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Interpreting the ERCB's "Hydraulic Fracturing" Bulletin

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On January 23, 2012 Alberta's Energy Resources Conservation Board (ERCB) issued Bulletin 2012-02 entitled *Hydraulic Fracturing: Interwellbore Communication between Energy Wells*¹ to provide guidance to operators using hydraulic fracturing in horizontal wells. The ERCB confirmed its expectation that operators maintain well control at all times so as not to impact the environment, public safety, or resource recovery, and to prevent adverse effects on offsetting wellbores. Industry was also reminded of its obligation to plan safe and effective hydraulic fracturing operations.

ERCB Bulletin 2012-02

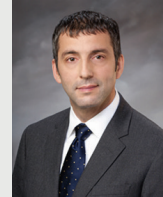
In maintaining well control, operators are required to prevent adverse effects to offsetting wellbores through appropriate planning, including the following measures:

- Assessing the risks that hydraulic fracturing may have on offsetting wellbores and how those risks are influenced by geology and the completion practices being employed. Undertaking fracture propagation modelling prior to operations may assist in determining the potential area of influence (AOI) resulting from the fracturing operation.
- Understanding the AOI that may be impacted by well stimulation operations and identifying all wellbores, including abandoned and suspended wells that may be in close subsurface proximity.
- Notifying offset well licensees of pending hydraulic fracturing that may impact offset wellbores.
- Collaborating with offset well licensees to ensure effective control of all wells.

By not providing concrete recommendations for determining potential AOIs, or addressing the increasingly common misconception that spacing units equate to AOIs, the ERCB has introduced significant ambiguity into the regulatory process, the consequence of which may be widespread non-compliance. In contrast, the United States Environmental Protection Agency (EPA) has recently issued its long awaited draft guidance regulating hydraulic fracturing entitled *Permitting Guidance for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels – Draft: Underground Injection Control Program Guidance #84*², which does provide a clear set of regulatory expectations. Accordingly, we suggest that operators in Alberta look to the EPA's recommendations as a due diligence guideline in delineating AOIs for compliance purposes.

The EPA's methodology for determining an "area of review"

Integral to the EPA's underground injection control regulatory regime is a determination of an "area of review" (AOR) associated with a well proposed to be hydraulically fractured. The purpose of the AOR determination is to identify "the area throughout which the owner or operator must search for conduits, such as abandoned wells, that could enable fluids containing diesel fuels to migrate from the injection zone into [an underground source of drinking water]". The EPA's underground injection regulations



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¹ <http://www.ercb.ca/docs/documents/bulletins/bulletin-2012-02.pdf>

² <http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/upload/hfdieselfuelsguidance508.pdf>



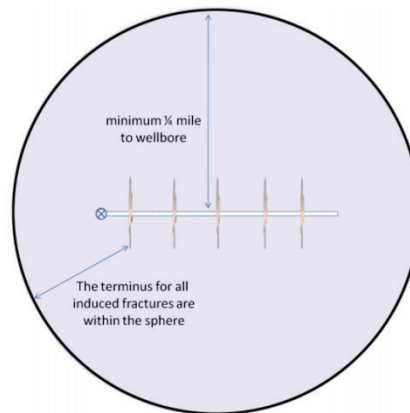
have historically provided for two approaches to delineating the AOR: a mathematical approach for calculating the zone influenced by the fracturing operation, and a fixed-radius approach.

The mathematical approach, which utilizes a formula referred to as the “modified Theis equation”, while apparently effective for calculating the zone of influence for a vertical well can be problematic when applied to horizontal laterals, and the EPA does not support its use. While the EPA suggests that alternate numerical models, supported by sufficient field data, could be appropriate to apply to a specific geologic setting, it recommends that a one-quarter (¼) mile (400 m) fixed radius be used to delineate the AOR of proposed horizontal wells to be hydraulically fractured.

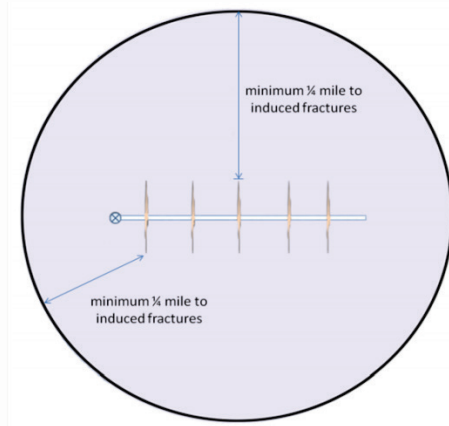
Variations of the Fixed Radius AOR for Horizontal Wells

Recognizing that the purpose of the AOR is to sufficiently protect underground sources of drinking water the EPA has developed four variations of the fixed radius AOR to apply to horizontal wellbores:

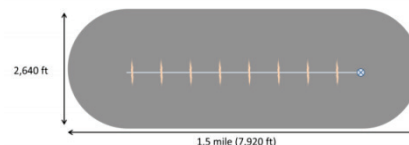
1. **400 m from Horizontal Completion:** A circle drawn around the horizontal completion of the well, where the circle is centered at the mid-point of the horizontal completion, fully contains all hydraulically induced fractures and has a radius of no less than 400 m.



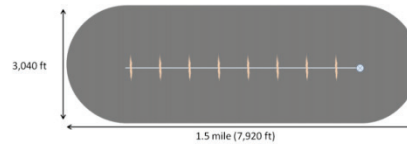
2. **400 m from Termination Point of Induced Fractures:** A circle drawn around the horizontal completion of the well, where the circle is centered at the mid-point of the horizontal completion, has a radius such that all fractures are completely contained and the termination points of the fractures are no closer to the sphere's circumference than 400 m.



3. **400 m from Horizontal Completion:** A cigar-shaped setback from the horizontal completion, where the cigar shape around the horizontal completion fully contains all hydraulically induced fractures and has a radius of no less than 400 m from the horizontal completion.



4. **400 m from Termination Point of Induced Fractures:** A cigar-shaped setback from the horizontal completion, where the setback is no less than 400 m from the estimated termination points of the fractures.³



Fixed Radius as minimum guideline

Key to the EPA's determination of the appropriate AOR for a hydraulically fractured horizontal well is the recognition that each determination must specifically address the full extent, shape, and size of the impacted rock volume for each hydraulic fracturing project. Of necessity, that determination must take into account variations in geology, operational practices, and drilling and fracturing techniques, including a review of past fracturing activities in each geographic area or field, and a consultation with the operator about the design and anticipated results for the fracturing operation. Information needed in evaluating the appropriate AOR delineation method includes three-dimensional well orientation and anticipated fracture length. In addition, multiple wells drilled from the same well pad introduce complexities into the AOR delineation and assessment process. Operators using multi-well pads must include the length and angle of each horizontal completion, fracture length, and an estimation of how closely the fractured zone approximates a porous medium.

Similarly, in Alberta, the overriding obligation that the ERCB places on operators is to "maintain well control at all times", and to "plan safe and effective hydraulic fracturing operations", all of which suggests that in each circumstance a separate and appropriate AOI must be determined. The application of appropriate fixed radius guidelines, however determined, may provide a reasonable minimum for an AOI but are no substitute for the exercise and application of professional judgment in seeking to remain compliant.

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³ In this example the hydraulically induced fractures extend 60m from the horizontal wellbore resulting in a total setback distance of 460m from the wellbore.

