



Status Report on Enhanced
Groundwater Protection Efforts Under
*Directive 044: Requirements for the
Surveillance, Sampling, and Analysis of
Water Production in Oil and Gas Wells
Completed Above the Base of
Groundwater Protection (BGWP)*

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ENERGY RESOURCES CONSERVATION BOARD

Report 2009-B: Status Report on Enhanced Groundwater Protection Efforts Under *Directive 044: Requirements for the Surveillance, Sampling, and Analysis of Water Production in Oil and Gas Wells Completed Above the Base of Groundwater Protection (BGWP)*

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1 Introduction

This status report summarizes the results of increased surveillance by the Energy Resources Conservation Board (ERCB) of energy development activity where there is associated water production occurring above the base of groundwater protection (BGWP)¹ in Alberta, as outlined in *Directive 044: Requirements for the Surveillance, Sampling, and Analysis of Water Production in Oil and Gas Wells Completed Above the Base of Groundwater Protection*. Section 4 of this report presents the findings on spatial distribution and volumes of non-saline water produced in conjunction with oil and gas production for the reporting period November 2006 to the end of 2008.

2 Background

On October 31, 2006, the ERCB issued *Directive 044*, which established a process for the identification and review of all oil and gas wells with perforations above the BGWP that produce 5 cubic metres (m³) or greater of water per month. This volume amount is a trigger used to identify wells producing water from above the base of groundwater protection. The objective of *Directive 044* is to enhance the protection of groundwater through

- increased surveillance of water produced from wells with perforations above the BGWP,
- collection of water chemistry data from wells with producing intervals above the BGWP, and
- taking appropriate regulatory actions, such as requiring a diversion application approval from AENV for non-saline water production from coal zones or ensuring adequate segregation or abandonment of water producing zones within the wellbore to avoid groundwater cross-flow.

The ERCB's produced-water surveillance results are shared and discussed with AENV on an ongoing basis. This information is used by both the ERCB and AENV to better understand the water being produced in conjunction with oil and gas in Alberta. Water chemistry data, collected in accordance with *Directive 044*, are being incorporated into an internal ERCB database and will be posted on the ERCB Web site at a later date.

3 *Directive 044* Review Process—Overview

Industry is required to report all produced fluid volumes to the ERCB via the Petroleum Registry of Alberta. The ERCB uses this information to identify wells with perforations above the BGWP producing water volumes of 5 m³ or greater per month.

3.1 Licensee Requirements

Licensees that have wells perforated above the BGWP are required to

- conduct internal monthly audits in order to identify wells that exceed the water production limit of 5 m³ or greater per month;
- self-disclose each well identified through monthly audits to the ERCB within the timeframes set out in *Directive 044*; and

¹ Alberta Environment (AENV) defines saline groundwater as having greater than 4000 milligrams per litre total dissolved solids. The BGWP is the depth at which saline groundwater is likely to occur. It is calculated as the base of the deepest protected (non-saline groundwater bearing) formation plus a 15 m buffer. BGWP information is available through the Digital Data Submission (DDS) system page on the ERCB Web site www.ercb.ca under Industry Zone : Data Submission and Reporting. A login ID is not required to retrieve this information.

- for each well that is self-disclosed, submit the following to the ERCB within 30 days of the self-disclosure:
 - representative water chemistry analyses of each water producing interval identified above the BGWP (a producing interval is defined as a perforated interval separated from an adjacent perforated interval by more than 2 m),
 - a mitigation plan showing appropriate wellbore segregation of perforated intervals (to avoid cross-flow of saline and non-saline water and/or avoid cross-flow between different non-saline intervals), and
 - in the event that there is production of non-saline water in coalbed methane (CBM) wells, proof of a water diversion licence issued by AENV or an application for a water diversion licence under the *Water Act*.

While AENV requires diversion permits only for CBM wells producing water above the BGWP, both AENV and the ERCB encourage industry to consider the beneficial use of all produced non-saline water. Applications for alternative water management options to deep well disposal may be submitted to the ERCB's Waste and Storage Section.

3.2 ERCB Surveillance Process

Each month, the ERCB identifies all oil and gas wells with perforations above the BGWP that produce 5 m³ or greater of water per month.

- For licensees that provide prior notification (self-disclosure) to the ERCB for wells identified through the surveillance process, the ERCB reviews their submissions and provides feedback. Licensees of self-disclosed wells will not receive enforcement action if they adhere to all *Directive 044* requirements.
- If a licensee doesn't provide a self-disclosure for a well identified through the surveillance process, the ERCB issues a High Risk enforcement action. This enforcement is for non-submission of data and does not necessarily indicate that large volumes of non-saline water or cross-flow issues are present. Details of all enforcement actions can be found in *ST108: ERCB Monthly Enforcement Action Summary* under the Groundwater Protection compliance category.

4 Surveillance Findings

4.1 For the reviews completed from November 2006 to the end of 2008

- There was no reported non-saline water production in association with coal zones above the threshold volume of 5 m³ per month.
- All identified non-saline water production above the threshold was from sandstone reservoirs.
- Of the 2057 wells found to be completed above the BGWP, a total of 113 wells were confirmed to be producing 5 m³ or greater of non-saline water from sandstone units above the BGWP, of which
 - 52 wells had single completion intervals, thus cross-flow was not an issue,
 - 58 wells were already segregated prior to ERCB review, thus no cross-flow was occurring,
 - 2 wells were subsequently abandoned since they were deemed uneconomic, and

- 1 well had several perforated intervals (above and below the BGWP) that were segregated after ERCB review to prevent possible cross-flow.
- With respect to the production volumes for the 113 wells,
 - 76 wells produced less than 30 m³ water per month,
 - 21 wells produced between 30 and 100 m³ water per month, and
 - 16 wells produced over 100 m³ water per month.

The above findings illustrate that of the few wells that produced non-saline water, very few produced greater than 100 m³ a month.

- The wells producing non-saline water were predominantly located in the east-central and northeast areas of the province. See Figure 1.
- A total of 243 reporting errors for small volumes were identified and are currently being addressed by the licensees. For example, some wells were swabbed once every 6 months, and the cumulative volume, which exceeded 5 m³, was recorded as a one-month volume when the actual monthly volume was below the 5 m³ criteria threshold.

4.2 For the Operating Year 2008

- The annual volume of non-saline water was 72 436.4 m³, which constitutes 0.03 per cent of the 249 505 590 m³ total water produced in Alberta in 2008 in conjunction with oil and gas production (excluding projects such as enhanced oil recovery and thermal oil sands that recycle produced water

4.3 Conclusions

One of the main aims of the *Directive 044* surveillance was to ensure that cross-flow of water of different qualities was not occurring in wellbores with more than one perforation above the BGWP. The results presented in Section 4.1 revealed that only one well required segregation of perforations as industry had undertaken to segregate all other wells where cross-flow could be an issue.

The results in Sections 4.1 and 4.2 indicated that a small volume of non-saline water was produced by oil and gas wells and that most of this water came from single-zone completions in sandstone reservoirs.

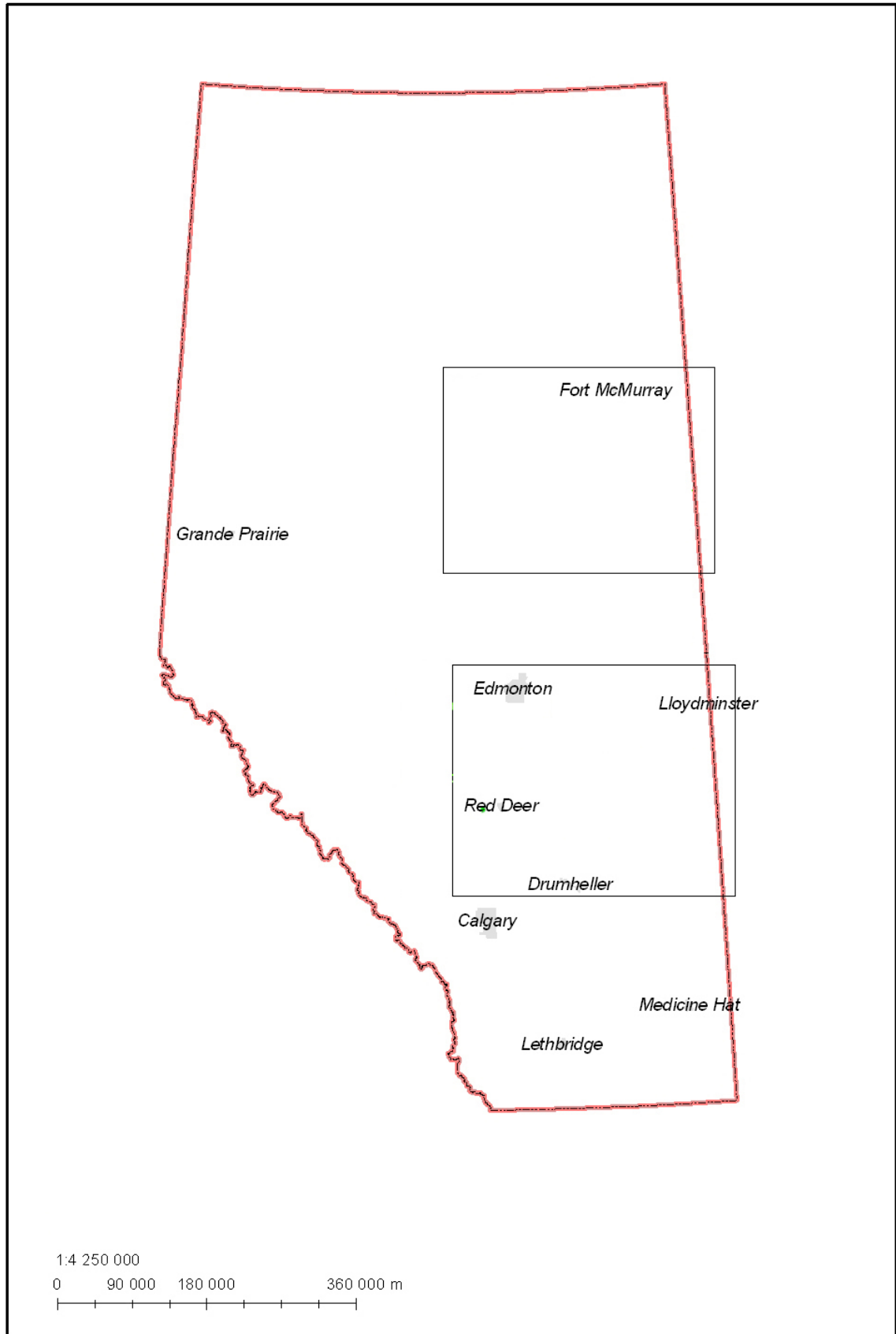


Figure 1. Predominant areas of non-saline water production from sandstone reservoirs identified through *Directive 044*