	3.10	2.68	2.77	2.54	---	2.83	3.35	3.22	3.23	3.18	3.11	3.27
31	3.06	---	2.76	2.52	---	2.82	---	3.21	---	3.17	3.15	---
MEAN	3.22	2.80	2.76	2.65	2.47	2.74	3.16	3.29	3.22	3.25	3.20	3.23
MAX	3.30	3.01	2.81	2.77	2.69	2.83	3.44	3.38	3.25	3.32	3.28	3.32
MIN	3.06	2.64	2.68	2.52	2.35	2.67	2.82	3.21	3.18	3.17	3.11	3.13

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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	184	173	174	e177	e170	e180	248	246	179	178	174	230
2	187	172	192	177	e165	178	272	235	179	173	175	192
3	182	185	189	175	e165	178	264	207	178	169	171	181
4	183	188	181	e175	e165	181	228	203	177	179	179	177
5	176	283	176	e175	e165	183	246	202	177	343	179	175
6	174	219	180	e175	e165	201	211	205	228	433	171	182
7	174	191	184	e175	e165	221	203	200	198	237	169	179
8	177	190	177	e175	e165	206	208	197	184	263	205	175
9	204	190	177	e175	e165	186	250	203	179	207	189	172
10	183	191	184	e175	e165	180	271	196	177	192	175	175
11	176	187	177	e175	e165	176	235	230	176	180	174	168
12	172	179	170	e175	e165	177	228	259	179	177	173	173
13	170	191	175	175	e165	177	353	203	232	172	174	188
14	171	188	176	e175	e165	180	274	195	203	175	182	312
15	172	228	176	e175	e165	184	267	201	182	179	174	241
16	213	211	174	e175	e165	173	240	215	175	174	171	205
17	187	188	173	e170	e165	176	212	197	172	206	169	188
18	176	180	177	e170	181	176	203	191	172	218	175	180
19	175	184	188	e170	229	172	204	189	171	261	361	176
20	174	185	186	e170	377	173	195	188	170	213	290	176
21	222	181	185	e170	271	240	192	187	168	226	348	173
22	193	182	176	e170	221	252	190	185	167	201	191	173
23	178	177	169	e170	200	269	190	184	169	196	180	174
24	175	175	174	e170	e200	281	256	184	176	199	177	172
25	173	171	e175	e170	e200	228	494	184	188	181	174	175
26	173	204	e175	e170	e200	214	326	223	174	177	214	188
27	181	212	e175	e170	e200	225	259	194	169	175	196	184
28	179	182	e176	e170	e190	213	218	187	188	173	225	241
29	185	179	e176	e170	---	214	211	185	252	172	182	197
30	185	176	e176	e170	---	220	206	185	202	171	184	181
31	177	---	e177	e170	---	221	---	183	---	171	291	---
TOTAL	5631	5742	5520	5354	5279	6235	7354	6243	5541	6371	6192	5703
MEAN	182	191	178	173	189	201	245	201	185	206	200	190
MAX	222	283	192	177	377	281	494	259	252	433	361	312
MIN	170	171	169	170	165	172	190	183	167	169	169	168
CFSM	2.68	2.82	2.62	2.54	2.78	2.96	3.61	2.97	2.72	3.03	2.94	2.80
IN.	3.09	3.15	3.02	2.93	2.89	3.42	4.03	3.42	3.04	3.49	3.39	3.12

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1994, BY WATER YEAR (WY)

	188	191	188	179	180	211	224	195	183	174	172	183
MEAN	188	191	188	179	180	211	224	195	183	174	172	183
MAX	235	226	217	198	209	281	273	237	230	210	203	223
(WY)	1987	1993	1983	1990	1984	1979	1979	1983	1969	1975	1972	1986
MIN	167	163	163	157	157	174	181	164	160	151	150	150
(WY)	1967	1982	1982	1971	1982	1972	1987	1982	1982	1981	1981	1981

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1967 - 1994
ANNUAL TOTAL	70494	71165	
ANNUAL MEAN	193	195	189
HIGHEST ANNUAL MEAN			204
LOWEST ANNUAL MEAN			171
HIGHEST DAILY MEAN	638	494	840
LOWEST DAILY MEAN	163	165	130
ANNUAL SEVEN-DAY MINIMUM	166	165	136
INSTANTANEOUS PEAK FLOW		(a)668	1360
INSTANTANEOUS PEAK STAGE		(b)6.40	(c) 6.51
INSTANTANEOUS LOW FLOW		(d)154	(f)91
ANNUAL RUNOFF (CFSM)	2.84	2.87	2.78
ANNUAL RUNOFF (INCHES)	38.62	38.99	37.80
10 PERCENT EXCEEDS	222	236	223
50 PERCENT EXCEEDS	183	181	179
90 PERCENT EXCEEDS	170	170	160

(a) Gage height, 5.39 ft.

(b) From floodmark; backwater from ice.

(c) Date unknown, occurred during period of no gage-height record, Jan. 19 to Feb. 16.

(d) Result of freezeup, may have been less during period of no gage-height record, Jan. 19 to Feb. 16.

(e) Estimated.

(f) Result of freezeup.

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. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	117	197	322	e95	e65	e95	e170	408	664	156	e160	276
2	176	183	243	e34	e65	e95	e185	401	438	115	e130	226
3	189	229	325	e92	e65	e98	e210	331	301	94	e110	169
4	175	256	311	e90	e65	e105	e240	289	228	86	e90	135
5	166	270	280	e88	e65	e110	e240	275	185	177	e78	115
6	150	276	254	e87	e64	e110	e230	276	164	269	e76	105
7	147	238	260	e86	e64	e110	e225	250	153	275	e75	98
8	600	217	222	e85	e64	e110	e270	226	137	202	e72	95
9	868	210	205	e84	e64	e105	e400	206	121	234	e68	89
10	619	204	175	e82	e64	e100	e600	193	109	232	e65	82
11	479	203	214	e80	e64	e95	e1000	207	100	169	e64	78
12	346	216	306	e78	e64	e90	1610	250	94	136	e64	76
13	283	529	324	e75	e64	e88	2110	215	107	e110	e63	84
14	228	918	214	e75	e64	e86	1990	189	223	e86	e64	113
15	203	651	174	e74	e64	e88	1920	235	270	e82	e64	109
16	437	490	164	e74	e65	e92	1790	270	224	e80	e65	104
17	483	384	223	e72	e66	e92	1340	229	171	e78	e66	102
18	378	308	146	e70	e70	e90	905	200	136	e78	e68	97
19	267	273	147	e70	e100	e90	776	173	118	e76	e120	87
20	238	282	144	e68	e200	e90	631	156	104	e75	e160	82
21	426	281	e140	e66	e190	e92	511	144	94	e75	e120	77
22	589	387	e140	e65	e170	e95	435	134	86	e130	e80	75
23	474	291	e135	e65	e150	e100	389	125	82	e210	e76	73
24	342	255	e130	e65	e130	e105	373	122	78	e180	75	71
25	276	336	e120	e65	e120	e110	371	129	81	e150	80	70
26	237	393	e110	e65	e110	e115	406	128	81	e125	95	71
27	216	945	e110	e65	e100	e120	572	118	76	e105	153	76
28	199	595	e105	e65	e95	e130	501	110	73	e90	135	86
29	240	426	e100	e65	---	e140	440	140	157	e140	122	108
30	241	330	e100	e65	---	e150	417	910	264	e240	108	98
31	218	---	e95	e65	---	e159	---	757	---	e200	163	---
TOTAL	10007	10773	5938	2335	2531	3255	21257	7796	5119	4455	2929	3127
MEAN	323	359	192	75.3	90.4	105	709	251	171	144	94.5	104
MAX	868	945	325	95	200	159	2110	910	664	275	163	276
MIN	117	183	95	65	64	86	170	110	73	75	63	70
CFSM	1.75	1.95	1.04	.41	.49	.57	3.85	1.37	.93	.78	.51	.57
IN.	2.02	2.18	1.20	.47	.51	.66	4.30	1.58	1.03	.90	.59	.63

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1972 - 1994, BY WATER YEAR (WY)

	MEAN	219	294	183	119	106	269	846	264	182	105	105	149
MAX	347	807	328	248	217	544	1589	633	432	261	349	318	
(WY)	1979	1989	1983	1980	1984	1973	1985	1972	1974	1979	1973	1978	
MIN	71.8	72.7	63.0	60.3	65.9	90.7	281	123	76.8	60.3	58.5	65.3	
(WY)	1977	1977	1977	1977	1979	1978	1987	1987	1988	1988	1991	1976	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1972 - 1994

ANNUAL TOTAL	98436	79522	234
ANNUAL MEAN	270	218	344
HIGHEST ANNUAL MEAN			149
LOWEST ANNUAL MEAN			1985
HIGHEST DAILY MEAN	1800	2110	4050
LOWEST DAILY MEAN	70	(e)63	45
ANNUAL SEVEN-DAY MINIMUM	71	64	50
INSTANTANEOUS PEAK FLOW		2760	4500
INSTANTANEOUS PEAK STAGE		12.74	18.44
INSTANTANEOUS LOW FLOW			(a)33
ANNUAL RUNOFF (CFSM)	1.47	1.18	1.27
ANNUAL RUNOFF (INCHES)	19.90	16.08	17.31
10 PERCENT EXCEEDS	600	421	470
50 PERCENT EXCEEDS	175	135	126
90 PERCENT EXCEEDS	86	67	71

(a) Result of freeze-up.

(e) Estimated.

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.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 3.60 ft, Apr. 12, 1948, present datum; minimum, 0.54 ft, Mar. 30, 1982.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 2.72 ft, Sept. 1; minimum, 1.10 ft, Mar. 20, 21.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.36	1.58	1.75	1.49	---	1.46	1.39	2.34	2.34	2.28	2.21	2.71
2	2.38	1.55	1.75	1.48	---	1.38	1.43	2.37	2.31	2.27	2.20	2.69
3	2.35	1.54	1.77	1.46	---	1.34	1.45	2.38	2.29	2.25	2.19	2.65
4	2.37	1.55	1.76	1.44	---	1.27	1.46	2.39	2.28	2.24	2.22	2.61
5	2.36	1.70	1.75	1.45	---	1.24	1.50	2.40	2.27	2.34	2.20	2.57
6	2.30	1.76	1.74	1.44	---	1.24	1.50	2.39	2.28	2.41	2.19	2.56
7	2.25	1.73	1.72	1.45	---	1.25	1.49	2.40	2.27	2.41	2.16	2.56
8	2.23	1.73	1.69	1.45	---	1.25	1.48	2.39	2.26	2.42	2.18	2.54
9	2.22	1.73	1.67	1.42	---	1.24	1.50	2.38	2.24	2.41	2.19	2.52
10	2.15	1.75	1.66	1.43	---	1.22	1.54	2.38	2.24	2.40	2.18	2.49
11	2.07	1.76	1.64	1.43	---	1.19	1.58	2.39	2.23	2.36	2.17	2.46
12	2.01	1.75	1.62	1.42	---	1.20	1.61	2.42	2.21	2.31	2.17	2.43
13	1.93	1.76	1.59	1.42	---	1.20	1.71	2.41	2.25	2.30	2.15	2.44
14	1.87	1.76	1.57	1.40	---	1.19	1.80	2.40	2.29	2.28	2.16	2.52
15	1.82	1.78	1.56	1.39	---	1.19	1.87	2.43	2.27	2.28	2.15	2.54
16	1.85	1.77	1.54	1.38	1.56	1.26	1.92	2.45	2.27	2.26	2.14	2.54
17	1.86	1.77	1.52	1.41	1.57	1.23	1.91	2.43	2.26	2.26	2.13	2.53
18	1.87	1.75	1.52	1.43	1.32	1.15	1.90	2.43	2.24	2.28	2.13	2.49
19	1.83	1.74	1.51	1.43	1.14	1.14	1.89	2.42	2.23	2.28	2.33	2.46
20	1.79	1.75	1.50	1.43	1.28	1.11	1.86	2.40	2.20	2.29	2.43	2.44
21	1.75	1.72	1.50	1.43	1.40	1.15	1.83	2.39	2.19	2.30	2.51	2.42
22	1.74	1.71	1.48	1.43	1.62	1.19	1.82	2.37	2.17	2.31	2.51	2.41
23	1.72	1.72	1.47	1.47	1.43	1.24	1.85	2.36	2.17	2.33	2.49	2.39
24	1.69	1.71	1.49	1.59	1.50	1.32	1.91	2.36	2.17	2.37	2.46	2.38
25	1.68	1.71	1.51	1.54	1.50	1.34	2.04	2.36	2.18	2.36	2.44	2.37
26	1.65	1.72	1.53	1.54	1.50	1.35	2.14	2.39	2.17	2.33	2.44	2.39
27	1.63	1.78	1.53	1.52	1.50	1.37	2.22	2.36	2.16	2.30	2.46	2.41
28	1.60	1.78	1.53	1.54	1.50	1.39	2.27	2.33	2.17	2.28	2.53	2.45
29	1.60	1.79	1.53	1.52	---	1.39	2.28	2.33	2.27	2.26	2.54	2.45
30	1.61	1.77	1.51	---	---	1.40	2.31	2.35	2.28	2.25	2.55	2.43
31	1.60	---	1.50	---	---	1.39	---	2.33	---	2.23	2.67	---
MEAN	1.94	1.72	1.59	---	---	1.27	1.78	2.38	2.24	2.31	2.31	2.49
MAX	2.38	1.79	1.77	---	---	1.46	2.31	2.45	2.34	2.42	2.67	2.71
MIN	1.60	1.54	1.47	---	---	1.11	1.39	2.33	2.16	2.23	2.13	2.37

STREAMS TRIBUTARY TO LAKE HURON

04128000 STURGEON RIVER NEAR WOLVERINE, MI

LOCATION.--Lat 45°17'56", long 84°36'40", in SE1/4 NE1/4 sec.36, T.34 N., R.3 W., Cheboygan County, Hydrologic Unit 04070004, on left bank 1.8 mi north of Wolverine, 2.8 mi downstream from West Branch, and 9 mi upstream from mouth.

DRAINAGE AREA.--198 mi².

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

REVISED RECORDS.--WSP 1307: 1944(M), 1948(M). WSP 1727: 1951(M). WDR MI-83-1: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 740 ft above sea level, from topographic map. Prior to June 15, 1942, nonrecording gage at site 1.0 mi upstream, and June 16, 1942 to Sept. 30, 1958, at site 0.7 mi upstream at different datums.

REMARKS.--Records good except for estimated daily discharges, which are poor. Prior to July 1975, intermittent regulation at low flows from ponds 2.4 mi upstream. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	223	226	229	e220	e200	e220	303	302	212	220	190	417
2	228	222	239	e210	e200	e220	334	336	203	199	198	276
3	221	229	258	e200	e200	220	353	285	200	191	188	236
4	231	241	248	e200	e200	217	313	260	193	186	214	224
5	230	385	240	e200	e200	217	323	253	189	398	243	215
6	217	365	233	e200	e200	225	286	253	191	509	204	217
7	218	277	233	e220	e200	250	269	248	208	427	192	217
8	215	259	227	e210	e200	244	277	240	204	433	196	206
9	253	259	226	e200	e200	222	330	243	193	357	212	198
10	236	256	231	e200	e200	220	410	231	187	275	194	194
11	224	255	230	e200	e200	213	362	255	186	241	187	188
12	215	246	226	e200	e200	214	331	306	190	221	187	188
13	211	251	217	e210	e200	214	487	255	229	206	189	193
14	212	256	220	e205	e200	211	498	232	258	202	207	381
15	210	271	221	e200	e200	215	444	236	209	210	195	402
16	266	291	221	e210	e200	214	427	246	202	203	187	328
17	264	265	219	e200	e200	211	339	236	187	196	181	257
18	234	246	220	e200	e220	225	297	228	183	214	178	237
19	222	247	227	e200	e300	207	292	229	176	211	246	223
20	219	261	229	e205	458	205	279	224	177	238	313	209
21	278	248	232	e210	435	267	261	218	174	216	309	203
22	294	251	221	e205	329	340	253	216	171	231	225	200
23	255	240	203	e205	e240	358	250	209	172	303	209	196
24	238	233	e200	e210	e220	341	261	208	184	324	204	190
25	231	221	194	e210	285	303	406	210	216	246	199	197
26	229	237	180	e190	e260	282	390	297	197	227	201	252
27	229	302	210	e200	e240	282	388	287	179	212	234	276
28	234	260	e220	e210	e230	271	298	231	181	210	407	260
29	231	238	e210	e200	---	269	278	219	324	221	259	251
30	237	231	e210	e200	---	260	268	220	328	197	227	222
31	232	---	e210	e200	---	267	---	217	---	191	403	---
TOTAL	7237	7769	6884	6330	6617	7624	10007	7630	6103	7915	6978	7253
MEAN	233	259	222	204	236	246	334	246	203	255	225	242
MAX	294	385	258	220	458	358	498	336	328	509	407	417
MIN	210	221	180	190	200	205	250	208	171	186	178	188
CFSM	1.18	1.31	1.12	1.03	1.19	1.24	1.68	1.24	1.03	1.29	1.14	1.22
IN.	1.36	1.46	1.29	1.19	1.24	1.43	1.88	1.43	1.15	1.49	1.31	1.36

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1994, BY WATER YEAR (WY)

MEAN	213	225	213	199	197	247	313	239	208	185	181	203
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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1942 - 1994

ANNUAL TOTAL	88403	88347	
ANNUAL MEAN	242	242	219
HIGHEST ANNUAL MEAN			268
LOWEST ANNUAL MEAN			167
HIGHEST DAILY MEAN	581	509	1080
LOWEST DAILY MEAN	175	171	113
ANNUAL SEVEN-DAY MINIMUM	180	177	118
INSTANTANEOUS PEAK FLOW		(a)557	1290
INSTANTANEOUS PEAK STAGE		(b)2.82	4.48
INSTANTANEOUS LOW FLOW		(c)138	(c)93
ANNUAL RUNOFF (CFSM)	1.22	1.22	1.10
ANNUAL RUNOFF (INCHES)	16.61	16.60	15.00
10 PERCENT EXCEEDS	323	324	294
50 PERCENT EXCEEDS	226	222	202
90 PERCENT EXCEEDS	191	194	159

(a) Gage height, 2.61 ft.

(b) Backwater from ice.

(c) Result of freezeup.

(e) Estimated.

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. Elevation of gage is 920 ft above sea level, from topographic map. September 1950 to October 1990, water-stage recorder at site 2.5 mi downstream at different datum (Station 04129000).

REMARKS.--Records good. Prior to May 16, 1957, and since Apr. 22, 1958, occasional regulation by Lansing Club Dam 1.0 mi upstream. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	78	67	77	75	70	73	113	101	64	79	60	179
2	76	80	79	72	66	76	121	128	60	64	62	99
3	74	76	87	68	68	70	129	112	65	55	59	80
4	80	80	84	66	67	74	123	102	56	61	73	71
5	76	151	82	67	68	71	111	84	61	329	99	67
6	75	139	85	65	67	77	101	95	60	486	66	71
7	72	90	76	74	67	84	107	82	67	197	58	74
8	62	84	78	68	67	83	92	88	60	184	62	70
9	84	85	76	69	68	75	106	84	58	126	69	64
10	76	86	78	68	67	78	153	76	60	89	62	57
11	75	89	78	69	64	73	82	82	54	69	60	65
12	83	84	67	68	66	72	121	130	60	69	58	64
13	63	87	74	71	69	72	216	100	69	65	61	65
14	64	89	81	70	66	73	210	85	87	57	62	295
15	70	99	68	68	66	73	213	92	65	60	65	195
16	95	101	74	71	67	71	210	108	60	63	54	135
17	81	93	74	67	67	70	123	80	55	62	60	93
18	78	79	74	69	73	71	110	85	54	67	50	81
19	75	81	79	69	105	69	102	84	51	85	104	77
20	74	87	84	68	177	71	109	65	51	89	90	70
21	100	83	75	71	156	104	84	76	50	74	130	73
22	108	94	76	69	86	134	93	78	49	92	88	69
23	84	85	63	68	79	130	84	56	49	184	77	66
24	77	84	80	71	73	139	87	70	50	120	60	69
25	75	71	67	69	97	103	248	68	68	82	61	68
26	72	84	65	61	86	103	220	99	63	69	64	89
27	66	115	70	65	80	93	171	98	59	64	67	110
28	84	88	77	71	77	101	108	80	56	60	109	102
29	72	82	71	69	---	106	88	75	154	61	80	105
30	76	81	70	66	---	85	108	64	113	59	77	71
31	82	---	69	66	---	85	---	68	---	72	154	---
TOTAL	2407	2694	2338	2128	2229	2659	4008	2695	1928	3293	2301	2794
MEAN	77.6	89.8	75.4	68.6	79.6	85.8	134	86.9	64.3	106	74.2	93.1
MAX	108	151	87	75	177	139	248	130	154	486	154	295
MIN	62	67	63	61	64	69	84	56	49	55	50	57
CFSM	1.35	1.56	1.31	1.19	1.38	1.49	2.32	1.51	1.11	1.84	1.29	1.61
IN.	1.55	1.74	1.51	1.37	1.44	1.71	2.58	1.74	1.24	2.12	1.48	1.80

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1951 - 1994, BY WATER YEAR (WY)

	MEAN	78.0	82.4	76.5	70.5	70.3	88.5	120	87.4	71.4	65.4	63.2	73.4
MAX	112	112	105	94.9	90.1	136	164	142	94.5	106	93.4	120	120
(WY)	1987	1989	1972	1973	1984	1976	1960	1983	1993	1994	1972	1961	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	53.2
(WY)	1964	1963	1959	1959	1957	1958	1987	1958	1958	1965	1958	1966	1966

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1951 - 1994
ANNUAL TOTAL	30848	31474	
ANNUAL MEAN	84.5	86.2	78.9
HIGHEST ANNUAL MEAN			90.7
LOWEST ANNUAL MEAN			62.3
HIGHEST DAILY MEAN	312	496	769
LOWEST DAILY MEAN	47	49	24
ANNUAL SEVEN-DAY MINIMUM	57	51	38
INSTANTANEOUS PEAK FLOW		600	(a)1500
INSTANTANEOUS PEAK STAGE		4.84	(b)6.80
INSTANTANEOUS LOW FLOW		33	(c)8.4
ANNUAL RUNOFF (CFSM)	1.46	1.49	1.37
ANNUAL RUNOFF (INCHES)	19.89	20.29	18.58
10 PERCENT EXCEEDS	126	120	110
50 PERCENT EXCEEDS	7	75	70
90 PERCENT EXCEEDS	60	61	55

(a) From rating curve extended above 500 ft³/s, result of failure of Lansing Club Dam; site then in use.

(b) From floodmark; site and datum then in use.

(c) Result of freezeup.

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 except for estimated daily discharges, which are fair. Flow completely regulated by Kleber Dam 400 ft upstream. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	243	256	249	216	e105	e240	422	480	228	252	308	548
2	241	205	272	201	e120	e250	438	479	201	307	276	560
3	242	204	258	208	e130	e255	466	480	199	238	233	506
4	241	273	291	204	e150	e240	496	479	192	200	291	469
5	220	303	286	192	191	236	476	468	191	269	342	395
6	187	350	256	188	184	245	476	415	190	433	326	277
7	186	407	258	184	166	309	465	397	190	479	304	248
8	228	404	259	e170	177	277	396	349	190	636	246	248
9	249	389	258	e165	167	298	392	334	190	682	248	325
10	230	350	257	e160	e175	314	433	353	186	664	294	232
11	222	318	229	e140	e180	292	486	332	155	570	243	217
12	251	298	212	e120	e160	296	493	322	174	508	235	205
13	218	276	214	e140	167	256	644	392	187	371	207	231
14	200	287	220	e180	167	219	784	413	229	263	195	259
15	201	330	251	193	174	246	863	352	252	255	197	313
16	227	318	242	e135	181	257	889	378	189	254	215	403
17	247	318	210	e130	182	291	858	374	172	225	213	464
18	247	318	238	e128	178	213	722	367	195	200	196	502
19	247	317	240	e125	209	263	625	341	182	324	186	479
20	248	321	241	e130	269	226	558	312	165	370	310	363
21	234	276	241	e125	440	302	501	265	165	257	449	252
22	303	281	246	e130	373	423	444	239	165	287	451	250
23	252	305	208	e125	392	587	380	253	157	315	309	214
24	330	269	161	e140	389	585	379	234	140	367	299	212
25	250	285	142	182	304	514	405	214	171	275	251	223
26	251	273	139	188	e260	482	496	242	217	371	251	247
27	244	294	119	182	e240	465	602	344	223	371	210	245
28	236	340	127	178	e250	401	634	327	215	220	325	385
29	210	254	214	e150	---	401	568	270	253	193	403	341
30	231	302	196	e145	---	372	510	230	253	206	354	277
31	256	---	206	e140	---	376	---	254	---	271	426	---
TOTAL	7372	9121	6940	4994	6080	10131	16301	10689	5816	10633	8793	9890
MEAN	238	304	224	161	217	327	543	345	194	343	284	330
MAX	330	407	291	216	440	587	889	480	253	682	451	560
MIN	186	204	119	120	105	213	379	214	140	193	186	205
CFSM	.76	.98	.72	.52	.70	1.05	1.75	1.11	.62	1.10	.91	1.06
IN.	.88	1.09	.83	.60	.73	1.21	1.95	1.28	.70	1.27	1.05	1.18

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1943 - 1994, BY WATER YEAR (WY)

MEAN	243	268	248	218	216	338	543	348	251	203	181	218
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	185	140	112	86.1	116
(WY)	1957	1950	1990	1948	1948	1956	1987	1987	1958	1966	1949	1949

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1943 - 1994

ANNUAL TOTAL	102830	106760	
ANNUAL MEAN	282	292	
HIGHEST ANNUAL MEAN			273
LOWEST ANNUAL MEAN			350
HIGHEST DAILY MEAN	811	Apr 25	1889
LOWEST DAILY MEAN	119	Dec 27	105
ANNUAL SEVEN-DAY MINIMUM	144	Aug 13	128
INSTANTANEOUS PEAK FLOW			960
INSTANTANEOUS PEAK STAGE			4.73
INSTANTANEOUS LOW FLOW			17
ANNUAL RUNOFF (CFSM)	.91		.94
ANNUAL RUNOFF (INCHES)	12.30		12.77
10 PERCENT EXCEEDS	481		477
50 PERCENT EXCEEDS	243		253
90 PERCENT EXCEEDS	170		167

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

442409084274001 LAKE ST. HELEN NEAR ST. HELEN, MI

LOCATION.--Lat 44°24'09", long 84°27'40", in SW1/4 NE1/4 sec.8, T.23 N., R.1 W., Roscommon County, Hydrologic Unit 04070007, at bridge 300 ft upstream from dam.

DRAINAGE AREA.--72.2 mi² at outlet.

PERIOD OF RECORD.--June 1942 to December 1959, August 1993 to current year.

GAGE.--Nonrecording gage. Datum of gage is 1,149.01 ft above sea level.

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, 1,154.15 ft, minimum winter level, 1,153.65 ft, above sea level.

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 observed, 6.75 ft, Aug. 21-31; minimum observed, 5.21 ft, Feb. 12.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.04	5.74	5.63	5.40	5.31	5.54	6.00	6.43	6.24	6.06	6.36	6.70
2	5.98	5.74	5.61	5.40	5.29	5.53	5.91	6.44	6.21	6.00	6.36	6.66
3	5.98	5.74	5.62	5.40	5.29	5.52	5.90	6.44	6.23	6.04	6.36	6.60
4	5.92	5.72	5.61	5.40	5.29	5.52	5.95	6.42	6.23	6.04	6.52	6.58
5	5.92	5.68	5.62	5.38	5.27	5.51	5.97	6.40	6.22	6.07	6.58	6.54
6	5.90	5.64	5.62	5.38	5.26	5.53	6.01	6.36	6.20	6.08	6.62	6.50
7	5.88	5.72	5.61	5.38	5.25	5.54	6.02	6.38	6.18	6.10	6.62	6.48
8	5.88	5.68	5.60	5.38	5.25	5.53	6.09	6.36	6.14	6.15	6.65	6.40
9	5.80	5.65	5.60	5.38	5.25	5.56	6.10	6.34	6.16	6.20	6.60	6.38
10	5.85	5.65	5.56	5.36	5.25	5.57	6.12	6.32	6.14	6.16	6.63	6.36
11	5.88	5.70	5.56	5.34	5.23	5.56	6.12	6.30	6.12	6.18	6.61	6.34
12	5.80	5.62	5.60	5.36	5.21	5.58	6.16	6.28	6.12	6.18	6.62	6.34
13	5.80	5.72	5.58	5.36	5.24	5.59	6.24	6.34	6.14	6.16	6.62	6.30
14	5.80	5.60	5.54	5.36	5.24	5.61	6.30	6.38	6.12	6.15	6.60	6.30
15	5.78	5.64	5.52	5.32	5.24	5.49	6.36	6.36	6.14	6.20	6.56	6.32
16	5.78	5.62	5.54	5.33	5.22	5.54	6.42	6.34	6.10	6.22	6.56	6.34
17	5.80	5.58	5.54	5.31	5.22	5.56	6.40	6.26	6.08	6.24	6.52	6.25
18	5.80	5.66	5.53	5.31	5.22	5.54	6.52	6.24	6.04	6.26	6.52	6.20
19	5.80	5.64	5.52	5.29	5.22	5.54	6.48	6.28	6.02	6.26	6.54	6.20
20	5.80	5.63	5.54	5.29	5.34	5.57	6.49	6.28	6.00	6.26	6.72	6.18
21	5.80	5.66	5.48	5.27	5.38	5.60	6.50	6.30	5.97	6.28	6.75	6.18
22	5.80	5.60	5.48	5.27	5.42	5.61	6.48	6.28	5.98	6.29	6.75	6.16
23	5.80	5.58	5.48	5.26	5.46	5.62	6.48	6.26	5.95	6.33	6.75	6.14
24	5.80	5.56	5.48	5.26	5.50	5.67	6.46	6.27	5.90	6.38	6.75	6.12
25	5.84	5.58	5.48	5.25	5.52	5.72	6.47	6.27	6.00	6.38	6.75	6.08
26	5.84	5.60	5.48	5.25	5.52	5.78	6.50	6.26	6.04	6.38	6.75	6.06
27	5.80	5.62	5.46	5.27	5.53	5.82	6.46	6.32	6.02	6.38	6.75	6.04
28	5.86	5.62	5.44	5.29	5.54	5.83	6.45	6.32	6.08	6.38	6.75	6.02
29	5.80	5.61	5.44	5.31	---	5.83	6.46	6.30	6.04	6.38	6.75	5.98
30	5.70	5.62	5.44	5.29	---	5.88	6.42	6.30	6.04	6.38	6.75	5.98
31	5.68	---	5.40	5.29	---	5.88	---	6.28	---	6.38	6.75	---
MEAN	5.84	5.65	5.54	5.33	5.32	5.62	6.27	6.33	6.09	6.22	6.63	6.29
MAX	6.04	5.74	5.63	5.40	5.54	5.88	6.52	6.44	6.24	6.38	6.75	6.70
MIN	5.68	5.56	5.40	5.25	5.21	5.49	5.90	6.24	5.90	6.00	6.36	5.98

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, nonrecording gage at same site and datum.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	230	230	235	176	e180	e210	344	385	190	175	182	293
2	227	225	240	172	e180	e210	361	386	183	163	180	281
3	221	228	245	171	e180	e210	381	377	179	151	179	272
4	218	228	244	173	e180	e210	392	361	177	146	208	263
5	211	242	240	170	e175	215	426	355	170	231	274	255
6	208	252	237	183	e175	229	423	350	170	387	282	249
7	206	252	234	177	e175	253	413	329	172	278	287	243
8	205	249	230	170	e175	259	394	320	172	289	289	241
9	210	242	225	e170	e175	257	375	313	174	281	268	235
10	212	236	227	e170	e175	e250	370	300	172	278	237	229
11	209	234	221	e170	e175	e240	365	309	172	259	222	225
12	207	230	198	171	e175	239	362	328	171	221	212	221
13	203	237	212	171	e175	e235	418	318	177	197	211	218
14	199	239	210	174	e175	234	448	311	181	184	225	224
15	195	246	210	174	e180	e225	488	304	177	189	213	232
16	200	249	209	e170	e185	219	546	305	171	204	205	247
17	221	250	208	e170	e185	219	539	297	164	243	196	245
18	240	248	209	e170	185	215	505	287	159	274	191	239
19	246	242	209	e170	185	200	470	271	154	255	230	232
20	250	248	210	e170	268	206	433	252	155	230	294	224
21	280	238	210	e175	296	251	403	239	154	219	301	218
22	278	241	207	e175	296	272	379	225	149	227	299	212
23	271	240	183	e175	e250	320	357	212	146	288	318	207
24	269	236	e180	e175	e220	386	355	201	153	276	326	202
25	256	229	e180	e175	e215	407	419	201	175	247	308	202
26	248	235	e180	e170	e210	394	458	228	174	228	299	211
27	247	262	e180	e170	e210	379	458	242	162	222	296	206
28	247	254	e180	e170	e210	354	439	241	159	222	296	209
29	247	249	e180	e175	---	345	412	221	202	210	291	206
30	242	248	e180	e180	---	341	388	209	191	200	287	205
31	234	---	181	e180	---	335	---	200	---	194	299	---
TOTAL	7137	7239	6494	5362	5565	8319	12521	8877	5105	7168	7905	6946
MEAN	230	241	209	173	199	268	417	286	170	231	255	232
MAX	280	262	245	183	296	407	546	386	202	387	326	293
MIN	195	225	180	170	175	200	344	200	146	146	179	202
CFSM	.57	.60	.52	.43	.50	.67	1.04	.71	.42	.58	.64	.58
IN.	.66	.67	.60	.50	.52	.77	1.16	.82	.47	.66	.73	.64

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1994, BY WATER YEAR (WY)

MEAN	217	243	240	199	186	263	406	287	210	169	150	179
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	152	124	107	119	119
(WY)	1967	1977	1977	1977	1978	1978	1987	1987	1977	1977	1989	1989

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1967 - 1994

ANNUAL TOTAL	89984	88638	
ANNUAL MEAN	247	243	229
HIGHEST ANNUAL MEAN			280
LOWEST ANNUAL MEAN			158
HIGHEST DAILY MEAN	501	Aug 31	1110
LOWEST DAILY MEAN	130	Aug 2	100
ANNUAL SEVEN-DAY MINIMUM	133	Jul 31	102
INSTANTANEOUS PEAK FLOW		(a)606	1120
INSTANTANEOUS PEAK STAGE		(b)6.86	(b)7.75
INSTANTANEOUS LOW FLOW		143	(c)
ANNUAL RUNOFF (CFSM)	.61	.61	.57
ANNUAL RUNOFF (INCHES)	8.35	8.22	7.76
10 PERCENT EXCEEDS	368	359	360
50 PERCENT EXCEEDS	234	225	202
90 PERCENT EXCEEDS	153	172	135

(a) Gage height, 5.94 ft.

(b) Backwater from ice.

(c) June 23, 24.

(d) 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 2.0 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, 4.10 ft, Apr. 19; minimum, 3.23 ft, Oct. 6, 28.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.31	3.32	3.47	3.59	---	3.80	3.89	3.91	3.53	3.46	3.51	3.56
2	3.33	3.29	3.48	3.60	---	3.79	3.89	3.89	3.50	3.45	3.50	3.55
3	3.31	3.30	3.48	3.60	---	3.78	3.89	3.87	3.47	3.43	3.48	3.53
4	3.33	3.32	3.48	3.60	---	3.79	3.88	3.85	3.46	3.43	3.49	3.52
5	3.32	3.41	3.48	3.61	---	3.78	3.91	3.85	3.44	3.55	3.48	3.50
6	3.29	3.41	3.48	3.62	---	3.80	3.91	3.84	3.48	3.63	3.45	3.51
7	3.31	3.37	3.49	3.63	---	3.80	3.90	3.83	3.48	3.63	3.43	3.49
8	3.32	3.37	3.48	3.63	---	3.80	3.90	3.80	3.46	3.66	3.44	3.49
9	3.37	3.38	3.48	3.63	---	3.79	3.90	3.81	3.44	3.68	3.44	3.49
10	3.32	3.38	3.49	3.63	---	3.79	3.90	3.78	3.43	3.68	3.41	3.47
11	3.29	3.38	3.49	3.63	---	3.79	3.90	3.78	3.41	3.63	3.40	3.46
12	3.32	3.38	3.48	3.63	---	3.79	3.90	3.81	3.40	3.62	3.39	3.45
13	3.29	3.38	3.48	3.63	---	3.80	3.96	3.77	3.42	3.60	3.38	3.46
14	3.28	3.41	3.48	3.64	---	3.80	3.98	3.74	3.42	3.57	3.40	3.51
15	3.28	3.43	3.48	3.64	---	3.81	4.00	3.75	3.42	3.56	3.38	3.53
16	3.31	3.41	3.47	3.64	---	3.81	4.01	3.76	3.42	3.54	3.36	3.54
17	3.33	3.43	3.47	3.64	---	3.80	4.02	3.73	3.42	3.53	3.36	3.55
18	3.31	3.41	3.48	3.67	---	3.82	3.98	3.71	3.41	3.54	3.35	3.53
19	3.31	3.42	3.48	3.68	3.73	3.82	4.00	3.69	3.39	3.56	3.44	3.51
20	3.31	3.45	3.49	3.68	3.74	3.82	3.99	3.67	3.36	3.56	3.46	3.49
21	3.33	3.43	3.49	3.68	3.75	3.86	3.97	3.66	3.35	3.57	3.47	3.48
22	3.35	3.45	3.50	3.68	3.76	3.89	3.95	3.65	3.31	3.59	3.45	3.46
23	3.33	3.44	3.49	3.68	3.78	3.89	3.89	3.63	3.29	3.61	3.43	3.46
24	3.33	3.45	3.51	3.70	3.80	3.90	3.89	3.61	3.31	3.61	3.42	3.45
25	3.33	3.43	3.51	3.70	3.80	3.90	3.95	3.60	3.34	3.59	3.42	3.44
26	3.32	3.45	3.55	3.70	3.80	3.89	3.96	3.62	3.30	3.56	3.43	3.46
27	3.34	3.47	3.55	3.70	3.80	3.90	3.97	3.59	3.29	3.55	3.45	3.45
28	3.30	3.47	3.55	3.71	3.80	3.90	3.93	3.56	3.30	3.52	3.52	3.47
29	3.32	3.47	3.55	3.72	---	3.90	3.90	3.54	3.46	3.50	3.50	3.46
30	3.34	3.47	3.57	---	---	3.90	3.90	3.53	3.48	3.51	3.49	3.44
31	3.34	---	3.57	---	---	3.89	---	3.54	---	3.52	3.56	---
MEAN	3.32	3.41	3.50	---	---	3.83	3.93	3.72	3.41	3.56	3.44	3.49
MAX	3.37	3.47	3.57	---	---	3.90	4.02	3.91	3.53	3.68	3.56	3.56
MIN	3.28	3.29	3.47	---	---	3.78	3.88	3.53	3.29	3.43	3.35	3.44

STREAMS TRIBUTARY TO LAKE HURON

04136500 AU SABLE RIVER AT MIO, MI

LOCATION.--Lat 44°39'36", long 84°07'52", in SE1/4 NE1/4 sec.12, T.26 N., R.2 E., Oscoda County, Hydrologic Unit 04070007, on right bank 150 ft upstream from bridge on State Highway 33 in Mio, 500 ft downstream from Mio hydroelectric plant, 9.5 mi downstream from Big Creek, and 73.0 mi upstream from mouth.

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

PERIOD OF RECORD.--July 1952 to current year.

GAGE.--Water-stage recorder. Datum of gage is 929.60 ft above sea level.

REMARKS.--Records good. Flow regulated by Mio Dam 500 ft upstream. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1000	995	1060	982	815	1060	1270	1440	942	1190	1090	1460
2	1000	979	1050	961	852	1070	1360	1490	918	1080	1040	1280
3	949	1000	1050	917	897	1040	1460	1510	900	1010	1040	1160
4	949	1020	1070	915	863	1040	1460	1440	893	937	1100	1160
5	948	1160	1070	907	840	1020	1620	1330	893	1460	1290	1110
6	939	1210	1060	849	860	1020	1520	1400	894	2720	1290	1090
7	924	1150	1050	874	841	1050	1430	1370	914	2990	1180	1060
8	924	1140	1020	923	812	1100	1380	1320	917	2590	1200	1030
9	933	1100	999	816	824	1110	1380	1270	905	2910	1230	1020
10	948	1070	1010	796	800	1050	1430	1170	900	2480	1140	999
11	951	1070	1010	930	821	1030	1430	1190	881	1770	1090	981
12	941	1060	923	965	863	1010	1350	1260	875	1420	1040	980
13	918	1060	938	905	854	1000	1840	1290	888	1380	1020	978
14	918	1080	987	831	822	1000	2050	1240	965	1330	1130	1100
15	917	1120	987	759	846	1000	1950	1200	950	1290	1110	1160
16	939	1170	987	763	871	969	2150	1240	930	1220	1050	1280
17	1080	1140	987	812	869	882	1990	1210	894	1260	1020	1220
18	1200	1090	979	890	910	989	1760	1170	863	1570	959	1120
19	1120	1050	979	790	971	1040	1650	1110	860	1480	1030	1070
20	1070	1070	987	779	1650	956	1560	1090	853	1320	1470	1030
21	1180	1080	1010	851	1660	1050	1450	1080	836	1200	1890	1000
22	1230	1080	986	873	1270	1270	1210	1040	839	1260	1360	991
23	1170	1080	861	922	1110	1490	1250	993	839	1350	1130	980
24	1130	1080	883	910	916	1560	1270	980	863	1610	1160	980
25	1080	1080	862	887	952	1510	1980	959	978	1400	1170	980
26	1050	1060	724	865	1010	1410	2140	1010	1010	1260	1160	991
27	1040	1090	655	837	961	1400	2050	1200	939	1150	1160	1150
28	1030	1190	785	898	999	1310	1800	1120	857	1140	1640	1240
29	1000	1150	899	895	---	1290	1570	999	1240	1150	1270	1140
30	1000	1090	907	798	---	1310	1450	926	1320	1090	1270	1070
31	1000	---	926	740	---	1270	---	923	---	1110	1320	---
TOTAL	31478	32714	29701	26840	26759	35306	48210	36970	27756	47127	37049	32810
MEAN	1015	1090	958	866	956	1139	1607	1193	925	1520	1195	1094
MAX	1230	1210	1070	982	1660	1560	2150	1510	1320	2990	1890	1460
MIN	917	979	655	740	800	882	1210	923	836	937	959	978
CFSM	.92	.99	.87	.79	.87	1.04	1.46	1.08	.84	1.38	1.09	.99
IN.	1.06	1.11	1.00	.91	.90	1.19	1.63	1.25	.94	1.59	1.25	1.11

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1994, BY WATER YEAR (WY)

MEAN	952	1003	976	897	883	1097	1477	1167	998	883	833	890
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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1952 - 1994

ANNUAL TOTAL	398885	412720	1004
ANNUAL MEAN	1093	1131	1213
HIGHEST ANNUAL MEAN			746
LOWEST ANNUAL MEAN			4110
HIGHEST DAILY MEAN	2450	2990	4110
LOWEST DAILY MEAN	655	655	21
ANNUAL SEVEN-DAY MINIMUM	802	803	420
INSTANTANEOUS PEAK FLOW		3330	4380
INSTANTANEOUS PEAK STAGE		5.54	6.16
INSTANTANEOUS LOW FLOW		35	7.0
ANNUAL RUNOFF (CFSM)	.99	1.03	.91
ANNUAL RUNOFF (INCHES)	13.49	13.96	12.41
10 PERCENT EXCEEDS	1480	1460	1370
50 PERCENT EXCEEDS	1030	1050	930
90 PERCENT EXCEEDS	844	863	720

STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI
(National stream quality accounting network station)

LOCATION.--Lat 44°26'09", long 83°26'28", in NE1/4 NW1/4 sec.35, T.24 N., R.8 E., Iosco County, Hydrologic Unit 04070007, at bridge on Rea Road, 5.5 mi northwest of Au Sable, and 10.4 mi upstream from mouth.

DRAINAGE AREA.--1,540 mi², approximately.

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.

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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	867	1830	1860	1470	1150	1640	1780	1790	1260	1840	1650	2160
2	1360	2490	1710	1580	1230	1820	1980	2170	928	1810	1640	2060
3	1610	2560	1360	1410	1230	1450	2050	2030	1110	1670	1410	1820
4	1230	1820	1280	1280	1280	1450	2080	2080	1260	1350	1650	1820
5	1340	1980	1460	1210	1440	1760	2270	2030	1260	1720	1990	1680
6	1230	1530	1310	1090	1330	1520	2280	1910	1420	2930	1970	1320
7	891	1070	1470	1350	1200	1360	2190	1970	1590	4710	1870	1240
8	1020	950	1590	1540	1190	1640	2000	1800	1350	4490	1830	1520
9	1370	924	1220	1150	1250	1760	1890	1700	1220	3360	1780	1630
10	1530	921	1340	896	1290	1590	1920	1760	1240	3330	1750	1530
11	1530	870	1600	1320	1240	1370	1910	1800	1190	3000	1700	1520
12	1470	824	1250	1500	1250	1210	1920	1790	1170	2220	1620	1700
13	1270	1230	1110	1470	1270	1510	2430	1790	1240	1670	1380	1230
14	1040	1550	1450	1090	1280	1710	3170	1830	1560	1790	1240	1450
15	1310	1590	1560	1000	1260	1660	3210	1810	1620	1920	1560	1710
16	1360	1570	1490	1050	1260	1530	3090	1800	1500	2020	1730	1790
17	1570	1520	1320	1100	1390	1260	2470	1750	1400	1990	1680	1870
18	1950	1550	1250	1200	1490	1410	2160	1690	1110	2220	1610	1740
19	1800	1310	1500	1210	1360	1660	2250	1430	920	2070	1570	1440
20	1610	1500	1580	1260	2390	1590	2230	1580	923	1900	2170	1490
21	1670	1650	1470	1340	2950	1670	1980	1850	1030	1930	2720	1550
22	1740	1450	1430	1470	2210	1830	1760	1760	1200	1980	2520	1670
23	1710	1430	1410	1240	2030	1930	1750	1250	1180	1990	2000	1840
24	1910	1510	1160	1030	1410	2120	1710	1130	1200	2030	1970	1270
25	2290	1530	1130	1540	801	2280	2520	1260	1660	2020	1770	944
26	2480	1500	1160	1600	1100	2180	3170	1470	1770	1930	1640	1440
27	2310	1570	914	1070	1250	2050	2920	1660	1550	1640	1750	1720
28	1100	1820	1090	1610	1780	1870	2680	1670	1370	1590	1930	1680
29	455	1540	1160	1820	---	2040	2290	1690	1260	1700	2550	1680
30	585	1800	1250	1220	---	2070	1720	1610	1590	1770	2230	1630
31	853	---	1340	950	---	1770	---	1550	---	1750	1970	---
TOTAL	44461	45389	42204	40066	40311	52710	67780	53410	39081	68340	56850	48144
MEAN	1434	1513	1361	1292	1440	1700	2259	1723	1303	2205	1834	1605
MAX	2480	2560	1860	1820	2950	2280	3210	2170	1770	4710	2720	2160
MIN	455	824	914	896	801	1210	1710	1130	920	1350	1240	944
CFSM	.93	.98	.88	.84	.93	1.10	1.47	1.12	.85	1.43	1.19	1.04
IN.	1.07	1.10	1.02	.97	.97	1.27	1.64	1.29	.94	1.65	1.37	1.16

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1994, BY WATER YEAR (WY)

	1987	1988	1989	1990	1991	1992	1993	1994
MEAN	1437	1636	1514	1395	1323	1762	2162	1637
MAX	1770	1944	1870	1527	1440	2097	2441	1773
(WY)	1992	1992	1992	1992	1994	1990	1992	1991
MIN	1152	1100	1132	1259	1224	1533	1684	1456
(WY)	1990	1990	1990	1991	1989	1993	1990	1989

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1987 - 1994
ANNUAL TOTAL	570129	598746	
ANNUAL MEAN	1562	1640	1528
HIGHEST ANNUAL MEAN			1640
LOWEST ANNUAL MEAN			1397
HIGHEST DAILY MEAN	3360	4710	5430
LOWEST DAILY MEAN	455	455	455
ANNUAL SEVEN-DAY MINIMUM	970	970	656
INSTANTANEOUS PEAK FLOW		5320	5850
INSTANTANEOUS LOW FLOW		15.43	16.27
ANNUAL RUNOFF (CFSM)	1.01	1.07	.99
ANNUAL RUNOFF (INCHES)	13.77	14.46	13.48
10 PERCENT EXCEEDS	2090	2180	2090
50 PERCENT EXCEEDS	1500	1590	1440
90 PERCENT EXCEEDS	1110	1130	1050

(a) Oct. 28, 29.

STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1978 to August 1994 (discontinued).

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: April 1978 to September 1981.

WATER TEMPERATURE: April 1978 to September 1981.

REMARKS.--Cross-sectional samples were collected at bridge.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1978-79): Maximum daily, 346 microsiemens, Nov. 21, 1978; minimum daily, 229 microsiemens, Apr. 19, 21, 1979.

WATER TEMPERATURE (water years 1979-80): Maximum measured, 28.0°C, Aug. 8, 1979; minimum daily, 0.0°C on many days during winter.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--Specific conductance of 354 microsiemens was measured Feb. 3, 1988.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

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, KF AGAR (COLS. PER 100 ML) (31673)
OCT 26...	1115	2490	311	8.1	9.5	0.30	10.6	96	<1	K6
DEC 09...	1300	1010	308	8.1	3.0	0.20	13.2	101	<1	<1
FEB 09...	1200	1280	338	8.0	0.5	0.30	12.0	85	<1	<1
MAY 19...	1330	1240	262	8.2	14.0	0.70	10.5	104	<1	K2
AUG 16...	1245	1720	296	8.2	21.5	1.0	7.9	91	K4	K2

DATE	HARD- NESS TOTAL (MG/L AS CACO3) (00900)	HARD- NESS NONCARB DISSOLV FLD. AS CACO3 (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 CACO3 HCO3 (00453)	ALKA- LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)
OCT 26...	150	12	45	10	4.4	0.50	173	142	8.4	7.5
DEC 09...	150	12	44	10	4.5	0.70	170	139	8.9	5.5
FEB 09...	170	10	48	11	4.6	0.60	189	155	10	6.1
MAY 19...	130	11	39	8.8	3.5	0.70	150	123	7.8	4.7
AUG 16...	140	7	41	9.0	3.6	0.50	161	132	7.1	4.7

DATE	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SiO2) (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, NO2+NO3 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 26...	0.20	8.4	181	0.25	1220	<0.010	<0.050	0.010	<0.20	<0.010
DEC 09...	<0.10	8.7	174	0.24	474	0.010	0.068	0.020	<0.20	<0.010
FEB 09...	<0.10	8.9	194	0.26	670	0.020	0.130	0.030	<0.20	0.020
MAY 19...	<0.10	6.4	167	0.23	559	0.020	<0.050	0.060	0.20	0.030
AUG 16...	<0.10	9.6	171	0.23	794	<0.010	<0.050	0.030	0.30	0.020

STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

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 26...	<0.010	0.010	<10	21	<3	7	<4	<1	<10
DEC 09...	<0.010	<0.010	--	--	--	--	--	--	--
FEB 09...	<0.010	<0.010	<10	20	<3	22	<4	10	<10
MAY 19...	<0.010	<0.010	<10	16	<3	14	<4	2	<10
AUG 16...	0.030	<0.010	<10	18	<3	8	<4	4	<10

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 26...	<1	<1	<1.0	69	<6	5	34	40
DEC 09...	--	--	--	--	--	3	8.2	58
FEB 09...	<1	<1	<1.0	72	<6	8	28	88
MAY 19...	<1	<1	<1.0	56	<6	3	10	53
AUG 16...	<1	<1	<1.0	60	<6	1	4.6	57

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. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	192	211	249	e200	e250	e400	599	363	194	258	194	217
2	188	227	246	e200	e240	e380	622	394	184	207	227	204
3	184	257	288	e190	e230	e370	657	350	178	177	214	185
4	182	261	284	e190	e220	e370	582	310	174	167	265	176
5	180	278	267	e190	e215	e370	541	297	173	179	463	174
6	176	321	256	e190	e210	e550	529	321	176	224	386	172
7	177	285	261	e190	e205	e700	456	310	181	323	267	168
8	178	255	255	e190	e200	e950	408	292	177	559	217	161
9	194	250	243	e190	e195	e700	387	282	169	694	228	156
10	213	243	e235	e190	e195	e540	406	263	164	505	215	155
11	194	247	e200	e190	e195	e480	392	288	161	344	200	155
12	188	243	e180	e190	e195	e440	371	431	162	269	194	154
13	186	253	e190	e190	e195	e480	700	365	166	212	191	156
14	181	298	e210	e190	e195	e560	1030	324	181	201	193	159
15	178	316	217	e185	e195	e440	835	302	174	251	188	200
16	189	317	221	e180	e195	e370	763	302	167	378	175	224
17	281	277	222	e175	e200	e310	660	280	158	316	169	185
18	468	256	224	e170	e230	e290	506	249	150	456	165	173
19	360	245	230	e165	e300	e290	428	237	148	377	180	163
20	281	248	236	e165	e400	e300	379	227	148	325	413	160
21	352	241	248	e160	e800	e420	340	222	150	401	600	158
22	398	242	e220	e160	e1200	905	312	215	144	372	402	158
23	313	234	e170	e160	e900	1210	298	205	141	325	255	156
24	295	228	e180	e160	e600	1290	289	196	186	300	213	158
25	292	221	e190	e160	e520	975	355	201	405	288	195	167
26	267	238	e200	e160	e490	771	557	262	354	255	192	172
27	254	365	e205	e160	e450	699	543	349	246	227	220	196
28	242	363	e210	e200	e420	653	443	269	209	217	211	230
29	233	290	e205	e250	---	650	381	234	266	226	216	212
30	224	263	e200	e260	---	612	352	217	312	202	187	188
31	214	---	e200	e260	---	587	---	207	---	192	189	---
TOTAL	7454	7973	6942	5810	9840	18062	15121	8764	5798	9427	7624	5292
MEAN	240	266	224	187	351	583	504	283	193	304	246	176
MAX	468	365	288	260	1200	1290	1030	431	405	694	600	230
MIN	176	211	170	160	195	290	289	196	141	167	165	154
CFSM	.75	.83	.70	.59	1.10	1.82	1.58	.88	.60	.95	.77	.55
IN.	.87	.93	.81	.68	1.14	2.10	1.76	1.02	.67	1.10	.89	.62

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1937 - 1994, BY WATER YEAR (WY)

	MEAN	242	293	289	248	279	566	647	394	286	195	178	206
MAX	741	826	579	538	741	1035	1160	859	842	335	282	712	
(WY)	1987	1993	1992	1973	1938	1991	1959	1983	1945	1969	1956	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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1937 - 1994

ANNUAL TOTAL	123251												
ANNUAL MEAN	338												
HIGHEST ANNUAL MEAN										(a)319			
LOWEST ANNUAL MEAN										501			1991
HIGHEST DAILY MEAN	1750									166			1964
LOWEST DAILY MEAN	150									4500			Mar 28 1950
ANNUAL SEVEN-DAY MINIMUM	156									98			Jul 30 1964
INSTANTANEOUS PEAK FLOW										105			Jul 26 1964
INSTANTANEOUS PEAK STAGE							(b)1360			(c)5340			Mar 28 1950
INSTANTANEOUS LOW FLOW							(d)7.08			13.74			Mar 28 1950
ANNUAL RUNOFF (CFSM)	1.06						139			(f)75			Nov 22 1964
ANNUAL RUNOFF (INCHES)	14.33						.93			1.00			
10 PERCENT EXCEEDS	661						12.57			13.56			
50 PERCENT EXCEEDS	250						524			562			
90 PERCENT EXCEEDS	179						230			230			
							167			150			

(a) Does not include water year 1937.

(b) Gage height, 5.79 ft.

(c) From rating curve extended above 3,800 ft³/s.

(d) Backwater from ice.

(e) Estimated.

(f) June 22, 23.

(g) Result of freezeup.

STREAMS TRIBUTARY TO LAKE HURON

04143900 SHIAWASSEE RIVER AT LINDEN, MI

LOCATION.--Lat 42°48'56", long 83°48'08", in SW1/4 sec.19, T.5 N., R.6 E., Genesee County, Hydrologic Unit 04080203, on right bank at upstream side of bridge on Hogan Road, 1.0 mi west of Linden.

DRAINAGE AREA.--83.7 mi².

PERIOD OF RECORD.--October 1967 to September 1994 (discontinued).

REVISED RECORDS.--WDR MI-87-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 844.96 ft above sea level.

REMARKS.--Records good except for estimated daily discharges, which are poor. Flow regulated by dam at Linden since 1967. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	107	78	79	50	109	129	143	161	33	163	51	34
2	101	78	85	47	105	117	141	170	33	157	54	33
3	93	74	87	42	96	111	140	171	33	144	52	33
4	86	71	89	e40	e83	84	137	169	33	133	51	33
5	78	66	90	e40	e74	83	135	165	32	134	56	33
6	70	61	89	e40	e66	103	121	159	31	139	54	32
7	66	59	91	e39	63	103	108	154	31	143	50	32
8	62	57	91	39	e59	102	88	150	31	155	44	31
9	61	54	90	40	e54	128	88	139	30	134	48	31
10	60	53	90	e40	e49	146	83	128	30	115	49	31
11	56	54	89	e40	47	167	79	121	30	102	44	31
12	51	64	88	e40	e45	152	78	117	32	92	43	30
13	50	90	87	e41	e44	151	89	109	40	83	47	30
14	50	98	79	e41	44	148	94	104	49	76	51	30
15	51	94	72	e41	e43	145	92	97	50	69	50	32
16	56	44	69	e41	e42	140	90	89	53	53	50	31
17	64	43	68	e40	e41	118	89	80	58	51	50	32
18	72	51	68	e40	40	115	90	68	76	52	50	30
19	78	60	68	e40	60	112	92	54	91	48	50	30
20	81	65	68	e39	86	111	92	39	97	49	54	30
21	96	67	69	e39	74	123	89	30	82	62	61	29
22	107	67	72	e38	94	122	84	32	64	68	61	29
23	111	70	72	e38	123	112	81	37	58	70	56	30
24	114	70	71	e38	145	119	74	44	60	71	50	29
25	113	66	71	e38	162	121	80	44	94	71	50	30
26	113	66	e69	e41	e169	131	86	35	165	69	49	32
27	104	73	e66	51	e170	136	102	31	170	63	49	37
28	91	71	e62	76	e154	138	109	32	167	58	49	39
29	82	69	e54	117	---	143	125	32	169	52	42	37
30	78	74	52	132	---	152	143	33	166	51	40	38
31	78	---	52	120	---	152	---	33	---	51	40	---
TOTAL	2480	2007	2347	1548	2341	3914	3052	2827	2088	2778	1545	959
MEAN	80.0	66.9	75.7	49.9	83.6	126	102	91.2	69.6	89.6	49.8	32.0
MAX	114	98	91	132	170	167	143	171	170	163	61	39
MIN	50	43	52	38	40	83	74	30	30	48	40	29
CFSM	.96	.80	.90	.60	1.00	1.51	1.22	1.09	.83	1.07	.60	.38
IN.	1.10	.89	1.04	.69	1.04	1.74	1.36	1.26	.93	1.23	.69	.43

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1968 - 1994, BY WATER YEAR (WY)

MEAN	49.5	62.5	68.7	64.5	66.8	110	119	70.6	49.4	35.8	25.4	36.4
MAX	158	118	121	135	140	208	234	149	117	89.6	77.6	144
(WY)	1982	1989	1976	1973	1976	1976	1975	1974	1989	1994	1992	1975
MIN	16.1	23.1	39.7	26.4	24.8	55.8	76.2	28.9	12.0	7.70	3.28	5.91
(WY)	1979	1979	1970	1984	1980	1969	1968	1977	1971	1988	1971	1969

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1968 - 1994

ANNUAL TOTAL	29527	27886	
ANNUAL MEAN	80.9	76.4	63.2
HIGHEST ANNUAL MEAN			89.7
LOWEST ANNUAL MEAN			41.3
HIGHEST DAILY MEAN	253	171	472
LOWEST DAILY MEAN	19	29	.91
ANNUAL SEVEN-DAY MINIMUM	20	30	1.4
INSTANTANEOUS PEAK FLOW		(a)173	476
INSTANTANEOUS PEAK STAGE		(b)5.67	7.43
INSTANTANEOUS LOW FLOW		29	.74
ANNUAL RUNOFF (CFSM)	.97	.91	.75
ANNUAL RUNOFF (INCHES)	13.12	12.39	10.25
10 PERCENT EXCEEDS	140	140	123
50 PERCENT EXCEEDS	72	68	51
90 PERCENT EXCEEDS	36	33	18

(a) Gage height, 5.44 ft.

(b) Backwater from ice.

(c) Sept. 21-25.

(d) May 22, 23, 1971.

(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 about 800 ft³/s by powerplant at Shiawassee town prior to February 1953; occasional regulation at low stages since. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	843	384	589	e200	e580	703	693	1530	184	1030	213	303
2	812	344	521	e200	e480	617	646	1420	144	815	192	284
3	740	345	501	e200	e430	535	642	1140	125	677	222	259
4	623	341	502	e200	e360	501	670	954	125	529	574	227
5	497	343	544	e180	e320	516	667	787	144	781	447	211
6	373	339	536	e170	e295	1330	546	767	172	865	377	202
7	331	331	538	e170	e265	2170	498	730	145	1840	368	199
8	321	325	509	e171	e235	1690	471	643	127	2950	329	183
9	324	313	474	e171	e220	1440	424	648	123	2080	298	152
10	330	298	463	e173	e205	1280	406	712	126	1860	273	132
11	349	283	444	e175	e200	1190	383	721	123	1770	259	125
12	377	284	401	e178	e199	1020	436	620	127	1480	255	120
13	353	295	376	e179	e198	1010	942	528	160	1130	279	118
14	312	298	349	e180	e199	953	955	469	222	772	327	170
15	281	312	338	e180	e205	819	885	445	448	606	321	183
16	256	319	335	e178	e210	679	930	418	690	525	380	186
17	790	328	340	e174	e270	628	734	389	843	472	444	197
18	835	323	348	e171	517	597	626	365	540	426	438	191
19	570	312	353	e168	1110	541	549	348	347	356	384	189
20	543	304	343	e167	2330	503	488	334	288	367	613	147
21	945	299	338	e167	2070	869	434	276	282	642	831	96
22	839	292	334	e168	1640	1260	413	206	276	577	508	114
23	663	289	308	e168	1520	1180	390	188	233	633	410	100
24	636	289	257	e169	1500	1270	411	209	885	707	425	93
25	594	290	254	e170	1280	1270	493	214	1950	618	350	107
26	538	333	190	e179	999	1110	1570	250	2310	573	301	113
27	488	594	e200	316	760	992	1560	263	1650	518	255	162
28	452	719	e210	482	694	928	1450	239	1450	500	215	262
29	428	651	e210	805	---	894	1250	220	1770	340	214	348
30	426	640	e200	821	---	788	1180	201	1450	255	244	355
31	430	---	e200	e680	---	731	---	193	---	224	303	---
TOTAL	16299	10817	11505	7710	19291	30014	21432	16427	17459	26918	11049	5528
MEAN	526	361	371	249	689	968	714	530	582	868	356	184
MAX	945	719	589	821	2330	2170	1570	1530	2310	2950	831	355
MIN	256	283	190	167	198	501	383	188	123	224	192	93
CFSM	.98	.67	.69	.46	1.28	1.80	1.33	.98	1.08	1.61	.66	.34
IN.	1.13	.75	.80	.53	1.33	2.08	1.48	1.14	1.21	1.86	.76	.38

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1994, BY WATER YEAR (WY)

MEAN	195	254	315	343	448	764	728	452	275	167	120	146
MAX	1442	985	922	1066	1728	1682	2060	1950	1051	868	578	922
(WY)	1982	1993	1976	1963	1938	1948	1947	1956	1989	1994	1992	1975
MIN	32.6	52.1	56.6	66.9	65.5	119	162	119	34.0	24.0	13.2	25.0
(WY)	1964	1964	1964	1940	1940	1964	1931	1958	1934	1934	1931	1931

SUMMARY STATISTICS FOR 1993 CALENDAR YEAR FOR 1994 WATER YEAR WATER YEARS 1931 - 1994

ANNUAL TOTAL	208171		194449			
ANNUAL MEAN	570		533		353	
HIGHEST ANNUAL MEAN					629	1993
LOWEST ANNUAL MEAN					97.7	1964
HIGHEST DAILY MEAN	2700	Apr 20	2950	Jul 8	5920	Apr 6 1947
LOWEST DAILY MEAN	107	Aug 18	93	Sep 24	2.0	Jul 28 1934
ANNUAL SEVEN-DAY MINIMUM	128	Aug 12	110	Sep 20	7.7	Aug 11 1936
INSTANTANEOUS PEAK FLOW			3210	Jul 8	6240	Apr 6 1947
INSTANTANEOUS PEAK STAGE			7.67	Jul 8	10.35	Apr 6 1947
INSTANTANEOUS LOW FLOW			89	Sep 21	.20	Jul 27 1934
ANNUAL RUNOFF (CFSM)	1.06		.99		.66	
ANNUAL RUNOFF (INCHES)	14.39		13.45		8.90	
10 PERCENT EXCEEDS	1140		1130		795	
50 PERCENT EXCEEDS	401		377		199	
90 PERCENT EXCEEDS	200		171		64	

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04145000 SHIAWASSEE RIVER NEAR FERGUS, MI

LOCATION.--Lat 43°15'17", long 84°06'20", in sec.22, T.10 N., R.3 E., Saginaw County, Hydrologic Unit 04080203, on right bank at downstream side of bridge on Fergus Road, 1.2 mi east of Fergus, 1.8 mi upstream from Bear Creek, and 14 mi upstream from mouth.

DRAINAGE AREA.--637 mi².

PERIOD OF RECORD.--October 1939 to September 1984, October 1988 to September 1994 (discontinued). Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1337: 1940(M), 1941-42, 1943(M), 1944, 1945(M), 1946, 1947(M), 1948, 1950. WSP 1627: 1952, 1954(M), 1957.

GAGE.--Water-stage recorder. Datum of gage is 585.80 ft above sea level. Prior to Aug. 22, 1968, nonrecording gage at same site and datum. Prior to Oct. 1, 1970, at datum 2.00 ft higher.

REMARKS.--Records good except for estimated daily discharges, which are poor. Some regulation at low stages by powerplant at Shiawassee town prior to February 1953; occasional regulation at low stages since. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1000	e550	663	e210	e640	1650	941	1780	240	e1600	302	322
2	1030	e490	612	e210	e520	1580	873	1830	228	e1200	324	301
3	972	e450	589	e215	e450	1420	832	1510	188	e1000	282	284
4	895	e435	577	e210	e370	1400	846	1250	175	e760	597	254
5	743	e430	592	e200	e330	1350	864	1100	169	e820	1140	228
6	613	e425	606	e190	e300	1910	787	961	193	e1000	631	215
7	502	e415	600	e180	e250	3970	662	961	205	e1500	530	213
8	472	e400	585	e180	e220	4110	627	876	176	e2700	477	207
9	473	e390	545	e180	e200	3050	601	803	160	e3600	431	195
10	477	e370	506	e185	e190	2660	567	828	158	e2600	385	169
11	497	337	508	e185	e180	2400	531	901	157	e2300	353	152
12	506	323	460	e190	e175	2290	544	928	152	e2100	339	147
13	538	333	420	e190	e175	1560	1190	739	160	e1700	405	143
14	496	341	409	e190	e180	1320	1470	638	213	e1160	465	144
15	454	353	385	e190	e190	1200	1190	582	289	909	434	188
16	420	358	365	e190	e200	1040	1210	555	549	771	432	189
17	1060	365	357	e185	e300	877	1040	519	823	688	489	199
18	2080	372	368	e185	e520	827	868	482	806	630	521	195
19	1150	360	375	e180	1040	764	755	452	482	561	487	193
20	862	346	377	e180	3780	706	660	428	358	501	498	192
21	1140	330	368	e180	4620	1050	591	392	309	654	1040	165
22	1330	333	364	e180	3640	1770	543	311	301	805	770	132
23	1000	314	e320	e180	2680	1530	514	248	284	727	542	138
24	868	314	e290	e180	2460	1520	492	245	e1050	801	495	134
25	821	313	e260	e180	2430	1540	545	274	e2180	809	461	132
26	755	336	e215	e190	2050	1420	1920	303	e2600	711	408	138
27	691	538	e205	e200	1790	1290	2080	313	e2750	667	367	154
28	639	819	e220	e450	1590	1250	1640	320	e2000	626	296	188
29	587	759	e230	e660	---	1200	1490	284	e2000	550	261	269
30	571	699	e220	e840	---	1120	1470	264	e2200	401	252	325
31	e560	---	e210	e740	---	1010	---	244	---	329	286	---
TOTAL	24202	12598	12801	7805	31470	50784	28343	21321	21555	35180	14700	5905
MEAN	781	420	413	252	1124	1638	945	688	718	1135	474	197
MAX	2080	819	663	840	4620	4110	2080	1830	2750	3600	1140	325
MIN	420	313	205	180	175	706	492	244	152	329	252	132
CFSM	1.23	.86	.65	.40	1.76	2.57	1.48	1.08	1.13	1.78	.74	.31
IN.	1.41	.74	.75	.46	1.84	2.97	1.66	1.25	1.26	2.05	.86	.34

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1940 - 1994, BY WATER YEAR (WY)

	MEAN	241	322	396	427	553	1005	941	597	344	222	149	175
MAX	1921	1286	1274	1358	1843	2047	2564	2532	1212	1135	669	1271	
(WY)	1982	1993	1976	1993	1976	1976	1947	1956	1989	1994	1992	1975	
MIN	40.6	58.9	62.9	80.5	76.4	140	253	155	86.1	42.1	42.2	42.1	
(WY)	1965	1965	1964	1940	1940	1964	1946	1958	1941	1965	1964	1964	

SUMMARY STATISTICS FOR 1993 CALENDAR YEAR FOR 1994 WATER YEAR WATER YEARS 1940 - 1994

ANNUAL TOTAL	263408	266664	
ANNUAL MEAN	722	731	(a)451
HIGHEST ANNUAL MEAN			797
LOWEST ANNUAL MEAN			118
HIGHEST DAILY MEAN	3730	Apr 21	7290
LOWEST DAILY MEAN	143	Aug 19	29
ANNUAL SEVEN-DAY MINIMUM	157	Aug 13	35
INSTANTANEOUS PEAK FLOW			4730
INSTANTANEOUS PEAK STAGE			12.25
INSTANTANEOUS LOW FLOW			129
ANNUAL RUNOFF (CFSM)	1.13	1.15	(d)
ANNUAL RUNOFF (INCHES)	15.38	15.57	.71
10 PERCENT EXCEEDS	1470	1590	1050
50 PERCENT EXCEEDS	503	496	240
90 PERCENT EXCEEDS	229	185	78

(a) Does not include water year 1940.

(b) Including overflow by-passing gage.

(c) Present datum.

(d) Sept. 22, 24, 25.

(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. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	45	33	34	e12	e40	e110	81	175	17	111	19	11
2	37	29	34	e12	e35	e100	77	152	15	93	19	10
3	32	29	32	e11	e30	e90	73	135	14	73	16	9.0
4	29	29	33	e11	e26	e83	69	107	12	56	23	8.2
5	25	29	33	e11	e24	e100	64	87	11	47	26	7.7
6	23	28	33	e11	e21	e140	60	72	10	50	28	7.7
7	22	27	34	e11	e18	e170	55	68	9.3	90	27	7.1
8	18	26	34	e11	e17	e200	50	69	8.8	100	24	7.2
9	18	25	34	e10	e16	e170	46	69	7.9	93	22	9.0
10	20	24	33	e10	e16	e150	42	68	7.4	79	20	9.4
11	21	22	31	e10	e15	e130	40	64	6.5	63	18	9.5
12	21	20	29	e10	e15	e100	42	59	5.9	52	16	9.3
13	19	21	28	e10	e15	e90	48	55	6.8	43	21	8.8
14	17	20	27	e9.9	e15	e78	52	50	10	35	29	12
15	17	21	27	e9.8	e15	e68	60	46	17	29	27	11
16	26	23	26	e9.6	e16	e62	65	41	21	26	27	11
17	52	24	26	e9.5	e17	e56	63	38	21	23	24	12
18	48	24	26	e9.2	e23	e52	60	35	19	21	21	11
19	46	25	25	8.9	e84	e48	56	32	15	19	18	11
20	48	24	25	e8.5	e170	e50	52	29	10	19	31	10
21	91	24	25	8.4	e360	e60	49	23	9.7	27	40	8.0
22	96	24	24	e8.3	e330	e90	42	20	8.8	36	37	7.4
23	78	23	23	e8.2	e260	e115	27	19	8.0	51	33	8.8
24	62	22	e18	e8.3	e230	e105	20	19	26	54	28	7.5
25	61	20	e16	e8.4	e210	e100	18	18	68	49	24	16
26	46	22	e15	8.5	e180	e92	47	21	137	42	21	46
27	40	28	e14	9.7	e160	e84	75	23	214	35	18	60
28	51	30	e13	e13	e130	e80	106	23	193	30	16	75
29	55	32	e13	24	---	e78	169	21	160	26	14	76
30	47	34	e13	e50	---	e80	181	19	126	22	13	70
31	39	---	e12	e45	---	82	---	18	---	19	11	---
TOTAL	1250	762	790	397.2	2488	3013	1889	1675	1195.1	1513	711	566.6
MEAN	40.3	25.4	25.5	12.8	88.9	97.2	63.0	54.0	39.8	48.8	22.9	18.9
MAX	96	34	34	50	360	200	181	175	214	111	40	76
MIN	17	20	12	8.2	15	48	18	18	5.9	19	11	7.1
CFSM	.73	.46	.46	.23	1.61	1.76	1.14	.98	.72	.88	.41	.34
IN.	.84	.51	.53	.27	1.67	2.03	1.27	1.13	.80	1.02	.48	.38

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1933 - 1994, BY WATER YEAR (WY)

	MEAN	18.3	24.5	28.4	31.0	42.3	74.2	71.1	39.1	22.9	11.0	9.12	15.5
MAX	134	101	93.3	132	174	154	226	188	127	48.8	49.8	226	226
(WY)	1987	1986	1951	1973	1938	1948	1947	1956	1943	1994	1937	1985	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	.89
(WY)	1939	1939	1964	1940	1940	1964	1946	1988	1988	1941	1944	1941	1941

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1933 - 1994

ANNUAL TOTAL	15631.5	16249.9	
ANNUAL MEAN	42.8	44.5	(a)32.2
HIGHEST ANNUAL MEAN			71.7
LOWEST ANNUAL MEAN			9.05
HIGHEST DAILY MEAN	227	Mar 31	360
LOWEST DAILY MEAN	2.1	Jul 25	5.9
ANNUAL SEVEN-DAY MINIMUM	4.0	Jul 21	7.5
INSTANTANEOUS PEAK FLOW			(e)360
INSTANTANEOUS PEAK STAGE			(b)
INSTANTANEOUS LOW FLOW			(d)1.7
ANNUAL RUNOFF (CFSM)	.77		.81
ANNUAL RUNOFF (INCHES)	10.52		10.93
10 PERCENT EXCEEDS	96		98
50 PERCENT EXCEEDS	29		27
90 PERCENT EXCEEDS	7.5		9.7
			3.8

(a) Does not include water year 1933.

(b) Not determined.

(c) From floodmark.

(d) Result of freezeup.

(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.

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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	136	113	134	e64	e200	700	309	632	82	434	72	66
2	118	108	124	e64	e170	616	283	625	79	355	89	62
3	99	108	127	e64	e150	532	269	531	75	282	81	59
4	88	110	128	e64	e130	492	249	434	72	212	106	55
5	80	109	156	e64	e115	468	232	345	69	209	164	53
6	74	107	155	e64	e102	597	216	297	69	230	125	53
7	71	104	153	e63	e94	976	200	259	72	395	107	62
8	68	100	148	e62	e85	1050	182	283	68	613	96	58
9	64	96	145	e62	e76	744	170	289	65	502	92	56
10	73	95	140	e62	e72	546	163	270	63	341	85	64
11	74	93	135	e63	e70	386	150	252	60	254	81	61
12	73	91	118	e64	e69	306	150	248	57	200	78	56
13	72	91	127	e63	e68	306	235	223	57	166	98	53
14	67	96	114	e62	e67	301	257	204	80	139	166	59
15	64	98	112	e61	e68	278	259	186	89	127	133	87
16	62	102	111	e60	e70	264	355	173	94	118	114	74
17	112	102	112	e60	e77	223	304	166	91	106	100	78
18	217	102	113	e59	e150	212	264	159	78	96	90	73
19	178	101	112	e58	313	196	234	144	67	88	81	77
20	158	99	112	e58	809	189	201	133	60	82	101	64
21	197	99	117	e57	1520	252	178	125	56	122	325	59
22	247	98	118	e57	1620	484	164	107	55	120	201	54
23	215	95	105	e56	1300	444	145	103	52	185	152	52
24	184	93	e96	e56	1150	443	129	97	169	213	124	52
25	160	92	e88	e56	1040	437	124	94	404	156	106	60
26	150	94	e82	e56	886	368	304	105	464	139	94	167
27	128	128	e78	e60	830	330	569	125	489	123	85	166
28	121	160	e74	e100	783	324	772	115	486	108	79	229
29	131	150	e70	e150	---	326	650	104	483	95	75	281
30	127	144	e67	e240	---	341	654	94	518	86	69	218
31	117	---	e65	e220	---	336	---	86	---	77	67	---
TOTAL	3725	3178	3536	2349	12084	13467	8371	7008	4623	6373	3436	2608
MEAN	120	106	114	75.8	432	434	279	226	154	206	111	86.9
MAX	247	160	156	240	1620	1050	772	632	518	613	325	281
MIN	62	91	65	56	67	189	124	86	52	77	67	52
CFSM	.54	.48	.52	.34	1.95	1.97	1.26	1.02	.70	.93	.50	.39
IN.	.63	.53	.60	.40	2.03	2.27	1.41	1.18	.78	1.07	.58	.44

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1980 - 1994, BY WATER YEAR (WY)

MEAN	171	195	190	168	226	360	344	158	129	79.3	70.0	149
MAX	583	474	349	354	485	712	630	274	251	206	166	635
(WY)	1987	1986	1988	1993	1985	1985	1985	1983	1989	1994	1992	1985
MIN	52.7	91.8	84.1	73.1	89.4	157	198	82.4	31.2	39.1	34.6	29.5
(WY)	1983	1981	1990	1981	1982	1989	1989	1988	1988	1988	1981	1991

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1980 - 1994

ANNUAL TOTAL	65847	70758	185
ANNUAL MEAN	180	194	295
HIGHEST ANNUAL MEAN			126
LOWEST ANNUAL MEAN			1985
HIGHEST DAILY MEAN	985	Mar 30	1620
LOWEST DAILY MEAN	34	Aug 22	52
ANNUAL SEVEN-DAY MINIMUM	35	Aug 17	57
INSTANTANEOUS PEAK FLOW			1690
INSTANTANEOUS PEAK STAGE			6.81
INSTANTANEOUS LOW FLOW			51
ANNUAL RUNOFF (CFSM)	.82		.88
ANNUAL RUNOFF (INCHES)	11.08		11.91
10 PERCENT EXCEEDS	415		439
50 PERCENT EXCEEDS	113		114
90 PERCENT EXCEEDS	57		62

(a) Backwater from ice.

(b) June 23, Sept. 23-25.

(c) 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. 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. Several measurements of water temperature were made during the year. City of Flint gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	289	364	285	136	376	569	759	1260	166	1130	213	187
2	267	609	268	135	385	326	718	1230	157	1070	225	174
3	233	716	264	135	378	369	690	1160	149	953	208	169
4	211	707	264	134	346	386	660	1050	144	824	279	159
5	191	726	264	135	307	392	653	924	141	846	362	150
6	177	768	277	139	272	475	451	806	137	830	375	141
7	167	600	287	136	249	712	135	729	139	881	364	140
8	162	530	287	134	238	988	234	650	137	1340	331	138
9	164	532	277	132	216	1260	289	627	127	1890	290	139
10	152	329	269	131	200	1290	329	515	125	2580	253	140
11	148	282	268	132	190	1130	247	417	122	2290	227	138
12	147	288	247	133	181	983	123	507	120	1820	209	134
13	148	259	230	133	177	896	128	492	120	1070	250	131
14	145	228	226	135	173	661	126	461	122	987	364	139
15	143	213	219	134	170	530	129	409	123	862	444	148
16	144	206	213	132	167	629	130	375	125	741	502	152
17	176	211	209	134	167	602	144	354	127	648	506	182
18	251	206	212	128	167	561	333	324	126	455	452	180
19	330	198	212	126	210	507	503	297	125	321	373	178
20	365	192	215	124	585	462	540	270	117	335	390	172
21	384	192	219	121	1220	503	514	253	115	360	574	165
22	455	196	223	119	1820	704	449	234	115	373	656	158
23	463	194	213	118	1850	1000	381	216	117	397	627	149
24	432	195	191	118	1530	1180	336	201	167	446	586	141
25	418	191	185	120	1260	1120	336	193	401	465	536	142
26	365	187	171	121	1070	1030	679	195	793	463	459	169
27	325	210	161	125	878	945	956	188	1000	429	385	247
28	283	252	156	158	770	868	1190	190	1100	367	309	388
29	260	281	151	218	---	825	1300	188	1200	313	270	523
30	260	293	144	310	---	791	1320	183	1200	275	230	570
31	248	---	138	355	---	771	---	170	---	240	204	---
TOTAL	7903	10355	6945	4541	15552	23465	14782	15068	8857	26001	11453	5743
MEAN	255	345	224	146	555	757	493	486	295	839	369	191
MAX	463	768	287	355	1850	1290	1320	1260	1200	2580	656	570
MIN	143	187	138	118	167	326	123	170	115	240	204	131

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1953 - 1994, BY WATER YEAR (WY)

MEAN	217	255	299	280	370	803	671	360	232	165	134	213
MAX	1688	911	900	1153	1123	1984	1549	1789	697	839	369	1507
(WY)	1987	1993	1988	1973	1968	1976	1960	1956	1989	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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1953 - 1994

ANNUAL TOTAL	149911	150665	333
ANNUAL MEAN	411	413	638
HIGHEST ANNUAL MEAN			82.7
LOWEST ANNUAL MEAN			5940
HIGHEST DAILY MEAN	2300	Mar 31	2580
LOWEST DAILY MEAN	84	Aug 22	115
ANNUAL SEVEN-DAY MINIMUM	85	Aug 20	120
INSTANTANEOUS PEAK FLOW			2620
INSTANTANEOUS PEAK STAGE			12.13
INSTANTANEOUS LOW FLOW			114
10 PERCENT EXCEEDS	901		954
50 PERCENT EXCEEDS	251		268
90 PERCENT EXCEEDS	98		133

(a) June 21-23.

(b) Oct. 11, 12, 1971.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	98	42	74	e28	e78	126	120	316	25	223	25	18
2	79	42	68	e28	e62	108	97	257	42	141	42	17
3	63	46	66	e28	e52	97	106	213	28	108	30	15
4	50	46	69	e28	e44	85	101	174	15	87	71	14
5	42	48	80	e28	e40	105	95	141	12	107	78	13
6	38	57	82	e28	e36	244	89	128	15	90	58	14
7	34	45	84	e27	e33	293	83	122	17	264	50	14
8	31	39	79	e27	e32	278	78	125	18	362	41	17
9	33	37	81	e27	e31	280	74	114	17	288	34	20
10	32	36	91	e28	e30	252	65	109	16	193	29	14
11	35	35	83	e27	e30	198	61	111	15	133	27	13
12	36	32	67	e27	e30	155	88	102	16	100	26	12
13	34	35	69	e26	e30	160	129	91	e24	77	39	12
14	34	39	51	e26	e30	141	120	84	e36	59	74	15
15	34	43	50	e26	e31	138	178	78	e54	54	60	15
16	34	45	49	e26	e32	127	209	72	e66	46	52	15
17	76	47	48	e25	e37	127	166	54	56	40	41	21
18	87	48	48	e25	126	102	146	35	39	37	32	19
19	92	50	50	e25	349	97	129	37	30	33	27	17
20	98	49	50	e25	663	90	106	40	24	30	75	16
21	136	44	52	e24	573	191	88	41	22	42	123	15
22	111	42	44	e24	342	227	76	39	19	54	87	14
23	84	38	44	e24	287	229	70	36	17	69	68	13
24	73	38	e40	e24	268	231	61	34	120	52	51	12
25	69	36	e37	e24	221	204	96	38	226	41	38	14
26	64	40	e35	e25	175	176	249	47	243	34	30	33
27	58	76	e33	e40	164	159	371	42	302	30	27	75
28	54	79	e31	e70	165	149	293	39	328	27	24	139
29	50	86	e30	e130	---	145	341	34	349	25	22	157
30	44	85	e29	e110	---	149	296	30	355	23	19	123
31	42	---	e29	e94	---	145	---	27	---	21	19	---
TOTAL	1845	1425	1743	1124	3991	5208	4181	2810	2546	2890	1419	906
MEAN	59.5	47.5	56.2	36.3	143	168	139	90.6	84.9	93.2	45.8	30.2
MAX	136	86	91	130	663	293	371	316	355	362	123	157
MIN	31	32	29	24	30	85	61	27	12	21	19	12
CFSM	.60	.48	.57	.36	1.43	1.69	1.40	.91	.85	.94	.46	.30
IN.	.69	.53	.65	.42	1.49	1.95	1.56	1.05	.95	1.08	.53	.34

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1994, BY WATER YEAR (WY)

MEAN	44.6	60.5	76.0	69.8	93.8	170	163	75.5	48.2	28.7	22.0	46.6
MAX	236	181	213	192	294	317	350	200	146	93.2	107	314
(WY)	1982	1986	1976	1973	1976	1973	1975	1974	1989	1994	1975	1985
MIN	10.7	16.2	22.2	15.6	24.3	57.9	80.9	24.7	7.39	5.48	5.83	7.06
(WY)	1967	1966	1970	1970	1970	1969	1966	1977	1988	1966	1966	1966

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1966 - 1994

ANNUAL TOTAL	32774	30088	74.8
ANNUAL MEAN	89.8	82.4	122
HIGHEST ANNUAL MEAN			35.3
LOWEST ANNUAL MEAN			1977
HIGHEST DAILY MEAN	533	663	1370
LOWEST DAILY MEAN	11	12	2.1
ANNUAL SEVEN-DAY MINIMUM	13	14	2.3
INSTANTANEOUS PEAK FLOW		700	1500
INSTANTANEOUS PEAK STAGE		9.78	(a)11.85
INSTANTANEOUS LOW FLOW		11	(b)
ANNUAL RUNOFF (CFSM)	.90	.83	.75
ANNUAL RUNOFF (INCHES)	12.27	11.26	10.22
10 PERCENT EXCEEDS	213	195	171
50 PERCENT EXCEEDS	47	49	40
90 PERCENT EXCEEDS	19	20	11

(a) From floodmark.

(b) Sept. 12, 13, 24, 25.

(e) 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 for flood seasons collected in this vicinity 1911-32, are contained in reports of the National Weather Service.

REVISED RECORDS.--WSP 954: 1941. WSP 1337: 1933-34(M), 1935-37. WDR MI-78-1: 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. 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. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	670	418	586	259	723	1100	1300	2860	311	1900	419	318
2	585	668	572	258	721	650	1140	2540	287	1670	561	294
3	500	870	542	253	684	617	1050	2220	279	1270	381	274
4	461	873	564	252	611	677	1050	1820	270	1180	1090	258
5	410	863	582	241	548	787	1040	1680	258	1690	872	243
6	364	929	602	245	496	1900	985	1340	284	1370	660	236
7	332	883	613	259	448	2700	404	1320	256	1970	575	234
8	324	589	590	240	417	2170	453	1310	247	2950	561	215
9	409	789	561	232	399	2110	516	1170	195	2910	499	241
10	315	566	563	237	358	2230	569	1010	204	3140	426	226
11	299	447	548	256	339	2010	562	800	204	3250	378	214
12	293	442	483	246	319	1470	616	986	192	2720	369	227
13	291	473	466	242	319	1650	960	868	424	1710	560	205
14	279	405	452	234	312	1490	861	811	368	1280	794	245
15	278	417	437	220	306	1110	755	727	280	1210	712	238
16	283	387	424	207	310	1110	925	682	288	866	696	283
17	817	394	416	240	328	1040	695	778	299	868	694	433
18	678	389	419	247	380	1040	651	518	278	745	636	281
19	605	382	415	226	849	920	878	560	258	495	549	275
20	700	369	430	227	2070	862	934	444	235	584	1290	262
21	1210	350	461	223	2410	1800	881	346	233	827	1220	251
22	937	379	442	218	2490	1810	800	424	217	637	1030	240
23	838	364	411	214	2550	1790	692	408	240	700	928	230
24	765	369	379	225	2460	2160	632	392	1700	592	829	221
25	696	339	353	226	2090	1930	846	374	2040	617	742	251
26	646	440	323	218	1680	1670	3620	461	2560	613	630	407
27	598	898	306	221	1480	1590	3350	360	2280	585	554	682
28	525	693	295	1220	1160	1580	2640	350	2140	531	483	915
29	475	635	281	1000	---	---	2870	340	2950	462	442	894
30	464	594	260	806	---	---	1450	329	2540	410	376	842
31	451	---	268	709	---	---	1360	318	---	371	343	---
TOTAL	16498	16614	14044	10101	27257	46273	35325	28546	22317	40123	20299	10135
MEAN	532	554	453	326	973	1493	1177	921	744	1294	655	338
MAX	1210	929	613	1220	2550	2700	3620	2860	2950	3250	1290	915
MIN	278	339	260	207	306	617	404	318	192	371	343	205

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1932 - 1994, BY WATER YEAR (WY)

MEAN	347	448	540	573	768	1517	1339	743	464	271	235	344
MAX	2764	1734	1739	2008	2867	3514	4209	3575	1613	1294	868	2635
(WY)	1987	1993	1976	1973	1938	1985	1947	1956	1943	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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1932 - 1994

ANNUAL TOTAL	311582		287532			
ANNUAL MEAN	854		788		631	
HIGHEST ANNUAL MEAN					1258	1985
LOWEST ANNUAL MEAN					153	1964
HIGHEST DAILY MEAN	5350	Apr 20	3620	Apr 26	14500	Apr 6 1947
LOWEST DAILY MEAN	155	Aug 22	192	Jun 12	14	Aug 7 1934
ANNUAL SEVEN-DAY MINIMUM	174	Aug 12	221	Jan 21	23	Aug 14 1936
INSTANTANEOUS PEAK FLOW			4320	Apr 26	14900	Apr 6 1947
INSTANTANEOUS PEAK STAGE			9.91	Apr 26	16.95	Sep 6 1985
INSTANTANEOUS LOW FLOW				Sep 8	9.0	Aug 7 1934
10 PERCENT EXCEEDS	2000		128			
50 PERCENT EXCEEDS	505		1810		1460	
90 PERCENT EXCEEDS	224		561		330	
			241		98	

STREAMS TRIBUTARY TO LAKE HURON

04150500 CASS RIVER AT CASS CITY, MI

LOCATION.--Lat 43°35'03", long 83°10'34", in NE1/4 NE1/4 sec.4, T.13 N., R.11 E., Tuscola County, Hydrologic Unit 04080205, on left bank 600 ft downstream from bridge on Cemetery Road, 0.3 mi downstream from confluence of North and South Branches, and 1.1 mi south of Cass City.

DRAINAGE AREA.--359 mi².

PERIOD OF RECORD.--October 1947 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1337: 1949-50. WSP 1727: 1948(M), 1950. WDR MI-78-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 697.92 ft above sea level. Prior to Nov. 14, 1952, nonrecording gage at site 600 ft upstream at present datum.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	215	105	127	e28	e180	e140	403	407	60	674	69	52
2	157	101	118	e28	e150	e135	337	491	53	641	64	48
3	113	102	112	e28	e130	e130	294	394	47	828	59	44
4	90	104	110	e28	e110	127	250	294	43	399	75	41
5	74	102	110	e28	e90	127	218	235	41	249	116	37
6	63	105	111	e28	e80	258	193	215	41	235	134	36
7	57	103	112	e28	e70	1400	168	194	41	1280	98	35
8	52	95	109	e28	e64	2060	145	178	41	3280	80	32
9	49	89	105	e28	e58	1360	128	165	39	3340	69	32
10	50	84	104	e28	e54	891	119	149	35	2290	61	30
11	51	85	e95	e28	e50	624	111	133	32	945	55	29
12	48	82	e75	e28	e49	513	114	131	31	459	52	27
13	45	83	e80	e28	e48	506	340	124	32	282	60	26
14	43	87	82	e28	e47	562	526	115	32	196	152	25
15	44	92	84	e28	e47	483	462	109	30	150	223	28
16	46	97	90	e27	e47	457	520	105	29	147	112	28
17	114	97	90	e27	e47	384	495	100	25	120	80	30
18	430	95	89	e27	e50	300	353	92	22	100	64	41
19	493	92	88	e26	e150	257	272	85	20	85	58	36
20	454	87	87	e26	e1000	236	214	79	19	78	177	31
21	436	82	90	e26	3510	474	175	73	18	177	831	28
22	458	79	88	e25	2240	1690	144	70	18	247	568	25
23	394	75	e65	e25	1390	1340	125	66	18	779	290	23
24	329	73	e50	e25	e600	1150	111	61	38	845	187	22
25	254	69	e40	e25	e250	897	122	61	1010	633	124	25
26	203	71	e35	e25	e200	598	330	74	1430	369	99	57
27	172	94	e32	e25	e170	461	612	92	871	221	90	134
28	151	133	e30	e30	e150	491	616	94	563	153	78	131
29	134	149	e29	e100	---	560	423	91	1230	114	68	264
30	120	150	e28	e150	---	637	335	80	1200	93	59	217
31	111	---	e28	e190	---	506	---	68	---	79	55	---
TOTAL	5450	2862	2493	1199	11031	19754	8655	4625	7109	19488	4307	1614
MEAN	176	95.4	80.4	38.7	394	637	288	149	237	629	139	53.8
MAX	493	150	127	190	3510	2060	616	491	1430	3340	831	264
MIN	43	69	28	25	47	127	111	61	18	78	52	22
CFSM	.49	.27	.22	.11	1.10	1.78	.80	.42	.66	1.75	.39	.15
IN.	.56	.30	.26	.12	1.14	2.05	.90	.48	.74	2.02	.45	.17

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1948 - 1994, BY WATER YEAR (WY)

	MEAN	86.3	139	192	177	271	762	533	221	115	70.2	35.7	101
MAX	952	683	653	840	982	2260	1296	1131	591	629	201	2239	
(WY)	1987	1993	1985	1952	1954	1985	1960	1956	1984	1994	1953	1986	
MIN	2.58	7.23	6.26	5.16	6.36	59.8	100	27.5	12.9	5.04	2.48	1.33	
(WY)	1949	1950	1959	1959	1959	1964	1964	1958	1964	1966	1963	1948	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1948 - 1994

ANNUAL TOTAL	92114						88587						
ANNUAL MEAN	252						243			(a)225			
HIGHEST ANNUAL MEAN										471		1985	
LOWEST ANNUAL MEAN										27.6		1964	
HIGHEST DAILY MEAN	3580				Apr 21		3510		Feb 21	11800		Sep 12 1986	
LOWEST DAILY MEAN	12				Aug 4		18		Jun 21	.50		Sep 26 1948	
ANNUAL SEVEN-DAY MINIMUM	14				Aug 1		20		Jun 17	.76		Sep 21 1948	
INSTANTANEOUS PEAK FLOW							(b)3740		Feb 20	12500		Sep 12 1986	
INSTANTANEOUS PEAK STAGE							(c)11.93		Feb 20	(d)19.82		Sep 12 1986	
INSTANTANEOUS LOW FLOW							17		Jun 20	.50		Sep 26 1948	
ANNUAL RUNOFF (CFSM)	.70						.68			.63			
ANNUAL RUNOFF (INCHES)	9.54						9.18			8.50			
10 PERCENT EXCEEDS	513						565			542			
50 PERCENT EXCEEDS	100						98			60			
90 PERCENT EXCEEDS	28						28			7.8			

(a) Does not include water year 1948.

(b) Gage height 11.64 ft.

(c) Backwater from ice.

(d) From floodmark.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04150800 CASS RIVER AT WAHJAMEGA, MI

LOCATION.--Lat 43°27'02", long 83°26'29", in NW1/4 NW1/4 sec.20, T.12 N., R.9 E., Tuscola County, Hydrologic Unit 04080205, on right bank 90 ft upstream from bridge on Chambers Road, on grounds of Caro Regional Center at Wahjamega, 1.9 mi downstream from Michigan Sugar Co. dam, and 40 mi upstream from mouth.

DRAINAGE AREA.--645 mi².

PERIOD OF RECORD.--October 1968 to September 1994 (discontinued).

REVISED RECORDS.--WDR MI-78-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 632.60 ft above sea level (levels by Edmonds Engineering, Inc.). Prior to June 19, 1969, nonrecording gage at bridge 90 ft downstream at present datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Some regulation by dam at Michigan Sugar Co., 1.9 mi upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	335	185	239	e80	e320	e480	794	901	125	1480	150	114
2	270	176	231	e78	e290	e440	688	1060	110	940	143	106
3	193	179	233	e78	e260	e410	617	870	101	1410	134	99
4	154	191	229	e78	e240	e390	549	690	95	958	177	92
5	123	193	228	e78	e220	378	494	573	92	618	266	86
6	107	186	228	e78	e200	472	450	528	87	552	290	81
7	96	178	234	e78	e180	1460	408	491	89	1320	245	79
8	91	168	229	e78	e160	2900	372	455	85	7190	191	77
9	90	164	221	e78	e150	2320	344	431	78	8220	166	77
10	81	154	215	e78	e140	1450	328	402	76	6140	144	72
11	79	148	209	e78	e135	1070	307	372	70	2870	132	67
12	84	146	143	e78	e130	860	319	376	66	1290	123	63
13	84	147	178	e78	e125	891	745	357	71	759	138	61
14	78	155	190	e78	e125	907	1180	328	74	541	193	69
15	76	162	180	e76	e125	895	1010	298	70	439	342	70
16	84	166	183	e76	e125	820	1000	284	67	394	285	69
17	204	168	188	e76	e125	659	996	265	60	357	189	76
18	613	164	187	e74	e140	645	763	244	53	304	148	86
19	772	158	190	e74	e270	527	619	226	48	253	129	95
20	691	156	193	e72	1630	502	518	207	45	219	188	84
21	696	146	198	e72	5740	672	442	191	46	362	825	76
22	751	142	202	e70	4970	2240	386	177	45	543	893	70
23	642	134	e140	e70	2680	2130	347	161	45	693	540	66
24	558	132	e120	e70	1530	1760	320	149	222	1110	373	61
25	462	125	e105	e70	1110	1470	382	147	1010	870	280	62
26	383	132	e98	e70	e800	1070	839	176	1940	619	220	70
27	337	183	e92	e70	e600	862	1270	199	1500	429	197	192
28	290	255	e88	e110	e540	858	1090	198	970	329	176	286
29	254	293	e86	e200	---	924	932	186	1220	254	150	356
30	222	285	e84	e300	---	1050	788	168	2370	205	130	420
31	202	---	e82	e350	---	958	---	145	---	172	121	---
TOTAL	9102	5171	5423	2994	23060	32470	19297	11255	10930	41840	7678	3282
MEAN	294	172	175	96.6	824	1047	643	363	364	1350	248	109
MAX	772	293	239	350	5740	2900	1270	1060	2370	8220	893	420
MIN	76	125	82	70	125	378	307	145	45	172	121	61
CFSM	.46	.27	.27	.15	1.28	1.62	1.00	.56	.56	2.09	.38	.17
IN.	.52	.30	.31	.17	1.33	1.87	1.11	.65	.63	2.41	.44	.19

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1969 - 1994, BY WATER YEAR (WY)

	MEAN	259	329	394	340	490	1370	1031	447	259	168	88.2	319
MAX	1738	1062	1048	1476	1717	3695	1909	1182	1064	1350	254	3834	
(WY)	1987	1993	1985	1973	1976	1985	1991	1991	1984	1994	1992	1986	
MIN	29.0	42.7	41.5	37.8	68.7	273	486	92.4	47.5	32.1	28.6	21.5	
(WY)	1980	1972	1977	1977	1970	1970	1977	1977	1988	1987	1978	1991	

SUMMARY STATISTICS FOR 1993 CALENDAR YEAR FOR 1994 WATER YEAR WATER YEARS 1969 - 1994

ANNUAL TOTAL	162792	172502	
ANNUAL MEAN	446	473	
HIGHEST ANNUAL MEAN			457
LOWEST ANNUAL MEAN			816
HIGHEST DAILY MEAN	6190	Apr 21	1985
LOWEST DAILY MEAN	40	Aug 5	1977
ANNUAL SEVEN-DAY MINIMUM	42	Aug 4	19500
INSTANTANEOUS PEAK FLOW			17
INSTANTANEOUS PEAK STAGE			17
INSTANTANEOUS LOW FLOW			20000
ANNUAL RUNOFF (CFSM)	.69		(a)26.66
ANNUAL RUNOFF (INCHES)	9.39		16
10 PERCENT EXCEEDS	906		.71
50 PERCENT EXCEEDS	195		9.64
90 PERCENT EXCEEDS	59		174
			41

(a) From floodmark.

(b) July 14-16, 1988.

(c) 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 poor. Occasional regulation by dams upstream from station. Prior to 1950, regulation at low and medium flows by mill upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	329	248	327	e110	e400	e800	1060	1210	174	2140	207	170
2	319	232	294	e110	e390	e740	920	1410	156	1460	192	159
3	262	226	309	e110	e360	e700	816	1240	144	1580	180	148
4	206	231	303	e110	e330	674	714	995	136	1430	285	139
5	173	242	297	e110	e300	644	632	808	129	937	458	131
6	149	239	295	e110	e270	984	566	704	128	734	403	124
7	134	228	305	e110	e240	2280	506	648	125	1350	356	125
8	123	219	299	e110	e210	3330	451	618	122	9220	291	120
9	122	210	285	e110	e190	3580	411	570	117	11500	249	116
10	118	209	276	e110	e180	2330	382	521	108	9180	221	113
11	111	201	269	e110	e170	1750	354	473	104	5070	201	108
12	109	196	220	e110	e165	1340	371	497	97	2130	190	102
13	109	203	208	e110	e165	1240	954	462	98	1280	317	98
14	107	208	235	e110	e165	1200	1540	413	110	879	522	108
15	103	214	230	e110	e165	1200	1430	371	106	677	411	123
16	109	216	227	e105	e165	1080	1380	347	99	567	452	119
17	244	217	225	e105	e180	959	1320	330	92	491	320	126
18	606	223	225	e105	e200	839	1090	313	81	420	245	133
19	972	214	225	e100	e350	674	871	293	71	351	209	138
20	904	214	226	e100	e800	632	709	273	66	318	241	139
21	925	202	233	e100	e3000	881	583	254	64	395	591	123
22	990	192	236	e98	7010	2020	494	233	62	669	1170	113
23	901	188	e170	e98	4340	2550	430	213	64	670	837	105
24	747	181	e145	e98	2460	2160	387	198	718	1180	523	100
25	621	177	e140	e98	1760	1840	480	193	2110	1100	382	99
26	486	184	e130	e98	e1200	1470	1090	202	2720	849	308	102
27	405	255	e125	e98	e1000	1180	1630	237	2350	582	276	145
28	348	327	e120	236	e900	1120	1440	242	1630	420	248	399
29	309	350	e115	336	---	1150	1320	229	2430	331	220	457
30	284	349	e115	368	---	1230	1150	214	3310	274	194	508
31	261	---	e110	402	---	1240	---	195	---	235	178	---
TOTAL	11586	6795	6919	4195	27065	43817	25481	14906	17721	58419	10877	4690
MEAN	374	226	223	135	967	1413	849	481	591	1884	351	156
MAX	990	350	327	402	7010	3580	1630	1410	3310	11500	1170	508
MIN	103	177	110	98	165	632	354	193	62	235	178	98
CFSM	.44	.27	.27	.16	1.15	1.68	1.01	.57	.70	2.24	.42	.19
IN.	.51	.30	.31	.19	1.20	1.94	1.13	.66	.78	2.58	.48	.21

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1908 - 1994, BY WATER YEAR (WY)

	MEAN	228	321	418	427	610	1680	1193	627	343	192	105	229
MAX	2637	1374	1335	2185	2225	4943	3121	2650	1499	1884	523	5000	
(WY)	1987	1993	1985	1973	1976	1976	1947	1956	1945	1994	1953	1986	
MIN	31.7	43.1	50.7	45.1	55.6	179	201	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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1908 - 1994

ANNUAL TOTAL	220300						232471						
ANNUAL MEAN	604						637			527			
HIGHEST ANNUAL MEAN										1063		1985	
LOWEST ANNUAL MEAN										96.6		1964	
HIGHEST DAILY MEAN	6720	Jan 6					11500	Jul 9		21700	Sep 12	1986	
LOWEST DAILY MEAN	60	Aug 13					62	Jun 22		(a)1.5	Aug 6	1944	
ANNUAL SEVEN-DAY MINIMUM	64	Aug 7					71	Jun 17		4.4	Jul 6	1936	
INSTANTANEOUS PEAK FLOW							12200	Jul 9		22200	Sep 12	1986	
INSTANTANEOUS PEAK STAGE							21.94	Jul 9		27.52	Sep 12	1986	
INSTANTANEOUS LOW FLOW							60	Jun 22		1.5	Aug 6	1944	
ANNUAL RUNOFF (CFSM)	.72						.76			.63			
ANNUAL RUNOFF (INCHES)	9.74						10.28			8.51			
10 PERCENT EXCEEDS	1450						1360			1230			
50 PERCENT EXCEEDS	260						274			180			
90 PERCENT EXCEEDS	85						109			48			

(a) Approximate.

(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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e100	e90	110	e68	e90	e200	196	159	76	77	55	70
2	e96	e88	105	e67	e85	e190	188	178	70	80	62	66
3	e94	83	121	e67	e83	e180	183	153	65	75	64	60
4	e93	86	122	e67	e80	e180	168	133	64	70	86	57
5	e92	87	117	e67	e80	e190	162	123	63	65	113	60
6	e91	95	114	e67	e78	e250	167	119	62	68	94	56
7	e90	95	117	e67	e77	e350	155	112	65	87	75	54
8	e90	89	116	e67	e76	e470	143	110	64	81	69	51
9	e94	86	111	e67	e74	e340	138	104	61	87	89	51
10	e100	84	108	e67	e72	e270	134	100	59	83	83	51
11	e98	85	e105	e67	e71	e240	128	104	58	74	73	50
12	e96	87	e95	e67	e70	e220	128	138	57	68	70	50
13	e94	89	e95	e67	e69	e250	245	128	57	66	72	51
14	e93	100	e96	e67	e69	e280	329	116	59	64	96	51
15	e92	112	98	e67	e69	e210	245	103	60	88	95	52
16	e98	137	101	e67	e69	e180	288	100	57	97	78	53
17	e200	118	100	e67	e70	e160	254	98	55	83	69	53
18	e205	115	101	e66	e100	e140	199	89	54	106	65	52
19	e150	102	105	e64	e140	e140	163	84	51	88	75	49
20	e140	100	107	e62	e200	e150	162	81	48	88	108	49
21	e160	95	111	e60	e350	e210	120	79	50	88	98	51
22	e190	94	e100	e58	e600	e425	123	76	48	74	80	50
23	e155	90	e90	e58	e400	391	119	73	47	80	72	51
24	e125	89	e80	e58	e300	349	115	70	71	72	68	50
25	e115	89	e70	e58	e260	290	126	69	275	67	63	53
26	e115	95	e70	e58	e240	230	234	109	251	66	66	56
27	e110	165	e72	e58	e220	196	223	171	124	61	97	59
28	e105	165	e74	e70	e210	212	174	123	97	60	91	61
29	e100	129	e74	e90	---	205	153	101	83	58	76	64
30	e96	117	e72	e100	---	204	147	90	83	55	68	60
31	e92	---	e70	e95	---	210	---	81	---	55	67	---
TOTAL	3569	3056	3027	2095	4302	7512	5309	3374	2334	2331	2437	1641
MEAN	115	102	97.6	67.6	154	242	177	109	77.8	75.2	78.6	54.7
MAX	205	165	122	100	600	470	329	178	275	106	113	70
MIN	90	83	70	58	69	140	115	69	47	55	55	49
CFSM	.72	.64	.61	.42	.96	1.51	1.11	.68	.49	.47	.49	.34
IN.	.83	.71	.70	.49	1.00	1.75	1.23	.78	.54	.54	.57	.38

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1994, BY WATER YEAR (WY)

	MEAN	127	187	148	103	108	234	255	133	119	74.6	75.8	82.0
MAX	202	364	253	176	172	296	478	211	279	92.3	85.8	127	
(WY)	1991	1993	1992	1993	1991	1991	1991	1991	1989	1992	1991	1992	
MIN	68.9	82.3	61.2	67.6	74.4	152	115	87.2	57.2	49.5	55.3	54.7	
(WY)	1990	1990	1990	1994	1993	1987	1987	1988	1988	1988	1988	1994	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1987 - 1994

ANNUAL TOTAL	51209	40987	
ANNUAL MEAN	140	112	141
HIGHEST ANNUAL MEAN			184
LOWEST ANNUAL MEAN			111
HIGHEST DAILY MEAN	865	Jan 5	1340
LOWEST DAILY MEAN	58	Aug 1	40
ANNUAL SEVEN-DAY MINIMUM	60	Jul 30	50
INSTANTANEOUS PEAK FLOW			(e)640
INSTANTANEOUS PEAK STAGE			(b)10.32
INSTANTANEOUS LOW FLOW			45
ANNUAL RUNOFF (CFSM)	.88	.70	.88
ANNUAL RUNOFF (INCHES)	11.91	9.53	11.94
10 PERCENT EXCEEDS	269	205	245
50 PERCENT EXCEEDS	97	90	95
90 PERCENT EXCEEDS	69	58	63

(a) Gage height 10.74 ft.

(b) Backwater from ice.

(c) July 6, Sept. 9, 1988.

(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 710.38 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. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	286	352	331	e260	e380	e520	486	548	236	279	208	360
2	276	344	332	e260	e360	e500	474	548	216	254	205	335
3	265	343	344	e260	e340	e480	468	497	205	229	205	311
4	258	342	340	e260	e320	e470	457	459	197	215	397	292
5	244	340	332	e260	e300	e470	448	430	193	231	533	278
6	244	339	331	e255	e280	e700	441	401	195	228	400	268
7	241	336	332	e255	e260	e1200	427	375	194	272	339	260
8	239	335	328	e255	e250	e1000	411	362	188	285	299	248
9	241	329	323	e255	e240	e800	395	344	179	286	274	241
10	240	324	321	e255	e230	e700	381	319	176	311	257	234
11	238	320	317	e255	e220	624	368	323	172	316	249	226
12	234	318	305	e255	e215	571	380	360	170	291	241	218
13	228	323	303	e255	e215	570	510	361	168	265	294	211
14	226	325	296	e250	e215	555	576	352	167	340	351	210
15	224	348	295	e245	e215	526	560	339	164	407	307	212
16	264	352	293	e240	e215	477	634	331	165	340	275	210
17	424	344	290	e235	e220	382	589	309	162	331	260	205
18	506	334	289	e230	e300	368	546	293	155	369	247	196
19	477	329	287	e225	e400	383	499	278	150	330	255	190
20	440	326	289	e225	e700	390	455	261	145	311	274	185
21	516	319	291	e225	e1500	498	424	251	143	369	285	181
22	492	316	284	e220	e1000	713	394	244	140	328	291	178
23	441	311	e270	e220	e840	686	366	237	142	299	276	174
24	424	307	e265	e220	e760	694	348	225	304	284	258	172
25	410	298	e260	e220	e700	685	414	223	656	271	242	172
26	398	328	e260	e220	e650	631	599	300	596	256	246	193
27	387	401	e260	e220	e600	589	681	324	512	243	304	191
28	381	378	e260	e240	e550	573	599	312	415	234	419	202
29	373	352	e260	e350	---	551	567	293	373	225	439	203
30	362	340	e260	e410	---	524	525	273	317	218	417	206
31	358	---	e260	e400	---	502	---	254	---	213	387	---
TOTAL	10337	10053	9208	7935	12475	18332	14422	10426	7195	8830	9434	6762
MEAN	333	335	297	256	446	591	481	336	240	285	304	225
MAX	516	401	344	410	1500	1200	681	548	656	407	533	360
MIN	224	298	260	220	215	368	348	223	140	213	205	172
CFSM	.80	.81	.71	.62	1.07	1.42	1.16	.81	.58	.68	.73	.54
IN.	.92	.90	.82	.71	1.12	1.64	1.29	.93	.64	.79	.84	.60

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1994, BY WATER YEAR (WY)

	MEAN	252	302	303	277	330	580	595	383	281	194	171	229
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 1993 CALENDAR YEAR FOR 1994 WATER YEAR WATER YEARS 1931 - 1994

ANNUAL TOTAL	146287	125409	
ANNUAL MEAN	401	344	
HIGHEST ANNUAL MEAN			325
LOWEST ANNUAL MEAN			585
HIGHEST DAILY MEAN	1370	1500	1976
LOWEST DAILY MEAN	170	140	163
ANNUAL SEVEN-DAY MINIMUM	177	148	1931
INSTANTANEOUS PEAK FLOW		(e)1690	6210
INSTANTANEOUS PEAK STAGE		(a)10.29	19
INSTANTANEOUS LOW FLOW		136	49
ANNUAL RUNOFF (CFSM)	.96	.83	6660
ANNUAL RUNOFF (INCHES)	13.08	11.21	(b)15.58
10 PERCENT EXCEEDS	708	549	12
50 PERCENT EXCEEDS	339	305	.78
90 PERCENT EXCEEDS	238	206	10.60

(a) Backwater from ice.

(b) From floodmark.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04155000 PINE RIVER AT ALMA, MI

LOCATION.--Lat 43°22'46", long 84°39'20", in SW1/4 SE1/4 sec.34, T.12 N., R.3 W., Gratiot County, Hydrologic Unit 04080202, on right bank 270 ft downstream from Superior Street Bridge in Alma, 0.6 mi downstream from municipal reservoir, and 38 mi upstream from mouth.

DRAINAGE AREA.--288 mi².

PERIOD OF RECORD.--October 1930 to current year. Gage-height records for flood seasons collected in this vicinity 1910-28 are contained in reports of National Weather Service.

REVISED RECORDS.--WSP 744: Drainage area. WSP 1307: 1945(M). WSP 1337: 1931, 1932-34(M), 1936, 1939, 1945, 1949.

GAGE.--Water-stage recorder. Datum of gage is 718.37 ft above sea level. Prior to Dec. 10, 1930, nonrecording gage at Superior Street Bridge at different datum. Dec. 10, 1930 to June 15, 1938, nonrecording gage at site 70 ft downstream from bridge, and June 16 to Oct. 25, 1938, nonrecording gage at bridge at present datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Flow regulated by dam 0.6 mi upstream from station, and by variable backwater from powerplant at St. Louis, 5.2 mi downstream. About 2.4 ft³/s diverted upstream from station for municipal and industrial use; sewage effluent is returned downstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	272	231	301	e140	e330	e400	376	584	186	571	161	270
2	240	222	274	e145	e280	e360	367	523	185	413	139	224
3	207	216	266	e150	e240	e340	336	490	167	291	150	197
4	191	206	272	e150	e230	e330	312	467	163	248	248	182
5	176	212	287	e150	e220	415	305	407	154	411	324	167
6	169	215	291	e150	e215	906	292	359	155	405	376	153
7	169	216	288	e150	e210	927	282	316	152	742	403	147
8	166	212	276	e150	e205	868	270	294	166	900	364	141
9	162	209	270	e150	e200	984	263	283	171	766	254	134
10	159	206	260	e150	e195	942	242	263	146	658	205	151
11	159	207	243	e150	e190	774	230	270	135	610	193	129
12	159	206	222	e150	e180	648	246	280	131	483	191	140
13	159	212	e210	e150	e185	636	328	310	138	327	269	148
14	167	211	e200	e150	e185	614	370	302	145	282	330	129
15	171	241	196	e150	e185	572	425	285	142	328	352	162
16	174	259	212	e150	e190	531	462	251	133	376	393	144
17	431	247	226	e155	213	455	413	249	122	555	332	125
18	642	250	241	e155	229	407	382	245	116	677	225	125
19	563	242	235	e155	277	358	357	219	113	529	194	128
20	591	221	225	e155	1290	375	303	201	111	392	230	134
21	639	206	221	e155	1440	462	263	188	107	400	242	133
22	558	200	209	e155	e905	534	244	180	101	387	315	130
23	472	203	e150	e155	e810	593	226	169	102	406	302	127
24	454	202	e140	e155	e1040	685	205	159	490	367	220	124
25	424	201	e130	e155	e900	628	234	162	873	291	171	123
26	361	243	e120	e155	e600	578	604	231	937	233	236	135
27	315	325	e110	e155	e500	547	521	274	983	222	305	141
28	283	347	e110	e200	e450	502	643	332	897	196	331	155
29	257	363	e120	275	---	457	661	386	969	179	371	134
30	237	352	e130	323	---	436	575	309	764	181	381	178
31	234	---	e135	e290	---	409	---	201	---	179	347	---
TOTAL	9361	7083	6570	5178	12094	17673	10737	9189	9154	13005	8554	4510
MEAN	302	236	212	167	432	570	358	296	305	420	276	150
MAX	642	363	301	323	1440	984	661	584	983	900	403	270
MIN	159	200	110	140	180	330	205	159	101	179	139	123
CFSM	1.05	.82	.74	.58	1.50	1.98	1.24	1.03	1.06	1.46	.96	.52
IN.	1.21	.91	.85	.67	1.56	2.28	1.39	1.19	1.18	1.68	1.10	.58

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1994, BY WATER YEAR (WY)

MEAN	165	206	213	193	236	475	441	278	186	111	95.3	143
MAX	894	574	488	680	997	1214	1054	677	575	420	276	1364
(WY)	1987	1993	1983	1973	1938	1976	1967	1956	1989	1994	1994	1986
MIN	66.4	82.6	78.4	66.6	72.6	161	159	109	50.8	35.6	34.7	47.5
(WY)	1939	1931	1940	1945	1940	1937	1945	1949	1934	1934	1936	1932

SUMMARY STATISTICS	FOR 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1931 - 1994
ANNUAL TOTAL	113349	113108	
ANNUAL MEAN	311	310	228
HIGHEST ANNUAL MEAN			398
LOWEST ANNUAL MEAN			97.8
HIGHEST DAILY MEAN	1420	1440	4960
LOWEST DAILY MEAN	103	101	.40
ANNUAL SEVEN-DAY MINIMUM	119	110	10
INSTANTANEOUS PEAK FLOW		2040	5160
INSTANTANEOUS PEAK STAGE		7.97	(a)12.82
INSTANTANEOUS LOW FLOW		95	(b).40
ANNUAL RUNOFF (CFSM)	1.08	1.08	.79
ANNUAL RUNOFF (INCHES)	14.64	14.61	10.77
10 PERCENT EXCEEDS	621	592	473
50 PERCENT EXCEEDS	230	240	150
90 PERCENT EXCEEDS	147	141	68

(a) From floodmark.

(b) Caused by closing dam during construction of waterworks.

(c) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04155500 PINE RIVER NEAR MIDLAND, MI

LOCATION.--Lat 43°33'52", long 84°22'09", in SW1/4 NW1/4 sec.4, T.13 N., R.1 E., Midland County, Hydrologic Unit 04080202, on left bank at downstream side of bridge on Meridian Road, 7.2 mi southwest of Midland, and 7.8 mi upstream from Chippewa River.

DRAINAGE AREA.--390 mi², approximately.

PERIOD OF RECORD.--May 1934 to September 1938, February 1948 to current year.

REVISED RECORDS.--WSP 1207: Drainage area. WSP 1307: 1935(M). WSP 1337: 1936-38, 1948-49.

GAGE.--Water-stage recorder. Datum of gage is 623.94 ft above sea level. Prior to Sept. 30, 1938, nonrecording gage at same site at datum 5.55 ft lower. Feb. 3, 1948 to Dec. 13, 1951, nonrecording gage at present site and datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Regulation at low and medium flows by hydroelectric powerplant at St. Louis. Some diversion upstream from station for irrigation. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	372	324	408	e150	e350	e620	543	851	190	1010	200	461
2	359	325	375	e150	e300	e560	446	875	183	718	259	310
3	334	325	362	e150	e260	e520	482	672	211	573	149	280
4	287	323	363	e150	e230	e500	456	578	187	355	258	227
5	289	305	349	e150	e210	e600	377	552	184	555	459	211
6	263	292	349	e150	e190	e1100	389	393	184	821	447	209
7	247	286	351	e150	e180	e1500	361	410	186	1480	493	194
8	251	282	372	e150	e170	e1700	349	399	168	1900	482	185
9	255	282	347	e150	e165	e1600	327	336	163	1700	488	183
10	257	283	348	e150	e165	e1400	319	321	205	1070	358	141
11	257	278	343	e150	e160	e1100	297	322	185	888	260	189
12	260	275	e310	e150	e160	e900	299	326	164	713	249	147
13	262	274	e280	e150	e160	e800	380	290	163	548	348	116
14	249	294	e250	e150	e160	e780	485	360	178	384	724	238
15	240	276	341	e145	e160	e740	518	336	190	445	568	124
16	272	279	233	e140	e160	e660	546	325	190	440	502	198
17	734	350	246	e135	e160	e580	586	241	182	551	556	236
18	1620	288	260	e135	e180	e520	488	249	168	736	440	137
19	1070	297	301	e135	e300	e490	434	262	152	761	300	149
20	821	293	312	e135	e900	e480	408	238	150	560	534	138
21	919	286	313	e130	e2500	e540	363	216	153	458	567	149
22	877	252	310	e130	e2000	829	293	202	150	609	357	149
23	714	245	e290	e130	e1800	812	283	202	152	502	437	147
24	581	246	e210	e125	e2100	808	276	201	656	531	434	148
25	563	243	e190	e125	e2000	923	354	186	2570	451	331	148
26	539	266	e180	e120	e1700	705	1640	223	1890	374	257	146
27	449	375	e170	e120	e1000	714	1500	374	2100	231	340	148
28	420	459	e165	e180	e700	707	807	334	1540	293	502	156
29	396	439	e160	e350	---	661	1050	383	1790	262	473	251
30	380	417	e155	e450	---	588	878	438	1540	192	449	149
31	329	---	e150	e400	---	571	---	406	---	195	472	---
TOTAL	14866	9159	8793	5185	18520	25008	15934	11501	16124	20306	12693	5664
MEAN	480	305	284	167	661	807	531	371	537	655	409	189
MAX	1620	459	408	450	2500	1700	1640	875	2570	1900	724	461
MIN	240	243	150	120	160	480	276	186	150	192	149	116
CFSM	1.23	.78	.73	.43	1.70	2.07	1.36	.95	1.38	1.68	1.05	.48
IN.	1.42	.87	.84	.49	1.77	2.39	1.52	1.10	1.54	1.94	1.21	.54

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1934 - 1994, BY WATER YEAR (WY)

	MEAN	230	268	296	258	343	693	632	358	245	150	132	202
MAX	1238	784	647	865	1356	1725	1549	980	900	655	421	2034	
(WY)	1987	1993	1983	1973	1938	1976	1967	1956	1989	1994	1972	1986	
MIN	72.0	94.8	96.9	70.5	91.3	207	211	106	43.9	35.5	37.4	58.0	
(WY)	1949	1950	1963	1977	1963	1964	1963	1958	1934	1934	1936	1948	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1934 - 1994

ANNUAL TOTAL	150394		163753									
ANNUAL MEAN	412		449									
HIGHEST ANNUAL MEAN										317		
LOWEST ANNUAL MEAN										541		1986
HIGHEST DAILY MEAN	2130	Jan 5	2570	Jun 25	8750	Sep 12	1986			150		1963
LOWEST DAILY MEAN	95	Aug 4	116	Sep 13	7.8	Jul 2	1988			17		Aug 13 1936
ANNUAL SEVEN-DAY MINIMUM	114	Aug 1	126	Jan 21	(a)9360	Sep 12	1986			(b)12.08		Feb 2 1968
INSTANTANEOUS PEAK FLOW			(e)3080	Feb 21	(c)7.6	(d)						
INSTANTANEOUS PEAK STAGE			(b)8.15	Feb 21								
INSTANTANEOUS LOW FLOW			82	Aug 3								
ANNUAL RUNOFF (CFSM)	1.06		1.15							.81		
ANNUAL RUNOFF (INCHES)	14.35		15.62							11.05		
10 PERCENT EXCEEDS	860		876							662		
50 PERCENT EXCEEDS	290		322							200		
90 PERCENT EXCEEDS	160		150							82		

(a) Gage height 11.74 ft.

(b) Backwater from ice.

(c) Does not include water years 1934 to 1952.

(d) July 1, 2, 1988.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04156000 TITABAWASSEE RIVER AT MIDLAND, MI

LOCATION.--Lat 43°35'43", long 84°14'08", in NW1/4 NE1/4 sec.28, T.14 N., R.2 E., Midland County, Hydrologic Unit 04080201, on right bank 2,000 ft downstream from dam at Dow Chemical Co. 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. About 9.8 ft³/s diverted above station for industrial use, flow partially returned to river 0.25 mi downstream from station, remainder returned 1 mi downstream. Prior to 1992 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. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1350	1190	2180	e700	e1500	e2900	3300	2950	1560	2600	825	1200
2	830	1280	1940	e750	e1400	e2600	2810	3800	1030	1460	924	1060
3	681	1130	1820	e1100	e1700	e2400	2080	4260	788	1010	1000	713
4	889	1370	1470	e1600	e1500	2180	2290	3050	542	784	1450	609
5	914	1360	1160	e1400	e900	1930	3020	2540	497	1310	2310	558
6	883	878	1730	e1000	e800	3140	2720	2410	821	1630	2550	1010
7	710	806	2160	e1200	e950	8260	2750	1680	874	2640	1470	922
8	822	1130	2220	e850	e1100	9740	2190	1290	861	3860	1460	862
9	551	1200	2120	e700	e1200	7860	1880	1910	658	3870	1380	912
10	490	1340	1780	e950	e1100	5880	1290	1950	807	2230	1480	494
11	773	1280	1260	e1100	e1100	5020	1800	2090	507	2080	1210	389
12	973	1470	e760	e1300	e700	4470	2030	2110	393	1680	1300	764
13	844	1010	e1300	e1200	e600	e4000	3160	2000	721	1500	1190	579
14	751	784	1510	e1100	e900	e3500	4430	1390	792	1350	1240	649
15	784	1300	1480	e800	e1100	e3100	4620	1090	953	2330	1740	598
16	536	1460	1430	e650	e1200	e2800	4050	1720	645	2190	1530	748
17	1160	1660	1250	e1100	e1300	e2600	4040	1910	578	1630	1380	522
18	3550	1890	903	e1100	e1200	2460	3360	1880	380	2190	1060	368
19	3680	1720	802	e1000	e1000	2410	2980	1400	314	2650	1270	679
20	3020	1030	1490	e900	e950	1740	2810	1230	632	2170	960	883
21	2990	827	1950	e1000	11400	2550	2310	803	535	2580	1120	748
22	3140	1220	1620	e700	12900	5010	1670	667	733	2820	1390	575
23	2080	1570	1300	e590	10200	5610	1160	978	525	2520	1380	695
24	1410	1510	961	e950	7580	5070	962	895	1430	1940	1640	376
25	1880	901	e700	e1100	e6000	4810	2070	1160	4170	1870	1190	328
26	1790	1460	e1100	e1300	e4800	4260	5070	1570	5010	1640	1340	664
27	1650	1810	e1400	e1500	e4000	4040	6860	2190	4610	1090	829	949
28	1340	2010	e1900	e1800	e3300	3490	4650	1920	3950	1220	871	754
29	1110	2160	e1300	e1200	---	3300	4060	1300	3470	1210	1250	830
30	906	2350	e1000	e950	---	3130	3880	965	3110	645	1450	656
31	806	---	e850	e1400	---	3420	---	1600	---	507	1290	---
TOTAL	43293	41106	44846	32990	86380	123680	90302	56708	41896	59206	41479	21094
MEAN	1397	1370	1447	1064	3085	3990	3010	1829	1397	1910	1338	703
MAX	3680	2350	2220	1800	12900	9740	6860	4260	5010	3870	2550	1200
MIN	490	784	700	590	600	1740	962	667	314	507	825	328
CFSM	.58	.57	.60	.44	1.29	1.66	1.25	.76	.58	.80	.56	.29
IN.	.67	.64	.70	.51	1.34	1.92	1.40	.88	.65	.92	.64	.33

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1936 - 1994, BY WATER YEAR (WY)

MEAN	1089	1468	1538	1370	1697	3949	3768	2124	1361	737	587	936
MAX	6318	6097	3907	5564	6455	10660	8096	5573	5270	4492	2236	10300
(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	250
(WY)	1949	1950	1964	1945	1963	1964	1945	1977	1964	1941	1936	1948

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1936 - 1994

ANNUAL TOTAL	764110	682980	1725
ANNUAL MEAN	2093	1871	3318
HIGHEST ANNUAL MEAN			699
LOWEST ANNUAL MEAN			1986
HIGHEST DAILY MEAN	13500	Apr 21	12900
LOWEST DAILY MEAN	377	Aug 1	314
ANNUAL SEVEN-DAY MINIMUM	520	Aug 1	528
INSTANTANEOUS PEAK FLOW			13300
INSTANTANEOUS PEAK STAGE			21.58
INSTANTANEOUS LOW FLOW			287
ANNUAL RUNOFF (CFSM)	.87		.78
ANNUAL RUNOFF (INCHES)	11.84		10.59
10 PERCENT EXCEEDS	4290		3860
50 PERCENT EXCEEDS	1460		1350
90 PERCENT EXCEEDS	696		680

(a) From floodmark.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE HURON

04156100 TITTABAWASSEE RIVER NEAR MIDLAND, MI
(National stream quality accounting network station)

LOCATION.--Lat 43°34'07", long 84°11'37", in SW1/4 SE1/4 sec.35, T.14 N., R.2 E., Midland County, Hydrologic Unit 04080201; at bridge on Gordonville Road, 3.0 mi downstream from gaging station 04156000, and 20 mi upstream from mouth.

DRAINAGE AREA.--2,450 mi².

PERIOD OF RECORD.--Water years 1987 to current year.

REMARKS.--Bimonthly cross-sectional samples were collected at or near bridge. Water-discharge measurements were made at time of sampling. All flow except for high-water is regulated by powerplants upstream.

WATER QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

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, .7 UM-MF (COLS/100 ML) (31625)	STREP-TOCOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
NOV 03...	1515	1390	612	8.3	6.0	1.8	12.0	99	K20	K23
DEC 08...	1300	1900	716	8.3	2.5	1.1	13.0	98	94	K27
MAR 15...	1130	4620	462	7.7	1.0	4.5	11.8	86	100	230
MAY 04...	1245	2200	535	8.2	12.5	7.3	9.8	94	130	K44
JUN 27...	1130	5300	541	8.0	18.5	9.0	7.7	84	2800	960
SEP 16...	1100	451	889	8.4	21.5	1.3	8.0	93	--	K24

DATE	HARD-NESS TOTAL (MG/L AS CaCO3) (00900)	HARD-NESS NONCARB DISSOLV FLD. AS CaCO3 (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 HCO3) (00453)	CAR-BONATE WATER DIS IT FIELD (MG/L AS CO3) (00452)	ALKA-LINITY WAT DIS TOT IT FIELD (MG/L AS CaCO3) (39086)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)
NOV 03...	260	62	73	19	28	2.1	238	2	199	33
DEC 08...	270	74	76	20	39	2.6	241	--	198	36
MAR 15...	170	34	50	12	20	2.7	171	--	140	25
MAY 04...	220	52	63	15	22	2.3	204	--	167	28
JUN 27...	250	120	72	16	16	5.6	150	--	123	35
SEP 16...	250	72	70	17	77	2.9	203	4	172	34

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS Cl) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SiO2) (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, NO2+NO3 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)
NOV 03...	54	0.20	6.6	362	0.49	1360	0.020	0.780	0.050	0.50
DEC 08...	82	0.20	6.9	411	0.56	2110	0.020	1.10	0.090	0.40
MAR 15...	42	0.10	6.7	262	0.36	3270	0.020	0.630	0.240	0.90
MAY 04...	49	0.10	4.1	329	0.45	1950	0.010	1.30	0.050	0.80
JUN 27...	45	0.20	7.7	388	0.53	5550	0.210	12.0	0.220	1.6
SEP 16...	150	0.20	6.0	500	0.68	609	0.030	0.430	0.010	0.50

STREAMS TRIBUTARY TO LAKE HURON

04156100 TITTABAWASSEE RIVER NEAR MIDLAND, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	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)	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)
NOV 03...	0.030	<0.010	0.010	10	35	<3	58	8	12
DEC 08...	0.040	<0.010	0.010	--	--	--	--	--	--
MAR 15...	0.070	0.040	0.030	20	29	<3	180	<4	33
MAY 04...	0.070	<0.010	<0.010	30	32	<3	100	<4	17
JUN 27...	0.180	0.080	0.050	30	48	<3	57	<4	7
SEP 16...	0.080	0.060	0.040	<10	33	<3	21	5	12

DATE	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	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)
NOV 03...	<10	1	<1	<1.0	270	<6	12	45	68
DEC 08...	--	--	--	--	--	--	9	46	75
MAR 15...	<10	<1	<1	<1.0	230	<6	30	374	68
MAY 04...	<10	<1	<1	<1.0	220	<6	32	190	87
JUN 27...	<10	1	<1	<1.0	210	<6	87	1240	82
SEP 16...	<10	<1	<1	<1.0	350	<6	--	--	--

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 1990, 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. 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 at Essexville.

REMARKS.--Water-discharge records good except for discharges less than 3,000 ft³/s, which are fair and for estimated daily discharges, which are poor. Minimum flows affected by wind direction and seiche on Saginaw Bay, 20.3 mi downstream. Considerable diversion through metropolitan area of Saginaw. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4700	3950	5000	e1500	e3800	9260	7480	10600	e2900	e9000	---	---
2	3720	3490	2530	e1600	e3600	7780	6890	10400	e2100	e7000	---	---
3	3160	1960	2950	e2000	e3800	7050	6250	10600	e1700	e5000	---	---
4	1190	2250	3640	e2600	e3400	6550	5140	9170	e1400	e3500	---	---
5	3280	3230	4300	e2300	e2500	5770	6480	7760	e1500	5080	---	---
6	2580	4260	4100	e2000	e2200	7330	7490	6590	e1800	7010	---	---
7	844	3330	2920	e1800	e2200	13500	6330	6410	e1900	8560	---	---
8	2340	1560	4980	e1600	e2300	18600	4630	5110	e1700	13600	---	---
9	4490	3300	1490	e1400	e2400	19500	4260	4850	e1500	20200	---	---
10	2850	3630	633	e1700	e2200	18500	4730	5050	e1600	21600	---	---
11	1760	2110	6460	e2000	e2100	15200	4340	5100	e1300	19700	---	---
12	2480	3750	4540	e2200	e1700	12700	5060	5770	e1100	16300	---	---
13	3400	3500	843	e2100	e1500	11000	7280	5480	e1700	12200	---	---
14	2860	e2500	2010	e1900	e1800	10100	9450	4540	e1900	8560	---	---
15	2660	3440	1140	e1500	e2100	9820	10500	3900	e2000	6450	---	---
16	3270	3480	7340	e1400	e2300	8920	9620	e4200	e2100	6150	---	---
17	6250	1400	3900	e1800	e2500	7870	8710	e4600	e2300	4820	---	---
18	8230	3340	2150	e1900	e2800	6730	7490	e4200	e2000	4760	---	---
19	8980	3040	3250	e1800	e4000	5970	7000	e3500	e1500	4400	---	---
20	8490	957	3060	e1700	9770	5660	6410	e3000	e1700	e5000	---	---
21	8930	e2000	1520	e1800	16400	6130	5860	e2300	e1500	e6000	---	---
22	7750	e3000	914	e1400	21600	9810	4990	e2100	e1700	e6400	---	---
23	6910	5500	4440	e1300	24300	11900	3600	e2200	e1500	e6200	---	---
24	5830	744	3210	e1700	22900	12300	1660	e2300	e2000	e6000	---	---
25	5210	6370	3030	e1900	19200	11200	5140	e2600	e6000	e5600	---	---
26	5000	3580	3360	e2200	15800	10400	8890	e3200	e13000	e4700	---	---
27	4590	1980	4390	e2400	12800	9450	12900	e4000	e17000	e4100	---	---
28	3770	5890	e3500	e4000	11100	8400	13600	e3000	e16000	e3800	---	---
29	3540	1280	e2100	e3800	---	8280	12400	e2500	e14000	e3200	---	---
30	4590	5020	e1800	e3500	---	8110	10600	e2300	e13000	e2900	---	---
31	4960	---	e1600	e3900	---	7740	---	e2500	---	e2700	---	---
TOTAL	138614	93841	97100	64700	203070	311510	215180	149830	121400	240490	---	---
MEAN	4471	3128	3132	2087	7252	10050	7173	4833	4047	7758	---	---
MAX	8980	6370	7340	4000	24300	19500	13600	10600	17000	21600	---	---
MIN	844	744	633	1300	1500	5660	1660	2100	1100	2700	---	---
CFSM	.74	.52	.52	.34	1.20	1.66	1.18	.80	.67	1.28	---	---
IN.	.85	.58	.60	.40	1.25	1.91	1.32	.92	.75	1.48	---	---

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1991 - 1994, BY WATER YEAR (WY)

	1991	1992	1993	1994	1991	1992	1993	1994	1991	1992	1993	1994
MEAN	5130	7755	6732	6383	5260	10910	14390	6524	4272	4351	3194	3600
MAX	8165	11430	10060	10950	7252	13470	18470	9685	5792	7758	4133	5202
(WY)	1991	1993	1991	1993	1994	1991	1991	1991	1993	1994	1992	1992
MIN	3898	3128	3132	2087	3311	9328	7173	4833	2526	2383	2462	2760
(WY)	1992	1994	1994	1994	1993	1993	1994	1994	1992	1993	1993	1991

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

WATER YEARS 1991 - 1994

ANNUAL TOTAL	2144929	
ANNUAL MEAN	5877	7037
HIGHEST ANNUAL MEAN		8170
LOWEST ANNUAL MEAN		6174
HIGHEST DAILY MEAN	29800	(a)67800
LOWEST DAILY MEAN	-1500	-1980
ANNUAL SEVEN-DAY MINIMUM	1370	941
INSTANTANEOUS PEAK FLOW		(a)68000
INSTANTANEOUS PEAK STAGE		(a)24.90
ANNUAL RUNOFF (CFSM)	.97	1.16
ANNUAL RUNOFF (INCHES)	13.17	15.78
10 PERCENT EXCEEDS	12500	13600
50 PERCENT EXCEEDS	3950	5000
90 PERCENT EXCEEDS	1640	2000

(a) Includes water years 1904-1990.

(e) 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.--Quarterly cross-sectional samples were collected at Rust Ave. 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.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	TIME	DIS- CHARGE, IN CUBIC FEET PER SECOND (00060)	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, KF AGAR (COLS. PER 100 ML) (31673)
NOV 04...	0900	2250	690	8.3	6.0	2.2	11.4	95	K42	K35
MAR 17...	1230	7870	525	7.8	1.0	2.7	--	--	K10	190
MAY 06...	1200	6590	602	8.4	13.0	16	10.0	97	K53	K30
AUG 24...	1300	4360	583	8.2	22.0	8.5	13.0	152	200	110

DATE	HARD- NESS TOTAL (MG/L AS CACO3) (00900)	HARD- NESS NONCARB DISSOLV FLD. AS CACO3 (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 HCO3 (00453)	CAR- BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	ALKA- LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)
NOV 04...	290	59	79	22	29	3.0	280	--	230	41
MAR 17...	210	47	58	15	20	2.9	195	--	160	32
MAY 06...	250	55	67	19	21	2.9	231	1	191	37
AUG 24...	230	44	63	17	25	3.9	224	--	184	29

DATE	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (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, NO2+NO3 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)
NOV 04...	53	0.20	6.7	399	0.54	2420	0.010	1.30	0.030	0.60
MAR 17...	43	0.20	6.3	295	0.40	6270	0.020	1.10	0.170	0.80
MAY 06...	48	0.20	3.0	361	0.49	6420	0.020	1.40	0.040	0.90
AUG 24...	51	0.20	7.2	341	0.46	4010	0.020	1.30	0.020	0.90

STREAMS TRIBUTARY TO LAKE HURON

04157000 SAGINAW RIVER AT SAGINAW, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	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)	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)
NOV 04...	0.050	<0.010	0.020	10	42	<3	43	8	15
MAR 17...	0.060	0.030	0.020	10	34	<3	110	<4	33
MAY 06...	0.080	<0.010	<0.010	20	39	<3	65	<4	17
AUG 24...	0.120	0.040	0.010	<10	42	<3	31	<4	6

DATE	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	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- PENDEDED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
NOV 04...	<10	2	<1	<1.0	260	<6	20	122	81
MAR 17...	<10	1	<1	<1.0	190	<6	23	489	78
MAY 06...	<10	1	<1	<1.0	210	<6	40	712	98
AUG 24...	<10	1	<1	<1.0	210	<6	54	636	99

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. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	101	157	87	e38	e130	e290	637	794	61	780	60	51
2	78	200	83	e38	e120	230	533	879	57	599	60	47
3	66	142	81	e38	e110	207	482	564	38	866	55	46
4	56	121	83	e38	e100	171	407	396	48	428	58	44
5	51	115	94	e38	e90	169	349	318	47	298	76	42
6	48	109	98	e38	e80	262	312	306	45	397	108	41
7	45	96	98	e38	e76	1850	265	302	44	2280	86	42
8	41	83	93	e38	e70	3210	224	460	45	3440	70	41
9	43	79	86	e38	e66	1760	199	379	42	2180	60	39
10	44	72	82	e38	e62	924	192	297	40	953	54	38
11	41	71	80	e38	e60	714	171	247	39	569	52	36
12	38	70	60	e38	e58	640	164	224	37	382	50	37
13	49	70	67	e38	e56	718	461	202	37	271	73	36
14	49	70	70	e38	e56	783	781	165	36	203	230	37
15	46	72	69	e37	e58	698	582	143	37	196	314	39
16	43	70	72	e36	e60	634	564	129	36	273	154	39
17	45	71	71	e36	122	501	596	122	36	188	111	41
18	84	68	68	e35	982	443	431	113	33	132	80	46
19	266	66	68	e35	4280	323	328	106	32	104	65	47
20	189	67	68	e35	4650	307	267	97	34	85	73	41
21	132	65	69	e35	e3500	1060	217	93	35	84	741	38
22	198	61	70	e35	e2700	2990	184	88	29	98	822	36
23	206	60	60	e35	e1900	1840	163	85	30	111	380	34
24	136	60	53	e35	e1400	1490	149	81	755	276	208	35
25	107	57	e50	e35	e980	1220	147	78	2570	270	134	35
26	89	55	e47	e37	e720	709	760	83	2030	160	99	35
27	80	67	e44	e44	e560	591	1790	84	1030	106	80	38
28	73	115	e42	e80	e380	859	1400	87	577	85	69	58
29	68	128	e41	e130	---	1210	821	81	1340	75	62	74
30	66	105	e40	e190	---	1280	664	72	1560	69	56	79
31	75	---	e39	e160	---	858	---	66	---	62	52	---
TOTAL	2653	2642	2133	1562	23426	28941	14240	7141	10780	16020	4592	1292
MEAN	85.6	88.1	68.8	50.4	837	934	475	230	359	517	148	43.1
MAX	266	200	98	190	4650	3210	1790	879	2570	3440	822	79
MIN	38	55	39	35	56	169	147	66	29	62	50	34
CFSM	.18	.19	.15	.11	1.80	2.01	1.02	.50	.77	1.11	.32	.09
IN.	.21	.21	.17	.13	1.88	2.32	1.14	.57	.86	1.28	.37	.10

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1994, BY WATER YEAR (WY)

	MEAN	117	167	253	247	422	1029	671	291	164	79.6	60.1	114
MAX	1316	972	1031	1315	1855	3218	2102	1511	796	517	559	2237	
(WY)	1987	1993	1951	1952	1954	1985	1947	1956	1967	1994	1953	1986	
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	1948	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1944 - 1994

ANNUAL TOTAL	120007		115422										
ANNUAL MEAN	329		316										
HIGHEST ANNUAL MEAN										302			
LOWEST ANNUAL MEAN										705			1985
HIGHEST DAILY MEAN	5790	Mar 29	4650	Feb 20	10100					28.6			1964
LOWEST DAILY MEAN	30	Sep 11	29	Jun 22	2.0								Apr 6 1947
ANNUAL SEVEN-DAY MINIMUM	33	Jul 31	33	Jun 17	2.7								Aug 17 1948
INSTANTANEOUS PEAK FLOW			5640	Feb 20	(a)14400								Sep 13 1946
INSTANTANEOUS LOW FLOW			12.68	Feb 20	(b)18.05								Apr 5 1947
ANNUAL RUNOFF (CFSM)	.71		27	Jun 22	(c)1.8								Feb 20 1951
ANNUAL RUNOFF (INCHES)	9.62		.68		(d)								
10 PERCENT EXCEEDS	747		9.25		8.84								
50 PERCENT EXCEEDS	80		805		670								
90 PERCENT EXCEEDS	37		83		61								
			38		15								

(a) From rating curve extended above 9,500 ft³/s.

(b) Observed; backwater from ice; site and datum then in use.

(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. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e33	35	35	13	e54	93	206	486	18	e140	14	20
2	24	34	30	e13	e47	78	165	439	17	e130	17	19
3	19	29	30	e13	e42	64	139	327	17	e120	15	18
4	17	23	32	e13	e37	52	119	237	16	e110	16	18
5	14	23	33	e13	e32	61	101	180	15	e105	17	18
6	13	24	33	e13	e28	184	86	148	15	e110	23	18
7	17	24	34	e13	e25	518	75	130	14	e120	21	18
8	20	23	36	e13	e24	649	62	190	14	e145	18	18
9	25	22	34	e13	e22	557	53	187	12	e110	17	17
10	17	23	33	e13	e21	386	50	146	12	e80	15	17
11	18	24	31	e13	e20	303	46	112	11	e58	14	17
12	22	25	25	e13	e20	242	51	96	11	e45	14	18
13	22	26	26	e13	e19	183	106	84	11	e36	24	19
14	23	29	30	e13	e19	200	157	72	12	e30	38	20
15	25	32	28	e13	e19	156	139	59	e13	e25	54	20
16	29	31	26	e12	e20	147	133	55	e16	e23	41	23
17	44	30	25	e12	e25	140	124	50	e18	e21	33	24
18	49	29	23	e12	77	116	100	44	e17	e19	30	20
19	60	25	23	e12	260	99	90	38	e15	e18	27	20
20	55	27	25	e12	921	94	70	34	e14	e17	29	19
21	53	24	25	e12	932	294	56	32	e14	e17	36	18
22	54	23	28	e12	710	579	51	29	e14	e19	62	17
23	61	23	25	e12	555	474	43	26	e15	e25	47	16
24	59	22	e22	e12	390	383	37	24	e98	e38	35	16
25	52	22	e20	e12	282	313	43	22	e570	e30	29	16
26	45	25	18	e13	212	227	434	32	e500	e25	26	19
27	42	35	e16	e17	177	188	764	33	e200	21	25	19
28	40	38	e14	e27	139	227	769	37	e120	21	22	29
29	36	47	13	e41	---	287	606	30	e130	19	19	27
30	34	41	13	e52	---	313	496	25	e150	17	19	34
31	39	---	13	e62	---	266	---	21	---	15	19	---
TOTAL	1061	838	799	527	5129	7873	5371	3425	2099	1709	816	592
MEAN	34.2	27.9	25.8	17.0	183	254	179	110	70.0	55.1	26.3	19.7
MAX	61	47	36	62	932	649	769	486	570	145	62	34
MIN	13	22	13	12	19	52	37	21	11	15	14	16
CFSM	.20	.17	.15	.10	1.08	1.50	1.06	.65	.41	.33	.16	.12
IN.	.23	.18	.18	.12	1.13	1.73	1.18	.75	.46	.38	.18	.13

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1963 - 1994, BY WATER YEAR (WY)

MEAN	19.3	55.3	86.2	104	136	286	250	90.6	56.7	20.2	14.8	13.1
MAX	67.4	261	266	404	382	664	715	328	274	62.6	57.3	95.9
(WY)	1991	1993	1988	1974	1968	1973	1975	1974	1989	1967	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 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1963 - 1994
ANNUAL TOTAL	41018.7	30239	
ANNUAL MEAN	112	82.8	95.7
HIGHEST ANNUAL MEAN			174
LOWEST ANNUAL MEAN			7.84
HIGHEST DAILY MEAN	1330	Mar 29	3940
LOWEST DAILY MEAN	8.0	Aug 20	.90
ANNUAL SEVEN-DAY MINIMUM	8.5	Aug 17	1.2
INSTANTANEOUS PEAK FLOW		1060	4570
INSTANTANEOUS PEAK STAGE		6.14	8.87
INSTANTANEOUS LOW FLOW		10	.80
ANNUAL RUNOFF (CFSM)	.66	.49	.57
ANNUAL RUNOFF (INCHES)	9.03	6.66	7.69
10 PERCENT EXCEEDS	300	202	227
50 PERCENT EXCEEDS	33	29	25
90 PERCENT EXCEEDS	10	13	5.0

(a) June 11, 12.

(b) Aug. 9-11, 1964.

(c) 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. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.8	5.0	6.4	e3.6	e12	e12	23	40	4.2	e25	4.9	2.9
2	7.7	4.5	6.7	e3.5	e11	e10	23	31	3.3	e16	7.1	1.9
3	6.0	4.6	6.9	e3.5	e10	e9.2	22	26	2.4	e11	5.6	1.7
4	5.3	4.6	7.7	e3.5	e9.2	8.9	16	21	1.8	e10	10	1.6
5	4.5	4.6	8.9	e3.5	e8.4	14	15	17	1.5	e19	11	1.4
6	4.2	4.8	8.7	e3.5	e7.6	56	13	14	1.8	e16	7.4	2.2
7	3.5	3.8	8.8	e3.6	e7.2	71	13	15	1.7	e23	5.5	2.5
8	3.5	5.4	7.5	e3.6	e6.5	45	13	27	.81	e17	3.7	2.1
9	5.9	11	6.8	e3.7	e6.0	33	13	20	2.2	e13	3.8	1.7
10	6.2	8.2	7.4	e3.7	e5.4	25	12	14	3.4	e9.2	3.6	1.5
11	5.3	4.9	6.4	e3.7	e5.2	23	9.0	12	2.0	e7.0	3.4	1.3
12	4.7	4.0	7.8	e3.7	e5.1	21	14	13	1.5	e5.0	3.4	1.1
13	4.3	5.0	5.4	e3.6	e4.9	25	25	9.8	3.0	e4.5	7.9	1.1
14	3.9	4.9	5.5	e3.6	e4.9	21	21	8.6	5.4	e4.0	9.4	6.1
15	3.9	5.8	6.3	e3.6	e4.9	21	21	8.7	4.8	e3.5	6.0	4.2
16	4.4	5.4	6.7	e3.5	e5.0	18	28	8.0	e3.8	e3.3	4.8	2.5
17	12	4.7	6.4	e3.5	e5.2	16	18	7.4	e3.0	e2.9	4.1	3.1
18	14	4.3	6.5	e3.4	32	11	16	6.9	e2.1	e2.7	3.4	2.3
19	9.6	4.7	6.6	e3.4	97	10	13	7.6	e1.7	e2.5	3.3	8.5
20	8.3	4.7	6.7	e3.3	173	12	9.4	5.6	e1.9	e2.6	6.8	7.7
21	12	4.3	7.3	e3.3	76	49	7.7	4.7	e2.0	e3.0	8.8	5.6
22	9.6	4.3	6.3	e3.3	45	43	6.5	4.1	e1.8	e7.4	6.6	3.6
23	6.9	4.3	6.6	e3.3	36	36	5.8	3.8	e1.3	18	5.9	2.3
24	6.1	4.5	6.3	e3.3	29	33	5.5	4.0	e6.6	14	4.3	1.7
25	5.7	4.1	e5.0	e3.3	e24	26	7.2	4.9	e6.9	9.9	3.7	2.7
26	5.9	5.4	e4.6	e3.3	e19	19	46	20	e5.0	9.0	3.1	2.4
27	5.6	16	e4.3	e3.4	e16	23	55	12	e4.3	6.8	8.2	2.7
28	5.5	12	e4.1	e7.0	e14	29	37	13	e6.0	5.8	10	7.2
29	4.7	8.8	e3.9	e14	---	34	43	7.9	e8.8	5.3	6.7	8.1
30	4.2	7.6	e3.8	e16	---	32	33	5.6	e5.0	6.3	3.5	5.3
31	4.7	---	e3.6	e14	---	27	---	4.9	---	4.2	3.3	---
TOTAL	197.9	176.2	195.9	145.2	679.5	813.1	584.1	397.5	495.11	286.9	179.2	99.0
MEAN	6.38	5.87	6.32	4.68	24.3	26.2	19.5	12.8	16.5	9.25	5.78	3.30
MAX	14	16	8.9	16	173	71	55	40	88	25	11	8.5
MIN	3.5	3.8	3.6	3.3	4.9	8.9	5.5	3.8	.81	2.5	3.1	1.1
CFSM	.35	.33	.35	.26	1.35	1.46	1.08	.71	.92	.51	.32	.18
IN.	.41	.36	.40	.30	1.40	1.68	1.21	.82	1.02	.59	.37	.20

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1994, BY WATER YEAR (WY)

	MEAN	7.82	10.5	12.0	10.8	16.3	30.1	24.2	10.8	9.17	4.90	3.39	6.11
MAX	36.8	31.0	28.2	32.9	46.6	60.5	59.6	32.3	32.6	12.5	10.1	38.4	
(WY)	1987	1986	1988	1973	1976	1973	1975	1974	1989	1980	1980	1986	
MIN	.82	2.49	2.71	2.64	3.24	8.92	9.15	2.76	1.21	.41	.57	.64	
(WY)	1967	1966	1977	1977	1980	1989	1966	1977	1988	1966	1966	1965	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1965 - 1994

ANNUAL TOTAL	4704.4	4249.61	
ANNUAL MEAN	12.9	11.6	12.2
HIGHEST ANNUAL MEAN			20.6
LOWEST ANNUAL MEAN			5.13
HIGHEST DAILY MEAN	139	Jun 21	307
LOWEST DAILY MEAN	2.1	Aug 8	.01
ANNUAL SEVEN-DAY MINIMUM	2.3	Aug 3	.14
INSTANTANEOUS PEAK FLOW			(a)354
INSTANTANEOUS PEAK STAGE			(b)9.33
INSTANTANEOUS LOW FLOW			.00
ANNUAL RUNOFF (CFSM)	.72		.68
ANNUAL RUNOFF (INCHES)	9.72		9.18
10 PERCENT EXCEEDS	26		27
50 PERCENT EXCEEDS	7.3		6.1
90 PERCENT EXCEEDS	3.3		1.7

(a) From rating curve extended above 100 ft³/s.

(b) Datum then in use.

(c) June 11, 12.

(d) 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, on right downstream side of bridge on State Highway 19 at Memphis.

DRAINAGE AREA.--151 mi².

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

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 705.41 ft above sea level (Michigan Department of Transportation bench mark).

REMARKS.--Records good except for periods, Feb. 20, 21, and Feb 28 to Mar. 30 which are fair, and estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	45	26	39	e16	e48	108	270	409	29	423	18	14
2	35	32	34	e16	e43	89	198	440	26	206	19	14
3	29	30	33	e16	e37	72	169	288	22	136	23	13
4	24	28	34	e16	e33	68	151	205	20	92	21	12
5	22	28	45	e16	e29	94	127	157	19	88	24	12
6	20	28	58	e16	e26	316	113	152	19	168	27	11
7	19	26	54	e16	e24	858	99	120	19	140	22	12
8	19	23	50	e16	e21	808	90	273	17	194	19	14
9	20	22	45	e16	e20	503	83	310	16	152	17	14
10	23	27	42	e16	e19	272	81	205	15	103	16	13
11	25	28	39	e16	e18	217	74	146	14	75	16	12
12	23	25	33	e16	e17	192	72	129	16	58	16	11
13	23	22	34	e16	e17	177	165	125	18	47	19	11
14	26	23	32	e16	e16	216	219	105	19	39	23	12
15	26	29	30	e15	e16	162	168	89	25	33	24	22
16	26	31	31	e15	e16	140	161	82	27	31	21	25
17	28	31	32	e15	e17	115	149	74	21	28	18	20
18	42	30	31	e15	e26	103	107	64	18	26	17	19
19	49	29	30	e15	e600	87	89	57	15	23	16	16
20	39	26	30	e15	1240	81	78	54	15	21	20	16
21	33	24	31	e14	1060	303	65	50	16	22	21	20
22	42	22	33	e14	e920	696	58	48	18	24	25	19
23	38	22	26	e14	e720	454	53	42	15	33	21	17
24	34	22	e23	e14	e520	318	48	39	122	50	19	15
25	29	22	e22	e15	e370	270	47	40	576	40	17	15
26	27	23	e21	e15	e280	196	261	39	603	33	17	16
27	26	31	e19	e15	e230	167	642	55	437	36	16	17
28	25	80	e18	e15	176	263	631	50	326	30	15	17
29	25	64	e18	e21	---	298	449	45	579	26	18	19
30	24	46	e17	e40	---	403	430	38	757	22	17	25
31	25	---	e17	e54	---	377	---	32	---	20	16	---
TOTAL	891	900	1001	545	6559	8423	5347	3962	3839	2419	598	473
MEAN	28.7	30.0	32.3	17.6	234	272	178	128	128	78.0	19.3	15.8
MAX	49	80	58	54	1240	858	642	440	757	423	27	25
MIN	19	22	17	14	16	68	47	32	14	20	15	11
CFSM	.19	.20	.21	.12	1.55	1.80	1.18	.85	.85	.52	.13	.10
IN.	.22	.22	.25	.13	1.62	2.08	1.32	.98	.95	.60	.15	.12

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1963 - 1994, BY WATER YEAR (WY)

	MEAN	44.0	69.6	93.3	83.2	137	265	212	86.3	52.9	26.0	19.0	32.4
MAX	330	375	247	315	528	595	617	270	206	82.3	91.3	256	
(WY)	1982	1986	1988	1973	1976	1973	1975	1974	1989	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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1963 - 1994

ANNUAL TOTAL	40505						34957						
ANNUAL MEAN	111						95.8			93.1			
HIGHEST ANNUAL MEAN										168		1985	
LOWEST ANNUAL MEAN										11.3		1964	
HIGHEST DAILY MEAN	1300				Mar 29		1240		Feb 20	3320		Apr 19 1975	
LOWEST DAILY MEAN	12				Aug 6		11		Sep 6	2.4		Sep 6 1978	
ANNUAL SEVEN-DAY MINIMUM	13				Aug 4		12		Sep 6	2.6		Sep 5 1978	
INSTANTANEOUS PEAK FLOW							2520		Feb 20	4520		Apr 19 1975	
INSTANTANEOUS PEAK STAGE							8.01		Feb 20	8.96		Apr 19 1975	
INSTANTANEOUS LOW FLOW							7.6		Sep 14	2.3		(a)	
ANNUAL RUNOFF (CFSM)	.73						.63			.62			
ANNUAL RUNOFF (INCHES)	9.98						8.61			8.38			
10 PERCENT EXCEEDS	252						271			220			
50 PERCENT EXCEEDS	45						29			31			
90 PERCENT EXCEEDS	18						16			8.8			

(a) Sept. 6, 10, 1978.

(e) 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 poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	8.6	12	e6.4	e10	e10	28	50	7.4	20	3.1	3.9
2	12	8.1	12	e6.2	e9.0	e9.9	27	43	6.7	17	3.1	3.6
3	9.9	8.6	12	5.9	e7.8	9.8	25	39	6.1	15	3.0	3.4
4	8.9	8.6	12	5.9	e7.2	9.0	23	36	5.5	13	4.0	3.2
5	8.0	8.3	13	5.8	e6.6	11	23	35	5.0	16	6.2	3.0
6	7.6	8.3	13	5.4	e6.4	30	23	34	5.2	16	4.4	2.8
7	7.3	7.9	13	e5.3	e6.2	46	22	33	5.2	23	3.9	2.8
8	7.4	7.6	12	e5.2	e6.0	39	20	43	4.7	19	3.5	2.7
9	11	7.6	12	e5.1	e5.9	e31	19	35	4.1	17	3.5	2.7
10	12	7.2	11	e5.1	e5.8	27	17	29	3.9	15	3.3	2.4
11	10	7.3	11	e5.0	e5.8	25	16	27	3.6	13	3.3	2.3
12	9.4	7.6	e10	e5.0	e5.8	24	19	26	3.4	12	3.6	2.2
13	9.4	8.2	9.1	e5.0	e5.7	29	27	22	8.0	12	6.3	2.2
14	9.7	8.3	9.0	e5.0	e5.8	26	26	20	17	11	11	2.2
15	9.6	8.6	9.0	e4.9	e6.0	27	25	20	13	11	8.5	3.1
16	9.9	8.4	9.0	e4.9	e6.4	e26	28	19	11	9.9	7.4	2.8
17	15	8.3	9.0	e4.9	e7.3	e24	22	17	7.5	9.0	6.7	2.6
18	16	8.5	9.0	e4.9	e9.0	23	18	16	6.9	8.3	5.8	2.6
19	14	8.8	9.0	e4.9	e13	20	18	15	5.6	7.3	5.0	2.3
20	13	8.8	9.3	e5.1	e5.0	19	16	14	5.8	7.0	6.7	2.1
21	15	8.7	10	e5.2	e35	41	14	14	6.9	7.5	13	2.1
22	13	8.5	9.6	e5.4	e25	49	12	13	5.1	8.0	10	1.9
23	11	8.4	9.6	e5.6	e19	45	11	12	4.8	9.7	8.2	1.9
24	10	9.2	8.9	e6.4	e16	44	12	12	19	7.8	7.0	2.0
25	9.4	9.5	8.7	e7.5	e14	38	15	12	32	6.0	6.1	3.8
26	9.4	11	7.8	e9.0	e13	32	21	12	28	4.9	5.5	4.2
27	9.1	17	e7.5	e11	e12	33	44	12	27	4.6	4.9	3.9
28	8.8	16	e7.2	e20	e11	35	41	11	21	4.3	5.3	5.4
29	8.2	14	e7.0	e30	---	34	49	10	27	3.9	5.1	5.2
30	7.9	13	e6.8	e20	---	33	42	8.9	25	3.6	4.6	4.1
31	8.3	---	e6.6	e14	---	30	---	8.1	---	3.3	4.4	---
TOTAL	323.2	278.9	305.1	240.0	330.7	879.7	703	698.0	331.4	335.1	176.4	89.4
MEAN	10.4	9.30	9.84	7.74	11.8	28.4	23.4	22.5	11.0	10.8	5.69	2.98
MAX	16	17	13	30	50	49	49	50	32	23	13	5.4
MIN	7.3	7.2	6.6	4.9	5.7	9.0	11	8.1	3.4	3.3	3.0	1.9
CFSM	.50	.44	.47	.37	.57	1.36	1.12	1.08	.53	.52	.27	.14
IN.	.58	.50	.54	.43	.59	1.57	1.25	1.24	.59	.60	.31	.16

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1960 - 1994, BY WATER YEAR (WY)

	7.13	10.8	13.1	12.7	14.6	26.5	29.1	18.1	11.1	5.69	4.50	5.85
MEAN	7.13	10.8	13.1	12.7	14.6	26.5	29.1	18.1	11.1	5.69	4.50	5.85
MAX	38.4	38.2	28.2	36.5	39.1	61.2	45.5	41.6	25.2	14.8	19.5	31.9
(WY)	1982	1986	1988	1993	1976	1976	1975	1974	1989	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	1984	1963

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1960 - 1994

ANNUAL TOTAL	6149.6	4690.9	13.3
ANNUAL MEAN	16.8	12.9	21.5
HIGHEST ANNUAL MEAN			4.12
LOWEST ANNUAL MEAN			1975
HIGHEST DAILY MEAN	70	50	146
LOWEST DAILY MEAN	1.7	1.9	Oct 1 1981
ANNUAL SEVEN-DAY MINIMUM	1.9	2.1	Jul 9 1988
INSTANTANEOUS PEAK FLOW		(a)59	181
INSTANTANEOUS PEAK STAGE		(b)3.35	Oct 1 1981
INSTANTANEOUS LOW FLOW		1.8	Oct 1 1981
ANNUAL RUNOFF (CFSM)	.81	.61	(c)
ANNUAL RUNOFF (INCHES)	10.95	8.35	.63
10 PERCENT EXCEEDS	38	28	8.62
50 PERCENT EXCEEDS	12	9.0	30
90 PERCENT EXCEEDS	4.1	3.9	9.3
			1.7

(a) Feb. 20, May 1.

(b) Backwater from ice.

(c) Sept. 22, 23.

(d) 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, 1.0 mi downstream from State fish hatchery, and 2.0 mi south of Drayton Plains.

DRAINAGE AREA.--79.2 mi².

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

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 940 ft above sea level, from topographic map. Jan. 29 to July 9, 1964, nonrecording gage at same site and datum.

REMARKS.--Records fair except for estimated daily discharges, which are poor. 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	78	45	57	49	e50	e72	99	124	38	136	13	12
2	77	44	57	45	e49	e72	97	125	23	129	11	10
3	76	44	57	45	e48	72	96	127	18	120	12	7.3
4	75	43	58	45	e46	72	94	126	12	107	16	7.2
5	70	43	58	45	e45	73	91	123	11	103	28	7.3
6	65	43	59	45	e44	80	91	114	11	99	28	7.1
7	48	41	59	46	e43	81	87	115	14	108	29	7.1
8	32	40	60	46	e43	84	85	112	11	102	33	7.6
9	37	41	60	46	e42	89	81	104	11	102	26	8.1
10	38	53	61	46	e42	91	79	96	13	99	11	8.2
11	39	72	61	45	e41	93	76	93	8.6	64	11	7.6
12	44	74	61	44	e40	93	75	84	7.8	19	10	7.1
13	50	76	60	44	e40	93	67	72	14	23	26	8.2
14	49	76	59	45	e39	93	63	73	87	20	62	9.8
15	48	76	58	45	e39	89	67	73	81	17	68	11
16	48	74	57	44	e39	86	70	72	71	19	59	11
17	63	76	55	44	e40	84	75	71	49	18	57	11
18	73	75	54	45	e41	84	79	61	34	13	56	11
19	71	72	54	47	e43	82	78	50	34	9.4	44	11
20	73	65	54	49	e47	81	76	35	25	17	27	11
21	73	59	54	50	e62	91	63	22	8.6	31	19	11
22	72	54	53	50	e68	90	43	13	8.4	40	22	11
23	72	51	50	43	e71	93	40	14	8.2	49	25	11
24	70	54	50	40	e73	95	40	16	39	35	28	11
25	70	55	51	39	e73	97	41	18	104	32	37	13
26	67	57	56	41	e73	99	42	32	120	16	46	26
27	64	61	55	e45	e72	103	52	49	134	19	45	42
28	64	59	53	e50	e72	102	77	48	140	19	48	66
29	57	58	53	e54	---	103	109	46	144	19	44	69
30	47	58	53	e54	---	102	118	45	140	19	38	32
31	46	---	51	e51	---	100	---	44	---	18	24	---
TOTAL	1856	1739	1738	1427	1425	2739	2251	2197	1419.6	1621.4	1003	472.6
MEAN	59.9	58.0	56.1	46.0	50.9	88.4	75.0	70.9	47.3	52.3	32.4	15.8
MAX	78	76	61	54	73	103	118	127	144	136	68	69
MIN	32	40	50	39	39	72	40	13	7.8	9.4	10	7.1
CFSM	.76	.73	.71	.58	.64	1.12	.95	.89	.60	.66	.41	.20
IN.	.87	.82	.82	.67	.67	1.29	1.06	1.03	.67	.76	.47	.22

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1960 - 1994, BY WATER YEAR (WY)

	MEAN	38.7	50.7	61.4	56.6	57.8	82.4	93.2	61.0	44.4	29.3	25.5	30.5
MAX	114	107	109	114	115	188	168	137	94.5	82.0	68.5	129	
(WY)	1982	1986	1986	1973	1974	1976	1974	1974	1989	1968	1968	1975	
MIN	4.83	7.90	15.6	15.5	16.6	28.8	52.5	22.9	6.47	5.79	6.39	4.80	
(WY)	1965	1965	1964	1964	1964	1964	1987	1988	1988	1988	1963	1963	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1960 - 1994

ANNUAL TOTAL	24959		19888.6									
ANNUAL MEAN	68.4		54.5									
HIGHEST ANNUAL MEAN										52.6		
LOWEST ANNUAL MEAN										87.9		1974
HIGHEST DAILY MEAN	161	Apr 11	144	Jun 29	274	Mar 12 1974				20.0		1964
LOWEST DAILY MEAN	10	Jul 9	7.1	Sep 6	3.1	Sep 18 1963						
ANNUAL SEVEN-DAY MINIMUM	12	Aug 12	7.4	Sep 3	3.5	Sep 16 1963						
INSTANTANEOUS PEAK FLOW			145	Jun 29	276	Mar 12 1974						
INSTANTANEOUS PEAK STAGE			3.80	Jun 29	4.95	Mar 12 1974						
INSTANTANEOUS LOW FLOW			6.9	(a)	2.4	May 31 1961						
ANNUAL RUNOFF (CFSM)	.86		.69		.66							
ANNUAL RUNOFF (INCHES)	11.72		9.34		9.02							
10 PERCENT EXCEEDS	122		96		102							
50 PERCENT EXCEEDS	65		50		46							
90 PERCENT EXCEEDS	23		11		11							

(a) Sept. 12, 13.

(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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	53	46	45	e31	e55	e62	90	167	30	78	19	20
2	49	44	46	e30	e45	61	86	137	29	83	20	19
3	45	46	46	e30	e40	60	84	122	28	64	19	18
4	42	45	48	e29	e37	62	77	115	27	52	27	17
5	38	46	51	e29	e35	77	70	106	26	78	31	16
6	36	44	50	e28	e34	192	56	93	29	64	21	17
7	34	42	53	e28	e33	187	53	97	27	97	19	19
8	35	44	47	e27	e32	131	50	127	25	64	18	17
9	54	40	46	e27	e32	109	50	93	23	54	20	16
10	50	38	46	e27	e31	104	50	77	22	46	20	16
11	39	38	57	e26	e31	98	47	75	21	40	23	15
12	44	38	53	e26	e31	94	59	74	20	37	30	15
13	40	42	48	e25	e31	103	75	66	98	36	49	13
14	37	43	43	e25	e31	94	65	62	80	32	67	15
15	35	43	43	e25	e32	92	70	60	36	30	37	21
16	36	42	42	e25	e33	86	82	61	28	29	30	16
17	69	42	41	e25	e36	78	71	57	24	27	28	15
18	59	40	41	e24	e47	76	72	54	21	27	26	15
19	48	40	42	e24	e100	73	75	49	20	24	23	14
20	60	40	43	e24	e170	71	70	37	27	24	31	14
21	72	39	46	e24	e110	188	63	35	27	27	59	14
22	62	38	47	e25	94	149	58	34	21	33	41	14
23	51	40	48	e27	94	127	55	34	21	39	34	14
24	47	43	e46	e29	96	126	56	35	135	29	30	14
25	44	43	e43	e34	90	114	60	44	91	25	27	22
26	46	47	e40	e45	e80	103	68	50	113	24	24	18
27	43	86	e38	e70	e70	115	141	44	138	22	23	25
28	45	58	e36	e230	e65	119	100	39	99	22	30	31
29	45	49	e35	e160	---	122	130	35	118	20	25	40
30	44	48	e33	e100	---	109	121	31	86	20	21	30
31	47	---	e32	e70	---	98	---	30	---	21	22	---
TOTAL	1449	1334	1375	1349	1615	3280	2204	2140	1490	1268	894	550
MEAN	46.7	44.5	44.4	43.5	57.7	106	73.5	69.0	49.7	40.9	28.8	18.3
MAX	72	86	57	230	170	192	141	167	138	97	67	40
MIN	34	38	32	24	31	60	47	30	20	20	18	13
CFSM	.66	.63	.63	.61	.81	1.49	1.04	.97	.70	.58	.41	.26
IN.	.76	.70	.72	.71	.85	1.72	1.16	1.12	.78	.67	.47	.29

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1960 - 1994, BY WATER YEAR (WY)

	MEAN	39.1	45.3	51.9	50.6	59.1	96.9	99.9	62.5	45.2	28.8	25.7	34.8
MAX	123	120	103	127	160	204	194	146	115	58.0	66.7	104	
(WY)	1982	1986	1976	1973	1976	1976	1975	1974	1989	1992	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	
(WY)	1964	1964	1965	1964	1963	1964	1964	1977	1988	1963	1965	1963	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1960 - 1994

ANNUAL TOTAL	24198	18948	
ANNUAL MEAN	66.3	51.9	53.2
HIGHEST ANNUAL MEAN			86.7
LOWEST ANNUAL MEAN			20.4
HIGHEST DAILY MEAN	334	(e)230	660
LOWEST DAILY MEAN	14	13	6.8
ANNUAL SEVEN-DAY MINIMUM	17	14	7.9
INSTANTANEOUS PEAK FLOW		(e)340	918
INSTANTANEOUS PEAK STAGE		(a)4.73	(a)5.95
INSTANTANEOUS LOW FLOW		13	(c)1.2
ANNUAL RUNOFF (CFSM)	.94	.73	.75
ANNUAL RUNOFF (INCHES)	12.70	9.94	10.20
10 PERCENT EXCEEDS	120	99	103
50 PERCENT EXCEEDS	49	42	40
90 PERCENT EXCEEDS	25	21	16

(a) Backwater from ice.

(b) On several days in September.

(c) Caused by 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 poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	8.3	12	e6.9	e11	e12	37	45	4.1	27	4.3	8.0
2	14	5.7	13	e6.8	e10	e12	34	39	3.9	25	7.4	9.5
3	13	6.4	14	e6.6	e9.5	e13	33	33	3.6	22	9.5	4.1
4	12	6.2	14	e6.5	e9.0	e14	28	29	4.4	19	7.9	2.4
5	11	6.0	15	e6.4	e8.8	19	26	27	4.4	13	6.0	2.4
6	10	5.5	15	e6.2	e8.7	52	25	25	4.9	8.2	3.7	3.6
7	9.6	5.3	15	e6.1	e8.6	60	22	26	4.7	14	3.0	2.4
8	9.6	5.1	14	e6.1	e8.5	54	19	35	4.2	9.4	3.4	2.0
9	15	5.3	13	e6.0	e8.4	e44	20	28	3.6	8.0	4.0	2.2
10	12	5.1	13	e6.0	e8.3	40	19	24	3.3	7.1	2.6	2.0
11	9.3	5.2	9.8	e6.0	e8.2	35	16	22	3.0	5.8	3.0	1.8
12	8.9	5.3	5.9	e5.9	e8.0	32	21	23	3.0	4.8	2.8	1.6
13	8.6	5.9	5.4	e5.9	e8.0	39	29	18	6.3	5.1	5.4	2.3
14	8.6	5.8	11	e5.9	e8.0	33	24	16	11	4.2	5.8	2.8
15	8.2	6.1	12	e5.9	e8.0	35	25	14	6.1	3.8	3.9	3.2
16	11	5.5	12	e5.8	e8.1	e31	28	14	4.2	3.3	3.1	3.0
17	17	5.5	12	e5.8	e8.3	e27	23	13	3.7	2.9	2.9	4.0
18	16	5.8	12	e5.7	e9.5	25	20	11	3.3	2.7	2.8	3.6
19	13	5.8	13	e5.7	e11	23	19	8.5	2.9	2.3	2.9	2.8
20	12	5.7	12	e5.7	e18	24	17	7.5	3.1	2.3	6.9	2.9
21	15	10	13	e5.7	e50	57	15	8.8	4.0	2.6	8.6	2.8
22	12	11	12	e5.8	e25	61	14	6.7	3.0	8.0	5.0	2.3
23	9.9	11	e11	e5.9	e18	59	12	5.6	3.0	16	3.6	2.4
24	8.9	13	e10	e6.0	e15	55	12	5.5	26	13	2.7	4.1
25	8.4	13	e9.0	e6.4	e13	44	12	6.0	30	6.4	2.8	3.3
26	8.3	14	e8.5	e7.5	e12	37	18	7.2	25	6.2	2.4	3.0
27	8.0	23	e8.2	e11	e12	38	32	7.1	24	3.4	2.2	3.1
28	6.6	17	e7.9	e23	e12	40	30	5.4	31	2.6	2.6	4.1
29	6.2	14	e7.7	e19	---	38	37	4.7	34	2.4	2.8	4.3
30	5.8	13	e7.5	e16	---	35	38	4.4	32	2.9	2.7	4.4
31	7.8	---	e7.2	e13	---	40	---	4.2	---	3.6	2.6	---
TOTAL	328.7	254.5	345.1	241.2	342.9	1128	705	523.6	299.7	257.0	129.3	100.4
MEAN	10.6	8.48	11.1	7.78	12.2	36.4	23.5	16.9	9.99	8.29	4.17	3.35
MAX	17	23	15	23	50	61	38	45	34	27	9.5	9.5
MIN	5.8	5.1	5.4	5.7	8.0	12	12	4.2	2.9	2.3	2.2	1.6
CFSM	.41	.33	.43	.30	.48	1.42	.92	.66	.39	.32	.16	.13
IN.	.48	.37	.50	.35	.50	1.64	1.02	.76	.44	.37	.19	.15

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1994, BY WATER YEAR (WY)

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
MEAN	10.6	15.6	18.0	16.9	20.9	36.0	35.7	18.3	13.0	8.15	6.93	8.86																		
MAX	25.1	46.2	41.3	47.7	62.9	79.7	75.1	57.1	47.7	20.0	48.5	41.2																		
(WY)	1982	1986	1976	1973	1976	1976	1975	1974	1989	1969	1975	1975																		
MIN	1.79	2.06	3.56	5.26	7.22	14.6	18.2	5.82	2.67	1.47	1.63	1.52																		
(WY)	1967	1965	1965	1965	1979	1983	1966	1977	1988	1965	1965	1966																		

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1965 - 1994

ANNUAL TOTAL	7031.1		4655.4																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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(a) Oct. 5, 9, 1967.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161790 STONY LAKE NEAR WASHINGTON, MI

LOCATION.--Lat 42°42'58", long 83°05'58", in SE1/4 sec.31, T.4 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank 1,000 ft east of bridge over dam on Stony Creek, 2.7 mi west of Washington.

DRAINAGE AREA.--68.0 mi².

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

REVISED RECORDS.--WDR MI-77-1: 1976.

GAGE.--Water-stage recorder. Datum of gage is 790.00 ft above sea level (levels by Huron-Clinton Metropolitan Authority); gage readings have been converted to elevations above sea level.

REMARKS.--Reservoir is formed by an earthfill dam with concrete spillway completed in 1962. The spillway section includes a drum gate with minimum crest elevation of 796 ft, maximum of 802 ft; and 2 sluices, one on each side, with valve controls capable of draining lake. Total capacity, 4,649 acre-ft at elevation of 802 ft. The reservoir began filling February 1963. Lake is used for recreational purposes.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 5,495 acre-ft, May 17, 18, 1974, Apr. 20, 1975, Apr. 1, 1993, elevation, 803.60 ft; minimum recorded, 1,758 acre-ft, Nov. 21, 1967, elevation, 794.7 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 5,107 acre-ft, May 1, elevation, 802.88 ft; minimum, 2,626 acre-ft, Jan. 5, 6, elevation, 797.47 ft.

MONTHEND ELEVATION, IN FEET ABOVE SEA LEVEL, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

Date	Elevation (feet)	Contents (acre-feet)	Change in contents	
			(acre- feet)	(equivalent in ft ³ /s)
Sept. 30	802.29	4,800	--	--
Oct. 31	800.86	4,086	-714	-11.6
Nov. 30	798.75	3,138	-948	-15.9
Dec. 31	797.68	2,705	-433	-7.0
CAL YR 1993	--	--	-1,574	-2.2
Jan. 31	798.75	3,138	+433	+7.0
Feb. 28	798.86	3,184	+46	+0.8
Mar. 31	802.12	4,711	+1,527	+24.8
Apr. 30	802.59	4,956	+245	+4.1
May 31	802.09	4,696	-260	-4.2
June 30	802.51	4,914	+218	+3.7
July 31	802.01	4,654	-260	-4.2
Aug. 31	802.02	4,659	+5	+0.1
Sept. 30	802.01	4,654	-5	-0.1
WTR YR 1994	--	--	-146	-0.2

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 except for estimated daily discharges, which are poor. 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	44	56	49	e30	e40	e65	81	89	19	72	9.8	12
2	42	56	49	e28	e35	e63	79	90	16	64	11	9.1
3	36	56	49	e26	e30	53	77	85	14	55	9.0	9.0
4	35	56	49	e25	e28	37	73	78	17	46	15	8.3
5	34	56	48	e23	e25	37	66	60	17	49	23	8.1
6	32	57	48	e22	e24	38	66	57	18	48	18	8.4
7	30	57	48	e21	e22	38	59	63	20	49	17	8.6
8	28	56	48	e20	e21	54	56	72	19	45	15	7.8
9	37	56	48	e19	e21	63	57	73	10	39	15	11
10	30	54	48	e19	e20	63	58	69	11	33	12	11
11	25	53	48	e18	e20	63	52	64	11	26	13	10
12	24	53	48	e18	e19	63	47	62	11	22	15	9.3
13	27	52	48	e17	e19	63	47	58	20	21	21	8.6
14	32	51	47	e17	e19	63	52	55	38	17	27	9.4
15	35	51	45	e16	e20	63	57	51	37	15	21	12
16	39	52	43	e16	e21	64	60	48	34	15	17	12
17	46	49	43	e16	e23	64	60	46	29	16	16	12
18	47	43	43	e16	e32	64	53	42	23	18	15	11
19	63	43	43	e16	e50	64	53	38	21	17	13	9.3
20	64	43	43	e16	e100	64	50	35	16	15	13	8.5
21	59	43	43	e16	e170	64	49	33	18	17	20	8.2
22	57	42	43	e16	e140	65	43	31	13	15	22	7.7
23	56	42	43	e16	e125	65	37	30	13	14	24	7.3
24	56	42	43	e17	e110	66	36	28	40	15	23	7.0
25	56	42	44	e19	e100	66	36	30	63	18	21	9.3
26	57	42	e44	e23	e88	66	37	35	78	18	20	9.1
27	59	42	e44	e27	e76	72	53	29	77	17	18	9.3
28	58	41	e43	e38	e71	78	64	28	69	16	19	12
29	58	45	e41	e70	---	87	73	26	98	14	16	12
30	57	50	e38	e62	---	87	79	23	86	13	12	10
31	56	---	e34	e55	---	84	---	20	---	11	12	---
TOTAL	1379	1481	1395	758	1469	1946	1710	1548	956	850	522.8	287.3
MEAN	44.5	49.4	45.0	24.5	52.5	62.8	57.0	49.9	31.9	27.4	16.9	9.58
MAX	64	57	49	70	170	87	81	90	98	72	27	12
MIN	24	41	34	16	19	37	36	20	10	11	9.0	7.0

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1994, BY WATER YEAR (WY)

	MEAN	31.7	43.1	45.9	42.0	49.1	78.0	79.0	49.3	35.1	21.3	19.3	23.4
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	9.11	10.7	9.79	5.14	10.0	17.2	6.93	4.41	4.00	4.72	
(WY)	1963	1964	1964	1963	1963	1964	1963	1963	1964	1988	1964	1964	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1958 - 1994

ANNUAL TOTAL	20289.2		14302.1									
ANNUAL MEAN	55.6		39.2									
HIGHEST ANNUAL MEAN										43.1		1976
LOWEST ANNUAL MEAN										79.1		1963
HIGHEST DAILY MEAN	262	Apr 2	(e)170	Feb 21						12.0		1963
LOWEST DAILY MEAN	9.4	Jul 24	7.0	Sep 24						407	Feb 2	1968
ANNUAL SEVEN-DAY MINIMUM	12	Jul 18	8.2	Sep 20						1.3	(a)	
INSTANTANEOUS PEAK FLOW			(b)							2.2	Jul 31	1964
INSTANTANEOUS PEAK STAGE			(b)							(c)552	Jun 10	1988
INSTANTANEOUS LOW FLOW			6.1	Sep 25						(d)6.71	Mar 6	1959
10 PERCENT EXCEEDS	95									.90	Jul 10	1963
50 PERCENT EXCEEDS	46									87		
90 PERCENT EXCEEDS	20									31		
										9.8		

(a) July 31, Aug. 1, 1964.

(b) Not determined.

(c) From rating curve extended above 380 ft³/s, caused by momentary release of water from Stony Lake.

(d) Backwater from ice.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04163400 PLUM BROOK AT UTICA, MI

LOCATION.--Lat 42°36'05", long 83°04'27", in SE1/4 NE1/4 sec.7, T.2 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank at upstream side of bridge on Ryan Road, 1.0 mi southwest of Utica.

DRAINAGE AREA.--16.5 mi².

PERIOD OF RECORD.--July 1965 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 619.79 ft above sea level (levels by Johnson and Anderson, Inc.).

REMARKS.--Records good except for estimated daily discharges, which are poor. Occasional diversion for sprinkler irrigation. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.6	7.2	11	e2.3	e7.0	e2.5	17	83	5.2	12	4.2	3.4
2	9.2	4.8	8.8	e2.2	e4.5	e2.8	14	35	4.4	7.9	4.1	2.9
3	6.6	5.5	8.8	e2.1	e3.5	e7.0	13	22	5.3	5.9	3.5	2.6
4	5.2	7.6	13	e2.0	e2.8	e16	12	19	2.7	5.0	1.6	2.5
5	4.9	5.7	15	e2.0	e2.5	e40	11	16	2.2	14	1.4	2.4
6	5.6	4.7	15	e1.9	e2.2	125	17	13	6.7	12	.90	2.4
7	4.6	3.8	12	e1.8	e2.1	69	16	13	4.0	50	.87	2.4
8	4.0	3.3	9.9	e1.8	e2.0	33	12	25	2.4	17	1.0	2.3
9	32	3.4	7.9	e1.7	e2.0	20	11	16	2.2	10	.78	3.6
10	19	4.7	7.5	e1.7	e2.0	18	10	11	1.6	8.0	.58	4.4
11	11	3.8	6.5	e1.7	e2.1	15	9.5	9.7	1.6	6.7	1.3	3.0
12	7.1	4.4	5.4	e1.6	e2.3	11	17	12	1.5	6.3	1.6	2.3
13	5.9	7.0	5.6	e1.6	e2.5	16	38	9.2	21	11	24	2.2
14	5.3	5.0	5.4	e1.6	e3.1	15	22	7.5	53	6.9	70	2.1
15	6.7	6.6	5.4	e1.6	e4.0	15	19	7.2	14	6.0	16	3.0
16	6.5	4.9	5.3	e1.5	e7.0	12	17	6.7	8.0	5.5	8.2	3.3
17	21	5.5	5.0	e1.5	e15	8.5	11	5.9	6.9	4.9	7.1	3.1
18	17	6.2	4.7	e1.5	e35	8.5	8.8	4.9	6.0	5.5	5.3	2.3
19	7.7	5.9	4.9	e1.5	e80	8.2	8.2	4.3	4.6	4.9	4.5	.64
20	7.7	5.8	5.3	e1.5	e100	8.5	7.3	4.1	10	5.2	4.7	.69
21	26	4.2	9.8	e1.5	e35	128	5.9	5.0	16	20	4.5	.88
22	11	3.6	7.6	e1.6	e15	66	5.0	4.8	6.6	24	3.7	.96
23	7.0	3.3	4.9	e1.7	e8.0	32	4.4	5.4	5.0	26	3.0	1.0
24	6.0	7.1	4.1	e1.8	e4.5	30	5.3	6.8	82	12	2.3	2.0
25	5.5	7.4	3.5	e2.0	e3.0	22	9.1	7.0	60	9.0	2.0	8.8
26	4.8	8.4	e3.3	e3.0	e2.6	16	17	8.9	83	8.1	2.1	6.3
27	5.0	59	e2.9	e4.0	e2.5	31	76	4.9	107	7.4	2.2	5.3
28	5.1	20	e2.7	e130	e2.5	33	36	3.4	26	4.7	24	7.1
29	4.4	16	e2.5	e60	---	43	60	2.9	40	3.0	20	5.4
30	4.1	13	e2.4	e25	---	26	45	2.6	20	2.9	6.4	3.6
31	6.1	---	e2.3	e14	---	20	---	3.2	---	4.1	4.3	---
TOTAL	280.6	247.8	208.4	279.7	354.7	898.0	554.5	379.4	608.9	325.9	236.13	92.87
MEAN	9.05	8.26	6.72	9.02	12.7	29.0	18.5	12.2	20.3	10.5	7.62	3.10
MAX	32	59	15	130	100	128	76	83	107	50	70	8.8
MIN	4.0	3.3	2.3	1.5	2.0	2.5	4.4	2.6	1.5	2.9	.58	.64
CFSM	.55	.50	.41	.55	.77	1.76	1.12	.74	1.23	.64	.46	.19
IN.	.63	.56	.47	.63	.80	2.02	1.25	.86	1.37	.73	.53	.21

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1965 - 1994, BY WATER YEAR (WY)

	MEAN	7.42	11.9	15.3	12.5	18.1	31.4	25.4	14.2	9.96	6.82	5.28	5.84
MAX	33.7	39.8	37.7	40.7	60.3	83.6	47.4	39.9	37.4	23.0	16.0	18.6	
(WY)	1982	1986	1973	1993	1976	1982	1979	1968	1968	1969	1972	1986	
MIN	.82	1.45	1.99	1.23	2.62	10.1	8.30	3.46	1.51	.29	.43	.44	
(WY)	1967	1966	1977	1977	1980	1981	1971	1971	1988	1965	1965	1969	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1965 - 1994

ANNUAL TOTAL	5688.2	4466.90	
ANNUAL MEAN	15.6	12.2	
HIGHEST ANNUAL MEAN			13.7
LOWEST ANNUAL MEAN			20.5
HIGHEST DAILY MEAN	216	Jan 4	1968
LOWEST DAILY MEAN	1.6	Jul 22	1970
ANNUAL SEVEN-DAY MINIMUM	2.2	Jul 31	707
INSTANTANEOUS PEAK FLOW			6.67
INSTANTANEOUS PEAK STAGE			.04
INSTANTANEOUS LOW FLOW			.09
ANNUAL RUNOFF (CFSM)	.94		1160
ANNUAL RUNOFF (INCHES)	12.82		10.36
10 PERCENT EXCEEDS	35		.00
50 PERCENT EXCEEDS	8.5		.83
90 PERCENT EXCEEDS	3.2		11.28

(a) Part of each day July 19, 28, 1966, Aug. 22-28, Sept. 3, 11, 1969.

(e) Estimated.

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. National Weather Service 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 about 9,000 ft³/s.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	394	316	328	242	364	391	547	1340	173	577	115	153
2	352	289	320	260	328	385	531	773	154	517	138	126
3	310	338	327	205	e300	397	533	626	139	439	150	115
4	297	301	367	194	e280	455	479	559	131	351	429	104
5	281	327	402	188	e260	598	449	528	123	515	376	99
6	229	295	379	175	e250	1140	524	495	245	456	200	102
7	200	281	363	175	e240	1110	482	490	152	920	153	109
8	182	275	325	e170	e220	669	431	705	130	694	139	110
9	520	320	307	166	e210	538	401	555	121	493	131	135
10	401	349	301	160	e200	501	386	486	119	384	116	102
11	236	367	296	203	e200	476	370	442	119	335	202	97
12	256	352	291	211	e205	452	429	440	111	246	188	99
13	296	375	278	209	e215	498	579	376	958	225	528	100
14	298	352	280	204	e225	478	474	316	2170	181	1540	96
15	281	387	278	e190	e240	483	542	321	507	176	517	194
16	296	335	267	e175	e260	464	573	321	354	170	371	117
17	474	344	260	e165	292	422	427	278	308	161	259	104
18	461	326	258	e160	408	425	386	255	236	163	204	102
19	373	293	258	e155	666	430	360	240	180	148	165	100
20	390	304	257	e165	980	416	331	221	244	177	187	99
21	527	283	329	e185	928	1890	285	203	345	252	196	99
22	388	280	280	e210	549	1460	252	174	171	320	169	97
23	318	276	263	e240	463	726	221	163	144	322	157	96
24	289	339	258	264	465	664	235	163	1500	227	143	97
25	281	327	238	267	432	587	269	200	1340	170	150	327
26	284	336	236	226	419	537	353	343	1040	145	188	252
27	282	806	e230	243	398	698	974	281	1590	157	183	223
28	277	494	e230	2590	392	669	684	234	815	145	900	373
29	275	359	228	1410	---	860	910	187	1380	161	528	297
30	273	348	225	616	---	676	805	166	807	143	268	224
31	355	---	228	409	---	587	---	168	---	110	199	---
TOTAL	10076	10374	8887	10432	10389	20082	14222	12049	15806	9480	9189	4348
MEAN	325	346	287	337	371	648	474	389	527	306	296	145
MAX	527	806	402	2590	980	1890	974	1340	2170	920	1540	373
MIN	182	275	225	155	200	385	221	163	111	110	115	96
CFSM	.73	.78	.65	.76	.84	1.46	1.07	.88	1.19	.69	.67	.33
IN.	.84	.87	.74	.87	.87	1.68	1.19	1.01	1.32	.79	.77	.36

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1947 - 1994, BY WATER YEAR (WY)

	MEAN	269	329	390	384	452	671	659	453	349	260	219	238
MAX	1021	834	837	975	1119	1313	1237	1382	841	664	480	758	
(WY)	1982	1986	1968	1950	1976	1976	1950	1956	1989	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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1947 - 1994

ANNUAL TOTAL	167489												
ANNUAL MEAN	459												
HIGHEST ANNUAL MEAN													
LOWEST ANNUAL MEAN													
HIGHEST DAILY MEAN	3400				Jan 5		2590		Jan 28	6930		May 11	1948
LOWEST DAILY MEAN	131				Jul 23		96		Sep 14	49		Sep 6	1955
ANNUAL SEVEN-DAY MINIMUM	141				Jul 18		99		Sep 18	59		Sep 3	1954
INSTANTANEOUS PEAK FLOW							4190		Jun 13	8840		Oct 1	1981
INSTANTANEOUS PEAK STAGE							15.94		Jun 13	19.56		Oct 1	1981
INSTANTANEOUS LOW FLOW							86		Sep 14	47		Sep 6	1955
ANNUAL RUNOFF (CFSM)	1.03						.84			.87			
ANNUAL RUNOFF (INCHES)	14.03						11.34			11.88			
10 PERCENT EXCEEDS	809						665			745			
50 PERCENT EXCEEDS	363						291			279			
90 PERCENT EXCEEDS	199						141			115			

(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 State Highway 53, 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 poor. Occasional regulation by lakes upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	9.7	12	e7.7	e13	e14	27	30	9.7	21	4.4	4.5
2	13	9.6	12	e7.5	e11	e14	26	29	9.6	19	4.5	4.4
3	13	9.6	12	e7.3	e10	e14	26	27	4.0	17	4.4	4.1
4	12	9.6	12	e7.0	e9.0	e15	24	25	3.9	16	5.1	3.9
5	11	9.7	12	e6.8	e8.5	e19	23	24	4.3	16	5.6	3.8
6	11	9.5	12	e6.7	e8.0	e27	22	24	5.6	16	5.0	3.9
7	9.9	9.3	12	e6.6	e7.8	e37	21	24	6.0	15	4.5	4.3
8	9.6	9.0	12	e6.5	e7.6	e34	21	29	6.1	14	4.1	4.4
9	11	8.9	12	e6.5	e7.4	32	20	28	6.7	13	4.0	4.9
10	12	9.0	12	e6.4	e7.4	29	19	25	6.1	12	4.1	5.0
11	12	9.2	11	e6.4	e7.3	27	19	24	5.8	11	4.2	5.0
12	11	9.2	e11	e6.4	e7.3	25	19	24	5.7	10	4.6	4.9
13	10	9.3	11	e6.4	e7.3	27	23	22	7.3	9.7	6.0	4.8
14	10	9.7	10	e6.4	e7.3	26	23	21	9.9	8.9	6.4	5.1
15	10	9.9	10	e6.4	e7.4	25	22	20	9.0	8.6	5.9	5.8
16	9.9	9.9	9.8	e6.3	e8.0	25	22	19	8.1	8.7	5.4	5.9
17	11	9.9	9.7	e6.3	e9.0	23	21	17	7.3	7.4	4.9	5.9
18	13	10	9.8	e6.3	e12	22	21	16	6.5	6.6	4.4	6.1
19	12	10	10	e6.3	e20	22	20	15	6.0	5.4	4.5	6.0
20	12	9.9	10	e6.4	e45	21	20	14	6.0	5.5	14	5.7
21	13	9.7	11	e6.5	e35	37	19	13	6.0	5.8	15	5.5
22	12	9.6	11	e6.7	e25	43	18	12	5.7	7.2	10	5.5
23	11	9.3	e11	e7.0	e23	37	16	11	6.2	9.4	7.8	5.5
24	11	9.4	e10	e8.0	e21	37	15	11	21	8.0	6.4	5.7
25	11	10	e9.7	e9.5	e19	32	15	11	28	6.7	5.6	5.7
26	11	10	e9.3	e12	e17	29	15	12	25	5.8	5.2	5.3
27	11	14	e9.0	e16	e16	30	22	12	24	5.4	4.9	5.1
28	10	14	e8.7	e23	e15	31	23	12	21	5.0	5.0	5.7
29	9.6	14	e8.5	e27	---	32	26	11	25	4.6	5.0	5.9
30	8.9	13	e8.2	e21	---	31	26	9.8	23	4.3	4.8	6.0
31	9.1	---	e7.9	e17	---	29	---	8.7	---	4.8	4.7	---
TOTAL	345.0	303.9	326.6	286.3	391.3	846	634	580.5	318.5	307.8	180.4	154.3
MEAN	11.1	10.1	10.5	9.24	14.0	27.3	21.1	18.7	10.6	9.93	5.82	5.14
MAX	14	14	12	27	45	43	27	30	28	21	15	6.1
MIN	8.9	8.9	7.9	6.3	7.3	14	15	8.7	3.9	4.3	4.0	3.8
CFSM	.51	.46	.48	.42	.64	1.25	.97	.86	.49	.46	.27	.24
IN.	.59	.52	.56	.49	.67	1.44	1.08	.99	.54	.53	.31	.26

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1994, BY WATER YEAR (WY)

MEAN	10.4	14.0	15.4	14.7	18.7	33.1	31.9	19.0	13.4	8.80	7.16	8.85
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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1958 - 1994

ANNUAL TOTAL	6614.0	4674.6	
ANNUAL MEAN	18.1	12.8	16.3
HIGHEST ANNUAL MEAN			29.0
LOWEST ANNUAL MEAN			4.99
HIGHEST DAILY MEAN	116	Apr 1	302
LOWEST DAILY MEAN	4.7	Aug 15	.90
ANNUAL SEVEN-DAY MINIMUM	5.1	Aug 13	.99
INSTANTANEOUS PEAK FLOW		(a)	358
INSTANTANEOUS PEAK STAGE		(a)	(b)4.56
INSTANTANEOUS LOW FLOW		3.5	.80
ANNUAL RUNOFF (CFSM)	.83	.59	.75
ANNUAL RUNOFF (INCHES)	11.29	7.98	10.14
10 PERCENT EXCEEDS	33	25	33
50 PERCENT EXCEEDS	13	10	11
90 PERCENT EXCEEDS	6.5	5.0	3.2

(a) Not determined.

(b) Backwater from ice.

(c) June 3, 4.

(d) July 30, 31, 1964, Aug. 6, 7, 1965.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04164300 EAST BRANCH COON CREEK AT ARMADA, MI

LOCATION.--Lat 42°50'45", long 82°53'06", in NE1/4 sec.23, T.5 N., R.13 E., Macomb County, Hydrologic Unit 04090003, on right bank at downstream side of bridge on Prospect Street in Armada.

DRAINAGE AREA.--13.0 mi².

PERIOD OF RECORD.--October 1958 to current year.

REVISED RECORDS.--WDR MI-83-1: 1982.

GAGE.--Water-stage recorder and concrete control. Elevation of gage is 735 ft above sea level, from topographic map.

REMARKS.--Records fair except for daily discharges below 1.0 ft³/s, and estimated daily discharges, which are poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.67	.53	1.0	.42	e.95	e1.8	15	34	.73	14	.52	.30
2	1.1	.49	.88	.41	e.70	e1.5	9.7	20	.64	6.3	.45	.25
3	1.0	.52	.88	.34	e.55	1.4	7.8	9.8	.62	4.3	.49	.24
4	.96	.44	1.0	.28	e.45	1.5	6.2	6.4	.53	3.2	.76	.24
5	1.0	.48	1.0	.28	e.40	e3.0	5.4	5.5	.47	4.0	.59	.22
6	1.1	.57	1.0	.28	e.35	e30	4.7	5.1	.56	7.8	.42	.26
7	1.0	.51	1.0	.28	e.29	e80	3.9	5.8	.60	7.6	.22	.43
8	1.0	.44	1.0	.28	e.25	e25	3.3	29	.63	19	.20	.36
9	1.6	.48	1.0	e.28	e.21	e10	2.8	19	.53	8.6	.22	.22
10	.91	.47	1.0	e.28	e.20	7.3	2.6	9.7	.51	4.0	.26	.26
11	.96	.47	.88	e.28	e.20	5.5	2.2	6.8	.44	2.6	.28	.22
12	1.1	.55	.88	e.28	e.20	5.1	3.3	11	.41	1.9	.33	.18
13	.81	.56	.75	e.28	e.20	8.0	11	6.8	.99	1.5	.62	.16
14	.68	.64	.75	e.28	e.30	7.3	10	5.0	1.2	1.3	.72	.66
15	.59	.75	.75	e.28	e.60	6.9	7.1	4.3	.68	1.1	.57	.18
16	.76	.75	.88	e.28	e1.5	6.3	6.1	3.7	.50	.97	.33	.20
17	1.1	.88	.76	e.28	e3.0	3.9	4.7	3.4	.41	.82	.28	.21
18	.88	.75	.78	e.25	e10	3.4	3.2	2.9	.34	.72	.28	.30
19	1.0	.75	.82	e.21	e50	2.8	2.9	2.6	.28	.60	.96	.35
20	.99	.75	.86	e.16	e110	3.0	2.3	2.3	.52	.63	5.7	.34
21	1.4	.64	.96	e.08	e60	65	2.0	2.1	.44	.67	3.0	.28
22	1.1	.64	.88	e.08	e30	54	1.8	1.8	.46	.70	1.2	.28
23	1.0	.64	.76	e.08	e15	20	1.6	1.3	1.6	.71	.62	.31
24	.81	.75	.73	e.08	e10	18	1.5	1.3	.60	.76	.51	.35
25	.65	.75	e.70	e.10	e7.0	12	1.7	1.4	.88	.56	.44	.25
26	.78	.88	e.66	e.20	e5.0	7.5	2.7	1.4	.42	.48	.44	.12
27	.54	2.4	.58	e.35	e3.5	9.7	17	1.2	.31	.44	.44	.19
28	.52	1.9	.45	e.60	e2.5	16	14	.95	.30	.53	.46	.34
29	.39	1.2	.44	e1.0	---	26	19	.85	101	.41	.53	.15
30	.37	1.0	.35	e1.5	---	34	15	.73	.42	.54	.41	.22
31	.67	---	.35	e1.3	---	31	---	.66	---	1.5	.31	---
TOTAL	27.44	22.58	24.73	11.08	313.35	506.9	190.5	206.79	408.09	98.24	22.56	8.07
MEAN	.89	.75	.80	.36	11.2	16.4	6.35	6.67	13.6	3.17	.73	.27
MAX	1.6	2.4	1.0	1.5	110	80	19	34	101	19	5.7	.66
MIN	.37	.44	.35	.08	.20	1.4	1.5	.66	.28	.41	.20	.12
CFSM	.07	.06	.06	.03	.86	1.26	.49	.51	1.05	.24	.06	.02
IN.	.08	.06	.07	.03	.90	1.45	.55	.59	1.17	.28	.06	.02

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1959 - 1994, BY WATER YEAR (WY)

MEAN	2.37	5.34	8.24	5.96	10.7	24.8	16.1	5.21	4.12	1.65	1.29	2.09
MAX	24.1	43.3	35.7	37.6	60.3	75.2	47.1	23.5	21.9	19.7	12.3	33.9
(WY)	1982	1986	1973	1974	1976	1982	1967	1974	1989	1967	1975	1985
MIN	.047	.088	.074	.078	.087	.23	.83	.61	.059	.047	.055	.056
(WY)	1964	1964	1964	1961	1964	1964	1964	1977	1964	1964	1963	1964

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1959 - 1994

ANNUAL TOTAL	3467.43	1840.33	7.31
ANNUAL MEAN	9.50	5.04	14.9
HIGHEST ANNUAL MEAN			.36
LOWEST ANNUAL MEAN			1985
HIGHEST DAILY MEAN	252	Jun 21	497
LOWEST DAILY MEAN	.09	Aug 7	(a)
ANNUAL SEVEN-DAY MINIMUM	.12	Aug 4	.00
INSTANTANEOUS PEAK FLOW			.00
INSTANTANEOUS PEAK STAGE			910
INSTANTANEOUS LOW FLOW			6.69
ANNUAL RUNOFF (CFSM)	.73		.00
ANNUAL RUNOFF (INCHES)	9.92	.39	.56
10 PERCENT EXCEEDS	17	11	7.64
50 PERCENT EXCEEDS	1.1	.78	.97
90 PERCENT EXCEEDS	.27	.26	.10

(a) Jan. 21-24.

(b) Jan. 25 to Feb. 9, 1961, result of freezeup.

(c) Not determined.

(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 30 ft upstream from bridge on State Highway 59, 2 mi north of Mount Clemens, and 3.6 mi upstream from mouth.

DRAINAGE AREA.--199 mi².

PERIOD OF RECORD.--May 1947 to current year.

REVISED RECORDS.--WSP 1437: 1948. WSP 1557: Drainage area.

GAGE.--Water-stage recorder. Concrete control since September 1961. Datum of gage is 576.38 ft above sea level (levels by Michigan Department of Natural Resources). Prior to Nov. 15, 1949, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. Some regulation at times by mill upstream from station. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	45	30	69	20	253	e80	332	473	27	660	11	11
2	37	38	58	22	194	e81	250	537	24	235	9.7	9.4
3	32	39	57	e20	136	e88	208	365	26	118	10	8.0
4	27	38	58	e19	101	99	190	209	20	87	14	6.4
5	25	40	70	e19	e70	146	168	159	15	74	15	6.8
6	24	39	79	e19	e55	420	156	135	17	89	18	6.6
7	23	37	79	e19	e45	1190	150	121	19	90	14	5.7
8	21	34	73	e18	e40	1790	136	170	19	89	12	4.0
9	23	32	65	e18	e35	e1070	122	302	16	83	9.7	4.4
10	34	30	60	e19	e34	567	116	228	14	73	8.7	4.6
11	41	29	56	e20	e34	323	107	152	13	54	10	6.1
12	36	28	42	e20	e35	240	102	123	11	44	13	6.9
13	30	29	44	e19	e36	254	160	135	38	38	17	4.9
14	26	30	44	e18	e37	264	266	112	93	32	25	5.5
15	25	33	41	e18	e39	240	228	93	53	29	25	5.9
16	25	35	41	e18	e43	239	241	84	36	27	21	14
17	27	36	41	e17	e48	179	194	78	26	25	16	15
18	37	36	41	e17	56	154	134	70	21	23	14	11
19	50	37	41	e17	129	120	108	62	17	20	12	8.8
20	43	38	43	e17	635	121	95	57	17	17	10	8.3
21	37	37	46	e17	1410	308	82	53	16	18	29	6.6
22	48	35	52	e17	1260	896	74	46	17	24	39	6.3
23	51	34	44	e18	762	865	68	42	14	33	27	5.4
24	41	33	36	e19	399	525	63	38	40	32	18	6.2
25	36	34	e33	e20	246	397	61	39	226	25	14	7.9
26	33	38	e27	e22	e150	280	64	40	412	19	12	11
27	32	79	e24	26	e100	234	205	46	762	15	10	16
28	32	200	e22	192	e90	329	380	43	685	14	13	17
29	31	142	e20	505	---	395	372	38	476	13	13	16
30	29	88	19	575	---	460	380	32	1050	12	13	18
31	29	---	19	402	---	427	---	29	---	10	11	---
TOTAL	1030	1408	1444	2187	6472	12781	5212	4111	4220	2122	484.1	263.7
MEAN	33.2	46.9	46.6	70.5	231	412	174	133	141	68.5	15.6	8.79
MAX	51	200	79	575	1410	1790	380	537	1050	660	39	18
MIN	21	28	19	17	34	80	61	29	11	10	8.7	4.0
CFSM	.17	.24	.23	.35	1.16	2.07	.87	.67	.71	.34	.08	.04
IN.	.19	.26	.27	.41	1.21	2.39	.97	.77	.79	.40	.09	.05

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1947 - 1994, BY WATER YEAR (WY)

	MEAN	52.6	92.4	136	129	200	361	273	135	74.4	32.7	25.2	40.2
MAX	479	595	460	507	766	928	560	790	424	127	247	484	
(WY)	1982	1986	1968	1974	1976	1982	1975	1956	1989	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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1947 - 1994

ANNUAL TOTAL	54631.3	41734.8	128
ANNUAL MEAN	150	114	230
HIGHEST ANNUAL MEAN			1986
LOWEST ANNUAL MEAN			1964
HIGHEST DAILY MEAN	2170	1790	5040
LOWEST DAILY MEAN	6.3	4.0	.09
ANNUAL SEVEN-DAY MINIMUM	8.4	5.2	.10
INSTANTANEOUS PEAK FLOW		1970	6700
INSTANTANEOUS PEAK STAGE		13.26	18.62
INSTANTANEOUS LOW FLOW		3.2	.08
ANNUAL RUNOFF (CFSM)	.75	.57	.65
ANNUAL RUNOFF (INCHES)	10.21	7.80	8.77
10 PERCENT EXCEEDS	362	304	310
50 PERCENT EXCEEDS	52	37	40
90 PERCENT EXCEEDS	17	12	7.1

(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
(National stream quality accounting network station)

LOCATION.--Lat 42°35'45", long 82°54'35", Macomb County, Hydrologic Unit 04090003, on left bank at downstream side of bridge on Moravian Drive, 0.2 mi downstream from North Branch, and 0.5 mi west of Mount Clemens.

DRAINAGE AREA.--734 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1934 to current year.

REVISED RECORDS.--WSP 1084: 1943, 1945-46. WSP 1937: 1935, 1936(M), 1937-39, 1949(M), 1950. WSP 1557: Drainage area. WSP 1727: 1952(M), 1954(M).

GAGE.--Water-stage recorder. Datum of gage is 570.43 ft above 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.--Water-discharge 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	564	433	503	e315	621	e485	1080	2380	245	1390	188	242
2	534	376	483	e330	e560	481	954	1620	216	810	202	223
3	453	453	498	e270	e450	495	904	1170	210	589	213	206
4	428	411	546	e250	e410	570	813	863	203	468	458	212
5	389	458	644	e240	e370	844	745	765	200	625	417	211
6	333	418	595	e230	e350	1870	832	716	300	585	244	204
7	289	384	594	e225	e320	2870	773	669	226	983	213	210
8	259	367	497	e225	e300	2400	666	1070	199	794	200	208
9	749	414	452	e220	e280	1540	595	982	197	566	193	224
10	634	456	452	e220	e260	1080	571	794	188	449	192	194
11	337	477	437	e270	e260	856	530	641	191	376	247	199
12	334	457	383	e280	e265	763	590	639	186	321	245	200
13	352	489	372	e270	e270	833	938	545	847	316	567	198
14	350	473	370	e260	e275	819	915	453	2740	252	1550	198
15	331	532	365	e250	e285	797	928	431	659	239	585	267
16	346	459	365	e230	e300	749	1010	448	438	235	411	211
17	615	459	340	e220	318	691	760	362	371	228	322	205
18	627	455	339	e210	500	687	589	329	309	228	278	193
19	479	410	358	e210	968	660	529	302	252	220	251	191
20	475	431	350	e225	1940	656	461	284	321	234	268	191
21	741	384	481	e250	2290	2440	389	266	462	297	292	191
22	564	383	420	e280	1600	3070	346	242	258	368	273	195
23	435	374	369	e310	1140	1940	310	230	227	361	256	190
24	384	453	350	e350	828	1460	314	239	1620	282	236	187
25	360	462	e330	e330	e630	1200	354	270	2080	235	238	375
26	359	454	e310	e310	e540	999	437	413	1690	215	262	376
27	360	1190	e300	408	e500	1170	1470	341	3300	215	266	287
28	355	923	e295	2850	e485	1300	1320	299	1840	207	933	432
29	364	677	e295	2470	---	1580	1620	259	2470	217	706	357
30	351	575	e295	1160	---	1420	1410	241	2240	206	344	285
31	480	---	e300	783	---	1240	---	248	---	188	285	---
TOTAL	13631	14687	12688	14451	17315	37765	23153	18521	24685	12699	11335	7062
MEAN	440	490	409	466	618	1218	772	597	823	410	366	235
MAX	749	1190	644	2850	2290	3070	1620	2380	3300	1390	1550	432
MIN	259	367	295	210	260	481	310	230	186	188	188	187
CFSM	.60	.67	.56	.64	.84	1.66	1.05	.81	1.12	.56	.50	.32
IN.	.69	.74	.64	.73	.88	1.91	1.17	.94	1.25	.64	.57	.36

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1934 - 1994, BY WATER YEAR (WY)

MEAN	311	411	530	545	738	1144	1058	675	465	290	241	267
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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1934 - 1994

ANNUAL TOTAL	281002		207992									
ANNUAL MEAN	770		570							557		
HIGHEST ANNUAL MEAN										929		1974
LOWEST ANNUAL MEAN										230		1964
HIGHEST DAILY MEAN	7220	Jan 5	3300	Jun 27	19200						Apr 6 1947	
LOWEST DAILY MEAN	170	Aug 14	186	Jun 12	25						Aug 24 1934	
ANNUAL SEVEN-DAY MINIMUM	189	Aug 8	191	Sep 18	28						Aug 22 1934	
INSTANTANEOUS PEAK FLOW			4160	Jun 14	21200						Apr 6 1947	
INSTANTANEOUS PEAK STAGE			11.24	Jan 28	(a)23.55						Apr 6 1947	
ANNUAL RUNOFF (CFSM)	1.05		.78		.76							
ANNUAL RUNOFF (INCHES)	14.24		10.54		10.31							
10 PERCENT EXCEEDS	1520		1170		1180							
50 PERCENT EXCEEDS	493		376		320							
90 PERCENT EXCEEDS	264		211		116							

(a) From floodmark.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1969, 1973 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1974 to September 1981.

WATER TEMPERATURE: October 1974 to September 1981.

INSTRUMENTATION.--Water-quality monitor from Aug. 13, 1975 to Sept. 6, 1981.

REMARKS.--Quarterly cross-sectional samples were collected at bridge.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975-76, 1978-81): Maximum, 3,580 microsiemens, Jan. 26, 1978; minimum, 126 microsiemens, July 29, 1976.

WATER TEMPERATURE (water years 1975-81): Maximum, 29.5°C, Sept. 20, 1978; minimum, 0.0°C on many days during winter.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	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 (PERCENT SATURATION) (00301)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML) (31625)	STREPTOCOCCI, KF AGAR (COLS./100 ML) (31673)
DEC 10...	1320	470	844	8.3	6.0	2.0	11.3	95	120	110
APR 21...	1020	379	942	8.2	10.0	1.4	10.0	90	70	44
JUN 16...	1105	442	843	8.0	23.5	2.8	5.4	64	310	1500
AUG 26...	1200	254	847	8.4	22.5	2.5	6.5	77	K1100	480

DATE	HARDNESS TOTAL (MG/L AS CaCO3) (00900)	HARDNESS NONCARB DISSOLV FLD. AS CaCO3 (MG/L) (00904)	CALCIUM DIS-SOLVED (MG/L AS Ca) (00915)	MAGNESIUM, DIS-SOLVED (MG/L AS Mg) (00925)	SODIUM, DIS-SOLVED (MG/L AS Na) (00930)	POTASSIUM, DIS-SOLVED (MG/L AS K) (00935)	BICARBONATE WATER DIS IT FIELD (MG/L AS HCO3) (00453)	CARBONATE WATER DIS IT FIELD (MG/L AS CO3) (00452)	ALKALINITY WAT DIS TOT IT FIELD (MG/L AS CaCO3) (39086)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)
DEC 10...	310	84	83	24	60	4.0	271	--	222	56
APR 21...	300	87	82	23	83	4.4	259	--	212	55
JUN 16...	250	99	70	19	72	5.4	188	--	188	44
AUG 26...	260	65	71	20	78	6.9	231	3	193	59

DATE	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SiO2) (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)	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 TOTAL (MG/L AS N) (00625)
DEC 10...	110	0.30	5.3	490	0.67	622	0.030	1.90	0.120	0.50
APR 21...	150	0.30	3.1	577	0.78	590	0.040	1.90	0.100	0.60
JUN 16...	130	0.30	5.7	500	0.68	597	0.060	1.90	0.170	1.1
AUG 26...	130	0.50	5.4	521	0.71	357	0.030	3.90	0.070	0.70

STREAMS TRIBUTARY TO LAKE ST. CLAIR

04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	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)	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)
DEC 10...	0.070	0.050	0.060	<10	54	<3	16	<4	35
APR 21...	0.100	0.080	0.070	<10	53	<3	12	<4	60
JUN 16...	0.180	0.090	0.080	<10	55	<3	41	7	43
AUG 26...	0.280	0.240	0.220	10	54	<3	32	<4	24

DATE	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	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- PENDEDED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
DEC 10...	<10	3	<1	<1.0	240	<6	9	11	88
APR 21...	<10	4	<1	<1.0	250	<6	57	58	73
JUN 16...	<10	6	<1	<1.0	250	<6	43	51	99
AUG 26...	<10	12	<1	<1.0	230	<6	14	9.6	99

STREAMS TRIBUTARY TO DETROIT RIVER

04166000 RIVER ROUGE AT BIRMINGHAM, MI

LOCATION.--Lat 42°32'45", long 83°13'25", in NW1/4 sec.36, T.2 N., R.10 E., Oakland County, Hydrologic Unit 04090004, on left bank 25 ft downstream from mouth of Quarton Lake outlet, and 100 ft upstream from bridge on Maple Road at Birmingham.

DRAINAGE AREA.--33.3 mi². Prior to water year 1971, drainage area was 36.9 mi². An area of 3.6 mi² noncontributing since then.

PERIOD OF RECORD.--June 1950 to current year.

REVISED RECORDS.--WSP 1387: 1951-52(M). WSP 1557: Drainage area.

GAGE.--Water-stage recorder. Concrete control since July 27, 1962. Datum of gage is 715.94 ft above sea level.

REMARKS.--Records good. Occasional regulation by Quarton Lake upstream from station. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23	15	19	12	21	20	32	97	16	27	12	14
2	20	14	20	13	19	21	31	56	13	22	12	12
3	17	17	20	12	19	22	30	43	11	19	12	11
4	15	16	25	11	17	29	28	36	10	17	20	10
5	14	16	28	11	16	49	29	33	10	43	22	9.9
6	13	15	26	12	16	139	37	31	20	29	14	9.6
7	14	13	24	13	15	89	32	35	14	148	12	9.2
8	15	12	20	12	14	51	28	55	10	46	11	8.8
9	54	12	19	11	14	35	27	36	8.9	30	10	9.4
10	33	12	19	11	15	30	25	30	7.8	24	10	8.1
11	21	12	17	13	15	28	24	28	7.5	21	18	7.5
12	20	11	15	13	14	26	41	28	7.3	19	19	7.4
13	18	14	15	12	14	33	56	25	7.5	22	51	7.5
14	17	14	16	12	14	30	36	24	8.4	19	146	6.9
15	16	15	16	11	15	31	42	23	24	17	39	9.5
16	18	14	15	10	15	28	47	23	15	16	27	7.2
17	51	16	15	11	15	24	31	21	11	14	19	6.6
18	32	15	15	e11	24	24	27	20	10	13	17	6.4
19	21	15	18	e11	97	24	26	20	8.8	13	15	6.4
20	22	17	17	e11	131	24	23	18	18	17	15	6.1
21	41	14	22	11	66	179	21	17	25	24	15	6.1
22	25	12	18	11	37	83	22	16	11	30	13	5.8
23	20	12	16	12	28	53	21	15	9.6	32	12	5.6
24	18	17	15	13	26	48	24	17	141	18	11	5.6
25	17	19	14	14	20	40	28	20	93	14	11	12
26	16	20	12	12	17	35	36	26	239	14	10	9.6
27	16	68	11	14	16	53	118	20	178	12	10	17
28	16	36	11	182	17	51	67	16	58	11	70	18
29	14	24	11	82	---	59	78	15	54	10	34	13
30	14	21	11	35	---	43	68	15	36	9.6	20	9.7
31	16	---	11	24	---	35	---	14	---	11	16	---
TOTAL	667	528	531	643	747	1436	1135	873	1225.9	761.6	723	275.9
MEAN	21.5	17.6	17.1	20.7	26.7	46.3	37.8	28.2	40.9	24.6	23.3	9.20
MAX	54	68	28	182	131	179	118	97	239	148	146	18
MIN	13	11	11	10	14	20	21	14	7.3	9.6	10	5.6
CFSM	.65	.53	.51	.62	.80	1.39	1.14	.85	1.23	.74	.70	.28
IN.	.75	.59	.59	.72	.83	1.60	1.27	.98	1.37	.85	.81	.31

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1950 - 1994, BY WATER YEAR (WY)

	MEAN	12.0	16.2	20.0	19.2	23.6	39.4	36.1	25.4	18.7	12.3	9.79	10.6
MAX	50.7	47.7	51.5	56.0	71.5	82.5	63.6	98.1	84.0	48.2	25.6	42.3	
(WY)	1982	1993	1988	1993	1976	1982	1974	1956	1989	1968	1968	1986	
MIN	1.48	2.11	1.88	2.18	2.21	7.59	10.4	5.82	4.33	1.42	1.58	1.42	
(WY)	1965	1965	1964	1963	1963	1964	1963	1958	1966	1966	1954	1963	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1950 - 1994

ANNUAL TOTAL	10377.1	9546.4	
ANNUAL MEAN	28.4	26.2	(a)20.3
HIGHEST ANNUAL MEAN			35.6
LOWEST ANNUAL MEAN			4.55
HIGHEST DAILY MEAN	261	239	902
LOWEST DAILY MEAN	6.1	5.6	.20
ANNUAL SEVEN-DAY MINIMUM	7.5	6.0	.34
INSTANTANEOUS PEAK FLOW		582	1390
INSTANTANEOUS PEAK STAGE		5.23	8.70
INSTANTANEOUS LOW FLOW		5.3	.10
ANNUAL RUNOFF (CFSM)	.85	.79	.61
ANNUAL RUNOFF (INCHES)	11.59	10.66	8.27
10 PERCENT EXCEEDS	53	51	42
50 PERCENT EXCEEDS	21	17	12
90 PERCENT EXCEEDS	11	10	3.0

(a) Annual mean, water years 1951-70, 15.3 ft³/s, 5.63 in/yr; water years 1971-94, 24.4 ft³/s, 9.95 in/yr.

(b) Sept. 23, 24.

(c) Aug. 8, 9, 1963.

(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 at Southfield, 4.2 mi east of Farmington.

DRAINAGE AREA.--87.9 mi².

PERIOD OF RECORD.--April 1958 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 609.62 ft 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. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	55	45	51	e27	e45	e38	82	460	32	60	24	34
2	57	39	52	e29	e41	e40	75	173	31	48	24	30
3	45	51	54	e26	e39	e43	76	119	29	42	24	27
4	43	46	77	e25	e37	e60	68	96	29	38	76	25
5	45	49	86	e25	e35	e100	67	86	32	290	51	24
6	37	47	72	e27	e34	e450	98	77	60	88	29	24
7	36	42	68	e29	e33	e250	83	84	34	337	25	24
8	36	39	54	e26	e33	e120	70	142	28	123	24	58
9	198	39	50	e25	e32	e95	65	87	25	78	23	47
10	104	38	49	e25	e33	e85	60	70	23	57	23	25
11	54	39	46	e28	e32	e80	56	62	22	49	49	23
12	49	38	42	e28	e32	e80	118	62	22	43	44	22
13	44	52	41	e27	e32	e90	162	54	188	46	230	21
14	41	49	41	e26	e32	e90	97	51	371	39	708	21
15	40	57	42	e25	e32	e90	158	54	65	36	113	38
16	66	46	40	e24	e33	e72	154	50	40	34	64	24
17	220	50	39	e24	e36	e66	89	45	31	31	46	21
18	105	51	40	e24	e60	e65	71	43	28	30	39	21
19	57	46	42	e24	e150	e66	67	41	25	28	35	20
20	51	56	44	e24	e400	e100	58	40	73	74	51	19
21	136	45	63	e24	e150	e900	55	38	80	57	36	19
22	69	41	49	e24	e90	e450	50	36	32	98	33	18
23	52	39	41	e25	e65	e280	54	34	26	50	30	18
24	46	67	e40	e26	e50	e200	55	35	498	37	28	18
25	43	61	e38	e27	e42	e150	59	41	507	30	27	61
26	42	79	e36	e30	e38	e120	81	55	437	30	26	44
27	41	305	e33	e50	e36	e180	346	46	845	27	25	52
28	41	119	e30	e600	e36	e180	198	36	140	25	351	63
29	39	72	e28	e200	---	e175	308	33	207	24	114	38
30	37	58	e25	e90	---	e130	220	32	89	23	50	28
31	45	---	e25	e55	---	105	---	31	---	26	39	---
TOTAL	1974	1805	1438	1669	1708	4950	3200	2313	4049	1998	2461	907
MEAN	63.7	60.2	46.4	53.8	61.0	160	107	74.6	135	64.5	79.4	30.2
MAX	220	305	86	600	400	900	346	460	845	337	708	63
MIN	36	38	25	24	32	38	50	31	22	23	23	18
CFSM	.72	.68	.53	.61	.69	1.82	1.21	.85	1.54	.73	.90	.34
IN.	.84	.76	.61	.71	.72	2.09	1.35	.98	1.71	.85	1.04	.38

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1994, BY WATER YEAR (WY)

MEAN	41.5	56.6	67.7	62.8	76.5	133	118	75.2	62.1	37.3	32.6	37.8
MAX	207	164	178	203	254	327	225	191	241	118	92.1	147
(WY)	1982	1993	1988	1993	1976	1982	1977	1983	1989	1968	1968	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
(WY)	1964	1964	1964	1961	1963	1964	1963	1958	1971	1964	1963	1963

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1958 - 1994

ANNUAL TOTAL	33724	28472	67.1
ANNUAL MEAN	92.4	78.0	105
HIGHEST ANNUAL MEAN			20.4
LOWEST ANNUAL MEAN			1993
HIGHEST DAILY MEAN	1150	(e)900	3210
LOWEST DAILY MEAN	20	18	.30
ANNUAL SEVEN-DAY MINIMUM	23	19	.66
INSTANTANEOUS PEAK FLOW		1290	4900
INSTANTANEOUS PEAK STAGE		11.33	19.04
INSTANTANEOUS LOW FLOW		18	.10
ANNUAL RUNOFF (CFSM)	1.05	.89	.76
ANNUAL RUNOFF (INCHES)	14.27	12.05	10.38
10 PERCENT EXCEEDS	195	152	130
50 PERCENT EXCEEDS	54	45	37
90 PERCENT EXCEEDS	30	25	10

(a) Sept. 22-24.

(e) Estimated.

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 at Southfield, 1.6 mi upstream from mouth, and 5.5 mi east of Farmington.

DRAINAGE AREA.--9.49 mi².

PERIOD OF RECORD.--September 1958 to current year.

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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.6	3.5	3.7	2.3	e2.5	e2.1	7.3	23	2.0	3.7	1.4	2.2
2	3.3	2.7	4.4	3.5	e2.2	e2.4	6.4	9.8	1.8	3.1	1.4	2.1
3	2.9	6.1	4.0	2.1	e2.1	e3.0	7.5	7.2	1.9	2.8	1.4	1.9
4	2.9	3.1	11	2.2	e2.0	e9.0	5.4	6.2	2.1	2.6	3.9	1.8
5	2.8	6.3	5.4	1.9	e1.9	e17	6.3	5.6	2.1	5.9	3.2	1.7
6	2.6	3.2	6.4	1.9	e1.9	5.4	13	5.1	9.2	5.3	1.6	1.9
7	2.7	2.7	4.4	2.0	e1.8	15	7.7	10	2.1	1.4	1.5	2.0
8	2.9	2.6	3.7	2.1	e1.8	8.3	6.0	7.6	1.7	3.8	1.4	2.2
9	3.6	2.6	3.4	2.0	e1.8	5.4	5.3	5.2	1.6	4.4	1.4	3.9
10	4.2	2.5	3.4	3.2	e1.7	5.7	5.0	4.6	1.6	2.8	1.3	1.8
11	3.3	2.5	3.0	2.9	e1.7	4.7	4.3	4.0	1.6	2.6	11	1.7
12	3.3	2.6	2.8	3.7	e1.7	4.4	19	3.9	2.0	2.3	2.3	1.7
13	3.2	5.4	2.8	2.3	e1.7	7.6	15	3.3	148	2.2	75	1.8
14	3.3	3.2	3.0	2.3	e1.7	4.9	7.4	3.3	13	2.0	7.8	1.8
15	3.9	5.3	3.0	2.0	e1.7	5.5	11	7.6	3.9	2.0	4.1	7.9
16	11	2.8	2.8	e1.8	e1.8	4.1	6.3	5.3	3.2	1.8	2.9	1.5
17	32	5.0	2.8	e1.6	e2.0	3.5	4.8	2.8	2.9	1.7	2.4	1.5
18	5.2	3.3	3.0	e1.5	e1.5	4.8	4.4	2.6	2.7	2.0	2.2	1.8
19	3.6	3.0	3.0	e1.4	e4.5	4.7	4.3	2.6	2.4	1.6	2.3	1.5
20	4.2	3.9	3.9	e1.3	e1.5	4.0	3.7	2.6	26	9.2	8.2	1.6
21	14	2.6	6.3	e1.3	e5.0	136	3.4	2.6	4.9	3.1	2.6	1.6
22	4.1	2.5	3.1	e1.3	e4.0	20	3.4	2.6	2.5	7.4	2.0	1.7
23	3.5	2.5	2.7	e1.3	e3.3	13	3.3	2.3	2.3	2.8	1.7	1.8
24	3.3	9.8	2.5	e1.4	e2.8	12	4.6	2.4	119	1.7	1.7	1.7
25	3.2	3.5	2.4	e1.5	e2.3	8.3	3.7	2.5	12	1.7	1.7	1.2
26	3.1	7.5	2.2	e2.0	e2.1	7.0	7.9	7.1	29	2.0	1.6	2.2
27	3.2	39	2.0	e5.0	e2.0	26	42	2.5	7.1	1.5	2.2	2.2
28	3.2	6.0	2.0	e8.0	e2.0	14	24	2.3	10	1.4	90	8.9
29	3.0	4.8	2.1	e1.0	---	24	15	2.2	29	1.4	4.7	2.3
30	2.9	4.0	2.0	e4.0	---	11	51	2.1	5.6	1.9	2.7	1.8
31	7.3	---	2.0	e3.0	---	8.3	---	2.1	---	3.8	2.5	---
TOTAL	187.7	154.5	109.2	154.8	130.5	449.7	308.4	153.0	453.2	157.6	355.4	120.1
MEAN	6.05	5.15	3.52	4.99	4.66	14.5	10.3	4.94	15.1	5.08	11.5	4.00
MAX	36	39	11	80	45	136	51	23	148	59	90	22
MIN	2.6	2.5	2.0	1.3	1.7	2.1	3.3	2.1	1.6	1.4	1.3	1.5
CFSM	.64	.54	.37	.53	.49	1.53	1.08	.52	1.59	.54	1.21	.42
IN.	.74	.61	.43	.61	.51	1.76	1.21	.60	1.78	.62	1.39	.47

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1994, BY WATER YEAR (WY)

	5.83	7.82	9.07	7.25	9.28	14.4	13.4	8.78	9.15	6.88	6.55	6.46
MEAN	5.83	7.82	9.07	7.25	9.28	14.4	13.4	8.78	9.15	6.88	6.55	6.46
MAX	23.3	19.8	25.4	26.7	32.1	32.6	27.4	27.1	30.5	23.7	21.4	20.0
(WY)	1982	1993	1968	1974	1971	1974	1977	1968	1968	1992	1968	1986
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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1958 - 1994

ANNUAL TOTAL	3837.1	2734.1	8.74
ANNUAL MEAN	10.5	7.49	16.9
HIGHEST ANNUAL MEAN			3.12
LOWEST ANNUAL MEAN			1968
HIGHEST DAILY MEAN	243	Jan 4	442
LOWEST DAILY MEAN	1.3	Jul 23	(a)
ANNUAL SEVEN-DAY MINIMUM	1.5	Jul 31	1.00
INSTANTANEOUS PEAK FLOW			.27
INSTANTANEOUS PEAK STAGE			(c)1200
ANNUAL RUNOFF (CFSM)	1.11	10.54	(d)15.03
ANNUAL RUNOFF (INCHES)	15.04	.79	.92
10 PERCENT EXCEEDS	25	10.72	12.51
50 PERCENT EXCEEDS	4.2	13	18
90 PERCENT EXCEEDS	2.1	3.0	3.4
		1.7	1.1

(a) Jan. 20-23, Aug. 10.

(b) June 13-15, 1986, caused by regulation of unknown sources.

(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 at Farmington.

DRAINAGE AREA.--17.5 mi².

PERIOD OF RECORD.--March 1958 to current year.

REVISED RECORDS.--WSP 1912: 1959(M), 1960(M).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 690.4 ft above 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	7.2	12	e7.5	e8.0	e6.4	15	68	10	9.9	4.1	7.3
2	10	6.8	11	e8.0	e7.2	e6.7	14	39	9.6	8.3	4.5	6.5
3	8.2	8.9	11	7.2	e6.7	e7.6	13	26	9.3	6.9	4.7	5.5
4	7.3	8.5	16	6.9	e6.3	e10	12	20	8.7	6.4	13	4.8
5	6.9	8.9	16	e6.9	e6.0	e15	13	18	8.7	44	11	4.4
6	6.7	8.2	14	e6.9	e5.7	e75	18	16	17	24	6.6	4.4
7	6.4	7.1	13	e7.0	e5.5	e45	15	23	11	60	5.4	4.9
8	6.2	6.8	11	7.1	e5.3	e20	13	34	9.0	29	4.7	2.3
9	32	6.8	9.7	7.0	e5.2	e15	13	23	8.2	16	4.5	2.1
10	19	6.5	9.3	7.0	e5.2	e14	12	17	6.2	12	4.4	8.5
11	11	6.4	8.4	7.2	e5.2	e13	10	16	5.5	9.1	12	6.4
12	9.5	6.3	7.3	6.8	e5.2	e13	27	15	6.7	8.2	10	5.7
13	8.7	8.3	7.2	6.8	e5.2	e16	32	13	36	12	62	5.2
14	7.9	7.8	7.3	e6.8	e5.3	e15	21	12	36	9.4	129	4.8
15	7.7	8.9	7.4	e6.4	e5.4	e15	38	12	15	7.3	32	5.4
16	9.4	7.6	7.4	e5.6	e5.5	13	34	11	10	6.8	16	5.3
17	35	7.8	7.2	e5.0	e5.8	11	21	11	9.4	6.3	12	5.0
18	20	7.6	7.3	e4.7	e9.0	11	16	13	7.9	6.2	9.0	4.6
19	12	8.1	7.3	e4.3	e20	11	15	12	7.1	6.0	7.6	4.1
20	11	8.0	7.7	e4.2	e70	11	13	12	20	19	7.5	4.2
21	17	7.0	9.6	e4.1	e30	145	11	12	15	19	6.9	4.2
22	11	6.7	8.3	e4.1	e15	80	11	9.9	9.8	15	6.6	4.2
23	10	6.7	7.1	e4.1	e11	45	11	10	8.6	8.3	6.6	4.3
24	8.7	11	6.4	e4.2	e9.0	37	11	13	78	6.9	5.9	4.3
25	7.8	9.8	5.9	e4.3	e7.2	26	11	13	96	6.2	5.4	18
26	7.6	16	e5.9	e4.5	e6.4	19	15	16	44	6.2	5.3	11
27	7.2	50	e5.8	e10	e6.0	32	53	13	26	5.6	5.5	17
28	6.8	24	e5.8	e100	e6.1	29	42	11	19	5.3	49	20
29	6.5	16	e5.8	e30	---	29	51	11	19	5.2	24	13
30	6.5	13	e6.0	e13	---	21	51	10	11	5.7	11	8.4
31	7.7	---	e6.8	e9.0	---	17	---	11	---	4.7	8.6	---
TOTAL	343.7	312.7	270.9	316.6	288.4	823.7	632	540.9	577.7	394.9	494.8	245.4
MEAN	11.1	10.4	8.74	10.2	10.3	26.6	21.1	17.4	19.3	12.7	16.0	8.18
MAX	35	50	16	100	70	145	53	68	96	60	129	23
MIN	6.2	6.3	5.8	4.1	5.2	6.4	10	9.9	5.5	4.7	4.1	4.1
CFSM	.63	.60	.50	.58	.59	1.52	1.20	1.00	1.10	.73	.91	.47
IN.	.73	.66	.58	.67	.61	1.75	1.34	1.15	1.23	.84	1.05	.52

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 1994, BY WATER YEAR (WY)

	7.52	10.6	12.2	12.3	15.8	27.3	23.8	15.3	12.5	6.83	6.14	6.98
MEAN	7.52	10.6	12.2	12.3	15.8	27.3	23.8	15.3	12.5	6.83	6.14	6.98
MAX	42.2	31.3	29.0	39.8	51.6	63.6	42.3	38.7	63.9	24.8	22.9	26.5
(WY)	1982	1993	1991	1974	1976	1982	1977	1983	1989	1992	1991	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
(WY)	1965	1965	1964	1961	1963	1964	1971	1971	1971	1964	1963	1964

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1958 - 1994

ANNUAL TOTAL	6591.6	5241.7	
ANNUAL MEAN	18.1	14.4	13.2
HIGHEST ANNUAL MEAN			21.2
LOWEST ANNUAL MEAN			4.54
HIGHEST DAILY MEAN	168	145	653
LOWEST DAILY MEAN	3.9	4.1	.30
ANNUAL SEVEN-DAY MINIMUM	4.8	4.2	.61
INSTANTANEOUS PEAK FLOW		264	1500
INSTANTANEOUS PEAK STAGE		(a)6.84	8.70
INSTANTANEOUS LOW FLOW		3.1	(c).07
ANNUAL RUNOFF (CFSM)	1.03	.82	.75
ANNUAL RUNOFF (INCHES)	14.01	11.14	10.24
10 PERCENT EXCEEDS	40	29	28
50 PERCENT EXCEEDS	11	9.0	7.0
90 PERCENT EXCEEDS	6.4	5.2	2.1

(a) Backwater from ice.

(b) Dec. 23, result of freezeup, Sept. 19.

(c) Result of regulation.

(e) Estimated.

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 at Detroit, 4 mi upstream from Middle River Rouge.

DRAINAGE AREA.--187 mi².

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. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	78	83	87	55	e100	e73	145	784	52	118	45	66
2	82	63	84	63	e80	e76	131	313	51	92	41	56
3	61	90	91	67	e72	e84	138	203	46	79	39	50
4	55	104	102	57	e66	e100	120	159	47	68	105	46
5	51	96	172	52	e62	e190	116	139	43	460	187	42
6	50	79	116	54	e61	e720	188	126	114	316	62	42
7	43	63	125	e56	e60	e500	170	133	76	301	46	48
8	43	56	93	e54	e60	302	130	235	49	270	41	63
9	275	52	80	e52	e59	178	115	158	43	143	38	187
10	238	52	75	e56	e59	145	107	122	40	101	36	54
11	85	52	70	e61	e59	137	97	103	34	82	85	41
12	64	53	57	e58	e59	115	226	100	36	72	132	38
13	59	79	63	e56	e58	144	339	89	251	114	527	37
14	50	90	61	e54	e58	144	209	82	850	70	1460	35
15	48	93	61	e52	e58	127	229	85	169	61	391	70
16	75	84	60	e51	e60	125	398	103	107	56	133	56
17	338	78	57	e50	e65	98	187	75	62	52	96	37
18	255	94	57	e50	e150	110	138	72	52	54	75	34
19	108	71	60	e50	e300	107	129	67	46	48	64	32
20	85	82	61	e50	e700	105	110	65	120	143	84	33
21	189	75	105	e51	e350	904	97	63	253	179	72	30
22	127	63	80	e51	e200	1250	89	59	75	166	58	29
23	78	57	64	e52	e120	333	90	56	53	112	53	28
24	67	94	54	e53	e100	252	87	54	786	72	49	29
25	62	120	e54	e56	e85	196	101	69	1120	54	48	183
26	57	104	e53	e62	e75	154	181	113	447	56	45	153
27	56	499	53	e80	e70	270	570	92	947	48	43	143
28	57	269	51	e1000	e70	271	349	63	339	42	525	192
29	55	135	46	e550	---	318	509	54	374	39	437	114
30	53	107	51	e300	---	220	326	51	217	36	110	61
31	67	---	54	e170	---	169	---	50	---	77	78	---
TOTAL	3011	3037	2297	3523	3316	7917	5821	3937	6899	3581	5205	2029
MEAN	97.1	101	74.1	114	118	255	194	127	230	116	168	67.6
MAX	338	499	172	1000	700	1250	570	784	1120	460	1460	192
MIN	43	52	46	50	58	73	87	50	34	36	36	28
CFSM	.52	.54	.40	.61	.63	1.37	1.04	.68	1.23	.62	.90	.36
IN.	.60	.60	.46	.70	.66	1.57	1.16	.78	1.37	.71	1.04	.40

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1994, BY WATER YEAR (WY)

	MEAN	65.4	88.5	112	118	164	237	232	165	108	65.1	55.2	57.4
MAX	450	321	321	456	519	488	965	683	478	385	183	274	274
(WY)	1982	1993	1968	1950	1938	1950	1947	1943	1968	1957	1968	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	1931	1931

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1931 - 1994

ANNUAL TOTAL	62049	50573	122	1968
ANNUAL MEAN	170	139	222	1931
HIGHEST ANNUAL MEAN			25.7	1931
LOWEST ANNUAL MEAN			7380	Apr 6 1947
HIGHEST DAILY MEAN	2470	Jan 5	1460	Aug 14
LOWEST DAILY MEAN	29	Jul 24	28	Sep 23
ANNUAL SEVEN-DAY MINIMUM	39	Jul 18	31	Sep 18
INSTANTANEOUS PEAK FLOW			1670	Mar 22
INSTANTANEOUS PEAK STAGE			(a)14.21	Jan 28
INSTANTANEOUS LOW FLOW			28	(c)
ANNUAL RUNOFF (CFSM)	.91	.74	.65	(d)
ANNUAL RUNOFF (INCHES)	12.34	10.06	8.87	
10 PERCENT EXCEEDS	346	300	259	
50 PERCENT EXCEEDS	94	78	60	
90 PERCENT EXCEEDS	52	46	16	

(a) Backwater from ice.

(b) From floodmark, site and datum then in use.

(c) Part of each day, Sept. 21-25.

(d) Aug. 1, 2, 1964.

(e) Estimated.

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. Occasional regulation by reservoirs upstream from station since 1956. Several measurements of water temperature were made during the year. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	51	39	49	31	e70	e46	94	342	30	69	33	42
2	44	36	46	32	e55	e48	84	216	29	51	27	35
3	38	50	48	31	e47	e54	93	136	27	43	26	32
4	34	43	71	29	e43	e60	78	99	28	39	68	30
5	31	47	86	28	e40	e100	81	84	28	239	68	28
6	29	42	74	e29	e39	360	128	73	77	175	38	27
7	29	36	64	e28	e39	355	105	90	42	110	29	26
8	29	33	53	e27	e39	238	85	125	30	146	27	27
9	207	32	47	e27	e39	145	76	94	25	84	26	26
10	99	32	44	e29	e38	109	67	70	23	55	24	25
11	52	31	41	e31	e38	91	58	60	23	45	91	24
12	41	31	37	e30	e38	77	207	58	24	40	67	23
13	36	48	35	e29	e38	88	213	52	99	41	351	23
14	33	42	35	e27	e38	94	162	48	201	36	746	e27
15	32	51	36	e26	e38	89	212	50	68	35	238	e40
16	61	41	35	e26	e39	85	242	50	37	33	101	e34
17	186	46	35	e26	e42	69	131	42	29	31	61	e24
18	108	45	35	e26	e70	69	91	39	26	32	46	e22
19	59	38	36	e26	e150	67	80	37	25	29	40	e20
20	48	41	40	e26	e300	62	69	36	75	117	39	e19
21	84	36	57	e26	e200	491	59	35	131	92	43	e19
22	60	34	43	e26	e120	527	55	34	42	61	37	e18
23	45	32	37	e27	e80	289	51	33	28	64	32	e18
24	40	74	33	e28	e65	195	54	34	451	36	30	e19
25	38	68	e32	e29	e55	148	54	53	454	50	29	e100
26	36	83	e30	e35	e48	117	117	105	232	62	28	e85
27	36	248	e28	e60	e46	187	263	51	258	32	26	e80
28	35	141	28	e450	e45	166	185	38	124	29	145	e105
29	34	80	29	e250	---	185	233	34	117	28	165	e60
30	34	58	30	e150	---	136	224	31	105	28	74	e36
31	46	---	29	e100	---	110	---	31	---	46	54	---
TOTAL	1735	1658	1323	1745	1899	4857	3651	2280	2888	1978	2809	1094
MEAN	56.0	55.3	42.7	56.3	67.8	157	122	73.5	96.3	63.8	90.6	36.5
MAX	207	248	86	450	300	527	263	342	454	239	746	105
MIN	29	31	28	26	38	46	51	31	23	28	24	18
CFSM	.56	.55	.43	.56	.68	1.57	1.22	.74	.96	.64	.91	.37
IN.	.65	.62	.49	.65	.71	1.81	1.36	.85	1.08	.74	1.05	.41

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1994, BY WATER YEAR (WY)

	MEAN	39.3	56.2	73.4	80.4	105	149	133	90.1	63.1	41.2	34.9	41.3
MAX	124	178	177	269	324	313	313	310	225	179	90.6	171	171
(WY)	1955	1993	1988	1952	1976	1976	1950	1956	1968	1957	1994	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	1931	1931

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1931 - 1994

ANNUAL TOTAL	36328	27917	75.1	
ANNUAL MEAN	99.5	76.5		
HIGHEST ANNUAL MEAN			133	1976
LOWEST ANNUAL MEAN			20.8	1931
HIGHEST DAILY MEAN	1220	746	2060	Jun 26 1968
LOWEST DAILY MEAN	26	(e)18	1.4	Aug 21 1931
ANNUAL SEVEN-DAY MINIMUM	29	19	3.0	Aug 30 1933
INSTANTANEOUS PEAK FLOW		1220	2330	Jun 26 1968
INSTANTANEOUS PEAK STAGE		9.09	(b)10.50	May 10 1948
INSTANTANEOUS LOW FLOW			.90	Aug 16 1956
ANNUAL RUNOFF (CFSM)	1.00	.77	.75	
ANNUAL RUNOFF (INCHES)	13.53	10.40	10.22	
10 PERCENT EXCEEDS	212	170	160	
50 PERCENT EXCEEDS	62	45	41	
90 PERCENT EXCEEDS	34	27	13	

(a) Sept. 22, 23.

(b) From floodmark.

(c) Estimated.

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 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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21	11	21	4.4	e33	24	60	297	10	25	9.3	4.4
2	19	7.8	22	5.9	e26	27	49	131	15	15	7.1	2.3
3	12	15	25	5.3	e21	33	57	80	14	11	5.8	1.9
4	7.5	12	40	5.7	e17	46	48	59	15	8.9	76	3.2
5	6.2	10	52	5.3	e15	108	47	49	7.7	157	33	3.8
6	6.4	10	45	4.8	e13	372	77	42	22	88	12	2.0
7	12	8.2	36	5.1	e11	370	73	54	12	52	8.1	1.5
8	5.6	7.4	29	5.5	e10	154	69	61	7.4	51	4.7	1.9
9	113	6.8	24	4.9	e9.5	87	60	48	5.4	41	4.2	4.3
10	53	8.1	22	4.7	e9.0	67	49	40	4.7	21	16	2.0
11	23	20	19	7.3	e8.7	57	41	31	4.5	15	35	3.4
12	13	7.8	15	8.9	8.5	49	206	30	4.6	13	27	3.5
13	10	10	14	7.1	8.5	58	299	26	44	10	136	2.9
14	9.1	9.6	13	e5.4	8.6	59	161	24	84	8.3	226	2.5
15	6.7	14	19	e4.3	19	57	165	28	27	6.6	50	2.7
16	23	11	14	e3.8	16	52	223	29	14	6.0	24	2.6
17	68	17	12	e3.7	28	37	92	22	10	6.3	16	3.0
18	47	14	12	e3.6	67	41	65	20	7.3	7.7	11	3.6
19	25	11	13	e3.5	253	32	59	18	6.1	5.3	10	3.4
20	18	9.5	14	3.5	464	34	46	17	16	66	7.6	2.7
21	24	8.4	25	3.6	288	466	46	15	30	33	10	9.6
22	18	7.1	19	3.9	103	552	37	15	12	32	6.6	5.3
23	15	6.5	14	e4.5	e55	181	31	14	7.3	32	7.2	1.2
24	11	28	e12	e5.3	e40	119	29	15	249	14	8.3	.97
25	9.8	29	e10	e6.5	e32	87	27	19	239	10	8.0	59
26	8.8	33	e8.0	8.0	e29	68	51	38	77	17	4.6	74
27	8.1	139	6.4	29	e26	104	102	21	142	8.1	3.9	62
28	7.5	76	4.6	475	e25	112	75	13	51	5.6	15	62
29	7.4	37	4.0	316	---	119	107	11	40	21	11	33
30	7.2	27	3.8	92	---	94	139	10	29	26	4.5	14
31	16	---	3.6	e50	---	73	---	9.8	---	40	5.7	---
TOTAL	631.3	611.2	571.4	1096.5	1643.8	3739	2590	1286.8	1207.0	852.8	803.6	378.67
MEAN	20.4	20.4	18.4	35.4	58.7	121	86.3	41.5	40.2	27.5	25.9	12.6
MAX	113	139	52	475	464	552	299	297	249	157	226	74
MIN	5.6	6.5	3.6	3.5	8.5	24	27	9.8	4.5	5.3	3.9	.97
CFSM	.24	.24	.22	.43	.71	1.45	1.04	.50	.48	.33	.31	.15
IN.	.28	.27	.26	.49	.73	1.67	1.16	.58	.54	.38	.36	.17

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1947 - 1994, BY WATER YEAR (WY)

	MEAN	20.2	36.9	61.0	56.7	86.6	134	112	56.3	34.1	18.8	13.8	19.7
MAX	110	176	179	294	307	301	280	183	221	95.8	65.7	99.5	
(WY)	1982	1986	1968	1952	1976	1982	1950	1983	1968	1969	1975	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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1947 - 1994

ANNUAL TOTAL	22831.7	15412.07	
ANNUAL MEAN	62.6	42.2	53.9
HIGHEST ANNUAL MEAN			98.8
LOWEST ANNUAL MEAN			15.9
HIGHEST DAILY MEAN	1610	Jan 5	2520
LOWEST DAILY MEAN	1.2	Aug 28	.30
ANNUAL SEVEN-DAY MINIMUM	3.9	Jul 31	.53
INSTANTANEOUS PEAK FLOW			3600
INSTANTANEOUS PEAK STAGE			13.62
INSTANTANEOUS LOW FLOW			.20
ANNUAL RUNOFF (CFSM)	.75		.65
ANNUAL RUNOFF (INCHES)	10.21		8.81
10 PERCENT EXCEEDS	146		120
50 PERCENT EXCEEDS	22		16
90 PERCENT EXCEEDS	6.2		2.6

(a) Sept. 13, 1955, Jan. 23, 1961.

(e) Estimated.

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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	173	102	115	94	124	125	171	175	64	195	59	128
2	166	100	112	94	117	122	167	180	62	184	58	105
3	160	107	113	92	114	119	164	170	61	173	57	95
4	155	107	119	90	108	121	159	162	58	163	64	90
5	147	108	130	88	103	129	154	158	48	178	74	84
6	140	108	130	91	100	170	156	159	50	190	65	81
7	132	110	131	92	96	200	151	166	52	252	60	79
8	132	105	127	89	e93	187	149	189	51	282	57	73
9	149	103	124	88	e92	168	137	185	49	273	55	74
10	155	102	121	87	e91	155	133	175	46	240	53	69
11	141	112	119	89	e90	150	127	163	42	203	59	65
12	136	115	115	89	91	146	128	151	39	180	67	62
13	132	116	111	89	90	155	146	141	57	169	81	61
14	128	114	110	89	90	152	140	130	111	162	157	61
15	123	117	111	86	88	147	133	115	88	160	173	63
16	125	116	113	85	88	145	139	106	75	155	153	62
17	157	114	114	86	87	141	131	101	69	147	131	59
18	163	114	115	e84	91	138	123	94	63	135	122	57
19	151	114	114	e82	124	135	116	94	63	117	116	55
20	144	112	116	e80	179	136	111	89	66	102	114	54
21	149	111	119	79	193	189	105	81	70	98	121	54
22	147	107	117	79	171	237	98	76	56	91	110	53
23	141	105	114	81	154	227	94	73	49	86	99	52
24	134	110	111	83	144	211	94	66	90	85	90	53
25	126	112	108	85	141	202	97	63	200	82	85	62
26	115	113	105	82	137	190	102	66	245	80	79	87
27	107	144	102	82	132	188	138	69	241	81	75	98
28	105	142	99	136	126	193	148	67	221	80	128	109
29	100	128	98	160	---	191	156	66	198	74	161	102
30	101	121	96	141	---	185	156	63	198	69	142	90
31	103	---	95	132	---	177	---	64	---	63	132	---
TOTAL	4237	3389	3524	2904	3254	5131	4023	3657	2782	4549	2997	2237
MEAN	137	113	114	93.7	116	166	134	118	92.7	147	96.7	74.6
MAX	173	144	131	160	193	237	171	189	245	282	173	128
MIN	100	100	95	79	87	119	94	63	39	63	53	52
CFSM	1.04	.86	.86	.71	.88	1.25	1.02	.89	.70	1.11	.73	.56
IN.	1.19	.96	.99	.82	.92	1.45	1.13	1.03	.78	1.28	.84	.63

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1948 - 1994, BY WATER YEAR (WY)

MEAN	80.0	93.6	106	105	112	155	165	115	86.7	66.0	53.1	65.1
MAX	283	179	218	211	226	337	389	340	181	233	142	247
(WY)	1982	1993	1951	1993	1951	1976	1950	1956	1993	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	1964

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1948 - 1994

ANNUAL TOTAL	51538	42684	100
ANNUAL MEAN	141	117	157
HIGHEST ANNUAL MEAN			1974
LOWEST ANNUAL MEAN			44.6
HIGHEST DAILY MEAN	408	282	632
LOWEST DAILY MEAN	55	39	5.2
ANNUAL SEVEN-DAY MINIMUM	58	47	11
INSTANTANEOUS PEAK FLOW		290	648
INSTANTANEOUS PEAK STAGE		6.67	8.26
INSTANTANEOUS LOW FLOW		37	(a)
ANNUAL RUNOFF (CFSM)	1.07	.89	.76
ANNUAL RUNOFF (INCHES)	14.52	12.03	10.31
10 PERCENT EXCEEDS	223	174	185
50 PERCENT EXCEEDS	130	112	83
90 PERCENT EXCEEDS	73	63	37

(a) June 12, 13.

(e) Estimated.

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.--The inlet and outlet is the Huron River which enters the northeast end of the lake and leaves the southwest 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, 10.77 ft, Dec. 23, 1992, but may have been lower during period of no gage-height record Nov. 13, 1992, to Jan. 22, 1993, due to repairs on dam structure.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 16.32 ft, May 9; minimum observed, 12.58 ft, Jan. 18, but may have been lower during period of no gage-height record Dec. 26 to Feb. 14.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15.94	15.43	12.72	---	---	12.73	13.21	15.53	15.80	15.96	15.57	15.86
2	15.93	15.30	12.70	---	---	12.72	13.28	15.60	15.79	15.96	15.58	15.83
3	15.90	15.22	12.70	---	---	12.72	13.39	15.65	15.79	15.92	15.57	15.80
4	15.90	15.02	12.71	---	---	12.71	13.58	15.76	15.79	15.88	15.61	15.77
5	15.89	14.91	12.71	---	---	12.71	13.71	15.82	15.78	15.91	15.64	15.74
6	15.88	14.85	12.72	---	---	12.79	13.83	15.94	15.79	15.93	15.62	15.72
7	15.87	14.67	12.73	---	---	12.88	13.95	15.98	15.79	15.97	15.60	15.71
8	15.86	14.34	12.73	---	---	12.91	14.04	16.19	15.78	16.02	15.59	15.70
9	15.90	14.15	12.71	---	---	12.90	14.07	16.30	15.76	16.05	15.58	15.70
10	15.90	13.99	12.71	---	---	12.86	14.10	16.20	15.75	16.05	15.58	15.68
11	15.89	13.92	12.71	---	---	12.83	14.10	16.03	15.74	15.98	15.61	15.66
12	15.87	13.85	12.68	---	---	12.81	14.20	15.96	15.73	15.94	15.63	15.65
13	15.87	13.63	12.68	---	---	12.82	14.29	15.89	15.77	15.92	15.69	15.64
14	15.85	13.53	12.67	---	---	12.81	14.36	15.85	15.89	15.88	15.88	15.64
15	15.85	13.48	12.67	---	12.74	12.81	14.41	15.81	15.91	15.86	15.90	15.65
16	15.85	13.40	12.66	---	12.72	12.80	14.51	15.79	15.90	15.85	15.91	15.64
17	15.91	13.27	12.66	---	12.71	12.78	14.60	15.77	15.88	15.83	15.87	15.64
18	15.94	13.18	12.67	---	12.70	12.78	14.68	15.75	15.86	15.80	15.84	15.62
19	15.94	13.14	12.67	---	12.69	12.76	14.73	15.74	15.84	15.77	15.81	15.61
20	15.92	13.11	12.67	---	12.78	12.75	14.76	15.74	15.82	15.75	15.82	15.61
21	15.90	13.05	12.69	---	12.87	12.86	14.78	15.74	15.84	15.73	15.85	15.60
22	15.90	12.89	12.69	---	12.89	12.95	14.79	15.74	15.81	15.71	15.83	15.60
23	15.88	12.78	12.68	---	12.86	13.00	14.78	15.73	15.79	15.68	15.80	15.60
24	15.87	12.74	12.66	---	12.84	13.00	14.77	15.72	15.87	15.66	15.77	15.60
25	15.86	12.71	12.66	---	12.81	12.99	14.82	15.71	16.05	15.64	15.76	15.61
26	15.84	12.70	---	---	12.79	12.96	14.91	15.72	16.17	15.63	15.74	15.65
27	15.82	12.75	---	---	12.77	12.96	15.06	15.71	16.23	15.62	15.73	15.70
28	15.79	12.77	---	---	12.74	12.95	15.18	15.73	16.18	15.62	15.80	15.74
29	15.77	12.76	---	---	---	12.96	15.30	15.76	16.07	15.61	15.89	15.75
30	15.78	12.74	---	---	---	13.02	15.43	15.78	16.00	15.60	15.89	15.73
31	15.68	---	---	---	---	13.06	---	15.79	---	15.59	15.88	---
MEAN	15.87	13.68	---	---	---	12.86	14.39	15.82	15.87	15.82	15.74	15.68
MAX	15.94	15.43	---	---	---	13.06	15.43	16.30	16.23	16.05	15.91	15.86
MIN	15.68	12.70	---	---	---	12.71	13.21	15.53	15.73	15.59	15.57	15.60

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 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	176	202	147	108	143	140	133	142	62	219	67	138
2	174	162	143	108	136	138	150	158	59	213	64	127
3	165	187	142	108	132	135	96	132	58	201	62	116
4	166	209	144	107	126	134	98	122	58	188	76	111
5	162	172	146	103	123	136	133	112	56	193	87	105
6	158	156	147	107	119	157	107	91	59	203	79	97
7	154	258	149	108	115	181	108	100	61	224	74	94
8	153	239	149	106	114	191	131	115	55	242	69	90
9	166	209	146	104	113	186	137	171	48	244	66	90
10	164	181	145	103	109	176	143	228	46	246	57	85
11	161	148	144	105	109	167	113	214	42	226	68	80
12	157	211	138	104	107	161	105	185	40	201	77	74
13	155	204	135	104	107	163	123	164	52	196	100	73
14	152	176	133	104	106	162	136	149	95	183	171	74
15	150	161	132	104	105	162	106	137	98	171	176	75
16	154	191	131	103	104	159	99	127	95	173	173	72
17	173	186	130	105	104	154	104	121	88	169	165	71
18	180	163	131	102	105	153	104	108	82	158	148	66
19	176	152	130	99	119	150	107	102	76	146	131	60
20	173	147	131	99	157	148	110	96	73	138	129	61
21	168	193	135	99	181	175	113	94	83	133	138	61
22	167	192	135	97	186	205	111	89	73	125	131	60
23	162	163	132	97	176	221	108	86	65	111	121	58
24	158	154	129	97	170	224	108	83	95	103	109	58
25	155	148	127	97	161	218	103	77	153	95	104	64
26	149	144	122	97	157	209	93	76	203	91	97	75
27	142	157	120	99	150	208	110	64	228	90	92	94
28	134	161	117	132	144	205	111	50	271	90	118	107
29	130	157	115	154	---	183	102	55	261	86	149	108
30	130	152	112	157	---	178	117	59	236	80	149	103
31	219	---	110	150	---	154	---	59	---	74	144	---
TOTAL	4983	5335	4147	3367	3678	5333	3419	3566	2971	5012	3391	2547
MEAN	161	178	134	109	131	172	114	115	99.0	162	109	84.9
MAX	219	258	149	157	186	224	150	228	271	246	176	138
MIN	130	144	110	97	104	134	93	50	40	74	57	58

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1948 - 1994, BY WATER YEAR (WY)

	MEAN	96.7	148	132	122	130	166	144	122	100	73.4	62.3	76.0
MAX	262	228	248	236	252	315	357	379	198	219	147	231	
(WY)	1982	1986	1951	1951	1951	1974	1950	1956	1993	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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1948 - 1994

ANNUAL TOTAL	58165	47749	
ANNUAL MEAN	159	131	114
HIGHEST ANNUAL MEAN			181
LOWEST ANNUAL MEAN			52.3
HIGHEST DAILY MEAN	356	Jun 23	582
LOWEST DAILY MEAN	59	Aug 9	6.4
ANNUAL SEVEN-DAY MINIMUM	62	Aug 4	12
INSTANTANEOUS PEAK FLOW			343
INSTANTANEOUS PEAK STAGE			3.04
INSTANTANEOUS LOW FLOW			37
10 PERCENT EXCEEDS	224		191
50 PERCENT EXCEEDS	157		131
90 PERCENT EXCEEDS	93		73

(a) From rating curve extended above 600 ft³/s.

(b) June 11,13.

STREAMS TRIBUTARY TO LAKE ERIE

04172000 HURON RIVER NEAR HAMBURG, MI

LOCATION.--Lat 42°27'55", long 83°48'00", in sec.24, T.1 N., R.5 E., Livingston County, Hydrologic Unit 04090005, on right bank at downstream side of bridge on Hamburg Road, 1.1 mi north of Hamburg, and 3 mi upstream from Strawberry Lake.

DRAINAGE AREA.--308 mi².

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

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 850.00 ft above 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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	292	241	262	e190	e330	e285	384	329	116	420	129	291
2	282	295	249	e190	e310	272	346	353	115	392	121	272
3	266	292	239	e190	e270	256	336	370	113	361	116	249
4	251	288	235	e190	e230	244	290	359	111	337	118	223
5	238	315	240	e190	e210	240	274	341	110	337	132	203
6	227	307	245	e185	e195	277	289	318	115	340	134	186
7	217	277	248	e185	e190	333	263	295	117	342	128	172
8	207	301	248	e185	e185	375	254	309	115	353	120	157
9	214	348	247	e185	e185	394	264	316	108	373	113	146
10	230	338	243	e185	e180	395	272	341	101	387	107	138
11	233	308	235	e180	e180	380	273	381	95	389	108	130
12	228	254	222	e180	e180	359	254	404	90	382	120	123
13	218	265	212	e180	e180	356	270	384	93	362	166	117
14	209	302	207	e180	e175	353	282	350	123	340	309	115
15	201	293	203	e180	e175	349	297	319	158	321	375	119
16	201	262	199	e175	e175	343	290	292	170	301	390	119
17	230	267	197	e175	e175	332	275	265	167	285	384	116
18	275	279	197	e175	e175	320	263	236	156	271	366	113
19	306	261	199	e175	e180	311	257	209	145	251	339	107
20	323	234	199	e175	e200	300	249	194	135	240	311	101
21	334	217	204	e170	e270	341	246	183	137	236	302	96
22	329	242	206	e170	e330	395	240	173	134	234	294	92
23	317	276	202	e170	e370	433	230	165	126	226	280	90
24	306	266	e200	e170	e370	469	222	160	148	211	261	88
25	292	244	e200	e170	e350	495	217	161	222	194	239	88
26	281	230	e195	e175	e330	501	212	163	287	181	221	94
27	266	254	e195	e200	e315	497	239	155	337	171	206	120
28	245	273	e195	e240	e300	485	269	138	374	162	214	149
29	227	278	e195	e280	---	472	296	121	413	154	263	167
30	207	274	e190	e320	---	452	299	115	434	150	293	171
31	198	---	e190	e330	---	421	---	114	---	139	301	---
TOTAL	7850	8281	6698	6045	6715	11435	8152	8013	5065	8842	6960	4352
MEAN	253	276	216	195	240	369	272	258	169	285	225	145
MAX	334	348	262	330	370	501	384	404	434	420	390	291
MIN	198	217	190	170	175	240	212	114	90	139	107	88
CFSM	.82	.90	.70	.63	.78	1.20	.88	.84	.55	.93	.73	.47
IN.	.95	1.00	.81	.73	.81	1.38	.98	.97	.61	1.07	.84	.55

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1952 - 1994, BY WATER YEAR (WY)

MEAN	163	234	225	221	237	349	333	261	201	150	122	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 1993 CALENDAR YEAR	FOR 1994 WATER YEAR	WATER YEARS 1952 - 1994
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ANNUAL TOTAL	114064		88408			
ANNUAL MEAN	313		242		219	
HIGHEST ANNUAL MEAN					337	1974
LOWEST ANNUAL MEAN					97.2	1964
HIGHEST DAILY MEAN	672	Apr 2	501	Mar 26	1560	May 15 1956
LOWEST DAILY MEAN	145	Jul 24	88	Sep 24	27	Jul 15 1988
ANNUAL SEVEN-DAY MINIMUM	153	Aug 4	93	Sep 20	28	Jul 10 1988
INSTANTANEOUS PEAK FLOW			502	Mar 25	1560	May 15 1956
INSTANTANEOUS PEAK STAGE			5.68	Aug 16	8.46	Jun 30 1968
INSTANTANEOUS LOW FLOW			85	Jun 13	26	(a)
ANNUAL RUNOFF (CFSM)	1.01		.79		.71	
ANNUAL RUNOFF (INCHES)	13.78		10.68		9.65	
10 PERCENT EXCEEDS	506		360		391	
50 PERCENT EXCEEDS	280		239		189	
90 PERCENT EXCEEDS	183		120		82	

(a) July 15, 16, 1988.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ERIE

04174050 HURON RIVER AT DELHI MILLS, MI

LOCATION.--Lat 42°20'01", long 83°48'34", in SE1/4 sec.2, T.2 S., R.5 E., Washtenaw County, Hydrologic Unit 04090005, at bridge on East Delhi Road, 5.0 mi northwest of Ann Arbor, 5.2 mi downstream from Mill Creek, 5.1 mi upstream from Barton Dam, and 60.0 mi upstream from mouth.

DRAINAGE AREA.--699 mi².

PERIOD OF RECORD.--Water years 1971-81, 1983 to current year.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	TIME	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	TEMPERATURE WATER (DEG C) (00010)	CARBON, ORGANIC TOTAL (MG/L AS C) (00680)	PCB, TOTAL (UG/L) (39516)	ALDRIN, TOTAL (UG/L) (39330)	CHLOR-DANE, TOTAL (UG/L) (39350)	CHLOR-PYRIFOS TOTAL RECOVER (UG/L) (38932)	DEF TOTAL (UG/L) (39040)
DEC 09...	0910	--	3.0	6.8	<0.1	<0.010	<0.1	<0.01	<0.01
JAN 13...	1510	--	1.0	6.2	<0.1	<0.010	<0.1	<0.01	<0.01
APR 20...	0820	628	9.0	7.5	<0.1	<0.010	<0.1	<0.01	<0.01
AUG 05...	0830	600	21.5	9.3	<0.1	<0.010	<0.1	<0.01	<0.01
25...	0815	590	21.5	10	<0.1	<0.010	<0.1	<0.01	<0.01
SEP 08...	1220	650	19.0	6.7	<0.1	<0.010	<0.1	<0.01	<0.01

DATE	DDD, TOTAL (UG/L) (39360)	DDE, TOTAL (UG/L) (39365)	DDT, TOTAL (UG/L) (39370)	DI-AZINON, TOTAL (UG/L) (39570)	DI-SYSTON, TOTAL (UG/L) (39011)	DI-ELDRIN, TOTAL (UG/L) (39380)	ENDO-SULFAN, TOTAL (UG/L) (39388)	ENDRIN WATER UNFLTRD REC (UG/L) (39390)	ETHION, TOTAL (UG/L) (39398)
DEC 09...	<0.010	<0.010	<0.010	<0.01	<0.01	<0.010	<0.010	<0.010	<0.01
JAN 13...	<0.010	<0.010	<0.010	<0.01	<0.01	<0.010	<0.010	<0.010	<0.01
APR 20...	<0.010	<0.010	<0.010	<0.01	<0.01	<0.010	<0.010	<0.010	<0.01
AUG 05...	<0.010	<0.010	<0.010	<0.01	<0.01	<0.010	<0.010	<0.010	<0.01
25...	<0.010	<0.010	<0.010	<0.01	<0.01	<0.010	<0.010	<0.010	<0.01
SEP 08...	<0.010	<0.010	<0.010	<0.01	<0.01	<0.010	<0.010	<0.010	<0.01

DATE	FONOFOS (DY-FONATE) WATER WHOLE TOT.REC (UG/L) (82614)	HEPTA-CHLOR, TOTAL (UG/L) (39410)	HEPTA-CHLOR EPOXIDE TOTAL (UG/L) (39420)	LINDANE TOTAL (UG/L) (39340)	MALATHION, TOTAL (UG/L) (39530)	METH-OXY-CHLOR, TOTAL (UG/L) (39480)	METHYL PARA-THION, TOTAL (UG/L) (39600)	MIREX, TOTAL (UG/L) (39755)	NAPHTHALENES, POLY-CHLOR. TOTAL (UG/L) (39250)
DEC 09...	<0.01	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01	<0.10
JAN 13...	<0.01	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01	<0.10
APR 20...	<0.01	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01	<0.10
AUG 05...	<0.01	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01	<0.10
25...	<0.01	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01	<0.10
SEP 08...	<0.01	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01	<0.01	<0.10

DATE	PARATHION, TOTAL (UG/L) (39540)	PER-THANE TOTAL (UG/L) (39034)	PHORATE TOTAL (UG/L) (39023)	TOX-APHENE, TOTAL (UG/L) (39400)	TOTAL TRI-THION (UG/L) (39786)	2,4-D, TOTAL (UG/L) (39730)	2,4-DP TOTAL (UG/L) (82183)	2,4,5-T TOTAL (UG/L) (39740)	SILVEX, TOTAL (UG/L) (39760)
DEC 09...	<0.01	<0.1	<0.01	<1	<0.01	<0.01	<0.01	<0.01	<0.01
JAN 13...	<0.01	<0.1	<0.01	<1	<0.01	<0.01	<0.01	<0.01	<0.01
APR 20...	<0.01	<0.1	<0.01	<1	<0.01	0.06	<0.01	<0.01	<0.01
AUG 05...	<0.01	<0.1	<0.01	<1	<0.01	0.30	<0.01	<0.01	<0.01
25...	<0.01	<0.1	<0.01	<1	<0.01	0.14	<0.01	<0.01	<0.01
SEP 08...	<0.01	<0.1	<0.01	<1	<0.01	0.09	<0.01	<0.01	<0.01

STREAMS TRIBUTARY TO LAKE ERIE

04174500 HURON RIVER AT ANN ARBOR, MI

LOCATION.--Lat 42°17'10", long 83°44'00", in NW1/4 sec.28, T.2 S., R.6 E., Washtenaw County, Hydrologic Unit 04090005, on left bank 100 ft upstream from bridge on Wall Street in Ann Arbor, 0.7 mi downstream from Argo Dam, and 4.2 mi upstream from Geddes Dam.

DRAINAGE AREA.--729 mi².

PERIOD OF RECORD.--February 1904 to current year. Monthly discharge only for 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 except for estimated daily discharges, which are fair. 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. National Weather Service gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	610	347	533	304	e550	706	917	995	225	585	201	391
2	439	414	517	294	e530	668	888	937	200	540	199	387
3	519	442	527	272	519	630	786	715	182	518	190	374
4	513	519	532	274	500	625	857	793	181	495	245	360
5	525	592	546	263	476	670	843	842	176	492	372	350
6	436	576	546	257	434	832	829	800	210	716	193	348
7	422	548	539	283	419	1080	758	730	176	601	155	300
8	417	268	527	274	381	1050	634	739	202	548	159	173
9	503	123	510	247	e360	1020	613	629	181	515	168	204
10	571	432	505	266	e350	988	485	626	170	507	178	219
11	437	473	487	291	e345	928	473	681	162	495	228	225
12	378	536	455	276	e340	879	591	678	169	476	237	245
13	512	524	440	310	342	893	830	666	263	462	382	239
14	443	563	424	297	348	892	807	726	304	474	800	214
15	427	864	418	346	336	873	798	721	295	468	600	197
16	399	791	416	e350	326	835	951	578	268	422	567	198
17	506	678	415	359	334	785	867	510	284	273	573	234
18	707	461	415	365	368	769	670	365	263	310	587	224
19	647	218	413	e360	635	729	643	379	259	323	621	211
20	606	320	389	e350	1220	694	621	369	284	444	618	197
21	618	361	407	e345	1210	1060	527	357	274	343	593	128
22	724	375	396	e335	1130	1370	519	338	225	357	378	135
23	691	387	382	326	1140	1310	523	322	183	335	404	146
24	638	434	370	312	980	1360	503	250	444	314	424	151
25	382	457	351	298	896	1380	492	273	570	397	498	183
26	513	485	283	313	849	1240	490	321	619	187	428	189
27	608	627	263	380	e780	1160	590	304	630	221	282	278
28	574	649	260	537	e740	1190	669	282	639	228	334	346
29	555	600	255	599	---	1200	744	259	557	269	415	328
30	444	563	279	600	---	1180	922	239	551	268	391	290
31	312	---	274	559	---	1090	---	227	---	206	399	---
TOTAL	16076	14627	13074	10642	16838	30086	20840	16651	9146	12789	11819	7467
MEAN	519	488	422	343	601	971	695	537	305	413	381	249
MAX	724	864	546	600	1220	1380	951	995	639	716	800	391
MIN	312	123	255	247	326	625	473	227	162	187	155	128

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1915 - 1994, BY WATER YEAR (WY)

	MEAN	267	376	419	444	542	863	870	598	396	239	176	214
MAX	904	1018	1080	1257	1431	2308	2647	2085	1341	1130	569	919	
(WY)	1982	1993	1951	1950	1976	1918	1947	1943	1943	1968	1968	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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1915 - 1994

ANNUAL TOTAL	241251												
ANNUAL MEAN	661												
HIGHEST ANNUAL MEAN										(a)450			
LOWEST ANNUAL MEAN										824			1974
HIGHEST DAILY MEAN	2380									171			1931
LOWEST DAILY MEAN	95									5840			Mar 14 1918
ANNUAL SEVEN-DAY MINIMUM	192									(b)4.0			(c)
INSTANTANEOUS PEAK FLOW										13			Jul 28 1934
INSTANTANEOUS PEAK STAGE													
10 PERCENT EXCEEDS	1210									927			
50 PERCENT EXCEEDS	546									325			
90 PERCENT EXCEEDS	267									118			

(a) Does not include water year 1948.

(b) Plant leakage, but doubtful due to possible change in leakage.

(c) Aug. 2, Sept. 11, 1931.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ERIE

04174800 HURON RIVER AT YPSILANTI, MI

LOCATION.--Lat 42°14'57", long 83°36'45", in SW1/4 sec.4, T.3 S., R.7 E., Washtenaw County, Hydrologic Unit 04090005, on left bank 30 ft downstream from bridge on Forest Avenue in Ypsilanti, 4.9 mi downstream from Geddes Dam, 5.6 mi upstream from Ford Dam, and at mile 42.8.

DRAINAGE AREA.--807 mi².

PERIOD OF RECORD.--June 1974 to September 1984, October 1989 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. Extensive regulation caused by many dams upstream from station; storage capacity is small. Several measurements of water temperature were made during the year. Gage-height telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	659	423	705	398	e680	877	1110	1310	265	729	223	515
2	501	511	680	376	e650	845	1080	1190	229	674	222	516
3	548	564	685	347	634	815	982	952	216	649	184	483
4	533	660	724	345	e600	826	1020	1000	209	615	352	461
5	577	760	744	330	e560	909	1020	1030	202	721	450	453
6	527	746	747	325	537	1190	1030	985	276	906	235	456
7	502	721	718	343	516	1420	964	965	225	795	159	415
8	488	401	710	325	e480	1310	829	972	222	746	171	222
9	703	142	681	281	e450	1210	826	836	221	702	197	243
10	713	500	679	322	e435	1180	690	820	210	666	187	262
11	552	575	636	362	e425	1120	640	877	193	648	351	268
12	440	666	589	329	e420	1070	924	866	207	613	280	300
13	609	676	575	362	417	1090	1130	854	451	594	571	298
14	542	675	555	e380	419	1070	1080	897	531	615	1060	279
15	516	1010	544	e410	418	1060	1050	914	413	618	789	239
16	544	936	544	e430	408	1010	1180	787	355	558	741	240
17	675	861	566	e440	427	961	1070	688	366	327	747	288
18	854	639	510	e440	521	951	884	461	347	375	749	269
19	797	280	522	e440	994	910	844	486	325	389	794	263
20	772	387	515	e430	1710	880	817	463	415	609	799	253
21	781	458	545	e420	1590	1490	726	494	375	445	779	169
22	854	475	525	e410	1360	1690	706	439	295	466	499	173
23	834	490	517	e390	e1300	1560	707	412	237	411	514	188
24	796	575	493	e370	1170	1560	686	300	762	365	532	203
25	481	590	457	342	e1100	1550	677	331	862	505	647	287
26	623	643	380	323	e1050	1430	684	436	840	231	579	254
27	756	897	338	368	e1000	1380	842	386	806	256	360	409
28	722	845	338	1030	e920	1400	923	340	811	251	427	483
29	699	781	334	867	---	1400	993	305	727	305	529	418
30	572	737	360	800	---	1370	1180	279	677	308	525	400
31	384	---	369	e730	---	1290	---	272	---	230	550	---
TOTAL	19554	18624	17285	13465	21191	36824	27294	21347	12270	16322	15202	9707
MEAN	631	621	558	434	757	1188	910	689	409	527	490	324
MAX	854	1010	747	1030	1710	1690	1180	1310	862	906	1060	516
MIN	384	142	334	281	408	815	640	272	193	230	159	169

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1974 - 1994, BY WATER YEAR (WY)

MEAN	448	620	645	615	719	1126	1112	786	510	339	286	380
MAX	1145	1219	1053	1576	1535	1925	1541	1301	870	528	524	960
(WY)	1982	1993	1991	1993	1976	1976	1993	1983	1993	1979	1992	1975
MIN	198	315	273	210	225	742	874	520	274	170	140	145
(WY)	1980	1979	1977	1977	1979	1983	1981	1982	1979	1984	1984	1978

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1974 - 1994

ANNUAL TOTAL	303494	229085	632
ANNUAL MEAN	831	628	909
HIGHEST ANNUAL MEAN			419
LOWEST ANNUAL MEAN			1993
HIGHEST DAILY MEAN	3290	Jan 5	1710
LOWEST DAILY MEAN	123	Aug 23	142
ANNUAL SEVEN-DAY MINIMUM	228	Aug 17	217
INSTANTANEOUS PEAK FLOW			2130
INSTANTANEOUS PEAK STAGE			10.78
10 PERCENT EXCEEDS	1500		1060
50 PERCENT EXCEEDS	717		560
90 PERCENT EXCEEDS	332		264

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ERIE

04174950 WILLOW RUN NEAR RAWSONVILLE, MI

LOCATION.--Lat 42°13'09", long 83°32'13", in SW1/4 sec.18, T.3 S., R.8 E., Wayne County, Hydrologic Unit 04090005, on right bank 30 ft upstream from culverts on North I-94 Service Road, 0.7 mi upstream from mouth, and 0.8 mi northeast of Rawsonville.

DRAINAGE AREA.--Indeterminate.

PERIOD OF RECORD.--April 1986 to current year (seasonal records only, April to September).

GAGE.--Water-stage recorder. Elevation of gage is 670 ft above sea level, from topographic map.

REMARKS.--Records good. Actual surface drainage area is 6.28 mi². Flow contains effluent from sewage-treatment plant about 1 mi upstream from station. Some of this flow originates from ground-water sources and other sources outside the basin. Several measurements of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge during period April to September, 142 ft³/s, Aug. 19, 1990; minimum daily, 16 ft³/s, Sept. 19, 1994.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	33	53	22	28	22	25
2	---	---	---	---	---	---	29	42	23	27	26	26
3	---	---	---	---	---	---	30	41	22	28	27	26
4	---	---	---	---	---	---	26	39	28	23	43	23
5	---	---	---	---	---	---	29	40	28	46	31	23
6	---	---	---	---	---	---	36	38	33	32	29	22
7	---	---	---	---	---	---	32	39	28	33	25	24
8	---	---	---	---	---	---	33	40	26	27	24	27
9	---	---	---	---	---	---	33	36	26	30	23	26
10	---	---	---	---	---	---	32	37	28	29	26	26
11	---	---	---	---	---	---	31	34	25	27	43	25
12	---	---	---	---	---	---	59	37	26	28	33	22
13	---	---	---	---	---	---	50	36	57	32	58	24
14	---	---	---	---	---	---	43	36	43	30	63	27
15	---	---	---	---	---	---	62	35	32	28	36	29
16	---	---	---	---	---	---	51	34	31	28	30	26
17	---	---	---	---	---	---	41	35	28	27	28	26
18	---	---	---	---	---	---	30	35	28	25	27	23
19	---	---	---	---	---	---	39	31	28	26	28	16
20	---	---	---	---	---	---	39	29	31	39	30	22
21	---	---	---	---	---	---	38	27	31	29	25	28
22	---	---	---	---	---	---	39	28	24	51	24	27
23	---	---	---	---	---	---	39	28	26	32	26	26
24	---	---	---	---	---	---	38	29	82	28	26	25
25	---	---	---	---	---	---	33	34	50	25	25	34
26	---	---	---	---	---	---	45	34	43	23	27	31
27	---	---	---	---	---	---	51	27	29	26	27	33
28	---	---	---	---	---	---	44	27	32	28	27	27
29	---	---	---	---	---	---	45	24	33	27	25	25
30	---	---	---	---	---	---	54	24	28	25	26	25
31	---	---	---	---	---	---	---	27	---	24	27	---
TOTAL	---	---	---	---	---	---	1184	1056	971	911	942	769
MEAN	---	---	---	---	---	---	39.5	34.1	32.4	29.4	30.4	25.6
MAX	---	---	---	---	---	---	62	53	82	51	63	34
MIN	---	---	---	---	---	---	26	24	22	23	22	16

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.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	133	87	116	e84	e105	e145	180	213	48	109	e31	49
2	120	83	114	e82	e100	e145	171	207	42	99	e35	44
3	105	85	117	e81	e98	e145	161	182	39	88	e37	41
4	94	87	120	e80	e96	e145	156	162	37	81	e34	39
5	83	88	e130	e79	e94	e150	150	151	36	95	e33	35
6	76	87	e140	e78	e92	e180	154	141	41	118	30	36
7	73	82	e135	e77	e90	e230	157	136	41	171	28	35
8	70	78	e130	e76	e89	224	161	160	37	158	27	33
9	90	74	e130	e75	e89	191	158	157	33	134	25	31
10	122	74	e125	e75	e88	175	150	143	31	111	25	30
11	110	72	e120	e75	e88	167	138	132	29	e95	51	29
12	97	73	e120	e74	e88	164	174	126	29	e80	115	27
13	87	75	e115	e74	e88	176	254	115	47	e70	121	28
14	79	82	e115	e74	e87	176	263	106	223	e62	174	28
15	74	87	e115	e74	e87	176	246	103	217	e56	144	27
16	89	85	e115	e74	e87	166	230	104	170	e50	108	26
17	157	85	e110	e73	e86	154	198	95	129	e45	87	27
18	186	88	e110	e73	e86	149	178	88	105	e43	77	26
19	172	89	e110	e73	e90	144	169	81	87	e40	70	23
20	154	89	e115	e73	e220	142	157	77	79	e50	70	22
21	154	83	e115	e73	e260	265	147	74	83	e60	82	21
22	154	82	e120	e73	e220	316	139	69	74	e65	81	21
23	140	77	e115	e73	e190	284	131	65	67	e58	75	21
24	131	83	e110	e73	e170	262	127	63	92	e52	70	22
25	119	96	e105	e74	e160	229	120	69	171	e46	68	24
26	112	104	e100	e100	e155	207	115	72	179	e42	65	33
27	109	152	e96	e160	e150	209	147	69	172	e39	63	48
28	105	160	e92	e140	e145	217	154	61	161	e36	60	54
29	102	143	e90	e120	---	218	183	55	147	e35	58	46
30	96	128	e88	e115	---	206	181	51	127	e36	51	38
31	92	---	e86	e110	---	193	---	50	---	e33	52	---
TOTAL	3485	2758	3519	2635	3398	5950	5049	3377	2773	2257	2047	964
MEAN	112	91.9	114	85.0	121	192	168	109	92.4	72.8	66.0	32.1
MAX	186	160	140	160	260	316	263	213	223	171	174	54
MIN	70	72	86	73	86	142	115	50	29	33	25	21
CFSM	.85	.70	.86	.64	.92	1.45	1.27	.83	.70	.55	.50	.24
IN.	.98	.78	.99	.74	.96	1.68	1.42	.95	.78	.64	.58	.27

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1970 - 1994, BY WATER YEAR (WY)

	MEAN	68.7	95.1	112	111	124	204	193	120	89.2	55.6	46.9	57.9
MAX	169	212	160	280	241	356	275	191	249	114	116	142	
(WY)	1987	1993	1991	1993	1976	1976	1978	1974	1989	1981	1981	1981	
MIN	24.8	25.1	30.7	27.6	45.0	123	116	52.7	13.9	10.4	12.4	15.1	
(WY)	1980	1972	1977	1977	1972	1987	1987	1971	1988	1988	1971	1971	

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1970 - 1994

ANNUAL TOTAL	51071	38212	
ANNUAL MEAN	140	105	107
HIGHEST ANNUAL MEAN			155
LOWEST ANNUAL MEAN			61.8
HIGHEST DAILY MEAN	449	Jan 5	690
LOWEST DAILY MEAN	34	Aug 22	5.7
ANNUAL SEVEN-DAY MINIMUM	38	Aug 17	6.1
INSTANTANEOUS PEAK FLOW			869
INSTANTANEOUS PEAK STAGE			7.21
INSTANTANEOUS LOW FLOW			4.5
ANNUAL RUNOFF (CFSM)	1.06		.81
ANNUAL RUNOFF (INCHES)	14.39		11.00
10 PERCENT EXCEEDS	265		215
50 PERCENT EXCEEDS	115		85
90 PERCENT EXCEEDS	60		25

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ERIE

04175957 SOUTH BRANCH RIVER RAISIN AT ADRIAN, MI

LOCATION.--Lat 41°54'30", long 84°01'42", in SE1/4 NE1/4 sec.35, T.6 S., R.3 E., Lenawee County, Hydrologic Unit 04100002, on right bank 600 ft downstream from bridge on State Highway 52 in Adrian, and 1,000 ft downstream from Wolf Creek.

DRAINAGE AREA.--164 mi².

PERIOD OF RECORD.--October 1991 to current year.

GAGE.--Water-stage recorder. Datum of gage is 720.00 ft above sea level (City of Adrian bench mark).

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	61	57	148	e49	e230	e130	127	263	31	76	14	16
2	57	56	135	e48	e180	e120	119	289	29	68	22	15
3	51	57	129	e47	e140	e115	124	188	28	30	24	14
4	46	53	145	e46	e120	e120	119	149	26	40	20	16
5	94	57	225	e45	e110	e210	120	130	24	39	18	16
6	76	56	225	e45	e100	e480	140	116	27	34	15	27
7	33	54	175	e45	e90	e570	171	110	24	34	16	18
8	25	52	153	e44	e82	e400	240	108	22	35	14	13
9	102	51	139	e44	e76	e300	225	99	22	38	14	13
10	136	49	129	e44	e72	236	174	67	21	35	13	12
11	116	49	119	e44	e68	196	146	77	20	30	32	12
12	86	50	106	e43	e66	174	338	82	19	25	23	13
13	73	55	101	e43	e64	172	762	76	40	20	112	14
14	64	64	94	e43	e62	181	811	72	61	18	120	16
15	60	66	92	e43	e61	177	533	70	100	18	122	17
16	69	66	90	e42	e61	165	347	66	75	17	94	17
17	113	85	87	e42	e70	143	251	64	53	16	70	17
18	218	90	88	e42	e90	132	186	60	41	18	53	17
19	186	95	87	e42	e250	125	166	56	34	16	43	19
20	130	83	89	e42	e700	118	145	51	50	38	39	20
21	116	75	92	e42	e1050	213	126	49	48	59	35	22
22	107	67	96	e42	e800	414	108	45	42	71	33	22
23	101	62	89	e42	e420	315	103	40	43	46	29	23
24	90	78	80	e42	e280	221	99	41	282	32	26	25
25	84	93	e70	e42	e210	169	94	39	329	25	23	38
26	77	133	e65	e45	e190	144	90	45	365	21	22	27
27	72	265	e62	e50	e170	156	116	41	217	18	20	43
28	68	383	e58	e150	e150	194	119	40	150	16	20	28
29	63	278	e55	e350	---	176	137	38	112	14	20	26
30	61	182	e53	e410	---	153	162	35	89	15	18	22
31	60	---	e51	e325	---	138	---	33	---	15	18	---
TOTAL	2695	2861	3327	2423	5962	6557	6398	2639	2424	977	1142	598
MEAN	86.9	95.4	107	78.2	213	212	213	85.1	80.8	31.5	36.8	19.9
MAX	218	383	225	410	1050	570	811	289	365	76	122	43
MIN	25	49	51	42	61	115	90	33	19	14	13	12
CFSM	.53	.58	.65	.48	1.30	1.29	1.30	.52	.49	.19	.22	.12
IN.	.61	.65	.75	.55	1.35	1.49	1.45	.60	.55	.22	.26	.14

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1992 - 1994, BY WATER YEAR (WY)

	MEAN	79.6	175	109	216	150	297	256	103	87.7	78.9	35.4	59.8
MAX	120	376	152	502	213	493	355	161	125	127	49.4	117	117
(WY)	1993	1993	1993	1993	1994	1993	1993	1993	1993	1992	1992	1992	1992
MIN	32.0	53.6	66.4	67.3	91.0	187	201	63.5	57.0	31.5	19.9	19.9	19.9
(WY)	1992	1992	1992	1992	1993	1992	1992	1992	1992	1994	1993	1994	1994

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1992 - 1994

ANNUAL TOTAL	65960						38003						
ANNUAL MEAN	181						104						
HIGHEST ANNUAL MEAN										137			1993
LOWEST ANNUAL MEAN										210			1992
HIGHEST DAILY MEAN										96.8			1993
LOWEST DAILY MEAN										2540			Jan 5 1993
ANNUAL SEVEN-DAY MINIMUM	2540				Jan 5		(e)1050		Feb 21				Oct 1 1991
INSTANTANEOUS PEAK FLOW	16				Aug 15		12		Sep 10				Sep 8 1994
INSTANTANEOUS PEAK STAGE	18				Aug 22		13		Sep 8				Jan 5 1993
INSTANTANEOUS LOW FLOW							(e)1200		Feb 21		2870		Jan 5 1993
ANNUAL RUNOFF (CFSM)							(a)7.77		Feb 21		10.45		Jan 5 1993
ANNUAL RUNOFF (INCHES)							11		Sep 10		9.4		Oct 2 1991
10 PERCENT EXCEEDS	1.10						.63				.84		
50 PERCENT EXCEEDS	14.96						8.62				11.35		
90 PERCENT EXCEEDS	369						219				313		
	90						65				77		
	26						18				22		

(a) Backwater from ice.

(e) Estimated.

(a) Backwater from ice.
(b) Sept. 23, 24.
(e) Estimated.

STREAMS TRIBUTARY TO LAKE ERIE

04176500 RIVER RAISIN NEAR MONROE, MI
(National stream quality accounting network station)

LOCATION.--Lat 41°57'38", long 83°31'52", Monroe County, Hydrologic Unit 04100002, on left bank 0.8 mi downstream from bridge on Ida Maybee Road, 5.0 mi downstream from Saline River, and 7.5 mi west of Monroe.

DRAINAGE AREA.--1,042 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--September 1937 to current year. Published as "Raisin River at Monroe" 1937-52 and as "River Raisin at Monroe" 1952-53.

REVISED RECORDS.--WSP 954: 1938-40(M), 1941. WSP 1437: 1939, 1948. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 616.26 ft above sea level. Prior to Oct. 1, 1953, at site 9 mi downstream at datum 46.26 ft lower.

REMARKS.--Water-discharge records good except for estimated daily discharges, which are poor. Diurnal fluctuation caused by powerplants upstream from station prior to June 27, 1968. At times, flow is affected by irrigation pumpage.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	403	341	1090	e270	e1500	e950	1090	1370	248	637	136	167
2	393	332	841	e270	e1300	e880	990	1470	233	510	136	161
3	357	328	731	e270	e1000	e850	927	1480	217	435	130	155
4	338	319	710	e270	e700	e820	904	1300	205	374	135	145
5	310	318	855	e265	e520	e900	908	1060	189	340	149	140
6	283	313	955	e265	e470	e1500	956	892	184	315	142	141
7	281	312	993	e265	e440	e2000	1070	788	185	508	129	137
8	297	308	903	e265	e410	e2400	1470	726	172	398	123	135
9	331	306	790	e265	e390	e2400	1540	688	170	370	123	139
10	515	302	722	e265	e385	e2200	1500	660	160	416	122	127
11	529	299	652	e260	e385	e1700	1290	657	153	407	133	116
12	529	288	584	e260	e380	e1400	1650	596	146	347	131	114
13	478	286	553	e260	e380	1340	3130	554	159	297	238	116
14	412	291	512	e260	e380	1390	3100	520	448	267	832	110
15	358	305	491	e260	e375	1420	3290	478	562	240	855	110
16	332	325	466	e255	e375	1350	3340	433	604	216	752	104
17	339	358	444	e255	e375	1190	2790	461	589	201	618	105
18	508	407	431	e255	e450	1070	2180	441	553	191	465	98
19	540	488	430	e255	e1000	933	1580	421	459	180	359	93
20	666	522	433	e255	e2000	849	1200	388	358	179	304	97
21	664	478	448	e255	e2300	1250	997	354	332	174	268	93
22	589	422	453	e255	e2500	2220	873	351	359	192	248	93
23	539	385	443	e250	e2500	2250	779	337	333	230	240	105
24	498	378	434	e250	e2400	2270	705	319	511	234	229	89
25	469	409	396	e250	e2100	1920	659	310	1450	210	220	98
26	436	454	e290	e250	e1700	1530	633	310	1650	191	213	94
27	414	948	e285	e280	e1400	1300	652	303	1500	176	197	122
28	398	1420	e280	e370	e1000	1290	683	298	1240	161	188	144
29	375	1410	e275	e550	---	1310	789	287	979	155	182	166
30	356	1360	e275	e900	---	1320	907	273	800	141	179	173
31	350	---	e270	e1400	---	1220	---	261	---	136	179	---
TOTAL	13287	14412	17435	10255	29115	45422	42582	18786	15148	8828	8355	3687
MEAN	429	480	562	331	1040	1465	1419	606	505	285	270	123
MAX	666	1420	1090	1400	2500	2400	3340	1480	1650	637	855	173
MIN	281	286	270	250	375	820	633	261	146	136	122	89
CFSM	.41	.46	.54	.32	1.00	1.41	1.36	.58	.48	.27	.26	.12
IN.	.47	.51	.62	.37	1.04	1.62	1.52	.67	.54	.32	.30	.13

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1937 - 1994, BY WATER YEAR (WY)

	304	496	743	800	1075	1691	1480	920	610	354	214	245
MEAN	304	496	743	800	1075	1691	1480	920	610	354	214	245
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 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1937 - 1994

ANNUAL TOTAL	370314											
ANNUAL MEAN	1015											
HIGHEST ANNUAL MEAN												
LOWEST ANNUAL MEAN												
HIGHEST DAILY MEAN	7480				Jan 6	3340		Apr 16	14600		Mar 16	1982
LOWEST DAILY MEAN	114				Aug 28	89		Sep 24	9.0		Sep 30	1941
ANNUAL SEVEN-DAY MINIMUM	125				Aug 24	95		Sep 18	18		Sep 26	1941
INSTANTANEOUS PEAK FLOW						3560		Apr 16	15300		Mar 16	1982
INSTANTANEOUS PEAK STAGE						(a)6.64		Feb 20	(a)11.16		Mar 15	1982
INSTANTANEOUS LOW FLOW						83		(b)	(c)2.0		(d)	
ANNUAL RUNOFF (CFSM)	.97					.60			.71			
ANNUAL RUNOFF (INCHES)	13.22					8.12			9.68			
10 PERCENT EXCEEDS	2290					1420			1850			
50 PERCENT EXCEEDS	473					388			354			
90 PERCENT EXCEEDS	205					143			103			

(a) Backwater from ice.

(b) Sept. 22, 24.

(c) Approximately, site then in use.

(d) Sept. 4, 1938, Sept. 19, 20, 1941.

(e) Estimated.

STREAMS TRIBUTARY TO LAKE ERIE

04176500 RIVER RAISIN NEAR MONROE, MI--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1966-75, 1978 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: April 1978 to July 1981.

WATER TEMPERATURE: March 1966 to September 1972, April 1978 to July 1981.

SUSPENDED-SEDIMENT DISCHARGE: March 1966 to September 1972.

INSTRUMENTATION.--Water-quality monitor from Mar. 23 to July 13, 1981.

REMARKS.--Cross-sectional samples were collected at gaging station, or 0.8 mi upstream at bridge on Ida Maybee Road.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1979-81): Maximum daily, 1,020 microsiemens, Feb. 16, 1979; minimum daily recorded (more than 20 percent missing record), 263 microsiemens, Jan. 25, 1981.

WATER TEMPERATURE (water years 1967, 1970-72, 1979-80): Maximum daily recorded (more than 20 percent missing record), 32.0°C, July 18, 1972; minimum daily, 0.0°C on many days during winter.

SEDIMENT CONCENTRATION (water years 1967-72): Maximum daily mean, 1,430 mg/L, Dec. 22, 1967; minimum daily mean, 1 mg/L on several days in 1970.

SEDIMENT LOAD: Maximum daily, 28,000 tons, Dec. 22, 1967; minimum daily, 0.29 ton, Aug. 31, 1971.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A specific conductance of 200 microsiemens was measured Feb. 25, 1985.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

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, KF AGAR (COLS. PER 100 ML) (31673)
DEC 09...	1445	780	692	8.3	3.5	9.9	12.7	98	K160	2400
APR 20...	1305	1180	580	8.3	12.0	4.5	10.9	103	K32	K45
JUN 15...	1355	542	753	8.2	23.5	9.2	7.2	86	K2600	3200
AUG 25...	1400	221	689	8.5	24.5	18	10.9	133	130	570

DATE	HARD- NESS TOTAL (MG/L AS CACO3) (00900)	HARD- NESS NONCARB DIS-SOLV FLD. AS CACO3 (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 HCO3 (00453)	CAR- BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	ALKA- LITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)
DEC 09...	330	110	97	22	14	8.5	273	--	224	82
APR 20...	290	81	86	19	12	5.6	259	--	212	61
JUN 15...	280	97	82	19	18	11	227	--	186	82
AUG 25...	280	67	79	20	20	17	254	3	212	86

DATE	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (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, NO2+NO3 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)
DEC 09...	35	0.20	7.6	427	0.58	899	0.020	4.40	0.070	0.60
APR 20...	30	0.20	5.5	390	0.53	1240	0.040	4.40	0.040	0.60
JUN 15...	45	0.30	7.6	458	0.62	670	0.130	9.00	0.320	1.6
AUG 25...	40	0.20	8.9	407	0.55	243	<0.010	0.610	0.020	0.80

STREAMS TRIBUTARY TO LAKE ERIE

04176500 RIVER RAISIN NEAR MONROE, MI--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	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)	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)
DEC 09...	0.060	0.020	0.020	<10	52	<3	20	<4	11
APR 20...	0.040	0.020	0.020	<10	47	<3	10	<4	13
JUN 15...	0.160	0.070	0.050	<10	57	<3	19	7	6
AUG 25...	0.090	<0.010	<0.010	<10	67	<3	10	<4	3

DATE	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	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)
DEC 09...	<10	1	<1	<1.0	440	<6	45	95	78
APR 20...	<10	1	<1	<1.0	340	<6	49	156	95
JUN 15...	<10	3	<1	<1.0	500	<6	61	89	99
AUG 25...	10	2	<1	<1.0	620	<6	27	16	99

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. Elevation of gage is 580 ft above sea level, from topographic map.

REMARKS.--Records fair except for estimated daily discharges and discharges below 1.0 ft³/s, which are poor. Several measurements of water temperature were made during the year.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.7	5.8	26	e4.8	e35	e26	e90	131	7.1	13	1.2	1.6
2	6.8	5.4	25	e4.7	e25	e28	e80	85	6.6	10	2.2	1.4
3	5.6	5.2	26	e4.6	e20	e32	e75	59	5.8	8.2	5.7	1.2
4	4.5	5.6	43	e4.5	e17	e40	e70	47	5.3	6.8	4.8	.99
5	4.1	5.8	89	e4.5	e15	e65	e59	40	5.1	14	3.2	.96
6	3.5	5.4	62	e4.4	e13	e220	73	34	4.7	21	2.2	1.0
7	3.1	4.9	46	e4.4	e11	e350	112	31	4.4	13	1.7	.99
8	2.9	4.3	37	e4.3	e10	254	167	34	4.3	10	1.4	.91
9	6.6	4.1	32	e4.3	e9.0	138	116	30	4.3	21	1.2	.81
10	15	3.9	31	e4.3	e8.9	e70	87	26	4.1	16	1.1	.72
11	10	3.8	25	e4.2	e8.8	e55	68	24	3.7	9.1	1.9	.66
12	8.3	3.7	21	e4.2	e8.7	e47	321	24	3.5	6.7	3.2	.63
13	6.8	4.1	20	e4.2	e8.7	e52	473	21	4.2	5.1	3.0	.36
14	5.6	5.7	19	e4.1	e8.8	e54	271	20	24	4.2	156	.02
15	5.0	12	18	e4.1	9.3	e50	174	21	14	4.0	59	.02
16	4.9	16	16	e4.1	11	e45	147	20	8.6	3.5	24	.01
17	8.9	28	15	e4.1	e25	e40	95	17	6.8	2.8	12	.00
18	16	41	15	e4.1	e45	e35	71	15	5.5	2.7	8.1	.00
19	13	32	15	e4.1	e180	e32	61	15	4.5	2.4	6.0	.00
20	10	26	15	e4.1	e250	e40	48	14	12	2.0	5.1	.00
21	11	18	18	e4.1	e150	e80	40	13	48	1.9	5.2	.00
22	13	14	18	e4.1	e80	e350	35	11	18	5.9	4.6	.00
23	10	11	15	e4.1	e50	e170	31	10	11	9.3	4.0	.00
24	8.9	12	e12	e4.1	e40	e110	29	9.6	60	5.2	3.3	.00
25	7.9	17	e9.5	e4.1	e30	e80	27	10	95	3.1	2.8	.00
26	7.2	18	e8.0	e4.5	e27	e70	27	12	98	2.2	2.4	.00
27	6.6	75	e7.0	e5.5	e26	e85	34	12	49	1.8	2.2	.00
28	6.0	85	e6.0	e50	e25	e105	36	9.7	29	1.6	2.1	.00
29	5.6	48	e5.5	e250	---	e120	55	8.4	22	3.4	1.9	.02
30	5.1	33	e5.2	e80	---	e105	49	7.2	18	1.7	1.7	.45
31	5.2	---	e5.0	e50	---	e98	---	6.7	---	1.4	1.7	---
TOTAL	235.8	553.7	705.2	546.6	1147.2	3046	3021	817.6	586.5	213.0	361.9	12.75
MEAN	7.61	18.5	22.7	17.6	41.0	98.3	101	26.4	19.5	6.87	11.7	.42
MAX	16	85	89	250	250	350	473	131	98	21	156	1.6
MIN	2.9	3.7	5.0	4.1	8.7	26	27	6.7	3.5	1.4	1.1	.00
CFSM	.15	.36	.45	.35	.80	1.93	1.97	.52	.38	.13	.23	.01
IN.	.17	.40	.51	.40	.84	2.22	2.20	.60	.43	.16	.26	.01

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1988 - 1994, BY WATER YEAR (WY)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
MEAN	19.1	47.4	65.3	66.6	66.8	92.4	94.4	53.7	43.2	14.4	5.09	9.71
MAX	53.3	144	168	181	186	199	152	130	141	55.1	11.7	46.2
(WY)	1993	1993	1991	1993	1990	1993	1993	1991	1989	1989	1994	1992
MIN	2.36	18.5	5.69	17.6	16.6	24.7	49.6	9.47	.58	.17	.15	.14
(WY)	1989	1994	1990	1994	1989	1989	1988	1988	1988	1988	1988	1991

SUMMARY STATISTICS

FOR 1993 CALENDAR YEAR

FOR 1994 WATER YEAR

WATER YEARS 1988 - 1994

ANNUAL TOTAL	20694.35	11247.25	48.0
ANNUAL MEAN	56.7	30.8	74.9
HIGHEST ANNUAL MEAN			30.1
LOWEST ANNUAL MEAN			1993
HIGHEST DAILY MEAN	971	473	1480
LOWEST DAILY MEAN	.02	.00	.00
ANNUAL SEVEN-DAY MINIMUM	.06	.00	.00
INSTANTANEOUS PEAK FLOW		656	(c)2050
INSTANTANEOUS PEAK STAGE		(d)9.32	10.73
ANNUAL RUNOFF (CFSM)	1.11	.60	.94
ANNUAL RUNOFF (INCHES)	15.09	8.20	12.80
10 PERCENT EXCEEDS	146	80	112
50 PERCENT EXCEEDS	17	10	20
90 PERCENT EXCEEDS	1.6	1.7	.89

(a) Sept. 17-28.

(b) On several days in water years 1988, 1991, 1992, 1994.

(c) From rating curve extended above 700 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 low-flow partial-record sites and 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 1994 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 .	1973-94	04-19-94	10.58	1,230	04-25-85	a8.42	3,210
West Branch Waiska River near Brimley, MI (04045538)	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 .	1973-94	04-16-94	7.85	556	04-18-74	b9.19	1,200
STREAMS TRIBUTARY TO LAKE MICHIGAN								
Black River near Garnet, MI (04046000)	Lat 46°07'05", long 85°21'55", in SE1/4 sec.13, T.43 N., R.9 W., Mackinac County, Hydrologic Unit 04060107, on right bank 10 ft upstream from footbridge, 15 ft down- stream from Peters Creek, 3.5 mi upstream from mouth, and 4 mi southwest of Garnet. Datum of gage is 629.7 ft above sea level. Drainage area is approxi- mately 28 mi ² .	1951-78†, 1979-94	04-16-94	5.22	204	05-07-60	8.55	860

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 1994 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								
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 mi northwest of Perron- ville, and 11.5 mi upstream from Ford River. Drainage area is 38.4 mi ² .	1971-77‡, 1978-94	04-30-94	c	<185	04-24-75	d5.42	810
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‡, 1980-94	02-22-94	--	e150	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 Hamilton. Drainage area is 274 mi ² .	1979-94	02-22-94	g17.06	3,110	06-01-89	h18.2	5,260
Sycamore Creek 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 .	1975-94	02-19-94	g9.99	e360	04-19-75	12.53	1,080
Carrier Creek near Grand Ledge, MI (04113090)	Lat 42°43'36", long 84°39'16", in SE1/4 SW1/4 sec.15, T.4 N., R.3 W., Eaton County, Hydrologic Unit 04050004, at St. Joe Highway, 3.7 mi upstream from mouth, and 4.0 mi southeast of Grand Ledge. Drainage area is 7.18 mi ² .	1975-94	10-17-93	5.40	93	06-12-86	10.01	465
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‡, 1993-94	02-21-94	g7.29	e1,900	09-13-86	9.05	4,700

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 1994 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								
Quaker Brook near Nashville, MI (04117000)	Lat 42°33'57", long 85°05'37", in NW1/4 sec. 13, T.2 N., R.7 W., Barry County, Hydro- logic Unit 04050007, on left bank 150 ft upstream from culvert on Clark Road, 500 ft upstream from small tribu- tary, and 2.5 mi south of Nashville. Datum of gage is 821.89 ft above sea level. Drainage area is 7.60 mi ² .	1954-75†, 1976-94	08-13-94	5.87	167	04-19-75	9.45	470
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 .	1974-94	02-21-94	10.90	1,240	03-04-79	--	e1,700
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 .	1974-94	02-21-94	9.74	1,390	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 .	1975-94	02-21-94	g3.93	e221	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 .	1975-94	02-20-94	i	e600	03-28-89	5.46	993
STREAMS TRIBUTARY TO LAKE HURON								
Au Sable River at Grayling, MI (04135500)	Lat 44°39'35", long 84°42'45", in SW1/4 SE1/4 sec.7, T.26 N., R.3 W., Crawford Coun- ty, Hydrologic Unit 04070007, on right bank 65 ft upstream from bridge on Interstate Highway 75 (Business Loop) in Grayling. Datum of gage is 1,123.49 ft above sea level. Drainage area is 110 mi ² .	1943-93†, 1994	07-06-94	3.25	322	07-06-94	3.25	322

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 1994 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								
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†, 1983-94	03-23-94	j	e484	05-20-59	6.76	2,760
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 .	1987-94	07-08-94	16.36	1,720	07-08-94	16.36	1,720
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†, 1991-94	02-19-94	8.28	2,220	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, 6.0 mi upstream from mouth, and 4.0 mi southeast of Flint. Datum of gage is 764.36 ft above sea level. Drainage area is 54.4 mi ² .	1970-84†, 1991-94	02-21-94	5.84	484	04-19-75	h7.65	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 .	1974-94	02-20-94	16.51	1,490	04-19-75	23.87	5,400
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 .	1965-94	02-21-94	g4.00	e65	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 1994 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 Almont. Drainage area is 9.56 mi ² .	1959-62, 1963-68†, 1969-94	03-07-94	m4.28	229	09-06-85	n8.60	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, Hydro- logic Unit 04090003, at 33 Mile Road, 2.2 mi north- east of Romeo. Drainage area is 49.7 mi ² .	1959-64, 1965-69†, 1970-94	03-07-94	o3.92	808	04-19-75	p5.44	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†, 1973-94	03-08-94	g7.13	e1,200	04-19-75	q7.76	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†, 1971-94	03-07-94	g5.95	e160	04-19-75	r6.25	480
Highbank Creek near Armada, MI (04164350)	Lat 42°28'24", 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†, 1971-94	02-20-94	s	e350	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 NW1/4 sec.19, 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†, 1973-94	02-20-94	7.15	583	04-19-75	t8.95	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†, 1966-94	03-07-94	g6.74	e300	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 1994 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‡, 1965-94	03-07-94	6.96	122	02-10-65	u8.82	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‡, 1971-94	06-26-94	v10.14	513	06-26-68	w12.17	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 .	1972-94	08-13-94	x7.84	228	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, at Maple Road, 2.8 mi south of Saline. Drainage area is 94.6 mi ² .	1966-77‡, 1978-94	02-21-94	10.32	890	06-26-68	13.37	3,990

‡ Operated as a continuous-record gaging station.

a Maximum gage height, 12.36 ft, Apr. 9, 1991, site and datum then in use.

b Maximum gage height, 9.84 ft, Apr. 6, 1988.

c Maximum gage height, 4.12 ft, Apr. 3, 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 Backwater from ice.

h From floodmark.

i Maximum gage height, 5.25 ft, backwater from ice, date not determined.

j Not determined.

k Maximum gage height, 5.93 ft, Jan. 27, 1974, backwater from ice.

m Maximum gage height, 5.20 ft, Feb. 20, backwater from ice.

n Maximum gage height, 8.62 ft, Apr. 19, 1975.

o Maximum gage height, 4.24 ft, Feb. 20, backwater from ice.

p Maximum gage height, 7.1 ft, Mar. 12 or 13, 1962, backwater from ice, site and datum then in use.

q Maximum gage height, 7.85 ft, Mar. 12, 1962, backwater from ice.

r Maximum gage height, 6.95 ft, Sept. 6, 1985.

s Maximum gage height, 15.98 ft, Mar. 7, backwater from ice.

t Maximum gage height, 9.48 ft, Sept. 6, 1985.

u Maximum gage height, 9.55 ft, June 26, 1968.

v Maximum gage height, 10.50 ft, Feb. 20, backwater from ice.

w Maximum gage height, 15.89 ft, Mar. 14, 1972, backwater from ice.

x Maximum gage height, 8.41 ft, Jan. 28, backwater from ice.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Low-flow partial-record stations

Measurements of streamflow in the area covered by this report made at low-flow partial-record stations are given in the following table. These measurements were made during periods of base flow when streamflow is primarily from ground-water storage. These measurements, when correlated with the simultaneous discharge of a nearby stream where continuous records are available, will give a picture of the low-flow potentiality of a stream. The column headed "Period of record" shows the water years in which measurements were made at the same, or practically the same, site.

Discharge measurements made at low-flow partial-record stations during water year 1994

Station No.	Station name	Location	Drainage area (mi ²)	Period of record	Measurements	
					Date	Discharge (ft ³ /s)
STREAMS TRIBUTARY TO LAKE MICHIGAN						
04096517	South Branch Hog Creek Tributary near Allen, MI	Lat 41°57'33", long 84°49'33", in SW1/4 SW1/4 sec.7, T.6 S., R.4 W., Hillsdale County, Hydrologic Unit 04050001, at Squires Road, 0.3 mi upstream from mouth, and 3.0 mi west of Allen.	2.61	1969-94	05-20-94	1.54
					06-30-94	1.36
					08-11-94	1.42
					09-26-94	1.24
04114594	Maple River near St. Johns, MI	Lat 43°02'43", long 84°28'11", in SW1/4 SE1/4 sec.30, T.8 N., R.1 W., Clinton County, Hydrologic Unit 04050005, at Colony Road, 4.5 mi northeast of St. Johns.	--	1981-94	10-14-93	54.5
					11-23-93	66.6
					03-18-94	a143
					09-09-94	39.0

a Not base flow.

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 1994

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							
04032510	Mineral River	Lake Superior	Lat 46°44'00", long 89°33'46", in NW1/4 sec.16, T.50 N., R.42 W., Ontonagon County, Hydrologic Unit 04020101, at State Highway 64, 1.5 mi southeast of White Pine.	6.80	1942,1970, 1975-77	07-26-94	*1.05
04032511	Mineral River	Lake Superior	Lat 46°44'26", long 89°34'26", in NW1/4 SW1/4 sec.9, T.50 N., R.42 W., Ontonagon County, Hydrologic Unit 04020101, above confluence with Paystreak Creek, 0.7 mi southwest of State Highway 64, and 19 mi southwest of Ontonagon.	--	--	07-25-94	*1.20
04032515	Mineral River	Lake Superior	Lat 46°45'44", long 89°34'30", in NE1/4 NE1/4 sec.5, T.50 N., R.42 W., Ontonagon County, Hydrologic Unit 04020101, at State Highway 64 in White Pine.	10.5	1952,1970, 1975-77	07-25-94	*2.54
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, 1987-93	06-28-94	a43.5
04041490	Sturgeon River	Portage Lake	Lat 46°40'18", long 88°36'55", in NE1/4 SE1/4 sec.6, T.49 N., R.35 W., Houghton County, Hydrologic Unit 04020104, at U.S. Forest Service Road 193, 4.5 mi southwest of Prickett Dam and 13.0 mi southwest of L'Anse.	335	1969,1970, 1976-77	06-23-94	182
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	10-02-93 05-24-94 07-05-94 08-24-94	a41.0 a51.7 a36.1 a23.0

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 1994--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 SUPERIOR--Continued							
04044563	Big Creek	Chocolay River	Lat 46°26'04", long 87°19'04", in SE1/4 SW1/4 sec.28, T.47 N. R.24 W., Marquette County, Hydrologic Unit 04020201, at former gaging station, 5.0 mi southeast of Harvey.	17.0	1964-70†, 1979-81‡, 1982	08-24-94	*28.7
04044583	Cherry Creek	Chocolay River	Lat 46°27'57", long 87°21'53", in NE1/4 SE1/4 sec.13, T.47 N., R.25 W., Marquette County, Hydrologic Unit 04020201, at former gaging station, 0.5 mi upstream from County Highway 551, and 2.0 mi south of Harvey.	4.53	1964-65, 1966-70‡, 1971-79†, 1979-81‡, 1982	08-24-94	*19.5
STREAMS TRIBUTARY TO LAKE MICHIGAN							
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	10-27-93 05-23-94 08-25-94 09-14-94	a3.48 a3.50 a2.60 a4.15
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, 2.0 mi north- west of Wells, and 2.5 mi upstream from mouth.	c920	1981-92†, 1993	06-17-94 07-25-94 09-09-94 09-26-94	a812 a629 a407 a510
04062085	Peshekee River	Lake Michigamme	Lat 46°36'35", long 88°01'20", in SW1/4 SE1/4 sec.26, T.49 N., R.30 W., Marquette County, Hydrologic Unit 04030107, at Huron Bay Peshekee Grade Road, 5.4 mi northwest of Martins Land- ing.	43.9	1992-93	10-19-93 11-23-93 12-28-93 01-25-94 02-16-94 03-29-94 04-21-94 04-26-94 05-24-94 06-21-94 06-29-94 07-26-94 08-15-94 08-31-94 09-21-94	*24.7 49.7 *17.4 *11.6 *10.5 *21.7 508 591 *39.1 113 52.5 50.4 *11.5 57.3 *15.7
04108900	Grand River	Lake Michigan	Lat 42°10'08", long 84°23'02", in SE1/4 NE1/4 sec.35, T.3 S., R.1 W., Jackson County, Hydrologic Unit 04050004, at Draper Road, 2.0 mi south of Vandercook Lake.	41.0	1961, 1963-65, 1974-79, 1987, 1989-92	08-18-94	*b35.6

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 1994--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							
04110663	Unnamed Tributary	Perry Creek	Lat 42°27'38", long 84°28'57", in SW1/4 NW1/4 sec.19, T.1 N., R.1 W., Ingham County, Hydrologic Unit 04050004, at Ridley Road, 2.0 mi west of Leslie.	--	1990-93	04-13-94 04-26-94 08-18-94	b4.45 *b0.93 *b1.48
04112670	Willow Creek	Sycamore Creek	Lat 42°32'18", long 84°29'26", in SW1/4 SE1/4 sec.24, T.2 N., R.2 W., Ingham County, Hydrologic Unit 04050004, at Toles Road, 3.7 mi southwest of Mason.	--	1990-93	04-13-94 08-18-94	b4.13 *b2.87
04112673	Unnamed Tributary	Willow Creek	Lat 42°32'33", long 84°27'45", in NW1/4 SW1/4 sec.20, T.2 N., R.1 W., Ingham County, Hydrologic Unit 04050004, at Tuttle Road, 0.2 mi south of Lyon Road, and 2.7 mi south-west of Mason.	--	1990-93	04-13-94 08-18-94	b0.81 *b0.50
04115130	Maple River	Grand River	Lat 43°05'22", long 84°45'35", in NE1/4 NE1/4 sec.15, T.8 N., R.4 W., Clinton County, Hydrologic Unit 04050005, at Tallman Road, 3.5 mi south-west of Maple Rapids.	--	--	04-26-94	1,480
04117150	Mud Creek	Thornapple River	Lat 42°41'00", long 85°06'46", in NW1/4 NW1/4 sec.2, T.3 N., R.7 W., Barry County, Hydro-logic Unit 04050007, at Coates Grove Road, 5.9 mi northwest of Vermontville.	--	1993	06-07-94	*b11.3
04117300	High Bank Creek	Thornapple River	Lat 42°37'17", long 85°10'47", in NE1/4 sec.30, T.3 N., R.7 W., Barry County, Hydrologic Unit 04050007, at Thornapple Lake Road in Morgan.	33.9	1964, 1989, 1993	06-07-94	*b12.3
04117450	Cedar Creek	Thornapple River	Lat 42°36'37", long 85°13'53", in NW1/4 NW1/4 sec.35, T.3 N., R.8 W., Barry County, Hydrologic Unit 04050007, at State Highway 79, 0.3 mi west of Quimby.	--	1964, 1988, 1993	06-07-94	*b26.8
04118570	York Creek	Grand River	Lat 43°02'42", long 85°41'23", in SE1/4 SE1/4 sec.26, T.8 N., R.12 W., Kent County, Hydro-logic Unit 04050006, at Alpine Avenue, 2.0 mi north-west of Grand Rapids.	--	--	05-11-94 05-25-94 06-06-94 07-08-94	b5.72 *b0.17 *b0.16 b0.43

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 1994--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							
04118590	York Creek	Grand River	Lat 43°01'37", long 85°40'05", in NW1/4 NW1/4 sec.6, T.7 N., R.11 W., Kent County, Hydro- logic Unit 04050006, at Pri- vate Drive, 0.5 mi north of Grand Rapids.	--	--	05-11-94 05-11-94 05-25-94 06-06-94	b42.8 b30.2 *b1.99 *b2.64
04119067	Unnamed Tributary	Grand River	Lat 42°54'49", long 85°43'48", in SW1/4 SE1/4 sec.9, T.6 N., R.12 W., Kent County, Hydro- logic Unit 04050006, at 28th Street in Wyoming.	--	--	06-06-94	*b2.01
04119068	Unnamed Tributary	Grand River	Lat 42°55'03", long 85°44'00", in NW1/4 SE1/4 sec.9, T.6 N., R.12 W., Kent County, Hydro- logic Unit 04050006, at Lee Street in Wyoming.	--	--	06-06-94	*b3.30
04120500	Higgins Lake Outlet ("The Cut")	Marl Lake	Lat 44°25'59", long 84°40'12", in NW1/4 NW1/4 sec.34, T.24 N., R.3 W., Roscommon County, Hydrologic Unit 04060102, at county road, 5.9 mi southwest of Roscommon.	49.2	1942-50†, 1973, 1993	10-22-93 11-29-93 01-06-94 02-22-94 04-01-94 04-11-94 04-11-94 04-15-94 05-24-94 06-03-94 06-13-94 07-08-94 08-05-94 08-05-94	a58.3 a49.1 a43.8 a64.8 a64.8 a63.4 a61.3 a70.5 a41.3 a39.2 a41.9 a105 a99.0 a101
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, at Smith Street in Cadillac.	c48	1983-84†, 1986-92†, 1993	10-21-93 01-12-94 02-23-94 04-21-94 06-14-94 08-11-94	a44.5 a27.5 a31.4 a2.68 a5.08 a58.4
STREAMS TRIBUTARY TO LAKE HURON							
04153350	North Branch Salt River	Salt River	Lat 43°41'54", long 84°39'29", in SE1/4, SW1/4 sec.10, T.15 N., R.3 W., Isabella County, Hydrologic Unit 04080201 at Rosebush Road, 5.5 mi east of Rosebush.	--	--	08-01-94	*b7.19
04153495	Salt River	Tittabawassee River	Lat 43°42'17", long 84°29'13", in NE1/4 SE1/4 sec.12, T.15 N., R.2 W., Midland County, Hydrologic Unit 04080201, at Castor Road, 0.5 mi south of North Bradley.	--	--	08-01-94	*b16.0

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 1994--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 DETROIT RIVER							
04165980	River Rouge	Detroit River	Lat 42°34'27", long 83°12'26", in NW1/4 NW1/4 sec.19, T.2 N., R.11 E., Oakland County, Hydrologic Unit 04090004, at Adams Road in Troy.	12.0	--	05-04-94	11.5
						06-14-94	24.0
						06-25-94	31.7
						07-18-94	*4.54
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.	--	--	05-04-94	45.2
						06-14-94	106
						06-24-94	286
						06-29-94	68.5
04166225	River Rouge	Detroit River	Lat 42°26'12", long 83°16'27", in NW1/4 sec.4, T.1 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at footbridge near Bonnie Brook Golf Course clubhouse, 0.2 mi east of Telegraph Road, in Redford.	100	--	05-11-94	58.0
						06-14-94	341
						06-21-94	79.4
						06-25-94	489
04166230	River Rouge	Detroit River	Lat 42°25'46", long 83°16'09", in SE1/4 SW1/4 sec.4, T.1 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at 7 Mile Road, 0.4 mi east of Telegraph Road in Redford.	101	1979-80	05-09-94	95.3
04166335	Upper River Rouge	River Rouge	Lat 42°25'30", long 83°18'58", in NE1/4 NE1/4 sec.12, T.1 S., R.9 E., Wayne County, Hydrologic Unit 04090004, at Inkster Road, 0.2 mi south of 7 Mile Road in Redford.	--	--	07-08-94	38.6
04166450	Bell Branch	Upper River Rouge	Lat 42°23'32", long 83°17'45", in NW1/4 SW1/4 sec.20, T.1 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at Beech-Daly Road in Redford.	40.8	1967-68, 1976-77, 1986-88	05-11-94	13.5
						06-14-94	47.0
						06-24-94	332
						07-18-94	*9.75
04166470	Upper River Rouge	River Rouge	Lat 42°23'38", long 83°16'35", in SW1/4 NE1/4 sec.20, T.1 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at Telegraph Road in Detroit.	67.3	1979-80	05-09-94	45.6
						06-14-94	131
						06-24-94	555
						06-29-94	105
04166575	River Rouge	Detroit River	Lat 42°20'10", long 83°14'50", in SW1/4 sec.10, T.2 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at Ann Arbor Trail in Dearborn Heights.	197	--	05-11-94	*105
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.	--	--	04-29-94	47.0
						05-11-94	*11.4
						06-24-94	48.1
						07-19-94	*4.84

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 1994--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 DETROIT RIVER--Continued							
04166700	Johnson Drain	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, Hydro- logic Unit 04090004, at Hines Drive, 0.1 mi upstream from confluence with Walled Lake Branch, in Northville.	26.1	1967-68, 1976-77, 1986-88	04-29-94	47.0
						05-26-94	*14.7
						07-19-94	*5.87
						08-02-94	*5.06
04166735	Middle River Rouge	River Rouge	Lat 42°23'33", long 83°28'02", in NW1/4 NW1/4 sec.23, T.1 S., R.8 E., Wayne County, Hydrologic Unit 04090004, at dam at outlet of Phoenix Lake, 1.0 mi north of Ply- mouth.	56.5	1974	04-29-94	125
						05-10-94	45.2
						06-14-94	67.0
						07-19-94	*16.2
04166760	Middle River Rouge	River Rouge	Lat 42°22'00", long 83°24'41", in NW1/4 NW1/4 sec.32, T.1 S., R.9 E., Wayne County, Hydrologic Unit 04090004, at dam at outlet of Newburgh Lake in Livonia.	62.3	1973-74	08-02-94	*15.4
						05-11-94	43.6
						06-14-94	90.8
						06-25-94	228
04166950	Middle River Rouge	River Rouge	Lat 42°20'27", long 83°21'05", in SE1/4, SE1/4 sec.3, T.2 S., R.9 E., Wayne County, Hydro- logic Unit 04090004, at Hines Drive in Westland.	--	--	07-08-94	61.9
						07-19-94	*20.5
						08-02-94	*19.2
						05-10-94	69.0
04167150	Middle River Rouge	River Rouge	Lat 42°19'50", long 83°14'53", in SW1/4 sec.10, T.2 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at Hines Drive in Dearborn Heights.	110	--	06-14-94	129
						06-24-94	632
						06-25-94	345
						07-19-94	*26.5
04167200	River Rouge	Detroit River	Lat 42°19'39", long 83°14'29", in land grant 615, T.2 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at Ford Road in Dearborn.	307	--	05-11-94	63.0
						06-14-94	197
						06-15-94	87.2
						06-24-94	594
04167300	Lower River Rouge	River Rouge	Lat 42°17'01", long 83°30'20", in NW1/4 SW1/4 sec.28, T.2 S., R.8 E. Wayne County, Hydrologic Unit 04090004, at Beck Road, 1.5 mi northwest of Sheldon.	9.01	1967-68	06-25-94	502
						07-19-94	*31.0
						06-14-94	1,060
						06-15-94	332
04167340	Fowler Creek	Lower River Rouge	Lat 42°16'56", long 83°30'20", in NW1/4 SW1/4 sec.28, T.2 S., R.8 E., Wayne County, Hydrologic Unit 04090004, at Beck Road, 1.5 mi northwest of Sheldon.	12.0	1967-68	06-21-94	392
						06-24-94	1,580
						06-25-94	1,710
						07-19-94	*90.6
04167300	Lower River Rouge	River Rouge	Lat 42°17'01", long 83°30'20", in NW1/4 SW1/4 sec.28, T.2 S., R.8 E. Wayne County, Hydrologic Unit 04090004, at Beck Road, 1.5 mi northwest of Sheldon.	9.01	1967-68	04-29-94	17.4
						05-11-94	2.51
						06-24-94	23.9
						06-24-94	77.4
04167340	Fowler Creek	Lower River Rouge	Lat 42°16'56", long 83°30'20", in NW1/4 SW1/4 sec.28, T.2 S., R.8 E., Wayne County, Hydrologic Unit 04090004, at Beck Road, 1.5 mi northwest of Sheldon.	12.0	1967-68	05-11-94	*3.43

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at special study and miscellaneous sites during water year 1994--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 DETROIT RIVER--Continued							
04167600	Fellows Creek	Lower River Rouge	Lat 42°17'38", long 83°26'11", in NW1/4 NE1/4 sec.25, T.2 S., R.8 E., Wayne County, Hydrologic Unit 04090004, at Palmer Road, 2.7 mi north-west of Wayne.	16.0	1967-68, 1976-77	04-29-94	31.7
						05-10-94	7.22
						06-20-94	60.9
						06-24-94	143
						07-18-94	*2.68
04167665	Lower River Rouge	River Rouge	Lat 42°17'06", long 83°23'02", in NW1/4 SE1/4 sec.28, T.2 S., R.9 E., Wayne County, Hydrologic Unit 04090004, at Wayne Road in Wayne.	71.2	--	05-10-94	30.6
						06-14-94	69.8
						06-24-94	296
						06-25-94	211
						07-18-94	*5.88
04167720	Lower River Rouge	River Rouge	Lat 42°17'24", long 83°20'21", in SE1/4 NW1/4, sec.26, T.2 S., R.9 E, Wayne County, Hydrologic Unit 04090004, at Henry Ruff Road, 0.2 mi north of Michigan Avenue, and 2 mi east of Wayne.	--	--	05-11-94	*25.3
04168400	Lower River Rouge	River Rouge	Lat 42°18'31", long 83°15'10", in NE1/4 sec.22, T.2 S., R.10 E., Wayne County, Hydrologic Unit 04090004, at Military Road in Dearborn.	c91	1979-80	05-11-94	31.0
						06-14-94	75.9
						06-24-94	403
						06-25-94	246
						07-19-94	*7.95
STREAMS TRIBUTARY TO LAKE ERIE							
04175305	Paint Creek	Stony Creek	Lat 42°13'18", long 83°37'34", in private claim 681, T.3 S., R.7 E., Washtenaw County, Hydrologic Unit 04100001, about 1,600 ft downstream from Interstate 94, 0.5 mi south of Ypsilanti.	--	1991-92	08-15-94	b2.45
04175306	Paint Creek	Stony Creek	Lat 42°12'54", long 83°37'29", in NE1/4 NE1/4 sec.20, T.3 S., R.7 E., Washtenaw County, Hydrologic Unit 04100001, 100 ft downstream from detention impoundment, about 4,700 ft downstream from Interstate 94, and 1.0 mi south of Ypsilanti.	--	1991	08-15-94	b2.98

* 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 Discharge measurement made by employees of Michigan Department of Natural Resources.

c Approximately.

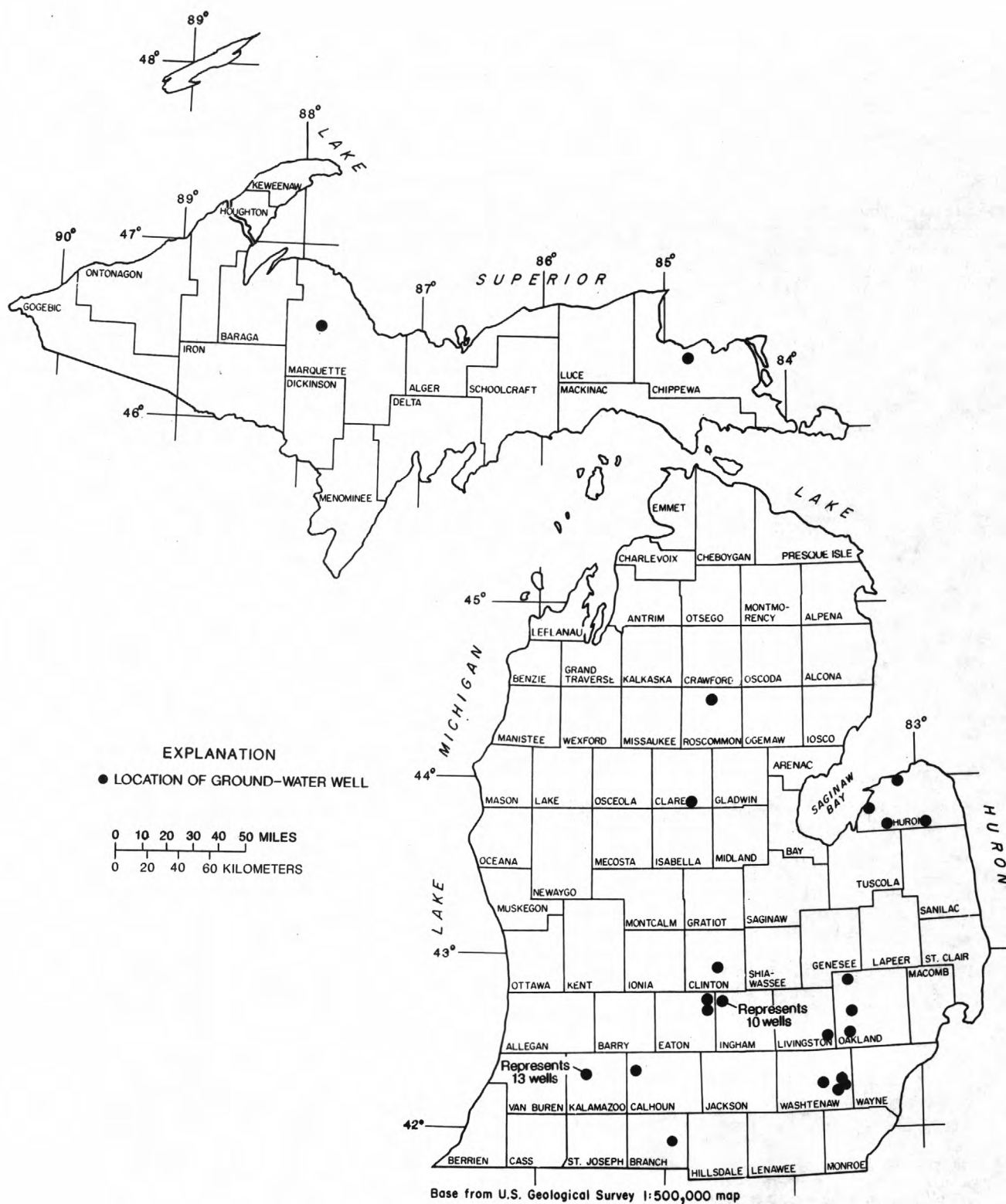


Figure 9.--Location of ground-water wells published in this report.

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, 2.50 ft above land-surface datum.

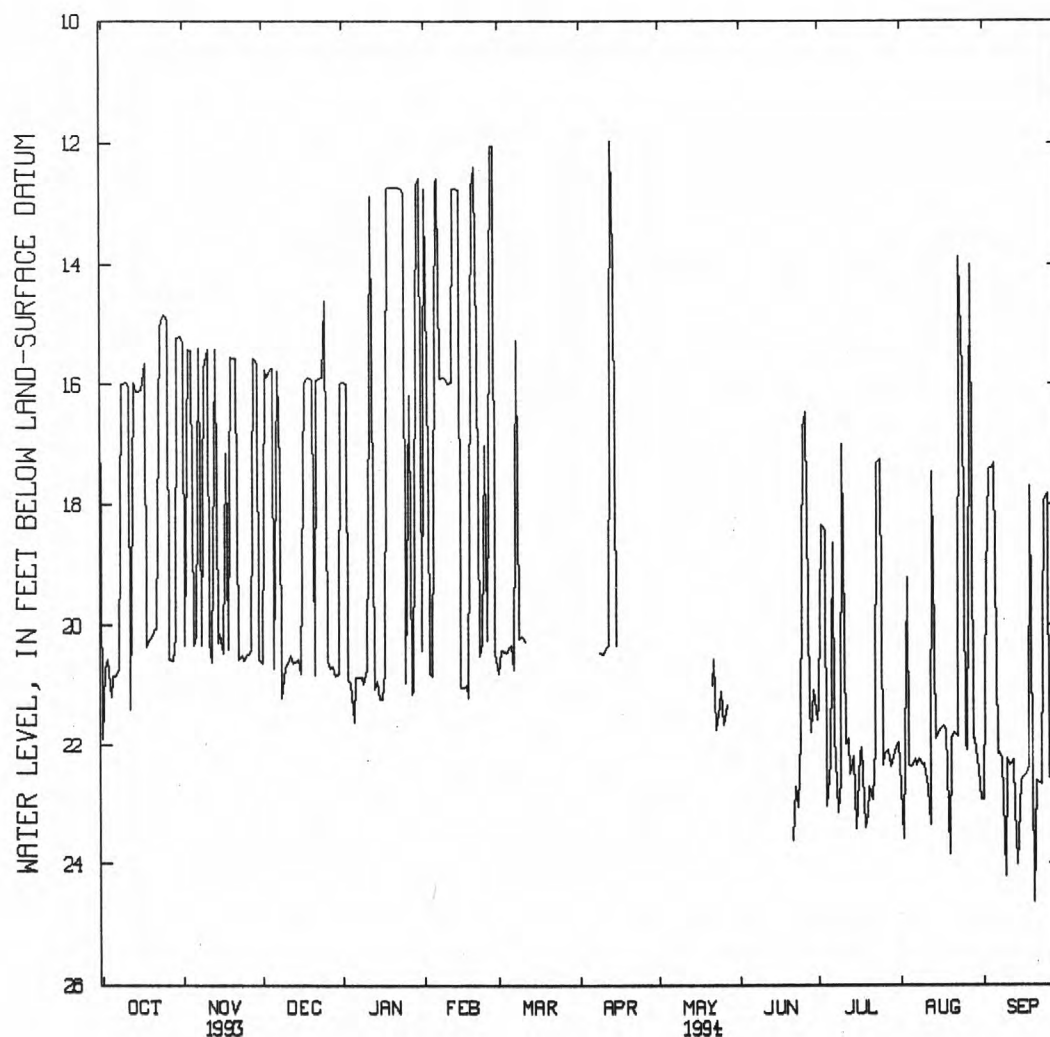
REMARKS.--Water levels affected by nearby pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 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 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	20.84	20.33	15.72	21.60	12.63	20.38	---	---	---	22.29	22.36	17.33
10	15.97	15.40	20.70	20.71	15.99	20.20	20.49	---	---	16.99	22.31	22.25
15	16.11	20.14	20.57	21.24	21.04	---	20.34	---	---	23.41	21.80	22.60
20	20.17	15.58	15.93	12.72	12.38	---	---	---	---	22.70	21.88	24.62
25	14.84	20.52	14.59	20.96	20.26	---	---	21.12	16.71	22.33	21.97	17.81
EOM	15.20	20.57	15.98	20.43	20.46	---	---	---	21.58	21.95	22.92	22.76
WTR YR 1994	HIGHEST			11.09	OCT 25			LOWEST	24.62	SEP 20		



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, at 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.

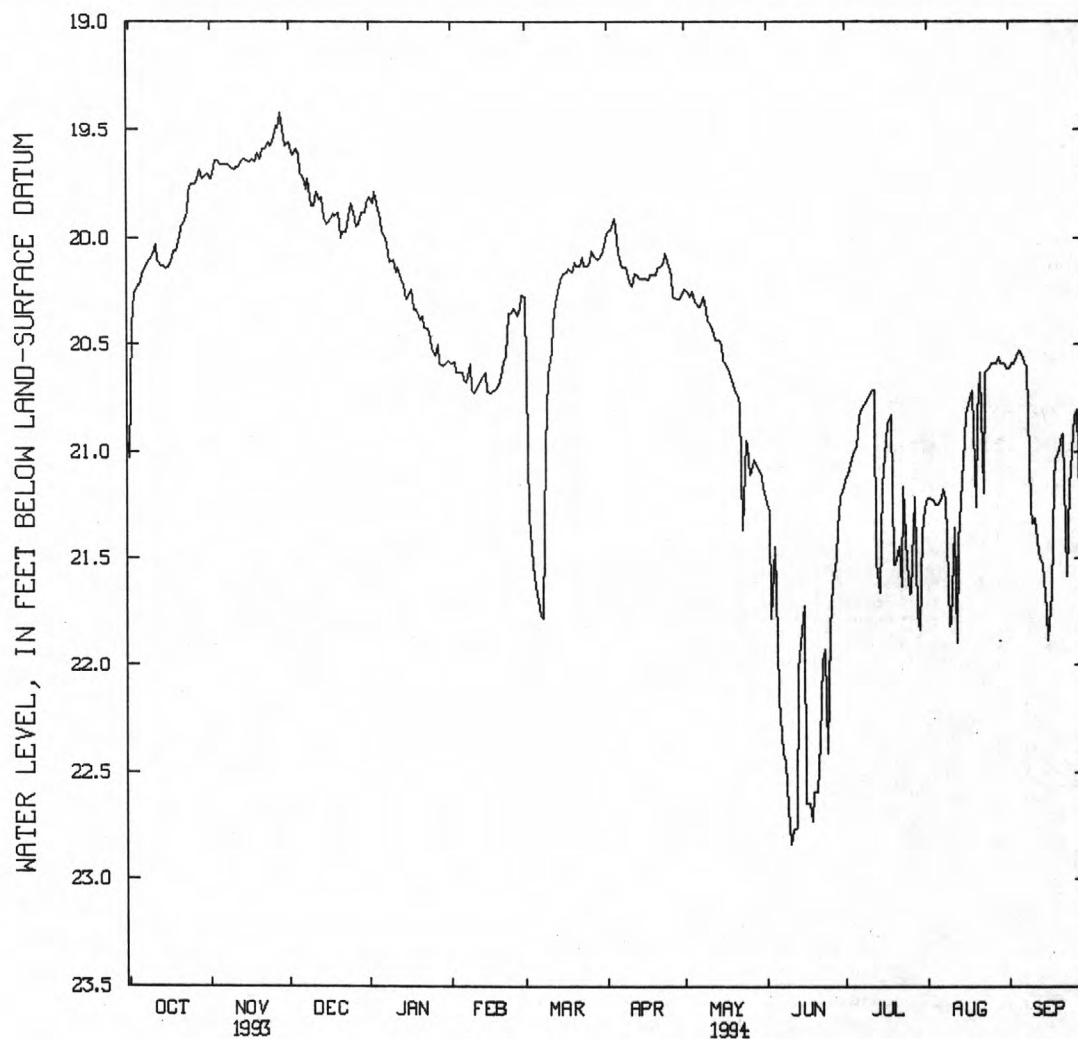
DATUM.--Elevation of land-surface datum is 845 ft above sea level, from topographic map. Measuring point: Top of shelter base, 1.0 ft above land-surface datum.

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 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	20.22	19.66	19.62	19.92	20.63	21.63	20.01	20.30	21.88	20.98	21.25	20.53
10	20.07	19.68	19.85	20.10	20.73	20.64	20.21	20.39	22.84	20.74	21.80	21.34
15	20.15	19.64	19.91	20.29	20.72	20.20	20.19	20.51	21.72	21.16	20.94	21.74
20	19.99	19.63	19.88	20.38	20.65	20.12	20.18	20.71	22.59	21.53	20.82	20.99
25	19.75	19.56	19.84	20.52	20.33	20.13	20.13	20.97	21.83	21.67	20.59	20.91
EOM	19.70	19.57	19.83	20.57	20.27	20.06	20.28	21.17	21.16	21.26	20.61	21.33
WTR YR 1994	HIGHEST			19.37	NOV 28			LOWEST	22.84	JUN 10		



GROUND-WATER LEVELS

CHIPPEWA COUNTY

462159084442201. Local number, 46N 4W 24DADA.

LOCATION.--Lat 46°21'59", long 84°44'22", Hydrologic Unit 04020203, on trail 0.2 mi south of State Highway 28, 1 mi west of Raco. Owner: U.S. Forest Service.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in., depth 54 ft.

INSTRUMENTATION.--Bimonthly readings by observer; periodic readings by U.S.G.S. personnel.

DATUM.--Elevation of land-surface datum is 850 ft above sea level, from topographic map. Measuring point: Top of shelter base, 3.07 ft above land-surface datum.

PERIOD OF RECORD.--June 1952 to April 1965, November 1969 to September 1994 (discontinued).

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 18.40 ft below land-surface datum, June 7, 1971; lowest recorded, 28.43 ft below land-surface datum, Apr. 14, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 7	25.78	JAN 5	26.07	MAR 8	26.63	MAY 5	26.45	JUN 6	25.67	AUG 22	25.94
20	25.92	20	26.17	22	26.80	16	26.04	22	25.54	23	25.97
NOV 6	25.93	FEB 9	26.34	APR 5	26.98	20	25.94	JUL 13	25.54	SEP 6	26.15
23	26.03	15	26.40	26	26.85	31	25.73	27	25.64	26	26.36
DEC 7	25.98										

CLARE COUNTY

434900084462501. Local number, 17N 4W 34DCAD.

LOCATION.--Lat 43°49'00", long 84°46'25", Hydrologic Unit 04080201, at Clare. Owner: City of Clare.

AQUIFER.--Gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 4 in., depth 91 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 850 ft above sea level, from topographic map. Measuring point: Top of shelter base, 3.50 ft above land-surface datum.

REMARKS.--Levels affected by nearby pumping.

PERIOD OF RECORD.--January 1975 to current year.

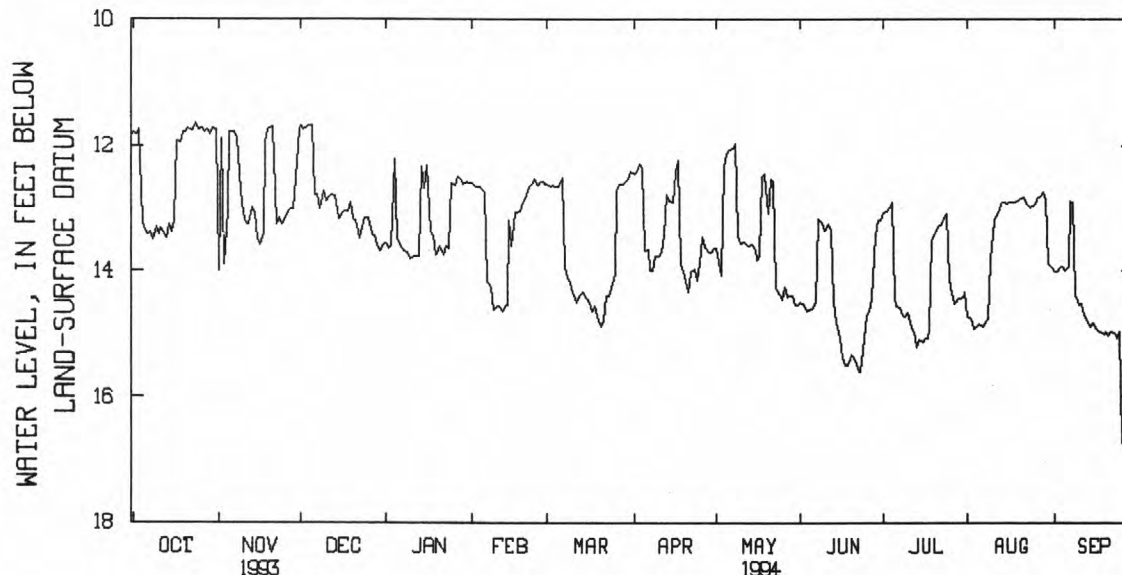
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 7.91 ft below land-surface datum, Mar. 31, 1976; lowest recorded, 24.95 ft below land-surface datum, May 28, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	13.35	11.79	11.69	13.50	12.72	12.66	13.70	12.14	14.60	14.45	14.85	13.99
10	13.43	13.10	12.90	13.81	14.59	14.33	13.75	13.56	13.34	14.68	13.20	14.54
15	13.38	13.52	13.17	12.69	13.18	14.45	12.92	13.66	15.06	15.14	12.95	14.84
20	11.79	11.74	13.17	13.66	12.92	14.89	14.17	13.09	15.38	13.37	12.85	14.97
25	11.76	13.17	13.15	12.59	12.65	14.03	13.87	14.46	14.69	14.13	12.94	14.98
EOM	11.75	11.76	13.58	12.60	12.61	12.41	13.64	14.53	13.19	14.33	13.93	14.51

WTR YR 1994 HIGHEST 10.85 DEC 4 LOWEST 16.87 SEP 27



GROUND-WATER LEVELS

CLINTON COUNTY

425410084323501. Local number, 6N 2W 16DDAD.

LOCATION.--Lat 42°54'10", long 84°32'35", Hydrologic Unit 04050005, at U.S. Highway 27, 6 mi south of St. Johns. Owner: Michigan Department of Transportation.

AQUIFER.--Gravel of Pleistocene age.

WELL CHARACTERISTICS.--Driven water-table well, diameter 2 in., depth 26 ft, screened 23 ft to 26 ft.

INSTRUMENTATION.--Monthly measurement.

DATUM.--Elevation of land-surface datum is 803.32 ft above sea level. Measuring point: Top of casing, 0.10 ft below land-surface datum.

REMARKS.--Federal key well. Measuring point changed from 1.30 ft above land-surface datum to 0.10 ft below land-surface datum on Sept. 23, 1980.

PERIOD OF RECORD.--August 1948 to September 1994 (discontinued).

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 13.84 ft below land-surface datum, Apr. 30, 1974; lowest measured, 19.93 ft below land-surface datum, Feb. 27, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 28	15.37	DEC 29	16.19	FEB 28	16.61	APR 26	16.07	JUN 29	16.62	AUG 30	16.76
NOV 29	15.98	JAN 28	16.49	MAR 28	16.22	MAY 31	16.41	AUG 01	16.78		

EATON COUNTY

424058084380301. Local number, 3N 3W 2BA.

LOCATION.--Lat 42°40'58", long 84°38'03", Hydrologic Unit 04050004, on Stiefel Farm grounds, 1.6 mi north of Dimondale. Owner: City of Lansing.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 1.25 in., depth 66 ft, screened 63 ft to 66 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 839 ft above sea level. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

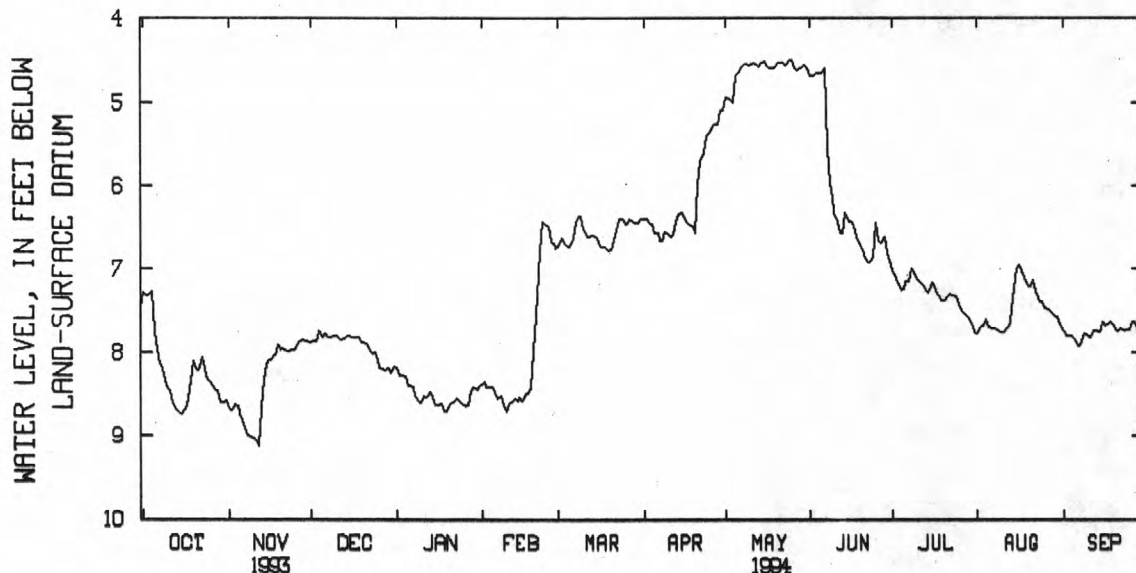
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 2.98 ft below land-surface datum, June 11, 1986; lowest recorded, 18.0 ft below land-surface datum, November 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	7.77	8.73	7.81	8.40	8.41	6.74	6.56	4.68	4.64	7.23	7.70	7.83
10	8.44	9.03	7.79	8.60	8.70	6.51	6.58	4.56	6.33	7.12	7.76	7.80
15	8.73	8.11	7.80	8.63	8.54	6.64	6.33	4.51	6.43	7.16	7.00	7.65
20	8.21	7.96	7.89	8.63	7.98	6.77	6.56	4.52	6.77	7.36	7.22	7.72
25	8.35	7.97	8.09	8.62	6.50	6.46	5.37	4.50	6.45	7.42	7.47	7.72
EOM	8.59	7.89	8.17	8.39	6.75	6.40	5.10	4.60	6.91	7.77	7.66	7.78
WTR YR 1994	HIGHEST 4.34			MAY 11, 20			LOWEST 9.12			NOV 12		



GROUND-WATER LEVELS

EATON COUNTY

424108084363201. Local number, 4N 3W 36DCAD.

LOCATION.--Lat 42°41'08", long 84°36'32", Hydrologic Unit 04050004, at end of Roscommon Street, in Delta Township, in Lansing. Owner: City of Lansing.

AQUIFER.--Saginaw Formation.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 14 in., depth 344 ft, cased to 123 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, 4.0 ft above land-surface datum.

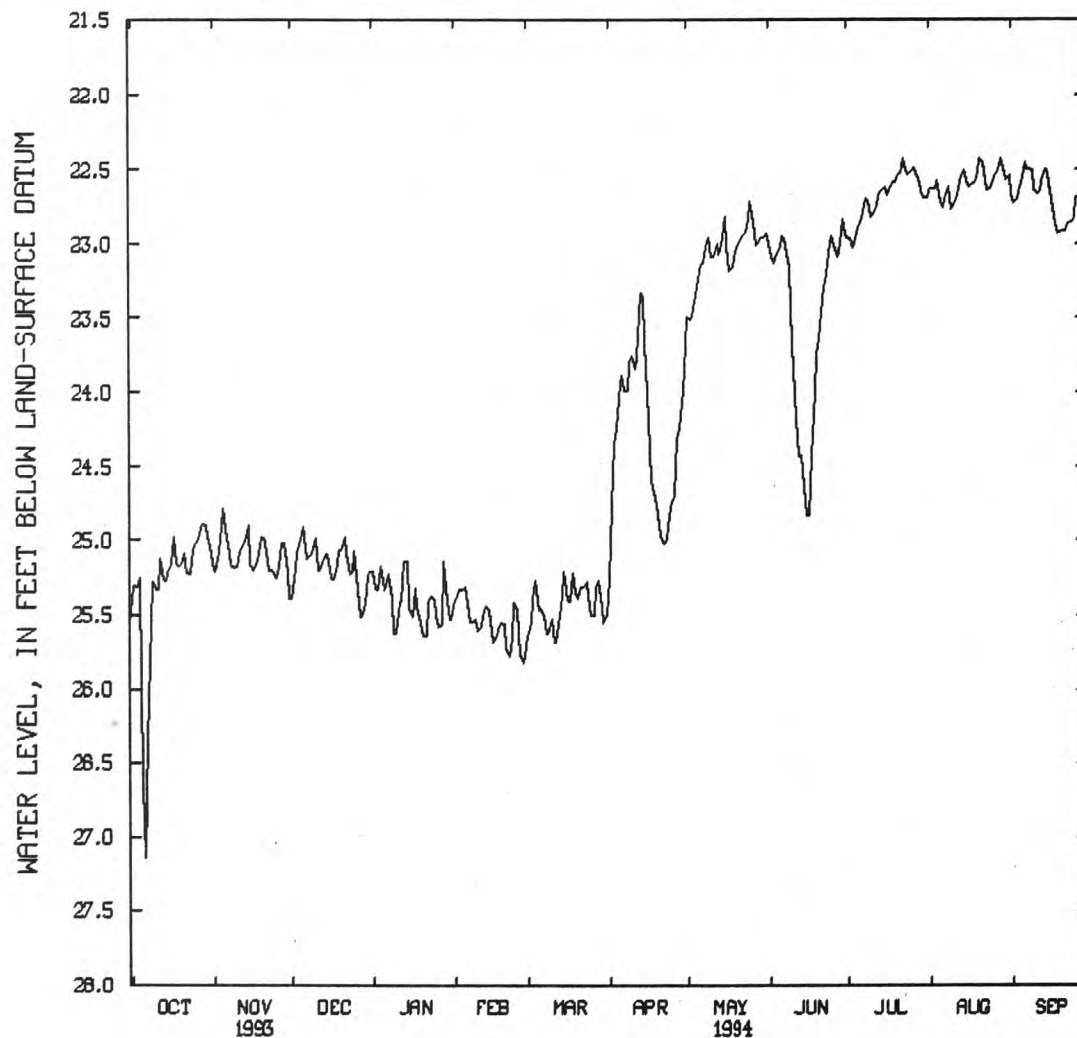
REMARKS.--Water levels affected by regional pumping.

PERIOD OF RECORD.--October 1993 to September 1994.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 22.30 ft below land-surface datum, Aug. 20, 1994; lowest recorded, 27.14 ft below land-surface datum, Oct. 6, 1993.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	26.65	24.78	24.91	25.33	25.31	25.47	23.94	23.23	23.03	22.89	22.71	22.59
10	25.34	25.18	24.98	25.62	25.61	25.53	23.75	23.08	23.68	22.82	22.75	22.64
15	25.22	25.17	25.10	25.45	25.55	25.21	23.67	22.82	24.82	22.61	22.57	22.53
20	25.15	24.98	25.06	25.64	25.57	25.39	24.89	23.02	23.64	22.53	22.42	22.92
25	25.03	25.25	25.07	25.50	25.47	25.50	24.73	22.71	22.94	22.51	22.57	22.82
EOM	25.04	25.39	25.21	25.53	25.77	25.49	23.84	22.93	22.93	22.69	22.54	23.00
WTR YR 1994	HIGHEST			22.30	AUG 20			LOWEST	27.14	OCT 6		



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.

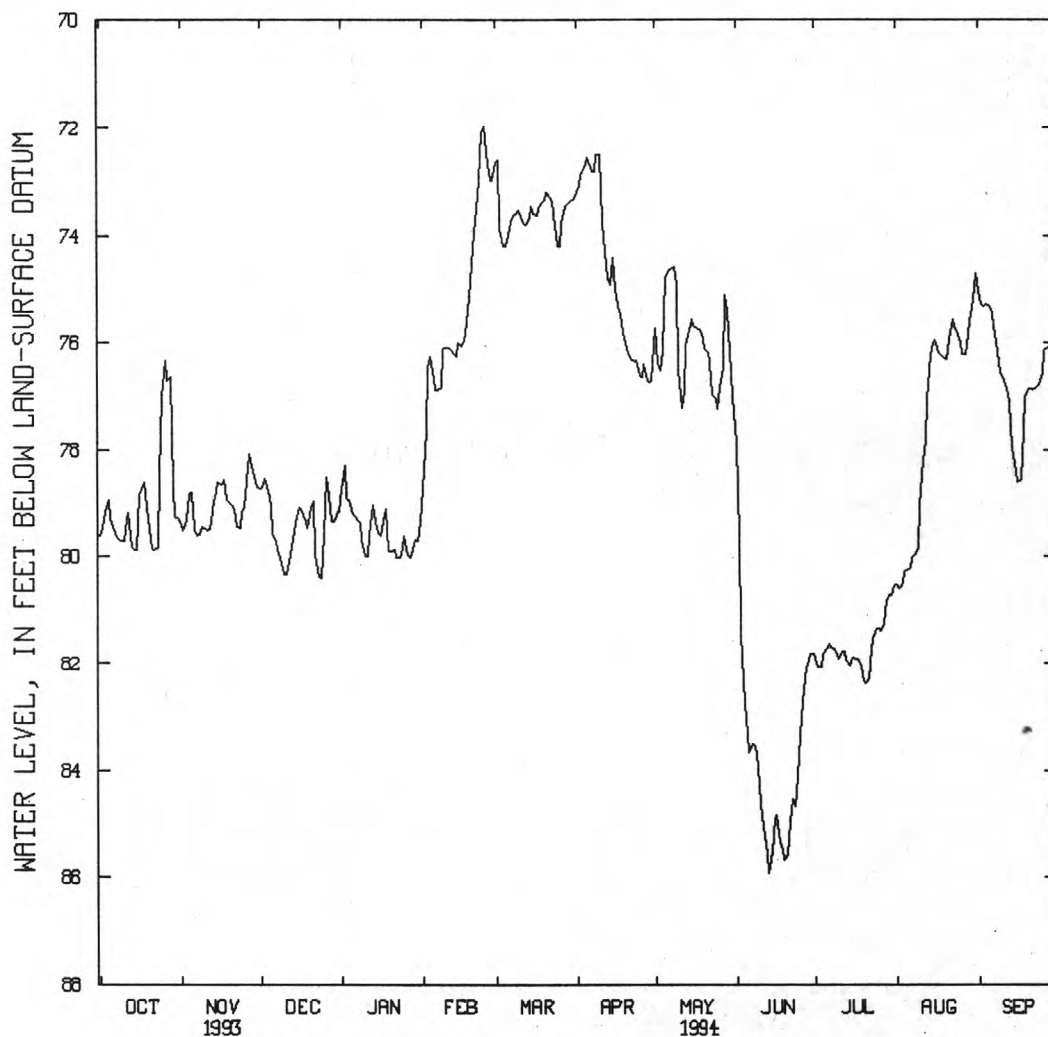
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 63.92 ft below land-surface datum, Feb. 20, 1991; lowest recorded, 103.6 ft below land-surface datum, Aug. 28, 1969.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	79.29	78.80	79.07	79.21	76.67	74.21	72.54	74.77	83.34	81.73	80.28	75.29
10	79.71	79.51	80.32	79.99	76.09	73.52	72.49	76.54	84.62	81.90	79.02	76.63
15	79.87	78.61	79.27	79.56	75.99	73.43	74.41	75.55	84.88	81.88	75.99	78.41
20	79.67	79.03	79.09	79.92	74.54	73.32	76.13	76.12	85.58	82.38	76.30	76.84
25	77.00	79.08	79.59	79.63	71.98	74.20	76.62	77.25	83.33	81.35	75.99	76.55
EOM	79.29	78.70	79.16	79.34	72.97	73.31	76.70	77.02	81.82	80.56	74.71	76.05
WTR YR 1994	HIGHEST			71.68	FEB 25			LOWEST	85.91	JUN 13		



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.

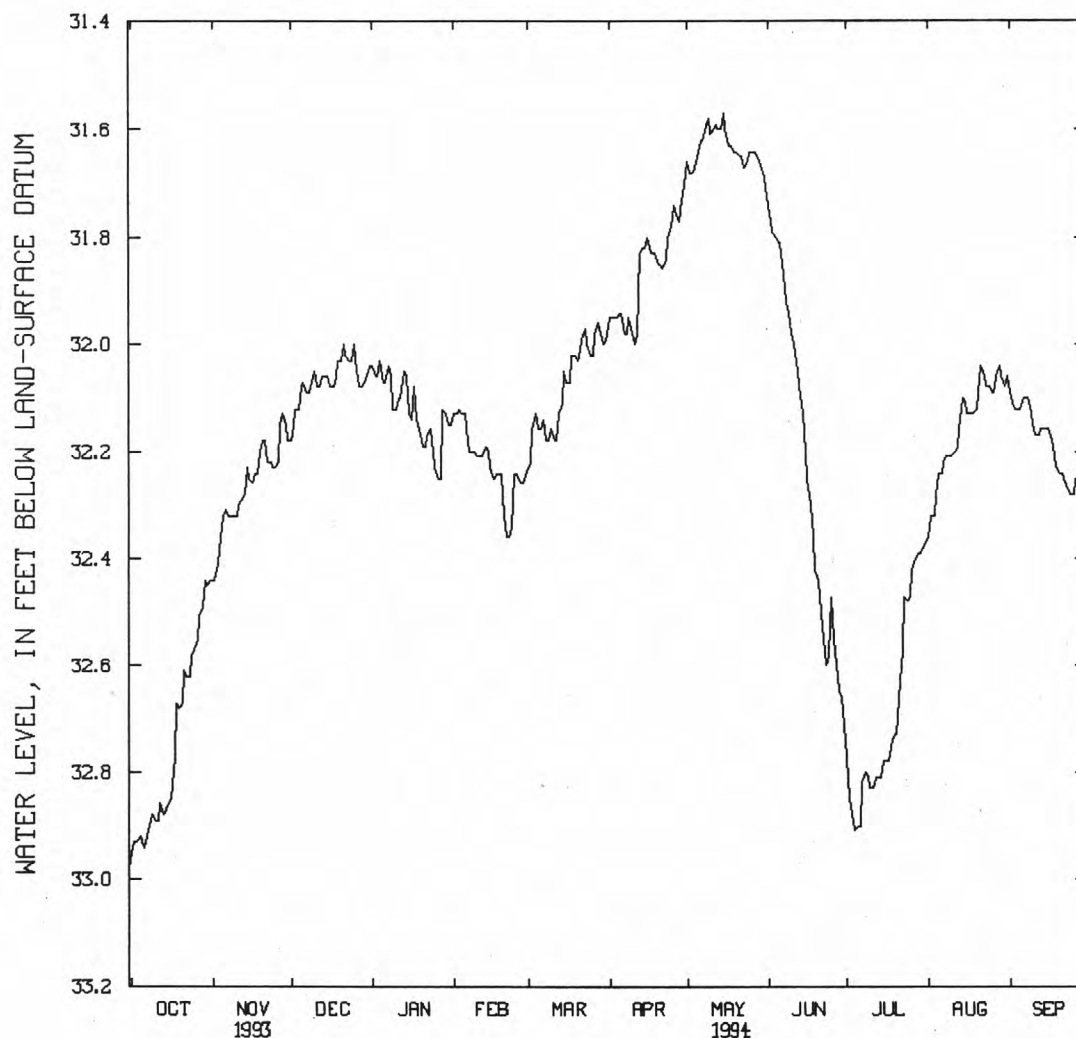
PERIOD OF RECORD.--February 1991 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 30.38 ft below land-surface datum, May 6, 1991; lowest recorded, 34.38 ft below land-surface datum, Sept. 20, 21, 1991.

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 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	32.93	32.32	32.08	32.07	32.13	32.16	31.94	31.65	31.81	32.90	32.24	32.12
10	32.89	32.32	32.05	32.12	32.21	32.16	31.98	31.61	31.98	32.83	32.21	32.15
15	32.86	32.25	32.06	32.13	32.23	32.05	31.82	31.57	32.20	32.78	32.11	32.16
20	32.67	32.18	32.03	32.19	32.32	32.03	31.85	31.64	32.44	32.73	32.09	32.24
25	32.57	32.23	32.00	32.23	32.24	32.02	31.78	31.64	32.47	32.47	32.09	32.28
EOM	32.44	32.18	32.04	32.15	32.25	31.99	31.72	31.69	32.74	32.37	32.06	32.26
WTR YR 1994	HIGHEST			31.52	MAY 11			LOWEST	32.95	OCT 1		



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.

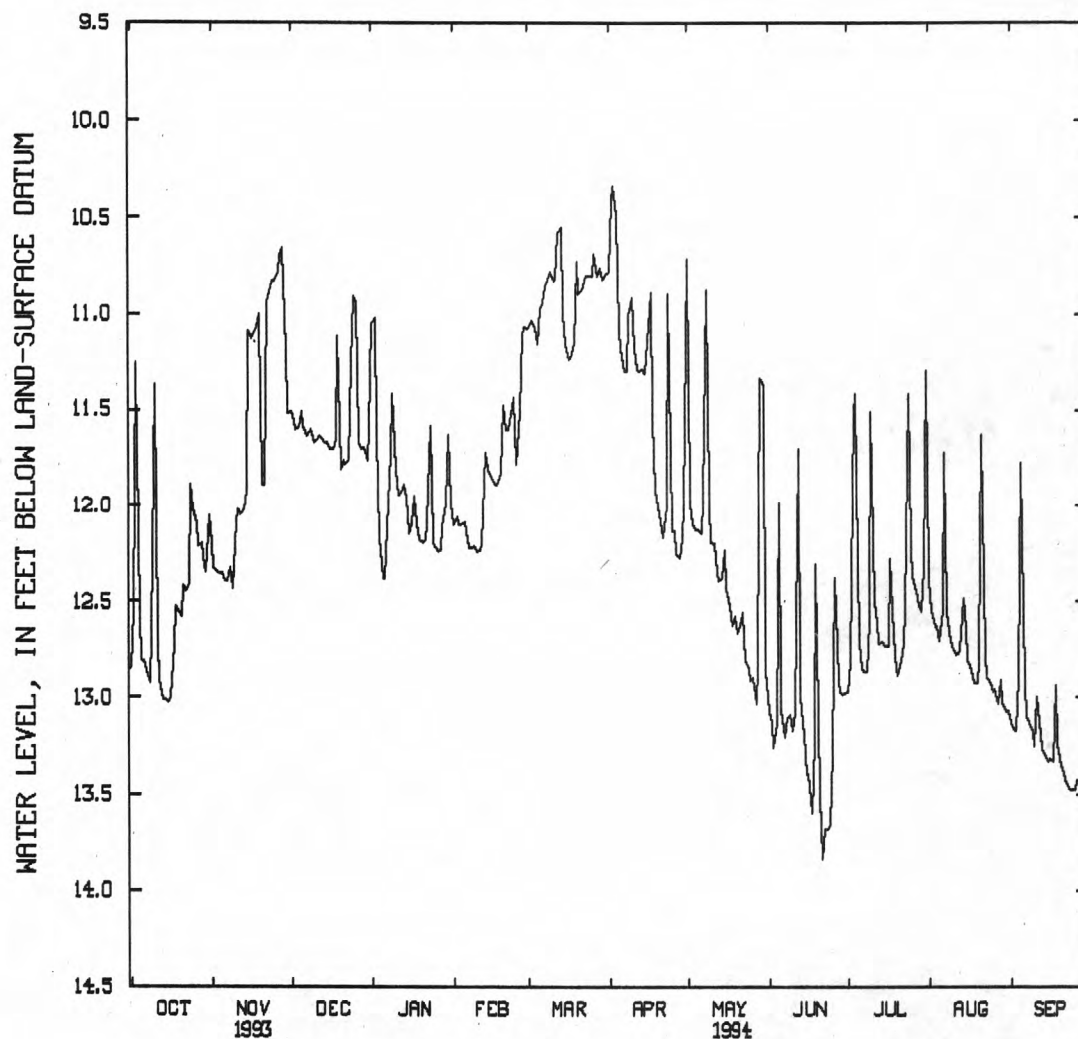
DATUM.--Elevation of land-surface datum is 795 ft above sea level, from topographic map. Measuring point: Top of casing, 2.81 ft above land-surface datum.

PERIOD OF RECORD.--December 1988 to September 1989, December 1992 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 9.67 ft below land-surface datum, Apr. 25, 1993; lowest recorded, 16.38 ft below land-surface datum, July 26, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	12.80	12.35	11.51	12.38	12.08	11.16	11.09	12.12	11.98	12.72	12.70	11.78
10	11.37	12.08	11.67	11.82	12.24	10.78	10.92	12.19	13.17	11.51	12.73	13.25
15	13.02	11.09	11.67	12.15	11.83	11.00	11.31	12.23	13.40	12.73	12.65	13.33
20	12.58	11.89	11.81	12.19	11.48	10.73	12.04	12.66	13.51	12.88	12.81	13.35
25	12.02	10.83	10.91	12.21	11.79	10.81	12.13	12.91	13.28	12.22	12.97	13.48
EOM	12.05	11.52	11.60	11.98	11.07	10.80	12.00	12.86	12.97	11.30	13.07	13.46
WTR YR 1994	HIGHEST 10.30			APR 2			LOWEST 13.84			JUN 21		



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.

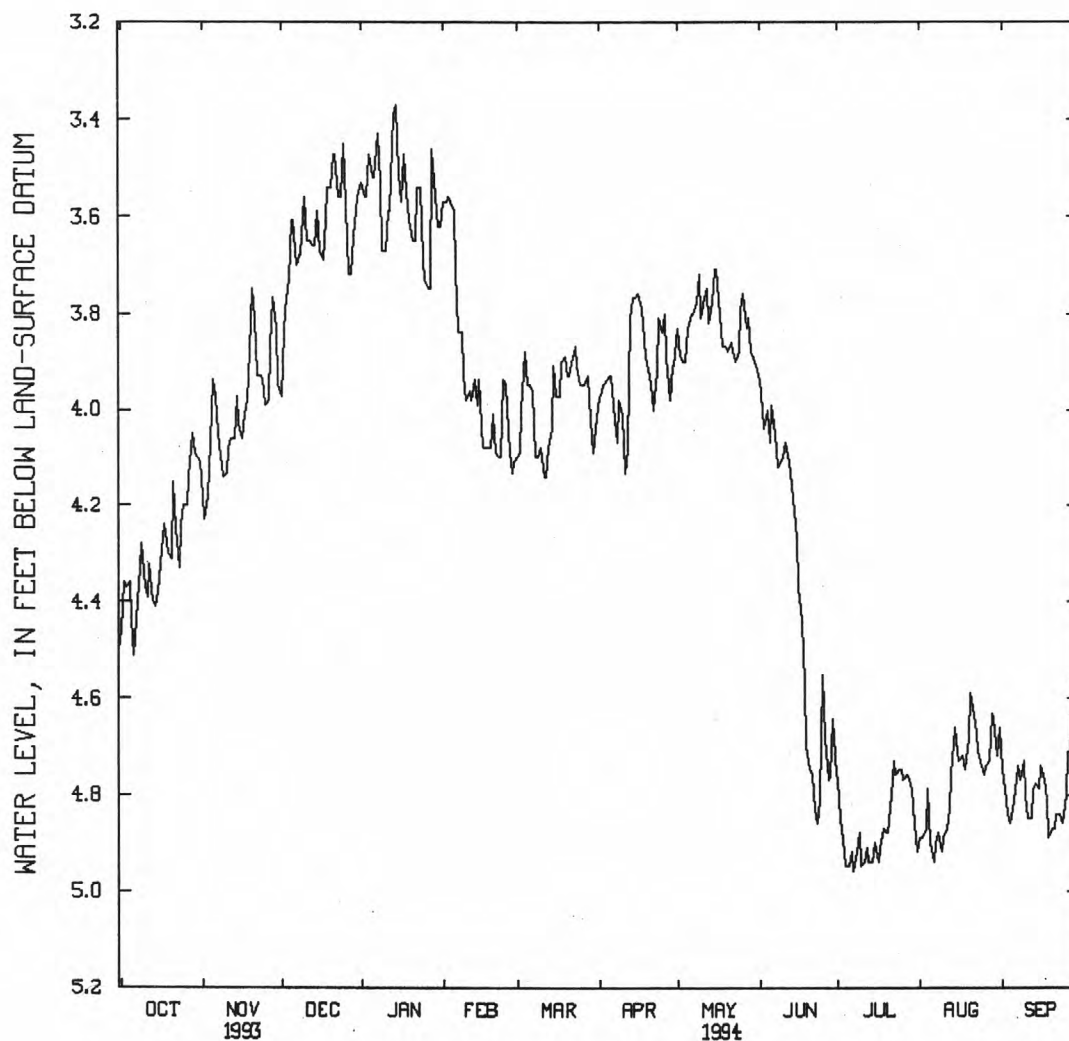
PERIOD OF RECORD.--February 1991 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 3.12 ft below land-surface datum, Apr. 20, 1993; lowest recorded, 6.03 ft below land-surface datum, Sept. 30, 1991.

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 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	4.44	3.94	3.61	3.52	3.59	3.95	3.93	3.83	4.07	4.95	4.90	4.83
10	4.37	4.13	3.56	3.67	3.98	4.08	4.01	3.81	4.10	4.95	4.89	4.80
15	4.38	4.03	3.59	3.51	3.94	3.91	3.77	3.71	4.27	4.90	4.71	4.79
20	4.31	3.75	3.54	3.65	4.01	3.93	3.93	3.88	4.75	4.88	4.59	4.87
25	4.20	3.99	3.45	3.73	3.95	3.95	3.84	3.79	4.55	4.75	4.76	4.80
EOM	4.11	3.95	3.55	3.62	4.11	4.04	3.91	3.91	4.76	4.92	4.66	4.69
WTR YR 1994	HIGHEST			3.26	JAN 28			LOWEST	4.96	JUL 7		



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, Lower

WELL CHARACTERISTICS.--Rotary drilled observation well, diameter 4 in., depth 200 ft, cased to 178 ft.

INSTRUMENTATION.--Water-level recorder.

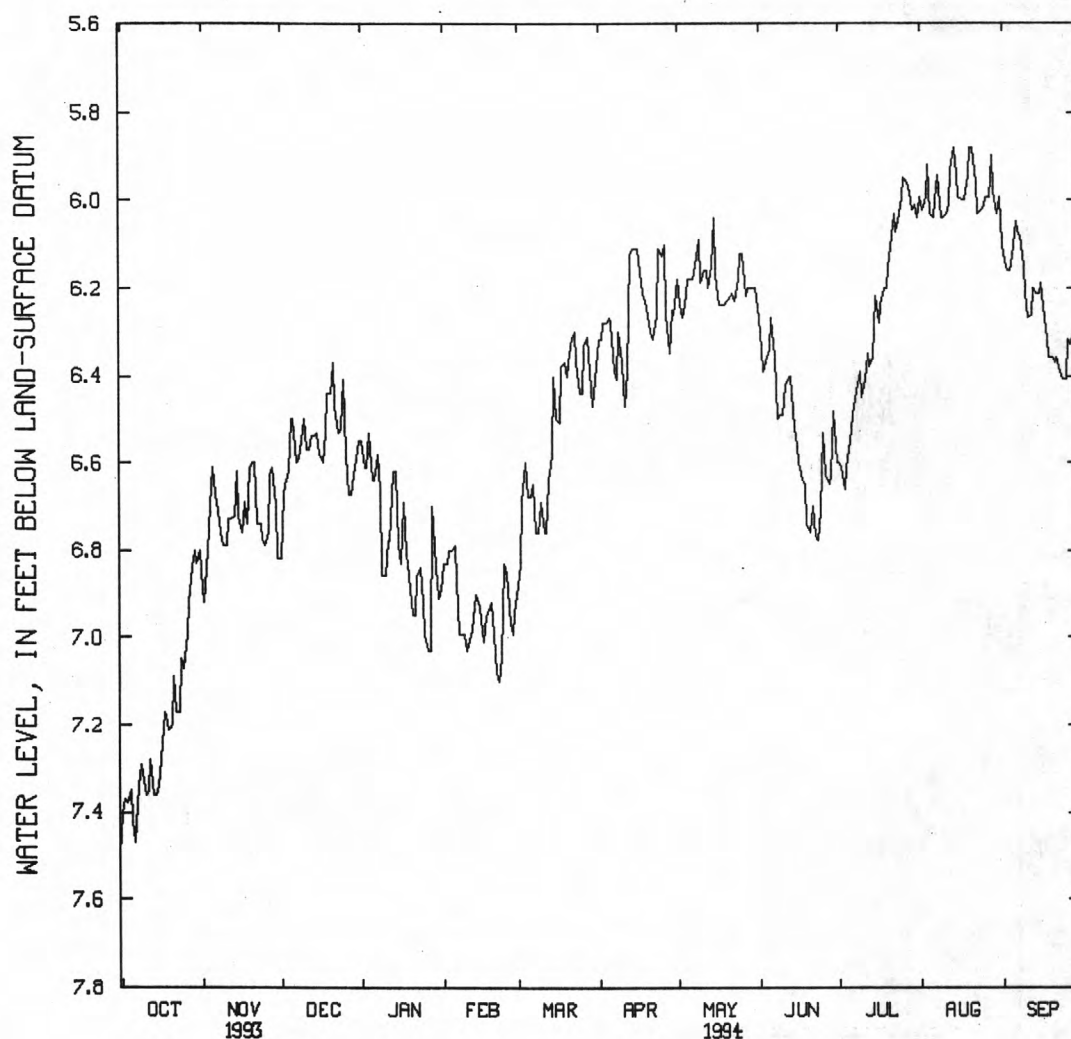
DATUM.--Elevation of land-surface datum is 600 ft above sea level, from topographic map. Measuring Point: Top of casing, 4.03 ft above land-surface datum.

PERIOD OF RECORD.--October 1988 to August 1989, December 1992 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 5.63 ft below land-surface datum, Jan. 31, 1993; lowest recorded, 8.62 ft below land-surface datum, Aug. 16, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	7.42	6.61	6.50	6.64	6.79	6.68	6.27	6.18	6.34	6.55	6.03	6.13
10	7.36	6.79	6.50	6.86	7.03	6.69	6.37	6.19	6.49	6.45	6.04	6.21
15	7.34	6.72	6.53	6.79	6.93	6.40	6.11	6.04	6.56	6.22	5.94	6.21
20	7.20	6.60	6.44	6.95	6.99	6.40	6.28	6.23	6.76	6.15	5.88	6.36
25	7.07	6.79	6.41	6.99	6.85	6.44	6.13	6.12	6.53	5.99	6.01	6.41
EOM	6.80	6.82	6.55	6.89	6.94	6.41	6.26	6.20	6.60	6.04	5.99	6.49
WTR YR 1994	HIGHEST			5.79	AUG 20			LOWEST	7.47	OCT 6		



GROUND-WATER LEVELS

INGHAM COUNTY

423127084321901. Local number, 4N 2W 16DAAA.

LOCATION.--Lat 42°31'27", long 84°32'19", Hydrologic Unit 04050004, between Cedar Street and Museum Drive, in 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.

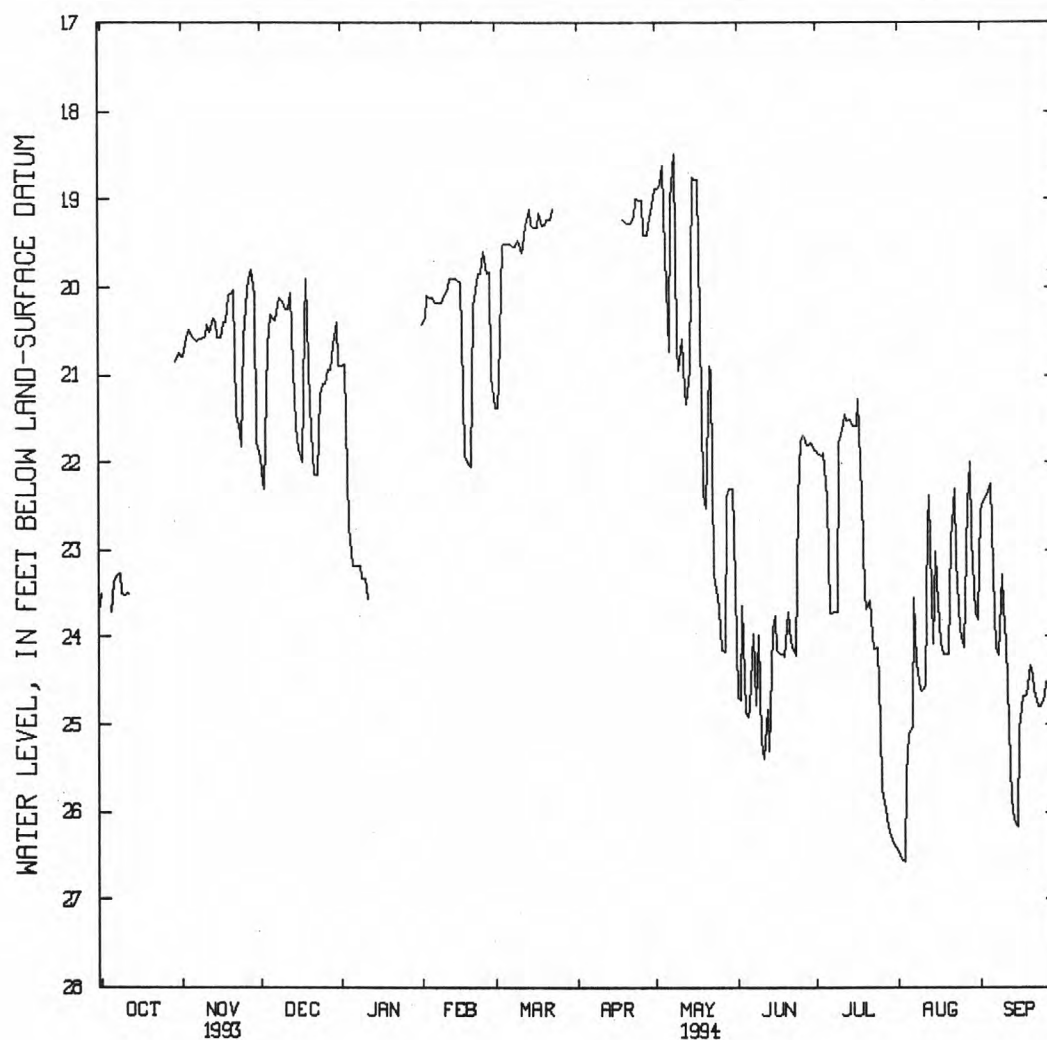
REMARKS.--Water levels affected by regional pumping.

PERIOD OF RECORD.--September 1945 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 18.26 ft below land-surface datum, May 9, 1994; lowest recorded, 67.0 ft below land-surface datum, August 1949.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	23.71	20.55	20.30	23.19	20.12	19.49	---	19.63	24.91	22.43	25.10	22.24
10	23.52	20.56	20.16	23.32	20.09	19.46	---	20.95	25.20	21.78	24.63	23.67
15	---	20.58	21.58	---	19.91	19.29	---	18.74	23.76	21.58	23.02	26.16
20	---	20.07	21.35	---	22.05	19.29	19.27	22.51	23.70	23.69	24.19	24.34
25	---	20.60	21.10	---	19.59	---	19.02	23.67	21.75	25.00	24.07	24.68
EOM	20.75	21.78	20.90	---	21.00	---	19.15	22.81	21.88	26.40	23.79	24.66
WTR YR 1994	HIGHEST			18.26	MAY 9			LOWEST	26.56	AUG 3		



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, in 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.

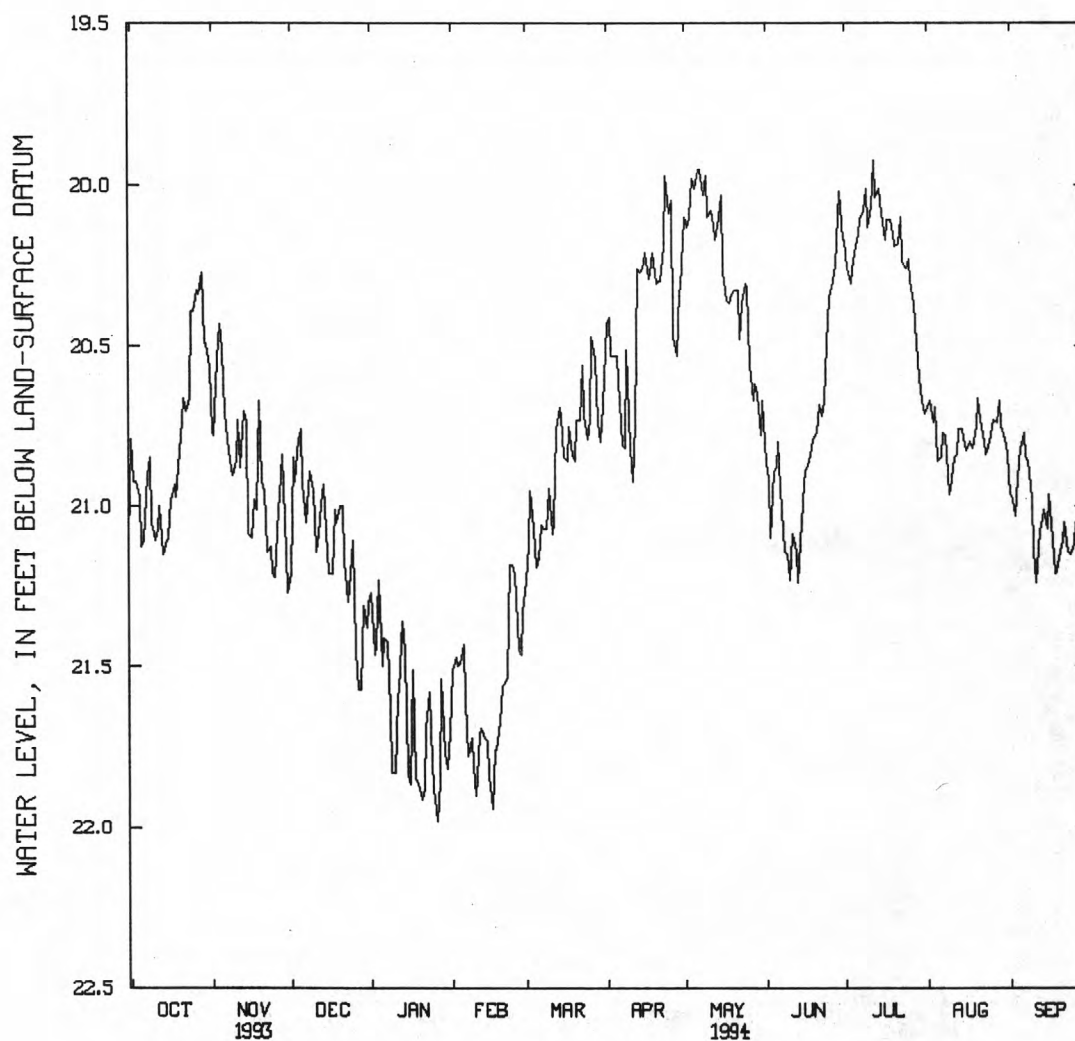
REMARKS.--Water levels affected by regional pumping.

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 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	21.13	20.51	20.76	21.50	21.43	21.19	20.53	20.01	20.88	20.19	20.86	20.82
10	21.11	20.86	20.95	21.83	21.90	20.94	20.82	20.10	21.23	20.13	20.94	21.14
15	21.10	21.09	21.08	21.84	21.84	20.72	20.26	20.03	20.92	20.09	20.81	21.07
20	20.73	20.92	21.00	21.91	21.56	20.86	20.31	20.33	20.77	20.19	20.66	21.14
25	20.39	21.22	21.11	21.88	21.21	20.79	20.09	20.32	20.35	20.23	20.75	21.12
EOM	20.57	21.27	21.30	21.70	21.33	20.68	20.32	20.67	20.17	20.71	20.84	21.35
WTR YR 1994	HIGHEST			19.72	MAY 11			LOWEST	21.98	JAN 26		



GROUND-WATER LEVELS

INGHAM COUNTY

424040084351401. Local number, 3N 2W 6ACAD1.

LOCATION.--Lat 42°40'40", long 84°35'14", Hydrologic Unit 04050004 at Pleasant Grove Road, in Delhi Township, in Lansing. Owner: City of Lansing.

AQUIFER.--Saginaw Formation of Pennsylvanian age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 4 in.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 870 ft above sea level, from topographic map. Measuring point: Plywood shelter base, 2.4 ft above land-surface datum.

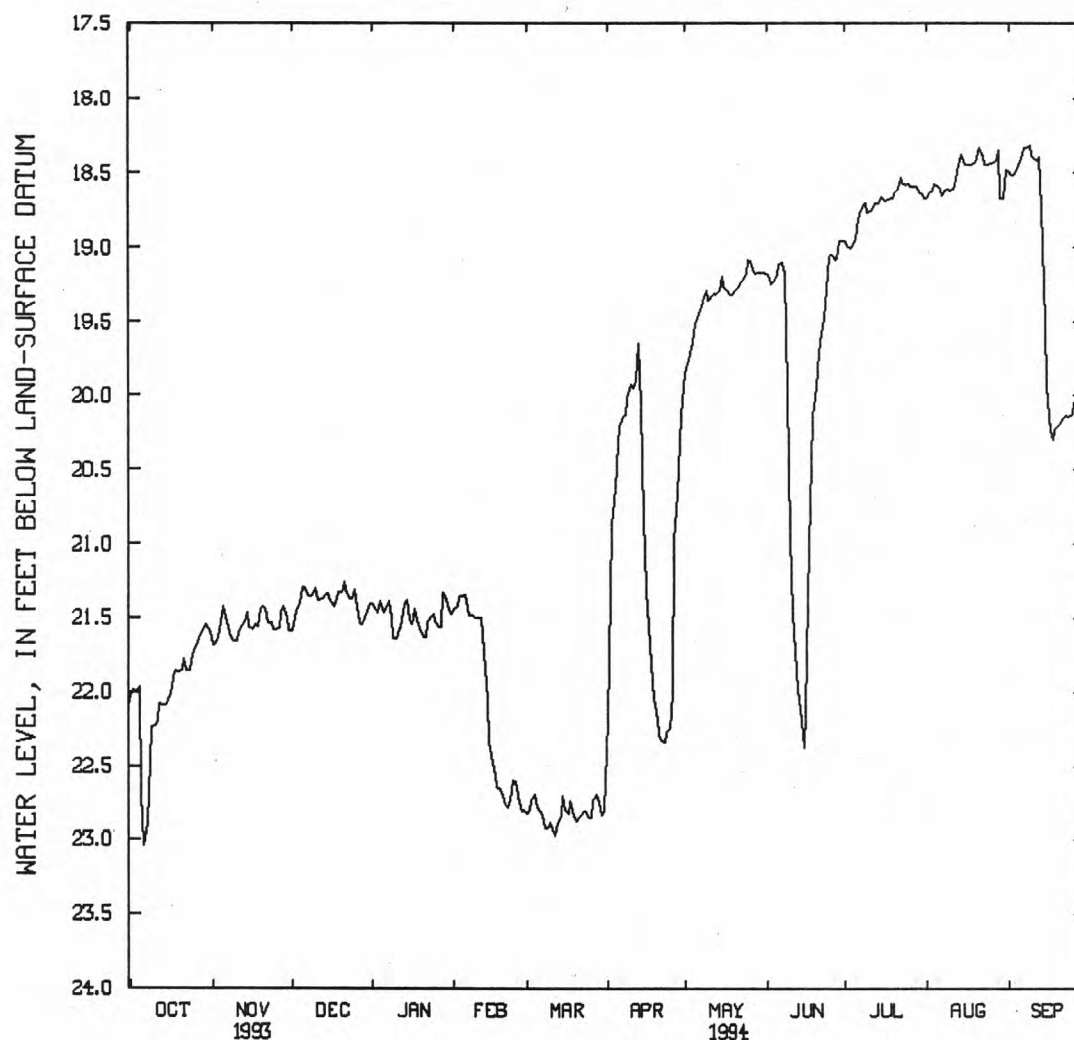
REMARKS.--Water levels affected by nearby pumping.

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

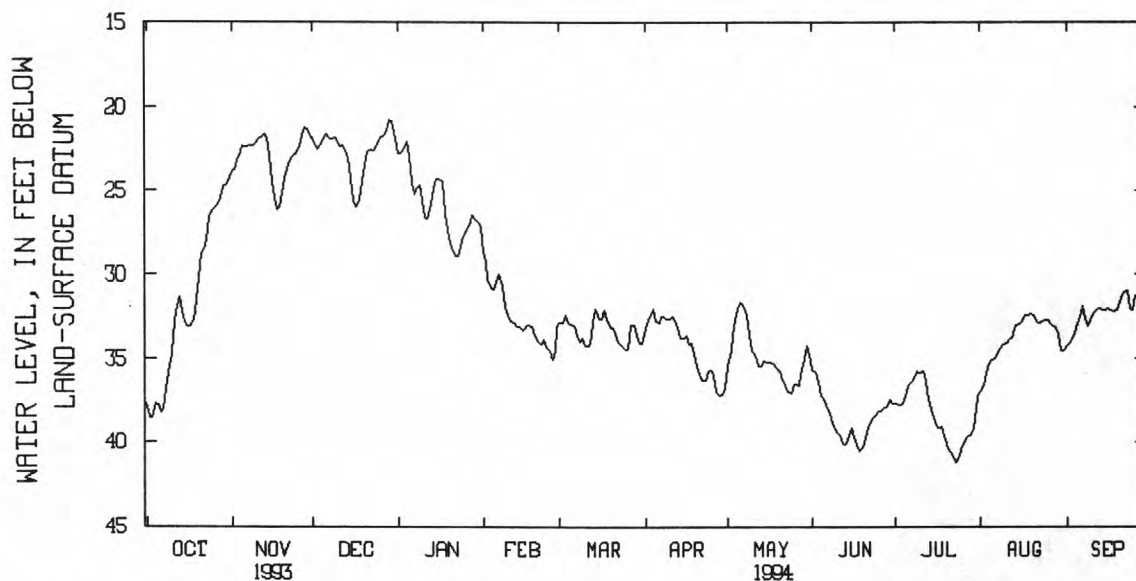
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 18.26 ft below land-surface datum, Aug. 20, 1994; lowest recorded, 27.52 ft below land surface datum, Dec. 27, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	22.68	21.42	21.29	21.46	21.35	22.78	20.33	19.52	19.18	18.93	18.58	18.44
10	22.23	21.65	21.30	21.64	21.51	22.89	19.92	19.36	20.95	18.76	18.61	18.38
15	22.06	21.56	21.34	21.52	22.34	22.71	20.83	19.20	22.38	18.66	18.41	19.52
20	21.86	21.42	21.32	21.63	22.71	22.88	22.18	19.29	19.94	18.64	18.39	20.20
25	21.72	21.58	21.31	21.53	22.61	22.85	22.25	19.08	19.06	18.57	18.43	20.12
EOM	21.60	21.59	21.41	21.47	22.80	22.80	20.13	19.17	18.95	18.67	18.48	20.16
WTR YR 1994	HIGHEST			18.26	AUG 20			LOWEST	23.05	OCT 6		



DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	37.78	22.32	21.87	23.06	30.86	32.96	32.81	32.00	37.36	36.97	35.13	32.92
10	34.79	22.21	22.16	25.58	32.40	34.20	32.65	34.55	39.33	35.87	34.09	32.53
15	32.84	22.91	24.31	24.31	33.17	32.57	33.80	35.28	39.09	38.79	32.94	32.06
20	30.22	25.17	23.46	28.17	33.67	33.22	35.45	35.77	39.70	40.36	32.47	31.82
25	26.18	22.89	22.03	27.73	34.57	34.46	35.67	36.53	38.16	40.25	32.69	32.11
EOM	24.20	21.79	21.93	27.23	33.14	34.04	36.77	34.75	37.66	37.24	34.57	31.53
WTR YR 1994		HIGHEST	20.24	DEC 29			LOWEST	41.20	JUL 23			



424312084321801. Local number, 4N 2W 22BC.
LOCATION.--Lat 42°43'12", long 84°32'18", Hydrologic Unit 04050004, at Pennsylvania Avenue, in Lansing. Owner: City of Lansing.
AQUIFER.--Saginaw Formation.
WELL CHARACTERISTICS.--Drilled artesian well, diameter 12 in., depth 338 ft, cased to 60 ft.
INSTRUMENTATION.--Periodic measurement.
DATUM.--Elevation of land-surface datum is 823.64 ft above sea level. Measuring point: Top of flange, 4.0 ft above land-surface datum.
REMARKS.--Water levels affected by nearby pumping.
PERIOD OF RECORD.--October 1930 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 7.1 ft below land-surface datum, July 1932; lowest measured, 80.49 ft below land-surface datum, Feb. 24, 1970.

[illegible]

GROUND-WATER LEVELS

INGHAM COUNTY

424324084331802. Local number, 4N 2W 21BADB.

LOCATION.--Lat 42°43'24", long 84°33'18", Hydrologic Unit 04050004, near Townsend and West Elm Streets, in Lansing.

AQUIFER.--Saginaw Formation.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 4 in., depth 400 ft, cased to 42 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 835 ft above sea level, from topographic map. Measuring point; top of flange, 7.0 ft above land-surface datum.

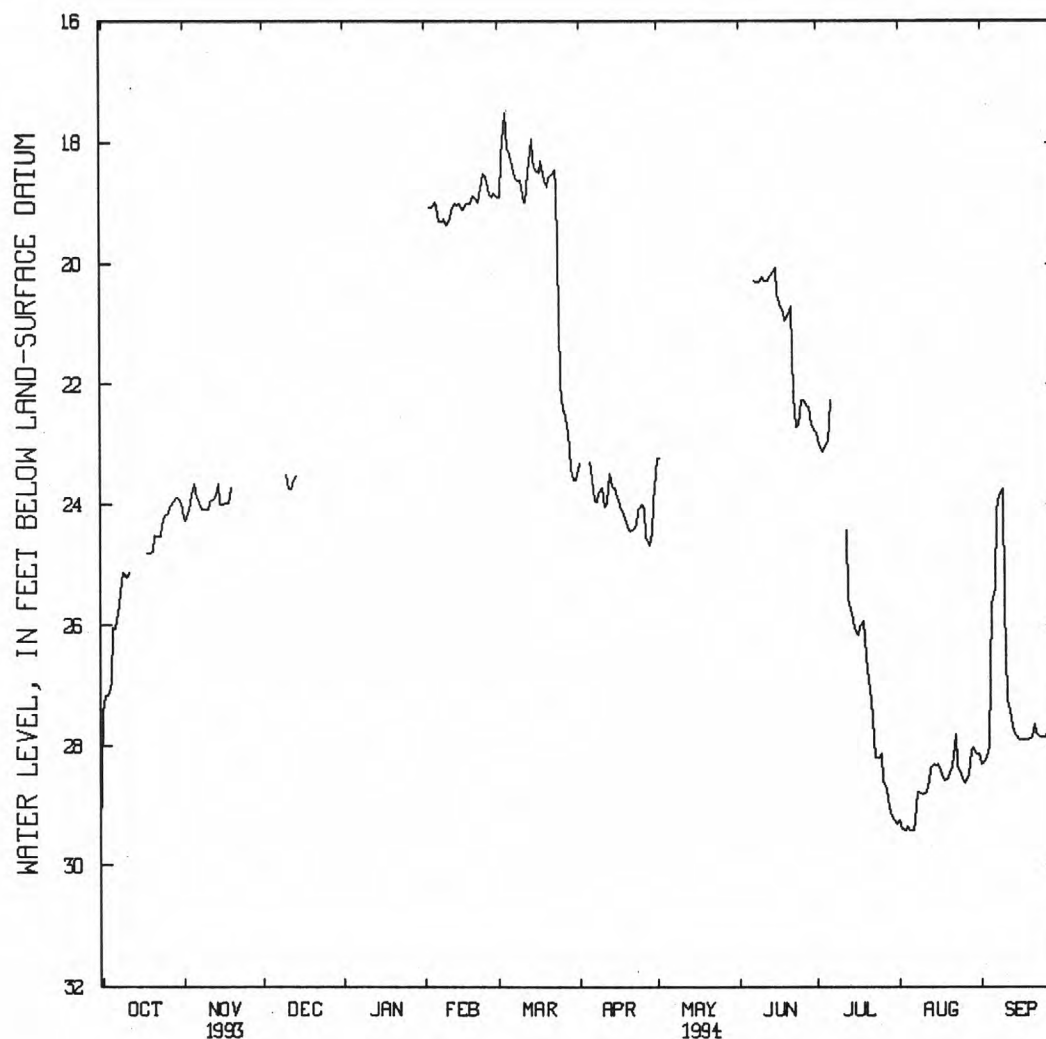
REMARKS.--Water levels affected by regional pumping.

PERIOD OF RECORD.--February 1979 to April 1988, October 1993 to September 1994.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 17.30 ft below land-surface datum, Mar. 4, 1994; lowest recorded, 58.77 ft, below land-surface datum, June 28, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	26.05	23.67	---	---	18.98	18.08	23.29	---	---	22.95	29.41	25.65
10	25.20	24.09	23.51	---	19.38	18.61	23.71	---	20.21	21.96	28.80	25.66
15	---	23.99	---	---	19.01	18.30	23.71	---	20.08	26.08	28.31	27.91
20	24.78	---	---	---	18.87	18.71	24.41	---	20.83	26.74	28.42	27.84
25	24.18	---	---	---	18.57	22.00	24.00	---	22.27	28.14	28.60	27.84
EOM	23.98	---	---	---	18.82	23.57	23.95	---	22.78	29.31	28.14	28.16
WTR YR 1994	HIGHEST		17.30	MAR 4		LOWEST		29.41	AUG 3, 5, 6			



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 measurement prior to August 1960.

DATUM.--Elevation of land-surface datum is 858.72 ft above sea level. Measuring point: Plywood shelter base at land-surface datum.

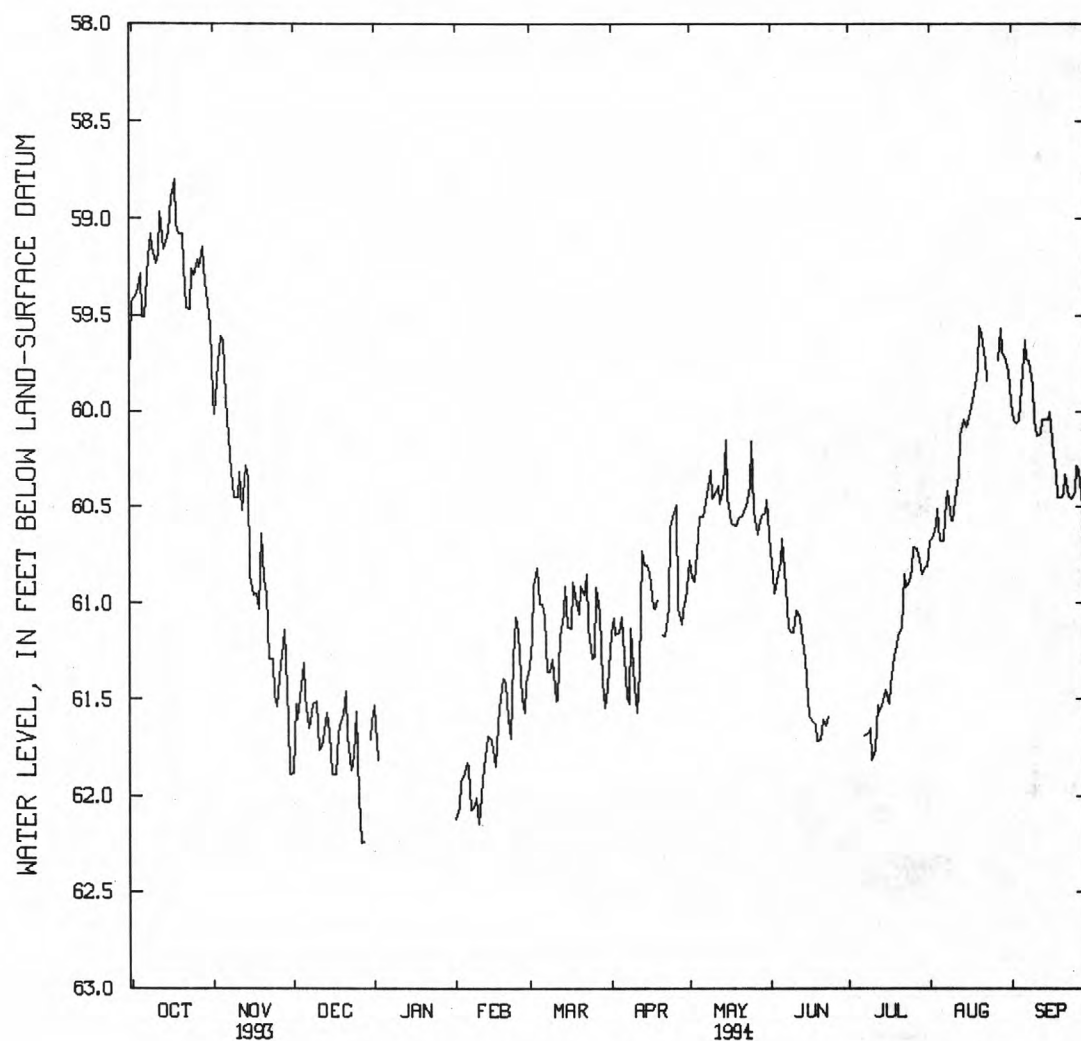
REMARKS.--Water levels affected by regional pumping.

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 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	59.51	59.63	61.31	---	61.83	61.01	61.07	60.55	60.79	---	60.68	59.88
10	59.23	60.45	61.51	---	62.15	61.29	61.43	60.46	61.15	61.82	60.57	60.04
15	59.07	60.86	61.68	---	61.72	60.91	60.80	60.15	61.49	61.45	60.08	60.04
20	59.08	60.88	61.58	---	61.41	61.06	---	60.56	61.71	61.16	59.56	60.45
25	59.29	61.54	61.56	---	61.15	61.29	60.53	60.16	---	60.83	---	60.43
EOM	59.56	61.89	61.61	---	61.41	61.44	60.99	60.47	---	60.81	59.80	60.84
WTR YR 1994	HIGHEST		58.41	OCT 17		LOWEST		62.69	JAN (day unknown)			



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, in 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.

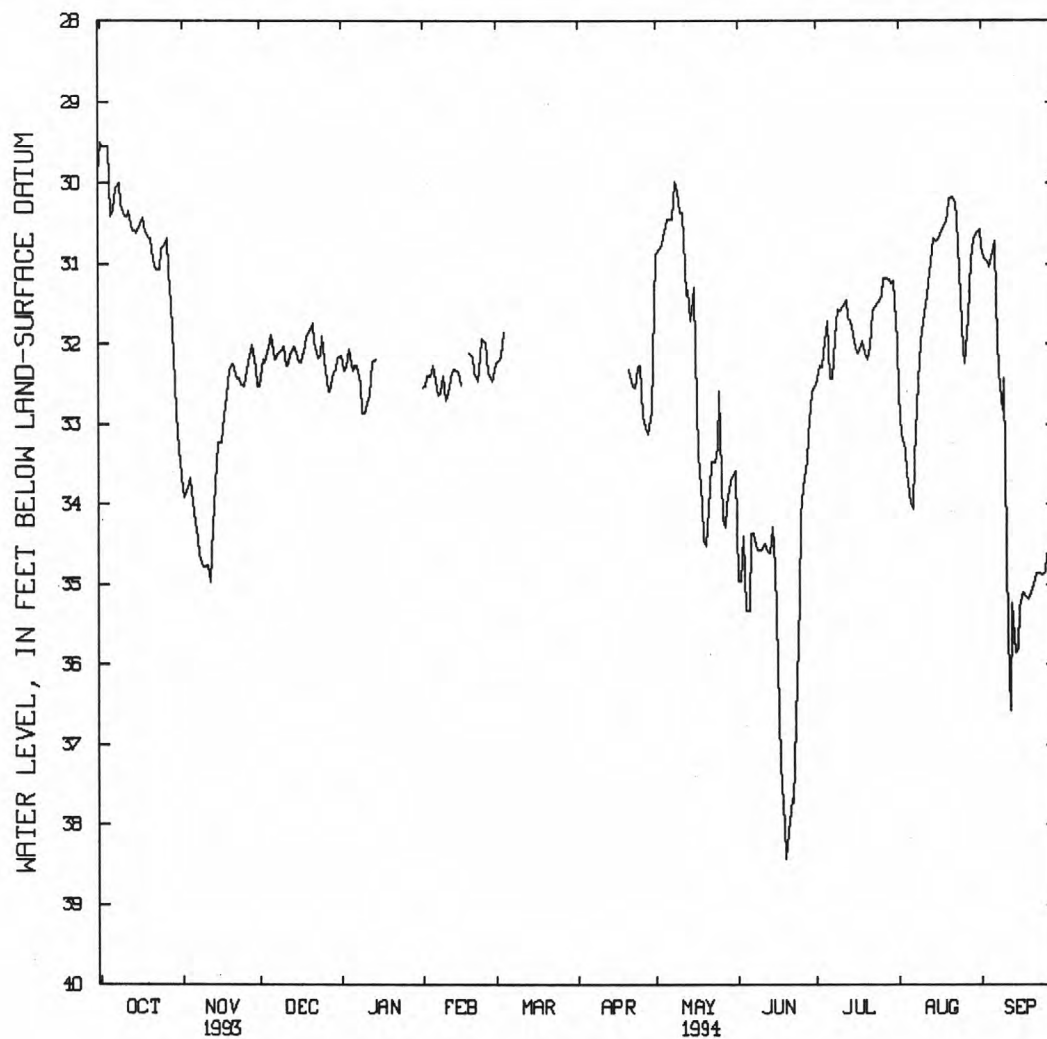
REMARKS.--Water levels affected by regional pumping.

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 1993 TO SEPTEMBER 1994

DAY	LOWEST VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	30.42	33.86	31.88	32.34	32.28	---	---	30.45	35.34	31.70	33.98	30.93
10	30.41	34.79	32.03	32.87	32.70	---	---	30.38	34.56	31.59	31.85	32.44
15	30.62	33.23	32.06	---	32.35	---	---	31.29	34.79	31.97	30.73	35.80
20	30.68	32.26	31.85	---	32.16	---	---	34.54	38.10	32.19	30.19	35.10
25	30.78	32.53	31.91	---	31.99	---	32.28	32.59	34.13	31.40	32.07	34.84
EOM	33.32	32.53	32.18	---	32.40	---	32.19	33.58	32.53	31.99	30.56	34.23
WTR YR 1994	HIGHEST 29.14			OCT 4			LOWEST 38.43		JUN 19			



GROUND-WATER LEVELS

INGHAM COUNTY

424521084342101. Local number, 4N 2W 5CDD1.

LOCATION.--Lat 42°45'21", long 84°34'21", Hydrologic Unit 04050004, at Muskegon Street, in Lansing Township, in Lansing. Owner: City of Lansing.

AQUIFER.--Saginaw Formation of Pennsylvanian Age.

WELL CHARACTERISTICS.--Drilled well, diameter 12 in., depth 418 ft, cased to 63 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 840 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

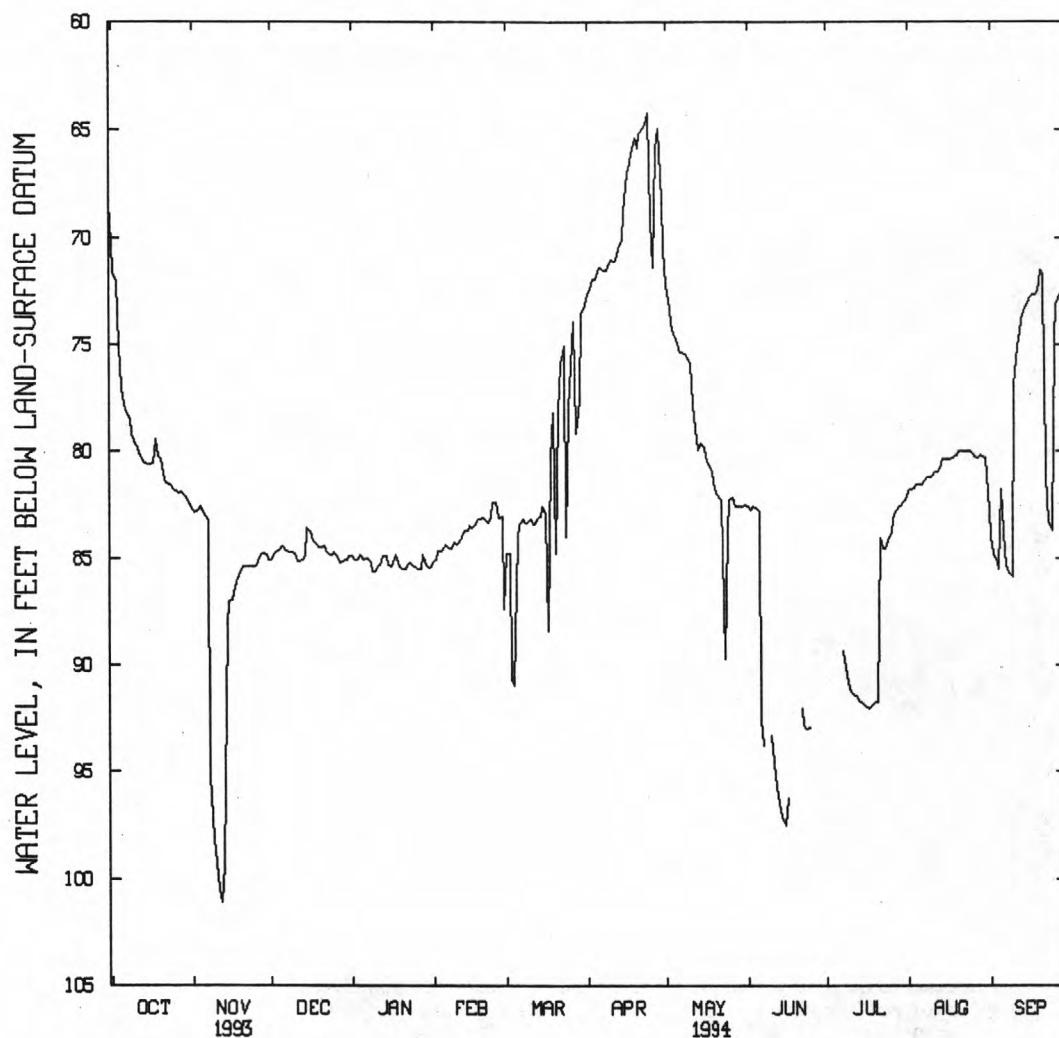
REMARKS.--Water levels affected by nearby pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 53.80 ft below land-surface datum, Jan. 13, 1991; lowest recorded, 101.94 ft below land-surface datum, June 29, 1991.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	77.05	82.71	84.44	85.10	84.52	84.04	71.40	74.89	82.81	---	81.57	81.75
10	79.70	99.28	84.78	85.57	84.34	83.14	71.01	75.91	93.34	91.26	81.16	76.84
15	80.62	87.02	83.59	85.33	83.47	82.58	68.74	79.81	97.51	91.90	80.38	73.12
20	80.39	85.36	84.47	85.50	83.11	84.79	65.83	81.96	---	91.80	79.97	71.58
25	81.76	85.38	84.72	85.40	82.38	78.01	69.20	82.30	---	83.77	80.04	74.69
EOM	82.42	85.10	84.94	85.48	87.38	73.13	70.59	82.47	---	82.16	82.75	83.89
WTR YR 1994	HIGHEST			63.73	APR 25			LOWEST	101.12	NOV 12		



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, in 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.

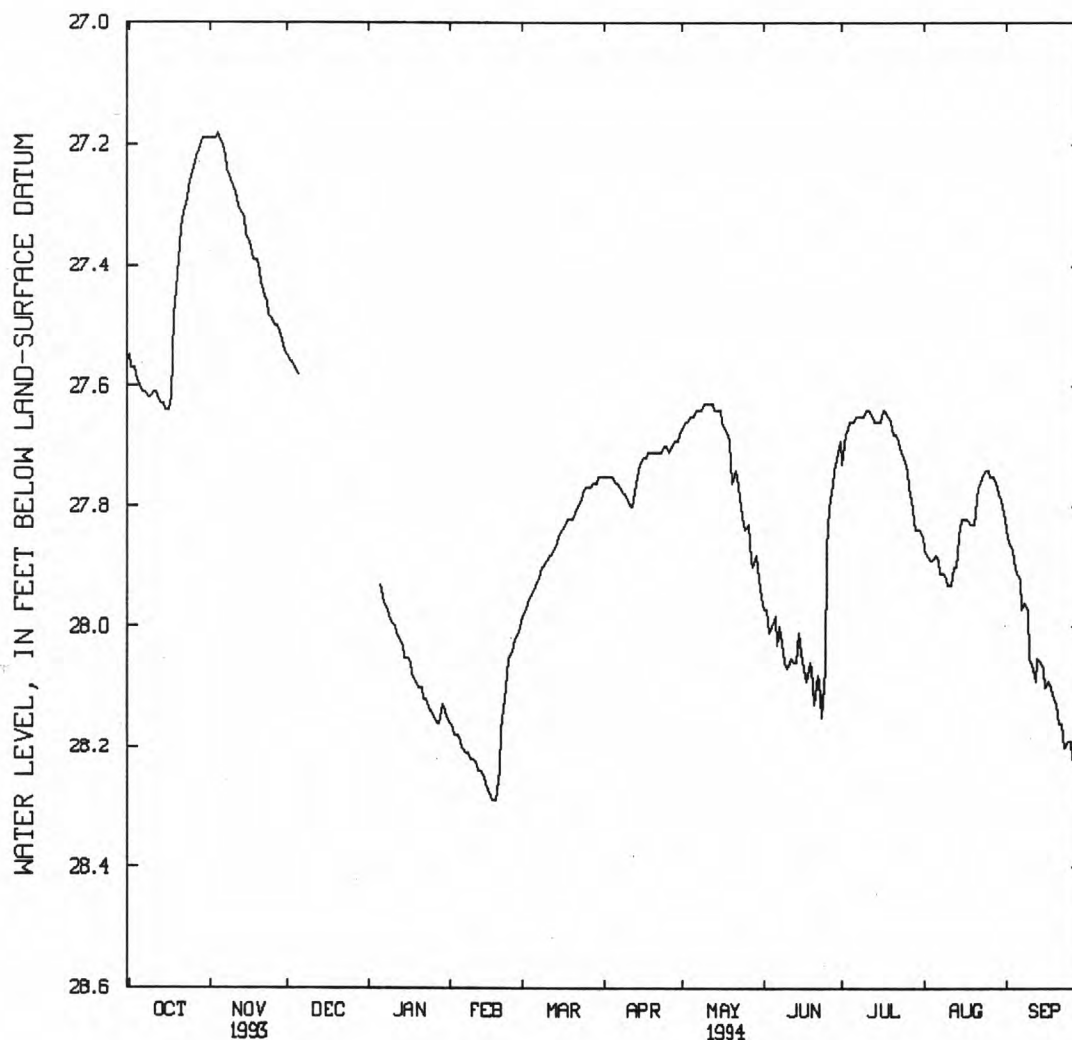
REMARKS.--Water levels affected by pumping.

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, 28.71 ft below land-surface datum, Oct. 13, 14, 1992.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	27.60	27.19	27.58	27.93	28.19	27.94	27.76	27.65	27.98	27.66	27.88	27.91
10	27.61	27.27	---	27.99	28.22	27.89	27.79	27.63	28.07	27.64	27.93	28.05
15	27.64	27.35	---	28.05	28.26	27.85	27.73	27.64	28.04	27.66	27.82	28.07
20	27.39	27.41	---	28.10	28.24	27.82	27.71	27.76	28.13	27.68	27.83	28.13
25	27.25	27.49	---	28.14	28.04	27.77	27.70	27.84	27.87	27.74	27.74	28.19
EOM	27.19	27.54	---	28.15	28.00	27.75	27.68	27.95	27.69	27.85	27.82	28.24
WTR YR 1994	HIGHEST			27.18	NOV 3-5		LOWEST		28.29	FEB 17-19		



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.

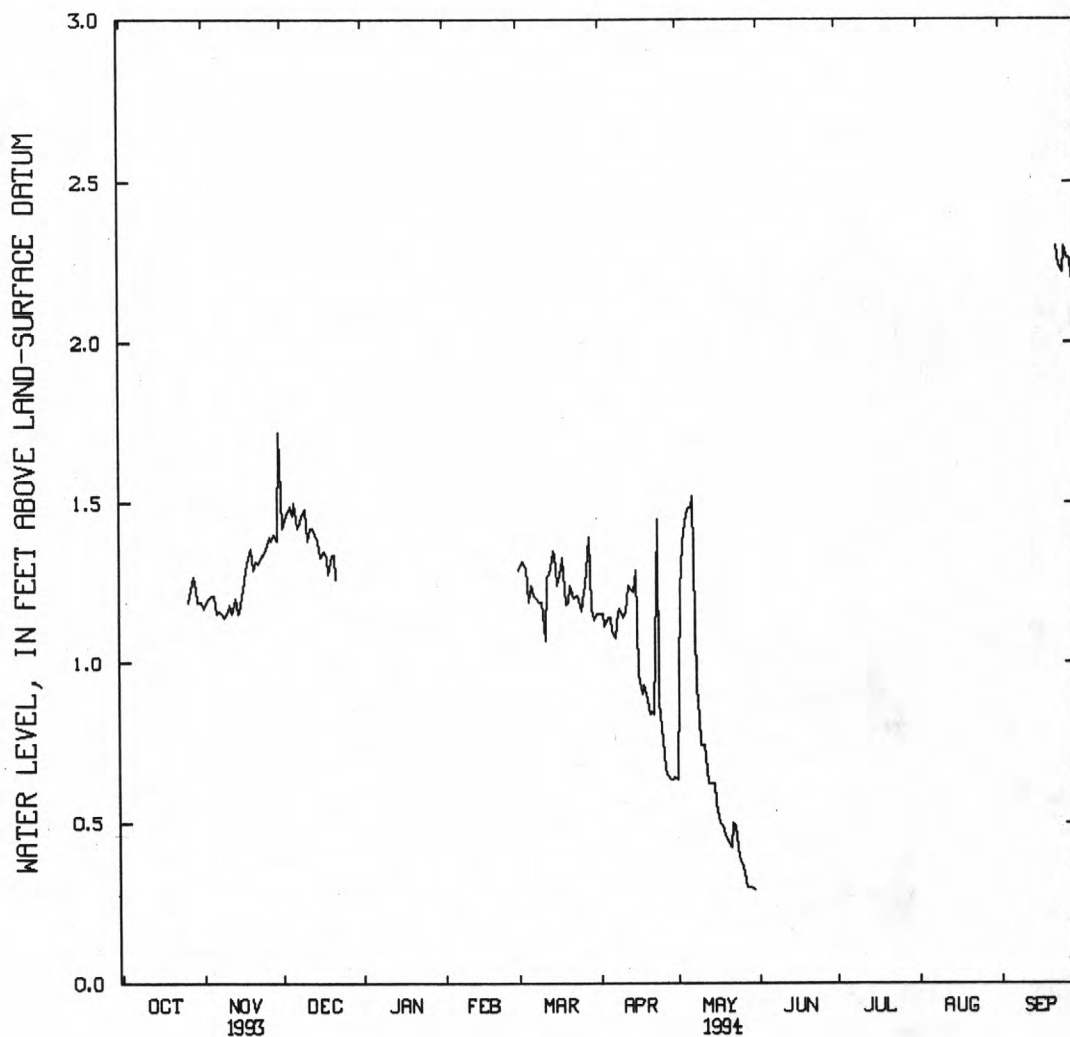
DATUM.--Elevation of land-surface datum is 880 ft above sea level, from topographic map. Measuring point: Top of shelter base, 3.5 ft above land-surface datum.

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, 1.10 ft below land-surface datum, July 14, 15, 1988.

WATER LEVEL, IN FEET ABOVE (+) AND BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	--	+1.21	+1.46	--	--	+1.19	+1.14	+1.48	--	--	--	--
10	--	+1.16	+1.48	--	--	+1.19	+1.14	+0.74	--	--	--	--
15	--	+1.16	+1.38	--	--	+1.34	+1.29	+0.62	--	--	--	--
20	--	+1.29	+1.34	--	--	+1.19	+0.84	+0.44	--	--	--	--
25	--	+1.36	--	--	--	+1.16	+0.76	+0.38	--	--	--	+2.22
EOM	+1.19	+1.72	--	--	--	+1.15	+0.64	--	--	--	--	+2.15
WTR YR 1994		HIGHEST	+2.30	SEP 23, 26		LOWEST	+0.21	JUN 29				



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.

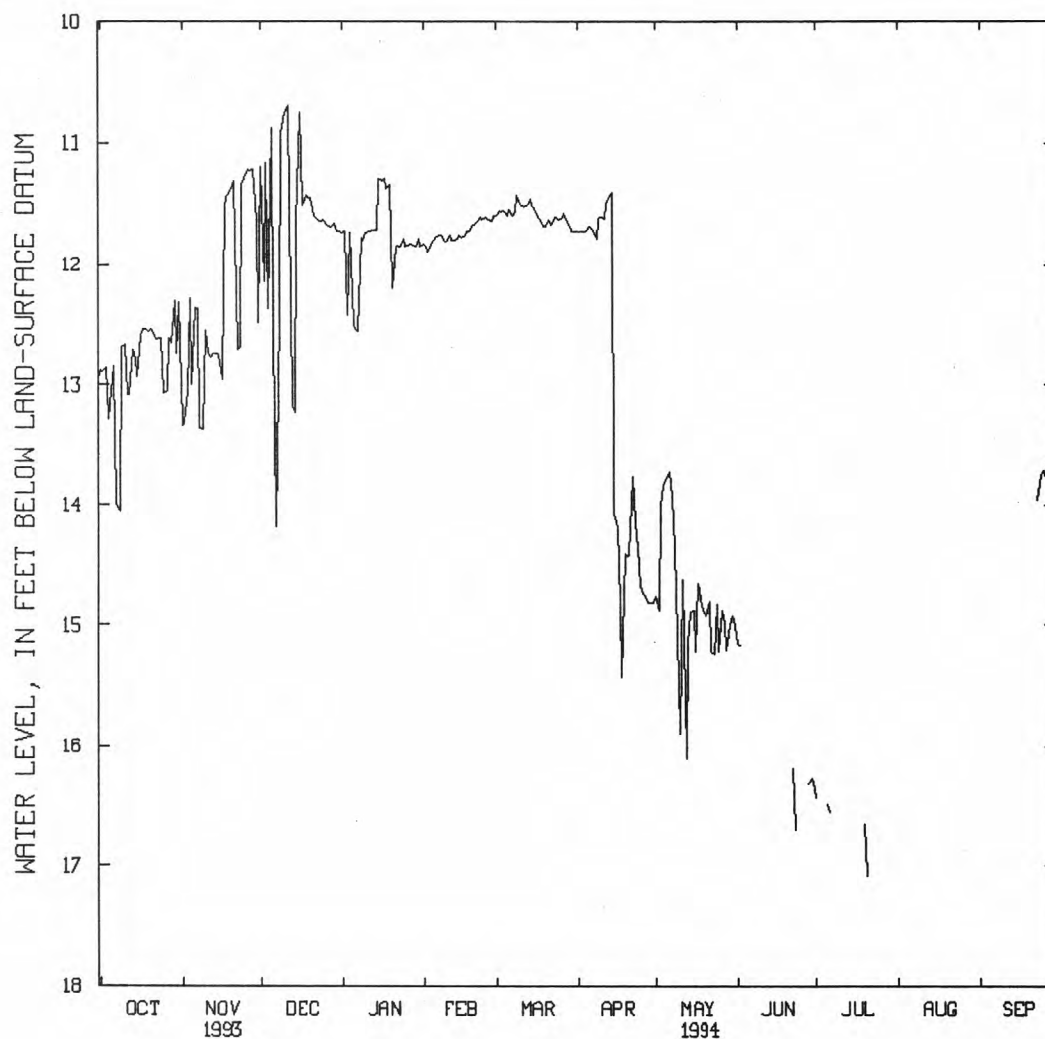
REMARKS.--Water levels affected by pumping.

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 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	13.04	13.00	10.88	12.51	11.80	11.59	11.69	13.76	---	16.48	---	---
10	12.67	12.55	10.74	11.74	11.82	11.50	11.61	15.90	---	---	---	---
15	12.93	12.76	11.66	11.29	11.77	11.52	14.08	14.88	---	---	---	---
20	12.54	11.35	11.45	12.19	11.67	11.68	14.43	14.91	---	17.09	---	---
25	13.07	11.26	11.64	11.85	11.61	11.64	14.67	15.21	---	---	---	13.71
EOM	12.31	12.49	11.73	11.85	11.60	11.73	14.81	15.01	16.36	---	---	13.35
WTR YR 1994	HIGHEST		5.94	SEP 28, 30		LOWEST		17.09	JUL 20			



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.

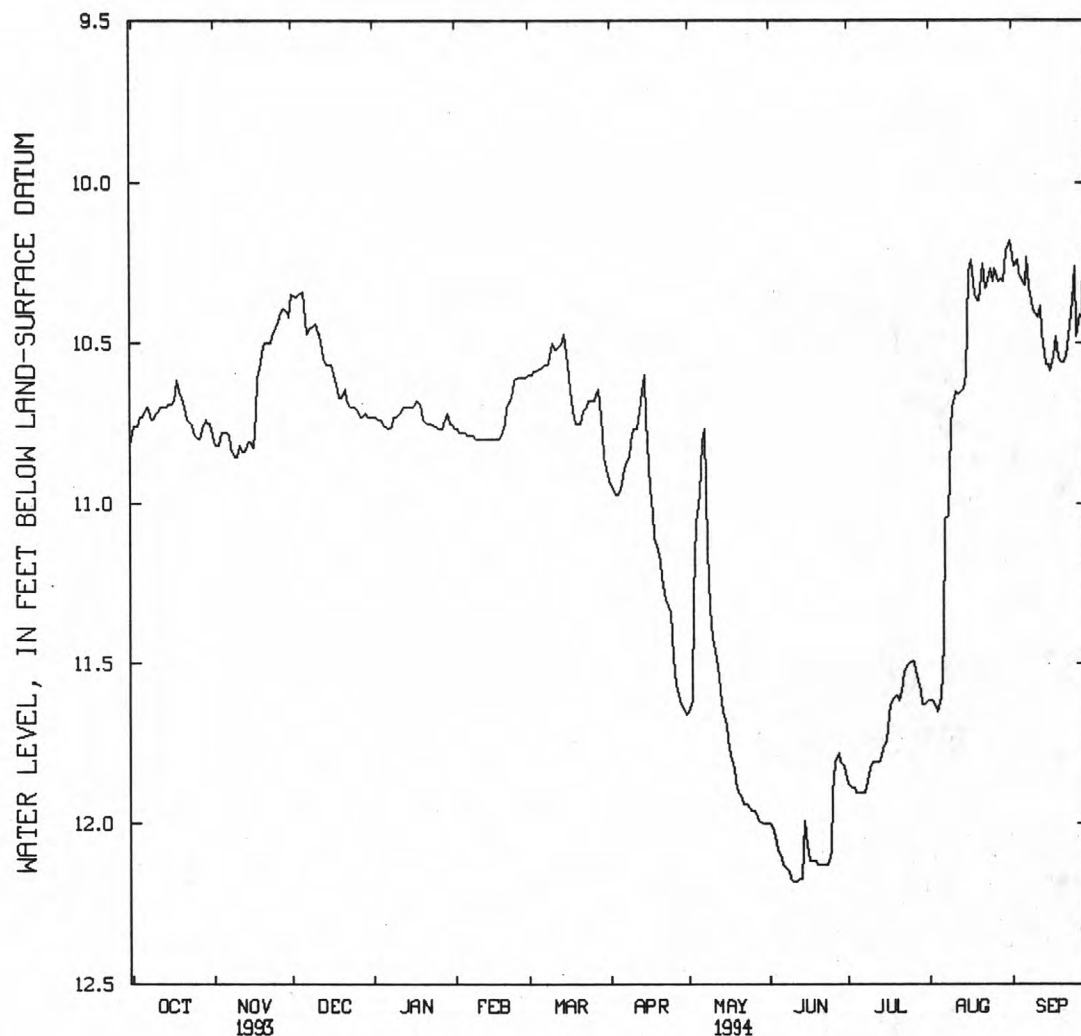
REMARKS.--Water levels affected by pumping.

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, 12.8 ft below land-surface datum, August, 1984.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	10.73	10.78	10.34	10.76	10.78	10.58	10.94	10.97	12.11	11.90	11.61	10.30
10	10.72	10.86	10.44	10.73	10.80	10.50	10.77	11.42	12.18	11.81	10.70	10.40
15	10.69	10.81	10.57	10.70	10.80	10.47	10.74	11.69	12.07	11.74	10.60	10.57
20	10.67	10.51	10.67	10.74	10.75	10.75	11.18	11.90	12.13	11.62	10.37	10.56
25	10.79	10.45	10.70	10.76	10.61	10.68	11.48	11.96	11.90	11.49	10.31	10.26
EOM	10.75	10.42	10.73	10.75	10.61	10.91	11.66	12.00	11.86	11.62	10.18	10.15
WTR YR 1994	HIGHEST			9.87	SEP 1, 30			LOWEST	12.18	JUN 10, 11		



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421435085353701. Local number, 3S 11W 4ABAD1.

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 36 ft, screened 33 ft to 36 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 860 ft above sea level. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

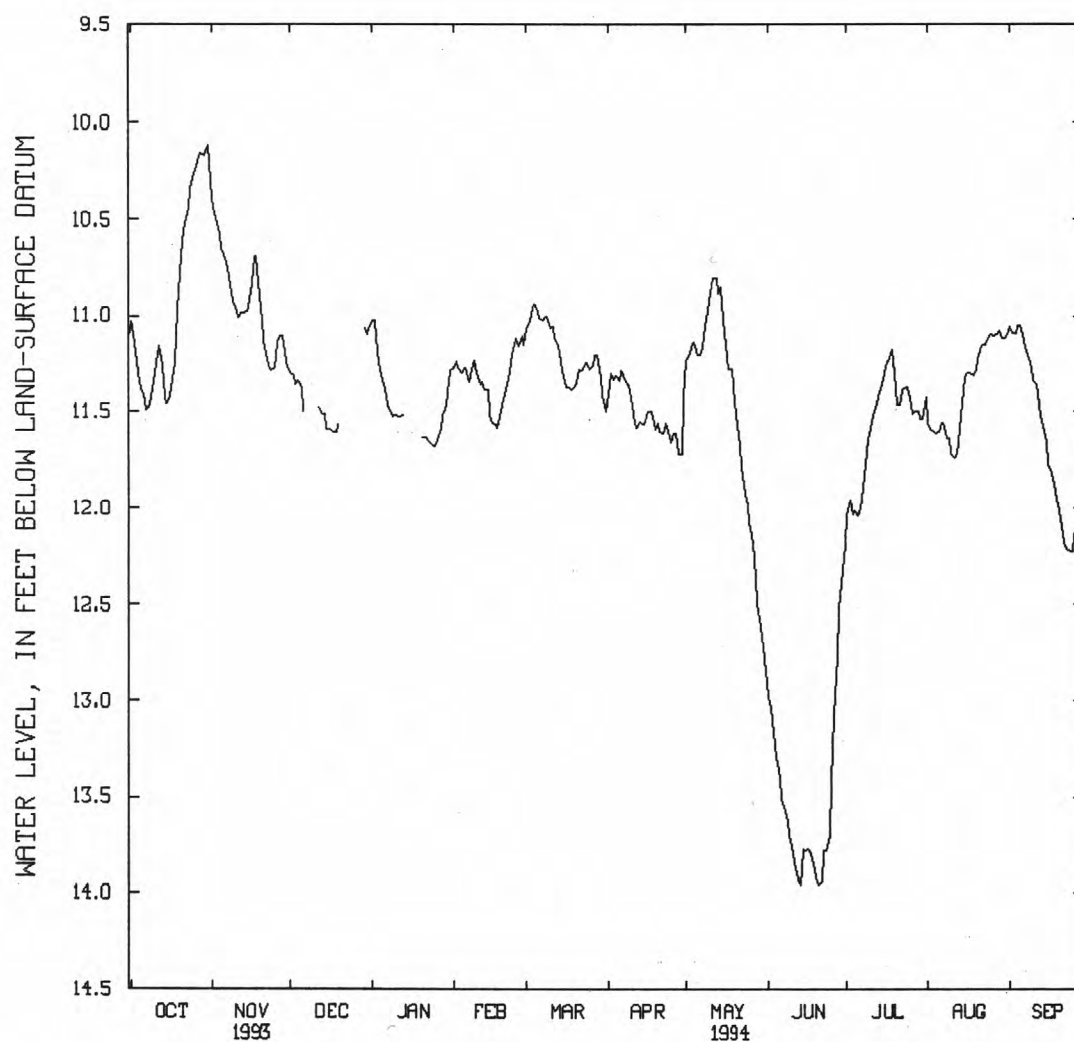
REMARKS.--Water levels affected by pumping.

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, 15.86 ft below land-surface datum, Sept. 17, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	11.39	10.65	11.38	11.36	11.27	10.98	11.34	11.21	13.40	12.04	11.61	11.05
10	11.30	10.96	---	11.52	11.30	11.07	11.43	10.88	13.76	11.58	11.72	11.34
15	11.46	10.96	11.59	---	11.52	11.29	11.57	11.10	13.78	11.30	11.32	11.66
20	10.78	11.03	---	11.63	11.44	11.35	11.56	11.52	13.96	11.47	11.22	12.02
25	10.28	11.27	---	11.68	11.12	11.28	11.66	12.07	13.42	11.47	11.10	12.23
EOM	10.12	11.27	11.07	11.29	11.15	11.50	11.43	12.85	12.19	11.43	11.08	12.13
WTR YR 1994	HIGHEST			10.10	OCT 31, NOV 1			LOWEST	13.96	JUN 13, 20		



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421435085353702. Local number, 3S 11W 4ABAD2.

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. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

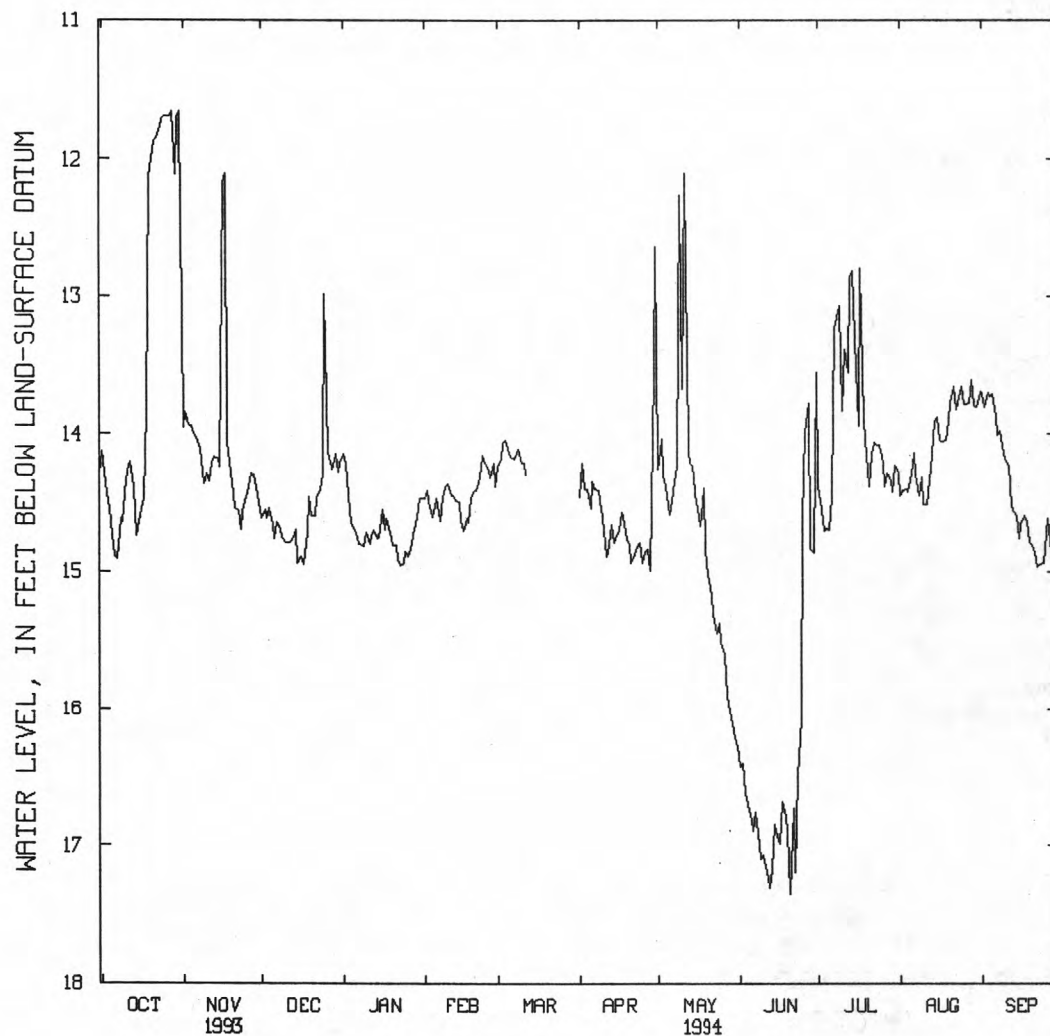
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 10.73 ft below land-surface datum, May 4, 5, 1993; lowest recorded, 18.61 ft below land-surface datum, Sept. 16, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	14.74	13.97	14.66	14.71	14.52	14.13	14.53	14.58	16.81	14.69	14.28	13.71
10	14.33	14.28	14.79	14.72	14.36	14.22	14.60	13.66	17.06	13.83	14.51	14.18
15	14.68	14.24	14.93	14.75	14.63	---	14.76	14.50	16.93	13.53	13.87	14.76
20	11.99	14.43	14.59	14.81	14.41	---	14.81	15.03	17.35	14.37	13.77	14.81
25	11.69	14.46	12.98	14.86	14.24	---	14.94	15.52	14.61	14.21	13.78	14.72
EOM	11.65	14.50	14.22	14.47	14.37	---	12.63	16.27	13.55	14.28	13.69	14.80
WTR YR 1994	HIGHEST		11.55	OCT 28, 31		LOWEST		17.35	JUN 20			



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.

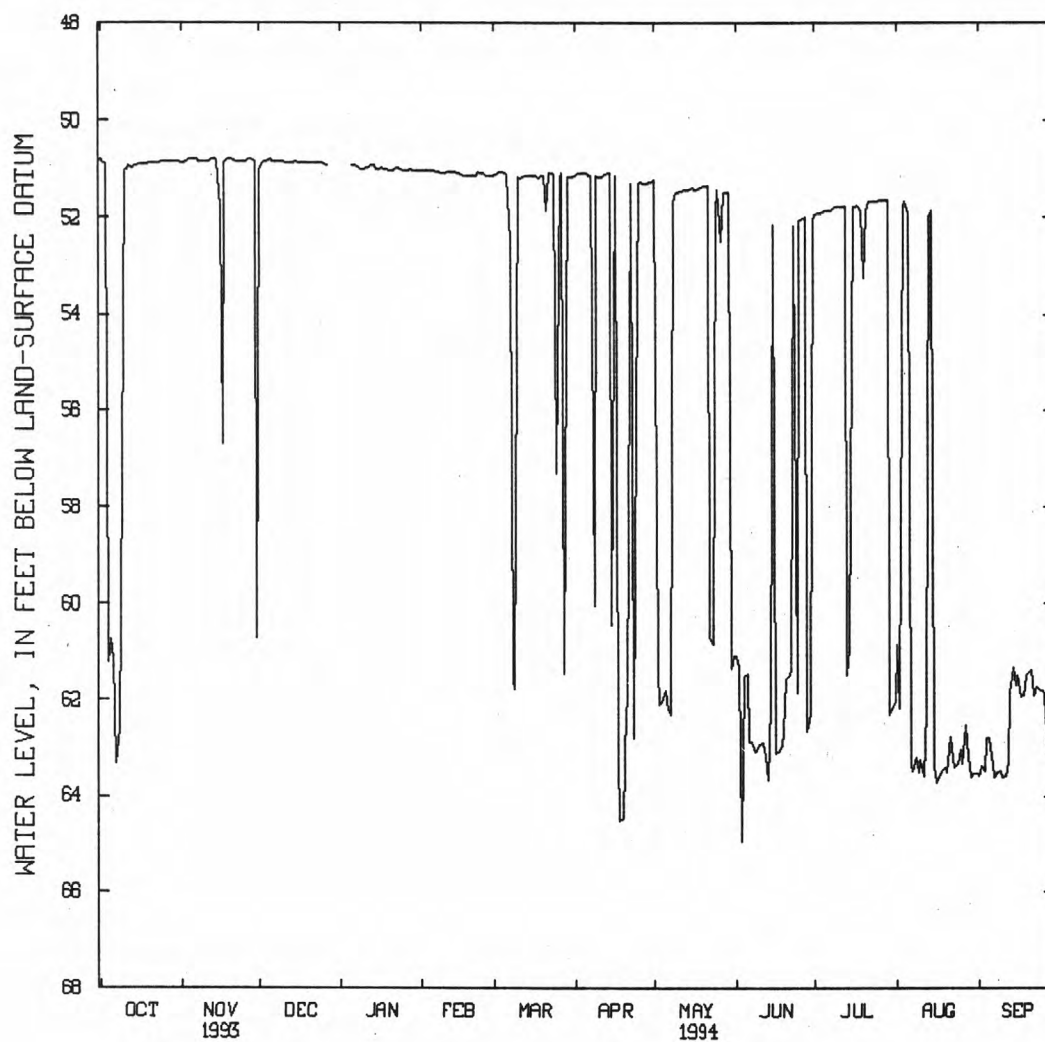
REMARKS.--Water levels affected by pumping.

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 1993 TO SEPTEMBER 1994

DAY	LOWEST VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	60.74	50.81	50.82	50.95	51.03	51.09	51.11	61.83	61.48	51.87	51.91	62.82
10	51.03	50.84	50.84	51.00	51.09	51.18	51.16	51.48	62.94	51.80	63.25	63.64
15	50.94	50.84	50.85	51.00	51.10	51.13	60.46	51.41	52.15	51.80	63.39	61.69
20	50.89	50.80	50.86	51.03	51.13	51.12	62.15	51.38	61.58	51.84	63.52	61.44
25	50.85	50.85	50.88	51.03	51.10	57.30	51.30	51.44	52.09	51.67	63.04	61.83
EOM	50.83	60.73	---	51.04	51.14	51.17	51.27	61.11	52.04	62.06	63.55	61.92
WTR YR 1994	HIGHEST			50.79	NOV 4, 5, 19, 20			LOWEST	64.98	JUN 3		



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.

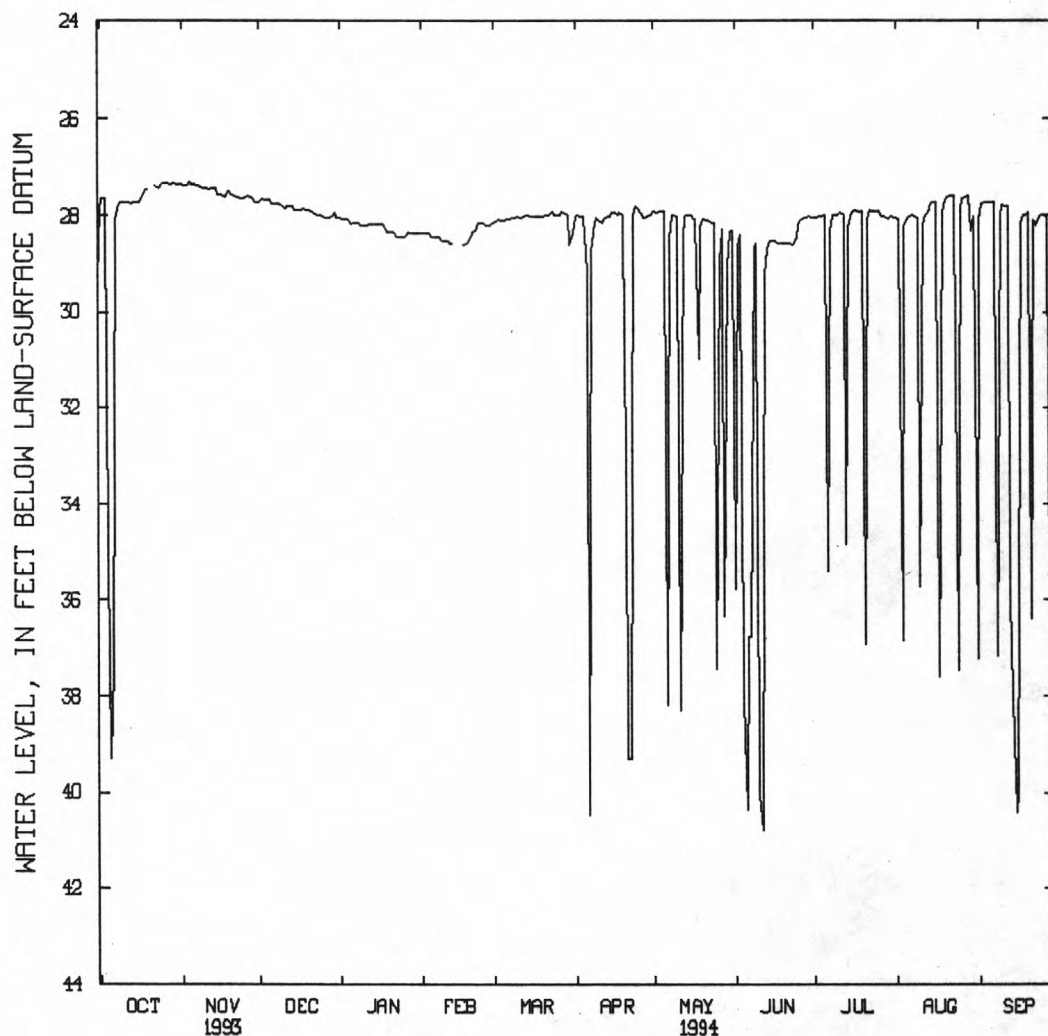
REMARKS.--Water levels affected by pumping.

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 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	39.29	27.35	27.70	28.17	28.44	28.13	29.19	27.93	40.36	27.98	28.04	27.71
10	27.73	27.43	27.83	28.23	28.53	28.03	28.13	28.01	40.06	28.00	35.74	27.80
15	27.74	27.56	27.88	28.19	---	28.01	27.94	28.00	28.53	27.95	27.73	40.43
20	---	27.56	27.88	28.35	28.46	28.01	33.31	28.10	28.59	36.94	27.63	27.96
25	27.34	27.65	27.98	28.45	28.16	27.99	27.84	37.42	28.18	27.91	27.86	27.98
EOM	27.38	27.72	28.04	28.37	28.18	28.37	27.98	28.32	28.06	28.05	37.23	28.30
WTY YR 1994	HIGHEST			27.23	OCT 29			LOWEST	40.79	JUN 11		



GROUND-WATER LEVELS

KALAMAZOO COUNTY

421614085270801. Local number, 2S 10W 26BCC.

LOCATION.--Lat 42°16'14", long 85°27'08", Hydrologic Unit 04050003, at end of Miller Road by Morrow Lake, Comstock Township, 4.0 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.

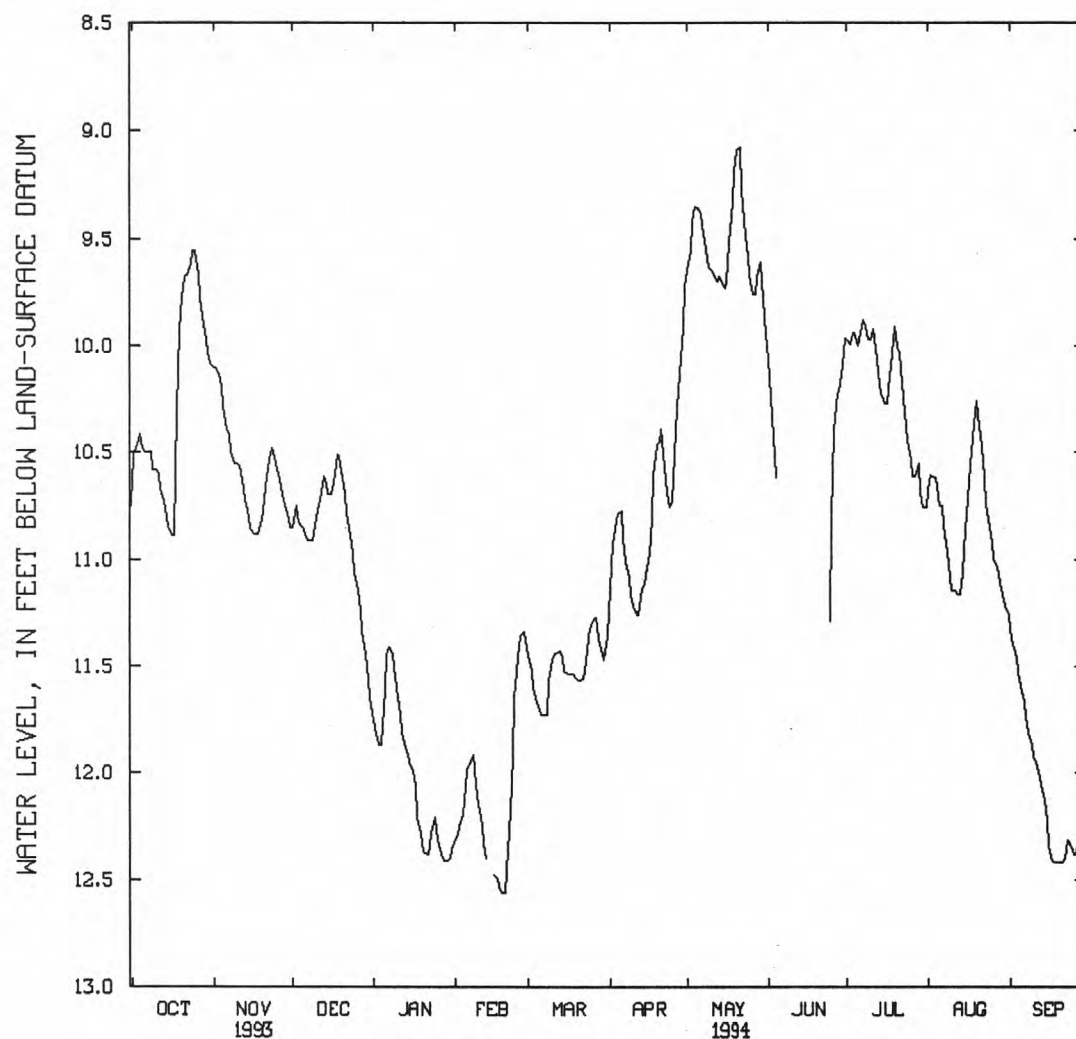
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 5.9 ft below land-surface datum, April 1988; lowest recorded, 13.1 ft below land-surface datum, September 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DAY	LOWEST VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	10.48	10.29	10.86	11.61	12.07	11.71	10.77	9.36	---	10.00	10.75	11.59
10	10.58	10.55	10.80	11.60	12.15	11.47	11.22	9.65	---	9.97	11.15	11.92
15	10.85	10.86	10.70	11.95	---	11.52	11.07	9.73	---	10.27	10.86	12.23
20	9.77	10.73	10.59	12.37	12.56	11.57	10.45	9.09	---	10.01	10.33	12.42
25	9.56	10.58	11.06	12.27	11.46	11.30	10.73	9.67	10.80	10.54	10.92	12.38
EOM	10.08	10.85	11.65	12.36	11.38	11.35	9.72	9.95	9.96	10.76	11.26	12.41
WTR YR 1994	HIGHEST			9.03	MAY 20, 21			LOWEST	12.56	FEB 19, 20		



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.

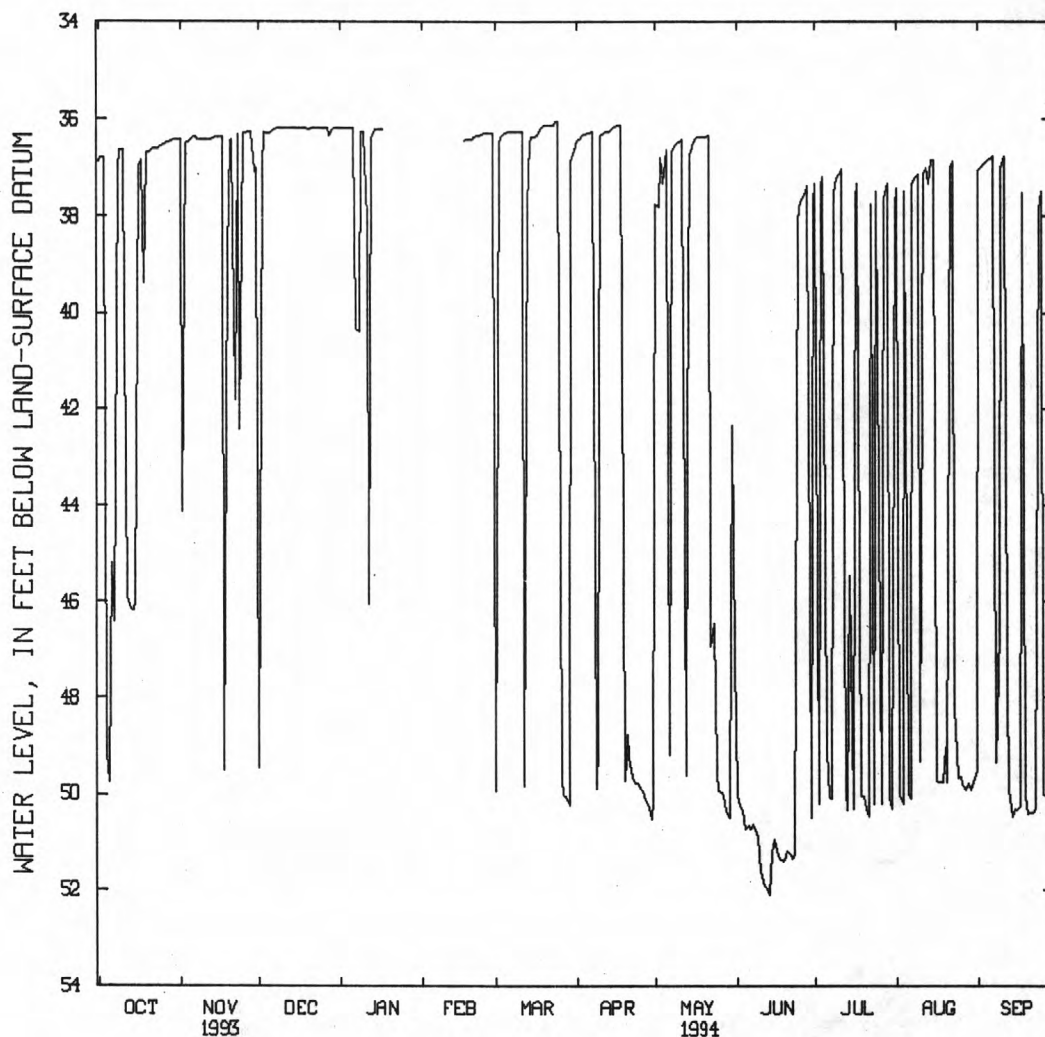
REMARKS.--Water levels affected by pumping.

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 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	49.76	36.45	36.27	36.20	---	36.26	36.29	36.63	50.67	49.12	50.03	36.85
10	36.66	36.41	36.19	36.24	---	36.25	36.35	36.47	51.63	37.13	49.32	37.01
15	46.00	36.40	36.19	36.21	---	36.39	36.18	36.48	50.98	50.32	36.84	50.31
20	36.67	36.44	36.21	---	36.41	36.12	48.76	36.37	51.20	50.30	49.74	50.43
25	36.56	36.29	36.20	---	36.30	36.06	49.87	49.95	37.83	47.20	49.65	37.49
EOM	36.42	36.99	36.19	---	36.29	36.63	50.13	47.18	37.72	37.76	49.51	37.31
WTR YR 1994	HIGHEST			36.06	MAR 23-26		LOWEST	52.10	JUN 13			



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.

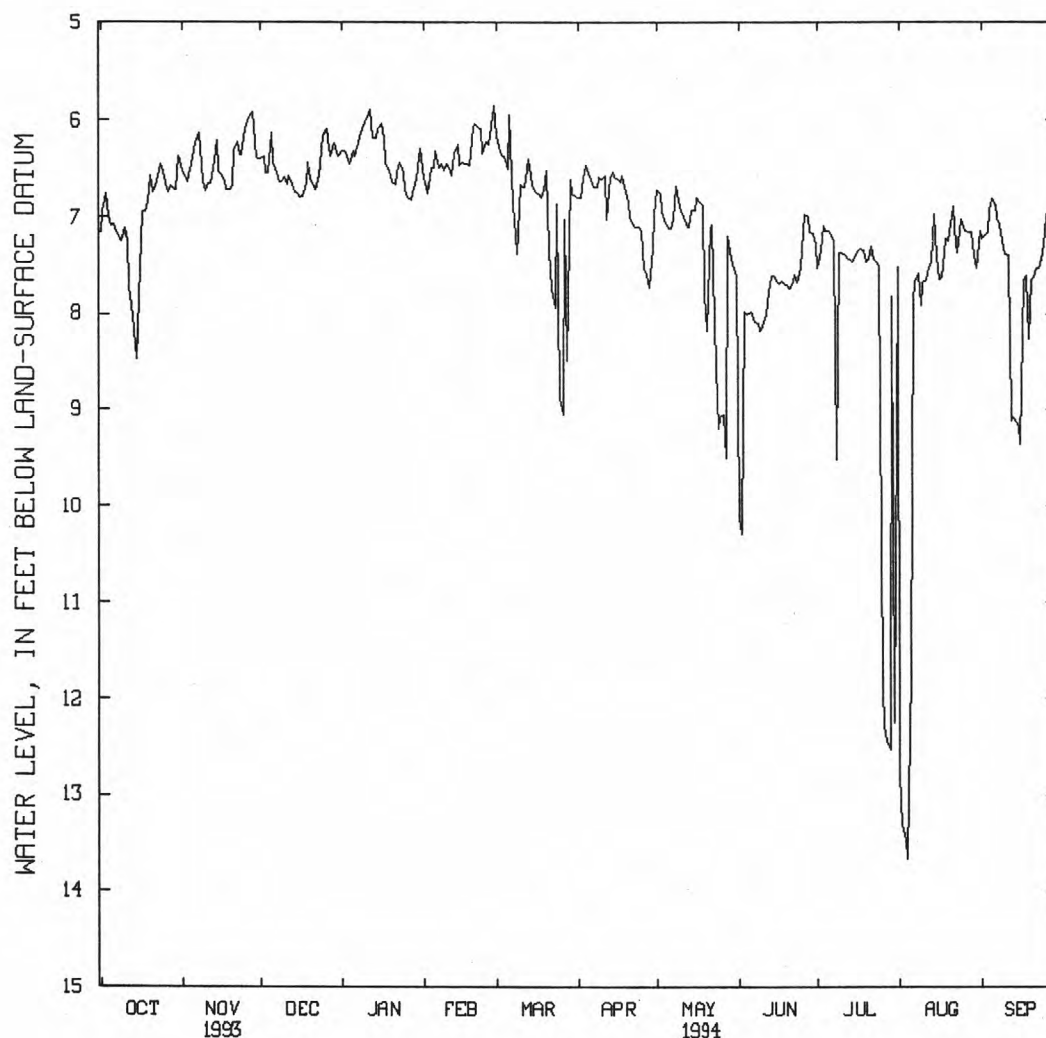
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 4.23 ft below land-surface datum, April 28, 1994; lowest recorded, 31.1 ft below land surface datum, August 1961.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	7.09	6.45	6.13	6.33	6.49	6.51	6.59	7.13	7.99	7.14	11.71	6.82
10	7.13	6.73	6.58	6.03	6.45	6.66	6.62	6.93	8.14	7.37	7.68	7.39
15	8.48	6.54	6.75	6.09	6.47	6.69	6.58	6.93	7.67	7.39	7.41	9.17
20	6.57	6.67	6.61	6.64	6.07	6.52	6.85	8.18	7.75	7.44	7.15	7.64
25	6.53	6.10	6.16	6.71	6.22	8.89	7.14	9.08	7.34	11.88	7.11	7.16
EOM	6.38	6.40	6.38	6.29	5.85	6.78	6.97	7.61	7.28	7.51	7.14	7.16
WTR YR 1994	HIGHEST			4.23	APR 28			LOWEST	13.66	AUG 4		



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.

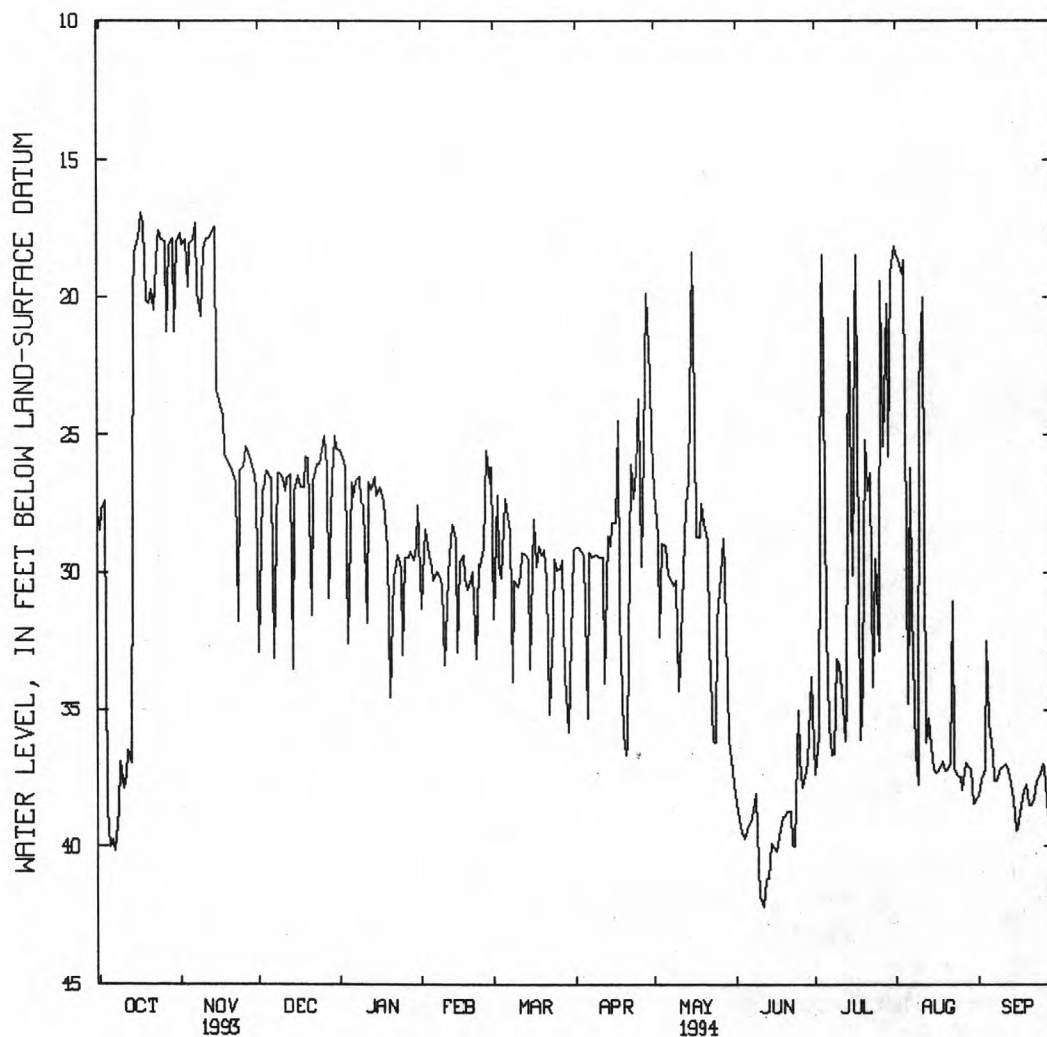
REMARKS.--Water levels affected by pumping.

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 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	40.03	17.98	26.56	26.72	29.87	27.33	35.28	29.05	39.24	31.97	34.75	35.46
10	37.84	18.23	26.57	27.56	33.38	30.53	29.46	34.30	41.78	33.42	23.23	37.13
15	18.33	23.36	27.03	27.21	32.95	33.49	28.20	18.36	40.02	30.14	37.15	39.40
20	20.21	26.18	25.82	34.51	30.21	29.18	36.66	28.21	38.70	25.14	37.25	38.51
25	17.87	26.14	25.76	32.99	29.10	29.89	23.66	31.74	36.79	32.87	37.47	36.98
EOM	17.95	26.94	25.48	27.54	26.14	29.18	25.16	37.74	36.33	18.11	38.20	36.14
WTR YR 1994	HIGHEST		16.74	OCT 17		LOWEST		42.12	JUN 11			



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.

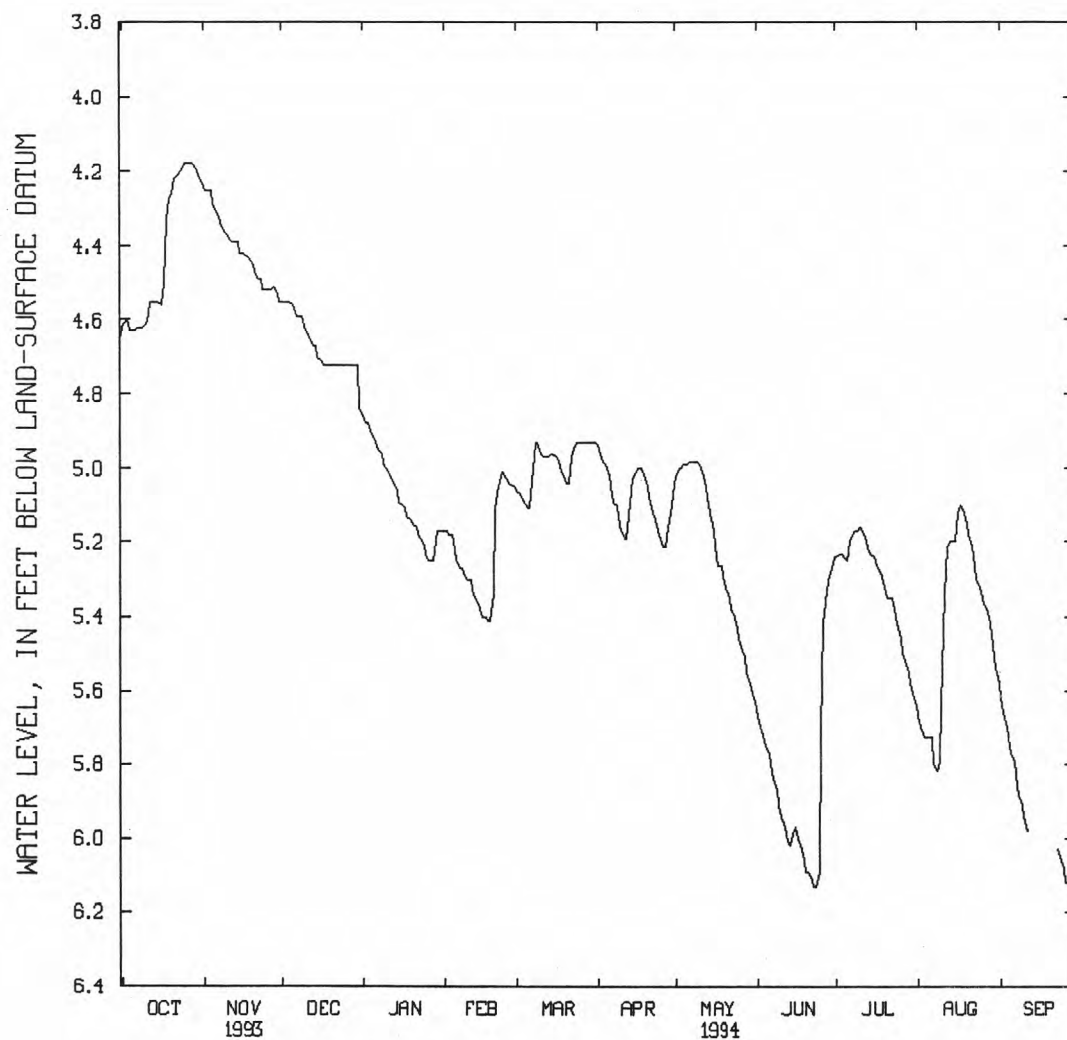
PERIOD OF RECORD.--March 1969 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 1.9 ft below land-surface datum, April 1974; lowest recorded, 6.67 ft below land-surface datum, Sept. 2, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	4.63	4.29	4.56	4.92	5.22	5.11	5.02	4.99	5.77	5.25	5.73	5.77
10	4.61	4.37	4.63	5.00	5.30	4.96	5.17	4.99	5.94	5.16	5.64	5.94
15	4.55	4.42	4.70	5.09	5.38	4.96	5.02	5.17	5.97	5.24	5.20	---
20	4.26	4.45	4.72	5.15	5.34	5.04	5.05	5.32	6.09	5.35	5.18	---
25	4.18	4.52	4.72	5.23	5.03	4.93	5.19	5.46	5.71	5.46	5.35	6.08
EOM	4.22	4.55	4.84	5.17	5.05	4.93	5.07	5.63	5.24	5.64	5.58	6.12

WTR YR 1994 HIGHEST 4.17 OCT 28, 29 LOWEST 6.13 JUN 22, 23



GROUND-WATER LEVELS

LIVINGSTON COUNTY

422853083402801. Local number, 1N 6E 13DBAB.

LOCATION.--Lat 42°28'53", long 83°40'28", Hydrologic Unit 04090005, at Twelve Mile Road, 2 mi northwest of South Lyon. Owner: American Aggregates Company.

AQUIFER.--Glacial deposits of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 2 in., depth 29 ft, 1.25 in. diameter screen.

INSTRUMENTATION.--Water-level recorder.

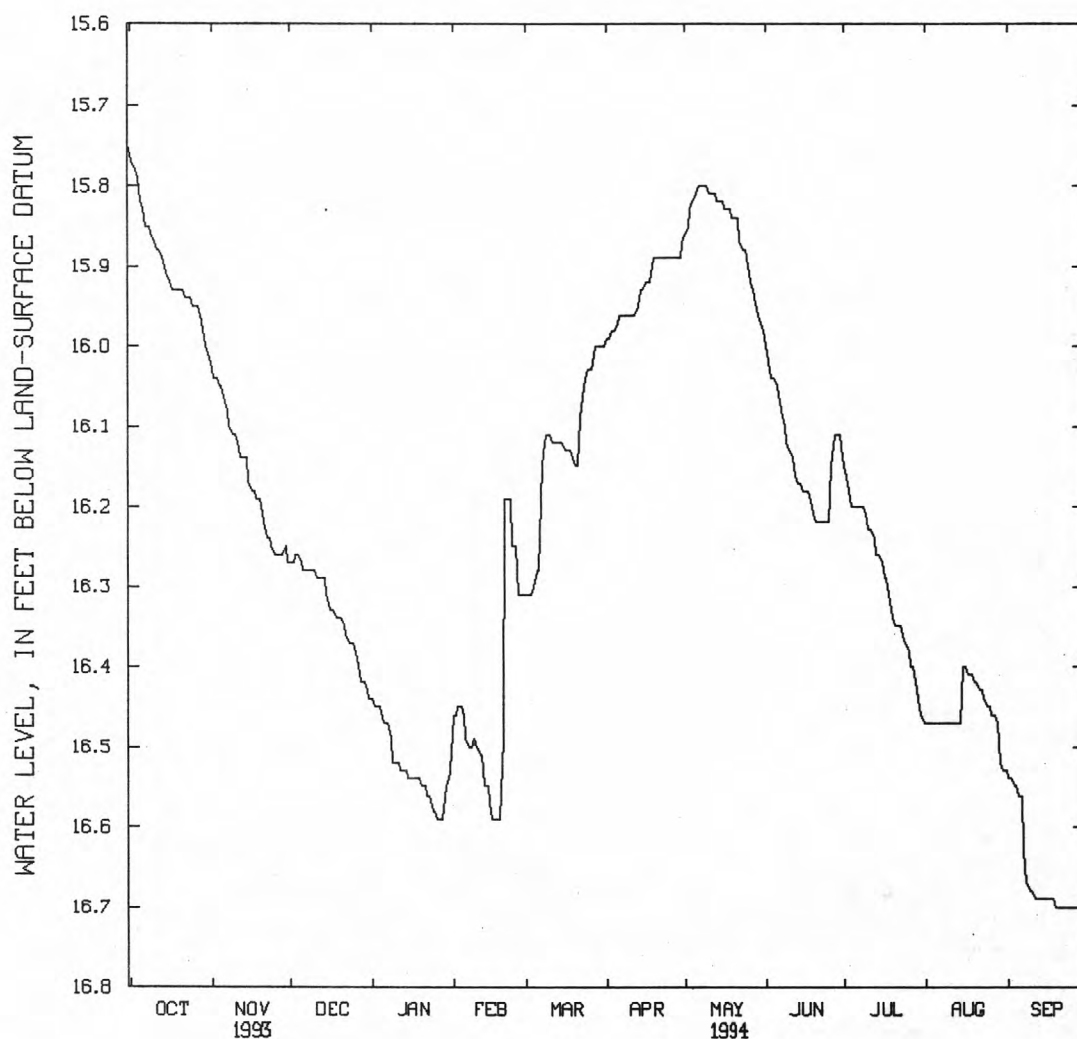
DATUM.--Elevation of land-surface datum is 930 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 2.50 ft above land-surface datum.

PERIOD OF RECORD.--April 1970 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 12.1 ft below land-surface datum, Apr. 22, 1974; lowest recorded, 21.58 ft below land-surface datum, Oct. 30, 31, Nov. 1, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	15.82	16.05	16.27	16.47	16.46	16.28	15.97	15.81	16.05	16.20	16.47	16.56
10	15.87	16.11	16.28	16.52	16.50	16.11	15.96	15.81	16.13	16.23	16.47	16.68
15	15.91	16.17	16.31	16.54	16.57	16.12	15.93	15.82	16.18	16.27	16.40	16.69
20	15.93	16.21	16.34	16.55	16.49	16.15	15.89	15.84	16.22	16.35	16.42	16.70
25	15.95	16.26	16.37	16.58	16.25	16.03	15.89	15.89	16.22	16.38	16.45	16.70
EOM	16.01	16.27	16.44	16.53	16.31	16.00	15.87	15.98	16.14	16.47	16.53	16.70
WTR YR 1994	HIGHEST			15.75	OCT 1	LOWEST			16.70	SEP 19-30		



GROUND-WATER LEVELS

MARQUETTE COUNTY

462938087475901. Local number, 47N 28W 3CCDC.

LOCATION.--Lat 46°29'38", long 87°47'59", Hydrologic Unit 04020105, on U.S. Highway 41 and State Highway 28, and 4.8 mi west of Ishpeming.

Owner: Ely Township.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 8 in., depth 72 ft, screened 68 ft to 72 ft.

INSTRUMENTATION.--Bimonthly readings by observer; periodic readings by U.S.G.S. personnel.

DATUM.--Elevation of land-surface datum is 1,571.99 ft above sea level. Measuring point: Top of recorder base, 3.00 ft above land-surface datum.

REMARKS.--Federal key well.

PERIOD OF RECORD.--Continuous record August 1961 to September 1993, periodic readings October 1993 to September 1994 (discontinued).

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 9.41 ft below land-surface datum, Apr. 21, 1985; lowest recorded, 19.26 ft below land-surface datum, Apr. 10, 11, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 8	14.31	NOV 21	14.08	JAN 9	15.20	FEB 20	15.78	APR 12	15.93	JUL 5	14.35
21	14.24	DEC 8	14.44	22	15.26	MAR 5	15.95	20	14.91	28	14.65
28	14.15	9	14.51	26	14.34	20	16.14	MAY 23	14.18	AUG 24	15.29
NOV 8	14.35	20	14.63	FEB 6	14.54	APR 5	16.25				

OAKLAND COUNTY

423622083390701. Local number, 2N 7E 5BAAD.

LOCATION.--Lat 42°36'22", long 83°39'07", Hydrologic Unit 04090005, at Honeywell Lake Road, 3.5 mi northwest of Milford. Owner: American Aggregates Company.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Bored observation well, diameter 2 in., depth 44 ft, screened 41 ft to 44 ft.

INSTRUMENTATION.--Water-level recorder.

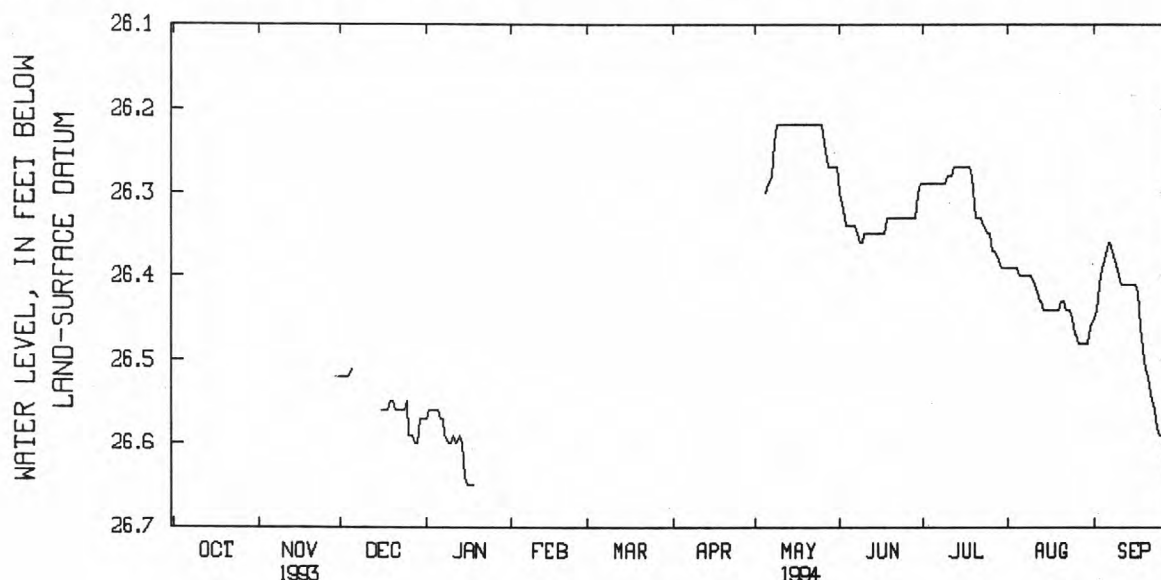
DATUM.--Elevation of land-surface datum is 1,020 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 3.0 ft above land-surface datum.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 23.9 ft below land-surface datum, April 1976; lowest recorded, 28.89 ft below land-surface datum, Dec. 1, 1971.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	---	---	26.51	26.56	---	---	---	26.30	26.34	26.29	26.40	26.38
10	---	---	---	26.60	---	---	---	26.22	26.35	26.28	26.41	26.40
15	---	---	---	26.64	---	---	---	26.22	26.35	26.27	26.44	26.41
20	---	---	26.55	---	---	---	---	26.22	26.33	26.33	26.43	26.51
25	---	---	26.55	---	---	---	---	26.22	26.33	26.35	26.47	26.59
EOM	---	26.52	26.57	---	---	---	---	26.27	26.29	26.39	26.46	26.65
WTR YR 1994	HIGHEST		26.21	MAY 19, 20			LOWEST	26.65	JAN 16-18, SEP 29, 30			



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.

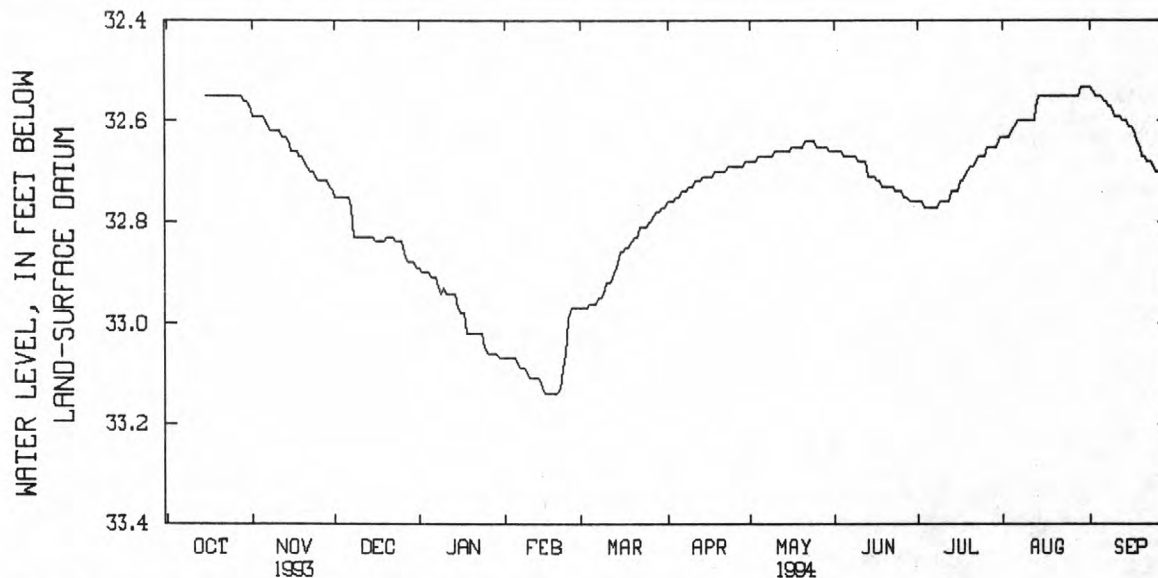
DATUM.--Elevation of land-surface datum is 1,055 ft above sea level, from topographic map. Measuring point: Top of flange, 3.0 ft above land-surface datum.

PERIOD OF RECORD.--Apr. 24, 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 1993 TO SEPTEMBER 1994

LOWEST VALUES												
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	---	32.59	32.75	32.91	33.07	32.96	32.75	32.67	32.67	32.77	32.61	32.55
10	---	32.62	32.83	32.93	33.11	32.92	32.73	32.66	32.68	32.76	32.60	32.59
15	32.55	32.66	32.83	32.97	33.13	32.86	32.71	32.66	32.71	32.74	32.55	32.61
20	32.55	32.68	32.83	33.02	33.14	32.83	32.70	32.65	32.73	32.69	32.55	32.67
25	32.55	32.72	32.84	33.05	32.97	32.80	32.69	32.65	32.74	32.67	32.55	32.70
EOM	32.57	32.74	32.89	33.07	32.97	32.77	32.68	32.66	32.76	32.63	32.53	32.71
WTR YR 1994		HIGHEST	32.53	AUG 28-SEP 2		LOWEST	33.14	FEB 16-19				



425116083321501. Local number, 5N 8E 8ACAC.

LOCATION.--Lat 42°51'16", long 83°32'15", Hydrologic Unit 04080204, at Van Atta Road, 6 mi northeast of Holly. Owner: Michigan Department of Natural Resources.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 1.25 in., depth 42 ft., screened 39 ft to 42 ft.

INSTRUMENTATION.--Periodic measurement.

DATUM.--Elevation of land-surface datum is 930 ft above sea level, from topographic map. Measuring point: Top of casing, 3.00 ft above land-surface datum.

REMARKS.--Water temperature also measured.

PERIOD OF RECORD.--November 1965 to September 1994 (discontinued).

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 22.30 ft below land-surface datum, Apr. 24, 1974; lowest measured, 26.48 ft below land-surface datum, Sept. 9, 1966.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

[illegible]

GROUND-WATER LEVELS

ROSCOMMON COUNTY

442722084350701. Local number, 24N 2W 20BABA.

LOCATION.--Lat 44°27'22", long 84°35'07", Hydrologic Unit 04070007, at State Highway 103, 2 mi south of Roscommon. Owner: Michigan Department of Natural Resources.

AQUIFER.--Sand of Pleistocene age.

WELL CHARACTERISTICS.--Jetted water-table well, diameter 8 in., depth 14 ft, open bottom.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 1,145.30 ft above sea level. Measuring point: Top of casing, 2.5 ft above land-surface datum.

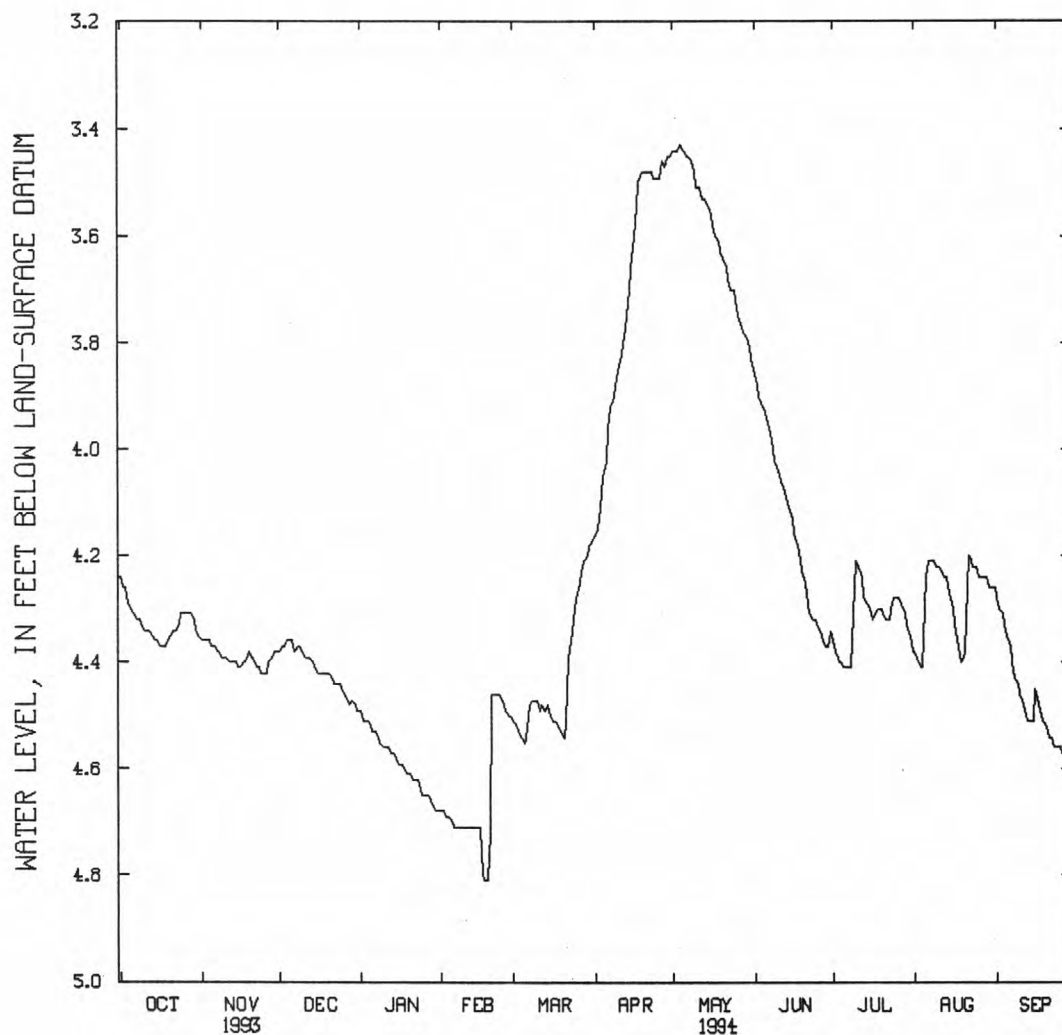
REMARKS.--Federal key well.

PERIOD OF RECORD.--December 1934 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 2.29 ft below land-surface datum, Apr. 19, 1985; lowest recorded, 6.23 ft below land-surface datum, Dec. 6-11, 1949.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	4.30	4.37	4.36	4.52	4.70	4.55	4.02	3.44	3.93	4.41	4.24	4.35
10	4.34	4.39	4.38	4.56	4.71	4.47	3.85	3.51	4.04	4.21	4.22	4.46
15	4.36	4.41	4.41	4.58	4.71	4.50	3.66	3.55	4.13	4.30	4.30	4.51
20	4.35	4.39	4.42	4.61	4.72	4.54	3.48	3.64	4.25	4.31	4.38	4.52
25	4.31	4.42	4.45	4.65	4.47	4.28	3.49	3.72	4.33	4.28	4.24	4.56
EOM	4.35	4.38	4.49	4.68	4.50	4.17	3.45	3.83	4.34	4.38	4.26	4.59
WTR YR 1994	HIGHEST		3.43	APR 30, MAY 1, 3-5			LOWEST	4.81	FEB 18, 19			



GROUND-WATER LEVELS

WASHTENAW COUNTY

421220083332501. Local number, 3S 7E 24CDBC.

LOCATION.--Lat 42°12'20", long 83°33'25", Hydrologic Unit 04090005, at Bridge Street, at Ypsilanti Township Waterworks. Owner: Ypsilanti Township.

AQUIFER.--Gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in., depth 75 ft, screened 70 ft to 75 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 657.83 ft above sea level. Measuring point: Plywood instrument shelf, 5.5 ft above land-surface datum.

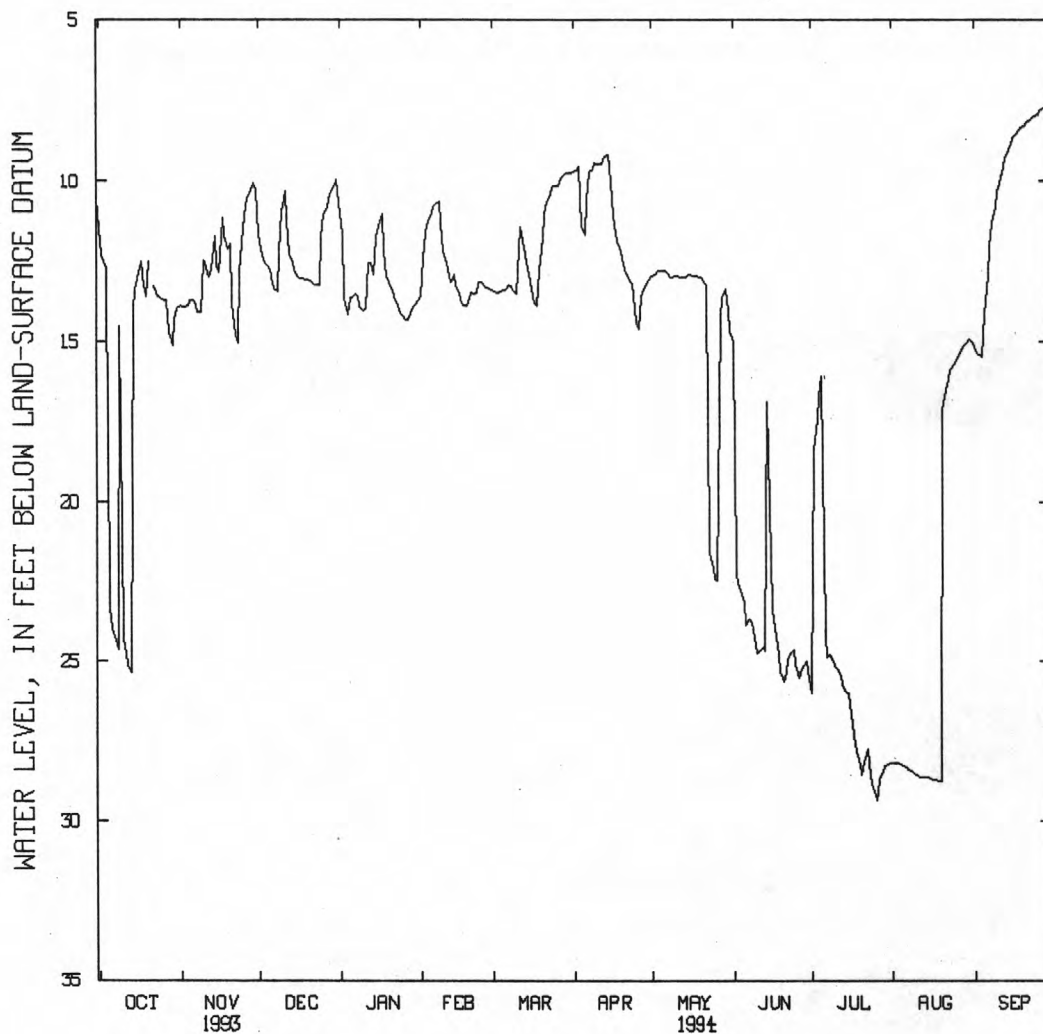
REMARKS.--Water levels affected by pumping.

PERIOD OF RECORD.--April 1944 to June 1945, December 1949 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 4.7 ft below land-surface datum, October 1981; lowest recorded, 63.2 ft below land-surface datum, February 1970.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	23.31	13.74	12.74	13.63	10.98	13.40	11.69	12.77	23.16	16.07	28.30	14.11
10	24.34	12.44	10.93	14.01	12.20	13.53	9.44	12.96	24.78	25.15	28.57	10.30
15	13.39	12.67	12.80	11.75	13.26	12.89	9.56	12.87	21.78	25.99	28.66	8.82
20	12.52	11.98	13.11	13.26	13.64	11.77	12.62	12.97	25.64	28.57	17.11	8.28
25	13.66	11.48	11.77	14.18	13.16	10.17	14.40	22.38	25.11	29.22	15.54	7.92
EOM	13.98	10.24	9.95	13.73	13.34	9.76	13.11	14.65	25.56	28.20	15.07	7.75
WTR YR 1994		HIGHEST	7.68	SEP 28, 30		LOWEST	29.35	JUL 26				



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.

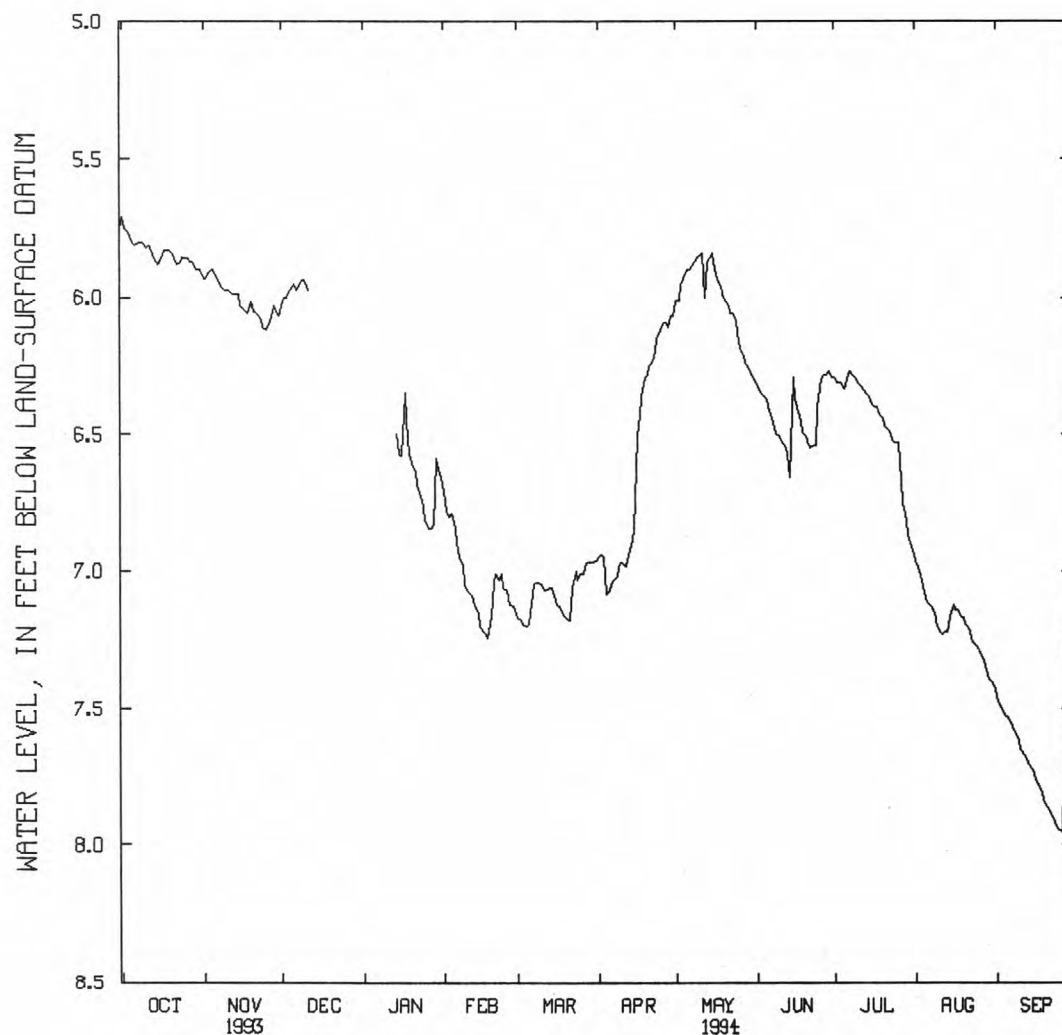
REMARKS.--Water levels affected by pumping.

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 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	5.80	5.90	5.96	---	6.85	7.19	7.07	5.90	6.37	6.33	7.11	7.53
10	5.82	5.97	5.94	---	7.07	7.05	6.97	5.85	6.51	6.31	7.22	7.65
15	5.88	6.03	---	6.57	7.20	7.09	6.85	5.84	6.29	6.39	7.12	7.74
20	5.84	6.05	---	6.62	7.04	7.18	6.28	6.01	6.51	6.47	7.19	7.86
25	5.86	6.12	---	6.82	7.07	7.01	6.12	6.13	6.40	6.53	7.29	7.95
EOM	5.90	6.07	---	6.66	7.14	6.96	6.07	6.29	6.29	6.94	7.43	6.95
WTR YR 1994	HIGHEST			5.56	MAY 14			LOWEST	7.96	SEP 26		



GROUND-WATER LEVELS

WASHTENAW COUNTY

421427083362301. Local number, 3S 7E 9ADBC1.

LOCATION.--Lat 42°14'27", long 83°36'23", Hydrologic Unit 04090005, at intersection of Park Street and Michigan Avenue, in Ypsilanti. Owner: City of Ypsilanti.

AQUIFER.--Medium to coarse gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in., depth 94 ft, screened 89 ft to 94 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 710 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 3.5 ft above land-surface datum.

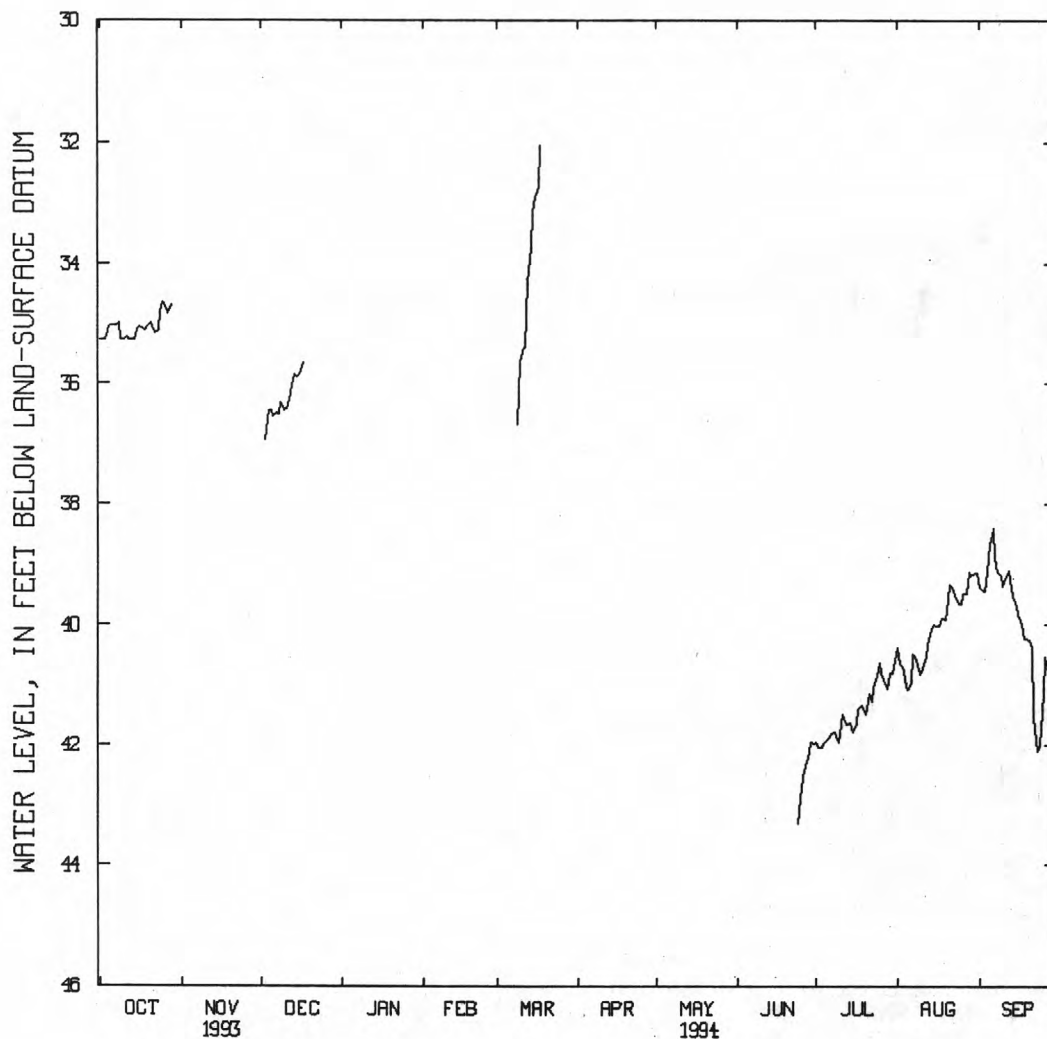
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 29.1 ft below land-surface datum, November 1945; lowest recorded, 78.8 ft below land-surface datum, October 1974.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	35.03	---	36.43	---	---	---	---	---	---	41.93	41.08	38.65
10	35.26	---	36.43	---	---	35.61	---	---	---	41.95	40.83	39.37
15	35.11	---	35.88	---	---	33.14	---	---	---	41.79	39.98	39.70
20	34.99	---	---	---	---	---	---	---	---	41.49	39.75	40.26
25	34.66	---	---	---	---	---	---	---	42.87	40.65	39.64	41.14
EOM	---	---	---	---	---	---	---	---	41.97	40.59	39.16	40.92
WTR YR 1994	HIGHEST		31.37	MAR 18		LOWEST		44.74	JUN 23			



GROUND-WATER LEVELS

WASHTENAW COUNTY

421532083382001. Local number, 3S 7E 5BBAC.

LOCATION.--Lat 42°15'32", long 83°38'20", Hydrologic Unit 04090005, at Superior Road, 1.5 mi northwest of Ypsilanti. Owner: City of Ypsilanti.

AQUIFER.--Sand and gravel of Pleistocene age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 8 in., depth 70 ft, screened 40 ft to 70 ft.

INSTRUMENTATION.--Water-level recorder.

DATUM.--Elevation of land-surface datum is 720 ft above sea level, from topographic map. Measuring point: Plywood instrument shelf, 6.0 ft above land-surface datum.

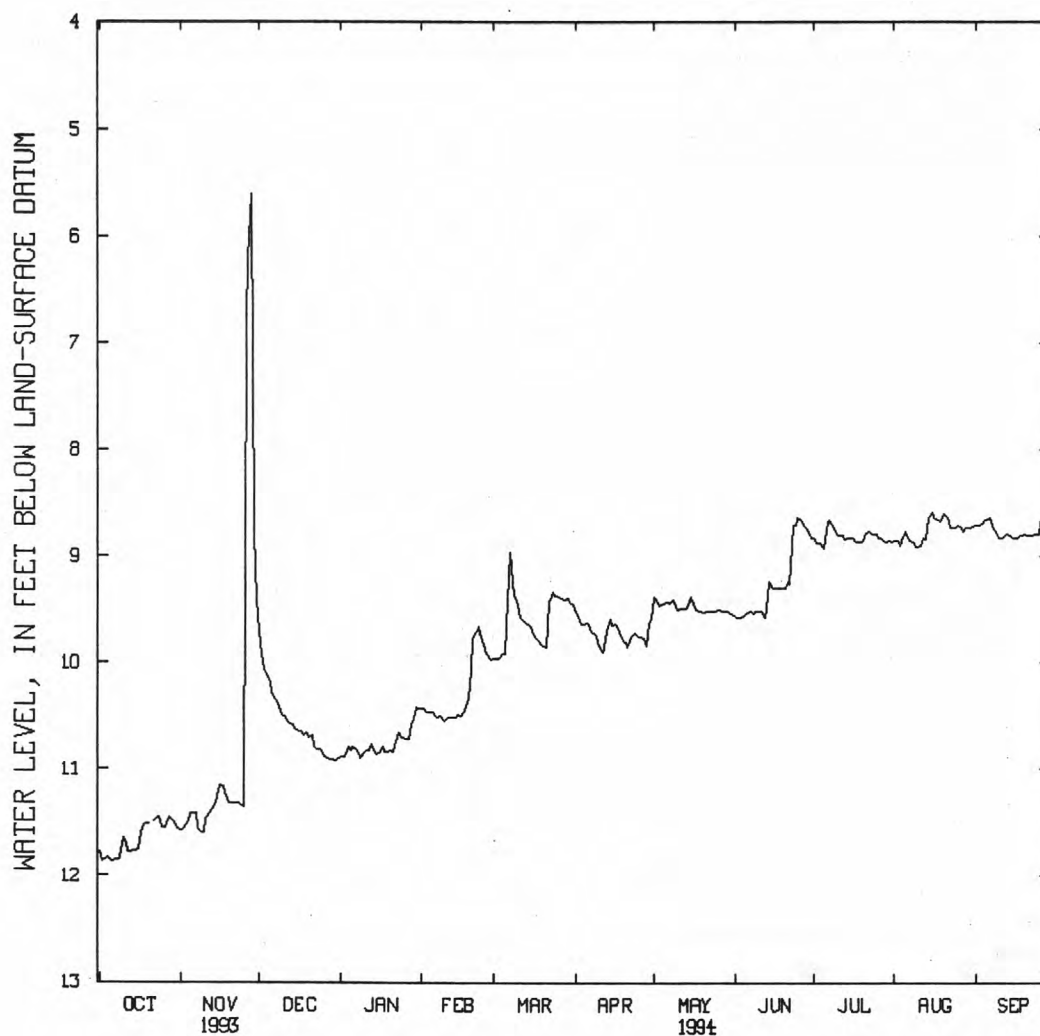
REMARKS.--Water levels affected by pumping.

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

EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 1.22 ft below land-surface datum, Jan. 30, 1992; lowest recorded, 21.4 ft below land-surface datum, Dec. 25, 1965.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	11.85	11.42	10.19	10.82	10.47	9.91	9.62	9.43	9.55	8.93	8.77	8.66
10	11.65	11.60	10.48	10.86	10.55	9.46	9.84	9.50	9.52	8.80	8.91	8.82
15	11.77	11.26	10.62	10.87	10.48	9.67	9.65	9.39	9.30	8.82	8.59	8.82
20	11.52	11.33	10.70	10.82	10.07	9.86	9.81	9.53	9.29	8.86	8.61	8.79
25	11.54	11.35	10.84	10.70	9.83	9.37	9.75	9.51	8.64	8.79	8.71	8.79
EOM	11.56	9.41	10.92	10.43	9.97	9.45	9.59	9.54	8.83	8.87	8.70	8.68
WTR YR 1994	HIGHEST			4.63	NOV 29			LOWEST	11.87	OCT 2, 3		



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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
