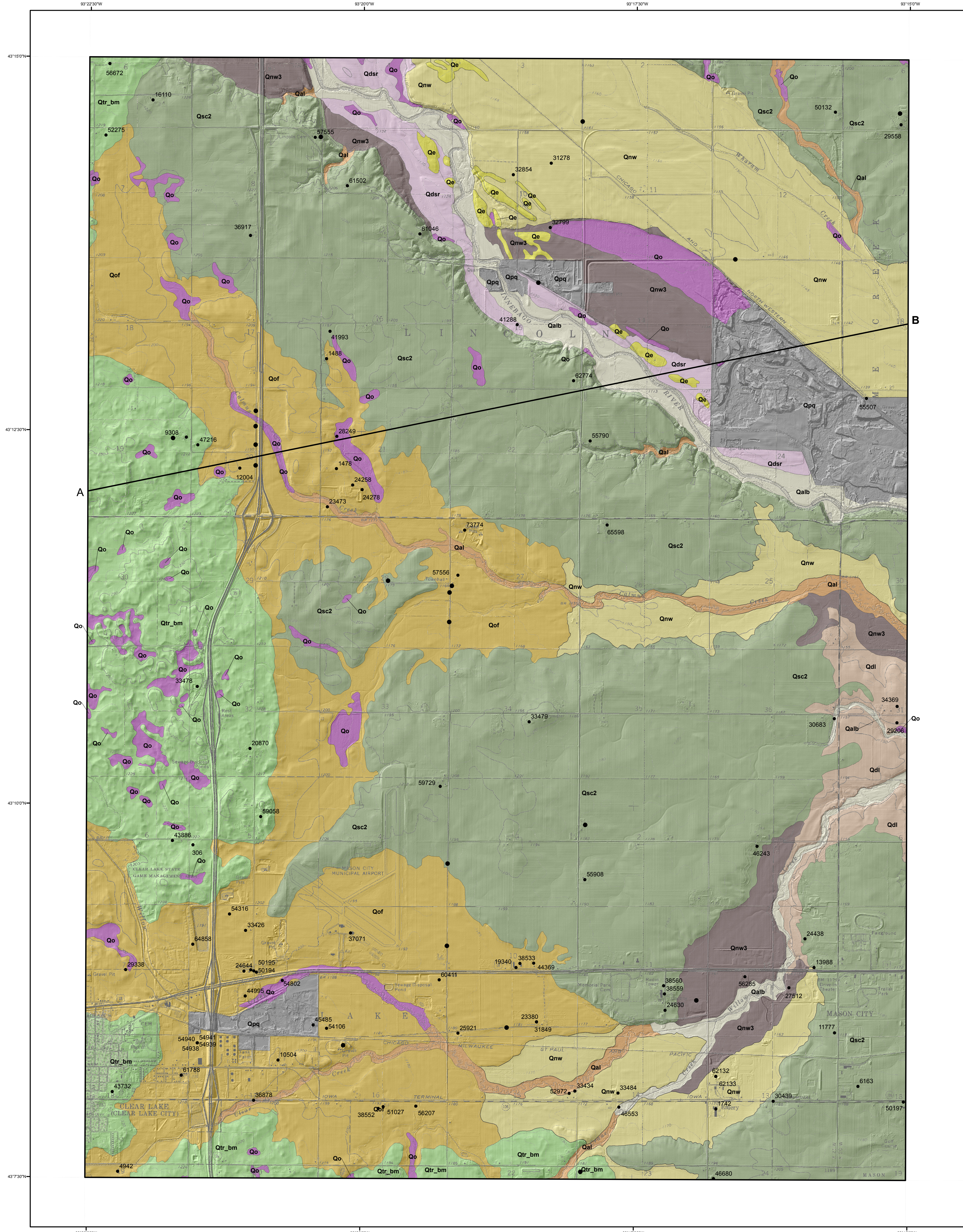


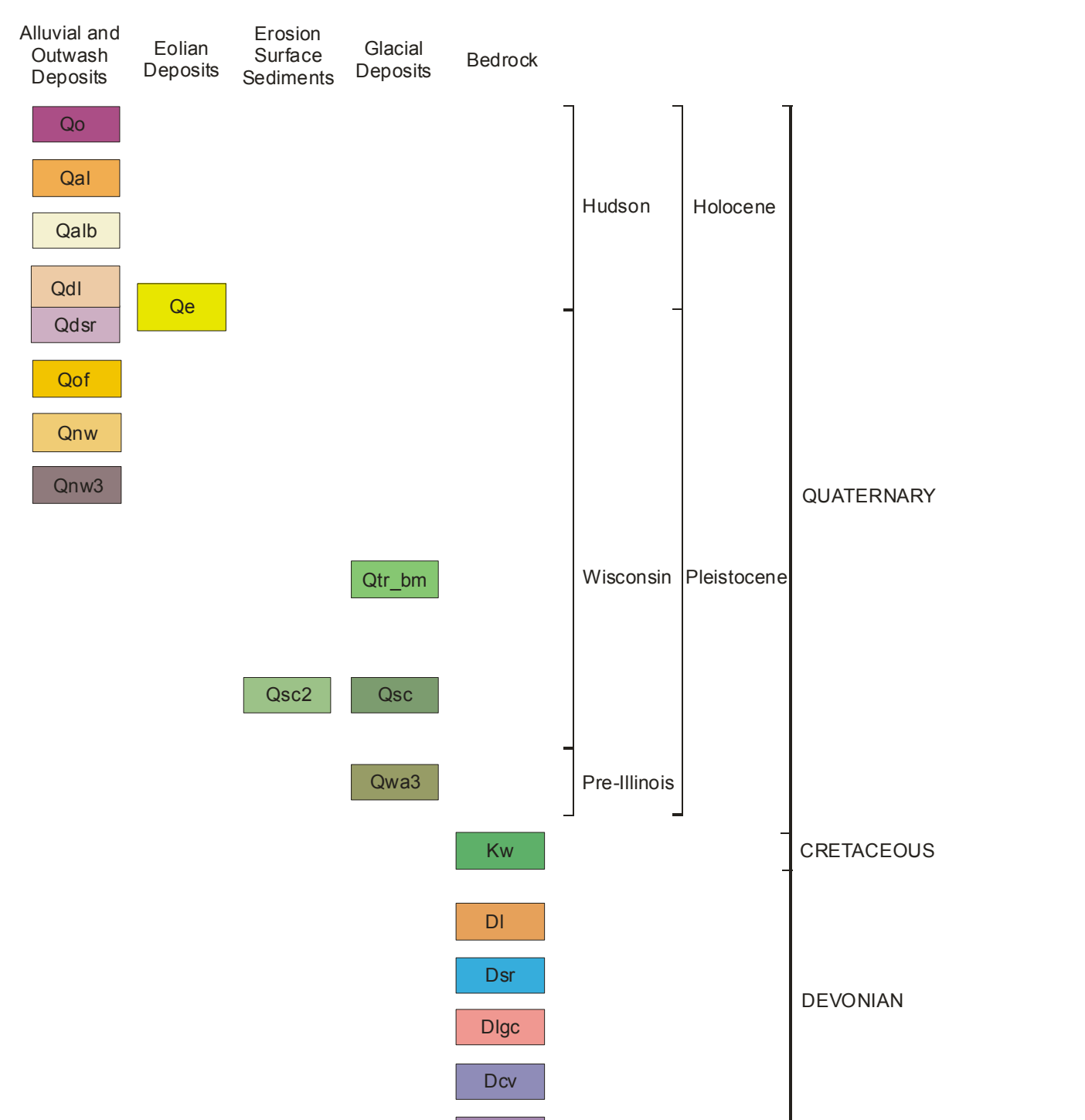
Surficial Geology of the Clear Lake East (Iowa) 7.5' Quadrangle



LEGEND

- CENOZOIC**
- QUATERNARY SYSTEM**
- Hudson Epoch**
- Qo** - **Deposition** (of sand or silt) - Generally 2 to 4 m (6.5 to 13 m) of black to very dark gray silty loam, sand, and silt. It may be locally more silty or more sandy. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
 - Qal** - **Alluvium** (of sand or silt) - Variable thickness of less than 1 to 2 m (3.3 to 6.6 ft) of very dark gray to brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
 - Qalb** - **Alluvium** (of sand or silt) - Variable thickness of less than 1 to 2 m (3.3 to 6.6 ft) of very dark gray to brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
- Hudson and Wisconsin Epoch**
- Qe** - **Sand and Gravel** (of sand or silt) - Generally less than 2 m (6.6 ft) of yellowish brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
 - Qdsr** - **Loam** (of sand or silt) - Generally less than 2 m (6.6 ft) of yellowish brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
 - Qdl** - **Loam** (of sand or silt) - Generally less than 2 m (6.6 ft) of yellowish brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
- Wisconsin Epoch**
- Qnw** - **Sand and Gravel** (of sand or silt) - Generally less than 2 m (6.6 ft) of yellowish brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
 - Qnw3** - **Sand and Gravel** (of sand or silt) - Generally less than 2 m (6.6 ft) of yellowish brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
 - Qof** - **Loam** (of sand or silt) - Generally less than 2 m (6.6 ft) of yellowish brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
 - Qtr_bm** - **Loam** (of sand or silt) - Generally less than 2 m (6.6 ft) of yellowish brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
 - Qsc2** - **Loam** (of sand or silt) - Generally less than 2 m (6.6 ft) of yellowish brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
 - Qsc** - **Loam** (of sand or silt) - Generally less than 2 m (6.6 ft) of yellowish brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
- PRE-ILLINOIS EPOCH**
- Qwa3** - **Loam** (of sand or silt) - Generally less than 2 m (6.6 ft) of yellowish brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
- MESOZOIC**
- CRETACEOUS SYSTEM**
- Kd** - **Sandstone, Mudstone, and Shale** (of sand or silt) - Generally less than 2 m (6.6 ft) of yellowish brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
- PALEOZOIC**
- DEVONIAN SYSTEM**
- DI** - **Shale, Limestone, and Dolomite** (of sand or silt) - Generally less than 2 m (6.6 ft) of yellowish brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
 - Dsr** - **Limestone, Sandstone, and Shale** (of sand or silt) - Generally less than 2 m (6.6 ft) of yellowish brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
 - Dlgs** - **Limestone, Sandstone, and Shale** (of sand or silt) - Generally less than 2 m (6.6 ft) of yellowish brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
 - Dcv** - **Limestone, Sandstone, and Shale** (of sand or silt) - Generally less than 2 m (6.6 ft) of yellowish brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
 - Dlc** - **Limestone, Sandstone, and Shale** (of sand or silt) - Generally less than 2 m (6.6 ft) of yellowish brown, massive to silty, silty loam, clay loam, silt, and sand. It is usually deposited in a narrow band along major valley floors or adjacent upland on the Des Moines Lobe. It is not correlated to other units in the region.
- Devil Hills**
- 1930** - **Water Well Logs** with IGWS well number (see www.igsb.uiowa.edu/gw) are available at the following locations:

CORRELATION CHART



SURFICIAL GEOLOGY OF THE CLEAR LAKE EAST 7.5' QUADRANGLE, CERRO GORDO COUNTY, IOWA

Iowa Geological and Water Survey
Open File Map OFM-13-2
September 2013

prepared by
Deborah Quade, Stephanie Tassier-Sunne, Huanbo Liu, Robert McKay, Robert Rowden and James Gliglerano
Iowa Geological and Water Survey, Iowa City, Iowa

Iowa Department of Natural Resources, Check City, Director
Iowa Geological and Water Survey, Robert D. Linn, State Geologist

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National Cooperative Geologic Mapping Program (STATEMAP)

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Introduction to the Surficial Geology of Clear Lake East 7.5' Quadrangle, Cerro Gordo County, Iowa

The Clear Lake East Quadrangle is located in Cerro Gordo County in north-central Iowa. The quadrangle straddles the eastern margin of the Late Wisconsinan-age Des Moines Lobe Landform (DML), the most recently glacial region of the state, and the Wisconsinan-age Iowa Erosion Surface (IES), a landscape formed by the Des Moines Lobe. The western part of the map area, consists of a complex suite of depositional landforms and sediment sequences related to supraglacial, subglacial, and proglacial sedimentation associated with the initial advance of the DML. Within the quadrangle, Quaternary deposits on the DML can reach a maximum thickness of 45 m (148 ft) and are significantly thicker than on the IES. The eastern portion of the map area is dominated by unglaciated loamy sediments (IES materials) of variable thickness overlying Wisconsinan-age Sheldon Creek Fm. glacial sediments. Pre-Illinoian glacial sediments or shallow rock. These deposits are regionally extensive and in this quadrangle, on average are less than 18 m (60 ft) in thickness. Significant areas of bedrock outcrop or areas with less than 15 feet of loamy material or rock are present, especially along the Winnebago River and the lower reach of Willow Creek. Bisecting the northeastern section of the map area is the Winnebago River valley. The valley is younger than the Bemis Moraine and was cut approximately 12,500 years before present during the catastrophic drainage of the younger Algona Moraine. The valley is dominated by a variable thickness 1 to 10 m (3 to 32 ft) of coarse grained outwash associated with the "last-gasp" drainage of the DML.

Williams (1899) described and mapped the Quaternary and Paleozoic bedrock geology of Worth County and made mention of similar geologic units in Cerro Gordo County. He also noted the extreme thickness of the "drift" along the Winnebago River and the remarkable difference in surface features between the eastern and western portions of Worth and Cerro Gordo counties. Statewide geologic maps by Hershler (1969) and most recently by Witke, Anderson, and Pope (2010), depict the increased understanding of the complex distribution of geologic units at the bedrock surface across this region, including Worth County. The only regional surficial geology map of the Des Moines 4' x 6' Quadrangle at a scale of 1:1,000,000 (Hallberg et al., 1991). In addition, Kemmis (1991) undertook a systematic study of glacial landforms, sedimentology and depositional environments of the northern Des Moines Lobe. This study served as the foundation for the lithostratigraphic framework for DML deposits in Iowa.

Surficial deposits of the map area are composed of seven formations: Deforest, Dow, Noah Creek, Peoria, Sheldon Creek, Wolf Creek, and Alburtus formations, as well as unnamed erosion surface sediments (see map discussion for further details). Hudson age deposits associated with fine-grained glacial, organic, and colluvial sediments include the Deforest Formation which is subdivided into the Camp Creek, Roberts Creek, Gander, Corrigan, Flack, and Woden members. The Dow Formation consists of upland glacial deposits and is subdivided into the Alden, Lake Mills, Morgan and Pilot Knob Members. The Noah Creek Formation includes coarse sand and gravel associated with outwash from the Des Moines Lobe. The Peoria Formation includes coarse to finer grained fluvial deposits associated with local stream and river valleys. Unglaciated erosion surface sediments consist of reworked till and spewdash deposits associated with periglacial activity during the Wisconsinan ice advance. Areas of Peoria Formation colluvial materials are present along the Winnebago River valley. Eolian materials may also be intermittedly present mantling most other mapping units, and are more abundant near stream valleys. Sheldon Creek Formation glacial deposits are undifferentiated and occur in northwestern and north-central Iowa. The full extent of these deposits is still not fully understood. Pre-Illinoian glacial deposits in Iowa consist of two formations: the younger Wolf Creek Formation and the Alburtus Formation. The Wolf Creek is divided into the Winthrop, Aurora, and Hickory Hills members (oldest to youngest). The Alburtus Formation consists of several "undifferentiated" members.

Three bedrock mapping units (Devonian Lime Creek, Shell Rock and Lithograph City) are exposed as outcrops or quarries in the map area. Bedrock outcrops occur primarily along the Winnebago River and to some extent along Willow Creek. The Devonian rocks are dominated by carbonates varying between limestone and dolomite, accompanied with minor shale.

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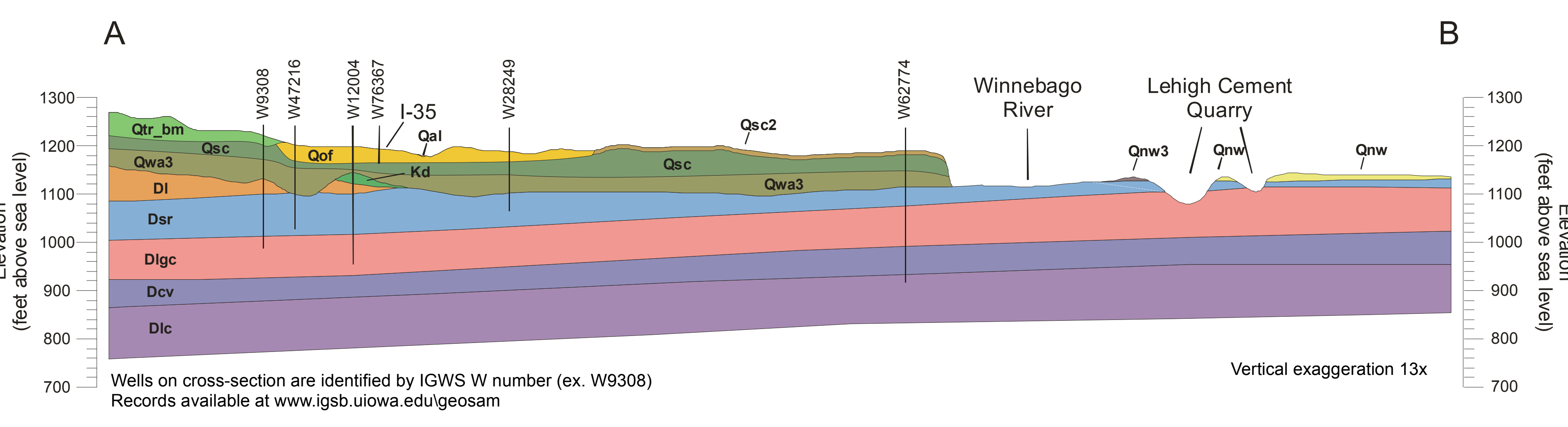
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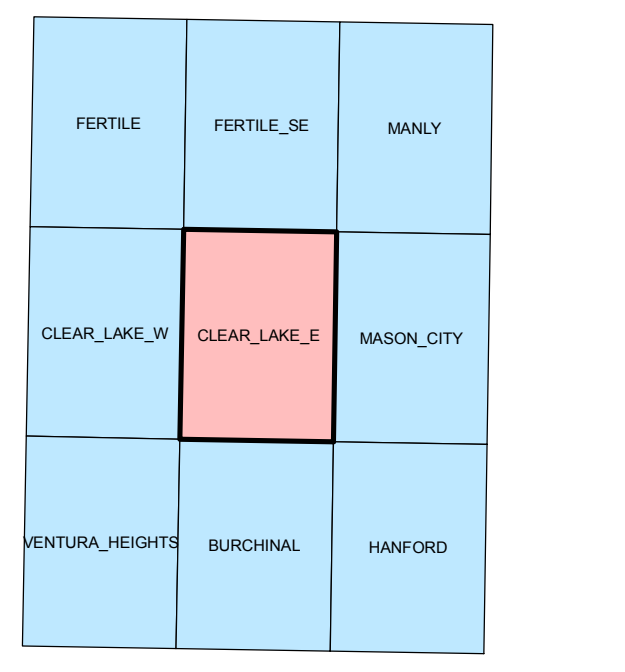
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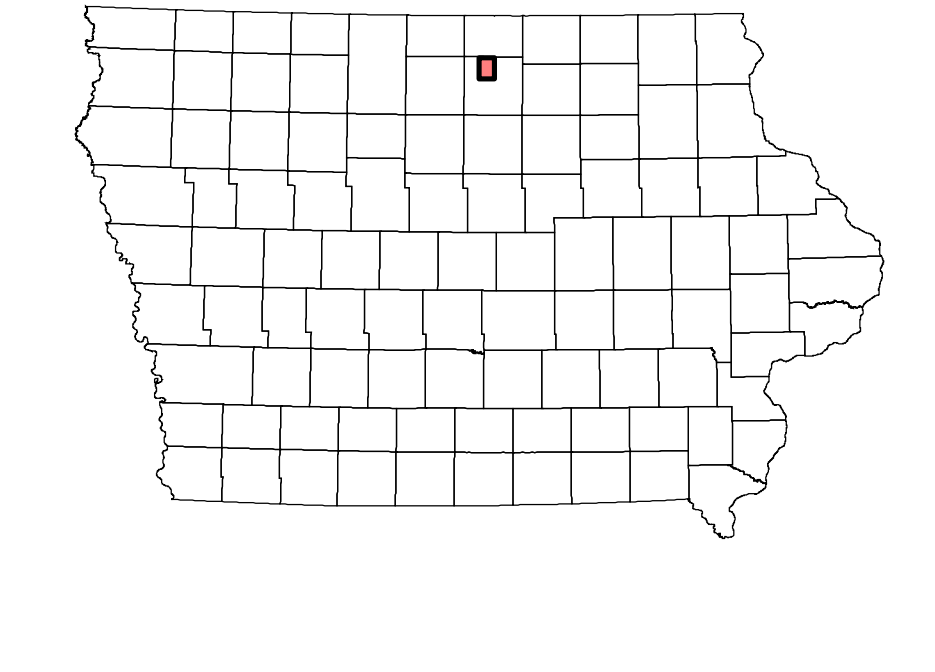
GEOLOGIC CROSS-SECTION A-B



Adjacent 7.5' Quadrangles



Location Map



Base map from USGS Clear Lake East 7.5' Digital Raster Graphic (DRG) (IGWS file DRG02026.TIF) which was scanned from the Clear Lake East 7.5' Topographic Quadrangle map, published by US Geological Survey in 1972. Land elevation contours (10' interval).

Iowa Geological and Water Survey digital cartographic file ClearLake_East_SurficialGeology.mxd, version 9/16/13 (AG0205 10). 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.

Wells on cross-section are identified by IGWS W number (ex. W9308)
Records available at www.igsb.uiowa.edu/geosam

Vertical exaggeration 13x