

GROUND WATER GEOLOGY OF THE DEKALB AND SYCAMORE QUADRANGLES

LOREN T. CALDWELL
Northern Illinois University, DeKalb

The DeKalb and Sycamore quadrangles lie principally in central DeKalb county. Their east and west margins extend into the western tier of Kane county townships and the eastern tiers of Ogle and Lee counties townships. Both Leighton (1958) and Frye (1960) described the surface of the study area as almost entirely covered by Tazewell' glacial drift materials, with the exception of the very narrow flood plains of the streams. The surface of Tazewell drift is covered almost entirely by Peorian loess and silts. Locally the loess and silt covers Sangamon soil and Illinoian glacial drift.

This writer (1936) previously described the glacial surfaces. They consist of two morainal ridges which cross the area in a northeast-southwest direction. These ridges belong to the general Bloomington morainic system. The western or outer ridge covers the west half of the DeKalb quadrangle. This ridge is the northern limit of the Bloomington moraine. The inner ridge or Arlington moraine covers the southeast corner of the DeKalb quadrangle and much of the Sycamore quadrangles.

The study area (Figure 1) varies in topography from flat to slightly rolling. The streams all flow in shallow valleys. The relief is due largely to irregular deposition of glacial materials super-imposed upon bedrock relief. The moraines are

characterized by an irregularly rounded, undulating topography. These moraines vary in width from 3 to 6 miles.

The southeast part of the Sycamore quadrangle has a gradual surface which slopes toward the Fox River valley. This area is drained into the Illinois River. The remaining surface is drained to the north through the south branch of the Kishwaukee river, which empties into the Rock river south of Rockford. A small area in the northwest part of the DeKalb quadrangle drains to the northwest in the east branch of Killbuck Creek.

The streams have done very little cutting into the glacial blanket since the retreat of the Wisconsin ice. Stream-cuts seldom occur with depth greater than 15' to 20'. This slight amount of post-glacial erosion has done very little to change the glacial topography except in the immediate valleys of the streams. Narrow alluvial flood plains occur irregularly along the stream banks only a few feet above the average water level.

PROCEDURE

This is a study of the glacial drift, bed-rock topography, and ground-water geology in the DeKalb and Sycamore quadrangles. Data are secured largely from drilled-well records located in and near the study

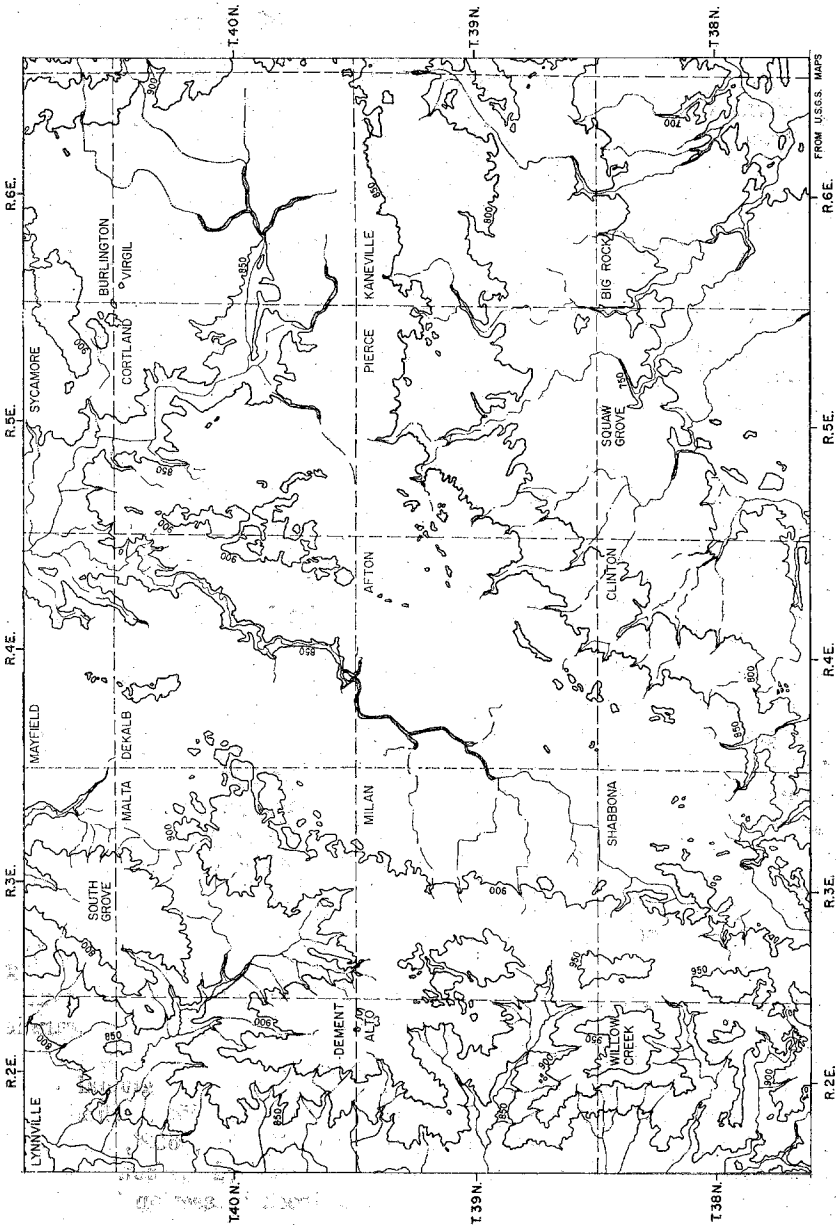


Fig. 1.—Topographic Map of Dekalb and Sycamore Quadrangles. One inch equals 5 miles; contour interval is 50 feet. Datum is mean sea level.

area. The United States Geological Survey topographic maps for the DeKalb and Sycamore quadrangles are used as a base upon which to chart the well log data. A large portion of the well logs are secured directly from well-drillers' records. 25 well records are secured from the files of the Illinois State Geological Survey well record file library.

All well records studied include the location of the well, the owner's name, the description and thickness of the rock formations through which the well penetrated, and ground water geology data made available through test pumping of the wells. These data include the piezometric levels and pump down capacity of the water in the aquifer strata tapped by the well. All well locations are charted on topographic maps, which show the following: altitude of well's surface, bedrock surface levels, and thickness of rock strata penetrated by each well. A bedrock surface contour map, and an areal geology map are made from these data. Since some wells did not penetrate the glacial drift to the bedrock surface, data from the deepest of these wells are used for their negative value in determining the elevation of the bedrock surface.

GLACIAL DRIFT COVER

The field data showing the glacial drift cover came from a total of 1100 well records. More than 930 of these well logs are located in the DeKalb and Sycamore quadrangles, while the remaining 150 well logs are located marginally outside the area. There are 542 wells which penetrate bedrock and 338 wells

which end in the glacial drift.

The initial study of this area was started in 1936 by this writer. The present study includes subsequent well log data. The well log data collected have made possible the charting of a bedrock surface map. These map data show drift thickness and buried bedrock surface information. The average thickness of the glacial drift is about 150'. Its greatest thickness is more than 350'. The minimum thickness is found in Cortland township. Here its minimum thickness is 15'. Loess and silt covers the drift over the entire area except in present stream channel and flood plain areas with thicknesses of 1.5' to 2.7'.

BURIED BEDROCK SURFACE

Bretz (1923), Ekblaw (1938), Foster (1956), Hackett (1960), and Horbert (1946), have separately reported that the buried bedrock surface in northern Illinois consists of deep valleys separated by high ridges. Buried bedrock river-channels and their directions of slope were charted on Figure 2. Locally it was difficult to decide the direction-of-flow and the elevation of divides for some minor preglacial tributaries due to a lack of well log data. For example, in the southwest part of the DeKalb quadrangle in Willow Creek township, section 14, a well penetrates glacial drift to an elevation of 552'. Similarly, levels of 600', 610', 632', and 640' have been reached without encountering bedrock in section 23, 10, 10 and 2, respectively. In addition, in Shabbona township, section 6, a well reached a 580' level in drift and in

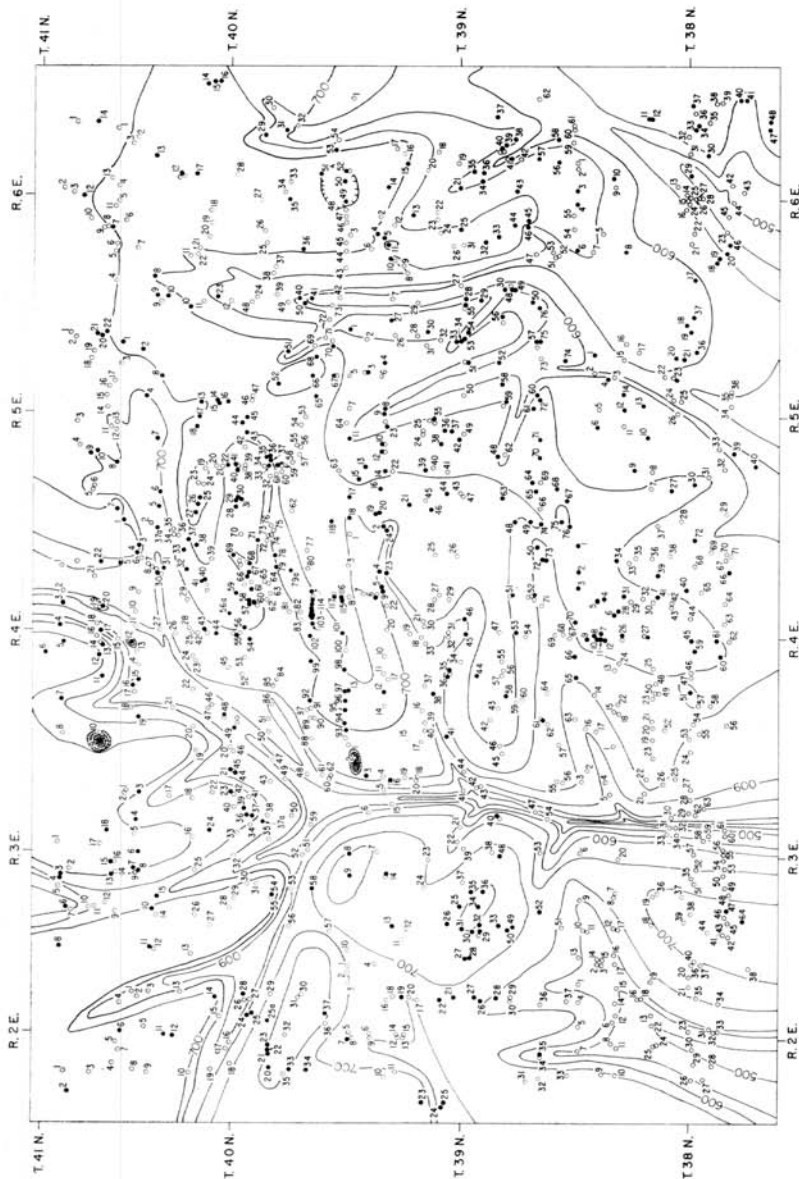


FIG. 2.—Well Location and Bedrock Surface of DeKalb and Sycamore Quadrangles. Bedrock surface contour interval is 50 ft. Circles represent wells ending in drift; solid dots represent wells ending in bedrock. One inch equals 5 miles.

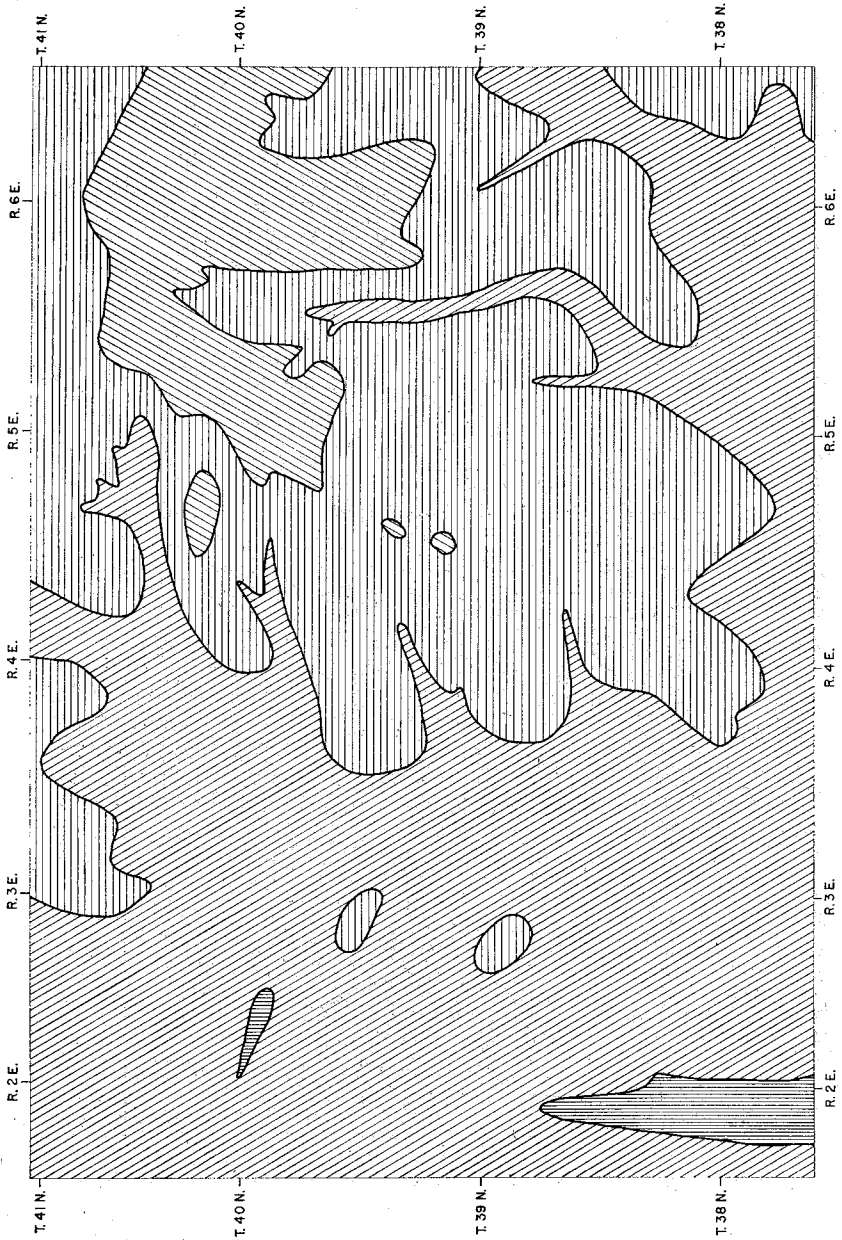


FIG. 3.—Areal Geology of DeKalb and Sycamore Quadrangles. One inch equals 5 miles. Vertical hatching represents St. Peter Sandstone; horizontal hatching represents Maquoketa Shale; right oblique hatching represents Niagaran Limestone; left oblique hatching represents Galena-Platteville Dolomite.

Alto township, section 36, a well reached a 630' level. Since wells have entered rock at levels from 700' to 750' in west central Shabbona, south central Alto, and southwest Milan townships, it is postulated that a short tributary here led into the Old Rock River instead of entering the Shabbona tributary. This conclusion was made because the stream valley should logically face in that direction at that location in order to be attached to the Old Rock River Valley. This valley was reported by Knappen and others (1926) to be located immediately to the west of this location.

Two wells in Alto township, section 12, enter rock at 640' and in section 12 at 690'. These wells are surrounded by higher bedrock levels, consequently a tributary probably entered the Old Rock River to the west.

Well log records indicate two southeast facing valleys to the west and northwest of Creston. These two valleys probably joined near the north and west edges of the quadrangle due to the proximity of the Old Rock River only two or three miles west of this quadrangle. The presence of a steep stratigraphic dip in this part of the quadrangle is a reason for expecting steep gradient valleys which face east. Also, a bedrock ridge extends from south to north across the DeKalb quadrangle, west of the Shabbona tributary.

Most of the buried bedrock topography of the DeKalb and Sycamore quadrangles is determined by two dendritic streams valleys which flow south across the two quadrangles and south west just beyond the south edge of the area. One of

these streams is located in the DeKalb and the other in the Sycamore quadrangle. The west and east tributaries will be called the Shabbona and Hinkley tributaries respectively.

The Shabbona tributary valley extends lengthwise through the center of the DeKalb quadrangle, extending south out of the quadrangle near Shabbona. It has a gradient of 3' to 5' per channel mile; and its lowest level is less than 500' above sea level. This channel floor lies near the bottom contact of the Galena-Platteville with older rocks. Its drainage divide to the west has elevations of 750' in the northwest part and 700' in the southwest part of the quadrangle. The drainage divide to the east of this valley attains elevations of more than 800' to the northeast and 700' to the southeast.

The Hinkley bedrock valley is located in the south and central parts of the Sycamore quadrangle. This stream has two main branches, one flowing south from the center of the quadrangle and the other flowing southwest along the south edge of the quadrangle. These two branches will be called the Maple Park and the Big Rock branches respectively. The pattern of the Maple Park and the Big Rock branches indicates that they join to the south of the Sycamore quadrangle. These two streams have average gradients near 5' per mile in their lower courses; their lowest levels are 450' for the Maple Park branch and 400' for the Big Rock branch. Their drainage divides vary in altitude from more than 800' above sea level in the north to 650' in the south.

The buried bedrock topography of these two quadrangles was formed by pre-glacial streams which eroded rock strata with differing hardnesses. The pre-glacial Rock river, located near the west edge of this region, may have caused the high gradients of this region's pre-glacial drainage channels. The DeKalb quadrangle's western half has its bedrock topography eroded into the Galena formation, resulting in the formation of its flat divides and abrupt valley walls. Two erosional remnants of the soft lower Maquoketa formation occur in parts of Malta and Milan townships. The middle horizon of the Maquoketa formation dominates the east side of the sloping valley in the east half of the DeKalb quadrangle. This Maquoketa-covering of shaly dolomite is very thin. It is immediately underlain by the top of the Galena dolomite formation. Along the extreme east edge of the DeKalb quadrangle, the more resistant middle horizon of the Maquoketa formation, occupies the steep preglacial valley wall. The western half of the Sycamore quadrangle contains the Niagaran limestone which caps the softer upper portion of the Maquoketa formation. This resistant dolomite cap-rock is located principally in Cortland township, and it extends into the northwest part of Pierce township. Relatively steep slopes border this cap-rock. These slopes extend downward through the resistant middle Maquoketa. Four wells (Figure 2) located in the northeast portion of the DeKalb quadrangle may have been drilled into solution cavities or sink holes which were formed by glacial waters dissolving the dolomite of the middle

Maquoketa. This resistant rock horizon is located at the 750' level in the north and near the 700' level in the south portion of the quadrangle.

The eastern half of the Sycamore quadrangle has bedrock surfaces capped largely by 25' to 30' of Niagaran limestone. The streams which cut through this Niagaran capping to the south and west formed steep valleys. One valley south of Maple Park has a crest to crest width of 3 miles and a depth of more than 150'.

PRE-GLACIAL DRAINAGE RELATIONS

This area has a buried bedrock topography which has been reported by Horbert (1950) to be in accord with the presence of the pre-glacial Rock river, located west of this area. This buried Rock river channel-floor lies at an elevation near 400', while the buried stream channels of the study area have average levels of less than 500' for both the Shabbona and Hinckley tributaries. Assuming that they enter the channel of the buried Rock river some miles to the south and slightly west, this difference in level would be expected. The tendency of these tributary streams to parallel the pre-glacial Rock river channel may have resulted from the influence of stratigraphic uplift associated with the sandwich fault which is known to occur immediately to the west of the study area in Ogle County.

PRE-GLACIAL AREAL GEOLOGY

A pre-glacial areal geology map was constructed for the study area. Figure 3 was constructed from data

supplied largely by 542 bedrock well records. The Shabbona tributary stream, flowing from north to south through the center of the DeKalb quadrangle, follows closely along the bedrock surface boundary between the Galena and the Maquoketa formations. The Galena formation lies west and the Maquoketa formation lies east of this buried outcrop contact line. Long tongues of the Galena dolomite are exposed in the lower portions of the stream valleys in the south and the central portions of the Sycamore quadrangle. Most of the east half of the DeKalb quadrangle and the west half of the Sycamore quadrangle have Maquoketa rock comprising the bedrock surface; one exception is the long narrow cap rock of Niagaran limestone in Cortland and Pierce townships. Most of the northeast one-third of the Sycamore quadrangle is capped with a very thin remnant of the Niagaran formation, while the southeast corner of the quadrangle has the valley slopes comprised of the Maquoketa and Galena formations.

Since, the pre-glacial surface distribution of rock formations are determined by well records, the question always exists about the extent of these strata between wells. To determine this extent, the bedrock surface contour map and two structural sections were employed. The main areas of rock were fairly easily determined. Certain localities offered problems. For example: the patches of the Maquoketa formation, shown west of the Shabbona tributary stream as capping the upland flats of the Galena dolomite ridge, were suggested by well records num-

bers 8, 9, 34, and 35 in sections 20, 21, 4, and 5, Milan township. The extent of the formation was postulated in part by widely scattered deep well records and by using known dip slope values and the bedrock surface contour map. The line of contact between the Maquoketa and the Galena formations in the southeast part of the DeKalb quadrangle and the southwest part of the Sycamore quadrangle is derived largely from known stratigraphic dip values, and bedrock surface contours.

The arm of Niagaran limestone shown in Cortland township has its presence established by well records numbers 16, 17, 19, 20, and 46 in sections 5, 6, 7, and 18, Pierce township. The areal extent of the formation is determined by widely separated deep well records and upon calculated structure and bedrock contours for the area.

One well record number 28 in section 23, Creston township, indicates that the floor of the pre-glacial valley may be in St. Peter sandstone. Due to the steep east dip of the formation at this location and the probably steep gradient of the pre-glacial stream, it is difficult to determine the bedrock surface extent of this formation. However it has been postulated to lie in a very narrow strip in the bed of this valley as well as in the floor of the pre-glacial valley located in Willows Creek township.

ROCK FORMATIONS

The nature and extent of rock formations has been determined by using data from about 60 deep well

logs (Table 1). These wells vary in depth from more than 3,000' to 500'. A few wells, located outside the area, are included in this group where deep well records are not available within the region. A few well logs have been selected which show the lithologic nature of the rock formations in widely separated areas. A few of the deepest wells furnish most of the correlating stratigraphic data. A deep well located in Sycamore township, section 35, SW $\frac{1}{4}$, NW $\frac{1}{4}$, SE $\frac{1}{4}$ was drilled to a depth of 3105'. This well penetrates (Cambrian) sediments with a total thickness of 2080'. These Cambrian strata include: upward; the Mt. Simon sandstone formation with a 1380' thickness, Eau Claire with 420', Iron-ton-Galesville with 145', Franconia with 80', and Trempealeau with 55'. These Cambrian formations were practically all sandstone with the exception of the Trempealeau, which was largely cherty dolomite.

Other deep well records show several Ordovician rock formations. The Prairie du Chien formation varies in thickness from 55' to more than 80'. An unconformity occurs at the top of this formation. The St. Peter sandstone rests upon the eroded surface of the lower formations. This formation varies in thickness from as much as 330' at Creston to 80' at Elburn. The Glenwood formation at the top of the St. Peter, varies in thickness from 95' in the west part of the area to 55' in the east. The Platteville and Galena formations are considered together in this discussion. They are variable in thickness throughout this area due to pre-glacial erosion,

with an original average thickness of 345'. In a few places, the Maquoketa formation is shown to possess considerable thickness. This thickness in the east portion of the area is 127'. The lower 35' of the Maquoketa formation consists of a soft black shale, interbedded with dolomite, the middle 37' is fairly compact dolomite, while the upper 35' of the formation is composed of calcareous shaly dolomite.

A very thin capping of Niagaran limestone (Silurian) is found in the Sycamore quadrangle. This compact dark gray dolomite varies in thickness from 15' in the western portions to 25' in the eastern portion of this quadrangle.

STRUCTURAL GEOLOGY AND SECTIONS A-B AND C-D

Section A-B crosses the area along an east-west line at latitude 45 degrees, 55 minutes (Figure 4). Deep well records at Creston, Malta, DeKalb, Cortland, Maple Park, and Elburn are used in deriving the section. In general, the section was constructed without difficulty. Some questions of well log interpretation arose. For example: well logs at Malta, Creston, and Elburn did not recognize the Glenwood formation; however, the description of the strata in the log led the writer to give the formation, the thickness indicated on the section. The lithologic nature of the Maquoketa is very dolomitic.

Section C-D is located along a north-south line across the area on west longitude 88 degrees 44 minutes (Figure 4). This longitudinal line crosses the north portion of the study area. The structural data of

section C-D is based upon deep well logs which are located largely in the north portion of the section.

Two sections have been made to show the salient features of structure. Section on line A-B crosses the area on a line through Creston, Malta, DeKalb, Cortland, Maple Park, and Elburn. Section on line C-D crosses the area on a line through DeKalb to one mile east of Waterman.

In general, the strata have a dip slope to the southeast. These stratigraphic dip values have been determined by the Maquoketa-Galena strata contact levels. However, dip-slope values have been measured in east-west and north-south directions. The average stratigraphic dip of the formations from Malta to Elburn, an east-west distance of about 20 miles, is from 7' to 10' per mile. In contrast to this value, the strata dip from Creston to Malta, an east-west distance of 5 miles, averages 60' per mile. The direction of dip in this section is to the east. From north to south along the west edge of the DeKalb quadrangle, these strata dip to the south at 10' per mile over a distance of more than 17 miles. On a line parallel to the above, but along the west edge of the Sycamore quadrangle, the average southerly stratigraphic dip is about 4' per mile. Along the east edge of the Sycamore quadrangle the average dip is 2.5' per mile the south. From the northwest corner of the area to the southeast corner, a distance of above 40 miles, the stratigraphic contact level (true dip) drops 560'. This dip direction indicates an average true dip of 14' per mile. The local true dip values are greatest along the

northwest edge of the area and less steep to the southeast. The true average stratigraphic dip in the southeast portion of the area is 9' per mile.

GROUND WATER AND AQUIFER STRATA

594 of the wells take water from the glacial drift. 338 wells take water from various bedrock aquifers. A majority of the wells which pump water from bedrock aquifers are located in the population centers of the area. The wells which pump water from the glacial drift formation are widely scattered over the entire area.

Wells ending in the glacial drift varied in depth from place to place. In the area from Creston to south of Lee, many of these glacial drift wells are 200' to 350' deep. In the vicinity of Steward and west of Lee, many of the glacial drift wells are driven wells penetrating to depths of 10' to 30'. Such shallow driven wells also occur northwest of Creston to the northwest corner of the quadrangle. Glacial drift wells in the vicinity of Waterman are near 130' to 140' in depth, giving satisfactory amounts of water. Wells near Hinkley vary in depth from 60' to 80'. Wells north and east of Malta and west and north of DeKalb which do not penetrate bedrock, have depths of 80', 120', and 160'. A good share of these wells are no deeper than 80' with small to average quantities of water for farm uses. Wells taking water from the bedrock formations usually penetrate the overlying strata until one of the following aquifer strata is

TABLE 1.—Well Log Data for 60 Drilled Well Records Which Penetrate Bedrock Formations.

Township	Well Location	Surface Elevation	Bedrock Surface Elevation	Top of Rock Formation	Bottom of Well
Willow Creek	T.38N., R.2E.,	(1-38) 38 drift wells, 0 bedrock wells.			
Shabbona	T.38N., R.3E.,	(1-64) 62 drift wells, 2 bedrock wells.			
Clinton	T.38N., R.4E.,	(1-72) 46 drift wells, 26 bedrock wells.			
Squaw Grove	T.38N., R.4E.,	(1-40) 21 drift wells, 19 bedrock wells.			
Big Rock	T.38N., R.6E.,	(1-48) 27 drift wells, 21 bedrock wells.			
10.	S12, SW, NE, SW	710	640 shale	510 limestone	505
11.	S12, SW, SW, SC	700	630 shale	580 limestone	470
12.	S13, SE, NW, SE	735	635 limestone	555 limestone	555
37a.	S24, NE, NW, NE	735	627 limestone	395 limestone	395
47.	S35, NE, NE, NE	700	640 shale	600 limestone	600
48.	S34, SW, SE, SE	700	630 shale	470 limestone	470
Alto	T.39N., R.2E.,	(1-37) 27 drift wells, 10 bedrock wells.			
Milan	T.39N., R.3E.,	(1-57) 33 drift wells, 24 bedrock wells.			
2.	S1, NW, NE, SW	880	472 shale	430 limsetone	410
40.	S23, SW, SW, SW	885	484 limestone	400 sandstone	400
Afton	T.39N., R.4E.,	(1-76) 48 drift wells, 28 bedrock wells.			
61.	S31, NE, NW, NW	880	665 shale	655 limestone	285
Pierce	T.39N., R.5E.,	(1-76) 24 drift wells, 52 bedrock wells.			

TABLE 1.—Continued.

Township	Well Location	Surface Elevation	Bedrock Surface Elevation	Top of Rock Formation	Bottom of Well
4.	S2, SW, SE, SW	880	712 shale	645 limestone	587
10.	S4, SE, SW, SW	870	710 shale	685 limestone	685
12.	S5, SE, SE, SE	890	711 shale	625 limestone	590
27.	S12, NW, NE, NE	870	660 shale	620 limestone	588
30.	S13, NW, NW, NE	850	686 shale	624 limestone	624
33.	S14, SE, SE, NE	810	646 shale	533 limestone	553
53.	S24, NW, NW, NW	810	664 shale	600 limestone	600
58.	S27, NE, NE, NE	800	660 shale	625 limestone	575
74.	S35, SE, NW, NW	770	613 shale	455 limestone 280 St. Peter sandstone	240
Kaneville	T.39N., R.6E., (1-62) 31 drift wells, 31 bedrock wells.				
4.	S5, SE, SE, SE	860	725 shale Glenwood shale	685 limestone 655	580
36.	S22, NE, SW, SW	800	Prairie du Chien dolomite 675	580 635 limestone 615 shale 575 limestone	575
38.	S26, NE, SW, SW	780	655 limestone	640 shale 520 limestone	520
48.	S30, NW, NE, NW	790	670 shale	550 limestone	526
57.	S35, NW, NW, NW	770	680 limestone	608 shale 485 limestone	485
Dement	T.40N., R.2E., (1-38) 24 drift wells, 14 bedrock wells.				
24.	S23, NW, SE, SE	910	730 shale	660 limestone	325
25a.	S23, SW, SE, NE	925	St. Peter sandstone 675 shale	325 510 limestone	185

TABLE 1.—Continued.

Township	Well Location	Surface Elevation	Bedrock Surface Elevation	Top of Rock Formation	Bottom of Well
Malta	T.40N., R.3E., (1-62) 47 drift wells, 15 bedrock wells.				
37a.	S22, SE, SE, NW	890	655 limestone	655 Galena Platteville 460 20 5 —85 —255	—363
39.	S23, NW, SW, NE	920	675 limestone	420 St. Peter sandstone 100 —300	—300
39a.	S23, SW, NW, NW	900	685 limestone	400 sandstone —100 limestone	—100
Malta	T.40N., R.4E., (1-118) 59 drift wells, 59 bedrock wells.				
12.	S4, NW, SW, NW	870	700 shale	687 limestone	665
19.	S6, SE, NW, NE	860	680 limestone	435 sandstone	405
37.	S12, SE, SW, NW	880	730 shale	655 limestone	655
37a.	S12, NE, NE, NW	860	685 shale	640 limestone	625
56a.	S15, SW, SW, SE	855 limestone	714 shale	673 limestone	—230
61.	S23, SW, NW, NW	880	710 shale	670 limestone	—441
67.	S23, NW, SE, NW	890	685 shale	660 limestone	—400
68.	S23, NE, SE, SW	890	755 limestone	340 320 320 St. Peter sandstone	—438

TABLE 1.—Continued.

Township	Well Location	Surface Elevation	Bedrock Surface Elevation	Top of Rock Formation	Bottom of Well
78.	S26, NE, NE, NE	Prairie du Chien dolomite 890	710 shale	—55 680 limestone	—485
		Glenwood shale		334	
		St. Peter sandstone		239	
79a.	S26, NW, SE, NW	Ironton Galesville sandstone 888	718 shale	—256 698 Galena limestone	—432
		Platteville limestone		458	
		Glenwood shale		333	
		St. Peter sandstone		263	
		Prairie du Chien limestone		58	
		Trempeleau dolomite		—37	
		Franconian dolomite		—168	
		Ironton sandstone		—272	
		Galesville sandstone		—352	
		Eau claire sandstone		—432	
93.	S31, SW, SW, SE	870	486 limestone shelf	460 Platteville limestone	358
		St. Peter sandstone		378	
Cortland	T.40N., R.5E., (1-73) 34 drift wells, 39 bedrock wells.				
5.	S4, SW, SW, SE	880	725 shale	690 limestone	590
22.	S17, SE, SW, WC	880	607 shale	660 limestone	215
			St. Peter sandstone	215	
28.	S19, NW, NW, NE	900	716 shale	660 limestone	525
35.	S20, SE, SW, NW	880	715 shale	540 limestone	540
37.	S20, NE, SW, SE	890	765 shale	740 limestone	725
40.	S20, NW, NE, NE	895	740 shale	690 limestone	635
41.	S20, NE, NW, NW	895	745 shale	207 limestone	207
51.	S26, NE, SW, NE	860	700 shale	690 limestone	690
53.	S29, NW, NE, SE	900	765 shale	755 limestone	745
65.	S34, NW, NE, SW	870	790 shale	720 limestone	720
Virgil	T.40N., R.6E., (1-54) 33 drift wells, 21 bedrock wells.				
36.	S29, SE, SW, NW	870	710	630 limestone	610

TABLE 1.—Concluded.

Township	Well Location	Surface Elevation	Bedrock Surface Elevation	Top of Rock Formation	Bottom of Well
Lynnville	T.41N., R.2E., (1-5) 4 drift wells, 1 bedrock well.				
South Grove	T.41N., R.3E., (1-18) 11 drift wells, 7 bedrock wells.				
5.	S29, NE, NW, NW	870	770 shale	730 limestone	730
13.	S33, SW, SE, NW	930	760 shale	750 limestone	600
15.	S33, SE, SE, SW	940	770 shale	750 limestone	660
Mayfield	T.41N., R.4E., (1-22) 20 drift wells, 2 bedrock wells.				
6.	S28, NW, NE, NE	890	760 shale	745 limestone	505
13.	S32, SE, NE, NE	890	690 shale	600 limestone	500
14.	S33, SW, NE, NE	900	700 limestone	620 limestone	620
21.	S34, SW, NW, NW	870	720 limestone	490 limestone	490
Sycamore	T.41N., R.5E., (1-22) 15 drift wells, 7 bedrock wells.				
9.	S32, NE, NE, SC	850	705 limestone	315 St. Peter sandstone	1002
19.	S35, SW, NW, SE	910	740 shale	660 Galena limestone	-2195
			Glenwood shale	330	
			St. Peter sandstone	265	
			Trempeleau dolomite	-105	
			Franconian dolomite	-155	
			Ironton Galesville sandstone	-240	
			Eau Claire sandstone	-380	
			Granite	-2195	
Burlington	T.41N., R.6E., (1-14) 11 drift wells, 3 bedrock wells.				
14.	S35, NE, SE, SE	925	715 shale	707 limestone	545
Total Number of Well Log Records					
Drift Deepened to Bedrock Logs 50					
Drift Wells 542					
Rock Wells 338					
Total.....930					

reached, the Ordovician dolomites, the St. Peter sandstones or the Cambrian sandstone aquifers. Most of the deep city, factory, and railroad wells take water from these aquifers horizons. This group of wells number about 60 in the total group of wells studied. 100 of the remaining 338 bedrock wells are located on farms. Most cases these farm wells were drilled through the Niagaran and Maquoketa formations and into the Galena dolomite 10' to 50' before being completed. The jointed and fractured Galena formation furnishes easy means for the circulation of good quality artesian water.

In general, the water supply is excellent from both bedrock and glacial drift aquifers throughout the entire study area. In agreement with earlier reports by Suter and others (1959), and Templeton (1950), wells less than 80' deep have proven to be unsatisfactory, except those shallow wells which are fed by spring water. The temperature of the water from wells which are drilled to 80' depth, varies from 48 to 52 degrees Fahrenheit, while those deeper wells have water slightly warmer.

ACKNOWLEDGMENTS

The author is indebted to Northern University for the use of equipment and facilities in making and reporting on this research project. I wish to express gratitude to the Illinois State Geological Survey well log record library for much data used in this study. I also extend thanks to Mr. Kenneth Prentice, a former student in my classes and a well driller who furnished more than 100 recent bedrock well records

taken largely from rural areas located in these two quadrangles. Specific thanks are offered to Mr. John Ross as the cartographer who made the final line work on figures one through four.

SUMMARY

A bedrock surface map and an areal geology map are formulated from 930 drilled well logs. Two structure cross sections are made from the data given by the deeper well records, one section extends across the study area in an east to west direction and the other from north to south across the central portion of the area. Interpretations are made for the data of the two sections and from the two maps. Glacial drift covers all the study area with thicknesses from 40' to 350'. The glacial drift aquifer which is the most productive, occurs at the base of the drift layer. The buried bedrock surface has an average dip-slope to the south, including one large and two small parallel stream channels with 5' per mile channel gradients southward. The areal geology consists of Galena-Platteville surfaces in the DeKalb quadrangle and Maquoketa shale slopes with Niagaran dolomite uplands in the Sycamore quadrangle. The rock strata have an average structural dip to the south-east of about 9' per mile. Bedrock aquifers occur in the Ordovician (Galena-Platteville) dolomite, Ordovician (St. Peter) sandstone, Cambrian (Iron-ton-Galesville) sandstone, Cambrian (Eau Claire) sandstone, and Cambrian (Mt. Simon) sandstone. The Iron-Galesville aquifer is the best water-

resource for water wells in the study area. The study is intended to furnish local detailed geologic data which could prove useful in further studies of ground water reserves in this area.

REFERENCES CITED

- BRETZ, J. HARLEN. 1923. Geology and mineral resources of the Kings Quadrangle. Illinois Geol. Survey Bull. No. 43, pp. 205-304.
- CALDWELL, LOREN T. 1936. A Study of the Stratigraphy and the PreGlacial Topography of the DeKalb and Sycamore Quadrangles. Unpublished Masters Thesis, University of Chicago, pp. 1-22.
- EKBLAW, GEORGE E. 1938. Kankakee Arch in Illinois. Geol. Soc. America Bull., 49: 1425-1430. (Reprinted as Illinois Geol. Survey Circ. 40, 1938).
- FOSTER, JOHN W. 1956. Groundwater geology of Lee and Whiteside Counties, Illinois. Illinois Geol. Survey Rept. Inv. 194, p. 9.
- FRYE, J. C., and H. B. WILLMAN. 1960. Classification of the Wisconsinan Stage in the Lake Michigan Glacial Lobe. Illinois Geol. Survey, Circ. 285, pp. 1-16.
- HACKETT, J. E. 1960. Ground-Water Geology of Winnebago County, Illinois. Illinois Geol. Survey, Rept. Inv. 213, pp. 40-49.
- HORBERT, LELAND. 1946. Preglacial erosion surfaces in Illinois. Jour. Geology, 54(3) 179-192. (Reprinted as Illinois Geol. Survey Rept. Inv. 118, 1946, pp. 183-186.)
- HORBERG, LELAND. 1950. Bedrock topography of Illinois. Illinois Geol. Survey Bull. 73, pp. 65-67.
- KNAPPEN, R. S. 1926. Geology and Mineral Resources of the Dixon Quadrangle, Illinois Geol. Surv. Bull. 49, p. 93.
- LEIGHTON, M. M. 1958. Important elements in the classification of the Wisconsin glacial stage. Jour. Geology, 66 (3) p. 288-309.
- SUTER, MAX, ROBERT E. BERGSTROM, H. F. SMITH, GROVER H. EMRICH, W. C. WALTON and T. E. LARSON. 1959. Preliminary report on groundwater resources of the Chicago region, Illinois. Illinois Water Survey and Illinois Geol. Survey Coop. Ground-water Rept. 1, pp. 48-65.
- TEMPLETON, J. S. 1950. The Mt. Simon sandstone in northern Illinois. Trans. Ill. Acad. Sci., 43: 151-159. (Reprinted as Illinois Geol. Survey Circ. 170, 1951.)