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1980

GROUND-WATER DATA FOR MICHIGAN

BY
G.C. HUFFMAN

U.S. GEOLOGICAL SURVEY

Open-File Report 81-811

PREPARED IN COOPERATION WITH THE
MICHIGAN DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

CONVERSION FACTORS

The following factors may be used to convert the inch-pound units published in this report to the International System of Units (SI).

Multiply inch-pound units	By	To obtain SI units
acres (a)	0.4047	hectares (ha)
feet (ft)	.3048	meters (m)
inches (in)	25.4	millimeters (mm)
miles (mi)	1.609	kilometers (km)
million gallons (10^6 gal)	3,785	cubic meters (m^3)
gallons (gal)	3.785	liters (L)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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Department of Natural Resources

Lansing, Michigan
1981

UNITED STATES DEPARTMENT OF THE INTERIOR

JAMES G. WATT, Secretary

GEOLOGICAL SURVEY

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ACKNOWLEDGEMENTS

Acknowledgement is made to personnel of Federal and State agencies, county and township governments, industrial concerns, well drillers, consultants, municipalities, and public utilities, without whose cooperation the accumulation of data presented in this report would have not been possible.

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INTRODUCTION

Purpose

The purpose of this report is to make available the 1980 records of water levels and related data for the principal aquifers of the State. This report is written for municipalities, industries, institutions, consultants, drillers, hydrologists and other people interested in the ground-water resources.

Scope

Data on the yield of wells, pumpage, quality of water, and trends of ground-water levels for the past 5 years are shown in the text. Many hydrographs are included to illustrate natural changes in water levels. Also included are data on municipal water-supply sources.

Tables 1, 2, and 3 contain records of water levels in observation wells, records of pumpage by most major ground-water users, and water quality data from selected wells sampled during 1980. Figure 1 shows distribution of observation wells.

Uses of data in this report

An effective method of determining the amount of water available from an aquifer is analysis of records of water levels and pumpage. Water-level records in pumped areas obtained by means of recorders indicate day-to-day and long-term effects of pumping. This information can be used by municipalities, industries, and institutions to estimate the capacity of aquifers to meet present and future demands for water and whether expansion of present supply systems for ground water is practicable. When new wells are to be installed in an area where water levels are declining because of pumping, projections of future water levels will indicate the depth below which the intake should be installed. Allowing for probably lowering of water levels, can extend the life of the installation.

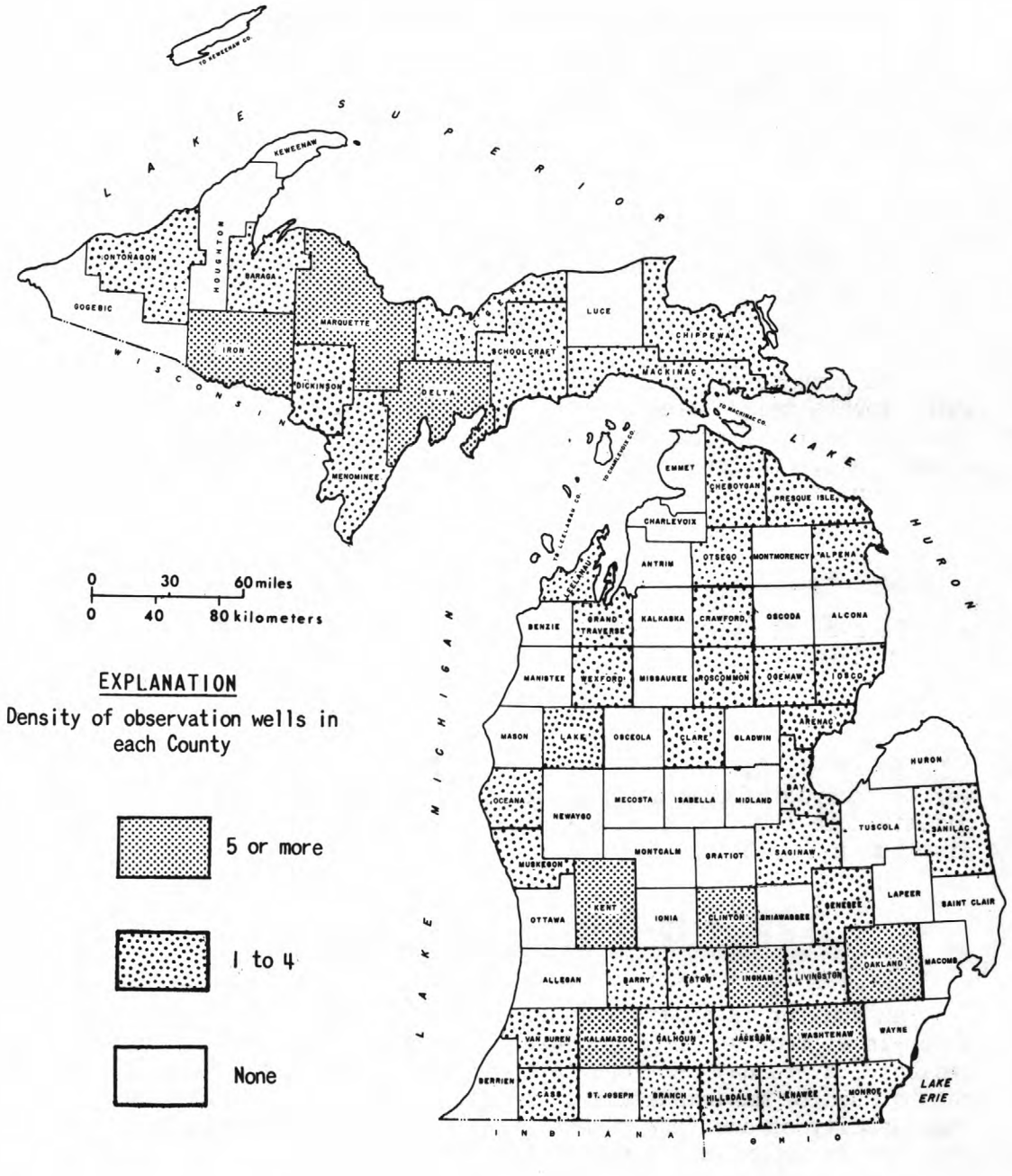


Figure 1.--Distribution of observation wells. Water levels were monitored in 133 observation wells in 1980.

The water table fluctuates an average of 2 to 3 feet annually and about 5 feet over a period of years. Thus, if an excavation for a basement or septic tank is made when the water table is low, good construction practices would allow for the probably higher water levels in the spring. If construction is made after several years of drought, the allowance for the subsequent rise in water levels would be larger. If a site is at all questionable, the depth to the water table could be determined by boring and allowances made for the probable rise in water levels.

Availability of records

Complete tabulations of water-level measurements, hydrographs for observation wells, records of chemical quality, water-temperature measurements, well records and logs, aquifer tests, records of pumping for public and industrial supplies, and water resources reports are on file for public inspection. They may be examined at the Geological Survey Division, Michigan Department of Natural Resources, Mason Building, Lansing, Michigan 48909; or at the U.S. Geological Survey, 6520 Mercantile Way, Suite 5, Lansing, Michigan 48910. Records for the Northern Peninsula are also kept on file in the State and Federal Geological Survey Offices, State Office Building, Escanaba, Michigan 49829.

Other ground-water reports

From 1935 to 1974, records of ground-water levels in Michigan were published in U.S. Geological Survey Water-Supply Papers (WSP). Since 1975, these records have been published in U.S. Geological Survey Water-Data Reports (WDR).

To supplement the Water-Supply Paper and Water-Data Report series, publication of annual reports, titled "Summary of Ground-Water Conditions in Michigan," was begun in 1956. Beginning in 1967, the title of the reports was changed to "Summary of Ground-Water Hydrological Data in Michigan," and in 1973 to "Ground-Water Data for Michigan."

Reports that describe ground water in Michigan are shown in figures 2 and 3. In addition, many publications dealing with ground water are listed in the selected references at the end of this report.

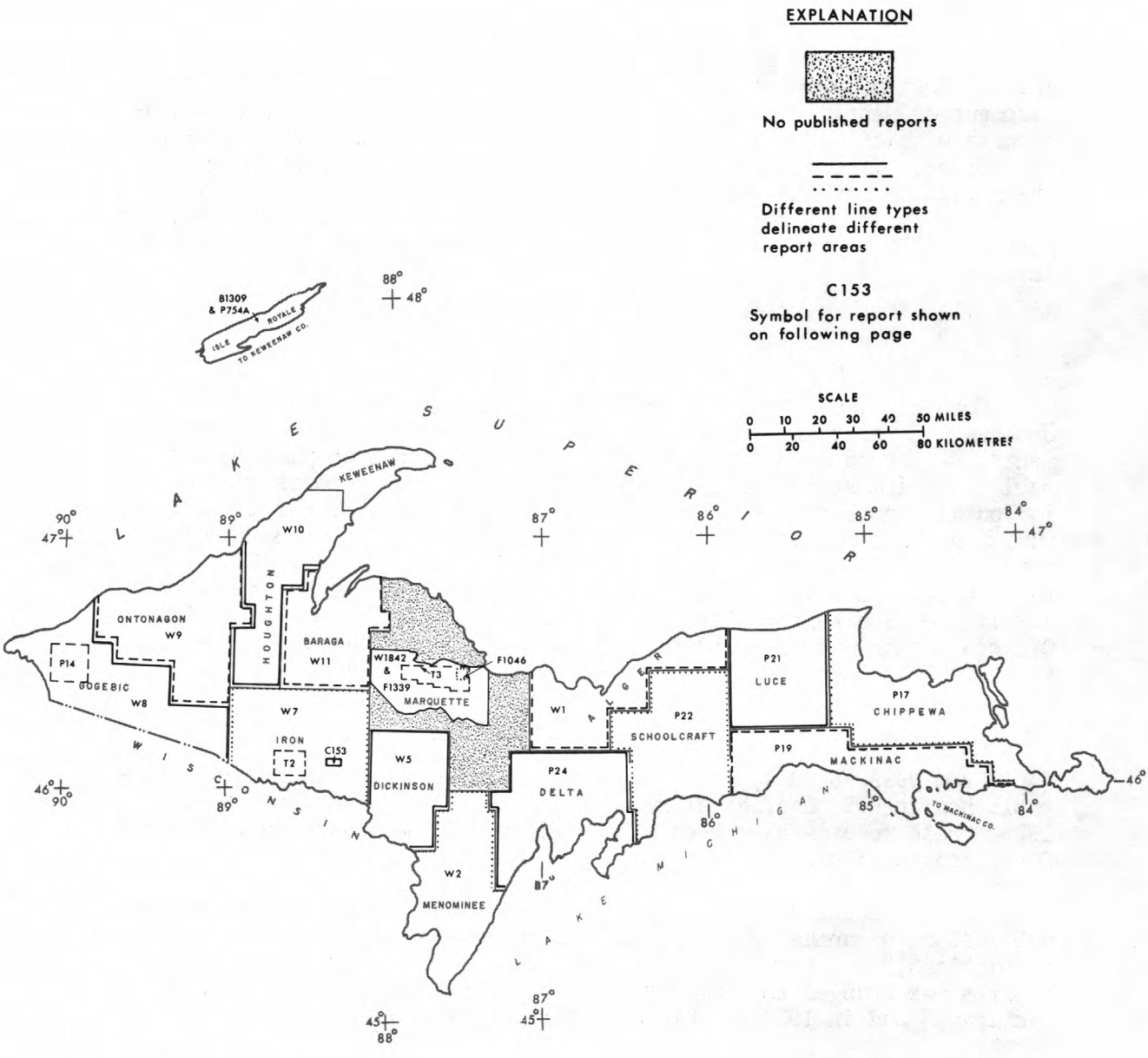


Figure 2.--Areas in the Upper Peninsula where ground-water conditions are described in published reports.

PUBLISHED REPORTS

Upper Peninsula

B1309 -- Huber, N. K., 1975, The geologic story of Isle Royale National Park: U.S. Geological Survey Bulletin 1309.

C153 -- Pettijohn, F. J., 1952, Geology of the northern Crystal Falls area, Iron County, Michigan: U.S. Geological Survey Circular 153.

F1046 -- Grannemann, N. G., 1978, Water supply potential of the Lake Sally system, Marquette County Michigan: U.S. Geological Survey Open-File Report 78-1046.

F1339 -- _____, 1979, Water resources of the Marquette Iron Range area, Marquette County, Michigan: U.S. Geological Survey Open-File Report 79-1339.

P14 -- Brown, E. A., and Stuart, W. T., 1951, Ground-water resources of the glacial deposits in the Bessemer area, Michigan: Michigan Geological Survey Progress Report 14.

P17 -- Vanlier, K. E., and Deutsch, Morris, 1958, Reconnaissance of the ground-water resources of Chippewa County, Michigan: Michigan Geological Survey Progress Report 17.

P19 -- _____, 1958, Reconnaissance of the ground-water resources of Mackinac County, Michigan: Michigan Geological Survey Progress Report 19.

P21 -- Vanlier, K. E., 1959, Reconnaissance of the ground-water resources of Luce County, Michigan: Michigan Geological Survey Progress Report 21.

P22 -- Sinclair, W. C., 1959, Reconnaissance of the ground-water resources of Schoolcraft County, Michigan: Michigan Geological Survey Progress Report 22.

P24 -- _____, 1960, Reconnaissance of the ground-water resources of Delta County, Michigan: Michigan Geological Survey Progress Report 24.

P754A -- Huber, N. K., 1973, Glacial and postglacial geologic history of Isle Royale National Park, Michigan: U.S. Geological Survey Professional Paper 754-A.

T2 -- Stuart, W. T., Theis, C. V., and Stanley, G. M., 1948, Ground-water problems in the Iron River district, Michigan: Michigan Geological Survey Technical Report 2.

T3 -- Stuart, W. T., Brown, E. A., and Rhodehamel, E. C., 1954, Ground-water investigations of the Marquette iron-mining district, Michigan: Michigan Geological Survey Technical Report 3.

W1 -- Vanlier, K. E., 1963, Reconnaissance of the ground-water resources in Alger County, Michigan: Michigan Geological Survey Water Investigation 1.

W2 -- _____, 1963, Ground water in Menominee County: Michigan Geological Survey Water Investigation 2.

W5 -- Hendrickson, G. E., and Doonan, C. J., 1966, Ground-water resources of Dickinson County, Michigan: Michigan Geological Survey Water Investigation 5.

W7 -- Doonan, C. J., Hendrickson, G. E., 1967, Ground water in Iron County, Michigan: Michigan Geological Survey Water Investigation 7.

W8 -- _____, 1968, Ground water in Gogebic County, Michigan: Michigan Geological Survey Water Investigation 8.

W9 -- _____, 1969, Ground water in Ontonagon County, Michigan: Michigan Geological Survey Water Investigation 9.

W10 -- Doonan, C. J., Hendrickson, G. E., and Byerlay, J. R., 1970, Ground water and geology of Keweenaw Peninsula, Michigan: Michigan Geological Survey Water Investigation 10.

W11 -- Doonan, C. J., and Byerlay, J. R., 1973, Ground water and geology of Baraga County, Michigan: Michigan Geological Survey Water Investigation 11.

W1842 -- Wiitala, S. W., Newport, T. G., and Skinner, E. L., 1967, Water resources of the Marquette Iron Range area, Michigan: U.S. Geological Survey Water-Supply Paper 1842.

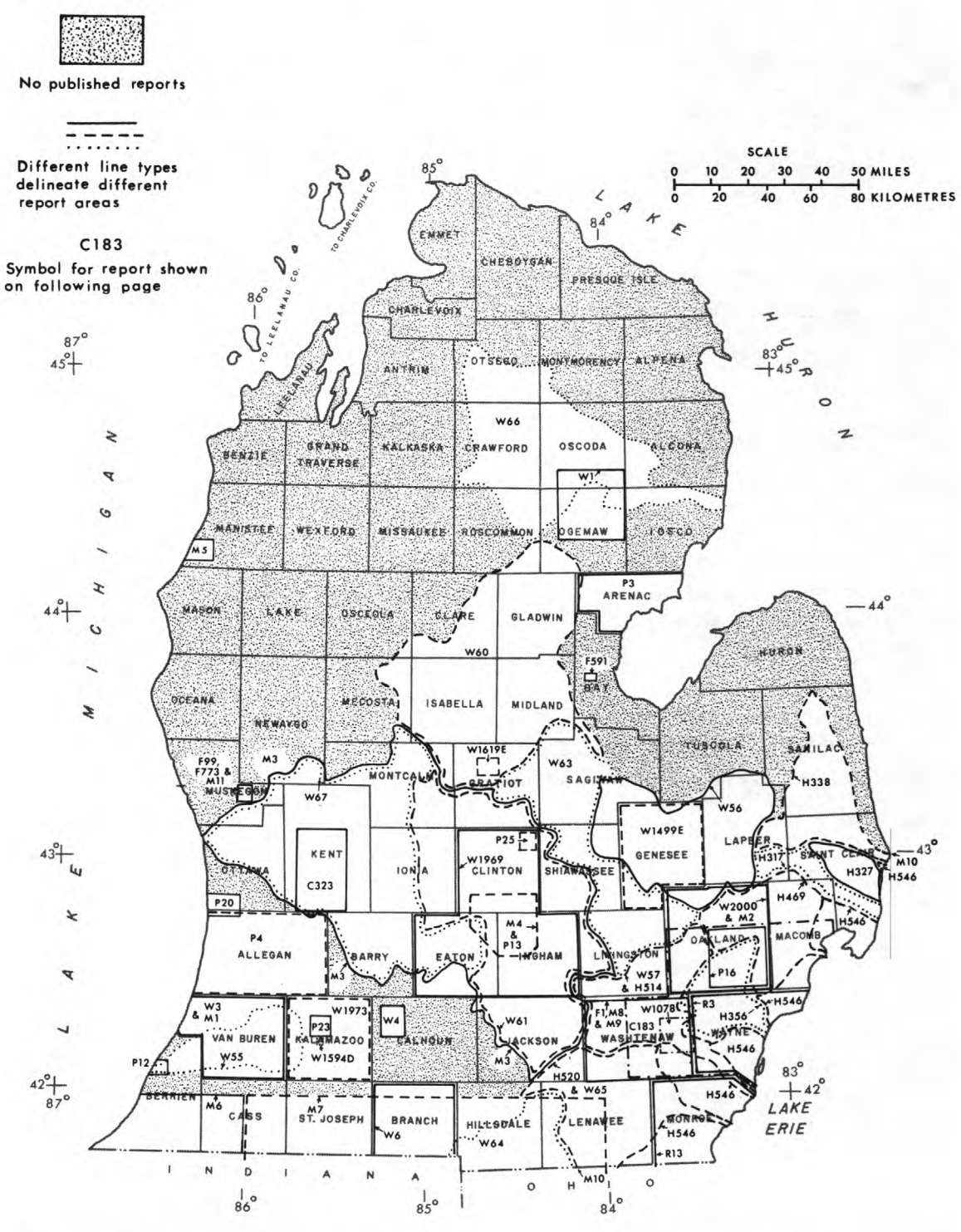


Figure 3.--Areas in the Lower Peninsula where ground-water conditions are described in published reports.

PUBLISHED REPORTS

Lower Peninsula

C183 -- Wisler, C. O., Stramel, G. J., and Laird, L. B., 1952, Water resources of the Detroit area, Michigan: U.S. Geological Survey Circular 183.

C323 -- Stramel, G. J., Wisler, C. O., and Laird, L. B., 1954, Water resources of the Grand Rapids area, Michigan: U.S. Geological Survey Circular 323.

F1 -- Fleck, W. B., 1974, Geology and hydrology for environmental planning in Washtenaw County, Michigan: U.S. Geological Survey Open-File Report unnumbered.

F99 -- McDonald, M. G., and Fleck, W. B., 1978, Model analysis of the impact on ground-water conditions of the Muskegon County wastewater disposal system, Michigan: U.S. Geological Survey Open-File Report 78-99.

F591 -- Stark, J. R., and McDonald, M. G., 1980, Ground water of coal deposits, Bay County, Michigan: U.S. Geological Survey Open-File Report 80-591.

F773 -- McDonald, M. G., 1980, Hydraulic characteristics of an underdrained irrigation circle, Muskegon County wastewater disposal system, Michigan: U.S. Geological Survey Open-File Report 80-773.

H317 -- Knutilla, R. L., 1969, Water resources of the Belle River basin, southeastern Michigan: U.S. Geological Survey Hydrological Investigation Atlas HA-317.

H327 -- _____, 1969, Water resources of the Pine River basin, southeastern Michigan: U.S. Geological Survey Hydrological Investigation Atlas HA-327.

H338 -- _____, 1970, Water resources of the Black River basin, southeastern Michigan: U.S. Geological Survey Hydrological Investigation Atlas HA-338.

H356 -- _____, 1971, Water resources of the River Rouge basin, southeastern Michigan: U.S. Geological Survey Hydrological Investigation Atlas HA-356.

H469 -- Nowlin, J. O., 1973, Water resources of the Clinton River basin, southeastern Michigan: U.S. Geological Survey Hydrological Investigation Atlas HA-469.

H514 -- Larson, R. W., Allen, W. B., and Hanson, S. D., 1975, Water resources of the Huron River basin, southeastern Michigan: U.S. Geological Survey Hydrological Investigation Atlas HA-514.

H520 -- Knutilla, R. L., and Allen, W. B., 1975, Water resources of the River Raisin basin, southeastern Michigan: U.S. Geological Survey Hydrological Investigation Atlas HA-520.

H546 -- Twenter, F. R., Knutilla, R. L., Cummings, T. R., 1975, Water resources of basins for minor streams draining into St. Clair River, Lake St. Clair, Detroit River, and Lake Erie, southeastern Michigan: U.S. Geological Survey Hydrological Investigation Atlas HA-546.

MI • -- Terwilliger, F. W., 1954, The glacial geology and ground-water resources of Van Buren County, Michigan, pt. 1 of Occasional papers for 1954 on the geology of Michigan: Michigan Geological Survey Publication 48.

M2 -- Mozola, A. J., 1954, A survey of ground-water resources in Oakland County, Michigan, pt. 2 of Occasional papers for 1954 on the geology of Michigan: Michigan Geological Survey Publication 48.

M3 -- Vanlier, K. E., 1968, Comprehensive planning study of the Grand River basin, Michigan, Appendix E, Ground-water resources and geology of the Grand River basin, Michigan: U.S. Army Engineers District, Detroit, Michigan.

M4 -- Vanlier, K. E., and Wheeler, M. L., 1968, Analog simulation of ground-water development of the Saginaw Formation, Lansing metropolitan area, Michigan: Tri-County Planning Commission, Lansing Ground-Water Report.

M5 -- Childs, K. E., 1970, History of the salt, brine, and paper industries and their probable effect on the ground-water quality in the Manistee Lake area, Michigan: Michigan Department of Natural Resources.

M6 -- Schneider, A. F., and Keller, S. J., 1970, Indiana Geological Survey regional geological map number 4: Indiana Department of Natural Resources.

M7 -- Johnson, G. H., and Keller, S. J., 1972, Indiana Geological Survey regional geological map number 8: Indiana Department of Natural Resources.

M8 -- Twenter, F. R., Knutilla, R. L., and Nowlin, J. O., 1976, Water resources of Washtenaw County, Michigan: Washtenaw County Metropolitan Planning Commission.

M9 -- Borton, T. E., 1974, Planning perspectives on water resources, Washtenaw County, Michigan: Washtenaw County Metropolitan Planning Commission.

M10 -- Twenter, F. R., 1975, Ground water and geology -- southeastern Michigan: U.S. Army Corps of Engineers.

M11 -- Fleck, W. B., and McDonald, M. G., 1978, Three-dimensional finite-difference model of ground-water system underlying the Muskegon County wastewater disposal system, Michigan: U.S. Geological Survey Journal of Research, volume 6, number 3.

P3 -- Pringle, G. H., 1937, Geology of Arenac County, Michigan: Michigan Geological Survey Progress Report 3.

P4 -- Riggs, C. H., 1938, Geology of Allegan County, Michigan: Michigan Geological Survey Progress Report 4.

P12 -- Stuart, W. T., and Stallman, R. W., 1945, Ground-water resources of the Benton Harbor area, Michigan: Michigan Geological Survey Progress Report 12.

P13 -- Stuart, W. T., 1945, Ground-water resources of the Lansing area, Michigan: Michigan Geological Survey Progress Report 13.

P16 -- Ferris, J. G., and others, 1954, Ground-water resources of southeastern Oakland County, Michigan: Michigan Geological Survey Progress Report 16.

P20 -- Deutsch, Morris, Burt, E. M., and Vanlier, K. E., 1958, Summary of ground-water investigations in the Holland area, Michigan: Michigan Geological Survey Progress Report 20.

Lower Peninsula

P23 -- Deutsch, Morris, Vanlier, K. E., and Giroux, P. R., 1960, Ground-water hydrology and glacial geology of the Kalamazoo area, Michigan: Michigan Geological Survey Progress Report 23.

P25 -- Vanlier, K. E., 1962, Summary of ground-water investigations in the Elsie area, Michigan: Michigan Geological Survey Progress Report 25.

R3 -- Mozola, A. J., 1969, Geology for land and ground-water development in Wayne County, Michigan: Michigan Geological Survey Report Investigation 3.

R13 -- _____, 1970, Geology for environmental planning in Monroe County, Michigan: Michigan Geological Survey Report Investigation 13.

WI -- Knutilla, R. L., Twenter, F. R., and Larson, R. W., 1971, Upper Rifle River Basin -- An Evaluation of its Water Resources and Hydrologic Environment: Michigan Geological Survey Water Information Series Report 1.

W3 -- Giroux, P. R., Hendrickson, G. E., Stoimenoff, L. E., and Whetstone, G. W., 1964, Water resources of Van Buren County, Michigan: Michigan Geological Survey Water Investigation 3.

W4 -- Vanlier, K. E., 1966, Ground-water resources of the Battle Creek area, Michigan: Michigan Geological Survey Water Investigation 4.

W6 -- Giroux, P. R., Stoimenoff, L. E., Nowlin, J. O., and Skinner, E. L., 1966, Water resources of Branch County, Michigan: Michigan Geological Survey Water Investigation 6.

W55 -- Water resource conditions and uses in the Paw Paw River Basin, 1955, (revised report in 1964): Michigan Water Resources Commission Report.

W56 -- Water resource conditions and uses in the Flint River Basin, 1956: Michigan Water Resources Commission Report.

W57 -- Water resource conditions and uses in the Huron River Basin, 1957: Michigan Water Resources Commission Report.

W60 -- Water resource conditions and uses in the Tittabawassee River Basin, 1960: Michigan Water Resources Commission Report.

W61 -- Water resource conditions and uses in the Upper Grand River Basin, 1961: Michigan Water Resources Commission Report.

W63 -- Water resource conditions and uses in the Shiawassee River Basin, 1963: Michigan Water Resources Commission Report.

W64 -- Water resource conditions and uses in the Maumee River Basin, 1964: Michigan Water Resources Commission Report.

W65 -- Water resource conditions and uses in the River Raisin Basin, 1965: Michigan Water Resources Commission Report.

W66 -- Water resource conditions and uses in the Au Sable River Basin, 1966: Michigan Water Resources Commission Report.

W67 -- Water resource conditions and uses in the Lower Grand River Basin, 1967, (open file): Michigan Water Resources Commission Report.

W1078 -- McGuinness, C. L., Poindexter, O. F., and Otten, E. G., 1949, Ground-water supplies of the Ypsilanti area, Michigan: U.S. Geological Survey Water-Supply Paper 1078.

W1499E -- Wiitala, S. W., Vanlier, K. E., and Krieger, R. A., 1963, Water resources of the Flint area, Michigan: U.S. Geological Survey Water-Supply Paper 1499-E.

W1594D -- Reed, J. E., Deutsch, Morris, and Wiitala, S. W., 1966, Induced recharge of an artesian glacial-drift aquifer at Kalamazoo, Michigan: U.S. Geological Survey Water-Supply Paper 1594-D.

W1619E -- Vanlier, K. E., 1963, Ground-water resources of the Alma area, Michigan: U.S. Geological Survey Water-Supply Paper 1619-E.

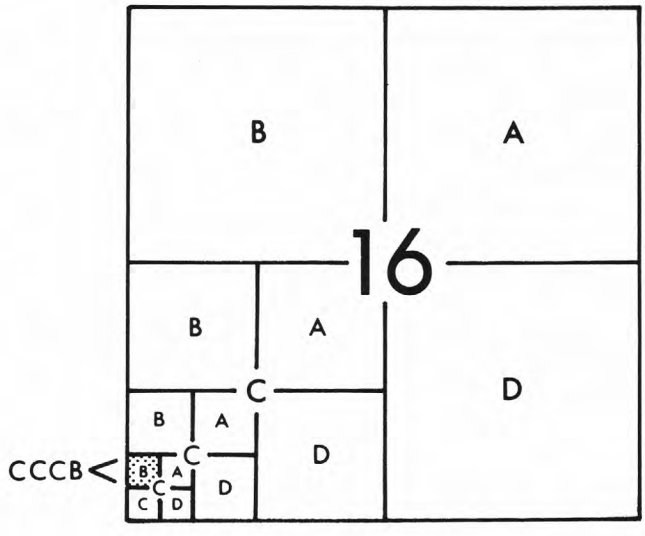
W1969 -- Vanlier, K. E., Wood, W. W., and Brunett, J. O., 1973, Water-supply development and management alternatives for Clinton, Eaton, and Ingham Counties, Michigan: U.S. Geological Survey Water-Supply Paper 1969.

W1973 -- Allen, W. B., Miller, J. B., and Wood, W. W., 1972, Availability of water in Kalamazoo County, Michigan: U.S. Geological Survey Water-Supply Paper 1973.

W2000 -- Twenter, F. R., and Knutilla, R. L., 1972, Water for a rapidly growing urban community -- Oakland County, Michigan: U.S. Geological Survey Water-Supply Paper 2000.

Well-numbering system

The well-numbering system for Michigan indicates the location of wells within the rectangular subdivision of the 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 below. Thus, a well designated as 32N 6E 16CCCB is located to the nearest 2.5 acres and is within the shaded area in section 16.



For many wells in this report, locations are only given to the nearest 40-acre tract, for example, 16CC. In the event that two or more wells are in the same tract, a sequential number designation is added--for example, 16CCCB1, 16CCCB2, etc. The Michigan Geological Survey uses a similar system except that numbers are used instead of letters.

GROUND-WATER LEVELS

Water levels were measured in 133 observation wells throughout the State (fig. 1 and table 1) in 1980. Ground-water levels generally follow precipitation trends. In areas where precipitation has been above normal, ground-water levels are generally above average. Where precipitation has been below normal, levels are generally below average. Although the quantity of precipitation is one of the major factors affecting ground-water levels, many other factors, such as soil conditions; time, duration, and intensity of precipitation; nature of underlying rocks; and slope of the land surface affect the levels.

Hydrographs of fluctuations of water levels in wells (fig. 4) show that levels are highest in the spring. At this time, snowmelt and rain normally result in large additions to ground-water reservoirs. However, ice cover or frost in the ground can impede infiltration. Under these conditions, most water from snowmelt and precipitation runs off rapidly, and little goes to recharge the ground-water reservoirs. Recharge is small during the growing season, as most rainfall is evaporated, is transpired by vegetation, or runs off overland after heavy showers. In the fall, evapotranspiration is reduced by cold weather. At this time, heavy rains may cause water levels to rise. Frozen ground impedes the infiltration of water during the winter.

In addition to changes in water levels from precipitation, temporary changes in levels may be caused by earth tides and variation in barometric pressure. Evapotranspiration causes small daily declines in water levels in some wells.

AREA GROUND-WATER DATA

Descriptions of some of Michigan's municipal, institutional, and areal ground-water supplies follow alphabetically, by counties. Yield of wells and pumpage data are given as they were reported by water departments and consultants. Included are data on the chemical quality of water, based on latest analyses made by the Michigan Department of Health. Where more than one well is involved, a range in quality is generally given. In this report, the unit milligrams per liter (mg/L) can be considered to be numerically equal to parts per million (ppm). Most descriptions are supplemented by illustrations.

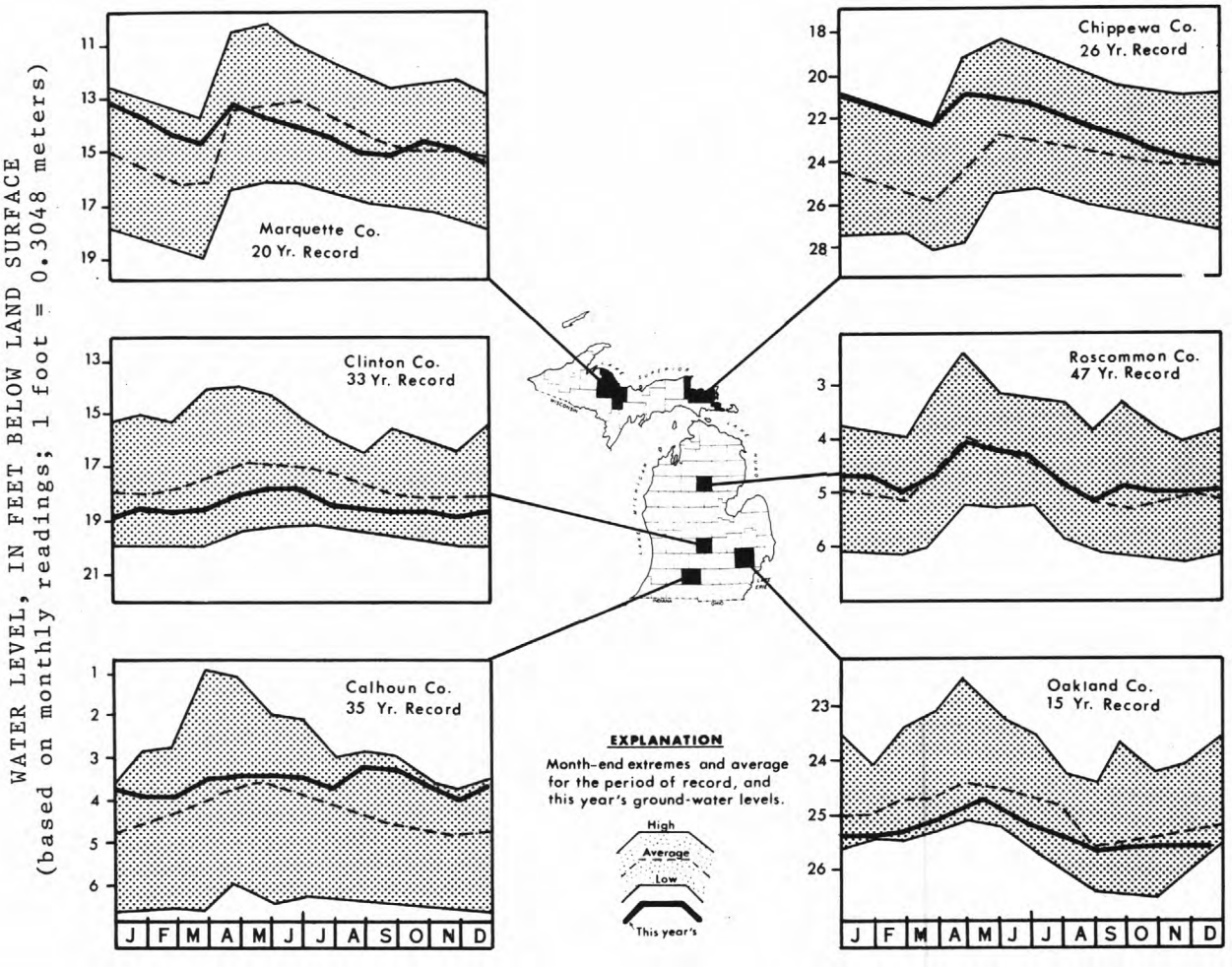
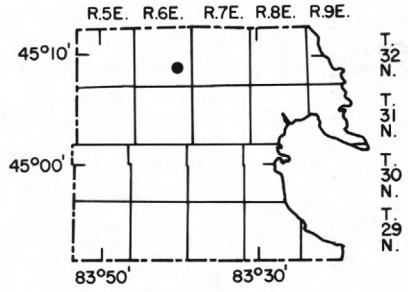
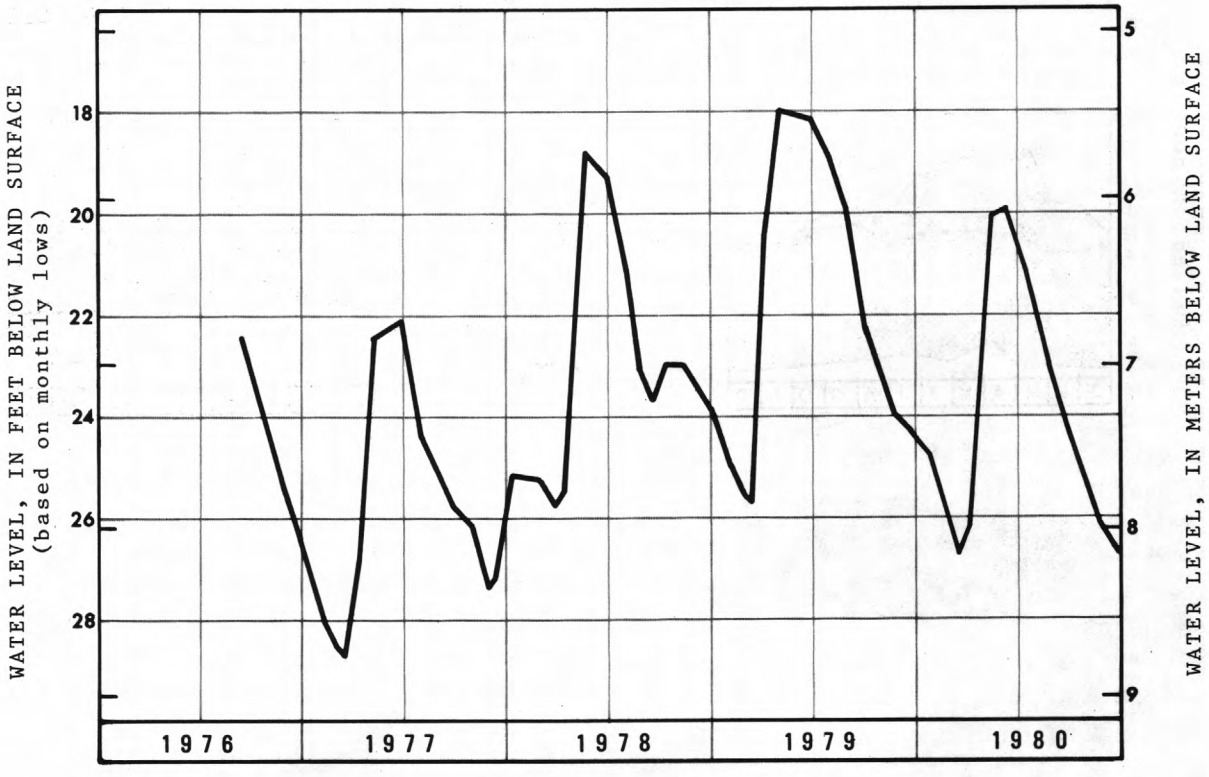


Figure 4.--Water levels in selected wells, 1980.





Geological Survey observation well 32N 6E 23DDDA1. Well is 88 feet deep and in sand. Water-quality data in previous ground-water report (Huffman, 1979).

BRANCH COUNTY - CITY OF COLDWATER

SUPPLY AND SOURCE -- 4 wells, 117 to 129 feet deep, tap glacial deposits.

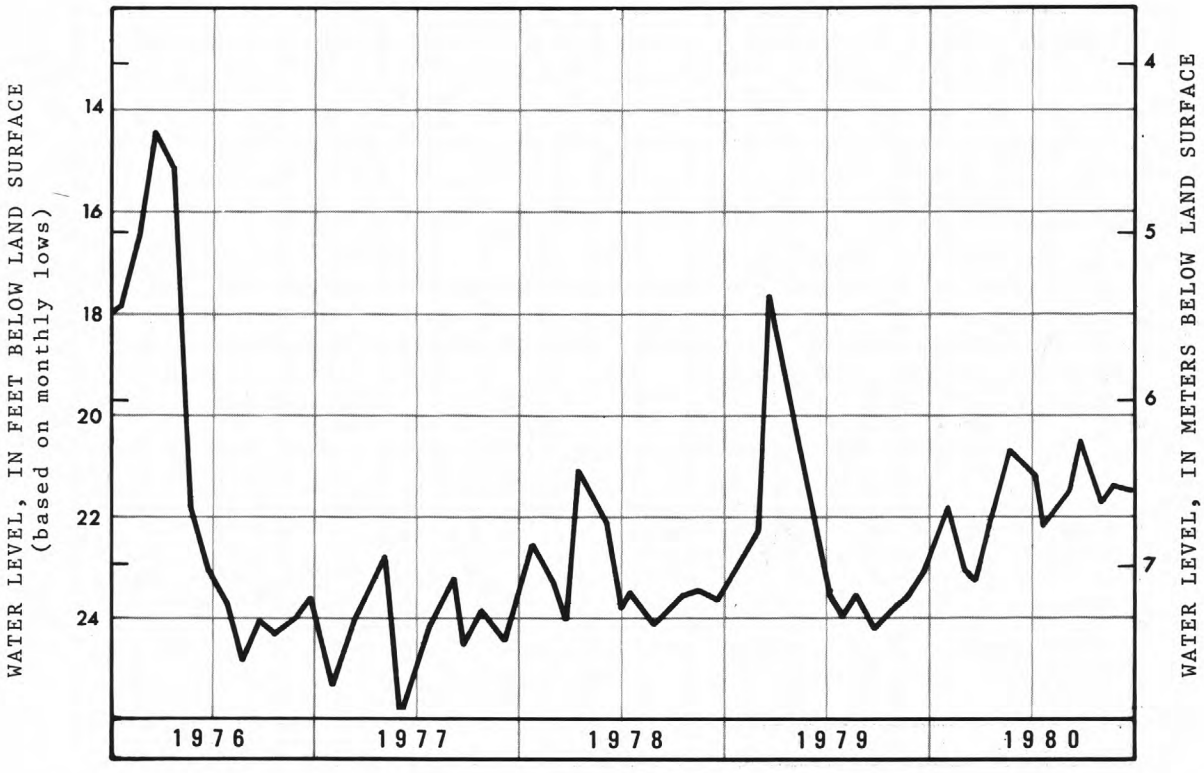
YIELD OF WELLS -- 1,200 to 2,850 gal/min; specific capacity -- 80 to 190 gal/min/ft of drawdown.

PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1980	1,169
1979	1,209
1978	1,223
1977	1,154
1976	1,085

QUALITY OF WATER --

Hardness	305-320 mg/L
Iron	1.9-2.3 mg/L
Diss. Solids	364-386 mg/L



Water levels in observation well 6S 6W 22CA at Coldwater. Well is 113 feet deep and in glacial deposits.

CALHOUN COUNTY - CITY OF BATTLE CREEK

SUPPLY AND SOURCE -- 29 wells, 110 to 152 feet deep, tap sandstones of Marshall Formation. All are located at the Verona Field.

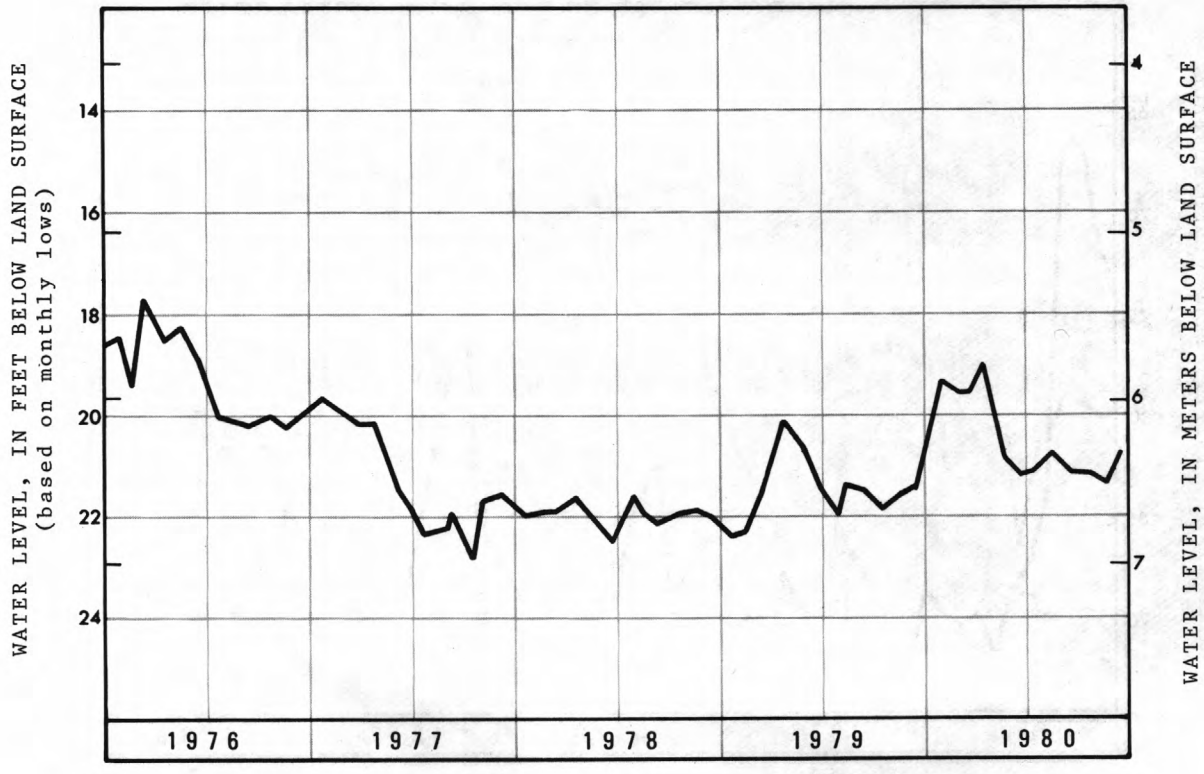
YIELD OF WELLS -- 300 to 1,000 gal/min; specific capacity -- 50 to 650 gal/min/ft of drawdown.

PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1980	2,836
1979	2,875
1978	2,659
1977	2,443
1976	2,357

QUALITY OF WATER --

Hardness	295-345 mg/L
Iron	0.05-1.3 mg/L
Diss. Solids	333-413 mg/L



Water levels in observation well 1S 7W 32BDCC1 at Battle Creek. Well is 95 feet deep and in the Marshall Formation.

CLINTON COUNTY - CITY OF ST. JOHNS

SUPPLY AND SOURCE -- 7 wells, 420 to 525 feet deep, tap sandstones of Saginaw Formation.

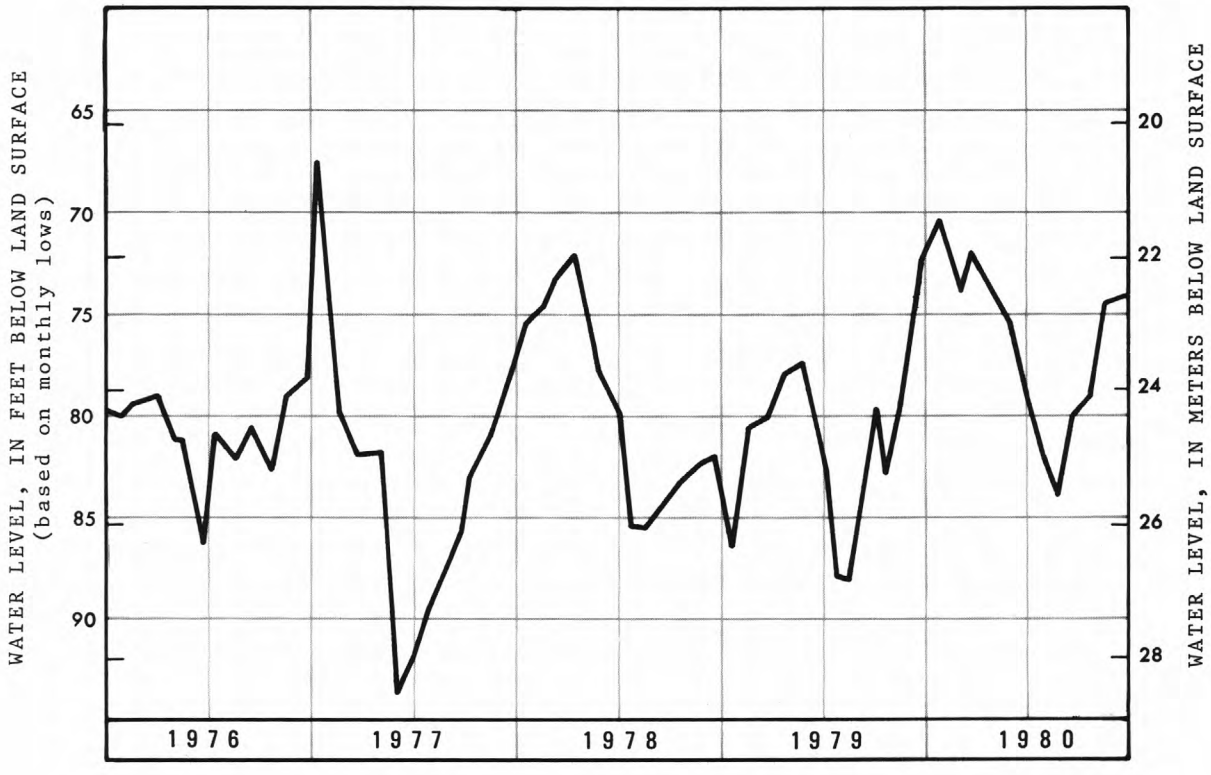
YIELD OF WELLS -- 250 to 500 gal/min; specific capacity -- 3 to 12 gal/min/ft of drawdown.

PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1980	423
1979	511
1978	529
1977	607
1976	562

QUALITY OF WATER --

Hardness	260-310 mg/L
Iron	0.15-1.0 mg/L
Diss. Solids	360-390 mg/L



Water levels in observation well 7N 2W 9BB at St. Johns. Well is 535 feet deep and in the Saginaw Formation.

SUPPLY AND SOURCE -- 8 wells, 268 to 423 feet deep, tap Saginaw Formation.

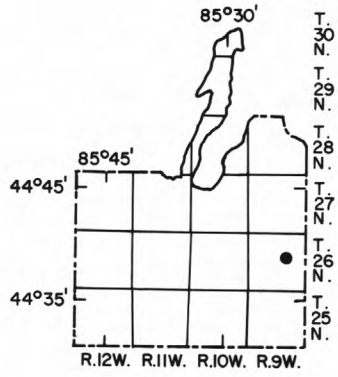
YIELD OF WELLS -- 160 to 700 gal/min.

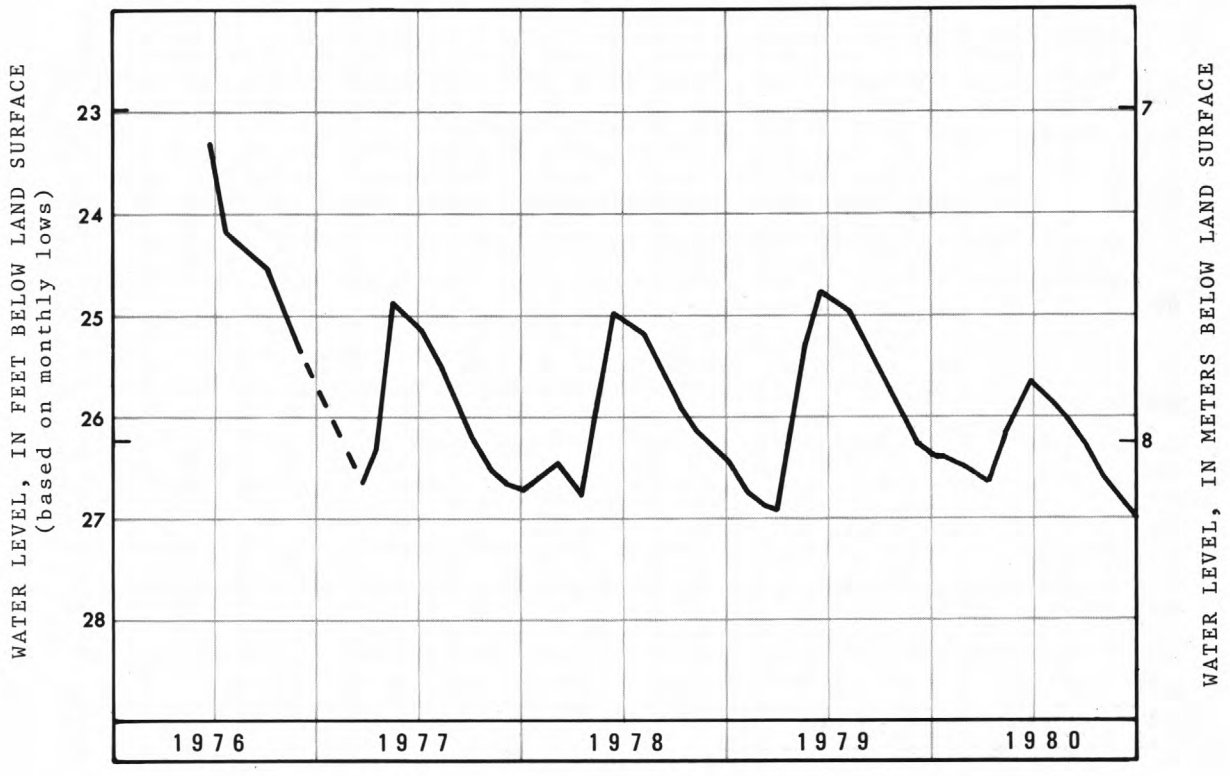
PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1980	753
1979	800
1978	771
1977	645
1976	625

QUALITY OF WATER --

Hardness	275-429 mg/L
Iron	0.4-3.1 mg/L
Diss. Solids	364-539 mg/L





Geological Survey observation well 26N 9W 14ABAA1. Well is 80 feet deep and in sand. Water-quality data in previous ground-water report (Huffman, 1979).

SUPPLY AND SOURCE -- 125 wells, 400 to 425 feet deep, tap sandstones of Saginaw Formation; 3 wells, 85 to 105 feet deep, tap sand beds in glacial deposits.

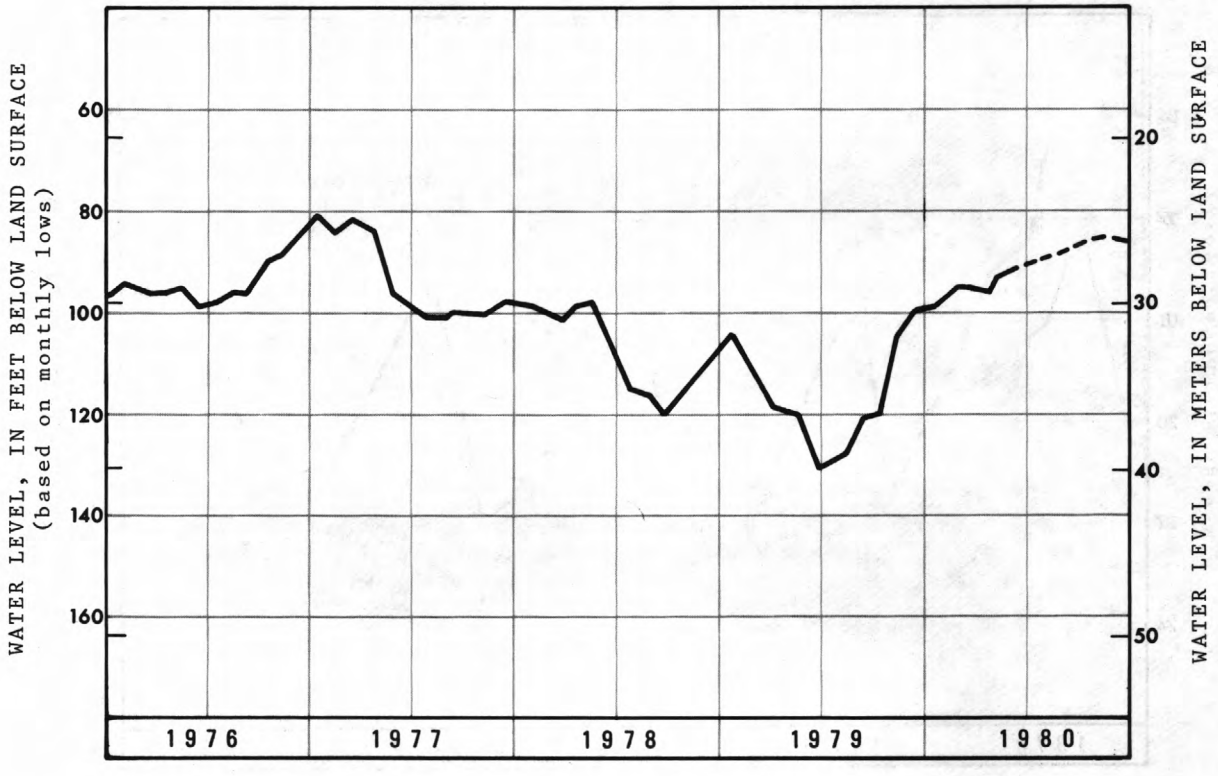
YIELD OF WELLS -- Sandstone - 100 to 700 gal/min; specific capacity --3 to 10 gal/min/ft of drawdown.
-- Glacial deposits - 790 to 1,200 gal/min, specific capacity 12 to 80 gal/min/ft of drawdown.

PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1980	8,592
1979	9,574
1978	9,308
1977	9,203
1976	8,976

QUALITY OF WATER -- Composite at Plant

Hardness	385 mg/L
Iron	0.88 mg/L
Diss. Solids	456 mg/L



Water levels in observation well 4N 2W 9BD at Lansing. Well is 401 feet deep and in the Saginaw Formation.

SUPPLY AND SOURCE -- 1 well, about 50 feet deep, taps glacial deposits;
1 well, 223 feet deep, taps sandstones of Saginaw Formation.

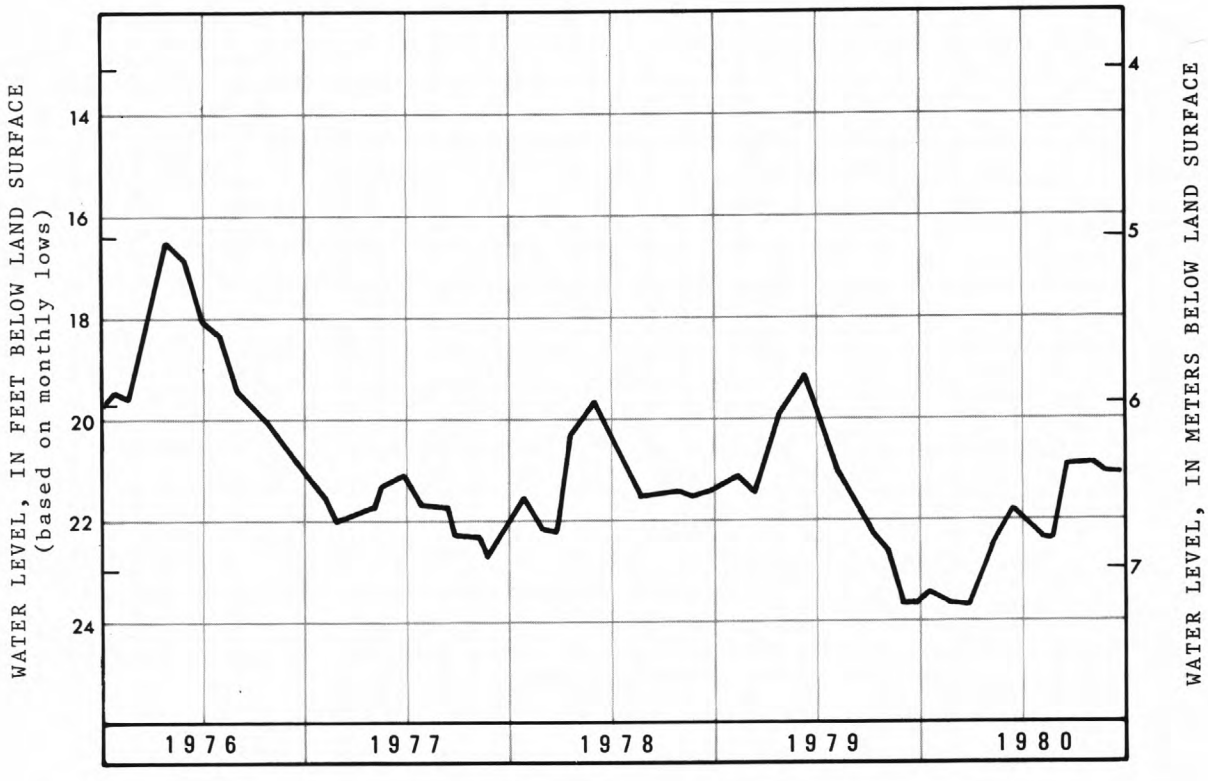
YIELD OF WELLS -- 675 to 700 gal/min; specific capacity -- No. 3 yields
30 gal/min/ft of drawdown from the glacial drift.

PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1980	217
1979	230
1978	191
1977	206
1976	218

QUALITY OF WATER --

Hardness	335-464 mg/L
Iron	0.0-0.40 mg/L
Diss. Solids	353-497 mg/L



Water levels in observation well 2N 1W 5BCAB1 at Mason. Well is 210 feet deep and in the Saginaw Formation.

INGHAM COUNTY
EAST LANSING-MERIDIAN WATER AUTHORITY

SUPPLY AND SOURCE -- 24 wells, 295 to 422 feet deep, tap Saginaw Formation; 1 well taps glacial deposits.

YIELD OF WELLS -- 280 to 1,000 gal/min; specific capacity -- 2 to 12 gal/min/ft of drawdown.

PUMPAGE -- Total annual pumpage, in million gallons.

1980	1,741
1979	1,775
1978	1,702
1977	1,654
1976	1,599

QUALITY OF WATER --

Hardness	360-505 mg/L
Iron	0.5-3.8 mg/L
Diss. Solids	386-662 mg/L

INGHAM COUNTY - LANSING TOWNSHIP

SUPPLY AND SOURCE -- 7 wells, 399 to 440 feet deep, tap sandstones of Saginaw Formation.

YIELD OF WELLS -- 260 to 500 gal/min; specific capacity -- 3 to 8 gal/min/ft of drawdown.

PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1980	513
1979	532
1978	538
1977	508
1976	586

QUALITY OF WATER --

Hardness	274-435 mg/L
Iron	0.35-13.0 mg/L
Diss. Solids	320-528 mg/L

REMARKS -- Most ground water pumped by the township is used to supply industrial plants in the area.

INGHAM COUNTY
MICHIGAN STATE UNIVERSITY

SUPPLY AND SOURCE -- 19 wells, 347 to 435 feet deep, tap sandstones of Saginaw Formation; 2 wells are on a standby basis only.

YIELD OF WELLS -- 147 to 654 gal/min; specific capacity -- 1 to 11 gal/min/ft of drawdown.

PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1980	1,627
1979	1,679
1978	1,698
1977	1,675
1976	1,731

QUALITY OF WATER --

Hardness	315-350 mg/L
Iron	0.15-1.20 mg/L
Diss. Solids	361-405 mg/L

JACKSON COUNTY - CITY OF JACKSON

SUPPLY AND SOURCE -- 14 wells, 380 to 400 feet deep, tap sandstones of Saginaw and Marshall Formations.

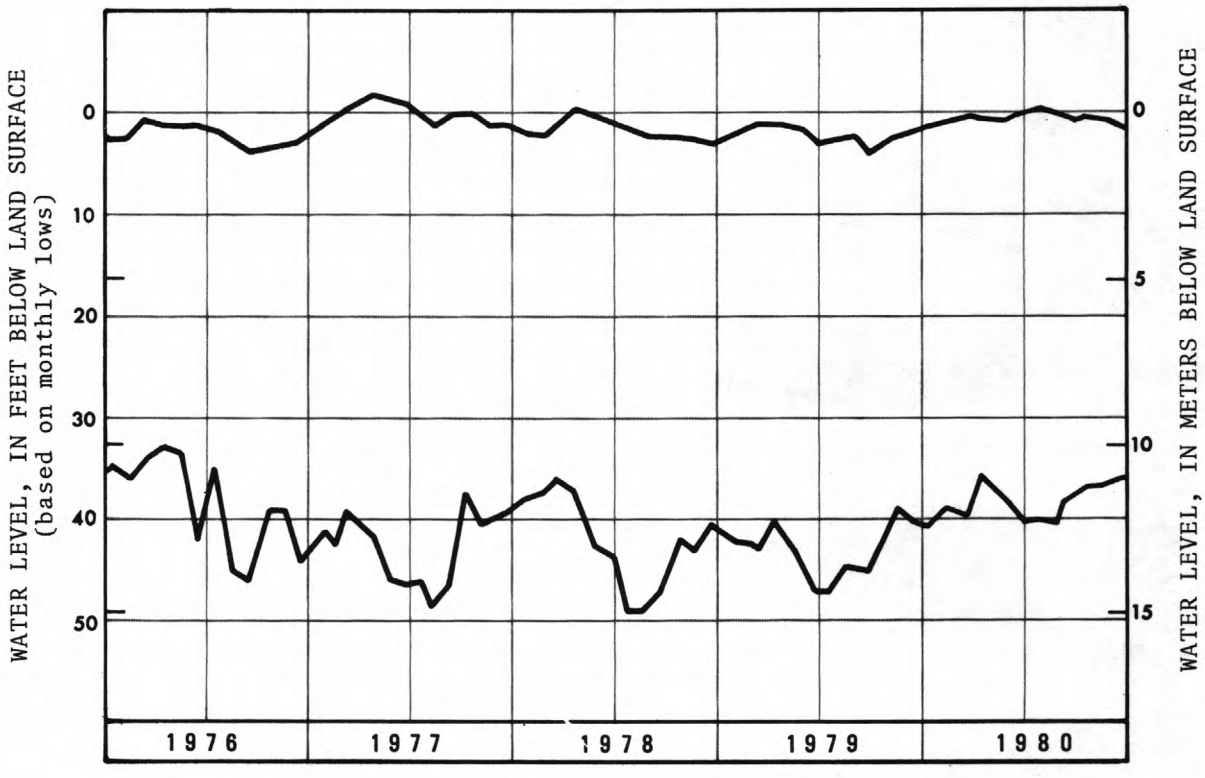
YIELD OF WELLS -- 1,000 to 2,800 gal/min; specific capacity -- reported average of all wells is 100 gal/min/ft of drawdown.

PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1980	3,734
1979	3,993
1978	4,225
1977	4,330
1976	4,104

QUALITY OF WATER --

Hardness	330-630 mg/L
Iron	0.2-0.42 mg/L
Diss. Solids	394-1072 mg/L



Water levels in observation wells 3S 1W 11AADD2 (top), and 3S 1W 2BDBA1 (bottom). Well 3S 1W 11AADD2 is 36 feet deep and in outwash. Well 3S 1W 2BDBA1 is 400 feet deep and in the Saginaw and Marshall Formations.

KALAMAZOO COUNTY - CITY OF KALAMAZOO

SUPPLY AND SOURCE -- 84 wells, 130 to 254 feet deep, tap glacial deposits.

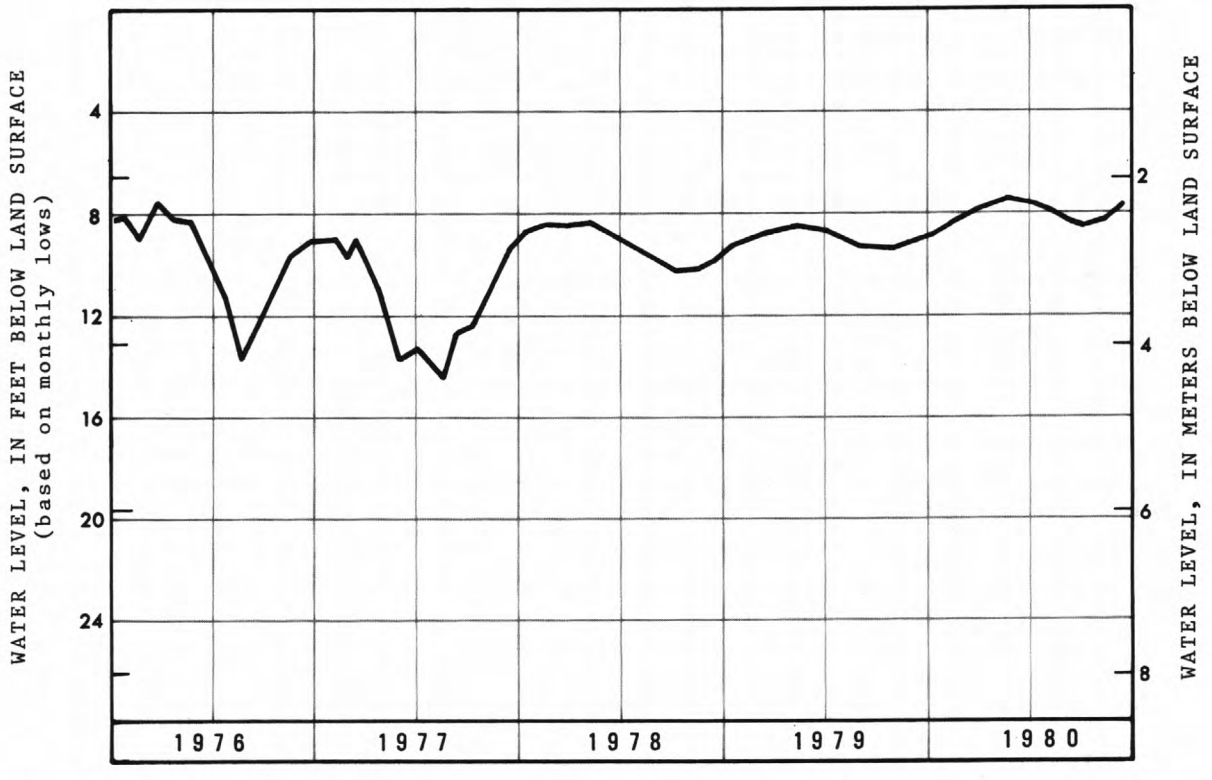
YIELD OF WELLS -- 200 to 2,000 gal/min; specific capacity -- 7 to 100 gal/min/ft of drawdown.

PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1980	5,774
1979	6,520
1978	6,551
1977	6,476
1976	6,549

QUALITY OF WATER -- Composite of 2 pumping stations:

Hardness	385-420 mg/L
Iron	0.49-3.10 mg/L
Diss. Solids	499-530 mg/L



Water levels in observation well 2S 11W 22CD at Kalamazoo. Well is 137 feet deep and in outwash.

KALAMAZOO COUNTY - CITY OF PORTAGE

SUPPLY AND SOURCE -- 15 wells, 92 to 184 feet deep, tap glacial deposits.

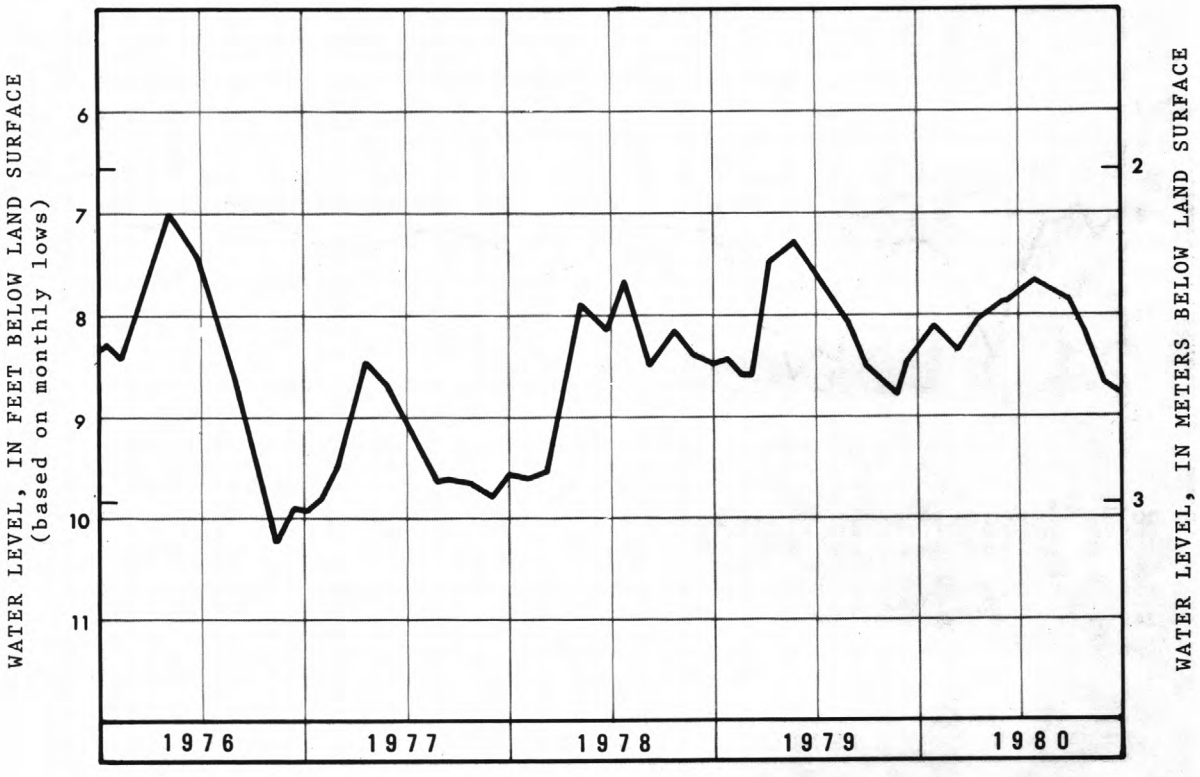
YIELD OF WELLS -- 300 to 1,000 gal/min; specific capacity -- 25 gal/min/ft of drawdown.

PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

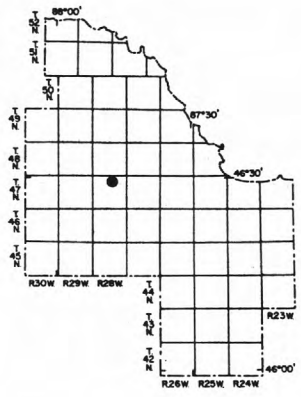
1980	811
1979	893
1978	851
1977	802
1976	784

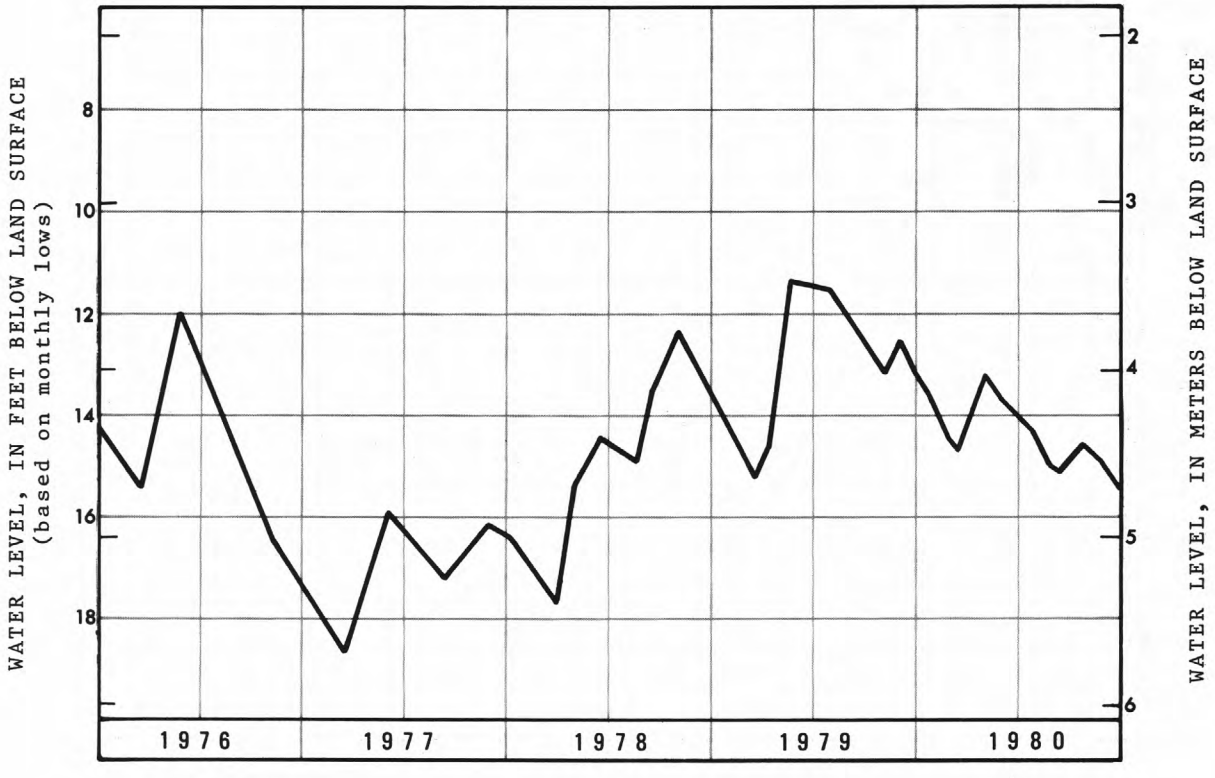
QUALITY OF WATER --

Hardness	185-345 mg/L
Iron	.08-1.2 mg/L
Diss. Solids	206-469 mg/L

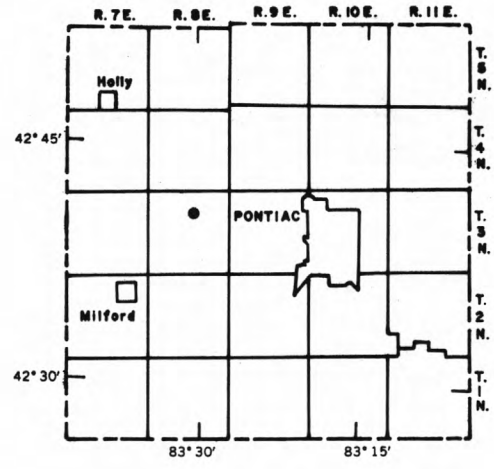


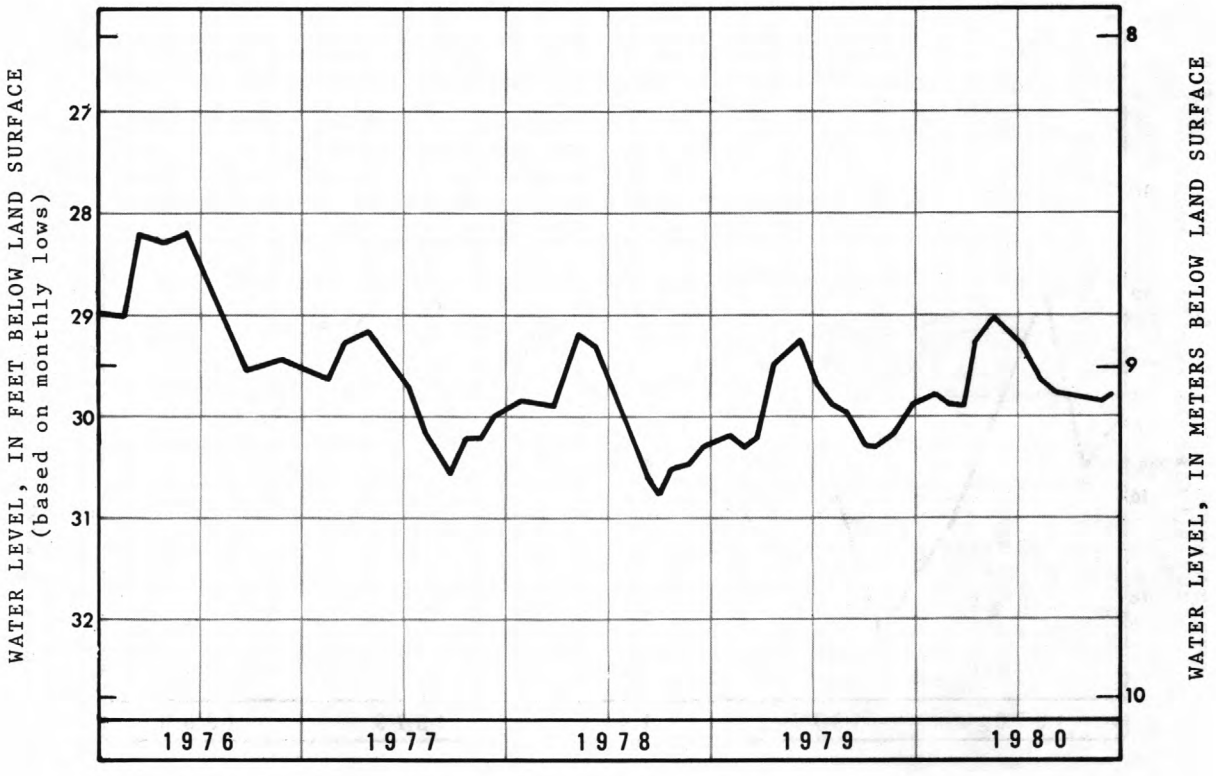
Water levels in observation well 3S 11W 22BD at Portage. Well is 120 feet deep and in outwash.



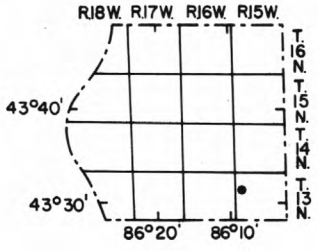


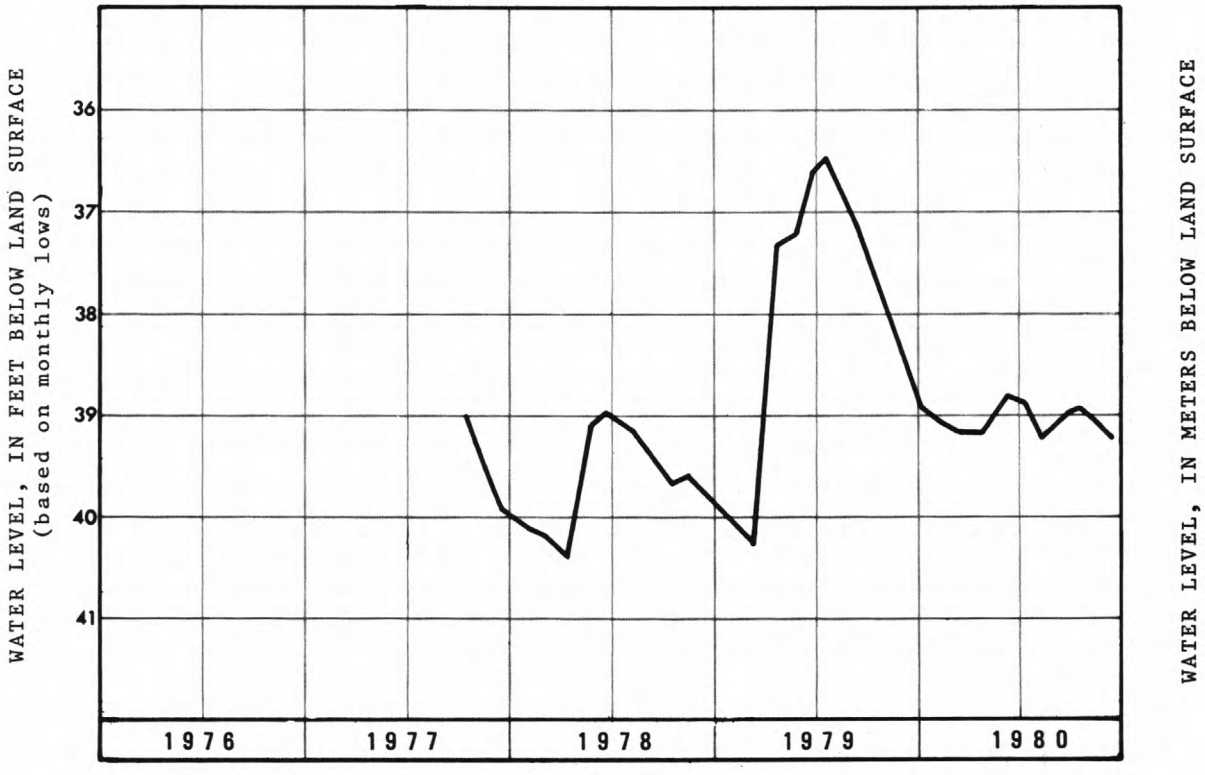
Water levels in observation well 47N 28W 3CCDC1 in Marquette County. Well is 75 feet deep and in outwash. Levels shown are typical of observation wells located in the Marquette Iron Range.



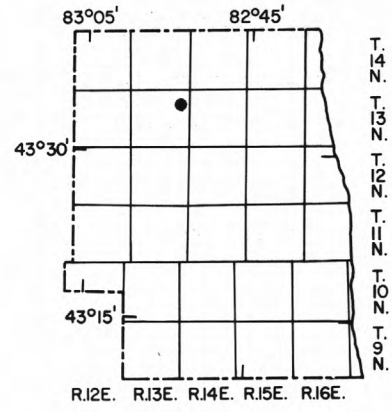


Water levels in observation well 3N 8E 10AB. Well is 163 feet deep and in glacial deposits.

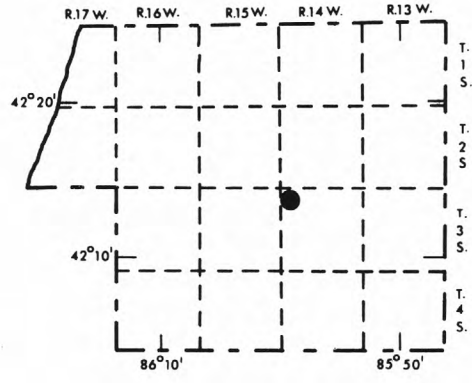


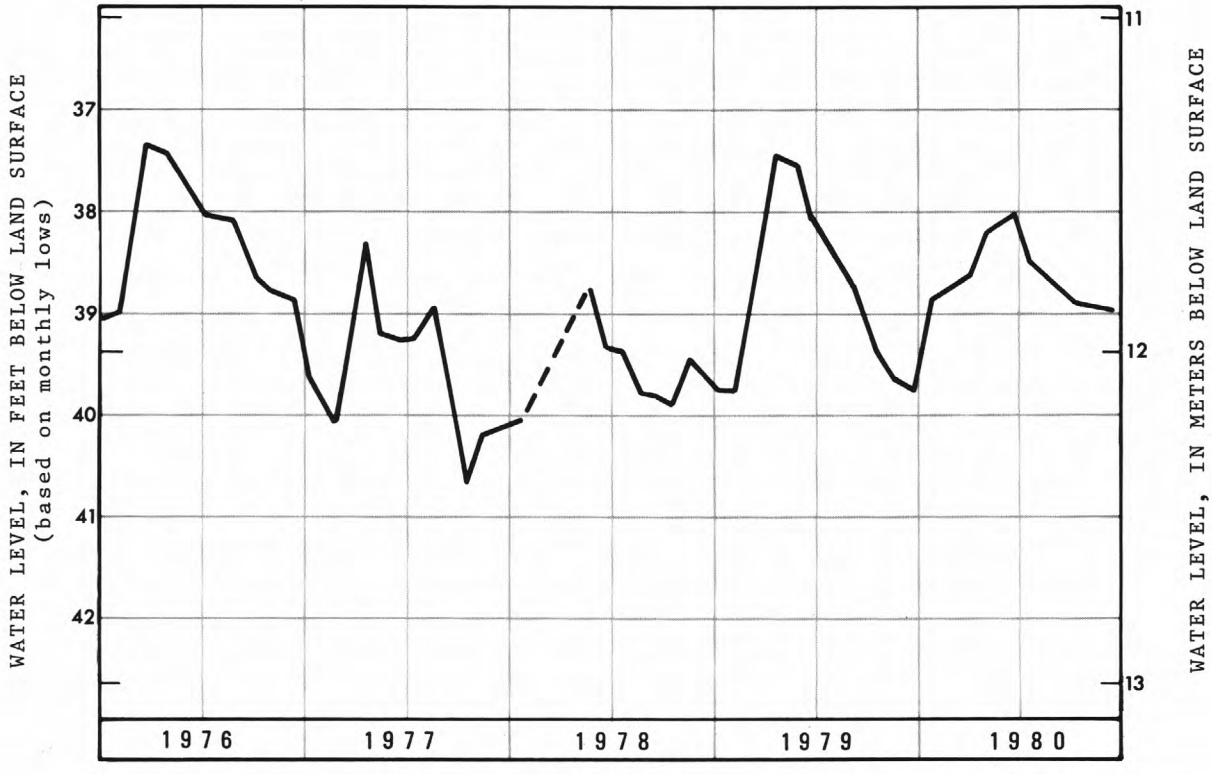


Geological Survey observation well 13N 15W 18AAAA01. Well is 79 feet deep and in outwash. Water-quality data in previous ground-water report (Huffman, 1979).



Geological Survey observation well 13N 13E 12ADAA1. Well is 130 feet deep and in the Marshall Formation. Water-quality data in previous ground-water report (Huffman, 1979).





Water levels in observation well 3S 14W 6BA in Van Buren County. Well is 59 feet deep and in glacial deposits. Levels are typical of other observation wells located in the county.

SUPPLY AND SOURCE -- 3 wells, 91 to 196 feet deep, tap glacial deposits; most water is pumped from the Huron River.

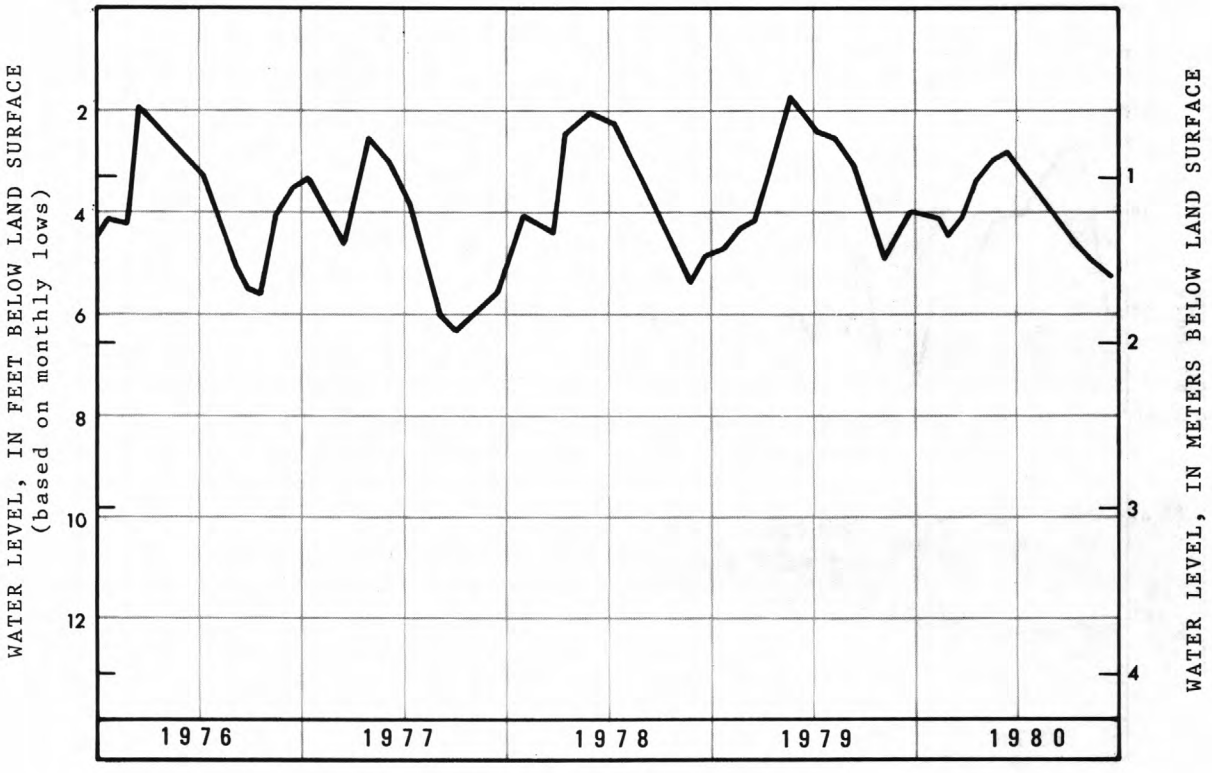
YIELD OF WELLS -- 1,050 to 4,860 gal/min; specific capacity -- 20 to 600 gal/min/ft of drawdown.

PUMPAGE -- Total annual ground-water pumpage, in million gallons, for past 5 years (ground water is used to augment supply from Huron River).

1980 - 742
1979 - 372
1978 - 705
1977 - 674
1976 - 677

QUALITY OF WATER -- Ground water:

Hardness	355-585 mg/L
Iron	0.25-2.4 mg/L



Water levels in observation well 3S 6E 16BCCD1 at Ann Arbor. Well is 55 feet deep and in glacial deposits.

SUPPLY AND SOURCE -- 6 wells, 87 to 102 feet deep, tap glacial deposits.

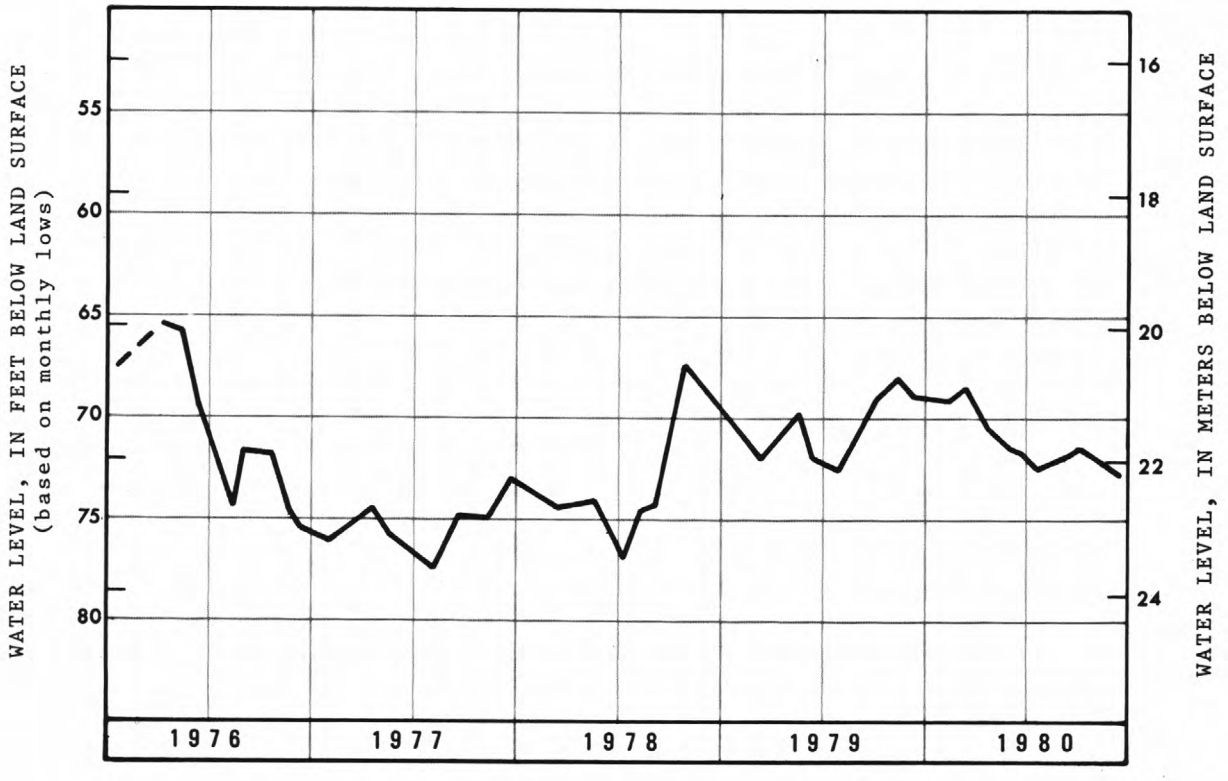
YIELD OF WELLS -- Average 450 gal/min; specific capacity -- 25 to 180 gal/min/ft of drawdown.

PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1980	1,288
1979	1,140
1978	1,296
1977	1,440
1976	1,652

QUALITY OF WATER -- Composite

Hardness	355 mg/L
Iron	0.2 mg/L
Diss. Solids	475 mg/L



Water levels in observation well 3S 7E 9AD at Ypsilanti. Well is 94 feet deep and in glacial deposits.

SUPPLY AND SOURCE -- 9 wells, 50 to 95 feet deep, tap glacial deposits.

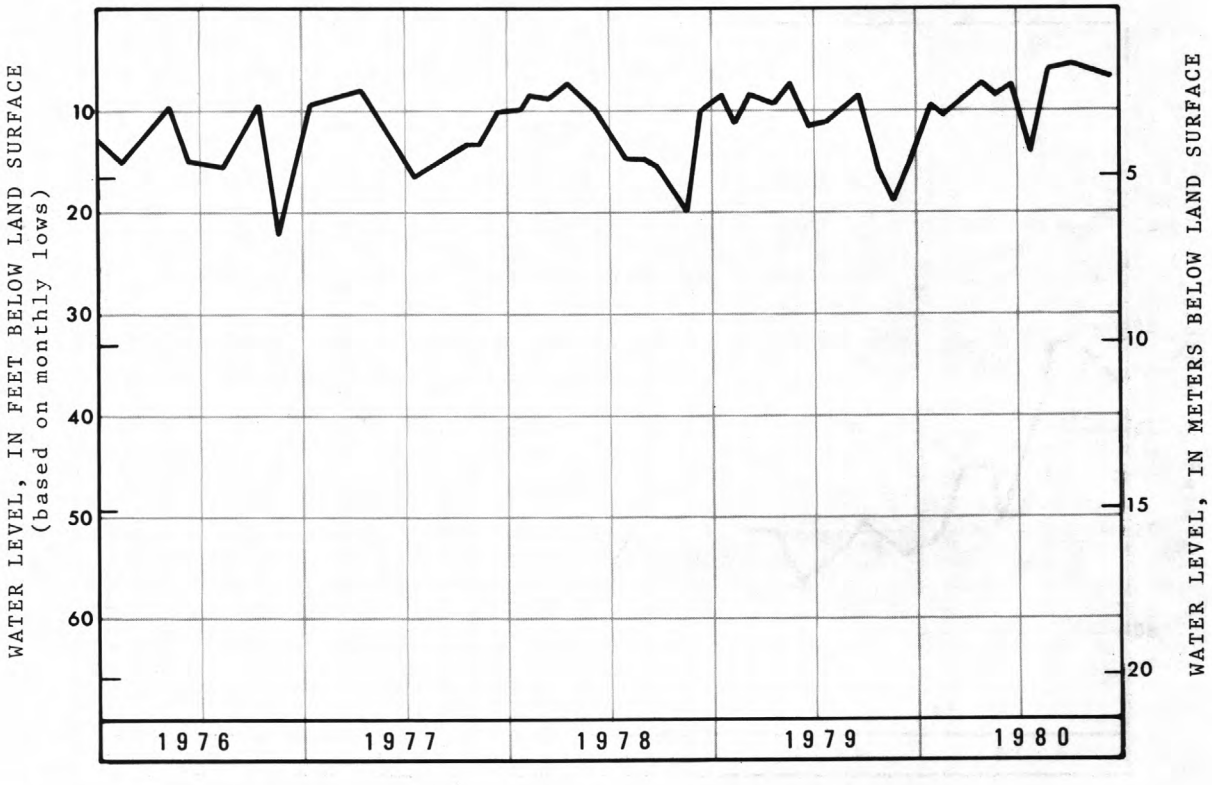
YIELD OF WELLS -- 700 to 3,500 gal/min.

PUMPAGE -- Total annual pumpage, in million gallons, for past 5 years.

1980 -	32
1979 -	431
1978 -	986
1977 -	792
1976 -	1,067

QUALITY OF WATER -- Composite

Hardness	370 mg/L
Iron	0.5 mg/L
Diss. Solids	496 mg/L



Water levels in observation well 3S 7E 24CD in Ypsilanti Township. Well is 75 feet deep and in glacial deposits.

TABLES

TABLE 1. RECORDS OF MICHIGAN OBSERVATION WELLS.

COUNTY AND WELL NUMBER: See section in text entitled "Well-numbering system."
NAME: MDNR - Michigan Department of Natural Resources; WMP - Wisconsin-Michigan Power Company; MSHD - Michigan State Highway Department; USFS - U.S. Forest Service; HCMA - Huron-Clinton Metropolitan Authority; BCRC - Branch County Road Commission.

AQUIFER:

112GLCL	Glacial deposits	337MRSL	Marshall Formation	361OCVCU	Ordovician, Upper
112GRVL	Gravel	341TRVR	Traverse Group	365TBRV	Trenton-Black River Group
1120TSH	Outwash	344DUND	Dundee Formation	368PRDC	Prairie du Chien Group
112SAND	Sand	348DRRV	Detroit River Group	372MNSG	Munising Sandstone
112SDGV	Sand and gravel	355SLINH	Salina Formation	420FRED	Freda Sandstone
324SGNW	Saginaw Formation	355MNSQ	Manistique Dolomite		

ALTITUDE: Land-surface datum in feet above mean sea level.
MEASUREMENTS, 1980 (frequency): R - Continuous recorder; D - Daily; W - Weekly; M - Monthly; Q - Quarterly; S - Semiannually; A - Annually; I - Intermittent.
OBSERVED WATER-LEVEL EXTREMES: In feet below or above (+) land surface. 1980 measurements underscored are extremes for entire record.
REMARKS: P - Water levels affected by pumping. Water-level measurements are made by the U.S. Geological Survey unless otherwise noted.

COUNTY AND WELL NUMBER TWP, RANGE, SECT	NAME	DEPTH (IN)	DIAMETER(IN)	AQUIFER	ALTITUDE	YRS. RECORD	MEAS. 1980	OBSERVED WATER-LEVEL EXTREMES THROUGH 1979 MAXIMUM	THROUGH 1979 MINIMUM	IN 1980 MAXIMUM	IN 1980 MINIMUM	REMARKS
ALGER												
45N 19W 25BD	CCC	66	6	112GLCL	850	22	Q	6.4 Jun 1960	14.2 Apr 1964	9.8 Jan	11.1 Oct	
ALPENA												
32N 6E 23DDDA1	Alpena State Forest	88	6	112SAND	713	4	R	15.8 May 1979	28.7 Mar 1977	19.2 Apr	26.8 Mar	
ARENAC												
19N 5E 7DABA1	Omer - Deep	185	6	324SGNW	667	1	M			8.3 Jul	10.1 Aug	
7DABA2	Omer - Shallow	21	6	112GLCL	667	1	M			5.8 Jul	6.9 Aug	
BARAGA												
48N 32W 12DD	WMP 14	10	1	112GLCL	1,630	33	M	3.3 Apr 1965	8.1 Sep 1969	5.9 May	7.1 Feb	Meas. by WMP
BARRY												
4N 9W 5DA	Solomon Road	131	2	112GLCL	860	17	Q	111.5 Mar 1978	122.0 Mar 1965	113.4 Jan	117.2 Dec	
BAY												
17N 4E 22DCAA1	Pinconning Township	110	6	324SGNW	620	19	R	0.0 Mar 1976	10.5 Aug 1963	1.7 Dec	3.8 Aug	
BRANCH												
6S 6W 18CCCD1	Coldwater Township	56	6	1120TSH	950	17	M	18.3 Mar 1976	28.3 Jul 1964	21.7 Sep	24.3 Jan	
22CA	Coldwater Test 4	113	6	112GLCL	970	17	R	9.0 May 1975	25.9 May 1977	10.2 Jul	23.1 Feb	p
CALHOUN												
1S 7W 10BB	Sabin	12	15	112GLCL	908.0	35	W	0.9 Mar 1950	7.2 Dec 1964	3.3 Sep	4.0 Dec	Meas. by owner
32BDCC1	Penfield Township	95	6	337MRSL	845	17	R	15.6 Apr 1974	27.0 Aug 1964	18.3 Apr	21.2 Nov	P
32DA	Battle Creek	127	8	337MRSL	830.8	42	D	0.7 Apr 1950	16.8 Jul 1959	5.8 Mar	10.2 Aug	P, Meas. by owner
2S 6W 25AA	Marshall	59	6	337MRSL	904.8	31	M	5.5 May 1950	9.7 Aug 1964	7.8 Sep	8.6 Mar	P, Meas. by owner
CASS												
8S 14W 17BA	Little	55	28	112GLCL	840	36	M	46.2 Jul 1950	55.0 Mar 1957	50.4 Mar	51.4 Jul	
CHEBOYGAN												
33N 1W 26DABB1	Pigeon River CCC	164	6	112SAND	933	15	R	56.1 Jun 1979	59.9 Dec 1965	57.3 Jun	58.9 Dec	
39N 3W 29CBCB1	Mackinaw 1	125	6	344DUND	705	2	M	5.2 May 1979	9.5 Sep 1979	7.3 Jan	11.3 Dec	
39N 3W 29CBCB2	Mackinaw 2	55	6	112SDGV	705	2	M	2.1 May 1979	4.7 Sep 1979	3.0 Jun	6.1 Dec	
CHIPPEWA												
46N 4W 24DADA1	Raco	54	6	1120TSH	850	28	R	18.4 Jun 1971	28.4 Apr 1964	20.6 May	24.3 Dec	
CLARE												
17N 4W 34DCAD	Clare	91	4	112GLCL	850	6	R	7.9 Mar 1976	24.9 May 1977	12.7 Dec	20.1 Aug	P

TABLE 1. RECORDS OF MICHIGAN OBSERVATION WELLS. (CONTINUED)

COUNTY AND WELL NUMBER TWP, RANGE, SECT	NAME	DEPTH (IN)	DIAMETER(IN)	AQUIFER	ALTITUDE	YRS. RECORD	MEAS. 1980	OBSERVED WATER-LEVEL EXTREMES				REMARKS
								THROUGH 1979		IN 1980		
								MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	
CLINTON												
5N 2W 31CBBA1	Capital City Airport	195	6	324SGNW	850	23	R	45.0 Mar 1949	66.4 Jan 1967	58.8 Jan	60.4 Sep	P
32DC	Quarantine Farm	135	4	324SGNW	849.2	37	M	42.0 Sep 1944	99.2 May 1966	82.8 Jan	86.9 Sep	P
6N 2W 16DD	MSHD, U.S. 27	23	14	112GLCL	803.3	33	M	13.8 Apr 1974	19.9 Feb 1964	17.9 May	19.0 Nov	Federal key well
7N 1W 34CC	Sleepy Hollow No. 7	32	1	1120TSH	785.3	14	A	17.1 Mar 1973	20.3 Oct 1973	17.8 May		
2W 9BBCD	St. Johns	535	6	324SGNW	743.4	17	R	52.2 May 1967	93.7 May 1977	60.7 Jan	83.9 Aug	P
CRAWFORD												
25N 1W 15DDCD1	Eldorado	56	6	112GLCL	1,190	33	R	25.7 May 1976	36.0 Apr 1951	30.3 Jan	31.2 Apr	
DELTA												
39N 23W 28AC	Schemmel	530	5	372MNSG	680	23	R	1.3 May 1960	8.9 Feb 1977	5.3 Apr	6.5 Aug	
41N 18W 31CD	Isabella	250	5	3610DVCU	615	23	Q	3.3 Sep 1979	6.4 Feb 1977	5.0 Jan	5.1 Aug	
42N 18W 17ABBD	Cooks CCC	60	6	112GLCL	760	19	Q	21.2 May 1960	28.4 Mar 1966	24.0 Apr	24.6 Oct	
42N 19W 20AA	Pollack CCC	134	6	112GLCL	740	23	Q	23.8 Mar 1960	28.1 Feb 1971	25.0 Apr	25.5 Oct	
43N 19W 24BB	Clarage	405	4	365TBRV	860	23	Q	77.0 Jul 1960	88.8 Oct 1966	78.7 Jan	79.8 Oct	
DICKINSON												
43N 23W 32ADAB1	Felch	31	1	112SAND	1,160	15	M	13.1 May 1972	16.8 May 1968	14.5 Jan	15.1 Dec	
EATON												
3N 3W 2BA	Lansing - Stiefel	66	1	112GLCL	839	17	R	3.1 Mar 1965	18.0 Nov 1968	4.5 Jan	12.9 Nov	P
4N 3W 12CD	Robins Road	381	6	324SGNW	861.9	28	R	67.5 Nov 1953	103.6 Aug 1969	82.1 Dec	100.1 Jul	P
GENESEE												
6N 7E 9DCCC1	Fisher Body No. 2	385	10	324SGNW	837.0	8	R	52.3 Dec 1975	87.0 Jun 1977	59.8 Nov	78.8 Jul	P
GRAND TRAVERSE												
26N 9W 14ABAA1	Fife Lake State Forest	80	6	112SAND	960	4	R	24.3 Sep 1976	26.7 Dec 1977	25.5 Jun	26.6 Apr	
HILLSDALE												
7S 2W 10BDDD1	Pittsford Game Area	20	1	112SAND	1,070	15	M	7.0 May 1978	11.1 Sep 1967	7.4 Sep	8.6 Feb	
7S 2W 15BCBA1	Osseo	150	6	1120TSH	1,095	2	M	47.9 Jun 1979	49.0 Dec 1979	48.0 Jun	48.9 Jan	
INGHAM												
2N 1E 34DB	Dansville Game Area	87	2	112GLCL	930	17	Q	22.4 Apr 1974	29.3 Oct 1964	24.1 Jun	24.6 Mar	
3N 1E 7DD	Lotte	184	3	324SGNW	900	17	M	+2.4 Apr 1974	7.0 Nov 1964	0.5 Dec	2.8 Jan	
4N 1E 21CDDA1	Duncan	265	8	324SGNW	890	18	R	20.1 May 1967	28.9 Jul 1979	23.8 Apr	28.8 Jul	Disc. 9-80
2N 1W 5BCAB1	Mason	210	8	324SGNW	890	17	R	14.7 Mar 1973	23.8 Nov 1964	19.4 Sep	23.7 Mar	P
4N 1W 16DA	Meridian Township	398	4	324SGNW	841.2	13	M	6.3 Mar 1976	15.5 Jun 1979	11.9 Apr	14.0 Jul	P
18AD	Marble School	175	3	324SGNW	847.8	29	M	20.1 Apr 1953	70.2 Nov 1972	53.4 Apr	56.2 Jul	P, Disc. 9-80
28BC	Okemos	125	4	324SGNW	865	5	R	18.1 May 1976	24.2 Sep 1978	21.7 Jun	23.4 Mar	
4N 2W 9BD	Lansing - Seymour	401	14	324SGNW	828.8	52	R	15.6 Mar 1931	179.4 Apr 1968	90.3 May	99.9 Jan	P, Disc. 5-80
16DA	Lansing - Cedar	417	12	324SGNW	829.1	36	R	42.0 Mar 1946	67.0 Aug 1949	45.7 Oct	49.4 Jan	P
17AB	Lansing - Logan	424	20	324SGNW	858.7	50	R	34.3 Dec 1929	168.3 May 1968	111.6 Dec	119.9 Jan	P
21BA3	Lansing - Scott Park	400	4	324SGNW	835	2	R	54.6 Jul 1979	58.8 Jun 1979	47.6 Nov	56.2 Jan	P

TABLE 1. RECORDS OF MICHIGAN OBSERVATION WELLS. (CONTINUED)

COUNTY AND WELL NUMBER TWP, RANGE, SECT	NAME	DEPTH (IN)	DIAMETER(IN)	AQUIFER	ALTITUDE	YRS. RECORD	MEAS. 1980	OBSERVED WATER-LEVEL EXTREMES THROUGH 1979 MAXIMUM	THROUGH 1979 MINIMUM	IN 1980 MAXIMUM	IN 1980 MINIMUM	REMARKS
INGHAM (Cont'd)												
4N 2W 22BC	Lansing - P-5	338	12	324SGNW	823.6	51	M	7.1 Jul 1932	80.5 Feb 1970	65.6 Nov	76.2 Jan	P
24CA	Spartan Village	453	10	324SGNW	853.4	36	R	25.5 Mar 1946	105.5 May 1972	76.5 Jan	92.4 Jan	P
27BB	Fenner Arboretum	215	6	324SGNW	835	13	R	52.0 Jul 1968	89.5 Oct 1972	64.4 Nov	76.7 Feb	P
31CC	Maybel Street	204	3	324SGNW	880.2	37	M	18.9 Apr 1952	45.1 Feb 1977	41.4 Nov	45.9 Jul	P
IOSCO												
24N 7E 13ADAD1	Oscoda	69	6	112SAND	760	1	M			30.2 Jul	31.3 Dec	
IRON												
42N 31W 33DB	WMP 7	10	1	112GLCL	1,275	33	M	+0.2 May 1960	6.7 Jan 1977	0.4 Mar	2.9 Nov	Meas. by WMP
43N 35W 11AD	WMP 23	47	36	112GLCL	1,565	36	M	35.5 Jul 1973	47.1 Aug 1949	37.8 Jan	38.8 Aug	Do
20DC	WMP 25	48	1	112GLCL	1,560	36	M	40.7 Jun 1973	48.3 Aug 1949	42.5 Jan	43.2 Dec	Do
33BD	WMP 34	12	1	112GLCL	1,520	33	M	1.7 Jun 1973	8.4 Mar 1949	3.7 Apr	4.6 Mar	Do
44N 33W 10CC	WMP 21	8	1	112GLCL	1,540	33	M	2.0 Apr 1954	8.2 Apr 1977	3.9 Apr	5.0 Aug	Do
37W 14BB	CCC Camp	102	6	112GLCL	1,730	22	Q	91.8 Oct 1973	100.9 Aug 1974	93.0 Nov	93.5 Jul	
45N 37W 23AC	WMP 28	8	1	112GLCL	1,600	33	M	0.7 Apr 1965	5.1 Sep 1976	1.4 Sep	2.5 Feb	Meas. by WMP
46N 33W 18BC	WMP 17	12	1	112GLCL	1,560	33	M	2.8 Apr 1949	dry Feb 1956	5.2 Oct	7.2 Feb	Do
JACKSON												
3S 1W 2BDBA1	Jackson - Hamburg	400	12	324SGNW, 337MRSL	935	15	R	16.3 Jan 1971	68.8 Jun 1971	21.2 Dec	40.2 Aug	P
10DC	Summit Township	323	12	324SGNW, 337MRSL	935	21	R	14.3 Jan 1961	36.5 Jun 1971	17.6 Dec	27.1 Mar	P
11AA1	Jackson - 4a Belden	360	6	324SGNW, 337MRSL	935	23	D	18.6 Jan 1961	119.1 Jun 1971	40.4 Dec	96.2 Mar	P, Meas. by owner
11AADD2	Jackson - Belden	36	3	112OTSH	928.8	19	R	+1.9 Apr 1977	18.2 Nov 1964	+1.7 Jun	1.2 Dec	
KALAMAZOO												
2S 10W 4D	Kalamazoo - Campbell	13	4	112OTSH	836.5	12	M	1.9 Apr 1974	3.7 Aug 1977	3.6 Jan	4.2 Nov	P
9B	Kalamazoo - Schoonover	21	6	112OTSH	828	12	R	+1.0 Apr 1975	1.5 Dec 1979	1.0 Jan	2.5 Nov	P
11W 20BB2	Kalamazoo - Kendall	106	4	112OTSH	880	13	R	12.5 Feb 1976	48.4 Jun 1971	17.3 Sep	37.1 Dec	P
22CD	Kalamazoo-Stockbridge	137	4	112OTSH	764.7	21	R	4.8 Feb 1975	31.1 Aug 1961	7.5 Dec	8.4 Jan	P
28AA	Kalamazoo - Maple	245	4	112OTSH	820	12	R	32.9 Jan 1979	61.6 Jun 1973	34.1 Dec	60.4 Oct	P
31CD	Kalamazoo - Colony	226	4	112OTSH	910	12	R	51.1 Jun 1974	71.8 May 1978	51.7 Jan	52.0 Nov	P
36CB	Kalamazoo - Emerald	226	4	112OTSH	860	12	R	25.7 May 1976	50.4 Jun 1971	27.4 Jul	41.1 Apr	P
3S 11W 4AD1	Kalamazoo - A-D	135	3	112OTSH	854.0	22	R	0.5 May 1967	12.9 Jul 1964	2.1 Dec	10.0 Dec	P
4AD2	Kalamazoo - A-S	40	3	112OTSH	854.0	22	R	+0.2 Sep 1975	9.1 Nov 1959	0.4 Aug	2.5 Apr	P
14AA	Upjohn 28	233	16	112OTSH	870	14	R	25.2 Feb 1976	45.2 Jul 1977	27.9 Dec	41.7 Aug	P
22BD	Portage - Site C	120	8	112OTSH	865	14	R	5.9 Jun 1967	10.2 Nov 1976	7.3 Jun	8.8 Dec	P
12W 11BD	Kalamazoo - Atwater	248	3	112OTSH	880	20	R	+3.0 Sep 1969	1.0 Aug 1977	+1.1 May	0.5 Oct	P
11AD1	Kalamazoo - Sabo-D	300	4	112OTSH	877	8	R	4.5 Jul 1973	16.4 Jul 1977	6.0 May	15.8 Oct	P
11AD2	Kalamazoo - Sabo-S	38	6	112OTSH	877	8	R	9.1 Aug 1975	12.7 Aug 1977	10.3 May	12.5 Oct	P
4S 11W 3CDDA1	Prairie View Park	190	4	112OTSH	870	12	R	18.2 Apr 1979	20.5 Dec 1977	18.4 Jun	19.5 Dec	

TABLE 1. RECORDS OF MICHIGAN OBSERVATION WELLS. (CONTINUED)

COUNTY AND WELL NUMBER TWP, RANGE, SECT	NAME	DEPTH (IN)	DIAMETER(IN)	AQUIFER	ALTITUDE	YRS. RECORD	MEAS. 1980	OBSERVED WATER-LEVEL EXTREMES				REMARKS
								THROUGH 1979		IN 1980		
								MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	
KENT												
5N 12W 4DCCD1	Wyoming - Wobma	86	6	112GRVL	868.0	19	M	7.8 Oct 1978	12.9 Aug 1964	10.2 May	11.2 Nov	
6N 10W 30AA	Kent County Airport	184	10	112GLCL	800	15	R	83.1 Apr 1977	108.0 Sep 1967	83.4 Feb	109.7 Jul	P
12W 17AD1	Alloytek	30	12	112GLCL	606	31	M	6.8 Apr 1965	16.4 Feb 1954	10.0 Jul	11.8 Aug	P, Meas. by owner
17AD2	Alloytek	26	6	112GLCL	606.0	31	M	6.8 Apr 1965	16.3 Feb 1954	9.5 Nov	10.8 Jan	P, Meas. by owner
10N 12W 13DD	Rogue River Game Area	30	1	112GLCL	785	15	Q	0.8 Jan 1975	9.2 Oct 1969	1.3 Aug	6.9 Feb	
LAKE												
20N 13W 13ACAC1	Irons	57	6	112OTSH	945	1	M			14.7 Jul	15.8 Dec	
LEELANAU												
28N 14W 8DDCA1	Sleeping Bear - D	138	6	112SAND	750	1	M			113.1 Mar	113.5 Jul	
28N 14W 18BABB1	Sleeping Bear - S	60	6	112SAND	625	1	R			23.2 May	24.0 Sep	
LENAWEE												
5S 1E 12DD	Onsted Game Area	39	1	112GLCL	1,000	15	M	16.1 May 1975	19.3 Sep 1971	16.2 Jul	17.2 Nov	
6S 4E 8DDBA1	Fisher Body	81	8	112OTSH	800	16	R	11.2 May 1976	18.4 Feb 1965	12.8 Jun	14.4 Feb	P
LIVINGSTON												
1N 6E 13DBAB1	American Aggregate	29	2	112OTSH	930	11	R	12.1 Apr 1974	21.6 Oct 1979	15.8 Jul	19.5 Jan	
2N 6E 31BA2	Brighton	83	10	112GLCL	935	7	R	27.2 Sep 1975	58.6 Jul 1978	29.9 Dec	52.3 Aug	P
MACKINAC												
41N 5W 23BC	Round Lake CCC	47	6	355SLINH	610	25	Q	4.3 May 1959	17.5 Mar 1959	6.2 Apr	16.5 Nov	
42N 2W 7AABB1	Pontchartrain CCC	102	6	355MNSQ	680	25	R	13.1 May 1960	32.3 Feb 1977	16.0 Apr	29.6 Nov	
MARQUETTE												
46N 25W 16DD	Sands Station	48	1	112GLCL	1,198.4	18	M	27.1 Jul 1969	37.7 May 1964	28.5 Mar	31.5 Dec	
47N 25W 20CC	East Cascade Junction	103	1	112GLCL	1,229.8	18	M	78.5 Oct 1973	90.6 Jun 1965	79.6 Jan	80.5 Nov	
32CA	Gentian	122	1	112GLCL	1,239.2	16	M	83.6 Apr 1976	100.0 Oct 1964	90.3 Jul	91.0 Jan	
26W 27BC	Laitala	31	1	112GLCL	1,290	13	M	+3.4 Apr 1979	10.1 Oct 1969	0.6 Apr	5.1 Nov	
36BBDB1	C.C. - Goose Lake	56	8	112OTSH	1,210	16	R	3.6 Apr 1969	8.8 Mar 1977	4.4 Apr	6.8 Sep	
28W 3CCDC1	Ely Township	75	8	112OTSH	1,572.0	20	R	9.7 May 1973	19.3 Apr 1964	13.2 Apr	15.4 Dec	Federal key well
48N 29W 30CC	Van Riper Park	78	6	112GLCL	1,560	12	M	9.6 May 1973	15.7 Feb 1977	12.4 May	13.3 Mar	
49N 30W 22AC	WMP 13	17	1	112GLCL	1,680	33	M	0.6 May 1951	13.3 Sep 1948	7.4 Apr	10.0 Aug	Meas.by WMP
MENOMINEE												
37N 26W 19DADA1	Carney	17	4	36STBRV	800	22	M	3.5 Apr 1979	8.6 Jan 1977	4.7 Nov	6.0 Mar	
MONROE												
7S 6E 15ADBB1	Petersburg Game Area	17	1	112GLCL	675	15	M	3.0 Feb 1966	6.8 Nov 1978	4.2 Sep	6.2 Feb	
7S 6E 15ACAA1	Petersburg - Rock	73	6	348DRRV	680	2	M	35.9 Apr 1979	40.2 Nov 1979	35.7 Sep	39.2 Jul	
MUSKEGON												
11N 15W 34ADDD1	Muskegon Game Area	31	1	112SAND	595	15	Q	+0.2 Apr 1978	4.7 Sep 1972	0.9 Jan	1.8 Aug	
OAKLAND												
2N 7E 5BA	Honeywell Lake Road	44	2	112GLCL	1,020	13	R	23.9 Apr 1976	28.9 Dec 1971	26.6 May	28.0 Mar	
8E 18DBAD1	Proud Lake Park	45	6	112OTSH	910	12	R	2.8 May 1974	6.4 Sep 1971	4.4 May	5.6 Feb	P

TABLE 1. RECORDS OF MICHIGAN OBSERVATION WELLS. (CONTINUED)

COUNTY AND WELL NUMBER TWP, RANGE, SECT	NAME	DEPTH (IN)	DIAMETER(IN)	AQUIFER	ALTITUDE	YRS. RECORD	MEAS. 1980	OBSERVED WATER-LEVEL EXTREMES				REMARKS
								THROUGH 1979		IN 1980		
								MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	
OAKLAND (Cont'd)												
3N 7E 5DA	Fish Lake Road	49	2	112GLCL	1,055	12	R	29.5 Jun 1976	38.7 Dec 1972	35.0 Oct	37.0 Feb	
8E 3DBAB1	White Lake Road	163	6	112OTSH	1,000	9	R	7.2 May 1976	11.2 Sep 1978	8.7 Apr	10.2 Mar	
10AB	Teggerdine Road	163	6	112GLCL	1,000	9	R	27.8 Mar 1976	30.8 Sep 1978	28.8 Apr	29.9 Feb	
10E 13AC	Oakland University	183	6	112GLCL	940	20	R	56.9 Feb 1978	93.5 Jul 1963	57.3 Apr	59.0 Aug	
5N 8E 8AC	Holly Recreation Area	42	1	112GLCL	930	15	M	22.3 Apr 1974	26.5 Sep 1966	24.7 May	25.7 Sep	
OCEANA												
13N 15W 18AAAA1	Hesperia	79	6	112OTSH	703	3	R	36.6 Jun 1979	40.4 Apr 1978	38.8 Jan	39.4 Aug	
OGEMAW												
23N 1E 2BAAA1	Rose City Road-D	105	1	112GLCL	1,265	13	Q	73.6 Oct 1976	78.2 Apr 1969	74.4 Jan	75.8 Apr	
2BAAA2	Rose City Road-S	20	1	112SAND	1,265	13	Q	7.6 Apr 1976	13.6 Dec 1972	10.5 Jun	11.6 Jan	
ONTONAGON												
46N 38W 30ADDD1	USFS	65	1	112SDGV	1,530	14	M	16.0 Jun 1973	19.7 Mar 1978	17.0 Feb	18.1 Sep	
51N 41W 8BDBC1	Silver City	100	6	420FRED	620	23	M	8.2 Apr 1959	21.8 Dec 1976	11.2 Nov	13.7 Sep	
OTSEGO												
30N 3W 19ABBB1	Gaylord	90	6	112OTSH	1,308	2	M	30.7 Jul 1979	33.9 Jun 1979	31.6 Apr	33.5 Dec	
PRESQUE ISLE												
33N 6E 8BBBB1	Styma	61	6	341TRVR	800	22	Q	5.1 Mar 1979	18.8 Mar 1963	9.6 Jun	14.4 Oct	
ROSCOMMON												
24N 2W 20BABA1	Exp. Station	14	8	112OTSH	1,145.3	47	R	2.1 Apr 1976	6.2 Dec 1949	4.1 Apr	5.2 Aug	Federal key well
SAGINAW												
10N 1E 22DADA1	Marion Springs	210	6	324SGNW	657	3	R	8.8 May 1979	10.0 Sep 1978	8.0 Dec	9.5 Jan	
SANILAC												
13N 13E 12ADAA1	Minden Game Area	130	6	337MRSL	805	4	R	17.7 Apr 1978	22.7 Oct 1979	18.5 May	21.6 Sep	
SCHOOLCRAFT												
45N 13W 16CCCB1	Seney	154	4	361ODVCU	710	29	R	4.6 Apr 1971	6.5 Oct 1963	4.9 Apr	5.8 Aug	
47N 16W 30BBBB1	Cusino CCC	57	6	368PRDC	900	24	R	5.7 May 1960	16.4 Feb 1977	8.7 Apr	14.5 Oct	
VAN BUREN												
3S 14W 6BA	Martin	59	1	112GLCL	740	18	M	37.2 May 1974	43.3 Nov 1964	38.0 Jun	38.9 Oct	
WASHTENAW												
2S 3E 9DAAB2	Waterloo Park	48	6	112SDGV	970	12	R	4.1 May 1974	7.0 Aug 1971	4.5 Mar	6.1 Jul	P
3S 6E 16BCCD1	Ann Arbor	55	10	112GLCL	821.5	18	R	0.7 Mar 1974	15.9 Oct 1964	2.2 Jun	5.3 Dec	P
7E 5BB	Ypsilanti - Superior	69	8	112GLCL	720	19	R	1.8 Feb 1965	21.4 Dec 1965	4.7 Jun	9.2 Feb	P
9AD	Ypsilanti - Gilbert	94	6	112GLCL	710	30	R	29.1 Nov 1945	78.8 Oct 1974	67.4 Mar	72.8 Dec	P
24CA1	Ypsilanti Township 104	87	4	112GLCL	665.6	35	R	5.8 Jan 1950	22.7 Feb 1971	12.4 Sep	14.8 Feb	P
24CD	Ypsilanti Township 117	75	6	112GLCL	657.8	34	R	5.3 May 1978	63.2 Feb 1970	5.5 Sep	14.3 Jul	P
WEXFORD												
22N 12W 13BA	Harrietta Fish Hatchery	141	4	112GLCL	1,060	20	R	13.8 Mar 1970	+0.4 Oct 1979	+2.6 Sep	1.1 Feb	P

TABLE 2. REPORTED GROUND-WATER PUMPAGE, IN 1980 (IN MILLIONS OF GALLONS)

COUNTY AND WATER USER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1980 TOTAL	MAX DAY	MIN DAY
ALCONA															
Harrisville	1.3	1.3	1.8	1.2	1.7	1.4	1.9	2.0	1.4	1.5	1.1	1.2	17.8	--	--
ALGER															
Burt Twp.	1.8	2.1	4.4	2.4	3.0	3.0	2.9	1.9	2.3	2.0	1.5	1.9	29.2	--	--
Chatham	.9	.9	1.0	.8	.9	.9	.9	1.1	.9	1.0	1.1	1.2	11.6	--	--
ALLEGAN															
Allegan	25.0	23.1	25.1	25.2	31.6	32.1	39.5	40.1	37.1	30.4	28.4	28.2	365.8	1.790	.453
Douglas	4.1	3.7	3.6	4.0	4.9	5.7	6.8	6.4	4.6	4.0	3.6	3.7	55.2	--	--
Otsego	34.2	30.4	30.1	31.3	32.6	33.1	35.6	33.5	28.4	28.3	26.3	28.6	372.4	--	--
Plainwell	13.2	13.3	13.2	13.4	16.4	16.3	15.0	15.4	14.8	14.7	13.2	13.9	172.8	.764	.280
Saugatuck	5.7	5.6	6.7	6.8	8.0	8.8	12.1	11.5	8.7	8.5	7.1	5.8	95.3	--	--
ANTRIM															
Bellaire	4.4	4.2	4.5	4.0	4.6	5.0	5.9	6.0	4.6	4.2	3.5	3.8	54.7	--	.040
Central Lake	3.2	3.1	3.3	2.9	1.1	3.7	5.8	6.9	5.6	4.2	3.3	3.8	46.9	.274	--
Ellsworth	1.5	1.1	1.3	1.3	1.2	1.3	1.6	1.4	1.7	1.2	1.3	1.8	16.7	--	--
Mancelona	10.9	14.8	15.1	8.6	11.5	15.7	14.3	12.0	11.9	17.4	11.7	11.6	155.5	.671	.157
BARRY															
Hastings	20.1	19.4	21.5	21.0	26.2	24.5	27.8	30.7	26.0	28.9	22.6	30.2	298.9	1.940	.535
Middleville	15.8	12.3	12.3	11.7	13.4	13.5	14.3	14.5	13.5	13.1	12.6	14.3	161.3	--	--
Nashville	3.3	3.0	3.4	3.3	3.5	3.4	3.8	3.6	3.3	3.2	2.9	3.0	39.7	.211	.043
BENZIE															
Frankfort	6.8	9.0	8.2	8.2	9.4	8.7	9.9	9.3	7.4	6.5	5.9	6.1	95.4	.584	.147
BERRIEN															
Berrien Springs	11.6	11.2	12.6	11.9	11.3	14.8	17.5	7.1	5.7	6.3	6.1	6.0	122.1	.869	--
Buchanan	45.6	42.7	44.5	39.7	38.3	37.6	41.4	48.0	44.2	43.6	38.9	39.4	503.9	1.990	.900
Coloma	11.1	9.5	11.0	10.7	12.4	16.6	11.9	12.0	12.5	14.2	13.4	16.8	152.1	.946	.200
Niles	76.5	72.9	77.5	75.9	79.8	82.4	89.1	86.2	77.1	76.3	68.5	68.7	930.9	3.900	1.260
Niles Twp.	4.0	3.6	3.9	4.1	7.6	7.8	10.8	6.1	4.1	3.8	3.5	3.7	63.0	.866	.001
Watervliet	6.0	5.4	6.7	6.2	6.8	6.7	7.9	7.5	6.3	13.4	6.0	5.6	84.5	--	.070
BRANCH															
Bronson	27.6	23.0	22.8	20.4	18.3	21.0	23.5	24.4	25.1	20.9	20.3	21.5	268.8	1.557	.076
Coldwater	91.8	88.7	93.5	98.0	111.8	110.4	108.8	98.7	95.1	96.0	87.3	88.8	1,168.9	5.398	1.930
Quincy	6.2	6.1	6.1	6.1	6.9	7.0	7.4	7.4	6.8	7.5	6.7	6.6	80.8	--	--
Reg. Center Dev. Disab.	6.8	6.2	6.5	6.1	7.0	7.1	7.0	6.3	6.0	5.9	5.4	5.6	75.9	.338	.068
Union City	4.7	5.2	4.2	4.8	4.9	4.8	4.8	4.3	4.8	5.3	3.7	7.0	58.5	.525	.103
CALHOUN															
Albion	80.2	83.8	93.1	86.2	86.5	79.0	73.1	79.4	84.4	80.2	70.8	68.9	965.6	3.675	1.511
Athens	2.8	3.0	3.1	2.4	2.9	4.0	2,6	2.9	2,8	3.1	2.6	2,4	34.6	.163	.059
Battle Creek	210.8	222.8	231.8	225.8	268.0	265.7	298.0	277.6	223,9	199.9	203,1	208.5	2,835.9	12.190	4.560
Battle Creek Twp.	44.1	46.1	47.4	44.9	56.7	61.0	63.6	58.1	49.1	50.6	45.0	44.8	611.4	3.400	1.149
Homer	4.4	4.1	5.2	4.5	4.6	4.5	4.9	5.0	4.7	6.4	4.1	4.4	56.8	.468	.102
Marshall	33.5	31.0	34.1	32.2	34.8	34.2	36.7	36.8	36.2	36.6	30.2	31.1	407.4	1.828	.672
CASS															
Cassopolis	5.8	6.0	5.7	6.5	6.4	6.2	6.5	6.8	5.9	5.7	5.9	6.0	73.4	.358	.171
Dowagiac	23.5	23.6	24.5	23.6	26.0	26.7	31.2	27.5	23.0	26.8	20.8	20.8	298.0	1.862	.184
CHARLEVOIX															
Boyne City	23.4	22.9	15.4	21.0	23.8	16.8	17.2	17.8	16.9	14.0	15.6	15.8	220.6	.806	.230
Boyne Falls	10.8	10.8	10.9	11.0	11.0	11.1	11.2	11.3	11.4	11.4	11.4	11.5	133.8	--	--
East Jordan	14.9	15.0	15.7	14.6	16.3	16.6	18.5	26.7	19.1	17.2	15.1	15.3	205.0	1.150	.320
CHEBOYGAN															
Cheboygan	--	--	--	--	22.2	25.5	25.1	26.0	24.4	23.2	20.8	27.9	195.0	1.250	.582
Mackinaw City	3.3	4.4	8.3	4.5	5.7	7.2	12.0	12.7	7.9	5.4	3.1	3.3	77.8	.503	.064
CHIPPEWA															
Kincheloe AFB	10.1	10.3	10.4	12.7	13.4	12.2	16.1	17.9	15.6	14.9	14.0	14.1	161.7	.881	.043

TABLE 2. REPORTED GROUND-WATER PUMPAGE, IN 1980 (IN MILLIONS OF GALLONS)-CONTINUED

COUNTY AND WATER USER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1980 TOTAL	MAX DAY	MIN DAY
CLARE															
Clare	22.1	19.8	21.0	21.1	29.0	29.7	29.5	27.1	19.7	21.0	20.3	18.8	279.1	1.392	.501
Farwell	6.3	5.4	5.7	5.4	5.7	5.6	5.7	5.4	5.0	4.0	4.9	4.1	63.2	.303	.074
Harrison	7.2	4.8	6.1	5.7	7.1	8.7	6.3	9.3	5.1	4.7	5.3	3.9	74.2	.872	--
CLINTON															
Fowler	1.8	2.4	2.0	2.0	2.5	1.9	2.1	2.4	2.1	2.3	1.8	1.9	25.2	.134	.039
Maple Rapids	1.8	1.9	1.9	1.8	1.7	2.1	2.1	1.9	2.5	1.8	1.8	1.7	23.0	.083	.054
Ovid	7.0	7.1	6.1	4.9	3.8	4.2	4.9	4.7	4.5	4.5	4.2	4.3	60.2	.275	.038
St. Johns	31.9	38.2	34.0	34.6	35.7	35.5	41.3	37.4	35.2	36.7	30.7	32.2	423.4	2.286	.163
Westphalia	1.6	1.6	1.6	1.7	1.7	2.1	2.0	1.8	1.6	1.7	1.7	1.6	20.7	.120	.016
CRAWFORD															
Grayling	19.1	17.5	19.5	18.5	18.7	18.9	18.9	18.6	14.8	14.5	13.4	14.6	207.0	.843	.427
DICKINSON															
Breitung Twp.	4.3	4.1	3.8	3.9	5.3	3.7	3.8	3.6	3.7	4.0	4.0	4.1	48.3	.262	.083
EATON															
Bellevue	3.6	4.9	6.0	4.1	4.7	4.0	4.9	4.4	4.4	3.5	3.7	4.2	52.4	.365	.080
Charlotte	36.4	33.3	38.2	35.3	35.5	23.3	37.5	38.1	36.4	35.4	30.5	33.0	412.9	2.280	.747
Delta Twp.	55.2	52.8	56.8	53.1	64.0	73.4	88.7	63.1	69.4	61.5	54.8	59.9	752.7	3.140	.248
Eaton Rapids	29.6	25.0	26.2	28.3	30.9	33.1	34.0	34.9	33.0	26.8	23.0	24.4	349.2	1.522	.668
Grand Ledge	17.8	15.5	16.0	16.5	18.6	23.9	24.6	18.6	18.7	23.1	17.8	18.2	229.3	--	--
Olds Warehouse	.3	.3	.3	.3	.2	--	--	--	.3	.3	.3	.3	e)2.6	--	--
Sunfield	2.9	2.7	3.0	2.9	2.8	2.2	2.6	2.2	2.4	2.0	1.9	2.1	29.7	--	--
EMMET															
Harbor Springs	11.9	13.2	13.8	13.3	17.3	20.9	24.1	24.9	13.8	12.0	9.3	11.7	186.2	1.229	.320
Petosky	45.7	43.5	46.8	44.2	50.6	56.3	66.6	66.3	52.6	43.3	46.6	43.8	606.3	2.575	1.152
GENESEE															
Beecher Metro. Dist.	38.3	36.6	38.1	39.5	40.9	40.0	43.6	40.4	37.2	38.4	37.8	43.0	473.8	1.990	.925
Burton	30.4	28.6	28.2	26.3	24.2	24.5	29.0	25.0	26.1	26.9	23.2	23.3	315.7	1.568	.389
Davison	18.7	8.1	18.7	16.6	22.3	21.8	21.7	18.9	19.4	19.1	18.3	18.3	221.9	3.215	.001
Fenton	30.4	23.8	27.5	27.0	27.6	26.8	32.4	25.3	25.5	24.7	23.8	25.0	319.8	1.522	.514
Grand Blanc	33.2	26.6	31.3	27.8	32.6	40.3	44.2	35.0	43.1	33.9	29.9	29.3	407.2	2.173	.775
Grand Blanc Twp.	6.8	6.5	6.7	7.1	7.5	7.8	7.5	7.4	6.9	7.2	7.1	7.0	85.5	--	--
Linden	4.0	3.9	4.9	4.5	5.4	5.4	7.5	5.8	5.0	4.9	4.6	5.0	60.9	.500	.100
Montrose	6.5	5.9	6.2	6.0	6.7	6.4	6.3	6.5	6.3	5.8	5.7	5.9	74.2	.360	.117
Otisville	1.2	1.2	1.2	1.2	1.2	1.4	1.4	1.5	1.4	1.2	1.2	1.2	e)15.3	.083	.029
GLADWIN															
Beaverton	2.7	2.8	2.9	2.9	2.9	2.7	2.9	2.9	3.3	3.5	3.3	3.8	36.6	--	--
GOGEBIC															
Ironwood	43.8	44.3	46.8	43.4	43.9	39.8	42.4	40.2	38.1	38.8	37.2	43.1	501.8	1.862	.110
Marenisco Twp.	7.2	6.3	6.1	5.4	6.1	5.3	5.6	--	--	--	--	3.8	45.8	1.755	.098
Wakefield	9.4	8.6	10.2	9.5	9.2	7.9	8.8	9.1	8.5	8.0	8.4	9.1	106.7	.418	.199
GRAND TRAVERSE															
Kingsley	1.5	1.9	1.6	1.8	3.5	3.4	3.4	2.9	1.7	1.9	1.5	1.6	26.7	--	--
GRATIOT															
Alma	--	--	3.3	--	--	--	--	--	--	--	--	--	3.3	--	--
Breckenridge	2.8	2.5	2.8	2.7	3.0	3.0	3.1	3.2	3.0	3.0	2.7	3.0	34.8	.145	.061
Ithaca	8.4	7.2	7.1	7.8	8.9	10.2	10.5	10.8	9.6	9.4	7.5	8.5	105.9	--	--
St. Louis	10.4	9.3	11.6	10.9	10.7	11.7	13.9	11.2	12.4	10.0	12.4	10.8	135.3	.849	.238
HILLSDALE															
Hillsdale	42.9	44.3	46.3	43.6	46.9	45.5	51.1	49.7	51.6	50.9	49.4	49.7	511.9	2.166	1.163
Jonesville	13.6	12.8	14.2	14.2	12.6	12.2	13.5	12.0	10.3	11.3	11.2	12.1	150.0	.967	.211
Litchfield	3.1	3.4	3.4	3.8	4.4	4.1	4.7	4.4	4.7	5.2	3.1	2.8	47.1	--	.077
Waldron	2.9	2.7	2.9	2.8	3.0	2.5	2.7	2.7	2.7	2.7	2.5	2.6	32.7	.156	.043
HOUGHTON															
a)Adams Twp. - S. Range Water Auth.	23.5	26.9	28.5	29.6	27.3	19.3	20.4	22.6	23.5	22.1	24.2	24.6	292.5	1.011	.660
b)Adams Twp. - S. Range Water Auth.	10.7	10.8	10.3	10.3	10.1	11.2	12.0	11.9	11.5	10.3	8.9	9.4	127.4	.417	.294
Chassell Twp.	2.8	2.7	2.6	2.6	3.2	3.0	3.3	3.1	3.7	2.5	2.8	3.2	35.5	.192	.069
Houghton	46.2	43.5	55.1	52.7	46.0	36.5	40.3	35.7	39.5	42.4	37.6	36.6	512.1	--	--
c)N. Michigan Water Co.	36.3	34.3	37.7	35.4	36.2	37.2	37.4	35.7	37.9	33.7	33.7	37.5	433.0	1.260	.922

TABLE 2. REPORTED GROUND-WATER PUMPAGE, IN 1980 (IN MILLIONS OF GALLONS)-CONTINUED

COUNTY AND WATER USER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1980 TOTAL	MAX DAY	MIN DAY
HURON															
Elkton	1.9	1.8	2.0	2.0	2.3	2.2	2.4	2.3	2.1	2.0	2.0	2.2	25.2	--	--
Q)Pigeon	3.5	3.1	3.7	3.6	3.9	3.9	4.4	4.4	4.2	3.5	3.3	3.8	45.3	--	--
Sebewaing	10.2	11.8	7.9	11.4	11.6	10.1	10.9	10.1	9.6	8.9	10.0	11.1	123.6	--	--
INGHAM															
E. Lansing-Meridian Twp.	138.1	134.6	136.4	143.1	148.4	138.1	184.6	155.0	139.9	144.0	137.3	141.5	1,741.0	8.834	3.122
Lansing	739.6	678.3	739.8	700.8	732.8	731.1	797.5	756.4	705.3	690.3	657.4	663.2	8,592.5	34.229	16.410
Lansing Twp.	32.9	33.3	33.2	40.3	49.7	53.7	46.8	45.9	39.3	46.0	43.7	48.4	513.2	--	--
Leslie	6.6	6.2	7.9	6.6	8.1	9.0	10.3	8.0	7.8	7.8	7.3	8.6	94.2	--	--
Mason	18.2	17.2	17.0	16.2	19.6	19.4	21.6	18.9	18.3	17.5	16.5	17.0	217.4	--	--
Michigan State Univ.	140.6	137.8	131.6	145.2	155.2	125.8	137.2	126.6	128.2	157.0	136.0	105.7	1,626.9	5.476	1.797
Oldsmobile Forge No. 2	6.0	5.7	5.4	4.8	5.2	4.6	4.7	4.7	5.9	7.8	5.3	5.0	65.1	--	--
Stockbridge	3.3	3.4	3.3	3.3	3.5	4.0	4.7	3.9	3.9	4.0	3.5	2.7	43.5	.251	.089
Webberville	3.9	3.6	3.3	3.7	4.1	4.3	5.1	3.7	3.3	3.6	2.9	3.4	44.9	--	--
Williamston	7.5	6.8	6.8	6.7	8.4	7.8	8.3	8.3	7.8	7.5	7.4	7.7	91.0	.400	.140
IONIA															
Belding	48.1	50.9	51.8	52.8	47.5	41.4	45.1	48.5	47.3	48.7	43.3	41.8	567.2	--	--
Ionia	26.4	20.0	23.5	24.6	24.3	25.2	28.0	28.8	27.1	28.1	24.5	25.0	305.5	1.235	.435
Mich. Reformatory, Ionia	17.0	13.9	15.2	15.0	14.3	10.0	20.2	17.1	14.4	16.0	13.4	16.1	182.6	--	--
Mich. Training Unit, Ionia	5.7	5.4	6.0	5.4	5.9	6.3	7.9	6.0	5.7	5.4	5.1	5.3	70.1	--	--
d)Muir	3.8	3.3	3.5	3.6	3.9	5.5	6.1	3.6	3.5	1.9	2.4	3.3	44.4	.239	.056
Pewamo	1.5	1.3	1.3	1.2	1.5	1.7	2.3	1.4	1.2	1.3	1.1	1.1	16.9	--	--
Portland	10.5	10.4	11.5	8.2	14.6	12.6	14.6	13.1	13.7	12.7	11.6	13.1	146.6	--	--
Riverside Center	6.4	6.3	6.3	6.8	6.9	6.6	7.4	7.4	7.1	6.5	7.8	9.0	84.5	.548	.110
Saranac	8.5	8.3	8.8	8.3	9.7	9.0	9.1	9.0	8.9	9.8	9.7	9.3	108.4	.781	.110
IOSCO															
Oscoda Twp.	20.9	19.5	22.2	15.5	20.7	19.3	26.8	29.0	20.2	19.8	36.5	20.5	270.9	--	--
Wurtsmith AFB	20.4	16.4	17.6	16.4	20.3	21.2	24.4	24.2	17.1	17.3	17.0	18.1	230.4	--	--
IRON															
Alpha													e)10.4	--	--
Caspian	9.2	9.2	9.8	10.0	11.4	11.2	12.8	13.1	13.9	10.8	8.6	9.0	129.0	.567	.222
Crystal Falls	14.6	14.0	14.6	13.4	17.4	14.0	16.3	15.2	13.0	13.2	12.1	12.7	170.5	.891	.367
Crystal Falls Twp.	10.8	8.5	7.9	8.0	8.2	7.6	13.7	8.0	7.9	6.5	6.8	6.5	100.4	--	.101
Iron River	10.9	11.1	11.7	10.1	10.6	9.9	11.1	10.1	9.6	9.4	8.1	9.8	122.4	.594	.148
Iron River Twp.	11.1	10.3	12.2	9.8	9.6	9.1	10.2	9.1	10.6	10.5	9.6	11.8	123.9	--	.022
Stambaugh	5.4	5.0	6.1	5.6	7.1	6.0	6.1	5.3	4.1	5.2	5.0	5.8	66.7	.330	.004
Stambaugh Twp.	5.1	5.3	6.0	4.9	4.7	4.7	4.2	3.8	3.6	3.5	3.3	4.4	53.5	--	--
ISABELLA															
f)Mt. Pleasant	65.9	72.1	70.4	77.1	73.0	72.5	76.3	86.4	87.7	81.4	75.3	69.1	907.2	3.418	1.209
Shepherd	3.8	3.6	3.8	4.2	4.0	3.8	3.7	3.4	4.3	4.3	3.9	5.1	47.9	.240	.074
JACKSON															
Concord	3.2	2.8	2.9	3.2	3.4	3.9	3.8	4.3	7.0	.3	6.0	3.0	43.8	.421	--
Grass Lake	1.7	1.6	1.6	1.7	2.0	2.1	2.5	2.0	2.0	1.8	1.6	1.7	22.3	.150	.040
Jackson	315.9	298.0	307.3	282.6	301.3	324.7	345.9	371.0	348.3	309.1	269.2	260.9	3,734.2	16.830	4.110
Springport	1.3	2.9	1.4	.6	3.4	3.6	4.5	4.3	.3	.5	1.8	1.2	25.8	--	--
State Prison, Jackson	49.2	45.3	50.2	42.7	46.3	50.1	52.2	58.3	58.3	57.6	58.5	59.0	627.7	1.980	1.430
KALAMAZOO															
Augusta	2.2	2.0	2.0	2.1	2.4	2.5	2.7	2.2	2.5	2.6	2.1	2.7	28.0	.190	.051
Brown Co.	243.5	182.4	192.4	184.0	188.3	187.5	184.1	198.9	185.9	211.9	203.8	217.0	2,379.7	--	--
Galesburg	6.1	5.1	5.9	5.6	6.7	7.4	7.9	7.5	6.5	6.0	7.3	6.0	78.0	.456	.146
Kalamazoo	429.3	331.2	426.3	451.8	515.8	607.2	594.9	578.9	525.4	488.9	428.4	395.7	5,773.8	27.614	12.687
Parchment	5.9	5.5	8.8	8.4	8.3	8.4	8.1	7.5	7.0	6.1	5.5	6.1	85.6	.589	.085
Portage	56.5	53.4	56.0	57.8	83.5	95.3	91.2	72.3	65.6	60.8	58.0	60.6	811.0	6.246	1.168
Simpson Paper Co.	28.8	26.9	27.3	24.3	22.8	24.9	16.8	25.6	24.5	27.1	23.7	22.5	e)295.2	--	--
Upjohn Co.	584.8	511.3	564.7	577.2	589.2	545.1	630.3	676.4	597.4	568.1	540.3	516.0	6,900.8	26.747	11.774
Vicksburg	9.0	9.5	9.9	9.6	11.7	13.1	13.4	11.5	15.2	9.7	9.1	9.5	131.2	1.087	.186
KALKASKA															
Kalkaska	14.6	14.7	15.9	15.0	18.4	18.8	20.1	17.7	11.5	9.9	10.6	13.3	180.5	.718	.230
KENT															
Alloytek Inc.	8.6	8.1	9.4	9.3	9.9	9.8	9.4	10.4	9.8	10.1	9.1	8.6	112.5	.460	.135
Cedar Springs	9.8	9.0	9.3	8.9	10.3	10.6	12.4	9.8	9.8	9.5	8.4	8.7	116.5	--	--
Kent County Airport													e)12.0	--	--
Lowell	19.7	18.3	19.8	19.3	22.8	21.5	23.7	21.4	19.4	19.8	18.3	19.4	243.4	1.240	.347
Plainfield Twp.	42.0	38.1	37.3	36.7	62.9	68.6	82.4	57.0	43.6	40.9	37.1	36.0	582.6	5.523	.778
Sparta	11.0	10.2	11.4	11.8	13.7	14.1	16.4	15.1	13.8	13.0	11.4	10.5	152.4	.659	.231

TABLE 2. REPORTED GROUND-WATER PUMPAGE, IN 1980 (IN MILLIONS OF GALLONS)-CONTINUED

COUNTY AND WATER USER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1980 TOTAL	MAX DAY	MIN DAY
LAKE															
Baldwin	2.4	4.9	5.5	2.9	3.9	4.6	5.0	6.4	4.1	3.0	3.0	4.9	50.6	.306	.070
LAPEER															
Columbiaville	3.2	3.3	3.3	3.0	3.5	3.5	3.3	3.6	3.0	3.2	2.8	2.2	37.9	.190	.053
Q)Dryden			4.2			3.6			3.5			3.3	14.6	--	--
North Branch	2.5	2.1	2.4	2.3	2.8	2.7	3.0	1.5	2.5	2.6	2.1	2.0	28.5	.117	--
LEELANAU															
Northport	2.3	2.3	2.7	2.4	3.5	3.7	6.0	5.6	2.2	2.1	2.0	1.5	36.3	.373	.010
LENAWEE															
Addison	2.9	2.8	3.4	2.9	3.2	3.1	3.1	3.2	3.4	3.2	3.0	3.0	37.2	.134	.026
Britton	1.1	1.2	1.1	1.4	1.2	1.2	1.5	1.2	1.1	1.1	1.0	1.1	14.2	.075	.025
Clinton	8.1	8.0	7.0	7.6	8.9	8.3	10.0	7.6	7.0	6.7	6.1	6.8	92.1	--	--
Hudson	8.2	7.7	9.1	9.3	10.1	10.3	10.5	9.9	9.1	8.6	8.6	8.0	109.4	.534	.163
Morenci	7.1	7.0	7.1	7.7	8.6	8.5	8.8	9.3	9.8	7.8	7.2	7.3	96.2	.578	.139
Onsted	4.0	3.9	4.1	4.8	4.4	4.7	5.2	4.6	4.7	4.5	3.3	3.2	51.4	--	--
Tecumseh	27.8	23.4	25.8	26.9	27.0	25.8	22.7	11.4	11.6	20.8	23.3	22.8	269.3	1.506	.048
Fisher Body, Tecumseh	.8	.7	.8	.7	.7	.7	.6	.8	.7	.8	.7	.7	8.7	e).171	.000
LIVINGSTON															
Brighton	24.0	22.3	19.4	24.0	23.5	28.5	25.0	22.2	22.0	21.3	19.9	20.3	272.4	1.400	.520
Fowlerville	15.5	14.8	15.8	15.0	11.5	9.3	12.3	8.6	8.6	8.3	6.7	8.7	135.1	.605	.176
Green Oak Twp.	2.0	1.9	2.0	2.3	3.3	4.0	5.1	3.1	2.9	2.0	1.9	2.0	32.5	.291	.030
Hillcrest Center,Howell	3.5	2.9	3.0	3.6	3.2	3.4	4.1	4.4	4.8	3.3	2.9	2.1	41.5	.269	.029
Howell	37.1	35.0	37.1	37.5	40.5	40.3	47.5	40.0	35.8	35.1	32.1	32.2	450.2	2.112	.649
Maxey Boys School	3.5	3.3	3.6	3.6	3.7	4.0	4.2	3.9	3.6	4.0	3.6	4.3	45.3	.763	.067
LUCE															
Newberry	11.3	11.3	11.9	10.5	11.1	10.2	11.1	10.3	9.0	9.5	9.1	8.7	124.0	--	--
Newberry Health Center	4.5	4.3	4.8	4.4	4.2	4.1	4.0	3.7	3.5	3.7	3.7	3.4	48.3	--	--
MACOMB															
Armada	2.1	1.8	1.9	2.0	2.5	2.2	2.1	2.2	1.9	1.7	1.6	1.6	23.6	.124	.030
Richmond	11.0	9.8	10.2	9.9	10.7	10.7	13.5	9.8	11.8	11.2	9.1	11.8	129.5	--	--
Romeo	12.0	8.1	9.5	9.2	7.2	9.6	8.5	13.4	12.9	12.9	12.6	12.9	128.8	--	--
MANISTEE															
Filer Twp.	4.1	3.5	3.5	3.3	5.8	6.5	7.2	5.7	4.9	4.3	4.2	5.8	58.8	.424	.070
Manistee	42.6	39.0	41.8	33.7	43.8	48.3	52.0	44.2	42.5	37.3	38.2	39.6	503.0	2.741	.801
MARQUETTE															
Ishpeming Twp.	10.1	9.1	9.6	9.8	14.8	11.1	11.6	9.3	9.1	9.4	8.4	9.0	121.3	.853	.278
K. I. Sawyer AFB	38.5	34.9	39.5	39.8	61.8	51.6	55.7	44.0	36.4	35.4	33.6	35.1	506.3	2.898	1.031
Powell Twp.	.6	.5	.6	.5	.5	.6	.6	.6	.6	.6	.6	.6	6.9	.025	.018
Richmond Twp.	3.9	4.6	5.2	3.2	3.2	2.2	2.1	2.0	3.0	3.1	3.6	4.1	e)40.2	--	--
MENOMINEE															
Stephenson	2.9	2.9	3.0	2.8	4.1	3.5	3.7	3.0	2.8	2.8	2.4	2.6	36.5	.256	.064
MIDLAND															
Coleman	3.7	3.7	4.1	3.3	4.0	3.5	4.0	3.5	3.2	3.0	2.8	3.0	41.8	.187	.066
MISSAUKEE															
Lake City	5.4	5.4	5.3	3.6	4.5	6.8	7.6	5.8	4.4	2.8	2.9	3.6	58.1	.869	.062
MONROE															
Milan	30.8	28.2	29.8	28.8	22.0	25.6	26.0	25.0	23.9	23.8	20.2	23.1	307.2	--	--
Petersburg	2.5	2.6	2.8	3.0	3.0	3.0	3.3	3.3	3.2	3.3	2.7	2.9	35.6	--	--
MONTCALM															
Carson City	5.3	5.0	5.3	4.9	5.2	5.1	5.7	5.4	5.0	5.0	4.7	5.1	61.7	.240	.130
Edmore	4.2	3.5	4.1	3.5	5.8	6.2	8.9	5.5	4.1	3.9	3.3	3.7	56.7	.545	--
Greenville	70.4	70.8	72.6	74.6	85.9	75.5	92.5	74.0	75.2	80.0	70.6	81.3	923.4	3.777	1.455
Howard City	3.0	2.8	3.0	2.6	2.6	2.8	3.2	2.7	2.5	2.9	2.3	3.0	33.4	--	--
Sheridan	1.9	1.7	1.8	1.8	2.9	3.2	3.7	2.5	2.3	1.9	1.7	1.8	27.2	--	--
Stanton	5.4	5.0	6.3	4.4	7.9	5.1	6.0	4.5	5.9	6.2	6.1	5.7	68.5	--	--

TABLE 2. REPORTED GROUND-WATER PUMPAGE, IN 1980 (IN MILLIONS OF GALLONS)-CONTINUED

COUNTY AND WATER USER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1980 TOTAL	MAX DAY	MIN DAY
MUSKEGON															
Montague	6.4	5.8	6.1	7.2	9.0	9.5	10.4	7.5	6.5	6.0	5.7	5.9	86.0	--	--
Whitehall	37.8	35.6	40.9	41.0	47.6	45.4	51.2	34.7	44.4	39.8	36.6	36.2	491.2	2.113	.619
NEWAYGO															
Fremont	19.0	14.4	23.3	24.8	29.3	35.0	42.3	32.0	38.4	34.6	24.1	31.2	348.4	3.916	.088
Hesperia													16.0	--	--
Newaygo	5.1	5.0	4.8	4.3	5.2	5.1	5.6	4.8	4.4	5.0	4.2	8.1	61.6	.892	.036
White Cloud	9.2	8.9	9.3	8.5	8.7	9.4	16.6	10.5	9.5	9.0	9.3	10.6	119.5	.548	.210
OAKLAND															
Holly	14.4	14.6	13.5	13.0	15.6	14.8	16.9	14.1	13.2	13.6	12.9	16.4	173.0	.750	.253
Independence Twp.	7.6	7.0	6.9	9.0	11.4	14.6	19.3	11.9	8.6	9.7	6.7	8.5	121.2	--	--
Milford	19.6	17.9	19.6	19.2	22.4	22.3	27.4	21.5	19.7	20.3	17.8	19.6	247.3	1.289	.385
Orion Twp.	15.0	21.1	13.3	15.5	23.0	24.4	29.6	16.5	18.0	14.7	14.6	13.7	210.4	1.659	.360
Oxford	13.8	12.7	14.4	14.4	15.2	14.4	15.6	13.3	13.1	12.8	10.3	10.8	160.8	.880	.198
Rochester	40.9	65.7	62.0	59.7	67.5	70.1	72.8	67.8	59.4	60.5	57.2	57.6	741.2	3.134	1.180
Southfield	.4	.4	.4	.4	.5	.5	.5	.5	.5	.4	.4	.4	e)5.3	--	--
South Lyon	63.5	65.4	62.0	59.3	58.5	62.1	57.2	41.1	38.0	42.3	43.6	45.2	638.2	--	--
Sylvan Lake	6.3	4.9	5.0	5.7	5.5	6.1	8.3	6.6	5.0	5.5	5.1	5.9	69.9	--	--
Walled Lake	20.1	16.8	17.7	22.0	22.5	25.0	35.0	20.0	18.9	16.9	26.5	16.2	257.6	--	--
Waterford Twp.	140.5	118.0	108.5	121.3	154.2	205.8	165.6	141.8	143.1	138.7	125.5	123.4	1,686.4	--	--
Q)Wolverine Lake			6.3			9.8			11.1			9.5	e)36.7	--	--
OCEANA															
Hart	10.7	10.2	12.2	19.1	18.0	18.5	19.0	22.9	34.6	40.4	10.4	15.7	231.7	--	--
Pentwater	4.2	3.1	3.1	3.4	4.3	5.9	7.5	7.1	4.0	3.7	3.2	3.5	53.0	.301	--
Shelby	1.3	1.3	1.4	1.3	1.8	2.0	2.2	1.5	1.4	1.4	1.3	1.3	18.2	--	--
OGEMAW															
West Branch	9.2	8.8	9.6	9.1	10.3	10.1	11.6	11.1	9.4	9.3	8.9	9.0	116.4	.581	.092
ONTONAGON															
Bergland Twp.	1.1	1.0	1.2	.8	1.0	1.6	1.3	1.3	1.0	1.0	1.0	1.0	e)13.3	--	--
Rockland Twp.	.8	.8	.8	.8	1.0	.9	1.1	1.2	1.2	1.2	1.2	1.2	12.2	.060	.014
OSCEOLA															
Evart	60.5	51.5	48.8	47.0	50.6	44.4	51.6	62.4	61.2	66.8	53.2	49.3	647.3	3.045	.264
Marion	4.8	5.2	5.9	4.8	4.8	4.6	4.7	4.7	4.8	5.0	5.0	5.6	59.9	.226	.124
Reed City	14.0	12.5	12.7	11.6	12.3	12.6	13.5	12.5	11.1	11.0	7.0	12.9	143.7	--	--
OTSEGO															
Gaylord	15.5	16.6	15.1	15.0	20.4	18.0	23.8	25.9	17.0	20.3	15.1	16.7	219.4	--	--
Alpine Center,Gaylord	1.1	1.1	1.2	1.3	1.2	1.1	1.8	1.3	1.1	1.1	.9	.9	14.1	.202	.023
OTTAWA															
Spring Lake	9.6	9.1	9.6	9.2	14.7	14.7	15.5	15.3	11.1	9.9	9.1	8.3	136.1	1.176	.183
PRESQUE ISLE															
Onaway	5.0	5.5	6.1	4.8	5.3	4.8	6.6	6.3	3.5	3.9	3.2	5.0	60.0	.214	.108
Rogers City	9.1	10.0	11.0	10.1	12.2	13.2	18.9	19.3	11.5	11.8	10.8	12.0	149.9	--	--
ROSCOMMON															
Roscommon	4.8	5.6	7.2	5.6	5.4	6.7	5.7	5.6	4.5	4.6	4.2	4.5	64.4	--	--
SAGINAW															
Chesaning	8.6	9.3	10.2	9.6	12.2	10.0	9.4	12.0	8.4	8.1	7.6	8.4	113.8	.568	.164
Tittabawassee Twp.	5.5	5.8	6.2	5.8	6.2	7.4	7.0	7.0	6.5	6.8	5.8	6.4	76.4	.341	.142
ST. CLAIR															
Capac	5.8	5.0	5.2	4.9	5.7	5.9	6.4	6.9	6.7	6.9	3.5	3.8	e)66.7	.375	.097
Yale	6.5	6.2	6.7	6.5	7.4	6.3	6.4	6.4	5.7	5.8	5.0	5.7	74.6	--	--

TABLE 2. REPORTED GROUND-WATER PUMPAGE, IN 1980 (IN MILLIONS OF GALLONS)-CONTINUED

COUNTY AND WATER USER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1980 TOTAL	MAX DAY	MIN DAY
ST. JOSEPH															
Constantine	8.4	8.2	8.8	6.9	7.9	8.2	9.8	8.8	8.6	7.7	7.7	8.1	99.1	.643	.102
Sturgis	72.0	65.8	79.5	79.4	88.8	83.6	95.3	85.9	76.5	76.2	69.4	69.8	e)942.2	4.538	1.382
SANILAC															
Croswell	17.0	11.3	14.0	10.8	15.9	17.8	18.9	22.7	16.0	15.5	11.9	10.8	182.6	1.176	.194
Deckerville	3.0	2.9	3.6	3.2	3.2	3.0	3.8	3.7	3.6	4.3	4.3	3.7	42.3	.233	.047
Marlette	8.5	8.3	8.3	7.9	9.5	9.1	9.7	9.6	9.2	9.6	8.9	8.6	107.2	.553	.136
Peck	1.8	1.5	1.7	1.7	1.9	1.7	1.8	1.7	2.0	1.8	1.6	1.9	21.1	.084	.046
Port Sanilac	3.1	3.3	2.7	2.8	2.9	3.8	5.7	4.8	4.2	3.6	2.8	3.1	42.8	.239	.073
Sandusky	15.3	14.5	15.9	21.3	20.0	16.4	18.5	22.3	20.2	13.2	14.4	16.1	208.1	1.138	.158
SHIAWASSEE															
Bancroft	1.4	1.5	1.8	1.8	1.3	1.9	2.4	1.9	1.7	2.2	1.5	1.2	20.6	--	--
Byron	1.6	1.7	1.5	1.3	1.7	2.3	2.8	2.0	2.4	2.1	1.8	1.7	22.9	--	--
Durand	10.8	10.0	10.4	10.5	11.8	11.9	13.4	11.9	11.2	11.5	10.7	10.8	134.9	.538	.111
Owosso	76.5	65.6	70.7	67.6	77.8	76.4	83.4	79.6	70.9	74.3	64.6	65.6	e)873.0	3.724	1.440
Perry	4.3	4.7	4.6	4.4	5.6	5.3	6.8	4.6	4.5	4.1	4.0	4.0	56.9	.345	.106
TUSCOLA															
Akron	5.2	5.6	7.7	9.3	13.6	12.3	11.1	8.8	11.5	10.4	8.8	11.0	115.3	--	--
Caro	20.3	15.2	14.8	13.6	16.9	16.8	20.1	19.7	17.3	23.1	20.8	21.3	219.9	--	--
Cass City	8.5	8.3	9.1	8.8	9.4	8.6	11.8	10.2	7.6	6.9	6.6	8.1	103.9	.511	.173
Kingston	1.4	1.6	1.5	1.3	1.3	1.3	1.6	1.2	1.1	1.2	1.1	1.1	15.7	--	--
Mayville	4.3	3.6	3.5	3.2	7.6	5.2	3.0	3.1	2.7	2.6	2.5	7.8	49.1	--	--
State Hosp., Caro	4.0	3.8	5.0	4.1	4.0	3.8	4.1	3.8	3.5	4.0	3.4	3.4	46.9	.320	.050
Vassar	12.7	15.0	17.2	19.6	22.0	23.8	26.4	18.7	20.7	12.8	15.1	16.9	220.9	1.059	.324
VAN BUREN															
Bangor	4.7	4.7	4.8	4.9	5.8	5.5	5.8	5.3	4.7	4.4	4.6	4.4	59.6	.374	.057
Decatur	8.8	8.3	8.8	8.1	8.3	6.5	8.6	7.4	6.8	6.8	5.6	10.1	94.1	--	--
Gobles	1.6	1.6	1.8	2.3	2.2	2.2	2.3	2.1	1.9	1.6	1.5	1.5	22.6	.094	.036
Hartford	8.7	7.3	7.8	7.8	8.2	8.2	9.1	8.6	9.1	8.9	6.6	6.6	96.9	.486	.121
Lawrence	3.4	3.3	3.9	3.2	3.2	3.3	3.6	3.9	3.4	3.4	3.2	3.4	41.2	--	--
Lawton	18.5	16.8	17.8	15.2	15.7	22.7	16.1	18.9	33.2	40.3	12.9	15.0	243.1	1.850	.227
Paw Paw	17.7	16.5	18.6	18.3	22.7	19.3	31.1	24.0	17.8	23.8	18.2	18.4	246.4	1.467	.073
WASHTENAW															
Ann Arbor	54.8	41.7	43.4	57.1	56.4	56.8	76.2	72.0	75.9	73.5	66.8	67.9	g)742.5	--	--
Chelsea	15.6	14.3	15.1	14.2	15.6	15.8	17.7	18.9	16.9	16.2	15.7	15.4	191.4	.900	.262
Dexter	6.8	6.8	7.1	6.9	6.8	6.3	6.6	6.8	6.4	6.1	6.3	6.7	79.6	--	--
Saline	38.2	30.9	33.8	32.4	35.4	34.0	36.6	35.1	33.8	37.1	38.4	33.5	419.2	2.192	.556
Webster Twp.	2.7	2.7	2.1	2.2	4.2	4.5	7.2	3.0	2.3	2.3	2.2	2.1	37.5	.482	.023
Ypsilanti	98.2	89.6	98.0	114.8	121.7	110.1	126.3	103.3	102.5	101.1	117.0	105.4	1,288.0	5.262	2.092
Ypsilanti Twp.	5.0	0	0	0	4.6	1.7	20.2	0	0	0	0	0	31.5	10.677	0
WEXFORD															
Cadillac	56.0	58.3	61.0	52.4	69.3	65.2	92.6	70.7	51.0	55.6	51.5	54.9	738.5	4.302	1.268
Manton	6.1	6.3	6.9	4.7	4.7	4.4	5.2	5.1	4.8	4.4	4.1	4.3	61.0	.514	.034

NOTES

a) Amount pumped to supply Houghton, Hancock, Portage Township, Copper Range Company, and Atlantic Mine.
b) Amount pumped to supply Painesdale, Trimountain, Baltic, and South Range.
c) Amount Pumped to Supply Calumet, Calumet Township, Copper City, Lake Linden, Laurim, Osceola Township, Torch Lake Township, Ahmeek, and Allegouez Township.
d) Supplies water to Lyons.
e) Wholly or partly estimated.
f) Use Ranney collector system at Chippewa River site.
g) Also pumped 4,459 million gallons from Huron River.
Q) Quarterly figures.

TABLE 3. WATER-QUALITY DATA.

LOCAL IDENTIFIER: See section in text entitled "Well-numbering system"; also includes abbreviated spelling of county name.

GEOLOGIC UNIT:

112GLCL	Glacial deposits	324SGNW	Saginaw Formation	361DVCU	Ordovician, Upper
112GRVL	Gravel	333MCGN	Michigan Formation	365TRNNL	Trenton Limestone
112LKBD	Lakebeds	337ANRM	Antrim Shale	372TPMG	Trempealeau - Munising Formations
112OTSH	Outwash	337MRSL	Marshall Formation	420 JCBV	Jacobsville Sandstone
112SAND	Sand				

UNITS: Units are reported in NTU = Nephelometric Trubidity Units, MG/L = Milligrams per Liter; UG/L = Micrograms per Liter.

LOCAL IDENTIFIER		DATE OF SAMPLE	GEOLOGIC UNIT	DEPTH OF WELL, TOTAL (FEET)	TEMPERATURE, WATER (DEG C)	TURBIDITY (NTU)	COLOR (PLATINUM COBALT UNITS)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH FIELD (UNITS)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	ALKALINITY (MG/L AS CACO3)
46N 19W 02BDCC01	ALGER	80-08-21	112GLCL	168	7.5	.10	3	161	8.1	.7	43
29N 08E 12DBCC01	ALPENA	80-08-19	337ANRM	98	8.5	210	3	777	7.6	16	330
29N 06W 17DBBA01	ANTRIM	80-08-28	112OTSH	173	9.5	.10	2	355	7.9	3.9	160
19N 05E 07DABA01	ARENAC	80-08-20	324SGNW	190	10.0	6.5	3	1470	7.2	26	210
19N 05E 07DABA02	ARENAC	80-08-20	112LKBD	21	10.0	.40	3	227	7.4	7.6	98
51N 32W 19DCCC01	BARAGA	80-08-19	420JCBV	290	8.0	4.3	8	206	7.3	9.6	98
51N 33W 21DABC01	BARAGA	80-08-21	420JCBV	200	9.0	.20	2	272	8.0	2.5	130
44N 01E 31CCCC01	CHIPWA	80-08-28	361ODVCU	120	13.0	1.6	0	1145	7.8	3.7	120
44N 02E 04ABDC01	CHIPWA	80-08-28	365TRNNL	93	10.0	1.6	5	510	7.5	14	230
44N 02W 05CBCD01	CHIPWA	80-08-27	112GRVL	121	10.5	.80	0	492	7.7	7.0	180
46N 02W 04ABDC01	CHIPWA	80-08-27	372TPMG	300	9.0	.10	4	272	8.4	.7	90
46N 02W 06ABCB01	CHIPWA	80-08-27	372TPMG	101	8.5	.90	3	130	7.4	.0	0
47N 01W 35DBDA01	CHIPWA	80-08-26	372TPMG	177	10.0	.50	2	84	6.2	22	18
28N 01W 18ABBB01	CRWFRD	80-08-19	112OTSH	41	7.5	.40	7	264	7.4	9.3	120
55N 35W 14CCCA01	HOGHTN	80-08-20	112GLCL	85	10.0	.40	3	201	8.1	1.2	76
18N 10E 35CCAD01	HURON	80-08-21	333MCGN	245	12.0	7.5	4	2410	7.0	33	170
19N 13E 31CADA01	HURON	80-08-21	337MRSL	180	11.0	.50	4	609	7.2	21	170
23N 07E 21BCCB01	IOSCO	80-08-20	112OTSH	46	9.5	.30	4	262	7.4	9.3	120
24N 07E 13ADAA01	IOSCO	80-08-20	112SAND	69	8.0	.30	4	283	7.7	4.3	110
20N 11W 01ADBD01	LAKE	80-08-29	112OTSH	63	9.5	.40	2	145	8.6	.4	73
20N 13W 13ACAC01	LAKE	80-08-29	112OTSH	58	9.5	.30	2	116	8.6	.3	56
28N 14W 08DDCA01	LELANU	80-08-26	112SAND	138	10.0	.20	5	286	7.4	10	130
28N 14W 18BABB01	LELANU	80-08-25	112SAND	60	10.0	.20	2	293	7.6	7.8	160
12N 08E 26DDCC02	TUSCLA	80-08-21	324SGNW	--	11.5	2.0	4	615	7.3	23	230

LOCAL IDENTIFIER		DATE OF SAMPLE	BICARBONATE (MG/L AS HCO3)	CARBONATE (MG/L AS CO3)	NITROGEN, TOTAL (MG/L AS N)	NITROGEN, ORGANIC TOTAL (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, NITRITE TOTAL (MG/L AS N)	NITROGEN, NITRATE TOTAL (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N)
46N 19W 02BDCC01	ALGER	80-08-21	97	0	1.1	.08	.000	.000	1.0	.08	1.0
29N 08E 12DBCC01	ALPENA	80-08-19	400	0	.44	.29	.150	.000	.00	.44	.00
29N 06W 17DBBA01	ANTRIM	80-08-28	220	0	2.0	.27	.000	.000	1.7	.27	1.7
19N 05E 07DABA01	ARENAC	80-08-20	280	0	.77	.00	.780	.000	.00	.77	.00
19N 05E 07DABA02	ARENAC	80-08-20	130	0	.04	.00	.030	.000	.03	.01	.03
51N 32W 19DCCC01	BARAGA	80-08-19	120	0	.41	.13	.000	.000	.28	.13	.28
51N 33W 21DABC01	BARAGA	80-08-21	170	0	.22	.19	.000	.000	.03	.19	.03
44N 01E 31CCCC01	CHIPWA	80-08-28	170	0	.26	.06	.190	.000	.01	.25	.01
44N 02E 04ABDC01	CHIPWA	80-08-28	330	0	.11	.09	.010	.000	.01	.10	.01
44N 02W 05CBCD01	CHIPWA	80-08-27	300	0	.18	.00	.180	.000	.00	.18	.00
46N 02W 04ABDC01	CHIPWA	80-08-27	130	2	.15	.07	.080	.000	.00	.15	.00
46N 02W 06ABCB01	CHIPWA	80-08-27	71	0	.05	.00	.040	.000	.01	.04	.01
47N 01W 35DBDA01	CHIPWA	80-08-26	28	0	.93	.25	.000	.000	.68	.25	.68
28N 01W 18ABBB01	CRWFRD	80-08-19	150	0	.21	.00	.040	.000	.17	.04	.17
55N 35W 14CCCA01	HOGHTN	80-08-20	90	0	1.8	.12	.030	.000	1.6	.15	1.6
18N 10E 35CCAD01	HURON	80-08-21	280	0	.40	.11	.290	.000	.00	.40	.00
19N 13E 31CADA01	HURON	80-08-21	200	0	.24	.11	.070	.000	.06	.18	.06
23N 07E 21BCCB01	IOSCO	80-08-20	150	0	.05	.00	.040	.000	.04	.01	.04
24N 07E 13ADAA01	IOSCO	80-08-20	160	0	.16	.01	.000	.000	.15	.01	.15
20N 11W 01ADBD01	LAKE	80-08-29	90	6	.46	.14	.000	.000	.32	.14	.32
20N 13W 13ACAC01	LAKE	80-08-29	92	4	.06	.00	.010	.000	.05	.01	.05
28N 14W 08DDCA01	LELANU	80-08-26	180	0	1.7	.07	.000	.000	1.6	.07	1.6
28N 14W 18BABB01	LELANU	80-08-25	200	0	.89	.02	.000	.000	.87	.02	.87
12N 08E 26DDCC02	TUSCLA	80-08-21	350	0	.24	.09	.140	.010	.00	.23	.01

TABLE 3. WATER-QUALITY DATA. (CONTINUED)

LOCAL IDENTIFIER		DATE OF SAMPLE	PHOSPHORUS, TOTAL (MG/L AS P)	CARBON, ORGANIC DISSOLVED (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	SODIUM ADSORPTION RATIO
46N 19W 02BDCC01	ALGER	80-08-21	.000	.6	.00	80	37	23	5.5	10	.5
29N 08E 12DBCC01	ALPENA	80-08-19	.000	.8	.00	91	0	21	9.3	140	6.4
29N 06W 17DBBA01	ANTRIM	80-08-28	.010	1.2	.00	190	29	56	12	5.6	.2
19N 05E 07DABA01	ARENAC	80-08-20	.000	2.1	.00	230	20	69	14	180	5.2
19N 05E 07DABA02	ARENAC	80-08-20	.030	3.0	.00	110	11	33	6.5	2.4	.1
51N 32W 19DCCC01	BARAGA	80-08-19	.020	8.0	.00	78	0	25	3.7	9.3	.5
51N 33W 21DABC01	BARAGA	80-08-21	.000	4.1	.00	94	0	28	5.8	15	.7
44N 01E 31CCCC01	CHIPWA	80-08-28	.010	5.7	.01	350	230	92	30	97	2.2
44N 02E 04ABDC01	CHIPWA	80-08-28	.050	8.4	.00	260	31	65	24	4.5	.1
44N 02W 05CBCD01	CHIPWA	80-08-27	.030	13	.00	210	28	42	25	17	.5
46N 02W 04ABDC01	CHIPWA	80-08-27	.020	8.6	.00	100	11	27	8.2	12	.5
46N 02W 06ABCB01	CHIPWA	80-08-27	.150	5.3	.00	53	53	14	4.3	3.3	.2
47N 01W 35DBDA01	CHIPWA	80-08-26	.010	1.4	.00	31	13	8.2	2.5	3.1	.2
28N 01W 18ABBB01	CRWFRD	80-08-19	.000	1.2	.00	130	11	39	8.1	.8	.0
55N 35W 14CCCA01	HOGHTN	80-08-20	.050	3.6	.00	88	12	28	4.5	2.6	.1
18N 10E 35CCAD01	HURON	80-08-21	.010	1.5	.01	390	160	110	27	290	6.4
19N 13E 31CADA01	HURON	80-08-21	.000	1.1	.00	250	75	62	22	28	.8
23N 07E 21BCCB01	IOSCO	80-08-20	.020	1.1	.00	130	8	36	9.3	3.3	.1
24N 07E 13ADAA01	IOSCO	80-08-20	.020	.9	.00	130	25	40	8.5	1.1	.0
20N 11W 01ADBD01	LAKE	80-08-29	.040	1.0	--	82	9	21	7.1	1.1	.1
20N 13W 13ACAC01	LAKE	80-08-29	.020	.7	.00	65	9	18	4.9	.7	.0
28N 14W 08DDCA01	LELANU	80-08-26	.020	1.9	--	150	19	40	12	2.9	.1
28N 14W 18BABB01	LELANU	80-08-25	.020	1.2	--	180	18	45	16	.9	.0
12N 08E 26DDCC02	TUSCLA	80-08-21	.010	1.1	.00	270	37	64	26	30	.8

LOCAL IDENTIFIER		DATE OF SAMPLE	SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)	CHLORIDE, DISSOLVED (MG/L AS CL)	SULFATE DISSOLVED (MG/L AS SO4)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOVERABLE (UG/L AS BA)	BERYLLIUM, TOTAL RECOVERABLE (UG/L AS BE)
46N 19W 02BDCC01	ALGER	80-08-21	21	.7	.4	4.6	.1	8.9	1	100	0
29N 08E 12DBCC01	ALPENA	80-08-19	77	2.3	53	.9	.9	10	1	100	0
29N 06W 17DBBA01	ANTRIM	80-08-28	6	.7	12	6.5	.1	8.6	1	<50	0
19N 05E 07DABA01	ARENAC	80-08-20	62	6.5	84	290	.8	7.3	1	200	0
19N 05E 07DABA02	ARENAC	80-08-20	5	.4	1.5	11	.1	8.5	2	100	0
51N 32W 19DCCC01	BARAGA	80-08-19	20	2.0	1.7	5.8	.2	13	1	100	0
51N 33W 21DABC01	BARAGA	80-08-21	25	4.7	1.6	2.4	.2	8.6	1	300	0
44N 01E 31CCCC01	CHIPWA	80-08-28	36	14	280	60	1.8	8.2	0	100	0
44N 02E 04ABDC01	CHIPWA	80-08-28	4	1.5	1.2	18	.2	16	1	100	0
44N 02W 05CBCD01	CHIPWA	80-08-27	15	5.0	10	11	.5	23	1	100	0
46N 02W 04ABDC01	CHIPWA	80-08-27	20	2.9	18	13	.5	13	2	100	0
46N 02W 06ABCB01	CHIPWA	80-08-27	11	4.2	2.6	8.5	.2	11	1	100	0
47N 01W 35DBDA01	CHIPWA	80-08-26	18	.8	3.4	12	.1	21	1	<50	0
28N 01W 18ABBB01	CRWFRD	80-08-19	1	.2	1.9	6.8	.1	6.0	1	100	0
55N 35W 14CCCA01	HOGHTN	80-08-20	6	1.2	2.8	13	.1	14	2	100	0
18N 10E 35CCAD01	HURON	80-08-21	62	3.6	440	200	.8	11	6	<50	0
19N 13E 31CADA01	HURON	80-08-21	20	1.3	55	40	.4	12	1	<50	0
23N 07E 21BCCB01	IOSCO	80-08-20	5	.3	1.8	12	.1	9.7	2	100	0
24N 07E 13ADAA01	IOSCO	80-08-20	2	.3	.9	12	.1	7.3	0	100	0
20N 11W 01ADBD01	LAKE	80-08-29	3	.4	.6	7.8	.1	7.9	1	200	0
20N 13W 13ACAC01	LAKE	80-08-29	2	.3	.7	8.0	.1	5.7	1	100	0
28N 14W 08DDCA01	LELANU	80-08-26	4	8.0	9.1	12	.1	6.9	--	<50	0
28N 14W 18BABB01	LELANU	80-08-25	1	.5	1.7	10	.2	8.2	0	<50	0
12N 08E 26DDCC02	TUSCLA	80-08-21	20	2.1	5.1	40	.8	13	2	100	0

TABLE 3. WATER-QUALITY DATA. (CONTINUED)

LOCAL IDENTIFIER		DATE OF SAMPLE	BISMUTH DISSOLVED (UG/L AS BI)	BORON, TOTAL RECOVERABLE (UG/L AS B)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD)	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR)	COBALT, TOTAL RECOVERABLE (UG/L AS CO)	COPPER, TOTAL RECOVERABLE (UG/L AS CU)	IRON, TOTAL RECOVERABLE (UG/L AS FE)	IRON, DISSOLVED (UG/L AS FE)	LEAD, TOTAL RECOVERABLE (UG/L AS PB)
46N 19W 02BDCC01	ALGER	80-08-21	<1	10	0	10	0	4	40	20	2
29N 08E 12DBCC01	ALPENA	80-08-19	<1	520	1	20	8	29	7200	20	10
29N 06W 17DBBA01	ANTRIM	80-08-28	<1	2	0	10	0	3	70	20	2
19N 05E 07DABA01	ARENAC	80-08-20	<1	1700	0	10	0	0	230	220	0
19N 05E 07DABA02	ARENAC	80-08-20	<1	30	0	10	0	1	20	20	0
51N 32W 19DCCC01	BARAGA	80-08-19	<1	120	1	10	0	9	620	560	3
51N 33W 21DABC01	BARAGA	80-08-21	<1	340	0	20	0	7	70	10	5
44N 01E 31CCCC01	CHIPWA	80-08-28	<1	450	0	20	0	2	120	60	0
44N 02E 04ABDC01	CHIPWA	80-08-28	<1	60	0	10	0	3	450	260	0
44N 02W 05CBCD01	CHIPWA	80-08-27	<1	390	0	20	0	1	120	30	1
46N 02W 04ABDC01	CHIPWA	80-08-27	<1	110	0	20	0	1	100	20	0
46N 02W 06ABCB01	CHIPWA	80-08-27	<1	40	0	20	0	7	390	140	2
47N 01W 35DBDA01	CHIPWA	80-08-26	<1	20	0	20	0	56	130	20	1
28N 01W 18ABBB01	CRWFRD	80-08-19	<1	8	0	10	0	6	310	10	3
55N 35W 14CCCA01	HOGHTN	80-08-20	<1	10	0	20	0	5	120	0	2
18N 10E 35CCAD01	HURON	80-08-21	<1	360	0	10	0	3	780	710	2
19N 13E 31CADA01	HURON	80-08-21	<1	100	0	10	0	15	1400	90	6
23N 07E 21BCCB01	IOSCO	80-08-20	<1	0	0	10	0	2	20	0	2
24N 07E 13ADAA01	IOSCO	80-08-20	<1	0	0	10	0	2	10	10	1
20N 11W 01ADBD01	LAKE	80-08-29	<1	0	1	20	0	8	280	40	3
20N 13W 13ACAC01	LAKE	80-08-29	<1	0	0	20	0	1	40	30	0
28N 14W 08DDCA01	LELANU	80-08-26	<1	40	0	10	0	2	30	10	0
28N 14W 18BABB01	LELANU	80-08-25	<1	30	0	20	0	1	100	30	1
12N 08E 26DDCC02	TUSCLA	80-08-21	<1	370	1	10	0	1	25000	23000	5

LOCAL IDENTIFIER		DATE OF SAMPLE	MANGANESE, SUSPENDED RECOV. (UG/L AS MN)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DISSOLVED (UG/L AS MN)	MOLYBDENUM, TOTAL RECOVERABLE (UG/L AS MO)	NICKEL, TOTAL RECOVERABLE (UG/L AS NI)	SILVER, TOTAL RECOVERABLE (UG/L AS AG)	STRONTIUM, TOTAL RECOVERABLE (UG/L AS SR)	VANADIUM, DISSOLVED (UG/L AS V)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)
46N 19W 02BDCC01	ALGER	80-08-21	0	10	10	2	0	0	40	.0	10
29N 08E 12DBCC01	ALPENA	80-08-19	130	150	20	6	15	0	410	.0	130
29N 06W 17DBBA01	ANTRIM	80-08-28	0	10	10	0	2	0	50	.0	20
19N 05E 07DABA01	ARENAC	80-08-20	10	40	30	4	2	0	280	.0	10
19N 05E 07DABA02	ARENAC	80-08-20	20	30	10	2	0	0	60	.0	10
51N 32W 19DCCC01	BARAGA	80-08-19	10	30	20	4	3	0	380	.0	610
51N 33W 21DABC01	BARAGA	80-08-21	0	10	10	3	8	0	550	.0	400
44N 01E 31CCCC01	CHIPWA	80-08-28	0	50	70	2	0	0	4900	.0	120
44N 02E 04ABDC01	CHIPWA	80-08-28	0	10	20	0	0	0	150	.0	30
44N 02W 05CBCD01	CHIPWA	80-08-27	0	10	10	1	1	0	980	.0	280
46N 02W 04ABDC01	CHIPWA	80-08-27	0	150	150	3	0	0	390	.0	30
46N 02W 06ABCB01	CHIPWA	80-08-27	0	30	30	4	2	0	150	.0	100
47N 01W 35DBDA01	CHIPWA	80-08-26	0	0	10	2	1	0	50	.0	60
28N 01W 18ABBB01	CRWFRD	80-08-19	0	10	10	3	0	0	20	.0	80
55N 35W 14CCCA01	HOGHTN	80-08-20	0	10	10	2	4	0	60	.0	50
18N 10E 35CCAD01	HURON	80-08-21	20	30	10	5	1	0	1800	.0	20
19N 13E 31CADA01	HURON	80-08-21	10	50	40	3	3	0	1800	.0	20
23N 07E 21BCCB01	IOSCO	80-08-20	0	10	10	5	0	0	40	.0	40
24N 07E 13ADAA01	IOSCO	80-08-20	0	10	9	2	0	0	20	.0	0
20N 11W 01ADBD01	LAKE	80-08-29	0	10	10	0	3	0	40	.0	330
20N 13W 13ACAC01	LAKE	80-08-29	0	10	10	0	4	0	40	.0	20
28N 14W 08DDCA01	LELANU	80-08-26	10	10	0	0	1	0	30	.0	50
28N 14W 18BABB01	LELANU	80-08-25	0	10	10	2	0	0	20	.0	20
12N 08E 26DDCC02	TUSCLA	80-08-21	0	30	30	4	2	0	1300	.0	10

TABLE 3. WATER-QUALITY DATA. (CONTINUED)

LOCAL IDENTIFIER		DATE OF SAMPLE	TIN, DISSOLVED (UG/L AS SN) (A.A.S. DIRECT)	ALUMINUM, TOTAL RECOVERABLE (UG/L AS AL)	GALLIUM DISSOLVED (UG/L AS GA)	GERMANIUM, DISSOLVED (UG/L AS GE)	LITHIUM TOTAL RECOVERABLE (UG/L AS LI)	SELENIUM, TOTAL (UG/L AS SE)	TITANIUM, DISSOLVED (UG/L AS TI)	ZIRCONIUM, DISSOLVED (UG/L AS ZR)	PHENOLS (UG/L)
46N 19W 02BDCC01	ALGER	80-08-21	0	40	0	0	10	0	0	0	2
29N 08E 12DBCC01	ALPENA	80-08-19	0	8400	0	0	80	0	0	0	0
29N 06W 17DBBA01	ANTRIM	80-08-28	0	40	0	0	0	0	0	0	0
19N 05E 07DABA01	ARENAC	80-08-20	0	60	0	0	10	0	0	0	2
19N 05E 07DABA02	ARENAC	80-08-20	0	40	0	0	10	0	0	0	1
51N 32W 19DCCC01	BARAGA	80-08-19	0	120	0	0	20	0	0	0	0
51N 33W 21DABC01	BARAGA	80-08-21	0	20	0	0	40	0	0	0	0
44N 01E 31CCCC01	CHIPWA	80-08-28	0	200	0	0	70	0	0	0	0
44N 02E 04ABDC01	CHIPWA	80-08-28	0	200	0	0	10	0	0	0	1
44N 02W 05CBCD01	CHIPWA	80-08-27	0	30	0	0	10	0	0	0	1
46N 02W 04ABDC01	CHIPWA	80-08-27	0	40	0	0	10	0	0	0	0
46N 02W 06ABCB01	CHIPWA	80-08-27	0	40	0	0	0	0	0	0	2
47N 01W 35DBDA01	CHIPWA	80-08-26	0	30	0	0	10	0	0	0	2
28N 01W 18ABBB01	CRWFRD	80-08-19	0	30	0	0	10	0	0	0	0
55N 35W 14CCCA01	HOGHTN	80-08-20	0	20	0	0	10	0	0	0	0
18N 10E 35CCAD01	HURON	80-08-21	0	40	0	0	30	0	0	0	2
19N 13E 31CADA01	HURON	80-08-21	0	240	0	0	30	0	0	0	11
23N 07E 21BCCB01	IOSCO	80-08-20	0	30	0	0	10	0	0	0	0
24N 07E 13ADAA01	IOSCO	80-08-20	0	30	0	0	10	0	0	0	3
20N 11W 01ADBD01	LAKE	80-08-29	0	50	0	0	0	0	0	0	0
20N 13W 13ACAC01	LAKE	80-08-29	0	50	0	0	0	0	0	0	0
28N 14W 08DDCA01	LELANU	80-08-26	0	200	0	0	0	--	0	0	9
28N 14W 18BABB01	LELANU	80-08-25	0	30	0	0	0	0	0	0	3
12N 08E 26DDCC02	TUSCLA	80-08-21	0	50	0	0	20	0	0	0	7

LOCAL IDENTIFIER		DATE OF SAMPLE	PERTHANE TOTAL (UG/L)	NAPHTHALENES, POLYCHLOR. TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	LINDANE TOTAL (UG/L)	CHLORDANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)	DDT, TOTAL (UG/L)	DIELDRIN TOTAL (UG/L)
46N 19W 02BDCC01	ALGER	80-08-21	.00	.00	.00	.00	.0	.00	.00	.00	.00
29N 08E 12DBCC01	ALPENA	80-08-19	.00	.00	.00	.00	.0	.00	.00	.00	.00
29N 06W 17DBBA01	ANTRIM	80-08-28	.00	.00	.00	.00	.0	.00	.00	.00	.00
19N 05E 07DABA01	ARENAC	80-08-20	.00	.00	.00	.00	.0	.00	.00	.00	.00
19N 05E 07DABA02	ARENAC	80-08-20	.00	.00	.00	.00	.0	.00	.00	.00	.00
51N 32W 19DCCC01	BARAGA	80-08-19	.00	.00	.00	.00	.0	.00	.00	.00	.00
51N 33W 21DABC01	BARAGA	80-08-21	.00	.00	.00	.00	.0	.00	.00	.00	.00
44N 01E 31CCCC01	CHIPWA	80-08-28	.00	.00	.00	.00	.0	.00	.00	.00	.00
44N 02E 04ABDC01	CHIPWA	80-08-28	.00	.00	.00	.00	.0	.00	.00	.00	.00
44N 02W 05CBCD01	CHIPWA	80-08-27	.00	.00	.00	.00	.0	.00	.00	.00	.00
46N 02W 04ABDC01	CHIPWA	80-08-27	.00	.00	.00	.00	.0	.00	.00	.00	.00
46N 02W 06ABCB01	CHIPWA	80-08-27	.00	.00	.00	.00	.0	.00	.00	.00	.00
47N 01W 35DBDA01	CHIPWA	80-08-26	.00	.00	.00	.00	.0	.00	.00	.00	.00
28N 01W 18ABBB01	CRWFRD	80-08-19	.00	.00	.00	.00	.0	.00	.00	.00	.00
55N 35W 14CCCA01	HOGHTN	80-08-20	.00	.00	.00	.00	.0	.00	.00	.00	.00
18N 10E 35CCAD01	HURON	80-08-21	.00	.00	.00	.00	.0	.00	.00	.00	.00
19N 13E 31CADA01	HURON	80-08-21	.00	.00	.00	.00	.0	.00	.00	.00	.00
23N 07E 21BCCB01	IOSCO	80-08-20	.00	.00	.00	.00	.0	.00	.00	.00	.00
24N 07E 13ADAA01	IOSCO	80-08-20	.00	.00	.00	.00	.0	.00	.00	.00	.00
20N 11W 01ADBD01	LAKE	80-08-29	.00	.00	.00	.00	.0	.00	.00	.00	.00
20N 13W 13ACAC01	LAKE	80-08-29	.00	.00	.00	.00	.0	.00	.00	.00	.00
28N 14W 08DDCA01	LELANU	80-08-26	.00	.00	.00	.00	.0	.00	.00	.00	.00
28N 14W 18BABB01	LELANU	80-08-25	.00	.00	.00	.00	.0	.00	.00	.00	.00
12N 08E 26DDCC02	TUSCLA	80-08-21	.00	.00	.00	.00	.0	.00	.00	.00	.00

TABLE 3. WATER-QUALITY DATA. (CONTINUED)

LOCAL IDENTIFIER		DATE OF SAMPLE	ENDOSULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	TOXAPHENE, TOTAL (UG/L)	HEPTACHLOR, TOTAL (UG/L)	HEPTACHLOR EPOXIDE TOTAL (UG/L)	METHOXYCHLOR, TOTAL (UG/L)	PCB TOTAL (UG/L)	MALATHION, TOTAL (UG/L)
46N 19W 02BDCC01	ALGER	80-08-21	.00	.00	.00	0	.00	.00	.00	.00	.00
29N 08E 12DBCC01	ALPENA	80-08-19	.00	.00	.00	0	.00	.00	.00	.00	.00
29N 06W 17DBBA01	ANTRIM	80-08-28	.00	.00	.00	0	.00	.00	.00	.00	.00
19N 05E 07DABA01	ARENAC	80-08-20	.00	.00	.00	0	.00	.00	.00	.00	.00
19N 05E 07DABA02	ARENAC	80-08-20	.00	.00	.00	0	.00	.00	.00	.00	.00
51N 32W 19DCCC01	BARAGA	80-08-19	.00	.00	.00	0	.00	.00	.00	.00	.00
51N 33W 21DABC01	BARAGA	80-08-21	.00	.00	.00	0	.00	.00	.00	.00	.00
44N 01E 31CCCC01	CHIPWA	80-08-28	.00	.00	.00	0	.00	.00	.00	.00	.00
44N 02E 04ABDC01	CHIPWA	80-08-28	.00	.00	.00	0	.00	.00	.00	.00	.00
44N 02W 05CBCD01	CHIPWA	80-08-27	.00	.00	.00	0	.00	.00	.00	.00	.00
46N 02W 04ABDC01	CHIPWA	80-08-27	.00	.00	.00	0	.00	.00	.00	.00	.00
46N 02W 06ABCB01	CHIPWA	80-08-27	.00	.00	.00	0	.00	.00	.00	.00	.00
47N 01W 35DBDA01	CHIPWA	80-08-26	.00	.00	.00	0	.00	.00	.00	.00	.00
28N 01W 18ABBB01	CRWFRD	80-08-19	.00	.00	.00	0	.00	.00	.00	.00	.00
55N 35W 14CCCA01	HOGHTN	80-08-20	.00	.00	.00	0	.00	.00	.00	.00	.00
18N 10E 35CCAD01	HURON	80-08-21	.00	.00	.00	0	.00	.00	.00	.00	.00
19N 13E 31CADA01	HURON	80-08-21	.00	.00	.00	0	.00	.00	.00	.00	.00
23N 07E 21BCCB01	IOSCO	80-08-20	.00	.00	.00	0	.00	.00	.00	.00	.00
24N 07E 13ADAA01	IOSCO	80-08-20	.00	.00	.00	0	.00	.00	.00	.00	.00
20N 11W 01ADBD01	LAKE	80-08-29	.00	.00	.00	0	.00	.00	.00	.00	.00
20N 13W 13ACAC01	LAKE	80-08-29	.00	.00	.00	0	.00	.00	.00	.00	.00
28N 14W 08DDCA01	LELANU	80-08-26	.00	.00	.00	0	.00	.00	.00	.00	.00
28N 14W 18BABB01	LELANU	80-08-25	.00	.00	.00	0	.00	.00	.00	.00	.00
12N 08E 26DDCC02	TUSCLA	80-08-21	.00	.00	.00	0	.00	.00	.00	.00	.00

LOCAL IDENTIFIER		DATE OF SAMPLE	PARATHION, TOTAL (UG/L)	DIAZINON, TOTAL (UG/L)	METHYL PARATHION, TOTAL (UG/L)	2,4-D, TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	MIREX, TOTAL (UG/L)	SILVEX, TOTAL (UG/L)	TOTAL TRITHION (UG/L)	METHYL TRITHION, TOTAL (UG/L)
46N 19W 02BDCC01	ALGER	80-08-21	.00	.00	.00	.00	.00	.00	.00	.00	.00
29N 08E 12DBCC01	ALPENA	80-08-19	.00	.00	.00	.00	.00	.00	.00	.00	.00
29N 06W 17DBBA01	ANTRIM	80-08-28	.00	.00	.00	.00	.00	.00	.00	.00	.00
19N 05E 07DABA01	ARENAC	80-08-20	.00	.00	.00	.00	.00	.00	.00	.00	.00
19N 05E 07DABA02	ARENAC	80-08-20	.00	.00	.00	.00	.00	.00	.00	.00	.00
51N 32W 19DCCC01	BARAGA	80-08-19	.00	.00	.00	.00	.00	.00	.00	.00	.00
51N 33W 21DABC01	BARAGA	80-08-21	.00	.00	.00	.00	.00	.00	.00	.00	.00
44N 01E 31CCCC01	CHIPWA	80-08-28	.00	.00	.00	.00	.00	.00	.00	.00	.00
44N 02E 04ABDC01	CHIPWA	80-08-28	.00	.00	.00	.00	.00	.00	.00	.00	.00
44N 02W 05CBCD01	CHIPWA	80-08-27	.00	.00	.00	.00	.00	.00	.00	.00	.00
46N 02W 04ABDC01	CHIPWA	80-08-27	.00	.00	.00	.00	.00	.00	.00	.00	.00
46N 02W 06ABCB01	CHIPWA	80-08-27	.00	.00	.00	.00	.00	.00	.00	.00	.00
47N 01W 35DBDA01	CHIPWA	80-08-26	.00	.00	.00	.00	.00	.00	.00	.00	.00
28N 01W 18ABBB01	CRWFRD	80-08-19	.00	.00	.00	.00	.00	.00	.00	.00	.00
55N 35W 14CCCA01	HOGHTN	80-08-20	.00	.00	.00	.00	.00	.00	.00	.00	.00
18N 10E 35CCAD01	HURON	80-08-21	.00	.00	.00	.00	.00	.00	.00	.00	.00
19N 13E 31CADA01	HURON	80-08-21	.00	.00	.00	.00	.00	.00	.00	.00	.00
23N 07E 21BCCB01	IOSCO	80-08-20	.00	.00	.00	.00	.00	.00	.00	.00	.00
24N 07E 13ADAA01	IOSCO	80-08-20	.00	.00	.00	.00	.00	.00	.00	.00	.00
20N 11W 01ADBD01	LAKE	80-08-29	.00	.00	.00	.00	.00	.00	.00	.00	.00
20N 13W 13ACAC01	LAKE	80-08-29	.00	.00	.00	.00	.00	.00	.00	.00	.00
28N 14W 08DDCA01	LELANU	80-08-26	.00	.00	.00	.00	.00	.00	.00	.00	.00
28N 14W 18BABB01	LELANU	80-08-25	.00	.00	.00	.00	.00	.00	.00	.00	.00
12N 08E 26DDCC02	TUSCLA	80-08-21	.00	.00	.00	.00	.00	.00	.00	.00	.00

TABLE 3. WATER-QUALITY DATA. (CONTINUED)

LOCAL IDENTIFIER		DATE OF SAMPLE	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	PHOSPHORUS, ORTHOPHOSPHATE TOTAL (MG/L AS P)	NITROGEN, TOTAL (MG/L AS NO3)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)	URANIUM DISSOLVED, EXTRACTION (UG/L)
46N 19W 02BDCC01	ALGER	80-08-21	--	101	.010	4.8	<.1	1.2
29N 08E 12DBCC01	ALPENA	80-08-19	439	434	.010	1.9	.1	.13
29N 06W 17DBBA01	ANTRIM	80-08-28	207	210	.000	8.7	<.1	.24
19N 05E 07DABA01	ARENAC	80-08-20	800	790	.000	3.4	<.1	.05
19N 05E 07DABA02	ARENAC	80-08-20	121	127	.020	.18	<.1	.21
51N 32W 19DCCC01	BARAGA	80-08-19	--	120	.000	1.8	.1	.76
51N 33W 21DABC01	BARAGA	80-08-21	--	144	.020	.97	.2	3.3
44N 01E 31CCCC01	CHIPWA	80-08-28	--	655	.000	1.2	.3	.10
44N 02E 04ABDC01	CHIPWA	80-08-28	--	269	.000	.49	.1	1.0
44N 02W 05CBCD01	CHIPWA	80-08-27	--	242	.000	.80	.1	<.01
46N 02W 04ABDC01	CHIPWA	80-08-27	--	161	.010	.66	.2	.83
46N 02W 06ABCB01	CHIPWA	80-08-27	--	83	.170	.22	.1	<.01
47N 01W 35DBDA01	CHIPWA	80-08-26	--	65	.010	4.1	.1	<.01
28N 01W 18ABBB01	CRWFRD	80-08-19	140	137	.000	.93	<.1	.20
55N 35W 14CCCA01	HOGHTN	80-08-20	--	112	.000	7.7	<.1	<.01
18N 10E 35CCAD01	HURON	80-08-21	1320	1220	.000	1.8	<.1	.11
19N 13E 31CADA01	HURON	80-08-21	381	319	.000	1.1	<.1	.04
23N 07E 21BCCB01	IOSCO	80-08-20	140	146	.000	.22	<.1	.34
24N 07E 13ADAA01	IOSCO	80-08-20	146	149	.020	.71	<.1	.13
20N 11W 01ADBD01	LAKE	80-08-29	85	96	.000	2.0	<.1	.09
20N 13W 13ACAC01	LAKE	80-08-29	62	88	.000	.27	<.1	.07
28N 14W 08DDCA01	LELANU	80-08-26	190	180	.010	7.4	<.1	.32
28N 14W 18BABB01	LELANU	80-08-25	190	181	.000	3.9	<.1	.20
12N 08E 26DDCC02	TUSCLA	80-08-21	350	376	.010	1.1	<.1	.08

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Year	WSP Number	Year	WSP Number	Year	WSP Number
1935	777	1944	1016	1953	1265
1936	817	1945	1023	1954	1321
1937	840	1946	1071	1955	1404
1938	845	1947	1096	1956-57	1537
1939	886	1948	1126	1958-62	1782
1940	906	1949	1156	1963-67	1977
1941	936	1950	1165	1968-72	2140
1942	944	1951	1191		
1943	986	1952	1221		

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Year	WDR Number
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1976	MI-76-1
1977	MI-77-1
1978	MI-78-1
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