1976

GROUND-WATER DATA
FOR
MICHIGAN

BY
G.C. HUFFMAN
U.S. GEOLOGICAL SURVEY

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

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DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

WATER RESOURCES DIVISION

Prepared by the U.S. Geological Survey
in cooperation with the
State of Michigan
Department of Natural Resources
H. A. Tanner, Director
Geological Survey Division
A. E. Slaughter, State Geologist

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METRIC EQUIVALENTS

Conversion Factors

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

Multiply English units	By	To obtain SI units
acres	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)

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INTRODUCTION

Purpose of this report

The purpose of this report is to make available the records of water levels in principal aquifers of the State through 1976 and to compile related data, such as records of ground-water pumpage. Also included in the report are data on municipal, public, and industrial water-supply facilities. Records of water levels in areas of heavy pumpage and in areas where changes are principally due to natural influences are illustrated or tabulated to allow comparison between these types of water-level fluctuations. Water levels and related data provide a record for the evaluation of available ground-water supplies. The long-term records serve as a framework to which short-term records may be related.

This report is written for persons, municipalities, industries, institutions, consultants, drillers, and hydrologists interested in the ground-water resources of the State.

What this report contains

Table 1 contains records of measurements of water levels in observation wells, well locations, depths, elevations, aquifers tapped, and water level extremes for the past. Figure 1 shows density of observation wells in the State. Table 2 contains records of pumpage by most major ground-water users in the State.

Many hydrographs are included in the report to illustrate changes in water levels. Most illustrations also show the effects of ground-water pumpage on water levels.

Supplementary data on the yield of wells, pumpage, quality of water, and trends of ground-water levels for the past five years are shown in summary form in the text. Yield data are given as they were reported by water departments and consultants.

Uses of data in this report

In areas where ground water is used for municipal or industrial supplies, hydrographs of water levels show the effects of pumpage from wells and recharge to the aquifers. Declines, except those caused by precipitation deficiencies

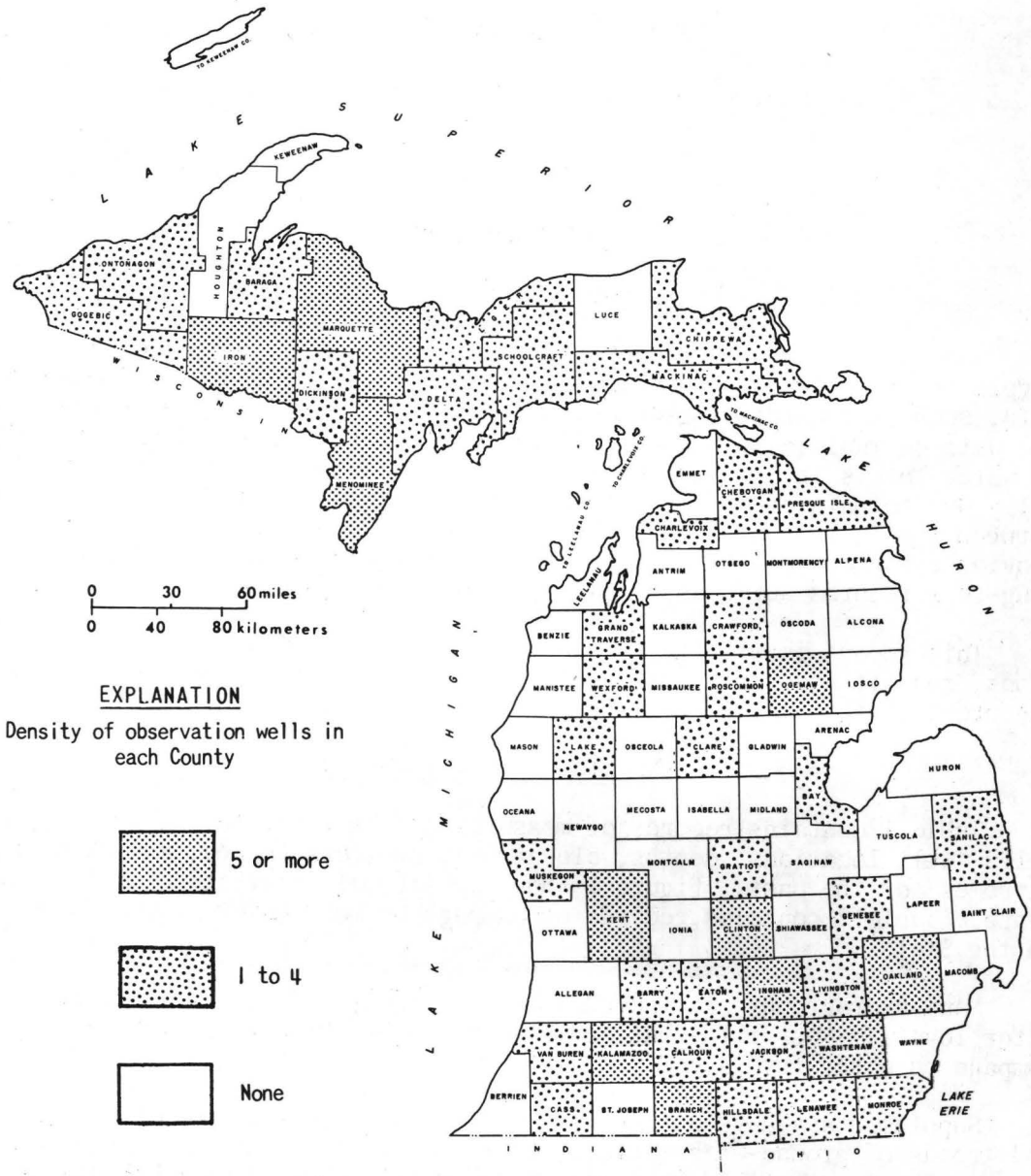


Figure 1.--In 1976, water levels were monitored in 167 observation wells.

and evapotranspiration, generally indicate depletion of storage in aquifers as caused by pumping. An effective method of determining the amount of water available from an aquifer is the analysis of long-term records of water levels and pumpage.

Many of the water-level records in pumped areas are obtained by means of recorders. These water-level records serve to 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 ground-water supply systems is practicable.

When a well is installed in an area where water levels are declining because of pumping, a projection of future water levels should be made. The well can then be drilled deep enough to take advantage of the full thickness of an aquifer, and the intake can be installed far enough below the water level in the well to allow for probable lowering of water levels and thereby extend the life of the installation. Future expense can thus be eliminated.

Water problems often are encountered when a basement or septic tank is constructed for a building or home. The water table fluctuates an average of 2 to 3 feet (0.6 to 0.9 m) annually and about 5 feet (1.5 m) over a period of years (figs. 5 and 6). Thus, if an excavation is made in the fall, when the water table is low, good construction practices would allow for the probable 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, borings would be made to determine the depth to water table, and allowances for the probable rise in water levels would be made.

Good construction of farm ponds and artificial lakes would also take into account the fluctuations of the water table, where these bodies of water depend on the height of the water table for their levels.

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), as shown on page 51. 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, publications 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.

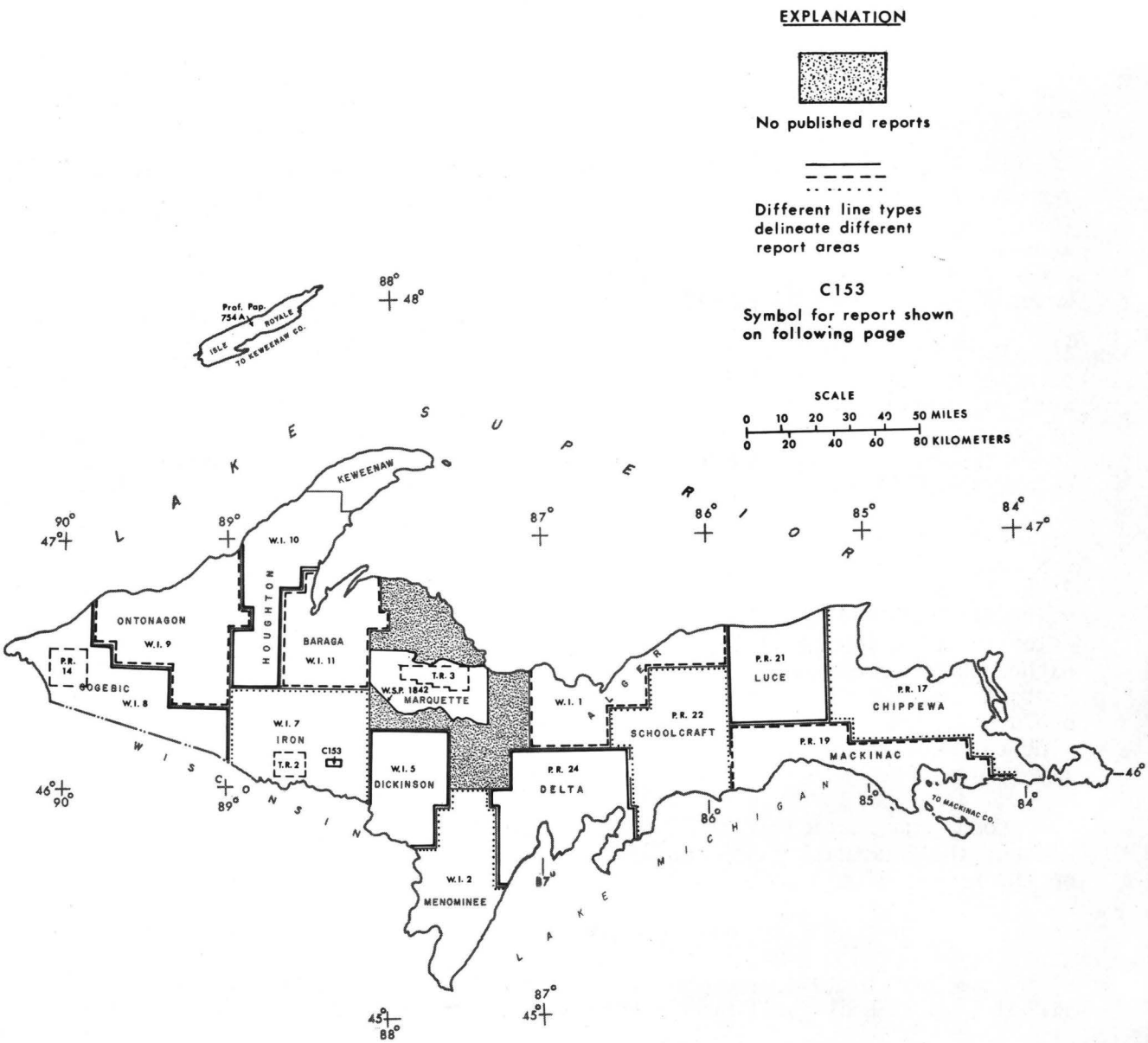


Figure 2.--Areas in the Upper Peninsula where ground-water conditions are described in published reports.

PUBLISHED REPORTS

Upper Peninsula

Circulars

C 153 -- Pettijohn, F. J., 1952, Geology of the northern Crystal Falls area, Iron County, Michigan: U.S. Geol. Survey Circ. 153.

Professional Papers

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

Progress Reports

PR 14 -- Brown, E. A., and Stuart, W. T., 1951, Ground-water resources of the glacial deposits in the Bessemer area, Michigan: Michigan Geol. Survey Prog. Rept. 14.

PR 17 -- Vanlier, K. E., and Deutsch, Morris, 1958, Reconnaissance of the ground-water resources of Chippewa County, Michigan: Michigan Geol. Survey Prog. Rept. 17.

PR 19 -- _____, 1958, Reconnaissance of the ground-water resources of Mackinac County, Michigan: Michigan Geol. Survey Prog. Rept. 19.

PR 21 -- Vanlier, K. E., 1959, Reconnaissance of the ground-water resources of Luce County, Michigan: Michigan Geol. Survey Prog. Rept. 21.

PR 22 -- Sinclair, W. C., 1959, Reconnaissance of the ground-water resources of Schoolcraft County, Michigan: Michigan Geol. Survey Prog. Rept. 22.

PR 24 -- _____, 1960, Reconnaissance of the ground-water resources of Delta County, Michigan: Michigan Geol. Survey Prog. Rept. 24.

Technical Reports

TR 2 -- Stuart, W. T., Theis, C. V., and Stanley, G. M., 1948, Ground-water problems in the Iron River district, Michigan: Michigan Geol. Survey Tech. Rept. 2.

TR 3 -- Stuart, W. T., Brown, E. A., and Rhodehamel, E. C., 1954, Ground-water investigations of the Marquette iron-mining district, Michigan: Michigan Geol. Survey Tech. Rept. 3.

Water Investigations

WI 1 -- Vanlier, K. E., 1963, Ground water in Alger County: Michigan Geol. Survey Water Inv. 1.

WI 2 -- _____, 1963, Ground water in Menominee County: Michigan Geol. Survey Water Inv. 2.

WI 5 -- Hendrickson, G. E., and Doonan, C. J., 1966, Ground-water resources of Dickinson County, Michigan: Michigan Geol. Survey Water Inv. 5.

WI 7 -- Doonan, C. J., Hendrickson, G. E., 1967, Ground water in Iron County, Michigan: Michigan Geol. Survey Water Inv. 7.

WI 8 -- _____, 1968, Ground-water in Gogebic County, Michigan: Michigan Geol. Survey Water Inv. 8.

WI 9 -- _____, 1968, Ground-water in Ontonagon County, Michigan: Michigan Geol. Survey Water Inv. 9.

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

WI 11 -- Doonan, C. J., and Byerlay, J. R., 1973, Ground water and geology of Baraga County, Michigan: Michigan Geol. Survey Water Inv. 11.

Water Supply Papers

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

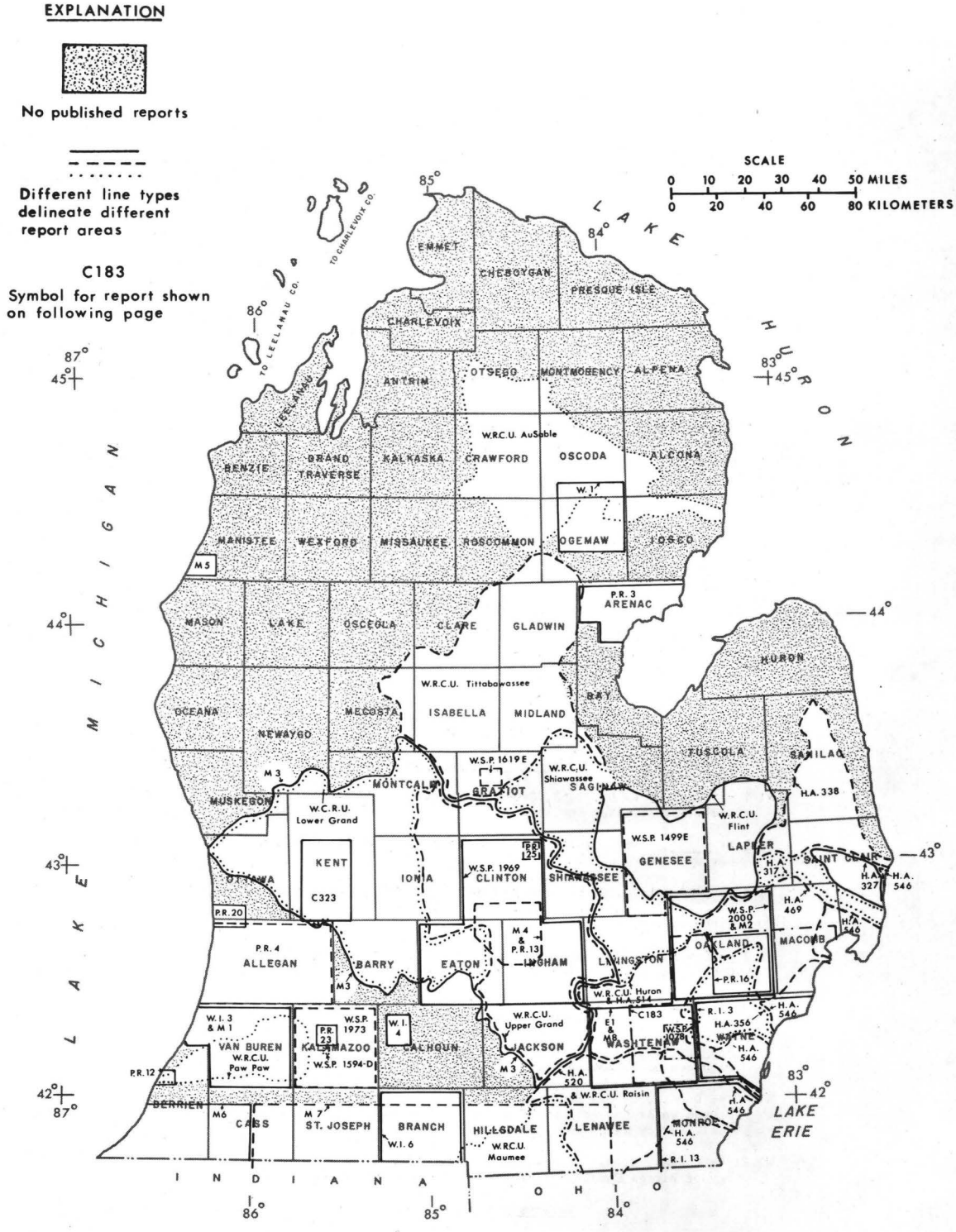


Figure 3.--Areas in the Lower Peninsula where ground-water conditions are described in published reports.

Circulars

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

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

Environmental Geology Series Reports

E 1 -- Fleck, W. B., 1974, Geology and hydrology for environmental planning in Washtenaw County, Michigan: Michigan Geol. Survey Environmental Geol. Series Rept. 1.

Hydrologic Atlases

HA 317 -- Knutilla, R. L., 1969, Water resources of the Belle River basin, southeastern Michigan: U.S. Geol. Survey Hydrol. Inv. Atlas HA-317.

HA 327 -- _____, 1969, Water resources of the Pine River basin, southeastern Michigan: U.S. Geol. Survey Hydrol. Inv. Atlas HA-327.

HA 338 -- _____, 1970, Water resources of the Black River basin, southeastern Michigan: U.S. Geol. Survey Hydrol. Inv. Atlas HA-338.

HA 356 -- _____, 1971, Water resources of the River Rouge basin, southeastern Michigan: U.S. Geol. Survey Hydrol. Inv. Atlas HA-356.

HA 469 -- Nowlin, J. O., 1973, Water resources of the Clinton River basin, southeastern Michigan: U.S. Geol. Survey Hydrol. Inv. Atlas HA-469.

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

HA 520 -- Knutilla, R. L., and Allen, W. B., 1975, Water resources of the River Raisin basin, southeastern Michigan: U.S. Geol. Survey Hydrol. Inv. Atlas HA-520.

HA 546 -- 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. Geol. Survey Hydrol. Inv. Atlas HA-546.

Miscellaneous Reports

M 1 -- 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 Geol. Survey Pub. 48.

M 2 -- Mozola, A. J., 1953, A survey of ground-water resources in Oakland County, Michigan, pt. 2 of Occasional papers for 1954 on the geology of Michigan: Michigan Geol. Survey Pub. 48.

M 3 -- Vanlier, K. E., 1968, Appendix E of the report on the Grand River Comprehensive Basin Study: U.S. Army Eng. District, Detroit, Michigan.

M 4 -- 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 Rept.

M 5 -- 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 Dept. Nat. Resources.

M 6 -- Schneider, A. F., and Keller, S. J., 1970, Indiana Geological Survey regional geological map number 4: Indiana Dept. Nat. Resources.

M 7 -- Johnson, G. H., and Keller, S. J., 1972, Indiana Geological Survey regional geological map number 8: Indiana Dept. Nat. Resources.

M 8 -- Twenter, F. R., Knutilla, R. L., and Nowlin, J. O., 1976, Water resources of Washtenaw County, Michigan: Washtenaw County Metro. Plan. Comm.

Progress Reports

PR 3 -- Pringle, G. H., 1937, Geology of Arenac County, Michigan: Michigan Geol. Survey Prog. Rept. 3.

PR 4 -- Riggs, C. H., 1938, Geology of Allegan County, Michigan: Michigan Geol. Survey Prog. Rept. 4.

PR 12 -- Stuart, W. T., and Stallman, R. W., 1945, Ground-water resources of the Benton Harbor area, Michigan: Michigan Geol. Survey Prog. Rept. 12.

PR 13 -- Stuart, W. T., 1945, Ground-water resources of the Lansing area, Michigan: Michigan Geol. Survey Prog. Rept. 13.

PR 16 -- Ferris, J. G., and others, 1954, Ground-water resources of southeastern Oakland County, Michigan: Michigan Geol. Survey Prog. Rept. 16.

Progress Reports--Continued

PR 20 -- Deutsch, Morris, Burt, E. M., and Vanlier, K. E., 1958, Summary of ground-water investigations in the Holland area, Michigan: Michigan Geol. Survey Prog. Rept. 20.

PR 23 -- Deutsch, Morris, Vanlier, K. E., and Giroux, P. R., 1960, Ground-water hydrology and glacial geology of the Kalamazoo area, Michigan: Michigan Geol. Survey Prog. Rept. 23.

PR 25 -- Vanlier, K. E., 1962, Summary of ground-water investigations in the Elsie area, Michigan: Michigan Geol. Survey Prog. Rept. 25.

Reports of Investigations

RI 3 -- Mazola, A. J., 1969, Geology for land and ground-water development in Wayne County, Michigan: Michigan Geol. Survey Rept.

RI 13 -- _____, 1970, Geology for environmental planning in Monroe County, Michigan: Michigan Geol. Survey Rept. Inv. 13.

Water Information Series

W 1 -- 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 Geol. Survey Water Information Series Rept. 1.

Water Investigations

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

WI 4 -- Vanlier, K. E., 1966, Ground-water resources of the Battle Creek area, Michigan: Michigan Geol. Survey Water Inv. 4.

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

Michigan Water Resources Commission Reports

WRCU Au Sable -- Water resource conditions and uses in the Au Sable River Basin, 1966: Michigan Water Resources Comm. Rept.

WRCU Flint -- Water resource conditions and uses in the Flint River Basin, 1956: Michigan Water Resources Comm. Rept.

WRCU Huron -- Water resource conditions and uses in the Huron River Basin, 1957: Michigan Water Resources Comm. Rept.

WRCU Lower Grand -- Water resource conditions and uses in the Lower Grand River Basin, 1967, (open file): Michigan Water Resources Comm. Rept.

WRCU Maumee -- Water resource conditions and uses in the Maumee River Basin, 1964: Michigan Water Resources Comm. Rept.

WRCU Paw Paw -- Water resource conditions and uses in the Paw Paw River Basin, 1955, (revised report in 1964): Michigan Water Resources Comm. Rept.

WRCU Raisin -- Water resource conditions and uses in the River Raisin Basin, 1965: Michigan Water Resources Comm. Rept.

WRCU Shiawassee -- Water resource conditions and uses in the Shiawassee River Basin, 1963: Michigan Water Resources Comm. Rept.

WRCU Tittibawassee -- Water resource conditions and uses in the Tittibawassee River Basin, 1960: Michigan Water Resources Comm. Rept.

WRCU Upper Grand -- Water resource conditions and uses in the Upper Grand River Basin, 1961: Michigan Water Resources Comm. Rept.

Water Supply Papers

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

WSP 1499E -- Wiitala, S. W., Vanlier, K. E., and Krieger, R. A., 1960, Water resources of the Flint area, Michigan: U.S. Geol. Survey Water-Supply Paper 1499-E.

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

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

WSP 1969 -- 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. Geol. Survey Water-Supply Paper 1969.

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

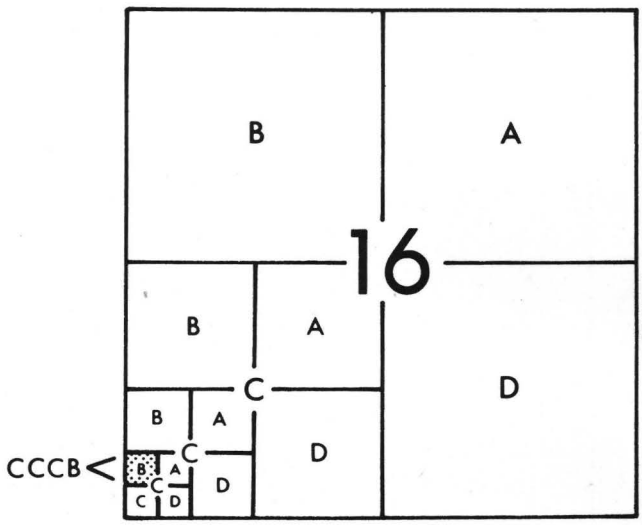
WSP 2000 -- Twenter, F. R., and Knutilla, R. L., 1972, Water for a rapidly growing urban community -- Oakland County, Michigan: U.S. Geol. Survey Water-Supply Paper 2000.

How records can be obtained

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, 2400 Science Parkway, Okemos, Michigan 48864. Records for the Northern Peninsula are also kept on file in the State and Federal Geological Survey Offices, State Office Building, Escanaba, Michigan 49829.

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 thru D designate successively smaller subdivisions of the section as shown below. Thus, a well designated as 32N 6E 16CCCB would be located to the nearest 2.5 acres (1 hectare) and would be within the shaded area in section 16.



For many wells in this report, locations are only given to the nearest 40-acre (16 hectares) tract, for example, 16CC. In the event that two or more wells are located in the same tract, a sequential number designation is added--for example, 16CC1, 16CC2, 16CC3, etc. The Michigan Geological Survey uses a similar system except that numbers are used in lieu of letters.

GROUND-WATER LEVELS IN 1976

During 1976, measurements of water levels were made in 167 observation wells, 74 of which were equipped with continuous recording gages (table 1). Record high levels occurred in 32 of the wells despite below normal precipitation in most climatological regions (fig. 4). Twenty wells were at record low levels however, an increase of 14 wells over 1975. In summary, levels were generally above average in most areas thru spring of 1976, (fig. 5), but declined to near or below average by years end.

Although precipitation is one of the major climatic factors affecting ground-water levels, annual total rainfall may not always bear a direct relationship to the amount of recharge received by an aquifer. Many factors affect this relationship, such as (1) soil conditions; (2) time, duration, and intensity of precipitation; (3) nature of underlying rocks; and (4) slope of land surface.

Hydrographs of natural fluctuations of water levels in wells (figs. 5 and 6) show that water 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 very little goes to recharge the ground-water reservoirs. There is little recharge during the growing season, as most rainfall is evaporated, is transpired by vegetation, or runs off overland after heavy showers. In the fall, evapotranspiration (return of water to the atmosphere as a vapor from water surfaces, soil, and plants) is reduced by cold weather. Thus, rises in water levels usually follow fall rains. 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.

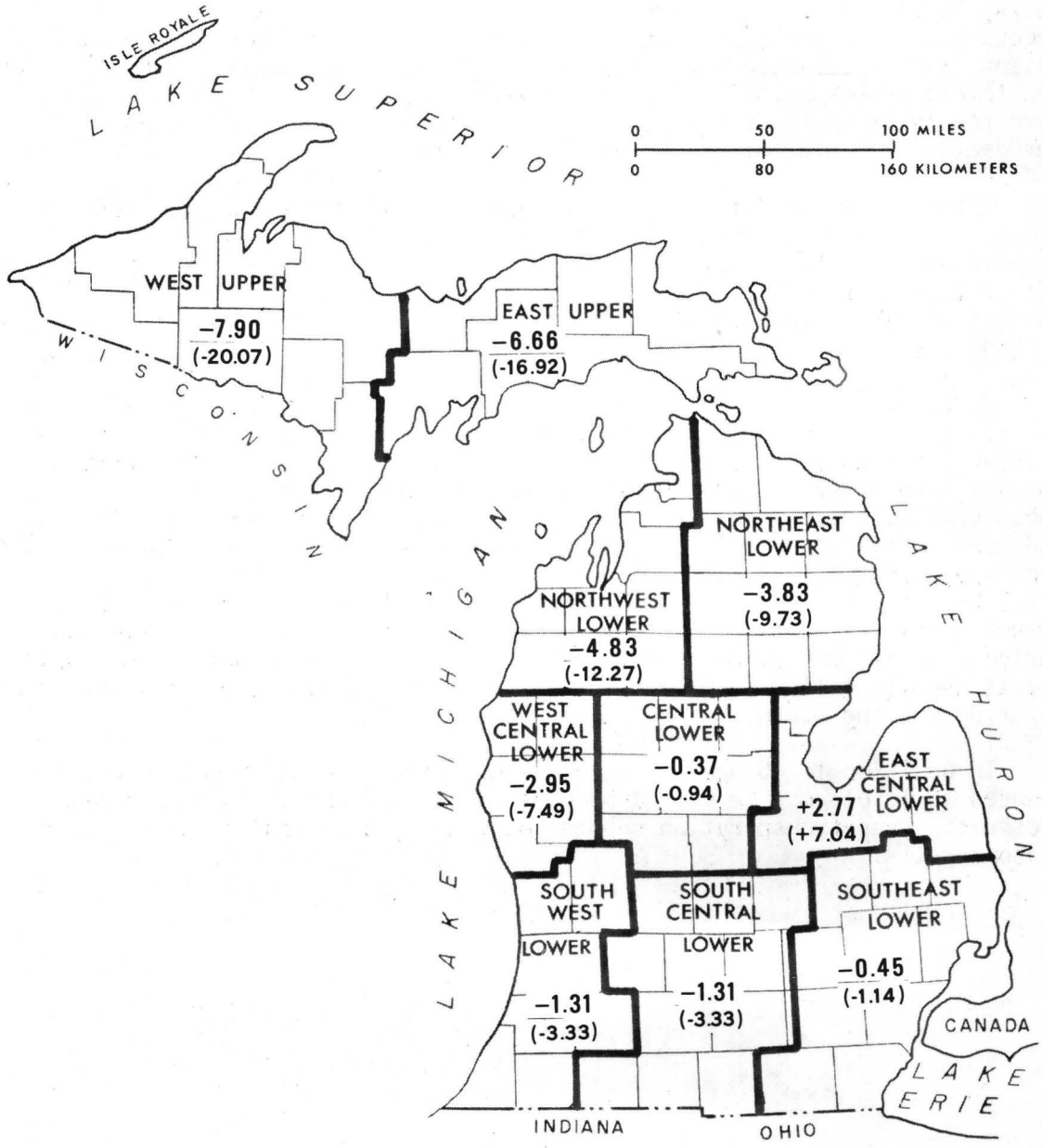


Figure 4.--Deviation of precipitation from normal during 1976 by climatological regions. Figures are in inches and, centimeters in parenthesis. Normals are based on data for 1931-60.

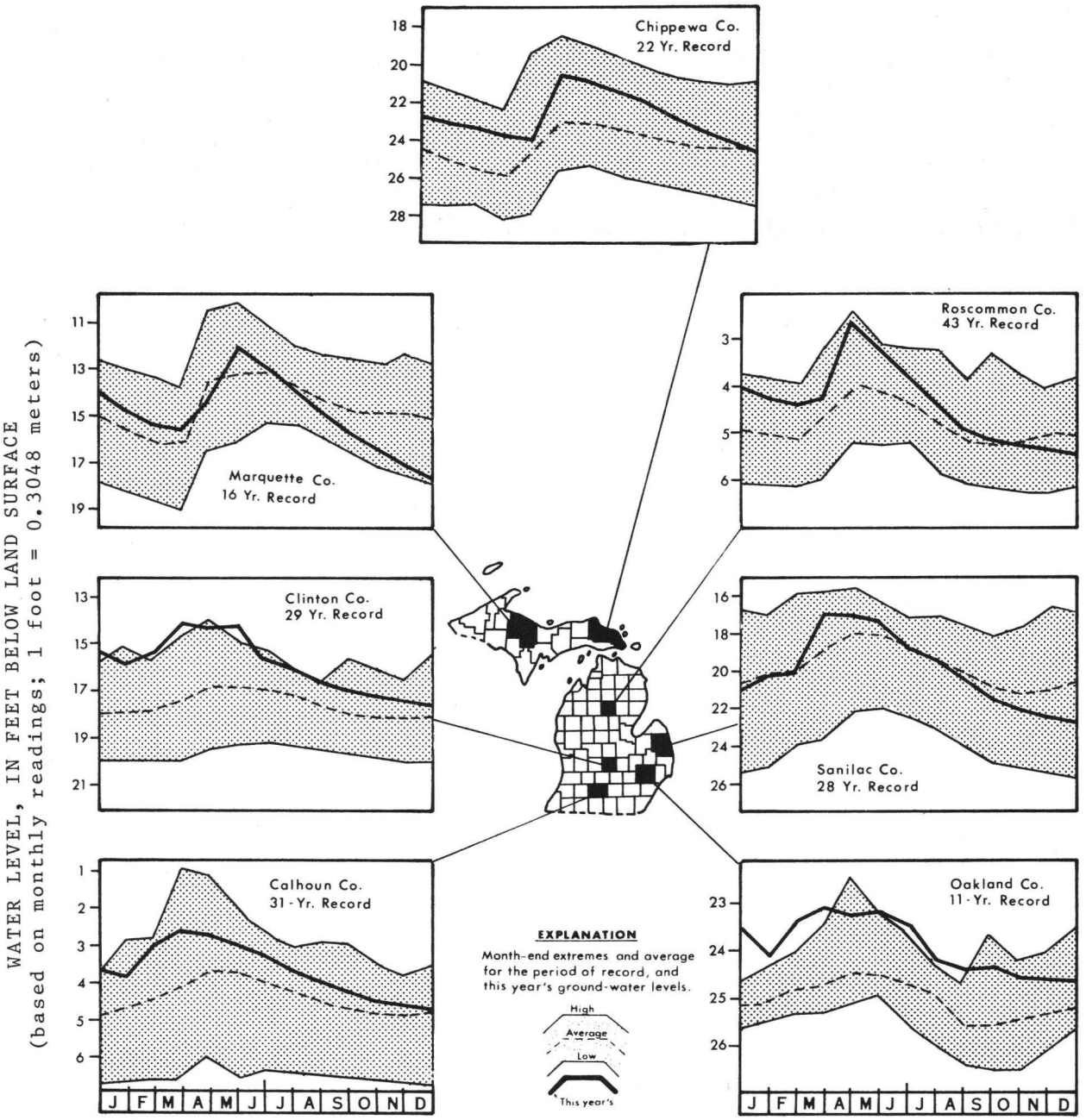


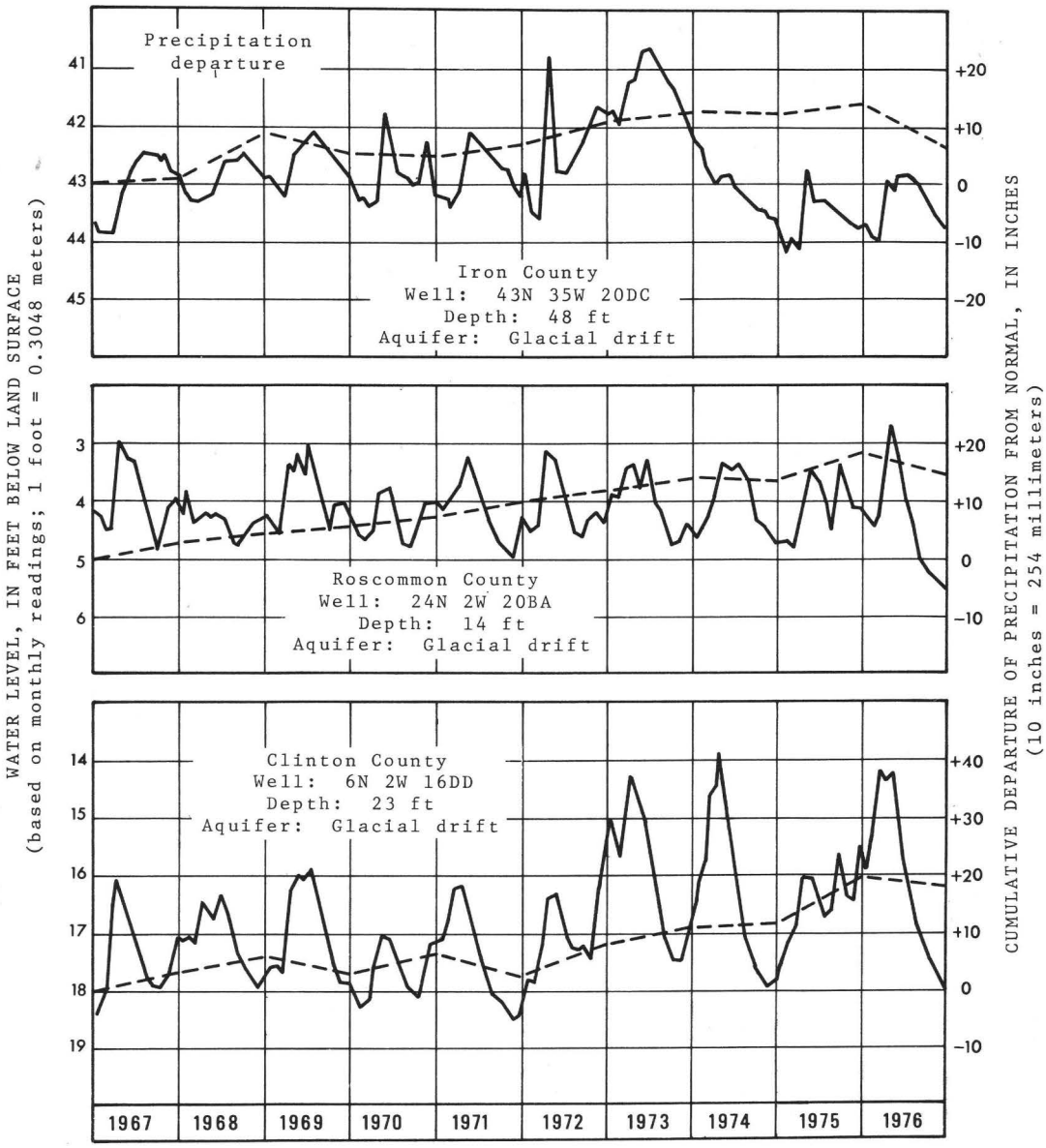
Figure 5.--Water levels in selected wells duirng 1976.

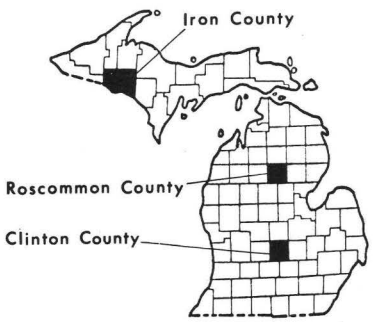
AREA GROUND-WATER LEVELS

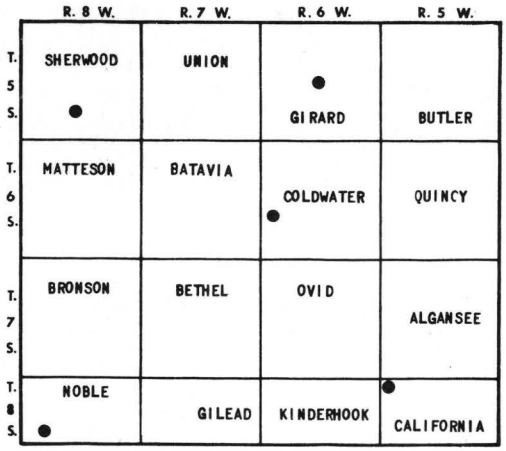
Descriptions of some of Michigan's municipal, institutional, industrial, and areal ground-water supplies follow alphabetically, by counties. Most descriptions are supplemented by illustrations.

The descriptions include a few 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).

Figure 6.--Long-term records of water levels in three wells whose levels respond principally to natural climatic conditions. Precipitation departures (dashed lines) are cumulative totals for the climatological divisions in which the wells are located.

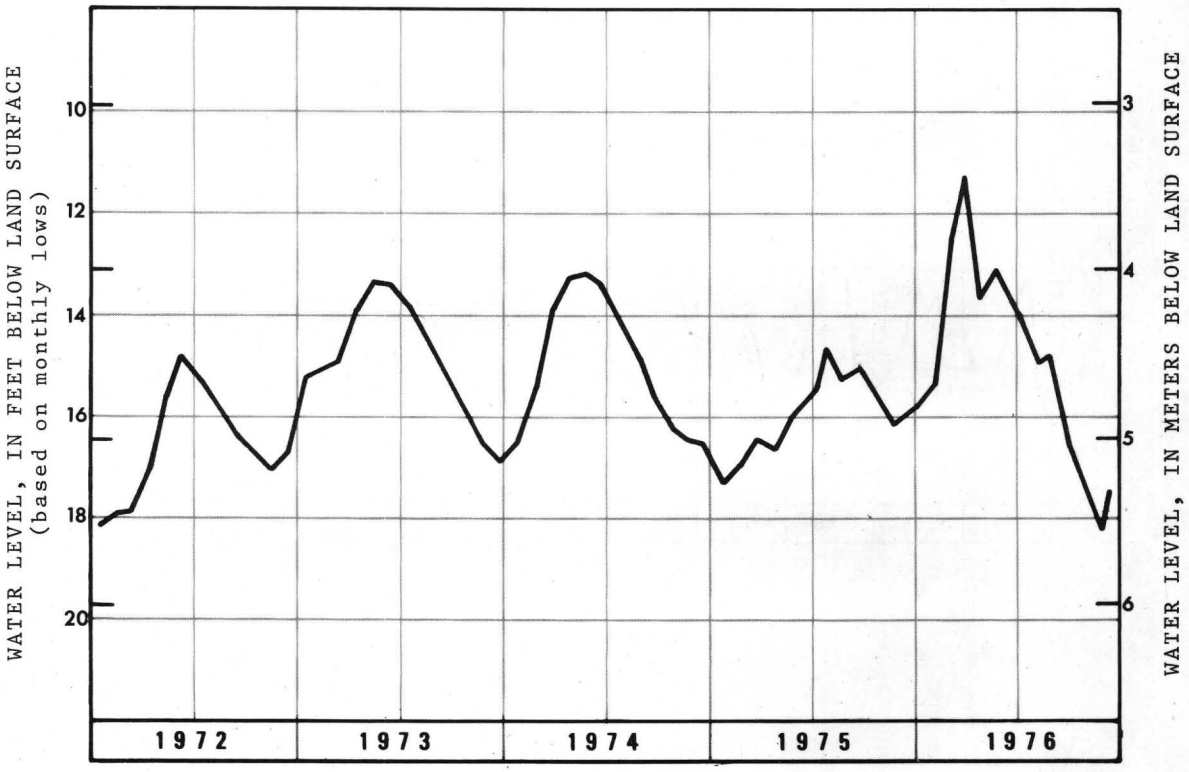

Precipitation departure
Iron County
Well: 43N 35W 20DC
Depth: 48 ft
Aquifer: Glacial drift
Roscommon County
Well: 24N 2W 20BA
Depth: 14 ft
Aquifer: Glacial drift
Clinton County
Well: 6N 2W 16DD
Depth: 23 ft
Aquifer: Glacial drift
41
42
43
44
45
3
4
5
6
14
15
16
17
18
19
+20
+10
0
-10
-20
+40
+30
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
WATER LEVEL, IN FEET BELOW LAND SURFACE
(based on monthly readings; 1 foot = 0.3048 meters)
CUMULATIVE DEPARTURE OF PRECIPITATION FROM NORMAL, IN INCHES
(10 inches = 254 millimeters)


Iron County
Roscommon County
Clinton County



EXPLANATION

● Location of observation wells



Water levels in observation well 5S 8W 28DB in Branch County. Well is 42 feet deep and in glacial deposits. Levels shown are typical of observation wells located in the county.

BRANCH COUNTY - CITY OF COLDWATER

SUPPLY AND SOURCE -- 4 wells, 121 to 132 feet deep, tap the glacial drift.

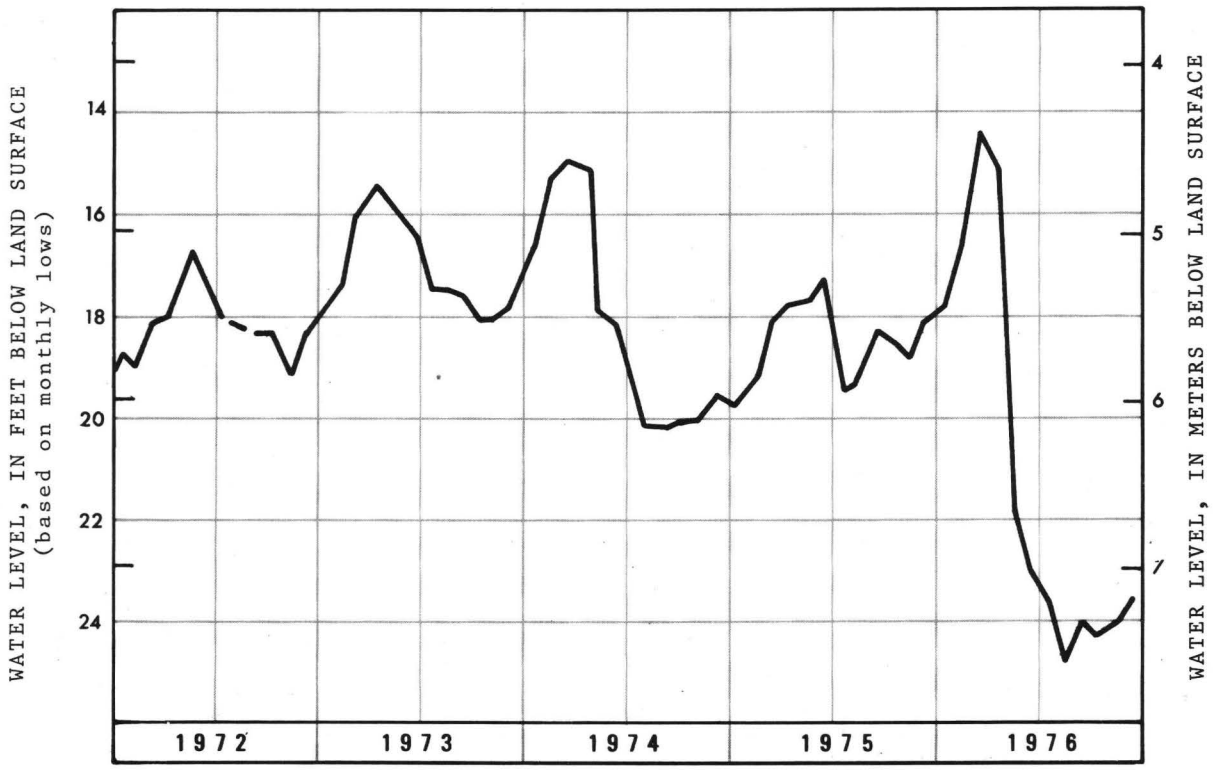
YIELD OF WELLS -- No. 3 - 1,200; No. 4 - 1,400; No. 5 - 2,250; No. 6 - 2,850 gal/min; specific capacity -- 80 to 190 gal/min/ft of drawdown.

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

1976	1,085
1975	965
1974	1,024
1973	1,023
1972	969

QUALITY OF WATER --

Hardness	300-330 mg/1
Iron	1.9-3.2 mg/1
Total Solids	343-390 mg/1



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, 120 to 160 feet deep, tap sandstones of the Marshall Formation. All are located at the Verona Field.

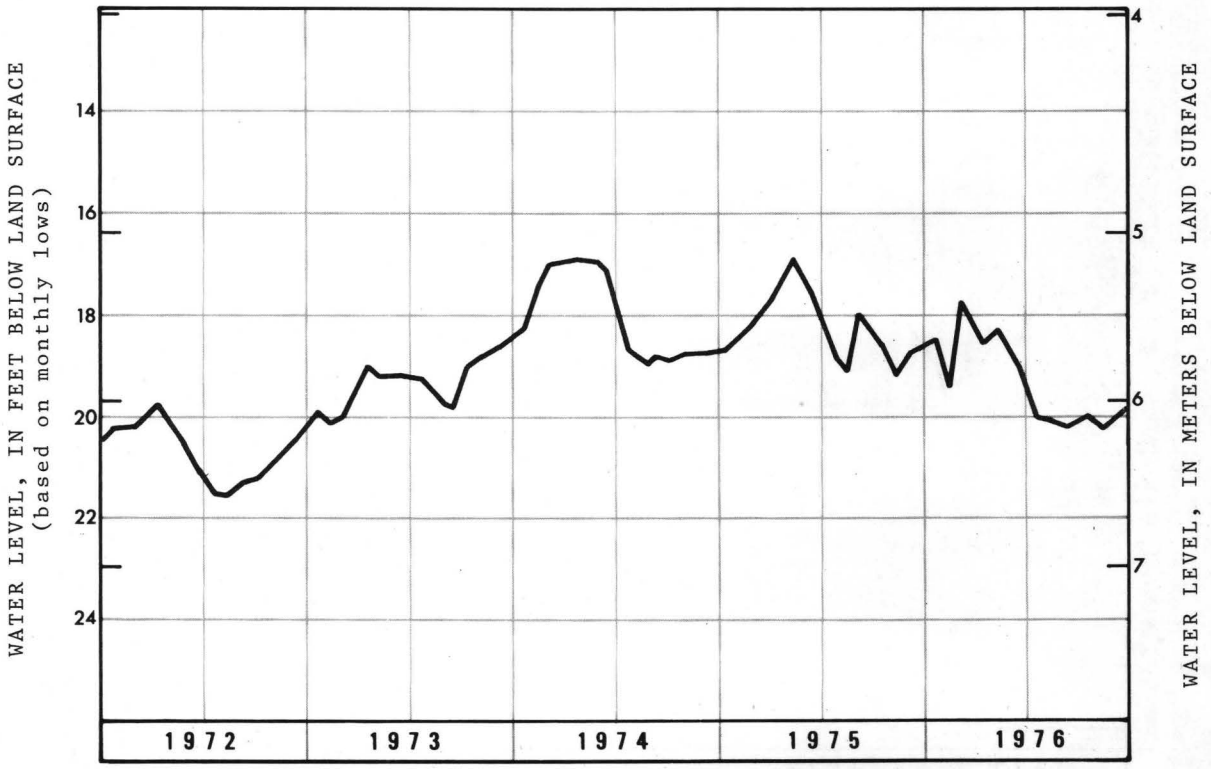
YIELD OF WELLS -- 300 to 1,000 gal/min; specific capacity -- 50 to 650 gal/min/ft of drawdown.

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

1976	2,357
1975	2,224
1974	2,168
1973	2,685
1972	2,749

QUALITY OF WATER --

Hardness	245-345 mg/1
Iron	0.05-1.3 mg/1
Total Solids	300-413 mg/1



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

CLINTON COUNTY - CITY OF ST. JOHNS

SUPPLY AND SOURCE -- 7 wells, about 500 feet deep, tap sandstones of the Saginaw Formation.

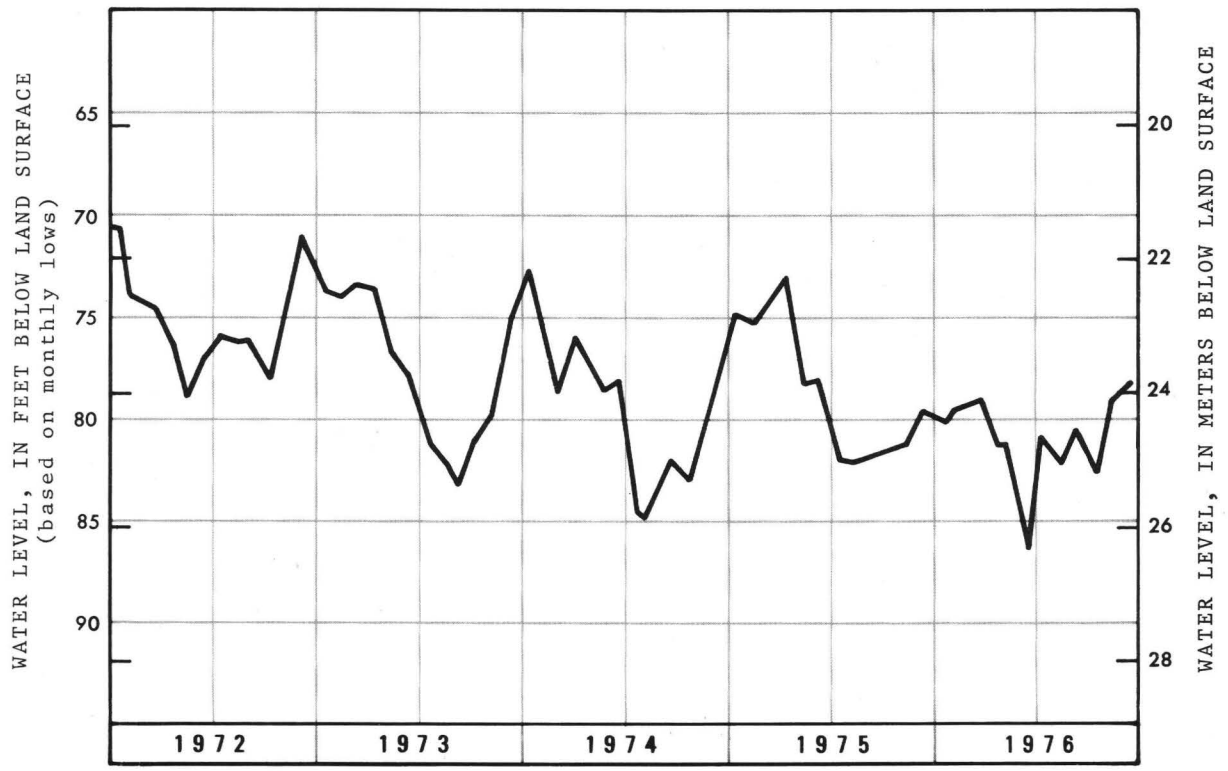
YIELD OF WELLS -- 250 to 500 gal/min; specific capacity -- 3 to 12 gal/min/ft of drawdown.

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

1976	562
1975	559
1974	576
1973	583
1972	486

QUALITY OF WATER --

Hardness	260-310 mg/1
Iron	0.15-1.0 mg/1
Total Solids	360-390 mg/1



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

SUPPLY AND SOURCE -- 4 wells, 370 to 450 feet deep, tap the Saginaw Formation.

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

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

1976	625
1975	541
1974	520
1973	435
1972	405

QUALITY OF WATER --

Hardness	275-429 mg/l
Iron	0.5-3.1 mg/l
Total Solids	334-539 mg/l

GENESEE COUNTY
FISHER BODY, GMC, AT GRAND BLANC

WATER SUPPLY AND SOURCE -- 4 wells, 200 to 285 feet deep, tap sandstones of the Saginaw Formation. Three of the four Fisher Body Plant wells have been added to the City of Grand Blanc water system since 1968.

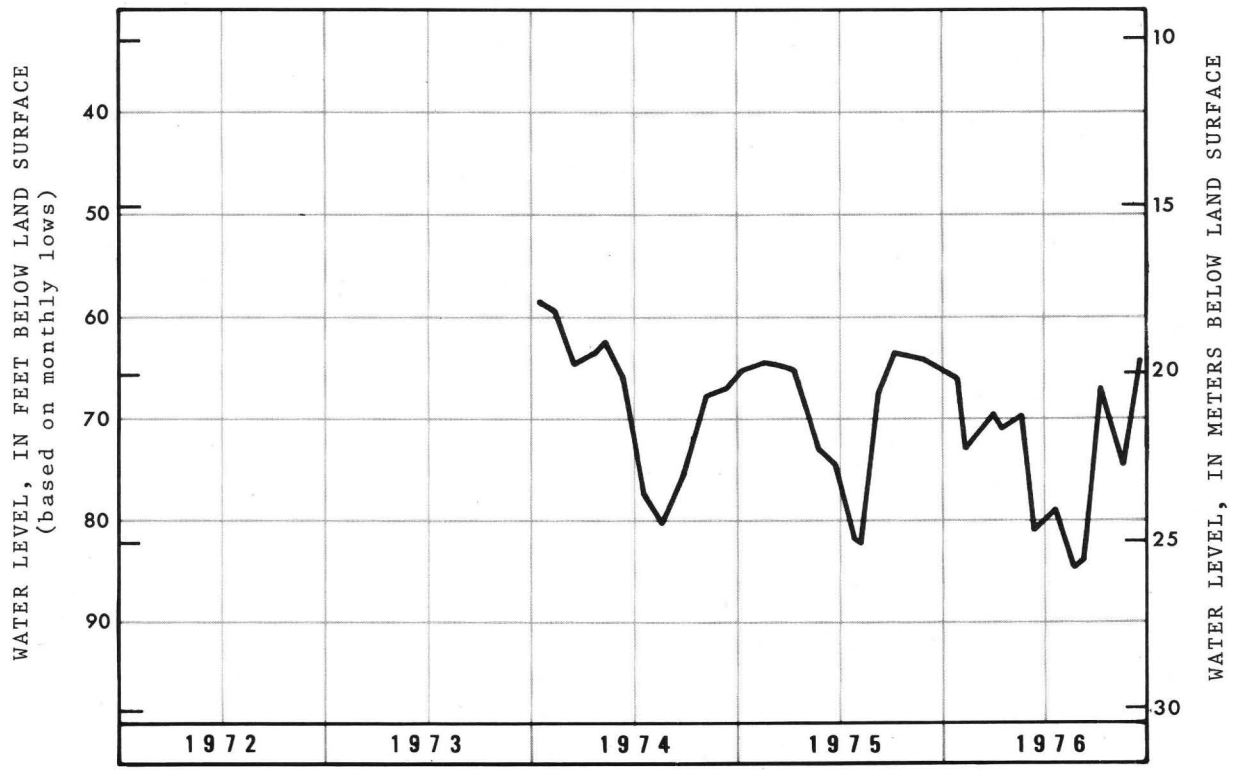
YIELD OF WELLS -- 250 to 300 gal/min; specific capacity 3 to 6 gal/min/ft of drawdown.

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

1976	52
1975	60
1974	39
1973	12
1972	89

QUALITY OF WATER --

Hardness	330 mg/l
Iron	0.80 mg/l
Total Solids	628 mg/l



Water levels in observation well 6N 7E 9DCC at Grand Blanc. Well is 385 feet deep and in the Saginaw Formation.

GRATIOT COUNTY - CITY OF ST. LOUIS

SUPPLY AND SOURCE -- 6 wells, 136 to 223 feet deep, tap buried outwash deposits in glacial drift.

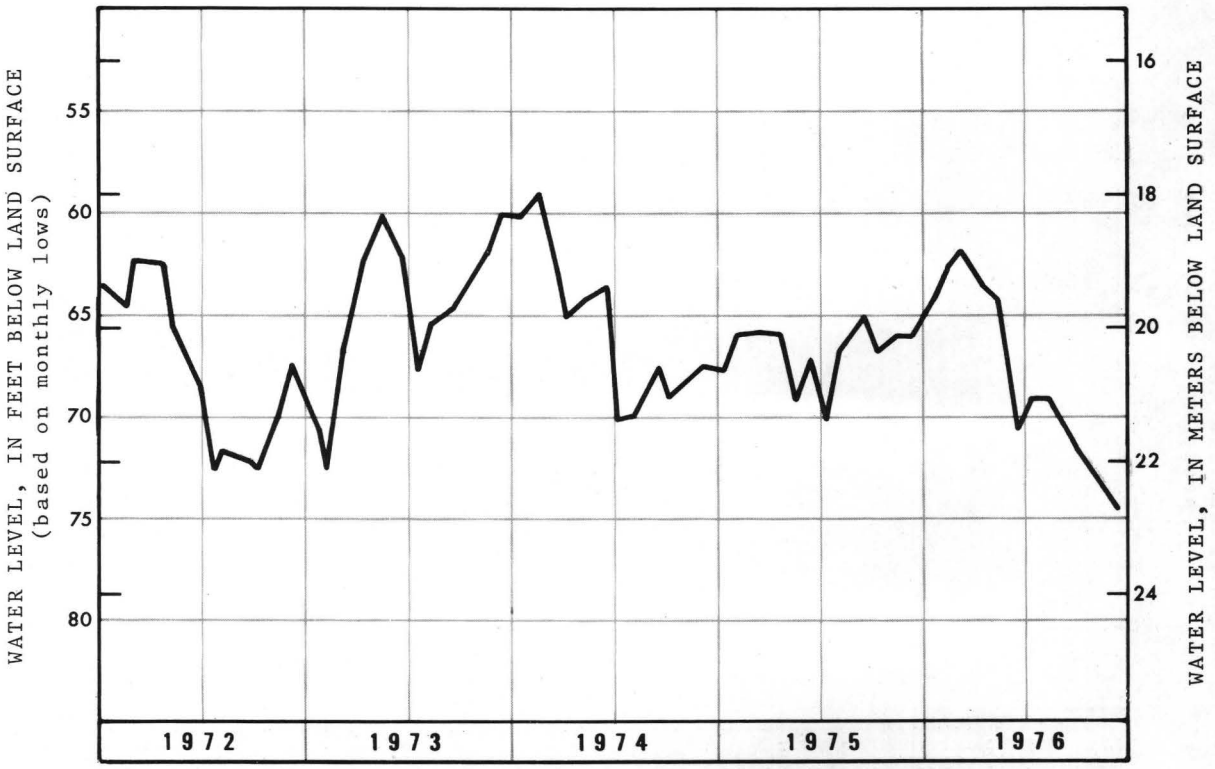
YIELD OF WELLS -- 350 to 500 gal/min; specific capacity -- 8 to 15 gal/min/ft of drawdown.

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

1976	542
1975	500
1974	530
1973	547
1972	570

QUALITY OF WATER --

Hardness	240-450 mg/l
Iron	0.3-0.8 mg/l
Total Solids	410-725 mg/l



Water levels in observation well 12N 3W 24DA at St. Louis. Well is 216 feet deep and in glacial deposits.

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

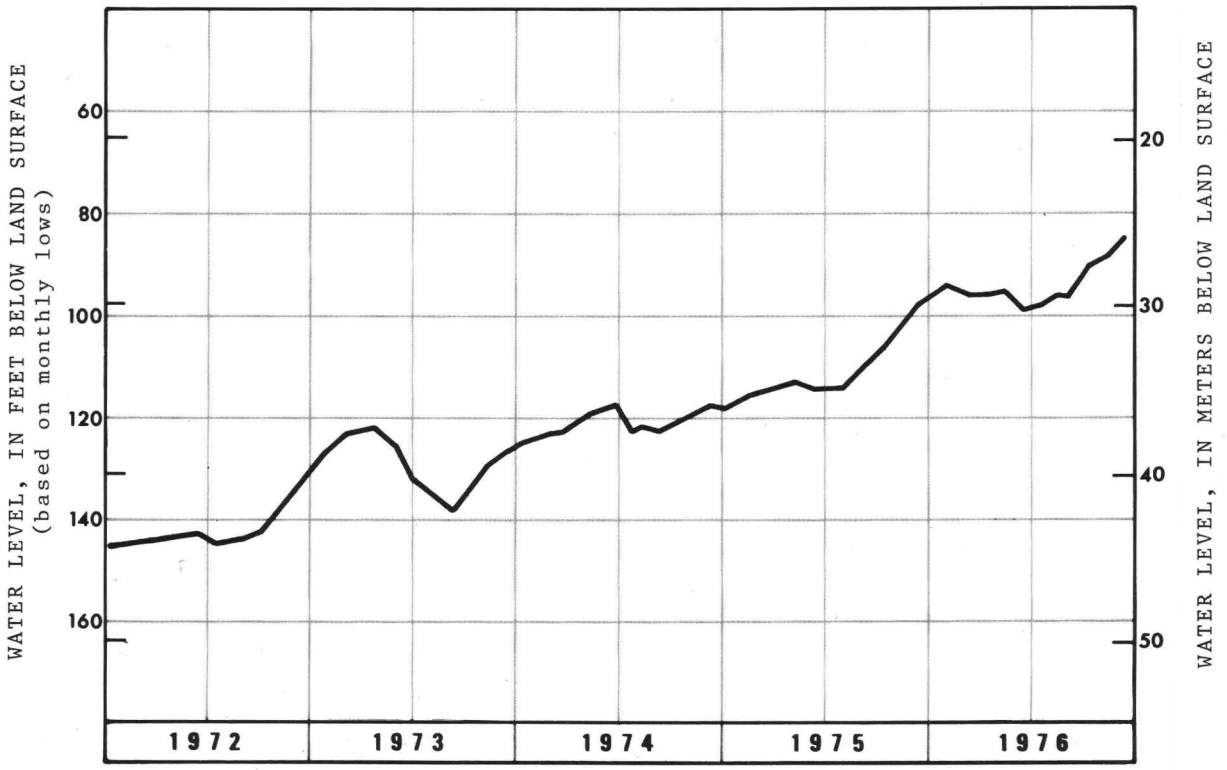
YIELD OF WELLS -- Sandstone - 100 to 700 gal/min; specific capacity - 3 to 10 gal/min/ft of drawdown.
-- Glacial drift - 790 to 1,200 gal/min, specific capacity - 12 to 80 gal/min/ft of drawdown.

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

1976	8,976
1975	8,099
1974	8,053
1973	8,850
1972	8,559

QUALITY OF WATER -- Composite at Plant

Hardness	385 mg/l
Iron	0.88 mg/l
Total Solids	456 mg/l



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

INGHAM COUNTY - CITY OF MASON

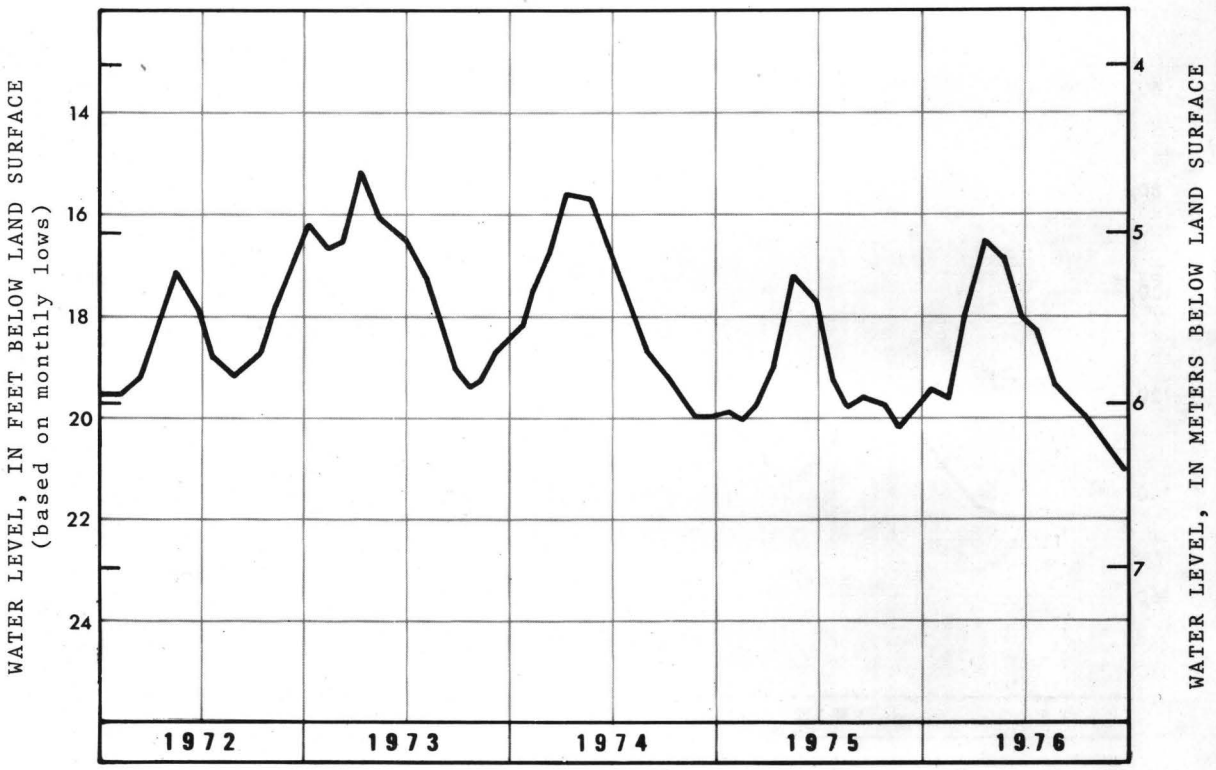
SUPPLY AND SOURCE -- 1 well, about 50 feet deep, taps the glacial drift; 1 well, 223 feet deep, taps sandstones of the Saginaw Formation.

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.

1976	218
1975	211
1974	222
1973	179
1972	192

QUALITY OF WATER -- Hardness 315-430 mg/l
Iron 0.0-0.37 mg/l
Total Solids 386-898 mg/l



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

INGHAM COUNTY
EAST LANSING-MERIDIAN TOWNSHIP

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

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

PUMPAGE -- Total annual pumpage, in million gallons.

1976	1,599
1975	1,566
1974	1,487

QUALITY OF WATER --

Hardness	310-505 mg/l
Iron	0.9-3.8 mg/l
Total Solids	345-662 mg/l

REMARKS -- In July 1973, the City of East Lansing and Meridian Township combined water systems forming the East Lansing-Meridian Township Water and Sewer Authority.

SUPPLY AND SOURCE -- 7 wells, 399 to 417 feet deep, tap sandstones of the 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.

1976	586
1975	725
1974	631
1973	750
1972	717

QUALITY OF WATER --

Hardness	274-435 mg/l
Iron	0.35-13.0 mg/l
Total 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 -- 17 wells, 353 to 435 feet deep, tap sandstones of the 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.

1976	1,731
1975	1,800
1974	1,800
1973	1,805
1972	1,712

QUALITY OF WATER --

Hardness	315-350	mg/1
Iron	0.15-1.20	mg/1
Total Solids	361-405	mg/1

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

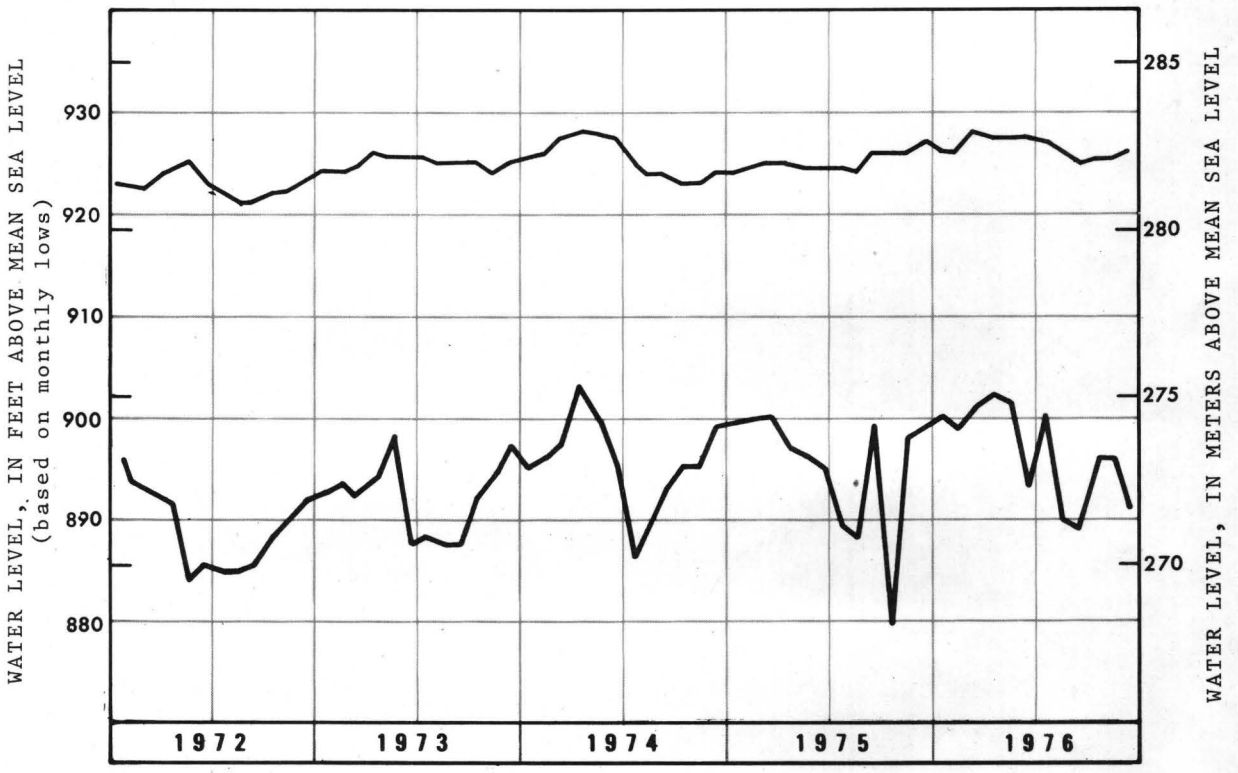
YIELD OF WELLS -- 1,000 to 2,800 gal/min; specific capacity -- No. 12 well is 56; reported average of all wells is 100 gal/min/ft of drawdown.

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

1976	4,104
1975	4,077
1974	4,634
1973	4,864
1972	4,919

QUALITY OF WATER --

Hardness	260-630	mg/l
Iron	0.2-1.0	mg/l
Total Solids	394-1072	mg/l



Hydrographs of water levels in observation wells 3S 1W 11AA2 (top), and 3S 1W 2BD (bottom). Well 3S 1W 11AA2 is 36 feet deep and in glacial deposits. Well 3S 1W 2BD 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 the glacial drift.

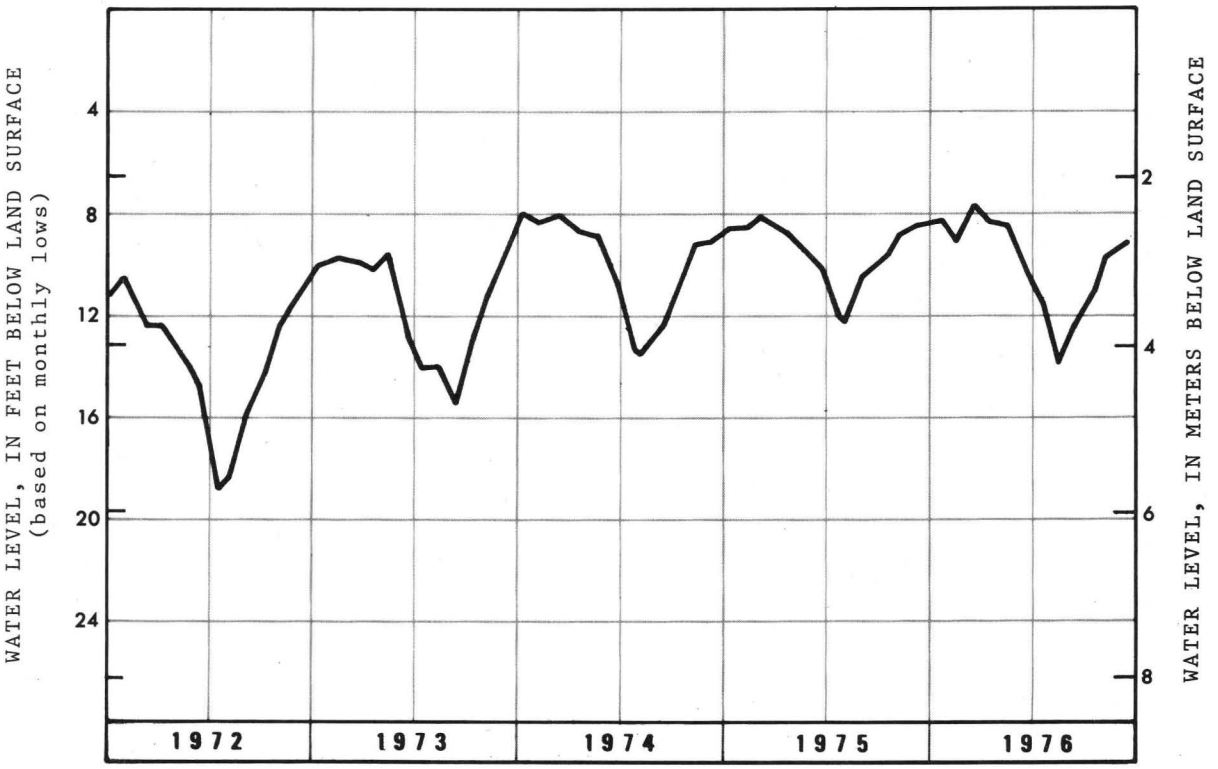
YIELD OF WELLS -- 200 to 2,000 gal/min; specific capacity -- 7 to 100 gal/min/ft of drawdown.

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

1976	6,549
1975	6,336
1974	6,454
1973	6,689
1972	6,032

QUALITY OF WATER -- Composite of 2 pumping stations:

Hardness	385-420	mg/1
Iron	0.49-3.10	mg/1
Total Solids	499-530	mg/1



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

KALAMAZOO COUNTY - CITY OF PORTAGE

SUPPLY AND SOURCE -- 15 wells, 95 to 185 feet deep, tap the glacial drift.

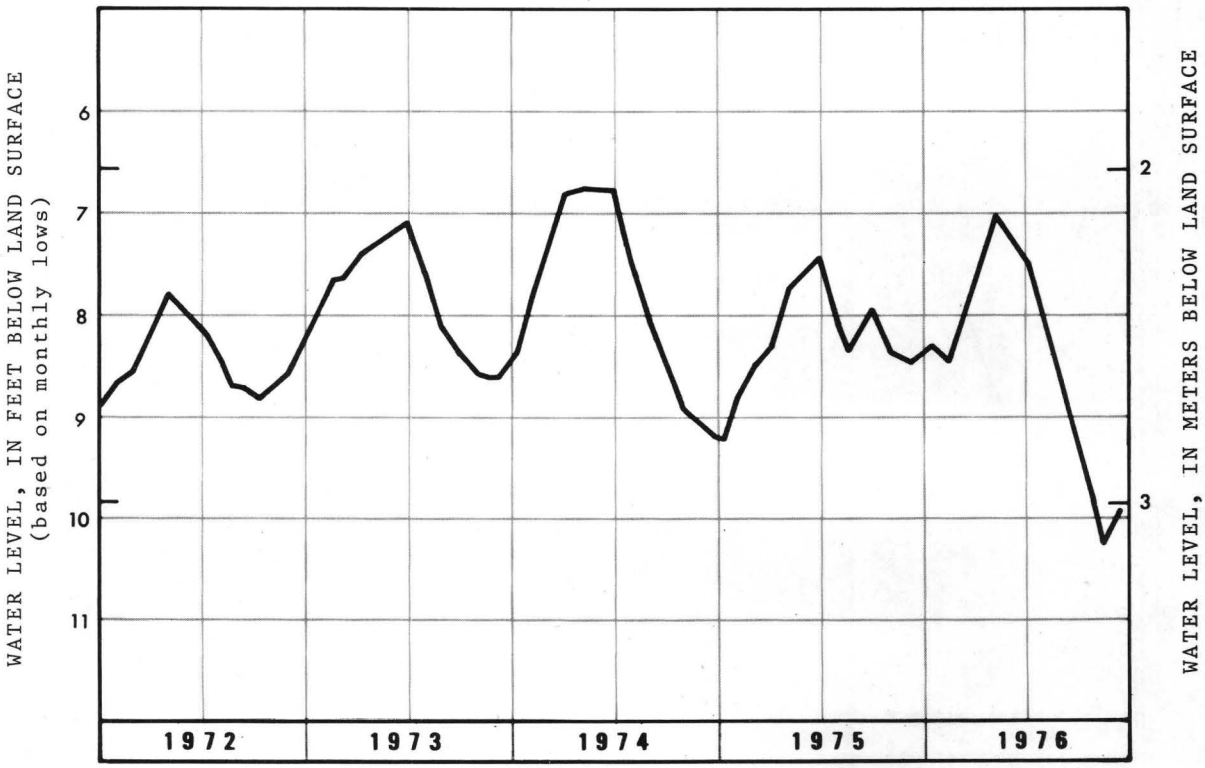
YIELD OF WELLS -- 300 to 1,000 gal/min; specific capacity -- 25 gal/min/ft of drawdown.

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

1976	784
1975	631
1974	647
1973	582
1972	526

QUALITY OF WATER --

Hardness	165-345 mg/1
Iron	0.0-1.5 mg/1
Total Solids	200-469 mg/1



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

KENT COUNTY - KENT COUNTY AIRPORT

SUPPLY AND SOURCE -- 3 wells, 180 to 203 feet deep, tap the glacial drift.

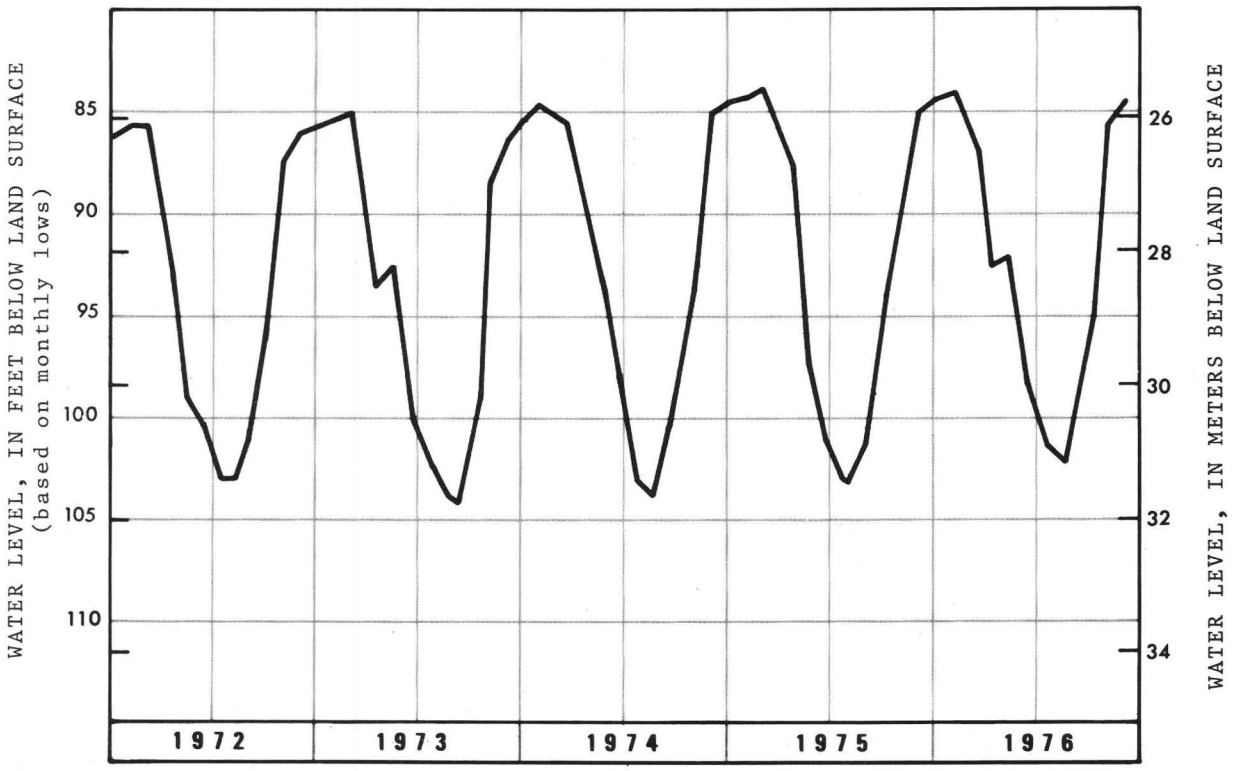
YIELD OF WELLS -- 100 to 360 gal/min; specific capacity -- 2.3 gal/min/ft of drawdown.

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

1976 - 12.0
1975 - 12.0
1974 - 12.0
1973 - 11.2
1972 - 11.2

Beginning in 1971, airport wells were used only to supply water for air conditioning.

REMARKS -- The City of Grand Rapids supplies the airport water for public use.



Water levels in observation well 6N 10W 30AA at Kent County Airport. Well is 184 feet deep and in glacial deposits.

LENAWEE COUNTY
FISHER BODY, GMC, NEAR TECUMSEH

SUPPLY AND SOURCE -- 3 wells, 76 to 89 feet deep, tap the glacial drift.

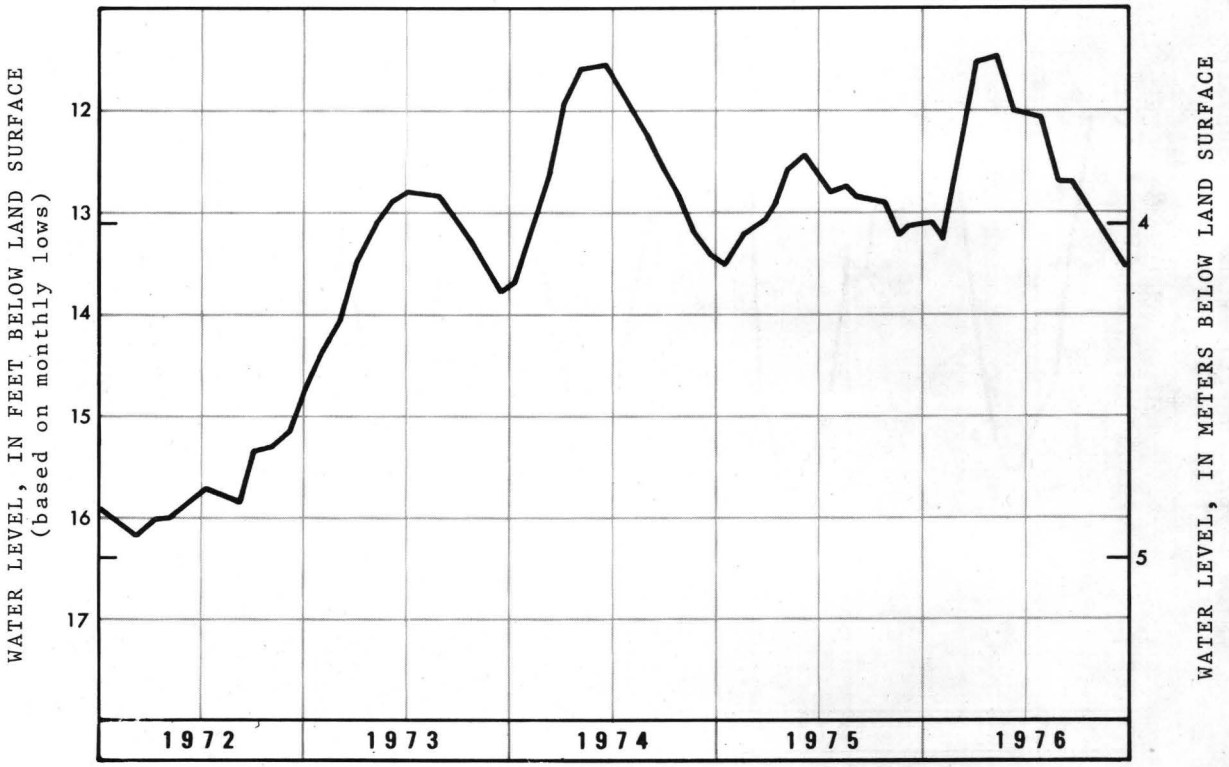
YIELD OF WELLS -- About 500 gal/min; specific capacity -- 25 to 30 gal/min/ft of drawdown.

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

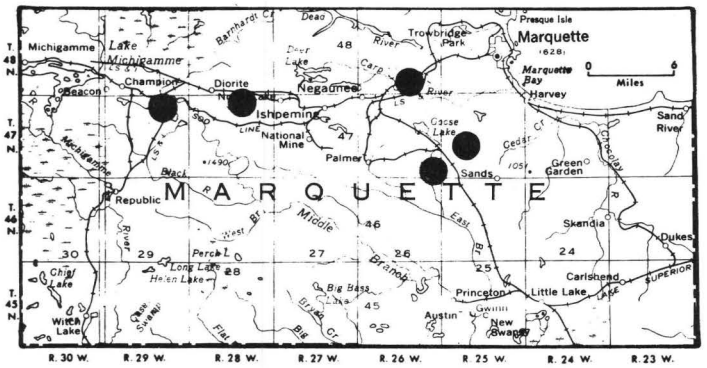
1976	14.9
1975	16.3
1974	17.4
1973	23.8
1972	22.7

QUALITY OF WATER --

Hardness	415-505 mg/1
Iron	2.2-4.4 mg/1
Total Solids	506-660 mg/1

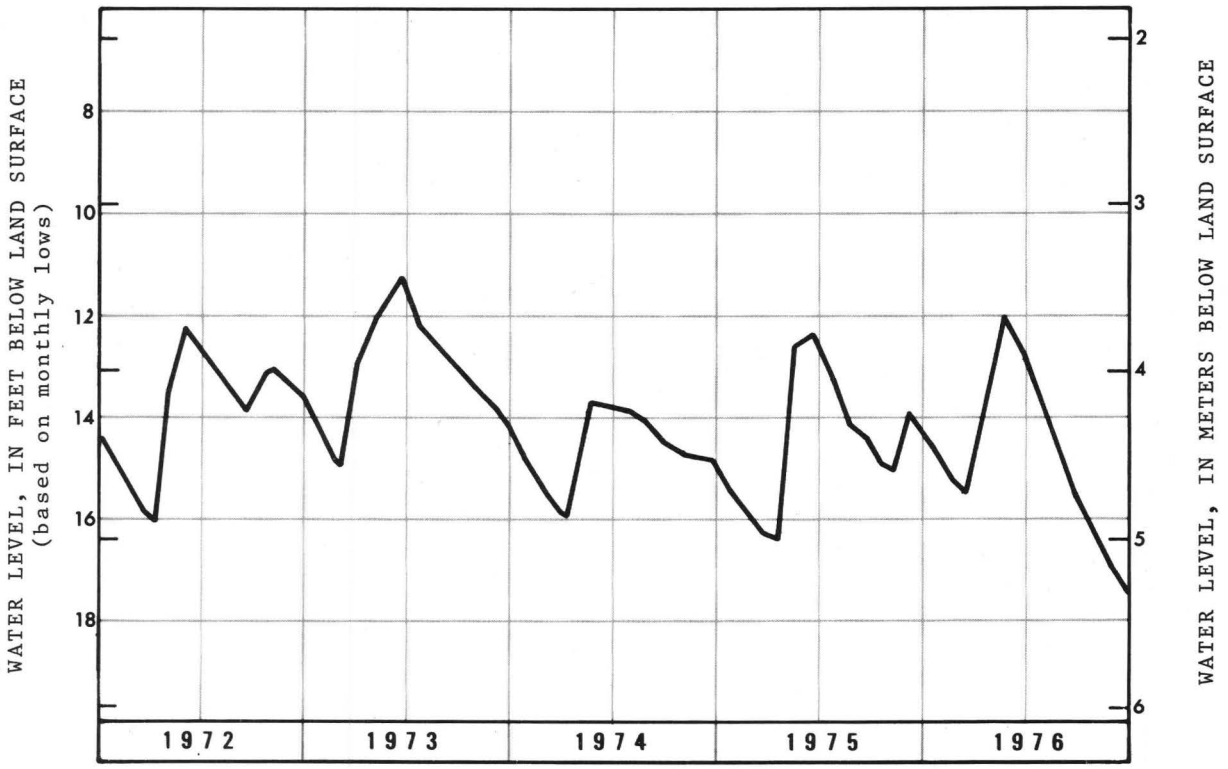


Water levels in observation well 6S 4E 8DD near Tecumseh. Well is 81 feet deep and in glacial deposits.

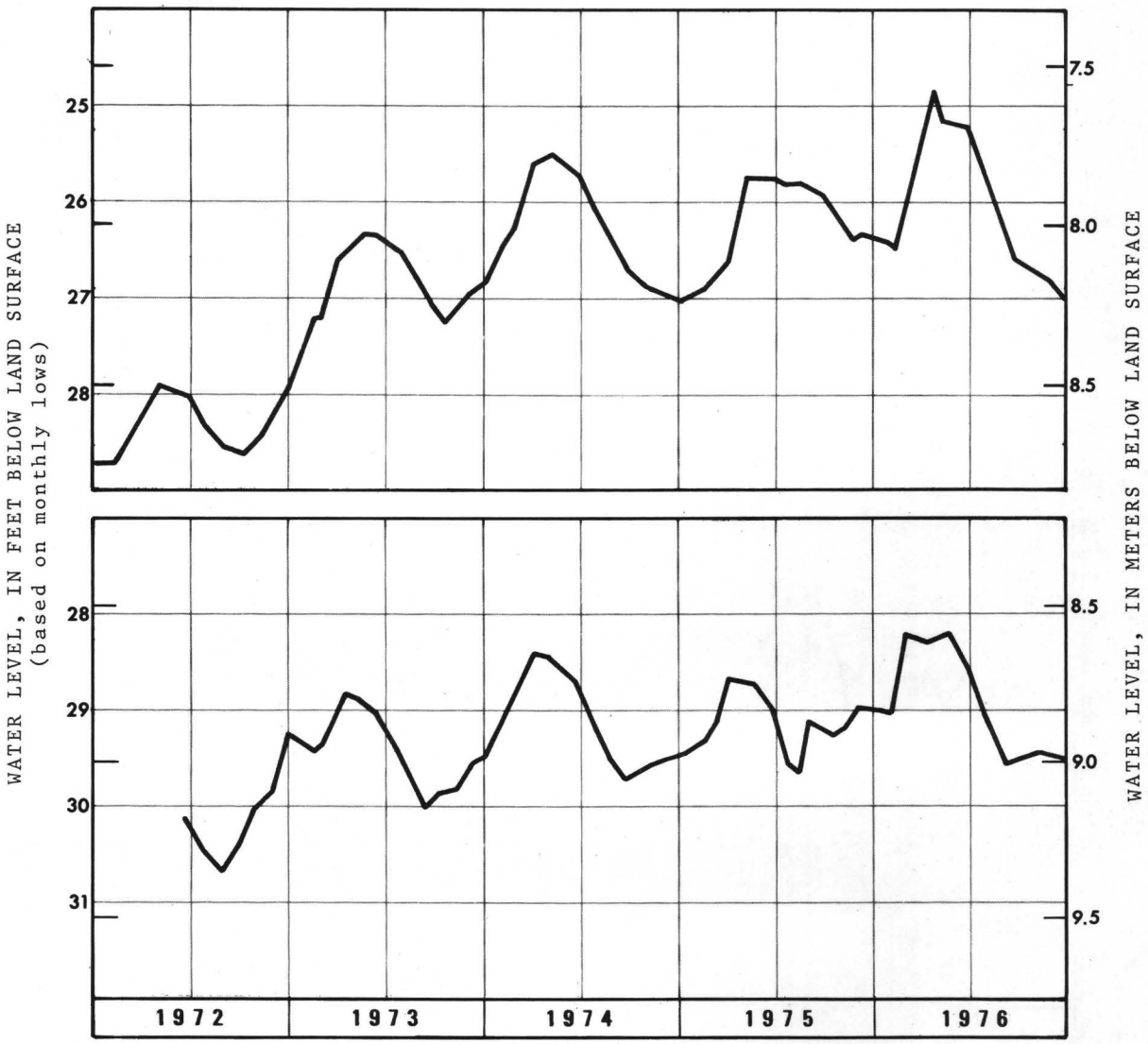


EXPLANATION

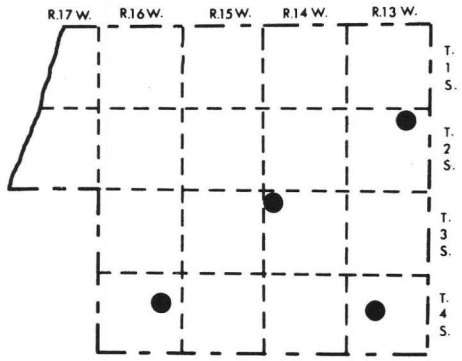
● Location of observation wells



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

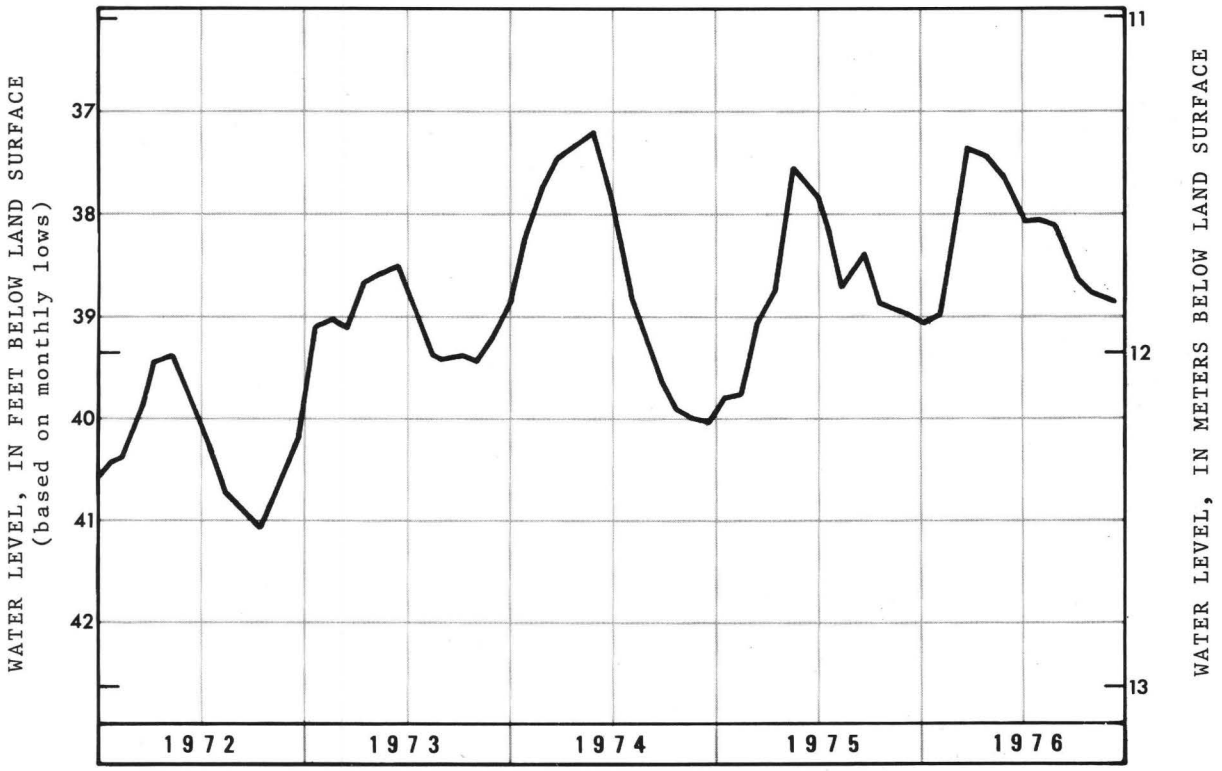


Hydrographs of water levels in observation wells 2N 7E 5BA (top), and 3N 8E 10AB (bottom). Well 2N 7E 5BA is 44 feet deep and well 3N 8E 10AB is 163 feet deep. Both wells are in glacial deposits.



EXPLANATION

● Location of observation wells



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 the glacial drift; most water is pumped from the Huron River.

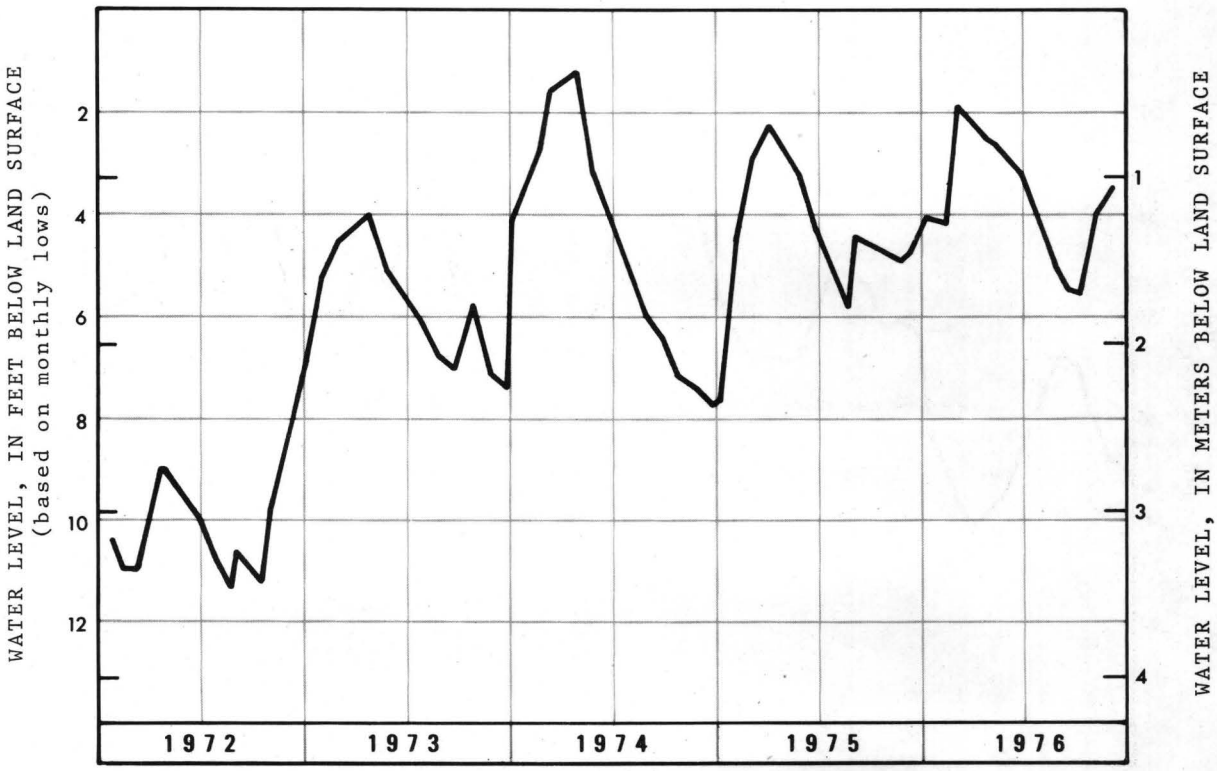
YIELD OF WELLS -- 1,050 to 4,860 gal/min; specific capacity -- 20 to 600 gal/min/ft of drawdown.

PUMPAGE -- Total annual ground-water pumpage, in million gallons, for past 5 years (only 15 to 20 percent of total pumpage is from ground-water sources).

1976 - 677
1975 - 878
1974 - 958
1973 - 899
1972 - 938

QUALITY OF WATER -- Ground water:

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



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

WASHTENAW COUNTY - CITY OF YPSILANTI

SUPPLY AND SOURCE -- 7 wells, 87 to 102 feet deep, tap the glacial drift.

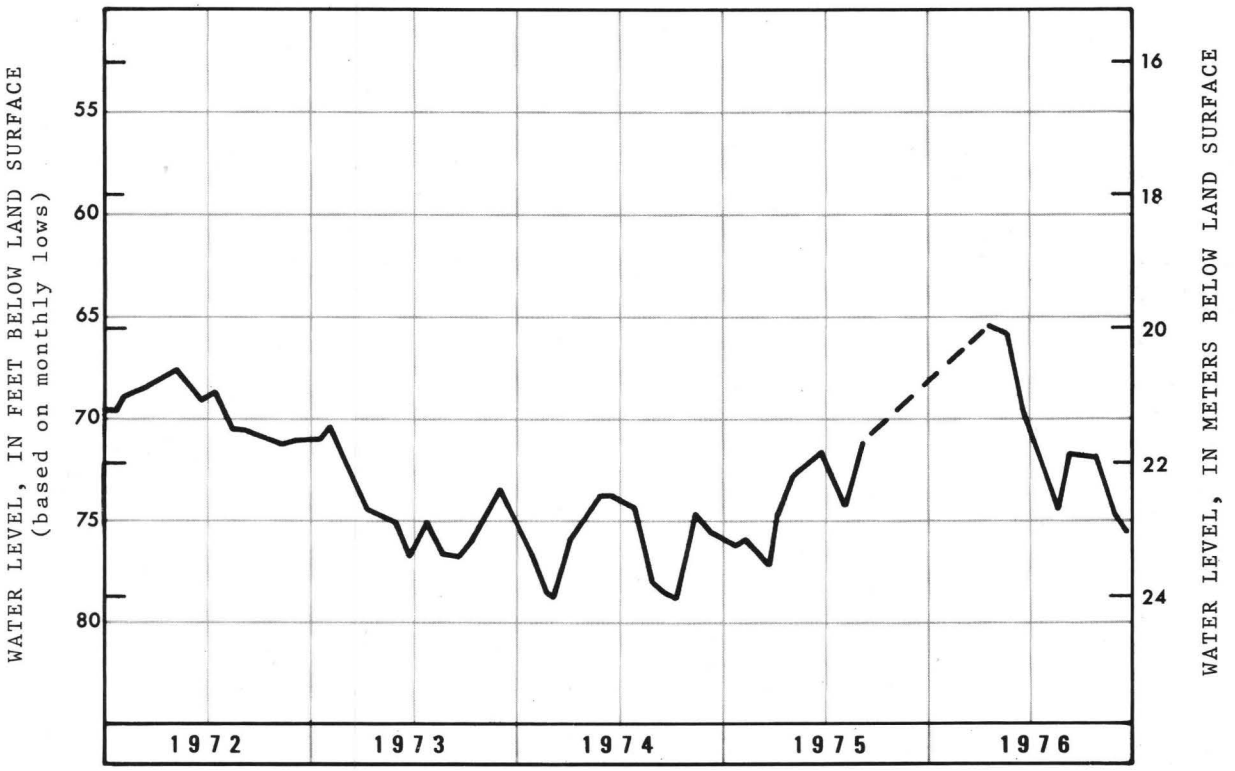
YIELD OF WELLS -- Average 450 gal/min; specific capacity -- 25 to 180 gal/min/ft of drawdown.

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

1976	1,652
1975	1,462
1974	1,958
1973	1,920
1972	1,759

QUALITY OF WATER --

Hardness	305-320 mg/l
Iron	1.2-5.0 mg/l
Total Solids	400-764 mg/l



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

WASHTENAW COUNTY - YPSILANTI TOWNSHIP

SUPPLY AND SOURCE -- 8 wells, 50 to 95 feet deep, tap the glacial drift.

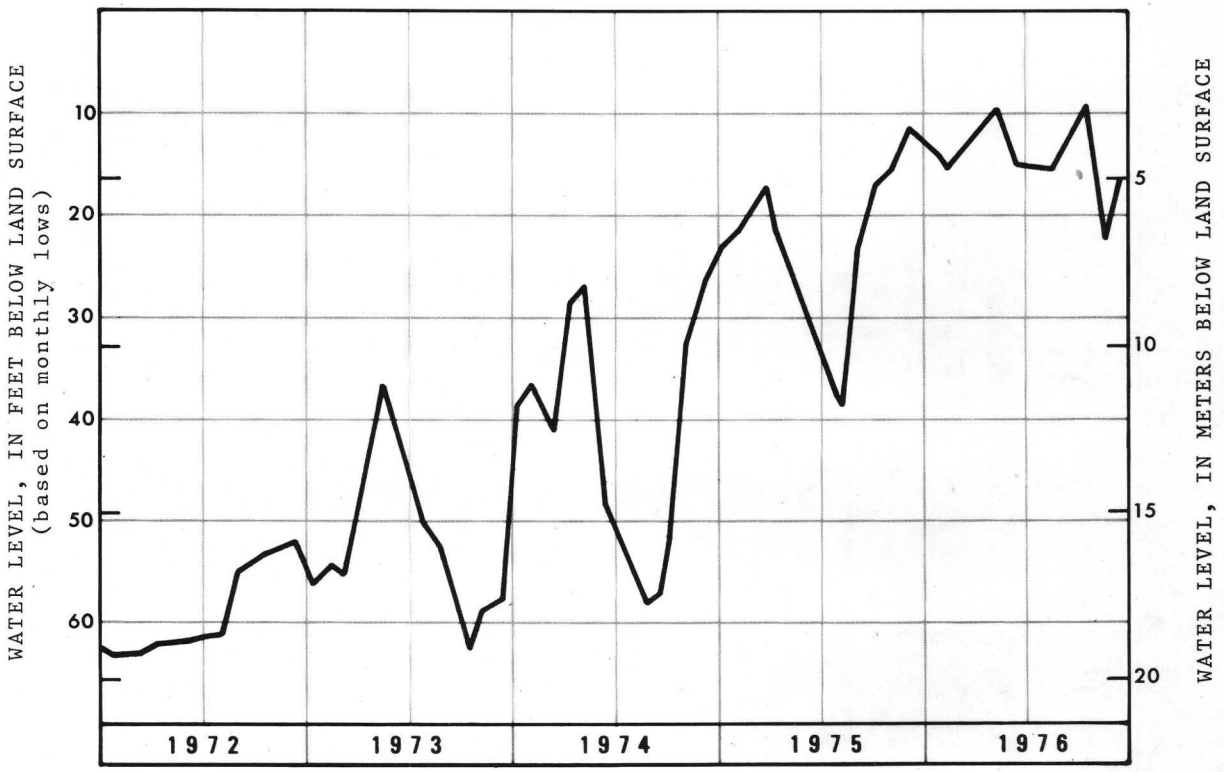
YIELD OF WELLS -- 700 to 3,500 gal/min.

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

1976	1,067
1975	854
1974	1,715
1973	2,284
1972	2,361

QUALITY OF WATER -- Composite

Hardness	370 mg/l
Iron	0.5 mg/l
Total Solids	496 mg/l



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

TABLE 1. RECORDS OF MICHIGAN OBSERVATION WELLS.

COUNTY AND WELL NUMBER: For explanation of well numbers, see text under - Introduction "Well numbering system":
OWNER: 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:
Qgd - Glacial drift deposits of Pleistocene (Quaternary) age
Ps - Saginaw Formation of Pennsylvanian age
Mm - Marshall Formation of Mississippian age
Dt - Traverse Group of Middle and Late Devonian age
Ss - Salina Formation of Late Silurian age
Sm - Manistique Dolomite of Middle Silurian age
pCf - Freda Sandstone of Keweenawan age (Precambrian)
Or - Limestones of Richmondian age (Late Ordovician)
Otb - Black River and Trenton Limestones of Middle Ordovician age
Op - Prairie du Chien Group of Early Ordovician age (previously designated as Au Train Formation)
Cm - Munising Sandstone of Cambrian age
pCj - Jacobsville Sandstone of Precambrian age
ALTITUDE: Land-surface datum in feet above mean sea level.
MEASUREMENT, 1976 (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. 1976 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.

WELL NUMBER AND COUNTY TWP. RANGE. SECTION	OWNER OR OTHER DESIGNATION	DEPTH (ft)	DIAMETER (in)	AQUIFER	ALTITUDE	YRS. RECORD	MEAS. 1976	OBSERVED WATER-LEVEL EXTREMES				REMARKS
								THROUGH 1975		IN 1976		
								MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	
ALGER												
45N 19W 25BD	USFS (Former CCC camp)	66	6	Qgd	850	18	Q	6.4 Jun 1960	14.2 Apr 1964	11.5 Apr	12.6 Dec	
BARAGA												
48N 32W 12DD	MSHD (WMP 14)	10	1	Qgd	1,630	29	M	3.3 Apr 1965	8.1 Sep 1969	6.0 Mar	7.2 Jan	Meas. by WMP
BARRY												
4N 9W 5DA	MDNR (Solomon Rd.)	131	2	Qgd	860	13	Q	114.4 Aug 1975	122.0 Mar 1965	113.2 Dec	115.7 Jan	
BAY												
17N 4E 22DC	Pinconning Twp. (2nd St.)	110	6	Ps	620	15	R	0.6 Apr 1970	10.5 Aug 1963	0.0 Mar	3.4 Aug	
BRANCH												
5S 6W 22BB	MSHD (U.S. 27)	27	1	Qgd	950	13	M	10.5 Mar 1974	16.3 Nov 1964	10.7 Mar	14.3 Oct	
8W 28DB	BCRC (Sherwood)	42	1	Qgd	880	12	M	13.2 May 1974	18.9 Nov 1965	11.3 Mar	18.2 Oct	
6S 6W 18CCCD	Coldwater Twp. (Test 1)	56	6	Qgd	950	13	M	21.0 Jul 1969	28.3 Jul 1964	18.3 Mar	24.4 Oct	
22CA	City of Coldwater (test for No. 4)	113	6	Qgd	970	13	R	9.0 May 1975	24.1 Aug 1964	9.2 Mar	24.8 Aug	P
8S 5W 6AB	Chipman (California No. 2 School)	55	4	Qgd	1,032	13	M	13.9 Feb 1968	19.4 Dec 1964	14.0 May	17.6 Dec	
8W 17CD	Bronson School (Trayer Rd.)	38	1	Qgd	917	13	M	13.1 May 1966	16.3 Nov 1964	13.4 Apr	15.6 Dec	
CALHOUN												
1S 7W 10BB	K. Sabin (M-78)	12	15	Qgd	908.0	31	W	0.9 Mar 1950	7.2 Dec 1964	2.6 Mar	4.8 Dec	Meas. by owner
32BD	Penfield Twp. (Hopkins St.)	95	6	Mm	845	13	R	15.6 Apr 1974	27.0 Aug 1964	15.9 Mar	20.2 Nov	P
32DA	City of Battle Creek (Verona 22)	127	8	Mm	830.8	38	D	0.7 Apr 1950	16.8 Jul 1959	3.1 Apr	7.6 Aug	P, Meas. by owner
2S 6W 25AA	City of Marshall (Ferguson)	59	6	Mm	904.8	27	M	5.5 May 1950	9.7 Aug 1964	6.3 Jun	7.9 Dec	P, Meas. by owner
CASS												
8S 14W 17BA	T. Little (Starbrick Rd.)	55	28	Qgd	840	32	M	46.2 Jul 1950	55.0 Mar 1957	48.8 Jul	51.1 Jan	
CHARLEVOIX												
33N 4W 2AC	MDNR (Wolverine CCC)	94	6	Qgd	970	29	Q	69.5 Jul 1960	75.8 Apr 1956	72.2 Apr		Disc. 4-76
CHEBOYGAN												
33N 1W 26DA	MDNR (Pigeon R. CCC)	164	6	Qgd	933	11	R	56.2 May 1971	59.9 Dec 1965	56.4 May	58.6 Apr	
34N 1W 1CB	MDNR (7) (M-68)	11	2	Qgd	780	31	Q	2.8 Mar 1938	5.6 Oct 1955	3.6 Apr		Disc. 4-76

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

COUNTY AND WELL NUMBER (TWP., RANGE, SECTION)	OWNER OR OTHER DESIGNATION	DEPTH (ft)	DIAMETER (in)	AQUIFER	ALTITUDE	YRS. RECORD	MEAS. 1976	OBSERVED WATER-LEVEL EXTREMES				REMARKS
								THROUGH 1975		IN 1976		
								MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	
CHIPPEWA												
46N 4W 24DA	USFS (Raco CCC camp)	54	6	Qgd	850	22	R	18.4 Jun 1971	28.4 Apr 1964	20.2 May	24.6 Dec	
CLARE												
17N 4W 34DCAD	City of Clare	91	4	Qgd	850	2	R	10.4 Sep 1975	20.4 Jul 1975	7.9 Mar	22.2 Aug	P
CLINTON												
5N 2W 31CB	Michigan Dept. of Aeronautics (Airport)	195	6	Ps	850	19	R	45.0 Mar 1949	66.4 Jan 1967	54.5 May	56.6 Aug	P
32DC	Michigan Health Dept. (Quarantine Farm)	135	4	Ps	849.2	33	M	42.0 Sep 1944	99.2 May 1966	86.8 Jan	91.0 Aug	P
6N 1W 3BB2	MDNR (Sleepy Hollow impoundment) No. 5	62	1	Qgd	814.0	11	A	38.2 Sep 1975	43.3 Nov 1966	No meas.		
10BC	Do No. 2	32	1	Qgd	801.4	11	A	14.6 Apr 1973	19.8 Nov 1966	No meas.		
6N 2W 16DD	MSHD (U.S. 27)	23	14	Qgd	803.3	29	M	13.8 Apr 1974	19.9 Feb 1964	14.1 Apr	17.9 Dec	Federal key well
7N 1W 34CA	MDNR (Sleepy Hollow impoundment) No. 9	39	1	Qgd	793.8	11	A	12.8 Apr 1973	21.7 Dec 1966	No meas.		
34CB	Do No. 10	62	1	Qgd	787.2	11	A	19.7 Mar 1973	23.2 Nov 1966	No meas.		
34CC	Do No. 7	32	1	Qgd	785.3	11	A	17.1 Mar 1973	20.3 Oct 1973	No meas.		
2W 9BB	City of St. Johns (6" test)	535	6	Ps	743.4	13	R	52.2 May 1967	84.9 Aug 1974	63.1 Dec	86.2 Jun	P
CRAWFORD												
25N 1W 15DD	USFS (Eldorado)	56	6	Qgd	1,190	29	R	26.8 May 1971	36.0 Apr 1951	25.7 May	28.5 Mar	
27N 4W 23AA	MDNR (51) (U.S. 27)	17	2	Qgd	1,180	37	Q	10.9 Jul 1943	15.6 Dec 1964	11.4 Apr		Disc. 4-76
DELTA												
39N 23W 28AC	M. and S. Blake (Schemmel)	530	5	Cm	680	19	R	1.3 May 1960	5.1 Dec 1966	3.4 Jan	8.4 Dec	
41N 18W 31CD	C. Thompson (Isabella)	250	5	Or	615	19	Q	3.6 Jun 1968	6.3 Feb 1961	3.9 Mar	5.9 Sep	
42N 19W 20AA	USFS (Pollack CCC camp)	134	6	Qgd	740	19	Q	23.8 Mar 1960	28.1 Feb 1971	25.3 Apr	26.0 Dec	
43N 19W 24BB	H. Clarage (FFHwy-13)	405	4	Otb	860	19	Q	77.0 Jul 1960	88.8 Oct 1966	78.9 Apr	79.6 Dec	
DICKINSON												
42N 27W 33BA	E. LaFreniere (WMP 10)	12	36	Qgd	1,060	23	M	2.7 May 1960	10.8 Oct 1955	2.1 Mar	11.3 Oct	Meas. by WMP
43N 28W 32AD	MDNR (Felch)	31	1	Qgd	1,160	11	M	13.1 May 1972	16.8 May 1968	13.4 May	15.8 Oct	
EATON												
3N 3W 2BA	City of Lansing (TW 63H) (Stiefel Farm)	66	1	Qgd	839	13	R	3.1 Mar 1965	18.0 Nov 1968	3.8 Mar	16.0 Dec	P
4N 3W 12CD	F. Wheeler (Robins Rd.)	381	6	Ps	861.9	24	R	67.5 Nov 1953	103.6 Aug 1969	81.6 Dec	95.4 Aug	P
11AB	City of Grand Ledge (Park)	350	8	Ps	788.9	17	R	*+4.6 Mar 1967	9.1 Aug 1966	*+4.0 Jan	2.8 Apr	P, *well flowing, Disc. 4-76
GENESEE												
6N 7E 9DCC	Fisher Body Division, GMC, No. 2 (Grand Blanc)	385	10	Ps	837.0	4	R	52.3 Dec 1975	82.3 Aug 1975	52.6 Jan	84.5 Aug	P
GOGEBIC												
48N 47W 31DC	City of Ironwood (Big Springs)	115	1	Qgd	1,170	14	R	12.6 Jun 1966	44.4 Feb 1974	12.0 Apr	18.8 Feb	P, Disc. 7-76
34DA	City of Ironwood (Spring Creek Gp 3)	22	6	Qgd	1,190	16	R	+0.7 Apr 1969	6.2 Nov 1975	0.5 Apr	8.6 Mar	P, Disc. 7-76

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

COUNTY AND WELL NUMBER (TWP., RANGE, SECTION)	OWNER OR OTHER DESIGNATION	DEPTH (ft)	DIAMETER (in)	AQUIFER	ALTITUDE	YRS. RECORD	MEAS. 1976	OBSERVED WATER-LEVEL EXTREMES				REMARKS
								THROUGH 1975		IN 1976		
								MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	
GRAND TRAVERSE												
27N 9W 4AB	MDNR (18) (Williamsburg)	15	2	Qgd	687.0	35	M	0.2 Feb 1966	2.5 Jul 1935	0.7 Feb	1.0 May	Disc. 5-76
GRATIOT												
12N 3W 24DA	City of St. Louis (3)	216	16	Qgd	730	17	R	37.9 Jan 1964	80.7 Jul 1967	55.9 Mar	74.4 Dec	P
HILLSDALE												
7S 2W 10BD	Pittsford State Game Area	20	1	Qgd	1,070	11	M	7.7 May 1969	11.1 Sep 1967	7.7 Mar	10.0 Oct	
INGHAM												
2N 1E 34DB	MDNR (Williamston Rd.)	87	2	Qgd	930	13	Q	22.4 Apr 1974	29.3 Oct 1964	22.8 Apr	25.3 Nov	
3N 1E 7DD	M. Lotte (windmill)	184	3	Ps	900	13	M	+2.4 Apr 1974	7.0 Nov 1964	+2.1 Mar	3.5 Nov	
4N 1E 21CD	Duncan Lumber Company (Sherwood)	265	8	Ps	890	14	R	20.1 May 1967	26.6 Sep 1973	21.2 May	26.4 Nov	
2N 1W 5BCAB	City of Mason (Gravel Pit)	210	8	Ps	890	13	R	14.7 Mar 1973	23.8 Nov 1964	15.6 May	21.1 Dec	P
4N 1W 16DA	Meridian Twp. (4" test)	398	4	Ps	841.2	9	M	6.6 Mar 1973	13.1 Jul 1974	6.3 Mar	12.3 Aug	P
18AD	Marble School (Hagadorn Rd.)	175	3	Ps	847.8	25	M	20.1 Apr 1953	70.2 Nov 1972	54.1 Nov	57.8 Jul	P
4N 2W 9BD	City of Lansing (Seymour 1)	401	14	Ps	828.8	48	R	15.6 Mar 1931	179.4 Apr 1968	82.7 Dec	98.7 Jun	P
16DA	City of Lansing (Cedar)	417	12	Ps	829.1	32	R	42.0 Mar 1946	67.0 Aug 1949	43.0 Dec	47.7 Feb	P
17AB	City of Lansing (Logan)	424	20	Ps	858.7	46	R	34.3 Dec 1929	168.3 May 1968	109.5 Dec	119.3 Jan	P
21BA2	City of Lansing (Scott Park)	400	4	Ps	835	6	R	46.0 May 1975	75.8 Nov 1971	43.8 Nov	53.3 Jul	P
22BC	City of Lansing (P-5)	338	12	Ps	823.6	47	M	7.1 Jul 1932	80.5 Feb 1970	41.0 May	54.0 Aug	P
24CA	Michigan State University (Spartan Village)	453	10	Ps	853.4	32	R	25.5 Mar 1946	105.5 May 1972	80.0 Dec	92.3 Oct	P
27BB	Fenner Arboretum Park	215	6	Ps	835	9	R	52.0 Jul 1968	89.5 Oct 1972	59.8 Apr	73.0 Oct	
31CC	C. Weber (Maybel St.)	204	3	Ps	880.2	33	M	18.9 Apr 1952	42.6 Oct 1973	31.1 Jan	43.2 Nov	P
IRON												
42N 31W 33DB	Iron County (WMP 7)	10	1	Qgd	1,275	29	M	+0.2 May 1960	6.3 Oct 1948	0.5 Apr	6.4 Dec	Meas. by WMP
43N 35W 11AD	J. Javoroski (WMP 23)	47	36	Qgd	1,565	32	M	35.5 Jul 1973	47.1 Aug 1949	39.1 Aug	40.8 Apr	Meas. by WMP
20DC	B. Henricksen (WMP 25)	48	1	Qgd	1,560	32	M	40.7 Jun 1973	48.3 Aug 1949	42.8 Jul	44.0 Mar	Do
33BD	MSHD (WMP 34)	12	1	Qgd	1,520	29	M	1.7 Jun 1973	8.4 Mar 1949	2.9 May	6.0 Dec	Do
44N 33W 10CC	Iron County (WMP 21)	8	1	Qgd	1,540	29	M	2.0 Apr 1954	8.0 Feb 1964	2.3 Apr	8.1 Dec	Do
37W 14BB	USFS (Former CCC camp)	102	6	Qgd	1,730	18	Q	91.8 Oct 1973	100.9 Aug 1974	92.9 Apr	96.7 Oct	
45N 37W 23AC	USFS (WMP 28)	8	1	Qgd	1,600	29	M	0.7 Apr 1965	4.7 Sep 1948	1.0 Apr	5.1 Sep	Meas. by WMP
46N 33W 18BC	MSHD (WMP 17)	12	1	Qgd	1,560	29	M	2.8 Apr 1949	dry Feb 1956	5.0 Apr	dry Oct	Do
JACKSON												
3S 1W 2BD	City of Jackson (Hamburg St.)	400	12	Ps, Mm	935	11	R	16.3 Jan 1971	68.8 Jun 1971	18.4 May	46.1 Sep	P
10DC	Summit Twp. (Francis St.)	323	12	Ps, Mm	935	17	R	14.3 Jan 1961	36.5 Jun 1971	15.5 May	29.5 Sep	P
11AA1	City of Jackson (4a) (Belden Rd.)	360	6	Ps, Mm	935	19	D	18.6 Jan 1961	119.1 Jun 1971	43.0 Jan	99.9 Aug	P, Meas. by owner
11AA2	City of Jackson (Belden Rd.)	36	3	Qgd	928.8	15	R	+1.5 Jul 1968	18.2 Nov 1964	+0.1 Mar	3.9 Sep	

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

COUNTY AND WELL NUMBER (TWP., RANGE, SECTION)	OWNER OR OTHER DESIGNATION	DEPTH (ft)	DIAMETER (in)	AQUIFER	ALTITUDE	YRS. RECORD	MEAS.1976	OBSERVED WATER-LEVEL EXTREMES				REMARKS
								THROUGH 1975		IN 1976		
								MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	
KALAMAZOO												
2S 10W 4D	City of Kalamazoo (Campbell Lake)	13	4	Qgd	836.5	8	R	1.9 Apr 1974	3.4 Sep 1971	2.1 Mar	3.0 Sep	
9B	City of Kalamazoo (Schoonover Lake)	21	6	Qgd	828	8	R	+1.0 Apr 1975	0.4 Sep 1971	+0.8 Mar	+0.1 Sep	
11W 3AA	Brown Co. (61)	36	6	Qgd	763.2	21	R	7.7 Mar 1974	14.0 Aug 1967	8.8 Dec	13.1 Jun	P
10DB	General Printing Ink Co.	49	10	Qgd	761	9	R	12.4 Jul 1968	20.8 Nov 1974	12.9 Mar	18.8 Jan	P
14DC	Brown Co. (East side plant) Well No. 13	90	12	Qgd	780	5	R	10.2 Jan 1973	17.9 Feb 1975	10.3 Mar	16.2 Jul	P
15DA	Consumers Power Co. (steam plant)	64	12	Qgd	766.2	31	R	5.5 Apr 1975	19.4 Sep 1964	7.7 Mar	12.7 Aug	P, Disc. 8-76
20BB2	City of Kalamazoo Kendall (Deep)	106	4	Qgd	880	9	R	16.8 Dec 1975	48.4 Jun 1971	12.5 Feb	47.4 Jul	P
22CD	City of Kalamazoo (Stockbridge)	137	4	Qgd	764.7	17	R	4.8 Feb 1975	31.1 Aug 1961	5.2 Feb	13.8 Aug	P
23AD	Allied Paper Co. (King Div.)	43	12	Qgd	760	9	R	+0.4 Apr 1975	22.0 Feb 1970	1.4 Mar	8.3 Sep	P
28AA	City of Kalamazoo (Maple Station)	245	4	Qgd	820	8	R	35.7 Jun 1974	61.6 Jun 1973	36.9 Apr	49.3 Sep	P
31CD	City of Kalamazoo (Colony Farm Station)	226	4	Qgd	910	8	R	51.1 Jun 1974	67.0 Jun 1971	51.2 Dec	62.7 Aug	P
36CB	City of Kalamazoo (Emerald Station)	226	4	Qgd	860	8	R	26.4 May 1974	50.4 Jun 1971	25.7 May	41.1 Jun	P
3S 11W 4AD1	City of Kalamazoo (A-D)	135	3	Qgd	854.0	18	R	0.5 May 1967	12.9 Jul 1964	0.7 May	10.3 Sep	P
4AD2	City of Kalamazoo (A-S)	40	3	Qgd	854.0	18	R	+0.2 Sep 1975	9.1 Nov 1959	+0.2 Apr	2.7 Sep	P
14AA	Upjohn Co. (28)	233	16	Qgd	870	10	R	26.0 Dec 1975	45.1 Aug 1972	25.2 Feb	41.1 Oct	P
22BD	City of Portage (site C)	120	8	Qgd	865	10	R	5.9 Jun 1967	9.4 Feb 1971	6.9 May	10.2 Nov	P
12W 11BD	City of Kalamazoo (Atwater)	248	3	Qgd	880	16	R	+3.0 Sep 1969	0.3 Jan 1965	+2.1 Jul	+1.1 Apr	P
11AD1	City of Kalamazoo (Sabo-deep)	300	4	Qgd	877	4	R	4.5 Jul 1973	14.2 Jul 1973	5.4 Jul	13.9 Sep	P
11AD2	City of Kalamazoo (Sabo-shallow)	38	6	Qgd	877	4	R	9.1 Aug 1975	11.4 Oct 1973	9.9 Jul	11.3 Sep	P
4S 11W 3CD	Prairie View Co. Park	190	4	Qgd	870	8	R	18.3 Jun 1973	20.3 Sep 1971	18.4 Mar	20.3 Dec	
KENT												
5N 12W 4DC	City of Wyoming (Wobma)	86	6	Qgd	686.0	15	R	8.3 Apr 1974	12.9 Aug 1964	8.1 Mar	10.9 Sep	
6N 10W 30AA	Kent Co. Airport	184	10	Qgd	800	11	R	83.3 Feb 1975	108.0 Sep 1967	83.2 Mar	102.2 Aug	P
12W 17AD1	Alloytek Incorporated	30	12	Qgd	606	27	M	6.8 Apr 1965	16.4 Feb 1954	7.1 May	11.8 Dec	P, Meas. by owner
17AD2	Alloytek Incorporated	26	6	Qgd	606.0	27	M	6.8 Apr 1965	16.3 Feb 1954	8.4 Jun	10.8 Mar	P, Meas. by owner
27BB	City of Wyoming (44th St.)	265	14	Mm	707.2	15	R	46.4 May 1974	56.0 Aug 1964	45.8 May	47.8 Dec	P
10N 12W 13DD	Rouge R. State Game Area	30	1	Qgd	785	11	Q	0.8 Jan 1975	9.2 Oct 1969	1.2 Jan	6.3 Oct	
LAKE												
17N 13W 4AD	C & O R.R. (West Well)	83	8	Qgd	840	20	Q	15.2 Jul 1969	20.4 May 1958	14.8 Apr	17.6 Dec	
LENAWEE												
5S 1E 12DD	Onsted State Game Area	39	1	Qgd	1,000	11	M	16.1 May 1975	19.3 Sep 1971	16.4 Feb	18.1 Sep	
6S 4E 8DD	Fisher Body Division (GMC) (Tecumseh Plant)	81	8	Qgd	800	12	R	11.3 May 1974	18.4 Feb 1965	11.2 May	13.3 Feb	P

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

COUNTY AND WELL NUMBER TWP. RANGE. SECTION	OWNER OR OTHER DESIGNATION	DEPTH (ft)	DIAMETER (in)	AQUIFER	ALTITUDE	YRS. RECORD	MEAS. 1976	OBSERVED WATER-LEVEL EXTREMES THROUGH 1975 MAXIMUM	THROUGH 1975 MINIMUM	IN 1976 MAXIMUM	IN 1976 MINIMUM	REMARKS
LIVINGSTON												
1N 6E 13DB	American Aggregate Corp.	29	2	Qgd	930	7	R	12.1 Apr 1974	18.1 Feb 1972	12.8 May	16.7 Dec	
2N 6E 31BA2	City of Brighton	83	10	Qgd	935	3	R	27.2 Sep 1975	53.4 Jul 1975	27.2 May	55.4 Jun	P
MACKINAC												
41N 5W 23BC	MDNR (Round L. CCC camp)	47	6	Ss	610	21	Q	4.3 May 1959	17.5 Mar 1959	8.3 Apr	17.5 Dec	
42N 2W 7AA	USFS (Pontchartrain CCC)	102	6	Sm	680	21	R	13.1 May 1960	32.2 Nov 1963	15.1 Apr	31.5 Dec	
MARQUETTE												
46N 25W 16DD	G. Johnson (Sands Sta.)	48	1	Qgd	1,198.4	14	M	27.1 Jul 1969	37.7 May 1964	29.9 Jul	32.0 Jan	
28W 12CB	Mrs. S. Hill (Ishpeming gage)	19	1	Qgd	1,410	15	M	1.3 May 1973	3.6 Jan 1972	1.7 Apr	2.9 Jul	
47N 25W 19CC	MDNR (Cascade Junction)	86	1	Qgd	1,222.1	14	M	25.0 Jul 1973	39.0 Feb 1965	27.4 Jun	31.5 Oct	
20CC	MDNR (East of Cascade Junction)	103	1	Qgd	1,229.8	14	M	78.5 Oct 1973	90.6 Jun 1965	81.0 Nov	82.0 May	
32CA	MDNR (Gentian)	122	1	Qgd	1,239.2	12	M	89.4 Feb 1974	100.0 Oct 1964	83.6 Apr	92.9 Jul	
26W 27BC	A. E. Laitala	31	1	Qgd	1,290	9	M	+0.6 May 1971	10.1 Oct 1969	+1.7 Apr	6.2 Nov	
36BB	Cleveland Cliffs Iron Co. (test)	56	8	Qgd	1,210	12	R	3.6 Apr 1969	7.5 Sep 1965	4.3 Apr	8.3 Dec	
27W 8BA	Cleveland Cliffs Iron Co. (near Rock Lake)	33	1	Qgd	1,430	9	M	3.6 May 1969	7.1 Aug 1970	5.3 Jun	6.4 Nov	
28W 3CC	Ely Twp. (U.S. 41)	75	8	Qgd	1,572.0	16	R	9.7 May 1973	19.3 Apr 1964	11.6 May	17.5 Dec	Federal key well
35CB	Triangle Intersection	52	1	Qgd	1,481.8	9	M	31.8 Jun 1973	37.9 Jun 1964	33.4 Jul	35.8 Feb	
29W 2DA	Marquette Co. Rd. Comm. (near Humboldt)	19	1	Qgd	1,527.3	14	M	1.9 May 1973	5.5 Aug 1963	0.8 Apr	3.9 Aug	
34CB	Do (near Black River School)	23	1	Qgd	1,494.4	15	M	2.0 Apr 1966	7.1 Sep 1969	2.3 Apr	7.1 Oct	
48N 26W 34DA	Do (near Eagle Mills)	31	1	Qgd	1,279.6	14	M	2.0 Apr 1967	7.0 Apr 1964	2.7 Apr	5.4 Nov	
29W 30CC	Van Riper State Park	78	6	Qgd	1,560	8	M	9.6 May 1973	14.7 Mar 1970	11.3 May	15.1 Dec	
49N 30W 22AC	Marquette Co. Rd. Comm. (WMP 13)	17	1	Qgd	1,680	29	M	0.6 May 1951	13.3 Sep 1948	7.4 Apr	11.5 Oct	Meas. by WMP
MENOMINEE												
37N 26W 19DA	MSHD (Carney)	17	4	Otb	800	18	M	3.6 May 1973	7.7 Jul 1967	4.3 Apr	8.4 Nov	
41N 25W 34AD1	Hanna Mining Co. (LB 69-7 Lower)					8	A	+11.8 Apr 1971	+6.9 Oct 1969	No meas.		
34AD2	Do (LB 69-7 Upper)					8	A	+2.0 Apr 1971	+0.3 Oct 1969	No meas.		
34AD3	Do (LB 68-1)					9	A	+7.6 Apr 1971	+4.3 Oct 1969	+5.1 Feb		
34DA1	Do (LB 67-1)					9	M	+10.9 May 1972	+5.5 Aug 1970	+10.9 Apr	+4.7 Nov	
34DA2	Do (Auger 68-2)		1	Qgd	920	8	M	2.0 May 1973	8.4 Aug 1975	2.8 Apr	9.1 Nov	
34DA3	Do (Auger 68-1)		1	Qgd	920	8	R	1.5 Apr 1971	8.0 Sep 1969	2.9 Apr	9.6 Dec	
34DA4	Do (LB 68-4)					8	A	0.8 Apr 1971	3.1 Feb 1970	No meas.		
35BA	Do (LB 69-4)					8	A	+0.9 Jul 1969	0.6 Aug 1969	No meas.		
35BB	Do (LB 69-5)					8	A	3.3 May 1969	4.7 Aug 1969	No meas.		
35BC	Do (LB 69-1)					8	A	0.2 Apr 1971	2.0 Aug 1969	No meas.		
MONROE												
7S 6E 15AD	Petersburg State Game Area	17	1	Qgd	675	11	M	3.0 Feb 1966	6.7 Dec 1971	4.1 Mar	6.7 Dec	

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

COUNTY AND WELL NUMBER TWP., RANGE, SECTION	OWNER OR OTHER DESIGNATION	DEPTH (ft)	DIAMETER (in)	AQUIFER	ALTITUDE	YRS. RECORD	MEAS. 1976	OBSERVED WATER-LEVEL EXTREMES				REMARKS
								THROUGH 1975		IN 1976		
								MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	
MUSKEGON												
11N 15W 34AD	Muskegon State Game Area	31	1	Qgd	595	11	Q	0.0 May 1974	4.7 Sep 1972	0.0 Apr	2.2 Jul	
OAKLAND												
2N 7E 5BA	American Aggregates (Honeywell Lake Rd.)	44	2	Qgd	1,020	9	R	25.3 Apr 1974	28.9 Dec 1971	23.9 Apr	27.0 Dec	
8E 18DA	Proud Lake State Park	45	6	Qgd	910	8	R	2.8 May 1974	6.4 Sep 1971	3.3 Mar	5.6 Sep	P
3N 7E 5DA	American Aggregates (Fish Lake Rd.)	49	2	Qgd	1,055	8	R	31.0 May 1975	38.7 Dec 1972	29.5 Jun	32.6 Feb	
8E 3AB	HCMA (White Lake Rd.)	163	6	Qgd	1,000	5	R	7.3 May 1974	11.0 Sep 1972	7.2 May	9.7 Sep	
10AB	HCMA (Teggerdine Rd.)	163	6	Qgd	1,000	5	R	27.9 May 1974	30.7 Sep 1972	27.8 Mar	29.6 Sep	
10E 13AC	Oakland University	183	6	Qgd	940	16	R	57.5 Nov 1975	93.5 Jul 1963	57.1 May	58.0 Jan	P
5N 8E 8AC	Holly State Recreation Area	42	1	Qgd	930	11	M	22.3 Apr 1974	26.5 Sep 1966	23.0 Mar	24.5 Nov	
OGEMAW												
23N 1E 2BA1	Ogemaw Co. Rd. Comm. (Rose City Rd.)	105	1	Qgd	1,265	9	Q	75.1 Jul 1974	78.2 Apr 1969	73.6 Oct	74.6 Apr	
2BA2	Do (Rose City Rd.)	20	1	Qgd	1,265	9	Q	8.7 Jul 1969	13.6 Dec 1972	7.6 Apr	11.7 Dec	
4AD	MDNR (Fire suppression well No. 15)	21	4	Qgd	1,230	23	Q	0.7 Apr 1971	4.4 Oct 1964	1.0 Apr		Disc. 4-76
2E 6AA	Ogemaw Co. Rd. Comm. (Fairview Rd.)	133	1	Qgd	1,270	9	Q	99.8 Aug 1971	103.6 Apr 1969	102.3 Apr		Do
24N 2E 35CD	Jim Kelley	70	1	Qgd	1,130	9	Q	6.1 Apr 1974	12.7 Feb 1969	5.7 Apr		Do
3E 8BB	Ogemaw Co. Rd. Comm. (Beechwood Rd.)	89	1	Qgd	1,215	9	Q	84.4 Oct 1974	87.8 Apr 1969	85.3 Apr		Do
ONTONAGON												
46N 38W 30AD	USFS	65	1	Qgd	1,530	10	M	16.0 Jun 1973	19.1 Apr 1970	17.1 Jun	19.0 Nov	
51N 41W 8BD	Michigan Corrections Dept. (Silver City)	100	6	pCf	620	19	A	8.2 Apr 1959	20.0 Sep 1975	21.8 Dec		
PRESQUE ISLE												
33N 2E 30DA	MDNR (19) (Truck trail)	14	2	Qgd	800	40	Q	0.6 Jul 1960	5.7 Jan 1956	2.0 Apr		Disc. 4-76
6E 8BB	A. Styma (farm)	61	6	Dt	800	18	Q	5.4 Apr 1967	18.8 Mar 1963	6.2 Apr	16.2 Dec	
21AA	M. Ardycan (M-65)	43	5	Dt	790	18	Q	1.1 Apr 1963	7.6 Oct 1966	2.5 Apr		Disc. 4-76
ROSCOMMON												
24N 2W 20BA	MDNR (1) (Exp. sta.)	14	8	Qgd	1,145.3	43	R	2.3 Apr 1971	6.2 Dec 1949	2.1 Apr	5.5 Dec	Federal key well
SANILAC												
12N 13E 33DD	MSHD (at Elmer)	150	3	Mm	800	29	W	15.4 Apr 1951	25.6 Jan 1965	16.6 May	22.7 Dec	
SCHOOLCRAFT												
45N 13W 16CC	U.S. Fish and Wildlife (Seney)	154	4	Or	710	25	R	4.6 Apr 1971	6.5 Oct 1963	4.9 Mar	6.5 Sep	
47N 16W 30BB	MDNR (Cusino CCC)	57	6	Op	900	20	R	5.7 May 1960	16.3 Oct 1963	7.9 Apr	16.3 Dec	

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

COUNTY AND WELL NUMBER TWP., RANGE, SECTION	OWNER OR OTHER DESIGNATION	DEPTH (ft)	DIAMETER (in)	AQUIFER	ALTITUDE	YRS. RECORD	MEAS. 1976	OBSERVED WATER-LEVEL EXTREMES				REMARKS
								THROUGH 1975		IN 1976		
								MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	
VAN BUREN												
2S 13W 2BB	Co. Rd. Comm. (8) (26th St.)	23	1	Qgd	740	14	M	1.6 Apr 1975	5.1 Sep 1964	2.0 Apr	2.8 Feb	Disc. 5-76
3S 14W 6BA	R. Martin (3) 45th St.	59	1	Qgd	740	14	M	37.2 May 1974	43.3 Nov 1964	37.3 Mar	39.0 Jan	
4S 16W 14CD	O. Klett (Keeler)	170	14	Qgd	800	14	M	16.5 Jul 1975	27.6 Aug 1964	16.4 Jul	18.5 Jan	P
13W 16DD	Porter Twp. (1) (Twp. Hall)	83	1	Qgd	930	14	M	40.4 Jun 1974	50.4 Oct 1964	41.0 Jul	42.6 Jan	
WASHTENAW												
2S 3E 9DA	Waterloo State Park	48	6	Qgd	970	8	R	4.1 May 1974	7.0 Aug 1971	4.2 Mar	6.7 Nov	P
3S 6E 16BC	City of Ann Arbor (Airport)	55	10	Qgd	821.5	14	R	0.7 Mar 1974	15.9 Oct 1964	0.8 Mar	5.6 Oct	P
7E 5BB	City of Ypsilanti (Superior Rd.)	69	8	Qgd	720	15	R	1.8 Feb 1965	21.4 Dec 1965	3.5 Mar	14.9 Nov	P
9AD	City of Ypsilanti (GP) (Gilbert Park)	94	6	Qgd	710	26	R	29.1 Nov 1945	78.8 Oct 1974	64.4 May	75.5 Dec	P
24CA1	Ypsilanti Twp. (104) (Water Works)	87	4	Qgd	665.6	31	R	5.8 Jan 1950	22.7 Feb 1971	12.8 May	17.8 Jul	P
24CD	Do (117)	75	6	Qgd	657.8	30	R	5.7 Feb 1950	63.2 Feb 1970	6.6 Nov	22.2 Nov	P
WEXFORD												
21N 9W 4AB	City of Cadillac (Lakeside)	277	6	Qgd	1,291.1	28	Q	20.0 Jul 1953	27.6 Jun 1964	19.4 Jun	19.7 Apr	P
22N 12W 13BA	Harrietta State Fish Hatchery	141	4	Qgd	1,060	16	R	+13.8 Mar 1970	+1.5 Jan 1966	+8.2 Dec	+4.2 Dec	P

TABLE 2. REPORTED GROUND-WATER PUMPAGE, IN 1976. (IN MILLIONS OF GALLONS)

COUNTY AND WATER USER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1976 TOTAL	MAX DAY	MIN DAY
ALCONA															
Harrisville	1.4	1.4	1.4	1.2	1.3	2.1	2.5	3.1	2.5	2.2	1.9	2.0	23.0	.120	.031
ALGER															
Burt Township	2.0	2.0	3.2	1.7	5.0	6.1	5.2	4.9	2.2	5.3	2.1	2.0	41.7	--	--
Chatham	.7	.7	.7	.6	.7	.7	.9	.8	.7	.7	.6	.8	8.6	--	--
ALLEGAN															
Allegan	27.6	28.2	29.4	27.9	28.3	40.6	47.8	48.7	42.2	33.4	26.8	26.5	407.4	2.540	.397
Douglas	2.8	2.5	2.6	3.2	3.7	5.5	7.2	8.3	4.8	3.8	3.1	3.6	51.1	.431	.067
Otsego	28.6	26.6	29.6	29.0	31.8	37.2	34.8	33.0	30.1	31.4	27.8	30.6	370.5	--	--
Saugatuck							14.0	11.6	8.1	4.9	4.0	4.1	46.7	--	--
ANTRIM															
Bellaire	3.6	3.5	3.7	3.7	3.8	5.5	5.7	6.1	4.4	4.1	3.6	3.7	51.4	.256	.095
Central Lake	2.5	2.2	2.1	2.3	3.0	3.4	4.1	3.5	2.9	2.6	2.6	2.9	34.1	.133	.063
Mancelona	15.3	15.2	16.9	13.5	10.8	14.3	15.9	18.6	12.6	12.0	10.7	11.5	167.3	--	--
BARRY															
Hastings	27.6	25.1	26.7	27.0	26.8	33.4	35.5	36.3	29.9	26.9	27.0	26.3	348.5	1.630	.500
Middleville	13.7	12.7	14.3	13.3	13.6	15.7	15.2	16.6	15.2	14.4	11.3	13.7	169.7	--	--
Nashville	3.1	2.8	3.1	3.5	3.8	3.7	4.3	3.9	3.6	3.9	2.7	3.3	41.7	.259	.028
BENZIE															
Frankfort	6.5	6.0	7.2	7.8	9.2	10.7	13.2	11.1	9.0	7.7	6.9	7.4	102.7	.607	.190
BERRIEN															
Berrien Springs	4.3	5.9	6.1	5.8	6.3	7.2	9.3	10.3	7.3	6.1	5.6	4.8	79.0	1.029	.223
Buchanan	69.1	67.9	71.6	69.3	72.7	78.8	81.3	80.5	82.5	79.2	71.3	63.8	888.0	3.271	1.663
Coloma	10.8	9.0	9.6	7.7	11.4	12.5	14.4	14.3	10.4	11.6	8.1	8.4	128.2	.627	.186
Niles	108.4	90.7	99.0	97.0	96.3	107.4	102.4	101.6	95.5	89.4	82.5	85.3	1,155.5	4.640	.870
Niles Township	3.6	3.7	3.5	4.2	5.6	9.2	10.5	8.3	6.4	4.2	3.8	3.5	66.5	.705	.001
BRANCH															
Bronson	18.9	18.1	21.3	21.7	21.8	25.5	25.7	25.6	24.6	22.1	22.9	21.8	270.0	1.351	.234
Coldwater	76.8	72.6	75.7	74.6	90.0	111.7	113.0	127.0	101.0	87.4	77.0	78.2	1,085.0	6.026	1.541
Quincy													e)52.4	--	--
State Training School	8.2	7.6	8.1	8.0	8.8	9.2	9.5	9.2	9.2	8.9	8.1	8.2	103.0	--	--
Union City	5.8	6.1	5.0	6.3	5.0	7.1	7.1	4.7	4.8	5.7	4.8	4.6	67.0	--	--
CALHOUN															
Albion	98.1	92.4	101.5	104.9	97.7	111.5	109.3	119.3	100.2	109.7	92.1	98.1	1,234.8	5.475	1.965
Athens	5.1	1.6	1.6	.8	2.6	4.4	4.8	5.9	4.3	2.7	2.2	2.5	38.5	.294	.066
Battle Creek	169.8	173.1	175.9	230.6	204.0	228.0	249.8	250.3	190.9	164.6	160.5	159.2	2,356.7	11.500	3.640
Battle Creek Township	43.7	42.9	47.8	49.8	54.1	70.2	77.1	83.0	58.8	44.3	40.2	42.3	654.2	3.995	1.078
Homer	6.0	5.6	4.7	4.9	5.5	5.7	6.2	6.4	8.3	5.3	4.9	5.4	68.9	.496	.094
Marshall	33.3	33.0	35.7	33.4	38.8	42.7	41.7	48.1	40.7	40.5	32.7	32.9	453.5	1.934	.666
CASS															
Cassopolis	6.7	6.5	6.7	6.4	6.0	7.1	5.7	6.1	5.4	3.9	5.2	5.2	70.9	.271	.131
Dowagiac	26.6	25.1	26.0	24.5	29.0	35.0	37.6	34.7	30.1	30.0	28.9	30.0	357.5	2.329	.406
CHARLEVOIX															
Boyne City	8.3	7.9	8.1	7.5	10.2	14.7	11.4	10.5	12.6	9.2	7.4	7.0	114.8	.700	--
Boyne Falls	1.7	1.8	1.3	1.2	2.6	1.5	1.9	2.3	1.4	1.4	1.4	1.1	19.6	--	--
East Jordan	16.2	17.5	17.9	18.4	19.1	21.4	22.8	23.2	19.4	16.1	15.8	15.8	223.6	1.240	.320
CHEBOYGAN															
Mackinaw City	2.3	2.1	2.3	3.5	4.0	6.8	10.5	10.9	5.9	3.9	2.1	1.6	55.9	.441	--
CHIPPEWA															
Kincheloe AFB	27.8	23.9	31.4	29.5	35.2	53.2	52.5	56.4	29.6	28.2	25.9	29.1	422.7	2.906	.640
CLARE															
Clare	19.2	19.1	20.1	19.6	22.0	40.0	46.3	46.3	23.1	19.2	17.3	16.8	309.0	2.499	.405
Farwell	3.3	3.1	3.0	3.0	3.3	6.1	8.0	7.5	4.8	3.2	3.0	3.1	51.4	--	--
Harrison	7.1	8.0	7.1	6.3	6.7	9.3	11.8	11.2	6.5	5.8	5.5	5.5	90.8	.459	.159

TABLE 2. REPORTED GROUND-WATER PUMPAGE, IN 1976. (IN MILLIONS OF GALLONS)-CONTINUED

COUNTY AND WATER USER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1976 TOTAL	MAX DAY	MIN DAY
CLINTON															
Maple Rapids	1.2	1.5	1.9	1.9	1.5	1.8	2.2	2.2	2.3	1.6	1.4	1.3	20.8	--	--
Ovid	4.6	5.6	7.1	7.1	5.0	4.7	4.8	4.7	4.2	4.5	6.8	7.2	66.3	.360	.097
St. Johns	46.6	44.0	47.5	46.4	47.5	53.2	48.1	50.4	45.1	47.2	42.7	43.3	562.0	2.431	.809
CRAWFORD															
Grayling	11.5	11.5	12.6	11.6	12.6	17.6	21.3	18.9	16.4	14.9	13.3	13.3	175.5	.871	.309
DICKINSON															
Breitung Township	2.1	2.0	2.1	2.2	2.7	3.5	4.0	3.1	2.3	2.1	1.9	2.0	30.0	.304	.061
EATON															
Bellevue	5.0	3.4	3.5	3.5	3.7	4.2	3.9	4.1	3.7	3.5	3.5	3.9	45.9	.200	.070
Charlotte	36.5	35.1	37.1	36.1	37.8	51.9	51.5	43.8	40.9	38.9	36.7	37.8	484.1	2.216	.103
Delta Township	45.5	43.8	43.2	42.4	50.5	66.7	66.2	68.1	56.9	49.2	45.8	46.6	624.9	3.323	1.031
Grand Ledge	16.8	17.5	17.0	16.9	17.3	21.3	22.4	22.8	17.9	17.4	16.1	16.3	219.7	--	--
Olds Warehouse	1.3	.7	1.3	1.4	1.4	1.0	1.5	1.3	1.6	1.2	1.5	.9	15.1	--	--
EMMET															
Harbor Springs	10.4	9.6	10.7	11.0	16.1	22.8	26.5	31.8	14.6	11.4	9.7	10.4	185.0	1.537	.302
Petosky	35.3	34.8	35.5	35.0	49.8	42.4	49.7	55.0	42.7	41.5	38.0	41.2	500.9	2.387	--
GENESEE															
Beecher Metropolitan District	40.2	38.3	38.1	36.7	37.3	44.7	41.0	44.7	36.5	36.1	38.1	37.1	468.8	1.988	.931
Davison	22.4	21.8	24.9	25.0	23.9	33.1	26.7	34.9	27.6	23.5	25.1	24.4	313.3	--	.372
Fenton	23.5	22.8	23.8	25.0	25.4	31.4	28.5	28.4	29.8	26.1	23.7	25.4	313.8	1.558	.543
Grand Blanc	31.8	34.1	30.6	30.8	35.2	52.4	39.7	51.5	36.2	30.7	32.3	26.4	431.7	2.704	.796
Grand Blanc Township													18.2	--	--
Linden													e)51.7	--	--
Montrose	4.1	4.0	4.2	4.2	4.7	4.9	4.8	5.0	4.9	4.7	4.6	5.1	55.2	.405	.097
Otisville	1.1	.9	1.1	1.0	1.1	1.6	1.6	1.6	1.3	e)1.1	e)1.1	1.0	e)14.5	.089	.032
GLADWIN															
Beaverton	3.2	3.2	3.3	2.9	3.0	3.4	3.5	3.8	3.3	3.1	3.2	3.3	39.2	.185	.063
GOGEBIC															
Bessemer	12.6	10.7	10.8	10.4	12.2	12.0	13.9	11.3	11.0	9.0	8.2	6.0	128.1	--	--
Ironwood	41.0	38.5	41.4	42.5	42.1	39.6	41.7	47.2	45.5	37.9	34.7	43.0	495.1	--	--
Marenisco Township	5.6	5.5	5.6	5.2	5.8	5.9	5.9	5.2	4.5	5.2	5.9	6.5	66.8	.293	.114
Wakefield	8.9	9.5	10.2	9.1	9.3	9.7	9.5	9.8	8.2	8.5	8.9	9.3	110.9	--	--
Wakefield Township													e)4.5	--	--
GRAND TRAVERSE															
Kingsley	1.6	1.4	1.8	1.8	1.9	3.9	2.9	3.4	2.4	1.5	1.5	1.5	25.6	--	--
GRATIOT															
a)Alma	--	--	2.9	3.2	12.7	15.8	--	--	--	--	.7	--	35.3	--	--
Ashley	2.6	2.8	2.7	2.5	2.5	3.1	3.1	3.2	2.6	2.6	2.5	2.5	32.7	.130	.060
Breckenridge	3.1	3.3	3.3	3.2	3.5	4.0	4.2	4.0	3.5	3.5	3.3	3.3	42.2	.182	.077
Ithaca	11.4	9.4	12.3	9.2	9.3	11.9	11.1	8.9	7.9	8.5	7.6	7.7	115.2	.592	.251
St. Louis	39.1	35.0	40.5	41.6	42.3	46.0	50.7	47.2	48.4	53.3	48.1	50.2	542.4	1.944	1.215
HILLSDALE															
Hillsdale	43.6	39.9	43.9	42.7	45.8	49.8	48.5	41.6	42.7	41.5	39.3	37.6	516.9	2.120	.886
Jonesville	15.0	15.0	15.8	14.8	15.1	16.3	17.2	17.3	15.0	14.4	12.9	15.1	183.9	.984	.252
Litchfield	3.1	2.8	3.6	3.6	2.8	4.5	5.4	5.7	4.2	3.5	3.4	3.6	46.2	.240	.088
Waldron	2.0	1.9	1.8	1.8	2.0	2.2	2.2	2.5	2.2	2.0	1.8	1.8	24.2	.149	.009
HOUGHTON															
b)Adams Township - S. Range Water Authority	59.1	57.8	58.0	58.0	61.6	59.7	64.5	63.8	63.0	62.3	57.5	59.7	e)725.0	--	--
c)Adams Township - S. Range Water Authority	9.5	9.2	9.9	9.7	9.4	9.1	9.5	9.3	8.9	9.2	8.8	9.5	e)112.0	--	--
Chassell Township	3.2	3.3	3.6	3.5	2.1	4.5	4.4	4.8	4.2	3.9	3.9	4.2	45.6	.187	.105
Houghton	32.5	32.6	31.1	32.0	33.4	31.8	34.7	35.1	35.9	35.2	33.1	33.9	401.3	1.168	.712
d)N. Michigan Water Company	38.5	43.9	43.2	40.1	40.4	49.1	42.3	45.0	38.6	37.7	32.4	30.1	481.3	1.810	.737

TABLE 2. REPORTED GROUND-WATER PUMPAGE, IN 1976. (IN MILLIONS OF GALLONS)-CONTINUED

COUNTY AND WATER USER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1976 TOTAL	MAX DAY	MIN DAY
HURON															
Elkton	1.8	1.3	2.1	2.1	2.3	3.2	2.4	2.5	2.0	1.9	2.3	2.3	26.2	.137	.048
Q)Pigeon			7.0			7.8			8.7			7.9	31.4	--	--
Sebewaing	7.7	7.4	7.3	7.1	7.8	10.7	9.5	11.8	11.9	9.9	9.1	9.4	109.6	--	--
INGHAM															
f)E. Lansing-Meridian Township	119.4	112.9	115.0	119.4	132.5	173.6	160.1	162.7	141.4	130.8	117.5	114.1	1,599.4	8.472	2.668
Lansing	691.6	656.8	708.9	696.6	736.7	885.6	818.7	846.9	790.8	742.1	694.7	707.1	8,976.5	39.513	15.000
Lansing Township	46.5	47.0	51.3	50.1	48.3	45.5	50.3	35.6	57.2	52.7	56.8	45.2	586.5	--	--
Leslie	6.5	5.9	6.4	6.8	8.1	12.3	8.8	14.7	9.1	6.8	6.1	6.6	98.1	--	--
Mason	19.5	17.7	16.5	16.9	15.1	19.4	20.6	20.8	19.5	18.4	16.9	17.2	218.5	.736	.001
Michigan State University	149.5	145.7	140.1	149.5	159.4	156.2	139.7	144.4	144.8	159.1	138.0	104.3	1,730.7	5.932	1.779
Oldsmobile Forge Number 2	11.0	9.9	11.8	11.5	10.9	10.4	8.2	10.3	9.7	8.7	7.5	5.7	115.6	--	--
Stockbridge	4.2	4.3	3.1	3.1	3.5	4.7	4.0	5.2	3.9	3.3	4.0	3.0	46.3	.232	.071
Webberville	2.9	2.3	2.7	3.1	3.0	5.1	4.2	5.3	4.0	2.9	2.9	3.0	41.4	--	--
IONIA															
Michigan Reformatory, Ionia	17.7	16.8	21.7	16.1	17.2	19.2	18.6	16.6	16.7	18.4	20.2	19.2	218.4	--	--
Michigan Training Unit, Ionia	4.8	4.6	4.8	5.1	6.1	8.4	8.8	10.1	7.6	6.5	5.5	5.7	78.0	.408	.094
Muir	2.1	2.0	2.5	2.4	2.4	e)3.1	4.7	5.1	3.5	3.3	2.5	3.9	37.5	--	--
Pewamo	1.2	1.0	1.2	1.3	1.1	2.1	2.1	2.6	1.7	1.3	1.0	1.2	17.8	--	--
Portland	11.7	11.7	13.1	12.3	11.6	17.4	16.3	12.9	15.9	16.0	13.6	10.4	162.9	--	--
Saranac	8.5	9.4	10.3	10.8	11.1	12.2	12.2	10.5	9.5	10.1	9.0	9.4	123.0	.557	.098
State Hospital, Ionia	2.9	2.6	3.0	2.9	2.7	3.0	3.1	3.0	2.7	2.7	1.8	2.1	32.5	.157	.034
IOSCO															
Oscoda Township	15.2	14.8	14.6	14.4	17.5	23.3	23.5	22.2	35.9	16.4	15.0	15.5	228.3	--	--
Wurtsmith AFB	19.7	16.6	18.6	17.9	24.3	35.0	29.2	33.5	22.7	19.5	18.8	17.0	272.8	1.763	.386
IRON															
Alpha	.8	.8	.9	.8	.9	.8	.9	.9	.8	.9	.9	.9	e)10.3	--	--
Caspian	11.9	11.4	12.8	12.5	13.4	13.7	13.6	12.2	11.2	9.7	8.6	9.7	140.7	.546	.240
Crystal Falls	12.7	11.9	13.2	12.7	14.5	14.8	17.6	16.1	12.5	11.7	11.4	11.8	160.9	.738	.348
Crystal Falls Township	4.7	4.0	5.2	6.6	4.5	7.5	8.6	8.4	5.9	5.8	5.3	5.5	72.0	.377	.119
Iron River	10.8	10.8	10.2	10.0	9.6	7.3	9.3	9.9	8.3	8.1	8.0	9.2	111.5	.518	.166
Iron River Township	10.6	10.6	12.8	10.1	9.4	13.0	14.1	14.0	11.0	9.8	11.1	11.2	137.7	--	--
Stambaugh	5.1	4.4	5.0	5.0	5.7	7.6	7.5	6.4	5.6	5.3	5.0	5.3	67.9	.417	.120
Stambaugh Township	3.0	3.0	3.0	2.6	2.6	4.1	7.0	5.1	3.3	2.9	2.7	3.5	42.8	--	--
ISABELLA															
g)Mt. Pleasant	61.2	68.2	67.2	70.1	64.5	71.4	79.9	77.9	85.0	84.5	72.5	62.6	865.0	3.509	1.023
JACKSON															
Concord	3.8	3.7	3.9	3.9	4.2	6.1	5.1	6.8	5.1	3.9	3.4	3.6	53.5	--	--
Jackson	329.0	322.5	349.2	316.9	306.0	365.5	348.2	383.9	380.3	349.8	317.7	334.9	4,103.9	16.231	5.655
Springport	3.4	3.4	3.8	3.3	3.9	4.8	4.9	4.4	3.8	3.2	3.7	2.5	45.1	--	--
State Prison, Jackson	43.2	38.6	42.0	41.7	44.2	47.0	45.6	45.7	45.3	43.4	41.3	41.3	519.3	2.300	1.070
KALAMAZOO															
Augusta	2.7	3.1	2.9	2.5	2.1	2.6	2.6	2.6	2.2	2.0	2.0	1.8	29.1	.256	.042
Brown Company	287.4	223.8	247.5	266.2	290.4	353.8	363.2	297.1	262.5	280.4	290.2	265.9	3,428.4	--	--
Galesburg	4.4	4.5	4.6	4.4	4.6	6.8	8.0	7.6	6.0	4.9	4.8	4.6	65.2	.373	.116
Kalamazoo	455.5	420.0	456.3	487.5	507.2	696.1	786.9	739.2	625.1	507.2	434.4	433.8	6,549.2	39.768	10.376
Parchment	6.6	5.8	6.5	6.5	8.1	14.1	16.9	17.5	10.8	7.5	7.0	7.1	114.4	1.198	.123
Portage	46.2	43.6	45.6	49.8	54.0	89.1	113.3	113.8	80.2	52.1	48.0	48.8	784.5	6.503	1.030
Schoolcraft	9.4	9.2	10.1	9.7	10.6	11.0	11.3	11.4	10.4	9.2	5.9	5.4	113.6	--	--
Simpson-Lee Paper Company	43.0	39.7	36.9	35.6	34.2	35.6	27.4	38.3	34.2	36.9	32.8	34.2	428.8	1.814	--
State Hospital, Kalamazoo	12.9	9.2	12.4	16.3	10.7	7.3	10.1	7.0	9.0	7.6	12.4	9.5	124.4	.725	--
Upjohn Company	408.5	385.6	438.4	451.8	461.9	508.7	479.7	536.7	509.8	484.8	429.3	466.5	5,561.7	20.549	9.492
Vicksburg	7.4	7.4	8.5	9.8	8.2	23.5	18.1	12.6	10.8	7.4	8.5	10.0	132.2	9.923	.114
KALKASKA															
Kalkaska	6.4	6.7	7.2	6.4	7.4	11.1	11.6	10.4	10.8	9.2	7.2	7.7	102.1	.519	.130
KENT															
Alloytek Incorporated	11.4	11.0	11.8	11.2	11.0	12.5	12.9	13.3	11.7	10.0	8.0	7.1	131.9	.524	.068
Cedar Springs	7.6	7.8	8.5	7.3	8.3	12.0	12.2	11.9	6.5	10.3	9.8	10.2	112.4	.811	.113
Kent County Airport													e)12.0	--	--
Plainfield Township	28.6	26.9	29.1	31.1	38.5	75.9	81.9	72.9	50.8	34.7	30.6	31.5	532.5	4.990	.847

TABLE 2. REPORTED GROUND-WATER PUMPAGE, IN 1976. (IN MILLIONS OF GALLONS)-CONTINUED

COUNTY AND WATER USER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1976 TOTAL	MAX DAY	MIN DAY
LAPEER															
i)Almont	3.2	2.5	3.3	3.0	.8	1.2	.9	.6	.2	.2	.4	.9	17.2	--	--
Columbiaville	3.1	3.3	3.1	3.2	3.4	4.9	4.9	4.6	3.7	3.0	2.8	3.3	43.3	.165	.092
Q)Dryden			3.6			3.9			3.7			3.7	e)14.9	--	--
North Branch	2.4	2.9	2.7	2.6	2.7	4.3	3.0	3.5	3.0	2.3	2.5	2.3	34.2	.232	.053
LENAWEE															
Addison	3.3	3.1	3.3	3.1	3.2	3.4	3.4	3.5	2.9	3.5	2.9	3.1	38.7	.168	.055
Britton	2.1	1.8	1.7	1.6	1.9	1.7	1.4	1.5	1.7	1.6	1.4	1.5	19.9	.077	.037
Clinton	6.0	6.8	6.2	7.0	7.0	10.6	10.6	8.9	12.9	6.6	7.1	6.5	96.2	--	--
Hudson	8.1	8.4	9.3	9.1	9.6	10.8	10.0	11.7	9.0	7.7	7.4	7.8	108.9	.566	.123
Morenci	7.4	6.4	6.9	6.9	7.2	8.7	8.7	9.3	7.9	7.4	6.8	7.6	91.2	.572	.175
Tecumseh	27.9	28.7	29.9	33.1	32.8	37.1	33.0	44.1	33.1	27.5	25.7	26.2	379.1	2.046	.259
Fisher Body, Tecumseh	1.1	1.1	1.2	1.3	1.2	1.6	1.7	1.7	1.2	1.0	1.0	.8	14.9	.092	.026
LIVINGSTON															
Brighton	19.5	19.8	20.9	20.7	20.7	28.4	29.2	32.1	24.7	22.3	21.2	22.0	281.5	1.300	.300
Fowlerville	6.9	6.5	7.1	5.0	6.1	12.1	11.3	9.7	8.2	6.4	6.9	7.7	93.9	1.386	.112
Green Oak Township	2.2	2.3	2.2	2.4	2.0	4.4	4.2	4.8	4.3	4.2	.6	1.7	e)35.3	.233	.031
Hillcrest Center, Howell	1.1	2.8	2.4	3.1	3.1	4.5	3.9	5.6	3.4	3.2	2.7	2.5	38.3	.322	.036
Howell	32.1	32.8	32.7	31.0	33.1	38.2	39.3	41.4	35.7	31.0	31.3	31.7	e)410.3	1.723	.735
Maxey Boys School	3.7	3.6	3.7	3.2	4.0	5.4	4.4	3.9	3.9	3.8	3.7	3.7	47.0	.386	.081
LUCE															
Newberry	11.5	11.1	11.6	11.1	9.8	17.6	15.6	16.8	13.0	8.9	10.1	10.6	147.7	.944	.182
State Hospital, Newberry	5.0	4.4	5.1	5.2	5.4	5.4	5.0	5.0	5.0	5.0	4.6	4.5	59.6	--	--
MACOMB															
Richmond	10.0	10.2	12.9	10.2	10.8	14.5	11.2	15.9	11.7	9.7	11.6	11.5	140.2	--	--
Romeo	20.0	19.0	18.3	18.9	19.5	29.7	18.5	19.7	18.6	17.4	19.3	22.9	241.8	--	--
MANISTEE															
Filer Township	3.0	2.8	3.2	4.1	3.9	5.7	7.6	6.8	4.0	3.0	3.1	2.3	49.5	.520	.072
MARQUETTE															
Ishpeming Township	8.5	8.0	6.6	7.8	9.7	9.7	8.4	10.1	8.0	9.5	8.9	9.1	104.3	--	--
K. I. Sawyer AFB	36.0	32.7	34.3	33.7	40.3	45.0	50.7	48.1	36.2	35.3	35.8	39.9	468.0	2.271	.884
Powell Township	.6	.7	.7	.6	.7	.8	.9	.9	.6	.6	.6	.6	e)8.3	.036	.019
MASON															
Scottville													43.7	--	--
MENOMINEE															
Stephenson	2.7	2.5	2.6	2.8	3.4	5.1	6.0	4.6	3.4	3.4	3.1	3.1	42.7	.285	.078
MISSAUKEE															
Lake City	3.4	3.2	3.3	3.4	4.0	8.5	11.4	10.3	6.5	5.5	3.8	4.6	67.9	--	--
MONROE															
Milan	15.4	15.0	14.0	16.1	15.8	19.4	15.9	23.0	17.2	16.4	14.7	15.7	198.6	4.275	.068
Petersburg	2.7	2.4	3.7	2.6	3.0	3.4	3.6	4.2	3.2	3.1	3.4	3.3	38.6	--	--
MONTCALM															
Carson City	6.3	6.2	6.8	6.5	7.3	7.5	7.5	7.1	7.0	6.9	6.6	6.6	82.3	.300	.150
Edmore	6.3	4.6	6.2	7.0	9.1	7.7	12.2	10.7	7.6	7.0	4.3	5.3	88.0	--	--
Greenville	54.1	50.0	52.9	55.0	58.7	75.7	81.7	70.3	63.3	63.5	56.2	58.0	739.4	3.791	1.117
Howard City	2.2	2.4	2.8	2.5	2.5	2.7	2.5	2.4	2.1	1.8	1.9	1.7	27.5	--	--
Sheridan	2.8	2.4	2.3	2.7	2.4	4.2	5.0	4.4	3.4	2.7	2.3	2.1	36.7	--	--
Stanton	3.3	2.3	3.2	3.2	3.1	3.9	3.4	3.6	3.3	3.3	3.3	2.6	38.5	--	--
MUSKEGON															
Montague	4.2	4.2	4.4	4.3	5.8	10.6	12.8	10.7	6.5	5.5	5.0	4.9	78.9	--	--
Ravenna	1.7	1.7	1.8	1.9	2.2	3.2	4.3	3.5	2.7	2.2	1.7	1.8	28.7	.261	.021
Whitehall	36.4	35.2	40.2	40.7	43.0	51.2	46.1	41.5	40.3	35.2	35.3	29.9	475.0	2.394	.545

TABLE 2. REPORTED GROUND-WATER PUMPAGE, IN 1976. (IN MILLIONS OF GALLONS)-CONTINUED

COUNTY AND WATER USER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1976 TOTAL	MAX DAY	MIN DAY
NEWAYGO															
Fremont	20.3	21.2	25.9	22.4	19.0	40.8	51.5	36.0	27.2	27.1	21.8	25.9	339.1	2.473	.316
Hesperia	.6	.6	.6	2.5	2.5	2.5	2.3	2.3	2.3	2.0	2.0	2.0	22.2	--	--
Newaygo	5.0	5.0	5.1	5.2	5.5	6.0	7.0	6.9	5.2	6.4	5.8	5.9	e)69.0	--	--
White Cloud	9.4	9.1	9.7	9.4	9.3	9.7	13.6	12.2	11.5	8.5	9.1	9.1	e)120.6	.550	.200
OAKLAND															
Independence Township	4.7	5.3	4.5	4.9	5.9	10.3	10.0	8.4	7.2	5.0	5.3	5.4	76.9	--	--
Milford	16.0	17.0	17.8	17.0	19.0	30.3	30.0	25.9	23.6	19.3	17.5	18.8	e)252.2	1.612	.125
Orion Township	12.4	11.1	10.6	12.0	12.0	29.9	22.8	28.7	17.3	12.6	13.1	13.6	196.1	--	--
Oxford	8.9	8.6	9.4	9.5	10.0	11.0	11.1	10.7	10.3	9.0	8.4	8.5	115.4	.583	.159
Rochester	59.2	57.4	59.4	55.1	62.2	80.9	75.0	77.8	64.4	57.1	52.0	51.1	751.6	3.801	1.213
j)Southfield													e)5.1	--	--
South Lyon	53.3	44.8	52.6	47.2	49.8	59.2	44.4	63.0	56.8	54.6	51.3	52.1	629.1	2.855	.674
Sylvan Lake	3.9	5.1	4.8	5.3	5.4	8.9	7.8	7.9	8.3	4.5	5.8	5.9	73.6	--	--
Walled Lake	17.1	15.4	15.4	20.3	17.9	24.9	25.0	16.1	17.1	18.4	15.0	15.9	218.5	--	--
Waterford Township	91.6	80.4	93.5	89.5	104.2	177.5	173.1	168.2	130.2	103.5	98.0	122.8	1,432.5	--	--
Wolverine Lake													89.0	--	--
OCEANA															
Pentwater	2.2	1.8	3.2	2.9	3.0	5.3	7.4	6.2	4.1	2.7	2.8	2.9	44.5	.513	--
OGEMAW															
West Branch	7.8	6.8	8.7	8.3	9.6	12.7	12.3	12.9	10.7	10.2	9.7	9.6	119.3	.552	.127
ONTONAGON															
Bergland Township	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.1	1.0	1.0	1.2	e)23.1	.060	.026
OSCEOLA															
Evart	64.2	58.1	70.9	63.7	64.6	67.2	40.1	69.3	53.7	52.7	53.4	54.3	712.2	3.340	.450
Reed City	10.1	10.9	13.5	11.5	12.9	9.3	15.4	15.9	12.7	11.8	12.0	12.1	148.1	--	--
OTSEGO															
Gaylord	18.1	14.5	15.0	13.1	16.1	20.6	22.8	24.1	21.0	20.3	15.9	25.3	226.8	--	--
State Hospital, Gaylord	.8	.9	.8	.8	.9	.9	1.0	1.1	.9	.9	.9	.9	10.8	.046	.011
OTTAWA															
Spring Lake	9.7	8.3	9.7	10.2	11.6	17.1	24.4	19.9	14.1	12.2	10.8	11.3	159.3	1.333	.050
PRESQUE ISLE															
Onaway	3.3	3.2	3.4	3.5	3.9	3.8	4.0	4.2	4.0	3.8	3.6	3.6	e)44.3	.312	.077
Rogers City	11.1	10.5	11.1	10.1	12.2	18.5	14.4	16.6	11.2	11.3	10.6	11.5	149.1	1.051	.210
ROSCOMMON															
Roscommon	4.6	4.4	4.7	4.8	4.8	5.7	6.6	6.4	5.7	5.6	5.5	5.1	63.9	--	--
SAGINAW															
Birch Run	1.6	1.6	1.8	1.9	2.2	2.4	2.3	2.3	2.2	2.1	2.0	1.9	24.3	.092	.018
Chesaning	8.3	8.2	8.3	8.7	8.8	10.1	9.6	9.8	9.2	10.2	8.4	10.1	109.7	--	--
ST. CLAIR															
Capac	3.5	3.2	3.5	3.8	3.6	4.1	3.9	5.8	5.7	3.6	3.2	3.7	47.6	.424	.045
Yale	6.4	6.5	6.6	6.7	7.1	6.8	8.0	8.5	7.1	6.6	6.6	6.8	83.7	--	--
ST. JOSEPH															
Constantine	8.8	10.4	8.7	7.2	7.6	9.1	9.6	8.8	6.2	7.2	7.1	10.3	101.0	.528	.013
Sturgis	61.9	58.7	63.8	61.8	66.6	79.0	78.5	79.8	68.9	63.6	60.3	65.9	e)808.8	4.107	1.079
Three Rivers	41.6	38.0	40.6	32.6	30.6	36.9	41.7	36.3	32.8	28.2	25.8	27.7	412.8	2.368	.463
SANILAC															
Brown City	4.9	4.7	4.8	5.2	6.8	7.5	6.8	3.5	4.2	5.6	2.1	4.8	e)60.9	--	--
Croswell	16.7	12.8	14.3	14.6	15.7	14.2	15.9	21.8	14.5	12.1	12.3	13.2	178.1	1.010	.119
Deckerville	2.7	2.3	2.5	2.4	2.9	6.3	4.4	4.4	4.0	4.2	3.0	3.0	42.1	--	.065
Marlette	8.1	7.4	7.9	8.4	8.9	10.1	8.9	10.1	9.7	9.2	8.5	7.9	105.1	.475	.157
Peck	1.9	1.3	1.5	1.3	1.2	2.4	1.8	2.5	1.8	1.3	1.5	1.1	19.6	.181	.042
Port Sanilac	2.0	2.0	1.9	1.9	2.1	2.5	5.0	5.5	5.0	3.4	3.0	2.3	36.6	--	--

TABLE 2. REPORTED GROUND-WATER PUMPAGE, IN 1976. (IN MILLIONS OF GALLONS)-CONTINUED

COUNTY AND WATER USER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1976 TOTAL	MAX DAY	MIN DAY
SHIAWASSEE															
Byron													e)14.4	--	--
Corunna	7.2	6.7	6.8	6.8	7.2	7.9	7.7	8.1	6.7	7.3	7.8	7.1	87.6	.370	.083
Durand	14.5	14.5	15.4	14.7	16.1	17.8	17.2	18.3	15.7	15.6	14.5	15.1	189.4	.816	.340
Owosso	67.8	66.7	71.0	66.5	71.4	99.6	96.8	86.7	83.9	74.5	68.7	70.1	e)923.7	4.320	1.700
Perry	4.6	3.5	3.7	3.7	4.4	5.8	5.5	5.5	4.8	3.9	4.5	3.9	53.8	--	--
TUSCOLA															
Akron	13.4	24.7	36.1	19.7	13.4	51.9	41.6	38.5	7.1	74.4	9.8	8.6	e)339.2	--	--
Caro	22.2	16.5	13.5	14.4	15.0	15.5	17.6	18.8	15.4	19.9	21.3	22.3	212.4	--	--
Cass City	8.0	7.8	9.4	10.2	9.2	13.5	10.7	14.3	11.8	8.6	8.0	8.6	120.1	.647	.163
Kingston	2.3	1.5	1.3	1.2	1.2	2.1	1.4	1.8	1.4	1.1	1.0	1.2	17.5	.120	.000
State Hospital, Caro	5.0	4.0	5.1	5.5	5.2	5.2	4.8	5.0	4.5	5.9	4.4	4.0	58.6	.310	.070
Vassar	16.1	20.4	20.0	15.5	15.0	21.8	19.8	21.6	24.4	16.7	19.0	18.7	229.0	--	--
VAN BUREN															
Bangor	8.7	8.3	9.2	9.2	6.4	6.9	7.4	7.3	6.5	6.9	5.8	5.6	88.2	.691	.071
Decatur	4.4	6.0	6.5	8.3	8.8	8.2	8.5	9.2	8.2	7.0	5.6	5.7	86.4	--	--
Lawrence	3.2	3.0	2.9	3.1	2.5	2.7	3.5	5.0	4.1	7.8	10.3	8.2	56.3	--	.002
Lawton	18.0	17.5	25.5	15.5	15.5	21.7	21.5	19.2	26.0	31.5	15.0	11.1	238.0	1.800	--
WASHTENAW															
h)Ann Arbor	64.5	60.1	57.0	79.8	76.5	70.4	76.6	74.8	75.1	33.1	3.1	6.3	677.3	--	--
Chelsea	15.8	15.6	17.9	17.5	18.1	20.8	21.3	22.9	21.2	18.3	16.5	16.2	222.1	1.045	.338
Dexter	8.3	8.1	8.1	7.6	8.1	8.2	9.0	7.9	7.2	8.0	7.1	7.0	94.6	.399	.118
Manchester	8.4	7.1	7.0	7.1	7.6	9.6	9.1	9.1	8.4	7.4	7.0	7.9	95.7	.749	.106
Saline	27.3	29.0	29.0	29.8	32.8	42.9	38.6	45.4	29.3	27.6	32.6	30.5	394.8	2.019	.586
Webster Township	1.6	1.4	1.8	1.7	2.9	5.8	6.2	7.9	4.5	1.9	1.8	1.7	39.2	.409	.029
Ypsilanti	121.2	119.3	125.7	124.1	124.7	161.6	153.1	171.9	137.1	129.1	144.0	140.5	1,652.3	7.721	1.784
Ypsilanti Township	33.5	59.9	66.8	39.9	78.2	180.7	195.1	194.6	115.7	63.8	0.0	38.6	1,066.8	10.044	.000
WEXFORD															
Cadillac	61.8	58.3	62.0	58.6	62.9	91.9	103.6	96.3	71.3	60.1	51.9	56.3	835.0	5.084	1.105
Manton	3.2	3.2	2.8	2.6	3.2	3.2	2.8	3.9	2.2	1.6	2.1	2.6	33.4	.225	.059

NOTES

a) Main source from the Pine River.

b) Amount pumped to supply Houghton, Hancock, Portage Township, Copper Range Company, and Atlantic Mine.

c) Amount pumped to supply Painesdale, Trimountain, Baltic, and South Range.

d) Amount pumped to supply Calumet, Calumet Township, Copper City, Lake Linden, Laurim, Osceola Township, Torch Lake Township, Ahmeek, and Alleouez Township.

e) Wholly or partly estimated.

f) East Lansing and Meridian Township combined water systems in July 1973.

g) Use Ranney collector system at Chippewa River site.

h) Also pumped 5,164 million gallons from Huron River.

i) Converted to Detroit Water System April 1976.

Q) Quarterly figures.

SELECTED REFERENCES

Publications of the U.S. Geological Survey

Water-Supply Papers

Allen, W. B., Miller, J. B., and Wood, W. W., 1972, Availability of water in Kalamazoo County, Michigan: U.S. Geol. Survey Water-Supply Paper 1973, 129 p., 36 figs., 9 pls.

Deutsch, Morris, 1963, Ground-water contamination and legal controls in Michigan: U.S. Geol. Survey Water-Supply Paper 1691, 79 p., 23 figs.

Lohr, E. W., and Love, S. K., 1954, The industrial utility of public water supplies in the United States 1952, pt. 1, States east of the Mississippi River: U.S. Geol. Survey Water-Supply Paper 1299, 639 p., 3 figs., 5 pls.

McGuinness, C. L., 1963, The role of ground water in the national water situation: U.S. Geol. Survey Water-Supply Paper 1800, 1121 p., 2 figs., 4 pls.

McGuinness, C. L., Poindexter, O. F., and Otten, E. G., 1949, Ground-water supplies of the Ypsilanti area, Michigan: U.S. Geol. Survey Water-Supply Paper 1078, 105 p., 7 figs., 5 pls.

Reed, J. E., Deutsch, Morris, and Wiitala, S. W., 1966, Induced recharge of an artesian glacial-drift aquifer at Kalamazoo, Michigan: U.S. Geol. Survey Water-Supply Paper 1594-D, 62 p., 36 figs., 2 pls.

Twenter, F. R., and Knutilla, R. L., 1972, Water for a rapidly growing urban community--Oakland County, Michigan: U.S. Geol. Survey Water-Supply Paper 2000, 150 p., 90 figs.

Vanlier, K. E., 1963, Ground-water resources of the Alma area, Michigan: U.S. Geol. Survey Water-Supply Paper 1619-E, 66 p., 20 figs., 2 pls.

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. Geol. Survey Water-Supply Paper 1969, 111 p., 35 figs., 3 pls.

Wiitala, S. W., Newport, T. G., and Skinner, E. L., 1967, Water resources of the Marquette Iron Range area, Michigan: U.S. Geol. Survey Water-Supply Paper 1842, 142 p., 40 figs., 4 pls.

Wiitala, S. W., Vanlier, K. E., and Krieger, R. A., 1960, Water resources of the Flint area, Michigan: U.S. Geol. Survey Water-Supply Paper 1499-E, 86 p., 32 figs., 6 pls.

Water-Supply Papers (contain ground-water data for Michigan)

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		

Circulars

Murray, C. R., and Reeves, E. B., 1972, Estimated use of water in the United States, 1970: U.S. Geol. Survey Circ. 676, 37 p., 12 figs.

Stramel, G. J., Wisler, C. O., and Laird, L. B. 1954, Water resources of the Grand Rapids area, Michigan: U.S. Geol. Survey Circ. 323, 40 p., 29 figs., 3 pls.

Wisler, C. O., Stramel, G. J., and Laird, L. B., 1952, Water resources of the Detroit area, Michigan: U.S. Geol. Survey Circ. 183, 36 p., 30 figs., 4 pls.

Water-Data Reports

Year	WDR Number
1975	MI-75-1
1976	MI-76-1

Other Publications

Brown, E. A., and Stuart, W. T., 1951, Ground-water resources of the glacial deposits in the Bessemer area, Michigan, 1950: Michigan Geol. Survey Prog. Rept. 14, 68 p., 27 figs.

Clayton, R. N., et al, 1966, The origin of saline formation waters, I, Isotopic composition: Jour, Geophys, Research, V. 71, No. 16.

Deutsch, Morris, 1956, Effects of dissemination of radioactive materials on water resources conservation--with special references to Michigan: Michigan State Univ. Agr. Expt. Sta. Water Bull. 2.

_____, 1961a, Hydrogeologic aspects of ground-water pollution: Water Well Jour., V. 15, No. 9.

_____, 1961b, Incidents of chromium contamination of ground-water in Michigan: U.S. Public Health Service Tech. Rept. W61-5, p. 98-104.

_____, 1962a, Controlled induced-recharge tests at Kalamazoo, Michigan: Jour. Am. Water Works Assoc., V. 54, No. 2, p. 181-196.

_____, 1962b, Phenol contamination of an artesian aquifer at Alma, Michigan: Open-file report.

Deutsch, Morris, Burt, E. M., and Vanlier, K. E., 1958, Summary of ground-water investigations in the Holland area, Michigan: Michigan Geol. Survey Prog. Rept. 20, 87 p., 16 figs.

Deutsch, Morris, Vanlier, K. E., and Giroux, P. R., 1960, Ground-water hydrology and glacial geology of the Kalamazoo area, Michigan: Michigan Geol. Survey Prog. Rept. 23, 122 p., 21 figs.

Deutsch, Morris, and Vanlier K. E., 1961, Ground-water for Michigan's future: Open-file report.

Doonan, C. J., and Byerlay, J. R., 1973, Ground-water and geology of Baraga County, Michigan: Michigan Geol. Survey Water Inv. 11, 26 p., 2 figs., 2 pls.

Doonan, C. J., and Hendrickson, G. E., 1967, Ground-water in Iron County, Michigan: Michigan Geol. Survey Water Inv. 7, 61 p., 3 figs., 2 pls.

_____, 1968a, Ground-water in Gogebic County, Michigan: Michigan Geol. Survey Water Inv. 8, 22 p., 5 figs., 2 pls.

_____, 1969, Ground-water in Ontonagon County, Michigan: Michigan Geol. Survey Water Inv. 9, 29 p., 5 figs., 1 pl.

Doonan, C. J., Hendrickson, G. E., and Byerlay, J. R., 1970, Ground-water and geology of Keweenaw Peninsula, Michigan: Michigan Geol. Survey Water Inv. 10, 41 p., 1 fig., 2 pls.

Ferris, J. G., and others, 1954, Ground-water resources of southeastern Oakland County, Michigan: Michigan Geol. Survey Prog. Rept. 16, 158 p., 44 figs., 6 pls.

Fleck, W. B., 1974, Geology and hydrology for environmental planning in Washtenaw County, Michigan: Geol. Survey Environmental Geol. Series Rept. 1.

Giroux, P. R., Hendrickson, G. E., Stoimenoff, L. E., and Whetstone, G. W., 1964, Water resources of Van Buren County, Michigan: Michigan Geol. Survey Water Inv. 3, 144 p., 45 figs.

Giroux, P. R., Stoimenoff, L. E., Nowlin, J. O., and Skinner, E. L., 1966, Water resources of Branch County, Michigan: Michigan Geol. Survey Water Inv. 6, 158 p., 34 figs., 2 pls.

Hendrickson, G. E., 1966, Michigan's Au Sable River--Today and tomorrow: Michigan Geol. Survey Bull. 3, 80 p., 29 figs., 11 photos.

Hendrickson, G. E., and Doonan, C. J., 1966, Ground-water resources of Dickinson County, Michigan: Michigan Geol. Survey Water Inv. 5, 49 p., 5 figs., 3 pls.

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 Geol. Survey Water Information Series Rept. 1, 66 p., 64 figs.

Michigan Department of Health, 1961, Data on public water supplies in Michigan: Michigan Dept. Health Eng. Bull. 4, 57 p.

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 Geol. Survey Pub. 48, p. 96-348, 31 figs.

_____, 1969, Geology for land and ground-water development in Wayne County, Michigan: Michigan Geol. Survey Rept. Inv. 3, 25 p., 9 figs., 4 pls.

_____, 1970, Geology for environmental planning in Monroe County, Michigan: Michigan Geol. Survey Rept. Inv. 13, 34 p., 18 figs., 6 pls.

Sinclair, W. C., 1959, Reconnaissance of the ground-water resources of Schoolcraft County, Michigan: Michigan Geol. Survey Prog. Rept. 22, 84 p., 14 figs.

Sinclair, W. C., 1960, Reconnaissance of the ground-water resources of Delta County, Michigan: Michigan Geol. Survey Prog. Rept. 24, 93 p., 13 figs.

Stuart, W. T., 1945, Ground-water resources of the Lansing area, Michigan: Michigan Geol. Survey Prog. Rept. 13, 35 p., 11 figs.

Stuart, W. T., Brown, E. A., and Rhodehamel, E. C., 1954, Ground-water investigations of the Marquette iron-mining district, Michigan: Michigan Geol. Survey Tech. Rept. 3, 92 p., 8 figs.

Stuart, W. T., and Stallman, R. W., 1945, Ground-water resources of the Benton Harbor area, Michigan: Michigan Geol. Survey Prog. Rept. 12, 15 p., 4 figs.

Stuart, W. T., Theis, C. V., and Stanley, G. M., 1948, Ground-water problems in the Iron River district, Michigan: Michigan Geol. Survey Tech. Rept. 2, 59 p., 16 figs.

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 Geol. Survey Pub. 48, p. 1-95, 24 figs., 1 pl.

Twenter, F. R., 1975, Ground water and geology--Southeastern Michigan: U.S. Army Corps of Engineers, Detroit, Michigan, 143 p., 31 figs., 36 tables, 46 refs.

Twenter, F. R., Knutilla, R., L., and Nowlin, J. O., 1976, Water resources of Washtenaw County, Michigan: Washtenaw County Plan. Comm., 143 p., 43 figs., 18 tables, 25 refs.

Vanlier, K. E., 1959, Reconnaissance of the ground-water resources of Luce County, Michigan: Michigan Geol. Survey Prog. Rept. 21, 76 p., 11 figs., 3 pls.

_____, 1962, Summary of ground-water investigations in the Elsie area, Michigan: Michigan Geol. Survey Prog. Rept. 25, 35 p., 7 figs.

_____, 1963a, Ground-water in Alger County, Michigan: Michigan Geol. Survey Water Inv. 1, 55 p., 13 figs.

_____, 1963b, Ground-water in Menominee County, Michigan: Michigan Geol. Survey Water Inv. 2, 42 p., 11 figs.

_____, 1966, Ground-water resources of the Battle Creek area, Michigan: Michigan Geol. Survey Water Inv. 4, 52 p., 19 figs.

_____, 1968, Appendix E of the report on the Grand River Comprehensive Basin Study: U.S. Army Eng. District, Detroit, Michigan, 82 p., 22 figs.

Vanlier, K. E., and Deutsch, Morris, 1958a, Reconnaissance of the ground-water resources of Chippewa County, Michigan: Michigan Geol. Survey Prog. Rept. 17, 56 p., 7 figs., 7 pls.

_____, 1958b, Reconnaissance of the ground-water resources of Mackinac County, Michigan: Michigan Geol. Survey Prog. Rept. 19, 82 p., 8 figs., 6 pls.

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 Rept., 40 p., 23 figs.

Michigan Water Resources Commission Reports

Water Resources of the Clinton River Basin, 1953.

Water resource conditions and uses in the Paw Paw River Basin, 1955 (revised report in 1964).

Water resources conditions and uses in the Flint River Basin, 1956.

_____ in the Huron River Basin, 1957.

_____ in the Tittabawassee River Basin, 1960.

_____ in the Upper Grand River Basin, 1961.

_____ in the Shiawassee River Basin, 1963.

_____ in the Maumee River Basin, 1964.

_____ in the River Raisin Basin, 1965.

_____ in the Au Sable River Basin, 1966.

_____ in the Lower Grand River Basin, 1967 (open file).

Water resources of southeastern Michigan, Feb. 1968.

Water resources of the lower Lake Huron drainage basin, May 1968.

Water quality standards for Michigan intrastate waters, Jan. 1968.

Water quality standards for Michigan waters, Appendix A (interstate and international waters) June 1967.

Water resource uses, present and prospective, and water-quality standards and plan of implementation (revised June 1967) for. . .

Lake Superior and the St. Mary's River,

Lake Huron,

The Menominee and Montreal River basins in Michigan and the other Michigan-Wisconsin interstate boundary waters,

St. Clair River, Lake St. Clair, Detroit River, Lake Erie, and Maumee River basin,

Lake Michigan,

St. Joseph River basin.

Use designation areas for Michigan's Intrastate water quality standards, Mar. 1969.

Twenter, F. R., 1966a, General availability and quality of ground water in the bedrock deposits in Michigan: State Resources Planning Division, Michigan Dept. Commerce and Michigan Water Resources Commission, map (color).

_____, 1966b, General availability of ground water in the glacial deposits in Michigan: State Resources Planning Division, Michigan Dept. Commerce and Michigan Water Resources Commission, map (color).

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