



## **STERLING RESOURCES (UK) LTD**

**WELL: 210/30a-4X Cladhan**

**APPRAISAL**

**WELLSITE GEOLOGICAL REPORT**

Stag Geological Services Ltd.  
3 Fortuna Court  
Calleva Park  
Aldermaston  
Reading. RG7 8UB  
UK

Tel: (0118) 982 0151  
Fax: (0118) 982 0152

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**WELLSITE GEOLOGISTS**  
Richard Tyndall  
Gabriel Vernica  
Patrick Clint  
Marcus Bawdon

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## 1. INTRODUCTION

The Cladhan 210/30a-4X well is planned as a sidetrack appraisal well located in Quad/Block 210/30a of the Northern North Sea.

The Cladhan discovery is located in the NW of the East Shetland Basin against the East Shetland Platform approximately 20 km from the South Cormorant platform and 150 km from the Sullom Voe oil terminal. The discovery comprises a stratigraphic trap of slump/channel sandstones of Late Oxfordian to Late Kimmeridgian age, pinching out within the Kimmeridge Clay Formation.

The Cladhan reservoir has been penetrated by six previous wells. These were 210/29a-4 in 2008 pilot well and subsequent sidetracks 210/29a-4Z and 210/29a-4Y in 2010. Most recently the 210/30a-4 well drilled in 2011. On completion this well was sidetracked to 210/30a-4Z and 210/30a-4Y. The 210/30a-4X well is the third sidetrack from the donor well 210/30a-4.

The Cladhan reservoir sands lie within the Kimmeridge Clay Formation. These isolated sands display characteristic slumps and channels indicative of deposition over the slope and terraces immediately east of the East Shetland Platform boundary fault line and consist of three channel belts with a potential fan complex. They lie adjacent to a relay ramp that links a series of down to the east normal faults into the basin area.

The interpreted mapping of the of the channel sands has been aided by Mu-Rho seismic amplitude extractions that have been calibrated to existing well data.

The sands pinch-out laterally and up-dip and are encased in the black shales and claystones of the Kimmeridge Clay Formation.

The source of the hydrocarbons are from the encasing Kimmeridge Clay black shales. The discovery is adjacent to, and along trend from the Tern and South Cormorant Fields, for which the Kimmeridge source is an effective source.

Three channel belts have been broadly mapped over the terrace slope area with a potential fan complex identified at the base of the relay ramp.

The location for the proposed B2 (210/30a-4X) well, with 75m radius tolerance, targets an area between the 210/30a-4 and the 210/30a-4Y wells, a channel to the south of the main area, to further evaluate the Cladhan structure.

Reservoir distribution and quality was controlled by the presence of turbidite channel and fan lobe sands together with the presence of calcite cement. The derivation of the calcite cement within the Cladhan reservoir is not yet understood but its presence is clearly an important consideration for reservoir deliverability. Calcareous cement is common in the Middle and Late Jurassic reservoirs in the East Shetland Basin and Viking Graben.

Other sand intervals were encountered in the original discovery well 210/29a-4 and were referred to as Sequence 2A/2B. Sequence 2A was tightly cemented and Sequence 2B was water wet and normally pressured. The most recent wells 210/30a-4, 4Y & 4Z, also encountered a thin sand in a stratigraphical similar position as the Sequence 2.

The proposed target coordinates for the well at the top of Sequence 1 was:

- shallow

Latitude 61° 07' 28.013" N

Longitude 00° 48' 45.352" E

-deep

Latitude 61° 07' 28.013" N

Longitude 00° 48' 45.352" E

The well was planned as a directional well from ~ 6,100ft MDBRT, building up to an inclination of 9deg by 6,400ft MDBRT on an azimuth of 66° deg. The well trajectory was planned to be held at this tangent to 9,200ft MDBRT where the hole inclination was to be dropped back to vertical by 9,660 ft and then drilled vertically to TD.

Last active survey at 10,541 ft MDBRT showed: inclination 0.62°, azimuth 254.73°, TVDBRT 10,497.21 ft (-10424.21 ft TVDSS).

The well TD was prognosed at 10614 ft MDRT (-10497 ft TVDSS) which was anticipated to be +/- 150 ft MDRT below the base of the Sequence 1 into the underlying Kimmeridgen.

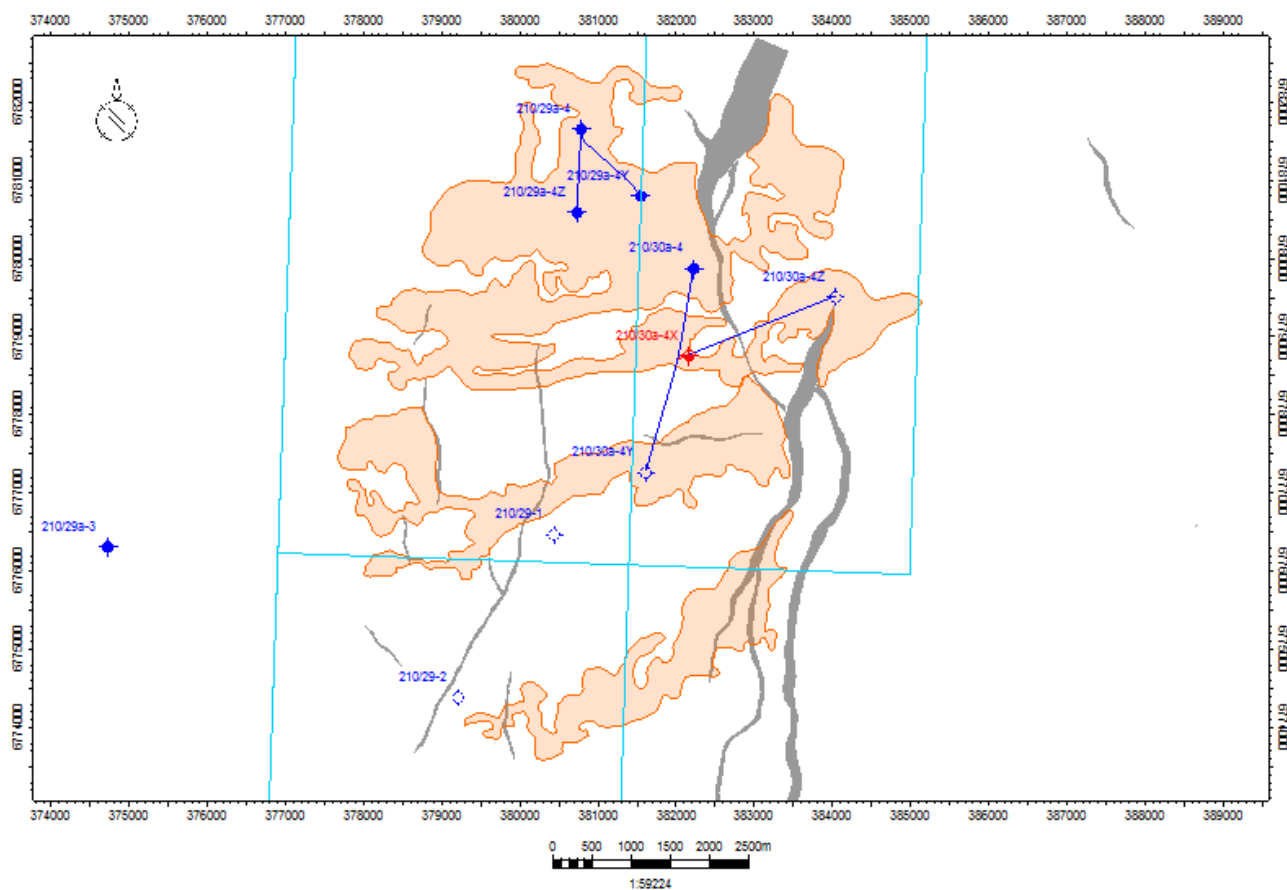
The base of the Sequence 1 was intersected at 10464 ft MDRT (-10347 ft TVDSS). This was 30ft deeper than expected. Well reached TD of 10614 ft (-10497.2 ft TVDSS) on 31<sup>st</sup> of May 2011.

### 1.1 Primary Objectives

- Drill the well with no recordable accidents and environmental incidents
- Establish the presence of hydrocarbon bearing sands.
- Acquire a 180ft core with BHI jam buster equipment into Sequence 1.
- Acquire reservoir pressure points and formation evaluation data via wireline RCI, EI, VSP, SLAM and MREX
- LWD logs will be run as a minimum data acquisition requirement and will include GR, Density, Neutron, Resistivity and Sonic (including shear).
- The TD of the well must allow all logging sondes, if wireline logging takes place, to pass below any recorded hydrocarbon bearing formation
- If possible, establish an OWC for the Cladhan accumulation
- Wireline logs must depth tie in at 13 3/8" casing shoe.

## 2. LOCATION MAP

The 210/30a-4X well is located on Cladhan discovery on Quad/Block 210/30a in the NW of the East Shetland Basin (UK offshore, Northern North Sea) against the East Shetland Platform approximately 20 km from the South Cormorant platform and 150 km from the Sullom Voe oil terminal.



**Location Map showing 210/30a-4X**

**3. WELL DATA SUMMARY**

Well:	210/30a-4X
Pre-spud designation:	Drill a deviated well as sidetrack from the donor well 210/30a-4 to establish the presence of hydrocarbons in the Cladhan reservoir up dip of previous drilled 210/30a wells. Evaluation of the reservoir with conventional coring, logging tools, formation pressures and fluid samples to be taken.
Well Type:	Deviated Appraisal
Operator:	Sterling Resources
Location:	UK offshore-Northern North Sea
Basin Name:	East Shetland
Prospect:	Cladhan
Quad/Block:	210/30a
Equity:	Sterling Resources (UK) Ltd: 39.9% Wintershall (UK North Sea) Ltd: 33.5% Encore Oil & Gas Ltd: 16.6% Dyas: 10%
Surface Location:	Latitude: 61° 07' 26.045" N Longitude: 00° 48' 35.936" E X UTM: 382 022.11 m E Y UTM: 6 778 723.84 m N Datum (MSL): ED 1950, UTM Zone 31E, Spheroid International 1924
Bottom Hole Coordinates	Latitude: 61° 07' 27.973" N Longitude: 00° 48' 45.356" E X UTM: 381 165.02 m E Y UTM: 6 778 778.77 m N
Target Formation:	Kimmeridge Clay Formation (Sequence 1)
Rig:	Prospect
Rig Contractor:	Transocean
RT-MSL:	73 ft
RT-SEABED:	574 ft
Water depth:	501 ft
Spud date:	21 <sup>st</sup> May 2011
TD Reached:	31 <sup>st</sup> May 2011
Total depth:	10614 ft MDBRT (-10497 ft TVDSS)

**HOLE SIZE and CASING DATA**

Hole Size (in)	Depth (ft MDRT)	Casing Shoe (ft MDRT)	Casing Diam (in)	Properties ppf/wall/grade
26" x 36"	842	813	30"	310/1"/X52 & 456/1.5"/X56
26"	2633	2572	20"	133/0.6875/X56
17 ½"	6036	6015	13 3/8"	72/0.5625/L80
12 ¼"	10614			

**BIT DATA**

Bit Run	Type	Size (in)	Depth in (ft)	Depth out (ft)	Footage (ft)
12	Smith MDSi716LBPX	12 ¼"	6100	10070	3970
13	Smith MDSi716LBPX	12 ¼"	10070	10268	198
14	Hughes BHC607	12 ¼"	10268	10448	180
15	Smith MDSi716LBPX	12 ¼"	10448	10614	166

**MUD SYSTEM: MI SWACO**

12 ¼" Hole Section drilled with VERSACLEAN OBM type									
Depth ft	MW ppg	FV s/q	PV/YP @120°F	GELS @120°F lb/100ft <sup>2</sup>	HTHP Filtrate cc/30'	HTHP Cake in/32	Corrected Solids % Vol	ESV volts	Oil/Water Ratio %
6100	13.15	64	37/20	9/14/15	3.4	2	23.94	507	63/37
6425	13.15	62	35/22	9/14/17	2.8	2	23.80	589	67/33
6896	13.25	63	35/26	13/16/18	2	2	22.79	663	68/32
7752	13.20	58	31/20	11/13/14	1.2	2	24.71	713	66/34
8104	13.20	62	33/24	14/17/19	2	2	23.71	676	67/33
8641	13.20	62	34/22	14/18/21	2	2	23.79	668	68/32
9264	13.20	66	37/31	17/20/21	2.2	2	24.86	673	68/32
9781	13.20	63	39/31	17/20/21	2.2	2	24.86	688	68/32
9899	13.20	64	36/33	17/20/21	2.2	2	24.86	723	68/32
10005	13.20	63	36/27	15/20/21	3	2	23.86	645	69/31
10048	13.20	61	36/28	15/19/21	2.8	2	23.86	677	69/31
10068	13.20	65	36/31	15/21/23	2.8	2	22.86	696	68/32
10200	13.20	73	33/30	14/20/22	2.8	2	22.86	654	68/32
10235	13.20	60	34/24	15/20/22	2.8	2	23.74	687	71/29
10248	13.20	58	30/24	14/19/21	2.8	2	23.74	712	71/29
10268	13.20	60	31/25	14/19/21	2.8	2	23.80	706	71/29
10448	13.3	72	35/27	15/21/22	2.8	2	24.74	744	73/27
10452	13.3	70	32/25	15/20/20	2.8	2	24.74	733	70/30
10500	13.2	54	31/23	14/20/20	2.5	2	24.55	749	73/27
10583	13.2	54	33/25	15/21/21	2.5	2	24.44	771	73/27
10614	13.2	55	35/31	16/21/22	2.6	2	24.38	814	73/27

**MEASUREMENT WHILE DRILLING LOGS: BHI**

Hole Size (in)	Run no.	Tools Run/Curves	Interval Logged (ft)	Date In-Out	Comments
12 ¼"	13	AutoTrakG3-On Trak II(NB GR/ Res/ ECD/ GR/ Dir/ Cal/ Dens/ Neutron)	6100 – 10070	21/05/11 - 25/05/11	Good run with no issues. Sonic in memory mode only. Shear values poor

12 ¼"	14	AutoTrakG3-On Trak (NB GR/ Res/ ECD/ GR/ Dir/ Cal/ Dens/ Neutron)	10070-10268	26/05/11 - 26/05/11	Good run with no issues. Sonic in memory mode only. Shear values poor
12 ¼"	15	Motor with OTK-LTK (GR/Res/ECD/Dir/Cal/Dens/Neut)	10448 - 10614	30/05/11 - 31/05/11	Good run. Logged down over cored section 10268-10448ft. Sonic in memory mode.
12 ¼"	6	DTC Sonic Pathfinder	5994-9964		
12 ¼"	7	DTC Sonic Pathfinder	9963-10162		
12 ¼"	8	DTC Sonic Pathfinder	10142-10489		

**WIRELINE LOGGING: BHI – Baker Atlas**

Hole Size (in)	Run no.	Tools Run	Interval Logged (ft)	Date In-Out	Comments
12 ¼"	#1a	SLAM/XMAC	6012-10600	01/06/11	Spectral GR, Hi res to 10,000ft standard res to 13/2/8" shoe
12 ¼"	#1b	EI-GR	9479 – 10606	01/06/11	Good Run, TD to BCU
12 ¼"	#1c	RCI	11549 -12084	02/06/11	RCI-Pretests in interval 10064 ft to 1438 ft: sampling depths.;10414.5.10329,10291.5ft
12 ¼"	#1d	60 AMF Caliper	560-6006	02/06/11	

Logs witnessed by Gaia Earth Sciences Ltd specialist

**CUTTINGS SAMPLES**

Hole Section	Washed & Dried Samples	Bulk Wet Samples	Sample Interval
12 ¼" section to TD	2	2	20 ft composite sample

**SAMPLE DESTINATIONS:****One set of wet / dry to be sent to:**

CORPRO  
Muirtonside  
Whitecairns  
Aberdeenshire  
AB23 8UP  
**Contact:** Dick Patterson  
**Tel:** (+ 44) (0)1651 863000  
**Email:** [ops@corpro.co.uk](mailto:ops@corpro.co.uk)

**One set of wet / dry to be sent to:**

British Geological Survey  
NGDC,  
Kingsley Dunham Centre,  
Keyworth,  
Nottingham,  
NG12 5GG  
**Contact:** Scott Renshaw  
**Tel:** 0115 9363 228

**RCI Fluid Sample to be sent to:**

Core Laboratories (U.K.) Ltd  
Howe Moss Drive,  
Kirkhill Industrial Estate  
Dyce,  
Aberdeen  
AB21 0GL  
**Contact:** Ewan Thomson  
**Tel:** (+ 44) (0)1224 421000  
**Email:** [Ewan.Thomson@corelab.com](mailto:Ewan.Thomson@corelab.com)



**4. FORMATION TOPS***Picked up on field based on cuttings examination/gas shows/MWD*

Wellsite Tops (provisional only)	Prognosis		Uncert.	Actual		Difference
	MDRT (ft)	TVDSS (ft)	+/- (ft)	MDRT (ft)	TVDSS (ft)	TVDRT (ft) -high /+ low
RT	0	-80	0	0	-73	-
Seabed-Recent/Eocene Undifferentiated	-	-	0	574	-501	-
Eocene Balder Formation	-	-	50	3808	-3735	-
Palaeocene Lista Formation	-	-		3975	-3902	-
Late Cretaceous Undifferentiated	-	-	50	5530	-5457	-
<b>KOP</b> (from donor well 210/30a-4)	6100	-6027	-	6100	-6027	0
Early Cretaceous Undifferentiated	8997	-8889	100	8974	-8862	-27
Jurassic Kimmeridge Clay formation	9761	-9649	100	9794	-9677	+28
J66 MFS	10024	-9911		10150	-10033	+30
Top Sequence 1	10188	-10075		10288	-10171	+96
Base Sequence 1	10460	-10347	100	10458	-10341	-6
TD	10610	-10497	-	10614	-10497	0

## 5. LITHOSTRATIGRAPHY

*All depths are drilled depths MDRT, unless otherwise stated, referred to the rotary table.*

Lithological descriptions from 6,100 ft (Kick off point) to TD at 10,614 ft are based on cutting samples examined at the wellsite. Samples were collected as follow:

- 20 ft intervals from 6100 ft to 10,614 ft – 12 ¼" section. Additionally spot samples were collected as per request.

*Formation tops on the lithology log were picked on MWD logging tool responses and cuttings examination along with gas shows.*

### LATE CRETACEOUS

#### Shetland Group

6100 (KOP) – 8974 ft MDRT

6027 – 8862 ft TVDSS

The lithology comprised of massive claystones with inter-bedded thin limestone and dolomite stringers throughout. The top of the section was not seen in this well as it was kicked off within the Late Cretaceous. The main part of the section consisted of medium light grey to dark grey grading to greyish black claystones with thin limestone/dolomite stringers interspersed. Commonly transition was observed from limestone to dolomitic limestone and dolomite. As well, from less calcareous to calcareous grading marl claystones. A thin blocky limestone, which is traceable to other Cladhan wells, was intersected from 8011 ft to 8018ft.

In the basal section, the lithology was represented by medium grey claystones with more numerous interbedded limestone stringers.

#### Upper Section

Claystone:	medium dark grey to dark grey, grading greyish black, occasionally brownish grey to dark brownish grey, commonly firm to very firm, sub-blocky to blocky, commonly waxy, crumbly, rarely plastic, slightly silty, slightly to moderately calcareous, commonly micromicaceous. Also: medium light grey to medium grey, light olive grey to light brownish grey in places, moderately firm to firm, sub-blocky to blocky, moderately calcareous to calcareous when lighter, grading marl in places, slightly micromicaceous, common agglomerated micropyrte, occasional disseminated micropyrte.
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Limestone:	white to off white, commonly cream, rarely very light brown, firm to moderately hard, sub-blocky to rarely
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sub-angular, brittle to crumbly, microcrystalline, mudstone, generally clean, occasional dark argillaceous microlaminations. Also: argillaceous, mudstone, varicoloured, light grey to light olive grey, greyish orange, very light brown, very pale orange, firm, crumbly in places, blocky to sub-blocky, crypto to micro-crystalline, grading argillaceous limestone in places.

## Lower section

### Claystone:

medium grey to dark grey, medium to dark brownish grey in places, locally olive grey to greenish grey, rarely greyish black to black, rarely reddish brown, firm, sub-blocky, waxy, crumbly, occasionally plastic, rarely sticky, moderately silty in places, moderately to very calcareous in places grading marl, commonly micromicaceous. Also: light to medium grey, rarely dark grey, generally soft and sticky, occasionally firm, sub-blocky, crumbly, waxy, slightly to moderately silty, slightly calcareous, commonly micromicaceous, common agglomerated micropyrte, occasional disseminated micropyrte.

### Limestone:

mudstone, white, very pale orange, chalky, firm to very firm, occasionally moderately hard, crumbly, brittle in places, blocky, micro-crystalline, argillaceous in places.

### Dolomite:

light brownish grey to light brown, becoming medium to dark brown, occasionally light yellowish grey to dark yellowish orange, firm to rarely moderately hard, sub-blocky, cryptocrystalline, commonly argillaceous, rare dark argillaceous microlaminations.

Depth Interval ft MDRT	BACKGROUND GAS									
	Min %	Max %	Avg %	C1 ppm	C2 ppm	C3 ppm	iC4 ppm	nC4 ppm	iC5 ppm	nC5 ppm
L. Cretaceous Shetland	ROP: min/max/avg – 18/228/124									
6100- 6900	0.19	0.23	0.20	315	Tr-3	0	0	0	0	0
6900-8720	0.20	0.26	0.25	531	4	0	0	0	0	0
8720-8974	0.23	0.27	0.25	434	4	0	0	0	0	0

Depth ft MDRT	GAS PEAKS									
	Background %	Max %	C1 ppm	C2 ppm	C3 ppm	iC4 ppm	nC4 ppm	iC5 ppm	nC5 ppm	Type
none										
Legend: FG=Formation gas, CG=Connection gas, TG=Trip gas, STG=Short trip gas, SW=Swab gas, POG=Pumps off gas										

## EARLY CRETACEOUS

### *Cromer Knoll Group*

8974 – 9794 ft MDRT  
8862 – 9677 ft TVDSS

The Early Cretaceous was picked on an increasing trend in gamma log response and a shift on porosity curve. This coincided with an increase in rate of penetration, an introduction of red brown claystone, and reduction in calcareous content.

The lithology of Early Cretaceous comprises of massive claystone beds and thin limestone/dolomite stringers, with an increase in dolomitic limestone/limestone when approaching the base of the section below 9600 ft. There is a notable change in the nature of the claystones that become very calcareous (marly) on intervals and varicoloured with the reddish brown ones being as a marker of Early Cretaceous.

The Early Cretaceous can be divided into three sections mainly on gamma ray trends. The upper section displays an average of 90 api GR trend with the middle section averaging 75 api. Towards end of the Early Cretaceous to top of the Kimmeridge Clay Formation the third section seen a gradually increase in gamma ray readings from averages of 75 api to averages of 110 api. In addition, a dolomitic limestone interbedded claystone interval was encountered at around 9250 ft that was accompanied by a notable increase in both overall gas levels and the appearance of heavier gases upon entering the lower section. This interbedded sequence - in some places sandstone observed - was also encountered in 210/30a-4, 4z and 4y wells.

8974 ft-9250 ft MDRT

Claystone:

varicoloured, commonly greyish brown to pale orange pink, medium to dark grey, occasionally dark bluish grey, rarely light grey, pale yellowish brown to pale reddish brown in places, moderate reddish brown, brick red, occasionally chocolate brown in places, soft to occasionally firm, sub-blocky, occasionally amorphous, sticky, waxy in places, rarely crumbly, increasingly silty in places, non to moderately calcareous, occasionally very calcareous, rarely micromicaceous, very common disseminated micropyrrite.

Limestone:	off white to white, rarely light grey to light brownish grey, very pale orange, firm to moderately hard, sub-blocky, occasionally sub-angular, crumbly, rarely brittle, microcrystalline to rarely cryptocrystalline, mudstone, clean, occasional dark argillaceous inclusions and microlaminations. Also: very dolomitic, predominantly wackestone, light brownish grey to dark yellowish orange, occasionally off white to white, rarely light grey to very pale orange, hard to very hard, sub-blocky, occasionally sub-angular, crumbly to commonly brittle, cryptocrystalline, mudstone, clean, common dark argillaceous inclusions and microlaminations.
Dolomite:	light grey to light brownish grey, very pale orange to pale yellowish brown, occasionally dark yellowish orange to moderate yellowish brown, moderately hard to hard, sub-blocky to rarely sub-angular, brittle to commonly crumbly, microcrystalline, argillaceous, common dark argillaceous inclusions.
9250 ft-9600 ft MDRT	
Claystone:	predominantly dark grey to dark olive grey, occasionally varicoloured, commonly greyish brown to pale orange pink, medium to dark grey, dark bluish grey, rarely light grey, pale yellowish brown to pale reddish brown in places, moderate reddish brown, brick red, occasionally chocolate brown in places, firm to occasionally very firm, sub-blocky to blocky, waxy, crumbly, occasionally slightly silty, moderate to very calcareous, occasionally micromicaceous, rare disseminated micropyrrite.
Limestone:	dolomitic, commonly moderate yellowish brown to dark yellowish brown, light brownish grey to light brown, greyish orange to dark yellowish orange, occasionally mottled white, very hard, sub-blocky to sub-angular, brittle, cryptocrystalline, generally clean. Also: white, very pale orange, greyish orange, firm to occasionally very firm, crumbly, sub-blocky, microcrystalline, mudstone, generally clean
Dolomite:	DOLOMITE: light brown to pale yellowish brown, dark yellowish orange, light brown in places, firm, sub-blocky, crumbly, cryptocrystalline, mudstone, commonly argillaceous.

## 9600 ft-9794 ft MDRT

## Claystone:

medium to dark grey, olive grey to olive black, greyish black, mottled reddish brown to brick red, firm, sub-blocky, crumbly, waxy, moderately to very calcareous, slightly to moderately silty in places, commonly micromicaceous, rare disseminated micropyrrite. Also (towards base Early Cretaceous): predominantly reddish brown, grey to medium dark grey in places, rarely light greenish grey and light bluish grey, slightly firm to firm, plastic in places, blocky to sub-blocky, non calcareous, slightly micromicaceous.

## Limestone:

mudstone, dark yellowish grey to moderate yellowish brown, light brown, slightly firm to firm, blocky, crypto to micro-crystalline, argillaceous with occasionally argillaceous laminations, dolomitic in places. Also: dolomitic, light brownish grey to medium brownish grey, white in places, firm to occasionally very firm, crumbly, sub-blocky, cryptocrystalline to occasionally microcrystalline, mudstone, generally clean.

Depth Interval ft MDRT	BACKGROUND GAS									
	Min %	Max %	Avg %	C1 ppm	C2 ppm	C3 ppm	iC4 ppm	nC4 ppm	iC5 ppm	nC5 ppm
L. Cretaceous Cromer Knoll	ROP: min/max/avg – 66/170/129									
8974-9250	0.24	0.27	0.26	500	5	0	0	0	0	0
9250-9600	0.22	0.29	0.26	518	8	3	0-2	0-4	0-4	0-5
9600-9600	0.22	0.39	0.29	586	9	3	0	0	0	0

Depth ft MDRT	GAS PEAKS									
	Background %	Max %	C1 ppm	C2 ppm	C3 ppm	iC4 ppm	nC4 ppm	iC5 ppm	nC5 ppm	Type
9266	0.25	0.39	1651	29	11	2	8	4	5	FG
Legend: FG=Formation gas, CG=Connection gas, TG=Trip gas, STG=Short trip gas, SW=Swab gas, POG=Pumps off gas										

## LATE JURASSIC

## Kimmeridge Clay Formation

9794 ft – 10150 ft MDRT TD

9677 ft – 10033 ft TVDSS TD

The Upper Jurassic, Kimmeridge Clay Formation was evident from incoming dark carbonaceous claystone with associated typical signature: a high increase in GR values (“hot shales”) and shifting in density, porosity and sonic curves. The Jurassic sequence saw an increase in the background gas that displayed the characteristic presence of heavy hydrocarbons C3 to C5, from 0.30 % in Lower Cretaceous to 0.5 to 0.88 % through the carbonaceous claystone of the upper section of the Kimmeridge Clay Formation.

The lithology consists of massive claystones with intercalations of sandstone and locally siltstone in thin to well developed beds throughout. In the basal section the formation becomes predominantly silty argillaceous with minor sandstone/siltstone and rare limestone stringers. The Cladhan structure omnipresent highly gamma ray J66 marker was picked up at 10153 ft MDRT (-10036 ft TVDSS)

**Claystone:** brownish black to olive black, very firm to moderately hard, sub-blocky to blocky, crumbly to occasionally brittle, earthy, very silty and grading to siltstone, slightly to moderately calcareous, very micromicaceous, occasional disseminated micropyrrite, rare agglomerated micropyrrite, common dark carbonaceous laminations.

Towards end of the section, the claystone becomes dark grey black, dark brown grey, brown black, medium brown grey, rare medium grey, firm, sub-blocky, non calcareous, in part silty to very silty, pyritic, carbonaceous, micromicaceous.

**Sandstone:** white, off white, occasionally light greenish grey, rarely translucent, dark argillaceous/ carbonaceous streaks/ laminations in places, common as rock flour, very fine, generally firm-friable, poorly to moderately cemented, slightly calcareous to calcareous cement, occasionally hard, well cemented, siliceous cement, micromica in places, glauconitic when greenish grey, no visual porosity, no shows.

**Limestone:** white, firm, blocky, crumbly, micro crystalline.

A single sandstone unit was developed within Kimmeridge Clay Formation

- *Sequence 1* : 10288 ft-10458 ft MDRT (-10171 ft —10341 ft TVDSS)

- The main part of this sequence was cored.
- Massive sandstone with locally thin beds of claystone and siltstone.

**Claystone:** dark brown grey, occasional medium brown grey, moderately hard, brittle to firm, blocky, carbonaceous, pyrite, traces medium green, medium brown, grades to siltstone: brown grey, firm, earthy, blocky to sub-fissile.

**Sandstone:** in part "rock flour", off white, white, light to medium grey in places, occasional very pale green, in part sandstone aggregates, colourless to translucent grains, very fine to fine, sub-angular to sub-rounded, sub-spherical, firm-friable, poorly to moderately cemented, slightly to moderately calcareous cement, argillaceous matrix, glauconite specks, poor visual porosity, from 10320ft increasingly as loose quartz grains, colourless to translucent, angular to sub-rounded, sub-spherical, very fine to medium, with coarse to very coarse, occasional very coarse smoky white grains, very hard, possibly lithic?, poorly sorted, traces glauconite, rare mica, shows: poor, patchy dull grey white to occasional specks moderate yellow direct UV, very slow developing dull white cut colour (masked by OBM), no residue ring stain.

The core was shipped contained in 30ft lengths of AL sleeve.

A small chip 10294 ft indicated

**SHOWS:** moderately bright yellow even fluorescence, slow to moderately fast streaming white cut, very faint light brown residue stain, hydrocarbon odour.  
Chips from deeper in the core displayed no shows, indicating oil bearing sands at the top of the reservoir.

Depth Interval ft MDRT	BACKGROUND GAS									
	Min %	Max %	Avg %	C1 ppm	C2 ppm	C3 ppm	iC4 ppm	nC4 ppm	iC5 ppm	nC5 ppm
Upper int. Jurassic Kimmeridge Clay	ROP: min/max/avg – 6/176/34									
9794-10253	0.26	0.88	0.53	2049	143	127	11	49	9	14
Sequence 1	ROP: min/max/avg – 8/93/46									
10253-10464	0.23	0.69	0.42	1719	116	99	7	33	7	12
Basal int. Jurassic Kimmeridge Clay	ROP: min/max/avg – 4/27/15									



10464-10614	0.31	0.55	0.47	1703	112	93	6	28	6	10
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Depth ft MDRT	GAS PEAKS									Type
	Bkgnd %	Max %	C1 ppm	C2 ppm	C3 ppm	iC4 ppm	nC4 ppm	iC5 ppm	nC5 ppm	
9825	0.29	0.81	5173	171	112	10	33	8	7	FG
9859	0.26	0.57	2791	172	107	7	29	5	5	FG
10194	0.56	0.88	4812	266	263	26	96	20	32	FG
10267	0.41	0.71	3101	226	206	17	76	17	27	FG
10317	0.4	0.69	3190	212	195	17	71	16	26	FG
Legend: FG=Formation gas, CG=Connection gas, TG=Trip gas, STG=Short trip gas, SW=Swab gas, POG=Pumps off gas										

**6. CUTTING DESCRIPTIONS LOG**Well 210/30a-4X sidetracked at 6100 ft MDRT (-6007 ft TVDSS) on 21<sup>st</sup> of May 2011

DEPTH (ft)	%	LITHOLOGICAL DESCRIPTION
6093 (spot)	100	CLAYSTONE: medium grey to medium dark grey, occasionally dark greenish grey, firm to very firm, sub-blocky to blocky, crumbly or occasionally waxy, sub-platy in places, slightly calcareous to calcareous, slightly micromicaceous.
6100	100	CLAYSTONE: medium grey to medium dark grey, occasionally dark greenish grey, firm to very firm, sub-blocky to blocky, waxy, slightly silty, slightly calcareous to calcareous, slightly micromicaceous.
6120	100	CLAYSTONE: medium dark grey to dark grey, grading greyish black, soft to firm, sub-blocky, occasionally sticky, commonly waxy, crumbly, rarely plastic, slightly silty, slightly to moderately calcareous, commonly micromicaceous.
6140	50  50	CLAYSTONE: medium dark grey to dark grey, grading greyish black, commonly firm to very firm, sub-blocky to blocky, commonly waxy, crumbly, rarely plastic, slightly silty, slightly to moderately calcareous, commonly micromicaceous. LIMESTONE: white to off white, commonly cream, firm to moderately hard, sub-blocky to rarely sub-angular, brittle to crumbly, microcrystalline, mudstone, generally clean, occasional dark argillaceous microlaminations.
6160	80  20	CLAYSTONE: medium dark grey to dark grey, grading greyish black, occasionally brownish grey to dark brownish grey, commonly firm to very firm, sub-blocky to blocky, commonly waxy, crumbly, rarely plastic, slightly silty, slightly to moderately calcareous, commonly micromicaceous. LIMESTONE: white to off white, commonly cream, rarely very light brown, firm to moderately hard, sub-blocky to rarely sub-angular, brittle to crumbly, microcrystalline, mudstone, generally clean, occasional dark argillaceous microlaminations.
6180		missed
6200	95  5	CLAYSTONE: medium grey to medium dark grey, firm, blocky to sub-blocky, slightly to moderately calcareous, slightly micromicaceous. LIMESTONE: mudstone, greyish orange, dark yellowish orange, very pale orange in places, firm, blocky, micro to crypto-crystalline, common argillaceous, slightly silty in places.
6220	100 Trace	CLAYSTONE: a/a, soft to slightly firm, plastic and sticky in places. LIMESTONE: a/a
6240	100 Trace	CLAYSTONE: a/a LIMESTONE: a/a
6260	100  Trace	CLAYSTONE: medium grey to medium dark grey, medium greenish grey in places, common firm, soft to slightly firm and plastic/ sticky in places, sub-blocky to blocky, moderately calcareous to calcareous in places, grading marl, slightly silty in places, slightly micromicaceous. LIMESTONE: a/a
6280	100 Trace	CLAYSTONE: a/a LIMESTONE: (very rare)a/a
6300		missed
6320	100 Trace	CLAYSTONE: a/a, less greenish grey, moderately calcareous to calcareous, grading marl. LIMESTONE: a/a
6340	35 65	CLAYSTONE: a/a, predominantly medium dark grey. LIMESTONE: mudstone, off white, yellowish grey, very pale orange, common chalky, clean, firm, crumbly, blocky, crypto to micro-crystalline, slightly argillaceous.
6360		missed
6380	100  Trace	CLAYSTONE: predominantly medium dark grey, rarely moderate brown, firm, sub-blocky to blocky, moderately calcareous to calcareous, grading marl, non calcareous when brown, slightly micromicaceous. LIMESTONE: a/a
6400	95 5	CLAYSTONE: a/a LIMESTONE: dolomitic, mudstone, dusky yellow, light brown, firm, blocky, crypto to micro-

DEPTH (ft)	%	LITHOLOGICAL DESCRIPTION
		crystalline, argillaceous, argillaceous streaks in places, grading dolomitic limestone.
6420	100 Trace	CLAYSTONE: a/a LIMESTONE: a/a
6440	100  Trace	CLAYSTONE: medium light grey to medium grey, light olive grey to light brownish grey in places, moderately firm to firm, sub-blocky to blocky, moderately calcareous to calcareous when lighter, grading marl in places, slightly micromicaceous. LIMESTONE: a/a, dolomitic
6460	80 20	CLAYSTONE: a/a LIMESTONE: argillaceous, mudstone, varicoloured, light grey to light olive grey, greyish orange, very light brown, very pale orange, firm, crumbly in places, blocky to sub-blocky, crypto to micro-crystalline, grading argillaceous limestone in places.
6480		missed
6500	95 5	CLAYSTONE: a/a LIMESTONE: a/a
6520	90  10	CLAYSTONE: predominantly medium light grey, soft to firm, plastic and sticky when soft, sub-blocky to blocky, slightly to moderately calcareous, slightly micromicaceous. LIMESTONE: dolomitic, mudstone, dusky yellow to dark yellowish orange, light brown, firm, crumbly in places, blocky, crypto to micro-crystalline, argillaceous, locally argillaceous laminations.
6540		missed
6560	90 10	CLAYSTONE: a/a, occasionally reddish brown, becoming less calcareous. LIMESTONE: a/a, dolomitic.
6580		missed
6600	95  5	CLAYSTONE: medium light grey to medium dark grey, firm, blocky to sub-blocky, non to moderately calcareous, micromicaceous, trace fine disseminated pyrite and nodules. LIMESTONE: dolomitic, mudstone, greyish orange to dark yellowish orange, firm, blocky, crypto to micro-crystalline, common argillaceous, argillaceous laminations in places.
6620		missed
6640	90 10	CLAYSTONE: a/a, trace pyrite LIMESTONE: a/a, dolomitic, mudstone, predominantly dark yellowish orange and dusky yellow, argillaceous.
6660		missed
6680	85 15	CLAYSTONE: a/a, non to slightly calcareous LIMESTONE: a/a, becoming more dolomitic.
6700	85 15	CLAYSTONE: a/a LIMESTONE: a/a
6720	40  60	CLAYSTONE: medium light grey to medium dark grey, light olive grey to greenish grey in places, rarely light grey, soft to firm, plastic and sticky when soft, non to slightly calcareous, slightly silty in places, micromicaceous. LIMESTONE: mudstone, common dark yellowish orange to dusky yellow, light brown in places, firm, crumbly in places, blocky to sub-blocky, crypto to micro-crystalline, generally argillaceous. Argillaceous laminations in places.
6740		missed
6760	90  10	CLAYSTONE: medium light grey to greenish grey, firm, blocky to sub-blocky, non to very slightly calcareous, slightly silty in places, slightly micromicaceous. LIMESTONE: dolomitic, mudstone, dark yellowish orange, light brown, firm, blocky to sub-blocky, crypto to micro-crystalline, common argillaceous, argillaceous lamination in places.
6780		missed
6800	80 20	CLAYSTONE: a/a LIMESTONE: mudstone to wackestone in places, common greyish orange, moderate yellow, firm to friable, blocky, crypto to micro-crystalline, common argillaceous with locally argillaceous laminations, silty in places.
6820		missed
6840	70	CLAYSTONE: a/a

DEPTH (ft)	%	LITHOLOGICAL DESCRIPTION
	30	LIMESTONE: a/a, mudstone, grading in places to dolomitic limestone (50% lst-50% dol lst)
6860		missed
6880		missed
6900	90	CLAYSTONE: medium light grey to light brownish grey, light olive grey in places, rarely medium dark grey, slightly firm to firm, occasionally plastic and sticky, sub-blocky to blocky, non to slightly calcareous, slightly micromicaceous.
	10	LIMESTONE: dolomitic, mudstone, dark yellowish orange to dusky yellow, light brown, firm, blocky, crypto to micro-crystalline, generally argillaceous, argillaceous laminations and streaks in places.
6920	70	CLAYSTONE: a/a
	30	LIMESTONE: a/a, mudstone, grading in places to dolomitic limestone (20% lst-10% dol lst)
6940	90	CLAYSTONE: a/a
	10	LIMESTONE: a/a, mudstone, grading in places to dolomitic limestone (5% lst-5% dol lst)
6960	100	CLAYSTONE: medium grey to medium dark grey, commonly light to medium brownish grey, soft to firm, occasionally very firm, sub-blocky, crumbly, occasionally sticky, slightly to moderately silty, non to slightly calcareous, commonly micromicaceous.
	Tr	DOLOMITE: light brownish grey to light brown, occasionally light yellowish grey to dark yellowish orange, firm to rarely moderately hard, sub-blocky, cryptocrystalline, commonly argillaceous, occasional dark argillaceous microlaminations.
6980		missed
7000		missed
7020	100	CLAYSTONE: light to medium grey, rarely dark grey, soft to firm, occasionally very firm, sub-blocky, crumbly, occasionally sticky, slightly to moderately silty, non to slightly calcareous, commonly micromicaceous.
	Tr	DOLOMITE: light brownish grey to light brown, occasionally light yellowish grey to dark yellowish orange, firm to rarely moderately hard, sub-blocky, cryptocrystalline, commonly argillaceous, rare dark argillaceous microlaminations.
7040	100	CLAYSTONE: light to medium grey, rarely dark grey, generally soft and sticky, occasionally firm, sub-blocky, crumbly, waxy, slightly to moderately silty, slightly calcareous, commonly micromicaceous.
	Tr	DOLOMITE: light brownish grey to light brown, becoming medium to dark brown, occasionally light yellowish grey to dark yellowish orange, firm to rarely moderately hard, sub-blocky, cryptocrystalline, commonly argillaceous, rare dark argillaceous microlaminations.
7060		missed
7080	100	CLAYSTONE: light to medium grey, rarely dark grey, generally soft and sticky, occasionally firm, sub-blocky, crumbly, waxy, slightly to moderately silty, slightly calcareous, commonly micromicaceous, common agglomerated micropyrrite, occasional disseminated micropyrrite.
	Tr	DOLOMITE: light brownish grey to light brown, becoming medium to dark brown, occasionally light yellowish grey to dark yellowish orange, firm to rarely moderately hard, sub-blocky, cryptocrystalline, commonly argillaceous, rare dark argillaceous microlaminations.
7100		missed
7120	100	CLAYSTONE: medium dark grey to dark grey, occasionally greyish black, rarely olive black, soft to firm, occasionally very firm, sub-blocky, crumbly, commonly sticky, waxy, rarely plastic, moderately silty in places, moderately to very calcareous, commonly micromicaceous, rare disseminated micropyrrite, occasional crystalline pyrite.
7140	100	CLAYSTONE: medium dark grey to dark grey, occasionally greyish black, rarely olive black, soft to firm, occasionally very firm, sub-blocky, crumbly, commonly sticky, waxy, rarely plastic, moderately silty in places, moderately to very calcareous, commonly micromicaceous, common disseminated micropyrrite.
	Tr	DOLOMITE: light to medium brown, brownish grey, dark brown to dark brownish grey, firm, sub-blocky, crumbly, cryptocrystalline, commonly argillaceous.
7160		missed
7180	100	CLAYSTONE: medium dark grey to dark grey, occasionally greyish black, rarely olive black, firm to very firm, sub-blocky, waxy, crumbly, moderately silty in places, moderately to very calcareous, commonly micromicaceous, common disseminated micropyrrite.

DEPTH (ft)	%	LITHOLOGICAL DESCRIPTION
	Tr	DOLOMITE: dark brown to dark brownish grey, moderately hard to hard, sub-blocky, crumbly, microcrystalline, mudstone, generally clean, rarely argillaceous.
7200	100	CLAYSTONE: medium dark grey to dark grey, increasingly greyish black to black, firm to very firm, sub-blocky, waxy, crumbly, moderately silty in places, moderately to very calcareous, occasionally micromicaceous, rare disseminated micropyrrite.
7220		missed
7240	100	CLAYSTONE: brownish black to greyish black, occasionally dark brownish grey, firm to very firm, sub-blocky, waxy, crumbly, moderately silty in places, moderately to very calcareous, occasionally micromicaceous, rare disseminated micropyrrite.
7260	100	CLAYSTONE: very dark grey to greyish black, firm to very firm, sub-blocky, waxy, crumbly, moderately silty in places, moderately calcareous, commonly micromicaceous.
7280	100	CLAYSTONE: very dark grey to greyish black, firm to very firm, sub-blocky, waxy, crumbly, moderately silty in places, moderately calcareous, commonly micromicaceous, rare disseminated micropyrrite.
	Tr	DOLOMITE: light to medium brown, occasionally dark brown, brownish grey to dark brownish grey, firm to occasionally moderately hard, sub-blocky, crumbly, cryptocrystalline, occasionally argillaceous.
7300	100	CLAYSTONE: medium to dark grey, occasionally dark olive grey, firm to very firm, sub-blocky, waxy, crumbly, moderately silty in places, moderately calcareous, commonly micromicaceous, rare disseminated micropyrrite.
	Tr	DOLOMITE: light to medium brown, occasionally dark brown, brownish grey to dark brownish grey, firm to occasionally moderately hard, sub-blocky, crumbly, cryptocrystalline, occasionally argillaceous.
7320		missed
7340	100	CLAYSTONE: medium to dark grey, occasionally dark olive grey, firm, sub-blocky, waxy, crumbly, occasionally plastic, moderately silty in places, moderately to very calcareous, commonly micromicaceous, occasional disseminated micropyrrite.
	Tr	DOLOMITE: light to medium brown, occasionally dark brown, brownish grey to dark brownish grey, firm to occasionally moderately hard, sub-blocky, crumbly, cryptocrystalline, increasingly argillaceous.
7360	100	CLAYSTONE: medium to dark grey, occasionally dark olive grey, occasional dark brownish grey, firm, sub-blocky, waxy, crumbly, occasionally plastic, moderately silty in places, moderately to very calcareous, commonly micromicaceous, occasional disseminated micropyrrite.
7380		missed
7400		missed
7420	100	CLAYSTONE: predominantly medium grey, occasionally dark grey to dark olive grey, firm, sub-blocky, waxy, crumbly, occasionally plastic, moderately silty in places, moderately to very calcareous, commonly micromicaceous, occasional disseminated micropyrrite.
7440	90	CLAYSTONE: predominantly medium grey, occasionally dark grey to dark olive grey, rarely dark brownish grey, firm, sub-blocky, waxy, crumbly, occasionally plastic, moderately silty in places, moderately to very calcareous, commonly micromicaceous, occasional disseminated micropyrrite, occasional dark carbonaceous specks.
	10	DOLOMITE: light to medium brownish grey, light brown, occasionally dusky yellowish orange to moderate yellowish brown, firm to moderately hard, sub-blocky, crumbly, cryptocrystalline, commonly argillaceous.
7460	80	CLAYSTONE: medium to dark grey, occasionally medium to dark brownish grey, rarely greyish black to black, firm, sub-blocky, waxy, crumbly, occasionally plastic, rarely sticky, moderately silty in places, moderately to occasionally very calcareous, commonly micromicaceous, rare disseminated micropyrrite.
	20	DOLOMITE: light brown to light brownish grey, occasionally dusky yellowish orange to dark yellowish brown, firm to moderately hard, sub-blocky to rarely sub-angular, crumbly, to rarely brittle, cryptocrystalline, rarely argillaceous but generally clean.
7480	100	CLAYSTONE: medium to dark grey, occasionally medium to dark brownish grey, rarely greyish black to black, firm, sub-blocky, waxy, crumbly, occasionally plastic, rarely sticky, moderately silty in places, moderately to occasionally very calcareous, commonly micromicaceous.

DEPTH (ft)	%	LITHOLOGICAL DESCRIPTION
	Tr	DOLOMITE: light brown to light brownish grey, occasionally dusky yellowish orange to dark yellowish brown, firm to commonly hard, sub-blocky to rarely sub-angular, crumbly, to rarely brittle, cryptocrystalline, rarely argillaceous but generally clean.
7500		missed
7520	100	CLAYSTONE: light to medium grey, light to medium brownish grey, firm, sub-blocky, waxy, crumbly, occasionally plastic, rarely sticky, moderately silty in places, moderately to occasionally very calcareous, commonly micromicaceous.
7540		missed
7560	100	CLAYSTONE: light to medium grey, light to medium brownish grey, firm, sub-blocky, waxy, crumbly, occasionally plastic, rarely sticky, non to rarely slightly silty, moderately to occasionally very calcareous, commonly micromicaceous.
7580	100	CLAYSTONE: medium to dark grey, commonly greyish black, firm, sub-blocky, waxy, crumbly, occasionally plastic, rarely sticky, non to rarely slightly silty, moderately to occasionally very calcareous, commonly micromicaceous.
	Tr	DOLOMITE: predominantly light brown to dark yellowish brown, firm to commonly hard, sub-blocky to rarely sub-angular, crumbly, to rarely brittle, cryptocrystalline, rarely argillaceous but generally clean.
7600		missed
7620	100	CLAYSTONE: dark olive grey to olive black, firm, sub-blocky, waxy, crumbly, occasionally plastic, rarely sticky, non to rarely slightly silty, moderately to occasionally very calcareous, commonly micromicaceous.
7640	100	CLAYSTONE: dark olive grey to olive black, very dark grey to greyish black, commonly medium grey, firm to very firm, sub-blocky, waxy, crumbly, occasionally plastic, rarely sticky, non to rarely slightly silty, moderately to occasionally very calcareous, commonly micromicaceous.
	Tr	DOLOMITE: predominantly light brown to dark yellowish brown, firm to commonly hard, sub-blocky to rarely sub-angular, crumbly, to rarely brittle, cryptocrystalline, rarely argillaceous but generally clean.
7660		missed
7680	100	CLAYSTONE: medium grey to dark grey, occasionally dark brownish grey, firm to very firm, sub-blocky, waxy, crumbly, occasionally plastic, rarely sticky, non to rarely slightly silty, moderately to occasionally very calcareous, commonly micromicaceous.
7700	100	CLAYSTONE: light to medium grey, commonly dark grey to greyish black, occasionally dark olive grey, firm to very firm, sub-blocky, waxy, crumbly, occasionally plastic, rarely sticky, non to rarely slightly silty, moderately to occasionally very calcareous, commonly micromicaceous.
	Tr	DOLOMITE: predominantly light brown to dark yellowish brown, firm to commonly hard, sub-blocky to rarely sub-angular, crumbly to rarely brittle, cryptocrystalline, rarely argillaceous but generally clean.
7720	100	CLAYSTONE: medium grey to medium dark grey, occasionally dark olive grey, firm to occasionally very firm, sub-blocky to blocky, waxy, crumbly, occasionally plastic, rarely sticky, rarely slightly silty, moderately to very calcareous, commonly micromicaceous.
	Tr	DOLOMITE: dark yellowish orange to moderate yellowish brown, occasionally dark yellowish brown, hard, angular to sub-angular, brittle, crystalline, splintery, clean.
7740	100	CLAYSTONE: generally uniform medium grey, occasionally dark grey, firm to occasionally very firm, sub-blocky to blocky, waxy, crumbly, rarely slightly silty, moderately to very calcareous, commonly micromicaceous.
7760		missed
7780	100	CLAYSTONE: generally uniform medium grey, occasionally dark grey, occasionally dark brownish grey, soft to firm, sub-blocky to blocky, waxy, crumbly, occasionally plastic, occasionally sticky, rarely slightly silty, moderately to very calcareous, commonly micromicaceous.
7800	100	CLAYSTONE: dark grey to greyish black, firm, sub-blocky to blocky, waxy, crumbly, rarely slightly silty, moderately to very calcareous, commonly micromicaceous.
7820	100	CLAYSTONE: uniform dark grey, occasionally dark brownish grey, soft to firm, sub-blocky to blocky, waxy, crumbly, rarely slightly silty, moderately to very calcareous, commonly micromicaceous.

DEPTH (ft)	%	LITHOLOGICAL DESCRIPTION
	Tr	DOLOMITE: predominantly light brown to dark yellowish brown, firm to commonly hard, sub-blocky to rarely sub-angular, crumbly to rarely brittle, cryptocrystalline, rarely argillaceous but generally clean.
7840	100	CLAYSTONE: dark grey, increasingly dark brownish grey to brownish black, soft to firm, sub-blocky to blocky, waxy, crumbly, rarely slightly silty, moderately to very calcareous, commonly micromicaceous.
7860	100	CLAYSTONE: medium to dark grey, medium to dark brownish grey, occasionally brownish black to olive black, firm, rarely soft, waxy, sub-blocky to blocky, rarely sticky and amorphous, occasionally plastic, occasionally slightly silty in places, very calcareous, commonly micromicaceous, rare disseminated micropyrrite.
	Tr	DOLOMITE: medium yellowish brown to dark yellowish brown, hard to very hard, mudstone, sub-blocky, brittle, microcrystalline, very clean.
7880	100	CLAYSTONE: very dark grey to greyish black, occasionally brownish black to olive black, firm, waxy, sub-blocky to blocky, occasionally slightly silty in places, very calcareous, commonly micromicaceous, rare disseminated micropyrrite.
	Tr	DOLOMITE: medium yellowish brown to dark yellowish brown, hard to very hard, mudstone, sub-blocky, brittle, cryptocrystalline, clean.
7900		missed
7920	100	CLAYSTONE: medium to dark grey, occasionally light grey, commonly dark brownish grey to brownish black, occasionally greyish black, firm, waxy, sub-blocky to blocky, occasionally slightly silty in places, very calcareous, commonly micromicaceous, rare disseminated micropyrrite. Where light grey; soft, sticky, amorphous to sub-blocky, non calcareous, glauconitic.
	Tr	DOLOMITE: very light brownish grey to light grey, dark yellowish orange, hard to very hard, mudstone, sub-blocky, brittle, cryptocrystalline, occasionally slightly argillaceous.
7940	100	CLAYSTONE: medium to dark grey, occasionally light grey, commonly dark brownish grey to brownish black, occasionally greyish black, becoming lighter with depth, firm, waxy, sub-blocky to blocky, occasionally slightly silty in places, very calcareous, commonly micromicaceous, rare disseminated micropyrrite. Where light grey; soft, sticky, amorphous to sub-blocky, non calcareous, glauconitic.
	Tr	DOLOMITE: very light brownish grey to light grey, dark yellowish orange, hard to very hard, mudstone, sub-blocky, brittle, cryptocrystalline, increasingly argillaceous.
7960	100	CLAYSTONE: medium brownish grey to medium grey, occasionally dark brownish grey to dark olive grey, soft to firm, rarely very firm, sub-blocky to blocky, generally waxy but occasionally sticky, occasionally slightly silty in places, very calcareous, commonly micromicaceous, rare disseminated micropyrrite.
	Tr	DOLOMITE: dark yellowish orange to medium yellowish brown, firm to hard, sub-blocky, crumbly, cryptocrystalline, moderately argillaceous, dark argillaceous microlaminations.
7980	100	CLAYSTONE: medium grey to medium dark grey, soft to firm, plastic when soft, sub-blocky to blocky, common moderately calcareous to calcareous (marly), slightly micromicaceous.
	Trace	DOLOMITE: a/a, common argillaceous.
8000	65	CLAYSTONE: a/a, rare light brownish grey to light olive grey.
	35	LIMESTONE: mudstone, white, very pale orange, chalky, firm to very firm, occasionally moderately hard, crumbly, brittle in places, blocky, micro-crystalline, argillaceous in places.
8020	75	CLAYSTONE: a/a
	25	LIMESTONE: a/a
8040	100	CLAYSTONE: a/a
	Trace	LIMESTONE: (rare)a/a
8060	100	CLAYSTONE: a/a, moderately calcareous to calcareous (marly)
	Trace	LIMESTONE: (rare)a/a
8080		missed
8100	100	CLAYSTONE: common medium light grey to light brownish grey, moderately firm to firm, blocky to sub-blocky, moderately calcareous to calcareous, grading marl, slightly micromicaceous.
	Trace	LIMESTONE: mudstone, white, very pale orange, rarely pale yellowish orange, firm, crumbly,

DEPTH (ft)	%	LITHOLOGICAL DESCRIPTION
		blocky, micro-crystalline.
8120	85 15	CLAYTONE: a/a LIMESTONE: mudstone, dark yellowish orange, dusky yellow, light brown, firm, blocky, crypto to micro-crystalline, common argillaceous, rare dolomitic grading dolomitic limestone.
8140		missed
8160	100 Trace	CLAYTONE: a/a LIMESTONE: (abundant)a/a, white and very pale orange in places.
8180	80 20	CLAYSTONE: a/a, moderately calcareous to calcareous grading marl. LIMESTONE: dolomitic in places (10%), mudstone, dark yellowish orange to dusky yellow, light brown, dark yellowish green in places, firm, occasionally moderately hard to hard, crumbly, brittle in places, blocky to sub-blocky, micro to crypto-crystalline in places, argillaceous.
8200	90  10	CLAYSTONE: medium light grey to medium brownish grey, olive grey in places, moderately firm to firm, blocky to sub-blocky, slightly calcareous to moderately calcareous, rarely slightly silty, slightly micromicaceous. LIMESTONE: common dolomitic, mudstone, a/a, occasionally light olive grey to very pale yellowish brown, grading in places to limestone/dolomite.
8220		missed
8240	100 Trace Trace	CLAYSTONE: a/a LIMESTONE: a/a DOLOMITE: dark yellowish orange, light brown, firm to moderately hard, brittle, blocky, micro-crystalline.
8260		missed
8280	100 Trace	CLAYSTONE: a/a, slightly to moderately calcareous, occasionally calcareous grading marl. LIMESTONE: a/a, dolomitic in places
8300	100  Trace Trace	CLAYSTONE: medium light grey to light olive grey, slightly firm to firm, blocky to sub-blocky, moderately calcareous to calcareous (marly), slightly silty in places, slightly micromicaceous. LIMESTONE: a/a, dolomitic in places. DOLOMITE: a/a
8320		missed
8340	100 Trace	CLAYSTONE: a/a, common earthy LIMESTONE: (rare), dolomitic.
8360	100  Trace	CLAYSTONE: medium light grey to medium grey, earthy, soft to firm, plastic when soft, blocky to sub-blocky, common moderately calcareous, calcareous grading marl in places, micromicaceous. LIMESTONE: dolomitic in places, mudstone, greyish orange, dark yellowish orange, very pale orange, firm, blocky, crypto to micro-crystalline, argillaceous.
8380		missed
8400		missed
8420	100  Trace	CLAYSTONE: medium grey to medium dark grey, brownish grey in places, firm, blocky to sub-blocky, moderately calcareous to calcareous (marly), slightly to moderately micromicaceous. LIMESTONE: (rare), dolomitic, a/a
8440	100 Trace	CLAYSTONE: a/a, occasionally reddish brown and non calcareous LIMESTONE: a/a, less dolomitic, fibrous and micro-crystalline in places.
8460	100  Trace	CLAYSTONE: medium light grey to medium brownish grey, rarely reddish brown, soft to firm, plastic and sticky when soft, blocky to sub-blocky, moderately calcareous to calcareous (marly), non calcareous when reddish brown, moderately silty in places, micromicaceous. LIMESTONE: (rare), dolomitic, mudstone, dark yellowish orange, light brown, firm, blocky, crypto to micro-crystalline, argillaceous.
8480	100 Trace	CLAYSTONE: a/a LIMESTONE: (rare), dolomitic.
8500		missed
8520		missed
8540	80	CLAYSTONE: a/a, common moderately calcareous, no reddish brown,



DEPTH (ft)	%	LITHOLOGICAL DESCRIPTION
	20	LIMESTONE: mudstone, dark yellowish orange, light brown to light olive brown, soft to firm, blocky, crypto-crystalline, argillaceous to very argillaceous, slightly silty in places.
8560	100 Trace	CLAYSTONE: medium light grey to light brownish grey, light olive grey in places, soft to firm, plastic and sticky when soft, blocky to sub-blocky, slightly to moderately calcareous, non calcareous in places, slightly micromicaceous. LIMESTONE: (rare), a/a
8580	100  Trace	CLAYSTONE: medium light grey to medium light brownish grey, medium dark grey in places, earthy, firm, rarely soft, blocky to sub-blocky, generally moderately calcareous, micromicaceous. LIMESTONE: mudstone, yellowish grey, very pale orange, blocky, crumbly, micro to crypto-crystalline, argillaceous in places.
8600	100 Trace	CLAYSTONE: a/a, very fine disseminated pyrite in places. LIMESTONE: a/a, dark yellowish orange to dusky yellow and light brown in places, dolomitic in places grading dolomitic limestone.
8620		missed
8640	100 Trace	CLAYSTONE: a/a LIMESTONE: (rare), dolomitic.
8660	100 Trace	CLAYSTONE: a/a, moderately calcareous to calcareous in places, grading marl. LIMESTONE: common dolomitic, mudstone, dark yellowish orange, light brown, firm, blocky, crypto to micro-crystalline, argillaceous, rarely argillaceous laminations, slightly silty in places.
8680		missed
8700	90  10	CLAYSTONE: light medium grey to light medium brownish grey, olive grey and greenish grey in places, soft to firm, plastic and sticky when soft, blocky to sub-blocky, moderately calcareous, micromicaceous LIMESTONE: mudstone, white, very pale orange, yellowish grey, rarely dark yellowish orange, firm to very firm, crumbly, micro-crystalline, locally argillaceous.
8720	100 Trace	CLAYSTONE: a/a, calcareous in places, grading marl LIMESTONE: (a/a, moderately hard and brittle in places.
8740		missed
8760	100	CLAYSTONE: light grey to medium light grey light greenish grey to light bluish grey, rarely medium grey, soft to rarely firm, plastic and sticky, sub-blocky, rarely blocky, occasionally amorphous, very calcareous, occasionally moderately silty in places.
8780		missed
8800	100  Tr	CLAYSTONE: light grey to medium light grey light greenish grey to light bluish grey, rarely medium grey, soft to firm, becoming firmer, plastic and sticky, sub-blocky, rarely blocky, occasionally amorphous, very calcareous, occasionally moderately silty in places, rarely micromicaceous. LIMESTONE: white to off white, occasionally very light grey to light grey, occasionally bluish white, firm to moderately hard, sub-angular, brittle to rarely crumbly, microcrystalline, clean.
8820	80  20	CLAYSTONE: very light brownish grey to light grey, increasingly medium to dark grey, firm, crumbly, sub-blocky, rarely blocky, very calcareous, occasionally moderately silty in places, rarely micromicaceous. LIMESTONE: white to off white, occasionally very light grey to light grey, becoming yellowish brown to light brown, firm to moderately hard, sub-angular, brittle to rarely crumbly, microcrystalline, clean.
8840		missed
8860	50  50	CLAYSTONE: predominantly medium to dark grey, occasionally very light brownish grey to light grey, firm to very firm, sub-blocky, rarely blocky, crumbly, waxy, occasionally soft and sticky, very calcareous, occasionally moderately silty in places, rarely micromicaceous. LIMESTONE: becoming dolomitic, white to off white, occasionally very light grey to light grey, becoming yellowish brown to light brown, increasingly brownish grey, firm to moderately hard, sub-angular, brittle to rarely crumbly, microcrystalline, clean.
8880	100	CLAYSTONE: light to medium grey, occasionally very light grey, increasingly medium to dark grey, rarely greyish black, firm to occasionally very firm, sub-blocky to blocky, crumbly, generally waxy, rarely soft, sticky and amorphous, moderate to very calcareous, rarely

DEPTH (ft)	%	LITHOLOGICAL DESCRIPTION
	Tr	micromicaceous. LIMESTONE: dolomitic, light grey to light brownish grey, very pale orange to pale yellowish brown, occasionally dark yellowish orange to moderate yellowish brown, firm to moderately hard, sub-blocky to rarely sub-angular, brittle to commonly crumbly, microcrystalline, generally clean, occasionally slightly argillaceous, rare dark argillaceous inclusions and microlaminations.
8900	100  Tr	CLAYSTONE: light to medium grey, occasionally very light grey, increasingly medium to dark grey, rarely greyish black, increasingly firm to very firm, sub-blocky to blocky, crumbly, generally waxy, moderate to very calcareous, rarely micromicaceous. LIMESTONE: dolomitic, light grey to light brownish grey, very pale orange to pale yellowish brown, occasionally dark yellowish orange to moderate yellowish brown, firm to moderately hard, sub-blocky to rarely sub-angular, brittle to commonly crumbly, microcrystalline, increasingly argillaceous.
8920		missed
8940	90  10	CLAYSTONE: medium to dark grey, occasionally dark olive grey, firm to very firm, sub-blocky to blocky, crumbly, generally waxy, occasionally slightly silty in places, very calcareous, occasionally micromicaceous. LIMESTONE: dolomitic, light grey to light brownish grey, very pale orange to pale yellowish brown, occasionally dark yellowish orange to moderate yellowish brown, moderately hard to hard, sub-blocky to rarely sub-angular, brittle to commonly crumbly, microcrystalline, argillaceous, common dark argillaceous inclusions.
8960	70  30  Tr	CLAYSTONE: medium to dark grey, occasionally dark olive grey, firm to very firm, sub-blocky to blocky, crumbly, generally waxy, occasionally slightly silty in places, very calcareous, occasionally micromicaceous. DOLOMITE: light grey to light brownish grey, very pale orange to pale yellowish brown, occasionally dark yellowish orange to moderate yellowish brown, moderately hard to hard, sub-blocky to rarely sub-angular, brittle to commonly crumbly, microcrystalline, argillaceous, common dark argillaceous inclusions. CLAYSTONE: reddish brown to pinkish grey, soft, sub-blocky, sticky, non calcareous.
8980		missed
9000	70  30  Tr	CLAYSTONE: medium to dark grey, occasionally dark olive grey, firm to very firm, sub-blocky to blocky, crumbly, generally waxy, occasionally slightly silty in places, very calcareous, occasionally micromicaceous. DOLOMITE: light grey to light brownish grey, very pale orange to pale yellowish brown, occasionally dark yellowish orange to moderate yellowish brown, hard, sub-blocky to rarely sub-angular, brittle to commonly crumbly, microcrystalline to cryptocrystalline, argillaceous. CLAYSTONE: reddish brown to pinkish grey, soft to firm, sub-blocky, sticky, non calcareous.
9020	100  Tr	CLAYSTONE: very uniform medium to dark grey, soft to firm, sub-blocky, crumbly, commonly sticky, waxy, non calcareous. LIMESTONE: off white to white, rarely light grey to light brownish grey, very pale orange, firm to moderately hard, sub-blocky, occasionally sub-angular, crumbly, rarely brittle, microcrystalline to rarely cryptocrystalline, mudstone, clean, occasional dark argillaceous inclusions and microlaminations.
9040		missed
9060	100  Tr	CLAYSTONE: very uniform medium to dark grey, soft to firm, sub-blocky, crumbly, commonly sticky, waxy, non calcareous, occasionally micromicaceous. LIMESTONE: predominantly light brownish grey to dark yellowish orange, occasionally off white to white, rarely light grey to very pale orange, firm to moderately hard, sub-blocky, occasionally sub-angular, crumbly, rarely brittle, microcrystalline to rarely cryptocrystalline, mudstone, clean, occasional dark argillaceous inclusions and microlaminations.
9080	90  10	CLAYSTONE: very uniform medium to dark grey, soft to firm, sub-blocky, crumbly, commonly sticky, waxy, non calcareous, occasionally micromicaceous. LIMESTONE: very dolomitic, predominantly wackestone, light brownish grey to dark yellowish orange, occasionally off white to white, rarely light grey to very pale orange, hard to very hard, sub-blocky, occasionally sub-angular, crumbly to commonly brittle, cryptocrystalline,

DEPTH (ft)	%	LITHOLOGICAL DESCRIPTION
		mudstone, clean, common dark argillaceous inclusions and microlaminations.
9100	100	CLAYSTONE: varicoloured, medium to dark grey, pale yellowish brown to pale reddish brown, moderate reddish brown, brick red, occasionally chocolate brown in places, soft to firm, sub-blocky, sticky, commonly waxy, crumbly in places, occasionally slightly silty, non to occasionally slightly calcareous, rarely micromicaceous.
9120		missed
9140	100	CLAYSTONE: varicoloured, medium to dark grey, occasionally dark bluish grey, rarely light grey, commonly pale yellowish brown to pale reddish brown, moderate reddish brown, brick red, occasionally chocolate brown in places, soft to occasionally firm, sub-blocky, occasionally amorphous, sticky, waxy in places, rarely crumbly, rarely silty, moderately calcareous, occasionally micromicaceous, rare disseminated micropyrrite.
9160	100  Tr	CLAYSTONE: varicoloured, medium to dark grey, occasionally dark bluish grey, rarely light grey, commonly pale yellowish brown to pale reddish brown, moderate reddish brown, brick red, occasionally chocolate brown in places, soft to occasionally firm, sub-blocky, occasionally amorphous, sticky, waxy in places, rarely crumbly, slightly silty in places, moderately calcareous, occasionally micromicaceous, rare disseminated micropyrrite.  DOLOMITE: light brownish grey to light brown, greyish orange to dark yellowish orange, occasionally mottled white, very hard, sub-blocky to sub-angular, brittle, cryptocrystalline, generally clean.
9180	100  Tr	CLAYSTONE: varicoloured, medium to dark grey, occasionally dark bluish grey, rarely light grey, commonly pale yellowish brown to pale reddish brown, moderate reddish brown, brick red, occasionally chocolate brown in places, soft to occasionally firm, sub-blocky, occasionally amorphous, sticky, waxy in places, rarely crumbly, slightly silty in places, moderately calcareous, rarely micromicaceous, rare disseminated micropyrrite.  DOLOMITE: light brownish grey to light brown, greyish orange to dark yellowish orange, occasionally mottled white, very hard, sub-blocky to sub-angular, brittle, cryptocrystalline, generally clean.
9200		missed
9220	90  10	CLAYSTONE: varicoloured, medium to dark grey, occasionally dark bluish grey, rarely light grey, commonly pale yellowish brown to pale reddish brown, moderate reddish brown, brick red, occasionally chocolate brown in places, soft to occasionally firm, sub-blocky, occasionally amorphous, sticky, waxy in places, rarely crumbly, increasingly silty in places, non to moderately calcareous, occasionally very calcareous, rarely micromicaceous, rare disseminated micropyrrite.  DOLOMITE: light brownish grey to light brown, greyish orange to dark yellowish orange, occasionally mottled white, occasionally firm and crumbly, predominantly very hard, sub-blocky to sub-angular, brittle, cryptocrystalline, generally clean.
9240	90  10	CLAYSTONE: varicoloured, commonly greyish brown to pale orange pink, medium to dark grey, occasionally dark bluish grey, rarely light grey, pale yellowish brown to pale reddish brown in places, moderate reddish brown, brick red, occasionally chocolate brown in places, soft to occasionally firm, sub-blocky, occasionally amorphous, sticky, waxy in places, rarely crumbly, increasingly silty in places, non to moderately calcareous, occasionally very calcareous, rarely micromicaceous, rare disseminated micropyrrite.  DOLOMITE: light brownish grey to light brown, greyish orange to dark yellowish orange, occasionally mottled white, predominantly firm and crumbly, rarely very hard, sub-blocky to sub-angular, brittle, cryptocrystalline, generally clean.
9260	30  70	CLAYSTONE: varicoloured, commonly greyish brown to pale orange pink, medium to dark grey, occasionally dark bluish grey, rarely light grey, pale yellowish brown to pale reddish brown in places, moderate reddish brown, brick red, occasionally chocolate brown in places, soft to occasionally firm, sub-blocky, occasionally amorphous, sticky, waxy in places, rarely crumbly, increasingly silty in places, non to moderately calcareous, occasionally very calcareous, rarely micromicaceous, very common disseminated micropyrrite.  LIMESTONE: dolomitic, commonly moderate yellowish brown to dark yellowish brown, light brownish grey to light brown, greyish orange to dark yellowish orange, occasionally mottled white, hard to very hard, sub-blocky to sub-angular, brittle, cryptocrystalline, generally clean.

DEPTH (ft)	%	LITHOLOGICAL DESCRIPTION
9280		missed
9300		missed
9320	100  Tr	CLAYSTONE: predominantly dark grey to dark olive grey, occasionally varicoloured, commonly greyish brown to pale orange pink, medium to dark grey, dark bluish grey, rarely light grey, pale yellowish brown to pale reddish brown in places, moderate reddish brown, brick red, occasionally chocolate brown in places, firm to occasionally very firm, sub-blocky to blocky, waxy, crumbly, occasionally slightly silty, moderate to very calcareous, occasionally micromicaceous, rare disseminated micropyrte. LIMESTONE: dolomitic, commonly moderate yellowish brown to dark yellowish brown, light brownish grey to light brown, greyish orange to dark yellowish orange, occasionally mottled white, very hard, sub-blocky to sub-angular, brittle, cryptocrystalline, generally clean.
9340	90  10	CLAYSTONE: predominantly dark grey to dark olive grey, occasionally varicoloured, commonly greyish brown to pale orange pink, medium to dark grey, dark bluish grey, rarely light grey, pale yellowish brown to pale reddish brown in places, moderate reddish brown, brick red, occasionally chocolate brown in places, soft to firm, occasionally very firm, sub-blocky to blocky, waxy, crumbly, rarely sticky, occasionally slightly silty, moderate to very calcareous, occasionally micromicaceous, rare disseminated micropyrte. LIMESTONE: dolomitic, commonly moderate yellowish brown to dark yellowish brown, light brownish grey to light brown, greyish orange to dark yellowish orange, occasionally mottled white, firm, sub-blocky to sub-angular, crumbly, cryptocrystalline, generally clean.
9360		missed
9380		missed
9400	100  Tr	CLAYSTONE: predominantly dark grey, commonly varicoloured, greyish brown to pale orange pink, medium to dark grey, dark bluish grey, rarely light grey, pale yellowish brown to pale reddish brown in places, moderate reddish brown, brick red, occasionally chocolate brown in places, soft to firm, occasionally very firm, sub-blocky to blocky, waxy, crumbly, rarely sticky, occasionally slightly silty, moderate to very calcareous, occasionally micromicaceous, rare disseminated micropyrte. LIMESTONE: dolomitic, commonly moderate yellowish brown to dark yellowish brown, light brownish grey to light brown, greyish orange to dark yellowish orange, occasionally mottled white, firm, sub-blocky to sub-angular, crumbly, cryptocrystalline, generally clean.
9420	100	CLAYSTONE: predominantly dark grey to dark olive grey, occasionally greyish black, soft to firm, sub-blocky, waxy, crumbly, rarely sticky, moderately calcareous, occasionally micromicaceous.
9440	100  Tr	CLAYSTONE: dark grey to dark olive grey, occasionally greyish black, rarely light to medium grey, soft to firm, sub-blocky, waxy, crumbly, rarely sticky, moderately calcareous, occasionally micromicaceous. LIMESTONE: dolomitic, commonly moderate yellowish brown to dark yellowish brown, light brownish grey to light brown, greyish orange to dark yellowish orange, occasionally mottled white, firm, sub-blocky to sub-angular, crumbly, cryptocrystalline, generally clean.
9460	100	CLAYSTONE: medium to dark bluish grey, dark grey to, occasionally greyish black, soft to firm, sub-blocky, waxy, occasionally earthy, crumbly slightly to moderately calcareous.
9480	90  10	CLAYSTONE: light to medium grey, medium to dark olive grey, occasionally olive black to greyish black, firm to occasionally very firm, sub-blocky, waxy, crumbly, moderately to very calcareous, rarely micromicaceous. LIMESTONE: slightly dolomitic, light brown to pale yellow brown, brownish grey to yellowish grey, firm, sub-blocky, crumbly, microcrystalline to cryptocrystalline, mudstone, argillaceous in places.
9500		missing
9520	100  Tr	CLAYSTONE: light to medium grey, commonly medium to dark olive grey, mottled reddish brown to brick red or pinkish grey, soft, sticky, sub-blocky to occasionally amorphous, moderately to very calcareous, rarely micromicaceous. DOLOMITE: light brown to pale yellowish brown, dark yellowish orange, light brown in places, firm, sub-blocky, crumbly, cryptocrystalline, mudstone, commonly argillaceous.
9540		missing

DEPTH (ft)	%	LITHOLOGICAL DESCRIPTION
9560		missing
9580	90	CLAYSTONE: light to medium grey, occasionally medium to dark grey, mottled reddish brown to brick red, soft to firm, sticky, sub-blocky to occasionally amorphous, occasionally crumbly, rarely plastic, waxy in places, moderately to very calcareous, rarely slightly silty, rarely micromicaceous.
	10	LIMESTONE: white, very pale orange, greyish orange, firm to occasionally very firm, crumbly, sub-blocky, microcrystalline, mudstone, generally clean.
9600	90	CLAYSTONE: medium to dark grey, olive grey to olive black, greyish black, firm, sub-blocky, crumbly, waxy in places, moderately to very calcareous, slightly to moderately silty in places, commonly micromicaceous, rare disseminated micropyrrite.
	10	LIMESTONE: white, very pale orange, greyish orange, firm to occasionally very firm, crumbly, sub-blocky, microcrystalline, mudstone, generally clean.
9620	80	CLAYSTONE: medium to dark grey, olive grey to olive black, greyish black, mottled reddish brown to brick red, firm, sub-blocky, crumbly, waxy, moderately to very calcareous, slightly to moderately silty in places, commonly micromicaceous, rare disseminated micropyrrite.
	20	LIMESTONE: slightly dolomitic, white, very pale orange, greyish orange, firm to occasionally very firm, crumbly, sub-blocky, microcrystalline, mudstone, generally clean.
9640		missing
9660	90	CLAYSTONE: medium to dark grey, olive grey to olive black, greyish black, mottled reddish brown to brick red, firm, sub-blocky, crumbly, waxy, moderately to very calcareous, slightly to moderately silty in places, commonly micromicaceous, rare disseminated micropyrrite.
	10	LIMESTONE: increasingly dolomitic, light brownish grey to medium brownish grey, white in places, firm to occasionally very firm, crumbly, sub-blocky, cryptocrystalline to occasionally microcrystalline, mudstone, generally clean.
9680	80	CLAYSTONE: medium to dark grey, olive grey to olive black, greyish black, mottled reddish brown to brick red, firm, sub-blocky, crumbly, waxy, moderately to very calcareous, slightly to moderately silty in places, commonly micromicaceous, rare disseminated micropyrrite.
	20	LIMESTONE: increasingly dolomitic, light brownish grey to medium brownish grey, white in places, firm to occasionally very firm, crumbly, sub-blocky, cryptocrystalline to occasionally microcrystalline, mudstone, generally clean.
9700	100	CLAYSTONE: medium to dark grey, olive grey to olive black, greyish black, mottled reddish brown to brick red, firm to very firm, sub-blocky to blocky, crumbly, waxy, occasionally plastic, slightly to moderately calcareous.
9720	100	CLAYSTONE: predominantly reddish brown, grey to medium dark grey in places, rarely light greenish grey and light bluish grey, slightly firm to firm, plastic in places, blocky to sub-blocky, non calcareous, slightly micromicaceous.
9740		missed
9760	80	CLAYSTONE: a/a, reddish brown (50%) and grey to medium dark grey (50%)
	20	LIMESTONE: mudstone, dark yellowish grey to moderate yellowish brown, light brown, slightly firm to firm, blocky, crypto to micro-crystalline, argillaceous with occasionally argillaceous laminations, dolomitic in places.
9780		missed
9800		missed
9820	95	CLAYSTONE: medium dark grey to dark grey, occasionally reddish brown, firm, blocky, non calcareous, slightly silty in places, micromicaceous, carbonaceous, trace fine disseminated pyrite.
	5	LIMESTONE: a/a
9840	70	CLAYSTONE: a/a, becoming dark brownish grey in places.
	30	SANDSTONE: white-off white, rarely translucent, dark argillaceous/ carbonaceous streaks in places, common as rock flour, very fine, generally firm-friable, poorly to moderately cemented, slightly calcareous to calcareous cement, occasionally hard, well cemented, siliceous cement, micromica in places, no visual porosity, no shows.
9860	75	CLAYSTONE: brownish grey, olive grey, medium dark grey, occasionally reddish brown, light bluish grey and light greenish grey, moderately firm to firm, sub-blocky to blocky, micromicaceous, trace pyrite nodules.

DEPTH (ft)	%	LITHOLOGICAL DESCRIPTION
	25 Trace	SANDSTONE: a/a, occasionally light greenish grey, glauconitic, common seen as rock flour. LIMESTONE: mudstone, dark yellowish orange to dusky yellow, occasionally white, very pale orange, firm to moderately hard, crumbly, crypto to micro-crystalline, argillaceous in places.
9880	100  Trace	CLAYSTONE: greyish brown to dusky brown, dark brownish grey, moderately firm to firm, sub-blocky to blocky, non calcareous, slightly silty, moderately silty in places, slightly micromicaceous. SANDSTONE: white-off white, very light grey, dark carbonaceous/ argillaceous spots in places, very fine, soft, friable, slightly to moderately calcareous cement, no visual porosity.
9900	100  Trace	CLAYSTONE: a/a, slightly silty in places, non to very slightly calcareous, trace very fine disseminated pyrite. SANDSTONE: (very rare) a/a
9920	100  Trace Trace	CLAYSTONE: greyish brown to dark brownish grey, moderately firm to firm, occasionally brownish black, very well compacted and moderately hard, sub-blocky to blocky, non calcareous, moderately silty to silty in places, grading silty claystone, slightly micromicaceous, trace very fine disseminated pyrite. SILTSTONE: dark brownish grey, friable, blocky, non calcareous, argillaceous. SANDSTONE: (very rare) a/a
9940	100	CLAYSTONE: greyish black to olive black, firm to very firm, generally sub-blocky, occasionally sub-fissile, crumbly, earthy, moderately to very silty, slightly to moderately calcareous, very commonly micromicaceous, very common fine disseminated micropyrte, common nodular pyrite, very common agglomerated micropyrte, occasional dark carbonaceous fragments.
9960	100	CLAYSTONE: brownish black to olive black, firm to very firm, generally sub-blocky, occasionally sub-fissile, crumbly, earthy, moderately to very silty, generally non calcareous, very commonly micromicaceous, common disseminated micropyrte, common agglomerated micropyrte, occasional dark carbonaceous fragments.
9980	100	CLAYSTONE: brownish black to olive black, firm to very firm, generally sub-blocky, occasionally sub-fissile, crumbly, earthy, very silty, slightly calcareous in places, very commonly micromicaceous, common fine disseminated micropyrte, occasional agglomerated micropyrte, occasional dark carbonaceous fragments.
10000	80  20	CLAYSTONE: brownish black to olive black, firm to very firm, generally sub-blocky, occasionally sub-fissile, crumbly, earthy, very silty, slightly calcareous in places, very commonly micromicaceous, common fine disseminated micropyrte, occasional agglomerated micropyrte, occasional dark carbonaceous fragments. SANDSTONE: white to very light grey, hard to occasionally very hard, sub-blocky, friable, quartz, colourless, predominantly transparent but occasionally translucent, very fine to fine grained, moderate to well sorted, sub-angular to sub-rounded, rarely angular, sub-spherical to spherical, very well cemented, calcareous cement, rare traces glauconite, occasional disseminated intergranular micropyrte or coating grains, very commonly as rock flour, off white to light grey, soft, amorphous, slightly calcareous, crumbly. No visible porosity, no shows.
10020	100	CLAYSTONE: brownish black to olive black, very firm, generally sub-blocky, occasionally sub-fissile, crumbly, earthy, very silty, slightly calcareous in places, very commonly micromicaceous, common fine disseminated micropyrte, occasional agglomerated micropyrte, occasional dark carbonaceous fragments.
10040	100	CLAYSTONE: dark brownish grey to dark greyish brown, dark olive grey, firm, sub-blocky, non calcareous, common silty grading silty claystone, slightly micromicaceous to micaceous in places, rarely dark carbonaceous and very well compacted claystone.
10060	100	CLAYSTONE: a/a
10069 (spot, very low ROP)	95  <5	CLAYSTONE: dark brownish grey to dark greyish brown, dark olive grey, moderately firm to firm, sub-blocky to blocky, non calcareous, moderately silty to silty in places grading silty claystone, micromicaceous to very micromicaceous, trace fine disseminated pyrite and nodules. SANDSTONE: very light grey to medium light grey, off white, occasionally medium grey, predominantly seen as rock flour, common argillaceous laminations, very fine, sub-rounded to rounded, poorly sorted, friable, poorly to moderately cemented, moderately calcareous

DEPTH (ft)	%	LITHOLOGICAL DESCRIPTION
		cement, no visual porosity.
10070 (BU)	100 Trace	Sample very highly contaminated with mud additive-Safecarb CLAYSTONE: a/a SANDSTONE: a/a, rarely smoky quartz aggregates, trace LIMESTONE: yellowish grey, friable-firm, blocky, crypto-crystalline, argillaceous (possible contamination from Safecarb mud additive).
10080	100  Tr	CLAYSTONE: brownish black to occasionally greyish black, firm to very firm, occasionally moderately hard, sub-blocky to blocky, crumbly to brittle, earthy, moderately silty, non calcareous, commonly micromicaceous, occasional traces disseminated micropyrrite. SANDSTONE: as rock flour, white to light grey, soft, amorphous, calcareous, very rare loose quartz grains, very fine, colourless, translucent, well sorted, round to sub-round, sub-spherical, trace calcareous cement, commonly micromicaceous, no visible porosity, no shows.
10100		missed
10120	100	CLAYSTONE: greyish black to brownish black, occasionally olive black, firm to very firm, occasionally moderately hard, sub-blocky to blocky, rarely sub-fissile, crumbly to brittle, earthy, moderately silty, non calcareous, commonly micromicaceous, occasional traces disseminated micropyrrite.
10140	100	CLAYSTONE: greyish black to brownish black, occasionally olive black, firm to very firm, occasionally moderately hard, sub-blocky to blocky, rarely sub-fissile, crumbly to brittle, earthy, moderately silty, non calcareous, commonly micromicaceous, occasional traces disseminated micropyrrite.
10160	100	CLAYSTONE: brownish black to olive black, very firm to moderately hard, sub-blocky to blocky, crumbly to occasionally brittle, earthy, very silty and grading to siltstone, slightly to moderately calcareous, very micromicaceous, occasional disseminated micropyrrite.
10180	90  10	CLAYSTONE: brownish black to olive black, very firm to moderately hard, sub-blocky to blocky, crumbly to occasionally brittle, earthy, very silty and grading to siltstone, slightly to moderately calcareous, very micromicaceous, occasional disseminated micropyrrite, rare agglomerated micropyrrite. SANDSTONE: as rock flour, white to light grey, soft, amorphous, calcareous, very rare loose quartz grains, very fine, colourless, translucent, well sorted, round to sub-round, sub-spherical, trace calcareous cement, commonly micromicaceous, no visible porosity, no shows.
10200	90  10	CLAYSTONE: brownish black to olive black, very firm to moderately hard, sub-blocky to blocky, crumbly to occasionally brittle, earthy, very silty and grading to siltstone, slightly to moderately calcareous, very micromicaceous, occasional disseminated micropyrrite, rare agglomerated micropyrrite. SANDSTONE: as rock flour, white to light grey, soft, amorphous, calcareous, very rare loose quartz grains, very fine, colourless, translucent, well sorted, round to sub-round, sub-spherical, trace calcareous cement, commonly micromicaceous, no visible porosity, no shows.
10211 (Spot)	90  10	CLAYSTONE: brownish black to olive black, very firm to moderately hard, sub-blocky to blocky, crumbly to occasionally brittle, earthy, very silty and grading to siltstone, slightly to moderately calcareous, very micromicaceous, occasional disseminated micropyrrite, rare agglomerated micropyrrite, common dark carbonaceous laminations. SANDSTONE: as rock flour, white to light grey, soft, amorphous, calcareous, very rare loose quartz grains, very fine, colourless, translucent, well sorted, round to sub-round, sub-spherical, trace calcareous cement, commonly micromicaceous, no visible porosity, no shows.
10220	90  10	CLAYSTONE: brownish black to olive black, very firm to moderately hard, sub-blocky to blocky, crumbly to occasionally brittle, earthy, very silty and grading to siltstone, slightly to moderately calcareous, very micromicaceous, occasional disseminated micropyrrite, rare agglomerated micropyrrite. SANDSTONE: as rock flour, white to light grey, soft, amorphous, calcareous, very rare loose quartz grains, very fine, colourless, translucent, well sorted, round to sub-round, sub-spherical, trace calcareous cement, commonly micromicaceous, no visible porosity, no shows.
10240	90	CLAYSTONE: brownish black to olive black, very firm to moderately hard, sub-blocky to blocky, crumbly to occasionally brittle, earthy, very silty and grading to siltstone, slightly to moderately calcareous, very micro-micaceous, disseminated micropyrrite.

DEPTH (ft)	%	LITHOLOGICAL DESCRIPTION
	10	SANDSTONE: predominantly as rock flour, white to light grey, soft, amorphous, calcareous, very rare loose quartz grains, very fine, colourless, translucent, well sorted, round to sub-round, sub-spherical, trace calcareous cement, commonly micromicaceous, glauconitic specks, no visible porosity, weak dull yellow fluorescence, very faint slow diffuse white cut.
10250	90	CLAYSTONE: a/a, traces red brown, occasionally mottled greenish grey.
	10	SANDSTONE: a/a, argillaceous matrix, generally as laminations in the Claystone.
10260	75	CLAYSTONE: brownish black to olive black, dark grey, very firm to moderately hard, sub-blocky to blocky, occasionally brittle, earthy, very silty and grading to siltstone, slightly to moderately calcareous, very micro-micaceous, disseminated micropyrrite, laminated.
	25	SANDSTONE: "rock flour", white to light grey to medium grey, soft, amorphous, slightly calcareous, with occasional sandstone aggregates and loose quartz grains, colourless to translucent, cloudy white, very fine to medium, occasional coarse to very coarse grains, sub angular to rounded, sub spherical, fair sorting, weak calcareous cement, argillaceous matrix, pyritic, trace glauconite grains, poor to no visible porosity, dull to moderate yellow fluorescence, very slow developing white cut, no residue stain, masked by OBM.
10268	70	CLAYSTONE: a/a
	30	SANDSTONE: a/a
10268-10248		<p>Cored Interval</p> <p>Description is of cuttings circulated out while coring:</p> <p>SANDSTONE: in part "rock flour", off white-white, light to medium grey in places, occasional very pale green, in parts sandstone aggregates, colourless to translucent grains, very fine to fine, sub-angular to sub-rounded, sub-spherical, firm-friable, poorly to moderately cemented, slightly to moderately calcareous cement, argillaceous matrix, glauconite specks, poor visual porosity, from 10320ft increasingly as loose quartz grains, colourless to translucent, angular to sub-rounded, sub-spherical, very fine to medium, with coarse to very coarse, occasional very coarse smoky white grains, very hard, possibly lithic?, poorly sorted, traces glauconite, rare mica, shows: poor, patchy dull grey white to occasional specks moderate yellow direct UV, very slow developing dull white cut colour (masked by OBM), no residue ring stain.</p> <p><b>Description of few pieces from Core #1</b></p> <p><b>10293.7 ft:</b></p> <p>SANDSTONE: light grey to very light brown, translucent to cloudy white grains, very fine to medium, angular to sub-rounded, sub-spherical, fair sorting, hard, silica/dolomitic cement, white matrix fill, occasional dark grey argillaceous specks, pyrite, poor visible porosity. SHOWS: moderately bright yellow even fluorescence, slow to moderately fast streaming white cut, very faint light brown residue stain, hydrocarbon odour.</p> <p><b>10323.65 ft:</b></p> <p>SANDSTONE: white, colourless to translucent to cloudy white grains, very fine to medium, rare coarse, sub-angular to occasionally rounded, especially the coarse grains, sub-spherical to elongate, poorly sorted, hard, well cemented, silica-slightly calcareous cement, occasional grey argillaceous matrix fill, mica flakes, glauconitic specks. SHOWS: faint dull brown to specks moderate orange/yellow fluorescence, extremely slow very faint white cut, crushing - no improvement, no residue stain, no HC odour.</p> <p><b>10353.8 ft:</b></p> <p>SANDSTONE/SILTSTONE: finely laminated, light to medium grey, very hard, brittle, splintery, very fine to silty, non calcareous, very micaceous laminations. SHOWS: moderate bright yellow on the sandy laminations, extremely slow developing hazy faint white cut, no residue stain, no HC odour.</p> <p><b>10383.8 ft:</b></p> <p>SANDSTONE: with thin very micaceous laminations, colourless to cloudy white grains,, predominantly very fine, occasional fine, sub-angular, sub-spherical, fair sorting, hard, silica cemented, poor visible porosity, dark grey/black very micaceous laminations. SHOWS: very dull to spots moderately bright yellow fluorescence, extremely slow developing hazy faint white cut or crush cut, no residue stain, no HC odour.</p> <p><b>10413.7 ft:</b></p> <p>SANDSTONE: white, clean, occasional scattered mica flakes, colourless to white grains, very</p>



DEPTH (ft)	%	LITHOLOGICAL DESCRIPTION
		fine, sub-angular to sub-rounded, sub-spherical, moderately hard to hard, brittle, slightly calcareous to silica cement, white matrix fill, traces glauconite specks, poor visible porosity. SHOWS: very dull to spots moderately bright yellow fluorescence, extremely slow developing hazy faint white cut or crush cut, no residue stain, no HC odour.
10460	100	SANDSTONE: off white to white, soft, weak calcareous cement, abundant rock flour, rare loose quartz grains, very fine to fine, rarely medium, sub-rounded to rounded, sub-spherical to spherical, poor to moderately sorted, argillaceous micro laminae, rare trace glauconite, poor visible porosity, no show.
	Tr	CLAYSTONE: green grey to brown grey, soft to firm, sub-blocky, carbonaceous, silty in places.
10480	20	SANDSTONE: off white to white, soft, weak calcareous cement, abundant rock flour, rare loose quartz grains, very fine to fine, rarely medium, sub-rounded to rounded, sub-spherical to spherical, poor to moderately sorted, argillaceous micro laminae, rare trace glauconite, poor visible porosity, no show.
	80	CLAYSTONE: dark grey to dark brown grey, soft to firm, sub-blocky, highly carbonaceous.
10500	30	SANDSTONE: off white to white, soft, weak calcareous cement, abundant rock flour, rare loose quartz grains, very fine to fine, rarely medium, sub-rounded to rounded, sub-spherical to spherical, poor to moderately sorted, argillaceous micro laminae, rare trace glauconite, poor visible porosity, no show.
	70	CLAYSTONE: dark grey to dark brown grey, soft to firm, sub-blocky, highly carbonaceous.
10520	100	CLAYSTONE: dark grey to dark brown grey, soft to firm, sub-blocky, highly carbonaceous.
10540	100	CLAYSTONE: dark grey to dark brown grey, soft to firm, sub-blocky, highly carbonaceous.
10560	100	CLAYSTONE: dark grey to dark brown grey, brown black, medium brown grey, firm, sub-blocky, non calcareous, in part silty to very silty, pyritic, carbonaceous, micromicaceous.
	Trace	LIMESTONE: white, firm, blocky, crumbly, micro crystalline.
10580	100	CLAYSTONE: dark grey to dark brown grey, brown black, medium brown grey, rare medium grey, firm, sub-blocky, non-calcareous, in part silty to very silty, pyritic, carbonaceous, micromicaceous.
	Trace	LIMESTONE: white, firm, blocky, crumbly, micro crystalline.
10600	100	CLAYSTONE: dark grey to dark brown grey, brown black, medium brown grey, rare medium grey, firm, sub-blocky, non-calcareous, in part silty to very silty grades to siltstone, pyritic, carbonaceous, micromicaceous.
	Trace	LIMESTONE: white, firm, blocky, crumbly, micro crystalline.
10614	100	CLAYSTONE: dark grey black, dark brown grey, brown black, medium brown grey, rare medium grey, firm, sub-blocky, non-calcareous, in part silty to very silty, pyritic, carbonaceous, micromicaceous.
	Trace	LIMESTONE: white, firm, blocky, crumbly, micro crystalline.
	Trace	SANDSTONE: medium gray, colourless grains, very fine to silt, friable.
		Well TD 10614ft

**7. WIRELINE LOGGING OPERATIONS**

<b>Hole Size (in)</b>	<b>Run no.</b>	<b>Tools Run</b>	<b>Interval Logged (ft)</b>	<b>Date In-Out</b>
12 ¼"	#1a	SLAM/XMAC	6012-10,615	01/06/11
12 ¼"	#1b	EI-GR	9479 – 10,615	01/06/11
12 ¼"	#1c	RCI	10064 -10428	02/06/11
12 ¼"	#1d	60 AMF Caliper	560 - 6006	02/06/11

Logs witnessed by Gaia Earth Sciences Ltd Company.