

5.3.5 Disturbed Belt Aquifer

The Disturbed Belt Aquifer comprises the permeable parts of the Disturbed Belt, as defined for the present program. Structure contours have not been prepared for the top and bottom of the Disturbed Belt, which is the bedrock in the extreme southwestern part of the County. The regional groundwater flow direction in the Disturbed Belt Aquifer is toward the Belly River (see CD-ROM).

5.3.5.1 Depth to Top

The depth to the top of the Disturbed Belt is mainly less than 50 metres and is a reflection of the thickness of the surficial deposits.

5.3.5.2 Apparent Yield

The apparent yields for individual water wells completed through the Disturbed Belt Aquifer are mainly in the range of 10 to 100 m³/day. Also shown on the adjacent map are the locations of the 43 dry water test holes. The areas showing water wells with yields of greater than 100 m³/day are mainly associated with the edge of the Disturbed Belt.

There are 35 authorized non-exempt water wells completed through the Disturbed Belt Aquifer, for a total of 49 m³/day. Thirty-four have been for registrations and are expected to be used for stock and/or crop spraying purposes. Twenty of the 35 authorized non-exempt water wells could be linked to a water well in the AENV groundwater database.

5.3.5.3 Quality

The groundwaters from the Disturbed Belt Aquifer are mainly a sodium-bicarbonate-type (see Piper diagram on CD-ROM), with 65% of the groundwater samples having TDS concentrations of less than 1,000 mg/L (page A-33). The sulfate concentrations are mainly less than 500 mg/L. Chloride concentrations from the Disturbed Belt Aquifer are mainly less than 100 mg/L.

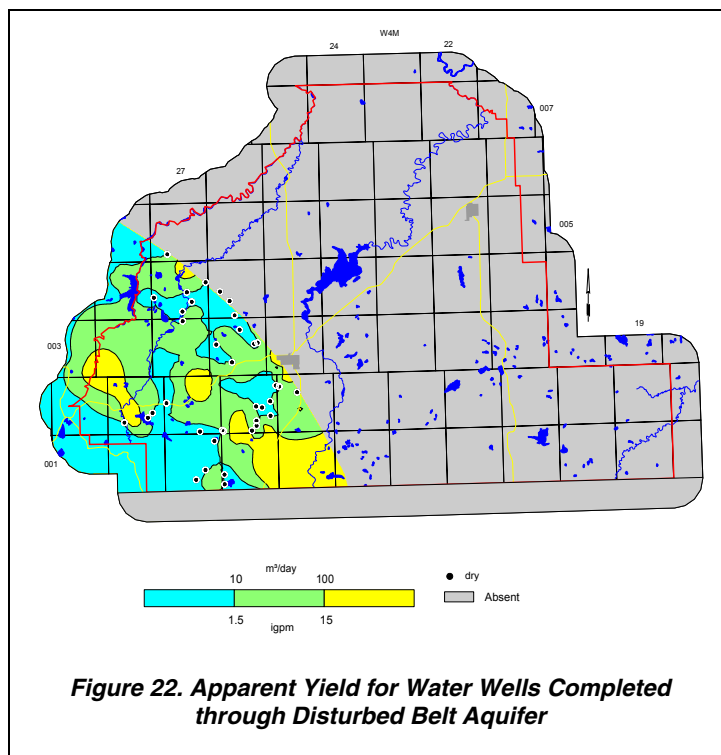


Figure 22. Apparent Yield for Water Wells Completed through Disturbed Belt Aquifer

Constituent	No. of Analyses	Range for County in mg/L			All Bedrock Median	Recommended Maximum Concentration SGCDWQ
		Minimum	Maximum	Median		
Total Dissolved Solids	133	4.2	4238	828	998	500
Sodium	109	3	820	214	265	200
Sulfate	132	0	2429	165	278	500
Chloride	133	0	175	7	10	250
Fluoride	100	0	4	0.4	0.4	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, March 2001

Table 8. Apparent Concentrations of Constituents in Groundwaters from Disturbed Belt Aquifer

The minimum, maximum and median concentrations of TDS, sodium, sulfate, chloride and fluoride in the groundwaters from water wells completed in the Disturbed Belt Aquifer in the County have been compared to the SGCDWQ and median concentrations from all upper bedrock aquifer(s) in the adjacent table. Of the five constituents that have been compared to the SGCDWQ, the median values of TDS and sodium exceed the guidelines in all upper bedrock aquifer(s) and the Disturbed Belt Aquifer. The median concentrations in the Aquifer are all below the median concentrations from water wells completed in all upper bedrock aquifer(s).

5.3.6 Upper Lacombe Aquifer (Paskapoo)

The Upper Lacombe Aquifer comprises the permeable parts of the Lower Lacombe Member, as defined for the present program. Structure contours have been prepared for the top of the Upper Lacombe Member. The structure contours show that the Upper Lacombe Member ranges in elevation from less than 1,070 to more than 1,130 metres AMSL and has a maximum thickness of 170 metres. The non-pumping water level in the Upper Lacombe Aquifer is downgradient to the northeast toward the Waterton River (see CD-ROM).

5.3.6.1 Depth to Top

The depth to the top of the Upper Lacombe Member is mainly less than 50 metres and is a reflection of the thickness of the surficial deposits (page A-34).

5.3.6.2 Apparent Yield

There are four available control points within the buffer area for individual water wells completed through the Upper Lacombe Aquifer, of which three values have an apparent yield of less than 100 m³/day.

In the County, there are no authorized non-exempt water wells completed through the Upper Lacombe.

5.3.6.3 Quality

There were sufficient data to determine the groundwater type for two water wells completed in the Upper Lacombe Aquifer. The data indicated that the groundwaters from the Upper Lacombe Aquifer are a bicarbonate type, with no dominant cation (see Piper diagram on CD-ROM).

The minimum, maximum and median concentrations of TDS, sodium, sulfate, chloride and fluoride in the groundwaters from water wells completed in the Upper Lacombe Aquifer in the County have been compared to the SGCDWQ and

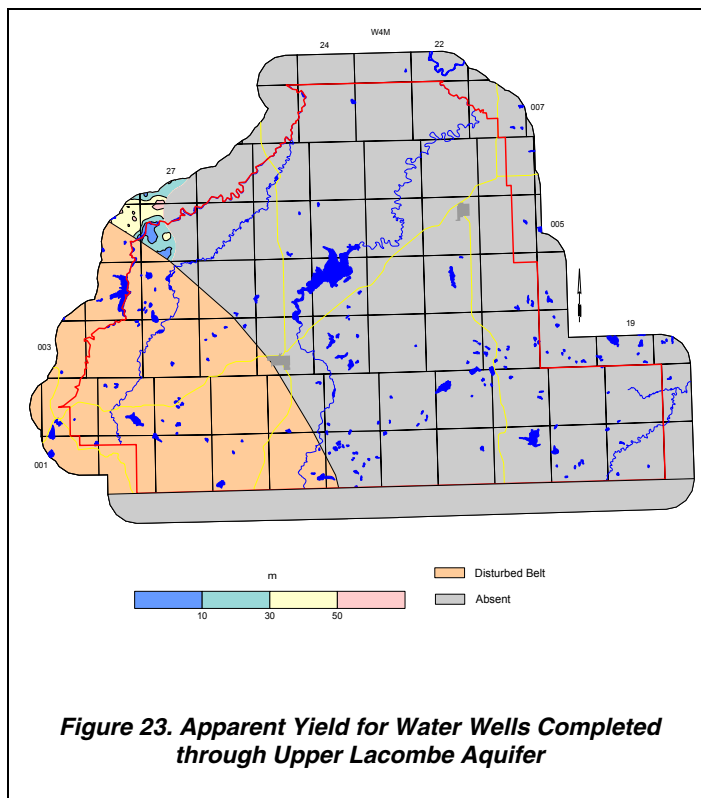


Figure 23. Apparent Yield for Water Wells Completed through Upper Lacombe Aquifer

Constituent	No. of Analyses	Range for County in mg/L			All Bedrock Median	Recommended Maximum Concentration SGCDWQ
		Minimum	Maximum	Median		
Total Dissolved Solids	4	564	1196	899	998	500
Sodium	3	91	269	225	265	200
Sulfate	4	96	253	118	278	500
Chloride	4	20	32	27	10	250
Fluoride	3	1	3	0.7	0.4	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, March 2001

Table 9. Apparent Concentrations of Constituents in Groundwaters from Upper Lacombe Aquifer

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

5.3.7 Lower Lacombe Aquifer (Paskapoo)

The Lower Lacombe Aquifer comprises the permeable parts of the Lower Lacombe Member, as defined for the present program. Structure contours have been prepared for the top of the Lower Lacombe Member. The structure contours show that the Lower Lacombe Member ranges in elevation from less than 925 to more than 1,100 metres AMSL and has a maximum thickness of 150 metres.

5.3.7.1 Depth to Top

The depth to the top of the Lower Lacombe Member ranges from less than ten metres below ground level where the Member subcrops to more than 100 metres at the western edge of the County. The greatest depth is in areas where the Upper Lacombe Member is also present (page A-37).

5.3.7.2 Apparent Yield

There is only one available apparent yield value for a water well completed through the Lower Lacombe Aquifer (see Table 6 on page 27). In addition, there are two dry water test holes that were completed in the Lower Lacombe Aquifer.

There is one registered water well completed through the Lower Lacombe Aquifer that has been authorized to divert 0.2 m³/day. This water well is in SE 05-008-21 W4M and could be linked to a specific water well in the AENV groundwater database.

5.3.7.3 Quality

There are no chemistry values available for groundwater from water wells completed through the Lower Lacombe Aquifer. There is one dry water test hole that was completed in the Haynes Aquifer.

5.3.8 Haynes Aquifer (Paskapoo)

The Haynes Aquifer comprises the permeable parts of the Haynes Member, as defined for the present program. Structure contours have been prepared for the top of the Haynes Member. The structure contours show that the Haynes Member ranges in elevation from less than 825 to more than 1,100 metres AMSL and has a maximum thickness of 50 metres.

5.3.8.1 Depth to Top

The depth to the top of the Haynes Member ranges from less than 25 metres below ground surface at the eastern extent to more than 200 metres in the western part of the County (page A-38).

5.3.8.2 Apparent Yield

There are no apparent yield values available for water wells completed through the Haynes Aquifer.

There is one registered water well completed through the Haynes Aquifer that has been authorized to divert 4.0 m³/day. This water well is in NW 30-005-26 W4M and could not be linked to a specific water well in the AENV groundwater database.

5.3.8.3 Quality

There were sufficient data to determine the groundwater type for one water well completed through the Haynes Aquifer. The data indicated that the groundwater from the water well is a sodium-bicarbonate type.

5.3.9 Upper Scollard Aquifer (Upper Part of Willow Creek)

The Upper Scollard Aquifer comprises the permeable parts of the Upper Scollard Formation that underlie the Haynes Member, and subcrops under the surficial deposits in the western quarter of the County. 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 785 to more than 1,160 metres AMSL and has a thickness of in the order of 240 metres. The non-pumping water level in the Upper Scollard Aquifer slopes north toward the Waterton and Belly rivers.

5.3.9.1 Depth to Top

The depth to the top of the Upper Scollard Formation ranges from less than ten metres below ground surface at the eastern extent to more than 250 metres in the western part of the County (page A-39).

5.3.9.2 Apparent Yield

Of the 201 dry water test holes completed in bedrock, 23 (11%) are completed in the Upper Scollard Aquifer. Without the inclusion of the 23 dry water test holes, there are equal percentages of apparent yield values in each contour interval (see Table 6 on page 27) for individual water wells completed through the Upper Scollard Aquifer. With the inclusion of the 23 dry water test holes shown on the adjacent map, the apparent yields for water wells completed in the Upper Scollard Aquifer are mainly less than ten m³/day.

In the County, there are four non-exempt water wells completed in the Upper Scollard Aquifer, authorized to divert a total of 22.2 m³/day. Of the four water wells, three are licensed for municipal purposes and the fourth is a registration. Only one authorized non-exempt water well could be linked to a water well in the AENV groundwater database.

5.3.9.3 Quality

The groundwaters from the Upper Scollard Aquifer are mainly a bicarbonate type, with no dominant cation (see Piper diagram on CD-ROM). Total dissolved solids concentrations range mainly between 500 and 2,000 mg/L (page A-41), with more than 65% of the groundwater samples having TDS concentrations of greater than 500 mg/L. The TDS concentrations of less than 500 mg/L may be a result of more active flow systems and shorter flow paths. The sulfate concentrations are mainly less than 500 mg/L. All of the chloride concentrations from the water wells completed in the Upper Scollard Aquifer are less than 100 mg/L.

Of the five constituents that have been compared to the SGCDWQ, the median values of **TDS** and **fluoride** exceed the guidelines. Only the median concentrations of fluoride 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).

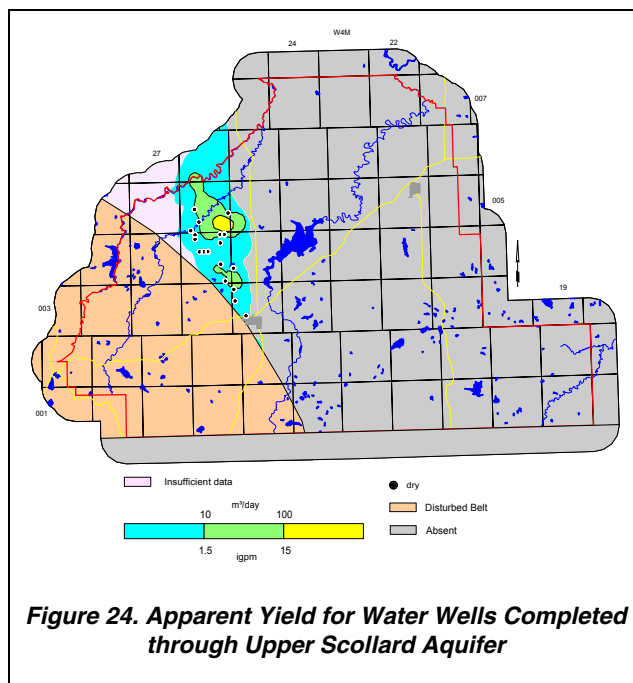


Figure 24. Apparent Yield for Water Wells Completed through Upper Scollard Aquifer

Constituent	No. of Analyses	Range for County in mg/L			All Bedrock Median	Recommended Maximum Concentration SGCDWQ
		Minimum	Maximum	Median		
Total Dissolved Solids	9	240	1677	729	998	500
Sodium	8	16	601	164	265	200
Sulfate	9	43	770	167	278	500
Chloride	9	2	35	7	10	250
Fluoride	7	0	4	2.4	0.4	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, March 2001

Table 10. Apparent Concentrations of Constituents in Groundwaters from Upper Scollard Aquifer

5.3.10 Lower Scollard Aquifer (Lower Part of Willow Creek)

The Lower Scollard Aquifer comprises the porous and permeable parts of the Lower Scollard Formation that underlie the Upper Scollard Formation, and subcrop under the surficial deposits mainly in the western third of the County. 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 625 to more than 1,275 metres AMSL and has a maximum thickness of 275 metres. The non-pumping water level in the Lower Scollard Aquifer is downgradient to the northwest toward the Waterton, Belly and St. Mary rivers.

5.3.10.1 Depth to Top

The depth to the top of the Lower Scollard Formation ranges from less than ten metres below ground surface at the eastern extent to more than 500 metres in the western part of the County (page A-42).

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, having a median apparent yield of 12.5 m³/day). Of the 201 dry water test holes completed in bedrock, 74 (38%) are completed in the Lower Scollard Aquifer.

In the County, there are 16 authorized non-exempt water wells that are completed in the Lower Scollard Aquifer, for a total authorized diversion of 49 m³/day. Four of the 16 authorized non-exempt water wells could be linked to a water well in the AENV groundwater database.

5.3.10.3 Quality

The groundwaters from the Lower Scollard Aquifer are mainly a bicarbonate-to-sulfate type, with sodium as the main cation (see Piper diagram on CD-ROM). Total dissolved solids concentrations are mainly less than 1,500 mg/L (page A-44), with more than 60% of the groundwater samples having TDS concentrations of greater than 1,000 mg/L. The sulfate concentrations are mainly less than 1,000 mg/L, with more than 73% of the groundwater samples having sulfate concentrations of less than 500 mg/L. More than 90% of the chloride concentrations from the Lower Scollard Aquifer are less than 50 mg/L.

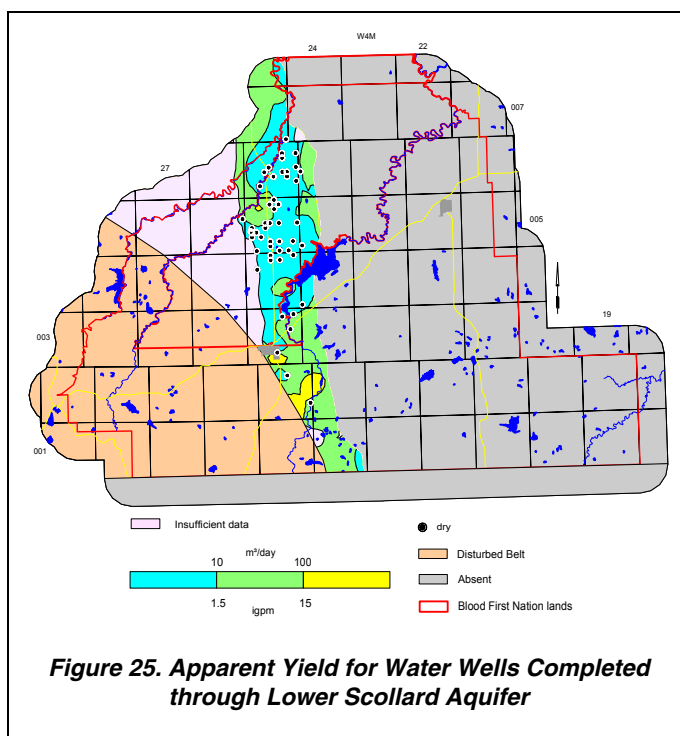


Figure 25. Apparent Yield for Water Wells Completed through Lower Scollard Aquifer

Constituent	No. of Analyses	Range for County in mg/L			All Bedrock Median	Recommended Maximum Concentration SGCDWQ
		Minimum	Maximum	Median		
Total Dissolved Solids	45	180	2433	1097	998	500
Sodium	37	14	740	308	265	200
Sulfate	45	10	1300	324	278	500
Chloride	42	0	88	14	10	250
Fluoride	34	0	3	0.6	0.4	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, March 2001

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

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, sulfate, 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).

5.3.11 Upper Horseshoe Canyon Aquifer (Upper St. Mary River)

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 western half 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 925 to more than 1,250 metres AMSL and has a thickness of up to 180 metres. The non-pumping water level in the Upper Horseshoe Canyon Aquifer is downgradient to the north toward the Waterton, Belly and St. Mary rivers.

5.3.11.1 Depth to Top

The depth to the top of the Upper Horseshoe Canyon Formation is variable, ranging from less than ten metres at the eastern extent to more than 700 metres in the western part of the County (page A-45).

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, and having a median apparent yield value of 19 m³/day. There are 25 (12%) dry water test holes completed in the Upper Horseshoe Canyon Aquifer.

In the County, there are 19 authorized non-exempt water wells completed in the Upper Horseshoe Canyon Aquifer, for a total authorized diversion of 127 m³/day; the highest single diversion of 44 m³/day is licensed for agricultural purposes. Four of the 19 authorized non-exempt water wells could be linked to a water well in the AENV groundwater database.

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 3,000 mg/L (page A-47), with more than 50% of the groundwater samples having TDS concentrations of greater than 1,000 mg/L. The sulfate concentrations range from less than 150 to more than 1,500 mg/L, with 47% of the groundwater samples having sulfate concentrations of more than 500 mg/L. Of the 49 chloride analyses available for water wells completed in the Upper Horseshoe Canyon Aquifer, only one has a chloride concentration that exceeds 50 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, sulfate, chloride and fluoride 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).

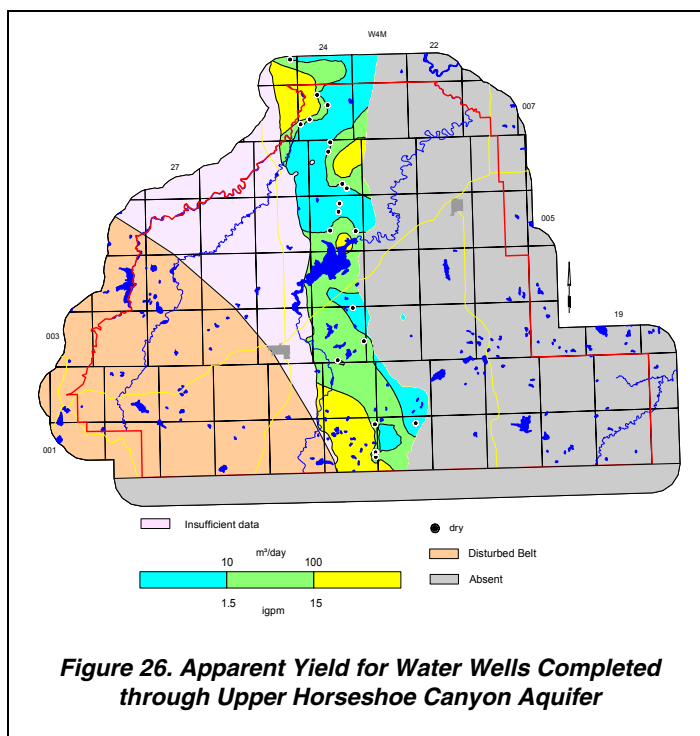


Figure 26. Apparent Yield for Water Wells Completed through Upper Horseshoe Canyon Aquifer

Constituent	No. of Analyses	Range for County in mg/L			All Bedrock Median	Recommended Maximum Concentration SGCDWQ
		Minimum	Maximum	Median		
Total Dissolved Solids	49	347	5066	1109	998	500
Sodium	35	1.3	1070	240	265	200
Sulfate	49	3	2859	385	278	500
Chloride	49	0	56	11	10	250
Fluoride	37	0	5	0.5	0.4	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, March 2001

Table 12. Apparent Concentrations of Constituents in Groundwaters from Upper Horseshoe Canyon Aquifer

5.3.12 Middle Horseshoe Canyon Aquifer (Lower St. Mary River)

The Middle Horseshoe Canyon Aquifer comprises the permeable parts of the Middle Horseshoe Formation that underlie the Upper Horseshoe Canyon Formation, and subcrop under the surficial deposits. Structure contours have been prepared for the top of the Formation, which underlies the western half of the County. The structure contours show that the Middle Horseshoe Canyon Formation ranges in elevation from less than 200 to more than 1,300 metres AMSL and has a maximum thickness of 200 metres. The non-pumping water level in the Middle Horseshoe Canyon Aquifer is downgradient to the north toward the Waterton, Belly and St. Mary rivers.

5.3.12.1 Depth to Top

The depth to the top of the Middle Horseshoe Canyon Formation is variable, ranging from less than ten metres at the eastern extent to more than 900 metres in the western part of the County (page A-48).

5.3.12.2 Apparent Yield

The apparent yields for individual water wells completed through the Middle Horseshoe Canyon Aquifer range mainly from 10 to 100 m³/day, with 57% of the values being greater than ten m³/day. There are four (2%) dry water test holes completed in the Middle Horseshoe Canyon Aquifer.

In the County, there are 20 authorized non-exempt water wells completed in the Middle Horseshoe Canyon Aquifer, for a total authorized diversion of 277 m³/day; the highest single diversion of 115 m³/day is for a water supply well in 01-01-004-24 W4M used for agricultural purposes. Five of the 20 authorized non-exempt water wells could be linked to a water well in the AENV groundwater database.

5.3.12.3 Quality

The groundwaters from the Middle Horseshoe Canyon Aquifer are mainly a sodium-bicarbonate or sulfate type (see Piper diagram on CD-ROM). Total dissolved solids concentrations range mainly between 500 and 2,000 mg/L, with only two values of TDS being less than 500 mg/L (page A-50). The sulfate concentrations are mainly less than 500 mg/L. Of the 27 chloride analyses available for the water wells completed in the Middle Horseshoe Canyon Aquifer, 26 have chloride concentrations of less than 50 mg/L.

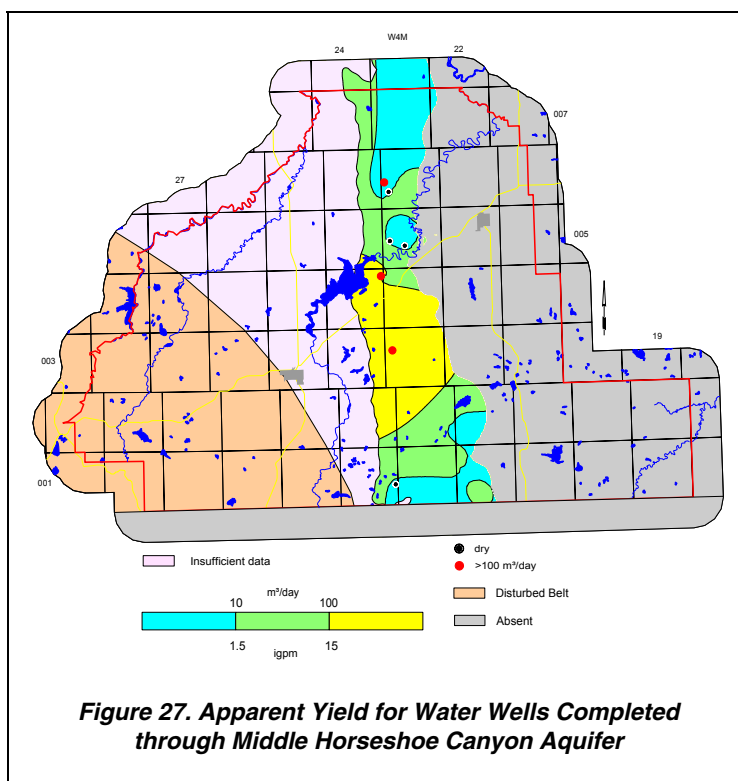


Figure 27. Apparent Yield for Water Wells Completed through Middle Horseshoe Canyon Aquifer

Constituent	No. of Analyses	Range for County in mg/L			All Bedrock Median	Maximum Concentration SGCDWQ
		Minimum	Maximum	Median		
Total Dissolved Solids	27	392	3830	1152	998	500
Sodium	19	101	623	290	265	200
Sulfate	27	54	2330	490	278	500
Chloride	27	4	78	9	10	250
Fluoride	21	0	4	0.3	0.4	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, March 2001

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

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 and sulfate from water wells completed in the Middle Horseshoe Canyon Aquifer are greater than the median concentrations from water wells completed in all upper bedrock aquifer(s).