

ALBERTA ENVIRONMENT
GUIDE TO
**Groundwater
Authorization**

MARCH 2011



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Introduction

In Alberta, water is owned by the Crown and its use is regulated by Alberta Environment (AENV) under the *Water Act*. The general procedure to obtain the authorization under the *Water Act* to divert water is described in the *Guidelines for Licensing Water Diversion Projects* <http://environment.alberta.ca/03222.html>. The goal of this updated *Guide to Groundwater Authorization* is to clarify the process applicants must follow when applying to divert groundwater, by

- (a) listing the administrative and technical requirements that need to be met to obtain authorization to divert groundwater,
- (b) directing applicants to a monitoring and reporting system where they can report the results of conditions attached to their authorization,
- (c) clarifying the distinction between replacement wells and supplementary wells,
- (d) providing water well users with a hotline number to report complaints related to their water wells, and
- (e) directing applicants seeking to disturb groundwater for an activity with specific authorization requirements to the appropriate policy.

Regulatory Framework

1.1 Authorizations

The authorization to divert and use groundwater is regulated by issuing a licence. An approval regulates disturbances or activities in groundwater, where no use of the water is intended.

1.1.1 Approval


An approval is issued for activities that disturb groundwater, such as aggregate mining, construction, or groundwater remediation, where the water disturbed is not needed for any use. An approval does not assign the holder a priority in time relative to other users. The approval identifies the holder's name, address, and legal land location; the conditions under which the disturbance can take place; and the expiry date.

1.1.2 Licence

A licence allows the diversion and use of water. The licence provides a right in time (priority) to divert an authorized amount of water for specific purposes such as agricultural, commercial, industrial, municipal, irrigation, and recreational uses. The licence identifies the holder's name, address, legal land location, and priority number based on the date a completed application was received; the maximum quantity of water the holder may divert annually; the maximum pumping rate; the expiry date; and the conditions under which the diversion can take place.

1.1.3 Temporary Diversion Licence (TDL)

A TDL authorizes the diversion and use of water for a period of one year or less. No priority is assigned to the TDL, and public notice may be required. To apply for a TDL, the applicant is required to complete and submit all applicable forms. A copy of all water well drilling reports

related to the well(s) must be included with the application, and provide the length of time the TDL is required. A copy of a TDL application form is included in Appendix 1, or can be found at http://environment.alberta.ca/documents/TDL_Application_Form.pdf. 

1.2 Process

The *Guide to Groundwater Authorization* applies to non-saline groundwater. Diversions of saline groundwater are currently exempt from requiring a licence. Section 1(1)(B)(z) of the *Water (Ministerial) Regulation* defines saline groundwater.

The diversion and use, for any purpose, of non-saline groundwater must be licenced. For disturbances or other activities where the water is not intended to be used, proponents must apply for an approval.

The licensing application process aims to

- (a) provide confidence in a sustainable supply of water for the applicant's needs;
- (b) protect the aquifer from overdevelopment;
- (c) protect the water supplies of household users, registration for a traditional agricultural users, and prior licence holders; and
- (d) foster beneficial use of the resource, prevent speculation in water, and protect the environment.

In general, the application process consists of six main steps (Figure 1.0):

1. submission of application to AENV,
2. review of application for administrative completeness,
3. public notice,
4. review for technical completeness,
5. director decision, and
6. appeal process.

The application process may vary from the general procedure described above, depending on the scale and the purpose of the diversion. For instance, applications for a TDL may or may not require public notices. The six steps are detailed in the following sections and graphically presented in the diagram at right.

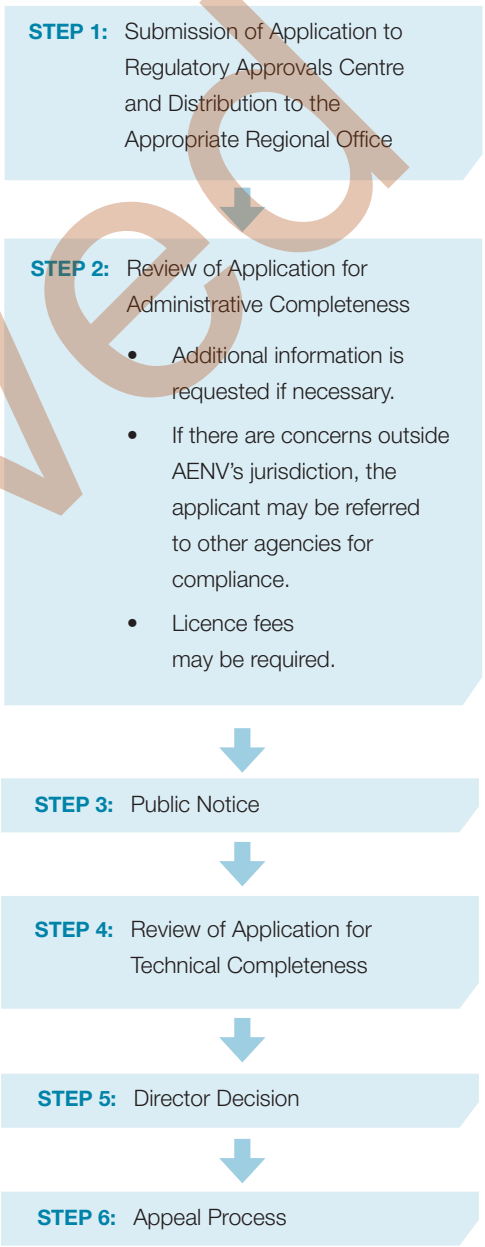
1.2.1 Application Submitted to AENV


The application process begins when a completed and signed application form, together with supporting information, is received by the Regulatory Approvals Centre (RAC). The amount of supporting information required varies with the scale and the purpose of the groundwater diversion. The application form can be downloaded from AENV's website at <http://www.environment.alberta.ca/documents/WAApplication.pdf>. A hard copy of the application form is provided in Appendix 1 of this document. A map of AENV district offices is provided in Appendix 7 (back cover).

1.2.2 Application Reviewed for Administrative Completeness

Once the application is received by the RAC and distributed to the appropriate regional office, an administrative review of the application is completed. AENV verifies that all required information is included with the application form and informs the applicant if a public notice of the application is required. If the submitted application is deficient (information missing), the applicant is notified of the deficiency, and the application process is put on hold until the deficient information is provided. For the purpose of a confined feeding operation (CFO), the applicant may choose to use the one-window provincial application process for CFOs administered by the Natural Resources Conservation Board or to apply directly to AENV.

FIGURE 1.0 APPLICATION PROCESS



For more information on CFOs, please visit  <http://www.nrcb.gov.ab.ca/Downloads/documentloader.ashx?id=11581>.

1.2.3 Public Notice

Upon submission of an administratively complete application, a public notice of application may be required, as set out in the legislation. This provides an opportunity for directly affected parties to submit statements of concern (SOCs) within a period specified in the public notice.

The applicant or applicant's representative is required to respond, in writing, to directly affected SOC filers. A copy of all correspondence must be filed with AENV. All parties submitting a SOC and who are considered to be directly affected will have their statements considered prior to issuance of an authorization. SOCs must be submitted within 7 days of the public notice for an approval and 30 days for a licence. However, the Director may specify a longer period for submission of SOCs. All SOCs are referred to the applicant or representative.

1.2.4 Review for Technical Completeness

Following the period for the submission of SOCs and after the applicant has responded to any concerns to the satisfaction of the Department, AENV proceeds to the technical review of the application. At this stage, AENV determines if the requested diversion amount is justified. AENV reviews applicable technical to ensure that the requested quantity of water can be diverted from the aquifer without adversely affecting existing household, registered, and licensed water users. If the application is

technically deficient, the applicant is notified of the deficiencies, and the application process is put on hold until the deficiencies are addressed to the satisfaction of AENV.

1.2.5 Director's Decision

Upon technical review of the application, the Director makes a decision on the application.

1.2.6 Appeal Process

Following the Director's decision, the applicant and directly affected SOC filers are sent a notice of decision. They may appeal the decision made by the Director to the Environmental Appeal Board.

1.2.7 Licence Fee

Licence applications may be subject to a fee as defined in Section 168 of the *Water Act*.

1.2.8 Unit System

Supporting measurements and calculations submitted with an application must use the metric system of measurement.

Authorization Requirements

The applicant must submit to the RAC a completed and signed application form and supporting documents justifying the need for the diversion and the capability of the aquifer to sustain the quantity of water required without adversely affecting existing household, registered, and licensed water users. The supporting documents consist of a report, as outlined in Section 2.2.

2.1 The Application Form

The application form is generic and can be used for licences, approvals, amendments, and cancellations for both groundwater and surface water diversions. The application form is provided in Appendix 1. PDF copies can be downloaded from AENV's website at <http://www.environment.alberta.ca/documents/WAApplication.pdf>. The following information must be included on the form:

- (a) applicant's name, address, and telephone number;
- (b) legal land location of the proposed diversion site(s), surface elevation and GPS coordinates of the diversion source (well or spring), street address, and lot block plan if available;
- (c) purpose for groundwater use (agricultural, oilfield injection, municipal, etc.);

- (d) water-bearing interval identified by a drilling report or a professional consultant's report;
- (e) yearly water requirement (indicate if seasonal use);
- (f) maximum pumping rate (instantaneous rate); and
- (g) consultant's name, if one is contracted to conduct testing and evaluations.

Note: For applications related to agriculture (livestock watering), Appendix 2 provides a calculation sheet for determining animal water requirements.

2.2 The Report

The applicant is responsible for submitting supporting information in a groundwater evaluation report together with a completed and signed application form. The report must be prepared by a qualified groundwater specialist who is a member of the Association of Professional Engineers, Geologists, and Geophysicists of Alberta (APEGGA). Under certain circumstances, such as a water requirement less than 3650 m³/year (10 m³/day) or a TDL, the applicant may not be required to provide a detailed hydrogeological assessment report prepared by a member of APEGGA.

If a requirement for water from an aquifer for any licensable purpose is less than 3650 m³/year, the applicant may complete and submit all applicable forms and include a copy of all water well drillers' reports related to the relevant well(s).

2.2.1 Regional Context

The regional context presents the setting of the proposed diversion site. It describes the landscape, surficial geology, and bedrock geology. The description should include the main surface water settings (major rivers, lakes, wetlands), known hydrostratigraphic units and their characteristics, such as the groundwater flow pattern, typical ranges of hydraulic conductivities, storativities/specific storage, hydraulic head, hydraulic gradients, and an overall discussion on the regional groundwater quality.

2.2.2 Local Context

The local context depicts the setting at the proposed diversion site and its immediate vicinity. In addition to the proposed site's water well driller's report, information on the local geology in the vicinity of the proposed site may be found in the Alberta Water Well Information Database at <http://www.envinfo.gov.ab.ca/GroundWater/>. The local context provides an overview of the areal extent and variability of the aquifer unit(s), and the water use trend. Cross sections and maps should be included to show the water elevation range, and the possible hydraulic relationships among the source aquifer, other aquifer units in which surrounding wells are completed, and nearby surface water bodies.

2.2.3 Well Completion Details

Water wells must be completed in accordance with the construction requirements specified in Part 7 of the *Water Act (Ministerial) Regulation* (http://www.qp.alberta.ca/574.cfm?page=1998_205.cfm&leg_type=Regs&isbncln=9780779738946). Drilling reports (originals or printouts from the Alberta Water Well Information Database) (<http://www.envinfo.gov.ab.ca/GroundWater/>) on wells for which the

groundwater diversion is requested, signed by a certified driller, must be provided. Additionally, a drawing of the well construction details showing the water production zone(s) is required.

2.2.4 Multiple Aquifer Completion Wells

Well construction requirements are provided in the *Water (Ministerial) Regulation*. Section 47 (g) prohibits the construction of a well in a manner that will result in multiple aquifer completion. (Figure 2.0)

2.2.5 Groundwater under the Direct Influence of Surface Water (GWUDI)

In Alberta, water quality is protected under the *Environmental Protection and Enhancement Act (EPEA)*. Waterworks systems using "high-quality groundwater" must not be under the direct influence of surface water. High-quality groundwater is defined in the *Potable Water Regulation, Alberta Regulation 277/2003* (http://www.qp.alberta.ca/570.cfm?frm_isbn=0779723023&search_by=link). Groundwater sources that are determined to be GWUDI require treatment equivalent to that required for surface water sources as specified in Section 1.2.1 of the *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems*.

The protocol for determining whether a source is GWUDI or non-GWUDI can be found at <http://environment.gov.ab.ca/info/library/6979.pdf>.

2.2.6 Field-Verified Survey

The radius of the field-verified survey is 1.6 km or more depending on the geological and hydrogeological conditions, the quantity of groundwater required by the proposed project,

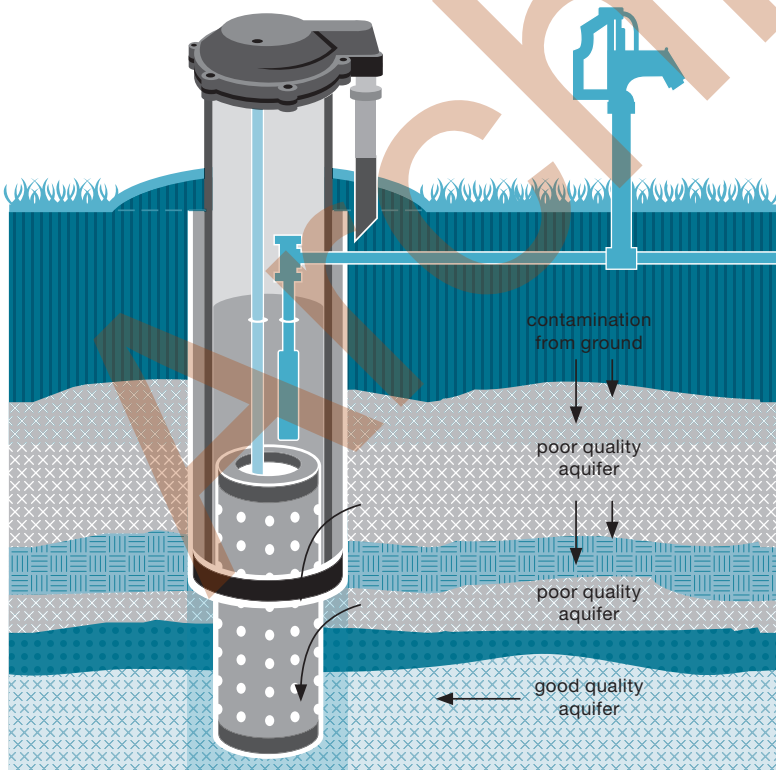
and the number of water users in the area. If it is not possible to contact landowner(s) in person during the survey, it is recommended that an explanatory letter be left for those who were not contacted in person. Details of efforts to contact landowners must be documented in the report supporting the application.

At a minimum, the field-verified survey shall consist of

- (a) plan(s) showing the ownership and locations of all currently used water wells, springs, and/or dugouts within a minimum 1.6 km radius of the project site; and
- (b) a table containing (insofar as possible)

- (i) owners'/lessees' names,
- (ii) legal land location of the groundwater source (if the groundwater source is a well or a spring, then also provide the surface elevation and GPS coordinates),
- (iii) type of water source (e.g., wells, springs, dugouts, etc.),
- (iv) well status (e.g., producing, standby, observation, abandoned, etc.),
- (v) well depth,
- (vi) original non-pumping water level including date and current non-pumping water level,
- (vii) well completion details including completion interval (open hole, perforated, or screened),
- (viii) depth to the top of the water-producing zone and the amount of available head,
- (ix) maximum pumping rate and current usage,
- (x) purpose of use (e.g., household, livestock, industrial, etc.) and current water daily/annual requirements,
- (xi) distance of well(s) from the proposed groundwater usage site, and
- (xii) summary of historical groundwater quality analyses, if available.

FIGURE 2.0 EXAMPLE OF MULTIPLE AQUIFER COMPLETION



The field survey provides the opportunity for the applicant to inform his or her neighbours and take note of any concerns that may be addressed in the report supporting the application. When the potential for conflict exists, the applicant and potentially affected neighbours may reach an agreement at this stage. A field-verified survey table form is included in Appendix 3.

2.2.7 Pumping Test

The aquifer test(s) shall be conducted on the proposed production well(s) to determine the hydraulic properties of the aquifer, to help assess potential groundwater boundary conditions, and to determine the long-term sustainable yield of the aquifer in the vicinity of the well. The selection of the aquifer test method is to be based on the hydrogeology of the proposed test site, as identified in Section 2.2.2.

During the aquifer test, the proponent shall

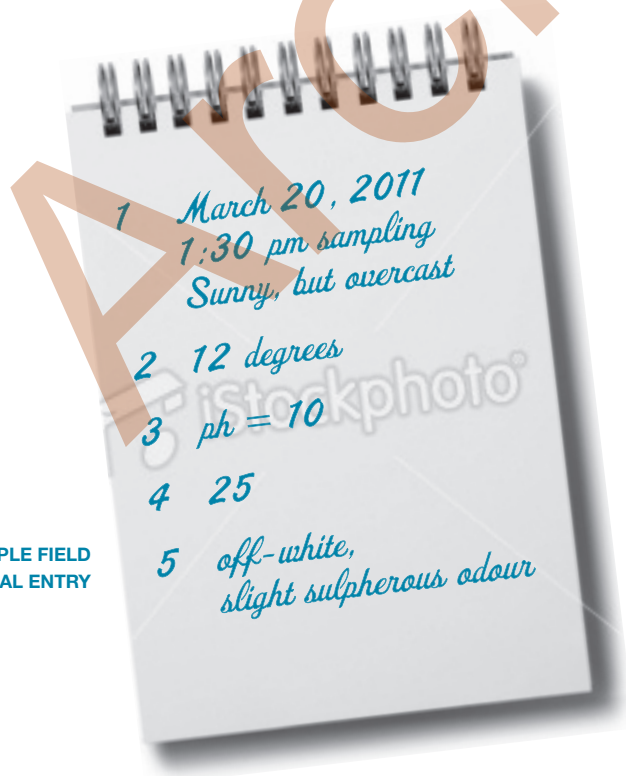
- (a) obtain water samples to be analyzed as described in Section 2.2.10;
- (b) record field parameters, including
 - (i) date and time of sampling and a brief description of the weather conditions,
 - (ii) water temperature,
 - (iii) pH,
 - (iv) electrical conductivity, and
 - (v) colour and odour, if any;
- (c) test at a discharge rate not less than the anticipated maximum production rate;
- (d) limit variation in pump rate to $\pm 5\%$ of the desired test rate;
- (e) continue the pumping long enough to identify any limiting boundary conditions (refer to Appendix 6 for recommended minimum pump test durations);
- (f) take recovery measurements for at least as long as the proposed production well(s) is pumped, or until the water level has recovered at least within 90% of the pre-test non-pumping water level, whichever comes first;
- (g) not deposit any harmful substance at the test site or in any water body receiving discharge; and
- (h) not discharge groundwater to the land surface where it may adversely affect soils or vegetation or cause any other environmental damage. Not following this step could result in prosecution.

2.2.8 Water Level Monitoring Frequency

Water levels measured in the production well(s) and observation wells shall be recorded to the nearest 1 cm during the pumping and recovery phases of the aquifer test. The monitoring frequency and the accuracy of the water level measurements must be adequate to determine aquifer parameters.

After cessation of pumping, the water level must also be measured while the well “recovers” after the pumping period. Monitoring frequency during the recovery period should be similar to the frequency during the pumping period and recorded for at least the same length of time as the well was pumped or until the water level has recovered at least within 90% of the pre-test non-pumping water level, whichever comes first. Continued monitoring of recovery beyond this time may allow more reliable estimates of long-term sustainable yield and is recommended.

EXAMPLE FIELD
JOURNAL ENTRY



A water level monitoring frequency of 1 minute is recommended when using data loggers. For manual water level reading, the following is recommended as an example of appropriate monitoring frequency:

| RECOMMENDED MANUAL GROUNDWATER LEVEL READING FREQUENCY | |
|---|-----------------------------|
| Time After Pumping Started/Stopped | Monitoring Frequency |
| 0–10 minutes | Every minute |
| 10–30 minutes | Every 5 minutes |
| 30–100 minutes | Every 35 minutes |
| 100 minutes–12 hours | Every hour |
| 12 hours–24 hours | Every 2 hours |
| 24 hours–35 hours | Every 4 hours |
| 36 hours–48 hours | Every 6 hours |
| 48 hours–72 hours | Every 8 hours |
| After 72 hours | Every 12 hours |

2.2.9 Observation Wells

The requirement for monitoring water level at observation wells during an aquifer test depends on the groundwater diversion amount and the anticipated discharge. Appendix 4 includes observation well requirements during pumping tests, according to the anticipated pumping rate.

When required, an observation well(s) should be installed at a suggested distance of between 15 m and 150 m from the proposed production well, or at least three times the aquifer thickness. The offset distance will also depend upon the aquifer type (e.g., confined, semi-confined, unconfined), intended pumping rate, anticipated drawdown based on the drilling reports, or any policy/regulation specifying other requirements. Therefore, other distances may be considered depending on site-specific conditions.

Observation well(s) should be completed in the same aquifer as the proposed production well and any other aquifer or aquitard if required.

In the absence of a dedicated observation well, it may also be advisable to monitor household or licensed groundwater diversion and/or observation wells in other aquifers. Depending on the geological and hydrogeological conditions and the proposed groundwater withdrawal rate at the diversion site(s), the Director may require the installation of additional observation wells for monitoring purposes.

Water levels in the observation well(s) should be monitored on a schedule similar to the monitoring of levels in the pumped well.

2.2.10 Groundwater Quality Assessment

Water quality assessment is required when submitting an application for a licence or an approval. The assessment is needed to assess the suitability of the water for its intended use. It also provides a benchmark against which the future water quality may be compared. In most cases, the analysis of a water sample collected from the proposed production well must be analyzed for a suite of parameters referred to as Routine Analysis. Detailed Analysis is required for municipal systems. A list of parameters included in the Routine and Detailed water analyses is provided below (Table 1.0). Depending on the intended use of the groundwater, additional parameter analyses may also be requested by the Director if necessary. The Federal-Provincial-Territorial Committee on Drinking Water establishes the *Guidelines for Canadian Drinking Water Quality* (GCDWQ). The GCDWQ



can be found at http://www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/water-eau/2010-sum_guide-res_recom_sum_guide-res_recom-eng.pdf.

Additionally, in Alberta, groundwater quality guidelines exist for

- (a) aquatic life, which set the groundwater quality acceptable for discharge in a surface water body hosting aquatic life;
- (b) livestock watering, which set the groundwater quality acceptable for livestock watering;
- (c) wildlife watering, which set the groundwater quality acceptable for discharge into a surface water body from which wildlife may drink;
- (d) irrigation, which set the groundwater quality acceptable for irrigation; and
- (e) eco soil contact, which describe the groundwater quality acceptable for discharge in areas of shallow groundwater hosting terrestrial plants and soil invertebrates.

These guidelines are summarized in the *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* and can be found at <http://environment.gov.ab.ca/info/library/7751.pdf>.

TABLE 1.0 LIST OF PARAMETERS FOR GROUNDWATER QUALITY ANALYSIS

| Routine Analysis | | Detailed Analysis | | Bacteriological Analysis |
|--|-----------------------------|---------------------------------|--|------------------------------|
| Bicarbonate (HCO ₃) | Sulphate (SO ₄) | Arsenic (As) | Nitrite + Nitrate (NO ₂ + NO ₃) | E. coli (CFU/100 mL) |
| Calcium (Ca) | Temperature | Bicarbonate (HCO ₃) | Nitrogen-Ammonia (NH ₃) | Coliforms–Total (CFU/100 mL) |
| Carbonate (CO ₃) | Total Dissolved Solids | Calcium (Ca) | Total Kjeldahl Nitrogen (TKN) | |
| Chloride (Cl) | Total Alkalinity | Carbonate (CO ₃) | pH | |
| Electrical Conductivity | Total Hardness | Chloride (Cl) | Phosphorus (P) | |
| Fluoride (F) | | Colour (TCU) | Potassium (K) | |
| Iron (Fe) | | Copper (Cu) | Sodium (Na) | |
| Magnesium (Mg) | | Fluoride (F) | Sulphate (SO ₄) | |
| Manganese (Mn) | | Iron (Fe) | Sulphide (H ₂ S) | |
| Nitrite + Nitrate (NO ₂ + NO ₃) | | Lead (Pb) | Total Alkalinity | |
| pH | | Magnesium (Mg) | Total Dissolved Solids (TDS) | |
| Potassium (K) | | Manganese (Mn) | Total Hardness | |
| Sodium (Na) | | Mercury (Hg) | Turbidity (NTU) | |
| | | Metals (total) | Zinc (Zn) | |

2.3 Aquifer Test Data Interpretation

The quantitative assessment of aquifer parameters (transmissivity, storativity, etc.), available head, and long-term yield is to be based on the following:

- (a) Aquifer type and assumptions, which typically include the assumptions that:
 - (i) the aquifer has an infinite areal extent;
 - (ii) the aquifer is bounded by a less permeable bed below in the case of an unconfined aquifer, and above and below in the case of a confined or leaky confined aquifer;
 - (iii) the aquifer is homogeneous, isotropic, and of uniform thickness;
 - (iv) flow is horizontal and laminar;
 - (v) water is released from storage instantaneously with a decline in head; and
 - (vi) the aquifer is pumped at a constant discharge rate.
- (b) Identification and location of any known or suspected aquifer boundary causing the test data to diverge from the appropriate aquifer model. The following conditions may cause departures from confined aquifer response resembling an aquifer response to either recharge or no-flow (barrier) boundaries:
 - (i) leakage from adjacent aquifers,
 - (ii) change in aquifer thickness,
 - (iii) change in aquifer permeability,
 - (iv) cessation (or initiation) of pumping in a nearby well that is hydraulically connected to the same aquifer,
 - (v) change in discharge rate during the test,
 - (vi) facies change,
 - (vii) secondary porosity (e.g., fracture porosity),
 - (viii) delayed yield in unconfined aquifers (resembling recharge), and
 - (ix) barometric and diurnal effects—may be significant when there is minimal drawdown.
- (c) Aquifer test data interpretation, performed using whichever is the most appropriate model for the particular aquifer type and hydrogeological conditions. The applicant or consultant is responsible for providing the specified data and defending the choice of analysis used. The two main approaches for analyzing test data are
 - (i) Analytical solutions (Figure 3.0) using simplified mathematical equations so that solutions to the groundwater movement may be obtained by analytical methods. The proper analytical solution should be used for the particular aquifer in question, such as Theis or Cooper-Jacob for a confined aquifer, Neuman (or alternates) for unconfined aquifers, etc. Once the aquifer parameters have been estimated these same analytical solutions may be used to predict drawdowns at different distances and times, in order to evaluate impacts
 - (ii) Numerical models (Figure 4.0), especially useful for analyzing aquifers having irregular boundaries, complex structures, and variable pumping or recharge rates.
- (d) Theoretical long-term yield, representing the amount of water that may be sustained by the aquifer in the vicinity of the tested well for 20 years, without lowering the water below the top of the aquifer for confined aquifers, or without resulting in a drawdown of more than two-thirds of the saturated thickness of an unconfined aquifer.

FIGURE 3.0 ANALYTICAL GRAPH

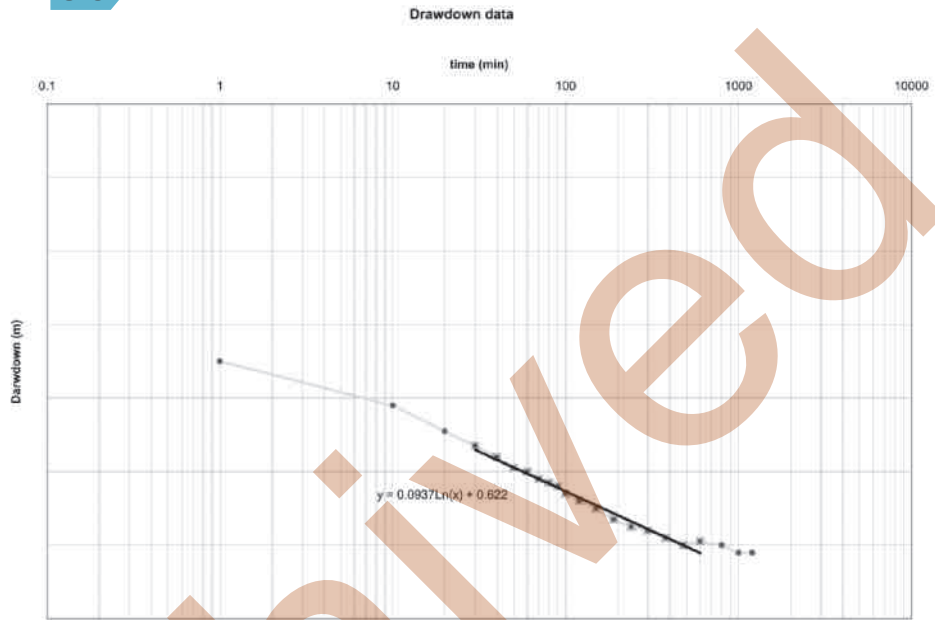


Figure 3: Example of an analytical solution (Cooper-Jacob straight-line time-drawdown)

FIGURE 4.0 NUMERIC METHOD

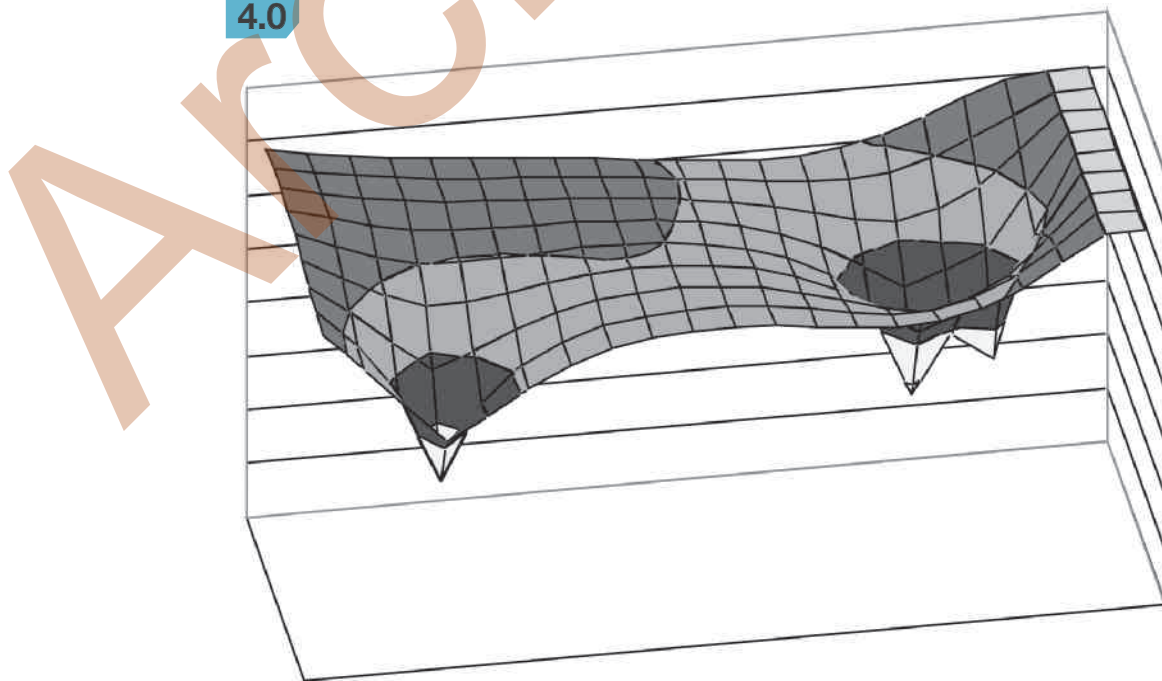


Figure 4: Example of a numerical solution (spreadsheet solution)

Modified Moell Method (Maathuis and van der Kamp)

AENV has adopted and encourages the preferred use of the Modified Moell method (Maathuis and van der Kamp, 2005) (Note: Copies of this report can be obtained from the regional offices) described below to evaluate the long-term safe yield for any type of aquifer including confined, leaky, unconfined, buried valley aquifers, etc, including wells where large drawdowns occur at the beginning of the pumping period. The use of the Modified Moell method must be consistent with the appropriate aquifer model. Rationale for the chosen aquifer model must be provided with supporting data. For continuity AENV will continue to accept the use of the Farvolden method to evaluate the long-term safe yield for confined aquifers only that are consistent with the limitations of the Theis method.

The available head (H_a) for a confined aquifer is the distance between the non-pumping water level and the top of the aquifer.

For unconfined aquifers, the available head (H_a) is two-thirds of the initial saturated thickness of the aquifer.

The available head is measured at the proposed production well.

Note: For confined aquifers, the water level shall not be drawn down by pumping to a level below the top of a confined aquifer. The water level drawdown in a well produced by pumping in an unconfined aquifer shall not be more than two-thirds of the aquifer's saturated thickness measured at the time of first groundwater evaluation.

LEGEND

| | |
|--------------|---|
| H_a | Available head (in metres) |
| S_{100min} | Measured drawdown at 100 minutes (in metres) |
| Q | Well pumping rate during the aquifer test (in cubic metres per day [m^3/day]) |
| Q_{20} | Sustainable yield for a 20-year period (in m^3/day) |
| S_{20yrs} | Calculated theoretical drawdown after 20 years of pumping at Q (in metres) |
| T | Transmissivity (in square metres per day [m^2/day]) |
| 0.7 | 70% safety factor |

Farvolden Method (confined aquifers only)

$$Q_{20} = (0.68)T(H_a) \times 0.7$$

Modified Moell Method (Maathuis and van der Kamp)

$$Q_{20} = \frac{0.7 \times Q \times H_a}{S_{100min} + (S_{20yrs} - S_{100min})_{Theor}}$$

2.3.1 Impact on the Aquifer, the Environment, and Other Users

Upon collecting and processing data, the applicant or the consultant acting on the applicant's behalf should consider the following when assessing both the long- and short-term impacts that could potentially occur as a result of the applicant diverting groundwater:

- (a) aquifer characterization determined from the analysis of aquifer test data, water quality data, field-verified survey data, and other hydrogeological reports and data (e.g., fracture-dominated flow, limited areal extent, strong dynamic flow regime, extensive diversion from other projects, strong natural discharge, limited or abundant recharge, confined/unconfined conditions, etc.)
- (b) interference with other groundwater and surface water users
- (c) proximity of surface water bodies (e.g., springs, dugouts, dams, sloughs, creeks, rivers, etc.)
- (d) evaluation of distance/time drawdown graphs and the calculation of the potential well interference effects. The aquifer model used to arrive at Q_{20} should also be used to estimate the distance at which well interference may occur after 20 years of pumping
- (e) predicted drawdown in the wells compared to available head, see 2.3(d) for definition of available head
- (f) evaluation of technical/hydrogeological or other valid concerns expressed in any response to public consultation (including SOCs) regarding the proposed diversion of groundwater by the project
- (g) identification of any other environmental/hydrogeological issues requiring referral to other agencies; specific monitoring requirements may be required to address such specific concerns
- (h) suitable models to properly assess groundwater flow systems and aquifer sustainability during the entire projected groundwater diversion period. These should be consistent with the model used to arrive at Q_{20}
- (i) evaluation of erosion potential and changes in fish habitat due to discharges from groundwater wells that may be required for large-scale mine or pit drainage projects
- (j) local sub-basins with sensitive water bodies (i.e., small ratio of contributing area to surface area) or rare biota to be specifically identified and protected
- (k) areas adjacent to protected wetlands or "special places" specifically identified and evaluated as sensitive areas
- (l) evaluation of effects caused by increased groundwater recharge needed in recharge-dominated flow systems or for drought-sensitive local water bodies
- (m) changes in water quality as a result of the diversion (e.g., increased metal mobility, anaerobic/aerobic changes, salinity increase, etc.).


Note: If authorization to divert groundwater is required for more than one well, and the wells are completed in the same aquifer, an assessment of the drawdown at the point of maximum interference must be provided.

3.0

Monitoring and Reporting

The monitoring and reporting requirements may be established for groundwater diversions. These conditions may be updated or amended at any time within the licence/approval term at the discretion of the Director. The licensee shall report to the Director the results of the conditions attached to the licence using the Water Use Reporting (WUR) System and shall provide in writing any other information required by the Director.

AENV has initiated the WUR System, an electronic reporting of water use and environmental monitoring, as part of our commitment to transparency to allow the public access to water production and water level data. For more information on the electronic

 reporting, please visit <http://environment.alberta.ca/01301.html>.

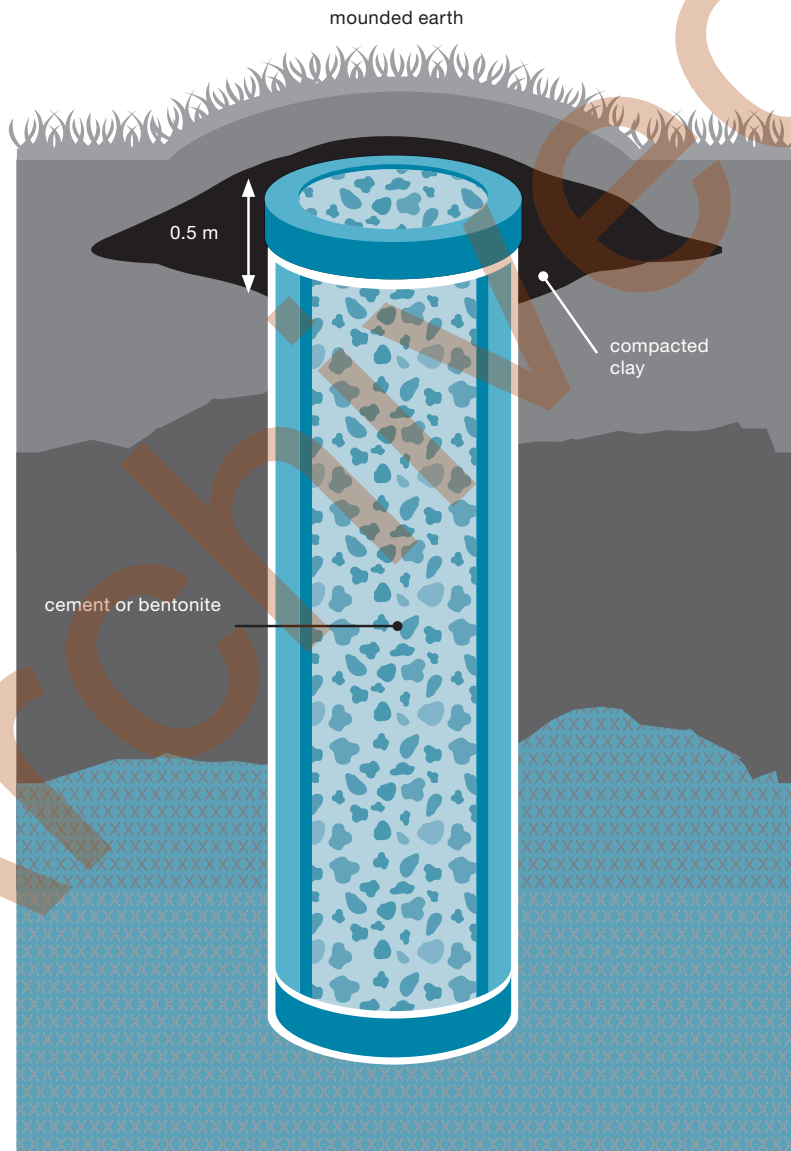
Monitoring, reporting, and other conditions attached to a licence or an approval are used to measure the achievement of a specific outcome. These performance measures help ensure a sustainable, reliable supply of quality water for Albertans.

Monitoring conditions may include

- (a) monitoring other selected wells in the area,
- (b) constructing and monitoring additional observation wells,
- (c) continuous or frequent monitoring of production volume and water level,
- (d) low-level shut-off requirements, and
- (e) annual water use reports.

Replacement and Supplementary Wells

FIGURE 5.0 EXAMPLE OF PLUGGED HOLES IN AN OLD WELL



A replacement water well must be constructed to replace an existing well.

5.0

Water Well Complaints

4.1 Replacement Water Well

A replacement water well is a new well constructed to replace an existing well. For a new well to qualify as a replacement well, it must

- (a) be constructed in the same quarter-section as the original well,
- (b) have a drawdown cone similar to that of the original well,
- (c) be completed in the same aquifer as the original well, and
- (d) be constructed in accordance with the regulation governing well completion at the time of the replacement.

An application under the *Water Act* must be submitted to amend the existing licence for the original well so that it reflects changes in the well construction. The original well must be decommissioned (Figure 5.0) upon completion of the replacement well. If an additional quantity of water (operation expansion) is needed at the time of drilling the replacement well, a new licence is required and additional testing may be required, similar to the testing required for the licensing of an initial quantity of water.


4.2 Supplementary Water Well

A supplementary well is a well drilled in addition to an existing well. The supplementary well can be added onto the existing well licences for a cumulative diversion equal to the original diversion authorized on the existing well licence. The supplementary well must be


- (a) completed in the same aquifer as the existing well, and
- (b) completed in accordance with the regulation at the time of the construction.

An application under the *Water Act* must be submitted to amend the existing licence pertaining to the original well to reflect the addition of the new well(s). If an additional quantity of water (operation expansion) is needed at the time of drilling the supplementary well, a new licence will be required, and additional testing may be required simultaneously on the existing well and the supplementary well(s) to assess the effects of potentially the overlapping cones.

All complaints related to water wells must be reported to the AENV hotline at 1-800-222-6514. AENV has developed a fact sheet that provides useful information needed when filing a complaint. This factsheet can be found

 at: <http://environment.gov.ab.ca/info/library/8082.pdf>.

AENV, in partnership with other agencies, has developed the *Working Well* program, which aims at assisting water well owners with all aspects of their water well knowledge, including operation, maintenance and repair issues.

Access to this information may be found at: <http://environment.alberta.ca/02207.html>. 

Activities with Specific Authorization Requirements

6.1 Oilfield Injection

AENV's objective is to enhance the conservation and protection of Alberta's water and to reduce or eliminate the use of non-saline water resources for oilfield injection purposes on a case-by-case basis. To achieve this objective, specific requirements are set out in the *Water Conservation and Allocation Guideline for Oilfield Injection 2006*, which applicants must follow to obtain a licence for oilfield injection purposes. This guideline and the *Conservation and Allocation Policy for Oilfield Injection* can



be found at <http://environment.gov.ab.ca/info/library/7700.pdf> and http://www.waterforlife.gov.ab.ca/docs/Oilfield_Injection_Policy.pdf.

6.2 Groundwater Diversion for Geothermal Purposes

Open-loop systems use the geothermal properties of groundwater for heating or cooling purposes. This is achieved by diverting groundwater from a well, circulating the water through a heat transfer system, and returning the water in the sub-surface through another well. Where there is no loss of water as part of the system, and where the withdrawal and the return points are within the same water body, the installation and operation of an open-loop system is an "activity" as defined by the *Water Act*; therefore, an approval is required. If the withdrawal and the return points of an open-loop system are within different water bodies and/or if there are water losses in the geothermal system, a licence under the *Water Act* is required.

Information supporting the application must include, but is not limited to, an assessment of the potential and cumulative effects, including

- (a) capability of the aquifer to circulate the required quantities of groundwater;
- (b) effects of the geothermal system on groundwater quantity, temperature, and quality; and
- (c) effects of the geothermal system on household users, traditional agricultural users, approval holders, or licensees.

A qualified groundwater practitioner who is a member of APEGGA must prepare the technical report supporting the application. The submitted report shall be prepared in accordance with the criteria identified in the *Guide to Groundwater Authorization*.

Canadian Standards Association (CSA) C448-02, *Design and Installation of Earth Energy Systems*, may be referenced for heat pump system installation standards. Where discrepancies arise between the CSA standards and the *Water Act* and *Water (Ministerial) Regulation* or AENV *Guide to Groundwater Authorization*, the *Water Act* and *Water (Ministerial) Regulation* and AENV *Guide to Groundwater Authorization* shall prevail in terms of authorization process, well construction, and the evaluation and reporting requirements.

The applicant is required to ensure that the water wells are constructed by an approved water well driller in accordance with Part 7 of the *Water (Ministerial) Regulation*.

The groundwater used in the geothermal system for heating/cooling purposes shall not be used for another purpose without prior authorization of the Director.

The Director must authorize temporary discharges or withdrawals of water from all geothermal systems.

Note: Approvals are not required for closed-loop systems.

6.3 Remediation

Remediation is the process by which contaminated groundwater is removed for treatment or disposal. If a project already holds an EPEA approval including groundwater remediation programs, an additional application under the *Water Act* is not required in order to disturb water for remediation purposes. For projects that do not hold any EPEA approval or registration, the diversion of small quantities (< 1250 m³/year) of contaminated groundwater do not require an authorization under the *Water Act*.

Note: Any person responsible for a contaminated site must prepare a remedial action plan for dealing with the contaminant and submit the plan to the appropriate AENV regional office.


6.4 Hydrocarbon Wells Producing Non-Saline Water


Prior to any oil and gas well being drilled, an operator must receive appropriate regulatory approval from the Energy and Resources Conservation Board (ERCB). Part of the information gathered initially helps assess the likelihood that an oil or gas well will produce non-saline groundwater. For some wells, that may be completed above the Base of Groundwater Protection (BGWP), an approval to divert non-saline groundwater may be required from AENV. The ERCB has information regarding the approximate depths to the BGWP in regional areas for the province of Alberta. The *Guideline for Hydrocarbon Wells Producing Non-Saline Water* can be found at <http://environment.gov.ab.ca/info/library/7834.pdf>. 

7.0

Groundwater Diversion in Restricted Water Basins

Water management plans have been developed for the South Saskatchewan River basin and the Cold Lake–Beaver River basin. All proposed groundwater diversions located in these regions must be consistent with the appropriate regional water management plan.

The *Approved Water Management Plan for the South Saskatchewan River Basin* can be found at http://environment.alberta.ca/documents/SSRB_Plan_Phase2.pdf. 

The 2006 *Cold Lake–Beaver River Water Management Plan* can be found at http://environment.alberta.ca/documents/Basin_Water_Mgmt_Plan_2006.pdf. 

8.0

Water Diversion from Sands and Gravels Adjacent to Surface Water and Water Diversion from Springs

Conventionally, all water diversion projects from sand and gravel deposits adjacent to a surface water body (river, stream, lake, etc.) are evaluated according to the procedure for licensing and approval of surface water works and diversion. Applications for diversion from springs are also evaluated using the procedure for evaluating surface water diversion.

If the spring development will increase the groundwater flow rate, the application to divert water from the spring is evaluated according to the Guide to Groundwater Authorization. The policy on water diversions from sands and gravels adjacent to a water body and from springs is included in Appendix 5.

APPENDIX 1: Application under the *Water Act* for Approvals and/or Licences

Documents or information provided to Alberta Environment pursuant to section 15(1)(a) of the *Water (Ministerial) Regulation* are public records and are accessible by the public.

Check one or more of the following to indicate type of application:

Diversion of Water Renewal of a Licence Constructing Works

Applicant

| | | | |
|--|-----------------------------|-----------------------------|------------------|
| Print Name and Company Name (if applicable): | Home Telephone: () | Bus. Telephone: () | |
| Address (Street, PO Box, etc.): | Place, Province: | Postal Code: | Fax: () |

Are you the registered landowner? Yes No If no, please attach a copy of the consent from the landowner.

Consultant, Signing Authority, or Applicant's Representative (if applicable)

| | | | |
|--|-----------------------------|-----------------------------|------------------|
| Print Name and Company Name (if applicable): | Home Telephone: () | Bus. Telephone: () | |
| Address (Street, PO Box, etc.): | Place, Province: | Postal Code: | Fax: () |

Contact Person (if not shown above)

| | | |
|-------------|------------------------|------------------|
| Print Name: | Telephone: () | Fax: () |
|-------------|------------------------|------------------|

Project Description

Tentative Starting Date: _____ (if applicable) Duration of Construction/Development: _____

Duration of Water Diversion/Use: _____

Describe, in detail, the location of works and activities relating to the project and attach plans.

Affected Water Sources (Location of Works and Activities)

Surface Water (if only constructing works, complete the first two columns)

| Source (e.g., lake, stream, or name of source, if known) | Diversion/Activity Location ¼ sec twp rge m | Annual Quantity (cubic metres) | Rate of Diversion (show units) | Is Construction or Development Required? (yes or no) | Purpose |
|--|--|-----------------------------------|-----------------------------------|---|---------|
| 1. | | | | | |
| 2. | | | | | |
| 3. | | | | | |

Groundwater

| Date Well Drilled or Proposed Drilling Date | Proposed Well Locations ¼ sec twp rge m | Total Depth (metres) | Production Interval (metres) | Pumping Rate (show units) | Annual Quantity (cubic metres) | Purpose |
|--|--|-------------------------|------------------------------------|------------------------------|--------------------------------------|---------|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |

Please attach a separate sheet if you wish to provide more information.

Statement of Confirmation

The information given on this form is true to the best of my knowledge.

| | | | |
|-----------------|-----------|------------|---------------------------------|
| _____ | _____ | _____ | _____ |
| Date of Signing | Signature | Print Name | Company Name (if applicable) |

Return the completed form to the Alberta Environment Regulatory Approvals Centre:

Regulatory Approvals Centre
9th Floor, Oxbridge Place
9820 – 106 Street
Edmonton, Alberta T5K 2J6
Telephone: **(780) 427-6311**
Fax: (780) 422-0154

Northern Regional Email Address
Aenv.northwaterapprovals@gov.ab.ca

Central Regional Email Address
Aenv.centralwaterapprovals@gov.ab.ca

Southern Regional Email Address
Aenv.southwaterapprovals@gov.ab.ca

OFFICE USE

| | | |
|---------------------|------------------------------|----------------------------------|
| File Number: | Fee Receipt Number: | Application ID: Operation ID: |
| Notice Information: | Application Completion Date: | Priority Number: |

Licensee/owner

| | | | |
|---|--------------------------------|-------------------------|-------------------------|
| Business Name: | Contact Person (please print): | Business Telephone: | Bus Cellular Telephone: |
| Business Address (Street, PO Box, etc): | City: | Business Fax: | |
| Province: | Postal Code: | Business Email Address: | |

Applicant/owner's representative: Same as above? Yes No If no, complete the following:

| | | | |
|---|--------------------------------|-------------------------|-------------------------|
| Business Name: | Contact Person (please print): | Business Telephone: | Bus Cellular Telephone: |
| Business Address (Street, PO Box, etc): | City: | Business Fax: | |
| Province: | Postal Code: | Business Email Address: | |

For surface water diversions complete the table below:

| Water Source (e.g., lake, stream, or name of source, if known) | Water Diversion Location | | | | | Pumping Rate (show units) | Annual Quantity (show units) | Point of Use | | | | | Purpose (e.g. stock drilling, etc.) |
|---|--------------------------|-----|-----|-----|---|------------------------------|---------------------------------|--------------|-----|-----|-----|---|--|
| | ¼ | sec | twp | rge | m | | | ¼ | sec | twp | rge | m | |
| | | | | | | | | | | | | | |

For groundwater diversions complete the table below:

| Date Well Drilled | Well (proposed) Location | | | | | Total Depth (metres) | Production Interval (meters) | Pumping Rate (show units) | Annual Quantity (show units) | Purpose (e.g. stock drilling, etc.) |
|-------------------|--------------------------|-----|-----|-----|---|-------------------------|---------------------------------|------------------------------|---------------------------------|-------------------------------------|
| | ¼ | sec | twp | rge | m | | | | | |
| | | | | | | | | | | |

Is the licensee the registered landowner? Yes No If no, written consent from the landowner is required.

If working on Crown land, (e.g. "Green Area"), indicate the authorization type and number obtained from Alberta Sustainable Resource Development to undertake the activity. Type _____ Number _____

Diversion Start Date: _____ Diversion Finish Date: _____

| | |
|----|----|
| NW | NE |
| SW | SE |

Indicate major land features on the plan such as roads, the water source, flow direction and/or the water diversion location.

Indicate the legal land location of the water diversion location.

Section ____ **Township** ____ **Range** ____ **West of the** ____ **Meridian**

Please attach a separate sheet if you wish to provide more information.

Statement of Confirmation

The information given on this form is true to the best of my knowledge. If you are signing on behalf of a company, provide a document indicating you are authorized to sign on their behalf.

| Date of Signing | Signature | Print Name | Company Name (if applicable) |
|-----------------|-----------|------------|---------------------------------|
|-----------------|-----------|------------|---------------------------------|

Return the completed form to the appropriate Alberta Environment District office.

| | | |
|---|---|--|
| Alberta Environment Northern Region – Peace River District Bag 900, Box 5 Provincial Building Peace River, Alberta T8S 1T4 Tel: 780.624.6167 Fx: 780.624.6335 | Alberta Environment Northern Region – Edmonton District 111, 4999 98 Avenue Edmonton, Alberta Tel: 780.427.5296 Fx: 780.42.7824 | Alberta Environment Central Region – Spruce Grove District Suite 1, 250 Diamond Avenue Spruce Grove, Alberta T7X 4C7 Tel: 780.960.8600 Fx: 780.960.8606 |
| Alberta Environment Central Region – Red Deer Floor 3, 4920 51 Street Red Deer, Alberta T4N 6K8 Tel: 403.340.7052 Fx: 403.340.5022 | Alberta Environment Southern Region – Calgary District 2938, 11 Street NE Calgary, Alberta T2E 7L7 Tel: 403.297.6582 Fx: 403.297.2749 | Alberta Environment Southern Region – Lethbridge District 200, 5 Avenue South Provincial Building Lethbridge, Alberta T1J 4L1 Tel: 403.382.4254 Fx: 403.381.5337 |

Note: In some instances, you may receive the *Water Act* Temporary Diversion Licence via e-mail or fax.

FOIP Information you provide to Alberta Environment to apply for a temporary diversion licence under the *Water Act* is collected under the authority of section 62(1) of the *Water Act*. This information will be used for the purpose of processing an application for a temporary diversion licence, as well as recording information regarding the licensee as needed for administration of the *Water Act*. This information may be publicly disclosed to anyone requesting a copy in accordance with Section 15(1) of the *Water (Ministerial) Regulation*. If the applicant wishes that a trade secret, process or technical information in the application be kept confidential, the applicant may make a written request to the Director within 30 days after the information is submitted, identifying the information, and requesting that the information be kept confidential and not be disclosed. The written request must identify the specifics of the information to be kept confidential and not be disclosed. Ultimately, it is the Director who makes the decision regarding the confidentiality of the identified information. To expedite application processing, the applicant can indicate, during the time of filing the application, that no information is deemed sensitive. The collection of personal information on this form is being managed in accordance with the *Alberta Freedom of Information and Protection of Privacy Act*. For more information about the collection, use or disclosure of this information, please contact Alberta Environment's Regulatory Approvals Centre at 780.427.6311.

OFFICE USE

- Exemption (no licence required) under:
- (1) *Water (Ministerial) Regulation* - Schedule 3, Section 1(c)
 - (2) or specify _____

Designated Director under the *Water Act*

Date

File:

Livestock Water Requirement Worksheet (if you know your own use, please change accordingly):

| Water Used For | | No. of Animals | No. of Gallons* | Quantity per Day (gallons) | No. of Days | Total Gallons per Year |
|-----------------------|-------------------------------|----------------|-----------------|----------------------------|-------------|------------------------|
| Dairy | Milking cows | x | 30.0 | = | x | = |
| | Dry cows, replacements | x | 10.0 | = | x | = |
| | Calves (up to 550 lbs) | x | 3.0 | = | x | = |
| Beef | Cow/calf pairs | x | 12.0 | = | x | = |
| | Calves (up to 550 lbs) | x | 3.0 | = | x | = |
| Beef | Feeders (550–900 lbs) | x | 6.0 | = | x | = |
| | (900–1250 lbs) | x | 9.0 | = | x | = |
| Hogs | Sows (farrow to finish) | x | 20.0 | = | x | = |
| | Sows (farrow to wean: 50 lbs) | x | 6.5 | = | x | = |
| | Feeders (50–250 lbs) | x | 1.5 | = | x | = |
| | Weaner (15–50 lbs) | x | 0.5 | = | x | = |
| Chickens | Broilers/roasters | x | 0.035 | = | x | = |
| | Layers/breeders | x | 0.055 | = | x | = |
| Turkeys | | x | 0.150 | = | x | = |
| Sheep/Goats | Milking ewes/does | x | 3.0 | = | x | = |
| | Ewes/does | x | 2.0 | = | x | = |
| | Feeders lambs | x | 1.5 | = | x | = |
| Horses, bison, mules | | x | 10.0 | = | x | = |
| Elk, donkeys | | x | 5.0 | = | x | = |
| Deer, llamas, alpacas | | x | 2.0 | = | x | = |
| Ostriches | | x | 1.0 | = | x | = |
| Other (specify) | | x | | = | x | = |
| Pesticide application | | | | | x | = |

TOTAL AMOUNT PER YEAR: _____

*Note: Quantities shown are averages only.

File:

Livestock Water Source Calculation Chart

| Water Sources and Locations | Animals (show type) | No. of Animals | Gallons Used per Day per Animal | No. of Days | Total Gallons per Year |
|-----------------------------|---------------------|----------------|---------------------------------|-------------|------------------------|
| | | | | | |
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Archived

APPENDIX 3: Example of Field-Verified Survey Form

Page 1 of _____

| Parameters | Water Source #1 | Water Source #2 | Water Source #3 | Water Source #4 |
|--|-----------------|-----------------|-----------------|-----------------|
| Owner/lessee name | | | | |
| Legal land location, lat/long, GPS coordinates | | | | |
| Surface elevation | | | | |
| Type of water source | | | | |
| Water source/well status | | | | |
| Well depth | | | | |
| Original non-pumping level and date level recorded | | | | |
| Current non-pumping water level and date level recorded | | | | |
| Well completion details (open hole, perforated, or screened) and completion interval | | | | |
| Depth to top of aquifer and amount of available head | | | | |
| Maximum pumping rate | | | | |
| Current estimated water requirements (daily/annual) | | | | |
| Purpose of use (household, livestock, industrial, etc.) | | | | |
| Distance from proposed water diversion or drainage site | | | | |
| Summary of historical chemical analyses | | | | |

APPENDIX 4: Minimum Recommended Length of Aquifer Test and Information Required for the Maximum Water Diversion/Drainage

| Daily Pumping Rate | Number of Days | Maximum Yearly Water Requirement | Length of Pumping and Recovery Period at Anticipated Maximum Pumping Rate | Observation/Monitoring Site | Information Required under Section 2 |
|---|--------------------|----------------------------------|---|-----------------------------|--|
| up to 10 m ³ /day (2200 lgpd) (1.5 lgpm) | 365 | 3650 m ³ (803,000 lg) | 2 + 2 hours* (or longer) and at least 90% recovery | 0 | 2.1 2.2.3 2.2.6 (A) to (M) 2.2.10 |
| > 10 to 35 m ³ /day (2200 to 7700 lgpd) (1.5 to 5.3 lgpm) | applicant to enter | applicant to enter | 24 + 24 hours (or longer) and at least 90% recovery | 0-1 | All of Section 2 |
| > 35 to 65 m ³ /day (7700 to 14,300 lgpd) (5.3 to 10.0 lgpm) | applicant to enter | applicant to enter | 24 + 24 hours (or longer) and at least 90% recovery | 1 | All of Section 2 |
| > 65 to 265 m ³ /day (14,300 to 60,500 lgpd) (10.0 to 40.0 lgpm) | applicant to enter | applicant to enter | 48 + 48 hours (or longer) and at least 90% recovery | 1-2 | All of Section 2 |
| > 265 m ³ /day | applicant to enter | applicant to enter | 72 + 72 hours (or longer) and at least 90% recovery | 1-2 | All of Section 2 |

*In some cases, more information or longer aquifer tests may be required.

LEGEND:

g = gallons

lgpd = Imperial gallons per day

lgpm = Imperial gallons per minute

m³ = cubic metre = 220 Imperial gallons

> = greater than

APPENDIX 5: Policy on Water Diversions from Sands and Gravels Adjacent to a Water Body and from Springs

- (1) All projects in sand and gravel deposits adjacent to a water body (river, stream, lake, etc.) will be evaluated according to procedures for licensing and approval of surface water works and diversions.
- (2) The *Groundwater Evaluation Guideline* should be used only
 - where the applicant proves no hydraulic connection between the sand and gravel deposits and the water body

Note: In this case, supporting information in accordance with this guideline should be provided with an application. Applicants should contact Department staff who process groundwater applications.

and

- where effects on local ground water users may be significant.

Note: In this case, appropriate evaluation in accordance with the *Groundwater Evaluation Guideline* will be needed as well as evaluation of surface water issues. Applicants should contact Department staff who process surface water applications.

- (1) All applications for diversion from springs will be evaluated using procedures for evaluation of surface water issues.
- (2) Evaluation in accordance with the *Groundwater Evaluation Guideline* will be needed for development of a spring where the development will increase the groundwater flow rate.

Note: In this case, supporting information in accordance with this guideline should be provided with an application. Applicants should contact Department staff who process groundwater applications.

3. Consultation among staff is encouraged at any stage of the process.

APPENDIX 6: Supplementary Forms

Water Well Inventory

File: _____

Name _____

| Land Location | Well Report ID | GPS Coordinates* | Water Used For | Well in Pit (yes/no) | Well in Building (describe building) |
|---------------|----------------|------------------|----------------|-------------------------|---|
| | | N | | | |
| | | W | | | |
| | | N | | | |
| | | W | | | |
| | | N | | | |
| | | W | | | |
| | | N | | | |
| | | W | | | |
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| | | W | | | |
| | | N | | | |
| | | W | | | |
| | | N | | | |
| | | W | | | |

* What GPS datum are you using (circle one)? NAD 27 NAD 83 WGS 84

Reading should appear in the following format: N 52o 27.501 W 114o 18.205

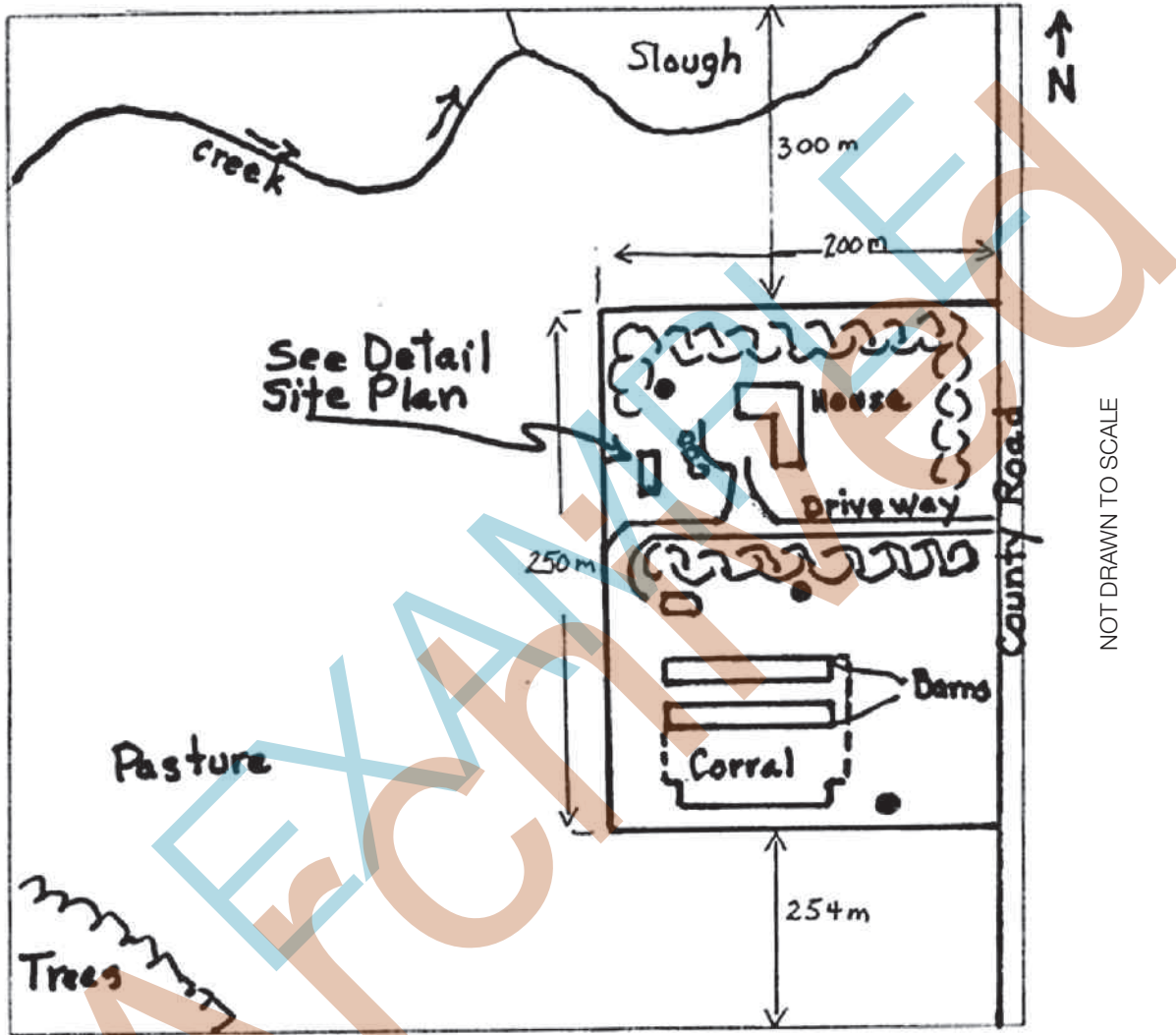
QUARTER-SECTION PLAN RELATED TO DETAIL SITE PLAN

Name: _____

File No: _____

Land Location: Qtr / Sec / Two / Rgw / W / M

Plan No. _____ Block _____ Lot _____



Include the following in the above detailed site plan:

1. Location of detail site plan on the quarter-section
2. Location of water bodies, roads, railroads, drawn to scale acceptable to Alberta Environment (drawings and labeling on an air photo may be substituted for hand drawn plan)

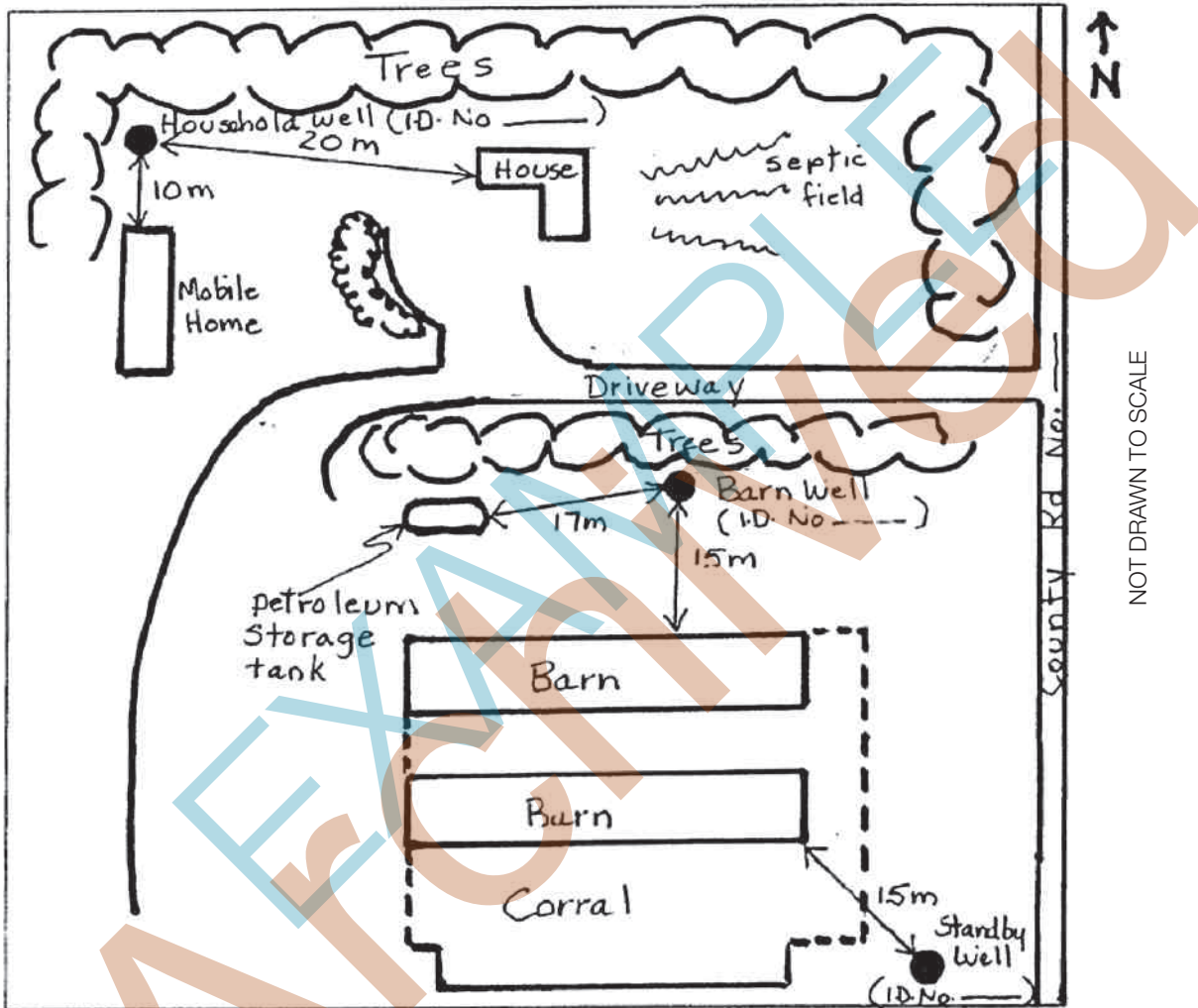
DETAIL SITE PLAN

Name: _____

File No: _____

Land Location: Qtr / Sec / Two / Rgw / W / M

Plan No. _____ Block _____ Lot _____



Include the following in the above detailed site plan:

1. Location of all water well(s) indicating distances to all buildings, storage tanks, sewage systems, water bodies, roads or any other structure, which may have an impact on the groundwater resource on or adjacent to the site drawn to a scale acceptable to Alberta Environment (drawings and labelling on an air photo may be substituted for a hand-drawing)
 - (a) GPS coordinates for each well on the quarter-section
 - (b) Driller report for each well on the quarter-section
 - (c) Photos of each well on the quarter section (identify with driller report ID and/or GPS coordinate as shown on the site plan)
2. Attach a list matching each well on the site plan with corresponding driller report ID and GPS coordinates.
3. Indicated what the water use from each well is (including if the well is unused), such as household, livestock, greenhouse, etc
4. Identify if any of the wells are in pits or in buildings other than a stand-alone pump house.

QUARTER-SECTION PLAN RELATED TO DETAIL SITE PLAN

Name: _____

File No: _____

Land Location: Qtr / Sec / Two / Rgw / W / M

Plan No. _____ Block _____ Lot _____

Include the following in the above detailed site plan:

1. Location of detail site plan on the quarter-section
2. Location of water bodies, roads, railroads, drawn to scale acceptable to Alberta Environment (drawings and labeling on an air photo may be substituted for hand drawn plan)

DETAIL SITE PLAN

Name: _____

File No: _____

Land Location: Qtr / Sec / Two / Rgw / W / M

Plan No. _____ Block _____ Lot _____

Include the following in the above detailed site plan:

1. Location of all water well(s) indicating distances to all buildings, storage tanks, sewage systems, water bodies, roads or any other structure, which may have an impact on the groundwater resource on or adjacent to the site drawn to a scale acceptable to Alberta Environment (drawings and labelling on an air photo may be substituted for a hand-drawing)
 - (a) GPS coordinates for each well on the quarter-section
 - (b) Driller report for each well on the quarter-section
 - (c) Photos of each well on the quarter section (identify with driller report ID and/or GPS coordinate as shown on the site plan)
2. Attach a list matching each well on the site plan with corresponding driller report ID and GPS coordinates.
3. Indicated what the water use from each well is (including if the well is unused), such as household, livestock, greenhouse, etc
4. Identify if any of the wells are in pits or in buildings other than a stand-alone pump house.

APPENDIX 7: Map of Alberta Environment Regional Offices



For more information, contact the appropriate regional office:

Alberta Environment

Northern Region – Peace River District

Bag 900, Box 5 Provincial Building
Peace River, Alberta T8S 1T4
Tel: 780.624.6167 Fx: 780.624.6335

Alberta Environment

Central Region – Red Deer

Floor 3, 4920 51 Street
Red Deer, Alberta T4N 6K8
Tel: 403.340.7052 Fx: 403.340.5022

Alberta Environment

Northern Region – Edmonton District

111, 4999 98 Avenue
Edmonton, Alberta
Tel: 780.427.5296 Fx: 780.42.7824

Alberta Environment

Southern Region – Calgary District

2938, 11 Street NE
Calgary, Alberta T2E 7L7
Tel: 403.297.6582 Fx: 403.297.2749

Alberta Environment

Central Region – Spruce Grove District

Suite 1, 250 Diamond Avenue
Spruce Grove, Alberta T7X 4C7
Tel: 780.960.8600 Fx: 780.960.8606

Alberta Environment

Southern Region – Lethbridge District

200, 5 Avenue South Provincial Building
Lethbridge, Alberta T1J 4L1
Tel: 403.382.4254 Fx: 403.381.5337