WATER SUPPLY REPORT NUMBER ONE

STATE OF MICHIGAN

DEPARTMENT OF CONSERVATION
GERALD E. EDDY, DIRECTOR

GEOLOGICAL SURVEY DIVISION
WILLIAM L. DAOUST, STATE GEOLOGIST

SUMMARY
OF
GROUND-WATER CONDITIONS
IN
MICHIGAN
1956

BY
P. R. GIROUX
U. S. GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE UNITED STATES
DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY

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INTRODUCTION

This paper is the first of a series of reports of ground-water levels and related hydrologic data covering the State of Michigan to be published by the Department of Conservation. The program of measurement of ground-water levels and collection of other pertinent information in Michigan by the United States Geological Survey is maintained in cooperation with the Michigan Department of Conservation, and the Water Resources Commission of Michigan.

Records and interpretations of water levels and artesian pressures from 1935 through 1955 have been published in the annual series of U. S. Geological Survey Water-Supply Papers entitled "Water levels and artesian pressures in the United States". The following tabulation gives the numbers of those papers containing water-level data for Michigan:

Year	No.	Year	No.	Year	No.
1935	777	1942	944	1949	1156
1936	817	1943	986	1950	1165
1937	840	1944	1016	1951	1191
1938	845	1945	1023	1952	1221
1939	886	1946	1071	1953	1265
1940	906	1947	1096	1954	1321
1941	936	1948	1126	1955	1404

Beginning in 1956, the U. S. Geological Survey discontinued publication of its series of annual reports preparatory to publishing water-level records at five-year intervals. The new Federal series will contain records collected from a basic network of about 50 to 75 observation wells in Michigan that were chosen to reflect general conditions of ground-water trends and storage in the State. Interpretive texts and illustrations were discontinued.

The needs of the State, however, call for a more comprehensive background of ground-water information, and as a result the present report is based on periodic measurements made during 1956 in about 275 observation wells including those in the Federal network. Continuous recording gages were in operation on 18 of the wells. The present report is designed to supplement the new Federal report series, to provide for a continuation of publications of interpretive text and illustrations, and to make basic information concerning ground-water conditions in Michigan readily available to Federal and State agencies, municipalities, industries, well drillers, farmers, and the general public.

Scope of this Report

The present report summarizes ground-water conditions in selected urban areas and in other areas which are deemed representative of general ground-water conditions in the State. Hydrographs showing trends of ground-water level in selected wells are included herein in lieu of tabulations of measurements. These hydrographs show fluctuations in response to climate, pumpage, and other factors. Table 1 gives the location and other pertinent information for observation wells in which water-level measurements were made in 1956 and table 2 gives the extremes of water levels in each observation well.

Open-File Data

Hydrologic data including tabulations of chemical analyses, water level measurements and hydrographs, temperature measurements, well-records, well logs, aquifer-test data, and unpublished reports are retained on file for public inspection. They may be consulted

at the Ground Water Branch office of the U. S. Geological Survey, 407 Capitol Savings and Loan Building, Lansing; or at the Water Resources Section of the Michigan Geological Survey, Mason Building, Lansing. Records for the Northern Peninsula are also on file in the office of the Michigan Geological Survey, State Office Building, Escanaba.

U. S. Geological Survey Water-Supply Papers may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., or consulted at any of the above-listed offices, and in major university and municipal libraries in the State. The Federal survey also publishes monthly a summary statement entitled "Water Resources Review" which evaluates streamflow and ground-water levels in the United States. Those statements, along with spring and annual summaries may be obtained free on application to the Director, U. S. Geological Survey, Washington 25, D. C.

Progress reports of cooperative ground-water investigations covering specific areas of the State are published from time to time by the Michigan Department of Conservation. Those reports also are available for inspection at the offices of the Department and in major university and municipal libraries, and, if not out of print, may be purchased from the Department.

Well-Numbering Systems

The well-numbering system now used in Michigan indicates the location of wells within the rectangular subdivisions of the public lands, with reference to the Michigan meridian and base line

(fig. 1). The first two segments of a well number designate the township and range; the third segment designates both the section and a serial number assigned arbitrarily to each well within the section. Thus, well number 32N 6E 16-1 is well number 1 in section 16, Township 32 North, Range 6 East. In the several small areas of the State where the rectangular subdivisions have not been made, wells are numbered as above by projection of the rectangular subdivisions to those areas.

The system outlined above supersedes the well-numbering system formerly used. In that system, wells were numbered according to the county, city, or township in which they are situated. The first segment of the well number consisted of an upper and a lower-case letter indicating the county in which the well is located. The second segment indicated the city or political township. Upper-case letters were used for cities, villages, or towns. An upper-case letter followed by a lower-case letter was used for the township designation. Numbers formerly assigned to each well are listed in table 1.

Acknowledgements

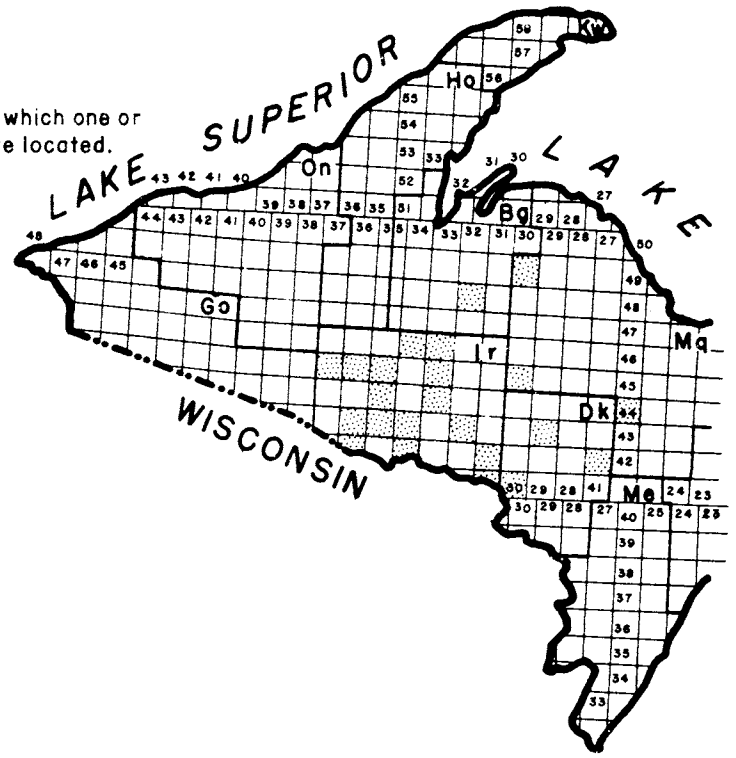
Cooperative ground-water investigations by the U. S. Geological Survey in Michigan are directed jointly by A. N. Sayre, Chief of the Ground Water Branch, U. S. Geological Survey, Washington, D. C., and W. L. Daoust, State Geologist, Michigan Department of Conservation, Lansing, and are under the direct supervision of Morris Deutsch, Acting District Geologist, Lansing.

Special thanks are given to Messrs. J. G. Rulison, Chief, Water Resources Section, Lansing, and A. E. Slaughter, Geologist,

EXPLANATION

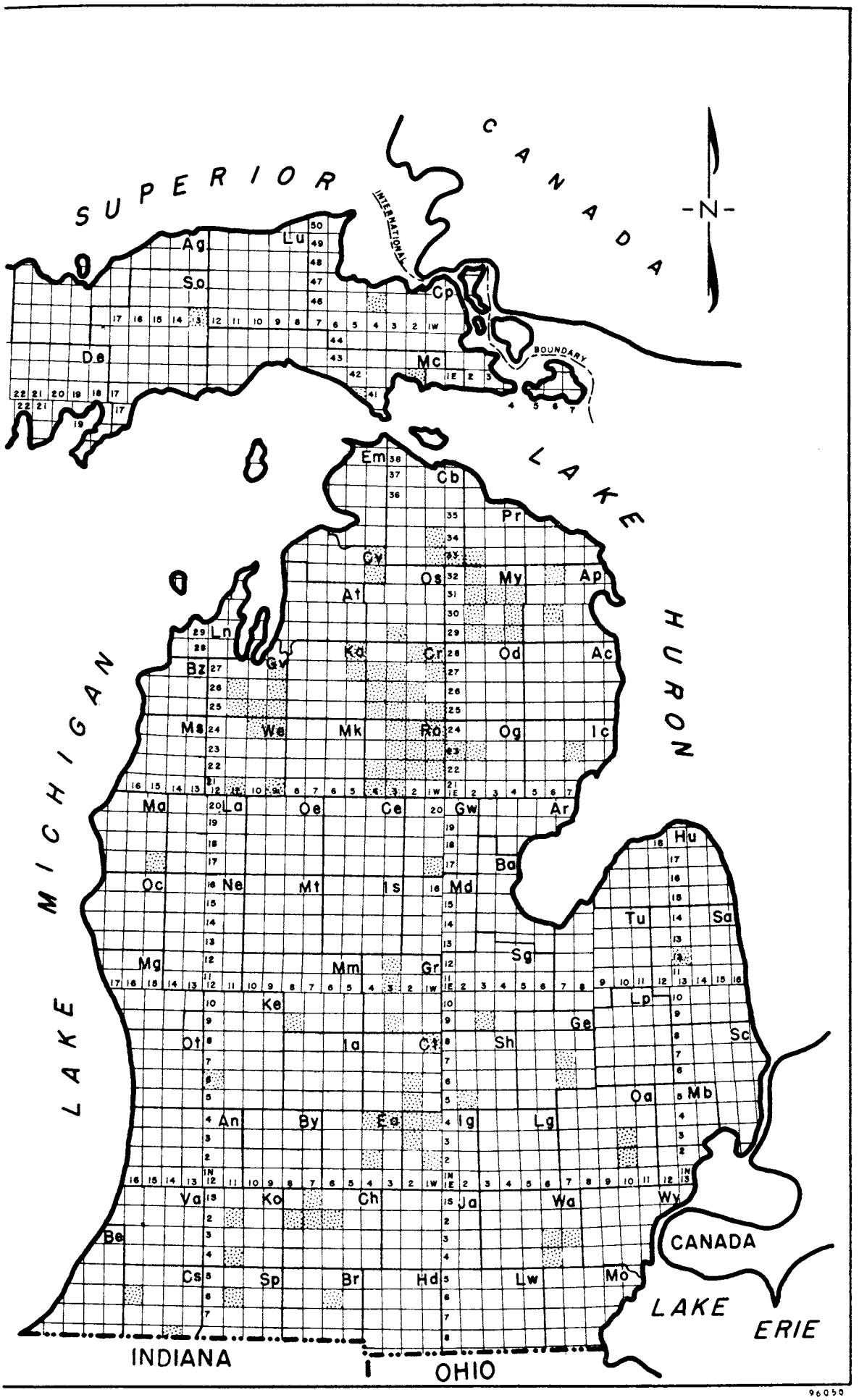
Geographical townships in which one or more observation wells are located.

0 10 25 50 Miles



INDEX TO COUNTIES

Ac – Alcona
Ag – Alger
An – Allegan
Ap – Alpena
At – Antrim
Ar – Arenac
Bg – Baraga
By – Barry
Ba – Bay
Bz – Benzie
Be – Berrien
Br – Branch
Ch – Calhoun
Cs – Cass
Cv – Charlevoix
Cb – Cheboygan
Cp – Chippewa
Ce – Clare
Ct – Clinton
Cr – Crawford
De – Delta
Dk – Dickinson
Ea – Eaton
Em – Emmet
Ge – Genesee
Gw – Gladwin
Go – Gogebic
Gv – Grand Traverse
Gr – Gratiot
Hd – Hillsdale
Ho – Houghton
Hu – Huron
Ig – Ingham
Ia – Ionia
Ic – Iosco
Ir – Iron
Is – Isabella
Ja – Jackson
Ko – Kalamazoo
Ka – Kalkaska
Ke – Kent
Kw – Keweenaw
La – Lake
Lp – Lapeer
Ln – Leelanau
Lw – Lenawee
Lg – Livingston
Lu – Luce
Mc – Mackinac
Mb – Macomb
Ms – Manistee
Mq – Marquette
Ma – Mason
Mt – Mecosta
Me – Menominee
Md – Midland
Mk – Missaukee
Mo – Monroe
Mm – Montcalm
My – Montmorency
Mg – Muskegon
Ne – Newaygo
Oa – Oakland
Oc – Oceana
Og – Ogemaw
On – Ontonagon
Oe – Osceola
Od – Oscoda
Os – Otsego
Ot – Ottawa
Pr – Presque Isle
Ro – Roscommon
Sg – Saginaw
Sa – Sanilac
So – Schoolcraft
Sh – Shiawassee
Sc – St. Clair
Sp – St. Joseph
Tu – Tuscola
Va – Van Buren
Wa – Washtenaw
Wy – Wayne
We – Wexford



96050

Figure 1.--Location of observation wells in Michigan, 1956.

Escanaba, both of the Michigan Geological Survey, who helped in the planning of this report. Appreciation is extended also to personnel of the Federal and State agencies, and of various industrial concerns and municipalities who serve as volunteer water-level observers.

PRECIPITATION AND TEMPERATURE

Precipitation in 1956 ranged from 63 percent of the long-term mean at Paw Paw to 119 percent at Flint. The southeast and east-central part of the Southern Peninsula received more than the usual precipitation, whereas small to large deficiencies were recorded in the remainder of the State. Deficiencies were large in the southwestern part of the Southern Peninsula.

Precipitation was comparatively light during the winter, but unseasonably cool, wet weather followed in the spring and early summer months. During late August rainfall was below normal, and in September and October was reported to be the lightest on record at many locations. Precipitation continued to be below average for the remainder of the year, except during November in the northern part of the State.

Temperatures for the year were near or somewhat below the long-term averages.

Precipitation and temperature figures in this report are based on averages compiled by the U. S. Weather Bureau. The Weather Bureau's figures for the cities of Lansing and Sault Ste. Marie are based on a normal for the period 1921 to 1950.

PUMPAGE

Trends of ground-water withdrawal in selected urban areas are discussed under the appropriate county headings, and in addition, some of the pumpage figures are graphically depicted with appropriate water-level hydrographs for the last decade of record. Cool, wet weather during the spring and summer months resulted in increased recharge, decreased evapotranspiration losses, and reduced ground-water withdrawals for sprinkling, air conditioning, and other warm weather uses. Restrictions on lawn sprinkling were few and occurred only where facilities were inadequate for peak demands.

PRINCIPLES OF OCCURRENCE OF GROUND WATER

The source of the ground water of Michigan is precipitation. The average annual precipitation over the State is about 30 inches. However, much of this water is lost by evaporation, by transpiration, and by surface runoff before it can enter the ground-water reservoirs.

The amount of precipitation which becomes ground water is influenced by a number of factors: the duration, intensity, and type of precipitation; the density and types of vegetation; the topography; and the porosity and permeability of the soil, subsoil, and underlying rock formations in the areas receiving precipitation.

A water-bearing bed that yields water in usable quantities is termed an aquifer. On the basis of water occurrence, aquifers may be classified as water table or artesian. In a water-table aquifer, ground water is unconfined and the upper surface of the

saturated zone is termed the water table. In an artesian aquifer, ground water is confined under pressure between relatively impermeable strata (strata through which water does not move readily). The water in a tightly cased well finished in an artesian aquifer will rise above the bottom of that bed, and, if under sufficient pressure, will flow at or above land surface.

INTERPRETATIONS OF WATER-LEVEL FLUCTUATIONS

Climatic Influences

Water levels in the State fluctuate with seasonal changes in the rate of recharge to, and discharge from, the aquifers. During the spring thaw, water levels in wells normally rise in response to the infiltration of rain and melting snow. Summer temperatures cause an increase in evapotranspiration resulting in declines in water levels. Rainfall during the growing season generally has slight effect on the rate of decline as vegetation tends to utilize most of the available moisture. Water from rains of high intensity and short duration tend to run off to surface streams. In the fall, after freezing temperatures end the growing season and transpiration ceases, precipitation may cause rises in water levels. However, the usual summer decline in stage may be continued by a deficiency of precipitation or by an early general freeze which tends to impede infiltration.

Fluctuations Due to Discharge from Wells

Generally, ground water is a renewable natural resource as it is intermittently or continually being replaced directly or

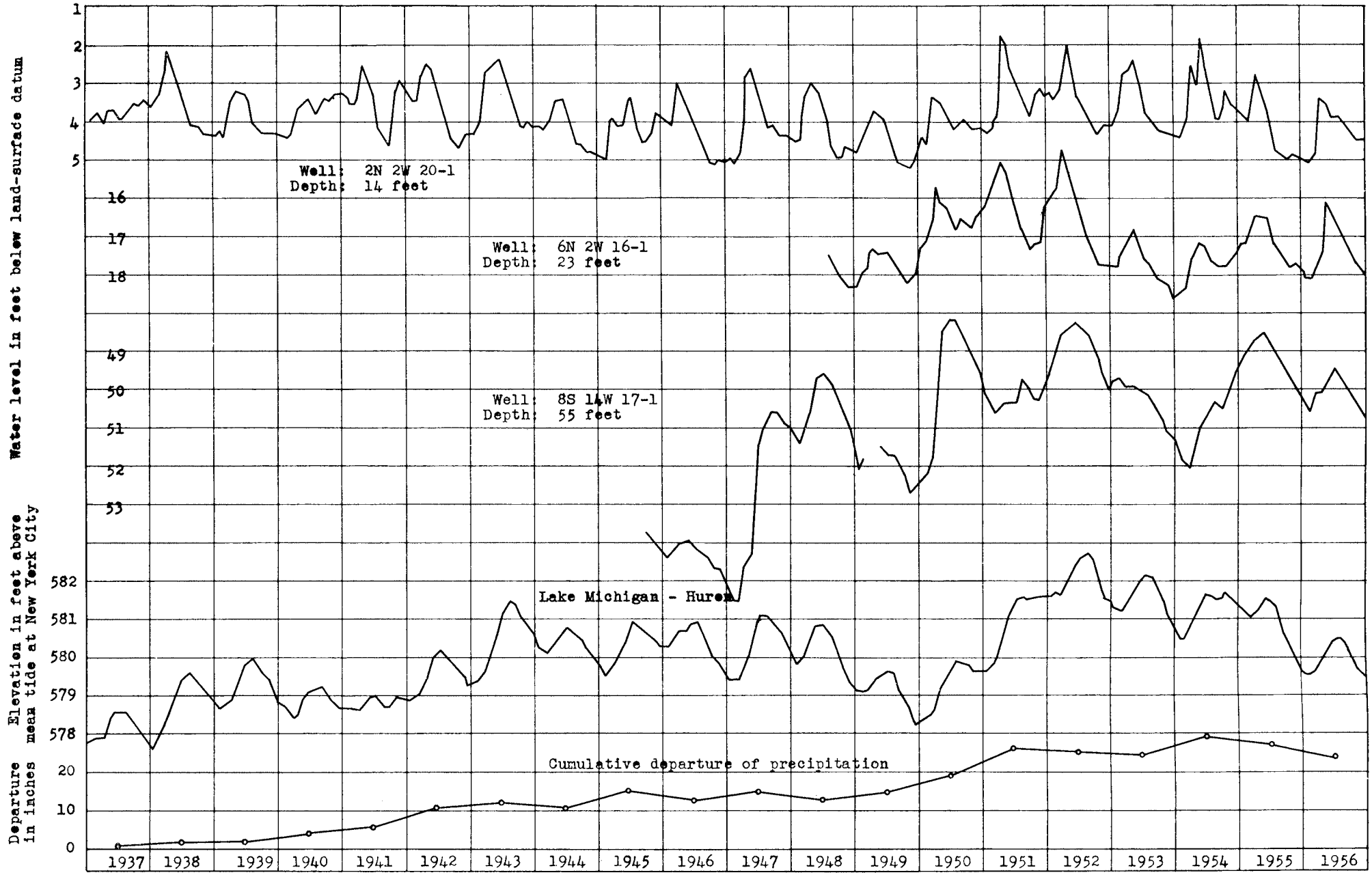


Figure 2.--Hydrographs of selected water-table observation wells tapping the glacial drift, levels of Lakes Michigan and Huron, and cumulative departure of precipitation from the statewide long-term mean, 1937-1956.

indirectly by precipitation. If an aquifer is to be developed by means of wells so that a long-term yield can be obtained without substantially dewatering the aquifer, then equilibrium must exist between the rate of recharge to the aquifer and the rate of discharge from the aquifer. Any aquifer in its natural state (before it is tapped by wells) is in approximate dynamic equilibrium. When water is discharged from an aquifer by means of a well, an increase results, at least temporarily, in the rate of total discharge from the aquifer. Pumping causes a cone-shaped depression in the water table or piezometric surface that expands with time around the discharging well. With continued discharge, the cone of depression will continue to expand until the resultant lowering of water levels causes a decrease in discharge from the aquifer, or an increase in recharge to the aquifer, or a combination of both, which restores the aquifer to a state of equilibrium.

Wells within the cone of depression are affected by the lowering of water levels or artesian pressures. Thus, a well tapping an aquifer may be affected by the discharge of other wells that tap the same aquifer. In the case of several or many discharging wells, a composite cone of depression results, that may extend over a large area. The result of the lowering of water levels over a large area may cause a considerable increase in the rate of recharge to, or a considerable decrease in the rate of natural discharge from, the aquifer. A lowering of the water level, therefore, is necessary in the utilization of a ground-water reservoir or aquifer.

Figure 2 shows water levels in selected observation wells tapping the glacial drift in Roscommon, Clinton, and Cass Counties,

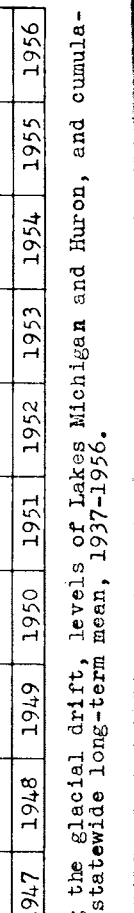


Figure 2.--Hydrographs of selected water-table observation wells tapping the glacial drift, levels of Lakes Michigan and Huron, and cumulative departure of precipitation from the statewide long-term mean, 1937-1956.

the cumulative departure from normal precipitation, and the Lake Michigan-Huron levels for the period 1937 to 1956, inclusive. As shown by the illustration considerable correlation exists between these water-table wells, annual precipitation, and lake levels.

Monthly Statements of Conditions

Following are general statements of ground-water conditions in the State for each month of the year. The statements are based, for the most part, on ground-water levels which fluctuate in response to natural conditions of recharge, storage, and discharge.

January.--Seasonal declines of ground-water levels continued throughout most of the State. Stages generally were well below average and in the Thumb area reached a new low for the period of record.

February.--In the southern third of the State, recharge from snowmelt during the latter part of the month was indicated by a rise of stage in ground-water reservoirs of shallow depth. However, in aquifers where the depth to water is appreciable, declines in stage were generally prevalent, and a significant proportion of the wells reached the lowest stage of the past 5 to 10 years of record.

In the northern two-thirds of the State, cold weather limited recharge opportunity and most observation wells showed declines in stage. Although February stages were considerably below average in most of this northerly area, the water levels in surficial aquifers of the western part of the Northern Peninsula remained at stages above the average of the past decade.

March.--In the Southern Peninsula the recent trend of low ground-water levels continued, resulting in record and near-record lows for March. Although above-average temperatures and heavy precipi-

tation early in the month caused ground-water stages to rise somewhat, the principal result was high surface runoff rather than substantial recharge to the ground. Low temperatures during the latter part of the month effectively impeded early spring recharge.

Seasonal declines continued in the Northern Peninsula as winter conditions prevailed. Ground-water levels were above average in the western half of the Peninsula and below average in the eastern half.

April.--Seasonal rises of ground-water levels were observed in the drift aquifers of the Northern Peninsula and in those of the northern half of the Southern Peninsula. In the southern half of the Southern Peninsula, ground-water levels remained low throughout most of the month, but rose sharply in shallow drift aquifers after several days of intense precipitation at the close of the month. However, month-end stages in most wells throughout the State were below average for the period of record.

May.--In the southern half of the Southern Peninsula, ground-water levels in most wells rose sharply in response to intense precipitation during the first two weeks of the month. The highest stages since 1952 were observed in wells tapping the surficial sands and gravels. Although average to below-average levels persisted in the deeper drift and rock aquifers, the levels generally rose toward the end of the month. Elsewhere, precipitation was deficient and water levels were below average, except in the western half of the Northern Peninsula.

June.--In the western half of the Northern Peninsula, ground-water levels were at average stages, but in the eastern half of the Peninsula stages were below average.

In the northern half of the Southern Peninsula, the water level in the index well at Roscommon declined to a near-record low stage. In the southern half of the Southern Peninsula, water levels declined seasonally. Levels in most shallow wells in the glacial drift were at above-average stages, but levels in deeper wells tapping the rock aquifers remained below average.

July.--In the Northern Peninsula and northern half of the Southern Peninsula, water levels in observation wells rose slightly during the month. Stages in many wells in the southern half of the Southern Peninsula declined somewhat, but the declines were less than usual for the season and resulted in the highest July stages since 1952.

At the end of the month, water levels throughout the state were generally near the average for the period of record.

August.--Seasonal declines of water level in most wells were somewhat less than usual and at the end of the month the levels were at or above the average for the period of record. Local rises in stage were observed in the drift aquifers of the Northern Peninsula and in the shallow drift aquifers of the Southern Peninsula.

September.--In the Southern Peninsula, water levels declined seasonally but remained at average to above-average stages, although precipitation was deficient. For the most part, the effects of the deficiency of precipitation were offset by low temperatures which resulted in reduced evapotranspiration demands.

In the Northern Peninsula, water levels rose in response to moderate rainfall, and at the end of the month the levels were above average for the period of record.

October.--Ground-water levels throughout most of the State declined from the relatively high levels of the summer to about-average stages by the end of October. Locally, in the western half of the Northern Peninsula and in the southwestern part of the Southern Peninsula, water levels were above average despite seasonal declines. Although the weather was unusually dry and warm, the declines of ground-water level were moderate because evapotranspiration losses were rather small since the growing season was effectively halted by the killing frosts of September.

November.--Ground-water levels continued to decline in most areas of the State. Notwithstanding the appreciable deficiency of precipitation over the past several months, stages in ground-water reservoirs are, in general, only slightly below average in the Southern Peninsula and at or above average in the Northern Peninsula.

December.--In the Southern Peninsula at the close of the year, ground-water levels generally were at or only slightly below average stages of the past decade despite the considerable deficiency of precipitation during the latter half of the year. The high stages of last Spring coupled with a short growing season sustained ground-water reservoirs through the recent drought period.

In the Northern Peninsula, ground-water stages remained above average through the end of the year.

Northern Peninsula

Western Half

Menominee River Basin.--Most observation wells in this basin are finished at shallow depth in glacial sand and gravel

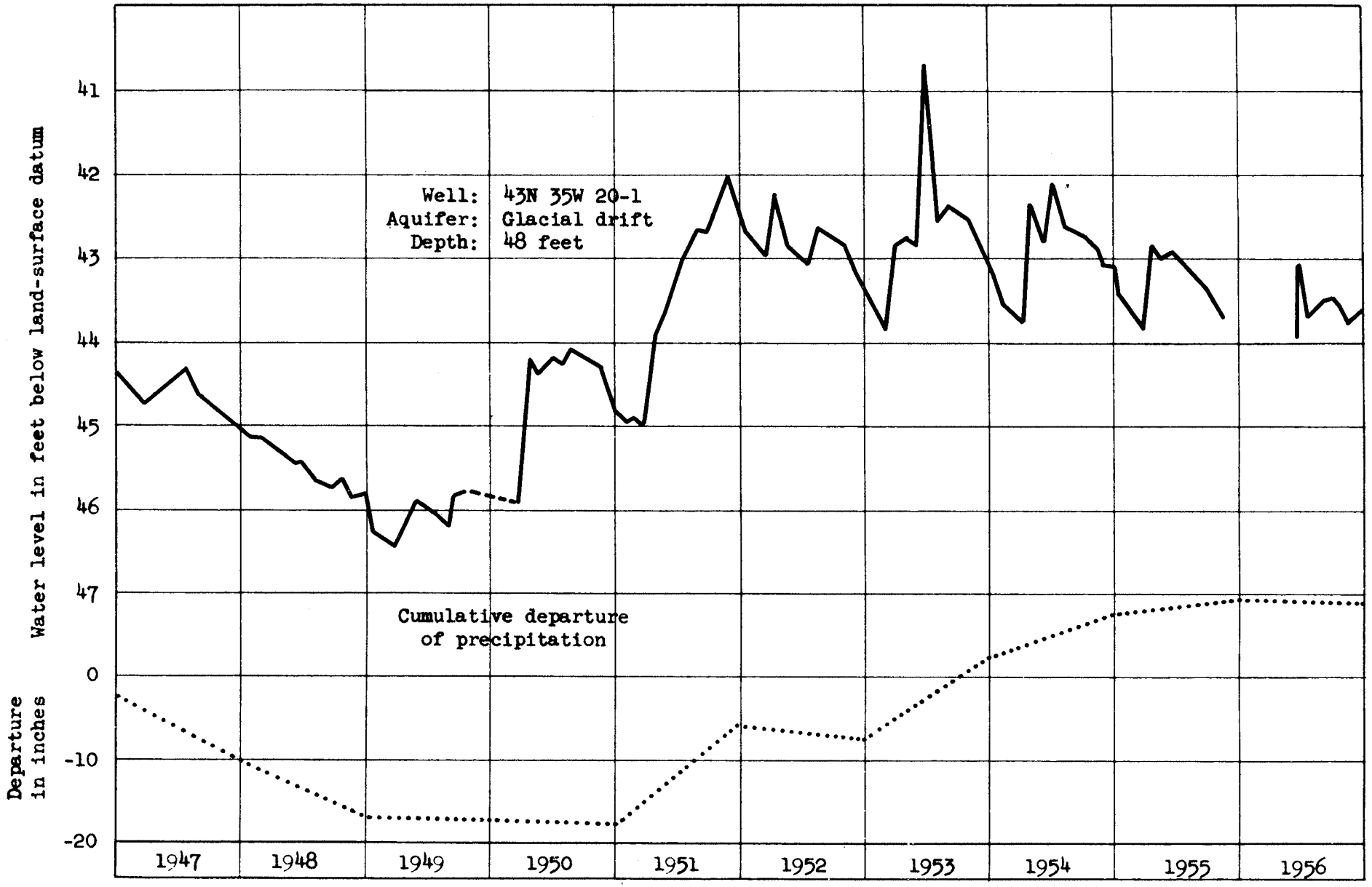


Figure 3.--Hydrograph of well 43N 35W 20-1 near Iron River, and cumulative departure of precipitation from long-term mean at Stambaugh, 1947-1956.

deposits of Pleistocene age. The water levels are a reflection of natural storage.

Seasonal winter declines of water levels continued until April when sharp rises from infiltration of snowmelt and rainfall were observed. The decline in water levels which normally occurs during the growing season was tempered by recharge derived from above-average precipitation in the May to August period, and as a result, summer levels were above average. The early fall months were dry, but some rainfall and snowmelt was recharged to the aquifers during November. At the end of the year, levels were about average and a foot higher than at the end of 1955.

Figure 3 shows the hydrograph of well 43N 35W 20-1, and the cumulative departure of precipitation from the long-term mean. This well is used as an index of trends of water level for the area.

Figure 3.--Hydrograph of well 43N 35W 20-1 near Iron River, and cumulative departure of precipitation from long-term mean at Stambaugh, 1947-1956.

Northern Peninsula

Eastern Half

Chippewa County.--Well 46N 4W 24-1, Near Raco, is finished in glacial drift. The decline in water levels which began in May 1955 continued until April 1956 as a result of deficient precipitation (fig. 4). The subsequent rise that continued until mid-August was the result of spring thaws and above-average precipitation during the late spring and most of the summer. The decline which followed continued to the end of the year and was due to deficient precipitation in October and to normal seasonal influences in November and December.

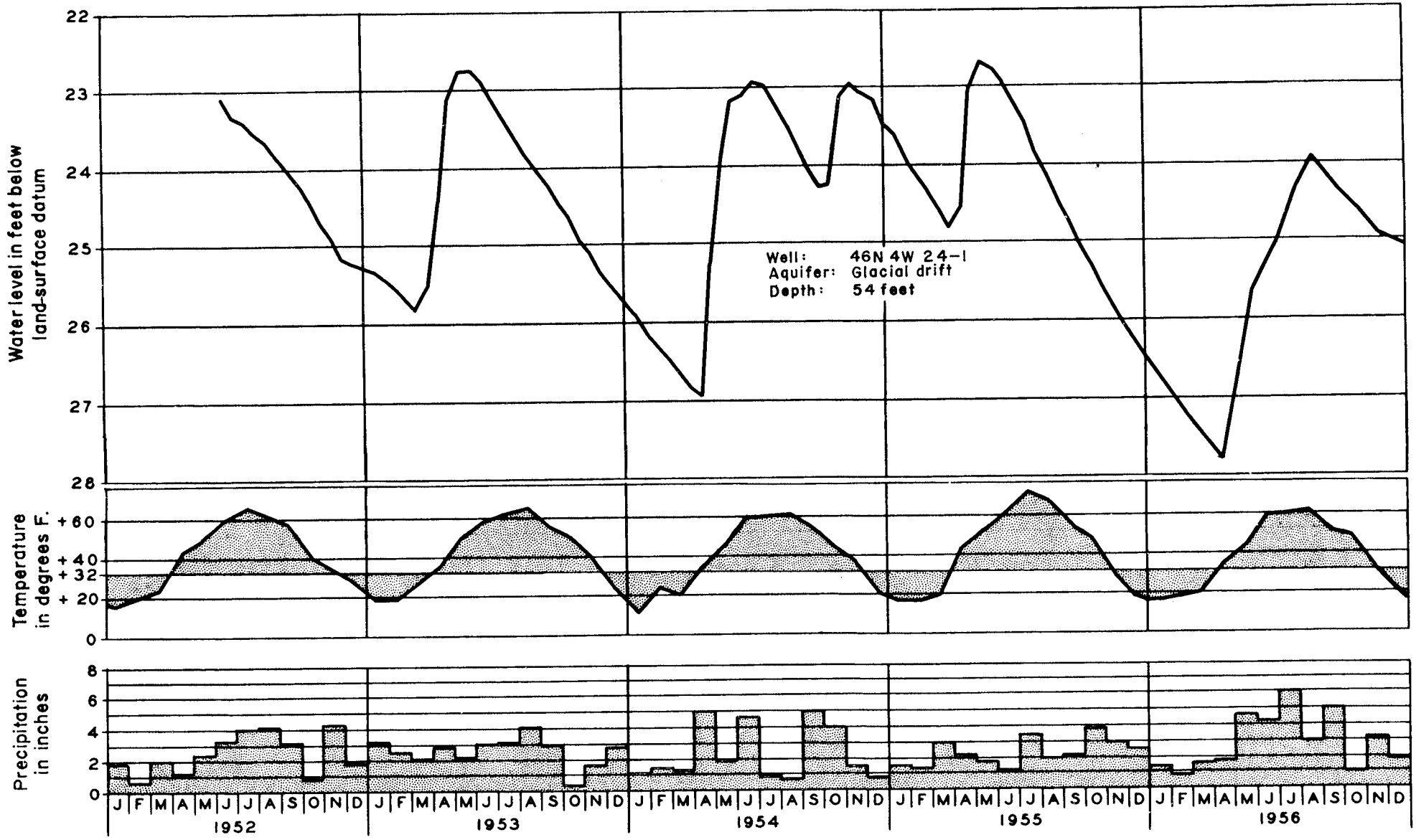


Figure 4.--Hydrograph of well 46N 4W 24-1 near Raco and graphs of temperature and precipitation recorded at Sault Ste. Marie, 1952-1956.

Figure 4.--Hydrograph of well 46N 4W 24-1 near Raco and graphs of temperature and precipitation recorded at Sault Ste. Marie, 1952-1956.

Mackinac County.--Observations in two wells (42N 2W 7-1 and 41N 5W 23-1) in Mackinac County were begun in 1956. Although the periods of record for these wells are short, it is believed that the water levels fluctuate principally in response to climatic conditions.

Observations were begun in June, 1956 in well 42N 2W 7-1 which taps the Engadine formation of Silurian age. The water level in the well rose sharply in response to heavy rains in late June and early July. Much of the precipitation during this period entered the ground-water reservoir, as the soil moisture and plant requirements had been supplied by snowmelt and earlier spring rains. Locally solution openings along joint fractures in the Engadine formation provide direct avenues for movement of water to the aquifer. Precipitation during later summer months was of insufficient quantity to materially affect the water level in the well. Fall rains following the end of the growing season caused a slight rise in the water level. The advent of cold weather and precipitation in the form of snow impeded recharge and a seasonal decline continued to the end of the year.

Schoolcraft County.--Well 45N 13W 16-1, near Germfask, is finished in shales and limestones of Richmond age (Ordovician). Water levels in the observation well reflect changes in artesian pressure of the water in the limestone strata in the upper part of the rocks of Richmond age. Snowmelt and rainfall in the spring caused a rise in early April (fig. 5). Cool, wet weather during the summer months resulted in less than the usual seasonal declines of previous years. Water levels declined during late summer and fall, and rose from October to December, and the year-end stage was higher than at the end of 1955.

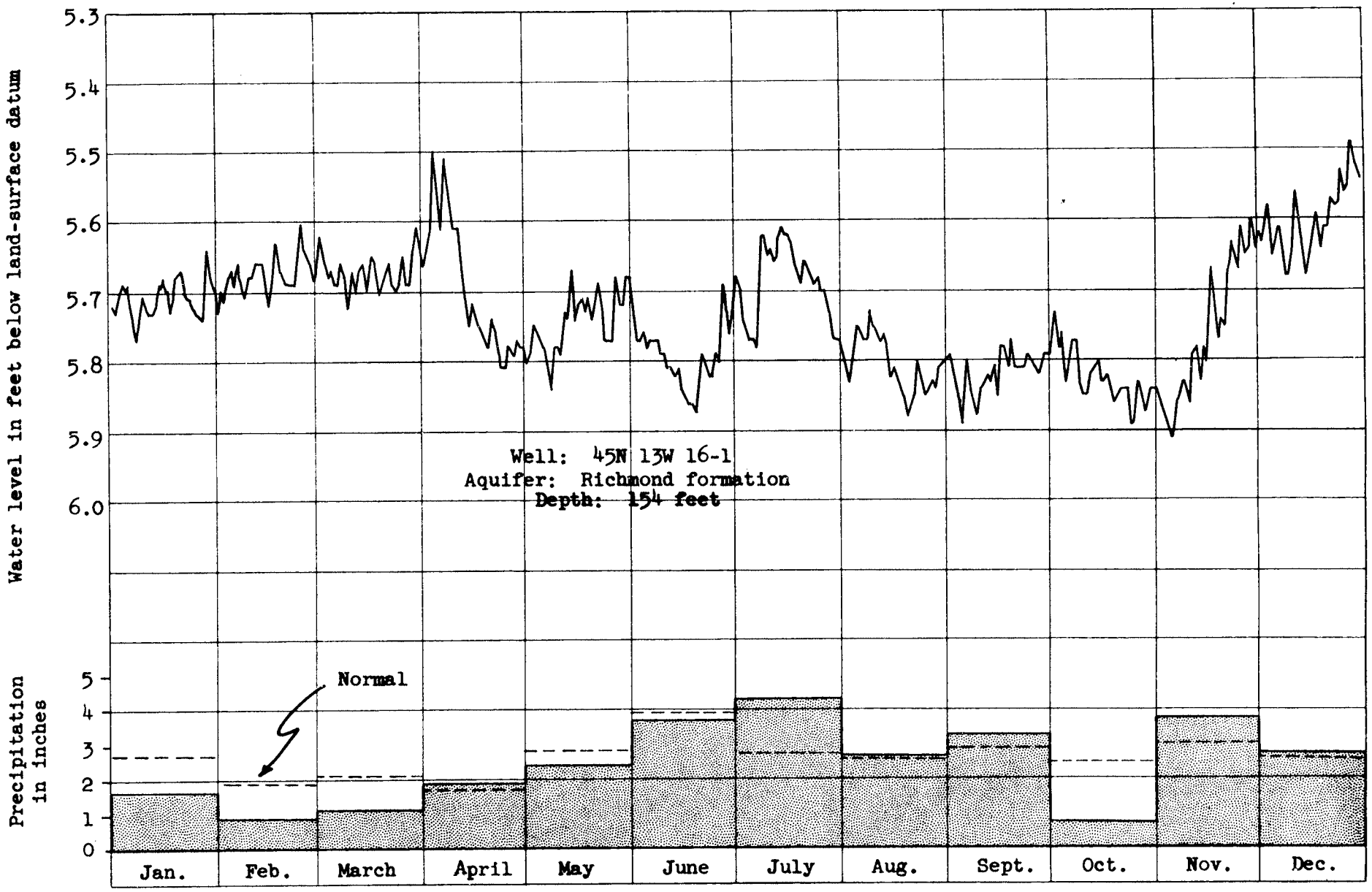


Figure 5.--Hydrograph of well 45N 13W 16-1 near Germfask, and total monthly precipitation at Germfask, 1956.

Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec.

Figure 5.--Hydrograph of well 45N 13W 16-1 near Germfask, and total monthly precipitation at Germfask, 1956.

Southern Peninsula

Northern Half

Well 24N 2W 20-1, near Roscommon, is used as an index of trends of ground-water level in the shallow drift aquifers in the northern half of the Southern Peninsula. Figure 6 is a graph of the daily water level for this index well, of precipitation, and of maximum and minimum temperatures at the Grayling Military Reservation for 1956. A decline in water level that began in July 1955, continued during the early part of the year. By the end of February, the water level in this well was only slightly above the lowest recorded for the past 22 years. Snowmelt in March induced a slight rise in stage. The water level rose sharply in April but the spring high water-level reading was below average. The seasonal decline which followed was gradual but levels were well below average for June. In August the water level rose above average for the first time since September 1955 in response to more than 13 inches of rain which fell in July and August. Relatively dry weather in September and October precluded the usual fall recharge to the aquifer and by the end of the year levels were about 0.3 foot below average but about 0.5 foot above the level recorded at the end of 1955.

Elsewhere in the northern half of the Southern Peninsula record and near-record low water levels were observed locally during the year (see table 2).

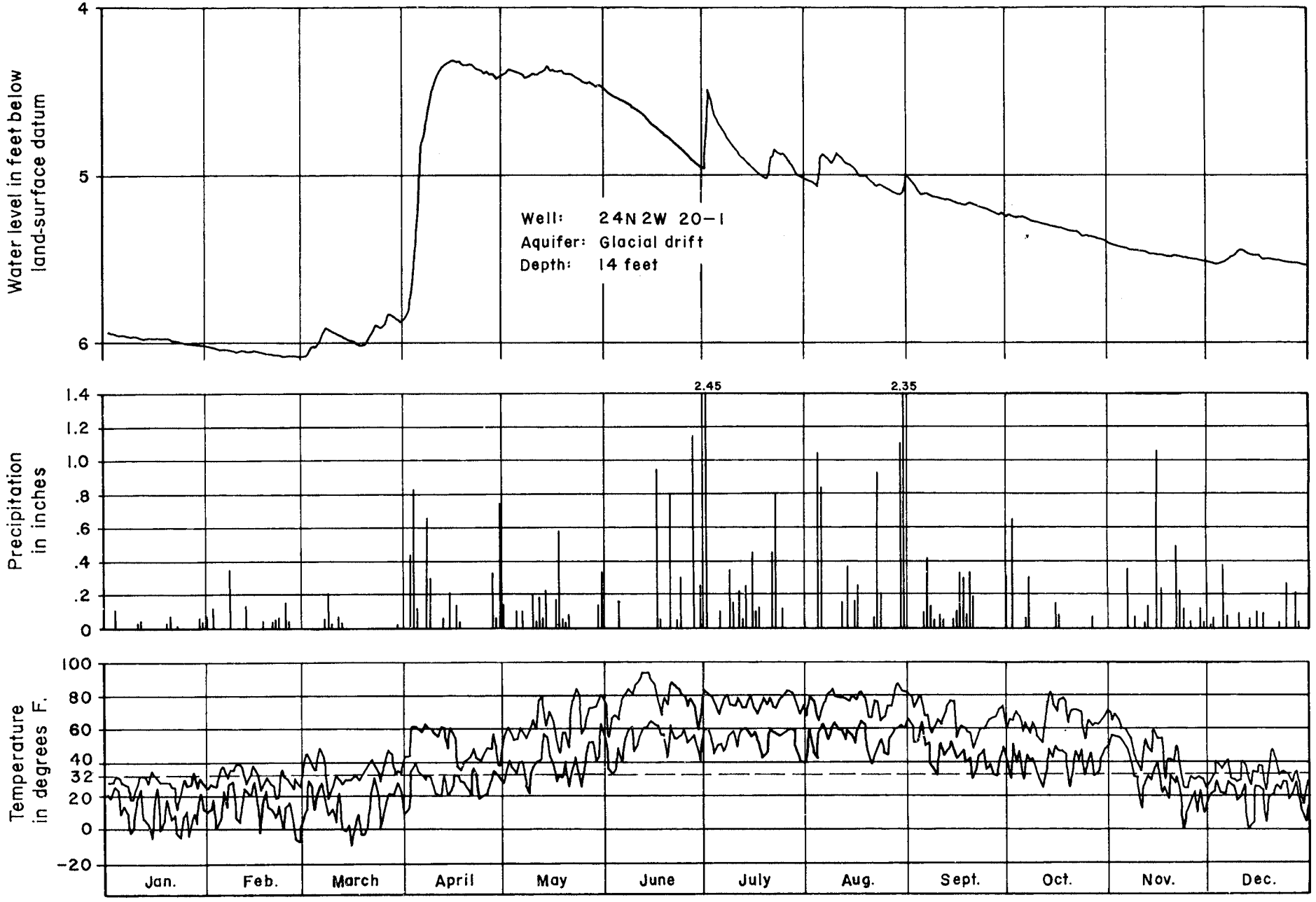


Figure 6.--Hydrograph of well 24N 2W 20-1 near Roscommon, daily precipitation, and maximum and minimum temperatures at Grayling Military Reservation, 1956.

Figure 6.--Hydrograph of well 24N 2W 20-1 near Roscommon, daily precipitation, and maximum and minimum temperatures at Grayling Military Reservation, 1956.

Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec.

Southern Peninsula

Southern Half

In the southern half of the Southern Peninsula, seasonal declines and a general trend of low water levels continued from the previous year through March. At the end of April, intense precipitation caused sharp rises of water levels in shallow drift aquifers, and as rainfall continued into early May, most water levels in the shallower aquifers reached the highest stages observed since 1952. June was comparatively warm but July and August were cool and wet, and as a result, the summer seasonal decline was moderate. Very little recharge occurred during the fall months when record-low precipitation was recorded in much of the area. Deficiencies were especially large in the southwestern counties. The water levels declined to stages generally below those of early April, except in the Thumb area and southeastern counties, where the total annual precipitation ranged from 2 to 5 inches above average despite the dry fall weather.

Branch County, City of Coldwater.--Observation well 6S 6W 22-1, in the municipal well field, is finished in glacial drift. The water level is affected by withdrawals of ground water from municipal wells tapping the drift deposits. As shown on the hydrograph (fig. 7), spring rains caused the water level to rise several feet. A seasonal decline that began in late May was due to the normal increase of municipal pumping during the summer months. Owing to deficient precipitation in the fall and winter, this decline continued through the end of the year. A total of less than 1 inch of rain fell in September and October. In addition to precluding recharge to the aquifer, the dryness resulted in increased demands for water for lawn

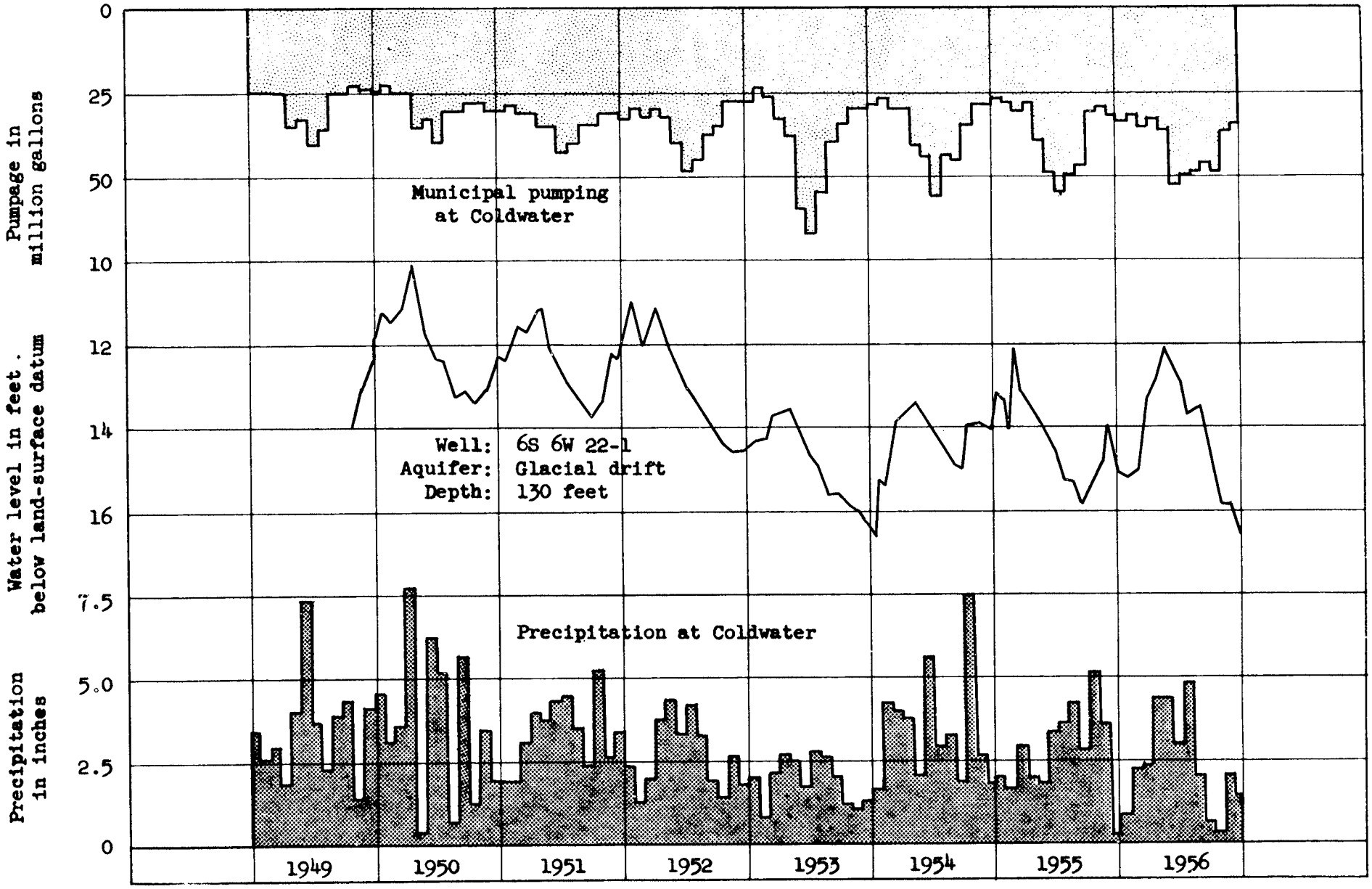


Figure 7.--Hydrograph of well 6S 6W 22-1, monthly precipitation, and pumpage at Coldwater, 1949-1956.

and garden sprinkling and other uses. Municipal withdrawal of ground water totaled 457 million gallons for the year, the highest since 1953, and reflected the abnormally high demands during the fall months.

Calhoun County, Battle Creek area.--Most observation wells and municipal and industrial wells in the Battle Creek area obtain water from the Marshall sandstone of Mississippian age, but a few are finished in the overlying glacial drift.

Water levels rose in response to decreased pumping and spring rains and in some wells reached the highest stages observed since 1950. The normal summer seasonal decline which followed continued through the end of the year as the dry fall precluded appreciable recharge. Precipitation was more than 8 inches below average for the last 5 months of the year and a total rainfall of only 0.7 inch was reported for September and October. Record and near-record lows were observed in some wells. Year-end water levels averaged about 0.7 foot below those observed at the end of 1955.

Municipal pumpage from the Marshall sandstone by the City of Battle Creek in June and September of 1956 were the largest of record for those months, and the yearly total of 2,498 million gallons was surpassed only in 1953 and 1955. The township of Battle Creek pumped about 318 million gallons during the year. In addition to municipal pumpage in the area, large withdrawals of ground water are made by industry.

Figure 8 is a hydrograph of observation well 2S 8W 2-1 for the 1947 to 1956 period. This hydrograph is based on the water level records obtained from a continuous water-stage recorder on a

Figure 7.--Hydrograph of well 6S 6W 22-1, monthly precipitation, and pumpage at Coldwater, 1949-1956.

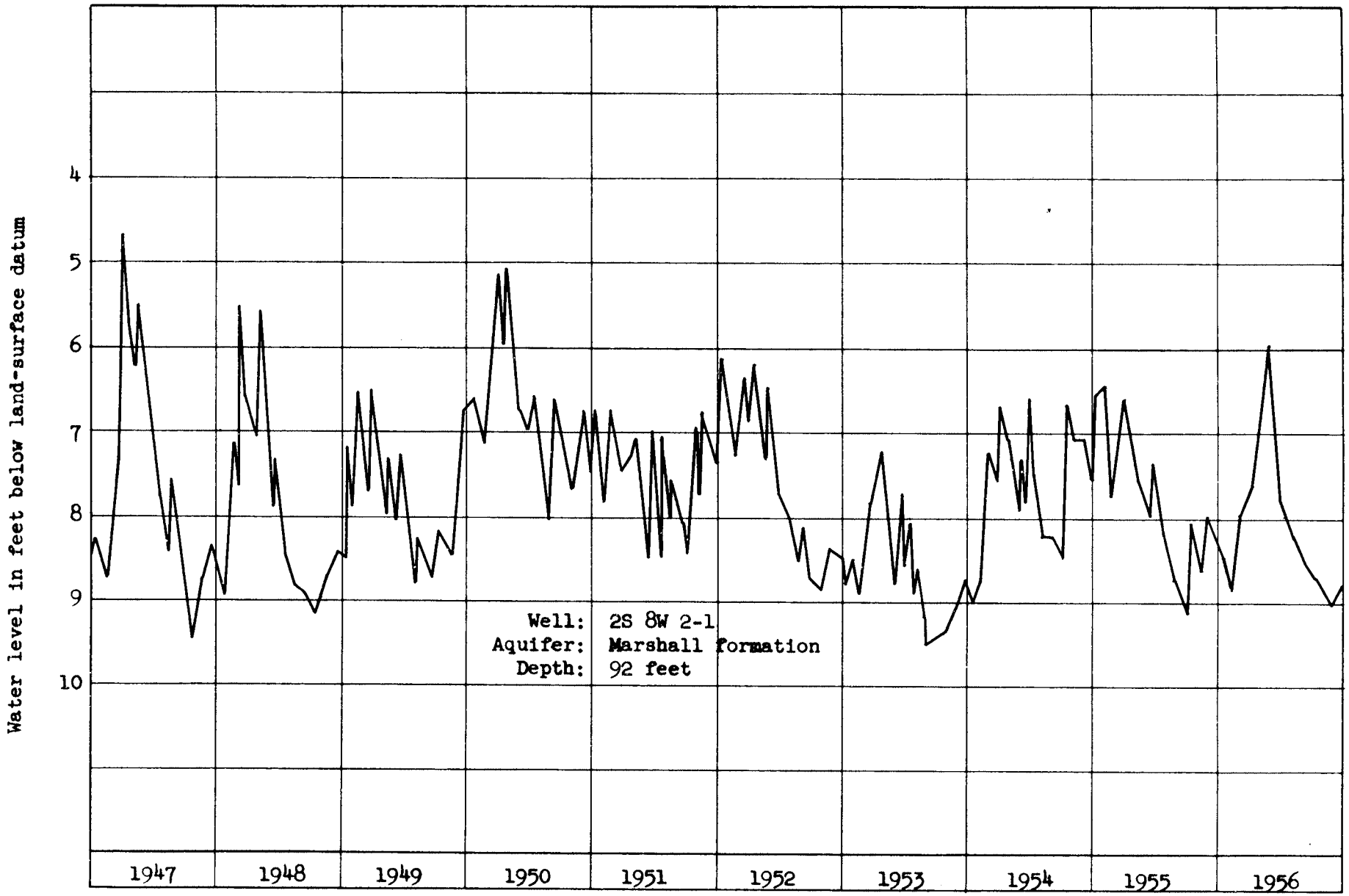


Figure 8.--Hydrograph of well 2S 8W 2-1 at Battle Creek, 1947-1956.

8

Figure 8.--Hydrograph of well 2S 8W 2-1 at Battle Creek, 1947-1956.

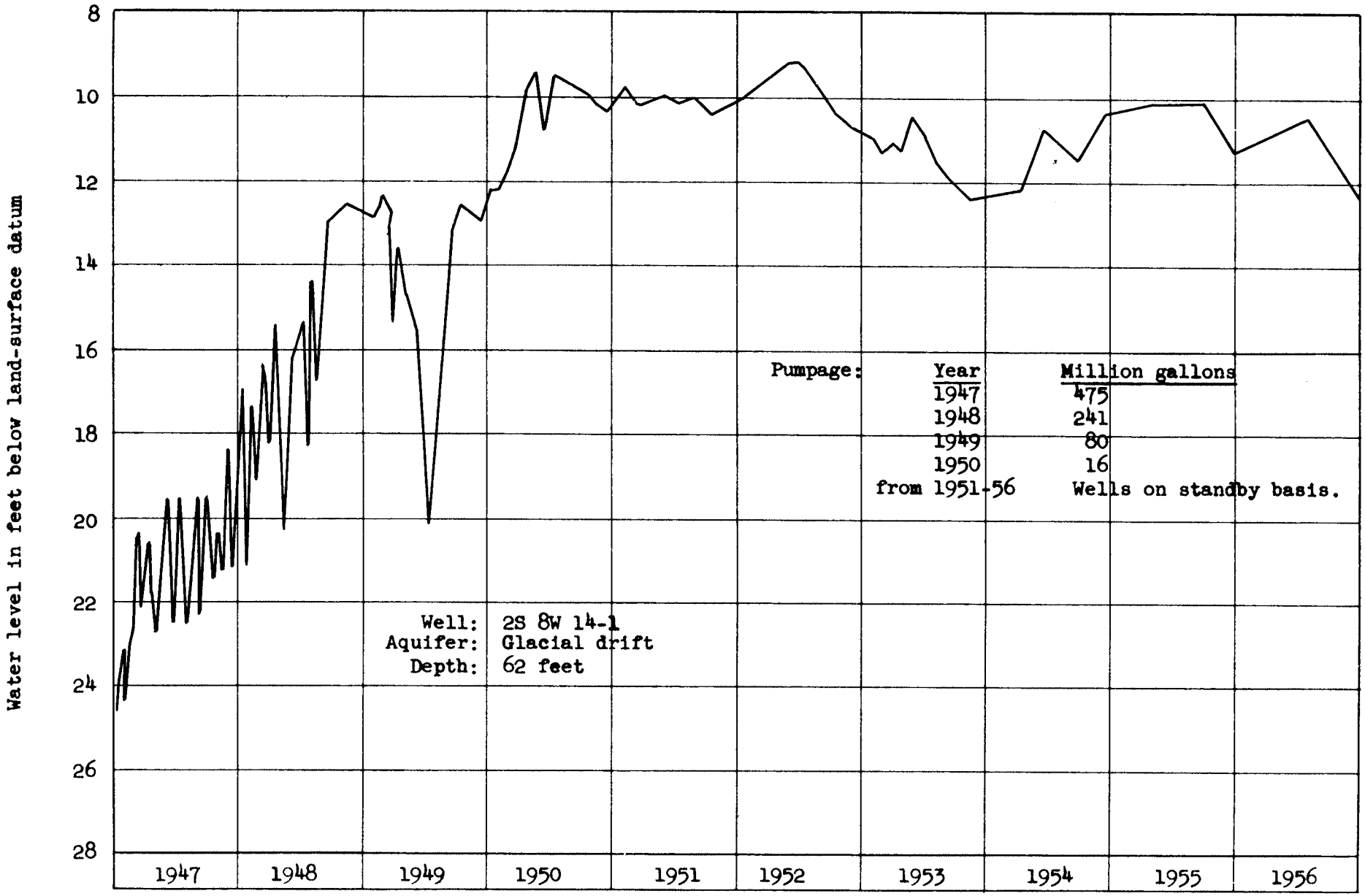


Figure 9.--Hydrograph of well 2S 8W 14-1 showing effects of gradual discontinuance of municipal pumping from the drift at Goguac well field by the City of Battle Creek, 1947-1956.

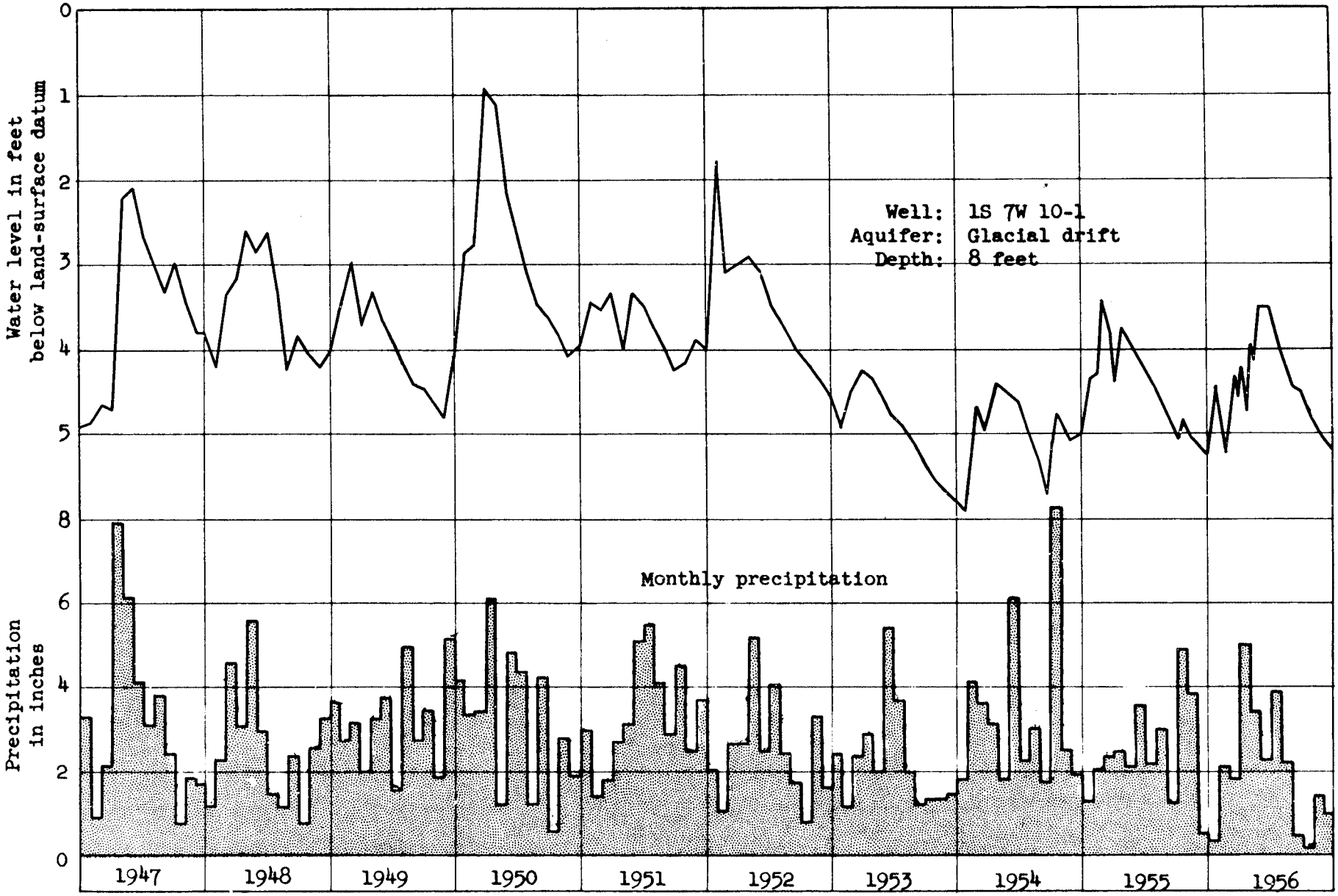


Figure 10.--Hydrograph of well 1S 7W 10-1 near Battle Creek, and monthly precipitation at Battle Creek, 1947-1956.

well finished in the Marshall sandstone. The water level is affected by municipal and industrial pumping from the Marshall sandstone. Figure 9 is a hydrograph of observation well 2S 8W 14-1 for the 1947 to 1956 period. The well is finished in glacial drift. This hydrograph illustrates the effect of the gradual abandonment of the Goguac municipal well field by the City of Battle Creek. The Goguac well field now is on a standby basis.

Figure 10 is a hydrograph of observation well 1S 7W 10-1, near Battle Creek and a graph of total monthly precipitation. The well is finished at shallow depth in surficial drift deposits. This hydrograph is used as an index of water levels in the shallow, unconfined glacial aquifers in the area.

Cass County, City of Dowagiac.--The observation well 6S 16W 1-1, in Dowagiac, is finished in sand and gravel of Pleistocene age and is affected by nearby municipal wells tapping the same aquifer.

As indicated on figure 11, the water level is influenced by precipitation and pumping. The low water levels observed in mid-1953 resulted from a combination of heavy municipal withdrawals and deficiencies in precipitation. Levels at the end of 1956 were lower than those of the past few years and reflected the dry weather during the latter part of the year. Municipal pumpage of ground water in 1956 was about 645,000 gallons per day, the lowest pumpage of the 1950 to 1956 period. Municipal pumping has been curtailed since 1954 when a local industry discontinued use of city water.

Clinton County, Village of Elsie.--In Elsie, water levels in observation wells 8N 1W 13-1 and 13-3 are influenced by municipal pumping from the Saginaw formation and from the glacial drift,

Figure 10.--Hydrograph of well 1S 7W 10-1 near Battle Creek, and monthly precipitation at Battle Creek, 1947-1956.

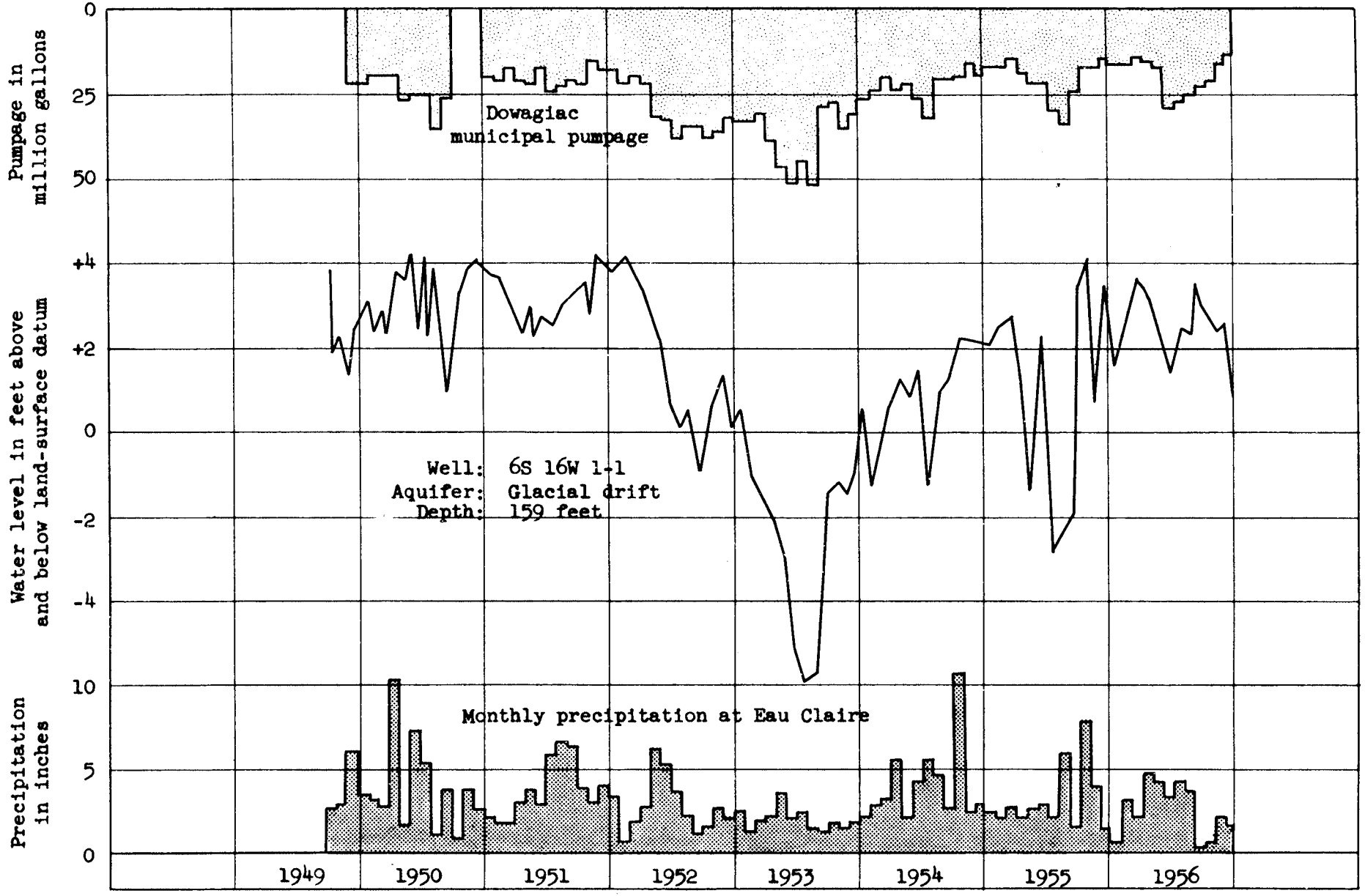


Figure 11. Hydrograph of well 6S 16W 1-1, monthly pumpage at Dowagiac and precipitation at Eau Claire, 1949-1956.

Figure 11. Hydrograph of well 6S 16W 1-1, monthly pumpage at Dowagiac and precipitation at Eau Claire, 1949-1956.

respectively. Based on quarterly observations the water levels during much of 1956 were several feet higher than in 1955.

Water levels in other wells in southern Clinton County are discussed in the section headed Ingham County, Lansing metropolitan area.

Eaton County, City of Charlotte.--Observation well 2N 4W 19-1 and all municipal wells are at Waterworks Park in Charlotte and are finished in the glacial drift. A deficiency of precipitation of more than 8 inches, most of which occurred during the fall months, sharply curtailed the usual fall recharge to the aquifer and as a result, the year-end level was about 1 foot lower than that observed at the end of 1955 and only 0.3 foot above the lowest level observed at the end of 1947.

City of Grand Ledge.--Observation well 4N 4W 2-1 in Grand Ledge is finished in the Saginaw formation of Pennsylvanian age, as are the municipal wells. In 1956 water levels rose sharply from February until May when the highest levels since May, 1952, were reached. This resulted from more than 10 inches of precipitation and decreased municipal pumping during the winter months (fig. 12). Although levels declined from May to December, levels at the end of 1956 were slightly higher than those at the end of 1955. Owing to a comparatively cool summer, municipal withdrawals of ground water totaled 165 million gallons in 1956 as compared to 176 million gallons in 1955.

Water levels in other wells in northeast Eaton County are included under the Ingham County, Lansing metropolitan area heading.

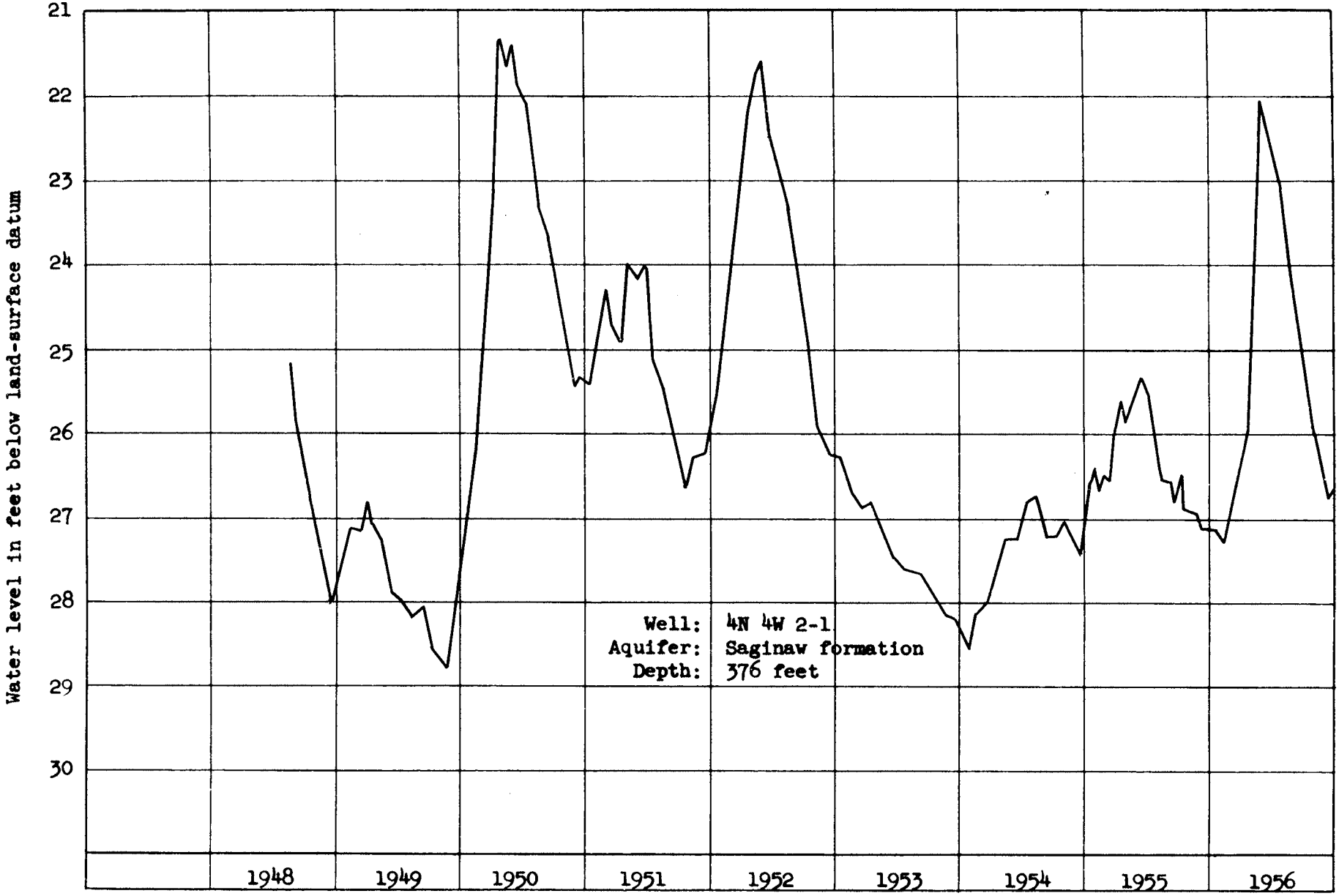


Figure 12.--Hydrograph of well 4N 4W 2-1 at Grand Ledge, 1948-1956.

Figure 12.--Hydrograph of well 4W 4W 2-1 at Grand Ledge, 1948-1956.

Genesee County, Flint metropolitan area.--The City of Flint obtains its water supply from the Flint River. However, Burton Township to the south, the Beecher Metropolitan Water District to the north, and many industries obtain water from the Saginaw formation. Observation wells in the Flint area are finished in the Saginaw formation, deep glacial drift deposits, and a few in the shallow drift aquifers. The water levels in the Saginaw formation were more than 1 foot higher at the end of 1956 than at the end of 1955 and approximately 4 feet below the high of record in the spring of 1950 (fig. 13). In the artesian drift aquifer (fig. 13) the water level in the spring of 1956 was the highest since 1953 and the year-end level was higher than at the end of 1955. In the water-table aquifers, levels were higher throughout 1956 than they were in 1955. These increases in stage from 1955 to 1956 were due primarily to above-average precipitation. A general trend of declining water levels is in evidence for the period 1950 to 1955. The correlation between the two wells shown on figure 13 indicates that the two aquifers are connected hydraulically. Municipal withdrawals of ground water by Burton Township and the Beecher Metropolitan Water District totaled 294 million gallons for the year 1956.

Gratiot County, City of Alma.--Observation wells in the Alma area are finished in the surficial drift deposits or in the buried outwash aquifers. Municipal and industrial wells tap the buried outwash. One deep municipal well taps the Saginaw formation. Artesian pressures in the buried outwash are affected by municipal and industrial pumpage whereas the water level in the surficial drift primarily reflects climatic conditions (fig. 14).

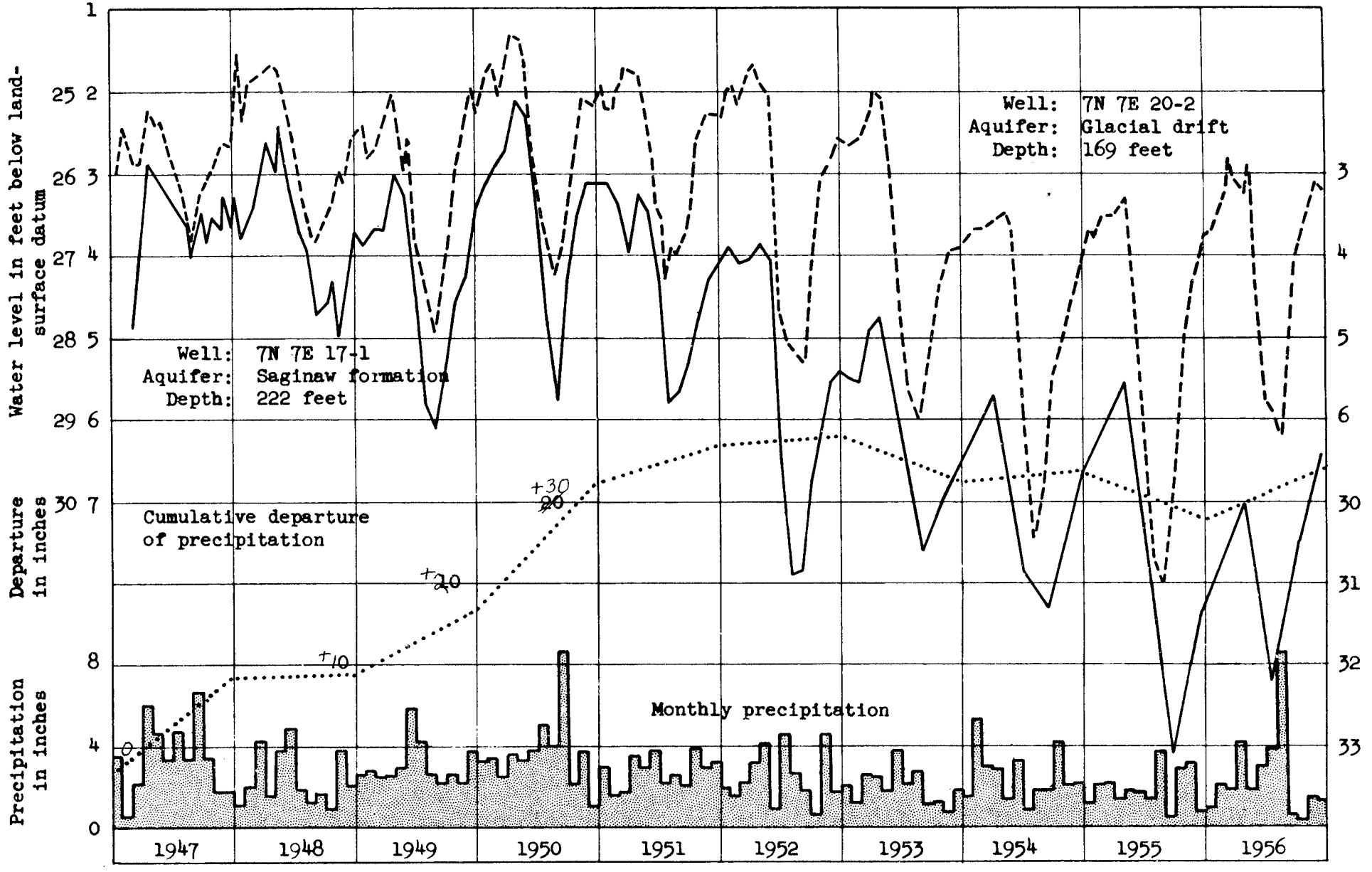


Figure 13.--Hydrographs of wells 7N 7E 20-2 and 17-1, monthly precipitation, and cumulative departure of precipitation from long-term mean, at Flint, 1947-1956.

precipitation from long-term mean, at Alma, 1947-1956.

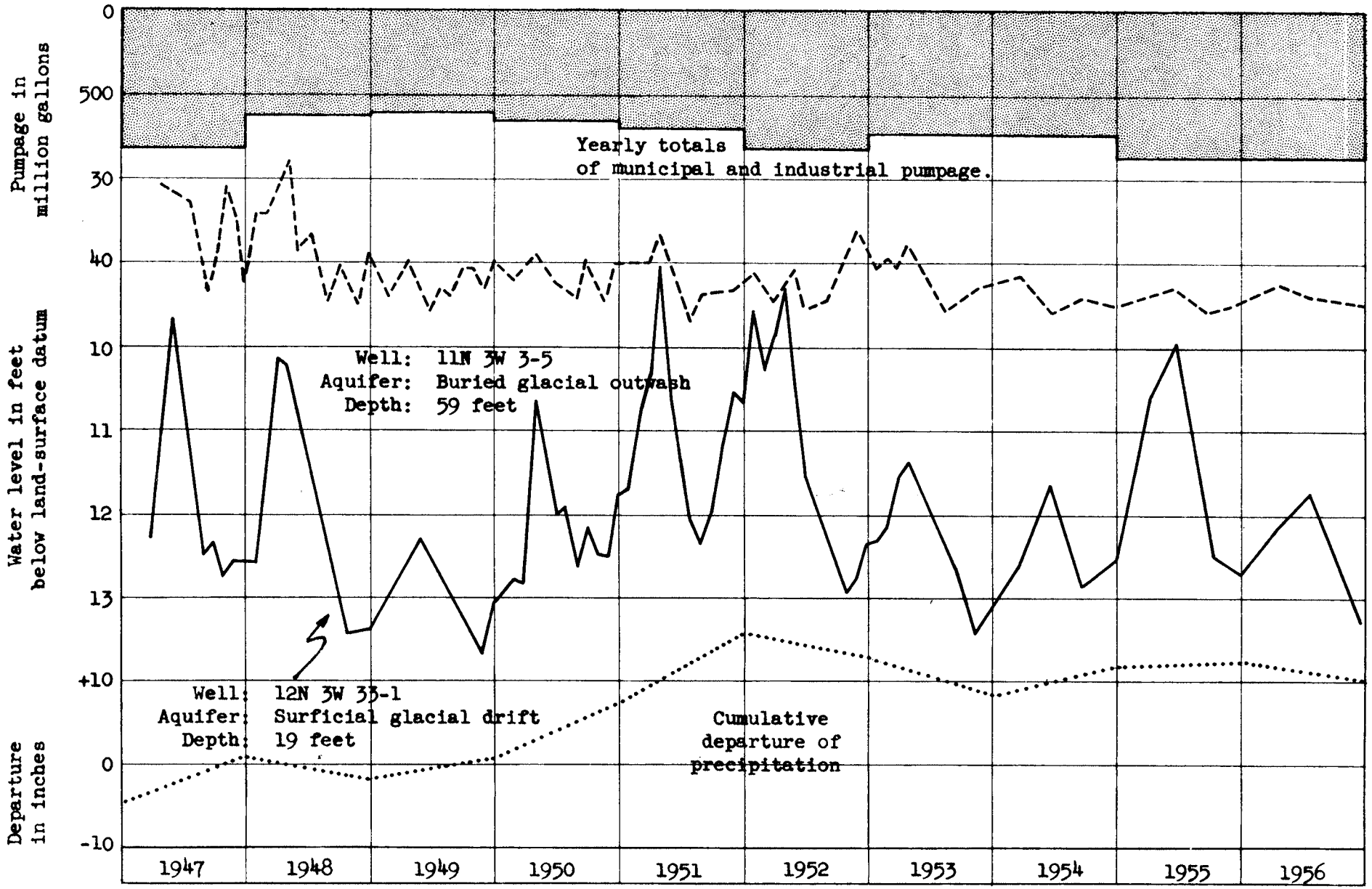


Figure 14.--Hydrographs of wells 11N 3W 3-5 and 12N 3W 33-1, monthly pumpage, and cumulative departure of precipitation from long-term mean, at Alma, 1947-1956.

Figure 15.--Hydrographs of wells 7N 7E 20-2 and 17-1, monthly precipitation, and cumulative departure of precipitation from long-term mean, at Flint, 1947-1956.

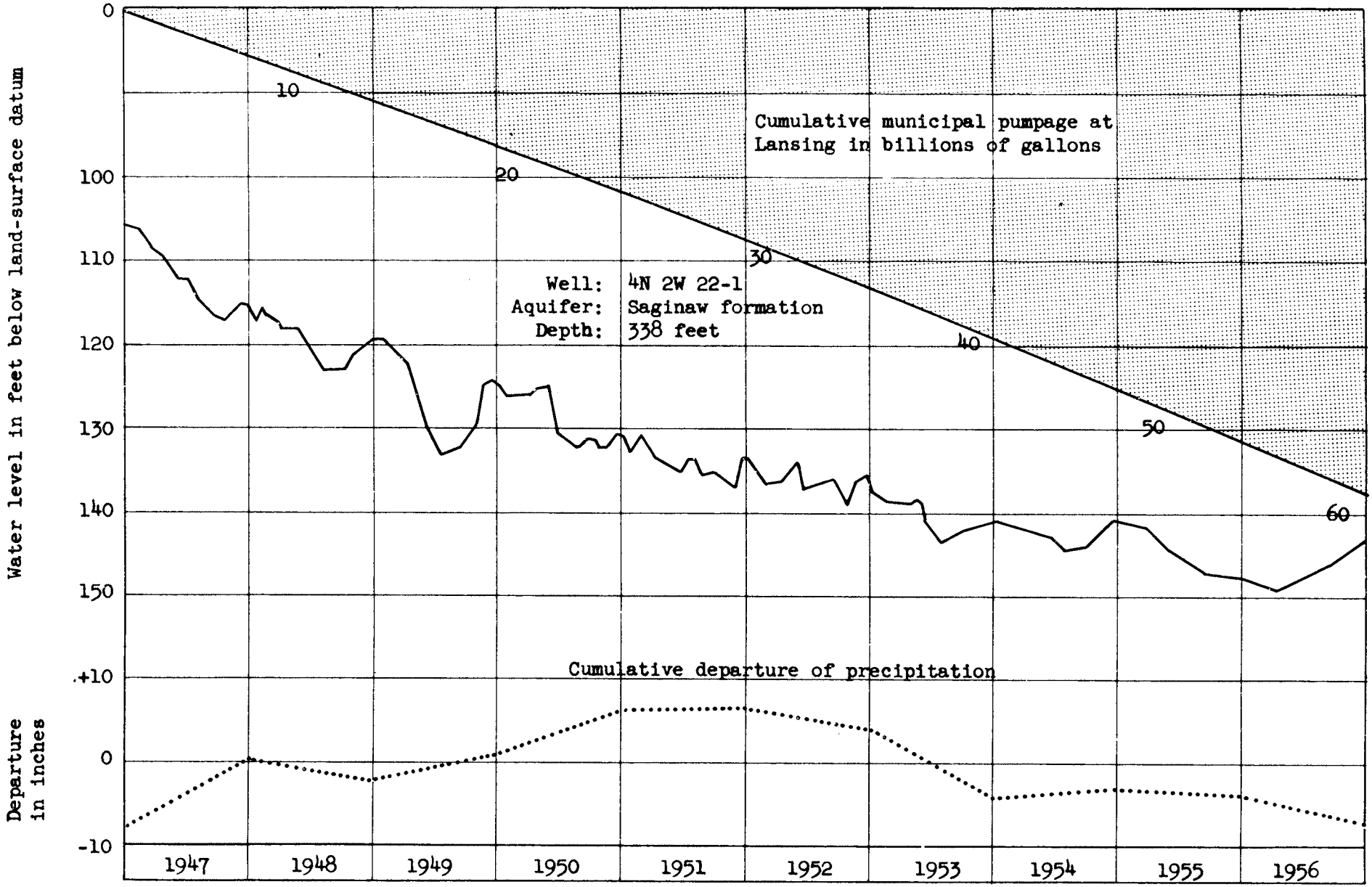


Figure 15.--Hydrograph of well 4N 2W 22-1, cumulative pumpage, and cumulative departure of precipitation from long-term mean, at Lansing, 1947-1956.

A deficiency of about 5 inches in precipitation during the period September to December precluded substantial fall recharge and as a result water levels in shallow observation wells at the end of 1956 were from 0.2 to 0.5 foot lower than the levels at the end of 1955 and a few were the lowest of record. The piezometric surface in the deep artesian drift aquifer responded to changes in municipal pumping. Following the installation of two new municipal wells on the west side of Alma, pumping in the center of the city was decreased, and this change in pumping pattern was reflected in higher levels in nearby observation wells (table 2).

Although municipal withdrawals in June and July were considerably lower than in 1955, increased consumption from August through October raised the total pumpage for 1956 to about 660 million gallons, which was slightly more than in 1955.

Ingham County, Lansing metropolitan area.--The Saginaw formation of Pennsylvanian age is the principal source of water for municipal and industrial wells in the area, although a few wells derive small quantities from the overlying glacial drift. The levels in observation wells drilled into the Saginaw formation reflect nearby pumping (fig. 15) as well as general climatic conditions. Generally, water levels in the winter months were near, or at, the lowest stages observed in the past decade. The levels rose sharply in the spring and in many wells reached the highest observed stages since the spring of 1952 (fig. 16). However, the levels declined during the balance of the year. The decline was started by hot weather in June and although the remainder of the summer was relatively cool and wet, a record-dry

Figure 15.--Hydrograph of well 4N 2W 22-1, cumulative pumpage, and cumulative departure of precipitation from long-term mean, at Lansing, 1947-1956.

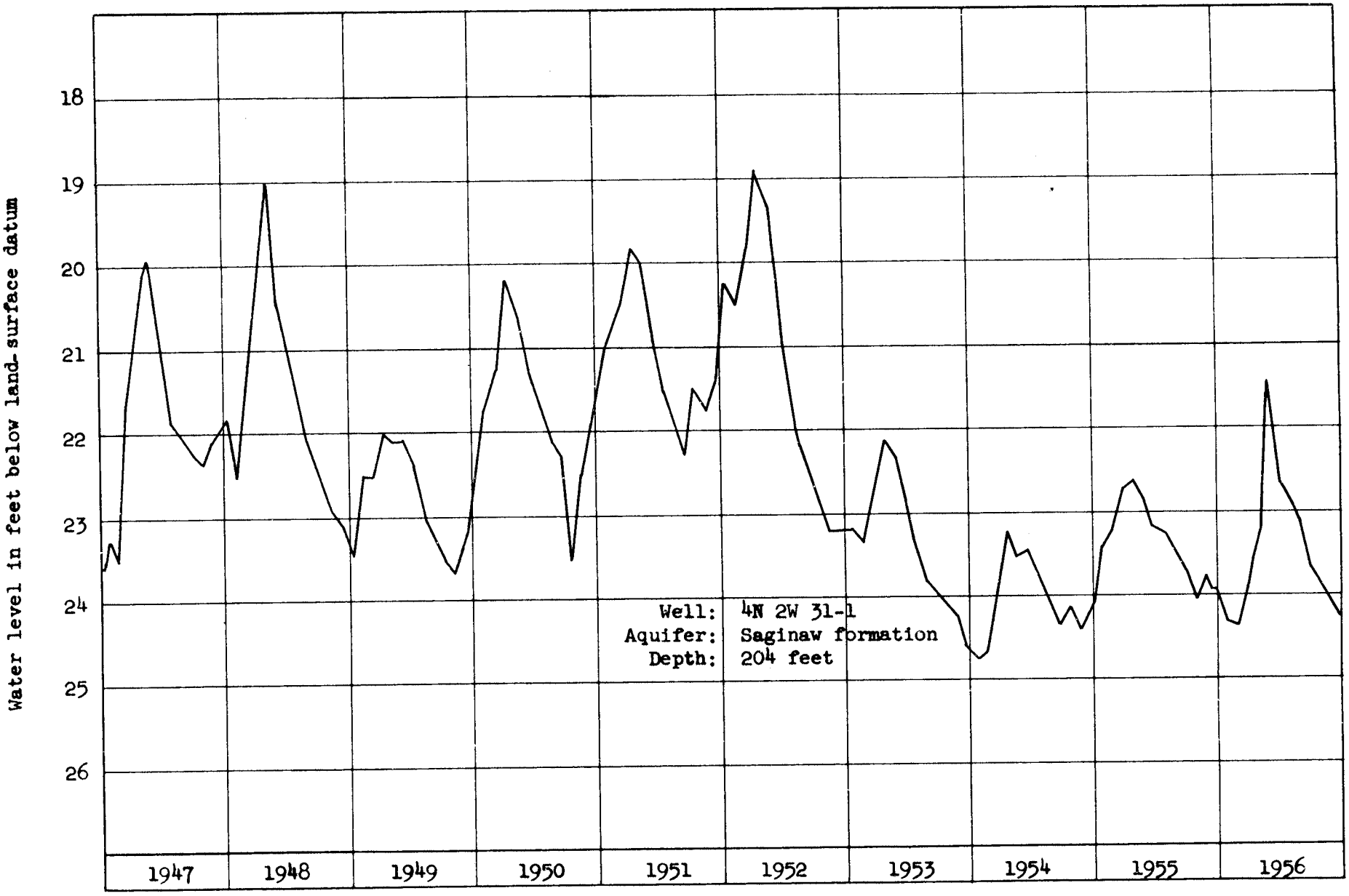


Figure 16.--Hydrograph of well 4N 2W 31-1 near Lansing, 1947-1956.

fall and attendant pumping caused levels to dip sharply and cancelled out earlier gains. End of the year levels were at, or slightly lower than, the stages at the end of 1955.

Changes in pumping pattern by the City of Lansing resulted in several feet of recovery in some wells on the northwest side, while declines were observed in wells located in the south and central portions of the city. The average daily pumpage of ground water for municipal use by Lansing, East Lansing, Lansing Township, Meridian Township, and Michigan State University was about 22.2 million gallons during 1956, and ranged from about 21.4 million gallons for December to about 25.5 million gallons for June. Total municipal pumpage for the year was 8.1 billion gallons.

City of Mason.--Observation well 2N 1W 5-1, in Mason, is finished in the Saginaw formation underlying the glacial drift. The fluctuation in water levels in this well (fig. 17) is due primarily to withdrawals of ground water from the Saginaw formation by local industries. The municipal supply is derived from the glacial drift. Water levels in the observation well rose in response to a wet spring until in mid-May the level was the highest observed since mid-1953. The low stage for the year was reached in mid-July as the result of peak industrial pumping for cooling during the warm summer months. Decreased pumping after the low July stage allowed water levels to recover despite the dry fall weather, and by the end of 1956 levels were nearly 1 foot above those observed at the end of 1955 and higher than any year-end level since 1951. Average municipal pumpage of ground water from the drift in 1956 was 380,000 gallons per day (gpd) or about 30,000 gpd more than in 1955.

Figure 16.--Hydrograph of well 4N 2W 31-1 near Lansing, 1947-1956.

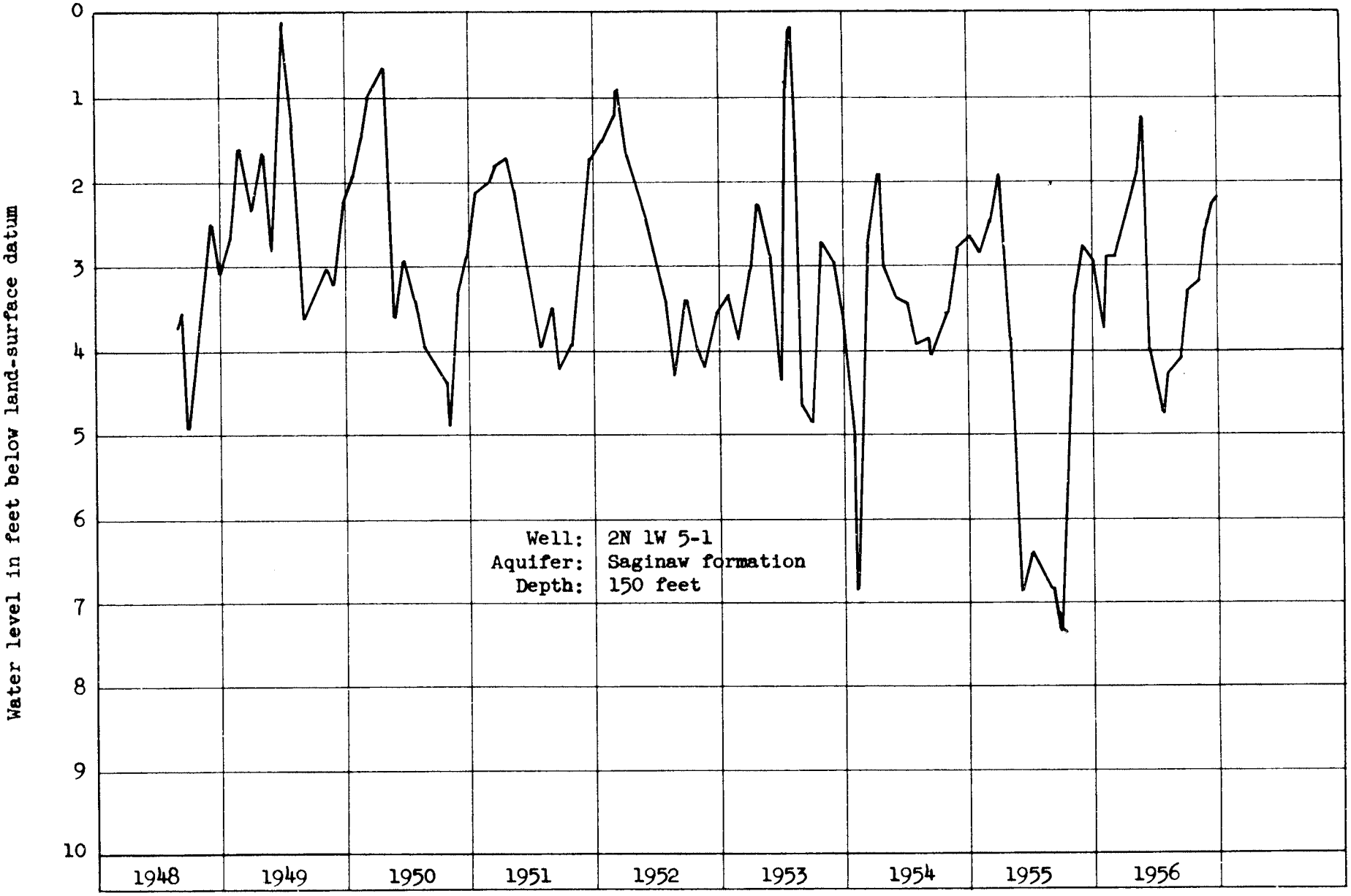


Figure 17.--Hydrograph of well 2N 1W 5-1 at Mason, 1948-1956.

Figure 17.--Hydrograph of well 2N 1W 5-1 at Mason, 1948-1956.

Kalamazoo County, City of Kalamazoo.--All municipal, industrial, and observation wells in the Kalamazoo area are finished in glacial drift. Although precipitation in the winter and spring caused ground-water levels to rise appreciably during the early part of the year, a precipitation deficiency of about 9 inches during August through December cancelled out earlier gains and caused levels to decline sharply (fig. 18). By the end of 1956, the water level in some wells was at or near the lowest levels of the past decade (table 2). Since 1952, ground-water levels have been comparatively low, owing mostly to a cumulative deficiency of more than 25 inches of precipitation from the long-term mean (fig. 18) and to four consecutive years (1952-1955) of above-normal temperatures.

Total municipal pumpage, including Millwood Community, averaged 11.4 mgd in 1956 and ranged from 8.4 mgd in January to 17.3 mgd in June. The 4.2 billion gallons pumped by the City of Kalamazoo during 1956 was a record high.

Oakland County, City of Pontiac.--The observation wells in Pontiac are finished in the glacial drift as are the municipal and most industrial wells in the area. A long general decline of water levels persisted from 1939 when observations were begun until 1955, and was due to heavy pumping from the aquifer. A rise in level of about 9 feet in observation well 3N 10E 32-1 since August 1955 (fig. 19) illustrates the combined effect of decreased pumping in the area adjacent to the observation well and above-average precipitation in the fall of 1955 and during most of 1956. Municipal withdrawal of ground water from the glacial drift for the year 1956 was 3.2 billion gallons.

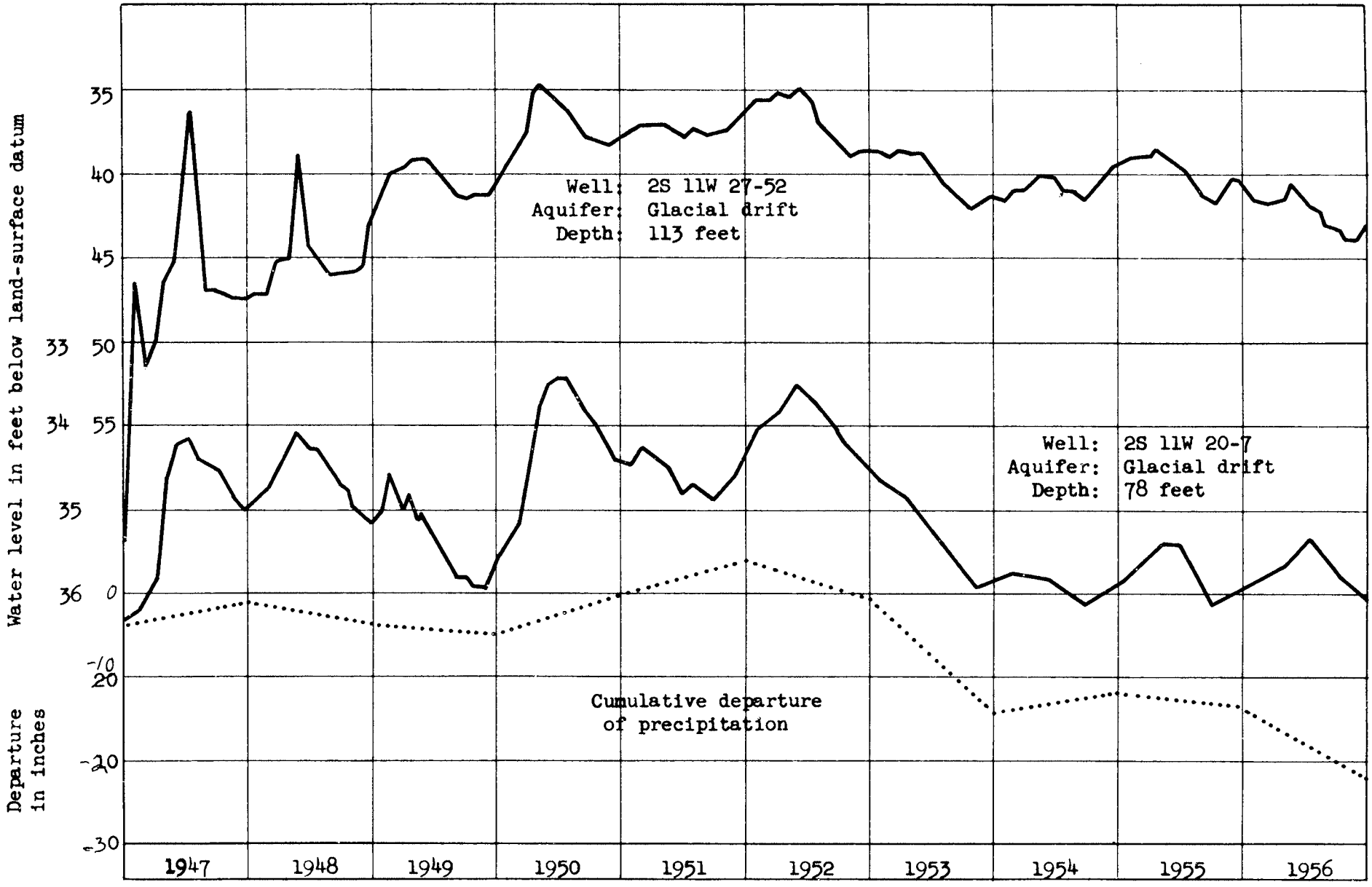


Figure 18.--Hydrographs of wells 2S 11W 20-7 and 27-52, and cumulative departure of precipitation from long-mean, at Kalamazoo, 1947-1956.

Figure 19.--Hydrograph of well 3N 10E 32-1 at Pontiac, 1947-1956.

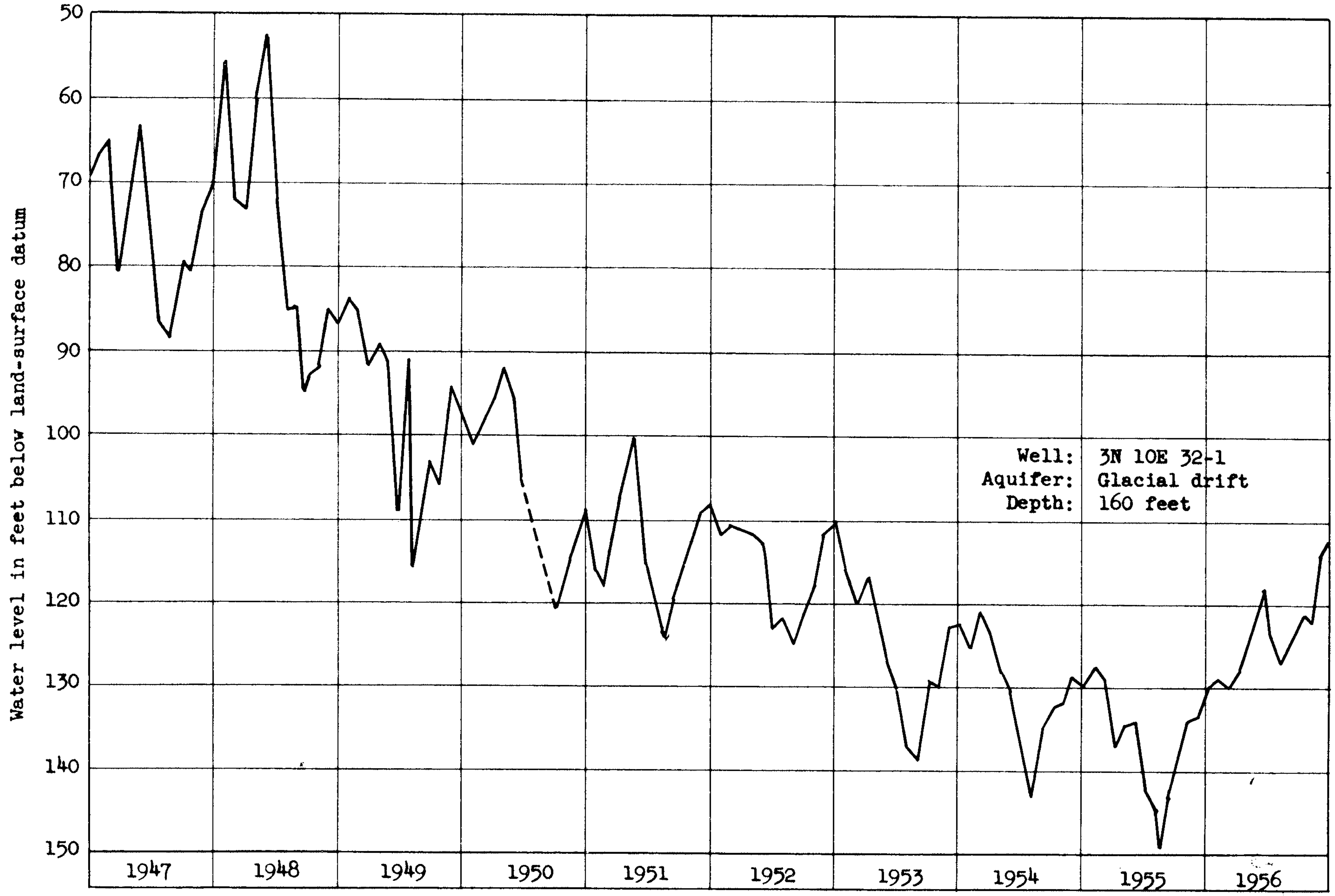


Figure 19.--Hydrograph of well 3N 10E 32-1 at Pontiac, 1947-1956.

Figure 18.--Hydrographs of wells 2S 11W 20-7 and 27-52, and cumulative departure of precipitation from long-mean, at Kalamazoo, 1947-1956.

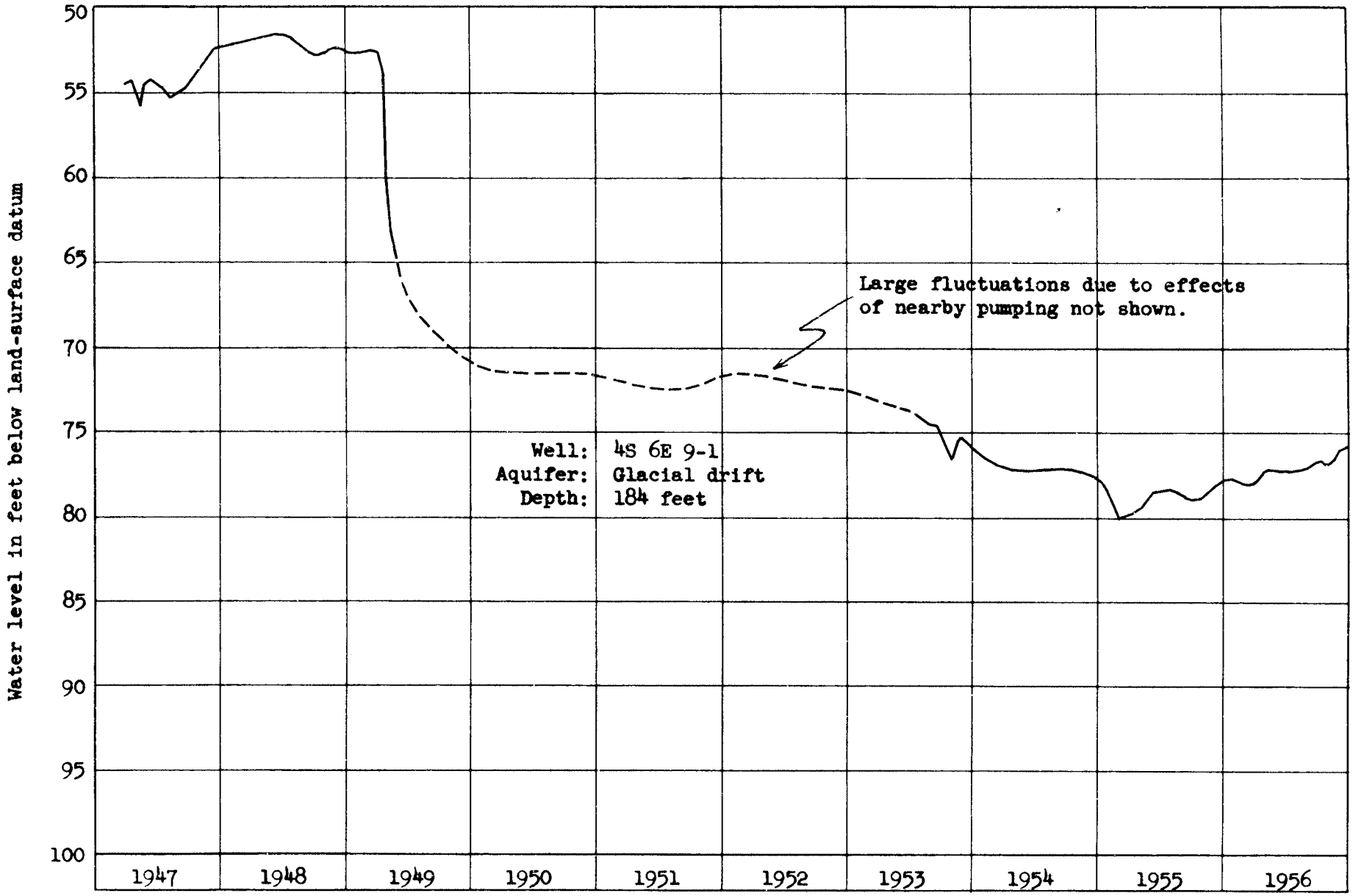


Figure 20.--Hydrograph of well 4S 6E 9-1 at Ypsilanti State Hospital, Washtenaw County, showing effects of pumping from the hospital well field, 1947-1956.

Figure 20.--Hydrograph of well 4S 6E 9-1 at Ypsilanti State Hospital, Washtenaw County, showing effects of pumping from the hospital well field, 1947-1956.

St. Joseph County, City of Three Rivers.--Observation well 6N 11W 18-1 at Scidmore Park in Three Rivers is finished in glacial drift and reflects withdrawals of ground water by the city. The levels in the well generally were higher throughout the year than in 1955. Measurements since 1939 show that no significant lowering of water levels have been caused by municipal pumping.

Washtenaw County.--Observation wells in this county are south of Ann Arbor at the municipal well field, at the Ypsilanti State Hospital, and at the Ypsilanti Township well field. The wells are finished in the glacial drift and reflect withdrawals of ground water from the drift.

At the City of Ann Arbor's Steere Farm well field, the two observation wells (3S 6E 16-1 and 16-2) reflect changes in municipal pumpage. Spring water levels were higher in 1956 than in 1955. However, dry weather during the fall months effectively limited recharge and the levels at the end of 1956 were not substantially different from those observed at the end of 1955.

At Ypsilanti State Hospital, water levels in the two observation wells reflect pumping of ground water from the glacial drift by the hospital. Levels at the end of 1956 were several feet higher than at the end of 1955, owing to above-average total annual precipitation and a decrease in pumping as a result of a relatively cool and wet summer. The hydrograph of well 4S 6E 9-1 (fig. 20), however, shows a net decline in water levels of more than 20 feet during the period of record 1947-1956. Large fluctuations in water levels due to the effects of nearby pumping during the 1949 to 1953 period are not shown on the hydrograph.

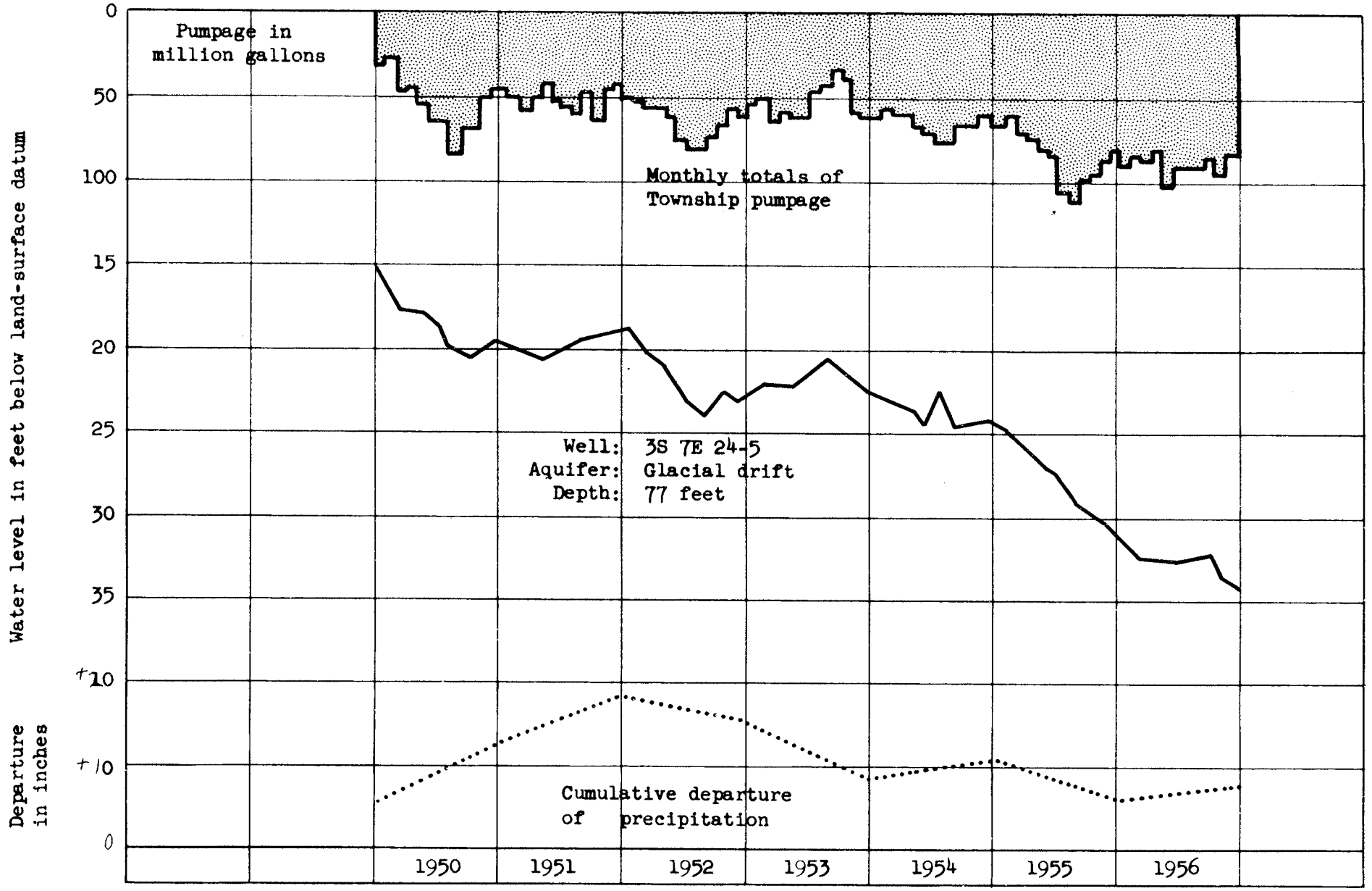


Figure 21.--Hydrograph of well 3S 7E 24-5 at Ypsilanti Township well field, pumpage, and cumulative departure of precipitation, from long-term mean at Detroit, 1950-1956.

At the Ypsilanti Township well field the observation wells and the supply wells tap the glacial drift aquifer. Increased withdrawals of ground water from this field during 1955 and 1956 resulted in sharp declines of water levels during this period (fig. 21).

Figure 21.--Hydrograph of well 3S 7E 24-5 at Ypsilanti Township well field, pumpage, and cumulative departure of precipitation, from long-term mean at Detroit, 1950-1956.

Table 1.--Records of Michigan observation wells in which water-level measurements were made during 1956.

Owner: Includes owner's designation or field number of well where applicable; MDC - Michigan Department of Conservation; MSHD - Michigan State Highway Department; USFS - United States Forest Service; WMP - Wisconsin-Michigan Power Co.; TW - Test well.

Chief aquifer: pC - Rocks of Precambrian age; Or - Limestones of Richmond age (Late Ordovician); Sm - Manistique dolomite of Middle Silurian age; Ss - Salina formation of Late Silurian age; Dtb - Thunder Bay limestone of Middle and upper (?) Devonian age; Mmn - Napoleon member of the Marshall sandstone of Mississippian age; Mb - Bayport limestone of Mississippian age; IP- Parma sandstone of Pennsylvanian age; IPs - Saginaw formation of Pennsylvanian age; Qgd - Glacial drift deposits of Pleistocene (Quaternary) age.

A - Water confined under artesian conditions; W - Water-table conditions.

Altitude: Land-surface datum in feet above mean sea level.

Observer: USGS - Water-level measurements made by U. S. Geological Survey; MDC - Michigan Department of Conservation; USFS - U. S. Forest Service; WMP - Wisconsin-Michigan Power Company.

Former USGS No.: See page 3 for explanation of well-numbering systems.

Twp.	Rg.	Sec.-No.	Location in section ¼ of ¼	Owner	Depth of well (ft.)	Diameter (in.)	Chief aquifer	Altitude	Observer	Former USGS No.	Remarks
				Alpena County							
32N	6E	16-1	NW SW	Harlo Mellon	53	6	Dtb A		USGS	ApLr 1	
30N	6E	6-1	NW NE	R. E. James	19	18	Qgd W		USGS	ApCn 1	
				Baraga County							
48N	32W	12-1	SE SE	MSHD (WMP 14)	10	1¼	Qgd W		WMP	BgCv 1	
				Branch County							
6S	6W	22-1	NE SW	City of Coldwater (3)	130	8-6	Qgd A		Owner	BrCW 3	Affected by pumping
				Calhoun County							
1S	7W	10-1	NW NW	K. N. Sabin	8	15	Qgd W	907.99	USGS	ChPf 102	
		31-1	NE SW	City of Battle Creek (TW 1)	140	2	Mmn A	838.92	USGS	58	
		32-1	NE SE	do. (Verona 22)	127	8	Mmn A	830.79	Owner	1	Affected by pumping
		32-2	NE NW	Mrs. Harriet Rice	43	2	Mmn A	842.88	USGS	105	
2S	8W	1-1	SW SE	Sherman Mfg. Co.	22	2	Qgd W	825.19	USGS	ChBC 150	
		1-2	SW SE	Electronics Supply Co.	61	2	Mmn A	819.08	USGS	170	Affected by pumping
		2-1	NW SE	Post Products Co.	92	10	Mmn A	819.99	City of Battle Creek	160	do.
		3-1	SE SE	Dominic Conto	12	2	Qgd W	862.02	USGS	ChBc 55	
		3-2	SE NE	Eaton Mfg. Co.	80	10	Mmn A	833.39	USGS	60	Affected by pumping
		3-3	NE SE	P. E. Slayton	64	4	Mmn A	849.51	USGS	169	do.
		14-1	NE SE	City of Battle Creek (TW 3)	62	2	Qgd W	916.05	USGS	2	
		14-2	SE SE	do. (TW 1)	89	26	Qgd W	914.97	USGS	137	
2S	7W	7-1	SW NE	Oliver Farm Implement Co.	74	6	Mmn A	834.30	USGS	ChBC 140	Affected by pumping
		10-1	NW SW	C. W. Cronkhite	90	6	Mmn A	884.94	USGS	ChEm 10	
		17-1	NW SW	City of Battle Creek	87	2	Mmn A	841.78	USGS	64	Affected by pumping
		18-1	SW SW	do.	87	2	Mmn A	832.49	USGS	60	do.
2S	6W	25-1	NE NE	City of Marshall (Ferguson Well)	59	6	Mmn A	904.85	USGS	ChMA 2	Affected by pumping
		25-2	SE NW	do. (Egeler Well)	67	6	Mmn A	901.15	USGS	3	do.
		25-3	SW SE	do. (Filkin Well)	82	4	Mmn A	914.15	USGS	4	do.
				Cass County							
6S	16W	1-1	SW NE	City of Dowagiac	159	10	Qgd A	750.19	Owner	CsDW 1	Affected by pumping
8S	14W	17-1	NE NW	Ted Little	55	28	Qgd W		USGS	CsMa 1	
				Charlevoix County							
33N	4W	2-1	SW NE	MDC	94	6	Qgd A		USGS	CvCh 1	
32N	4W	10-1	NE SE	MDC	17	2	Qgd W		USGS	CvHu 33	
				Cheboygan County							
34N	1W	1-1	NW SW	MDC (7)	11	2	Qgd W		USGS	CbWk 11	
		26-1	SE NW	MDC (10)	17	2	Qgd W		USGS	33	
33N	1W	3-1	SW SW	MDC (11)	15	2	Qgd W		USGS	CbMd 2	
		10-1	SE SE	MDC (12)	13	2	Qgd W		USGS	4	
33N	1E	23-1	NE SE	MDC (17)	9	2	Qgd W		USGS	CbFr 17	
		27-1	SE NE	MDC (16)	15	2	Qgd W		USGS	5	
		28-1	NE NW	MDC (7)	14	2	Qgd W		USGS	7	
				Chippewa County							
46N	4W	24-1	NE SE	USFS	54	6	Qgd A		Owner	CpSp 59	
				Clinton County							
8N	1W	13-1	SW NW	Village of Elsie	298	12	IPs A	699.68	USGS	CtES 1	Affected by pumping
		13-3	SW NW	do. (3)	45	12	Qgd A	706.17	USGS	3	do.
6N	2W	16-1	SE SE	MSHD	23	14	Qgd W	803.32	USGS	CtOp 1	
5N	2W	32-1	SW SE	Mich. Dept. Health	135	6-4	IPs A	849.21	USGS	CtDw 159	Affected by pumping
				Crawford County							
28N	2W	30-1	NW SW	MDC (2)	10	2	Qgd W		USGS	CrLw 6	
28N	1W	8-1	NE NE	MDC (6)	13	2	Qgd W		USGS	CrLw 4	

Table 1.--Records of Michigan observation wells in which water-level measurements were made during 1956.

Twp. Rg. Sec.-No.	Location in section ¼ of ¼	Owner	Depth of well (ft.)	Diameter (in.)	Chief aquifer	Altitude	Observer	Former USGS No.	Remarks
Crawford County - Continued.									
28N 1W 26-1	NE SW	MDC (18)	13	2	Qgd W		USGS	CrLw 5	
27N 4W 2-1	NE NW	MDC (42)	13	2	Qgd W	1,194.18	USGS	CrFr 1	
19-1	SE SW	MDC (12)	19	2	Qgd W		USGS	5	
23-1	NE NE	MDC (51)	17	2	Qgd W		USGS	2	
27N 3W 15-1	NW NE	MDC	17	1¼	Qgd W		USGS	CrOr 13	
15-2	NE NW	MDC	13	1¼	Qgd W		USGS	14	
27N 1W 4-1	SW SW	MDC (8)	10	2	Qgd W		USGS	CrLw 3	
20-1	SW SW	MDC (22)	13	2	Qgd W		USGS	1	
22-1	NE NE	MDC (27)	12	2	Qgd W		USGS	2	
26N 4W 2-1	SW SW	MDC (15)	14	2	Qgd W		USGS		
5-1	NW NW	MDC (9)	8	2	Qgd W	1,137.17	USGS	CrOr 4	
5-2	NE SE	MDC (12)	9	1¼	Qgd W	1,144.01	USGS	7	
10-1	NE SE	MDC (10)	12	2	Qgd W	1,146.11	USGS	5	
11-1	NW SW	MDC (Grayling recorder well)	12	15	Qgd W	1,147.59	USGS	6	
28-1	NE SW	Michigan National Guard Camp	31	3	Qgd W		USGS	11	
26N 3W 8-1	NW NW	MDC	8	1¼	Qgd W		USGS	CrOR 3	
12-1	SE SE	MDC (28)	16	1¼	Qgd W		USGS	CrOR 3	
26N 2W 11-1	SE SE	MDC (9)	7	2	Qgd W		USGS	CrOr 1	
25N 4W 7-2	NW SE	H. H. Joseph (8)	137	2	Qgd W		USGS	CrBo 32	
8-1	SW SW	H. H. Joseph (9)	88	2	Qgd W	1,248.8	USGS	31	
21-1	NE NE	MDC (03)	53	2	Qgd W	1,229.9	USGS	20	
25N 3W 28-1	SW SW	MDC (8)	13	1¼	Qgd W	1,173.14	USGS	1	
25N 1W 15-1	SE SE	USFS	56	6	Qgd A		USGS	CrSb 1	
Dickinson County									
43N 29W 32-1	NW NE	Dickinson Co. Rd. Comm. (WMP 11)	12	1¼	Qgd W		WMP	DkFe 1	
42N 27W 33-1	NE NW	E. W. LaFreniere (WMP 10)	12	36	Qgd W		WMP	DkBe 1	
41N 30W 25-1	NE SW	Dickinson Co. Rd. Comm. (WMP 1)	20	1¼	Qgd W		WMP	DkBg 1	
25-2	NW SE	Wm. Carrolo (WMP 2)	16	36	Qgd W		WMP	2	
25-3	SE NE	Oscar Martinson (WMP 3)	12	48x48	Qgd W		WMP	3	
Eaton County									
4N 4W 2-1	SW SW	City of Grand Ledge	376	12	Ips A	846.59	Owner	EaGL 1	Affected by pumping
4N 3W 9-1	SW SW	B. B. Bosworth	18	48	Qgd W	851.71	USGS	EaDt 215	
10-1	SE NE	John Schneeberger	121	3	Ips A	855.99	USGS	214	
12-1	SE SW	Mrs. Harold Worden	381	6	Ips A	861.91	USGS	30	Affected by pumping
24-1	SE SE	J. R. McLaughlin	22	12	Qgd W	851.96	USGS	217	
2N 4W 19-1	NW SW	City of Charlotte	25	20 ft.	Qgd W	889.44	USGS	EaCH 1	
Genesee County									
7N 7E 9-1	SE SW	Consumers Power Co.	288	12	Ips A	761.83	USGS	GeFL 500	
17-1	SE NE	do.	222	12	Ips A	757.83	USGS	491	
20-2	SW SW	City of Flint	169	2	Qgd A	749.48	USGS	354	
29-1	SE SW	C. F. Crain	14	1¼	Qgd W	776.63	USGS	GeBu 300	
29-2	SW SE	Clarence Chappell	8	18	Qgd W	779.86	USGS	303	
32-1	SW SW	A. W. Arndt	140	2	Qgd A	792.27	USGS	492	
6N 7E 9-1	SW SE	Grand Blanc Tank Plant (6)	375	6	Ips A	841.71	Owner	GeGb 25	
Gladwin County									
17N 1W 7-1	SW NW	City of Beaverton	93	12	Qgd A	721.50	Owner	GwBV 1	
Grand Traverse County									
27N 9W 4-1	NW NE	MDC (18)	15	2	Qgd W	687.01	USGS	GvWw 18	
28-1	SE NW	MDC (15)	17	2	Qgd W	893.26	USGS	GvWw 15	
34-1	SE NW	MDC (25)	18	2	Qgd W	900.25	USGS	25	
35-1	SE NW	MDC (1)	17	2	Qgd W	906.11	USGS	1	
26N 11W 21-1	SW SW	MDC (14)	13	2	Qgd W	899.26	USGS	GvBr 14	
27-1	NW SW	MDC (2)	14	2	Qgd W	914.25	USGS	2	
26N 9W 13-1	SW SW	MDC (2)	14	2	Qgd W	961.78	USGS	GvUn 2	
25N 11W 2-1	SE NW	MDC (19)	11	2	Qgd W	1,058.81	USGS	GvMy 19	
25N 10W 2-1	SW SW	MDC (25)	15	2	Qgd W	945.27	USGS	GvPr 25	
8-1	NW NW	MDC (26)	13	2	Qgd W	949.58	USGS	26	
25N 9W 23-1	NW SE	MDC (6)	17	2	Qgd W	1,017.85	USGS	GvFf 6	
26-1	NW NW	MDC (24)	19	2	Qgd W	1,024.02	USGS	24	
34-1	NW NW	MDC (27)	17	2	Qgd W	1,025.34	USGS	27	
Gratiot County									
12N 3W 33-1	NE SE	E. E. Peterson	19	1¼	Qgd W	756.10	USGS	GrAL 252	
34-1	SW SE	S. J. Brown	55	2	Qgd A	727.12	USGS	99	Affected by pumping
34-2	SW NE	Vane Mills	13	1¼	Qgd W	747.17	USGS	103	
34-3	SW SE	M. J. Patterson	76	2	Qgd A	727.19	USGS	255	Affected by pumping

Table 1.--Records of Michigan observation wells in which water-level measurements were made during 1956.

Twp.	Rg.	Sec.-No.	Location in section ¼ of ¼		Owner		Depth of well (ft.)	Diameter (in.)	Chief aquifer	Altitude	Observer	Former USGS No.	Remarks
									Gratiot County - Continued.				
12N	3W	34-4	SE	NE	Orie Martin		55	2	Qgd A	744.03	USGS	GrAL 358	Affected by pumping
		34-5	SW	NE	City of Alma	(5)	90	38-18	Qgd A		USGS	5	do.
		35-1	SW	SW	A. F. Tennant		14	1¼	Qgd W	747.88	USGS	148	
		35-2	NE	SW	C. H. Gould		14	1¼	Qgd W	739.71	USGS	254	
		35-3	NW	SW	L. A. Halker		26	2	Qgd A	732.62	USGS	256	Affected by pumping
		35-4	NE	SW	Calvin Sherwood		28	3	Qgd W	736.1	USGS	331	
		35-5	SW	NW	Reed Excavating Co.		20	36	Qgd W	738.78	USGS	360	
11N	3W	2-2	NW	NE	Layne Water Co.	(2)	130	8	Qgd A	744.15	USGS	54	Affected by pumping
		2-3	NE	NW	Bernard Engbloom		11	1¼	Qgd W	749.01	USGS	230	
		2-4	NW	NW	C. D. Peet		15	1¼	Qgd W	750.24	USGS	240	
		3-1	NW	SW	City of Alma	(TW 17)	179	8	Qgd A	746.8	USGS	23	Affected by pumping
		3-2	SW	NW	do.	(TW 1)	160	8	Qgd A	733.51	USGS	73	do.
		3-4	NE	NW	Marshall Dallas		49	2	Qgd A	737.48	USGS	98	do.
		3-5	NE	NE	Thomas Thompson		59	2	Qgd A	743.27	USGS	135	do.
		3-6	NW	NW	E. H. Waber		49	2	Qgd A	733.20	USGS	258	do.
		4-1	SW	NE	City of Alma	(TW 6)	165	8	Qgd A	732.31	USGS	78	do.
		4-2	SW	NE	do.	(TW 10)	167	8	Qgd A	734.43	USGS	82	do.
		5-1	SE	NE	John Pfarr	(Alma TW 12)	162	4	Qgd A	740.97	USGS	GrAr 33	do.
		36-1	SE	SE	Village of Ithaca		785	10-8	IPs, IP) Mb A)	804.50	USGS	GrIH 1	
9N	3W	8-1	NE	NE	Glenn Corson		31	30	Qgd W		USGS	GrPE 1	
									Ingham County				
4N	2W	4-1	NW	SW	C & O RR.	(East 1)	38	12	Qgd A	842.19	USGS	IgLS 33	
		7-1	SE	NW	Tank Bros.		107	3	IPs A	866.01	USGS	IgLs 35	Affected by pumping
		9-1	SE	NW	City of Lansing	(Seymour 1)	401	14	IPs A	828.81	USGS	IgLS 7	do.
		9-2	SW	NW	Consumers Power Co.		370	12	IPs A	820.69	USGS	60	do.
		16-1	NE	SE	City of Lansing	(Cedar)	417	12	IPs A	829.11	USGS	9	do.
		17-1	NW	NE	do.	(Logan)	424	20	IPs A	858.72	USGS	6	do.
		17-2	NW	NW	Olds Drop Forge	(4)	417	12	IPs A	872.55	USGS	51	do.
		19-1	SW	SW	Waverly Hills Association		87	2	IPs A	833.94	USGS	IgLs 805	
		21-1	NE	NW	City of Lansing	(Townsend)	410	14	IPs A	834.10	USGS	IgLS 8	Affected by pumping
		22-1	SW	NW	do.	(P-5)	338	12	IPs A	823.64	USGS	3	do.
		22-2	SW	NW	do.	(P-9)	218	6	IPs A	830.76	USGS	4	do.
		23-1	NE	NW	do.	(RS-7)	467	12	IPs A	824.86	Owner	5	do.
		24-1	NE	SW	Michigan State University		453	10	IPs A	853.45	USGS	IgLs 265	do.
		25-1	NW	NE	do.	(Lamb Farm)	120	3	IPs A	866.67	USGS	266	do.
		28-1	NE	NW	Atlas Drop Forge	(2)	425	8	IPs A	849.20	USGS	IgLS 182	do.
		31-1	SW	SW	C. A. Weber		204	3	IPs A	880.15	USGS	IgLs 271	
4N	1W	16-1	NW	NE	City of East Lansing	(2)	440	12	IPs A	858.8	Owner	IgEL 421	Affected by pumping
		18-1	SE	NE	Marble School		175	3	IPs A	847.85	USGS	IgMr 405	do.
3N	2W	8-1	NW	NW	F. H. Kraus		72	3	IPs A	876.67	USGS	IgDh 12	
2N	1W	5-1	SE	SE	City of Mason	(old 2)	150	6	IPs A		Owner	IgMS 30	Affected by pumping
									Iosco County				
23N	7E	7-1	NE	SE	USFS		341	6	Qgd A		USGS	IoWr 1	
									Iron County				
46N	33W	18-1	SW	NW	MSHD	(WMP 17)	12	1¼	Qgd W		WMP	IrHm 4	
46N	34W	14-1	NE	NW	Oliver Iron Mining Co.	(WMP 18)	12	1¼	Qgd W		WMP	IrHm 5	
45N	37W	23-1	SW	NE	USFS	(WMP 28)	8	1¼	Qgd W		WMP	IrSt 1	
45N	36W	23-1	NE	NE	USFS	(WMP 29)	22	48	Qgd W		WMP	IrIr 4	
45N	35W	33-1	SE	NW	MSHD	(WMP 39)	12	1¼	Qgd W		WMP	IrSt 5	
45N	33W	8-1	SW	SW	Basilio Prandi	(WMP 20)	33	36	Qgd W		WMP	IrHm 1	
		10-1	SE	NW	Bonifas Lumber Co.	(WMP 19)	7	1¼	Qgd W		WMP	2	
44N	35W	6-1	SW	SW	USFS (Paint River profile 1)		6	1¼	Qgd W	1,468.15	WMP	IrIr 5	
		6-2	SW	SW	USFS (Paint River profile 2)		13	1¼	Qgd W	1,475.14	WMP	6	
		6-3	NW	SW	USFS (Paint River profile 3)		12	1¼	Qgd W	1,476.35	WMP	7	
		7-1	NW	NW	USFS (Paint River profile 4)		4	1¼	Qgd W	1,469.28	WMP	8	
		7-2	NW	NW	USFS (Paint River profile 5)		13	1¼	Qgd W	1,471.25	WMP	9	
		7-3	NW	NW	USFS (Paint River profile 6)		17	1¼	Qgd W	1,475.83	WMP	10	
44N	33W	10-1	SW	SW	Iron Co. Rd. Comm. (	(WMP 21)	8	1¼	Qgd W		WMP	IrHm 3	
43N	36W	1-1	SW	NE	do.	(WMP 27)	9	1¼	Qgd W		WMP	IrIr 4	
		1-2	SW	SW	Mr. Williams	(16)	50(?)	?	Qgd W		MDC		Mine-drainage observation well
43N	35W	11-1	SE	NE	J. J. Javoroski	(WMP 23)	47	36	Qgd W		WMP	IrIr 1	
		13-1	SW	SE	F. V. Gendswill	(5)	65	36	pC ?		MDC		Mine-drainage observation well
		13-2	SW	SE	Boyington	(hole 4-44)	?	?	? ?		MDC		do.
		20-1	SW	SE	Mrs. B. Henriksen	(WMP 25)	48	1¼	Qgd W		WMP	IrIr 2	Federal Key Well
		22-1	SE	NE	Homer Mine No. 6	(2)	?	?	Qgd W		MDC		Mine-drainage observation well
		24-1	SE	NE	Spies - Johnson No. 73	(7)	?	3	QgdTW		MDC		do.
		26-1	SW	NE	City of Iron River		130	2	Qgd W		MDC		do.
43N	34W	19-1	NW	SW	Spies - Johnson No. 3004	(8)	?	3	QgdTW?		MDC		do.
		19-2	NE	SW	do. No. 3c	(9)	?	3	QgdTW?		MDC		do.
		29-1	SW	NE	Rogers Mine	(11)	?	48	Qgd W		MDC		do.

Table 1.--Records of Michigan observation wells in which water-level measurements were made during 1956.

Twp. Rg. Sec.-No.	Location in section ¼ of ¼	Owner	Depth of well (ft.)	Diameter (in.)	Chief aquifer	Altitude	Observer	Former USGS No.	Remarks
Iron County - Continued.									
43N 32W 26-2	NE SW	Cayia Mine (17)	?	?	Qgd?TW?		MDC		Mine-drainage observation well
42N 36W 15-1	NE SW	MSHD (Brule River Profile 1)	6	1¼	Qgd W	1,543.92	WMP	IrSt 2	
15-2	NE SW	MSHD (Brule River Profile 2)	7	1¼	Qgd W	1,545.60	WMP	3	
15-3	NW SW	W. Young Estate (Brule River Profile 3)	14	1¼	Qgd W	1,554.36	WMP	4	
42N 34W 7-1	SW NE	Zimmerman No. 1 (13)	171	20-12	Qgd W	1,165.32	MDC		Mine-drainage observation well
42N 31W 33-1	NW SE	Iron Co. Rd. Comm. (WMP 7)	11	1¼	Qgd W		WMP	IrMt 1	
33-2	NW SE	Joseph Giachino (WMP 8)	12	15	Qgd W		WMP	2	
41N 31W 10-1	SW NE	Iron Co. Rd. Comm. (WMP 5)	17	1¼	Qgd W		WMP	3	
Kalamazoo County									
2S 11W 3-29	SE NE	KVP CO. (50)	39	12	Qgd A	774.05	Owner	KoPT 50	Affected by pumping
3-37	NE NE	do. (TW 6)	25	2	Qgd A	766.93	USGS	6	
3-60	NE NE	do. (61)	36	6	Qgd A	763.18	Owner	3-60	Affected by pumping
15-18	NE SE	Consumers Power Co.	64	12	Qgd A	766.17	USGS	KoKO 211	do.
15-31	NW SW	Wigginton Co.	68	6	Qgd A	781.37	USGS	228	do.
15-33	NE SW	Columbia Hotel	65	5	Qgd A	769.46	USGS	311	do.
20-7	SW SE	Western Michigan Univ.	78	8	Qgd A	868.68	USGS	KoKo 42	
22-6	NE SW	City of Kalamazoo	115	6	Qgd A	777.45	Owner	KoKO 114	Affected by pumping
22-102	NE SW	Kalamazoo Creamery	61	12	Qgd A	773.19	USGS	242	do.
26-3	NE NE	Reed Land Co.	41	6	Qgd A	773.71	USGS	240	
27-52	NE NE	Bryant Paper Co. (7)	113	12	Qgd A	802.59	City of Kalamazoo	284	Affected by pumping
29-3	SW SE	Oakwood, Inc.	47	2	Qgd A	880.72	USGS	KoKo 43	
4S 11W 13-1	NW SE	Lee Paper Co. (6A)	144	12	Qgd A	839.08	Owner	KoVB 6	Affected by pumping
13-2	NE SW	do. (7A)	48	12	Qgd A	838.18	Owner	7	do.
27-1	SE NW	H. H. Chamberlain	19	1¼	Qgd W	854.64	USGS	KoSc 5	
Kalkaska County									
28N 5W 35-1	SE SE	MDC (22)	14	2	Qgd W		USGS	KaBk 22	
27N 5W 27-1	NE SW	MDC (13)	19	2	Qgd W		USGS	KaOw 13	
36-1	SE NW	MDC (100)	16	1¼	Qgd W		USGS	100	
Kent County									
6N 12W 17-1	SE NE	Jervis Corp. (1)	30	12	Qgd W		Owner	KeGV 10	Affected by pumping
17-2	SE NE	do.	26	6	Qgd W	606.05	Owner	11	do.
17-3	SE NE	do.	21	2	Qgd W	607.38	Owner	12	do.
17-4	SE NE	do.	20	1¼	Qgd W	608.26	Owner	13	do.
17-5	SE NE	do.	28	2	Qgd W	613.92	Owner	14	do.
Mackinac County									
42N 2W 7-1	NE NE	USFS (Pontchartrain well)	102	6	Sn A		USGS		
41N 5W 23-1	SW NW	MDC (Round Lake Well)	47	6	Ss A		USGS		
Marquette County									
49N 30W 22-1	SW NE	Marquette Co. Rd. Comm. (WMP 13)	17	1¼	Qgd W		WMP	MqMc 1	
45N 30W 1-1	SW NW	Arnold Janofski (WMP 4)	31	36	Qgd W		WMP	MqRe 1	
44N 26W 28-1	NE SE	MDC	31	6	Qgd W		USFS	MqFr 1	
Mason County									
17N 15W 3-1	SE SW	USFS	32	6	Qgd W	737.37	USGS	MaLo 1	
Montcalm County									
9N 8W 15-1	SW NW	City of Greenville (9)	65	12	Qgd A		Owner	MmGV 9	Affected by pumping
Montmorency County									
32N 2E 34-1	NW NE	MDC	24	2	Qgd W		USGS	MyMy 1	
31N 2E 11-1	NW NW	MDC (6)	12	2	Qgd W		USGS	MyBr 6	
14-1	SW SW	MDC (16)	18	2	Qgd W		USGS	16	
31N 3E 9-1	NW NE	MDC	14	2	Qgd W		USGS	MyHm 22	
31N 4E 8-1	NE SW	MDC (1)	14	2	Qgd W		USGS	MyHm 1	
34-1	NE SW	MDC (23)	13	2	Qgd W		USGS	23	
30N 2E 6-1	SW NW	MDC (1)	11	2	Qgd W		USGS	MyBr 8	
30N 4E 26-1	NW NE	MDC (18)	10	2	Qgd W		USGS	MyRs 18	
29N 2E 22-1	SW SE	MDC	64	6	Qgd A		USGS	MyAb 1	
27-1	NW NW	MDC (32)	10	2	Qgd W		USGS	7	
29N 3E 21-1	NW NE	MDC (32)	14	2	Qgd W		USGS	MyLd 6	
29N 4E 5-1	Ctr SW	MDC	14	2	Qgd W		USGS	MyRs 4	

Table 1.--Records of Michigan observation wells in which water-level measurements were made during 1956.

Twp.	Rg.	Sec.-No.	Location in section ¼ of ¼	Owner	Depth of well (ft.)	Diameter (in.)	Chief aquifer	Altitude	Observer	Former USGS No.	Remarks
				Oakland County							
3N	10E	31-1	NE SW	City of Pontiac (Orchard Lake)	173	12	Qgd A		Owner	OaPT 48	Affected by pumping
3N	10E	32-1	SE NW	do. (6)	160	8	Qgd A	921.88	Owner	OaPT 1	do.
2N	10E	22-1	NE NW	Cranbrook School (3)	65	6	Qgd A		Owner	OaBH 2	do.
				Ogemaw County							
23N	1E	4-1	SE NE	MDC (15)	21	4	Qgd W		USGS	OgFr 15	
		17-1	SE NW	MDC (30)	19	4	Qgd W		USGS	30	
23N	2E	2-1	NE NW	Charles Hudson	7	36x48	Qgd W		USGS	OgKa 1	
				Otsego County							
29N	3W	29-1	SW SE	MDC (106)	15	2	Qgd W		USGS	OsOk 106	
		32-1	SE SW	MDC (105)	8	2	Qgd W		USGS	105	
				Presque Isle County							
33N	2E	18-1	NE NE	MDC (5)	14	2	Qgd W		USGS	PrAs 20	
		29-1	SW NE	MDC (20)	13	2	Qgd W		USGS	13	
		30-1	NE SE	MDC (19)	14	2	Qgd W		USGS	18	
		30-2	SW NW	MDC (18)	14	2	Qgd W		USGS	19	
				Roscommon County							
24N	3W	3-1	NW NW	MDC (17)	17	1¼	Qgd W	1,168.02	USGS	RoGr 17	
		24-1	NW NW	MDC (1)	15	2	Qgd W	1,162.42	USGS	1	
24N	2W	1-1	NE NE	MDC (88)	14	1¼	Qgd W	1,164.39	USGS	RoHg 88	
		7-1	NE SE	MDC (107)	13	1¼	Qgd W	1,138.01	USGS	107	
		19-1	NE SW	MDC (150)	14	2	Qgd W	1,154.17	USGS	150	
		20-1	NE NW	MDC (1)	14	8	Qgd W	1,145.30	USGS	1	Federal Key Well
		21-1	NW NW	MDC (1000)	15	2	Qgd W		USGS	1000	
24N	1W	34-1	NE NE	MDC (30)	19	2	Qgd W	1,194.81	USGS	RoAs 30	
23N	3W	12-1	NE SE	MDC (75)	14	2	Qgd W		USGS	RoMk 75	
		25-1	NE SE	MDC (5)	14	2	Qgd W	1,154.29	USGS	5	
23N	2W	31-1	NW NW	MDC	13	2	Qgd W	1,153.63	USGS	RoHg 7	
23N	1W	3-1	SE SE	MDC (50)	12	2	Qgd W	1,188.95	USGS	RoRf 50	
22N	4W	15-1	SE SE	MDC (4)	11	2	Qgd W	1,155.72	USGS	RoRo 4	
22N	3W	22-1	SE NE	MDC (7)	14	2	Qgd W	1,170.58	USGS	RoDt 7	
		34-1	SE SW	MDC (26)	11	2	Qgd W	1,177.82	USGS	26	
22N	2W	14-1	NE NW	MDC (9)	12	2	Qgd W	1,201.55	USGS	RoBk 9	
		17-1	NE NW	MDC (15)	13	2	Qgd W	1,165.46	USGS	15	
22N	1W	11-1	NW NW	MDC (5)	14	2	Qgd W		USGS	RoRf 5	
21N	4W	4-1	NW SE	MDC (50)	14	2	Qgd W		USGS	RoRo 50	
		13-1	NE NE	MDC (8)	12	2	Qgd W	1,132.33	USGS	8	
21N	3W	2-1	NE NW	MDC (3)	19	2	Qgd W	1,201.40	USGS	3	
		5-1	NE NW	MDC (15)	15	2	Qgd W	1,147.86	USGS	15	
				Saginaw County							
9N	3E	16-1	NE NW	August Bauer	72	2	IPs A		USGS	SgCH 9	Affected by pumping
				St. Joseph County							
6S	11W	18-1	SW SE	City of Three Rivers (7)	59	6	Qgd A	790.92	Owner	SpTR 1	Affected by pumping
				Sanilac County							
12N	13E	33-1	SE SE	MSHD	150	3	Mmn A		USGS	SaMr 1	
				Schoolcraft County							
45N	13W	16-1	SW SW	U. S. Fish & Wildlife Service	154	4	Or A		Owner	ScCe 112	
				Shiawassee County							
5N	2E	16-1	NE SE	A. B. Cobb	26	1¼	Qgd W	896.00	USGS	ShPR 8	
				Washtenaw County							
3S	6E	16-1	SW NW	City of Ann Arbor	23	2	Qgd A	817.43	Owner	WaPf 1	Affected by pumping
		16-2	SE NW	do.	23	16 ft.	Qgd A		Owner	2	do.
3S	7E	24-1	NE SW	Ford Motor Co. (104)	87	4	Qgd W	665.56	Ypsilanti Twp.	WaYp 8	do.
		24-2	NE SW	do. (106)	53	4	Qgd W	664.51	do.	9	do.
		24-4	NE SW	do. (107)	53	4	Qgd W	664.05	do.	11	do.
		24-5	NW SW	do. (109)	77	4	Qgd W	665.56	do.	12	do.
		24-6	SW SW	Federal Works Agency (117) (FWA-13)	75	6	Qgd W	657.83	do.	13	do.
		24-7	SW	Ford Motor Co. (124)	90	24	Qgd W	686.5	do.	14	do.
4S	6E	9-1	NW NW	Ypsilanti State Hospital (TW 20)	184	6	Qgd A		Owner	WaYk 20	do.
		10-1	SW NW	do. (TW 22)	173	6	Qgd A		Owner	22	do.

Table 1.--Records of Michigan observation wells in which water-level measurements were made during 1956.

Twp. Rg. Sec. & No.	Location in section ¼ of ¼	Owner	Depth of well (ft.)	Diameter (in.)	Chief aquifer	Altitude	Observer	Former USGS No.	Remarks
		Wexford County							
24N 10W 22-1	SW NW	MDC (2)	13	2	Qgd W	974.11	USGS	WeOw 2	
26-1	SW NW	MDC (4)	13	2	Qgd W	979.26	USGS	4	
28-1	SE NE	MDC (3)	18	2	Qgd W	1,005.49	USGS	3	
36-1	NW NW	MDC (42)	12	2	Qgd W	1,004.86	USGS	42	
24N 9W 19-1	SW NW	MDC (38)	11	2	Qgd W	994.16	USGS	WeIb 38	
21N 11W 13-1	NW NE	USFS	62	6	Qgd W		USGS	WeHn 1	
21N 9W 4-1	NW NE	City of Cadillac	277	8-6	Qgd A		USGS	WeCD 1	Affected by pumping

Table 2.--Extremes in ground-water levels in observation wells in Michigan.
(in feet below or above (+) land surface)

Frequency of measurement in 1956: R - well equipped with recording gage; D - daily; W - weekly; M - monthly; Q - quarterly; A - annual.

Remarks: A - Annual measurement made in 1956 listed with date of measurement.

Well Designation Twp.Rg.Sec.-No.	Years of record	Frequency of measurement in 1956	Observed water-level extremes								Remarks
			Period of record				1956				
			Highest	Date	Lowest	Date	Highest	Date	Lowest	Date	
Alpena County											
32N 6E 16-1	1948-56	Q	5.46	4-15-55	16.67	11-12-48	5.92	4-13	12.76	10-31	
30N 6E 6-1	1948-56	Q	0.90	4-13-52	9.52	12-11-49	2.66	4-13	6.95	10-31	
Baraga County											
48N 32W 12-1	1948-56	M	4.19	5- 3-51	6.72	3-15-49	4.75	7- 3	6.01	3-29	
Branch County											
6S 6W 22-1	1949-56	W	10.08	4- 8-50	16.67	1-15-54	12.24	5-18	16.48	12-21	
Calhoun County											
1S 7W 10-1	1946-56	W	0.89	3-28-50	5.90	1-27-54	3.43	5-23	5.23	1- 4	
31-1	1945-56	Q	+ 0.08	5-23-50	4.65	9-19-55	2.90	7-16	4.23	12-19	
32-1	1939-56	D	0.7	4-26-50	12.75	8- 5-55	4.12	5-27	10.20	8-31	
32-2	1946-56	Q	8.98	4-25-50	16.00	9-19-55	14.17	7-16	15.38	10- 3	
2S 8W 1-1	1946-56	Q	10.49	4-11-47	17.74	8-21-53	15.16	4-24	15.88	10- 3	
1-2	1945-56	Q	3.26	4-11-47	11.16	7-27-49	8.50	4-24	9.85	7-16	
2-1	1946-56	R	4.75	4- 9-47	9.53	9- 4-53	5.98	5-14	9.04	11-17	
3-1	1946-56	Q	1.75	4-28-50	8.25	12-19-56	5.19	4-24	8.25	12-19	
3-2	1946-56	Q	13.43	4-25-50	22.78	12-19-56	20.25	4-24	22.78	12-19	
3-3	1945-56	Q	0.26	4-25-50	9.39	8- 2-46	6.60	4-24	8.79	10- 3	
14-1	1939-56	Q	9.10	5-31-52	32.76	3-26-41	10.51	7-16	12.29	12-19	
14-2	1945-56	Q	6.22	5-29-50	12.86	10-18-46	7.61	7-16	9.63	12-19	
2S 7W 7-1	1946-56	Q	15.00	4-11-47	23.86	9-19-55	20.28	4-24	23.12	10- 3	
10-1	1946-56	Q	11.42	5-29-50	15.54	3- 7-47, 11- 6-53, 9-19-55	14.00	7-16	15.48	12-19	
17-1	1945-56	Q	6.57	4-25-50	11.23		9.85	4-24	11.05	10- 3	
18-1	1945-56	Q	+ 0.50	4-25-50	3.24	9-21-49	1.19	4-24	2.56	10- 3	
2S 6W 25-1	1950-56	Q	5.46	5- 9-50	9.36	9-19-55	8.65	7-16	9.26	12-19	
25-2	1950-51, 56	Q	6.50	9-14-50	8.69	10-3- 56	8.36	7-16	8.69	10- 3	
25-3	1950-56	Q	19.71	5- 3-50	26.32	12-19-56	25.76	7-16	26.32	12-19	
Cass County											
6S 16W 1-1	1949-56	W	+ 4.20	11-30-51	5.97	7-24-53	+ 3.61	3-16	2.72	9-14	
8S 14W 17-1	1945-56	W	46.20	7-16-50	55.03	3-10-47	49.44	7-15	50.78	12-30	
Charlevoix County											
33N 4W 2-1	1948-56	Q	70.85	7-19-52	75.85	4-16-56	74.40	10-24	75.85	4-16	
32N 4W 10-1	1934-41, 48-56	Q	1.19	3-30-38	5.85	10-24-56	2.90	4-16	5.85	10-24	
Cheboygan County											
34N 1W 1-1	1938-41, 48-52, 55-56	A	2.75	3-28-38	5.55	10-13-55					A - 5.08, 10-24-56
26-1	1935-44, 48-56	Q	3.90	3-28-38	7.45	10-13-55	5.87	4-16	7.26	10-24	
33N 1W 3-1	1935-44, 48-56	Q	3.99	8-12-42	7.63	10-24-56	5.90	4-16	7.63	10-24	
10-1	1935-41, 48-52, 55-56	A	1.98	3-28-38	7.84	10-13-55					A - 6.53, 10-24-56
33N 1E 23-1	1935-41, 48-52, 55-56	A	1.89	3-28-38	9.42	10-18-49					A - 8.08, 10-31-56
27-1	1939-44, 48-56	Q	1.72	4-28-54	5.21	10-18-49	2.06	4-13	3.61	1-27	
28-1	1935-41, 48-52, 55-56	A	0.95	3-28-38	4.51	10-13-55					A - 3.42, 10-24-56
Chippewa County											
46N 4W 24-1	1952-56	R	22.67	5-21-53	27.77	4-12-56	23.90	8-22	27.77	4-12	
Clinton County											
8N 1W 13-1	1947-56	Q	+ 3.78	6- 3-50	35.97	9-16-47	26.60	4-13	33.62	9-27	
13-3	1947-56	Q	8.3	4- 5-50	26.4	10-11-49	11.95	7-13	19.03	4-13	
6N 2W 16-1	1948-56	M	14.59	4-19-52	18.53	12-29-53	16.13	5-28	18.13	2-28	
5N 2W 32-1	1944-56	Q	42.02	9-14-44	75.82	12-20-56	73.37	5-28	75.82	12-20	
Crawford County											
28N 2W 30-1	1933, 35-37, 43-56	A	1.33	4-17-47	4.92	10-13-49					A - 4.47, 10-31-56
28N 1W 8-1	1934-56	A	4.16	4-18-52	8.78	3-10-36					A - 7.97, 10-31-56
20-1	1934-56	A	3.44	4-18-52	7.04	10-12-55					A - 6.69, 10-31-56

Table 2.--Extremes in ground-water levels in observation wells in Michigan.--Continued
(in feet below or above (+) land surface)

Well Designation Twp.Rg.Sec.-No.	Years of record	Frequency of measurement in 1956	Observed water-level extremes: Period of record: Highest	Date	Lowest	Date	1956: Highest	Date	Lowest	Date	Remarks
Crawford County - Continued											
27N 4W 2-1	1934-56	Q	3.84	4-17-47	7.08	3-14-51	5.25	4-17	6.71	10-24	
19-1	1949-56	A	14.43	5-14-52	17.59	12-14-49					A - 16.60, 11- 1-56
23-1	1939-56	A	10.91	7-11-43	14.49	10-24-56					A - 14.49, 10-24-56
27N 3W 15-1	1948-56	A	6.95	4-18-52	10.14	10-12-55					A - 10.07, 10-31-56
15-2	1948-56	A	1.32	4-18-52	4.20	10-12-55					A - 4.07, 10-31-56
27N 1W 4-1	1934-56	A	2.74	4-18-52	4.77	3-14-51					A - 4.38, 10-31-56
20-1	1934-56	A	1.55	7-11-43	5.92	10-12-55					A - 5.31, 10-31-56
22-1	1934-56	Q	3.51	4-18-52	6.38	1-27-56	4.50	4-13	6.38	1-27	
26N 4W 2-1	1955-56	Q	7.55	4-18-56	11.08	10-11-55	7.55	4-18	9.22	1-12	
5-1	1934-56	A	+ 0.35	4-18-52) 6-17-43)	4.63	9-25-35					A - 2.95, 11- 1-56
5-2	1934-56	A	2.31	6-17-43	7.21	10-11-55					A - 5.64, 11- 1-56
10-1	1934-56	A	2.04	6-17-43	8.42	10-11-55					A - 6.96, 11- 1-56
11-1	1942-56	R	4.03	6- 1-43	9.83	10- 3-55	6.33	10- 9	9.17	3- 1	
28-1	1949-56	Q	19.42	7- 1-54	22.39	7-23-49	20.93	4-18	21.66	11- 1	
26N 3W 8-1	1949-56	Q	2.62	4-18-52	3.44	10-13-49	2.91	4-19	3.14	11- 2	
12-1	1935-56	Q	4.04	3-21-38	9.39	2-15-51	8.04	8-21	9.21	1-27	
26N 2W 11-1	1935-56	A	0.77	6-13-39	2.54	7-23-40					A - 1.44, 10-31-56
25N 4W 7-2	1952-56	A	62.58	11-10-53	64.66	11- 2-56					A - 64.66, 11- 2-56
8-1	1952-56	A	55.36	11-12-52	57.48	11- 2-56					A - 57.48, 11- 2-56
21-1	1953-56	A	36.72	9- 9-53	38.66	11- 2-56					A - 38.66, 11- 2-56
25N 3W 28-1	1934-37, 39-56	Q	8.70	6-15-43	10.85	11-11-49) 2-15-51)	9.93	4-12	10.73	10-23	
25N 1W 15-1	1943-56	R	29.44	8- 4-53	35.97	4- 4-51	32.10	9-19	33.56	4- 9	
Dickinson County											
43N 29W 32-1	1948-56	M	5.12	4-18-51	dry	10-12-48	7.72	4-30	10.55	3-29	
42N 27W 33-1	1945-46, 48-56	M	3.08	4-29-54	10.75	10- 3-55	5.08	4-30	9.41	2-28	
41N 30W 25-1	1948-56	M	3.51	10-30-51	dry	10-3 to 12-30-55	9.24	8- 1	dry	Jan.-March	
25-2	1945-46, 48-56	M	2.61	10-30-51	14.40	3-29-56	6.73	8- 1	14.40	3-29	
25-3	1945-46, 48-56	M	1.73	7- 6-53	dry	Nov. 1948) - Apr. 1949)	4.91	7- 3	dry	2-28 - 3-29	
Eaton County											
4N 4W 2-1	1948-56	W	21.34	5- 5-50	28.79	12- 3-49	22.07	6- 4	27.31	2-20	
4N 3W 9-1	1944-56	Q	5.55	4-26-52	dry	2-23-54	10.60	7-11	15.12	12-21	
10-1	1944-56	M	31.28	5-27-48	37.78	2-28-56	36.51	5-28	37.78	2-28	
12-1	1953-56	R	67.51	11-23-53	78.10	8-19-55	69.20	5-14	75.26	6-15	
24-1	1944-56	Q	0.14	4-24-50	dry	12-12-55	19.23	4-10	dry	9-24) 12-20)	
2N 4W 19-1	1947-56	Q	8.04	4-7-47	15.77	1- 2-48	13.57	4-24	15.47	12-19	
Genesee County											
7N 7E 9-1	1946-56	Q	17.50	4-11-48	41.11	7- 6-56	25.71	4-13	41.11	7- 6	
17-1	1946-56	R	24.23	2-12-50	37.99	8-24-55	27.63	3- 7	34.41	8-18	
20-2	1947-56	Q	1.09	4-26-50	9.07	9-15-55	5.44	12-12	8.20	7- 6	
29-1	1946-56	Q	1.69	12-22-49	7.62	9-15-55	3.32	4-13	4.74	7- 6	
29-2	1946-56	M	+ 0.20	6-29-48	5.37	10-17-46	1.60	4-13	3.27	9-27	
32-1	1946-56	Q	18.51	6- 2-47	30.35	9-15-55	27.82	12-12	29.45	7- 6	
6N 7E 9-1	1952-56	R	37.79	11-24-52	52.9	8- 3-55	42.8	12-26	49.8	8- 3	
Gladwin County											
17N 1W 7-1	1950-56	D	28.90	5-14-56	49.35	6-26-50	28.90	5-14	46.95	6-15	
Grand Traverse County											
27N 9W 4-1	1934-37, 41-44, 48-52, 55-56	A	0.91	9-20-44	2.54	7-26-35					A - 1.34, 10-30-56
28-1	1934-37, 41-44, 48-52, 55-56	A	12.11	8- 6-43	dry	10-30-56					A - dry, 10-30-56
34-1	1934-37, 41-44, 48-52, 55-56	A	13.78	8- 6-43	dry	Jan, May) - Dec. 37)					A - dry, 10-30-56
35-1	1934-37, 41-44, 48-56	Q	11.76	10-7-53	15.62	9-10-37	13.85	1-12	14.26	10-30	
26N 11W 21-1	1936-37, 41-44, 48-52, 55-56	A	1.02	10-30-51	3.31	7-31-41					A - 2.02, 10-30-56
27-1	1935-37, 41-44, 48-56	Q	1.32	10-30-51	4.02	8-18-36	1.58	4-17	3.11	10-30	
26N 9W 13-1	1934-37 41-44, 48-56	Q	4.83	4-14-55	7.87	10-11-49	5.18	4-17	7.19	1-12	
25N 11W 2-1	1935-37, 43-44, 48-56	Q	1.51	4-22-54	6.40	11-14-35	1.71	4-17	5.73	1-12	
25N 10W 2-1	1936-37, 41-44, 48-56	Q	0.29	9- 3-42	1.68	7-1 -37	1.10	4-17	1.59	10-30	

Table 2.--Extremes in ground-water levels in observation wells in Michigan.--Continued
(in feet below or above (+) land surface)

Well Designation Typ.Rg.Sec.-No.	Years of record	Frequency of measurement in 1956	Observed water-level extremes: Period of record: Highest	Period of record: Date	Period of record: Lowest	Period of record: Date	1956: Highest	1956: Date	1956: Lowest	1956: Date	Remarks
Grand Traverse County - Continued											
25N 10W 8-1	1934-37, 41-44, 48-52, 55-56	A	0.22	10-30-51	2.43	8-27-37					A - 1.06, 10-30-56
25N 9W 23-1	1934-37, 41-44, 48-53, 55-56	A	3.23	5- 8-51	5.37	9-20-44					A - 4.05, 10-30-56
26-1	1934-37, 41-44, 48-53, 55-56	A	3.96	5- 9-52	7.63	1-24-49					A - 6.94, 10-30-56
34-1	1934-37, 41-44, 48-56	Q	10.86	8- 6-43	14.38	2-22-49	13.58	8-22	13.96	4-17	
Gratiot County											
12N 3W 33-1	1947-56	Q	8.88	6-10-47	13.63	11-28-49	11.72	7-10	13.26	12-17	
34-1	1947-56	Q	6.08	4-26-48	40.87	6-28-50	27.76	9-26	28.45	4-18	
34-2	1946-52, 54-56	A	4.47	3-23-48	9.39	8-23-46					A - 7.87, 9-26-56
34-3	1946-52, 54-56	Q	5.17	4-26-48	31.05	6-28-50	24.14	12-17	24.86	4-18	
34-4	1950-56	Q	21.41	4-28-50	dry	Feb. & April '50)	25.15	4-18	26.88	9-26	
34-5	1944, 47-50, 55-56	Q	19.94	5- 6-50	42.73	9-15-48	25.06	4-18) 7-10)	26.60	9-26	
35-1	1947-52, 54-56	A	10.60	5-17-48	12.95	9-26-56					A - 12.95, 9-26-56
35-2	1947-52, 54-56	A	4.72	6-10-47	11.98	12-22-54					A - 11.96, 9-26-56
35-3	1947-56	Q	10.07	5- 3-48	21.64	6-24-52	19.82	4-18	20.61	12-17	
35-4	1950-52, 54-56	A	4.36	4-27-51	9.56	9-26-56					A - 9.56, 9-26-56
35-5	1950-56	Q	13.74	4- 7-50	17.91	11-12-53	15.99	4-18	17.54	12-17	
11N 3W 2-2	1947-56	Q	25.0	4-29-48	72.5	8-26-50	62.65	7-10	65.36	12-17	
2-3	1946-52, 54-56	A	5.00	3-23-48	9.16	11-28-49					A - 8.08, 9-26-56
2-4	1947-56	Q	7.69	6-10-47	11.37	11-28-49	9.09	7- 9	10.92	12-17	
3-1	1946-56	Q	20.45	11- 6-47	67.62	8-14-53	35.54	12-17	44.96	9-26	
3-2	1955-56	Q	32.26	6-14-55	73.55	12-17-56	36.35	9-26	73.55	12-17	
3-4	1946-52, 54-56	A	16.76	4-12-48	33.22	7-26-51					A - 29.59, 9-26-56
3-5	1947-56	Q	24.35	4-26-48	45.79	9-14-55	42.47	4-18	44.89	12-17	
3-6	1946-56	Q	7.64	2-27-51	32.98	12-16-55	25.52	9-26	32.50	7-10	
4-1	1955-56	Q	12.06	6-14-55	18.58	9-26-56	12.93	4-18	18.58	9-26	
4-2	1955-56	Q	9.24	6-14-55	48.48	9-26-56	11.03	7-10	48.48	9-26	
5-1	1955-56	Q	11.01	7-10-56	13.46	9-26-56	11.01	7-10	13.46	9-26	
36-1	1947-56	Q	78.25	1-22-52	83.96	9- 4-49	80.25	4-18	80.66	9-26	
9N 3W 8-1	1947-56	Q	1.82	1-17-52	21.23	12-16-49	8.61	4-18	19.58	12-17	
Ingham County											
4N 2W 4-1	1953-56	R	25.98	3- 3-53	31.51	12-12-56	30.29	1- 9	31.51	12-12	
7-1	1944-56	M	53.94	11- 2-44	78.31	11-30-56	77.09	8-28	78.31	11-30	
9-1	1919, 1929-56	Q	15.63	3-26-31	154.77	4-10-56	142.84	12-21	154.77	4-10	
9-2	1945-56	Q	61.26	3-23-46	143.27	12-12-55	134.02	12-21	142.77	4-10	
16-1	1945-56	Q	42.01	3-11-46	67.0	8-22-49	58.62	4-10	59.85	12-27	
17-1	1929, 31, 33-56	Q	34.34	Dec. '29	149.64	4-11-56	143.41	12-21	149.64	4-11	
17-2	1946-56	Q	104.86	12-10-46	148.47	4-10-56	145.77	12-21	148.47	4-10	
19-1	1947-56	Q	0.00	3-29-50	4.68	12-20-56	3.55	5-28	4.68	12-20	
21-1	1906-56	Q	2.	5- 9-06	61.26	4-11-56	59.66	12-21	61.26	4-11	
22-1	1930-56	Q	7.1	July '32	47.36	12-21-56	36.96	7- 9	47.36	12-21	
22-2	1930-56	Q	12.65	July '32	60.73	9- 2-55	48.22	7- 9	56.74	12-21	
23-1	1930-32, 36-56	M	7.55	11-17-30	105.28	7-17-56	77.61	12-31	105.28	7-17	
24-1	1945-56	R	25.47	3-25-46	67.10	6-14-56	50.1	1- 4	67.10	6-14	
25-1	1944-50, 55-56	M	21.60	3-30-46	39.06	10-31-56	36.06	4-10	39.06	10-31	
28-1	1944-45, 48-56	Q	30.28	4-23-48	54.40	8-19-48	43.66	7- 9	49.75	9-24	
31-1	1944-56	M	18.92	4-26-52	24.77	2- 2-54	21.47	5-28	24.40	2-28	
4N 1W 16-1	1953-56	M	50.20	12-15-53	58.07	12- 5-56	52.93	1- 3	58.07	12- 5	
18-1	1952-56	Q	20.09	4-27-53	28.56	12-21-56	26.32	7- 9	28.56	12-21	
3N 2W 8-1	1950-56	Q	10.43	5- 1-50	15.22	11-24-53	11.63	5-28	14.82	12-21	
2N 1W 5-1	1948-56	W	0.08	6-29-49	7.37	9-17-55	1.25	5-14	4.79	7-14	
Iosco County											
23N 7E 7-1	1948-56	Q	25.13	8- 3-52	27.94	1- 3-50	25.88	1- 9	26.11	10-23	
Iron County											
46N 34W 14-1	1945-56	M	3.65	6- 2-54	8.60	3-15-49	5.76	4-30	7.74	3-29	
46N 33W 18-1	1948-56	M	2.80	4-18-49	dry	2-28-56	5.68	5-31	dry	2-28	
45N 37W 23-1	1948-56	M	0.75	8-31-51	4.72	9-11-48	1.27	5-31	2.74	9- 1	
45N 36W 23-1	1945-46, 48-56	M	5.71	5-31-56	23.21	5-16-49	5.71	5-31	19.93	11-30	
45N 35W 33-1	1948-56	M	1.93	7- 6-53	8.44	3-15-49	3.70	8- 1	6.18	3-29	
45N 33W 8-1	1945-56	M	23.39	10-30-51	32.16	3-15-49	26.50	9- 1	28.75	3-29	
10-1	1948-56	M	2.01	9-28-51	4.23	3-12-49	2.73	4-30	3.44	8- 1	
44N 35W 6-1	1948-56	M	+ 0.10	5- 2-51	2.26	11-15-48	1.16	7- 3	1.88	9- 1	
6-2	1948-56	M	5.08	7- 6-53	8.92	11-15-48	7.30	4-30	8.45	11- 1	
6-3	1948-56	M	4.03	7- 6-53	9.20	11-15-48	7.02	4-30	8.70	11- 1	

Table 2.--Extremes in ground-water levels in observation wells in Michigan.--Continued
(in feet below or above (+) land surface)

Well Designation Twp. Rg. Sec.-No.	Years of record	Frequency of measurement in 1956	Observed water-level extremes: Period of record Highest	Date	Lowest	Date	1956 Highest	Date	Lowest	Date	Remarks
Iron County - Continued											
44N 35W 7-1	1948-56	M	1.12	5- 2-51	3.51	9-14-49	2.46	7- 3	3.30	9- 1	
7-2	1948-56	M	2.50	7- 6-53	9.44	10-26-48	4.23	4-30	5.13	11- 1	
7-3	1948-56	M	8.48	5- 2-51	13.40	10-26-48	11.50	4-30	12.60	11- 1	
44N 33W 10-1	1948-56	M	1.95	4-29-54	7.94	1-12-51) 12-29-52)	3.19	4-30	7.03	2-28	
43N 36W 1-1	1948-56	M	6.67	4-29-54	9.02	6-30-52	7.87	5-31	8.74	8- 1	
1-2	1945-56	M	42.17	4-11-52	48.68	11-23-48	44.02	7-25	45.50	3-21	
43N 35W 11-1	1945-56	M	39.33	1-11-52	47.08	8-15-49	41.92	1-30	43.07	8- 1	
13-1	1945-56	M	47.90	9-11-46	63.68	11-30-46	53.73	10-23	54.70	6-25	
13-2	1945, 47-56	M	66.39	1-14-52	71.56	3-24-49	68.50	11-20	69.44	3-21	
20-1	1945-56	M	41.66	6-20-53	48.29	8-15-49	44.10	8- 1	44.96	6-25	
22-1	1945, 47-56	M	118.82	9-16-53	132.37	1-19-49	127.61	8-23	131.29	3-21	
24-1	1945-56	M	70.42	11-20-56	86.05	1-19-49	70.42	11-20	71.16	4-25	
26-1	1945-56	M	25.30	9-24-45	44.58	3-24-50	30.45	9-26	34.41	3-21	
43N 34W 19-1	1945-56	M	63.37	12-20-56	89.5	10-20-45	63.37	12-20	64.60	3-21	
19-2	1945-56	M	69.35	12-20-56	84.10	12-21-48	69.35	12-20	70.29	3-21	
29-1	1947-53, 56	M	10.31	8-15-53	20.69	3-24-50	13.07	5-28	15.01	12-20	
43N 32W 26-2	1952-56	M	1.04	5-12-55	86.03	3-18-53	6.08	7-25	9.77	12-20	
42N 36W 15-1	1948-56	M	0.81	4-29-54	3.17	10-26-48	1.84	5-31	2.84	11- 1	
15-2	1948-56	M	0.46	7- 6-53	3.10	10-26-48	1.26	4-30	2.59	11- 1	
15-3	1948-56	M	3.67	4-29-54	8.29	10-26-48	5.57	7- 3	7.32	11- 1	
42N 34W 7-1	1945-56	M	132.24	8-23-56	153.27	4-21-50	132.24	8-23	133.84	7-25	
42N 31W 33-1	1948-56	M	+ 0.03	7- 3-56	6.28	10-13-48	+ 0.03	7- 3	4.50	2-28	
33-2	1945-56	M	1.89	10-30-51	12.22	2-25-53	4.40	8- 1	11.51	3-29	
41N 31W 10-1	1948-56	M	8.47	1- 3-52	dry	In 1948; '49, '52)	10.40	8- 1	15.79	4-30	
Kalamazoo County											
2S 11W 3-29	1953-56	W	18.85	3- 7-55	24.60	7-27-53	20.41	5-21	23.60	7- 2	Measurements discontinued 7-9-56
3-37	1946-56	Q	9.49	4-18-50	14.90	10- 4-56	12.68	4-25	14.90	10- 4	
3-60	1956	W	--	--	--	--	10.48	7-17	12.04	10-15	Measurements begun 7-16-56
15-18	1946-56	Q	9.20	3-28-50	15.40	8-23-56	12.95	8-23	15.40	12-19	
15-31	1946-56	Q	18.55	5-22-50	25.85	2-24-54	24.99	10- 4	25.85	12-20	
15-33	1946-56	Q	13.64	4-18-50	20.95	2-24-54	17.90	7-17	20.94	12-20	
20- 7	1946-56	Q	33.44	6-19-50	36.43	12- 5-46	35.34	7-17	36.06	12-19	
22- 6	1946-56	R	11.22	3-11-52	29.36	8- 9-46	17.17	1- 3	23.56	8-31	
22-102	1946-56	Q	13.98	5- 3-50	27.42	12- 5-46	21.62	7-17	26.18	10- 4	
26- 3	1947-56	Q	3.63	4-26-50	11.14	11- 6-53	8.06	7-17	9.48	10- 4	
27-52	1946-56	R	34.46	5- 5-50	64.37	9- 1-46	40.27	1- 2	43.94	11- 9	
29- 3	1946-56	Q	26.12	8- 1-52	29.88	8- 6-53	28.15	7-17	29.08	12-19	
4S 11W 13-1	1946-56	W	+ 2.08	4- 7-47	10.15	9- 9-46	+ 0.62	5-19	5.88	9-15	
13-2	1946-56	W	+ 0.55	7- 8-50	9.72	9-14-46	1.67	7- 6	7.71	8-25	
27-1	1953-56	W	12.94	7-12-56	15.22	1-20-54	12.94	7-12	14.84	12-27	
Kalkaska County											
28N 5W 35-1	1949-56	Q	8.62	4-16-53	11.77	12-14-49	10.46	8-22	11.64	1-12	
27N 5W 27-1	1942-56	A	12.50	7-11-43	17.22	1-23-50					A - 16.86, 10-30-56
36-1	1939-56	Q	11.12	7-11-43	14.69	3-12-40	13.47	4-17	14.36	1- 9	
Kent County											
6N 12W 17-1	1950-56	W	6.88	6- 8-56	16.45	2-12-54	6.88	6- 8	13.82	2- 3	
17-2	1950-56	W	7.34	6- 1-56	16.32	2-12-54	7.34	6- 1	13.70	2-10	
17-3	1950-56	W	7.14	6- 1-56	15.87	2-12-54	7.14	6- 1	13.32	1-20	
17-4	1950-56	W	7.80	6- 1-56	16.81	2-12-54	7.80	6- 1	14.14	12-28	
17-5	1950-56	W	13.30	6- 1-56	22.22	2-12-54	13.30	6- 1	19.52	12-28	
Mackinac County											
42N 2W 7-1	1956	R	--	--	--	--	16.56	7-15	28.0	10-25	Measurements begun 6-7-56
41N 5W 23-1	1956	R	--	--	--	--	13.93	12-14	15.51	11-15	Measurements begun 10-18-56
Marquette County											
49N 30W 22-1	1948-56	M	0.64	5- 3-51	13.32	9- 2-48	6.79	4-30	10.81	11- 1	
45N 30W 1-1	1945-56	M	24.38	12-13-56	29.28	3-15-49	25.71	10- 1	26.92	4-30	
44N 26W 28-1	1953-56	M	2.05	5-10-54	2.64	8-30-55	2.17	4- 6	2.53	11- 2	

Table 2.--Extremes in ground-water levels in observation wells in Michigan.--Continued
(in feet below or above (+) land surface)

Well Designation Twp. Rg.Sec.-No.	Years of record	Frequency of measurement in 1956	Observed water-level extremes								Remarks
			Period of record				1956				
			Highest	Date	Lowest	Date	Highest	Date	Lowest	Date	
Mason County											
17N 15W 3-1	1948-56	Q	14.44	5-15-52	18.50	3- 1-51	~~17.20~~ ~~17.20~~	4-18	~~18.47~~	1-11	
Montcalm County											
9N 8W 15-1	1950-56	W	11.40	4- 1-50	17.36	8- 3-55	13.16	5-16	16.96	6-13	
Montmorency County											
32N 2E 34-1	1948-56	Q	17.41	5-15-52	20.97	8-17-49	20.07	4-13	20.62	10-31	
31N 2E 11-1	1934-56	Q	7.40	3-29-38) 4-21-52)	dry	10-27-39	9.94	4-13	11.89	1-27	
14-1	1948-56	A	11.79	5-15-52	14.81	~~10-31-56~~					A - 14.81, 10-31-56
31N 3E 9-1	1936-44, 48-56	Q	2.85	4-21-52	7.76	12-15-49	6.00	4-13	7.82	1-27	
31N 4E 8-1	1935-53, 55-56	A	0.06	6-19-51	4.84	9- 4-36					A - 2.13, 10-31-56
34-1	1935-37, 46-53, 55-56	A	0.02	4-15-36	1.05	7-17-50					A - 0.77, 10-31-56
30N 2E 6-1	1945-53, 55-56	A	+ 0.55	6-19-51	3.98	12-15-49					A - 0.81, 10-31-56
30N 4E 26-1	1935-37, 45-56	Q	+ 0.78	7- 2-45	2.33	9-23-48	0.04	4-13	1.34	1-27	
29N 2E 22-1	1948-53, 56	Q	+11.39	4-19-56	4.95	1-29-49	+ 11.39	4-19	+ 9.68	10-31	
27-1	1945-53, 55-56	A	+ 1.20	4-18-46) 6- 1-46)	1.98	9-27-49					A - 1.17, 10-31-56
29N 3E 21-1	1945-56	Q	2.63	5-15-52	5.91	1-27-56	4.65	8-21	5.91	1-27	
29N 4E 5-1	1945-53, 55-56	A	2.75	3-18-53	dry	11- 1-46					A - 8.76, 10-31-56
Oakland County											
3N 10E 31-1	1952-56	R	109.2	1- 5-53	128.0	8- 6-55	111.0	12-25	120.3	1-13	
32-1	1939-56	R	59.55	4-22-40	129.5	8- 5-55	110.9	12-25	121.1	1-13	
2N 10E 22-1	1950-56	W	11.00	4-30-56	17.60	9-26-55	11.00	4-30	17.05	2-20	
Ogemaw County											
23N 1E 4-1	1934, 55-56	Q	~~1.97~~ ~~5-18-55~~ ~~2.89~~ ~~5-12-56~~		4.26	10-10-55	~~2.04~~ ~~2.89~~	4-12	~~4.20~~ ~~5.29~~	~~1-9~~ ~~12-23~~	
17-1	1934, 55-56	A	4.34	5-19-55	7.04	10-10-55					A - 6.89, 10-23-56
23N 2E 2-1	1951-56	Q	0.37	5- 5-52	3.45	1- 9-56	1.70	4-12	3.45	1- 9	
Otsego County											
29N 3W 29-1	1933-56	Q	5.56	5-14-47	9.68	9-16-41	7.27	4-16	8.88	10-24	
32-1	1935-56	A	0.67	4-17-47	4.59	8-26-41					A - 3.92, 10-24-56
Presque Isle County											
33N 2E 18-1	1933-44, 48-52, 55-56	A	2.05	3-29-38	5.74	10-18-49					A - 4.72, 10-31-56
29-1	1934-44, 48-52, 55-56	A	6.87	3-29-38	9.79	10-18-49					A - 9.34, 10-31-56
30-1	1934-44, 48-56	Q	1.80	5-23-38	5.69	1-27-56	3.53	8-21	5.69	1-27	
32-1	1934-44, 48-52, 55-56	A	5.86	3-29-38	10.58	10-18-49					A - 9.06, 10-31-56
Roscommon County											
24N 3W 3-1	1934-56	A	10.20	7- 7-54	13.26	12-14-49					A - 12.67, 10-23-56
24-1	1934-56	Q	5.95	7- 9-43	11.62	12-13-49	9.50	4-12	10.61	1- 9	
24N 2W 1-1	1934-56	A	6.68	4-17-52	11.53	12-14-49					A - 9.16, 10-23-56
7-1	1934-56	A	5.18	7- 7-54	8.62	9-17-45					A - 7.61, 10-23-56
19-1	1934-56	A	1.15	6-15-43	6.05	11-11-49					A - 5.29, 11- 1-56
20-1	1934-56	R	2.78	5- 3-51	6.23	12- 6-49	4.31	4-15	6.08	2-23	
21-1	1939-56	A	1.98	4-17-52	8.07	12-13-49					A - 6.28, 11- 1-56
24N 1W 34-1	1934-56	Q	14.40	6-15-43	dry	11- 6-39) 5- 2-40)	16.38	8-20	17.33	1- 9	
23N 3W 12-1	1938-56	A	5.21	6-15-43	10.15	8-16-54					A - 9.23, 11- 1-56
25-1	1934-56	Q	3.44	4-17-52	6.76	8-14-36	4.12	4-12	5.94	11- 1	
23N 2W 31-1	1949-56	A	1.55	4-17-52	4.78	10-11-55					A - 3.63, 11- 1-56
23N 1W 3-1	1939-56	Q	1.62	6-15-43	7.31	12-14-49	3.93	4-12	5.90	1- 9	
22N 4W 15-1	1934-46, 48-56	A	1.29	11-16-45	5.29	9-20-54					A - 3.66, 11- 1-56
22N 3W 22-1	1934-56	Q	3.25	4-17-52	8.25	12-13-49	5.71	4-12	7.48	1- 9	
34-1	1934-37, 39-56	A	2.54	6-15-43	8.45	12-13-49					A - 5.82, 11- 1-56
22N 2W 14-1	1934-56	A	2.93	10-14-41	7.35	10-14-48					A - 5.47, 10-23-56
17-1	1934-56	Q	1.34	4- 1-38	5.38	11- 9-49	2.18	4-12	4.56	1- 9	
22N 1W 11-1	1934-56	A	1.10	6-15-43	6.22	11-11-49					A - 4.37, 10-23-56

Table 2.--Extremes in ground-water levels in observation wells in Michigan.--Continued
(in feet below or above (+) land surface)

Well Designation Twp.Rg.Sec.-No.	Years of record	Frequency of measurement in 1956	Observed water-level extremes								Remarks
			Period of record				1956				
			Highest	Date	Lowest	Date	Highest	Date	Lowest	Date	
Roscommon County - Continued											
21N 4W 4-1	1939-56	A	1.28	4-21-41	7.14	10-12-49					A - 5.31, 11- 1-56
13-1	1935-56	A	1.54	6-16-45	5.95	10-14-48					A - 4.23, 11- 1-56
21N 3W 2-1	1936-56	A	11.96	7- 9-43	15.98	4- 2-40					A - 14.58, 11- 1-56
5-1	1934-56	Q	9.61	6-15-43	11.81	11-11-49	10.29	4-12	11.15	11- 1	
Saginaw County											
9N 3E 16-1	1950-56	W	39.66	11-23-51	dry	summers	51.74	12-24	dry	summer	Often dry in summer
St. Joseph County											
6S 11W 18-1	1939-56	W	+ 2.90	5-22-53) 6-12-53)	5.70	9-27-47	+ 1.58	5-18	2.60	9-14	
Sanilac County											
12N 13E 33-1	1948-56	W	15.45	4-25-51	23.42	2- 1-56	17.54	5-23	23.42	2- 1	
Schoolcraft County											
45N 13W 16-1	1952-56	R	5.09	4-12-54	6.28	9-26-55	5.49	12-27	5.91	11- 5	
Shiawassee County											
5N 2E 16-1	1948-56	Q	17.28	5- 3-50	21.10	10-30-53	18.48	7-13	20.31	12-12	
Washtenaw County											
3S 6E 16-1	1920-56	W	e/ + 2.5	2- -30	e/ 10.0	11- -27	e/ + 0.6	5-16	5.19	10-20	e/ estimated
16-2	1948-56	W	+ 2.00	6-30-51	15.31	8-30-53	0.83	5-30	10.80	9-20	
3S 7E 24-1	1943-45, 49-56	M	5.79	1- 5-50	16.43	10-16-56	13.70	7-17	16.43	10-16	
24-2	1943-45, 49-56	M	11.81	7-13-43	30.46	10-16-56	25.12	7-17	30.46	10-16	
24-4	1943-45, 49-56	M	11.55	1- 5-50	31.68	10-16-56	26.55	7-17	31.68	10-16	
24-5	1943-45, 49-56	M	15.15	6- 6-45	34.12	12-17-56	23.12	6- 1	34.12	12-17	
24-6	1944-45, 49-56	M	5.69	2-15-50	25.87	8- 2-56	20.28	7-17	25.87	8- 2	
24-7	1955-56	M	23.47	12-29-55	36.05	10-16-56	34.59	6- 1	36.05	10-16	
4S 6E 9-1	1946-56	W	51.22	5-15-48	88.14	6-17-49	75.92	12-28	78.09	3-23	
10-1	1946-56	W	61.48	6-12-53	88.27	7- 8-55	66.18	6- 1	83.77	8-31	
Wexford County											
24N 10W 22-1	1935-37, 41-44, 48-52, 55-56	A	1.40	8- 6-43	3.88	10-30-56					A - 3.88, 10-30-56
26-1	1935-37, 44, 48-52, 55-56	A	0.99	3-27-36	3.15	10-30-56					A - 3.15, 10-30-56
28-1	1935-37, 41-44, 48-56	Q	5.20	8- 6-43	9.36	1-11-56	8.07	4-17	9.36	1-11	
36-1	1935-37, 41-44, 48-52, 55-56	A	2.70	3-27-36	5.63	8-19-36					A - 4.85, 10-30-56
24N 9W 19-1	1935-37, 41-44, 49-56	Q	0.94	4-10-51	3.74	8-19-36	1.24	4-17	1.99	10-30	
27-1	1935-37, 41-44, 49-53, 55-56	A	0.00	3-21-50	dry	1-10-49) 10-30-56)					A - dry , 10-30-56
21N 11W 13-1	1948-56	Q	46.28	6- 5-52	49.78	4-18-56	48.73	10-25	49.78	4-18	
21N 9W 4-1	1949-56	Q	19.99	7- 6-53	23.24	2-14-51	21.01	1-11	21.96	10-30	