

July 27, 2017

4700-8400-32640-02

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 HELMET d-79-A/94-P-07; WA# 2881
HELMET FIELD – SLAVE POINT 'B' POOL**

Approval for disposal of produced water was issued for the subject well, Slave Point 'B' pool, on April 14, 2004. The Commission is presently amending disposal well approvals to conform to current requirements.

The subject well produced gas from the Slave Point 'B' pool between April 1976 and December 1992. Disposal started into the subject well in February 2005. The other three former producing wells in the pool have been abandoned. Since 1978 the reservoir pressure in the subject well has been maintained at the same pressure, indicating an extensive aquifer accepting fluids. During a workover in June 2015, a casing inspection log was performed, which showed 14 casing joints with class 4 damage and one with class 5 damage.

Attached please find **Order 04-02-004 Amendment #1**, designating an area in the Helmet field – Slave Point 'B' pool 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, and a maximum wellhead injection pressure. Additional general information regarding disposal wells is available on the Commission's website at <http://www.bcogc.ca/industry-zone/documentation/Subsurface-Disposal>.

Conditions are included to address integrity concerns for this well. Casing alarms are to be set to ensure that abnormal casing pressures are immediately identified and investigated. A monthly volume limit of 1,000 m³ will ensure that the well is used only to support the continued declining activity in the area. Should disposal demand in the area increase, the Commission expects that the casing damage risk be further mitigated, or an alternative disposal option be considered. The maximum reservoir pressure is calculated based on the top of a hydrostatic column of disposal fluid, to ensure the protection of groundwater. Casing inspection frequency is increased to every 5 years in order to more effectively track the rate of corrosion. A hydraulic isolation log was not run during the August 2015 workover, so this log will be required by December 31, 2017.

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,

A handwritten signature in black ink, appearing to read 'R. Stefik', is written over a horizontal line.

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

Attachment

ORDER 04-02-004 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 Slave Point 'B' pool – Helmet field as a special project in the following area:
NTS 94-P-07 Block A Unit 79
- 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 Helmet d-79-A/94-P-07; WA# 2881 – Slave Point 'B' pool (perforations 1911.6 – 1918.6 mKB).
 - b) Not exceed an injection pressure, measured at the wellhead on the subject well, of 4,205 kPag or the pressure required to fracture the formation, whichever is lesser.
 - c) Not exceed a maximum volume of 1,000 m³ injected per month.
 - d) Inject only through tubing with a packer set as near as is practical above the injection interval.
 - e) Continually measure and record the wellhead casing and tubing pressures electronically.
 - f) Alarm the annulus pressure monitoring system to indicate when casing pressure varies outside the normal operating range.
 - g) Cease injection and notify the Commission immediately if hydraulic isolation is lost in the wellbore or formation.
 - h) Submit the annual packer isolation test report to the Commission within 30 days of the completion of the test.
 - i) Include the disposal operating hours and the maximum injection pressure value on the monthly BC-S18 disposal statement.
 - j) Conduct a reservoir pressure test on the formation in the subject well every 2 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.
 - k) Cease injection upon reaching a maximum formation pressure of 16,380 kPaa, measured at 1915.1 mKB.
 - l)
 - 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 5 years.
 - ii) Perform a hydraulic isolation temperature log on the subject well by December 31, 2017, and submit results to the Commission within 30 days of the completion of logging. Thereafter, perform a hydraulic isolation log on the subject well at an interval of not more than every 5 years.
 - m) 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 27th day of July, 2017.

Advisory Guidance for Order 04-02-004 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.