

Aquifer Name: Valley View - Dawson Creek Bedrock Aquifer

Aquifer Number: 0593

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A. AQUIFER DESCRIPTION FOR AQUIFER 0593

A.1 CONCEPTUAL UNDERSTANDING OF HYDROSTRATIGRAPHY

A.1.1 AQUIFER EXTENTS

The aquifer is located between the Kiskatinaw River and the Pouce Coupe River. It is a bedrock aquifer delineated based on water licensing watershed boundaries and surface water bodies within a regionally extensive geological/hydrostratigraphic unit. The aquifer is bound to the north and northwest by water licensing watershed boundaries, to the east by the Pouce Coupe River and the provincial boundary between British Columbia and Alberta, to the south by the Bisette Creek, and tributaries of Bisette Creek and the Kiskatinaw River and to the west by the Kiskatinaw River, (Lengyel et al. 2023, Figure 1). The aquifer extent is uncertain in the south where it follows the Bisette Creek and the unnamed tributaries of Bisette Creek and Kiskatinaw River. It is also uncertain in the east where it follows the provincial boundary as the aquifer likely extends into Alberta. The aquifer to the north of the aquifer (0633) is part of the same geological/hydrostratigraphical unit.

A.1.2 GEOLOGIC FORMATION (OVERLYING MATERIALS)

The aquifer is primarily overlain by variable thickness of till and glaciolacustrine sediments, with more limited extents of alluvial and colluvial sediments. Fifty-six of the 60 wells associated with the aquifer reported fine-grained material (clay, till, silt) on the surface and four reported bedrock material extending to surface. The thickness of the overlying material ranges from 0 to more than 70 meters.

A.1.3 GEOLOGIC FORMATION (AQUIFER) – 5A FRACTURED SEDIMENTARY ROCK

The bedrock aquifer is primarily comprised of sediments of the Kaskapau Formation with a limited extent of Cardium Formation near the southern margin of the aquifer. The Kaskapau Formation mostly consists of shale, siltstone, and sandstone, while the Cardium Formation consists of sandstone, conglomerate, and shale (Monahan et al. 2018). Permeability may be associated with primary and secondary porosity (through fracturing) of the Kaskapau and Cardium formations. The Kaskapau and Cardium formations are described in further detail by Lengyel et al. (2023). The aquifer is interpreted to be a confined aquifer except where it outcrops.

A.1.4 VULNERABILITY

Depth to groundwater varies from shallow to deep. At provincial observation wells OW-419 (Well Tag Number [WTN] 104710), a pumping test analysis estimated the transmissivity at 13.5 m²/d and the hydraulic conductivity at 0.53 m/d (Baye et al. 2016). Surficial mapping by Reimchen (1980) and

borehole logs indicate that most of the bedrock aquifer is covered by fine-grained materials of variable thickness, with limited areas where the aquifer unit outcrops at surface (WTN 1052, 1924, 38945, and 103013). The overall vulnerability of the aquifer to surface contamination has been qualitatively assessed to be moderate except high where it outcrops at the surface.

A.2 CONCEPTUAL UNDERSTANDING OF FLOW DYNAMICS

A.2.1 GROUNDWATER LEVELS AND FLOW DIRECTION

Static water levels recorded in the provincial groundwater wells database (GWELLS) and in research wells (Goetz 2021) range from shallow (1.8 m) to deep (85.3 m). Flowing artesian conditions were encountered at two wells (WTN 118215 and 104710). There is one active and one inactive bedrock provincial observation well within the aquifer extents, OW-420 (WTN 104711) and OW-419 (WTN 104710), respectively.

The groundwater surface is interpreted to be a subdued representation of the topography based on regional interpolation of groundwater surface elevations. Groundwater is interpreted to flow primarily towards the Kiskatinaw and Pouce Coupé rivers and their tributaries.

A.2.2 RECHARGE

Recharge to the aquifer could occur via distributed infiltration of precipitation and snowmelt through areas of thin overburden (Baye et al. 2016) with direct recharge in spots where the aquifer outcrops at surface. Much of the recharge is expected to occur in the spring associated with snowmelt. The aquifer may also be recharged by the overlying minor tributaries of the Kiskatinaw and Pouce Coupé rivers and/or regional groundwater flow in the bedrock units. However, the spatial and temporal understanding of these recharge pathways as well as vertical flow potential within the bedrock are uncertain and further investigation is required to be evaluated.

A.2.3 POTENTIAL FOR HYDRAULIC CONNECTION

Groundwater in the aquifer is in direct hydraulic connection with its neighbouring bedrock aquifer 0633. Aquifer boundaries are defined based on inferred groundwater flow paths within the Kaskapau and Cardium formations within a continuous hydrostratigraphic unit.

Hydraulic connection may exist between aquifer 0593 and the coarse-grained sediments in aquifer 0851, where they are not separated by thick fine-grained sediments. Groundwater in the aquifer may also be in direct hydraulic connection with the Kiskatinaw and Pouce Coupe rivers and their tributaries.

A.3 WATER MANAGEMENT

A.3.1 ADDITIONAL INFORMATION ON WATER USE AND MANAGEMENT

Baye et al. (2016) reported elevated concentrations of arsenic, iron, sulphate, total dissolved solids (TDS), and hardness in some of the bedrock wells within the extent of aquifer 0593. Some wells report poor to very poor quality (mainly due to excessive iron concentrations). Stated yields in the well records

range from 0.02 to 3.15 L/s, with a geometric mean of 0.3 L/s indicating low/moderate productivity. Several wells were reported dry. Where the purpose of groundwater use is recorded, it is primarily reported as domestic use. In addition, wells with observation and unknown purposes were also recorded in GWELLS.

A.3.2 ADDITIONAL ASSESSMENTS OR MANAGEMENT ACTIONS

Baye et al. (2016) concluded that recharge occurs in upland areas by precipitation percolating through the till, however the recharge pathways to the regional bedrock aquifer are currently uncertain and require further investigation.

Aquifer 0593 is part of the Kaskapau Formation. Bedrock aquifers in the weathered and fractured Dunvegan and Kaskapau formations in the Study Area (0589, 0591, 0593, 0595, 0633, and 1275) are inferred to be part of the same hydrostratigraphic unit and are interpreted to be continuous on a regional scale (see Lengyel et al. 2023). The aquifer is differentiated from adjacent aquifers (0633 and 1275) based on regional groundwater flow paths and major geographic features. Water management decisions for the aquifer may require assessment of adjacent aquifers, especially where development is near the aquifer boundaries.

A.4 AQUIFER REFERENCES

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A.5 REVISION HISTORY

Date	Version	Revision Class	Comments	Author
2011	1	Major	Initial mapping of aquifer	Lowen Hydrogeology Consulting Ltd. 2011.
02/10/2023	2	Major	Aquifer boundaries updated to include hydraulically connected geologic formations	Tibor Lengyel, M.Sc., P.Geo., Judit Deri-Takacs, Ph.D., Andrew Hinnell, Ph.D., P.Geo.