BC Oil & Gas COMMISSION

January 31, 2019 9021-5000-59240-13

Doug Carter, P.Eng.
Exploitation Engineer
Canadian Natural Resources Limited
2100, 855 – 2nd Street S.W.
CALGARY, AB T2P 4J8

Dear Mr. Carter:

RE: INNOVATIVE TECHNOLOGY SPECIAL PROJECT, GAS CYCLING PILOT HYDROCARBON LIQUIDS RECOVERY
HERITAGE FIELD (SEPTIMUS) – MONTNEY "A" POOL

The Commission has reviewed the application dated November 26th, 2018 requesting an Innovative Technology pilot project for enhanced hydrocarbon liquid recovery from the Heritage field Montney "A" pool utilizing gas cycling.

The pilot is restricted to the eight wells located on pad 8-24-81-19. These wells, on production since June/July 2013, have produced just under 20 BCF of gas and associated liquids. Gas cycling operations, huff-puff, refers to a procedure where dry gas injection and production occurs cyclically in the same well. The goal of the pilot is to find the optimum parameters to economically increase hydrocarbon liquid production in the Montney formation.

Attached please find **Order 19-13-001** designating an Innovative Technology project within the Heritage (Septimus) field – Montney 'A' pool, as a Special Project under section 75 of the *Oil and Gas Activities Act*.

The Commission grants CNRL the requested flexibility to inject into any of the wells listed in Appendix 'A' of the attached Order. However, each time there is a change in well operations, from injector to producer or vise versa, the change of status must be submitted to the Commission via Petrinex. The pilot duration is limited to three years from the time of issue of this Order. Please note that, as per section 75 of the *Drilling and Production Regulation*, a record of the volume of gas injected, maximum wellhead pressure and total monthly operating hours must be included on a Monthly Injection Statement to the Commission via Petrinex not later than the 20th day of the month following the reported month. All gas produced must be reported with disposition of produced gas to sales or re-injection.

Should you have any questions, please contact Petra Kriescher-Trudgeon at (250) 419-4415 or the undersigned at (250) 419-4430.

Sincerely,

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

BC Oil & Gas COMMISSION

ORDER 19-13-001

1 Under Section 75(1) (a) & (b) of the *Oil and Gas Activities Act*, the Commission approves an Innovative Technology pilot project for enhanced hydrocarbon liquid recovery from the Heritage field, Montney"A" pool utilizing gas cycling.

DLS Twp 81 Rge 18 W6M Sections 17 - 20

Twp 81 Rge 19 W6M Section 23 & 24

2 Under section 75(2) of the *Oil and Gas Activities Act*, I specify the following:

a) The Innovative Technology pilot is limited to the wells, specified in Appendix 'A', located on pad 08-24-081-19.

b) The pilot duration and confidentiality of data, is limited to three years from the approval date, as per section 17 (1)(f) of the *Oil and Gas Activities Act General Regulation*.

c) Re-inject produced gas only into the wells located at pad 08-24-081-19.

d) Not exceed a maximum injection pressure, measured at the wellhead on the subject well, specified in Appendix 'A', or the pressure required to fracture the formation, whichever is lesser.

e) At the start of injection, the Commission must be informed the well permit number of the injector(s).

f) The injection volume is limited to the cumulative volume the well produced prior to injection start.

g) The following information must be recorded from the pilot pad wells:

   i. Daily gas, condensate and water production and hours on production

   ii. Daily gas injection, injection hours and WHIP

   iii. Daily casing and tubing pressures

h) A report of information (g) be submitted to the Commission within 30 days of the conclusion of six months increments or after each complete cycle of injection and production, whatever is earlier, and within 30 days of the conclusion of the pilot, in both tabular and graphical format, also include gas-condensate ratio, cumulative volumes of each fluid, VRR, gas and liquid compositional changes of the injected and produced fluids and results of any reservoir pressure tests.

i) Conduct and submit an annual Surface Casing Vent Flow test to the Commission within 30 days of the completion of the test.

j) Not conduct a hydraulic fracture stimulation on any formation in the subject well(s) without prior Commission approval.

k) Complete an inspection, satisfactory to the Commission, within 4 weeks of initial injection operations.

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

DATED AT the City of Victoria, in the Province of British Columbia, this 31st day of January, 2019.

Advisory Guidance for Order 19-13-001

I. Injected fluids must be metered and the injection pressure measured at the wellhead, as per section 74 of the Drilling and Production Regulation.

II. A monthly gas injection statement must be submitted to the Commission via Petrinex not later than the 20th day of the month following the reported month, as per section 75 of the Drilling and Production Regulation.

III. Seismic events must be reported and injection operations suspended as per section 21.1 of the Drilling and Production Regulation.

Appendix "A"

WA	Surface Location	UWI	MWHIP
28181	CNRL HZ SEPTIMUS A08-24-081-19	100042008118W600	34,200 kPa
28183	CNRL HZ SEPTIMUS B08-24-081-19	102042008118W600	34,900 kPa
28184	CNRL HZ SEPTIMUS C08-24-081-19	100131708118W600	34.300 kPa
28192	CNRL HZ SEPTIMUS D08-24-081-19	102131708118W600	35,000 kPa
28388	CNRL HZ SEPTIMUS E08-24-081-19	100151808118W600	34,300 kPa
28389	CNRL HZ SEPTIMUS F08-24-081-19	103162308119W600	34,300 kPa
28391	CNRL HZ SEPTIMUS G08-24-081-19	102102308119W600	34,900 kPa
28392	CNRL HZ SEPTIMUS H08-24-081-19	103102308119W600	34,400 kPa