UNIVERSITY OF MINNESOTA
**MINNESOTA GEOLOGICAL SURVEY**
**Harvey Thorleifson, Director**

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**COUNTY ATLAS SERIES**
**ATLAS C-33, PART A**
**Houston County**
**Plate 4—Bedrock Topography**
***and* Depth to Bedrock**


Digital base modified from the Minnesota Department of Transportation BaseMap data; digital base annotation by the Minnesota Geological Survey.

Elevation contours were derived from the U.S. Geological Survey 30-meter Digital Elevation Model (DEM) by the Minnesota Geological Survey.

Universal Transverse Mercator Projection, grid zone 15
1983 North American Datum

SCALE 1:100 000

1 0 1 2 3 4 5 MILES

1 0 1 2 3 4 5 6 7 8 KILOMETERS

LAND SURFACE CONTOUR INTERVAL 50 METERS

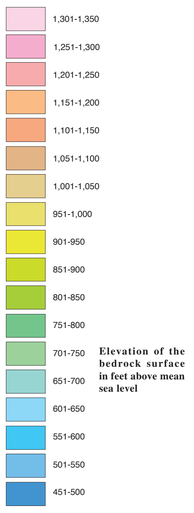
GIS compilation by J.D. Hamilton
Edited by Lori Robinson

# BEDROCK TOPOGRAPHY

By

Julia R. Steenberg

2014




**Elevation of the bedrock surface in feet above mean sea level**

## EXPLANATION

The configuration and elevation of the bedrock surface in Houston County are represented by the colors assigned to 50-foot (15-meter) elevation intervals (example: 751-800 feet above sea level) on the Bedrock Topography map. The position of the contour intervals was determined mostly from bedrock outcrop mapping, records of water-well construction, seismic soundings, and scientific borings. Geomorphic features indicative of near-surface bedrock conditions were also used to create the contour intervals. These features include prominent steep rocky bluffs, rock-cored mesas, and areas of karst (indicated by sinkholes, blind valleys, and sinking streams), which in general indicate shallowly buried bedrock (less than 50 feet [15 meters] of overburden). The somewhat irregular distribution and density of data can be seen on Plate 1, *Data-Base Map*, and this should be considered when assessing the reliability of the map at any particular location. Areas with a high density of bedrock control points are likely to have accurate interpretation of the bedrock elevation, whereas those areas with widely spaced control points may be less reliable and inappropriate for site-specific needs. Records of drill holes that intersect bedrock are fairly evenly distributed across Houston County. The highest density of data points occurs near urban areas that rely on ground water from bedrock aquifers for their drinking water needs.

The bedrock surface in Houston County varies from more than 1,300 feet (396 meters) above sea level on the high plateaus near Spring Grove to less than 500 feet (152 meters) above sea level within the deeply incised Mississippi River and Root River valleys. Due to the thin cover of glacial sediments in this region, the bedrock topography surface closely coincides with present-day land-surface topography in most parts of the county. Bedrock is at or near the surface throughout the upland areas, or plateaus, and is dissected by steep sided valleys of the Mississippi and Root Rivers and their tributaries. The valleys are incised deeply into the bedrock layers and filled with a thick accumulation of glacial sediments.

The resistance of the underlying bedrock to weathering and erosion is a major factor in shaping the bedrock topography surface. As a result, the bedrock topography exhibits some correlation with rock units. Weakly cemented sandstones and shales are easily eroded by flowing water; they are also subject to mass movement along near-vertical slopes. Limestone and dolostone are resistant to physical erosion but susceptible to solution in slightly acidic ground water. The flat uplands, or plateaus, in the county are mostly underlain by resistant limestone and dolostone of the Prairie du Chien Group. The high plateau in the southwest is also capped by resistant limestone of the Galena Group.


# DEPTH TO BEDROCK

By

Julia R. Steenberg

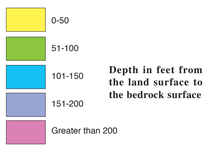
2014

## EXPLANATION

The depth to bedrock is equal to the depth from the land surface to the bedrock surface. To calculate this thickness, a grid of bedrock-surface elevations was subtracted from a corresponding grid of land-surface elevations (30-meter cell size). The surface elevation grid was resampled from the National Elevation 10-meter data set of the U.S. Geological Survey, whereas the bedrock elevation grid is taken from the Bedrock Topography map, which was interpolated from outcrop mapping and interpretation of water-well data. The residual grid was then classified at a 50-foot (15-meter) interval to produce the color-coded Depth to Bedrock map. In places, the thickness of the unconsolidated Quaternary sediments varies greatly over short distances, and mapping at this scale (1:100,000) may not properly resolve such prominent variations. For that reason it is best to consult site-specific data, such as water-well records and seismic soundings, wherever they are available.

The thickest sediments in Houston County occur within the Mississippi River and Root River valleys and their tributaries, where several deep valleys have more than 200 feet (61 meters) of sediment overlying the bedrock. Areas where bedrock is at or within 50 feet (15 meters) of the land surface occur within the uplands throughout the county.

The detailed appearance of the Depth to Bedrock map is related to surficial landforms because the land surface topography model is based on much more detail than the model of the bedrock surface.




**Depth in feet from the land surface to the bedrock surface**



# GEOLOGIC ATLAS OF HOUSTON COUNTY, MINNESOTA