

March 24, 2016

4470-8200-32640-02

Bryan Wright, P.L. Eng  
Production Engineer  
Endurance Energy Ltd.  
Suite 800, 215 – 9<sup>th</sup> Ave S.W.  
Calgary AB T2P 1K3

Dear Mr. Wright,

**RE: PRODUCED WATER DISPOSAL SPECIAL PROJECT APPROVAL  
ENDURANCE HZ ELLEH a-43-E/94-I-12; WA# 14202  
GUNNELL CREEK AREA, JEAN MARIE "A" POOL**

Commission staff have reviewed your application, dated October 8, 2015, requesting approval to dispose of produced water into the Jean Marie formation at the well Endurance HZ Elleh a-43-E/94-I-12. An extended injection test approval was granted December 2, 2015. The Jean Marie is typically a low permeability low water saturation formation, historically developed utilizing underbalanced drilling, purposely avoiding water contact with the formation. However, recent slickwater frac completions have resulted in improved gas production, suggesting the Jean Marie will tolerate water as a stimulation fluid.

Continued field development is partially predicated on the economic disposal of hydraulic fracture stimulation flow-back fluid. Injectivity and wellbore integrity testing on the subject well indicate disposal may be successful at this location. The subject well is a former low-rate gas producer, with production decline analysis indicating limited remaining reserves potential. Disposal capacity proximal to process facilities will benefit continued production operation for gas resource recovery in this field area. Conditions within the approval Order serve to protect remaining gas reserves within this producing pool.

Attached please find **Order 15-02-015 Amendment #1**, designating an area in the Gunnell Creek field, Jean Marie "A" pool as a Special Project under section 75 of the Oil and Gas Activities Act, for the operation and use of a storage reservoir for the injection of produced water.

Additional general information regarding disposal wells is available on the Commission's website at <http://www.bcogc.ca/industry-zone/documentation/Subsurface-Disposal>.

Should you have any questions, please contact Michelle Gaucher at (250) 419-4482 or Ron Stefik at (250) 419-4430.

Sincerely,



Ron Stefik, Eng. L.  
Supervisor, Reservoir Engineering  
Oil and Gas Commission

Attachments



IN THE MATTER of a submission from Benoit Regulatory Compliance on behalf of Endurance Energy Ltd (Endurance), to the Oil and Gas Commission (Commission) dated October 8, 2015 for the use of a storage reservoir:

**ORDER 15-02-015 Amendment #1**

1 Under Section 75(1)(d) of the *Oil and Gas Activities Act*, the Commission designates the operation and use of a storage reservoir for the disposal of produced water, including hydraulic fracture flowback fluid, in the Gunnel Creek field – Jean Marie “A” pool as a special project in the following area:

NTS 94-I-02 Block E Unit 43.

2 Under section 75(2) of the *Oil and Gas Activities Act*, the special project designation in this Order is subject to the following conditions. The Permit Holder shall:

- a) Inject produced water only into the horizontal well Endurance HZ Elleh a-43-E/94-I-12; WA# 14202 Jean Marie formation, 1559.2 - 2600.4 mCF MD.
- b) Not exceed an injection pressure, measured at the wellhead on the subject well, of 9,450 kPag or the pressure required to fracture the formation, whichever is lesser.
- c) Inject only through tubing with a packer set as near as is practical above the injection interval.
- d) Continually measure and record the wellhead casing and tubing pressures electronically.
- e) Cease injection and notify the Commission immediately if hydraulic isolation is lost in the wellbore or formation.
- f) Submit the annual packer isolation test report to the Commission within 30 days of the completion of the test.
- g) Include the disposal operating hours and the maximum injection pressure value on the monthly BC-S18 disposal statement.
- h) Conduct an annual reservoir pressure test on the formation in the subject well, with a shut-in period of sufficient length to provide data for calculation of the reservoir pressure, and submit a report of the test within 60 days of the end of the test.
- i) Cease injection upon reaching a maximum formation pressure of 10,700 kPaa, measured at MPP.
- j) Maintain and manage the well head to prevent surface liquids from entering the well bore through the annulus outside or between casing and conductor strings.
- k) Cease injection and contact the Commission if injected water is indicated at any of the following wells:
  - i) Endurance HZ Elleh c-68-F/94-I-12; WA# 16884
  - ii) Endurance HZ Gunnell d-A39-F/94-I-12; WA# 27206
  - iii) Endurance HZ Elleh a-A40-F/94-I-1; WA# 17050

  
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Ron Stefik, Eng. L.  
Supervisor, Reservoir Engineering  
Oil and Gas Commission

DATED AT the City of Victoria, in the Province of British Columbia, this 24<sup>th</sup> day of March, 2016.

Advisory Guidance for Order 15-02-015 Amendment #1

- I. A production packer must be set above the injection interval and the space between the tubing and casing filled with corrosion and frost inhibiting fluids, as per section 16(2) of the Drilling and Production Regulation.
- II. Annual packer isolation tests are required to be submitted, as per section 16(3) of the Drilling and Production Regulation.
- III. Injected fluids must be metered and the injection pressure measured at the wellhead, as per section 74 of the Drilling and Production Regulation.
- IV. A monthly disposal statement must be submitted to the Commission not later than the 25<sup>th</sup> day of the month following the reported month, as per section 75 of the Drilling and Production Regulation.
- V. Seismic events must be reported and disposal operations suspended as per section 21.1 of the Drilling and Production Regulation.