

June 11, 2018

8120-2010-32640-02

Deb Gogol, P.Tech (Eng.)
Sr. Engineering Technologist
Encana Corporation
500 Centre Street SE, PO Box 2850
Calgary, Alberta T2P 2S5

Dear Ms. Gogol,

**RE: PRODUCED WATER DISPOSAL SPECIAL PROJECT APPROVAL
ECA HZ SUNRISE D13-1-79-17 W6M; WA# 34056
SUNRISE FIELD – PADDY-CADOTTE FORMATION**

Commission staff have reviewed the application from Encana Services Company Ltd, on behalf of Encana Corporation, dated May 2nd, 2018, for produced water disposal into the subject well, Cadotte formation. Approval was previously granted on May 15th, 2018 for an extended injectivity test of 5,000 m³ under Order 18-02-007. The subject well was horizontally drilled and completed in the Cadotte formation for disposal purpose in March 2018. The well is intended as supplemental disposal capacity for Encana's Sunrise water hub.

Attached please find **Order 18-02-007 Amendment #1**, designating an area in the Sunrise field, Paddy-Cadotte 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. Note that although this well was completed in the Cadotte formation, the Commission has defined a combined Paddy-Cadotte zone for the purposes of source and disposal due to the areal connectivity of the zones. The maximum wellhead injection pressure (MWHIP) designated in condition 2b) was calculated using a fluid hydrostatic gradient of 11.4 kPa/m, the density of the fluid to be disposed as indicated in Encana's application, and using a formation fracture gradient of 28 kPa/m, as the maximum the Commission deems suitable for the Paddy-Cadotte formation. A minor surface casing vent flow was measured on the well during completion, so annual SCVF testing is required as per condition 2g). The formation pressure limit in condition 2j), is based on 120% of initial pool pressure at the time the water cycling scheme was applied for in 2011, corrected to MPP. It is noted that the sandface pressure measured in March 2018 at the subject well was around 114% of initial pool pressure, due to the fact that this was a period of high injection and low production in the water hub. Pressures will fluctuate according to operations, and Encana has reservoir maintenance plans in place to not exceed 120% in the pool at any time.

For the inspection requirement of Order 18-02-007 Amendment #1 condition 2m), please arrange via email to OGCPipelines.Facilities@bcogc.ca.

In certain circumstances, disposal well operation may induce seismicity of values that require modification of operations to mitigate.

Should you have any questions, please contact Michelle Harding at (250) 419-4493 or Ron Stefik at (250) 419-4430.

Sincerely,



Richard Slocomb, M.A.Sc., P.Eng.
Vice President, Reservoir, Field Engineering & Technical Svcs
Oil and Gas Commission

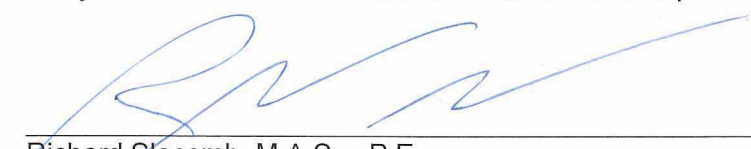
Attachment

ORDER 18-02-007 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, into the Paddy-Cadotte formation – Sunrise field as a special project in the following area:

DLS Twp 79 Rge 17 W6M Section 1 – Lsds 1, 2, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16

- 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 HZ Sunrise D13-1-79-17; WA# 34056 – Paddy-Cadotte formation (open hole from 1151.0 – 2141.0 mKB MD).
 - b) Not exceed an injection pressure, measured at the wellhead on the subject well, of 13,090 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) Conduct and submit an annual Surface Casing Vent Flow test to the Commission within 30 days of the completion of the test.
 - h) Include the disposal operating hours and the maximum injection pressure value on the monthly BC-S18 disposal statement.
 - i) 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.
 - j) Cease injection upon reaching a maximum formation pressure of 6,110 kPaa, measured at 944.1 mKB TVD.
 - k)
 - 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.
 - 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.
 - l) Not conduct a hydraulic fracture stimulation on any formation in the subject well without prior Commission approval.
 - m) Complete an inspection, satisfactory to the Commission, within 4 weeks of initial disposal operations under this Order.



Richard Slocomb, M.A.Sc., P.Eng.

Vice President, Reservoir, Field Engineering & Technical Svcs
Oil and Gas Commission

DATED AT the City of Victoria, in the Province of British Columbia, this 11th day of June, 2018.

Advisory Guidance for Order 18-02-007 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 25th 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.