FMS Metadata

Map name: Bedrock Geology of the Fargo-Moorhead Area
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Date of publication: 2005
Date of data: 2005
Map key words: bedrock, geology

Horizontal accuracy The map accuracy varies greatly because the spacing of the drillhole data it is based on varies greatly. It some places the contact accuracy may exceed a mile.

Coordinate system: Lambert Conformal Conic Projection, 1983 North American Datum
1st std parallel - 33°, 2nd std parallel - 45°
Central meridian - 96°, Latitude of project origin - 45°

Map area: The study area consists of all or part of six Minnesota Counties (Norman, Clay, Wilkin, Otter Tail, Becker, and Mahnomen) and all or part of seven North Dakota Counties (Barnes, Cass, Sargent, Steele, Traill, Ransom, and Richland). This area extends from 46°N to 47.5°N latitude and is bounded on the west by 98°W longitude and on the east by 95°W longitude. The study area measures about 120 miles (193 km) east to west and about 103 miles (166 km) north to south; it covers an area of approximately 12,360 square miles (32,012 square kilometers).

GIS files associated with map from ArcInfo or (ArcView 3.x or 8.x): bdrkgeol.e00- ArcExport file bedrock geology; bg.aml, Arc aml to draw bedrock geology in ArcInfo; fmsbglut.e00, ArcExport file to color map in ArcInfo when using the bg.aml.

Description of map:
A depiction of the distribution of bedrock formations.

Map scale: 1:400,000

Map units: PreCretaceous, Cretaceous undifferentiated, Greenhorn Formation, Carlile Formation, Niobrara Formation, Pierre Formation

List features and accuracy as shown on map, including scales of fieldwork and compilation:
No fieldwork was done in producing this map. For the Minnesota portion of the map, drillhole data from the County Well Index database was used to develop a bedrock topography map, and some of the contacts between Cretaceous and PreCretaceous rock units. The drillholes locations are field-verified to a horizontal accuracy of approximately 0.10 mile and a vertical accuracy of 5 feet. The accuracy of the North Dakota drillhole data is unknown.

Summary of procedures for compiling data used to make map:
The well records used in the Minnesota portion of the study area were examined and interpreted by the author. The interpretations are based on the descriptions provided by the drillers, and these are considered in the light of the fewer, professionally-logged wells drilled for scientific or exploration purposes. A few tens of downhole geophysical logs were also used as standards for interpreting the

other wells. The interpretations and the maps themselves are made contemporaneously and iteratively such that each supports the other.

In Minnesota, the well records were examined and the rocks encountered were assigned initial age interpretations. These interpretations were entered in the County Well Index (CWI) database. Then the data were plotted at 1:100,000 scale and well-bottom elevations or bedrock elevations were labeled. This data set was then hand-contoured at a 50-foot contour interval to represent the bedrock topography. Some records were re-interpreted in the contouring exercise and these changes were made to the database. After preliminary contouring, the database was again plotted on stable base material and final contours were drafted. These contours were scanned and vectorized and gridded. The grid of bedrock elevations was then subtracted from a grid of surface topography elevations to yield a grid of drift thickness (or depth to bedrock). Where this process yielded negative drift thicknesses (bedrock topography grid elevation was higher than the land surface topography grid elevation) the contours were redrawn.

The data plot of bedrock elevations was then modified at those 108 locations in the Minnesota portion of the study area where well records indicated that Cretaceous strata were encountered. If the boring fully penetrated the Cretaceous section the elevation of the sub-Cretaceous (Precambrian) rock was labeled. If the Cretaceous strata were not fully penetrated, the elevation of the bottom of the hole was labeled to indicate a maximum elevation of the sub-Cretaceous surface. The data was then re-contoured to yield a subCretaceous bedrock topography at a 50-foot contour interval. These contours were then scanned and vectorized, and a grid of sub-Cretaceous topography elevations was generated. Subtracting the sub-Cretaceous topography grid from the bedrock topography grid yields the thickness and extent of the Cretaceous strata. This method was used to generate the contact between the two geologic units. These same grids were then used to generate three-dimensional graphic representations of the bedrock geology.

Lineage:
All of the mapping in the Minnesota portion of the study area is original. In the North Dakota portion of the study area a data plot was created to show bottom hole elevations on wells that did not reach bedrock, and bedrock elevations for those wells that did. The same plot included an image of the bedrock topography of this area as mapped by Bluemle, 1983, "Geologic and Topographic Bedrock Map of North Dakota", (1:670,000). This compilation of data was used to draft a new bedrock topography, slightly modified from the Bluemle map. In a similar manner, the Precambrian bedrock topography was modified from a scanned image of the Heck, 1988, "Precambrian Structure Map of North Dakota", (1:1,000,000) map. The database supplied did not indicate the age of the bedrock encountered. Therefore the Precambrian surface was delineated by the elevation of the contact as mapped by Bluemle in that small part of the North Dakota portion of the study area where the first bedrock is Precambrian, and by the Heck data for the remainder of the map. The geologic contact between post-Precambrian and Precambrian rocks is derived from the difference between the two topographic grids

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Online linkage: ftp://156.95.153.1/pub5/fms/

Other comments: