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Water-Level Trends and Pumpage in the Cambrian and Ordovician Aquifers in the Chicago Region, 1980-1985

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SUMMARY

This report considers pumpage and water-level changes from 1980 through 1985 in deep sandstone wells penetrating the Cambrian and Ordovician aquifer system in northeastern Illinois, the most highly developed aquifer system for large ground-water supplies in Illinois. The term "Cambrian and Ordovician aquifer system" is an unofficial designation for the "Cambrian-Ordovician Aquifer" in northeastern Illinois that has been described in previous reports. Its usage in this report is for convenience only, since formal names of hydrostratigraphic units in Illinois are in the process of change to reduce confusion with rock stratigraphic terminology (Visocky et al., 1985). The Cambrian and Ordovician aquifer system is encountered at depths ranging from less than 300 feet in areas of central northern Illinois to an average of about 500 feet below land surface at Chicago. The aquifer system has an average thickness of 1000 feet and is composed chiefly of sandstones and dolomites: most of the water is obtained from the sandstones. In this report, emphasis has been given to eight counties of the Chicago metropolitan area.

Pumpage from deep wells for public and self-supplied industrial supplies in the Chicago region increased from 200,000 gallons per day (gpd) in 1864 to 175.9 million gallons per day (mgd) in 1980 and by 1985 declined to 157.7 mgd. Peak pumpage of 182.9 mgd occurred in 1979. As a result of the pumpage, artesian pressure in the Cambrian and Ordovician aquifer system declined more than 850 feet in Chicago. Pumpage from deep wells in the Chicago region is concentrated in northwestern and western Cook County, eastern Du Page and eastern Kane Counties, and around Joliet in northwestern Will County. Heavy pumpage from deep wells outside the Chicago region occurs at Rockford in southeastern Winnebago County, Belvidere in south central Boone County, De Kalb-Sycamore in central De Kalb County, Rochelle in southeastern Ogle County, and Ottawa-Peru in central and west central La Salle County. Numerous other municipalities and self-supplied industries throughout northeastern Illinois pump small to large quantities of water from deep wells.

During the period from October 1980 through December 1985, pumpage from deep wells in the Chicago region decreased from 175.9 mgd to 157.7 mgd, a decrease of 18.2 mgd or 10.3 percent. This is the first time that there has been an extended period of decreased pumpage from deep wells in the area since the post-depression pre-World War II period. Changes in pumpage primarily reflect the transition from use of deep wells to water from Lake Michigan for public and industrial supplies, decreasing use of deep wells by self-supplied industries, and use of Fox River water to supplement the public water supply at Elgin in northeastern Kane County.

As a result of this transition, water levels in deep wells in some areas of the Chicago region have risen during the period. However, throughout most of the area, and for the region as a whole, the average trend continues downward, because total deep well pumpage continues to exceed the sustained yield. Average annual water-level changes during the 5-year period varied from a rise of approximately 2 feet in Will

County to a decline of 9 feet in Du Page County and averaged a decline of about 3 feet. This is the lowest average decline since detailed records began in the 1950s.

Withdrawals for the 1980-1985 period within the Chicago region continued to exceed the practical sustained yield of the Cambrian and Ordovician aquifer system, as they have each year since before 1950, with the result that ground-water users continue to mine water and to borrow water from future generations. By the end of 1985, the upper and some of the middle units of the aquifer system had already been dewatered in many areas, with some pumping levels exceeding 1000 feet. In spite of the recent decrease in deep well pumpage, withdrawals continue to exceed the practical sustained yield by a ratio of more than 2 to 1. Continued heavy withdrawals and declining water levels are major factors in the acute concern regarding the capability of the aquifers to continue to provide a significant share of the water supply for northeastern Illinois.

INTRODUCTION

In May 1959, the State Water Survey and State Geological Survey published Cooperative Ground-Water Report 1 (Suter et al., 1959), which discussed the geology and hydrology of the ground-water resources of the Chicago region, the yields of aquifers, and the possible consequences of future ground-water development. Special emphasis was placed on the deep aquifers which have been most widely used for large ground-water supplies. Cooperative Report 1 indicated that pumpage from deep wells during 1958 approached the amount that could be continuously withdrawn without eventually dewatering the most productive formation of the deep aquifers. Future (1958-1980) water-level declines were predicted, ranging from 190 feet at Elgin to 300 feet at Chicago and Des Plaines. It was recognized that actual water-level declines would vary from the predicted declines if future distribution and rates of pumpage deviated from extrapolations of past ground-water use.

In 1959, as a result of the findings of Cooperative Report 1, the State Water Survey's program of collecting and reporting water-level and pumpage data for deep wells in the Chicago region was expanded. The objectives of the program were: 1) to provide long-term continuous records of pumpage and water-level fluctuations, 2) to delineate problem areas, and 3) to report hydrologic information to facilitate the planning and development of water resources of the Cambrian and Ordovician aquifer system in the Chicago region. The importance of the program has increased during the years because of the increasing demands for water and the continuing decline of ground-water levels.

Seven reports on water levels and pumpage from deep wells have been issued by the State Water Survey since the publication of Cooperative Report 1. These are: Circular 79 (Walton et al., 1960), and Circulars 83, 85, 94, 113, 125, and 154 (Sasman et al., 1961, 1962, 1967, 1973, 1977, and 1982, respectively). These reports summarized data for 1959, 1960, 1961, 1962-1966, 1966-1971, 1971-1975, and 1975-

1980, respectively. In addition, Reports of Investigation 50 (Sasman, 1965) and 52 (Sasman and Baker, 1966) summarized data on ground-water pumpage in 17 counties of northern Illinois through 1961 and 1963, respectively. Report of Investigation 73 (Sasman et al., 1974) discussed ground-water pumpage in 20 counties of northern Illinois during the period 1960-1970. Report of Investigation 83 (Schicht et al., 1976) and Report of Investigation 97 (Singh and Adams, 1980) described the available ground-water and surface-water resources for the Chicago region, predicted water shortages depending on various water use schemes, and offered alternatives for meeting projected water supply needs to the year 2010. State Water Survey Contract Report 292 (Visocky, 1982) described the impact of additional withdrawal of water from Lake Michigan on deep-well pumpage and water-level trends. Cooperative Ground-Water Report 10 (Visocky et al., 1985) provides a current hydrogeologic evaluation of the water resources of the Cambrian and Ordovician aquifer system.

In response to the increasing expansion of urban development, the outward migration of deepening water levels, the increasing use of lake water for public supplies, and increasing interest in regional water resources development, this report provides a detailed discussion of ground-water withdrawals and water-level trends in 14 counties of northeastern Illinois. Particular emphasis has been given to the 8 counties of the Chicago region because of the continuing heavy pumpage from the Cambrian and Ordovician aquifer system and the changes in water levels as they are influenced both by increasing ground-water withdrawals in some areas and decreasing withdrawals in other areas.

In this report, pumpage for public use includes use by municipalities, subdivisions, mobile home parks, and institutions. No attempt has been made to determine the final use of water within these categories. Available records indicate that 86 municipalities and 41 subdivisions, mobile home parks, and institutions obtained water from deep wells in 1985.

Pumpage for self-supplied industries includes only pumpage from wells owned and operated by the industries. For convenience, country clubs are included in this category in this report. Records indicate that at least 99 self-supplied industries in the Chicago region used deep wells and 24 self-supplied industries in northeastern Illinois outside the Chicago region used deep wells during the period 1980-1985.

Pumpage from deep wells for individual domestic and rural residences or farm supplies is not included in this report, since there are very few such wells for these uses in the Chicago region and total estimated pumpage for these uses in northeastern Illinois is extremely limited.

Water-level measurements in deep wells are obtained by a variety of methods and under a wide range of operating conditions and reliability. A few wells are open holes and can be measured very accurately. However, most wells are equipped with pumps that limit or prevent access for measuring water levels. Water levels are affected by pumpage of the well to be measured or by pumpage of adjacent wells.

The reliability of the water-level-measuring equipment and the experience of the person taking the measurement are also important considerations.

The eight counties of the Chicago region, with the abbreviations used in this report, are

Cook	COK	Kendall	KEN
Du Page	DUP	Lake	LKE
Grundy	GRY	Mc Henry	MCH
Kane	KNE	Will	WIL

The six northern counties outside the Chicago region included in this report are:

Boone	BNE	La Salle	LAS
De Kalb	DEK	Ogle	OGL
Kankakee	KNK	Winnebago	WIN

Acknowledgments

The authors wish to acknowledge the numerous individuals and organizations who have generously contributed information incorporated in this report. Operators of more than 75 percent of the public and self-supplied industrial water supply systems reported their annual pumpage in response to mailed questionnaires. Water-level data were largely obtained in visits of Illinois State Water Survey personnel to system operators. Numerous water levels, well construction records, and pump depth and capacity records were obtained from well contractors and consulting engineers. Paul Jahn assisted with the collection of 1985 water-level data, and Judy Mead assisted with the tabulation of much of the pumpage and water-level data and with the preparation of numerous drafts of the text. Special acknowledgment goes to Adrian Visocky, of the Water Survey Ground-Water Section, and Ellis Sanderson, Head of the Ground-Water Section, for their valuable review and suggestions during the preparation of the report. Editorial and graphics support was furnished by the Water Survey's Communications Unit, under the supervision of Loreena Ivens; Pamela Lovett prepared the camera copy. The Illinois Department of Transportation, Division of Water Resources, provided significant financial support to the preparation of this report. Their interest and support of water resource investigations in northeastern Illinois is gratefully acknowledged.

GEOLOGY AND HYDROLOGY

Ground-water resources in the Chicago region are developed from three aquifer systems: 1) sand and gravel deposits of the glacial drift, 2) shallow dolomite formations mainly of Silurian age, and 3) sandstone aquifers of Cambrian and Ordovician age, of which the Ironton-Galesville Sandstone is the most productive formation. The

sequence, structure, and general characteristics of these rocks are shown in figures 1 and 2.

The Glenwood and St. Peter units of the Ancell Group are present throughout northeastern Illinois and frequently exceed 200 feet in thickness. The sandstones of this formation are the primary water-yielding units. In some sections of central northern Illinois, these sandstones are immediately below the glacial drift. The majority of public and industrial wells finished in the Glenwood-St. Peter in the Chicago region produce less than about 200 gallons per minute (gpm). In the central part of northern Illinois, the Glenwood-St. Peter yields several hundred gpm to wells and is the primary source of ground water for some municipal and industrial supplies.

The Prairie du Chien, Eminence-Potosi, and Franconia Formations underlie the St. Peter sandstone and are present throughout much of northern Illinois, although the upper units have been eroded extensively in the north. In some areas, these formations provide significant amounts of water to wells tapping the Cambrian and Ordovician aquifer system.

The Ironton-Galesville Sandstone underlies the Franconia Formation and overlies the Eau Claire Formation. It occurs throughout northeastern Illinois, and on a regional basis is the most consistently permeable and productive unit of the Cambrian and Ordovician aquifer system. Most of the high capacity deep sandstone municipal and industrial wells in the Chicago region obtain a major part of their yields from this aquifer.

Supplemental yields are obtained from wells penetrating the Elmhurst-Mt. Simon aquifer, particularly in parts of northwestern Cook County and eastern Kane County, in the Chicago region, and farther west in Lee, Ogle, and Winnebago Counties. A major problem with the Elmhurst-Mt. Simon aquifer is the possibility of obtaining water with high concentrations of chlorides. Generally in the Chicago region, water below an elevation of about 1300 feet below sea level is commonly too salty for municipal or industrial use. Overpumping of the Cambrian and Ordovician aquifer system has resulted in degradation of the water quality in some areas by inducing upward migration of highly mineralized water from the deeper sections of the Elmhurst-Mt. Simon aquifer. There is evidence of this degradation where the deepest cones of depression have been created in the potentiometric surface of the Cambrian and Ordovician aquifer system. The potentiometric surface of the Ironton-Galesville aquifer is lower than that of the Elmhurst-Mt. Simon aquifer, causing upconing of the poorer quality water. Numerous wells in Cook, Du Page, and Kane Counties, originally drilled into the Elmhurst-Mt. Simon aquifer, have been plugged above these formations to obtain water of better quality. Additional study is necessary to determine recommended depth limits, yield characteristics, and plugging methods for wells penetrating this formation.

The primary source of recharge to the sandstone aquifers is precipitation percolating through the glacial deposits where the Galena-Platteville dolomite or older rocks are the uppermost bedrock

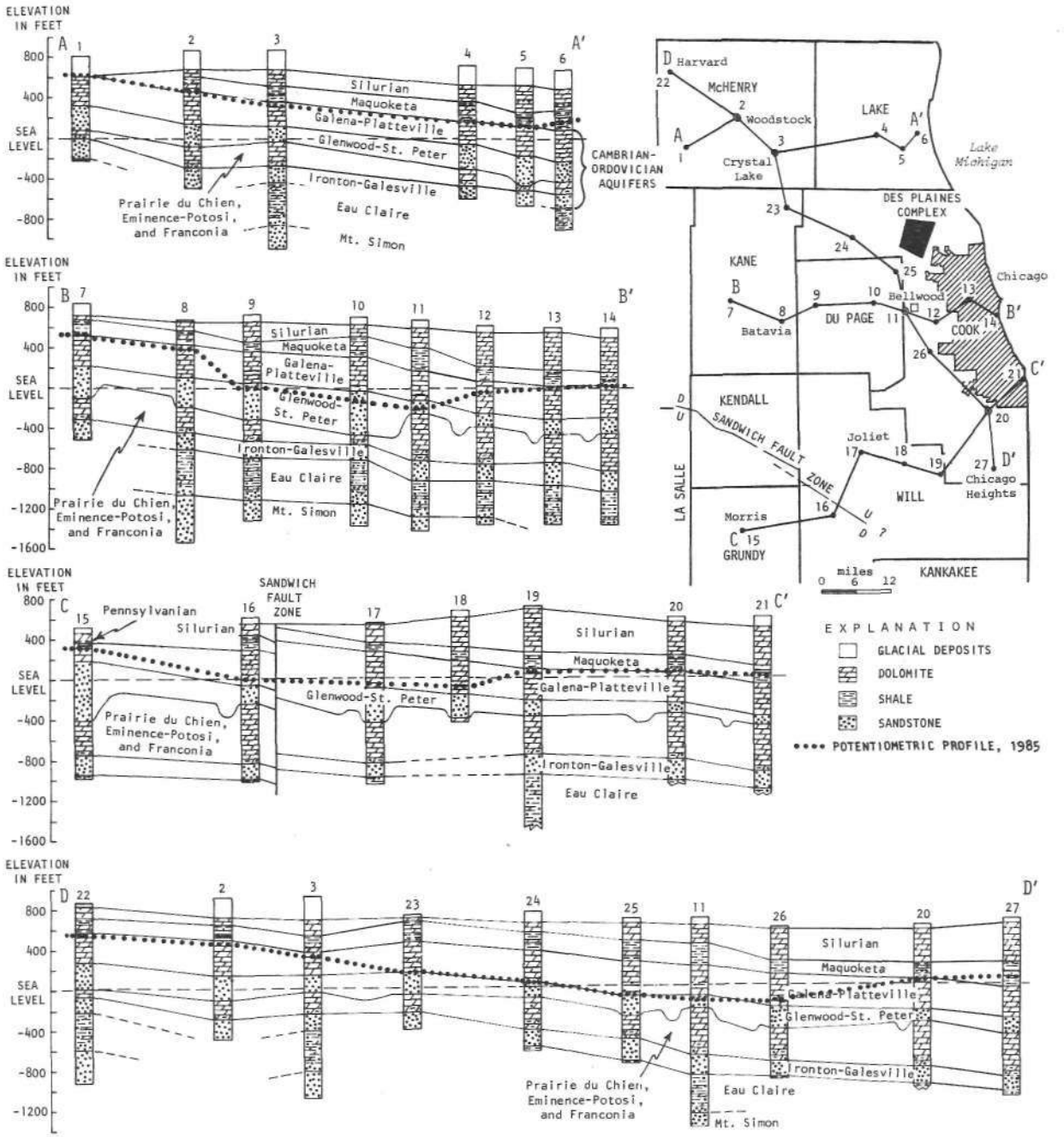
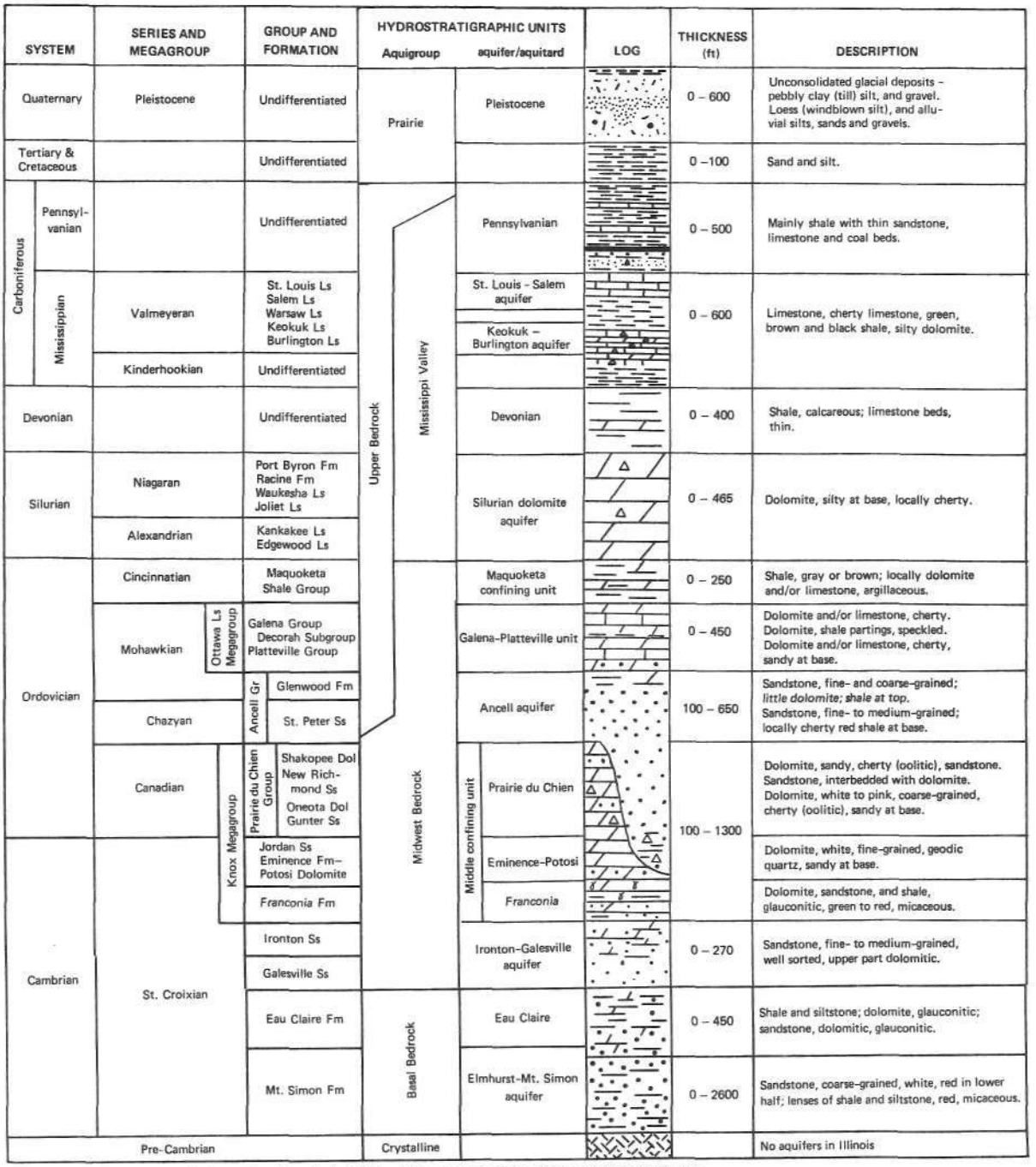


Figure 1. Cross sections of the structure and stratigraphy of the bedrock and potentiometric profile of the Cambrian and Ordovician aquifers in the Chicago region *(after Cooperative Ground-Water Report 1)*



Note: The rock-stratigraphic and hydrostratigraphic-unit classifications follow the usage of the Illinois State Geological Survey.

Figure 2. Stratigraphy and water-yielding properties of the rocks and character of the ground water in northeastern Illinois *(after Cooperative Ground-water Report 10)*

DRILLING AND CASING CONDITIONS	WATER-YIELDING PROPERTIES	CHEMICAL QUALITY OF WATER	WATER TEM-PERATURE °F
Boulders, heaving sand locally: sand and gravel wells usually require screens and development; casing in wells into bedrock.	Sand and gravel, permeable. Locally, wells yield as much as 3000 gpm. Specific capacities vary from about 0.1 to 5600 gpm/ft.	TDS generally between 400 and 600 mg/L. Hardness 300-400 mg/L. Iron generally 1-5 mg/L.	50-64
Shale requires casing.	Extremely variable. Sandstone and limestone units generally yield less than 10 gpm.	TDS extremely variable regionally and with depth. Morth-central Illinois, 500-1500 mg/L; southern, 500-3000 mg/L. Hardness: 150-400 mg/L north; 150-1000 mg/L south. Iron generally 1-5 mg/L.	53-57
	In southern two-thirds of state yields generally less than 25 gpm.	TDS ranges between 400 and 1000 mg/L. Hardness is generally between 200 and 400 mg/L. Iron: 0.3-1.0 mg/L.	53 - 59
Upper part usually weathered and broken; crevicing varies widely.	Yields inconsistent. Major aquifer in NE and NW Illinois. Yields in fractured zones more than 1000 gpm.	TDS: 350-1000 mg/L; Hardness: 200-400 mg/L; Iron: 0.3-1.0 mg/L.	52-54
Shale requires casing.	Shales generally not water yielding. Crevices in dolomite units yield small local supplies.		
Crevicing commonly where formations underlie drift. Top of Galena usually selected for hole reduction and seating of casing.	Where overlain by shales, crevicing and well yields small. Where overlain by drift wells yield moderate quantities of water.	For Midwest Bedrock Aquigroup as a whole, TDS ranges from 400 to 1400 mg/L in NW and up to 2000 mg/L in south. Hardness ranges from 175 mg/L in northern recharge areas to 600 mg/L in E. Cook and S. Fulton Counties. Iron generally less than 1.0 mg/L.	52 - 73
Lower cherty shales cave and are usually cased. Friable sand may slough.	Small to moderate quantities of water. Transmissivity approximately 15 percent of that of the Midwest Bedrock Aquigroup.		
Crevices encountered locally in the dolomite, especially in the Eminence-Potosi. Casing not required.	Crevices in dolomite and sandstone yield small to moderate quantities of water. Transmissivity approximately 35 percent of that of the Midwest Bedrock Aquigroup.		
Amount of cementation variable. Lower part more friable. Sometimes sloughs.	Most productive unit of the Midwest Bedrock Aquigroup. Yields over 500 gpm common in northern Illinois. Transmissivity approximately 50 percent of that of the Midwest Bedrock Aquigroup.		
Casing not usually necessary. Locally weak shales may require casing.	Shales generally not water yielding.		
Casing not required.	Moderate quantities of water in upper units. Comparable in permeability to the Glenwood-St. Peter Sandstone.	Varies northwest to southeast and with depth. At shallower depths, TDS: 235-4000 mg/L, Hardness: 220-800 mg/L, Iron: 0.1-20 mg/L. High chloride concentrations with depth.	51 - 62 in the north 80 or more in the south

Figure 2. Concluded

formation. This area is defined essentially by the western-limits of the Maquoketa Formation of Ordovician age and encompasses major portions of north-central and northwestern Illinois. The shale of the Maquoketa Formation is the primary overlying confining material in the Chicago region. The continual lowering of water levels accompanying the large withdrawals of ground water has established steep hydraulic gradients north, west, and southwest of Chicago and Joliet, so that large quantities of water from recharge areas in northern Illinois and relatively minor quantities from southeastern Wisconsin are being transmitted toward pumping centers. Water derived from storage within the aquifer and from vertical leakage downward through the Maquoketa Formation also moves toward cones of depression (Walton, 1960). Lesser amounts of water are derived from the south in Illinois, from the southeast in Indiana, and from the northeast beneath Lake Michigan.

PRODUCTION FROM CAMBRIAN AND ORDOVICIAN WELLS

The first deep well in northern Illinois was drilled in Chicago in 1864 and had an artesian flow at ground surface estimated at 150 gpm, or about 200,000 gallons per day (gpd). A considerable number of deep wells were in operation in the Chicago region by 1900, and pumpage was estimated at 23.0 million gallons per day (mgd). Pumpage increased at a rather irregular rate during the first half of this century and was 75.6 mgd in 1955 as shown in figure 3. During the next 24 years, pumpage for public and industrial uses increased dramatically by 142 percent at an average rate of 4.5 mgd per year, and was at an all time record high of 182.9 mgd in 1979. Public and industrial pumpage was 175.9 mgd in 1980 and 157.7 mgd in 1985.

Pumpage, 1980 through 1985

In an unprecedented occurrence, pumpage from deep wells has decreased significantly during the past few years. There are four primary reasons for this decrease. First, the availability of water from Lake Michigan has prompted nearly all municipalities in Cook and Du Page Counties to move toward receiving that source of water. By the end of 1985, most of the public water supply systems in Cook County were receiving at least some lake water and had discontinued or drastically reduced pumpage from their deep wells. Management of public water supply systems in Du Page County are actively moving in the same direction, although on a slower time schedule. No lake water had been supplied to Du Page County by the end of 1985. Second, numerous high-volume water-consuming industries in the Chicago region have discontinued use of their deep wells: several have gone out of business and abandoned their plants, and others have changed to a municipal source of water, at least partly because of the continually increasing costs of deep-well operation and maintenance. Third, the City of Elgin, in Kane County, has constructed a water treatment plant adjacent to the Fox River, and is using that source for part of their public supply.

The fourth reason contributing to the decrease in deep well pumpage is the increasing use of shallow wells by several public water

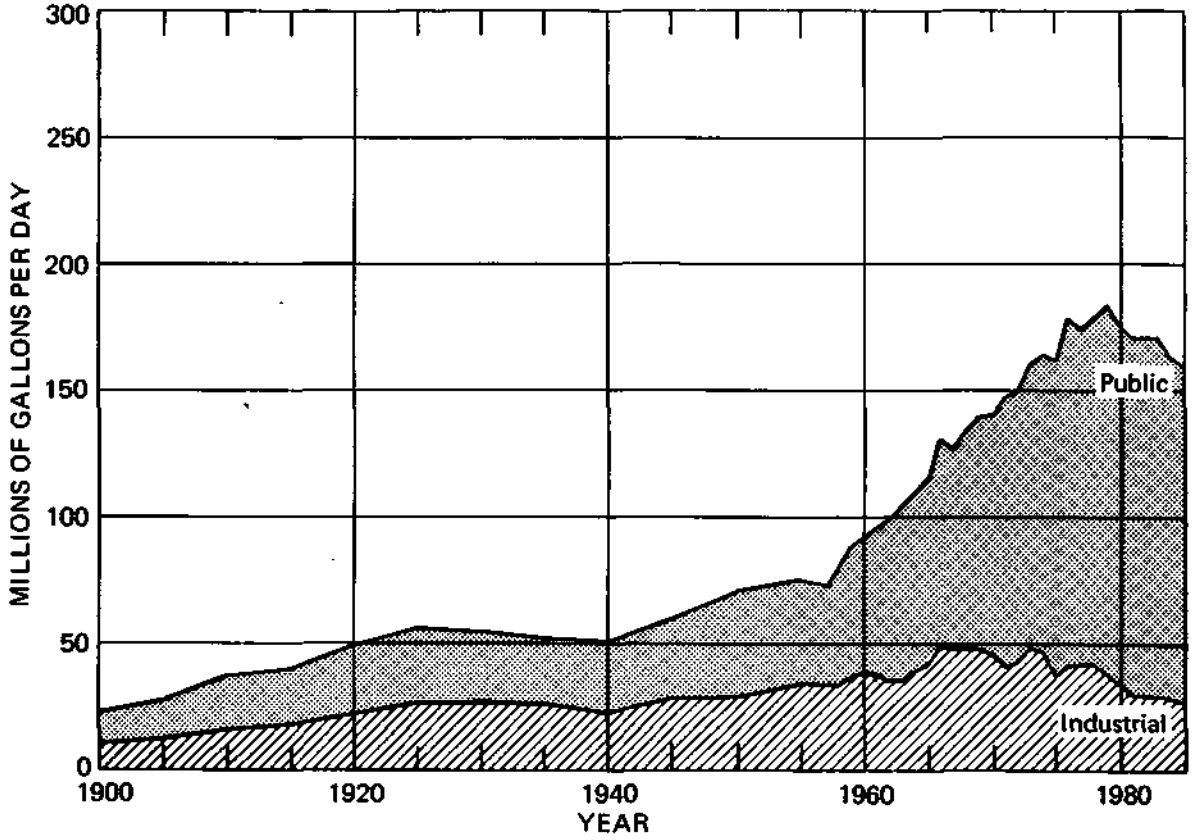


Figure 3. Production from the Cambrian and Ordovician aquifers in the Chicago region, 1900-1985, subdivided by use

supply systems. Shallow wells are less costly to construct, operate, and maintain than deep wells. In addition, numerous deep wells in the Chicago region have failed to meet the Safe Drinking Water Standards for radium and barium, both of which require treatment or blending with other-source water to meet the Standards (USEPA, 1975). Where moderate- to high-capacity shallow wells can be developed, they provide a very suitable alternative to meet the demand for water. Changes in the relative use of shallow and deep wells account for some of the indicated changes in deep well pumpage.

During the period 1980 through 1985, pumpage for public and industrial supplies from sandstone wells decreased from 175.9 mgd to 157.7 mgd, a decline rate averaging 3.6 mgd per year. The 1985 pumpage is the lowest amount of deep well pumpage since 1972, when pumpage was 150.2 mgd. This is a decrease of 10.3 percent in pumpage between 1980 and 1985. The distribution of pumpage in the 8-county Chicago region for the period 1980 through 1985, subdivided by public and industrial use categories and by counties, is shown in table 1 and figure 4.

Ground-water production decreased in Cook, Grundy, Kane, Lake, and Will Counties during the period, in amounts ranging from 10.0 mgd in Cook County to 1.6 mgd in Grundy County. Production in Du Page County increased each year, to 31.9 mgd in 1985. Production in Kendall County remained about the same during the period, and production increased by 0.4 mgd in Mc Henry County.

Production for public supplies decreased 11.0 mgd or 7.7 percent during the period 1980-1985 and was 130.9 mgd in 1985. This represents 83 percent of the total deep well production in the Chicago region. Self-supplied industrial water use decreased 7.2 mgd or 21 percent during this period to 26.8 mgd in 1985. This represents approximately 17 percent of the deep well production.

Figures 5 and 6 show the pumpage for 1980 and 1985, respectively, for each of the 134 full or partial townships in the Chicago region. Records indicate that 1985 deep well production of more than 10,000 gpd occurred in 86 townships, and production of more than 1.0 mgd occurred in 39 townships. Ten townships had pumpage of more than 5.0 mgd, and 2 had more than 10.0 mgd. Ground-water production continued to be concentrated in northwestern and western Cook County, eastern Du Page and Kane Counties, and in the Joliet area of Will County.

Another part of the deep well water-use picture is the number of new wells constructed and the number of wells taken out of service. Since 1980, only 7 new wells have been drilled, 6 for public water supplies and 1 for industry. Many of the existing deep wells and pumps were rehabilitated to meet continuing demands. Eleven public supply systems and 12 industries discontinued withdrawing water from the deep sandstones during this period. Nearly all of these systems had used more than one deep well to meet their demand.

Table 1. Distribution of Pumpage from Cambrian and Ordovician Wells in Northeastern Illinois, 1980-1985, Subdivided by Use and County

(Pumpage in millions of gallons per day)

County	Public	Industrial	Total
1980			
COK	56.22	11.16	67.38
DUP	28.00	0.54	28.54
GRY	1.91	9.03	10.97
KNE	27.20	0.63	27.83
KEN	0.92	0.76	1.68
LKE	9.20	2.02	11.22
MCH	3.05	1.09	4.14
WIL	15.40	8.74	24.14
Total	141.93	33.97	175.90
1981			
COK	55.25	9.79	65.04
DUP	28.07	0.58	28.65
GRY	2.05	8.05	10.10
KNE	27.06	0.50	27.56
KEN	0.81	0.70	1.51
LKE	8.22	1.23	9.45
MCH	3.00	1.04	4.04
WIL	15.03	9.62	24.65
Total	139.49	31.51	171.00
1982			
COK	55.56	9.85	65.41
DUP	29.39	0.40	29.79
GRY	2.01	6.91	8.92
KNE	26.62	0.54	27.16
KEN	0.81	0.75	1.56
LKE	8.29	1.20	9.49
MCH	2.93	1.12	4.05
WIL	14.40	9.68	24.08
Total	140.01	30.45	170.46
1983			
COK	59.67	10.51	70.18
DUP	30.12	0.42	30.54
GRY	2.05	8.01	10.06
KNE	23.66	0.46	24.12
KEN	0.85	0.74	1.59
LKE	7.75	1.22	8.97
MCH	3.06	1.09	4.15
WIL	14.25	7.41	21.66
Total	141.41	29.86	171.27

Table 1. Concluded

County	Public	Industrial	Total
1984			
COK	55.30	9.47	64.77
DUP	31.22	0.29	31.51
GRY	2.02	7.28	9.30
KNE	21.38	0.42	21.80
KEN	0.91	0.82	1.73
LKE	7.07	1.19	8.26
MCH	3.23	1.25	4.48
WIL	14.67	6.96	21.63
Total	135.80	27.68	163.48
1985			
COK	48.67	8.72	57.39
DUP	31.60'	0.29	31.89
GRY	2.11	7.26	9.37
KNE	22.01	0.39	22.40
KEN	0.92	0.32	1.74
LKE	7.54	1.16	8.70
MCH	3.26	1.28	4.54
WIL	14.81	6.88	21.69
Total	130.92	26.80	157.72

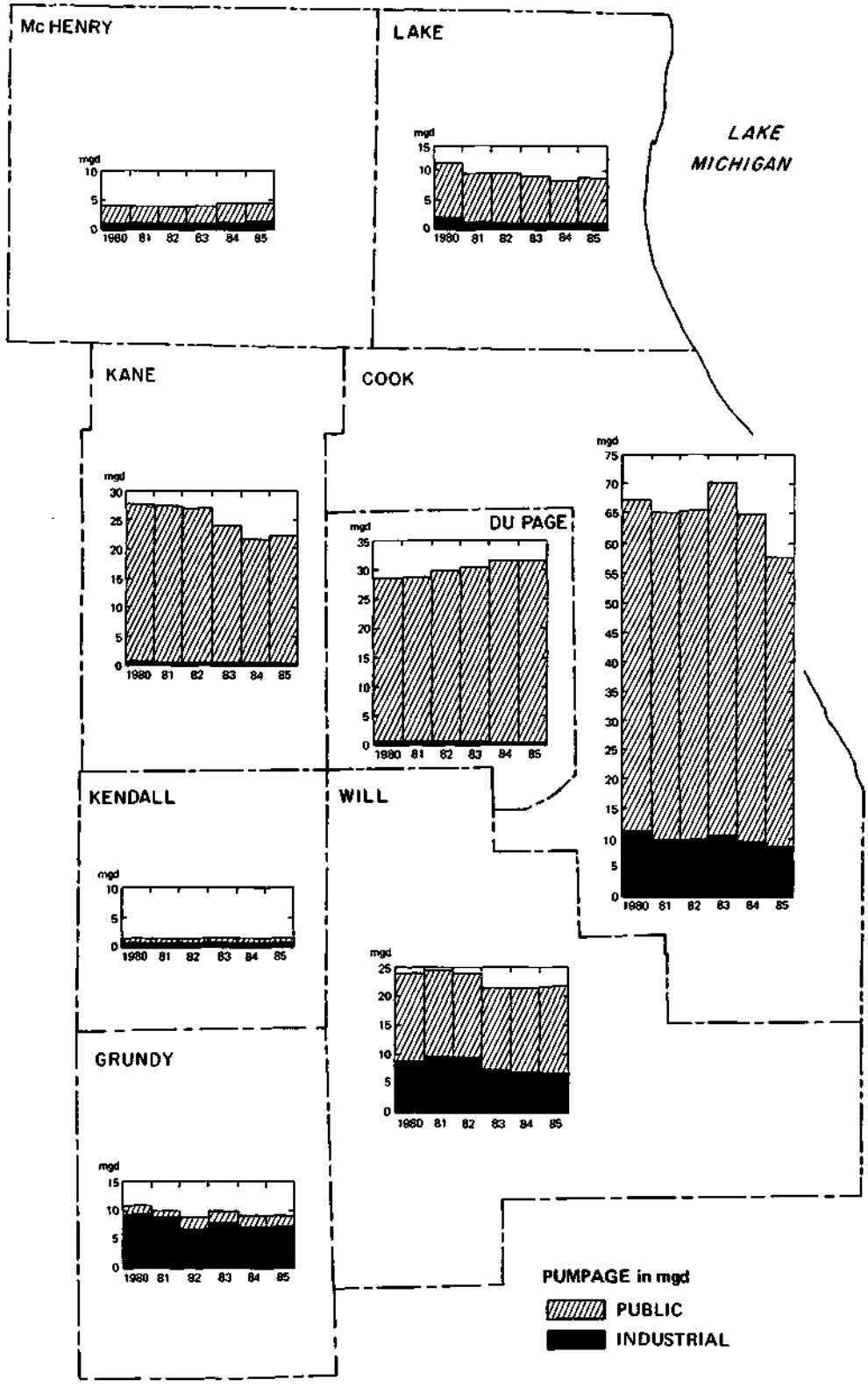


Figure 4. Production from the Cambrian and Ordovician aquifers in the Chicago region, 1980-1985, subdivided by use and by county

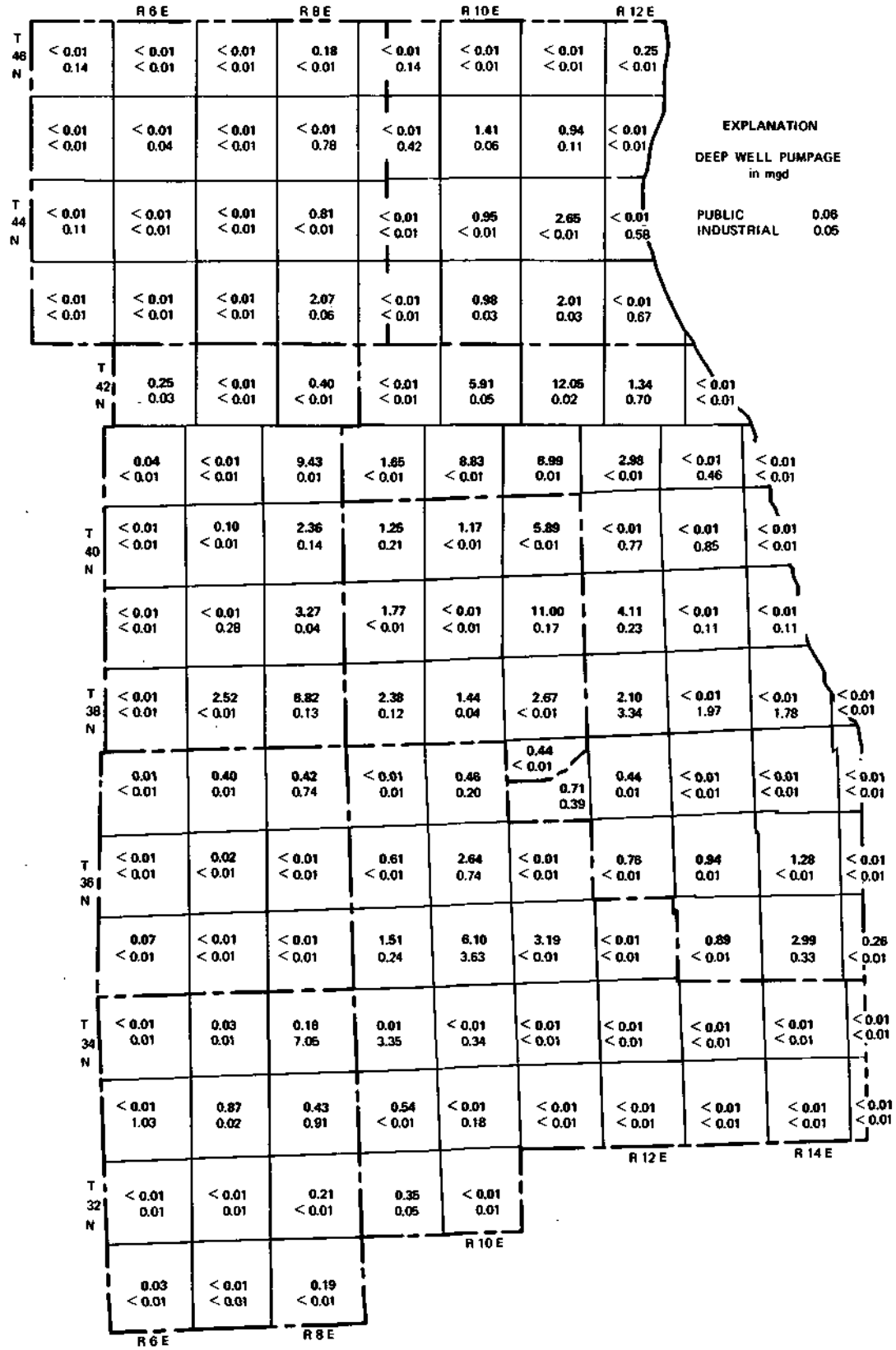


Figure 5. Distribution of pumpage from the Cambrian and Ordovician aquifers in the Chicago region, 1980 *(from Circular 154)*

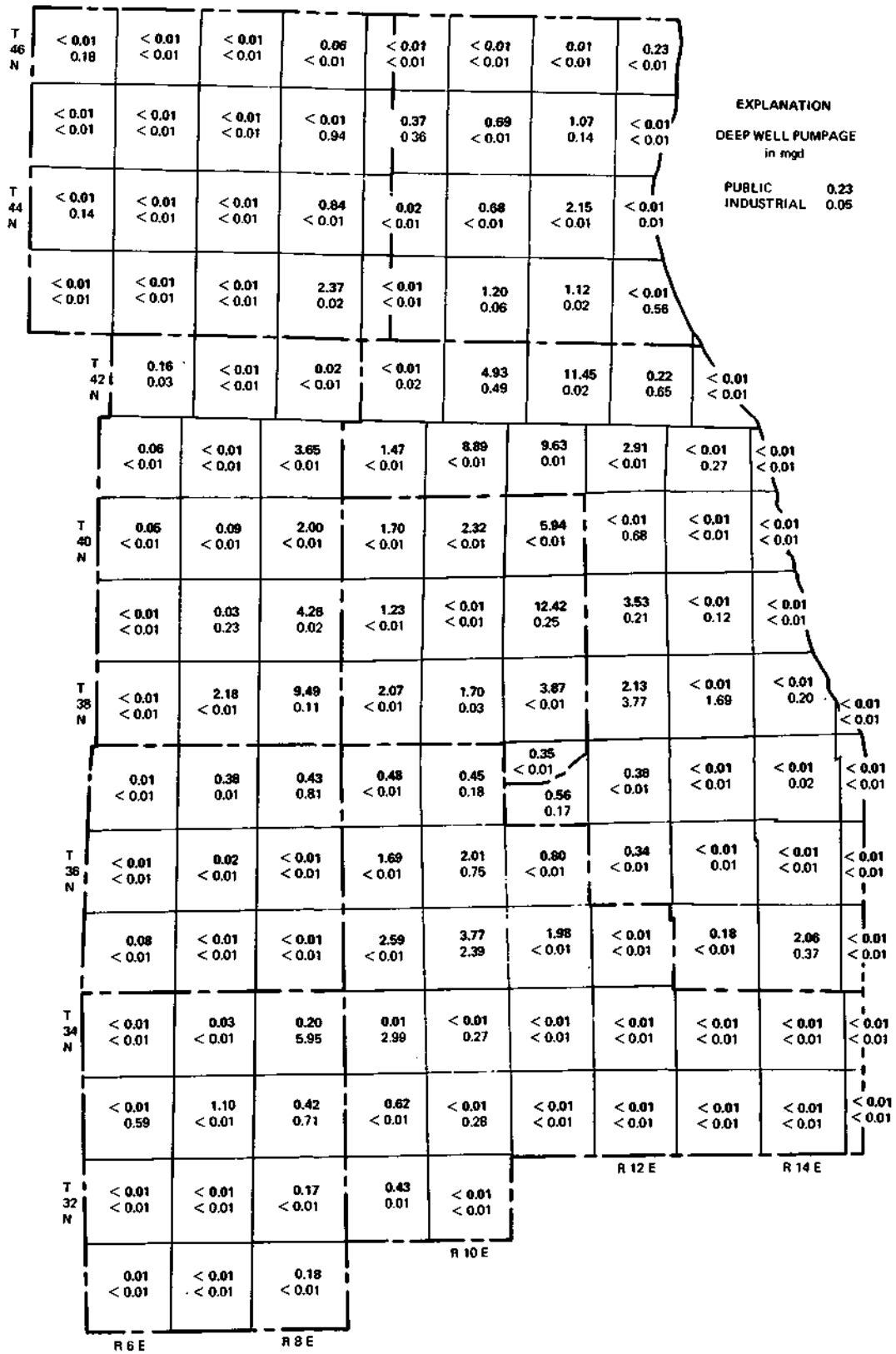


Figure 6. Distribution of pumpage from the Cambrian and Ordovician aquifers in the Chicago region, 1985

Public Pumpage

Public pumpage remained rather constant through 1983 and then declined significantly during 1984 and 1985. Pumpages of 141.9 and 141.4 mgd in 1980 and 1983, respectively, were the highest during this period. Pumpage of 130.9 mgd in 1985 was the lowest since 1975.

Eleven municipalities discontinued the use of their wells since 1980, 3 in 1982, 2 in 1984 and 6 in 1985, and now obtain all of their water from Lake Michigan. Although some deep wells at some of these communities have been out of service for several years, 27 wells in these systems have been taken out of service since 1980. In addition to this trend, Elgin in northeastern Kane County constructed a surface water treatment plant and since 1984 has obtained about 50 percent of its public water supply from the Fox River. Most of the public water supply systems, including most of those with large changes in pumpage, obtain water from both shallow and deep wells. Changes in the relative use of shallow and deep wells also account for some of the indicated changes in deep well production.

The greatest decreases in public pumpage occurred in Cook, Kane, and Lake Counties, with decreases of 7.5, 5.2, and 1.7 mgd, respectively. The only significant increase, of 3.6 mgd, occurred in Du Page County. Public pumpage in Grundy, Kendall, Mc Henry, and Will Counties changed very little or not at all during this period.

Thirty-seven public supply systems pumped more than 1.0 mgd from their deep wells during 1985 and had a combined production of 111.5 mgd. The pumpage for these 37 systems decreased 1.1 mgd or 1.0 percent after 1980. The production of these 37 systems accounted for 85 percent of the total deep well production for all public water supplies and 71 percent of the total deep well production. Of these 37 systems, production increased for 21 by amounts of from 0.1 to 1.3 mgd and decreased for 13 systems by amounts of from 0.1 to 5.7 mgd; 3 systems reported the same volume of pumpage in 1980 and 1985. Only three systems reported increases of 1.0 mgd or more: Carol Stream in northwestern Du Page County, with an increase of 1.0 mgd, and Elk Grove and Schaumburg, both in northwestern Cook County, with increases of 1.3 mgd and 1.1 mgd, respectively. Two systems reported decreases of more than 1.0 mgd: Arlington Heights, in northern Cook County, with a decrease of 2.5 mgd; and Elgin with a decrease of 5.7 mgd.

Self-Supplied Industrial Pumpage

Cambrian and Ordovician ground-water withdrawal for self-supplied industrial use in the Chicago region was 26.8 mgd in 1985, a decrease of 20 percent since 1980. Pumpage has decreased each year during the period 1980-1985. The all-time high industrial pumpage from deep wells for the region was 48.1 mgd in 1966 and 48.2 mgd in 1973. Pumpage in 1985 was the lowest since 1940, just before the start of World; War II. Pumpage decreased in all counties except Kendall and Mc Henry in amounts ranging from 0.2 mgd in Du Page and Kane Counties to 2.5 mgd in

Cook County. Pumpage remained about the same in Kendall County and increased by 0.1 mgd in Mc Henry County.

Some of the decrease in self-supplied industrial pumpage was due to the abandonment of inefficient wells or those with poor-quality water. Many industries have reduced their demand by more efficient operations and various methods of water recirculation within the plant. Some of the decrease in pumpage for self-supplied industries has been offset by an increase in the purchase of water from municipalities. Several industries have gone out of business, and their plants, including the wells, are idle or have been abandoned.

Four self-supplied industries pumped more than 1.0 mgd from deep wells in 1985, three less than in 1980. Production from these four ranged from 1.3 to 5.2 mgd and totaled 11.7 mgd. This accounts for 44 percent of the industrial deep well pumpage.

Pumpage Related to the Practical Sustained Yield

In Report of Investigation 83 (Schicht et al., 1976), it was estimated that the practical sustained yield of the Cambrian and Ordovician aquifer system, with any possible scheme of well development, cannot exceed about 65 mgd. It was thought that the 65 mgd could be obtained by increasing the number of pumping centers, shifting some centers of pumping to the west, and spacing wells at greater distances. The practical sustained yield of the aquifer system is defined as the maximum amount of water that can be withdrawn without eventually dewatering the most productive water-yielding formation, the Ironton-Galesville Sandstone. It is largely limited by the rate at which water can move from recharge areas eastward through the aquifers to pumping centers.

Based on records of deep well production, the estimated practical sustained yield of the aquifer system has been exceeded each year since before 1950. Sustained withdrawals at these excessive rates have already resulted in the dewatering of parts of the St. Peter Sandstone in a considerable area of the Chicago region. They also have resulted in water levels approaching the Ironton-Galesville Sandstone much sooner than earlier anticipated in many areas. Predictions of the time when pumping levels will reach the top of the Ironton-Galesville Sandstone were made by Schicht et al. (1976). According to this report, by 1995 pumping levels will be at the top of the Ironton-Galesville Sandstone in four townships: COK 41N10E, COK 41N11E, DUP 40N11E, and KNE 41N8E. Dewatering the Ironton-Galesville Sandstone is not recommended, because this will result in significant reductions in well yields.

WATER LEVELS IN CAMBRIAN AND ORDOVICIAN WELLS

In 1864, the artesian pressure in the Cambrian and Ordovician aquifer system was sufficient to cause wells to flow above the ground surface in many parts of the Chicago region. Numerous deep wells

throughout northern Illinois had water levels above the ground surface during the late 1800s and early 1900s.

The original average elevation of water levels in deep wells at Chicago and Joliet was about 700 feet above mean sea level (msl). As a result of continued heavy pumpage, the nonpumping water levels in deep wells had declined by 1980 to elevations of 150 feet above msl to more than 250 feet below sea level at Arlington Heights in north Cook County, at.Bellwood in west Cook County, at Elmhurst in east Du Page County, and at Joliet in northwest Will County. From 1864 to 1980, the potentiometric level at Chicago declined more than 850 feet.

Water-Level Changes - Observation and Mass Measurement Wells

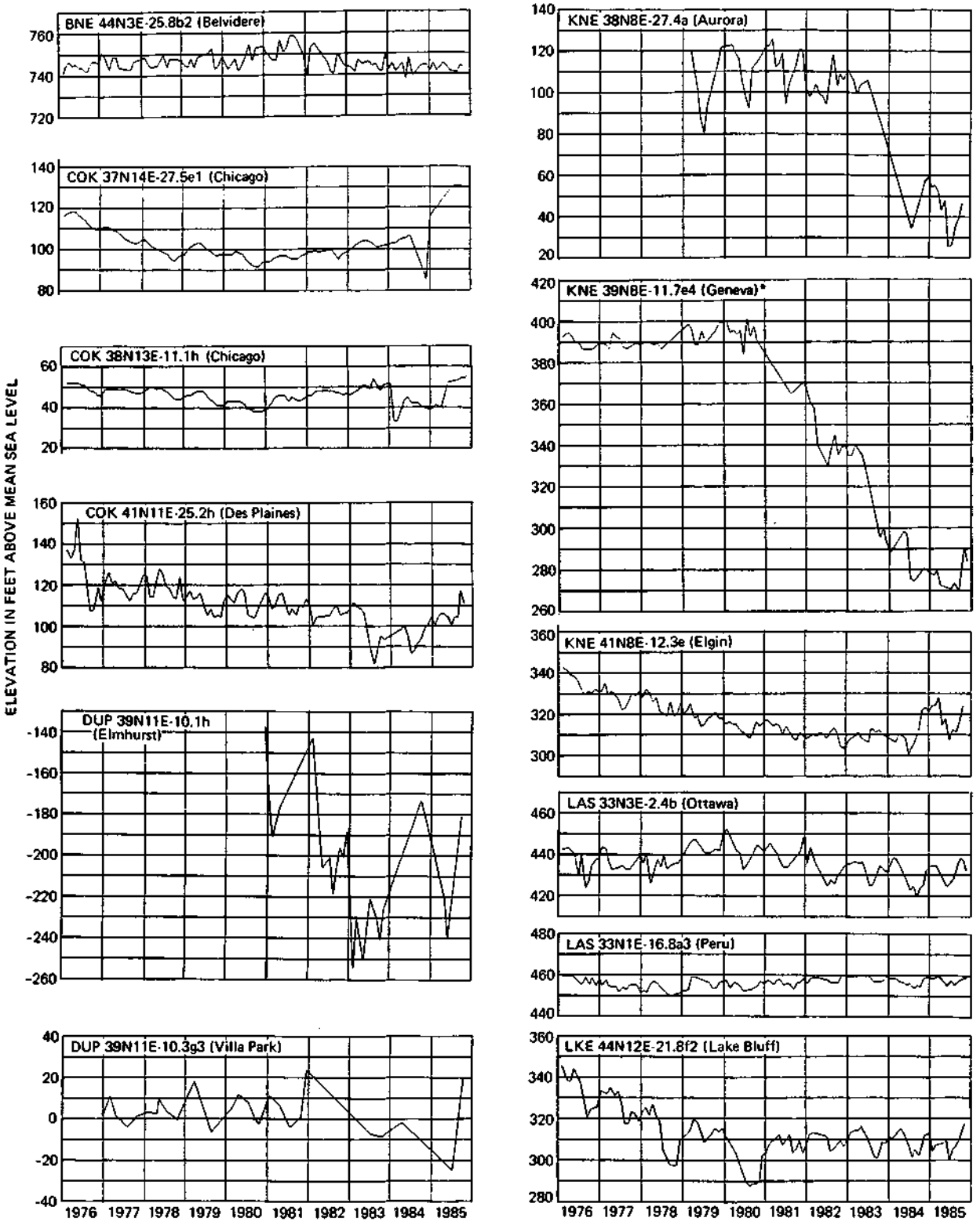
Water levels in 547 deep wells in northeastern Illinois were measured during October and November 1985. Data for these wells are given in the appendix. Water levels for 469 of the wells, including 364 in the 8-county Chicago region, had been measured during the same period in 1980.

Examples of changes in nonpumping water levels in selected wells in northern Illinois for the period 1976 through 1985 are shown in figure 7. Figure 8 shows the locations of these selected wells. Hydrographs of the wells reflect seasonal and long-term pumping trends, with steady declines of water levels generally indicating increasing rates of local and regional pumpage and rising water levels indicating decreasing rates of pumpage or long idle periods for the well pump.

The hydrograph shown in figure 9 reflects the long-term trend in water levels in Cook County since 1940.. Water levels declined rapidly during the period of the 1950s through the 1970s with dramatic increases in pumpage due to urban residential and industrial development. Decreased pumpage and increasing reliance on water from Lake Michigan for public water supply since 1980 has slowed or reversed the downward trend in water levels in some areas of the Chicago region. Decreased rates of decline, or locally, rises in water levels, are shown in many of the hydrographs during the 1980s. This is largely due to the decrease in pumpage during recent years and the shift in use to water from Lake Michigan.

Table 2 shows average annual water-level changes in 11 observation wells in the Chicago region for periods of 3 to 14 years prior to 1971 and for the periods 1971-1975, 1975-1980 and 1980-1985. Prior to 1971, average water-level changes in these wells ranged from a rise of 3.7 feet per year south of Joliet to a decline of 10.6 feet per year at Des Plaines in north Cook County. Nine of the eleven wells showed average declines for the periods prior to 1971.

For the period 1971 to 1975, average changes in the 11 observation wells ranged from a rise of 10.5 feet per year at Geneva to a decline of 15.0 feet per year on the north side of Joliet. In addition to the rise in water levels in the well at Geneva, the water levels in the observation well at Des Plaines showed a rise.



*Institutional well changed to a municipal supply well (see page 25)

Figure 7. Water levels in selected observation wells in northern Illinois, 1976-1985

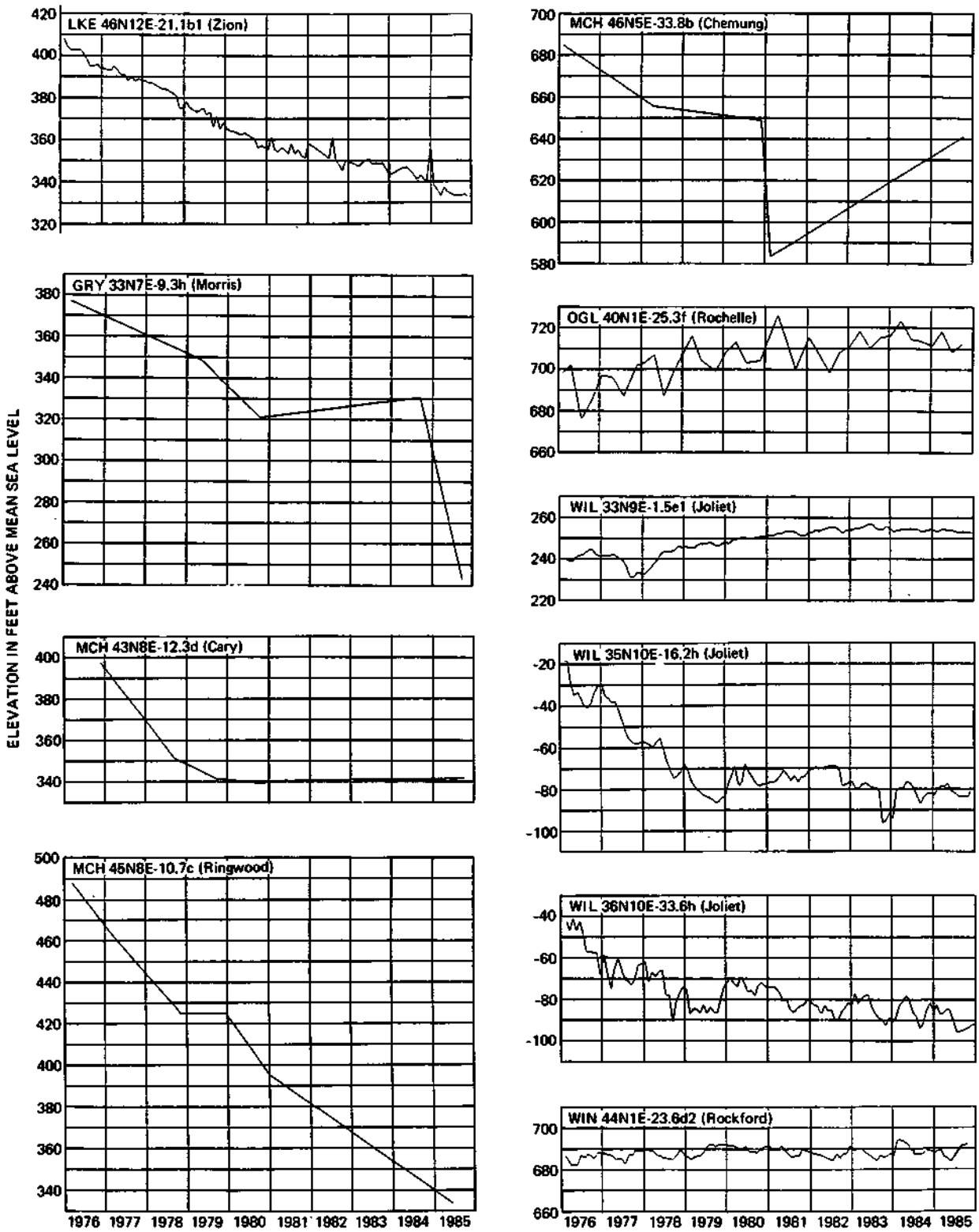


Figure 7. Concluded

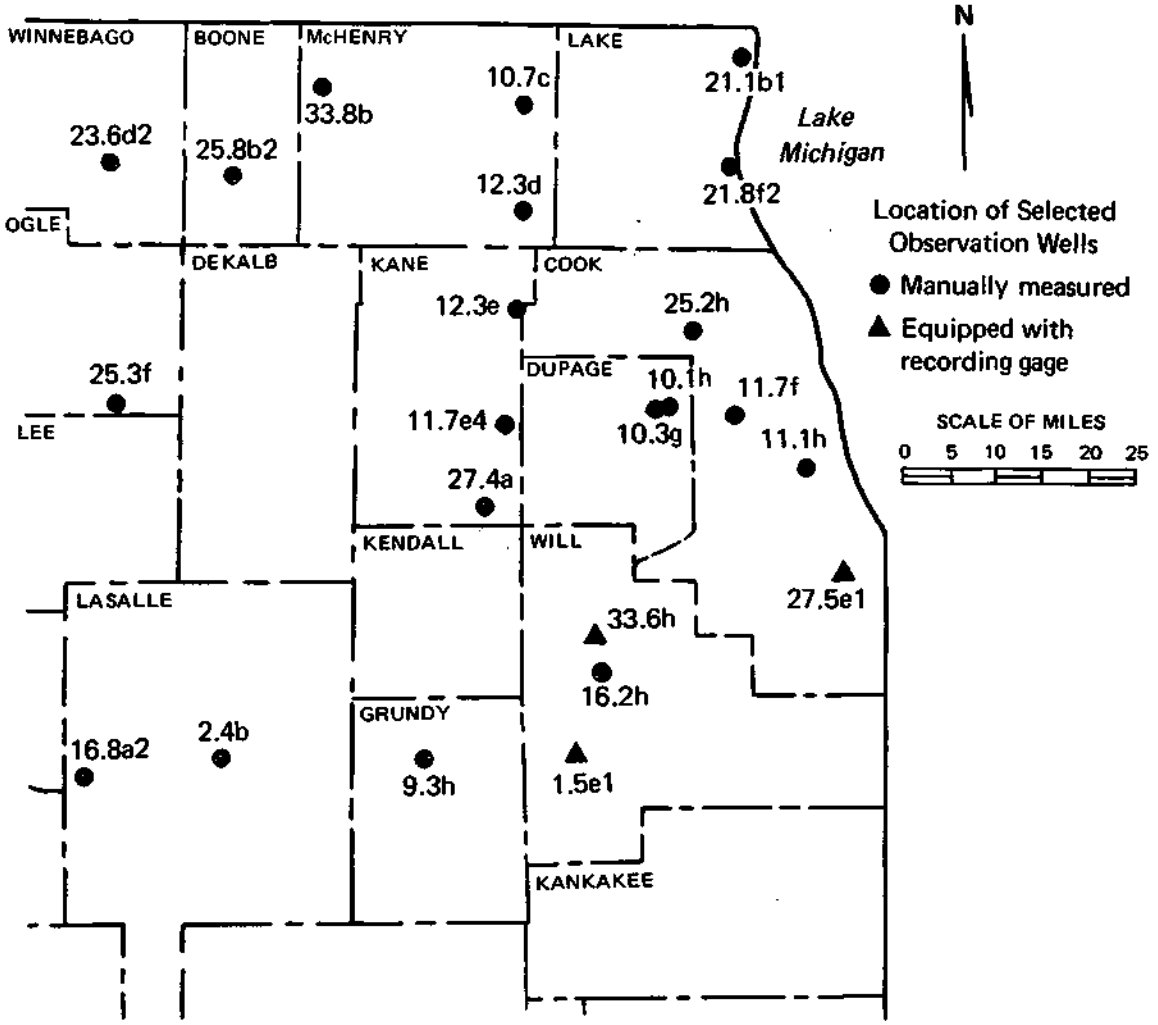


Figure 8. Location of wells for which hydrographs are shown in figures 7 and 9

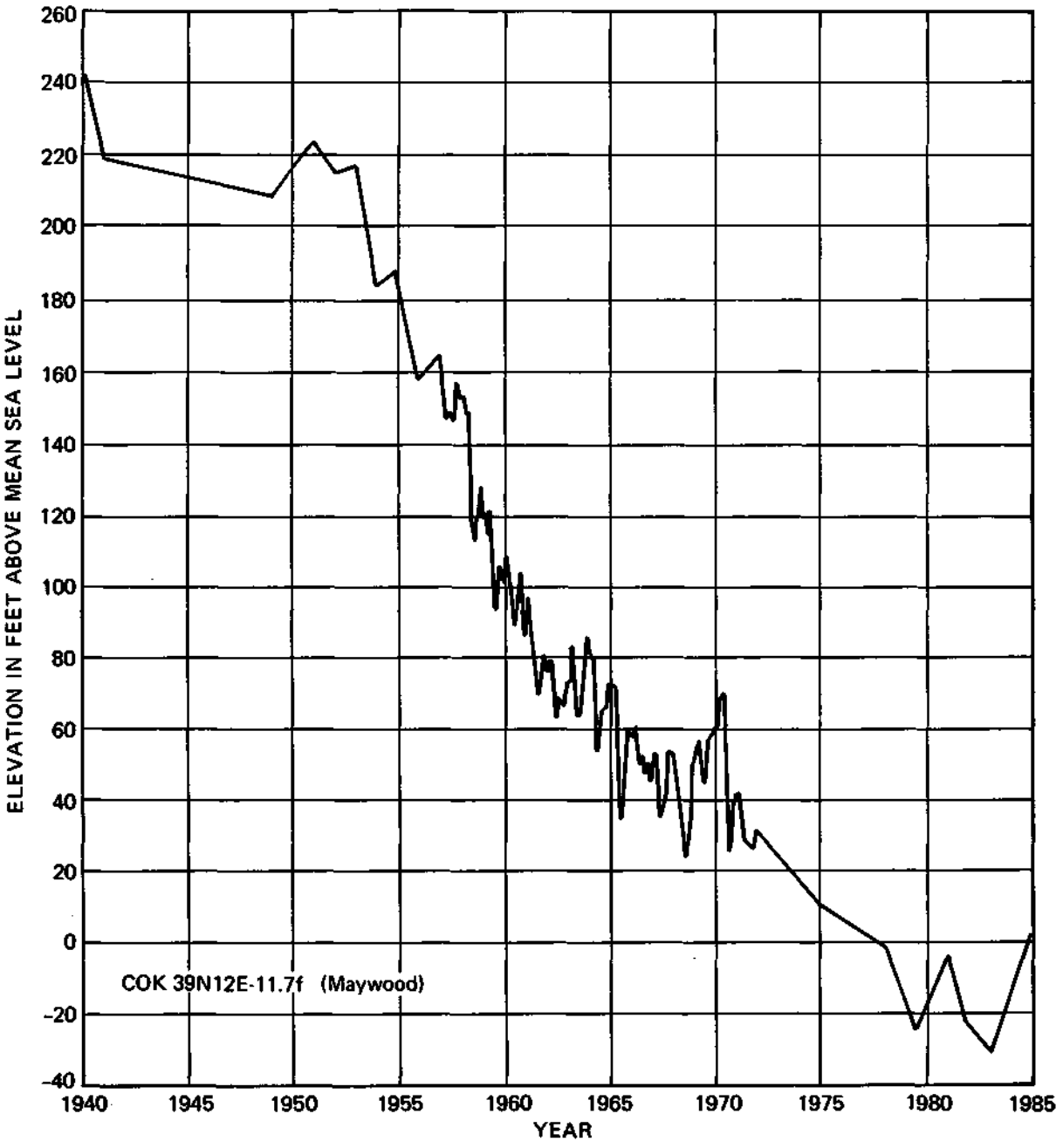


Figure 9. Representative trend of deep well water levels in Cook County since 1940

Table 2. Changes in Nonpumping Water Levels in Selected Cambrian and Ordovician Observation Wells in the Chicago Region

(Average change in ft/yr)

	Prior to 1971	1971-1975	1975-1980	1980-1985
COK 37N14E-27.5e1 (Chicago)	-5.3	-7.3	-4.4	+8.0
COK 38N13E-11 .1h (Chicago)	-2.8	-6.5	-2.8	+3.2
COK 39N12E-11.7f (Maywood)	-7.9	-6.7	-6.2	+4.6
COK 41N11E-25.2h (Des Plaines)	-10.6	+0.7	-4.4	+0.2
KNE 39N8E-11.7e4 (Geneva)	+0.8	+10.5	+1.8	-25.8*
KNE 41N8E-12.3e (Elgin)	-6.0	-3.5	-5.2	0.0
LKE 44N12E-21.8f2 (Lake Bluff)	-8.2	-6.3	-7.7	+1.6
LKE 46N12E-21.1b1I (Zion)	-8.4	-10.0	-9.4	-5.6
WIL 33N9E-1.5e1 (Joliet)	+3.7	-3.5	+2.2	+0.4
WIL 35N10E-16.2h (Joilet)	-9.5	-11.7	-11.6	-1.2
WIL 36N10E-33.6h (Joliet)	-9.0	-15.0	-6.0	-3.8

*Institutional well changed to a municipal supply well (see page 25)

Water-level measurements for both 1971 and 1975 are available for 290 individual wells in the Chicago region. Water levels in 262 wells declined, levels in 28 rose, and levels in 4 showed no change. Declines of 50 to 162 feet occurred in 109 wells. Rises of 84 to 122 feet occurred in three wells in Cook County, and rises of 10 to 45 feet occurred in 13 wells in Cook, Kane, Lake, and Will Counties.

Between 1975 and 1980, average water-level changes in the 11 observation wells ranged from a rise of 2.2 feet per year south of Joliet to a decline of 11.6 feet per year in the center of Joliet. The water level at Geneva continued to rise.

A total of 349 wells were measured in the Chicago region in both 1975 and 1980. In 306 wells water levels declined, in 40 they rose, and in 3 they showed no change. Declines of 50 to 149 feet were recorded in 148 wells. Water level rises of 52 to 80 feet occurred in four wells in Cook, Kane, and Will Counties. Rises of 10 to 47 feet occurred in 22 wells.

Since 1980, average water-level changes in the 11 observation wells have ranged from a rise of 8.0 feet per year in the well in the south part of Chicago to a decline of 25.8 feet per year in the well at Geneva. Five of the wells showed a rise in water level, four showed a decline, and one showed no change. The dramatic change in trend at Geneva is primarily the result of the use of the observation well being changed from an institutional supply with limited demand to a municipal supply with heavy demand. The trend in the observation well in south Chicago reflects the major shift of public water supply systems in south Cook County from well water to lake water during the past few years.

For the first time since detailed water levels have been recorded, a significant number of wells in the Chicago region have shown a rise of water level. The number of water-level rises result from major shifts in the distribution of pumpage and local reductions in pumpage since 1980. Of the 364 wells measured in both 1980 and 1985, 109 showed rises, 250 showed declines, and 5 showed no change. Changes in water levels ranged from a rise of 265 feet for one well in Lake County to a decline of 319 feet for one well in Du Page County. Water-level rises were recorded in one or more wells in all eight counties of the region, with 43 wells showing rises in Cook County, 25 in Will County, 17 in Kane County, and 11 in Lake County. Water-level declines were also recorded in all eight counties, ranging from 95 in Cook County to 9 in Kendall County, and, in addition to Cook County, more than 23 in each of the counties of Du Page, Kane, Lake, and Will.

Water-Level Changes - Regional Trends

Indications of regional trends in the Chicago region are given by the average water-level measurements for the individual counties. Table 3 shows the computed average annual water-level change for each of the 8 counties for several periods of time between 1961 and 1985.

Table 3. Average County Changes in Nonpumping Water Levels in Cambrian and Ordovician Wells in the Chicago Region

(Average changes in ft/yr)

County	1961-1971	1971-1975	1975-1980	1980-1985
Cook	-11	-11	-10	-1
Du Page	-12	-13	-12	-9
Grundy	-3	-16	-5	-5
Kane	-9	-9	-7	-2
Kendall	-11	-12	-1	-3
Lake	-15	-10	-11	-1
Mc Henry	-2	-6	-8	-7
Will	-11	-11	-6	+2
Weighted Average	-11	-12	-9	-3
Number of Observations	153	290	319	361

The changes are based on the available water-level measurements in each county.

Since 1980, and for the first time since at least the mid-1950s, average annual county water-level changes have shown a rise for one county (1.7 feet per year in Will County). Also for the first time, average annual county water-level changes for the entire 8-county region were less than 10 feet per year and showed an average decline of only 3 feet per year for the entire region. In 1985, about 63 percent of the deep wells in western Cook, 85 percent in eastern Du Page County and 93 percent in the Joliet area of Will County had water-level elevations more than 50 feet below mean sea level. Nearly 50 percent of the wells in these areas had water-level elevations more than 100 feet below mean sea level.

Regional trends of water levels in deep wells in areas of northeastern Illinois outside the Chicago region (table 4) show less fluctuation and are less well-defined. In these areas, there are fewer and more widely spaced wells, and in general, regional and local pumpage is considerably less. Also, the proximity to the primary recharge area in north central Illinois, as described earlier, lessens the effect pumpage has on water levels.

During the periods 1971-1975 and 1975-1980, average water-level changes in 5 selected observation wells outside the Chicago region ranged from a rise of 2.8 feet per year, during the latter period at Belvidere in Boone County, to a decline of 3.3 feet per year, during the early period at Rochelle in southeast Ogle County. Both rises and declines occurred in the wells at Ottawa in La Salle County, Rockford in Winnebago County, and at Rochelle. Since 1980, 3 wells have shown rises of 0.2 to 2.6 feet per year and 2 wells have shown declines of 1.2 and 2.0 feet per year. None of these five wells has shown a continuous trend either upward or downward during their periods of observation.

Water levels in 105 wells in 6 counties of northeastern Illinois outside the Chicago region were measured in both 1980 and 1985. Thirty-seven of these, in four counties, showed rises of from 1 foot in De Kalb County to 103 feet in one well in La Salle County. Rises of more than 50 feet occurred in 2 wells, 1 each in De Kalb and La Salle Counties. Sixty-four wells, in all six counties, showed declines of from 1 foot in Boone, De Kalb, and La Salle Counties, to 53, 57, and 61 feet in wells in La Salle, Kankakee, and Winnebago Counties, respectively. Declines of more than 50 feet occurred in 5 wells, 1 in Kankakee County and 2 each in La Salle and Winnebago Counties. Five wells throughout the area showed no change in water level. Average changes in the 6 counties ranged from a rise of 0.4 feet per year in Ogle County to a decline of 3.6 feet per year in De Kalb County.

Superimposed on the long-term trend of water-level changes in deep wells are seasonal fluctuations caused chiefly by changes in rates of pumping from wells and well fields. Water levels in deep wells generally drop during the summer and early fall when pumpage is greatest. Water levels may start to recover during late fall when pumpage is

Table 4. Changes in Nonpumping Water Levels in Selected Cambrian and Ordovician Observation Wells in Northeastern Illinois outside the Chicago Region

(Average change in ft/yr)

	Prior to 1971	1971-1975	1975-1980	1980-1985
BNE 44N3E-25.8b2 (Belvidere)	-1.2	+0.8	+2.8	-2.0
LAS 33N1E-16.8a3 (Peru)	-1.4	-0.7	-0.6	+0.2
LAS 33N3E-2.4b (Ottawa)	-1.8	-0.5	+0.6	-1.2
OGL 40N1E-25.3f (Rochelle)	-2.7	-3.3	+2.6	+2.6
WIN 44N1E-23.6d2 (Rockford)	0	-1.0	+0.8	+0.4

reduced. Minimum ground-water levels are usually recorded during September and October; maximum annual water levels usually occur during the late winter and early spring months. Short-term fluctuations reflect intermittent pumping, day-to-day variations in local pumping, or changes in atmospheric pressure.

POTENTIOMETRIC SURFACE OF THE CAMBRIAN AND ORDOVICIAN AQUIFERS

The potentiometric surface is an imaginary surface to which water will rise in tightly cased wells. The term "potentiometric surface" is replacing the term "piezometric surface" used in previous reports of this series. Piezometric surface was originally used to imply an artesian head at some level above the top of the aquifer. Potentiometric surface more appropriately refers to the water-level surface, whether or not it is above the top of the aquifer.

Pumpage from individual wells and major pumping centers is an important factor influencing the surface configuration of a potentiometric surface. This is especially significant in the Chicago region. Other contributing factors include natural recharge and discharge areas and the geologic and hydrologic characteristics of the aquifers and the overlying material. Changes in pumpage have been described in an earlier section, as have the geology and hydrology of the aquifers.

Several potentiometric surface maps of areas of the Cambrian and Ordovician aquifer system in northern Illinois have been published in previous reports. Maps of 1950 (Foley and Smith, 1954), 1971 (Sasman et al., 1973), and 1980 (Sasman et al., 1982) cover all of the northern part of the state. Other maps have generally been limited to northeastern Illinois. A previously published map of 1980 (Sasman et al., 1982) is included in this report for comparison with the 1985 map.

Potentiometric Surface, 1980

Figure 10 shows the potentiometric surface of the Cambrian and Ordovician aquifers in October 1980. Data on water levels, presented in the appendix, were used to prepare the map. The general features of the 1980 potentiometric surface map differ very little from those of potentiometric surface maps for 1971 and 1975.

The deepest cones of depression in the Chicago region in 1980 were in the vicinity of Elk Grove in north Cook County, Elmhurst in east central Du Page County, and Joliet in northwest Will County, where some levels were more than 200 feet below mean sea level (see appendix). Pronounced cones of depression were apparent in north Cook County near Arlington Heights and Mt. Prospect, in eastern Du Page County near Bensenville and Oak Brook, in western Cook County near Bellwood, and in northeastern Kane County near Elgin. The zero-foot msl potentiometric surface areas, centered around Joliet and Elmhurst, included almost all of western Cook, most of eastern Du Page, and a large area of northwestern Will Counties. Contours of -100 feet msl enclosed several square miles in northern Cook County, western Cook and eastern Du Page

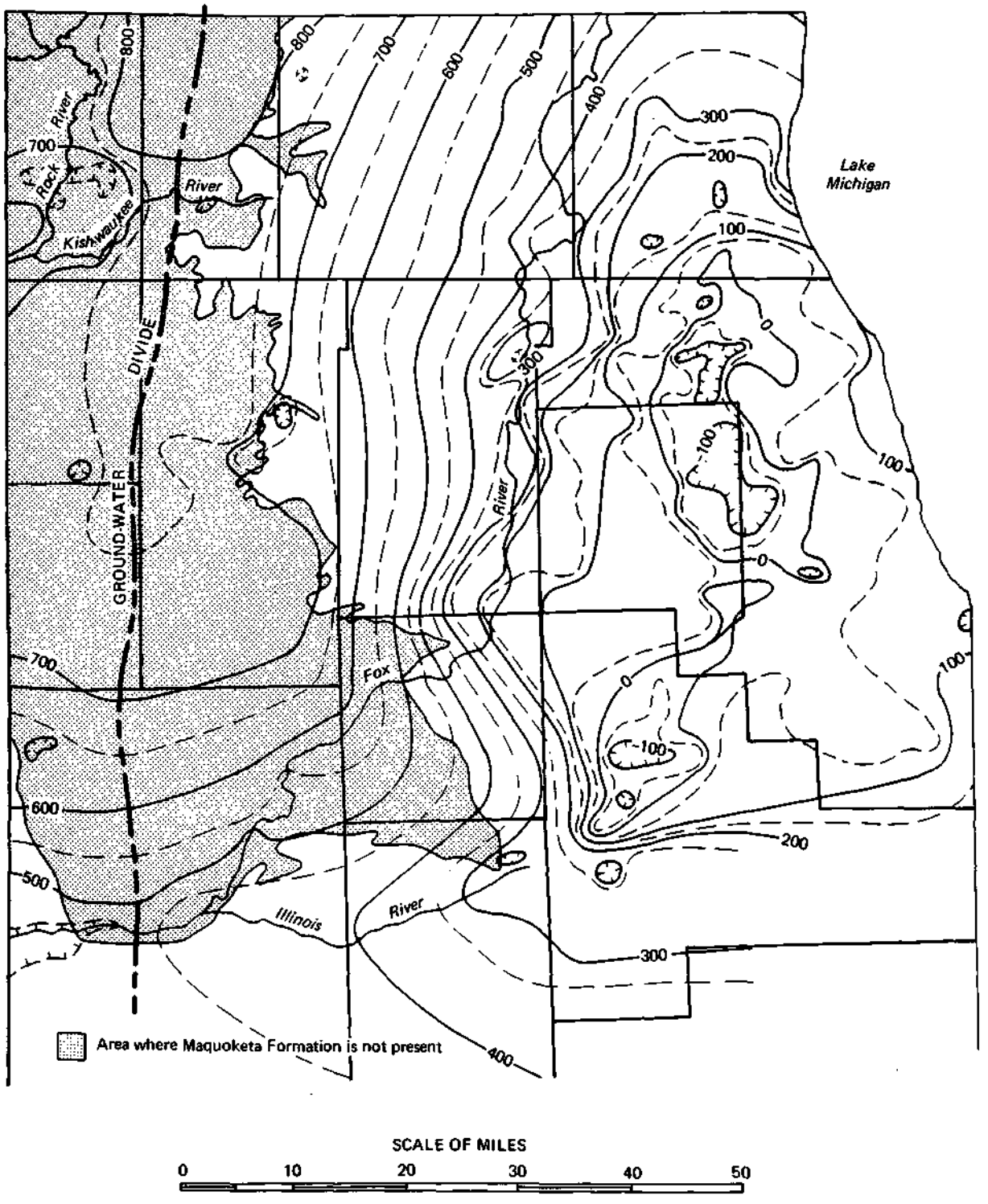


Figure 10. Elevation (in feet msl) of the potentiometric surface of the Cambrian and Ordovician aquifers, October 1980 *(from Circular 154)*

Counties, and the Jollet area in Will County. Other significant depressions in the potentiometric surface in the Chicago region are also present in southern and northern Cook County, at Libertyville-Mundelein in central Lake County and at Minooka in Grundy County. The potentiometric surface was below the middle of the Galena-Platteville dolomite in large areas of the Chicago region and as far west as central Kane County. The potentiometric surface was below the top of the Glenwood-St. Peter in large areas of northern Cook and eastern Du Page Counties and in the Joliet area.

The general pattern of flow of water in the deep sandstone wells in 1980 was from all directions toward the deep cones of depression, primarily centered at Arlington Heights, Elk Grove-Mt. Prospect, Bensenville-Elmhurst, Bellwood, and Joliet. Some of the water moving toward these areas is intercepted by enlarging pumping centers in Kane County at Elgin, Geneva-St. Charles, and Aurora; in Lake County at Libertyville, Mundelein, and Lake Zurich; in Grundy County at Minooka; and at other locations. In addition, water from the recharge area west of the Chicago region is being diverted into cones of depression at Rockford in Winnebago County, at Rochelle in Ogle County, at De Kalb-Sycamore in De Kalb County, and at Mendota and La Salle-Peru in La Salle County.

Potentiometric Surface, 1985

Figure 11 shows the potentiometric surface of the Cambrian and Ordovician aquifer system in October 1985. Water-level data in the appendix were used to prepare the map. The general features of the 1985 potentiometric surface map differ very little from those of the potentiometric surface maps for 1.975 and 1980.

The deepest cones of depression in the Chicago region in 1985 continue to be in the vicinity of Elk Grove, Elmhurst, and Joliet, where some levels were more than 225 feet below mean sea level (see appendix). Pronounced cones of depression were apparent at Arlington Heights, Mt. Prospect, Bensenville, Bellwood, Oak Brook, and Aurora. The zero-foot msl potentiometric surface areas, centered around Joliet, Elmhurst, and Arlington Heights, included almost all of western and northern Cook, most of eastern Du Page, and a large area of north-western Will Counties. Contours of -100 feet msl enclosed extensive areas in northern Cook County, western Cook and eastern Du Page Counties, and the Joliet area in Will County. Other depressions in the potentiometric surface in the Chicago region are also apparent in southern and northern Cook County, southwestern Du Page County, in eastern Mc Henry County, and in central Grundy County. The potentio-metric surface was below the middle of the Galena-Platteville dolomite in large areas of the Chicago region, as far west as central and western Kane County. The potentiometric surface was below the top of the Glenwood-St. Peter in large areas of northern Cook County, much of Du Page County and in the Joliet area.

For the entire area of northeastern Illinois, the 1985 potentio-metric surface map shows the areas of highest elevation in Boone and

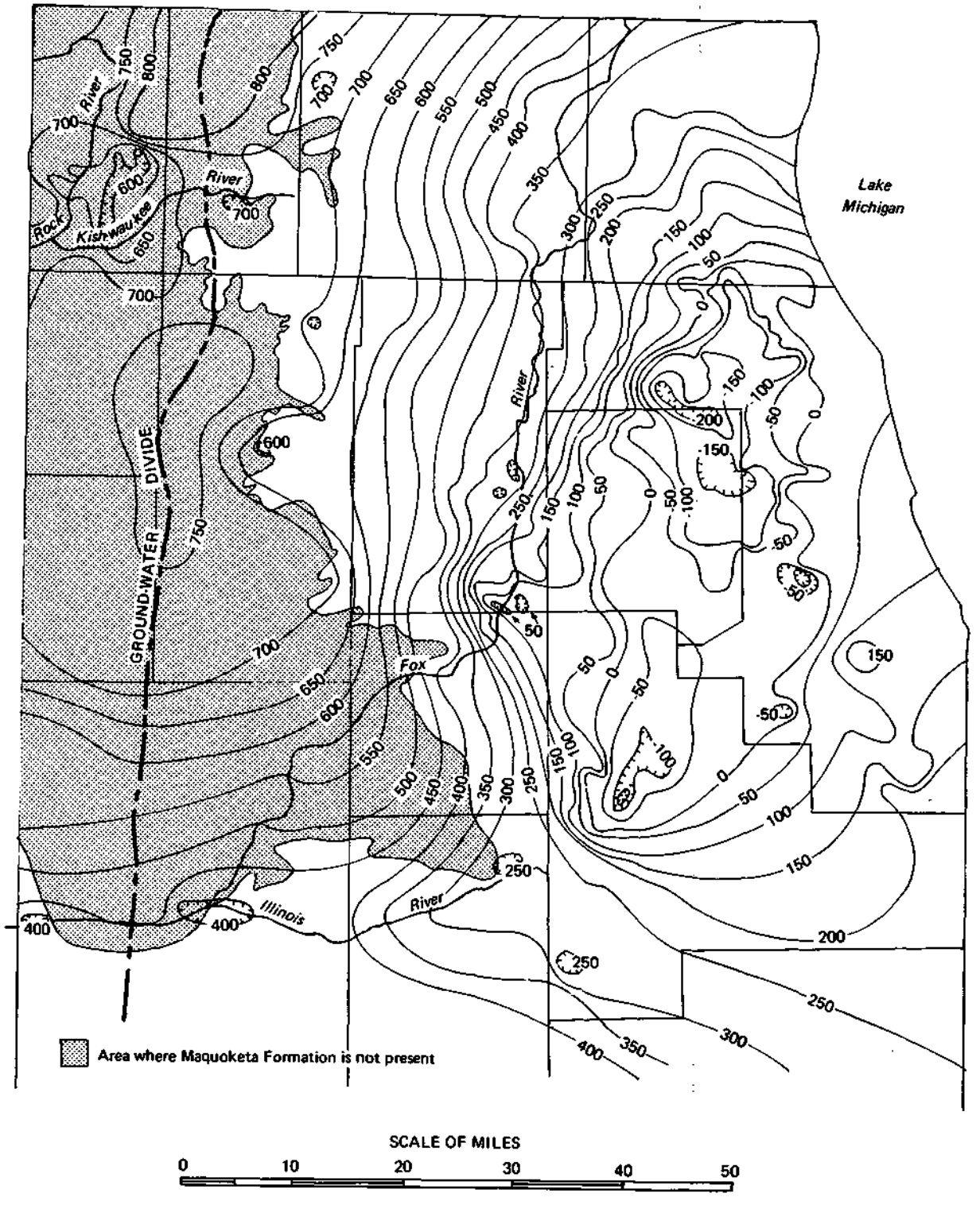


Figure 11. Elevation (in feet msl) of the potentiometric surface of the Cambrian and Ordovician aquifers, October 1985

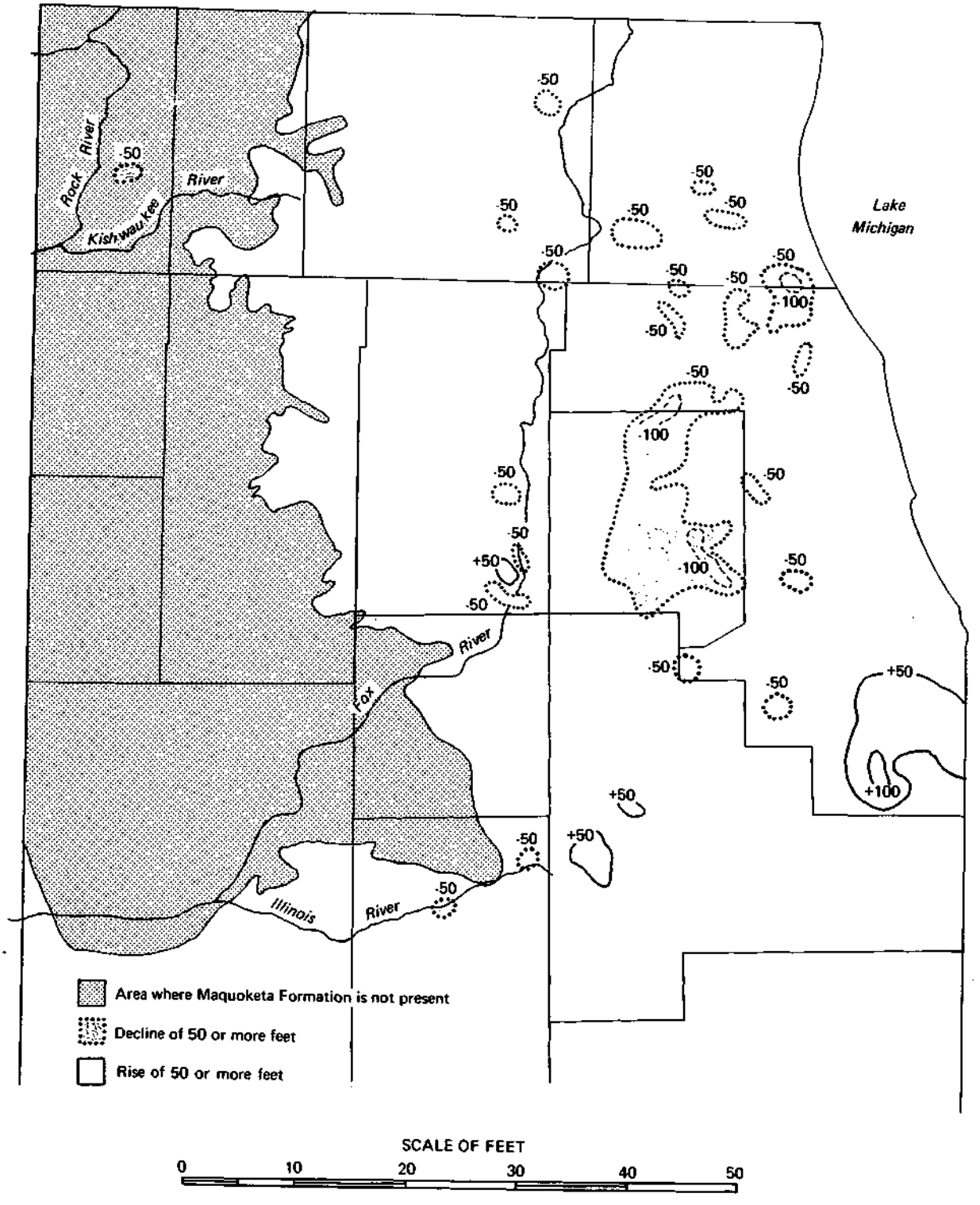


Figure 12. Changes (in feet) in the potentiometric surface of the Cambrian and Ordovician aquifers in northeastern Illinois, 1980-1985

De Kalb Counties in north-central Illinois. A major depression in the potentiometric surface is apparent at Rockford, with other depressions at Rochelle, De Kalb-Sycamore, La Salle-Peru, and Mendota.

The general pattern of flow of water in the deep sandstone wells in 1985 was from high elevations in north-central Illinois toward the southeast and south. Locally flow is toward the deep cones of depression, primarily centered in Arlington Heights-Elk Grove-Mt. Prospect, Bensenville-Elmhurst, Bellwood, and Joliet. Some of the water moving toward these areas is intercepted by enlarging pumping centers at Aurora, Geneva-St. Charles, Naperville (southwest Du Page County), Lake Zurich, Minooka-Morris, and other locations. In addition, water from the recharge area west of the Chicago region is being diverted into cones of depression at Rockford, Rochelle, De Kalb-Sycamore, and Mendota. The approximate limit of diversion for the Cambrian and Ordovician aquifer system west of the Chicago region is shown by the ground-water divide in figures 10 and 11.

Change in Potentiometric Surface, 1980-1985

The potentiometric surface maps for 1980 and 1985 and the computed changes for ground-water levels measured in those two years were used to prepare a potentiometric surface change map as shown in figure 12. The computed average changes in nonpumping water levels from October 1980 to October 1985 for each county of the Chicago region are given in table 3. Water-level elevations are tabulated in the appendix.

The changes vary considerably, even within areas of heavy pumpage. For the first time ever in the Chicago region, the potentiometric surface showed a significant rise of more than 50 feet in a major area of south Cook County. This is primarily due to the transition from the use of deep well water to the use of lake water for public supplies in that area. Smaller areas which show a rise in the potentiometric surface are in the Elgin area of Kane County, between Libertyville and Lake Bluff in Lake County, south of Joliet in Will County, and at several other limited areas throughout the region.

Declines in the potentiometric surface of more than 50 feet occurred over an extensive area in Du Page County, in several areas of northern Cook County, southeastern Kane County, southern Lake County, and in numerous smaller areas throughout the entire region. Declines of more than 100 feet occurred in a few areas of Du Page and northern Cook Counties.

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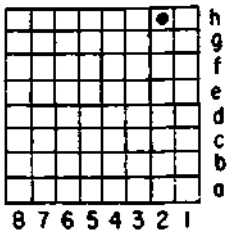
APPENDIX

The well-numbering system used in this report is based on the location of the well, and uses the township, range, and section for identification. The well number consists of five parts: county abbreviation, township, range, section, and coordinates within the section. Sections are divided into rows of 1/8-mile squares. Each 1/8-mile square contains 10 acres and corresponds to a quarter of a quarter of a quarter section. A normal section of 1 square mile contains eight rows of 1/8-mile squares; an odd-sized section contains more or fewer rows. Rows are numbered from east to west and lettered from south to north as shown below.

The number of the well shown in Sec. 25 at the right is as follows:

COK 41N11E-25.2h



In the appendix, the well numbers given are those by which the wells are generally known, except in the case of 3~ and 4-digit numbers, which were assigned for computer purposes. In those cases, the owners' numbers are identified in parentheses.

The appendix presents water-level data for the following counties (in alphabetical order):

Boone	BNE	007*	Kendall	KEN	093
Cook	COK	031	Lake	LKE	097
De Kalb	DEK	037	La Salle	LAS	099
Du Page	DUP	043	Mc Henry	MCH	111
Grundy	GRY	063	Ogle	OGL	141
Kane	KNE	089	Will	WIL	197
Kankakee	KNK	091	Winnebago	WIN	201

*FIPS code

Appendix - Water-Level Elevations of the Cambrian and Ordovician Aquifers in Northern Illinois, 1980-1985

County Location	Well no.	Owner	Depth ft.	Surface elev	Water level elevation 1980	1981	1982	1983	1984	1985	Water level changes, ft. 1980-1985
Boone											
00744N03E248a	6	Belvidere	870	784						722	
00744N03E256d	2	Dean Foods Co.	868	770	721					712	-9
00744N03E257c	2	Belvidere	1861	763						753	
00744N03E258b	3	Belvidere	1803	765	754	757	750	742	743	744	-10
00744N03E261e	4	Belvidere	1800	778						716	
00744N03E351e	5	Belvidere	610	800	728	733				728	0
00744N03E362g	7	Belvidere	967	840	688					652	-36
00745N04E198f	1	McLay Grain Co.	570	892	839					838	-1
Cook											
03135N13E011d	602	Flossmoor (2A)	1764	674	32	36				144	112
03135N13E023a	606	Flossmoor (6A)	1784	705	32	37				127	95
03135N13E123b	607	Flossmoor (7A)	1722	653	42	35				158	116
03135N14E085e	32	Chicago Heights	1777	652	95	35				112	17
03135N14E101g	5	Glenwood	1785	623	5					-7	-12
03135N14E194C	22	Chicago Heights	1800	677	107					209	102
03135N14E212h	2	Stauffer Chemical Co.	1800	640	72					127	55
03135N14E236e	3	East Chicago Heights	1858	667						237	
03135N15E075d	2	Lynwood	1827	615	145					235	90
03136N12E025h	11	Orland Park	1683	712	14	9				2	-12
03136N12E035d	9	Orland Park	1706	705	73					38	-35
03136N12E131d	6	Orland Park	1809	732	31					62	31
03136N12E151a	10	Orland Park	1718	720	-70				-92	-126	-56
03136N12E226b	3	Citizens Util. Co.-Westhaven	1712	720	38					-5	-43
03136N13E012g	1	Blue Island Ind Term	1618	597	50					117	67
03136N13E098b	1	Oak Forest	1701	672	47					77	30
03136N14E311f	11	Homewood	1735	627	27					82	55
03136N14E344d	4	Thornton	1785	617	18					175	157
03137N11E148C	3	Powell Duffryn Terminal	1464	585	-15					-15	0
03137NllE283b	1	DeAndreis Seminary	1690	740	-35					-48	-13
03137NllE291g	4	Lemont	1658	737	-15				-60	-54	-39
03137NllE294b	3	Lemont	1723	743	-33	-24			-57	-90	-57
03137N12E028h	2	Hickory Hills	1608	685	-28				-48	-21	7
03137N13E261g2	3	Oak Hill Cemetery	1637	617						227	
03137N14E275e	1118	Met. San. Dist. (TW1)	1683	590	91	95	95	101	90	131	40
03138N12E018g	2	Lyons	1750	621	-50					-27	23
03138N12E048d	8	LaGrange	1538	648	-42					-36	6
03138N12E058d	3	Western Springs	1258	673	-95	-95	-139	-167	-149	-124	-29
03138N12E066b	4	Western Springs	1913	642	-8	-18	-18	-28	-18	2	10
03138N12E125C	6818	Met San. Dist. (SW13A)	1193	600	-5					19	24
03138N12E188f	3	Suburban Cook Co. T.B. San.	1540	689	39	18	19	19	21	38	-1
03138N12E232g	13	CPC International, Inc.	1525	600	-28					-92	-64
03138N12E241g	12	CPC International, Inc.	1507	597	-51					-157	-106
03138N12E247h	14	CPC International, Inc.	1481	597	-64					-158	-94
03138N12E29Id	1	Fisher Body Div.	1517	605	-35					-11	24
03138N13E081f	4	Rose Packing Co.	1590	594	26					44	18
03138N13Elllh	1	Bradshaw-Praeger & Co.	1224	597	38	43	47	51	40	54	16
03138N13E194e	2	Union Carbide Corp.	1550	619	-115					-60	55
03138N13E211f	2	Cracker Jack Co.	1585	620	24					37	13
03138N14E076c	1	Fleischmann Malting Co.	1925	594	51		55				
03138N14E076d	2	Fleischmann Malting Co.	1964	594	6		54				
03139N12E085g	4	Bellwood	1960	645		-55			-40	-145	-90
03139N12E093f	1	Bellwood	1952	636	-153				-92	-128	25
03139N12E095a	3	Bellwood	1428	624	-137				-157	-227	-90
03139N12E095d	2	Bellwood	1954	632	-113				-113	-108	5
03139N12E117f	3	Maywood	1640	630	-19		-20	-29		4	23
03139N12E162f	5	Bellwood	1845	627	-123				-208	-159	-36
03139N12E227bl	1	Bunker Ramo Corp.	1560	628						-22	
03139N12E353h	2	Chicago Zoological Park	2081	615	-46					-85	-39
03139N12E368d	3	Riverside	2047	618	-35				-176		

County Location.	Well no.	Owner	Depth ft.	Surface elev	Water level elevation 1980	1981	1982	1983	1984	1985	Water level changes, ft. 1980-1985
Cook Cont.											
03139N13E334a	1	Waste Management	16S0	589	1					41	40
03139N14E217b	1	Joanna Western Mills Co.	1610	593	46					69	23
03140N12E186c	1	Nelson Wire Co.	1457	663	-127					-133	-6
03140N12E314C	2	GTE Communication systems	1468	655	-124				-145	-183	-59
03140N12E314d	1	GTE Communication Systems	1470	655	-105				-139	-135	-30
03140N12E314d	3	GTE Communications Systems	1487	655	-53					-55	-2
03140N13E314el	1	M&M/Mars Inc	2033	651						-59	
03140N13E314e2	2	M&M/Mars Inc.	1978	653	-25					45	70
03141N09E235g3	3	Streamwood	1410	820						222	
03141N09E363f	2	Hanover Park	1429	828	98					68	-30
03141N09E366b	4	Hanover Park	1310	820	140					188	48
03141N10E065b	10	Hoffman Estates	1357	810	138					132	-6
03141N10E076d	11	Hoffman Estates	1380	812	106					167	61
03141N10E313e	3	Hanover Park	1952	798	107					88	-19
03141N10E364g	7	Elk Grove	1365	720	-71					-270	-199
03141N10E367h	12	Elk Grove	1352	743						-217	
03141N10E368b	11	Elk Grove	1367	725	-65					-171	-106
03141N11E071C	4	Rolling Meadows	1603	706	-127			-144		-122	5
03141N11E083a	6	Rolling Meadows	1602	694	-106	-91	-88			-136	-30
03141N11E091h	8	Arlington Heights	1445	703	-144		-149	-184	-214	-159	-15
03141N11E097g	1	US. Army	1812	712	143					35	-108
03141N11E128h	3	Mt Prospect	1935	670	-125				-170	-150	-25
03141N11E145b	3	Citizens Util. Co.-Waycinden	1368	672	-136		-223	-214	-216	-153	-17
03141N11E157b	15	Arlington Heights	1414	696	-134				-226	-174	-40
03141N11E162h	12	Arlington Heights	1775	714	-91	-71	-146		-146	-111	-20
03141N11E211b	1	Elk Grove	1415	715	-158					-106	52
03141N11E237f	16	Mt Prospect	1961	675	-130				-225	-144	-14
03141N11E241g	2	Citizens Util. Co.-Waycinden	1652	660	-82		-133	-142	-138	-160	-78
03141N11E252h	7	Des Plaines	1815	655	116	110	105	95	94	117	1
03141N11E256b	4	Touhy Mobil Homes	1515	657	-45				-161	-142	-97
03141N11E256b	5	Touhy Mobil Homes	940	657	112				27	30	-82
03141N11E268a	2	Elk Grove	1395	682	-154					-188	-34
03141N11E273f	9	Elk Grove	1403	682	-153					-243	-90
03141N11E313a	14	Elk Grove	1390	702		-98				-208	
03141N11E325g	3	Elk Grove	1408	705	-42					-125	-83
03141N11E337b	5	Elk Grove	1403	685	-125	-125				-199	-74
03141N12E127b	3	Domestic Utilities Co.	1423	661	-9				-118	-139	-130
03141N12E127d	2	Domestic Utilities Co.	1390	658					-102	-117	
03141N12E128b	1	Domestic Utilities Co.	1342	662	-107	-23			-155	-128	-21
03141N12E266e	1	Park Ridge Country Club	1355	643	-10					-27	-17
03141N13E086d	2	Glenview Club	1546	649	25					3	-22
03141NI3E185g	1	Avon Products Inc	1410	644	31	34				11	-20
03141N13E207e	1	Baxter Lab.	1414	627	29	32				13	-16
03141N13E224g	2	Evanston Country Club	1465	608	-47					-52	-5
03141N13E298d	1	Howard Commons	1465	624	16					-3	-19
03142N09E347a	1	Allstate Insurance Co.	1250	850	300				302	310	10
03142N09E351b	1	Rose Packing Co.	700	825	276					322	46
03142N10E014h	16	Palatine	1609	745	15					-20	-35
03142N10E018f	15	Palatine	1603	750	79					-10	-89
03142N10E146h	10	Palatine	1995	750	65					60	-5
03142N10E153f	7	Palatine	1350	750	40	40				-95	-135
03142N10E194C	14	Hoffman Estates	1415	830	47	88				101	54
03142N10E222a	8	Palatine	1950	735	103	90				65	-38
03142N10E248a	1	Arlington Park Jockey Club	1815	724	65					10	-55
03142N10E251b	1	Rolling Meadows	1530	711	93	95	-17		-11		
03142N10E256b	2	Rolling Meadows	1537	714	-24	-36	-56	-157	-110		
03142N10E258g	3	Arlington Park Jockey Club	1906	728	56					78	22
03142N10E264h	5	Rolling Meadows	1555	733	51			-27		9	-42
03142N10E297e	9	Hoffman Estates	1392	820	118	115				92	-26
03142N10E344h	7	Rolling Meadows	1528	728	59	57	64	32		39	-20
03142N10E364d	3	Rolling Meadows	1585	717	-23	-24		-108		-59	-36
03142NllE033b	5	Wheeling	1355	650	-10					-106	-96

County Location	Well no.	Owner	Depth ft.	Surface elev	Water level elevation 1980	1981	1982	1983	1984	1985	Water level changes, ft. 1980-1985
Cook Cont.											
03142N11E051g	3	Buffalo Grove	1340	686	-21				-53	-44	-23
03142N11E058e	1	Buffalo Grove	1335	725	-32	-30	-85	-69	-120	-75	-43
03142N11E066c	13	Arlington Heights	1795	730	30		20	-25	-58	30	0
03142N11E081a	11	Arlington Heights	1647	689	-6	-11			-101	-36	-30
03142N11E107a	7	Wheeling	1350	661	1					-110	-111
03142N11EU6e	3	Wheeling	1370	644	-21					-110	-89
03142N11E118b	2	Ekco Products, Inc.	1320	650	-35				-65	-55	-20
03142N11E127b	1	Plum Creek Apartments	1338	640	-26	-61	-56			18	44
03142N11E128b	2	Plum Creek Apartments	1323	645	-37	-64	-64			51	88
03142N11E167a	10	Arlington Heights	1778	684	44		-100	-136		-2	-46
03142N11E177e	9	Arlington Heights	1532	691	-29	-29	-59	-69	-99	-19	10
03142N11E194a	14	Arlington Heights	1320	719	-31				-138	-32	-1
03142N11E243g	5	Citizens Util. Co.-Brickman	1320	638	-80		-70	-116	-100	-90	-10
03142N11E244d	4	Citizens Util. Co.-Brickman	1323	642	-40		-41	-118	-148	-120	-80
03142N11E245f	6	Citizens Util. Co.-Brickman	1323	643			-77	-115	-125	-112	
03142N11E264h2	2	Prospect Heights	1318	648			-123	-97		-147	
03142N11E267d	2	Citizens Util. Co.-Brickman	1468	661	-59		-122	-147	-179	-134	-75
03142N11E272a	6	Mt. Prospect	1468	668	-84	-64		-153		-142	-58
03142N11E275h	17	Mt. Prospect	1947	663	-14	-102	-127	-107		-172	-158
03142N11E294h	7	Arlington Heights	1524	685	-72	-62	-87				
03142N11E303b	17	Arlington Heights	1323	708	-74	-72	-182	-187	-127	-80	-6
03142N11E317a	16	Arlington Heights	1810	698	-92	-71	-187	-127	-139	-77	15
03142N11E333b	4	Mt. Prospect	1950	693	-115	-89		-207		-147	-32
03142N11E344g	5	Mt. Prospect	1822	670	-50	-59		-130		-115	-65
03142N11E352a	13	Mt. Prospect	1337	655	-125			-233			
03142N12E142a	3	Sunset Ridge Country Club	1396	655	20			28		1	-19
03142N12E142c	2	Sunset Ridge Country Club	1247	655	45				8	13	-32
03142N12E147f	1	St Ann's Home	1686	668						30	
03142N12E148e	2	St Ann's Home	1190	665	60					5	-55
03142N12E181e	1	Mission Brook San. Dist.	1399	685	-10					-36	-26
03142N12E182b	1	Illinois Bell Telephone Co.	1380	660	2					-33	-35
03142N12E183a	1	Culligan. Inc.	1380	652	3				-41	-56	-59
03142N12E183b	1	Intl. Mineral & Chemical Co.	1330	660	35					-5	-40
03142N12E183e	3	Mission Brook San. Dist.	1400	660	2					-17	-19
03142N12E191b	3	Allstate Insurance Co.	1401	662	31				-54	-41	-72
03142N12E191c	1	Allstate Insurance Co.	1400	663	-1				-76	-64	-63
03142N12E191d	2	Allstate Insurance Co.	1404	663	-1				-47	-47	-46
03142N12E192a	4	Allstate Insurance Co.	1400	655	7				-57	-46	-53
03142N12E192e	2	Nielsen Co.	1400	657	-12				-69	-102	-90
03142N12E192h	2	Culligan. Inc.	1400	655	-1				-75	-45	-44
03142N12E193f	1	Nielsen Co.	1400	655	-35				-64	-61	-26
03142N12E194e	1	Household Finance Corp.	1308	648	7				-27	48	41
03142N12E235f	3	Convent of the Holy Spirit	1451	648						146	
03142N12E287e	1	Signode Steel Strapping Co.	1452	670						-70	
03142N12E291h	1	Glenbrook Hospital	1406	677	4					-27	-31
03142N12E293d	3	Glenview	1366	682	-85					-96	-11
03142N12E324f	1	Moore Business Forms	1450	670	52				35	-29	-81
03142N12E326f	2	Zenith Radio Corp.	1368	662	-8			-20		-41	-33
DeKalb											
03737N05E321c	1	Somonauk	190	685	665					663	-2
03737N05E321c	2	Somonauk	502	685	665					662	-3
03737N05E367g	3	Sandwich	610	655	647					645	-2
03737N05E367h	1	Sandwich	600	667	649					639	-10
03737N05E367h	2	Sandwich	600	667	636					632	-4
03738N05E144d	3	Hinckley	605	740	663			698		708	45
03738N05E152d	2	Hinckley	708	740	727					718	-9
03740N03E157C	2	Kishwaukee College	920	910	727					736	9
03740N03E236e	2	Malta	1254	915	733	744				741	8
03740N03E237e	1	Malta	853	915						771	
03740N04E014e	7	Sycamore	1233	835	610					609	-1
03740N04E157a	6	De Kalb	1291	855	605	599	607	604	611	599	-6

Appendix - Continued.

County Location	Well no.	Owner	Depth ft.	Surface elev	Water level elevation 1980	1981	1982	1983	1984	1985	Water level changes, ft. 1980-1985
DeKalb Cont.											
03740N04E161g	1	De Kalb Dev. Corp.	803	880	790					790	0
03740N04E162g	2	De Kalb Dev. Corp.	970	883	746					745	-1
03740N04E214f	10	De Kalb	1310	880	633	624	642	625	630	624	-9
03740N04E231g	9	De Kalb	1330	885	655	730	739	722	723	716	61
03740N04E235d	4	De Kalb	1178	885	610	619	602	613	605	597	-13
03740N04E263g	1	Del Monte Corp.	1324	890	632					632	0
03740N04E263g	2	Del Monte Corp.	1345	890	624					625	1
03740N04E266e	7	De Kalb	1315	885	629	584	577	585	615	604	-25
03740N04E331h	12	De Kalb	1200	862	664	669	666	672	652	639	-25
03740N05E055e	5	Sycamore	1227	872	597	597				595	-2
03741N05E321g	3	Sycamore	932	845	805					819	14
03741N05E323e	1	Sycamore	902	870	826					826	0
03741N05E327g	6	Sycamore	1213	845	598	600	600				
03742N03E263h	2	Kirkland	636	764	759	748				761	2
03742N05E194b	3	Genoa	732	830	740					723	-17
03742N05E196b2	2	Genoa	730	820						724	
03742N05E207a	4	Genoa	770	847	667					647	-20
DuPage											
04337N11E027d	1	Rosewood Trace	1610	710	-3					-11	-8
04338N09E132b	7	Naperville	1445	680	54		48			-30	-84
04338N09E157d	1	J.S. Plastics Co.	1000	704	155					136	-19
04338N09E295g	22	Aurora	1420	684	81		81			62	-19
04338N10E304d	16	Naperville	1478	690	23		45			-5	-28
04338N10E334h	20	Naperville	1572	748	63		0			-47	-110
04338N11E037e	13	Westmont	1578	740	-55	-54				-81	-26
04338N11E107e	11	Westmont	1604	751	51	65				-57	-108
04338N11E115c	7	Clarendon Hills	1585	722	-38	-40	-59	-67	-74	-71	-33
04338N11E235e	3	Willowbrook	1620	734	13			-42		-98	-111
04338N11E281c	4	Darien	1612	767	-29					-28	1
04339N09E041b	3	West Chicago	1378	762	171					152	-19
04339N09E055d	5	West Chicago	1376	751	173	182				128	-45
04339N09E157h	4	West Chicago	1362	746	122	135				85	-37
04339N09E196c	4	Fermi Nat Accelerator Lab.	1432	756	178	183	177	173	164	151	-27
04339N10E014d	1	Comm. Ed.-Lombard Station	1465	740	-16					-45	-29
04339N11E041f	7	Villa Park	1418	702	-140	-126				-160	-20
04339N11E052c	9	Lombard	1431	710	-116				-112	-137	-21
04339N11E063a	4	Lombard	1560	698	8				-20	-86	-94
04339N11E091h	1	Villa Park	1441	694	-130	-136	-178			-168	-38
04339N11E092h	2	Villa Park	2125	699	-171					-141	30
04339N11E101h	4	Elmhurst	1390	669	-181	-176	-196	-241	-173	-181	0
04339N11E103g	11	Ovaltine Food Products	1897	670	2 - 1			1 - 9	-2	20	18
04339N11E104g	7	Ovaltine Food Products	1936	675	-3		17			73	76
04339N11E128e	5	Elmhurst	1480	677						-163	
04339N11E133g	10	Elmhurst	1567	705	-115					-145	-30
04339N11E158d	10	Villa Park	1458	685		-75	-115		-147	-117	
04339N11E161b	8	Villa Park	1485	705						-148	
04339N11E178d	7	Lombard	1520	730		-33			-102	-71	
04339N11E207a	8	Lombard	1590	775	-57				-101	-106	-49
04339N11E243b	5	Oak Brook	1503	680	-110	-90			-124	-135	-25
04339N11E265h	1	Oak Brook	1521	685	-81	-65			-104	-135	-54
04339N11E277g	7	Oak Brook	1513	715	-83				-118	-130	-47
04339N11E336h	6	Oak Brook	1522	695	-30	-25			-108	-155	-125
04340N09E116h	4	Bartlett	1985	770	114					108	-6
04340N09E138d	5	Hanover Park	1445	793	102					74	-28
04340N09E231e	5	Carol Stream	1357	775						15	
04340N10E093h	5	Roselle	1423	805	105	105	75	65	-5	-5	-110
04340N10E094a	7	Bloomingdale	1420	790	35					-83	-118
04340N10E148c	2	Bloomingdale	1395	750	10	-33			-45	-75	-85
04340N10E204g	8	Bloomingdale	1415	765	22					-38	-60
04340N10E321c	4	Carol Stream	1963	790	79					22	-57
04340N11E035e	8	Elk Grove	1445	700						-230	

Appendix - Continued.

County Location	Well no.	Owner	Depth ft.	Surface elev	Water level elevation 1980	1981	1982	1983	1984	1985	Water level changes, ft. 1980-1985
DuPage Cont											
04340n11E104h	5	Wood Dale	1400	695						-165	
04340N11E134b	6	C.M., StP. & P. RR	1440	671	83				51	68	-15
04340N11E138e	2	Bensenville	1442	676	-136	-143				-152	-16
04340N11E144e	3	Bensenville	1445	670	-142	-132				-125	17
04340N11E166g	7	Wood Dale	1356	693	-97	-114				-132	-35
04340N11E261d	9	Elmhurst	1479	675	-235					-225	10
04340N11E262h	6	Bensenville	1900	684	148					-171	-319
04340N11E315a	5	Lombard	1723	738	-55				-87	-104	-49
04340N11E355e	6	Elmhurst	1471	703	-137						
Grundy											
06331N08E041a	4	Gardner	1933	588	386	419				469	83
06332N08E031e	4	Coal City	786	567	345					315	-30
06333N07E042a	3	Morris	865	523	323			372	382	333	10
06333N07E044c	5	Morris	1462	506	344			347	370	350	6
06333N07E093h	4	Morris	1492	519	321				331	242	-79
06333N08E074c	3	Comm. Ed.-Collins Station	1513	525					226	252	
06333N08E075d	2	Comm. Ed.-Collins Station	1477	525	287					235	-52
06333N08E078d	4	Comm Ed.-Collins Station	1495	520	288					275	-I3
06333N08E341d	5	Coal City	1785	560	312					310	-2
06333N08E353a	2	Coal City	700	565	343			331		328	-15
06333N08E353f	1	DeMert & Dougherty Inc.	805	560	349	340				321	-28
06333N08E364b	2	Diamond	850	562	317					322	5
06333N08E365a	1	Diamond	723	562						322	
06334N08E013e	3	Minooka	1508	610						254	
06334N08E013e	4	Minooka	725	610	367					362	-5
06334N08E202e	1	Northern Petrochemical Co.	1453	524						161	
06334N08E213f	2	Alumax Mill Products Inc	1515	525	215					216	1
06334N08E213g	1	Alumax Mill Products Inc.	1540	525	235					211	-24
06334N08E219c	2	Northern Petrochemical Co.	1470	526	181					142	-39
06334N08E226e	2	Northern Ill. Gas Co.	1519	523	238					42	-196
06334N08E228e	1	Northern Ill. Gas Co.	1511	522	227	212				42	-185
06334N08E285f	5	Northern Petrochemical Co.	1455	502						187	
06334N08E345h	1	Reichhold Chemicals, Inc	706	510	429					425	-4
06334N08E347h	2	Reichhold Chemicals. Inc	710	518	438					437	-1
06334N08E351e	2	Comm. Ed.-Dresden Station	1500	515	281					279	-2
06334N08E351g	1	Comm Ed.-Dresden Station	1499	519	256					254	-2
Kane											
08938N07E052d	1	Waubonsee College	1323	703	465					495	30
08938N07E197e	4	Sugar Grove	1475	705	457	459		457		441	-16
08938N07E255b	23	Aurora	1420	670	180		165			200	20
08938N08E012C	20	Aurora	1400	715	173					135	-38
08938N08E036g	5	North Aurora	1330	700	196					172	-24
08938N08E043g	3	North Aurora	1305	675	241					173	-68
08938N08E048d	4	North Aurora	1325	689	225	218				185	-40
08938N08E083e	25	Aurora	1460	695	76					136	60
08938N08E137b	2	Aurora Paperboard Co.	1787	696	100					169	69
08938N08E138b	1	Aurora Paperboard Co.	1397	696	135					118	-17
08938N08E153h	612	Aurora (12A)	1660	669	309		319			357	48
08938N08E154h	11	Aurora	1434	635	160					110	-50
08938N08E155e	1	Aurora Bleachery Co.	1276	648						268	
08938N08E155f	2	Aurora Bleachery Co.	1368	650	152					155	3
08938N08E156f	1	Oberweiss Dairy	875	660	173					160	-13
08938N08E164d	17	Aurora	2152	685	210					305	95
08938N08E19Sa	19	Aurora	1424	685	240		220	248		115	-125
08938N08E227b	8	Aurora	1380	628	120		100			86	-34
08938N08E247c	18	Aurora	1486	715	112		104			89	-23
08938N08E274a	6	Aurora	2185	662	109	113	103	106	57	46	-63
08938N08E292h	15	Aurora	1719	665	157		137			115	-42
08938N08E324f	4	Montgomery	1333	642	67	32		84	-3	37	-30
08938N08E337c	3	Montgomery	1331	635	63	68		115		14	-49

Appendix - Continued.

County Location	Well no.	Owner	Depth ft.	Surface elev	Water level elevation 1980	1981	1982	1983	1984	1985	Water level changes, ft. 1980-1985
Lake Cont.											
09743N10E152d	2	Kemper Insurance	1402	796	145		166			135	-10
09743N10E164d	8	Lake Zurich	1373	868	146	61				86	-60
09743N10E184h	5	Lake Zurich	1345	822	203	172					
09743N10E215e	7	Lake Zurich	1333	846	150	196				166	16
09743N11E213g	1	Powernail Co.	1258	685	67					170	103
09743N11E226d	3	Lincolnshire	1300	667	-43	-55			-83	-34	9
09743N11E235f	1	Lincolnshire	1305	645	32	38	46			4	-28
09743N11E328f	2	Buffalo Grove	1355	703	23	35		-19	-47	11	-12
09743N11E331b	6	Buffalo Grove	1355	675	-68	-105				-100	-32
09743N12E313c	1	Walgreen Co.	1465	680	11					-1	-12
09743N12E316e	1	Baxter Travenol Lab.	1456	685	30				-44	-47	-77
09743N12E335c	1	Kitchens of Sara Lee, Inc.	1350	690	31					-80	-111
09744N09E245d	4	Wauconda	1264	792	316					293	-23
09744N10E128a	9	Mundelein	1380	830	190			220			
09744N10E252c	10	Mundelein	1421	760	115			177			
09744N11E193c	6	Mundelein	1405	743	218					143	-75
09744N11E217f	11	Libertyville	1490	703	153					132	-21
09744N11E284e	12	Libertyville	1926	700	110	145				161	51
09744N11E314h	8	Mundelein	1383	730	150	136				168	18
09744N11E326a	1	Vemon Hills	1912	725	175					110	-65
09744N11E333g	1	Hawthorne Melody Farms	1290	690	135					122	-13
09744N11E335a	2	Vernon Hills	1870	685	150					90	-60
09744N12E183f	2	Ingrid Co.	1600	680	192					200	8
09744N12E218f	4	Lake Bluff	1804	680	302	305	307	301	302	310	8
09744N12E322c	1	Owentsia Golf Club	1250	660	158					135	-23
09745N09E366c	1	Baxter Travenol Lab.	2010	810		340				315	
09745N10E157e	6	Round Lake Beach	1287	790	264					332	68
09745N 10E204h	7	Round Lake Beach	2000	760	302					284	-18
09745N10E262b	4	Grayslake	1354	780	290					250	-40
09745N10E303d	3	Round Lake	1241	791			289			292	
09745N11E162g	2046	Ill. Toll Highway Comm.(M4)	980	730						336	
09745N11E252h	2	Park City Mobile Homes	1203	700	230					336	106
09745N11E281e	2	Gurnee	1450	730						265	
09745N11E298a	2	Wildwood	1845	785	205					202	-3
09745N11E304g	4	Wildwood	1320	795	280					249	-31
09745N11E367c	3	American Hospital Supply Co.	1415	710	254					231	-23
09745N11E367d	1	American Hospital Supply Co.	1421	710	130					395	265
09746N12E081d	6	Winthrop Harbor	1500	690	313					322	9
09746N12E146g	1	US.G.S.	1250	585	370					347	-23
09746N12E211b	1	Zion	1100	633	361	355	348	348	343	333	-28
LaSalle											
09933N01E168a	4	Peru	1505	460	457	457	457	457	455	458	1
09933N01E168a	6	Peru	2665	540	410					400	-10
09933N01E201h	7	Peru	2591	460	297					400	103
09933N01E202h	5	Peru	2601	465		414				387	
09933N01E366f	3	Oglesby	2812	630	397					406	9
09933N01E366f	4	Oglesby	2747	630	399					401	2
09933N02E097b	2	Utica	1078	470	494					474	-20
09933N03E017c	11	Ottawa	1203	488	437					426	-11
09933N03E018a	8	Ottawa	1180	489	433					419	-14
09933N03E024b	9	Ottawa	1220	495	445	442	430	435	424	439	-6
09933N03E032b	1	American Hoechst Film Div.	1225	490	422					416	-6
09933N03E035a	2	American Hoechst Film Div.	1255	490	420	428				413	-7
09933N03E162f	1	Naplate	420	485	427	425				374	-53
09933N03E177c	2	Buffalo Rock State Park	480	542	450					452	2
09933N04E132f	5	Marseilles	1450	670					420	421	
09933N04E157e	2	Borg-Warner Chemicals	1292	480	401					356	-45
09933N04E157f	1	Borg-Warner Chemicals	1253	480	384					410	26
09933N04E158g	3	Borg-Warner Chemicals	1243	490	400					366	-34
09933N04E163g	1	Kerley Industries	442	480	420					398	-22
09933N05E076a	3	Marseilles	1466	688	416					419	3

Appendix - Continued.

County Location	Well no.	Owner	Depth ft.	Surface elev	Water level elevation 1980	1981	1982	1983	1984	1985	Water level changes. ft. 1980-1985
Kane Cont											
08938N08E347b	8	Montgomery	1378	665	126	138		76		54	-72
08938N08E348g	16	Aurora	2139	660	149		187			161	12
08939N07E058f	1	Elburn	1350	850	514	485	508	503		497	-17
08939N07E104g	1	Broadview Academy	1335	790						398	
08939N08E024c	5	Geneva	2292	753	343					373	30
08939N08E031b	2	Geneva	2172	678	235					271	36
08939N08E035e	1	Burgess Norton Mfg. Co.	1308	760	340					332	-8
08939N08E098h	6	Geneva	1350	758	319					193	-126
08939N08E117e	7	Geneva	2001	730	398	371	335	300	280	269	-129
08939N08E223e	2	Batavia	2200	667	253			255		220	-33
08939N08E223e	3	Batavia	2200	667	304					333	29
08939N08E238f	4	Batavia	1357	721	243					205	-38
08939N08E266h	5	Batavia	1440	780	232					206	-26
08939N08E335g	2	Mooseheart	1485	704	240		274			227	-13
08939N08E335g	3	Mooseheart	1386	713	231		261			239	8
08940N06E305a	4	Maple Park	960	862				602		588	
08940N07E328b	3	Elburn	1393	900	490	488	480	490		491	1
08940N08E254a	8	St Charles	1373	761	327	340				350	23
08940N08E275a	3	St. Charles	1191	690	220	213				239	19
08940N08E276b	4	St Charles	1647	692	307	306				231	-76
08940N08E316f	5	Illinois Youth Center	1292	763	378	378				363	-15
08940N08E316h	4	Illinois Youth Center	1322	790	385	374				369	-16
08940N08E346e	5	St Charles	1713	764	264	274				224	-40
08940N08E346e	6	St Charles	1502	755						259	
08941N06E091g2	2	Burlington	1105	922	569					562	-7
08941N06E091g3	3	Burlington	1105	925				573		564	
08941N07E193d	2	Burlington Central High School	1022	1037			497			475	
08941N08E123e	1	Simpson Co.	998	805	316	307	311	312	312	316	0
08941N08E233b	1	Elgin Mental Health Center	2000	748	360					538	178
08942N06E031e	2066	ILL Toll Highway Coram. (M6)	962	910	643					633	-10
08942N06E214b	5	Hampshire	804	878	588					618	30
08942N08E227f	1	Spring Hill Mall	1227	790	380					372	-8
Kankakee											
09129N10E042a	1	Natural Gas Pipeline Co.	1837	690	444					429	-15
09130N09E068a	1	Reddick	1188	612	401					344	-57
09130N10E085a	1	Natural Gas Pipeline Co.	2582	628	428					414	-14
09130N10E168c	1	Natural Gas Pipeline Co.	1825	635	422					410	-12
09130N10E193h	1	Natural Gas Pipeline Co.	1769	638	425					415	-10
09130N10E292h	5	Herscher	789	648	457					452	-5
09130N10E301h	1	Natural Gas Pipeline Co.	1788	649	439					424	-15
09130N10E348f	1	Natural Gas Pipeline Co.	1881	670	450					434	-16
Kendall											
0933SN06E056a	3	Newark	336	690	607					605	-2
09335N06E062e	2	Newark	287	663	583					583	0
09337N07E165g	1	Ill. Division of Highways	750	725	509					501	-8
09337N07E272b	1	Hide-A-Way Lakes	550	590	423					405	-18
09337N07E288b	4	Yorkville	1393	628						343	
09337N07E315b	1	Boy Scouts Of America	850	640	503					497	-6
09337N07E321e	3	Yorkville	1335	584	365					382	17
09337N08E055i	1	AT&T	1332	640	155					125	-30
09337N08E056e	2	Aurora San. Dist.	1325	628	146					135	-11
09337N08E0S9f	I	Caterpillar Tractor Co.	1384	661		175				123	
09337N08E062d	3	Caterpillar Tractor Co.	1352	661		199				141	
09337N08E062f	2	Caterpillar Tractor Co.	1346	660		180				172	
09337N08E172e	4	Oswego	1344	658	248					195	-53
09337N08E208h	3	Oswego	1378	640	240					203	-37
Lake											
09743N09E112a	2	Lake Barrington Shores	1305	815	195					140	-55
09743N10E147d	1	Kemper Insurance	1400	796	181		172			161	-20

Appendix - Continued.

County Location	Well no.	Owner	Depth ft.	Surface elev	Water level elevation 1980	1981	1982	1983	1984	1985	Water level changes, ft. 1980-1985
LaSalle Cont.											
09933N05E204e	1	Illinois Nitrogen	360	496	417					441	24
09933N05E21Sc	1	Beker Industries	575	490	420					439	19
09933N05E248c	1	Seneca	700	510	434	383					
09933N05E248c	2	Seneca	700	510	408					430	22
09934N01E051h	15	Northern Ill. Gas Co.	1007	678	585					582	-3
09934N01E052h	9	Northern Ill. Gas Co.	1022	676	583					580	-3
09934N05E022i	1	AT&T	1348	770	500					511	11
09934N05E023h	2	AT&T	1353	770	485	492				512	27
09935N01E348g	1	Northern Ill. Gas Co.	1292	675	594					589	-5
09935N05E086b	1	Sheridan Correctional Ctr.	885	591	575					573	-2
09935N05E177h	3	Sheridan Correctional Ctr.	900	592	570					565	-5
09936N01E274a	1	Del Monte Corp.	1384	730	585					591	6
09936N01E275b	2	Del Monte Corp.	1385	740	576					580	4
09936N01E292d	6	Mendota	1400	771	595					570	-25
09936N01E321a	4	Mendota	1450	740	582					585	3
09936N01E333h	3	Mendota	1377	740	576					566	-10
09936N03E184d	1	Earlville	625	703	674					673	-1
McHenry											
11143N08E054g	2	Crystal Lake	1218	917	482					467	-15
11143N08E064a	6	Crystal Lake	1295	892	389	376		367		327	-62
11143N08E082c	8	Crystal Lake	1300	900	404	420			407	380	-24
11143N08E123d	4	Cary	1350	855	339	340				341	2
11143N08E141e	6	Cary	1300	840	329	331				322	-7
11143N08E204c	5	Lake-in-the-Hills	910	870			320			415	
11143N08E213a	1	Material Service Corp.	1262	835						433	
11143N08E334h	4	Algonquin	955	870	435					421	-14
11143N08E341f	2	Algonquin	1265	860	401					308	-93
11144N05E355h	1	Arnold Engr. Co.	846	818	688					668	-20
11144N08E335a	7	Crystal Lake	1400	930	382	383		409		344	-38
11145N08E107c	8	Morton Chemical Co.	1160	835	395					333	-62
11145N08E108a	1	Modine Mfg. Co.	1200	843	451					377	-74
11145N08E108d	7	Morton Chemical Co.	1161	850	425					395	-30
11145N08E158h	2	Modine Mfg. Co.	1220	835	435					381	-54
11146N05E338b	1	Dean Food Co.	1775	880	648	582				640	-8
Ogle											
14124N10E242h	1	Comm. Ed.-Byron Station	1500	875	651					635	-16
14124N10E244h	2	Comm. Ed.-Byron Station	1500	860	641					631	-10
14140N01E234b1	2	Del Monte Corp.	404	793	730					734	4
14140N01E234b2	1	Del Monte Corp.	494	793						728	
14140N01E245h	7	Rochelle	925	795	721					716	-5
14140N01E247a	4	Rochelle	1450	793					693	725	
14140N01E252i	9	Rochelle	888	785	722					715	-7
14140N01E253f	6	Rochelle	867	800	704	700	708	715	713	717	13
14140N01E265h	3	Del Monte Corp.	420	778	591					603	12
14140N02E231f	2	Creston	737	905	770					774	4
14140N02E304c	8	Rochelle	935	793	669					690	21
Will											
19732N09E056d	3	Braidwood	1733	560	296					230	-66
19732N09E085c	1	Braidwood	1050	575	250					235	-15
19732N09E193h	1	Comm. Ed.-Braidwood Station	1753	599	353					360	7
19732N09E281d	1	Comm Ed-Braidwood (Trng Ctr 1)	1690	594		367				372	
19733N09E015e	5	Joliet Army Ammun Plt	935	570	250	250	252	253	252	252	2
19733N09E048a	1	Ill. Conservation Dept.	775	517	287					286	-1
19733N09E254g	1	Personal Products Co.	708	565	280					276	-4
19733N09E367h	3	Wilmington	1578	530	270					263	-7
19734N09E031a	4	Amoco Chemical Corp.	1415	570						-6	
19734N09E094a	1	Channahon	765	570	301					294	-7
19734N09E101h	2	Amoco Chemical Corp.	1405	568	-34					4	38

Appendix - Continued.

County Location	Well no.	Owner	Depth ft.	Surface elev	Water level elevation 1980	1981	1982	1983	1984	1985	Water level changes, ft. 1980-1985
Will Cont.											
19734N09E117g	1	Amoco Chemical Corp.	1422	569						-5	
19734N09E118f	3	Amoco Chemical Corp	1400	575	-80		-24			-8	72
19734N09E212d	1	Mobil Chemical Co.	1573	545	238					300	62
19734N09E218b1	1	Glidden Durkee Div, SCM Corp.	1555	530						140	
19734N09E218b2	2	Glidden Durkee Div, SCM Corp.	1555	530	240					240	0
19734N09E255a	8	Joliet Army Ammun Plt	1639	606	148		260			251	103
19734N09E255d	9	Joliet Army Ammun Plt	1602	590	76		182			230	154
19734N09E255h	10	Joliet Army Ammun Plt	1569	591	236		230				
19734N09E285h	1	Dow Chemical Co.	1605	534						249	
19734N09E292d	2	Dow Chemical Co.	800	523	254					255	1
19734N09E347d	1	Chicago Joliet Livestock	796	530	259					263	4
19734N09E355a	1	Joliet Army Ammun Plt	1597	539						214	
19734N09E358a	2	Joliet Army Ammun Plt	1612	532	217		244			242	25
19734N09E365a	6	Joliet Army Ammun Plt	1648	578	178		232			243	65
19734N09E365e	7	Joliet Army Ammun Plt	1649	601	248		244			249	1
19734N10E071a	1	Liquid Carbonic Corp	1630	620	42					65	23
19734N10E075a	1	Peoples Gas Co.	1581	609	68					56	-12
19734N10E076b	2	Peoples Gas Co.	1597	609	45					49	4
19734N10E316a	12	Joliet Army Ammun Plt	1670	625						241	
19735N09E093c	2	Will County Water Co.	1499	605	25				115	115	90
19735N09E103a	2	Holiday Inn Motel	1556	570	192					20	-172
19735N09E111b	10	Joliet (10D,Essington Rd)	1572	610					15	88	
19735N09E251e	3	Caterpillar Tractor Co.	1556	547	-74					-63	11
19735N10E034e	3	Joliet Correctional Center	1518	560	-160					-150	10
19735N10E035e	2	Joliet Correctional Center	1550	549	-111	-151				-149	-38
19735N10E042h	1	Penn Dixie Steel	1595	553	-121	-119	-125			-93	28
19735N10E074b	9	Joliet (9D,Campbell St)	1671	647	-103					-73	30
19735N10E091d	1	Joliet (1D,Ottawa)	1525	536						-114	
19735N10E145d	1	Prairie State Paper Mills	1639	593	-127					-107	20
19735N10E162h	604	Joliet (Des Plaines St)	1575	531	-79	-75	-79	-98	-85	-85	-6
19735N10E192b	4	Comm. Ed.-Station 9, Unit 6	1525	523	-188				-135	-141	47
19735N10E206a	2	Comm. Ed.-Station 9. Unit 6	1505	536			-179			-154	
19735N10E207g	2	Rockdale	1586	556						-112	
19735N10E214b	2	American Cyanamid Co.	1612	583	-47	-25			-47		
19735N10E228g	1	Intl. Fabricare Institute	1608	569	83					69	-14
19735N10E298c	5	Olin Co.	1490	567	-267					-136	131
19735N10E301c	4	Olin Co.	1555	583	-326					-211	115
19735N10E301e	1	Olin Co.	1520	548	-214					-232	-18
19735N10E301e	2	Olin Co.	1495	550	-218					-229	-11
19735N10E306e	2	Caterpillar Tractor Co.	1543	546	-81					-129	-48
19735N10E307f	1	Caterpillar Tractor Co.	1560	544	-90					-74	16
19736N09E044a	4	Plainfield	1443	620						38	
19736N09E108d	3	Plainfield	1481	612	35					34	-1
19736N10E027f	1	Comm. Ed.-Station 18	1500	587	-71						-88-17
19736N10E028f	3	Comm. Ed.-Station 18	1507	590	-39					-64	-25
19736N10E028h	2	Comm. Ed.-Station 18	1536	590	-37					-67	-30
19736N10E046g	4	Romeoville	1524	670	-38					-41	-3
19736N10E214a	6	Stateville Correctional Ctr	1611	642	-120					-105	15
19736N10E277a	1	Met San Dist	852	547	-61						-71-10
19736N10E281b	1	Alcan Powder and Chemicals	1546	563	-47					-98	-51
19736N10E286f	4	Stateville Correctional Ctr	1537	640	-90					-90	0
19736N10E292g	5	Stateville Correctional Ctr	1570	645	-71					-75	-4
19736N10E336h	1	Nash Brothers	1558	593	-75	-84	-85	-96	-86	-94	-19
19736N11E318a	6	Joliet (6D.Hadley Valley)	1652	642						-87	
19737N09E128c	21	Naperville	1441	645	86					75	-11
19737N10E331h	2	Romeoville	1520	640						-40	
19737N10E353c	1	Union Oil Co.	1460	585	-44				-80	-74	-30
19737N10E353c	2	Union Oil Co.	1460	585					-81	-86	
Winnebago											
20143N02E177h	36	Rockford (Unit Well 36)	1505	864	613					585	-28
20144N01E098c	20	Rockford (Unit Well 20)	1200	735	652					652	0

Appendix - Continued.

County Location	Well no.	Owner	Depth ft.	Surface elev	Water level elevation 1980	1981	1982	1983	1984	1985	Water level changes, ft. 1980-1985
Winnebago Cont.											
20144N01Elllld	1	Essex Wire Corp.	1150	740	692					690	-2
20144N01E126b	1	Ingersoll Milling Machine Co.	750	746	690					698	8
20144N01E1S3c	1	Dean Milk Co.	1125	725.	635					639	4
20144N01E173d	22	Rockford (Unit Well 22)	1380	760	613					656	43
20144N01E207f	21	Rockford (Unit Well 21)	1205	820						657	
20144N01E218e	15	Rockford (Unit Well 15)	1355	810	662					621	-41
20144N01E236d	801	Rockford (Beattie Pk/Obs Well)	1300	708	691	690	688	687	689	693	2
20144N01E271e	1	Reed-Chatwood, Inc.	450	705	620	620				643	23
20144N01E338f1	1	Muller's Pinehurst Dairy	482	760	722	722				729	7
20144N01E338f2	2	Muller's Pinehurst Dairy	465	759	727				725	724	-3
20144N01E346h	4	Rockford (Unit Well 4)	1219	730						634	
20144N01E352f	2	National Lock Co.	1140	731	651					677	26
20144N02E034c	30	Rockford (Unit Well 30)	1325	905	618					599	-19
20144N02E077e	2	Woodward Governor Co.	1227	725						697	
20144N02E082g	29	Rockford (Unit Well 29)	1357	845						595	
20144N02E092a	25	Rockford (Unit Well 25)	1290	878	641					615	-26
20144N02E145d	31	Rockford	1505	880		656				592	
20144N02E162a	27	Rockford (Unit Well 27)	1280	840	628					575	-53
20144N02E176g	17	Rockford (Unit Well 17)	1195	785	640					645	5
20144N02E186a	5	Rockford (Unit Well 5)	1312	792						610	
20144N02E203e	13	Rockford (Unit Well 13)	1457	835	655					594	-61
20144N02E231a3	3	Clock Tower Inn	860	818		665	661			650	
20144N02E285g	26	Rockford (Unit Well 26)	1326	835	637					630	-7
20144N02E293a	10	Rockford (Unit Well 10)	1426	865						606	
20144N02E324a	16	Rockford (Unit Well 16)	1310	840						600	
20144N02E355e	3	Cherry Vale Mall	682	800	690					675	-15
20144N02E358e	1	Cherry Vale Mall	1201	800	666					648	-18
20145N02E333a	4	Loves Park	1313	888					688	682	
20145N02E347g	3	Loves Park	844	840	803				783	800	-3
20146N01E248a	6	Rockton	728	828	723					728	5
20146N02E057d	3	Wis. Power & Light Co.	1200	745	721					706	-15
20146N02E065q	5	Wisconsin Power and Light	1225	779						709	
20146N02E155b	1	Colt Industries	301	820	771					774	3