Regional Geological Mapping

The regional geological maps were drawn using a database that comprised of verified geological picks derived from most of the drillholes penetrating Devonian and deeper horizons and from selected wells (averaging 5 wells per township in densely drilled areas) penetrating Mississippian- and Mesozoic-aged rocks. The final database contains information from a total of 9012 wells, which includes 2606 wells from Manitoba, 5046 wells from Saskatchewan, 771 wells from North Dakota, and 589 wells from Montana. Data was collected from the wells located in up to five townships outside of the project boundaries, including North Dakota and Montana, to ensure accurate mapping up to the project boundaries.

Structure Contour Map

Structure Contour Map of the Winnipeg Formation; contour interval is 20 m.

Structure maps were all computer-generated using ArcInfo GIS Spatial Analyst, version 9.2.

Map specifications

Central Meridian: 101°W

Map Projection:
Transversse Mercator
North American Datum 1983

Spatial Interpolation:
Tension spline

Isopach Map

Isopach Map of the Winnipeg Formation; contour interval is 1 m.

Isopach maps were all computer-generated using ArcInfo GIS Spatial Analyst, version 9.2.

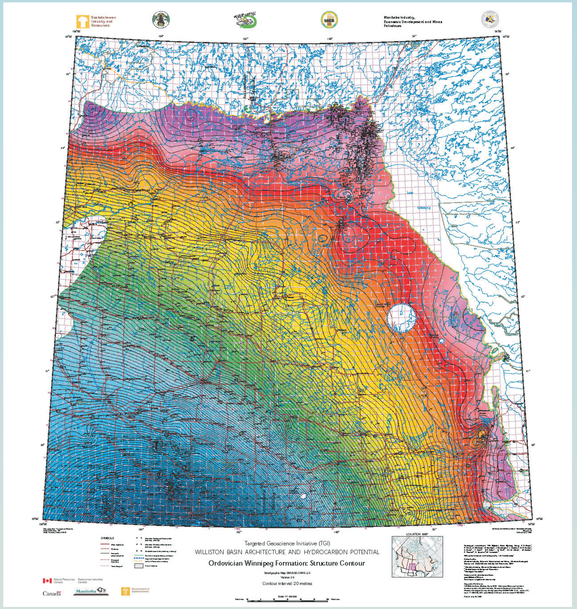
Map specifications

Central Meridian: 101°W

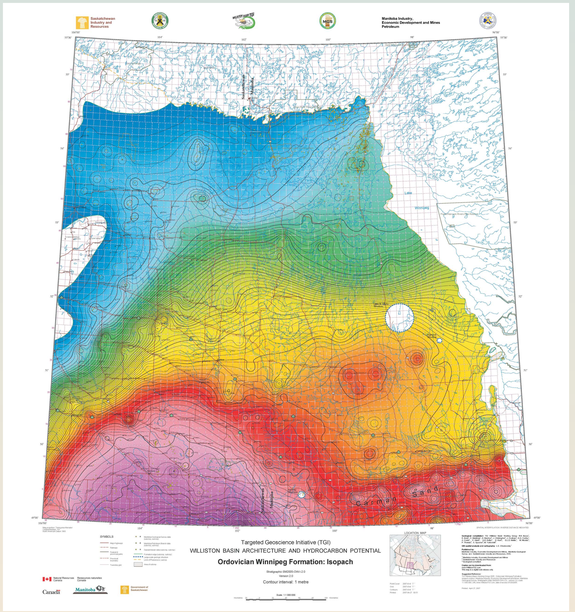
Map Projection:
Transversse Mercator
North American Datum 1983

Spatial Interpolation:
Inverse Distance Weighted

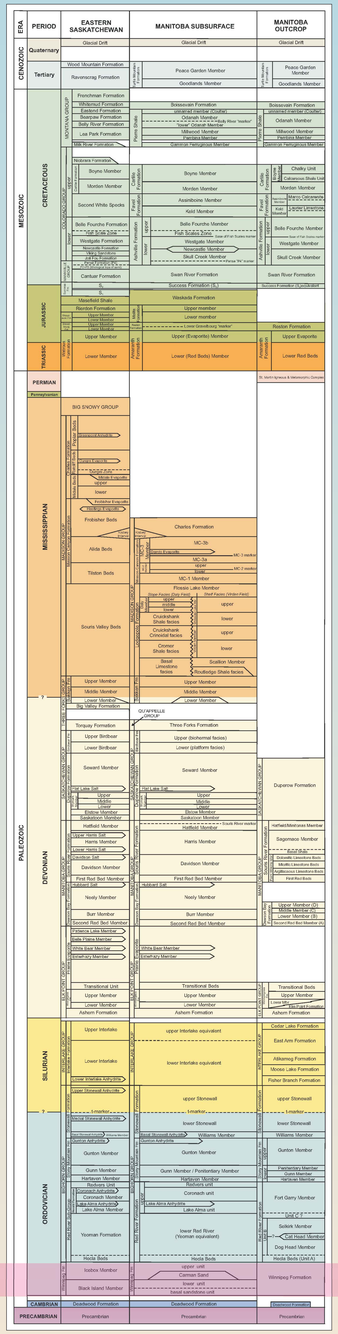
Structure Mapping



Isopach Mapping

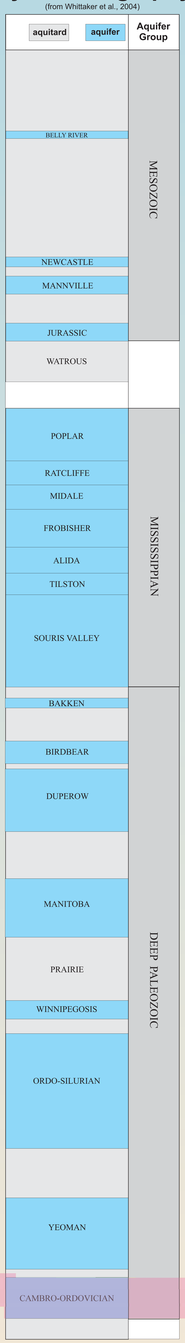


Stratigraphy



Hydrostratigraphy

(from Whittaker et al., 2004)



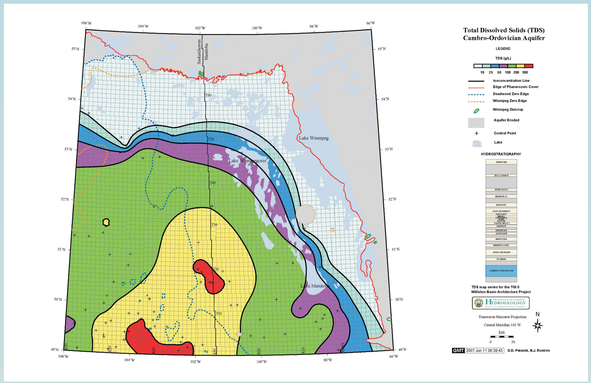
Regional Hydrogeology

(Palombi, 2007, in progress)

The regional hydrogeology maps were drawn using a database that comprised of the TGI verified geological picks in combination with water chemistry data.

A series of maps consisting of Total Dissolved Solids, Freshwater Head, and Water Driving Force for every hydrostatic unit (18 in total) have been completed, as well as hydrochemical and hydrauliccross-sections.

Total Dissolved Solids (TDS) - Cambro-Ordovician Aquifer

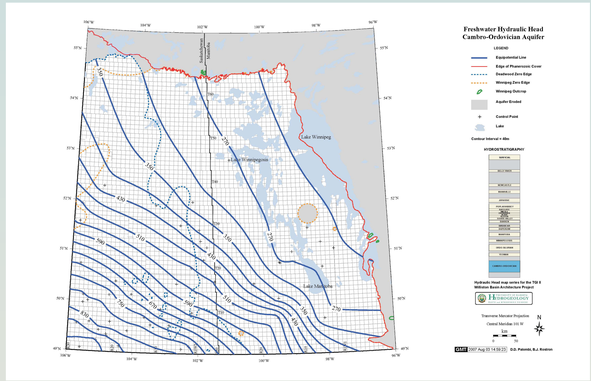


Total Dissolved Solids Map

Total Dissolved Solids of the Cambro-Ordovician aquifer (mg/L).

Geochemical mapping revealed large variations in water chemistry (both composition and TDS) within, and between, the aquifer in the study.

Freshwater Hydraulic Head - Cambro-Ordovician Aquifer

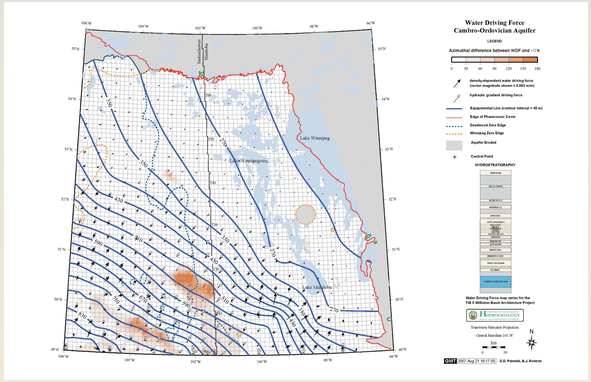


Freshwater Head Map

Potentiometric Surface Map for the Cambro-Ordovician aquifer.

In the deep paleozoic aquifers, hydraulic heads range from over 900m in the south to less than 270 in the NE. Hydraulic gradients range from approximately 0.04m/km to ~ 4m/km with an average of about 0.8m/km. Hyraulic head decreases across the study area in a generally NE direction indicating a preferential flow direction towards the lakes.

Water Driving Force - Cambro-Ordovician Aquifer



Water Driving Force Map

Water Driving Force Map for the Cambro-Ordovician aquifer.

Vector maps depicting the actual flow directions and magnitudes corrected for density. The colours indicate where there is an azimuthal difference between hydraulic gradient driving force and density-dependent water driving force (from 0-180 degrees). These vectors are calculated using structural gradient (of the underlying aquifer/formation which in this case is the PreCambrian), TDS, temperature of the formation, Pressure distribution, and hydraulic gradient. With all the information a Water Driving Force is calculated which corrected for the density of fluid giving a certain Pressure, temperature, and salinity regime.

References

Li, J., and Morozov, I., 2007. Geophysical Investigations of the Precambrian Basement of the Williston Basin in south-eastern Saskatchewan and south-western Manitoba. University of Saskatchewan Final Project Report, http://seisweb.usask.ca/Reports/TGI2/.

Palombi.D., 2007, Regional Hydrogeological Characterization in the North Eastern Margin of the Williston Basin, Saskatchewan-Manitoba, Canada. Univeristy of Alberta, M.Sc. Thesis, in progress.

Whittaker, S., Rostron, B.J., Khan, D., Hajnal, Z., Qing, H., Penner, L., Maathuis, H., and Goussev, S., 2004. Theme 1: Geological Characterization; in Wilson, M. and Monea, M. (eds.), IEA GHG Weyburn CO2 Monitoring and Storage Project Summary Report 2000-2004; Seventh International Conference on Greenhouse Gas Control Technologies, Petroleum Technology Research Centre, Vol. 3, p.15-69.