This report has been examined; declared acceptable as Representation Work under Section 32 and Schedule B of the Canada Mining Regulations and valued in part of the amount of $ 173,851.00

Chief, J. M. Retchless

Date: Feb. 7, 1979.

061805

PAN OCEAN OIL LTD.

REPORT ON THE GEOLOGY OF THE BONNET PLUME BASIN YUKON TERRITORY AS DETERMINED BY THE 1978 FIELD SEASON

NTS 106-E

65° 15' N, 135° W

COAL EXPLORATION LICENCES

NOS. 77-92 and 94-98

DATED: November 14, 1977

Written By: James S. McKinney
Supervisor - Coal
Exploration

January, 1979

Pan Ocean Report No. 79-1

TABLE OF CONTENTS

LIST OF PLATES

(Included in End Pocket)

SELECTED REFERENCES

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Pan Ocean Oil Ltd.

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Telex: 038-22681

REPORT ON THE
GEOLOGY OF THE BONNET PLUME BASIN
YUKON TERRITORY
AS DETERMINED BY THE 1978 FIELD SEASON

NTS 106-E
65°, 15' N, 135°W

Coal Exploration Licences
Nos. 77-92 and 94-98

INTRODUCTION

This report covers the geology of the Bonnet Plume Basin as determined by regional field mapping, air-photo interpretation and the surface diamond drilling during the 1978 field season.

This was the first season that Pan Ocean Oil Ltd. conducted work on the 21 Coal Exploration Licences acquired in November, 1977.

LOCATION, PHYSIOGRAPHY AND ACCESS

The Bonnet Plume Coalfield is located in the northeastern portion of the Yukon Territory. (Plate 1, end pocket) The coalfield is contained entirely within the Wind River map area (NTS-106E).

The basin is bounded on the north by the Richardson Mountains, on the east by the Knorr Ranges, on the south by the Wernecke Mountains and on the west by a rather ill-defined low, hilly region about 5 miles west of the Wind River.

Pan Ocean Oil Ltd. controls 24 exploration licences in the Bonnet Plume basin of the Yukon Territory, (Plate 2, end pocket). These licences, covering 957,024 acres, are underlain by sedimentary rocks of Tertiary age containing lignitic coals in the north and Cretaceous age sedimentary rocks containing bituminous coal seams in the south.

The basin forms a depression which is relatively featureless having elevations between 300 and 500 meters above sea level. Much of the area is covered by muskeg and swamp with a lesser part of the basin covered by scrubby tree growth of spruce, larch and birch, interspersed with willow and berry patches.

Both the Wind and Bonnet Plume Rivers flow, from south to north through the basin, into the Peel River, which flows from east to west along the northern margin of the basin.

A winter road from Keno Hill runs 165 Km (100 miles) onto the property. Several lakes throughout the basin are of sufficient size and depth to allow float plane access. The Dempster Highway lies 130 km (80 miles) to the west of the property.

HISTORY

The earliest geological account of the Bonnet Plume Basin was written by Camsell (1906) about his journey through the Wernecke Mountains, down the Wind River to the Peel River and then onto Fort McPherson in the Northwest Territories. He assigned the sediments encountered within the Bonnet Plume Basin along the Wind and Peel Rivers to the Tertiary period and reported several lignite occurrences along the Peel River.

Mountjoy (1967) examined the stratigraphy along the lower portion of the Wind River and on the Peel River. Norris et al (1963) produced a geological map of NTS 106-E which included the entire area of the Bonnet Plume Basin. They divided the Bonnet Plume Formation into an Upper or Tertiary age portion and a Lower or Cretaceous age portion.

Rouse and Srivastava (1972) conducted a palynological analyses of the Bonnet Plume Formation which confirmed Norris et al (1963) subdivisions.

Norris and Hopkins (1977) published a comprehensive study of the Bonnet Plume Basin. Cyprus Anvil acquired two Coal Exploration Licences covering the lignite occurrences along the Peel River in the Upper Bonnet Plume Formation.

Aran Oil and Gas Ltd. acquired three Coal Exploration Licences in the northwestern central portion of the Basin (CEL Nos. 72, 73 and 93). These have since been transferred to Pan Ocean Oil Ltd.

Pan Ocean Oil Ltd. acquired 21 Coal Exploration Licences covering the remainder of the Basin after the discovery of coal seams within the Lower Bonnet Plume Formation along the Wind River and Illtyd Creek and its tributaries, during the 1977 field season. Regional geological mapping to verify air-photo analysis, measurement of stratigraphic sections, regional checks for coal occurrences and the drilling of surface boreholes to sample two major coal seams was conducted during the 1978 field season.

GEOLOGY

Introduction

Most of the surface area within the Bonnet Plume Basin is masked by a cover of Recent age alluvial or lacustrine deposits which are remanents of the glacial period. Late Cretaceous or Tertiary age mudstones, sandstones and shales in which lignite beds occur are found in the northern portion of the Basin (Plate 3, end pocket). Cretaceous age sedimentary deposits consisting of conglomerate, sandstone and shale in which bituminous coal seams occur are found in the southern portion of the Basin, (Plate 4, end pocket). Local pre-Cretaceous age rocks which form fensters within the Basin have been produced by faulting. The Basin is bounded on all sides by pre-Cretaceous age rocks.

Little is known as yet of the detailed stratigraphy of the Cretaceous and Tertiary age sedimentary rocks found within the Bonnet Plume Basin. Future stratigraphic mapping and surface diamond drilling accompanied by palynological analysis will hopefully provide a complete picture of the stratrigraphic sequence. To date, the scattered stratigraphic sections that have been measured over such a vast area are difficult to correlate as a whole. However, within the area studied in detail and paritally drilled during the 1978 field season, correlation does appear to be possible, at least within the section of the sequence explored by drilling.

During the 1978 field season, geological investigations were primarily confined to the southern half of the Basin. It is within this area that Cretaceous age

sedimentary rocks occur which were named by Norris (1976), the Lower Bonnet Plume Formation. Preliminary palynological analysis indicates, Rouse and Srivastava(1972), that the Lower Bonnet Plume Formation is lower to mid-Cretaceous in age. As exploration progresses within the Basin, more detailed palynological investigations are being conducted in order to arrive at a more detailed model of the age and correlation of the sedimentary rocks found within the Basin.

Upper Bonnet Plume Formation

This unit consisting of unconsolidated sandstones, mudstones and conglomerates of Cretaceous, Maastrichtian to Paleocene age (Rouse and Srivastava, 1972) containing lignite beds was not studied in detail during the 1978 field season.

Based on the limited observations made of this unit during the 1978 field season, it is separated from the Lower Bonnet Plume Formation by a structural unconformity and in places is deposited directly on pre-Cretaceous age rocks.

Lower Bonnet Plume Formation

The Lower Bonnet Plume Formation is composed of conglomerate, sandstone, mudstone, shale and coal seams. The Formation is middle or late Albian in age (Rouse and Srivastava, 1972). The Formation rests uncomformably on Permian or older age rocks within the Basin.

In the southernmost portions of the Bonnet Plume Basin, conglomerates are the most conspicuous units. They

are fairly well sorted, very poorly cemented and well compacted. Most surface samples can be crumbled by hand, and bedrock surface weathering is such that in drill holes it is hard to tell where overburden ends and weathered conglomerate begins.

Although poorly cemented, the conglomerates form prominent ridges and cliffs. They are exposed in well defined outcrops.

The pebbles, cobbles and boulders within the typical conglomerate consist of light grey quartzite, black chert, white quartz with minor clasts of grey chert and a distinctive green chert. The matrix, not always present, is composed of quartz, chert and sericite grains. Trough mega cross-bedding is common within this rock type.

The conglomerate beds range in thickness from less than one meter to greater than 100 meters. Individual beds are traceable over large distances, at least 70 square kilometers within Blocks A and B.

A conglomerate, poorly sorted, having a reddish muddy-sand matrix and large well rounded boulders consisting of quartzite, various quartz, igneous rocks and minor amounts of smaller pebbles of chert and limestone was found at coal site C-7 (Plate 4) immediately overlying rocks of pre-Cretaceous age. This conglomerate is in turn overlain by typical rocks of the Lower Bonnet Plume Formation.

Sandstones form the second most conspicuous surface outcropping, particularly in the south central portions of the Bonnet Plume Basin. They are usually, grey to buff coloured, fine to medium-grained quartz and black chert

sandstone having a sericitic matrix, forming a poor cementing agent. The sandstone is a typical "salt and pepper" rock type.

Inter-related zones of siltstone, mudstone, shale and coal form recessive outcrop zones having little or no surface rock outcrop except in incised stream channels. These rocks were best noted from surface borehole cores. The siltstone is grey to dark grey having minor thin, pebble conglomerates and grits and frequently grades directly into a grey mudstone.

Carbonaceous shale or mudstone occur as lenses within the coal seams and at the floor of the coal seams. These grade into a black silty mudstone. These weather rapidly when brought to the surface.

Insufficient data exists to date to allow a complete lithostratigraphic section to be constructed for the Lower Bonnet Plume Formation. Plate 5 illustrates the limited stratigraphic section known from surface mapping in coal reserve Blocks A and B (coal areas 1, 3 and 5) (Plate 4). Correlation of the remaining coal areas throughout the southern portion of the basin is not as yet possible. A more complete picture of the regional lithostratigraphy is to be obtained during the 1979 field season.

Coal Areas of the Lower Bonnet Plume Formation
Located During the 1977 Field Season

(C-1) Wernecke (Reserve Block A) This area is characterized by an outcropping of conglomerates, sandstones and recessive zones representing siltstones, mudstones and coal horizons. Coal seams outcrop under a thick conglomerate in the creek adjacent to surface borehole site BP 78-1. Borehole BP 78-1 (Plate 6) was collared in conglomerate and sampled two coal seams below the conglomerate. The conglomerate is measured to be 120 meters thick and may be traced over an outcrop distance of 7000 meters. The dip of outcrops in coal area C-1 is 25-30 degrees to the south-southwest.

Coal float has been found in frost boils in several of the recessive zones throughout coal area C-1. The thickness and quality of these occurrences must be confirmed by surface drilling before their significance can be judged.

(C-2) Spaceship Creek Outcropping in this creek indicates a conglomerate overlain by a coal seam dipping to the south at 35 degrees. The coal is at least 3 meters thick. Its base and top are not exposed. Coal float occurs in a cut-bank 50 meters north of the seam described above suggesting a second stratigraphically higher seam. No estimate of thickness is possible since no complete exposure was achieved or found.

(C-3) Illtyd Creek Southwest This area encompasses a syncline and an anticline lying immediately to the north. The exposed rock outcroppings are primarily sandstones and conglomerate. These units are presumed to lie below

the 120 metre thick conglomerate found in coal areas C-1 and C-5. Float in frost boils indicate that there may be four coal seams of unknown thickness occurring within the recessive units between the conglomerate beds.

(C-4) Illytd Creek Northwest The area is formed by a shallow dipping syncline having an east-west axis plunging gently to the east.

Two coal seams, one 3 metres thick and the other 1 metre thick were located in outcrop along the banks of Illtyd Creek in this coal area. Coal also occurs in frost boils scattered throughout the area.

(C-5) Illtyd Creek East (Reserve Block B) This area on the east side of Illtyd Creek extends along that creek from the site of surface Borehole BP 78-2 (Plate 7) to about one kilometer north of surface Borehole BP 78-3 (Plate 8), a distance of about 4,000 metres. The thick conglomerate occurring in coal area C-1 immediately above the outcropping coal seams near Borehole 78-1, forms the surface outcrop along Illtyd Creek throughout the above distance. The unit forms a broad shallow syncline plunging gently to the east. Dips taken on this unit indicates 10-15 degrees to the east.

The stratigraphic sequence as investigated by surface borehole drilling in coal area C-5 is the same as that found in coal area C-1 (Plate 5). Illtyd Creek forms the western boundary of coal area C-5. The eastern boundary is probably faulted at a distance of about 5,000 metres from that Creek thus giving the area a size of about 20 square kilometers.

The two coal seams intersected in Borehole BP 78-2 outcrop at the base of a cliff on Illtyd Creek immediately below that borehole site.

(C-6) Koubasa Lake Bounded on all sides by faulting, this area consists of a steeply dipping (70-90 degrees) sediments of the Lower Bonnet Plume Formation and is characterized by a series of upright ribs formed by beds of conglomerate with deeply cut depressions which represent less competent layers.

No definitively measurable coal occurrences have been located within this area, however, coal float was noted in some scattered frost boils.

(C-7) Garlic Ring Lakes A low flat hill formed by pre-Bonnet Plume Formation rocks is marked upon the northeast side by an unconformable contact of Bonnet Plume Formation.

Immediately above the unconformable contact is a conglomerate unit having a lithology distinct from the conglomerates forming the Lower Bonnet Plume Formation noted elsewhere in the basin. This unit in this locale appears to be 200 meters thick. Near its base, the clasts are pebbles, cobbles and boulders 1-20 cm long, mainly greenish altered siltstones and quartzite, surrounded by a matrix of crumbly, reddish-brown weathering silty mudstone. Most clasts are elongate or tublar and very well rounded. Sorting is poor. Higher in this unit the clasts become smaller, generally less than 10 cm, and are dominantly quartzite and quartzitic siltstone. The matrix remains muddy but is better cemented and weathers yellow.

Above this basal unit the exposed rocks are typical of the Lower Bonnet Plume Formation having an estimated thickness of 100 meters. An outcrop of coal occurs at the base of a conglomerate bed. The basal contact was not exposed. It would appear to be at least 3 meters thick. Coal float in a gully suggested a lower seam, but no exposure could be found. On the plain below the hill, no outcrops of any type could be found to indicate whether or not additional coal might be found.

(C-8) Wind River This area is designated basal on several outcroppings of Lower Bonnet Plume Formation sedimentary rocks containing several coal horizons located on the west side of the Bonnet Plume River just upstream from its confluence with Illtyd Creek. These rocks appear to form a dip slope having dips of 5-15 degrees to the east. To the north of this structure, several other potential sites exist, but have not been mapped.

A series of coal outcrops occur below a sandstone cap, indicate a thick seam locally dipping 4 degrees to the east. The bottom of the seam is not exposed. At it southern occurrence, the seam has a measurable exposed portion about 3 meters thick. A second seam 2 to 3 meters thick is exposed in the Wind River approximately 400 meters north of the occurrence described above. It appears to be stratigraphically higher than the 3 meter thick seam.

To the south of these occurrences and along the bank of the Wind River, several other coal seams outcrop. They range in thickness up to 4 meters.

(C-9) Wind River - Southeast A large area of Lower Bonnet Plume Formation outcroppings dipping to the north at 5 to 15 degrees. The area is bounded on the north by a fault and on the south by a probable thrust fault bringing pre-Lower Bonnet Plume Formation rocks to the surface.

No significant coal outcrops have been found in this block, but one surface occurrence of burnt coal has been located.

(C-10) Wind River - Northeast An even larger area of Lower Bonnet Plume Formation, having some outcrop exposure on Illtyd Creek to the east, along a minor unnamed creek on the south and the Wind River to the west.

No seams have been located. Possible coal float has been seen in frost boils, however most of the area is well-covered, thus masking any outcrops.

(C-11) Upper Wind River Located on the west bank of the Wind River is a northwest-southwest trending syncline having an apparent length of 2-5 kilometers and a width of 1.5 kilometers. The few outcrops exposed are typical Lower Bonnet Plume Formation.

A possible coal seam was noted from the air, but was not investigated on the ground.

(C-12) Lower Illtyd Creek Lower Bonnet Plume Formation rocks were noted here during a boat traverse of Illtyd Creek in 1977. These coal seams occurred along the west side of the creek.

STRUCTURAL GEOLOGY

The dominant structural features of the Bonnet Plume Basin appear to be thrust faulting of pre-Bonnet Plume Formation rocks forming the south and western margins of the Basin and a set of tear faults having a northwest-southeast trend which offset the older thrust faults. Minor cross faults running east-west appear to be adjustment phases of the tear faulting.

Most of these faults and/or lineaments are apparent on air-photos, but the ground cover within the Basin proper precludes observations in the field. Individual fault-lines and blocks will have to be determined by surface diamond drilling.

Folding within the deposits of the Lower Bonnet Plume Formation does not appear to be sharp except adjacent to the major faults. Outcrops within the Basin proper are rare and most of the folds or sedimentary rock contact structures are alluded to from air-photo lineaments. Again, surface diamond drilling will be necessary to finally determine the structures.

CANADA

Department of Energy, Mines and Resources, Surveys and Mapping Branch
Ministère de l'Énergie, des Mines et des Ressources, Direction des Levés et de la Cartographie

HUITIÈME EDITION — EIGHTH EDITION

TRANSPORTATION FACILITIES
MOYENS DE TRANSPORT
1974
NORTHWESTERN CANADA
NORD-OUEST DU CANADA

SCALE 1:3,168,000 ÉCHELLE

Miles 0 25 50 75 100 125 150 Miles
Kilometres 0 50 100 150 200 Kilomètres

Produced by the Surveys and Mapping Branch
Department of Energy, Mines and Resources, 1974

Établie par la Direction des levés et de la cartographie
Ministère de l'Énergie, des Mines et des Ressources, 1974

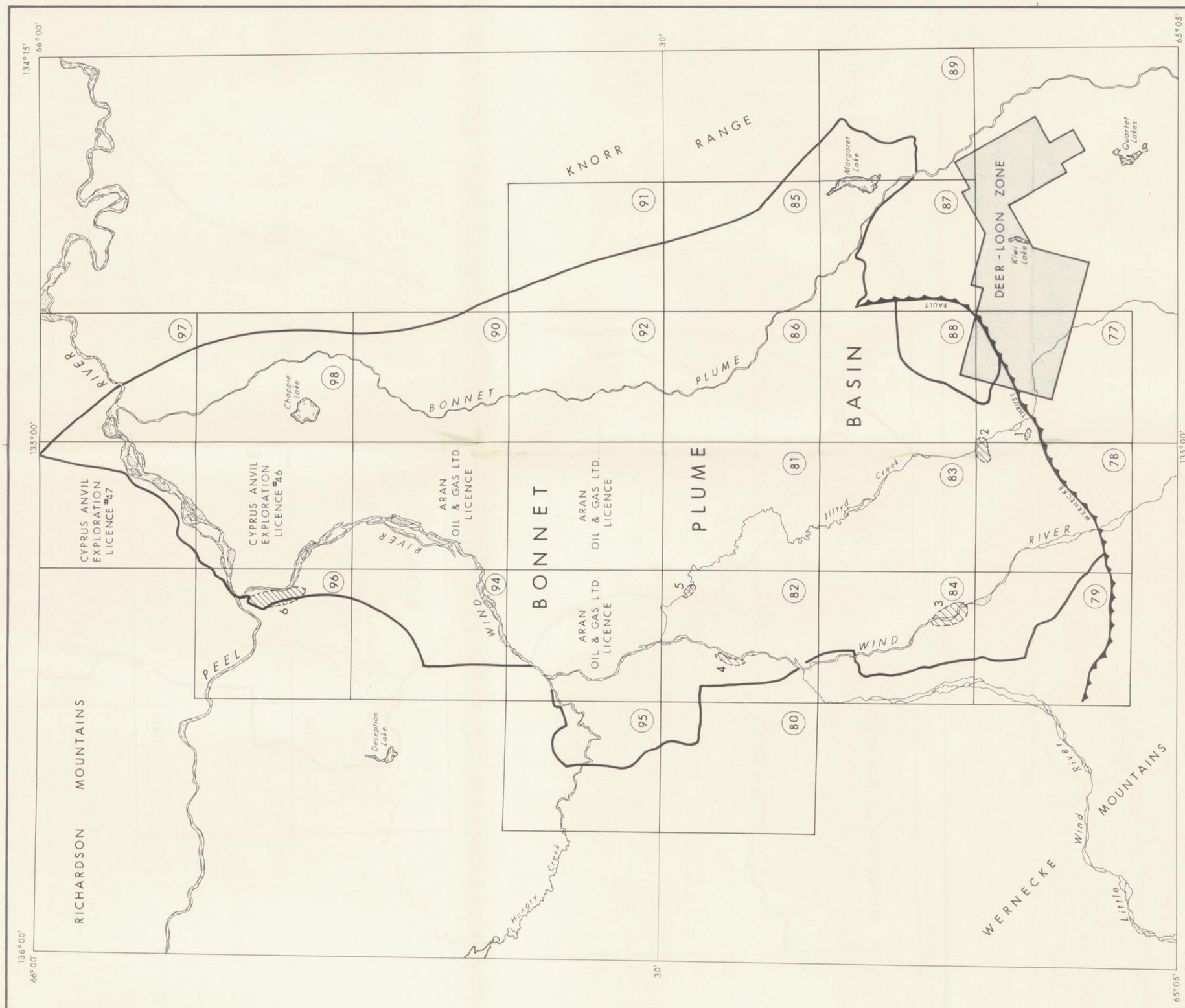
LEGEND - LÉGENDE

- RAILWAY - CHEMIN DE FER
- MOTOR ROAD - CHEMIN POUR VÉHICULE À MOTEUR
- WINTER ROAD - CHEMIN D'HIVER
- HIGHWAY NUMBER - NUMÉRO DE LA ROUTE
- FERRY - TRAVERSIER
- SHIPPING SERVICE - SERVICE DE MESSAGERIE
- AIRPORT - AÉROPORT
- AIRFIELD - CHAMP D'ATTERRISSAGE
- SEAPLANE ANCHORAGE - MOUILLAGE D'HYDRAVIONS

AIR DISTANCES BETWEEN MAIN CENTRES (in statute miles)
DISTANCES AÉRIENNES ENTRE CENTRES PRINCIPAUX (en milles terrestres)

Edmonton (Intl) - Fort McMurray	249	Edmonton (Intl) - Grande Prairie	230
Fort McMurray - Fort Smith	234	Grande Prairie - Fort St. John	103
Fort Smith - Hay River	142	Fort St John - Fort Nelson	192
Hay River - Fort Simpson	192	Fort Nelson - Watson Lake	236
Fort Simpson - Wrigley	122	Watson Lake - Whitehorse	217
Wrigley - Norman Wells	175	Whitehorse - Dawson	264
Norman Wells - Inuvik	277		
		Grande Prairie - Prince George	176
Fort Smith - Fort Resolution	99	Prince George - Smithers	193
Fort Resolution - Yellowknife	93	Smithers - Terrace	61
Yellowknife - Cambridge Bay	529	Terrace - Prince Rupert	76

CARTER MAPPING LIMITED
810-5 Street S.W., Calgary, Alberta
264-1236



COAL OCCURRENCES

1 - WERNECKE

2 - UPPER ILLTYD CREEK

3 - WIND RIVER - West of Illtyd Range

4 - WIND RIVER - Between Little Wind River and Illtyd Creek

5 - LOWER ILLTYD CREEK

6 - WIND - PEEL JUNCTION

SYMBOLS

COAL OCCURRENCES

BONNET PLUME BASIN BOUNDARY

(96) COAL EXPLORATION LICENCE NO.

Figure 1 TO ACCOMPANY REPORT NO. 78-3 BY RJM

PAN OCEAN OIL LTD.
CALGARY ALBERTA

COAL OCCURRENCES OF THE BONNET PLUME BASIN

YUKON TERRITORY

DATE	SCALE	NTS	DRAWING NO.
LB / NOV., '77	1:250,000	106 E	C-0069

136°00' 45' 30' 15' 135°00' 45' 30' 15' 134°00'

66°00'

45'

30'

RICHARDSON MOUNTAINS

PEEL RIVER

PEEL RIVER

Mountain Creek

Creek

Creek

Basin

BONNET

Creek

Creek

Creek

Creek

Creek

RIVER

RIVER

SNAKE RIVER

Dog L.

Sola Lake

Chappie Lake

Cabin

Cabin

Deception Lake

Hungry Lake

MOUNT DECEPTION

MOUNT DESLURIERS

3384

2433

1856

2261

2440.

2803

3328

2379.

2867

3351.

1680

96

97

98

94

93

90

95

73

72

92

91

8

LEGEND

- RECENT STREAM DEPOSITS
- UPPER BONNET PLUME FORMATION - UNCONSOLIDATED SANDSTONE, CONGLOMERATES, MUDSTONE AND LIGNITE
- LOWER BONNET PLUME FORMATION - CONGLOMERATE, SANDSTONE, SHALE, MUDSTONE AND COAL
- PRE-BONNET PLUME FORMATION ROCKS

BASED ON AIR PHOTO INTERPRETATION:
- DIP LESS THAN 25 DEGREES
- DIP 25 - 49 DEGREES
- DIP 50 - 74 DEGREES
- DIP GREATER THAN 75 DEGREES
- DIP FLAT

- ANTICLINE
- SYNCLINE
- THRUST FAULT
- MAJOR FAULT
- MINOR FAULTS AND LINEAMENTS
- ROCK CONTACT
- BEDDING TRACE
- RP-78-1 SURFACE BORE HOLE AND NUMBER
- 87 COAL EXPLORATION LICENCE NUMBER
- INTERNAL AND LIMIT OF PAN OCEAN LTD. C.E.L.'S
- C-8 COAL OCCURRENCE AREA AND NUMBER
- BLOCK A COAL RESERVE BLOCK

CONTOUR INTERVAL 500 FEET AMCL

MILES 0 1 2 3 4 5 6 MILES

PAN OCEAN OIL LTD.

GEOLOGICAL MAP OF THE BONNET PLUME BASIN

SHEET NUMBER 1 - NORTHERN HALF OF BASIN

DATE	SCALE	NTS	No.
JAN. 1979	1"=1 MILE (approx)	106 E	0385

136°00' 45' 30' 15' 135°00' 45' 30' 15' 134°00'

30' 15'

BESSHUARIERS

Liard River

Creek

Lake

ponds

Creek

Rabbit River

Creek

Creek

Margaret Lake Cabin

Creek

Rapids

Creek

Quartet Lakes

Creek

MOUNTAINS

MOUNTAINS

RANGE

RANGE

RIVER

RIVER

BP-78-3
BP-78-4
BLOCK B
BP-78-2
BP-78-1

4930

4496

4819

5170

4618

4005

5137

5521

5889

5405

5271

5304

4396

4384

3643

3853

3583

3871

3009

1605

LEGEND

- RECENT STREAM DEPOSITS
- UPPER BONNET PLUME FORMATION - UNCONSOLIDATED SANDSTONE, CONGLOMERATES, MUDSTONE AND LIGNITE
- LOWER BONNET PLUME FORMATION - CONGLOMERATE, SANDSTONE, SHALE, MUDSTONE AND COAL
- PRE-BONNET PLUME FORMATION ROCKS

BASED ON AIR PHOTO INTERPRETATION
- DIP LESS THAN 25 DEGREES
- DIP 25-49 DEGREES
- DIP 50-74 DEGREES
- DIP GREATER THAN 75 DEGREES
- DIP FLAT

- ANTICLINE
- SYNCLINE
- THRUST FAULT
- MAJOR FAULT
- MINOR FAULTS AND LINEAMENTS
- ROCK CONTACT
- BEDDING TRACE
- BP-78-1 SURFACE BORE HOLE AND NUMBER
- 87 COAL EXPLORATION LICENCE NUMBER
- INTERNAL AND LIMIT OF PAN OCEAN LTD. C.E.L.'S
- (C-8) COAL OCCURRENCE AREA AND NUMBER
- BLOCK A COAL RESERVE BLOCK

CONTOUR INTERVAL 500 FEET AMCL

MILES 0 1 2 3 4 5 MILES

PAN OCEAN OIL LTD.

GEOLOGICAL MAP OF THE BONNET PLUME BASIN

SHEET NUMBER 2 - SOUTHERN HALF OF BASIN

DATE	SCALE	NTS	DRAWING NO.
JAN 1979	1"=1MILE(approx)	106 E	0384

65°00'

136°00' 45' 30' 15' 135°00' 45' 30' 15' 134°00'

DRAWING NO. X-

SECTION 78-1

WERNECKE THRUST

WERNECKE SUPERGROUP HELIKIAN CARBONATES AND CLASTICS

DDH-BP-78-1

NO.1 SEAM ZONE

NO.2 SEAM ZONE

UNNAMED CAMBRIAN CARBONATES AND CLASTICS

ILLTYD CREEK FAULT

SECTION 78-3

SECTION 78-2

DDH-BP-78-2

DDH-BP-78-4

DDH-BP-78-3

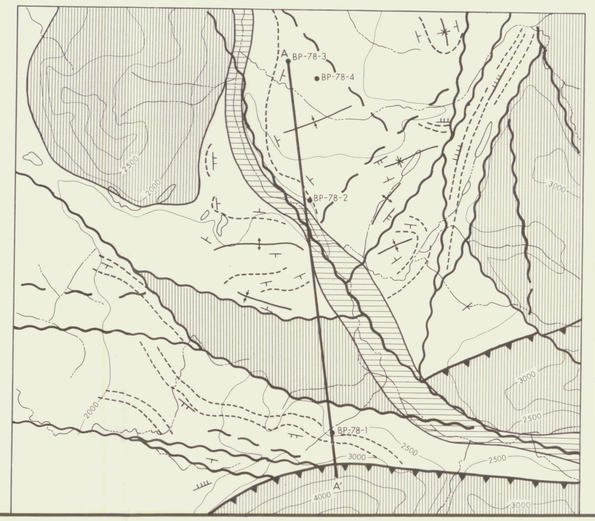
NO. 1 SEAM ZONE

? ? ? ?

GEOLOGICAL LOCATION MAP

SHOWING LINE OF SECTION

SCALE: APPROX. 1 INCH = 1 MILE



LEGEND

THRUST FAULT

FAULT

QUATERNARY

PRE-COAL

LEGEND

BOREHOLE LOG

NO RECOVERY

CONGLOMERATE

SANDSTONE

SILTSTONE

MUDSTONE

COAL

MEASURED STRATIGRAPHIC SECTION

CONGLOMERATE

RECESSIVE UNIT, COVERED

PEBBLY SANDSTONE

RECESSIVE UNIT WITH PROBABLE COAL SEAM

SANDSTONE

GEW

PAN OCEAN OIL LTD.

CALGARY ALBERTA

SCHEMATIC RELATIONSHIP OF MEASURED STRATIGRAPHIC SECTIONS AND SURFACE BOREHOLE LOGS IN THE ILLTYD CREEK COAL AREA

DATE	SCALE	NTS	DRAWING NO
JAN., 1979	VERTICAL 1:2000 HORIZONTAL 1:10000	106 E	X-0386

LOCATION MAP

TN ↑

SCALE:

COORDINATES: Y X

ELEVATION:

DIP: 90° BEARING

CORE SIZE: HQ CASING: 24'

BITS USED: JK SMITH

MUD USED: 12 BAGS / 24 HRS

FT LEFT IN HOLE 24 FT.

DATE START: 30 JUNE, 1978 FINISH 5 JULY, 1978

DRILLER: CARON DIAMOND DRILLING OVERALL RECOVERY 81.7%

TESTS: NIL

SAMPLED BY: J.S. MCKINNEY DATE 6 JULY, 1978 ANALYZED BY: BIRTLEY

BOREHOLE NO. BP-78-1

PAN OCEAN OIL LTD. (PAGE 1)

MINING DIVISION – COAL

LOGGED BY: J.S. MCKINNEY DATE 6 JULY, 1978

SIGNED James S. McKinney

GEOLOGICAL LOG – SCALE: 1:500

DETAILS OF COAL SEAMS – SCALE: 1:100

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION
		7.50	OVERBURDEN – A FEW LIMESTONE, QUARTZITE AND CHERT PEBBLES IN MUD
7.5		17.50	CONGLOMERATE – WEATHERED, POOR RECOVERY OF LOOSE PEBBLES OF CHERT, QUARTZITE AND QUARTZ
25.0		18.74	CONGLOMERATE – 20-30mm PEBBLES OF BLACK CHERT (10%), GREY & BUFF QUARTZITE (20%), BLACK SLATEY CHERT (50%) VERY BRITTLE, GREEN MUDSTONE (1%). GRIT IN MATRIX, BLACK MUDSTONE (5%), QUARTZ (5%). ZONES 20-50 mm PEBBLES AT 72 m, 86m, 101m, 116m, 127m. THESE AVERAGE 0.15-0.30m THICK. PYRITE IN BASAL 100mm.
43.74		0.15	COAL – BRIGHT
43.89		1.90	SILTSTONE – GREY, SANDY IN PLACES. DIPS 25-35° CROSS-BEDDED. GRIT BAND AT 45.6m
45.79		1.00	
46.79		0.65	CONGLOMERATE – 10mm PEBBLES
47.44			SANDSTONE – GREY, GRITTY, CROSS-BEDDED
		10.31	CONGLOMERATE – AS ABOVE, 10-20mm PEBBLES
57.75		0.15	SANDSTONE – GREY, COARSE GRAINED
57.90		5.89	CONGLOMERATE – VERY COARSE AT 63.09m. 10-20mm PEBBLES. PREDOMINATLY BLACK CHERT. PYRITE IN MATRIX.
63.79		8.49	NO. 1 SEAM HORIZON
72.28		4.98	MUDSTONE – SILTSTONE – GREY, BECOMMING FINE SANDSTONE AT BASE WITH SLUMP STRUCTURES.
77.26		16.04	CONGLOMERATE – AS ABOVE
93.30		2.45	SANDSTONE – GREY, FINE GRAINED, CROSS-BEDDED. SOME THIN (<1mm) CARBONACEOUS BANDS
95.75		6.67	CONGLOMERATE – AS ABOVE
102.42		1.26	SANDSTONE – GREY MEDIUM GRAINED TO GRITTY
103.68		9.51	NO. 2 SEAM HORIZON
113.19		0.78	SHALE – CARBONACEOUS GRADING INTO
113.97		2.77	MUDSTONE – GREY
116.74		E.O.H.	

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION	SAMPLE NUMBER	THICKNESS
			No. 1 SEAM HORIZON		
		5.89	ROOF CONGLOMERATE GOOD		
63.79			CARBONACEOUS SHALE 50mm		
		1.81	BRIGHT COAL 250 mm	7814	1.81
			DULL COAL 800mm		
65.60		0.70	COAL – BRIGHT		
		0.45	COAL – DULL SHALEY		
		0.73	COAL – BRIGHT		
		0.35	COAL – DULL	7815	3.84
		1.61	COAL – BRIGHT		
69.44		2.84	SHALE – CARBONACEOUS COALY IN PLACES	7816	2.84
		4.98	FLOOR – MUDSTONE – SILTSTONE, GREY		
			No. 2 SEAM HORIZON		
103.68		1.26	SANDSTONE – GOOD		
		0.65	COAL – BRIGHT, THINBANDED SOME RESIN MINOR DULL		
		0.25	COAL DULL		
		0.67	COAL – BRIGHT	7817	3.30
		0.44	COAL – DULL		
		1.10	COAL – BRIGHT		
106.98		0.15	SHALE – CARBONACEOUS		
		0.33	COAL – BRIGHT AND DULL THICK BANDED		
		0.96	SHALE – CARBONACEOUS DIP 30°	7818	1.69
108.67		0.22	COAL – DULL		
		1.88	COAL – BRIGHT & DULL THICK BANDED		
		0.26	COAL – DULL		
		2.30	COAL – BRIGHT WITH MINOR DULL BANDS	7819	4.52
113.19			FLOOR – OKAY – SHALE CARBONACEOUS		

SIZE		WEIGHT PERCENT									CUMULATIVE WEIGHT PERCENT							
DIAMETER	WT %	SPEC GRAV	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C.	BTU	F.S.I.	S	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C.	BTU	F.S.I.	S
+28	94.9	-1.50	14.4	4.4	7.5	36.6	51.5	11398	-	-	14.4	4.4	7.5	36.6	51.5	11398	-	-
		-1.60	3.1	2.9	24.1	32.2	40.8	9006	-	-	17.5	4.1	10.4	35.8	49.6	10974	-	-
		-1.70	3.0	3.6	35.4	25.6	35.4	7214	-	-	20.5	4.1	14.1	34.3	47.5	10423	-	-
		+1.70	79.5	2.0	76.5	-	-	-	-	-	100.0	2.4	63.7	-	-	-	-	-
-28m	5.1	RAW	100.0	-	-	-	-	-	-		RAW	3.1	53.9	23.6	19.4	-	-	0.27
1/4×0	100.0	RAW	-	2.1	64.5	20.7	12.7	-	-	0.12	CALC	2.4	63.2	-	-	-	-	-
+28	94.9	-1.70	20.5	-	-	-	-	-	-	-	19.5	4.1	14.1	34.3	47.5	10423	-	-
- 28	5.1	RAW	100.0	-	-	-	-	-	-	-	5.1	3.1	53.9	23.6	19.4	4340*	-	-
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	24.6	3.8	22.4	32.1	41.7	9161	-	-
+28	95.2	-1.50	58.7	4.2	6.1	38.6	51.1	11501	-	-	58.7	4.2	6.1	38.6	51.1	11501	-	-
		-1.60	3.4	3.2	18.4	36.0	42.4	9815	-	-	62.1	4.2	6.8	30.5	50.6	11408	-	-
		-1.70	3.2	3.8	29.8	29.5	36.9	7991	-	-	65.3	4.1	7.9	38.0	50.0	11241	-	-
		+1.70	34.7	1.9	60.4	-	-	-	-	-	100.0	3.4	26.1	-	-	-	-	-
- 28	4.8	RAW	100.0	-	-	-	-	-	-	-	RAW	4.2	20.5	32.9	42.4	9334	-	0.29
1/4×0	100.0	RAW	100.0	3.4	26.6	34.3	35.7	8398	-	0.23	CALC	3.4	20.8	-	-	-	-	-
+28	95.2	-1.70	65.3	-	-	-	-	-	-	-	62.2	4.1	7.9	38.0	50.0	11241	-	-
-28	4.8	RAW	100.0	-	-	-	-	-	-	-	4.8	4.2	20.5	32.9	42.4	9334	-	-
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	67.0	4.1	8.8	37.6	49.5	11104	-	-
+28	95.0	-1.50	9.8	4.3	7.1	36.1	52.5	11348	-	-	9.8	4.3	7.1	36.1	52.5	11348	-	-
		-1.60	2.0	2.7	22.4	33.0	41.9	9434	-	-	11.8	4.0	9.7	35.6	50.7	11022	-	-
		-1.70	1.8	2.4	34.1	29.0	34.5	7550	-	-	13.6	3.8	12.9	34.7	48.6	10562	-	-
		+1.70	86.4	1.5	80.5	-	-	-	-	-	100.0	1.8	71.3	-	-	-	-	-
-28	5.0	RAW	100.0	-	-	-	-	-	-	-	RAW	3.0	57.5	18.9	20.6	-	-	0.22
1/4×0	100.0	RAW	100.0	2.1	71.1	14.6	12.2	-	-	0.15	CALC	1.9	70.6	-	-	-	-	-
+28	95.0	-1.70	13.6	-	-	-	-	-	-	-	12.9	3.8	12.9	34.7	48.6	10562	-	-
- 28	5.0	RAW	100.0	-	-	-	-	-	-	-	5.0	3.0	57.5	18.9	20.6	3720*	-	-
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	17.9	3.6	25.4	30.3	40.6	8650	-	-
+28	96.2	-1.50	85.3	5.7	5.3	38.7	50.3	11453	-	-	85.3	5.7	5.3	38.7	50.3	11453	-	-
		-1.60	2.9	4.8	20.5	33.5	41.2	9272	-	-	88.2	5.7	5.8	38.5	50.0	11381	-	-
		-1.70	3.1	3.7	30.0	30.9	35.4	7986	-	-	91.3	5.6	6.6	38.3	49.5	11266	-	-
		+ 1.70	8.7	2.1	53.6	-	-	-	-	-	100.0	5.3	10.7	-	-	-	-	-
- 28	3.8	RAW	100.0	-	-	-	-	-	-	-	RAW	5.9	11.1	38.9	44.1	10577	-	0.39
1/4×0	100.0	RAW	100.0	5.4	10.8	38.6	45.2	10574	-	0.33	CALC	5.3	10.7	-	-	-	-	-
+ 28	96.2	-1.70	91.3	-	-	-	-	-	-	-	87.8	5.6	6.6	38.3	49.5	11266	-	-
- 28	3.8	RAW	100.0	-	-	-	-	-	-	-	3.8	5.9	11.1	38.9	44.1	10557	-	-
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	91.6	5.6	6.8	38.3	49.3	11237	-	-
+28	95.6	-1.50	9.7	4.4	7.2	33.9	54.5	11372	-	-	9.7	4.4	7.2	33.9	54.5	11372	-	-
		-1.60	1.8	3.7	17.6	30.6	48.1	9849	-	-	11.5	4.3	8.8	33.4	53.5	11134	-	-
		-1.70	1.3	3.5	31.2	26.4	38.9	7813	-	-	12.8	4.2	11.1	32.6	52.0	10796	-	-
		+ 1.70	87.2	1.8	79.1	-	-	-	-	-	100.0	1.8	79.7	-	-	-	-	-
- 28	4.4	RAW	100.0	-	-	-	-	-	-	-	RAW	3.0	61.5	19.2	16.3	-	-	0.18
1/4×0	100.0	RAW	100.0	2.2	70.7	17.7	9.4	-	-	0.12	CALC	1.9	78.9	-	-	-	-	-
+28	95.6	-1.70	12.8	-	-	-	-	-	-	-	12.2	4.2	11.1	32.6	52.0	10796	-	-
- 28	4.4	RAW	100.0	-	-	-	-	-	-	-	4.4	3.0	61.5	19.2	16.3	3220*	-	-
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	16.6	3.9	24.5	29.2	42.5	8788	-	-
+28	95.4	-1.50	59.7	4.9	6.0	35.9	53.2	11449	-	-	59.7	4.9	6.0	35.9	53.2	11449	-	-
		- 1.60	4.9	4.4	17.1	34.4	44.1	9850	-	-	64.6	4.9	6.8	35.8	52.5	11328	-	-
		-1.70	6.7	2.8	28.0	31.8	37.4	8393	-	-	71.3	4.7	8.8	35.4	51.1	11052	-	-
		+ 1.70	28.7	2.1	54.3	-	-	-	-	-	100.0	3.9	21.9	-	-	-	-	-
-28	4.6	RAW	100.0	-	-	-	-	-	-	-	RAW	5.8	17.5	34.6	42.1	9793	-	0.37
1/4×0	100.0	RAW	100.0	5.1	22.4	32.9	39.6	8879	-	0.27	CALC	4.0	21.7	-	-	-	-	-
+28	95.4	-1.70	71.3	-	-	-	-	-	-	-	68.0	4.7	8.8	35.4	51.1	11052	-	-
-28	4.6	RAW	100.0	-	-	-	-	-	-	-	4.6	5.8	17.5	34.6	42.1	9793	-	-
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	72.6	4.8	9.4	35.4	50.4	10972	-	-

CUMULATIVE SAMPLE VALUES									OTHER
THICKNESS	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL.	F.C.	BTU	F.S.I.	S	
1.81	24.6	3.8	22.4	32.1	41.7	9161			87.4% RECOVERY 5.65 m COAL 4.94 m RECOVERED
5.65	53.4	4.1	10.8	36.8	48.3	10817			
8.49	41.5	4.0	12.9	35.9	47.2	10504			
3.30	91.6	5.6	6.8	38.3	49.3	11237			99% RECOVERY
4.99	66.2	5.5	8.3	37.5	48.7	11029			
9.51	69.2	5.1	8.9	36.5	49.6	11000			9.51 m COAL 9.40m RECOVERED

* FROM ASH / BTU CURVE

LOCATION MAP

TN ↑

SCALE:

COORDINATES: Y X

ELEVATION:

DIP BEARING

CORE SIZE CASING

BITS USED

MUD USED

FT LEFT IN HOLE FT

DATE START FINISH

DRILLER

TESTS

OVERALL RECOVERY

SAMPLED BY DATE ANALYZED BY

LOGGED BY DATE

SIGNED James S. McKinney

BOREHOLE NO. BP-78-1 (PAGE 2)
PAN OCEAN OIL LTD.
MINING DIVISION – COAL

GEOLOGICAL LOG – SCALE:

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION
			SEE BP-78-1 (PAGE 1)

DETAILS OF COAL SEAMS – SCALE:

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION	SAMPLE NUMBER	THICKNESS
			No. 1 SEAM HORIZON		
		5.89	ROOF CONGLOMERATE GOOD		
63.79			CARBONACEOUS SHALE 50 mm		
		1.81	BRIGHT COAL 250 mm DULL COAL 800 mm	7814	1.81
65.60		0.70	COAL-BRIGHT		
		0.45	COAL-DULL SHALEY		
		0.73	COAL-BRIGHT		
		0.35	COAL-DULL	7815	3.84
		1.61	COAL-BRIGHT		
69.44		2.84	SHALE-CARBONACEOUS / COALY IN PLACES	7816	2.84
		4.98	FLOOR-MUDSTONE-SILTSTONE, GREY		
			No. 2 SEAM HORIZON		
		1.26	SANDSTONE - GOOD		
103.68		0.65	COAL-BRIGHT, THINBANDED SOME RESIN MINOR DULL		
		0.25	COAL DULL		
		0.67	COAL-BRIGHT	7817	3.30
		0.44	COAL-DULL		
		1.10	COAL-BRIGHT		
106.98		0.15	SHALE-CARBONACEOUS		
		0.33	COAL-BRIGHT AND DULL THICK BANDED		
		0.96	SHALE-CARBONACEOUS DIP 30°	7818	1.69
108.67		0.22	COAL-DULL		
		1.88	COAL-BRIGHT & DULL THICK BANDED		
		0.26	COAL-DULL		
		2.30	COAL-BRIGHT WITH MINOR DULL BANDS	7819	4.52
113.19			FLOOR-OKAY-SHALE CARBONACEOUS		

SIZE / WEIGHT PERCENT

DIAMETER	WT %	SPEC GRAV	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C	BTU	F.S.I.	S
		-1.70	-	-	-	-	-	-	-	-
+28	95.2	-1.80	2.5	2.0	31.3	27.4	39.3	8305	-	-
		-1.90	1.8	2.0	47.1	22.7	28.2	5894	-	-
		+1.90	75.2	1.6	79.4	13.9	5.1	-	-	-
+28	94.9	-1.80	23.0	-	-	-	-	-	-	-
-28	5.1	RAW	100.0	-	-	-	-	-	-	-
1/4×0	-	COMB	-	-	-	-	-	-	-	-
+28	94.9	1.90	24.8	-	-	-	-	-	-	-
-28	5.1	RAW	100.0	-	-	-	-	-	-	-
1/4×0	-	COMB	-	-	-	-	-	-	-	-
ULTIMATE ANALYSIS & ASH FUSION										
+28	-	-1.70	-	-	-	-	-	-	-	-
-28	-	RAW	-	-	-	-	-	-	-	-
		-1.70	-	-	-	-	-	-	-	-
		-1.80	3.0	2.4	28.4	29.8	39.4	8341	-	-
+28	95.2	-1.90	2.3	2.0	44.4	25.0	28.6	6087	-	-
		+1.90	29.5	1.7	66.1	19.7	12.5	-	-	-
+28	95.2	-1.80	68.3	-	-	-	-	-	-	-
-28	4.8	RAW	100.0	-	-	-	-	-	-	-
1/4×0	-	COMB	-	-	-	-	-	-	-	-
+28	95.2	-1.90	70.6	-	-	-	-	-	-	-
-28	4.8	RAW	100.0	-	-	-	-	-	-	-
1/4×0	-	COMB	-	-	-	-	-	-	-	-
ULTIMATE ANALYSIS & ASH FUSION										
+28	-	-1.70	-	-	-	-	-	-	-	-
-28	-	RAW	-	-	-	-	-	-	-	-
		-1.70	-	-	-	-	-	-	-	-
		-1.80	2.9	2.5	27.6	29.1	40.8	8693	-	-
+28	95.0	-1.90	1.3	2.3	47.1	23.5	27.1	6014	-	-
		+1.90	82.2	3.3	81.3	9.7	5.7	-	-	-
+28	95.0	-1.80	16.5	-	-	-	-	-	-	-
-28	5.0	RAW	100.0	-	-	-	-	-	-	-
1/4×0	-	COMB	-	-	-	-	-	-	-	-
+28	95.0	-1.90	17.8	-	-	-	-	-	-	-
-28	5.0	RAW	100.0	-	-	-	-	-	-	-
1/4×0	-	COMB	-	-	-	-	-	-	-	-
ULTIMATE ANALYSIS & ASH FUSION										
+28	-	1.70	-	-	-	-	-	-	-	-
-28	-	RAW	-	-	-	-	-	-	-	-
		-1.70	-	-	-	-	-	-	-	-
		-1.80	1.5	1.8	28.9	30.5	38.8	8343	-	-
+28	96.2	-1.90	1.2	1.4	45.0	25.7	27.9	5866	-	-
		+1.90	6.0	1.3	63.3	21.1	14.3	-	-	-
+28	96.2	-1.80	92.8	-	-	-	-	-	-	-
-28	3.8	RAW	100.0	-	-	-	-	-	-	-
1/4×0	-	COMB	-	-	-	-	-	-	-	-
+28	96.2	-1.90	94.0	-	-	-	-	-	-	-
-28	3.8	RAW	100.0	-	-	-	-	-	-	-
1/4×0	-	COMB	-	-	-	-	-	-	-	-
ULTIMATE ANALYSIS & ASH FUSION										
+28	-	-1.70	-	-	-	-	-	-	-	-
-28	-	RAW	-	-	-	-	-	-	-	-
		-1.70	-	-	-	-	-	-	-	-
+28	95.6	-1.80 -1.90	TOTAL FLOAT AT -1.70, ALL MATERIAL SANK AT -1.80 AND -1.90							
		+1.90	87.2	1.2	79.7	13.4	5.7	-	-	-
ULTIMATE ANALYSIS & ASH FUSION										
+28	-	-1.70	-	-	-	-	-	-	-	-
-28	-	RAW	-	-	-	-	-	-	-	-
1/4×0		COMB	AT -1.70	-	-	-	-	-	-	-
		-1.70	-	-	-	-	-	-	-	-
		-1.80	5.1	2.6	26.1	30.2	41.1	8630	-	-
+28	95.4	-1.90	2.4	2.1	43.6	25.0	29.3	6319	-	-
		+1.90	21.2	1.7	63.9	20.5	13.9	-	-	-
+28	95.4	-1.80	76.4	-	-	-	-	-	-	-
-28	4.6	RAW	100.0	-	-	-	-	-	-	-
1/4×0	-	COMB	-	-	-	-	-	-	-	-
+28	95.4	-1.90	78.8	-	-	-	-	-	-	-
-28	4.6	RAW	100.0	-	-	-	-	-	-	-
1/4×0	-	COMB	-	-	-	-	-	-	-	-
ULTIMATE ANALYSIS & ASH FUSION										
+28	-	-1.70	-	-	-	-	-	-	-	-
-28	-	RAW	-	-	-	-	-	-	-	-

CUMULATIVE WEIGHT PERCENT

YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C	BTU	F.S.I.	S
20.5	4.1	14.1	34.3	47.5	10423	-	-
23.0	3.9	15.0	33.6	46.6	10192	-	-
24.8	3.7	18.2	32.8	45.3	9980	-	-
100.0	2.1	64.2	18.6	15.1	-	-	-
21.8	3.9	16.0	33.6	46.6	10192	-	-
5.1	3.1	53.9	23.6	19.4	4340*	-	-
26.9	3.8	23.2	31.7	41.4	9082	-	-
23.5	3.7	18.2	32.8	45.3	9980	-	-
5.1	3.1	53.9	23.6	19.4	4340*	-	-
28.6	3.6	24.6	31.1	40.7	8974	-	-
	H_2O	C	H	N	S	ASH	O
-	5.8	60.5	4.6	0.61	0.32	13.5	14.7
-	3.1	28.9	2.7	0.36	0.27	53.9	11.3
65.3	4.1	7.9	38.0	50.0	11241	-	-
68.3	4.0	8.8	37.6	49.5	11113	-	-
70.6	4.0	10.0	37.3	48.9	10949	-	-
100.0	3.3	26.5	32.1	38.1	-	-	-
65.0	4.0	8.8	37.6	49.5	11113	-	-
4.8	4.2	20.5	32.9	42.4	9334	-	-
69.8	4.0	9.6	37.3	49.0	10990	-	-
67.2	4.0	10.0	37.3	48.9	10949	-	-
4.8	4.2	20.5	32.9	42.4	9334	-	-
72.0	4.0	10.7	37.0	48.5	10841	-	-
	H_2O	C	H	N	S	ASH	O
-	6.21	64.3	4.9	0.76	0.27	7.48	16.1
-	4.19	55.0	4.24	0.59	0.29	20.5	15.1
13.6	3.8	12.9	34.7	48.6	10562	-	-
16.5	3.6	15.5	33.7	47.2	10233	-	-
17.8	3.5	17.8	33.0	45.8	9925	-	-
100.0	3.3	70.0	13.8	12.8	-	-	-
15.7	3.6	15.5	33.7	47.2	10233	-	-
5.0	3.0	57.5	18.9	20.6	3720*	-	-
20.7	3.0	25.6	30.1	40.8	8659	-	-
16.9	3.5	17.8	33.0	45.8	9925	-	-
5.0	3.0	57.5	18.9	20.6	3720*	-	-
21.9	3.4	28.9	29.8	40.0	8508	-	-
	H_2O	C	H	N	S	ASH	O
-	5.79	60.6	4.49	0.70	0.32	12.43	15.7
-	3.03	27.4	2.49	0.39	0.22	57.5	8.92
91.3	5.6	6.6	38.3	49.5	11266	-	-
92.8	5.5	7.0	38.1	49.3	11219	-	-
94.0	5.5	7.5	38.0	49.1	11150	-	-
100.0	5.2	10.8	37.0	47.0	-	-	-
89.3	5.5	7.0	38.1	49.3	11219	-	-
3.8	5.9	11.1	38.9	44.1	10557	-	-
93.1	5.5	7.2	38.1	49.1	11192	-	-
90.4	5.5	7.5	38.0	49.1	11150	-	-
3.8	5.9	11.1	38.9	44.1	10557	-	-
94.2	5.5	7.7	38.0	48.9	11126	-	-
	H_2O	C	H	N	S	ASH	O
-	6.69	65.3	4.96	0.67	0.40	6.38	15.6
-	5.93	62.2	4.68	0.62	0.39	11.09	15.1
12.8	4.2	11.1	32.6	52.0	10796	-	-
100.0	1.6	70.9	15.9	11.6	-	-	-
	H_2O	C	H	N	S	ASH	O
-	5.50	63.15	4.38	0.62	0.40	10.56	15.4
-	5.80	56.63	4.27	0.56	0.37	17.54	14.8
16.6	3.9	24.5	29.2	42.5	8788	-	-
71.3	4.7	8.8	35.4	51.1	11052	-	-
76.4	4.6	10.0	35.1	50.4	10890	-	-
78.8	4.5	11.0	34.8	49.8	10751	-	-
100.0	3.9	22.2	31.7	42.2	8472	-	-
72.9	4.6	10.0	35.1	50.4	10890	-	-
4.6	5.8	17.5	34.6	42.1	9793	-	-
77.5	4.7	10.5	35.1	49.9	10824	-	-
75.2	4.5	11.0	34.8	49.8	10751	-	-
4.6	5.8	17.5	34.6	42.1	9793	-	-
79.8	4.6	11.4	34.8	49.4	10695	-	-
	H_2O	C	H	N	S	ASH	O
-	6.09	63.63	4.67	0.68	0.36	8.51	16.1
-	5.80	56.63	4.27	0.56	0.37	17.54	14.8

CUMULATIVE SAMPLE VALUES

THICKNESS	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C	BTU	F.S.I.	S
1.81	26.9	3.8	23.2	31.7	41.4	9082	-	-
1.81	28.6	3.6	24.6	31.1	40.7	8974	-	-
	OXIDIZING I.D.T.	S.T.	HT	FT	REDUCING I.D.T.	S.T.	HT	FT
	2440	2580	2620	2640	2310	2400	2450	2560
	+2750	-	-	-	+2750	-	-	-
5.65	56.1	4.0	11.7	36.4	47.8	10696	-	-
5.65	58.1	3.9	12.9	36.1	47.3	10547	-	-
	OXIDIZING I.D.T.	S.T.	HT	FT	REDUCING I.D.T.	S.T.	HT	FT
	2440	2460	2490	2510	2360	2420	2440	2480
	2640	2680	2700	2740	2500	2550	2600	2660
8.49	44.2	3.8	13.9	35.4	46.7	10377	-	-
8.49	46.0	3.9	15.4	35.1	46.1	10222		
	OXIDIZING I.D.T.	S.T.	HT	FT	REDUCING I.D.T.	S.T.	HT	FT
	2380	2460	2540	2570	2200	2320	2360	2490
	2620	2750	+2750	-	2560	2640	2680	2740
3.3	93.1	5.5	7.2	38.1	49.1	11192	-	-
3.3	94.2	5.5	7.7	38.0	48.9	11126		
	OXIDIZING I.D.T.	S.T.	HT	FT	REDUCING I.D.T.	S.T.	HT	FT
	2420	2450	2470	2510	2380	2400	2440	2460
	2400	2470	2520	2590	2220	2290	2340	2480
4.99	67.2	5.4	8.6	37.4	48.5	10991	COMB	-1.80
4.99	67.9	5.4	9.1	37.3	48.4	10932	COMB	-1.90
9.51	72.1	5.0	9.6	36.2	49.2	10906	-	-
9.51	73.6	5.0	10.3	36.0	48.9	10810	-	-
	OXIDIZING I.D.T.	S.T.	HT	FT	REDUCING I.D.T.	S.T.	HT	FT
	2420	2500	2540	2620	2320	2440	2470	2560
	2680	2750	+2750	-	2480	2520	2540	2550

OTHER

HARDGROVE 47

HARDGROVE 45

* FROM ASH / BTU CURVE

LOCATION MAP

TN ↑

SCALE:

COORDINATES: Y X

ELEVATION:

DIP: 90° BEARING

CORE SIZE: HQ CASING: 10

BITS USED: J.K. SMIT 100'S

MUD USED: 12 bags (50lb) / day

FT. LEFT IN HOLE: NIL FT.

DATE START 7 JULY, 1978 FINISH 10 JULY, 1978

DRILLER: CARON DIAMOND DRILLING OVERALL RECOVERY 79.1%

TESTS NONE

SAMPLED BY: J. S. McKINNEY DATE 10 JULY, 1978 ANALYZED BY: BIRTLEY

BOREHOLE NO. BP-78-2

PAN OCEAN OIL LTD. (PAGE 1)

MINING DIVISION – COAL

LOGGED BY: J. S. McKINNEY DATE 10 JULY, 1978

SIGNED James S. McKinney

GEOLOGICAL LOG – SCALE: 1:500

DETAILS OF COAL SEAMS – SCALE: 1:100

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION
		12.8	OVERBURDEN - NO RECOVERY
12.8		10.67	CONGLOMERATE - 10-20mm PEBBLES OF CHERT QUARTZITE AND QUARTZ, POROUS: THIN SANDSTONE BEDS SCATTERED THROUGHOUT.
23.47		7.27	NO. 1 SEAM HORIZON
30.74		9.40	MUDSTONE - SILTSTONE, CARBONACEOUS AT TOP, GRADING DOWNWARD INTO GREY SILTSTONE.
39.78		13.25	SANDSTONE - GREY MEDIUM GRAINED SOME SLUMP STRUCTURE. MINOR THIN GRITS AND MUDSTONES SCATTERED THROUGHOUT.
53.03		5.70	GRIT - GREY SUB-ROUNDED
58.73		2.85	MUDSTONE, SANDSTONE, GRIT - CROSS-BEDDED
61.58		8.43	NO. 2 SEAM HORIZON
70.01		11.75	MUDSTONE - GREY SCATTERED COALY SHALE AND COALY MATERIAL. 0.76m CONGLOMERATE NEAR BASE
81.76		3.36	NO. 3 SEAM HORIZON
85.12		3.88	MUDSTONE, GREY, GRADING INTO SILTSTONE
89.00			END OF HOLE

No. 1 SEAM HORIZON

DEPTH	THICKNESS	DESCRIPTION	SAMPLE NUMBER	THICKNESS
		ROOF - GOOD CONGLOMERATE SHALEY LAYER GROUND		1.53
23.47	0.08	SHALE - CARBONACEOUS	7821	
	0.53	COAL - MOSTLY BRIGHT		
	0.32	COAL - BRIGHT		
	0.57	SHALE - CARBONACEOUS		
25.00	0.30	COAL - BRIGHT		
	0.35	COAL - DULL AND SHALEY		
	1.13	COAL - BRIGHT	7822	1.84
26.84	0.58	COAL - DULL SHALEY		
	0.20	COAL - BRIGHT		
	0.57	COAL - DULL SHALEY		
	0.86	COAL - BRIGHT	7823	2.83
	0.20	COAL - DULL SHALEY		
	0.33	COAL - BRIGHT		
29.67	0.77	SHALE - CARBONACEOUS		
	0.23	COAL - BRIGHT	7824	
30.74		FLOOR - MUDSTONE - SILTSTONE CARBONACEOUS AT TOP		1.07

No. 2 SEAM HORIZON

DEPTH	THICKNESS	DESCRIPTION	SAMPLE NUMBER	THICKNESS
		ROOF - FAIR - MUDSTONE, SANDSTONE AND GRIT		1.97
61.58	0.56	COAL - MOSTLY BRIGHT	7825	
	0.66	COAL - DULL		
	0.75	COAL - BRIGHT		
63.55	0.40	SHALE - CARBONACEOUS		
	1.10	COAL - BRIGHT WITH CARBONACEOUS SHALE STRINGERS	7826	1.52
65.07	1.77	SHALE - CARBONACEOUS	N.A.	1.77
66.84		COAL - BRIGHT WITH OCCASIONAL THIN DULL COAL AND CARBONACEOUS SHALE STRINGERS	7827	3.17
	0.35	COAL - DULL		
	0.80	COAL - BRIGHT		
70.01				

SIZE

DIAMETER	WT %	SPEC GRAV	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C.	BTU	F.S.I.	S
+28	96.2	-1.50	26.9	6.6	9.4	34.9	49.1	10435	-	-
		-1.60	6.7	3.8	24.6	34.7	36.9	8647	-	-
		-1.70	4.7	3.4	34.3	33.2	33.2	7175	-	-
		+1.70	61.7	2.9	71.4	-	-	-	-	-
-28	3.8	RAW	100.0	-	-	-	-	-	-	-
1/4×0	100.0	RAW	100.0	6.2	49.5	23.8	20.5	-	-	0.14
+28	96.2	-1.70	38.3	-	-	-	-	-	-	-
-28	3.8	RAW	100.0	-	-	-	-	-	-	-
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-
+28	96.6	-1.50	83.2	7.7	6.0	36.0	50.3	10705	-	-
		-1.60	3.1	3.7	21.5	35.7	39.1	8976	-	-
		-1.70	1.6	3.4	32.7	30.0	33.9	7439	-	-
		+1.70	12.1	2.2	70.0	-	-	-	-	-
-28	3.4	RAW	100.0	-	-	-	-	-	-	-
1/4×0	100.0	RAW	100.0	8.4	14.3	34.9	42.4	9371	-	0.24
+28	96.6	-1.70	87.9	-	-	-	-	-	-	-
-28	3.4	RAW	100.0	-	-	-	-	-	-	-
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-
+28	94.3	-1.50	33.3	6.4	7.7	38.5	47.4	10778	-	-
		-1.60	11.1	6.4	14.8	32.9	45.9	9643	-	-
		-1.70	8.0	4.7	30.0	28.2	37.1	7723	-	-
		+1.70	47.6	2.7	64.9	-	-	-	-	-
-28	5.7	RAW	100.0	-	-	-	-	-	-	-
1/4×0	100.0	RAW	100.0	6.0	36.8	27.0	30.2	6450	-	0.27
+28	94.3	-1.70	52.4	-	-	-	-	-	-	-
-28	5.7	RAW	100.0	-	-	-	-	-	-	-
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-
+28	95.3	-1.50	11.2	9.6	10.3	34.9	50.2	10654	-	-
		-1.60	6.0	4.5	25.1	32.4	38.0	8663	-	-
		-1.70	8.2	3.0	36.2	28.0	32.8	7082	-	-
		+1.70	74.6	2.1	70.0	-	-	-	-	-
-28	4.7	RAW	100.0	-	-	-	-	-	-	-
1/4×0	100.0	RAW	100.0	4.0	57.0	19.8	-	-	-	0.20
+28	95.3	-1.70	75.4	-	-	-	-	-	-	-
-28	4.7	RAW	100.0	-	-	-	-	-	-	-
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-
+28	96.5	-1.50	87.3	7.3	5.2	36.0	51.5	10987	-	-
		-1.60	4.2	4.6	21.1	32.8	41.5	9154	-	-
		-1.70	3.0	3.7	29.6	32.0	34.7	7986	-	-
		+1.70	5.3	2.6	46.4	-	-	-	-	-
-28	3.5	RAW	100.0	-	-	-	-	-	-	-
1/4×0	100.0	RAW	100.0	9.1	8.6	37.3	45.0	10080	-	-
+28	96.5	-1.70	94.5	-	-	-	-	-	-	-
-28	3.5	RAW	100.0	-	-	-	-	-	-	-
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-
+28	95.7	-1.50	48.3	6.7	6.8	38.6	47.9	10996	-	-
		-1.60	6.5	4.4	20.9	32.3	42.4	9180	-	-
		-1.70	4.8	2.9	32.2	28.2	36.7	7615	-	-
		+1.70	40.4	1.5	73.0	-	-	-	-	-
-28	4.3	RAW	100.0	-	-	-	-	-	-	-
1/4×0	100.0	RAW	100.0	5.9	34.5	28.2	31.4	6941	-	0.22
+28	95.7	-1.70	59.6	-	-	-	-	-	-	-
-28	4.3	RAW	100.0	-	-	-	-	-	-	-
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-
1/4×0	100.0	RAW	0.0	-	100.0	-	-	-	-	-
+28	96.1	-1.50	57.0	6.0	6.9	40.2	46.9	11020	-	-
		-1.60	4.6	3.7	22.0	31.4	42.9	9127	-	-
		-1.70	5.7	4.5	30.0	30.3	35.2	7758	-	-
		+1.70	32.7	2.3	58.7	-	-	-	-	-
-28	3.9	RAW	100.0	-	-	-	-	-	-	-
1/4×0	100.0	RAW	100.0	6.9	25.4	31.6	36.1	8017	-	-
+28	96.1	-1.70	67.3	-	-	-	-	-	-	-
-28	3.9	RAW	100.0	-	-	-	-	-	-	-
1/4×0	100.0	COMP	-	-	-	-	-	-	-	-

CUMULATIVE WEIGHT PERCENT

YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	FC	BTU	F.S.I.	S
26.9	6.6	9.4	34.9	49.1	10435	-	-
33.6	6.0	12.4	34.7	46.7	10078	-	-
38.3	5.7	15.1	34.2	45.0	9722	-	-
100.0	4.0	49.8	-	-	-	-	-
RAW	6.0	49.3	23.7	21.0	-	-	0.33
CALC	4.0	49.8	-	-	-	-	-
36.8	5.7	15.1	34.2	45.0	9722	-	-
3.8	6.0	49.3	23.7	21.0	5000*	-	-
40.6	5.7	18.3	33.2	42.8	9280	-	-
83.2	7.7	6.0	36.0	50.3	10705	-	-
86.3	7.7	6.6	36.0	49.9	10642	-	-
87.9	7.5	7.0	35.9	49.6	10585	-	-
100.0	6.8	19.7	-	-	-	-	-
RAW	8.2	17.9	34.8	39.1	9366	-	0.38
CALC	6.9	19.6	-	-	-	-	-
84.9	7.5	7.0	35.9	49.6	10585	-	-
3.4	8.2	17.9	34.8	39.1	9366	-	-
88.3	7.5	7.4	35.9	49.2	10538	-	-
33.3	6.4	7.7	38.5	47.4	10778	-	-
44.4	6.4	9.5	37.1	47.0	10494	-	-
52.4	6.1	12.6	35.7	45.5	10071	-	-
100.0	4.5	37.5	-	-	-	-	-
RAW	5.4	41.3	26.0	27.3	5891	-	0.29
CALC	4.6	42.3	-	-	-	-	-
49.4	6.1	12.6	35.7	45.5	10071	-	-
5.7	5.4	41.3	26.0	27.3	5891	-	-
55.1	6.0	15.6	34.7	43.7	9638	-	-
11.2	4.6	10.3	34.9	50.2	10654	-	-
17.2	4.6	15.5	34.0	45.9	9959	-	-
25.4	4.1	22.1	32.1	41.7	9030	-	-
100.0	2.6	57.9	-	-	-	-	-
RAW	4.4	53.8	23.4	18.4	-	-	0.29
CALC	2.7	57.7	-	-	-	-	-
24.2	4.1	22.1	32.1	41.7	9030	-	-
4.7	4.4	53.8	23.4	18.4	4340*	-	-
28.9	4.2	27.3	30.7	37.8	8267	-	-
87.3	7.3	5.2	36.0	51.5	10987	-	-
91.5	7.2	5.9	35.9	51.0	10903	-	-
94.5	7.1	6.7	35.7	50.5	10810	-	-
100.0	6.8	8.9	-	-	-	-	-
RAW	8.8	11.9	38.3	41.0	9982	-	0.35
CALC	6.7	9.0	-	-	-	-	-
91.2	7.1	6.7	35.7	50.5	10810	-	-
3.5	8.8	11.9	38.3	41.0	9982	-	-
94.7	7.2	6.9	35.8	50.1	10779	-	-
48.3	6.7	6.8	38.6	47.9	10996	-	-
54.8	6.4	8.5	37.9	47.3	10780	-	-
59.6	6.1	10.4	37.1	46.4	10526	-	-
100.0	4.3	35.7	-	-	-	-	-
RAW	6.0	32.0	26.9	35.1	7382	-	0.33
CALC	4.4	35.5	-	-	-	-	-
57.0	6.1	10.4	37.1	46.4	10526	-	-
4.3	6.0	32.0	26.9	35.1	7382	-	-
61.3	6.1	11.9	36.4	45.6	10305	-	-
0.00	0	0	0	0	0		
57.0	6.0	6.9	40.2	46.9	11020	-	-
61.6	5.8	8.0	39.5	46.6	10878	-	-
67.3	5.7	9.9	38.8	45.6	10614	-	-
100.0	4.6	25.8	-	-	-	-	-
RAW	7.1	24.5	29.6	38.8	8247	-	0.26
CALC	4.7	25.8	-	-	-	-	-
64.7	5.7	9.9	38.8	45.6	10614	-	-
3.9	7.1	24.5	29.6	38.8	8247	-	-
68.6	5.8	10.7	38.2	45.2	10479	-	-

CUMULATIVE SAMPLE VALUES

THICKNESS	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	FC	BTU	F.S.I.	S
1.53	40.6	5.7	18.3	33.2	42.8	9280		
3.37	66.6	7.0	10.4	35.2	47.4	10190		
6.20	61.4	6.6	12.6	34.9	45.9	9963		
7.27	56.6	6.4	13.6	34.6	45.3	9836		
1.97	94.7	7.2	6.9	35.8	50.1	10779		
5.26	53.2	6.8	8.6	36.0	48.6	10621		
8.43	59.0	6.4	9.5	37.0	47.1	10559		

OTHER

7.27m COAL 94.5% RECOVERY
6.87m RECOVERED

8.43m COAL 99% RECOVERY
8.36m RECOVERED

*FROM ASH/BTU CURVE

LOCATION MAP

TN ↑

SCALE:

COORDINATES: Y X
ELEVATION:
DIP BEARING
CORE SIZE CASING

BITS USED
MUD USED
FT. LEFT IN HOLE FT.

DATE START FINISH
DRILLER OVERALL RECOVERY
TESTS
SAMPLED BY: R.J. MAZUR DATE 11 JULY, 1978 ANALYZED BY: BIRTLEY

BOREHOLE NO. BP-78-2
PAN OCEAN OIL LTD. (PAGE 2)
MINING DIVISION – COAL

LOGGED BY: R.J. MAZUR DATE 11 JULY, 1978

SIGNED James S. McKinney

GEOLOGICAL LOG – SCALE:

DETAILS OF COAL SEAMS – SCALE:

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION	SAMPLE NUMBER	THICKNESS	SIZE DIA-METER	SIZE WT %	WEIGHT PERCENT SPEC GRAV	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C.	BTU	F.S.I.	S	CUMULATIVE WEIGHT PERCENT YIELD	PROXIMATE ANALYSIS RM	ASH	VOL.	F.C.	BTU	F.S.I	S	CUMULATIVE SAMPLE VALUES THICK-NESS	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL.	F.C.	BTU	F.S.I.	S	OTHER
			SEE PAGE 1																															
						+28	90.3	-1.50	64.0	4.0	9.8	37.0	49.2	10708	-	-	64.0	4.0	9.8	37.0	49.2	10708	-	-										
								-1.60	13.3	3.8	24.6	31.9	39.7	8701	-	-	77.3	4.0	12.4	36.1	47.6	10363	-	-										
								-1.70	9.0	3.4	35.7	27.3	33.6	7073	-	-	86.3	3.9	14.8	35.2	46.1	10020	-	-										
								+1.70	13.7	2.5	55.9	-	-	-	-	-	100.0	3.7	20.4	-	-	-	-	-										
						-28	9.7	RAW	100.0	-	-	-	-	-	-	-	RAW	3.7	25.9	34.1	36.3	8542	-	0.45										
						1/4×0	100.0	RAW	100.0	3.7	20.9	32.0	43.4	9186	-	0.43	CALC	3.7	20.9	-	-	-	-	-										
			No. 3 SEAM HORIZON		1.07	+28	90.3	-1.70	86.3	-	-	-	-	-	-	-	77.9	3.9	14.8	35.2	46.1	10020	-	-										
						-28	9.7	RAW	100.0	-	-	-	-	-	-	-	9.7	3.7	25.9	34.1	36.3	8542	-	-										
						1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	87.6	3.9	16.0	35.1	45.0	9856	-	-	1.07	87.6	3.9	16.0	35.1	45.0	9856			
			ROOF – POOR MUDSTONE	7828		-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	-	-	1.68	55.8	3.9	16.0	35.1	45.0	9856			
81.76		0.24	COAL – BRIGHT																														
		0.190	COAL – DULL																														
		0.37	COAL – BRIGHT		0.61	+28	92.5	-1.50	64.5	4.5	9.2	37.8	48.5	10899	-	-	64.5	4.5	9.2	37.8	48.5	10899	-	-										
82.83					N.A.			-1.60	15.1	4.3	27.0	31.5	37.2	8372	-	-	79.6	4.5	12.6	36.6	46.4	10419	-	-										
		0.61	MUDSTONE, GREY					-1.70	7.0	4.3	34.2	29.0	32.5	7257	-	-	86.6	4.5	14.3	36.0	45.2	10164	-	-										
83.44								+1.70	13.4	2.1	74.0	-	-	-	-	-	100.0	4.1	23.3	-	-	-	-	-										
83.67		0.23	COAL – BRIGHT	7829	0.23	-28	7.5	RAW	100.0	-	-	-	-	-	-	-	RAW	6.4	22.0	34.6	37.0	8753	-	0.50										
						1/4×0	100.0	RAW	100.0	5.5	21.8	31.1	41.6	8876	-	0.47	CALC	4.3	22.3	-	-	-	-	-										
		0.99	MUDSTONE, GREY			+28	92.5	-1.70	86.6	-	-	-	-	-	-	-	80.1	4.5	14.3	36.0	45.2	10164	-	-										
84.66					N.A.	-28	7.5	RAW	100.0	-	-	-	-	-	-	-	7.5	6.4	22.0	34.6	37.0	8753	-	-										
		0.46	COAL – DULL & BRIGHT			1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	87.6	4.7	15.0	35.8	44.5	10043	-	-	1.91	59.6	4.0	15.8	35.2	44.9	9889			
85.12			FLOOR – MUDSTONE	7830	0.99																												
						-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	-	-	2.90	39.3	4.0	15.8	35.2	44.9	9889			
					0.46	+28	91.0	-1.50	43.1	3.7	6.7	35.5	54.1	11361	-	-	43.1	3.7	6.7	35.5	54.1	11361	-	-										
								-1.60	13.0	4.5	22.1	30.9	42.5	8904	-	-	56.1	3.9	10.3	34.4	51.4	10792	-	-										
								-1.70	11.5	4.0	31.7	26.8	37.5	7518	-	-	67.6	3.9	13.9	33.1	49.1	10235	-	-										
								+1.70	32.4	2.5	56.5	-	-	-	-	-	100.0	3.5	27.7	-	-	-	-	-										
						-28	9.0	RAW	100.0	-	-	-	-	-	-	-	RAW	5.7	24.3	34.3	35.7	8421	-	0.35										
						1/4×0	100.0	RAW	100.0	5.9	27.3	27.8	39.0	7899	-	0.29	CALC	3.7	27.4	-	-	-	-	-										
						+28	91.0	-1.70	67.6	-	-	-	-	-	-	-	61.5	3.9	13.9	33.1	49.1	10235	-	-										
						-28	9.0	RAW	100.0	-	-	-	-	-	-	-	9.0	5.7	24.3	34.3	35.7	8421	-	-										
						1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	70.5	4.1	15.2	33.3	47.4	10003	-	-	3.36	43.5	4.1	15.7	34.8	45.4	9914			

RECOVERY UNCERTAIN

LOCATION MAP

TN ↑

SCALE:

COORDINATES: Y X
ELEVATION:
DIP: 90° BEARING: 0
CORE SIZE: HQ CASING 48

BITS USED SMITH
MUD USED QUICK GEL
FT. LEFT IN HOLE NIL FT.

DATE START 29 JULY, 1978 FINISH: 6 AUGUST, 1978
DRILLER: CARON DIAMOND DRILLING OVERALL RECOVERY 86.2%
TESTS: NONE
SAMPLED BY: J.S. McKINNEY DATE: 15 SEPT., 1978 ANALYZED BY: BIRTLEY

BOREHOLE NO. BP-78-3
PAN OCEAN OIL LTD. (PAGE 1)
MINING DIVISION – COAL

LOGGED BY: R.F. McINTYRE DATE 6 AUGUST, 1978

SIGNED James S. McKinney

GEOLOGICAL LOG – SCALE: 1:500

DETAILS OF COAL SEAMS – SCALE: 1:100

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION
		10.40	OVERBURDEN - ASSORTED PEBBLES IN MUD
10.4		0.30	MUDSTONE - GREY
10.7		4.20	OVERBURDEN ? NO RECOVERY
14.9		1.70	MUDSTONE - GREY
16.6		0.40	SANDSTONE - FINE GRAINED BUFF TO GREY
17.0		74.80	CONGLOMERATE - BLACK AND BUFF CHERT PEBBLE CONGLOMERATE WITH QUARTZITE AND QUARTZ PEBBLES. USUAL SIZE OF PEBBLES 25-50mm, POORLY CEMENTED, HIGH POROSITY, SEE WRITTEN LOG. SANDSTONE BEDS 0.1 TO 0.5m THICK AT 21.2, 29.0, 35.8, 88.8 AND 91.4m. MUDSTONE 0.1 TO 0.2m THICK AT 49.0, 52.4, 52.9, 87.3 AND 91.8m DIPS APPEAR TO BE 10-15 DEGREES.
91.8		8.70	NO.1 SEAM HORIZON
100.5		7.90	MUDSTONE - GREY
108.4		1.90	CONGLOMERATE - AS ABOVE
110.3		2.80	SANDSTONE - GREY
113.1		2.10	CONGLOMERATE - AS ABOVE
115.2		1.90	SANDSTONE - GREY
117.1		2.40	CONGLOMERATE - AS ABOVE
119.22		2.43	COAL - NO. 2 SEAM HORIZON ?
121.65		5.80	SANDSTONE - GREY, FINE GRAINED
129.7		0.50	CONGLOMERATE - AS ABOVE
130.2			E.O.H.

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION	SAMPLE NUMBER	THICKNESS
			No. 1 SEAM HORIZON		0.27
91.80		0.30	ROOF - GOOD CONGLOMERATE SILTSTONE	78311	2.63
92.07		0.31	COAL - THIN BANDED MOSTLY DULL W/1mm BRIGHT STRINGERS		
92.38			GRINDING - COAL & SH.?	N.A.	
		1.41	SHALE AND COALY SHALE		1.55
93.79		0.91	MUDSTONE ROOF - POOR		
94.70			COAL - BRIGHT	78312	
94.95			COAL - DULL W/SOME BRIGHT		
95.30			COAL - BRIGHT		
95.50			MUDSTONE		
95.70			SHALEY COAL		0.40
96.50			COAL - BRIGHT	78313	
96.90			SHALE - CARBONACEOUS	78314	
97.30			COAL - MOSTLY DULL, THICK BANDED SHALEY COAL IN PLACES	78315	0.60
100.50			FLOOR - POOR MUDSTONE, COALY SHALE AND SILTSTONE		3.00
			No. 2 SEAM HORIZON ?		1.33
119.22			CONGLOMERATE ROOF - GOOD		
119.82		0.60	COAL - BRIGHT AND DULL THICK BANDED	78321	
120.55		0.73	COAL - BRIGHT		0.70
121.25		0.70	COAL - BRIGHT AND DULL THICK BANDED	78322	
121.65		0.40	COALY SHALE		
			FLOOR - POOR - MUDSTONE	78323	0.40

	SIZE		WEIGHT PERCENT									CUMULATIVE WEIGHT PERCENT								CUMULATIVE SAMPLE VALUES									OTHER
	DIAMETER	WT %	SPEC GRAV	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C.	BTU	F.S.I.	S	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C.	BTU	F.S.I.	S	THICKNESS	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C.	BTU	F.S.I.	S			
	+28	91.2	-1.70	81.8	4.8	17.6	31.0	46.6	9574	-	-	81.8	4.8	17.6	31.0	46.6	9574	-	-												
			-1.80	8.9	3.3	45.5	24.2	27.0	5826	-	-	90.7	4.7	20.3	30.3	44.7	9206	-	-												
			-1.90	5.8	3.2	52.7	21.4	22.7	5032	-	-	96.5	4.6	22.3	29.8	43.4	8955	-	-												
			+1.90	3.5	2.6	66.0	17.7	13.7	-	-	-	100.0	4.5	23.8	29.4	42.3	-	-	-												
	-28	8.8	RAW	-	-	-	-	-	-	-	-	RAW	6.8	20.6	27.0	45.6	9164	-	-												
	1/4×0	100.0	RAW	100.0	8.2	63.1	28.5	40.4	8382	-	0.49	CALC	4.7	23.5	29.2	42.5	-	-	-												
	+28	91.2	-1.70	81.8	-	-	-	-	-	-	-	74.6	4.8	17.6	31.0	46.6	9574	-	-												
	-28	8.8	RAW	100.0	-	-	-	-	-	-	-	8.8	6.8	20.6	27.0	45.6	9164	-	-												
	1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	83.4	5.0	17.9	30.6	46.5	9530	-	-												
	+28	92.6	-1.70	34.0	6.8	13.6	34.8	44.8	9875	-	-	34.0	6.8	13.6	34.8	44.8	9875	-	-												
			-1.80	3.5	3.7	44.5	23.9	27.9	6067	-	-	37.5	6.5	16.5	33.8	43.2	9514	-	-												
			-1.90	7.9	3.3	53.4	20.6	22.7	4928	-	-	45.4	6.0	22.9	31.5	39.7	8716	-	-												
			+1.90	54.6	3.9	73.7	13.4	9.0	-	-	-	100.0	4.8	50.6	21.6	22.9	-	-	-												
	-28	7.4	RAW	-	-	-	-	-	-	-	-	RAW	6.7	48.2	20.7	24.4	5159	-	-												
	1/4×0	100.0	RAW	100.0	7.1	50.1	21.0	21.8	4901	-	0.18	CALC	4.9	50.4	21.5	23.0	-	-	-												
	+28	92.6	-1.70	34.0	-	-	-	-	-	-	-	31.5	6.8	13.6	34.8	44.8	9875	-	-												
	-28	7.4	RAW	100.0	-	-	-	-	-	-	-	7.4	6.7	48.2	20.7	24.4	5159	-	-												
	1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	38.9	6.8	20.2	32.1	41.0	8978	-	-	1.55	38.9	6.8	20.2	32.1	41.0	8978					
	+28	93.4	-1.70	98.2	6.4	5.7	37.3	50.6	10884	-	-	98.2	6.4	5.7	37.3	50.6	10884	-	-												
			+1.70	1.8	2.7	49.9	20.5	26.9	5505	-	-	100.0	6.3	6.5	37.0	50.2	10787	-	-												
	-28	6.6	RAW	-	-	-	-	-	-	-	-	RAW	8.7	8.7	34.6	48.0	10467	-	-												
	1/4×0	100.0	RAW	100.1	10.2	6.6	35.5	47.7	10394	-	0.29	CALC	6.5	6.7	36.8	50.1	10765	-	-												
	+28	93.4	-1.70	98.2	-	-	-	-	-	-	-	91.7	6.4	5.7	37.3	50.6	10884	-	-												
	-28	6.6	RAW	100.0	-	-	-	-	-	-	-	6.6	8.7	8.7	34.6	48.0	10467	-	-												
	1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	98.3	6.6	5.9	37.1	50.4	10856	-	-	1.95	51.2	6.7	14.6	34.1	44.7	9719					
	+28	94.3	-1.70	2.8	5.3	10.8	36.6	47.3	10445	-	-	2.8	5.3	10.8	36.6	47.3	10445	-	-												
			-1.80	0.3	4.4	44.3	24.9	26.4	5970	-	-	3.1	5.2	14.0	35.5	45.3	10011	-	-												
			-1.90	0.6	3.7	54.9	21.7	19.7	4711	-	-	3.7	4.9	20.7	33.2	41.1	9152	-	-												
			+1.90	96.3	4.1	80.7	12.3	2.9	-	-	-	100.0	4.1	78.5	13.1	4.3	-	-	-												
	-28	5.7	RAW	-	-	-	-	-	-	-	-	RAW	6.0	70.8	14.2	9.0	-	-	-												
	1/4×0	100.0	RAW	100.0	6.5	76.4	12.7	4.4	-	-	0.09	CALC	4.2	78.1	13.2	4.6	-	-	-												
	+28	94.3	-1.70	2.8	-	-	-	-	-	-	-	2.6	5.3	10.8	36.6	47.3	10445	-	-												
	-28	5.7	RAW	100.0	-	-	-	-	-	-	-	5.7	6.0	70.8	14.2	9.0	2680*	-	-												
	1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	8.3	5.8	52.0	21.2	21.0	5112	-	-	2.55	41.0	6.7	16.3	33.5	43.6	9499					
	+28	94.5	-1.70	52.3	6.9	17.1	33.4	42.6	9340	-	-	52.3	6.9	17.1	33.4	42.6	9340	-	-												
			-1.80	10.9	3.6	45.5	25.0	25.9	5863	-	-	63.2	6.3	22.0	31.9	39.7	8740	-	-												
			-1.90	15.0	3.4	51.8	23.6	21.2	5152	-	-	78.2	5.8	27.7	30.4	36.2	8052	-	-												
			+1.90	21.8	2.6	75.4	14.7	7.3	-	-	-	100.0	5.1	38.1	26.9	29.9	-	-	-												
	-28	5.5	RAW	-	-	-	-	-	-	-	-	RAW	7.6	33.1	27.6	31.7	7036	-	-												
	1/4×0	100.0	RAW	100.0	7.8	39.0	25.9	27.3	6126	-	0.20	CALC	5.2	37.8	26.9	30.0	-	-	-												
	+28	44.5	-1.70	52.3	-	-	-	-	-	-	-	49.4	6.9	17.1	33.4	42.6	9340	-	-												
	-28	5.5	RAW	100.0	-	-	-	-	-	-	-	5.5	7.6	33.1	27.6	31.7	7036	-	-												
	1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	54.9	7.0	18.7	32.8	41.5	9109	-	-	5.55	48.5	6.9	17.8	33.1	42.3	9260					
	+28	93.5	-1.70	93.8	6.9	13.6	34.1	45.4	9686	-	-	93.8	6.9	13.6	34.1	45.4	9686	-	-												
			-1.80	2.3	3.2	40.5	26.3	30.0	6616	-	-	96.1	6.8	14.2	33.9	45.1	9613	-	-												
			-1.90	1.3	3.1	46.8	24.3	25.8	5813	-	-	97.4	6.7	14.7	33.8	44.8	9561	-	-												
			+1.90	2.6	1.9	66.6	20.4	11.1	-	-	-	100.0	6.6	16.0	33.4	43.9	9313	-	-												
	-28	6.5	RAW	-	-	-	-	-	-	-	-	RAW	8.4	17.8	31.1	42.7	9063	-	-												
	1/4×0	100.0	RAW	100.0	9.9	15.7	32.2	42.2	9110	-	0.33	CALC	6.7	16.1	33.3	43.9	9297	-	-												
	+28	93.5	-1.70	93.8	-	-	-	-	-	-	-	87.7	6.9	13.6	34.1	45.4	9686	-	-												
	-28	6.5	RAW	100.0	-	-	-	-	-	-	-	6.5	8.4	17.8	31.1	42.7	9063	-	-												
	1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	94.2	7.0	13.9	33.9	45.2	9643	-	-	1.33	94.2	7.0	13.9	33.9	45.2	9643					
	+28	92.8	-1.70	51.0	5.2	15.4	32.2	47.2	9637	-	-	51.0	5.2	15.4	32.2	47.2	9637	-	-												
			-1.80	13.7	3.8	40.8	24.7	30.7	6492	-	-	64.7	4.9	20.8	30.6	43.7	8971	-	-												
			-1.90	11.9	3.1	47.6	23.4	25.9	5705	-	-	76.6	4.6	25.0	29.5	40.9	8464	-	-												
			+1.90	23.4	2.0	66.3	19.6	12.1	-	-	-	100.0	4.0	34.6	27.2	34.2	-	-	-												
	-28	7.2	RAW	-	-	-	-	-	-	-	-	RAW	7.1	30.6	25.9	37.0	7367	-	-												
	1/4×0	100.0	RAW	100.0	7.6	33.4	25.8	33.2	7048	-	0.24	CALC	4.2	34.3	27.1	34.4	-	-	-												
	+28	92.8	-1.70	51.0	-	-	-	-	-	-	-	47.3	6.9	13.6	34.1	45.4	9686	-	-												
	-28	7.2	RAW	100.0	-	-	-	-	-	-	-	7.2	7.1	30.6	25.9	37.0	7367	-	-												
	1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	54.5	6.9	15.9	33.0	44.3	9380	-	-	2.03	80.5	7.0	14.4	33.7	45.0	9582					
	+28	89.5	-1.70	35.0	4.8	17.8	31.9	45.5	9593	-	-	35.0	4.8	17.8	31.9	45.5	9593	-	-												
			-1.80	7.7	2.8	46.5	23.7	27.0	6014	-	-	42.7	4.4	23.9	30.4	42.2	8948	-	-												
			-1.90	11.0	2.7	54.9	19.6	22.8	4769	-	-	53.7	4.1	29.5	28.2	38.2	8090	-	-												
			+1.90	46.3	2.1	78.3	12.6	7.0	-	-	-	100.0	3.2	52.1	20.9	23.8	-	-	-												
	-28	10.5	RAW	-	-	-	-	-	-	-	-	RAW	4.9	50.9	18.9	25.3	5056	-	-												
	1/4×0	100.0	RAW	100.0	-	-	-	-	-	-	-	CALC	3.4	52.0	20.7	23.9	-	-	-												
	+28	89.5	-1.70	35.0	-	-	-	-	-	-	-	31.3	4.8	17.8	31.9	45.5	9593	-	-												
	-28	10.5	RAW	100.0	-	-	-	-	-	-	-	10.3	7.1	30.6	25.9	37.0	7367	-	-												
	1/4×0	100.0	COMB	-	-	-	-	-	-	-	-	41.8	5.4	21.0	30.4	43.4	9034	-	-	2.43	74.1	6.8	15.0	33.4	44.8	9531					

5.55m COAL 99% RECOVERY
5.51m RECOVERY

2.43m COAL 92% RECOVERY
2.24m RECOVERY

*FROM ASH/BTU CURVE

LOCATION MAP

TN ↑

SCALE:

COORDINATES: Y X

ELEVATION:

DIP BEARING

CORE SIZE CASING

BITS USED

MUD USED

FT. LEFT IN HOLE FT.

DATE START FINISH

DRILLER

TESTS

SAMPLED BY DATE ANALYZED BY

BOREHOLE NO. BP-78-3 (PAGE 2)

PAN OCEAN OIL LTD.

MINING DIVISION – COAL

LOGGED BY DATE

SIGNED James S McKinney

GEOLOGICAL LOG – SCALE:

DETAILS OF COAL SEAMS – SCALE:

SEE BP-78-3 (PAGE 1)

No. 1 SEAM HORIZON

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION	SAMPLE NUMBER	THICKNESS
			ROOF - GOOD CONGLOMERATE		
91.80		0.30	SILTSTONE		
92.07			COAL - THIN BANDED MOSTLY DULL W/1mm BRIGHT STRINGERS		1.55
92.38		0.31	GRINDING - COAL & SH?		
		1.41	SHALE AND COALY SHALE		
93.79			MUDSTONE ROOF - POOR		
		0.91	COAL - BRIGHT		
94.70			COAL - DULL W/SOME BRIGHT	78312	0.40
94.95			COAL - BRIGHT		
95.30			MUDSTONE		
95.50			SHALEY COAL		
95.70			COAL - BRIGHT	78313	
96.50			SHALE - CARBONACEOUS	78314	0.60
96.90			COAL - MOSTLY DULL, THICK BANDED, SHALEY COAL IN PLACES		
97.50				78315	
					3.00
100.50			FLOOR - POOR MUDSTONE, COALY SHALE AND SILTSTONE		

SIZE		WEIGHT PERCENT										CUMULATIVE WEIGHT PERCENT							CUMULATIVE SAMPLE VALUES									OTHER
DIAMETER	WT %	SPEC GRAV	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C	BTU	F.S.I.	S		YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C	BTU	F.S.I.	S	THICKNESS	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C	BTU	F.S.I.	S	
+28	92.6	-1.80	37.5	-	-	-	-	-	-	-		34.7	6.5	16.5	33.8	43.2	9514	-	-										
-28	7.4	RAW	100.0	-	-	-	-	-	-	-		7.4	6.7	48.2	20.7	24.4	5159	-	-										
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-		42.1	6.5	22.1	31.5	39.9	8748	-	-	1.55	42.1	6.5	22.1	31.5	39.9	8748	-	-	
+28	92.6	-1.90	45.4	-	-	-	-	-	-	-		42.0	6.0	22.9	31.5	39.7	8716	-	-										
-28	7.4	RAW	100.0	-	-	-	-	-	-	-		7.4	6.7	48.2	20.7	24.4	5159	-	-										
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-		49.4	6.1	26.7	29.9	37.4	8183	-	-	1.55	49.4	6.1	26.7	29.9	37.4	8183	-	-	

ULTIMATE ANALYSIS & ASH FUSION																											
												H_2O	C	H	N	S	ASH	O	OXIDIZING				REDUCING				
																			IDT	ST	HT	FT	IDT	ST	HT	FT	
+28	-	-1.70	-	-	-	-	-	-	-	-		-	6.84	58.17	4.51	0.77	0.40	13.63	15.7	2280	2350	2400	2440	2220	2270	2300	2360	HARDGROVE 39
-28	-	RAW	-	-	-	-	-	-	-	-		-	6.72	31.48	2.88	0.47	0.19	48.23	10.0	2690	+2750	-	-	2600	2690	2720	+2750	

1/4×0		COMB	AT -1.70 + RAW -28									98.3	6.6	5.9	37.1	50.4	10856	-	-	1.95	53.6	6.5	16.0	33.6	43.8	9540	AT -1.80	
												-	-	-	-	-	-	-	-	1.95	59.4	6.3	19.6	32.3	41.8	9089	AT -1.90	

ULTIMATE ANALYSIS & ASH FUSION																											
												H_2O	C	H	N	S	ASH	O	OXIDIZING				REDUCING				
																			IDT	ST	HT	FT	IDT	ST	HT	FT	
+28	-	-1.70	-	-	-	-	-	-	-	-		-	6.44	64.51	4.82	0.92	0.32	5.74	17.3	2200	2230	2240	2280	1890	1920	1980	2030	HARDGROVE 37
-28	-	RAW	-	-	-	-	-	-	-	-		-	8.66	62.45	4.71	0.80	0.25	8.71	14.4	2160	2230	2310	2400	1980	2040	2110	2170	

+28	94.3	-1.80	3.1	-	-	-	-	-	-	-		2.9	5.2	14.0	35.5	45.3	10011	-	-									
-28	5.7	RAW	100.0	-	-	-	-	-	-	-		5.7	6.0	70.8	14.2	9.0	2680*	-	-									
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-		8.6	5.7	51.6	21.4	21.2	5152	-	-	2.55	43.0	6.5	17.7	33.0	42.8	9334	-	-	
+28	94.3	-1.90	3.7	-	-	-	-	-	-	-		3.5	4.9	20.7	33.2	41.1	9152	-	-									
-28	5.7	RAW	100.0	-	-	-	-	-	-	-		5.7	6.0	70.8	14.2	9.0	2680*	-	-									
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-		9.2	5.6	51.7	21.4	21.2	5142	-	-	2.55	47.6	6.2	21.1	31.8	40.9	8910	-	-	

ULTIMATE ANALYSIS & ASH FUSION																											
												H_2O	C	H	N	S	ASH	O	OXIDIZING				REDUCING				
																			IDT	ST	HT	FT	IDT	ST	HT	FT	
+28	-	-1.70	-	-	-	-	-	-	-	-		-	5.34	61.84	4.59	0.90	0.29	10.76	16.3	2230	2270	2300	2350	2120	2160	2200	2220	HARDGROVE 38
-28	-	RAW	-	-	-	-	-	-	-	-		-	6.02	12.26	2.13	0.26	0.15	70.76	8.42	+2750	-	-	-	+2750	-	-	-	

+28	94.5	-1.80	63.2	-	-	-	-	-	-	-		-	59.7	6.3	22.0	31.9	39.7	8740	-									
-28	5.5	RAW	100.0	-	-	-	-	-	-	-		-	5.5	7.6	33.1	27.6	31.7	7036	-									
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-		-	65.2	6.4	22.9	31.5	39.0	8596	-	5.55	55.0	6.4	21.0	32.0	40.4	8861	-	-	
+28	94.5	-1.90	78.2	-	-	-	-	-	-	-		-	73.9	5.8	27.7	30.4	36.2	8052	-									
-28	5.5	RAW	100.0	-	-	-	-	-	-	-		-	5.5	7.6	33.1	27.6	31.7	7036	-									
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-		-	79.4	5.9	28.1	30.2	35.9	7981	-	5.55	64.8	6.0	25.7	30.8	37.6	8294	-	-	

ULTIMATE ANALYSIS & ASH FUSION																											
												H_2O	C	H	N	S	ASH	O	OXIDIZING				REDUCING				
																			IDT	ST	HT	FT	IDT	ST	HT	FT	
+28	-	-1.70	-	-	-	-	-	-	-	-		-	6.86	55.54	4.34	0.86	0.42	17.07	14.9	2320	2440	2500	2520	2220	2270	2290	2320	HARDGROVE 38
-28	-	RAW	-	-	-	-	-	-	-	-		-	7.64	42.61	3.57	0.56	0.25	33.12	12.3	2740	+2750	-	-	2570	2690	2720	2730	

No. 2 SEAM HORIZON?

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION	SAMPLE NUMBER	THICKNESS
			CONGLOMERATE ROOF - GOOD		
119.22					1.33
		0.60	COAL - BRIGHT AND DULL THICK BANDED	78321	
119.82					
		0.73	COAL - BRIGHT		
120.55					
		0.70	COAL - BRIGHT AND DULL THICK BANDED	78322	0.70
121.25					
		0.40	COALY SHALE		
121.65			FLOOR - POOR - MUDSTONE	78323	

SIZE		WEIGHT PERCENT										CUMULATIVE WEIGHT PERCENT							CUMULATIVE SAMPLE VALUES									OTHER
DIAMETER	WT %	SPEC GRAV	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C	BTU	F.S.I.	S		YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C	BTU	F.S.I.	S	THICKNESS	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C	BTU	F.S.I.	S	
+28	93.5	-1.80	96.1	-	-	-	-	-	-	-		89.9	6.8	14.2	33.9	45.1	9613	-											
-28	6.5	RAW	100.0	-	-	-	-	-	-	-		6.5	8.4	17.8	31.1	42.7	9063	-											
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-		96.4	6.9	14.4	33.7	44.9	9576	-		1.33	96.4	6.9	14.4	33.7	44.9	9576	-	-	
+28	93.5	-1.90	97.4	-	-	-	-	-	-	-		91.1	6.7	14.7	33.8	44.8	9561	-											
-28	6.5	RAW	100.0	-	-	-	-	-	-	-		6.5	8.4	17.8	31.1	42.7	9063	-											
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-		97.6	6.8	14.9	33.6	44.7	9528	-		1.33	97.6	6.6	14.9	33.6	44.7	9528			

ULTIMATE ANALYSIS & ASH FUSION																											
												H_2O	C	H	N	S	ASH	O	OXIDIZING				REDUCING				
																			IDT	ST	HT	FT	IDT	ST	HT	FT	
+28	-	-1.70	-	-	-	-	-	-	-	-		-	6.88	57.75	4.43	0.74	0.44	13.63	16.1	+2750	-	-	-	2650	+2750	-	-	HARDGROVE 39
-28	-	RAW	-	-	-	-	-	-	-	-		-	8.35	53.61	4.25	0.73	0.32	17.79	15.0	2660	2700	2720	2760	2480	2540	2560	2580	

+28	92.8	-1.80	64.7	-	-	-	-	-	-	-		-	60.0	4.9	20.8	30.6	43.7	8971	-									
-28	7.2	RAW	100.0	-	-	-	-	-	-	-		-	7.2	7.1	30.6	25.9	37.0	7367	-									
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-		-	67.2	5.1	21.9	30.1	43.0	8799	-	2.03	86.3	6.4	16.4	32.7	44.4	9367	-	-	
+28	92.8	-1.90	76.6	-	-	-	-	-	-	-		-	71.1	4.6	25.0	29.5	40.9	8464	-									
-28	7.2	RAW	100.0	-	-	-	-	-	-	-		-	7.2	7.1	30.6	25.9	37.0	7367	-									
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-		-	78.3	4.8	25.5	29.2	40.5	8363	-	2.03	90.9	6.2	18.0	32.3	43.5	9182	-	-	

ULTIMATE ANALYSIS & ASH FUSION																											
												H_2O	C	H	N	S	ASH	O	OXIDIZING				REDUCING				
																			IDT	ST	HT	FT	IDT	ST	HT	FT	
+28	-	-1.70	-	-	-	-	-	-	-	-		-	5.18	59.03	4.09	0.76	0.35	15.35	15.2	2620	2680	2700	2710	2400	2480	2560	2640	HARDGROVE 39
-28	-	RAW	-	-	-	-	-	-	-	-		-	7.09	45.89	3.32	0.71	0.27	29.98	12.7	2710	+2750	-	-	2540	2610	2640	2700	

+28	89.5	-1.80	42.7	-	-	-	-	-	-	-		-	38.2	4.4	23.9	30.4	42.2	8948	-									
-28	10.5	RAW	100.0	-	-	-	-	-	-	-		-	10.5	7.1	30.6	25.9	37.0	7367	-									
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-		-	48.7	5.0	25.3	29.4	41.0	8607	-	2.43	80.1	6.3	17.3	32.4	44.0	9291	-	-	
+28	89.5	-1.90	53.7	-	-	-	-	-	-	-		-	48.1	4.1	29.5	28.2	38.2	8090	-									
-28	10.5	RAW	100.0	-	-	-	-	-	-	-		-	10.5	7.1	30.6	25.9	37.2	7367	-									
1/4×0	100.0	COMB	-	-	-	-	-	-	-	-		-	58.6	4.6	29.7	27.8	38.0	7460	-	2.43	85.6	6.0	19.4	31.8	42.8	9044	-	-	

ULTIMATE ANALYSIS & ASH FUSION																											
												H_2O	C	H	N	S	ASH	O	OXIDIZING				REDUCING				
																			IDT	ST	HT	FT	IDT	ST	HT	FT	
+28	-	-1.70	-	-	-	-	-	-	-	-		-	4.79	57.51	4.06	0.74	0.40	17.82	14.7	2300	2490	2530	2580	2260	2360	2420	2500	HARDGROVE 38
-28	-	RAW	-	-	-	-	-	-	-	-		-	4.90	31.85	2.53	0.55	0.23	50.91	9.1	2650	+2750	-	-	2590	2720	+2750	-	

* FROM ASH/BTU CURVE

LOCATION MAP

TN ↑

SCALE:

COORDINATES: Y X

ELEVATION:

DIP BEARING

CORE SIZE CASING

BITS USED

MUD USED

FT. LEFT IN HOLE FT.

DATE START

DRILLER

TESTS

SAMPLED BY

FINISH

OVERALL RECOVERY

DATE ANALYZED BY

BOREHOLE NO. BP-78-2 (PAGE 3)

PAN OCEAN OIL LTD.

MINING DIVISION – COAL

LOGGED BY DATE

SIGNED James S. McKinney

GEOLOGICAL LOG – SCALE:

DETAILS OF COAL SEAMS – SCALE:

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION	SAMPLE NUMBER	THICKNESS	SIZE DIAMETER	SIZE WT %	SPEC GRAV	YIELD	PROXIMATE ANALYSIS RM	PROXIMATE ANALYSIS ASH	PROXIMATE ANALYSIS VOL	PROXIMATE ANALYSIS F.C	BTU	F.S.I.	S
			SEE BP-78-2 (PAGE 1)													
			NO. 1 SEAM HORIZON													
			ROOF - GOOD CONGLOMERATE SHALEY LAYER GROUND	7821		+28	96.2	-1.70	-	-	-	-	-	-	-	-
								-1.80	3.6	2.7	31.9	28.4	37.0	7793	-	-
								-1.90	1.9	2.8	46.6	24.6	26.0	6009	-	-
								+1.90	56.3	4.3	73.5	14.1	8.1	-	-	-
23.47		0.08	SHALE - CARBONACEOUS													
		0.53	COAL - MOSTLY BRIGHT													
		0.32	COAL - BRIGHT													
		0.57	SHALE - CARBONACEOUS		1.84											
25.00		0.30	COAL - BRIGHT													
		0.35	COAL - DULL AND SHALEY	7822												
		1.13	COAL - BRIGHT													
26.84		0.58	COAL - DULL SHALEY													
		0.20	COAL - BRIGHT													
		0.57	COAL - DULL SHALEY													
		0.86	COAL - BRIGHT	7823	2.83											
		0.20	COAL - DULL SHALEY													
		0.33	COAL - BRIGHT													
29.67		0.77	SHALE - CARBONACEOUS													
30.74		0.23	COAL - BRIGHT	7824												
			FLOOR - MUDSTONE - SILTSTONE CARBONACEOUS AT TOP													

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION	SAMPLE NUMBER	THICKNESS	SIZE DIAMETER	SIZE WT %	SPEC GRAV	YIELD	PROXIMATE ANALYSIS RM	PROXIMATE ANALYSIS ASH	PROXIMATE ANALYSIS VOL	PROXIMATE ANALYSIS F.C	BTU	F.S.I.	S
						+28	96.2	-1.80	41.9	-	-	-	-	-	-	-
						-28	3.8	RAW	100.0	-	-	-	-	-	-	-
						+28	96.2	-1.90	43.8	-	-	-	-	-	-	-
						-28	3.8	RAW	100.0	-	-	-	-	-	-	-
						ULTIMATE ANALYSIS & ASH FUSION										
					1.53	+28	-	-1.70	-	-	-	-	-	-	-	-
						-28	-	RAW	-	-	-	-	-	-	-	-
						+28	96.6	-1.70	-	-	-	-	-	-	-	-
								-1.80	0.9	2.6	32.5	29.0	35.9	7667	-	-
								-1.90	0.4	2.5	45.4	25.0	27.1	6197	-	-
								+1.90	10.8	2.4	73.8	15.9	7.9	-	-	-
						+28	96.6	-1.80	88.8	-	-	-	-	-	-	-
						-28	3.4	RAW	100.0	-	-	-	-	-	-	-
						1/4×0	-	COMB	-	-	-	-	-	-	-	-
						+28	96.6	-1.90	89.2	-	-	-	-	-	-	-
					1.84	-28	3.4	RAW	100.0	-	-	-	-	-	-	-
						1/4×0	-	COMB	-	-	-	-	-	-	-	-
						ULTIMATE ANALYSIS & ASH FUSION										
						+28	-	-1.70	-	-	-	-	-	-	-	-
						-28	-	RAW	-	-	-	-	-	-	-	-
						+28	94.3	-1.70	-	-	-	-	-	-	-	-
								-1.80	4.2	2.7	32.6	29.5	35.2	7758	-	-
								-1.90	3.3	2.4	47.3	25.8	24.5	5609	-	-
								+1.90	40.1	2.2	70.0	17.3	10.5	-	-	-
						+28	94.3	-1.80	56.6	-	-	-	-	-	-	-
					2.83	-28	5.7	RAW	100.0	-	-	-	-	-	-	-
						1/4×0	-	COMB	-	-	-	-	-	-	-	-
						+28	94.3	-1.90	59.9	-	-	-	-	-	-	-
						-28	5.7	RAW	100.0	-	-	-	-	-	-	-
						1/4×0	-	COMB	-	-	-	-	-	-	-	-
						ULTIMATE ANALYSIS & ASH FUSION										
						+28	-	-1.70	-	-	-	-	-	-	-	-
						-28	-	RAW	-	-	-	-	-	-	-	-
						+28	95.3	-1.70	-	-	-	-	-	-	-	-
								-1.80	8.8	3.0	33.8	28.0	35.2	7597	-	-
								-1.90	3.8	3.1	49.2	22.9	24.8	5231	-	-
								+1.90	62.0	2.4	73.8	14.7	9.1	-	-	-
					1.07	+28	95.3	-1.80	34.2	-	-	-	-	-	-	-
						-28	4.7	RAW	100.0	-	-	-	-	-	-	-
						1/4×0	-	COMB	-	-	-	-	-	-	-	-
						+28	95.3	-1.90	38.0	-	-	-	-	-	-	-
						-28	4.7	RAW	100.0	-	-	-	-	-	-	-
						1/4×0	-	COMB	-	-	-	-	-	-	-	-
						ULTIMATE ANALYSIS & ASH FUSION										
						+28	-	-1.70	-	-	-	-	-	-	-	-
						-28	-	RAW	-	-	-	-	-	-	-	-

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION	CUMULATIVE WEIGHT PERCENT YIELD	PROXIMATE ANALYSIS RM	ASH	VOL.	F.C.	BTU	F.S.I.	S
			SEE BP-78-2 (PAGE 1)								
			NO. 1 SEAM HORIZON								
			ROOF - GOOD CONGLOMERATE SHALEY LAYER GROUND	38.3	5.7	15.1	34.2	45.0	9722	-	-
				41.9	5.4	16.5	33.7	44.3	9556	-	-
				43.8	5.3	17.9	33.3	43.5	9402	-	-
				100.0	4.8	49.2	22.5	23.6	-	-	-
23.47		0.08	SHALE - CARBONACEOUS								
		0.53	COAL - MOSTLY BRIGHT								
		0.32	COAL - BRIGHT								
		0.57	SHALE - CARBONACEOUS								
25.00		0.30	COAL - BRIGHT								
		0.35	COAL - DULL AND SHALEY								
		1.13	COAL - BRIGHT								
26.84		0.58	COAL - DULL SHALEY								
		0.20	COAL - BRIGHT								
		0.57	COAL - DULL SHALEY								
		0.86	COAL - BRIGHT								
		0.20	COAL - DULL SHALEY								
		0.33	COAL - BRIGHT								
29.67		0.77	SHALE - CARBONACEOUS								
30.74		0.23	COAL - BRIGHT								
			FLOOR - MUDSTONE - SILTSTONE CARBONACEOUS AT TOP								

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION	CUMULATIVE WEIGHT PERCENT YIELD	PROXIMATE ANALYSIS RM	ASH	VOL.	F.C.	BTU	F.S.I.	S
				40.3	5.4	16.5	33.7	44.3	9556	-	-
				3.8	6.0	49.3	23.7	21.0	5000*	-	-
				42.1	5.3	17.9	33.3	43.5	9402	-	-
				3.8	6.0	49.3	23.7	21.0	5000 *	-	-
			ULTIMATE ANALYSIS & ASH FUSION		H_2O	C	H	N	S	ASH	O
					6.99	56.8	4.36	0.68	0.36	14.6	16.2
				-	6.02	29.9	2.74	0.34	0.33	49.3	11.4
				87.9	7.5	7.0	35.9	49.6	10585	-	-
				88.8	7.5	7.3	35.8	49.5	10555	-	-
				89.2	7.4	7.4	35.8	49.4	10535	-	-
				100.0	6.9	14.6	33.6	44.9	-	-	-
				85.7	7.5	7.3	35.8	49.5	10555	-	-
				3.4	8.2	17.9	34.8	39.1	9366	-	-
				89.1	7.5	7.7	35.8	49.1	10509	-	-
				86.2	7.4	7.4	35.8	49.4	10535	-	-
				3.4	8.2	17.9	34.8	39.1	9366	-	-
				89.6	7.4	7.8	35.8	49.0	10490	-	-
			ULTIMATE ANALYSIS & ASH FUSION		H_2O	C	H	N	S	ASH	O
				-	8.09	61.98	4.80	0.71	0.36	6.69	17.4
				-	8.15	54.07	4.21	0.66	0.38	17.91	14.6
				52.4	6.1	12.6	35.7	45.5	10071	-	-
				56.6	5.9	14.1	35.2	44.7	9899	-	-
				59.9	5.7	15.9	34.7	43.6	9663	-	-
				100.0	4.3	37.6	27.7	30.3	-	-	-
				52.8	5.9	14.1	35.2	44.7	9899	-	-
				5.7	5.4	41.3	26.0	27.3	5891	-	-
				58.5	5.9	16.8	34.3	43.0	9508	-	-
				56.5	5.7	15.9	34.7	43.6	9663	-	-
				5.7	5.4	41.3	26.0	27.3	5891	-	-
				62.2	5.7	18.2	33.9	42.1	9317	-	-
			ULTIMATE ANALYSIS & ASH FUSION		H_2O	C	H	N	S	ASH	O
				-	7.19	58.45	4.50	0.71	0.37	12.13	16.7
				-	5.38	36.29	3.16	0.46	0.29	41.28	13.1
				25.4	4.1	22.1	32.1	41.7	9030	-	-
				34.2	3.8	25.1	31.1	40.0	8661	-	-
				38.0	3.8	27.5	30.2	38.5	8318	-	-
				100.0	2.9	56.2	20.6	20.3	-	-	-
				32.6	3.8	25.1	31.1	40.0	8661	-	-
				4.7	4.4	53.8	23.4	18.4	4340*	-	-
				37.3	3.9	28.7	30.1	37.3	8116	-	-
				36.2	3.8	27.5	30.2	38.5	8318	-	-
				4.7	4.4	53.8	23.4	18.4	4340*	-	-
				40.9	3.9	30.5	29.4	36.2	7861	-	-
			ULTIMATE ANALYSIS & ASH FUSION		H_2O	C	H	N	S	ASH	O
				-	5.83	52.31	4.03	0.69	0.36	21.32	15.5
				-	4.42	28.27	2.62	0.41	0.29	53.78	10.2

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION	CUMULATIVE SAMPLE VALUES THICKNESS	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL.	F.C.	BTU	F.S.I.	S	OTHER
			SEE BP-78-2 (PAGE 1)										
			NO. 1 SEAM HORIZON										
			ROOF - GOOD CONGLOMERATE SHALEY LAYER GROUND										
23.47		0.08	SHALE - CARBONACEOUS										
		0.53	COAL - MOSTLY BRIGHT										
		0.32	COAL - BRIGHT										
		0.57	SHALE - CARBONACEOUS										
25.00		0.30	COAL - BRIGHT										
		0.35	COAL - DULL AND SHALEY										
		1.13	COAL - BRIGHT										
26.84		0.58	COAL - DULL SHALEY										
		0.20	COAL - BRIGHT										
		0.57	COAL - DULL SHALEY										
		0.86	COAL - BRIGHT										
		0.20	COAL - DULL SHALEY										
		0.33	COAL - BRIGHT										
29.67		0.77	SHALE - CARBONACEOUS										
30.74		0.23	COAL - BRIGHT										
			FLOOR - MUDSTONE - SILTSTONE CARBONACEOUS AT TOP										

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION	CUMULATIVE SAMPLE VALUES THICKNESS	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL.	F.C.	BTU	F.S.I.	S	OTHER
				1.53	44.1	5.5	19.3	32.8	42.3	9163	-	-	
				1.53	45.9	5.4	20.5	32.5	41.6	9038	-	-	
			OXIDIZING					REDUCING					
			IDT ST HT FT					IDT ST HT FT					
			+28 -28	1.53	2420 +2750	2500 -	2540 -	2610 -	2360 +2750	2440	2480	2560	
				3.37	68.7	6.9	11.1	34.9	47.1	10117			
				3.37	69.8	6.8	11.6	34.8	46.8	10056			
			OXIDIZING					REDUCING					
			IDT ST HT FT					IDT ST HT FT					
			+28 -	2.83	2340 2220	2400 2460	2440 2520	2460 2560	2140 2100	2240 2180	2300 2260	2340 2380	HARDGROVE 39
				6.2	64.0	6.5	13.5	34.7	45.4	9863			
				6.20	66.3	6.3	14.4	34.4	44.8	9770			
			OXIDIZING					REDUCING					
			IDT ST HT FT					IDT ST HT FT					
			+28 -	1.07	2400 +2750	2560 -	2580 -	2600 -	2290 +2750	2420 -	2460 -	2560 -	HARDGROVE 35
				7.27	60.1	6.3	14.9	34.2	44.6	9703			
				7.27	62.6	6.1	16.0	33.9	44.0	9559			
			OXIDIZING					REDUCING					
			IDT ST HT FT					IDT ST HT FT					
			+28 -		2580 +2750	2720 -	2740 -	+2750 -	2460 2700	2620 +2750	2650 -	2720 -	
			-28										

*FROM ASH/BTU CURVE

LOCATION MAP

TN ↑

SCALE:

COORDINATES: Y X

ELEVATION: BITS USED

DIP BEARING MUD USED

CORE SIZE CASING FT. LEFT IN HOLE FT.

DATE START FINISH

DRILLER OVERALL RECOVERY

TESTS

SAMPLED BY: J.S. McKINNEY DATE: JULY 10, 1978 ANALYZED BY

BOREHOLE NO. BP-78-2
PAN OCEAN OIL LTD. (PAGE 4)
MINING DIVISION – COAL

LOGGED BY: J.S. McKINNEY DATE: JULY 10, 1978

SIGNED James S. McKinney

GEOLOGICAL LOG – SCALE:

DETAILS OF COAL SEAMS – SCALE:

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION
			SEE BP-78-2 (PAGE 1)

NO. 2 SEAM HORIZON

DEPTH	GRAPHIC LOG	THICKNESS	DESCRIPTION	SAMPLE NUMBER	THICKNESS
			ROOF - FAIR - MUDSTONE, SANDSTONE AND GRIT		1.97
61.58		0.56	COAL - MOSTLY BRIGHT		
		0.66	COAL - DULL	7825	
		0.75	COAL - BRIGHT		
63.55		0.40	SHALE - CARBONACEOUS		
		1.10	COAL - BRIGHT WITH CARBONACEOUS SHALE STRINGERS	7826	1.52
65.07			SHALE - CARBONACEOUS		
		1.77		N.A.	
66.84			COAL - BRIGHT WITH OCCASIONAL THIN DULL COAL AND CARBONACEOUS SHALE STRINGERS		1.77
		0.35	COAL - DULL	7827	
		0.80	COAL - BRIGHT		3.17
70.01					

SIZE

DIAMETER	WT %
+28	96.5
1/4 × 0	100.0
+28	95.7
−28	4.3
1/4 × 0	100.0
+28	95.7
−28	4.3
1/4 × 0	100.0
+28	96.1
−28	3.9
1/4 × 0	100.0
+28	96.1
−28	3.9
1/4 × 0	100.0

WEIGHT PERCENT

SPEC GRAV	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C	BTU	F.S.I.	S
-1.70	-	-	-	-	-	-	-	-
-1.80	INSUFFICENT	SAMPLE	-	-	-	-	-	-
-1.90	-	-	-	-	-	-	-	-
+1.90	5.5	2.6	46.4	-	-	-	-	-
COMB	-	-	-	-	-	-	-	-
ULTIMATE ANALYSIS & ASH FUSION								
-1.70	-	-	-	-	-	-	-	-
RAW	-	-	-	-	-	-	-	-
-1.70	-	-	-	-	-	-	-	-
-1.80	3.1	2.3	26.7	30.7	40.3	8668	-	-
-1.90	1.4	2.5	40.4	21.8	35.3	6967	-	-
+1.90	35.9	1.8	78.1	13.7	6.4	-	-	-
-1.80	62.7	-	-	-	-	-	-	-
RAW	100.0	-	-	-	-	-	-	-
COMB	-	-	-	-	-	-	-	-
-1.90	64.1	-	-	-	-	-	-	-
RAW	100.0	-	-	-	-	-	-	-
COMB	-	-	-	-	-	-	-	-
ULTIMATE ANALYSIS & ASH FUSION								
-1.70	-	-	-	-	-	-	-	-
RAW	-	-	-	-	-	-	-	-
-1.70	-	-	-	-	-	-	-	-
-1.80	3.9	2.7	26.6	29.4	41.3	8749	-	-
-1.90	2.0	2.8	40.4	24.9	31.9	6580	-	-
+1.90	26.8	2.1	65.2	20.2	12.5	-	-	-
-1.80	71.2	-	-	-	-	-	-	-
RAW	100.0	-	-	-	-	-	-	-
COMB	-	-	-	-	-	-	-	-
-1.90	73.2	-	-	-	-	-	-	-
RAW	100.0	-	-	-	-	-	-	-
COMB	-	-	-	-	-	-	-	-
ULTIMATE ANALYSIS & ASH FUSION								
-1.70	-	-	-	-	-	-	-	-
RAW	-	-	-	-	-	-	-	-

CUMULATIVE WEIGHT PERCENT

YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C.	BTU	F.S.I	S
94.5	7.1	6.7	35.7	50.5	10810	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
100.0	6.8	8.9	-	-	-	-	-
94.7	7.2	6.9	35.8	50.1	10779	-	-
	H_2O	C	H	N	S	ASH	O
-	7.85	62.23	4.74	0.66	0.36	6.35	
-	8.83	58.16	4.44	0.61	0.35	11.85	15.8
59.6	6.1	10.4	37.1	46.4	10526	-	-
62.7	5.9	11.2	36.8	46.1	10434	-	-
64.1	5.8	11.8	36.5	45.9	10358	-	-
100.0	4.4	35.6	28.3	31.7	6639	-	-
60.0	5.9	11.2	36.8	46.1	10434	-	-
4.3	6.0	32.0	26.9	35.1	7382	-	-
64.3	5.9	12.6	36.1	45.4	10230	-	-
61.3	5.8	11.8	36.5	45.9	10358	-	-
4.3	6.0	32.0	26.9	35.1	7382	-	-
65.6	5.8	13.1	35.9	45.2	10163	-	-
	H_2O	C	H	N	S	ASH	O
-	6.96	60.88	4.42	0.63	0.36	10.04	16.7
-	6.03	44.60	3.48	0.51	0.33	31.99	13.1
-	0.00	0	0	0	0	-	-
-	-	-	-	-	-	-	-
67.3	5.7	9.9	38.8	45.6	10614	-	-
71.2	5.5	10.8	38.3	45.4	10511	-	-
73.2	5.5	11.6	37.9	45.0	10404	-	-
100.0	4.6	26.0	33.2	36.3	7616	-	-
68.4	5.5	10.8	38.3	45.4	10511	-	-
3.9	7.1	24.5	29.6	38.8	8247	-	-
72.3	5.6	11.5	37.8	45.0	10389	-	-
70.4	5.5	11.6	37.9	45.0	10404	-	-
31.9	7.1	24.5	29.6	38.8	8247	-	-
74.3	5.6	12.3	37.5	44.7	10291	-	-
	H O	C	H	N	S	ASH	O
-	6.95	61.02	4.59	0.69	0.34	9.41	17.0
-	7.08	49.52	3.85	0.59	0.26	24.46	14.2

CUMULATIVE SAMPLE VALUES

THICKNESS	YIELD	PROXIMATE ANALYSIS RM	ASH	VOL	F.C.	BTU	F.S.I.	S
1.97	94.7	7.2	6.9	35.8	50.1	10779		
				OXIDIZING			REDUCING	
				IDT	ST	HT	FT	
				2440	2460	2480	2520	
				2420	2480	2560	2520	
				2280	2340	2390	2450	
				1920	2080	2130	2200	
3.49	81.5	6.8	8.9	35.9	48.5	10590		
				OXIDIZING			REDUCING	
				IDT	ST	HT	FT	
				2390	2460	2480	2530	
				2740	+2750	-	-	
				2110	2160	2200	2290	
				2560	2650	2680	2730	
5.26	54.0	6.8	8.9	35.9	48.5	10590	at -1.80	
5.26	54.4	6.7	9.1	35.8	48.4	10564	at -1.90	
8.43	60.9	6.2	10.0	36.8	46.9	10500		
8.43	61.9	6.2	10.5	36.6	46.7	10441		
				OXIDIZING			REDUCING	
				IDT	ST	HT	FT	
				2560	2580	2610	2630	
				+2750	-	-	-	
				2200	2480	2500	2550	
				2640	2660	2680	2710	

OTHER

HARDGROVE 42

HARDGROVE 41