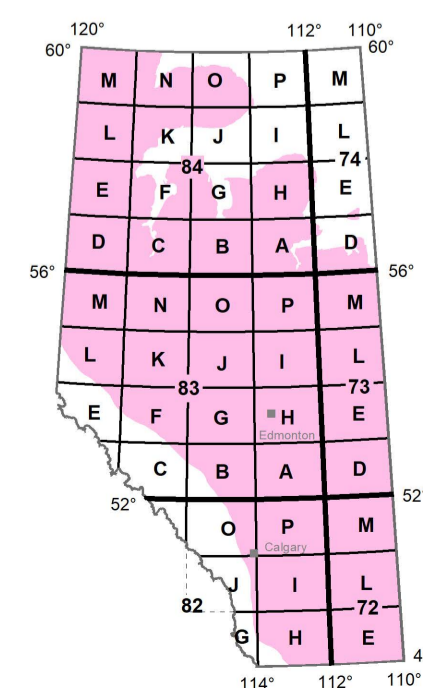
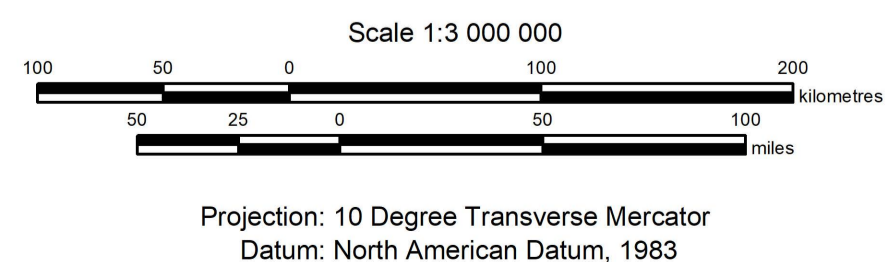


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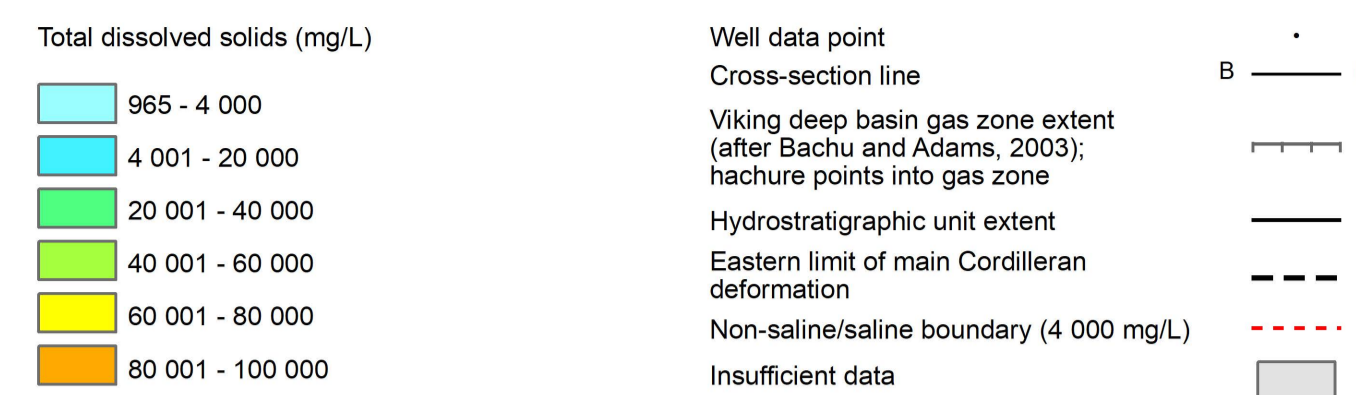
Published 2021  
ISBN: 978-1-4601-3994-3

**Map 593**

**Distribution of Total Dissolved Solids in the Peace River / Viking / Bow Island Hydrostratigraphic Unit**  
Hydrogeology by: T.G. Lemay, A. Singh and J. Brinsky



**SYMBOL LEGEND**



This map depicts the concentration of total dissolved solids (TDS) in groundwater in the Peace River / Viking / Bow Island hydrostratigraphic unit (PVB HSU). The horizontal and vertical extent of the unit was adopted from the 3D Provincial Geological Framework Model of Alberta, Version 1 (Branscombe et al., 2018). The relationship of the PVB HSU with the units above and below as well as its geometry can be seen on Figure 1. On the basis of time equivalency, similarities in lithologic composition, and previous hydrogeological assessments (Bachu, 1995, 1999; Bachu and Adams, 2003; Bachu et al., 1993; Michael, 2002) the Peace River / Viking / Bow Island stratigraphic units were combined into a single hydrostratigraphic unit (Figure 2).

**Methodology**

The TDS distribution map is a result of an ordinary kriging technique using publicly available data from 25 water chemistry analyses from water wells and 1 940 water chemistry analyses from oil and gas wells. A screening process modified from Jensen et al. (2013) was used to ensure that only representative formation water chemistries were used.

Measured values of TDS range from ~200 mg/L to >100 000 mg/L. The final gridded map surface was clipped based on the spatial distribution of representative chemistry data. Where data density was insufficient to generate a TDS grid, data points are plotted with TDS labels only. Residual values are plotted at each location (Figure 3) to indicate where underprediction and overprediction occurs compared to the measured TDS values.

Additional formation-scale hydrogeological maps for the PVB HSU are presented in Figures 4 and 5. Figure 4 shows the distribution of hydraulic head in the PVB HSU, with hydraulic heads calculated using fresh water density. Figure 5 shows the water driving force (WDF) map for the PVB HSU. The WDF vector map allows identification of areas where formation water density has the potential to change the inferred magnitude and direction of groundwater flow (Singh et al., 2017). Overall, buoyancy does not appear to have a significant effect on groundwater flow in the PVB HSU.

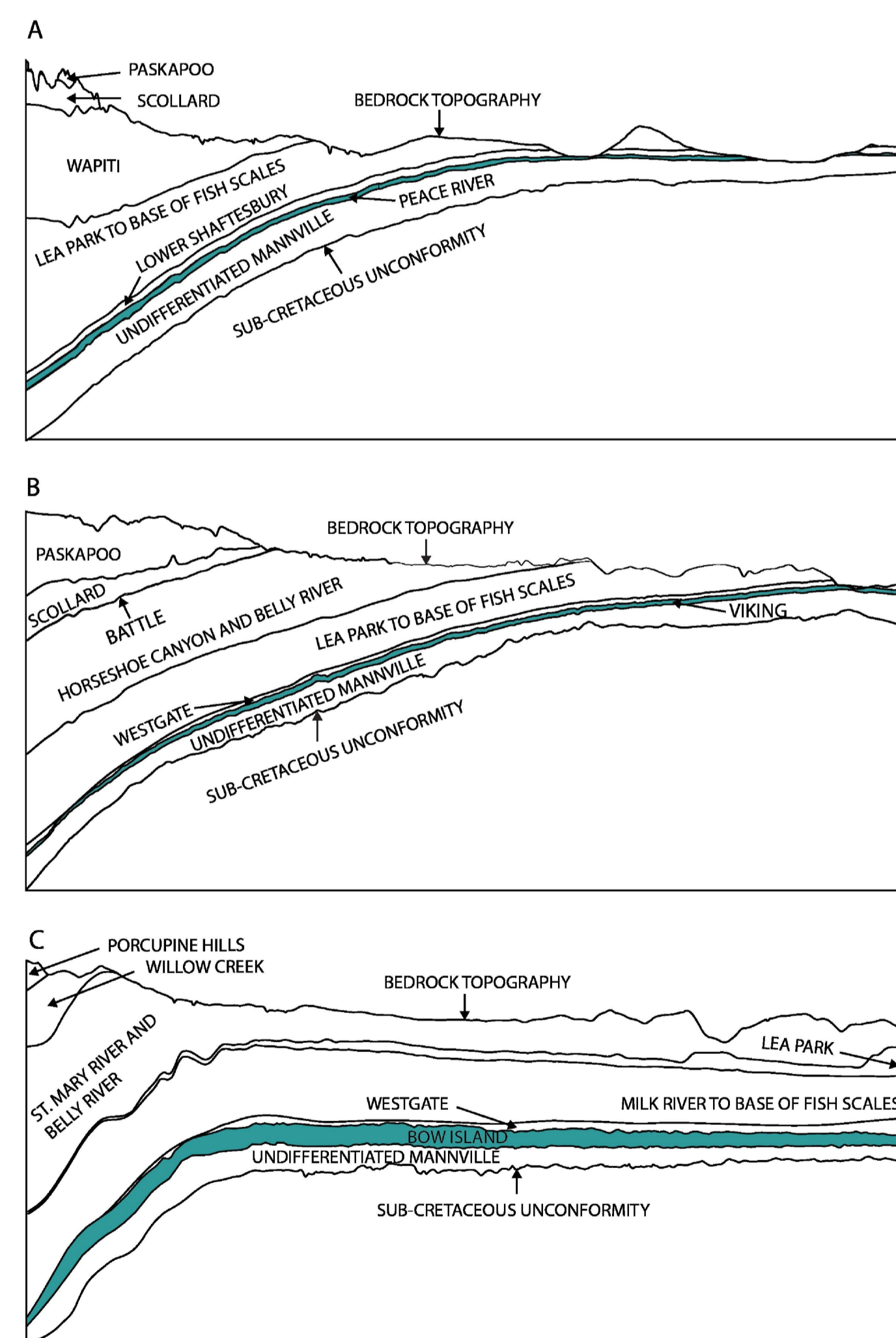


Figure 1. Schematic cross-sections identifying the geometry and variable thickness of the PVB HSU (not to scale).

**Acknowledgements**

Cartography by E.J. Waters, data processing support by S. Stewart. Base data from the Atlas of Canada (Natural Resources Canada, 2012) and Spatial Data Warehouse, Ltd.

**Recommended Reference Format**

Lemay, T.G., Singh, A. and Brinsky, J. (2021). Distribution of total dissolved solids in the Peace River / Viking / Bow Island hydrostratigraphic unit; Alberta Energy Regulator / Alberta Geological Survey, AER/AGS Map 593, scale 1:3 000 000.

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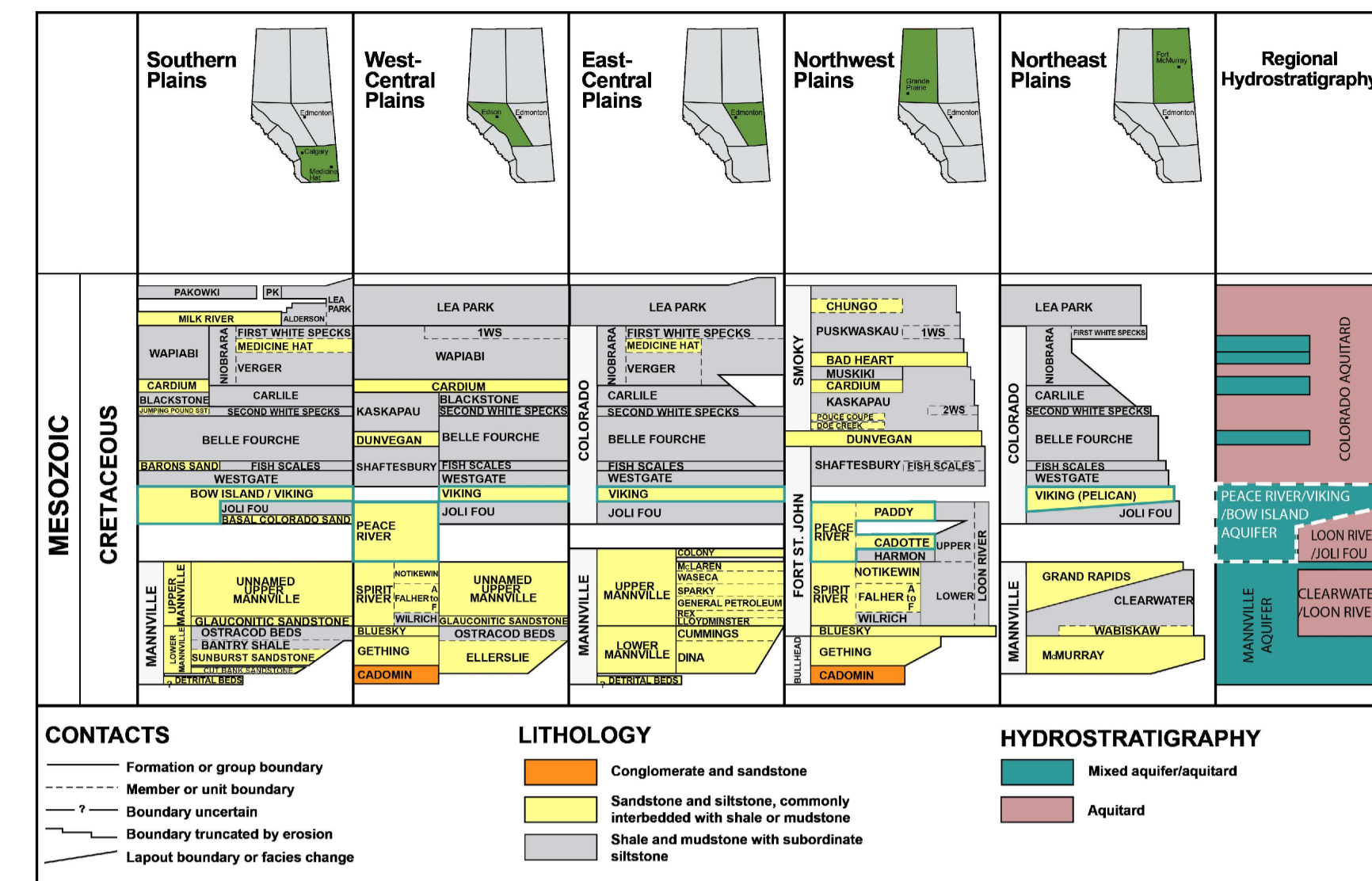


Figure 2. Regional lithostratigraphy based on Alberta Geological Survey (2019), with regional hydrostratigraphy based on Hitchon et al. (1989). Solid teal lines depict the top and base of stratigraphic units combined for the mapping of the PVB HSU. Dashed white lines depict the PVB HSU within the regional hydrostratigraphy. Strata above the Lea Park Formation are not shown.

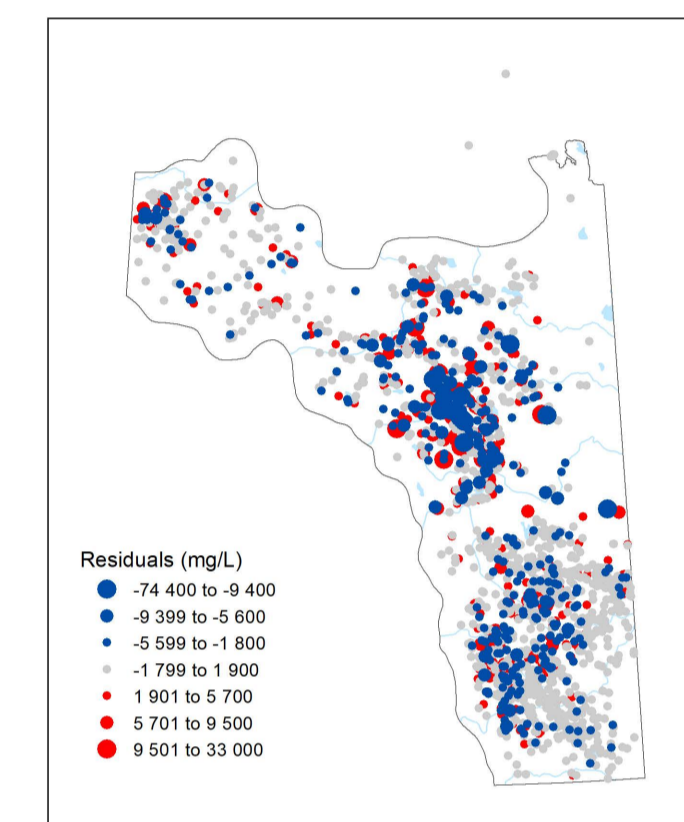


Figure 3. Calculated residuals between the modelled distribution of TDS and measured values. Symbol classes are based on the standard deviation of the calculated residuals.

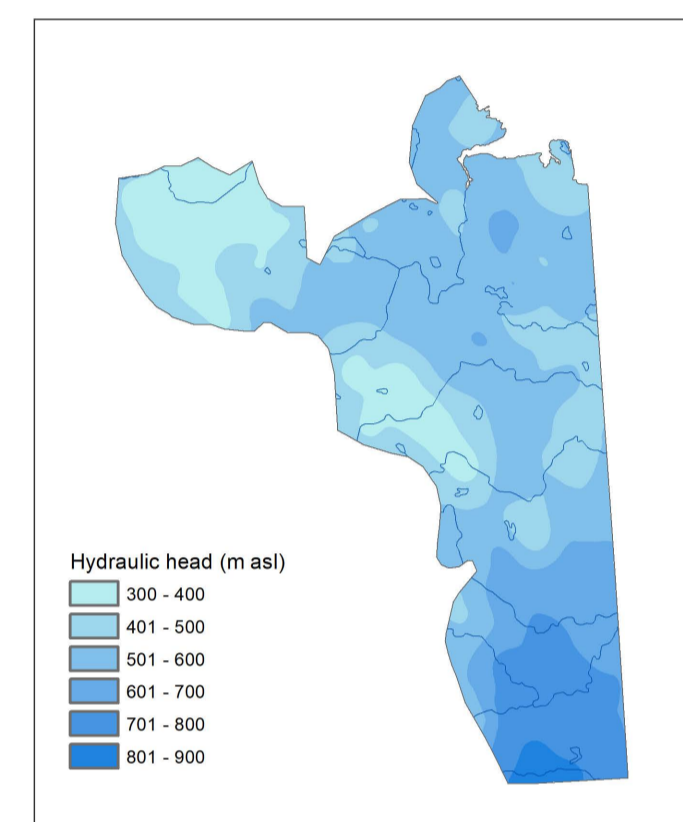


Figure 4. Distribution of hydraulic head in the PVB HSU (Singh and Lemay, 2020). The map extent is based on the spatial distribution of hydraulic head data and differs from the extent of the main map.

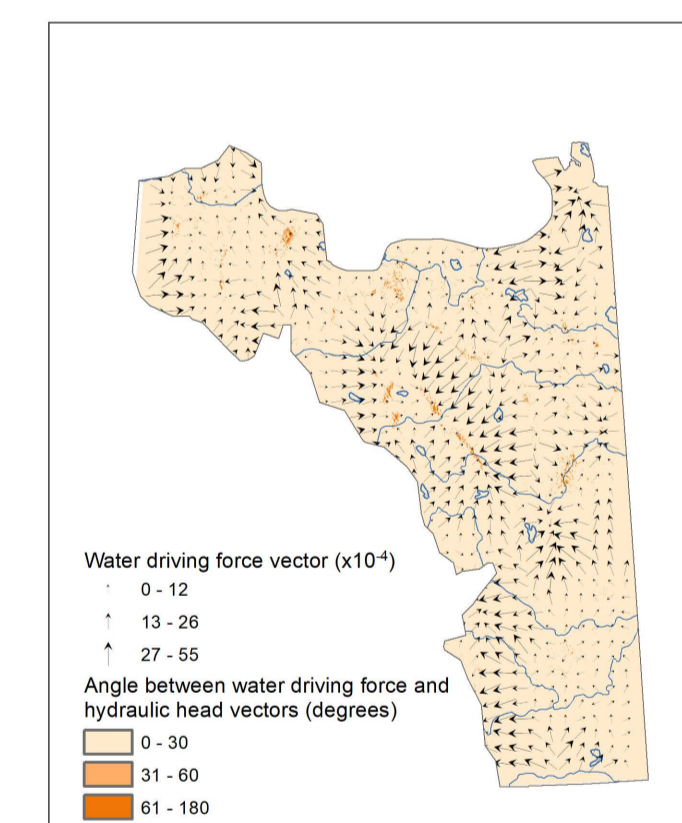


Figure 5. Water driving force map of the PVB HSU. The map only covers the area where hydraulic head and TDS gridded surfaces overlap.

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