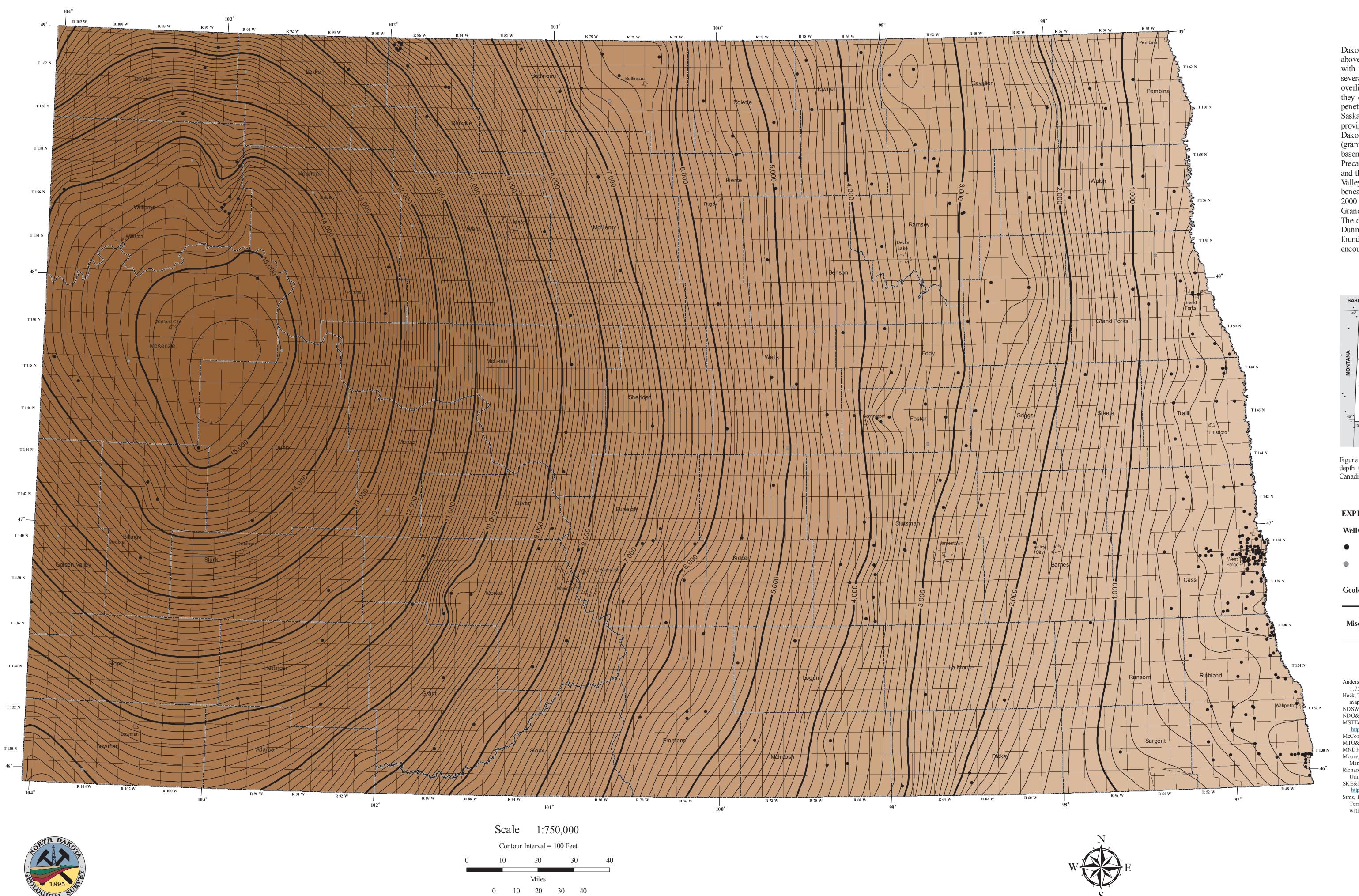
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# DEPTH TO PRECAMBRIAN BASEMENT ROCK IN NORTH DAKOTA

## Fred J. Anderson

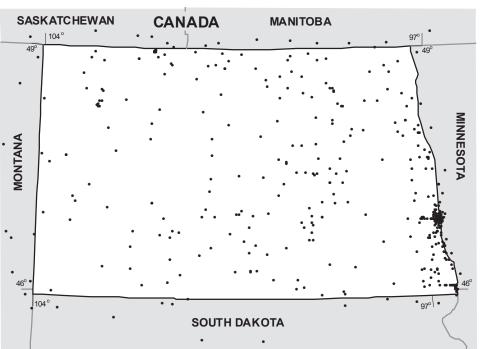




North American Datum 1983 Lambert Conformal Conic

#### **DISCUSSION**

This map displays the depth (in feet) to Precambrian age (>542 Ma) basement rocks in North Dakota. These depths represent the total thickness of the Phanerozoic sedimentary rock interval present above the Precambrian surface across the state. This map was created from available drilling records with reported depth to Precambrian rocks in over 400 basement drillhole penetrations. Additionally, several wells that were completed into the Cambrian Deadwood Formation, which nonconformably overlies the Precambrian surface, were included, to better constrain the modeled depth contours when they exist at greater depths than surrounding Precambrian basement penetrations. Selected basement penetrations from the States of Montana, South Dakota, and Minnesota, and the Canadian Provinces of Saskatchewan and Manitoba, were also included to better constrain the contours along state and provincial boundaries (Figure 1). Depth to basement rock contours have been "clipped" to the North Dakota boundary. Precambrian basement rocks in North Dakota are predominantly of igneous (granites) and metamorphic (gneisses, schists) origin and are found only in the subsurface. Depths to basement are commonly greater than 7,000 feet, in the area encompassed by the Williston Basin. Precambrian rocks grade upward from 40 feet per mile between the deepest part of the Williston Basin and the eastern flank and continue to grade at approximately 23 feet per mile well into the Red River Valley of North Dakota and Minnesota. Precambrian basement rocks are generally less than 300 feet beneath the surface in the populated areas of the Red River Valley (Table 1). These rocks are less than 2000 feet below the land surface along the easternmost quarter of North Dakota in Pembina, Walsh, Grand Forks, Steele, Traill, Barnes, Cass, LaMoure, Dickey, Ransom, Sargent, and Richland counties. The deepest portion of the Williston basin is in excess of 15,000 feet and is located in northwestern Dunn County near the Killdeer Mountains. The shallowest depths to Precambrian basement rock are found along the southern Red River Valley where depths may be less than 200 feet. The rocks encountered in the shallow subsurface in these areas are commonly highly weathered.



Urban Area	Approximate Depth (feet)
Watford City	(5,175
Williston	[4,h54]
5lauley	13,850
Porchall	13,750
Dickinson	13,550
Medora	13/150
Howman	10,850
Minut	9,650
Mandan	\$,100
Hásang cylk	7,050
Dottineau	6,590
Rugby	5,650
Carrington	3,900
Devils Linke	3,550
Jumestown	2,950
Valley City	1,650
Pendalan	750
Wahperin	350
Hillsboro	325
Grand Forks	500
Forgo	200

Figure 1. Location of wells and drill holes used for the creation of modeled Table 1. Approximate depths to Precambrian depth to basement contours. Well control from neighboring states and basement rocks under selected urban areas Canadian provinces used in the construction of this map are shown. in North Dakota. Urban areas are ordered

from greatest depth to shallowest depth from top to bottom.

#### **EXPLANATION**

#### Wells and Drill Holes

- Well Location-Precambrian Penetration: location of oil, water, or exploratory test well drilled to Precambrian basement rocks.
- Well Location-Cambrian Deadwood Formation: location of oil, water, or exploratory test well drilled with a total depth completed in the Deadwood Formation and deeper than surrounding Precambrian wells.

#### **Geologic Symbols**

Depth to Basement Contour (feet). Hachured contour indicates area of approximate maximum depth.

#### Misc Symbols

Township Boundaries

---- County Boundaries



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