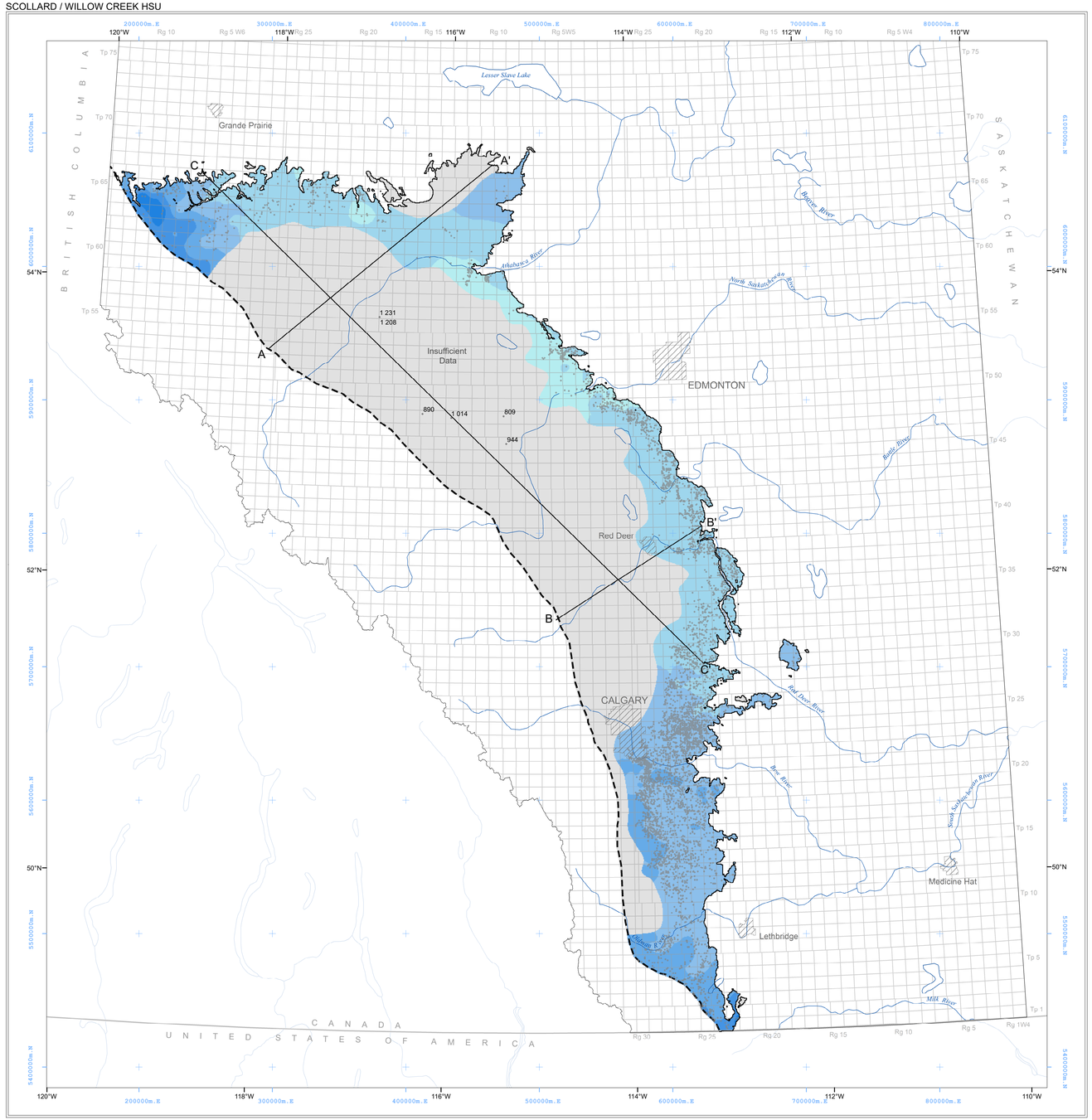
HYDRAULIC HEAD
SCOLLARD / WILLOW CREEK HSU



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Map 629

Distribution of Hydraulic Head in the Scollard / Willow Creek Hydrostratigraphic Unit

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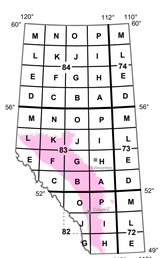
Scale 1:1 750 000

60 30 0 60 120 Kilometres
25 12.5 0 25 50 miles

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



SYMBOL LEGEND

Hydraulic head (m asl)
- 670 - 750
- 751 - 900
- 901 - 1 050
- 1 051 - 1 200
- 1 201 - 1 350
- 1 351 - 1 450

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

This map depicts the distribution of hydraulic head in the Scollard / Willow Creek 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 Scollard / Willow Creek 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 an empirical Bayesian kriging technique using publicly available static water levels from 6 489 water wells. The Scollard / Willow Creek HSU is exposed at the ground surface in some areas, has a vertical thickness of up to 1 573 m, and its top reaches a maximum depth of 1 118 m in the western part of its extent (Figure 3). Most of the water wells are located near the subcrop margin of the Scollard / Willow Creek HSU. The average depth of the screened interval midpoint in wells used to map the hydraulic head distribution for the Scollard / Willow Creek HSU is 43 m and the minimum and maximum midpoint depths are 6 and 154 m, respectively. Outliers were identified and removed using a cross-validation statistical approach. Drillstem test pressure data from only six oil and gas wells in the deeper part of the HSU were insufficient to map the hydraulic head grid in that area.

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. Residual values are plotted at each location (greater than 1.5 and less than -1.5 standard deviations) to indicate where underprediction or overprediction occurs compared to the measured hydraulic head values (Figure 4). An additional formation-scale hydrogeological map displaying the distribution of total dissolved solids in the Scollard / Willow Creek HSU is presented in Figure 5.

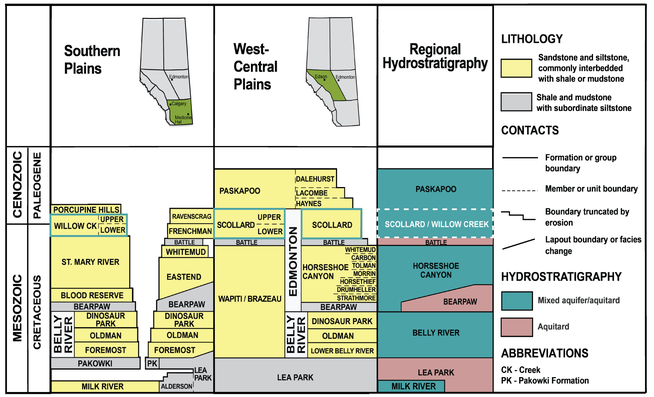


Figure 1. Regional lithostratigraphy and hydrostratigraphy (based on Alberta Geological Survey, 2019). Solid teal lines highlight the Scollard / Willow Creek stratigraphic unit. Dashed white lines depict the Scollard / Willow Creek HSU within the regional hydrostratigraphy. Strata below the Lea Park and equivalent formations are not shown. In the southern portion of the province, the Battle Formation is not present and the Scollard / Willow Creek HSU overlies the St. Mary River Formation.

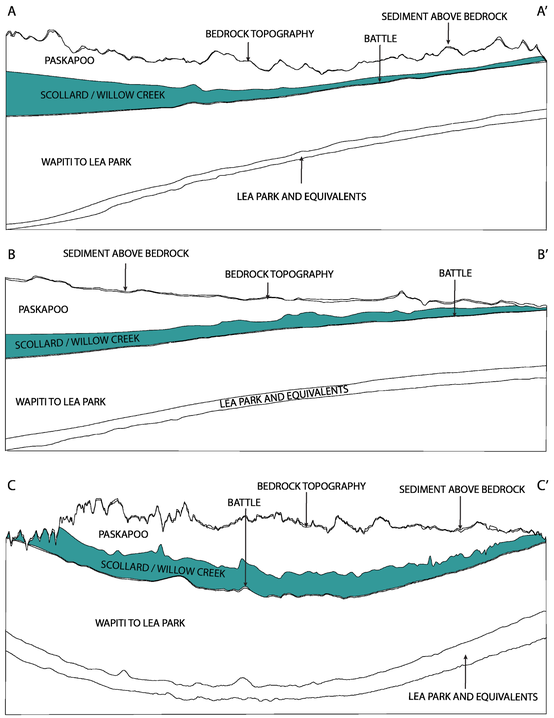


Figure 2. Schematic cross-sections identifying the geometry and variable thickness of the Scollard / Willow Creek HSU. Strata below the Lea Park and equivalent formations are not shown.

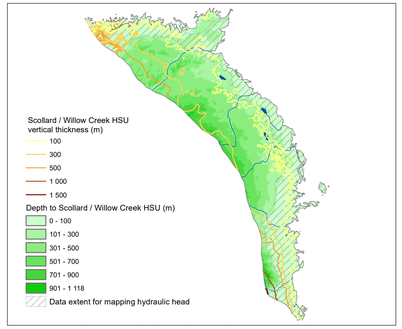


Figure 3. Depth to, and vertical thickness of the Scollard / Willow Creek HSU. Hatch pattern shows the extent of data used for total dissolved solids mapping.

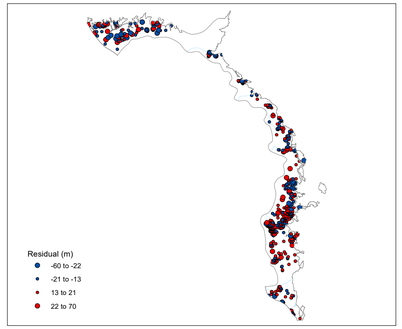


Figure 4. Calculated residuals between the modelled distribution of hydraulic head and measured values. Symbol classes are based on the standard deviation of the calculated residuals. Residuals within 1.5 standard deviations are excluded from this figure due to high data density.

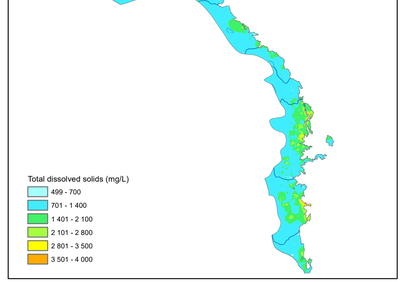


Figure 5. Distribution of total dissolved solids in the Scollard / Willow Creek HSU (Brinsky and Lemay, 2022). The map extent is based on the spatial distribution of total dissolved solids data and differs from the extent of the main map.

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].

Alberta Geological Survey (2021): Geological Framework of Alberta, version 3 (interactive app and map, methodology, model, dataset, story maps, web maps); Alberta Energy Regulator / Alberta Geological Survey, AER/AGS Interactive Application <https://gfa-v3-ags-aer.hub.arcgis.com> [December 2021].

Brinsky, J. and Lemay, T.G. (2022): Distribution of total dissolved solids in the Scollard / Willow Creek hydrostratigraphic unit; Alberta Energy Regulator / Alberta Geological Survey, AER/AGS Map 628, scale 1:1 750 000.

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> [December 2012].

Acknowledgements

Base data from the Atlas of Canada (Natural Resources Canada, 2012) and Spatial Data Warehouse, Ltd.

Recommended Reference Format

Brinsky, J. and Singh, A. (2022): Distribution of hydraulic head in the Scollard / Willow Creek hydrostratigraphic unit; Alberta Energy Regulator / Alberta Geological Survey, AER/AGS Map 629, scale 1:1 750 000.

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