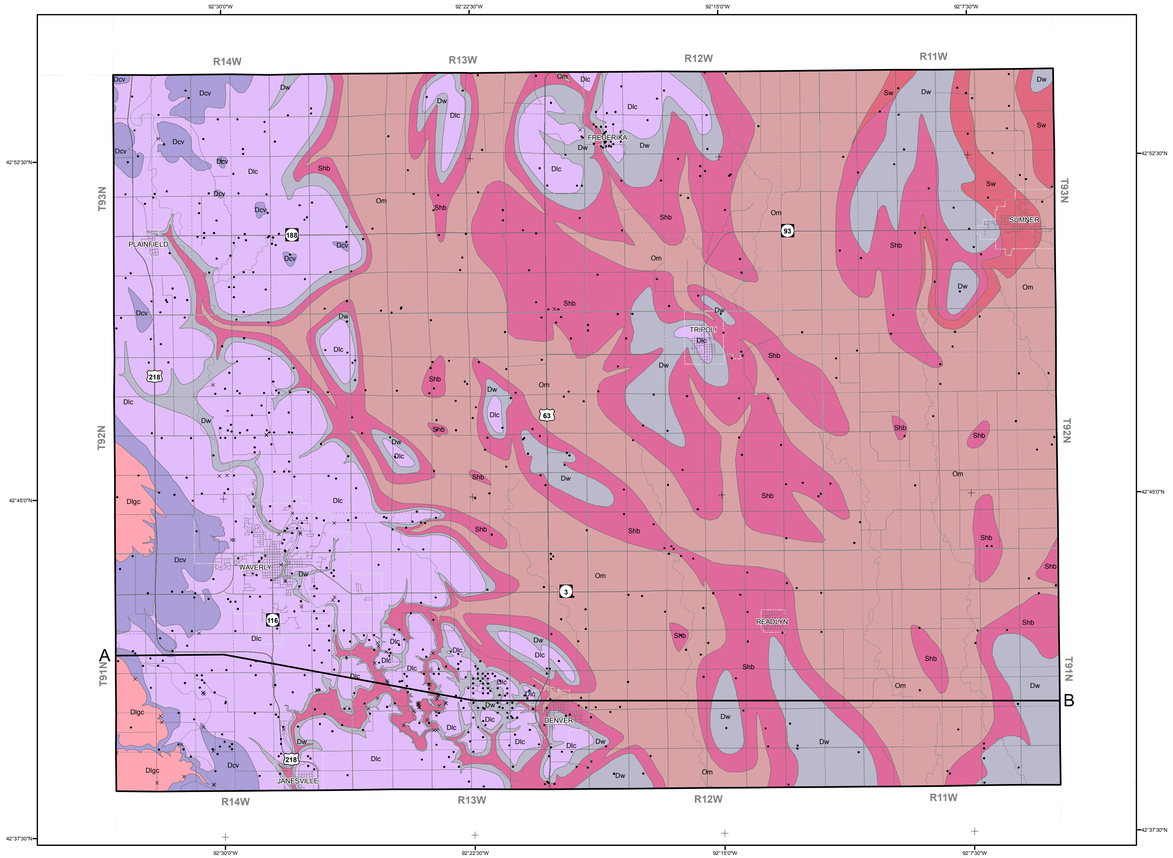
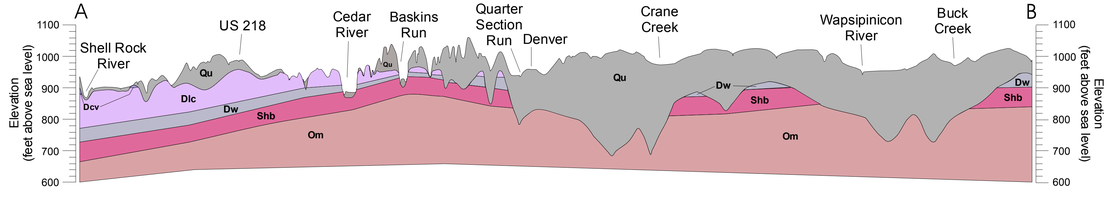
Bedrock Geology of Bremer County, Iowa



GEOLOGIC CROSS-SECTION A-B



Base map from Iowa DNR NRGIS Library (Bremer County GIS files) derived from USGS 1:100,000 scale DLGs, Census Bureau TIGER line files and IGS PLSS files.

Iowa Geological Survey digital cartographic file BremerCo_Bedrock10.mxd , version 8/20/10 (ArcGIS 9.3).
Map projection and coordinate system based on Universal Transverse Mercator (UTM) Zone 15, datum NAD83.

Map and cross-sections 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.

LEGEND

CENOZOIC

QUATERNARY SYSTEM

Qu – Undifferentiated unconsolidated sediment Consists of loamy soils developed in loess and glacial till of variable thickness, and alluvial clay, silt, sand and gravel. Total thickness can be up to 90 m (300 ft) in the eastern part of the county. Unit shown only on cross-section, not on map.

PALEOZOIC

DEVONIAN SYSTEM

Dlgc - Dolomite, Limestone, and Shale (Lithograph City Formation) Middle to Upper Devonian. Maximum thickness of this map unit is up to 15 m (45 ft), consisting of, in ascending order, Osage Springs Member which is dominated by dolomite and dolomitic limestone, in part argillaceous and fossiliferous; Thunder Woman Shale Member which is characterized by grey shale, slightly dolomitic and silty; and partial Idlewild Member which is characterized by interbeds of laminated lithographic and sublithographic limestone and dolomitic limestone with scattered to abundant brachiopods and/or stromatoporoids.

Dcv - Limestone and Dolomite (Coralville Formation) Middle Devonian. Thickness of this formation varies between 0 and 10 m (0-32 ft), and is dominated by limestone, dolomitic limestone, and dolomite, in part laminated and argillaceous; brachiopods and corals are usually abundant in the limestone facies.

Dlc - Dolomite and Limestone (Little Cedar Formation) Middle Devonian. The thickness of this formation ranges from 27 to 36 m (90-120 ft) in this quad. It 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.

Dw - Dolomite, Limestone, Shale, and minor Sandstone (Wapsipinicon Group) Middle Devonian. This map unit usually contains the Pinicon Ridge Formation only, with a total thickness that varies between 6 and 12 m (18-40 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.

SILURIAN SYSTEM

Shb – Dolomite with Chert (Hopkinton and Blanding formations) Lower Silurian. Total thickness up to 20 m (65 ft). Fossil-moldic to vuggy dolomite, and cherty to very cherty with nodular to bedded chert in the upper part of the Blanding. Fossils include corals, brachiopods and stromatoporoids.

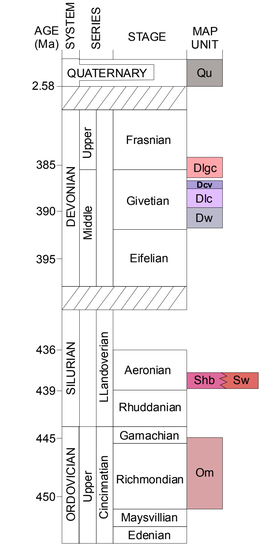
Sw – Limestone with Chert (Waucoma Formation) Lower Silurian. Total thickness up to 20 m (65 ft). This unit is a limestone facies that correlates with dolomite strata of the Blanding and lower Hopkinton formations; it occurs in the northeast part of the county. Primary lithology is dense fossiliferous limestone, and secondary lithologies are cherty to very cherty limestone to dolomitic limestone with silty to sandy dolomite locally at the base above the Maquoketa Formation.

ORDOVICIAN SYSTEM

Om – Shale and Dolomite (Maquoketa Formation) Upper Ordovician. Total thickness up to 78 m (250 ft). 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).

- **Drill Holes**
- × **Bedrock Outcrops**

Correlation Chart



Location Map

BEDROCK GEOLOGY OF BREMER COUNTY, IOWA

Iowa Geological and Water Survey
Open File Map OFM-10-10
August 2010

prepared by

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New subsurface geologic data was mostly generated by University of Iowa students Kyle Bracken and Sarah Byram who produced descriptive logs of water well drill samples. Special thanks to Paul Niemann Construction, owner of the Denver-Foelske and the Tripoli quarries and BMC Aggregates, owner of the Frederika Quarry. Thomas Marshall of the Iowa Geological and Water Survey (IGWS) provided additional descriptive logging of water wells. Michael Bounk (IGS) participated in part of the field work; Deborah Quade and Stephanie Tassier-Surine (IGWS) lent support with Quaternary field and office expertise; Jason Vogelgesang and Murray Perdue (IGWS) prepared well samples for stratigraphic logging; Ray Anderson and Brian Witzke (IGS) provided valued information concerning the bedrock topography, geology and Devonian and Silurian stratigraphy of the area; and Bill Bunker, Chris Kahle and Andy Asell (IGWS) provided GIS mapping technical help.

Introduction to the Bedrock Geology of Bremer County, Iowa

Bremer County lies totally within the Iowan Surface landform region of northeast Iowa, an area of subdued topographic relief developed on eroded Pre-Illinoian glacial deposits, Wisconsinan loess, and Paleozoic bedrock formations (Prior, 1991). Norton (1906) first described and mapped the Quaternary and Paleozoic bedrock geology of the county, and discussed the stratigraphy of Devonian and Silurian strata that were exposed at the land surface. He also noted the presence of Ordovician strata at the bedrock surface in areas covered by thick glacial deposits. Statewide bedrock geologic maps by Hershey (1969), and most recently, by Witzke, Anderson, and Pope (2010), depict the increased understanding of the complex distribution of geologic units at the bedrock surface across this region, including Bremer County.

Bedrock exposed at the land surface is restricted to the northern and western portions of the county and all rock outcrops and quarries are located in close proximity to surface topographic lows coincident with the modern drainages of the Shell Rock River, the Cedar River and its tributaries Baskins Run and Quarter Section Run, and Crane Creek, and the Wapsipinicon River. 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.

The distribution of bedrock map units is dominantly influenced by the extremely gentle southwest dip of bedrock strata, approximately 15 to 20 feet per mile, in combination with the bedrock topography; gentle structural upwarp of strata appears to superimpose a subtle contribution. In the eastern and southern portions of the county the topography of the bedrock surface is controlled primarily by a complex network of buried pre-Pleistocene and Pleistocene age bedrock valleys and uplands. In the western and northern part of the county where the bedrock surface is elevated enough to intersect modern drainages bedrock topography is influenced more strongly by the modern stream corridors.

The oldest bedrock mapped at the bedrock surface is the Maquoketa Formation, a thick sequence of shaly and cherty dolomite and lesser dolomitic green, gray and brown shale. The Maquoketa is not exposed in outcrop due to it occupying the deeper portions of bedrock valleys that are buried by thick glacial deposits.

Silurian strata of the combined Hopkinton and Blanding formations are exposed along Baskins Run, Quarter Section Run and Crane Creek and the Cedar River. The unit, composed of clean to cherty and moderately fossiliferous to extremely fossiliferous dolomite, is the major bedrock unit quarried in the county for construction aggregate. The area of the Loomis and Denver-Folske quarries along Baskins Run, and that of the Tripoli Quarry along the northern part of Crane Creek, has been the subject of several fieldtrips and investigations over the years. (Dorheim and Koch, 1962; Bunker, Klapper and Witzke, 1983; Anderson, Smith, and Walters, 1992; and Walters, 1996). These quarries host the best exposures of Silurian bedrock in the county and exposures at the Denver-Folske Quarry illustrate pre-Devonian paleotopographic relief (Bremer County High) that influenced overlying Wapsipinicon Group sedimentation. The Tripoli Quarry hosts a large pentamarid brachiopod dominated biohermal buildup or mound that is unusual for the Hopkinton Formation. The Waucoma Formation, a limestone facies of the Hopkinton/Blanding formations, is not exposed but is mapped beneath glacial deposits in the northeast corner of the county.

The western third of the map area is dominated by the Devonian Wapsipinicon Group and the overlying Devonian Little Cedar Formation, Coralville Formation and Lithograph City Formation, all of which are carbonate formations of shallow marine origin within the well studied Cedar Valley Group of eastern Iowa (Bunker, Witzke and Day, 1986; Witzke, Bunker and Rogers, 1988; Bunker and Witzke, 1992; and Anderson, Smith and Walters, 1992). The best exposures of these strata are along the valley walls of the Cedar River and its tributaries, the Denver Folske Quarry, and outcrops along the Shell Rock River. All of these units have been quarried in the past for construction aggregate, but are only secondary sources of crushed stone today.

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