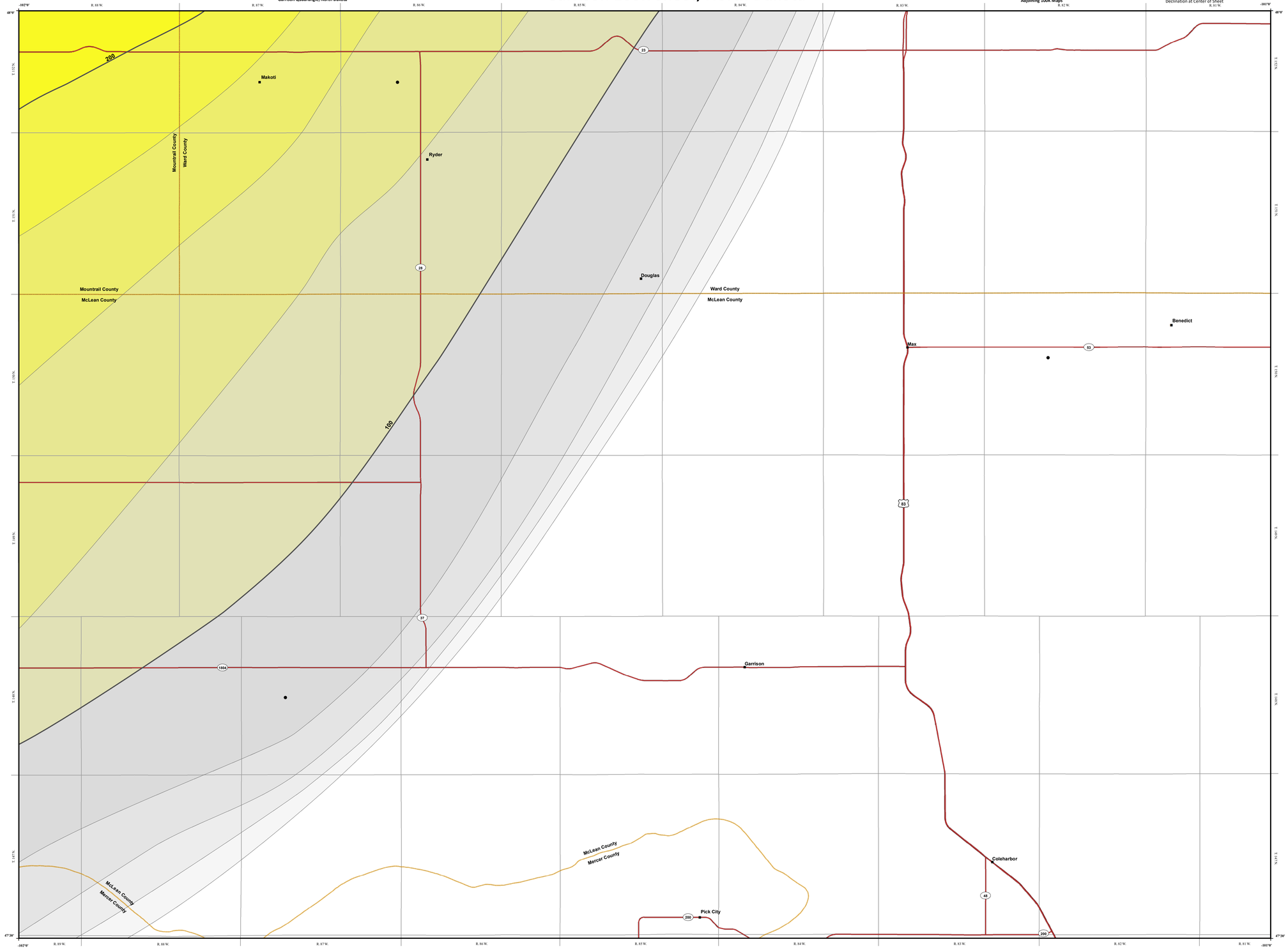
North Dakota Geological Survey
Geological Investigation No 228

Salt Isopach of the Devonian Prairie Formation

Garrison 100K Sheet, North Dakota



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General Information on the Prairie Formation

The Prairie Formation consists of a thick sequence of evaporites of mid-Devonian age. At the time of deposition, open ocean water, at what is now the southern Northwest Territories of Canada, flowed through the interior of Canada via a corridor referred to as the Elk Point Basin. Water became increasingly concentrated with solutes as reefs restricted inflow from the open sea and as circulation was impeded by additional reefs forming on structural divides within the basin (Holter, 1969). The resulting brines deposited horizontally bedded salts over large areas including parts of Saskatchewan, southwestern Manitoba, northwestern North Dakota, and northeastern Montana. The deposition followed a typical progression of gypsum or anhydrite, followed by halite, sylvite, and carnallite. Alternating beds of halite, sylvite, and carnallite occurred when the introduction of fresh water into the system reversed the depositional sequence (Anderson and Swinehart, 1979; Kruger, 2014).

There are six potash-containing members identified in the Prairie Formation salts of North Dakota. From lowest to highest they are the Esterhazy, White Bear, Belle Plaine, Patience Lake, Mountrail, and White Lake members (Kruger, 2014). These potassium-salt bearing intervals include extensions of those currently mined for potash in the Canadian province of Saskatchewan.

The Garrison Sheet

The isopach contours of this sheet are based upon log interpretations of the tops and bottoms of the main body of salt, excluding the basal clay or anhydrite layer where it is observed, from 3 wells and the well control from adjacent sheets. The thickest salt deposits of this sheet were mapped at the northwest corner where the salt may exceed 200 feet (61 meters) at depths which may approach 10,000 feet (3,048 meters) (Kruger, 2019). The salt body thins to the southeast to its limit of deposition or a dissolution edge. Measured thicknesses of the Prairie Formation salt within the sheet ranged from 85 to 139 feet (25.9 to 42.4 meters).

Thickness (ft)

0	101-125
1-25	126-150
26-50	151-175
51-75	176-200
76-100	201-225

Symbols

- Well Control

Other Features

- Section Line
- City
- Federal Highway
- State Highway

Scale 1:100,000

0 1 2 3 4 Miles

0 1 2 3 4 Kilometers

Mercator Projection
Standard Parallel 47°30'0"N

North American 1983 Datum
Central Meridian 101°30'0"W

References:

Anderson, S.B. and Swinehart, R.P., 1979, Potash Salts in the Williston Basin: Economic Geology, v. 74, no. 2, p. 358-376.

Holter, M.E., 1969, The Middle Devonian Prairie Evaporate of Saskatchewan: Saskatchewan Department of Mineral Resources, Rep. 123, 134p.

Kruger, N.W., 2014, The Potash Members of the Prairie Formation in North Dakota: North Dakota Geological Survey, Report of Investigation no. 113, 39p.

Kruger, N.W., 2019, Measured Depths to the Prairie Formation Salt: North Dakota Geological Survey, Geological Investigation no. 221, Plate II.

Cartographic Compilation: Navin Thapa