

July 20, 2017

1800-7400-32640-02

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

Dear Mr Penner:

**RE: PRODUCED WATER DISPOSAL SPECIAL PROJECT APPROVAL, AMENDMENT #1  
CNRL ET AL W BLUEBERRY b-7-L/94-A-12; WA# 12092  
BLUEBERRY WEST FIELD – DEBOLT FORMATION**

Approval for disposal of produced water, Order 00-02-001, was issued for the subject well, Debolt formation, on January 21, 2000. The Commission is presently amending disposal well approvals to conform to current requirements.

The subject well was drilled through both the hanging wall and the foot wall of a well-defined thrust fault, resulting in a repeat of the Montney, Belloy, and Debolt zones within the wellbore. The upper Debolt zone produced from the Blueberry West Debolt 'C' oil pool between December 1999 and January 2004. The lower Debolt zone has been used for disposal since January 2000.

Attached please find **Order 00-02-001 Amendment #1**, designating an area in the Blueberry West 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 a maximum wellhead injection pressure, reservoir pressure fill-up limit, and continuous tubing and casing pressure monitoring. Currently a set of packers on the tubing string isolates the upper Debolt formation, in addition to the inflatable injection packer set above the lower Debolt. The annual packer isolation test confirms the integrity of the annulus to the top packer. To augment this, a pressure test of the tubing will be required to ensure integrity of the lower sections (Condition 2g)ii) in the attached Order).

Disposal in close proximity to a fault raises the possibility of induced seismicity. There has been no indication to date of seismicity associated with disposal, however the Commission requests that CNRL closely monitor for the potential of any induced events. Enhanced seismic monitoring may be considered in the future if potentially significant concerns are raised.

The maximum wellhead injection pressure outlined in condition 2b) was calculated using the Commission's methodology, including review of nearby Debolt fracture gradients. Currently the well is operating at tubing pressures near vacuum. Considering the proximity to a fault, any significant change in operating pressures may be a concern. The Commission expects CNRL to closely monitor casing and tubing pressures (Condition 2c)) for any signs of abnormal activities.

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

Sincerely,

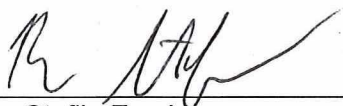


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Ron Stefik, Eng.L.  
Supervisor, Reservoir Engineering  
Oil and Gas Commission

Attachment

ORDER 00-02-001 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 – Blueberry West field as a special project in the following area:  
NTS 94-A-12 Block L Unit 7
- 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 W Blueberry b-7-L/94-A-12; WA# 12092 – Debolt formation (open hole from 2191.7 – 2232.0 mKB MD).
  - b) Not exceed an injection pressure, measured at the wellhead on the subject well, of 10,650 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) i) Install electronic equipment to continually measure and record wellhead casing and tubing pressures by October 16, 2017, and from this date onwards;  
ii) Continually measure and record the wellhead casing and tubing pressures electronically.
  - e) Set casing and tubing pressure alarms for values at endpoints of normal operating range, and notify the Commission immediately if significant changes occur.
  - f) Cease injection and notify the Commission immediately if hydraulic isolation is lost in the wellbore or formation.
  - g) Submit the annual packer isolation test report to the Commission within 30 days of the completion of the test, consisting of:
    - i) Annular integrity test
    - ii) Tubing integrity pressure test, with plug set as close as possible to base of injection string
  - 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 21,655 kPaa, measured at 2200.7 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.



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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 20<sup>th</sup> day of July, 2017.



**ORDER 00-02-001 Amendment #1**

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Advisory Guidance for Order 00-02-001 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 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.