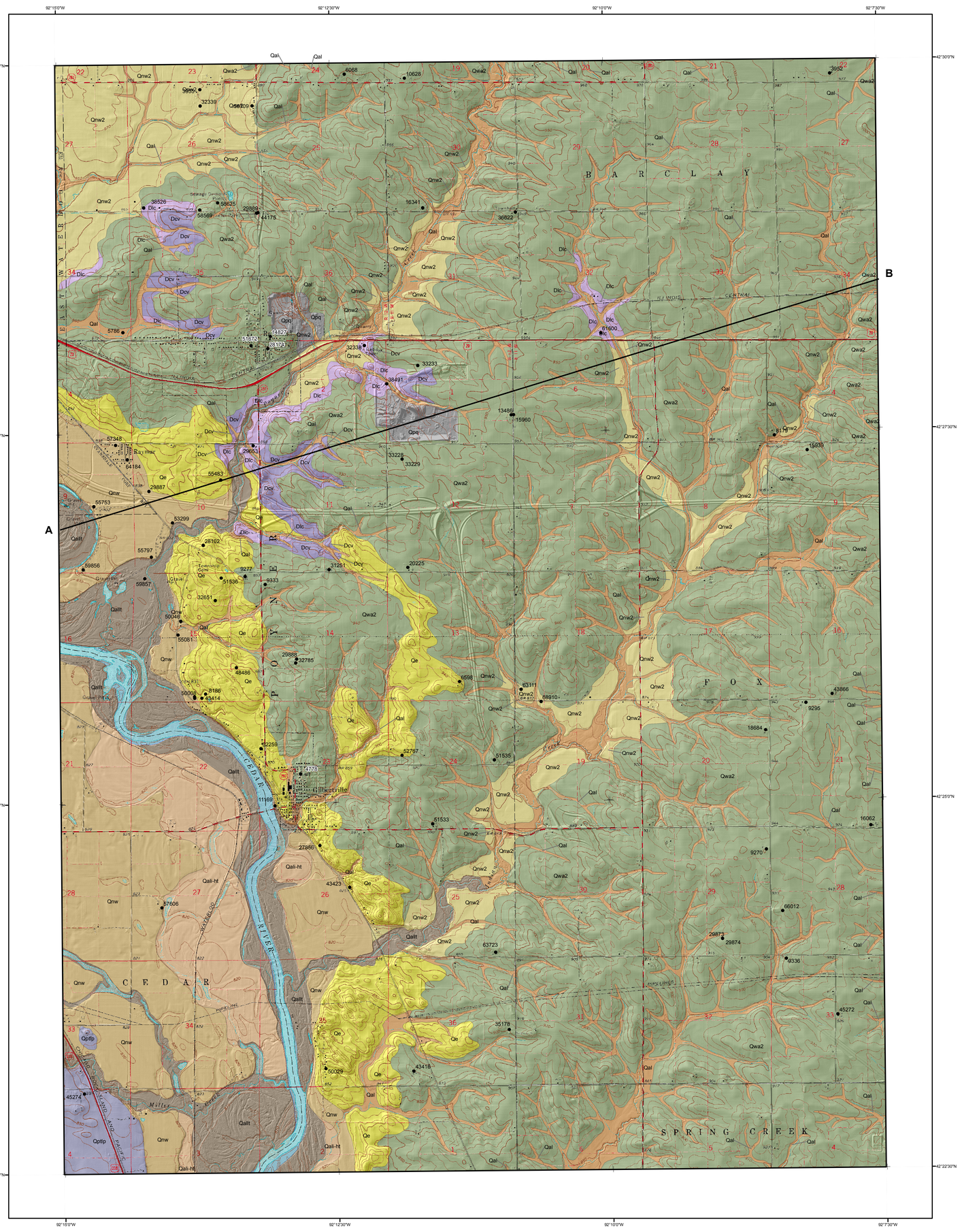
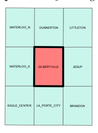
Surficial Geology of the Gilbertville (Iowa) 7.5' Quadrangle



Adjacent 7.5' Quadrangles



1:24,000

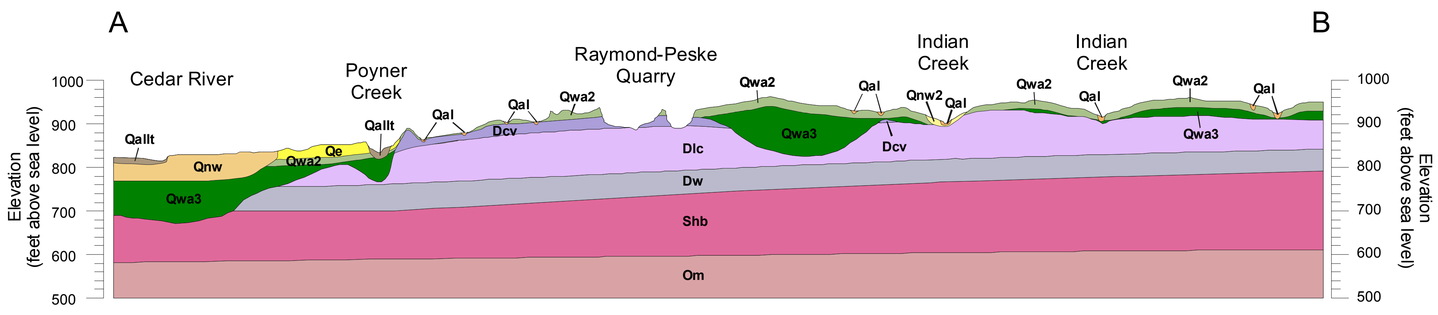
0 0.5 1 2 3 4 Miles

0 0.5 1 2 3 4 Kilometers

Location Map

N

GEOLOGIC CROSS-SECTION A-B



Base map from USGS Gilbertville 7.5' Digital Raster Graphic (IGS GIS file DRGB28.TIF) which was scanned from the Gilbertville 7.5' Topographic Quadrangle map, published by US Geological Survey in 1972
Topographic contours and land features based on 1971 aerial photography, field checked in 1972
Land elevation contours (10' interval).

Iowa Geological and Water Survey digital cartographic file Gilberville_SurficialGeology.mxd, version 9/28/11 (ArcGIS 10.0)
Map projection and coordinate system based on Universal Transverse Mercator (UTM) Zone 15, datum NAD83.

The map and cross section are based on interpretations of the best available information at the time of mapping. Map interpretations are not a substitute for detailed site specific studies.

SURFICIAL GEOLOGY OF THE GILBERTVILLE 7.5' QUADRANGLE, BLACK HAWK COUNTY, IOWA

Iowa Geological and Water Survey
Open File Map OFM-11-07
September 2011

prepared by

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Supported in part by the U.S. Geological Survey
Cooperative Agreement Number G10AC00423
National Cooperative Geologic Mapping Program (STATEMAP)

ACKNOWLEDGMENTS

Recognized for contributions to map's production: Special thanks to Sherm Lundy of BMC Aggregates, and Lee Pries of Paul Neiman Construction for allowing us access to their properties. New subsurface geologic data was mostly generated by University of Iowa students Kyle Bracken and Jaime Ricci who produced descriptive logs of water well drill samples. Michael Bounk and Tom Marshall of the Iowa Geological and Water Survey (IGWS) provided additional descriptive logging of water wells. Jason Vogelgesang (IGWS) prepared well samples for stratigraphic logging and assisted with field work during core collection. Ray Anderson and Brian Witzke (IGWS) provided valuable background information concerning the bedrock topography, geology and Devonian stratigraphy of the area. Andy Asell and Casey Kohrt (IGWS) provided GIS mapping technical help. A special thank you to landowners who graciously allowed access to their land for drilling: John Backer, Lonnie Even, Mike Even, Ralph Kraus, Dave Myers (Heartland Farms), John and Denise Rottinghaus, and Craig Sharp. Drilling was provided under contract with Cabey Well and Pump Service of Fredericksburg, Iowa. Special thanks to driller Mark Claassen.

Introduction to the Surficial Geology of the Gilbertville 7.5' Quadrangle

The Gilbertville Quadrangle, located in Black Hawk County, lies within the Iowan Erosion Surface (IES) Landform Region (Prior and Kohrt, 2006). This area has been subjected to multiple periods of Quaternary glaciations and subaerial erosion. Generally speaking, the map area consists of unnamed loamy sediments (IES materials) of variable thickness overlying Pre-Illinoian glacial sediments. These deposits are regionally extensive. Some areas of shallow rock have been identified along Poyner Creek and in the northern drainages of Indian Creek.

Previous surficial geologic mapping has been completed as part of the STATEMAP program (Tassier-Surine et al., 2007, 2009, 2010) to the north in adjacent Bremer County. The only other regional surficial map of the area consists of the Des Moines 4 ° x 6 ° Quadrangle at a scale of 1:1,000,000 (Hallberg et al., 1991). The Devonian stratigraphy of the regional area has been intensively studied by IGWS staff (e.g., Belanski, 1927; Koch, 1970), and re-studied and correlated by Witzke and Bunker (1984), Witzke and others (1988), Anderson and Bunker (1998), and Groves and others (2008). Other studies in the area include Anderson and Garvin (1984) and Day and others (2006). The stratigraphic nomenclature and correlation in this map follow the stratigraphic framework proposed by Witzke and others (1988).

At least seven episodes of Pre-Illinoian glaciations occurred in this region between approximately 2.2 and 0.5 million years ago (Boellstorff, 1978a,b; Hallberg, 1980, 1986). Episodic erosion during the last 500,000 years has led to the destruction of pre-existing glacial landforms associated with Pre-Illinoian glaciations. A period of intense cold occurred during the Wisconsin full glacial episode from 21,000 to 16,500 years ago (Bettis, 1989). This cold episode and ensuing upland erosion led to the development of the distinctive landform recognized as the IES (Prior, 1976). A periglacial environment prevailed during this period with intensive freeze-thaw action, solifluction, strong winds and a host of other periglacial processes (Walters, 1996). Surface soils were removed from the IES and the Pre-Illinoian till surface was significantly eroded; resulting in the development of a region-wide colluvial lag deposit referred to as a "stone line." Other common features of this region are pahas, isolated and uneroded topographic highs of loess mantled Pre-Illinoian till with a directional orientation from northwest to southeast and exist as erosional outliers of the once higher and older landscape. Thick packages of stratified loamy and sandy sediments located low in the upland landscape and adjacent to streams are remnants of solifluction lobes associated with the formation of the IES. These materials can commonly be found along Indian and Poyner creeks.

Surficial deposits of the map area are composed of five formations: DeForest, Noah Creek, Peoria, Wolf Creek, and Alburnett formations as well as unnamed erosion surface sediments. Hudson age deposits associated with fine-grained alluvial and colluvial sediments include the DeForest Formation which is subdivided into the Camp Creek, Roberts Creek, Gunder, and Corrington members. The Noah Creek Formation includes coarse sand and gravel associated with outwash from the Des Moines Lobe. The Noah Creek Formation includes coarse to finer grained fluvial deposits associated with local stream and river valleys. Unnamed erosion surface sediments consist of reworked till and slopewash deposits associated with post-glacial activity during the Wisconsin ice advance and may be up to 25' thick. Peoria Formation eolian materials consist of fine sand with thick deposits only present along the Cedar River Valley. Additional eolian materials may be intermittently present mantling most other mapping units, and are more abundant near stream valleys. Pre-Illinoian glacial deposits in northeast Iowa consist of two formations: the younger Wolf Creek Formation and the Alburnett Formation. The Wolf Creek is divided into the Winthrop, Aurora and Hickory Hills members (oldest to youngest). The Alburnett Formation consists of several "undifferentiated" members. Pre-Illinoian till is not exposed in the map area but is mantled throughout the Gilbertville Quadrangle by IES materials, eolian sand or alluvial sediments. Pre-Illinoian deposits may be as thick as 150' in bedrock valleys, as seen on the cross-section.

Two bedrock mapping units, the Devonian Little Cedar and Coralville formations, are exposed as outcrop in the map area. Bedrock exposed at the land surface is restricted to the areas near Poyner Creek and the northern portion of Indian Creek. The Little Cedar Formation is the dominant bedrock surface unit in the quad, and is characterized by fossiliferous dolomite and dolomitic limestone in the lower part, and by sparsely fossiliferous to unfossiliferous dolomite, shale, and limestone (laminated to brecciated) in the upper part. The Coralville Formation occurs mostly in the western half of the quad on bedrock highs, and is characterized by a lower fossiliferous carbonate member with abundant marine fauna (Gizzard Creek Member) and an upper carbonate dominated unit with laminated, brecciated, or evaporitic textures and some restricted marine faunas (Iowa City Member). Throughout the remainder of the county bedrock is covered by thick deposits of glacial sediments, and bedrock formation distribution is known solely from water well cuttings samples.

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LEGEND

CENOZOIC

QUATERNARY SYSTEM

HUDSON EPISODE

Qal — **Qal - Alluvium** (DeForest Formation-Undifferentiated) Variable thickness of less than 1 to 5 m (3-16 ft) of very dark gray to brown, noncalcareous to calcareous, massive to stratified silty clay loam, clay loam, loam to sandy loam alluvium and colluvium in stream valleys, on hillslopes and in closed depressions. May overlie Noah Creek Formation, Wolf Creek or Alburnett formations or fractured Devonian or Silurian carbonate bedrock. Associated with low-relief modern floodplain, closed depressions, modern drainageways or toeslope positions on the landscape. Seasonal high water table and potential for frequent flooding.

Qallt — **Qallt - Low Terrace** (DeForest Formation-Camp Creek Mbr. and Roberts Creek Mbr.) Variable thickness of less than 1 to 5 m (3-16 ft) of very dark gray to brown, noncalcareous, stratified silty clay loam, loam, or clay loam. Associated with the modern channel belt of the Cedar River valley. Overlies the Noah Creek Formation. Occupies lowest position on the floodplain, ie. modern channel belts. Seasonal high water table and frequent flooding potential.

Qali-ht — **Qali-ht - Intermediate-High Terrace** (DeForest Formation-Gunder Mbr.) Variable thickness of less than 1 to 5 m (3-16 ft) of very dark gray to brown, noncalcareous, silty clay loam to loam alluvium or colluvium that overlies the Noah Creek Formation. Occupies terrace and valley margin positions 1 to 2 m (3-7 ft) above the modern floodplain. May be mantled with 2 to 3 m (7-10 ft) of well sorted medium to fine sand derived from wind reworking of the alluvium. Seasonal high water table and low to moderate flooding potential.

HUDSON and WISCONSIN EPISODE

Qe — **Qe - Sand Dunes and Sand Sheets** (Peoria Formation-sand facies) Generally less than 3 m (10 ft) of yellowish brown, massive, calcareous loamy sand to fine sand. It may overlie yellowish-brown sand and gravel (Noah Creek Formation) or reworked unnamed loamy sediments associated with the Iowan Erosion Surface and/or it may overlie yellowish to grayish brown, often calcareous and fractured clay loam to loam diamicton of the Wolf Creek and Alburnett formations.

Qnw2 — **Qnw2 - Sand and Gravel** (Noah Creek Formation) Generally 2 to 8 m (6-26 ft) along Indian Creek, Poyner Creek and Elk Run- yellowish brown to gray, poorly to well sorted, massive to well stratified, coarse to fine feldspathic quartz sand, pebbly sand and gravel with few intervening layers of silty clay. A thin mantle of loess, reworked loess or fine-grained alluvium may be present. This unit includes silty colluvial deposits derived from the adjacent map units. In places this unit is mantled with 1 to 3 m (3-10 ft) of well sorted medium to fine sand derived from wind reworking of the alluvium. This unit encompasses deposits that accumulated in low-relief stream valleys during the Wisconsin and Hudson. Seasonal high water table and some potential for flooding.

WISCONSIN EPISODE

Qptlp — **Qptlp - Late Phase High Terrace (LPHT)** (Peoria Formation-silt and/or sand facies) Generally 2 to 8 meters (6 to 26 feet) of yellowish brown to gray, massive, jointed, calcareous or noncalcareous, silt loam and interculated fine to medium, well sorted, sand. Grades downward to poorly to moderately well sorted, moderately to well stratified, coarse to fine feldspathic quartz sand, loam, or silt loam alluvium of the Noah Creek Formation.

Qnw — **Qnw - Sand and Gravel** (Noah Creek Formation) 3 m (10 ft) to more than 20 m (66 ft) of yellowish brown to gray, poorly to well-sorted, massive to well stratified, coarse to fine feldspathic quartz sand, pebbly sand and gravel. In places mantled with 1 to 3 m (3-10 ft) of fine to medium, well sorted sand derived from wind reworking of the alluvium. This unit encompasses deposits that accumulated in stream valleys during the Wisconsin Episode.

Qwa2 — **Qwa2 - Loamy and Sandy Sediment Shallow to Glacial Till** (Unnamed erosion surface sediment) Generally 2 to 8 m (6-26 ft) of yellowish brown to gray, massive to weakly stratified, well to poorly sorted loamy, sandy and silty Iowan Erosion Surface sediment. Map unit includes some areas mantled with less than 2 m (7 ft) of Peoria Formation materials (loess and eolian sand). Overlies massive, fractured, firm glacial till of the Wolf Creek and Alburnett formations. Seasonally high water table may occur in this map unit.

PRE-ILLINOIS EPISODE

Qwa3 — **Qwa3 - Till** (Wolf Creek or Alburnett formations) Generally 3 to 45 m (10-148 ft) of very dense, massive, fractured, loamy glacial till of the Wolf Creek or Alburnett formations with or without a thin loess mantle (Peoria Formation—less than 2 m) or thin loamy sediment mantle. An intervening clayey Farmdale/Sangamon Geosol may separate these units. This mapping unit is shown only in the cross-section and may be buried by unnamed erosion surface sediments, loess or alluvium.

PALEOZOIC

DEVONIAN SYSTEM

Dcv — **Dcv - Limestone and Dolomite** (Coralville Formation) Middle Devonian. The thickness of this map unit varies between 0 and 10 m (0-32 ft) within the quad. The lower, Gizzard Creek Member, is fossiliferous carbonate with an abundant marine fauna, and is dominated by dolomite and dolomitic limestone, becoming slightly argillaceous in part, with common calcite filled vugs; the low diversity fauna are characterized by crinoid debris and brachiopods, and rare gastropods and bryozoans. The upper, Iowa City Member, is carbonate dominated, with laminated, brecciated, or evaporitic textures and some restricted marine faunas; the restricted marine fauna is dominated by favositid corals and/or branching and domal stromatoporoids. Stromatoporoid rich biostromal intervals occur within and around the quad area. This unit may be overlain by up to 2 m (6 ft) of Quaternary materials.

Dlc — **Dlc - Dolomite and Limestone** (Little Cedar Formation) Middle Devonian. The thickness of this map unit ranges from 0 to 30 m (0-100 ft) within the quad. The map unit is dominated by slightly argillaceous to argillaceous dolomite and dolomitic limestone, usually vuggy and partially laminated and/or cherty. This unit is commonly fossiliferous and brachiopods are especially abundant in lower portion. The upper portion (Hinkle Member) is dense unfossiliferous lithographic or sublithographic limestone or dolomitic limestone, with laminated, pelleted, intraclastic, and birdseye fabrics. This unit may be overlain by up to 2 m (6 ft) of Quaternary materials.

Dw — **Dw - Dolomite, Limestone, Shale, and Minor Sandstone** (Wapsipinicon Group) Middle Devonian. This map unit contains only the Pinicon Ridge Formation of the group, with a total thickness that varies from 0 to 23 m (0-75 ft) in the mapping area. It is dominated by laminated or brecciated, unfossiliferous limestone and dolomite that is sometimes sandy and cherty at its base. This unit is shown only on the cross-section, not on the map.

SILURIAN SYSTEM

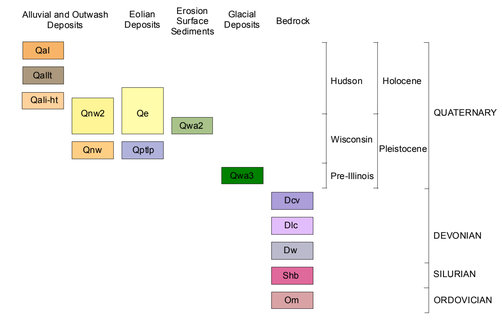
Shb — **Shb – Dolomite with Chert** (Hopkinton and Blanding formations) Lower Silurian. The total thickness of the map unit is up to 49 m (160 ft). The unit is fossiliferous to vuggy dolomite, and cherty to very cherty with nodular to bedded chert in the upper part of the Blanding formation. Fossils include corals, brachiopods and stromatoporoids. The Hopkinton rocks are generally more fossiliferous and less cherty than the underlying Blanding rocks. This unit is shown only on the cross-section, not on the map.

ORDOVICIAN SYSTEM

Om — **Om – Shale and Dolomite** (Maquoketa Formation) Upper Ordovician. The total thickness of the map unit is up to 91 m (300 ft). The unit is comprised of interbedded green to gray dolomitic shale and shaly dolomite with minor limestone; variably cherty and variably fossiliferous with brachiopods and graptolites; thin brown to brown-gray dolomitic shale layers occur in lower 10 m (33 ft). This unit is shown only on the cross-section, not on the map.

Qpq — **Qpq – Pits and Quarries** Sand and gravel pits and rock quarries. Extent mapped as shown in county soil surveys and as identified on aerial imagery.

Drill Holes

Water Wells

Correlation of Map Units