Alberta Energy Regulator

Directive 079

Release date: May 14, 2025

Effective date: May 14, 2025

Replaces previous edition issued September 6, 2022

Surface Development in Proximity to Abandoned Wells

Contents

Introduction 2

What's New in this Edition 3

Potential Issues Surrounding Abandoned Wells 3

Obtaining Abandoned Well Site Records 3

Setback Requirements for Abandoned Wells 4

Applications for Subdivision or Development 6

Licensee Requirements 6

Abandoned Well Locating and Testing Protocol 7

- 1.0 Well File Review 8
- 2.0 Locating an Abandoned Well 8
- 3.0 Gas Detection Survey 8
- 3.1 Gas Detection Grid Survey Procedure for a Well That Cannot Be Located 10
- 4.0 Do Methane Anomalies Exist? 10
- 4.1 Is Well Source of Anomaly? 10
- 5.0 AER Risk Score 10
- 6.0 Develop Well-Specific Action Plan for a Leaking Well 11

Report Test Results to the AER 11

Records Retention 12

Gas Detection Specifications 12

Quality Assurance / Quality Control 13

Contact Information 14

Introduction

Alberta Municipal Affairs (MA) has introduced amendments to the *Subdivision and Development Regulation* (*SDR*), effective November 1, 2012, that require developers and property owners applying for a subdivision or development permit to identify the location of abandoned wells during planning and to appropriately address them in the proposed development.

This directive has been prepared in support of the *SDR* and

- sets out minimum setback requirements from abandoned wells to surface structures;
- presents important information for municipal officials, planners, development officers, and applicants for subdivision or development approval (applicants) about abandoned oil and gas wells licensed by the Alberta Energy Regulator (AER);
- provides guidance for municipalities in ensuring that abandoned wells are identified and appropriately located within subdivisions and developments;
- sets out the AER's requirements of the oil and gas industry to locate and test abandoned wells
  - where potential conflicts with proposed surface structures may exist, and
  - where abandoned wells already exist in proximity to surface structures;
- provides instructions on obtaining the necessary abandoned well information from the AER; and
- details the protocol for locating and testing abandoned wells.

The *SDR* and this directive replace MA *Information Bulletin 06/10: Advisory Land Use Planning Notes on Abandoned Well Sites*, which contained recommended guidelines for development near abandoned wells.

For the purposes of this directive, an abandoned well is a well that has been abandoned, plugged, cut, and capped as required by AER *Directive 020: Well Abandonment*.

In accordance with section 3.013 of the *Oil and Gas Conservation Rules* (*OGCR*), section 98 of the *Geothermal Resource Development Rules* (*GRDR*), and section 106 of the *Brine-Hosted Mineral Resource Development Rules* (*BMR*), licensees must comply with the requirements in *Directive 079*.

Requirements pertaining to abandonment apply to licensees of abandoned wells and will be enforced by the AER under the *Oil and Gas Conservation Act* (*OGCA*) and *OGCR, Geothermal Resource Development Act* (*GRDA*) and *GRDR*, and the *Mineral Resource Development Act* (*MRDA*) and *BMR.* The subdivision or development authority for a municipality is responsible for ensuring that applicants meet the requirements of the *SDR* and this directive.

What's New in this Edition

This directive now also applies to brine-hosted mineral resource development. References to the *MRDA*, *BMR*, and other appropriate references to brine-hosted mineral resource development have been made.

Potential Issues Surrounding Abandoned Wells

Oil and gas wells prior to abandonment are evident, both visually and through a notation on the land title. However, abandoned wells cannot be located by such means. Abandonment of an oil or gas well occurs by rendering the well incapable of flow and placing a cap over the casing one metre (m) or more below the surface. *Directive 020* sets out well abandonment requirements that ensure the integrity of the well to protect the public and the environment.

After surface reclamation has been completed and a reclamation certificate issued by the AER, the well site lease notation is typically removed from the land title records. At this point, there is nothing visible on the surface of the land or documented on the land title to indicate the presence of an abandoned well.

Surface access to abandoned wells may be required in the event a repair is necessary. Repairing an abandoned well may require a service rig and, in some cases, a drilling rig, which requires access to a larger work area than a service rig. A licensee of an abandoned well is required to determine the condition of the abandonment and conduct any additional abandonment operations prior to surface development occurring in proximity to the well. This could include reabandonment to meet current *Directive 020* requirements.

Since the abandoned well is not visible on the surface, it may present a risk to the safety of the equipment operator and may damage excavation and construction equipment if not properly located prior to any development activity.

Obtaining Abandoned Well Site Records

The *SDR* requires applicants to include abandoned well information from the AER in applications for subdivision or development.

This information can be obtained from the AER's abandoned well map viewer (viewer) on the AER website, www.aer.ca. The viewer will provide a map identifying all recorded abandoned well surface locations in the selected area and list any additional details that are available, including the licensee(s) of record and the latitude and longitude of each well's surface location.

If you do not have Internet access or have questions about the information provided by the viewer, contact the AER Customer Contact Centre by telephone at 1-855-297-8311 (toll free) or by email to

inquiries@aer.ca, or contact the AER Information Management Branch by mail at Suite 1000, 250 – 5 Street SW, Calgary, Alberta T2P 0R4.

If it appears that there may be a potential conflict between abandoned well locations and proposed surface development, the *SDR* requires applicants to provide to the subdivision or development authority a map showing the actual surface location of the abandoned well. Applicants should contact the well licensee of record for any additional information that may be needed or to physically locate the well.

If an applicant is unable to contact the licensee of record using the information provided by the viewer or the Information Management Branch, the AER may be able to supply additional contact information.

The AER and its predecessors have administered the abandonment of oil and gas wells since January 1945. The AER may not be aware of all wells drilled and abandoned before 1945, and records for a small number of wells abandoned before this time may not be complete because the data are not available. AER records may only provide general information on how these wells were abandoned. In such cases, the licensee of record should be contacted for detailed information and verification of well data.

Setback Requirements for Abandoned Wells

In support of the *SDR*, the AER has established minimum setback requirements in this directive to address public safety issues that could result from an abandoned well. While the likelihood is low that future access to an abandoned well for repairs will be needed, establishing and maintaining a greater setback than is required should be considered between the abandoned well and surface structures to

- allow well access with minimal disruption to surface structures and
- prevent accidental contact of the construction equipment with the well.

Applicants are strongly encouraged to address the need for a greater setback with the licensee before submitting their application to the municipality.

The *SDR* requires the municipality to ensure that applicants seeking subdivision or development approval have appropriately identified and considered locations of abandoned wells, including any prescribed setback area, when making planning, development, and construction decisions. The municipality may require a larger setback than the minimum requirement set out in this directive.

Surface structures on top of an abandoned well are not permitted and a minimum 5 m setback radius around the well must be maintained.

However, some very shallow abandoned wells that were drilled for geological evaluation or did not penetrate hydrocarbon-bearing formations may not require a setback. Specifically, wells drilled and abandoned to a depth of less than 150 m do not require a setback and are exempt from the requirements set out in this directive. In other limited circumstances, the AER may determine that a setback distance can be reduced or is not required at all (e.g., for oil sands evaluation wells and certain stratigraphic test wells). If it is determined by the licensee in consultation with the AER that there is no need for a setback, the applicant for subdivision or development approval should obtain a letter from the AER confirming its support of the decision by the municipal approving authority to grant an exemption from the setback requirement and submit this letter with its application.

Provision of an access route should be discussed between the applicant for subdivision or development approval and the licensee. The licensee of the well is expected to determine whether there are any existing well integrity issues that need to be addressed prior to surface development taking place and whether the well was abandoned to an acceptable standard. In order to minimize the chance that a well may leak once surface development occurs in proximity to the well, the licensee is strongly encouraged to consider reabandoning the well to current standards prior to surface development taking place.

The applicant for subdivision or development approval and the licensee of any abandoned wells in the area are strongly encouraged to discuss whether the 5 m setback is sufficient. Legislation administered by the AER provides that the licensee of an abandoned well remains responsible for the well indefinitely. Therefore, licensees should ensure that they maintain abandoned wells in a condition that minimizes the chance of a leak.

The *SDR* requires applicants seeking subdivision or development approval to comply with this directive. As a result, applicants must incorporate the 5 m setback radius into their subdivision and/or development. Applicants are strongly encouraged to also incorporate any additional area recommended by the licensee, including an access route. Early identification of abandoned wells and consultation with the municipality and licensee will help in determining an effective subdivision design, the location of surface structures, the siting of underground utilities, and the land grading. It is strongly recommended that the applicant for subdivision or development approval, the licensee, and the municipality discuss early in the planning stages possible land use around abandoned wells, including land contouring that may require an abandoned well to be cut and capped at a greater depth below the surface.

Should there be lack of agreement between the licensee and applicant for subdivision or development approval with the licensee recommending a setback greater than the requirements of this directive, the parties should consider third-party mediation.

While the *SDR* amendments and this directive do not apply retroactively, it is strongly recommended that parties that have received approval for but have not yet constructed a proposed subdivision or development take steps to determine if abandoned wells exist within the project area and, if so, ensure that an appropriate setback area is incorporated.

Applications for Subdivision or Development

Before completing an application for subdivision or development, applicants should search for abandoned wells in the proposed development area using the viewer or request the information from the Information Management Branch, as mentioned above. The *SDR* requires that applicants include in their application information from the AER identifying the locations or confirming the absence of any abandoned wells within the proposed project area. The information is to consist of the following:

- a map of the search area from the viewer and a statement that there are no wells in the project area *or*
- a list and map identifying the locations of abandoned wells within the search area, including the surface coordinates, as provided by the viewer or the Information Management Branch, *and*
- written confirmation from the applicant for subdivision or development approval that the licensee responsible for each well has been contacted and the exact well location confirmed (any additional information discussed with the licensee that may have led to a change in the setback area should also be included),
- a sketch of the proposed development incorporating the necessary setback area for each well, *and*
- if the development will result in construction activity within the setback area, a statement confirming that the abandoned wells will be temporarily marked with on-site identification to prevent contact during construction.

If applicants find abandoned wells within the project development area, the *SDR* requires them to contact the licensee.

Licensee Requirements

Under section 29 of the *OGCA* and section 16 of the *GRDA*, abandonment of a well does not relieve the licensee from responsibility to control or further abandon the well or the costs of doing that work. Section 3.013(2) of the *OGCR* and section 98 of the *GRDR* require licensees to comply with the requirements in this directive.

If a licensee of an abandoned well is contacted by an applicant for subdivision or development approval or if surface development has already occurred in proximity to the abandoned well, the

licensee must follow the procedures detailed in the following Abandoned Well Locating and Testing Protocol.

The licensee must contact the AER immediately if it is not able to gain access to the property upon which the abandoned well is located.

Abandoned Well Locating and Testing Protocol

The AER has developed the Abandoned Well Locating and Testing Protocol to provide a consistent approach to locating, testing, and confirming the integrity of abandoned wells. Licensees must follow the protocol when an abandoned well is identified in proximity to existing or planned surface development.

The numbering in the decision tree below corresponds to parts within this protocol.

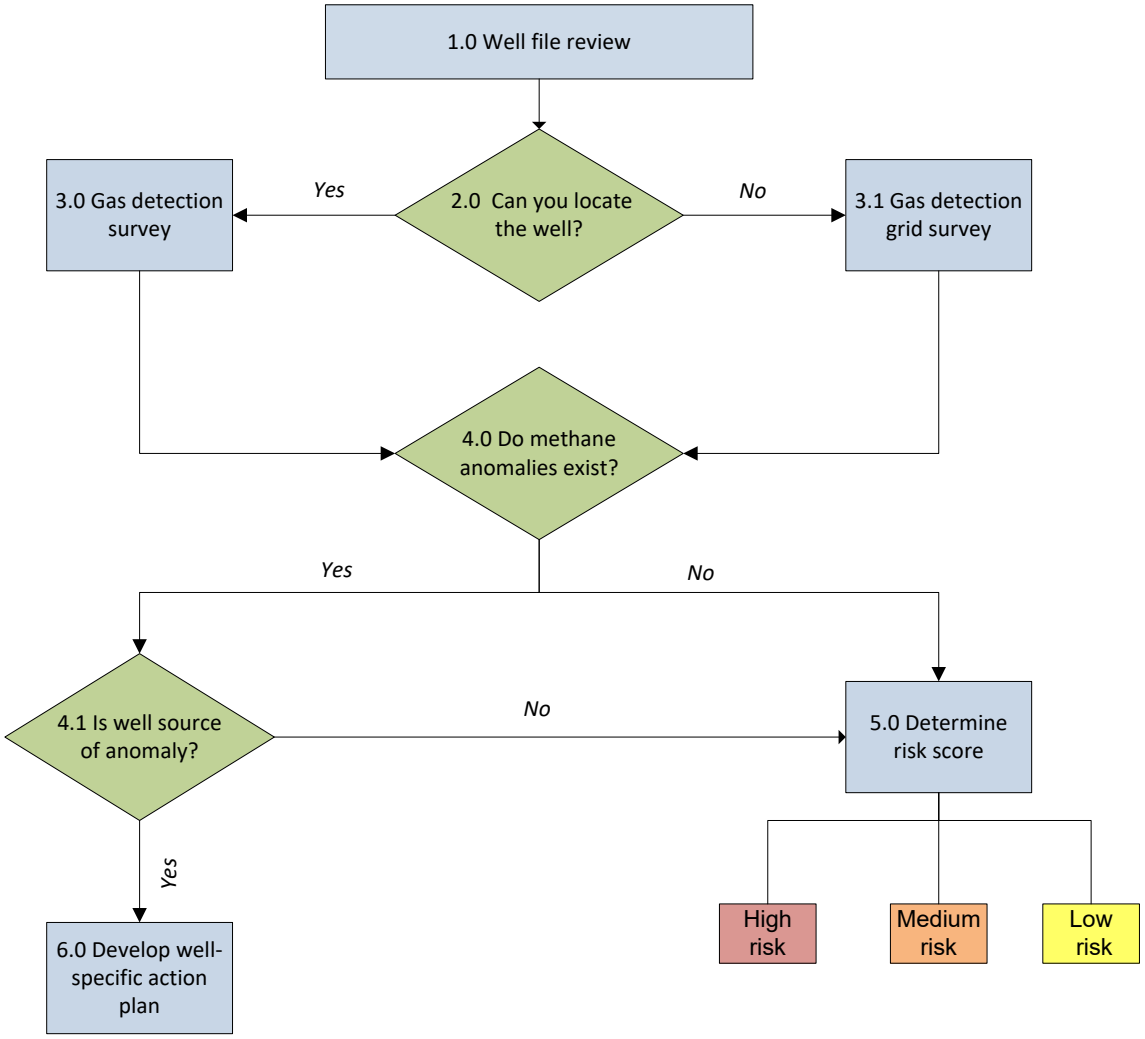

Figure 1. Abandoned well locating and testing decision tree

1.0 Well File Review

A well file must be reviewed prior to any on-site activities. This review must include, to the extent possible,

- well site history
- important well information (e.g., hydrogen sulphide, cement top, surface casing vent flow/gas migration/casing failure history, completion and abandonment details)
- the most recent survey plat
- historical aerial photos

2.0 Locating an Abandoned Well

An abandoned well is to be located using the survey plat and historical aerial photos from the well file review and pin locating by a competent operator.

The licensee must take all reasonable efforts to locate the well and must contact the AER via email at directive079@aer.ca if it is unable to locate the well.

The licensee must keep all well location records on file and ensure that they are available for audit by the AER. Records must include each of the following if available:

- copy of the most recent survey plat showing the well
- historical aerial photos
- drawing identifying
  - the well centre and its global positioning system (GPS) coordinates
  - surface structures adjacent to the test area and their distances from the well centre
  - buried infrastructure identified by the Alberta One-Call process
  - other buried infrastructure within the property boundary or test area identified when locating the well, or as required by ground disturbance
- photos identifying the well centre (marked by stakes) and other surface structures

3.0 Gas Detection Survey

(A) Establish Background Methane Level

Background soil surface methane levels must be measured. These measurements must eliminate erroneous readings from nonsoil methane sources.

Soil methane must be measured according to the following criteria:

- minimum of three test points within +/−2 parts per million (ppm) of each other
- minimum of 10 m from the well

Average the test points that are within +/−2 ppm to establish the background value.

If background soil methane levels exceed 10 ppm, the AER must be consulted via email at directive079@aer.ca before proceeding.

(B) Survey Methods

Once background methane levels are established, a gas detection survey is required to confirm the integrity of the well.

The personnel and equipment used for the gas detection survey must be in accordance with the Gas Detection Specifications in this protocol.

The two acceptable gas detection survey methods are

1) in-soil gas detection—includes auguring holes in the soil and measuring methane concentrations,[1] and
2) soil surface gas detection—includes measuring methane concentrations at the air-soil interface.

(C) Testing Procedures for a Located Well

Well located greater than 6 m from any surface development[2]

For the selected gas detection survey method, follow the Recommended Test Point Locations in *Directive 087: Well Integrity Management*, appendix 3. There must also be a sampling location directly over the well centre, as well as sample test points in areas with apparent vegetation stress in proximity to the well.

Well located under a surface structure

Test the surface structure perimeter and all visible cracks and openings in floors and walls at the lowest level.

Well located under a roadway

Test the roadway perimeter, including updip areas and utility openings. For paved roadways, test all cracks and openings.

[1] *Directive 020: Well Abandonment* (appendix 2) describes this method and the required equipment.

[2] Surface development includes any structure or roadway.

Well located less than 6 m from surface development

Follow all procedures above to the extent possible.

3.1 Gas Detection Grid Survey Procedure for a Well That Cannot Be Located

Use a 1 m grid pattern across the entire property to determine if a methane anomaly exists. If the well location of record is within 6 m of the property line, grid testing is also required on adjacent properties to ensure coverage over the extent of the area believed to contain the well. If there is surface development within the grid area, the testing procedures for a located well must be followed.

4.0 Do Methane Anomalies Exist?

A methane anomaly exists if the methane level at a test location exceeds the background methane level.

4.1 Is Well Source of Anomaly?

If soil surface methane detection was used as the initial survey method, then the in-soil methane detection method must be used to confirm the results, including the assessment of the background methane level.

If a methane anomaly exists, the licensee must confirm the source.

If during the grid survey a methane anomaly is detected that is not within the same surface location of the initial well locating activities, the licensee must repeat the locating activities of part 2.0 for the area encompassing the anomaly to determine if the well is the source of the anomaly.

If the well is not the source of the anomaly, the requirements in part 5.0 apply. If the well is the source of the anomaly, the requirements in part 6.0 apply.

5.0 AER Risk Score

Ongoing soil methane testing is required if the test results indicate that there are no methane anomalies or the well is not the source. The frequency of testing is determined by the AER Abandoned Well Risk Assessment Model (risk assessment model).

The AER uses the risk assessment model to determine a risk score for each well. This score is used to establish the testing frequency based on the following risk thresholds:

- high risk—annually
- medium risk—every three years

- low risk—every ten years

Testing performed according to the risk classification determined by the risk assessment model must be completed no later than September 30 of each year testing is required.

6.0 Develop Well-Specific Action Plan for a Leaking Well

The licensee must submit to the AER via email at directive079@aer.ca an action plan to address the source of any well-based anomalies within 30 days. The action plan must detail the approach and set out the timeline to repair the well in accordance with *Directive 020*. Well-specific action plans must consider site-specific conditions.

If test results indicate that the source of a methane anomaly is an abandoned well and the methane reading exceeds 10 000 ppm, the AER must be contacted via email at directive079@aer.ca within 24 hours.

If the AER is of the opinion that it is more appropriate for a methane anomaly to be monitored and managed rather than for the source of the anomaly to be repaired due to the specific circumstances, the AER may authorize such an approach. The criteria used to make this determination will vary depending on the circumstances and will be based on an analysis of how best to address the well abandonment requirements while ensuring public safety, resource conservation, and protection of the environment.

Action plans must be approved by the AER.

Report Test Results to the AER

The licensee must report all test results to the AER within 30 days of completing testing via email at directive079@aer.ca. The information reported will depend on whether a methane anomaly exists and if the well is the source.

No methane anomaly exists

Test information submitted to the AER is to include

- test date
- an indication that no methane anomaly exists
- latitude and longitude of well centre
- any applicable comments

Methane anomaly exists and well is not the source

The source of the methane anomaly must be determined, and the appropriate government agency notified.

Test information submitted to the AER is to include

- test date
- an indication that a methane anomaly exists
- latitude and longitude of well centre
- identification of source of methane anomaly
- any applicable comments

Methane anomaly exists and well is the source

Test information submitted to the AER is to include

- test date
- latitude and longitude of well centre
- indications that a methane anomaly exists and that the well is the source
- any applicable comments
- other information as required by the AER to develop a well-specific action plan

Records Retention

The licensee must keep all gas detection survey records on file indefinitely and ensure that they are available for audit by the AER. Records must include the following:

- a test-area plot plan consisting of all test points, including background, well centre, and identified surface structures points
- test-point results
- test-point GPS coordinates
- photos of staked test locations and exposed well (if applicable)

Gas Detection Specifications

Operating requirements

Testing must be conducted by trained and competent personnel. Appropriate safety procedures, standard operating procedures, and quality assurance and quality control measures must be documented and available for verification by a third party.

Sample data must be collected using an electronic datalogger capable of sampling at time intervals of one second with automatic date and time stamp.

GPS data referenced to NAD83 should be collected to provide additional geospatial data and to supplement sample point location identification. This information will provide an audit trail if required.

Multipoint calibration should be performed as per manufacturer specifications. A span (bump) check must be performed daily.

Instrument requirements

Acceptable detection instruments for methane include

- flame ionization detection (FID)
- photo ionization detection (PID)
- laser detection

Acceptable instruments must meet the following specifications:

- measuring range: 0–100, 0–1000, 0–10 000 ppm; lower explosive limit (LEL): 0–100%
- accuracy: +/−10%
- linearity +/−10%
- sensitivity: 1 ppm, LEL: 1%
- response time: <5 seconds
- calibration: adjustable zero and span with a maximum +/−15% drift over 24 hours

Quality Assurance / Quality Control

All equipment must be maintained to manufacturer standards.

All performance tests and calibration and span data must be retained for a minimum of five years.

The AER may conduct an audit at any time to ensure compliance with the requirements in this directive.

Contact Information

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