

Bedrock Geology of the St. Ansgar (Iowa) 7.5' Quadrangle

BEDROCK GEOLOGY OF THE ST. ANSGAR 7.5' QUADRANGLE, MITCHELL COUNTY, IOWA

Iowa Geological Survey
Open File Map OFM-14-5
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Introduction to the Bedrock Geology of St. Ansgar 7.5' Quadrangle, Mitchell County, Iowa

The St. Ansgar quad lies within the Iowan Surface landform region (Prior, 1991 and Prior and Kober, 2006). This area has been subjected to multiple periods of Quaternary glaciations and subaerial erosion providing a relatively low-relief terrain with moderately incised drainage valleys.

The thickness of Quaternary materials varies from 0 to 12 m (0 to 40 ft) across the mapping area. Bedrock outcrops exist primarily along the Cedar River and its tributaries, Otter Creek, Deer Creek, and Turtle Creek. Several bedrock quarries located within the quad were also visited during field mapping activities. Subsurface information was mostly derived from the analysis of water well cutting samples repositied at the Iowa Geological Survey (IGS). Lithologic and stratigraphic information from these samples are stored in the online GEOSAM database of the IGS. Geologic information from a total of 26 outcrops and more than 90 private and public wells within the mapping area were used for bedrock geological mapping purposes. Shallow bedrock information from the soil survey in Mitchell County (Voy & Highland, 1975) was used for identifying potential bedrock outcrop locations during field mapping activities. Stratigraphic information from the surrounding area, including bedrock outcrops, quarries, and well samples, were also utilized for this mapping project.

Paleogeographically, the mapping area is within the northern portion of the Devonian Iowa Basin, a region of thickened shelf carbonate and shale deposits. Middle and lower Devonian rocks form the major bedrock surface and upper bedrock aquifer in this area. The hydrogeology of Floyd and Mitchell counties has been well studied by Libra and others (1994). Due to its stratigraphic completeness, the stratigraphy and depositional environments of the Devonian Iowa Basin have been intensively studied (e.g., Belanski, 1927, 1928; Koch, 1970). Recent geologic and stratigraphic studies of this basin include Witke and Bunker (1984), Anderson (1984), Bunker and others (1986), Witke and others (1988), Bunker (1995), and Groves and others (2008). Devonian stratigraphy at Mason City, Iowa, has also been discussed by McKay and Liu (2012). The bedrock surface of the surrounding areas recently mapped by Witke and others (2010) and Liu and others (2010a & b, 2011a & b, 2012). Results from these studies provided an important stratigraphic framework for this bedrock geologic map. The bedrock stratigraphic nomenclature and correlation for this map follows the stratigraphic framework proposed by Witke and others (1988).

The entire mapping area is underlain by Devonian rocks comprised of carbonates, varying between limestone and dolomite, and shale. Based on lithologic features and fossils, the Devonian strata comprising the bedrock surface in the mapping area can be subdivided into, in descending order, the Lithograph City, Coralville, and Little Cedar Formations. The Middle to Upper Devonian Lithograph City Formation dominates the bedrock surface within the mapping area and is characterized by laminated lithographic and sublithographic limestone and dolomite. "Birdseye," vugs, and calcite vug-fills are common in this formation. Some layers of this formation are fossiliferous with abundant brachiopods and stromatoloids. The majority of bedrock outcrops within the mapping area are of the Lithograph City Formation. The maximum thickness of the Lithograph City Formation is about 24 m (80 ft) within the St. Ansgar quad. The Coralville Formation consists of limestone, dolomite limestone, and dolomite, in part laminated and argillaceous. Brachiopods, schistoid debris, and corals may be found within the limestone facies. The Coralville Formation has an average thickness of about 12 to 18 m (40 to 60 ft) in the mapping area and occurs at the bedrock surface primarily within the core of the Cedar River valley and portions of the Otter Creek valley. The Little Cedar Formation is dominated by slightly argillaceous to argillaceous dolomite and dolomite limestone, usually vuggy or partially laminated and/or cherty. Moderate shale units also occur in this formation with the lower portion being commonly fossiliferous. The thickness of the Little Cedar Formation in the mapping area is approximately 40 m (130 ft). This unit is shown only on the cross-section, not on the map. Deep wells within the St. Ansgar quad (W-62090, W-66806, W-66808, W-66810) along with previous research by Witke and Bunker (1984), indicate that the Devonian bedrock units lie unconformably over older Ordovician units across the entire quad.

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LEGEND

CEANOZOIC

QUATERNARY SYSTEM

Qu Quaternary (unconsolidated) glacial till, sand, gravel, and silt, and other deposits of recent origin. This unit is shown only on the cross-section and is not mapped on the map.

PALEOZOIC

DEVONIAN SYSTEM

Dlgc Dolomite limestone and shale (Lithograph City Formation). This unit is shown only on the cross-section and is not mapped on the map. It is composed of thin bedded to massive bedded limestone and dolomite, and shale. It is fossiliferous and contains brachiopods, stromatoloids, and corals. It is also characterized by "birdseye" vugs and calcite vug-fills. The maximum thickness of this unit is about 24 m (80 ft) within the St. Ansgar quad.

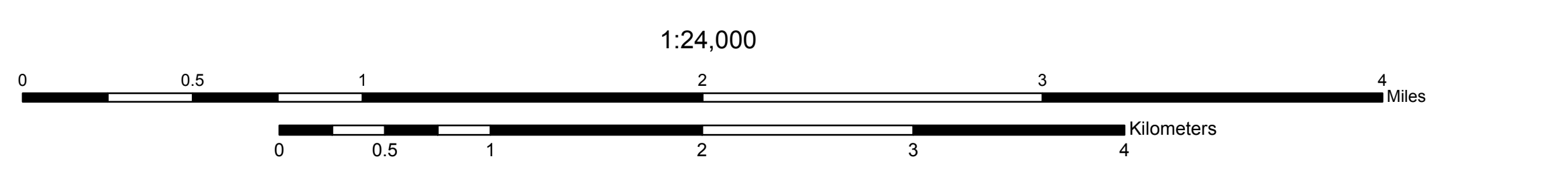
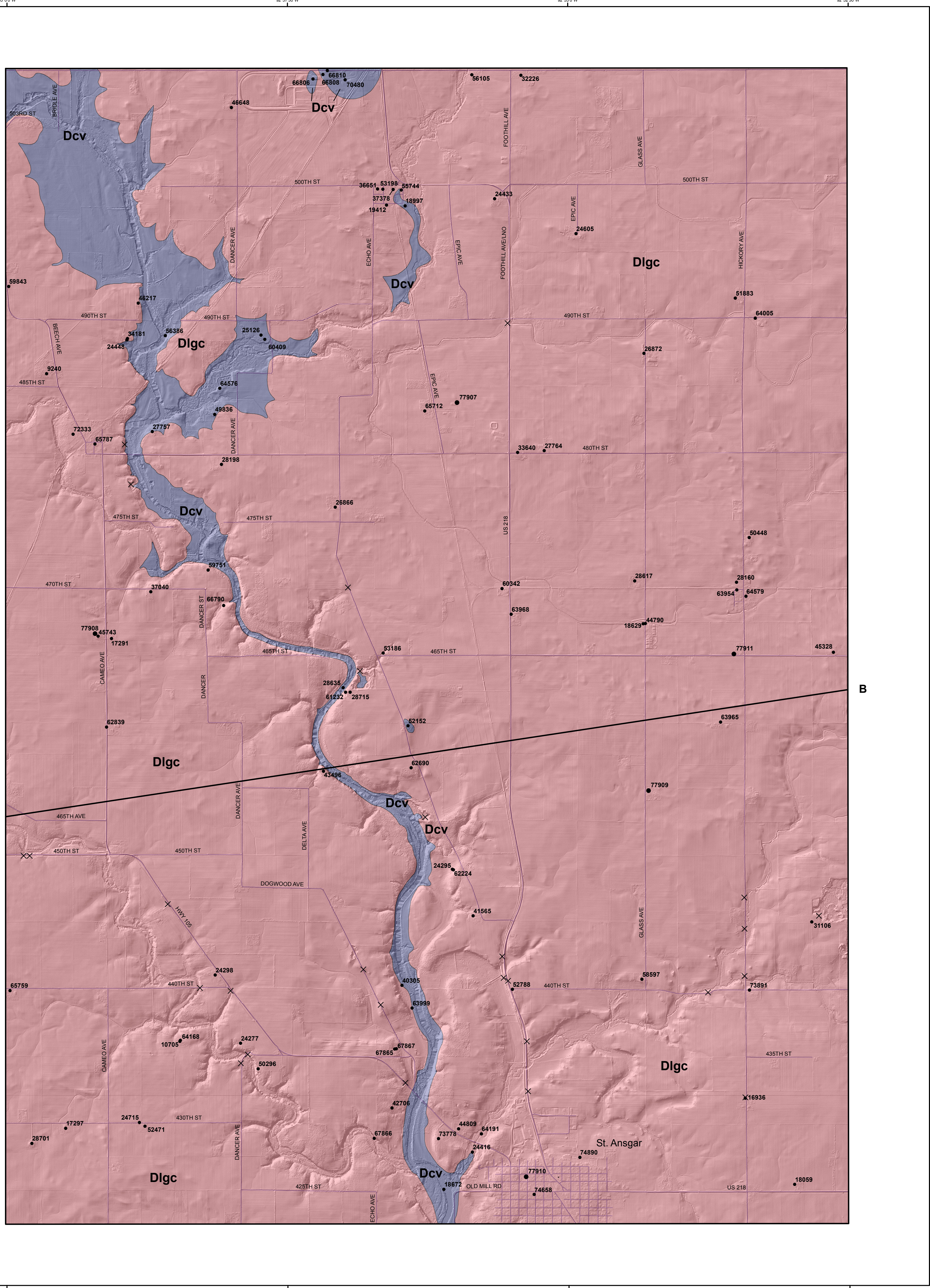
Dcv Dolomite limestone and shale (Coralville Formation). This unit is shown only on the cross-section and is not mapped on the map. It is composed of thin bedded to massive bedded limestone and dolomite, and shale. It is fossiliferous and contains brachiopods, schistoid debris, and corals. The maximum thickness of this unit is about 12 to 18 m (40 to 60 ft) in the mapping area.

Dic Dolomite limestone and shale (Little Cedar Formation). This unit is shown only on the cross-section and is not mapped on the map. It is composed of thin bedded to massive bedded limestone and dolomite, and shale. It is fossiliferous and contains brachiopods, schistoid debris, and corals. The maximum thickness of this unit is about 40 m (130 ft) in the mapping area.

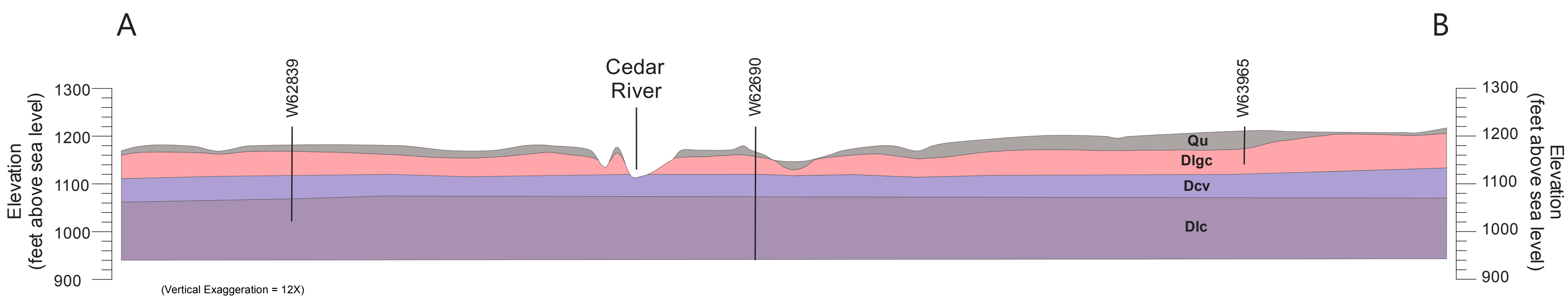
77202 New Well for 900' map
20239 IGS/IDNR/USGS Well - located outside of this quadrangle

Base map from Iowa DOT Road map Layers 2006. Shaded relief from Iowa Lidar Project 2007-2011.
Iowa Geological Survey digital cartographic file Storage: BedrockGeology.mxd, version: 9/15/14 (ArcGIS 10.1). Map projection and coordinate system based on General Transverse Mercator (NAD 83), 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.
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GEOLOGIC CROSS-SECTION A-B



Correlation of Map Units

AGE (Ma)	SYSTEM	SERIES	STAGE	MAP UNIT
2.588	QUATERNARY	Upper	Frasnian	Dlgc
382.7			Givetian	Dcv
387.7	DEVONIAN	Middle	Eifelian	Dic
393.3				

