

January 24, 2018

1260-2600-32640-02

Lynn Wood, P.Eng.
Exploitation Engineer
Canadian Natural Resources Ltd.
Suite 2500, 855 – 2nd Street S.W.
Calgary, Alberta T2P 4J8

Dear Ms. Wood,

**RE: PRODUCED WATER DISPOSAL SPECIAL PROJECT APPROVAL
CNRL FIREWEED d-82-H/94-A-13; WA# 21595
BIRCH FIELD – BLUESKY FORMATION**

The Commission has reviewed CNRL's application, dated November 24, 2017, for produced water disposal into the subject well, Bluesky formation. The d-82-H well was drilled to the depth of 1617.0 m targeting Lower Halfway gas. The Lower Halfway was completed in August 2006 but the formation was wet and did not flow, suspended in Sept 2006. The Dunlevy was completed 1207.5 – 1227.5 m, which was also wet and did not flow. The well was suspended with a bridge plug in Nov 2006.

CNRL re-entered this well in November 2017, perforating the Bluesky interval 1172.0 – 1179.5 m. Swabbing produced water but no gas. The well was prepared for disposal operations, including an acid squeeze, 2 step-rate tests, a pressure test, integrity logging, a surface casing vent flow test and a 10 minute packer isolation test.

Attached please find **Order 18-02-001**, designating an area in the Birch field – Bluesky 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. Annual surface casing vent flow and packer isolation testing are required to ensure continued wellbore integrity. 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. The Commission advises that disposal well permit holders monitor seismic events in proximity to the well and be prepared to modify operations to mitigate induced seismicity. Permit holders may monitor seismic events through the Natural Resources Canada seismic monitoring network at: <http://www.earthquakescanada.nrcan.gc.ca/recent/index-eng.php>

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

Sincerely,

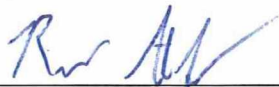


Ron Stefik, Eng.L.
Supervisor, Reservoir Engineering
Oil and Gas Commission

Attachment

ORDER 18-02-001

- 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 Bluesky formation – Birch field as a special project in the following area:
NTS 94-A-13 Block H Unit 82
- 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 Fireweed d-82-H/94-A-13; WA# 21595 – Bluesky formation (disposal perforations 1172.0 – 1179.5 mKB).
 - b) Not exceed an injection pressure, measured at the wellhead on the subject well, of 8,440 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 annual surface casing vent flow test and submit report within 30 days of test completion.
 - 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 5,500 kPaa, measured at 1175.8 mKB.
 - 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, 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.
 - l) 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 24th day of January, 2018.



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Advisory Guidance for Order 18-02-001

- 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.