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**Northern Oil and Gas**

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**Annual Report 1992**

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International Year of  
the World's Indigenous People  
A New Partnership



Année internationale  
des populations autochtones  
Un nouveau partenariat

**Message from the Honourable Tom Siddon  
Minister of Indian Affairs and Northern Development**

I am pleased to table before Parliament the *Northern Oil and Gas Annual Report for 1992*.

As I reflect on the past year, I am acutely aware of the challenging times that the petroleum industry has faced. A global recession, depressed energy prices, the economic liberalization policies of foreign countries previously closed to foreign investment and the competition among resource-rich countries for investment capital were felt across Canada. Limited funds were diverted to areas of least cost and least risk. Land sales were down in every part of Canada.

The North has also been faced with a depressed economic oil and gas climate. Few companies maintained active drilling programs or acquired new rights during the past year. This situation was compounded by the continued freeze on the issuance of new exploration rights in many areas, subject to the resolution of Native land claims.

I would like to take this opportunity to look toward a stronger economic future for the North. It is my conviction that the recent Gwich'in land claim settlement and pending settlements with the Sahtu and other groups will create new and exciting opportunities in northern oil and gas exploration and development. These settlements will give the Aboriginal peoples a clear title, a defined land base and economic opportunities for jobs and investment. The oil and gas industry, among others, will benefit from the removal of years of uncertainty and confusion about the ownership of the land and its resources. And Canadians, as consumers, will benefit from additional supplies of oil and gas.

The North shows great promise for oil and gas development. We have barely begun to discover what geologists tell us is there waiting to be found.

In the Arctic Islands, for example, fewer than 200 wells have been drilled and already there have been 18 significant oil and gas discoveries. The Geological Survey of Canada estimates that only 16 per cent of the gas and just 10 per cent of the oil in the islands have been discovered to date.

The Beaufort Sea-Mackenzie Delta area is potentially even richer. Perhaps one of the more prolific petroliferous basins in the world, it has an estimated reserve of nine billion barrels of oil and 112 trillion cubic feet of gas.

There are also significant quantities of oil and gas still to be found in the sedimentary basins of both the Northwest Territories and Yukon. More than 900 wells have been drilled in this area. Large quantities of oil are being marketed from Norman Wells and gas sales continue from Kotaneelee and Pointed Mountain.

Given its potential, I have no doubt that the North will become a major North American oil and gas exploration area in the future.

I look forward to working with northerners, industry and other interested parties in the coming year to develop a stronger, more diversified northern economy with oil and gas exploration and development leading the way to a brighter economic future for northerners.



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## Contents

Overview of Northern Oil and Gas Activities .....	3
Resource Management Regime .....	4
Oil and Gas Management .....	5
Rights Issuance .....	5
Consultation .....	6
Resource Evaluation .....	6
Rights Administration .....	7
Employment and Industrial Benefits .....	11
Exploration .....	12
Mainland Territories .....	12
Mackenzie Delta-Beaufort Sea .....	12
Arctic Islands .....	13
Development and Production .....	14
Mainland Territories .....	14
Mackenzie Delta .....	15
Arctic Islands .....	16
Protection of the Environment .....	17
Environmental Measures .....	17
Environmental Reviews .....	21
Environmental Studies Research Fund .....	21
Acts and Regulations .....	22
Northern Frontier Lands — Statistical Summary .....	23
Mainland Territories .....	24
Mackenzie Delta and Beaufort Sea .....	26
Arctic Islands and Eastern Arctic Offshore .....	28
Sources of Information About Northern Oil and Gas .....	30
Glossary .....	36
Maps	
Canada's Northern Frontier Lands .....	2
Oil and Gas Discoveries .....	18

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*Canada's Northern Frontier Lands*



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## Overview of Northern Oil and Gas Activities

The history of oil and gas exploration in the North has been influenced by many external forces. During World War II, there was a rush to the North to build the Canol project. In the 1960s, there was a surge to file rights in the Arctic after the Geological Survey of Canada had completed its geological map of the area. The Prudhoe Bay discovery at the end of the decade created a new swell of interest, this time in the Beaufort Sea. A high level of activity continued throughout the North into the early 1970s when Crown lands were withdrawn from disposition pending the settlement of land claims. Since 1986, the fall in oil and gas prices, which coincided with the ending of the Petroleum Incentive Program, has caused exploration expenditures to drop to pre- 1970 levels. The current low level of exploration is not a phenomenon unique to the North, but rather a reflection of external forces — a global recession, a volatile oil market and a scarcity of exploration dollars throughout North America.

Since 1989, yearly calls for nominations have been initiated in the Beaufort Sea-Mackenzie Delta area following settlement of a land claim agreement with the Inuvialuit of the Western Arctic. The settlement of a land claim agreement with the Gwich'in of the Mackenzie Delta will allow the opening of new acreage to oil and gas exploration.

In 1992, one exploratory well and one delineation well were drilled and four seismic programs were carried out. Production continued at Norman Wells, one of the largest producing pools in Canada, as well as at Kotaneelee, Pointed Mountain and Bent Horn.

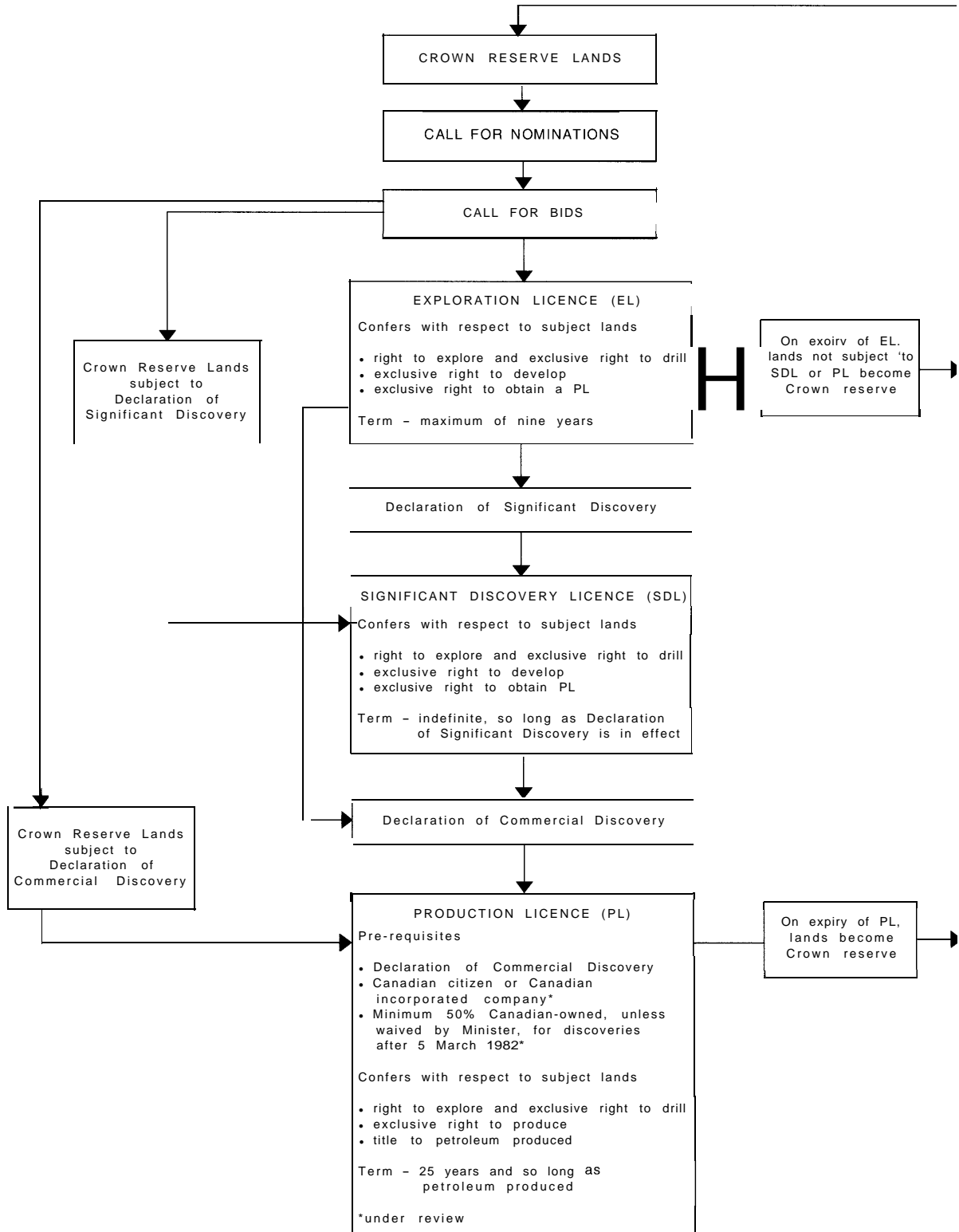
Exploration and development activity in the North is not directed by government. Rather, the government provides a legislative and regulatory framework that enables the private sector to develop petroleum resources in the North effectively and efficiently. A number of important steps have been taken to renew interest in northern exploration and development.

The process for issuing new oil and gas exploration rights through Calls for Nominations and Calls for Bids was regularized to make the system more predictable, and to allow industry to develop long-term exploration programs. A single criterion, the refundable work bonus, has been adopted for assessing bids in the Beaufort Sea and Mackenzie Delta.

An attractive royalty regime is in place. The regime charges one per cent of gross revenues rising to five per cent in one per cent increments every 18 production months. After project payout, the royalty becomes either 30 per cent of net revenues or five per cent of gross revenues, whichever is greater.

The *Canadian Ownership Requirement Repeal Bill* was tabled in the House of Commons in December 1992. This initiative will lift foreign ownership restrictions on production licences, recognizing that new and additional sources of capital are required to develop frontier areas.

## Resource Management Regime Under the Canada Petroleum Resources Act



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## Oil and Gas Management

The prudent management of Canada's oil and natural gas resource endowment in the frontier lands north of 60° is an economic, social and environmental responsibility. The *Canada Petroleum Resources Act* (CPRA) provides the administrative framework for managing these resources and includes a process for granting rights to search for, develop and produce oil and gas, and setting and collecting royalties. The *Canada Oil and Gas Operations Act* provides the regulatory framework.

### Rights Issuance

A simple, competitive system is used to issue new exploration rights to industry. The non-discretionary land management model is based on a competitive bidding process where a single criterion is used to assess winning bidders.

Under the CPRA, three types of licences are issued. An **exploration licence** grants industry the exclusive right to explore a specific parcel of land for oil and gas for a limited period of time. If a significant accumulation of hydrocarbons is discovered, the interest holder has a right to a **significant discovery licence**. This licence confers the exclusive right to further explore a significant discovery area for an indefinite period of time. If the economic and technical conditions favour commercial production, a **production licence** allows the rights holder to produce oil and gas.

Rights issuance has been constrained for almost two decades (1972-89) by the withholding of lands from disposition to facilitate the settlement of land claims. The resulting decrease in land holdings also reflects the general decline in oil and gas exploration activity throughout Canada. At year end, about 2.6 million hectares were held under licence north of 60°, down about four per cent from the previous year.

Three significant discovery licences were issued in the Beaufort Sea and two production licences were issued in the southern Mainland Territories in 1992.

A Call for Nominations in the Beaufort Sea-Mackenzie Delta area, which opened in February 1992, failed to attract any nominations.

### *Licences Issued on Northern Frontier Lands in 1992*

Representative	Licence Number	Number of Licences	Area (thousands of ha)	Location	Term (years)
Paramount	PL 4,5	2	0.1	Southern Mainland Territories	25
Imperial	SDL 110, 111,112	3	3.2	Beaufort Sea	-



## **Consultation**

The rights issuance process is carried out in consultation with the governments of the Northwest Territories and the Yukon and in accordance with applicable terms of Aboriginal land claim settlements. For example, to prepare for the 1992 Call for Nominations, consultations were held with the following agencies to set terms and conditions relating to the call:

- Northwest Territories departments of Energy, Mines and Petroleum Resources, and Renewable Resources, and Yukon departments of Economic Development, Mines and Small Business, and Renewable Resources;
- the Inuvialuit Game Council, which represents the collective Inuvialuit interest on such issues as wildlife management, conservation and environmental protection;
- the Hunters and Trappers committees of Inuvik, Aklavik and Tuktoyaktuk; and
- Fisheries and Oceans, Environment Canada, External Affairs and International Trade Canada and the National Energy Board.

## **Resource Evaluation**

Studies of the geological, operational, developmental and economic factors that may affect the risk of exploration in a given area form the criteria for proposed rights issuance. These studies include:

- a review of exploration maturity and available information and data;
- a geological overview of exploration play distribution and potential; and
- the identification of operational constraints and access to markets.

A review of areas that may be included in future calls for nominations were carried out with the assistance of staff of the National Energy Board.

For the purposes of defining up-to-date terms for new exploration licences, allowable expenditures for exploration activities were reviewed in 1992. Changes to allowable expenditures for seismic operations will be incorporated in the 1993 Call for Nominations.

Evaluations of significant discoveries and areal extent were conducted for two applications: Imperial Oil's Nipterk P-32 and Amoco's Kingark J-54, both in the Beaufort Sea. The areal extent of the Kotaneelee field relative to lease boundaries was reviewed for the purpose of royalty calculations.

Current exploration results were evaluated and incorporated in the regional assessments of oil and gas potential to develop a comprehensive picture of the Canadian frontier energy supply. The inventory of discovered resources is calculated by staff of the National Energy Board.

## Rights Administration

The Crown land inventory continues to increase as exploration licences are surrendered or reach the end of their terms. Some 7.3 million hectares of Crown land in the Beaufort Sea-Mackenzie Delta were incorporated in the 1992 Call for Nominations.

With the conclusion of the Gwich'in claim and the imminent conclusion of the Sahtu claim, new acreage will become available for disposition in the Mackenzie Delta and the Mainland Territories. Each additional land claim settlement will increase the quantity of lands available for new rights issuance and exploration and development.

To date, 111 significant discovery licences have been issued in the North:

Mainland Territories	30
Mackenzie Delta	33
Beaufort Sea	27
Arctic Islands	20
Eastern Arctic Offshore	1

Five production licences have been issued to date. The licence for Bent Horn, on Cameron Island, produces oil regularly. The other four licences, one in the Beaufort Sea and three in the southern Mainland Territories, were issued to accommodate production for test purposes.

Oil and gas leases issued under the Canada Oil and Gas Land Regulations continue for Pointed Mountain and Kotaneelee, two gas-producing fields in the North — nine leases in the Pointed Mountain field and five in the Kotaneelee field in the Yukon.

The Norman Wells oil field continues to produce oil and gas under a Proven Area Agreement.

### *Northern Frontier Land Status at Year End 1992*

Region	Active Licences <sup>1</sup>	Lands Relinquished or Surrendered (millions of ha)	Lands Issued in Licences (millions of ha)	Lands Active (millions of ha)	Pending Lands <sup>3</sup> (millions of ha)
Mainland Territories	53	0 <sup>2</sup>	0 <sup>2</sup>	0.2	0.5
Mackenzie Delta– Beaufort Sea	73	0.2	0 <sup>2</sup>	1.1	–
Arctic Islands and Eastern Arctic Offshore	23	–	–	1.3	2.5
<b>Total</b>	<b>149</b>	<b>0.2</b>	<b>0<sup>1</sup></b>	<b>2.6</b>	<b>3.0</b>

<sup>1</sup>Includes exploration licences, significant discovery licences and production licences.

<sup>2</sup>Less than 0.1.

<sup>3</sup>Includes areas such as Cape Bathurst and Baffin Bay. Rights at Old Crow have been surrendered.

*Northern Frontier Land Holdings at Year End 1992*

	1988	1989	1990	1991	1992
Number of Licences Active <sup>1</sup>	119	111	132	147	149
Lands Issued in Licences (millions of ha)	1.9	0.2	0.1	0.3	0 <sup>2</sup>
Lands Relinquished or Surrendered (millions of ha)	3.6	2.0	1.1	1.3	0.2
Lands Active (millions of ha)	6.0	4.7	3.8	2.7	2.6

<sup>1</sup>Includes exploration, significant discovery and production licences.

<sup>2</sup>Less than 0.1.

*Gross Oil and Gas Revenues Received in 1992*

(in dollars)					
Month	Issue Fees	Rentals	Registration Fees	Royalties	Total
January	0.00	0.00	962.50	539 744.05	540 706.55
February	0.00	0.00	0.00	648 897.31	648 897.31
March	0.00	293.33	301.25	697 865.50	698 460.08
April	0.00	105.90	320.50	667 165.74	667 592.14
May	<b>30.00</b>	<b>0.00</b>	<b>9.25</b>	<b>654 073.66</b>	<b>654 112.91</b>
June	10.00	23 916.00	25.00	549 541.82	573 492.82
July	0.00	0.00	0.00	824 391.79	824 391.79
August	0.00	0.00	0.00	847 115.49	847 115.49
September	0.00	0.00	1.00	1 090 374.68	1 090 375.68
October	10.00	0.00	0.00	709 741.53	709 751.53
November	0.00	1 440.00	53.50	772 747.81	774 241.31
December	0.00	0.00	625.00	716 026.24	716 651.24
<b>Total</b>	<b>50.00</b>	25 755.23	2 298.00	<b>8 717 685.62</b>	<b>8 745 788.85</b>

## Active Northern Exploration Licences

EL317

Representative: Pembina  
Effective Date: 5 October 1986  
Expiry Date: Current  
Status: Under work prohibition order  
Area: 175 810 ha

EL329

Representative: Amoco  
Effective Date: 5 September 1987  
Expiry Date: Current  
Status: Under work prohibition order  
Area: 349 982 ha

EL330

Representative: Amoco  
Effective Date: 5 September 1987  
Expiry Date: Current  
Status: Maintained under application for SDA  
Area: 5 684 ha

EL343

Representative: Imperial Oil  
Effective Date: 1 June 1987  
Expiry date: Current  
Status: Maintained under application for SDA  
Area: 5 094 ha

EL344

Representative: Imperial Oil  
Effective Date: 1 June 1987  
Expiry Date: Current  
Status: Maintained under application for SDA  
Area: 7 787 ha

EL346

Representative: Amoco  
Effective Date: 1 January 1988  
Expiry Date: Current  
Status: Maintained under application for SDA  
Area: 6 294 ha

## Active Northern Exploration Licences (continued)

### EL355

Representative: Imperial Oil  
Effective Date: 1 August 1990  
Expiry Date: 31 July 1998  
Status: One well to be drilled before 1 August 1994  
Work Expenditure Bid: \$1 500 031  
Area: 15 351 ha

### EL356

Representative: Imperial Oil  
Effective Date: 1 August 1990  
Expiry Date: 31 July 1998  
Status: One well to be drilled before 1 August 1994  
Work Expenditure Bid: \$1 500 032  
Area: 30 331 ha

### EL358

Representative: Chevron  
Effective Date: 16 December 1991  
Expiry Date: 15 December 2000  
Status: One well to be drilled before 16 December 1996  
Work Expenditure Bid: \$3 200 000  
Area: 140 088 ha

### EL359

Representative: Shell  
Effective Date: 16 December 1991  
Expiry Date: 15 December 1999  
Status: One well to be drilled before 16 December 1995  
Work Expenditure Bid: \$1 555 880  
Area: 37 322 ha

### EL360

Representative: Shell  
Effective Date: 16 December 1991  
Expiry Date: 15 December 1999  
Status: One well to be drilled before 16 December 1995  
Work Expenditure Bid: \$6 556 728  
Area: 36 765 ha

### EL361

Representative: Shell  
Effective Date: 16 December 1991  
Expiry Date: 15 December 1999  
Status: Drilling commitment fulfilled  
Work Expenditure Bid: \$45 223 000  
Area: 36 756 ha

## Employment and Industrial Benefits

The provision of full and fair opportunities for Canadians to supply goods and services used in northern oil and gas activities is specifically defined in oil and gas legislation. When exploration and development are undertaken on northern frontier lands, the proponent must ensure full and fair access to employment, training and business opportunities for northerners.

Although activity levels remained low in 1992, about \$35.4 million was invested in the North through exploration, production and development activities and about 976 person months of work were carried out. Benefits from northern exploration programs are, with few exceptions, domestic in nature since expenditures and labour are concentrated in Western Canada and in the North.

With the settlement of land claims, a positive environment is being established for the future revitalization of the petroleum industry and increased oil and gas activity. Northerners can look forward to a further expansion of employment and business opportunities. Together with the territorial governments, the Department of Indian Affairs and Northern Development will continue to encourage equal opportunities for northerners to compete for the employment and business opportunities that arise from exploration.

### *Employment Related to Petroleum Activity on Northern Frontier Lands 1992*

	Person Months of Work <sup>1</sup>
Mainland Territories	408
Mackenzie Delta-Beaufort Sea	462
Arctic Islands and Eastern Arctic Offshore	106
<b>Total</b>	<b>976</b>

<sup>1</sup>Represents approximate number of person months of work created.

### *Northern Petroleum Expenditures 1992*

(millions of dollars)	Exploration <sup>1</sup>	Development <sup>2</sup>	Production <sup>3</sup>	Total
Mainland Territories	–	5.0	22.4	27.4
Mackenzie Delta	7.8	–	–	7.8
Arctic Islands and Eastern Arctic Offshore	–	–	0.2	0.2
<b>Total</b>	<b>7.6</b>	<b>5.0</b>	<b>22.6</b>	<b>35.4</b>

<sup>1</sup>Includes geophysical expenditures.

<sup>2</sup>Includes expenditures undertaken to develop an oil or gas field up to the time of production.

<sup>3</sup>Includes expenditures made after production starts.

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## Exploration

Two wells were drilled in the North in 1992. An exploratory well, Shavilig J-20, and a delineation well, Unipkat B-12, were drilled in the Mackenzie Delta. Geophysical operations were also at a low level, although there was an increase in the number of 3-D seismic programs carried out.

### Mainland Territories

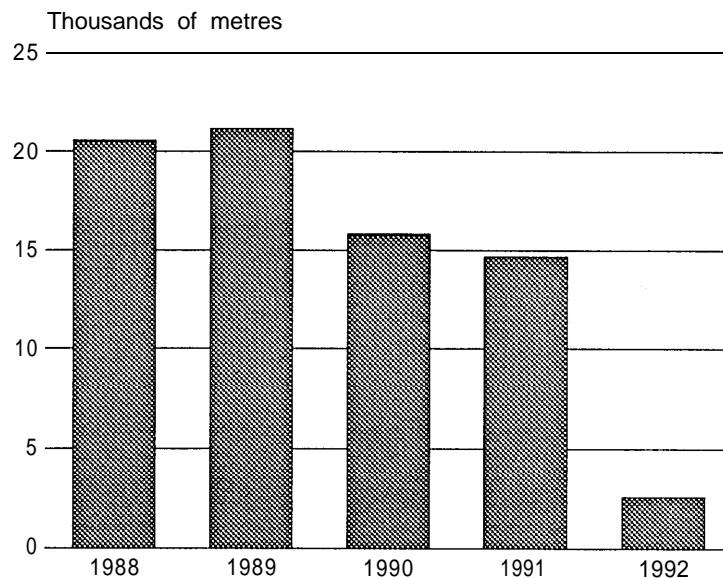
No wells were drilled in the Mainland Territories during 1992. Imperial Oil carried out a 3-D seismic program on the Mackenzie River on the east side of the Norman Wells oil field.

### Mackenzie Delta-Beaufort Sea

The Shell Shavilig J-20 exploratory well, which was drilled on a structure south of the Unipkat discovery, was plugged and abandoned. Shell Unipkat B-12, which was drilled to delineate the 1990 Unipkat discovery, was suspended without testing.

Geophysical operations were also at a low level. Three seismic programs were conducted in the Mackenzie Delta-Beaufort Sea region. Shell undertook a seismic program, which included some 3-D seismic, over exploration licences acquired in 1991 and Imperial undertook two 2-D programs on the Tuktoyaktuk Peninsula.

#### *Exploratory and Delineation Drilling on Northern Frontier Lands*

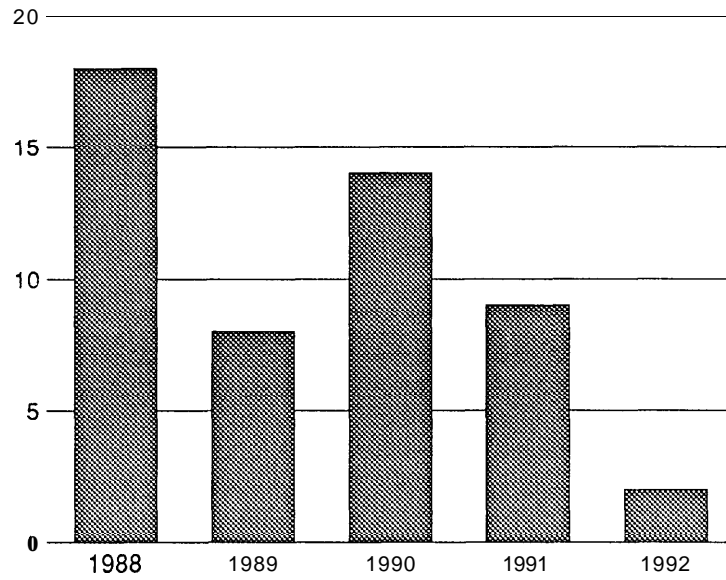


In addition to the drilling programs, the Geological Survey of Canada undertook a geotechnical borehole program at three existing well sites (Unipkat B-12, Taglu D-43 and Kumak E-58) to determine the extent and properties of permafrost at the sites.

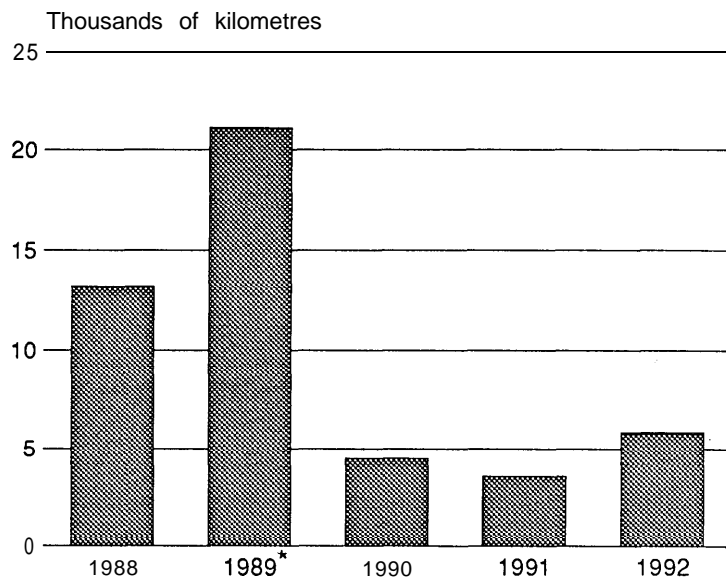
## Arctic Islands

No exploration or geological or geophysical work was carried out in the High Arctic in 1992.

### *Number of Wells Terminated on Northern Frontier Lands*



### *Reflection Seismic Shot on Northern Frontier Lands*



\*Includes three-dimensional seismic equivalent



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## Development and Production

In 1992, oil production from Norman Wells and Bent Horn decreased by 2.5 per cent from the previous year. Gas production in the North increased by 61 per cent from the previous year.

### Mainland Territories

Amoco carried out workovers on five wells. Approval was given to abandon two of the wells: Amoco Pointed Mountain O-46 and Amoco Pointed Mountain F-38. The Amoco Pan Am Pointed Mountain A-55 well was suspended pending further evaluation and the Pan Am Pointed Mountain K-45 well was upgraded to a suspended production well. Amoco Pointed Mountain P-53 is a producing well.

### Norman Wells

The Norman Wells field, located in the Northwest Territories, is one of the largest pools in Canada, with estimated recoverable reserves of about 38.5 million cubic metres. Approximately 46 per cent of the recoverable reserves have been produced and production is expected to continue for at least 16 more years.

The Norman Wells Expansion project, started in 1983, and the Interprovincial Pipeline NW were the first major hydrocarbon development and transportation projects in the North. The federal government, in partnership with Imperial Oil, has a one-third interest in Norman Wells. Imperial Oil Limited holds the remaining two-thirds interest.

In 1992, oil production from the Norman Wells field was 1.85 million cubic metres, a decrease of 2.3 per cent from 1991. Production peaked in March with an average daily production rate of 5 396 million cubic metres. Gas production decreased slightly from 130 million cubic metres to 128 million cubic metres.

At the end of the year, the Norman Wells field comprised 165 production wells and 166 injection wells.

The Minister approved an amendment to the Norman Wells Development Plan to initiate a pilot hydrocarbon miscible flood. The project, which is expected to be conducted over a three-year period, will assess the technical merits of the hydrocarbon miscible flood process in the Norman Wells oil pool using propane as the flooding medium. Imperial Oil was also authorized to upgrade the production facilities at Norman Wells.

In December, a fire at the Norman Wells Refinery caused extensive damage to the building that processes aviation and jet fuel and gas for communities in the Mackenzie Delta and the Western Arctic. Sufficient stocks of fuel are on hand to last until mid-1993, when Imperial Oil plans to rebuild. The Central Process Facility, which processes crude oil for shipment to Zama, was not affected.

## **Pointed Mountain**

Production from the Pointed Mountain gas field continued in 1992 and is being sustained at moderate levels. The field produced 86.7 million cubic metres in 1992 compared with 90 million cubic metres in 1991. Cumulative production to the end of 1992 was 849.1 million cubic metres.

## **Cameron Hills**

Phase one of Paramount Resources Limited's original Development Plan, approved on 16 January 1992, called for an extended production test over a one-year period. Paramount submitted an amendment to their plan that would extend the Extended Production Testing (Phase One) over a two-year period and reschedule a 3-D seismic program. The Minister approved the proposed amendment in December 1992. The approved Development Plan is subject to terms and conditions that will serve as safeguards during the life of the project.

## **Kotaneelee**

The Kotaneelee gas field in the southern Yukon was put back into production in February 1991 after having been shut-in and the wells suspended since 1983. Workover and re-drilling of suspended wells have been encouraging and will sustain production for the foreseeable future.

Production at the Kotaneelee gas field was 506.9 million cubic metres in 1992, compared with 227.2 million cubic metres in 1991. Cumulative production to the end of 1992 was 779.6 million cubic metres.

Anderson Oil & Gas Inc., the operator of the field, received approval to cease operation of the vapour recovery unit that was part of the field fuel gas sweetening operation. Removal of this unit still permits the operation of the field facility within the approved environmental limits.

## **Mackenzie Delta**

Workover operations were carried out on 13 wells in the Mackenzie Delta-Beaufort Sea area. Approval was given to abandon these previously suspended wells.

In 1989 Esso, Shell and Gulf received approval to ship some 260 billion cubic metres of gas from the Mackenzie Delta to the United States over a 20-year period, beginning in 1996. An environmental screening held by the National Energy Board in 1992 has determined that there are no potential adverse effects associated with the export licences. However, all of the facilities related to the development, production and transmission of natural gas will be subject to a review by regulatory authorities, including examination of the environmental and related social effects.

## Arctic Islands

Workovers were carried out on five wells in the High Arctic and approval was given to abandon these previously suspended wells.

### Bent Horn

In the High Arctic, Panarctic continued production and seasonal shipping from Bent Horn, the world's most northerly oil field. Two shipments of crude oil were made from Cameron Island. The *M.V. Arctic*, a double-hulled tanker, sailed from Cameron Island on 21 August 1992 with a shipment of 24 321 cubic metres of oil and on 13 September 1992 with 24 37 1 cubic metres of oil. Cumulative oil production to the end of the year totalled 264 602 cubic metres. Currently, 778 cubic metres of oil are in storage at the Bent Horn facility.

Approval has been given for Panarctic to transport oil by truck from Bent Horn to Rea Point via an ice road. If ice conditions are favourable for an ice road in 1993, this operation will proceed.

Panarctic submitted an amendment to the Bent Horn Development Plan to replace 48 storage bladders with a new steel storage tank with a capacity of 40 300 cubic metres. With favourable ice conditions, Panarctic would use the *M. V. Arctic* or an equivalent type of tanker as a shuttle to transfer multiple loads of oil to a larger vessel stationed in open water. The proposal is under review.

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## Protection of the Environment

### Environmental Measures

#### **Beaufort Sea Steering Committee**

The Beaufort Sea Steering Committee (BSSC) was established in September 1990 to address concerns identified by the Environmental Impact Review Board regarding oil spill preparedness. Following the presentation of the Committee's final report to the Minister in April 1991, an implementation work plan was developed identifying the appropriate government departments, Aboriginal organizations and industry groups responsible for implementing the committee's recommendations.

Since then, substantial progress has been made to implement the recommendations of the BSSC. Scientific workshops successfully addressed the routine aspects of oil and gas development. The digitization of an existing oil spill atlas will help with updating information. Potential oily waste disposal sites are being investigated in the vicinity of the Beaufort coast. Some recommendations, such as a government-industry-Inuvialuit co-ordinated exercise to respond to a mock oil spill, must wait until drilling activity resumes in the Beaufort Sea.

#### **Northern Oil and Gas Action Program**

The Northern Oil and Gas Action Program (NOGAP) is a multi-disciplinary research and planning program established in 1984 to advance the federal government's ability to respond to future northern hydrocarbon development proposals. It supports studies that respond to specific research and monitoring recommendations of the BSSC.

#### **Beaufort Region Environmental Assessment and Monitoring Program**

The Beaufort Region Environmental Assessment and Monitoring program is a NOGAP-funded initiative to identify the most important research and monitoring priorities related to future hydrocarbon development in the Beaufort Sea, Mackenzie Delta and Mackenzie Valley. A recent workshop addressed the routine aspects of oil and gas development and a future workshop will target catastrophic oil spills and community-based concerns.

#### **Arctic Seas Strategic Plan**

An Arctic Seas Strategic Plan (ASSP), which outlines the government's responsibilities in responding to spills in northern Canadian waters, has been developed under the auspices of the Green Plan. The ASSP is currently being reviewed and rewritten.

## **Environmental Reviews**

Environmental reviews were conducted on several Panarctic well abandonments.

Several project applications in the Mackenzie Delta and Mackenzie Valley underwent environmental reviews. Four amendments were made to development plans or operations related to existing developments: six geophysical programs, several well abandonments and one Authority to Drill a Well.

## **Environmental Studies Research Fund**

The Environmental Studies Research Fund, under the *Canada Petroleum Resources Act*, funds environmental and social studies related to the exploration and development of oil and gas resources on frontier lands. Focus is placed on studies that provide information needed for the regional or national regulatory decision-making process.

Board members represent federal government departments, regional petroleum boards, petroleum industry organizations and the general public. The program is funded by a levy on interest holdings on frontier lands. In 1992, the budget for administering the fund and six new studies was \$991 000. New northern-related studies approved under the 1992 program include:

- **Beluga Telemetry Field Program** — documents the position, dive profile and behaviour of live captured and released Belugas in the southern Beaufort Sea using satellite tracking and aircraft or marine vessel ground tracking.
- **Mackenzie Delta Permafrost and Geology Transect Study** — an integrated geoscience study of a transect of geophysical data and geotechnical boreholes to document the geological, geothermal and geotechnical conditions of perennially frozen sediments at three sites along the Mackenzie Delta.
- **Environmental Loading Studies, Canadian Standards Association (CSA) Offshore Structures Code** — a study to resolve issues related to combined environmental loading as defined in the new CSA offshore platform code.
- **Bibliography on Oil Pollution Fate and Effects** — development of a computerized up-to-date bibliography of all accessible scientific literature on the fate and effect of oil in aquatic systems.

These new studies will augment a program of about 20 studies now under way. A published report is available for each study funded by the program. The study series currently has 106 titles in print.

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## Acts and Regulations

In 1992, the *Canadian Ownership Requirement Repeal Bill* was tabled in Parliament. Proclamation of the Bill will remove the minimum 50 per cent Canadian ownership requirements for production licences on frontier lands. The Bill will amend three pieces of federal legislation: the *Canada Petroleum Resources Act* (CPRA), the *Canada-Newfoundland Atlantic Accord Implementation Act* and the *Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act*.

The *Canada Oil and Gas Operations Act* (COGOA) was proclaimed on 1 September 1992. The safety amendments to the *Oil and Gas Production and Conservation Act* and the related accord legislation it contains are the final statutory measures needed to implement the balance of the recommendations from the Royal Commission on the *Ocean Ranger* Marine Disaster.

Regulatory initiatives being pursued under the COGOA and CPRA in the coming year are identified in the following table.

### ***Regulatory Initiatives***

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Canada Oil and Gas Geophysical Regulations	to regulate all geophysical operations on federal lands
Canada Oil and Gas Drilling Regulations	to reflect the Certificate of Fitness requirements and update provisions relating to authorization of drilling activity
Canada Oil and Gas Installation Regulations	to establish performance criteria for the various components of a superstructure to ensure that operations are carried out in a safe environment
Canada Certificate of Fitness Regulations	to define which companies can issue certificates of fitness and prescribe required criteria
Canada Oil and Gas Production and Conservation Regulations	to establish the minimum requirements and conservation regulations for all persons engaged in the development and production of oil and gas on lands under federal jurisdiction
Frontier Lands Petroleum Land Division and Survey Regulations	to reflect more accurate methods of surveying brought about by new survey systems
Canada Oil and Gas Diving Regulations	to set out regulatory requirements that operators must follow to undertake diving operations

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# Northern Frontier Lands — Statistical Summary”

## Activity Status on Northern Frontier Lands

	1988	1989	1990	1991	1992
Licences Issued (Exploration, Significant Discovery, Production)	91	7	4	24	5
Wells Spudded	17	11	12	9	2
Metres Drilled	29 216	21 138	15 811	15 325	2 560
Wells Terminated	18	8	14	9	2
Geophysical Programs Run	16	19	8	6	4
Reflection Seismic (km)	13 204	21 083	4 552	3 641	5 822
Rig Months	16	14	12	12	2

## Northern Frontier Lands Resource Inventory 1992

	Crude Oil <sup>1</sup> Discovered* (millions of m <sup>3</sup> )	Natural Gas Discovered (billions of m <sup>3</sup> )
Mainland Territories	39.1	22.7
Mackenzie Delta and Beaufort Sea	228.0	356.0
Arctic Islands and Eastern Arctic Offshore	65.7	416.0
<b>Total</b>	<b>332.8</b>	<b>794.7</b>

<sup>1</sup>Includes condensate.

\*Discovered resource totals are original recoverable in-place estimates and don't reflect production (totals have been rounded).

## Oil and Gas Production on Northern Frontier Lands

	1988	1989	1990	1991	1992
Oil Production (thousands of m <sup>3</sup> )					
Norman Wells	1 728.0	1 789.0	1 841.0	1 894.0	1 850.0
Bent Horn	54.9	43.4	24.0	32.6	28.2
<b>Total</b>	<b>1 782.9</b>	<b>1 832.4</b>	<b>1 865.0</b>	<b>1 926.6</b>	<b>1 878.2</b>
Gas Production (millions of m <sup>3</sup> )					
Pointed Mountain	154.0	96.0	74.0	90.0	86.7
Norman Wells	138.0	129.0	126.0	130.0	128.0
Kotanelee			—	227.2	506.9
<b>Total</b>	<b>292.0</b>	<b>225.0</b>	<b>200.0</b>	<b>447.2</b>	<b>721.6</b>

<sup>1</sup>Exploration, development, production and resource inventory statistics courtesy of the National Energy Board. Resource estimates are expressed as best current estimates.

## Mainland Territories

### Activity Status

	1988	1989	1990	1991	1992
Wells Spudded					
Exploratory/Delineation	3	6	11	7	—
Development	11			1	
<b>Total</b>	<b>14</b>	<b>6</b>	<b>11</b>	<b>8</b>	
Wells Terminated <sup>1</sup>					
Exploratory/Delineation	3	4	12	7	
Development	11			1	
<b>Total</b>	<b>14</b>	<b>4</b>	<b>12</b>	<b>8</b>	
Metres Drilled	15 778	9 865	14 197	12 152	—
Exploratory/Delineation	7 095	9 865	14 197	11 517	
Development	8 683			636	
Rigs Active	3	5	6	5	
Rig-Months	6	5	10	10	
Geophysical Programs Run	9	9	2	5	1
Reflection Seismic (km)	1 729 <sup>2</sup>	1 600	181	321 <sup>2</sup>	1 867 <sup>2</sup>
Money Spent (millions of \$)					
Geophysical/Geological	8.7	12.6	2.8	2.5	1.1
Exploratory/Delineation/Workovers	6.3	11.5	26.3	18.8	7.7
Development Drilling	5.3			3.7	
Production Facilities	5.3			—	8.6
<b>Total Money Spent (millions of \$)</b>	<b>25.6</b>	<b>24.1</b>	<b>29.1</b>	<b>25.0</b>	<b>17.4</b>

<sup>1</sup>In the Mainland Territories, where exploratory operations are generally restricted to the winter months, a well is deemed to be terminated in the year in which it reaches total depth, even though it may be re-entered in the following year for testing.

<sup>2</sup>Includes three-dimensional seismic equivalent.

### Resources Status

	1988	1989	1990	1991	1992
Discovered Resources <sup>1</sup>					
Gas (billions of m <sup>3</sup> )	20.8	21.8	35.5	22.7	22.7
Oil (millions of m <sup>3</sup> )	37.2	37.7	37.7	39.1	39.1
Gas and Oil Production					
Pointed Mountain Gas (millions of m <sup>3</sup> )	154	96	74	90	86.7
Norman Wells Gas (millions of m <sup>3</sup> )	138	129	126	130	128
Norman Wells Oil (thousands of m <sup>3</sup> )	1 728	1 789	1 841	1 894	1 850
Kotaneelee Gas (millions of m <sup>3</sup> )	—	—	—	227.2	506.9

<sup>1</sup>Includes new discoveries and revisions to previous estimates.



### *Land Status*

	1988	1989	1990	1991	1992
Licences Issued (Exploration, Significant Discovery, Production)	18	—	1	12	2
Active Licences	30	25	45	51	53
Lands Issued in Licences (millions of ha)	0.1	—	—	0'	0 <sup>1</sup>
Lands Relinquished or Surrendered (millions of ha)	0.9	0.4	0.4	0.5	0'
Lands Active (millions of ha)	1.2	0.9	0.6	0.2	0.2

<sup>1</sup>Less than 0.1.

### *Well Workover Operations 1992*

Well Name	Location (Latitude, Longitude)	Date (Spud or Re-entry, Terminated)	Status	Total Depth (m)
Amoco Pointed Mountain P-53	60°22'46"N 123°54'33"W	92-08-1 8 92-09-1 1	producer	4 371
Pan Am Pointed Mountain K-45	60°24'34"N 123°53'52"W	92-08-31 92-09- 12	suspended producer	4 100
Amoco Pointed Mountain O-46	60°25'57"N 123°52'59"W	92-08- 14 92-08-26	plugged & abandoned	4 313
Amoco Pointed Mountain F-38	60°27'19"N 123°51'55"W	92-08-1 3 92-08-20	plugged & abandoned	4 673
Amoco Pointed Mountain A-55	60°24'05"N 123°54'39"W	92-08-21 92-08-23	suspended	3 757

## Mackenzie Delta and Beaufort Sea

### Activity Status

	1988	1989	1990	1991	1992
Wells Spudded					
Exploratory/Delineation	3	5	1	1	2
Wells Terminated <sup>1</sup>					
Exploratory/Delineation	4	4	2	1	2
Metres Drilled					
Exploratory/Delineation	13 438	11 273	1 614	3 173	2 560
Rigs Active	2	4	2	1	1
Rig-Months	10	9	2	2	2
Geophysical Programs Run	7	10	6	1	3
Reflection Seismic (km)	11 475 <sup>2</sup>	19 483 <sup>2</sup>	4 371	3 320 <sup>2</sup>	3 955 <sup>2</sup>
Money Spent (millions of \$)					
Geophysical/Geological	27.6	36.6	16.6	4.2	a.8
Exploratory/Delineation/Workovers	99.0	196.6	18.9	4.9	10.1
<b>Total Money Spent (millions of \$)</b>	<b>126.6</b>	<b>233.2</b>	<b>35.5</b>	<b>9.1</b>	<b>18.9</b>

<sup>1</sup>In the Beaufort Sea, where operations are seasonal and could take place over a number of seasons for a given well, a well is deemed to be terminated in the year in which it reaches total depth.

<sup>2</sup>Includes three-dimensional seismic equivalent.

### Resource Status

	1988	1989	1990	1991	1992
Discovered Resources <sup>1</sup>					
Gas (billions of m <sup>3</sup> )	308.5	322.7	356.6	357.0	356.0
Oil (millions of m <sup>3</sup> )	253.2	256.4	240.7	241.4	228.0

<sup>1</sup>Includes new discoveries and revisions to previous estimates.

### Land Status

	1988	1989	1990	1991	1992
Licences Issued					
(Exploration, Significant Discovery, Production)	49	7	3	12	3
Active Licences	59	62	64	73	73
Lands Issued in Licences (millions of ha)	1.4	0.2	0.1	0.3	0 <sup>1</sup>
Lands Relinquished or Surrendered (millions of ha)	2.1	1.4	0.7	0.8	0.2
Lands Active (millions of ha)	3.4	2.5	1.9	1.2	1.1

<sup>1</sup>Less than 0.1.

### *Wells Drilled 1992*

<b>Well Name</b>	<b>Location</b> (Latitude, Longitude)	<b>Date</b> (Spud or Re-entry, Terminated)	<b>Status</b>	<b>Total Depth</b> (m)
Shell et al Unipkat B-12	69°11'01"N 135°18'25"W	92-01-08 92-02-10	plugged & suspended	1 186
Shell et al Shavilig J-20	69°09'38"N 135°18'12"W	92-02-1 8 92-03-1 6	plugged & abandoned	1 374

### *Well Workover Operations 1992*

<b>Well Name</b>	<b>Location</b> (Latitude, Longitude)	<b>Date</b> (Spud or Re-entry, Terminated)	<b>Status</b>	<b>Total Depth</b> (m)
Gulf Mobil Parsons F-09	68°58'28"N 133°31'45"W	92-03-04 92-03-05	plugged & abandoned	3 547
Gulf Mobil Parsons N-10	68°59'49"N 133°31'50"W	92-02-1 7 92-03-02	plugged & abandoned	3 205
Gulf Mobil Atigi O-48	68°57'48"N 133°56'07"W	92-03-10 92-03-1 1	plugged & abandoned	1 981
Gulf Mobil Parsons A-44	68°53'05"N 133°40'36"W	92-03-07 <b>92-03-08</b>	plugged & abandoned	3 536
Gulf Mobil Parsons L-43	68°52'39"N 133°41'56"W	92-03-08 92-03-09	plugged & abandoned	3 305
Gulf Mobil Parsons N-17	68°56'53"N 133°33'59"W	92-02-24 92-02-27	plugged & abandoned	3 295
Gulf Mobil Kamik D-48	68°57'13"N 133°27'30"W	92-03-05 92-03-06	plugged & abandoned	3 235
Gul Mobil Siku C-1 1	69°00'05"N 133°33'50"W	92-02-29 92-02-29	plugged & abandoned	3 295
Gul Mobil Siku A-12	69°01'00"N 133°32'32"W	92-03-03 92-03-03	plugged & abandoned	3 288
Gulf Mobil Parson D-20	68°59'09"N 133°34'25"W	92-02-21 92-02-23	plugged & abandoned	4 130
Gulf Mobil Parsons L-37	68°56'43"N 133°39'55"W	92-02-27 92-02-28	plugged & abandoned	3 961
Gulf Mobil Parsons P-41	68°50'51 "N 133°40'29"W	92-03-09 92-03-09	plugged & abandoned	3 556
Gulf Mobil Siku E-21	69°00'29"N 133°36'55"W	92-03-01 92-03-01	plugged & abandoned	3 427

## Arctic Islands and Eastern Arctic Offshore

### Activity Status

	1988	1989	1990	1991	1992
Wells Spudded					
Exploratory/Delineation			-	-	-
Wells Terminated					
Exploratory/Delineation					
Metres Drilled					
Exploratory/Delineation	-	-			-
Rigs Active					-
Rig-Months					
Geophysical Programs Run					
Reflection Seismic (km)					-
Money Spent (millions of \$)					
Geophysical/Geological					
Exploratory/Delineation/Workovers				2.7	4.2
Production Facilities					0.2
<b>Total Money Spent (millions of \$)</b>				<b>2.7</b>	<b>4.4</b>

### Resource Status

	1988	1989	1990	1991	1992
Discovered Resources'					
Gas (billions of m <sup>3</sup> )	416.4	416.4	416.4	416.4	416.4
Oil (millions of m <sup>3</sup> )	65.7	65.7	65.7	65.7	65.7
Oil Production					
Bent Horn (thousands of m <sup>3</sup> )	54.9	43.3	24.0	32.6	28.2

'As reported in previous years.

### Land Status

	1988	1989	1990	1991	1992
Licences Issued					
(Exploration, Significant Discovery, Production)	24				-
Active Licences	30	24	23	23	23
Lands issued in Licences (millions of ha)	0.4	-	-		-
Lands Relinquished or Surrendered (millions of ha)	0.6	0.17	-	-	
Lands Active (millions of ha)	1.4	1.29	1.29	1.3	1.3

### *Well Workover Operations 1992*

<b>Well Name</b>	<b>Location</b> (Latitude, Longitude)	<b>Date</b> (Spud or Re-entry, Terminated)	<b>Status</b>	<b>Total Depth</b> (m)
Panarctic King Christian 2D-18	77°47'09"N 101°06'44"W	92-04-22 92-04-25	plugged & abandoned	847
Panarctic Tenneco et al King Christian N-06	77°45'54"N 101°02'19"W	92-05-11 92-05-16	plugged & abandoned	3 359
Panarctic Tenneco et al Kristoffer Bay B-06	78°15'01"N 102°32'25"W	92-04-06 92-04-10	plugged & abandoned	3 925
Dome Arctic Ventures Wallis K-62	77°51'44"N 102°25'16"W	92-05-01 92-05-07	plugged & abandoned	2 629
Panarctic Tenneco et al Thor H-28	78°07'23"N 103°10'33"W	92-04-12 92-04-20	plugged & abandoned	1 756

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## **Sources of Information About Northern Oil and Gas**

### **Calls for Nominations and Bids**

Calls for Nominations solicit nominations from companies interested in exploring for oil and natural gas on Crown reserve lands in the territories. Calls for Bids solicit bids for exploration licences.

Copies of Calls for Nominations and Bids, the dates of upcoming calls, and other related information are available from:

Chief, Rights Issuance and Policy  
Northern Oil and Gas Directorate  
Department of Indian Affairs and Northern Development  
10 Wellington St.  
Terrasses de la Chaudiere  
Hull, Quebec, Canada  
K1A 0H4  
Telephone: (819) 994-1606  
Fax: (819) 953-5828

### **Exploration, Significant Discovery and Production Licences**

Procedures and forms for the formal registration of transfers and notices relating to exploration, copies of exploration, significant discovery and production licences, registration regulations, maps and summary information on licences are available from:

Chief, Rights Administration/Registrar  
Northern Oil and Gas Directorate  
Department of Indian Affairs and Northern Development  
10 Wellington St.  
Terrasses de la Chaudiere  
Hull, Quebec, Canada  
K1A 0H4  
Telephone: (8 19) 953-86 13  
Fax: (819) 953-5828

### **Northern Oil and Gas Directorate Papers and Reports**

*The Social Challenge of Development: Oil and Gas in the Canadian Western Arctic* (Tanguay, Durie and Melzer) was presented at the 15th Congress of the World Energy Council, September 1992.

Copies are available from:

Administrative Assistant  
Northern Oil and Gas Directorate  
Department of Indian Affairs and Northern Development  
10 Wellington St.  
Terrasses de la Chaudiere  
Hull, Quebec, Canada  
K1A 0H4  
Telephone: (819) 997-9339  
Fax: (819) 953-5828

### **Northern Resource Activities**

Information on northern geophysical resource activities is available from:

Senior Geophysicist  
Northern Oil and Gas Directorate  
Department of Indian Affairs and Northern Development  
10 Wellington St.  
Terrasses de la Chaudiere  
Hull, Quebec, Canada  
K1A 0H4  
Telephone: (819) 953-8722  
Fax: (819) 953-5828

### **Land Use Regulations and Environmental Operating Guideline Handbooks**

The following handbooks provide information on land use regulations pertaining to the territories:

- *Territorial Land Use Regulations*
- *Natural Resource Development in the Yukon -Requirements, Procedures and Legislation*
- *Natural Resource Development in the Northwest Territories — Requirements, Procedures and Legislation*
- *Information and Procedures — Developing the Inuvialuit Settlement Region*

The following handbooks provide information about environmental operating guidelines:

- *Seismic Operations*
- *Hydrocarbon Well-sites*
- *Reclamation Procedures*
- *Access Roads and Trails*
- *Mineral Exploration*
- *Pits and Quarries*

The land use and environmental handbooks, including a brochure, are available from:

Enquiries Kiosk  
Communications Branch  
Department of Indian Affairs and Northern Development  
10 Wellington St.  
Terrasses de la Chaudiere  
Hull, Quebec, Canada  
K1A OH4  
Telephone: (8 19) 997-0380  
Fax: (819) 953-3017

### **Northern Oil and Gas Action Program**

The Northern Oil and Gas Action Program (NOGAP) is a multi-disciplinary research and planning program that advances the state of federal and territorial government preparedness for major hydrocarbon development north of 60°.

A cumulative bibliography is available from:

NOGAP Secretariat  
Department of Indian Affairs and Northern Development  
10 Wellington St.  
Terrasses de la Chaudiere  
Hull, Quebec, Canada  
K1A OH4  
Telephone: (819) 997-8293  
Fax: (819) 997-0552

### **Beaufort Region Environmental Assessment and Monitoring Program**

The Beaufort Region Environmental Assessment and Monitoring Program (BREAM) is a NOGAP-funded initiative that plans and co-ordinates environmental studies and workshops in preparation for hydrocarbon development in the Beaufort Region of the Western Arctic.

A list of the reports and individual reports are available from:

Enquiries Kiosk  
Communications Branch  
Department of Indian Affairs and Northern Development  
10 Wellington St.  
Terrasses de la Chaudiere  
Hull, Quebec, Canada  
K1A OH4  
Telephone: (8 19) 997-0380  
Fax: (819) 953-3017



## **Environmental Studies Research Funds**

The Environmental Studies Research Funds (ESRF) program sponsors environmental and social studies research to assist government decision making related to oil and gas exploration on Canada's frontier lands.

ESRF annual reports, which include a list of available studies, technical research reports and a newsletter that includes information on the status of the program, are available from:

Environmental Studies Research Funds  
Environment Directorate  
National Energy Board  
Cadillac Fairview Building  
31 1-6th Ave. S.W.  
Calgary, Alberta, Canada  
T2P 3H2  
Telephone: (403) 299-368 1  
Fax: (403) 292-4192

## **Program of Energy Research and Development**

The Program of Energy Research and Development (PERD) funds energy research and development that promotes Canadian sustainable economic growth, industrial development, productivity and improved environmental quality by developing the science and technology for Canada to produce and use its energy resources responsibly and cost-effectively.

Information concerning PERD is available from:

Director General  
Office of Energy Research and Development  
Energy, Mines and Resources  
580 Booth St.  
Ottawa, Ontario, Canada  
K1A 0E4  
Telephone: (613) 995-8860  
Fax: (613) 9956146

## **Regulation of Exploration, Development, Production, Pipeline Transportation and Export**

The National Energy Board:

- grants authorizations for the exportation of oil, natural gas and electricity;
- certificates interprovincial and international pipelines and designated inter-provincial and international power lines;

- reviews the Canadian supply of all major energy commodities with emphasis on electricity and oil and natural gas and their by-products, as well as the demand for Canadian energy at home and abroad;
- sets tolls and tariffs for oil and gas pipelines under federal jurisdiction; and
- has regulatory responsibilities for oil and gas exploration and development in frontier lands.

The Board provides storage, curation and public viewing services for:

- geological and geophysical reports and records from surveys conducted on federal lands north of 60° under the responsibility of the Minister of Indian Affairs and Northern Development; and
- well history reports and records from wells drilled on these lands.

For copies of Board regulations and reports or further information, contact:

Regulatory Support Office  
 National Energy Board  
 Cadillac Fairview Building  
 311-6th Ave. S.W.  
 Calgary, Alberta, Canada  
 T2P 3H2  
 Telephone: (403) 292-4800  
 Fax: (403) 292-5503

A list of surveys is available from:

Data Management  
 Resource Evaluation Branch  
 National Energy Board  
 Telephone: (403) 299-3 112  
 Fax: (403) 292-5503.

A list of the wells drilled may be obtained from:

Manager  
 Information Systems  
 Engineering Branch  
 National Energy Board  
 Telephone: (403) 299-2799  
 Fax: (403) 292-5503

## **Geological and Geophysical Information**

The Institute of Sedimentary and Petroleum Geology of the Geological Survey of Canada provides storage, curation, public viewing and sampling facilities for cores and samples from wells drilled on federal lands north of 60° and conducts studies of petroleum geology and potential.

Information on wells north of 60°, excluding wells drilled in the Baffin Bay-Davis Strait region, is available from:

Institute of Sedimentary and Petroleum Geology  
Geological Survey of Canada  
3303-33rd Street NW  
Calgary, Alberta, Canada  
T2L 2A7  
Telephone: (403) 292-7000  
Fax: (403) 292-5377

Information on wells drilled in the Baffin Bay-Davis Strait region is available from:

Core Storage and Laboratory  
Atlantic Geoscience Centre  
Bedford Institute of Oceanography  
Dartmouth, Nova Scotia, Canada  
B2Y 4A2  
Telephone: (902) 426-6 127  
Fax: (902) 426-6186

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## Glossary

**abandoned well**

any well that has been permanently plugged

**benefits plan**

a plan submitted by operators and approved by the Minister that states the employment and procurement intentions of operators related to the exploration and development of frontier lands

**blowout**

uncontrolled flow of gas, oil, water or other fluid from a well

**Call for Bids**

a notice published in The *Canada Gazette* and other publications whereby the Minister calls for the submission of bids in relation to Crown reserve lands identified in a preceding Call for Nominations

**Call for Nominations**

a notice published in trade journals inviting interested parties to nominate tracts of Crown reserve lands for potential inclusion in a Call for Bids

**completed well**

a well that has been drilled and equipped so that it can produce oil or gas

**cubic metre of gas**

equivalent to 35.301 cubic feet at 14.73 pounds per square inch of atmospheric pressure at sea level

**cubic metre of oil**

equivalent to 6.2898 American stock tank barrels

**delineation well**

a well drilled as a follow-up to a discovery well on the same geological feature to determine the extent and commercial potential of the oil or gas accumulation encountered in the discovery well

**development plan**

a plan that describes the approach and facilities that the proponent intends to use to recover hydrocarbon resources based on the proponent's interpretation of geology and reservoir characteristics of a field

**discovery well**

the first oil or gas well drilled in a new field; the well that reveals the presence of a petroleum-bearing reservoir. Subsequent wells are development wells.

**exploration licence**

a licence granting the right to explore for and the exclusive right to drill and test for petroleum, and the exclusive right to obtain a production licence subject to compliance with the other provisions of the *Canada Petroleum Resources Act*

**exploration well**

a well drilled on a geological feature where no significant discovery has previously been made (synonymous with wildcat well)

**flow test**

an operation to induce the flow of formation fluids to the surface of a well to procure reservoir fluid samples and determine reservoir flow characteristics

**gravity survey**

a type of geophysical survey program that measures variations in the gravitational field of the earth and relates them to the densities of various rock types. This enables the form and thickness of a sedimentary basin to be determined.

**hectare (ha)**

10 000 square metres (equivalent to 2.47 acres)

**hydrocarbon**

a naturally occurring compound consisting primarily of atoms of hydrogen and carbon in solid, liquid or gaseous form

**hydrodynamic**

of or relating to the force or pressure of water or other fluids

**injection well (injector)**

a well in which fluids are injected into an underground formation to increase reservoir pressure

**magnetometer survey**

a geophysical technique that measures the intensity of the earth's magnetic field over an area. Variations in this intensity are related to mineralization or differing rock types both on the surface and in the subsurface.

**reflection seismic**

the primary geophysical technique used in petroleum exploration for mapping subsurface geological features. Acoustic pulses created at the surface are reflected from layers that have different acoustic properties within the earth. The pulses are recorded at the surface for processing and interpretation.

**rights issuance**

the process of granting rights on Crown reserve lands subject to the *Canada Petroleum Resources Act*

**shut-in well**

a well in which operations have been temporarily ceased

**significant discovery**

a discovery indicated by the first well on a geological feature that demonstrates by flow testing the existence of hydrocarbons and suggests the existence of an accumulation that has potential for sustained production

**significant discovery licence**

confers the right to explore, drill, test and develop petroleum resources and to obtain a production licence

**spud**

to start drilling a well

**suspended well**

a well in which drilling or production operations have been temporarily ceased

**terminated well**

a well that has reached total depth and has been abandoned, completed or suspended

**work expenditure**

actual cost of exploration activities

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# Notes

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## Notes