

MADE at the City of Calgary, in the
Province of Alberta, on
26th day of August 2016.


ALBERTA ENERGY REGULATOR

The Alberta Energy Regulator (AER) pursuant to the Oil and Gas Conservation Act, chapter O-6 of the Revised Statutes of Alberta, 2000, orders as follows:

- 1) The scheme of Penn West Petroleum Ltd. for enhanced recovery of oil by water and gas injection in that part of the **Armisie Blairmore Pool** outlined in Appendix A of the approval, as described in

- a) Application No. 1832419,

is approved, subject to the terms and conditions herein contained.

- 2) Water and gas may be injected into the subject pool through the well(s) with the following unique identifier(s):

Class II & III

00/03-04-052-25W4/0 {4000}

Injection shall commence in the well(s) referred to in clause 2 within three months of the date of this approval.

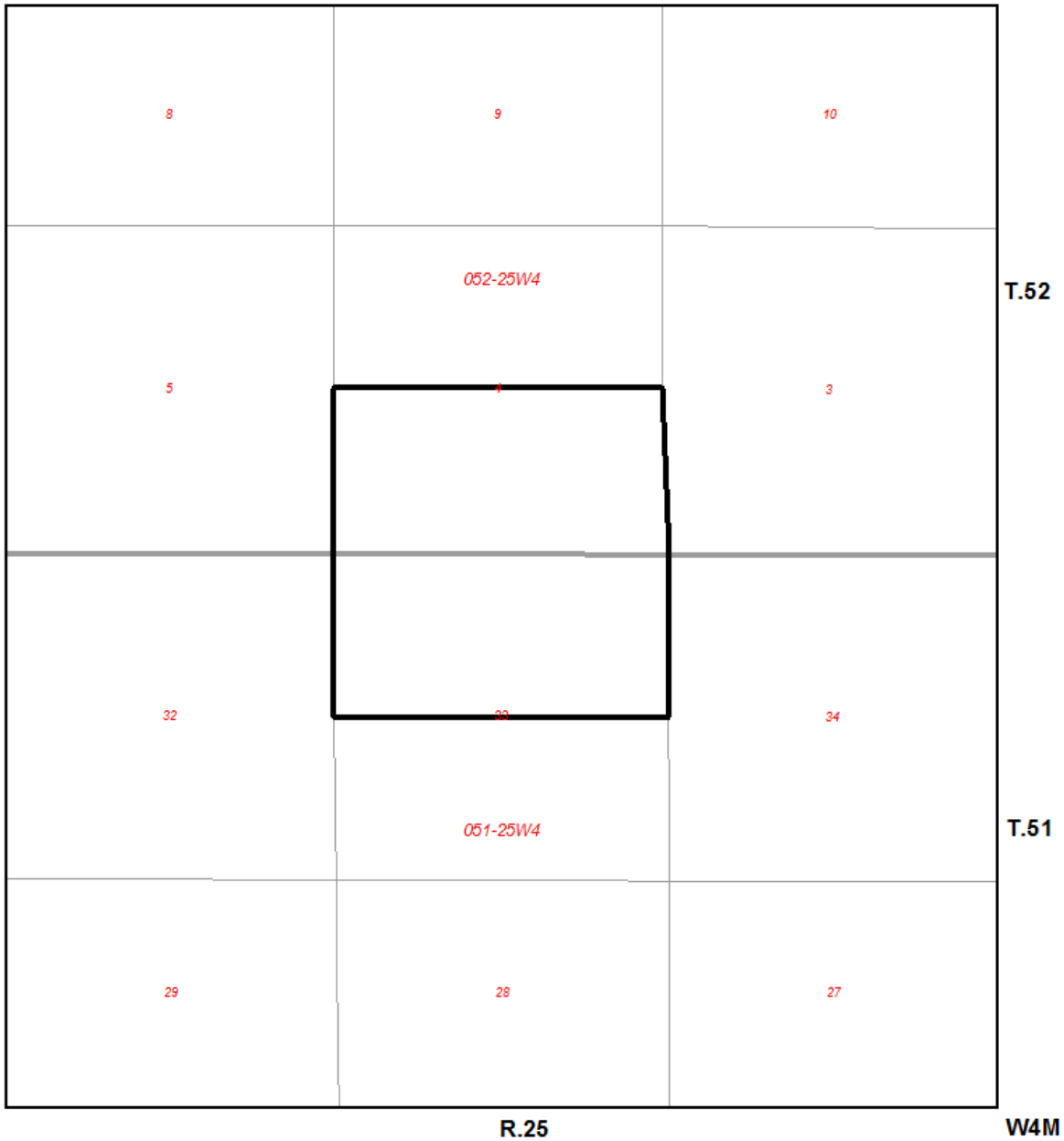
The class of injection fluid is described in *Directive 051*.

Bracketed value denotes the maximum wellhead injection pressure (kilopascals gauge) for the specified well for {water and gas} injection.

- 3) The injection of water and gas may commence in the well(s) referred to in clause 2 once the AER has confirmed in writing that *Directive 051* requirements have been met.
- 4) The water and gas injected to that part of the subject pool outlined in Appendix A
 - a) must not exceed voidage replacement ratio of 1.0 on the basis of cumulative production and injection volumes following the commencement of production and or a maximum average reservoir pressure of 9560 kPa, whichever occurs first, and
 - b) must maintain a minimum voidage replacement ratio of 0.7 on a twelve month moving average basis.
- 5) The composition of the injected gas shall not exceed 0.66 mole percent hydrogen sulphide.
- 6) The injection stream shall not exceed 1.6 mole percent gas and 98.4 mole percent water.

- 7) The maximum daily gas injection rate must not exceed 5000 standard cubic metres per day.
- 8) The pressure of the tubing casing annulus must be continuously monitored with any significant fluctuations immediately reported to the AER via WellOperations@aer.ca.
- 9) The 02/03-04-052-25W4/2 well must be suspended in accordance with *Directive 013: Suspension Requirements for Wells* as a high-risk well Type 1 prior to the commencement of injection.
- 10) The approval holder shall submit and present annual progress reports to the AER Resource Compliance Group on an annual basis. These reports shall include the following information, in metric units:
 - a) a discussion of the overall performance of the scheme, including the incremental oil recovery and the volume of incremental oil produced as a result of water and gas injection,
 - b) a discussion of any changes in the operation of the scheme including, but not limited to identification of problems, remedial action take, and results of remedial action on scheme performance during the reporting period,
 - c) the net amount of injected gas in the reservoir, in reservoir cubic metres and in standard cubic metres, the difference between the total gas injected into and that produced from the scheme,
 - d) a table showing gas production rates in the four offset wells, 00/14-33-051-25W4/0, 00/15-33-051-25W4/0, 00/02-04-052-25W4/0 and 00/04-04-052-25W4/0, to evaluate the absolute open flow potential to ensure H₂S release rates will not exceed 0.01 m³/second in a blow-out scenario,
 - e) a table and plot of the calculated voidage replacement ratios both on a monthly and cumulative basis from the start of the scheme operations and from the start of production, and
 - f) verification that all conditions of this approval have been met during the reporting period. All non-compliance events should be summarized, and should be voluntarily self-disclosed as soon as they occur to Resource Compliance in the AER Environment & Operational Performance Branch in accordance with *Manual 13: Compliance and Enforcement Program*.

END OF DOCUMENT



**ARMISIE BLAIRMORE POOL
APPENDIX A TO APPROVAL NO. 12447**

The AER does not warrant the accuracy or completeness of the information contained in this map and is not responsible for any errors or omissions in its content and accepts no liability for the use of this information.

Base Data Provided by Spatial Data Warehouse Ltd., 2003

Area(s) of Change

////// Added

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