# SURFICIAL GEOLOGY OF BARRINGTON QUADRANGLE
## LAKE, MCHENRY, COOK, AND KANE COUNTIES, ILLINOIS


Illinois Department of Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY
William W. Shilts, Chief

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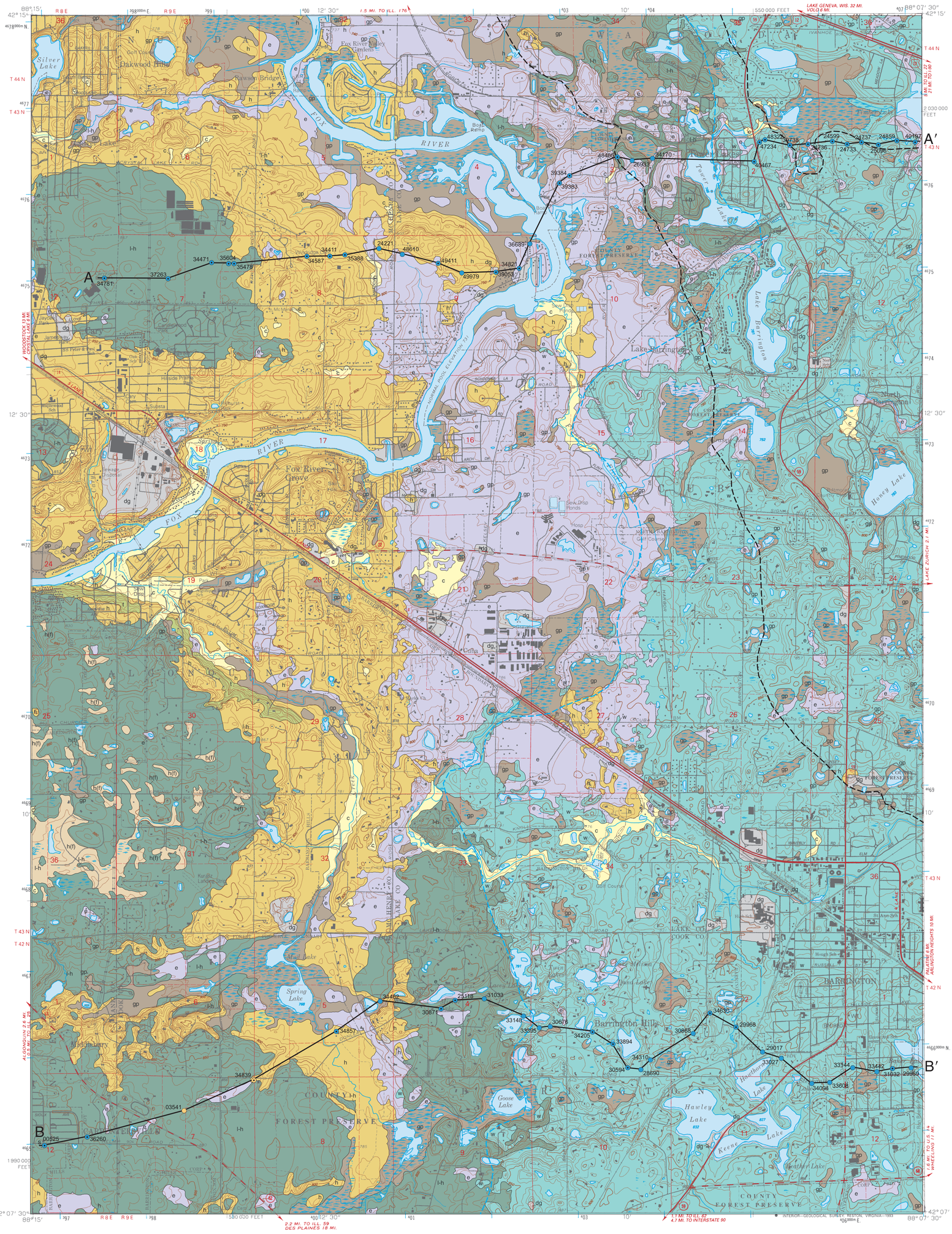
2007



STATEMAP Barrington-SG


## QUATERNARY DEPOSITS

| Description | Unit | Interpretation |
|---|---|---|
| **HUDSON EPISODE (~12,500 years before present (B.P.) to today)** | | |
| **Fill or disturbed earth material;** grain sizes range from clay to gravel, usually less than 20 feet thick | Disturbed ground: dg | **Human-disturbed deposits** found in gravel pits and quarries, retention ponds, embankments and mounds |
| **Silt, clay, sand and gravel;** well sorted sand and bedded silt and clay; brown to yellowish brown, may be mottled to gleyed, sometimes organic-rich, up to 40 feet thick in the Fox River valley; generally less than 5 feet thick in upland valleys | Cahokia Formation: c | **Modern alluvial deposits** found along rivers and streams that include sand and gravel channel deposits as well as floodplain deposits |
| **Peat and muck;** silt, clay, and fine sand; black to dark brown; often organic rich with snail shells common; 1 to 10 feet thick | Grayslake Peat: gp | **Organic wetland sediment** found in low-lying depressions and floodplains that may include areas of open water; commonly found along lakes, marshes and channels connecting larger bodies of water |
| **WISCONSIN EPISODE (Late) (~25,000–12,500 years B.P.)** | | |
| **Silt, clay, or fine sand;** massive to bedded, dark gray to light gray, calcareous, surficial deposits may be as much as 30 feet thick within the Fox River valley | Equality Formation: e | **Lake deposits** that infill kettles and infill low-lying areas within the Fox River valley and its tributaries; associated with proglacial lake environments and may be overlain by Cahokia Formation sediments |
| **Sand;** fine to medium, massive to stratified, lenses of silt common; yellowish brown to gray; generally less than 30 feet thick | Henry Formation (fine facies): h(f) | **Lake sediment and slope deposits** that infill depressions on moraines; associated with Woodstock moraine |
| **Sand and gravel;** fine to coarse; often well stratified; yellowish brown to brown; may contain some silt and clay lenses; generally around 30 feet thick within the Fox River valley | Henry Formation: h | **Proglacial outwash deposits** exposed at land surface associated with channelized glacial meltwater within the Fox River valley and its tributaries |
| **Diamicton;** silty clay loam to silty clay; dark gray to yellowish brown near land surface; calcareous, dense, and pebbly with occasional cobbles and boulders; some thin beds of fine sand and silt; as much as 130 feet thick east of the Fox River | Wadsworth Formation: w | **Subglacial till and ice marginal sediment** deposited from Wadsworth glacial ice; may have been deposited at the base of the glacier or along the ice margin and reworked by slope processes and water |
| **Diamicton;** sandy loam to loam; dolomite rich; usually oxidized yellowish brown; often stratified with lenses of sand and gravel; up to 50 feet thick | Haeger Member, Lemont Formation: l-h | **Subglacial till and ice marginal sediment;** associated with Woodstock Moraine (sandy loam) and Fox Lake Moraine (stratified with sand and gravel); deposited at base of the glacier or along the ice margin and reworked by slope processes and water |
| **Sand and gravel** below the Haeger Member; medium sand to coarse gravel with some lenses of fine sand and silt; well stratified; yellowish brown to brown; typically between 30 and 130 feet thick in the subsurface | Beverly Tongue, Henry Formation (cross sections only): h-b | **Proglacial outwash** deposited in front of Haeger glacial ice; likely deposited as alluvial fans and deltas; may be adjacent to or intertongue with Haeger Member till |
| **Silt, clay and fine sand;** massive to laminated; dark gray to grayish brown; typically between 5 and 30 feet thick in subsurface | Equality Formation undivided (cross sections only): e-u | **Proglacial lake deposits** found in topographic lowlands and kettles in front of advancing or retreating glacial ice |
| **Diamicton;** silty clay loam; pebbly; gray to brownish gray; up to 50 feet thick in the subsurface west of the Fox River, absent east of the Fox River | Yorkville Member, Lemont Formation (cross sections only): l-y | **Subglacial till** associated with Yorkville glacial ice advance; deposited beneath basal glacial ice |
| **Sand and gravel** below the Yorkville Member; medium sand to coarse gravel with some lenses of fine sand and silt; typically less than 30 feet thick in the subsurface | Unnamed tongue, Henry Formation (cross sections only): h(l-y) | **Proglacial outwash** deposited in front of Yorkville glacial ice; likely associated with channelized glacial meltwater streams |
| **Diamicton;** silty clay loam to loam; very pebbly; dense; reddish brown to brown; between 20 and 100 feet thick where present; often locally absent; thickens to the west | Tiskilwa Formation: t | **Subglacial till** associated with the Tiskilwa glacial advance and deposited beneath active basal ice |
| **Sand and gravel** below the Tiskilwa Formation; medium sand to coarse gravel with some lenses of fine sand and silt; less than 10 to 20 feet thick in the subsurface | Ashmore Tongue, Henry Formation (cross sections only): h-a | **Proglacial outwash** deposited in front of Tiskilwa glacial ice; likely deposited in channelized glacial meltwater streams or possibly deposited as proglacial fans and deltas |
| **ILLINOIS EPISODE (~200,000–130,000 years B.P.)** | | |
| **Diamicton;** silty clay loam to loam; very pebbly; dense; reddish brown, pinkish brown, or brown; abundant sand and gravel lenses; between 20 and 70 feet thick where present; often locally absent | Glasford Formation (cross sections only): g | **Subglacial till, outwash, and debris flow deposits** associated with pre-Wisconsin Episode glacial events |

## PRE-QUATERNARY DEPOSITS

| Description | Unit | Interpretation |
|---|---|---|
| **Rock;** predominately dolomite with some shaly zones; upper surface is often fractured with solution cavities and mineral precipitation; some oil staining locally | Bedrock (cross sections only) | **Bedrock** associated with shallow marine environment of Silurian Period; buried by 120-300 feet of Quaternary sediments |

Base map compiled by Illinois State Geological Survey from digital data (Raster Feature Separates) provided by the United States Geological Survey.Topography by photogrammetric methods from aerial photographs taken 1958. Field checked 1960. Revised from aerial photographs taken 1988. Field checked 1992. Map edited 1993.

North American Datum of 1927 (NAD 27)
Projection: Transverse Mercator
10,000-foot ticks: Illinois State Plane Coordinate system, east zone (Transverse Mercator)
1,000-meter ticks: Universal Transverse Mercator grid system, zone 16

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 1929

Released by the authority of the State of Illinois: 2007

Geology based on field work by J. Thomason and M. Barnhardt, 2006–2007.

Digital cartography by J. Carrell, Z. Golshani, D. Stevenson, and J. Domier, Illinois State Geological Survey.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### Data Type

- Stratigraphic boring
- Water well boring
- $S_{\odot}$ 26211 — Labels indicate samples (s). Dot indicates boring is to bedrock.
- Contact
- West extent of the Wadsworth advance
- Fox Lake Moraine boundaries
- 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.

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

ISGS Illinois State Geological Survey


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| | | |
|---|---|---|
| 1 | 2 | 3 |
| 4 | | 5 |
| 6 | 7 | 8 |

ADJOINING QUADRANGLES
1 McHenry
2 Wauconda
3 Grayslake
4 Crystal Lake
5 Lake Zurich
6 Elgin
7 Streamwood
8 Palatine


APPROXIMATE MEAN DECLINATION, 2007

ROAD CLASSIFICATION

- Primary highway, hard surface
- Secondary highway, hard surface
- Light-duty road, hard or improved surface
- Unimproved road
- U.S. Route
- State Route

## Introduction

The surficial geology map of the Barrington 7.5-minute Quadrangle (Lake, McHenry, Kane, and Cook Counties) was developed for the United States Geological Survey's National Cooperative Geologic Mapping Program STATEMAP with support from the Central Great Lakes Geologic Mapping Coalition (CGLGMC) and the State of Illinois. This work is part of the Illinois State Geological Survey (ISGS) mapping program in Northeastern Illinois and its purpose is to provide preliminary geological information useful for decision-making for land use, environmental, and resource development and management. The Barrington Quadrangle is located in northeast Illinois and encompasses parts of southwest Lake County, southeast McHenry County, northeast Kane County, and northwest Cook County. The mapping area includes all or portions of the villages of Barrington, North Barrington, Lake Barrington, Barrington Hills, Tower Lakes and Cary and surrounding unincorporated areas.

The surficial geology map delineates geologic materials at the land surface, classified by their lithology (sediment type or rock type) and stratigraphy (relative position and age). The distribution of geologic materials in the study area is remarkably complex but has a mappable pattern. Thus, this map may help users with preliminary studies to locate water and earth resources, delineate geologically hazardous areas, or aid the construction and maintenance of transportation systems and residential and commercial infrastructure.

## Mapping Techniques

The surficial geologic map is based largely on digitized soil survey maps (1: 15,840 scale) for the counties of Lake, McHenry, Kane and Cook. The soil survey classifications in the study area were grouped according to their parent material, and the geologic materials were classified based on regional geologic patterns and location on the landscape. The stratigraphic nomenclature used in this map is from Willman and Frye (1970) and Hansel and Johnson (1996).

Field methods were also critical to the mapping efforts. Through an extensive drilling program in northeast Illinois, continuous cores to bedrock were collected at seven locations, and their descriptions were used to establish geologic mapping units and interpret depositional environments. Cores were collected using a CME 75 wire-line drill rig and reached depths ranging from 130 to 202 feet. In addition to cores, natural gamma-ray logs were collected from each borehole to further delineate geologic units. Monitoring wells were also installed within each borehole to be used for long term water-level monitoring. In addition to drilling, outcrops of geologic materials were investigated and described at several locations throughout the mapping area.

Visualization techniques were used to display the sediment descriptions of water well drillers logs in three-dimensional space. The geologic materials recorded in 3247 drillers logs (fig. 1) were standardized to 18 descriptors of unlithified material such as clay, gravel, sand, and clay and gravel mix. These standardized descriptions were then used to generate interactive 3-D datasets for display using ArcGIS software. This visualization of geologic data in 3-D space was critical for interpreting map units and delineating their spatial geometries and relationships.

## Regional Setting and Geomorphology

The surficial geology of the Barrington Quadrangle developed predominantly as a result of continental glaciers and their meltwater during the Quaternary Period. Deposits from Quaternary glaciations from at least 130,000 years B.P. are preserved in the subsurface, especially in western Lake County and McHenry County. A buried soil horizon (which represents a former land surface) is also often preserved in the subsurface and core samples of this material have been dated to be about 30,950 ± 250 years old (ISGS 5315). The Quaternary deposits at land surface represent at least three major glacial events that occurred during the last glaciation (Wisconsin Episode) between about 25,000 and 14,000 years B.P. Furthermore, the mapping area is located within a transitional zone between two sublobes of the Lake Michigan Lobe, thus the stratigraphic and spatial relationships between these glacial deposits constitute a remarkably complex glacial record. These deposits consist generally of lithologically distinct diamictons, coarse sand and gravel, and fine-grained sediments (interpreted as tills, meltwater outwash, and lake sediments, respectively).

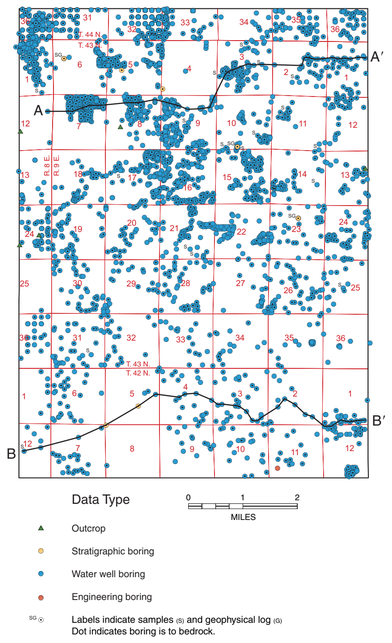


**Figure 1** Data point locations of Barrington Quadrangle.

The configuration of the landscape (geomorphology) in the study area is critical to understanding Quaternary geologic history. During the Wisconsin Episode in northeastern Illinois, glaciers fluctuated into and out of the Lake Michigan basin, and their former margins are preserved commonly as arcuate ridges (moraines) that formed at the front of these glaciers (fig. 2). These moraines mark important glacial boundaries that help delimit the interpretations of stratigraphy and depositional environments.

Parts of at least three moraines are present within the Barrington Quadrangle (see surficial geologic map). In the southwest portion of the quadrangle, west of Spring Creek, the upland is part of the Woodstock Moraine, which formed during a phase of glaciation ending before 15,000 years B.P. (Hansel and Johnson 1992). In the study area, this moraine trends northwest-southeast and extends into north-central McHenry County. Sandy till is often present at the surface of this upland and is underlain by sand and gravel, which is often exposed at the surface further down slope.

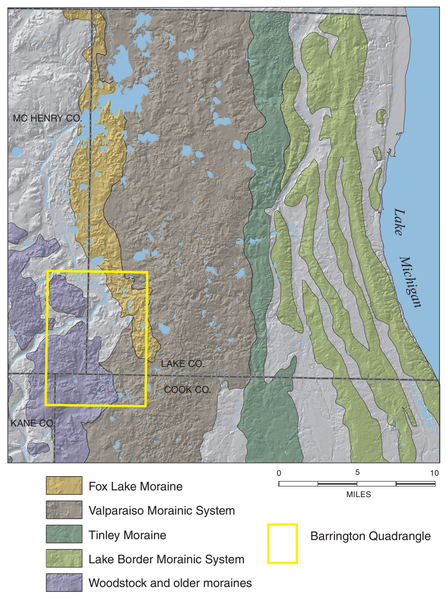


**Figure 2** Surface topograpy and moraines of northeastern Illinois.

The Fox Lake Moraine is present in the northeast portion of the map area and formed during the retreat of the Woodstock Phase. This moraine is characterized by irregular topography that is associated often with glacier stagnation and the in situ melting of glacial ice blocks. Evidence of this process is reflected in the northwest-southeast trending hummocky topography in the areas of Tower Lake, Lake Barrington, and Honey Lake. Deposits comprising this moraine often indicate a complex history of fluvial and lacustrine sedimentation near melting glacial ice blocks, exhibited as inter-stratified deposits of sand and gravel, fine grained sediments, and till.

The last glacial advance of the Lake Michigan Lobe into the Barrington Quadrangle occurred approximately 14,000 yr. B.P. and formed the Valparaiso Moraine that trends north-south through western Lake County. This moraine buries many of the deposits of the older Fox Lake Moraine in the mapping area. The western edge of this moraine extends through the eastern part of the Barrington Quadrangle and is expressed topographically as an upland that reaches elevations as high as 908 feet a.s.l. east of Flint Creek, near the village of Barrington.

## Unit Characterization, Stratigraphy, and Implications for Economic Resources

The surficial deposits of the Barrington Quadrangle represent a complex stratigraphy that includes diamictons, sand and gravel, and fine-grained sediments. The geometry of these deposits and the spatial relationships between them reflect a series of active ice advances, ice marginal environments, and proglacial meltwater streams and lakes.

The oldest Quaternary deposits in the mapping area are pre-Wisconsinan glacial deposits that are found exclusively in the subsurface. In the Barrington Quadrangle, they have been described from three ISGS boreholes and interpreted from other water well logs. Similar to younger Quaternary materials, these deposits often include diamicton and proglacial stream and lake deposits. In the northwest portion of the mapping area, a buried soil horizon (paleosol) is often preserved within the upper part of these materials and marks an important stratigraphic boundary. The sand and gravel deposits of these older Quaternary materials are often in direct contact with bedrock and commonly serve as aquifer material for local residential and municipal water supplies.

Along the south bluff of the Fox River Valley in the western part the mapping area, the diamicton of the Tiskilwa Formation is exposed. This fine-grained diamicton, which often includes sand and gravel lenses, is a subglacial till deposited by the first Wisconsin ice advance out of the Lake Michigan basin, about 24,000 yr. B.P. It is the oldest unit exposed at land surface and constitutes the bulk of glacial material making up the uplands west of the Fox River. The Tiskilwa Formation is often bounded stratigraphically by sand and gravel of the Henry Formation, so this unit is likely an important subsurface aquitard in the regional groundwater flow system.

The sandy diamicton of the Haeger Member of the Lemont Formation is found at land surface in the uplands located west of the Fox River and Spring Creek. The Haeger Member is also found at land surface in the northeast and south-central portions of the mapping area within the Fox Lake Moraine and Spring Creek Valley, respectively. In these areas the diamicton is often similar (sometimes indistinguishable) in character to meltwater outwash deposits of the Henry Formation, which often have high hydraulic permeability. Therefore, in these areas the potential for groundwater recharge and contaminate transport is more sensitive than those areas with fine-grained diamicton at land surface.

The diamicton of the Wadsworth Formation is found commonly at land surface east of the Fox River and Spring Creek. This diamicton is typically comprised of fine-grained matrix and clasts predominately of dolomite and shale. It is commonly massive but may contain significant beds of stratified fine sand or silt, suggesting that the ice-marginal and proglacial environments were active with debris-rich ice and reworked river and lake deposits. The western extent of this formation has been mapped to the eastern edge of Flint Creek and the eastern wall of the Fox River Valley to the north of Flint Creek. Based on water well logs and the topographic and spatial relationships between surficial units, Flint Creek was likely a former ice marginal stream of the glacier that deposited the Wadsworth Formation. However, the local geomorphology suggests that the Wadsworth ice may have advanced as far west as Spring Creek, but deposits of the fine-grained diamicton may have been either removed by erosion or are too thin to be mapped. Nonetheless, east of Flint Creek, the Wadsworth Formation thickens quickly to as much as 130 feet along the eastern edge of the mapping area.

Fine-grained deposits of the Equality Formation are common within lowlands in the Fox River Valley and its tributaries (Spring Creek and Flint Creek). These materials represent sediments deposited in proglacial lakes during glacial and postglacial times. ISGS borings indicate that packages of fine sand and silt beds in the subsurface locally may be greater than 100 feet thick (near the Village of Lake Barrington) and are likely associated with the proglacial environment of the Woodstock Phase (Curry et al. 1997). Much of the Equality Formation at land surface may be related to a lake that likely formed behind the Woodstock Moraine after the Haeger ice retreat. Evidence of this lake then drained when meltwater breached the Woodstock Moraine and locally formed the valley of the present-day Fox River. This lake may be reflected by a terrace system apparent at about 800 feet a.s.l. that is covered by Equality Formation sediments.

Meltwater stream deposits of coarse sand and gravel (Henry Formation) are found commonly at land surface, especially within and west of the Fox River valley. The Henry Formation is also found commonly between diamicton units in the subsurface and indicates a period of meltwater discharge during glacial advance and retreat. In the mapping area (especially in the western half of the area) this unit may be as much as 70 feet thick and is often utilized as an aquifer unit in private and municipal water wells. In the mapping area, this unit is likely the most common surficial aquifer material utilized for groundwater resources by residential water wells. Furthermore, it is the source material for numerous sand and gravel aggregate operations throughout western Lake County and McHenry County.

## Acknowledgments

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