

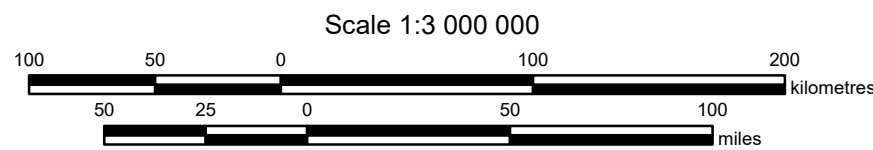
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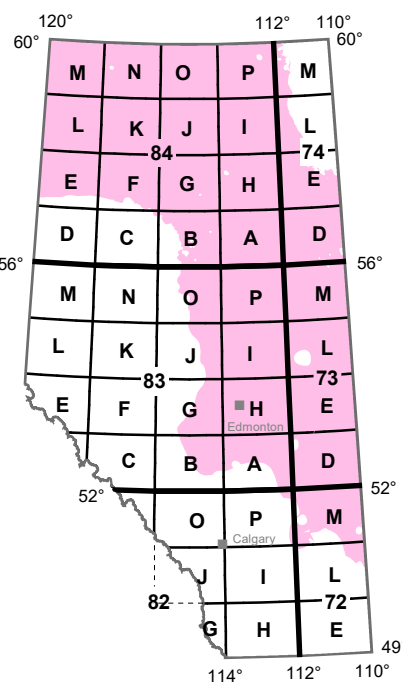
#### Map 624

### Distribution of Hydraulic Head in the Keg River / Winnipegosis Hydrostratigraphic Unit

Hydrogeology by: N. Nakevska

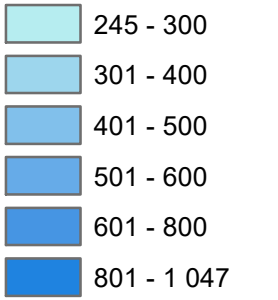


Projection: 10 Degree Transverse Mercator  
Datum: North American Datum, 1983



#### SYMBOL LEGEND

Hydraulic head (m asl)



Well data point

Hydrostratigraphic unit extent

Eastern limit of main Cordilleran deformation

Cross-section line

Insufficient data

Insufficient data

This map depicts the distribution of hydraulic head in the Keg River / Winnipegosis hydrostratigraphic unit (HSU). The horizontal and vertical extent of the unit was adopted from the Geological Framework of Alberta, Version 3 (Alberta Geological Survey, 2021). The relationship of the Keg River / Winnipegosis 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 publicly available data from a total of 325 oil and gas wells and industry monitoring wells. A screening process modified from Jensen et al. (2013) was used to ensure that only representative pressures were used to calculate equivalent freshwater hydraulic heads. The final gridded map surface was clipped based on the spatial distribution of representative data. Where data density was insufficient to generate a hydraulic head grid, data points are plotted with hydraulic head labels only (i.e., southeast of Edmonton). Residual values are plotted at each location (Figure 3) to indicate where underprediction or overprediction occurs compared to the measured hydraulic head values. Using the methodology of Singh et al. (2017) the Cumulative Interference Index (CII) was determined and used to identify and remove data that have been influenced by production or injection (Figure 4).

Additional formation-scale hydrogeological maps for the Keg River / Winnipegosis HSU are presented in Figures 5 and 6. Figure 5 illustrates the distribution of total dissolved solids in the Keg River / Winnipegosis HSU. Figure 6 shows the water driving force (WDF) vector map for the Keg River / Winnipegosis HSU. The WDF vector map allows identification of areas where the buoyancy effect of formation water density has the potential to change the inferred magnitude and direction of groundwater flow (Singh et al., 2017). With the exception of some localized areas in the northern and southeastern parts of the map where larger angles between the WDF vector and the hydraulic gradient vector are observed (dark orange areas), buoyancy does not appear to have a significant effect on groundwater flow.

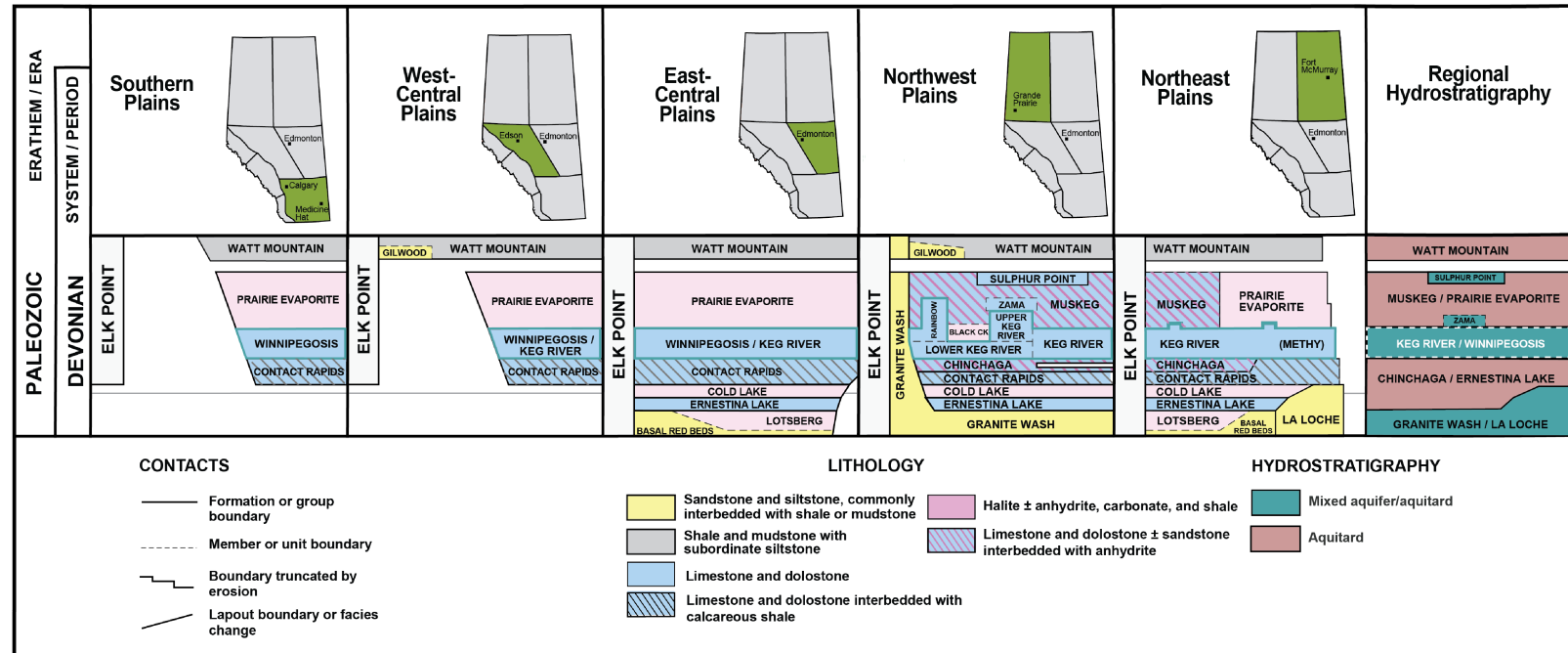


Figure 1. Regional lithostratigraphy and hydrostratigraphy (based on Alberta Geological Survey, 2019). Solid teal lines highlight the top and base of the Keg River / Winnipegosis HSU. Dashed white lines depict the Keg River / Winnipegosis HSU within the regional hydrostratigraphy. Strata above the Watt Mountain Formation and below the Elk Point Group are not shown.

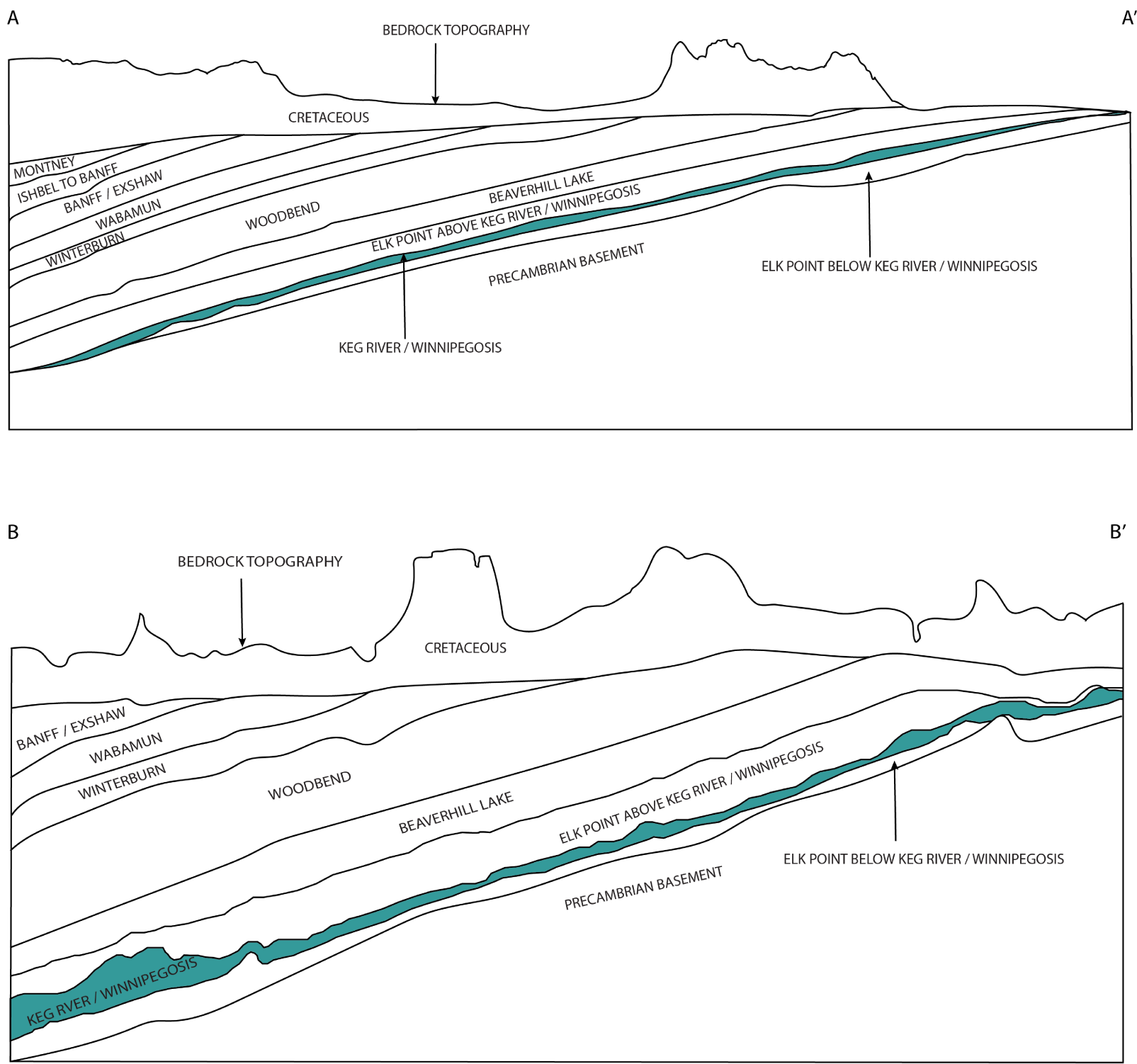


Figure 2. Schematic cross-sections identifying the geometry and variable thickness of the Keg River / Winnipegosis HSU (not to scale).

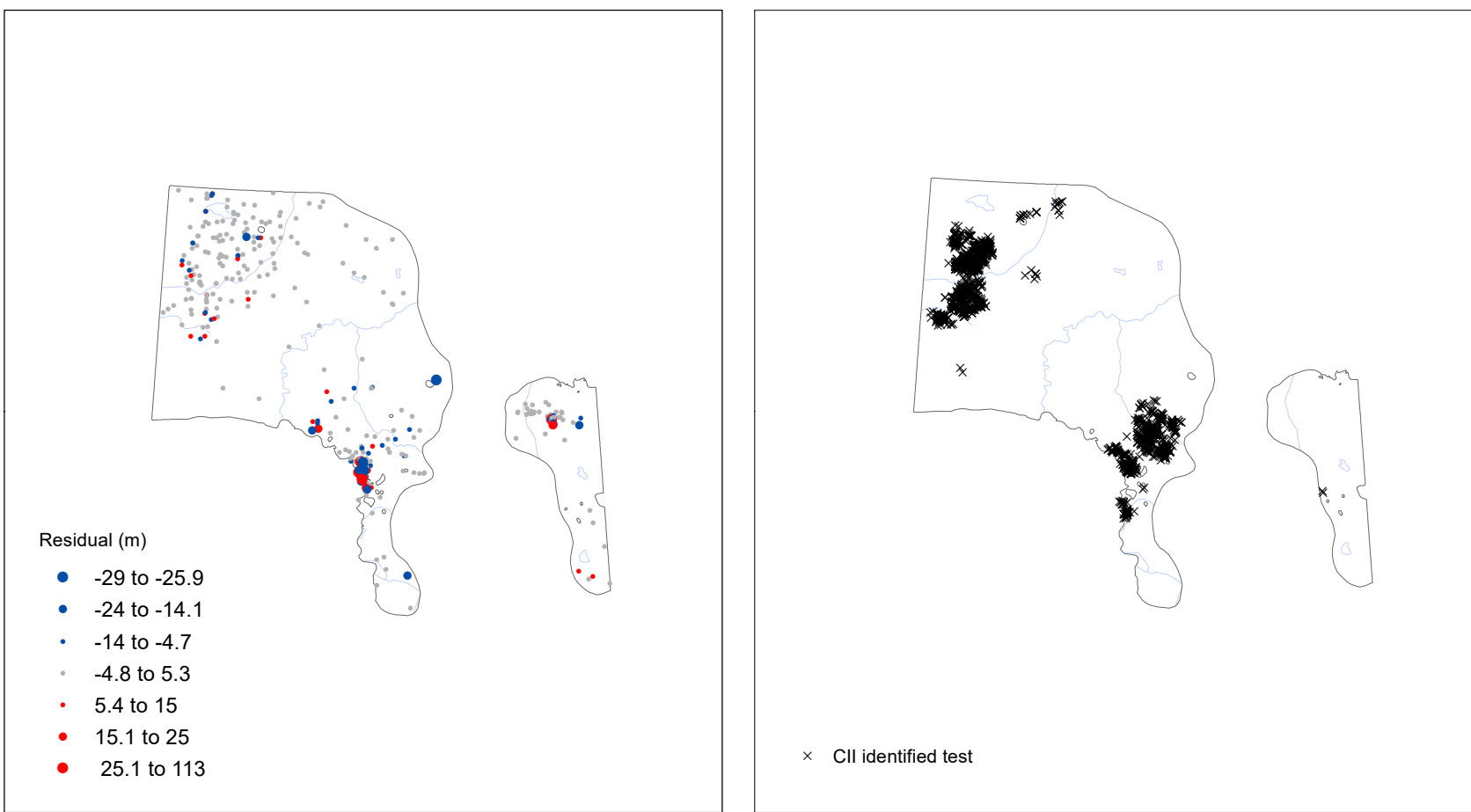


Figure 3. Calculated residuals between the modelled distribution of hydraulic head and measured values. Symbol classes are based on the standard deviation of the calculated residuals.

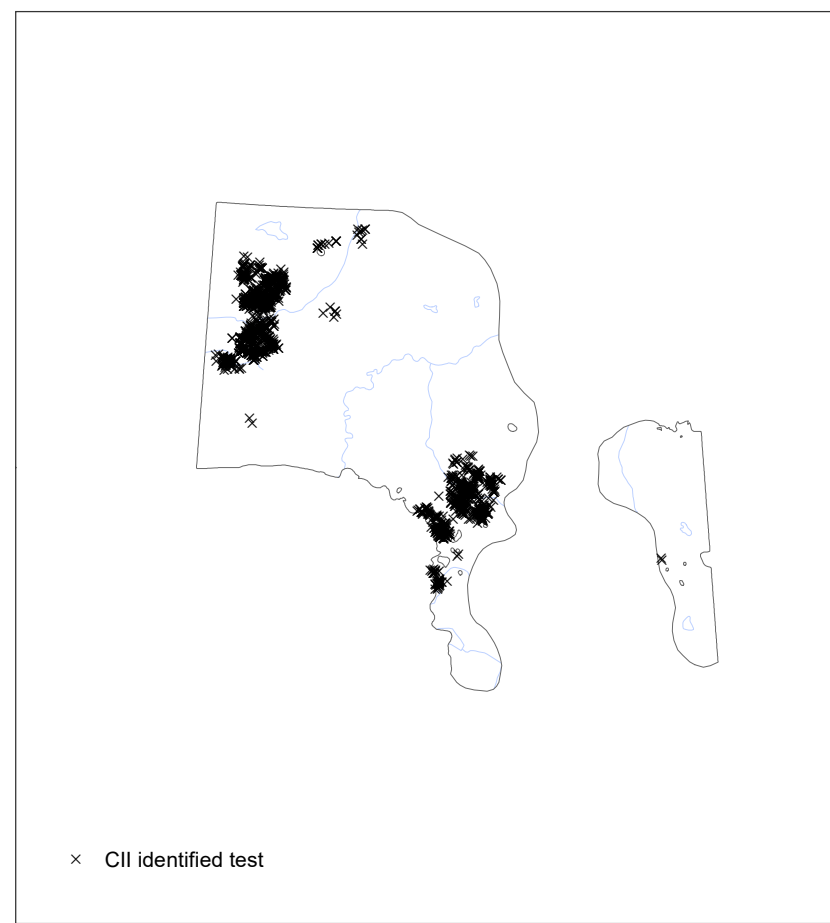


Figure 4. Location of tests that may have been influenced by production or injection and were removed during the Cumulative Interference Index (CII) process.

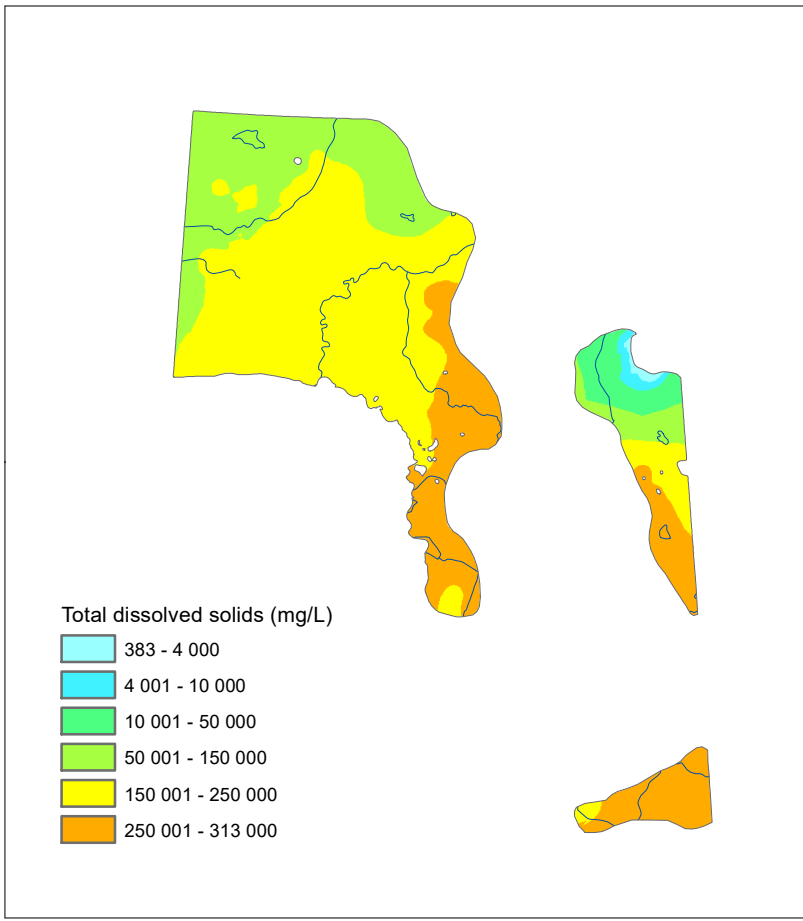


Figure 5. Distribution of total dissolved solids in the Keg River / Winnipegosis HSU. The map extent is based on the spatial distribution of TDS data and differs from the extent of the main map.

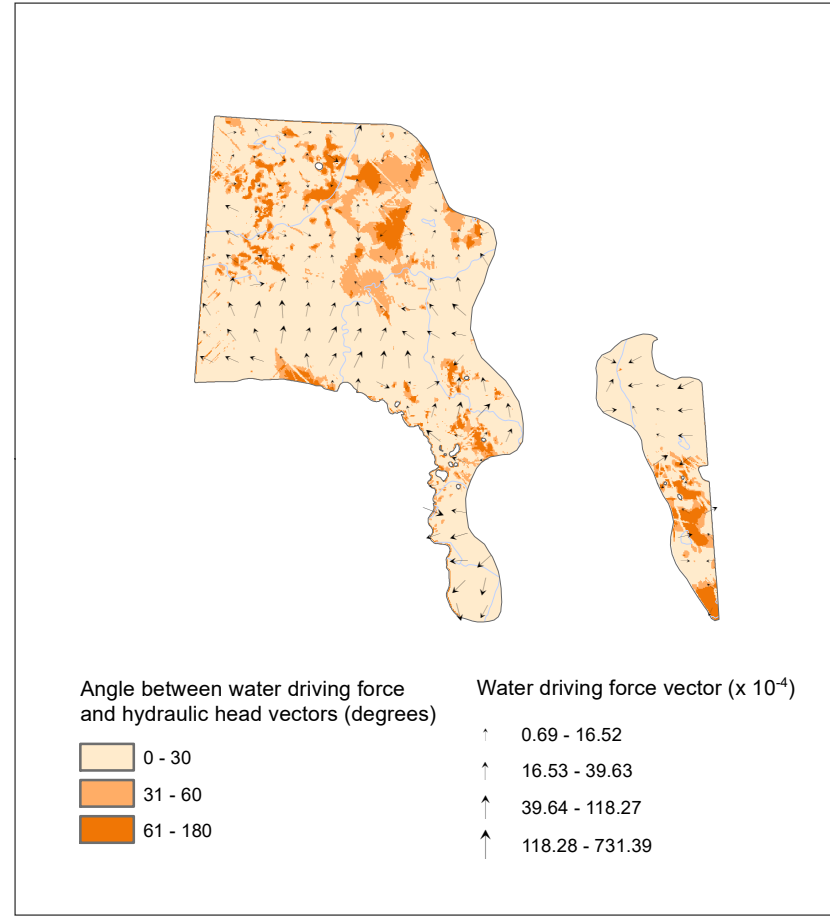


Figure 6. Water driving force vector map of the Keg River / Winnipegosis HSU. The map covers only the area where hydraulic head and TDS gridded surfaces overlap.

#### Acknowledgements

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#### References

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#### Recommended Reference Format

Nakevska, N. (2023): Distribution of hydraulic head in the Keg River / Winnipegosis hydrostratigraphic unit; Alberta Energy Regulator / Alberta Geological Survey, AER/AGS Map 624, scale 1:3 000 000.

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