



September 25, 2015

9045-7400-32640-02

Chris Sieben, P.Eng.
Conventional Reservoir and Subsurface Engineering Supervisor
Imperial Oil Resources Limited
8095, 237 – 4th Avenue SW
Calgary AB T2P 0H4

Dear Mr. Sieben,

**RE: PRODUCED WATER DISPOSAL SPECIAL PROJECT AMENDMENT #3
IMP MCADAM c-24-I/094-O-02; WA# 27668
DEBOLT FORMATION**

Commission staff have reviewed the disposal approval Order for the well Imp McAdam c-24-I/94-0-2 with a focus on increasing maximum wellhead injection pressure (MWHIP) for deep disposal in the McAdam field – Debolt formation. Deep disposal approval was issued for the subject well on May 24, 2012 through Order 12-02-014 and was amended June 18, 2015.

Step-rate injectivity tests in May 2012 and June 2015 did not result in a definitive Formation Fracture Pressure (FFP). However, the maximum pressure of 7,040kPa, achieved in the June 2015 test was used to determine the MWHIP for Order 12-02-014 Amendment #2. Despite the higher MWHIP, Imperial was not able to achieve the disposal rates required and requested approval to conduct additional injectivity tests. Based on other Debolt step-rate tests and the relative depth of this formation, a 28 kPa/m gradient was agreed upon as a reasonable limit for the Imperial McAdam well.

Attached please find Order 12-02-014 Amendment #3, designating an area in the McAdam 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 includes a number of detailed operational conditions including: continuous tubing and casing pressure measurements, a maximum wellhead injection pressure, an ultimate reservoir pressure limit, as well as wellbore integrity monitoring and reporting requirements. Disposal wells are subject to regular field inspection and audit. Contravention of a condition of this Order may be subject to enforcement under section 62 of OGAA, or suspension or cancellation of the Order under section 75(2)(b).

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

Sincerely,

A handwritten signature in black ink, appearing to read "Ron Stefik", written over a horizontal line.

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

Attachment



ORDER 12-02-014 AMENDMENT #3

- 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, into the Debolt formation – near the McAdam field as a special project in the following area:

NTS Map 094 - O - 2 Block I Unit 24

- 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 IMP McAdam c-24-1/94-O-2; WA# 27668 – Debolt formation (disposal perforations 461.0 – 572.0 mKB MD).
 - b) Not exceed an injection pressure, measured at the wellhead on the subject well, of 6,900 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 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.
 - i) Cease injection upon reaching a maximum formation pressure of 6,525 kPaa, measured at MPP.
 - 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, 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.
 - k) Not conduct a hydraulic fracture stimulation on any formation in the subject well without prior Commission approval.

A handwritten signature in black ink, appearing to read "Ron Stefik", written over a horizontal line.

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

DATED AT the City of Victoria, in the Province of British Columbia, this 25th day of September, 2015.

Advisory Guidance for Order 12-02-014 Amendment #3

- I. A production packer must be set above the injection interval and the space between the tubing and casing filled with corrosion inhibiting fluids, as per section 16(2) of the Drilling and Production Regulation.
- II. Annual packer isolation tests are required, as per section 16(3) of the Drilling and Production Regulation.
- III. Injected fluids must be metered, 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.