

September 5, 2017

7660-7400-32640-02

Stephen Penner
Exploitation Engineering Technologist
Canadian Natural Resources Limited
2100, 855 – 2nd Street SW
Calgary AB, T2P 4J8

Dear Mr. Penner,

**RE: PRODUCED WATER DISPOSAL SPECIAL PROJECT APPROVAL; AMENDMENT #1
CNRL ET AL RING c-81-I/94-H-09; WA# 7536
RING FIELD – DEBOLT FORMATION**

Approval for disposal of produced water, Order 92-02-001, was issued for the subject well, Debolt formation, on January 13, 1992. The Commission is presently amending disposal well approvals to conform to current requirements.

The subject well was completed in the Debolt zone for disposal purpose. To date, the well has disposed over 345,713 m³. Wellbore integrity testing performed in February 2017 verify that continued disposal into the subject well is suitable. Reservoir pressures from the past three years prove that the pressure is not increasing substantially year-over-year, indicating continued disposal capacity.

Attached please find **Order 92-02-001 Amendment #1**, designating an area in the Ring field – Debolt 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 tubing and casing pressure monitoring requirements, a maximum wellhead injection pressure and an ultimate reservoir pressure limit. Bi-annual reservoir pressure tests will be required, based on slow reservoir fill-up. Additional general information regarding disposal wells is available on the Commission's website at <http://www.bcogc.ca/industry-zone/documentation/Subsurface-Disposal>.

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

Disposal of fluid with high total dissolved solids content requires adjustment of the wellhead injection pressure to remain below formation fracture pressure

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

Sincerely,



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

Attachment



ORDER 92-02-001 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 Debolt formation – Ring field as a special project in the following area:
NTS 94-H-09 Block I Unit 81
- 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 CNRL et al Ring c-81-1/94-H-09; WA# 7536 – Debolt formation (open hole from 990.0 to 1005.0 mKB).
 - b) Not exceed an injection pressure, measured at the wellhead on the subject well, of 3,160 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 a reservoir pressure test on the formation in the subject well once every two years, 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 8,260 kPaa, measured at 997.5 mKB.
 - 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.
 - 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.
 - k) Not conduct a hydraulic fracture stimulation on any formation in the subject well without prior Commission approval.



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

DATED AT the City of Victoria, in the Province of British Columbia, this 5th day of September, 2017.

Advisory Guidance for Order 92-02-001 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.