

July 17, 2019

8157-2800-32640-02

Brett Ferguson, P. Eng.
Senior Development Engineer
Encana Services Company Ltd.
500 Centre Street SE, PO Box 2850
Calgary, Alberta T2P 2S5

Dear Mr. Ferguson,

**RE: PRODUCED WATER DISPOSAL SPECIAL PROJECT APPROVAL
ECA TOWER 13-08-81-17 W6M; WA# 27431
TOWER LAKE FIELD – CADOMIN FORMATION**

The Commission has reviewed the Encana application, dated November 28th, 2018, for produced water disposal into the subject well, Cadomin formation. The subject vertical well was drilled in July of 2011 for the purpose of production from the Montney formation. The well was cased and cemented but not perforated or stimulated. The well was suspended in September 2012. In September 2018 the well was prepared for microseismic monitoring of nearby Montney completions.

In November of 2018, the Cadomin formation was completed for disposal purposes. Encana requested and received an extended injectivity approval to assess the disposal capability of the vertical well, and to allow wellsite commissioning activities to begin.

Attached please find **Order 18-02-011 Amendment #1**, designating an area near the Tower Lake field – in the Cadomin formation – 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 disposal of produced water.

This Order contains a number of detailed operational conditions, including continuous wellhead measurements, a maximum wellhead injection pressure, and an ultimate reservoir pressure limit. The MWHIP in condition 2b) is based on a fracture gradient the Commission deems suitable for the Cadomin formation at this location, 28 kPa/m, calculated to the top of the open hole section using a fluid gradient of 11.7 kPa/m. Disposal of fluid with high total dissolved solids content requires adjustment of the wellhead injection pressure to remain below formation fracture pressure.

For the inspection requirement of Order condition 2 l), please arrange via email to OGCPipelines.Facilities@bcogc.ca.

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

Sincerely,



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

Attachment

ORDER 18-02-011 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 flowback from fracturing operations, in the Tower Lake field - Cadomin formation as a special project in the following area:
DLS Twp 81 Rge 17 W6M Section 8 - Lsds 11,12, 13 and 14
- 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 well ECA Tower 13-08-81-17; WA# 27431 – Cadomin formation from 1,257.0 to 1,277.0 mKB.
 - b) Not exceed an injection pressure, measured at the wellhead on the subject well, of 17,100 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) Conduct and submit an annual Surface Casing Vent Flow test 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 Petrinex disposal report.
 - 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 12,780 kPaa, measured at 1267.0 mKB TVD.
 - j)
 - i) Perform a casing inspection log on the subject well and submit results to the Commission within 30 days of the completion of logging, at an interval of not more than every 10 years, commencing from the date of initial disposal.
 - ii) Perform a hydraulic isolation temperature log on the subject well and submit results to the Commission within 30 days of the completion of logging, at an interval of not more than every 5 years, commencing from the date of initial disposal.
 - k) Not conduct a hydraulic fracture stimulation on any formation in the subject well without prior Commission approval.
 - l) Complete an inspection, satisfactory to the Commission, within 4 weeks of initial disposal operations.



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

DATED AT the City of Victoria, in the Province of British Columbia, this 17th day of July, 2019.

Advisory Guidance for Order 18-02-011 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 conducted and the associated report must be submitted to the Commission within 30 days of the test completion, 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 via Petrinex not later than the 20th 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.