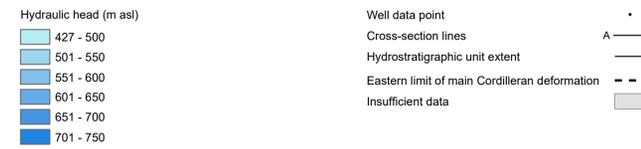


**SYMBOL LEGEND**



This map depicts the distribution of hydraulic head in groundwater in the Dunvegan hydrostratigraphic unit (HSU). The horizontal and vertical extent of the unit was adopted from the 3D Provincial Geological Framework Model of Alberta, Version 2 (Alberta Geological Survey, 2019a). The relationship of the Dunvegan HSU to 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 52 water wells and pressure data from 47 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 representative hydraulic head data and an assessment of plausible data trends. Residual values are plotted at each location (Figure 3) to indicate where underprediction or overprediction occurs compared to the measured hydraulic head values.

Additional formation-scale hydrogeological maps for the Dunvegan HSU are shown in Figures 4, 5, and 6. Using the methodology of Singh et al. (2017) the Cumulative Interference Index (CII) was determined and used to identify and remove tests that have been influenced by production or injection (Figure 4). Figure 5 shows the distribution of total dissolved solids in the Dunvegan HSU. Figure 6 illustrates the water driving force (WDF) vector map. The WDF vector map allows identification of areas where buoyancy differences from changes in formation water density and/or temperature have the potential to affect the inferred magnitude and direction of groundwater flow (Singh et al., 2017). Buoyancy does not appear to have a significant effect on groundwater flow in the Dunvegan HSU.

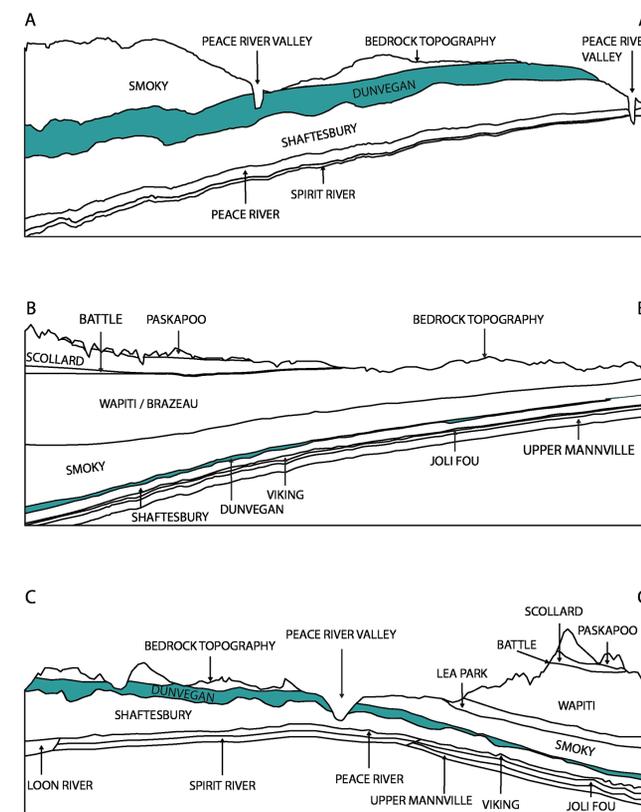


Figure 1. Schematic cross-sections identifying the geometry and variable thickness of the Dunvegan HSU (not to scale). Strata below the Spirit River Formation and equivalents are not shown.

**References**

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Singh, A., Palombi, D., Naveksa, N., Jensen, G. and Rostrom, B. (2017): An efficient approach for characterizing basin-scale hydrodynamics; Marine and Petroleum Geology, p. 332-340, URL <http://dx.doi.org/10.1016/j.marpetgeo.2017.02.015>.

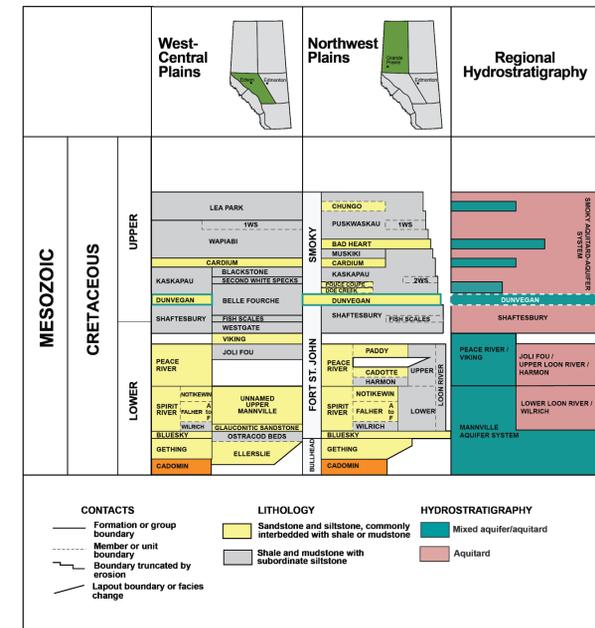


Figure 2. Regional lithostratigraphy and hydrostratigraphy (based on Alberta Geological Survey, 2019b). Solid teal lines highlight the Dunvegan Formation. Dashed white lines depict the Dunvegan HSU within the regional hydrostratigraphy. Strata above the Smoky Group are not shown.

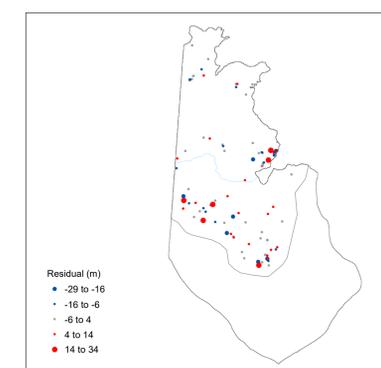


Figure 3. Calculated residuals between the modelled distribution of hydraulic head and measured values. Symbol classes are based on the standard deviation of the calculated residuals.

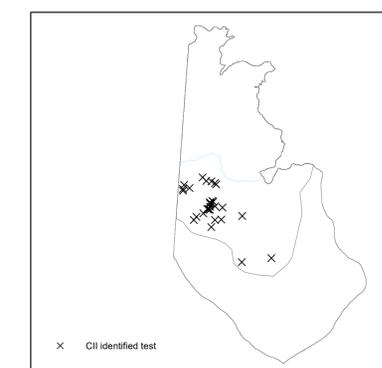


Figure 4. Location of tests that may have been influenced by production or injection and were removed during the Cumulative Interference Index (CII) process.

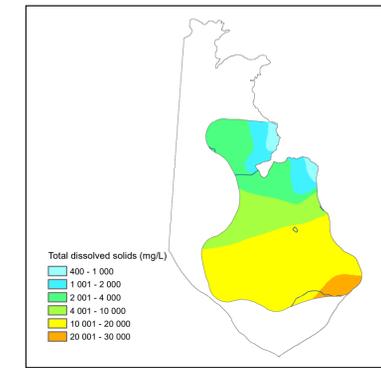


Figure 5. Distribution of total dissolved solids in the Dunvegan HSU (Lemay and Singh, 2021). The map extent is based on the spatial distribution of TDS data and differs from the extent of the main map.

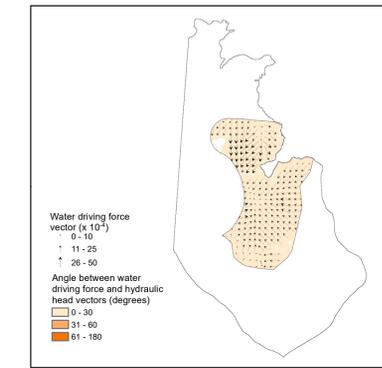


Figure 6. Water driving force vector map of the Dunvegan HSU. The map only covers the area where hydraulic head and TDS gridded surfaces overlap.

