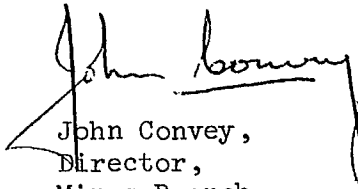


F O R E W O R D

Numerous samples of crude oil collected in various regions of Canada have been analysed, over a period of several decades, at the Fuels Research Centre, Mines Branch, Department of Energy, Mines and Resources, in Ottawa, as part of the resource evaluation program. For general documentation, as well as for specialized studies, it has been considered desirable to publish nearly 400 of these analyses of typical oil samples, together with some reservoir data.

The present publication is part of a series which will cover separately the Maritime Provinces (New Brunswick, Newfoundland and Nova Scotia), Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia and Northwest Territories. All these analyses were performed according to the United States Bureau of Mines Routine Method of Distillation. In the more recent analyses, refractive index and dispersion were determined at 20°C, using an Abbé-type refractometer equipped with compensating prisms. The refractive index thus determined is for the Sodium D line of light, and the dispersion $(N_F - N_C) 10^4$ is calculated from the position of the compensating prisms.

Most of the reservoir data are estimates obtained in the mid 1960's and grateful acknowledgement is hereby given for the excellent cooperation received from the various provincial authorities (Departments of Mines and others concerned with oil resources development and conservation) and from the numerous oil companies which contributed to this project. In order to improve further editions of this publication, it would be greatly appreciated if any errors, additional data, or supplementary bibliographical references were reported to the authors.


John Convey,
Director,
Mines Branch.

Ottawa, June 16, 1969.

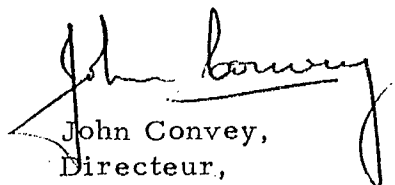
AVANT-PROPOS

Au cours d'une période de plusieurs décennies, de nombreux échantillons de pétrole brut recueillis dans diverses régions du Canada ont été analysés au Centre de recherches sur les combustibles, Direction des mines, ministère de l'Énergie, des Mines et des Ressources, à Ottawa, dans le cadre du programme de l'évaluation des ressources. Pour la documentation générale, aussi bien que pour des études spécialisées, il a semblé désirable de publier presque 400 de ces analyses d'échantillons de pétrole typiques, ainsi que quelques caractéristiques des gisements.

La présente publication fait partie d'une série de rapports qui traitera séparément les Provinces Maritimes (Nouveau-Brunswick, Terre-Neuve et Nouvelle-Écosse), le Québec, l'Ontario, le Manitoba, la Saskatchewan, l'Alberta, et la Colombie-Britannique et les Territoires du Nord-Ouest. Toutes ces analyses ont été faites d'après la méthode "Routine" de distillation du Bureau des Mines des États-Unis d'Amérique. Dans les analyses plus récentes, l'indice de réfraction et la dispersion ont été déterminés à 20°C à l'aide d'un réfractomètre de type Abbé équipé de prismes compensateurs. L'indice de réfraction ainsi obtenu correspond à la raie de lumière D du sodium, et la dispersion $(N_F - N_C)10^4$ est calculée d'après les positions des prismes compensateurs.

La plupart des caractéristiques de gisement sont des estimations obtenues vers 1965, et l'on doit rendre hommage à l'excellente collaboration reçue des diverses autorités provinciales (Ministères des mines, et autres intéressés au développement et à la conservation des ressources pétrolières) ainsi que des nombreuses sociétés de pétrole qui contribuèrent à ce projet.

Pour l'amélioration de rééditions de cette publication, il serait très apprécié que toute erreur, caractéristique ou référence bibliographique supplémentaire soit indiquée aux auteurs.


John Convey,
Directeur,
Direction des mines.

Ottawa, le 16 juin 1969.

Mines Branch Information Circular IC 220

ANALYSES AND CHARACTERISTICS
OF OIL SAMPLES FROM BRITISH COLUMBIA AND
NORTHWEST TERRITORIES

by

R. P. Charbonnier¹, R. G. Draper¹,
W. H. Harper² and A. Yates¹.

--

ABSTRACT

The 6 oil analyses gathered in this publication have been performed in the Fuels Research Laboratories of the Mines Branch in Ottawa, according to the U.S.B.M. Routine Method of Distillation. Some reservoir characteristics are also included.

¹ Senior Scientific Officer, and ² Technical Officer, Fuels Research Centre, Mines Branch, Department of Energy, Mines and Resources, Ottawa, Canada.

Direction des mines

Circulaire d'information IC 220

ANALYSES ET CARACTÉRISTIQUES D'ÉCHANTILLONS
DE PÉTROLE DE LA COLOMBIE-BRITANNIQUE ET
DES TERRITOIRES DU NORD-OUEST

par

R. P. Charbonnier¹, R. G. Draper¹,

W. H. Harper² et A. Yates¹

RÉSUMÉ

Les 6 analyses de pétrole rassemblées dans cette publication ont été faites aux laboratoires de recherches sur les combustibles de la Direction des mines, à Ottawa, suivant la méthode U.S.B.M. de distillation. On a aussi inclus quelques caractéristiques des gisements.

¹ Officier scientifique principal, ² agent technique, Centre de recherches sur les combustibles, Direction des mines, ministère de l'Énergie, des Mines et des Ressources, Ottawa, Canada.

TABLE OF CONTENTS

	<u>Page</u>
Foreword	i
Abstract	ii
Résumé	iii
 <u>BRITISH COLUMBIA OIL SAMPLES</u>	
Boundary Lake	2
Fort St. John	10
 <u>NORTHWEST TERRITORIES OIL SAMPLES</u>	
Norman Wells	14

BRITISH COLUMBIA
OIL SAMPLES

OIL FIELD DATA

Field and Pool: Boundary Lake Field, Boundary Lake Pool

Location: Twp(s): 83, 84, 85, 86, 87; Rge(s): 13, 14, 15; W 6 M

DISCOVERY DETAILS

Method: Rotary Drilling

Well: Name^{1/}: Texaco NFA Boundary L 6-6-86-13

Completed: February 4, 1955

Perforated: 4306 - 4323 W/4 bullets/ft

Treatment: 500 gallons Dowell regular acid w/additives

Initial Potential: 242 BOPD on 20/64" choke

GEOLOGY

Producing Zone: Boundary Lake

Other Shows: Nil

Trap Type: Stratigraphic

Lithology: Limestone, Skeletal

Maximum Reservoir Thickness: 30 feet

Regional Setting: Shallow Marine Environment

Deepest Formation Penetrated: Mississippian Banff

DEVELOPMENT DATA - of entire Boundary Lake Field at April 1, 1965

Total Wells: Completed Oil: 236. Gas: 13. Dry and Abandoned: 19.

Producing Oil: 219. Suspended Oil: 17.

Injection or Disposal: Water: 24. Gas: -

Well Spacing: 160 Acres; Pattern: Rectangular

Logging Practice: E-Log or IE Log, & Sonic

Completion Practice: Case & Perforate

RESERVOIR DATA

Type of Drive: Solution Gas

Estimated Oil in Place:^{2/} 579,000,000 S.T.bbbls(1016 bbbls/acre-foot)

Estimated Recoverable Oil:^{2/} 202,000,000 S.T.bbbls(1016 bbbls/acre-foot)

Oil Zone Thickness:^{2/} Maximum: 30. Average: 12

Gas Zone Thickness: Maximum: 30

Porosity: 18.3%. Permeability:^{2/} 45 md (Air)

Area:^{2/} 47,700 Acres

Oil Characteristics:^{3/} Gravity: 33.5 °API, Sulphur: 0.68% by wt.

Pour Point: +20°F. Initial Solution GOR: 485

Pressure Maintenance or Secondary Recovery: Water Injection

PRODUCTION - @ May 1, 1965

MPR: 32,177

Economic Allowance: None. Operating:^{1/} 14,135 BOPD

Market Outlet: Trans-Prairie Pipelines Ltd.

Bibliographical References and Footnotes:

- 1/ Oil & Gas Production Report, April 1965, B.C. Dept. of Mines & Pet. Res.
- 2/ B.C. Dept. Mines & Pet. Res. Estimate @ December 31, 1964.
- 3/ Composite Sample, May 17, 1961.

SECONDARY RECOVERY

RESERVOIR DATA

- 1) Field: Boundary Lake
- 2) Pool: Boundary Lake
- 3) Province: B.C.
- 4) Location: Twp(s) 84, 85, 86; Rge(s): 13, 14; W 6 M
- 5) Operator: Imperial, Texaco, Dome¹/₁
- 6) Project: Boundary Lake Unit¹/₁
- 7) Reservoir: Boundary Lake Member, Charlie Lake Fm., Schooler Creek Group, Triassic
- 8) Discovery Date: February 1955
- 9) Date Injection Began: June 1964
- 10) Main Structural Feature: Stratigraphic Trap
- 11) Gas Cap: Originally: Yes. At Present: Yes.
- 12) Time Required for Initial Results (Months): Not Known
- 13) Initial Results on Production, BHP, GOR, etc: N.A.
- 14) Main Drive in Primary Production: Solution Gas
- 15) Productive Area (Acres) of Reservoir: 47,700 Acres; Of Project: A/A.
Affected by Injection: A/A
- 16) Average Depth to Top of Pay (feet): 4,500
- 17) Average Effective Thickness (feet): 12
- 18) Average Porosity %: 18.3
- 19) Average Horizontal Permeability and Range in Brackets (Producing Wells)
(millidarcys): 45 (200-2.4)
- 20) Connate Water (% of Pore Space): 11
- 21) Viscosity at initial Reservoir Conditions (Centipoises): 1.18
- 22) API Gravity: 33.5
- 23) Solution Gas/Oil Ratio at Saturation Pressure (cu.ft/bbl): 485
- 24) Bubble Point Pressure (psi): 1570
- 25) Original Pressure (psi): 1840
- 26) Reservoir Pressure at Start of Injection (psi): 1525
- 27) Latest Reservoir Pressure: 1515 (Est.) psi (May 1965)
- 28) Injection Fluid: Fresh Water
- 29) Injection Fluid Source: Peace River
- 30) System: Closed
- 31) Fluid Treatment Before Injection: Deaeration
- 32) Injection Pattern: Inverted 9 Spot
- 33) Structural Position Injection Wells: Oil Zone

- 34) Distance Injection Wells to Producers (feet): 2640
- 35) Number of Injection Wells at Start: 21
- 36) Number of Injection Wells at Present: 44 on April 30, 1965
- 37) Average Daily Injection Rate per Injection Well at Start (bbls): 1000
- 38) Average Daily Injection Rate per Injection Well at Present (bbls):^{2/} 1050
on April 30, 1965
- 39) Average Injection Pressure at Start (psi): 1050
- 40) Average Injection Pressure at Present (psi): 2200 on May 15, 1965
- 41) Number of Producing Wells in Project Area at Start: 242
- 42) Number of Producing Wells in Project Area at Present: 230 on April 30, 1965
- 43) Average Production Rate in Project Area at Start (bbls/day): 15,535
- 44) Average Production Rate in Project Area at Present: 14,135 B/D (April 1965)
- 45) Original Oil in Place in Project Area (bbls): 579,000,000
- 46) Original Oil Saturation (% of Pore Space): 68 (Imperial Oil Limited)
- 47) Primary Recovery from Project Area when Injection Started (bbls): 19,627,593
- 48) Oil Saturation at Start of Project (% of Pore Space): -
- 49) Oil Production from Project Area from Start of Injection to Now (bbls): 4,388,284
on April 30, 1965
- 50) Total Volume of Injected Fluids at Present (bbls): 6,297,453 on April 30, 1965
- 51) Estimated Primary Ultimate Recovery from Project Area (bbls): 74,000,000
- 52) Estimated Increase in Ultimate Recovery from Project Area (bbls): 146,000,000
- 53) Well Spacing: 160 Acres
- 54) Oil Volume Factor (initial Reservoir Barrels per Stock-Tank Barrel): 1.25
- 55) Footnotes of Data Given Above:^{1/} Includes 3 projects: No. 1 Imperial Oil,
No. 2 Texaco-NFA & No. 3 Dome Area.
^{2/} Applies only to Unit No. 1. Unit No. 2 commenced
injection May 1965. Dome commenced injection in
September 1964.

OIL FIELD DATA

Field and Pool: Boundary Lake Pool (Southern Part Only)

Location: Twp(s): 84, 85; Rge(s): 13, 14; W 6 M

DISCOVERY DETAILS

Method: Exploratory Stepout

Well Name: Imperial Pac Boundary 11-10-85-14

Completed: February 1957

Perforated: 4080-4084 and 4084-4102

Treatment: 500 gallons mud cleanout acid

Initial Potential: 150 bbls/day

GEOLOGY

Producing Zone(s): Boundary Lake

Trap Type: Stratigraphic Trap

Lithology: Limestone

Maximum Reservoir Thickness: 30 feet (gross)

DEVELOPMENT DATA

Total Wells: Completed Oil: 162. Dry and Abandoned: 13.

Producing Oil: 139. Suspended Oil: 2.

Injection or Disposal: Water: 21. Gas: -

Well Spacing: 160 Acres Pattern: Lsd. 6, 8, 14, 16

Logging Practice: Induction E-log, Sonic log.

Completion Practice: Case through, perforate, acid and sand frac.

RESERVOIR DATA

Type of Drive: Solution Gas

Estimated Oil in Place: 280,000,000 S.T.bbls(950 bbls/acre-foot)

Estimated Recoverable Oil: 69,000,000 S.T.bbls(234 bbls/acre-foot)

Oil Zone Thickness: Maximum: 25 feet. Average: 12 feet

Gas Zone Thickness: Maximum: 10 feet

Porosity: 20%. Permeability: 30 md

Area: 26,000 Acres

Oil Characteristics: Gravity: 35 °API. Sulphur: 0.8%. Initial Solution GOR: 465

Pressure Maintenance or Secondary Recovery: Water Injection

PRODUCTION

MPR.: 19,000. Operating: 8,000 BOPD

Market Outlet (pipeline): Trans Prairie, Western Pacific, Trans Mountain.

SECONDARY RECOVERY

RESERVOIR DATA

- 1) Field: Boundary Lake
- 2) Pool: Boundary Lake
- 3) Province: B.C.
- 4) Location: Twp(s): 84, 85; Rge(s): 13, 14; W 6 M
- 5) Operator: Imperial Oil
- 6) Project: Boundary Lake Unit #1
- 7) Reservoir: Boundary Zone, Charlie Lake Member, Triassic Schooler Creek
- 8) Discovery Date: February 1955
- 9) Date Injection Began: May 1964
- 10) Main Structural Feature: Stratigraphic Trap
- 11) Gas Cap: Originally: Yes. At Present: Yes
- 12) Time Required for Initial Results (months): Not Known
- 13) Initial Results on Production, BHP, GOR, etc: N/A
- 14) Main Drive in Primary Production: Solution Gas
- 15) Productive Area (Acres) of Reservoir: 41,600 Acres; Of Project: 24,600 Acres.
Affected by Injection: 20,000 Acres
- 16) Average Depth to Top of Pay (feet): 4,300
- 17) Average Effective Thickness (feet): 12
- 18) Average Porosity %: 20
- 19) Average Horizontal Permeability and Range in Brackets (millidarcys): 38(1-75)
- 20) Connate Water (% of Pore Space): 10 (Average)
- 21) Viscosity at Initial Reservoir Conditions (Centi-Poises): 1.18
- 22) API Gravity: 35⁰
- 23) Solution Gas/Oil Ratio at Saturation Pressure (cu.ft/bbl): 465
- 24) Bubble Point Pressure: 1840 psi
- 25) Original Pressure: 1840 psi
- 26) Reservoir Pressure at Start of Injection: 1525 psi
- 27) Latest Reservoir Pressure: 1515 (est.) psi on May 15, 1965
- 28) Injection Fluid: Fresh Water
- 29) Injection Fluid Source: Peace River
- 30) System: Closed
- 31) Fluid Treatment Before Injection: Deaeration
- 32) Injection Pattern: Inverted 9 Spot
- 33) Structural Position Injection Wells: Oil Zone
- 34) Distance Injection Wells to Producers (feet): 2,640

- 35) Number of Injection Wells at Start: 21
- 36) Number of Injection Wells at Present: 21 on May 15, 1965
- 37) Average Daily Injection Rate per Injection Well at Start: 1000 bbls/day
- 38) Average Daily Injection Rate per Injection Well at Present (bbls): 1050 on May 15, 1965
- 39) Average Injection Pressure at Start: 1050 psi
- 40) Average Injection Pressure at Present: 2200 psi on May 15, 1965
- 41) Number of Producing Wells in Project Area at Start: 131
- 42) Number of Producing Wells in Project Area at Present: 135 on May 15, 1965
- 43) Average Production Rate in Project Area at Start (bbls/day): 10,000
- 44) Average Production Rate in Project Area at Present: 7800 on May 15, 1965
- 45) Original Oil in Place in Project Area (bbls): 280,000,000
- 46) Original Oil Saturation (% of Pore Space): 68
- 47) Primary Recovery from Project Area when Injection Started: 10,000,000 bbls
- 48) Oil Saturation at Start of Project (% of Pore Space): -
- 49) Oil Production from Project Area from Start of Injection to Now (bbls): 2,900,000
on May 1, 1965
- 50) Total Volume of Injected Fluids at Present (bbls): 6,300,000 on May 1, 1965
- 51) Estimated Primary ultimate Recovery from Project Area: 36,000,000 bbls
- 52) Estimated Increase in Ultimate Recovery from Project Area: 69,000,000 bbls
- 53) Well Spacing: 160 Acres
- 54) Oil Volume Factor (Initial Reservoir Barrels per Stock-Tank Barrel): 1.3

CRUDE PETROLEUM ANALYSIS

Laboratory Number 303-57

FIELD: Boundary Lake

POOL:

ZONE: Schooler Creek

Well Name: Imperial Pacific Boundary Lake No. 11-10
 Location: Lsd. 11, Sec. 10, Twp. 85, Rge. 14, W.6th
 Interval tested, depth, feet: 4073-4101
 Producing Zone: Schooler Creek
 Geological Age: Triassic

Province: British Columbia
 Sample From: British Columbia Dept. of Mines
 Date Sampled: August 20, 1957
 Sampled at: Tank

GENERAL CHARACTERISTICS

Specific gravity at 60°F.: 0.841
 Sulphur, percent by weight: 0.72
 Saybolt Universal Viscosity:
 at 100°F., sec. 42
 at °F., sec.
 A.P.I. gravity at 60°F.: 36.8
 Pour point, °F.: 5
 Colour: Greenish Black
 Carbon residue, percent by weight: 2.9
 (Conradson)

DISTILLATION

(U.S. Bureau of Mines Routine Method)

Stage 1 - Distillation at atmospheric pressure, 764 mm. Hg.
 First drop, 32°C. (90°F.)

Fraction No.	Cut at		Per Cent	Sum Per Cent	Specific Gravity 60°F.	Degrees A.P.I. 60°F.	Correlation Index	Aniline Point, °C.	Viscosity S.U. 100°F.	Cloud Test, °F.
	°C.	°F.								
1.	50	122	1.9	1.9)						
2.	75	167	2.0	3.9)	0.661	82.6	-	-		
3.	100	212	3.9	7.8	0.698	71.2	11	57.0		
4.	125	257	5.6	13.4	0.730	62.3	17	54.0		
5.	150	302	5.4	18.8	0.754	56.2	21	52.5		
6.	175	347	5.3	24.1	0.773	51.6	23	53.5		
7.	200	392	4.0	28.1	0.788	48.1	24	56.0		
8.	225	437	5.0	33.1	0.804	44.5	26	59.4		
9.	250	482	4.8	37.9	0.816	41.9	26	63.0		
10.	275	527	6.9	44.8	0.830	39.0	28	66.7		

Stage 2 - Distillation continued at 40 mm. Hg. pressure

11.	200	392	2.7	47.5	0.850	35.0	34	69.7	39	15
12.	225	437	5.5	53.0	0.857	33.6	33	73.4	44	35
13.	250	482	6.0	59.0	0.870	31.1	36	75.6	56	50
14.	275	527	4.7	63.7	0.886	28.2	40	78.1	84	65
15.	300	572	5.3	69.0	0.897	26.2	43	82.4	148	80
Residuum			27.0	96.0	0.968	14.7				

Carbon residue of residuum: 9.2%

Carbon residue of crude: 2.9%

APPROXIMATE SUMMARY

	Percent by Vol.	Specific Gravity	Degrees A.P.I.	Viscosity S.U. 100°F.
Light gasoline	7.8	0.680	76.6	
Total gasoline and naphtha	28.1	0.737	60.5	
Kerosine distillate	9.8	0.810	43.2	
Gas oil	15.3	0.844	36.2	
Nonviscous lubricating distillate	9.4	0.864-0.889	32.3-27.7	50-100
Medium lubricating distillate	6.4	0.889-0.903	27.7-25.2	100-200
Viscous lubricating distillate	-	-	-	Above 200
Residuum	27.0	0.968	14.7	
Distillation loss	4.0			

OIL FIELD DATA

Field and Pool: Fort St. John, Triassic "C" Oil Pool

Location: Twp: 83; Rge: 18; W 6 M

DISCOVERY DETAILS

Method: Stray Sand Encountered During Early Stepout Drilling, Fort St. John Field

Well Name: Pacific Fort St. John #9 (3-14-83-18-W6)

Completed: August 24, 1956 (Well Drilled October 16, 1952)

Perforated: 4356 to 4365. Four jets and Four Bullets per Foot.

Treatment: Nil

Initial Potential: 420 BOPD (4-Hour Test)

GEOLOGY

Producing Zone: Triassic "C"

Other Shows: Slight oil show in the Cadomin, Triassic "A" & "B", and Belloy. Small gas show in the Halfway and Belloy. Good gas show in stray Triassic dolomite just below Triassic "C" sand and in the Triassic "A".

Trap Type: Structural and Stratigraphic (lenticular sand)

Lithology: Quartzose Sandstone

Maximum Reservoir Thickness: 10.5 feet

Regional Setting: A very gentle Laramide fold in a pre-Permo-Penn graben associated with the Peace River arch collapse.

Deepest Formation Penetrated: Belloy

DEVELOPMENT DATA

Total Wells: Completed Oil: Four. Gas: Thin gas cap encountered while drilling updip. Well completed in lower horizon. Dry and Abandoned: One.

Producing Oil: Three. Suspended Oil: One

Injection or Disposal: Water: Nil. Gas: Nil

Well Spacing: 160 Acres

Logging Practice: ES, ML-C

Completion Practice: Perforated and Acid Washed

RESERVOIR DATA

Type of Drive: Solution Gas and Small Gas Cap

Estimated Oil in Place: 1,910,000 S.T.bbbls

Estimated Recoverable Oil: 382,000 S.T.bbbls

Oil Zone Thickness: Maximum: 7 feet

Gas Zone Thickness: Maximum: 4 feet

Porosity: 13.8% estimated. Permeability: N/A (Not Cored)

Area: 160 Acres

Oil Characteristics: Gravity: 39.6 °API. Sulphur: 0.23%

Pour Point: +20°F. Initial Solution GOR: 533 (based on initial 5 months production)

Pressure Maintenance or Secondary Recovery: Nil

PRODUCTION

46 BOPD (Initially 116 BOPD)

Market Outlet: Truck to Pacific Refinery, Taylor, B.C.

CRUDE PETROLEUM ANALYSIS

Laboratory Number 280-57

FIELD: Fort St. John

POOL:

ZONE: Triassic "C"

Well Name: Pacific Fort St. John No. 9

Location: Lsd. 3, Sec. 14, Twp. 83, Rge. 18, W.6th

Interval tested, depth, feet: 4363-4370

Producing Zone: Triassic "C"

Geological Age: Triassic

Province: British Columbia

Sample From: D.M.T.S.

Date Sampled: August 1, 1957

Sampled at: Tank

GENERAL CHARACTERISTICS

Specific gravity at 60°F.: 0.826

Sulphur, percent by weight: 0.28

Saybolt Universal Viscosity:

at 100°F., sec. 37

at °F., sec.

A.P.I. gravity at 60°F.: 39.8

Pour point, °F.: 15

Colour: Greenish Black

Carbon residue, percent by weight: 1.0
(Conradson)

DISTILLATION

(U.S. Bureau of Mines Routine Method)

Stage 1 - Distillation at atmospheric pressure, 752 mm. Hg.
First drop, 37°C. (97°F.)

Fraction No.	Cut at		Per Cent	Sum Per Cent	Specific Gravity 60°F.	Degrees A.P.I. 60°F.	Correlation Index	Aniline Point, °C.	Viscosity S.U. 100°F.	Cloud Test, °F.
	°C.	°F.								
1.	50	122	0.8	0.8)						
2.	75	167	2.7	3.5)	0.670	79.7	-			
3.	100	212	4.3	7.8	0.704	69.5	14	53.4		
4.	125	257	5.6	13.4	0.732	61.8	18	51.0		
5.	150	302	6.0	19.4	0.754	56.2	21	52.0		
6.	175	347	6.3	25.7	0.772	51.8	23	53.7		
7.	200	392	4.7	30.4	0.788	48.1	24	56.7		
8.	225	437	5.4	35.8	0.802	44.9	25	60.5		
9.	250	482	5.3	41.1	0.814	42.3	25	65.0		
10.	275	527	7.4	48.5	0.828	39.4	27	69.9		

Stage 2 - Distillation continued at 40 mm. Hg. pressure

11.	200	392	3.8	52.3	0.845	36.0	31	74.2	38	5
12.	225	437	5.4	57.7	0.853	34.4	31	77.0	44	25
13.	250	482	5.4	63.1	0.866	31.9	34	81.0	54	45
14.	275	527	5.5	68.6	0.877	29.8	36	84.1	73	65
15.	300	572	6.3	74.9	0.890	27.5	39	87.9	133	80
Residuum			20.2	95.1	0.935	19.8				

Carbon residue of residuum: 4.3%

Carbon residue of crude: 1.0%

APPROXIMATE SUMMARY

	Percent by Vol.	Specific Gravity	Degrees A.P.I.	Viscosity S.U. 100°F.
Light gasoline	7.8	0.689	73.9	
Total gasoline and naphtha	30.4	0.742	59.2	
Kerosene distillate	10.7	0.808	43.6	
Gas oil	17.1	0.840	37.0	
Nonviscous lubricating distillate	10.3	0.861-0.883	32.8-28.8	50-100
Medium lubricating distillate	6.4	0.883-0.897	28.8-26.2	100-200
Viscous lubricating distillate	-	-	-	Above 200
Residuum	20.2	0.935	19.8	
Distillation loss	4.9			

NORTHWEST TERRITORIES

OIL SAMPLES

OIL FIELD DATA

Field and Pool: Norman Wells, N.W.T.

Location:

DISCOVERY DETAILS

Method: Cable Tools

Well Name: N.W. Discovery No. 1

Completed: 785 feet in 1920

Perforated: 991 feet - 1025 feet within 100 feet Kee Scarp (August 1944) open hole

Treatment: None

Initial Potential: 5 bbls/day (1920)

GEOLOGY

Lithology: Hope Shales (Fort Creek)

Deepest Formation Penetrated: 1025 feet

DEVELOPMENT DATA

Total Wells: Dry and Abandoned: 5 (August 1944)

OIL FIELD DATA

Field and Pool: Norman Wells, N.W.T.

Location:

RECOVERY DETAILS

Method: All Rotary

Well Name:	NW Discovery No. 4	I M P E R I A L C A N O L			
		5X	12X	27X	28X
Completed:	22-1-44	20-6-43	16-8-42	6-3-44	31-3-44
Perforated:	Open Hole	Open Hole	Open Hole	1140-80 1200-40 Some Open Hole	1240-1320 Some Open Hole
Treatment: HCl	Acidized 2000-15%	Acidized 2000-15%	None	Acidized 1995-15%	Acidized 1950-15%
Initial Potential: (b/d)	160	300	400	200	260
Geology					
Producing Zone:	Kee Scarp	Kee Scarp	Kee Scarp	Kee Scarp	Kee Scarp
Other Shows:	Nil	270-290' oil 665-680' oil 925' gas	Nil	Nil	Nil
Trap Type:	Yes	Yes	Yes	Yes	Yes
Lithology:	Ls Reef	Ls Reef	Ls Reef	Ls Reef	Ls Reef
Maximum Reservoir Thickness:	292'	165'	408'	241'	150'
Regional Setting:	SW Dip				
Deepest Formation Penetrated:	1384'	1330'	1496'	1374'	1380'

DEVELOPMENT DATA

Total Wells: Completed Oil: 63. Gas: Nil. Dry & Abandoned: 2

Currently Producing Oil: up to 45. Protectively Plugged: 16

Injection or Disposal: Water: Nil. Gasoline Base Stock: 2

RESERVOIR DATA

Type of Drive: Minor Water, Solution Gas Predominates

Estimated Oil in Place: 500×10^6 S.T. bbls

Estimated Recoverable Oil: 50×10^6 S.T. bbls

Oil Zone Thickness (Max.): NW Discovery No. 4 - N/A
Imperial Canol 5X - 115'
" " 12X - 302'
" " 27X - 237'
" " 28X - 130'

Permeability: No Cores

Oil Characteristics: Gravity: 38-42°API. Sulphur: Nil

Pour Point: -70°F. Initial Solution GOR: 373. Base: Paraffinic

Pressure Maintenance or Secondary Recovery: None

PRODUCTION

Operating: Based on GOR

Market Outlet (Pipeline): Originally to Whitehorse. Now Imperial Oil Limited Refinery,
Norman Wells

Remarks: Secondary recovery has not been attempted, other than some minor gas re-pressuring during the Canol period in 1945 and a pilot water injection scheme on Goose Island in 1963, which has been discontinued, now that some Goose Island wells have been reopened.

CRUDE PETROLEUM ANALYSIS

Laboratory Number 1718

FIELD: Norman Wells

POOL:

ZONE: Fort Creek

Well Name: Discovery No. 1
 Location: Oil Creek, 45 miles north Ford Norman
 Interval tested, depth, feet: 260-272
 Producing Zone: Fort Creek
 Geological Age: Upper Devonian

Province: Northwest Territories
 Sample From: Geological Survey
 Date Sampled: September, 1920
 Sampled at:

GENERAL CHARACTERISTICS

Specific gravity at 60°F.: 0.862
 Sulphur, percent by weight: 0.38
 Saybolt Universal Viscosity:
 at 70°F., sec. 66
 at 100°F., sec. 50
 A.P.I. gravity at 60°F.: 32.6
 Pour point, °F.: Below 0
 Colour: Brownish Green
 Carbon residue, percent by weight: 1.8
 (Conradson)

DISTILLATION

(U.S. Bureau of Mines Routine Method)

Stage 1 - Distillation at atmospheric pressure, 754 mm. Hg.
 First drop, 44°C. (111°F.)

Fraction No.	Cut at		Per Cent	Sum Per Cent	Specific Gravity 60°F.	Degrees A.P.I. 60°F.	Correlation Index	Aniline Point, °C.	Viscosity S.U. 100°F.	Cloud Test, °F.
	°C.	°F.								
1.	50	122	0.3	0.3						
2.	75	167	1.1	1.4	0.678	77.2	-			
3.	100	212	4.9	6.3	0.718	65.6	20			
4.	125	257	7.0	13.3	0.742	59.2	23			
5.	150	302	6.0	19.3	0.763	54.0	25			
6.	175	347	6.8	26.1	0.784	49.0	28			
7.	200	392	5.9	32.0	0.802	44.9	31			
8.	225	437	5.2	37.2	0.816	41.9	32			
9.	250	482	6.7	43.9	0.829	39.2	32			
10.	275	527	7.2	51.1	0.842	36.6	34			

Stage 2 - Distillation continued at 40 mm. Hg. pressure

11.	200	392	5.7	56.8	0.860	33.0	38		42	0
12.	225	437	5.3	62.1	0.868	31.5	38		52	20
13.	250	482	6.2	68.3	0.882	28.9	42		74	40
14.	275	527	5.0	73.3	0.895	26.6	45		125	55
15.	300	572	5.3	78.6	0.905	24.9	46		252	65
Residuum			20.4	99.0	-	-				

Carbon residue of residuum: 9.0%

Carbon residue of crude: 1.8%

APPROXIMATE SUMMARY

	Percent by Vol.	Specific Gravity	Degrees A.P.I.	Viscosity S.U. 100°F.
Light gasoline	6.3	0.710	67.8	
Total gasoline and naphtha	32.0	0.759	55.9	
Kerosine distillate	5.2	0.816	41.9	
Gas oil	21.1	0.844	36.1	
Nonviscous lubricating distillate	9.7	0.866-0.888	31.9-27.8	50-100
Medium lubricating distillate	5.9	0.888-0.901	27.8-25.5	100-200
Viscous lubricating distillate	4.7	0.901-0.910	25.5-24.0	Above 200
Residuum	20.4			
Distillation loss	1.0			

CRUDE PETROLEUM ANALYSIS

Laboratory Number 3437

FIELD: Norman Wells

POOL:

ZONE: Fort Creek

Well Name: Norman Wells Field Sample
 Location:
 Interval tested, depth, feet:
 Producing Zone: Fort Creek
 Geological Age: Upper Devonian

Province: Northwest Territories
 Sample From: Imperial Oil,
 Calgary, Alta.
 Date Sampled: May 22, 1942
 Sampled at:

GENERAL CHARACTERISTICS

Specific gravity at 60°F.: 0.833
 Sulphur, percent by weight: 0.55
 Saybolt Universal Viscosity:
 at 0°F., sec. 142
 at 70°F., sec. 42

A.P.I. gravity at 60°F.: 38.4
 Pour point, °F.: Below -60
 Colour: Dark Green
 Carbon residue, percent by weight: 1.4
 (Conradson)

DISTILLATION

(U.S. Bureau of Mines Routine Method)

Stage 1 - Distillation at atmospheric pressure, 757 mm. Hg.
 First drop, 28°C. (82°F.)

Fraction No.	Cut at		Per Cent	Sum Per Cent	Specific Gravity 60°F.	Degrees A.P.I. 60°F.	Correlation Index	Aniline Point, °C.	Viscosity S.U. 100°F.	Cloud Test, °F.
	°C.	°F.								
1.	50	122	2.7	2.7	0.657	83.9	-			
2.	75	167	3.1	5.8	0.673	78.8	9			
3.	100	212	4.7	10.5	0.712	67.2	18			
4.	125	257	7.9	18.4	0.742	59.2	23			
5.	150	302	5.7	24.1	0.764	53.7	26			
6.	175	347	6.1	30.2	0.781	49.7	27			
7.	200	392	5.4	35.6	0.801	45.2	30			
8.	225	437	5.7	41.3	0.815	42.1	31			
9.	250	482	5.4	46.7	0.828	39.4	32			
10.	275	527	6.2	52.9	0.842	36.6	34			

Stage 2 - Distillation continued at 40 mm. Hg. pressure

11.	200	392	4.6	57.5	0.856	33.8	37		40	-5
12.	225	437	6.0	63.5	0.865	32.1	37		49	20
13.	250	482	5.0	68.5	0.880	29.3	41		71	40
14.	275	527	3.8	72.3	0.894	26.8	44		114	60
15.	300	572	5.2	77.5	0.902	25.4	45		207	75
Residuum			21.5	99.0	0.948	17.8				

Carbon residue of residuum: 6.5%

Carbon residue of crude: 1.4%

APPROXIMATE SUMMARY

	Percent by Vol.	Specific Gravity	Degrees A.P.I.	Viscosity S.U. 100°F.
Light gasoline	10.5	0.686	74.8	
Total gasoline and naphtha	35.6	0.745	58.4	
Kerosine distillate	5.7	0.815	42.1	
Gas oil	19.5	0.845	36.0	
Nonviscous lubricating distillate	8.1	0.866-0.889	31.9-27.7	50-100
Medium lubricating distillate	5.7	0.889-0.902	27.7-25.4	100-200
Viscous lubricating distillate	2.9	0.902-0.907	25.4-24.5	Above 200
Residuum	21.5	0.948	17.8	
Distillation loss	1.0			

Remarks: The sample as received contained a trace of water and sediment (by centrifuge).

CRUDE PETROLEUM ANALYSIS

Laboratory Number 3923

FIELD: Norman Wells

POOL:

ZONE: Fort Creek

Well Name: Norman Wells Field Sample
 Location:
 Interval tested, depth, feet:
 Producing Zone: Fort Creek
 Geological Age: Upper Devonian

Province: Northwest Territories
 Sample From: Imperial Oil Ltd.
 Date Sampled: March 1943
 Sampled at:

GENERAL CHARACTERISTICS

Specific gravity at 60°F.: 0.825
 Sulphur, percent by weight: 0.36
 Saybolt Universal Viscosity:
 at 70°F., sec. 40
 at 100°F., sec. 36

A.P.I. gravity at 60°F.: 40.0
 Pour point, °F.: Below -35
 Colour: Dark Green
 Carbon residue, percent by weight: 1.5
 (Conradson)

DISTILLATION

(U.S. Bureau of Mines Routine Method)

Stage 1 - Distillation at atmospheric pressure, 760 mm. Hg.
 First drop, 30°C. (86°F.)

Fraction No.	Cut at		Per Cent	Sum Per Cent	Specific Gravity 60°F.	Degrees A.P.I. 60°F.	Correlation Index	Aniline Point, °C.	Viscosity S.U. 100°F.	Cloud Test, °F.
	°C.	°F.								
1.	50	122	3.1	3.1	0.644	88.2	-			
2.	75	167	3.3	6.4	0.673	78.8	9			
3.	100	212	5.1	11.5	0.712	67.2	18			
4.	125	257	6.4	17.9	0.741	59.5	22			
5.	150	302	6.4	24.3	0.761	54.4	24			
6.	175	347	5.5	29.8	0.780	48.8	26			
7.	200	392	5.5	35.3	0.797	46.0	28			
8.	225	437	5.2	40.5	0.814	42.3	31			
9.	250	482	5.9	46.4	0.828	39.4	32			
10.	275	527	5.8	52.2	0.841	36.8	33			

Stage 2 - Distillation continued at 40 mm. Hg. pressure

11.	200	392	4.4	56.6	0.854	34.2	36		39	-5
12.	225	437	4.5	61.1	0.863	32.5	36		48	20
13.	250	482	5.2	66.3	0.876	30.0	39		66	40
14.	275	527	5.1	71.4	0.889	27.7	42		105	55
15.	300	572	4.1	75.5	0.897	26.3	43		220	70
Residuum			21.4	96.9	0.945	18.2				

Carbon residue of residuum: 7.1%

Carbon residue of crude: 1.5%

APPROXIMATE SUMMARY

	Percent by Vol.	Specific Gravity	Degrees A.P.I.	Viscosity S.U. 100°F.
Light gasoline	11.5	0.682	76.0	
Total gasoline and naphtha	35.3	0.740	59.7	
Kerosine distillate	5.2	0.814	42.3	
Gas oil	19.1	0.843	36.4	
Nonviscous lubricating distillate	8.6	0.865-0.887	32.1-28.0	50-100
Medium lubricating distillate	4.5	0.887-0.896	28.0-26.4	100-200
Viscous lubricating distillate	2.8	0.896-0.901	26.4-25.6	Above 200
Residuum	21.4	0.945	18.2	
Distillation loss	3.1			

Remarks: The sample as received contained a trace of water and sediment (by centrifuge).

CRUDE PETROLEUM ANALYSIS

Laboratory Number 2208-54

FIELD: Norman Wells

POOL:

ZONE: Fort Creek

Well Name: Composite 5 Wells: Imperial No. 4, 5X,
12X, 27X & 28X

Province: Northwest Territories

Location: Lat. 65° 17' N., Long 126° 51' W.
Interval tested, depth, feet: 1092 to 1390

Sample From: Dept. of Northern Affairs
and National Resources

Producing Zone: Fort Creek
Geological Age: Upper Devonian

Date Sampled: July 26, 1954
Sampled at: Group Separator at
Battery No. 3

GENERAL CHARACTERISTICS

Specific gravity at 60°F.: 0.823
Sulphur, percent by weight: 0.41
Saybolt Universal Viscosity:
at 100°F., sec. 40
at °F., sec.

A.P.I. gravity at 60°F.: 40.4
Pour point, °F.: Below -75
Colour: Dark Green
Carbon residue, percent by weight: 1.4
(Conradson)

DISTILLATION

(U.S. Bureau of Mines Routine Method)

Stage 1 - Distillation at atmospheric pressure, 765 mm. Hg.
First drop, 28°C. (82°F.)

Frac- tion No.	Cut at		Per Cent	Sum Per Cent	Specific Gravity 60°F.	Degrees A.P.I. 60°F.	Corre- lation Index	Aniline Point, °C.	Visc. S.U. 100°F.	Cloud Test, °F.	Refractive Index 20°C.
	°C.	°F.									
1.	50	122	3.7	3.7	0.666	81.1	-	-			1.3741
2.	75	167	3.7	7.4	0.681	76.4	13	57.7			1.3886
3.	100	212	5.3	12.7	0.721	64.8	22	53.9			1.4022
4.	125	257	7.3	20.0	0.744	58.7	24	53.5			1.4129
5.	150	302	6.1	26.1	0.770	52.2	28	53.1			1.4260
6.	175	347	5.7	31.8	0.788	48.0	30	53.9			1.4364
7.	200	392	5.4	37.2	0.805	44.3	32	56.7			1.4452
8.	225	437	5.0	42.2	0.819	41.3	33	60.3			1.4530
9.	250	482	5.0	47.2	0.831	38.7	33	64.1			1.4602
10.	275	527	6.5	53.7	0.845	36.0	35	68.0			1.4682

Stage 2 - Distillation continued at 40 mm. Hg. pressure

11.	200	392	1.7	55.4	0.860	33.1	38	-	42	0	1.4752
12.	225	437	4.4	59.8	0.866	32.0	37	73.9	46	20	1.4792
13.	250	482	5.0	64.8	0.876	30.0	39	76.9	58	40	1.4852
14.	275	527	5.3	70.1	0.889	27.6	42	79.7	87	55	1.4927
15.	300	572	4.7	74.8	0.902	25.4	45	85.1	185	80	1.5002
Resid- uum			21.3	96.1	0.950	17.5					

Carbon residue of residuum: 5.6%

Carbon residue of crude: 1.4%

APPROXIMATE SUMMARY

	Percent by Vol.	Specific Gravity	Degrees A.P.I.	Viscosity S.U. 100°F.
Light gasoline	12.7	0.693	72.7	
Total gasoline and naphtha	37.2	0.747	57.9	
Kerosine distillate	5.0	0.819	41.3	
Gas oil	17.0	0.847	35.6	
Nonviscous lubricating distillate	9.0	0.870-0.891	31.1-27.3	50-100
Medium lubricating distillate	5.0	0.891-0.904	27.3-25.0	100-200
Viscous lubricating distillate	1.6	0.904-0.908	25.0-24.3	Above 200
Residuum	21.3	0.950	17.5	
Distillation loss	3.9			

Remarks: The sample as received contained 0.3% by vol. water and sediment (by centrifuge)
and a trace of salt (as NaCl) per 1000 bbl.