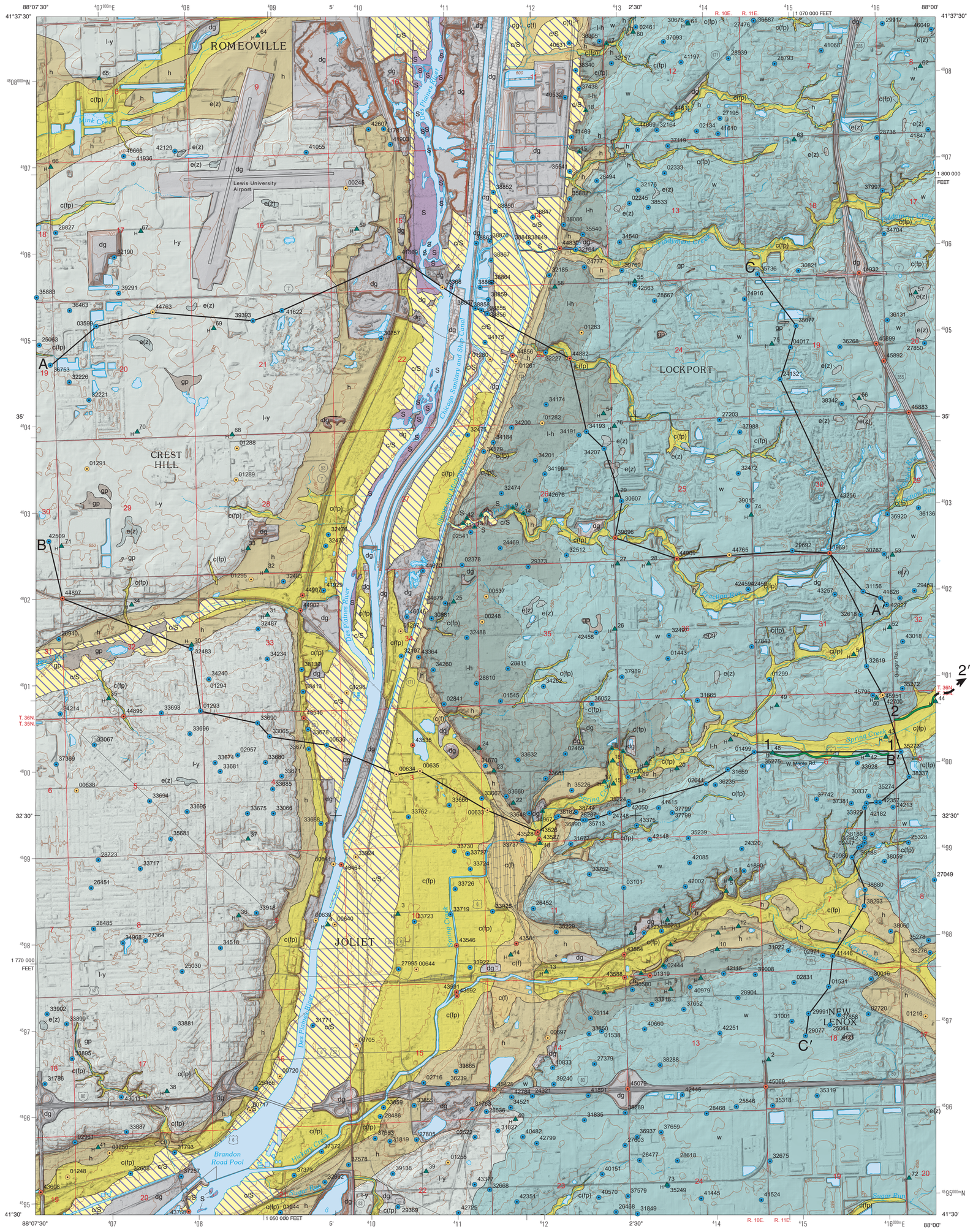
Surficial Geology of Joliet Quadrangle
Will County, Illinois

Prairie Research Institute
ILLINOIS STATE GEOLOGICAL SURVEY

Olivier J. Caron
2017

STATEMAP Joliet-SG



QUATERNARY DEPOSITS

Description	Unit	Interpretation
HUDSON EPISODE (~14,700 years before present (B.P.) to today)[1]		
Diamicton, sand, gravel, silt, and peat; as much as 10 feet thick	Disturbed ground: dg	**Disturbed land;** includes former gravel pits and major areas of construction
Mucky sand, silt and clay ('natural materials') mixed with post settlement refuse, including industrial and sanitary sewage; about 35 feet thick	Disturbed ground, dredge spoils: dg	**Disturbed land;** dredge spoils from creation of canals
Peat, muck, organic silt and clay; interbedded with sand, silt, and clay in some places; up to about 10 feet thick typically	Grayslake Peat: gp	**Organic debris accumulated in depressions;** intertongues with the Equality and Cahokia Formations
Sand, silt, and clay; massive; locally containing beds of sand; as much as 40 feet thick; but generally less than 10 feet thick in smaller upland valleys	Cahokia Formation: c	**Alluvium in floodplains and channels of modern rivers and streams;** includes alluvial fan deposits locally
Sand, silt, and clay; stratified; locally containing beds of sand; from 5 to 15 feet thick	Cahokia Formation, fan: c(f)	**Alluvium in floodplains and channels of modern rivers and streams;** includes alluvial fan deposits locally
Sand, silt, and clay; stratified; locally containing beds of sand; from 5 to 25 feet thick	Cahokia Formation, floodplain: c(fp)	**Alluvium in floodplains and channels of modern rivers and streams;** includes alluvial fan deposits locally
Silt, silty sand and sand; mostly uniform; from 5 to 15 feet thick	Equality Formation (silty facies): e(z)	**Glaciolacustrine nearshore sediments;** few deposits are slackwater; intertongues with alluvium of Cahokia Formation or Henry Formation
WISCONSIN EPISODE: Michigan Subepisode (~29,000–14,700 years B.P.)[1]		
Sand, typically with little gravel, interbedded with uncommon beds of silt or diamicton; typically less than 50 feet thick	Henry Formation: h	**Proglacial Outwash along Spring, and Hickory Creeks;** deposited in glacial meltwater channels and in alluvial fans
Sand and gravel with interbeds of silt and clay; gray; bedded to laminated; as much as 35 feet thick	Henry Formation, unnamed tongue (cross sections only): h(l-y)	**Proglacial outwash and deltaic (?) deposits;** underlies deposits of the Yorkville Member, distribution not well known
Diamicton; silty clay, silty clay loam, and clay; gray, oxidizes to yellowish brown; includes layers of sand and gravel, silt, and silty clay; as much as 70 feet thick	Lemont Formation, Yorkville Member: l-y	**Till and debris flow deposits** associated with the Rockdale Moraine
Diamicton, loam and silt loam as much as 25 feet thick; sandy loam; yellowish brown; attaining about 50 feet maximum thickness	Lemont Formation, Haeger Member: l-h	**Till and debris flow deposits**
Sand and gravel; yellowish brown; stratified in places; otherwise massive; includes large boulders; as much as 95 feet thick	Henry Formation, Beverly Tongue (cross sections only): h-b	**Proglacial outwash deposited in broad plain;** underlies deposits of the Haeger Member, deposited during ice advance
Diamicton, loam to silty clay loam; uniform; stratified in places, gray (fresh) to brown, yellowish brown, and light gray (weathered); may include patches of surficial silt, clay and sand (Equality Formation) with lenses of sand and gravel and laminations; as much as 65 feet thick	Wadsworth Formation: w	**Till and debris flow deposits** associated with the West Chicago Moraine and the Valparaiso Morainic System

PRE-QUATERNARY DEPOSITS

SILURIAN SYSTEM (440-410 million years B.P.)

Dolomite; upper 30 feet may include layers of diamicton about 1 to 3 inches thick along bedding planes	Silurian Bedrock: S (beneath 5 feet or less of Cahokia Formation): c/S	**Dolomitized carbonate bank deposits;** diamicton was likely injected by glacier

[1] The time periods for the Wisconsin Episode and the Hudson Episode are reported as calibrated radiocarbon years and can be directly compared to calendar years before 1950.

Data Type

- Hand auger station
- Stratigraphic boring
- Water-well boring
- Engineering boring
- Outcrop

SG 26211 — Labels indicate samples (s) or geophysical log (g). Boring labels indicate the county number. Outcrop labels indicate geologist's field number. Dot indicates boring or outcrop is to bedrock.

- Contact
- Inferred contact
- 1—1′ Electrical resistivity profile line
- A—A′ Line of cross section

Note: The county number is a portion of the 12-digit API number on file at the ISGS Geological Records Unit. Most well and boring records are available online from the ISGS Web site.

Base map compiled by Illinois State Geological Survey from digital data (2015 US Topo) provided by the United States Geological Survey. Shaded relief and contours derived from LiDAR data provided by Will County (2004).

North American Datum of 1983 (NAD 83)
Projection: Transverse Mercator
10,000-foot ticks: Illinois Coordinate System of 1983, east zone
1,000-meter ticks: Universal Transverse Mercator grid system, zone 16

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SCALE 1:24,000

1 — 1/2 — 0 — 1 MILE
1000 — 0 — 1000 — 2000 — 3000 — 4000 — 5000 — 6000 — 7000 FEET
1 — .5 — 0 — 1 KILOMETER

BASE MAP CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1988

Geology based on field work by O. Caron, 2016–2017.

Digital cartography by Deette M. Lund and Jennifer E. Carrell, Illinois State Geological Survey.

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This map has not undergone the formal Illinois Geologic Quadrangle map review process. Whether or when this map will be formally reviewed and published depends on the resources and priorities of the ISGS.

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4		5
6	7	8

ADJOINING QUADRANGLES
1 Normantown
2 Romeoville
3 Sag Bridge
4 Plainfield
5 Mokena
6 Channahon
7 Elwood
8 Manhattan

APPROXIMATE MEAN DECLINATION, 2017

ROAD CLASSIFICATION

Interstate Route — State Route
U.S. Route — Local road

Introduction

This surficial geologic map of the Joliet 7.5' Quadrangle is part of a long-term geological mapping project (Caron, 2016; Caron and Phillips, 2015; Curry and Grimley, 2001; Curry and Bruegger, 2014) in Will County. This map continues ISGS efforts in northeastern Illinois to map deposits at the land surface and in the subsurface down to bedrock to gain a better understanding of the complex geology left behind by repeated glaciations and associated flooding events. The Joliet Quadrangle is located between the Rockdale Moraine and the Valparaiso Morainic System, about 35 miles from the southern shore of Lake Michigan and the southern portion of the City of Chicago (Fig. 1 [map sheet 2]). The largest communities in the area include the cities of Joliet (147,433, United States Census Bureau 2016), Lockport (24,839), Romeoville (39,680), and the villages of Rockdale (1,976), Fairmount (642), Homer Glen (24,220), Preston Heights (2,575), Crest Hill (20,837), and Forest Park (14,167). Interstate-80 crosses the southern edge and Interstate-355 crosses the northeastern edge of this quadrangle.

Setting

The landscape was constructed during the last glaciation (Wisconsin Episode) between about 29,000 and 14,700 cal yr BP (Curry et al., 2014). Four moraines constitute the Valparaiso Morainic System: the Westmont, Wheaton, West Chicago, and Manhattan moraines (Fig. 1; Willman and Frye 1970). Shallow valleys trending northeast-southwest crosscut the moraines and were likely formed by subglacial meltwater channels that evolved near the ice margin during downwasting of the ice (Menzies 1995). The discontinuous Rockdale Moraine is the oldest upland feature. Formed of diamicton of the Yorkville Member, the Rockdale Moraine has been dissected by the Des Plaines River and by perched channels that were formed and abandoned during the last deglaciation. Bedrock, comprise of resistant Silurian sedimentary rocks, has low relief and gently dipping settings (Fig. 5).

Mapping Methods

The surficial geology map is based primarily on interpretation of aerial imagery, LiDAR elevation data, boring records archived at the Illinois State Geological Survey (ISGS), new outcrop and hand auger descriptions, and the Will County soils map (Hanson, 2004). The soil survey map details soil parent materials in the upper five feet, which in Will County are glacial and post-glacial deposits. Geologic contacts were verified at 17 outcrops and 76 sites by examining exposures along roads, creeks, and ditches, and by sampling with a hand auger. The subsurface data include detailed studies of 28 stratigraphic test holes including 10 stratigraphic test holes drilled by the ISGS, 313 water well logs, and 26 bridge and foundation (engineering) borings from the Will County Highway Department. Positions of some map boundaries and descriptions of some units were modified based on geotechnical logs and test hole descriptions, from the field sites, and from other archival data. Locations of the water-well logs and geotechnical borings were confirmed by plat books of land ownership, aerial photography, tax records, and site visits. The records for all data sources are on file at the ISGS Geological Records Unit. We acquired a total of 145 feet of core at 3 locations using hydraulic push methods, and a total of 265 feet of core at two locations using continuous wireline coring. The two wireline core reached bedrock and the holes were logged with natural gamma-ray. Earth electrical resistivity (EER) totaling 1.2 miles was acquired along two lines within the Spring Creek drainage. The first line (Fig. 2) was acquired along W. Maple Road and along Spring Creek in portions of the Hadley Valley Preserve of Will County. The second line (Fig. 3) was acquired along the trail of the Hadley Valley Preserve between Gougar Road and Interstate-355. Particle-size distributions (Table 1) were determined by laser diffraction on 35 samples from test holes and 15 samples from outcrop and hand auger holes. Finally, elemental analyses by Energy Dispersive XRF was performed on 50 samples from test holes. Sample testing was completed in Prairie Research Institute laboratories.

Table 1 Summary of particle size of selected map units

Units	Sand (%)	Silt (%)	Clay (%)
Grayslake Peat, gp	7-12	42-54	33-43
Cahokia Formation, c	27-39	36-45	19-27
Equality Formation, (z)	6-10	62-66	31-34
Henry Formation, h	51-70	32-34	12-17
Henry Formation, Beverly Tongue, h-b	55-70	25-35	7-13
Wadsworth Formation, w	10-20	45-51	26-30
Lemont Formation, Haeger Member, l-h	31-37	42-48	10-15
Lemont Formation, Yorkville Member, l-y	7-12	40-46	44-50
Henry Formation underlying Yorkville Member, h(l-y)	50-58	20-29	10-15
Silurian bedrock	ND	ND	ND

Geology and Surficial Deposits

The glacial stratigraphy of the Joliet 7.5' Quadrangle is dominated by sorted deposits of the Mason Group and glacigenic diamicton of the Wedron Formation (Hansel and Johnson 1996; Fig. 4). These units attain thicknesses of more than 170 feet (51.9 m) along the Spring Creek valley (Fig. 6 and cross sections A and B). Older units of the Wedron Group (Tiskilwa Formation and Batestown Member, Lemont Formation) are absent.

Bedrock Surface

Silurian-age rocks at the bedrock surface are composed of light gray, fine-grained dolomite and limestone. Bedrock highlands mainly in the southwestern portion of the quadrangle ascend gently from about 600–625 feet mean sea level (MSL) to 650–675 MSL feet in the northwest (Fig. M5). Silurian rocks commonly exceed 250 feet in thickness, except where they have been deeply eroded as in buried bedrock valleys. The most significant features of the bedrock topography of the Joliet Quadrangle are the Des Plaines (500-550 feet MSL) and the Spring Creek Bedrock Valleys (525-550 feet MSL). The glacial sediments filling this tributary of the Des Plaines River include thick deposits of diamictons and sand and gravel, which extend northeastward from Joliet for a distance of at least 10 miles (Fig. 6). This bedrock valley coincides with the present valleys of Spring Creek and Hickory Creek. The bedrock valleys below Spring Creek and Hickory Creek are about 1 mile wide, have relatively steep walls, average 150 feet in depth, and bifurcate around a bedrock island (Fig. 5). The surface elevations of water wells, engineering borings, stratigraphic borings, and gamma logs were interpolated from the Will County LiDAR using ESRI's ArcGIS software. Preliminary elevation contours were derived from a surface calculated by subtracting thickness of consolidated materials from the ground elevation. A smoother bedrock surface was created from the contours with ArcGIS' Topo-to-Raster interpolation method. Finally, the contours were adjusted to honor all of the data points on the final bedrock topography map.

Glacial Sediments

The lowermost unit is an unnamed tongue of sand and gravel below the Yorkville Member, h(l-y). This outwash unit consists of interbedded brown to gray fine gravel to sandy gravel, and it is typically less than 35 feet thick. The Yorkville Member (Lemont Formation; l-y) is a gray, fine textured diamicton that contains lenses of gravel, sand, silt, and clay. It is typically 45 feet, but up to 70 feet thick. The Yorkville Member is identified at the surface in the western part of the quadrangle, west of the Des Plaines River. The Haeger Member (Lemont Formation, l-h) diamicton is yellowish brown, coarse-grained, friable and has a high dolomite content. This unit is greater than 50 feet thick in some places. Its extent and thickness are difficult to discern beneath the southwestern Lake Michigan area because of limited exposure, but the Haeger Member was clearly identified in the Joliet Quadrangle as the uppermost diamicton between the cities of Lockport and Joliet. The Haeger Member is also associated with the underlying Beverly Tongue of the Henry Formation (h-b). The Beverly Tongue is regionally the thickest and most continuous subunit of the Henry Formation (95 feet thick). The fill along Spring Creek contains a large proportion of sand and gravel of the Beverly Tongue. Locally, the lower part of the fill contains finer-grained material than the upper part.

The sand and gravel is overlain by either diamictons of the Haeger Member of the Lemont Formation and by the Wadsworth Formation, the latter of which contains a high percentage of silt and clay (cross sections A and B). The uppermost diamicton unit has a heterogeneous lithology that is locally consistent with the Wadsworth Formation (w). The Wadsworth Formation is an extensive surficial clay-rich stratigraphic unit in northeastern Illinois. It is interpreted commonly as interstratified clayey till and lacustrine sediment (Hansel and Johnson, 1996). In the Joliet Quadrangle, this unit is greater than 65 feet thick.

Postglacial Sediment

Deposits of silt and clay, peat, sandy gravel, and sand overlie the glacial units, filling the valleys throughout the mapped area as well as many low spots scattered across the uplands. Alluvium comprised of fine-grained floodplain and coarser-grained active channel deposits are undifferentiated within the Cahokia Formation (c). Bridge boring data indicate that the floodplain unit is generally <40 feet thick, and more typically 10 feet thick. The Grayslake Peat (gp) consists of peat, muck, organic silt and clay, and interbedded sand, and is less than 10 feet thick. The Grayslake Peat was deposited in depressions and at the toes of slopes. Glacial and post-glacial silt and clay lacustrine sediments are assigned to the Equality Formation. The glaciolacustrine nearshore sediments e(z) are composed primarily of silt, silty sand, and sand. The deposits are relatively thin (<15 feet thick) and are typically discontinuous in Will County. This unit was deposited in ice-dammed lakes during late-glacial icestagnation and retreat.

Important Findings

- Three glacial diamicton units were identified: The Yorkville and Haeger Members of the Lemont Formation, and the Wadsworth Formation. The uppermost diamicton unit is the Wadsworth Formation which forms the West Chicago Moraine and the Valparaiso Morainic System.
- East of the Des Plaines River, the Haeger Member (Woodstock Moraine remnant ?) was identified as the uppermost diamicton along a thin band between the cities of Joliet and Lockport. The Yorkville Member was identified at the surface in the western part of the quadrangle (Rockdale moraine).
- A buried valley, extending northeastward from Joliet for a distance of at least 10 miles, was identified along the Spring Creek valley. The glacial sediment infill is more than 150 feet thick, including deposits of sand and gravel, exceeding 70 feet. The sand and gravel is an aquifer associated with the Beverly Tongue of the Henry Formation and exceeds 70 feet in thickness. This tongue of outwash was consistently found across the Joliet and the Mokena Quadrangles between the Wadsworth Formation and the Haeger Member of the Lemont Formation.
- As the glacial ice that deposited the Rockdale Moraine began to retreat from its maximum position, two westward flowing (?) channels formed successively in the valleys of Rock Run and Mink Creek, west of the Des Plaines River. The relative elevations of the abandoned channels at Rock Run ~585 feet (178.3 m) and Mink Creek ~620 feet (189 m) suggest that Rock Run formed first and later was abandoned as the ice retreated to the north and east. The similar elevations along the valley floors and relief of the cross-valley profiles indicate that the valleys of Mink Creek and Lily Cache (located in the Romeoville Quadrangle; Caron, 2017) formed at about the same time. Later, these channels were abandoned in favor of the modern course of the Des Plaines River, with its valley bottom elevation of about 530 feet (161.5 m).

Acknowledgements

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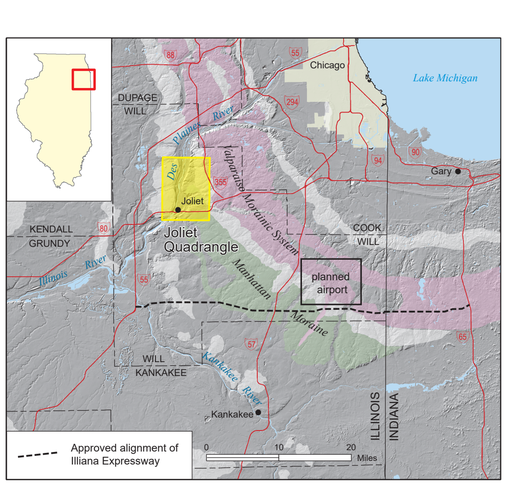

Figure 1 Location map for the Joliet Quadrangle in northeastern Illinois. The area includes portions of the Valparaiso Morainic System and the Manhattan Moraine. Moraines modified from Willman and Frye (1970). Dashed lines show approved alignment of the Illiana Expressway corridor, and the black box shows the area of the proposed South Suburban Airport.

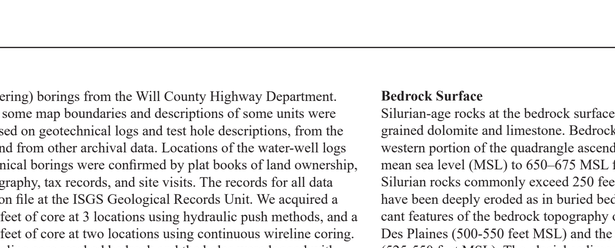

Figure 2 Line 1-1′, 0.86 miles long, was acquired along West Maple Road and along Spring Creek in portions of Hadley Valley Preserve of Will County (map sheet 1, Fig. 5). The bedrock is very shallow in the southwest but gradually dips towards the center line of Spring Creek Valley. Four distinct and one gradational resistivity layers are apparent on this profile: a shallow low-resistivity layer (about 20 ohm-m) overlies a discontinuous moderately high-resistivity layer (80 to 160 ohm-m). Where the high-resistivity layer is present, it is underlain by a second relatively low-resistivity layer (40 to 60 ohm-m) above the high-resistivity bedrock (greater than 160 ohm-m). The boundary between the lower low-resistivity layer and the high-resistivity bedrock is gradational. On the east end of the profile, the gradational resistivity is caused by the sand and gravel deposit of the Beverly Tongue (Henry Formation, h-b) on the bedrock.

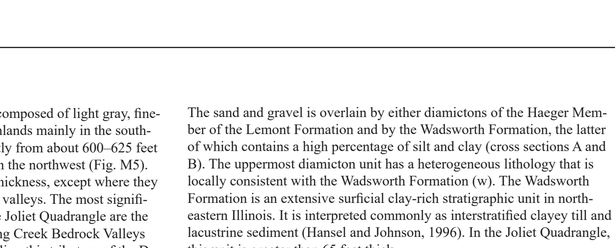

Figure 3 Line 2-2′ was acquired along the trail of the Hadley Valley Preserve between Gougar Road and the Interstate 355 (map sheet 1, Fig. 5). The profile begins near Spring Creek and gradually ascends the rough topography of the West Chicago Moraine. Four distinct and one gradational resistivity layers are apparent on this profile: a shallow low-resistivity layer (about 20 ohm-m) overlies a discontinuous moderately high-resistivity layer (80 to 160 ohm-m). These shallow layers are underlain by a second relatively low-resistivity layer (40 to 80 ohm-m) above the high-resistivity bedrock (greater than 160 ohm-m). Although the shallow high-resistivity layer is discontinuous, it can be traced across the entire profile. The boundary between the lower low-resistivity layer and the high-resistivity bedrock is gradational. It is likely that the gradational resistivity is caused by the sand and gravel deposit of the Beverly Tongue (Henry Formation, h-b) on the bedrock. A pipeline crossing wiped out a lot of information at 1000m but the deep high-resistivity layer, interpreted to be bedrock, has significantly higher values on the east half of the profile compared to the west half.

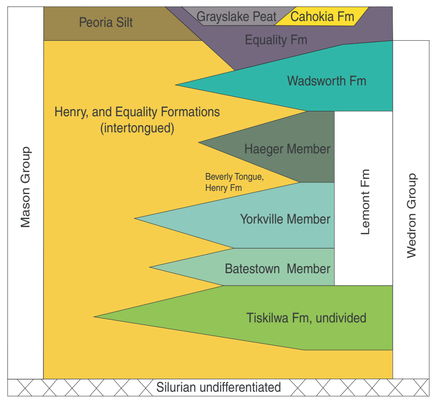

Figure 4 Schematic vertical and intertonguing relationships among the lithostratigraphic units of Will County and environs (Caron and Curry, 2016). The Batestown Member and the Tiskilwa Formation were not identified in the Joliet 7.5′ Quadrangle.

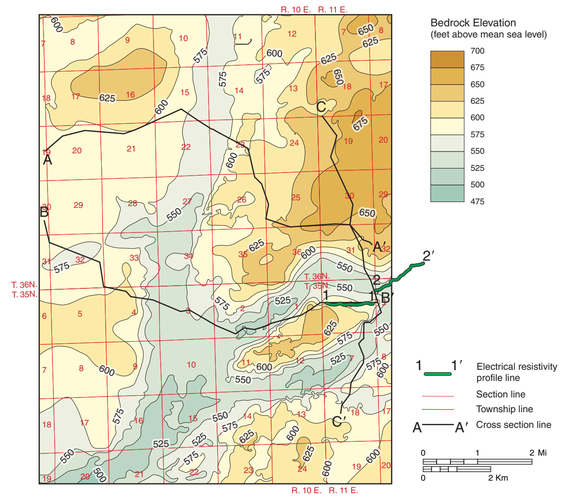

Figure 5 The generalized topography of the Bedrock surface of the Joliet Quadrangle. Map scale is 1:100,000.

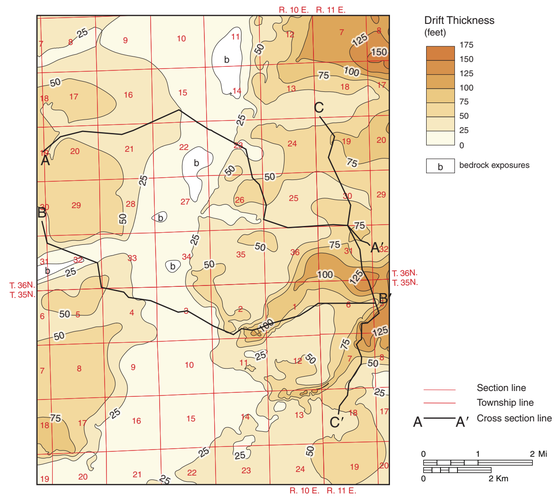

Figure 6 Drift thickness of the Joliet Quadrangle. Drift includes all the unconsolidated sediments above bedrock (e.g., till, alluvium, outwash). Map is 1:100,000.