

July 24, 1997

File: 760-4800-59240-09

Reference: 970697

CNRL Project (06)

Mr. E. P. Vigneau, P. Eng.  
Exploitation Engineer  
Canadian Natural Resources Limited  
2000, 425 - 1st Street S.W.  
Calgary, AB T2P 3L8

Dear Mr. Vigneau:

**Re: Application For Waterflood Pressure Maintenance Approval  
Beavertail Halfway "B" Pool**

This refers to your application dated June 6, 1996 wherein you requested approval of a waterflood pressure maintenance scheme in the subject oil pool.

Attached is Approval # 97-09-003 for the application, granted under section 100 of the Petroleum and Natural Gas Act.

Please note that Progress Reports shall be filed as stipulated in Part 9, section 108 of the Drilling and Production Regulation, B.C. Reg. 336/91.

The GEP Approval # 92-06-003 granted for the pool is hereby rescinded.

Yours truly,



Bou van Oort, P. Eng.  
Director  
Engineering and Operations Branch

Attachment

Copies for Approval Letter to Industry (11)  
RE: GEP, Salt Water Disposals, etc.  
 G. Miltenberger  
 Data Management  
 R. Stefik  
 D. Richardson (PGE)  
 P. Attariwala  
 G. Farr  
 S. Chicorelli (PGE)  
 Resource Revenue  
 59240  
 Wellfiles (originals)  
 Daily

APPROVAL 97-09-003

THE PROVINCE OF BRITISH COLUMBIA  
PETROLEUM AND NATURAL GAS ACT  
MINISTRY OF EMPLOYMENT AND INVESTMENT  
ENERGY AND MINERALS DIVISION

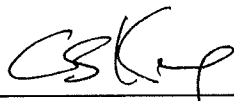
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IN THE MATTER of a pressure maintenance scheme of Canadian Natural Resources Limited (CNRL) for waterflood recovery of oil by water injection into the Beavertail Halfway "B" pool.

The Deputy Minister of Employment and Investment, pursuant to section 100 of the Petroleum and Natural Gas Act, R.S.B.C.1996, c.361 orders as follows.

The pressure maintenance scheme of CNRL for waterflood recovery of oil from the Beavertail Halfway "B" pool as described in the Application from CNRL to the Ministry dated June 6, 1996 and supplemented with additional information dated June 10, 1997 is approved, subject to the following terms:

1. The project area of the pressure maintenance scheme consists of units 58, 59, 68, 69, 78 - 80 and 88 - 90 Block A/94-A-15.
2. The project oil production allowable is 90 m<sup>3</sup>/d.
3. Water may only be injected into wells d-58-A and d-69-A/94-A-15.
4. The scheme is deemed to have commenced upon water being injected into the wells referred to in clause 3. ✓
5. The Division must be notified in writing of the date of commencement. ✓ 97/09/01 ✓
6. The injection pressure at the sandface must not exceed the formation fracture pressure.
7. Equipment must be installed at the well head of water injection wells to ensure that fracturing of the formation does not occur.
8. All associated gas production must be conserved.
9. An oil well may be drilled anywhere within the project area provided that it is not completed within 100 m of the boundary of the project area.
10. The operations of the pressure maintenance scheme are subject to periodic review, and modification to the approval may be ordered, if deemed appropriate, by the Director of the Engineering and Operations Branch.

  
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Charles Kang  
Deputy Minister of Employment and Investment

DATED AT the City of Victoria, in the Province of British Columbia, this 21 day of July, 1997.

## MINISTRY OF EMPLOYMENT AND INVESTMENT

- I. Prepared for Charles Kang, Deputy Minister for DECISION.
- II. Subject: "Pressure Maintenance" application under section 100 of the Petroleum and Natural Gas Act (the Act).

III. Recommendation:

Approval of a waterflood pressure maintenance scheme in the Beavertail Halfway "B" oil pool is technically justified. There are no equity, resource conservation, or environmental concerns. Your review and approval of this straightforward application is recommended under section 100 of the Act.

IV. Background:

At issue in this case is granting permission to Canadian Natural Resources Limited (CNRL) as operator to inject water into an oil bearing formation. This is an effective production stimulation technique to enhance oil recovery. The technical work to date in this pool supports this approach.

The Beavertail Halfway "B" pool was discovered in 1979 and six oil wells have been drilled to date. As of the end of December 1996, these wells had produced about 535,000 barrels of oil. Under its current mode of operation, we estimate that the remaining recoverable oil for the pool is about 60,000 barrels. However, the remaining recoverable oil is expected to increase very significantly with the installation of a waterflood. This pool is considered to be a good candidate for pressure maintenance by waterflooding.

There are no equity concerns as the project area is being unitized by CNRL and Apache Canada Ltd. No objections were received from any interested parties following publication of a notice of the application in the B.C. Gazette.

V. Discussion:

Approvals for industry applications granted under section 100 of the Act require signature of the Minister. The Deputy Minister has full authority to act on behalf of the Minister in all matters explicitly authorized for ministerial action. The protocol among the Division, the Deputy's Office, and the Minister's Office, is to have the Deputy sign straightforward and non-controversial section 100 approvals and have any complex or controversial ones reviewed and signed by the Minister. Pressure maintenance by waterflooding under section 100 of the Act is justified for the Beavertail Halfway "B" pool and your approval of the scheme is recommended.

VI. Options:

1. Approval of the waterflood pressure maintenance improves recovery of oil which results in higher oil production and higher level of Crown royalty.
2. Rejection of the application results in poor oil recovery with significant volumes of oil left behind in the reservoir.

VII Recommended Option

Option 1.

AGREE/DISAGREE

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Charles Kang  
Deputy Minister  
Ministry of Employment  
and Investment

Prepared by: P. S. Attariwala, P.Eng.  
Engineering and Operations Branch  
952-0311  
July 8, 1997  
EMD970551