B. L. RAYNER

OLANGOLAH-1 WELL COMPLETION REPORT (OTWAY BASIN, P.E.P. 100)

1982

O L A N G O L A H - 1

W E L L C O M P L E T I O N R E P O R T

(OTWAY BASIN, P.E.P.100)

BY

B.L. RAYNER.

GAS AND FUEL EXPLORATION N.L.

SEPTEMBER, 1982.

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C O N T E N T S CONT'D.

SUMMARY

Olangolah - 1 was drilled to establish the existence of suitable sandstone reservoirs within or especially at the base of the Lower Cretaceous Otway Group in the Otway Ranges, Victoria.

Drilling commenced on the 5th of May 1982. Schlumberger ran ISF-Sonic, H.D.T. and C.S.T. logs at 511m., D.L.L. and Sonic logs at 2089m. and H.D.T. and C.S.T. logs at 2157m. Samples of the drill cuttings were taken at 5m. intervals and no coring operations were performed.

No significant hydrocarbon indications were found. The sediments proved to be argillaceous siltstones and sandstones with low porosities, and have been exposed to temperatures in the order of 200-300°C.

The program was plagued by a number of washouts and severe hole deviation, the latter eventually caused the well to be abandoned prior to reaching basement.

Olangolah - 1 was abandoned on the 19th of June 1982 after having drilled a total of 2302m.

1. INTRODUCTION

The primary objective of Olangolah - 1 was to establish the existence of the Lower Cretaceous basal sandy unit known as the Pretty Hill Sandstone in that portion of the Otway Basin encompassed by P.E.P.100. (See location sketch overleaf).

The Pretty Hill Sandstone has been penetrated in wells to the west of the permit and is often accompanied by minor oil and gas shows (e.g. Crayfish - 1, Robertson - 1, Hawkesdale - 1, Woolsthorpe - 1, and Garvoc - 1). This sandstone generally has excellent reservoir properties (Ellenor, 1976) and hence confirmation of its presence within P.E.P.100 would upgrade the petroleum prospects of the permit.

The secondary objective was to penetrate and log a complete lower Otway Group succession and so gain valuable stratigraphic information about this poorly known area of the permit.

Olangolah - 1 was located on an anticlinal structure (defined by surface geological mapping) to minimise the depth of penetration to the Pretty Hill Sandstone and to test the petroleum prospects of that structure.

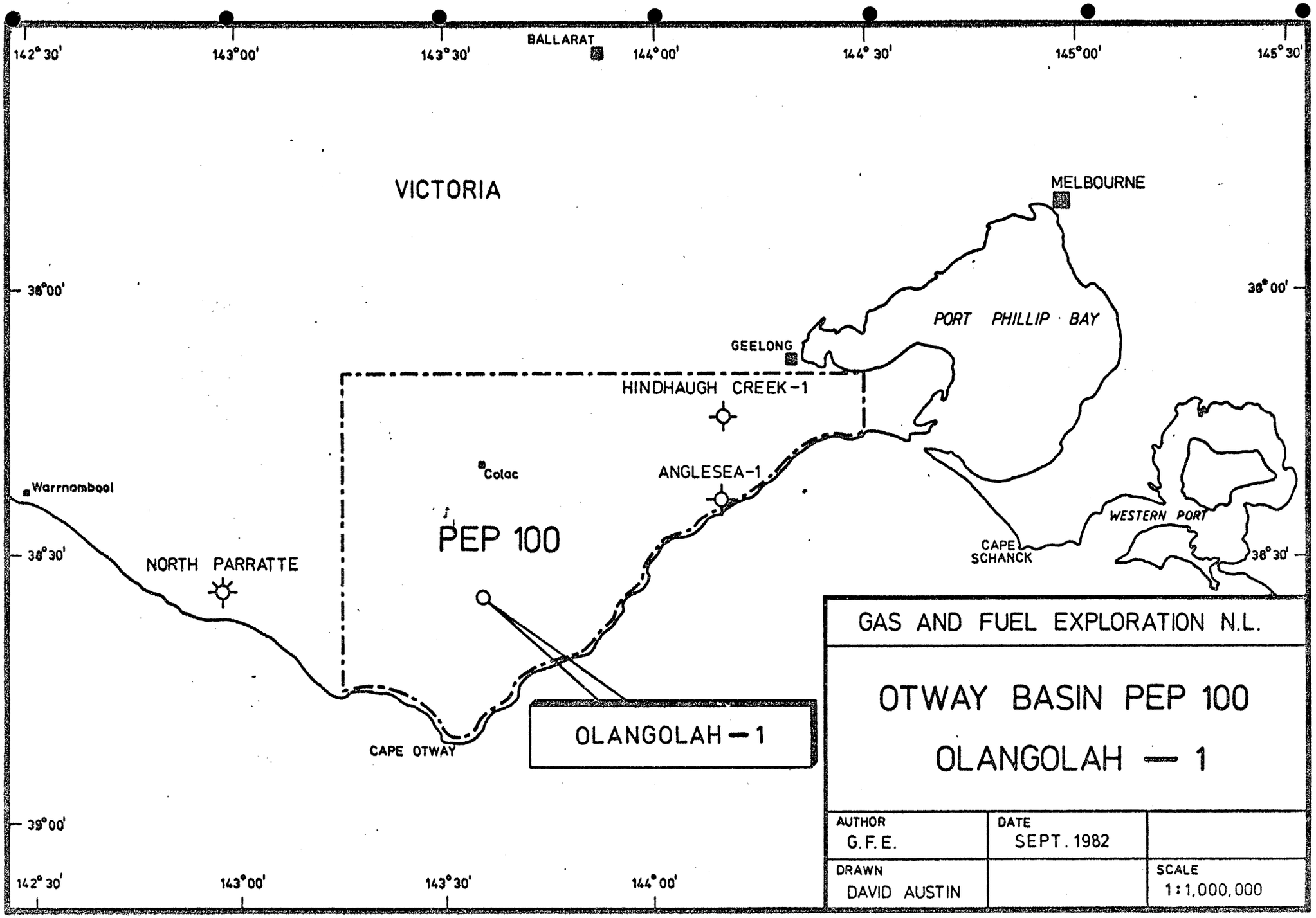

FIGURE 1 : LOCALITY MAP

2. WELL HISTORY

2.1	General Data		
2.1.1	Well	:	Olangolah - 1
2.1.2	Operator	:	Gas and Fuel Exploration N.L., 171 Flinders Street, Melbourne, 3000.
2.1.3	Tenement Holder	:	Gas and Fuel Exploration N.L., 171 Flinders Street, Melbourne, 3000.
2.1.4	Petroleum Tenement	:	Petroleum Exploration Permit 100.
2.1.5	District	:	Colac (1:250,000; SJ54-12)
2.1.6	Location	:	Latitude 38° 40' 20.71" S. Longitude 143° 38' 53.40" E. (Australian National Spheroid)
2.1.7	Elevation	:	Ground - 447.5M. Derrick floor - 454M.
2.1.8	Total Depth	:	2302M. (D.F.) Driller.
2.1.9	Date Drilling Commenced	:	5th May, 1982.
2.1.10	Date Total Depth Reached	:	13th June, 1982.
2.1.11	Date Well Abandoned	:	19th June, 1982.
2.1.12	Drilling Time	:	46 days (See Appendix I)
2.1.13	Status	:	Plugged and abandoned. Plugs: (1) 515M. - 468M., 75 sacks.
2.1.14	Total Cost	:	$1,402,692 as at 1/10/82.

2.2 Drilling Data

Detailed information is included in Appendix V and VI.

2.2.1 Drilling Contractor : Richter Drilling Pty. Ltd., 43 Creek St., Brisbane, Queensland.

2.2.2 Drilling Rig : National 610M. with a Dreco 133ft. mast stem, Dreco 20ft. self elevating sub-structure and $4\frac{1}{2}$" drillpipe.

2.2.3 Drawworks : National 610M., 750H.P. rating, $1\frac{1}{8}$" drilling line, National B2 Catheads. Satellite automatic drilling control. Parmac 281 hydro-matic brake.

2.2.4 Mud Pumps : Two National 8P-80 triflex single acting slush pumps driven by Caterpillar D398 TA series B deisel engines via National L shaped single engine V-belt independant pump driver.

2.2.5 Blow-out Preventors : - $13\frac{5}{8}$" C.I.W. double type "U"
- Hydril GK12".

2.2.6 Hole Sizes and Depths :

Hole size (ins.)		Depth - K.B. (M.)
$17\frac{1}{2}$	to	80
$12\frac{1}{4}$	to	511
$8\frac{1}{2}$	to	2302

for bit record see Appendix I.

2.2.7 Casing

Depth to shoe (in.)	Size (O.D. ins.)	Weight (Lb./Ft.)	Grade	Thread and Coupling	Safety Factors		
					Collapse	Burst	Tensio
13	24	Conductor			N/A		
80	$13\frac{3}{8}$	54	H-40	8R ST & C	High	High	High
511	$9\frac{5}{8}$	36	J-55	8R ST & C	2.55	1.53	High

2.2.8 Cementing

Casing Size (ins.)	Hole Size (ins.)	Type	Sacks (88 lb.)	Additives	Slurry Weight (ppg)
$13\frac{3}{8}$	$17\frac{1}{2}$	A	300	2% $CaCl_2$	15.6
$9\frac{5}{8}$	$12\frac{1}{4}$	A	350	2% prehydrated gel	13.7
			150	Neat	15.6

2.2.9 Drilling Fluid

See Appendix I.

2.2.10 Water Supply

Freshwater was delivered daily as required by road tanker, and was obtained from the Aire River approximately 8 kms. from the wellsite.

2.2.11 Plugging

At the request of the Department of Minerals and Energy no surface plug was set. The Department of Minerals and Energy will carry out this task after they run a temperature survey of the well.

Location	Sacks of Cement	Tested
515 - 468M.	75	-

2.2.12 Fishing Operations

At 508M. the pin of a $6\frac{1}{2}$" DC twisted off in $4\frac{1}{2}$" XH X $6\frac{5}{8}$" Reg. crossover to 8" DC. The fish was recovered by an overshot with a $7\frac{7}{8}$" spiral grapple.

At 1322M. a steel blade stabilizer became detached from the assembly and subsequently damaged the bearing on the bit. Full recovery of the junk was achieved by a fishing magnet.

At 2302M. hole problems caused the program to be abandoned. The sequence of events was as follows:

- The drill string became stuck in a suspected key seat whilst tripping for a new bit.
- Despite working the pipe with the kelly for $12\frac{1}{2}$ hours and spotting E-Z spot around the collars, the string could not be freed.
- Schlumberger ran a free point indicator which suggested the DC's were free to the top of the top stabilizer. The first string shot was unsuccessful at 1912M.
- Schlumberger ran in with the second string shot. Whilst working in left hand torque an accidental mechanical back off occurred at approximately 1188M. and damaged the Schlumberger line. The fish was re-engaged with the drill string.
- Successful mechanical backoff was achieved at approximately 1807M. The fish consisted of a bit, junk sub., float sub., 2 x $6\frac{1}{2}$" D.C., steel blade stabilizer, 1 x $6\frac{1}{2}$" D.C., steel blade stabilizer, 12 x $6\frac{1}{2}$" D.C. and an Eastman 30^{o} drift indicator.
- A $8\frac{1}{8}$" overshot dressed with a $6\frac{3}{8}$" spiral grapple was unable to reach the top of the fish. (Stopped at 1803).
- The hole was reamed over the intervals 737-768M., 1307-1337M. and from 1760M. to the top of the fish at 1809M.
- The fish was subsequently engaged on overshot. When jarred free, the fish broke out of the overshot and dropped to the bottom of the hole. A further attempt to engage the fish failed.

2.3 Location

A drilling site of 100 x 70M. was levelled and gravelled. The existing entry track was upgraded to allow access to the wellsite for heavy vehicular traffic. A bulldozer was kept on permanent standby to assist as needed with vehicle movements.

2.4 Formation Sampling

2.4.1 Ditch Cuttings

Ditch cuttings were collected at the shale shaker at 5M. intervals whilst drilling. Samples were distributed as follows:

One sample washed and dried	Department of Minerals and Energy.
Two samples washed and dried plus one sample unwashed.	Gas and Fuel Exploration N.L., 171 Flinders St., Melbourne, 3000.

The following additional samples were also taken and distributed as follows:

One sample unwashed every 100M., for fission track dating.	University of Melbourne, Swanston Street, Melbourne, 3000.
Two samples part washed and low temperature dried. 0-1000M. every 100M. 1000M.-T.D. every 50M..	Petroleum Geochemistry Group, Western Australian Institute of Technology, Bentley, Western Australia, 6102.
For organic petrology.	Keiraville Konsultants Pty. Ltd., 7 Dallas Street, Keiraville, N.S.W. 2500.

2.4.2 Coring

No coring operations were performed.

2.4.3 Sidewall Samples

A total of 30 sidewall sample shots were taken from different levels of which 21 were recovered in acceptable condition, 9 were empty. No bullets were lost. The cores were analysed palynologically by Dr. M. Dettman of Mines Administration Pty. Ltd., 10 Eagle Place, Brisbane, Q'ld. The remnants were stored with Gas and Fuel Exploration N.L. in Melbourne. See Appendix III.

2.5 Logging and Surveys

2.5.1 Wireline Logging

Wireline logging was performed by Schlumberger Seaco Inc. using an offshore skid mounted unit. Details of runs taken are tabulated below and the analysis of the logs in Appendix II and IX. A velocity survey was not run due to the non-availability of contractor personnel and equipment.

INTERVAL	LOGS
80 - 511M.	Induction Resistivity Sonic (ISF - Sonic) High Resolution Dipmeter Tool (HDT) Sidewall Core Tool (CST)
510 - 2090M.	Dual Laterolog (DLL) Bore Hole Compensated Sonic (BHC)
511 - 2154M.	High Resolution Dipmeter Tool (HDT) Sidewall Core Tool (CST)

See Enclosure 3.

2.5.2 Penetration Rate and Gas Logs

A standard Exploration Logging of Australia Inc. unit provided the mudlogging, penetration rate and gas recording services. The mudlog is included in the Composite Log. (Enclosure 1).

2.5.3 Deviation Surveys

A Totco double recorder was used to measure hole deviation up to 16°, and an Eastman 30° drift indicator was used for higher deviations encountered below 2237M.

Details of the deviation survey results are tabulated below.

DEPTH (M)	DEVIATION (DEGREES)	DEPTH (M)	DEVIATION (DEGREES)
80	1	996	6½
100	¾	1050	7¼
142	¾	1100	9
253	3	1123	8½
272	3	1148	8½
301	3¼	1179	9
320	3	1204	8
347	3	1236	8
376	3	1280	6
423	3¼	1320	6
460	4	1367	4
479	3¾	1409	2¾
498	4½	1480	1¾
517	4½	1556	2¾
526	4½	1635	2½
538	4¾	1745	12
547	5	1768	11½
573	5¼	1800	12
620	6¼	1843	10
636	6	1890	11
664	6¼	1937	12
695	7	1993	12
733	7	2040	10
767	6	2086	12
799	6	2165	13½
845	6	2219	16
899	6	2237	16
949	6½	2284	17

2.5.4 Temperature Survey

No temperature logging operations were performed.

2.6 Testing

No drill stem testing or wireline testing were performed.

3. GEOLOGY

3.1 Regional Geology

The Otway Basin is an east-west treading trough extending from Cape Jaffa in South Australia to the west coast of Tasmania. It contains up to 8000 metres of Lower Cretaceous to recent sediment and covers an areal extent of some 105,000 kms.

To the north thick Lower Cretaceous to Tertiary strata are either faulted, or pinch out against a shallow basement of Palaeozoic igneous and metamorphic rocks which form the Lachlan Fold Belt. To the southwest the basin is contained by a basement high on the inner edges of the continental slope.

The Otway Basin succession may be divided into three suites related to the separation events of Australia and Antarctica They are from oldest to youngest, the Lower Cretaceous Otway Group, deposited in an intra-cratonic basin or prerift phase; the Upper Cretaceous to Palaeocene Sherbrook and Wangerrip Groups which are transgressive - regressive rift valley sequences, and the Eocene to Pliocene Nirranda and Heytesbury Groups, deposited in an open marine setting following continental separation. Unconformities mark the base of these suites suggesting uplift and erosional periods separate each depositional episode.

Otway Group

The Pretty Hill Sandstone is the lowermost unit of the Otway Group succession in the eastern part of the basin. This formation is Lower Neocomian in age and consists of up to 1590 metres of quartz sandstone along with interbeds of siltstone, shale and coal. Pink and brown garnet grains are characteristic accessory minerals. Porosities range up to 25% and permeabilities to a few darcies. (Ellenor, 1976). Distribution is erratic and thought to be largely restricted to the flanks of basement palaeohighs. The presence of exclusively non-marine fossils and the predominance of sedimentary structures consistent with tractional processes of stream flow suggest a fluvial depositional environment.

The Eumeralla Formation overlies the Pretty Hill Sandstone or may rest unconformably on basement. It ranges in age from Upper Neocomian to Albian and forms the bulk of the Otway Group succession. The formation is up to 3000 metres thick and consists mainly of immature, often argillaceous, fine grained sandstones, siltstones, carbonaceous claystones and minor coal. The source material is considered to have been alkaline intermediate contemporaneous volcanics. Two peaks of volcanic activity have been noted at 106 my and 123 my on the strength of fission track dating, (Gleadow and Duddy, 1980) the latter of which may account for what appears to be an inter-Eumeralla hiatus noted in some wells of the basin. Extensive diagenetic alteration of the volcanic detritus has generally destroyed all reservoir potential in the sandstone (Ellenor, 1976). The sequence is remarkably lithologically uniform and as yet no comprehensive stratigraphic subdivision has been made. The depositional environment appears to have been entirely terrestrial, probably fluvial.

The close of Otway Group sedimentation is marked by a period of differential uplift and erosion, as evident by the absence of the Sherbrook Group east of the Otway Ranges and the geometry of Upper Cretaceous and younger sequences in the Port Campbell, Tyrendarra and Gambier Embayments.

There is some evidence to suggest that the Otway Ranges, at least, did not remain a structural high from that point in time until the present. The discovery of a single Tertiary fossil gastropod in the ditch cuttings at Olangolah - 1 suggests that at some time in the Tertiary that portion of the Otway Ranges received marine sedimentations and has since been uplifted.

Sherbrook and Wangerrip Groups

The Sherbrook Group ranges in age from Cenomanian to Maestrichtian and attains thicknesses of up to 3500 metres offshore. The sediments rapidly thin onshore, extending only to a distance of 30 km. parallel to the coastline in the Port Campbell and Tyrendarra Embayments and up to 70km. inland in the Gambier Embayment. The sequence is absent east of the Otway Ranges in the Torquay Embayment.

The Sherbrook Group consists of the basal Waarre Formation followed by the Flaxman, Paaratte and Curdies Formations.

The Waarre Formation is composed of fine to locally very coarse grained, often argillaceous sandstones, interbedded with minor siltstones and carbonaceous shales. The lower part of the formation was deposited in a paralic environment while the upper parts of the sequence are considered to be of entirely terrestrial origin. (Hawkins and Dellenbach, 1971).

The Flaxman Formation represents the first definite marine trangression into the Otway Basin. The unit consists of marine shales, glauconitic sandstones and a characteristic ferruginous oolitic sandstone (Ellenor, 1976).

The Paaratte Formation includes the Belfast Mudstone and the Nullawarre Greensand Members. The formation consists of intertonguing glauconitic quartz sandstone and siltstone deposited in a marginal marine to marine environment. (Douglas and Ferguson, 1976).

The Curdies Formation consists of quartz sands, coal and minor siltstone, deposited under fluvial conditions.

The Wangerrip Group ranges in age from Palaeocene to early Eocene and has an average thickness of about 240 metres. The basal unit consists of marine sandstones and shales, the Pebble Point Formation, and conformably underlies the paralic sandstones, shales and minor coals of the Dilwyn Formation.

Nirranda and Heytesbury Groups

The Nirranda and Heytesbury Groups represent the onset of truly marine conditions following continental breakup.

The Nirranda Group comprises the Mepunga Formation (ferruginous quartz sands and limonitic sandy limestone) and the Narrawaturk Marl (fossiliferous, olive-green to brownish marls and muddy limestones with some calcareous sandstone units) and ranges in age from Eocene to early Oligocene.

The group is known only from subsurface sections and is absent in the Torquay Embayment where the time equivalent Boonah Sandstone (fluviatile quartz sands) and Demon's Bluff Formation (marginal marine sands and clays) is deposited.

The Heytesbury Group ranges in age from Oligocene to Miocene. It is comprised of the Clifton Formation (limonitic bryozoal calcarenite to limonitic calcareous quartz sands and sandstones); the Gellibrand Marl predominantly greyish marls with some calcareous clay and silt and clayey limestone); and the Port Campbell limestone (predominantly limestone with some marls).

3.2 Previous Work

Petroleum exploration in the Otway Basin began in the late 19th Century after reports of stranded bituminous material along the coastline and numerous oil seepages throughout the area. (Spencer-Jones and Kenley, 1971).

Early wells were drilled with little knowledge of the local geology and had disappointing results.

Detailed geological mapping of the area commenced in the late 1940's as a joint Geological Survey of Victoria and South Australia project. (Spencer-Jones and Kenley, 1971).

In 1953 the discovery of oil at Rough Range in Western Australia promoted petroleum exploration throughout Australia. Later that year the Frome-Broken Hill Company Pty. Ltd. began what was to be a long and unsuccessfull venture in the Otway Basin. Frome-Broken Hill were joined by Shell Development (Australia) Pty. Ltd. as operator in 1966. The group pulled out of the Otway Basin in 1976 after having drilled some 14 wells, and declared the area unprospective. (McPhee, 1980).

Moderate geophysical exploration has been undertaken. There is aeromagnetic coverage of the entire basin and gravity coverage of most of the onshore portion. Seismic coverage onshore has been hampered by terrain, volcanics, sand dunes and cavernous limestones, and much of the earlier data is of poor quality. Offshore seismic coverage is fairly dense and a number of new projects have recently been completed by Esso Australia Ltd. and Phillips Australian Oil Company.

Since 1953 more than 33 onshore wells and 13 offshore wells have been drilled in the Otway Basin. The recent Port Campbell gas finds in the Upper Cretaceous Waarre Formation are the most encouraging results of this work. Production testing resulted in a sustained flow of 9.5 MMCFD through a 7/16" choke from North Paaratte - 1, 9.3 MMCFD (15/32" choke) from North Paaratte - 1, 7.3 MMCFD (7/16" choke) from Grumby - 1, 9.8 MMCFD (15/32" choke) from Wallaby Creek - 1. Significant shows include Port Campbell - 1 which flowed gas at a rate of 4 MMCFD with 6 barrels per day of 65° API condensate in a DST of the Waarre Formation; Pecten - 1 which flowed at a rate of 145 MCFD plus 615 BWPD on a DST of the Waarre Formation; Port Campbell - 4 which produced 4 bbl of 35° API free oil with a small quantity of gas from two DST's of the Lower Cretaceous Eumeralla Formation and Flaxmans - 1 which flowed wet gas at a rate of 250 MCFD with minor condensate from the Eumeralla Formation.

No wells had been drilled in the Otway Ranges prior to Olangolah - 1. The closest to the ranges are Fergusons Hill - 1 and Sherbrook - 1 to the west, and Hindhaugh Creek - 1 and Anglesea - 1 to the east.

Petroleum Exploration Permit 100 encompasses 5175 sq. kms. which previously formed parts of P.E.P. 6 and P.E.P. 68, held by FBH-Shell and Pursuit Oil respectively. The permit was granted to Gas and Fuel Exploration N.L. (G.F.E.) on the 26th of November, 1980.

G.F.E. began a field mapping program and air photo interpretation in early 1981 and has since redefined the structure of the Otway Ranges.

3.3 Olangolah - 1 Stratigraphy

See also the well index sheet below.

3.3.1 Tertiary (Surface to ? 13M.)

Minor surface deposits of Tertiary age are suggested by the presence of a single fossil gastropod in the ditch cuttings from a depth of 35 - 40M.

The fossil is probably referable to Cerithiderma accrescens, a common species in Lower Miocene sediments (P. Bock, pers. comm.).

Since the ditch cuttings themselves appear to be of Lower Cretaceous age, the fossil is suspected of having originated from the mud sump.

3.3.2 Otway Group

Eumeralla Formation (? 13M to 2302M)

Lithology. Siltstones predominate throughout the entire sequence. They are remarkably uniform lithology and are characteristically light to medium grey, moderately hard and very argillaceous with occasional quartz and feldspar fragments. Micaceous and fissile rock chips were common, as were fine calcitic and quartzitic veins.

The sandstones were generally light to medium grey, moderately soft to hard, very fine to fine grained with clear and milky, subangular to subrounded, moderately sorted quartz and subangular feldspar. The sandstone was also very argillaceous and was variously cemented by silica, feldspar and calcite. Minor lithologies include coal (with associated pyrite), claystones and carbonaceous shales.

Age ? Neocomian - Albian.

Environment. Continental.

See Appendices III and IV for Sidewall core and cuttings descriptions.

G.F.E. WELL INDEX SHEET — ISSUED: 19/8/82 REVISED: — BY: B. Rayner APPROVED: G.K. Pearson

COMPANY: GAS AND FUEL EXPLORATION N.L.
SPUDDED: 5TH MAY, 1982
COMPLETED: 19TH JUNE 1982 T.D.: 2302M.
STATUS: P/A ELEV. GL/~~SF~~: 447.5M.
~~RT~~: 454.3M.
DATUM: M.S.L. 1st FLANGE:

WELL: OLANGOLAH - 1 NO. 1
BASIN: OTWAY
TENEMENT: P.E.P.100
LAT.: 38°40' 20.71" S LONG.: 143°38' 53.4" E
NORTHING: EASTING:

FORMATION / MARKER	KEY	TOPS (m) DRILL	TOPS (m) SUB SEA	LITHOLOGIC SUMMARY / PALEO DATING	REMARKS / SHOWS
TERTIARY	T	7 ?	+ 448 ?	Sst, Siltstone	Thin surface marine deposits
EUMERALLA	K1	13 ?	+ 441 ?	Sst, Siltstone, Sh.	
T.D.		2302	-1848		

CORES

Nº	DEPTH (m)	REC	LITHOLOGY	Nº	DEPTH (m)	REC	LITHOLOGY

LOGS

IES ☐ BSGR ☐ FDC ☐ SNP ☐ HDT ☒ CDM ☐ GRN ☐ CBL ☐ CCL ☐ ISF SONIC ☒
MUD ☒ C GPH ☐ PWL ☐ REPORT ☐ DLL ☒ ML/PL ☐ DIP PLOT ☒ VEL SURV. ☐ ☐ BHC - SONIC ☒
SWC 30 DITCH SAMPLES at 5M. INTERVALS STORED G.F.E.

CASING TUBING

SIZE (" x lb/ft)	$13\frac{3}{8}$" x 54		$9\frac{5}{8}$" x 36				
LANDED AT (m)	80		511				
CEMENT (SACKS)	300		500				

TEST RESULTS: FLUID ANALYSES. LOST CIRCULATION (INTERVALS. CAUSES): PLUG TOPS: REMARKS

(1) LOST CIRCULATION AT 508M. A CEMENT PLUG SET ON THE BOTTOM FAILED TO RECTIFY THE PROBLEM. RETURNS WERE FINALLY SUSTAINED AFTER ADDING L.C.M. (SAWDUST), WHICH PLUGGED THE FRACTURE ZONE.

(2) THE WELL WAS PLUGGED OVER THE INTERVAL 468 - 515M. NO SURFACE PLUG WAS SET AT THE REQUEST OF THE DEPARTMENT OF MINERALS AND ENERGY.

3.4 Olangolah Structure

Geological mapping has demonstrated the existence of anticlinal and faulted structure in the Otway Ranges. Open, plunging, upright folds with a wavelength of one to five kilometres are recognised throughout the ranges.

A major feature in the region of Olangolah - 1 is an anticlinal axis trending northeast-southwest, which has been termed the Seaview Ridge Anticline. Second generation of folding is also evident which has a northwest - southeast trend. About an axis joining Gellibrand and Skenes Creek the Seaview Ridge anticline plunges to the southwest west of the axis, and to the northeast east of the axis.

Monoclinal zones of steep dip occur in the ranges, especially inland from Skenes Creek and near Barramunga. In such a structurally complex area it seems very likely that faulting of considerable magnitude has occurred. However, the lack of distinctive marker beds makes it impossible to measure the displacement and magnitude of fault throw.

3.5 Relevance to the Occurrence of Petroleum

Apart from a number of minor gas shows recorded throughout the well no hydrocarbons were noted in Olangolah - 1. See Enclosure 1. The electric logs did not reveal the presence of any hydrocarbon bearing intervals. The gas shows are thought to have originated from thin coal horizons and some gas filled fractures. Generally porosities are poor (averaging less than 10%). See Appendix II.

Geochemical rock evaluation has shown that although the samples have a moderate level of total organic carbon and hence once capable of being a petroleum source, the level of free petroleum and pyrolysable petroleum is extremely low. (See Appendix VII). Vitrinite reflectance studies on the sediments have shown that they have been heated to approximately 200-300°C. The oil generation "window" is believed to range between 75°C and 130°C.

The conclusion from these studies is that the sediments may well have once generated and expelled oil and/or gas but are now overmature.

Formation waters are very fresh (1000 ppm NaCl) except for the zone 430 - 510M. where salinity rose to between 8,000 and 16,000 ppm NaCl.

3.6 Reservoirs

Sandstone porosities calculated over suitable intervals ranged from 5% to 24% (see Appendix II). The shallow parts of the hole yielded the lowest porosities, and the highest was 24% at a depth of 1975M.

The sonic log indicated two well defined low velocity zones at 1208.5 - 1234M. and 1238 - 1250M., where the estimated porosity

averaged 18 - 20%. The units, however, proved to be very argillaceous sandstone (S.W.C., 1212M.) and these calculations based on the sonic log are considered to be misleading. Elsewhere in the formation porosities are very poor to nil.

Log derived water saturations were in excess of 71% and were presumably 100%.

In conclusion, no significant inter-Eumeralla porous zones were penetrated in Olangolah - 1, and those sandstones that were encountered were very argillaceous and close to water saturated.

3.7 Contribution to Regional Geology

The presence of a single Tertiary gastropod in the drill cuttings suggest that sediments of this age once covered this part of the Otway Ranges (present elevation + 448M. S.L.).

The Lower Cretaceous sequence in the Otway Ranges was thicker than expected. Spores and pollen grains from the area around the wellsite were examined by Dettman in 1964. Dettman found some evidence for correlating these assemblages with horizons between 2145M. and 2239M. in the Fergusons Hill - 1 well. Since Fergusons Hill - 1 encountered basement at approximately 3509M. the projected total depth for Olangolah - 1 of 1800M. should have achieved the primary objective of the program. However drilling had not reached basement by 2302M. The palynological report on selected sidewall cores from Olangolah - 1 (see appendix VIII) was inconclusive because of the poor preservation of the spore and pollen grains. A broad correlation of electric logs from Olangolah - 1 with those of Fergusons Hill - 1 and Hindhaugh Creek - 1 wells suggest that basement may be at 2500M. in Olangolah - 1.

Vitrinite analysis has revealed that the sediments have been exposed to temperatures in the order of 200-300°C, consistent with the emplacement of a major igneous intrusion.

4. CONCLUSION

Olangolah - 1 did not achieve its primary objective, which was to establish the existence of the Pretty Hill Sandstone in that portion of P.E.P.100. Severe hole deviation problems eventually forced the well to be abandoned prior to reaching basement.

However, the high temperatures to which these sediments have been exposed, the absence of any significant hydrocarbon shows and the paucity of suitably porous sandstone bodies downgrades the petroleum prospectivity of the Otway Ranges.

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APPENDIX I.

GAS AND FUEL CORPORATION OF VICTORIA

DRILLING FLUID RECAP

OLANGOLAH #1

July 1982

CONTENTS

BAROID AUSTRALIA PTY. LIMITED

NL INDUSTRIES

WELL SUMMARY

Baroid Engineers: ROGER ARNOLD
MARK THACKRAY

	Operator	:	Gas and Fuel Corp. of Victoria
	Well Number	:	Olangolah #1
	Location	:	Otway Basin, P.E.P. 100
	Contractor	:	Richter Drilling
	Rig	:	#7
	Total Depth	:	2302m
	Water Depth/KB to Ocean Floor	:	6.9m
	Arrived on Location	:	3 May 82
	Spud Date	:	5 May 82
*	Date Reached T.D.	:	19 June 82
*	Total Days Drilling	:	46
	Date off Location	:	21 June 82
	Total Days on Well	:	50
*	Total Cost of Mud Materials	:	$24,853.72
*	Mud Costs/m	:	$10.83
*	Mud Costs/day	:	$540.30
	Engineer Service (30 days) @ $ 275	:	27 days R. Arnold) 3 days M. Thackray) $8250.00
	Total Cost Materials and Engineer Service	:	$33,103.72
	Mud Materials not Charged to Drilling	:	-0-
	Engineer Service Not Charged to Drilling	:	-0-
	Casing Program	:	Surface: 13.3/8" @ 80m Interm. 9.5/8" @ 511m

* Calculated as from actual spud to P and A or final casing run and testing program started etc.

GAS AND FUEL CORP. OF VICTORIA

OLANGOLAH #1

DISCUSSION

Phase 1

17½" Hole

Olangolah #1 was spudded in on 5 May 82. A high viscosity gel-water mud was used to drill the 80m. After 15 hours of drilling a wiper trip was made and the hole circulated clean. Seven joints of 13.3/8" casing were run to bottom and cemented in place.

Phase II

12¼" Hole

The 13.3/8" casing shoe and 20m of new hole was drilled out. The BHA was changed to a stiffer assembly and drilling continued.

Surveys were taken approximately every 25m with deviation not exceeding 3°. ROP averaged 5 - 6 m/hour. At 508m the pipe twisted off and the bit and 8 collars were left in the hole.

An overshot assembly was picked up and the fish recovered on the first attempt. When drilling was resumed total loss of circulation was encountered. The lost circulation zone was repaired by setting a cement plug on bottom and adding 5m³ of sawdust to the mud. The hole was drilled to 511m then logged. A wiper trip was made then 9.5/8" casing ran to bottom and cemented in place.

DISCUSSION (Cont'd)

Phase III

8½" Hole

The 9.5/8" casing shoe was drilled out with mud. As drilling continued the mud was gradually diluted back to water. The mud weight and viscosity averaged 8.6 ppg and 26 sec/qt respectively.

Except for a couple of insignificant drilling breaks of 6-7m/hour, the ROP averaged 1-3m/hour throughout the 8½" hole.

Regular surveys showed erratic deviations which would eventually cause serious key-seats. Listed below are various depths and deviations.

547m	5¼°
799m	6°
1,123m	8½
1,236m	8°
1,320m	6°
1,480m	1.3/4°
1,744m	12°
1,846m	10°
2,221m	16°
2,284m	17°

At 1,750+m the hole began to feel tight on connections and after surveys GEL and CMC-XHV was added to increase viscosity from 26 to 30, decrease filtrate from 25 to 6, and improve hole cleaning.

DISCUSSION (Cont'd)

These mud properties proved quite adequate and economical for drilling the siltstone and sandstone that prevailed.

In fact, the formation remained virtually unchanged during the entire 8½" hole.

Pipe failures proved a serious problem on this well. At least 6 wash-outs were encountered. A new string of drill pipe was received and this replaced about 2/3 of the old string. Corrosion inhibitors were added at the suction and a corrosion ring inserted in the kelly to monitor corrosion.

At 2,302m the bit was being pulled when it got stuck at 1952m. Working the pipe and spotting E-Z spot around the collars could not free it. The free point was located and the pipe backed off just above the collars.

After three days of working with jars, overshots etc, the 145m BHA could not be recovered. It was decided to quit fishing, run the necessary logs and abandon the well.

A wiper trip to the top of the fish was made and the hole circulated clean. Schlumberger ran an HDT log and Dip Meter, then took sidewall core samples.

Halliburton was called to mix a 75 sack cement plug. The plug was set at 515m and the top was tagged at 468m. The BOP's were nippled down and the rig released at 1300 hours, 19 June 1982.

BIT RECORD

COUNTRY	STATE	FIELD	LOCATION
AUSTRALIA	VICTORIA	P.E.P. 100	OTWAY BASIN

WELL	CONTRACTOR	RIG
ORLANGOLAH #1	RICHTER	#7

OPERATOR	TOOL PUSHERS	SPUD	REACHED T.D.
GAS & FUEL CORPORATION		5 MAY 1982	19 JUNE 1982

UNDER SURFACE	UNDER INTER.	PUMP NO.1 LINER	PUMP NO.2 LINER	PIPE COLLARS	MUD
13 3/8" @ 80m.	9 5/8" @ 511m..				GEL/CMC L.V.

no.	size	make	type	jets 32nd	depth out(m)	mtrs.	hours	m/h	accum. drlg. hours	tonne 1,000	rpm	ver. dev.	pump pres. psi.	spm 1	spm 2	mud wt.	mud vis.	mud w.l.	formation, remarks	Dull	Cond	
1	17½	HTC	OSC 3AJ	3x18	80	68	15	4.5	15	5/15	50/80	1	400	120	120	8.8	46	13	Spud	2	2	1
2	12¼	HTC	X3A	3x16	160	80	22½	3.5	37.5	40	50	3/4	1100	100	100	8.7	35	13		3	2	1
3	12¼	HTC	J33	3x16	508	348	74	4.7	111.5	25/40	50/100	4°	1325	100	100	9.3	29	13		2	4	1
4	8½	HTC	J3	3x10	548	38	23.5	1.6	135	15	120	5°	1600	120	-	8.5	28	NC	Drilled hole	3	3	1
5	8½	HTC	J22	3x10	1110	562	87.7	6.4	222.7	20/30	80/100	9°	1700	110	-	8.6	28	NC	Stiff BHA	7	7	1/8
6	8½	REED	HS51	3x10	1236	126	31.9	3.9	254.6	15/20	100/120	-	1750	110	-	8.6	28	NC	Plugged jets	2	4	1
7	8½	HTC	J22	3x12	1322	86	20.9	4.1	275.5	20	90	6°	950	110	-	8.6	27	NC	Siltstone, Sandstone Sandstone	2	7	1
8	8½	HTC	JD3	3x12	1367	45	15.0	3.0	240.5	25	80	4°	1650	110	-	8.6	26	NC	Siltstone Sandstone	6	2	1
9	8½	HTC	J22	3x10	1535	168	29.6	5.7	320.1	30	80	2°	1650	110	-	8.7	26	NC	Pulled for W/O	-	-	-
10	8½	HTC	J22	3x10	1765	230	44.4	5.2	369.5	30	80	12	1675	110		8.8	27	NC	Bit trip	7	5	1
11	8½	HTC	J33	3x10	1903	138	48.6	2.8	413.1	27	60/80	12	1775	110		8.9	33	6.0	Pulled for washout	7	5	1
12	8½	HTC	J33	3x10	2089	186	84.5	2.2	497.6	25	60/80	12	1800	110		8.9	32	5.8	Logging point	4	4	1

no.	size	make	type	jets 32nds	depth out(m)	mtrs.	hours	m/h	accum. drlg. hours	tonne wt.	rpm	ver. dev.	pump pres. psi.	spm		mud			formation , remarks
														1	2	wt.	vis.	w.l.	
13	8½	HTC	J33	3x10	2302	213	91.2	2.3	5888	20	90	17°	1850	110		89	30	6.0	left in hole
14	8½	HTC	J2	3x12		(Ream and clean out to fish)													

BAROID DIVISION N.L. INDUSTRIES
DRILLING FLUID PROPERTY RECAP

Company GAS AND FUEL CORP. OF VICTORIA
Well OLANGOLAH #1
Contractor/Rig RICHTER RIG #7

ate May	depth m.	hole size "	temp. °C.	wt. p/g	vis. sec.	P.V.	Y.P.	gels 10 SEC.	gels 10 MIN.	w.l. a.p.i	cake mm	w.l. hpht	°C	filtrate anal. pf	filtrate anal. Cl.ppm	filtrate anal. Ca.	sand %	retort anal.% oil	retort anal.% wat.	retort anal.% sol.	mbc kg/m³	PH	activity	formatio
5	67	17½		8.8	46					13.5										4		9.5	Drilling	
6	80	17½		8.8	65															4			Rng Casing	
7	95	12¼		8.6	40					13										3		10	Drilling	
8	145	12¼		8.7	37					14										4		10	Drilling	
9	256	12¼		8.9	32					13										6		9.0	Drilling	
10	364	12¼		9.3	33					14							TR			10		11.0	Drilling	
11	472	12¼		9.1	28					15										8		10.5	Drilling	
12	473	12¼		9.1	29					-										8		10.0	Drilling	
13	508	12¼		9.0	30					16										7		9.5	Set cement plug	
14	508	12¼		-	-					-										-		-	Running casing	
15	512	8½		8.6	26					100										2		11.5	Drilling	
16	530	8½		8.6	26					120										2		11.8	Drilling	
17	600	8½		8.5	26					115										2		11.5	Drilling	
18	740	8½		8.5	27					110										2		11.5	Drilling	
19	870	8½		8.5	27					116										2		11.0	Drilling	

BAROID DIVISION N.L. INDUSTRIES
DRILLING FLUID PROPERTY RECAP

Company GAS AND FUEL CORP. OF VICTORIA
Well OLANGOLAH #1
Contractor/Rig RICHTER RIG #7

date May	depth m.	hole size "	temp. °C.	wt. p/g	vis. sec.	P.V.	Y.P.	gels 10 SEC.	gels 10 MIN.	w.l. a.p.i	cake mm	w.l. hpht °C	filtrate anal. pf	filtrate anal. Cl.ppm	filtrate anal. Ca.	sand %	retort anal.% oil	retort anal.% wat.	retort anal.% sol.	mbc kg/m³	PH	activity	formati
20	1048	8½		8.6	26					NC									3		10.5	Drilling	
21	1110	8½		8.5	25					NC									2		9	Drilling	
22	1178	8½		8.7	26	-	-			NC	1		.2	400		TR		96	4		9.5	Drilling	
23	1236	8½		8.6	26					NC			.3	500	40	TR		97	3		9.5	Drilling	
24	1311	8½		8.6	25					NC			.2	600	40	TR		98	2		9.5	Drilling	
25	1340	8½		8.6	26					NC			.4	600	40	TR		98	2		10	Drilling	
26	1410	8½		8.6	26					NC			.4	600	40	TR		98	2		10.5	Drilling	
27	1535	8½		8.7	26					26			.6	800	40	TR		97	3		10.5	Drilling	
28	1620	8½		8.7	26					28			.8	1,000	20	TR		97	3		11.0	Drilling	
29	1747	8½		8.7	27					28			.5	1,000	20	TR		96	4		10.0	Drilling	
30	1768	8½		8.8	27					26			.8	1,000	20	TR		96	4		10.5	Drilling	
31	1830	8½	40	8.8	29	3	2	0	0	12	1		.6	1,100	10	TR		95	5		10	Drilling	
June 1	1890	8½	41	8.9	31	7	4	0	1	6	1		.5	1,000	10	TR		94	6		10	Drilling	
2	1920	8½	42	8.9	33	9	6	1	3	4.5	1		.9	900	10	TR		94	6		11	Drilling	
3	1975	8½	43	8.9	30	5	3	0	1	6	1		.8	1,100	10	TR		94	6		10.5	Drilling	
4	2020	8½	45	8.9	31	6	3	0	2	6	1		.8	1,200	10	TR		94	6		10.5	Drilling	

BAROID DIVISION N.L. INDUSTRIES
DRILLING FLUID PROPERTY RECAP

Company GAS & FUEL CORP. OF VICTORIA
Well OLANGOLAH #1
Contractor/Rig RICHTER #7

date June	depth m.	hole size "	temp. °C.	wt. p/g	vis. sec.	P.V.	Y.P.	gels 10 SEC.	gels 10 MIN.	w.l. api	cake mm	w.l. hpht	w.l. °C	filtrate anal. pf	filtrate anal. Cl.ppm	filtrate anal. Ca.	sand %	retort anal.% oil	retort anal.% wat.	retort anal.% sol.	mbc kg/m³	PH	activity	formatio
5	2066	8½	47	8.9	31	7	4	1	2	5	1	-	-	1.0	1,200	10	TR	-	94	6	-	11	Drilling	Siltstone Sandstone
6	2089	8½	45	8.9	32	7	5	1	3	5.8	1	-	-	.7	1,400	10	TR	-	94	6		10	Drilling	Siltstone Sandstone
7	2092	8½	45	8.9	35	11	5	1	4	6	1	-	-	.7	1,300	<10	TR		94	6		10	Logging	Siltstone Sandstone
8	2137	8½	45	8.9	32	8	5	1	2	6.4	1	-	-	.8	1,200	6	TR		94	6		10.5	Drilling	Siltstone Sandstone
9	2152	8½	-	9.0	31	6	3	1	2	5.8	1			.8	1,300	10	TR		94	6		10.5	Drilling	Siltstone Sandstone
10	2160	8½	-	8.9	30	5	2	0	2	6.0	1	-	-	.7	1,100	10	TR	-	94	6		10.5	P/u new drill string	Siltstone Sandstone
11	2172	8½	-	8.9	31	6	4	1	2	6.0	1	-	-	.9	1,200	8	TR		94	6		11.0	Drilling	Siltstone Sandstone
12	2220	8½	45	8.9	31	6	3	0	2	6.8	1	-	-	.7	1,400	10	TR		94	6		10.5	Drilling	
13	2272	8½	45	8.9	32	7	3	1	2	5.5	1	-	-	.7	1,400	10	TR	-	94	6		10.5	Drilling	
14	2302	8½	-	8.9	30	6	2	0	2	6.0	1	-	-	.9	1,300	10	TR		94	6		10.5	Stuck pipe	
15	2302	8½	-	8.8	32	8	2	0	2	8.0	1	-	-	.6	1,400	8	TR		95	5		10	Jar on fish	
16	2302	8½	-	8.8	30	6	2	0	1	8.4	1	-	-	.5	1,400	10	TR		95	5		9.5	Fishing	
17	2302	8½	-	9.0	47	17	19	7	30	4.8	1	-	-	1.1	1,500	10	TR	-	94	6	-	11	Fishing	
18	2302	8½	-	8.9	41	12	9	2	16	7	1	-	-	.8	1,600	10	TR	-	95	5	-	10.5	Logging	
19	2302	8½	-	NO	T E S T																		P & A	

BAROID MATERIAL RECAP

COMPANY	GAS & FUEL CORP	MUD TYPE	WATER, GEL	PHASE HOLE SIZE	17½
LOCATION	OTWAY BASIN			INTERVAL TO	80m
WELL	OLANGOLAH #1	CONTRACTOR	RICHTER #7	FROM	7m
COST/DAY	$807.26	DRILLING DAYS/PHASE	2		
COST/M	$22.12	ROTATING HRS/PHASE	15		
COST/M/DAY	$11.06		TOTAL DRILLING		73m
COST/M³	$14.55	MUD CONSUMPTION FACTOR		1.52 m³/m	
COST/M³/DAY	$7.27	DATE	5 - 6 MAY 1982		

MATERIAL	UNIT	COST UNIT	QUANTITY				TOTAL COST	
			ESTIMATE	KG/M³	ACTUAL	KG/M³	ESTIMATE	ACTUAL
AQUAGEL	100 p	16.5			80			1,320.00
CAUSTIC		36.35			3			109.05
SODA ASH		12.95			3			38.85
CMC - XHV		64.00			1			69.00
CA. CL		13.77			6			82.62
DIESEL								
FRESH WATER	m³ (b)		111 (700)					
SEA WATER								
TOTAL MUD MADE			111					
COST LESS BARYTES								1,619.52
COST W/BARYTES								

COMMENTS Calcium Chloride used for cementing csg.

BAROID MATERIAL RECAP

COMPANY GAS & FUEL CORP
LOCATION OTWAY BASIN
WELL OLANGOLAH #1
COST/DAY $640.98
COST/M $10.41
COST/M/DAY $1.49
COST/M³ $21.78
COST/M³/DAY $3.11

MUD TYPE GEL , WATER
CONTRACTOR RICHTER
DRILLING DAYS/PHASE 7
ROTATING HRS/PHASE 96.5
MUD CONSUMPTION FACTOR 0.48 m³/m
DATE 7 - 13 MAY 1982

PHASE HOLE SIZE 12¼
INTERVAL TO 511m
FROM 80m
TOTAL DRILLING 431m

MATERIAL	UNIT	COST UNIT	QUANTITY				TOTAL COST	
			ESTIMATE	KG/M³	ACTUAL	KG/M³	ESTIMATE	ACTUAL
AQUAGEL		16.5			189			3036.0
CAUSTIC		36.35			6			218.1
Q-BROXIN		29.52			12			354.24
BICARB.		16.59			24			398.16
CMC - XHV		64.00			6			384.00
CAL. CHLORIDE	25 kg	13.77			7			96.39
SAWDUST	m³				5			
DIESEL								
FRESH WATER	m³ (B)		206 (1300)					
SEA WATER								
TOTAL MUD MADE								
COST LESS BARYTES								
COST W/BARYTES								4486.89

COMMENTS Hi water usage due to lost circulation zone.

BAROID MATERIAL RECAP

COMPANY GAS & FUEL CORP
LOCATION BEACH FOREST
WELL OLANGOLAH #1
COST/DAY $506.82
COST/M $10.47
COST/M/DAY $0.28
COST/M³ $39.9
COST/M³/DAY $1.08

MUD TYPE GEL, WATER, CAUSTIC
CONTRACTOR RICHTER ORLG #7
DRILLING DAYS/PHASE 37
ROTATING HRS/PHASE 477
MUD CONSUMPTION FACTOR 3.81 m³/m
DATE 14 MAY - 19 JUNE 1982

PHASE HOLE SIZE 8½
INTERVAL TO 2302
FROM 511
TOTAL DRILLING 1791

MATERIAL	UNIT	COST UNIT	QUANTITY				TOTAL COST	
			ESTIMATE	KG/M³	ACTUAL	KG/M³	ESTIMATE	ACTUAL
BARITE	100 p	7.0			40			280.00
AQUAGEL	100 p	16.5			600			9900.0
Q BROXIN		29.52			3			88.56
CAUSTIC		36.35			34			1235.9
CMC - Reg		62.3			18			1121.4
CMC - XHV		65.0			33			2112.0
BARA FLOC		6.7			3			20.1
SODA ASH		12.95			5			64.75
BC - 456	32 kg	65.0			8			520.0
SURFLO - H-35	205 l	858.2			1			858.2
COAT 632	205 l	581.4			1			581.4
E-Z SPOT	205 l	860.0			2			1720.0
CON - DET	205 l	250.0			1			250.0
DIESEL m³ (BBL)								
FRESH WATER m³	(BBL)		470 (2956)		3.5(22)			
SEA WATER								
TOTAL MUD MADE								
COST LESS BARYTES								18472.31
COST W/BARYTES								18752.31

COMMENTS Diesel used for E-Z Spot mixture

BAROID MATERIAL RECAP SUMMARY

COMPANY GAS & FUEL CORP
LOCATION OTWAY BASIN
WELL NAME OLANGOLAH #1
CONTRACTOR RICHTER #7
COST/DAY $540.3
COST/M $10.83
COST/M/DAY $0.24
COST/M³ $31.58
COST/M³/DAY -$0.69
RECAPPED BY Roger Arnold

MUD TYPES 1) WATER
2) GEL WATER, CAUSTIC NON DISPERSED

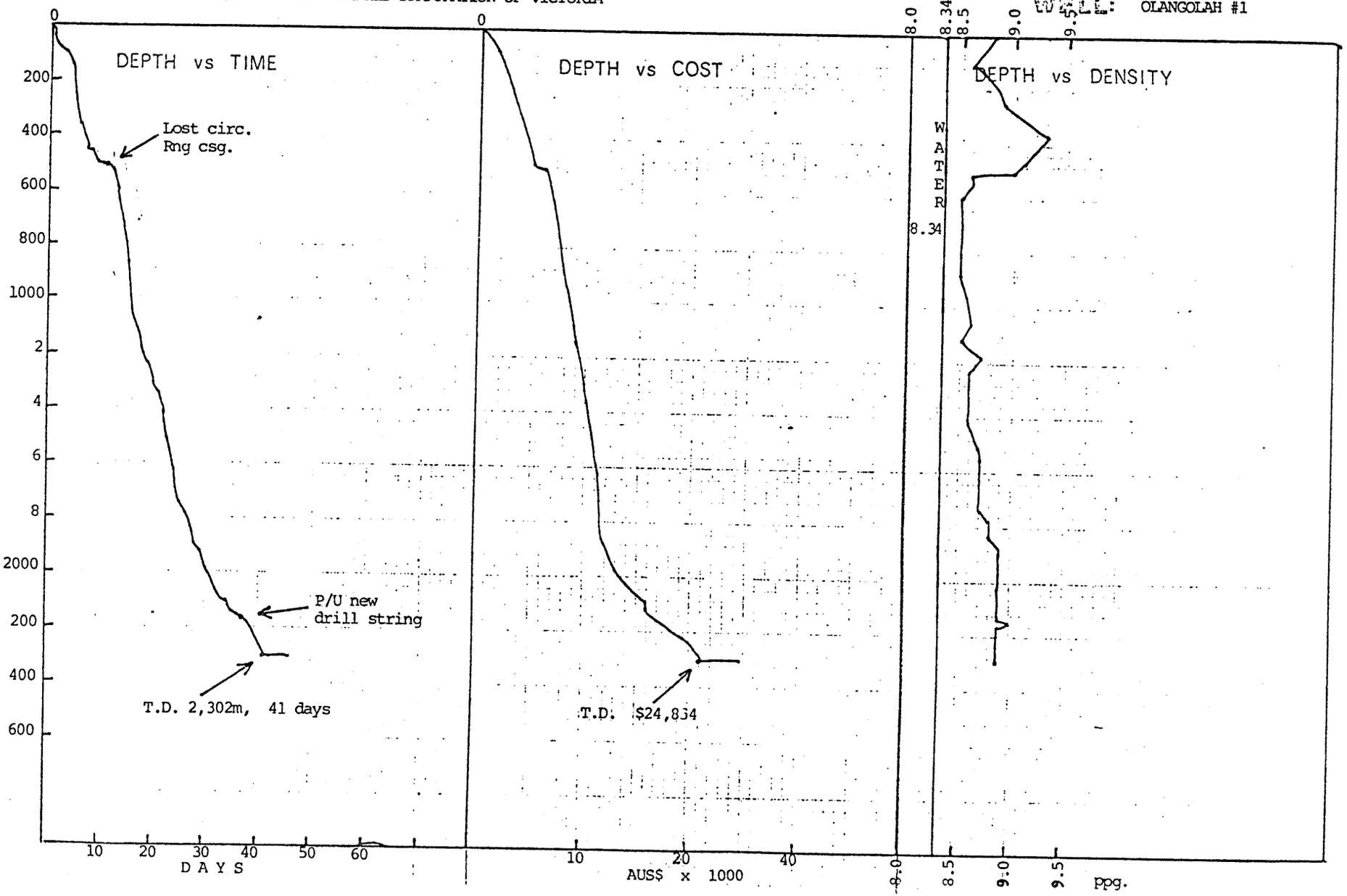
TOTAL DEPTH 2302
TOTAL ROTATING HRS. 589
TOTAL DAYS ON HOLE 46
DATE 5 MAY - 19 JUNE 1982
DATE OF RECAP 23 JUNE 1982

HOLE SIZE	AMOUNT HOLE DRILLING	DRILLING DAYS
RKB	(7)	
17½	73	2
12¼	431	7
8½	1791	37
TOTAL	2295	46
WELL AVERAGE MUD CONSUMPTION		

MATERIALS	UNIT	COST UNIT	QUANTITY ESTIMATE	KG/m³	ACTUAL	KG/m³	TOTAL COST ESTIMATE	ACTUAL
AQUAGEL	100 p	16.5			864			14256.00
BARITE	100 p	7.0			40			280.00
CAUSTIC		36.35			43			1563.05
Q-BROXIN	50 p	29.52			15			442.80
CMC - REG		62.3			18			1121.40
CMC - XHV		64.0			40			2560.00
SODA ASH		12.95			8			103.60
BICARB. OF SODA		16.59			24			398.16
CALCIUM CHLORIDE	25 kg	13.77			13			179.01
BC 456	32 kg	65.0			8			520.00
SURFLO - H-35	205 l	852.2			1			858.2
COAT 632	205 l	581.4			1			581.4
BARA FLOC		6.9			3			20.10
E-Z SPOT	205 l	869.0			2			1720.00
CON DET	205 l	250.0			1			250.00
SALVAGE MUD	m³							
DIESEL OIL								
FRESH WATER	m³		787					
SEA WATER								
TOTAL MUD MADE								
COST LESS BARYTES								
COST WITH BARYTES								
COMMENTS								24853.72

COMPANY: GAS AND FUEL CORPORATION OF VICTORIA

WELL: OLANGOLAH #1



APPENDIX II:

REPORT ON ELECTRIC LOGS FROM OLANGOLAH - 1.

The following logs were run:

80 - 511M.

Induction Resistivity Sonic (ISF - sonic)
High Resolution Dipmeter Tool (HDT)
Sidewall Core Tool (CST)

510 - 2090M.

Dual Laterolog (DLL)
Bore hole compensated sonic (BHC - sonic)

511 - 2154M.

High Resolution Dipmeter Tool (HDT)
Sidewall Core Tool (CST)

1. Formation Water Resistivity - Rw.

Rw was calculated from the SP log by using charts GEN-9, SP - 1 and SP - 2 of Schlumberger Log Interpretation Chart Manual.

Depth (M)	SP. Spontaneous Potential (volts)	Temp. (°F)	Rmf Resistance of mud filtrate (ohm-M)	Rw (ohm-M)	NaCl PPM.
255	-25	63.5°F	1.8	5	1,200
450	-43	69°F	1.65	0.4	16,000
500	-34	72°F	1.6	0.75	8,000
1000	-12	101°F	1.8	4	1,000
1500	-15	128.5°F	1.45	3.8	800
1950	- 8	153.3°F	1.22	5.5	450

2. Porosity - ϕ

Porosity was calculated from the interval transit time log using the Wyllie formula.

$$\phi = \frac{\Delta t_{log} - \Delta t_{ma}}{\Delta t_f - \Delta t_{ma}}$$

ϕ = porosity of formation

Δt_{log} = reading on sonic log of transit time in micro sec/ft.

Δt_{ma} = transit time of matrix material, taken as 51.5 - 55.5 micro sec/ft.

Δt_f = transit time of formation fluid, taken as 189 micro sec/ft.

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This formula assumes that the formation is clean, well compacted and with uniformly distributed pores. While the lithologies logged are well compacted, they are generally very argillaceous. This dispersed clay may be seen as water, and hence the true porosity may well be less than the calculated value.

Depth (M)	t_{log} micro sec/ft.	ϕ %
255	61.4	7%
720	57.1	5%
1215	82.9	20%
1475	73.6	14%
1477	65.7	10%
1720	60	7%
1975	87.1	24%
1986	73.6	14%

3. Water Saturation - Sw.

Water saturations were calculated in sandstones of reasonable porosity using the Archie formula.

$$Sw = \sqrt{\frac{Ro}{Rt}}$$

R_o = Resistivity of the formation when 100% saturated with water.

R_t = Resistivity of formation.

S_w = Water saturation.

This formula is designed for clean sandstone formations. As the formations under consideration are very argillaceous, a check calculation was made using the Indonesian equation which is more suitable for shaly sands, but rather more cumbersome to use.

Sandstone 1208.5 - 1234M.

Depth (M)	ϕ %	Ro ohm-M.	Rt ohm-M.	Sw (Archie) %	Sw (Indonesian) %
1210	13%	45	65	83%	76%
1211	16%	45	60	86%	
1212	19%	45	65	83%	
1213	20%	45	56	90%	

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Sandstone 1238 - 1250M.

Depth (M)	ø %	Ro ohm-M.	Rt ohm-M.	Sw (Archie) %
1241.5	18%	29	56	72%

Sandstone 1595 - 1611M.

Depth (M)	ø %	Ro ohm-M.	Rt ohm-M.	Sw (Archie) %
1604.5	8%	100	200	71%
1609.5	15%	100	150	82%

Sandstone 1974 - 1978M.

Depth (M)	ø %	Ro ohm-M.	Rt ohm-M.	Sw (Archie) %
1974.5	23%	55	60	96%

4. Bore hole Geometry.

The four arm high resolution dip-meter was run from 80M to 2154M. The results were computer processed for "Cluster", a process designed to clarify structural dips.

In addition caliper and bore hole deviation logs were run.

4.1 Structural dips were determined by selecting shale formations of constant dip.

Depth Interval (M)	Dip magnitude	Dip Direction
80-630	9-12°	W-WSW
780-980	8-13°	S-SE
1090	10°	SSW
1160	4°	E
1190	5°	NE
1470	74°	NNW
1550	70°	NNW
2090	8°	NNW

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Considering all dip results, the following patterns were observed.

Depth Interval (M)	Dip Magnitude	Dip Direction
80-670	9-12°	W-SW
670-800	6-30°	SE-E
850-1120	4-20°	S
1120-1170	4°	E
1170-1240	6-40°	N
1240-1480	Transition zone of few results and varied dip magnitudes and directions.	
1480-1570	50-85°	N
1570-1620	few dips - second transition zone.	
1650-1820	15-65°	N
1820-1850	30-80°	SSW
1880-2040	5-40°	NNE-NNW
2040-2150	4-26°	N-NW

4.2 Bore hole Deviation

Deviation reached a maximum of 15° however there were certain depths at which change was more rapid, these have been marked *.

Depth Interval	Deviation	Rate of Changed Deviation	Direction of Deviation	
80-480	0-3.5°	0.009°/M.(v low)	NW	
480-510	3.5-4.5°	0.03°/M.(mod high)	NW	*
510-650	4.5-7.5°	0.02°/M.(mod.)	NW→ W	
650-770	7.5-7°	0.004°/M(v low)	WNW	
770-820	7-5.5°	-0.03°/M.(mod high)	WSW	*
820-850	5.5°	0 (v v low)	W	
850-1030	5.5-8.2°	0.015°/M.(mod.)	W-WSW	
1030-1100	8.2-9.4°	0.017°/M.(mod.)	SW	
1100-1170	9°	0 (v v low)	SSW	
1170-1450	9-1.5°	-0.027°/M.(mod.)	SW	

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Depth Interval	Deviation	Rate of Changed Deviation	Direction of Deviation	
1450-1520	1.5°	0 (v v low)	N	
1520-1600	1.5-5°	0.044°/M.(high)	N	*
1600-1800	5-12°	0.035°/M.(high)	NNW	*
1800-1870	12-10°	-0.029°/M.(mod.)	NNW	
1870-2000	10-13°	0-023°/M.(mod.)	NNW	
2000-2030	13°	0 (v v low)	NNW	
2030-2130	13-15°	0.02°/M. (mod.)	NNW	
2130-2150	15-14°	0.05°/M.(v high)	NNW	*

Discussion.

1. Formation waters are generally very fresh with Rw lying between 4 and 5.5 ohm-M (salinities between 450 and 1200 PPM of NaCl). However between 430 and 510M. is a more saline zone where R_w is less than 1 (salinities 8,000 - 16,000 PPM of NaCl). The lower boundary of this saline zone is confused by the change of logging runs at 511M. It is possible that the saline zone may extend to 600M. or deeper. At 1000M. the R_w has returned to its original value of 4 ohm-M (1000 PPM of NaCl).

2. Porosities are very poor, generally averaging less than 10% and occasionally rising to 20%. The best value being 24% at 1975M.

   There are two well defined low velocity zones at 1208.5-1234M. and 1238-1250M. separated by a 4M clay band. Over this 37.5M. section porosities average 18-20%.

3. Lithologies are generally interbedded shale and shaly sandstone. The only zone of reasonable porosity at 1208.5 - 1250M. was very argillaceous.

   Gamma Ray values averaged 60-100 A.P.I. units.

   The clay index was obtained from the gamma ray log according to the formula.

$$V_{cl} = \frac{GR_{log} - GR_{min}}{GR_{max} - GR_{min}.}$$

   The clay index ranged from 0.5 - 0.6 in sandstones.

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4. Water saturations in all sandstones were greater than 71% indicating a very low hydrocarbon saturation.

   The Indonesian formula showed only a marginal improvement over the Archie formula for values of SW, and so the Archie formula was considered to give a reasonably accurate result.

   Choosing R_o, the resistivity of the zone when 100% saturated with water, is slightly arbitrary. For each sand R_o was chosen to give an optimistic value, and so the S_w values may be considered the best of a range of possible results. Despite this bias all S_w values were greater than 71% and so the sandstones had very poor hydrocarbon potential.

5. Structural dips fell into three groups, those to the west (80-630M.), those to the south (780-1090M.) and those to the north (1190-2154M.).

   Between 630 and 1470M. there were many changes in dip direction (S to E to N), and from 1240-1480M., and again from 1570-1620M. there were few dip results, and those that did exist, lacked a cohesive pattern. From 1480-1570M., and below 1620M. there were good dip results generally to NNW, commencing with high dips, 74° at 1480M., gradually decreasing to 8° at 2090M. At 1820-1850M. there was a zone of dips trending SSW.

6. Borehole deviation changed in both direction and magnitude and at times the rate of change of deviation was significant in that it could be correlated with other changes, such as dip. At 480-510M. the rate of change increased and this coincided with a change of R_w (more saline formation waters). At 770-820M. the rate of change decreased and this coincided with a change in both structural and total dips.

   At 1450M. the direction of deviation changed from SW to N, although the magnitude of deviation remained unchanged at 1.5°. This marked the end of the first transition zone of total dips and the beginning of the zone of very large magnitude dips (up to 85° to N).

   From 1520 to 1800M. the rate of change of deviation was large and this was through a second transition zone and the zone of steep dips mentioned in the previous paragraph.

   From 2130-2154M. (T.D.) the rate of change of deviation reached its maximum.

CONCLUSIONS:

1. Olangolah - 1 contains a very argillaceous sequence of clastic sediments.

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2. Four argillaceous sands were examined for porosity and water saturation. All had poor porosity (8 - 24%) and were water saturated (S_w between 71 and 96%).

R.K. INGRAM.

30th August, 1982.

APPENDIX III: Sidewall core sample descriptions.

DEPTH (M)	RECOVERY (CM)	DESCRIPTION
83.5	0.5	Siltstone, mottled lt. grey - med. grey: prominent calcite vein (2mm. wide) across sample; argillaceous; very hard.
235	1.5	Siltstone, light - medium grey; very hard; argillaceous matrix; trace bedding defined by carbonaceous laminae; with bright orange limonitic clays locally concentrated.
290	3.5	Sandstone; light grey; very fine - fine grained; very hard; subangular - subrounded; poor - moderate sorting; argillaceous matrix, occasionally calcitic; lithic fragments of rounded to subrounded white blebs; micaceous flakes present, very tight.
336.5	1	Sandstone; medium grey;"as above".
359	1.5	Silty sandstone; light - medium grey; very fine grained; moderately hard; argillaceous matrix; black and white speckled lithic fragments.
467	2.5	Siltstone; dark grey - black; moderately hard;
490	1.5	Sandstone; light grey; fine - medium grained; moderately hard; subangular - subrounded; poor - moderate sorted; cement in argillaceous with some intergranular calcite, lithic fragments of light grey - white grains and dark - black carbonaceous fragments, both are lineated, possibly bedding could be compaction, very tight.
658.6	2.2	Silty sandstone; light grey - medium light grey (N7 - N6); very fine, clear, subrounded - rounded grains, aften rimmed with white (zeolite?); occasionally grading to silt; slight trace dark unidentified mineral (possibly lithic fragment); moderately clayey, possibly from degraded feldspar grains; moderately hard, moderately fractured.
753.6	2.4	Shale; medium dark grey - dark grey (N4 - N3); argillaceous; brittle; occasionally very hard; fissile; very fractured; often slightly silty.
924.6	1.8	Shale; medium dark grey - dark grey (N4 - N3); hard, fissile; very fractured; occasionally moderately silty.

DEPTH (M)	RECOVERY (CM)	DESCRIPTION
1029	1.0	Siltstone; medium dark grey - dark grey (N4 - N3); hard; very fractured; moderately fissile; argillaceous; trace black vitreous mineral possibly coal. Fractures often filled with white - light grey clay.
1120	1.8	Siltstone; dark grey (N3); hard; moderately fissile; very fractured; very argillaceous: with good trace dispersed white irregularly shaped lithic fragments (shards ?).
1212	5.8	Sandstone; light - medium grey (N7 - N6); clear, white, very pale, cream grains probably predominently after feldspar with minor quartz and moderate interstitial white clays possibly from breakdown of feldspar. Occasional crystal possibly of feldspar; moderately soft.
1355	2.8	Sandy siltstone; medium - dark grey (N4); clear, subrounded grains grading silt to very fine sand, feldspathic and quartzose with abundant clay and interbedded with Silty Shale; dark grey (N3) very firm; fissile; hard; fractured.
1422.2	3.2	Siltstone; medium - dark grey - dark grey (N4 - N3); medium grey - white, clear, very fine - silty grains, probably of quartz and feldspar, variably cemented often with intergranular clay possibly produced from feldspathic breakdown; varying locally from hard to moderately soft, fissile, fractured.
1533	2.0	Siltstone; dark grey (n3); very fine, clear grains grading siltstone occasionally to very fine sandstone with trace white, fine - medium, irregularly shaped lithic fragments, argillaceous, hard, moderately fractured.
1640	2.9	Shale; greyish black (N2), moderately firm; fissile; very fractured; slightly silty; possibly finely micaceous?
1755	3.7	Silty Shale; dark grey (N3), very hard; fissile; very fractured with interbeds of feldspathic silt and with clays filling fractures.
1864.7	2.8	Siltstone; medium dark grey (N4); grading very fine Sandstone; very argillaceous, local concentrations of clear, angular feldspar, and interbedded with Shale; greyish black (N2); very hard; moderately fissile; probably feldspathic.

DEPTH (M)	RECOVERY (CM)	DESCRIPTION
1959	0.7	Shale; greyish black (N2); very hard; moderately fissile; occasionally slightly silty; including good trace clear, prismatic crystals, probably feldspar.

APPENDIX IV : CUTTINGS DESCRIPTIONS.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
10	15	100	Sandstone Orange-Brown, very fine, clear sub angular - angular, quartz, with abundant limonite clays, with interbedded yellow-orange limonite clays.
15	20	60	Sandstone - Orange-brown, fine-medium, clear, argillaceous, quartz, mod. W. sorted, W/SL Limonite clays.
		20	Silty Sandstone - Med. Grey, silt - fine sand, ang, clear quartz, W/clay matrix, grdg. grey silty claystone.
		20	Claystone - Yellow brown claystone.
20	25	100	Sandstone - Orange-yellow, sub ang., very fine grain moderately well sorted, moderately argillaceous with trace dark sub ang. grains, poss. lithic fragments. With clear HD. prob. silica cement.
25	30	100	Sandstone Light-medium grey, fine - very fine, poorly sorted quartz, with clear silica cement, very tight.
30	35	90	Sandstone Medium grey, fine grain, ang., clear, quartz, very argillaceous, very soft, slight trace mic.
		10	Sandstone Light-medium grey, W. sorted sub Rounded - sub ang., quartz with trace clay matrix very poor porosity.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
35	40	80	Sandy Siltstone - med. grey, argillaceous, mod. soft.
		20	Orange - limonitic claystone, and light-med. grey sandstone A/A - poss. cavings.
40	45	100	Sandy Siltstone - med. grey, very fine, with slightly argillaceous matrix, mod. soft, very light, poor por. with interbeddings grey, clay, slightly calc. cement. Trace calcite in fracture.
45	50	80	Sandy Siltstone - med.-dark grey, very fine grain (0.125 - 0.062 mm), mod. sorted, poor por. with calcite veins to fracture infills.
		20	Sandstone - light-med. grey, fine grained, sub ang., med. sorted, dark lithic fragments, argillaceous, very poor por.
50	55	80	Sandstone - light brown-grey, fine grain, well sorted, sub rounded-rounded, cl. - transl. cement, dark lithic fragments, trace carb., very poor por.
		20	Siltstone - dark grey, very fine grain, dark matrix, poor por. With trace calcite veins.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
55	60	100	Sandstone - olive green, fine to very fine, clear & pale wh. opaque, rounded - sub. ang. quartz grains, with trace med. grey lithic ? fragments, pale green - yellow green, Transparent intergran. cement, very hard slightly calc. very tight. Trace xln calcite.
60	65	100	Sandstone - pale orange-green, fine grain mod. well Sorted, sub ang. - sub rounded quartz grains and trace w rounded dark grey lithic fragments. Very hard, orange - clear intergran. cement (poss clay stained silica) very tight. Trace vein quartz stnd w/brown black poss. carb. mat.
65	70	100	Sandstone - A/A
70	75	50	Sandstone - light grey - slightly yellow, fine to med. clear, angular quartz, with abundant limonitic clay matrix.
		50	Argillaceous Siltstone - med. grey, firm, silty claystone with trace limonitic fractures.
75	80	70	Argillaceous Siltstone - grey A/A.
		30	Sandstone - A/A

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
120	125 contd.		Sl. trace calc. very poor por. Trace fine fractures with xln calcite infilling. Trace carb. mat.
		10	Silty Sandstone - med. grey, argillaceous, trace carb. mat.
114	130	50	Siltstone - dark grey, very fine.
		40	Quartz Sandstone - light grey, fine grain with intergran. mat. in optical continuity with trace dark grey lithic fragments with trace mica.
		5	Calcite - wh xln, infilling fractures.
130	135	100	Siltstone - med.-dark grey, very hard, argillaceous poss. with silica cement?, poss. feldspathic appearance of sub // arrangement of grains poss // to bedding? Minor Quartz Sandstone - A/A prob. cav.
135	140	90	Siltstone - med.-dark grey, very hard, argillaceous, grading occasional to very fine argillaceous sandstone Trace calcite xls in vug.
		10	Sandstone - light grey, fine, well sorted ang. - sub ang. clear quartz, with cl. calc. cement, very tight.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
100	105		A/A
105	110	90	Sandstone - light grey-grey, very fine grain to fine grain mod. well sorted, sub rounded-rounded, dark lithic fragments, trace pynite, cl. - trans. cement (SiO_2?), very low por.
		10	Siltstone - med-dark grey, very fine grain, dark matrix.
110	115	80	Sandstone - light grey, very fine grain to fine grain mod. well sorted A/A firm-hard.
		20	Siltstone - med-dark grey, argillaceous, grading shale (better fissility).
115	120	90	Sandstone - light-med. grey, fine grain, well sorted with prob. secy silica in optical continuity with grains sl. calc. cement, very tight.
		10	Argillaceous Siltstone - med. dark grey, frm, quartz with dark grey clay matrix - poss. with dispersed carb. mat.
120	125	90	Sandstone - light grey, sub ang. well sorted clear quartz, grains with clear - transl., hard intergran cement (prob. silica). Trace dark grey unidentified grains (poss lithic fragments).

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
80	85	100	Sandstone - light grey, fine grain, well sorted, rounded - sub rounded. Dark lithic fragments, clear cement, very poor por.
85	90	100	Siltstone - med. grey, argillaceous, sl. firm.
90	95	100	Sandstone - light-med. grey, fine to very fine well sorted, ang.-sub ang. quartz. Clear - wh. transl. intergran xln mat. fissile silica. Mod. calc. xls as fract. fills and sl. cement.
95	100	100	Sandstone - light-med. grey, fine to very fine well sorted, ang. - sub. ang. quartz. Secy silica as intergran. cement in almost optical continuity. Very tight. Trace fine fractures, secy infilled with silica. Trace dark grey grains poss. lithics. Trace carb. mat. grading coal.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
140	145	80	Sandstone - wh. - very light grey, optically continuous, clear - wh., quartz grains and intergran. mat. (poss. silica, poss. felspathic) showing fine prismatic shapes - poss xln form or fine fractures. Sl. trace dark grey grains - poss. lithic, very tight, very slightly calc. cement.
		20	Siltstone - med.-dark grey, argillaceous A/A.
145	150	80	Sandstone - light grey, fine-med. grain, mod. w. sorted, sub ang. clear quartz, with trace dark grey sub rounded-sub ang., unidentified grains - poss. lithic fragments, mod. - abundant clear and wh. intergran. material, poss. quartz or feldspar, often in partial or complete optical continuity with grains, - appears to show rect. fracture patterns, very slightly calc., mainly seen as fract. filling, very tight, very hard. Trace black, carb. mat. grading coal - showing poss. fine bedding - firm, brittle.
		10	Clay - wh., mod. soft, friable, often in thin lamina - poss. degraded feldspar?
		10	Siltstone - med. grey, argillaceous, hard, poss cav. Trace vein calcite.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
150	155		Sandstone - Light grey, fine - very fine grain, angular-
			subangular, moderately well sorted, clear - translucent
			cement (SiO_2?), trace calcite cement and possible feldspar,
			dark lithic fragments medium hard, trace calcite vein,
			poor porosity.
155	160	100	Sandstone - A/A 15% medium-dark grey, angular, lithic
			fragments, tr. green strain on both quartz grains and
			intergranular material slightly softer, possibly less
			well cemented.
			Slight increase in calcite cement.
160	165	80	Siltstone, dark grey, very fine grain, argillaceous
			material, trace carbonaceous lamina, trace calcite vein,
			fairly hard, poor porosity.
		20	Sandstone, A/A, possible caving.
165	170	80	Siltstone - medium - dark grey, firm argillaceous,
			fissile, non calcareous occasionally light brown
			siltstone less fissile, with calcite cement.
			Trace carbonacous material as waxy, sub vitreous soft,
			lenses or layers.
		20	Sandstone - A/A possibly carbonaceous
			very calcareous.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
170	175	50	Sandy Siltstone, medium grey, very fine grain (0.125 - 0.062 mm), rounded, moderately sorted, argillaceous material, dark lithic fragments, fairly soft, trace carbonaceous lamina, trace calcite vein, poor porosity.
		50	Siltstone, medium grey, very fine grain, fairly hard, dark matrix, poor porosity.
175	180	80	Sandstone - light grey, fine grain, sub rounded - subangular, clear quartz, with crystalline intergranular cement, white to colourless. Very firm, very hard, very tight. Trace dark grey, angular - subrounded, lithic fragments within the sandstone. Very slight calcite only.
		15-20	Siltstone - medium - dark grey - A/A possible caving. Trace white brittle clay.
180	185	40	Sandstone - light grey, fine grain, (.125 - 002mm) well sorted, subrounded - subangular, clear quartz, with clear - colourless translucence intergranular cement occassionally recrystallised, possible prismatic micro fractures, possible silica and feldspar. Slight trace dark grey, lithic fragments. Slight trace carbonaceous material, very slight trace cacite.
		30	Sandstone - A/A slight green, clear quartz grains more lithic fragments, moderate calcite cement.
		40	Siltstone - medium - dark grey, argillaceous, hard, non calc.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
185	190	75	Siltstone - medium - dark grey, argillaceous, hard, non calcareous, sub fissile.
		25	Sandstone Light grey, angular, clear, quartz, and brown, dark green, unidentified minerals, with clear to white abundant cement, variable calacareous cement.
190	195	80	Sandstone - A/A moderately calcareous, good trace white clay. Trace black, vitreous, coal.
		20	Siltstone A/A.
195	200	70	Siltstone - Medium - dark grey, firm, argillaceous, hard, non calcareous, sub fissile, grading shale.
		30	Sandstone - A/A. Light grey, fine grain, clear quartz, with white intergranular cement, trace lenses and grains of dark grey possibly lithic fragments.
200	205	85	Sandstone very light grey - white, fine grain, clear subangular - sub rounded, quartz, with abundant white intergranular cement occasionally containing clear lathes - possible recrystalline feldspar. Trace dark brown material in fine fractures and in sub parallel lenses or layers possibly parallel to bedding? Slight to moderately calcareous cement.
		15	Siltstone - medium - dark grey, hard A/A.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
205	210	40	Sandstone - A/A with fine - medium blebs of sub
			vitreous, waxy coal, slightly calcareous.
		60	Siltstone - medium grey, hard, sub fissile, non
			calcareous, slightly argillaceous.
210	215	80	Siltstone - light - grey, fine - very fine grain,
			subrounded, poor - moderately sorted, fairly soft,
			part calcite/clayey cement, possibly some Si02 cement,
			dark lithic fragments (15-20%), with some calcite vein,
			poor porosity.
		20	Siltstone A/A with occasional carbonaceous lamina.
215	220	80	Sandstone A/A with moderately well sorted, sub-
			rounded - rounded, 5% dark lithic fragments, trace coal.
		20	Siltstone, medium - dark grey, hard, occasionally very
			very carbonaceous with carbonaceous laminae, non
			calcareous.
220	225	90	Siltstone, medium grey, medium hard, non-calcareous.
		10	Sandy Siltstone, light - medium grey, very fine grain
			(0.125 - 0.062 mm), rounded, medium to well sorted,
			cement clear to translucent, difficult to see,
			argillaceous, fairly soft, poor porosity.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
225	230	30	Sandstone Light - medium grey, fine grain, well sorted sub rounded, sub angular, quartz, trace coal fragments, trace lithic grains, non calcareous, with white - clear cement, very tight, very hard.
		5	Sandstone - white - very light grey, fine grain, well sorted sub angular - sub rounded, slightly - moderate cement (possibly calcareous) moderate porosity.
		60	Siltstone - Medium grey, hard, sub fissile across bedding (seen as fine laminations). Trace white clay.
230	235	70	Sandstone - light grey, fine grain A/A. Very tight, very hard.
		30	Siltstone - medium grey, hard, argillaceous, sub fissile occasionally showing curved ring type fractures.
235	240	80	Sandy Siltstone, medium grey, very fine grain with rounded, poor sorted, dark matrix, some carbonaceous laminae, fairly hard.
		20	Sandstone, light - medium grey, very fine - fine grain, subangular - subrounded, poorly sorted, cement clear translucent, intergranular calcareous, fairly soft, 1-5% dark lithic fragments, trace coal, poor porosity.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
240	245	80	Sandstone, light grey, fine grain, subangular -
			subrounded, moderately well sorted, medium hard, clear -
			translucent cement (SiO2?) 5-10% dark lithic fragments,
			very tight.
		20	Silty Sandstone, medium grey, very fine grain, well
			rounded, well sorted, carbonaceous laminae, poor porosity.
245	250	70	Sandstone - light grey, fine grain, clear, subrounded
			quartz, with angular, irregular fragments of dark grey -
			black, fine unidentified material possibly coal.
			With clear - colourless translucent intergranular cement,
			in almost optical continuity with grains. Very tight,
			very hard, trace dark grey lithic fragments, generally
			non calacareous.
		30	Occasionally Sandstone A/A with moderately calcareous
			cement, slight porosity.
250	255		Sandstone, A/A with subangular - subrounded, poor -
			moderately sorted, 5% dark lithic fragments. Frequent
			coaly laminae.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
255	260	90	Sandstone very light grey, fine grain, sub rounded, sub angular, quartz grains, with moderately clear intergranular cement, trace black, fine irregular blebs of possibly coal. Occasionally dark brown to black lenses of carbonaceous material. Trace lithic fragments. Slightly - moderately calcareous cement. Formation slightly more friable.
		5	Claystone - white, slightly firm.
260	265	90	Sandstone - light grey, fine grain, sub rounded - sub angular, well sorted, with slightly clear cement (silica, feldspar?) and moderately calcareous cement. Slightly friable. Trace - 5%. Carbonaceous material - black, slightly firm, sub vitreous coal in small irregular blebs. Occasional trace green grains. Trace - very coarse, milky, subangular quartz.
		5	Siltstone - medium grey, firm, slightly fissile, trace Claystone - white, moderately soft, occasionally showing laminae.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
265	270	95	Sandstone - light grey, fine grain, moderately well
			sorted clear quartz, with moderately clear cement
			possibly feldspathic siliceous and calcareous.
			Trace dark brown, rounded and angular lithic fragments.
			Trace coal - black, vitreous, firm.
			Trace green grains.
			Trace white, coarse crystalline calcite.
			Trace white, soft clay, Trace slickensides.
270	275	80	Siltstone - medium - dark grey, hard, argillaceous,
			sub fissile, possibly slightly carbonaceous.
		20	Sandstone - A/A.
275	280	80	Siltstone A/A grading dark grey fine grain argillaceous
			Sandstone.
		20	Sandstone - A/A.
280	285	80	Siltstone, medium grey, A/A with occasional calcite
			vein, some carbonaceous laminae.
		20	Sandstone, light - medium grey, very fine grain, Si02
			and calcareous cement, fairly soft, 2-10% dark lithic
			fragments, occasionally very argillaceous, poor
			porosity.
285	290	70	Siltstone, medium grey, A/A with trace coal.
		30	Sandstone, light grey, very fine grain, medium hard,
			subangular subrounded, poor - moderately sorted,
			argillaceous, intergranular calcite, poor porosity.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
290	295	90	Sandy Siltstone, medium grey, very fine grain, moderately hard, occasionally carbonaceous laminae, trace coal, trace calcite vein, poor porosity.
		10	Sandstone, light grey, fine grain, poorly sorted, subangular - subrounded, hard, occasionally carbonaceous, some intergranular calcite, with clear - translucent cement (SiO_2), poor porosity.
295	300	60	Siltstone - medium - dark grey, argillaceous, hard, sub fissile occasionally grading fine silty sandstone, carbonaceous, feldspathic.
		40	Sandstone - light grey fine grain, clear, quartz, feldspathic, siliceous and calcareous cement. Trace brown layers parallel to bedding. Trace coal - black, sub vitreous, firm.
300	305	100	Sandstone light grey, fine grain, clear quartz, with trace dark grey - dark brown lithic fragments?, slight trace green grains (glauconite ?), feldspathic, possibly siliceous, and moderately calcareous cement, - moderately friable. Trace coal. Trace very coarse, clear sub angular quartz. Trace claystone - yellow, brown, possible contamination?

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
305	310	80	Siltstone, medium grey, very fine grain, argillaceous matrix, with occasional carbonaceous laminae and calcite vein, fairly hard, poor porosity.
		20	Sandstone, light grey, fine grain, fairly hard, poor - moderately sorted, subrounded - rounded, siliceous cement, argillaceous in part; 2% dark lithic fragments, poor porosity.
310	315	90	Sandy Siltstone, medium - dark grey, medium hard, very fine grain, quartz is subrounded - rounded, poorly sorted, dark argillaceous matrix, no calcite, poor porosity.
		10	Sandstone, light grey, very fine to fine grain A/A (possibly caving).
315	320	90	Sandstone, light - grey, A/A with moderately hard - fairly soft, 2-5% dark lithic fragments, intergranular calcite cement to possibly Si02 cement.
		10	Siltstone, medium - dark grey, very fine grain, occasionally very carbonaceous, dark matrix, poor porosity.
320	325	90	Sandstone, A/A with 2% dark lithic fragments, fairly soft.
		10	Siltstone, A/A
325	330	90	Siltstone, medium grey, very fine grain, fairly hard, dark matrix, carbonaceous laminae, in places, poor porosity.
		10	Sandstone, A/A (possibly caving)
330	335	80	Siltstone, medium grey, A/A with occasional calcite vein.
		20	Sandstone, light grey, fine grain, fairly hard, poor - moderately sorted, subrounded - rounded, siliceous - argillaceous, 2% dark lithic fragments, poor porosity.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
335	340	100	Siltstone - med.-dark grey, felspathic, argillaceous, very hard, very tight, non calc., sub fissile.
340	345	70	Siltstone - A/A grading fine grain argillaceous, non calc. sandstone.
		30	Sandstone - fine grain, clear quartz with clear probable felspathic or siliceous cement, with fine interbedded wh. felspathic mat.
345	350	80	Sandstone - light grey-med. grey, fine grain clear quartz, with dark brown probable lithic fragments and wh. - clear felspathic and calcitic cement. Slightly friable, poor - sl. variable porosity.
		20	Siltstone - med.-dark grey, hard, felspathic, occasionally sandy, usually argillaceous. Trace clay - wh., mod. soft, possibly felspathic origin.
350	355	90	Sandstone - light grey, fine grain, clear quartz, with dark grey - dark brown probable lithic fragments and mod. felspathic and calcareous cement. Good trace coal - black, waxy in small lenses // bedding. Slightly friable.
		10	Siltstone - A/A and trace wh clay.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
355	360	70	Sandstone - med. grey, argillaceous, grading siltstone, with interbeds Sandstone - light grey, clear, quartz, with felspathic and calcareous cement.
		30	Siltstone - med. grey, fissile, argillaceous.
360	365	70	Sandstone - med. grey, argillaceous, A/A
		30	Siltstone - A/A
365	370	60	Siltstone - med. grey, argillaceous, fissile, mod. soft grading very fine grain sandstone.
		40	Sandstone - light grey, fine grain clear quartz, felspathic, calcareous, trace coal - black, vit.
370	375	80	Siltstone - med. grey, grading very fine sandstone, argillaceous, fissile, brittle, non calc., trace bedding.
		20	Sandstone - light grey, clear quartz, felspathic, calcareous.
375	380	90	Siltstone - med. grey, argillaceous, mod. soft, sub fissile, occasionally carbonaceous.
		10	Sandstone - A/A
380	385	60	Siltstone - med.-dark grey, hard, sub fissile, argillaceous, grading very fine sandstone, non calc.
		40	Sandstone - light grey, fine grain, quartz, with felspathic cement. Trace wh., slightly friable claystone. Trade coal, black, sub vit., firm, brittle.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
385	390	90	Siltstone - med.-dark grey, hard, slightly fissile, argillaceous, occasionally grading very fine sandstone.
		10	Sandstone - light grey, fine grain clear quartz, with trace lithic fragments, felspathic & calcitic cement very hard, very tight.
390	395	70	Siltstone - med.-dark grey, A/A occasionally very carbonaceous.
		30	Sandstone - light grey, very fine to fine grain well srtd., sub rounded - rounded, fairly soft, trace dark lithic fragments, calcite cement, (possible feld./ silica cement) very tight.
395	400	80	Sandy Siltstone - med.-dark grey, quartz is rounded, well srtdd., matrix is dark argillaceous, trace dark lithic fragments, very hard, very tight.
		20	Sandstone - light grey, very fine grain, very hard, calcite cement, possible SiO_2 most difficult to distinguish, 2% dark lithic fragment, very tight.
400	405	60	Sandstone - light grey, very fine to fine grain, sub arg. - sub rounded, poor-med. srtdd., mod. hard, cement is cl-trans. (SiO_2) in places & also calc. in var. prop. very tight.
		40	Siltstone - med. grey, very fine grain, mod. hard, argillaceous matrix, with occasionally very dark chip.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
405	410	60	Siltstone - med. grey, argillaceous, fissile, firm brittle, occasionally grading to very fine grain sandstone minor dark grey, mod. soft, carbonaceous siltstone.
		40	Sandstone - light-med. grey, with clear occasional wh. poss. felspathic cement. Trace coal - black, as discrete fragments. Trace lithic fragments. Occasional grain shows sub // arrangement grains - poss. bedding, with calcite cement.
410	415	40	Sandstone - med. grey - very fine grain (grading to siltstone), sub arg. - sub rounded, poorly srtdd. very hard, argillaceous matrix, very tight.
		60	Siltstone A/A
415	420	60	Sandstone - light grey, very fine to fine grain sub arg. - sub rounded, poorly srtdd., mod. hard, argillaceous & calcite cement, calcite veins, very tight.
		40	Siltstone - med.-dark grey, fine to very fine grain, very hard argillaceous matrix, very tight, occasionally carbonaceous.
420	425	90	Siltstone - med. grey A/A
		10	Sandstone - light grey, very fine grain, A/A
425	430	80	Sandstone - light grey, very fine to fine grain, very hard, sub arg. - sub rounded, poorly srtdd. argillaceous & calcite cement, 2% dark lithic fragments, very tight.
		20	Siltstone - med.-dark grey, very fine grain, occasionally very carbonaceous, argillaceous matrix.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
430	435	85	Sandstone - light grey, fine grained clear quartz sub rounded, with trace dark brown sub rounded lithic fragments, variable clear - wh. cement, prob. felspathic siliceous, calcitic, with trace coal, black, waxy, on bedding planes.
		15	Siltstone - dark grey, argillaceous, grading sandstone, poss. carbonaceous. Trace coarse fragments clear quartz? - poss. vein quartz.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
435	440	70	Sandstone - light-med. grey, fine grain clear quartz and dark brown-grey rounded lithic fragments with clear-wh. felspathic and calcareous cement.
		30	Siltstone - dark grey, argillaceous, carbonaceous felspathic slightly mic. occasionally grading very fine grained sandstone, very hard, tight.
440	445	90	Sandstone A/A
		10	Siltstone A/A
445	450	80	Sandstone - light-med. grey, fine grained, clear quartz with slight trace dark grey lithic fragments abundant felspathic and variable calcitic cement, occasional trace bedding, occasionally black soft carbonaceous material
		20	Siltstone - med. grey, hard, felspathic, argillaceous and occasionally slightly carbonaceous.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
450	455	100	Sandstone, light grey, very fine to fine grain, moderately hard, subrounded - rounded, moderately - well sorted, clear - translucent to calcite cement, trace dark lithic fragments, trace coal.
455	460	90	Sandstone, A/A with occasional carbonaceous laminae very tight.
		10	Siltstone, medium grey, very hard, very fine grain, argillaceous matrix.
460	465	60	Siltstone, medium - dark grey, moderately soft, very fine to fine grain, all sandy siltstone, argillaceous matrix, occasionally very carbonaceous.
		40	Sandstone, light grey, very fine to fine grain, argillaceous - subangular, poorly sorted, calcite cement, SiO2 cement?, trace dark lithic fragments with occasional calcite vein, very tight.
465	470	70	Siltstone, medium grey, very hard, with trace coal.
		30	Sandstone, A/A
470	475	90	Sandstone, Light grey, fine grain - very fine grain, moderately soft subangular - subrounded, poorly sorted, varying amounts of calcite cement, trace coal fragments, with rare calcite vein, tight.
		10	Siltstone, medium grey, moderately soft, very fine grain, occasionally very carbonaceous.
475	480	90	Sandstone, light grey, very fine to fine grain, moderately hard subangular - subrounded, poor - moderately sorted, carbonaceous and possibly feldspathic cement trace coal, trace dark lithic fragments.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
475	480		Cont'd. from previous page...
		10	Siltstone, A/A.
480	485		Sandstone, light grey, fine to medium grain, subangular - subrounded, poor - moderately sorted, calcareous to clear - translucent (SiO_2) cement, moderately hard, trace dark lithic fragments, very tight.
485	490	90	Sandstone A/A with common coal, vitreous black, moderately hard, conchoidal fracture.
		10	Siltstone, medium - dark grey, very fine grain, dark matrix, moderately hard. With occasional calcite vein.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
490	495	70	Siltstone - medium grey, argillaceous, moderately soft occasionally carbonaceous, slightly fissile.
		30	Sandstone - light grey, fine grain, clear quartz, slight trace lithic fragments, with variable white - clear cement feldspathic and calcareous and with good trace - 5% coal - black, waxy, as small intergranular lenses. Slight trace limonite string on grains and as alteration of the intergranular material.
495	500	90	Siltstone - medium grey, very argillaceous, moderately fissile grading shale, moderately soft, occasional very fine sandy sections, trace carbonaceous lenses - black, waxy, slightly firm, fissile.
		10	Sandstone - A/A.
500	505	90	Siltstone, medium - dark grey, very fine - fine grain, moderately soft, occasionally carbonaceous, with calcite veins.
		10	Sandstone, A/A.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
512	515		Sandstone, light - medium grey, very fine grain, very hard, angular - subangular, poorly sorted, calcite and silica cement, dark lithic fragments possibly coal, white blebs possibly after feldspar, very tight with occasional isolated quartz medium grain.
515	520		Sandstone, White - light grey, very fine - fine grain, moderately hard, angular - subangular, poortly sorted, clear - translucent cement (SiO_2), intergranular calcite, dark lithic fragments, occasional calcite veins, very tight.
			Good trace claystone- white, soft, fissile, with micaceous slickensides (note the chips are medium - sand size due to bit type and rota speed ∴ finer particles may have been omitted).
520	525	70	Sandstone, A/A with trace black vitreous coal, conchoidal fracture, soft, occasionally clear quartz grain.
		30	Siltstone, medium - dark grey, very fine grain, moderately soft, fine carbonaceous lithic fragments, argillaceous material, occasionally showing fissile micaceous surfaces - possibly slickensides.
525	530	80	Siltstone, medium - dark grey, very fine grain, argillaceous matrix, occasional black carbonaceous chip, trace coal.
		20	Sandstone, A/A
530	535	60	Siltstone - grey - brown, argillaceous, grading very fine sandstone moderately soft, sub fissile.
		30	Shale - light grey - medium brown, soft fissile, laminated.
		10	With interbedded coal - black, very fissile - sub fissile, occasionally with polished possibly micaceous appearance, soft, occasionally silty.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
535	540	80	Siltstone - medium grey - brown, soft, very fissile, with prominent polished micaceous surfaces - possibly slickensides, occasionally grading fine grain, argillaceous silty sandstone.
		20	Shale - light grey - light brown, fissile, laminated, soft, occassionally showing polished micaceous slickensides Trace coal - black, soft, occasionally micaceous, fissile.
540	545	70	Siltstone - dark brown, occasionally fine grain sandy siltstone, argillaceous, soft, fissile, occasionally micaceous along probable slickensides, calcareous.
		30	Interbedded with shale - light grey - white - grading light brown, soft, occasionally laminated fissile, micaceous slickensides, good trace coal - black, fissile, soft, micaceous.
545	550	60	Siltstone - medium grey - brown, slightly firm, argillaceous, fissile, occasionally grading to sandy siltstone with trace carbonaceous material.
		30	Sandstone - light grey, salty, clear to white, easily crushed grains - unidentified, moderately soft - slightly firm, sub fissile grains.
		10	Shale - A/A

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
550	555	90	Siltstone - dark - medium brown grey, argillaceous, occasionally grading to fine grain sandstone, sub fissile with trace white claystone grains with trace dispersed carbonaceous grains.
		10	Sandstone - very light grey brown, clear grains, very fine grain of unidentified mineral, very friable, grains easily crushed, with slight trace dispersed carbonaceous material.
555	560	70	Siltstone - light medium brown, soft - firm, sub fissile, with slight trace micaceous slickensides, argillaceous, occasionally fine sandy, with trace dispersed black carbonaceous material.
		30	Sandstone light grey, fine - very fine, sub rounded, slightly friable, calcareous, with trace carbonaceous material, trace grains showing fissility.
560	565	50	Siltstone - medium brown grey, moderately soft - slightly firm, argillaceous, grading very fine sandstone, with white - light cream claystone, possibly altered feldspars?, with trace black irregular dispersed carbonaceous material, possibly coal.
		40	Sandstone - light grey, firm - friable, grains of clear unidentified mineral, slightly calcareous cement, possibly also felspathic.
		10	Occasional beds Claystone - white, soft - slightly firm, possibly degraded feldspar, occasionally showing laminations, with trace slickensides.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
565	570	70	Siltstone - dark - medium grey brown, argillaceous, sub fissile, calcareous, occasionally grading to fine grain sandstone.
		30	With interbeds Sandstone - light grey, clear unidentified, easily crushed grains, with slight calcareous cement, - friable with trace carbonaceous material - black, micaceous.
570	575	70	Sandstone - light grey, clear, easily crushed grains and with similar cement (anhydrite?), and with slight calcareous cement, occasionally beds of white clay, slight trace - clear, tabular, crystalline, material.
		30	Siltstone - A/A. Trace - slickensides - on white clay.
575	580	100	Sandstone - A/A. Trace coal - black, fissile, micaceous. Good trace - clay - white, in thin tabular sheets. Trace orange brown crystalline material.
580	585	90	Sandstone - light grey, grains of clear, unidentified grains, with slight white intergranular cement in optical continuity, - trace calcareous cement.
		10	Interbeds of Claystone - white, tabular. Siltstone - A/A probably caving, Trace - coal - black, fissile.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
585	590	100	Sandstone - light grey, clear, unidentified grains, slightly calcareous with interbeds of white finely crystalline clay. Trace - coal - black, blocky, brittle with high vitreous lustre and coal - black, fissile, micro micaceous, good trace slickensides.
590	595	100	Sandstone - A/A.
595	600	80	Siltstone Grading
		20	Sandstone A/A.
			Trace coal - fissile, micaceous.
600	605	100	Siltstone - light - medium grey, slightly argillaceous, occasionally grading fine grain sandstone, with slightly calcareous cement. Trace clear, tabular, crystalline, mineral showing three good cleavages.
605	610	100	Siltstone - A/A.
610	615	100	Siltstone - A/A. Good trace - clear, tabular, crystalline, mineral,

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
615	620	90	Sandstone - light grey, sub rounded, clear, easily crushed grains, with optically continuous cement and slightly calcareous cement.
		10	Claystone - White possibly very finely crystalline, occasionally showing fissility and occasionally slickensides.
			Trace coal - black, fissile.
620	625	90	Sandstone - A/A occasionally ading siltstone
		10	Claystone - A/A
			Trace - 5% Coal - black, very micaceous, fissile.
			Trace - limonite - bright orange, amorphous, occasionally in contact with finely disseminated grains of coal, rare grain - muscovite mica -very coarse - possibly contaminated.
625	630	80	Siltstone - light grey brown, argillaceous fissile, with trace dispersed coal, trace - coal - black, fissile, micaceous.
			Good trace slickensides.
		20	Sandstone - A/A.
630	635	80	Siltstone - A/A.
635	640	70	Siltstone - A/A.
		30	Sandstone
			Trace coal - A/A.
			Good trace - slickensides.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
640	645	60	Sandstone - light grey, clear, sub rounded, grains with optically continuous white - clear cement, slightly calcareous.
		30	Grading Siltstone - medium brown grey, good trace coal - black, micaceous, fissile, with vitreous lustre.
		10	Claystone - white, occasionally finely laminated, very fissile, often with slickensides - possibly caused by drilling.
			Trace limonite claystone - bright orange, in contact with black micaceous mineral.
			* Possible that black micaceous mineral logged as coal may be biotite mica - difficult to identify as grains are very small ~ 0.25 MM in size.
645	650	80	Siltstone - A/A.
		20	Sandstone - A/A.
650	655	60	Siltstone - A/A.
		30	Sandstone - A/A.
		10	Claystone - White, fissile.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
655	660		Poor returns.
		70	Siltstone - medium brown grey, friable, argillaceous,
			occasionally grading to fine grain sandstone.
		20	Sandstone - light grey, sub angular - sub rounded
			clear, quartz, with calcareous cement.
		10	Claystone - White, fissile, with rare trace bright
			green, pellet - glauconite?
660	665	60	Siltstone, medium grey, very argillaceous, moderately
			soft.
		30	Sandstone, light grey, fine grain, subrounded -
			rounded, moderately sorted, cement is clear -
			transulcent (SiO_2?) also calcite.
		10	Coal black, shiny, very soft, platy fracture,
			occasionally vesicular texture.
665	670	60	Sandstone, light grey, very fine grain, angular -
			subangular, poor - moderately sorted, clear - translucent
			cement and calcite in part with occasional coal A/A.
		40	Coal - Carbonaceous Chips, black, vitreous, platy
			cleavage, occasionally brittle, vesicular? chips.
			Claystone? A/A possibly a drilling product rather
			than from formation.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
670	675		Poor returns over shaker screen.
		70	Sandstone - light grey, sub rounded - sub angular, clear
			fine grain quartz with poor calcareous cement. Very
			friable - grains able to be easily crushed. 10-20%
			claystone - white, in thin laminae possibly produced by
			action of bit - (high rotation button bit).
		20	Coal - black, fissile, lenticular firm, micaceous and
			with minor irregular, vitreous, soft
		10	Siltstone - medium brown grey, firm.
675	680	50	Siltstone - medium brown grey, firm.
		30	Sandstone - A/A.
		20	Coal - black, micaceous, lenticular, occasionally
			vitreous, soft to slightly firm.
		10	Clay - white, with fine disseminated crystalline
			material, some possibly produced by action of the bit.
680	685	70	Siltstone, medium grey - black, fine grain, argillaceous
			occasionally 1 surface of chip is very carbonaceous
			- coal?
		30	Sandstone, light - grey, very fine grain, soft,
			angular - subangular, poorly - moderately sorted, clear
			quartz grains, cement is clear - transulcent and clay
			in part, no intergran. calcite.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
690	695	95	Sandstone - light brown grey, fine grain, clear and colourless translucent grains, after loose with rare trace coarse clear, sub angular - sub rounded quartz.
		5	Coal - black, fissile A/A.
			Trace clear tabular mineral - possibly mud.
695	700		Poor returns - cuttings may not be representative of the formation.
		90	Sand - light brown grey, loose, fine grains clear, light brown, crystalline material with 30% white amorphous grains.
		10	Coal - black, fissile, micaceous, with vitreous lustre. Trace - clear, sub angular, quartz grains slight trace - clear mica.
700	705		Poor returns A/A.
		90	Sandstone - light brown grey, clear crystalline aggregates and loose grains.
		10	Coal - micaceous - moderately fissile.
705	710		Poor returns A/A.
		70	Siltstone, medium grey - argillaceous grades to very carbonaceous, micaceous, trace coal, black vitreous lustre.
		30	Sandstone A/A. with trace calcite vein.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
710	715	80	Sandstone, light grey - brown, very fine grain, clear
			quartz, subangular - subrounded, medium sorted, calcite
			and clear - transulcent cement, medium soft.
		20	Coal - micaceous, moderately fissile.
715	720	60	Sandstone, Light grey A/A.
		40	Siltstone, Dark, micaceous, occasionally carbonaceous,
			with trace coal black vitreous lustre.
720	725	60	Siltstone, medium grey, medium hard, very fine grain
			argillaceous matrix, dark lithic fragments.
			Lignite?, grades to black, micaceous, trace laminae,
			carbonaceous siltstone.
		40	Sandstone, A/A.
725	730	70	Siltstone, A/A.
		30	Sandstone, light grey, A/A.
			With dark lithic fragments possibly carbonaceous.

POOR RETURNS

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
730	735		Poor returns
		50	Sandstone - light grey, possibly fine crystalline
			aggregates grading siltstone slightly calcareous cement.
		30	Siltstone, medium grey, argillaceous, occasionally
			carbonaceous.
		20	Coal black, vitreous, fissile, micaceous.
			Trace black, carbonised, fibrous plant remains.
735	740		Poor returns.
		50	Siltstone, A/A.
		30	Claystone - white, probably powdered siltstone.
		20	Coal - A/A.
740	745	50	Siltstone - A/A
		30	Claystone - A/A
		20	Coal - A/A
745	750	80	Siltstone - medium - dark brown, finely crystalline,
			moderately soft, crushes easily to white powder -
			30% white clay probably produced by grinding action of
			bit on siltstone.
		10	Coal - black, vitreous, fissile, micaceous.
		10	Sandstone - very light brown, clear, quartz, friable
			and grains easily crushed, with slight calcareous cement.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
750	755	60	Sandstone, light grey - brown, very fine grain, clear quartz, subangular - subrounded, poor - moderately sorted, clear - translucent cement, calcite in part; occasionally dark lithic fragments and white - creamy prismatic crystalline possibly feldspar, argillaceous in part.
		40	Siltstone, medium grey, very fine grain, moderate - hard argillaceous, occasionally grading to darker chip, possibly carbonaceous, trace coal, black, vitreous lustre, conchoidal fracture.
755	760		Sample collected in the ditch - i.e. more complete sample - cuttings very fine.
		60	Sandstone - light - medium brown grey, very fine grain clear to light brown quartz, with lithics.
		40	Siltstone - grey brown, argillaceous, occasionally grading fine grain sandstone, occasionally carbonaceous. Trace occasional grains loose, clear, quartz.
760	765		Ditch sample - cuttings very fine.
		80	Sandstone, Light grey - brown, very fine grain quartz is clear - light brown. A/A.
		20	Siltstone, medium grey, argillaceous, occasionally dark lithic fragments (Carbonaceous?). With calcite vein.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
765	770		Poor returns / flow line sample.
		60	Sandstone, A/A.
		40	Siltstone, medium grey - black, argillaceous matrix, occasionally white lithic fragments, possibly feldspathic. Grades to dark/black carbonaceous? Trace coal, black vitreous lustre, micaceous.
770	775		Poor returns/flow line sample.
		90	Sandstone, clear - light brown: quartz is clear - translucent, subrounded - rounded, medium - well sorted; poorly cemented, calcite in part, otherwise appears to be a loose aggregrate. Occasionally black micaceous, platy coal? Contact with sandstone is preserved.
		10	Siltstone, medium - dark grey, grades to very fine grain sandstone, medium hard, argillaceous, occasionally very carbonaceous.
775	780		Poor returns/flow line samples.
		80	Silty Sandstone, medium - dark grey, medium soft, argillaceous, calcite cement in part. Grades to dark, micaceous coal?, trace carbonaceous laminations.
		20	Sandstone, A/A.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
780	785		Poor returns/flow line sample
		60	Silty Sandstone, A/A.
		40	Sandstone, light grey-brown, medium soft, subangular -
			subrounded, moderately sorted, cement is calcareous
			in part, otherwise clear translucent/loose aggregate
			(note difficult to see if grain is breaking or the chip
			is breaking along grain boundaries), with trace coal,
			micaceous, brittle.
785	790		Poor returns/flow line sample.
		50	Sandstone, light grey-light brown A/A.
		50	Silty Sandstone, medium grey, moderately soft,
			argillaceous matrix, very fine grain, angular white
			blebs set in matrix.
790	795		Poor return - A/A - cutting very fine ~ 0.125mm.
		60	Sandstone - light grey, sub rounded clear, very fine
			grain, with slight calcareous cement.
		30	Siltstone - medium grey brown, soft to brittle slightly
			argillaceous,
		10	Coal - black, vitreous, fissile micaceous.
795	800	60	Sandstone)
		30	Siltstone) A/A.
		10	Coal)

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
800	805	70	Sandstone - light brown grey, fine grained, clear,
			subrounded, with slight calcareous, cement, slightly
			argillaceous, friable.
		30	Siltstone medium grey brown, slightly firm, argillaceous.
			Trace coal.
805	810		Two samples collected.
			A. Flow line 70 Sandstone
			30 Siltstone
			B. Over shaker screen - as below *
		70	Siltstone - medium brown grey, grading very fine
			sandstone, argillaceous, with occasionally dispersed
			coal, and white to off white often prismatic grains -
			possibly altered minerals, moderately firm, with sub
			parallel arrangement of grains possibly indicating
			bedding.
		30	Sandstone - light grey brown, clear, subrounded, fine
			grains, with slight calcareous cement, trace lithic
			fragments - additional intergranular material optically
			similar to grains.
			Trace Quartz grains - coarse clear angular, very
			fractured, obvious fracture patterns, easily broken
			with probe.
			Trace coal - black, micaceous, but often poor
			fissility.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
810	815	70	Siltstone - medium brown grey, argillaceous, slightly
			carbonaceous as above (-tuffaceous?)
		20	Sandstone - light brown grey, subrounded - sub angular,
			clear grains, with optically continuous cement.
			Good trace clay - white
			Trace - Calcite - clear, vein infilling.
			Good trace - Quartz - loose, clear, coarse, slightly
			fractured.
			Trace Coal - black, sub vitreous, occasionally with
			woody, fibrous plant remains.
815	820	90	Siltstone - medium grey brown, argillaceous, carbonaceous,
			occasionally sandy, firm.
		10	Sandstone - light grey, subrounded, clear to slightly
			milky, quartz, with occasionally chalky white mineral -
			often prismatic - possibly feldspars, and clear cement
			very slight calcareous.
			Trace Quartz - clear, coarse, angular - subangular
			often fractured.
			Trace - Calcite - clear, crystalline, coarse - very
			coarse, Quartz and Calcite probably from veins.
820	825	80	Siltstone A/A.
		10	Sandstone A/A - clear, fine grain, subrounded inequant
			with slightly calcite cement.
		10	Coal - black, micaceous, fissile, waxy - vitreous, lenticular.
			Trace Quartz and Calcite A/A.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
825	830	70	Siltstone - medium brown grey, argillaceous slightly
			carbonaceous A/A. Interbedded with
		30	Sandstone - light grey brown, clear, crystalline, with
			optically similar cement.
			Trace Quartz - coarse, clear, often fractured, angular -
			sub angular - probably from veins
			Trace - Calcite - clear, crystalline.
			Break sample 833
833	834	60	Sandstone - A/A
		30	Siltstone - A/A
		10	Coal - black, micaceous.
			Trace - 5% Calcite - clear crystalline
			Trace Quartz - clear, coarse,
830	835	80	Sandstone - light - medium grey, clear to light grey,
			unidentified mineral (firm but softens and easily crushed
			in fluid). Carbonaceous, slightly argillaceous,
			slightly micaceous
		20	Siltstone - medium grey, argillaceous
			Good trace Calcite - A/A. Trace pyrite.
835	840	80	Sandstone A/A
		10	Siltstone A/A
		5	Calcite A/A
		5	Good trace - Quartz - coarse clear, crystalline.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
840	845	70	Sandstone, light - grey, very fine grain, moderately hard, angular - subangular, poorly sorted, argillaceous calcareous cement in part, otherwise clear - translucent, trace dark lithic fragments, trace grain orientation possibly bedding, occasional calcite vein.
		30	Siltstone, medium - grey - black, argillaceous, trace carbonaceous laminae, occasionally very carbonaceous, moderately hard.
845	850	80	Siltstone, very fine grain, dark - grey - black A/A. Occasionally very carbonaceous, trace black, vitreous lustre, platy fracture, possibly coal.
		15	Sandstone A/A.
		5	Unidentified, black - brown outside core of red-brown possibly Fe_2O_3, very soft.
850	855	60	Sandstone A/A.
		40	Siltstone, fine grain, dark-grey, argillaceous material containing white angular blebs, grading to very carbonaceous, trace coal.
855	860	60	Siltstone, medium grey, very fine grain, moderately hard, trace laminae claystone, very hard, trace black vitreous lustre, fissile coal, platy fracture.
		40	Sandstone, A/A.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
860	865	80	Siltstone - medium grey, firm sub fissile - fissile
			slightly carbonaceous and micaceous, argillaceous,
			with interbeds of coal - black, vitreous fissile,
			micaceous, lenticular.
		20	Sandstone - light grey, fine grain, sub rounded quartz,
			with trace lithics, with clear calcareous cement and
			probably silica cement, firm, trace Calcite
865	870	80	Siltstone - fissile, argillaceous
			A/A grading shale
		20	Sandstone
			Trace Calcite - A/A.
870	875	80	Siltstone A/A.
			Grades to very fine silty sandstone, dark grey,
			sub fissile, argillaceous matrix, clear quartz
			sub rounded - rounded, moderately sorted, with white,
			rounded lithics possibly after feldspar
		20	Sandstone light grey, fine grain, subangular -
			subrounded, poor - moderately sorted, dark argillaceous
			cement, calcite in part, dark subrounded lithics

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
875	880	50	Shale - medium - dark grey, moderately fissile, firm -
			hard, silty, occasionally carbonaceous grading.
		30	Siltstone - medium grey, sub fissile with interbedded.
		10	Coal - black, fissile, micaceous,
		10	Sandstone - light grey, sub rounded clear quartz, with
			trace lithic fragments slightly calcareous cement,
			slightly friable.
880	885	70	Siltstone - medium grey, fissile, argillaceous,
			occasionally carbonaceous A/A
		20	Shale - A/A.
			Trace coal - black, micaceous fissile, trace vitreous,
			non micaceous
			Trace calcite - clear, crystalline.
			Trace bright orange limonite scale in association with
			black possibly micaceous grain - possibly biotite -
			possibly contaminated?
		10	Sandstone - A/A
885	890	60	Siltstone - A/A.
		20	Occasionally grading shale A/A.
		20	Sandstone - light grey, clear sub rounded quartz with
			clear calcareous cement.
			Trace coal, black, vitreous usually fissile and micaceous.
890	895	60	Siltstone)
		20	Shale) A/A
		20	Sandstone)
			Trace coal.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
895	900	70	Siltstone - Flowline sample medium brown grey, sub fissile, slightly firm, with layers and lenses of coal - fissile, micaceous *
		20	Sandstone - light grey, fine grain to very fine grain clear quartz, with variable calcarious cement and silica cement, moderately firm, tight
		10	Shale - medium grey, fissile, firm, good trace coal, A/A.
			Trace Calcite - clear, crystalline.
			* siltstone contains white irregular shaped, occasionally prismatic, possibly remnant feldspars.
900	905		Flowline
		70	Siltstone, A/A.
		30	Sandstone - light - grey, very fine - fine grain, moderately soft, clear quartz, angular - subangular, poorly sorted, calcite cement in part otherwise clear - translucent or clayey.
905	910		Poor returns/flowline sample.
		85	Sandstone, light grey, very fine grain, moderately soft, clear quartz, subangular - subrounded, well sorted, minor calcite cement, otherwise clear - translucent SiO_2.
		15	Siltstone, A/A with rounded to white blebs possibly after fold.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
910	915	50	Sandstone - light grey, clear, sub rounded quartz, with slight calcareous cement, moderately friable.
		50	Siltstone - medium grey, argillaceous grading fine grain sandstone, often carbonaceous, trace carbonaceous laminae with calcite vein. Trace limonite? stain on one side of the chip, possibly introduced from casing or damaged.
915	920	60	Siltstone, medium grey, A/A, trace laminae of white blebs, bedding? Occasionally very carbonaceous, micaceous (coal?) Trace calcite vein.
		40	Sandstone, light grey, mod. hard, very fine grain, subangular - subrounded, medium - well sorted, cement is argillaceous, calcareous in part; trace dark lithic fragments.
920	925	40	Sandstone, light grey - brown, medium soft A/A with occasionally coal - black, vitreous lustre, micaceous in part, interbeds.
		20	Siltstone, medium - grey, argillaceous material clear quartz, trace white lithics (possibly feldspar)
		40	Coal, black, moderately soft, largely micaceous, some with conchoidal fracture surfaces.

* gas show = 922

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
925	930	60	Siltstone, medium grey - brown, argillaceous matrix, grades to very fine grain sandstone, moderately soft, occasionally laminae.
		35	Sandstone, light - grey - brown, very fine graine - fine grain, moderately soft, calcarious cement in part otherwise clear transulcent to dark brown lithics, occasionally calcarious vein.
		5	Coal A/A
930	935		Poor returns/Flowline Sample
		70	Sandstone A/A except partly disaggregated, calcite vein.
		30	Siltstone, A/A with trace black coal.
935	940	50	Siltstone, medium grey, fissile, argillaceous, grades to very fine grain sandstone, trace laminae.
		50	Sandstone: light brown-grey; very fine grained; clear quartz, subangular, poorly sorted, cement is calcite in part, also clayey and Si02, occasional coal, black micaceous, moderately hard.
940	945	50	Siltstone, A/A
		50	Sandstone, A/A
			Coal, A/A.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
945	950	50	Sandstone - light grey, sub rounded clear grains of quartz with poor cement occasionally calcareous, friable grains easily separated and easily crushed, occasionally containing trace of dark grey lithic fragments, white irregular grains sometimes prismatic - possibly remnant feldspar.
		50	Interbedded with siltstone - medium grey, moderately firm, sub fissile - fissile with occasional traces of bedding, very argillaceous, occasionally carbonaceous.
			Trace - Coal - black, micaceous, fissile
			Trace Calcite - clear, crystalline often coarse.
950	955	70	Siltstone - medium - grey, fissile A/A
			Occasionally grading shale.
		20	Sandstone - A/A.
		10	Coal A/A.
			Trace Calcite.
955	960	70	Siltstone - medium grey, fissile, A/A grading shale.
		20	Sandstone A/A.
		10	Coal - black fissile
			Trace micaceous surfaces as possible slickensides - possible fracture zone.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
960	965	60	Siltstone - medium grey, argillaceous, fissile,
			occasionally carbonaceous, with micaceous fissile
			surfaces - possibly slickensides.
		40	Sandstone - light grey, clear, quartz with lithic
			fragments and occasional white oten prismatic grains
			and clear cement - slightly calcareous in part.
			Moderately friable and with associated beds of white
			clay often polished by action of bit.
			Good trace - coal - fissile, micaceous
			Trace - calcite and other clear crystalline, prismatic
			unidentified mineral.
			Trace - pale orange - yellow fluorescence from black,
			micro granular disseminated material - probably
			contamination in mud.
965	970		Flowline sample.
		70	Sandstone - light grey, clear, subangular - subrounded,
			quartz, trace white dispersed occasionally prismatic
			grains - possibly feldspar remnants
		30	Siltstone - light - medium grey grading fine sand, with
			trace - 5% dispersed coal - black, vitreous.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
970	975	60	Siltstone - medium - dark grey, argillaceous firm,
			fissile, moderately carbonaceous.
		30	Sandstone - light grey, clear, angular - sub angular,
			slightly calcareous, with thin platy interbeds of
			white clay.
		10	Coal - black, micaceous, fissile, firm
975	980		Flowline
		60	Siltstone A/A
		40	Sandstone A/A
			Clear trace calcite.
980	985		No returns
985	990		Flowline
		80	Sandstone - pale brown grey, clear to pale brown,
			crystalline grains with slight calcareous cement in
			part
		20	Siltstone - dark grey, firm, sub fissile often very
			carbonaceous, trace calcite.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
990	995		Flowline Sample - Fine Cuttings.
		90	Sand - Light grey, loose very pale brown to clear, grains appear to be two types - minor clear quartz, dominantly pale brown translucent grains able to be crushed to white powder (unidentified), slightly calcareous, possibly felspathic. Good trace white clay derived from above.
		10	Siltstone - A/A.
			Good trace coal - Black, micro micaceous, sub fissile.
995	1000	80	Sand - A/A, slight calcareous.
		20	Siltstone - Argillaceous, carbonaceous.
1000	1005		N.R.
1005	1010	70	Silty Sandstone - Light to medium grey, firm, argillaceous, often with disseminated and finely bedded coal.
		30	Sandstone - Light grey, subangular to subrounded clear quartz, slight trace dark lithic fragments and white occasionally prismatic grains with partly calcareous cement.
			5% Quartz - Loose, very coarse sub rounded, clear, not obviously fractured - rare trace clear yellow grains.
		Trace	Quartz - Coarse, slightly milky aggregates of fractured quartz.
		Trace	Coal - Dark grey to black, occasionally silty, non fissile occasionally micro micaceous.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL		%	SAMPLE DESCRIPTION
FROM	TO		
1010	1015	60	Siltstone - A/A.
		20	Sandstone
		10	Sand - Coarse, subangular, loose quartz.
		10	Coal

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1015	1020	90	Siltstone - Medium grey, moderately hard, sub·fissile,
			argillaceous, grades to very dark carbonaceous - coaly,
			black, moderately hard.
			Trace coal, black, micaceous - platy, moderately soft.
		10	Sandstone - Light grey, very fine grain, moderately soft
			subangular to sub rounded, moderately sorted, calcareous
			to clayey cement, traces dark lithic fragments, appear
			crystalline, rare medium-red-brown well rounded lithic,
			with white lithics lineated to bedding, possibly often
			felspar.
1020	1025	60	Siltstone - Medium to dark grey, argillaceous with thin
			carbonaceous beds, firm, sub fissile to fissile,
			grading
		20	Shale - Medium grey, firm, fissile.
		Trace	Coal - Dark grey to black, fissile, lenticular.
		10	Sandstone - Light grey, very fine grain with trace dark
			lithics, very tight
		10	Sand - Loose, fine to medium, clear, subangular to well
			rounded, clear quartz.
		Trace	Calcite - White, crystalline.
1025	1030	70	Siltstone - Medium grey, firm, sub fissile, argillaceous
			occasionally carbonaceous grading Shale.
		20	Sandstone - Light grey, fine to medium quartz with clear
			cement, slightly calcareous in part.
		10	Coal - Black, variably fissile, firm, waxy.
		Trace	Calcite

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1030	1035	60	Siltstone - Medium grey, firm, fissile, argillaceous,
			grading to silty shale.
		10	Sandstone - Light grey, slightly calcareous., quartz.
		20	Coal - Black, fissile, micaceous, waxy.
		10	Calcite - White, crystalline.
		Trace	Quartz - Clear, rare clear orange-yellow, medium.
1035	1040	70	Siltstone - Medium grey, slightly brown, firm, fissile,
			argillaceous, grading shale.
		30	Sandstone - Light grey, fine to medium grain quartz
			with slight calcareous cement.
		Trace	Calcite - White, crystalline.
		Trace	Coal - Black, waxy, slightly fissile.
1040	1045	80	Siltstone - Medium grey, moderately hard, argillaceous,
			grading to very carbonaceous; lithic includes some
			milky quartz and white blebs (felspar?).
		20	Sandstone - A/A.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1045	1050	70	Siltstone - Medium grey A/A with traces laminae.
		25	Sandstone - Light grey-brown, very fine grain, angular to subangular, poor sorted, calcareous cement in part, otherwise clear to translucent silica, traces dark angular lithic fragments; moderately soft.
		5	Coal - Black, moderately hard, micaceous, traces conchoidal fracture.
			Note: Hole was swabbed at this level, possible that coal was caving because no gas.
1050	1055	80	Siltstone - A/A, fissile, occasionally very carbonaceous.
		20	Sandstone - A/A., occasional calcite.
1055	1060		Flowline Sample/poor returns.
		60	Sandstone - Light brown-grey, very fine grain, clear to translucent quartz aggregate, calcareous cement in part; quartz is angular to subangular, moderately sorted, traces dark lithic fragments, with calcite
		40	Siltstone - Medium to dark grey, argillaceous, grading to very carbonaceous.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1060	1065		Poor returns, description is from "shale shaker" but
			bags are from the flowline.
		50	Siltstone - Medium grey, argillaceous, moderately hard.
		40	Coal - Black, platy, micaceous, moderately hard,
			occasionally conchoidal fracture, fissile.
		10	Sandstone - A/A.
1065	1070	50	Siltstone - Dark to mediun brown-grey, firm, fissile,
			argillaceous.
		20	Sandstone - Light grey, very fine grain clear quartz
			with slightly calcareous cement interbedded with
		10	white Claystone - soft, translucent with trace
			very fine brown to grey, possibly lithic fragments.
		20	Coal - Black, fissile, lenticular micaceous, waxy to
			splendent lustre, with occasionally vitreous coal with
			conchoidal fracture.
			(Abundant brown, soft argillaceous material scraped
			from wall of hole by drilling and seen as flat peels
			polished and lineated on one surface.
			Very slight trace Calcite - white, crystalline -
			probably amount to 30-40% of sample).
1070	1075		No returns.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	Flowline Sample SAMPLE DESCRIPTION
1075	1080	80	Sandstone - Light grey, clear, angular to subangular
			quartz with slightly calcareous cement. (Very fine
			cuttings) occasionally grading siltstone.
		10	Clay - White
		10	Coal - Black micaceous, fissile.
		Trace	Pyrite
			Flowline:
1080	1085	70	Sandstone - A/A.
		20	Siltstone - Medium grey, argillaceous, carbonaceous,
			firm.
		10	Coal - Black, sub fissile,
		Trace	Quartz - Loose, clear, well rounded.
			Flowline:
1085	1090	60	Siltstone - Medium grey, argillaceous, sub fissile,
			with occasional thin beds of coal.
		30	Sand - Loose, clear, subangular to subrounded, fine
			to medium grain quartz.
		10	Coal - A/A.
1090	1095	50	Sandstone - Light grey, fine grain with slightly
			calcareous cement, occasionally argillaceous and silty.
		30	Siltstone
		10	Sand - Loose, clear quartz.
		10	Coal - Black, slightly fissile, possibly micaceous.
			Good traces of white clay.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	Flowline Sample SAMPLE DESCRIPTION
1090	1095	60	Sandstone - Light grey, fine grain, subrounded to
			subangular, clear quartz with in part a slightly
			calcareous cement.
		15	Sand - Loose, clear, medium to coarse, sub rounded
			quartz.
		15	Siltstone - Medium grey, argillaceous, slightly
			dispersed grain.
		10	Coal - Black, sub fissile, micaceous.
			Circulated returns - to get bottom hole sample.
			Flowline Sample:
1095	1096	60	Sandstone - Light grey, very fine to medium, poorly
			sorted quartz with slightly calcareous cement in part.
		20	Sand - Loose clear subrounded quartz and very pale
			brown translucent quartz.
		20	Siltstone - Medium to dark grey, firm, sub fissile,
			argillaceous and locally carbonaceous.
		Trace	Coal - Good trace coal, A/A.
			Flowline Sample:
1097	1098	70	Sandstone - Loose sand, A/A.
		30	Siltstone - A/A.
			Trace to 5% coal, A/A.
1098	1099	60	Sandstone and trace loose quartz sand
		15	Coal - Black, sub vitreous, firm, occasionally
			micaceous and fissile.
		25	Siltstone - A/A.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	Flowline SAMPLE DESCRIPTION
1095	1100	70	Siltstone - Light to medium grey, argillaceous, with dispersed coal.
		30	Sandstone - Light grey, subangular to sub rounded, fine to medium grain quartz, slight calcareous cement.
		Trace	Good trace Coal - Black, micaceous, sub fissile, occasionally sub vitreous.
		Trace	Calcite - White and clear crystalline.
1100	1105	70	Sandstone - Light grey, A/A.
		30	Siltstone - A/A grading to silty sandstone, argillaceous angular white blebs, traces dark lithics (carbonaceous?)

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1110	1115		Poor returns - Sample description from shaker screen
			Bagged samples from flowline
		70	Siltstone - dark grey, argillaceous carbonaceous,
			sub fissile, firm
		30	Sandstone - light grey, fine - medium clear quartz,
			poorly sorted, with trace disseminated, coal, possibly
			with silica cement - hard, poor porosity.
			Abundant - Coal - black, fissile, lenticular, micaceous,
			waxy lustre - probably caved.
			Abundant grey and brown claystone scraped by bit action
			into thin striated laminae - probably caved.
1115	1120	60	Siltstone, medium grey, medium soft, argillaceous,
			grading to carbonaceous.
		20	Sandstone, light grey, very fine grain, subangular -
			subrounded, poor - mod. sorted, calcareous cement in
			part, trace dark lithic fragments to angular elongated
			white blebs (feldspar?/glass shards), moderately hard.
		20	Coal, A/A, probably caved.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1120	1125	60	Siltstone. A/A.
		30	Sandstone A/A with trace laminae occasionally very carbonaceous.
		10	Coal, A/A black, micaceous, occasionally conchoidal fracture. (probably caving).
1125	1130	90	Siltstone, medium grey, moderately soft, speckled dark to white lithics, trace carbonaceous laminae, argillaceous.
		10	Coal, A/A occasionally splinter, platy, black, micaceous,
			Note: abundant soft creamy - white and grey claystone chips, very thin egg shell type A/A. Common laminae on one side only, probably via action of the bit since they have a curved surface, often deeply grooved and laminae not always continuous through the chips.
1130	1135		Flowline sample - poor returns
		70	Siltstone, medium - dark grey, medium hard, very argillaceous, grading to very fine grain, argillaceous sandstone.
		30	Sandstone, light grey, very fine grain, subangular - subrounded, poorly sorted, calcareous cement in part otherwise argillaceous, trace dark lithics and white flattened? blebs, poor porosity.
			With trace coal, A/A.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1135	1140		Flowline
		50	Sandstone, light grey, moderately soft, very fine grain,
			subangular - subrounded, medium - poor sorted, poor to
			strong calcite cement, poor porosity.
		50	Silty Sandstone, Medium - grey, very argillaceous,
			trace laminae, gradings to very carbon with occasional
			coal micaceous, black.
1140	1145		Flowline sample - Poor returns
		60	Siltstone, medium - dark grey, argillaceous, grounded to
			silty sandstone, occasionally very carbonaceous, trace
			coal.
		40	Sandstone, light brown - grey, moderately soft, aggregate
			of grains, poorly cemented, angular - subangular, poorly
			sorted, porosity ?.
1145	1150		Flowline sample - Poor returns.
		60	Silty Sandstone, medium - grey, moderately hard, sub
			fissile, argillaceous, speckled texture dark to white
			lithics, occasionally carbonaceous, trace laminae.
		40	Sandstone, light grey - brown, moderately soft, clear
			quartz aggregate A/A trace dark lithics, calcite cement
			in part. Porosity.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1155	1160	70	Sandstone - Light grey to pale brown, fine to medium, subangular to subrounded, clear quartz; moderate to poorly sorted, freable with slightly calcareous cement; locally argillaceous, occasionally trace lithic fragments, traces fine carbonaceous lamina - moderate porosity.
		30	Siltstone - Medium to dark grey, firm, occasionally carbonaceous, argillaceous.
		Trace	Calcite - white to clear, crystalline.
1160	1165	20	Sandstone - Light grey, occasionally light brown, fine to medium grain, clear quartz, with slightly calcareous cement in part, with interbeds of
		60	very fine to fine Sandstone, moderately argillaceous with slightly fine lenses and grains of coal, traces of white grains - possibly altered felspar.?
		20	Siltstone - Medium to dark grey, firm sub fissile, carbonaceous.
		Trace	Good traces of Coal - Black, sub vitreous, often fibrous
		Trace	Quartz - Loose, subrounded to rounded, clear.
		Trace	Slight trace Pyrite - massive medium coarse.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1165	1170	60	Siltstone - Light grey-brown, firm, sub fissile to fissile - possibly micro micaceous, occasionally with fine disseminated grains of coal.
		30	Sandstone - Light grey, angular to sub angular, fine to medium quartz with clear optically continuous cement, with occasional traces of white clay grains - poor porosity.
		10	Sand - Medium to coarse, loose clear, rounded to sub-angular, quartz occasionally with fragments of black coal attached.
		Trace	Coal - Black, sub vitreous, blocky - sub fissile.
		Trace	Calcite - good trace - clear to white crystalline.
			Circulated returns at 1180.
	1175	60	Sandstone - Light grey, fine grain, sub angular, moderately sorted, friable with slightly calcareous cement,
		20	with minor Sandstone - light brown, very fine grain quartz, argillaceous with trace dispersed coal grains.
		20	Sand - Loose medium to coarse, clear, subangular to subrounded quartz.
		Trace	Clay - White

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1170	1175	40	Sandstone - Light grey, fine to medium, subangular to subrounded clear quartz with slightly calcareous cement.
		20	Sand - Loose clear quartz, A/A.
		30	Sandstone - Light brown, very fine to fine, argillaceous, carbonaceous, non calcareous.
		10	Siltstone - Medium to dark grey, carbonaceous.
		Trace	Calcite
		Trace	Clay - Trace to 5% white clay.
	1176	80	Sand and Sandstone - Light grey, fine to medium, occasionally coarse, clear quartz with slightly calcareous cement - locally carbonaceous.
		20	Siltstone - Medium grey to occasionally dark grey, firm, occasionally carbonaceous, moderately soft and friable.
		Trace	Clay - good trace clay - white, translucent to clear.
	1177	60	Sand - A/A
		10	Sandstone - Light grey, A/A.
		20	Sandstone - Light brown, very fine, argillaceous, A/A.
		10	Siltstone - A/A.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
	1178	40	Sand - A/A with minor aggregated sandstone.
		50	Siltstone - Dark grey carbonaceous, micro micaceous
		10	with Coal - Black, sub vitreous, gas.
	1179	15	Sand - Loose, grains quartz.
		15	Sandstone - Light grey, fine to medium with slightly
			calcareous cement, moderately tight occasionally
			dispersed grains, white to off-white clay grains - very
			angular and irregular in shape.
		60	Sandstone - Light brown, very fine to medium grained,
			occasionally silty, argillaceous with dispersed coal.
		10	Siltstone - Dark grey to black, very carbonaceous,
			finely to micro micaceous, sub fissile, grading silty
			coal.
	1180	10	Sand
		10	Sandstone - Light grey, A/A.
		60	Sandstone - Light brown, argillaceous, A/A.
		10	Siltstone - Medium grey, firm, fissile, micro micaceous.
		10	Carbonaceous Siltstone - Grading coal finely micaceous
			A/A.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1175	1180	60	Sand - Light grey, clear subrounded quartz and angular to subangular, occasionally prismatic, possibly felspar.
		20	Sandstone - Light grey clear subrounded quartz with calcareous and felspathic cement.
		20	Siltstone - Medium grey, finely crystalline, carbonaceous - Black micaceous, sub fissile grains coal.
		Trace	Calcite - Good trace calcite - white to clear, crystalline.
		Trace	Clay - White
		Trace	Pyrite - Medium to coarse, yellow gold crystalline grains. (Similar to sample at 995).
1180	1185	40	Sandstone - Light brown, very fine to fine grain, quartz with traces medium white irregularly shaped, occasionally prismatic grains and traces medium grain black grains of coal, argillaceous and often silty.
		30	Sandstone - Light grey, fine to medium with moderately abundant clear and occasionally white cement - possibly felspar cement and slightly calcareous cement, and occasionally disaggregated loose quartz.
		20	Siltstone - Light to medium brown, fissile, carbonaceous possibly micaceous.
		10	Coal - Black often fibrous, possibly micro micaceous.
		Trace	Pyrite - Rare trace pyrite.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1185	1190	50	Siltstone - medium - dark grey, sub fissile slightly soft, argillaceous, occasionally carbonaceous
		30	Sandstone - light grey, very fine clear quartz, slightly firm, very poor porosity.
		20	Shale - medium - dark grey, fissile occasionally silty, occasionally carbonaceous.
			Good Trace - Calcite - white - clear crystalline.
1190	1195	50	Siltstone medium - dark grey, medium soft, argillaceous, calcite cement/matrix in part, grades to silty sandstone, occasionally carbonaceous.
		40	Sandstone, light grey, brown, very fine grain, soft, subangular - subrounded, moderately sorted, good calcite cement otherwise clayey, trace dark lithics, poor porosity.
		10	Coal, black, micaceous/platy, fissile, moderately soft, possibly caving.
1195	1200		A/A.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1200	1205	60	Siltstone, medium - dark grey, sub fissile, moderately soft, argillaceous, occasionally very carbonaceous.
		40	Sandstone, light grey - brown, very fine grain, moderately hard, good - poor calcite cement, otherwise clayey, poor porosity.
			With trace coal, black, micaceous/platy, moderately hard. Common calcite crystal.
1205	1210	70	Siltstone, medium - dark grey A/A and grading to silty sandstone, speckled, dark lithics, white blebs.
		30	Sandstone A/A.
1210	1215	50	Siltstone, A/A with trace laminae
		30	Shale, medium - dark grey, medium hard - hard, fissile, grades to silty, occasionally carbonaceous.
		20	Sandstone A/A
1215	1220	50	Siltstone A/A
		40	Sandstone, light-grey brown, very fine - fine grain, medium - hard, clear quartz, subangular - subrounded, poor - medium sorted, poor calcite cement otherwise in optically continuous possibly SiO2, trace dark lithics and white clayey blebs
		10	Shale - A/A
			Trace crystalline calcite occasionally adhering to sandstone.
			Trace coal, black, micaceous/platy, moderately hard.
NOTE:	Large amount of		coal was washed from the sample.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1220	1225	90	Siltstone - Medium grey, very fine grain, argillaceous matrix, fissile, grades to silty sandstone.
		10	Sandstone - A/A.
		Trace	Coal - Black, micaceous/platy, fissile.
1225	1230	60	Siltstone - A/A.
		40	Sandstone - A/A with trace coal adhering to chips, crude lineation (bedding) of white blebs, occasionally very clayey cement.
		Trace	Coal - Black, micaceous, occasionally conchoidal fracture.
1230	1235	50	Siltstone - Medium to dark grey, argillaceous, carbonaceous, fissile grading silty sandstone - moderately micaceous.
		40	Sandstone - Light to medium grey, varying locally from fine grain with minor argillaceous material to medium grained, clear subrounded to subangular quartz and slightly calcareous cement.
		10	Sand - Loose, coarse, milky subrounded quartz.
		Trace	Coal - Good trace coal - Black, micaceous, fissile. Slight trace bright orange limonite around sand grains in light grey sandstone above.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1235	1240		Fluorescence at 1238 - traces bright yellow in silty
			sandstone - dark brown - dark grey, carbonaceous,
			argillaceous.
		40	Sandstone - Medium grey-brown - dark grey, very fine,
			argillaceous, locally - brown black carbonaceous
			material. Trace fluorescence - very poor porosity.
		30	Sandstone - Light grey, subrounded, clear, fine to
			medium quartz with white to clear cement, slightly
			calcareous rare green grains - very tight.
		30	Siltstone - Medium grey to dark grey, argillaceous, firm
			very finely bedded, carbonaceous and micaceous.
		Trace	Quartz - Loose clear medium quartz.
		Trace	Coal - Black to brown, possibly micaceous.
1240	1245	40	Sandstone - Medium grey, slightly brown-grey, very fine,
			argillaceous, dark brown-black waxy carbonaceous
			material.
		30	Sandstone - Light grey, A/A.
		30	Siltstone - A/A.
		Trace	Quartz - Loose, clear, medium quartz.
		Trace	Coal - good trace coal, black, micaceous, fissile,
			possibly caved?
		Trace	Clay - Good trace clay - white in thin platy grains.
		Trace	Pyrite - Slight trace pyrite - yellow gold, crystalline.
		Trace	Calcite

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1245	1250	50	Siltstone - medium grey, firm, siltstone - very fine
			sand sized quartz grains occasionally showing, fine
			bedding, slightly fissile with trace carbonaceous laminae
			and grains, micaceous.
		40	Sandstone - light grey, fine - medium, sub anfular - sub
			rounded, clear quartz with moderately clear - white
			cement, possibly feldspathic.
		10	Sandstone - loose, clear to slightly milky, medium,
			subrounded quartz.
			Good trace - calcite - white, crystalline.
1250	1255	70	Siltstone - medium - dark grey A/A.
		20	Sandstone - light grey A/A.
		10	Sandstone coarse quartz grains with silica cement in
			optical continuity
1255	1260	80	Siltstone, medium - dark grey, moderately hard, A/A.
		20	Sandstone, light grey, very fine - fine grain, medium
			hard, clear quartz, subrounded - rounded, moderately
			sorted, poor to moderately calcite cement, otherwise
			clear SiO2? / feldspathic, trace dark lithic frags. poss.
			carbonaceous, trace isolated, loose quartz A/A.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1260	1265	70	Siltstone - medium - dark grey, firm, slightly fissile,
			argillaceous, micaceous with fine lenses and laminae
			of coal, trace white medium occasionally prismatic
			irregular grains - possibly remnant feldspar.
		20	Quartz - very coarse, clear, crystalline quartz possibly
			occurring parallel to bedding. Occasionally seen as
			coarse, subangular - rounded quartz with clear
			intergranular quartz in optical continuity.
		10	Sandstone - light grey - light brown, clear, quartz
			with slight trace dark grey lithic fragments and
			carbonaceous material, good trace white grains, very
			hard and with probable siliceous cement.
			Good trace Calcite - white, crystalline.
1265	1270	60	Siltstone - medium brown grey, argillaceous micaceous,
			with trace fine lenses, and grains of coal with good
			trace white, irregularly shaped grains, firm, sub
			fissile occasionally less argillaceous and with grains
			grading to fine sandstone.
		20	Sandstone - light medium grey, fine - medium clear
			quartz, occasionally with trace grains of coal, and
			good trace white irregularly shaped grains.
		20	Quartz - beds and veins of clear coarse quartz with
			clear intergranular cement, occasionally fracturing
			along plane surfaces, possibly feldspathic in part.
			Occasionally merging into silicified sediments.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1270	1275	70	Siltstone, medium - dark grey, fissile, argillaceous,
			grades to silty sandstone, trace carbonaceous laminae,
			occasionally very carbonaceous.
		30	Sandstone, light - grey, A/A
			Trace pyrite in coal.
			Common calcite crystalls.
			Occasionally clear - milky quartz grains A/A.
1275	1280	80	Siltstone medium dark grey, medium - hard, fissile
			A/A. Trace coal, black, micaceous/platy, medium soft.
		20	Sandstone, light grey - brown, very fine grain, moderately
			hard, angular - subangular, poor - medium sorted.
			Calcite cement in part, otherwise clayey. Trace dark
			lithics.
			Occasionally clear quartz grain, often coal adhering.
1280	1285		A/A.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1285	1290	90	Siltstone, light - medium grey, fissile, argillaceous, occasionally very carbonaceous, grades to argillaceous silty sandstone with subrounded quartz grains and elongate or'flattened' white lithics. Occasionally carbonaceous laminae.
		10	Sandstone, light grey brown, moderately hard, angular - subangular, poor - moderately sorted, cement is clear - transulcent, some calcite in fractures, trace dark lithics.
1290	1295	90	Siltstone - medium - dark grey, fissile argillaceous, firm - occasionally hard, locally carbonaceous with trace subrounded, fine quartz grains, trace lithic fragments (crystalline appearance).
		10	Sand - medium - coarse, clear and slightly milky, angular, quartz - possibly quartz vein. Good trace - Calcite - white, crystalline.
1295	1300	90	Siltstone - medium - dark brown grey, fissile, moderately soft, argillaceous, with grains of quartz and white lithic fragments.
		10	Sand - medium - coarse, clear angular quartz. Good trace calcite.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1300	1305	90	Silty Sandstone - Medium to dark brown grey, argillaceous grading silt to fine sand, small lenses and trace inclusions to carbonaceous materials. White fine grained lithic fragments grading moderately soft to hard.
		5-10	Sand - Medium to coarse, clear to slightly milky, angular, quartz.
		Trace	Coal - Black, micaceous, fissile.
		Trace	Calcite
1305	1310	70	Sandstone - Light to medium grey, fine to medium clear to very pale brown quartz, with white occasionally clear intergranular matrix, calcareous in part. Trace of carbonaceous material, trace of dark-brown lithic fragments and occasionally white lithics.
		30	Siltstone - Dark grey, carbonaceous, argillaceous and possibly micaceous, firm, slightly fissile.
		Trace	Quartz - Clear, argillaceous, coarse from veins and fractures.
		Trace	Calcite -
		Trace	Good trace Coal - Black, fissile, micaceous, rarely - vitreous with conchoidal fracture.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1310	1315	40	Sandstone - Light to medium grey, A/A.
		40	Siltstone - Medium brown, occasionally dark grey-brown,
			argillaceous, carbonaceous, A/A.
		10	Coal - Black, micaceous, fissile, easily disaggregated
			into fine fibrous grain, very slight traces dark gold
			fluorescence, cut fluorescence and stain.
1315	1320	60	Sandstone - Light to medium grey=brown, very fine to
			medium clear quartz, traces white and dark grey lithic
			fragments, carbonaceous, occasionally argillaceous.
		30	Siltstone - Light to medium grey, firm, carbonaceous.
		10	Quartz - Coarse, angular, clear quartz, occasionally
			fractured and with slightly calcareous cement in fracture.
			Occasional contacts between sediments and the quartz,
			also some cuttings show quartz transgressing bedding as
			a vein.
		Trace	Calcite - Clear - white, crystalline.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1320	1325		Flowline Sample - Poor Returns.
		90	Sandstone, light grey, very fine grain, angular -
			subangular, poor sorted, moderately soft, poor calcite
			cement in part otherwise clayey, trace dark lithics.
		10	Siltstone, medium - dark grey, argillaceous, fissile
			grades to silty sandstone, occasionally very
			carbonaceous, trace laminae, with common calcite
			crystals.
			Trace quartz, clear, fractured.
1325	1330		Flowline Sample - Poor Returns.
		80	Sandstone A/A.
		20	Siltstone A/A. with trace coal, black, shiny,
			moderately hard.
1330	1335	90	Sandstone, light gray - brown, very fine grain,
			moderately hard, subangular - subrounded, poor -
			moderately sorted, poor - good calcite cement, otherwise
			clear - translucent/clayey, trace dark lithics, poor
			porosity, with occasionally adhering coal/carbonaceous
			fragments, trace bedding, common calcite crystals.
			trace coal, black, micaceous, moderately hard.
		10	Siltstone, medium dark grey, fissile, argillaceous
			grades to silty sandstone.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1335	1340	60	Siltstone, medium - dark grey, very fine grain,
			grades to silty sandstone, trace carbonaceous laminae,
			occasionally very carbonaceous.
			Fissile, moderately hard.
		40	Sandstone, light grey - brown, very fine grain, medium -
			hard, subrounded - rounded, moderately sorted, good
			calcarious cement, some intergranular clay, trace dark
			lithics to white blebs (after fold?), with trace coal,
			black, micaceous, moderately hard.
1340	1345	80	Siltstone A/A
		20	Sandstone A/A with occasionally black conchoidal
			fracture coal, trace clear - transulcent isolated,
			angular, coarse quartz grains.
1345	1350	80	Siltstone, A/A
		20	Sandstone, light grey, very fine - fine grain, moderately
			hard, clear - transulcent quartz, subangular - subrounded,
			moderately sorted, calcite cement in part, otherwise
			clayey siliceous, trace dark lithics, poor porosity.
1350	1355	90	Siltstone, medium - dark grey, argillaceous, fissile,
			moderately hard, grades to argillaceous sandy siltstone,
			with angular white lithics, occasionally coal, black,
			micaceous, platy fracture interbeds, occasionally very
			carbonaceous trace laminae, common calcite (milky and
			clear) grains.
		10	Sandstone A/A.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1355	1360	70	Siltstone A/A
			Trace shale, medium - dark, fissile, occasionally
			carbonaceous.
		30	Sandstone, light - grey brown, very fine grain, medium -
			hard - friable, trace lineation of white lithics, trace
			coal, black, moderately soft, micaceous.
			Common calcite crystals.
1360	1365	80	Siltstone, medium - dark grey, argillaceous, fissile
			moderately hard, grades to very carbonaceous, common
			calcite crystals.
			Trace coal.
		20	Sandstone A/A
1365	1370		Poor returns - Flowline Sample.
		90	Sandstone, light - grey - brown, very fine grain,
			moderately hard angular - subangular, poor sorted,
			good - poor calcite cement, trace dark lithics, poor
			porosity.
		10	Siltstone A/A.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1370	1375	80	Siltstone, medium - grey, fissile, moderately hard,
			trace coal, black, micaceous, splintery, moderately
			soft.
		20	Sandstone, light grey, very fine grain, A/A.
1375	1380	90	Siltstone, light - medium grey, fissile, moderately
			hard, dominantly light grey, common carbonaceous
			laminae grades to sandy siltstone, with argillaceous
			matrix and black/dark lithics and white blebs.
		10	Sandstone A/A
			Trace coal.
			Trace shale, medium grey, hard, fissile.
1380	1385	70	Siltstone, medium - dark grey, fissile, moderately
			hard, argillaceous, occasionally very carbonaceous.
		30	Sandstone, light grey, very fine grain, moderately hard,
			trace dark lithics. A/A.
1385	1390		Flowline Sample - Poor Returns.
		60	Sandstone, light grey, moderately hard, very fine grain,
			clear quartz, subrounded - rounded, moderately sorted,
			calcite cement in part, otherwise clear - transulcent
			SiO_2.
		40	Sandy Siltstone, medium - dark grey, very argillaceous,
			trace white lithics, occasionally very carbonaceous.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1390	1395	80	Siltstone, medium - dark grey, fissile, argillaceous,
			occasionally carbonaceous, grades to sandy siltstone,
			trace coal, black, moderately soft, micaceous, fissile.
		20	Sandstone, A/A.
1395	1400		Flowline Sample - Poor Returns.
		70	Siltstone, A/A, very argillaceous, grades to sandy
			siltstone, occasionally carbonaceous.
		30	Sandstone, light grey - brown, very fine grain,
			subrounded - rounded, moderately sorted, trace dark
			lithics, good - poor calcite cement otherwise clayey/
			Si02, poor porosity.
1400	1405		Flowline Sample - Poor Returns.
		70	Siltstone, A/A trace carbonaceous laminae, grades to
			argillaceous sandy siltstone with subrounded quartz
			and angular white lithics.
		20	Coal, black, micromicaceous, trace conchoidal fracture,
			fissile, moderately hard, platy fracture.
		10	Sandstone, A/A.
1405	1410		Siltstone, medium - dark grey, argillaceous, moderately
			soft, occasionally carbonaceous, trace carbon
			laminae, trace lineated white lithics (feldspar?)
			grades to sandy siltstone.
			Trace calcite crystalline vein.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1410	1415	50	Sandstone, light grey - brown, very fine - fine grain,
			moderately hard, subangular - subrounded, moderately
			sorted calcite cement in part otherwise clear - transulcent
			in optical continuity Si02, trace dark and white lithics,
			poor porosity.
			With common calcite crystalline chips (vein).
		40	Siltstone A/A.
		10	Coal, black, brittle, vitreous lustre in part otherwise
			micromicaceous, occasionally conchoidal fracture.
			Trace pyrite in coal.
1415	1420	70	Sandstone A/A. trace coal A/A.
		30	Siltstone A/A.
1420	1425	80	Sandy Siltstone, medium - dark grey, argillaceous,
			fine grain, white angular lithics in very fine grain
			matrix, moderately hard grades to siltstone, occasionally
			carbonaceous.
			Occasionally calcite crystalline chips.
		20	Sandstone A/A.
1425	1430	60	Sandstone, light grey - brown, very fine grain,
			moderately hard, subrounded - rounded, poor - moderately
			sorted, good - poor calcite cement, otherwise Si02,
			poor porosity.
		40	Siltstone, medium - dark grey, argillaceous, fissile
			occasionally carbonaceous.
			With common milky calcite crystals. (vein) trace clear,
			angular, loose, quartz (vein?).

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1430	1435	100	Siltstone, medium - dark grey, moderately hard fissile, occasionally very carbonaceous, trace shale, medium grey, hard, fissile, occasionally milky to clear calcite crystals. Trace coal, black, hard, micromicaceous, fissile.
1435	1440	80	Siltstone, medium - dark grey, A/A.
		10	Sandstone, light grey - brown, very fine - fine grain, occasionally very argillaceous, grading to silty sandstone, occasionally milky and clear calcite crystals.
		10	Coal, black, moderately soft, appears to be a very fine aggregate, micaceous in part.
1440	1445	50	Siltstone, medium grey, argillaceous fissile, occasionally carbonaceous. Trace shale, medium - grey.
		10	Sandstone, light grey - brown, very fine - fine grain, moderately soft, good - poor calcite cement, trace dark lithics.
		30	Silty Sandstone, medium - grey, very argillaceous, trace white lithics, calcite cement in part.
		10	Coal, Black, vitreous lustre, conchoidal fracture.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1445	1450	90	Siltstone, medium grey, fissile, moderately hard,
			trace loose, clear, angular quartz, common calcite
			crystalls (vein).
		10	Silty Sandstone, medium grey, very fine grey, moderately
			hard, grades to light - grey brown sandstone A/A.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1450	1455	90	Siltstone - Medium grey, moderately hard, argillaceous fissile. Common calcite crystals.
		10	Sandstone - A/A.
1455	1460	70	Siltstone - A/A.
		30	Sandstone - Light grey-brown, very fine to fine grain, sub-angular to subrounded, medium sorted, good calcareous cement in part, trace dark lithics, common calcite crystalline.
1460	1465	90	Siltstone - A/A.
		10	Sandstone - Light grey, very fine to fine grain, occasionally medium grain, moderately soft quartz is angular to sub-angular, poor to moderate sorted, good calcareous cement in part, otherwise clayey, traces dark lithics, possibly coal, common calcite crystalline chips (vein).
1465	1470		A/A.
1470	1475		Poor returns - Flowline Sample.
		70	Siltstone - Medium to dark grey, vary argillaceous, occasional carbonaceous laminae, occasionally carbonaceous. Trace coal, black, soft, micaceous, splintery.
		30	Sandstone - Light grey-brown, A/A.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1475	1480	70	Silty Sandstone - Light to medium grey, V.F.G.,
			moderately hard, occasionally very argillaceous, trace
			dark lithics, trace coal, black, waxy lustre, mod.
			8 ft.
		25	Siltstone - A/A.
		5	Sandstone - Light grey-borwn, A/A.
1480	1485	90	Silty Sandstone - Light to medium grey, A/A.
		10	Sandstone - Light grey, medium grain.
		Trace	Coal - Black, subvitreous - waxy.
		Trace	Calcite - Clear-white, crystalline.
		Trace	Quartz - Clear, angular, medium-coarse.
1485	1490	90	Silty Sandstone - Medium to dark grey, argillaceous,
			occasionally carbonaceous, slightly fissile.
		5	with interbedded coal - black, vitreous, fissile.
		Trace	Good trace Calcite - clear, crystalline, occasionally
			showing good rhombohedra.
		Trace	Quartz
1490	1495	70	Siltstone - medium to dark grey, A/A.
		5	Quartz
		5	Calcite
		10	Coal - Black, fissile, waxy.
		10	Clay - White.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1495	1500	60	Sandstone - Light grey - light brown subrounded - sub-
			angular, fine to medium, with calcareous cement in part.
		30	Siltstone - Medium to dark grey, A/A, occasionally
			carbonaceous.
		10	Coal - Black, fissile, vitreous, firm.
		Trace	Good trace Quartz - loose, clear, very angular, coarse,
			often fractured.
		Trace	Calcite
			Clay - white A/A.
1500	1505	60	Sandstone - Light grey - light brown, A/A.
		30	Siltstone - A/A.
		10	Coal - A/A - Black, fissile.
		Trace	Good trace Calcite.
		Trace	Quartz
			Possible slickensides? Some grains show one side
			flattened and polished.
1505	1510	70	Siltstone - Medium to dark grey, argillaceous, occasion-
			ally carbonaceous.
		20	Sandstone - Light grey, A/A.
		10	Coal - A/A.
		Trace	Calcite and Quartz

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1510	1515	70	Siltstone - Medium-dark grey micaceous A/A.
		15	Coal - black, fissile, micaceous
		10	Quartz - clear, angular, medium - coarse.
		5	Calcite
1515	1520	70	Siltstone - Medium to dark grey, carbonaceous with
			interbeds of :-
		10	Coal - black, fissile, micaceous often lenticular.
		10	Sandstone - Light to medium grey, fine grain, possibly
			carbonaceous.
		10	Quartz - Narrow veins of clear, fractured quartz,
			occasionally as loose grains of quartz.
		Trace	Calcite
		Trace	White Clay
1520	1525	70	Siltstone - A/A.
		10	Coal - A/A

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1525	1530	50	Sandstone - Light grey, fine grained, subangular.
			- subrounded, clear quartz with white
			- clear cement, calcareous in part, moderately friable.
		40	Siltstone: Medium grey, - dark grey, argillaceous,
			firm - hard, often carbonaceous.
		10	Coal - Black, vitreous - subvitreous fissile.
		Trace	Quartz - loose, V angular, coarse, clear, often fractured
			probably from veins.
		Trace	Calcite - white - clear, crystalline.
		Trace	Claystone - white, in thin plates or lamina.
1530	1535	60	Sandstone - Light A/A.
		40	Siltstone - Medium to dark grey A/A.
		Trace	Coal, quartz, calcite, white clay.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1535	1540		Flowline sample.
		60	Sandstone - Light grey, fine grained with calcareous
			cement in part, probably also felspathic in part.
			Friable associated with white clay.
		40	Siltstone - Medium grey, slightly argillaceous,
			occasionally carbonaceous, moderately firm, has a
			crystalline appearance.
			Trace coal - black, sub vitreous, blocky.
1540	1545		Flowline Sample.
		60	Siltstone - A/A
		30	Sandstone - A/A
			Trace coal
			Trace 5% Quartz - clear, medium - coa
			- coarse, angular.
1545	1550	80	Silty Sandstone - Medium, dark grey, argillaceous,
			generally silty but occasionally grading to medium
			clear, subrounded quartz; occasionally carbonaceous
			with included grains of coal.
		20	Sandstone - Light grey, medium clear quartz, with
			slightly calcareous cement in part, with trace lithic
			fragments friable.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1540	1545	60	SILTSTONE, medium - dark grey, argillaceous, occasionally carbonaceous, trace white lithics, very fine grained.
		40	SANDSTONE, light - medium grey, very fine grained, angular to subangular, moderate sorting, calcareous cement in part, grades to argillaceous. Trace coal.
1545	1550	60	SILTY SANDSTONE, medium - dark grey, very fine grained, grades to argillaceous siltstone.
		40	SANDSTONE, A/A. Trace micaceous, carbonaceous mudstone, common vein quartz and calcite.
1550	1555		Flowline sample.
		80	SILTY SANDSTONE, A/A.
		20	SANDSTONE, A/A.
1555	1560	80	SILTSTONE, medium - dark grey, argillaceous, grades to silty sandstone.
		20	SANDSTONE, light grey, very fine grained, angular, poor - moderate sorting, moderately hard. Trace shale.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1560	1565	60	SILTSTONE, medium grey, argillaceous, grades to carbonaceous shale.
		40	SANDSTONE, light - medium grey, very fine - fine grained, moderately hard, subangular - subrounded, moderate sorting, calcareous cement in part, grades to silty sandstone.
1565	1570	60	SILTY SANDSTONE, medium to dark grey, very fine grained, argillaceous.
		20	SILTSTONE, A/A.
		20	SANDSTONE, A/A.
1570	1575	60	SANDSTONE, light - medium grey, A/A.
		40	SILTSTONE, A/A grading to sandy siltstone.
1575	1580	80	SILTSTONE, A/A with occasional speckled texture.
		10	SANDSTONE, A/A.
		10	SHALE, medium - dark grey, grading to very carbonaceous.
1580	1585	90	SILTSTONE, A/A, occasionally very carbonaceous.
		10	SANDSTONE, light grey, very fine - fine grained, subangular, moderately sorted.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1585	1590	60	SILTY SANDSTONE, light - medium grey, very fine grained, argillaceous, speckled texture in part, grades to very fine grained, light grey sandstone.
		40	SILTSTONE, A/A.
1590	1595	60	SILTY SANDSTONE, A/A, grades to siltstone.
		40	SANDSTONE, A/A.
1595	1600		A/A, with trace sandstone, greeny - brown.
1600	1605	70	SILTSTONE, medium grey, moderately hard, very argillaceous.
		30	SANDSTONE, light grey - brown, very fine - fine grained, angular, moderately sorted, siliceous cement, calcareous in part. Trace carbonaceous shale.
1605	1610	90	SILTSTONE, A/A.
		10	SANDSTONE, A/A occasionally very argillaceous, grading to silty sandstone.
1610	1615		A/A, trace shale.
1615	1620	80	SILTSTONE, medium - dark grey, hard, very argillaceous, occasional speckled texture, grades to very carbonaceous.
		20	SANDSTONE, A/A.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1620	1625	80	SILTSTONE, medium - dark grey, sub-fissile, argillaceous, grades to very carbonaceous, occasional laminae.
		20	SANDSTONE, medium grey - brown, very fine grained, moderately hard, subangular - subrounded, moderately sorted, siliceous cement, calcareous in part.
1625	1630	70	SILTSTONE, A/A.
		30	SANDSTONE, light - medium grey, moderately soft - hard, very fine grained, angular, poorly sorted, trace laths of plagioclase (?), good to trace calcite cement, very tight.
1630	1635	80	SILTSTONE, A/A.
		20	SANDSTONE, A/A.
			Trace coal, black, vitreous lustre, coachoidal fracture.
1635	1640	90	SILTSTONE, A/A, with common calcite veinlets.
		10	SANDSTONE, light brown, very fine grained, hard, subangular - subrounded, moderate sorting, siliceous cement, tight.
1640	1645	60	SILTSTONE, A/A.
		40	SANDSTONE, light grey - light brown, very fine - fine grained, subangular - subrounded, moderate - well sorted, siliceous cement, calcareous in part, occasionally argillaceous.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1645	1650	60	SANDSTONE, light grey, very fine grained, hard,
			subangular, moderate sorting, siliceous cement,
			calcareous in part, good trace prismatic feldspars.
		40	SILTSTONE, medium - dark grey, sub-fissile,
			argillaceous, moderately hard, grades to sandy
			siltstone, occasionally carbonaceous.
1650	1655	70	SANDSTONE, light grey - brown, very fine - fine
			grained, subrounded, moderately sorted, siliceous and
			calcareous cement, moderately hard.
		30	SILTSTONE, A/A.
			Trace Coal, black, micaceous, soft and trace calcite
			grains, possibly veinlets.
1655	1660	60	SILTSTONE, A/A.
		40	SANDSTONE, A/A.
1660	1665	80	SILTSTONE, A/A.
		20	SANDSTONE, A/A.
1665	1670	90	SILTSTONE, A/A, trace calcite veinlets.
		10	SANDSTONE, medium grey - brown - dark grey, very fine
			grained, moderately hard, occasionally very
			argillaceous.
			Common calcite chips.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1670	1675	80	SILTSTONE, dark grey, subfissile, argillaceous, trace laminae, grades to sandy siltstone.
		20	SANDSTONE, A/A.
1675	1680	70	SILTSTONE, A/A, occasionally grades to very carbanaceous.
		20	SANDSTONE, A/A, good - trace calcite cement.
		10	CLAYSTONE, light grey - green, fissile, moderately soft. Common calcite ships.
1680	1685		
		60	SILTSTONE, A/A.
		40	SANDSTONE, light grey - light brown, very fine - fine grained, subangular - subrounded, poor - moderate sorting, siliceous and calcareous cement, very argillaceous in part, very tight. Common quartz and calcite chips.
1685	1690	70	SILTSTONE, A/A.
		20	SANDSTONE, A/A.
		10	SHALE, dark grey - black, very carbonaceous, fissile, moderately hard.
1690	1695	60	SANDSTONE, light grey, very fine grained, subangular - subrounded, moderate sorting, good calcite cement in part.
		40	SILTSTONE, A/A. Trace shale, A/A; common quartz and calcite chips.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1695	1700	60	SANDSTONE, light grey, very fine grained, moderately hard, angular - subangular, poor - moderate sorting, good calcite cement.
		40	SILTSTONE, A/A.
1700	1705		As above.
1705	1710	90	SANDSTONE, light grey, very fine grained, moderately hard, subangular - subrounded, moderate sorting, poor - good calcite cement, siliceous in part, occasionally argillaceous, very tight.
		10	SILTSTONE, dark grey - black, very carbonaceous, subfissile, hard. Common calcite chips.
1710	1715	95	SANDSTONE, A/A.
		5	SILTSTONE, A/A.
1715	1720	60	SILTSTONE, medium - dark grey, fissile, argillaceous, grades to sandy siltstone.
		40	SANDSTONE, A/A.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1720	1725	60	SILTSTONE; dark grey, subfissile, moderately hard,
			grades to very carbonaceous.
		40	SANDSTONE, light - medium grey, very fine - fine
			grained, angular - subangular, moderately sorted, good
			to poor calcite cement, good trace feldspathic laths,
			grades to silty sandstone.
1725	1730	50	SANDSTONE, light grey - light brown, A/A.
		50	SILTSTONE, A/A.
			Common chips of vein calcite.
1730	1735	80	SILTSTONE, medium - dark grey, hard, argillaceous,
			grades to sandy siltstone.
		20	SANDSTONE, light grey - light brown, very fine - fine
			grained, angular, poor - moderate sorting, good calcite
			cement in part, trace carbonaceous fragments, very
			tight.
			Common quartz and calcite chips.
1735	1740	80	SILTSTONE, A/A.
		20	SANDSTONE, A/A.
			Trace shale, dark grey, hard, fissile.
			Common quartz and calcite chips.
1740	1745	90	SILTSTONE, A/A.
		10	SANDSTONE, light grey, very fine - fine grained,
			subrounded, moderate sorting, siliceous and calcite
			cement, trace feldspar, very tight, very hard.
			Trace Shale A/A.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1745	1750	70	SILTSTONE, A/A.
		30	SANDSTONE, A/A.
			Common quartz and calcite chips.
1750	1755	60	SILTSTONE, medium - dark grey, fissile, hard,
			argillaceous, often containing calcite veinlets.
		40	SANDSTONE, light - medium grey - brown, very fine
			grained, subangular - subrounded, moderate sorting,
			good calcite cement, argillaceous in part, trace
			carbonaceous fragments.
1755	1760	90	SILTSTONE, A/A.
		10	SANDSTONE, light grey, very fine grained, moderately
			hard, subrounded, poor - moderate sorting, siliceous
			cement, calcite in part, very tight.
			Common calcite chips.
1760	1765	60	SILTSTONE, A/A.
		40	SANDSTONE
			Trace shale, common calcite chips.
1765	1770		As above.
1770	1775	80	SANDSTONE, light grey, very fine grained, subangular,
			moderate sorting, siliceous and calcite cement,
			occasionally argillaceous.
		20	SILTSTONE, medium - dark grey, grades to sandy
			siltstone with speckled texture.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1775	1780	60	SANDSTONE, light grey, very fine - fine grained, subrounded, moderate sorting, siliceous and calcite cement, clayey in part, abundant feldspar laths, grading to silty sandstone, occasional carbonaceous fragment, very tight.
		40	SILTSTONE, medium - dark grey, argillaceous, fissile, very hard, grades to carbonaceous.
1780	1785	60	SILTSTONE, A/A.
		40	SANDSTONE, A/A. with occasional laminae defined by angular grain orientation and carbonaceous fragments.
1785	1790	80	SILTSTONE, A/A.
		20	SANDSTONE, light grey, very fine grained, subrounded, poorly sorted, siliceous cement, calcite in part, occasional clayey matrix, grades towards sub-arkosic, moderately hard, very tight.
1790	1795	70	SILTSTONE, A/A with grade to sandy siltstone, speckled texture.
		30	SANDSTONE, A/A. Common quartz and calcite chips.
1795	1800	60	SILTSTONE, A/A.
		40	SANDSTONE, A/A.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1800	1805	80	SILTSTONE, medium - dark grey, moderately hard, fissile,
			grades to sandy siltstone
		20	SANDSTONE, light grey, very fine grained, very
			argillaceous
1805	1810		As above
1810	1815	90	SILTSTONE, A/A grading to shale
		10	SANDSTONE, A/A
			Common quartz and calcite chips, trace coal.
1815	1820		As above
1820	1825	70	SILTSTONE, Medium grey, subfissile, moderately hard,
			argillaceous
		20	SANDSTONE, Light grey - brown, very fine - medium
			grained, angular, moderately sorted, siliceous cement,
			in part, common feldspar laths, occasionally
			argillaceous, moderately hard
		10	SHALE, dark grey, carbonaceous, fissile.
			Trace coal, black, hard, micromicaceous.
			Common quartz and calcite chips.
1825	1830	80	SILTSTONE, A/A grading to sandy siltstone.
		20	SANDSTONE, A/A.
			Trace shale, common quartz and calcite chips.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1830	1835	80	SILTSTONE, medium grey, argillaceous, fissile,
			occasional speckled texture, often the chips are cut by
			calcite veinlets, moderately hard.
		20	SANDSTONE, light grey, very fine grained, clayey matrix.
			Trace shale, common quartz and calcite chips.
1835	1840	90	SILTSTONE, A/A.
		10	SANDSTONE, A/A.
1840	1845		As above.
1845	1850	60	SANDSTONE, light grey, very fine - fine grained,
			moderately hard - moderately soft, subangular -
			subrounded, moderately sorted, siliceous cement, calcite
			in part, occasionally argillaceous.
			Good trace feldspathic laths and carbonaceous (?)
			lithics.
		40	SILTSTONE, A/A.
			Trace coal.
1850	1855	90	SANDSTONE, A/A.
		10	SILTSTONE, A/A.
			Common quartz and calcite chips.
1855	1860	100	SANDSTONE, A/A.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1860	1865	60	SANDSTONE, light grey, hard, very fine - fine grained, subangular, moderate sorting, good calcite cement, with slight clayey matrix, good trace dark grey - black (carbonaceous ?) lithics and feldspars.
		40	SILTSTONE, dark grey, subfissile, argillaceous, grades to very carbonaceous. Abundant calcite chips.
1865	1870	60	SILTSTONE, A/A.
		40	SANDSTONE, A/A.
1870	1875	50	SANDSTONE, light grey - brown, very fine grained, subrounded, moderate sorting, calcite and siliceous cement, abundant subangular feldspathic grains, common angular dark grey-black carbonaceous chips.
		50	SILTSTONE, A/A, grades to sandy siltstone. Common calcite chips.
1875	1880	70	SILTSTONE, A/A.
		30	SANDSTONE, A/A.
1880	1885	60	SILTSTONE, A/A.
		40	SANDSTONE, A/A.
1885	1890	80	SILTSTONE, medium - dark grey, argillaceous, subfissile, speckled texture with pin-head white lithics, grades to sandy siltstone.
		20	SANDSTONE, light grey, very fine grained, angular, moderate sorting, clayey matrix, moderately soft, siliceous in part, very tight. Trace coal, common quartz and calcite chips.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1890	1895	90	SILTSTONE, A/A.
		10	SANDSTONE, light grey, very fine grained, clayey matrix, soft, very tight. Trace coal, common quartz and calcite chips.
1895	1900	80	SILTSTONE, dark grey, subfissile, moderately hard, occasionally micromicaceous and carbonaceous.
		20	SANDSTONE, A/A.
1900	1905	60	SILTSTONE, A/A.
		40	SANDSTONE, light grey, very fine - fine grained, angular, moderate sorting, good calcite cement in part, moderately hard, very tight.
1905	1910		As above.
1910	1915	80	SILTSTONE, medium - dark grey, occasional speckled texture, grades to sandy siltstone.
		20	SANDSTONE, light grey - light brown, very fine - fine grained, angular, moderate sorting, calcite cement in part, common feldspathic (?) grains, moderately hard, very tight.
1915	1920	90	SILTSTONE, A/A, occasionally cut by calcite veinlets.
		10	SANDSTONE, A/A.
1920	1925	70	SILTSTONE, A/A.
		30	SANDSTONE, light grey, very fine grained, angular, poorly sorted, clayey matrix, soft, good trace feldspathic laths.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1925	1930	70	SANDSTONE, A/A.
		30	SILTSTONE, A/A.
			Common calcite chips
1930	1935		As above
1935	1940	100	SILTSTONE, medium grey, speckled texture with pin-head white lithics, grades to sandy siltstone.
1940	1945	90	SILTSTONE, A/A.
		10	SANDSTONE, light grey, very fine grained, moderately hard, very tight.
1945	1950	80	SANDSTONE, light grey, very fine - medium grained, angular - subangular, poor - moderate sorting, siliceous and calcite cement in part, otherwise clayey matrix, moderately soft - moderately hard.
		20	SILTSTONE, A/A.
1950	1955	100	SILTSTONE, A/A. with occasional calcite veinlets.
1955	1960	60	SANDSTONE, light grey - brown, very fine - fine grained, abundant feldspathic laths, clayey matrix, moderately soft, poor visual porosity.
		40	SILTSTONE, dark grey, subfissile, A/A.
			Trace coal, black, conchoidal fracture; common calcite chips.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
1965	1970	70	SILTSTONE, A/A.
		30	SANDSTONE, light - medium grey, very fine - medium grained, hard, angular, poorly sorted, calcite cement in part, otherwise clayey matrix, possibly degraded feldspathic cement, very tight.
1970	1975	80	SILTSTONE, A/A, grades to sandy siltstone, with rare calcite vugs and common calcite veinlets.
		20	SANDSTONE, A/A. occasionally argillaceous.
1975	1980		As above, common calcite chips.
1980	1985	90	SILTSTONE, medium grey, subfissile, moderately hard, common calcite veinlets, grades to sandy siltstone.
		10	SANDSTONE, A/A.
1985	1990	70	SILTSTONE, A/A.
		30	SANDSTONE, A/A.
			Abundant calcite chips.
1990	1995	60	SANDSTONE, light - medium grey - brown, very fine - fine grained, subangular, poor - moderate sorting, moderately hard, calcite cement, poor visual porosity.
		40	SILTSTONE, A/A.
1995	2000		As above.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
2000	2005	90	SANDSTONE, light grey - brown, very fine grained,
			subangular, moderate sorting, calcite cement, clayey in
			part, moderately hard.
		10	SILTSTONE, medium - dark grey, common calcite veinlets,
			grades to very carbonaceous.
2005	2010	80	SILTSTONE, A/A.
		20	SANDSTONE, A/A.
			Common calcite chips.
2010	2015	60	SILTSTONE, medium - dark grey, argillaceous, subfissile,
			occasional speckled texture, grades to very carbonaceous.
		40	SANDSTONE, light grey - light brown, very fine - fine
			grained, soft, clayey matrix, very poor visual porosity.
			Common calcite chips.
2015	2020	60	SANDSTONE, A/A.
		40	SILTSTONE, A/A.
			Common calcite chips.
2020	2025	70	SILTSTONE, A/A. with numerous calcite veinlets across
			the chips.
		30	SANDSTONE, light grey - pale green, very fine grained,
			A/A.
2025	2030	60	SANDSTONE, light grey, very fine - fine grained,
			moderately soft - hard, subangular, poor sorting,
			siliceous and calcite cement, otherwise clayey, very
			tight.
		40	SILTSTONE, A/A.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
2030	2035	50	SANDSTONE, A/A.
		50	SILTSTONE, A/A.
2035	2040	80	SILTSTONE, A/A. grading shale, dark grey, micaceous,
			hard, fissile.
		20	SANDSTONE, light - medium grey, fine - medium grained,
			subrounded, clear quartz with 20-30% dark brown lithic
			fragments, very hard, very tight.
			Good trace calcite chips.
2040	2045	90	SILTSTONE, A/A.
		10	SANDSTONE, A/A.
2045	2050		As above.
2050	2055	70	SILTSTONE, dark grey, hard, with trace dispersed white
			silt to very fine sand sized lithic fragments,
			occasionally fissile, grading to shale.
		30	SANDSTONE, A/A.
2055	2060	60	SILTSTONE, A/A.
		40	SANDSTONE, A/A.
			Common calcite chips.
2060	2065	80	SILTSTONE, A/A.
		20	SANDSTONE, A/A.
2065	2070	60	SILTSTONE, medium - dark grey, argillaceous, speckled
			texture with white, dispersed very fine grained lithics,
			grading to shale.
		40	SANDSTONE, A/A.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
2070	2075		As above
2075	2080	70	SILTSTONE, A/A.
		30	SANDSTONE, light grey, soft, very fine - fine grained, good trace feldspathic laths, clayey matrix, calcite in part.
2080	2085	90	SILTSTONE, A/A, grades to sandy siltstone, common calcite veinlets.
		10	SANDSTONE, A/A. Common calcite veinlets.
2085	2090	60	SILTSTONE, A/A.
		40	SANDSTONE, light grey - light green, very fine grained, angular, poorly sorted, calcite cement in part, clayey elsewhere. Abundant calcite chips.
2090	2095		As above.
2095	2100	80	SILTSTONE, medium - dark grey, argillaceous, moderately hard, occasional speckled texture with white angular to subangular lithics and dark lithics, grades to sandy siltstone, occasionally micromicaceous.
		20	SANDSTONE, A/A. Trace pyrite, coal, common quartz and calcite chips. Trace light green moderately soft, clear - translucent chips.
2100	2105	60	SILTSTONE, A/A.
		40	SANDSTONE, A/A.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
2105	2110	80	SILTSTONE, A/A, grades to shale.
		20	SANDSTONE, A/A.
2110	2115	90	SILTSTONE, dark grey, fissile, argillaceous, grades to micromicaceous shale.
		10	SANDSTONE, light grey, very soft, very fine grained, argillaceous.
2115	2120	70	SILTSTONE, A/A.
		30	SANDSTONE, light - medium grey - brown, moderately soft, friable in part, very fine - fine grained, subangular - subrounded, moderately sorted, good calcite cement in part, siliceous and clayey otherwise, trace dark grey subangular lithics, good trace subrounded, prismatic creamy - white lithics, trace carbonaceous laminae.
2120	2125	60	SANDSTONE, light - medium grey A/A.
		40	SILTSTONE, A/A. Trace coal, good trace calcite chips.
2125	2130	80	SILTSTONE, A/A with occasional light brown, moderately soft siltstone.
		20	SANDSTONE, A/A. Common calcite chips.
2130	2135	60	SILTSTONE, dark grey, fissile, hard, argillaceous, occasional dispersed white very firm grained lithics, common calcite veinlets, grades to shale.
		40	SANDSTONE, A/A. Common calcite chips.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
2135	2140	70	SILTSTONE, A/A.
		30	SANDSTONE, A/A.
2140	2145	90	SILTSTONE, dark grey, A/A.
		10	SANDSTONE, light grey brown, moderately soft, grades to silty sandstone.
2145	2150		As above.
2150	2155	80	SILTSTONE, dark grey, fissile, argillaceous, hard, grades to micaceous shale.
		20	SANDSTONE, A/A.
2155	2160	90	SILTSTONE, medium - dark grey, argillaceous, speckled texture with dispersed white very fine grained lithics, grades to sandy siltstone, occasionally carbonaceous and micaceous,
		10	SANDSTONE, light - medium grey, very fine grained, moderately hard, angular subangular, poor - moderate sorting, siliceous and minor calcite cement in part.
2160	2165	70	SILTSTONE, A/A.
		30	SANDSTONE, A/A.
2165	2170	80	SILTSTONE, A/A.
		20	SANDSTONE, A/A.
			Common calcite chips.
2170	2175	70	SILTSTONE, medium - dark grey, fissile, micromicaceous, hard.
		30	SANDSTONE, light grey - light brown, very fine grained, argillaceous, angular, poorly sorted, siliceous, calcite

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
			cement in part, hard, very tight.
2175	2180	90	SILTSTONE, A/A.
		10	SANDSTONE, A/A.
			Common calcite chips.
2180	2185	80	SANDSTONE, light - medium grey, very fine - fine
			grained, moderately soft, angular, poor - moderate
			sorting, siliceous, clayey in part, very tight.
		20	SILTSTONE, A/A.
2185	2190	100	SILTSTONE, A/A.
2190	2195	90	SILTSTONE, A/A.
		10	SANDSTONE, A/A.
			With trace coal, common calcite chips.
2195	2200	80	SILTSTONE, A/A.
		20	SANDSTONE, A/A.
2200	2205	70	SILTSTONE, A/A.
		30	SANDSTONE, Light grey, very fine grained, angular,
			moderate sorting, calcite cement in part,
			occasionally argillaceous.
			Common quartz calcite chips.
2205	2210	90	SILTSTONE, A/A.
		10	SANDSTONE, A/A.
2210	2215	100	SILTSTONE, A/A grades to sandy siltstone.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
2215	2220	70	SILTSTONE, A/A.
		30	SANDSTONE, A/A.
			Trace Pyrite.
2220	2225		As above
			Trace pyrite, trace coal, black, vitreous lustre,
			conchoidal fracture.
2225	2230	90	SILTSTONE, dark grey, fissile, hard, micromicaceous,
			shaley.
		10	SANDSTONE, A/A.
2230	2235	100	SILTSTONE, A/A.
2235	2240	80	SILTSTONE, medium - dark grey, fissile, argillaceous,
			grades to shale.
		20	SANDSTONE, light grey, very fine - medium grained,
			siliceous cement, clayey in part, moderately hard, very
			poor visual porosity.
2240	2245	90	SILTSTONE, A/A.
		10	SANDSTONE, A/A.
			Trace coal, black, vitreous lustre conchoidal fracture.
2245	2250	60	SANDSTONE, light grey, very fine grained, angular,
			moderately sorted, siliceous to calcite cement,
			moderately soft.
		40	SILTSTONE, A/A.
			Common quartz and calcite chips.

GAS AND FUEL EXPLORATION N.L.
SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
2250	2255	60	SILTSTONE, A/A.
		40	SANDSTONE, light grey - brown, very fine - fine grained, angular, poorly sorted, siliceous, hard, very tight.
2255	2260	90	SILTSTONE, A/A grades to sandy siltstone.
		10	SANDSTONE, A/A. Common quartz and calcite chips.
2260	2265		As above.
2265	2270	80	SILTSTONE, A/A.
		20	SANDSTONE, A/A. Common quartz and calcite chips.
2270	2275	50	SANDSTONE, A/A.
		50	SILTSTONE, A/A. Note; large amount of caving.
2275	2280	70	SILTSTONE, A/A.
		30	SANDSTONE, light grey, very fine - fine grained, abundant feldspathic laths, argillaceous, moderately hard, very tight. Common quartz and white chips.
2280	2285		As above.

GAS AND FUEL EXPLORATION N.L.

SAMPLE DESCRIPTION REPORT

INTERVAL FROM	INTERVAL TO	%	SAMPLE DESCRIPTION
2285	2290	60	SILTSTONE, medium - dark grey, argillaceous, fissile,
			speckled texture in part, grades to sandy siltstone,
			occasionally carbonaceous and shaley.
		40	SANDSTONE, light grey - brown, very fine - fine
			grained, moderately hard - hard, subangular - subrounded,
			moderately sorted, siliceous, in part calcite cement,
			good trace white to creamy angular prismatic
			feldspathic grains, trace black highly reflective
			rounded lithics, very poor visual porosity.
			Common quartz and calcite chips.
2290	2295	70	SILTSTONE, A/A.
		30	SANDSTONE, A/A.
			Common quartz and calcite chips.
2295	2300	80	SILTSTONE, A/A.
		20	SANDSTONE, A/A
2300	2302		As above, with trace vein quartz containing angular
			fragments of sandstone and siltstone.

APPENDIX V: Summary of drilling operations.

Olangolah - 1 was spudded on the 5th of May, 1982.

Prior to rig-up a 24" conductor pipe had been installed to 6m. below ground level. A 17½" hole was drilled to a depth of 80m. (K.B.) and 13 3/8" casing was run and cemented.

A Cameron Iron Works double type "U" and a Hydril GK12" annular B.O.P. was installed on the casing head and pressure tested to 1000 p.s.i.

Drilling recommenced with 12¼" hole at a slow rate of 4 m/hour due to increasing hole deviation, which proved to be a problem throughout the drilling program.

At 508m. the pin of a 6½" DC twisted off and the fish was retrieved with an overshot. On running back in the hole all circulated returns were lost. Returns were finally sustained by adding L.C.M. (sawdust) to the mud after a cement plug set on the bottom did not rectify the loss.

At 511m. Schlumberger ran ISF-Sonic, H.D.T. logs and the C.S.T., after which 9 5/8" casing was run and cemented, and the 9 5/8" casing head and B.O.P. were installed all of which were pressure tested to 2000 p.s.i.

Drilling recommenced with 8½" hole. At 514m. a leak-off test to 0.7 p.s.i./ft gradient (13.5 PPG equivalent) was successfully performed. Between 512m. and 2160m. progress was plagued by eight washouts, culminating with the replacement of 147 lengths of drill pipe at 2160m. In summary the following washouts occurred:

- at 512m.; one cracked pin, one washed box, two galled faces in DC.
- at 1110m; two cracked pins, two washed boxes, two galled faces in DC.
- at 1536m.; one cracked box in DC.
- at 1765m.; one crack in the body of a down jar.
- at 1903m.; a hole in the body of a DP.
- at 2108m.; a hole in the body of a DP.
- at 2136m.; holes in the body of two DP.
- at 2160m.; a hole in the body of a DP.

Progress was further hampered by a steel blade on a stabilizer becomming detached from the assembly and subsequently damaging the bearing on the bit at 1322m. A fishing magnet recovered the junk.

Schlumberger ran D.L.L. and Sonic logs and attempted a H.D.T. log run at 2089m., but the tool failed and the H.D.T. was not run.

Whilst tripping for a new bit from 2302m. the string became stuck in a suspected key seat with the bit at 1952m. Continued working of the pipe for 12½ hours failed to free the string. An unsuccessful string shot back off was attempted in the drill collars above the stabilizers (the apparent stuck point). A successful back off was subsequently achieved at the top of the drill collars after repairing the Schlumberger line damaged in an accidental mechanical back off whilst working in left hand torque. The fish was engaged with an overshot and jars only after an unsuccessful run and a cleanout trip. When jarred free, the fish broke out of the overshot and dropped to the bottom from whence it could not be recovered. The top of the fish was then at 2157m.

It was then decided to abandon the hole and the H.D.T. and C.S.T. logs were run by Schlumberger.

The hole was plugged over the interval 460-515m. leaving a fish consisting of a bit, junk sub., float sub., 2 x 6½" DC, steel blade stabilizer, 1 x 6½" DC, steel blade stabilizer, 12 x 6½" DC and an Eastman 30° drift indicator still in the hole.

Olangolah - 1 was abandoned on the 19th June 1982, after having drilled a total of 2302m.

APPENDIX VI.

GEOCHEMICAL EVALUATION OF OLANGOLAH #1 CUTTINGS

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July, 1982

CONTENTS

TABULATED DATA

WELLNAME = OLANGOLAH NO. 1

DATE OF JOB = JULY 1982

ROCK-EVAL PYROLYSIS DATA

DEPTH(m)	TMAX	S1	S2	S3	S1+S2	S2/S3	PI	PC	TOC	HI	OI
200.0	nd	nd	nd	nd	nd	nd	nd	nd	0.35	nd	nd
300.0	nd	nd	nd	nd	nd	nd	nd	nd	0.54	nd	nd
400.0	521	0.01	0.02	0.09	0.03	0.22	0.33	0.00	0.61	3	14
500.0	nd	nd	nd	nd	nd	nd	nd	nd	0.69	nd	nd
600.0	515	0.02	0.10	0.36	0.12	0.28	0.17	0.01	1.55	6	23
800.0	418	0.01	0.05	0.01	0.06	5.00	0.17	0.00	0.86	5	1
900.0	324	0.02	0.03	0.01	0.05	3.00	0.40	0.00	0.67	4	1
1000.0	nd	nd	nd	nd	nd	nd	nd	nd	0.19	nd	nd
1100.0	nd	nd	nd	nd	nd	nd	nd	nd	1.15	nd	nd
1200.0	418	0.02	0.04	0.06	0.06	0.67	0.33	0.00	0.96	4	6
1300.0	nd	nd	nd	nd	nd	nd	nd	nd	0.99	nd	nd
1400.0	347	0.01	0.02	0.01	0.03	2.00	0.33	0.00	0.62	3	1
1500.0	nd	nd	nd	nd	nd	nd	nd	nd	0.69	nd	nd
1600.0	295	0.03	0.04	0.05	0.07	0.80	0.43	0.01	0.73	5	6
1700.0	nd	nd	nd	nd	nd	nd	nd	nd	0.65	nd	nd
1800.0	260	0.01	0.01	0.04	0.02	0.25	0.50	0.00	0.50	2	8
1900.0	288	0.01	0.01	0.01	0.02	1.00	0.50	0.00	0.53	1	1
2000.0	217	0.02	0.01	0.01	0.03	1.00	0.67	0.00	0.43	2	2
2100.0	nd	nd	nd	nd	nd	nd	nd	nd	0.50	nd	nd
2200.0	260	0.01	0.03	0.01	0.04	3.00	0.25	0.00	0.54	5	1
2300.0	nd	nd	nd	nd	nd	nd	nd	nd	0.76	nd	nd

KEY

TOC = Total organic carbon (soluble + insoluble)

PI = Production Index

PC = Pyrolysable Carbon

HI = Hydrogen Index

OI = Oxygen Index

HC = Hydrocarbon

nd = No data

THEORY AND METHOD

THEORY AND METHOD

1. PREPARATION OF SAMPLES

The samples provided for this study were all cuttings. Each sample was air dried, crushed to 1/8" chips using a jaw crusher, and finally crushed to 0.1mm using a Cross Beta grinding mill.

2. TOC DETERMINATIONS

The total organic carbon value (TOC) was determined on the unextracted sediment sample. The value was determined by treating a known weight of sediment with dilute HCl to remove carbonate minerals, and then heating the residue to approximately 1700 ^{o}C (Leco Induction Furnace) in an atmosphere of pure oxygen. The carbon dioxide produced was absorbed on a "Carbosorb" tower. The weight of carbon dioxide produced was then used to calculate %TOC in the sediment.

3. ROCK-EVAL PYROLYSIS

Rock-Eval pyrolysis is carried out by placing approximately 100mg of the crushed sample into a crucible and then subjecting it to the following pyrolysis cycle:

Stage (i) - Sample purged with helium for 3.5 minutes outside of heated part of pyrolysis furnace;

Stage (ii) - Sample heated at 300^{o}C for 3 minutes to liberate free petroleum (S_1 peak);

Stage (iii)- Sample heated from 300^{o}C to 550^{o}C at 25^{o}C/minute to produce petroleum from kerogen (S_2 peak). The furnace is maintained at 550^{o}C for one minute. Carbon dioxide produced during this pyrolysis up to 390^{o}C (550^{o}C in the case of the carbonate-free sediment) is absorbed on a special column;

Stage (iv) - During cool-down period the carbon dioxide produced during pyrolysis is measured (S_3 peak).

The units used for Rock-Eval data are as follows:

S_1, S_2, S_3 = kg/tonne of rock
T_{max} = ^{o}C
Hydrogen Index = mg HC/g TOC
Oxygen Index = mg CO_2/g TOC

Rock-Eval data is most commonly used in the following manner:

(i) S_1 - indicates the level of oil and/or gas already generated by the sample.

(ii) S_1+S_2 - referred to as the genetic potential this parameter is used for source rock evaluation according to the following criteria:

<2	kg/tonne	Poor
2-6	kg/tonne	Moderate
>6	kg/tonne	Good

(iii) $S_1/(S_1+S_2)$ - this parameter is the production index which is a measure of the level of maturity of the sample.

(iv) T_{max} - the temperature corresponding to the S_2 maxima. This temperature increases with increasingly mature sediments.

(v) HI, OI - the hydrogen ($[S_2 x 100]/TOC$) and oxygen ($[S_3 x 100]/TOC$) indices when plotted against one another provide information about the type of kerogen contained in the sample and the maturity of the sample.

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COMMENTS AND CONCLUSIONS

DISCUSSION

General

A series of 21 canned cuttings samples from the Olangolah #1 exploration well were provided for geochemical analysis. After careful drying the samples were crushed to 0.1mm. An aliquot of each sample was then treated with dilute acid to remove carbonate minerals and analysed for its total organic carbon (TOC) content. Finally, both the crushed but otherwise untreated sediment and the crushed, acid-treated sediment from eleven representative samples were analysed by the Rock-Eval pyrolysis technique. Based on the TOC and Rock-Eval data it was not considered worthwhile subjecting these samples to any further geochemical analysis.

Although the geochemists responsible for the development of the Rock-Eval technique suggest that the analysis can be carried out on crushed but otherwise untreated sediment, it has now been established that in many cases analysis of this type of sample results in unreliable S_3 data due to a contribution to this peak from carbon dioxide resulting from carbonate mineral decomposition. It has consequently been suggested that Rock-Eval pyrolysis should be carried out on carbonate-free (acid-treated) sediment. However it is our experience that analysis of the carbonate-free sediment often provides unreliable S_1 and S_2 data. Therefore, the S_1 and S_2 data presented in this report was obtained by pyrolysis of crushed but otherwise untreated sediment whereas the S_3 data was obtained by pyrolysis of carbonate-free sediment. This approach provides the most meaningful Rock-Eval data.

Source Rock Richness

The basic requirement for sediments to be considered a petroleum source is that they contain sufficient organic matter to allow the generation of commercial quantities of petroleum. Since the type of organic matter contained in sediments strongly influences their petroleum generating potential then the minimum level of organic matter required to classify sediments as source rocks also depends upon the source type. However, several prominent geochemists have suggested that generally this minimum TOC value can be set at 0.5% and therefore we use the following criteria for source rock classification based on %TOC:

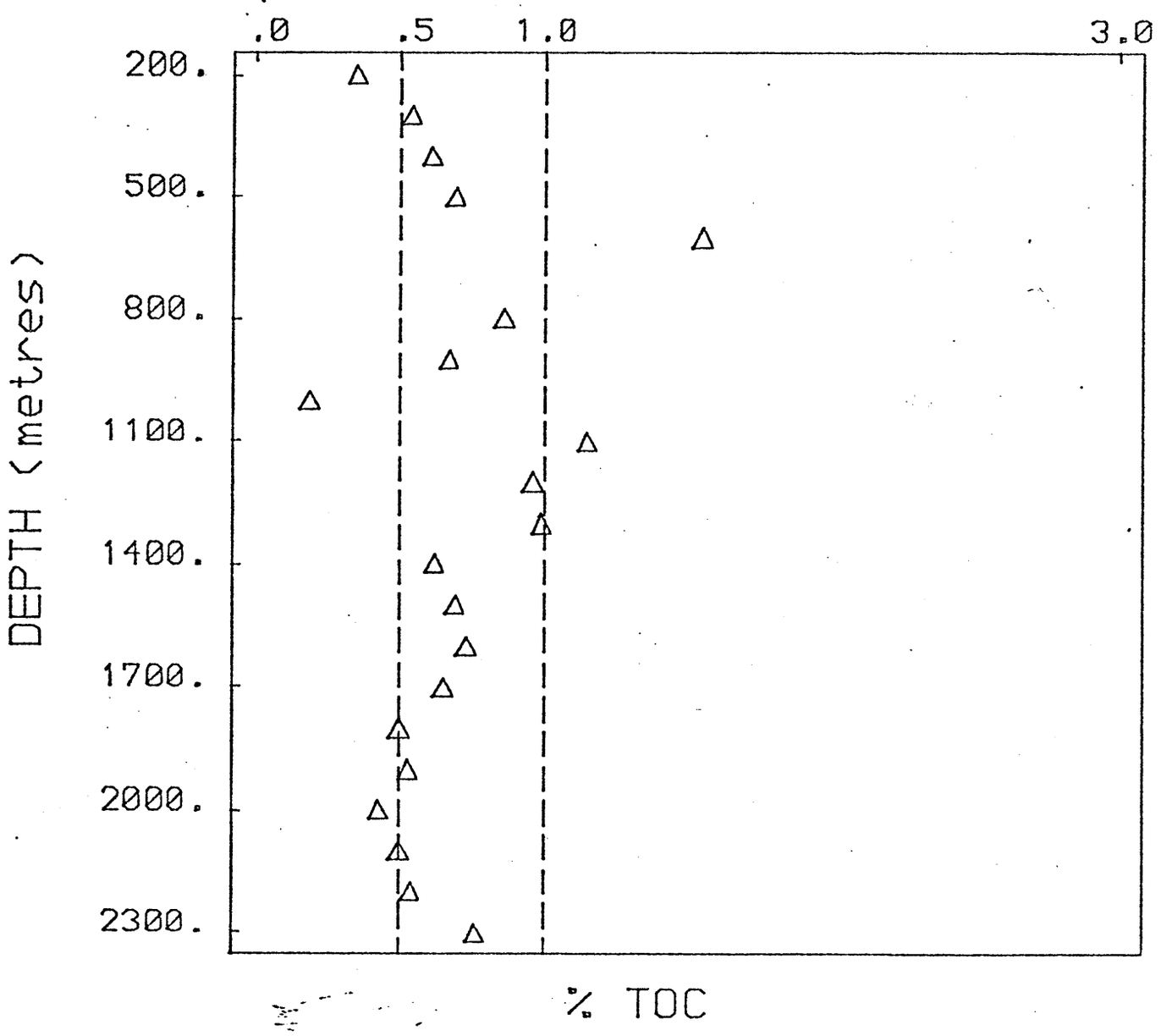
<0.5%	Poor
0.5 -1.0%	Moderate
>1.0%	Good

On this basis the 600m and 1100m samples are good source rocks; the 200m, 1000m and 2000m samples are poor source rocks; and the other 16 samples are all moderate petroleum sources (see plot over the page). Since these samples are generally at least moderate source rocks based on TOC data a more detailed investigation of their source rock suitability was carried out by subjecting eleven representative samples to Rock-Eval pyrolysis.

The most meaningful source rock classification is carried out on the basis of the potential yield (S_1+S_2) data. Unlike the TOC data this parameter at least partially accounts for variation in source type. The criteria used for source rock assessment based on the Potential Yield data are as follows:

<2.0 kg/tonne	Poor
2.0 - 6.0 kg/tonne	Moderate
>6.0 kg/tonne	Good

PLOT OF TOTAL ORGANIC CARBON VERSUS SEDIMENT BURIAL DEPTH



Clearly, based on this parameter these samples are very poor source rocks for either oil or gas. In fact their potential yield values are abnormally low considering their level of TOC. There are two likely reasons for this characteristic:

(i) the samples contain extremely poor quality organic matter; or

(ii) they have been subjected to extreme conditions of maturation.

The only evidence as to the most likely of these two possibilities is the oxygen index (OI) data. Overmature sediments have very low OI values (similar to those observed for these samples) whereas poor quality organic matter has values up to 150 depending on its level of maturity. On this basis it seems likely that the poor pyrolysis yield for these samples is largely due to the samples having been overmatured.

It should be noted that these sediments may have generated and expelled some petroleum before being overmatured, in which case they cannot be totally excluded as a petroleum source.

Sediment Maturity

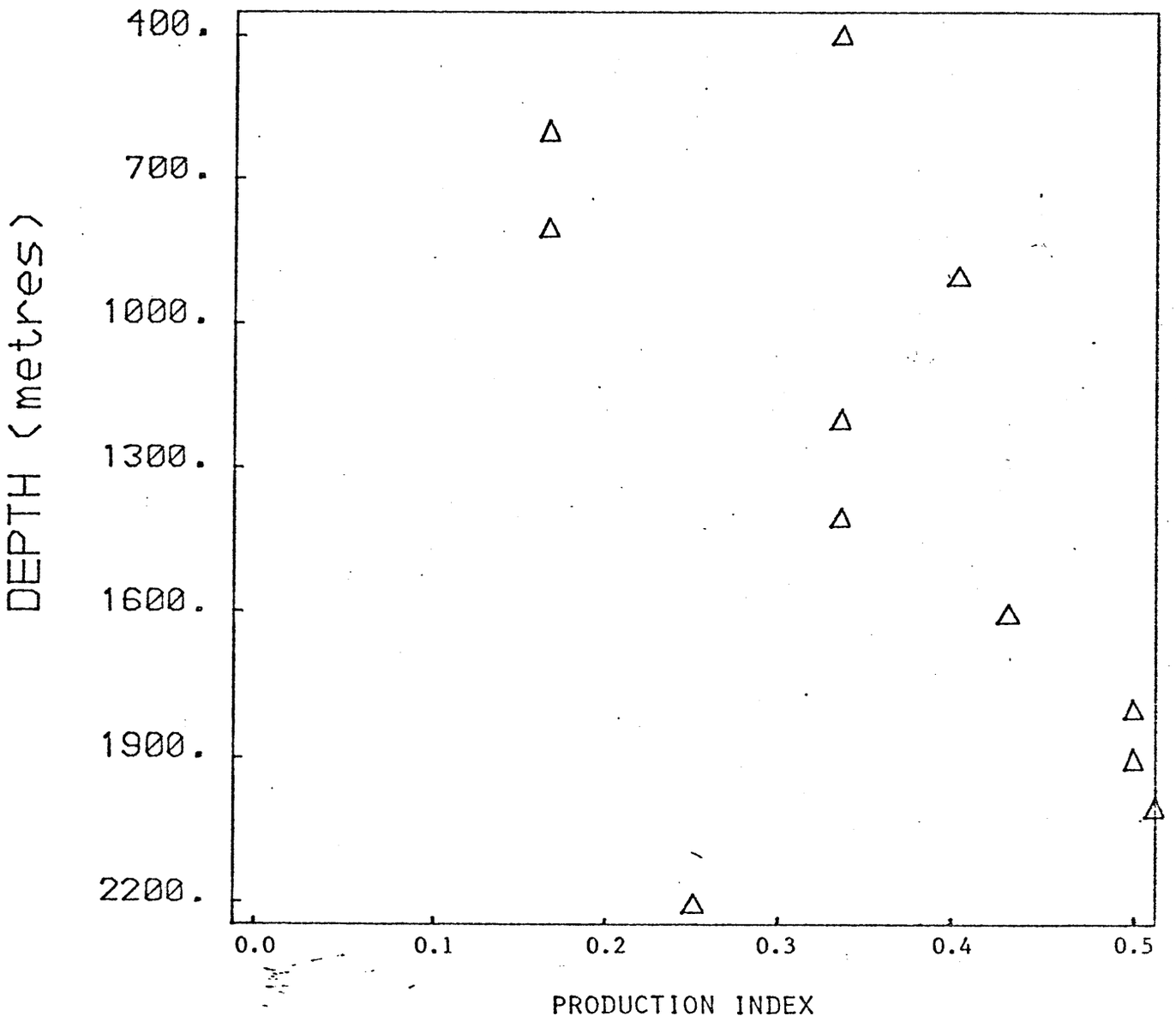
It has already been suggested on the basis of OI data that these samples are probably overmature. In this section, however, the more conventional Rock-Eval maturation parameters are discussed. These parameters are the T_{max} value and production index (PI). Detailed study of samples from the Paris Basin has shown that a T_{max} value of 430-435°C represents a maturity level equivalent to the onset of oil generation whereas T_{max} of about 460°C corresponds to the peak of oil generation. For oil prone sediments the PI value varies from about 0.1 at the onset of oil generation to 0.5 at peak oil generation. For gas prone sediments, the PI data shows only a small change with increasing maturity.

Due to the very small S_2 values the T_{max} data is totally unreliable and in fact is so scattered that our normal plot of T_{max} versus depth included only two data points on scale. Consequently, we have not presented this plot in this report. Although the plot of Production Index versus depth (shown over the page) included all data points on scale we are not prepared to place any emphasis on any trend in this data because the very low S_1 and S_2 values make this data fairly unreliable. Thus the conventional Rock-Eval maturation parameters are of little use in this study.

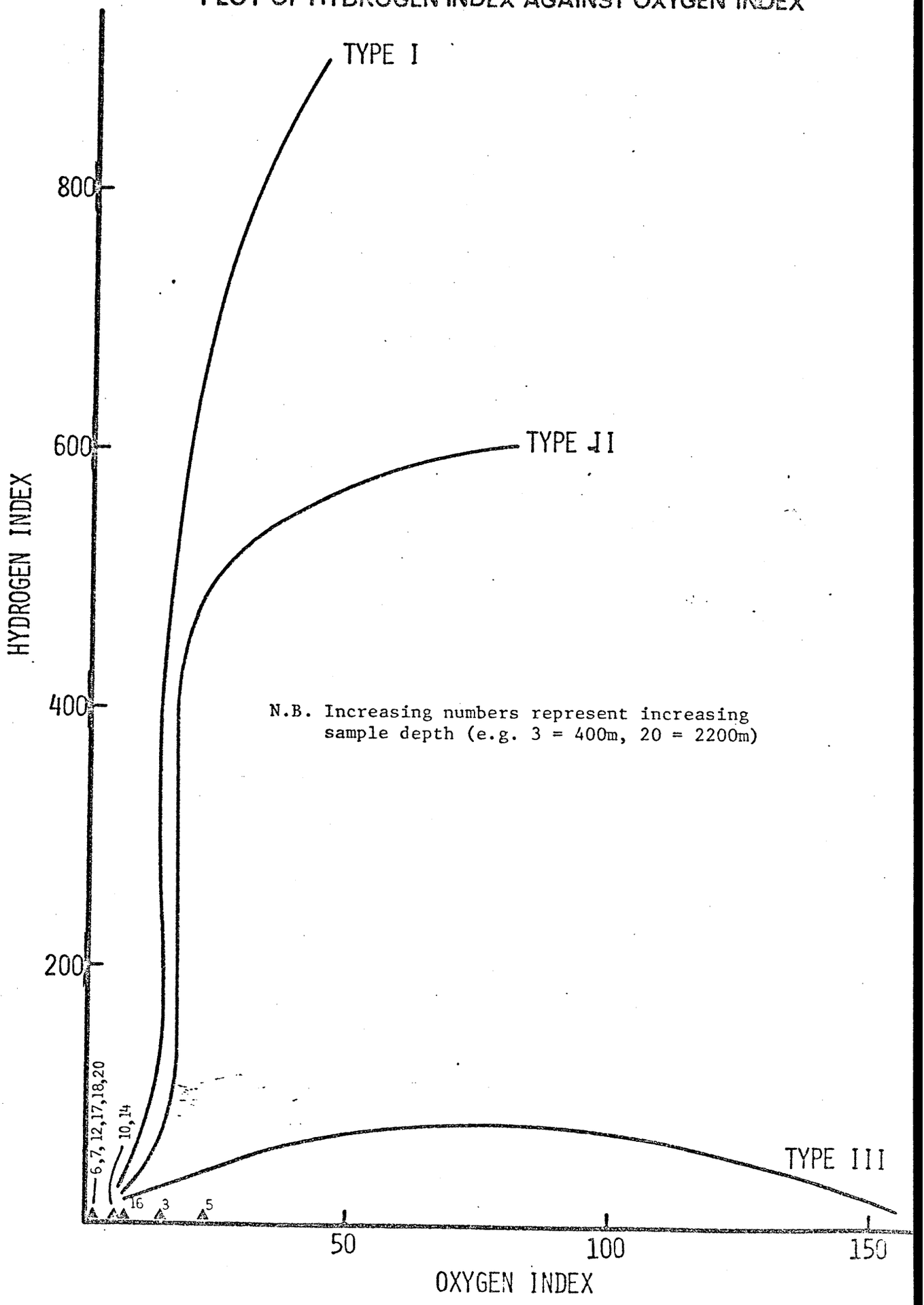
Source Type

A plot of hydrogen index versus oxygen index is shown over the page. The location of the data points on this plot suggests that these sediments are very mature and thus we cannot comment on their kerogen type.

PLOT OF PRODUCTION INDEX VERSUS SEDIMENT BURIAL DEPTH



PLOT OF HYDROGEN INDEX AGAINST OXYGEN INDEX



N.B. Increasing numbers represent increasing sample depth (e.g. 3 = 400m, 20 = 2200m)

CONCLUSIONS

(i) The samples are generally moderately endowed with organic carbon, although this is apparently residual carbon;

(ii) The level of free petroleum (S_1) and pyrolysable petroleum (S_2) in these sediments is extremely low;

(iii) The poor potential yield (S_1+S_2) data is most likely due to the sediments having been overmatured, as evidenced by the low hydrogen index and oxygen indes values;

(iv) It is possible that these sediments generated and expelled oil and/or gas prior to being overmatured. Of course such petroleum may have suffered the same fate as the source sediments;

(v) Conventional Rock-Eval maturation and source typing parameters are of little use in this study.

APPENDIX VII.

MINES ADMINISTRATION PTY. LIMITED

PALYNOLOGICAL LABORATORY

REPORT NO. 272/1

Client: GAS AND FUEL EXPLORATION N/L

Study: OLANGOLAH NO. 1

M.E. Dettmann

I. SUMMARY

See Palynological Data Table appended to report.

II. INTRODUCTION

This report contains the results of a palynological investigation of nine sidewall core samples taken from between 83.5 metres and 1959 metres in Olangolah No. 1 well, Victoria.

The samples yielded extremely low to high volumes of organic material, consisting chiefly of opaque detritus with minor representation of severely to ± totally degraded spore/pollen fragments.

Spore-pollen taxa identified and their biostratigraphic implications are discussed in Section III. Section IV includes an account of the kerogen content of the sample as deduced from transmitted light microscope observations. A chart with a summary of the results is appended to the report.

III. BIOSTRATIGRAPHY

1. 83.5 metres to 290 metres.

Cretaceous; no older than *D. speciosus Zone*

Spore-pollen material extracted from samples at SWC 14/83.5m, swc 13/233m, and SWC 12/290m is meagre, mostly fragmented, and very poorly preserved. Forms identified in the residues are as follows:-

(a) 83.5 metres

Lycopodiumsporites spp. indet.
Stereisporites antiquasporites
Cicatricosisporites australiensis

(b) 235 metres

bisaccate grains indet.

(c) 290 metres

Cyathidites australis/minor
Lycopodiumsporites austroclavatidites
Foraminisporis wonthaggiensis
Cicatricosisporites australiensis
Osmundacidites spp.
Stereisporites antiquasporites
saccate grains indet.

Cicatricosisporites, which occurs at 83.5m and 290m, ranges from the latest Jurassic or earliest Cretaceous to the Turonian in the Otway Basin (see Dettmann and Playford 1969).

Foraminisporis wonthaggiensis at 290 m supports a Cretaceous age, since in the Otway Basin the species first appears within the Early Cretaceous *D. speciosus* Zone and ranges into the Turonian *C. triplex* Zone (Dettmann 1963, Dettmann and Playford 1969). Thus the sediments between 83.5 m and 290 m are considered to be of Cretaceous (Neocomian to Turonian) age and no older than the *D. speciosus* Zone. The microfloral data is insufficient for more precise biostratigraphic allocation in terms of the schemes that Dettmann and Playford (1969) and Dettmann and Douglas (1976) defined for the Otway Basin sequence. In terms of the basins lithostratigraphy, the microfloral evidence indicates that the sampled section is no lower in the Mesozoic sequence than the Otway Group.

2. 467 metres to 658.6 metres

Unassigned Interval

Spore-pollen recovery from the samples between 467m and 658.6m was extremely meagre, with representation of occasional generically identifiable, but extremely poorly preserved and fragmented specimens. Forms identified in the residues include *Osmundacidites Lycopodiumsporites* and *Stereisporites*, all of which are long-ranging within the Mesozoic and Cainozoic sequences of the Otway Basin. Thus on the basis of the recovered plant material the age can not be more precisely stated than Mesozoic or Cainozoic.

3. 924.6 metres to 1959 metres.

Unassigned Interval.

The uppermost sample (SWC 28/924.6m) yielded extremly degraded spores

and pollen grains that could not be identified at generic level.

The lower samples, from 1422.2m (SWC 18) and 1959m (SWC 8), provided residues in which almost totally degraded spore-pollen fragments occur rarely. None of these could be identified and thus no opinion can be given as to the age of the sediments.

IV. KEROGEN ANALYSIS

1. The samples from between 83.5m and 924.6m yielded spores with a dark brown to black colour which suggests that the section has been altered to a level more or less equivalent to that of vitrinite with a reflectance of 2.0%. On this basis the section is considered to be within the high temperature dry gas zone.

The kerogen types represented in the residues are dominantly hydrogen lean (opaque detritus) indicating that the sediments are likely to be gas prone. The sample from 924.6m yielded a high volume of organic material and could thus be considered to be a potential hydrocarbon source rock. However, the samples between 83.5m and 658.6m provided low to extremely low volumes of plant material, indicating that these sediments have no or only very limited potential to source hydrocarbons.

2. 1422.2 metres to 1959 metres

The samples from 1422.2m and 1959m provided residues in which spore-pollen material is almost totally degraded, indicating that the section has been altered to a level equivalent to or greater than that of vitrinite with a reflectance of 3.0%. The presence of low to moderate volumes of predominantly hydrogen lean kerogens indicates that the sediments may have a limited potential to source gas.

V. REFERENCES

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Aust. National Univ. Press Canberra

M[illegible]ADE[illegible]TRA[illegible]PTY[illegible]TED
PA[illegible]OGICAL LABORATORY

Summary of Palynological Data

Company : GAS & FUEL EXPLORATION

Well : OLANGOLAH NO. 1

Basin : OTWAY

REPORT No 272/1

Sample	Depth (feet / metres)	Lithology	Biostratigraphic Unit	Inferred Stratigraphic Unit	Polynomorph preservation	Microplankton / Miospore ratio	Organic Residue Yield	Composition of Organic Residue (as a percentage)								Partical Size (% > 20 u m)		Spore Colour (Estimate of Vitrinite Reflectance)	Remarks
								Dense Sapropelic Detritus	Diffuse Sapropelic Detritus	Fine Sapropelic Detritus	Miospore & Cuticle	Wood Tissue	Opaque Detritus			Structured Tissue	Opaque Detritus		
													Humic Detritus	Vitrinite	Inertinite				
SWC 14	83.5	SILTSTONE; med. grey with SANDSTONE lamination	Cretaceous	-	Very poor	-	Ex. Low	-	5	10	5	-	25	5	50	10	30	ca. 2.0 (dark brown-black)	Very low yield of fragmented spores and pollen grains. Presence of *Cicatricosisporites*.
SWC 13	235	SILTSTONE; med. dark grey	-	-	Very poor	-	Ex Low	-	+	15	+	-	25	5	55	10	35	ca. 2.0 (dark brown-black)	Meagre representation of unidentifiable spore-pollen remnants.
SWC 12	290	SILTSTONE; med. dark grey	Cretaceous; no older than *D. speciosus* Zone.	No lower than Otway Group.	Very Poor	-	Low	-	-	5	15	-	10	50	20	20	40	ca. 2.0 (dark brown black)	A few identifiable spore fragments recovered. *Cicatricosisporites australiensis* and *Foraminisporis wonthaggiensis* represented.
SWC 6	467	SHALE; dark grey carbonaceous	-	-	ex Poor	-	Low	-	-	20	25	-	10	30	15	20	50	2.0-3.0 (black)	Small residue of mostly indeterminate spore/pollen fragments.
SWC 4	490	SANDSTONE; fine grained, light grey	-	-	ex Poor	-	Very Low	-	5	15	10	-	20	30	20	20	30	2.0-3.0 (black)	A few generically identifiable spore/pollen fragments.
SWC 30	658.6	SHALE; med. grey friable	-	-	ex Poor	-	Low	-	-	15	30	-	30	20	15	20	30	2.0-3.0 (black)	Small residue of spore/pollen fragments that are mostly unidentifiable at generic level.
SWC 28	924.6	SHALE; med. grey friable	-	-	ex Poor	-	High	-	10	20	+	-	10	30	30	10	20	2.0-3.0 (black)	Spore-pollen fragments rare almost totally degraded; none identifiable.
SWC 18	1422.2	SHALE; friable med. grey	-	-	-	-	Low	-	-	15	+	-	10	35	40	5	10	-	Rare ± totally degraded spore/pollen fragments
SWC 8	1959	SILTSTONE; med grey	-	-	-	-	Mod.	-	-	20	+	-	+	40	40	5	10	-	As Above

APPENDIX VIII. Well velocity analysis.

GAS AND FUEL EXPLORATION N.L.

WELL OLANGOLAH - 1.

LISTING OF:

1. Z, depth in metres below datum (arbitrary sub-weathering datum) chosen at 400 metres above mean sea level.

2. T, one-way travel time in milliseconds below datum.

3. V_i, V_{AV}, interval and average velocities in M/Sec.

Elevation of K.B. 454 metres above mean sea level.

Times from sonic log are from 85 - 2080 metres K.B.

NOTE:- Sonic Log is not calibrated with respect to eheck shots.
No check shots were performed.

See Enclosure 2 for time-depth curve.

z	T	ΔT	z_i	V_i	V_{AV}
0	0				
		7.75	15.5	4000	
31	7.75				4000
		3.10	38.5	4839	
46	10.85				4240
		4.16	56	4808	
66	15.01				4397
		4.41	76	4535	
86	19.42				4428
		4.23	96	4728	
106	23.65				4482
		4.38	116	4566	
126	28.03				4495
		4.22	136	4739	
146	32.25				4527
		4.15	156	4819	
166	36.40				4560
		4.30	176	4651	
186	40.70				4570
		4.05	196	4938	
206	44.75				4603
		4.10	216	4878	
226	48.85				4626
		4.37	236	4577	
246	53.22				4622
		4.20	256	4762	
266	57.42				4633
		4.28	276	4673	
286	61.70				4635
		4.15	296	4819	
306	65.85				4647
		4.32	316	4630	
326	70.17				4646
		4.38	336	4566	
346	74.55				4641
		4.25	356	4706	

2/....

z	T	ΔT	z_i	V_i	V_{AV}
726	153.20				4739
		4.13	736	4843	
746	157.33				4742
		4.06	756	4926	
766	161.39				4746
		4.01	776	4988	
786	165.40				4752
		4.09	796	4890	
806	169.49				4755
		4.11	816	4866	
826	173.60				4758
		4.25	836	4706	
846	177.85				4757
		4.09	856	4890	
866	181.94				4760
		4.00	876	5000	
906	190.03				4768
		4.05	916	4938	
926	194.08				4771
		3.96	936	5051	
946	198.04				4777
		4.25	956	4706	
966	202.29				4775
		4.18	976	4785	
986	206.47				4776
		4.08	996	4902	
1006	210.55				4778
		4.20	1016	4762	
1026	214.75				4778
		4.19	1036	4773	
1046	218.94				4778
		4.17	1056	4796	
1066	223.11				4778
		4.26	1076	4695	
1086	227.37				4776
		4.36	1096	4587	

4/.....

z	T	ΔT	z_i	V_i	V_{AV}
1106	231.73				4773
		4.21	1116	4751	
1126	235.94				4772
		4.22	1136	4739	
1146	240.16				4772
		4.47	1156	4474	
1166	244.63				4766
		4.90	1176	4082	
1186	249.53				4753
		4.53	1196	4415	
1206	254.06				4747
		3.94	1216	5076	
1226	258.00				4752
		4.06	1236	4926	
1246	262.00				4755
		3.85	1256	5195	
1266	265.91				4761
		3.64	1276	5495	
1286	269.55				4771
		3.82	1296	5236	
1306	273.37				4777
		3.71	1316	5391	
1326	277.08				4785
		3.77	1336	5305	
1346	280.85				4793
		3.78	1356	5291	
1366	284.63				4799
		3.74	1376	5348	
1386	288.37				4806
		3.76	1396	5319	
1406	292.13				4813
		3.90	1416	5128	
1426	296.03				4817
		3.86	1436	5181	
1446	299.89				4822
		3.82	1456	5236	
1466	303.71				4827
		3.81	1476	5249	

5/.....

z	T	ΔT	z_i	V_i	V_{AV}
1486	307.52				4832
		3.83	1496	5222	
1506	311.35				4837
		3.95	1516	5063	
1526	315.30				4840
		3.93	1536	5089	
1546	319.23				4843
		4.21	1556	4751	
1566	323.44				4842
		3.97	1576	5038	
1586	327.41				4844
		3.67	1596	5450	
1606	331.08				4851
		3.83	1616	5222	
1626	334.91				4855
		3.72	1636	5376	
1646	338.63				4861
		3.72	1656	5376	
1666	342.35				4866
		3.83	1676	5222	
1686	346.18				4870
		3.78	1696	5291	
1706	349.96				4875
		3.79	1716	5277	
1726	353.75				4879
		3.77	1736	5305	
1746	357.52				4884
		3.82	1756	5236	
1766	361.34				4887
		3.86	1776	5181	
1786	365.20				4890
		3.81	1796	5249	
1806	369.01				4894
		3.76	1816	5319	
1826	372.77				4898
		3.84	1836	5208	
1846	376.61				4902
		3.76	1856	5319	

6/.....

z	T	ΔT	z_i	V_i	V_{AV}
1866	380.37				4906
		3.77	1876	5305	
1886	384.14				4910
		4.25	1896	4706	
1906	388.39				4907
		4.35	1916	4598	
1926	392.74				4904
		4.10	1936	4878	
1946	396.84				4904
		3.79	1956	5277	
1966	400.63				4907
		3.90	1976	5128	
1986	404.53				4909
		3.64	1996	5495	
2006	408.17				4915
		3.88	2016	5155	
2026	412.05				4917

APPENDIX IX.

OLANGOLAH NO. 1

Organic petrology of a suite of samples from Olangolah No. 1

A.C. COOK

A report prepared for
Gas and Fuel Exploration N/L

Keiraville Konsultants Pty. Ltd.,
7 Dallas St.,
Keiraville, N.S.W., 2500,
Australia.

August 1982

Olangolah No. 1

Contents

Organic petrology of a suite of samples from Olangolah No. 1

Introduction

Ten cuttings and one junk basket samples were received from Gas and Fuel Exploration N/L for petrological examination of the contained organic matter. These samples covered a depth interval from 195m to 2200m and are believed to be from the Eumeralla Formation.

Short descriptions of the organic matter in each sample, together with vitrinite reflectance data and descriptions of rock-types, are given in Appendix 1. This report draws together the petrological and other data for the suite of samples and develops an interpretation of the source-potential of, and the extent to which hydrocarbons are likely to have been generated from, the sequence drilled at the location of Olangolah No. 1. Estimates of the thermal history and the possible timing of maturation are also made.

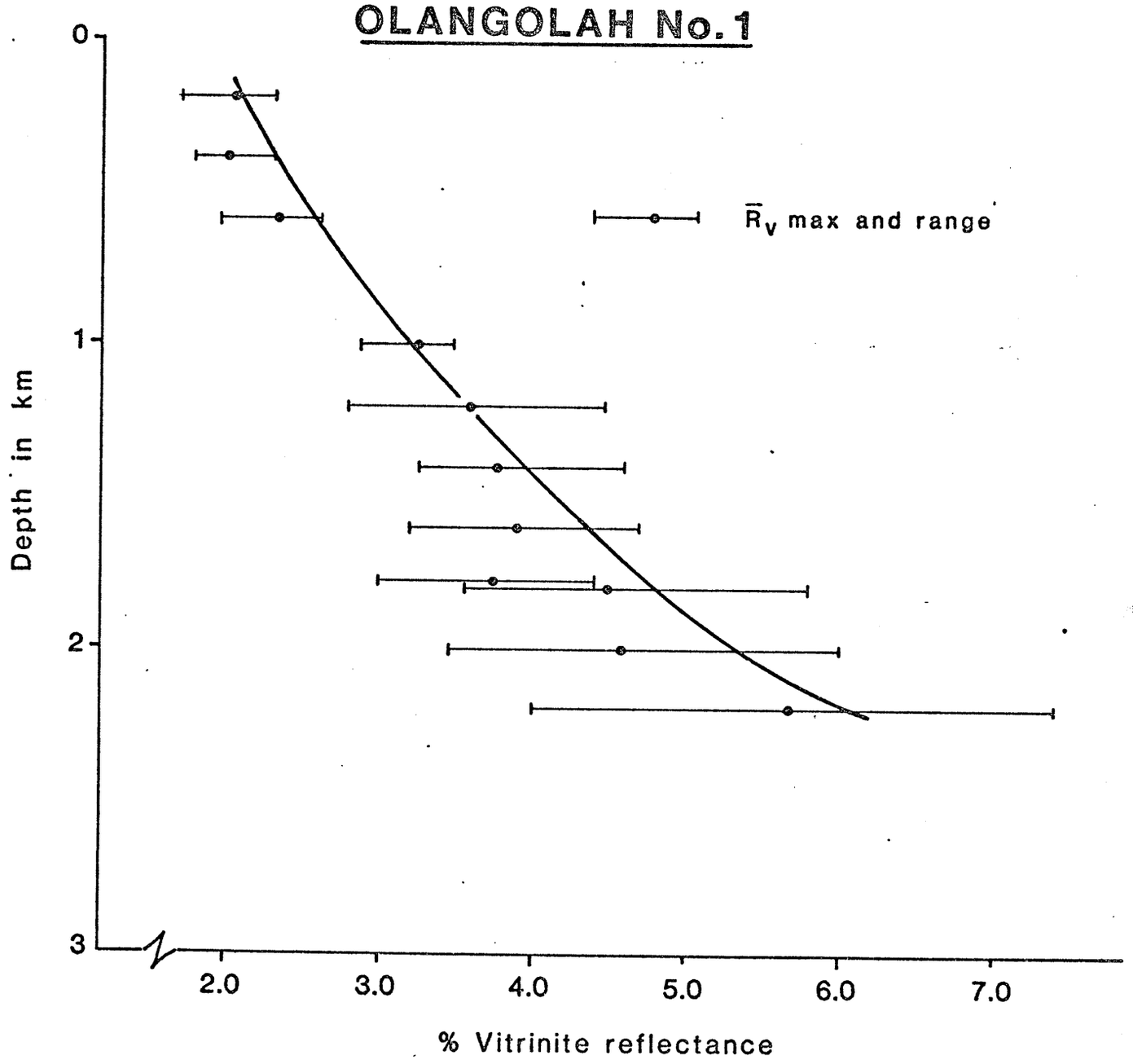
Experimental Methods

Samples were mounted in cold-setting polyester resin and polished "as received", so that whole-rock samples rather than concentrates of organic matter were examined. This method is preferred to the use of demineralised concentrates because of the greater ease, with whole-rock samples, of identifying first generation vitrinite. The whole-rock method also permits the examination of maceral associations and is useful in establishing the R_{max} and true R_{min} values.

Vitrinite reflectance measurements were made using immersion oil of refractive index 1.518 (at 546nm and 23°C) and spinel and garnet standards of 0.42%, 0.917% and 1.726% reflectance. Fluorescence-mode observations were made to provide a check that the anthracitic vitrinite was not a reworked population. For fluorescence-mode, a 3mm BG 3 excitation filter was used with a TK400 dichroic mirror and a K490 barrier filter. A Leitz MPV 1.1 photometer mounted on a Leitz Orthoplan was used for photometric work.
A separate Opak illuminator is normally used for examination in fluorescence-mode.

Vitrinite Reflectance

The sample set provides good control over the variation of the vitrinite reflectance as a function of depth, even though the range of reflectance from each sample is relatively high. The ranges obtained may be partly due to the presence of cavings, but with high rank samples, the R_{max} values may be difficult to find and the distinction of vitrinite from inertinite is not always unequivocal, especially in sections parallel to bedding. In defining the vitrinite population, measurements were made first on the more highly bireflecting phytoclasts — that is vitrinite sectioned perpendicular to, or nearly perpendicular to, bedding. All eight samples were found to contain vitrinite. Twenty readings were obtained for all samples except for that from 1000m where only ten readings were obtained. In all samples, the vitrinite population was relatively well defined. The results for the samples fall on a smooth trend. They provide a good indication of the level and the rate of change (with


OLANGOLAH No.1
0
1
2
3
Depth in km
$\bar{R}_V$ max and range
2.0
3.0
4.0
5.0
6.0
7.0
% Vitrinite reflectance

depth) of maturation (Fig. 1, p 4). The best estimate of maturation (solid curve on Fig. 1) is drawn to take account of the possibility of cavings and the probability that measurement errors will be biased towards lower readings rather than high readings.

The level of maturation is very high with all samples being beyond the oil dead-line ($\bar{R}_{max}$ 1.3%) and beyond the normal limit of commercial gas production ($\bar{R}_{max}$ 2.0%). The three shallowest samples lie slightly below the reflectance trend for the deeper samples but indicate that the upper part of the section is overmature. The relatively smooth form of the reflectance profile, and the high bireflectances found for much of the vitrinite (Plates 1, 2 and 3, and 4 and 5), indicate a normal coalification history rather than very localized contact metamorphism. However, it is clear that the temperatures involved must have been unusually high (see also the section on Thermal History). Slight evidence of a mosaic texture was found in the sample from 600m, but evidence of contact metamorphism is generally lacking. Petrologically the vitrinite resembles the meta-anthracites of the Cooper Basin (Kantsler et al 1978) rather than those described by Creaney (1980). Bireflectance exceeds 2.0% in many of the samples and appears to be typical of that for normally coalified vitrinite.

The reflectance gradient is high with the reflectance increasing at an average of 1.82%/km. This is an average for the depth interval sampled and the tangents to the curve give lower values in the upper part of the section and higher values in the lower part of the section. The reflectance gradient is not, however, unusually high for overmature sections.

Organic Matter Type

Dispersed organic matter (d.o.m.) ranges from rare to abundant (less than 0.1% to >2.0%) but is typically sparse (0.5% to 2.0%). Vitrinite is typically more abundant than inertinite but, at high ranks, these macerals cannot always be reliably distinguished. Vitrinite occurs as small to moderately large phytoclasts (Plates 1 to 5). No fragments derived from coal seams were found. Exinite is also difficult to distinguish but some of the phytoclasts with very high values for R_{max} and bireflectance may be cutinite (Plate 6). The lack of exinite fluorescence is due to the high rank of the sequence. Relatively little variation was found in organic matter type.

Mineral matter fluorescence is weak to absent. Small amounts of chalcopyrite were noted in one of the samples. Pyrite is present in most samples, none appears to have been altered to pyrrhotite.

Thermal History

The sequence must have suffered early, rapid coalification under a significant cover of younger sediments. The duration of coalification is not known but was probably much less than the total age of the sequence. Estimates of palaeotemperatures using the total age of the sediment will give minimum estimates. The estimates in Table 1 were made using the Bostick recalibration of the Karweil nomogram (Appendix 2). The Karweil nomogram is not well calibrated for such high rank coals, but the data in Table 1 give

Table 1. Model temperatures for Olangolah No. 1.

Depth m	Vitrinite Reflectance	Assumed age	Model Temperatures T_{ISO}	T_{GRAD}
150	2.0	120my	130	208
1900	5.1	120my	240	384
2200	6.2	120my	>240	>384

an indication of the order of the magnitude of temperatures involved.

The duration of coalification must have been much less than the total age of the sediments, so that the estimates in Table 1 are likely to be systematically low. The palaeo-geothermal gradient probably exceeded 100°C/km. The depth of cover which has been removed was probably in excess of 1.5km and less than 2.5km. Assumptions concerning the timing of coalification do not greatly affect the estimate of cover loss.

These inferred temperatures contrast markedly with reported well temperatures for the Otway Basin (typically less than 130°C) and with model tempertures based on vitrinite reflectance (maximum value 152°C for T_{GRAD}). The reflectance profiles for some other wells may be consistent with a loss of cover in excess of 1km. Thus, it is probable that the area in which Olangolah No. 1 was drilled was subject to very high temperatures soon after deposition of the sedimentary sequence drilled. Subsequent uplift and erosion has been similar to, or marginally greater than, that in other parts of the onshore Otway Basin notwithstanding the very high rank of near-surface samples.

Hydrocarbon Generation

The source-potential of the sequence ranged from poor to moderately good prior to coalification. The proportion of exinite cannot be estimated accurately so that it is difficult to be definitive concerning the relative importance of oil generation as compared with gas during maturation. The overmature to highly overmature nature of the sequence means that the hydrocarbon potential at Olangolah is restricted to dry gas. Hydrocarbon generation must have occurred early in the history of the sequence. Such timing is commonly considered to give enhanced migration efficiency, and early reservoiring can result in the preservation of porosity and permeability in sandstones at unusually high levels of maturity.

Levels of maturation in the Otway Basin are typically much lower than those found in Olangolah. For example, the depth to the 0.7% reflectance level is typically in excess of 2000m. The high rank found at Olangolah is likely to affect a significant area. Hydrocarbons generated within this area will have largely been driven out of the high rank part of the section. Some zones of anomalously high rank are associated with an aureole of hydrocarbon accumulation. Two of the best known are the Bramsche Massif in W. Germany (Teichmüller and Teichmüller, 1968) and the Nappamerri trough in the Cooper Basin of South Australia (Kantsler and Cook, 1979/1982). If these analogies hold, a potential exists for the existence of hydrocarbon accumulations between the location of Olangolah and areas showing maturation levels more typical of the Otway Basin. Wet gas index should increase away from the high rank areas and some

potential exists for oil accumulation peripheral to the zone of high rank.

Conclusions

The section at Olangolah is overmature. The coalification appears to be a response to a regional rise in temperature rather than to contact metamorphism, but the maturation level for Olangolah is clearly anomalous as compared with reported data for the Otway Basin. The original source-potential of the sequence ranged from poor to moderately good. Exinite cannot be reliably distinguished but is probably present. Potential exists for the occurrence of hydrocarbon accumulations between the location of Olangolah and the typical low levels of maturation found in the Otway Basin. Coalification probably occurred at an early stage with temperatures in the lower part of the sequence probably exceeding 300°C and reaching approximately 200°C in the upper part of the sequence.

References

Creaney, S., 1980. Petrographic texture and vitrinite reflectance variation on the Alston Block, north-east England. Proc. Yorks. geol. Soc. 42, 4, 553-580.

Kantsler, A.J. and Cook, A.C., 1982. Rank variation in the Cooper and Eromanga Basins, Central Australia. Compte Rendu, IX ICC, Urbana, 1979, (In Press).

Kantsler, A.J., Smith, G.C., and Cook, A.C., 1978. Lateral and vertical rank variation : implications for hydrocarbon exploration. J. Aust. Petrol Explor. Assoc., 18, 143-156.

Teichmüller, M. and Teichmüller, R., 1968. Geological aspects of coal metamorphism. In Murchison, D.G., and Westoll, T.S. (Eds). Coal and Coal Bearing Strata. Oliver and Boyd, 347-379.

Plate Captions

V - vitrinite

R.L. reflected white light

Fl. fluorescence mode

PLATES

The Plates have been printed from photomicrographs using 35 mm transparencies. All the photomicrographs were taken using oil immersion. Magnification is indicated by the field width given in the Plate captions. Polarized light was not used for all of the photographs and Plate 1 was taken using partially crossed polars.

Plate 1. Ctgs. 600m

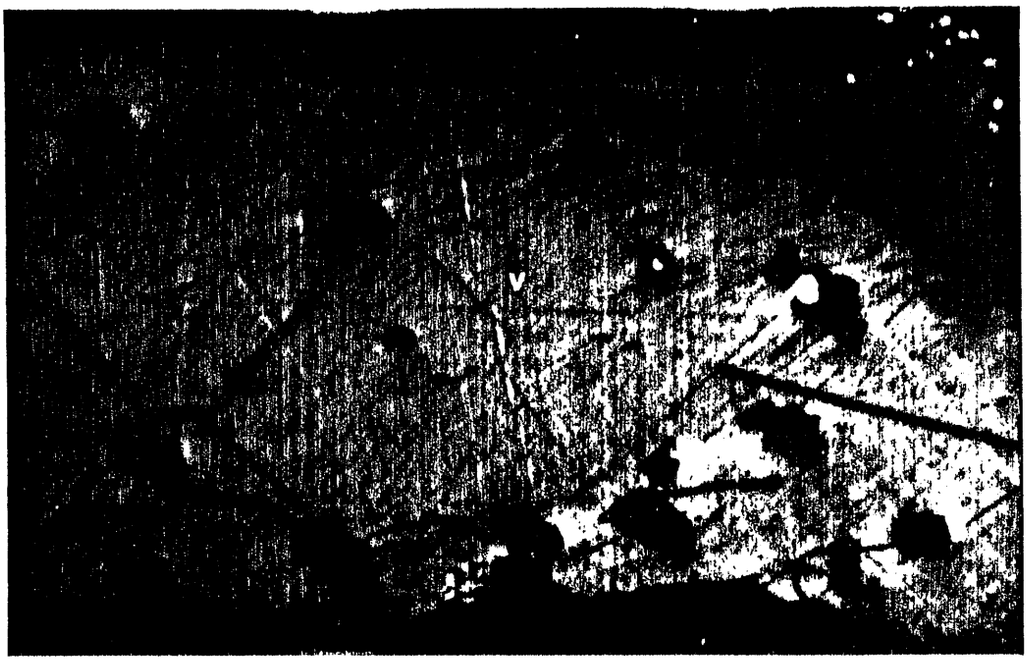
Large phytoclast of vitrinite.
$\bar{R}_v$max 2.35%.
Partially crossed polars, R.L., field width 0.27mm.

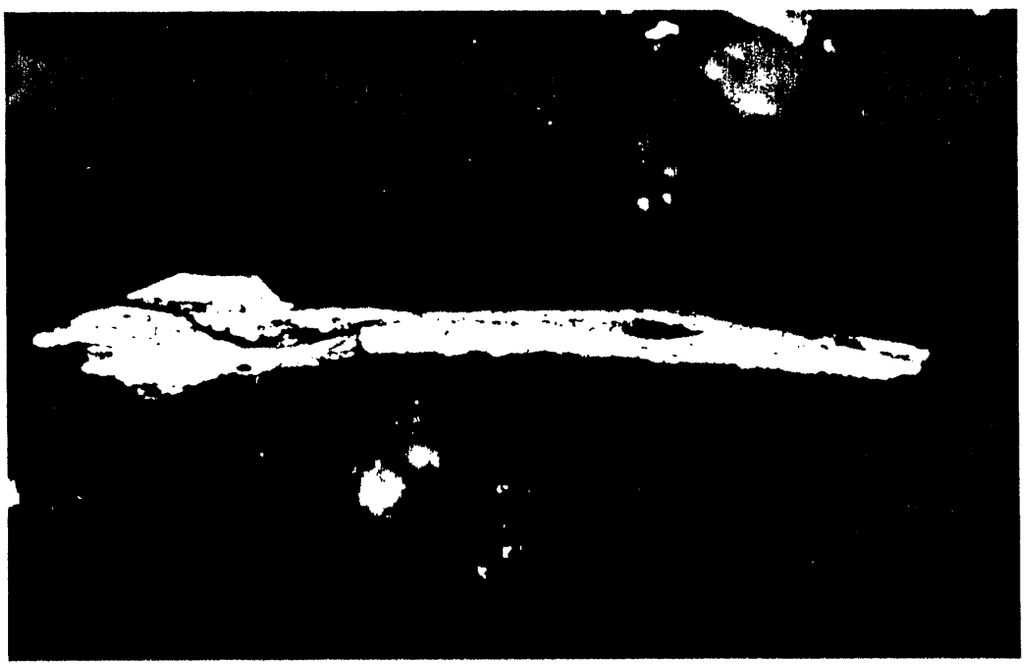
Plate 2. Ctgs. 1200m

Vitrinite phytoclast photographed in plane polarized light with the polarization direction of the analyser running "E-W".
$\bar{R}_v$max 3.60%.
R.L., field width 0.27mm.

Plate 3.

As for Plate 2, but with the analyser rotated 90° to give illumination in the Rmin position.





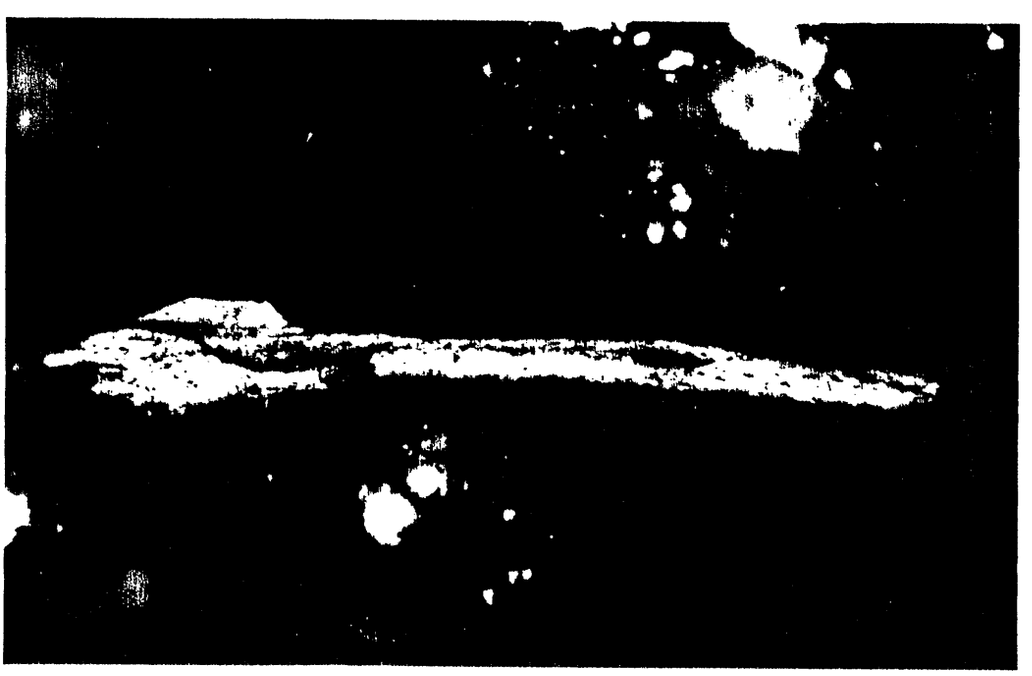


Plate 4. Ctgs 1400m

Vitrinite phytoclast photographed in the illumination conditions used for measurement of Rmax. Polarizer direction and Rmax direction are both "NE-SW".
Rmax 3.78%.
$\bar{R}_v$max 4.04%.
R.L., field width 0.27mm.

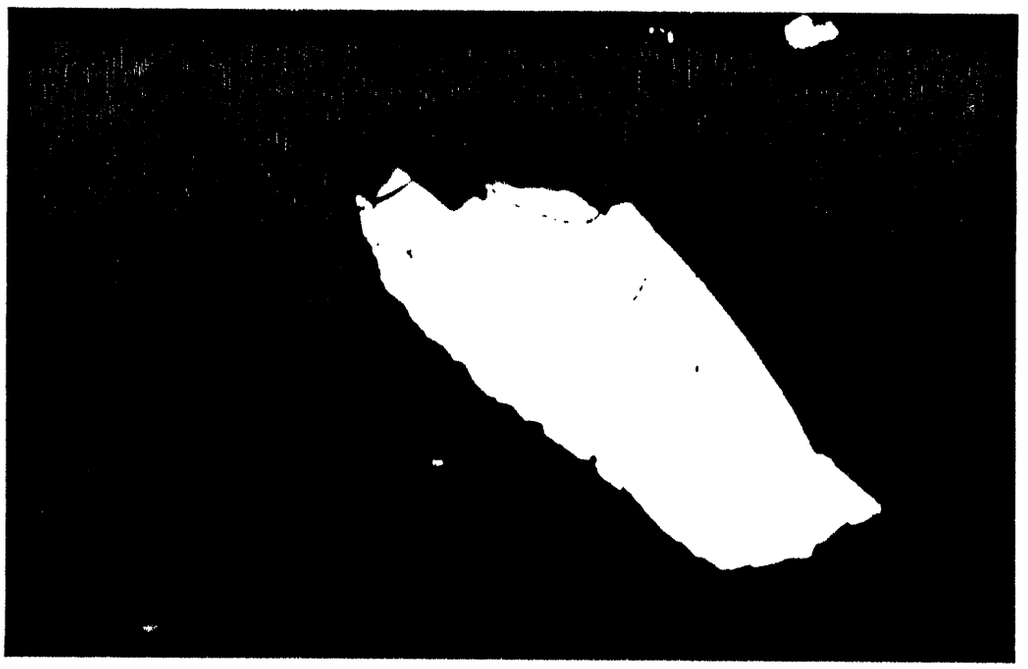
Plate 5.

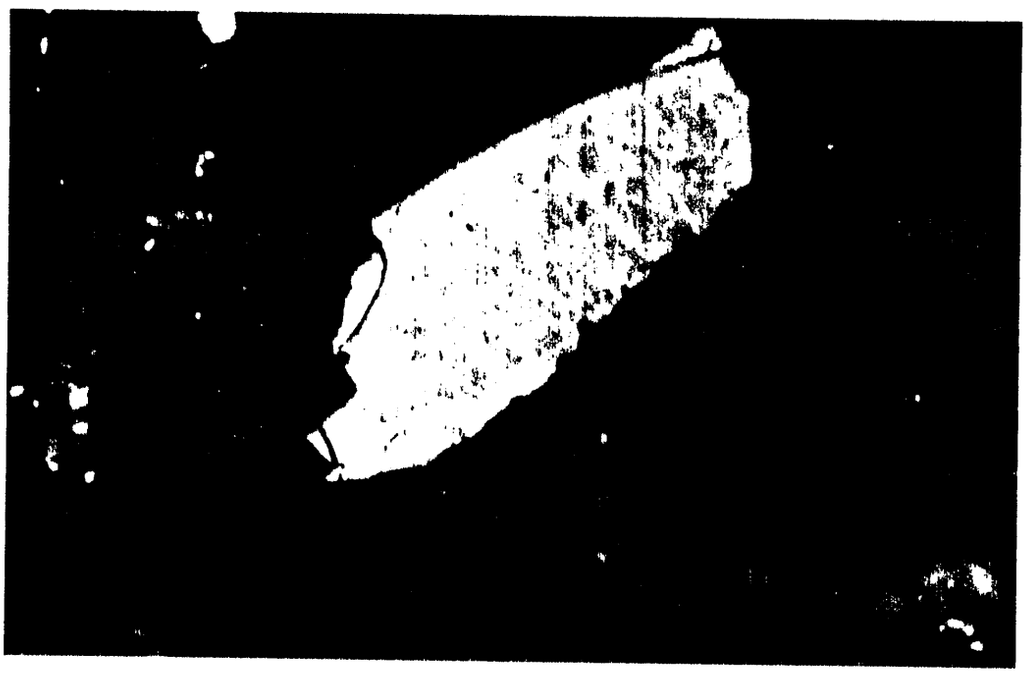
As for Plate 4, but stage rotated through 90° to the measurement position for Rmin. Rmin 1.72%. More surface texture can generally be distinguished in the Rmin position.

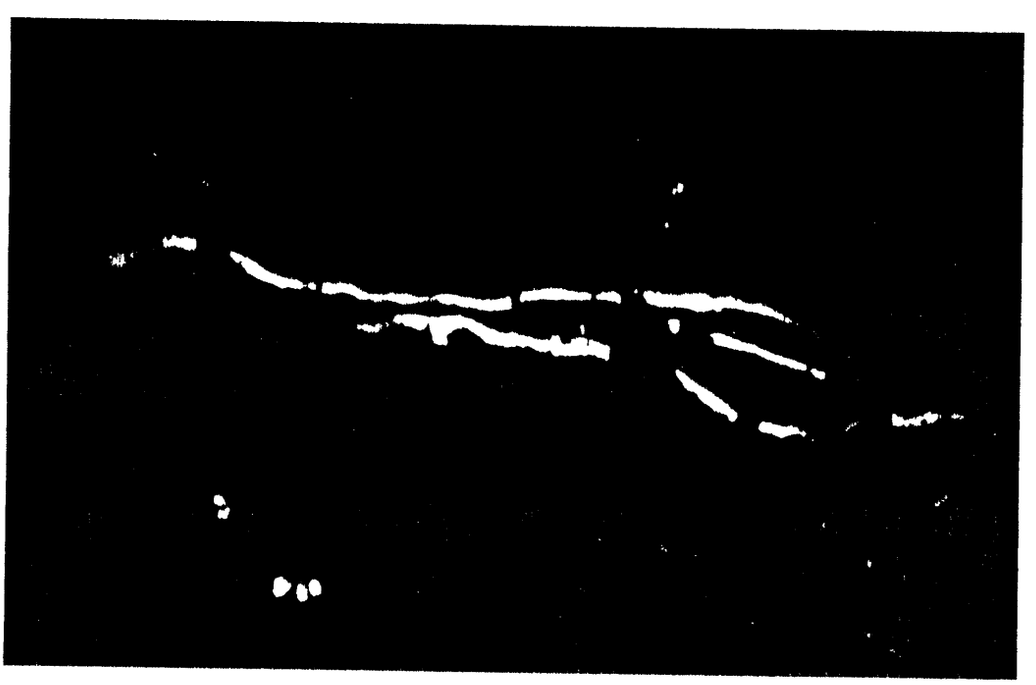
Plate 6. Junk basket 1765m

Phytoclast possibly derived from plant cuticle. The form and extreme bireflectance suggest that the phytoclast may be cutinite, but its optical properties are very similar to those of vitrinite. Rmax 4.40%, Rmin 1.28%

$\bar{R}_v$3.76%.







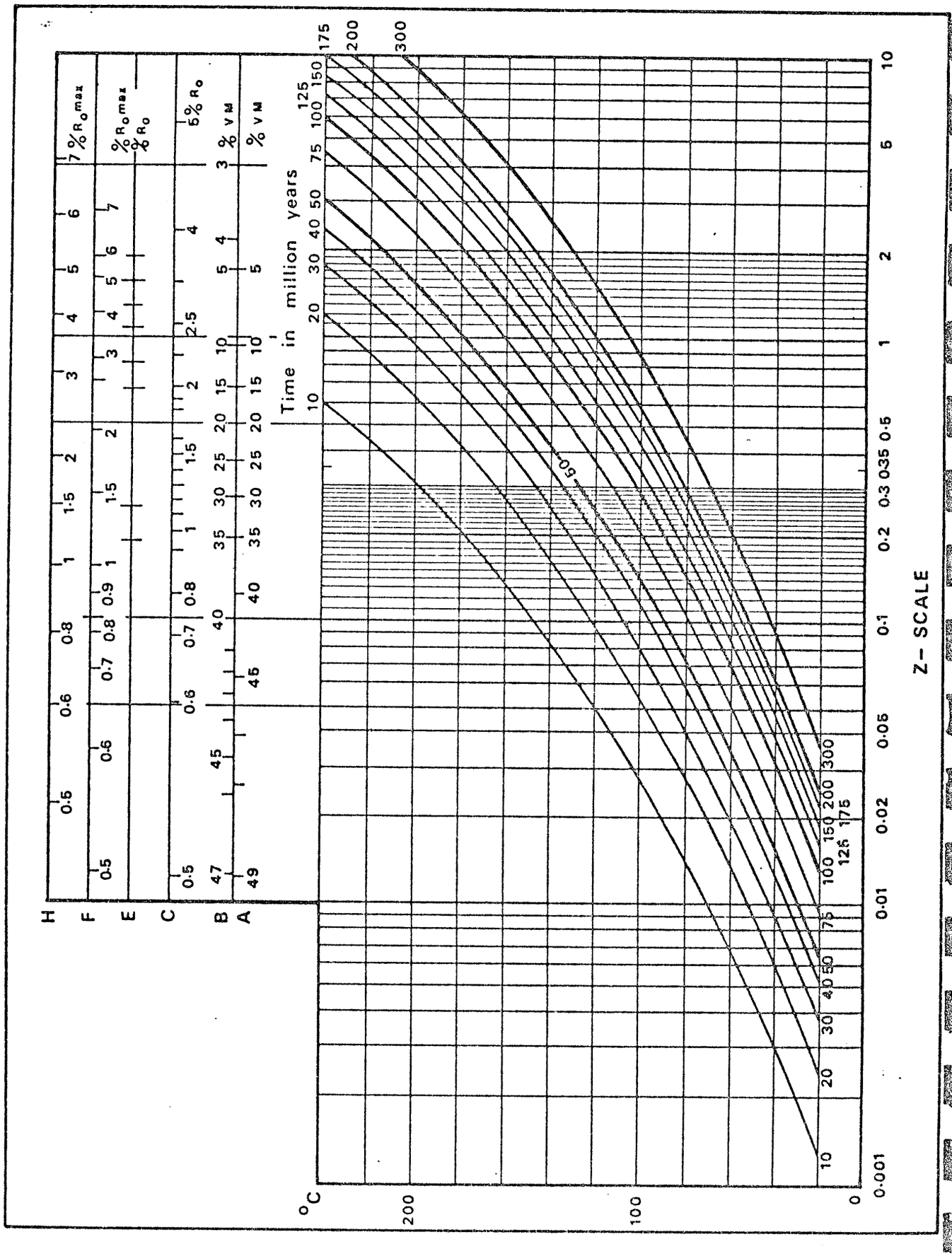
OLANGOLAH No. 1

K.K. No.	Depth	$\bar{R}_o$max	Range	N	Exinite Fluorescence (Remarks)
16025	195 Ctgs	2.05	1.73-2.47	11	No fluorescing exinite. (Calcareous siltstone and sandstone with d.o.m. rare to sparse, V>I. Vitrinite rare.)
16026	400 Ctgs	2.01	1.82-2.35	16	No fluorescing exinite. (Calcareous siltstone, claystone, and sandstone. D.o.m. rare to sparse, V>I, vitrinite rare. Rare chalcopyrite present.)
16027	600 Ctgs	2.35	1.97-2.63	20	No fluorescing exinite. (Claystone and siltstone with rare coal or thick vitrinite layers. D.o.m. rare but sparse vitrinite, chiefly as isolated grains derived from thick layers of massive telocollinite. V>>?I. Slight evidence of very fine-mosaic structure present in the vitrinite. No other evidence of contact alteration.)
15902	1000 Ctgs	3.26	2.90-3.50	10	No fluorescing exinite. (Claystone with abundant carbonate, d.o.m. rare, V>I, E not distinguished. Vitrinite and inertinite are both rare. Pyrite rare, some iron oxide minerals present.)
15903	1200 Ctgs	3.60	2.80-4.44	20	No fluorescing exinite. (Claystone with d.o.m. sparse, V>I. Vitrinite sparse, inertinite rare. The bireflectance of the vitrinite ranges up to 2.11%.)
15904	1400 Ctgs	3.78	3.25-4.60	20	No fluorescing exinite. (Similar to 15903, d.o.m. sparse V>I. Vitrinite sparse, small phytoclasts.)
15905	1600 Ctgs	3.90	3.20-4.70	20	No fluorescing exinite. (Siltstone and claystone, d.o.m. sparse, V>I. Vitrinite and inertinite sparse.)
15754	1765 Junk basket	3.76	3.00-4.40	20	No fluorescing exinite. (Silty mudstone with abundant d.o.m., macerals difficult to distinguish due to very high rank, probably V>I>E. The vitrinite has a high bireflectance, R_{min} approx 1.9%, and the highest reflectance values were probably measures on cutinite. The level of maturity indicated is higher than that usually associated with adequate permeability for gas production.)
15906	1800 Ctgs	4.50	3.57-5.80	20	No fluorescing exinite. (Siltstone, sandstone and claystone, d.o.m. common, V>I, vitrinite common, inertinite sparse. Pyrite sparse to common.)
15907	2000 Ctgs	4.56	3.47-6.00	20	No fluorescing exinite. (Claystone and siltstone with abundant carbonate, d.o.m. rare to sparse, V>I.)
15908	2200 Ctgs	5.69	4.00-7.40	20	No fluorescing exinite. (Siltstone, claystone and sandstone, d.o.m. common V=I, vitrinite and inertinite both sparse. Bireflectance of vitrinite high, up to 4.18%.)

Appendix 2 Thermal History Models

The Karweil nomogram (Fig 2-1) can be used to determine the third variable if two of the three variables — rank, temperature and time of coalification — are known. Thus, using Scale C, a reflectance of 2%, and an age of 120 million years, gives a coalification temperature of 130°C. A z value of 0.7 corresponds to the reflectance value of 1%. The z value is a measure of coalification work and is an additive quantity. The temperature of 130°C is that which, if operative over the period of 120 million years, would give z value of 0.7. Given the form of the equation relating time, temperature and z, it is possible to recalculate the isothermal temperatures to fit a model of an initial temperature of 10°C and constantly rising temperature. The final or gradthermal temperature T_{grad} is effectively given by T_{iso} X 1.6. The factor (1.6) is not a constant and does vary with the value of T_{iso} but the variation is small in relation to other possible errors. The Karweil nomogram is known to be wrong in detail but has given model temperatures which have proved useful in terms of testing assumptions concerning thermal history in a number of sedimentary basins. Scales C ($R > 0.6$) and H ($R < 0.6$) are normally used by the author and a recalibration of the scales is being undertaken. The value of model temperatures lies chiefly in their use in a qualitative way to compare the model temperature data from a set of wells with present well temperatures.

Figure 2-1


KARWEIL DIAGRAM (AFTER BOSTICK)
Time in million years
°C
Z- SCALE
H
F
E
C
B
A
7 %Ro max
%Ro max / %Ro
6% Ro
3 % VM
% VM
60

PE903833

This is an enclosure indicator page.
The enclosure PE903833 is enclosed within the container PE903830 at this location in this document.

The enclosure PE903833 has the following characteristics:

ITEM_BARCODE	= PE903833
CONTAINER_BARCODE	= PE903830
NAME	= Velocity-Time-Depth Curves
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= VELOCITY_CHART
DESCRIPTION	= Velocity-time-depth curves (enclosure from WCR) for Olangolah-1
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	= 2/12/82
W_NO	= W774
WELL_NAME	= Olangolah-1
CONTRACTOR	=
CLIENT_OP_CO	=

(Inserted by DNRE - Vic Govt Mines Dept)

PE602616

This is an enclosure indicator page.
The enclosure PE602616 is enclosed within the container PE180181 at this location in this document.

The enclosure PE602616 has the following characteristics:

ITEM_BARCODE	= PE602616
CONTAINER_BARCODE	= PE180181
NAME	= Composite Well Log - sheet 1
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= COMPOSITE_LOG
DESCRIPTION	= Olangolah-1 Composite Well Log sheet 1, 1:1000, Enclosure from WCR
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 2/12/82
W_NO	= W774
WELL_NAME	= Olangolah-1
CONTRACTOR	=
CLIENT_OP_CO	= Gas and Fuel Exploration N.L

(Inserted by DNRE - Vic Govt Mines Dept)

PE602615

This is an enclosure indicator page.
The enclosure PE602615 is enclosed within the container PE180181 at this location in this document.

The enclosure PE602615 has the following characteristics:

ITEM_BARCODE	= PE602615
CONTAINER_BARCODE	= PE180181
NAME	= Composite Well Log - sheet 2
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= COMPOSITE_LOG
DESCRIPTION	= Olangolah-1 Composite Well Log sheet 2, 1:1000, Enclosure from WCR
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 2/12/82
W_NO	= W774
WELL_NAME	= Olangolah-1
CONTRACTOR	=
CLIENT_OP_CO	= Gas and Fuel Exploration N.L

(Inserted by DNRE - Vic Govt Mines Dept)

PE601345

This is an enclosure indicator page.
The enclosure PE601345 is enclosed within the container PE902666 at this location in this document.

The enclosure PE601345 has the following characteristics:

ITEM_BARCODE	= PE601345
CONTAINER_BARCODE	= PE902666
NAME	= Induction Resistivity Sonic
BASIN	= OTWAY
PERMIT	= PEP 100
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Simultaneous Induction Resistivity Sonic ISF-Sonic (enclosure from WCR) for Olangolah-1
REMARKS	=
DATE_CREATED	= 13/05/82
DATE_RECEIVED	= 2/12/82
W_NO	= W774
WELL_NAME	= Olangolah-1
CONTRACTOR	= Schlumberger
CLIENT_OP_CO	= GAS & FUEL EXPLORATION N.L

(Inserted by DNRE - Vic Govt Mines Dept)

PE601346

This is an enclosure indicator page.
The enclosure PE601346 is enclosed within the container PE902666 at this location in this document.

The enclosure PE601346 has the following characteristics:

ITEM_BARCODE	= PE601346
CONTAINER_BARCODE	= PE902666
NAME	= Dual Laterolog
BASIN	= OTWAY
PERMIT	= PEP 100
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Dual Laterolog 510-2090, Simultaneous (enclosure from WCR) for Olangolah-1
REMARKS	=
DATE_CREATED	= 6/06/82
DATE_RECEIVED	= 7/06/82
W_NO	= W774
WELL_NAME	= Olangolah-1
CONTRACTOR	= Schlumberger
CLIENT_OP_CO	= GAS & FUEL EXPLORATION N.L

(Inserted by DNRE - Vic Govt Mines Dept)

PE601347

This is an enclosure indicator page.
The enclosure PE601347 is enclosed within the container PE902666 at this location in this document.

The enclosure PE601347 has the following characteristics:

ITEM_BARCODE	= PE601347
CONTAINER_BARCODE	= PE902666
NAME	= Bore Hole Compensated Sonic
BASIN	= OTWAY
PERMIT	= PEP 100
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Bore Hole Compensated Sonic Log 510-2090 (enclosure from WCR) for Olangolah-1
REMARKS	=
DATE_CREATED	= 6/06/82
DATE_RECEIVED	= 7/06/82
W_NO	= W774
WELL_NAME	= Olangolah-1
CONTRACTOR	= Schlumberger
CLIENT_OP_CO	= GAS & FUEL EXPLORATION N.L

(Inserted by DNRE - Vic Govt Mines Dept)

PE601348

This is an enclosure indicator page.
The enclosure PE601348 is enclosed within the container PE902666 at this location in this document.

The enclosure PE601348 has the following characteristics:

ITEM_BARCODE	= PE601348
CONTAINER_BARCODE	= PE902666
NAME	= Cluster Dip Log
BASIN	= OTWAY
PERMIT	= PEP 100
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Cluster Computer Processed Log, Four Arm High Resolution Continuous Dipmeter, (enclosure from WCR) for Olangolah-1
REMARKS	=
DATE_CREATED	= 17/05/82
DATE_RECEIVED	= 2/12/82
W_NO	= W774
WELL_NAME	= Olangolah-1
CONTRACTOR	= Schlumberger
CLIENT_OP_CO	= GAS & FUEL EXPLORATION N.L

(Inserted by DNRE - Vic Govt Mines Dept)

PE601349

This is an enclosure indicator page.
The enclosure PE601349 is enclosed within the container PE902666 at this location in this document.

The enclosure PE601349 has the following characteristics:

ITEM_BARCODE	= PE601349
CONTAINER_BARCODE	= PE902666
NAME	= Cluster Dip Log
BASIN	= OTWAY
PERMIT	= PEP 100
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Cluster Computer Processed Log, Four Arm High Resolution Continuous Dipmeter, (enclosure from WCR) for Olangolah-1
REMARKS	=
DATE_CREATED	= 23/06/82
DATE_RECEIVED	= 2/12/82
W_NO	= W774
WELL_NAME	= Olangolah-1
CONTRACTOR	= Schlumberger
CLIENT_OP_CO	= GAS & FUEL EXPLORATION N.L

(Inserted by DNRE - Vic Govt Mines Dept)

PE604763

This is an enclosure indicator page.
The enclosure PE604763 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604763 has the following characteristics:

ITEM_BARCODE	= PE604763
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 1 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 1 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604764

This is an enclosure indicator page.
The enclosure PE604764 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604764 has the following characteristics:

ITEM_BARCODE	= PE604764
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 2 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 2 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604765

This is an enclosure indicator page.
The enclosure PE604765 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604765 has the following characteristics:

ITEM_BARCODE	= PE604765
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 3 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 3 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604766

This is an enclosure indicator page.
The enclosure PE604766 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604766 has the following characteristics:

ITEM_BARCODE	= PE604766
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 4 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 4 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604767

This is an enclosure indicator page.
The enclosure PE604767 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604767 has the following characteristics:

ITEM_BARCODE	= PE604767
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 5 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 5 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604768

This is an enclosure indicator page.
The enclosure PE604768 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604768 has the following characteristics:

ITEM_BARCODE	= PE604768
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 6 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 6 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604769

This is an enclosure indicator page.
The enclosure PE604769 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604769 has the following characteristics:

ITEM_BARCODE	= PE604769
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 7 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 7 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604770

This is an enclosure indicator page.
The enclosure PE604770 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604770 has the following characteristics:

ITEM_BARCODE	= PE604770
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 8 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 8 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604771

This is an enclosure indicator page.
The enclosure PE604771 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604771 has the following characteristics:

ITEM_BARCODE	= PE604771
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 9 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 9 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604772

This is an enclosure indicator page.
The enclosure PE604772 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604772 has the following characteristics:

ITEM_BARCODE	= PE604772
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 10 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 10 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604773

This is an enclosure indicator page.
The enclosure PE604773 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604773 has the following characteristics:

ITEM_BARCODE	= PE604773
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 11 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 11 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604774

This is an enclosure indicator page.
The enclosure PE604774 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604774 has the following characteristics:

ITEM_BARCODE	= PE604774
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 12 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 12 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604775

This is an enclosure indicator page.
The enclosure PE604775 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604775 has the following characteristics:

ITEM_BARCODE	= PE604775
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 13 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 13 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604776

This is an enclosure indicator page.
The enclosure PE604776 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604776 has the following characteristics:

ITEM_BARCODE	= PE604776
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 14 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 14 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604777

This is an enclosure indicator page.
The enclosure PE604777 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604777 has the following characteristics:

ITEM_BARCODE	= PE604777
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 15 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 15 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604778

This is an enclosure indicator page.
The enclosure PE604778 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604778 has the following characteristics:

ITEM_BARCODE	= PE604778
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 16 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 16 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604779

This is an enclosure indicator page.
The enclosure PE604779 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604779 has the following characteristics:

ITEM_BARCODE	= PE604779
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 17 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 17 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604780

This is an enclosure indicator page.
The enclosure PE604780 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604780 has the following characteristics:

ITEM_BARCODE	= PE604780
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 18 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 18 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604781

This is an enclosure indicator page.
The enclosure PE604781 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604781 has the following characteristics:

ITEM_BARCODE	= PE604781
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 19 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 19 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604782

This is an enclosure indicator page.
The enclosure PE604782 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604782 has the following characteristics:

ITEM_BARCODE	= PE604782
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 20 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 20 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604783

This is an enclosure indicator page.
The enclosure PE604783 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604783 has the following characteristics:

ITEM_BARCODE	= PE604783
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 21 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 21 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604784

This is an enclosure indicator page.
The enclosure PE604784 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604784 has the following characteristics:

ITEM_BARCODE	= PE604784
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 22 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 22 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604785

This is an enclosure indicator page.
The enclosure PE604785 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604785 has the following characteristics:

ITEM_BARCODE	= PE604785
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 23 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 23 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)

PE604786

This is an enclosure indicator page.
The enclosure PE604786 is enclosed within the container PE902666 at this location in this document.

The enclosure PE604786 has the following characteristics:

ITEM_BARCODE	= PE604786
CONTAINER_BARCODE	= PE902666
NAME	= Mud Log, 24 of 24
BASIN	= OTWAY
PERMIT	= PEP100
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud Log, 24 of 24, (enclosure from WCR) Olangolah-1
REMARKS	=
DATE_CREATED	= 19/06/82
DATE_RECEIVED	= 22/06/82
W_NO	= W774
WELL_NAME	= OLANGOLAH-1
CONTRACTOR	= EXPLORATION LOGGING
CLIENT_OP_CO	= GAS & FUEL EXPLORATION NL

(Inserted by DNRE - Vic Govt Mines Dept)