

Lac Ste. Anne County

Parts of the North Saskatchewan and Athabasca River Basins
Parts of Tp 053 to 059, R 01 to 09, W5M
Regional Groundwater Assessment

Prepared for



In conjunction with



Agriculture and
Agri-Food Canada

Agriculture et
Agroalimentaire Canada

Prairie Farm Rehabilitation
Administration

Administration du rétablissement
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Our File No.: **97-112**

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HYDROGEOLOGICAL CONSULTANTS LTD.

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The Association of Professional Engineers,
Geologists and Geophysicists of Alberta

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- B MAPS AND FIGURES ON CD-ROM
- C GENERAL WATER WELL INFORMATION
- D MAPS AND FIGURES INCLUDED AS LARGE PLOTS

1 PROJECT OVERVIEW

“Water is the lifeblood of the earth.” - Anonymous

How a county takes care of one of its most precious resources - groundwater - reflects the future wealth and health of its people. Good environmental practices are not an accident. They must include genuine foresight with knowledgeable planning. Implementation of strong practices not only commits to a better quality of life for future generations, but creates a solid base for increased economic activity. **This report, even though it is preliminary in nature, is the first step in fulfilling a commitment by Lac Ste. Anne County toward the management of the groundwater resource, which is a key component of the well-being of the County, and is a guide for future groundwater-related projects**

1.1 About This Report

This report provides an overview of (a) the groundwater resources of Lac Ste. Anne County, (b) the processes used for the present project and (c) the groundwater characteristics in the County.

Additional technical details are available from files on the CD-ROM provided with this report. The files include the geo-referenced electronic groundwater database, grid files used to prepare the distribution of various hydrogeological parameters, the groundwater query, and ArcView files. Likewise, all of the illustrations and maps from the present report, plus additional maps, figures and cross-sections, are available on the CD-ROM. For convenience, poster-size maps and cross-sections have been prepared as a visual summary of the results presented in this report. Copies of these poster-size drawings have been forwarded with this report, and are included in Appendix D.

Appendix A features page-size copies of the figures within the report plus additional maps. An index of the page-size maps and figures is given at the beginning of Appendix A.

Appendix B provides a complete list of maps and figures included on the CD-ROM.

Appendix C includes the following:

- 1) a procedure for conducting aquifer tests with water wells;
- 2) a table of contents for the Water Well Regulation under the Environmental Protection and Enhancement Act; and
- 3) additional information.

The Water Well Regulation deals with the wellhead completion requirement (no more pits), the proper procedure for abandoning unused water wells and the correct procedure for installing a pump in a water well.

1.2 The Project

It must be noted that the present project is a regional study and as such the results are to be used only as a guide. Detailed local studies are required to verify hydrogeological conditions at given locations.

The present project is made up of five parts as follows:

- Module 1 - Data Collection and Synthesis
- Module 2 - Hydrogeological Maps
- Module 3 - Covering Report
- Module 4 - Groundwater Query
- Module 5 - Training Session

This report represents Module 3.

1.3 Purpose

This project is a regional groundwater assessment of Lac Ste. Anne County. The regional groundwater assessment provides the information to assist in the management of the groundwater resource within the County. Groundwater resource management involves determining the suitability of various areas in the County for particular activities. These activities can vary from the development of groundwater for agricultural or industrial purposes, to the siting of waste storage. **Proper management ensures protection and utilization of the groundwater resource for the maximum benefit of the people of the County.**

The regional groundwater assessment includes:

- identification of the aquifers¹ within the surficial deposits² and the upper bedrock;
- spatial definition of the main aquifers;
- quantity and quality of the groundwater associated with each aquifer;
- hydraulic relationship between aquifers; and
- identification of the first sand and gravel deposits below ground level.

Under the present program, the groundwater-related data for Lac Ste. Anne County have been assembled. Where practical, the data have been digitized. These data are then being used in the regional groundwater assessment for the County.

¹ See glossary

² See glossary

2 INTRODUCTION

2.1 Setting

Lac Ste. Anne County is situated in central Alberta. This area is part of the Alberta Plains region. The County is within the North Saskatchewan and Athabasca River basins, with the boundaries mainly following township or section lines. There are two small areas where the boundary follows the Pembina River and three areas where the boundary is a lake. The area includes some or all of townships 053 to 059, ranges 01 to 09, west of the 5th Meridian.

The ground elevation varies between 640 and 880 metres above mean sea level (AMSL). The topographic surface generally decreases toward the Pembina River and toward the northeastern part of the County.

2.2 Climate

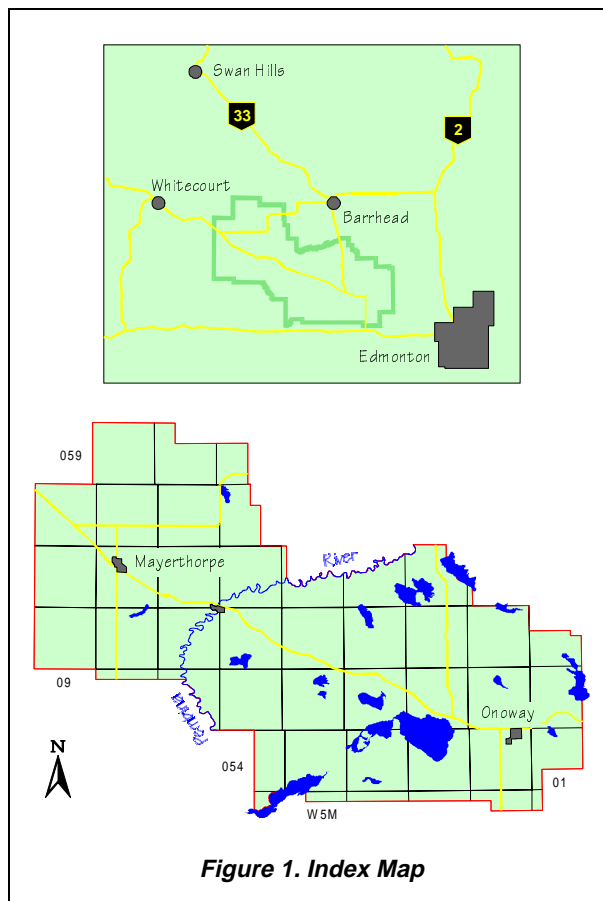
Lac Ste. Anne County lies within the Dfb climate boundary. This classification is based on potential evapotranspiration values determined using the Thornthwaite method (1957), combined with the distribution of natural ecoregions in the area. The ecoregions map shows that the County is located in both the Low Boreal Mixedwood region and Mid Boreal Mixedwood region. Increased precipitation and cooler temperatures, resulting in additional moisture availability, influence this vegetation change.

A Dfb climate consists of long, cool summers and severe winters. The mean monthly temperature drops below -3°C in the coolest month, and exceeds 10°C in the warmest month.

The mean annual precipitation averaged from two meteorological stations within the County measured 522 millimetres (mm), based on data from 1963 to 1993. The mean annual temperature averaged 2.7°C , with the mean monthly temperature reaching a high of 16.0°C in July, and dropping to a low of -12.6°C in January. The calculated annual potential evapotranspiration is 515 millimetres.

2.3 Background Information

There are currently records for 5,399 water wells in the groundwater database for Lac Ste. Anne County. Of the 5,399 water wells, 5,013 are for domestic/stock purposes. The remaining 386 water wells were completed for a variety of uses, including municipal, observation and industrial purposes. Based on a rural population of 8,059, there are 2.7 domestic/stock water wells per family of four. The domestic or



stock water wells vary in depth from less than 3 metres to 305 metres below ground level. Lithologic details are available for 3,875 water wells.

Data for casing diameters are available for 3,612 water wells, with 87 indicated as having a diameter of more than 250 mm and 3,525 having a diameter of less than 250 mm. The casing diameters of greater than 250 mm are mainly bored water wells and those with a surface casing diameter of less than 250 mm are for drilled water wells.

There are five different materials that have been used for surface casing over the last 40 years in water wells completed in the County. The three most common materials are galvanized steel, steel and plastic. Steel casing was in use in the 1950s and is still used in 54% of the water wells being drilled in the County. Galvanized steel surface casing was used in 20% of the new water wells in the mid-1950s. By the mid-1970s, galvanized steel casing was being used in more than 70% of the water wells. From 1975 onward, there was a general decrease in the percentage of water wells using galvanized steel, with the last reported use in October 1994. Plastic casing was used for the first time in August 1972. The percentage of water wells with plastic casing has increased and in the mid-1990s, plastic casing was used in 46% of the water wells drilled in the County.

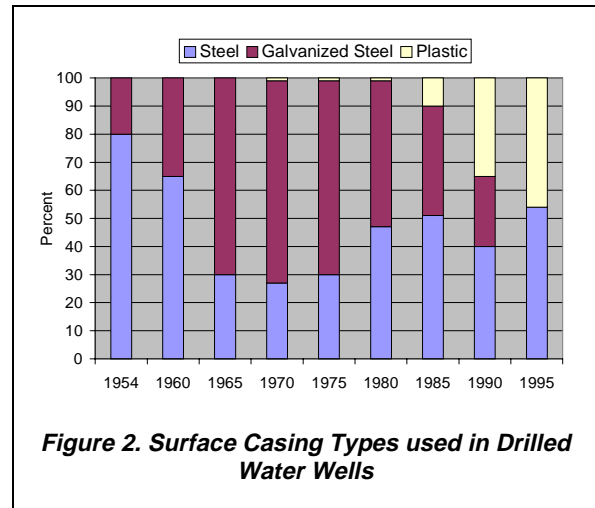


Figure 2. Surface Casing Types used in Drilled Water Wells

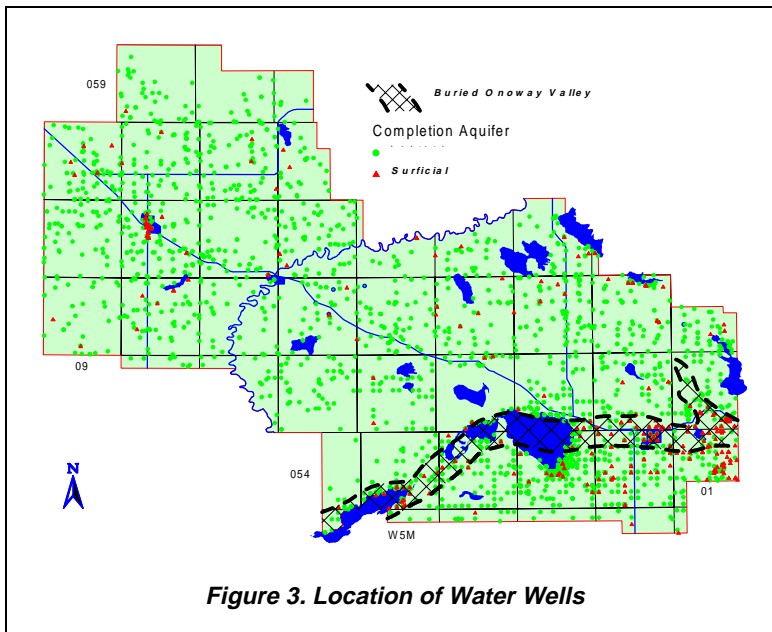


Figure 3. Location of Water Wells

There are 3,404 water well records with sufficient information to identify the aquifer in which the water wells are completed. The water wells that were not drilled deep enough to encounter the bedrock plus water wells that have the bottom of their completion interval above the bedrock surface are water wells completed in surficial aquifers. The number of water wells completed in aquifers in the surficial deposits is less than 9%, a total of 302 water wells. Seventy percent of the surficial water wells are completed in the Buried Onoway Valley or within 3.5 kilometres to the south.

The remaining 3,102 water wells have the top of their completion interval deeper than the depth to the bedrock surface. From the above map, it can be seen that water wells completed in the surficial aquifers occur mainly in the southeastern part of the County and water wells completed in the bedrock aquifers occur over most of the County.