

The Cambrian Deadwood from a Saskatchewan Perspective

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Summary

The Middle Cambrian Deadwood Formation in Saskatchewan is composed of fluvial-deltaic tidal flat and aeolian sandstones which are capped by tidal flat carbonates (Lake, J.H., 2020). The clastics are sourced from Manitoba and Ontario and were influenced by the Transcontinental Arch. The lower portion of the Deadwood in central North Dakota is dominated by frequent exposures and soils deposited in a carbonate environment and capped by a clastic embayment influenced by longshore drift (and are likely age equivalent with the clastics in Saskatchewan). The upper portion of the section is dominated by tidal flat carbonates. Post-Cambrian erosion of the Deadwood in southeast Saskatchewan was influenced by tectonic reactivation along the Precambrian Basement Churchill/Superior Boundary. The infill of this incised valley is Ordovician in age and dominated by longshore drifted clastics (Winnipeg Sands) and Organic-rich limestone and platform carbonates of the Red River Formation into an east-facing basin.

Bibliography:

Fox, J.E., McCormick, K.A., and Haggar, T.N., 2009: Cross Sections showing Geophysical Logs of Phanerozoic Rocks in South Dakota, South Dakota Geological Survey Oil & Gas Investigation 1

Lake, J.H., Marcia, K., Drobot, A., Groenewoud, L., and Marsh, A., 2020. Upper Cambrian-Lower Ordovician Carbonates from the top of the Deadwood Formation in the Williston Basin in Southeast Saskatchewan, CSPG Virtual Core Conference, 7-8 May, 2020, Calgary, Alberta

Lake, J.H., Marcia, K., Groenewoud, L., Drobot, A., and Marsh, A., 2021; Sedimentology of the Cambrian Deadwood sand in southeast Saskatchewan. CSPG Hybrid Core Conference, 17-18 June, 2021

Lake, J.H., 2021, Sedimentology of the Upper Cambrian Deadwood Sands in the Williston Basin : Potential for CO₂ disposal and geothermal energy source. North Dakota Geological Survey Core Workshop, Grand Forks, North Dakota, August 9-13, 2021.

Lake, J.H., and Marsh, A., 2022, The Potential for Geothermal Energy, CO₂ disposal and helium in the Deadwood and Winnipeg Sands. Sask. Geol. Soc. Special Publication No. 27, Dr. Don Kent Core Workshop Vol, pp29-34, 29th Williston Basin Petroleum Conference, May 16, 2022, Regina, Sk.

Lake, J.H., 2022, Cambrian Deadwood Sands in the Williston Basin. North Dakota Geological Survey Core Workshop, Grand Forks, N. Dak., August 10-11, 2022.

Lefever, R.D., 1996; Sedimentology and Stratigraphy of the Deadwood-Winnipeg Interval (Cambro-Ordovician), Williston Basin. In M.W. Longman and M.D. Sonnenfeld, eds, Paleozoic Systems of the Rocky Mountain Region, Rocky Mountain Section, SEPM (Society for Sedimentary Geology) p.11-28.

Marsh, A. and Love, M. (2014): Cambro-Ordovician Deadwood Formation: isopach map; Saskatchewan Phanerozoic Fluids and Petroleum Systems Project; Sask. Ministry of the Economy, Saskatchewan Geological Survey, Open File 2014-1, map 155 of 156.

Results, Observations, Conclusions

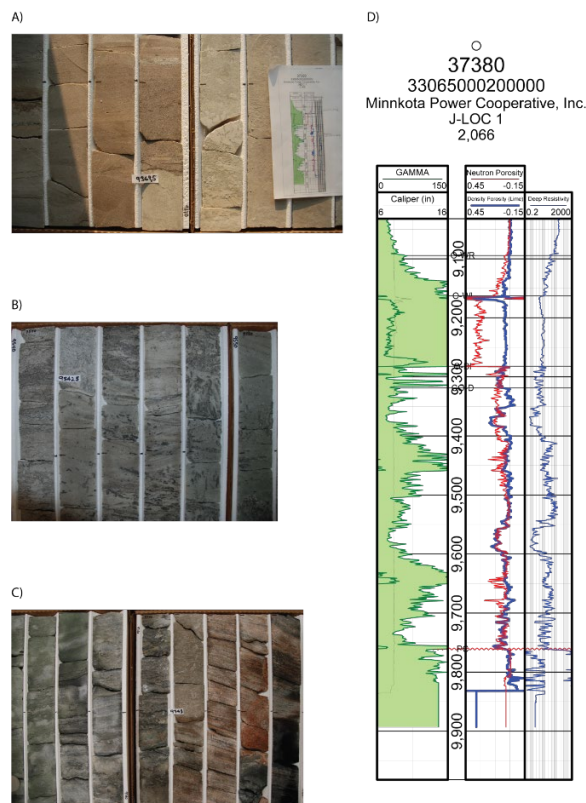
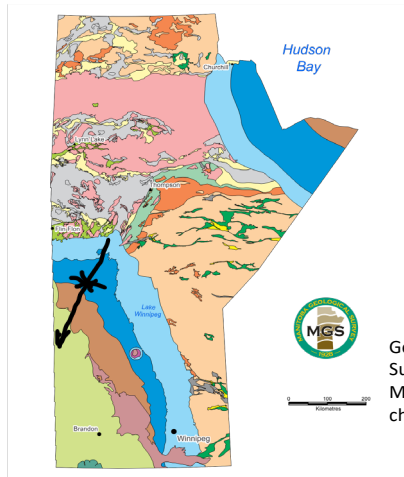
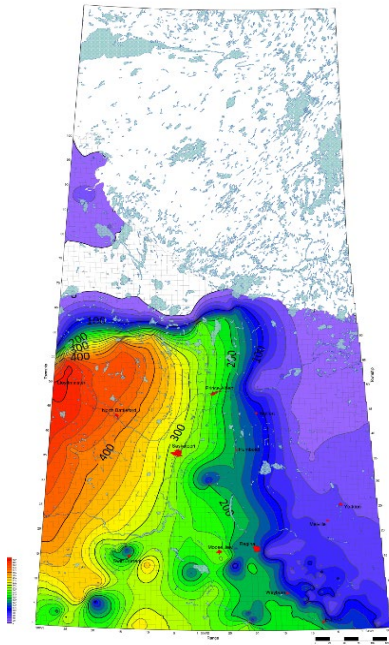


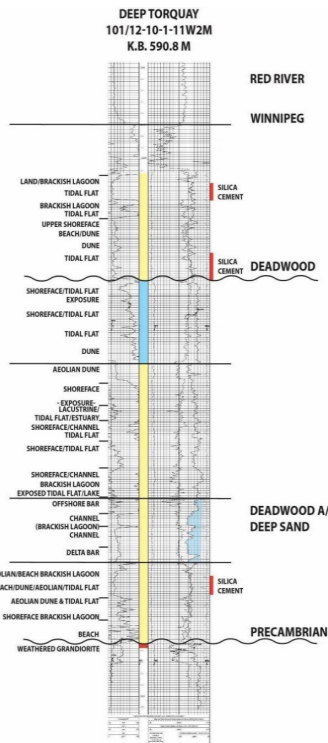
Figure 1: Images of Deadwood Formation from the Minnkota J-Loc 1 (North Dakota Lic. #37380): A) Winnipeg/Deadwood Formation contact at 9369.5'. B) Deadwood Formation Baymouth Bar bidirectional porous reservoir facies sandstone showing truncated skolithos burrows (9542'). C). Precambrian/Deadwood Formation contact showing burrowed dolomitized mudstone in contact with metamorphic gneiss. D). Electrical Log of Minnkota J-Loc 1 (core depth is 17' high to log depth). Precambrian/Deadwood Formation contact showing burrowed dolomitized mudstone in contact with metamorphic gneiss. D). Electrical Log of Minnkota J-Loc 1 (core depth is 17' high to log depth).



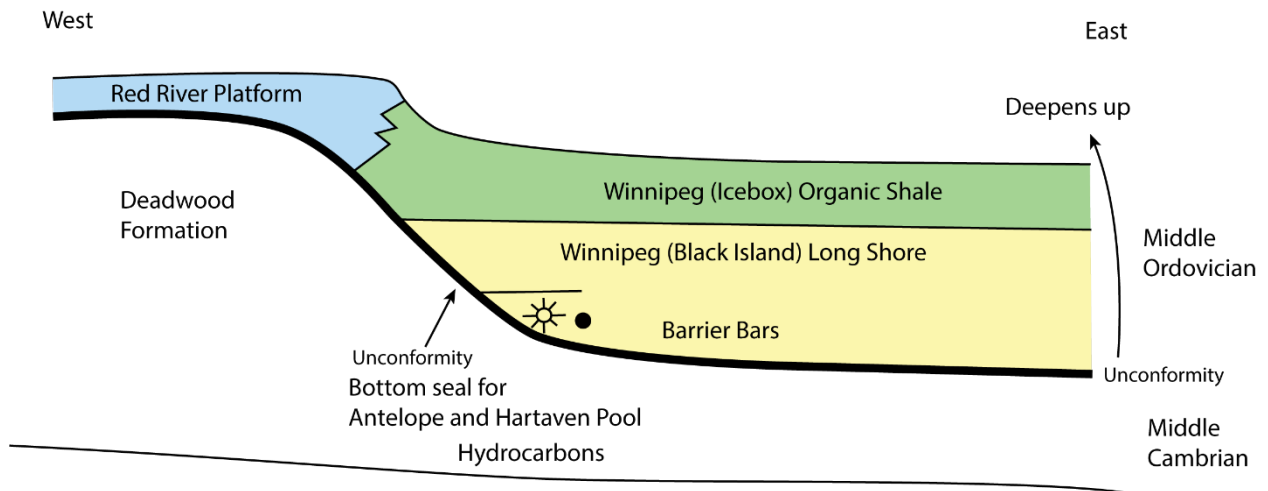
Geological Map of Manitoba showing the Churchill-Superior collision zone. Black arrow shows axis of Moose Lake Syncline and the trace of the erosional channel which downcut the Deadwood Formation.



Isopach of Deadwood Formation in Saskatchewan. Notice thinning to the east in response to post-depositional erosion (Lake and Marsh, 2019)



Electrical Log for the DEEP Torquay 12-10-1-11W2M well (DEEP Corp.). Well was cored from top of Winnipeg Formation to the Precambrian basement (Deadwood A/DEEP Fluvial/Deltaic Sand is the geothermal target). The top of the Deadwood Formation (21m/70 feet) is limestone deposited in a tidal flat environment (Lake and Marsh, 2019).



Revised Winnipeg Formation Incised Valley Model. Ordovician Red River carbonate platform is part of the deepening upwards sequence (Valley Fill) from Longshore drifted Winnipeg (Black Island) Sands to Winnipeg Icebox (black organic calcareous shales) and ultimately the Red River carbonates (Lake, 2022).