GEOLOGY FOR PLANNING IN NORTHEASTERN ILLINOIS

VI. GEOLOGY FOR PLANNING IN WILL COUNTY

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INTRODUCTION

Will County is the southernmost and second largest, after Cook, of the six metropolitan Chicago counties. It has a land area of 845 square miles (2,110 km^2) and a population of approximately 250,000, mostly concentrated in the towns and cities along the Des Plaines River. Joliet is the county seat besides being a large industrial city. The eastern part of the county is still mainly agricultural and residential, but a number of suburban towns in this area, located along the major highways and commuter railroads, are continually growing.

The most striking geologic feature in Will County and its most important economic asset is the Des Plaines River Valley (Willman, 1973). This valley has served Indians, early explorers, and modern man as the major transportation route between the Great Lakes and the Mississippi River. Since the completion of the Illinois Waterway, which, in Will County, consists of the Des Plaines River south of Lockport, and of the Chicago Sanitary and Ship Canal north of there, the strategic role played by the Waterway in the industrial and agricultural vitality of the Chicago Metropolitan Area, and to the entire Midwest, cannot be over-emphasized. Barge traffic on the Waterway makes it one of the busiest in the country and vast tonnages of grain, soy beans, coal, oil, chemicals, and mineral products are carried on its waters every year. In addition, several of the major rail lines in the country, on entering and leaving Chicago, follow the easy grade of the valley on their routes to the southern and western parts of the United States.

Industrial and residential growth will undoubtedly continue in Will County and it is important for planners to be aware of the county's natural assets and limitations. If limiting geologic and hydrogeologic

conditions are not considered in the planning process, some human activities directly affecting the physical environment could have deleterious effects on the resources, industries, residential facilities, and health of the county's citizens.

To furnish planners with some understanding of the physical environment of the county, this study presents a basic geologic map of the surficial materials present to a depth of 20 feet (6 meters). A number of interpretive maps are also included to facilitate in the evaluation of all areas of the county for specific land uses and resource development.

In preparing this report, the geologic materials were first mapped in detail on 7½ minute U. S. Geological Survey Topographic Quadrangle sheets at a scale of 1:24,000 and then reduced to a 1:62,500 scale county base (plate 1) generated by the ILLIMAP system. Units less than 40 acres (16 hectares) in extent were eliminated from the reduced map. Various types of data were utilized for mapping surficial materials, such as field observations and laboratory study of samples, logs and sample descriptions of water wells and engineering borings, test data from engineering borings, previously published and unpublished reports, and published soil maps. Also included in the report are a terrain map (plate 2), a map of the poorly-drained soils (plate 3), five interpretive maps detailing conditions for various waste disposal practices (plates 4a - 4e), two maps for interpretations of land utilization (plates 5a and 5b), and maps showing dolomite (figure 2) and coal (figure 3). Criteria and methods for preparing both the geologic materials maps and the interpretive maps were described in Volume 1.

Acknowledgements

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GEOLOGY

The present-day drainage, topography, and distribution of surficial materials in Will County result from the action of glacial ice and running water. Unlike the other five Northeastern Illinois Counties, consolidated bedrock is present at or within five feet (1.5 meters) of ground surface in approximately 50 square miles (125 km^2) in Will County. In the remainder of the county, the layered, consolidated bedrock is covered by unconsolidated surficial deposits up to 150 feet (45 meters) thick in several small areas in the eastern part of the county, but generally averaging 50 to 100 feet (15 to 30 meters) thick.

The bedrock exposed at the surface and underlying most of the drift in the county is primarily Silurian-age dolomite. Thirty square miles (75 km^2) in the southwestern part of the county, however, are underlain by Pennsylvanian shales, sandstones, and thin coal beds and there are several small outcrops of these rocks in the lower Des Plaines Valley. In addition, shale and dolomite of the Maquoketa Group (Ordovician in age) also form the uppermost bedrock in several areas in the southwestern portion of the county, outcropping generally along the Kankakee Valley.

The general stratigraphy and age relationships of both the glacial deposits and bedrock are shown in Figures 1 and 2 in Volume 1. Detailed descriptions of the bedrock geology can be found in Buschbach (1964) and Willman (1973) and a summary of both the glacial and the bedrock geology can be found in Willman (1971). Some of the data available on the glacial deposits has been presented by Lund (1966).

The major topographic features in Will County reflect the influence of both glacial deposition and erosion. The valleys of the Des Plaines and Kankakee Rivers are the most striking glacial features in the county. These valleys were the main drainageways for exceptionally large volumes of glacial meltwater. Large quantities of sand and gravel were also deposited along these drainageways as valley trains, and, along the Kankakee River, large quantities of this sand has since been blown into dunes.

Moraines, or hilly ridges, composed of till deposited directly by glacial ice are the second most conspicuous topographic features in the county. Most of the eastern portion of Will County is covered by the Valparaiso Moraine (figure 1). The Minooka Moraine covers small areas along the western county line. The Rockdale Moraine is present between the DuPage and Des Plaines Valleys in the northwestern part of the county, and in the southwestern part, remnants of this moraine are present east of the Kankakee and the Des Plaines Rivers.

Large areas east and west of the river valleys are flat, rather extensive lake plains, underlain by till. This till is covered by sand in the southwest, and, in a few other areas, by small, discontinuous deposits of silt. Detailed descriptions of the formation of all of these features and a discussion of the geologic history of the region are given by Willman (1971). Older publications (Fisher, 1925) and (Ekblaw and Athy, 1925) are also excellent sources of information that detail the glacial history of the county.

Glacial and Unconsolidated Surficial Deposits

On plate 1, the consolidated and unconsolidated surficial geologic materials are mapped to a depth of 20 feet (6 meters). These materials exert the major physical control on human activities within the county. In the legend on plate 1, the materials are listed in stratigraphic order; that is, the oldest is at the bottom and the youngest is at the top. For convenience, the materials are also listed in alphabetical order on Table 1, Volume I. In this report,

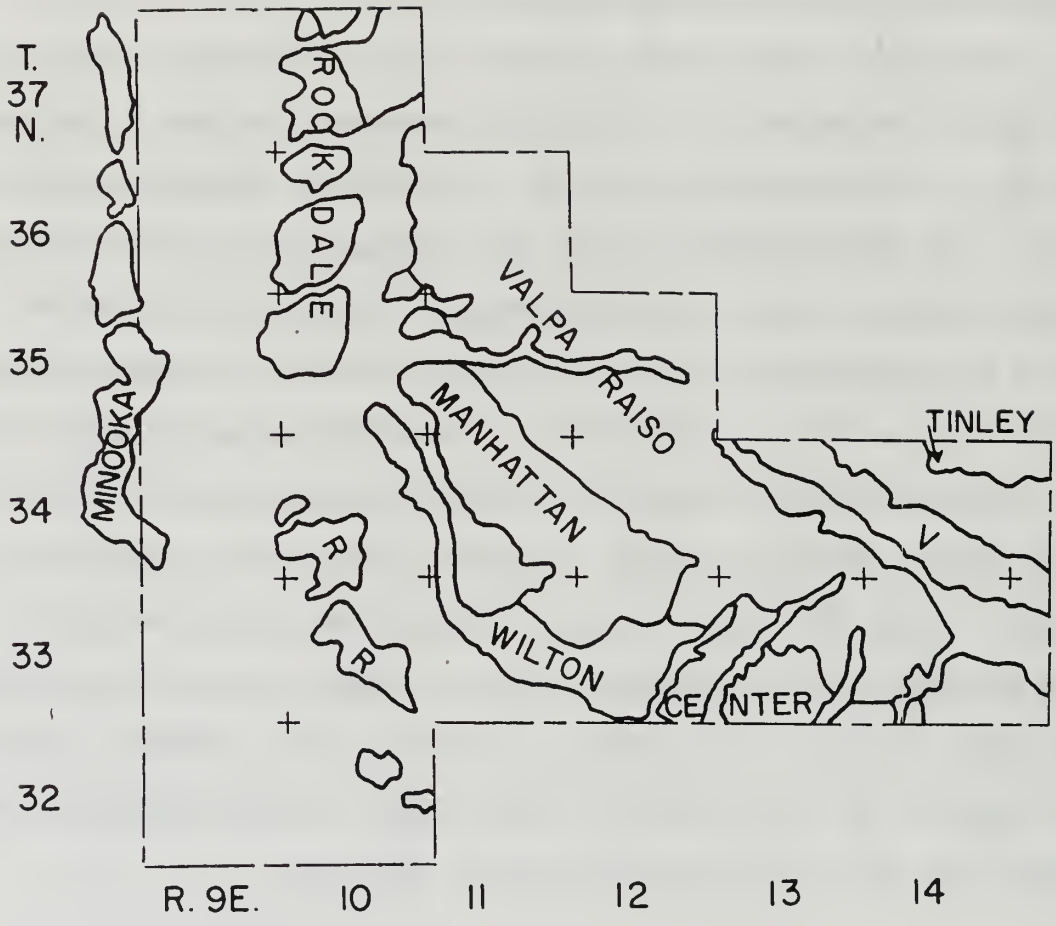

Figure 1 - Moraines in Will County (after Willman and Frye, 1970).

the deposits are described in groups of similar materials: till, glacial sand and gravel, glacial lake and wind-blown deposits, and recent deposits. The available physical and mineralogical properties of the geologic units in Will County are summarized in Table 1. The character of each individual geologic unit and the geologic processes which formed it are discussed in Volume I of this series.

Till

Till is the most abundant glacial material in Will County, lying from the surface to a depth of 20 feet (6 meters) over approximately 75% of it. Till is unsorted debris deposited directly by glacial ice and is composed of pebbles, cobbles, and boulders embedded in a matrix of clay, silt, and sand. Two surficial till units are present in the county — the Yorkville Member of the Wedron Formation and the Wadsworth Member of the Wedron Formation.

The stratigraphic relationship of the Wadsworth and Yorkville Tills is discernible from the surficial materials map. The Yorkville is the older of the two and is present at the surface in the southwestern two-thirds of the county. The younger Wadsworth overlies the Yorkville in the northeastern third of the county. The Malden Till, an older member of the Wedron Formation, occurs at the surface in Kane County about 10 miles northwest of the Will County line. The Malden Till does not occur as the surface till in Will County, but it has significance here as there is evidence suggesting that the Malden, and particularly its characteristic outwash, is present discontinuously at shallow depth in scattered areas throughout Will County.

Wedron Formation

Wadsworth Till Member (ww). The material at the surface in the northeastern third of Will County is Wadsworth Till where it forms the conspicuous Valparaiso Moraine. This moraine is a 10 mile-wide complex of low ridges and hills form-

TABLE 1

Physical and Mineralogical Properties of
Geologic Units Mapped in Will County

Units		Data									
		N	qu	w	Gvl	Sd	St	Cl	M	I	C-K
Henry Formation	$\bar{X}$	11	-	-	42.6	48.3	34.6	17.1	-	-	-
Mackinaw and Batavia	n	62	-	-	16	16	16	16	-	-	-
Members (hm & hb)	R	35-119	-	-	2-73	22-87	2-57	0-47	-	-	-
Cahokia Alluvium	$\bar{X}$	-	-	-	15	29	45	26	-	-	-
(c)	n	-	-	-	12	16	16	16	-	-	-
	R	-	-	-	0-51	0-51	23-58	6-49	-	-	-
Peyton Colluvium	$\bar{X}$	14.7	3.5	19.8	1.0	8.2	47.8	45.0	-	-	-
(py)	n	7	10	11	9	9	9	9	-	-	-
	R	8-23	1.3-8.9	14.2-24.4	0-5	1-18	26-65	33-69	-	-	-
Wedron Formation	$\bar{X}$	29.7	4.5	16.5	4.2	14.9	45.7	39.4	5	76	19
Wadsworth Till	n	79	100	78	152	152	152	152	10	10	10
Member (ww)	R	13-78	1.2-9.5	12-26	0-27	0-59	4-90	10-75	3-9	72-82	14-22
Wedron Formation	$\bar{X}$	34.4	4.3	17.8	3.2	12.7	44.4	42.9	2	75	23
Yorkville Till	n	16	17	21	263	263	263	263	11	11	11
	R	17-58	1-8.2	9.2-29.4	0-29	0-54	18-83	19-62	2-4	72-78	19-25

Explanation of Symbols:

$\bar{X}$ = mean
n = number of tests
R = range of data: low value - high value
N = number of blows per foot (Standard Penetration Test)
qu = unconfined compressive strength in tons per square foot
w = natural moisture content in percent
Gvl = percent of gravel in total sample
Sd
St } = percent of sand, silt and clay, respectively, in < 2mm fraction of sample
Cl
M = percent montmorillonite and expandables in clay fraction
I = percent illite in clay fraction
C-K = percent chlorite plus kaolinite in clay fraction

Data for several mapped units are not available for Will County.

ing the most rugged topography in the county. Elevations of over 800 feet (240 meters) above sea level are attained in several small areas just west of Monee. From this crest, the moraine slopes gradually to the east and west.

The Wadsworth Till is a silty clay which is gray when unaltered and, when oxidized, varies from yellow to light-brown. It usually contains a small quantity of dolomite pebbles and black shale fragments. There are also numerous, discontinuous silt and sand lenses of lacustrine origin (ww-l) within it. Minor variations in the silt to clay ratio are common in the Wadsworth Till, but these appear to have little stratigraphic significance and are characteristic of this till whenever it occurs.

Yorkville Till Member (wy). The Wadsworth Till appears to grade imperceptibly into the Yorkville in a zone trending northwest-southeast through the center of the county and there is no topographic indication of this boundary. Furthermore, the two tills are so similar near the boundary that they cannot be easily distinguished from each other by visual inspection. Therefore, the boundary placement is somewhat arbitrary. However, laboratory analyses of samples of the two tills collected at some distance from the boundary show only slight differences in mineralogical and physical properties (table 1).

The Yorkville is a dark gray or brownish-gray silty clay till, like the Wadsworth, only slightly more clayey, with the clay fraction increasing towards the west. Yorkville Till is also more liable to contain silt lenses rather than lenses of sand and gravel. Although the Yorkville does not form a conspicuous moraine immediately west of its boundary with the Wadsworth, in the western half of the county, the low knolls rising above the level of the lake plain are remnants of the breached and eroded Rockdale Moraine composed of Yorkville Till. Immediately west of the county, Yorkville Till also forms the long, narrow, north-south trending Minooka Moraine. The southern terminus of the Minooka Moraine swings southeastward into Will County to form the

Kankakee Bluffs north of the Des Plaines River, three miles south of Channahon. Yorkville Till also underlies the entire lake plain, but the plain has been scoured and flattened by wave erosion and displays no morainic topography. Due to the overall similarities of the Yorkville to the Wadsworth, the Yorkville Till has not been differentiated where it lies below the Wadsworth.

Glacial Sand and Gravel

Large quantities of sand and gravel occur at the surface in Will County, concentrated in the drainageways of the Des Plaines, the Du Page and the Kankakee Rivers. The areas covered by these sands and gravels total more than 100 square miles (250 km^2). The glacial events responsible for the accumulation of these vast sand and gravel deposits were regional in scope and perhaps the most spectacular in the glacial history of the entire Great Lakes area.

Origin of Deposits

The most phenomenal of these glacial events was the Kankakee Flood. At one time in Great Lakes' history, the meltwaters from three major ice lobes tilling several Great Lakes' basins were all simultaneously discharging through the valley of the Kankakee River. The volume of water in this torrent was so great that not all of it could be accommodated in the Kankakee Valley. Consequently, the water spread over a very large area, including much of southwestern Will County, to form a large glacial lake (Ekblaw and Athy, 1925). The swiftness of the current had such great erosive power that tremendous quantities of previously deposited glacial materials were stripped away to expose the underlying bedrock. Rock outcroppings which occur along the lower Kankakee were uncovered at this time. This huge flood also deposited large quantities of boulders, rubble, gravel, and sand, and some of the sand has subsequently been blown into dunes. Away from the river, the till surfaces that were flattened by wave erosion, plus the weak topographic expression of the Rockdale Moraine, which was breached and partially inundated by torrent

waters, further attest to the tremendous force of this flood.

More or less contemporaneously with the Kankakee Flood, the Valparaiso Moraine was being constructed. Along the front of the Valparaiso ice sheet (the contact between ww and wy on plate 1) meltwater issued forth from numerous braided channels and flowed toward the southwest, mainly into the Du Page and Des Plaines River Valleys. Much of the sand and gravel presently at the surface in these valleys and in the valleys of Lilly Cache Creek, Mink Creek, Rock Run, Long Run, Fraction Run, Spring Creek, and Hickory Creek was deposited from this meltwater at this time. Particularly thick sequences of these sands and gravels accumulated in the Channahon and Plainfield areas.

With the retreat of the Valparaiso ice sheet to the north and east of Will County, meltwater from ancient Lake Chicago (the ancestral Lake Michigan) cut an outlet across the Valparaiso Moraine to the Des Plaines River Valley, as the lake's drainage to the north and east was blocked by ice. Again, tremendous torrents of glacial meltwater poured through Will County. The erosive power of the flow removed much of the sand and gravel that had previously been deposited. At one time, the combined discharge from four Great Lakes' basins was flowing through the Des Plaines Valley and so much erosion occurred that the entire stretch of the river in Will County became trenched into the Silurian dolomite bedrock, as it remains today.

The cutting and trenching power of the water flowing through the Chicago Outlet also exhumed and exposed older sand and gravel deposits along the lower valley walls of the Des Plaines River in northern Will County. These old gravels lie under the Wadsworth and Yorkville Tills and extend beneath them, away from the valley. These gravels were described by Bretz (1955), who called them the Lemont Drift, and have been restudied and tentatively identified as Malden outwash (wm-o) by Bogner (1973). In the northwestern part of the county,

west of the Du Page River, a very coarse, bouldery gravel is encountered at shallow depth beneath the Yorkville Till in several areas. This probably is also Lemont Drift, or Malden outwash. Other remnants of this outwash may underlie some areas northwest of the Des Plaines River to the Malden outcrop area in Kane County.

Henry Formation

The foregoing discussion of the sand and gravel in Will County explains its origin as glacially-derived surficial outwash and it has therefore been assigned to and mapped as Henry Formation. Although three members of the Henry Formation are recognized (each distinguished by its lithology and mechanism of deposition) two of the members, the Batavia (hb), and the Wasco, (hw) form no significant deposits in Will County; therefore, neither of these appears on the map (plate 1).

Valley Train Deposits (Mackinaw Member, (hm))

As the major sands and gravels in Will County consist of outwash that was deposited in the river valleys, they have been assigned to the Mackinaw Member of the Henry Formation (hm). In various locations, these valley train deposits may be present in terraces on the sides of valleys and/or beneath the valley floors. In the Des Plaines Valley, the terrace deposits may also occur at more than one level, as the river experienced several intervals of cutting and filling during its complex glacial history.

The valley train deposits are evenly bedded, generally uniform in texture, and usually consist of pebbly sand or sandy gravel. Between Joliet and Channahon, as the deposits were related to the high-energy Lake Chicago Outlet, the gravel is exceptionally coarse. In the Plainfield area, the sand and gravel averages about 25 feet (8 meters) thick; near Channahon, it is almost 50 feet (17 meters) thick. In major portions of both of these areas, the sand and gravel lies directly on bedrock.

Malden Outwash (wm-o)

As previously noted, some of the gravels outcropping on the lower walls of the Des Plaines Valley probably are Malden-associated outwash (wm-o). On the map, however, this outwash has not been distinguished from the Henry Formation, Mackinaw Member (hm), as time did not allow for the field examinations necessary to distinguish between the two.

Glacial Lake and Windblown Deposits

The surficial materials of Will County that consist of sediments deposited in glacial lakes are assigned to the Equality Formation. They include silts, clays, and sands that were deposited in low energy, relatively deep, water environments (Carmi Member - ec), and coarser-grained, high energy, near-shore deposits, assigned to the Dolton Member (ed).

In the western part of Will County, both east and west of the major river valleys, there are extensive areas characterized by flat, level topography. These level areas are part of an old lake plain produced by glacial Lake Wauponsee. The only relief on this plain is provided by the low, subdued knolls of the breached and truncated Minooka and Rockdale Moraines. Lake Wauponsee came into existence at the peak of the Kankakee Flood when ponded water spread over the entire area from the Valparaiso Morainic Front to the Marseilles Moraine, a number of miles west of Will County.

As Lake Wauponsee was relatively short-lived, the accumulation of lake sediments on its bottom was not excessive, so the sediments left were fairly thin and discontinuous. The lake had more of a scouring and leveling effect on the area rather than a depositional effect. Lake currents smoothed off the relatively higher areas on the lake bottom and in some places filled the lower areas with lacustrine sediments. The scattered Carmi deposits thus occur in small, basin-like fills, not more than 6 feet (1.5 meters) thick, and are surrounded by and underlain by areas of till. Topographic indications

of the presence or absence of these sediments on the lake plain are usually difficult to discern.

Several small areas of fine-grained lacustrine sediments occur in eastern Will County near Steger and south of Tinley Park. These deposits accumulated in ice-front lakes between ice pulses of the glacier which deposited the Valparaiso Moraine.

In southwestern Will County, both east and west of the Kankakee River, there are extensive areas of sand. These sands were deposited by the Kankakee Flood and are mapped as the Dolton Member (ed) of the Equality Formation as they are considered to be near-shore lake deposits. West of the river to the county line, the sand may be 25 to 40 feet (8 to 12 meters) thick and it forms a level plain. Near the river, the sand has been blown into numerous dunes which are mapped as Parkland sand (pl).

Over parts of the county, a thin veneer of Richland loess (ri) is present, but as it is generally never more than two feet (0.7 meters) thick, it has not been mapped for this study.

Other Sediments

In addition to glacial sediments, other recent surficial geologic materials are present in Will County. Alluvial deposits, mapped collectively as Cahokia Alluvium (c) may contain some organic material, silt, clay, sand, and sometimes gravel. Alluvial deposits are found scattered along the valleys of the Des Plaines, the Kankakee and the Du Page Rivers, and are present in almost all of the small valleys draining the Valparaiso Moraine and flowing toward the southwest. Other recent fine-textured, sediments found in shallow, poorly-drained, depressions are called accretion-gley (ag). Fine-textured materials occurring along stream valleys where they accumulate as a result of slope wash and downslope gravity movement are called Peyton Colluvium (py). A considerable quantity of Peyton Colluvium has been mapped in northwestern Will

County. It accumulated in numerous, small, shallow drainageways that flowed through the area during low levels of Lake Wauponsee.

Deposits of Grayslake Peat (gl) are not very abundant in Will County when compared with other areas of Northeastern Illinois. Small deposits of peat are found scattered in depressions on the surface of the Valparaiso Moraine; the three or four largest being in the eastern part of the county. Spoil piles resulting from coal strip mining in southwestern Will County are mapped with the designation sm and old quarries and gravel pits along the rivers are also designated with this symbol.

TERRAINS

A series of morainic ridges, level plains, and extensive river valleys comprise the landscape of Will County. The complex ridges of the Valparaiso Moraine, underlain by 100 to 150 feet (30 to 45 meters) of glacial till trend northwest-southeast across the eastern third of the county and within this region lie the areas of highest elevation.

Through the central third of the county, also trending generally northwest-southeast, there is an extensive plain sloping gently to the southwest. The level character of this plain is interrupted only by low knolls of remnant moraines and sand dunes. Large portions of the plain surface have been flattened by the waves and currents of glacial lakes and floods. For the most part, this plain is underlain by 25 to 50 feet (8 to 15 meters) of till which is overlain in a few scattered areas by lacustrine silts and clays, or sand.

Three major rivers flow through western Will County — the Des Plaines, the Kankakee, and the Du Page. In some areas, the valleys are narrowly trenched into bedrock. In others, the valleys are wide and contain sand and gravel deposits up to 50 feet (15 meters) thick.

For this study, the landscape in Will County has been subdivided into three basic terrains: uplands, plains, and lowlands, listed as A, B, and C respectively, on plate 2. These terrains were identified on the basis of relative elevation, slope characteristics, and sequence and character of underlying material.

The areas mapped as uplands (A) on plate 2 are on the highest portions of the Valparaiso Moraine as it crosses Will County. Elevations are generally 750 feet (225 meters) above sea level and reach over 800 feet (240 meters) in several small areas southeast of Frankfort.

The plains area, B on plate 2, comprises about one-third to one-half of the county, trending through its center from northwest to southeast. The elevation of the plains ranges from approximately 600 to 750 feet (180 to 225 meters).

The principal river valleys form the lowland areas (C). The Du Page and Des Plaines Rivers flow southwest and the Kankakee River flows northwest. In their lower stretches the rivers flow across the Morris Basin where elevations range from only 500 to 600 feet (150 to 180 meters) above sea level.

Numerous long, parallel tributaries of both the Des Plaines and the Kankakee Rivers flow toward the southwest down the slope of the Valparaiso Moraine and these drain about two-thirds of the county. In contrast, there are only short and relatively few tributary streams to the Du Page River in the northwestern part of the county.

NATURAL AND ARTIFICIAL RECHARGE

In Will County, the predominant geologic materials at the surface are silty clay Wadsworth and Yorkville tills. In these tills, the water table, or top of the zone of saturation, is normally high and the predominant

terrain mapped on the tills is plains. On the basis of these considerations, it could be concluded that there is only limited natural recharge of rainfall to the ground-water system in these areas. However, based on the hydrogeologic principles and potentials of the regional ground-water flow systems described in Volume 1 of this series, all of the area included as upland and portions of the area mapped as plains in Will County (plate 2) may be contributing significantly to the natural recharge of the shallow aquifer system.

The preliminary evaluation of the six county Metropolitan Region suggests that the areas mapped as upland terrains in Kane and McHenry Counties, particularly those underlain by sand and gravel at shallow depths, may contribute most to regional natural recharge. It is likely that many of the areas mapped as uplands and plains on the terrain map (plate 2) in Will County may be considered as potentially contributing local recharge to the shallow aquifer. Therefore, much of the areas mapped as plains and upland between the Des Plaines River lowland and Lake Michigan, in effect, may act as a local recharge area to the shallow aquifer east of the river.

The lowlands (terrains C), particularly those associated with the Des Plaines, the Du Page, and the Kankakee Rivers, are underlain by sand, gravel, and bedrock. These areas may be suitable for artificial recharge locally in places where there has been extensive ground-water development.

The significance of each terrain in Will County with respect to both natural and artificial recharge cannot be finalized until all terrains in Northeastern Illinois have been evaluated.

DRAINAGE

The soil drainage conditions of an area are a major consideration in interpreting geologic materials for planning purposes. There are many factors influencing soil drainage in Will County, such as: depth to and

fluctuations of the top of the zone of saturation (water table), permeability of the underlying material, local and regional slope characteristics, position with respect to local and regional ground-water flow systems and streams. Plate 3 shows areas of poorly-drained soils in Will County which were interpreted from existing soils maps (Wascher et. al., 1962). Areas prone to flooding were taken from Flood Hazard Maps (U. S. Geological Survey Hydrologic Atlas Series). Poorly-drained areas have developed in Will County in distinct areas with specific mappable characteristics. Poorly-drained soil conditions are common all over the county where the material underlying the surface is silty clay till or lacustrine sediments. Those areas shown as well-drained are the sand and gravel areas in and adjacent to the river valleys and sloping surfaces of finer textured material.

INTERPRETATIONS FOR PLANNING

Waste Disposal and Pollution Potential

Five waste disposal and/or pollution potential maps are presented for Will County. These maps evaluate conditions relative to:

(1) land burial of wastes (plate 4a)

(2) surface spreading of wastes (plate 4b)

(3) waste disposal by septic systems (plate 4c)

(4) application of fertilizers and soil additives (plate 4d)

(5) application of herbicides and insecticides (plate 4e)

These maps only indicate the probability of finding suitable or unsuitable waste disposal sites within Will County and they should not be used as substitutes for individual site evaluation. A detailed discussion of the factors involved in the limitations in this mapping has been presented in Volume 1.

Land Burial of Waste (including sanitary landfills)

This map (plate 4a) differentiates areas for the suitability of burial of all types of waste products in the ground. The state of the waste has not been distinguished; that is, whether it is solid, semi-solid, or liquid. Considerations for the burial of both domestic refuse and industrial chemical wastes have been included in this map. Some of these wastes may be toxic. On plate 4a, areas A through E are listed in ascending order (least to greatest) of their capacity to provide protection from pollution for both ground and surface waters. Assumed conditions are: (1) burial in a trench 20 feet deep: (2) contact with ground water.

Along the river valleys in Will County there are large areas where the Silurian dolomite aquifer lies within 25 to 50 feet (8 to 15 meters) of land surface and these areas, labelled on the map as A and C respectively, have the most severe limitations for the burial of wastes as ground-water pollution is most likely to occur here from such practices. This is particularly true in natural recharge areas on areas of pumpage of the shallow aquifers. Furthermore, the dolomite may be exposed directly at the surface or it may be overlain by saturated sand and gravel of high hydraulic conductivity which is then in hydrologic connection with the dolomite. In the construction of this map, as shallow bedrock (the A areas) is considered the more critical condition, the shallow sand and gravel (B areas) are not mapped separately even though the materials from ground surface to the bedrock surface often consist entirely of sand and gravel and therefore would fall into the B category. The A and C areas are located along the Des Plaines, the Du Page, and the Kankakee River valleys.

In the D area in the southwestern part of the county, 25 to 50 feet (8 to 15 meters) of surficial sand and gravel lies at the surface. As these sands overlie fairly impermeable shales and sandstones of the Pennsylvanian Series, which are not considered aquifers, burial of wastes in this area will

not pollute a bedrock aquifer, but may pollute the surficial drift aquifer.

The remaining areas, labelled E, present the optimum waste disposal conditions in the county. In these areas, fine-grained impermeable materials (the Wadsworth and Yorkville Tills) are generally greater than 50 feet (15 meters) thick. These till areas have varying drainage characteristics, depending upon their position in the landscape, surrounding topography, and variations in local materials. Their principal limitations as waste disposal sites are their poor surface drainage characteristics which may cause pollutants to return to or remain on the surface. This condition, however, correspondingly decreases the potential for pollution of ground-water. Poorly-drained areas are mapped A', C', D' and E', respectively, and were generalized from the detailed soil maps.

In some cases, areas mapped as generally unsuitable for waste disposal sites can be engineered to conform to State licensing requirements, as the proper engineering techniques can confine and collect leachate generated at a landfill.

Surface Spreading of Wastes

Plate 6 designates areas where there may be pollution problems resulting from the spreading of waste in Will County on land surface. It is to be used primarily when considering the spreading of industrial and sewage wastes by any method. The factors considered in the mapping include the depth to sand and gravel aquifers, the terrain, the drainage characteristics, the soil characteristics, and particularly, the hydraulic conductivity.

Areas having the most severe limitations for surface spreading of wastes are those where bedrock is exposed at ground surface (area A) or where it occurs within 20 feet (6 meters) of the surface, (Area B). These areas occur mainly along the valleys of the Des Plaines, the Kankakee, and the Du Page Rivers. The potential for ground-water pollution in these areas is very high.

The C areas shown are poorly-drained lowlands or plains underlain by relatively impermeable surficial materials. Areas mapped as C include the large portion of Will County which is underlain by Wadsworth or Yorkville Till. These tills are clayey and have a low-hydraulic conductivity and are frequently characterized by poor surface drainage. Locally, slopes may exceed seven percent in the morainic areas in the eastern part of the county. Since waste materials will either infiltrate very slowly in areas of low relief or will tend to run off of steep slopes, acceptability into the ground is the major problem in spreading wastes in the C areas.

There are no areas mapped as E as no areas in Will County are without limitations when considering the spreading of wastes on the surface.

Waste Disposal by Septic Systems

Areas of potential pollution by septic systems in Will County are shown on plate 4c. The mapping criteria and procedures have been discussed in detail in Volume I of this report.

Surficial materials with high infiltration rates, primarily sands and gravels deposited in valley trains, occur mainly in the western portion of Will County along the Kankakee, Des Plaines and Du Page Rivers. These areas have been included in Area A and should be avoided due to the high potential for local ground-water pollution. A large portion of the southwestern corner of Will County has also been included in this category. The surficial deposits consist mainly of sands with some silts and clay deposited along shorelines during flooding of the Kankakee drainageway during late glacial advances. Although these deposits do not comprise a continuous aquifer system, the variability and coarse texture of some of the materials place a need for some precautions for waste disposal and have, therefore, been included in Area A.

Areas with bedrock and sand and gravel aquifers within 20 feet (6 meters) of the land surface, Area B, have high potentials for ground-water pollution. These areas occur mainly along the major drainageways of western

Will County where channels have cut through the glacial deposits exposing the underlying sands and gravels, and bedrock formations. Pennsylvanian shales do occur in some areas of southwestern Will County. Where present, they form a confining bed for the underlying bedrock aquifers. Local site investigation is necessary to delineate the occurrence of the shales.

The majority of Will County is underlain by thick, fine-grained clay and silty-clay tills. These tills impose acceptance problems for septic systems due to their low hydraulic conductivity. These areas are classified as Area D.

Areas of exceptional pollution hazards in these tills (Area C) are formed where poor soil drainage and discharge areas are created and where moraines form steep slopes.

There are no areas without limitation for septic systems in Will County

The Application of Fertilizers and Soil Additives

Plate 4d indicates conditions for applying fertilizers and soil additives in Will County. The most severe limitations exist in areas with surficial sands and gravels (Area A), sand and gravel within 20 feet (6 meters) (Area D), and shallow bedrock aquifers (Area B). Areas with such conditions will allow fertilizers and soil additives easy access to the local ground-water system. The A and B Areas are the most critical and occur along the major drainageways in Will County.

Areas mapped as C are those where runoff problems or ponding may occur on surficial materials of low-hydraulic conductivity. In Will County, these include large areas of Wadsworth and Yorkville Till, where these poorly-drained materials form moraines and underlie lowlands and former lake plains.

Application of Herbicides and Insecticides

Conditions for application of herbicides and insecticides in Will County are mapped on plate 4e. The limitations for such applications are very similar to those for fertilizers and soil additives as both are applied

at or near ground surface and are subjected to the same natural processes of precipitation, infiltration, and runoff.

Areas with sand and gravel deposits at the surface or within 20 feet (6 meters) of it are mapped as Area A. These occur along the major river valleys.

Remaining areas in Will County which include moraines, lowlands, and plains underlain by materials of low hydraulic conductivity are in Area B. These materials include the Wadsworth and Yorkville Tills, the lake deposits, alluvial deposits, and the poorly-drained materials in small depressions. Areas mapped as B occur in the major portions of the county.

Land Utilization

Material properties, such as texture and bearing capacities, terrain characteristics, such as drainage and depth to the zone of saturation, affect the suitability of land for varying purposes. Two maps were prepared (plates 5a and 5b) to evaluate both terrain and material characteristics for two specific land uses -- community development and roadway construction. These maps should be used in conjunction with the USGS Flood Hazard Maps and the poorly-drained soils map (plate 3).

Rigid classifications such as good, fair, or poor were avoided in the preparation of these maps. Rather, their use should be as one source of technical information in making planning decisions in conjunction with other types of non-geological data. It is assumed that specific construction projects will include an adequate subsurface investigation program.

Construction Conditions for Community Development

Plate 5a indicates construction conditions for community residential development. The major problems in Will County associated with such land use include the presence of bedrock at shallow depths, poor surface drainage conditions, and flooding along the major drainageways.

In general, the constraints for community development listed on plate 5a decrease in alphabetical order. However, areas labelled as C or D that are located along the drainageways may be subject to infrequent flooding and thus may have rather severe constraints. There are large areas underlain by shallow bedrock in Will County. These are located along the Kankakee and the Des Plaines River valleys. Although areas of shallow bedrock exhibit very high bearing strength, the bedrock is extremely difficult to excavate and therefore may limit the construction of septic systems.

Problems of poor drainage and the potential for flooding are not limited to the valley areas in the western part of the county. In the topographically higher morainic areas, (the eastern part of the county) these problems also exist locally due to poorly-developed drainageways and the presence of surface depressions on predominantly fine-grained materials. With the exception of the peat areas, bearing strengths of surficial materials on the moraines are generally adequate for residential construction and can be easily excavated for foundations and utility trenches. In the undeveloped areas of the county, acceptance problems with septic systems are likely to be encountered in both the higher areas, because of low permeability surface materials, and in low areas, due to the shallow depth of the top of the zone of saturation.

Construction Conditions for Roadways

Plate 5b indicates construction conditions for roadways. A major responsibility of highway planners is to be aware of areas where there is poor drainage, low-bearing capacity materials, and/or the potential of seasonal flooding. They must also determine the quantity of material to be blasted or excavated, to be replaced in cuts and fills, and, finally, must locate sources of borrow that are close to the proposed construction. In general, the constraints for roadway construction listed on plate 5b decrease in alphatetical order. Roadway construction in areas mapped as A may require:

(1) special treatment to provide proper support where the surficial material has no strength,

(2) construction of embankments to grades above expected flood levels,

(3) construction of structures over waterways,

(4) blasting for rock cuts.

In the remaining areas cuts and fills may be needed, but the material from cuts should be suitable for common backfill.

NATURAL RESOURCES

Ground-Water Resources

Will County obtains all of its water supply from ground-water sources. This resource is primarily developed from two aquifer systems — the shallow system and the deep system. The shallow aquifers consist of dolomite rocks of Silurian Age, dolomite beds in the Maquoketa Group, and sand and gravel in the glacial drift. The deep aquifers, referred to as the deep standstone aquifers, are composed of sandstone and dolomite formations of Cambrian and Ordovician Ages. The principal water-yielding unit in the deep sandstone aquifer is the Ironton-Galesville. A general description of these units can be found in Volume I of this series.

The Deep Aquifers

Almost all of the major industrial plants and municipalities along the Des Plaines River obtain their water supply from the deep sandstone aquifers. Although these aquifers have been extremely dependable sources of water for many years, water levels in the deep sandstones decline continually every year, so that this source of supply may become less dependable and more costly in the future. Detailed information on these bedrock aquifers in Will County can be found in Suter et. al., (1960) and Hughes et. al., (1966).

The Shallow Aquifers

Silurian Dolomite Aquifer — All of the public and private wells in the eastern part of Will County use the Silurian Dolomite for water supply. On the average, the dolomite is encountered at approximately 100 feet (30 meters) below ground surface and, as the upper 50 feet (15 meters) of the dolomite is the principal water-yielding zone, most dolomite wells average between 100 and 150 feet (30 to 45 meters) deep. The dolomite aquifer is recharged by local precipitation and in Will County is capable of yielding moderate to large supplies of water. As large portions of eastern Will County are not as yet heavily urbanized, the dolomite here could sustain much increased development without seriously lowering water levels. In fact, this part of Will County can be considered a ground-water surplus area from which water could be piped to other areas in the county.

Sand and Gravel Aquifers — As most of the sand and gravel in Will County occurs at the surface, and these deposits can be readily identified on the surficial materials map (plate 1), drift aquifer maps have not been prepared for this study. In addition, interbedded sand and gravel aquifers within the body of the drift are of such limited extent within the county that they cannot be utilized for water supply except very locally for individual homes. Sand and gravel aquifers lying at the base of the drift occur in several fairly well-defined areas which, therefore, can be easily identified and discussed.

Surficial Aquifers — The extensive surficial sand and gravel aquifers occur along the Du Page River Valley, in the Channahon area between the Du Page and the Des Plaines Rivers, and in the Kankakee River Valley, north of Wilmington (plate 1). These deposits vary from 25 to 50 feet thick (8 to 15 meters) and, in large portions of them the sand and gravel is continuous to the bedrock surface. At present most of the pumpage from these surficial aquifer is for small, private, domestic wells.

Basal Aquifers — Trending northeast from the City of Joliet there is a deep, narrow valley on the bedrock surface. This valley, known as the Hadley, is filled with thick sands and gravels which are heavily pumped and supply a number of wells with very large quantities of water.

In the other areas where basal aquifers occur, they are not confined in bedrock valleys but are sheet-like in occurrence. As they are in hydrologic connection with the underlying Silurian dolomite, they contribute to the productivity of the dolomite and the wells in these areas usually penetrate into the rock. Such basal sand and gravel aquifers are present in Crete and Monee Townships (T. 34 N., R. 13 E. and T. 34 N., R. 14 E.), New Lenox Township (T. 35 N., R. 11 E.), and the northern half of Homer Township (T. 36 N., R. 12 E.).

Sand and Gravel Resources

In 1973, Will County ranked fourth in Illinois with a production of 3,313,000 tons of common sand and gravel, a quantity exceeded only by McHenry, Kane, and LaSalle Counties (Malhotra, 1975, pg. 29). In Will County, the economically valuable sand and gravel deposits occur in the valley trains of the Du Page and Des Plaines Rivers (plate 1). Their importance as a mineral resource depends on the thickness and extent of the deposit, its texture and minerology, its accessibility, and the thickness of overburden that might be present.

Five companies are presently operating the major pits in Will County. The Avery Gravel Company has two near Plainfield and the Elmhurst-Chicago Stone Company also operates a pit in this vicinity. The Materials Service Corporation has a pit in Lockport and Meyer Aggragate has one in Joliet. Vulcan Materials Company also operates a plant in the Joliet area. Sand and gravel quite commonly directly overlies dolomite bedrock in Will County. Therefore,

once the gravel has been removed a company may often initiate quarrying operations at the gravel pit site.

According to Willman (1942) the feldspar content of the dune sands in southwestern Will County is sufficiently high to justify commercial recovery. As there is also a heavy concentration of dunes in several areas in the county the development of a large-scale feldspar-producing plant could easily be justified. This resource has not as yet been developed, however, and Hunter (1965) suggested that the iron content of the feldspar sands may be the inhibiting factor.

Feldspar in the dune sands averages about 21 percent of the total mineral content and the deposits range from 15 to 50 feet thick. The dune sands are usually non-calcareous.

Willman pointed out two areas in Will County as potential sites for Feldspar-producing plants:

(1) Section 18, T. 32 N., R. 10 E. (Symerton and Bonfield Quads)

(2) The area between the towns of Braidwood and Godley (Wilmington and Essex Quads).

Dolomite Resources

The bedrock of Will County, underlying the glacial drift, is almost entirely dolomite of Silurian age, except in the southwestern corner of the county where the Silurian strata have been removed by erosion to expose the underlying Maquoketa Shale Group. Younger Pennsylvanian strata encroach from the southwest and overlap the Maquoketa in the extreme southwest corner of the county.

Most of the Silurian strata in Will County are of a quality suitable for making most grades of construction aggregate, but certain impure zones, containing excessive chert or silty or clayey beds, may be found throughout the Silurian interval. As a general rule, quarries are able to handle the

lower-quality intervals by blending them with stone from the better benches, thus achieving a quarry product that meets the necessary specifications. However, a small quarry, excavating only a limited thickness of stone, may have difficulty with the impure intervals because of an insufficient supply of high-purity stone above or below the impure interval. Also, local increases in the amount of impurities in any one interval or in the thickness of the impure interval(s) may make any particular locations unfavorable for quarrying.

Crushed stone production in Will County is reported from nine quarries, listed below and shown on the accompanying small-scale map. The last four have not been visited by Survey personnel. These are at the sites of present or former gravel pits, as in the quarry of Meyer Aggregate Co. (7), and are presumed to have been developed in the floors of the pits following the removal and marketing of the gravel. The numbers of the listed quarries match the identifying numbers on the map.

	Company	Near	sec.-twnshp-range
1.	Lincoln Stone Quarry	Joliet	NE 29-35N-10E
2.	Material Service	Romeoville	NW 10-36N-10E
3.	Vulcan Materials	Joliet	NE 21-35N-10E
4.	Vulcan Materials	Romeoville	NE 26-37N-10E
7.	Meyer Aggregate	Channohon	NE 10-34N-9E
8.	Boughton Materials	Plainfield	NW 26-37N-9E
10.	Elmhurst Chicago Stone	Bolingbrook	SW 3-37N-10E
11.	Elmhurst Chicago Stone	Plainfield	SW 36-37N-9E
12.	Material Service	Plainfield	SE 35-37N-9E

Areas that may be considered quarryable (less than 50 feet of overburden) are common in western Will County along the Des Plaines and Du Page Rivers. Rock outcrops are numerous, and in the gravel-producing area along the two river valleys, gravel probably directly overlies dolomite bedrock in a number of places. Near the western limit of the Silurian strata in the southwestern corner of the county, variable thicknesses of impure, shaly dolomite (a few to 40 (12 meters) or more feet), that constitute the basal part of the Silurian column, may make some areas unattractive for quarry

development. In eastern and northeastern Will County, generally southeast of the Des Plaines River and northeast of the C.M. & St. P. R. R. tracks, the glacial drift is excessively thick and appears to preclude any quarry development in this part of the county.

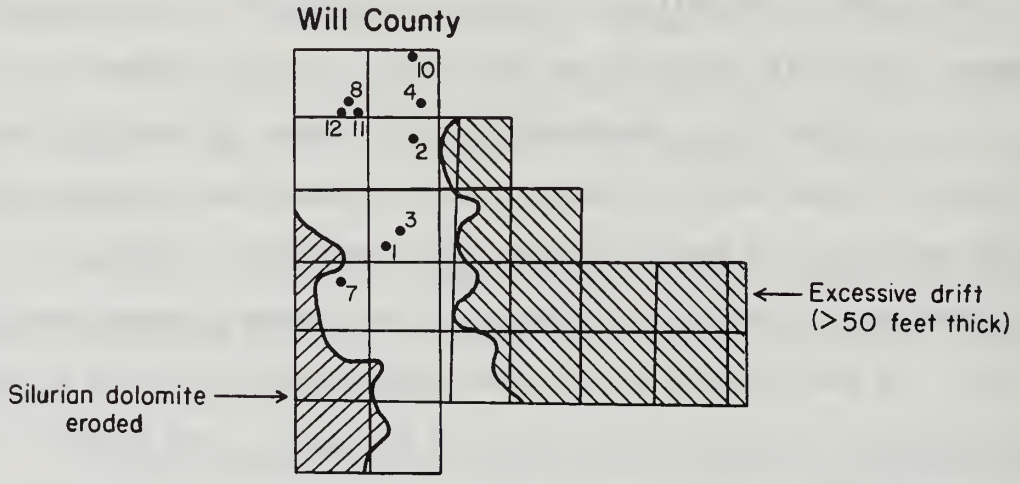

Figure 2. Map of Will County showing locations of operating quarries in 1974 and parts of county unfavorable for quarry development.

Coal Resources

At present, no coal is being produced in Will County (Malhotra and Smith, 1976). In the past, however, beginning in the late 1800's, large quantities of coal were mined here by both underground and stripping methods. The coal produced in the county was the Colchester (No. 2) which was everywhere less than 100 feet (30 meters) below ground surface. As shown in Figure 3, most of the available coal has by now been mined out. A small reserve (21.6 million tons) of strippable coal still remains in the county but it has not been mined because it is not favorably located for stripping.

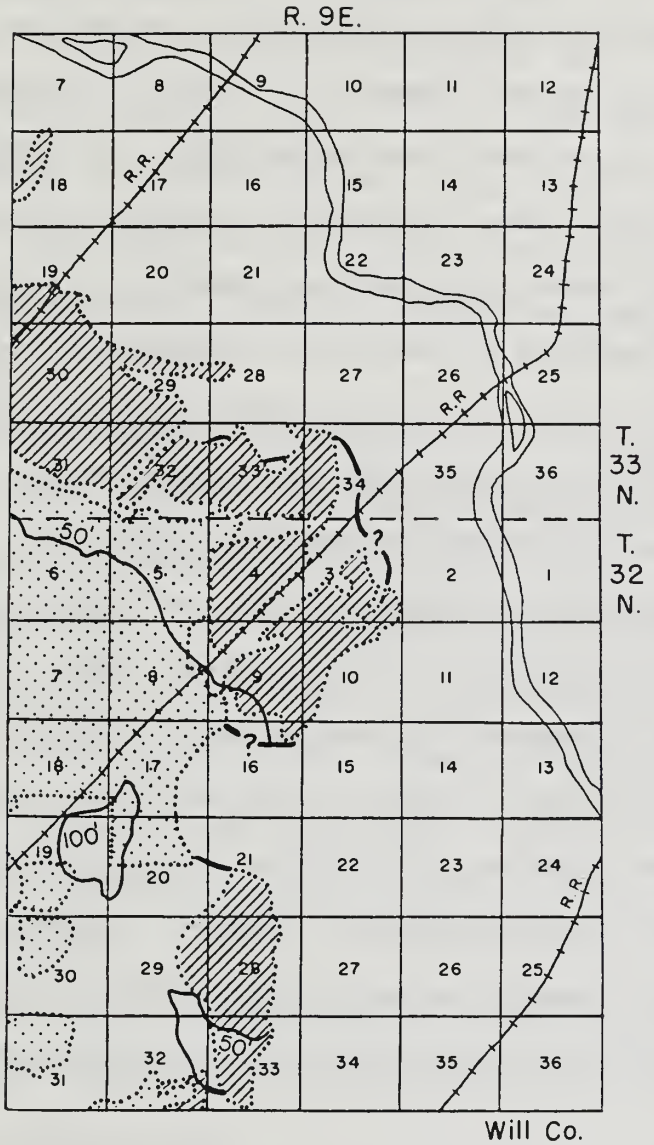

Figure 3. Strippable Coal Reserves
(Smith and Boudreaux, 1967)

A detailed description of the strippable coal reserves in Will County can be found in Smith (1968).

GEOLOGICAL HAZARDS

Regionally hazardous and destructive geologic events are extremely uncommon in Will County. However, as a result of natural processes, flooding of the river valleys does occur periodically. In addition, the presence of many poorly-drained areas throughout the county can cause unwelcome property damage. Flood hazard areas have been identified on the U.S.G.S. Hydrologic Atlas sheets available for each of the topographic sheets in the county. Additionally, for this study, poorly-drained areas have been identified on plate 3 and have been incorporated into the interpretations for community development (plate 5a) and roadway construction (plate 5b).

One hazard is present in Will County that is not encountered anywhere else in the metropolitan Chicago area. This is a man-made hazard caused by the underground coal mining that took place here before 1920. Land subsidence due to the collapse of roof-supporting timbers in the old mines has been known to occur. One instance of the failure of a section of highway pavement due to such collapse was reported to Survey personnel several years ago. As maps of many of the abandoned underground mines are not available, it is not possible to predict where such subsidence may occur in the mined-out area.

UNIQUE GEOLOGIC FEATURES IN WILL COUNTY

1. Des Plaines River Valley: a transmorainic river with a complicated glacial history. At one time it carried all discharge from glacially-ponded water in the Michigan, Superior, Huron, and Erie Basins. The valley is trenched into bedrock throughout most of Will County.
2. Kankakee River Valley, T. 33 N., R. 9 E. The Kankakee Flood, or Torrent, swept through this valley stripping large areas of their glacial overburden. Other areas adjacent to the valley were covered with rubble, gravel, and sand bars. Much of the sand has subsequently been blown into dunes.
3. Du Page River Valley, T. 36 and 37 N., R. 9 E. Contains extensive sand and gravel deposits that originated as outwash from the meltwaters of the Valparaiso Moraine and the Chicago Outlet.
4. Valparaiso Moraine: A wide complex of ridges and hills with the most rugged topography in Will County. A few small areas are over 800 feet (240 meters) in elevation. (Three miles south of Frankfort, Sections 10 and 11, T. 34 N., R. 12 E. - elevation 805 feet; two miles west of Monee, Sections 19 and 20, T. 34 N., R. 13 E. - elevation 800 to 830 feet).
5. The Kankakee Bluffs, Sections 18, 19, 30 and 31, T. 34 N., R. 9 E.: the southern terminus of the Minooka Moraine near Channahon and north of the Des Plaines River.
6. Quarries, between Lemont and Joliet: Many abandoned quarries along the Des Plaines River present the opportunity not only to see outcroppings of the bedrock but to search for and collect fossils. The reader is cautioned, however, that quarries can be dangerous. Furthermore, as they are privately owned, permission to enter them should be sought from the property owner.

7. Elevations, Section 31, T. 34 N., R. 9 E. It is interesting to note that where the Des Plaines River flows out of Will County, it's normal pool level is only 505 feet (152 meters) above sea level. This is 75 feet (22 meters) below the normal level of Lake Michigan, which is only 40 miles to the northeast.

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