

5.3.9 Upper Scollard Aquifer

The Upper Scollard Aquifer comprises the permeable parts of the Upper Scollard Formation that underlie the Haynes Member. Structure contours have been prepared for the top of the Formation. The structure contours show that the Upper Scollard Formation ranges in elevation from less than 540 to more than 880 metres AMSL and has a thickness of in the order of 130 metres. The non-pumping water level in the Upper Scollard Aquifer slopes toward the Battle River and toward Maskwa Creek in the areas north of the Battle River.

5.3.9.1 Depth to Top

The depth to the top of the Upper Scollard Formation ranges from less than 20 metres below ground surface at the eastern extent to more than 400 metres in the western part of the County (page A-46).

5.3.9.2 Apparent Yield

The apparent yields for individual water wells completed through the Upper Scollard Aquifer are mainly in the range of 10 to 100 m³/day. There are two dry water test holes that are completed in the Upper Scollard Aquifer.

There are 104 non-exempt groundwater users that have water wells completed through the Upper Scollard Aquifer, for a total authorized groundwater diversion of 4,519 m³/day.

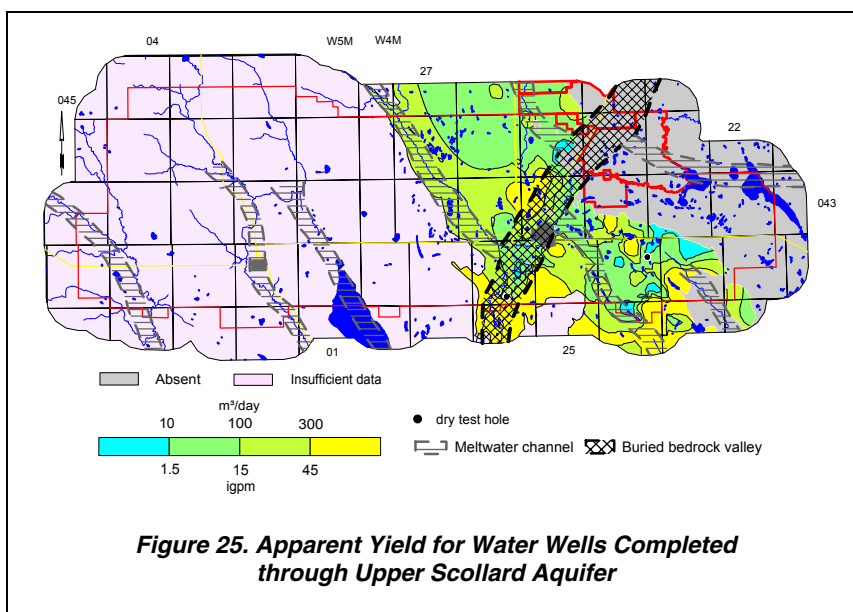
The Town of Ponoka operates eight water supply wells that are completed in the Upper Scollard Aquifer, having a total authorized diversion of 3,054 m³/day. Three of these eight water wells could be linked to water wells in the AENV groundwater database.

Of the 104 non-exempt authorizations, 47 could be linked to water wells in the AENV groundwater database.

Extended aquifer tests were conducted with two water test holes drilled for the Town of Ponoka and completed in the Upper Scollard Aquifer. The extended aquifer test with Water Test Hole (WTH) No. 1-79 in 14-05-043-25 W4M indicated a long-term yield of 655 m³/day, and the aquifer test with WTH No. 2-79 in 12-05-043-25 W4M indicated a long-term yield of 125 m³/day based on an effective transmissivity of 105 m²/day and a corresponding storativity of 1.7×10^{-4} (HCL, June 2002). These long-term yields are based on the premise that the water supply wells would be pumped simultaneously. If the water supply wells were pumped individually the long-term yields would be greater than 1,300 m³/day for each of the water supply wells.

5.3.9.3 Quality

The groundwaters from the Upper Scollard Aquifer are mainly a sodium-bicarbonate type (see Piper diagram on CD-ROM), with nearly 60% of the groundwater samples having TDS concentrations ranging from 500 to 1,000 mg/L (page A-48). The sulfate concentrations are mainly less than 200 mg/L. The chloride concentrations from the water wells completed in the Upper Scollard Aquifer are mainly less than 10 mg/L. There are only two analyses where fluoride concentrations exceed 1.5 mg/L.



A chemical analysis of a groundwater sample collected during the aquifer test with WTH No. 1-79 in July 1979 indicated the groundwater is a sodium-bicarbonate type, with a TDS concentration of 863 mg/L, a sulfate concentration of 188 mg/L, a chloride concentration of 6 mg/L, a fluoride concentration of 0.23 mg/L, and a total hardness of 324 mg/L. A chemical analysis of a groundwater sample collected during the aquifer test with WTH No. 2-79 in July 1979 indicated the groundwater is also a sodium-bicarbonate type, with a TDS concentration of 631 mg/L, a sulfate concentration of 5 mg/L, a chloride concentration of 33 mg/L, a fluoride concentration of 0.94 mg/L, and a total hardness of 12 mg/L (HCL, Apr-1980).

The total hardness value in WTH No. 1-79 varies significantly from the total hardness value in WTH No. 2-79. It was apparent during the aquifer test with WTH No. 1-79 that the groundwater was a mixture of the Upper Scollard Aquifer groundwater and water leaking through the fractured shale from the surficial deposits (HCL, Apr-1980).

Of the five constituents that have been compared to the SGCDWQ, the median value of **TDS** exceeds the guidelines. The median concentrations of TDS and sulfate from water wells completed in the Upper Scollard Aquifer are greater than the median concentrations from water wells completed in all upper bedrock aquifer(s).

Constituent	No. of Analyses	Range for County in mg/L			All Bedrock Median	Recommended Maximum Concentration SGCDWQ
		Minimum	Maximum	Median		
Total Dissolved Solids	50	283	2,557	632	629	500
Sodium	37	11.5	5,290	153	239	200
Sulfate	48	0	1,431	53	52	500
Chloride	50	0	98	2	3	250
Fluoride	43	0	3	0.2	0.3	1.5

Concentration in milligrams per litre unless otherwise stated
 Note: indicated concentrations are for Aesthetic Objectives except for Fluoride, which is for Maximum Acceptable Concentration (MAC)
 SGCDWQ - Summary of Guidelines for Canadian Drinking Water Quality
 Federal-Provincial Subcommittee on Drinking Water, April 2002

Table 11. Apparent Concentrations of Constituents in Groundwaters from Upper Scollard Aquifer

5.3.10 Lower Scollard Aquifer

The Lower Scollard Aquifer comprises the porous and permeable parts of the Lower Scollard Formation that underlie the Upper Scollard Formation. Structure contours have been prepared for the top of the Formation. The structure contours show that the Lower Scollard Formation ranges in elevation from less than 450 to more than 840 metres AMSL and has a maximum thickness of 40 metres. The non-pumping water level in the Lower Scollard Aquifer is mainly downgradient to the northwest toward the Battle River and toward Maskwa Creek in the areas north of the Battle River.

5.3.10.1 Depth to Top

The depth to the top of the Lower Scollard Formation ranges from less than 20 metres below ground surface at the eastern extent to more than 500 metres in the western part of the County (page A-49).

5.3.10.2 Apparent Yield

The apparent yields for individual water wells completed through the Lower Scollard Aquifer range mainly from 10 to 100 m³/day. There are two dry water test holes that are completed in the Lower Scollard Aquifer. The areas showing water wells with yields of greater than 300 m³/day are expected mainly in the linear bedrock lows.

In the County, there are 30 non-exempt groundwater users that have water wells that are completed in the Lower Scollard Aquifer, for a total authorized diversion of 181 m³/day. Of the 30 authorizations, 18 are new registrations and 12 are for agricultural purposes. The highest single allocation of 50 m³/day is for a water supply well in 13-22-043-25 W4M licensed to divert groundwater for agricultural purposes.

Thirteen of the 30 authorized non-exempt water wells could be linked to a water well in the AENV groundwater database.

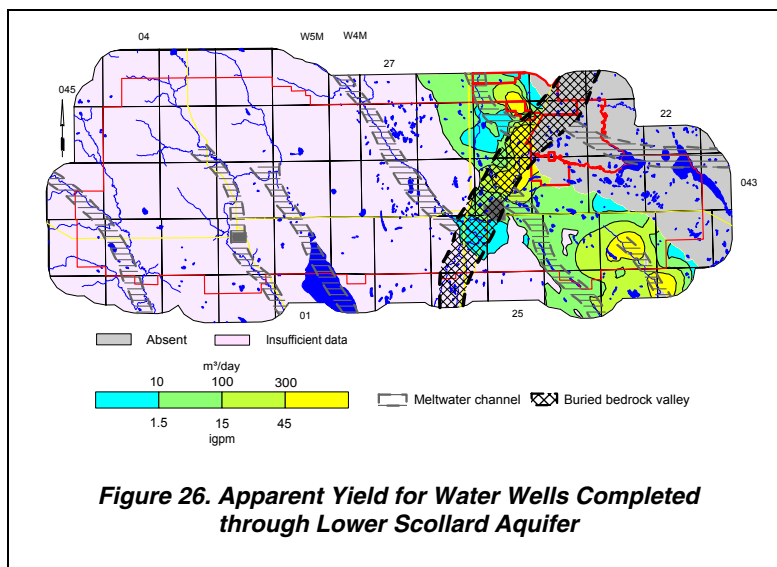


Figure 26. Apparent Yield for Water Wells Completed through Lower Scollard Aquifer

5.3.10.3 Quality

The groundwaters from the Lower Scollard Aquifer are mainly a sodium-bicarbonate type (see Piper diagram on CD-ROM), with more than 75% of the groundwater samples having TDS concentrations ranging from 500 to 1,000 mg/L (page A-51). The sulfate concentrations are mainly less than 100 mg/L. The chloride concentrations from the water wells completed in the Upper Scollard Aquifer are mainly less than 50 mg/L. There are eight analyses where fluoride concentrations exceed 1.5 mg/L.

Of the five constituents that have been compared to the SGCDWQ, the median values of TDS and sodium exceed the guidelines. The median concentrations of TDS, sodium, chloride and fluoride from water wells completed in the Lower Scollard Aquifer are greater than the median concentrations from water wells completed in all upper bedrock aquifer(s).

Constituent	No. of Analyses	Range for County in mg/L			All Bedrock Median	Recommended Maximum Concentration SGCDWQ
		Minimum	Maximum	Median		
Total Dissolved Solids	37	407	4,537	780	629	500
Sodium	28	24.4	31,510	286	239	200
Sulfate	40	0	2,812	44	52	500
Chloride	40	0	58	6	3	250
Fluoride	32	0	3	0.9	0.3	1.5

Concentration in milligrams per litre unless otherwise stated
 Note: indicated concentrations are for Aesthetic Objectives except for Fluoride, which is for Maximum Acceptable Concentration (MAC)
 SGCDWQ - Summary of Guidelines for Canadian Drinking Water Quality
 Federal-Provincial Subcommittee on Drinking Water, April 2002

Table 12. Apparent Concentrations of Constituents in Groundwaters from Lower Scollard Aquifer

5.3.11 Upper Horseshoe Canyon Aquifer

The Upper Horseshoe Canyon Aquifer comprises the permeable parts of the Upper Horseshoe Canyon Formation that underlie the Lower Scollard Formation. The Upper Horseshoe Canyon Formation subcrops under the surficial deposits in the eastern third of the County. Structure contours have been prepared for the top of the Formation. The structure contours show that the Upper Horseshoe Canyon Formation ranges in elevation from less than 360 to more than 760 metres AMSL and has a thickness of up to 100 metres. The non-pumping water level in the Upper Horseshoe Canyon Aquifer is downgradient to the northwest and downgradient to the southeast toward the Battle River.

5.3.11.1 Depth to Top

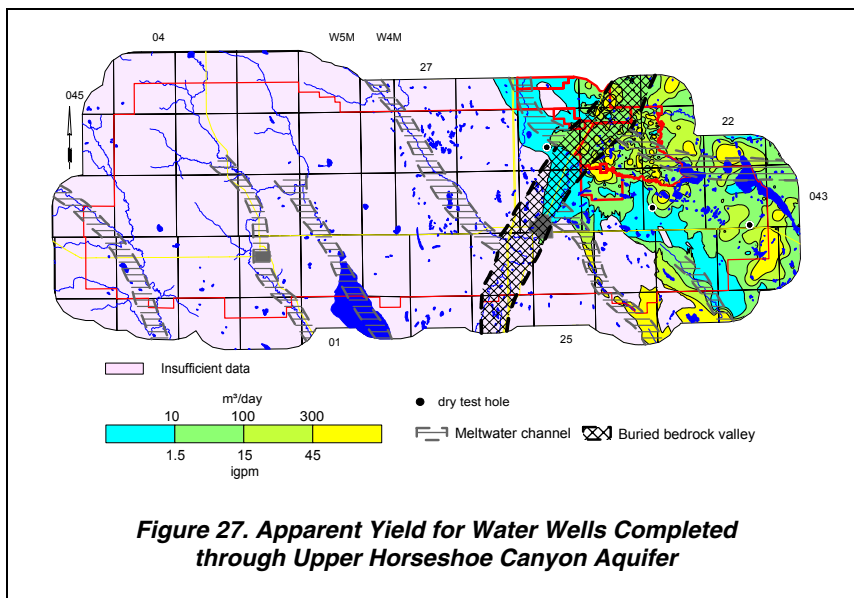
The depth to the top of the Upper Horseshoe Canyon Formation is variable, ranging from less than 20 metres at the eastern extent to more than 600 metres in the western part of the County (page A-52).

5.3.11.2 Apparent Yield

The apparent yields for individual water wells completed through the Upper Horseshoe Canyon Aquifer range mainly from 10 to 100 m³/day. There are three dry water test holes that are completed in the Upper Horseshoe Canyon Aquifer. The areas showing water wells with yields of greater than 300 m³/day are expected mainly in the linear bedrock lows.

In the County, there are 70 non-exempt groundwater users that have water wells that are completed in the Upper Horseshoe Aquifer, for a total authorized diversion of 1,441 m³/day. Of the 1,441 m³/day, the Samson First Nations are licensed to divert 1,159 m³/day for municipal purposes, of which the highest allocation of 450 m³/day is for a water supply well in 08-17-044-24 W4M. Twenty-six of the 70 authorized non-exempt water wells could be linked to a water well in the AENV groundwater database.

Between 1971 and 1995, extended aquifer tests have been conducted by Mow-Tech Ltd. for Samson First Nations with eleven water supply wells and numerous domestic water wells completed in the Upper Horseshoe Canyon Aquifer in township 044, range 24, W4M. The results of the aquifer tests have indicated long-term yields that range from less than ten to more than 3,000 m³/day.



5.3.11.3 Quality

The groundwaters from the Upper Horseshoe Canyon Aquifer are mainly a bicarbonate-to-sulfate type, with sodium as the main cation (see Piper diagram on CD-ROM). Total dissolved solids concentrations range from less than 500 to more than 1,000 mg/L (page A-54), with more than 80% of the groundwater values having TDS concentrations of less than 1,000 mg/L. The sulfate concentrations range from less than 100 to more than 500 mg/L, with 90% of the groundwater samples having sulfate concentrations of less than 500 mg/L. The chloride concentrations range from less than ten to more than 100 mg/L, with 85% of the groundwater samples having chloride concentrations of less than 50 mg/L. One hundred seventy-one (55%) of the 309 fluoride analyses for water wells completed in the Upper Horseshoe Canyon Aquifer exceed the MAC of 1.5 mg/L; 150 of the 171 analyses are from water wells that were part of a field-verified water well survey conducted by Mow-Tech Ltd.²³ in July and August 2002 within the Samson First Nations land (see CD-ROM).

A chemical analysis of a groundwater sample collected during the aquifer test with a water supply well in 08-17-044-24 W4M in October 1995 indicated the groundwater is a sodium-bicarbonate type, with a TDS concentration of 826 mg/L, a sulfate concentration of 66 mg/L, a chloride concentration of 25 mg/L, and a fluoride concentration of 0.64 mg/L (HCL, Revised Mar-1996).

Of the five constituents that have been compared to the SGCDWQ, the median values of **TDS**, **sodium** and **fluoride** exceed the guidelines. The median concentrations of all five constituents from water wells completed in the Upper Horseshoe Canyon Aquifer are greater than the median concentrations from water wells completed in all upper bedrock aquifer(s).

Constituent	No. of Analyses	Range for County in mg/L			All Bedrock Median	Recommended Maximum Concentration SGCDWQ
		Minimum	Maximum	Median		
Total Dissolved Solids	321	570	2,435	748	629	500
Sodium	302	1	762	291	239	200
Sulfate	323	0	1,210	73	52	500
Chloride	323	0	205	24	3	250
Fluoride	309	0	3	1.7	0.3	1.5

Concentration in milligrams per litre unless otherwise stated
 Note: indicated concentrations are for Aesthetic Objectives except for Fluoride, which is for Maximum Acceptable Concentration (MAC)
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 Federal-Provincial Subcommittee on Drinking Water, April 2002

Table 13. Apparent Concentrations of Constituents in Groundwaters from Upper Horseshoe Canyon Aquifer

²³ Mow-Tech Ltd. 1-800-GEO-WELL