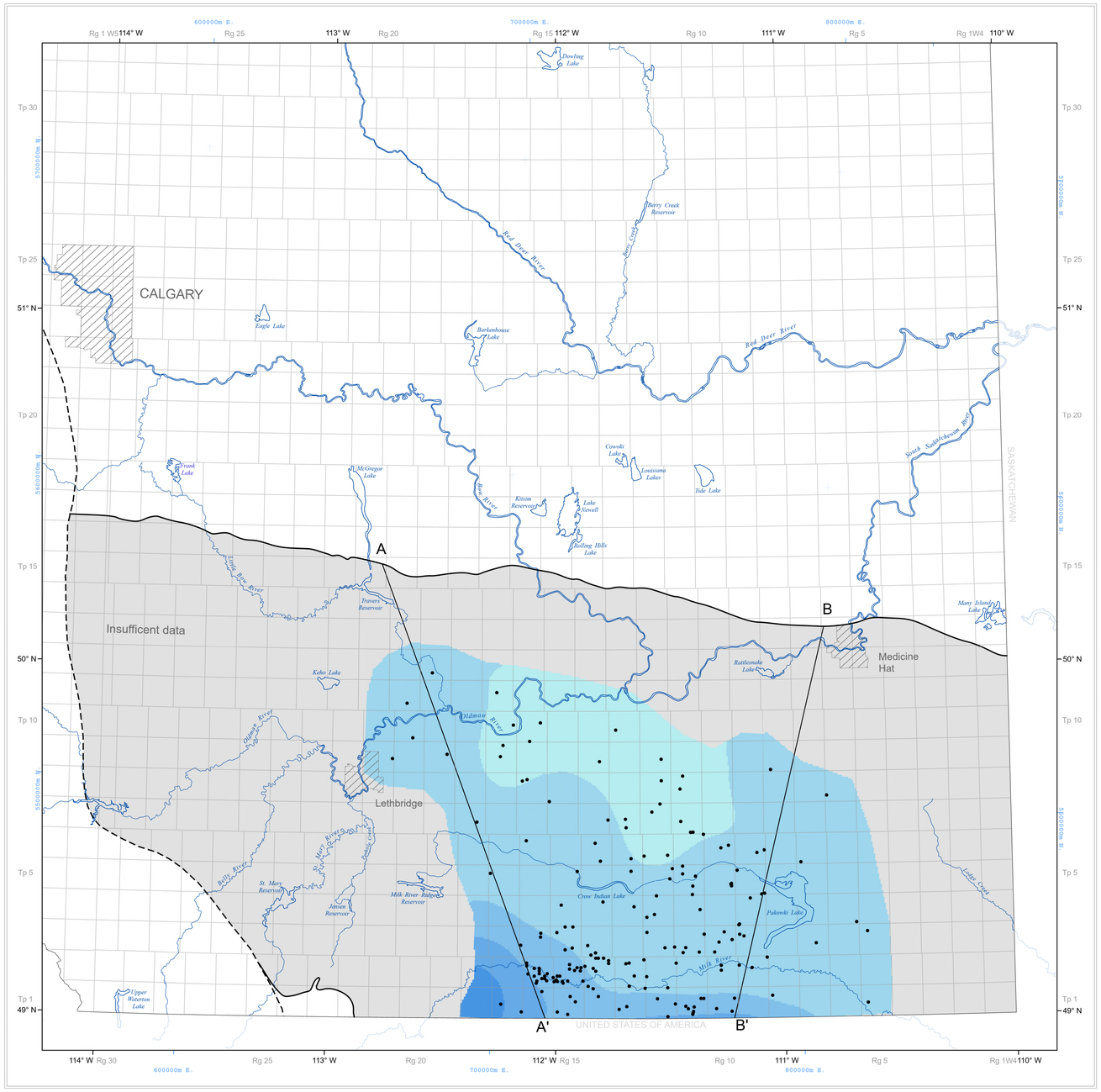
HYDRAULIC HEAD
MILK RIVER HSU



SYMBOL LEGEND

Hydraulic head (m asl)

- 751 - 850
- 851 - 950
- 951 - 1 050
- 1 051 - 1 150
- 1 151 - 1 250

- Well data point
- Cross-section line (A —— A')
- Hydrostratigraphic unit extent
- Eastern limit of main Cordilleran deformation
- Insufficient data

This map depicts the distribution of hydraulic head in groundwater in the Milk River hydrostratigraphic unit (HSU). The horizontal and vertical extent of the unit was adopted from the 3D Provincial Geological Framework of Alberta, Version 1 (Branscombe et al., 2018). The relationship of the Milk River HSU with the units above and below as well as its geometry can be seen in Figures 1 and 2.

Methodology

The hydraulic head distribution map is a result of a simple kriging technique using equivalent freshwater heads calculated from publicly available static water levels from 161 water wells and pressure data from 24 oil and gas wells. A screening process modified from Jensen et al. (2013) was used to ensure that only representative formation pressures from oil and gas wells were used. The final gridded map surface was clipped based on the spatial distribution of the representative data. Residual values are plotted at each location (Figure 3) to indicate where underprediction and overprediction occurs compared to the measured hydraulic head values.

Figure 4 shows the distribution of total dissolved solids in the Milk River HSU. Figure 5 shows what the Milk River HSU looks like in outcrop in the Milk River valley.

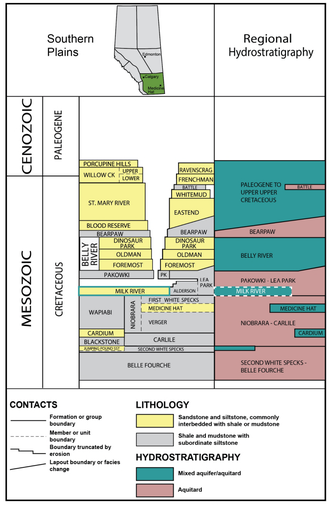


Figure 1. Regional lithostratigraphy and hydrostratigraphy (based on Alberta Geological Survey, 2019). Solid teal lines highlight the Milk River stratigraphic unit. Dashed white lines depict the Milk River HSU within the regional hydrostratigraphy.

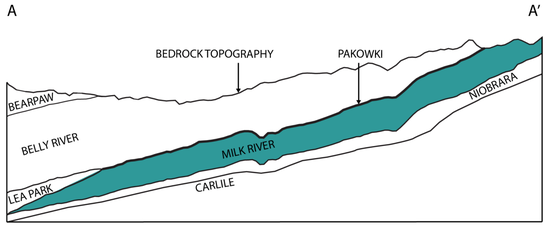


Figure 2. Schematic cross-sections identifying the geometry and variable thickness of the Milk River HSU (not to scale). Strata below the Carlile Formation are not shown.

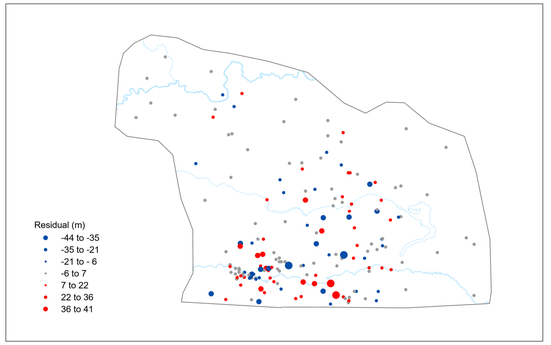


Figure 3. Calculated residuals between the modelled distribution of hydraulic head and measured values. Symbol classes are based on the standard deviation of the calculated residuals.

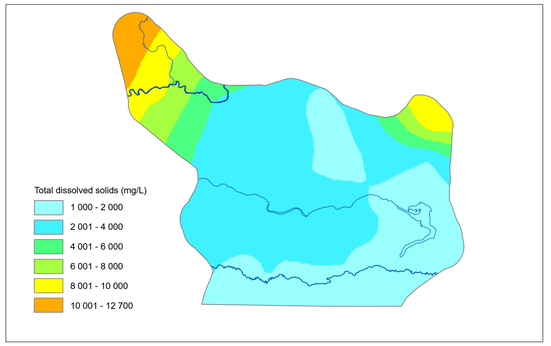


Figure 4. Distribution of total dissolved solids in the Milk River HSU (Lemay et al., 2021). The map extent is based on the spatial distribution of TDS data and differs from the extent of the main map.

Figure 5. Milk River at Writing-on-Stone Provincial Park incising into the Milk River HSU.

Acknowledgements

Photo courtesy of R. Elgr, data processing support by S. Stewart. Base data from the Atlas of Canada (Natural Resources Canada, 2012) and Spatial Data Warehouse, Ltd.

References

Alberta Geological Survey (2019): Alberta Table of Formations; Alberta Energy Regulator, URL <https://ags.aer.ca/publications/table_of_formations_2019.html> [October 2019].

Branscombe, P., MacCormack, K.E., Corlett, H., Hathway, B., Hauck, T.E. and Peterson, J.T. (2018): 3D Provincial Geological Framework Model of Alberta, version 1 (dataset, multiple files); Alberta Energy Regulator / Alberta Geological Survey, AER/AGS Model 2017-03.

Jensen, G.K.S., Rostron, B., Palombi, D. and Melnik, A. (2013): Saskatchewan Phanerozoic Fluids and Petroleum Systems project: hydrogeological mapping framework; *in* Summary of investigations 2013, v. 1, Saskatchewan Geological Survey, Saskatchewan Ministry of the Economy, Miscellaneous Report 2013-4.1, Paper A-5,10 p.

Natural Resources Canada (2012): CanVec digital topographic data; Natural Resources Canada, Earth Sciences Sector, URL <https://open.canada.ca/data/en/dataset/8ba2aa2a-7bb9-4448-b4d7-f164409fe056> [September 2020].

Lemay, T.G. and Singh, A. (2021): Distribution of total dissolved solids in the Milk River hydrostratigraphic unit; Alberta Energy Regulator / Alberta Geological Survey, AER/AGS Map 598, scale 1:750 000.

Recommended Reference Format

Singh, A. and Lemay, T.G. (2021): Distribution of hydraulic heads in the Milk River hydrostratigraphic unit; Alberta Energy Regulator / Alberta Geological Survey, AER/AGS Map 599, scale 1:750 000.

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Map 599

Distribution of Hydraulic Head in the Milk River Hydrostratigraphic Unit

Hydrogeology by: A. Singh and T.G. Lemay

Scale 1:750 000

0 10 20 40 60 kilometres
0 5 10 20 30 miles

Projection: 10 Degree Transverse Mercator
Datum: North American Datum, 1983

Alberta Energy Regulator

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