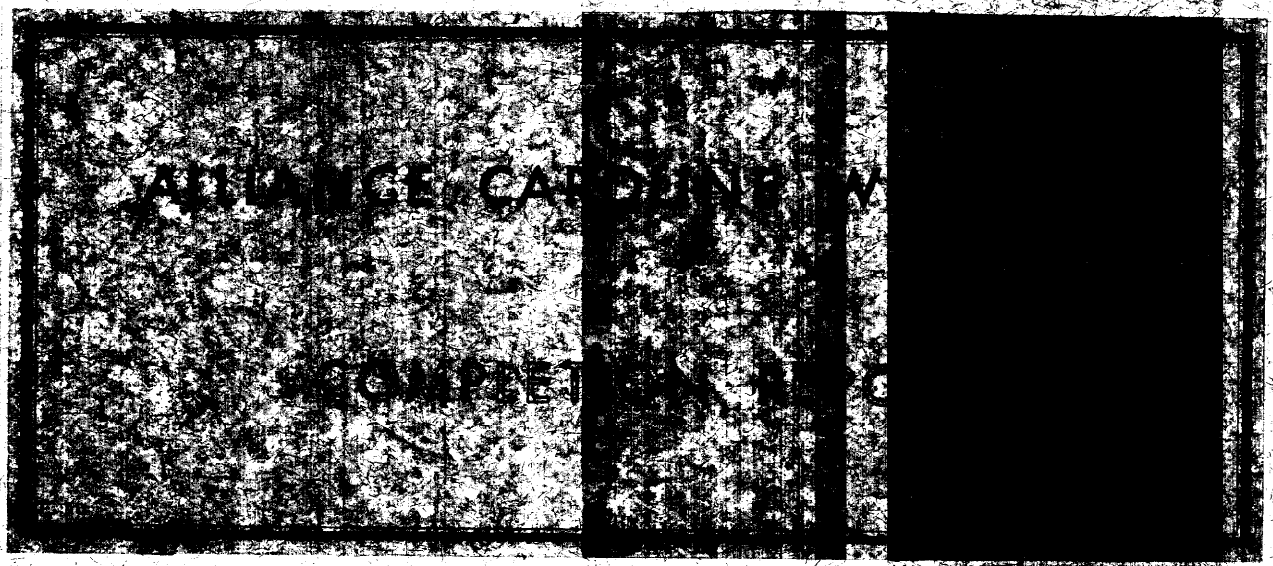

ALLIANCE OIL DEVELOPMENT AUSTRALIA N.L.

COMPLETION REPORT

CAROLINE WELL No. 1

O.E.L. 22, SOUTH AUSTRALIA

by: M. C. LoBianco

June, 1967

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C O N T E N T S

P L A T E S

A P P E N D I C E S

A P P E N D I C E S
(Contd.)

b. Analysis of Gas Sample from D.S.T. No.5, Caroline Well No.1, by Gas and Fuel Corporation of Victoria

c. Analysis of Gas Sample from D.S.T. No.8, Caroline Well No.1, by Gas and Fuel Corporation of Victoria

d. Analysis of Water Sample from D.S.T. No.5, Caroline Well No.1, by Gas and Fuel Corporation of Victoria.

3. Lithological Description of Cores by M.C. LeBlanc, G. Campo and J. Gausden

4. Electrical and Other Logs -

a. List of Logs Run.

b. Interpretation of Logs, by M. Gahan, Data Analysis Pty. Ltd.

5. Results of Formations Tests Nos. 1 to 8 inclusive.

6. Lithological Description of Samples by M.C. LeBlanc, G. Campo and J. Gausden

7. Core Analysis Results, Cores 1 to 17 inclusive, by Staff of Petroleum Technology Laboratory, Bureau of Mineral Resources

E N C L O S U R E S

1. Composite Well Log - Alliance Caroline Well No.1 (in 4 sheets)

2. Induction Electric Logs - Run Nos. 1 to 4

3. Microlog Caliper Logs - Run Nos. 1 to 3

4. Sonic - Gamma Ray Logs - Run Nos. 1 to 3

5. Continuous Dipmeter Survey - Run Nos. 1 and 2

6. Temperature Log - Run No.1

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ENCLOSURES
(Contd.)

8. Well Velocity Survey - Alliance Caroline Well No.1

9. Formation Test Reports and Pressure Records.

I. SUMMARY

Alliance Caroline Well No.1 is located in the Caroline Forest, 10 miles southeast of Mount Gambier, South Australia and 11 miles northwest of Nelson, Victoria. Geologically the well location is in the Gambier Sunklands province of the Otway Basin.

The well was drilled to a total depth of 11,061 feet during the period from 2nd September, 1966 to 29th January, 1967 and was completed as a carbon dioxide gas well on 21st February, 1967. Surface hole was drilled to a depth of 510 feet with a percussion rig and the remainder of the well was drilled with a National 80B rig owned and operated by Oil Drilling and Exploration Limited.

The well spudded in surface sands which were 10 feet thick and passed through the Glenelg Group (Gambier formation) to 640 feet, equivalents of the "Browns Creek Group" (Nelson formation) to 652 feet, the Wangerrip Group (Dilwyn and Pebble Point formations) to 3123 feet and the Sherbrook Group (Curdies, Paaratte and Belfast formations) to 8080 feet. The well then passed through a transition unit to 8179 feet and sediments of the Otway Group (Waarre and Eumeralla formations) to total depth.

The Upper Cretaceous and uppermost Lower Cretaceous sequence encountered at the Caroline well is essentially similar to that present in the Port Campbell Embayment in the eastern part of the Otway Basin. The occurrence of 1141 feet of Waarre Formation at Caroline No.1 has substantially upgraded the petroleum potential of the western and central parts of the Otway Basin. This potential reservoir unit has not been encountered in wells previously drilled in the Tyrendarra Embayment and Gambier Sunklands structural provinces of the Otway Basin.

Several small gas shows were recorded on the gas detector while drilling through the Waarre and Eumeralla formations and slight fluorescence was observed in sandstone cuttings from several zones within the Waarre Formation.

Of the eight formation tests conducted, three were "misrun" because of packer failure and two yielded recoveries of fresh water and mud from sandstones within the Wangerrip Group. The remaining three tests were of sandstone members of the Waarre Formation. Of these tests, one yielded a recovery of gassy salt water, one resulted in a moderate flow of non-combustible gas accompanied by slugs of salt water, and one resulted in a substantial flow of non-combustible gas.

Gas flowed at a maximum rate of 2,280,000 cubic feet per day and stabilised at a rate of 2,495,000 cubic feet per day during a fifteen hour test of the interval 9154 to 9182 feet within the Waarre Formation. Analyses of the gas shows that it consists predominantly of carbon dioxide and includes less than one percent of hydrocarbons and about one half percent of nitrogen.

II. INTRODUCTION

The Alliance Caroline Well No.1 was drilled in Oil Exploration Licence No.22, South Australia, at a location ten miles southeast of the city of Mount Gambier. The well was drilled by Alliance Oil Development Australia N.L. as part of a farmout agreement with General Exploration Company of Australia Ltd. The drilling operation was subsidised on a "test well" basis under the terms of the Petroleum Search Subsidy Act 1959-1961.

The well was located in the central part of the Gambier Trough, a west-northwesterly trending graben, in the Gambier Sunklands structural province of the western part of the Otway Basin. Nearby exploratory wells include Mount Salt No.1 (T.D. 10,044 feet), located fifteen miles to the west, and the Nelson Bore (T.D. 7305 feet) located eleven miles to the southeast.

The Caroline structure was initially located by detailed gravity survey (Caroline-Killanoola Gravity Survey 1966). The presence of closed structure above the gravity anomaly was confirmed by reflection seismic survey (Caroline-Killanoola Seismic Survey 1966). The well location is near the culmination of the seismic structure which has an area of approximately nine square miles and a closure of about 400 feet mapped on a phantom horizon at about 4000 feet below sea level.

The Caroline well was originally programmed for a depth of 6,000 feet to test the petroleum potential of the lower part of the Wangerrip Group and to investigate possible facies changes within the upper part of the Sherbrook Group. The target zones were found to be fresh water bearing but lithological and log correlation indicated that, as a result of non-deposition or erosion of a part of the Pannatta Formation, the Upper Cretaceous sequence at Caroline No.1 was substantially thinner than that encountered at Mount Salt No.1. As a result the well was deepened to 11,061 feet to investigate the stratigraphy of the entire Sherbrook Group and of the upper part of the Otway Group.

III. WELL HISTORY

1. GENERAL DATA

Well Name and Number:

Alliance Caroline Well No.1

Operator:

Alliance Oil Development Australia N.L.
100 Collins Street,
MELBOURNE, Victoria.

Tenement Holder:

General Exploration Company of Australia Pty.Ltd.,
68 Grenfell Street,
ADELAIDE, South Australia

Details of Petroleum Tenement: O.E.L.22, South Australia occupies an area of 4,900 square miles in the southeastern corner of South Australia. It is bounded on the north by parallel of latitude 36°48' South, on the east by the eastern border of South Australia and on the west by a line parallel to the coast and three miles offshore. The Licence expires on 30th April, 1969.

Alliance Oil Development Australia N.L. is the operator for the tenement and upon meeting certain exploration commitments will earn a 50 percent interest in the tenement.

District:

Hundred of Caroline, County Grey, South Australia.

Location: The co-ordinates of the well are:-

Latitude - 37°56'30" South
Longitude - 140°54'30" East

The well location is in Allotment 573, Hundred of Caroline, County Grey, South Australia (Map Reference: Map of County Grey; scale of one inch equals two miles; Department of Lands, South Australia; 1961)

Elevation:

K.B. (Datum)	123.3'	A.S.L.
G.L.	107'	A.S.L.

Total Depth:

11,061 feet (Driller)
11,060 feet (Schlumberger)

Date Spudded:

Percussion hole - 2nd September, 1966.
Rotary hole - 14th November, 1966.

Date Drilling Stopped:

Percussion hole - 18th October, 1966
Rotary hole - 29th January, 1967

Date Well Completed:

21st February, 1967

Date Rig Released:

Percussion rig - 18th October, 1966
Rotary rig - 21st February, 1967

Drilling Time to Total Depth:

Percussion hole - 47 days to 510 feet
Rotary hole - 77 days to 11,061 feet

Status: Completed as a carbon dioxide gas well

Cost: Estimated $300,000 (not including cost of completion)

2. DRILLING DATA:

Drilling Contractor:

a. Percussion Hole -

Department of Mines, South Australia,
169 Rundle Street,
ADELAIDE, South Australia

b. Rotary Hole -

Oil Drilling and Exploration Ltd.,
93 York Street,
SYDNEY, New South Wales

Drilling Plant

a. Percussion Rig

Make:	Ruston Bucyrus
Type:	W.22
Rated Capacity:	1200 feet (6-inch hole)
Motors (one):	Ruston 22 H.P. (maximum)
Drill Cable:	750 feet; 2½-inch O.D.
Drill Sinkershaft:	One (4½-in. x 15 feet)

b. Rotary Rig

Make:	National
Type:	80B
Rated Capacity:	12,000 feet with 4½-inch drill pipe
Motors:	3 Paxman Diesel; 400 B.H.P. each

Mast:

Make:	Idoco
Type:	FM 136-450 Full View
Rated Capacity:	700,000 pounds

Pumps (2):

Make:	Ideal
Type:	G700
Size:	8-inch by 14-inch
H.P. Rating:	700

Pumps are powered by the motors listed above.

Blow Out Preventor Equipment:

Make:	Hydril	Cameron
Model:	GK	QRC Double Gate
Size:	12-inch	12-inch
Series:	3000	3000

Hydril 1000 Automatic Accumulator;
3-Station Control Unit.

Hole Sizes and Depths:

(i)	22-inch to 165 feet
(ii)	18-inch to 510 feet
(iii)	17½-inch to 761 feet
(iv)	12¼-inch to 3150 feet
(v)	8½-inch to 11,051 feet
(vi)	7⅞-inch to 11,061 feet

Casing Details:

Size:	19½-inch	13⅜-inch
Weight:	3/16-inch thick	48 lb.
Grade:	Local manufacture	H-40
Depth Landed:	163 feet	740 feet
Float Collar:		
Type -	none used	none used
Location -	------	------
Guide Shoe:		
Type -	none used	none used
Location -	------	------
Plugs:		
Type -	none used	Halliburton
Location -	------	Top
Centralisers:		
Type -	none used	Halliburton "latch-on"
Location -	------	730.10 feet and 699.84 feet
Scratchers:		
Type -	none used	none used
Location -	------	------
Sacks of cement:	------	700
Rise of cement:	------	380 feet (logs). Cemented to surface through annulus
Method used:		Displacement (top plug only)

Size:	9⅝-inch	5½-inch
Weight:	36 lb.	17 lb.
Grade:	J-55	J-55 and N-80
Depth Landed:	3149 feet	9400 feet
Float Collar:		
Type -	Halliburton	Baker - Type G
Location -	Top at 3115 feet	Top at 9364.23 feet
Guide Shoe:		
Type -	Halliburton	Halliburton
Location -	Top at 3147.80 feet	Top at 9399.15 feet
Plugs:		
Type -	Halliburton	Halliburton
Location -	Top and bottom	Top and bottom
Centralizers:		
Type -	Halliburton 93	Halliburton
Location -	3045; 3072; 3098; 3132.	7990; 8090; 8170; 8230; 8290; 8350; 9084; 9154; 9306; 9366.
Scratchers:		
Type -	none used	Halliburton RWC
Location -	-------	8086; 8096; 8111; 8126; 8177; 8192; 8207; 8222; 8241; 8256; 8278; 8290; 9149; 9164; 9178; 9195; 9210; 9225; 9240; 9258; 9298; 9314;
Sacks of cement:	480	640
Rise of cement:	1950 (estimated)	7726 (logs)
Method used:	Displacement (top and bottom plugs)	Displacement (top and bottom plugs)

Tubing Details:

Size:	2⅜-inch
Weight:	4.7 lb.
Grade:	J-55
Depth Landed:	8136 feet
Packer:	
Type:-	Guiberson AVL30
Size -	5½-inch
Location -	8126 to 8136 feet
Length Tubing Stringer:	3.16 feet

Drilling Fluid: The drilling fluid was a fresh water and bentonite mud with an average weight of 9.8 lb/gal. Below a depth of 1700 feet 8 to 12 percent diesel-line was incorporated into the drilling fluid.

The following weekly averages give an approximation of the mud characteristics.

Week ending (8:00 am)	Depth (feet)	Weight (lb/gal.)	Viscosity (sec.)	Water Loss (cc/30 min.)	pH
28 Nov.66	3160	9.2	50	5.0	9.5
5 Dec.	5396	9.4	56	4.1	10.0
12 Dec.	6016	9.6	52	4.6	10.0
19 Dec.	7099	9.9	55	4.4	9.5
26 Dec.	7957	9.9	59	4.2	9.2
2 Jan.67	8568	9.9	65	3.9	9.1
9 Jan.	9440	10.0	54	4.1	8.8
16 Jan.	9760	10.1	60	4.4	9.0
23 Jan.	10383	9.8	54	4.4	8.4
30 Jan.	11061	10.2	59	4.5	9.0

Water Supply: Water was obtained from a sub-artesian bore located 200 feet east of the well-site. The bore was drilled to a depth of 120 feet and cased to 97 feet with 6-inch casing. A Pomona submersible unit, powered by a 32 H.P. International tractor, was utilised to obtain water at a rate of approximately 9000 gallons per hour from the Gambier Formation.

Perforation and Shooting Record:

Casing Size:	
Intervals Shot:	8204-8210; 8214-8230 9152-9172; 9303-9321
Type of charge:	Ceramic Link-Jets
Shots per foot:	Four
Method Employed:	Thru-Tubing Gun
Operator:	Welex

Plugs: When completing the well the following plug was spotted in 8¾-inch hole and "felt for".

Interval:	9401 to 9550 feet
Cement:	73 sacks
Method used:	Displacement

Fishing Operations: The following fishing operations were conducted:-

1. On 17th November, 1966, while tripping out of the hole (total depth 761 feet), a pickup sub failed and three 8-inch drill collars were lost downhole. The fish was recovered on the first run with an overshot.

2. On 15th January, 1967, while conducting D.S.T. No.8, the testing string became stuck in the hole as a result of differential sticking against a porous sandstone unit some 700 feet above the packer. Following an unsuccessful attempt to back off the pumpout sub, two barrels of commercial grade hydrochloric acid were spotted opposite the porous zone. After allowing the acid to work for three hours the testing string pulled free.

3. SAMPLING AND CORING

Ditch Cuttings: In general, samples representative of each ten-foot interval were collected on a platform at the base of the shale-shaker. During coring operations and when zones of special interest were being drilled the sampling interval was reduced to five feet or less. Samples obtained from 510 feet to total depth were logged. Lithological descriptions of the samples were made after they had been examined under the microscope and all samples were further examined under ultraviolet light for fluorescence indicative of the presence of hydrocarbons.

Sample cuts were distributed to the South Australian Department of Mines, the B.M.R. and Alliance Oil Development Australia N.L.

Coring: A total of seventeen cores were cut utilising both conventional and wireline coring equipment. The conventional equipment produced cores with a diameter of 3½-inches and the wireline equipment produced cores with a diameter of 1¾ inches.

Core No.	Interval (feet)	Conventional	Wireline	Recovery (feet)	Recovery (percent)
1	581- 599	x		15.5	86.1
2	699- 719	x		11	55
3	2454- 2476	x		11	50
4	2560- 2572		x	4	33.3
5	2572- 2580		x	3	37.5
6	2580- 2582.5		x	1.17	46.6
7	2669- 2673		x	3.5	95
8	2673- 2681		x	6.5	81.3
9	2711- 2715		x	3	75
10	3040- 3060	x		8.25	41.2
11	4091- 4102		x	4.33	39.4
12	4102- 4114		x	7	58.3
13	6001- 6016	x		10.5	70
14	7699- 7702	x		0.21	7
15	7957- 7975	x		1.5	8.3
16	10057-10067	x		9.17	91.7
17	11051-11061	x		7.66	76.6

Core cuts were distributed to the Bureau of Mineral Resources and the remainder of the core was shipped to the South Australian Mines Department.

Side-wall Sampling:

No side-wall samples were obtained.

4. LOGGING AND SURVEYS

Electrical and other logging: Well logging services were provided by Schlumberger-Seaco Inc., and by Welex. Induction-Electric, Microlog-Caliper,

and Neutron-Gamma Ray logs were run from the base of surface casing to total depth and a continuous dipmeter survey was conducted over the interval 742 to 10,799 feet. Only a Gamma Ray log was run over the cased interval 20 to 742 feet. A Temperature log, a Cement Bond log, and a Microseismogram-Gamma Collar log were run over selected intervals. Details of logs run are presented as Appendix 4A.

Note: Elevations shown on several of the log headings are incorrect and should be changed to:-

Ground Elevation:	107 feet
K.B. Elevation:	123.3 feet

A velocity survey with 34 shots was conducted between 750 and 11,050 feet by Namco International Inc. The results of the survey comprise Enclosure 8 of this report.

Penetration Rate and Gas Log: Rate of penetration was continuously recorded by means of a Geolograph and a drilling time log was maintained continuously from 510 feet to total depth.

A Johnston Williams hot-wire filament type gas detector connected to a Honeywell recorder was used from 510 feet to total depth.

The penetration rate and the gas detection records are presented graphically on the composite log (Plate 1).

Temperature Surveys: Bottom hole temperatures taken while logging were:

Depth	Temperature
3290	120°F
6007	135°F
9412	187°F
11060	195°F

5. TESTING

Formation Testing: A total of 8 open-hole drill stem tests were run. In all tests, two Amerada B.T. pressure recorders, safety joint, hydraulic jars, and dual closed-in pressure tools were used. Of the eight tests, five are considered to have successfully evaluated the zone of interest in each interval and three were "misrun" because an adequate packer seat was not obtained.

The intervals covered and the results of all drill stem tests are shown on the composite log (Plate 1). Analyses of gas recovered from these tests are included as Appendices 2 (a), 2 (b), and 2 (c); analysis of the formation

water recovered from D.S.T. No.5 is included as Appendix 2 (d). Detailed reports of drill stem tests Nos. 1 to 8 inclusive are included as Appendix 5 and reproductions of the pressure records obtained from drill stem tests Nos. 1 to 6 and 8 are included in this report as Enclosure 9.

The results of the tests are summarised in the following table:

D.S.T. No.	Interval	Type	Results
1	3042-3130	Bottom-hole; dual packers	Recovered 370' of mud and 2530' of water (3.3 Ohms at 80°F)
2	2936-2961	Straddle; dual packers	Recovered 2670' of mud and 900' of water (3500 ppm Cl at 80°F)
3	8094-8149	Straddle; single packer	Misrun
4	8256-8433	Bottom-hole; dual packers	GTS in 7 mins. at rate too small to measure; increased to 800 Mcf/d in 12 mins. accompanied by slugs of mud and salt water. Estimated maximum flow of 2-3MMcf/d. Recovered 4333' of salt water separated by pockets of non-combustible gas.
5	8610-8730	Bottom-hole; dual packers	Non-combustible GTS in 20 minutes at rate too small to measure. Short flow of solution gas at start of second flow period. Recovered 279' gassy water-cut mud and 6603' of gassy salt water (0.341 Ohms at 38°F)
6	8140-8238	Straddle; single packers	Misrun
7	8163-8221	Straddle; dual packers	Misrun
8	9154-9182	Straddle; dual packers	Non-combustible GTS in 2 minutes at rate too small to measure; increased to 2.29 MMcf/d at end of first flow period. Flow stabilised at 2.495 MMcf/d during second flow period

Production Testing: Production testing operations were not subsidised

IV. GEOLOGY

1. Stratigraphic Sequence, Caroline Well No.1

The stratigraphic sequence penetrated in the Caroline well is summarised in the table below which shows the depth to the top of each lithological unit measured from the top of the kelly bushing (123.3 feet above sea level and 16.6 feet above ground level) and from sea level together with the thickness of each formation.

Lithological Unit	Formation top Depth (feet)		Thickness (feet)
	K.B.	Subsea	
Quaternary sands	16	+ 107	10
---- Disconformity ----			
Glenelg Group			626
Gambier Formation	26	+ 97	614
---- Unconformity ----			
"Browns Creek Group" Equivalent			12
Nelson Formation	640	- 517	12
---- Unconformity ----			
Wangerrip Group			2400
Dilwyn Formation			2388
BMR Unit Db1	652	- 529	1318
BMR Unit Db2	1970	-1847	1070
Pebble Point Formation	3040	-2917	83
---- Unconformity ----			
Sherbrook Group			4957 +
Curdies Formation	3123	-3000	837
---- Disconformity ? ----			
Paaratte Formation			3108
Macdonnel Member	3970	-3847	1736
Caroline Member	5706	-5583	1366
Belfast Formation	7072	-6949	1008
Transition Unit	8080	-7957	99
Otway Group			2882 +
Waarre Formation			1141
Unit 1	8179	-8056	386
Unit 2	8565	-8442	355
Unit 3	8920	-8797	230
Unit 4	9150	-9027	170
Transition unit	9320	-9197	170
Eumeralla Formation	9490	-9367	1571 +
TOTAL DEPTH	11061	-10938	

2. Stratigraphy

The lithology of the formations penetrated in the Caroline Well No.1 is summarised below. A detailed description of the stratigraphy is included in this report as Appendix 6.

Surface sands:

Age: Quaternary
16 to 26 feet (thickness - 10 feet)

Fine grained, unconsolidated, subangular quartz sand.

GLENELG GROUP

Gambier Formation

Age: Oligocene - Miocene
26 to 640 feet (thickness - 614 feet)

Bioclastic limestone, calcarenite and dolomite; with some marl, sandstone and chert.

26 to 46 feet - Greyish yellow to light brown, very fine grained to medium grained, slightly argillaceous and dolomitic, poorly consolidated bioclastic LIMESTONE with abundant bryozoal fragments.

46 to 146 feet - White, cream and buff, very fine to finely crystalline DOLOMITE which generally is very friable and in part is recovered as loose rhombs. Near the base of the unit the dolomite becomes buff to reddish brown and pale yellow, slightly calcareous and well consolidated.

146 to 316 feet - Cream to light grey, poorly sorted, bioclastic LIMESTONE with abundant dolomitised bryozoal fragments; light grey to white, very fine grained to fine grained, fossiliferous CALCARENITE; light to dark grey CHERT; white to light grey, sparsely to moderately fossiliferous (predominantly bryozoal fragments) MARL.

316 to 376 feet - Cream bioclastic LIMESTONE consisting of poorly sorted (very fine to granule sized) dolomitised bioclastic grains in an abundant (30 to 60 percent) matrix of silt-sized carbonate grains; in part very dolomitic with up to 20 percent dolomite rhombs. Several thin beds of dolomite and chert.

376 to 436 feet - Cream to pale yellow, poorly sorted (very fine grained to granule sized) CALCARENITE with abundant fossil fragments (predominantly bryozoal) and a microcrystalline to very finely crystalline matrix.

436 to 460 feet - Buff, very fine grained to coarse grained (predominantly fine grained) SANDSTONE consisting of angular to subangular quartz grains, 35 percent dolomitic carbonate grains, and less than 5 percent fossil fragments. The quartz is predominantly clear but several grains are iron-stained.

460-530 feet - Cream, buff, reddish brown and brick red, microcrystalline to finely crystalline DOLOMITE.

530-640 feet - No sample returns were obtained while drilling through this interval. Core 1 (581 to 599 feet) consists predominantly of a light grey, very finely crystalline, argillaceous, calcareous DOLOMITE resulting from dolomitisation of a poorly sorted bioclastic limestone. The gamma-ray log indicates that carbonate rock is the dominant lithological type within the interval 530 to 640 feet.

The Oligocene-Miocene succession in the southern part of the Gambier Sunklands consists predominantly of limestone but, as at Caroline No.1, may include a significant proportion of other rock types, particularly dolomite. Lithological variation is even more pronounced to the northwest of Mount Gambier where in a series of 24 structure holes the Oligocene-Miocene sequence was found to include a substantial proportion of clays, marls, dolomite, and some sandstone. (Tartwaup Structure Drilling Project - 1966; unpublished report to Alliance Oil Development Australia N.L.). In view of these diverse lithologies it is proposed that the stratigraphic name Gambier Limestone, previously applied to the Oligocene-Miocene succession of the Gambier Sunklands, be amended to Gambier Formation.

"BROWNS CREEK GROUP" equivalent ?

Nelson Formation

Age: Upper Eocene.
640 to 652 feet (thickness 12 feet)

No sample returns were obtained while drilling through the Nelson Formation. The boundaries of the formation are defined by changes in radioactivity on the Gamma-Ray log. At the nearby Nelson Bore the formation comprises very coarse grained sandstone, with limonite pellets and a dolomitic and sideritic cement, underlain by a quartz pebble conglomerate with limonite pellets in a cement of siderite and iron oxide.

The Nelson Formation unconformably overlies the Dilwyn Formation and is unconformably overlain by the Gambier Formation.

WANGERRIP GROUP

Dilwyn Formation

Age: Paleocene to Eocene.
652-3040 feet (thickness - 2388 feet)

Three lithological units have been recognised within the Dilwyn Formation. Unit one is considered to be equivalent to the BMR subdivision Unit Db1 (BMR Record 1966/170) and Units 2 and 3 combined are thought to be equivalent to BMR Unit Db2. Unit 3 itself is considered to be correlative with the "Rivernook Member" of the Port Campbell Embayment.

Unit 1 (652 to 1970 feet)

Poorly consolidated, poorly sorted SANDSTONE and 25 percent interbedded SILTSTONE with some CLAY and rare COAL stringers.

The quality of samples obtained while drilling through this unit is poor. The samples consist for the most part of medium grained to granule sized discrete quartz grains. It is most probable that the matrix has washed out of the sandstones and that the finer sand fractions have passed through the shale shaker screen. The lithology of the unit as deduced from the cuttings and logs is as follows:-

SANDSTONE: white to light grey, poorly sorted, consisting predominantly of round to subangular and rare angular, very fine to granule sized grains of clear to smoky quartz. Light to dark grey chert, grey and green quartzite, pyrite, muscovite and carbonaceous grains are the most common accessories. Of these accessories chert and carbonaceous grains are more common in the upper part of the unit and quartzite near the base. Rare pellets of glauconite, yellow and orange tinted quartz grains and iron-stained quartz also occur. Cement, where present, consists of pyrite or in places siderite. Matrix, where present, consists of grey, brown, and black silty, pyritic clay or argillaceous silt. The cuttings and logs indicate a decrease in average grain size and/or increase in proportion of matrix towards the base of the unit.

SILTSTONE: brownish grey to medium brown; generally very finely sandy, very argillaceous, moderately micaceous, slightly to very pyritic and only slightly carbonaceous.

CLAY: (observed in Core No.2 only) black, carbonaceous, slightly sandy; with common pyrite nodules and traces of limonite, glauconite, ironstone and chert.

COAL: black, lignitic; in part sandy and pyritic.

Unit 2 (1970 to 2430 feet)

The quality of samples obtained while drilling through this unit is poor, partly as a result of caving from Unit 1. The electrical, sonic and gamma-ray logs indicate that the unit includes about 35 percent siltstone and silty clay but only sandstone and loose sand grains were recovered in the cuttings.

The SAND consists of clear to cloudy, round to subangular quartz with traces of grey quartz, light to dark grey chert and quartzite. Amber, pink, orange and yellow tinted quartz grains are common at several horizons. Traces of pyritic and brown silty clay matrix adhere to several of the grains.

The SANDSTONES are predominantly grey and brown, very fine to fine grained, moderately to very silty, micaceous, in part pyritic and are generally well cemented with dolomite or less commonly with siderite. They consist of angular to subangular quartz and up to 20 percent lithic grains (including greyish brown siltstone) set in a silty matrix. Several of the sandstones have as much as 50 percent dolomitic carbonate matrix.

Traces of brown, silty and carbonaceous CLAY and of brown, argillaceous SILTSTONE are present in the cuttings.

Unit 3 (2430 to 3040 feet)

The samples are greatly contaminated by loose sand from the overlying units of the Dilwyn Formation. The unit consists predominantly of argillaceous SILTSTONE and silty CLAY and SHALE. Several thin beds of SANDSTONE are also present.

The SILTSTONES are greyish brown to brownish grey, slightly micaceous, moderately to very argillaceous, slightly sandy (very fine grained quartz) and contain abundant streaks and specks of carbonaceous matter. Interbeds of light grey to pale brown SILTSTONE which is only slightly argillaceous and very slightly carbonaceous are present near the base of the unit.

The CLAYS are medium to dark brown, moderately to very carbonaceous and micaceous, are often silty and in part are pyritic. In Cores 3, 4, 5 and 6 the CLAYS contain laminae of SILTSTONE and of greenish grey, very fine grained, silty, carbonaceous SANDSTONE.

The SHALES are medium to dark brown, moderately to very carbonaceous, micaceous and silty.

The SANDSTONES are predominantly white to light grey and brownish grey, slightly argillaceous and moderately to very silty. They consist of angular to subangular, very fine to fine grained quartz and a small amount

of dark grey to black lithic grains set in a silty, argillaceous matrix. Clean very fine to fine grained quartzose SANDSTONES with an abundant dolomitic cement are not uncommon.

Pebble Point Formation

Age: Palaeocene
3040 to 3123 feet (thickness-83 feet)

Limonite OOLITE, oolitic SANDSTONE, pebble CONGLOMERATE, poorly sorted quartz SANDSTONE and sandy SIDERITE.

The top of the formation is well defined on the Electric Micrelog and Gamma-Ray logs. The base was picked on the Gamma-Ray log where the change to clean sandstone of the Curdies Formation is characterised by a sharp decrease in gamma-ray units.

Core 10, from the uppermost part of the formation, is described in Appendix 3.

Samples obtained from the interval 3060 to 3123 feet are not fully representative of the section drilled. The samples consist predominantly of loose, medium to very coarse grains and some granules of angular to subangular quartz. Accessory grains consist of a few grey and yellow quartz grains and traces of chert, iron-stained quartz grains and limonite. Traces of pyrite cement and of brown clay matrix adhere to several of the grains.

The samples include a small proportion of brownish grey, fine to coarse grained, angular, quartz SANDSTONE with subabundant matrix of silty clay and argillaceous siderite and of dark brownish grey, very sandy SIDERITE containing abundant poorly sorted quartz grains and a few limonite oolithe.

A small proportion of sandstone similar to that in Core 10 is present in samples obtained from the bottom part of the formation.

Regionally the Pebble Point Formation is separated from the underlying sediments by an unconformity or disconformity.

SHERBROOK GROUP

Curdies Formation

Age: Upper Cretaceous
3123 to 3970 feet (thickness 847 feet)

SANDSTONE with some SILTSTONE and SHALE interbeds and rare stringers of COAL.

The SANDSTONES are predominantly white to light grey, very poorly sorted and are only weakly cemented. They consist of very fine to very coarse grains, with abundant granules and some pebbles, of angular to subround (mostly angular to subangular) quartz.

Grains of medium grey siliceous rock and of grey, brown and greenish grey quartzite are the most common accessories. Pink, yellow, red, and orange tinted quartz grains are fairly common in places. Pyrite is the dominant cement in the upper part of the formation but is less common towards the base. In this part of the formation the sandstones may have a matrix of silty, carbonaceous clay or less commonly of kaolin.

Several interbeds of poorly sorted, well cemented SANDSTONE are present between 3745 and 3823 feet. These sandstones consist of fine to very coarse grains and occasional granules of quartz set in an abundant (20 to 40 percent) matrix of silica and dolomite.

The SILTSTONES are dark grey to greyish brown, slightly to moderately carbonaceous, micaceous, moderately to very argillaceous and in part grade to very silty shale.

The base of the formation, at 3970 feet, was picked at the first appearance of green clay matrix adhering to the loose quartz grains. At this same depth there also occurs a marked change in the average degree of roundness of the sand grains derived from the coarser sandstone members. Those of the Curdies Formation are predominantly angular to subangular and those of the underlying Paaratte Formation are predominantly subround to subangular.

At Caroline Well No.1 the Curdies Formation is separated from the Paaratte Formation by a disconformity or an unconformity.

Paaratte Formation

Age: Upper Cretaceous.
3970 to 7072 feet (thickness - 3102 feet)

The Paaratte Formation has been subdivided into the Macdonnel and Caroline members on the basis of the marked changes in sandstone to shale ratio which occur within the formation.

At Caroline No.1, the Macdonnel Member has a sandstone to shale ratio of 6 to 1 and the Caroline Member a ratio of 1.1 to 1. Sandstone to shale ratios for these members at the nearby Mount Salt No.1 are 4.5 to 1 and 1 to 1 respectively.

Macdonnel Member (3970 to 5706 feet): SANDSTONE with less than 15 percent interbedded SILTSTONE and SHALE.

The most common sandstone type is a white to light grey, occasionally buff, very friable, poorly sorted SANDSTONE which is recovered in the cuttings as loose, medium to very coarse grains and some granules of clear to slightly cloudy quartz. The grains range from angular to round but are most commonly subround to subangular. Tinted quartz grains are the most common accessories and in places form as much as thirty percent of the framework; they are most commonly yellow amber and pink but green, red and

orange grains are also present. Chert, grey, siliceous grains, quartzite and other lithic grains are present in trace amounts. The most common void filler is a green, chloritic clay but kaolin and grey and brown clay are present as a void filler in places. These sandstones differ from similar sandstones of the overlying Curdies Formation in the following respects:

- on the average, the constituent quartz grains are less angular.
- the predominant void filler is a green chloritic clay.
- tinted quartz grains are more common.
- grey siliceous grains, chert and quartzite are much less abundant.

The consolidated SANDSTONES for the most part are white to light grey, very fine to fine grained, slightly to moderately silty, only slightly micaceous, and are moderately well sorted. They consist of angular to subround quartz and a variable amount of accessory grains set in a matrix which is usually kaolinitic but is occasionally argillaceous and rarely chloritic. Cement, where present, is usually siliceous. The most common accessories are carbonaceous matter, pellets of green chloritic clay and of chlorite and indeterminate, green and grey lithic grains. Traces of coal, pyrite, feldspar, white clay and pink quartz grains are also present. Content of accessory grains varies greatly ranging from less than five percent in most sandstones to as much as twenty percent in others.

The SILTSTONES vary greatly in colour (light to dark grey, brown and in part green) but are for the most part moderately to very micaceous and carbonaceous. They are usually either very sandy (very fine to fine grained quartz) or argillaceous and grade to sandstone and shale. Below 4800 feet they often contain abundant pellets of chlorite or of green chloritic clay.

The SHALES are medium greyish brown and brownish grey, slightly to moderately silty and carbonaceous, slightly micaceous, and are occasionally slightly sandy (very fine grained quartz).

Caroline Member (5706 to 7072 feet): SANDSTONE with 48 percent interbedded SILTSTONE and SHALE.

The coarser grained SANDSTONES are poorly sorted and very friable. They are recovered as loose very fine to very coarse grains, granules and occasional pebbles of round to angular (predominantly subangular to subround) clear to slightly cloudy quartz. Accessory grains which consist of yellow, amber, green and orang tinted quartz grains and rare grains of chert and pyrite are usually present only in trace amounts. Traces of kaolinitic matrix adhere to many of the quartz grains and some siliceous cement and traces of carbonate and pyritic cement are present near the base of the unit.

The finer grained SANDSTONES are also poorly sorted but for the most part are well cemented. They consist of very fine to fine grains and scattered medium to very coarse grains of angular to subround quartz and a small amount of accessory grains. The most common accessories are pellets and grains of green chloritic clay and white kaolinitic grains. Traces of chert, red grey and black lithics, tinted quartz and pyrite are also present. Some carbonaceous matter and mica occurs near the top of the unit but is not common in the lower part.

Sandstones above 6200 feet have a kaolinitic or occasionally an argillaceous matrix and are poorly cemented; those below 6200 feet contain only minor amount of kaolin and are generally moderately well cemented with silica, dolomite or less commonly with siderite or pyrite.

The unit contains fairly common lenses and stringers of sandstone with an abundant cement of pyrite or of siderite.

The coarser sandstone beds of the Caroline Member lack the green chloritic clay matrix and the abundance of tinted quartz grains which are characteristic of similar sandstones in the overlying Macdonnel Member. In general, the consolidated sandstones of the Caroline Member are more poorly sorted, better cemented and contain considerably less carbonaceous matter than those of the Macdonnel Member.

The SILTSTONES are medium to dark grey, firm, micaceous carbonaceous and contain variable amounts (trace to abundant) of green chlorite and/or chloritic clay grains. Traces of glauconite, pyrite and sideritic cement are present in several of the siltstones. In the upper part of the unit the siltstones are often moderately to very sandy or argillaceous and grade to silty sandstone and shale. In general the following changes in composition of the siltstones occur towards the base of the Caroline Member.

a. decrease in amount of carbonaceous matter and of mica.

b. decrease in amount of argillaceous matter and of sand content.

c. increase in abundance of chloritic grains.

The SHALES are medium to dark grey, moderately to very silty, slightly to moderately carbonaceous and micaceous and are rarely kaolinitic.

The Paaratte Formation conformably overlies the Belfast Formation.

Belfast Formation:

Age: Upper Cretaceous
7072 to 8080 feet (thickness -1008 feet)

SHALE or MUDSTONE grading downwards to SILTSTONE, with minor interbedded SANDSTONE.

A large proportion of the shale or mudstone has been ground up by bit action and has washed out of the samples. The SHALES which were recovered in the samples are medium to dark grey, slightly carbonaceous and moderately to very silty. The shales from above 7400 feet are slightly micaceous (muscovite), rarely sandy, and contain traces of glauconite, pyrite and of white clay grains. Those from below 7400 feet contain fairly common shreds and grains of grey, brown, and green lithic debris (altered feldspar ?) and of carbonaceous matter and/or biotite. Traces of glauconite or chlorite are also present.

The SILTSTONES are light to medium grey, slightly to moderately micaceous, moderately carbonaceous, and in slight part sandy or argillaceous. They contain abundant (up to 30 percent) white, brown, buff and green feldspathic/lithic grains and shreds, fairly common patchy chlorite, and possibly traces of glauconite. Several of the siltstone beds, near the base of the formation, have a moderately abundant cement of dolomite or of siderite.

The SANDSTONES are white to light grey, very fine to fine grained (with occasional medium and coarse grains) and are moderately well cemented with silica and dolomite. They consist of angular to subangular quartz and variable amounts (trace to 15 percent) of white clay grains, brown buff and black feldspathic/lithic grains and traces of muscovite, biotite, carbonaceous matter, tinted quartz grains and pyrite.

The shales and siltstones of the Belfast Formation can be distinguished from those of the Paaratte Formation by their content of feldspathic/lithic debris.

TRANSITION UNIT
8080 to 8179 feet (thickness -99 feet)

SILTSTONE, similar to that of the Belfast Formation, with several SANDSTONE interbeds similar to those in the uppermost part of the Waarre Formation.

OTWAY GROUP

Waarre Formation

Age: Lower to Upper Cretaceous.
8179 to 9320 feet (thickness -1141 feet)

SANDSTONE with 36 percent interbedded SHALE and SILTSTONE. The sandstone to shale ratio is 1.8 to 1. Contacts with the Belfast Formation, above, and the Eumeralla Formation, below, are conformable and appear to be gradational.

Unit One (8179 to 8565 feet): SANDSTONE (orthoquartzite) with 22 percent SILTSTONE and SHALE.

The SANDSTONES are white to light grey, poorly sorted and very friable. They consist of angular, very fine to very coarse grains, common granules and some pebbles of quartz, and traces of accessory grains. The sandstones are poorly cemented with silica or rarely with siderite and occasionally have a sparse matrix of kaolin. The accessory grains consist of yellow, amber and pink tinted quartz, fresh orange feldspar, white and grey chert, grey and green lithics, white and brown weathered feldspar, carbonaceous matter and mica.

The SILTSTONES are light to medium grey, moderately to very carbonaceous and contain abundant white to brown grains of weathered feldspar, occasional green chloritic grains, and traces of pyrite and glauconite. Several of the siltstones are slightly sandy (very fine to medium grained quartz).

The SHALES are medium to dark grey, slightly to moderately silty, slightly carbonaceous, occasionally slightly micaceous and contain scattered grains of white and brown weathered feldspar.

The unit includes lenses of very sideritic, very fine grained sandstone, siltstone and claystone.

Unit 2 (8565 to 8920 feet): SHALE with some SILTSTONE and 38 percent interbedded SANDSTONE (orthoquartzite).

The SHALES are medium to dark grey, moderately silty, often slightly to moderately carbonaceous and micaceous (muscovite and biotite), and contain trace amounts to fairly abundant white, cream and buff grains of weathered feldspar and traces of glauconite (?).

The SILTSTONES are light to medium grey, slightly micaceous and carbonaceous and contain very abundant cream, buff and greenish grey feldspathic/lithic shreds and grains and traces of glauconite.

The SANDSTONES are similar to those in Unit 1 but generally are finer grained and less poorly sorted.

Unit 3 (8920 to 9150 feet): SANDSTONE (protoquartzite) and 27 percent SILTSTONE and SHALE.

The SANDSTONES are light grey, slightly carbonaceous, very silty, moderately well sorted and compact. The framework consists of very fine to fine grains and occasional medium grains of predominantly subangular quartz and abundant (generally 10 to 20 percent) weathered feldspar, white and green clay and indeterminate lithic grains. The matrix is usually silty but is occasionally kaolinitic or argillaceous. Cement, where present, is siliceous and is rarely slightly calcareous.

The SILTSTONES are medium grey, slightly to moderately carbonaceous and micaceous, moderately to very sandy and contain abundant feldspathic/ lithic shreds and grains and traces of pyrite.

The SHALES are medium to dark grey, moderately silty, slightly to moderately carbonaceous and contain traces to fairly abundant lithic/feldspathic debris.

Unit 4 (9150 to 9320 feet): SANDSTONE (proto-quartzite and orthoquartzite) and 20 percent SILTSTONE.

The SANDSTONES are white, cream and buff, poorly sorted and very friable. They consist of very fine to coarse grains and occasional very coarse grains and granules of angular to subround quartz and 2 to 15 percent accessory grains set in a matrix consisting predominantly of powdery silica, but including some kaolin and traces of siderite. The most common accessories are white, light grey and pale green grains (weathered feldspar ?), carbonaceous matter, and red andblack lithic grains. Chert, orange feldspar and tinted quartz grains are present in trace amounts.

The SHALES and SILTSTONES are similar to those in Unit 3.

The unit includes fairly common lenses of brown, very fine to fine grained, silty sandstone with an abundant siderite coment.

Transition Unit
9320 to 9490 (?) feet (thickness -99 feet)

Interbedded SANDSTONE, SILTSTONE and SHALE.

The SANDSTONES are predominantly white to light grey, very fine to medium grained and have a siliceous to slightly calcareous cement. The framework consists of angular to subround (predominantly subangular) quartz and from 5 to 25 percent white and brown weathered feldspar grain, grey lithics and occasional green clay grains. Traces of kaolinitic matrix are present.

The SILTSTONES are light to medium grey, slightly carbonaceous, occasionally micaceous or sandy and contain fairly abundant white and brown feldspathic/ lithic grains and shreds.

The SHALES are medium to dark grey, slightly carbonaceous and micaceous, in part sligthly silty and contain occasional feldspathic/lithic grains and shreds.

Eumeralla Formation

Age: Lower Cretaceous
9490 to 11,060 feet (thickness -1571+ feet)

The top of the formation has been picked at 9490 feet on the basis of electrical characteristics. Orthoquartzites are fairly common in the uppermost part of the formation and the "Transitional Unit" may in fact, extend to as deep as 9600 feet.

The formation consists of SANDSTONE with 53 percent interbedded SHALE and SILTSTONE and traces of COAL. The sandstone to shale ratio is 0.6 to 1.

The dominant SANDSTONE type is arkose [1] , but the formation includes some feldspathic greywacke [1]. Protoquartzites [1] are common in the uppermost part of the formation and are interbedded with arkose from 10,600 feet to total depth. Volcanic sandstones are not present or have not been recognised.

The ARKOSE is white to light grey and greenish grey, moderately well sorted and friable. The framework, on the average, consists of angular to subangular, very fine to fine grains of white to pale green fresh translucent feldspar (70 percent), lithic grains, kaolin grains and weathered feldspar (20 percent) and quartz grains (10 percent). The arkose is generally poorly cemented with silica and/or calcite. An argillaceous, silty or more rarely chloritic matrix is present in places.

The orthoquartzites below 10,600 feet are white, cream and buff and consist of very fine to fine grains and occasional medium to coarse grains of quartz with less than 10 percent weathered feldspar, lithic and chloritic grains set in a matrix of slightly calcareous to dolomitic powdery silica.

[1] Pettijohn, F.J., 1957 - Sedimentary Rocks. Harper, New York.

The SHALES are medium light to medium dark grey, in part brownish grey, slightly to moderately micromicaceous and very slightly carbonaceous. They are often slightly to moderately silty, rarely sandy and for the most part contain only traces of feldspathic/lithic debris.

The SILTSTONES are light to medium grey, in part brownish and greenish grey, slightly micromicaceous, very slightly carbonaceous and usually contain abundant grains of feldspar and some lithic grains. They are often very sandy (very fine grains) and grade in part to sandstone.

Traces of COAL are present in the uppermost part of the formation.

Between 10,600 and 10,900 feet traces of light grey, cream and pale brown bentonite and waxy bentonitic shale are present.

PE900455

This is an enclosure indicator page.
The enclosure PE900455 is enclosure within the
container PE900454 at this location in this document.

The enclosure PE600352 has the following characteristics:

ITEM_BARCODE	=	PE900455
CONT AINER_BARCODE	=	PE900454
NAME	=	Caroline 1 Correlation of Selected Wells in Otway Basin
BASIN	=	OTWAY
PERMIT	=	OEL22
TYPE	=	WELL
SUBTYPE	=	DIAGRAM
DESCRIPTION	=	Caroline 1 Correlation of Selected Wells in Otway Basin
DATE_CREATED	=	
DATE_RECEIVED	=	
W_NO	=	
WELL_NAME	=	Caroline 1
CONTRATOR	=	
CLIENT_OP_CO	=	Alliance Oil Development Australia NL.

4. Contributions to Geological Knowledge

Caroline Well No.1 was located near the culmination of a closed structure which had been defined by reflection seismic survey (Caroline-Killanoola Seismic Survey-1966). The structure (see Plate 1) has a maximum closure of about 400 feet mapped on a phantom horizon at about 4000 feet below sea level.

The Caroline well was originally programmed for a depth of 6000 feet to test the petroleum potential of the lower part of the Wangerrip Group and to investigate possible facies changes within the upper part of the Sherbrook Group. The major target zones of the well were:-

1. A sandstone unit which at the nearby Mount Salt Well No.1 is present between 2500 and 2950 feet and is overlain by a 400 foot thick "caprock" of siltstone. The unit occurs near the base of the Dilwyn Formation of Palaeocene to Eocene age.

2. The Pebble Point Formation of Palaeocene age. The formation was encountered between 3134 and 3242 feet at Mount Salt No.1 where it is overlain by 220 feet of shale.

The first target zone was not encountered at Caroline No.1 where the lower part of the Dilwyn Formation (B.M.R. Unit Db.2) has changed in facies to predominantly clay and siltstone. A formation test of a thin sandstone member of Unit Db.2, present between 2928 and 2964 feet yielded a recovery of brackish water.

The top of the Pebble Point Formation was encountered at 3040 feet (-2917 subsea), only 131 feet structurally higher than at Mount Salt No.1. A test conducted over the upper part of the formation also yielded a recovery of brackish water.

Upon reaching the programmed depth of 6000 feet, electric log correlation of the Mount Salt and Caroline wells indicated that at Caroline No.1 the Paaratte Formation was substantially thinner than at Mount Salt No.1. The thinning may have resulted from non-deposition of the younger beds of the Paaratte Formation but lithological evidence suggests that a period of erosion, prior to deposition of the Curdies Formation, is a more probable cause. The log correlation also indicated that beds within the lowermost part of the Paaratte Formation at Caroline No.1 were about 2850 feet structurally higher than equivalent sediments at Mount Salt No.1. Accordingly the well was deepened to 11,061 feet to investigate the stratigraphy and test the petroleum potential of the entire Sherbrook Group and of the upper part of the Otway Group.

The contributions to geological knowledge of the Gambier Sunklands province of the Otway Basin which have resulted from the drilling of Caroline No.1 may be summarised as follows:-

1. The well has demonstrated the presence in the Gambier Sunklands of a well developed sequence of Belfast Formation and Waarre Formation sediments. It has provided lithological evidence that sediments at the nearby Mount Salt No.1 well which previously had been considered to be equivalents of these formations should be included in the Paaratte Formation.

3. Sandstone members of the Eumeralla Formation consist predominantly of arkose characterised by an abundance of fresh feldspar. Volcanic sandstones, which are common in the upper part of the Eumeralla Formation at wells drilled elsewhere in the Gambier Sunklands, were not encountered at the Caroline Well.

3. The Waarre Formation was found to include moderately thick beds of porous and permeable sandstones, several of which contain a commercial volume of carbon dioxide gas.

4. At Caroline No.1 contacts between the Waarre Formation and both the overlying Belfast and the underlying Eumeralla formations are conformable and may in fact be gradational. At well locations on the margins of the Otway Basin, however, the boundary between the Sherbrook and Otway Groups is usually unconformable or disconformable. On the basis of lithological evidence the Bureau of Mineral Resources (B.M.R. Record 1966/170) have postulated that an unconformity or disconformity is also present between the Waarre and Eumeralla formations.

5. Shales and siltstones of the Belfast Formation can be readily differentiated from the same rock types in the overlying Paaratte Formation by their content of white, buff, grey and green weathered feldspar grains and lithic debris.

6. On the basis of differing sandstone to shale ratios the Paaratte Formation, within the Gambier Sunklands, is divisible into two members. The Macdonnel Member has a sandstone to shale ratio of 6-1 and the underlying Caroline Member a ratio of 1.1-1. Sandstone to shale ratios for these members at the nearby Mount Salt No.1 are 4.5-1 and 1-1 respectively.

7. The Macdonnel Member of the Paaratte Formation, which is 4320 feet thick at Mount Salt No.1, thins to 1756 feet above the Caroline structure and thickens again in an easterly direction. At the Nelson Bore 2805 feet of the member were penetrated without reaching the Caroline Member.

8. Lithological and stratigraphic evidence indicate that an unconformity or disconformity is present between the Paaratte Formation and the overlying Curdies Formation. The available evidence indicates that the tectonic movements which formed the Caroline structure occurred after deposition of the Caroline Member of the Paaratte Formation and preceded deposition of the Curdies Formation.

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PE900456

This is an enclosure indicator page.
The enclosure PE900456 is enclosure within the
container PE900454 at this location in this document.

The enclosure PE600352 has the following characteristics:

ITEM_BARCODE	=	PE900456
CONT AINER_BARCODE	=	PE900454
NAME	=	Caroline 1 Locality Map
BASIN	=	OTWAY
PERMIT	=	OEL22
TYPE	=	WELL
SUBTYPE	=	DIAGRAM
DESCRIPTION	=	Caroline 1 Locality Map
DATE_CREATED	=	
DATE_RECEIVED	=	
W_NO	=	
WELL_NAME	=	Caroline 1
CONTRATOR	=	
CLIENT_OP_CO	=	Alliance Oil Development Australia NL.

PE900457

This is an enclosure indicator page.
The enclosure PE900457 is enclosure within the
container PE900454 at this location in this document.

The enclosure PE600352 has the following characteristics:

ITEM_BARCODE	=	PE900457
CONT AINER_BARCODE	=	PE900454
NAME	=	Caroline 1 Regional Geology and Structural Features of the Gambier Sunklands
BASIN	=	OTWAY
PERMIT	=	OEL22
TYPE	=	WELL
SUBTYPE	=	MAP
DESCRIPTION	=	Caroline 1 Regional Geology and Structural Features of the Gambier Sunklands
DATE_CREATED	=	
DATE_RECEIVED	=	
W_NO	=	
WELL_NAME	=	Caroline 1
CONTRATOR	=	
CLIENT_OP_CO	=	Alliance Oil Development Australia NL.

APPENDIX No.2

ALLIANCE CAROLINE WELL No.1

COMPLETION REPORT

ANALYSES

A) Analysis of Gas Sample from D.S.T. No.4, Caroline Well No.1, by Gas and Fuel Corporation of Victoria.

B) Analysis of Gas Sample from D.S.T. No.5, Caroline Well No.1, by Gas and Fuel Corporation of Victoria.

C) Analysis of Gas Sample from D.S.T. No.8, Caroline Well No.1, by Gas and Fuel Corporation of Victoria.

D) Analysis of Water Sample from D.S.T. No.5 Caroline Well No.1, by Gas and Fuel Corporation of Victoria.

APPENDIX No.2A

ALLIANCE CAROLINE WELL NO.1

COMPLETION REPORT

ANALYSIS OF GAS SAMPLE
FROM D.S.T. No.4
(8256-8433)

Helium	0.008 %
Hydrogen	0.04
Nitrogen	0.42
Methane	1.31
Ethane	0.03
Propane	0.011
Iso-butane	0.001
Normal Butane	0.001
CO_2	97.5 (probably 0.7% higher)

APPENDIX No. 2B

ALLIANCE CAROLINE WELL NO. 1

COMPLETION REPORT

ANALYSIS OF GAS SAMPLE FROM
D.S.T. No.5 (8610-8730)

Helium	0.0026
Hydrogen	0.054
Nitrogen	0.094
Methane	0.74
Ethane	0.039
Propane	0.022
i/Butane	0.003
n/Butane	0.004
CO_2	99.1

APPENDIX No. 2C

ALLIANCE CAROLINE WELL No. 1

COMPLETION REPORT

ANALYSIS OF GAS SAMPLE FROM

D.S.T. No. 8 (9154-9182)

Helium	.0071
Hydrogen	.0023
Nitrogen	.46
Methane	.93
Ethane	.006
Propane less than	.001
i/Butane less than	.001
n/Butane less than	.001
CO_2	98.6

APPENDIX No.2D

ALLIANCE CAROLINE WELL NO.1

COMPLETION REPORT

ANALYSIS OF WATER SAMPLE
FROM D.S.T. No.5
(8610-8730)

Ph.	8.7	
Chlorine	8,600	parts per million
Sodium	13,300	" " "
Sulphates	1,480	" " "
Calcium	18	" " "
Magnesium	15	" " "

APPENDIX No.2

ALLIANCE CAROLINE WELL No.1

COMPLETION REPORT

LITHOLOGICAL DESCRIPTION OF CORES

By: M. LeBlanc, G. Campo and J. Gaunden

The lithology of each core is described in sequence from top to bottom of the recovered section. Oil staining was not observed in any of the cores.

Core No.1:- Interval - 581 to 599 feet
Recovery - 15.5 feet (86.1%)

1.3 feet DOLOMITE: pale greenish grey; poorly sorted dolomitised bioclastic fragments in microcrystalline to very fine crystalline matrix;
rare quartz grains; slightly argillaceous; earthy texture; slight organic porosity and good earthy porosity - grades to -

11.0 feet DOLOMITE; light grey; very finely crystalline; dolomitised poorly sorted bioclastic limestone; moderately calcareous; in part with earthy texture ; generally slight to moderately argillaceous; moderate earthy porosity; grades in part to bioclastic limestone with abundant dolomite rhombs. - grades to -

3.2 feet MUDSTONE; medium greyish brown, with 40% fossil fragments (predominantly bryozoa); moderately calcareous slightly glauconitic; in part slightly pyritic.

3.5 feet No recovery.

Bedding poorly defined. Dip not discernible

Core No.2:- Interval - 699 to 719 feet
Recovery - 11 feet (55%)

11.0 feet CLAY; black carbonaceous, slightly sandy; in part grading to very argillaceous sand; firm to soft. The core contains common pyrite nodules (up to 3 cm in diameter but generally $\frac{1}{2}$ cm. or less) and occasional clear mica flakes (up to 5 mm.). The sand grains range from fine to very coarse grained (30% fine grains; 40% medium grains; 20% coarse grains; 10% very coarse grains). The grains are subrounded to rounded, have poor sphericity, and are generally polished. They are occasionally pitted and are clear to cloudy, common reddish brown and orange stained grains,

occasional yellow and pink grains and very rare grains of prismatic quartz. Other constituent grains are common (up to 15%) ironstone and limonite (?) and traces of chert and glauconite pellets. Finely disseminated pyrite is common in the clay.

The core is generally structureless but there are some thin fine grained sandstone laminations in the clay. The core is tight with rare zones of poor porosity.

9.0 feet — No recovery.

As the core is massive the dip of the bedding is not discernible.

Core No.3:- Interval - 2454 to 2476 feet
Recovery - 11 feet (50%)

9.5 feet

Macro Description

CLAY: black to dark brown, carbonaceous finely micaceous, firm to moderately hard; finely laminated with silty, sandy laminations or with colour laminations. Common lenses of very fine grained sandstone (½ mm. to 1 cm. thick); undulatory lenses; common sandstone-filled erosional scours; occasional cross-bedding in sandstone lenses with erosional truncations of these by the sandstone or clay. Common lenses and laminations of very fine grained pyritic sandstone with occasional pyritic nodules and (?) dolomitic sandstone nodules. Rare lenses of medium to coarse grained sandstone. Clay beds are up to 2 cms. thick. Occasional fractures with 60° dip.

Micro Description

CLAY: black to dark brown, commonly silty, finely micaceous with occasional mica flakes (to 8 mms), occasional plant fragments. Generally the clay is black and the silty clay is dark brown. The clay has common lenses and interbeds of very fine to fine grained argillaceous sandstones which are greyish green, tight, and occasionally porous the sandstones show micro-graded bedding. There are common sandstone-filled erosional scours. Several beds of clay which are more indurated than the remaining beds may be slightly pyritic. There are also common thin laminations of fine to very fine grained pyritic sandstones; these sandstone laminations and lenses are often slightly micaceous and are generally tight but some have traces of porosity. Differential compaction in places results in undulatory bedding.

Dip of the bedding ranges between 0 and 5 degrees but is predominantly less than 3 degrees.

1.5 feet

Macro Description
SANDSTONE: greenish grey, fine to very fine grained with occasional coarse to granule sized grains, micaceous; occasional fine laminations of argillaceous material; occasional beds (up to 1 cm thick) of blueish grey clay and dark grey to black carbonaceous clay.

Micro Description
SANDSTONE: light greenish grey, very fine grained, well sorted with occasional fine to coarse grains, friable. Composed of clear to slightly cloudy, subangular to subrounded quartz grains with occasional coal fragments and traces of mica (white) and dark green lithic grains in an argillaceous matrix. There are common interbeds and laminations of black to dark brown finely micaceous clay. The sandstones often include thin laminations with pyritic cement.

Bedding dips at from 3 to 7 degrees.

11.0 feet — No recovery.

Core No.4: — Interval - 2560 to 2572 feet
Recovery - 4 feet (33.3%)

Core consists predominantly of CLAY: medium dark brown, moderately micaceous, moderately carbonaceous to very carbonaceous, silty. The clay has common flecks of coal and scattered very fine to fine sand grains. Scour structure infilled with white, very fine to fine grained quartz sandstone occurs at several horizons.

The core includes numerous laminations (generally 0.3 to 0.5 mm. thick) of very fine grained sandstone and siltstone. Several thin laminations of pyrite occur in association with thin interbeds of SAND-STONE: light grey, very fine grained, quartz and 5% dark grains, pyritic, silty moderately carbonaceous, well indurated, tight.

The clay is dominantly moderately firm and has a moderately well developed fissility as a result of planar concentration of carbonaceous flecks.

The microstructure of the core is obscured by a coating of clay.

Dip of the bedding is poorly defined but is in the order of 3 to 5 degrees.

8.0 feet — No recovery.

Core No.5: — Interval - 2572 to 2580 feet
Recovery - 3 feet (37.5%)

3 feet — CLAY: medium brown, moderately micaceous and silty, very carbonaceous, plastic to moderately firm. The core includes

approximately 30% laminations of light grey, very fine grained (in part fine grained) quartz sandstone which is slightly silty and moderately to very carbonaceous.

Plant fragments and large carbonaceous fragments are present on several bedding planes. Carbonaceous flecks in both the sandstone laminations and in the clay are orientated parallel to the bedding and impart a moderate fissility to the clay.

5 feet — No recovery.

The dip of the bedding is not well defined but is in the order of 3 to 5 degrees.

Core No.6: — Interval - 2580 to 2582.5 feet
Recovery - 1.17 feet (46.8%)

1.17 feet — CLAY: chocolate brown, moderately well indurated, very micaceous, very carbonaceous (carbonaceous flecks oriented parallel to bedding planes), moderately to very silty and grades in part to very argillaceous siltstone.

The core includes about 20% laminae and lenses of SANDSTONE: light grey, very fine grained (occasional fine grains), quartzose, silty, very carbonaceous and micaceous, tight.

1.33 feet — No Recovery.

Dip of bedding is poorly defined but is in the order of 2 to 5 degrees.

Core No.7: — Interval - 2663 to 2673 feet
Recovery - 9.5 feet (95%)

9.5 feet — SHALE: medium brown, moderately to very micaceous; abundant carbonaceous specks; predominantly moderately to very silty; generally firm but in part slightly plastic. The core includes zones with common small pyrite concretions and wavy bedded pyrite. The shale has a poorly developed fissility and includes occasional laminations of white, very fine grained quartz sandstone and some siltstone near the base of the core.

0.5 feet — No recovery.

The bedding is moderately well defined and dips at 12 to 16 degrees.

Core No.8: — Interval - 2673 to 2681 feet
Recovery - 6.5 feet (81.3%)

6.5 feet — SHALE: medium brown, moderately to very silty, very micaceous, very carbonaceous

(carbonaceous flecks oriented parallel to fissility), moderately well indurated but becomes plastic when wet; poorly developed fissility. The core includes less than 5% laminations (generally less than 1 cm. in thickness) of white, very fine to fine grained, silty, carbonaceous, in part pyritic, sandstone and siltstone. Rare small stringers of pyrite and of fine grained sandstone in a pyritic matrix are also present.

1.5 feet — No recovery. Core loss probably distributed along length of core.

Dip of bedding is well defined at 22 degrees.

Core No.2: — Interval - 2711 to 2715 feet
Recovery - 3 feet (75%)

0.75 feet — SILTSTONE: medium brown, moderately micaceous, very carbonaceous, very argillaceous, indurated.

---- grades to ----

2.25 feet — SHALE: medium brown, moderately to very silty, micaceous and carbonaceous (carbonaceous flecks oriented parallel to poorly developed fissility). The core includes occasional blebs and stringers of pyrite and includes less than 5% laminations of light grey carbonaceous siltstone.

1.00 feet — No recovery.

Bedding dips at 22 degrees.

Core No.4: — Interval - 2784 to 2789 feet.
Recovered - 3.25 feet (65%)

4.50 feet — SANDSTONE: pale grey to yellowish brown, very poorly sorted, fine grained to granule sized, angular to rounded grains of quartz with abundant cellules of light yellowish-brown limonite (?) and traces of chert, muscovite and other labile grains. The quartz grains are generally fractured or cracked. Many of the limonite cellules are surrounded by and/or partially replaced by an indeterminate soft white mineral which is also present as discrete grains. Part of the limonite cellules have a core consisting of a quartz grain; limonite also occurs as irregular grains or nodules.

The quartz grains and limonite cellules are set in an abundant matrix (30-40%) which is variably yellowish brown and limonitic, dark brownish grey and limonitic/carbonaceous or in places black and bituminous.

Intraformational conglomerate, comprising fragments of less than 1 inch in diameter is developed in several zones within the core.

----- gradational contact -----

1.00 foot — SANDSTONE: very dark grey, very poorly sorted; similar to the sandstone described above but includes abundant granules and an occasional pebble. The majority of the grains are ironstained and some grains are iron-coated. Pellets and/or ooliths of limonite are abundant but the indeterminate white mineral present in the overlying unit is absent. The matrix consists of dark yellowish grey ferruginous clay.

----- gradational contact -----

2.75 foot — OOLITE: medium dark grey, fine to medium grained, in part coarse grained; dark brown limonite oolitha and/or pellets and a much smaller proportion of poorly sorted (very fine to very coarse grained) ironstained quartz set in an abundant (35%) yellow-brown, earthy textured, limonitic clay matrix.

The oolite is reworked and comprises well indurated, elongate (generally less than 1 inch in length) fragments set in a softer limonitic and argillaceous matrix.

11.75 foot — No recovery.

The core includes several pyritised zones. No hydrocarbon shows. As the core is unoriented the dip of the bedding is unknown.

<u>Core No. 11:</u> Interval - 6091 to 6102 feet
Recovery - 4.39 feet (39.[illegible]%)

<u>Megascopic Description</u>

1 foot 6 inches — SANDSTONE: discoloured by mud; medium grained; occasional carbonaceous laminations and streaks with 10 degree dip. Structures:- laminations, disturbed bedding and cross bedding.

10 inches — Interlaminated greenish grey siltstone and black, carbonaceous siltstone. Structures:- laminations, cross-bedding washouts, lenses, erosional truncation, animal burrows (?) and graded bedding. Grades downward to a fine to medium grained sandstone. The siltstone is more carbonaceous near the top of units between the major erosional truncations.

Bedding dips at 5 degrees

3 inches — SANDSTONE: fine to medium grained, discoloured by mud.

1.5 inches — SILTSTONE: black with, near base, laminations of greenish-grey siltstone. Structures: - laminations, lenses. A pebble of brown, sandy and very argillaceous siltstone occurs at base of unit.

Bedding dips at 3 to 5 degrees.

6 inches — SILTSTONE: greenish grey. Grades downwards to a coarse grained sandstone. Common carbonaceous streaks and lenses. Structures: - undulating bedding, cross-bedding, graded bedding, lenses. Bedding dips at 5 to 25 degrees.

1 foot 1.5 inches — SILTSTONE: black, tough; with laminations and lenses of greenish grey to light grey siltstone and fine grained sandstone. Structures:- lenses, laminations, washouts, rare animal burrows, distorted bedding, bedding disturbed by compaction.

Bedding dips at 0 to 3 degrees.

Micro description

1 foot 6 inches — SANDSTONE: brown (mud discoloured), slightly friable, fine to medium grained with occasional coarse grains and occasional very fine grains, generally well sorted. Grains comprise angular to subrounded quartz, 3 to 5 percent carbonaceous and lithic grains, traces brown siltstone grains, 5 percent black lithic grains, traces mica flakes (to 5 mm.) Grains are set in 5 to 25 percent white kaolinitic matrix. Sorting varies from fair to good and porosity from poor to good. The sandstone shows poorly developed graded bedding with a decrease in porosity as the average grain size decreases and the percentage of matrix increases. Traces of green chloritic clay are present in pore spaces.

10 inches — Interlaminated light greenish-grey siltstone and black to brown carbonaceous siltstone. The light greenish-grey siltstone is composed of quartz grains with up to 5 percent of a light green, soft mineral (chlorite or glauconite), 5 percent black rounded lithic grains, traces of mica, common carbonaceous lithic grains, traces red to brown lithic grains, some very fine to fine grained quartz set in an argillaceous (kaolinitic?) matrix. The black to brown siltstone is composed of quartz grains and lithics as above and includes abundant carbonaceous fragments and laminations.

3 inches — SANDSTONE: brown (mud discoloured); grades from the greenish-grey siltstone described above to very fine grained fine grained and medium grained sandstone. Constituents are similar to those in sandstone unit at top of core. Porosity increases from

tight (at the top of the unit) to good (at the base of the unit).

1.5 inches — SILTSTONE: black with greenish-grey laminations near base. The siltstone is very argillaceous (up to 50 percent argillaceous matter) and includes common fine to medium rounded quartz grains, abundant carbonaceous fragments and common mica flakes.

6 inches — SILTSTONE: greenish-grey as above; grades downwards to medium grained sandstone, as above, with carbonaceous laminations and streaks. The sandstone has good porosity. Bottom ½ inch of unit is greenish-grey as above, with laminations of dark brown siltstone as above, with laminations of dark brown siltstone as above, and thin interbeds of fine to coarse grained poorly sorted sandstone with up to 40 percent argillaceous and silty matrix.

1 foot 1.5 inches — SILTSTONE: black, argillaceous; grades to a very argillaceous shale. The siltstone-shale is firm, carbonaceous, micaceous and includes laminations and lenses of greenish siltstone, lenses of white siltstone with 40 percent kaolinitic matrix, and occasional burrows filled with fine to coarse grained subangular sandstone with a kaolinitic matrix.

6 feet 8 inches — No recovery.

Core No.12: Interval - 4102 to 4114 feet
Recovery - 7 feet (58.3%)

2 feet 7 inches — SHALE: medium dark grey, in part brownish grey, micaceous, very silty, subfissile to blocky. The shale is generally moderately carbonaceous, but includes several zones with abundant flecks and blebs of coaly material; it grades in part to very argillaceous siltstone.

The unit contains about 10 percent of interlaminated SANDSTONE: white, very fine grained, quartzose, very silty, slightly to moderately carbonaceous, kaolinitic matrix, tight and also includes some interlaminated SILTSTONE.

In the basal 4 inches the shale is dark grey and contains scattered fine to medium angular quartz grains. This part of the unit includes several lenses (4 mm. thick) and patches (10 mm thick) of SANDSTONE: white, medium to coarse grained, angular to subangular quartz, kaolinitic matrix, tight. At 4102'4" and at 4104'4" lenses of sandstone have a matrix of pyrite. Rare nodules of pyrite are present elsewhere in the unit. Bedding dips at 2 - 4 degrees.

----- erosional contact -----

7 inches — Irregular stringers and lenses of white to light grey sandstone and 20 percent interlaminated dark grey shale. Scours in this unit are infilled by pockets of medium light grey, poorly sorted sandstone which constitutes 30 percent of the unit.

The white to light grey sandstone is very fine grained (in part fine grained), silty, in part slightly carbonaceous, compact tight and consists of medium well sorted quartz with occasional pink and green quartz grains and black lithic grains set in a kaolinitic matrix.

The medium light grey sandstone consists of poorly sorted, very fine to coarse grained angular quartz in a compact, silty to argillaceous and in part kaolinitic matrix.

1 inch — Large nodule of poorly sorted, fine to coarse grained, subangular to subrounded, quartz sandstone cemented with pyrite.

2 feet 10 inches — Interlaminated SILTSTONE and SANDSTONE (40 percent)

The siltstone is medium to dark grey, moderately to very carbonaceous, very argillaceous and in part grades to silty shale.

The sandstone is light grey, compact, tight and consists of very fine grained angular quartz, common pink quartz grains and abundant silt grains in a kaolinitic and in part carbonaceous matrix.

The sandstone is in part cross-laminated. Compaction structures are developed above several sandstone lenses and several burrows are present.

Bedding dips at from 4 to 5 degrees.

9 inches — Irregular laminations and lenses of SANDSTONE and SILTSTONE (40 percent)

The sandstone is light grey (discoloured by mud) and consists of medium to coarse, subangular, clear quartz grains and occasional pink quartz grains set in a kaolinitic matrix. The sandstone is well sorted and in places has moderate intergranular porosity.

In the uppermost part of the unit the sandstone is more poorly sorted and includes grains of granule size. In this part of the core blebs and laminae of vitreous coal (rarely replaced by pyrite) are present.

The siltstone is medium to dark grey, moderately to very carbonaceous, very argillaceous and in part grades to SHALE.

2 inches — Interlaminated very fine grained, silty sandstone and dark grey, carbonaceous, silty shale.

5 feet — No recovery.

Core No.13: Interval - 6001 to 6016 feet
Recovery - 10.5 feet (70%)

4 inches — SILTSTONE: dark grey to black, very sandy (sand consists of very fine to fine angular to subangular grains of quartz which occur disseminated and also in small lenses and stringers), very argillaceous, very slightly micaceous. The core contains traces of glauconite, green clay (?) grains, and occasional medium sized grains of quartz. Sand grains compriso about 30 percent of the volume of the core. There is no bedding definition but the orientation of several elongate sand lenses suggest that the bedding dips very gently.

3 feet 10 inches — SANDSTONE: dark grey (slightly greenish-grey when wet), very poorly sorted; consists of very fine to very coarse angular to subround quartz grains, occasional white kaolinitic grains, occasional red quartz grains and occasional green clay grains set in a matrix which is variably brown, argillaceous/silty or light grey kaolinitic. Predominant grain size is fine grained. Lenses and angular fragments of shale up to pebble size are common. In parts of the core fragments of light grey, kaolinitic sandstone are set in a matrix of sandy brown clay. The sandstone is slightly micaceous and is for the most part carbonaceous. It is well consolidated and tight. Carbonaceous plant fragments (in part pyritised) are not uncommon.

The core exhibits a "chaotic" or "churned-up" texture suggestive of deposition under shallow water conditions and of organic reworking. Animal burrows are present within the core but are not common. The dip of the bedding is not discernible.

9 inches — SANDSTONE: as above. Consists predominantly of fine to medium quartz grains set in a medium greenish grey matrix of clay. The core contains about 30 percent of "clay balls" (up to 3 inches along their major axis) of light brownish grey, very sandy and silty clay.

3 feet 1inch	SANDSTONE: similar to unit at top of core. Consists of poorly sorted, predominantly fine to medium grained, subangular to subround quartz fairly common white kaolin and green clay grains set in a matrix which is variably medium brownish grey to dark grey, silty, slightly carbonaceous, or very light grey and kaolinitic. Grain size ranges from very fine grained to pebbly. The amount of matrix is in the order of 35percent but in parts of the unit, where fragments of sandstone are set in a matrix of very sandy clay, the percentage of matrix is as high as 70 percent. Several zones include greyish brown, sandy "clay balls". The sandstone is tight. The unit exhibits a "chaotic" texture indicative of shallow water deposition and of extensive re-working while in a semi-consolidated state.
7 inches	SANDSTONE: light grey, slightly greenish, poorly sorted, very fine to very coarse grained; predominantly medium to coarse grained, subrounded quartz grains, occasional tinted quartz grains, and 5 percent dark greenish grey and white clay grains; very friable, poorly cemented with 10 percent kaolin cement; excellent intergranular porosity.
----- Abrupt contact defined by pebble band -----	
1 foot 7 inches	Intermixed SANDSTONE and very sandy SHALE. SANDSTONE: light grey, very fine to very coarse grained; predominantly very fine to fine grained, subangular quartz with common tinted and occasional white clay grains; moderately to very silty, slightly micaceous; in part with a brown argillaceous matrix, in part with a white kaolinitic matrix; tight. SHALE: dark grey, slightly brownish, very sandy (very fine grained to fine grained), very silty; grades to very argillaceous sandstone; tough and well indurated. The core shows well developed micro-structures indicative of shallow water deposition; i.e. scour and fill, interrupted bedding, compaction structure, sandstone "balls". Bedding dips are in the order of 0 to 8 degrees but are not considered reliable.
2 inches	SANDSTONE: light grey, very fine grained, quartz and 5 to 10 percent green, red and black grains, silty, well sorted, compact kaolinitic matrix, tight.

2 inches	SANDSTONE and sandy SHALE as above.
4 feet 6 inches	No recovery
Core No.14:	Interval - 7699 to 7702 feet Recovery - 2.5 inches (7%)
0.21 feet	SHALE: dark grey, firm, moderately micaceous (muscovite), abundant carbonaceous flecks (orientated parallel to bedding), abundant white, grey and pink grains and shreds of altered feldspar (?), moderately to very silty with patches of siltstone.
2.79 feet	No recovery As the core is massive the dip of the bedding is not discernible.
Core No.15:	Interval - 7957 to 7975 feet Recovery - 1.5 feet (8.3%)
1.0 feet	SILTSTONE: medium grey; common white to brown feldspathic grains and pale green chloritic (?) patches; occasional carbonaceous flecks; occasional brown and white mica; traces disseminated pyrite; traces calcite fossil fragments. The unit also includes diffuse argillaceous laminae. Bedding is indistinct. Occasional fine subvertical fractures.
0.5 feet	SILTSTONE: as above but light grey and slightly sandy. Occasional poorly preserved fossil fragments. Apparent dip of argillaceous laminae is 7 degrees. In addition to the above several abraded fragments were recovered. These were largely SHALE: dark grey, with only occasional feldspathic grains but fairly common well oriented biotite or carbonaceous flecks.
16.5 feet	No recovery.
Core No.16:	Interval - 10,057 to 10,067 feet Recovery - 9.17 feet (91.7%)
1½ inches	SILTSTONE: medium light grey, very sandy (25% very fine grained and occasionally fine grained lithic/feldspathic grains), argillaceous, very carbonaceous, slightly micaceous. The siltstone is cross-laminated; laminations are defined by abundant carbonaceous/bituminous flakes and grains.
1 inch	SILTSTONE: dark grey, very argillaceous, moderately to very feldspathic/lithic, slightly micaceous, moderately carbonaceous (flecks). ------ sharp contact ------

4½ inches	SANDSTONE: light grey, very fine grained; very abundant altered feldspar (cream, buff, grey), translucent feldspar ?, dark brown, black and carbonaceous grains; well sorted; well cemented; silty/argillaceous matrix; tight. Bedding dip as defined by upper and lower surfaces of this unit is 7 degrees.
	------ sharp contact ------
3 ft.8½inches	MUDSTONE: dark grey, moderately to very micromicaceous, slightly to moderately carbonaceous (flecks), predominantly slightly silty, common silt sized feldspar/ lithic grains. Laminae of siltstone, which is in part very finely sandy, are present within the unit particularly in the uppermost foot. Dip as defined by the laminae is variable but appears to be in the order of 6 to 7 degrees.
4½ inches	SANDSTONE: light grey to greenish grey, fine grained with common very fine grains; angular to subangular grains of white to cream kaolinised feldspar, translucent fresh feldspar, and common black, brown and occasional red lithic grains, with about 30 percent of quartz grains tough, well indurated, well sorted, tight.
	------ gradational contact ------
3 inches	SANDSTONE: light grey; similar to above but generally very fine grained; moderately silty; cross laminated (laminae defined by concentrations of carbonaceous flecks and coal flecks and grains). Burrow 2½ inches deep and 1¼ inches wide is infilled with sandstone as above.
10 inches	SANDSTONE: light grey to greenish grey, very fine to fine grained, kaolinitic, lithic; as above with occasional carbonaceous laminae.
	------ gradational contact ------
10 inches	SANDSTONE: light grey, similar to above, predominantly very fine grained; common irregular laminae of sandy siltstone, argillaceous siltstone and occasionally of carbonaceous to coaly matter.
	------ gradational contact ------
6½ inches	SANDSTONE: light grey to very light grey, fine grained with common very fine and medium grains, angular to subangular, vitreous quartz and less than 5 percent lithic grains, slightly silty, poorly sorted, well cemented with powdery silica, very slightly calcareous, tight. Rare carbonaceous laminae.
1 inch	SILTSTONE: light to medium light grey, very sandy (very fine grained), very lithic/feldspathic, slightly micaceous.

6½ inches	SANDSTONE: light grey, fine grained ((common very fine grains); angular quartz, with about 5 percent feldspar and 10 to 15 percent brownish grey, greyish brown and black lithic grains; moderately well sorted, well cemented with silica, slightly calcareous, tight.
1½ inches	SILTSTONE: medium to medium dark grey, very sandy (very fine grained quartz, feldspar and lithic grains), moderately micaceous and carbonaceous.
1 inch	SANDSTONE: light grey, fine grained as above.
1½ inches	SILTSTONE: medium to medium dark grey, very sandy as above.
1 ft 1 inch	SANDSTONE: medium grey, very fine grained, quartz and abundant feldspar and lithic grains, very silty, moderately carbonaceous, slightly to moderately micaceous, well indurated, in part with patchy matrix of brown calcareous carbonate, tight.
10 inches	No recovery.

Core No.17: **Interval - 11,051 to 11,061 feet**
Recovery - 7.66 feet (76.6%)

7.0 feet	MUDSTONE: dark grey, slightly micaceous, very carbonaceous (sparsely distributed flecks and abundant carbonised plant and wood fragments), non-feldspathic, blocky, in part very silty; grades to 50 percent SILTSTONE: medium to medium dark grey, very argillaceous, moderately to very micaceous and micromicaceous, moderately to very feldspathic (predominantly silt sized grains but occasional very fine grains), very carbonaceous (specks and plant fragments).
0.66 feet	SANDSTONE: light greyish-green, very fine grained, feldspar and lithic grains, abundant silty and argillaceous matrix, very micaceous, very carbonaceous (flecks and plant fragments), tight; grades to sandy and argillaceous SILTSTONE.
2.34 feet	No recovery

Bedding dips at 15 degrees.

APPENDIX No. 4A

ALLIANCE CAROLINE WELL No.1

COMPLETION REPORT

LIST OF LOGS RUN

Logging services were provided by Schlumberger-Seaco Inc. and Welex.

The following logs were run by Welex:

A) TEMPERATURE LOG:

Run No.	Interval (feet K.B.)	Scales (inches/100ft)	Date
1	30-653	5	19 Nov.1966

* B) MICROSEISMOGRAM-CEMENT BOND-GAMMA COLLAR LOG:

Run No.	Interval (feet K.B.)	Scales (inches/100ft)	Date
1	7300-9239	2 and 5	14 Feb.1967

* Not subsidised

The following logs were run by Schlumberger:

A) INDUCTION ELECTRIC

Run No.	Interval (feet K.B.)	Scales (inches/100ft)	Date
1	742- 3990	2 and 5	1 Dec.1966
2	3778- 6006	2 and 5	7 Dec.1966
3	6006- 9411	2 and 5	9 Jan.1967
4	9411-11059	2 and 5	31 Jan.1967

B) MICROLOG-CALIPER

Run No.	Interval (feet K.B.)	Scales (inches/100ft)	Date
1	742- 6007	2 and 5	8 Dec.1966
2	6007- 9412	2 and 5	9 Jan.1967
3 ML	8000- 8500 and 9000-11045	2 and 5	30 Jan.1967
CL	7000-11045		

C) SONIC-GAMMA RAY:

Run No.	Interval (feet K.B.)	Scales (inches/100ft)	Date
1	SL 742-6001	2 and 5	7 Dec.1966
	GRL 20-5980		
2	SL 6001-9404	2 and 5	9 Jan.1967
	GRL 5980-9385		
3	SL 9404-11038	2 and 5	30 Jan.1967
	GRL 9385-11019		

D) CONTINUOUS DIPMETER SURVEY:

Run No.	Interval (feet K.B.)	Date
1	742- 6009	8 Dec. 1966
2	6009-10798	31 Jan. 1967.

E) CEMENT BOND LOG:

Run No.	Interval (feet K.B.)	Scales (inches/100ft)	Date
1	40-740	2 and 5	1 Dec.1966

F) VELOCITY SURVEY

A velocity survey was conducted over the interval 750 to 11,050 feet by Namco International Inc. Nineteen shots were recorded on 8 December, 1966 and an additional 14 shots were recorded on 30 January, 1967. The results of the survey are included in this report as Enclosure 8.

NOTE: The elevations shown on several of the logs (refer enclosures 2 to 7) are incorrect and should be changed to:

Ground Elevation: 107 feet

Kelly Bushing Elevation: 123.3 feet

APPENDIX No. 4B

ALLIANCE CAROLINE WELL No.1

COMPLETION REPORT

INTERPRETATION OF LOGS

By: M. Gahan
Data Analysis Pty. Ltd.

Logs available were -

Induction-Electric Log
Sonic-Gamma Ray
Microlog.

Permeable intervals were selected from the microlog and an Rwa interpretation made to indicate intervals where water saturation was less than 100%. The matrix velocity for sandstone at 1800 feet per second was used and the Rwa values obtained (Table 1) averaged 0.15 with the exception of the intervals from 8100 to 8248 feet and 8823 feet to total depth.

A more detailed interpretation of the zones of interest was made using the SP to obtain a more accurate value for Rw, the Induction compared to the 16" normal to obtain a second evaluation of Sw, and the Gamma Ray log to obtain an estimate of the shale content. The results are shown on Table 2.

The water resistivity values of 0.15 in the interval from 8100 to 8280 feet and 0.25 from 9153 to 9305 feet are equivalent to salinities of 16,000 ppm and 12,000 ppm respectively. The variation in water salinity seems to indicate that there are two independent reservoirs. This might be confirmed by comparison of the DST pressure charts.

The shale content was obtained assuming a linear relation between the percentage shale and the gamma ray deflection. Although this linear relation is by no means accurate, the gamma ray deflection does represent in most cases, a satisfactory measure of shale content and consequently gives an idea of permeability.

TABLE 1

ALLIANCE CAROLINE WELL NO.1

Rwa Plot

Depth	Thickness	Ril	Sonic	SP	F	Rwa
5906	4	2	77	65	30	.07
5916	6	2	81	65	20	.10
5975	10	2	84	70	16	.12
6046	18	3	81	70	20	.15
6076	13	3	78	65	27	.11
6097	5	5	80	65	22	.23
6118	6	2	77	70	30	.07
6127	14	4	81	70	20	.20
6141	20	5	82	70	18	.30
6161	12	2	82	70	18	.11
6198	11	3	77	70	30	.10
6210	10	2	78	70	27	.07
6220	10	4	78	70	27	.14
6248	6	4	80	70	22	.18
6317	6	2	84	75	16	.12
6327	14	2	84	75	16	.12
6349	8	1	89	75	12	.08
6365	14	3	80	75	22	.14
6412	29	3	76	75	33	.09
6540	10	2	83	75	17	.12
6655	9	2	84	75	16	.12
6752	10	4	80	75	22	.18
6770	6	3	75	75	36	.08
6780	8	2	76	75	33	.06
6804	20	2	78	75	27	.07
6864	16	2	83	75	17	.12
7034	38	3	78	75	27	.11
7278	13	5	77	60	30	.17
7466	6	7	70	45	70	.10
8100	6	9	77	45	30	.30
8128	7	11	81	45	20	.55
8180	4	7	77	45	30	.23
8191	5	15	78	45	27	.55
8204	7	15	77	45	30	.50
8215	5	24	77	60	30	.80
8220	5	20	76	60	33	.60

...../..

Depth	Thickness	Ril	Sonic	SP	F	Rwa
8225	5	12	75	60	36	.33
8248	15	10	79	60	24	.42
8280	6	16	72	60	50	.32
8298	5	12	73	60	45	.27
8310	12	8	76	60	33	.24
8322	10	6	78	60	27	.22
8353	5	6	76	60	33	.18
8385	39	7	77	60	30	.23
8434	22	6	71	60	60	.10
8466	9	8	76	60	33	.24
8480	22	6	76	60	33	.17
8520	14	5	80	60	22	.22
8535	20	6	75	60	36	.16
8558	7	6	71	60	60	.10
8612	12	6	74	65	40	.15
8776	5	25	65	20	150	.17
8823	6	17	70	20	70	.24
9153	19	14	84	40	16	.88
9192	6	21	81	30	20	1.05
9216	8	18	80	30	22	.82
9227	20	19	78	30	27	.70
9305	17	50	71	45	60	.83

TABLE 2

ALLIANCE CAROLINE WELL No. 1

Depth	Thickness	Porosity from Sonic	Porosity from Short Normal	Water Saturation From Sonic	Water Saturation from Induction	Shale Content
8100	6	16	22	70	50	40
8128	7	19	21	55	40	30
8191	5	17	16	55	55	25
8204	7	16	16	55	50	20
8215	5	16	14	45	40	20
8220	5	15	14	55	55	18
8225	5	15	17	70	55	40
8248	15	17	17	65	65	20
8280	6	12	15	75	60	18
9153	19	21	18	60	50	25
9192	6	19	17	55	40	25
9216	8	17	16	65	45 x	25
9227	20	17	16	60	45 x	30
9305	17	11	11	65	∞ xx	15

x Invasion is probably small and water saturations estimated from the Induction not accurate.

xx The ratio of the Short Normal resistivity to the Induction resistivity is not suitable for a quantitative interpretation using the Induction.

APPENDIX NO.5

ALLIANCE CAROLINE WELL NO.1

COMPLETION REPORT

Results of Drill Stem Tests
Nos. 1 to 8

D.S.T. No.1 Dual packer bottom-hole test in 8¾ inch hole. Bottom-hole choke - ⅝ inch.

Interval:	3042-3130 feet
Formation:	Pebble Point
I.S.I. period:	35 minutes
T.O.	3 minutes and 40 minutes
F.S.I. period:	45 minutes

Good initial puff; good air blow, decreased to fair air blow after 15 minutes and died out after 21 minutes.

Recovered 370 feet of mud (9.2 lbs/U.S. gal.) and 2530 feet of water (3.2 Ohms at 80°F)

Pressures (top recorder):-

IHP	1481	p.s.i.
ISIP	1501	p.s.i.
IFP	1034	p.s.i.
FFP	1303	p.s.i.
FSIP	1504	p.s.i.
FHP	1475	p.s.i.

Bottom pressure recorder malfunctioned.

D.S.T. No.2 Dual packer straddle test in 8¾ inch hole. Bottom-hole choke - ⅝ inch.

Interval:	2936-2961 feet
Formation:	Dilwyn
I.S.I. period:	41 minutes
T.O.	5 minutes and 30 minutes
F.S.I. period:	2 minutes

Good initial puff; good air blow, decreased to fair air blow after 10 minutes and died after 20 minutes.

Recovered 2670 feet of mud and 900 feet of water (3500 ppm Cl at 80°F)

Pressures (bottom recorder):-

IHP	1476	p.s.i.
ISIP	1467	p.s.i.
1st IFP	999	p.s.i.
1st FFP	1122	p.s.i.
2nd IFP	1169	p.s.i.
2nd FFP	1248	p.s.i.
FSIP	----	p.s.i.
FHP	1476	p.s.i.

Packer seat failed seon after commencement of final shut-in period.

D.S.T. No.3 — Single packer straddle test in 8¾ inch hole. Bottom-hole choke - 5/8 inch.

Interval:	8094-8149 feet
Formation:	Belfast-Waarre Transition Unit.
Misrun:	Unable to obtain packer seat.

Recovered 180 feet of thick mud and 742 feet of gas cut mud.

Pressures (top recorder):

IHP	4364	p.s.i.
FHP	4367	p.s.i.

D.S.T. No.4 — Dual packer bottom-hole test in 8¾ inch hole. Bottom-hole choke - 5/8 inch.

Interval:	8256-8433
Formation:	Waarre
I.S.I. period:	60 minutes
T.O.	54 minutes and 90 minutes
F.S.I. period:	720 minutes

Good air blow throughout test.

Non-combustible gas to surface in 7 minutes at rate too small to measure; flow increased to rate in excess of 800,000 cubic feet per day after 12 minutes; after 20 minutes gas was accompanied by slugs of mud and muddy saltwater; after 40 minutes gas was accompanied by slugs of clean saltwater. Flow rate estimated to be between 2,000,000 to 3,000,000 cubic feet per day.

Recovered 4393 feet of saltwater separated by pockets of non-combustible gas.

Resistivity of saltwater produced during test was 0.266 Ohms at 63°F.

Pressures (top recorder):-

IHP	4452	p.s.i.
ISIP	3546	p.s.i.
1st IFP	1663	p.s.i.
1st FFP	2796	p.s.i.
2nd IFP	3036	p.s.i.
2nd FFP	3187	p.s.i.
FSIP	3576	p.s.i.
FHP	4436	p.s.i.

D.S.T. No.5 — Dual packer bottom-hole test in 8¾ inch hole. Bottom-hole choke - 5/8 inch.

Interval:	8610-8730 feet
Formation:	Waarre
I.S.I. period:	102 minutes
T.O.	33 minutes and 71 minutes
F.S.I. period:	117 minutes

Weak airblow, increasing to good airblow after 15 minutes; decreased to fair airblow after 25 minutes. Weak airblow throughout second flow period.

Non-combustible gas to surface in 20 minutes at rate too small to measure, flow rate steady throughout first flow period. During second flow period solution gas to surface immediately at 340,000 cubic feet per day, decreasing to 140,000 cubic feet per day after five minutes and too small to measure after 7 minutes.

Recovered 279 feet of gas-cut, watery mud and 6603 feet of gas-cut saltwater (0.341 Ohms at 58°F)

Pressures (top recorder):-

	IHP	4573 p.s.i.
	ISIP	3683 p.s.i.
1st	IFP	453 p.s.i.
1st	FFP	1838 p.s.i.
2nd	IFP	1756 p.s.i.
2nd	FFP	2091 p.s.i.
	FSIP	3672 p.s.i.
	FHP	4570 p.s.i.

D.S.T. No.6 — Single packer straddle test in 8¾ inch hole.

Interval: 8184-8298 feet
Formation: Wasatch

Misrun: Unable to obtain packer seat.

D.S.T. No.7 — Dual packer straddle test in 8¾ inch hole.

Interval: 8265-8281 feet
Formation:

Misrun: Unable to obtain packer seat.

D.S.T. No.8 — Dual packer straddle test in 8¾ inch hole. Bottom-hole choke - ½ inch.

Interval: 9158-9183
Formation: Wasatch
I.S.I. period: 136 minutes
I.F. 43 minutes and 869 minutes
F.S.I. period: 685 minutes

Strong airblow throughout test.

Non-combustible gas to surface in two minutes at rate too small to measure.

Flow rate increased to 1,540,000 cubic feet per day after 17 minutes and to 2,290,000 cubic feet per day at end of first flow period. During second flow period gas flow stabilised at 2,730,000 cubic feet per day. Flow rates were then restricted to ¼, ½, and ¾ of stabilised flow rate for periods of 1 hour. The well was then flowed without restriction for the duration of the test. During this period the flow rate stabilised at 2,495,000 cubic feet per day.

Pressures (top recorder):-

	IHP	4923	p.s.i.
	ISIP	4124	p.s.i.
1st	IFP	1263	p.s.i.
1st	FFP	1252	p.s.i.
2nd	IFP	1270	p.s.i.
2nd	FFP	1153	p.s.i.
	FSIP	3711	p.s.i.
	FHP	4906	p.s.i.

During test the testing string became stuck at 8450 feet. As it was not possible to rotate tool shut the tool was closed at surface to obtain a final closed in pressure.

NOTE: D.S.T.No.7 is a misrun not charged for by the contractor. Consequently the Formation Testing Report (Enclosure No.9) covering D.S.T.No.8 has been incorrectly numbered D.S.T.No.7 by the contractor.

TABLE ONE

ALLIANCE CAROLINE No.1

Flow Measurements D.S.T.No.8

First Flow Period (commenced 5:17 PM, 14 Jan. 67)

Time	Inches of Mercury	Riser Size
5:34 PM	9.3	2 in.
5:38	12.0	"
5:46	16.0	"
5:55	18.6	"
6:02	20.0	"

Second Flow Period (commenced 9:20 PM, 14 Jan. 67)

Time	Inches of Mercury	Riser Size
9:32 PM	3.0	3 in.
9:45	5.0	"
10:03	6.0	"
10:24	5.9	"
10:50	5.9	"
11:27	5.65	"

At 11:50 flow was restricted to ½ of stabilised flow rate (2.2 inches of mercury -- 2 in. riser) and maintained at that rate until 00:58 AM, 15th Jan. 67.

The flow rate was then restricted to ¼ of stabilised flow rate (3.7 inches of mercury -- 2 in. riser) and maintained at that rate until 2:15 AM.

The flow rate was then restricted to ⅛ of stabilised flow rate (8.4 inches of mercury -- 2 in. riser) and maintained at that rate until 3:30 AM at which time the surface choke was fully opened.

The following flow measurements were then recorded:

Time	Inches of Mercury	Riser Size
3:50 AM	22 plus.. mercury blown out of manometer	3 in.
4:20	8.1	"
4:30	6.7	"
4:43	5.6	"
4:53	5.3	"
5:07	4.9	"
5:21	4.95	"
5:42	4.9	"

Some water present at impact end of manometer when above readings taken. Water removed before taking following readings. Water level was only ½ inch.

7:21	4.7	"
8:02	4.6	"
8.19	4.65	"
9.06	4.65	"
9:42	4.7	"
10:20	4.7	"
10:27	4.7	"

M.G. LeBlanc

APPENDIX No. 5

ALLIANCE CAROLINE WELL No.1

COMPLETION REPORT

LITHOLOGICAL DESCRIPTION OF SAMPLES

By: M.C. LeBlanc
G. Campe and
J. Gausden

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1. Description of samples from percussion operation - pages "a" to "f"

2. Description of samples from rotary operation - pages 1 to 172

ALLIANCE CAROLINE No.1 WELL
(PERCUSSION HOLE)

The interval surface to 514 feet (16-530 feet KB) was drilled with a percussion rig.

0-10 SAND: buff, fine grained, subangular, quartz, well sorted, unconsolidated.

10-20 LIMESTONE; medium light greyish yellow, poorly sorted (very fine grained to medium grained, occasional coarse grains), bioclastic, moderately silty, slight to moderately argillaceous, abundant bryozoal fragments, excellent (30%) intergranular and earthy porosity.

20-30 LIMESTONE; buff to light brown, dioclastic, very fine grained poorly sorted with abundant fine and occasional medium grains, abundant bryozoal fragments very poorly consolidated, slight dolomitic probably very good intergranular porosity.

30-40 DOLOMITE; white to light grey, slightly calcareous recrystallised very fine to fine grained calcarenite 5% SANDSTONE: medium light grey, very fine coarse grained angular quartz, very poorly sorted, moderately silty, siliceous cement, tight.

40-50 DOLOMITE; white to buff, fine crystalline (abundant loose rhombs), slight calcareous, fair intercrystalline porosity (5%).
10% DOLOMITE; as above.
10% DOLOMITE; light orange brown, moderately calcareous slight ferruginous, traces organic porosity.
Traces of limestone, bioclastic fragments, and sandstone as above.

50-60 DOLOMITE; cream, fine crystalline, moderately friable good intercrystalline porosity.

60-70 DOLOMITE; cream, unconsolidated, fine to medium crystalline, probably very porous.

70-80 DOLOMITE; cream, pink and pale mauve, fine crystalline in part very fine crystalline in part friable but predominantly well consolidated, fair (6%) intercrystalline porosity in part (20%) with good (15%) intercrystalline porosity.

80-90 DOLOMITE; buff, fine crystalline, unconsolidated, probably with very good porosity.

90-100 DOLOMITE; as above, in part consolidated.

100-110 DOLOMITE; light orange brown, fine crystalline slightly calcareous, unconsolidated, very good intergranular and microvugular porosity (18%) in consolidated chips.

110-120 DOLOMITE; lightreddish brown, in slight part mottled pale green, fine crystalline, slightly calcareous common green (chlorite?) grains, consolidated, good (12%) intercrystalline and microvugular porosity.

120-130 DOLOMITE; pale yellow, very fine crystalline to fine crystalline very slightly calcareous, poor intercrystalline and microvugular porosity.
10% DOLOMITE; mauve, microcrystalline to very fine

crystalline, very slightly argillaceous.
5% LIMESTONE; light grey, poorly sorted bioclastic fragments, in a very fine crystalline matrix, earthy texture.

130-140 LIMESTONE; white to light grey, bioclastic, very dolomitic, tight.

140-150 LIMESTONE; cream, bioclastic fragments (including abundant bryozoal fragments) in an abundant very fine grained to silt sized marly matrix, earthy texture.
40% CHERT; light to dark grey.
5% LIMESTONE; light grey, as above.

150-160 MARL; light grey, moderately fossiliferous (bryozoal fragments)
20% CHERT; as above.

160-170 MARL; as above.
15% CHERT; as above.

170-180 LIMESTONE; very light grey, very fine to very coarse grained dolomitised bioclastic fragments (predominantly bryozoal) in a moderate to very argillaceous matrix, grades to fossiliferous marl.
50% CHERT; dark grey.

180-190 LIMESTONE; as above.
40% CHERT; as above.

190-200 LIMESTONE; light grey, poorly sorted (to very coarse grained) bioclastic grains (abundant bryazoa) in a silt sized slightly argillaceous matrix, earthy texture; fair organic porosity and good earthy porosity; trace very fine grained glauconite pellets.
20% CHERT.

200-210 LIMESTONE; as above; traces of very fine to fine grained glauconite.
Occasional DOLOMITE; light pink, microcrystalline to very fine crystalline, some silty. matrix, non-calcareous, fair intercrystalline porosity.
Occasional CHERT.

210-220 LIMESTONE; as above, in part with silty matrix, trace glauconitic.
10% CHERT; light to dark grey occasional translucent
10% MARL; white to light grey, 20-30% argillaceous matrix.

220-230 MARL:white to light grey, 20-40% argillaceous matrix, occasional fossil fragments, trace glauconite.
20% CHERT; as above.
10% LIMESTONE; as above, fragmental, with up to 60% matrix.

230-240 LIMESTONE; as above in part consolidated but generally unconsolidated.
30% CHERT; light grey to black, grades to siliceous limestone.
20% MARL; as above.

240-250 CALCARENITE; light grey to white, silt sized to fine grained with 20% fossil fragments; traces glauconite.
20% CHERT; as above.

250-260 LIMESTONE; as above.
30% CHERT; as above.

10% DOLOMITE; light orange to light pink, very fine to fine crystalline, poor intercrystalline porosity.

260-270 CHERT; light to dark grey
30% LIMESTONE; as above; bioclastic grains predominantly bryozoal.
20% CLAY; light grey, slightl calcareous, moderately siliceous.
Occasional DOLOMITE.

270-280 LIMESTONE; as above, consists predominantly of unconsolidated bioclastic fragment; trace glauconite pellets.
30% CHERT; as above.
10% CLAY; as above.
Trace DOLOMITE.

280-290 CHERT; as above.
40% LIMESTONE; as above; rarely with fine to ¼ mm spherical aggregates of pyrite (on fracture planes?)
Traces od CLAY and DOLOMITE, as above.

290-300 CHERT; as above.
30% LIMESTONE; as above, silty to argillaceous matrix.
30% CLAY; light grey; soft to firm, occasional fossil fragments, very calcareous, grades to MARL.

300-310 LIMESTONE; cream, consists of poorly sorted (predominantly fine to medium grained) bioclastic fragments which are dolomitised; matrix is calcareous abundant bryozoal fragments; very friable and recovered predominantly as loose grains; possibly good intergranular porosity.
10% CHERT; light to medium dark grey.
5% DOLOMITE; white microcrystalline to fine crystalline in part altered bioclastic limestone.

310-320 LIMESTONE; cream, poorly sorted (predominantly medium grained) dolomitised bioclastic grains, in a microcrystalline to very fine crystalline matrix, in part slightly argillaceous.
5% CHERT; medium to dark grey.
5% DOLOMITE; as above, moderately calcareous.

320-330 LIMESTONE; cream, poorly sorted, selectively dolomitised bioclastic fragments (predominantly bryozoal) with 40% matrix of silt sized to very fine grained clastic fragments; earthy texture; in part (10%) argillaceous; poor intergranular porosity.

330-340 LIMESTONE; as above.

340-350 LIMESTONE; cream, poorly sorted (predominantly very fine to fine grained) bioclastic grains with 60% silt sized clastic carbonate matrix; moderate to very dolomitic with approximately 20% dolomite rhombs, earthy texture, good earthy porosity; very friable; sample predominantly unconsolidated.

350-360 LIMESTONE; cream, bioclastic, as above; 40% silt sized matrix; sample predominantly unconsolidated.

360-370 LIMESTONE; cream, bioclastic (predominantly bryozoal) as above, poorly sorted (predominantly medium to very coarse grained; sample predominantly unconsolidated.
20% DOLOMITE; white, crypto-crystalline altered bioclastic limestone.

370-380 CALCARENITE; cream, in part pale yellow, medium to coarse subrounded grains in a siltcized to very fine grainedmmatrix; abundant bioclastic grains, very friable, poor intergranular porosity and good earthy porosity.
5% CHERT; brown and grey.
Trace DOLOMITE; orange, medium crystalline, calcareous.

380-390 CALCARENITE; cream to light yellow, loose coarse to granule sized grains and 40% bioclastic fragments (predominantly bryozoal) rounded to angular, dolomitic, possibly with very good intergranular porosity.
20% CHERT; dark grey.
35% DOLOMITE white, fine to medium grains and fossil fragments, in a microcrystalline matrix, moderately well indurated, moderate to very calcareous, recrystallised bioclastic limestone.

390-400 CALCARENITE; cream, poorly sorted (predominantly fine to medium grained), abundant fossil fragments (predominantly bryozoa), microcrystalline to very fine crystalline matrix, trace glauconite, poor organic and intergranular porosity in chips; sample predominantly unconsolidated.
7% CHERT.

400-410 CALCARENITE; light grey, very fine grained, in part fine grained, occasional coarser grains, dolomitic with abundant very fine dolomite rhombs; grades in part to dolomitic CALCILUTITE.
5% CHERT; medium dark grey.
Occasional concretions of pyrite.

410-420 Lithology and % ; as above.

420-430 SAND; buff, fine grained, angular quartz and 30% calcareous dolomite grains and 5% fossil fragments well sorted, unconsolidated, probably excellent intergranular porosity.

430-440 SAND; buff, very fine to coarse grained (predominantl fine grained) angular to subangular quartz and 40% carbonate grains with occasional fossil fragments. moderately well sorted, unconsolidated, probably excellent intergranular porosity; quartz grains are generally clear but occasional grains are ironstained.
15% CALCARENITE; as above.

440-450 DOLOMITE; medium lightreddish brown, microcrystalline indurated, tight; recrystallised very fine to fine grained calcarenite.
20% SAND; as above.
8% DOLOMITE; pale brown, fine crystalline, slightly silty, poor to fair interorystalline porosity.
1% CHERT
1% Fossil fragments.

450-460 DOLOMITE; cream to buff, fine crystalline, traces calcite; fair interorystalline porosity.
15% DOLOMITE; pale brown to reddish brown, as above.

460-470 DOLOMITE; cream to buff, as above; fair intercrystalline porosity in chips but overall porosity may be greater as majority of sample is unconsolidated.
50% DOLOMITE; brick round to pale orange very fine to fine crystals in microcrystalline matrix, slightly siliceous indurated, tight.
Trace CHERT.

470-480 DOLOMITE: buff, fine to medium crystalline, microcrystalline matrix, traces calcite, poor microvugular and intercrystalline porosity in chips but sample predominantly unconsolidated.

480-490 DOLOMITE; pink to buff, microcrystalline, in part fine crystalline, indurated, tight.
DOLOMITE: as above.

490-500 DOLOMITE: cream and light greyish brown, very fine to fine cyrstalline, poor intercrystalline and microvugular porosity.
25% DOLOMITE: pink to buff, as above.
1% CHERT: medium grey, as above.

500-510 DOLOMITE: buff to light brown, in part cream, fine crystalline, moderate to very friable; only poor intercrystalline porosity evident in chips but greater part of sample is unconsolidated.

510-514 DOLOMITE; cream to pale brown, fine crystalline, only poor intercrystalline porosity in consolidated chips but sample predominantly unconsolidated.
Occasional chert and fossil fragments.

- -

Percussion hole bottomed at 514 feet below ground level i.e.530 feet K.B. Rotary drilling commenced at 510 feet K.B.

- -

Depths which follow are all measured from the top of the Kelly Bushing

510-581 No samples. Unable to obtain circulation.
Drilled "blind".
.. ..

Core No.1 Interval: 581-599' Rec 15' 6"

581'00"-582'4"
DOLOMITE: pale greenish grey, poorly sorted dolomitised bioclastic fragments in microcrystalline to very fine crystalline matrix, rare quartz grains, slightly argillaceous; earthy texture; slight organic porosity; good earthy porosity.
-- grades to --

582'04"-593'03"
DOLOMITE; light grey, very fine crystalline, dolomitised poorly sorted bioclastic limestone; moderately calcareous; in part with earthy textures; generally slight to moderately argillaceous; moderate earthy porosity; grades in part to bioclastic limestone with abundant dolomite rhombs.
-- grades to --

593'03"-596'06"
MUDSTONE; medium greyish brown, with 40% fossil fragments (predominantly bryozoa); moderately calcareous slightly glauconitic; in part slightly pyritic.

596'06"-599'00"
No Samples. Bedding is not well defined; no reliable dip evident.

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599-699 No samples. Unable to obtain circulation. Drilled "blind".

. . . . . .

Core No.12 Interval: 699'-719' Rec 11'
Drilling time -- 15 mins.

699-710 CLAY; black carbonaceous, slightly sandy; in part grading to argillaceous sand(with 50% clay) firm to soft. The core contains common pyrite nodules (up to 3 cm. but generally ½ cm. or less) and occasional clear mica flakes (up to 5 mm.). The sand grains range from fine to very coarse grained (30% fine grains; 40% medium grains, 20% coarse grains; 10% very coarse grains). The grains are subrounded to rounded, have poor sphericity, and are generally polished. They are occasionally pitted and are clear to cloudy with common reddish brown and orange stained grains, occasional yellow and pink grains and very rare grains of prismatic quartz. Other constituents of the sand grains are common (up to 15%) ironstone and limonite (?) and traces of chert and glauconite pellets. Finely disseminated pyrite is common in the clay.

The core is generally structureless but there are some thin fine grained sandstone laminations in the clay. The core is tight with rare zones of poor porosity. No shows were recorded.

As the core is massive the dip of the bedding is not discernible.

710-719 No recovery.

. . . . . .

719-761 No samples. Unable to obtain circulation. Drilled "blind".

ALLIANCE CAROLINE WELL No.1

CUTTINGS DESCRIPTIONS

761-770 SANDSTONE: grey; coarse to very coarse grained; in part medium grained round to subrounded; in part medium grained round to subrounded; well sorted quartz; occasional limonite coated grains, abundant pyritic cement (approximately 5% of sample consists of pyrite); probably with moderate to good intercrystalline porosity 40% CEMENT.

770-780 SANDSTONE: grey medium grained to granule size; round to subrounded quartz; occasionally white and black, poorly sorted; matrix predominantly pyrite (?); (approximately 5% of sample consists of pyrite).

780-790 SANDSTONE: grey unconsolidated, medium to very coarse grained with occasional granules; subangular to subrounded frosted and polished grains, poorly sorted. Sandstone consists of quartz grains clear to cloudy, rare fossil fragments (bryozoa), in a pyrite matrix with up to 20% very finely divided pyrite in sample. Fossil fragments contain limonite pellets and are possibly recirculated (?) Nelson Formation.

790-800 SANDSTONE: grey silt to very coarse grained with 10% granules; poorly sorted, rounded to subangular frosted and polished grains. Sandstone consists of quartz grains, occasional liminitic pellets, rare carbonaceous matter in a pyritic matrix (40% - 50% matrix). Pyritic matrix occasionally contains some grey to brown clay. Common fossil fragments rare black chert.

800-810 SANDSTONE: light grey, unconsolidated generally cleaner than above, coarse to very coarse grained with 20% granules, rounded to subrounded, medium sorting, composed of clear to cloudy quartz, rare dark gray quartz, trace micaceous trace limonite stained quartz, rare glauconite, trace carbonaceous matter. Grains generally unconsolidated, some with gray clay matrix adhering. Common finely divided pyrite aggregates.

810-820 SANDSTONE; light grey, unconsolidated medium to very coarse grained with 10% granules rounded to subangular fair sorting, composed of clear to slightly cloudy, frosted and fresh quartz grains rare dark grey chert grains, occasional very finely disseminated pyrite, in a dark grey silty clay matrix (or possibly the silty clay occurs as interbeds in the sandstone). Rare sandstone with carbonaceous silty clay matrix (50% quartz 50% matrix). No shows.

820-830 90% SANDSTONE: unconsolidated light grey, medium to coarse grained with 20% very coarse and 5% granule, rounded to subangular fairly sorted, fresh and frosted quartz grains, composed of clear to slightly cloudy quartz grains, common mica, rare dark grey chert flakes (clear) to 5 mms rare finely

divided pyrite and pyrite cemented with fine grained sandstone. No shows. 10% clay (?) green gray, firm, speckled black, non-calcareous but resembles cement, massive.

830-840 100% SANDSTONE: light grey, unconsolidated, generally coarse grained with 20% medium grains 10% very coarse grains and 10% granules. Medium sorting rounded to subangular, clear, fresh and frosted quartz grains, occasional mica flakes, rare pyrite. The sandstone in part is consolidated with a carbonaceous clay matrix (20% matrix) and with quart grains from fine to very coarse grained and with a trace of mica.

840-850 100% SANDSTONE: light grey, unconsolidated medium to coarse grained with 10% very coarse 10% granules, fair sorting, round to subangular fresh, frosted and polished quartz grains, occasional mica, occasional pyrite matrix, otherwise no matrix visible. Quartz grains generally clear to cloudy, occasionally light grey, occasionally orange. Trace of white quartzite.

850-860 100% SANDSTONE; light grey unconsolidated coarse to very coarse grained with 20% granules, rounded to subrounded fair sorting, composed of clear to cloudy quartz grains, with 5% light to dark grey chert. Matrix rare and consists of finely divided pyrite or pyritic carbonaceous material. Sandstone with matrix is tight.

860-870 100% SANDSTONE: light grey unconsolidated medium to very coarse grained with 10% granules rounded to subrounded occasional subangular fair sorting composed of clear to slightly cloudy fresh frosted and polished quartz, occasional light grey to dark gray chert, light grey microcrystalline argillaceous limestone to micaceous; with common pyrite matrix sandstone, pyritic to carbonaceous matrix and up to 10% grey to brown pyritic clay matrix. Sample contains one grain of fine grained sandstone with 20% kaolinitic matrix, tight.

870-880 90% SANDSTONE: light grey unconsolidated, medium to coarse grained with 20% very coarse and 10% granules, rounded to subangular, fair sorting, clear to cloudy fresh and frosted quartz, traces of dark grey chert, to pyrite, to fossil fragments. Traces of pyritic cemented fine to medium grained sandstone, 10% silt, brown, grey, firm, clayey sandy, grades into very fine to fine sandstone, finely micaceous. Silt occasionally has limonite coated quartz grains fine to medium grained.

880-890 100% SANDSTONE light grey, unconsolidated medium to very coarse grained with 10% granules rounded to subangular, fair sorting clear to slightly cloudy and grey quartz, fresh and frosted, rarely polished to chert, fossil fragments, pyrite. Trace carbonaceous material and carbonaceous clay matrix. Trace silt as above slightly pyritic.

890-900 100% SANDSTONE: light grey, unconsolidated medium to very coarse grained, with 5% granules fair to good sorting, rounded to subrounded and occasionally

subangular clear to slightly cloudy quartz grains, occasionally light grey quartz grains and common brown stained quartz grains; traces of chert common pyrite to carbonaceous clay matrix. Traces of brown to grey pyritic clay matrix. Traces of siliceous matrix in fine quartz sandstone. Traces of green pyritic fragment (?) glauconitic.

900-910 100% SANDSTONE; light grey, unconsolidated, medium to coarse grained with 20% fine grains, rounded to subangular, clear to slightly cloudly and occasional grey quartz, fresh to frosted quartz grains, common pyrite cemented sandstone, traces mica to 3 mms, rare glauconite pellets, occasional black clay (carby) stuck to quartz grains. /10% very coarse grains,

910-920 100% SANDSTONE: light grey unconsolidated, fine to coarse grained, rounded to subangular, clear to slightly cloudy quartz, fresh, frosted and polished grains, fair to well sorted occasional pyrite cemented sandstone and very finely divided pyrite aggregate, as matrix, to mica to 3 mms, trace light grey chert pebble.

920-930 10% Coal, black soft to moderately firm, in part sandy and slightly pyritic.
90% Sandstone; light grey unconsolidated, fine to coarse grained with 10% very coarse grains, rounded to subangular clear to slightly cloudy, fresh and frosted quartz grains, fairly sorted, occasional pyrite cemented sandstone, trace mica, trace greyish quartz grains, trace grey chert.

930-940 100% SANDSTONE: light grey, unconsolidated fine to coarse grained, with 10% very coarse grains, rounded to subangular, clear to slightly cloudy fresh and polished quartz grains, to mica pyrite. Trace coal.

940-950 100% SANDSTONE: light grey unconsolidated fine to coarse grained, generally medium grained with 10-15% very coarse and 5% granules, fair sorting rounded to subangular, clear to cloudy quartz. Trace pyrite cemented sandstone, mica light grey quartzite, silty matrix.

950-960 100% SANDSTONE; light grey unconsolidated, medium to coarse grained with 20% very coarse and 10% granules; trace fine grains, rounded to subangular, clear to slightly cloudy and rarely deep pink fresh and polished quartz. Traces fossil fragments, siliceous cemented finely grained sandstone (tight) pyrite coal, mica, light grey chert.

960-970 100% SANDSTONE: light grey unconsolidated, medium to very coarse grained with 10% granules and 15% fine grains, rounded to subangular, clear to slightly cloudy quartz grains, poorly sorted. Traces of pyrite, mica, chert, siliceous coarse pyrite cemented fine grained to medium grained sandstone. Traces sandstone composed of limonite coated sandstone in a black hard (? sideritic matrix) tight. Traces grey brown silt.

970-980 100% SANDSTONE; light grey unconsolidated, medium to very coarse grained with 10-15% granules, 10% fine to medium grains, rounded to subangular, clear to slightly cloudy, occasional grey, frosh and polished quartz grains; traces of mica, chert, pyrite cemented sandstone, traces of carbonaceous matter, traces pyritic glauconite, rare fossil fragments.

980-990 100% SANDSTONE: light grey, unconsolidated, fine to coarse grained with 10% very coarse and granules poor sorting, rounded to subangular, clear to slightly cloudy, frosted and polished quartz grains, to pyrite matrix, traces dark grey quartz, to grey chert, traces carbonaceous material.

990-1000 Poor sample
100% SANDSTONE: light grey, unconsolidated, medium to very coarse grained with 20% granules and traces fine grains. Poorly sorted quartz with traces of chert, common pyrite and carbonaceous material.

1000-1010 80% SANDSTONE: light grey, unconsolidated, medium to very coarse with 30% granules, rounded to sub-rounded, clear to cloudy quartz, common pyrite and carbonaceous.
20% SILT: brown grey, very finely sandy, firm, micaceous, slightly carbonaceous, clayey, very slightly calcareous.

1010-1020 80% SANDSTONE: light grey unconsolidated, medium to very coarse grained with 10% granules, fair sorting rounded to subangular clear to slightly cloudy and occasional light grey quartz grains, trace mica pyrite and carbonaceous material.
20% Silt brownish grey, micaceous, slightly pyritic, very finely sandy, clayey.

1020-1030 90% SANDSTONE: light grey unconsolidated, coarse to granular with 10% medium grains and 20% fine grains, poorly sorted rounded to subangular, clear to slightly cloudy quartz grains, traces pyrite cemented sandstone, carbonaceous matter, mica, fossil fragments.
10% silt as above.

1030-1040 100% SANDSTONE: light grey, unconsolidated, medium to very coarse with 15% granules, rounded to sub-rounded, fair sorting, polished, frosted and fresh clear to slightly cloudy quartz grains, traces black chert, pyrite, mica to 3 mm, carbonaceous matter, white massive vuggy limestone.

1040-1050 100% SANDSTONE: light grey, unconsolidated, medium to very coarse grained with 10% granular and 15% finely grained, rounded to subangular, clear to slightly cloudy and occasional grey quartz grains, fresh and frosted occasional polished, with traces mica, pyrite, carbonaceous matter, chert.
Traces silt as above.

1050-1060 100% SANDSTONE: light grey, unconsolidated, medium to very coarse with 20% granules and 10% fine grains,

rounded to subangular, clear to slightly cloudy polished and frosted quartz grains, traces pyrite, carbonaceous matter, blue grey chert, common white mica. Common grey brown clay, black clay and pyrite adhering to grains.

1070-1080 100% SANDSTONE; light grey unconsolidated medium to granular 20% granules, rounded to subangular, clear to milky quartz, polished and frosted, traces pyrite, carbonaceous matter, mica, quartzite and chert,
Traces silt as above.

1080-1090 90% SANDSTONE; light grey, unconsolidated coarse to granular with 15% granules, 15% medium and fine grains, fair to poor sorting, rounded to subangular, clear to cloudy and occasional milky quartz grains, traces mica carbonaceous matter, pyrite, quartzite.

10% SILT, part clayey, occasional very finely sandy, micaceous, carbonaceous, in part slightly pyritic, firm to hard, laminated.

1090-1100 95% SANDSTONE: light grey, unconsolidated coarse grained to granules, 25% granules 10% medium and fine grains, rounded to subrounded, clear to slight cloudy and milky (especially the granules) quartz grains, to carbonaceous matter, pyrite mica.
Traces laminations of sand and fine grained sandstone to laminations ½ mm thick 5% silt as above.

1100-1110 90% SANDSTONE: light grey unconsolidated, medium to very coarse grained with 10% granules and 10% very fine to fine grains, fair to poorly sorted rounded to subangular, clear to cloudy quartz grains in possibly a silty and pyritic matrix, traces mica carbonaceous material, pyrite.

10% silt as above.

1110-1120 95% SANDSTONE: light grey, unconsolidated coarse to very coarse grained with 15% granules and 10% medium to fine grains, poorly sorted, rounded to subangular frosted and polished, clear to cloudy quartz grains, traces mica, pyrite, carbonaceous matter.

5% silt as above in part very clayey.

1120-1130 80% SANDSTONE; light grey, unconsolidated, medium to very coarse grained with 10% granules and 15% fine grains, poorly sorted, rounded to subangular clear to cloudy occasional milky quartz grains, traces pyrite, mica.

20% silt, brown grey clayey in part very finely sandy firm, in part pyritic and often very pyritic, finely micaceous, occasionally slightly carbonaceous. Occasionally laminated. Grades in part to a silty clay.

1130-1150 90% SANDSTONE: light grey unconsolidated, medium to very coarse grained, well sorted, rounded to subrounded, clear to slightly cloudy, polished and frosted quartz grains, traces mica carbonaceous matter, pyrite. Grains occasionally have silty clay or pyrite adhering to them.

10% silt as above.

1150-1160 100% SANDSTONE; light grey unconsolidated, medium to coarse grained, with 20% very coarse and granules, sub rounded to rounded, clear to slightly cloudy and grey quartz grains, with traces carbonaceous matter, mica, dark grey chert and pyrite.
Traces silt as above.
Traces coal, black, firm to soft, earthy.
Traces limestone, mud grey, argillaceous massive.

1160-1190 90% SANDSTONE light grey, unconsolidated coarse to granules with 2% granules 10% medium grains, rounded to subangular clear to slightly cloudy quartz and [illegible] quartz grains, to grey and pink quartz, pyrite.

10% silt as above in part sandy. This silt may be the matrix of the sandstone or if so the sandstone is 100%.

10% Coal, black, fine to soft, dull in part sandy and micaceous, in part pyritic.

1150-1160 100% SANDSTONE; light grey, unconsolidated, medium to very coarse grained with 20% granules, fair sorting, rounded to subrounded clear to very slightly cloudy, polished and frosh quartz grains. Traces mica pyrite, carbonaceous matter. Traces matrix to silty.
Traces silt as above.
Traces coal as above.

1160-1170 100% SANDSTONE; light grey, unconsolidated, medium to very coarse grained with 15% granules, fair sorting rounded to subrounded occasional subangular, clear occasionally cloudy or milky frosted and polished quartz grains, with traces of silt matrix, traces pyrite, mica, grey chert, carbonaceous matter.
Traces silt as above.
Traces limestone, brown grey, argillaceous massive with bryozoes.

1170-1180 90% SANDSTONE: light grey, unconsolidated, medium to very coarse grained with 10-15% granules, fair sorting, rounded to subangular clear occasionally cloudy, milky or grey quartz, with traces pyrite, grey chert, mica to white.
10% Silt, clayey, brown grey, firm micaceous, occasional slightly pyritic, laminated. Traces limestone, white finely crystalline with white earthy slightly calcareous argillaceous matrix. Traces porosity.

1180-1190 100% SANDSTONE: light grey, unconsolidated, medium very coarse grained with 10% granules, fair sorting, rounded to subangular, clear to slightly cloudy quartz occasionally light grey quart, traces chert black and dark grey, pyrite mica.
Traces white porous very fine grained sandstone.
Traces silt as above.

1190-1200 100% SANDSTONE; light grey, unconsolidated, medium to very coarse grained with 10% granules and 20% very coarse grains, fair to good sorting, rounded to subangular, clear to slightly cloudy and occasionally milky to light grey (especially the granules), fresh and frosted quartz grains, with traces pyrite matrix, silt matrix, mica, dark grey chert and rare limonite coated quartz granules.

1200-1210 100% SANDSTONE: light grey, unconsolidated, medium to very coarse with 10% granules, rounded to sub-angular, clear to slightly cloudy fresh and frosted and polished quartz grains, traces white quartzite, mica pyrite as very fine crystalline aggregate, traces silty matrix.

1210-1220 100% SANDSTONE: light grey unconsolidated, medium to very coarse grained with 10% granules rounded to subangular, clear to slight cloudy and occasional milky fresh and frosted quartz grains, traces pyrite, white quartzite, traces black (?) chert, traces carbonaceous matter. Traces white earthy argillaceous limestone.
Traces silt as above.

1220-1230 100% SANDSTONE: light grey unconsolidated, coarse to very coarse grained with 15% granules and 15% medium grains, fair to good sorting, rounded to good sorting, rounded to subangular, clear to slightly clear cloudy, frosted and polished quartz, traces chert white with quartz veins (?), pyrite carbonaceous matter and clayey silt matrix, traces light grey quartzite.

1230-1240 100% SANDSTONE; light grey unconsolidated medium to very coarse grained with 10-15% granules, sub-angular to rounded, clear to slight cloudy quartz grains, rare veined and fractured quartz or chert grains, traces dark grey chert, light pink quartz pyrite, dark brown iron stained silty matrix.
Traces silt as above.

1240-1250 95% SANDSTONE; light grey unconsolidated coarse to very coarse grained with 20% granules, rounded to subangular clear with cloudy and milky fresh and frosted quartz grains, traces silty brown grey matrix, traces finely crystalline pyrite, aggregate traces grey chert, traces orange quartz, traces carbonaceous material.
5% silt, brown grey clayey, very finely sandy, micaceous, firm laminated.

1250-1258 SANDSTONE; white to light grey, fine grained to granule size, quartz, poorly sorted, subangular to rounded, predominantly rounded; 35% of grains are very coarse to granule sized; remainder predominantly coarse grained; grains predominantly vitreous but in part cloudy; occasionally large (2 mm) mica (muscovite) flakes; occasionally concretionary pyrite, sample unconsolidated.
1% LIGNITE; brown, very argillaceous, in part sandy.

1250-1270 SANDSTONE: light grey, unconsolidated, medium to very coarse grained; predominantly coarse grained, rounded to subrounded quartz, moderately well sorted, clear to dull grains, occasional muscovite flakes. Rare pyrite.
1% SILTSTONE: medium brown, very carbonaceous in part pyritic, sandy.

1270-1280 SANDSTONE: as above, coarse to very coarse, occasionally granules; occasional chert grains
1% CLAY medium brown, silty, very slightly micaceous.

1280-1290 SANDSTONE: light grey, unconsolidated, coarse grained to granule size, generally well rounded grains of cloudy (in part clear) quartz, with occasional chert grains and occasional metamorphic grains. Occasional clay and silt as above. Traces pyrite.

1290-1300 SANDSTONE: medium light grey, unconsolidated; very poorly sorted, finely grained to very coarse grained (70% fine to medium grained; 30% coarse grained; 10% very coarse grained); angular to rounded (coarse grains generally rounded and fine grains generally subangular.) Grains consist of cloudy to smoky quartz with traces of medium grey chert and occasionally have traces of brown carbonaceous argillaceous matrix adhering.
Traces pyrite with mica.

1300-1310 SANDSTONE: as above, fine to very coarse grained (60% fine to medium grained, 40% coarse to very coarse grained).
Minor amounts of sandstone; medium brown, very fine to finely grained with very abundant clay matrix, in part pyritic, grading to sandy clay.

1310-1320 SANDSTONE: medium grey unconsolidated, finely grained to granule sized subangular to rounded quartz. (30% granules 30% coarse with very coarse 40% fine to medium); traces of brown clay cement adhering to some grains.

1320-1330 SANDSTONE: as above (35% granules, 35% coarse to very coarse 30% fine to medium); finer grains generally subangular to subrounded and coarser grains subrounded; more consolidated chips have minor amounts of brownish grey, very silty cement are very friable and exhibit good intergranular porosity.

1330-1340 SANDSTONE: medium light grey, unconsolidated, poorly sorted, 35% subrounded to rounded coarse grained to granule sized and 65% fine to medium angular to subangular grains of clear to smoky quartz. Occasionally consolidated chips are very friable, have good intergranular porosity and are poorly cemented by greenish brown micaceous silty to argillaceous cement.
Traces chert, pyrite and rare coal fragments.

1340-1350 SANDSTONE: light grey unconsolidated, poorly sorted fine to very coarse grained, occationally fine grains and granules, predominantly medium to coarse grained, rounded to subrounded, frosted quartz.
Traces pyrite and black vitreous coal.
Occasional pyrite and very pyritic with very fine

grained tight sandstone.

1350-1360 SANDSTONE; medium light grey unconsolidated, very poorly sorted, predominantly coarse grained (with 30% very coarse grained and 10% granule sized) rounded to subrounded quartz.

1360-1370 SANDSTONE: light grey unconsolidated, coarse to very coarse grained; occasional granules, clear to dull, rounded quartz, traces jasper, occasionally dull medium light grey quartz grains, rare consolidated chips with matrix of brown silty clay. Some grains have remnants of clay matrix adhering.

1370-1380 SANDSTONE: light grey unconsolidated, coarse to very coarse grained, subrounded to rounded quartz, well sorted, fairly clean.
Traces of pyrite adhering to several grains.
Traces of brown clay.

1380-1390 SANDSTONE; as above, predominantly very coarse grained with about 15% granule sized, grains; traces of pyritic and argillaceous silt cement observed; clean.

1390-1400 SANDSTONE; light grey unconsolidated, medium to very coarse grained, occasionally granule. Rounded to subrounded quartz, well sorted, clean, traces of brown clay matrix; traces of sandstone cemented by pyrite and with good intergranular porosity.

1400-1410 SANDSTONE: light grey, unconsolided, coarse grained to granule size, predominantly very coarse grained, subrounded, milky quartz, occasionally orange quartz grains, flaky common medium grey smoky quartz; moderately sorted, Trace pyrite.

1410-1420 SANDSTONE; as above, 25% granule sized, 25% medium to coarse grained.

Traces sandstone; very fine to finely grained 30% pyritic cement tight.
Trace sandy siderite. Traces massive pyrite.

1420-1430 SANDSTONE; light grey, unconsolidated, coarse to very coarse with 15% granules and 15% medium grains subrounded in part rounded, quartz. Vitreous to cloudy, occasionally consolidated chips loosely cemented with silty to very fine sandy clay (brownish to sideritic?); other chips cemented with pyrite and/or siderite.

1430-1440 SANDSTONE; light grey, unconsolidated coarse to very coarse grained, rounded to subangular, quartz and occasional quartzite grains, moderately well sorted; rare yellowish or quartz and medium grey smoky quartz grains.
Traces pyrite. Traces brown argillaceous sandy siltstone.

1440-1450 SANDSTONE; light grey, unconsolidated, coarse to very coarse, rounded to subangular quartz, well sorted; predominantly clear grains; occasionally pink and grey and yellowish quartz grains.

Traces pyrite.

1450-1460 SANDSTONE: white to light grey, coarse to very coarse as above.

1460-1470 SANDSTONE; white, coarse grained, in part (15%) very coarse grained, rounded to subrounded clear to cloudy quartz, well sorted.

1470-1480 SANDSTONE; white coarse to very coarse grained, subrounded, quartz, well sorted, clean, unconsolidated, predominantly clear but in part frosted grains.

1480-1490 SANDSTONE: white, coarse to very coarse grained rounded to subrounded quartz, well sorted clean.

1490-1500 SANDSTONE; white as above.

1500-1510 SANDSTONE: white to light grey, coarse to very coarse grained (80% coarse grained) rounded quartz; well sorted; residue of silty matrix preserved on many grains. Occasional CLAY; medium brown, moderate to very silty, in part sandy, moderate to very carbonaceous, slightly mica.

1510-1520 SANDSTONE; white, coarse grained, in part (10%) very coarse grained, rounded to subrounded, quartz cloudy, occasional pink and yellowish orange quartz grains, trace quartzite grains, well sorted, clean, unconsolidated.

1520-1530 SANDSTONE; white, coarse to very coarse grained (20% very coarse), as above.

1530-1540 90% SANDSTONE; white, unconsolidated, coarse grained in part (30%) very coarse grained, well rounded, quartz, well sorted, clean.
8% LAMINITE; black, silty very argillaceous grading to very carbonaceous clay.
Occasional massive pyrite.

1540-1550 95% SANDSTONE; white, unconsolidated, coarse to very coarse grained (40% very coarse), rounded to subrounded quartz, well sorted, occasionally quartzite and chert grains; quartz grains predominantly clear.
5% LAMINITE; occasionally pyrite.

1550-1560 SANDSTONE; white, unconsolidated coarse grained, in part (10%) very coarse grained, rounded to angular, predominantly clear quartz, well sorted clean; occasionally quartzite and rare chert grains.
Occasional massive pyrite and pyritic cement.

1560-1570 SANDSTONE; white, medium to coarse grained, subrounded, round as above. Occasional pyrite.

1570-1580 SANDSTONE; white unconsolidated, coarse grained, in part (30%) very coarse grained, generally well rounded, 20% angular, predominantly vitreous quartz grains, well sorted, clean.
Trace topaz.
1% black sandy, very carbonaceous silty clay grading to lignite.

1580-1590 SANDSTONE; white, unconsolidated, finely grained to very coarse grained (10% fine 10% very coarse remainder medium to coarse grained) rounded to subrounded, vitreous quartz, poorly sorted, clean; traces of pyritic cement; also several chips poorly cemented with silica.
Occasional pyrite, traces quartzite grains, traces black pyritic clay.

1590-1600 SANDSTONE; white, unconsolidated, coarse grained, in part (30%) very coarse grained, rounded predominantly clear, quartz, well sorted, clean.

1600-1610 SANDSTONE; white, unconsolidated coarse to very coarse grained, rounded to subrounded, vitreous to cloudy quartz, well sorted, clean.
Occasional Sandstone; light grey, very fine grained, abundant pyritic cement traces.
Traces black pyritic and argillaceous, very finely grained Sandstone; traces mica

1610-1620 SANDSTONE; white to light grey, unconsolidated very coarse grained (20% coarse grained), generally well rounded, quartz, clear to dull grains, occasional polished quartz grains, well sorted, clean.
Occasional chips with pyrite or clay cement.
Traces pyritic Sandstone.

1620-1630 SANDSTONE; white, unconsolidated, coarse to very coarse, rounded to subrounded as above.

1630-1640 SANDSTONE; white, unconsolidated, medium to very coarse grained, predominantly coarse grained, rounded to subrounded, cloudy quartz, traces quartzite grains, moderately sorted; many grains with remnants of brown carbonaceous clay matrix and/or pyrite cement adhering.
Occasional massive pyrite, pyritic finely grained sandstone and carbonaceous pyritic clay.

1640-1650 SANDSTONE; white, unconsolidated coarse grained, in part (20%) very coarse grained, cloudy quartz, well sorted, clean; traces of pyritic cement.
Trace quartzite and chert grains, traces carbonaceous and pyritic very fine to fine grained sandstone.

1650-1660 SANDSTONE; white, unconsolidated, coarse grained (with 15% very coarse grained), predominantly well rounded but in part angular, clear to cloudy quartz, well sorted, clean; occasional chert grains.
Traces of muscovite.
5% SANDSTONE; white, very fine to finely grained in part medium grained abundant pyritic matrix generally well indurated, tight.

1660-1670 95% SANDSTONE; unconsolidated, light grey, coarse to very coarse grained, rounded to subrounded, clear occasional slightly cloudy quartz traces pyrite.
5% SANDSTONE; finely grained, light grey, subangular to subrounded composed of quartz occasional black lithic in a pyritic matrix. Generally tight, occasional poor porosity.

1670-1680 90% SANDSTONE; unconsolidated light grey, coarse to very coarse grained with 10% granules, rounded to subangular, clear to slightly cloudy quartz, traces mica.
10% SANDSTONE; finely grained pyritic as above, Generally tight, occasional traces porosity.

1680-1690 95% SANDSTONE; unconsolidated light grey, coarse to very coarse grained with 10% granules rounded to subrounded clear to slight cloudy quartz, to mica.
5% SANDSTONE; pyritic as above, fine to medium or very fine to finely grained, traces poor porosity.

1690-1700 90% SANDSTONE; unconsolidated, light grey, coarse to very coarse grained with 5% granules rounded to subrounded clear to slightly cloudy polished and frosted quartz grains, traces dark grey chert, light grey quartzite.
10% SANDSTONE; light grey, fine to medium grained or finely grained well sorted subangular to subrounded quartz grains in pyritic matrix, occasional traces to poor porosity.

1700-1710 100% SANDSTONE; light grey, unconsolidated, coarse to very coarse grained, with 5% granules well sorted, rounded to subrounded clear to slightly cloudy quartz grains, traces carbonaceous matter, chert and quartzite.
Traces sandstone pyritic as above.
Traces silt, brown grey, clayey micaceous, firm.

1710-1720 100% SANDSTONE; light grey unconsolidated, fine to very coarse grained, poorly sorted, rounded to subangular, clear to slightly cloudy quartz grains with traces pyrite carbonaceous matter, mica and ? fossil fragments.
Traces pyrite cemented sandstone as above.

1720-1730 100% SANDSTONE; light grey unconsolidated, medium to very coarse grained fair sorting rounded to subrounded quartz grains, to light pink quartz, traces dark grey chert, mica, pyrite.

1730-1740 100% SANDSTONE; light grey unconsolidated, fine to medium with 30% coarse to very coarse grains, subrounded to subangular, clear occasional slightly cloudy frosted quartz grains, traces mica carbonaceous matter pyrite, grey quartzite. Sandstone has fair sorting.

1740-1750 100% SANDSTONE; light grey unconsolidated very fine to medium with 30% very coarse and coarse grains, subangular to subrounded clear quart grains to pyrite, carbonaceous matter chert, common white mica flakes to 2 mms.

1750-1760 100% SANDSTONE; light grey unconsolidated, very fine to medium with 25% coarse to very coarse and granules fair sorting, subangular to subrounded occasional rounded quartz grains, traces pyrite, mica, quartzite rare glauconite and fossil fragments.

1760-1770 100% SANDSTONE; light grey unconsolidated, very fine to medium grained with 15% coarse to very coarse grains. Subrounded to subangular occasional round (coarse and very coarse grains) fair sorting, clear to slight cloudy quartz, traces pyrite, mica, haematitic (?) quartzite, limonite stained quartz, traces very fine medium grained pyrite cemented sandstone. Traces chert.

1770-1780 100% SANDSTONE; light grey unconsolidated, fine to medium grained with 20% coarse to very coarse grains subrounded to subangular and occasional argillaceous quartz grains, fair sorting, traces pyrite, quartzite mica chert. Traces pyrite matrix sandstone.

1780-1790 95% SANDSTONE; light grey unconsolidated, very fine to medium grained with 10% coarse to very coarse grains, subrounded to subangular clear to slightly cloudy quartz grains, fair to good sorting, traces pyrite, mica. Traces pyrite cemented very fine to medium grained sandstone with occasional traces porosity.
5% Silt, dark brown grey, clayey firm, pyritic muscovite.

1790-1800 100% SANDSTONE; very fine to medium grained unconsolidated with 10% coarse to granular grains subrounded to subangular, clear to slight cloudy quartz grains with rare traces glauconite, traces chert, pyrite, mica and pyritic carbonaceous matter.

1800-1810 100% SANDSTONE; light grey, unconsolidated, very fine to medium grained with 5% coarse grains, subangular to subrounded clear to slightly cloudy quartz grains, traces chert grey, mica, pyrite, light pink quartz.

1810-1820 100% SANDSTONE; light grey unconsolidated, very fine to coarse grained with 5% very coarse grains rounded to subangular clear to slight cloudy, rare pink quartz grains, fair sorting with traces grey, grey brown and veined chert, light grey quartzite, mica and pyrite.

1820-1830 100% SANDSTONE; light grey, unconsolidated medium to very coarse grained with 5% granules rounded to subrounded, clear to slightly cloudy quartz, fresh and frosted quartz with traces chert mica pyrite and quartzite.
Traces carbonaceous matter.

1830-1840 100% SANDSTONE; light grey unconsolidated, medium to very coarse grained with 10% fine and very fine grains and 5% granules, fair sorting, rounded to subangular clear to occasionally cloudy quartz grains, traces chert veined chert, mica pyrite and carbonaceous matter.

1840-1850 100% SANDSTONE; light grey, unconsolidated, medium to very coarse grained with 10% granules rounded to subrounded occasional subangular clear to slight cloudy fresh and polished quartz grains,

fair to good sorting, traces mica pyrite, chert; pink and orange quartz. Chert between 1 and 3% of sample.

1850-1860 100% SANDSTONE; light grey, unconsolidated, medium to very coarse grained with 10% granules and 10% fine to very fine and silt sized quartz, rounded to subangular clear to slightly cloudy quartz, with traces mica pyrite chert.

1860-1870 100% SANDSTONE; light grey, unconsolidated medium to very coarse grained with 10% granules, subrounded to subangular with occasional rounded, clear to cloudy and occasional light grey quartz grains, fair sorting, with traces argillaceous quartz, chert, pyrite, carbonaceous matter mica, pyrite cemented finely grained sandstone traces porosity.

1870-1880 100% SANDSTONE; light grey, unconsolidated; medium to very coarse grained with 15% granules and 10% fine grains, rounded to subangular, clear to cloudy quartz grains, traces mica, chert, carbonaceous matter, pyrite cemented tight sandstone, pink quartz and light grey quartzite.

1880-1890 100% SANDSTONE; light grey unconsolidated, medium to very coarse grained with 10% granules, rounded to subrounded occasionally subangular clear to slightly cloudy quartz grains, fair to good sorting, traces mica, chert, quartzite, pyrite, orange quartz, pyrite cemented fine grained sandstone.

WHOLE CIRCULATION TIME at 1900' - 23 minutes

1890-1900 100% SANDSTONE; light grey unconsolidated, medium to very coarse grained with 10% granules and 10% very fine to fine grained, fair sorting, rounded to subangular clear to slight cloudy quartz grains, traces orange quartz, pyrite, mica carbonaceous matter chert, dark grey fine grained quartzite, pyrite cemented tight fine to medium and very finely grained sandstone.

1900-1910 100% SANDSTONE; light grey, unconsolidated coarse to very coarse with 15-20% granules, rounded to subrounded occasional subangular, clear to slightly cloudy and occasional yellowish quartz grains with traces chert, drusy quartz, pyrite cemented fine grained sandstone, mica, coal, chert and fine grained quartzite.

1910-1920 100% SANDSTONE; light grey unconsolidated coarse to very coarse with 10-15% granules and 10% fine to medium grains, rounded to subrounded clear to cloudy fresh and polished quartz grains with traces mica pyrite cemented sandstone, chert, grey quartz, traces coal, blak, slightly argillaceous firm, no cleat, earthy.

1920-1930 100% SANDSTONE; light grey unconsolidated, coarse to very coarse with 10% medium and 10% granules, well sorted, rounded to subrounded, clear to cloudy

fresh and polished quartz grains, traces mica, pyrite, pyrite cemented sandstone, carbonaceous matter, orange quartz, and chert grey.

1930-1940 100% SANDSTONE; light grey unconsolidated coarse to very coarse grained with 20% granules and 10% medium grains, fair sorting, rounded to subangular, clear to cloudy with traces yellow orange and limonite stained quartz grains traces dark grey very finely grained quartzite, pyrite cemented sandstone and carbonaceous matter.

1940-1950 100% SANDSTONE; light grey unconsolidated coarse to very coarse grained with 10% granules and 15% very fine to medium grains, clear slightly cloudy rounded to subangular fresh and polished quartz grains with traces pyrite, pink quartz, ironstone, chert and carbonaceous matter and pyrite cemented fine grained sandstone.

1950-1960 100% SANDSTONE, light grey unconsolidated, fine to very coarse grained with 40% fine to medium grains and 20% very coarse grains, poorly sorted, rounded to subangular clear to cloudy quartz with trace pyrite, carbonaceous matter.
Traces sandstone light grey finely grained sub-rounded with silty matrix (30% of rock) tight.

1960-1970 100% SANDSTONE, light grey, unconsolidated very fine to very coarse grained with 50% fine and very fine to medium grains, rounded to subangular clear to cloudy quartz grains, traces pyrite cemented finely grained sandstone, pink and light orange quartz, carbonaceous matter, mica.

1970-1980 100% SANDSTONE, light grey, unconsolidated coarse to very coarse grained with 2-% granules rounded to subrounded clear to cloudy fresh and frosted quartz grains with traces pyrite cemented sandstone, carbonaceous matter white mica, orange quartz, and chert grey.

1980-1990 100% SANDSTONE; light grey unconsolidated medium to very coarse grainedwith 10% very fine to fine grains and fair to good sorting, rounded to subrounded clear to cloudy frosted quartz grains with traces carbonaceous matter, traces light pink and orange quartz, and traces dark grey chert, traces mica white.

1990-2000 100% SANDSTONE; light grey unconsolidated medium to coarse grained with 10% very coarse grains, well sorted, rounded to subrounded clear to cloudy quartz grains with traces quartz and chert, traces mica.

2000-2010 100% SANDSTONE; light grey unconsolidated medium to very coarse grained with 10% very fine to fine grains, rounded to subrounded and occasional subangular clear to slightly cloudy quartz grains, traces chert, traces pyrite cement sandstone.

2010-2020 100% SANDSTONE; light grey unconsolidated medium to very coarse grained with 10% granules and 10% fine grains, fair sorted, rounded to subrounded

clear to slightly cloudy quartz grains with traces pyrite, carbonaceous matter and grey chert.

2020-2023 100% SANDSTONE, clean light grey, unconsolidated medium to very coarse grained, rounded to sub-rounded, clear to cloudy fresh and frosted quartz grains with traces pyrite cemented fine to medium grained sandstone, traces dark grey quartzite.

TOP 2023

At 2023 is a hard bed of light grey very fine to fine grained sandstone with 30% matrix that is dolomitic. Slow drilling.
of = 2200 Mt. Salt
= 2800 Glenelg (Nelson) No.1

2023-2030 90% SANDSTONE; light grey, unconsolidated, coarse to very coarse grained with minor medium grains, rounded to subrounded clear to slightly cloudy quartz grains, traces chert, pyrite carbonaceous matter.
10% Sandstone; light grey hard, very fine to finely grained, composed generally of quartz grains with some dark lithics and 20-40% dolomitic matrix. Tight.

2030-2040 80% SANDSTONE; light grey, unconsolidated coarse to very coarse with 10% medium grains, rounded to subrounded clear to slightly cloudy, traces pink quartz, traces mica, pyrite.
20% Sandstone; light grey hard, medium fine to fine grained, composed 60% quartz 10% black lithics and 30% dolomitic matrix, tight.
Traces silt, dark brown grey, firm, micaceous argillaceous.

2040-2050 60% SANDSTONE; light grey unconsolidated, medium to very coarse grained rounded to subrounded well sorted, clear to cloudy frosted and polished quartz grains with traces grey chert, pyrite cemented sandstone, carbonaceous matter, 40% sandstone dolomitic tight as above.
Traces silt as above.

2050-2060 50% SANDSTONE; unconsolidated light grey coarse to very coarse grained rounded to subrounded well sorted quartz with traces pyrite, pink quartz. 50% sandstone dolomitic as above.
Argillaceous, traces limestone dark brown, very argillaceous, massive, traces bryozoa fossil fragments.

2060-2070 50% SANDSTONE, unconsolidated light grey, coarse to very coarse grained with 5% granules, well sorted, overall mainly very coarse grained, rounded to subrounded quartz with traces orange quartz, grey chert.
50% Sandstone; dolomitic as above, very fine to fine grained, argillaceous in part with 50% matrix.

2070-2080 80% SANDSTONE; unconsolidated light grey coarse to very coarse grained with 10% medium grains, well sorted, rounded to subangular clear to slightly cloudy quartz grains, frosted and polished quartz grains with traces chert grey grains and carbonaceous matter.
20% DOLOMITE SANDSTONE; as above, fine to very finely grained argillaceous. Traces dolomite limestone, slight greenish white, with brown ? siderite grains medium to coarse grained (composed 25% of rock).

2080-2090 90% SANDSTONE; unconsolidated, light grey coarse to very coarse grained with 5% granules and 5% medium grains, rounded to subrounded clear to cloudy with traces orange and pink quartz with common grey chert and traces carbonaceous matter.
10% Sandstone, dolomitic as above.

2090-2100 SANDSTONE; white, unconsolidated, coarse grained, predominantly well rounded but occasional angular, clear to slight cloudy, quartz, traces orange quartz, well sorted, clean.
5% Sandstone, dolomitic as above.

2100-2110 SANDSTONE; white, unconsolidated, coarse grained, in part (20%) very coarse grained, rounded to subrounded with about 20% angular, clear (in part cloudy) quartz, traces orange and yellowish stained quartz grains, well sorted, clean.
Traces chert and dolomitic sandstone as above.

2110-2120 SANDSTONE; white, unconsolidated, coarse grained in part (35%) very coarse grained, rounded to subrounded, clear to slightly cloudy quartz, trace yellow stained, grains, well sorted clean.
1% SANDSTONE; light greyish brown, very fine grained, quartz, moderately silty, well sorted and consolidated, subangular to subrounded, 20% brown clay (?) grains, dolomitic tight.
Traces sandy massive pyrite; traces chert grains.

2120-2122 SANDSTONE; as above.

2122-2129 SANDSTONE; medium light greyish brown, very fine grained, subangular to subrounded quartz, with 20% dark grey grains of argillaceous siltstone? well sorted, slight to moderately silty, dolomitic and in part silica cement, well indurated, tight slightly pyritic.

2129-2140 SANDSTONE; light grey, unconsolidated, very coarse grained, in part (20%) coarse grained, occasional granules, subrounded, cloudy quartz, well sorted.
35% Sandstone; as above (possibly cavings)

2140-2150 SANDSTONE; white, unconsolidated, medium to coarse grained, occasional very coarse grains rounded to subrounded, clear to slightly cloudy quartz, well sorted, clean.
10% Sandstone; greyish brown, dolomitic as above (cavings ?).

2150-2160 SANDSTONE; white, unconsolidated, coarse grained, in part (10%) very coarse grained, predominantly rounded to subrounded, clear to slightly cloudy quartz, rare pink and yellowish stained grains, (quartz), moderately well sorted.
15% Sandstone as above.

2160-2170 SANDSTONE; white, unconsolidated, coarse grained, in part (10%) very coarse grained and in part (5%) medium grained, rounded to subrounded, clear to slightly cloudy quartz with about 15% amber to slightly pink quartz grains, moderately well sorted clean.
20% Sandstone as above.
Occasional chips of dense sandstone, very fine to medium grained, [illegible].

2170-2180 SANDSTONE; light grey, unconsolidated, coarse to very coarse grained, occasional medium grains, rounded to subrounded, cloudy quartz, fairly common amber to yellowish quartz grains and [illegible] chert grains, moderately well sorted clean.
5% Sandstone; light brown, very fine grained, in part finely grained, subangular to subrounded quartz, with approximately 20% dark brownish grey siltstone (?) grains, slightly [illegible], moderately silty, dolomitic or possibly sideritic cement, friable in part tight. Traces of silty brown clay and brown argillaceous siltstone. Traces of pyritic sandstone and of massive pyrite.

2180-2190 SANDSTONE; light grey, unconsolidated, very coarse grained in part (30%) coarse grained, subrounded, cloudy quartz and occasional amber to orange quartz grains, well sorted, clean.
40% Sandstone; light to medium dark brown as above, predominantly very fine grained and grading to siltstone in part, in part pyritic, tight.

2190-2200 SANDSTONE; white to light grey, unconsolidated, coarse grained, in part (10%) very coarse grained, predominantly rounded to subrounded, occasional angular grains, clear to slightly cloudy quartz, fairly common amber and pink tinted quartz grains, [illegible] sandstone, light to dark brown, very fine to fine grained as above.

2200-2210 SANDSTONE; white to light grey, unconsolidated, as above, [illegible] quartz grains and occasional chert grains.
5% Sandstone; light to dark brown, as above.
Traces pyrite, [illegible] chert.

2210-2220 SANDSTONE; white, unconsolidated, coarse to very coarse grained, (10% medium grained) round (in part subrounded to angular) clear to cloudy quartz, common grey, quartz grains, occasional polished quartzite grains, well sorted, clean.
25% SANDSTONE - SILTSTONE, light to dark brown as above (cement probably sideritic).

2220-2230 SANDSTONE; white to light grey, unconsolidated, coarse to very coarse grained, rounded to subrounded quartz, well sorted, clean.
10-15% SANDSTONE; SILTSTONE as above.
Traces muscovite, siderific ironstone, brown silty clay; occasional pyrite.

2230-2240 SADNSTONE: white to light grey, unconsolidated, very coarse grained, in part (20%) coarse grained, 5% granules, subrounded to subangular, clear to cloudy quartz, common pinkish with yellowish quartz grains, occasional grey quartz grains, moderately well sorted.
15% SANDSTONE; brown, as above, generally pyritic and micaceous.
Occasional muscovite, very fine to fine grained, sandstone, pyrite. Traces of brown clay.

2240-2250 SANDSTONE; white, unconsolidated, coarse to very coarse grained, rounded to subrounded, milky quartz, common pinkish and amber grains.
35% SANDSTONE; light to medium brown, very fine grained in part fine grained, subangular quartz and about 20% dark lithic (?) grains, moderate to very silty, moderate micaceous. in part pyritic, dolomitic to slightly calcareous cement, indurated, tight.
Common muscovite.

2250-2260 SANDSTONE; white to light grey, very coarse grained in part coarse grained as above. with 40% Sandstone, brown as above.

2260-2270 SANDSTONE; light grey, unconsolidated, medium grained to granule sized; predominantly coarse (40%) to very coarse (40%); round to subangular clear to cloudy quartz, fair sorting, many of grains with remnants of silty/argilleceous brown cement.
25% SANDSTONE; brown, as above, in part light grey.
Occasionnal pyrite. Traces of chert and mica.

2270-2280 SANDSTONE; white, unconsolidated coarse grained, with 25% very coarse grains and 10% medium grained, subrounded, clear to slightly cloudy quartz, moderately well sorted, clean; fairly common amber and rare pink and brown quartz grains, traces of pyrite cement on several grains.
5% Sandstone; brown to grey as above.

2280-2290 SANDSTONE; white, unconsolidated, coarse to very coarse grained (predominantly coarse grained); rounded to subrounded, clear, quartz, in part cloudy, moderately well sorted, clean, occasional grey, yellow and pink quartz grains.
5% SANDSTONE; brown to grey as above.

2290-2300 SANDSTONE; white to light grey, unconsolidated, coarse grained, in part (30%) very coarse grained, occasional granules, subrounded cloudy quartz, common amber quartz grains, moderately well sorted, clean.
5-10% SANDSTONE; light grey to brown, very fine to fine grained dolomitic as above.

2300-2310 SANDSTONE; white to light grey as above.
20% SANDSTONE; dolomitic as above.

2310-2320 SANDSTONE; white, unconsolidated, coarse to predominantly very coarse grained, 5% granules, rounded to subrounded quartz, clear to slightly milky grains,

moderately sorted,
25% SANDSTONE; brownish grey as above.

2320-2330 SANDSTONE; white to light grey, unconsolidated, coarse grained to very coarse grained, 5-10% granules subround, quartz with rare chert and quartzite grains and occasional pinkish and yellowish quartz grains. 30% SANDSTONE; grey to brown very fine grained, as above.
Traces Sandstone; medium grained subangular quartz, very poorly cemented, excellent intergranular porosity.
Traces of pyrite.

2330-2340 SANDSTONE; Light grey, unconsolidated, very coarse grained (20% granules and 10% coarse grained, rounded to subrounded quartz, occasional yellow and pinkish quartz, traces chert.
15-20% Sandstone, medium grey, very fine grained as above.
Occasional pyrite.

2340-2350 Unreliable sample
SANDSTONE; white to light grey, very fine grained to very coarse grained, subangular to subrounded quartz, grains predominantly clear, poorly sorted.
10% SANDSTONE; as above.

2350-2360 Questional sample
SANDSTONE; white, unconsolidated, coarse grained, in some parts medium and very coarse grained, subrounded to subangular quartz, occasional grey quartz grains, traces orange stained grains, moderately well sorted.
2% SANDSTONE; medium grey to brown as above.

2360-2370 Not much sample - predominantly lost circulation material over the shaker.
SANDSTONE, white, unconsolidated, medium to coarse grained as above.

2370-2380 Poor Sample
SANDSTONE; white to light grey, unconsolidated, medium to very coarse grained, (predominantly coarse grained) with 5% very coarse grained and 15% medium grained, subrounded to subangular, clear quartz, common medium dark grey quartz grains, traces quartzite.
Traces mica, pyrite and carbonaceous clay.

2380-2390 SANDSTONE; white to light grey, unconsolidated, medium to very coarse grained, as above, but 40% medium 55% coarse and 5% very coarse.

2390-2400 SANDSTONE: white unconsolidated, coarse grained with 20% medium grains, and 5% coarse grains, rounded to subrounded, clear to cloudy quartz, well sorted clean

2400-2410 No sample.

2410-2420 100% SANDSTONE; light grey unconsolidated coarse to very coarse grained with 10% granules, rounded to subangular occasional Angular clear to cloudy quartz grains with traces carbonaceous matter, mica
Traces dolomite sandstone.

2420-2430 100% SANDSTONE; light grey unconsolidated fine to medium grained with 20% coarse to bery coarse grains, subrounded subangular occasional rounded clear to cloudy, traces pink quartz grains, traces mica, traces pyrite cemented sandstone, traces grey chert.

2430-2440 100% SANDSTONE as above with trace grey quartz.

TRIP TO CORE 2442
PIT UNDER GAUGE

2440-2442 100% SANDSTONE unconsolidated light grey, very fine to fine grained with 15% medium to very coarse grains, subrounded to subangular clear to slightly cloudy quartz grains, trace mica, grey quartz, basal fragments.

Trace dolomite sandstone, very fine to fine grained hard, argillaceous.

Reamed hole

2442-2450 100% SANDSTONE unconsolidated light grey, medium to very coarse grained with 5% granules, subrounded to subangular and angular cloudy, frosted quartz grains. Common pyritic cemented sandstone and traces silica cemented medium to very coarse grained quartz sandstone, slightly argillaceous tight. Traces mica.

The siliceous sandstone may be the hard bands around 2440.

2450-2454 100% SANDSTONE as above coarse to very coarse grained, with traces chert, mica. Traces siliceous sandstone, pyritic sandstone dolomite sandstone and traces dark brown sideritic (?) sandstone (with 50% quartz grains coarse to very coarse grained).

TRIP TO CORE

REAMED APPROXIMATELY 490 ft HOLE

2454-2477 CORE No.2 Diameter 3¼" Cut 22½' Rec. 12'

See Core Descriptions.

CORE No.3 2½ 54 - 76

Rec 11'

Time to Cut 22½' = 21 mins
= 55 ft/hr 54-60
= 60 ft/hr 60-70
= 80 ft/hr 70-76

Macro Description
TOP 9'6" Clay black to dark brown, carbonaceous finely micaceous, firm to moderately hard, finely laminated with silty, sandy laminations or with colour laminations. Common lenses very fine grained sandstone - ¼ mm - 1 cm thick, undulatory lenses, common sandstone filled erosional scours, occasional x bedding in sandstone lenses with erosional truncations of these by the sandstone or clay. Common lenses and laminations of very fine grained pyritic sandstone with occasional pyritic nodules and ? dolomitic sandstone nodules. Rare lenses medium to coarse grained sandstone. Clay beds up to 2 cms thick. Occasional fractures 60° dip. Core dips 0°5° gen. 0-3° Bottom 1'6" Sandstone green grey fine to very fine grained with occasional coarse to granule grains, micaceous occasional finely laminated with argillaceous rich laminations, and occasionally with beds to 1 cm of bluish grey clay and dark grey to black carbonaceous clay.

Micro Description
Top 9'6" Clay black to dark brown, commonly silty, finely micaceous with occasional mica flakes to 8 mms, occasional plant fragments. Generally the clay is black and the silty clay is dark brown. The clay has common lenses and interbeds of very fine to fine grained argillaceous sandstones, grey green, tight with occasional porosity and the sandstone shows micro graded bedding. There are common sandstone filled micro erosional scours. There are occasional beds of clay which are more indurated and may be slightly pyritic. There are common thin laminations of fine to very fine grained pyritic sandstones in the clay. The sandstone laminations and lenses are often slightly micaceous and are generally tight, though some laminations have trace porosity. Differential compaction in places results in undulatory bedding. Bottom 1'6" Sandstone light green grey, very fine grained well sorted with occasional fine to coarse grains; friable, composed of clear to slightly cloudy subangular to subrounded quartz grains with occasional coal fragments, and traces mica (white) and dark green lithic grains) in an argillaceous matrix. There are common interbeds and laminations of clay black to dark brown as above finely micaceous. The sandstone often has thin laminations of pyritic cemented sandstone.

Bedding at 3 to 7 degrees

- -

Samples lagged from 2477 onwards
Lag time at 2500' approximately 25 mins

Poor Samples 2477-2560

2477-2490 100% SANDSTONE coarse to very coarse grained with 10% granules, unconsolidated light grey subangular to subrounded and occasional angular clear to slightly cloudy quartz grains traces chert mica coal fragments, pyrite cemented sandstone.

Traces dolomite sandstone fine to very fine grained, argillaceous hard, tight.

2490-2500 95% Sandstone as above coarse to very coarse grained with 10% granules 5% sandstone white hard fine to medium and occasional coarse grained, fairly well sorted dolomitic sandstone with 30% matrix, very slightly argillaceous tight.

2500-2510 90% SANDSTONE as above coarse to very coarse grained with 5% granules and 5% medium grains.

10% SANDSTONE white fine to medium and occasional coarse grained, dolomitic matrix, tight hard.

2510-2520 90% SANDSTONE, as above coarse to very coarse grained etc.
10% SANDSTONE white hard dolomitic as above.

2520-2530 90% SANDSTONE, light grey unconsolidated coarse tovvery coarse grained with 10% granules; well sorted, clear to slightly cloudy subrounded to subangular quartz grains with chert, traces pink and grey quartz, carbonaceous matter, mica.
10% SANDSTONE dolomitic grey argillaceous very fine to fine grained.

NB Much very fine to fine silt sized quartz with mica from desander sample.

2530-2540 90% SANDSTONE, light grey unconsolidated coarse to very coarse grained, as above.
10% SANDSTONE, dolomitic white and occasional grey. Traces pyrite fine to medium grained sandstone.

2540-2550 50% SANDSTONE light grey unconsolidated coarse to very coarse grained occasional medium grains as above.
50% SANDSTONE, white, hard, very fine to fine grained, with from 10% to 30% matrix, dolomitic slightly argillaceous, and traces carbonaceous matter, pyrite and chert. Tight to poor porosity.

2450-2460 Poor sample 20% SANDSTONE; as above
Predominantly SANDSTONE, white to buff, fine grained, in part very fine grained, angular to subangular quartz, with 2% dark grey occasional

red lithic grains, well sorted, occasional muscovite flakes to 0.2 mm, traces pyrite, grains, in part with film of red clay adhering to grains; in part with poor to fair intergranular porosity.

CORE No.4 (Wireline) 2560-2572
CUT 12' Recovered 4'

2560-2564 Core consists predominantly of CLAY, medium dark brown, moderately micaceous, moderately carbonaceous to very carbonaceous, silty. The clay has common flecks of coal and scattered very fine to fine sand grains. Scour structure infilled with white, very fine to fine grained quartz sandstone occurs at several horizons.

The core includes numerous laminations (generally 0.3 to 0.5 mm thick) of very fine grained sandstone and siltstone. Several thin laminations of pyrite occur in association with thin interbeds of sandstone, light grey very fine grained quartz and 5% dark grains, pyritic, silty, moderately carbonaceous, well indurated, tight.

The clay is dominantly moderately firm and has a moderately well developed fissility as a result of planar concentration of carbonaceous flecks.

The microstructure of the core is obscured by a coating of clay.

Dip of the bedding is poorly defined but is in the order of 3 to 5 degrees.

2564-2572 No recovery.

CORE NO.5
Int: 2572'-2580' Recovered 3'

2572-2575 CLAY; medium brown, moderately micaceous and silty, very carbonaceous, plastic to moderately firm. The core includes approximately 30% laminations of light grey, very fine grained (in part fine grained) quartz sandstone which is slightly silty and moderately to very carbonaceous

Plant fragments and large carbonaceous fragments are present on several bedding planes. Carbonaceous flecks in both the sandstone laminations and in the clay are orientated parallel to the bedding and impart a moderate fissility to the clay.

The dip of the bedding isnot well defined but is in the order of 3 to 5 degrees.

2575-2580 No recovery.

CORE No.6
Int: 2580-2582½' Recovered 1'2"

2580-2581'2" CLAY: chocolate brown, moderately well indurated, very micaceous, very carbonaceous (carbonaceous flecks oriented parallel to bedding planes) moderate to very silty and grades in part to very argillaceous Siltstone

The core includes about 20% laminae and lenses of sandstone; light grey, very fine grained (occasional fine grains), quartzose, silty, very carbonaceous and micaceous, tight.

Dip of bedding is poorly defined but is in the order of 2 to 5 degrees.

2581'2"-2582'6"
No recovery.

2582½'-2590' Very Poor sample approximately 10% - 20%
60% sandstone, light grey, unconsolidated, coarse to very coarse with occasional granules. Subrounded to subangular, occasionally rounded clear to slight cloudy, quartz grains with traces grey chert, clear micaceous and carbonaceous matter and traces pyrite cemented sandstone.

40% SANDSTONE, white hard, fine to medium grained occasionally with some coarse grains, dolomite matrix slight argillaceous, tight.

2590-2600 Very Poor Sample approximately 10%
90% SANDSTONE light grey unconsolidated coarse to very coarse grained, subangular to rounded occasionally angular, as above.
10% SANDSTONE, dolomitic as above, tight.
Traces siltstone firm, grey brown, with carby streaks, occasional very fine to fine quartz grains, common very fine micaceous, traces bedding.

2600-2610 Poor Sample 20%

90% SANDSTONE as above light grey unconsolidated coarse to very coarse grained, subangular to subrounded clear to slightly cloudy quartz with traces chert grey and red, traces pyrite cemented sandstone, traces mica.

10% SANDSTONE white dolomite fine to medium grained, slightly argillaceous with occasional traces porosity.
Traces siltstone as above very slightly calcareous.

2610-2620 Very Poor Sample 10-20%
Traces siltstone grey brown as above carby calcareous micaceous Traces siltstone, black micaceous, carby, firm to soft 70% sandstone, coarse to very coarse grained with 5% granules, as above, 30% sandstone dolomitic very fine to coarse grained, fair to good sorting in individual cuttings, hard, occasional traces porosity.

2620-2630 Very Very poor sample
80% sandstone light grey unconsolidated coarse to very coarse grained with occasional medium grains or granules. Composed of clear slightly cloudy rounded to subangular quartz, traces chert, carbonaceous matter and pyrite cemented sandstone
20% sandstone dolomitic slight argillaceous as above, traces siltstone light grey brown as above.

2630-2640 Poor sample 10-20%
50% sandstone light grey unconsolidated coarse to very coarse grained with occasional medium and granules grains, rounded to subangular clear to slightly cloudy quartz grains well sorted, with traces chert grey, pyrite cemented fine to medium grained sandstone.
50% sandstone light grey, hard, silty to medium grained, generally very well sorted individual cuttings, composed of quartz grains with up to 40% generally 20%, dolomitic slightly argillaceous matrix. Tight with occasional traces porosity, occasional black light grains. Traces siltstone light brown grey, firm, micaceous earby, traces bedding in part very finely sandy, in part clayey, grading to a silty clay (or shale).

2640-2650 40% sandstone lgith grey unconsolidated as above
60% sandstone white to light brown, hard, silty to fine grained, occasional medium grained composed of quartz grains with 20-40% slightly argillaceous dolomitic matrix, and traces black lithic fragments. Tight with occasional traces porosity. Generally well sorted, occasionally fair sorting. Common siltstone as above clayey to very clayey.

2650-2670 Very poor sample approximately 10%
50% sandstone light grey unconsolidated as above.
40% sandstone light white to light brown, hard, dolomitic, generally slightly argillaceous in part clean. Tight with occasional traces porosity. In part very argillaceous.
10% siltstone in part very clayey and grades to a silty clay (or shale), in part slightly sandy generally brown, firm to hard, micaceous slightly earby, traces bedding.

2660-2663 Very poor sample 10-20%
60% sandstone, light grey unconsolidated, very coarse to coarse grained as above.
30% sandstone, light grey unconsolidated very fine to fine grained quartz grains well sorted.
10% sandstone, white to light brown, dolomitic, tight, occasional traces porosity as above.
Traces siltstone as above.

CORE No.7 2663-2673 cut 10' Rec 9½'

9'6" SHALE; medium brown, moderate to very micaceous, abundant carbonaceous specks, predominantly moderate to very silty, generally firm but in part slightly plastic. The core includes zones with common small pyrite concretions

and rare bedded pyrite. The shale has a poorly developed fissility and includes occasional laminations of white, very fine grained quartz sandstone and some siltstone near the base of the core.
The bedding is moderately well defined and dips at 12°-16°.

0'6" NO recovery

CORE NO.8 2679-2681 Cut 8 Rec. 6½'

6'6" SHALE; medium brown, moderate to very silty, very micaceous, very carbonaceous (carbonaceous flecks oriented parallel to fissility), moderately well indurated but becomes plastic when wet, poorly developed fissility.
The core includes less than 5% laminations (generally less than 1 mm in thickness) of white, very fine to fine grained, silty, carbonaceous in part pyritic sandstone and of siltstone. Rare small stringers of pyrite and of fine grained sandstone in a pyritic matrix are present.
Dip of bedding is well defined at 22°.

1'6" NO recovery, Core loss probably distributed along length of core.

2681-2690 SANDSTONE; white, unconsolidated, coarse to very coarse grained, occasional medium grains angular to rounded quartz. (CAVINGS)
2% Concretionary pyrite.
5% SANDSTONE: white, very fine grained angular quartz and occasional dark grains, well consolidated micaceous, silty tight.
1% siltstone white to light grey, micaceous very fine sandy slight carbonaceous, Occasional coal and traces medium dakr brown siltstone the pyrite, siltstone and consolidated sandstone probably present as laminations in CLAY and/or SHALE.

2690-2700 1. From lip to rear of shaker:- (unconsolidated residue)
CLAY : chocolate brown, slightly micaceous, very silty with abundant intercrystalline sand grains which are poorly sorted and probably represent cavings.

2. From sample platform - (only slightly washed)
SANDSTONE unconsolidated medium to coarse quartz grains with abundant 40% very fine grains.

2700-2711 1. Unconsolidated residue sampled at rear of shale shaker.
60% silt: light brown, unconsolidated
40% sand: unconsolidated very fine to medium quartz grains, occasional coarse grain.
2. From sample platform (only slightly washed)
Sandstone unconsolidated, fine grained to granule sized with abundant 35% grains of silt size to very fine grained size.

CORE NO.9 2711-2715 Cut 4' Rec 3'

0'9" SILTSTONE medium brown, moderately micaceous, very carbonaceous, very argillaceous, indurated

------- grades to -------

2'3" SHALE: medium brown, moderate to very silty, micaceous and carbonaceous (carbonaceous flecks oriented parallel to poorly developed fissility). The core includes occasional blebs and stringers of pyrite and includes less than 5% laminations of light grey carbonaceous siltstone.

1'0" No recovery

The bedding dips at 22°

2715-2720
1. From lip at rear of shaker
40% sand unconsolidated, medium to very coarse grained.
40% silt brown, slightly micaceous very finely sandy.
20% clay, brown, slightly silty slight micaceous
2. From sample platform
100% sandstone light grey, unconsolidated medium to very coarse grained rounded to sub-angular quartz with traces chert. Traces siltstone brown grey, slight micaceous, very argillaceous

2720-2730
1. From lip behind shaker
Mainly brown silt, unconsolidated
Approximately 20% sandstone unconsolidated medium to very coarse grained
Traces sandstone very fine to fine and silty dark grey very poorly consolidated, argillaceous matrix, ? light.
2. Normal sample to poor sample
95% sandstone medium to very coarse grained as above.
5% siltstone, light brov brown, firm argillaceous slightly sandy, finely micaceous with common carbon streaks.

2730-2740
1. From lip behind shaker
Silt brown very argillaceous slightly micaceous, ? slightly carbonaceous.
2. Normal sample (very poor sample)
95% sandstone medium to very coarse grained as above with traces chert, pyritic cemented sandstone.
5% siltstone as above, very argillaceous.

2740-2750
1. From lip behind shaker
Silt, brown, very argillaceous grading to silty clay, as above.
2. Normal sample (very very poor sample)
80% sandstone unconsolidated, medium to very coarse grained as above.
10% sandstone, white firm, fine to medium grained, well sorted quartz with occasional

black lithic specks in a slightly argillaceous slightly dolomite matrix. Tight with occasional traces porosity.

2750-2760 Very very poor sample
70% sandstone unconsolidated light grey medium to very coarse grained as above.
30% siltstone light brown, firm, generally argillaceous in part very finely sandy (grading to a very fine grained sandstone, clean) finely micaceous, carbonaceous streaks and specks.

2760-2770 Very poor sample.
50% sandstone unconsolidated as above.
50% SILTSTONE as above, grey brown firm argillaceous micaceous, slightly carby, in part grading to very fine sandstone.

2770-2780 Very poor sample
40% sandstone light grey unconsolidated medium to very coarse grained as above.
60% siltstone brown to grey brown, firm, argillaceous, in part grading to silty shale, in part slightly sandy grading to very fine grained silty and argillaceous sandstone, slightly micaceous, carbonaceous streaks and specks. Traces fine to very fine grained slightly pyritic argillaceous sandstone. Traces pyritic cemented fine to medium grained sandstone.

2780-2790 30% sandstone light grey unconsolidated as above. very poor sample 60% siltstone as above, generally very argillaceous, grading mainly to a silty shale.
10% sandstone white firm, very fine to fine grained quartz slightly argillaceous, with black and green lithic specks, slightly micaceous tight, well sorted.

2790-2800 10% sandstone light grey unconsolidated as above. very poor sample 70% siltstone, as above, very argillaceous grades to a silty shale.
20% sandstone very fine grained, white to light brownish white, slightly argillaceous silty grading to a siltstone, slightly micaceous, common black ? carbonaceous lithic specks.

2800-2810 30% sandstone light grey, medium to coarse grained unconsolidated as above.
60% siltstone as above.
20% sandstone white to light brownish white, very fine grained with occasional fine grains composed of quartz grains with occasional black lithic specks and traces mica, silty to very silty, slightly argillaceous, tight with ? argillaceous matrix, slightly carby.

2810-2820 20% sandstone light grey unconsolidated, medium to coarse grained clear quartz rounded to sub-rounded with traces pyritic cemented sandstone and grey chert.

70% siltstone as above mostly very argillaceous to almost a silty shale.
10% sandstone white, very fine grained silty tight as above.

2820-2830 20% sandstone light grey unconsolidated medium to coarse grained occasionally very coarse grains clear to slight cloudy quartz grains with traces pyrite cemented sandstone.
40% siltstone grey brown to brown grey, firm argillaceous in part slightly sandy, slighhly micaceous, carby streaks and specks.
40% sandstone light grey to occasional brownish, firm very fine to fine grained silty, composed of quartz grains with black lithic specks (5-10%) in a ? silty and argillaceous very slightly calcareous matrix. Tight.

2830-2840 10% sandstone light grey unconsolidated as above
30% siltstone as above in part very argillaceous
40% sandstone light grey to brownish grey firm very fine grained silty slightly argillaceous, as above. Tight with occasional traces porosity. Evidence of laminations of siltstone and very fine grained sandstone.

2840-2850 10% sandstone light grey unconsolidated medium to very coarse grained with 20% granules as above 40% siltstone as above very argillaceous (a silty shale in part).
50% sandstone as above very fine to fine grained silty, occasional fine grained. Common pyrite cemented fine to very fine grained sandstone with 60% pyrite 40% quartz.

2850-2860 10% sandstone light grey unconsolidated medium to very coarse grained as above.
40% siltstone as above very argillaceous.
50% sandstone as above traces porosity.
Evidence in cuttings of interlining of silt and sandstone.

2860-2870 10% sandstone light grey unconsolidated as above.
30% siltstone as above very argillaceous.
60% sandstone light grey to slightly brownish grey, very fine to fine grained, silty occasional very fine or fine grained, well sorted, composed of quartz, traces black lithic grains (? coal) traces carby streaks. Traces porosity but generally tight.

2870-2880 10% SANDSTONE unconsolidated light grey, medium to very coarse grained, composed of clear to cloudy and slightly milky quartz, rounded to subrounded with traces chert.
60% SILTSTONE grey brown to brown grey firm argillaceous to very argillaceous , in part slightly sandy, slightly micaceous common carbonaceous streaks and specks.
30% SANDSTONE light grey to brown, firm, very fine to fine grained, silty becoming more argillaceous, composed of quartz grains with traces carbonaceous material and black specks, traces mica. Tight with occasional traces porosity. Traces pyrite, traces pyrite cemented fine grained sandstone.

2880-2890 10% SANDSTONE unconsolidated as above.
50% SILTSTONE as above.
40% SANDSTONE as above generally tight with occasional traces porosity, silty and argillaceous matrix.

2890-2900 10% SANDSTONE as above
60% SILTSTONE as above very argillaceous, firm carby and micaceous.
30% SANDSTONE as above but more argillaceous. Tight with occasional traces porosity.

2900-2910 10% SANDSTONE light grey unconsolidated as above
60% SILTSTONE as above very argillaceous, in part slightly argillaceous.
30% SANDSTONE as above tight, grading to a siltstone, clean.

2910-2920 10% SANDSTONE light grey unconsolidated as above.
30% SILTSTONE % very argillaceous, brown grey, carby
50% light grey, slightly sandy slightly argillaceous, generally clean, traces carbonaceous matter and mica.

10% SANDSTONE as above very fine grained silty, tight.

2920-2930 NO SAMPLE

2930-2940 10% SANDSTONE unconsolidated medium to very coarse grained as above. Traces fossil-foraminifera
70% SILTSTONE, half of sample argillaceous, half slightly sandy as above.
20% SANDSTONE as above.

2940-2950 30% SANDSTONE light grey unconsolidate medium to coarse grained occasional very coarse grained rounded to subrounded clear to slightly cloudy quartz grains.
50% SILTSTONE, 30% brown to grey brown very argillaceous slightly carby, slightly micaceous.
70% light grey to slightly brownish grey, very finely sandy, slight argillaceous, occasionally slightly carby or slightly micaceous. Grades to a very fine sandstone.
New 20% SANDSTONE white hard, very fine to fine grained with 30% dolomitic matrix tight.
Traces sandstone very fine to fine grained silty as above.

2950-2960 50% SANDSTONE light grey unconsolidated fine to very coarse grained predominantly fine to medium grained rounded to subrounded clear to slightly cloudy quarts grains.
40% SILTSTONE as above brown and lith grey varieties as above.
10% SANDSTONE, dolomite as above.

2960-2970 Traces foraminifera
50% SANDSTONE, light grey unconsolidated fine to coarse grained, predominantly fine to medium grained with pyrite cemented sandstone.
40% SILTSTONE as above light grey quartzitic clean in part slightly argillaceous and brown very argillaceous slight carby.
10% SANDSTONE dolomite very fine to medium grained

occasional coarse grained tight.

2970-2980 30% SANDSTONE light grey unconsolidated as above.
60% SILTSTONE generally the grey clean variety with 30% brown very argillaceous variety.
10% Dolomitic sandstone as above.
Traces pyrite cemented sandstone.

2980-2990 55% SANDSTONE: light grey unconsolidated, very fine grained to granule sized, predominantly medium to coarse grained, subangular-subrounded quartz, poorly sorted.
35% SILTSTONE: light grey, slightly argillaceous slight to moderately micaceous with carbonaceous, slightly pyritic friable.
3% PYRITE massive, in part sandy, in part with abundant silt. Abundant very fine grained, quartz sandstone with approximately 50-60% pyrite matrix and with traces of intergranular porous.
Fairly common tight very fine grained sandstone completely cemented with pyrite, occasional buff to light brown sideritic ironstone.

2990-3000 30% SANDSTONE light grey unconsolidated as above.
30% SILTSTONE light grey to pale brown moderately to very friable, slightly micaceous, occasional slightly carbonaceous, slightly argillaceous, in part pyritic (disseminated).
40% SHALE: medium brown to medium light brown, moderately micaceous, slightly to moderately carbonaceous, moderate to very silty, chunky.
Fairly common pyrite; sideritic brown, dense clay ironstone.

3000-3010 30% SANDSTONE: light grey, unconsolidated very fine grained to granule size, predominantly coarse to very coarse grained, subangular to subrounded quartz.
SILTSTONE: white to light grey, friable, moderate to very micaceous, slightly carbonaceous with argillaceous, in slight pyrite very fine to sandy.
10% SHALE or CLAY; asabove.
Occasional sandstone; white consolidated fine to medium grained angular quartz, abundant (25%) pyrite cemented fair porosity.
5% CLAYSTONE; buff brittle, dolomitic or sideritic (?) slightly pyritic and carbonaceous.
Common massive pyrite.

3010-3020 25% SANDSTONE; unconsolidated as above.
55% SILTSTONE; white to light grey as above.
20% CLAY to SHALE as above.
Occasional buff to medium light brown claystone as above.
Occasional sandstone, light grey very fine to fine grained, quartz silty, compact, dolomitic cement, tight.
Common pyrite fragments, traces lignite.

3020-3030 20% SANDSTONE light grey unconsolidated, as above.
65% SILTSTONE white in part pale brown, friable, kaolinitic matrix, slightly carbonaceous, micaceous in part moderately to very pyritic, in part very fine sandy and in slight part grades to very fine grained sandstone, traces of green grains (chamusite?)
10% CLAY medium light brown, moderate micromic

carbonaceous, moderate to very silty.
2% SANDSTONE white to light grey, fine grained common very fine grains, subangular quartz, dolomitic cement, tight.
3% CLAY IRONSTONE medium light brown, sideritic (?) in part very argillaceous; grades to brittle sideritic (?) claystone.
Common massive pyrite, occasional light grey, pyritic, very fine to fine grained sandstone with fair intergranular porosity.

3030-3040 — 50% CLAY to SHALE light to medium brown, micaceous carbonaceous, moderate to very silty grades to very argillaceous siltstone.
40% SILTSTONE white, as above, in part grades to very fine grained sandstone.
10% SANDSTONE; white, unconsolidated as above.
Common massive pyrite, clay ironstone - occasional dolomitic very fine to fine grainded sandstone.

CORE No.10 — 3040-3060 Cut 20' Rec. 8'3"

4'5" — SANDSTONE dark grey to yellowish brown, very poorly sorted; very fine grained to granule sized, angular to rounded grains, of quartz, with abundant ooliths of light yellowish brown limonite (?) - traces of chert, quartzite - other lithic grains. The quartz grains are generally iron stained or coated. Many of the limonite ooliths are surrounded by and/or partially replaced by an indeterminate soft, white mineral which is also present as discrete grains. Many of the limonite ooliths have a core consisting of a quartz grain; limonite also occurs as irregular grains or patches.
The quartz grains and limite ooliths are set in an abundant matrix (30-40%) which is variably yellowish brown, limonitic dark brownish grey, limonitic/carbonaceous, or in places black, bituminous.
Intraformational conglomerate, comprising fragments of less than 1-inch in diameter is developed in several zones within the core.

---------- gradational contact ----------

1'0" — SANDSTONE very dark grey, very poorly sorted, similar to the sandstone described above but includes abundant granules and an occasional pebble. The majority of the grains are iron-stained and some grains are iron-coated. Pellets and/or ooliths of limonite are abundant but the indeterminate white mineral, present in the overlying unit is absent. The matrix consists of dark yellowish grey ferruginous clay.

---------- gradational contact ----------

2'10" — OOLITE; medium dark grey, fine to medium grained in part coarse grained, dark brown limonite ooliths and/or pellets and a much smaller proportion of poorly sorted (very fine to very coarse grained) iron-stained quartz set in an abundant (35%) yellowish brown earthy textured, limonitic clay matrix.

The oolite is reworked and comprised well indurated, elongate (generally less than 1 inch in length) fragments set in a softer limonitic and argillaceous matrix.

11'9" NO RECOVERY

The core includes several pyritised zones. No hydrocarbon shows recorded. As the core is massive the dip of the bedding is unknown.

3060-3070 SANDSTONE; white unconsolidated, coarse to very coarse grained, occasional granules, sub-angular quartz, in part iron-stained, poorly sorted. Occasional grains are consolidated and are in abundant medium brown silty clay cement and are tight.
Rare limonite oolite. Fairly common pyrite grains 15% SILTSTONE dark grey to brown, very argillaceous, in part carbonaceous, similar to matrix in core.
Sandstone may not be porous in subsurface but drilled extremely quickly.

3070-3080 SANDSTONE; white unconsolidated predominantly very coarse to granules sized, with 10-20% finer grains angular to subangular quartz, not iron-stained, poorly sorted, pyrite adhering to grains.
15% SANDSTONE brownish grey, fine to coarse, angular grains of quartz in an abundant (45%) matrix of silty clay - in part of argillaceous siderite (?).

3080-3090 SANDSTONE; white unconsolidated, poorly sorted but predominantly very coarse to coarse grained.
5% SANDSTONE; brownish grey as above.
Occasional siderite, occasional carbonaceous clay.

3090-3100 SANDSTONE; light grey, unconsolidated, poorly sorted but predominantly coarse to very coarse grained, angular to subrounded, cloudy quartz, common yellowish quartz grains - occasional medium grey quartz grains, rare chert grains.
10% SIDERITE; dark brownish grey to medium grey, dense cryptocrystalline-microcrystalline appear, often very sandy (poorly sorted quartz to very coarse grained size - occasional limonite oolite) grades to sideritic sandstone - sideritic claystone.

3100-3110 SANDSTONE; white, unconsolidated, poorly sorted predominantly coarse to very coarse but 20% granules - 10% finer sized grains, subangular-to subrounded cloudy quartz, fairly common medium grey quartz grains, trace iron-stained, grains commonly grains have traces of pyrite adhering; occasional chert - other lithic grains.
10% SIDERITE - sandstone with argillaceous matrix as in core 10.
Occasional massive pyrite.

3110-3120 SANDSTONE; white to light grey, unconsolidated very poorly sorted, predominantly very coarse to granule sized, predominantly subangular quartz grains with abundant medium grey quartz grains with occasional chert grains.
5% SANDSTONE consolidated as above.

3120-3130 SANDSTONE; light grey, unconsolidated predominantly coarse grained angular to subangular quartz with approximately 30% light to medium grey quartz grains, abundant pyrite (in part crystalline tetrahedrums); SANDSTONE probably porous and with pyritic cement

D S T No.1 3042-3130 Rec 370' mud - 2530' fresh water.

3130-3140 SANDSTONE; white, unconsolidated, coarse to very coarse grained, occasional medium to very coarse grains, angular to subangular, clear to slightly cloudy quartz with 30% medium light to medium dark grey cloudy quartz grain, pyrite cement including many well developed tetrahedrums adhering to many very fine grains, moderately well sorted, probably with excellent intergranular porosity.
1% SANDSTONE with abundant argillaceous/ferruginous matrix as in Core 10 (cavings)

3140-3150 SANDSTONE; light grey, unconsolidated, coarse to very coarse grained, as above. with 30% medium light to medium dark grey subrounded quartzite quartz grains, rare chert grains, with abundant pyrite cement including common crystalline moderately well sorted, excellent ingergranular porosity.

3150-3160 SANDSTONE; white, unconsolidated, predominantly coarse to very coarse grained angular to subangular vitreous to slightly cloudy quartz with 15% grey quartz - quartzite grains, with occasional round chert with other siliceous rock grains, moderately well sorted, probably with good intergranular porosity; very abundant pyrite cement adhering to grains.

3160-3170 SANDSTONE; white unconsolidated, predominantly very coarse grained but ranges from medium grained to granule size, angular to subangular quartz, with 25% greenish grey with grey quartz grains, quartzite grains. with occasional chert lithic grains.

3170-3180 SANDSTONE; white to light grey unconsolidated, fine grained to granule size, predominantly coarse to very coarse, angular to subrounded, milky quartz with 30% medium to dark grey quartz, quartzite rare chert, and other lithic grains, abundant pyrite cement, poorly sorted; occasionally well cemented consolidated chip with very poor porosity overall porosity probably very good.

3180-3190 SANDSTONE; as above light grey with 35% dark grains as above (i.e. lithic) in part(5%) consolidated.

3190-3200 SANDSTONE; white, unconsolidated fine to very coarse grained predominantly coarse grained angular vitreous quartz, abundant pyrite cement, moderately sorted, only about 3% grey quartz grains, 3% of sample consolidated with porosity moderate.

3200-3210 SANDSTONE; white, unconsolidated medium grained to very coarse grained with 5% granules, predominantly coarse to very coarse grained, angular quartz, traces grey chert, quartzite siderite grains, abundant pyritic cement including tetrahedrite, moderately sorted clean approximately 3% consolidated.

3210-3220 SANDSTONE: white to light grey, unconsolidated medium granule sized grains, predominantly very coarse grained subangular to angular slightly cloudy quartz with 10% medium to medium dark grey quartz occasionally round chert quartzite grains, abundant pyritic cement. Tarry pyritic wood fragment.
Occasional brown carbonaceous siltstone.

3220-3230 SANDSTONE; white, unconsolidated poorly sorted, predominantly very coarse grained, 10% granules 5-10% dark grey quartz, quartzite, occasional chert grains, pyritic cement as above.

3230-3240 SANDSTONE; white, unconsolidated, coarse grained with 25% very coarse grains, subangular clear quartz, moderately well sorted, 5% grey quartz grains, traces quartzite grains, abundant pyrite.

3240-3250 SANDSTONE; white, unconsolidated very poorly sorted, predominantly coarse grained, 25% very coarse grained, 15% granules, scattered rounded pebbles, angular to subangular, vitreous quartz occasional grey quartz grains, rare quartzite grains, abundant pyritic cement (crystalline) probably with excellent porosity.
5% SANDSTONE; consolidated (poor porosity but consolidation is probably result of increased amount of cement)
Traces limonitic sandstone as in Core 10.

3250-3260 SANDSTONE; white to light grey as above but generally coarser with 20% granules - 25% very coarse grains, very abundant pyrite; scattered pebbles. Occasional SANDSTONE - SILTSTONE similar to that in Core 10.

3260-3270 SANDSTONE; white to light grey unconsolidated, coarse grained, 20% very coarse grains, angular to subangular vitreous quartz, with 2% grey, quartz - quartzite grains, abundant pyritic SANDSTONE pyrite, cement adhering to grains, clean, moderately well sorted.

3270-3280 SANDSTONE; white, unconsolidated, coarse grained 20% very coarse grains, 5% granules, angular to subangular quartz, traces quartzite grains, clean, moderately sorted. 5% SANDSTONE white to light grey, consolidated fine to medium grained sub-angular quartz; well cemented with crystalline pyrite, - traces kaolin, poor to fair intergranular porosity.
Very abundant pyrite cement with fragments with common pyrite crystals.

3280-3290 SANDSTONE; white to light grey very poorly sorted, medium grained to pebbly predominantly coarse to very coarse grained angular to subangular, quartz,

very abundant pyrite.
60% SANDSTONE; white to light grey, as above, in part with a silty carbonaceous clay matrix. Occasional chert and quartzite.

3290-3300 SANDSTONE; light grey, unconsolidated, very coarse (60%) to granule size, angular to subangular quartz, with some grey quartz - lithic grains, pyritic cement.
15% SANDSTONE; light grey medium grained, angular quartz, well cemented with abundant (35%) pyrite, indurated tight.
5% SILTSTONE; buff, moderately micaceous, slight to moderately carbonaceous, in part moderate to very argillaceous.
1% SANDSTONE; dark brown, poorly sorted angular to subangular quartz grains in a very abundant siderite matrix; grades to sandy siderite and in part to sandy sideritic claystone.

3300-3310 SANDSTONE; light grey to white, unconsolidated, coarse grained 20% very coarse grained to granule sized, angular, vitreous quartz, traces lithic grains, clean, moderately well sorted; pyritic cement.
5% SANDSTONE; light grey as above.

3310-3320 SANDSTONE; light grey, unconsolidated, coarse grained, 30% very coarse grained, occasionally granule, angular to subangular quartz, abundant pyrite cement.

3320-3330 SANDSTONE; light grey to white, unconsolidated, medium grained to granule size, predominantly coarse to very coarse grained angular to subangular milky quartz, traces quartzite grains, abundant pyrite.
5-10% SANDSTONE; light grey consolidated cemented with 35% pyrite cement.
Traces quartzite, chert, siltstone, siderite.

3330-3340 SANDSTONE; white, unconsolidated, coarse grained, in part (20%) very coarse grained, angular vitreous to slightly cloudy quartz, rare rose quartz, rare pink - yellow stained quartz.
5% SANDSTONE; grey, consolidated pyritic as above.
Traces coal, grey chert, quartzite.
Occasional white clean SILTSTONE; occasional carbonaceous SILTSTONE; rare siderite.

3340-3350 SANDSTONE; white, unconsolidated coarse grained, in part (15%) very coarse grained, occasional granule, angular to subangular, vitreous, in part milky quartz, traces pink and pale green quartz, traces haematite stained quartz, occasional medium to dark grey chert - quartzite grains; abundant massive pyrite - cement (crystalline pyrite). 3% SANDSTONE grey, consolidated, as above.

3350-3360 SANDSTONE; white, unconsolidated, coarse to very coarse grained, angular to subangular, vitreous quartz, occasional grey chert grains, rare quartzite rare yellow - pink quartz grains; cement is pyritic but is less abundant than in overlying sands, some carbonaceous/argillaceous cement as well.

Traces of pyritized wood fragments; trace coal.

3360-3370 SANDSTONE; white to light grey, unconsolidated, coarse to very coarse (35%) - in part granule sized (10%) , subangular vitreous to slightly milky quartz, occasional pink - yellowish quartz grains, occasional grey chert to rare quartzite grains, traces feldspar, pyritic cement, slight traces of kaolinitic - carbonaceous cement.
2% SANDSTONE; light grey, poorly sorted, fine to coarse grained quartz, pyritic to carbonaceous/ argillaceous cement, tight.
Traces brown, carbonaceous siltstone.

3370-3380 SANDSTONE; white, unconsolidated, medium to very coarse grained with occasional granules, predominantly coarse grained with 30% very coarse grains subangular, vitreous to slight milky quartz, occasional grey quartz grains - grey to dark grey chert; rare quartzite grains. Common pyrite pyritic sandstone. Traces feldspar, siderite.

3380-3390 SANDSTONE; white, unconsolidated, coarse grained subangular, vitreous, quartz with traces grey quartz - chert, brown - grey quartzite, well sorted, clean , pyritic - in part carbonaceous cement, probably less well cemented than sandstone above. 5% Massive pyrite - pyritic sandstone.

3390-3400 SANDSTONE; white, unconsolidated, predominantly coarse grained, with 25% very coarse grains - occasional granule, angular vitreous quartz, occasional grey, pink - yellow quartz grain, trace chert grains, pyritic cement. Traces siderite, brown sideritic claystone, limonitic (oolitic) sandy clay.

3410-3420 SANDSTONE; white, unconsolidated, coarse grained to granule sized (40% coarse 40% very coarse 20% granule) angular to subangular quartz, occasional grey chert - quartzite grains, pyritic cement.

3420-3430 SANDSTONE; white, unconsolidated, coarse to very coarse grained, with occasional granules, angular quartz grains with fairly common chert - quartzite grains, pyritic - in part carbonaceous cement.

BIT CHANGE LAG TIME 35 MINS

3430-3440 100% SANDSTONE; light grey unconsolidated medium to very coarse grained angular to subangular clear to slightly cloudy quartz grains with common pyrite matrix, traces chert. Pyrite cemented sandstone has occasional traces porosity. Traces sandstone fine grained to very fine grained, kaolinitic matrix, light.
Traces siltstone, dark grey, argillaceous firm with occasional laminations of very fine grained quartz sandstone.
At shaker lip sandstone unconsolidated fine to coarse grained clear to slightly cloudy angular to subrounded quartz.

3440-3450 100% SANDSTONE; unconsolidated light grey, medium

to coarse grained, occasionally very coarse grained, angular to subangular clear to slightly cloudy quartz grains, traces chert quartzite grey, traces pyrite cemented medium to coarse grained sandstone.

3450-3460 100% SANDSTONE; unconsolidated light grey medium to very coarse grained well to fairly sorted, angular to subrounded clear to cloudy quartz grains, traces chert and quartzite, grey, traces pyrite cemented medium to coarse grained sandstone.

3450-3460 100% SANDSTONE; unconsolidated light grey medium to very coarse grained well to fairly sorted, angular to subrounded clear to cloudy quartz grains traces chert and quartzite, traces pyrite cemented sandstone. Traces pink quartz. Traces sideritic matrix.

3460-3470 100% SANDSTONE; light grey unconsolidated, medium to coarse grained with 10% very coarse grains angular to subrounded clear to slightly cloudy trace pink quartz grains with traces common quartzite grey to dark grey and traces chert. Traces pyrite cemented sandstone.

3470-3480 100% SANDSTONE; light grey unconsolidated medium to very coarse grained angular to subangular as above. Traces coal, black.

N.B. Black to dark grey silty carby clay being washed out on sieve.

3480-3490 100% SANDSTONE; light grey unconsolidated medium to very coarse grained as above with 2-3% quartzite white to grey.
Common coal black, argillaceous.

3490-3500 100% SANDSTONE; light grey unconsolidated medium to very coarse grained angular to subrounded quartz grains, traces yellow and pink quartz grains common chert and quartzite traces pyrite cemented medium to coarse grained sandstone. Traces coal black, brittle with interbeds fine grained laminitic sandstone with poor porosity.

3500-3510 100% SANDSTONE; light grey unconsolidated medium to very coarse grained angular to subangular occasionally subrounded clear to slightly cloudy quartz with traces pyrite cemented quartzite and chert. Traces coal black with traces fine grained laminitic sandstone. Common light brown grey argillaceous siltstone, firm slightly carby very finely micaceous. Generally breaks up in water to soft clayey.

3510-3520 90% SANDSTONE; light grey unconsolidated medium to very coarse grained, generally coarse to very coarse grained fair to good sorting, angular to subangular clear to cloudy, with yellow and pink quartz grains, common (2-3%) quartzite and chert Traces pyrite cemented sandstone.
10% SILTSTONE, brown grey argillaceous as above.

3520-3527 85% SANDSTONE: light grey unconsolidated medium to very coarse grained as above.
15% SILTSTONE; as above, breaks up in water, possibly slightly bentonitic, blocky.

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3527-3540 SANDSTONE: light grey to buff, unconsolidated medium to very coarse grained, predominantly coarse grained, angular to subangular, vitreous, quartz, common grey to greenish grey chert - quartzite round grains, only minor amounts of pyrite.
Traces coarse grained angular sandstone in abundant brown, tough, argillaceous/silty matrix.

3540-3550 SANDSTONE; white, unconsolidated, coarse grained, occasional medium - very coarse grains, subangular vitreous to cloudy quartz, with 1-2% medium to dark grey - greenish grey quartz grains, chert quartzite. Traces bright red lithic grains; only trace of pyrite cement.
Trace fine to medium grained quartz sandstone with kaolinitic matrix.

3550-3560 SANDSTONE; white, unconsolidated predominantly coarse grained (approximately 20% medium - 5% very coarse grains) angular to subangular, cloudy quartz with 3% medium light grey quartz grains, medium to dark grey (slightly greenish) quartzite grains - occasional chert grains, moderately well sorted, traces of pyritic - kaolinitic cement.
Traces black coal; dull with conchoidal fracture
Traces sandstone light grey medium grained to coarse grained with pyritic - kaolinitic cement, tight.

3560-3570 SANDSTONE; white to light grey, unconsolidated coarse grained to granule size, (60% coarse 25% very coarse 15% granule) subangular quartz, fairly common light grey quartz grains, approximately 1% dark grey and greenish grey lithic grains.
Traces sandstone; light grey fine grained, consolidated, cemented with pyrite and kaolinite.

3570-3580 **SANDSTONE; light grey, unconsolidated as above. Traces pyrite and pyritised wood fragments.**

3580-3590 SANDSTONE; light grey, unconsolidated, medium to very coarse grained (30% medium 45% coarse 25% very course) subangular quartz, fairly common grey quartz grains, traces chert and occasional lithic grains; pyritic and carbonaceous matrix adhering to several grains.
Traces of sandy siltstone, and of very fine to fine grained sandstone with pyritic kaolinitic to carbonaceous matrix, poor intergranular porosity.

3590-3600 [illegible] coarse grained [illegible] grains, angular to subrounded vitreous quartz, occasional yellowish stained quartz grains, traces medium grey quartz grains.
Traces SANDSTONE light grey, fine grained, quartz matrix of carbonaceous matter, pyrite and in part kaolinite.
Traces pyrite.

3600-3610 SANDSTONE: white to light grey, unconsolidated coarse to very coarse grained, occasional medium grained, angular to subangular quartz, traces greenish grey, quartz and quartzite, clean, poorly sorted. Traces massive pyrite, pyritic sandstone as above, pyritised wood fragment.

3610-3620 SANDSTONE: white, unconsolidated, very poorly sorted medium grained to granule size, predominantly very coarse grained, subangular to subrounded vitreous to cloudy quartz, traces pink yellow grey quartz grains, traces quartzite (1% or less lithic grains) only rare traces of pyritic cement. Occasional pyritic sandstones, traces pyritised wood fragment.

3620-3630 SANDSTONE: white, unconsolidated, coarse grained in part (15%) very coarse grained, subangular to subrounded, quartz, occasional grey quartz grains, traces red and orange quartz grains; traces quartzite and other lithic grains, poorly sorted traces pyritic cement.
Occasional massive pyrite.

3630-3640 SANDSTONE; white, unconsolidated, coarse grained 10% very coarse grains and occasional granule, angular vitreous to milky quartz rare yellowish orange, orange and pink quartz, grains, rare dark grey lithic grains, moderately well sorted, clean. Rare massive pyrite.

3640-3650 SANDSTONE; white, unconsolidated; very poorly sorted to granule size, predominantly coarse grained angular to subangular quartz, rare pink grey and yellow quartz grains, traces greenish grey quartzite.
1% SANDSTONE; light grey, fine to medium grained quartz. kaolinitic/pyritic matrix.

3650-3660 SANDSTONE: white, unconsolidated, coarse grained in part (25%) very coarse grained with 10% granules; finer grains angular to subangular coarser grained subrounded, vitreous to milky quartz, common amber and occasional grey and pink quartz grains; traces orthoquartzite and dark lithic grains, traces of carbonaceous and pyritic matrix adhering to rare grains.
Occasional massive pyrite. Traces light grey, carbonaceous, kaoliniti siltstone and very fine grained sandstone.

3660-3670 SANDSTONE; white, unconsolidated coarse grained to very coarse grained with 20-30% granules, angular, milky quartz common yellowish pinkish and grey quartz, traces medium to dark grey quartzite and other lithic fragments, very poorly sorted, clean.
1% SANDSTONE: light grey, very fine to medium grained quartz, angular to subangular, pyritic and in slight part kaolinitic cement, fair intergranular porosity.

3670-3680 SANDSTONE: white, unconsolidated poorly sorted as above with 30-40% granules and 30-40% very coarse grains, angular quartz, occasional grey quartzite.

3680-3690 SANDSTONE: light grey, unconsolidated, very poorly sorted, predominantly very coarse grained but abundant 40% granules and occasional pebbly subrounded quartz.

3690-3700 TRIP sample (Brown clay and siltstone in teeth of pulled bit)
SANDSTONE: white, unconsolidated, predominantly coarse grained with 30% very coarse 10% medium and occasional granules, angular to subangular quartz (cloudy) occasional grey quartz and lithic grains.
1% SILTSTONE - very fine grained sandstone, light grey to white kaolinitic, in part carbonaceous.

3700-3710 100% SANDSTONE: light grey unconsolidated medium to coarse grained with 10% very coarse grains, angular to subangular and occasional subrounded clear to slightly cloudy with traces yellow to orange and greenish grey quartz grains with traces red chert, grey chert and grey quartzite. Abundant pyrite cemented medium to coarse and occasionally fine grained sandstone, traces pyrite nodules.
Traces siltstone dark grey, very argillaceous, firm traces bedding micaceous, slightly carby.

3710-3720 95% SANDSTONE; medium to very coarse grained as above with traces chert and traces pyrite cemented sandstone.
5% SILTSTONE as above.

3720-3730 95% SANDSTONE, medium to very coarse grained, generally coarse grained well sorted with common pyrite cemented sandstone, traces coal.
5% SILTSTONE as above.
Traces siltstone light grey fine to medium grained with kaolinite matrix, tight.
Traces black coal, sandy.

3730-3740 90% SANDSTONE; light grey unconsolidated medium to very coarse grained as above, generally coarse grained.
10% SANDSTONE: white hard fine to coarse grained well sorted with dolomitic/siliceous matrix. Matrix from 20-40" of rock. Tight. Sandstone occasionally has subrounded quartz granules.
Traces pyrite cemented sandstone.

3740-3750 50% SANDSTONE: light grey unconsolidated medium to coarse grained with occasional very coarse grains or granules as above.
50% SANDSTONE: white hard as above dolomite/ siliceous matrix. Common poor porosity.
Traces pyrite cemented sandstone.

3750-3760 60% SANDSTONE; light grey medium to very coarse grained as above.
40% SANDSTONE; white hard dolomite/siliceous as above with traces pyrite and occasional poor porosity.
Traces siltstone, grey argillaceous carby micaceous.

2760-2770 60% SANDSTONE; light grey unconsolidated medium to very coarse grained subangular to angular well sorted clear to cloudy quartz grains with traces chert and greenish grey quartz and quartzite, grey.
40% SANDSTONE; white hard medium to very coarse grained generally medium to coarse grained, well sorted quartz grains in a dolomitic/siliceous matrix (20-40% matrix) with traces of pyrite, chert and coal. Tight with common traces porosity.

2770-2780 60% SANDSTONE; light grey unconsolidated as above.
40% SANDSTONE; white hard fine to very coarse grained with occasional granules, sorting of individual cuttings ranges from good to poor, siliceous/dolomite matrix as above. Traces porosity.

3780-3790 80% SANDSTONE; light grey, unconsolidated as above, medium to coarse and occasionall very coarse grains with 5% granules. Common chert and quartzite.
20% SANDSTONE; white hard as above with common quartzite and chert lithic grains.
Traces black siltstone argillaceous as above.

3790-3800 70% SANDSTONE light grey unconsolidated as above.
20% SANDSTONE white as above occasionally poor porosity.
10% SILTSTONE dark grey, firm, argillaceous micaceous, slightly carby. Balls up when wet.

Uphole time approximately 33 minutes.

From lip of shaker
60% SILTSTONE dark grey very argillaceous, carby micaceous, soft when wet.
30% SANDSTONE; light grey unconsolidated fine to granule sized and with boxton pebbles.
10% SANDSTONE; dolomite/siliceous as above.

380-3810 80% SANDSTONE; light grey unconsolidated medium to very coarse grained with 5% granules and traces chert as above.
10% SANDSTONE; dolomitic/siliceous fine to coarse grained as above tight.
10% SILTSTONE; as above.
Traces sandstone fine to medium grained subrounded to subangular clear to slightly cloudy quartz in kaolin matrix. Tight.
The kaolin sandstone is slightly friable but the MOJ bit is probably breaking it up into grains and these are passing through the shaker. The sample taken at the shaker lip had approximately 60% fine to medium grains of the quartz grains.

3810-3820 80% SANDSTONE; light grey unconsolidated medium to very coarse grained well sorted angular to subrounded clear to slightly cloudy quartz grains with traces coal.
Trace pyrite cemented sandstone.
10% SILTSTONE; dark grey as above.

10% SANDSTONE; white fine to coarse grained dolomite/siliceous matrix, tight. Traces sandstone very fine to fine grained slightly carby with kaolin matrix and with traces ? glauconite.

3820-3830 80% SANDSTONE; light grey unconsolidated as above, with some fine grained quartz.
10% SILTSTONE; as above.
10% SANDSTONE white fine to coarse grained dolomite/siliceous matrix, generally tight with occasional traces porosity.
Traces kaolin matrix fine to medium grained well sorted quartz sandstone. Traces coal.
Traces pyrite cemented sandstone.

3830-3840 90% SANDSTONE: light grey unconsolidated medium to coarse grained angular to subrounded clear to slightly cloudy quartz grains.
10% SILTSTONE; as above very argillaceous, dark grey, micaceous, carby with laminations siltstone white, kaolinitic, grading to very fine grained sandstone.
Traces dolomite/siliceous sandstone, coal, pyrite cemented sandstone.

3840-3850 60% SANDSTONE; light grey unconsolidated as above, with occasional chert or quartzite pebbles
30% SILTSTONE as above dark grey carby and white slightly carby.
10% SANDSTONE hard white dolomite/siliceous matrix, medium to very coarse grained, tight.

3850-3860 60% SANDSTONE; light grey unconsolidated as above with 30% fine grains.
30% SILTSTONE; as above carby dark grey.
10% Dolomite/siliceous sandstone tight.
Traces kaolin sandstone, fine to medium grained, poor porosity. Common pyrite cemented sandstone.

3860-3870 Slow drilling. Very poor sample as a slurry of mud and very fine sand.
40% SILTSTONE, very argillaceous (a silty shale?) dark grey, carby.
60% SANDSTONE, grey, very fine grained, silty, argillaceous, firm in cuttings but generally as loose grains, micaceous, slightly carbonaceous. Argillaceous matrix, generally dirty, occasional kaolin. Tight. This lithology the siltstone shale especially, probably represents the slow drilling where it is ground up and remains in suspension in the mud.

3870-3880 50% SANDSTONE; unconsolidated light grey medium to granule, generally coarse to very coarse grained, angular to subrounded clear to slightly cloudy quartz grains with traces coal, chert, and pyrite cemented sandstone.
20% SANDSTONE; light grey to white, very fine to fine grained semi friable, well sorted clear subangular quartz grains with traces lithics green rod, common coal fragments and traces mica in an argillaceous, (kaolin) matrix approximately 30% matrix. Traces porosity but generally tight.
30% SILTSTONE; dark grey, very argillaceous as above. Carby. Common sandstone light grey to white with dolomite/siliceous matrix.

3880-3890 100% SANDSTONE; unconsolidated light grey, coarse grained with 15% medium to fine grains, clear to slightly cloudy with traces grey, orange pink subangular quartz grains with common pyrite cemented sandstone, traces quartzite, coal. Traces siltstone and fine grained sandstone as above with kaolin matrix. Rare mica flakes, white.

3890-3900 100% SANDSTONE; unconsolidated light grey coarse grained with 10% medium grains as above with traces quartzite grey, white and green, traces pyrite cemented sandstone, traces coal and traces glauconite.

3900-3910 95% SANDSTONE; unconsolidated light grey coarse to very coarse grained with 10% medium grains, an angular to subangular clear to cloudy traces yellow quartz grains, well sorted with traces pyrite cemented sandstone, greenish grey quartz grains, grey quartzite.
5% SILTSTONE; brownish grey to dark grey, firm argillaceous earthy. Traces sandstone very fine to fine grained with kaolin matrix, tight.

3910-3920 80% SANDSTONE; as above with traces quartzite and traces of carbonaceous clayey silt matrix adhering to some grains. Traces yellow and orange quartz grey chert, common pyrite cemented medium grained sandstone.
20% SILTSTONE; dark grey to grey brown, firm argillaceous laminated, earthy, slightly micaceous blocky.

3920-3930 70% SANDSTONE; light grey unconsolidated coarse grained with 10% very coarse grains and occasional medium grains, subangular to angular, clear slightly cloudy with traces orange and yellow quartz grains with common coal and pyrite cemented sandstone, traces quartzite.
20% SILTSTONE; dark grey to grey brown, firm blocky with carbonaceous laminations.

3930-3940 50% SANDSTONE; light grey unconsolidated medium to very coarse grained as above.
40% SANDSTONE; light grey to white, firm to semi friable very fine to fine occasional medium grained well sorted subangular quartz grains with 5-10% dark grey lithic grains, traces mica, 5% coal fragments and rare traces glauconite ? in a slightly dirty kaolin matrix, generally tight.
10% SILTSTONE as above.

3940-3950 80% SANDSTONE; light grey unconsolidated medium to very coarse grained mainly coarse grained, well sorted subangular to angular clear to slightly cloudy with traces orange yellow greenish and grey quartz grains with traces pyrite cemented sandstone and traces coal.
20% SANDSTONE; light grey and white very fine to fine grained as above with traces glauconite ? (a firm light green mineral - it may be chlorite) Traces siltstone as above.

3950-3960 100% SANDSTONE; light grey unconsolidated medium to very coarse grained, generally coarse grained well sorted, subangular occasionally angular or

subrounded clear to slightly cloudy with common yellowish, traces green grey quartz grains, traces pyrite cemented sandstone, traces coal, traces black rounded chert.
Traces SILTSTONE and fine grained SANDSTONE as above.

3960-3970 100% SANDSTONE; Light grey unconsolidated coarse to very coarse grained, well sorted, subangular to angular clear to slightly cloudy with common yellowish, traces orange and greenish quartz grains, traces chert, pyrite cemented sandstone and brown quartzite. Traces green clay as matrix (? glauconitic). Traces siltstone as above with coarse quartz grains. Traces sandstone semi-friable very fine to fine grained with kaolin matrix, tight.

3970-3980 100% SANDSTONE; light grey unconsolidated coarse to very coarse grained, well sorted clear to slightly cloudy, with common yellowish and greenish quartz grains, subangular to subrounded occasional angular with traces pyrite matrix, traces greenish clay matrix, traces pyrite cemented sandstone. Traces siltstone and fine grained sandstone as above.

3980-3990 100% SANDSTONE; as above with common yellowish and greenish, traces orange quartz grains and with traces dark grey chert grains.
Traces siltstone as above, grey brown, argillaceous, carby. Traces sandstone, very fine to fine grained firm, subangular clear to cloudy quartz grains with 10% grey lithics and 5% green soft mineral (glauconite ?) with 30% kaolin matrix. Tight.

RAN WELEX CABLE TYPE ELECTRIC LOG
approximately 3950 casing (740')
Plexum

Waited on orders from Melbourne

Drilling Mud at 3990
R = 2.9 ohm M² @ 60° F = 1
= 2200 ppm chlorides

1 DECEMBER 1966 - RAN THE FOLLOWING LOGS: (Schlumberger)

RUN ONE INDUCTION ELECTRICAL LOG 743-3990' K.B. 2" 5" scales
RUN ONE CEMENT BOND LOG 40-740' K.B. 2" 5" scales

3990-4000 70% SANDSTONE; Light grey unconsolidated, coarse to very coarse grained subrounded to subangular clear to cloudy and greenish quartz grains, common green clay adhering to grains, traces pyrite cemented sandstone.
20% SANDSTONE; Light grey unconsolidated coarse to very coarse grained quartz grains with siliceous matrix, occasional consolidated hard chips.
10% SILTSTONE; dark grey to black, argillaceous firm, very carbonaceous micaceous and traces firm silty shale green.

Medium blue fluorescence from many of quartz grains. Fluorescence associated with black carbonaceous deposit (in part with silty appearance) which is present in trace amounts on the grains. Possibly remnants of carbonaceous matrix. No cut in solvent. No oil staining observed. Fluorescence similar to that obtained from carbonate.

4000-4010 Poor sample volume over shaker
70% SANDSTONE; light grey unconsolidated as above with traces green clay, common pyrite cemented sandstone and traces coal, traces black quartzite.
10% SANDSTONE; siliceous hard as above.
10% SANDSTONE; fine to medium grained, light grey firm, composed of quartz, 5% coal fragments, traces to 50% green chlorite? in a kaolinitic occasional siliceous matrix, traces porosity in 50% of chips.
10% SILTSTONE; black as above.
Traces siltstone very argillaceous grey brown, slightly carby.

4010-4020 70% SANDSTONE; light grey unconsolidated, coarse to very coarse grained subangular to subrounded occasionally rounded or angular clear to cloudy with common yellowish, traces orange quartz grains, well sorted with traces kaolin matrix adhering to some grains, traces pyrite cemented sandstone, traces grey green 20% chlorite ? matrix.
30% SANDSTONE; light grey generally unconsolidated coarse to very coarse grained angular to subangular clear to cloudy quartz grains, occasionally with evidence of secondary enlargement and traces occasionally consolidated hard chips with siliceous matrix.
Traces chips of grey green firm chloritic (?) clay (shale).

4020-4030 Sample from shaker lip as little passing over shaker.
70% SANDSTONE; light grey unconsolidated fine to very coarse grained subangular to subangular quartz grains with traces coal pyrite cemented sandstone as above.
10% SANDSTONE; light grey firm, very fine to fine grained, silty composed of quartz with 5-10% carbonaceous and dark grey lithic fragments, traces green chlorite, traces to common micaceous flakes in a kaolin matrix. Generally tight with traces porosity in 20% of chips. This sandstone grades to a slightly sandy siltstone.
10% SANDSTONE; light grey siliceous as above.
10% SILTSTONE; dark grey to black, very finely sandy, very carbonaceous micaceous, argillaceous firm to hard.

4030-4040 70% SANDSTONE; light grey unconsolidated - Poor Sample - medium to very coarse grained as above with more rounded and subrounded grains, as above.
20% SANDSTONE; light grey firm very fine grained, silty as above with traces bedding. Tight.
10% SILTSTONE; dark grey to black as above occasionally dark brownish grey.

4040-4050 POOR SAMPLE
70% SANDSTONE; light grey as above with traces green chloritic clay adhering to grains.
30% SANDSTONE: light grey to dark grey, firm to very fine to fine grained, in part very silty and grading to a siltstone, carby, micaceous traces chlorite. Tight. Traces siltstone, as above dark grey to brown, in part very argillaceous.

4050-4060 70% SANDSTONE: light grey POOR SAMPLE, unconsolidated coarse to very coarse grained, angular to rounded grains clear to cloudy, traces yellowish quartz grains with common pyrite matrix sandstone, traces fine and talline pyrite aggregates, traces coal, black chert.
20% SANDSTONE; light grey firm to hard, brittle very fine to fine grained, silty, composed quartz with 10% carbonaceous lithic fragments, 5-10% green chlorite (?) common micaceous in a kaolin matrix, occasional argillaceous (matrix 20-30% of rock). Generally tight. 10% SILTSTONE: brown, argillaceous, firm, carby slightly micaceous.

4060-4070 70% SANDSTONE: light grey unconsolidated as above POOR SAMPLE
10% SANDSTONE: light grey, firm, very fine to fine grained silty as above with 20% of sample with traces porosity.
20%%SILTSTONE; brown as above very argillaceous. Traces sandstone very fine grained, brown with sideritic matrix.

From lip-spot sample at 4170.
60% SILTSTONE; unconsolidated consisting of 95% siltssized clear quartz grains and 5% carbonaceous fragments.
40% SILTSTONE; brown very argillaceous carby soft. Traces sandstone unconsolidated very fine to very coarse grained.

4070-4080 60% SANDSTONE; unconsolidated POOR SAMPLE light grey very fine to coarse grained angular to sub-rounded quartz grains as above.
20% SANDSTONE; light grey firm to hard, very fine grained, very silty, composed quartz grains with 10% lithic and carbonaceous fragments, 5% chlorite ?, common micaceous, to 5% white partly decomposed feldspar?
Tight. Grades to a siltstone.
10% SILTSTONE; light brown to dark grey as above.
10% SILTSTONE; unconsolidated quartz grains.

4080-4091 POOR SAMPLE. Contaminated by rig oils.
60% SANDSTONE, light grey unconsolidated, medium to coarse grained subangular to subrounded clear to cloudyy quartz grains as above.
30% SANDSTONE; light grey firm as above with carbonaceous streaks.
10% SILTSTONE; light brown to dark grey argillaceous as above.

4091 CORE 11

CORE No.11

4091-4102 Rec 4'2"

Macro Description

Top 1'6" SANDSTONE; discoloured by mud, medium grained with occasional carbonaceous laminations and streaks with 10° dip. Structures - laminations disturbed bedding and cross bedding. No show.

Next 10" Interlaminated siltstone green grey and carbonaceous siltstone black. 5° dip. Structures - laminations cross bedding, washouts, lenses, erosional truncations, animal burrow (?) graded bedding. Grades downward to a fine to medium grained sandstone. Between major erosional truncations the siltstone becomes more carbonaceous to the top.

Next 3" SANDSTONE; fine to medium grained discoloured by mud, no shows.

Next 1½" SILTSTONE; black with laminations at base of green grey siltstone. Structures laminations lenses. Pebble of brown sandy and very argillaceous siltstone at base - 2 cms long and tabular. Dips 3-5°.

Next 6" SILTSTONE; green grey grading downwards to a coarse grained sandstone. Common carbonaceous streaks and lenses. Structures - undulating beddings, cross bedding, graded bedding, lenses, with dips 5-25°. No shows.

Bottom 1'1½" SILTSTONE; black hard with laminations and lenses of green grey to light grey siltstone and fine grained sandstone. Dips 0-3° structures - lenses laminations, washouts, rare animal burrow, distorted bedding, bedding disturbed by compaction.

Top 1'6" SANDSTONE; brown (mud discoloured) slightly friable, fine to medium grained with occasional coarse grains and occasional very fine grains, generally well sorted. Angular to subrounded quartz grains with 3-5% carbonaceous lithic grains traces brown siltstone grains, 5% black lithic grains, traces mica flakes to 5 mms (clear) with from 5 to 25% argillaceous commonly white kaolinitic matrix. Sorting varies from fair to good, good to poor porosity. The sandstone shows poor graded bedding with the porosity decreasing as the average grain size decreases, due to the very fine grains and increase in matrix. Traces green chloritic clay in pore spaces.

Next 10" Interlaminated siltstone light greenish grey, and carbonaceous siltstone black to brown light greenish grey siltstone composed of quartz grains with to 5% light green soft mineral (chlorite or glauconite) 5% black rounded lithic grains, traces mica, common carbonaceous lithic grains, traces red to brown lithic grains, rare very fine to fine grains quartz, with an argillaceous (kaolinitic?) matrix. Black to brown siltstone, very carby with quartz grains, rare fine grained quartz grains, lithics as above. Very common carbonaceous fragments. Common laminations of carbonaceous material.

Next 3" SANDSTONE brown (mud discoloured) grades from the greenish grey siltstone above through very fine grained and fine grained, to medium grained. Conditions as top 1'6" with porosity increasing from tight at the top to good at the base.

Next 1½" SILTSTONE; black, with laminations at base of greenish grey siltstone. Siltstone black, very argillaceous with up to 50% argillaceous matter, common fine medium rounded quartz grains, abundant carbonaceous fragments, common mica flakes. Siltstone as above.

Next 6" SILTSTONE; greenish grey as above grading downward to medium grained sandstone as above with carbonaceous laminations and streaks. Sandstone has good porosity. Bottom ½" is siltstone greenish grey as above with laminations of siltstone dark brown as above and thin interbeds of fine to coarse grained sandstone, poorly sorted with up to 40% argillaceous and brown silty matrix, traces porosity to tight.

Bottom 1'1½"SILTSTONE; black grades to a very argillaceous shale black. Firm, carbonaceous, micaceous with laminations lenses etc. of siltstone, greenish as above, lenses of white siltstone with 40% kaolin matrix, and occasional burrows filled with fine to coarse grained subangular sandstone with kaolin matrix.

CORE No.12 4102' - 4114' Rec 7

2'7" **SHALE; medium dark grey, in part brownish grey, micaceous, very silty, subfissile to blocky. The shale is generally moderately carbonaceous, but includes several zones with abundant flecks and blebs of coaly material; it grades in part to very argillaceous siltstone. The unit contains about 10% interlaminated SANDSTONE; white, very fine grained, quartz, very silty, slight to moderately carbonaceous, kaolinitic matrix, tight and some interlaminated SILTSTONE. In the basal 4 inches the shale is dark grey and contains scattered fine to medium angular quartz grains. This part of the unit includes several lenses, (4 mm thick) and patches (10mm thick) of SANDSTONE; white, medium to coarse grained, angular to subangular quartz, kaolinitic matrix, tight. At 4102'4" and at 4104'4" lenses of sandstone have a matrix of pyrite, and rare nodules of pyrite are present elsewhere in the unit. Bedding dips at 2 - 4 degrees.**

---------- erosional contact ----------

0'7" **Irregular stringers and lenses of white to light grey sandstone and 20% interlaminated dark grey shale Scourse in this unit are infilled by pockets of medium light grey poorly sorted sandstone which constitutes 30% of the unit. The white to light grey sandstone very fine grained (in part fine grained), silty in part slight carbonaceous, compact, tight and consists of medium well sorted, quartz, with occasional pink and**

and green quartz grains - black lithic grains, set in a kaolinitic matrix.
The medium light grey sandstone consists of poorly sorted, very fine to coarse grained angular quartz in a compact, silty to argillaceous in part kaolinitic matrix.

0'1" Large nodule of poorly sorted, fine to coarse grained, subangular to subrounded, quartz, sandstone cemented with pyrite.

2'10" Interlaminated siltstone and sandstone (40%)

The siltstone is medium to dark grey, moderate to very carbonaceous, very argillaceous and in part grades to silty shale.

The sandstone is light grey, compact, tight and consists of very fine grained angular quartz, common pink quartz grains and abundant silt grains in a kaolinitic and in part carbonaceous matrix.

The sandstone is in part cross-laminated. Compaction structures are developed above several sandstone lenses and several burrows are present.

Bedding dips at from 4 to 5 degrees.

0'9" Irregular laminations - lenses of sandstone and 40% siltstone.
The sandstone is light grey (discoloured by mud) and consists of medium to coarse, subangular clear quartz grains, occasional pink quartz grains, in a kaolinitic matrix. The sandstone is well sorted and in places has moderate intergranular porosity.
In the uppermost part of the unit the sandstone is more poorly sorted and includes grains of granule size. In this part of the core blebs and laminae of vitreous coal (rarely replaced by pyrite) are present.
The siltstone is medium to dark grey, moderate to very carbonaceous, very argillaceous and in part grades to SHALE.

0'2" Interlaminated very fine grained, silty sandstone and dark grey, carbonaceous, silty shale.

5'0" No recovery.

4114-4120 Poor sample returns. Probably predominantly shale to siltstone as in core No.12. Sample consists of: SANDSTONE; unconsolidated light grey to buff, coarse grained, in part very coarse grained, subangular quartz, with traces of kaolinitic matrix in many grains.
Several of quartz grains have very fine to fine grains and/or silty argillaceous matrix adhering.
5% SANDSTONE; light grey, very fine grained, angular quartz, fairly common pinkish and green (chloritic?) grains, very silty, tight slightly micaceous (biotite) Traces siltstone - shale.

4120-4130 Poor sample - Described from coarser cuttings.
20% SHALE; medium brownish grey, moderate to very

silty; 5% moderately micaceous, carbonaceous chunky.
30% SILTSTONE; medium brownish grey, micaceous very fine sandy in part, moderately argillaceous, generally carbonaceous.
10% SANDSTONE; buff , fine grained, subangular quartz, moderately friable (matrix to poorly sorted quartz sandstone; which was recovered as loose grains in the finer part of sample).
50% SANDSTONE; unconsolidated, coarse grained in part very coarse grained, subangular quartz grains. Traces pyrite.

4130-4140 SANDSTONE; buff unconsolidated, medium to very coarse grained, predominantly coarse grained, subangular subrounded quartz; probably consolidated with kaolinitic matrix in subsurface.
5% SHALE brownish grey, very silty moderate to very micaceous - carbonaceous, platy.
5% SILTSTONE light brown, micaceous carbonaceous, in part argillaceous, traces glauconite, very fine sandy - grades to siltstone.
10% SANDSTONE; buff, very fine to fine grained. occasional medium grained, quartz, occasional carbonaceous grains, poor to fair sorting, friable, slightly kaolinitic matrix, slightly micaceous, commonly with moderate to good intergranular porosity. (10-13%).
Traces pyritic sandstone - white clay.

4140-4150 SANDSTONE; white to buff, unconsolidated, medium grained - granule size, predominantly coarse grained, subangular to subrounded, clear quartz, traces grey quartzite, occasional pink - yellow quartz, traces lithic grains, moderately well sorted, clean traces of pyrite cement.
5% SILTSTONE; and very fine grained sandstone, pale brown, medium to very silty - carbonaceous, micaceous, kaolinitic matrix with some green chloritic (?) grains with patches. Occasional carbonaceous laminae with chlorite patches.

4100 Lag time 41 minutes

4150-4160 Trip Sample - 415' Bit Change
100% SILTSTONE; light grey unconsolidated coarse to very coarse grained with 20% medium grains 10% granules, fair sorting rounded to subangular cloudy quartz grains with traces mica pyrite cemented sandstone, chert and carbonaceous matter. Quartz grains generally polished.
Traces sandstone light grey firm, fine grained carbonaceous lithic grains, good porosity.
Traces siltstone light green grey, quartzose, slightly carby slightly micaceous.

4160-4170 90% SANDSTONE light grey unconsolidated medium to very coarse grained as above.
10% SANDSTONE; light grey firm, very fine to fine grained silty, with 5% carbonaceous fragments, common green chlorite pellets, traces micaceous, with 30% kaolin matrix. Tight with occasional poor porosity.

4170-4180 90% SANDSTONE; light grey unconsolidated, medium to very coarse grained rounded to subrounded occasionally subangular quartz grains, polished and frosted with traces coal, chert, mica.

10% SANDSTONE; light grey firm very fine to fine grained, silty, carby, traces green chlorite ? with 20-40% kaolin matrix.

4180-4190 90% SANDSTONE; light grey unconsolidated medium to coarse grained as above subrounded to subangular
10% SANDSTONE; light grey very fine to fine grained as above.
Traces siltstone brown argillaceous carby and black carby micaceous, argillaceous.

4190-4200 70% SANDSTONE; light grey unconsolidated medium to coarse grained as above rounded to subangular
30% SANDSTONE; light grey very fine to fine grained with kaolin matrix traces coal pyrite, and traces pyrite matrix. Tight.
Traces siltstone greenish grey kaolinitic, and brown argillaceous, carby. Traces coal, black, brittle with sub conchoidal fractures.

4200-4210 80% SANDSTONE; light grey unconsolidated medium to very coarse grained as above.
20% SANDSTONE; light grey consolidated firm very fine to fine grained and fine to coarse grained composed of quartz grains subangular to subrounded with 5% carbonaceous fragments, common green lithic grains, traces red lithic specks, with a kaolinitic matrix approximate 20-30% of rock.
Generally tight with occasional traces porosity.

4210-4220 80% SANDSTONE; light grey unconsolidated medium to coarse grained with 10% very coarse grains well sorted rounded to subangular clear to slightly cloudy occasional pink or greenish quartz grains with occasional pyrite cement, traces coal.
20% SANDSTONE light grey consolidated firm, generally very fine to fine grained, occasional fine to medium grained, composed subangular to subrounded clear quartz grains with common carbonaceous matter, traces mica green and grey lithic grains, generally tight with occasional traces porosity. Traces black carby siltstone.

4220-4230 80% SANDSTONE; light grey unconsolidated as above with 20% very coarse grains.
20% SANDSTONE; consolidated as above with traces grey quartzite grains, and occasional carby streaks.

4230-4240 80% SANDSTONE; light grey unconsolidated as above with traces chert.
10% SANDSTONE; consolidated as above.
10% SILTSTONE; dark grey firm, argillaceous carby slightly micaceous.

4240-4250 50% SANDSTONE; light grey unconsolidated as above.
50% SANDSTONE; consolidated light grey, very fine to medium grained with chips generally well sorted, composed subangular to subrounded quartz grains with traces carbonaceous matter; lithic fragments, with 5-30% kaolin or siliceous matrix.
Tight with 50% poor to good porosity.

4250-4260 40% SANDSTONE; medium to very coarse grained light grey unconsolidated rounded to subangular quartz grains, well sorted with traces pyrite.

60% SANDSTONE consolidated light grey, generally fine grained fine to coarse grained well sorted quartz grains with 5-10% carbonaceous matter, common mica, traces pyrite matrix, to 5% grey and green lithic grains in a generally kaolin matrix, occasional siliceous matrix. Tight with 60% poor to good porosity.

4260-4270 30% SANDSTONE; unconsolidated light grey coarse to very coarse grained rounded to subrounded quartz grains.
60% SANDSTONE; consolidated as above 50% with poor porosity.
10% SILTSTONE; brown to black firm argillaceous slightly sandy carby blocky.

4270-4280 30% SANDSTONE; unconsolidated medium to very coarse grained well sorted subangular to subrounded quartz grains with traces pyrite, coal, yellowish quartz, chert.
60% SANDSTONE; consolidated light grey to white. Very fine to fine grained occasional medium grained or silty well sorted quartz with traces pyrite, common carbonaceous matter, traces mica, with 10-30% kaolinitic or argillaceous matrix. Generally tight with 30% poor to trace porosity.
10% SILTSTONE; dark brown to black very carby argillaceous in part slightly sandy, firm, traces bedding.

4280-4290 30% SANDSTONE; light grey unconsolidated coarse to very coarse grained well sorted rounded to subrounded quartz grains as above traces pyrite cemented sandstone.
60% SANDSTONE; consolidated firm to friable, very fine to fine occasional medium grained, light grey to white clean. White variety composed of quartz with traces carbonaceous fragments, 10% kaolin matrix and good porosity. Light grey variety composed quartz 5-15% carbonaceous fragments, common green mineral soft, traces mica grey lithic grains with 20-30% argillaceous and slightly silty, generally kaolin matrix, tight with some poor porosity.
10% Siltstone as above very carby.

4290-4300 20% SANDSTONE; ligth grey unconsolidated as above.
60% SANDSTONE; consolidated as above.
20% SILTSTONE; brown to black argillaceous, slightly sandy, slightly micaceous grades to very fine grained sandstone.

4300-4310 30% SANDSTONE; light grey unconsolidated coarse to very coarse grained quartz.
60% SANDSTONE; consolidated, generally fine to very fine grained, with kaolin matrix.
Tight with 30% ofsample with poor porosity.
10% SILTSTONE; black to dark grey, very carby as above. Common coal.

4310-4320 30% SANDSTONE; light grey unconsolidated, coarse to very coar grained as above.
70% SANDSTONE; consolidated white to light grey, very fine to fine grained, in part silty as above generally with poor to traces porosity.

4320-4330 40% SANDSTONE; unconsolidated light grey coarse to very coarse grained rounded to subrounded clear to slightly cloudy quartz grains.
50% SANDSTONE; light grey to white firm to friable very fine to fine grained, occasional silty and grading to a siltstone, composed of quartz with 0-5% carbonaceous fragments and 0-5% lithic grains traces mica, generally with traces porosity occasional good porosity.
10% SILTSTONE; light grey grading from very fine grained sandstone above.
Traces pyrite cemented very fine grained sandstone.
Traces brown limestone.

4330-4340 30% SANDSTONE;Unconsolidated light grey coarse to very coarse grained, rounded to subangular quartz as above.
50% SANDSTONE; light grey etc. consolidated as above. Tight with occasional poor porosity.
20% SILTSTONE; light grey to black as above in part very argillaceous and carbonaceous.

4340-4350 20% SANDSTONE; unconsolidated light grey coarse to very coarse grained rounded to subrounded quartz as above.
60% SANDSTONE; consolidated as above.
20% SILTSTONE; as above.

4350-4360 20% SANDSTONE; light grey unconsolidated coarse to very coarse grained as above.
50% SANDSTONE; light grey to white, often very carby very fine to fine grained, often very silty as above, generally tight.
30% SILTSTONE; grading from the sandstone, generally very carby with carbonaceous streaks, in part argillaceous.

4360-4370 20% SANDSTONE; unconsolidated coarse to very coarse grained rounded to subrounded as above.
40% SANDSTONE; consolidated as above in part very carby and slightly micaceous.
40% SILTSTONE; as above with common dark grey very carby and argillaceous, slight micaceous.
Traces limestone brown massive argillaceous as above.

4370-4380 90% SANDSTONE: unconsolidated light grey coarse to very coarse grained with 10% medium grains, rounded to subangular clear to slightly cloudy quartz grains with common coal, traces grey green clay, traces pyrite cemented sandstone.
10% SANDSTONE; consolidated as above in part very carby.

4380-4390 80% SANDSTONE; light grey unconsolidated coarse to very coarse grained well sorted rounded to subangular quartz grains with traces coal.
10% SANDSTONE; light grey to white firm in part friable very fine to fine grained often silty with 5-10% carbonaceous material common green and grey lithic grains, traces mica, with 20-30% kaolin, slightly dirty, matrix generally tight. with 20% poor porosity.
10% SILTSTONE; green grey and brown, green grey grades from sandstone as above, brown is very argillaceous and carby, slight micaceous, blocky.

4390-4400 60% SANDSTONE; light grey unconsolidated as above.
20% SANDSTONE; consolidated as above.
20% SILTSTONE as above.

4400-4410 50% SANDSTONE: light grey unconsolidated, coarse to very coarse grained rounded to subangular as above.
30% SANDSTONE consolidated very fine to fine grained as above.
20% SILTSTONE as above.
Traces claystone grey green hard, massive.

4410-4420 85% SANDSTONE, unconsolidated coarse to very coarse grained rounded to subrounded well sorted quartz grains.
10% SANDSTONE; consolidated tight as above.
5% Claystone; as above.

4420-4430 100% SANDSTONE; unconsolidated light grey coarse to very coarse grained with 5-10% medium grains rounded to subangular clear to slightly cloudy with common yellowish quartz grains, traces sandstone consolidated, siltstone, claystone as above and glauconite.

4430-4440 95% SANDSTONE; unconsolidated as above with common grey quartz grains.
5% SILTSTONE; dark grey carby argillaceous micaceous
Traces claystone, sandstone consolidated as above.

4440-4450 100% SANDSTONE; unconsolidated light grey as above with 10% grey quartz grains and traces grey quartzite. Traces glaunconite with pyrite cross tabular. Common grey silty shale micaceous.

4450-4460 85% SANDSTONE; light grey unconsolidated coarse to very coarse grained well sorted rounded to subrounded clear to slight cloudy with 10-15% grey quartz grains, traces mica, traces pyrite matrix sandstone. Traces grey quartzite.
10% SILTSTONE; grey very argillaceous micaceous, slight carby grades to shale.
5% SANDSTONE; light grey consolidated very fine grained tight with kaolin matrix.

4460-4470 90% SANDSTONE; light grey as above with 10% grey quart.
5% SHALE; grey silty blocky slightly micaceous slightly carby.
5% SANDSTONE; very fine grained tight as above.

4470-4480 70% SANDSTONE; light grey unconsolidated as above with 5% grey quartz grains.
20% SANDSTONE; light grey to white, very fine grained, silty composed of quartz grains with 5% carbonaceous matter, traces grey lithic in 20-40% kaolin, ofter very dirty matrix. Tight.
10% SILTSTONE; grey, very argillaceous micaceous carby grades to a shale.

4480-4490 50% SANDSTONE; light grey unconsolidated as above with traces grey quartz grains.
40% SANDSTONE; light grey to white consolidated very fine grained to occasional fine grained as above in part with green grey hard clay matrix.
10% SHALE; grey green, pyritic massive.

Traces siltstone as above.

4490-4500 50% SANDSTONE; light grey unconsolidated coarse to very coarse grained with 10% granules, rounded to subrounded quartz grains as above.
40% SANDSTONE light grey consolidated very fine to fine grained as above carby.
10% SILTSTONE; grey as above.

4500-4510 70% SANDSTONE; unconsolidated coarse to very coarse grained with 5% medium grains and 10% granules rounded to subangular quartz grains.
20% SANDSTONE; light grey consolidated as above, generally tight with kaolin matrix. Occasionally with pyrite matrix. Silty.
10% SILTSTONE; grey to light grey as above.

4510-4520 70% SANDSTONE; unconsolidated coarse to very coarse grained with 10% granules as above.
10% SILTSTONE: light grey, grades from very fine grained sandstone very carby.

4520-4530 80% SANDSTONE; unconsolidated light grey coarse to very coarse grained with occasional medium grains and granules, rounded to subangular clear to slightly cloudy quartz grains, traces pyrite cemented sandstone, traces coal.
20% SANDSTONE; light grey firm very fine to fine grained occasional silty. Tight with kaolin matrix. Consists of quartz grains with 10% carbonaceous fragments, traces grey lithics traces mica.

4530-4540 80% SANDSTONE; unconsolidated light grey as above.
20% SANDSTONE; light grey firm, with traces of grey to green grey clayey matrix.

BIT CHANGE 4542

4540-4550 SANDSTONE; light grey, sand buff, unconsolidated coarse to very coarse grained, subrounded quartz generally cloudy, traces of argillaceous matrix adhering to grains, rare lithic grains, moderately well sorted.
20% SILTSTONE; medium light grey-brown, moderately to very carbonaceous, in part moderate to very argillaceous, micaceous, in part white - only slightly carbonaceous common green grains.
15% SHALE; medium grey, very micaceous, carbonaceous silty.
Occasional pyrite. Fairly common mica flakes.

4550-4560 SANDSTONE; light grey, as above.

30% SANDSTONE; white to light grey slightly greenish, very fine grained, in part fine to grained, subangular quartz, common green grains blebs (chloritic). Fairly common pyrite, generally moderate micaceous - carbonaceous, kaolinitic matrix, moderate to very silty - grades to very fine sandy siltstone. Kaolinitic matrix, good porosity.
15% SILTSTONE; light grey medium brownish grey, very fine sandy, carbonaceous, argillaceous.
5% SHALE; dark greyish brown, very micaceous moderate carbonaceous, in part moderately to very silty, sub fissile.
Occasional pyrite.

Occasional pyrite. Occasional shale as above.

4570-4580 SANDSTONE; white to buff, unconsolidated predominantly medium to coarse grained, subangular to subrounded cloudy quartz, moderately well sorted, rare yellowish - or grains, or grains, traces of pyrite - greenish clay - more common kaolin adhering to grains.
20% SANDSTONE; white to light grey, very fine to fine grained, subangular to subrounded quartz, fairly common pink - grains, generally moderately micaceous (biotite muscovite) slight to moderate carbonaceous, silty, with abundant kaolinitic argillaceous matrix, with some chlorite.
15% SILTSTONE; laminae, medium dark brown, very micaceous (biotite), moderate to very chloritic argillaceous.
Occasional light green clay, occasional pyrite.

4580-4590 SANDSTONE; light grey to buff, unconsolidated, coarse to very coarse, subangular to subrounded, cloudy quartz.
60% SANDSTONE; light grey very fine grained angular to subangular quartz, 5% green rod - black lithic grains or pellets, moderately well sorted, friable earthy porosity.
5% SILTSTONE; as above.

4590-4600 SANDSTONE; light grey, unconsolidated, prodominantly course to very coarse grained, subangular to subrounded slightly cloudy quartz with common clear polished round grains, many yellowish, occasionally orange tinted quartz, green well sorted clean.
55% SANDSTONE; light grey, very fine grained, rarely fine grained, and to subangular quartz, occasional round grains, common grains green, spex (chlorite ?), common black diotite - carbonaceous grains, very moderately micaceous (muscovite & biotite) very silty, siliceous cement, good earthy porosity.
5% SILTSTONE; medium grey to brown, carbonaceous laminations, biotate rich laminations.
Occasional pyrite, occasional green (chloritic?) clay.

4600-4610 SANDSTONE; light grey unconsolidated as above with 10% yellowish orange coloured grains.
40% SANDSTONE; as above very silty, abundant greenish spar - grains, good earthy porosity abundant 4% intergranular porosity grades to,
20% similar siltstone.

4610-4620 SANDSTONE; light grey, unconsolidated predominantly course grained, in part 20% very coarse grained subangular to subrounded slightly cloudy quartz, about 10% of grains with yellowish tint, many others with slightly pink tint, well sorted clean, pyritic/kaolinitic/chloritic cement (?)
7% SANDSTONE; very fine grained as above to fine to medium subangular quartz cemented with green to brown argillaceous cement and showing good intergranular porosity.
3% SILTSTONE; medium grey to brown, carbonaceous very micaceous (predominantly biotite) abundant grain spar, moderately argillaceous, generally very sandy (very fine grained).

4620-4630 SANDSTONE; light grey, as above with 20-25% coloured grains, occasional consolidated chips indicate that matrix is greyish green (chloritic?) clay.
5% SANDSTONE; greenish grey, very fine to fine grained quartz, greenish grey argillaceous matrix, generally tight.
2% SILTSTONE; brown, argillaceous silty micaceous.
Traces pyrite, micaceous silty shale, greenish grey clay.

4630-4640 SANDSTONE; light greynto white, unconsolidated, predominantly coarse grained, 20% very coarse grains, 5% medium grains, subangular to subrounded, cloudy quartz,
30% of grains with yellowish or yellow coloration or less commonly with pink colour, moderately well sorted, clean, traces pyrite, kaolin green clay adhering to many grains.
5% SANDSTONE; grey greenish grey, very fine to fine grained quartz, micaceous, silty, green to brown, argillaceous matrix, in part with fair (5%) intergranular porosity.
Occasional pyrite, occasional siltstone, brown silty very carbonaceous, micaceous slight laminae.

4640-4650 SANDSTONE; light grey, slightly yellowish, unconsolidated, predominantly coarse grained, subangular quartz as above.
10% SILTSTONE; medium grey to brownish grey, moderate to very carbonaceous in part chloritic moderate to very micaceous argillaceous, grades to.
2% SHALE; dark greyish brown, silty, carbonaceous micaceous.
3% SANDSTONE; as above poorly sorted.

4650-4660 Lithology percentages approximately as above.

4660-4670 SANDSTONE; light grey, slightly yellowish, unconsolidated, coarse grained occasionally very coarse grains, subangular to subrounded, predominantly cloudy, quartz, grains, 10% amber, yellow pink quartz grains, well sorted, greenish grey argillaceous matrix.

3% SANDSTONE; medium light greenish grey, very fine to fine grained quartz, micaceous carbonaceous, kaolinitic to chloritic ?/argillaceous matrix, in part with fair intergranular porosity.
2% SILTSTONE; medium light grey brownish grey, very fine sandy.
1% CLAY: light greyish green micaceous, silty.

4670-4680 SANDSTONE; white, unconsolidated, coarse to very coarse grained subangular, clear to cloudy quartz, 20-25% amber - yellowish grains with occasional pink red grains,
5% SANDSTONE; as above in part poorly sorted with scuffed medium grains, and abundant matrix (sandstone is probably matrix to unconsolidated sandstone above).
5% SILTSTONE; shale; sandy, carbonaceous micaceous.

4680-4690 65% SANDSTONE; light grey, unconsolidated as above.
25% SANDSTONE; consolidated, light grey, very fine grained, in part fine grained, subangular to subrounded quartz, fairly common green grains, common black mica and/or carbonaceous grains, moderate to very silty, slightly argillaceous, generally tight to grades to.
10% SILTSTONE; light grey brownish grey, moderate to very micaceous carbonaceous, moderate to very sandy (very fine - occasionally fine grains) Occasional brownish grey, very carbonaceous micaceous silty shale.

4690-4700 40% SANDSTONE; light grey, unconsolidated, coarse to very coarse grained, subangular in part subrounded, clear quartz grains, common amber, yellowish - occasional pink tinted grains.
40% SANDSTONE; consolidated, light grey, very fine to fine grained, angular to subangular quartz, some pink quartz grains, occasional white, green clay grains, friable moderately well sorted, silty to argillaceous (kaolinitic in part chloritic) matrix, carbonaceous micaceous in part and grades to very fine grained sandstone as in section above.
20% SILTSTONE; medium light grey medium brown, very sandy (very fine - fine grained), carbonaceous/ argillaceous micaceous grades to silty very fine sandstone.

4700-4710 60% SANDSTONE; light grey unconsolidated as above with abundant amber yellowish grains.
30% SANDSTONE; medium light grey, very fine to fine grained, subangular quartz, poorly sorted, moderately silty, argillaceous (brown) matrix, in part clean, slightly micaceous slightly carbonaceous in part, traces intergranular porosity grades to .
10% SILTSTONE; light grey to medium ligth brown, moderately micaceous, very carbonaceous generally very sandy in part argillaceous - grades to silty shale.

4710-4720 50% SANDSTONE; light grey, slightly yellowish, unconsolidated, coarse grained, in part very coarse grained, cloudy quartz, common coloured quartz grains.

30% SANDSTONE; as above
20% SILTSTONE; as above.

4720-4730 35% SANDSTONE; medium light yellowish grey, unconsolidated, coarse grained, in part (20%) very coarse grained, subangular to subrounded quartz, occasional amber, orange - yellowish quartz,
35% SANDSTONE; light grey very fine to fine grained, occasionally medium grains, subangular to subrounded quartz, compact, moderately friable, slightly micaceous - argillaceous, siliceous cement, poor to fair (4%) intergranular porosity.
10% SILTSTONE; as above.

4730-4740 SANDSTONE; light yellowish grey, unconsolidated, coarse grained, in part (15%) very coarse grained, subangular quartz, fairly common amber - yellow quartz grains.
25% SANDSTONE; as above, being in part moderately to very silty, generally more carbonaceous than above, only poor intergranular porosity evident
5% SILTSTONE; as above.
5% SHALE; medium greyish brown, moderate to very carbonaceous - micaceous, silty, platy.

4740-4750 SANDSTONE; light grey, unconsolidated, coarse grained as above.
35% SANDSTONE; very light grey, very fine to medium (predominantly fine) grained, subangular quartz, very slightly micaceous - slightly carbonaceous in part, well consolidated, slight to moderately friable, siliceous cement poor intergranular porosity.
10% SANDSTONE; light grey, carbonaceous aaaat 4730-4740.

4750-4760 95% SANDSTONE; white, unconsolidated coarse to very coarse grained, subangular to subrounded clear to slightly cloudy, quartz, fairly common amber, yellow pink - orange quartz grains, well sorted, clean.
5% SANDSTONE; as above.
Traces siltstone, carbonaceous very fine grained sandstone; pyrite - carbonaceous shale.

4760-4770 SANDSTONE; white, unconsolidated, coarse grained with 30% very coarse grains, occasional granules subangular, in part subrounded, predominantly clear quartz moderately well sorted, clean, common amber, pink - orange quartz grains.
2% sandstone-siltstone-shale
Traces of pyrite.

4770-4780 SANDSTONE; white, unconsolidated, coarse to very coarse grained (50%-50%), subrounded to rounded, clear to slightly cloudy quartz, trace crystalline pyrite.
1% very fine to fine grained sandstone, carbonaceous clay, siltstone.

4780-4790 SANDSTONE; white, unconsolidated as above, traces chert and quartzite grains.
3-5% SILTSTONE; medium grey to brown, micaceous argillaceous.
2% SANDSTONE; grey, very fine to fine grained,

silty, argillaceous tight, moderately carbonaceous, slightly chloritic clay matrix.
Occasionally poorly sorted sandstone cemented with pyrite.

4790-4800 SANDSTONE; light grey, unconsolidated, coarse grained, subrounddd quartz, occasional pink, orange - yellow grains.
20% SANDSTONE; light grey, very fine to fine grained, predominantly very fine grained, sub-angular quartz, moderate to very silty, slightly to moderately micaceous, slightly carbonaceous, argillaceous (in part chloritic matrix) generally tight.
Occasional SILTSTONE; traces green chloritic clay.

4800-4810 SANDSTONE; white, unconsolidated coarse grained, in part (20%) very coarse grained, subrounded clear to cloudy quartz, common tinted quartz grains, traces chert - jasper, clear, well sorted, traces of green argillaceous matrix on many of grains.
Traces sandstone; very fine to fine grained as above.

4810-4820 SANDSTONE; white, unconsolidated as above, abundant, amber, yellow - pink quartz grains.
1% very fine grained sandstone, brown carbonaceous shale - siltstone.

4820-4830 SANDSTONE; white to light grey, unconsolidated, coarse grained, (25% very coarse grains - occasional medium grains) subangular to subrounded clear quartz, 10% amber, yellow - orange quartz grains, greyish green argillaceous matrix, adhering to many grains, moderately well sorted clean.
5% SILTSTONE; very fine grained sandstone medium greyish brown traces green grains, moderate carbonaceous.
5% SANDSTONE; light grey very fine to fine grained subangular quartz, argillaceous/chloritic matrix tight.

4830-4840 Lithology - percentages as above.

4840-4850 SANDSTONE; light grey, unconsolidated, coarse to very coarse grained, occasional medium grains, subangular to subrounded, quartz, 10% amber orange - pink quartz, grains, moderately well sorted.
15% SANDSTONE; light grey, very fine to medium grained, predominantly fine grained, subangular quartz, occasionally green - white clay grains carbonaceous grains, trace round grains, very poorly sorted, moderately friable, argillaceous/ siliceous cement poor porosity.
10% SILTSTONE; medium brown, very micaceous, carbonaceous, very argillaceous, grades to SHALE
Occasional medium light grey - brownish grey soft shale.

4850-4860 SANDSTONE; white to light grey unconsolidated, as above.
10% SANDSTONE; light grey, dirty, very fine to medium grained, as above.
5% SILTSTONE; as above.
Occasional grey clay - brown shale.

4860-4870 SANDSTONE; as above predominantly coarse grained
5% SANDSTONE; similar to above.
5% SILTSTONE; as above grading to silty shale.
Common poorly sorted sandstone with abundant pyrite matrix.

4870-4880 SANDSTONE; as above.
10% SANDSTONE; light grey to greyish brown, very fine to fine grained, quartz, very silty, occasionally green chlorite (?) grains - blobs, in part carbonaceous, in part pyritic, silty to argillaceous matrix, earthy porosity - poor intergranular porosity.
Traces pyrite - pyrite cemented sandstone; occasionally carbonaceous clay - siltstone.

4880-4900 No samples. Totco dropped before sample completely circulated up.

EXT CHANGE 4904
4.12.66.

4900-4910 70% SANDSTONE; unconsolidated coarse to very coarse grained rounded to subangular clear to slightly cloudy occasionally light grey well sorted quartz grains, traces mica, pyrite cemented sandstone, traces black quartzite, traces veined chert.
20% SANDSTONE; light grey to white, occasionally dirty, very fine to fine grained, well sorted composed of quartz grains with 0-5% carbonaceous matter, 0-5% green and grey lithic grains, traces mica, traces green soft chlorite ? with generally a kaolin matrix, occasionally with a calcareous matrix. Generally tight.
10% SILTSTONE; dark grey, very earby slightly sandy slight micaceous with a greenish clayey matrix.

4910-4920 70% SANDSTONE; unconsolidated as above with common green clay adhering to grains. Some consolidated chips, with green matrix, tight.
10% SANDSTONE; consolidated very fine to fine grained, in part silty as above.
20% SILTSTONE; grade to shale greenish black with very carby with green chloritic clay matrix.

4920-4930 50% SANDSTONE; unconsolidated medium to very coarse grained rounded to subangular well sorted clear to cloudy with common grey, traces yellowish quartz grains. traces quartzite, mica, pyrite matrix sandstone, with traces of green clay matrix.
30% SANDSTONE; white to light green very fine to fine grained, slightlysilty as above with kaolin matrix or green clay matrix, tight. In part very carby.
20% SILTSTONE; dark grey to black carby micaceous, very argillaceous with occasional green clay matrix. Common clayey green slightly carby.
Interbeds of very fine grained sandstone and siltstone.

4930-4940 50% SANDSTONE; coarse to very coarse grained unconsolidated as above with common green clay matrix.
20% SANDSTONE; very fine grained with kaolin or calcareous/siliceous matrix with occasional green clay pellets or some green clay matrix.
30% SILTSTONE; dark grey, sandy very carby with kaolin matrix or occasionally with green clay matrix to grades to very fine sandstone, silty.
Common clay grey green, slightly micaceous slightly carby.
Traces brown very argillaceous siltstone.

4940-4950 60% SANDSTONE; unconsolidated coarse to very coarse grained with occasional granule.
20% SANDSTONE; very fine to fine grained light grey to white, kaolin matrix tight with 10% calcareous/siliceous matrix tight with occasional traces porosity.
10% SILTSTONE; dark grey to black, very carby very micaceous, very argillaceous with occasional green clay pellets or matrix as above.

4950-4960 40% SANDSTONE; unconsolidated medium to very coarse grained as above traces green clay matrix, traces chert.
40% SANDSTONE; light grey to white very fine to fine grained, angular to subrounded quartz grains with trades coal, mica, green clay pellets with 20-30% kaolin occasional dirty, matrix.
Tight with 30% sample with traces porosity.
20% SILTSTONE; dark grey, firm very carby, argillaceous micaceous, occasional green clay pellets.

4960-4970 40% SANDSTONE; unconsolidated, with traces green clay and kaolin matrix.
40% SANDSTONE; light grey very fine to fine grained as above, 20% traces porosity.
20% SILTSTONE; dark grey as above.

50 minutes lag time

4970-4980 60% SANDSTONE; light grey unconsolidated coarse to very coarse grained rounded to subangular clear to slightly cloudy with common yellowish and orange quartz grains, traces green clay matrix.
30% SANDSTONE; light grey, very fine to fine grained slightly silty with quartz grains -0-5% green clay pellets 0-5% carbonaceous fragments with a kaolin matrix. Generally tight with 10% sample with traces porosity, traces mica.
10% SILTSTONE; dark grey carby argillaceous micaceous slightly sandy with common green clay pellets.

4980-4990 60% SANDSTONE; light grey unconsolidated as above with traces pink quartz.
30% SANDSTONE; light grey very fine to fine grained as above.
10% SILTSTONE; as above.
Common green clay.

4990-5000 50% SANDSTONE; light grey as above with traces brown chert.
40% SANDSTONE; light to dark grey as above with dirty kaolin matrix.
10% SILTSTONE; as above slightly sandy (very fine to coarse grains)
Traces green clay. Traces glauconite (?) in siltstone.

5000-5010 50% SANDSTONE; light grey unconsolidated coarse to very coarse grained rounded to angular clear to slightly cloudy with common yellowish quartz grains, with traces pyrite cemented sandstone, traces green clay matrix.
30% SANDSTONE; light to dark grey very fine to fine grained with rare medium to very coarse quartz grains, with to 5% carbonaceous fragments, common green clay pellets (chlorite with possibly some glauconite), traces mica in a greyish dirty kaolin matrix comprising 20-45% of rock, tight.
Traces felspar.
20% SILTSTONE; dark grey very carby as above, well bedded. Traces shale mid grey firm sandy.
Indications of thin interbedding and laminations of very fine grained sandstone and siltstone.

5010-5020 50% SANDSTONE; unconsolidated asabove with traces pyrite cemented sandstone.
30% SANDSTONE; light to dark grey very fine to fine grained with dirty kaolin matrix, tight.
20% SILTSTONE; as above, traces green clay.

5020-5030 40% SANDSTONE; light grey unconsolidated to very coarse grained well sorted with 10% granules rounded to subangular clear to slightly cloudy with 25% yellowish quartz grains, traces green clay matrix.
50% SANDSTONE; very fine to medium grained well sorted quartz with traces kaolinised felspar, green clay pellets, common carbonaceous fragments, rare mica, in part very carby with clayey kaolin matrix, tight.
10% SILTSTONE; dark grey, very carby, argillaceous in part sandy, micaceous. Exists interbedded with the sandstone.

5030-5040 60% SANDSTONE; light grey unconsolidated as above with traces pink quartz.
30% SANDSTONE; consolidated very fine to medium grained with 20-40% kaolin clay matrix, tight.
10% SILTSTONE; as above with common green clay pellets.

5040-5050 60% SANDSTONE; unconsolidated medium to very coarse grained with 15% yellowish quartz grains, traces grey green clay matrix.
35% SANDSTONE; light to medium grey, in part very carby, very fine medium grained, tight as above.
5% SILTSTONE; as above.

5050-5060 50% SANDSTONE; unconsolidated medium to very course grained as above traces brown quartz with traces brown chert.
40% SANDSTONE; very fine to fine occasionally medium grained with kaolin clayey matrix, tight.
10% SILTSTONE; dark grey to medium grey, micaceous very carby occasionally finely sandy.

5060-5070 70% SANDSTONE; unconsolidated medium to very coarse grained rounded to subangular clear to slightly cloudy with traces red, yellowish quartz grains with traces grey green silty clay matrix.
20% SANDSTONE; very fine to fine grained as above with common green clay pellets.
10% SILTSTONE; as above.

5070-5080 70% SANDSTONE; unconsolidated as above with traces orange quartz.
20% SANDSTONE; as above with traces glauconite ?
10% SILTSTONE; as above very carby.
Traces clay grey slightly silty, green.

5080-5090 60% SANDSTONE; light grey unconsolidated coarse to very coarse grained rounded to subangular clear to slightly cloudy with traces orange and common quartz grains, traces pyrite cemented sandstone, traces green and grey silty clays as matrix.
30% SANDSTONE; very fine to fine grained with occasional medium to very coarse grains well sorted light to mid grey, subangular to subrounded quartz with 0-10% carbonaceous matter, to 5% green clay pellets, traces mica in a dirty kaolin clay matrix. Tight.
10% SILTSTONE; dark grey dirty, very argillaceous, very carby, slightly micaceous, occasional kaolinitic, with green clay pellets, interbedded with very fine to fine grained sandstone.
Traces grey clay, silty, blocky, sandy.

5090-5100 70% SANDSTONE; light grey unconsolidated as above with traces chert, red and orange quartz, pyrite cemented sandstone.
20% SANDSTONE; very fine to fine grained, grey as above tight.
10% SILTSTONE; dark grey to black as above very carby, occasionally sandy, occasionally very micaceous, with matrix fine mid gray clay.
Traces clay, grey, slightly sandy, silty, blocky firm.

5100-5110 80% SANDSTONE; light grey unconsolidated coarse to very coarse grained with 10% medium grains rounded to subangular well sorted clear to cloudy with traces orange, red, pink and common yellowish quartz grains, with green grey clay matrix adhering to grains.
10% SANDSTONE; very fine to fine grained slightly silty, grey, well sorted quartz grains, very carby slightly micaceous, tight with grey to light grey clayey matrix.
10% SILTSTONE; as above generally very carby, in part very argillaceous and very finely micaceous.

5110-5120 20% SANDSTONE; light grey as above with traces grey and brown quartz grains.
20% SANDSTONE; grey very fine to fine grained as above in part with medium to very coarse quartz grains, silty. Tight.
10% SILTSTONE; as above grades to very fine grained sandstone.

5120-5130 60% SANDSTONE; light grey unconsolidated rounded to subangular, coarse to very coarse grained with 10% granules, well sorted clear to slightly cloudy, common yellowish, with traces orange, red and grey quartz grains, traces pyrite cemented sandstone, with common green grey clay matrix. Traces grey chert.
30% SANDSTONE; very fine to fine grained, with occasional medium grains well sorted subangular to subrounded clear to slightly cloudy quartz grains with very common carbonaceous matter, common green pellets, in a clayey matrix, tight. Occasional grains clean with kaolin matrix, strong porosity, slightly micaceous.
10% SILTSTONE; dark grey to black very argillaceous in part very finely sandy, very carbonaceous, micaceous with occasional green clay pellets.

5130-5140 50% SANDSTONE; unconsolidated as above.
50% SANDSTONE; consolidated as above with kaolin clayey matrix, tight.

5140-5150 60% SANDSTONE; unconsolidated fine to very coarse grained rounded to angular quartz grains as above
30% SANDSTONE; very fine to fine grained as above with common grey green clay pellets.
10% SILTSTONE; dark grey argillaceous very carbonaceous slightly micaceous as above.

5150-5160 80% SANDSTONE; unconsolidated medium to very coarse grained, rounded to subangular as above.
20% SANDSTONE, very fine to fine grained, with kaolin or green grey clay matrix, tight.

5160-5170 80% SANDSTONE; medium to very coarse grained unconsolidated as above with common yellowish quartz grains, traces orange quartz grains.
10% SANDSTONE; very fine to fine grained tight as above.
10% SILTSTONE; dark grey to black, carby micaceous, very finely sandy, well bedded as above.

5170-5180 70% SANDSTONE; fine to very coarse grained poorly sorted unconsolidated as above.
20% SANDSTONE; very fine to fine grained as above silty.
10% SILTSTONE; as above grades to very fine grained sandstone, very carby.
Traces clay grey, silty, very finely sandy.

5180-5190 SANDSTONE; buff, unconsolidated very poorly sorted, fine to very coarse grained, predominantly coarse grained, subrounded, in part rounded cloudy quartz, common yellowish, cream and amber quartz grains, occasionally orange quartz grains, traces brown and grey quartzite granules,
10% SANDSTONE; light grey, very fine to fine grained, angular to subangular quartz, common green clay grains, slightly to moderately carbonaceous flecked, occasionally micaceous, friable, kaolinitic to silty matrix, good earthy porosity.
5% SILTSTONE; medium dark brown, in part grey, moderate to very sandy (very fine to fine grains) moderate to very micaceous, generally carbonaceous.

2% SHALE; medium brown, very micaceous and silty. Traces pyrite. Slow drilling due to argillaceous matrix ?.

5190-5200 SANDSTONE; light grey, unconsolidated fine grained to granule size, predominantly coarse grained, (80%) and very coarse grained (10%) subrounded quartz, predominantly milky, but fairly common vitreous grains, fairly common (but much fewer than above) tinted grains, majority of grains retain traces of soft green argillaceous matrix.
2% SANDSTONE & SILTSTONE; as above.
Slow drilling due to argillaceous matrix.

5200-5210 SANDSTONE; light grey, unconsolidated, medium to very coarse grained, predominantly coarse grained, subrounded cloudy quartz, 2% tinted grains, traces volcanic grain, remnants of green argillaceous matrix on many grains.
2% SANDSTONE; as at 5180-5190.
1% SILTSTONE; as above.

5210-5220 SANDSTONE; light grey to buff, unconsolidated, coarse grained to granule size, predominantly coarse grained, subrounded, vitreous to slightly cloudy quartz, 35% of quartz grains are tinted. amber, yellow and occasionally orange, very poorly sorted, traces of green argillaceous matrix on many grains.
10% SANDSTONE; as at 5180-5190.
3% SILTSTONE; medium dark brown, very argillaceous micaceous, in part carbonaceous, grades to silty shale.

5220-5230 SANDSTONE; buff, unconsolidated coarse grained, to granule size as above with 30% amber, yellow, pink and orange tinted grains.
7% SANDSTONE; medium light grey and brownish grey, very fine to fine grained, angular to subangular quartz, and slightly dark grains, in part very silty, generally with abundant brown and greenish argillaceous matrix.
7% SILTSTONE; medium grey and brown, spocked with green grains, micaceous and carbonaceous in part very fine to fine sandy, in part very argillaceous and grades to shale.

5230-5240 SANDSTONE; buff, unconsolidated, predominantly coarse to very coarse grained, occasionally granule sized, subrounded quartz, 5-10% tinted grains as above.
25% SANDSTONE; as above.
15% SILTSTONE; similar to above.

5240-5250 SANDSTONE; buff, unconsolidated as above.
20% SANDSTONE; variable, very fine grained to predominantly fine grained, subangular quartz traces pink quartz grains, some white clay and occasional green clay grains, slight to moderately silty, slightly micaceous, in part moderately carbonaceous, matrix consists predominantly of silty brown carbonaceous matter and in part of greenish clay; traces poor to fair intergranular porosity, moderate earthy porosity, occasionally very carbonaceous and very micaceous laminae.
5% SILTSTONE; as above.

5250-5260 35% SANDSTONE; buff, as above.
60% SANDSTONE; light grey, very fine to fine occasionally medium grained, subangular quartz, traces red quartz grains, occasional carbonaceous grains, in part slightly silty, generally well indurated and only slightly friable, siliceous cement with slightly silty argillaceous matrix, in part with poor intergranular porosity.
5% SILTSTONE; SHALE; carbonaceous/micaceous, medium grey to dark brown.
Occasional massive pyrite and traces pyritic sandstone.

5260-5270 40% SANDSTONE; buff, as above.
55% SANDSTONE; similar to above.
5% SILTSTONE; medium dark greyish brown, firm moderately micaceous, carbonaceous and argillaceous.

5270-5280 TRIP SAMPLE
SANDSTONE; light grey to buff, unconsolidated coarse to very coarse grained, subrounded, cloudy quartz, abundant tinted grains, traces chert and lithic grains.
10% SANDSTONE; as above and greenish grey, very fine grained quartz and abundant green grains, argillaceous.
10% SILTSTONE; medium greenish grey, abundant carbonaceous spck and green clay grains,
5% SHALE; grey to brown, very silty.

5280-5290 SANDSTONE; buff, unconsolidated, as above.
15% SHALE; medium brown, moderate to very silty moderately micaceous and carbonaceous specked, in part very finely sandy, grades to argillaceous SILTSTONE;.
10% SANDSTONE; as above.
5% SILTSTONE; medium brownish grey, coarse micaceous and slightly carbonaceous, abundant green clay grains, in part very fine sandy.

5290-5300 SANDSTONE; buff to light grey, unconsolidated, medium to very coarse grained with occasional granules, predominantly coarse grained, subrounded to rounded clear quartz grains, common polished quartz grains, very abundant tinted grains.
10% SHALE; medium brownish grey, moderate to very silty, micaceous, carbonaceous, platy to subfissile.
5% SANDSTONE; variable as above.
Traces massive pyrite, trace feldspar.

5300-5310 SANDSTONE; light grey, unconsolidated, coarse to very coarse grained, predominantly very coarse grained, 5% granules, angular to subrounded quartz, occasionally polished grains, 10% orange, pink yellow tinted grains.
5% SANDSTONE; variable, very fine to fine grained, in part clean but commonly argillaceous.
3% SHALE TO SILTSTONE as above
Traces siltstone pale brown, abundant carbonaceous debris, slightly micaceous, very argillaceous.

5310-5320 SANDSTONE; light grey, unconsolidated, medium grained to granule size (60% very coarse, 25% coarse, 10% granule) predominantly subrounded, slightly cloudy quartz, 15% yellowish, amber and pink or orange quartz grains, many of grains have traces of sea green argillaceous cement adhering.

3% SANDSTONE; variable
2% SILTSTONE - SHALE

5320-5330 SANDSTONE; light grey, unconsolidated medium to very coarse grained, predominantly very coarse grained with 10% granules subrounded quartz, as above.
10% SANDSTONE; light grey, very fine to medium grained, subangular to subrounded quartz, moderately friable, poorly sorted, abundant sea green silty/argillaceous matrix, good earthy porosity fair (3-6%) intergranular porosity; in part carbonaceous, in part grades to sandy siltstone.
5% SILTSTONE; medium grey and greenish brown, micaceous, carbonaceous sandy, argillaceous and in part grades to shale.

5330-5340 SANDSTONE; buff to light grey, unconsolidated coarse to very coarse grained, as above.
5% SANDSTONE; poorly sorted with abundant argillaceous cement, as above.
5% SILTSTONE; brown carbonaceous, argillaceous, sandy and some silty shale.

5340-5350 90% SANDSTONE; light grey, unconsolidated coarse to very coarse grained, subrounded to subangular, clear to cloudy with very common yellowish common orange, traces grey and greenish quartz grains, traces pyrite cemented sandstone, with common traces of green, grey and black (carby) clay cements.
5% SANDSTONE; very fine to fine grained as above tight.
5% SILTSTONE; mid grey, micaceous, very carbonaceous slightly sandy, very argillaceous in part bedded.

5350-5360 90% SANDSTONE; light grey unconsolidated as above traces chert.
5% SANDSTONE; consolidated very fine to fine with common medium to very coarse quartz grains, kaolin matrix, in part very clayey, tight.
5% SILTSTONE; as above grades to silty carbonaceous and micaceous shale.

5360-5370 80% SANDSTONE; light grey unconsolidated coarse to very coarse grained with 10% medium grains and 10% granules as above.
15% SANDSTONE; mid grey, very fine to fine grained with occasional medium grains, subangular, composed of quartz with to 20% carbonaceous matter, traces pyrite, traces mica and traces kaolinised felspar in a dirty kaolin matrix tight.
5% SILTSTONE; as above.

5370-5380 60% SANDSTONE; light grey unconsolidated medium to very coarse grained with common fine grains and 5% granule subrounded subangular clear to cloudy with very common yellowish, traces pink and orange quartz grains with common kaolinitic or grey to green clayey matrix. Traces grey quartz, traces pyrite cemented sandstone.
30% SANDSTONE; mid grey firm very fine to medium grained with occasional coarse to very coarse grains subangular to subrounded quartz grains with to 20% carbonaceous matter, in part silty and very argillaceous, generally with 20-30% kaolin or

clayey matrix, tight.
10% SILTSTONE; black very argillaceous, micaceous grades traces shale, in part slightly sandy, well bedded.
Traces shale black, slightly micaceous, hard, fissile.

5380-5390- 70% SANDSTONE; as above with traces orange and common yellowish quartz grains, traces greenish quartz grains.
30% SANDSTONE; as above consolidated, very dirty tight, traces fine pyrite crystals, traces greenish clay pellets.

5390-5400 70% SANDSTONE; as above with 15% granules, 30% yellowish quartz grains and traces orange quartz grains.
25% SANDSTONE; mid grey as above, grades to siltstone, tight.
5% SILTSTONE; as above in part coarsely sandy, traces bedding.

5400-5410 Poor Sample 60% SANDSTONE; as above with common yellowish quartz grains.
30% SANDSTONE; very fine to fine grained as above tight with to 40% matrix.
10% SILTSTONE; as above grading to very fine grained sandstone, carby, micaceous.
Traces pyrite cemented sandstone.

5410-5420 60% SANDSTONE; light grey unconsolidated coarse to very coarse grained with 10% granules and traces medium grains subrounded to subangular occasionally rounded quartz grains common yellowish, traces pink quartz grains with traces kaolin and clayey matrix. Common pyrite cemented sandstone.
30% SANDSTONE; very fine to fine grained occasionally medium to coarse grained as above tight.
10% SILTSTONE; as above very carby.

5420-5430 60% SANDSTONE; light grey unconsolidated medium to very coarse grained with 5% generally 20% medium grains as above.
35% SANDSTONE; very fine to fine grained tight. Generally dirty matrix, rarely siliceous and hard.
5% SILTSTONE as above very carby, argillaceous, slightly micaceous, firm traces bedding.

5430-5440 50% SANDSTONE; light grey unconsolidated, medium to very coarse grained rounded to subangular clear to cloudy with common yellowish, traces orange and grey quartz grains, traces very fine pyrite crystals on quartz grains.
40% SANDSTONE; mid grey dirty very fine to fine grained with occasional medium to very coarse grains, subangular to subrounded quartz with to 10% carbonaceous matter, slightly micaceous in a clayey kaolin matrix, tight.
10% SILTSTONE; dark grey to black, firm carby, micaceous, very slightly sandy.

5440-5450 Poor Sample 40% SANDSTONE; light grey unconsolidated medium to very coarse grained as above.
50% SANDSTONE; mid grey very fine to fine grained tight as above.
10% SILTSTONE; as above, grades to shale.

Sample probably not representative as most of sample lost through shaker or in suspension in mud.

5450-5460 60% SANDSTONE; light grey medium to very coarse grained as above.
20% SANDSTONE; very fine to fine grained tight very dirty.
10% SILTSTONE; as above.
10% SHALE; grey brown, firm, silty unstable in water.

Grab sample fro lip of shaker
Contains 10-20% clay, dark grey, silty, slightly carby, soft, goes into suspension in water.

5460-5470 40% SANDSTONE; light grey unconsolidated, medium to very coarse grained with traces fine grains, subrounded to subangular clear to cloudy with traces orange yellowish and greenish quartz grains traces pyrite cemented sandstone.
10% SANDSTONE; light to mid grey, occasionally dirty grey, very fine to fine occasionally medium grained, composed of quartz, common carbonaceous matter, traces mica, in a kaolin clayey matrix, tight.
50% SHALE; brown grey soft, slightly silty, goes into suspension in water - possibly slightly bentonitic, slightly carby, in part slightly kaolinitic, traces bedding.

5470-5480 60% SANDSTONE; light grey unconsolidated fine to very fine grained poorly sorted as above.
20% SANDSTONE; mid grey very fine to medium grained with rare coarse grains, composed of quartz, traces carby, in a kaolin ofter very clayey matrix, tight.
20% SHALE; brown grey, soft as above.
traces siltstone dark grey carby micaceous argillaceous

5480-5490 30% SILTSTONE; as above fine to very coarse grained with 15% fine to medium grains.
10% SILTSTONE as above tight.
10% SILTSTONE as above.
50% SHALE, as above grades from brown grey to black. Traces pyrite cemented sandstone.

5490-5500 50% SANDSTONE; light grey, unconsolidated medium to very coarse grained with 5% granules subrounded subangular clear cloudy with common yellowish and traces orange quartz grains, traces pyrite cemented sandstone.
10% SANDSTONE; very fine to fine grained, mid grey with kaolin of clayey kaolin matrix, tight.
40% SHALE; as above in part carby.

5500-5510 40% SANDSTONE; unconsolidated medium to very coarse grained as above.
10% SILTSTONE; fine to very fine occasionally medium grained with kaolin matrix, slightly carby, with 15-30% matrix, tight.
50% SHALE; as above in part very carby and silty, traces mica.

5510-5518 Poor sample; cuttings coated with film of clay.
45% SANDSTONE; light grey to buff, unconsolidated as above.
45% SHALE; medium brown, very slightly micaceous,

silty, platy to chunky.
10% Variable very fine to fine grained micaceous moderately clean sandstone and argillaceous SILTSTONE;/

5518-5530 SANDSTONE; buff, unconsolidated, coarse to very coarse grained, subangular to subrounded, quartz occasionally amber, yellow and orange quartz grains, residue of brown silty argillaceous cement or matrix on many grains.
10% SHALE; medium brown as above.
5% SILTSTONE: light grey, in part green, grading to silty argillaceous, very fine to finegrained sandstone.

5530-5540 SANDSTONE; buff, unconsolidated coarse grained, 10-20% very coarse grains and occasional medium grains, subangular to subrounded, vitreous to slightly cloudy quartz, occasional tinted quartz grains to black lithic grains.
10% SANDSTONE; light grey, very fine medium grained, quartz and occasional green clay grainss, poorly sorted, in slight part clean but generally very silty and argillaceous, poorly sorted, grades to sandy siltstone.
2% SHALE; as above.
Occasional pyritic sandstone.

5540-5550 SANDSTONE; light grey to buff, unconsolidated, coarse grained, in part very coarse grained sub-rounded, cloudy quartz, occasional tinted grains.
15% SANDSTONE; grey, very fine to coarse grained, poorly sorted, predominantly fine grained, angular subrounded, quartz grains in a silty, argillaceous (in part kaolinitic) matrix, slightly to moderately micaceous (muscovite and biotite) traces intergranular porosity.
5% SILTSTONE - SHALE, brown, micaceous, slight to moderately carbonaceous, in part very fine and fine sandy.

5550-5560 SANDSTONE; light grey to buff, fine to very coarse grained, predominantly coarse grained subrounded, cloudy quartz.
30% SANDSTONE; as above clean to very silty and argillaceous, clean variety has kaolinitic/slightly chloritic cement and poor to fair intergmanular porosity, dirty variety is silty, argillaceous and tight.
5% SILTSTONE; as above.
5% SHALE; as above.

5560-5570 SANDSTONE; unconsolidated as above.
25% SANDSTONE; similar to above.
10% SILTSTONE and SHALE as above.

5570-5580 Depth correction. Hole deeper by 8' than recorded on pipe tally. No sample.

5580-5590 SANDSTONE; light grey, unconsolidated, medium to very coarse grained, predominantly coarse grained, subangular to subrounded, cloudy quartz, 10% yellow, amber, orange tinted grains.
15% Interlaminated sandstone, siltstone and occasional shale.
sandstone is grey, predominantly very fine grained

in part fine and medium grained, quartzose, compact, with a silty to argillaceous matrix. The siltstone is medium grey, moderately carbonaceous very argillaceous.

5590-5600 SANDSTONE; light grey, unconsolidated coarse to very coarse grained, subrounded quartz, fairly common tinted grains.
15% SANDSTONE; as above.
5% SILTSTONE; grey to brown, very fine to fine sandy argillaceous, grades to shale, siltstone, sandstone and shale are graditional and are probably interlaminated.

5600-5610 Dirty sample, probably much SHALE has washed out SANDSTONE; buff to light grey unconsolidated, predominantly coarse grained, abundant very coarse grains, angular to subrounded quartz, some tinted quartz grains.
15% SANDSTONE; light grey, dirty, very fine to fine grained, occasional medium grains, angular to subangular, quartz graces red quartz grains and green clay grains, poorly sorted, moderately friable, slightly silty to very silty, in large part argillaceous, matrix of kaolin and clay, probably with moderate earthy porosity and in part with poor intergranular porosity.
8% SILTSTONE; medium light grey and brownish grey, slight to moderately micaceous, in part carbonaceous generally very fine sandy, occasional green clay grains; generally argillaceous, grades to sandstone as above and to shale.
2% SHALE; medium dark grey to brown, silty, micaceous, platy to sub-fissile.

5610-5620 Dirty sample; possible much SHALE has washed out.
35% SANDSTONE; unconsolidated, as above.
45% SANDSTONE; light grey dirty as above grading to
20% SILTSTONE; as above.

5620-5630 SANDSTONE; buff, unconsolidated, very poorly sorted very fine to very coarse grained, predominantly coarse grained.
30% SANDSTONE; as above very fine to fine grained in part clean, commonly silty and argillaceous.
20% SILTSTONE; as above, generally very sandy (very fine grains).
5% SHALE; dark grey, silty, micaceous, in part carbonaceous.
Occasional massive pyrite.

5630-5640 SANDSTONE; buff, unconsolidated, coarse to very coarse grained, common medium grains, clear to cloudy, subangular to subrounded quartz, 25% yellow, amber and occasional orange tinted quartz grains, fairly clean, traces of green chloritic (?) clay matrix, fairly common massive pyrite.
1% SILTSTONE; light grey, micaceous very fine sandy.
3% SANDSTONE; light grey as above.

5640-5650 SANDSTONE; white to buff, unconsolidated, coarse grained, in part (15%) very coarse grained, angular to subangular, in part subrounded, vitreous to cloudy quartz grains, 10% tinted quartz grains, traces green quartzite, green, brown and grey argillaceous matrix adhering to some grains.
2% SILTSTONE; medium brown, moderately micaceous, carbonaceous, red quartz and green clay specks, very fine sandy.
1% SANDSTONE; grey, very fine to medium grained, argillaceous matrix, traces porosity.
Occasional pyrite cemented sandstone.

5650-5660 SANDSTONE; white, unconsolidated, coarse to very coarse grained, angular to subangular, cloudy quartz, traces chert, occasionally tinted grains clean.
1% SANDSTONE-SILTSTONE as above.
Traces pyritized wood fragment.

5660-5670 SANDSTONE; buff to light grey, unconsolidated, coarse to very coarse grained, subangular to subrounded, cloudy quartz, traces chert, 15-20% amber and yellow and rarely orange tinted quartz grains, traces pyrite cement; common green clay cement.
2% SANDSTONE; light grey, very fine to very coarse grained, predominantly fine grained quartz set in an abundant silty/argillaceous matrix, fair earthy porosity.
Occasional SILTSTONE and SHALE.

5670-5680 SANDSTONE; buff to light grey unconsolidated coarse grained in part (20%) very coarse grained subangular to subrounded to subangular, cloudy quartz, occational tinted grains..
5% SANDSTONE; as above.
1% SHALE; dark grey, moderate to very silty platy to blocky.
2% SILTSTONE; medium to dark grey, speckled green micaceous, moderate to very argillaceous.
Occasional pyrite and pyritic sandstone.

5680-5690 Lithology and percentages similar to above.

5690-5700 SANDSTONE; light grey, unconsolidated, coarse grained, in part (30%) very coarse grained, subrounded, cloudy quartz, 3% tinted grains.
3% SANDSTONE; similar to above.
Occasional black carbonaceous shale and occasional siltstone as above.
Sample dirty, possibly shale washing out.

5700-5710 SANDSTONE; medium light grey, unconsolidated, coarse to very coarse grained subangular to subrounded, dull quartz, in part vitreous, fairly common tinted grains, traces pyritic cement and abundant grains with brown to grey argillaceous matrix adhering.
3% SANDSTONE; grey, very fine to fine grained, abundant greenish and grey argillaceous/silty matrix.

2% SILTSTONE; grey to brownish grey, very sandy (very fine to fine grained) argillaceous, dirty. Occasional shale; dark grey to black carbonaceous micaceous silty.

5710-5718 Very dirty sample. Percentages of component lithologies obscured shale as above.
35% SILTSTONE; dark greyish brown, slightly micaceous and carbonaceous, moderate to very argillaceous, grading to.
35% SHALE; dark brown slight to very silty, with platelets of bluish grey bentonitic (?) shale.
Occasional very fine to fine grained sandstone.
Occasional very fine to fine grained sandstone.

Bit change at 5718

5718-5730 70% SANDSTONE; light grey unconsolidated very fine to very coarse grained occasionally silty, sub-angular to subrounded clear to slightly cloudy quartz grains, traces orange, greenish and red quartz grains.
20% SANDSTONE; light grey very fine to fine grained silty subangular quartz grains with traces to 5% carbonaceous matter with 30-40% kaolin matrix tight.
10% Shale, dark grey, carby, slightly silty, slightly micaceous, firm, traces bedding.

5730-5740 50% SANDSTONE; unconsolidated fine to very coarse grained as above, traces pyrite cemented sandstone.
40% SANDSTONE; light grey dirty, very fine to fine grained, in part very silty, with dirty kaolin matrix, tight.
10% SHALE dark grey carby and dark brown slightly silty.

5740-5750 70% SANDSTONE; unconsolidated very fine to very coarse grained, generally coarse grained as above.
20% SANDSTONE; grey, very fine to fine grained, silty with occasional medium or coarse grained, with up to 40% greenish or grey clay matrix. Traces felspar, carbonaceous material and ? glauconite. Common grey dirty kaolin sandstone as above.
10% SHALE; dark grey as above in part very silty grading to an argillaceous siltstone.

5750-5760 30% SANDSTONE; unconsolidated as above very fine to very coarse grained.
50% SANDSTONE; light grey very fine to fine grained silty argillaceous, composed of quartz with traces carbonaceous matter, with slightly kaolin argillaceous matrix tight.
20% SHALE; dark grey carby very silty grades to an argillaceous siltstone; in part slightly sandy, slightly micaceous.

5760-5770 Poor samples since new bit.
30% SANDSTONE; unconsolidated as above traces pyrite cemented sandstone.
30% SANDSTONE; as above tight, in part very silty
10% SILTSTONE; mid-dark grey, in part sandy, in part very argillaceous.
30% SHALE as above, grades to argillaceous siltstone carby. Occasional dark brown sandy and slightly bentonite.

5770-5780 30% SANDSTONE; unconsolidated as above very fine to very coarse grained.
40% SANDSTONE; grey to white, very fine to fine grained occasionally silty, with argillaceous slightly kaolin matrix, or slightly calcareous matrix (white variety). Tight with occasional traces porosity. Slightly friable.
30% SHALE; black to dark brown, silty, and sandy grades to siltstone, carby.

5780-5790 10% SANDSTONE; unconsolidated medium to very coarse grained as above.
60% SANDSTONE; grey dirty very fine to fine grained silty, carby, slightly micaceous, with argillaceous in part kaolin matrix, tight, friable.
30% SHALE; as above very silty and slightly sandy.

5790-5800 20% SANDSTONE; unconsolidated as above.
30% SANDSTONE; dark grey very argillaceous very fine to fine grained, tight.
50% SILTSTONE - SHALE dark grey as above carby slightly sandy.

5800-5810 30% SANDSTONE; unconsolidated medium to very coarse grained as above.
40% SANDSTONE; very fine to fine grained slightly silty, argillaceous carby, slightly micaceous tight with carby stringers and traces bedding.
30% SILTSTONE; SHALE as above with traces bedding.

5810-5820 30% SANDSTONE; unconsolidated medium to very coarse grained subangular to subrounded quartz grains, traces orange quartz.
30% SANDSTONE; very fine to fine grained grey, silty, friable, argillaceous, tight with occasional traces porosity, slightly carby.
30% SILTSTONE; dark grey very argillaceous very carby, slightly micaceous, in part sandy, generally grades to a silty shale. Firm, well bedded.
10% SHALE; black carby slightly silty, firm, well bedded.

5820-5830 40% SANDSTONE; unconsolidated as above, traces chert.
40% SANDSTONE; very fine to fine grained as above with common grey, hard calcareous matrix, tight, with occasional coarse to very coarse grains of green chert and pink quartz.
10% SILTSTONE; as above.
10% SHALE; as above.

5830-5840 50% SANDSTONE; unconsolidated medium to very coarse grained subrounded to subangular quartz grains as above traces pyrite cemented sandstone.
30% SANDSTONE; very fine to fine grained, grey, silty, argillaceous with traces carbonaceous matter, occasionally medium to very coarse quartz grains, tight.
20% SILTSTONE; dark grey to grey, firm, argillaceous in part sandy grading to very fine grained sandstone as above, slightly micaceous.
Common carby streaks in sandstone and siltstone.

5840-5850 40% SANDSTONE; unconsolidated medium to very coarse grained as above.
10% SANDSTONE; very fine to fine grained as above.
50% SILTSTONE; grading to shale, dark greenish grey; very argillaceous slightly carbonaceous slightly micaceous, in part slightly sandy.

5850-5860 50% SANDSTONE; unconsolidated medium to very coarse grained subangular to subrounded quartz, traces pyrite cemented sandstone.
20% SANDSTONE; light grey very fine to fine grained well sorted quartz with traces carbonaceous matter with 20-30% kaolin matrix, traces porosity.
30% SILTSTONE; dark grey argilliceous. occasionally sandy firm, carby, micaceous, well bedded, grades in part to shale.

5860-5870 40% SANDSTONE; light grey unconsolidated, medium to very coarse grained well sorted subrounded to subangular clear to slightly cloudy rare yellowish and orange quartz grains.
20% SANDSTONE; very fine to fine grained in part silty light grey to white, clean or slightly carby and argillaceous, traces grey lithic grains, traces glaucnite ? with 20-40% kaolin or argillaceous matrix, generally tight with clean white variety having poor to trace porosity.
40% SILTSTONE; dark grey to black argillaceous to very argillaceous, in part slightly sandy in part coarsely sandy, firm, slight to very carby, slightly micaceous, well bedded, grades to grey silty sandstone, tight, or black silty shale.

5870-5880 40% SANDSTONE; unconsolidated medium to very coarse grained, as above traces pink quartz.
20% SANDSTONE; very fine to fine grained as above generally tight with traces porosity, with common green lithic spar.
40% SILTSTONE; as above grading to shale.

5880-5890 Trip sample (poor sample)
10% SANDSTONE; unconsolidated, coarse to very coarse grains.
40% SILTSTONE; medium greyish brown, coarse, slightly argillaceous to very argillaceous and in part grades to silty shale, slightly micaceous and carbonaceous, traces green clay specks and rare red quartz, in part very fine sandy and grades to very fine grained silty sandstone.
10% SHALE; medium greyish brown, slightly micaceous moderately to very silty, platy.
40% SANDSTONE; light to medium brownish grey and greyish brown, very fine grained, in part fine grained subangular quartz, slightly to moderately silty, kaolinitic matrix, good earthy porosity traces interganular porosity, moderately friable in part grades to sandy siltstone.

5890-5900 Poor sample returns.
5% SANDSTONE; unconsolidated as above.
60% SANDSTONE; white to light grey, very fine grained, in part fine grained, subangular to subrounded quartz, rare pink quartz grains, occasionally green clay grains, slightly micaceous (biotite) or more probably slightly carbonaceous, kaolinitic cement, good earthy porosity.

5% SANDSTONE; greyish brown as above.
20% SILTSTONE; as above
10% SHALE; as above.

5900-5910 Poor sample returns
35% SANDSTONE; light grey, unconsolidated, very poorly sorted, fine grained to very coarse grained, subrounded quartz, fairly common tinted grains.
35% SANDSTONE; white to light grey, as above predominantly fine grained and with fairly abundant white clay grains, poor intergranular and good to earthy porosity.
30% SILTSTONE; as above and medium light grey, moderately micaceous and carbonaceous, common green chloritic (?) patches, coarse and grades to sandstone.
Occasional pyrite and traces pyrite cemented sandstone.

5910-5920 Poor sample returns.
65% SANDSTONE; white, unconsolidated, medium to very coarse grained, predominantly coarse grained subangular to rounded quartz.
20% SILTSTONE; light to medium grey, moderately micaceous and carbonaceous, well consolidated, slightly to moderately argillaceous, in part sandy and grades to
10% SNADSTONE; as above but generally more argillaceous.
5% SHALE; as above.

5920-5930 Poor sample returns.
15% SANDSTONE; white, unconsolidated as above.
40% SANDSTONE; white to light grey, very fine to fine grained, rarely medium grained subangular subrounded quartz, fairly common green clay grains, friable, very good earthy and fair (3%) intergranular porosity; generally slight to moderately micaceous (muscovite and biotite) and carbonaceous.
15% SANDSTONE; light to medium grey, slightly moderately argillaceous, in part moderate to very silty, very fine to fine grained quartz with very common green flecks and grains (chloritic clay?)
20% SILTSTONE; as above.
5% SHALE; as above.

5930-5940 10% SANDSTONE; light grey, unconsolidated.
50% SILTSTONE; medium to dark grey, slightly to moderately micaceous and carbonaceous, slightly argillaceous in part, coarse, in part very fine and finely sandy, grades to
35% SANDSTONE; light to medium grey, very fine grains in part fine grained, quartz, slightly micaceous and carbonaceous, moderately friable, silty in part slightly argillaceous, tight.
5% SHALE as above.

5940-5950 Poor sample returns.
10% SANDSTONE; white to light grey, unconsolidated.
60% SANDSTONE; light grey, very fine grained subangular to subrounded quartz, traces pink quartz grains and rare green grains (glauconite ?) generally slight to moderately silty, well consolidated, siliceous cement, slightly kaolinitic matrix, possible with fair earthy porosity - grades to -

25% SILTSTONE; medium dark greyish brown, green spox, moderately micaceous, moderate to very argillaceous.
5% SHALE; dark grey to black, moderate to very silty, micaceous.

5950-5960 5% SANDSTONE; light grey, unconsolidated as above.
70% SANDSTONE; light to medium light brownish grey, very fine grained, occasionally fine grained subangular quartz, slightly micaceous, slightly medium carbonaceous in part, generally only slightly silty but in part moderate to very silty and grades to siltstone, well sorted, very friable good cavity porosity and possibly fair intergranular porosity.
20% SILTSTONE; medium to dark grey and brownish grey, coarse micaceous in part moderate to very argillaceous.
5% SHALE; as above.

5960-5970 40% SHALE; light grey, unconsolidated, coarse to very coarse, subrounded to rounded, clear to slightly cloudy, quartz, occasionally amber and rare orange tinted grains.
20% SANDSTONE; light grey to very fine grained as at 5950, occasionally green grains.
40% SILTSTONE; medium to medium dark grey, slightly brownish, coarse generally very fine sandy, occasionally greenish flecks, slightly carbonaceous and micaceous, in part grades to silty shale.

5970-5980 50% SANDSTONE; light grey, unconsolidated coarse to very coarse grained rounded to subangular quartz grains with rare yellowish quartz grains.
40% SANDSTONE; very fine grained light grey hard and occasionally greenish clay pellets, tight.
10% SILTSTONE; dark grey, occasionally brownish slightly sandy argillaceous, carby slightly micaceous.

5980-5990 50% SANDSTONE; light grey unconsolidated coarse to very coarse grained subangular to rounded clear to cloudy with traces orange tinted quartz grains.
20% SANDSTONE; light grey very fine to fine grained, slightly silty, composed of quartz grains with traces mica, green and grey lithic grains, carbonaceous streaks with kaolin slightly dirty, matrix, tight.
30% SILSTONE; medium to dark grey, firm carby argillaceous, slightly sandy, slightly micaceous. Common pyrite cemented very fine to fine grained sandstone.

5990-6000 40% SANDSTONE; light grey unconsolidated coarse to very coarse with traces medium quartz grains, rounded to subangular clear to cloudy quartz grains, traces amber quartz.
30% SNADSTONE; very fine to fine grained as above light to mid grey, with dark variety being more carby and with a grey clayey matrix and with common green clay pellets. Tight.
30% SILSTONE; as above grades to the darker very fine grained sandstone.
Very common pyrite cemented very fine to fine grained sandstone.

6000-6001 Circulated lag time + 1 hour
70% SANDSTONE; light grey unconsolidated coarse to very coarse grained, predominantly coarse grained, subangular to rounded clear to cloudy with orange, pink and yellowish quartz grains, traces grey quartz.
20% SANDSTONE; very fine grained silty as above tight.
10% SILTSTONE; dark grey as above slightly sandy argillaceous, slightly carby to carby.

CORE NO.13 6001-6016 Cut 15' recovered 10½'

6001' - 6001'4"
SILTSTONE; dark grey, black, very sandy (sand consists of very fine to fine angular to sub-angular grains of quartz, which occurs disseminated and also in small lenses and stringers), very argillaceous, very slightly micaceous. Traces of glauconic and some green grains possibly of clay. The core contains occasional medium sized grains of quartz. Sand grains comprise about 30% of the volume of the core. There is no bedding definition but the orientation of several elongate lenses of sand suggest that the bedding dips very gently.

6001'4"-6005'2"
SANDSTONE; dark grey, (slightly greenish grey when wet), very poorly sorted, consists of very fine to very coarse grained, angular to subrounded quartz grains, occasionally white kaolinitic grains, occasional red quartz grains and occasional green clay grains set in a matrix which is variably brown, argillaceous/silty or light grey kaolinitic. Predominant grains size is fine grained. Lenses and angular fragments of shale up to pebble size are common. In parts of the core fragments of light grey, kaolinitic sandstone are set in a matrix of sandy brown clay.
The sandstone is slightly micaceous and is for the most part carbonaceous. It is well consolidated and tight. Carbonaceous plant fragments in part pyritised, are not uncommon.
The core exhibits a "chaotic" or "churned-up" texture suggestive of deposition under shallow water conditions and of organic reworking.
Animal burrows are present within the core but are not common. The dip of the bedding is not discernible.

6005'2"-6005'11"
SANDSTONE; as above. Predominantly fine to medium grained quartz set in a medium greenish grey matrix of clay. The core contains about 30% "clay balls" (up to 3 inches along their major axis) of light brownish grey, very sandy and silty clay.

6005'11"-6009'0"
SANDSTONE; similar to that at 6001'4". Poorly sorted, predominantly fine to medium grained, subangular to subrounded quartz, with fairly common white kaolin and green clay grains, set in a matrix which is variable medium brownish grey to dark grey, silty, slightly carbonaceous, or very light grey, kaolinitic. Grain size ranges from very fine grained to pebbly. The amount of

matrix is in the order of 35% but in parts of the core where fragments of sandstone are set in a matrix of very sandy clay, the percentage of matrix is as high as 70%. Several zones include greyish brown, sandy "clay balls". The core is tight.
The core exhibits a "chaotic" texture indicative of shallow water deposition and of extensive re-working while in a semi-consolidated state.

6009'0"-6009'7"
SANDSTONE; light grey, slightly greenish, poorly sorted, very fine to very coarse grained, predominantly medium to coarse grained, subrounded quartz grains, occasionally tinted quartz grains 5% dark greenish grey and white clay grains, very friable, poorly cemented with 10% kaolin cement, excellent intergranular porosity.
Abrupt contact defined by pebble band.

6009'7"-6011'2"
Intermixed sandstone and very sandy shale to very argillaceous sandstone.
SANDSTONE; light grey, very fine to very coarse grained, predominantly very fine to fine grained, subangular quartz, common tinted and occasional white clay grains, moderate to very silty, slightly micaceous, in part with a brown argillaceous matrix, in part with a white kaolinitic matrix, tight..
SHALE; dark grey, slightly brownish, very sandy (very fine grained to fine grained) very silty grades to very argillaceous sandstone, tough well indurated.
The core shows well developed microstructure indicative of shallow water deposition; i.e. scour and fill, interrupted bedding, compaction structure, sandstone "balls".
Bedding dips are in the order of 0^{o} to 8^{o} but are not reliable.

6011'2"-6011'4"
SANDSTONE; light grey, very fine grained, quartz 5-10% green, red and black grains, silty, well sorted, compact, kaolinitic matrix, tight.

6011'4"-6011'6"
SANDSTONE; and sandy shale as at 6009'7"

6011'6"-6016'0"
Not recovered.

6016-6020 Very poor sample - - - muddy.
80% CEMENT
10% SILTSTONE; light grey and brownish grey, moderately micaceous, fairly friable
5% SILTSTONE-SHALE; medium grey, slightly chloritic, slightly micaceous, very argillaceous scattered very fine to fine sand grains.
5% SANDSTONE; unconsolidated to very coarse grained size.

6020-6030 Poor sample.
SILTSTONE; medium light to medium dark grey, well indurated, moderately argillaceous, moderately carbonaceous in part (carbonaceous fleck) some chloritic elements, in slight part sandy - grades to
10% SHALE; medium grey, very silty platy.
5% SANDSTONE; medium grey, very fine to fine grained, silty, abundant argillaceous matrix. Common massive pyrite. Abundant subrounded coarse to very coarse quartz grains.

6030-6040 SILTSTONE; medium grey, slightly greenish, slight to moderately micaceous, generally with common carbonaceous specks, slight to moderately argillaceous, in part coarse and grades to silty very fine grained sandstone.
10% SHALE; medium dark to dark grey, micaceous platy.
5% Unconsolidated coarse to pebble sized subrounded to rounded quartz grains.
Occasionally poorly sorted argillaceous sandstone.
Traces chert pebble; traces massive pyrite.

6040-6050 SILTSTONE; medium grey moderately to very carbonaceous, slight to moderately micaceous, well indurated, very argillaceous and grades to silty shale.
15% SHALE; medium grey very silty.
10% SANDSTONE; light to medium grey, very fine grained, in part fine grained, silty, subrounded quartz, in part clean with white kaolinitic matrix in part argillaceous and silty with some green grains, tight.
5% Unconsolidated, medium to very coarse sand grains.
Occasionally pyrite cemented sandstone; occasionally massive pyrite.

6050-6060 30% SILTSTONE; medium grey, argillaceous as above.
10% SHALE; medium to medium dark grey, moderately micaceous, slightly carbonaceous, silty, platy
60% SANDSTONE; light grey, predominantly unconsolidated, very fine to granule sized, predominantly coarse grained, angular and subrounded quartz, white kaolin matrix, traces pyrite cement; probably with good earthy porosity and poor intergranular porosity; rare consolidated chips inclusde grains of pale green chloritic clay.

6060-6070 30% SANDSTONE; unconsolidated, poorly sorted quartz grains, ranging to pebble size, as above.
SILTSTONE; medium light to medium grey, moderately to very carbonaceous, moderately micaceous, generally moderate to very argillaceous, chloritic grains, in slight part grades to silty very fine grained sandstone.
10% SHALE; medium to medium dark grey, silty, micaceous and carbonaceous platy - chunky.
Fairly common massive pyrite; traces crystalline pyrite aggregate.

6070-6080 Muddy sample.
SILTSTONE; medium light grey, moderate to very micaceous and carbonaceous, generallynmoderately argillaceous, firm, in part very fine to fine sandy.

grades to
10% SHALE; medium grey, silty, micaceous and carbonaceous platy and chunky.
5% SANDSTONE; white to light grey, generally dirty, fine grained quartz with common green clay grains, kaolinitic matrix, in part silty and argillaceous, earthy porosity.
20% Unconsolidated quartz grains, as above.
Traces of sandstone in pale brown sideritic matrix.

6080-6090 60% SANDSTONE; light grey, unconsolidated, poorly sorted, very fine to very coarse grained subangular to subrounded quartz, traces yellow and orange quartz, traces green clay grains, matrix, probably as in sandstone below.
25% SANDSTONE; light grey, very poorly sorted, very fine to very coarse grained, predominantly medium grained quartz and common sea-green chloritic grains in an abundant matrix of pale brown sideritic ? clay and siderite, in part kaolinitic, slightly carbonaceous, tight.
15% SILTSTONE; as above grading to sandstone.
Traces pyrite.

6090-6100 SILTSTONE; medium grey, in part medium dark grey moderate to very carbonaceous, slightly micaceous slight to moderately argillaceous, chloritic elements firm, rarely pyritic grading to
10% SHALE; medium to dark grey, very silty, blocky and chunky.
10% SANDSTONE; light grey to brownish grey, poorly sorted, as above.
15% SANDSTONE; unconsolidated grains as above.

6100-6110 SANDSTONE; light grey, very fine to fine grained (predominantly fine grained), occasional medium grained, subangular quartz, rare green clay grains traces black coal (?) grains, slightly silty, very slightly micaceous, moderately friable, kaolinitic to silty matrix, moderate earthy porosity, slight)3%) intergranular porosity.
grades to
20% SILTSTONE; very fine grained sandstone medium light to medium grey, micaceous and slightly carbonaceous, common green specks, moderately to very kaolinitic, in part argillaceous.
5% SHALE; grey silty.
5% SANDSTONE; unconsolidated poorly sorted quartz grains.
Occasional sideritic sandstone as above.

6110-6120 SILTSTONE; medium light to medium grey, coarse moderately sandy (very fine to fine grained quartz) moderate to very carbonaceous, abundant green chloritic grains, slightly micaceous.
grades to
30% SANDSTONE; medium light grey, very fine grained in part fine grained, moderate to silty, chloritic and kaolinitic elements, tight.
10% SANDSTONE; unconsolidated, coarse to very coarse subrounded grains.

6120-6130 SANDSTONE; white to light grey, unconsolidated, very poorly sorted, fine grained to granules sized occasional pebbles, subangular to subrounded quartz probably with kaolinitic matrix and good intergranular and earthy porosity.

25% SILTSTONE - very fine grained sandstone medium light grey, as above.
10% SHALE; medium dark grey micaceous carbonaceous very silty.
Traces fine grained sandstone with light brown sideritic clay matrix.
Occasionally very micaceous shale laminae.

6130-6140 20% SANDSTONE; light grey, poorly sorted very fine to very coarse grained (predominantly very fine grained with 20% coarser grains), subangular to subrounded quartz.
60% SANDSTONE; white to very light grey, very fine grained, in part fine grained subangular to subrounded quartz, traces green grains, slight to moderately micaceous, slightly silty, good earthy porosity and probably fair intergranular porosity (average 30%) friable.
20% SHALE and SILTSTONE; as above.
Traces very fine to fine grained sandstone with sideritic (?) cement.
Common carbonaceous/micaceous (biotite) partings.

6140-6150 SANDSTONE; white to light grey, unconsolidated, very poorly sorted, fine grained to granule sized predominantly coarse grained, subangular vitreous quartz, rare yellowish and pinkish quartz grains, kaolinitic and in slight part pyritic cement, probably very good porosity.
15% SANDSTONE; white to light grey, very fine to fine grained as above.
5% SANDSTONE; buff, very fine to fine grained, quartz occasionally white kaolin grains and green clay, grains, micaceous, sideritic (?) cement, friable, slightly porous in part and occasionally sandy argillaceous siderite.
Occasionally massive pyrite; common micaceous partings.

6150-6160 50% SANDSTONE; white to light grey, unconsolidated as above with occasionally rounded quartz pebbles.
40% SANDSTONE; light grey, very fine grained, in part fine grained occasionally medium to coarse grains, subangular quartz, with occasional green and round grains, poorly sorted, friable, kialinitic matrix, generally silty and slightly carbonaceous moderately micaceous with very micaceous laminations grades to
10% SILTSTONE; moderately grey, very fine sandy to moderate to very micaceous in part argillaceous
Occasionally sandstone with sideritic cement, occasionally massive pyrite.

6160-6170 Dominantly sandstone; white to light grey, very fine to fine grained, subangular quartz occasionally green clay grains and white kaolin, poorly sorted with scattered medium and coarse grains, friable, good earthy porosity; in part clean but commonly slightly silty and argillaceous, kaolinitic matrix slightly to moderately carbonaceous and micaceous, grades to siltstone.
10% SILTSTONE; as above.
5% Unconsolidated quartz grains as above.
Occasionally sideritic cemented sandstone; occasionally pyrite and pyritic sandstone.

6170-6189 SILTSTONE; medium light grey, coarse, micaceous carbonaceous, kaolinitic, common green clay grains, grades to
30% SANDSTONE; as above.
25% Unconsolidated quartz grains to pebble size.

6180-6190 10% SHALE; dark grey, micaceous, very silty blocky
50% SILTSTONE; medium light grey coarse, kaolinitic slightly micaceous, slightly carbonaceous, in part moderate to very argillaceous and carbonaceous pink and green grains.
grades to -
20% SANDSTONE; medium light grey to light grey, very fine grained silty, common pink and green grains.
20% Unconsolidated poorly sorted quartz grains.

6190-6200 Variable sample
15% SHALE; medium dark grey, slightly brownish moderately micaceous, moderate to very silty, slightly waxy, platy to sub fissile.
20% SILTSTONE; medium to light grey coarse; with micaceous and argillaceous laminations; grades to very fine grained sandstone.
10% Unconsolidated poorly sorted, fine grained to granule sized, subangular quartz.
45% SANDSTONE; white to light grey, fine grained, in part very fine grained, angular to subangular quartz, 5-10% pale green clay grains, red grains, with occasional kaolin and carbonaceous grains, moderately friable, tight; in slight part dirty.

6200-6210 5% SHALE; as above very silty and micaceous.
20% SILTSTONE; medium light to medium grey, moderately micaceous, slightly argillaceous, coarse and grade to very fine to fine grained silty sandstone.
55% SANDSTONE; light grey unconsolidated, very poorly sorted, fine grained to pebbly, angular to subrounded quartz and rare chert grains; matrix probably as below. Predominantly grain size is very coarse.
20% SANDSTONE; white to light grey, as above.
Traces andstone with sideritic cement.

6210-6220 SANDSTONE; white, unconsolidated, very poorly sorted medium grained to pebbly (predominantly coarse to very coarse grained with 20% granules and pebbles) subangular to subrounded quartz, possibly with kaolinitic and lesser sideritic and pyritic cement.
15% SANDSTONE; white to medium light grey, very fine to medium grained quartz with minor green clay and black carbonaceous grains, in part clean but generally dirty and carbonaceous, in slight parts with traces of intergranular porosity.
5% SHALE and SILTSTONE; as above.
Common pyrite cemented sandstone and fairly common sideritic sandstone.

6220-6230 SANDSTONE; light grey unconsolidated, poorly sorted, predominantly coarse grained variably cemented with kaolin, siderite and rarely pyrite
20% SANDSTONE; very light grey, fine grained, subangular to subrounded quartz, with scattered coarse to granule sized grains, very poorly sorted friable, kaolinitic/sideritic clay matrix, siliceous cement, moderate intergranular porosity (12%)
10% SHALE; dark grey, moderate micaceous and carbonaceous, tough, blocky, very silty.

6230-6240 15% SHALE; dark grey, very micaceous, slightly silty, sub-fissile.
25% SILTSTONE; medium to grey, moderate to very argillaceous, moderately micaceous and carbonaceous, grades in part to sandstone and in part to shale.
5% SANDSTONE; as above.
55% SANDSTONE; light grey, unconsolidated, fine grained to pebbly, predominantly medium to coarse grained, subangular to subrounded, quartz, cement probably pyritic, sideritic and in part kaolinitic. Common sandstone with abundant pyrite cement.

6240-6250 25% SHALE; dark grey, very micaceous, moderate carbonaceous, platy to sub fissile, silty, and grades to -
70% SILTSTONE; medium light to medium dark grey, moderate to very carbonaceous, slight moderately micaceous, traces glauconite, occasionally very finely pyritic, in part argillaceous.
5% SANDSTONE; light grey, unconsolidated, as above Occasional massive pyrite.

6250-6260 Predominantly SILTSTONE; medium grey, moderate to very argillaceous, very carbonaceous, with 10% SHALE as above.
40% SANDSTONE; light grey, unconsolidated very poorly sorted but predominantly fine grained, subangular to aburounded quartz.
3% SANDSTONE; light brown, poorly sorted quartz in abundant sideritic matrix, tight.
Traces haematite stained round chert granules.
Occasional pyrite.

6260-6270 SHALE; medium to medium dark grey, moderate micaceous and carbonaceous, moderate to very silty grades to -
30% SILTSTONE; medium light to medium grey, very argillaceous.
15% SANDSTONE; light grey, unconsolidated, poorly sorted, quartz grains.
1% light brown, sideritic sandstone and clay.
Occasional massive pyrite. Occasional quartz pebbles.

6270-6280 SHALE; medium dark to dark grey, moderately micaceous and carbonaceous, silty, slightly chloritic grains, chunky to platy; grades to -
35% SILTSTONE; medium light to medium grey coarse slight to moderately micaceous and carbonaceous, in part clean but predominantly slightly argillaceous.
15% SANDSTONE; white to light grey, very fine grained quartz, silty, kaolinitic matrix, tight.
2% SIDERITE; medium light brown, microcrystalline-cryptocrystalline, in part sandy (fine to medium grained quartz) silty and slightly argillaceous.
Occasional massive pyrite; occasional fine to medium grained, pyritic sandstone.
10% SANDSTONE; unconsolidated, medium to granule sized, subrounded quartz, in part stained yellowish and orange; traces of pyrite cement.

6280-6290 SILTSTONE; medium light grey, compact, coarse, micaceous and carbonaceous slightly argillaceous, fairly common green chloritic grains.
20% SHALE: medium to medium dark grey, moderate to very silty, tough, slightly micaceous, platy to chunky.

5% SANDSTONE; light grey, very fine grained, silty tight.
3% SANDSTONE; variable, light grey to white, very fine to medium grained, in part with green chloritic shale grains, in part pyritic, in part with abundant sideritic cement.
2% Unconsolidated quartz grains as above with occasional rounded quartz pebble.

6290-6300 SILTSTONE; medium grey, moderately micaceous, coarse, compact, slightly argillaceous, slightly moderate carbonaceous, grades to very fine grained sandstone;
25% SANDSTONE; light to medium igith grey, very fine grained, quartz rare green and red grains, occasionally with white kaolin grain, slight to moderately silty, tight.
5% SHALE; as above.
Occasional siderite and sideritic sandstone; occasional medium grained sandstone with abundant pyrite matrix. Green round quartz granules and pebbles.

6300-6310 SILTSTONE; medium light to medium grey, micaceous and carbonaceous, moderate to very argillaceous in slight part sideritic ? - grades to -
20% SHALE; medium grey, moderate to very silty, micaceous and carbonaceous.
5% SANDSTONE; light grey very fine grained, dirty tight.
Occasional massive pyrite; occasional pyritic sandstone.
2% SIDERITE; medium brown, cryptocrystalline to microcrystalline appears.

6310-6320 SILTSTONE; medium to medium dark grey, compact, slightly argillaceous, traces green grains, slightly moderate micaceous, moderately carbonaceous.
15% SHALE as above.
Occasional very fine grained and fine grained sandstone; fairly common siderite and sideritic clay ironstone; occasional round quart granules; traces black quartzite granules.

6320-6330 20% SILTSTONE; medium dark grey, moderate to very argillaceous, micaceous carbonaceous, in part very fine to sandy, in slight part pyritic; grades to -
5% SHALE AS above.
20% SANDSTONE: white to pale brown, fine grained, subrounded quartz, occasional very fine grains, slightly silty in part, slightly friable, occasionally well sorted and pink quartz grains, predominantly siliceous cement, some kaolinitic and sideritic cement; occasionally with fair (10%) intergranular porosity; generally with moderately earthy porosity, this sandstone probably matrix for sandstone below.
55% SANDSTONE; white, unconsolidated, very poorly sorted, coarse grained to granules size, subrounded slightly cloudy quartz.
Occasional pyrite cemented sandstone; fairly common sideritic sandstone and sandy siderite.

6330-6340 SANDSTONE; white, very fine to medium grained, predominantly medium grained, subangular to subrounded, quartz, poorly sorted, well consolidated siliceous cement, in slight part with sideritic or kaolinitic cement, in part with poor intergranular porosity.
20% SANDSTONE; white, unconsolidated, medium grained to granule sized subangular to subrounded cloudy quartz and occasional grey quartz grains, derived from sandstone above.
2% SANDSTONE; brown, poorly sorted, quartz and common white kaolin grains, very abundant siderite cement, grades to silty, argillaceous, carbonaceous sideritic ironstone.
Traces pyritic sandstone, pyritised wood, siltstone and shale.

6340-6350 20% SANDSTONE; white, very fine to medium grained, as above.
25% SANDSTONE; white, unconsolidated, very poorly sorted quartz grains as above.
20% SANDSTONE; light to medium brown, very poorly sorted fine grained coarse grained quartz and occasional white clay grains, tough, cemented by siderite (up to 45%) and in part by pyrite, tight.
35% SILTSTONE; medium light to medium grey, sandy argillaceous micaceous and carbonaceous, grades to shale.

6350-6360 Variable sample. Interbedded and gradational.
SILTSTONE; medium grey, moderately micaceous, slightly carbonaceous in part, argillaceous in part, traces glauconitic, sandy in part; grades to
10% SHALE; medium grey, moderate to very silty, platy to chunky.
5% SANDSTONE; brown, sideritic, as above.
10% SANDSTONE; white to light grey, very fine to medium grained, tight, as above.
20% Loose quartz grains.
Traces massive pyrite and sideritic ironstone.

6360-6370 15% SILTSTONE; as above.
5% SHALE; as above.
30% SANDSTONE; white, unconsolidated, medium grained, angular to subangular, quartz, siliceous to sideritic cement, in slight part pyritic, poor intergranular porous.
35% SANDSTONE; medium light brown, poorly sorted, quartz and occasional white clay grains, cemented by an abundant matrix of siderite and grading to sandy siderite.

6370-6380 10% SANDSTONE; medium light brown, as above.
15% SILTSTONE; as above.
10% SANDSTONE; white to light brown as above.
5% SHALE; medium grey, very silty, micaceous.
60% SANDSTONE; white, unconsolidated, as above.

6380-6390 10% SHALE and SILTSTONE; as above.
90% SANDSTONE; white to very light grey, very fine grained, angular quartz, 2-3% grec, reddish brown and black accessories, clean, well sorted ? (may include scattered fine to coarse quartz grains), well cemented with silica and minor amount of carbonate, slightly calcareous, tough, tight, trace dolomite vein.

6390-6400 20% SANDSTONE; as above.
60% SANDSTONE; white, unconsolidated, very poorly sorted quartz to granule size, clear to slightly cloudy,
10% SILTSTONE; as above.
10% SANDSTONE; sideritic, as above. Occasional massive pyrite. Traces vein dolomite.

6400-6410 Trip sample
SILTSTONE; medium to medium dark grey, slight to moderately micaceous and carbonaceous, very finely sandy, generally moderate to very argillaceous and grades to
20% SHALE; medium to dark grey, moderate to very silty, platy to blocky.
15% SANDSTONE; unconsolidated, poorly sorted, medium grained to granule sized, angular to rounded quartz grains, rarely with traces of pyrite cement.
5% SANDSTONE; white to light grey, consolidated, variable from very fine grained and clean to medium grained with abundant sideritic cement. Occasionally massive pyrite; occasional sideritic claystone.

6410-6420- SILTSTONE; as above, moderate carbonaceous.
10% SHALE; as above, very silty.
5% SANDSTONE; light grey, very fine grained quartz traces green grains, very silty and moderately argillaceous tight.
65% SANDSTONE; light grey, very fine grained, to granule sized, angular subrounded quartz, very poorly sorted comprising matrix of very fine grained to fine grained quartz with 30% coarser grains, rare white kaolin grains and traces of reddish grains, traces carbonaceous and micaceous moderately silty, friable, siliceous cement, good earthy porosity and traces intergranular porosity. Traces siderite, occasional massive pyrite.

6420-6430 10% SHALE; medium to dark grey, tough, silty, in part very fine and finely sandy, blocky, grades to siltstone.
SANDSTONE; white to light grey, unconsolidated, fine grained to granule size, predominantly coarse grained, poorly sorted, clean, predominantly subangular but common well rounded, clear to slightly cloudy grains; rare consolidated chips are cemented with siliceous and have traces (1%) of intergranular porosity; possibly with fair earthy porosity.
Fairly common chips of very fine to medium grained dirty quartz sandstone with abundant pyrite cement traces of siderite and sideritic sandstone.

6430-6440 SANDSTONE; as above but in part consolidated and predominantly coarse to very coarse grained with occasional well rounded quartz pebbles.
25% SILTSTONE; as above grading to shale.
Abundant massive pyrite and pyritic sandstone, occasional siderite and sideritic sandstone.

6440-6450 SANDSTONE; white, very poorly sorted, fine grained to granule sized, 65% coarse grained to granule sized subrounded to round quartz grains in matrix of fine to medium grained subangular to subrounded quartz sandstone, minor amounts of white kaolin matrix, siliceous cement tight.
5% SILTSTONE; medium greenish grey, coarse, argillaceous.
2% SHALE; medium grey silty, sub-fissile.
1% Pyrite and poorly sorted quartz sandstone with 40% pyrite matrix.

6450-6460 Very poor sample; probably as below.

6460-6470 Drilling time indicates section penetrated is most probably shale or clay. Sample recovered as paste. Shale medium light brownish grey, slightly silty, in part kaolinitic.

6470-6480 Interlaminated and gradational siltstone and sandstone with occasional shale.
SILTSTONE; dark to medium grey and brownish grey coarse, generally moderate to very carbonaceous and very sandy, some chloritic elements, traces of glauconite ?, moderately argillaceous.
40% SANDSTONE; predominantly light to medium grey, very fine grained, quartz with occasional green grains, commonly carbonaceous and very silty, slightly micaceous, often dirty, tight.

6480-6490 SILTSTONE; medium light to medium grey, coarse, predominantly very sandy (very fine and occasionally fine grained quartz); variably carbonaceous, micaceous and/or argillaceous, common green chloritic grains.
grades to and interlaminated with
20% SANDSTONE; light to medium grey, predominantly very fine grained, very silty, quartz with traces green grains, micaceous, dirty, tight.
Occasionally silty shale; occasionally pyrite pyritic sandstone, sideritic sandstone.

6490-6500 SILTSTONE; medium light to medium grey, as above.
20% SANDSTONE; as above variable.
10% SHALE; dark grey, silty, sub-fissile to platy.
Occasional loose coarse to very coarse quartz grains, traces ironstone; traces massive pyrite and occasional poorly sorted dirty quartz sandstone.

6500-6510 Interbedded and gradational sandstone and siltstone.
SILTSTONE; medium to dark grey, moderately sandy (very fine grained quartz), slight to moderately micaceous, moderately carbonaceous, traces green chloritic grains, trace round glauconite grain, in part argillaceous.
30% SANDSTONE; light to medium light grey, very fine grained, quartz, traces of green and reddish brown grains, friable, well sorted, moderate to very silty, kaolinitic matrix, in part with earthy porosity.
10% SHALE; dark grey very silty.
Occasional brown microcrystalline siderite, occasional massive pyrite.

Fairly common very fine to medium grained subangular to subrounded quartz sandstone with abundant pyritic and/or sideritic cement (up to 50%).
Traces feldspar; occasional loose quartz grains.

6510-6520 SILTSTONE; medium grey, slightly micaceous, generally only slightly carbonaceous, well indurated in part sideritic - grades to -
10% SANDSTONE; as above in part sideritic ?
5% SHALE; dark grey very silty.
2% SANDSTONE; dark brown, poorly sorted (silt to fine grained? with up to 60% sideritic matrix.
5% Unconsolidated poorly sorted quartz grains, medium grained to granule size.
Occasional massive pyrite, pyritic sandstone; trace chert.

6520-6530 20% SILTSTONE; as above.
5% SHALE; dark grey silty, chunky - sub-fissile
75% SANDSTONE; light to medium light grey, very fine grained, angular to subangular, quartz, traces of green and reddish grains, slightly carbonaceous very slightly micaceous, slight to moderately silty, well sorted in part slightly pyritic, well cemented with silica and minor amounts of kaolin, poor earthy porosity.
1% Sideritic ironstone (very sideritic siltstone and very fine grained sandstone)
3% Unconsolidated quartz grains.
Occasional massive pyrite; trace quartzite.

6530-6540 15% SANDSTONE; as above, becoming dirty and in part pyritic, in part sideritic grades to -
10% SILTSTONE; as above.
75% SANDSTONE; white to light grey, poorly sorted predominantly unconsolidated, medium grained to granule sized, predominantly very coarse grained, subangular, cloudy quartz, traces amber and pink stained grains, pyritic cement adhering to many grains (in part crystalline), probably with excellent intergranular porosity.
Common massive pyrite.
Fish teeth. Occasionally siderite.

6540-6550 SANDSTONE; as above but decrease in grain size to predominantly coarse grained; the sandstone includes grains of pyrite (as well as cement); consolidated chips are cemented with silica and dolomitic carbonate and show little porosity in the finer grained variety; the coarser grained chips have very good intergranular porosity in part.
Traces of dark grey quartzite grains.
10% SILTSTONE; SANDSTONE; as above.
Common massive pyrite; occasional sideritic sandstone.

6550-6560 SANDSTONE; as above but with increase in proportion of consolidated chips; in part with kaolinitic matrix, but some pyritic and siliceous cement; average porosity possibly 8-10%.
5% SANDSTONE; light brown, fine to medium grained, sideritic.
15% SILTSTONE; medium to medium dark grey, argillaceous, slightly micaceous, carbonaceous sandy in part - grades to -
10% SHALE; as above.

6560-6570 Variable lithology - interbedded and gradational
25% SILTSTONE; medium to dark grey, moderately micaceous, slight to moderately carbonaceous argillaceous.
5% SHALE; dark grey, micaceous carbonaceous and moderate to very silty, platy-chunky.
20% SANDSTONE; as above, fairly common dark grey quartz, occasional tinted grains, traces chert.
50% SANDSTONE; light grey, very fine to predominantly fine grained, occasional medium and coarse grains, angular to subangular quartz, occasional dark grains, moderate friable, poorly sorted, siliceous cement with in part kaolinitic cement and rare pyrite cement, fair intergranular and earthy porosity (6%) in part grades to dirty, very silty, argillaceous sandstone. Probably matrix for sandstone above.
Common sandy siderite and brown sideritic sandstone common pyrite.

6570-6580 SILTSTONE; medium light to medium grey, coarse slightly micaceous, slightly argillaceous, slight to moderately carbonaceous, in slight part pyritic well consolidated, in part very finely sandy and grades to -
35% SANDSTONE; light to medium light grey, very fine grained, in part fine grained, very slightly carbonaceous, silty, tight.
Occasional sideritic sandstone and massive pyrite.

6580-6590 55% SILTSTONE; medium to medium dark grey, slightly micaceous, moderately carbonaceous, argillaceous in part very fine and finely sandy grades to.
15% SHALE; dark grey, silty sub-fissile to platy.
30% SANDSTONE; light grey, predominantly unconsolidated, very poorly sorted medium grained to granule sized, predominantly coarse grained, angular to subangular quartz.
Occasional siderite, sideritic sandstone, massive pyrite.

6590-6600 Trip sample. Poor quality. Lithology and percentages similar to 6580-6590.

6600-6610 SILTSTONE; medium light to medium grey, generally slightly micaceous, slight to moderately carbonaceous (flecks have linear orientation), occasional chloritic grains, slightly argillaceous in part, slightly sandy (very fine grained) in part.
15% SHALE; dark grey, slightly micaceous, carbonaceous, occasionally chlorite (?) grains, platy to fissile.
Occasional very fine grained silty sandstone.
Traces of pyrite, quartz grains, siderite.

6610-6620 15% SILTSTONE; as above with common chloritic grains, coarse and grades to silty very fine grained sandstone.
85% SANDSTONE; light grey, very fine to fine grained, angular to subangular quartz, occasional green chloritic clay grains, rare black grain, well sorted, moderately silty, friable, in part pyritic, kaolinitic dolomitic cement, fair (5%) earthy porosity.

6620-6630 Muddy sample.
20% SHALE or CLAY; washed out of sample?
75% SILTSTONE; medium light grey, firm, coarse

and generally moderate to very sandy (very fine grained), slightly micaceous and carbonaceous, abundant green chloritic clay or glauconite grains, in part argillaceous in part slightly pyritic in part sideritic/dolomitic - grades to 5% sandstone; light grey, very silty.
Traces massive pyrite, pyritic sandstone, sideritic siltstone and sandstone.

6630-6640 Muddy sample.
60% SHALE of CLAY; washed out of sample?
25% SILTSTONE; medium dark grey, slightly micaceous and carbonaceous, very fine sandy in part, common green chloritic (?) clay and buff to white clay flecks, moderate to very argillaceous - grades to -
10% SHALE; medium dark grey, moderate to very silty.
5% Siderite and sideritic siltstone medium brown.

6640-6650 Muddy sample.
50% CLAY or SHALE; ground up by bit action and washes out of sample. Probably medium dark grey, slightly micaceous and carbonaceous, slight to moderately silty.
50% SILTSTONE; medium to medium dark grey, slightly brownish as at 6630-6640, slightly sideritic or dolomitic in part.
Common medium brown very sideritic, argillaceous siltstone with microcrystalline appear.

6650-6660 SHALE and SILTSTONE; as above.

6660-6670 50% CLAY of SHALE; ground up by bit, washes out of sample SILTSTONE; medium grey, slight to medium micaceous, and carbonaceous, common green flecks, generally well indurated; coarse and grades in part to very fine grained sandstone, scattered fine to medium quartz grains.
10% SANDSTONE; unconsolidated, very fine grained, in part fine grained (20% medium to coarse) subangular to subrounded quartz grains. The very fine grained quartz probably present as sandstone lenses while coarser grains probably scattered through the siltstone.

6670-6680 40% CLAY of SHALE; ground up by bit action washes out of sample.
Possibly (at least in part) kaolinitic and very silty.
30% SILTSTONE; medium to medium dark grey, as above but no fine to medium quartz in part argillaceous and grades to -
10% SHALE; dark grey, slightly to moderately micaceous, slightly carbonaceous, very silty, platy to chunky.
20% SANDSTONE; white to light grey, very fine grained, in part fine grained, quartz, traces green grains, occasional reddish brown and black grains, moderately well sorted, slightly friable, in part kaolinitic, often dirty, slight micaceous and carbonaceous, silty, fair earthy porosity.

6680-6690 40% CLAY or SHALE; washes out of sample .
40% SILTSTONE; similar to above.
20% SANDSTONE; as above, predominantly very fine grained and unconsolidated.

6690-6700 70% CLAY and SHALE; ground up by bit action, washes out of sample; probably kaolinitic.
20% SANDSTONE; white to light grey as at 6670-6680.
10% SILTSTONE; as above.

6700-6710- 70% CLAY; washes out of sample.
20% SILTSTONE; as above.
10% SANDSTONE; as above.

6710-6720 70% SILTSTONE; medium dark to dark grey, slightly micaceous, moderately carbonaceous, in part argillaceous and grades to shale.
30% SANDSTONE; light grey very fine grained, angular to subangular quartz, well sorted, friable, moderate to very silty, kaolinitic matrix, good earthy porosity, in part clean but often micaceous carbonaceous and argillaceous, in part moderate to very pyritic.
Occasional siderite and sideritic ironstone, scattered very coarse quartz grains.

6720-6730 SILTSTONE; as above, and medium grey, coarse medium to very carbonaceous, moderate to micaceous in part argillaceous, fairly common green chloritic (?) grains, grades to silty sandstone.
5% SHALE; dark grey, very silty, platy.
40% SANDSTONE; variable, light to medium grey, very fine grained, quartz, occasional green and reddish grains, often very argillaceous and dirty in part clean with kaolinitic matrix and fair earthy porosity; generally micaceous and slightly to moderately carbonaceous.

6730-6740 10% SHALE; dark grey, very silty, platy.
15% SILTSTONE; medium to medium dark grey, in slight part greenish grey, coarse generally very finely sandy, slight to moderately carbonaceous, slightly micaceous, commonly with green chloritic and white clay grains, grades to sandstone.
15% SANDSTONE; light to medium light grey, very fine grained as above.
60% SANDSTONE; white to light grey, unconsolidated predominantly medium to coarse grained subangular vitreous to slightly cloudy quartz, possibly cemented by pyrite and pale brown siderite (?) clay in part with kaolinitic cement; probably good intergranular porosity.
Common massive pyrite; trace siderite ironstone.

6740-6750 Variable cavds
25% SILTSTONE; similar to above.
5% SHALE; similar to above.
10% SILTSTONE; white to light grey, very fine to fine grained as above.
60% SANDSTONE; white to light grey, unconsolidated predominantly coarse to very coarse grained.

6750-6760 25% SILTSTONE; medium to medium dark grey, coarse moderate to very sandy (very fine grained) in part argillaceous, slightly micaceous, slight to moderate carbonaceous, occasional green chloritic grains, in part common white to light grey clay flecks - grades to -
10% SHALE; dark grey to black, moderate to very silty carbonaceous.

45% SANDSTONE; white to light grey, in part light brown, very fine to fine grained, angular to subangular, quartz, in large part clean and well sorted, in part (30%) argillaceous, silty, micaceous, and slightly carbonaceous, matrix varies from silica to kaolinitic with lesser siderite and pyrite; predominantly with earthy porosity but in part with medium (10%) intergranular porosity.
20% SANDSTONE; unconsolidated, poorly sorted quartz grains, as above.
Occasional massive pyrite; occasional siderite ironstone.

6760-6770 20% SILTSTONE; as above, in slight part with scattered fine to medium quartz grains.
10% SHALE; medium dark grey, slightly brownish slight to moderately silty, slightly micaceous fairly soft, sub-fissile.
70% SANDSTONE; white to light grey, consolidated fine grained, in part very fine grained, subangular quartz, clean, well sorted, well cemented, siliceous cement and minor kaolinitic cement with traces siderite cement, poor earthy porosity.

6770-6780 15% SILTSTONE; dark grey, similar to above.
5% SHALE; as above.
75% SANDSTONE; as above, very fine to medium grained, predominantly fine grained, in part with siderite cement good earthy porosity in part with fair intergranular porosity.
5% SANDSTONE; light brown, very fine grained, moderate to very siderite and siltstone brown, siderite, carbonaceous.
Occasional massive pyrite; common loose coarse to very coarse quartz grains.

6780-6790 Variable sample.
30% SILTSTONE; medium to medium dark grey, coarse kaolinitic, very finely and in part finely sandy, commonly moderately carbonaceous, slightly micaceous in pyritic.
5% SHALE; as above.
10% SANDSTONE; light brown, very fine to fine grained quartz, traces white clay and green chloritic grains, in part with carbonaceous flecks, very abundant siderite cement, grades to siderite siltstone.
55% SANDSTONE; white to light grey predominantly unconsolidated, very poorly sorted, medium grained to granule size, predominantly coarse grained, subangular to subrounded, slightly cloudy quartz, occasional amber stained grains, in part with pyritic cement. Common massive pyrite.

6790-6800 60% SANDSTONE; white very poorly sorted, medium grained to pebble sized, subangular, vitreous quartz, (predominantly coarse grained, with 30% very coarse grained to granule size)
30% SANDSTONE; white, consolidated (matrix for unconsolidated grains above) very fine to fine grained quartz, subangular, very friable, minor siliceous and kaolinitic cement, fair intergranular porous.
10% SILTSTONE; as above, coarse and grading to silty very fine grained sandstone.

Occasional pyrite, occasional siderite sandstone.

6800-6810 85% SANDSTONE: white, very poorly sorted, subangular to subrounded cloudy quartz grains, ranging from medium grained to pebble size (predominantly coarse grained with 30% coarser grains) set in approximately 30% matrix of sandstone. light grey to white, very fine to fine grained, subangular to subrounded quartz, rare white clay grains and tinted quartz grains, moderate to very friable, good earthy porosity, fair intergranular porosity.
10% SILTSTONE; SHALE, silty very fine grained sandstone.
Occasionally pyrite and pyritic sandstone.

6810-6820 83% SANDSTONE; white unconsolidated, poorly sorted quartz grains as above, dominantly coarse to very coarse grained, subangular to subrounded common pellucid and other tinted quartz grains, probably very porous and in part cemented with pyrite.
3% Pyrite and pyrite cemented sandstone.
12% SILTSTONE; SHALE to silty sandstone as above.

6820-6830 90% SANDSTONE: white unconsolidated, poorly sorted coarse grained to granule size, subangular cloudy quartz, rare yellowish and orange tinted grains, with 10% sandstone (matrix) very fine to fine grained as above.
6% SILTSTONE: medium to moderately dark grey, slightly micaceous, argillaceous and grades to shale.
4% Massive pyrite and pyrite cemented sandstone.

6830-6840 SANDSTONE; buff, unconsolidated, poorly sorted, medium grained to granule size, predominantly coarse to very coarse grained, subangular quartz with 20% sandstone buff, very fine to medium grained subangular quartz, rare pyrite green, traces red grains, well cemented, well cemented with siliceous dolomitic cement and sericite.
3% Pyrite and pyritic sandstone.
3% SILTSTONE - SHALE.

6840-6850 SANDSTONE; white, unconsolidated, coarse to very coarse grained, occasional medium grains and granules, subangular, slightly cloudy quartz, traces pyrite cement adhering to some grains, 10% consolidated sandstone buff to white, very fine to medium grained with siliceous and in slight part pyritic cement, in part cemented with sideritic (?) carbonate, in part with poor intergranular porosity.
5% SHALE - SILTSTONE
Fairly common sandstone light brown, fine to medium grained, quartz with some pyritic cement and abundant sideritic cement, in part with medium intergranular porosity. Common massive pyrite and pyritic sandstone.

6850-6860 SANDSTONE; white to buff, unconsolidated as above, predominantly coarse to very coarse grained with 30% matrix of sandstone; buff, very fine to medium grained, predominantly medium grained, subangular quartz, rare grey and black argillaceous grains, well cemented and siliceous dolomitic cement, predominantly tight but in part with good intergranular porosity.

5% SHALE and SILTSTONE as above.
Occasional massive pyrite; fairly abundant siderite sandstone.

6860-6870 Trip sample
Sandstone white as above predominantly coarse to granule grained quartz with 20% sandstone white to buff, fine to medium grained fairly well sorted subangular quartz, part with common dolomitic matrix, part fair to good intergranular porosity.
40% SANDSTONE; light to medium grey, very fine grained grading to siltstone micaceous, part slightly carbonaceous.
Occasional massive and crystalline pyrite.

6870-6880 SANDSTONE; grey to white, fine to coarse grained occasionally very coarse to granule unconsolidated ? quartz grains, predominantly subangular quartz in siliceous part calcareous matrix. Part very poor intergranular porosity
30% SILTSTONE; medium grey pyritic micaceous, occasional brown clay with disseminated pyrite.

6880-6890 50% SANDSTONE; as above but with common pyrite cementing grains. Tight.
20% SILTSTONE; as above.
30% SHALE; medium grey unconsolidated to very fine micaceous.
Traces siderite (vein?).

6890-6900 SANDSTONE; off white; predominantly fine grained angular to subangular quartz, in abundant dolomitic matrix. Tight.
10% SILTSTONE; light to medium grey slightly micaceous.

6900-6910 75% Returned as clay.
10% SILTSTONE; medium grey, micaceous, occasional pyritic, with common carbonaceous specks, grading to and interbedded with shale.
10% SANDSTONE; as above.

6910-6920 70% SANDSTONE; off white as above but sparser matrix. Occasional medium to coarse grained, occasional poor intergranular porosity. Occasional pyrite cement.
30% SILTSTONE; and shale as above.

6920-6930 60% SANDSTONE; off white as above.
40% SILTSTONE; off white to medium grey part with common black mica; grading to shale.

6930-6940 SANDSTONE; off white with fine grained angular to subangular quartz in a predominately dolomite matrix. Occasional medium to coarse grained occasional disseminated pyrite.
30% SILTSTONE; light to medium grey with common black mica.

6940-6950 50% SANDSTONE; as above.
50% SILTSTONE; as above.

6950-6960 60% SANDSTONE; off white very fine to medium grained part pyritic. Occasional mica and carbonaceous specks. Minor poor to fair intergranular porosity.

40% SILSTONE; light to medium grey, micaceous part with dissominated pyrite.

6960-6970 60% SANDSTONE; as above.
40% SILTSTONE; as above.

6970-6980 20% SANDSTONE; white to medium to coarse grained, subrounded clear quartz in a sparse dolomitic matrix.
10% SANDSTONE; off white to very fine to fine grained quartz in dolomitic matrix.
40% SILTSTONE; light to medium grey, part micaceous part with occasional medium to coarse sand grains, minor pyrite.
30% SHALE; medium grey, part fine micaceous, very occasionally containing medium to coarse sand grains.

6980-6990 15% SHALE; black slightly micaceous, slight to moderately silty, fissile to platy, grades to
30% SILTSTONE; medium dark to medium grey, very argillaceous, in part very finely sandy, in part pyritic, common green chloritic (?) grains, often with scattered fine to medium quartz grains.
10% Loose coarse grained to granule sized, subangular to subrounded, quartz grains (probably derived from sandstone below).
45% SANDSTONE; white to light grey, variable, in part very fine to fine grained, silty, dirty, silty in part very fine to fine grained, angular to subangular quartz, friable, fair intergranular porosity, traces kaolin matrix, in part fine to medium grained, with siliceous matrix tight; often pyritic.

6990-7000 Trip Sample: Interbedded and gradational.
15% SHALE; dark grey and brownish grey, slightly micaceous, in slight part pyritic, occasionally with subrounded medium to coarse quartz, grains, in part moderate to very silty.
50% SILTSTONE; medium grey and brownish grey; moderate to very argillaceous, greenish and light grey clay elements. Generally slightly micaceous and carbonaceous, in part coarse and grades to dirty very fine to fine grained sandstone, in part with scattered fine to coarse quartz grains.
35% SANDSTONE; variable predominantly light grey, very fine to fine grained subangular quartz, moderate to very silty, kaolinitic to siliceous cement, thin [illegible] porosity; in part very silty and argillaceous, dirty, in slight part very sideritic or pyritic cement; majority of sandstone has scattered green (chloritic?) grains and rare black coal grains.
Common brown [illegible] pyrite, pyritic sandstone, and coarse grained to granule sized quartz.

7000-7010 Interlaminated and gradational
10% SHALE; similar to above, generally tough.
55% SILTSTONE; essentially as above, in part grading to shale and very fine sandstone.
30% SANDSTONE as above.
5% Sideritic claystone (brown) and sideritic sandstone.

7010-7020 15% SHALE; medium to medium dark grey, generally moderately micaceous, common green (chloritic ?) elements, moderate to very silty, fissile in part generally chunky, grades to
15% SILTSTONE; medium light to medium grey coarse in part argillaceous, commonly very fine sandy, green chloritic (?) grains slightly carbonaceous in part.
60% SANDSTONE; light grey, very fine grained, angular to subangular quartz, rare green clay grains, occasional black and reddish accessory grains, slight kaolinitic moderate friable, good earthy porosity and lesser (35%) sandstone light grey, fine grained, subangular quartz, traces round and green accessories, occasional white and greenish clay grains, rarely pyritic, well consolidated dolomitic/siliceous cement tight.

7020-7030 SILTSTONE; very light to medium light grey, slight to moderately argillaceous, slightly micaceous, in part very fine sandy or with poorly sorted fine to medium quartz grains, predominantly tough but in slight part kaolinitic and friable.
10% SHALE; similar to that above.
30% SANDSTONE; as above predominantly silty, kaolinitic very fine grained but in part dolomitic, in part pyritic.

7030-7040 10% SHALE; as above.
55% SILTSTONE; medium light to medium dark grey, as above.
35% SANDSTONE; white to light grey, very fine to fine grained, as above.
Occasionally brown sideritic claystone and sandstone
Occasionally poorly sorted quartz grains.

7040-7050 15% SHALE; medium dark to dark grey, moderate to very silty, micaceous slightly carbonaceous, fissile to chunky.
45% SILTSTONE; as above.
40% SANDSTONE; light grey, fine grained common very fine grains, occasional medium grains, angular to subangular quartz, and 1% green and white clay grains, black carbonaceous grains, well cemented with siliceous/dolomitic cement, fair earthy porosity; tinges dolomite veining.
Occasional loose quartz grains; occasional sideritic claystone.

7050-7060 10% SHALE; medium grey, micaceous, carbonaceous earthy fissile.
10% SILTSTONE; as above.
5% Sideritic sandstone; medium to dark brown, cryptocrystalline appearance in part, consists of very fine grained quartz sandstone similar to that below, slightly pyritic, slightly carbonaceous moderately silty, abundant cement of siderite, tight.
75% SANDSTONE; white to light grey in part very fine to fine grained, slightly carbonaceous and micaceous. Predominantly fine grained, subangular to subrounded quartz, less than 1% green and black accessory grains (clay?) well cemented with white dolomitic/sideritic cement moderately friable, tight.

7060-7070
10% SHALE; as above.
10% SILTSTONE: light to medium grey, slightly carbonaceous micaceous occasional fine sand grains.
10% Sideritic sandstone as above with occasional dark brown mineral grains.
70% SANDSTONE: white to light grey as above, but fine grained with part developing very inter-granular porosity.

7070-7080
10% SHALE; medium grey, carbonaceous micaceous silty with very minor amount of lignite.
10% SILTSTONE; as above.
10% Sideritic sandstone, medium brown as above part very silty, occasional brown and black lithorelicts.
70% SANDSTONE; white to light grey very fine to predominantly fine grained with subangular fairly well sorted quartz with dolomitic cement, occasional argillaceous and carbonaceous streaks and specks. Very occasionally mica and pyrite. Traces dark and colour grains. Part poor intergranular porosity.

7080-7090
10% SHALE; as above grading to siltstone as above.
20% Sideritic sandstone light to medium brown with very fine to fine grained quartz in siderite cement, part very silty part argillaceous.
70% SANDSTONE; white to white brown as above but part with siderite/dolomite cement, gradational to sideritic sandstone above.

7090-7100
Returns 20% clay.
20% SHALE; medium grey, micaceous slightly carbonaceous silty.
30% SILTSTONE: light to medium grey, micaceous carbonaceous, minor pyrite, occasional fine sand grains.
10% Sideritic sandstone as above, with occasional carbonaceous and micaceous streaks. Part with common fine slightly irregular grains of a light green mineral, possible of ferrous sulphate.
20% SANDSTONE; white to white brown as above.

7100-7110
Returns 20% Clay.
30% SHALE as above.
30% SILTSTONE; as above.
20% SANDSTONE; as above, but only very minor siderite. Part medium to course grained with subangular quartz in dolomite cement.

7110-7120
20% Returns of clay (washed out of sample)
30% SHALE; medium grey micaceous slightly carbonaceous occasional fine sand laminae.
30% SILTSTONE; light to medium grey micaceous occasional carbonaceous material, part very fine sandy.
20% SANDSTONE; off white very fine to fine grained subangular quartz in dolomitic matrix. Occasional mica, occasionalcarbonaceous specks, includes less than 5% siderittic sandstone as above.

7120-7130 (Trip sample)
20% of returns clay (washed out of sample)
40% SHALE; medium grey as above.
30% SILTSTONE; light to medium grey as above
10% SANDSTONE; white to white brown, very fine to fine grained quartz in dolomite/siderite cement, occasionally micaceous. Trace dark and coloured grains.

7130-7140 SHALE; medium to dark grey, moderate to very silty slightly micaceous, in slight part with scattered coarse to very coarse quartz grains, chunky, in slight part subfissile, grades to -
35% SILTSTONE; medium to medium dark grey, moderate to very argillaceous, slightly micaceous, in part slightly carbonaceous, in part slight to moderately sandy (very fine grained).
5% SANDSTONE; light grey, in part brownish grey, very fine grained as above tight.
Occasional pyrite. Rare sideritic sandstone.
Scattered coarse grained to granule sized quartz grains.

7140-7150 20% CLAY or SHALE (washes out of sample)
50% SHALE; medium to medium dark grey, moderate to very silty, slightly micaceous, firm, chunky to platy - grades to -
25% SILTSTONE; medium light to medium dark grey, very argillaceous, slightly micaceous and carbonaceous, in slight part with occasional glauconite (?) grains.
5% SANDSTONE; very fine grained, in part medium grained, generally with abundant silty and argillaceous matrix, rare glauconite grains, dirty and tight.
Traces of pyrite and of siderite. Rare loose quartz grains.

7150-7160 50% CLAY or SHALE; washes out from sample.
35% SHALE; medium to medium dark grey, moderate to very silty, slightly micaceous, chunky to blocky, in part glauconitic - grades to -
15% SILTSTONE; as above, in slight part very slightly glauconitic.
Occasionally very fine to medium grained dirty sandstone, occasional massive pyrite, pyritic sandstone and sideritic sandstone.

7160-7170 75% CLAY or SHALE; washes out from sample.
20% SHALE; medium dark grey very silty, slightly micaceous, traces glauconite, chunky grades to -
5% SILTSTONE: as above.
Occasional fine to fine grained sandstone.
Traces sideritic sandstone and loose quartz grains.

7170-7180 60% CLAY or SHALE; washes out from sample.
20% SHALE; medium to medium dark grey and brownish grey as above - grades to -
20% SILTSTONE;;medium to medium dark grey and brownish grey, moderate to very argillaceous in part coarse; slightly micaceous, in slight part glauconitic.
Occasional very fine to medium grained argillaceous sandstone; occasional sideritic sandstone, rare loose quartz grains.

7130-7150 60% CLAY or SHALE; washes out of sample.
20% SANDSTONE; medium light grey, very fine grained angular quartz, occasionally green glauconite (?) grains, in large part moderate to very silty, slightly micaceous, in part carbonaceous, generally slightly pyritic, in large part dirty and friable, in part 20% with abundant brown siderititic cement, tight (note: the siderititic sandstone includes grains of altered feldspar)
5% SHALE; as above, slightly glauconitic.
5% SILTSTONE; as above slightly glauconitic.

7150-7200 70% CLAY or SHALE; washes out of sample.
20% SANDSTONE; medium light to medium grey and brownish grey, coarse, slightly micaceous in part slightly carbonaceous, argillaceous, abundant in grey and orange lithic specks (probably altered feldspar) - grades to -
5% SHALE; as above and in part lithilic; occasional glauconitic.
5% SANDSTONE; light to medium light grey, very fine grained, quartz and abundant white to grey lithic (feldspar) grains silty, tight.
Occasional siderititic sandstone and siltstone.

7200-7210 50% SHALE or CLAY (washes out of sample)
30% SANDSTONE; as above coarse and in part grades to very fine grained sandstone.
20% SHALE; as above and medium grey, tough, moderate to very silty, blocky.

7210-7220 70% of sample washing away. Sample most probably consists predominantly of medium brownish grey, silty clay and very fine grained very poorly cemented sandstone.
20% SILTSTONE; Light to medium light grey, coarse slight to moderately micaceous, slightly carbonaceous common white and orange specks (altered feldspar?) in part grades to very silty sandstone (30%)
10% SHALE; dark grey, very slightly micaceous silty platy.

7220-7230 80% CLAY: (washes out of sample) medium grey, slight to moderately micaceous, generally slight to moderately silty, in part kaolinitic.
15% SHALE; as at 7150-7160 grades to -
5% SILTSTONE; feldspathic as above.

7230-7240 80% CLAY or SHALE (washes out of samples)
10% SHALE; medium to medium dark grey, slightly brownish, flecked with lithic (feldspar ?) grains, moderate to very silty, rarely glauconitic, chunky - grades to -
10% SILTSTONE; as above.

7240-7250 80% CLAY or SHALE (washes out of sample)
15% SHALE; medium dark grey, slightly brownish very slightly micaceous, moderate to very silty, glauconitic in part grades to -
5% similar siltstone.
Scattered fine to medium quartz grains, occasional consolidated very fine to fine grained quartz sandstone with siliceous cement.

7250-7260 55% CLAY or SHALE (washes out of sample)
10% SHALE; as above and dark grey slightly silty, tough, rarely glauconitic lathliko 5% siltstone as above.
30% SHALE; light grey fine grained, in part very fine grained, angular to subangular quartz with 15% pale green and greyish green clay grains (altered feldspar ?), traces red grains, rare pyrite grains, moderately micaceous (large flakes of muscovite and biotite), occasionanl carbonaceous grains, moderately silty, well cemented with silica and dolomitic (or traces of calcareous) cement, moderately friable tight.

7260-7270 60% returned as clay, washes out of sample.
10% SHALE; medium grey, slightly micaceous occasional carbonaceous specks and white clay aggregates. Traces pyrite.
15% SILTSTONE; light to medium grey, with common white brown and green, green grains (altered felspathic or lithics ?) occasional carbonaceous specks, micaceous argillaceous.
15% SANDSTONE; white to light grey very fine to fine grained, subangular clear quartz in dolomite /siliceous cement. Occasional fine to medium white mica, very occasionally dark lithics. Minor part with pyrite cement.

7270-7280 30% Returned as clay.
15% SHALE; medium grey as above.
20% SILTSTONE; light to medium grey as above but part dolomitic.
35% SANDSTONE; white to light grey, very fine to fine grained occasionally in grained otherwise as above.

7280-7290 10% SHALE; medium grey as above.
10% SILTSTONE; light to medium grey as above.
30% SANDSTONE; white, fine grained subangular quartz in fairly sparse dolomitic cement. Minor part with chalky dolomitic matrix and possibly earthy porosity. Very occasional dark and coloured grains minor pyrite.
50% SANDSTONE; returned as individual medium to very coarse subangular clear to slightly cloudy quartz grains, probably derived from a coarser version of sandstone above. Occasional pale yellow and slightly coloured quartz grains. The presence of several cutting with interlocking quartz crystals suggests unit sandstone be tight.

7290-7300 40% Returned as clay, washed out of sample.
10% SHALE; medium grey slightly micaceous slightly carbonaceous with occasional white argillaceous specks, possibly altered feldspar.
10% SILTSTONE; light to medium grey, with occasional carbonaceous specks and dark mica flakes. Common white to light green grains possibly altered lithics and feldspar.
40% SANDSTONE; white fine grained and medium to very coarse grained as in previous sample. Cuttings occasional show coarse grains set in matrix of fine grained variety.
Part with poor to fair intergranular porosity, no shows.

7300-7310 Trip sample.
30% SHALE; medium grey as above.
50% SILTSTONE; as above part very fine sandy.
20% SANDSTONE; white to light grey very fine to fine grained subangular quartz in dolomitic cement. Occasionally carbonaceous specks, very occasional dark and coloured lithic ? grains.

7310-7320 20% returned as clay.
20% SHALE; medium grey silty, occasionnl white argillaceous specks. Minor very finely disseminated pyrite, slightly micaceous minor part with abundant irregular dark green mineral specks.
30% SILTSTONE; as above.
20% SANDSTONE; as above whit to light grey.
Trace siderritic mudstone, medium brown, slightly silty to very fine sandy.

7320-7330 50% returned as clay.
20% SHALE; medium grey as above.
20% SILTSTONE; light o medium grey, argillaceous streaks, part very fine sandy and grading to sandstone below, fairly common white to brown (altered feldspar ?) and green grains, occasional carbonaceous specks and disseminanted pyrite, partly micaceous.
20% SANDSTONE; white to light grey, very fine to fine grained as above. Part with occasional mica. Tight.

7330-7340 50% returned as clay. Washes out of sample.
45% Predominantly very fine to occasionally fine grained sandstone to light white grey, with clear quartz in fairly sparse silicaceous/dolomite cement. Occasional carbonaceous specks and brown mica. Trace intergvanular porosity. Grades to and interbedded with siltstone with similar constituents.
5% SHALE; as above very minor glauconite.

7340-7350 70% returned as clay, washes out of sample.
10% SHALE; medium grey micaceous, slightly carbonaceous, very slight glauconite scattered white argillaceous specks.
20% very fine sandstone and siltstone as above.

7350-7360 85% CLAY or SHALE ? (washes out of sample)
12% SANDSTONE; light to medium light grey, very fine grained angular quartz, abundant (15-20%) white and pastel coloured clay grained and altered feldspar (?) grains, slightly carbonaceous, slightly micaceous, in part slightly pyritic, slightly friable, siliceous cement, tight, grades to coarse siltstone.
3% SILTSTONE; medium to dark grey, slightly brownish slightly micaceous, slightly carbonaceous coarse.
Rare shale as above.

7360-7370 90% returned as clay (washes out of sample)
10% SILTSTONE; medium grey, slightly brownish, characterised by an abundant off white, pink grey and greenish lithic grains (in part of very fine grained size and probably predominantly feldspar) common black carbonaceous flocks, rare very fine grained quartz, slightly micaceous.
Occasional shale as above.

7370-7380 90% returned as clay (washes out of sample)
10% SILTSTONE; very fine grained sandstone medium light to medium grey, abundant (10-20%) lithic grains and angular to subangular quartz grains, occasional fine grains, often carbonaceous with carbonaceous flex linearly orientated.
Grades in part traces shale.

7380-7390 90% of sample returned as clay. Dirty sample.
10% SILTSTONE; sandstone medium light to moderately grey, very fine grained quartz and silt with approximately 20-25% lithic fragments (predominantly feldspar ?) including green chlorite grains, common black carbonaceous flecks; grades in part to silty, lithic shale; in part with sideritic cement.
Fairly common sideritic siltstone and very fine grained sandstone.

7390-7400 75% of sample recovered as clay (washes out)
20% SHALE; medium dark grey, tough, silty, (very abundant lithic debris) in part with laminations of silt and very fine grained sandstone, both of which are lithic, carbonaceous with carbonaceous specs linearly orientated.
5% SANDSTONE - siltstone as above.

7400-7410 75% recovered as clay (sample washes out)
20% SANDSTONE; light of medium light grey, very fine grained, in part fine grained, subangular quartz, with 10-15% lithic (feldspar ?) grains, common reddish brown (altered biotite ?) and black carbonaceous grains, well cemented, moderate to very silty, siliceous and minor carbonate cement.
10% SILTSTONE; medium light to medium grey, very lithic, as above,
20% SHALE; dark grey, very silty, abundant lithic elements, occasional green chlorite (?) patches and grains, abundant black carbonaceous or altered biotite flecks with linear orientation.
Occasional massive pyrite; 10% loose medium to very coarse, subangular quartz grains.

7410-7420 80% recovered as clay (washes out of sample)
10% SANDSTONE; as above.
5% SHALE; as above very silty.
5% SANDSTONE; unconsolidated, predominantly very fine subangular grains of quartz, but some grains up to coarse grained also.
Occasional sideritic sandstone.

7420-7430 80% recovered as clay.
10% SHALE; dark grey, very silty, abundant lithic specks, tough, platy subfissile abundant carbonaceous specks.
5% SANDSTONE; white to light grey, as above, with scattered grains of round poorly sorted quartz, traces calcareous tight.
5% SILTSTONE; similar to above.

7430-7440 70% returned as clay.
20% shale medium to dark grey, silty, common carbonaceous and lithic specks, slightly micaceous
10% SILTSTONE; to very fine sandstone white to light grey, with subangular quartz in sparse siliceous cement occasional carbonaceous specks and lithic grains.

7440-7450 Drill sample 20% returned as clay.
60% SHALE: medium grey, very silty, common lithic/feldspar ? specks, occasional carbonaceous specks, slightly micaceous traces pyrite.
20% SILTSTONE: to very fine sandstone as above part coarse clouded feldspar ? occasional coarser grains probably cavings.

7450-7460 60% SHALE: medium grey as above moderately micaceous traces glauconite.
40% SANDSTONE; to very fine sandstone, white to light grey very fine subangular quartz in sparse siliceous matrix fairly common lithic and feldspathic grains. Occasional mica, traces pyrite, part with argillaceous specks. Interlaminated with shale above.

7460-7470 60% SHALE; as above.
20% SILTSTONE: light to medium grey with carbonaceous flecks, lithic and fold grains and occasional mica.
20% SANDSTONE; white to light grey, with very fine to fine grained subangular clear quartz in occasional lithic grains in slight dolomitic cement, part with white to brown mica.

7470-7480 60% SHALE; medium grey with calcareous dark mica and white feldspar specks, occasional carbonaceous flecks.
20% SILTSTONE: as above.
20% SANDSTONE; white to off white, as above but part with traces intergranular porosity.

7480-7490 20% SHALE: as above.
30% SILTSTONE; as above.
45% SANDSTONE; white to off white as above, minor medium grained.
5% Siderittic mudstone: light to medium brown, occasional white feldspar grains and carbonaceous flecks, minor pyrite.

7490-7500 55% SHALE; medium grey, silty, slightly micaceous slightly carbonaceous occasional feldspar specks, rare medium quartz grains.
35% SILTSTONE: light to medium grey occasional argillaceous streaks, brown mica flakes, occasional white feldspar and coloured lithic grains.
35% SANDSTONE; white to light grey, very fine to fine grained mainly coarse slight dolomite cement. tight.
5% Siderittic mudstone as above.

7500-7510 35% SHALE; as above traces glauconite.
30% SILTSTONE; as above part with abundant mica.
35% SANDSTONE; as above occasional coloured lithic grains occasional white micaceous very occasional medium grained.

7510-7520 30% returned as clay, washes out of sample.
20% SHALE; medium grey, silty, as above with very occasional glauconite grains.
30% SILTSTONE; as above grading to sandstone.
20% SANDSTONE; white to light grey very fine to fine grained as above, occasionally carbonaceous flecks.

7520-7530 80% returned as clay (shale ?) washed out of sample.

5% SHALE; medium grey as above.
10% + SILTSTONE; light to medium grey common white to coloured specks (altered feldspar and lithics ?) occasional carbonaceous flecks and brown mica flakes.
5% - SANDSTONE; white to light grey as above.

7530-7540 30% returned as clay, washed out of sample.
20% SHALE; medium grey silty, micaceous, occasional white feldspathic ? specks.
30% SILTSTONE; as above.
5% very fine to fine sandstone as above.

7540-7550 30% returned as clay (shale ? siltstone ?) washed out of sample.
15% SHALE; medium grey, very silty as above
30% SILTSTONE; light to medium grey with orientated brown mica, abundant white and brown, argillaceous specks (after feldspar) occasional green grains (glauconite ?) trace carbonate.

7550-7560 30% returned as clay.
40% SHALE; as above.
30% SILTSTONE; as above, but grading to very fine sandstone white to light grey with subangular clear quartz in friably mixed matrix with trace carbonate occasional irregular pale green grains occasional mica flakes. Rare coloured lithic grains.

7560-7570 30% Returned as clay.
SILTSTONE; medium to medium light grey, 10-20% white, greenish, buff feldspar (?) shreds and grains and possibly lithic fragments, slight to moderate micaceous (muscovite and black and reddish biotite) probably slight to moderately carbonaceous, in part with very minor very finely disseminated pyrite, slightly sandy in part (very fine grained)
5% SHALE; dark grey to black, feldspathic, very silty platy.
2% SANDSTONE; light grey, very fine grained. Occasional sideritic inclusions.

7570-7580 20% SHALE; dark grey, moderate to very silty, feldspathic, moderately carbonaceous (linear orientation) platy to chunky.
35% SILTSTONE; medium light to medium dark grey, coarse, 15-20% feldspathic shreds and grains (often very fine grained size) grades to siltstone and shale.
40% SANDSTONE; very light grey to light grey, very fine grained, 20% fine grains, angular to subangular quartz, 5-10% white clay (altered feldspar) and occasional buff to pink grains, moderately silty, well sorted, well cemented traces calcite, tight.

7580-7590 55% SILTSTONE; light to medium light grey, feldspathic and carbonaceous/biotitic as above, coarse and grades to -
25% SANDSTONE; light grey, very fine grained, angular quartz with 5-10% lithic (shredded and altered feldspars) and biotite flakes, very silty well sorted, well cemented, tight.
20% SHALE; dark grey to black, feldspathic, tough, very silty, platy to fissile ? abundant black carbonaceous flakes or biotite shreds commonly with a linear orientation.

7590-7600 SILTSTONE; medium to light grey, abundant lithic (feldspathic) grains and shreds as above but only slightly carbonaceous/micaceous in part coarse and grades to very fine grained sandstone.
20% SHALE; as above.
5% SANDSTONE; as above.

7600-7610 SILTSTONE; as above slight to moderately micaceous (muscovite)
35% SHALE; as above.
Occasional sandstone as above.
Traces pyrite and loose quartz grains.

7610-7620 SHALE; dark grey, moderately carbonaceous/biotitic slight to moderately feldspathic (5%), moderate to very silty, platy and chunky grades to
40% SILTSTONE; as above.
5% SANDSTONE; very fine grained as above.
Occasional sideritic ironstone.

7620-7630 SHALE; medium light to medium dark grey, generally moderate to very silty, feldspathic, slightly micaceous (muscovite) abundant carbonaceous/ biotitic shreds, moderately soft - subfissile to platy.
25% SILTSTONE; as above.
1% SANDSTONE; light grey very fine grained as above. Rare fine to medium grained quartz with abundant siderite matrix.

7630-7640 SHALE; as above generally very silty, subfissile to platy.
20% SILTSTONE; as above.
Occasional sandstone; as above.
Traces massive pyrite + Trace pelecypod.

7640-7650 SILTSTONE; medium light to medium grey, moderate to very feldspathic, moderately carbonaceous/ biotitic, slightly micaceous (muscovite) in part argillaceous, traces chlorite (?) grains and pyrite - grades to -
20% SHALE; as above.

7650-7660 SILTSTONE; medium grey slightly greenish, abundant (up to 30%) feldspar grains, very carbonaceous, in part to slightly argillaceous, in part very fine sandy grades to -
15% SHALE; as above.
5% SANDSTONE: as above.
Traces fossiliferous fragment. Occasional sideritic siltstone.

7660-7670 SILTSTONE; as above, coarse and in part very fine sandy. traces green chloritic.

7680-7690 SILTSTONE; as above part with fairly common light green chloritic ? patches.
15% SHALE; as above.

7690-7699 Trip sample. Probably unreliable sample. Predominantly siltstone as above.

CORE No.14 7699-7709 Cut 3' Rec. 0'2½" Core Jammed.

2½ inches SHALE; dark grey, firm, moderately micaceous (muscovite), abundant carbonaceous flecks (orientated parallel to bedding) abundant white, grey and pink grains and shreds of altered feldspar (?) moderate to very silty with patches of siltstone.

2'9½ inches No recovery.

As the core is marked the dip of the bedding is not discernible.

7702-7710 SHALE; medium to medium dark grey, moderately to very silty, slightly feldspathic grades to - 30% SILTSTONE; medium to medium dark grey, moderate to very feldspathic and kithic (?) slightly micaceous, moderate to very carbonaceous

7710-7720 10% SHALE; as above generally very silty.
SILTSTONE medium grey to medium light grey, slightly micaceous, moderate to very feldspathic and kithic (?), moderately carbonaceous (flecks with linear orientation) slightly argillaceous Occasional sandstone very light grey, very fine grained, angular quartz, occasional feldspar grains and shreds, slightly carbonaceous tight.

7720-7730 SHALE; as above, moderately silty, slightly micaceous, platy to chunky.
25% SILTSTONE; as above moderately argillaceous Traces sandstone light grey, very fine to medium grain, subangular quartz, occasional chlorite grains, argillaceous matrix, fair intergranular porosity.

7730-7740 SHALE; medium grey, generally very silty, slightly to moderately feldspathic and carbonaceous, platy to chunky.
Occasional siltstone; as above occasional subrounded coarse quartz grains. Traces of pyrite and chloritic, feldspathic sideritic ironstone.

7740-7750 SHALE; medium to medium dark grey, slightly micaceous moderately silty and carbonaceous, moderately

7760-7770 35% SANDSTONE; light grey, very fine grained, angular quartz, 15% feldspar and lithic grains moderate to very silty, slightly carbonaceous, well cemented, dolomitic cement, tight, grades to -
45% SILTSTONE; as above, in part very argillaceous and grades to -
20% SHALE; as above, very silty.

7770-7780 SILTSTONE; medium grey, coarse, slightly micaceous (muscovite) element, shreds and grains of altered feldspar (also very fine garnet also), moderate to very carbonaceous, in part argillaceous.
15% SHALE; as above, very silty.
Occasional sandstone; as above, traces siderotic inclusions.

7780-7790 SILTSTONE; medium light to medium grey, coarse, as above (feldspar/lithic grains generally of very fine grained size), slightly siderotic, in part slightly calcareous, grades to -
10% SHALE; as above.

7790-7800 SILTSTONE; medium grey, coarse slightly argillaceous very feldspathic/lithic as above, moderately carbonaceous, rarely pyritic, traces dolomitic siderotic. Rare siderotic to moderately calcareous siltstone.

7800-7810 SILTSTONE; as above, becoming moderately argillaceous and grading to very silty shale.
15% SHALE; medium grey, feldspathic, slightly micaceous, moderately carbonaceous very silty platy to shaly.
Occasional sandstone; light grey, very fine grained quartz and approximately 20% lithic/feldspathic grains, very silty, slightly calcareous tight.
Occasional siderotic/slightly calcareous clay ironstone and argillaceous siltstone.

7810-7820 65% SILTSTONE; as above grading to shale.
35% SILTSTONE; medium light brownish grey, abundant feldspathic grains and flecks, moderate to very carbonaceous (?) and/or micaceous (biotite shreds) with an abundant cement of calcareous siderite; grades in part to very silty siderite.

7820-7830 SILTSTONE; medium grey, common white to brown feldspathic grains and dark brown mica flakes, occasional chlorite ? grains, traces pyrite, grade to silty shale with similar accessories.
10% SILTSTONE; light to medium brown similar to medium grey siltstone above but with abundant calcareous siderite cement.

7830-7840 SILTSTONE; light to medium grey, as above but minor part very fine sandy. Occasional brown siderotic siltstone as above.

7840-7850 SILTSTONE; light to medium grey, abundant white and brown feldspathic and light green chloritic ? grains. Common dark brown mica, occasional carbonaceous flecks, grades to shale (40%) medium grey silty, occasional feldspathic and chlorite grains and well orientated biotite flakes.

7850-7860 Lithology siltstone to shale as above. Occasional light to medium green, siltstone with common feldspar and chlorite, grains and biotite flakes in abundant calcareous siderite cement.

7860-7870 SILTSTONE; light to medium grey abundant brown white feldspathic grains and light green grey lithics ? common well icated biotite, occasional argillaceous and slightly carbonaceous laminellae and part very fine sandy. Grades to shale, medium grey occasional white feldspathic grains and biotite.

7870-7880 SILTSTONE; light to medium grey, grades to shale as above. 10% Sandstone; light grey, silty, with very fine grained quartz, white to brown feldspathic grains and light green lithic ? grains, occasional biotite. Sparse slightly calcareous matrix.

7880-7890 SILTSTONE; light to medium grey as above, partly very fine sandy, occasional glauconite grains, grades to silty shale - in part glauconitic. Traces pyrite. Traces carbonaceous material.

7890-7900 SILTSTONE; light to medium grey abundant white to brown feldspathic grains. Light green chlorite? grains, common biotite flakes, minor finely disseminated pyrite, grades to shale (10%) silty occasional feldspathic and chloritic grains. Minor part glauconite. Occasional carbonaceous material up to 2 mm diameter.

7900-7910 SILTSTONE; grading to shale as above. 10% SILTSTONE; light to medium brown with abundant slightly calcareous siderite matrix. Otherwise as for siltstone above.

7910-7920 SILTSTONE; light to medium grey as above, partly slightly glauconite. 10% SILTSTONE; light to medium brown, as above, part with very fine quartz grains.

7920-7930 Lithology as for 7910-7920.

7930-7940 SILTSTONE; light to medium grey, abundant white to brown feldspar and light grains chloritic ? grains occasional biotite, occasional biotite occasional carbonaceous material traces pyrite. Part very fine sandy and grading to sandstone (20%) light grey with very fine quartz grains, occasional white feldspar grains, occasional light green irregular chlorite, dark brown mica. Tight.

7940-7950 SILTSTONE; light to medium grey, part veryffine sandy and as above. 30% SANDSTONE; white to light grey, very fine grained silty as above. Traces coarse quartz grains ?

7950-7957 Lithology as above.

Core No.15 7957' - 7975'
Cut 18' Rec. 1'6"

6757' - 7958'2"
SILTSTONE; medium grey with common white to brown feldspathic grains and pale green chloritic ? patches, occasional carbonaceous flecks; occasional brown and white mica; traces disseminated pyrite; traces calcite fossil fragment. The core also shows diffuse argillaceous laminae.
Bedding is indistinct. Occasional fine sub-vertebrate fractures.

7958'-7958'6"
SILTSTONE; as above but light grey, slight to very fine sandy. Occasional poorly defined fossil remnants. Apparent dip on argillaceous laminae is 7°.

In addition to the 1'6" above, several abraided fragments were recovered. These were largely shale; dark grey, with only occasional feldspathic grains but fairly common well oriented biotite or carbonaceous flecks.

7958'6"-7975'No recovery. Coring samples indicate that this section is siltstone, light to medium grey as above with minor shale as above.

7970-7980 Trip sample.
50% SILTSTONE; light to medium grey, as above with minor shale as above.
50% SANDSTONE; light grey with very fine grained subangular quartz in sparse and in part slightly calcareous matrix. Common white to brown grains (altered feldspar ?) fairly common carbonaceous flecks, occasional dark green irregular glauconite ? grains, occasional white mica, traces coloured lithic ? grains.

7980-7990 30% SILTSTONE; light to medium grey, as above,
30% SANDSTONE; as above with occasional brown mica, and traces pyrite, very minor part with calcareous/sideritic matrix.

7990-8000 70% SILTSTONE; light to medium grey, with common white to brown feldspathic grains, occasional biotite and carbonaceous flecks, occasional glauconite up to fine grain size.
10% SILTSTONE; medium brown as above but with abundant calcareous possibly sideritic matrix.
20% SANDSTONE; light grey as above.

8000-8010 85% SILTSTONE; light to medium grey as above but no glauconite. Part with fairly common brown and white mica.
5% medium brown siltstone as above.
10% SHALE; dark grey with occasional white to brown feldspathic grains and well oriented biotite or carbonaceous flecks.

8010-8020 SILTSTONE; light to medium grey common white to brown feldspathic grains, occasional light green chloritic ? patches, occasional brown and white mica occasional carbonaceous flecks, very minor part with fine quartz grains minor shale as above probably interlaminated.

8020-8030 SILTSTONE; light to medium grey, as above, but major part with common glauconite part very fine sandy. Occasional (5%) brown sideritic siltstone.

8030-8040 SILTSTONE; light to medium grey common white to brown feldspathic grains occasional white and brown mica and carbonaceous flecks. Part with occasional glauconite, part very fine sandy. Traces pyrite. 5% brown coloured with abundant slightly calcareous sideritic matrix.

8040-8050 SILTSTONE; medium light grey, coarse, in part very fine sandy, rarely with fine to medium grained quartz, moderate to very feldspathic (white, grey cream and greenish grey silt size to very fine grained size grains), moderately carbonaceous and/or micaceous (biotite) slightly micaceous (muscovite), occasionally with pale green glauconite (?) pellets.
10% SANDSTONE; very light grey, very fine grained quartz with 10-15% altered feldspar and lithic grains, very slightly calcareous tight, very silty Occasional brown, very glauconitic (?) slightly calcareous sideritic siltstone.

8050-8060 30% SILTSTONE; as above in part slightly pyritic
60% SILTSTONE; light grey, coarse moderate to very sandy (very fine grained) otherwise similar to siltstone above; grades to -
10% SANDSTONE; as above.

8060-8070 SILTSTONE; light grey, slightly brownish, coarse very feldspathic, slight to moderately carbonaceous slightly micaceous, in part glauconitic (?), often moderate to very sandy (very fine grained) and grades to approximately
20% SANDSTONE; light grey very silty (similar to siltstone).
Occasional sandy siltstone with abundant siderite cement.

8070-8080 SILTSTONE - SANDSTONE; as above, in part pyritic, often with an abundant brownish cement of calcareous siderite, only rarely glauconitic, generally tough grades to -
10% SANDSTONE; light grey very silty as above.
Rare fine to medium loose grains of quartz, trace brownish orange soft mineral with bright yellow fluorescence.

8080-8090 SILTSTONE; as above but generally less sandy, commonly with sideritic cement; only traces of glauconite, grades to -
10% SANDSTONE; silty, as above.
Occasional fine to very coarse quartz grains.

8090-8100 10% SILTSTONE;- SANDSTONE; as above.
30% SANDSTONE; white to light grey, very fine grained, angular to subangular quartz, less than 10% altered feldspar, rare green grains, occasional pyrite grain, very slightly calcareous, often pyritic, generally moderate to very silty, kaolinitic cement in part, in part with fair (5-7%) intergranular porosity.
45% SILTSTONE; medium grey moderately feldspathic and carbonaceous, moderate to very micaceous, firm, generally moderate to very argillaceous and grades to -
15% SHALE; medium grey, very silty, blocky.

Scattered loose quartz grains, abundant sideritic calcareous siltstone.

8100-8110 GAS SHOW

Gas kick of one unit recorded for a period of five minutes after penetrating this section and was recycled. 7½ minutes later. Abundant bright yellow fluorescence is related to presence of a soft brownish-orange mineral; however, afaint cut was observed when chips containing the mineral were immersed in solvent.
45% SANDSTONE; white to very light grey fine grained, occasional very fine and medium grains, subangular quartz; occasional carbonaceous grains and white clay grains, often slightly pyritic, in part very pyritic, occasional carbonaceous streaks, matrix of silica with minor amounts of very slightly calcareous siderite, probably poorly sorted, generally well consolidated and only slightly friable, moderate earthy porosity and in part (20%) with fair intergranular porosity.
10% SANDSTONE; white to light grey, unconsolidated poorly sorted fine to granule sized angular to round quartz grains (finer grain sizes are more angular) average grains size is medium to coarse grains in part probably scattered in sandstone as above but some may result from breakup of friable porous sandstone
40% SILTSTONE; light to medium light grey moderate micaceous, slightly carbonaceous, very feldspathic generally firm, rare green grains, in part pyritic, in part moderate to very argillaceous in part sandy (very fine to fine grained quartz) and grades to dirty, silty sandstone.
5% SHALE - light medium light grey, similar to siltstone above, subfissile.
Occasional sideritic sandstone-siltstone.

8110-8120

Very variable sample.
10% SANDSTONE; as above being very fine to fine grained dirty and tight.
10% SANDSTONE; loose quartz grains, as above.
10% SHALE; light grey to medium brownish grey moderate carbonaceous and feldspathic, generally moderate to very silty, fissile.
25% SANDSTONE; light grey, very fine grained to fine grained subangular quart with 10% buff, cream and grey (altered feldspar ?) grains, common black grain (carbonaceous ? may in part be biotite), occasional green grains, set in abundant silty matrix, in part slightly to moderately pyritic and micaceous, tight.
45% SILTSTONE; light to medium light grey as above, coarse and in part sandy (very fine grained) grades to very silty sandstone; in part argillaceous.

8120-8130

Variable lithology
15% Unconsolidated subangular quartz grains, predominently fine grained, common very fine grains and occasional very coarse grains.
30% SANDSTONE; white to light grey, fine grained, in part very fine grained, subangular quartz, occasional dark grey grains and kaolin grains, well cemented with silica and some kaolin, fair earthy porosity traces intergranular porosity.
15% SHALE; as above.

40% SILTSTONE; medium light to medium dark grey as above in part grades to sandstone.
Uneven bright yellow mineral fluorescence.
Occasional siderritic sandstone and siltstone.

8130-8140 30% SANDSTONE; off white with very fine to predominantly fine grained (occasional medium grained) angular to subangular quartz in medium sparse white carbonate cement - slightly calcareous probably dolomitic. Very minor white micaceous and carbonaceous flecks. Minor part with poor intergranular porosity. Gas kick of 1 unit but to coincident with recycle of trip gas.
No hydrocarbon fluorescence.
35% SILTSTONE; medium grey common off white feldspathic grains, common pale grey green chloritic grains. Occasional carbonaceous flecks and brown mica traces glauconitic traces pyrite.
5% Siderritic siltstone medium brown, as above but not in abundant argillaceous very slightly calcareous and probably siderritic matrix.
20% SHALE; dark grey, silty, with feldspathic and chloritic grains as for siltstone above, well carbonaceous brown mica.

8140-8150 10% SANDSTONE; off white as above part slightly argillaceous.
75% SILTSTONE; as above part very fine to fine sandy.
5% Siderritic siltstone as above.
10% SHALE; dark grey, silty, as above.

8150-8160 30% SANDSTONE; off white to light grey predominantly very fine grained silty, and part argillaceous common white and brown feldspathic grains and light green chloritic grains, fairly common carbonaceous flecks, grades to -
55% SILTSTONE; light to medium grey, part very fine sandy as above.
5% Siderritic siltstone as above.
20% SHALE; medium to dark grey silty occasional white to brown feldspathic grains. Occasional carbonaceous flecks and brown mica part with occasional fine quartz grains.

8160-8170 30% SANDSTONE; white to light grey with very fine to fine grained subangular quartz and fairly common white to light brown irregular feldspathic grains, in moderate sparse white siliceous part dolomitic cement, very occasional white and brown mica and carbonaceous flecks.
50% SILTSTONE; light to medium grey part very fine sandy part argillaceous, common white to off white feldspathic grains fairly common carbonaceous flecks occasional brown mica.
5% Siderritic siltstone as above.
20% SHALE; medium to dark grey, silty as above.

8170-8180 40% SANDSTONE; white tollight grey, as above traces porosity.
45% SILTSTONE; light to medium grey as above.
5% Siderritic siltstone medium brown, with fairly common white to light grey feldspathic grains and occasional very fine quartz grains, in abundant argillaceous siderritic matrix.
10% SHALE; medium to dark grey silty as above.

8180-8190 20% SANDSTONE; white to off white, with fine to occasional medium grained subangular to subrounded quartz, in fairly sparse siliceous part dolomitic cement very occasionally white feldspathic grains and mica. Part with fair porosity.
30% SANDSTONE; white to light grey very fine to fien grained as above.
40% SILTSTONE; light to medium grey, part very fine sandy, part as above, argillaceous.
5% Sideritic siltstone; as above.
5% SHALE; as above.

8190-8200 80% SANDSTONE; white to off white with fine to medium grained angular to occasionally subrounded quartz in fairly sparse siliceous slightly dolomitic cement. Very occasionally white feldspathic and coloured lithic grains. Traces pyrite grains moderately friable, generally fair intergranular porosity.
Occasionally coarse to very coarse quartz grains are probably derived from this sandstone.
10% SANDSTONE; light grey very fine grained, silty argillaceous with common feldspathic grains and brown mica.
10% SILTSTONE; as above including occasional sideritic siltstone with occasional development of poor part porosity.

8200-8210 50% SANDSTONE; white to off white fine to medium grained as above, fair intergranular porosity and occasional coarse to very coarse loose grains as above.
10% SANDSTONE; light grey very fine grained with common feldspathic grains and pale green chloritic grains, silty, common carbonaceous flecks, part pyritic.
20% SILTSTONE; medium grey with abundant white to brown feldspathic and light green chloritic grains occasional carbonaceous flecks, part pyritic.
20% SHALE; medium to dark grey as above.

8210-8220 SHALE; dark grey, silty, platy fairly common well oriented biotite, occasional feldspathic and chloritic grains.
15% SANDSTONE; and siltstone as above.

8220-8230 60% SANDSTONE; white with fine to occasional medium subangular clear quartz in very sparse siliceous cement, very occasionally grey lithic grains.
Traces pyrite occasional loose coarse quartz grains.
10% SILTSTONE; light to medium grey as above part fine sandy.
30% SHALE; as above.

8230-8240 30% SANDSTONE; white to light grey with very fine to fine grained subangular quartz and white to brown feldspathic grains in a fairly sparse siliceous slightly dolomitic cement, Part with common carbonaceous flecks and laminae.
20% SANDSTONE; white fine to medium grained as above.
10% SILTSTONE; light to medium grey as above.
40% SHALE; dark grey, silty as above part slightly pyritic.

8240-8250 1.3% SHALE; medium to medium dark grey, slight to moderately carbonaceous, flecked, generally only slightly feldspathic, silty in part subfissile to fissile.
15% SANDSTONE; light grey, unconsolidated, predominantly very fine to fine grained, subangular quartz grains with occasional medium to very coarse grains, generally angular, derived from poorly sorted friable sandstone as below.
5% SANDSTONE and SILTSTONE; variable grain size but cemented with abundant siderite generally moderate to very feldspathic and slightly carbonaceous, tight.
30% SILTSTONE; medium light to medium grey, variable but generally moderate to very feldspathic and moderately carbonaceous, in large part sandy (very fine grains and occasional fine to medium grains) in part trace pyritic, in part micaceous, in part argillaceous.
10% SANDSTONE; white, fine to medium grained, as above.
25% SANDSTONE; light grey, very fine grained in part fine grained, subangular quartz, 5-20% altered feldspar, slight to moderately carbonaceous, tight, generally very silty and grades to siltstone.

8250-8260 10% SHALE; medium dark grey, moderate to very micaceous, slightly feldspathic and carbonaceous moderate to very silty, platy and blocky.
5% SILTSTONE; as above.
5% SANDSTONE; light grey silty as above.
80% SANDSTONE; white, very poorly sorted, sample predominantly unconsolidated, very fine to granule sized, predominantly medium grained, predominantly angular quartz, traces white kaolin grains.
Consolidated chips include occasional rounded grains, occasional yellowish stained, grains, fairly common kaolin grains and in part common black carbonaceous grains, some chips have kaolin matrix but sandstone probably poorly cemented with silica; consolidated chips show fair to very good intergranular porosity; overall porosity probably 15-20%. Faint yellowish fluorescence from several quartz grains.
Fairly common medium light brown sandstone with abundant (90%) sideritic matrix.

8260-8270 Trip Sample. Sample unreliable.
20% SANDSTONE; light grey, predominantly fine to medium grained, in part clean quartz with occasional white kaolin grain and traces feldspar; in part with abundant feldspar grains, kaolinitic to siliceous cement, tight.
40% SILTSTONE; medium light to medium grey, very feldspathic, moderate to very carbonaceous, in part argillaceous, as above.
40% SHALE; (probably largely cavings) medium to medium dark grey, slightly feldspathic and carbonaceous, slight to moderately silty, lathlike to subfissile.

8270-8280 25% SANDSTONE; white fine to occasional medium grained with angular to subangular clear quartz in fairly sparse white cement to possible kaolinitic or siliceous rare included coarse to very coarse quartz grains occasional carbonaceous grains part with fine pyrite, occasional white feldspathic grains, traces lithic fragments. Partly poor to fair intergranular porosity, part with earthy porosity in kaolinitic matrix.
20% SANDSTONE; off white to light grey very fine grained with common white to brown feldspathic grains fairly common carbonaceous flecks and laminae silty, grades to siltstone below.
20% SILTSTONE; light to medium grey with feldspathic and carbonaceous grains as for sandstone above.
30% SHALE; medium to dark grey silty occasional feldspathic grains part with oriented carbonaceous flecks.
5% SANDSTONE; dark grey with fine to medium angular quartz grains in abundant dark grey argillaceous slightly carbonaceous matrix.

8280-8290 SANDSTONE; white fine to very coarse and granule grain size largely returned as loose angular clear to white (occasional lemon yellow) quartz grains. Consolidated chips have coarse part siliceous, part kaolinitic cement and traces grey green lithic grains and orange felspar. Part show fair intergranular porosity and earthy (cement) porosity. Some coarser chips show tightly interlocking quartz crystals and overall porosity may be less than that suggested by the loose grains.
10% SANDSTONE; light grey, very fine grained grading to siltstone as above.
10% SHALE; dark grey as above probably interlaminated with sandstones above.

8290-8300 50% SANDSTONE; white as abovebbut predominantly fine to medium grained consolidated, and tight.
15% SANDSTONE; light grey very fine grained grading to siltstone as above common carbonaceous flecks.
5% SANDSTONE; light brown with fine to medium angular quartz in abundant argillaceous to sideritic? matrix. Traces orange feldspar and grey lithic grains.
30% SHALE; dark grey part silty traces to occasional white feldspathic grains and light chloritic grains Part with common oriented carbonaceous flecks. Minor part pyritic.

8300-8310 SANDSTONE; white fine to very coarse and grain size. Returned largely as single clear to white and occasional pale yellow angular quartz grains, consolidated chips show very sparse siliceous and kaolinitic cement but generally only poor intergranular porosity. Traces orange feldspar and grey green lithic grains.
20% SANDSTONE; light grey silty, very fine grained grading to siltstone with abundant white to brown feldspathic and light green chloritic grains, common carbonaceous flecks and argillaceous streaks traces white mica.
10% SHALE; dark grey as above.

8320-8330 SANDSTONE; white fine to granule size as above, but predominantly medium grained largely returned as single grains.
15% Very fine sandstone grading to siltstone as above minor part very poorly sorted with occasional medium to coarse angular quartz grains. Traces orange feldspar. Traces glauconite ?
15% SHALE; dark grey and silty with occasional white feldspathic grains and common well oriented biotite, occasional carbonaceous flecks.

8330-8340 SANDSTONE; white to offwhite fine to granule size mostly returned as single, angular clear to white quartz grains. Consolidated chips are predominantly fine to medium grained with very sparse siliceous and kaolinitic cement, and generally fair to very occasionally good porosity.
Occasional carbonaceous grains, occasional white feldspathic grains, traces orange feldspar and grey lithic grains.
10% SILTSTONE; light to medium grey with common white feldspathic green chloritic grains, occasional carbonaceous flecks, traces orange feldspar.
Traces glauconite? part very (fine to medium) sandy and grading to a sandstone equivalent.
15% SHALE; dark grey as above.

8340-8350 60% SANDSTONE; white to off white as above but consolidated chips show poor sorting with quartz grains ranging from fine to granule size, slightly more common grey green fine to medium lithic grains. Poor to fair intergranular porosity.
15% SILTSTONE; light to medium grey grading to sandstone as above.
5% Sideritic siltstone medium brown common carbonaceous flecks and occasional white feldspathic grains in abundant slightly argillaceous sideritic matrix.
20% SHALE; dark grey as above.

8350-8360 50% SANDSTONE; white to off white as above.
30% SILTSTONE; light to medium grey with abundant white to brown feldspathic and light green diloritic grains. Occasional carbonaceous flecks occasional brown mica traces orange feldspar traces glauconite, part very fine to fine sandy.
5% Sideritic siltstone as above.
15% SHALE; dark grey feldspathic grains occasional brown mica.

8360-8370 SANDSTONE; white to off white with fine to very coarse grained angular quartz and very sparse white siliceous part kaolinitic cement, very occasionally white feldspathic grains, traces grey green lithic grain traces part with pyritic cement. Poor to occasionally fair intergranular porosity, probably earthy porosity in kaolinitic cement, part returned as loose angular clear to white and very occasionally lemon yellow quartz grains.
40% SILTSTONE; light to medium grey as above with 5% sideritic siltstone as above.
10% SHALE; dark grey as above.

8370-8380 SANDSTONE; white to off white as above with occasional very fine to fine carbonaceous grains traces white mica flakes.
15% SILTSTONE; as above but with common carbonaceous lamellae.

15% SHALE; dark grey as above.

83808390 40% SANDSTONE; white to off white as above.
20% SILTSTONE; light to medium grey part very fine sand as above.
40% SHALE; dark grey silty, occasional white to brown feldspathic grains occasional carbonaceous flecks and brown mica part with common carbonaceous lamellae traces pyrite.

8390-8400 SANDSTONE; white to off white predominantly fine to medium grained with fairly well sorted angular clear quartz grains in a sparse siliceous part kaolinitic cement.
Very occasional white feldspathic grains, traces orange feldspathic and grey lithic grains, traces pyrite traces muscovite fairly common very fine to micro carbonaceous specks, occasional carbonaceou flecks and laminae.
Part with poor intergranular porosity.
10% loose medium to very coarse quartz grains, may be cavings or derived from above.
5% SILTSTONE; light to medium grey with abundant white to brown feldspathic grains angular quartz grains in argillaceous matrix, common carbonaceous flecks and lamellae.
5% SHALE; dark grey slightly silty with very occasional white to brown feldspathic grains and carbnaceous specks, part micro-micaceous.

8400-8410 SANDSTONE; white to off white part fine to medium grained as above but largely returned as loose medium to very coarse clear to white angular quartz grains occasional consolidated chips show interlocking quartz grains in very sparse siliceous cement.
5% SILTSTONE; as above.
5% SHALE; as above.
Traces orange brown mineral with bright yellow fluorescence. Brittle with sub-conchoidal fracture vitreous lustre.

8410-8420 SANDSTONE; white to off white fine to very coarse grained as above approximately 60% returned as loose grains. Common carbonaceous specks occasional lamellae. Part traces poor intergranular porosity (consolidated chips).
5% SILTSTONE; as above with carbonaceous lamellae
10% SHALE; dark grey slightly silty carbonaceous as above.

8420-8430 Circulated sample. Possibly unreliable.
60% SANDSTONE; white to off white fine to very coarse grained with poorly sorted clear to white angular quarts in very sparse siliceous part kaolinitic cement. Part with slightly more orange feldspar and lithic grains then above. Common carbonaceous specks. Part with poor to fair intergranular porosity. Approximately 30% returned as loose quartz grains.
20% SILTSTONE; as above, part sandy and part glauconite - are probably cavings.
20% SHALE; dark grey, carbonaceous ab above, part very silty and probably cavings.

8430-8440 Trip Sample.
SANDSTONE; white fine to very coarse grained predominantly medium grained with angular clear quartz in very sparse siliceous part kaolinitic cement. Traces orange feldspar and lithic fragments; fairly common carbonaceous specks, part fair to good intergranular porosity.
40% returned as loose grains.
Fluorescence: a. Bright yellow no cut orange/brown mineral previously described.
b. White to blue no cut white to massive kaolinitic material possibly part of sandstone matrix.
c. Dull orange to yellow no cut clear quartz with no staining possibly due to mineral inclusion.
d. Bright yellow as for a. but with slight white not attributed: Orange mineral may be a resin ?? or cut from residual hydrocarbons.
20% SHALE; dark grey silty occasional white feldspathic fine grains common carbonaceous flecks, slightly micaceous.
5% SILTSTONE; light to medium grey part sandy part argillaceous common white to brown feldspathic grains and carbonaceous flecks.
5% 'Kaolin' white massive to microcrystalline possibly earthy porosity. Probably derived from sandstone.

8440-8450 SANDSTONE; white fine to very coarse and occasionally granule size as above but predominantly coarse grained largely returned as loose single angular clear quartz grains. Consolidated chips show fair to good intergranular porosity in part with part tight and interlocking fluorescence. Mineral as above.
5% SHALE and SILTSTONE as above.
5% Kaolin as above.

8450-8460 SANDSTONE; white with poorly sorted fine to very coarse angular clear quartz in very sparse siliceous kaolinitic cement. Occasional lemon yellow quartz grains and rounded in part. Common specks of black carbonaceous/bitumin ? material.
Part fair to good porosity, part tight as above, very minor shale siltstone and kaolin as above.

8460-8470 15% SHALE; medium light to medium grey, moderately micromicaceous, moderately carbonaceous, predominantly only slightly feldspathic, in part silty, fissile to platy.
85% SANDSTONE; white to light grey, very poorly sorted, matrix consists predominantly of fine to medium grained angular quartz, rare white kaolin grains, traces pink grains and pyrite grains, commonly cemented with silica but in part by a powdry white kaolinitic cement and less commonly by brown siderite? The sandstone is slightly silty and includes abundant very fine grains coarser grains (approximately 35% of sample) range in size from coarse grained to pebble size and are predominantly coarse to very coarse grained.
The sandstone has moderate intergranular porosity and many chips and individual quartz grains exhibit a very pale fluorescence (mineral) but not cut in solvent and no stain. Scattered bright yellow mineral fluorescence. Fairly common brown sandy siderite and/or ironstone.

8470-8480 15% SHALE; as above.
85% SANDSTONE: similar to above but in general with an increase in matrix and only about 15 to 20% scattered coarser grains predominantly of coarse to very coarse grained sized. The sandstone is most commonly cemented with a siliceous cement and has fair intergranular and earthy porosity It exhibits fait yellow fluorescence in part and rare bright yellow fluorescence both of which appear to abe attributable to the presence of a brownish orange mineral. Occasional carbonaceous/bitumen stringers.

8480-8490 15% SHALE; medium grey, slightly modorate carbonaceous and feldspathic silty in part moderate to very micaceous, fissile to platy.
85% SANDSTONE; as at 8460-8470 with some argillaceous grains and occasional black carbonaceous grains and generally with moderate to good intergranular and earthy porosity.

8490-8500 20% SHALE; as above.
80% SANDSTONE; white to light grey, poorly sorted matrix consists predominantly of fine to medium, angular quartz with traces of black carbonaceous grains, orange grains, white kaolin grains, friable cemented predominantly with silica but some kaolinitic and lesser sideritic (?) cement, moderate to good intergranular and earthy porosity. Mineral fluorescence as above. Very abundant (50%) coarse grained to granule sized loose quartz grains. Average grain size coarse.

8500-8510 60% SHALE; medium light to medium grey as above, in part moderately silty.
40% SANDSTONE; similar to above, fine to medium grained but with a marked decrease in percentage of coarser grains;;common black carbonaceous to coaly flecks and grains occasional red grains; moderate earthy and interganular porosity. Occasional siltstone. Fairly common brown very fine grained sandstone and siltstone with abundant sideritic matrix.

8500-8510 50% SHALE; medium light to medium grey moderate to very carbonaceous, slightly feldspathic (?) in part silty sub-fissile to platy - grades to.
10% SILTSTONE; medium grey, carbonaceous, argillaceous.
10% SILTSTONE; medium brown, moderate to very carbonaceous and slightly argillaceous, very abundant sideritic cement.
30% SANDSTONE; as above, fair porosity in part but in part with brown sideritic matrix; matrix predominantly fine grained; fairly common coarse to very coarse grains. Traces bright yellow mineral fluorescence.

8510-8520 75% SHALE; medium grey slightly micaceous, slightly carbonaceous, in part slightly silty, fissile.
20% SANDSTONE; white to light grey, poorly sorted, as above (30% with fair to good porosity) in part with sideritic ? cement.
5% SILTSTONE; as above.

8520-8530 Fast drilling break at 8525.
35% SHALE; as above, moderately micaceous, subfissile to platy.
5% SILTSTONE; medium grey, as above.

60% SANDSTONE; white to light grey, medium grained in part fine grained, scattered coarse to granule sized grains, poorly sorted with common very fine and silt sized grains, angular quartz, traces of white kaolin, pink and orange stained quartz, green clay grains, fairly common black carbonaceous specs; friable, good to very good intergranular and earthy porosity. Scattered mineral fluorescence. Common sideritic siltstone.

8530-8540 35% SHALE; medium grey slightly micromicaceous, slightly to moderately carbonaceous, fissile to subfissile in part silty and platy.
5% Brown and brownish grey, very sideritic, argillaceous and carbonaceous siltstone and silty clay ironstone.
60% SANDSTONE; light grey, matrix similar to sandstone above but 40% of sample consists of angular to sub-angular coarse grained to granule sized (predominantly coarse grained) quartz grains.

8540-8550 10% SHALE; as above.
5% Medium light to medium greyish brown very sideritic very fine grained sandstone and CLAYSTONE.
85% SANDSTONE; white to light grey, unconsolidated, poorly sorted, medium grained to granule size with rare pebble, predominantly coarse to very coarse grained, clear to slightly cloudy, angular in part subangular quartz, common yellow with occasional amber and pink tinted quartz grains. traces white and grey chert grains, black carbonaceous matter adhering to some grains minor consolidated chips have a siliceous cement and in part are cemented with white kaolin or more rarely with a reddish brown sideritic/ dolomitic cement. Consolidated chips show fair to poor porosity and overall porosity possibly moderate.

8550-8560 15% SHALE; as above.
5% Sideritic sandstone and ironstone, as above.
80% SANDSTONE; as above predominantly unconsolidated, predominantly coarse to very coarse grained, quartz and traces red jasper (?) grains.
Rare pyrite.
Common pale yellowish fluorescence possibly due to inclusions in quartz or to cement but perhaps hydrocarbon fluorescence. No cut in solvent.

8560-8570 10% SHALE; as above, often silty.
3% Sideritic ironstone, siltstone, very fine grained sandstone as above.
87% SANDSTONE; white, predominantly unconsolidated, very poorly sorted to pebble size, predominantly coarse to very coarse grained, angular, vitreous quartz, traces of blue grey quartz and of red jasper (?), occasional amber and yellow tinted grains, black carbonaceous matter adheres to several grains, but consolidated chips indicate cement probably is siliceous/kaolinitic as above. Faint yellow fluorescence (as above) on many quartz grains.
Traces of bright yellow mineral fluorescence.

8570-8580 25% SHALE; medium dark grey, slightly micaceous, moderately carbonaceous, slight to moderately silty, fissile to platy.
75% SANDSTONE; similar to that at 8530-8540 but predominantly well cemented and only with poor intergranular and earthy porosity. Scattered mineral fluorescence.

8580-8590 Trip Sample
50% SANDSTONE; white poorly sorted fine to very coarse grained as above but predominantly fine grained with angular quartz in very sparse siliceous/kaolinitic cement. Part poor to fair intergranular porosity. Trace residual hydrocarbon with pink to yellow fluorescence and slight cut.
40% SHALE; dark grey silty with occasional white to brown feldspathic grains, carbonaceous slightly micaceous.
10% SILTSTONE; part sandy, with abundant white to brown feldspathic grains and common carbonaceous stains and specks.

8590-8600 35% SHALE; dark grey silty with well oriented brown mica, occasional white to brown feldspathic and light green chloritic grains.
10% SANDSTONE; white as above probable cavings.
35% SANDSTONE; white to light grey very fine to fine grained with angular to subangular quartz in siliceous/kaolinitic cement, occasional white to brown feldspathic grains and carbonaceous specks. Tight.
20% SILTSTONE; light to medium grey part sandy, part argillaceous and grading to shale above. Common white to brown feldspathic and light green chloritic grains. Occasional carbonaceous flecks, traces glauconite traces mica, traces pyrite. 5% with sideritic matrix.

8600-8610 60% SHALE; dark grey,micaceous, part silty with occasional white to brown feldspathic grains part with laminae of very fine quartz sand, very occasionally with fine to very coarse quartz grains grades to to siltstone, below.
30% SILTSTONE; light to medium grey as above.
10% SANDSTONE; off white with fine to medium grained angular and occasional oriented clear quartz in siliceous slightly kaolinitic cement. Occasionally carbonaceous grains, traces grey lithic grains. Part with traces intergranular porosity.

8610-8620 30% SHALE: dark grey silty, micaceous as above.
30% SILTSTONE; light to medium grey part argillaceous part sandy common carbonaceous flecks, as above.
40% SANDSTONE; white with fine to very coarse angular clear quartz, largely returned as single grains in consolidated chips. More sparse siliceous or kaolinitic cement. Minor part with good intergranular porosity. Occasional faint yellow fluorescence wth very slight cut.

8620-8630 70% SANDSTONE; white to off white fine to very coarse grained but predominantly fine to medium and returned as consolidated chips, with angular clear quartz as above, but generally fair to good intergranular porosity. Traces fluorescence as above.
20% SILTSTONE; light to medium grey as above, slightly micaceous.
10% SHALE; dark grey as above very minor part with glauconite.

8630-8640 30% SANDSTONE; white to off white as above.
30% SILTSTONE; light to medium grey, part sandy, common white to brown feldspathic grains and

carbonaceous flecks, part argillaceous grading to shale below.
40% SHALE; dark grey part silty with occasional white to brown feldspathic grains common mica, very occasionl quartz sandsgrains.

8640-8650 20% SHALE; medium to medium dark grey, very slightly micaceous, rarely glauconitic, slight to medium carbonaceous and feldspathic, in part silty, subfissile to platy - grades to -
15% SILTSTONE; medium grey slight to moderately carbonaceous, moderate to very feldspathic (?) (cream buff and grey altered clayey grains), in part very fine sandy.
65% SANDSTONE; white to light grey, poorly sorted, recovered predominantly as unconsolidated grains, fine grained and very coarse grained, predominantly very coarse grained, angular, vitreous quartz, common amber and yellow tinted quartz grains; consolidated chips are generally cemented with silica and tight. Occasional brown sideritic ironstone; traces of pyrite.

8650-8660 40% SHALE; medium to medium dark grey, as above, but generally moderate to very silty and occasionally with scattered very fine to medium rounded quartz grains grades to -
25% SILTSTONE; medium grey, slightly micaceous, abundant altered feldspar and possibly lithic grains slightly carbonaceous.
35% SANDSTONE; similar to that above, consolidated chips cemented with silica and tight.
Traces pyrite, very fine grained glauconitic sandstone occasional sandy sideritic IRONSTONE.

8660-8670 40% SHALE; medium to dark grey silty as above.
30% SILTSTONE; light to medium grey as above grades to very fine grained silty sandstone with occasional glauconite.
40% SANDSTONE; white to off white fine to very coarse grained with poorly sorted angular quartz in sparse siliceous/kaolinitic cement. Part returned as single grains consolidated chips are predominantly fine grained with poor porosity, part tight.

8670-8680 30% SANDSTONE; white to off white as above but part with poor to fair porosity.
30% SHALE; medium to dark grey occasional feldspathic grains with oriented mica and carbonaceous flecks, part silty and grading to siltstone below.
20% SILTSTONE; light to medium grey with common altered feldspar grains, occasional carbonaceous specks and traces glauconite?

8680-8690 50% SHALE; medium to dark grey silty, as above.
15% SILTSTONE; light to medium grey as above with 5% sideritic matrix.
25% SANDSTONE; white to off white as above to very poorly sorted and with rare white feldspathic and grey lithic grains, very occasional carbonaceous flecks. Mainly tight.

8690-8700 60% SANDSTONE; white to off white fine to very coarse grained but predominantly fine grained with angular quartz in siliceous slightly kaolinitic cement, scattered with white feldspathic grains, rare lithic grains very occasional carbonaceous/bitumen specks.

Traces poor intergranular and earthy porosity.
10% SILTSTONE; as above.
30% SHALE; dark grey silty as above, but very minor part glauconite.

8700-8710 60% SANDSTONE; white to off white as above occasionally yellow quartz grains, very minor part with sideritic cement, traces poor porosity as above.
15% SILTSTONE; light to medium grey with abundant altered feldspathic grains. Occasional mica and carbonaceous flecks, part very fine sandy, traces glauconite.
25% SHALE medium to dark grey silty, as above grading to siltstone above.

8710-8720 55% SHALE; medium to dark grey, predominantly very silty and grading to siltstone, occasional white kaolinitic grains, common white mica very minor part with glauconite, traces pyrite.
15% SILTSTONE; light to medium grey as above.
30% SANDSTONE; white to off white fine to very coarse grained as above.

8720-8730 55% SHALE; medium dark to dark grey, slight to moderately micromicaceous, predominantly slightly silty, rarely glauconitic, common carbonaceous flecks (or biotite shreds) with linear orientation occasional white cream and buff altered feldspar grains, rarely with scattered very fine to medium grained quartz; sub-fissile to chunky.
10% SANDSTONE; light grey, poorly sorted, very fine to medium grained, quartz with 30-40% cream buff green black altered feldspar and lithic grains, well indurated, tight.
15% SANDSTONE; white to light grey, very fine to medium grained, predominantly fine grained, subangular quartz, traces grey, orange and black grains, well cemented with silica tight.
5% Loose fine to very coarse quartz grains, sub-angular to well rounded; well rounded grains probably "float" from siltstone and shale and remainder derived from sandstone above.
15% SILTSTONE; medium to dark grey, argillaceous predominantly very fine to fine sandy.

8730-8740 5% SANDSTONE; white to light grey, very fine to medium grey, as above.
5% SANDSTONE; light grey, very fine to medium grey, quartz and lithic grains, silty, as above.
5% Loose quartz grains as above.
20% SILTSTONE; medium to medium dark grey, carbonaceous micaceous, in part sandy and grades to very fine grained, silty sandstone, generally with abundant feldspathic/lithic grains.
65% SHALE; medium dark grey moderate to very carbonaceous and in part micaceous (biotite shreds) in part slight to moderately silty, rare poorly sorted sand grains, subfissile to platy. Occasionally sideritic IRONSTONE.

8740-8750 10% SANDSTONE; white to light grey, very fine grained angular quartz, occasional lithic (?) grains, occasionally carbonaceous grains, rare mica, friable in part, silty, siliceous to slightly kaolinitic cement, predominantly tight.
20% SILTSTONE; as above.
70% SHALE; as above.
Rare angular quartz pebbles with poorly sorted sandstone adhering. Occasional sideritic ironstone.

8750-8760 SHALE; medium to medium dark grey, in slight part micromicaceous, slight to moderately carbonaceous, occasionally feldspathic/lithic grains, fissile with lesser shale; medium to medium dark grey moderately carbonaceous, slight to moderately silty common silt to very fine grained size lithic/ feldspathic grains, chunky.
20% SILTSTONE; medium grey, in part brownish grey slight to moderately micaceous, in part argillaceous in part grades to very fine grained sandstone, slightly carbonaceous, moderate to very feldspathic lithic, in part with common green chloritic (?) grains.
5% SANDSTONE; variable, white to light grey predominantly very fine grained, quartz and occasional pink green and buff accessory grains, tight.
Scattered fine to very coarse quartz grains.

8760-8770 50% SHALE; medium to dark grey, silty, common well oriented mica, occasional dark carbonaceous flecks, traces pyrite, grades to -
30% SILTSTONE; light to medium grey with abundant altered feldspathic and lithic grains, fairly common white mica, and carbonaceous streaks and flecks. Minor part very fine sandy with occasional glauconite grains and minor part with sideritic matrix.
20% SANDSTONE; white, returned as single grains fine to very coarsebbut predominantly coarse grained angular to subrounded clear to cloudy quartz. Very minor fine to medium grained consolidated chips with siliceous matrix, tight.

8770-8780 SANDSTONE; white to off white fine to occasionally medium grained with angular clear quartz in a siliceous slightly kaolinitic cement. Very occasional white altered feldspar carbonaceous specks, rare coloured lithics. Traces to occasional poor intergranular porosity. 0.1 unit shift on gas detector similar to previous CO_2 shows. Traces bright yellow fluorescence due to orange brown organic matter previously described.
10% SANDSTONE; white, fine to very coarse single grains, as above.
10% SHALE; medium to dark grey, silty as above.
10% SILTSTONE; light to medium grey as above.

8780-8790 SANDSTONE; white fine to very coarse and granule size, poorly sorted made at coarse grain size. 50% returned as single angular and clear to cloudy quartz grains. Consolidated chips have sparse siliceous slightly kaolinitic cement, and very occasionally white to light brown feldspathic shreds and dark carbonaceous specks. Minor part with poor intergranular porosity. Very minor part with brown sideritic cement. Rare carbonaceous/ bitumen lamellae.
10% SHALE & SILTSTONE; as above.

8790-8800 SHALE; medium to dark grey micromicaceous, part silty occasional carbonaceous flecks.
30% SILTSTONE; light to medium grey with common white feldspathic grains and occasional mica and carbonaceous flecks, very minor part with common glauconite, rare fine to medium angular quartz grains.
10% SANDSTONE; white fine to very coarse grained as above.

8800-8810 Trip sample. Poor quality.
SHALE; medium dark grey, slightly micromicaceous slightly carbonaceous (flecks), very slightly feldspathic (shreds and silt size grains) in part silty, fissile to subfissile.
35% SILTSTONE; medium light to medium grey, moderately carbonaceous, moderate to very feldspathic lithic (cream, buff, grey shreds and very fine grains of altered feldspar and/or buff lithic grains) in part very fine sandy, in part argillaceous.
5% Loose angular quartz grains predominantly of coarse to very coarse grained size (cavings?)
5% SANDSTONE; white to light grey, variable, in part coarse to very coarse grained, clean well cemented with silica, in part very fine to fine grained lithic.

8810-8820 SHALE; medium dark grey as above, slightly silty, fissile to subfissile.
20% SILTSTONE; as above, coarse, very fine sandy in part and grades to very fine grained silty sandstone.
15% SANDSTONE; white, very fine grained to medium grained, predominantly fine grained, angular to subangular quartz, traces altered feldspar, pink fresh feldspar, black carbonaceous (?) grains, green grains and schist fragments, moderately friable, poor to medium sorting siliceous cement. tight.
5% Loose quartz grains as above. Trace black chert rounded pebbles.
Fairly common medium light to medium dark brown sideritic ironstone and silty shale.

8820-8830 35% SHALE; dark grey, very slightly micaceous, slight to moderately carbonaceous, in part medium to very silty, occasionally kaolinitic (?) flecks, fissile to lathlike.
10% SILTSTONE; medium grey as above, in part sandy (very fine to fine grained quartz).
1% Sideritic ironstone and sideritic siltstone and shale.
50% SANDSTONE; white, fine grained, in part very fine grained, angular to subangular quartz. Rare reddish orange feldspar (?) grains, occasional white kaolinitic grains, green argillaceous grains, pale orange grains and black grains, moderately well sorted, very friable, cemented with sparse silica and rarely with kaolin, very slightly intergranular porous.
4% Loose quartz grains, predominantly subrounded but in part angular, generally coarse to very coarse grained.

8830-8840 20% SHALE; dark grey, slightly carbonaceous, in part moderate to very silty, rarely feldspathic, subfissile chunky.
5% SILTSTONE; as above.
70% SANDSTONE; white, fine grained, fairly common very fine grains and silt, angular to subangular quartz 5% accessory grains consisting predominantly of white kaolin and including grey and green argillaceous grains and black carbonaceous (?) grains, slight to moderately friable, siliceous cement. Fair to moderate intergranular porosity in part.
Common ironstone as above.

8840-8850 20% SHALE; medium dark grey slightly micaceous, slightly carbonaceous, in large part slight to moderatelybsilty, subfissile to platy.
5% SILTSTONE; medium grey, coarse similar to that above.
2% Medium to dark brown, sideritic ironstone with cryptocrystalline texture; sandy and feldspathic in part.
3% Loose quartz grains, angular to subrounded, fine grained to granule size but predominantly coarse grained; probably derived from sandstone below.
70% SANDSTONE; white to very light grey, fine grained, with some very fine grains, angular quartz, with less than 3% accessory grains including white kaolin grains, altered metamorphics (?), common reddish orange and black grains, occasional fresh feldspar, slight to moderately friable, siliceous and in part moderate amounts of kaolinitic cement, traces intergranular porosity, fair earthy porosity.

8850-8860 15% SHALE; medium to medium dark grey, slightly carbonaceous, slight to moderate feldspathic/lithic in large part silty, sub fissile to platy.
10% Medium light medium dark brown sideritic ironstone and siltstone and sandstone with abundant sideritic cement.
45% SANDSTONE; white, very poorly sorted, in part matrix of very fine to fine grained sandstone as described above and in part of medium to coarse grained sandstone. Both types consist of angular to subangular quartz with less than 3% accessory grains, as above; the sandstone has fair (finer fraction) to moderate (coarser fraction) intergranular porosity and good earthy porosity; it is friable and only poorly cemented with silica and powdery kaolinitic cement.
30% Loose angular to subrounded quartz grains, medium to very coarse grained, predominantly coarse grained.

8860-8870 10% SHALE; as above.
10% Sideritic ironstone, sandstone and siltstone as above.
15% SILTSTONE; medium light grey to medium dark grey slightly to moderately carbonaceous, moderate to very feldspathic/lithic (ver fine and occasional fine grains of altered feldspar and/or lithics).
65% SANDSTONE; white similar to that above but less friable and with only traces of porosity. Average grain size is fine grained.

8870-8880 SHALE; as above and medium grey moderate to very silty slightly carbonaceous, chunky, grades to -
15% SILTSTONE; medium light to medium grey, tough, in part siliceous, as above.
40% SANDSTONE; white to very light grey, fine to coarse grained, predominantly fine grained, angular to subangular quartz with 1-5% black pink, orange and green accessory grains (including kaolin and feldspar) well cemented with silica and in part with kaolin, indurated, traces at poor intergranularporosity.
Common sideritic ironstone; as above.
Fairly common poorly sorted loose quartz grains.

8880-8890 Variable sample - interbedded and gradational.
40% SHALE; as above generally medium to very silty subfissile-platy.
40% SILTSTONE; as above grading to sandstone and shale.

20% SANDSTONE; white to light grey, predominantly fine grained, quartz, lithic grains and accessories range from 5-15%.

8890-8900 50% SHALE; medium to dark grey silty to very silty common white feldspathic grains and well orientated mica minor part with fine subangular to subrounded quartz grains grades to 15% SILTSTONE; light to medium grey to brown with abundant feldspathic and lithic ? grains occasional mica part with dark brown argillaceous slightly sideritic matrix grading to -
15% Sideritic mudstone, medium dark brown, argillaceous slightly sideritic part silty as above.
20% SANDSTONE; white to light grey (brown) fine to coarse grained, predominantly fine grained as above. Well cemented siliceous and kaolinitic with very minor sideritic cement, generally - 5% feldspathic and lithic grains, generally tight, very minor poor porosity.

8900-8910 Gradational and variable lithology as above.
60% SHALE; medium to dark grey as above part silty, part sandy, grades to 15% SILTSTONE; light to medium grey as above grades to
5% SANDSTONE; light grey silty, with abundant altered feldspathic and lithic ? grains occasionally mica.
5% Sideritic mudstone as above part sandy.
15% SANDSTONE; white to light grey as above.

8910-8920 Trip sample - Interbedded and gradational.
55% SHALE; dark to medium dark grey, slightly carbonaceous, in part moderate carbonaceous, generally moderate to very silty, moderate to very feldspathic lithic, grades to -
45% SILTSTONE; light to medium light grey, very feldspathic/lithic (predominantly cream grey and greenish grey); very fine sandy (lithic/feldspathic grains) and grades to very silty very fine grained sandstone; slightly carbonaceous.
10% SANDSTONE; as above.

8920-8930 Interbedded and gradational.
25% SHALE; medium dark grey, silty, feldspathic/lithic, as above.
35% SANDSTONE; medium light grey, very fine to predominantly fine grained, occasional medium grains angular to subrounded quartz, 20% feldspar (altered) and lithic grains including fairly common green chloritic clay grains, poorly sorted, very silty, in part slightly argillaceous, well consolidated, tight trace pyritic and calcareous.
40% SILTSTONE; medium light to light grey, very feldspathic/lithic, slightly carbonaceous, often very fine to finely sandy and grades to sandstone, as above.
Occasionally sideritic ironstone; occasionally loose quartz grains.

8930-8940 15% SHALE; medium to medium dark grey, carbonaceous, slightly feldspathic/micaceous, generally slight to moderately silty, platy-blocky.
60% SANDSTONE; light to medium light grey, very fine to medium grained, predominantly fine grained, as above, traces intergranular porosity, abundant silty matrix and grades to siltstone abundant green clay grains, slightly pyritic in part, traces calcite.

Occasional siderític ironstone; Trace pale yellow fluorescence with slightly cut.

8940-8950 5% SHALE; as above.
85% SANDSTONE; light to medium light grey, very fine to fine grained, with occasional medium grains, (including common sea-green clay grains and white altered feldspar), dirty appearance, in part with carbonaceous flex, traces pyrite and pyritized plant remains, well indurated, abundant silty matrix and grades to very sandy siltstone, trace calcite, in part with sideritic cement, tight.
10% SILTSTONE; medium grey, very sandy.

8950-8960 10% SHALE; as above (cavings ?)
SANDSTONE; light to medium light grey very fine to fine grained, subangular quartz and abundant 25-30% lithic grains as above, dirty appearance, in part micaceous, generally slight to moderately carbonaceous, abundatn silt matrix, in part slightly argillaceous; grades to very sandy siltstone; well consolidated tight.

8960-8970 Variable lithology interbedded and gradational
5% SHALE; as above.
10% SANDSTONE; as above.
45% SILTSTONE; medium light to medium grey, moderately carbonaceous, slightly micaceous, coarse generally moderately sandy (very fine grained) in slight part traces calcite.
40% SANDSTONE; as above but predominantly very fine grained with sandstone very light grey; very fine grained angular quartz, 10% lithics, moderately friable, carbonaceous and micaceous, tight.
Occasional sandstone and siltstone with sideritic cement.

8970-8980 5% SHALE; as above (cavings)
65% Light grey, very fine grained, occasional fine grains, angular quartz, 10-15% feldspar (altered) and lithic grains (only rare green clay grains) slight to micecus (muscovite and reddish brown biotite) moderatel: carbonaceous with occasional plant fragments, dirty, appearance, abundant silt matrix, non-calcite, siliceous and in part sideritic cement, possibly some earthy porosity but generally tight - grades to -
30% SILTSTONE; similar to that above, very sandy.

8980-8990 SANDSTONE; light grey to medium light grey, very fine to fine grained, occasional medium grains, predominantl: fine grained, angular to subangular quartz, with about 20% lithic grains (including very common green clay and white kaolin grains, buff altered feldspar; less common black & orange grains), poorly sorted, very silty, slightly micaceous and carbonaceous, pyritic in part tight, - grades to -
30% SILTSTONE; medium light to medium grey, lithic/ feldspathic, moderately carbonaceous and micaceous, very sandy.

8990-9000 SANDSTONE; similar to that above but predominantly very fine grained and very silty, slight to moderately pyritic in large part, possibly in part with earthy porosity - grades to approximately.
20% SILTSTONE; as above.
Common sideritic sandstone and siltstone; fairly common poorly sorted, loose quartz grains.

9000-9010 Variable lithology. Interbedded and gradational.
10% SHALE; medium light to medium grey, slightly to moderately carbonaceous and silty, platy.
55% SANDSTONE; light to medium light grey, very fine to fine grained, predominantly fine grained, subangular quartz, with abundant 20% lithic and altered feldspar grains, (including common sea-green clay grains and white kaolin grains), poorly sorted, very silty, dirty appearance in part, micaceous and carbonaceous, tight - in part pyritic grades to -
27% SILTSTONE; medium light to medium grey, felds-pathic/lithic, moderately carbonaceous and micaceous very sandy (very fine to fine grained quartz and lithics), in part pyritic.
3% Light to medium brown siltstone and very fine to medium grained sandstone with very abundant sideritic cement.
5% Loose poorly sorted medium to very coarse quartz grains.

9010-9020 Varied lithology - interbedded and gradational.
SANDSTONE; as above, very fine to fine grained, silty tight in part very light grey and traces calcite grades to -
30% SILTSTONE; moderately grey, very sandy as above.
5% Sideritic sandstone and siltstone as above.
10% SHALE; as above.

9020-9030 Varied lithology - interbedded and gradational
5% SHALE; as above.
10% Medium light to dark brown sideritic sandstone and siltstone.
60% SANDSTONE; light to medium light grey, predominantly very fine grained, in part fine grained, subangular quartz with 15-25% lithic/feldspathic grains, moderately to poorly sorted, very silty, generally moderately micaceous, in part carbonaceous, in part slightly pyritic and firm, siliceous to clayey cement, tight, grades to -
25% SILTSTONE; medium light to medium grey, similar constituents, in part argillaceous, coarse, very fine sandy and grades to sandstone.

9030-9040 Interbedded and gradtional.
10% SHALE; medium to dark to dark grey, slight to moderately carbonaceous, slightly micaceous, moderate to very silty.
50% SILTSTONE; medium light to medium grey, coarse very sandy (very fine grained quartz and lithics) slightly micaceous, moderately carbonacoous, grades to -
35% SANDSTONE; medium light grey, very fine grained as above, tight.
5% Brown sideritic ironstone and siltstone and sandstone white abundant sideritic cement.

9040-9050 SILTSTONE; medium ligth grey coarse very sandy (very fine to grained quartz and lithic grains) moderately carbonaceous and micaceous grading to -
45% SANDSTONE; medium light grey, very fine grained in part fine grained, subangular quartz, with 15-25% lithic grains and altered feldspar, very silty, moderate sorting, firm tight, slightly micaceous, slight to moderately carbonaceous, in slight part pyritic.
Common Ironstone, as above.

9050-9060 10% SHALE; dark grey, slightly carbonaceous with silty, in part with subrounded medium to coarse grained quartz grains.
75% SANDSTONE; predominantly as at 9040
20% SILTSTONE; as above.
5% Ironstone and sideritic sandstone to siltstone.

9060-9070 No sample.

9070-9080 50% SANDSTONE; off white to light grey very fine to fine grained with subangular clear quartz and up to 20% white to brown and light green argillaceous grains - partly altered feldspar fairly common brown and white mica. Occasional carbonaceous specks. Matrix is generally kaolinitic but in part slightly calcareous and slightly sideritic; also part argillaceous and silty, grading to siltstone. Traces pyrite. Traces iron stained quartz grains. Tight.
30% SILTSTONE: light grey with common altered feldspathic grains, occasional carbonaceous flecks and medium, very fine sandy and grading to sandstone above. Part slight sideritic.
20% SHALE; medium to occasionally dark grey, silty, micromicaceous slightly carbonaceous, occasional altered feldspathic grains.

9080-9090 50% SANDSTONE; off white to light grey, as above, 10% with brown slightly calcareous slightly sideritic argillaceous matrix.
40% SILTSTONE; light to medium grey as above grading to sandstone above.
10% SHALE; medium to dark grey silty very minor part with scattered very fine to fine quartz and feldspar grains.

9090-9100 20% SANDSTONE; off white fine grained with subangular quartz and occasional (5-10%) white to brown altered feldspathic grains in siliceous/kaolinitic matrix, very occasionally carbonaceous specks.
30% SANDSTONE; off white to light grey, very fine to fine grained, silty and argillaceous as above grading to -
30% SILTSTONE; light to medium grey part sandy as above
20% SHALE; medium to dark grey, micromicaceous to micaceous slightly carbonaceous.

9100-9110 20% SANDSTONE; off white, fine grained as above.
30% SANDSTONE; very fine to fine grained as above, grading to -
30% SILTSTONE; light to medium grey, as above.
20% SHALE; medium dark grey as above. Traces glauconite.

9110-9120 20% SANDSTONE; off white fine grained with subangular quartz in kaolinitic/siliceous matrix. 5-10% white to brown feldspathic grains, traces light green argillaceous grains occasional carbonaceous flecks, occasional muscovite. Tight.
40% SANDSTONE; off white to light grey, very fine to fine grained with subangular quartzaand 10-15% white to brown and light green altered feldspathic grains in kaolinitic and a silty and argillaceous matrix.
5% Slightly calcareous slightly sideritic matrix. Fairly common white and bronw mica, minor pyrite. Grades to -
25% SILTSTONE; light to medium grey, argillaceous and very fine sandy with common white to light green

altered feldspathic grains and white and brown mica, occasional carbonaceous flecks, traces pyrite.
15% SHALE; medium to dark grey, partysilty with occasional white to brown and light green feldspathic grains, generally very micro to very fine micaceous

9120-9130 Trip sample - appears unreliable.
Lithology as for 9110-9120

9130-9140 60% SANDSTONE; light to white grey, very fine to fine and very rarely medium grained with subangular quartz. Common 20-25% white to brown and light green feldspathic grains in a kaolinitic matrix, very minor part with sideritic matrix. Commonly argillaceous and silty, occasionally white to brown mica, occasional fine pyrite. Tight.
30% SILTSTONE; light to medium grey as above, grading to sandstone above.
10% SHALE medium to dark grey as above part with carbonaceous flecks.

9140-9150 60% SANDSTONE; light to white grey as above but with very occasional scattered medium to coarse quartz grains and rare fine to medium grey lithic grains.
20% SILTSTONE; light tommedium grey part very fine sandy as above.
20% SHALE; medium to dark grey, part silty as above part very micro to very fine micaceous.

9150-9160 N.B. sample caught late.
20% SANDSTONE; off white fine to occasional medium grained with very occasional scattered coarse to very coarse subrounded quartz grains, but predominantly subangular clear quartz with white and occasional green altered feldspathic grains.
40% SANDSTONE; light to white grey, very fine to fine grained as above grading to siltstone.
30% SILTSTONE; light to medium grey, part very fine sandy as above, - 5% white sideritic matrix.
10% SHALE; medium dark grey silty, as above.

9160-9170 Variable sample. Interbedded and gradational.
15% SHALE; medium grey, moderately carbonaceous flecks, slightly feldspathic/lithic in part silty, platy.
30% SILTSTONE; medium dark grey, very feldspathic/lithic, moderate to very sandy (very fine grained).
10% SANDSTONE; medium light to medium grey, predominant fine grained, quartz and abundant feldspathic/lithic grains, dirty, tight.
45% SANDSTONE; cream to light grey, fine to coarse grained, predominantly medium grained, subangular quartz, 5% accessory grains (including common pale green clay grains and occasional carbonaceous grains and pink grains), very friable, loosely cemented with silica ? and minor kaolin, very good earthy porosity and traces intergranular porosity.

9170-9175 10% SHALE; as above.
15% SILTSTONE; light grey, carbonaceous and micaceous, coarse, moderately feldspathic/lithic, in part very fine sandy.
10% SANDSTONE; variable, light to medium grey, very fine to fine grained, generally silty, feldspathic/lithic, carbonaceous and micaceous dirty - grades to
65% SANDSTONE; white to cream moderately grained, common fine grains, subangular to subrounded quartz and abunt 15% accessory grains (predominantly white to light grey kaolin (?) grains, common seagreen clay

grains; occasional black to brown carbonaceous or shale grains, traces red and black grains), powdery siliceous cement, occasional brown sideritic cement or kaolinitic cement, very friable, good earthy porosity and occasional poor intergranular porosity. Scattered medium to very coarse subangular to subrounded quartz grains, traces red earthy grain.

9175-9180 15% SHALE; medium to dark grey as above in part silty grading to -
15% SILTSTONE; medium grey, very feldspathic/lithic moderately carbonaceous, slightly micaceous, very sandy, often with light to dark green chloritic clay (?) grains; grading to very silty dirty sandstone.
70% SANDSTONE; white to cream, very fine to medium grained, (predominantly fine grained) angular quartz and approximately 5-10% accessories (as previously described) friable, cemented with silica and in part with some kaolinitic and sideritic cement, good earthy porosity. Questional very pale yellowish fluorescence common.
Common medium to coarse subangular to subrounded loose quartz grains; rarely stained yellowish or reddish.

9180-9190 25% SHALE; dark grey, very slightly micromicaceous, slight to moderately carbonaceous (spex), generally silty, blocky - grades to -
5% SILTSTONE; medium grey, as above.
5% SANDSTONE; medium light grey, very fine to fine grained, feldspar/lithic, very silty, dirty, tight.
65% SANDSTONE; light grey, very fine to medium grained, predominantly fine grained, angular to subrounded quartz, less than 5% accessory grains (as above), carbonaceous in part, slightly calcareous, compact, traces intergranular porosity, very pale fluorescence may be due to carbonaceous material ?.
Occasional sideritic ironstone; occasional poorly sorted loose quartz grains.

9190-9200 Sample missed.

9200-9210 Sample missed.

9210-9220 This sample is probably poorly representative of the interval 9190-9220. Drilling break (from slow to fast) encountered at 9219.
10% SHALE; medium dark grey, slightly carbonaceous, slight to moderately feldspathic/lithic, silty platy to blocky.
5% Variable siltstone and dirty very fine to fine grained silty sandstone.
5% SANDSTONE; brown, texture and grain size obscured by abundant siderite cement.
70% SANDSTONE; white to cream poorly sorted, predominantly fine grained, angular to subangular quartz, with about 5% accessory grains (white kaolin, green clay round and black grains). Very friable, poorly cemented with silica ? and in part siderite, probably porous common patches of black carbonaceous/bitumen matter.
10% Loose quartz grains, medium to very coarse grained, predominantly coarse grained angular to subangular
Traces of quartzite (pebble) and of pyrite.
Sample shows common pale yellow fluorescence but has no cut. Fluorescence attributed to the presence of carbonaceous/bituminous matter in sandstone.

9220-9230 15% SHALE; as above.
10% SILTSTONE; medium grey, moderately carbonaceous, bitumen, moderate to very feldspathic/lithic grades to similar variable very fine to fine grained sandstone.
10% Sideritic sandstone as above.
15% Loose fine to coarse angular to subangular quartz grains; predominantly medium grained.
50% SANDSTONE; white to cream, fine to medium grained in consolidated chips, similar to that abbve; common carbonaceous bitumen grains and partings, good earthy porosity and only poor intergranular porosity evident in cuttings but porosity probably good. Fluorescence as above; no stain, no cut.
Patch of carbonaceous/bitumen matter present; however does not fluoresce.

9230-9240 10% SHALE; as above.
5% SILTSTONE and dirty sandstone as abofe.
10% Sideritic sandstone as above.
20% Loose subangular to round, medium to very coarse quartz grains, predominantly medium grained.
55% SANDSTONE; as above, fairly common carbonaceous/bitumont matter, very friable, occasional pink feldspar and round grains included in the accessory grains, common siderite stained grains.
Traces of pyrite ± Pale yellowish fluorescence as above, no stain, no cut.

9240-9250 5% SHALE; as above.
10% SILTSTONE; medium grey, moderate to very carbonaceous moderate to very lithic/feldspathic, very finely sandy and grades to similar very fine grained dirty sandstone.
5% Light to medium dark brown, very fine to fine sandy, siltstone with very abundant sideritic matrix, sandy and silty siderite; sideritic sandstone all of which are very carbonaceous.
80% SANDSTONE; white to buff, fine to medium grained, subangular quartz, with about 5-10% accessory grains (white clay grains, some green clay and black carbonaceous grains, rare pink feldspar and black mineral grains), moderate to poorly sorted, friable, poorly sorted with powdery siliceous cement and in part kaolin or kaolin or sideritic cement, traces intergranular porosity, poor earthy porosity, fairly common carbonaceous flakes.
Occasional loose carbonaceous/bitumen partings grading to earthy coal. Sandstone has scattered very faint fluorescence; no cut, no stain.

9250-9260 Lithology and percentages essentially as above. The sandstone contains a somewhat greater percentage (10-15%) of accessory grains and coaly to carbonaceous flakes are more common.
Only scattered fluorescence (?) as above.

9260-9270 5% SHALE; dark grey, moderately carbonaceous (specks) in part feldspathic/lithic platy-blocky, silty and grades to -
5% SILTSTONE; medium to medium dark grey as above.
10% Sideritic siltstone and sandstone as above.
80% Sandstone; white to cream, poorly sorted (as above) very fine to very coarse grained but predominantly fine to medium grained, subangular, in part angular and subrounded, quartz with less than 10% accessory grains (kaolin, some orange feldspar, black carbonaceous grains, occasional red grained, occasional green clay grains,) poorly sorted.

very friable, poorly cemented with white powdery silica and in slight part with kaolin or siderite, probably good earthy porosity and fair intergranular porosity: fairly common carbonaceous/bitumen partings Traces quartzite pebbles.

9270-9280 5% SHALE; as above.
10% SILTSTONE; very fine to fine grained silty sandstone as above.
10% Sideritic siltstone and claystone as above.
10% Loose quartz grains, medium to very coarse grained, predominantly medium to coarse grained,
65% SANDSTONE; as above very fine to medium grained predominantly fine grained.

9280-9290 10% SHALE; medium dark to dark grey, slight to moderately micromicaceous, slightly waxy in part, slighty carbonaceous and feldspathic/lithic, in part silty, fissile platy.
5% SILTSTONE; sandstone as above.
85% SANDSTONE; white to very light grey, fine to medium grained as above.
Occasional sideritic siltstone as above.
Traces of pyrite. Slight fluorescence but no cut.

9290-9300 5% SHALE; as above.
10% Variable medium light to medium dark grey siltstone and sandstone.
5% Sideritic siltstone, sandstone and clay as above.
80% SANDSTONE; white to buff, very fine to medium grained, predominantly fine grained, angular to subrounded quartz, less than 10% accessory grains (including kaolin, green clay ; grey black and pink grains) silty, friable, cemented with silica and in part by kaolin and commonly by siderite, good earthy porosity.

9300-9310 10% Variable shale, siltstone and very fine grained sandstone.
10% Sandstone; as above.
80% Sandstone, white, unconsolidated, poorly sorted, medium to very coarse grained, very angular quartz grains, generally milky but in part vitreous, probably; with good intergranular porosity. Average grain size coarse grained.

9310-9320 15% SHALE and SILTSTONE; very fine grained sandstone as above.
85% SANDSTONE; white unconsolidated, poorly sorted, medium grained and granule size, predominantly very coarse grained, angular quartz; traces grey chert grain, rare yellowish tinted grains; probably with good intergranular porosity.
Occasional sideritic ironstone.

9320-9330 5% SHALE; dark grey, slight to moderately carbonaceous (specks with linear orientation) in part silty, platy to blocky.
10% SILTSTONE; medium to medium dark grey, moderate to very carbonaceous, feldspathic/lithic, in part glauconitic ? very fine to fine sandy grading to -
5% SANDSTONE; very fine grained, similar to the siltstone and in part white, clean.
80% SANDSTONE; white, very poorly sorted, unconsolidated as above, traces of chert.
Occasional sideritic ironstone, siltstone and sandstone.
Occasional sandstone as at 9290-9300.

9330-9340 Trip sample - unreliable.
Predominant siltstone to very fine sandstone as above, with 20% shale as above.

9340-9350 70% SANDSTONE; off white fine to medium grained with subangular quartz and fairly common white feldspathic grains in a siliceous and kaolinitic matrix. Occasional white mica, very occasional greenlithics part very fine grained and silty. Part very slightly calcareous. Tight.
20% SILTSTONE; light to medium grey with abundant white to brown feldspathic grains. Occasional carbonaceous flecks and white mica.
10% SHALE; medium to dark grey micro to very micaceous part silty with feldspathic grains as above.

9350-9360 20% SANDSTONE; off white as above but with occasional carbonaceous laminae.
10% SANDSTONE· light tommedium grey, very fine to fine grained with subangular clear quartz and white (occasional light green) feldspathic grains in a very silty and argillaceous matrix. Occasional glauconite ?
40% SILTSTONE; light medium grey, with common white to brown feldspathic grains part with common carbonaceous flecks.
30% SHALE; medium to dark grey, iceaceous, part silty and grading to siltstone above. Part slightly carbonaceous.

9360-9370 40% SANDSTONE; white to light grey, fine to occasional medium grained with chalc to subrounded quartz and up to 25% white feldspar with occasional grey lithics in a siliceous slightly calcareous matrix. Occasional white micaceous and carbonaceous flecks. Tight.
40% SILTSTONE;, light to medium grey, as above, part very fine sandy.
- 5% white siderittic matrix.
20% SHALE; medium to dark grey as above.

9370-9380 45% SANDSTONE; white to light grey as above but part with kaolinitic slightly calcareous matrix may possess earthy porosity.
40% SILTSTONE;as above rare pyrite.
15% SHALE; medium to dark grey, as above.

9380-9390 40% SANDSTONE; white to light grey, as above, part very fine grained and silty with occasional light green argillaceous grains. Minor disseminated pyrite.
40% SILTSTONE; light to medium grey, as above.
20% SHALE; medium to dark grey generally silty as above.

9390-9400 45% SANDSTONE; light white grey, very fine to occasional medium grained, predominantly fine grained with subrounded subangular quartz and up to 20% white to light brown feldspar and occasional lithic grains in a sparse siliceous slightly calcareous matrix. Minor pyrite, occasional carbonaceous lamellae, tight.
10% SANDSTONE; light to medium grey, very fine to fine grained, as above but with commin light green argillaceous grains and with silty argillaceous matrix.
30% SILTSTONE; light to medium grey with fairly common feldspathic grains and mica, occasional carbonaceous flecks, traces pyrite.
15% SHALE; medium to dark grey,micaceous, part silty with feldspathic grains as above, including 5% black carbonaceous material.

9400-9410 50% SANDSTONE: light white grey as above part traces intergranular poristy.
5% SANDSTONE; light to medium grey, silty as above.
25% SILTSTONE; light medium grey, as above.
20% SHALE; medium dark grey, with carbonaceous material as above.

9410-9420 Lithology as for previous interval minor yellow with cut fluorescence noted - attributed to orange brown organic mineral

9420-9430 55% SANDSTONE; white to off white fine to medium grained with angular to subangular clear quartz, but - 5% feldspathic grains, in fairly sparse siliceous slightly calcareous matrix. Traces intergranular porosity.
25% SANDSTONE; light grey very fine grained silty, with common feldspathic grains and mica, occasional carbonaceous flecks, occasional orange/brown argillaceous mineral with yellow fluorescence and occasional cut.
15% SILTSTONE; light to medium grey, as above.
5% SHALE; medium to dark grey micaceous, part carbonaceous as above.

9430-9440 50% SANDSTONE; white to off white as fine to medium grained as above. but part with up to 20% feldspathic lithic grains.
20% SANDSTONE; light grey, very fine grained silty as above.
20% SILTSTONE; light to medium grey, micaceous with common feldspathic grains, occasional carbonaceous flecks.
10% SHALE; medium to dark grey, ioiceous, part carbonaceous, part silty with feldspathic grains.

DEPTH CORRECTION BASED ON LOGS (MINUS 10 FT)

9430-9440 50% SANDSTONE; light white grey, fine grained with subangular quartz and 5-10% FELDSPATHIC/lithic grains in a siliceaceous/slightly kaolinitic cement. Occasional carbonaceous (bit) laminae and flecks, scattered white mica. Tight.
10% SANDSTONE; light grey as above but very fine to fine grained, silty and argillaceous and with light green argillaceous grains.
20% SILTSTONE; light to medium grey, with common feldspathic grains and carbonaceous specks, part very fine sandy.
20% SHALE; medium to dark grey, micaceous part carbonaceous specks, part silty grading to siltstone above.

9440-9450 40% SANDSTONE; light to white grey as above but with abundant fine carbonaceous stringers.
5% SANDSTONE; light grey, very fine to fine grained silty, as above.
35% SILTSTONE; light to medium grey as above, but part micaceous.
20% SHALE; medium to dark grey as above.

9450-9460 Lithology as for 9440-9450 but minor part of sandstone with 10% feldspathic/lithic grains and traces pyrite.

9460-9470 70% SANDSTONE; white to off white fine to medium grained with angular clear quartz in a very sparse siliceous part kaolinitic matrix, rare lithic/ feldspathic grains. Poor to fair intergranular

porosity. Faint pale yellow fluorescence no cut.
Occasional carbonaceous/bitumen material.
5% SANDSTONE; light grey, very fine to fine grained silty, argillaceous with common feldspathic grains.
10% SILTSTONE; light to medium grey, with common feldspathic grains carbonaceous flecks and mica.
15% SHALE; medium to dark grey, micaceous part carbonaceous, part silty and grading to siltstone above.

9470-9480 50% SANDSTONE; white to off white, as above but with very occasional coarse grains and average grains size medium generally poor to fair porosity but very minor part shows good to very good intergranular porosity.
5% SANDSTONE; light grey, very fine to fine grained silty, as above.
15% SILTSTONE; light to medium grey, as above.
30% SHALE; medium to dark grey as above.

9480-9490 30% SANDSTONE; white to off white predominantly medium grained as above.
10% SANDSTONE; light grey to grey green very fine to fine grained silty, with subangular clear quartz, white to brown feldspathic grains and light green argillaceous grains in a silty, argillaceous matrix. Occasional carbonaceous flecks, minor pyrite, grades to siltstone.
25% SILTSTONE; light to medium grey with white to brown feldspathic grains and mica, part very fine to fine sandy, minor pyrite.
45% SHALE; medium to dark grey, moderately micro-very fine micaceous, silty and grading to siltstone above, part slightly carbonaceous.

9490-9500 25% SANDSTONE; white to off white as above but very fine to fine (occasional medium) grained and generally tight. Minor part with up to 5% feldspathic/lithic grains.
25% SILTSTONE; light to medium grey part very fine sandy, as above.
50% SHALE; medium to dark grey, micaceous as above but part non-silty and moderately soft.

9500-9510 25% SANDSTONE; white to off white as above with very scattered coarse quartz grains, part with fine stringers of carbonaceous/bitumen material. Tight.
25% SILTSTONE; light to medium grey as above.
50% SHALE; medium to dark grey, as above, generally silty.

9510-9520 Interbedded and gradational.
55% SHALE; medium to medium dark grey, moderately micromicaceous, slight to moderately carbonaceous (flecks), generally slight to moderately feldspathic lithic (silt size to very fine grained), ofter moderate to very silty; grades to -
15% SILTSTONE; medium grey to medium light grey, slightly carbonaceous and micaceous, moderately feldspathic/lithic in part very argillaceous, in part very fine sandy.
35% SANDSTONE; white to light grey, very fine to medium grained, predominantly fine grained, sub-angular quartz with 3-10% PALE green and white to light grey altered feldspar (?) black and brownish argillaceous grains, slightly micaceous in part, slightly carbonaceous in part, moderately well sorted siliceous cement, traces calcite, traces intergranular porosity. Occasional quartz grains, traces chert grains, traces ironstone, occasional pyrite.

9520-9530 Trip sample
60% SILTSTONE; medium light to medium grey, micaceous, moderate to very carbonaceous (flecks), moderate to very feldspathic/lithic (very fine grained).
15% SHALE; as above.
20% SANDSTONE; in part as above predominantly very light grey, speckled black, very fine to fine grained, silty, angular to subangular quartz, 30% altered feldspar and lithic grains, (grey, greenish grey, cream, common black, occasional round), siliceous to very slightly calcareous cement, tight.
Traces of coal, pyrite and quartzite grain.

9530-9540 45% SANDSTONE; light grey to very light grey, very fine to medium grained, predominantly fine grained, angular to subangular quartz, salt and pepper texture with up to 30% altered feldspar and lithic grains as above (black coal grains fairly common) moderate to well sorted, slightly silty, very slightly calcareous siliceous cement, tight.
35% SILTSTONE; medium to medium light grey, slightly micaceous, moderately carbonaceous (in part coal flecks), slight to moderately feldspathic/lithic, in part argillaceous, coarse and grades to very fine grained sandstone.
20% SHALE; dark grey, generally tough, slightly carbonaceous, generally silty, blocky.

9540-9550 5% SHALE; similar to above.
65% SANDSTONE; white to light grey, very fine to fine grained, occasional medium grains, predominantly fine grained, angular subangular quartz and 20-40% lithic grains, similar to sandstone above but increase in darker accessory grains, slightly calcareous in part silty, siliceous cement, tight.
30% SILTSTONE; medium light grey, coarse, slightly micaceous, slight to moderately carbonaceous (shreds), very sandy (very fine grained and occasional fine grained quartz and very abundant lithic/feldspathic grains).

9550-9560 SANDSTONE; light grey to medium light grey, very fine to fine grained salt and pepper texture, as above, in part silty, slightly micaceous, occasional carbonaceous blobs and stringers, other wise as above, tight.
25% SILTSTONE; as above.
10% SHALE: as above, very silty, platy to blocky.

9560-9570 40% SILTSTONE; light grey, coarse, slightly carbonaceous slight to moderately carbonaceous stringers, slightly micromicaceous, moderate to very feldspathic, grades to -
35% SANDSTONE; light grey, slightly greenish, very fine grained to predominantly fine grained, subangular quartz, and abundant feldspathic/lithic grains (20-30%) which are predominantly green, brown, black, with some white kaolinitic grains and rare red grains, well sorted, slightly moderately silty, very slightly calcareous, slightly friable, siliceous cement, tight. grades in part to siltstone.
25% SHALE; medium grey, slight to moderate micaceous moderate to very silty, slightly carbonaceous and feldspathic, chunky.

9570-9580 60% SANDSTONE; as above, salt and pepper texture, very

fine to fine grained as above, siliceous/kaolinitic cement with, in part sideritic.
20% SHALE; as above.
20% SILTSTONE; as above.

9580-9590 15% SHALE; medium to medium dark grey, slightly micromicaceous, moderately carbonaceous, very silty, platy.
20% SILTSTONE; medium light grey, moderately micaceous very sandy (very fine grained), moderately carbonaceous, slightly feldspathic, grades to -
65% SANDSTONE; light grey very light grey, very fine to fine grained, predominantly fine grained, angular quartz and 20-25% lithic ? and altered feldspar grains (white, green, brown, black, reddish brown, cream) well sorted, slightly silty, siliceous cement, occasional sideritic and kaolinitic cement, tight.

9590-9600 40% SANDSTONE; light grey, very fine to fine grained as above, salt and pepper texture, tight.
40% SILTSTONE; as above, in part argillaceous, rarely slightly pyritic.
20% SHALE; as above, very silty, rarely glauconitic.

9600-9610 50% SANDSTONE; off white to light grey, very fine to fine grained, rarely medium grained, with angular to subangular clear quartz and irregular to elongate white to off white feldspar occasional grey or brown quartz (quartzite?) occasionally light green argillaceous grains (altered feldspar ?) very occasionally carbonaceous grains and fine stringers.
Feldspar content from 5 to 10%. Rare muscovite.
Traces pyrite. Tight. Cement sparse generally siliceous part slightly calcareous.
25% SILTSTONE; light to medium grey, with common and abundant white to brownfeldspathic grains, occasional carbonaceous flecks, part very fine micaceous.
25% SHALE; medium to dark grey, micromicaceous, occasional carbonaceous flecks, part silty and grading to siltstone above. Minor part light grey brown, and moderately soft.
No sample. Returns swamped with cavings after D.S.T. 9610-9618 circulated before trip - lithology as for 9600-9610.

9620-9630 SHALE (mudstone) light to medium dark grey, massive, moderately soft, micromicaceous, very occasionally carbonaceous flecks. Minor part silty with white and green feldspathic grains, mica and carbonaceous flecks and grading to siltstone below. Minor part very fine to medium sandy with subrounded quartz grains, and occasional pale feldspar and green glauconite ? grains. Part with clear to brown moderately soft pelletal grains.
10% SILTSTONE; light to medium and dark grey, with white and light green feldspathic grains, carbonaceous flecks and white and brown mica.
10% SANDSTONE; light grey to grey green very fine to fine grained with up to 80% white to light white green angular to irregular feldspar with occasional dark lithics and subsiduary angular clear to grey quartz. Cement ranges from abundant argillaceous to very sparse and slightly calcareous, tight.

9630-9640 60% SHALE; light to medium ad dark grey as above.
10% SILTSTONE; as above.
30% SANDSTONE; light grey to green grey, as above but predominantly very fine grained and argillaceous,

with common dark grey brown carbonaceous/bitumen material.

9640-9650 30% SHALE and varieties as above, but major part silty, rarely dark grey brown and slightly siderittic.
10% SILTSTONE; as above.
60% SANDSTONE; light white grey, very fine to fine grained, with up to 50% angular to irregular and altered feldspar (white to white brown, white green etc) with occasional dark lithic grains and subsidiary subangular quartz in a kaolinitic, slight to moderately calcareous cement, minor white and brown mica, occasional carbonaceous/bitumen material, traces pyrite. Tight.

9650-9660 65% SHALE; medium to dark grains, micromicaceous, part silty with common foliopathic grains.
35% SANDSTONE; light grey white, very fine to fine grained as above, with carbonaceous/bitumen material and occasional coal/argillaceous laminae.

9660-9670 40% SHALE (light) to medium dark grey as above.
15% SILTSTONE; light grey with common foldspathic grains and occasional mica.
45% SANDSTONE; light grey white, very fine to fine grained as above. - 5% Coal, probably sub-bitumen grade cuttin with vitrain lenses.

Gas Show A 1.5 unit gas kick was recorded on the detector unit. As the interval is tight this is assumed to be derived from thin coal bands in the interval. No other shows.

9670-9680 50% SHALE (light) medium to dark grey as above, part with carbonaceous flecks, part grading to carbonaceous shale.
20% SILTSTONE; light grey as above occasional carbonaceous flecks, fairly common mica.
30% SANDSTONE; light white grey foliopathic, slightly lithic, slightly calcareous as with occasional carbonaceous/bitumen material as above.

9680-9690 50% SANDSTONE; light white grey, very fine to medium grained, medium to fine grained with angular clear quartz, up to 30% angular white to off white feldspar and up to 10% dark lithic grains, in a coarse kaolinitic slight to moderately calcareous cement, part with argillaceous matrix and light green chloritic ? grains, occasional white and brown mica in very fine grained variety. Minor carbonaceous bitumen material. Traces pyrite. Possibly enahy porosity only.
15% SILTSTONE; light grey, micaceous as above.
35% SHALE; medium to dark grey, part carbonaceous as above.

9690-9700 60% SHALE; medium to medium dark grey, slight to moderately micaceous, occasional carbonaceous blebs, in part moderately carbonaceous (flecks), slight lithic/foldspathic, generally silty, chunky.
20% SILTSTONE; medium grey, slightly micromicaceous, slightly carbonaceous, occasional carbonaceous laminae, slightly lithic/foldspar, argillaceous and grades to shale; in part very fine sandy.
20% SANDSTONE; light grey, in part with salt and pepper texture, very fine to fine grained, occasional medium grain, subangular, quartz and approximately 20% altered feldspar (white) and lithic grains (including black coal and/or carbonaceous grains and brown argillaceous ? grains; occasional green clay grains), moderately well sorted, well consolidated

generally silty, siliceous cement, tight.
Traces of medium to course loose quartz grains, trace ironstone, trace earthy coal.

9700-9710 50" SHALE; medium dark grey as above and in large part medium grey, non-silty, with abundant light brown flecks.
25% SILTSTONE; light to medium grey generally, coarse micaceous, carbonaceous and feldspathic as above; grades to -
25% SANDSTONE; light grey as above, in part very silty and in part argillaceous, with minor amounts of sandstone white to very light grey, fine to medium grained, subangular quartz and 5-10% feldspar, grey quartz or quartzite grains, occasional green clay grains, black carbonaceous grains, siliceous to kaolinitic cement, friable, earthy porosity, in general the sandstone is dirtier than above and contains common carbonaceous streaks.
Trace of massive pyrite; occasional loose quartz grains.

9710-9720 SHALE; medium to medium dark grey, moderate to micromicaceous, slightly carbonaceous (disseminated and occasionally flecks), generally moderately silty in part very silty, chalky with traces of coal veining, rarely with green glauconite or chlorite pellets; grades to -
20% SILTSTONE; medium grey, in part coarse, moderately carbonaceous and feldspathic/lithic, moderate to very micromicaceous, in part argillaceous grades to shale and in part to
5% SANDSTONE; as above.

9720-9730 30% SHALE; as above.
25% SILTSTONE; medium light grey, very carbonaceous (very fine spar) moderately micaceous, in part argillaceous.
45% SANDSTONE; medium light brownish grey to light grey, predominantly fine grained, but with common very fine grains, angular to subangular quartz with 15-25% white to cream altered feldspar and lesser grey quartzite, black carbonaceous grains, occasional green and greenish grey and rare red lithic ? grains, slightly micaceous (muscovite) in part with carbonaceous wrappings, moderately silty, moderately well sorted, matrix of brown, moderately calcareous carbonate, tight.
Traces of coal.

9730-9740 Variable lithology - predominantly.
30% SHALE; medium grey, slightly micromicaceous, moderately carbonaceous (very fine spar), moderate to very silty.
45% SILTSTONE; medium light to light grey coarse, slight to moderately micromicaceous, moderately carbonaceous, slightly feldspathic, in part very fine sandy, grades to .
20% SANDSTONE; light grey, very fine grained in part fine grained, quartz and 20-30% feldspathic/lithic grains, well sorted, silty, tissue calcite tight.
5% SANDSTONE; brownish grey calcite as above.

9740-9750 15% SHALE; as above.
30% SILTSTONE; as above.
65% SANDSTONE; very light grey, predominantly very fine grained, in part fine grained, occasional medium grained, angular to subangular quartz, with about

20% feldspathic and occasional lithic grains, (including black carbonaceous grains) moderately well sorted, slightly friable, moderate to very silty, trace to slightly calcareous, medium grained sandstone has traces of pores.

9750-9760 25% SHALE; medium to dark grey slightly micaceous slightly silty, carbonaceous specked, as above,
15% SILTSTONE; similar to above.
60% SANDSTONE; as above but generally very fine to fine grained and fairly common medium grained, in part brownish grey with calcareous cement.
Common loose medium to coarse quartz grains derived from slightly porous friable sandstone.

9760-9770 Ditch Sample. After D.S.T.3.
90% cavings.
Lithology is probably predominantly sandstone, light grey, very fine to predominantly fine grained with angular to subangular quartz with up to 50% white to white green feldspathic and subidiomitic dark lithic fragments, occasional carbonaceous grains very minor calcareous cement.

9770-9780 50% Cavings sample unreliable.
Lithology comprises:
50% SANDSTONE; light grey, very fine to fine grained with angular to subangular quartz, up to 60% white feldspar lathe and white to brown and green irregular feldspathic grains, minor dark grey to brown lithics occasional carbonaceous/bitumen grains. Very minor mica, very minor calcareous cement. Minor part with argillaceous matrix. Tight.

20% SILTSTONE; light to medium grey, feldspathic very fine micaceous. Occasional carbonaceous streaks, part very fine sandy and grading to sandstone above.
30% SHALE; (mudstone) light to dark grey micromicaceous part carbonaceous. Part silty and slightly feldspathic and grading to siltstone above.

9780-9790 50% SANDSTONE; light grey, as above but predominantly very fine grained and sandy medium grained, and minor part with moderately calcareous matrix.
15% SILTSTONE; as above.
35% SHALE; light to dark grey as above but predominantly medium grey micromicaceous.

9790-9800 50% Cavings sample appears unreliable.
Lithology comprises:
40% SANDSTONE; very fine to fine as above very occasional medium and part with abundant argillaceous matrix. Large chips show interlaminated sandstone/siltstone.
20% SILTSTONE; as above, part very fine to fine sandy.
40% SHALE; light to medium grey as above rarely dark grey and carbonaceous.

9800-9810 60% SANDSTONE; grey white very fine to fine grained, with angular to subangular quartz and white to white brown feldspar up to 40% minor dark grey to brown lithics Occasional carbonaceous/bitumen grains and flecks. Traces white mica, traces calcareous matt.
20% SILTSTONE; light to medium grey, moderately to very feldspathic occasional carbonaceous/bitumen flecks part argillaceous. Part very fine sandy and grading to sandstone above. Part very fine micaceous.

20% SHALE; light to medium micromicaceous predominantly silty and grading to siltstone above.

9810-9820 Abundant cavings.
50% SHALE; medium light to medium dark grey, moderately to very micaceiaceous and silty, slight to moderately carbonaceous (silt size flecks), platy to chunky - grades to -
15% SILTSTONE; light to medium light grey coarse, very finely sandy, slightly carbonaceous, very feldspathic/lithic.
35% SANDSTONE; light to medium light grey, fine grained common very fine grains, angular to sub-angular quartz and 20-30% feldspar (grey, greenish grey, white green) and lithic (abundant dark brown to black argillaceous/carbonaceous grains), very slightly to slightly calcareous cement, well consolidated generally tight, occasional cleaner sandstone is slightly brownish and has good earthy porosity.
Trace pyrite cemented sandstone; traces ironstone.

9820-9830 SHALE; medium to medium dark grey as above but generally less carbonaceous and silty.
30% SILTSTONE; medium light to medium grey, moderately carbonaceous, moderate to very feldspathic/lithic, in part argillaceous, in part very sandy (very fine grained) and grades to
5% SANDSTONE; as above.
Trace pyrite.

9830-9840 Poor sample - abundant cavings.
55% SHALE; medium to medium dark grey, micromicaceous as above, rarely fine sandy.
5% SILTSTONE; as above.
40% SANDSTONE; very light to medium light grey, fine grained, common very fine grains and occasional medium grains, angular to subangular quartz and - 20% feldspar and lithics (including common green argillaceous grains and black carbonaceous/coaly grains) slightly silty, scattered muscovite flakes, moderately well cemented with silica and in part kaolinitic cement, some earthy porosity.
Trace coal (cavings ?) traces pyrite cemented sandstone.

9840-9850 30% SHALE: medium light to medium grey, moderate to very micaceous, carbonaceous slightly silty, platy to subfissile.
10% SILTSTONE; medium light grey, in part argillaceous slight to moderately carbonaceous and feldspathic/lithic, micaceous in part.
55% SANDSTONE; light grey, in part medium light brownish grey, salt and pepper texture, very fine to fine grained, occasional medium grains, predominantly fine grained, angular to subangular quartz, with approximately 25% altered feldspar and lithic grains (many green argillaceous grains and black carbonaceous to coaly grains); occasional carbonaceous laminations siliceous cement, well indurated, tight, brownish sandstone has a slightly calcareous sideritic cement in part.
5% loose fine to coarse grained subangular to sub-rounded quartz.

9850-9860 20% SHALE; as above and commonly medium light greenish grey, waxy texture, very slightly carbonaceous, fissile to subfissile; traces of coaly stringers.
10% SILTSTONE: similar to above.
5% COAL; dark grey to black, micaceous silty, to very fine sandy, carbonaceous matter in flaky aggregates present as laminae in the sandstone below.

55% SANDSTONE; similar to that above but with increase in proportion of very fine grains and decrease in proportion with sideritic/calcareous cement and slight decrease in feldspar/lithics; tight.
10% Loose fine to very coarse quartz grains, predominently fine to medium grained.

9860-9870 30% SHALE; similar to above.
25% SILTSTONE; medium grey as above.
45% SANDSTONE; white to medium light grey very fine grained, similar to above.
Traces coal as above.

9870-9880 50% SANDSTONE; light grey very fine to occasionally fine grained with angular to subangular quartz and up to 40% feldspar including - 10% dark grey, grey brown grey green lithic grains. Occasional carbonaceous/bitument grains, occasional white and brown mica. Part with argillaceous silty matrix. Part slightly calcareous. Tight.
25% SILTSTONE; light to medium grey, with abundant feldspathic grains, part very micaceous (biotite)
25% SHALE; medium grey micromicaceous, part silty and grading to siltstone above.

9880-9890 Trip sample
65% SANDSTONE; light grey, as above but predominantly fine grained.
15% SILTSTONE; as above.
20% SHALE; light to medium grey as above.

9890-9900 70% SANDSTONE; light grey very fine to fine grained with angular to subangular quartz, and up to 40% opaque, translucent white feldspar, 10% grey, grey brown and grey green, lithic grains. Occasional carbonaceous/bitument grains and lamellae. Minor white and brown mica. Part with moderately sparse kaolinitic slightly calcareous matrix. Tight.
No shows.
15% SILTSTONE; light to medium grey with abundant feldspar and green argillaceous grains, occasional carbonaceous streaks, part very fine sandy and grading to sandstone above.
15% SHALE; medium grey, silty, micromicaceous, grades to siltstone above.

9900-9910 70% SANDSTONE; as above but predominantly fine grained. Tight.
10% SILTSTONE; as above.
20% SHALE; but only part silty. Fluorescence. A faint yellow to orange, fluorescence with slight cut in fairly common and is attributed to resinous material. One siltstone chip was found to contain a lense of this material which is orange/brown resinous/waxy, with yellow fluorescence and a strong cut. A light brown waxy/resinous residue is left on evaporation of the solvent.
N.B. The fluorescence and this material is not so evident in the dried sample.

9910-9920 70% SANDSTONE; light grey as above but part with argillaceous to very argillaceous matrix with occasional medium to coarse angular/subangular quartz grains. Part also with medium size light green argillaceous lithic ? grains. Rare coal laminae, fluorescence as above. Tight, but part with matrix could exhibit capilliary porosity.
10% SILTSTONE; as above.
20% SHALE; as above.

9920-9930 50% SANDSTONE; light grey very fine to predominantly fine grained with angular to angular quartz, up to 40% feldspar as above and 15% grey and grey green lithic grains, occasional carbonaceous bitumen material, minor white to brown mica. Generally with slightly calcareous matrix. Tight.
15% SILTSTONE; light grey, with abundant fridspar common very fine mica, occasional carbonaceous/ bitumen streaks.
35% SHALE; light to medium grey, micromicaceous, part silty grading to siltstone above.

9930-9940 50% SANDSTONE; light grey, very fine to fine grained as above.
15% SILTSTONE; light grey, as above, part very fine sandy and grading to sandstone as above.
35% SHALE; light to medium grey as above.

9940-9950 30% SANDSTONE; light grey, as above, part with argillaceous matrix.
45% SANDSTONE; white/grey, fine to occasional medium grained with angular/subangular clear quartz, but only very scattered feldspar and lithic grains (5%) in a sparse siliceous slightly calcareous cement. Tight, but part fairly friable. 5% loose medium to coarse clear angular quartz grains probably derived from this sandstone.
15% SILTSTONE; light to medium grey, as above.
10% SHALE; medium grey, as above.

9950-9960 40% SANDSTONE; light grey, grey green, very fine to occasionally fine grained with subangular quartz and up to 20% feldspar with grey to grey green and rarely reddish lithic grains slightly calcareous cement, occasional carbonaceous/bitument material, tight.
20% SANDSTONE; white/grey fine to occasional medium grained as above.
10% SILTSTONE; light grey (grey brown) with abundant feldspathic grains, occasional carbonaceous material and mica.
30% SHALE; light to medium grey, micromicaceous, part silty and grading to siltstone.. Minor part dark grey and slightly carbonaceous.

9960-9970 40% SANDSTONE; light grey, grey green, very fine to occasionally fine grained as above.
20% SILTSTONE; light grey, as above.
40% SHALE (mudstone) light to medium and dark grey, micromicaceous part moderately soft with waxy lustre. Part slight to medium carbonaceous minor part silty grading to siltstone as above.

9970-9980 30% SHALE; medium light to medium dark grey, slight to moderate micaceous, slightly carbonaceous and silty, slightly feldspathic/lithic, platy.
40% SILTSTONE; light to medium grey, micaceous, in part coarse and very finely sandy, slightly carbonaceous moderate to feldspathic/lithic, grades to -
30% SANDSTONE; white to light grey, very fine grained, in part fine grained, angular to subangular, quartz, 20% white feldspar and common greenish grey, argillaceous lithic grains, moderately well sorted, well cemented, tight, occasionally micaceous flakes, occasionally carbonaceous grains.

9980-9990 20% SHALE; (cavings) medium grey, slightly micaceous, slightly carbonaceous, in slight part silty platy to subfissile.
20% SILTSTONE; medium grey, slightly micaceous slightly argillaceous, in part, moderately, carbonaceous (specks and shreds), moderately feldspathic/lithic, very fine sandy in part.
60% SANDSTONE; light grey, salt and pepper texture, in part greenish grey, very fine grained, occasional fine grains, angular to subangular quartz with 25%? altered feldspar and lithic (?) grains (including common green argillaceous grains, occasional coal and carbonaceous grains), slightly micaceous (biotite) silty, clayey, slightly calcareous matrix, slightly friable, tight.

9990-10,000 35% SHALE (cavings ?) as above, platy to chunky.
20% SILTSTONE; medium grey, as above.
45% SANDSTONE; light grey, salt and pepper texture, very fine to fine grained angular to subangular quartz and 15% altered feldspar (white, greenish grey, cream), traces fresh pink feldspar, common dark brown to dark grains, occasional carbonaceous/ coaly grains, only traces calcareous, firm, argillaceous/silty matrix, tight; carbonaceous and micaceous in part.
Scattered well rounded quartz grains, medium coarse grained, in part clear in part stained.

10,000-10,010 Sample not caught. See below.

10,010-10,020 This sample covers the interval 10,000-10,020
15% SHALE; medium light grey, moderately micaceous, generally moderate to very silty, slight to moderately carbonaceous, platy and chunky.
35% SILTSTONE; light grey, slightly greenish, coarse, very fine sandy, very lithic/feldspathic, slightly micaceous, slightly carbonaceous, grades to.
50% SANDSTONE; light grey, very fine grained, occasional fine grained, angular to subangular, quartz; 15% feldspathic/lithics as above, give sandstone a greenish tinge, very slightly micaceous, very silty, well cemented, slightly carbonaceous tight.
Scattered subangular to rounded, medium to very coarse quartz grains.

10,020-10,030 10% SHALE; as above.
20% SILTSTONE; similar to that above.
70% SANDSTONE; light to medium lgith grey, slightly greenish very fine grained, in part fine grained, similar to sandstone above but less silty, slightly calcareous, well indurated, tight.
Occasional loose quartz grains.

10,030-10,040 10% SHALE; medium grey, moderately micromicaceous, slight to moderately carbonaceous, moderate to very silty, platy to chunky.
10% SILTSTONE; as above.
80% SANDSTONE; light grey, in part slightly greenish, very fine grained, in slight part fine grained, angular to subangular quartz with 10% white to cream feldspar and lesser green, brown and black lithic grains, in part micaceous (predominantly reddish brown biotite), occasional carbonaceous patches, in part slight to moderately calcareous, generally well cemented, tight, generally slight to moderately silty.

Trace reddish brown mineral with bright yellow fluorescence.
Common medium to coarse predominantly well rounded loose quartz grains.

10,040-10,050 Variable sample, interbedded and gradational.
15% SHALE; as above, in part with carbonaceous patches.
10% Loose quartz grains, fine grained and granule size, predominantly medium grained, angular to well rounded, rarely with traces pyrite cement, traces obsidian fragment of granule size.
25% SILTSTONE; light greenish grey, in slight part brownish grey, very feldspathic/lithic, in part micaceous, generally slight to moderately carbonaceous, in part argillaceous; commonly coarse and grades to .
50% SANDSTONE; similar to that above, in part (20%) fine grained, rarely medium grained tight.

10,050-10,057 20% SHALE; as above.
20% SILTSTONE; as above.
60% SANDSTONE; Variable but generally similar to that above, very fine to fine grained, predominantly very fine grained and silty; generally well cemented with silica, tight.

CORE NO.16 10,057 - 10,067 Rec. 9'2"

1½ inches SILSTONE; medium light grey, very sandy (25% very fine grained and occasionally fine grained lithic/feldspathic grains), very lithic/feldspathic, argillaceous, very carbonaceous, slightly micaceous. The siltstone is cross-laminated; laminations defined by abundant carbonaceous/bitumen flakes and grains.

1 inch SILTSTONE; dark grey, very argillaceous, moderate to very feldspathic/lithic, slightly micaceous, moderately carbonaceous (flecks).

- - - - sharp contact - - - -

4½ inches SANDSTONE; light grey, very fine grained, very abundant altered feldspar (cream, buff, grey), translucent feldspar ? dark brown, black, carbonaceous grains, well sorted, well cemented, silty/argillaceous matrix, tight.
Bedding dip as defined by upper and lower surfaces of this unit is 7 degrees.

- - - - sharp contact - - - -

3 ft.8½ inches MUDSTONE; dark grey, moderate to micromicaceous, slight to moderately carbonaceous (flecks), predominantly, slightly silty, common silt sized feldspar/lithic grains; Laminae of siltstone which is in part very fine sandy are present within the unit particularly in the uppermost foot. Dip as defined by the laminae is variable but appears to be in the order of 6-7 degrees.

4½ inches SANDSTONE; light grey to greenish grey fine grained, common very fine grains, angular to subangular grains of white to cream kaolinised feldspar, translucent fresh feldspar, with common black brown to black and occasional red lithic grains about 30% quartz, tough, well indurated, well sorted tight.

- - - - gradational contact - - - -

3 inches — SANDSTONE; light grey, similar to above but generally very fine grained, moderately silty, and cross laminated; laminae defined by concentrations of carbonaceous to coal flecks and grains. Burrow 2½ inches deep and 1¼ inches wide is infilled with sandstone as above.

10 inches — SANDSTONE; light grey to greenish grey, very fine to fine grained, kaolinitic lithic, as above with occasional carbonaceous laminae.

- - - - gradational contact - - - -

10 inches — SANDSTONE; light grey, similar to above, predominantly very fine grained with common irregular laminae of sandy siltstone, argillaceous siltstone and occasionally of carbonaceous to coal matter.

- - - - gradational contact - - - -

6½ inches — SANDSTONE; light grey very light grey fine grained, common very fine and medium grains, angular to subangular, vitreous quartz, less than 5% lithic grains, slightly silty, poorly sorted, well cemented with powdery silica, very slightly calcareous, tight. Rare carbonaceous/laminae.

1 inch — SILTSTONE; light to medium light grey, very sandy (very fine grained) very lithic/feldspathic, slightly micaceous.

6½ inches — SANDSTONE· light grey fine grained, common very fine grained, angular quartz, with abunt 5% feldspar; 10-15% brownish grey, grey brown, black lithic grains, moderately well sorted, well cemented with silica, slightly calcareous, tight.

1½ inches — SILTSTONE; medium to medium dark grey, very sandy (very fine grained quartz, feldspar and lithic grains) moderately micaceous and carbonaceous.

1 inch — SANDSTONE; light grey, fine grained as above.

1½ inches — SILTSTONE; medium to medium dark grey, very sandy as above.

1 ft 1 inch — SANDSTONE; medium grey, very fine grained, quartz and abundant (30% ?) feldspar and lithic grains, very silty, moderately carbonaceous, slight to moderately micaceous, well indurated, in part with patchy matrix of brown calcareous carbonate, tight.

10 inches — No recovery

- - - - - - - - - - - - - - - - - -

10,067-10,070 — Trip sample
70% SANDSTONE; light grey to grey green, very fine to fine grained with angular to subangular quartz and various amounts of white translucent and opaque feldspar up to 40% and from 5-15% dark grey, brown grey and green grey lithic grains. Occasional carbonaceous/bitumen material.

Minor white and brown mica. Siliceous slightly calcareous cement. Tight.
10% SILTSTONE; light grey with abundant feldspathic grains and occasional lithic grains common carbonaceous/bitumen lamellae. Occasional white and brown mica very fine, sandy and grading to sandstone above.
20% SHALE(mudstone) medium to dark grey, micromicaceous. Occasional carbonaceous flecks. Part silty and grading to siltstone as above.

10,070-10-080 60% SANDSTONE; light grey to grey green, very fine to fine grained, as above.
20% SILTSTONE; light grey, with abundant feldspar as above.
20% SHALE; medium to dark grey, micromicaceous, part carbonaceous, part silty, as above.

10,080-10,090 70% SANDSTONE; light grey to green grey, very fine to predominantly fine grained, as above, with common feldspar and lithic grains up to 50% rare orange feldspar.
10% SILTSTONE; as above part slighlly brownish.
20% SHALE: as above.

10,090-10,100 50% SANDSTONE; light grey green very fine to fine grained with approximately 40% angular to subangular clear quartz, 40% white to very pale green translucent opaque feldspar, 10% off white altered feldspar, 10% dark grey, grey brown to grey green lithic grains traces orange feldspar occasional carbonaceous/bitumen material, and pale brown mica. Silica and slight to moderate calcareous cement. Tight.
20% SANDSTONE; light grey brown, very fine to fine grained with constituents as above but with a light brown moderately calcareous (dolomitic?) matrix.
10% SILTSTONE; light grey with common feldspar part very fine sandy and grading to sandstones above.
20% SHALE; (mudstone) medium to dark grey, micromicaceous, partcarbonaceous, part silty and grading to siltstone above.
5% dark brown hard, moderately calcareous mudstone.

10,100-10,110 50% SANDSTONE; light green grey, very fine to fine grained asabove.
15% SANDSTONE; light grey brown, moderately calcareous, as above.
15% SANDSTONE; white to white grey, very fine grained with angular clear quartz and 5% feldspar and lithics in a clacareous cement. Tight.
10% SILTSTONE; light grey as above, very occasionally specks of resinous material.
10% SHALE; medium to dark grey, as above.

10,110-10,120 60% SANDSTONE; predominantly light green grey as above but predominantly fine grained, feldspathic and lithic, minor brown grey and moderately calcareous as above. Minor part white to white grey, quartzose as above, but with traces medium to coarse angular quartz. Also minoe part with argillaceous, silty matrix, and carbonaceous flecks, and mica as above.
35% SHALE; medium dark grey, part silty part carbonaceous with fine coal lamellae.

10,120-10,130 60% SANDSTONE; light grey green very fine to fine grained, with up to 80% white and pale green feldspar and common dark grey and greenish grey lithic grains, very minor part with 5% feldspathic/lithic grains. Fairly sparse calcareous and occasional siliceous cement. Occasional carbonaceous/bitumen material very occasional orange feldspar traces white mica. Tight.
20% SILTSTONE; light to medium grey with abundant feldspathic grains, occasional mica and carbonaceous flecks. Part argillaceous, part very fine sandy grading to sandstone, as above.
20% SHALE; medium to dark grey, part carbonaceous as above.

10130-10140 70% SANDSTONE; light grey green, very fine to fine grained as above with 5% with brown calcareous (dolomitic ?) matrix.
15% SILTSTONE; light to medium grey, as above, part with rare medium to coarse subrounded quartz grains.
15% SHALE; medium dark grey, micromicaceous, part carbonaceous part silty. Traces coal.

10,140-10,150 70% SANDSTONE; light grey green, very fine to fine grained, as above but more quartzose with abundant 20-30% feldspar/lithic grains.
15% SILTSTONE; light to medium grey, feldspathic, micaceous sandy as above.
15% SHALE; as above, but generally medium grey and silty to grading to siltstone.

10,150-10,160 25% SHALE; medium light to medium grey, slightly micromicaceous, slightly carbonaceous, generally slightly silty, in part very silty, platy to blocky.
15% SILTSTONE; light to medium light grey, in part argillaceous, generally coarse, slightly micaceous slight to moderately carbonaceous, very feldspathic/ lithic, grades to .
60% SANDSTONE; light grey, often brownish grey, very fine grained, occasional fine grained, sub-angular clear to translucent feldspar (60%), quartz (20%) brown and black lithic grains (10%) opaque white altered feldspar (5%) and green and greenish grey lithic grains (5%) in part with common argillaceous grains, in part with carbonaceous/coaly grains, silty and argillaceous matrix, dirty appearance, indurated tight.

10,160-10,170 Variable sample.
25% SHALE; medium to medium dark grey, variable in part slightly micromicaceous non-silty, generally micromicaceous, slightly carbonaceous, moderate to very silty chunky.
45% SILTSTONE; light to medium light grey as above.
30% SANDSTONE;similar to above but predominantly very fine grained, moderate to very silty.
Traces massive pyrite. Trace argillaceous coal.

10,170-10,180 Variable sample.
15% SHALE; medium to dark grey, predominantly tough and very silty, blocky, grades to
55% SILTSTONE; medium light grey and greenish grey, tough, in part argillaceous but predominantly siliceous and very fine sandy, generally very feldspathic/lithic but in part quartzose, slightly micromicaceous and carbonaceous - grades to shale

and to -
30% SANDSTONE; light grey and greenish grey, very fine grained as above, in part slightly calcareous, tight.
Scattered medium to very coarse angular to subangular quartz grains.

10,180-10,190 30% SHALE; medium to medium dark grey, slight to moderately micromicaceous, trace carbonaceous non-silty platy; in part (30%) slightly carbonaceous, moderate to very silty, slightly sandy (very fine grained) lithic/feldspathic, chunky and grades to.
20% SILTSTONE; medium light grey, slightly to moderately micromicaceous, coarse, occasional carbonaceous specks, moderate to very feldspathic/lithic, in part argillaceous, commonly sandy (very fine grained) and grades to -
50% SANDSTONE; light grey and greenish grey, speckled black ("salt and pepper" texture), very fine grained, in part fine grained, angular to subrounded pale greenish grey to translucent feldspar grains, quartz (percentage unknown but probably very small), 5% opaque white altered feldspar grains, 10% medium brown to black argillaceous grains, rare carbonaceous grains, rare schist grains, well indurated, siliceous to moderately calcareous cement, tight.
Rare medium to coarse quartz grains in shale.

10,190-10,200 Variable sample.
10% SHALE; as above in part carbonaceous, moderate to very silty.
40% SILTSTONE; medium light to medium grey, slightly carbonaceous, slightly micromicaceous, in part argillaceous, predominantly coarse, very sandy (very fine grained) very feldspathic/lithic and grades to -
50% SANDSTONE; light grey to greenish grey, similar to that above but very fine grained, moderate to very silty in part, only trace calcareous.

10,200-10,210 10% SHALE; as above moderate to very silty - grades to.
25% SILTSTONE; medium light to medium grey, in part moderately argillaceous, predominantly slightly micromicaceous, tough, moderately feldspathic/lithic and in part slightly carbonaceous & coarse and grades to -
65% SANDSTONE; light greenish grey, very fine grained, in part fine grained, angular subrounded quartz and very abundant (30%)? grey and greenish grey translucent feldspar, with about 5% white kaolinised feldspar, 10-15% dark greyish green, brown and black lithic grains, traces schist grains; traces pink feldspar well sorted, well cemented with silica, trace calcareous tight, rarely with medium grained "floating" quartz grains.

10,210-10,220 Variable sample
20% SHALE; as above and in part non-silty
40% SILTSTONE; light to medium grey, often argillaceous, as above
35% SANDSTONE; light greenish grey similar to that above, predominantly very fine grained, slightly calcareous in part, tight.

5% Unconsolidated quartz and feldspar grains, predominantly very fine to fine grained but including some medium to coarse quartz grains. Trace massive pyrite.

10,220-10,230 Trip sample
15% SHALE: medium to dark grey, micromicaceous part silty, part carbonaceous.
20% SILTSTONE; light to medium grey, with abundant feldspathic grains micromicaceous, with carbonaceous material, part very fine sandy.
60% SANDSTONE; light grey green, very fine to fine grained, feldspathic as above.
5% Unconsolidated quartz and feldspar grains, very fine to coarse grained as above.

10,230-10,240 50% SANDSTONE; light grey green, very fine to occasionally fine grained with subangular clear quartz, up to 60% feldspar including 5% lithic grains as above.
Occasionally carbonaceous bitumen material and pale brown mica. Siliceous slightly calcareous cement. Tight.
25% SILTSTONE; light to medium grey as above.
25% SHALE; medium to dark grey, as above part with waxy appearance, traces coal.

10,240-10,250 75% SANDSTONE; light grey green, very fine to fine grained, very feldspathic as above. 5-10% lithics, traces orange feldspar, tight.
15% SILTSTONE; light to medium grey as above.
10% SHALE; medium to dark grey as above.

10,250-10,260 80% SANDSTONE; light grey green very fine to fine grained as above part with up to 80% white to pale green feldspar including 10-15% grey brown and grey green lithics. Part with pale brown moderately calcareous matrix. Part with argillaceous matrix. Tight.
10% SILTSTONE; light to medium grey as above occasionally grey brown and slightly calcareous
10% SHALE: medium to dark grey as above.

10,260-10,270 50% SANDSTONE; light grey green, very fine to occasionally fine grained with 60-80% white to white green translucent feldspar including 10-15% grey brown, grey green, and light green lithic grains. Subsidiary subangular clear quartz occasionally white to brown mica, trace orange feldspar slightly calcareous cement, tight.
30% SILTSTONE; light grey to grey green with abundant feldspar and occasional lithic grains, minor mica. Gradational to sandstone above.
15% SHALE; medium grey, micromicaceous part silty and grading to siltstone.
5% Mudstone; grey brown slight to calcareous with scattered silt to very fine size quartz and feldspar grains, occasionally carbonaceous flecks.

10,270-10,280 50% SANDSTONE; light grey green, very fine to occasionally fine grained feldspathic lithic slightly calcareous as above, minor part with 50% quartz.
30% SILTSTONE; light grey to grey green as above grading to sandstone above.

20% SHALE; medium to occasional dark grey, micromicaceous, major part silty, part slightly carbonaceous.

10,280-10,290 40% SANDSTONE; light grey green, very fine to occasionaly fine grained feldspathic/lithic as above with part - 50% angular/subangular quartz with siliceous cement.
40% SILTSTONE; light grey to grey green, as above.
20% SHALE; medium to occasionally dark grey as above, part very silty.

10,290-10,300 40% SHALE; in part medium light grey slightly micromicaceous platy to chunky, predominantly black brownish grey rarely silty, only trace feldspathic, commonly with carbonaceous fragments and in part with coal laminae.
30% SILTSTONE; light to medium light grey, very slightly micaceous, slightly carbonaceous in part, often only slightly feldspathic lithic but in part very feldspathic and coarse and grades to sandstone; in part argillaceous and grades to grey shale; as above.
30% SANDSTONE; light grey, very fine grained, very lithic/feldspathic as above, rarely with carbonaceous blebs, in large part silty, in part slightly calcareous tight, grades to siltstone.

10,300-10,310 5% SHALE; brown, as above.
10% SANDSTONE; light grey to greenish grey, very fien grained, as above.
15% SANDSTONE; medium light brownish grey, very fine grained, in slight part fine grained, sub-angular to subrounded cream and off white to light grey feldspar 15% lithics, 10% quartz, very calcareous, tight.
10% SILTSTONE; light to medium light greenish grey, slight to moderately micromicaceous, moderately feldspathic/lithic, slight to moderately carbonaceous in part, in part argillaceous and grades to shale as below.
60% SHALE; medium light to medium grey, slightly micaceous, occasionally with silt size carbonaceous flecks and rare carbonaceous patches, in part slightly silty, only traces feldspathic.
Traces of sandstone cream, fine to medium grained rounded to subrounded quartz, well cemented, with a white powdery cement, tight, yellowish mineral ? fluorescence.
Traces coal, occasional loose rounded to subrounded medium to coarse grained quartz.

10,310-10,320 Interbeddedand gradational.
5% SHALE; brown, as above.
10% SANDSTONE; medium light brownish grey, as above.
20% SHALE; as above, in part moderate to very silty.
30% SILTSTONE; medium light to medium greenish grey, in part as above but predominantly coarse, very feldspathic/lithic, carbonaceous slightly micromicaceous and grades to -
35% SANDSTONE; light greenish grey, very fine grained, lithic/feldspathic as above, tight.
Occasional loose quartz grains; trace shell fragment?

10,320-10,330 35% SHALE; medium grey, in part brownish grey, slight to moderately micromicaceous, slight to to moderately silty, very slightly carbonaceous, and feldspar, platy-subfissile.
45% SILTSTONE; light to medium light greenish grey, as above; grades to
20% SANDSTONE; light greenish grey very fine grained, as above, predominantly silty, tight. Scattered medium to coarse quartz and occasional translucent feldspar grains.

10,330-10,340 15% SANDSTONE; light to medium light greenish grey, as above.
50% SHALE; medium light to medium dark grey, as above.
35% SILTSTONE; medium light to medium grey, moderately micaceous, moderate to very feldspathic/ lithic, in part slight to moderately carbonaceous, in part argillaceous and in part very fine sandy. Occasional buff, medium to very coarse grained sandstone with traces intergranular porosity and occasionally medium to coarse loose quartz grains.

10,340-10,350 Variable sample - interbedded and gradational
5% SANDSTONE; medium light to medium grey, very fine grained as at 10,300-10,310
20% SANDSTONE; light greenish grey, very fine grained as above slightly calcareous, tight.
30% SILTSTONE; as above, generally coarse and grades to sandstone.
45% SHALE; as above, in part carbonaceous flecked rarely feldspathic in part silty.
Traces coal; traces loose poorly sorted quartz grains, traces quartzose sandstone; as above.

10,350-10,360 65% SHALE; medium light to medium grey, slightly brownish, slight to moderately micaceous, in part with pale borrw indeterminate flecks, predominantly non-feldspathic but in part (40%) slight to moderately silty and feldspathic/lithic slightly carbonaceous in part.
15% SILTSTONE; medium light grey, coarse, slightly micromicaceous, very sandy (very fine grained) slightly carbonaceous, in large part feldspathic/lithic, grades to silty sandstne.
25% SANDSTONE; light grey slightly greenish, very fine grained as above tight.

10,360-10,370 45% SHALE; medium light to medium greenish grey, slightly micromicaceous, slightly silty, very slightly feldspathic rarely carbonaceous, platy to blocky.
15% SILTSTONE; medium grey, slightly greenish as above.
40% SANDSTONE; light to medium light greenish grey very fine grained occasional fine grained angular to subangular, pale greenish grey translucent feldspar, 5-10% white kaolinitic grains, less than 10% quartz, 10-15% brown and occasional black argillaceous grains, very slightly micaceous commonly well cemented (with silica ?) but in part moderately friable with silty partly kaolinitic (?) matrix, tight, in part very slightly calcareous. Traces quartzose sandstone as above Traces pyrite.

10370-10,380 45% SHALE; similar to that above.
10% SILTSTONE; as above and in part light greenish

grey, quartzose, moderately micaceous.
45% SANDSTONE; as above, in part brownish grey slightly calcareous.

10,380-10,390 Trip sample.
45% SANDSTONE; light grey green, very fine to fine grained with 50-80% white to white green feldspar 5-10% grey brown and grey green lithic grains, and subsiduary angular to subangular clear quartz. Occasionally carbonaceous/bitumen material. Occasionally light brown to green micaceous flakes. Traces orange feldspar. Slight to moderately calcareous cement. Tight.
15% SILTSTONE; light to medium grey green with abundant poorly defined white to green feldspar and occasional lithic grains. Occasional carbonaceous bitumont flecks. Grades to sandstone above.
40% SHALE; medium to dark grey, micromicaceous part silty with abundant feldspar grains grading to siltstone above. Part non-silty but with scattered very fine subrounded clear quartz grains. Part with poorly orientated carbonaceous flecks.

10,390-10,400 60% SANDSTONE; light grey green, very fine to fine grained as above.
15% SILTSTONE; light grey to grey green feldspathic lithic as above.
25% SHALE; medium to dark grey, micromicaceous as above.

10,400-10,410 45% SANDSTONE; light grey green, very fine to fine grained, feldspathic/lithic slightly calcareous as above. Part with argillaceous matrix.
15% SILTSTONE; light grey to grey green as above.
40% SHALE; medium to dark grey, micromicaceous as above.

10,410-10,420 40% SANDSTONE; light grey green, very fine to fine grained with 50-80% white to white green translucent feldspar with 5-10% off white altered feldspar, 5-10% grey brown to grey green and green lithic grains. Occasional carbonaceous/bitumen material and light brown mica. Traces orange feldspar slightly calcareous. Part with argillaceous matrix. Tight.
15% SILTSTONE; light grey to light grey green with common feldspar and occasional lithic grains, part argillaceous grades to sandstone above.
45% SHALE; medium to dark grey micromicaceous. Part silty and very silty and grading to siltstone. Rare carbonaceous streaks.

10,420-10,430 40% SANDSTONE; light grey green, very fine to fine grained feldspathic/lithic slightly calcareous tight as above.
20% SILSTONE; light grey to occasionally green grey, common feldspar, part argillaceous, occasional mica, as above.
40% SHALE; medium to dark grey as above, predominantly silty, micro to very fine micaceous.

10,430-10,440 65% SANDSTONE; light grey green, as above but predominantly fine grained with slight increase in lithic content.
15% SILTSTONE; light grey to grey green, as above.
20% SHALE; light medium to occasionally dark grey, as above but with part non silty scattered very fine clear to brown subrounded quartz grains.

10,440-10,450 75% SANDSTONE; light grey green fine grained, occasional very fine and medium grained, with approximately 60-70% white to white grain, feldspar as 10-15% subangular grey brown, grey grey green lithic grains 10-20% clear angular quartz grains. Occasional orange feldspar, light brown mica, and carbonaceous bitumen material. Slightly calcareous cement. Part with light brown moderately calcareous matrix. Traces intergranular porosity. Traces relative clear quartz sandstone to very fine to fine grained with traces intergranular porosity.
GAS SHOW: A 0.8 unit kick was recorded by the detector unit.
Pale yellow mineral fluorescence only. No cut.
15% SILTSTONE; light grey to grey green with common indistinct feldspathic grains, argillaceous slightly micaceous.
10% SHALE; medium to dark grey, micromicaceous part carbonaceous generally silty and grading to siltstone above.

10,450-10,460 35% SHALE;medium grey, slightly silty, very slightly carbonaceous specked, only trace feldspathic chunky-platy and predominant shale dark brownish grey, slightly micaceous and carbonaceous, very slight to slightly feldspathic/lithic in part moderate to very silty, tough, blocky.
15% SILTSTONE; medium light to medium grey and greenish grey, slighly micromicaceous, coarse, feldspathic/lithic, in part argillaceous, predominantly very fine sandy and grades to sandstone.
50% SANDSTONE; light to medium light greenish grey very fine grained, occasional fine grained, angular to subangular pale greenish grey translucent feldspar, approximately 10% quartz.
5% white kaolinitic grains, 15% medium brown to black shale grains, occasional pink feldspar grains; argillaceous/slightly kaolinitic matrix, in part well cemented (with silica?) in part very friable; slightly micaceous, occasional carbonaceous grains; possibly with some earthy porosity.
Traces of sandstone; cream to buff, very fine grained subangular to subrounded quartz and occasional translucent feldspar white powdery matrix, very friable, poor intergranular and good earthy porosity.

10,460-10,470 20% SHALE; similar to above.
15% SILTSTONE; similar variable, predominantly medium light to medium grey, brownish grey, greenish grey, and essentially similar to that above.
65% SANDSTONE; light greenish grey, very fine grained, in part fine grained, similar to above, generally with argillaceous kaolinitic matrix with good earthy porosity.
Traces sandstone; cream to buff as above, traces loose medium to very coarse quartz grains.

10,470-10,480 Not much volume of cuttings over shaker.
30% SHALE; predominantly medium dark brownish grey, in part silty, in part micaceous generally slightly carbonaceous and rarely with carbonaceous and coal blebs, sub-fissile to chunky.

15% SILTSTONE; variable, predominantly medium grey, slightly micaceous, slightly feldspar, very slightly carbonaceous, tough; in part argillaceous.
55% SANDSTONE; light greenish grey very fine to fine grained angular to subangular light greenish grey translucent feldspar, similar to above but with increase in quartz content and decrease in the lithic content, possibly with fairto moderate earthy porosity in large part.

10,480-10-490 30% SHALE; medium light to medium grey, moderately to very silty, slightly carbonaceous in part, slightly feldspat in part, platy to chunky to grades to -
50% SILSTONE; medium to medium dark grey, coarse slightly micaceous, in part argillaceous, tough, slightly carbonaceous, in large part slightly feldspathic/lithic, often very finely sandy. grades to -
20% SANDSTONE; light to medium greenish grey very fine grained, occasional fine grained as above, generally slight to moderately silty, tight.
Occasional sandstone buff to very fine to fine grained, subangular to subrounded quartz, occasional carbonaceous grains, powdery siliceous cement, friable, good earthy and traces intergranular porosity. Traces of boutonite.

10,490-10,500 25% SHALE; medium to dark grey, and brownish grey, slightly carbonaceous slightly carbonaceous, slightly feldspathic in part, generally slightly silty.
25% SILTSTONE; medium grey, slightly greenish coarse feldspathic/lithic, very sndny(very fine grained) in part slightly carbonaceous, slightly micromicaceous grades to
50% SANDSTONE; light greenish grey, very fine grained, angular to subangular, pale greenish grey translucent feldspar, 5-10% quartz, 5% kaolin, 10-15% brown and black lithic grains, generally slight to moderately silty, dirty appearance, well consolidated traces calcite tight.

10,500-10,510 15% SHALE; variable (cavings?)
20% SILTSTONE; as above well consolidated siliceous in part, grades to very fine grained sandstone.
65% SANDSTONE; light greenish grey, very fine grained, moderately silty, as above, grades to siltstone.
Occasional quartzose sandstone, buff, very fine to fine grained as above.

10,510-10-520 15% SHALE; variable medium to dark grey, often very silty, in part siliceous, probably at least in part cavings, blocky.
15% SILTSTONE; as above rarely carbonaceous.
70% SANDSTONE; light greenish grey, as above but very fine to fine grained and only slightly silty very slightly calcareous, tight; in part brownish grey with moderate calcareous carbonate cement tight.

10,520-10,530 Interbedded and gradational
20% SHALE; medium dark to dark grey slightly brownish in part slightly micaceous, in part carbonaceous, in part feldspathic, in part silty.

30% SILTSTONE;light to medium grey and greenish grey, slightly micromicaceous, occasional biotite flakes, in slight part argillaceous, in part siliceous, coarse and predominantly moderate to very sandy (very fine grained), moderate to very feldspathic/lithic - grades to -
50% SANDSTONE; light to medium light grey as above.

10,530-10,540 10% SHALE; as above, rarely with subangular medium to very coarse quartz grains.
25% SANDSTONE; as above generally silty - grades to -
65% SILTSTONE; medium greenish grey, slightly micaceous, in part argillaceous, slight to moderately feldspathic/lithic, coarse and grades to sandstone.

10,540-10,550 Sample not caught.

10,550-10,560 Trip sample.
75% SHALE; medium to medium dark grey, very slightly micaceous, in part slightly carbonaceous, rarely slightly feldspathic, in slight part silty, platy to blocky.
10% SILTSTONE; medium light to medium grey, predominantly coarse and very sandy, (very fine grained) generally moderate to very feldspathic/lithic, rarely argillaceous.
15% SANDSTONE; medium light grey very fine grained feldspar and abundant lithic fragments, in slight part with abundant quartz, in part silty occasional dirty, argillaceous and chloritic, tight.

10,560-10,570 Variable lithology interbedded and gradational.
50% SHALE; as above but generally very tough, slight to moderately silty and slightly feldspathic lithic.
35% SILTSTONE; medium grey, in part greenish grey, coarse and very sandy, as above.
15% SANDSTONE; variable but predominantly medium l light grey, very fine grained, angular, light grey and greenish grey and pale green feldspar with less than 10% quartz, 5-10% white to cream kaolin and 10% light brown grains, well cemented in part silty, trace calcareous, tight.
Traces of coal matter.

10,570-10,580 20% SHALE; medium dark grey, tough, in slight part moderately feldspathic/lithic, in part silty in part carbonaceous, rarely with coal laminae, blocky.
20% SILTSTONE; light to medium greenish grey, coarse very sandy (very fine grained feldspar and lithics) in part siliceous, grades to -
60% SANDSTONE; light greenish grey, very fine grained occasional fine grains, angular to subangular pale greenish grey, translucent feldspar 5-10% white kaolin grains, less than 5% (?) quartz, 10-15% black, and brown grains, slightly silty, compact, well sorted, tough, tight.
Traces cream very fine to fine grained quartz sandstone; occasional medium to very coarse loose grains of quartz and feldspar.

10,580-10,590 Variable lithology.
20% SHALE: dark grey and brownish grey, micaceous, in part silty, non-feldspathic, blocky (probably cavings)
15% SHALE; light greenish grey, trace carbonaceous very slightly feldspathic, very silty, platy.
25% SILTSTONE; medium light greenish grey, very feldspathic/lithic, tough, moderate to very sandy (very fine grained) interlaminated with and grades to -
40% SANDSTONE; as above predominantly very fine grained.

10,590-10,600 Variable lithology - interbedded and gradational.
40% SHALE; predominantly dark grey and brownish grey, very slightly carbonaceous, rarely slightly silty, in slight part greenish grey as above.
40% SILTSTONE; as above, tought.
20% SANDSTONE; as above, very fine grained, well indurated, slightly siliceous in part, tight.

10,600-10,610 60% SHALE; dark grey and greyish brown, as above and lesser medium greenish grey, slightly micaceous generally moderate to very silty, feldspathic/lithic.
30% SANDSTONE; medium light grey and greenish grey, very fine grained, occasional fine grained as above, tight.
10% SILTSTONE; as above.
Traces shale; dark brownish grey, very glauconitic.

10,610-10,620 Variable lithology to interbedded and gradational.
45% SHALE; dark brownish grey, as above, rarely sandy, with occasional shale greenish grey as above.
40% SANDSTONE; variable, very fine to fine grained, feldspathic/lithic, in part argillaceous, often slightly carbonaceous or micaceous, rarely silty and with abundant chlorite pellets.
Trace coal; trace very coarse grained feldspar and quartz grains.
18% SILTSTONE; similar to that above.
2% SANDSTONE; cream, very fine to fine grained, quartz, well cemented with powdery white silica (?) trace calcareous, fair earthy porosity.

10,620-10,630 45% SHALE; medium to dark grey and brownish grey, slightly carbonaceous, in part silty sub-fissile to platy.
15% SILTSTONE; as above.
35% SANDSTONE; light to medium light grey, in part greenish grey, very finegrained, occasional fine grained, grey and greenish grey feldspar common white kaolinitic grains 10-15% grey brown, and black argillaceous lithic grains and less than 10% quartz, in part slightly silty, compact very slightly calcareous, tight.
Traces of coal, abundant sandstone cream to light grey, quartzose, as above.

10,630-10,640 35% SANDSTONE; light grey to green grey, very fine to fine grained with white to light green feldspar. 10-15% lithic grains as above. Occasional white altered feldspathic grains 10-20% clear angular quartz, part argillaceous part silty, very slightly calcareous, tight.
5% SANDSTONE; cream, fine to very occasional medium

with subangular clear quartz and 5% feldspathic/ lithic grains in a powdery siliceous ? part slightly calcareous cement, with earthy porosity
20% SILTSTONE; light to medium grey, occasional grey green with common feldspathic and lithic grains occasional carbonaceous flecks, part argillaceous.
40% SHALE; medium to dark grey and brownish grey as above.
Traces coal.

10,640-10,650 35% SANDSTONE; light grey to grey green, very fine to fine grained, feldspathic/lithic as above.
20% SANDSTONE; Cream, as above but occasional very fine grained and part with 5% feldspathic/ lithic grains and gradational to grey green sandstone as above. Also occasional carbonaceous coal stringers, traces intergranular porosity.
No shows.
15% SILTSTONE; as above.
30% SHALE; medium to dark grey part silty as above, traces coal.

10,650-10,660 35% SANDSTONE; light grey green, as above but predominantly very fine grained and part silty. Feldspathic/lithic. Tight.
25% SANDSTONE; cream, predominantly fine grained. quartzose as above, with traces intergranular porosity. Very slightly increases 0.1-0.2 unit in background on detector unit.
20% SILTSTONE; light grey to light grey green feldspathic/lithic, part very fine sandy and grading to sandstone above. Part argillaceous Part micromicaceous.
20% SHALE; medium dark grey, part carbonaceous, predominantly silty but minor part non silty with scattered very fine quartz grains.

10,660-10,670 20% SANDSTONE; light grey green, feldspathic lithic as above, but with 50% angular to subangular clear quartz.
30% SANDSTONE; cream, fine grained, quartzose as above, slight increase inggas background. Bright yellow fluorescence in siltstone. No cut.
20% SILTSTONE; light grey to light grey green, as above.
30% SHALE; medium to dark grey, as above part grey brown hard and moderately carbonaceous.

10,670-10,680 25% SANDSTONE; light grey green very fine to fine grained with white to white green feldspar, 5-10% white altered feldspar, 10-15% grey, grey green, brown, black lithic grains and 20-50% angular to subangular clear quartz slightly calcareous cement, tight.
25% SANDSTONE; white to cream, fine grained, with angular to subangular clear to slightly cloudy quartz with scattered (0-5%) white feldspar and lithic grains as for sandstone above. Part with traces intergranular porosity slightly calcareous powdery siliceous ? matrix with possible capillary porosity.
0.3 unit gas kick on detector. Scattered yellow fluorescence no cut as above.
20% SILTSTONE; light to medium grey grey green, grading to sandstone as above.
30% SHALE; medium to dark grey as above but minor part with scattered very fine to medium subangular to subrounded clear to cloudy quartz grains.

10,680-10,690 Sampel appears unreliable and hight proportion of large cuttings.
20% SANDSTONE; light grey green, very fine to fine grained, feldspathic/lithic as above.
30% SANDSTONE; cream, fine grained quartzose as above but occasional medium grained and moderately friable.
20% SILTSTONE; light grey to grey green as above.
30% SHALE; medium to dark grey, part very fine to medium sandy as above.

10,690-10,700 25% SANDSTONE; light grey green, feldspathic/lithic as above with occasional carbonaceous/bitumen material.
25% SANDSTONE; cream, fine to occasional medium grained quartzose with 5% lithic/feldspar as above.
20% SILTSTONE; light to medium grey, occasional grey green as above.
30% SILTSTONE, medium to dark grey, micromicaceous as above increase 5% shale (mudstone) light grey moderately soft, and slightly waxy lustre, with micron size carbonaceous specks and occasional with yellow fluorescence. No cut.

10,700-10,710 40% SANDSTONE; light grey green, very fine to fine grained with white to white green feldspar 10-20% grey, brown, black greey etc, angular lithic grains. 0% - 5% clear angular quartz occasional white altered feldspar very occasional orange feldspar. Occasional carbonaceous/bitumen material, very occasional pale brown mica, very sparse slightly calcareous cement. Tight.
30% SANDSTONE; white to off white predominantly fine grained and well sorted angular clear quartz Rare lithic or feldspathic grains. Part with medium to granule size cloudy white to yellowish subrounded quartz grains and traces pebble size quartz fragment suggest conglomeritic in part Generally fairly sparse white powdery matrix - slightly calcareous or dolomitic ? Traces intergranular porosity, fair earthy porosity.
GAS SHOW. A well defined two unit gas kick was recorded by the detector unit in this interval. No fluorescence occurs in the sandstones. Scattered yellow fluorescence with no cut occurs in the siltstones and shales.
10% SILTSTONE; light to medium grey, with occasional feldspathic and lithic grains part micromicaceous.
20% SHALE; medium to dark grey, and grey brown. Part silty and grading to siltstone above with occasional carbonaceous specks. Part very micromicaceous. Part carbonaceous with coal laminae.

10,710-10,720 35% SANDSTONE; light grey green, feldspathic lithic as above but predominantly very fine grained, part silty and grading to siltstone, part with argillaceous matrix.
15% SANDSTONE; white to off white, fine grained quartzose as above part with traces poor intergranular porosity.
20% SILTSTONE; light to medium grey as above, part grey green and very fine sandy.
20% SHALE; medium to dark grey, as above.
10% Bentonite; grey to grey white, moderately soft, massive, slightly waxy lustre, with

scattered silt size dark brown, possibly argillaceous specks, and light brown mica.

10,720-10,730 Variable sample.
25% SHALE; medium dark to dark grey, in part slightly micaceous, rarely slightly pyritic, rarely with coal blebs, generally slight to moderately carbonaceous (flecks), in part slightly feldspathic, in part slightly silty.
5% BENTONITE; and very bentonitic shale variably cream, greenish grey, grey, and pale brown. Fluorescence moderate yellow.
10% SILTSTONE; predominantly medium greenish grey, in part moderately grey, slightly micaceous, moderately carbonaceous (specks and occasional patches and laminae), generally very fine sandy (feldspathic) in part argillaceous.
2% Loose medium to very coarse grained, angular to subangular quartz grains.
25% SANDSTONE; light brownish grey, very fine grained, angular to subangular feldspar with 15-25% quartz and 15-20% lithic grains (including phyllite), generally abundant brown sideritic dolomitic cement, tight.
10% SANDSTONE; light grey to buff, very fine to fine grained, angular to subangular quartz, trace feldspar and green chlorite grains, in slight part with siliceous cement, generally, with white to pale brown powdery slightly calcareous very dolomitic cement, rare carbonaceous grains, good earthy porosity, traces intergranular porosity.
25% SANDSTONE; light greenish grey, very fine grained, feldspathic/lithic, as above, tight.
Traces massive pyrite.

10,730-10,740 Tripsample.
40% SHALE; dark grey, in part brownish grey, very slightly carbonaceous, in part slightly feldspathic in part slight to moderately silty, in part fissile but predominantly chunky.
10% SILTSTONE; as above.
5% SANDSTONE; light grey to buff, very fine to fine grained as above.
44% SANDSTONE; light to medium light greenish grey, mottled texture, very fine to fine grained, angular to subangular, pale green and greenish grey, feldspar, 3% white, clay grains, less than 15% subangular to subrounded quartz grains, 15-20% dark greyish brown and occasional black argillaceous grains, traces orange to red feldspar, slightly friable, argillaceous/silty matrix, compact, tight, scattered. Mica (predominantly biotite) occasional with carbonaceous streaks.
1% Bentonite; predominantly cream, grey, white. Pale yellow fluorescence.

10,740-10,750 83% SHALE; dark grey and brownish grey, as above predominantly slight to moderately silty and occasional medium light grey very silty shale.
10% SILTSTONE; medium greenish grey to dark grey and brownish grey slight to micaceous, in part argillaceous, predominantly moderate to very feldspathic/lithic.
5% SANDSTONE; variable, very fine grained, silty. Common bentonite as above, traces coal, occasional loose quartz and feldspar grains.

10,750-10,760 60% SHALE; dark grey and brown grey, as above and grading to light to medium grey siltstone.
10% SILTSTONE; light to medium grey, occasional green grey, as above.
20% SANDSTONE; light to medium light green grey very fine to fine grained, feldspathic/lithic as above.
10% SANDSTONE; light grey and buff, quartzose as above.

10,760-10,770 20% SANDSTONE; light grey green very fine to fine grained with white to white green feldspar 10-15% grey brown, green lithic grains, variable content of angular clear quartz from 10% - 50% Occasional carbonaceous/bitumen material, traces orange feldspar slightly calcareous cement. Tight.
10% SANDSTONE; light grey white, very fine to predominantly fine and very occasional medium grained part with slight calcareous powdery white matrix. Probably earthy porosity.
15% SILTSTONE; light to medium grey brown to grey green, moderately feldspathic part grading to sandstone above. Part with abundant fairly well orientated carbonaceous flecks. Occasonal light brown mica.
55% SHALE; medium to dark grey, slight to moderately micromicaceous part silty and grading to siltstone part carbonaceous, 5% light grey and bentonite.

10,770-10,780 20% SANDSTONE; light grey green, feldspathic/ lithic as above.
20% SANDSTONE; light grey white, quartzose, as above part moderately friable. Traces white mica.
10% SILTSTONE; grey brown to grey green as above.
50% SHALE; medium to dark grey as above 5% bentonitic.

10,780-10,790 20% SANDSTONE; light grey green, feldspathic/ lithic as above.
35% SANDSTONE; light grey white to off white, quartzose as above, but with rare coarse to very coarse clear and cloudy quartz grains. Traces massive pyrite. Occasional light green argillaceous grains. Predominantly tight. A 0.2 unit gas kick occurs in this interval.
10% SILTSTONE; as above.
35% SHALE; medium to dark grey as above but minor part with scattered very fine to fine quartz grains 5% light grey bentonitic.

10,790-10,800 20% SANDSTONE; light grey green, very fine to fine grained with white to green feldspar, 10-20% lithic grains, variable clear angular to sub-angular quartz and up to 50%. Slightly calcareous matrix, occasional carbonaceous bitumen material, tight.
35% SANDSTONE; light grey white to off white, very fine to predominantly fine grained and occasional medium grained. Rare coarse quartz grains; with angular to subangular clear to slightly brown quartz and 0-5% lithic feldspathic grains. Part with occasional light green argillaceous grains Part with powdery white slight to moderately calcareous matrix. Predominantly tight, part with earthy porosity, and traces intergranular porosity. A 0.2 unit gas

kick occurs at the start of this interval.
10% SILTSTONE; light to medium grey with occasional feldspathic grains, part grading to quartz sandstone.
25% SHALE; medium to dark grey, part micromicaceous, part silty with occasional feldspathic grains, part with scattered very fine to fine quartz grains, traces light grey bentonitic.

10,800-10,810
15% SANDSTONE; light grey green, very fine to fine grained feldspathic/lithic as above.
20% SANDSTONE; light grey white to off white, quartzose as above.
15% SILTSTONE; light to medium grey as above, part brown grey.
50% SHALE; medium to dark grey, as above.

10,810-10,820
15% SANDSTONE; light grey green, very fine to fine grained as above.
30% SANDSTONE; light grey white to off white, fine grained, quartzose, as above part with earthy porosity and traces intergranular porosity. No shows.
20% SILTSTONE; light to medium grey, as above, part with brown mica.
35% SHALE; medium to dark grey, traces bentonite as above.

10,820-10,830
25% SANDSTONE; light to medium light grey and greenish grey, very fine to fine grained, as above in part with brown carbonate cement.
15% SANDSTONE; off white as above.
10% SILTSTONE; as above.
50% SHALE; as above.
Scattered medium to very coarse quartz grains, rare pyrite, common bentonite.

10,830-10,840
40% SHALE- medium dark to dark grey, in part brownish grey, rarely green, slight to moderately micaceous, predominately moderately silty, in slight part with medium to coarse, subrounded quartz grains slightly carbonaceous, rarely feldspathic, platy to blocky - grades to 0
30% SILTSTONE; medium light to medium grey, in part brownish and greenish grey, slightly micaceous, slightly carbonaceous, feldspathic/lithic, in part sandy - in part argillaceous.
30% SANDSTONE; light to medium greenish grey, very fine grained, occasional fine grained, angular to subrounded pale green and occasional clear feldspar generally in with less than 10% quartz, up to 15% brownish grey lithic grains, well consolidated, slightly calcareous tight. grades to -
5% SANDSTONE; white to off white, very fine to fine grained, subangular to subrounded quartz, with up to 20% grey lithic grains (predominantly siltstone and shale) and up to 5% pale brown stained feldspar ? moderately friable in part, siliceous cement, probably fair earthy porosity. Occasional loose poorly sorted quartz grains common bentonite and bentonitic shale.

10,840-10,850
40% SHALE (mudstone) medium to dark grey, generally slightly silty, slight to moderately carbonaceous, slight to moderately feldspathic, blocky - rarely very fine to fine sandy. (feldspar with minor chloritic and lithic grains) grades to .
20% SILTSTONE; as above.

35% SANDSTONE; light to medium greenish grey as above.
5% SANDSTONE; white as above.
Occasional bentonite; rare coaly grains; scattered unconsolidated quartz grains (derived from quartzose lenses, cemented with pyrite in sandstone above).

10,850-10,860 Trip Sample.
20% SANDSTONE; light grey to white, fine grained quartzose - 5% feldspar/lithic grains as above slight to medium calcareous as above.
20% SANDSTONE; light grey green very fine to fine grained lithic/feldspathic with variable quartz slightly calcareous as above.
20% SILTSTONE; light to medium grey, occasional grey brown, grey green, feldspathic, part argillaceous, part sandy.
40% SHALE; medium to dark grey part silty, part slightly micromicaceous. 5% light grey bentonitic.

10,860-10,870 40% SANDSTONE; light grey green very fine to fine grained with white to white green feldspar, 10-15% lithic grains, very variable angular to subangular clear quartz content. Occasional brown mica, and carbonaceous bitumen material. Part with slight to moderately calcareous matrix, tight.
10% SANDSTONE; light grey to white, very fine to predominantly fine grained, with angular clear quartz and 5% feldspathic/lithic grains in common white slightly calcareous matrix.
30% SILTSTONE; light to medium grey brown to grey green with common well orientated feldspathic grains and carbonaceous flecks.
20% SHALE; medium grey part silty and grading to siltstone as above 5% light grey bentonite.

10,870-10,880 30% SANDSTONE; light grey green, very fine to fine grained feldspathic lithic as above but part white argillaceous and silty matrix and occasional carbonaceous streaks.
20% SANDSTONE; light grey to white quartzose as above.
30% SILTSTONE; as above.
20% SHALE; as above.

10,880-10,890 40% SANDSTONE; light grey green, as above, but predominantly very fine grained tight.
10% SANDSTONE: light grey to white as above.
30% SILTSTONE:as above grading to sandstone.
20% SHALE; medium grey, as above part dark grey carbonaceous.

10,890-10,900 40% SANDSTONE; light grey green fine to predominantly very fine grained and grading to siltstone with white to white green feldspar, 10-15% lithic grains very variable quartz content. Occasional brown mica and carbonaceous /bitumen material Part very slightly calcareous cement.
10% SANDSTONE; light grey to white, veryy fine to fine grained quartzose as above part with slightly calcareous matrix.
25% SILTSTONE; light to medium grey green to grey brown, part with common feldspar and grading to sandstone above.
25% SHALE; medium grey, part silty, part with carbonaceous flecks.

10,900-10,910 40% SANDSTONE; light grey green, very fine to fine grained feldspathic/lithic as above part with carbonaceous streaks.
25% SANDSTONE; light grey white quartzose, but with rare medium to very coarse cloudy quartz grains minor part with light green argillaceous grains. Tight.
15% SILTSTONE; as above.
20% SHALE; medium to dark grey, as above, part medium brown, part micromicaceous.

10,910-10,920 35% SANDSTONE; light grey green, as above.
25% SANDSTONE; light grey to white, very fine to fine grained, quartzose and rarely medium grained, as above.
15% SILTSTONE; as above.
25% SHALE; medium to dark grey as above, part light to medium grey and slightly bentonitic.

10,920-10,930 30% SANDSTONE; light grey green, very fine to fine grained feldspathic/lithic part silty with varying quartz as above.
20% SANDSTONE; light grey to white, very fine to fine grained to rarely medium grained as above. Traces medium to very coarse subrounded quartz grains.
20% SILTSTONE; as above.
30% SHALE; as above.

10,930-10,940 45% SANDSTONE; light grey green, very fine to predominantly fine grained with white to white green feldspar, 10-15% lithic grains occasional carbonaceous/bitumen material. Part slightly calcareous cement tight.
15% SANDSTONE; light grey to white, very fine to predominantly fine and very occasionally medium grained with angular to subangular clear to cloudy quartz, in white powdery kaolinitic ? matrix, part slightly calcareous traces intergranular porosity. Rare coarse to very coarse quartz grains.
15% SILTSTONE; light to medium grey to grey brown. Predominantly very fine quartz sandy. occasional carbonaceous flaks.
25% SHALE; medium to dark grey, part silty, part very fine sandy, part micromicaceous.
A 0.7 unit gas kick occurs in this interval.

10,940,10,950 Lithology as for 10,930-10,940

10,950-10,960 50% Light grey green predominantly fine grained as above but part very fine grained and grading to siltstone and very occasionally medium grained very occasionally orange feldspar, tight.
15% SANDSTONE; light grey to white fine grained quartzose as above. Very rarely medium grained. Traces intergranular and probably earthy porosity.
10% SILTSTONE; as above.
25% SHALE; as above par light grey and slightly bentonitic.
A 0.7 unit gas kick occurs in this interval.

10,960-10,970 35% SANDSTONE; light grey green, predominantly fine grained as above part grading to siltstone rarely medium grained, tight.
15% SANDSTONE; light grey to white as above, occasionally medium grained and with rare coarse to very coarse angular quartz grains, predominantly tight.

20% SILTSTONE; as above but part with common feldspar.
35% SHALE; as above.
GAS SHOW; A 3 unit gas kick occurs at the start of this interval.

10,970-10,980 Interbedded and gradational
30% SHALE; (mudstone) medium to medium dark grey, moderate to very silty, slightly feldspathic, very slightly micaceous, in slight part carbonaceous (flecks) chunky-blocky - grades to -
45% SILTSTONE; medium grey and greenish grey, coarse in part slight to moderately argillaceous, rarely very slightly calcareous, slightly carbonaceous, very feldspathic/lithic, in part very fine sandy - grades to -
25% SANDSTONE; medium light greenish grey, very fine grained, rarely fine grained, subangular to subrounded, pale green feldspar, 20% quartz, 15% white to cream altered feldspar and/or schist grains, 5-10% dark grey to black carbonaceous and argillaceous grains, well consolidated, trace calcareous, in part silty, tight.

10,980-10,990 25% SHALE (mudstone) as above.
55% SILTSTONE; coarse as above - grades to -
20% SANDSTONE; greenish grey very fine grained, silty as above rarely very fine to fine grained, with abundant pale green chloritic/argillaceous grains.
Occasional sandstone white fine grained, angular quartz with/in part up to 10% white clay grains, well sorted and cemented, slightly calcareous to siliceous cement tight.
Scattered medium tocoarse quartz grains.

10,990-11,000 35% SHALE; (mudstone) medium medium to dark grey, slightly micaceous in part, generally slight to moderately silty, occasional carbonaceous, in part feldspathic blocky.
35% SILTSTONE; medium to medium light greenish grey, coarse, moderate to very sandy (very fine grained), feldspathic/lithic, slight to moderately carbonaceous grades to
25% SANDSTONE; medium light greyish green, very fine grained as above generally very silty tight.
5% SANDSTONE; white as above but with up to 20% feldspathic and lithic grains.
Occasional loose angular to subangular quartz grains.

11,000-11,010 65% SHALE (mudstone) as above.
25% SILTSTONE; as above.
10% SANDSTONE; as above.
Traces coal, traces white sandstone as above, traces slickensided shale.

11,010-11,020 Interbedded and gradational
65% SHALE; (mudstone) medium to medium dark grey and greenish grey, slight to moderately carbonaceous, generally slightly silty, occasional slightly feldspathic, blocky.
20% SILTSTONE; as above.
15% SANDSTONE; very fine grained as above, occasional fine grained.

11,020-11,030	Interbedded and gradational 45% Mudstone; as above 25% SILTSTONE; as above. 30% SANDSTONE; light greenish grey, very fine to fine grained, subangular to subrounded, feldspar with 30% plus quartz, and 15% lithic grains, in part silty, generally very slightly calcareous, tight. Common bentonite, common white quartzose sandstone; traces coal.
11,030-11,040	Lithology and percentages, similar to above. Traces coal and bentonite; common loose angular to subangular quartz grains. Sandstone in general more quartzose than above.
11,040-11,050	70% SHALE; (mudstone) as above. 20% SILTSTONE; as above. 10% SANDSTONE; as above.
	CORE No.17 11,051-11,062 Rec. 7'8"
7'0"	MUDSTONE; dark grey, slightly micaceous, very carbonaceous (sparsely distributed flecks and abundant carbonised plant and wood fragments) non-feldspathic, blocky in part very silty, grades to 50% siltstone: medium to medium dark grey very argillaceous, moderate to very micaceous and micromicaceous moderate to very feldspathic (predominantly silt sized grains but occasionally very fine grains) very carbonaceous (specks and plant fragments).
0'8"	SANDSTONE; light greyish green, very fine grained, feldspar and lithic grains in an abundant silty and argillaceous matrix, very micaceous, very carbonaceous (flecks and plant fragments, tight - grades to sandy and argillaceous SILTSTONE)
2'4"	No recovery
	Bedding dips at 15°.

APPENDIX No.7

ALLIANCE CAROLINE WELL No.1

COMPLETION REPORT

CORE ANALYSIS RESULTS
CORE Nos. 1 to 17
INCLUSIVE ALLIANCE
CAROLINE WELL No.1

By: Staff of the
Petroleum Technology
Laboratory, Bureau
of Mineral Resources

NOTES

(i) Unless otherwise stated, the porosities and permeabilities were determined on two small plugs (V and H) cut at right angles from the core. Ruska porosimeter and permeameter were used, with air at 30 p.s.i.g. and dry nitrogen, respectively, as the saturating and flowing media.

(ii) Residual oil and water saturations were determined using Soxhlet type apparatus.

(iii) Acetone test precipitates and fluorescence of solvent after extraction are recorded as nil, trace, fair, strong or very strong.

WELL NAME AND NO. CAROLINE NO. 1.

DATE OF TEST. 24th April 1967

Core No.	Depth From:- To:-	Lithology	Average Effective Porosity from two plugs (% Bulk Vol.)	Absolute Permeability (Millidarcy)		Average Density (gm./cc.)		Fluid Saturation (% of pore space)		Acetone Test	Core Water Salinity (P.P.M. NaCl)	Solubility in 15% HCl (% Bulk vol.)	Fluorescence of freshly broken core.
				V	H	Dry Bulk	Apparent Grain	Water	Oil				
1	586' 8" 587' 0"	coral limestone	34	2	20	1.73	2.63*	9	Nil	Nil	N.D.	N.D.	Nil
1	594' 8" 595' 0"	mudstone & coral 1st	35	0	3	1.66	2.55*	N.D.	N.D.	N.D.	"	"	"
2	704' 5" 704' 9"	carbonaceous shale	Drying cracks occurred; results unreliable										
3	2464' 6" 2464'10"	Compressed clay and other unconsolidated material. Unsuitable for analysis.											
4	2560' 0" 2560'10"	Insufficient sample for analysis.											
5	2572' 0" 2572' 7"		" "	"	"								
6	2580' 0" 2580' 3"		" "	"	"								

* Void space in centre of plugs not penetrated by air during grain density determination resulting in low values for apparent grain density.

Remarks:-

General File No. 62/399.

Well File No. 66/4222

WELL NAME AND NO. CAROLINE No. 1 DATE OF TEST. 24th April 1967.

Core No.	Depth From:- To:-	Lithology	Average Effective Porosity from two plugs (% Bulk Vol.)	Absolute Permeability (Millidarcy)		Average Density (gm./cc.)		Fluid Saturation (% of pore space)		Acetone Test	Core Water Salinity (P.P.M. NaCl)	Solubility in 15% HCl (% Bulk vol.)	Fluorescence of freshly broken core.
				V	H	Dry Bulk	Apparent Grain	Water	Oil				
7	2664' 0" 2664' 6"	Shale	21	Nil	Nil	2.35	2.98	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
8	2673' 0" 2673' 6"	"	23	"	"	2.20	2.86	"	"	"	"	"	"
9	2711' 0" 2711' 6"	Shale siltstone	22	"	"	2.29	2.89	"	"	"	"	"	"
10	3046' 0" 3046' 4"	Sst.	32	"	"	2.58	3.77	"	"	"	"	"	"
11	4091' 0" 4091' 4"	Sandstone	28	N.D.	N.D.	1.92	2.63	"	"	"	"	"	"
12	4106' 0" 4106' 4"	Shale; sst. partings	21	"	1	2.31	2.89	"	"	"	"	"	"
13	6006' 6" 6006'10"	Shale grit	17	Nil	Nil	2.44	2.91	7	Nil	Nil	"	"	Nil

Remarks:-

General File No. 62/399.
Well File No. 66/4222