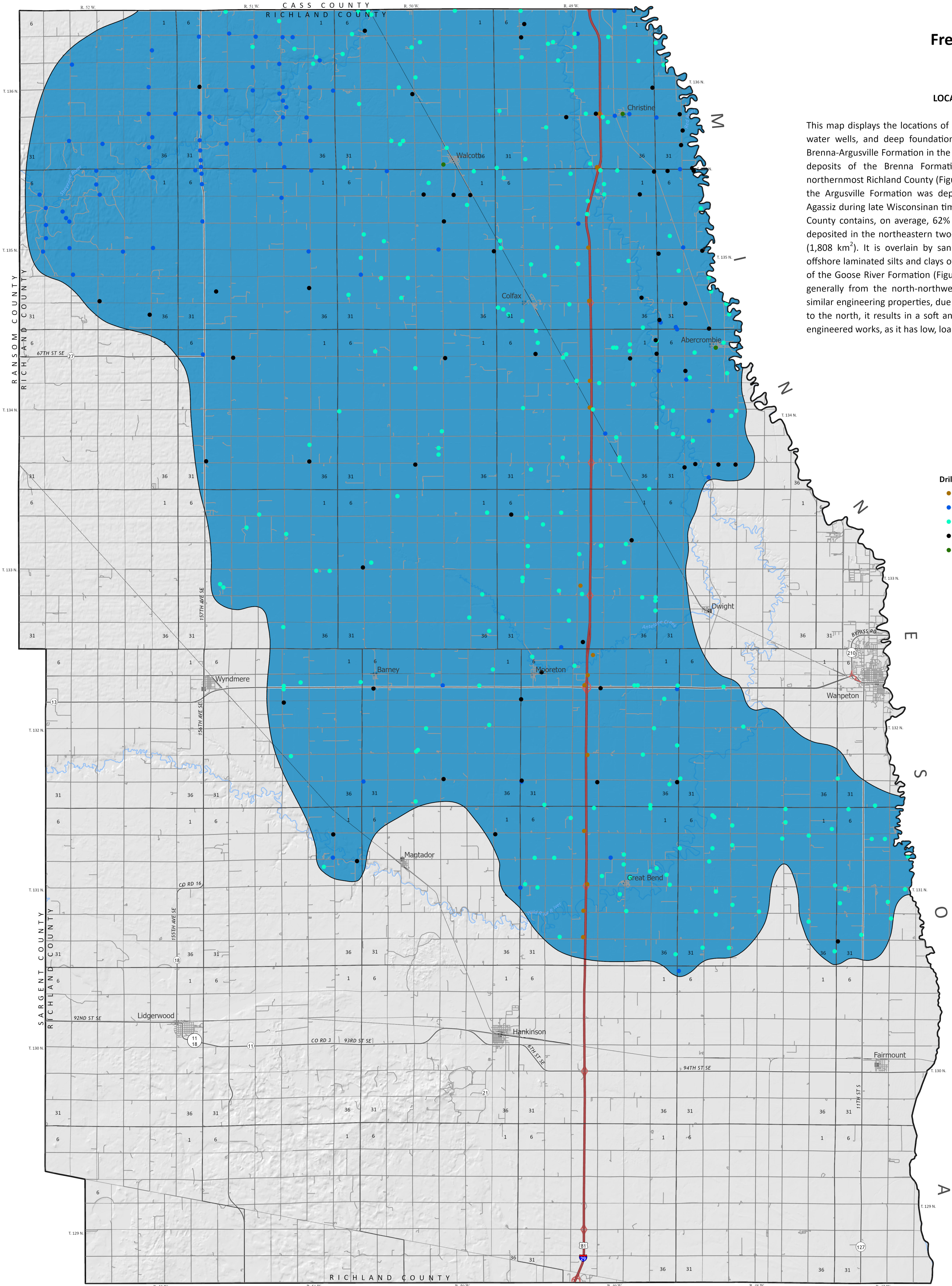




Fred J. Anderson

2026

LOCATIONS OF DRILLHOLES

This map displays the locations of drillholes in Richland County consisting of test holes, water wells, and deep foundation borings, used to map the geologic extent of the Brenna-Argusville Formation in the shallow subsurface. The glaciolacustrine offshore clay deposits of the Brenna Formation end near the border of southern Cass and northernmost Richland County (Figure 1). Like the Brenna Formation, the silty and clay of the Argusville Formation was deposited in the offshore environment of glacial Lake Agassiz during late Wisconsinan time. Lithologically, the Argusville Formation in Richland County contains, on average, 62% clay, 24% silt, and 3.4% sand (Figure 2). It was only deposited in the northeastern two-thirds of the county and covers and area of 698 mi² (1,808 km²). It is overlain by sand and silt deposits of the Sheyenne Delta and the offshore laminated silts and clays of the Sherack Formation and is underlain by glacial till of the Goose River Formation (Figure 3). The Argusville becomes siltier as the unit thins generally from the north-northwest to the south-southeast. Since the Argusville has similar engineering properties, due to its smectitic clay content, to the Brenna Formation to the north, it results in a soft and expansive clay that can be problematic for surface engineered works, as it has low, load-bearing properties.

Drillholes

- NDDOT Geotechnical Borings
- Observation Wells
- Private Well
- Test Hole
- Water Supply Well

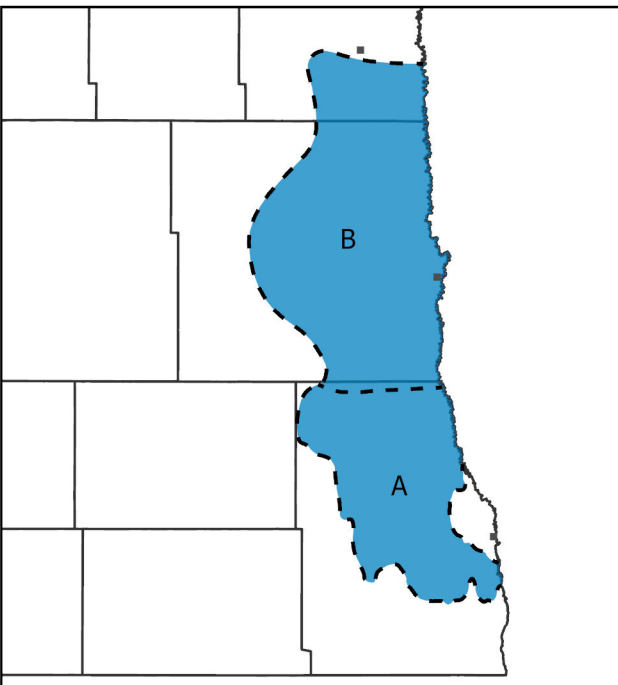


Figure 1. Location and extent of the offshore lake clays of the Brenna (B) and Argusville (A) Formation in the Southern Red River Valley of North Dakota.

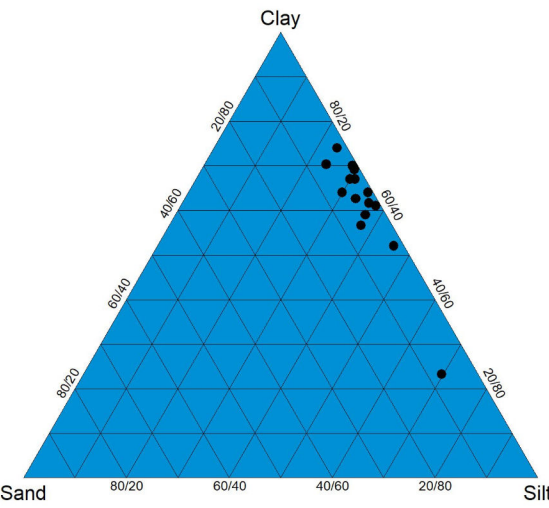
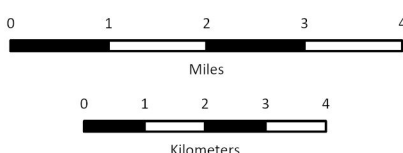


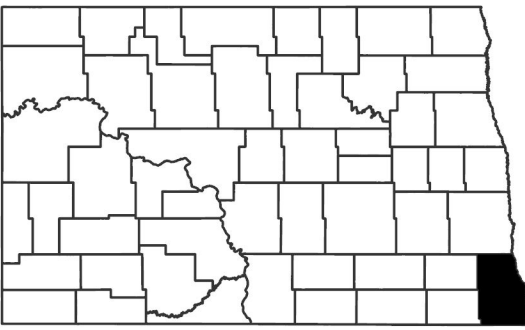
Figure 2. Ternary diagram of Argusville Formation lithology. The Argusville Formation is overall siltier than the Brenna Formation and becomes gradually siltier towards the south in Richland County.



Scale 1:125,000



Mercator Projection
Standard Parallel 45°56'15"N
North American 1983 Datum
Central Meridian 97°0'0"W



Richland County, North Dakota

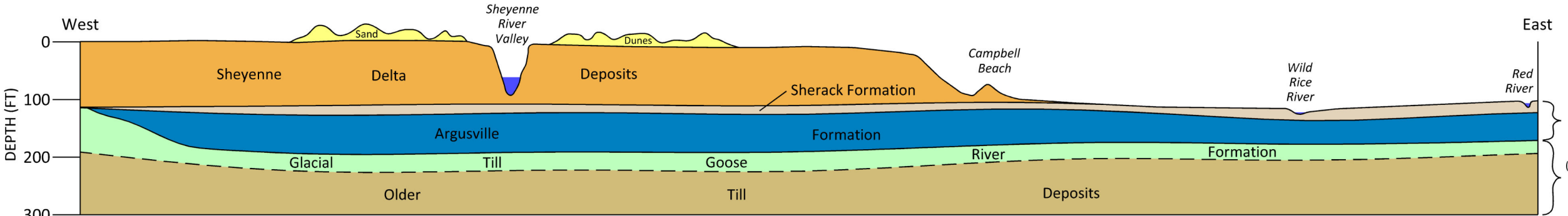
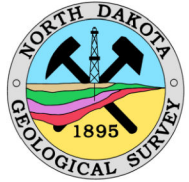
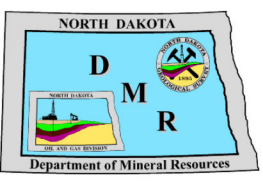


Figure 3. Diagrammatic cross-section from west to east in northern Richland County. The younger sand and silt deposits of the Sheyenne Delta overlay the glacial Lake Agassiz silty clay deposits, making the depth to the Argusville Formation greater in the western part of the county.



Offshore Glaciolacustrine Deposits of Glacial Lake Agassiz: The Brenna-Argusville Formation in Richland County, North Dakota



Fred J. Anderson

2026

DEPTH TO THE BRENNA-ARGUSVILLE FORMATION

This map depicts the depth of the Brenna-Argusville Formation in the shallow subsurface in Richland County. Depth to the top of the Brenna Formation is shown as colored depth contour intervals modeled from test hole, water well, and deep-foundation drilling data. The Brenna Formation transitions into the Argusville Formation just south of the Cass and Richland County border and was deposited in the central part of the county, covering an area of 737 square miles (1,910 km²). It is found deepest in the areas underlying the deposits of the Sheyenne Delta, at upwards of 60 feet (18.3 m) or more in the northeast, and relatively consistent in depth from 20 to 40 feet (6.1 to 12.2 m) across the south-central part of the county.

Depth Contour (feet bls)

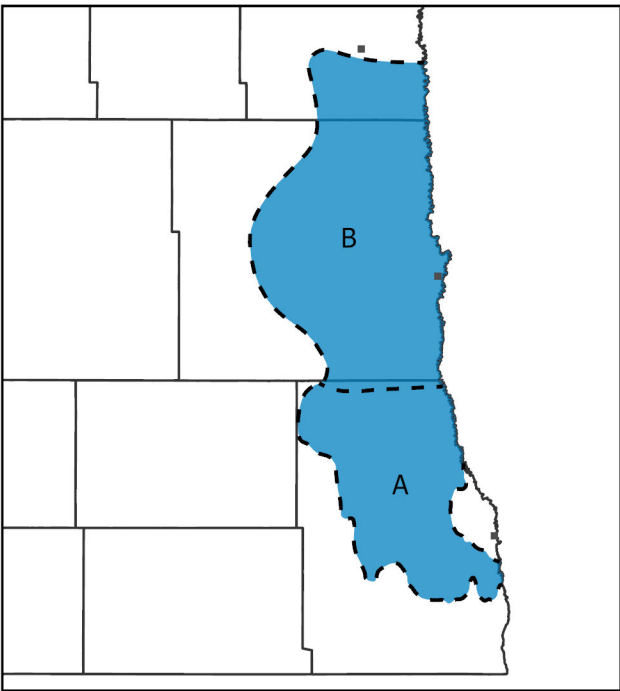
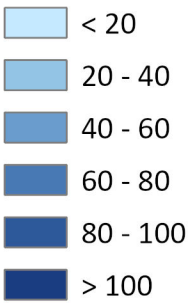
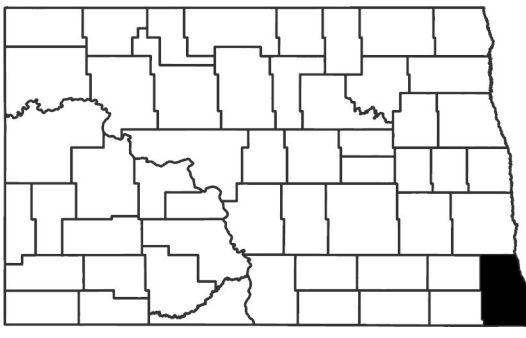
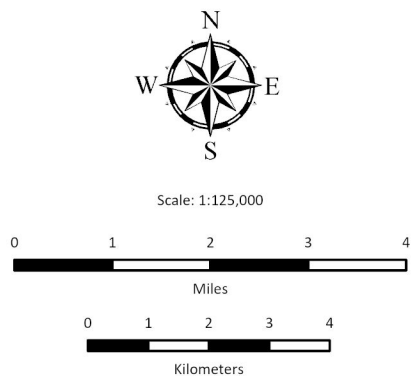


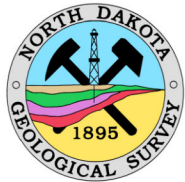
Figure 1. Location and extent of the offshore lake clays of the Brenna (B) and Argusville (A) Formation in the Southern Red River Valley of North Dakota.



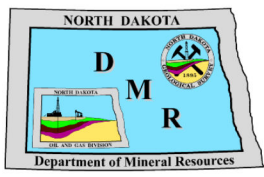
Richland County, North Dakota



Mercator Projection North American 1983 Datum
Standard Parallel 45°56'15"N Central Meridian 97°0'0"W



Offshore Glaciolacustrine Deposits of Glacial Lake Agassiz: The Brenna-Argusville Formation in Richland County, North Dakota



Fred J. Anderson

2026

BRENNA-ARGUSVILLE FORMATION ISOPACH

This map depicts the thickness of the glaciolacustrine offshore clay of the Brenna-Argusville Formation in Richland County as colored isopach intervals modeled from test hole, water well, and deep foundation drilling data. The Brenna Formation transitions into the Argusville Formation just south of the Cass and Richland County border and is not present in the shallow subsurface near Wahpeton. It tends to thicken in all directions, from thicknesses of 20 to 40 feet (6.1 to 12.2 m) near the margins of the deposit, towards the central part of Richland County northeast of Barney, ranging from 60 to potentially 120 feet (18.3 to 36.6 m) thick.

Brenna Formation Isopach Contour (feet)

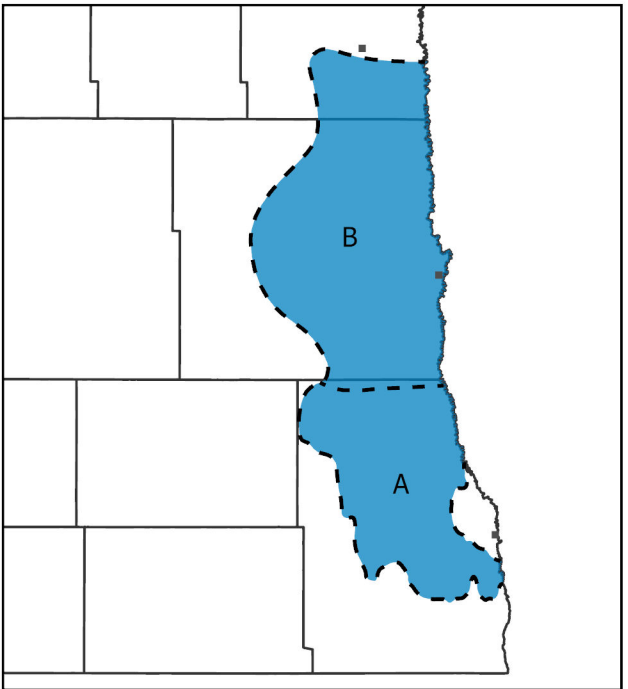
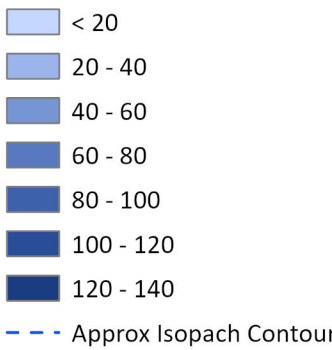
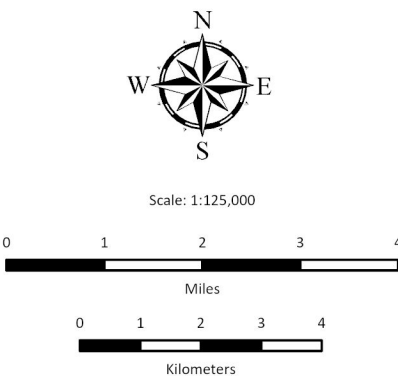


Figure 1. Location and extent of the offshore lake clays of the Brenna (B) and Argusville (A) Formation in the Southern Red River Valley of North Dakota.



Richland County, North Dakota



Mercator Projection North American 1983 Datum
Standard Parallel 45°56'15"N Central Meridian 97°0'0"W