Geological Final Well Report

Well 6004/8a-1
Anne-Marie Prospect

Faroe-Shetland Basin

FAROE ISLANDS

July 2010 – November 2010

Rev	Date	Description	Originator	Reviewed	Checked	Approved
0	Mar 2011	First Issue	ME	SB/GB	EA	
4	Oct. 2011	Final Issue	ME/GB	GB	EA	MS

1. INDEX

2. AUTHORISATION

Prepared by	Name	Position	Signature / Date
Written by	Simon Hutchings Mike Eynon	Wellsite Geologist Operations Geologist	
Reviewed by	Gianfranco Bagnoli Simon Beswetherick	Chief Ops Geologist Geological Advisor	
Checked by	Eugenio Antonielli	Atlantic Margin EXP Project Manager	
Approved by	Marco Serazzi	Exploration Manager	

3. RECORD OF CONTROLLED DOCUMENTS ISSUE

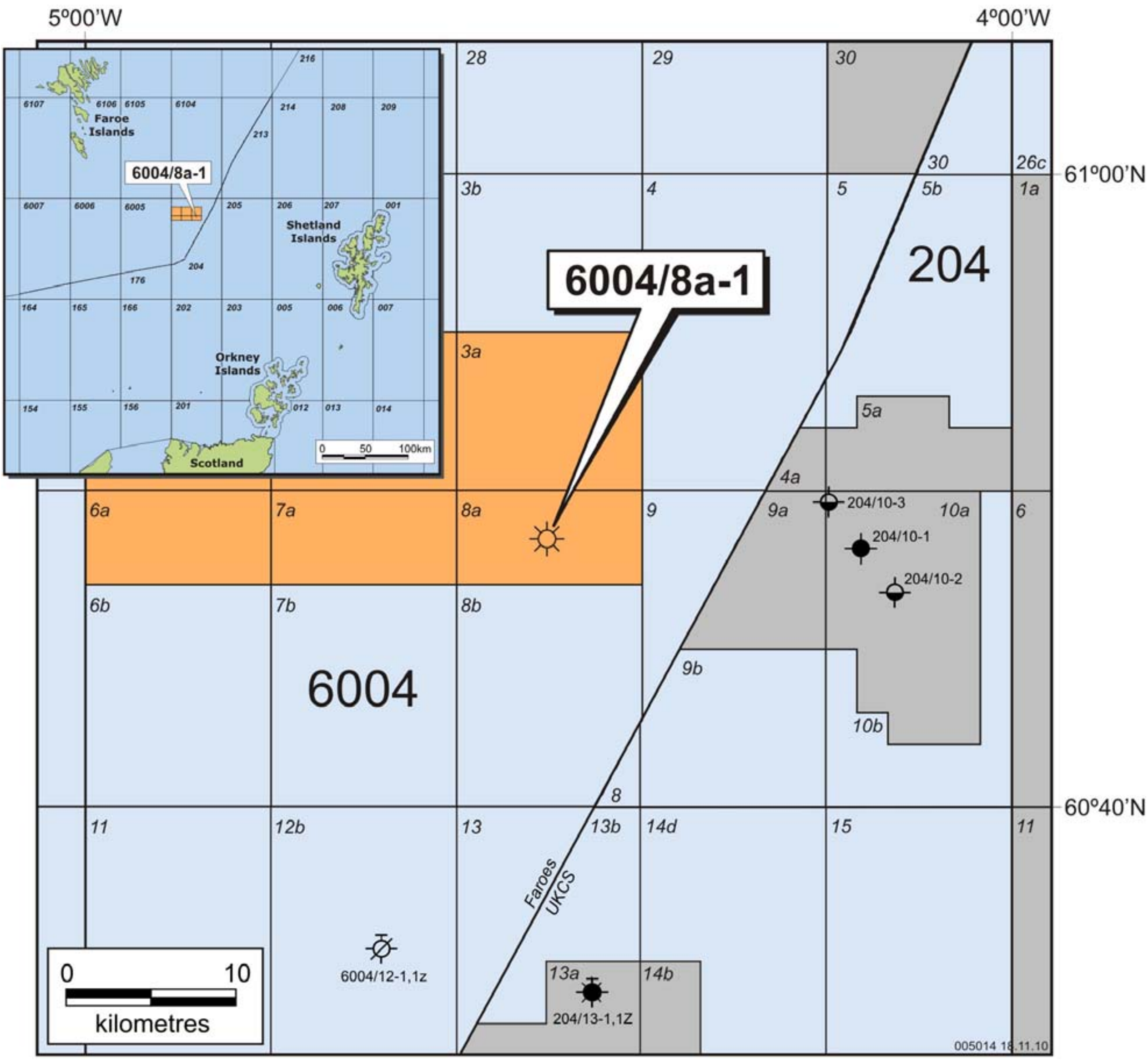
Copy No.	Name	Department	Company
Hard Copies+CD			
1	E. Antonielli	EXP	Eni Denmark B.V.
1	Anne Stewart	Library	Eni U.K.
1	Carlo Zollino	Archivio SEBU-ARMA	Eni S.p.A. E & P Division
2	Heri Ziska	Head Geosciences Dpt.	Jardfeingi (Faroe Directorate)
1	Jill Thompson	Exp	Dana Petroleum (E&P) Ltd.
1	Stephan Hanke	Exp	OMV (Faroe Islands) Exploration GmbH
3	Dave Holland	Exp	Cieco E&P (UK) Ltd.
1	Gordon Smith	Exp	Faroe Petroleum (F. K.)
1	Ross Cameron	Exp	First Oil Expro
Electronic Copies			
1	ECMS	320220	ENI Denmark B.V.
Original	Archive	Document Control	ENI Denmark B.V.

4. GENERAL WELL INFORMATION

COMPANY	Eni Denmark B.V.	
WELL NAME	6004/8a-1	Eni Well Code: 22879
LOCATION / QUAD	Faroe-Shetland Basin Offshore Faroe Islands	6004/8a
PROSPECT	Anne-Marie	
LICENCE GROUP	Eni Denmark B.V.	25% - (OPERATOR)
	Dana Petroleum (E&P) Ltd	25%
	OMV (Faroe Islands) Exploration GmbH	20%
	Cieco E&P (UK) Ltd	12.5%
	Faroe Petroleum	12.5%
	First Oil Expro	5 %
SURFACE POSITION (WGS84, ETRF89)	60° 49' 14.667" North	04° 33' 55.327" West
(UTM Zone 30, CM 3° West)	6 743 836.40m North	414 864.60m East
CONTRACTOR / RIG (RIG TYPE)	Seadrill	West Phoenix Deepwater Semi submersible
RT-MSL	38.65m	
RT-SB	1145m	
WATER DEPTH	1106.35m	
RIG ON CONTRACT	12th July 2010	
SPUD DATE	23rd July 2010	
TD DATE	23rd October 2010	
TD DEPTH (Drillers/Loggers)	3941 / 3943m MDRT	-3901.1 / - 3903.1m TVDSS
TD POSITION LAT./LONG. (ED50)	60° 49' 13.934" North	04° 33' 52.947" West
TD POSITION (UTM Zone 30, CM 3° W)	6 743 812.87m North	414 900.01m East
FINAL WELL CLASSIFICATION	New Field Discovery Wildcat	NFDW - Gas (NON-commercial discovery)
COMPLETION STATUS	Plugged & Abandoned	

HOLE SUMMARY	Hole Size	Depth to, MDRT	Depth to, TVDRT
	42″ x 36″	1232.0m	1232.0m
	26″	1607.0m	1607.0m
	17 ½″	2361.0m	2360.9m
	12-1/4″	3097.0m	3096.9m
	8-1/2″	3941.0m	3939.7m
CASING SUMMARY	**Casing Size**	**Set at, MDRT**	**Set at, TVDRT**
	36″ x 30″ Conductor	1229.0m	1229.0m
	20″ Casing	1601.0m	1601.0m
	13-3/8″ Casing	2357.0m	2356.9m
	9-5/8″ Casing	3093.5m	3093.4m
TEST INTERVALS	No Test	N/A	N/A
ACTUAL DURATION	118 Days	Expected duration was 67.5 days (Dry Hole)	
RIG OFF CONTRACT	11th November 2010		

5. LOCATION MAP



6. EXECUTIVE SUMMARY

The Anne-Marie Prospect (Licence 005) is located in the lightly explored Faroese sector of the Faroe-Shetland Basin and lies in a water depth of 1106 m. Licence 005 is operated by Eni Denmark B.V. with a 25% interest and includes co-venturers of Dana Petroleum (E&P) Ltd (25%), OMV (Faroe Islands) Exploration GmbH (20%), Cieco E&P (UK) Ltd (12.5%), Faroe Petroleum (12.5%) and First Oil Expro (5%).

The 6004/8a-1 well was designed as a vertical exploration well to evaluate the T45-T50, and T36-T31 primary targets and T40-T38, T10 and Mesozoic potential on the prospect.
The drilling programme included coring and a comprehensive wireline formation evaluation programme.

The Seadrill West Phoenix deepwater semi-submersible rig was utilised to drill the well.
The rig was on contract from on the 12th July 2010 and after upgrades, maintenance and picking up riser at CCB shorebase in Bergen, was on location at 10:00 hrs, 20th July 2010.

The well was spudded at 20:30hrs 23rd July 2010 and a casing scheme of 36" x 26" conductor, 20", 13 3/8" and 9.5/8" casing used to allow evaluation of the reservoir targets in 12 ¼" and 8 ½" hole.

The 12 ¼" section recorded the T50 Cambo Sandstone as water bearing and 88.8m shallow to prognosed. The T45 Hildasay Sandstones were also recorded to be water bearing. The Flett Basalt Series was recorded 34m shallow to prognosed. A significant gas show zone ("Flett 1") and dated as T45.1-T45.2 (Upper Faroe Lavas) was recorded from 2854.5m to 2965m and gas ratio analysis indicated a wet gas hydrocarbon type. The 12 ¼" section TD was at 3097m MDRT and the section was comprehensively wireline logged with the following four runs:

- Run #1A: FMI-GPIC-DSI-GR-ACTS-ECRD
- Run #1B: SP-CMR-HRLA-TLD-APS-HNGS- ACTS-ECRD
- Run #1C: PQ-HY-PO-BA-LFA-CFA-SC-MS-MS-GR-ACTS-ECRD (MDT)
- Run #1D: MSCT-GR-ECRD

The 8 ½" section drilled the Lower Faroe Lavas with a second gas show interval recorded from 3395m to 3480m ("Lamba 1") with a wet gas hydrocarbon type identified from gas ratio analysis. An 11m core was cut over the "Lamba 1" gas show zone (3412m to 3423m MDRT) before jamming off and 10.75m was recovered to surface (98% recovery).

Drilling continued and a third gas show zone was recorded from 3734m MDRT ("Lamba 2") in the Kettla Tuff Member Equivalent and continuing through into the Vaila Fomation to well TD. Note that below 2854.5m MDRT, there was no typical water leg gas response seen to well TD at 3941m MDRT.

The well was TD'd at 3941m MDRT (on 23rd October 2010) and meeting the licence commitment depth and the 8 ½" hole section was comprehensively wireline logged with the following five runs:

- Run #2A: FMI-GPIC-DSI-GR- ACTS-ECRD
- Run #2B: SP-HRLA-TLD-APS-HNGS-ACTS-ECRD
- Run #2C: VSI-GR-ACTS-ECRD
- Run #2D: MSCT-GR-ECRD
- Run #2E: PQ-HY-AFA-PO-CGA-SC-MS-GR-ACTS-ECRD (MDT)

Upon completion of the wireline logging programme the 6004/8a-1 well was plugged and abandoned and the West Phoenix was released from contract at 00:15 hrs 11th November 2010.

There were 3 first-aid cases, restricted work cases or lost time incidents during the drilling of the 6004/8a-1 well.

7. GEOLOGICAL SUMMARY

7.1 Geological Setting and prognosis

The Licence 005 was awarded to Eni (Operator) and partner Faroe Petroleum in August 2000 during the Faroe Islands First Licensing Round. The licence comprises six part blocks (6004/1a, 2a, 3a, 6a, 7a and 8a) and covers an area of 480 square kilometres. Water depth ranges from 960m to 1160m.

Licence 005 is located in the lightly explored Faroese sector of the Faroe-Shetland Basin and covers an east-west trending splay off the Westray-Corona Ridge that separates the Faroe sub-basin to the north from the Judd sub-basin to the south. The licence lies within the area covered by a thick extrusive Paleogene basalt sheet that extends over much of the Faroese sector of the basin.
Several of the main challenges faced in assessing the prospectivity of Licence 005 arise from poor seismic imaging related to the presence of the Paleogene basalt sheet and of intrusive igneous bodies, coupled with limited well control.

Well 6004/8a-1 was drilled on the Anne-Marie prospect which comprises a structural trap with four-way dip closure located over an old Mesozoic high. Two primary and up to four secondary reservoir targets have been identified for the Anne-Marie prospect.

The primary targets comprised:

- Early Eocene T50-T45 fluvial and shallow marine sandstones (the reservoir for the 204/10-1 Cambo oil discovery to the east of the licence).
- Late Paleocene T36-T31 deep marine sandstones (the reservoir for several large oil discoveries in the Judd sub-basin to the south of the licence).

Secondary targets comprised:

- Sandstones in the late Paleocene T40 and T38 sections,
- The early Paleocene T10 section
- The Mesozoic section

Seal is provided by regionally extensive early Eocene and late Paleocene shales or tuffs. Two main source rock intervals are capable of providing a hydrocarbon charge to the Anne-Marie prospect, oil-prone lacustrine shales in the middle Jurassic section and oil-prone marine shales in the late Jurassic section (the Kimmeridge Clay Formation).

7.2 Well Objectives

The well objectives were summarised as follows;

1. Drill a vertical exploration well on the defined target on the Anne-Marie Prospect and to a well TD to the licence commitment depth of -3900m TVDSS, or 50m into the Mesozoic, whichever is recorded first.

2. Drill the Primary target reservoirs (T50-T45 and T36-T31 levels) and the secondary target reservoirs (T40-T38, T10 and Mesozoic) in a complete / un-faulted section and in a structurally valid position in order to test the hydrocarbon column.

3. Acquire representative bottomhole core sample.

4. Obtain sufficient information on the hydrocarbon bearing reservoirs encountered in order to evaluate the commercial potential of the discovery, i.e. estimations of hydrocarbons in place volumes, potential reserves and well productivity. Therefore the following requirements are essential;
   - obtain representative core in hydrocarbon bearing sections.
   - acquire a full set of petrophysical logs through the reservoir in order to facilitate reservoir characterisation.
   - obtain downhole pressure measurements and temperatures.
   - establish fluid contacts, if any.
   - acquire fluid samples (gas, oil, water) in order to obtain fluid properties (API, composition, dewpoint).

5. Perform a rig sourced VSP survey in order to establish a seismic to well tie.

6. All of the objectives given above should be pursued within Eni Denmark B.V. commitment to safe operations with minimal impact on the environment and cost-effective drilling operations.

7.3 Target Definition

The surface well location was defined as 60°49’14.51’’N and 004°33’56.17’’W (Datum ETRF89, Spheroid GRS 1980), 6,743,832.1m Northing and 414,851.7m Easting (Zone 30N; Central Meridian 3° W), with a 150m circle radius at each of the target levels from the surface location.

7.4 TD Criteria

The licence commitment was that the well would have been drilled to a TD of -3900m TVDSS.

In the scenario that oil shows were recorded down to -3900m TVDSS, there was a contingency to deepen the well to a maximum TD at -4500m TVDSS.

7.5 Summary of Well Results

A tailored set of studies were started during the drilling of the well and concluded through the 3rd quarter of 2011 to clarify the Petrophysical, Mineralogical and structural/stratigraphic characteristics of the drilled sequence.
An estimate of the possible range of Gas In Place was also attempted.
The analysis of the Anne-Marie well data was performed with a truly integrated approach by a multidisciplinary team, composed by Professionals of Eni Denmark, Eni Head Quarters and Contractors.
Such an approach allowed to obtain a satisfactory interpretation of the vast amount of the complex data acquired, and to achieve a "fit for purpose" evaluation of Anne-Marie.
While detailed and specific analyses of the data are contained in the dedicated reports, all major conclusions are here summarised.

The fundamental outcomes of the well were also presented and discussed at the 30th March 2011 J.V. Workshop held at Eni Denmark Office in London. The Operator reported the essential elements and results as follows:

√ A very substantial Geological, Geophysical and Drilling dataset was positively acquired, satisfying the work obligations.
√ A working Petroleum System with the presence of a charged trap has been proved.
√ Well result departed from prognosis as lithology and HC type.
√ Well 6004/8a-1 was drilled within a valid 4 way closure for all the original targets:
  - The T50 shallow target has good reservoir characteristics, but is clearly water bearing
  - The Section of T45 to T36 age (Flett and Lamba equivalent) is made up by three distinct, unconformity-bounded, sequences of Basalt, Volcanic and Tuffs deposited along a volcanic dominated ridge
  - The T35 age (Vaila Fm) shows the onset of clastic input in a distally sourced and/or shallow intra-basinal ridge, affected by volcanic sill intrusion.

√ 5 main lithofacies associations were recognised using core data, conventional logs and formation image logs within the volcanoclastic complex:
  - Basalts, basaltic lava flows, sub-volcanic dolerite sills and dykes
  - Coarse-grained volcaniclastic, reworked/altered basalts, breccias, conglomerates, hyaloclastites and minor tuffs
  - Stratified tuffs, stratified and laminated tuffs

- Structure less tuffs, homogeneous, amalgamated tuffs
- Mixed deposits, lithic arenites and volcaniclastic-siliciclastic alternations

√ The Gas shows recorded as "Flett 1", "Lamba 1" and "Lamba 2" intervals, proved the presence of an active charge, but:

- Gas is not related to viable reservoir facies and the net pay is negligible as per the CPI-Petrophysical Study
- Pay sensitivity has been run using 25% porosity cut-off (0.1 mD permeability cut-off as conventional gas reservoir) and 30% porosity cut-off (0.3 mD) considering MDT results
- Best case pay: 5m of net pay thickness with 28% of porosity.
- Worst case pay: thickness lower than 1m
- Intervals with high porosity values are related to micro-porosities
- Fractures pay contribution is difficult to be estimated (roughly 10m)
- Several MDTs, which resulted in negligible if any permeability, were attempted in correspondence to all major Gas Shows intervals.
- Gas in Place volume is estimated as very modest.

7.6 Petrophysical Interpretation

Petrophysical interpretation of the log data across the siliciclastic sequence in the 12 ¼" hole section (288 m) recorded 0m MDRT net pay over 115.6m MDRT net reservoir and 25% average effective porosity.

Petrophysical interpretation of the Volcanic Complex across both 12 ¼" and 8 ½" hole sections recorded 4.9m MDRT net pay, 2.5% Net:Gross, 28% average porosity and 40% average water saturation in the main Gas shows intervals of "Flett 1" and "Lamba 1" (total Gross interval 196m).
The total fracture contribution to net pay assessed using the fractures intensity calculation is roughly 10m. The deeper Gas show at 3740m within the Lower Faroe Lavas (Lamba Formation), related to a fault which cuts through very tight basalt, was the larger one and indicates the increase of pressure regime in the below Vaila formation where down to the final TD no clean porous sandstone layer clearly water bearing was recognized.

Conventional logs and image logs calibrated by means of bottom cores, sidewall cores and ditch cuttings, show very well the stratigraphic organization and permitted to link stratigraphy, facies and petrophysics.
The mineralogical study showed a complex lithological assemblage due to the interlayering of volcanics, mixed siliciclastic/volcanoclastics and siliciclastics and permitted the chemostratigraphic characterization of the volcanogenic succession by means of XRD analyses.

The first important sequence boundary, in the lower part of Early Thanetian (base of the T36 sequence), represents the base of the Lamba Fm., that unconformably overlies siliciclastic sediments of the Vaila Formation. The second high-rank stratigraphic surface represents the base of the Flett Fm., Upper Faroe Lavas Mb. (base T40 sequence boundary), unconformably overlying the Upper Lamba Tuff Mb.

Below the T36 sequence boundary, the T35 sequence consists in the well mainly of siliciclastic sediments dominated by thin-bedded sandstone-mudstone alternations belonging to the upper part of the Vaila Formation.

Above the T36 sequence boundary, the volcanoclastic sequence is quite various in term of lithology and textures. Five main lithofacies associations have been recognized using image log, conventional log response and core descriptions.

The Lamba Fm. penetrated by the well can be subdivided into the Lower Lamba, Lower Faroe Lavas Mb. and the Upper Lamba, Tuff Mb. The numerous dykes affecting the Vaila Fm. were likely to have originated in relation to the onset of the volcanic activity.
The lithofacies associations detected within the volcaniclastic complex show a definite stacking pattern.
The lower part consists mainly of coarse-grained volcaniclastics interbedded by 40m thick shales and cut by sub-volcanic dolerite sills intrusion. The Tuff Member of the Lamba Formation is mainly composed by laminated or homogenous tuffs with local dyke intrusion.

The Flett Fm. recorded in the well is bounded at the base by a sub-aerial unconformity (base T40 sequence boundary). This unit can be subdivided into a lower interval consisting of basaltic lava flows (Upper Faroe Lavas Mb.) overlain by a shallow-water unit (Hildasay Sst. Mb.). The Hildasay Sandstone Mb. of the Flett Fm. and the overlying Balder Fm. are mainly characterized by sandstone beds interbedded with mudstones. In the lower part the presence of sandstone, mudstone and coal suggests the transition to a fluvio-deltaic environment. The whole interval shows well defined and regular stratification with common internal laminations.

In both borehole sections was carried out a petrophysical interpretation. The uppermost siliciclastic Balder and Flett formations between 2355 and 2604m MD was evaluated using a conventional deterministic methodology while the deeper volcaniclastic sequences (2604-3925m MD) have been analysed with a probabilistic approach.

Siliciclastic Sequence Balder and Flett Fm. (T50-T45) - Deterministic Log Analysis

Balder Formation and Hildsay Sandstone (Flett Formation) are Eocene sequences characterised by two sandstone lithologies with interbedded claystones. The Petrophysical interpretation was carried out using Geolog (Paradigm) with a deterministic methodology.

The following logs were used for the evaluation: gamma ray (HCGR), bulk density (RHOB), neutron (APLC), sonic compressional (DT4P) and deep resistivity (RT_HRLT). The volume of shale (VSH) was computed from gamma ray. The Silt Volume is the difference between the previous VSH and the volume of shale calculated from density-neutron. The effective porosity was computed from density-neutron and the results were calibrated with CMR data. The sonic porosity was evaluated with Wyllie Formula and used where density and neutron were more affected by bad hole conditions. For the water saturation computation the Indonesia equation was used with a=1, m=2 and n=2, with a formation water salinity equal to 50000 ppm taking into account the water sample @2574m MD.

Reservoir summation

In order to compute the net pay thickness over the analysed intervals, the following cut offs were applied: VSH< 45%, PHIE> 13% SW< 60%. Here below the reservoir summation table is presented. The sandstone units are characterised by good porosity with an average value of 25% and the pressures measurements confirmed good mobility. From water saturation calculation the reservoir is water wet as confirmed also by gas while drilling data.

Formation	Member	Top (m)	Base (m)	Gross (m)	Net Reservoir (m)	Net / Gross	PHIE Av. V/V	VSH Av. V/V	Net Pay (m)
Balder		2355	2382	27	10.25	0.38	0.20	0.27	0
Balder	**Cambo Sst**	2382	2400	18	17.30	0.96	0.27	0.10	0
Flett	**Hildasay Sst**	2400	2643	243	88.05	0.36	0.23	0.30	0
	Total	**2355**	**2643**	**288**	**115.6**	**0.4**	**0.25**	**0.17**	**0**

Volcanic Complex Flett and Lamba Fm. - Probabilistic Approach

During drilling three main gas shows were detected (Figure 3). The "Flett 1" gas show onset at 2854m (TGAS up to 90,000 ppm) in the Upper Faroe Lavas, Flett Formation is characterized by a sealing interval at the top made by tuffs and by porous reworked basalts interbedded with very tight basalts. The porosity evaluated from CPI has values up to 29% with very low mobility from MDT. The gas show at 3391m in the Lower Faroe Lavas (Lamba Formation) is characterized by a sealing interval at the top made by tuffs and porous and fractured breccias basalts. The routine core analysis run on the bottom core, between 3412 and 3422.75m MD, highlight that high porosity values match with very low horizontal permeability values from 0.001 up to 1 mD.

The deeper Gas show at 3740m within the Lower Faroe Lavas (Lamba Formation) is the larger one with a total gas curve value up to 266,000 ppm related to a sub-seismic fault which cuts through very tight basalt.

In the volcanic complex the five main lithofacies associations detected from image log texture and conventional log were used as reference in the petrophysical rock based model. From the petrophysical point of view those lithologies are mainly characterized by micro-porosity related to capillary bound water or not connected porosity and the permeability values range from very low to tight as confirmed by core analysis and formation pressure test results.

A reservoir summation sensitivity was performed with reference to the three gas shows using two different cut-off values. In both cases the reservoir summation shows a negligible pay.

Also a contribution of fractures and faults was assessed using the fractures intensity calculation (fracture index) which is small.

Reservoir summation

In order to compute the net pay thickness over the analysed interval a pay sensitivity was run considering the RCA results with 25% porosity cut-off using 0.1 mD as conventional gas reservoir and 30% porosity cut-off based on MDT results.

Here below the reservoir summation sensitivity is presented with reference to the "Flett 1" and "Lamba 1" gas shows, in both cases the reservoir summation shows a negligible pay.

Formation	Gas Show Interval	Depth Interval (m)		Gross (m)	Net (m)	Net / Gross	PHIE Av. (V/V)	SWE Av. (V/V)
Flett	"Flett 1" Gas Show	2854	2961	107	1.1	0.01	0.27	0.35
Lamba	"Lamba 1" Gas Show	3391	3480	89	3.8	0.043	0.29	0.42
	Tot				**4.9**		0.28	0.4

PHIE >= **0.25** V/V
SWE <= 0.60 V/V

Formation	Gas Show Interval	Depth Interval (m)		Gross (m)	Net (m)	Net / Gross	PHIE Av. (V/V)	SWE Av. (V/V)
Flett	"Flett 1" Gas Show	2854	2961	107	0	0		
Lamba	"Lamba 1" Gas Show	3391	3480	89	**0.8**	0.009	0.342	0.363

PHIE >=**0.30** V/V
SWE <= 0.60 V/V

This type of reservoir summation can only highlight the conventional reservoir related to a primary porosity. In order to emphasize the fractures contribution a fracture index using the image log analysis was evaluated. Overlaying the interval with fracture index higher than 5 or with a fault and gas shows was possible to discriminate zones that contribute to the net pay. **The total fracture contribution is roughly 10m**.

The deeper Gas show at 3740m within the Lower Faroe Lavas (Lamba Formation), related to a fault which cuts through very tight basalt, was the larger one and indicates the increase of pressure regime in the below Vaila formation where down to the final TD no clean porous sandstone layer clearly water bearing was recognized.

For the more comprehensive Log Analysis and Petrophysical Evaluation of well 6004/8a-1, make reference to the "Integrated Geological Study".

7.7 Post-well studies

Biostratigraphy	Report: Well 6004/8a-1 Biostratigraphy Study	Ichron Limited ECMS: #319758

Objectives:

Infill anaysis for both Palynology and Micropalaeontology to better define to wellsite stratigraphic scheme.

Summary:

Biostratigraphic based determination of ages and formation was performed in spite of relative low recovery of in situ marine Palynomorphs.

The low preservation and the sparse assemblages recorded in the swc have been attributed to the essential volcanic nature of the drilled sequence.

The final stratigraphic breakdown has been based upon Biostratigraphic analyses together with LWD log data: marine (shelf) environment has been recognised for the Eocene to Palaeocene series.

Core Analysis	Report: Well 6004/8a-1 Conventional Core Analysis	Kirk Petrophyscis ECMS: #319773

Objectives:

Petrographic study and routine core analysis on Core 1.

Summary:

A petrographic study has been undertaken on 15 core samples from Core 1 (core depth: 3412-3422.75 m) of well 6004/8a-1.

The cored interval is interpreted as a hyaloclastic pillow breccia deposit, consisting of basalt that was rapidly quenched and locally granulated by subaqueous chilling. Three lava microfacies or lithotypes are recognized from thin section: 1. Vesicular Basalt, 2. Vesicular Glassy Basalt and 3. Palagonized Vesicular Glassy Basalt. Vesicular basalt is preserved mainly towards the centre of the core (samples 3413.75-3417.33 m). A thick interval dominated by palagonitized glassy basalt constitutes a lower part of the core (samples 3419.19- 3422.51 m). Vesicles are abundant; pipe vesicles are developed in places.

The reservoir properties of the cored interval are highly variable. Measured porosities range from 2.53-42.2% (arithmetic mean: 23.2%) and permeabilities vary from 0.05 mD (the detection limit) to 1.7 mD (geometric mean: 0.21 mD).

Gas Analysis of Head Space & Vacutainer gas samples	Report: Well 6004/8a-1 Lic. 005 Geochemical Characterization of Head Space Gases and Gas Shows	Eni Spa E&P Division Department: SGEG-GEBA

Objectives:

A series of head space samples has been collected over the depth interval 2370m to 3943m and gas shows were sampled (by Vacutainer type pre-evacuated glass vials) from 2610m to 3943m. Chemical, quantitative and isotopic analyses have been carried out in order to characterize the gaseous hydrocarbons found during the drilling of the well.

Summary:

Chemical analyses indicate a gas enriched in heavy homologues (WET gas). The chemical composition of the trace gases (from Head Space) is represented by methane as the most abundant component and ethane, propane, butanes and pentanes. The heavier homologues i.e. C2–C3–C4 –C5 are detected throughout the sampled interval with higher concentration in the depth interval 2500-2900 m and 3700 to T.D..

By the use of the isotopic data of methane, ethane and propane it was possible to make a quick estimation of the maturity of the generating sediments: the Isotopic analyses indicate Thermogenic Hydrocarbons (Mature) throughout the analyzed interval; beyond of the peak of the oil window.

VSP processing	VSP processing Well Seismic data processing	Eni Spa E&P Division Department: GEPO. ECMS: #319778

Objectives:

VSP acquisition supervision and processing: scope of work was to indicate the best parameters to acquire the seismic at Zero offset VSP without any problems and trying to prevent the risk of a technical nature. The acquisition of good geophysical data will give us the opportunity to process the data and correlate them with the seismic reference surface in order to find the best tie.

Summary:

The acquired data is of good quality throughout. The processing flow applied took into consideration only the Z component. The result of processing is of good quality and the tie of borehole seismic data was performed with the 3D Seismic Volume "crs prod_03"inline 3030.

A zero phase conversion filter was already applied by PGS, directional designature was chosen for production.

Formation Water Chemistry Analysis	Report: Well 6004/8a-1 Water and Pressurized Sample Characterization	Eni spa e&p division Departments: LAAP LAIP & GEOLAB

Objectives:

Verify the presence of formation water in the MDT standard samples and a single pressurised sample recovered at 2574 m MDRKB from a sandstone layer of the Flett Formation – Lower Hildasay Sandstone and identify formation water characteristics.

Summary:

On a single pressurised sample separation, quantification and analysis of gas and water phases were carried out.

This report represents the results obtained from the chemical and isotopic analyses of sampled fluids including Drilling Mud and filtrate. The pressurised sample contains a small quantity of gas, the main component are methane, H_2S is absent, the CO_2 content is around 1% mol and the superior hydrocarbons are present in trace (values <0.1 %mol).

The compositions of MDT standard and pressurised samples show similar content of major component, with a chloride concentration from 27 to 29 g/L and a high potassium concentration (around 15 g/L), greater than that of sodium and unusual for a formation water – salinity as NaCl ranges from 45 to 47 g/l .

The isotopic data on water samples show negative values of δ18O, which is related to the contamination by modern meteoric water, represented in the well by drilling fluids.

Based on chemical and isotopic data, all the samples collected at Anne-Marie well are considered not representative of formation water. The uncertainty on mud samples data makes very hard if not impossible to define the degree of contamination by the modern water in these samples.

Petrography, Facies and Log Analysis, Petrophysical Evaluation	Report: Well 6004/8a-1 Integrated Geological Study	Eni spa e&p division Departments: GICA, SPES & GEOLAB.

Objectives:

The aim of this study was to provide an integrated geological characterization of the Upper Palaeocene-Earliest Eocene succession penetrated by the well 6004/8a-1.

Summary:

Selected samples from bottom cores, sidewall cores and ditch cuttings were analyzed and integrated with the results of both in-house and outsourced geological investigations.

The former consisted of the following activities: petrography, mineralogy, facies analysis, log analysis, seismic interpretation, and comparison with outcrop analogues.

8. WELL OPERATIONS

8.1 Drilling Operations Overview

8.2 Summary by hole section

8.2.1 Rig Move in

The Seadrill West Phoenix dynamically positioning, semi-submersible rig, was contracted to drill the 6004/8a-1 well on the Anne-Marie prospect.

The West Phoenix rig came on contract at 19:00hrs, 12th July 2010 and was moved to the CCB shipyard in Bergen where it underwent maintenance and servicing (replacement of thruster/ DAT cylinders, cleaning of mud/slop tanks cleaned of OBM, loading of additional riser and maintenance of rig and third party equipment/systems).

The rig move from CCB shipyard commenced at 20:30hrs, 17th July 2010 and was on location at 10:00 hrs, 20th July 2010. During the move the rig undertook riser integration work and thruster/GPS commisioning tests.

A survey was taken at the seabed prior to spudding to check that the inclination was near vertical. The actual seabed location was 60° 49' 14.667" North and 04° 33' 55.327" West (WGS84, ETRF89)', 6 743 836.40m Northing and 414 864.60m East, and 13.61m on a bearing of 069.8° from the intended surface location.

8.2.2 36" x 42" Hole / 30" x 26" Conductor

Seabed was tagged as expected at 1145m MDBRT and the well spudded at 20:30hrs 23rd July 2010, without rotation. The flow rate was increased in stages from 1000 lpm and commenced rotation once the 36" hole opener was below seabed. The well was spudded vertically in 26"/36"/42"hole with a Directional, Gamma assembly (Run 1), and drilled with seawater to a section TD depth of 1232m MDBRT. The maximum recorded inclination over this section was 0.97°. At section TD, the well was displaced to 1.15 SG mud prior to POOH.

8.2.3 26" Hole / 20" Casing

The 26" casing was run to 1229m MDRT and cemented with no issues. A Directional, Gamma and Resistivity M/LWD assembly (Run 2) was made up and RIH, tagged cement at 1219m MDRT and commenced drilling using seawater (returns to seabed), with pre-hydrated

bentonite sweeps pumped every 15m. Section TD was defined as 30m above the seismically mapped Fan B which the site survey showed had potential for shallow gas. The 26" hole section was drilled without issue through this undifferentiated Tertiary (?Stronsay Group) interval with only occasional harder stringers encountered to a section TD at 1607m MDRT. The verticality was maintained while drilling and at section TD, the well was at 0.76° inclination.
The 20" casing was run to 1601m MDRT and cemented with no issues. Following setting of the 20" casing the rig then proceeded with upgrade of the BOP stack to the revised deepwater standards.

8.2.4 17.1/2" Hole / 13.3/8" Casing

A 17 ½" BHA comprising Directional, Gamma, Resistivity, Pressure and ESonic M/LWD (Run 3) was made up and RIH. Cement was tagged at 1573m MDRT and the cement, wiper plug, float and shoe track was drilled to 1595m MDRT before displacing the well to 1.15sg KCL/Aquacol/Polymer mud and drilling the remaining shoetrack and shoe to 1601m. The rathole was drilled and 3m of new formation and a LOT performed to 1.20sg EMW at 1610m MDRT (-1571.3m TVDSS) in the undifferentiated Stronsay Group siltstones.

Drilling resumed and the Fan B was recorded at 1640m MDRT (-1601.3m TVDSS) and 11.7m TVD shallow to prognosed, and seen to be water bearing. The Rothbury Sandstone was recorded at 1786m (-1747.2m TVDSS), 56.8m TVD shallow to prognosed and also seen to be water bearing.

The seismic 'slow' marker towards the base of the Stronsay Group was identified on sonic and resistivity data at 2254m MDRT (-2215.2m TVDSS) and dated as the T70 regional event.

Section TD was planned at the base of the Stronsay Group/Top Balder Group with the objective to case-off the potentially unstable silty claystone series. The 17 ½" hole encountered numerous slow ROP sandstone and limestone stringers, but ROP recovered below the Rothbury Sandstones and section TD was reached at 2361m MDBRT in the uppermost Top Balder Formation claystones. The verticality was maintained while drilling and at section TD, the well was at 0.35° inclination. KCl content in the mud resulted in very high gamma ray readings which were later corrected by Eni and presented as part of the final data.

The 13 3/8" casing was run to 2356.7m MDRT and cemented with no issues (although the wireline Run 1A sonic log through 13 3/8" casing showed a poor cement job). A 12 ¼" BHA full Quad-combo LWD logging suite (Run 4), comprising of Directional, Gamma, Resistivity, Density, Neutron, Caliper, E-Sonic and Pressure, was made up and RIH. Cement was tagged at 2326m MDRT and the cement, wiper plug, float and shoe track was drilled to 2336m MDRT before weighting up to 1.22sg KCL/Aquacol/Polymer mud and drilling the remaining shoetrack and shoe to 2357m. The rathole was drilled and 3m of new formation and a LOT performed to 1.40sg EMW at 2364m MDRT (-2325.3m TVDSS) in the Balder Formation tuffaceous claystones.

8.2.5 12.1/4" Hole / Logging / 9.5/8" Casing

12 ¼" drilling resumed after the LOT and the T50 Primary Target (Balder Formation, Cambo Sandstone Member) was recorded water wet at 2382m MDRT (-2343.2m TVDSS) and 88.8m shallow to prognosed. The T45 Primary Target (Flett Formation, Upper Hildasay Sandstone) was recorded water wet at 2418.0m MDRT (-2379.2m TVDSS). A minor gas peak (0.2% total gas) with C1-C5 was recorded at 2607m MDRT but this was localized and associated with a local coal stringer. Top Flett Upper Faroe Lavas was recorded at 2643m MDRT (-2604.2m TVDSS) and 34m shallow to prognosed and a trip was required at 2651m (ROP had dropped to ~2m/hr) to change from a PDC bit to an Impregnated bit with turbine to drill the hard Basalt series (Run 5).

The BHA run 5 Quad combo-turbine drilling assembly drilled ahead with high vibration to 2811m MDRT when at 21:00hrs on the 15th September 2010 drilling had to be stopped due to worsening weather conditions. Initially the drill string was pulled back above the BOP, with the well shut in amd riser displaced to seawater. But as weather as conditions worsened the LMRP was unlatched and the BHA was tripped out of the hole to surface.

The Quad combo LWD tools were replaced with the backups and the turbine/bit re-run on the 19th September 2010 (Run 6). Eni took the opportunity of the BHA on surface to add a Franks Harmonic Isolation sub below the LWD to reduce vibration. This proved particularly effective and very beneficial to the LWD data acquisition. Drilling resumed with reduced vibration while drilling the basalt and tuffs and at 2854m MDRT a drill gas peak of 1.0% with predominantly C1 plus minor C2-C5 was recorded. This was followed by further gas peaks of 4.7% at 2862m and 16.2% at 2869m and gas ratio analysis indicated a Wet Gas hydrocarbon type. The gas shows continued while drilling, but with a decreasing trend with depth to 2965m MDRT over this "Flett 1" interval (T45.1-T45.2, Flett Upper Faroe Lavas). Also recorded were connection gases, but these were also recorded to reduce with depth and were not interpreted as increasing pore pressure.

Real time LWD data communication was lost at 3037m MDRT (23:37hrs 22nd September 2010) and the decision to drill ahead a short section without M/LWD while troubleshooting was made. The 12 ¼" section TD was called at 3097m MDRT, 100m shallow to prognosed in a competent formation of T38 Lamba Tuffaceus Member (T38), instead of continuing to drill ahead blind. Note, at 12 ¼" section TD, although drill gas levels were reduced, there was no evidence a water leg had been entered from the continued minor C1-C5 being recorded.

The in-town tool inspection by Pathfinder identified washed/worn valve poppets damage as a result of high vibration drilling. The verticality was maintained while drilling the 12 ¼" section and at section TD, the well was at 0.72° inclination. The KCl content in the mud over the 12 ¼" section resulted in elevated gamma ray readings.

Schlumberger were contracted to undertake the comprehensive wireline logging and 4 wireline runs were made from 24th to 28th September 2010:

- Run #1A: FMI-GPIC-DSI-GR-ACTS-ECRD
- Run #1B: SP-CMR-HRLA-TLD-APS-HNGS- ACTS-ECRD
- Run #1C: PQ-HY-PO-BA-LFA-CFA-SC-MS-MS-GR-ACTS-ECRD (MDT)
- Run #1D: MSCT-GR-ECRD

Overrall the wireline logging was successful with a complete and good quality data set recorded including water samples at 2574m (Lower Hildasay Sandstone Member), although true formation pressures were not recorded over the Flett 1 gas show interval. However there were some issues including friction/overpulls while logging the FMI, resulting in a total of 7hrs lost time over 78hrs of total operating time: rope socket failure required Run 1B tool-string to be POOH and a new one made up, tested and RIH; SPMC MDT sample was taken after four failed attempts to acquire sample to MPSR as MPSRs did not open and the bottom nose hole finder from the MDT tool string resulted lost in hole; initially MSCT motor stalled after 1.2" coring.

A junk basket wiper trip (Run 7) successfully fished the MDT hole finder. The 9 5/8" casing was run to 3093.5m MDRT and cemented with no issue.

8.2.6 8 ½" Hole / Logging

The 8 ½" BHA was made up with a PDC bit, turbine and an LWD suite consisting of Directional, Gamma, Resistivity, standard Sonic and Pressure tools and RIH (Run 8). Cement was tagged at 3065m MDRT and the cement, wiper plug, float and shoe track was drilled with the mud system displaced to 1.30sg KCL/Aquacol/Polymer mud. The rathole was drilled and 5m of new formation and a LOT performed to 1.62sg EMW with closure pressure 1.41 sg EMW at 3102m MDRT (-3163.2m TVDSS) in the Lamba Tuffaceous Member basalt and tuffs.

After the LOT, drilling ahead recorded mud losses at 5.3m3/10min (32m^3/hr rate) at 3122m MDRT, followed by a flow check and trip tank increase of 1-2m3/hr rate. Drilling continued with a reduced loss rate to 5-6m3/hr from 3122m to 3131m MDRT. Calcium carbonate LCM pills were pumped as required and drilling from 3131m to 3176m MDRT had no losses. A drill break was recorded at 3176m MDRT and during the flow check, a loss of 6m in 7minutes (50m3/hr rate) was recorded, this was followed by a 1.9% pipe connection gas at 3184m MDRT and 6.3% at 3214m. It was concluded that the losses/gains/connection gas being recorded were a result of well 'ballooning' while drilling.

At 3235m MDRT a further gain was recorded and the well was shut in. Then with increasing sea state and worsening weather conditions the riser was displaced to seawater in case unlatching was required. This proved unnecessary and the storm was successfully ridden out. The chokes were opened and the pressure bled off before running back in and drilling ahead.

Drilling continued through the T38 Lamba Volcanic Series with reducing gas peak levels associated at pipe connections. At 3412m MDBRT, sequence T38 to ?T36, a drilling break was accompanied by a gas increase and it was decided to pull out of hole and make up the 18m core barrel. The core would be cut within the second gas show zone and meet the licence commitment. Over the run, the well had built angle slightly to 2.64° inclination.

Halliburton were contracted for coring services and a conventional 6 ¾" x 4" core barrel with an 18m aluminium fluted inner barrel was made up and run in hole (Run 9). From 3412m, the formation was cored at approximately 2m/hr rate until indications of jamming at 3423m (11m cut). The core was pulled out of hole at controlled trip rate to minimize damage from gas expansion and examined on surface where 10.75m was seen to be recovered (98% recovery). The core in the aluminium inner barrels was marked-up, gamma ray logged, cut into 1m lengths and gypsum stabilized for shipment to Kirk Petrophysics laboratory for analysis. The core was then seen to have three distinct lithologies, with the upper part (to approx. 3415m) comprising mostly vesicular glassy basalt. The middle section (to 3417.5m) comprising mostly vesicular basalt and the lower section (to 3422.5m) comprising mostly vesicular palagonite basalt. There were no oil shows present in the core but gas shows continued while coring this section including a gas peak of 2.1% at 3415m (C1: 18532 ppm; C2: 557 ppm; C3: 192 ppm; iC4: 33 ppm; nC4: 51 ppm; iC5: 15 ppm; nC5: 12 ppm).

The 8 ½" BHA of a PDC bit, turbine and an LWD suite consisting of Directional, Gamma, Resistivity, standard Sonic and Pressure tools was re-run back in the hole (Run 10), with only the CLSS sonic changed for the backup tool. Drilling continued from 3423m and the base of the second gas show interval ("Lamba 1" gas show) was recorded at 3445m MDRT. Pumps off and connection gases were recorded throughout the interval but showed a decreasing trend with depth (1.8% at 3465m to 0.8% at 3575m). The off-bottom vibration throughout drilling the T38 to ?T36 Lamba Volcanics Series was excessive until at 3604m the ROP died and the BHA was tripped for an impreg bit. Over the run, the well had built angle slightly to 3.08° inclination.

An 8 ½" BHA of an impreg bit, new turbine and a re-run of the previous LWD suite of Directional, Gamma, Resistivity, standard Sonic and Pressure tools was made up and run in the hole (Run 11). Based on biostratigraphic dating and log character, the Kettla Tuff Member was identified at 3624m MDRT (-3584.7m TVDSS) and 413.7m TVD deep to prognosed. Drilling continued to 3666m MDRT where ROP died with higher pump pressures recorded and a ring-out was suspected. The bit was tripped and on surface was seen to be rung-out. Over the run, the well had built angle slightly to 3.52° inclination.

An 8 ½" BHA with a new impreg bit and a re-run of the previous run turbine and LWD suite of Directional, Gamma, Resistivity, standard Sonic and Pressure tools was made up and run in the hole (Run 12). Before drilling ahead, the bit fanned to bottom and a pill was pumped to clear any junk.

Drilling ahead from 3666m in the more uniform Kettla Tuff Member until at 3741m MDBRT a turbine stall was observed concurrently with dynamic losses of 3.5m3 over 15mins. With the pumps off, a gain was recorded and the well was shut in and an 8 bar observed. This was bled-off to the strip tank then circulated bottoms up through choke, with high gas levels of 24.5% recorded. When circulating was restablished, dynamic losses observed and it was concluded that the gain was due to ballooning from bottom hole fractures.

The "Lamba 2" gas show zone was identified from 3735m MDRT, with formation drill gas peaks of 24.4% at 3749m and 13.4% at 3770m recorded and with similar wet gas hydrocarbon signatures from ratio analysis (24.4% total gas at 3749m, C1: 177598ppm, C2: 5398ppm, C3: 1964ppm, iC4: 344ppm, nC4: 668ppm, iC5: 323ppm and nC5: 364ppm).

Significant off-bottom vibration was again apparent; flow rates were reduced from 2400 to 1500 lpm to reduce this. The LWD tools were subjected to several hours of excessive vibration on this run and with no loss of data/tool failures. At 3770m MDBRT the ROP died associated with an increase in standpipe pressure. On surface the bit was seen to be severely rung-out and with 10cm in length was missing. Over the run, the well had built angle slightly to 4.04° inclination.

An 8 ½" BHA with a new impreg bit and a re-run turbine and LWD suite of Directional, Gamma, Resistivity, Pressure and a re-run of the sonic CLSS tool (from Run 8) due to battery life, was made up and run in the hole (Run 13). Drilling ahead from 3770m in the

Vaila Formation (T35) that was subsequently picked at 3770.5m MDRT (-3730.9m TVDSS), at the base of the relatively uniform Kettla Tuff Equivalent. The transition to Vaila was seen to be more interbedded with claystones and basalts/tuffs.
T35, Vaila Formation was picked on biostratigraphic data at 3771m MDRT and this sequence continued to well TD at 3941m MDRT (drillers depth).
In the Vaila Fm. pumps off and pipe connection gases continued showing no trends with depth and were interpreted as well ballooning. The gas show zone continued throughout this section to well TD confirming the higher pore pressure of the Formation.

On reaching TD, a discrepancy in the pipe tally was discovered. It transpired that a complete stand (28m) had been missed out and resulted in drilling an additional stand and the depth corrected to a TD at 3941m MDBRT (-3901.1m TVDSS). All depths mudlogging and LWD depths were adjusted accordingly as per ENI instructions. TD was reached at 21:00hrs, 23rd October 2010. At TD, the well was at an inclination of 4.13° and the bottom hole location was calculated to be 52m to the SE of the well surface location.

Throughout the 8 ½" section, the KCl content in the mud resulted in elevated gamma ray readings.

A comprehensive wireline logging programme was undertaken on the 8 ½" section and brought on depth with Run 1A. The wireline TD depth of 3943m MDRT (-3903.1m TVDSS) was recorded. The following logging runs were successfully undertaken from the 24th to 27th October 2010 (total operating time: 56hrs) with no downtime:

- Run #2A: FMI-GPIC-DSI-GR- ACTS-ECRD
- Run #2B: SP-HRLA-TLD-APS-HNGS-ACTS-ECRD
- Run #2C: VSI-GR-ACTS-ECRD
- Run #2D: MSCT-GR-ECRD
- Run #2E: PQ-HY-AFA-PO-CGA-SC-MS-GR-ACTS-ECRD (MDT)

Good quality log data was recorded, with 100% recovery of rotary sidewall cores (20 attempted & 20 recovered), but unfortunately no successful pretests were recorded.

8.2.7 Plug & Abandonment

Upon completion of the wireline logging, the well was plugged (four open hole cement plus, straddle bridge plug, 13 3/8" bridge plug and T plug at the 13 3/8" csg cut) and abandoned.

8.2.8 Demobilise

The BOPs and the Riser were recovered as per Seadrill procedure, the rig moved for the well head cutting and recovering final operations, Aftyer de-ballasting, the West Phoenix was released from Anne-Marie Location and the contract at 00:15 hrs 11th November 2010.

8.3 Hole / Casing Summary

Rotary Table Elevation: 38.65m
Water Depth: 1106.3m

Hole			Casing			MW	LOT / FIT	Remarks
Size	Top MDBRT (TVDRT)	Base MDBRT (TVDRT)	Size (Weight lb/ft)	Top MDBRT	Shoe MDRT (TVDRT)			
42" x 36"	1145.0m (1145.0m)	1232.0m (1232.0m)	**36" x 30"** (553 x 310)	1143.0	1229.0m (1229.0m)	Seawater / Bentonite sweeps.	None	Spudded Anne-Marie well at 20.30hrs on 23/07/10 from 1145m MDBRT.
26"	1232.0m (1232.0m)	1607m (1607m)	**20"** (133)	1142.2m	1601.0m (1601.0m)	Seawater / Bentonite sweeps.	None	
17.1/2"	1607.0m (1607.0)	2361.0m (2360.9m)	**13.3/8"** (68)	1143.6m	2356.7m (2356.6m)	1.14 sg KCI Glycol Polymer WBM	LOT 1.199 sg	
12.1/4"	2361.0m (2360.9m)	3097.0m (3096.9m)	**9.5/8"** (47)	1143.0m	3093.5m (3093.4m)	1.22 sg KCI Glycol Polymer WBM	LOT 1.40 sg	
8.1/2"	3097.0m (3096.9m)	3941.0m (3939.7m)	**-**	-	-	1.30 sg KCI Glycol Polymer WBM	LOT 1.62 sg	Cut core from 3412 - 3423m. Suspended coring operations due to jam. Recovered 10.75m, 98% recovery.

Notes

1. The LWD data from Run X recorded the 30" x 26" shoe 5m shallower at 1224m MDRT
2. The 8 ½" hole wireline caliper logs (Run 2A) recorded the 9 5/8" casing shoe 3.5m shallower at 3090.0m MDRT.

8.4 Drilling / Operational inefficiencies related to Geology

Hole Section	Comment
36"	• No boulders encountered while drilling the 36" hole section
26"	• No problems encountered. No increase torque or hole problems recorded.
17 ½"	• No shallow gas recorded and the section drilled without problem with minor ROP reduction over cemented sandstone and limestone stringers.
12 ¼"	• Hard basalts and volcanics resulted in very slow ROPs and very high vibration to LWD tools and real time transmission failure on Run 6. • No hole related problems with running casing, although with the hole was open for 12 days and the wireline Run 1A had problems with stick-slip/overpulls.
8 ½"	• Well ballooning with losses/gains and very high gas levels. Two intervals encountered from 3122m to 3259m and from 3741m to TD at 3941m. • Very hard volcanic section (Basalts and Tuffs) resulted in very slow ROPs and severely damaged bits from 3650m. • Minor overpulls on wireline runs 2A & 2B. Schlumberger reported that the capstan system prevented a possible stuck tool on Run 2B.

9. STRATIGRAPHY SUMMARY

9.1 Lithostratigraphy

Group	Formation / Member	T Sequence	Depths (metres) MDBRT	TVDSS	TWT (ms)	Pick Criteria
Seabed			1145.0	-1106.3	1557.4	Tagged
Nordland - Stronsay	**Undifferentiated**	Undifferentiated	1154.0	-1115.3	1567.7	LWD
Stronsay	-	T97 – T96	1630.0	-1591.3	2089.8	Bio
	Fan B	-	1640.0	-1601.3	2105.4	ROP / Cuttings
	Base Fan B	-	1676.0	-1637.3	2144.5	LWD
	-	T94	1690.0	-1651.3	-	Bio
	-	T93	1720.0	-1681.3	-	Bio
	Rothbury Sandstone	-	1786.0	-1747.3	2266.6	LWD / Cuttings
	-	T91	1920.0	-1881.3	-	Bio
	Base Rothbury Sst.	-	1965.0	-1926.3	2426.9	LWD
	-	T85	2090.0	-2051.3	-	Bio
	-	T82	2215.5	-2176.8	-	LWD
	T70 Soft Shale	T70	2254.0	-2215.3	2681.5	LWD / Bio
	-	T60	2300.0	-2261.3	-	Bio
Moray	**Balder**	T50.2	2355.0	-2316.3	2776.6	WL
	-	T50.1	2378.0	-2339.3	-	WL / Bio
	Cambo Sandstone	-	2382.0	-2343.3	2796.7	WL
	Flett	T45.3	2400.0	-2361.3	2809.7	WL / Bio
	-	T45.2	2407.0	-2368.3	-	WL / Bio
	Upper Hildasay Sst.	-	2418.0	-2379.2	2822.8	WL
	Base Up. Hildasay Sst.	-	2473.5	-2434.8	2862.4	WL
	Lower Hildasay Sst.	-	2567.0	-2528.3	2936.9	WL
	Upper Faroe Lavas (F1b-F2a)	T45.2 – T45.1	2643.0	-2604.3	2991.6	WL / Cuttings
	Massive tuff	-	2821.0	-2782.3	3068.5	WL / Cuttings
	Flett 1 gas shows	-	2853.9	-2815.2	3093.1	WL / Gas Shows
	-	T45 – ?T40	2922.0	-2883.3	-	Bio
Faroe	**Lamba** Tuff Member (L2)	-	2961.5	-2922.7	3142.9	WL
	-	T38	3025.0	-2986.2	3193.7	WL / Bio
	-	T38 – ?T36	3382.0	-3343.1	-	Bio
	Base T38 Unconformity Lower Faroe Lavas (L1) *Lamba 1 gas shows*	-	3391.0	-3352.1	3395.0	WL / Gas Shows
	Kettla Tuff Equivalent	-	3624.0	-3584.8	3510.8	WL / Bio
	-	T36	3664.0	-3624.7	-	Bio
	Lamba 2 gas shows	-	3714.0	-3674.6	3546.4	WL / Gas Shows
	Vaila	T35	3770.5	-3731.0	3566.4	WL / Bio /Cuttings
	Well TD (Loggers)	-	3943.0	-3903.1	3672.6	WL

Sequence tops based on Ichron wellsite biostratigraphy report and shifted to wireline depths.

Flett 1, *Lamba 1* and *Lamba 2* are informal units based on zones where significant gas shows were detected.

9.2 Biostratigraphy (Ichron)

Age	Zone	Depth
Middle Eocene	T16.3.2	1630m (first sample analysed)
	?T16.1	1690m
	T15.4 – T15.2	1720m
	T15.1	1920m
Early Eocene	T14.4	2090m
	T14.3	2200m
	?T14.1	2230m
	T13.3	2260m
	T13.1.2	2300m
	T12	2361m
	T11	2420m
	?T11	2760m
Early Eocene - ?Late Paleocene	?T11 - ?T9	2922m
Late Paleocene		3025m (log)
	T8	3026m
	Unassigned	3139m
	T8 - ?T7	3382m
	Unassigned	3412m
	T8 - ?T7	3613m
	Unassigned	3637m
	T7	3664m
	T6	3774m – 3942.5m (TD)

173 ditch cutting & 7 rotary sidewall core samples analysed at the well site.

9.3 Formation Summary

The descriptions below are based on cuttings samples. Interpreted formation tops and bed boundaries of well 6004/8a-1 are based on LWD, Biostrat, ROP, Cuttings, Wire Line and Gas Shows. Depths are relative to RTE (38.65 m above MSL).

Undifferentiated Stronsay - Nordland	**1145.0 m to 1640.0 m MD (-1106.3.0 m to -1601.3 m TVDSS)**

The seabed was tagged at 1145 m MDRT, -1106.3 m TVDSS and 36” x 42” hole drilled to 1232 m MD. 26” x 30” Caasing was set at 1229 m MD. The 26” hole was drilled to 1607 m and 20” casing set at 1601 m.

These sections were drilled riserless with returns to the seabed using seawater and high-vis bentonite sweeps.

A basic Real Time only gamma ray tool was used to drill to 1232 m MD for the 36”/42” hole section and a gamma ray and resistivity set up was used to 1607 m MD for the 26” hole.
First returns were at 1610 m MD within this group. ROP figures above cover the entire interval while Total Gas figures and sample descriptions are representative for the interval 1610 to 1640 m MD only.

SILTSTONE: grey to dark grey, firm to moderately firm, crumbly to moderately friable, blocky, very argillaceous, common colourless fine to medium sand grains and vari-coloured lithic clasts, common glauconite and mica, commonly grading to silty and sandy Claystone, non calcareous.
CLAYSTONE: grey to bluish grey, pale olive grey, firm to moderately soft, crumbly to plastic, blocky, sitly in part, trace sand, common mica and glauconite, slightly to non calcareous, non swelling.

Stronsay Group, Fan B Member	**1640.0 m to 1676.0 m MD (-1601.3 m to -1637.3 m TVDSS)**

This sequence was picked using ROP and primarily Cuttings. The Fan B Member is a sand prone submarine fan deposition. Up to 80% of SAND was observed in the cuttings as well as minor amounts of COAL and CLAYSTONES.

SAND: colourless, pale grey to pale yellow brown, transparent to translucent, loose quartz, occasional scattered dark lithic clasts, fine to medium grained, rare coarse grains, sub angular to well rounded, moderately to well sorted, moderately elongated to sub spherical,

trace nodular pyrite, no visible cement, occasional trace argillaceous matrix, poor to moderate inferred porosity. No shows.
COAL: black to brown black in part, firm, earthy, crumbly, and blocky.
CLAYSTONE: grey to bluish grey, pale olive grey, firm to moderately soft, crumbly to plastic, blocky, sitly in part, trace sand, common mica and glauconite, slightly to non calcareous, non swelling.

Stronsay Group, Base Fan B **1676.0 m to 1786.0 m MD (-1637.3 m to -1747.2 m TVDSS)**

This sequence was picked using LWD and marks a transition from the overlying SAND prone Fan B member and into a CLAYSTONE dominated interval preceeding the Rothbury Sandstone Formation.

Dominated by CLAYSTONE: grey, dark grey, bluish grey, firm to soft, crumbly to earthy in part, sub blocky to blocky, scattered very fine glauconite, trace mica, rare scattered very fine grained sand grains, silty in part, common elongated to well rounded mudstone with occasional glauconite pellets.

Minor amounts of SILTSTONE: grey to moderate grey, soft, crumbly to sub friable, sub blocky, argillaceous, scattered very fine sand grains, trace glauconite, non to slightly calcareous, no visible porosity. No shows.

Decreasing amounts of SAND down to 1710 m: colourless, pale grey to pale yellow brown, transparent to translucent, loose quartz, occasional scattered dark lithic clasts, fine to medium grained, rare coarse grains, sub angular to well rounded, moderately to well sorted, moderately elongated to sub spherical, trace nodular pyrite, no visible cement, occasional trace argillaceous matrix, poor to moderate inferred porosity. No shows.

Stronsay Group, Rothbury Sandstone Member **1786.0 m to 1965.0 m MD (-1747.2 m to -1926.2 m TVDSS)**

This sequence was picked using LWD and Cuttings and consists of SANDSTONE with interbedded SILTSTONES and CLAYSTONES. SANDY LIMESTONE was also present in minor amounts.

The top of the member was marked by a drop in the gamma ray.

SAND: yellow grey, colourless, pale orange brown, pale brown, pale grey, pale yellow grey, transparent to translucent, loose quartz, with occasional dark lithic grains, fine to coarse grained, poorly sorted, sub angular to well rounded, sub elongated to spherical, common nodular pyrite with sand grain inclusions, traces of coal in places, rare trace pyrite, common argillaceous coatings on grains, predominantly with no visible cement, rarely with calcite cement, poor to no inferred porosity. No shows.

CLAYSTONE: grey to moderately grey, soft to moderately firm, crumbly, sub blocky, very silty, common very fine sand grains, common glauconite, occasional mica, occasional black carbonaceous speckles, non calcareous.

SILTSTONE: grey, soft to moderately firm, crumbly, sub blocky, argillaceous, commonly sandy, abundant glauconite, rare black carbonaceous speckles, non to slightly calcareous.
SILTY CLAYSTONE: grey to moderately grey, soft to moderately firm, crumbly to sub friable, sub blocky, abundant nodular pyrite as marcasite, common glauconite, trace mica, very silty, common scattered very fine sand grains, slightly to non calcareous, non swelling.

SANDY LIMESTONE: white to off white, crypto-crystalline, crumbly, with abundant matrix and grain supported very fine grained colourless quartz and varicoloured lithic grains, no visible porosity. No shows.

Stronsay Group, Base Rothbury Sandstone Member	**1965.0 m to 2254.0 m MD (-1926.2 m to -2215.2 m TVDSS)**

This sequence was picked using LWD and consists of a CLAYSTONE and SILTSTONE dominated sequene with rare SANDSTONE stringers.

CLAYSTONE: grey to moderate grey, soft to moderately firm in part, crumbly, sub blocky, abundant pyrite commonly as marcasite, very silty, trace glauconite and mica, scattered shell fragments, slightly to non calcareous.

SILTY CLAYSTONE: grey, soft, crumbly to moderately friable, blocky, common glauconite, trace pyrite, scattered very fine sand grains, rare mica, slightly calcareous to calcareous.
SILTSTONE: grey to medium grey, soft, crumbly to moderately friable, sub blocky to blocky, argillaceous, common glauconite, trace mica, scattered very fine sand grains, slightly calcareous to calcareous.

SANDSTONE: pale grey, yellowish grey, firm to very hard, blocky, brittle quartzose, very fine to occasionally fine grained, well sorted, sub to well rounded, spherical, common dark lithic grains, traces of carbonaceous material, very well cemented with calcite, becoming very Sandy Limestone in part, no visible porosity. No shows.

Stronsay Group, T70 Soft Shale Marker	**2254.0 m to 2355.0 m MD (-2215.2 m to -2316.2 m TVDSS)**

This sequence was picked using LWD and Biostrat. Resistivity and Sonic responces were slighty lower than the previous interval. The Member consists of a CLAYSTONE dominated sequence with minor thin beds of LIMESTONE with anhydrite. The top of the sequence also contained some SILTSTONE.

CLAYSTONE: medium grey to medium dark grey, brownish grey, blue grey, soft to moderately firm, crumbly to slightly waxy, sub blocky, scattered glauconite, silty in part, common micro fossils and shell fragments, slightly to non calcareous.

LIMESTONE: cream to pale yellow grey, off white, firm to moderately soft, micro to crypto-crystalline, no visible porosity. No shows.

Moray Group, Balder Formation **2355.0 m to 2382.0 m MD (-2316.2 m to -2343.2 m TVDSS)**

This sequence was picked using Wire Line and consists of a relatively thin layer of TUFF, TUFFACEOUS CLAYSTONE and CLAYSTONE.

TUFF: brown grey to grey, firm to moderately hard, brittle to crumbly, blocky to sub blocky, argillaceous, common varicoloured weathered crystal fragments, trace sand, slightly calcareous.

TUFFACEOUS CLAYSTONE: mottled pale blue grey, cream and off white, soft to firm, crumbly, dispersive in part, sub blocky to amorphous, abundant kaolinite? and mineral fragments, common mica, chlorite and pyrite, silty to sandy in part, grading to Claystone in part, slightly to non calcareous.

CLAYSTONE: blue grey to pale blue grey, brownish grey, grey, soft to firm, crumbly to slightly waxy, sub blocky, trace pyrite nodules, trace glauconite, rare trace mica, occasional micro fossils, trace kaolin in part, slightly calcareous, with trace black, firm, vitreous, crumbly to plastic Bitumen.

Moray Group, Balder Fm, Cambo Sandstone Member **2382.0 m to 2400.0 m MD (-2343.2 m to -2361.2 m TVDSS)**

This sequence was picked using Wire Line and consists primarily of a thin layer of shaley SANDSTONE. TUFFACEOUS CLAYSTONE and traces of LIMESTONE was also observed within this interval.

SANDSTONE: colourless, pale grey, transparent to translucent, loose quartz, fine to very coarse grained, sub to well rounded, moderate to highly spherical, poorly sorted, occasional argillaceous matrix, no visible cement. No shows.

TUFFACEOUS CLAYSTONE: mottled pale blue grey, cream and off white, soft to firm, crumbly, dispersive in part, sub blocky to amorphous, abundant kaolinite? and mineral fragments, common mica, chlorite and pyrite, silty to sandy in part, grading to Claystone in part, slightly to non calcareous.

LIMESTONE: off white, soft, crypto-crystalline, no visible porosity. No shows.

Moray Group, Flett Formation **2400.0 m to 2418.0 m MD (-2361.2 m to -2379.2 m TVDSS)**

This sequence was picked using Wire Line and Biostrat and consists of a thin layer of SANDSTONE and CLAYSTONE.

SANDSTONE: colourless, pale grey, transparent to translucent, loose quartz, fine to very coarse grained, sub to well rounded, moderate to highly spherical, poorly sorted, occasional argillaceous matrix, no visible cement. No shows.

CLAYSTONE: dark green, firm, sub blocky, medium hard, rarely slightly sity, with rare inclusions of dark brown splinters (micaceous aspect). Tuffaceous in places.

Moray Group, Flett Fm, Upper Hildasay Sandstone Mbr. **2418.0 m to 2473.5 m MD (-2379.2 m to -2434.8 m TVDSS)**

This sequence was picked using Wire Line and consists of a SANDSTONE dominated interval with minor amounts of TUFFACEOUS CLAYSTONE and traces of TUFF.

SANDSTONE: colourless, pale grey, transparent to translucent, loose quartz, fine to coarse grained, sub to well rounded, moderate to highly spherical, moderate to poorly sorted, occasional argillaceous matrix grey and light grey, no visible cement. No shows.

Minor presence of TUFFACEOUS CLAYSTONE: mottled pale blue grey, cream and off white, soft to firm, crumbly, dispersive in part, sub blocky to amorphous, abundant kaolinite? and mineral fragments, common mica, chlorite and pyrite, silty to sandy in part, sporadically grading to Claystone, slightly to non calcareous.

Traces of TUFF clasts: brown grey to grey, and olive greenish, blocky, very tight, slightly calcareous. Traces of Pyrite nodules.

Moray Group, Flett Fm, Base Upper Hildasay Sandstone Mbr. **2473.5 m to 2567.0 m MD (-2434.8 m to -2528.3 m TVDSS)**

This sequence was picked using Wire Line and consists of a TUFFACEOUS CLAYSTONE dominated interval with minor amounts of SANDSTONE.

TUFFACEOUS CLAYSTONE: dark grey, very fine mottled pale blue grey, cream, firm, dispersive in part, sub blocky to amorphous, common weathered mineral fragments, common mica, chlorite and pyrite, silty to sandy in part, grading to Claystone in part, slightly to non calcareous.

SANDSTONE: colourless, pale grey, transparent to translucent, loose quartz, fine to medium grained, minor coarse to sub angular sub rounded to rounded, moderate to highly spherical, moderate to poorly sorted, occasional argillaceous matrix dark grey and whitish, no visible cement. No shows.

Moray Group, Flett Fm, Lower Hildasay Sandstone Mbr. — 2567.0 m to 2643.0 m MD (-2528.3 m to -2604.3 m TVDSS)

This sequence was picked using Wire Line and consists of a mixed sequence of CLAYSTONE, SANDSTONE, COAL and TUFF which becomes present only towards the base.

CLAYSTONE: bluish grey to pale grey, firm to soft, crumbly to waxy, sub blocky to blocky, occasional tuffaceous material, traces of pyrite, glauconite and mica, very calcareous.

SANDSTONE: colourless, pale grey, off white, rare pinkish grey, loose quartz, very fine to fine grained, occasional medium grains, angular to sub rounded, moderately sorted, elongate to sub spherical, occasional argillaceous matrix, occasional calcite and rare silica cement. No shows.

COAL: black to brownish black, firm to hard, crumbly to brittle, blocky, angular in part, vitreous with conchoidal fractures, trace pyrite.

TUFF: blue grey, brown, firm to moderately hard, crumbly, common dark mineral fragments, argillaceous, trace pyrite, common quartz shards, trace kaolin, non calcareous.

Moray Group, Flett Formation Upper Faroe Lavas — 2643.0 m to 2821.0 m MD (-2604.3 m to -2782.3 m TVDSS)

This sequence was picked using Wire Line and cuttings. It consists of BASALT and TUFF with minor traces of VOLCANICLASTIC SANDSTONE.

BASALT: black to very dark grey, firm to hard, crumbly, brittle, friable, blocky to sub blocky, common mafic inclusions in a quartz matrix, trace pyrite, occasional sparry calcite inclusions, non calcareous, commonly showing bit metamorphism as brittle flakes.

COARSE GRAINED VOLCANICLASTICS: grey, dark grey, blue grey, brown grey, soft to firm, crumbly, plastic, brittle, sub blocky to blocky, occasional mafic / mineral inclusions, argillaceous aspect, occasional sparry calcite inclusions, commonly showing alteration due to bit action with crumbly to brittle flakes and sticky paste.

Traces of VOLCANICLASTIC SANDSTONE: pale brown, friable, quartzose, very fine to fine grained, angular to sub rounded, moderately sorted, with abundant dark altered volcaniclastic grains, poor to no visible porosity. No shows.

Moray Group, Flett Fm. Upper Faroe Lavas 2821.0 m to 2853.9 m MD
***Massive tuff* (-2782.3 m to -2815.2 m TVDSS)**

This sequence was picked using Wire Line and cuttings. It consists primarily of TUFFACEOUS CLAYSTONE with minor amonts of VOLCANICLASTIC SANDSTONE and BASALTS.

TUFFACEOUS CLAYSTONE: moderate brown, firm to soft, friable plastic and washable, sub blocky, amorohous, with argillaceous aspect, non calcareous.

WEATHERED TUFFACEOUS CLAYSTONE: brown, grey brown, grey, bluish grey, soft to occasionally hard, plastic to brittle, amorphous to blocky, predominantly bit metamorphosed to plastic paste and brittle flakes, occasional scattered weathered volcanic and mineral fragments, common argillaceous aspect, non calcareous.

VOLCANICLASTIC SANDSTONE: colourless, pale orange, pale yellow, transparent to translucent, loose quartz and lithic grains, very fine to fine grained, angular to sub rounded, well sorted, moderately spherical, no visible cement, poor to no inferred porosity. No shows.

BASALT: black to very dark grey, firm to hard, very tight, blocky to sub blocky, with very fine mafic minerals, minor with quartz and feldspar inclusions.

Moray Group, Flett Fm. Upper Faroe Lavas 2853.9 m to 2961.5 m MD
***"Flett 1" Gas shows* (informal unit) (-2815.2 m to -2922.7 m TVDSS)**

This sequence was picked using Wire Line and Gas Shows. It consists of a mixed sequence of TUFFACEOUS SANDSTONE, BASALT, SANDSTONE, CLAYSTONE and TUFFACEOUS CLAYSTONE.

COARSE GRAINED VOLCANICLASTICS: greenish grey, very fine grading to SILT sized, with quartz and black volcanic grains, with argillaceous/tuffaceous matrix, crumbly to friable, non calcareous, no visible porosity. Traces of Pyrite. Presence of quartzose grains, colourless, loose, very fine, sub angular to sub rounded, well sorted, micaceous, with rare coarse grains, angular, in places grading to Sandstone: off white, very fine, well cemented with siliceous cement, medium hard and compact, no visible porosity. No Shows.

BASALT: dark grey, grey, brownish black, firm to soft, brittle, crumbly and plastic, blocky to sub blocky, predominantly altered by bit action to brittle flakes and occasionally soft paste, very fine mafic minerals in a feldspar matrix, non calcareous.trace of tuff brown a.a.(cavings?) and Pyrite.

VOLCANICLASTIC SANDSTONE: colourless, occasional pale yellow and pale brown stain, transparent to translucent, loose quartz, with common dark volcaniclastic grains, very fine to fine grained, angular to sub rounded, well sorted, sub spherical to elongated, occasional well cemented with silica, poor to no inferred porosity. No shows.

CLAYSTONE: brown to grey brown, pale yellow brown, soft, crumbly, dispersive, plastic, amorphous, as bit metamorphosed paste, occasional Tuffaceous fragments, occasionally slightly silty, non calcareous.

TUFFACEOUS CLAYSTONE: pale brownish grey, grey, pale grey, greenish grey, firm to soft, brittle, crumbly, platy to blocky, predominantly as brittle flakes and soft paste from bit action, occasional volcaniclastic and mineral fragments, occasionally with weathering halo, argillaceous aspect, common coarse colourless, white and pale green transparent to translucent crystalline inclusions.

Faroe Group, Lamba Formation Tuffaceous Mbr — 2961.5 m to 3391.0 m MD (-2922.7 m to -3352.1 m TVDSS)

This sequence was picked using Wire Line and Biostrat. It primarily consists of TUFFACEOUS CLAYSTONE with a sequence of TUFFACEOUS SILTSTONE between @ 3100 – 3185 m MD. TUFFACEOUS SANDSTONE and SANDSTONE were also observed along with occasional beds of TUFF. Traces to 5% of BASALT were rarely present.

From 2961.5 – 3024 m MD, TUFFACEOUS CLAYSTONE: blue grey to dark green grey, minor pale purple, firm to soft, crumbly, washable in part, sub blocky, amorphous, with argillaceous aspect, common very fine cubic pyrite, non calcareous.

From 3027 - 3100 m MD, TUFFACEOUS CLAYSTONE: medium bluish, firm to soft, crumbly, washable in part, sub blocky to amorphous, with argillaceous aspect, non calcareous.

From @ 3100 – 3120 m MD, TUFF: greenish to grayish green, sandy to very sandy, sub blocky, crumbly, minor plastic and washable. Presence of Basalt clasts, blackish to brown, tight.

TUFFACEOUS SANDSTONE: greenish to grayish green, very fine to silt quartz grains, sub angular to sub rounded, and rare dark mafic grains, with abundant tuffaceous matrix, friable, also with abundant loose grains.

From @ 3120 – 3185 m MD, TUFFACEOUS SILTSTONE: predominantly light grey, occasionally medium grey, very rarely green grey to light green grey, occasionally speckled with dark mafic minerals, soft to rarely firm, blocky to rarely sub blocky, with rare loose coarse quartz grains, occasionally grading to TUFFACEOUS CLAYSTONE.

TUFFACEOUS SANDSTONE: (15%) predominantly clear to colourless, occasionally milky white to pale grey, rarely light orange, as loose quartz grains, very fine to fine grained, sub rounded, sub spherical, moderately sorted, no cement. No shows.

Trace to 5% BASALT @ 3185m: black to very grey black, hard, very tight, sub angular, with very fine mafic minerals.

From 3195m – to the base of the sequence, predominantly TUFFACEOUS CLAYSTONE: light grey to medium grey, pale to dark green grey, firm to soft, crumbly, washable in part, sub blocky to amorphous, with argillaceous aspect, slightly silty, non calcareous.
SANDSTONE: predominantly clear to colourless, occasionally milky white to pale grey, rarely light orange, as loose quartz grains, predominantly as very fine to fine grained, very rarely coarse, sub rounded, sub spherical, moderately sorted, predominantly as loose grains rarely with hard calcite cement. No shows.

TUFF: dark greenish, in part becoming pale greyish the depth, tight, sub blocky, minor crumbly, homogeneous, locally becoming patchy, with micro inclusions of quartz grains, angular, and beige grains (Feldspar?) with a sub rounded shape, grading to TUFFACEOUS SANDSTONE /SILTSTONE very well cemented by tuffaceous matter. No visible porosity. No shows.

Faroe Group, Lamba Fm. Lower Faroe Lavas **3391.0 m to 3480.0 m MD**
"Lamba 1" Gas shows **(informal unit)** **(-3352.1 m to -3441.1 m TVDSS)**

This sequence was picked using Wireline and Gas Shows. Initially from cutting was described as consisting of TUFF and TUFFACEOUS SANDTONE. A core was taken in this sequence and the descriptions below are from this core (a summary from Kirk Petrophysics Final Report).

From 3412 to 3422.75 m (summary of Core # 1)

The core consists of generally altered, dark greenish grey highly amygdaloidal basalt.

A submarine rather than subaerial depositional setting can be proposed on the following lines of evidence:

1. Arcuate margins corresponding to pillow lava-type forms are visible in the core (e.g. 3417.2-3417.5 m). Here cemented vesicles are arranged in concentric zones parallel to the pillow margins. Radial pipe vesicles are also evident (e.g. 3418.20, 3420.85 m).
2. Thin section and XRD analyses indicate the presence of palagonite, formed from the reaction of volcanic glass with seawater.
3. Ferric oxides are rare both in thin section and in the core.

The interval may be interpreted as a hyaloclastic pillow breccia deposit (e.g. Suthren, 1985), consisting of basalt that was rapidly quenched and locally granulated by subaqueous chilling. The vesicles are former bubbles of gas that were entrained during cooling. Most are spherical to ellipsoidal, but as noted above elongate fabric-discordant structures suggestive of pipe vesicles are noted in places.
The cored interval (3412-3422.75 m) is interpreted as a hyaloclastic pillow breccia deposit, consisting of basalt that was rapidly quenched and locally granulated by subaqueous chilling.
Three lava microfacies or lithotypes were recognized from thin sections: 1. Vesicular Basalt, 2. Vesicular Glassy Basalt and 3. Palagonized Vesicular Glassy Basalt. Vesicular basalt is preserved mainly towards the centre of the core (samples 3413.75-3417.33 m). A thick interval dominated by palagonitized glassy basalt constitutes a lower part of the core (samples 3419.19-3422.51 m). Vesicles are abundant; pipe vesicles are developed in places.

The three lithotypes are host to a wide range of secondary and authigenic minerals, of which the most significant are palagonite, smectite and supposed mixed-layer chlorite-smectite, non-ferroan calcite, albite, prehnite and various zeolite minerals, the latter chiefly comprising levyne, analcime and laumontite.

Horizontal fractures within the vesicular glassy basalt near the top of the core (3412.22 m) are extensively cemented by pyrite, prehnite and laumontite. Microfractures are sealed by calcite or laumontite or are locally open where porosity has been created by calcite dissolution. Microcracks within fragmental palagonite groundmass are generally sealed, rarely open and zeolite-lined.

Cementation took place from volcanic gasses, glass-seawater reactions, from the further subaqueous weathering of the volcanic glass and from hot juvenile fluids that intermingled with extraneous and connate sea water. Early hydrous zeolites will have inverted to less hydrous species with progressive burial.

Several distinctive diagenetic mineral assemblages can be recognized that are specific to lithotype and stratigraphic interval. Vesicular basalts at 3413.75-3417.33 m are characterized by abundant non-ferroan calcite and later subordinate albite and local chlorite-smectite. Prehnite and laumontite formed locally and are more abundant within the vesicular glassy basalts of this zone and from the succeeding interval, where an indeterminate zeolite is also locally present. The glassy vesicular basalts present below this zone (3417.83-3419.09 m) are characterized by a cement assemblage of calcite-chlorite/smectite-albite-prehnite-analcime-apophyllite. The early assemblages apparently resulted from the alteration of unpalagonitized volcanic groundmass.

The minor horizons of palagonitized glassy basalt in the upper part of the core show secondary mineral assemblages of smectite-laumontite, including flaky smectite, with minor early zeolite. High temperature laumontite apparently crystallized from ions released from the further breakdown of groundmass components remaining after early palagonite/smectite alteration or from reactions within the palagonite.

The lower interval of palagonitized glassy basalts is characterized by a cement assemblage of early smectite followed by minor thomsonite and common blocky levyne and analcime. It is possible that analcime is proxying for laumontite within this interval. Prehnite and analcime have been altered to two new minerals of unknown mineralogy.

Calcite leaching took place at an intermediate stage in the diagenesis whereas zeolite dissolution took place late in the diagenetic history. In both cases leaching may have followed an ingress of acidic pore waters, either formation brines accompanying or preceding a hydrocarbon charge, or meteoric water flushing following uplift. Calcite leaching could have been brought about by a drop in CO_2 partial pressure.

Visible porosity (up to 12%) within the vesicular basalts and glassy vesicular basalts is contained mostly within the vesicles, and locally within the groundmass. Much porosity is secondary, created by the leaching of calcite, analcime and local early zeolite. Porosity is also retained or created within partly laumontite-cemented vesicles. Fracture porosity is sparse.

Visible porosity magnitude and type within the palagonitized glassy vesicular basalt lithotype vary down-hole. The thinner beds in the upper part of the core show moderately high (10-13%) porosities contained within incompletely-cemented vesicles and created by early zeolite dissolution. Porosity is also locally retained (~2%) within the fragmental microfabric. In contrast, visible porosity within the lower palagonitized interval is low (<5%) and hosted by minor open and partly cemented vesicles. Microporosities are very high throughout (~22-32%), and are attributed to micropores within the palagonite groundmass.

The reservoir properties of the cored interval are highly variable. Measured porosities range from 2.53-42.2% (arithmetic mean: 23.2%) and permeabilities vary from 0.05 mD (the detection limit) to 1.7 mD (geometric mean: 0.21 mD). A progression in reservoir quality is evident for the different lithotypes. The palagonitized glassy basalts show the best reservoir quality. Relatively high permeabilities (0.56-1.7 mD) are obtained from the upper part of the main lower palagonitized interval at core depth 3419.35-3420.34 m, and the highest porosities (>35%) are recorded from these and stratigraphically higher palagonite samples. These enhanced reservoir characteristics probably reflect a more thorough degree of alteration (palagonitization). Porosities at upper horizons down to 3417.58 m are enhanced by preserved porosity within laumontite-rimmed vesicles, smectite-cemented vesicles and also created by zeolite dissolution.

High porosities for vesicular basalts (9.2-23.4%) are explained by the creation of secondary porosity through the dissolution of calcite. A population of higher porosities for vesicular glassy basalts (20.9-28.9%) from the upper interval reflects both the generation of secondary pores from calcite, zeolite and analcime dissolution and the preservation of porosity within laumontite-lined vesicles.

Faroe Group, Lamba Fm. Lower Faroe Lavas — 3480.0 m to 3624.0 m MD (-3441.1 m to -3584.8 m TVDSS)

This sequence was picked using Wire Line and indicates a harder sequence. It consists primarily of Coarse Grained VOLCANOCLASTICS, HYALOCLASTITE and TUFFACEOUS CLAYSTONE that are becoming less tuffaceous from @ 3580 m MD. BASALT are also present at the base of the sequence.

TUFFACEOUS CLAYSTONE: medium dark grey to dark grey, mainly homogeneous, sub-blocky, soft, washable in part, in traces patchy with white matter, friable.

CLAYSTONE: predominantly medium grey to medium dark grey, occasionally light grey, rarely light green grey, firm, occasionally hard, blocky to sub blocky, occasionally sub angular, non swelling, slightly calcareous, silty in places, TUFFACEOUS in places, grading to TUFFACEOUS CLAYSTONE.

Coarse Grained VOLCANOCLASTICS: appearing on cuttings as loose grains, colourless to pale grey, mainly fine fine, grained, sub rounded, well sorted, with abundant medium and coarse grains moderately sorted. Abundant presence of volcanic clasts; fine to coarse, off- white sub spherical, and pale grey, sub rounded. No cement visible. Traces of Pyrite. No shows. Good trace to 10% BASALT: black to grey black, hard, sub angular.

Faroe Group, Lamba Formation — **3624.0 m to 3714.0 m MD**
Kettla Tuff Equivalent Member — **(-3584.8 m to -3674.6 m TVDSS)**

This sequence was picked using Wire Line and Biostrat. It consists primarily of Coarse Grained VOLCANOCLASTICS, TUFF, with minor amounts of TUFFACEOUS CLAYSTONE and minor amounts of COAL from @ 3700 m MD.

TUFF: predominantly light grey, occasionally light green grey, rarely medium grey, very rarely dark grey, friable to crumbly, occasionally seen as brittle flakes (bit action?), argillaceous in part, arenaceous with predominantly very fine to fine dispersed quartz, rare coarse quartz grains, commonly speckled with mafic mineral inclusions, traces of nodular pyrite; abundant in places, rarely grading to TUFFACEOUS CLAYSTONE.

COAL: (10% in 3703m sample) black, firm, crumbly to brittle, blocky to sub angular in places, vitreous.

TUFFACEOUS CLAYSTONE: light grey to dark grey, mainly homogeneous, sub blocky, soft to firm, washable in part grading to TUFF: light grey, firm to moderately hard, brittle flakes.

Faroe Group, Lamba Formation — **3714.0 m to 3753.5 m MD**
***"Lamba 2" Gas shows* (informal unit)** — **(-3674.6 m to -3714.0 m TVDSS)**

This sequence was picked using Wire Line and Gas Shows. It consists of primarily of TUFF and BASALT/DOLERITE.SILTY SANDSTONE observed towards the base of the sequence.

TUFF: light grey to light green grey, rarely medium grey soft to friable, argillaceous in part, with very fine to fine dispersed quartz, commonly speckled with mafic mineral inclusions, traces of micro Pyrite.
BASALT/DOLERITE?: grey black to black, blocky to angular, very hard, in places crystalline and vitreous, with common dark green to dark olive green mafic minerals; Olivine vein encountered?

Faroe Group, Lamba Formation — **3753.5 m to 3770.5 m MD**
Base Kettla Tuff Equivalent Member — **(-3714.0 m to -3731.0 m TVDSS)**

This sequence was picked using Wire Line and Cuttings. It consists of a thin sequence of TUFFACEOUS CLAYSTONE and SILTY SANDSTONE.

TUFFACEOUS CLAYSTONE: predominantly light grey, occasionally medium grey to medium dark grey, rarely light green grey, firm, blocky to sub blocky, commonly seen as brittle flakes; bit action?, non swelling, moderately calcareous, grading to CLAYSTONE.

SILTY SANDSTONE: predominantly milky white to opaque, occasionally pale grey, as loose quartz grains, predominantly very fine to fine grained, sub rounded, sub spherical, moderately sorted, as loose grains, no cement. Rare trace nodular pyrite. No shows.

Faroe Group, Vaila Formation **3770.5 m to 3943.0 m MD (-3731.0 m to -3903.1 m TVDSS)**

This sequence was picked using Wire Line and Biostrat. It consists of a mixed sequence of TUFFACEOUS CLAYSTONE, SANDSTONE, CLAYSTONE, BASALT and TUFF. TD of the well was in this sequence.

TUFFACEOUS CLAYSTONE: predominantly light grey, occasionally medium grey to medium dark grey, rarely light green grey, firm, blocky to sub blocky, commonly seen as brittle flakes; bit action?, non swelling, moderately calcareous, grading to CLAYSTONE.

SANDSTONE to SILTY SANDSTONE: predominantly milky white to opaque, occasionally clear to colourless and transparent, occasionally greenish, rarely light grey & light orange, as loose quartz grains, predominantly fine to medium grained, very fine, sub rounded to occasionally sub angular, sub spherical, moderately sorted, as loose grains, no cement. Very rare trace nodular pyrite. No shows.

CLAYSTONE: predominantly medium grey to medium dark grey, occasionally light grey, rarely light green grey to brown grey, firm, occasionally soft, blocky to sub blocky, non swelling, moderately calcareous. Very rarely grading to TUFFACEOUS CLAYSTONE.

BASALT/DOLERITE: grey black to black, homogeneous, in places crystalline, blocky to angular, very hard, vitreous in places, with common dark green to dark olive green mafic minerals; Olivine.
TUFF: predominantly light grey, occasionally light green grey, commonly mottled, firm, sub blocky to sub angular, argillaceous in part, commonly speckled with mafic mineral inclusions, occasionally grading to TUFFACEOUS CLAYSTONE.

Sample Quality
From 2651 m MD the well was drilled with a turbine combined with an Impreg bit. (Two runs covering @ 500 m were drilled with a turbine and PDC bit). **Resulting sample quality was not good with the cuttings severly pulverized** and in places showed bit induced metamorphism. In addition samples tended to be highly contaminated with a calcite mud additive from @ 3250m MD to well TD.

10. HYDROCARBON INDICATIONS

10.1 Oil shows

All samples were examined using the UV light and tested with solvent for cut colouration under UV and natural light. There were no oil shows seen in the 6004/8a-1 well.

10.2 Gas shows

The 42"x36" and 26" hole sections were drilled riserless down to 1607m MDRT.

Gas levels through the 17 ½" hole section (undifferentiated Stronsay Group) are seen to be very low (0.01% total gas). The 12 ¼" hole section gas averages remained very low (<0.05% total gas) over the Balder Group claystones, Cambo Sandstones, Flett Formation Claystones, Upper & Lower Hildasay Sandstones and into the Flett Basalt Series (Upper Faoe Lavas). Note, a localized gas peak of 0.2% at 2607m MDRT is associated with a coal interbed within the Lower Hildasay Sandstone.

The first formation gas & trip gas peaks were recorded withing the Flett Basalt Series (downhole from 2811m MDRT) in the 12 ¼" hole section with 0.15% over a background of 0.05% total gas and a composition of predominantly C1 (926ppm) with minor/trace C2-C5s.

Three prominant gas zones are recognized in the 6004/8a-1 well. The upper gas show interval (**"Flett 1" Gas zone**) was recorded from 2854m to 2965m MDRT (-2815.2m to -2926.2m TVDSS) over the Flett Volcanic Series of Basalts and Tuffs, with significant formation gas peaks of 1.0%, 4.7%, 16.2% and 1.4% over background levels of to 1.0% to 3.7%. Gas compostion at the largest gas peak (16.2% total gas) was C1 112358ppm; C2 3690ppm; C3 1537ppm; iC4 305ppm; nC4 517ppm; iC5 191ppm and nC5 203ppm, and gas ratio analysis indicates a Wet Gas hydrocarbon type. Also recorded over this interval are significant connection gases of 13.8% to 1.4% which are seen to decrease with depth and are not interpreted as a result of increasing pore pressure, but a reflection of formation 'ballooning' with losses/gains while drilling.

The middle gas show interval (**"Lamba 1" Gas zone**) was recorded in the 8 ½" hole section from 3391m to 3480m MDRT (-3352.3m to -3441.3m TVDSS) over the Lamba Lower Faroe Lavas, with abundant crystalline grains recorded in the cuttings and cored by a 10.75m bottom hole core. Significant formation gas peaks of 4.3%, 5.9% and 2.0% over background levels of 0.6% to 2.5%. Gas compostion at the largest formation gas peak (5.9% total gas) at 3404m was C1 55506ppm; C2 1517ppm; C3 474ppm; iC4 80ppm; nC4

122ppm; iC5 39ppm and nC5 31ppm, and gas ratio analysis indicates a Wet Gas hydrocarbon type.

The 8 ½" section recorded both losses (rate of 32m3/hr) and gains from 3122m MDRT. Typical connection and pumps-off gas levels recorded were between 0.4% and 1.9%, plus locally up to 6.2% and appeared to show a reduction with depth trend. The connection gases recorded in the upper part of the 8 ½" section and over the Lamba 1 Gas zone are associated with wellbore 'ballooning' and not drilling with a mud weight close to balance.

The lower gas show interval (**"Lamba 2" Gas zone**) was recorded from 3734m to 3770.5m and continued to well TD at 3941m MDRT (-3694.6m to -3901.1m TVDSS) over the basal Kettla Tuff Member (Lamba Formation) and Vaila Formation. Major gas peaks of 24.5% (bottoms up gas) and 25.7% (formation gas) resulted in the well being closed and the gas being circulated through the choke. The composition of the 25.7% formation gas peak was C1 183582ppm; C2 6587ppm; C3 2670ppm; iC4 531ppm; nC4 998ppm; iC5 470ppm and 507ppm, and gas ratio analysis indicates a Wet Gas hydrocarbon type.

At 3740m MDRT 3.5m3 of mud was lost to the formation, followed (after a flow check) by a gain of 0.4m3 over 15mins. When drilling resumed, a series of significant pumps-off and connection gases (30.4% to 19.8%) were recorded, and below 3826m MDRT these reduced to 11.8% to 1.5%. There was no increasing gas levels with depth trend and the connection/pumps-off gases recorded in the lower part of the 8 ½" section and over the "Lamba 2" Gas zone are likely to be associated with wellbore 'ballooning' and not drilling with a mud weight close to balance. Increase pore pressure cannot be discounted in this basal interval as the Kettla Tuff is a regional pressure barrier.

Note, downhole from 2845m to well TD at 3941m MDRT, there were no water leg gas composition signatures recorded (e.g. very low total gas with only minor C1 values). Background Gas and Gas Peaks for the 6004/8a-1 well are summarized in the following tables:

Background Gas: 17 ½" Section (mudweight 1.15sg)

Top Depth MDRT (m)	Base Depth MDRT (m)	Total Gas %	C1 ppm	C2 ppm	C3 ppm	IC4 ppm	NC4 ppm	IC5 ppm	NC5 ppm
1607	2361	0.005	7	0	0	1	0	0	1

Background Gas: 12 ¼" Section Section (mudweight 1.22sg)

Top Depth MDRT (m)	Base Depth MDRT (m)	Total Gas %	C1 ppm	C2 ppm	C3 ppm	IC4 ppm	NC4 ppm	IC5 ppm	NC5 ppm
2361	2605	0.01	20	1	2	1	1	1	1
2605	2811	0.04	153	18	9	3	7	2	3
2811	2852	0.05	293	16	2	0	1	0	0
2852	2867	1.03	6132	193	71	12	19	5	5
2867	2922	3.73	20548	747	319	62	118	52	58
2922	2950	1.34	7470	275	111	22	46	23	26
2950	3022	0.44	2786	80	29	5	10	5	6
3022	3097	0.18	1164	31	8	2	4	2	2

Background Gas: 8 ½" Section (mudweight 1.30sg to 1.31sg)

Top Depth MDRT (m)	Base Depth MDRT (m)	Total Gas %	C1 ppm	C2 ppm	C3 ppm	IC4 ppm	NC4 ppm	IC5 ppm	NC5 ppm
3097	3270	0.20	1900	26	5	0	0	0	0
3270	3392	0.40	3650	60	15	1	1	1	1
3392	3420	2.50	23700	600	200	30	50	11	11
3420	3500	0.25	2320	60	20	2	2	2	2
3500	3604	0.10	930	90	21	4	13	2	2
3604	3650	0.20	1500	220	50	35	2	2	2
3650	3660	0.08	482	204	23	27	1	0	0
3660	3706	0.03	187	47	3	0	4	1	1
3706	3716	0.03	187	47	3	0	4	1	1
3716	3740	0.06	650	8	3	0	4	0	0
3740	3743	8.42	61958	3133	1198	722	306	436	482
3743	3751	15.02	113693	4034	1796	930	458	414	414
3751	3760	5.28	37991	1321	603	174	390	271	316
3760	3763	4.23	29223	1032	489	147	338	243	286
3763	3768	3.45	19880	675	331	92	226	180	223
3768	3770	5.56	40161	1277	516	112	253	190	234
3770	3771	10.70	83930	2313	1029	533	237	338	394
3771	3774	5.90	49487	1506	624	132	279	213	263
3774	3857	1.60	10089	303	127	24	52	44	57
3857	3941	0.95	7839	243	110	15	38	15	16

Gas peaks

Depth MDRT (m)	Type	Total Gas %	Back-ground %	C1 ppm	C2 ppm	C3 ppm	IC4 ppm	NC4 ppm	IC5 ppm	NC5 ppm	Formation
2811.0	TG	0.1560	0.0454	902	59	23	5	12	2	3	Flett U. Faroe Lavas
2822.0	FG	0.1419	0.0417	926	61	9	1	4	0	1	Flett (Massive Tuff)
2856.0	FG	1.0338	0.0602	6561	198	74	10	17	4	3	"Flett 1"
2862.0	FG	4.7028	0.0947	24496	813	322	59	96	28	26	"Flett 1"
2869.0	FG	16.203 4	0.2550	112358	3690	1537	305	517	191	203	"Flett 1"
2873.3	CG	13.785 5	9.8205	94878	3255	1318	259	432	158	167	"Flett 1"
2898.2	CG	4.5324	1.9022	23164	866	393	78	148	63	71	"Flett 1"
2926.0	CG	2.4950	1.9024	13316	487	201	40	76	36	41	"Flett 1"
2953.0	CG	1.3688	0.4490	7723	266	103	20	36	17	20	"Flett 1"
2962.0	FG	1.4542	0.3572	8342	289	136	25	50	20	22	"Flett 1"
2979.0	PO	1.1946	02968	6675	240	98	17	27	9	9	Lamba Tuff Mbr
2982.0	CG	1.1502	0.3022	6677	225	90	14	22	7	7	Lamba Tuff Mbr
3009.6	CG	1.0886	0.2644	6451	214	77	11	18	5	4	Lamba Tuff Mbr
3027.7	PO	0.4484	0.1605	2779	94	30	4	7	4	3	Lamba Tuff Mbr
3037.7	CG	0.7714	0.1844	4893	165	59	8	16	5	5	Lamba Tuff Mbr
3041.0	PO	0.4148	0.1200	2667	88	28	4	8	4	3	Lamba Tuff Mbr
3065.5	PO	0.6110	0.2030	4218	131	48	7	11	6	7	Lamba Tuff Mbr
3065.7	CG	1.4480	0.2030	8899	249	88	11	19	7	7	Lamba Tuff Mbr
3092.0	CG	0.4377	0.1293	2629	102	33	5	12	4	4	Lamba Tuff Mbr
3176.0	FG	0.83	0.20	6079	65	12	1	2	1	1	Lamba Tuff Mbr
3184.0	PCG	1.8557	0.20	12330	142	23	3	4	0	1	Lamba Tuff Mbr
3214.0	PCG	6.2475	0.29	36726	694	219	36	55	13	12	Lamba Tuff Mbr
3231.0	BU	3.1561	0.42	19496	361	105	16	24	6	5	Lamba Tuff Mbr
3235.0	BU	0.3582	0.10	3290	40	7	0	1	0	1	Lamba Tuff Mbr
3238.0	FG	1.7276	0.07	16986	217	36	4	7	0	1	Lamba Tuff Mbr
3242.0	POG	1.71	0.12	16478	207	34	4	6	1	0	Lamba Tuff Mbr
3270.0	PCG	1,67	0.09	16360	191	28	3	5	0	0	Lamba Tuff Mbr
3299.0	PCG	1,54	0.20	15029	178	27	3	5	0	1	Lamba Tuff Mbr
3327.0	PCG	1.5317	0.37	12683	144	25	2	5	1	1	Lamba Tuff Mbr
3382	PCG	1.1429	0.50	10800	127	23	3	5	1	1	Lamba Tuff Mbr
3393-3399	FG	4.3007	0.60	40637	911	262	41	62	20	16	"Lamba 1"
3403-3406	FG	5.8900	3.52	55506	1517	474	80	122	39	31	"Lamba 1"
3402.0	BU	2.01	0.50	18491	305	90	16	24	11	10	"Lamba 1"
3412.0	BU	1.38	0.90	13040	159	29	5	7	4	6	"Lamba 1"
3415.0	FG	2.13	0.20	18532	557	192	33	51	15	12	"Lamba 1"
3423.0	BU	1.35	0.17	12442	159	35	5	10	4	5	"Lamba 1"
3437.0	PCG	1.90	0.32	17474	441	150	26	41	14	12	Lamba L. Faroe Lavas
3465.0	PCG	1.80	0.22	17061	293	96	15	25	9	7	Lamba L. Faroe Lavas
3492.0	PCG	1.14	0.30	11125	131	38	5	14	4	4	Lamba L. Faroe Lavas

3520.0	PCG	1.23	0.03	11078	107	22	2	6	1	0	Lamba L. Faroe Lavas
3532.0	POG	0.55	0.40	5323	56	12	0	4	0	0	Lamba L. Faroe Lavas
3543.0	POG (FC)	0.79	0.10	7690	74	18	1	6	0	1	Lamba L. Faroe Lavas
3548.0	PCG	0.84	0.79	8138	74	20	1	7	0	1	Lamba L. Faroe Lavas
3575.0	PCG	0.81	0.14	7911	66	23	2	11	0	0	Lamba L. Faroe Lavas
3604.0	BU	1.85	0.63	17975	230	46	4	11	1	4	Lamba L. Faroe Lavas
3606.0	PCG	0.6955	0.07	6880	80	26	2	10	1	1	Lamba L. Faroe Lavas
3614.0	FG	0.8349	0.23	7309	254	109	12	40	7	7	Lamba L. Faroe Lavas
3631.0	PCG	0.74	0.21	6599	189	48	3	40	2	2	Lamba (Kettla Tuff)
3661.0	PCG	0.58	0.08	5633	189	36	0	30	1	1	Lamba (Kettla Tuff)
3665.0	BU	1.95	0.31	17862	209	37	2	5	0	0	Lamba (Kettla Tuff)
3688.0	PCG	1.10	0.08	10424	106	22	2	7	2	3	Lamba (Kettla Tuff)
3716.0	PCG	1.84	0.03	17862	171	29	1	5	0	1	"Lamba 2"
3730.0	FG	0.82	0.05	7724	211	72	6	13	4	3	"Lamba 2"
3740.0	BU	24.5	0.06	104161	8692	8304	3097	7027	3703	3703	"Lamba 2"
3742.0	FG	25.67	13.7	183582	6587	2670	531	998	470	507	"Lamba 2"
3744.0	FG	26.6	11.3	190337	6298	2505	467	879	359	385	"Lamba 2"
3749.0	FG	24.4	15.2	177598	5398	1964	344	668	323	364	"Lamba 2"
3770.0	FG	13.35	5	90277	3886	1784	422	865	430	454	"Lamba 2"
3770.0	POG	30.4	5	219032	7288	2801	487	850	348	375	"Lamba 2"
3771.0	PCG	19.79	3.3	164188	5618	2617	503	897	423	447	Vaila
3786.0	POG	14.2	0.87	118523	3262	1195	187	316	149	176	Vaila
3794.6	FG	1.518	1.09	11636	355	147	22	46	47	64	Vaila
3801.6	PCG	20.73	3.4	185860	6324	2721	479	784	262	260	Vaila
3826.0	POG	10.5	0.5	902554	2554	940	145	237	74	75	Vaila
3829.0	PCG	4.6	0.5	40104	1072	413	57	103	38	43	Vaila
3838.0	POG	3.63	0.64	30417	830	343	51	96	36	38	Vaila
3857.0	POG	11.790	0.38	103537	2899	1107	171	277	77	71	Vaila
3857.0	PCG	9.8879	0.38	86503	2450	933	141	236	70	68	Vaila
3883.0	PCG	3.96	0.57	35909	961	375	50	95	27	25	Vaila
3891.0	POG	2.74	0.49	24989	685	272	34	75	22	23	Vaila
3907.0	POG	1.61	0.55	14134	431	215	24	64	20	20	Vaila
3911.0	PCG	3.62	0.86	33688	914	377	48	101	26	28	Vaila
3913.0	POG	11.06	0.91	99105	2474	846	126	207	55	50	Vaila
3938.7	PCG	2.1492	0.37	19944	517	199	24	55	18	18	Vaila
3941.0	POG	1.5550	0.34	14504	396	148	17	37	16	16	Vaila
3941.0	WTG	10.06	0.34	95208	2707	969	147	239	63	54	Vaila

H_2S & CO_2

There were no indications of H_2S or CO_2 recorded while drilling the well.

11. PRESSURE AND TEMPERATURE ENVIRONMENT

11.1 Formation pressure

Pore Pressure Interpretation

Geoservices mudlogging pore pressure interpretation while drilling is summarized below:

17 ½" section (1607m - 2361m MD)

- The Dxc data trend was well developed and exhibited a normal compaction trend within the predominantly Claystone intervals. Minor defluxions from the established trend can be attributed to lithological variations such as the presence of localized sandstones.
- Formation gas levels were extremely low throughout the section with an average of 0.005%. There was no formation gas peaks, no connection or trip gas detected.
- Low temperature was showed for the section due to the length of the riser (1145m). The mud was cooled down on the way in and out. The MWD temperature ranged from around 12°C to 15°C by the section TD.
- No pressure cavings seen in this section.
- No evidence that the pore pressure of the section was greater than he prognosis.

12 ¼" section (2361m – 3097m MD)

- Dxc data trend was well developed and exhibited a normal compaction trend within the Claystone (Tuff), Sandstone intervals.
- Formation gas levels were ranged from 0.01% to 3.7%. Only two significant formation gas peaks were detected with a maximum of 16.20% at 2869m and 4.70% at 2862m. A few connection or pump off gases was detected due to some fractures, losses were observed at the same time.
- Low temperature was showed for the section due to the length of the riser. The MWD temperature ranged from around 15°C to 33°C by the section TD.
- No significant pressure or mechanical caving observed in this section.
- No evidence whilst drilling to suggest that the pore pressure for this section was greater than the prognosis.

8 ½" section (3097m – 3941m MD Drillers TD)

- Dxc trend was initially well developed and exhibited a normal compaction trend within tuffaceous siltstone and tuffaceous Claystone with coarse volcanoclastics locally interpreted as sandstones. Significant shift from the established trend from 3412m onwards is attributed to the coring run.

- Formation gas levels in the upper part of the section (3097m – 3740m MD) ranged from 0.20% to 2.50%. Only two significant formation gas peaks were encountered with 4.30% at 3395m and 5.89% at 3404m. In the lower part of the section (3740m – 3941M MD), background gas level ranged from 1.0% to 15.0%. Four significant formation gas peaks were detected with 25.67% at 3742m, 26.62% at 3744m, 24.46% at 3749m and 13.35% at 3770m.
- The MWD temperature ranged from around 33°C to 47°C by the section TD. Due to the length of the riser, no reliable trend can be identified from the mud temperature data.
- No pressure or mechanical caving observed in this section.
- No evidence whilst drilling to suggest that the pore pressure for this section was greater than the prognosis but from 3740m MD to the well TD, connection gases showed that the calculated pore pressure was very close to the 1.3 sg mud weight.

Wireline Formation Pretests

Direct formation pressure measurements were attempted with the Schlumberger MDT wireline tool in both 12 ¼” (Run 1C) and 8 ½” sections (Run 2E). Results are summarized in the following table and presented in the Pressure Vs depth plot. Note, there was no strain gauge pressure measurement as back up during Run 1C due to a failure.

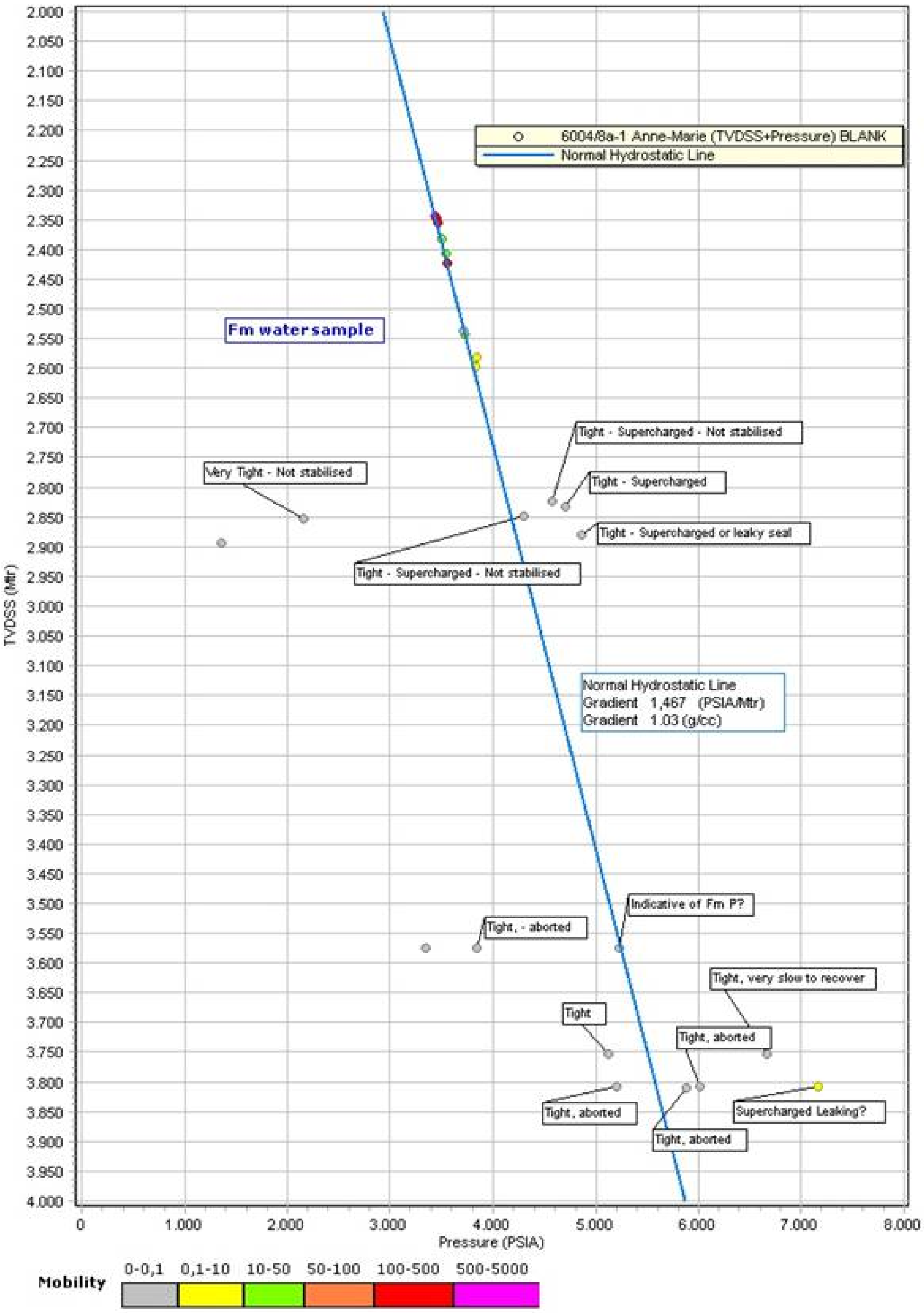
Reliable pore pressure data, as showed also in the Geopressure Gradient plot were achieved only in the Balder-flett formation section where essentially a normal hydrostatic pressure regime is present.

In the *Flett 1 gas shows* interval of the Flett Upper Faroe Lavas the acquisition of the MDT was constrained by the hole conditions; the obtained pressure values are not reliable (supercharged or not stabilized) and could indicate a possible hydrocarbon buoyancy effect in a tigh formation.

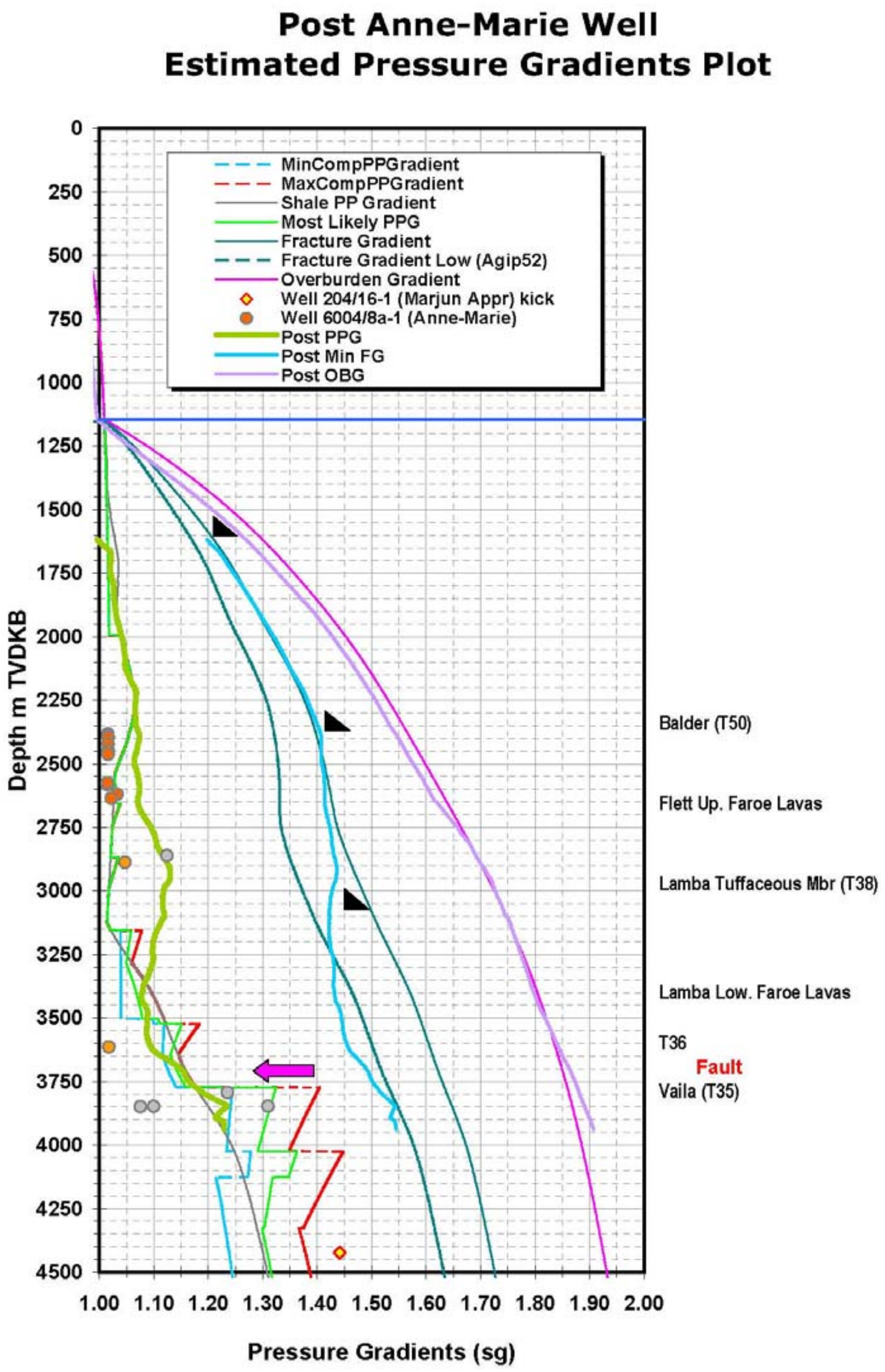
In the *Lamba 1 gas shows* interval of the Lower Faroe Lavas Member no pre-test was attempted due to the severe washouts present especially above the bottom hole cored interval. The 8 ½” section MDT Run 2E, even if the tool was working properly, did not achieve any reliable formation pressure value after a lot of attempts that resulted in a lot of lost seals or tight – supercharged measure points. Only the first build up of the pre-test at 3614.3m MD (-3575.1m) could give an indication that at that depth the pore pressure regime is still near normal.

The evaluation of the pore pressure gradient during the drilling operations was affected by the thickness of the basalts, tuffs and volcaniclastics that resulted significantly higher than in the prognosis, however produced a profile that is quite in line with the pre-drill estimated pore pressure gradient confirming the increase of pressure regime in the Vaila formation where a maximum value of 1.23 sg was reached.

Well 6004/8a-1 Pressure Vs Depth Plot



Well 6004/8a-1 Gepressure Gradients Plot



Run No.	Test		Depth		Time (hrs - min)			Hydrostatic (Before)		Formation Pressure		Hydrostatic (After)		Mobility (mD/cP)	Temp (degC)	DD (cc)	Remarks	Zone
	No.	File	MDRT (m)	TVDSS (m)	Start	End	Duration	SG (psia)	CQG (psia)	SG (psia)	CQG (psia)	SG (psia)	CQG (psia)					
1C	1	10	2383.0	-2344.2	10:35	10:48	13	Failed	4196.5	Failed	3442.6	Failed	4196.7	3452.6	51.9	17	Good Test	T12
1C	2	11	2387.0	-2348.2	10:58	11:07	9	Failed	4203.4	Failed	3448.4	Failed	4203.2	111.3	51.4	20	Good Test	T12
1C	3	12	2395.0	-2356.2	11:18	11:32	14	Failed	4217.2	Failed	3460.9	Failed	4217.7	157	51.1	20	Good Test	T12
1C	4	14	2422.0	-2383.2	11:49	12:07	18	Failed	4264.8	Failed	3499.9	Failed	4264.5	26.6	51.3	20	Good Test	T11
1C	5	15	2447.0	-2408.2	12:12	12:23	11	Failed	4308.3	Failed	3536.2	Failed	4308.2	41.2	51.6	15	Good Test	T11
1C	6	16	2463.0	-2424.2	12:30	12:40	10	Failed	4336.1	Failed	3559.4	Failed	4336.1	103.3	52.0	15	Good Test	T11
1C	7	21	2574.0	-2535.2	13:25	13:37	12	Failed	4527.9	Failed	3715.7	Failed	4527.4	12.6	55.2	17	Good Test	T11
1C	8	22	2581.0	-2542.2	13:44	13:54	10	Failed	4539.9	Failed	3725.7	Failed	4539.9	57.6	55.8	17	Good Test	T11
1C	9	24	2619.2	-2580.4	14:17	14:40	23	Failed	4606.1	Failed	3847.7	Failed	4605.8	0.2	56.9	10	Low K-Supercharged Not fully stabilised	T11
1C	10	25	2635.0	-2596.3	14:44	15:01	17	Failed	4633.3	Failed	3830.0	Failed	4633.6	0.2	57.5	9	Very low K – Supercharged?	T11
1C	11	30	2861.2	-2822.5	16:07	17:03	56	Failed	5025.6	Failed	4575	Failed	5025.5	N/A	64.6	7	Tight - Supercharged - Not stabilised	?T11
1C	12	31	2867.5	-2828.8	17:36	17:47	11	Failed	5036.4	Failed	N/A	Failed	5036.4	N/A	64.9	5	Lost Seal	?T11
1C	13	35	2871.5	-2832.8	18:12	18:36	24	Failed	5043.2	Failed	4707.8	Failed	5043.4	N/A	66.6	7	Tight - Supercharged	?T11
1C	14	36	2888.0	-2849.2	18:54	19:21	27	Failed	5072.2	Failed	4300.7	Failed	5071.9	N/A	67.3	4	Tight - Supercharged Not stabilised	?T11
1C	15	40	2892.7	-2854.0	19:44	19:54	10	Failed	5080.4	Failed	2160.	Failed	5080.4	N/A	67.7	2	Very Tight Not stabilised	?T11
1C	15a	41	2892.0	-2853.2	19:56	20:01	5	Failed	5079.2	Failed	N/A	Failed	5079.2	N/A	67.8	5	Lost Seal	?T11
1C	16	48	2912.2	-2873.5	20:52	20:59	7	Failed	5115.5	Failed	N/A	Failed	5115.7	N/A	70.5	8	Lost Seal	?T11
1C	17	51	2914.7	-2876.0	21:36	21:42	6	Failed	5120.2	Failed	N/A	Failed	5120.0	N/A	69.7	2.2	Lost Seal	?T11
1C	8a	54	2581.0	-2542.3	22:01	22:06	5	Failed	4539.3	Failed	3724.8	Failed	4539.0	27.0	67.1	7	Re-test for packer check, due to lost seals -OK	T11
1C	18	58	2918.5	-2879.7	23:10	23:37	27	Failed	5126.2	Failed	4857.8	Failed	5126.5	N/A	67.7	5	Tight - Supercharged or leaky seal	?T11
1C	19	59	2920.0	-2881.2	23:42	01:21	39	Failed	5129.0	Failed	N/A	Failed	5128.8	N/A	68.9	5	Lost Seal – Slow rec. to hydrostatic	?T11

Run No.	Test		Depth		Time (hrs - min)			Hydrostatic (Before)		Formation Pressure		Hydrostatic (After)		Mobility (mD/cP)	Temp (degC)	DD (cc)	Remarks	Zone
1C	20	60	2932.0	-2893.2	00:50	00:54	4	Failed	5150.0	Failed	1359.3	Failed	5149.8	N/A	69.6	7	Very Tight Not stabilised	?T11- ?T9
1C	21s	69	2574.0	-2535.2	01:51	09:57	486	Failed	4525.0	Failed	3715.7	Failed	4524.8	N.R.	58.4	-	Fluid sample: N.1 MRSC (1gal) + N.1 SPMC (450cc)	T11
2E	1	12	3794.0	-3754.4	20:10	20:22	12	7088.4	7087.7	N/A	N/A	7089.8	7088.2	N/A	101.9	-	Lost Seal	T6
2E	1a	13	3794.1	-3754.5	20:25	20:37	12	7090.3	7089.3	5125.3	5124.5	7090.2	7088.9	0.01	101.7	1.4	Tight, very slow to recover. 8psi / 9 sec	T6
2E	1b	14	3793.8	-3754.2	20:40	21.15	35	7089.4	7088.4	6663.8	6662.9	7088.6	7087.6	0.01	102.2	4	Tight, very slow to recover. 2psi / 2 sec	T6
2E	1c	15	3794.5	-3754.9	21:18	21:35	17	7090.0	7089.3	N/A	N/A	7089.6	7089.2	N/A	103.0	2	Lost Seal	T6
2E	1d	16	3794.2	-3754.6	21:40	21:47	7	7089	7088.8	N/A	N/A	7089.6	7088.9	N/A	103.2	-	Lost Seal	T6
2E	2	17	3847.5	-3807.8	21:50	22:00	10	7190.2	7189.9	7167.2	7166.4	7188.4	7187.5	1.3	105.7	5	Supercharged Leaking?	T6
2E	3	19	3848.5	-3808.8	22:43	22:50	7	7192.5	7191.3	6019.2	6018.1	7190.8	7189.9	0.02	105.2	3.5	Tight, very slow to recover, 7psi/9sec, aborted	T6
2E	3a	20	3848.3	-3808.6	22:55	23:05	10	7190.5	7189.9	5197.5	5197.2	7190.1	7189.2	0.01	105.8	4.9	Tight, very slow to recover, 2psi/9sec, aborted	T6
2E	4	21	3850.0	-3810.3	23:18	23:37	19	7194.4	7193.2	5887.1	5886.7	7193.1	7192.4	N/A	106.9	5	Tight, very slow to recover, 7psi / 9sec, aborted	T6
2E	5	23	3614.5	-3575.3	23:55	0:05	10	6766.6	6763.8	3842.6	3841.5	-	-	N/A	97.0	5	Tight, - aborted	T8-?T7
2E	5a	24	3614.3	-3575.1	00:15	00:35	20	6763.8	6762.6	5231? 3349.8	5230 3349.4	6764.1	6763.2	N/A	96.0	5	1st bu ~5230 psia, 2nd bu 3349 psia, Tight – 6psi / 9sec	T8-?T7

11.2 Fracture pressure

Casing			Hole			Formation	Test	EMW (sg)
Shoe	Depth MDRT	Depth TVDSS	Size	Depth MDRT	Depth TVDSS			
20″	1601.0m	-1562.3m	17 ½″	1610m	-1571.3	Stronsay Gp	LOT	1.20
13 3/8″	2356.7m	-2317.9m	12 ¼″	2364m	-2325.3	Balder Fm.	LOT	1.40
9 5/8″	3093.5m	-3054.7m	8 ½″	3102m	-3063.2	Lamba Tuffaceous Member	LOT	1.62 (1.41)*

*Closure pressure 1.41 sg EMW.

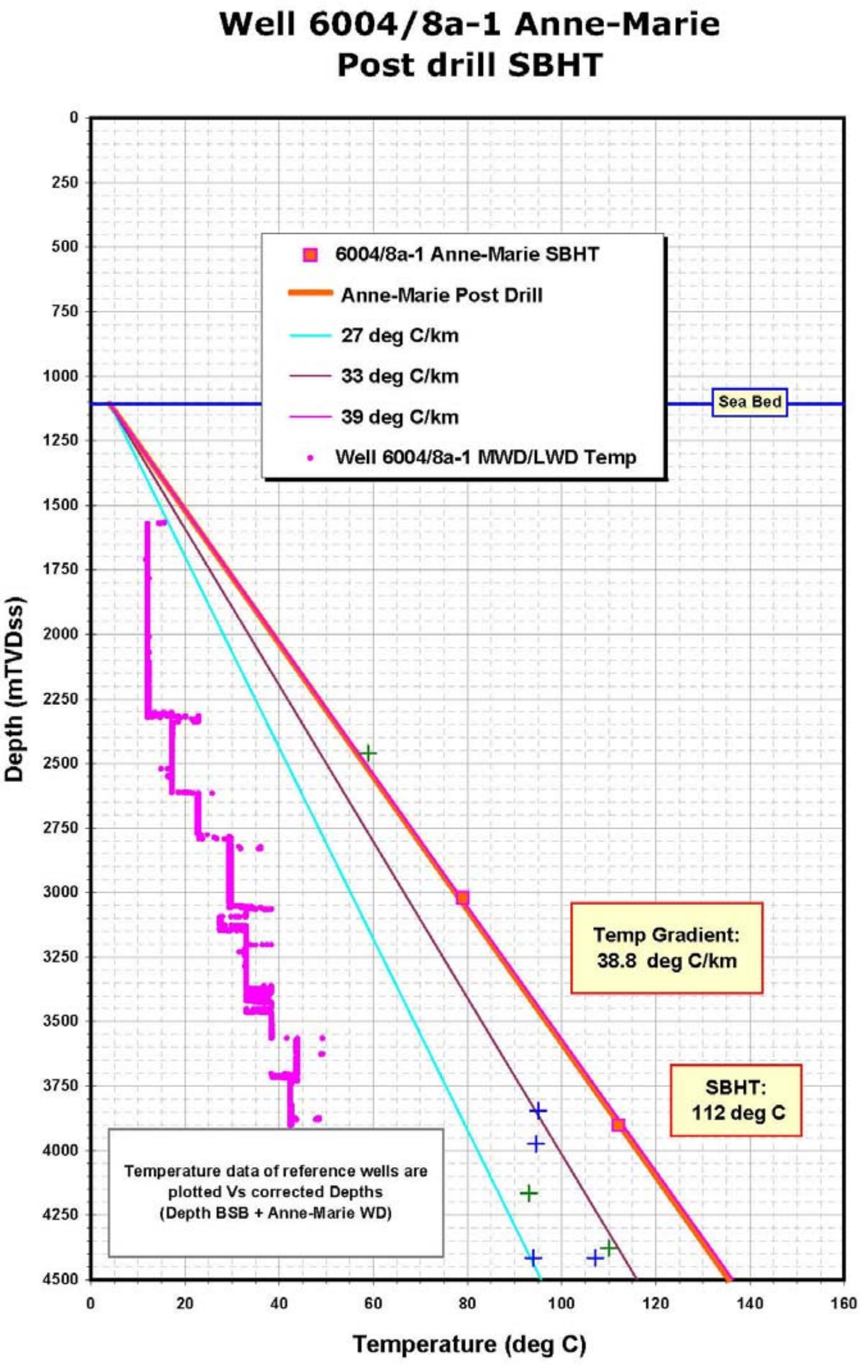
11.3 Temperature

Temperatures were recorded by both LWD and wireline tools. The maximum downhole temperature recorded While Drilling was 48 °C approaching well TD. The wireline cable head temperatures are summarized below and the maximum was 107 °C at 3810.3m TVDSS (loggers depth).

Run	Tool String	Time Circulation Stopped	Time Logger on bottom	Time since Circulation	Cable head Thermometers (maximum reading °C)			Depth m MDBRT (m TVDSS)
1A	FMI-DSI-GR-EDTC	02:00hrs 24-Sep-10	23:00hrs 24-Sep-10	21 hrs 23 mins	60	60	60	3099 m (-3060.2 m)
1B	SP-CMR-HRLA-TLD-APS-HNGS-EDTC	02:00hrs 24-Sep-10	22:22hrs 25-Sep-10	44 hrs 22 mins	70	70	70.5	3097 m (-3058.2 m)
1C	PQ-HY-PO-BA-LFA-CFA-SC-MS-MS-GR (MDT)	02:00hrs 24-Sep-10	00:50hrs 27-Sep-10	70 hrs 50mins	70	70	70	2932 m (-2914.2 m)
1D	MSCT-GR-ECRD	02:00hrs 24-Sep-10	17:00hrs 27-Sep-10	87hrs 00mins	78	78	78	3072 m (-3033.2 m)
2A	FMI-DSI-GR-EDTC	07:00hrs 24-Oct-10	00:39hrs 25-Oct-10	17 hrs 39 mins	97	97	97	3943 m (-3904.4 m)
2B	SP-HRLA-TLD-APS-HNGS-ACTS-ECRD	07:00hrs 24-Oct-10	09:20hrs 25-Oct-10	26 hrs 20 mins	98	98	98	3931 m (-3891.0 m)
2C	VSI-GR-ACTS-ECRD	07:00hrs 24-Oct-10	21:00 hrs 25-Oct-10	38 hrs 00 mins	97.7	104 Bottom receiver		3935 m (-3895 m)
2D	MSCT-GR-ECRD	07:00hrs 24-Oct-10	08:27hrs 26-Oct-10	49 hrs 27 mins	98	98	98	3905 m (-3865.1 m)
2E	PQ-HY-AFA-PO-CGA-SC-MS-GR-EDTC (MDT)	07:00hrs 24-Oct-10	23:30hrs 26-Oct-10	64 hrs 30 mins	107	107	107	3850 m (3810.3 m)

Calculated Static Bottom Hole Temperatures at TD from the wireline data gives an extrapolated BHT of 112 °C at 3901m TVDSS. This gives a temperature gradient of about 3.88°C /100m from seabed (estimated seabed temperature of 4°C at 1106m below MSL). This is above the pre-drill estimation.

Well 6004/8a-1 Temperature Plot



12. WELL DATA ACQUISITION SERVICES

Geological data acquisition was primarily acquired using Geoservices mud logging systems, Pathfinder MWD and LWD systems, Schlumberger wireline, Ichron biostratigraphy analysis and Halliburton coring. These services were all quality controlled and supervised by the well site geologist.

12.1 Mudlogging Services

Mudlogging services were provided by Geoservices. Drilling and other related operations were continuously monitored from spud to TD using an advanced surface fully computerised mudlogging unit, with basic pressure evaluation service and high resolution chromatograph. Geoservices provided a geoNEXT V2 (version 4.5.19) service from the spud to well TD.

Gas Equipment

Chromatograph Type	Reserval with integrated Total Gas Detection (FID system)
Chromatograph Cycle Time	42 seconds
Total Gas Type	Integrated with Chromatograph
Gas Trap Type	GZG (Constant volume flow degasser)
Gas Trap Location	Flow line / Shakers & Active pit (Plus another spare in Shakers)
H2S Location	In Gasline In & Out

The rig layout was slightly unconventional on the West Phoexix with the systems operators' office being located separately from the actual logging unit in the accomadation offices.

The crew comprised:

- 2x Systems Operators from spud to first returns.
- 2 x Systems Operators and 2 Logging Geologists from first returns to 13 3/8" shoe.
- 2 x Systems Operators and 4 Logging Geologists from 13 3/8" shoe to well TD.

Mudlogging Crew

Systems Operators	Logging Geologists	
Gerard Guinel	Slawomir Borzynski	Tonnes Nilsen
Christophe Ageorges	Per Erik Glaerum	Ole Andreas Dahl
Tomasz Liszka	Even Hansen	Thomas Cronqvist
Piotr Chwil	Ahmed Iman Osman	Mabne Stensland
Ronny Sandslett	Lena Schilling	

Drilled cuttings were collected from first returns to TD for lithological analysis, and for show evaluation. A summary of the drilling data, sample descriptions and interpretation is presented in the Geoservices Final Well Report, which includes the mudlogger's Master Log, the Formation Pressure Log and the Drilling Parameters Log. In addition, ASCII data of selected drilling parameters and drill gas data was provided.

Samples

Geoservices Mudlogging were responsible for collecting and processing four sets of unwashed (Sample Sets A, B, C and D) and four sets of washed/dried cuttings (Sample Sets E, F, G and H), plus one large volume 5 kg composite set for drilling mud optimization studies (Sample Set I). Samples were collected from first returns at 1610 m to well TD at 3941 m. Sample frequency is summarized below:

Well	Depth Interval	Sample Frequency
6004/8a-1	1610m to 2360m MDRT	10m
	2360m to 2874m MDRT	5m
	2874m to 3941m MDRT TD	3m

Please refer to section 13.1 for a complete listing of samples collected for each box and dispatch address.

Geoservice were also responsible for collecting representative drilling samples and drill gas (head space and gas peaks) at the wellsite. The drilling mud samples were collected during drilling, at significant gas peaks, during coring operations while the core was being broken-down on surface and prior to wireline logging operations at the following depths (summarized in section 13.7).

The drill gas samples were collected in vacutainer vials and taken either at 20 m intervals from 2610 m or at gas peaks. The head space gas samples were collected at 15 m intervals to 2865 m and then at 9 m intervals to well TD, plus three additional ones were taken at gas peaks. The gas samples acquired are summarized in section 13.6.

Mudlogging Contractor Performance

Highlights

- The Eni wellsite geologists reported that overrall Geoservices provided a good level of service on the well.
- All the Systems Operators and Logging Geologists had been involved in wells prior to Anne-Marie on the West Pheonix which was very beneficial.
- Setting up of reporting formats initially took some time to finalise. When completed all required data was generally delivered on time each day to agreed deadlines on time.
- The crews were communicative and worked professionally and with minimal supervision. Communication with the Systems Operators was made easier by the fact there office was only a short distance away from the wellsite geologists office.
- The Systems Operators provided an excellent summary report of events (at the start of the 8 ½" section) during the losses/gains which were used by the drilling supervisors and onshore teams to conclude the well was ballooning and not in an overpressure/kick-situation.
- Despite the Logging Geologists being "unsupervised" due to the Systems Operators being based in the offices, there were no problems encountered with this rather unusual set up.
- The Mud loggers showed good awareness of subtle lithology changes and were quick to report and any changes in lithology and drilling parameters. They coped well with the volcanic sequences despite having little or in some case no experience through such lithologies.
- Despite the comprehensive samping programme the Logging Geologists and additional Sampe Catchers coped well with the associated requirements.
- Equipment-wise no major equipment issues were experienced.
- Gas monitoring was efficient; the gas trap was checked by the mud loggers at regular intervals.
- Gas calibrations were carried out on a regular basis to ensure accurate measurements.
- The crews worked safely and played an active part in both Eni's and the drilling contractor's safety culture.

Lowlights

- The Eni geologist reported minor issue with checking the position of the degasser probe and making sure the degasser probe was clean.
- Geoservices provided an electronic weighing scale, which was affected by rig heave and could not give an accurate enough reading when looking for a 1-2g sample. If calcimetry information is critical, then for drilling operations on similar rigs, calcimetry analysis should be done onshore.
- Between 2650 to 2667 m the C1 & C2 values were wrong due to incorrect chomatagraph settings. Between 3097 to 3235 m total gas figures were reading artificially high.

- A new update patch was installed on the logging software prior to the start of drilling. These caused problems after spud of the well and prevented the Masterlog being generated. In future any updates should not be done prior to well spud and the system thoroughly tested.
- During drilling of the 12 ¼" section Geoservices experienced several faults where computer system memory was at full utilization, causing the loss of computed data whilst drilling.
- In the Basalt section, with low ROP's a number of very high ROP figures were recorded by Geoservices (up 1200 m/hr) this was caused by the on-off bottom threashold being too fine to cope with low ROP and large rig heave (a period of bad weather was approaching the rig – during which the riser was unlatched from the BOPS). The settings were altered to take this into account.
- The drill floor experienced numerous IT issues with the systems for depth tracking, hookload monitoring and other systems, whilst working on the rig computer systems Geoservices occasionally lost depth tracking, hook load data and on one occasion lost communicatio with the mud logging unit and therefore gas data. Fortunately this incident occurred when the LMRP was disconnected and no drilling operation was ongoing. The fix was for Schlumberger in Aberdeen to remotely re-boot a switch between the fibre optic cable and analogue switch unit in the accommodation. This particular problem would appear to have been caused by someone unplugging the fibre optic cable (it runs through the rig floor systyems) without turning off the switches.
- There was some confusion with the base in town as to what equipment items had been ordered and shipped.
- Incomplete listing of samples collected for manifests.

12.2 MWD / LWD

The well was designed as a vertical hole. The MWD and LWD service was provided by Pathfinder.

All well surveys were acquired by MWD and listed in Appendix D. Surveys taken within the basalts and tuffs will have been influenced by the magnetic properties of these volcanic rocks which retain the field readings at the time they cooled, with the iron minerals affecting the MWD magnetometers or compass results. Pathfinder report that the magnetic QC readings (TMF, MDIP) on these surveys showed slight deviation from the BGS model and previous values and a small azimuth error would be expected if compared to gyro survey data.

Overview

The well was spudded vertically in 26"/36"/42" hole, with the inclination reaching a maximum of 0.97°. A Directional, Gamma assembly was used. A 26" hole section was then drilled to 1607m MDBRT, with verticality maintained. A Directional, Gamma and Resistivity M/LWD assembly was utilised in this section. Following setting of the 20" casing the rig then proceeded with upgrade of the BOP stack to revised deepwater standards and PathFinder personnel were down manned until this was completed.

The 17 ½" hole was then drilled to 2361m MDBRT utilising a Directional, Gamma, Resistivity, Mud Pressure and ESonic M/LWD service. Verticality was maintained a good quality open hole log data including compressional sonic were acquired.

The 12 ¼" was drilled to 3097m MDBRT in four runs utilising a full Quad-combo LWD logging suite, comprising of Directional, Gamma, Resistivity, Density, Neutron, Caliper, E-Sonic and Mud Pressure. Verticality was maintained throughout 12 ¼" section.

The 8 ½" section was drilled in six runs utilising an LWD suite consisting of Directional, Gamma, Resistivity, Sonic and Mud Pressure tools. At 3412m MDBRT a drilling break was accompanied by a gas increase and it was decided to pull out and cut a core. It was a licence requirement to cut at least one core in the well. This was cut from 3412m MDBRT to 3423m MDBRT.

On reaching TD, a discrepancy in the pipe tally was discovered. It transpired that a complete stand (28m) had been missed out, resulting in drilling the additional depth to TD at 3941m MDBRT. All depths were adjusted accordingly as per ENI instructions.

LWD Crew

Lead M/LWD Engineers	Second M/LWD Engineers
John Bayliss	Adam MacLennan
Ian Jenner	Michael Torrie
Stuart Thomson	Jonathan Wigg
Igor Blok	Peter J Kott

LWD Tool Failures

Failure #1: E-Sonic tool transmitting constant value (Run 4)

During Run 4, the E-Sonic tool continually transmitted 187 for DTCU from 06:23hrs 12th Sep, 2405m MDBRT sensor depth.

The tool was returned to the Aberdeen PathFinder workshop where a failure investigation was initiated and tool memory was downloaded and viewed, confirming reported problems. Two power connecting pins between the power source and upper transmitter were found to be retracted and not making the required contact. It is thought that due to the tool being subjected to high vibration on the run the bond holding the connections in place had broken away from the board resulting in the pins retracting far enough to cause the upper transmitter to cease working. Pathfinder have confirmed that their procedures toincorporate further checks on each of these pins and sockets to further check the integrity as well as introducing a secondary fastening method to supplement the bonding currently used will now also be performed.

Failure #2: MWD pulser stopped transmitting (Run 6)

During Run 6, the MWD pulser stopped pulsing at 3037m MDBRT immediately after a connection. Detection was poor for 1.5 hrs leading up to the connection but it was thought to be pump related at the time as Seadrill had been repairing their pumps. The well drilled on to troubleshoot the problem with no success and the decision was made to POOH 100ft shallower than planned to wireline log the section.

All tools involved in run 6 were returned to the Aberdeen PathFinder workshop so that the cause of reported problems could be identified and upon return all tools were assembled as a string for testing. During the test the pulser poppet was not moving indicating a mechanical failure within the pulser. The rest of the string was tested separately with a new pulser and tested OK and were released for routine servicing. Washed / worn relief valve poppets within the MOP were found to be the cause of reported pulsing problems. On strip down of the MOP it was found that both poppets had suffered wash damage with one so bad it had actually fallen through its seat. These were replaced with new and all subsequent testing was performed and passed ok.

Pathfinder commented that these poppets are spring loaded relief valves that regulate the amplitude of the pressure wave produced by the poppet / orifice. Reliability of these components is good however new ceramic tipped poppets have recently undergone field testing globally and results have shown them to be even more reliable and resistant to wash. As a result of this testing they are being introduced as standard along with ceramic seats to continue to improve reliability.

Failure #3: Surface test failure (Run 8)

A completely new 6¾" string was made up after full deck testing with no problems. However this shallow test was without the bit, the tool string then had to be parted between the CLSS and the Datalink Stab in order to pick up far enough to fit the bit. To confirm the connection after making the string back up, a brief second shallow test was performed which did not cummincate and required the complete ABS / AWR to be changed out for the backup.

The AWR tool was returned to the Aberdeen PathFinder workshop where the reported problems were confirmed. The lower part of the internal tool assembly, the Gamma Chassis, was loose inside the mandrel, suggesting the torqued connection to the Gamma centraliser had backed off. On removal the chassis was found to be completely saturated with mud. Checksheets, which are completed during servicing and assembly of the AWR tool, were checked and the step relating to the Gamma centraliser torque had been signed off. It is probable that the "O"-ring seating of the tool was tight resulting in the connection backing off (this was also confirmed by the Pathfinder technician who built the tool). Pathfinder has confirmed that a procedural change will be implemented to increase the torque on this connection to prevent it from backing off during BHA break out in the future.

MWD Run Summary & Sensor Offset

Run	Bit	Hole Size	Start Depth (m)	End Depth (m)	Drill / Wipe Distance (m)	BRT Time / Date	ART Time / Date	BRT Hrs	Circ Hrs	Max Angle	Max Temp C	Failure
1	XR+J3C (Mill Tooth)	36/42"	1145	1232	87.0	22/07/2010 13:00	24/07/2010 22:00	57.0	11.5	0.97	8.0	No
2	XR+J3C-RR (Mill Tooth)	26"	1232	1607	375.0	24/07/2010 23:00	28/07/2010 11:00	84.0	29.0	1.23	8.0	No
3	MXL-1 (Mill Tooth)	17.5"	1607	2361	754.0	02/09/2010 12:00	07/09/2010 11:00	119.0	74.5	0.79	15.0	No
4	VB613GP1UXS4 (PDC)	12.25"	2361	2651	290.0	10/09/2010 23:00	13/09/2010 12:00	61.0	36.0	0.35	18.0	Yes
5	K705 (Impreg.)	12.25"	2651	2811	160.0	13/09/2010 16:00	17/09/2010 02:00	82.0	40.0	0.88	25.0	No
6	K705-RR (Impreg.)	12.25"	2811	3097	286.0	19/09/2010 21:00	24/09/2010 17:00	116.0	80.5	1.14	34.0	Yes
7	Reverse Circ. Basket	12.25"	3097	3097	--	28/09/2010 01:00	29/09/2010 09:00	32.0	5.5	1.14	--	Fishing
8	MTI913 (PDC)	8.5"	3097	3412	315.0	03/10/2010 14:30	08/10/2010 17:30	123.0	53.0	2.37	40.0	Yes
9	FC3743 (Core)	8.5"	3412	3423	11.0	08/10/2010 18:00	10/10/2010 20:00	--	--	2.37	--	Core Run
10	MTI913 (PDC)	8.5"	3423	3604	181.0	10/10/2010 23:00	13/10/2010 06:00	55.0	29.5	2.73	41.0	No
11	K507ZQ (Impreg.)	8.5"	3604	3666	62.0	13/10/2010 10:00	15/10/2010 00:15	38.5	15.5	3.52	46.0	No
12	K507ZQ (Impreg.)	8.5"	3666	3770	104.0	15/10/2010 01:30	20/10/2010 22:00	140.5	60.0	3.69	45.0	No
13	K507ZQ (Impreg.)	8.5"	3770	3941	171.0	21/10/2010 05:00	24/10/2010 18:30	85.5	56.0	4.13	46.0	No

Run	Start Depth	End Depth	GR offset (m)	CWR / AWR Resistivity offset (m)	DNSC Caliper offset (m)	DNSC Density offset (m)	DNSC Neutron offset (m)	E-CLSS / CLSS Sonic offset (m)	DPM Pressure offset (m)	MWD offset (m)
1	1145	1232	17.91	--	--	--	--	--	--	22.95
2	1232	1607	15.31	16.93	--	--	--	--	--	23.49
3	1607	2361	14.77	16.38	--	--	--	45.91	22.02	24.52
4	2361	2651	3.16	5.29	15.73	16.79	17.30	24.38	31.18	35.14
5	2651	2811	17.69	19.82	30.26	31.32	31.83	38.80	45.51	49.47
6	2811	3097	19.22	21.35	32.00	33.02	33.77	40.73	47.54	51.50
7 (Fishing)	3097	3097	--	--	--	--	--	--	--	--
8	3097	3412	16.14	18.24	--	--	--	30.43	37.28	41.23
9 (Coring)	3412	3423	--	--	--	--	--	--	--	--
10	3423	3604	16.14	18.24	--	--	--	30.54	37.40	41.35
11	3604	3666	16.20	18.30	--	--	--	30.60	37.46	41.41
12	3666	3770	16.20	18.30	--	--	--	30.60	37.46	41.41
13	3770	3941	16.20	18.30	--	--	--	30.60	37.46	41.41

Run #	Run BRT Start Date	Service	Top m MDRT	Bottom m MDRT	MWD Operational & Perfomance Summary
1	22/07/10	**36½" x 42" Section:** RT Gamma Ray & MWD Directional	1145	1232	Seabed was tagged as expected at 1145m MDBRT and the well spudded at 20:30hrs 23rd July 2010, without rotation. Increased flow rate in stages from 1000 lpm and commenced rotation once the 36" hole opener was below seabed. Drilled to a section TD depth of 1232m MDBRT. Displaced the well to 1.15 SG mud prior to POOH. The interval was drilled utilising seawater with hi vis sweeps pumped every half stand. Low levels of vibration were encountered throughout the run with a maximum figure of 31cps. A complete real-time only Gamma Ray log was obtained. Real-time signal detection was excellent throughout the run.
2	24/07/10	**26" Section:** CWR GR & Resistivity / MWD Directional	1232	1607	RIH, tagged cement at 1219m MDBRT and commenced drilling using seawater, with pre-hydrated bentonite sweeps pumped every 15m. A few stringers were encountered, apart from that drilling was generally easy. Performed a wiper trip then POOH to just above the seabed and waited there whilst running casing from the auxiliary rig (in case it hung up and a wiper trip was required). POOH to surface on successful setting of the 20" casing &l aid out the CWR and motor. Low to medium vibration levels were recorded throughout the run. The rig then proceeded with upgrade of the BOP stack to revised deepwater standards and PathFinder personnel were down manned until this was completed. Good real-time log and data density with the 0.8 sec pulse width in use. Occasional bad decodes corresponded with sweeps being pumped.
3	02/09/10	**17 ½" Section:** CWR Gamma / CWR Resistivity / E-CLSS Sonic / DPM Pressure / MWD Directional	1607	2361	RIH and tagged cement at 1573m MDBRT and drilled cement, wiper plug, float and shoe track to 1595m MDBRT. Displaced well to 1.15 SG KCL/Aquacol/Polymer mud then drilled out remainder of shoetrack and shoe at 1601m MDBRT. Cleaned out rathole then drilled 3m of new formation before performing a LOT to 1.20 SG EMW and drilling ahead. Numerous slow sandstone and limestone stringers were encountered throughout the mid part of the interval, the bit was not well suited to them but on breaking through back to siltier formations ROP was restored. Some pump problems with clogged strainers. Performed a wiper trip then POOH. Low to medium vibration levels were recorded throughout the run. KCl content in the mud resulted in elevated Gamma readings. These were corrected by ENI petrophysicists and their data presented on as part of the final data presentation. Good real-time log and data density with the 0.6 sec pulse width in use. Full memory data was recovered and processed from the LWD tools. Compressional field sonic data was generated at the rigsite for the open hole section using DPP fullwave semblance processing, this was later fine tuned by the PathFinder petrophysicist. No slow shear was able to be generated onshore, on this occasion, using XACTware phase velocity software by PathFinder's petrophyicist. This was due to weak waveform arrival in 17½" hole with an 8" collar. In future a 9½" sonic collar should be run, if available, to try to get a better sonic response.
4	10/09/10	**12 ¼" Section:** AWR Gamma / AWR Resistivity /	2361	2651	Made up LWD stand on auxiliary rig, enabled the batteries and initialised all tools before transferring the stand to the main rig. Made up the bit, installed sources, shallow hole tested with 1600 lpm and RIH. Extremely high vibration was encountered at 2424m MDBRT, which lasted for 25 minutes. Drilling parameters were altered in attempts to reduce the vibration.

		DNSC Density-Neutron / E-CLSS Sonic / DPM Pressure / MWD Directional			KCl content in the mud resulted in elevated Gamma readings. Good real time log and data density with the 0.5 sec pulse width in use, with the exception of the Sonic (E-CLSS) which began sending repeat values (transmitted 187 for DTCU from 06:23hrs 12th Sep, 2405m MDBRT sensor depth) after encountering an area of extremely high vibration. Excellent quality full memory data recovered and processed from the LWD tools. Full Sonic compressional and shear data was obtained from the E-CLSS lower transmitter. Continual WITS input of depth and surface drilling data from Geoservice, adding flow rate, RPM and torque to DPM pressure log.
5	**13/09/10**	**12 ¼" Section:** **AWR Gamma / AWR Resistivity / DNSC Density-Neutron / E-CLSS Sonic / DPM Pressure / MWD Directional**	**2651**	**2811**	Extremely high levels of vibration were seen as the turbine BHA was picked up off bottom - max 374 cps. High vibration (of over 250cps) and torque was also experienced within the basalts; it was found that reducing the surface RPM from 45 to 10 reduced this vibration to acceptable levels. The LWD tools were subjected to several hours of excessive vibration. At 21:00 on the 15-Sep drilling ceased at 2811m MDBRT and the drill string pulled back until the bit was above the BOP. The well was shut in and the riser displaced to sea-water. As weather conditions worsened the LMRP was unlatched and the BHA was tripped out of the hole to surface. KCL content in the mud resulted in elevated gamma readings. Good real time log and data density with the 0.5 sec pulse width in use from all tools. Excellent quality full memory data recovered and processed from the LWD tools. Full Sonic compressional and shear data was obtained for the run. Continual WITS input of depth and surface drilling data from Geoservice, adding flow rate, RPM and torque to DPM Pressure log.
6	**19/09/10**	**12 ¼" Section:** **AWR Gamma / AWR Resistivity / DNSC Density-Neutron / E-CLSS Sonic / DPM Pressure / MWD Directional**	**2811**	**3097**	ENI requested a new LWD suite was utilised for this run and a Franks Harmonic Isolation sub installed below the LWD to reduce vibration. The Franks Harmonic Isolations Sub proved effective in reducing vibration and surface RPM was increased to 80. KCL content in the mud resulted in elevated gamma readings. KCL content in the mud resulted in elevated gamma readings. Good real-time log and data density with the 0.5 and 0.6 sec pulse width used until 23:27hrs (3037m) on the 22/09/10 when real-time data transmission from the tool stopped (No telemetry pulses were apparent) due to downhole pulser failure or blockage. Well drilled ahead blind while troubleshooting, but TD called at 3097m to acquire wireline data and confirm 12 ¼" TD. Excellent quality full memory data recovered and processed from the LWD tools. Full Sonic compressional and shear data was obtained for the run. Continual WITS input of depth and surface drilling data from Geoservice, adding flow rate, RPM and torque to DPM Pressure log.
7	**28/09/10**	**12 ¼" Section:** **Junk Basket**	**3097**	**3097**	Fishing run: Reverse circulating junk basket successfully recovered wireline tool bull-nose.
8	**03/10/10**	**8 ½" Section:** **AWR Gamma /**	**3097**	**3412**	RIH with turbine LWD assembly and tagged cement at 3065m MDBRT. Commenced drilling shoetrack and displaced well to 1.30 SG mud. Drilled ahead to 3102m MDBRT then performed a LOT to 1.56 SG, repeated to 1.62 SG. Drilled ahead with 2500 l/min to 3122m where losses were observed. Drilled ahead to 3235m MDBRT with reduced flow, pumping LCM as required. At 3235m

		AWR Resistivity / CLSS Sonic / DPM Pressure / MWD Directional			MDBRT a gain was observed and the well was shut in. With increasing sea state and weather conditions the riser was displaced to sea water in case unlatching was required. This proved unnecessary and the storm was successfully ridden out. The chokes were opened and the pressure bled off, the increase and gain seemed due to wellbore ballooning. Drilled ahead to 3412m MDBRT where the decision was made to POOH and cut a core after a significant drilling break associated with higher gas levels. Considerable off-bottom vibration was once again apparent, being generated by the turbine spinning loose; little could be done toalleviate this. KCL content in the mud resulted in elevated gamma readings. Good real-time log data and data density for all tools with the 0.8 sec pulse width in use. Excellent quality full memory data recovered and processed from the LWD tools. Full AWR and Sonic compressional data was obtained for the run. Some sections of shear were missing in slower formations, being outside the range of the standard CLSS tool utilised for thesection. An E-CLSS tool (as used in the previous hole section) would have been more likely to provide a complete log. Continual WITS input of depth and surface drilling data from Geoservice, adding flow rate, RPM and torque to DPM Pressure log.
9	**08/10/10**	**<u>8 ½" Section:</u>** **Coring Run**	**3412**	**3423**	Made up core assembly and RIH. Had some difficulty entering open hole, with the stiff core assembly standing up and the hole packing off at 3101m MDBRT, but established rotation and re-gained circulation and worked past. Reamed down to 3130m MDBRT, then RIH slowly to bottom. Circulated bottoms up, dropped ball and commenced cutting core. Core jammed at 3423m MDBRT, circulated bottoms up then POOH. 11m of core cut, 10.75m recovered (98%).
10	**10/10/10**	**<u>8 ½" Section:</u>** **AWR Gamma / AWR Resistivity / CLSS Sonic / DPM Pressure / MWD Directional**	**3423**	**3604**	RIH and logged across cored section and drilled ahead with excessive off-bottom vibration readings to 3604m when the penetration rate died, bit ring out was suspected and the bit POOH. KCL content in the mud resulted in elevated gamma readings. Good real time log data and data density for all tools with the 0.8 sec pulse width in use. Excellent quality full memory data recovered and processed from the LWD tools. Full sonic compressional and shear data was obtained for the run.
11	**13/10/10**	**<u>8 ½" Section:</u>** **AWR Gamma / AWR Resistivity / CLSS Sonic / DPM Pressure / MWD Directional**	**3604**	**3666**	Changed the turbine and bit and made up LWD stands. Shallow hole tested MWD with 1400 lpm, 100 bar. RIH and drilled ahead to 3666m MDBRT. Pulled the bit when ROP died with associated higher pump pressures; a ring out was suspected. Significant off-bottom vibration was once again apparent, being generated by the turbine spinning loose; little could be done to alleviate this. KCL content in the mud resulted in elevated gamma readings. Good real time log data and data density for all tools with the 0.8 sec pulse width in use. Excellent quality full memory data recovered and processed from the LWD tools. Full Sonic compressional and shear data was obtained for the run. Continual WITS input of depth and surface drilling data from Geoservice, adding flow rate, RPM and torque to DPM pressure log.
12	**15/10/10**	**<u>8 ½" Section:</u>** **AWR Gamma / AWR Resistivity /**	**3666**	**3770**	Changed the bit. RIH, fanned bottom and pumped a pill to clear any junk, then drilled ahead. At 3741m MDBRT a turbine stall was observed concurrently with dynamic losses of 3.5m3 over 15mins. Observed a gain when the pumps were stopped so the well was shut in, with 8 bar observed. Bled off to strip tank then circulated bottoms up through choke, with high gas levels observed. Dynamic losses observed when circulating. Concluded the gain was due to ballooning. On resuming drilling after a few metres of at

		CLSS Sonic / DPM Pressure / MWD Directional			80 RPM (as used previous to the shut in) downhole vibration levels of over 400 cps were evident. Dropping the RPM to 50 reduced this to 200-250 cps, and reducing surface RPM further to 24 dramatically reduced this vibration to minimal levels. Significant off-bottom vibration was again apparent; flow rates were reduced from 2400 to 1500 lpm to reduce this. The LWD tools were subjected to several hours of excessive vibration. At 3770m MDBRT the ROP died associated with an increase in standpipe pressure. High gas levels were experienced and wellbore ballooning was apparent. Pumped back to the shoe, circulated bottoms up then performed a BOP test with the bit at the shoe in case a well control situation developed. POOH to replace the bit. The bit was severely rung out and graded 8-8-RO-T-X-1-BT-PR; some 10 cm in length was missing. KCL content in the mud resulted in elevated gamma readings. Good real time log data and data density for all tools with the 0.8 sec pulse width in use. Excellent quality full memory data recovered and processed from the LWD tools. Full Sonic compressional and shear data was obtained for the run. Continual WITS input of depth and surface drilling data from Geoservice, adding flow rate, RPM and torque to DPM pressure log.
13	**21/10/10**	**<u>8 ½" Section:</u>** **AWR Gamma / AWR Resistivity / CLSS Sonic / DPM Pressure / MWD Directional**	**3770**	**3941**	Changed the bit. RIH, fanned bottom and pumped a pill to clear any junk, then drilled ahead. T.D. was supposedly reached at 3941m MDBRT at 11:15hrs 23rd Oct. After circulating bottoms up a double check on the stand count in the derrick revealed a discrepancy, with the T.D. too short by one stand (27.9m). During the trip in the 1st stand had 'drilled' surprisingly fast and ROP was controlled, this was queried at the time but the tally appeared correct. After the discrepancy was confirmed it was obvious that essentially the final stand of the last run, when the bit came out 1/16" under gauge, had been reamed and re-logged. Another stand was picked up and drilling re-commenced from 15:15hrs to 21:00hrs 23 Oct, to the correct T.D. KCL content in the mud resulted in elevated gamma readings. Good real-time log data and data density for all tools with the 0.8 and 1.0 sec pulse width in use. Excellent quality full memory data recovered and processed from the LWD tools. Full Sonic compressional data was obtained for the run. Some sections of shear were missing in slower formations, being outside the range of the standard CLSS tool utilised for the section. .An E-CLSS tool (as used in the previous hole section) would have been more likely to provide a complete log. As normal a 10m relog (relog77) was performed during the trip in; in reality due to the stand error this ended up being a stand +10m. A further relog (relog1) was performed from bit depths 3730m to 3780m MDBRT, during the wiper trip back to bottom after reaching the corrected T.D. This was requested by ENI and correlated well with the original drilled data.

Lessons learnt

- Review of the sonic data recorded showed that in the 17½" section the 8" E-CLSS tool was unable to produce a satisfactory shear response. This had been highlighted as a possibility during the planning stage. Pathfinder recommends the use of a 9½" collar on future wells if available.
- Vibration was found to be a contributory factor in the E-CLSS upper transmitter failure on run 4 and the use of a shock sub may have helped reduce vibration and therefore prevented the upper transmitter failure.
- The use of the Franks Harmonic Isolation sub on run 6 proved very effective in reducing drillstring vibration and in future it should be considered on all turbine runs.
- During the planning phase offset well data was used to help decide which Sonic tool should be run in the 8½" section and based on those sonic arrival times the standard tool was selected by ENI. Whilst drilling the section it became apparent that the shear arrival was too slow in some formations for the standard tool therefore on future wells it would be prudent to run the PathFinder E-CLSS tool, as run in previous sections, to stand the best chance of obtaining full shear data from the well.
- The use of LWD Density-Neutron-Caliper provided a very useful data set for real time interpretation when the actual formations drilled differed from the well prognosis. It is recommended on future exploration wells.

LWD Contractor Performance

- The wellsite geologist reported that Pathfinder provided experienced, communicative, helpful and consistent personnel throughout the project.
- Communication with the engineers was made easier by the fact there office was only a short distance away from the LWD & wellsite geologists offices.
- Required data was provided in a timely manner when requested for all deadlines.
- The crews worked safely and played an active part in both ENI's and the drilling contractor's safety culture

12.3 Coring

It is a Faroese regulation that at least one bottom hole core must be taken during the drilling of the exploration well. In the event of hydrocarbon-bearing sandstones being encountered in the primary early Eocene T50 target it was planned to take a single core of 18m. A core was not taken in the early Eocene T50 target as it resulted water bearing. Then a core should be taken in the upper part of the late Paleocene T36 target regardless of hydrocarbon shows.
While drilling the 8 ½” section through the T38 Lamba Volcanic Series (sequence T38 to ?T36), at 3412m MDBRT, a drilling break was accompanied by a gas increase and it was decided to pull out of hole and make up the 18m core barrel.
Halliburton was the coring contractor. The reasons for coring were the lithology and porosity/permeabilty evaluation of a potential reservoir zone.

Core #	Diameter	Interval Cored (m)	Cut	Recovery	%	Depth shift to Wireline depth	Comments
1	5 ¼”	3412.0 - 3423.0	11.0m	10.75m	98	+0.45m	Conventional core barrel (6” ¾ x 4”). Aluminium fluted inner tube. 18m lengths run.

Operational Summary

An 18 meter core barrel and FC3743Li core head was made up and RIH to the casing shoe at 3094m. Broke circulation and continued to RIH to a depth of 3112m and took 20 ton weight. Picked up off the hang up and started pumps with no returns, picked up drillstring to free point and gradually staged pumps increasing flow until gaining returns gradually until such point as maximum flow of 1200 LPM was achieved.

Washed and reamed down with 1200 LPM, 40-50 RPM and 2-4ton WOB. Continued to wash and ream with these parameters until TD was established at 3412m MDRT. Tagged bottom lightly observing both weight and pressure increases. Picked up string approx 2mtrs and circulated bottoms up with 10RPM and 1200 LPM.

Dropped coring ball and pumped down with 570 LPM, once seated the pressure increased by 4 bar. The drop ball took 20 minutes to seat.

Commenced coring with 50 RPM, 830 LPM and 1-2 ton WOB and continued to cut core for 2m. At this point the RPM was increased to 70 and the WOB was gradually increased until good ROP was achieved at 5-7m/hr.

At a depth of 3421m the torque was observed to suddenly drop off to equal off bottom torque and a pressure increase of 4-5 bar was also recorded. This was a positive indication that the core had jammed and that milling of formation was occurring.

Attempts were made to continue coring applying various parameters in order to regain torque and ROP with no success. At 3423m the ROP had dropped to approximately 0.4m/hr and the decision was made to POOH. A strong indication was that the previous 2m had been milled and not cored (on the surface inspection showed only the last ~35cm of the core was missing).

When picking up no over pull was observed confirming that core was jammed. There does not appear to be a lithological change at the jam-off depth, with a log shift of the density/neutron occurring at 3420m MDRT (although no shift in resistivity, sonic or gamma ray is seen at that depth).

Pulled off bottom 3m and circulated bottoms up with 1200LPM and continued to POOH to surface following HPHT trip procedures.

At surface the inner barrels were recovered and laid down and it was confirmed that the coring objective had been successfully completed. The outer barrel assembly was laid down.

The core was gamma logged at surface and the inner tubes were marked once the top of the core had been identified. The inner tubes were cut into 1m sections and the core was then stabilized using Gypsum.

The coring operation was complete. A total of 11m of core was cut and 10.75m was recovered equalling 97.73% overall recovery.

Controlled Trip Times

Start Depth (m MDRT)	Stop Depth (m MDRT)	Trip Speed/Stand
TD	915m	Normal
915m	610m	1 minute
610m	366m	3 minutes
366m	Surface	6 minutes

Core Quality Assessment by Kirk Petrophysics Laboratory

- Quality of received gypsum stabilised core: Stabilisation poor - the gypsum had not set (see photograph below). This was first apparent from inspection through one of the end caps, but also seen in the CT images (Core always resting on base of barrel).

- Core damage: Natural damage over 50% of core.
- Damage remarks: Low mud invasion, low induced fractures.
- Core suitability for analysis: Medium / Low. The top section appears more weathered and represents "low". Bottom section more consolidated and represents "medium". Re-stabilisation after cleaning the core (removing unset gypsum) - using Kirk Lithotarge foam after plugging has allowed more successful slabbing and taking of vertical plugs.
- Comments: The 4" diameter core is naturally fractured throughout and the upper half is poorly consolidated. The lower half contains mostly cemented fractures and is therefore more consolidated.

Coring Contractor Performance

Highlights

- The Halliburton coring team was helpful, communicative and worked professionally during coring operations.
- There were no relevant Halliburton coring equipment issues.
- The Halliburton coring personnel worked safely and there were no safety issues during the coring operations. This included running the pre-job meeting with the rig crew prior to handling the core barrel on surface and testing the core for H2S when at surface.

Lowlights

- Gypsum stabilization at the wellsite was not successful in fully stabilizing the core at the wellsite and an additional stabilizing medium of Lithotarge foam was required at the laboratory to allow processing.
- The special wooden sample / core boxes for JARDFEINGI provided by Geoservices were not to the exact specified size, making the fitting of 1m core barrels difficult. This was only apparent once the sample boxes were at the rig site.

Coring End of Well Summary

Drilling Rig: West Phoenix Well Name: 6004/8a-1	Mud Type: WBM Mud Weight: 1.30 sg	Inclination: 2.6 degrees

Run No. / Date	Barrel		Core Bit			Core Information						Parameters				Formation / Lithology
	Type / Size	Length / Inner Barrel	Corehead / Size	Serial / Part No	Dull In / Dull Out	Depth (m)	Cut	Hrs	ROP	Recovery		RPM (ave.) m/hr	WOB (ave.) T	Flow Rate gpm	Torque (ave.) K/ft/lbs	
										m / %	Effic %					
#1 09-OCT-2010	Convent. (SJ) / 6 ¾" x 4"	18m / Alum. fluted	FC-3743Li / 8 ½" x 5 ¼"	11496681	New / 0-0-NO-A-X-0-PN-PR	3412.0 to 3423.0	11	4.82	2.1	10.75 / 98	60.2	70	1-7	830	-	Lamba Lower Faroe Lavas / Basalt & Palagonite Basalt

12.4 Open hole Wireline Logging

Wireline logging was supplied by Schlumberger who provided a logging unit with capstan. Oilphase were contracted to provide the pressurized formation sample at surface to transportable PVT sample bottles for the laboratory.

Wireline Crew

12 ¼" Logging Crew (Days)		12 ¼" Logging Crew (Nights)		Specialists	
Position	**Engineer**	**Position**	**Engineer**	**Position**	**Engineer**
Engineer	Gavin Hulmston	Engineer	Aernot Schram de Jong	MDT Engineer	James Patton
Crew Chief	Jason Stanley	Crew Chief	Fraser Chalmers	MSCT Engineer	Neil Sangster
Operator	Matthew Laird	Operator	Mark Ewan	Oilphase Engineer	Carol Tervet
Capstan	Andy Anderson	Capstan	Kristian Thellesen	Oilphase Engineer	Paul Sudjic

8 ½" Logging Crew (Days)		8 ½" Logging Crew (Nights)		Specialists	
Position	**Engineer**	**Position**	**Engineer**	**Position**	**Engineer**
Engineer	Gavin Hulmston	Engineer	Aernot Schram de Jong	MDT Engineer	Benton Shipman
Crew Chief	Jason Stanley	Crew Chief	Matthew Bartlett	MDT Technician	Neale Geddes
Operator	Mark Ewan	Operator	Matthew Laird	MSCT Engineer	Neil Sangster
Capstan	Jimmy Cheramie	--	--	VSP Engineer	Leslie Dallas
--	--	--	--	Oilphase Engineer	Carol Tervet
--	--	--	--	Oilphase Engineer	Paul Sudjic

Operational Summary: 12 ¼" Hole Section

Run	Dates	Hole	Base Logged Interval MDBRT	Top Logged Interval MDBRT	Tool / Remarks
1A	24-Sep-10	12 ¼"	3099.0 m	1601.0 m	**FMI-DSI-EDTC** First log in hole procedure used. DSI logged through casing from the 13 3/8" casing shoe at 2355m to 1601m and GR logged to seasbed. DSI modes P&S, upper & lower dipoles, stonely recorded. Poor quality log data was recorded through the 13 3/8" section to 1601m MDRT. FMI data was locally affected by stick-and-slip. Repeat 2920m to 2850m. Total Operating Time: 10hrs 10mins
1B	25-Sep-10	12 ¼"	3097.0 m	2355.2 m	**SP-CMR-HRLA-TLD-APS-HNGS-EDTC** Rope socket failure required tool-string to be POOH and a new socket made up, tested and tool-string RIH. The CMR was first logged at 800ft/hr from 2643m to 2365m, from 2932m to 2822m & from 2985m to 2796m. Followed by the full logging from 3097m to 2355m at 900ft/hr. Total Operating Time: 22hrs 35mins with 6hrs 30 mins lost time.
1C	26-Sep-10	12 ¼"	2932.0 m	2383.0 m	**PQ-HY-PO-BA-LFA-CFA-SC-MS-MS-GR (MDT)** Note, all measurements were recorded using only the Quartz gauge because the Strain gauge was out of order. 38 Formation Pretests attempted, with 9 good, 3 supercharged, 5 not stabilised and 5 lost seals. Formation water sample at 2574m MDRT. 1 gallon (MRSC) and 1 pressurised 250cc SPMC sample taken after four failed attempts to acquire sample to MPSR – MPSRs did not open. Lost the bottom nose hole finder downhole due to poorly made-up tool (successfully fished by reverse circulation junk basket trip). Total Operating Time: 32hrs 20mins with 30 mins lost time.
1D	27-Sep-10	12 ¼"	3072.0 m	2366.0 m	**MSCT-GR** After 1.2" cored at first sample depth the motor would not turn. Tool moved and test repeated at 2970m and 2836m without success. Further repeat test at 2834m was successful (the motor stalling was imputed to possible debris, lost time = 58 min) and no further problems. 24 sidewall cores attempted (23 planned) & 21 recovered. Total Operating Time: 10hrs 30 mins.
					Well ready for logging: 18:30hrs 24-09-2010 **Rig Down complete: 00:30hrs 28-09-2010** **Total Operating Time: 78hrs** **Total Lost Time: 7hrs**

Operational Summary: 8 ½" Hole Section

Run	Dates	Hole	Base Logged Interval MDBRT	Top Logged Interval MDBRT	Tool / Remarks
2A	25-Oct-10	8 ½"	3942.0 m	3096.0 m	**FMI-DSI-EDTC** Some minor overpulls while logging recorded. TD found at 3943m and casing shoe at 3090m. Repeat interval: 3821m to 3714m. Log data good with no operational issues. Total Operating Time: 9hrs 30mins
2B	25-Oct-10	8 ½"	3935.0 m	3090.0 m	**SP-HRLA-TLD-APS-HNGS-LEH** Overpulls at TD upto 10,000lbs Some other minor overpulls while logging recorded till 3769m. SP started to work only above 3780 m TD found at 3937.5m, log not correctly spliced between 3131 – 3135 m, so the section above is off depth when compared to Run 2A and the Casing logger results at 3087.5m instead of 3090.0m. Repeat interval: 3508m to 3330m. Log data good with no significant operational issues. Total Operating Time: 10hrs 30mins.
2C	25-Oct-10	8 ½"	3935.0 m	1649.1 m	**VSI-GR** Zero Offset VSP survey acquired with 153 VSP levels, 280 shots fired. A good quality VSP was acquired survey. Only issue was to do with the weather and performance of the rig compensator which was not doing a good. There was periodically movement in the top shuttle which was caused by the sea swell. Adjustments were made to the compensator by driller. Total Operating Time: 12hrs 30mins.
2D	26-Oct-10	8 ½"	3905.0 m	3145.0 m	**MSCT-GR** During the logging, there were some motor stall problems which did not prevent successful coring. 20 sidewall cores attempted & 20 recovered (1 with partial recovery). Total Operating Time: 11hrs 30mins.
2E	26-Oct-10	8 ½"	3850.1 m	3614.4 m	**PQ-HY-AFA-PO-CGA-SC-MS-PC-EDTC (MDT)** Formation pressures only logging run with 11 pretests attempted. No successful pretests recorded, 1 supercharged, 7 tight and 3 lost seals. Total Operating Time: 11hrs 30mins.
					Well ready for logging at 19:30hrs 24-10-2010 **Rig Down complete at 03:30hrs 27-10-2010** **Total Operating time: 56hrs** **Total Lost time: 0hrs**

Depth Control

Run 1A was used as the primary depth control log. The main log depth was correlated with the down log, following Schlumberger's first RIH procedures and applying all the necessary corrections, e.g. stretch, temperature, length of cable between rig and unit, block height, etc. The log reference was set to the rotary table.

Run 2A was logged through 9 5/8" casing and from the overlap log data, the 8 ½" log runs were put on depth with the Run 1A reference depth log (+3m depth correction applied).

Level	Drillers	Loggers	Difference
13 3/8" Casing	2357.0m MDRT	2355.2m MDRT	-1.8m
12 ¼" Section TD	3097.0m MDRT	3099.0m MDRT	+2.0m
9 5/8" Casing	3093.5m MDRT	3090.0m MDRT (SLB log headers and Run 2A calipers)	-3.5m
8 ½" Well TD	3941.0m MDRT	3943.0m MDRT	+2.0m

Mud Properties

Section	12 ¼"	8 ½"
Mud type	WBM (KCL/GLYCOL/POL)	WBM (KCL/GLYCOL/POL)
Mud weight (sg)	1.22	1.3
Funnel Viscosity (s/qt)	51	54
PV (cP)	17	20
YP (lbf/100ft^2)	25	22
Corrected Solids (%)	9.84	11.01
API Filtrate cc	4.2	3.4
Water (%)	84.5	83
pH	9.7	9.3
KCl mg/l	80081	81941
Cl mg/l	51000	58000
Hardness mg/l	360	400
MBT kg/m3	28.5	28.5
Flow line temp C	21	12.7

% Glycol	3	3
ASG	2.7	3.2
Last Circulation Stopped	02:00hrs, 24 October 2010	07:00hrs, 24 October 2010

Note, both 12 ¼" and 8 ½" mud systems had been treated with Calcium Carbonate to 100-150kg/m3.

Wireline Operational Issues

Operational Issues #1: Rope Socket & short circuit (Run 1B)

When sending AC Aux to do the LFST for CMR, telemetry was lost and a short circuit observed. Communication was re-established with the tool but AC-AUX continued to show a short circuit. Upon inspection it was seen that the rope socket failed due to lost insulation on lines 2, 3 & 7 upon sending high current for CMR and resulted in the conductors getting burnt between the boots and the base of the socket. The most plausible explanation is that the insulator got damaged while the rope socket was being built or installed inside the logging head. Note that the previous run was completed with the same rope socket.

Operational Issues #2: MPSR chambers not opening (Run 1C)

When attempting to fill the MPSR, the pump pressure started to increase immediately after closing off the flow line. On failing to fill the MPSR it took an additional 30 minutes to fill an SPMC, which was carried out successfully.

On investigation it transpired that the MPSR lower bleed plug had not been removed before running in hole. Both MDT engineer and technician failed to notice that the lower bleed plug was still in place during the rig up. The systematic use of a rig floor check sheet was not adhered to. The purpose of the checklist is to verify the correct set-up of every module, just before running in the hole.

Operational Issues #3: Bottom Nose (Run 1C)

After pulling the MDT string out of the well it was observed that the elliptical bottom nose had been left in the well. Junk basket was run at the bottom of wiper assembly and successfully retrieved the bottom nose on the first attempt and in one piece.

The bottom nose was fastened using only the lower nut exposed on the bottom of the device. Installation requires a dedicated jam nut to be tightened prior to fastening the bottom nose with the secondary retaining nut. The MDT technician had not previously seen or installed this piece of equipment.

Wireline Data Quality QC

Data QC Issue #1: DSI (Run 1A)

Poor quality log was recorded through the 13 3/8" casing section to 1601m MDRT. Only 280 m of valid sonic data over the 2000 m log interval and the data showed strong casing arrival as a result of poor cement quality over this interval with the DTCO and DTSH not available. Also, shear data could not be obtained from monopole mode across slow formations. Across intervals of better cement, a weaker casing arrival was recorded and allowed the DTCO to be extracted and improved on over this interval, although no DTS available.

Data QC Issue #2: FMI (Run 1A)

FMI data was locally affected by stick-and-slip.

Wireline Contractor Performance

Schlumberger provided a good service on both 12 ¼" and 8 ½" logging operations. The engineers were sufficiently experienced, communicative and generally helpful.

Highlights

- No LTI - Lost Time Injuries.
- The crews worked safely and played an active part in both ENI's and the drilling contractor's safety culture.
- Early dispatch of Rig-Up & Capstan equipment and personnel to survey the rig ensured a smooth rig up during logging operations.
- 9 Capstan runs performed with no Capstan related issues.
- Capstan prevented a probable stuck tool situation on Run 2B.
- No requirement for additional equipment shipments to remote location (35 lifts).
- No problems with Seismic data acquisition despite severe weather conditions.
- 100% Operating Efficiency & 100% Core Recovery on 8 ½" section.

Lowlights

- 7 hours Lost Time due to human error.
    - Burnt rope socket.
    - MPSR bleed plugs not removed prevented chambers being filled.
    - Lost bottom nose downhole which required to be fished as part of a wiper trip.
- Problems getting the Schlumberger equipment hooked up to rig power due to use of NORSOK standards. This was not anticipated by Schlumberger.
- Numerous crew changes due to unforeseen length of operation (2x 3 weeks).
- Poor sonic data quality on DSI in casing due to bad cement.

12.5 Cased Hole Wireline Logging

There were no dedicated cased hole wireline logging runs were undertaken. The wireline run 1A logged the DSI sonic and gamma ray from the 13 3/8" shoe to 1601m MDRT (20" shoe depth) and continued logging the gamma ray continue to be logged to seabed.

12.6 Wellsite Biostratigraphy

Ichron were contracted to undertake the wellsite biostratigraphic analysis (palynology only) to aid real time interpretation and confirm if Cretaceous age sediments had been penetrated (criteria for shallower well TD).

Ichron provided an A60 Zone 2 Module and 2 x mini freight containers with equipment/chemicals. 100% of the chemical waste produced was collected and returned onshore for disposal. Ichron provided 24 hr biostratigraphic coverage while drilling which required 2x biostratigraphers and 2x technicians onboard for the 12 ¼" and 8 ½" sections.

Ichron crew

Biostratigraphers	Technicians
Anja Oosting	Terence Jones
John Lignum	Steve Clarke
Phil Jones	Samuel Bates
Gavin Howarth	Stuart Forster
Gareth Hughes	

Wellsite biostratigraphy provided an important dataset to real time operational discussions on the Anne-Marie 6004/8a-1 well and helped confirm that Palaeocene aged sections were present to the commitment TD at -3900m TVDSS.

13. GEOLOGICAL SAMPLES

13.1 Drill Cuttings

Geoservices Mudlogging were responsible for collecting and processing four sets of unwashed (Sample Sets A, B, C and D) and four sets of washed/dried cuttings (Sample Sets E, F, G and H), plus one large volume 5 kg composite set for drilling mud optimization studies (Sample Set I). Samples were collected from first returns at 1610 m to well TD at 3941 m. Sample frequency and depth interval of samples collected for each sample box are summarized below:

Well	Depth Interval	Sample Frequency
6004/8a-1	1610m to 2360m MDRT	10m
	2360m to 2874m MDRT	5m
	2874m to 3941m MDRT TD	3m

List of Jardfeingi cuttings samples collected (wooden boxes & Sample Set A):

Sample Set	Depth Interval	Sample Frequency	Missed Samples
1	1610-1720	10	-
2	1730-1840	10	-
3	1850-1960	10	-
4	1970-2080	10	-
5	2090-2200	10	-
6	2210-2320	10	-
7	2330-2395	10 / 5	-
8	2400-2460	5	-
9	2465- 2515	5	2495
10	2520-2575	5	-
11	2580-2635	5	-
12	2640-2695	5	-
13	2700-2760	5	-
14	2765-2815	5	-
15	2820-2868	5	-
16	2870-2904	5 / 3	-
17	2907- 2940	3	-
18	2943 - 2977	3	-
19	2979-3012	3	-
20	3015-3048	3	-
21	3051-3084	3	-
22	3087-3118	3	-
23	3021-3154	3	-

Sample Set	Depth Interval	Sample Frequency	Missed Samples
24	3157-3190	3	-
25	3193-3226	3	-
26	3229-3262	3	-
27	3265-3298	3	-
28	3301-3334	3	-
29	3337-3370	3	-
30	3373-3406	3	-
31	3409-3451	3	-
32	3454-3487	3	-
33	3490-3359	3	-
34	3562-3559	3	-
35	3362-3595	3	-
36	3598-3631	3	-
37	3634-3667	3	-
38	3670-3703	3	-
39	3706-3739	3	-
40	3742-3772	3	-
41	3775-3808	3	
42	3811-3847	3	-
43	3850-3883	3	-
44	3886-3915	3	-
45	3928-3941	3	-

List of standard cuttings samples collected (Sample Set B, C & D):

Sample Set	Depth Interval	Sample Frequency	Missed Samples
1	1610-1790	10	-
2	1800-1970	10	-
3	1980-2150	10	-
4	2160-2360	10	-
5	2365-2470	5	-
6	2475-2580	5	2495
7	2585-2680	5	-
8	2685-2780	5	-
9	2785-2877	5 / 3	-
10	2880-2940	3	-
11	2943-3003	3	-
12	3006-3069	3	-

Sample Set	Depth Interval	Sample Frequency	Missed Samples
13	3072-3124	3	-
14	3127-3181	3	-
15	3184-3229	3	-
16	3232-3283	3	-
17	3286-3331	3	-
18	3334-3382	3	-
19	3385-3445	3	-
20	3448-3508	3	-
21	3511-3568	3	-
22	3571-3676	3	-
23	3679-3798	3	-
24	3801-3941	3	-

List of washed & dried cuttings samples (Sample Sets E, F & G) collected:

Sample Set	Depth Interval	Sample Frequency	Missed Samples
1	1610-1860	10	-
2	1870-2100	10	-
3	2110-2360	10	-
4	2370-2625	10 / 5	2495
5	2630-2805	5	-
6	2810-3000	5 / 3	-
7	3003-3097	3	-

Sample Set	Depth Interval	Sample Frequency	Missed Samples
8	3100-3235	3	-
9	3238-3349	3	-
10	3352-3463	3	-
11	3466-3574	3	-
12	3577-3685	3	-
13	3688-3801	3	-
14	3804-3941	3	-

List of composited (5kg bucket) cuttings samples (Sanple Set I) collected for future mud analysis:

Bucket	Depth (m MD)
1	2100 - 2140
2	2300 - 2330
3	2400 - 2430
4	2471 -2650
5	2670 - 2750
6	2950 - 3000
7	3100 - 3130
8	3130 - 3160
9	3160 - 3190
10	3190 - 3220
11	3220 - 3250
12	3250 - 3280

Bucket	Depth (m MD)
13	3280 - 3310
14	3310 - 3340
15	3340 - 3370
16	3370 - 3400
17	3400 - 3430
18	3430 - 3460
19	3460 - 3490
20	3490 - 3520
21	3520 - 3550
22	3550 - 3580
23	3580 - 3610
24	3610 - 3640

Bucket	Depth (m MD)
25	3640 - 3670
26	3670 - 3700
27	3700 - 3730
28	3730 - 3760
29	3760 - 3790
30	3792 - 3822
31	3822 - 3852
32	3852 - 3882
33	3882 - 3912
34	3912 - 3941

Sample Sets	Sample Type	Destination
A	Bulk Unwashed 1Kg Wooden Boxes A1-A45	Jardfeingi (Faroese Earth & Energy Directorate) Attn: Heri Ziska Brekkutun 1, FO 188 Hoyvik, P.O. Box: 3059, Torshavn, Faroe Islands. Tel: +298 357000
B	Bulk Unwashed 250cc Boxes B1-B24	ENI Denmark B.V Eni S.p.A. – E&P Division Attn: MICHELE IMPALA Laboratori Bolgiano, Via Maritano 26, 20097 San Donato, Milanese (MI), Italy Tel: +39 02 520 46397
C	Bulk Unwashed 250cc Boxes C1-C24	ENI Denmark B.V Eni S.p.A. – E&P Division Attn: MICHELE IMPALA Laboratori Bolgiano, Via Maritano 26, 20097 San Donato, Milanese (MI), Italy Tel: +39 02 520 46397
D	Bulk Unwashed 250cc Boxes D1-D24	ENI Denmark B.V (Studies) Ichron Limted Century House, Gadbrooks Business Centre, Northwich, Cheshire, CW9 7TL.
E	Washed and Dried >50 grams Boxes E1-E14	Jardfeingi (Faroese Earth & Energy Directorate) Attn: Heri Ziska Brekkutun 1, FO 188 Hoyvik, P.O. Box: 3059, Torshavn, Faroe Islands. Tel: +298 357000
F	Washed and Dried >50 grams Boxes F1-F14	ENI Denmark B.V Eni S.p.A. – E&P Division Attn: MICHELE IMPALA Laboratori Bolgiano, Via Maritano 26, 20097 San Donato, Milanese (MI), Italy Tel: +39 02 520 46397
G	Washed and Dried >50 grams Boxes G1-G14	ENI Denmark B.V Eni S.p.A. – E&P Division Attn: MICHELE IMPALA Laboratori Bolgiano, Via Maritano 26, 20097 San Donato, Milanese (MI), Italy Tel: +39 02 520 46397
H	Washed and Dried >50 grams Boxes H1-H11*	OMV c/o Iron Mountain Unit 25 Wellheads Crescent, Dyce Industrial Estate, Aberdeen, AB21 7GA. *Note, OMV samples collected from 2370m to 3941m TD.
I	Bulk Unwashed 5Kg buckets	ENI Denmark B.V. – Drilling mud optimisation Baker Hughes Drilling Fluids Attn: Jonathan Wharton Tel: +44 1493 336453

13.2 Biostratigraphy Samples

Sample Set D was collected for infill biostratigraphic analysis.

13.3 Sidewall Cores

Two sidewall core runs were carried out; 24 attempted (planned 23) and 21 recovered in the 12 ¼" hole and 20 attempted and 20 recovered (1 with partial recovery) in the 8 ½" hole. All samples were packaged in jars for shipment.

Wireline Run	Rotary SWC Samples collected	Destination
1D	2366m, 2372.5m, 2383m, 2404m, 2520.5m, 2606m, 2617.5m, 2683.8m, 2716.5m, 2763m, 2767.8m, 2776m, 2877.5m, 2915m, 2918.5m, 2955m, 2965.4m, 3020.5m, 3026m, 3049m & 3072m	**Eni Denmark B.V.** **Eni S.p.A. – E&P Division** Dpt. GEOLAB Geology Laboratories Attn: Michele Impala' Via Maritano, 26 20097 San Donato Milanese (MI) Italy Tel: +39 02 520 46397
2D	3145m,3237m, 3296.5m, 3340.4m, 3349.1m, 3387m, 3427.9m, 3454m, 3572.6m, 3582m, 3614m, 3686m, 3747m, 3758m, 3783.6m, 3794m, 3818m, 3848m, 3890.1m & 3905m	

13.4 Cores

A total of 1 x 11m length core was cut in the 6004/8a-1 well.

Core #	Formation	Cored interval	Recovered	Recovery %	Destination
#1	Lamba Lower Faroe Lavas	3412.0 – 3423.0 m	10.75m	98	**Kirk Petrophysics** Attn: Chris Holmes Kirk Petrophysics Unit1A/1B, Henley Park, Normandy, Guidlford GU3 2DX, UK Tel: +44 (0)1483 235183

The cores were marked-up on surface, gamma ray logged, cut into 1m lengths and stabilised in gypsum before being shipped to Chris Holmes at Kirk Petrophysics to co-ordinate the core analysis. The gypsum stabilized 1m length cores inside the aluminium inner liner were X-Ray imaged before start of analysis. The review of the core quality assessment is summarized in Section 12.3.

13.5 Formation Fluid Samples

Water samples were collected as part of the 12 ¼" wireline geological acquisition programme at 2574m MDRT.

Sample Type	Samples collected	Sample Type	Destination
1 x MRSC	1x 1 gallon sample acquired (100% water from LFA flag). Transferred to 4 bottles for shipment to laboratory.	Formation Water Samples	**Eni Denmark B.V.** **Eni S.p.A. – E&P Division** Dpt. GEOLAB Geology Laboratories Attn: Michele Impala' Via Maritano, 26 20097 San Donato Milanese (MI) Italy Tel: +39 02 520 46397
1 x SPMC	SPMC bottle #657 transferred at pressure on surface by Oilphase to PVT bottle #10290-MA (final pressure 10000psi @ 14degC) for shipment to laboratory.		

13.6 Drill Gas Samples

Sample Set	Samples collected	Destination
Vacutainer Gas Samples	12 ¼" Section: total of 33 Vials: gas peaks and bottom ups 8 ½" Section: total of 47 Vials: gas peaks, pump off gas and bottom ups	**Eni Denmark B.V.** **Eni S.p.A. – E&P Division** Dpt. GEOLAB Geology Laboratories Attn: Michele Impala' Via Maritano, 26 20097 San Donato Milanese (MI) Italy Tel: +39 02 520 46397
Head Space Analysis	12 ¼" Section: total of 62 Vials: 15-9m interval + gas peaks 8 ½" Section: total of 94 Vials: 9m interval + gas peaks	

For the list of Head Spaces and Vacutainer (gas peak samples) collected and analysed after QC, see ANNEXES of the report "Geochemical Characterization of Head Space Gases and Gas Shows" (February 2011) of Eni SGEG-GEBA department.

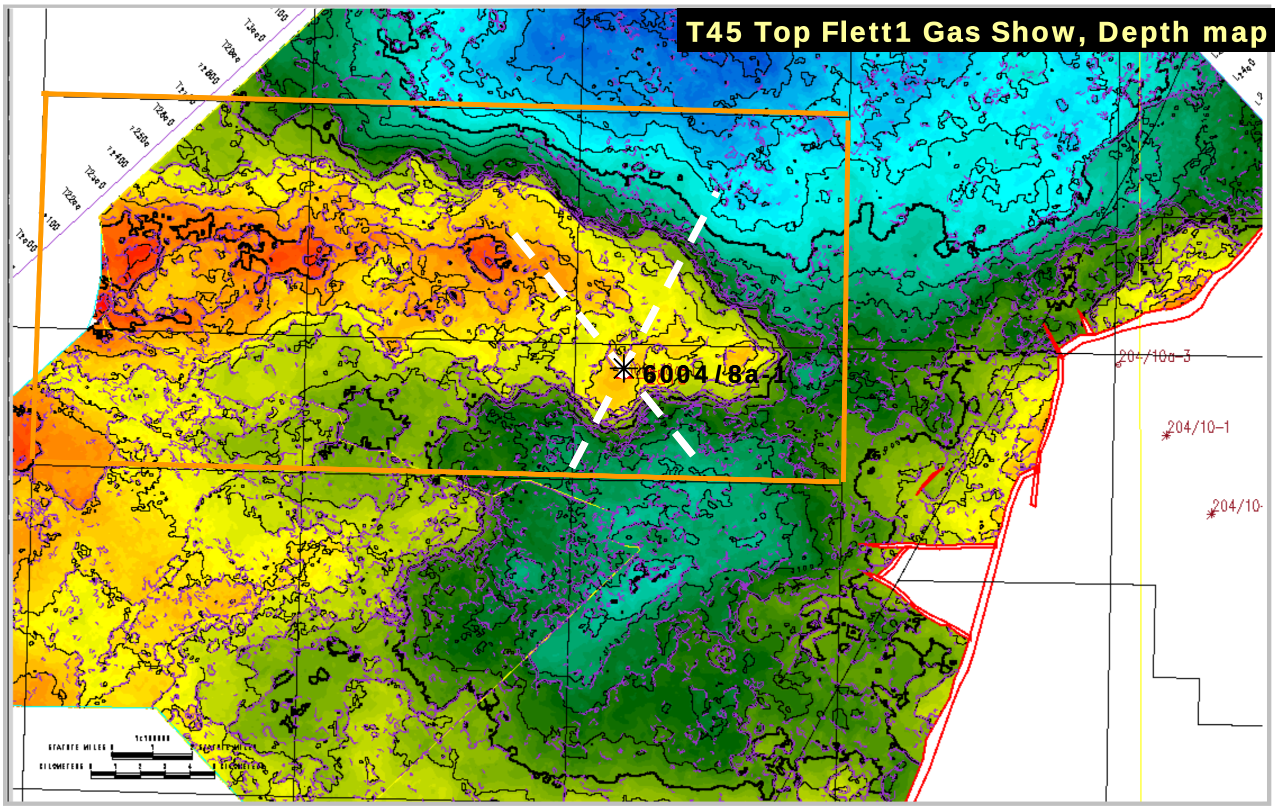
13.7 Drilling mud samples

1 litre drilling mud samples were collected during drilling, at significant gas peaks, during coring operations while the core was being broken-down on surface and prior to wireline logging operations at the following depths:

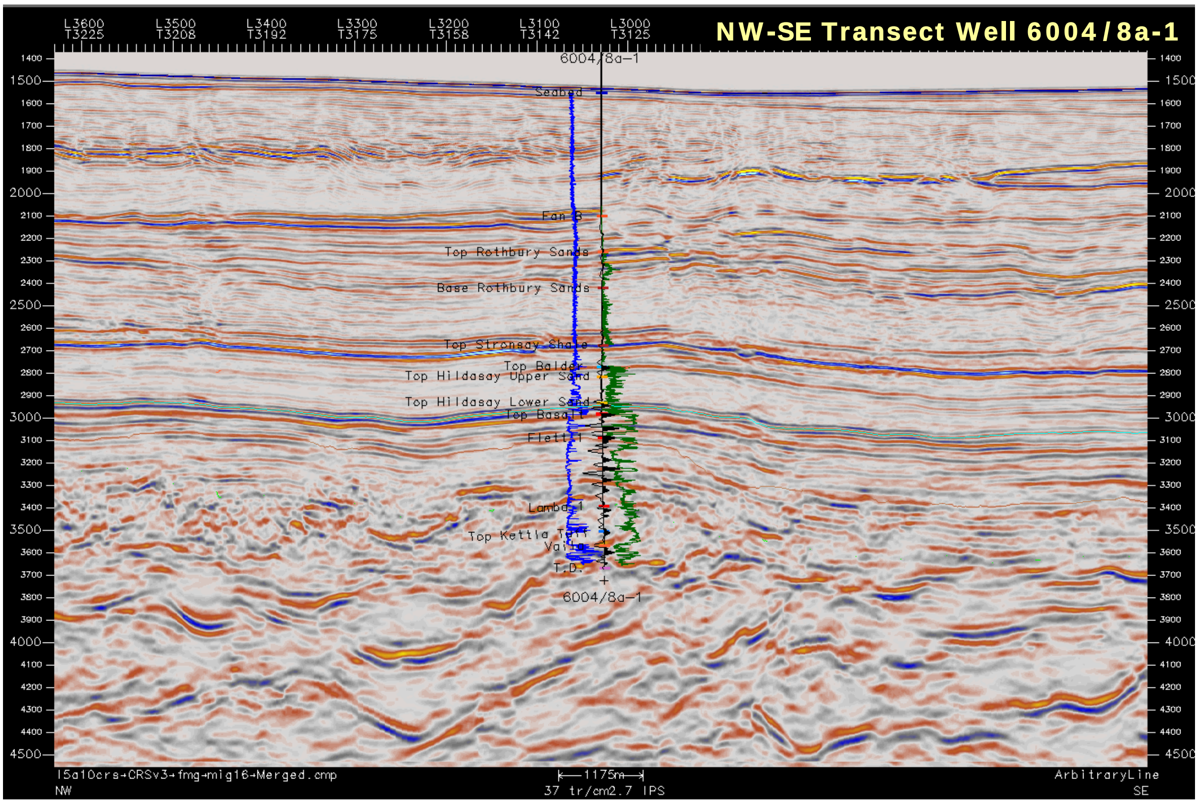
Hole Section	Samples collected	Sample Type	Destination
12 ¼"	7 bottles: 1610m, 2361.31m, 2x 2861m, 2365m, 2368m, 3097m.	Drill Mud Samples	**Eni Denmark B.V.** **Eni S.p.A. – E&P Division** Dpt. GEOLAB Geology Laboratories Attn: Michele Impala' Via Maritano, 26 20097 San Donato Milanese (MI) Italy Tel: +39 02 520 46397
8 ½"	16 bottles: 3100m, 3215m, 3231m, 3212m, 3231m, 3212m, 3418m, 3423m, 3412m Top core #1, Base of core #1, 3100m, 3215m, 3231m, 3436m, 3740m, 3770m, 3770.2m, 3941m.		

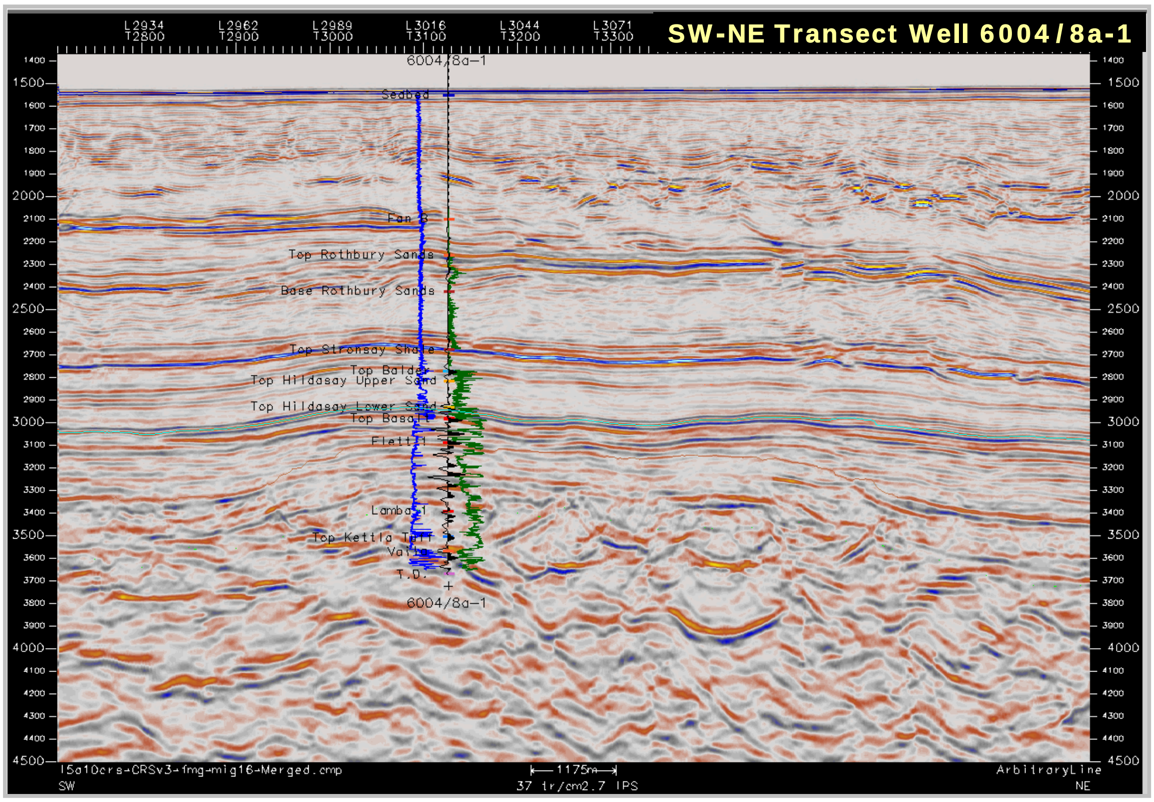
14. FIGURES

14.1 Figure 1: Top Gas Shows T45, "Flett 1" Level

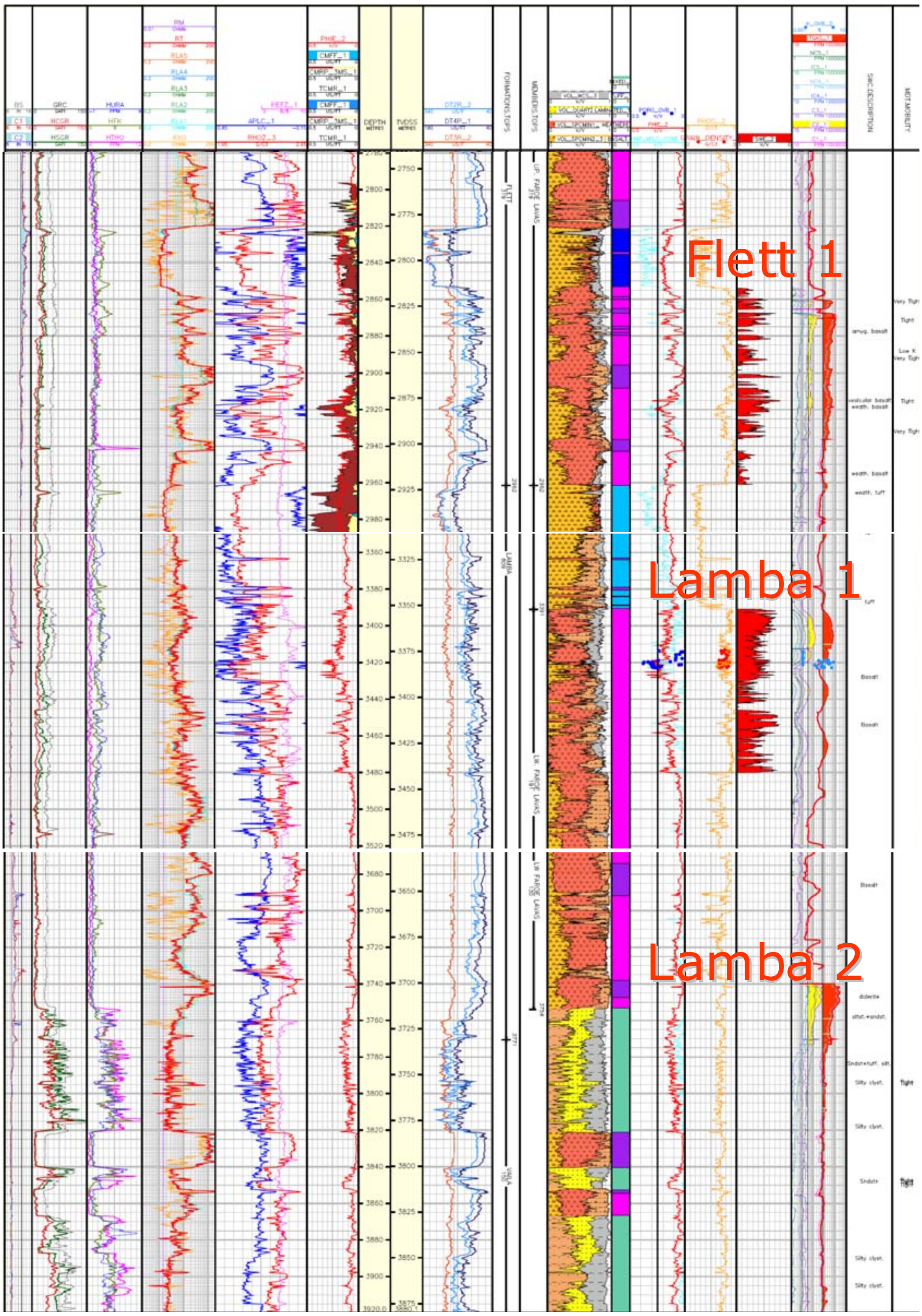


14.2 Figure 2: Geo-seismic Traverses across 6004/8a-1 well path

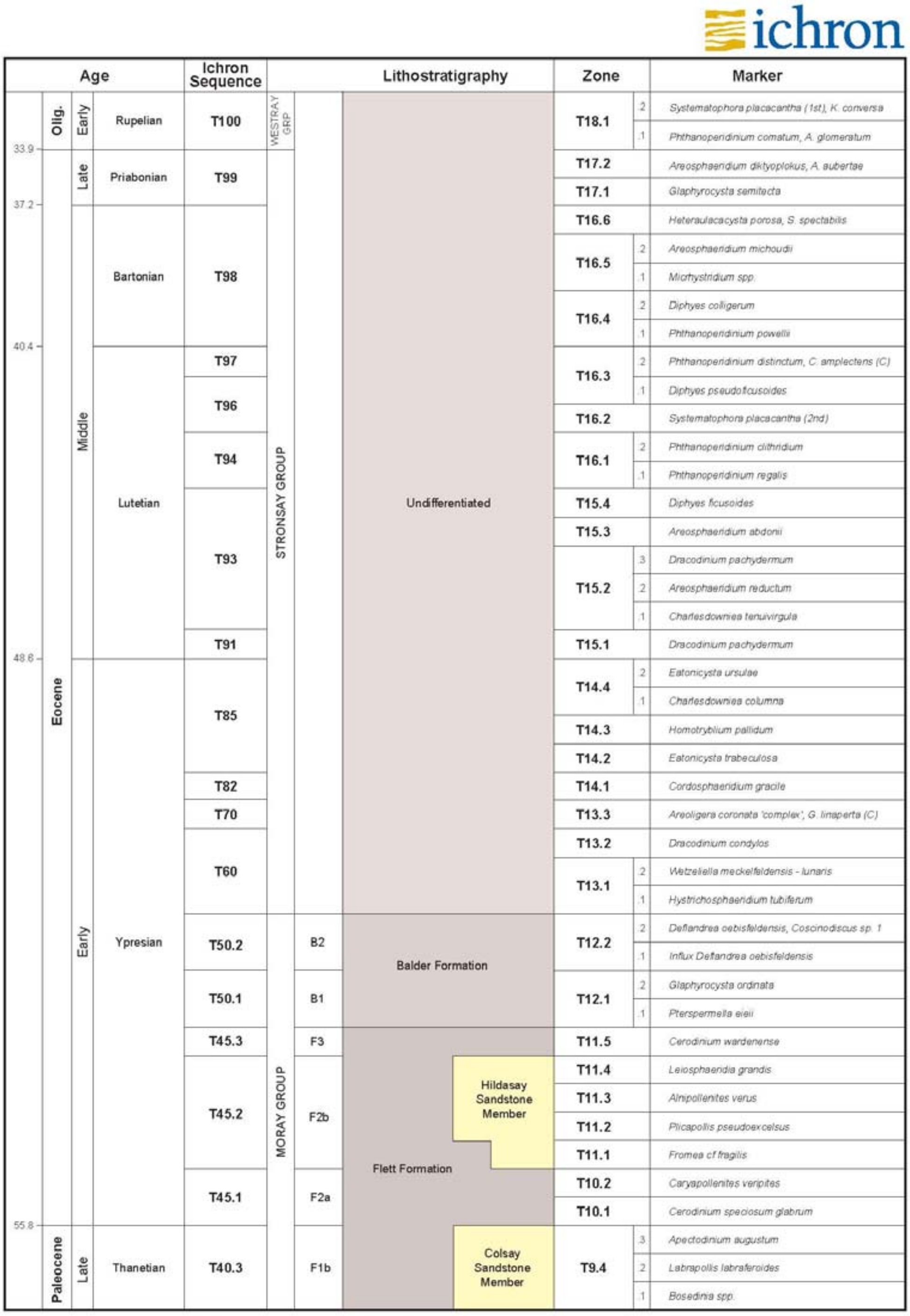




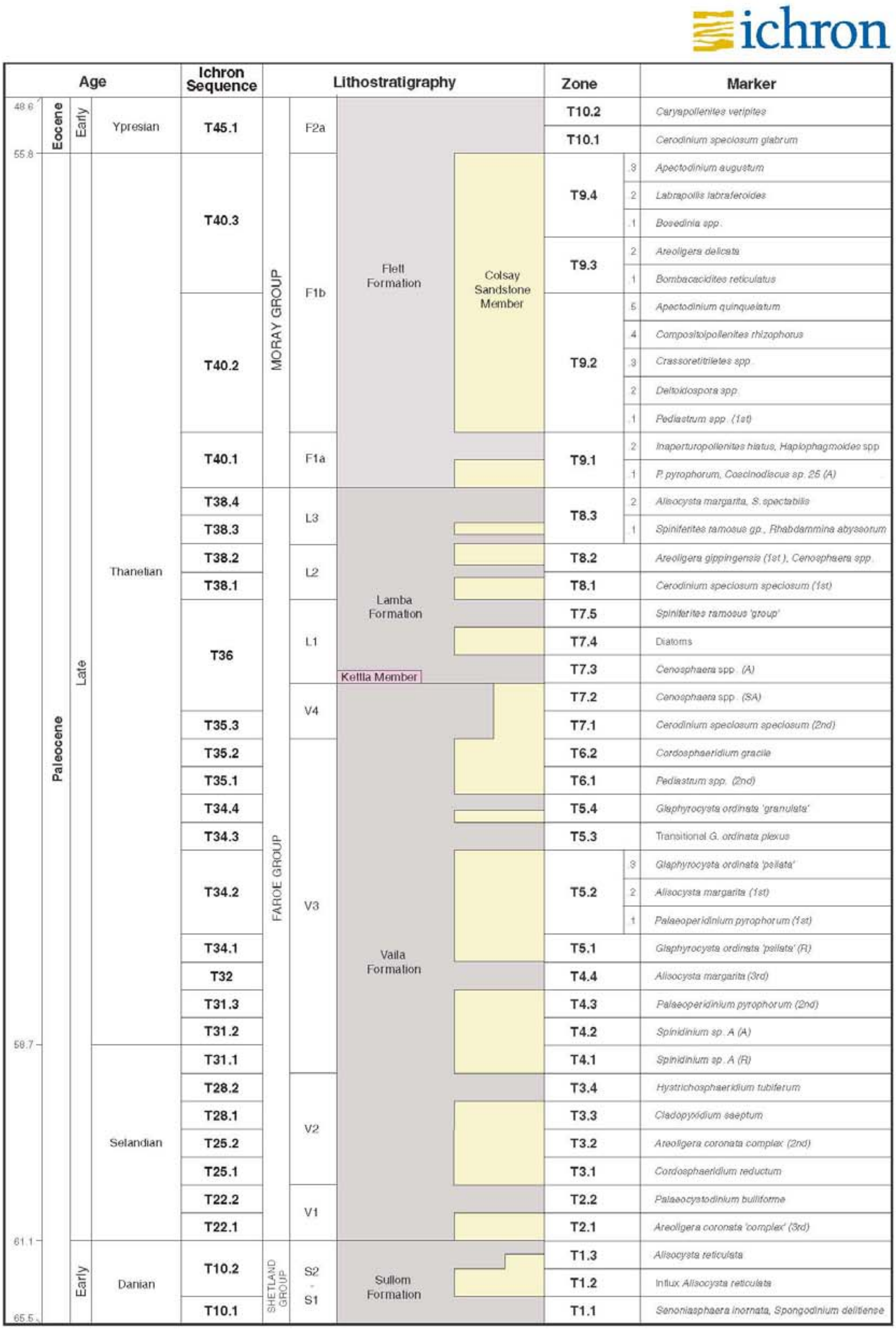
14.3 Figure 3: Well 6004/8a-1 (Anne-Marie) Gas Shows Intervals



15. APPENDIX A: BIOSTRATIGRAPHIC ZONATION SCHEME (ICHRON)



Text-Figure 1. Eocene biostratigraphical zonation scheme, Faroe - Shetland Basin.



Text-Figure 2. Paleocene biostratigraphical zonation scheme, Faroe - Shetland Basin.

16. APPENDIX B: WELLSITE BOTTOM HOLE CORE CHIP DESCRIPTIONS

Drillers Depth m MDRT	Loggers Depth m MDRT	Core No.	Lithology	Formation	Lithological Description
3412.0	3412.7	1	Vesicular Glassy Basalt	Lamba Fm. Lower Faroe Lavas	Dk grn gy, microxln - v f grained, mass, mod hd, w incs consituted by crystalline growth & vesicles, variably granular, locally coarse grained, w abun grns; f-med, crs, locally with aspect of a "Tuffaceous Sandstone".
3412.84	3413.5	1	Vesicular Glassy Basalt	Lamba Fm. Lower Faroe Lavas	As above & inc elements of Breccia, consitituted by clasts (2cm) of tuffaceous feature, gy blue grn, waxy, w partial weathered aspect.
3414.0	3414.7	1	Vesicular Glassy Basalt	Lamba Fm. Lower Faroe Lavas	NOTE: all descs to 3417m = as in 3412 & 3414m. Comm - abun presence of vesicles, sphr & elng, max 5mm, w rnd, w wh mod hd mineral (no reaction to HCL), gd mineral flour. No-rr tr vis porosity.
3415.0	3415.7	1	Vesicular Glassy Basalt	Lamba Fm. Low. Faroe Lavas	As 3412m & 3414m.
3416.0	3416.7	1	Vesicular Glassy Basalt	Lamba Fm. Low. Faroe Lavas	As 3412m & 3414m.
3417.0	3417.7	1	Vesicular Glassy Basalt	Lamba Fm. Low. Faroe Lavas	As 3412m & 3414m.
3418.0	3418.7	1	Vesicular Glassy Basalt	Lamba Fm. Lower Faroe Lavas	(Breccia?) dk grn, v tight, vesicular, rich qtz? fillings; med - v crs, w irreg wh inclusions of Zeolite. Presence of filled microfractures.
3419.0	3419.7	1	Palagonitized Vesicular Glassy Basalt	Lamba Fm. Lower Faroe Lavas	Dk grn - gy, hd, med – crs grained, with tuffaceous aspect; w elements off blk tuff, waxy & wh mineral fillings a.a; w cmt, w abun dk grn mtx, ip gy/blu, waxy, w altered aspect, loc grdg tuff, w abun grns a.a. No - rr tr vis porosity.
3420.0	3420.7	1	Palagonitized Vesic. Glassy Basalt	Lamba Fm. Low. Faroe Lavas	As description above.
3421.0	3421.7	1	Palagonitized Vesic. Glassy Basalt	Lamba Fm. Low. Faroe Lavas	As description above.
3422.0	3422.7	1	Palagonitized Vesic. Glassy Basalt	Lamba Fm. Low. Faroe Lavas	As description above.
3422.75	3423.5	1	Palagonitized Vesic. Glassy Basalt	Lamba Fm. Low. Faroe Lavas	As description above.

Well site descriptions revised following laboratory analysis.

17. APPENDIX C: WELLSITE CORING REPORT & CORE GAMMA RAY

Eni Denmark B.V.

BOTTOM HOLE CORING REPORT

(Page 1 of 1)

Well: 6004/8a-1 (Anne-Marie 1) R.T.E. (m): 38.65 m Bore hole Ø : 8"1/2

Bottom hole Core N° 1 **From (m): 3412** **To (m): 3423** Date: 11 October 2010
TVD (m): 3411.7 **TVD (m): 3422.7**

Last casing: 9"5/8 a m 3093.5 Hole deviation: m 3367 incl. 2.37° - Az. 149.96°

Mud data: KCL /GLYCOL/POLYMER MW: 1300 g/l Visc.: 52 sec Cl^- : 51 g/l
Core barrel type: HDBS - alluminium Inner Tube Ø 4" (tot. lenght 18 m - n.2 tubes x 9 m)
Core bit: PDC Type: FC3743LI; Size: 8"1/2 x 4"
Recovered: 10.75 m = 98 % Purpose: Mineral / Petrophysical / Stratigraphic

AGE and/or FORMATION: **L. Paleocene (Faroe Group) Lamba - Lower faroe Lavas (T38)**
Porosity: n.a. **Permeability: n.a.**

Depth (m)	Lithology	Shows	Fluoresc.	Calcimetry 1' - 15'	Box Lenght (m)	Box N°
3412				12-13%		
		-	-		0.84	1
3412.84				12-13%		
		-	-		1,16	2
3414				8-10%		
		-	-		1,0	3
3415				36-39%		
		-	-		1,0	4
3416				3.6-4%		
		-	-		1,0	5
3417				1-1%		
		-	-			
					1,0	6
3418		-	-	70-79%		
		-	-		1,0	7
3419				46-56%		
		-	-		1,0	8
3420				2-2%		
		-	-		1,0	9
3421				0.3-0.3%		
		-	-		1,0	10
3422				3-4%		
		-	-		0.75	11
3422.75				0.6-0.6%		

LITHOLOGICAL DESCRIPTION AND REMARKS
(Core Chips in corrispondence of severing points - Bottom Box)

From 3412 to 3418 m :
VESICULAR GLASSY BASALT, dark greenish grey, microcrystalline to very fine grained, massive, moderately hard, with inclusions (with irregular shape) constituted by crystalline growth and vesicles, variably granular, locally coarse grained, with abundant grains, fine-medium, to coarse, locally with aspect of a "TUFFACEOUS SANDSTONE".
Common to abundant presence of clasts, spherical and elongated (Ø max 5 mm), well rounded, constituted by white moderately hard mineral (a 3412.84 m showing hollow spheres) with no reaction with HCl (possible volcanic mineral?) showing a good mineral fluorescence. None to rare traces of visual porosity.
At 3412.84 m : VESICULAR GLASSY BASALT a.a., including elements of Breccia, constituted by clasts (Ø 2 cm) of Tuffaceous feature, greyish blue green, waxy, with partial weathered aspect.

At 3418 m VESICULAR GLASSY BASALT (Breccia?) dark greenish very tight, vesicular, rich of quartz? fillings medium to very coarse, with irregular whitish inclusions of Zeolite. Presence of filled microfractures.

From 3419 to 3422.75 m:
PALAGONITIZED VESICULAR GLASSY BASALT, dark greenish - grey, hard, medium to coarse grained, with Tuffaceous aspect, waxy and white spherical matter a.a.; well cemented with abundant dark greenish tuffaceous matrix, in part greyishblue, waxy, with altered aspect, locally grading to Tuff, with abundant contents of grains a.a. (Zeolite?).
No to rare traces of visual porosity.

Shows
No Direct & Cut Fluorescence from hydrocarbons
Trip Gas @ 3412m = 1.38 % (C1:13040 ppm ; C2: 159 ppm; C3: 29 ppm; iC4: 5 ppm; nC4: 7 ppm; iC5: 4 ppm ; nC5: 6 ppm)

Background gas: F/3412 T/3418 = 1.73%; F/3418 T/3423 = 0.44%.
Max Drilling Gas = 2.13 % @ 3415 m
(C1: 18532 ppm; C2: 557 ppm; C3: 192 ppm; iC4 : 33 ppm;
nC4 : 51 ppm; iC5 : 15 ppm; nC5 : 12 ppm).

With Core barrel on surface, while breaking out at the top on PBL valve, checked with portable gas detector: No mix explosive; No CO (carbon monoxide); No H2S.
No hydrocarbons shows observed on core and mud core.
No Direct & Cut Fluorescence observed in the mud.

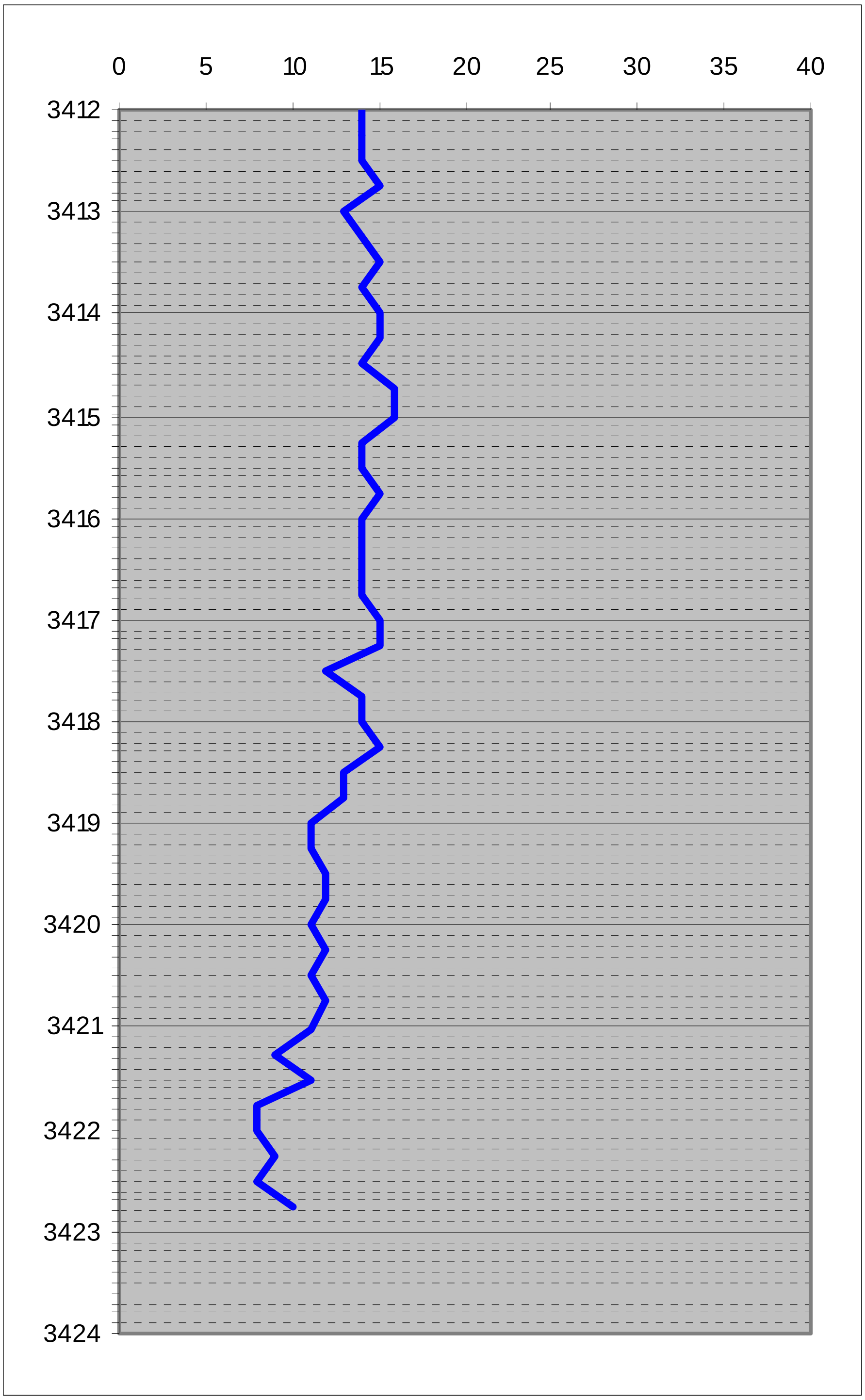
Losses:
No losses observed during the coring

Remark:
The interval F/3412 T/2423 m was cored on 10th Oct 10 in 04h55'.
F/3412 T/3418: ROP= 4.8 m/h. F/3418 T/3423m: ROP = 1.3 m/h.
Suspended coring due core jammed.
Core preserved with Gypsum Method.

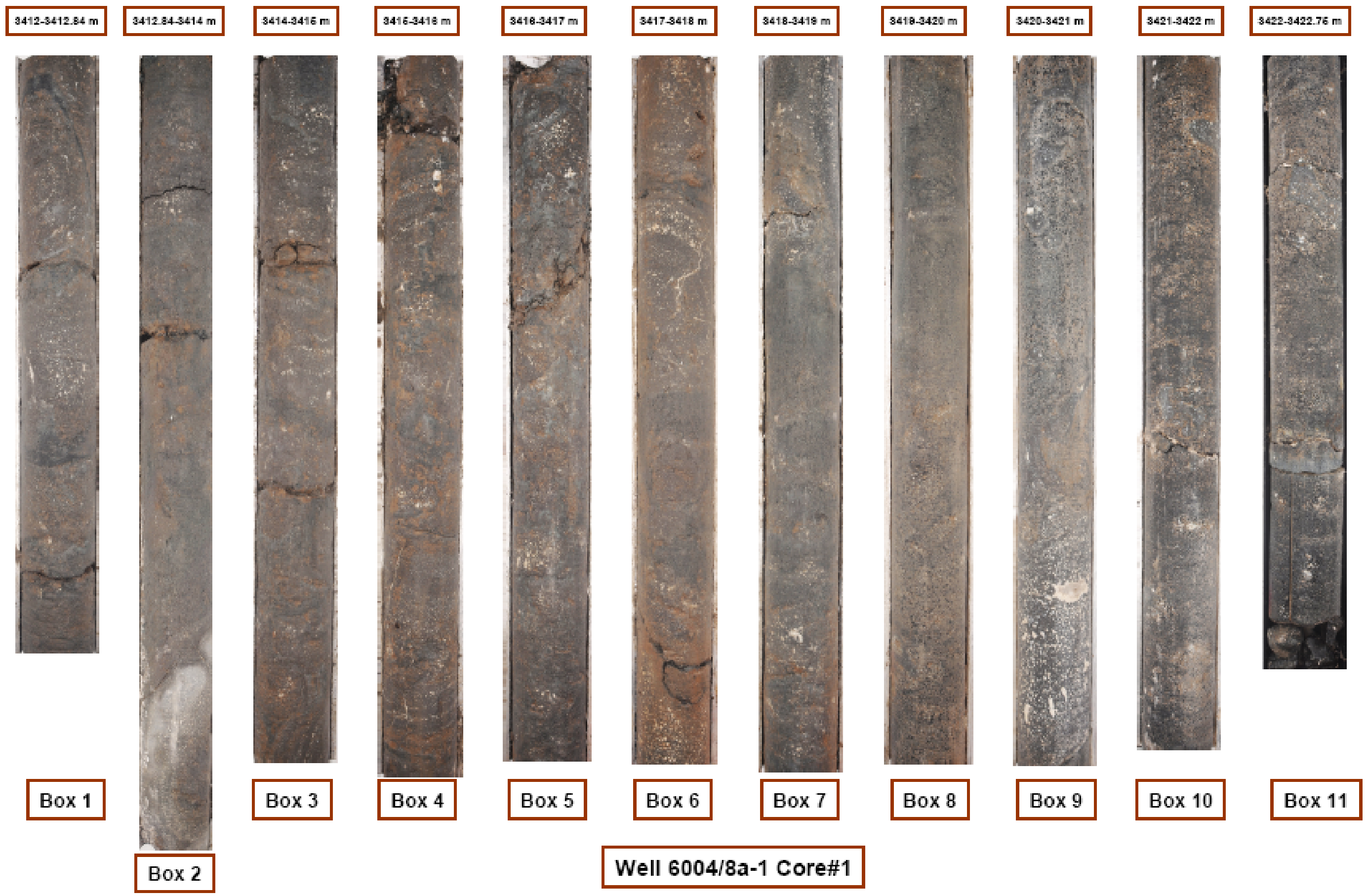
Legend of Shows: Fluorescence: G = Good F = Fair W = Weak P = Poor N = Null
Gas Oil Oil traces Water

Well Site Geologist : **I.Tome'** Stratigrapher : **//** Checked by : **G. Bagnoli**

CPS counts from core cut from 3412m to 3423m MDRT



18. APPENDIX D: FULL BOTTOM HOLE CORE PICTURES



19. APPENDIX E: ROTARY SIDEWALL CORE DESCRIPTIONS (RUN 1D)

Well Name:	6000/8a-1 (Anne Marie)		Country:	Faroe Islands (Offshore)			
Run Nr: 1D	From: 2366	to 3072		Date	28-Sep-10	Contractor:	Schlumberger
Bit Size	12-1/4"		Mud	KCL/GLYCOL/PO		CST Type	MSCT
Total depth (m)	3097	3096.9 TVD	Density	1.22	kg/l	Samples programmed	N. 23
Last casing (m)	13-3/8"	@ 2356.7	Viscosity	54	sec	Samples attempted	N. 24
Max Hole Dev.	1.14 °	@ 2899m	Salinity	50 g/l	Cl-	Samples recovered	N. 21 (N. 19 good recovery + N. 2 partial recovery)

N°	Depth	Description	Recovery		Shows			
			mm	%	Oil	Bit	Direct fuor.	Cut fluor.
23	2366	TUFFACEOUS CLAYSTONE: dark grey, massive, firm, crumbly, brittle, common weathered mineral and tuffaceous fragments, argillaceous aspect, non calcareous.	10	20	NN	NN	NN	NN
22	2372.5	TUFFACEOUS CLAYSTONE: As above with non tuffaceous faint dark grey laminae, occasional carbonaceous grains.	40	80	NN	NN	NN	NN
21	2383	SANDSTONE: massive, grey to bluish grey, very hard, quartzose, very fine to fine grained, well sorted, sub angular to sub rounded, elongate to sub spherical, abundant disseminated pyrite, common lithic and Tuffaceous fragments, occasional laterite grains, trace carbonaceous material in parts, very well cemented with calcite, common off white interstitial clay, no to poor visible porosity. No Shows.	40	80	NN	NN	NN	NN
20	2404	CLAYEY SILTSTONE: grey to bluish grey, micro laminated with argillacoeus Tuffaceous flakes, very fine to fine grained, well sorted, sub angular to sub rounded, elongate to sub spherical, abundant disseminated pyrite, common mica and weathered Tuffaceous fragments, clay laminae commonly Tuffaceous, moderately to well cemented with calcite and clay, poor to no visible porosity. No Show.	50	100	NN	NN	NN	NN

19	2520.5	SANDSTONE: pale grey to off white, laminated, friable to hard, quartzose, medium grained, occasional fine grains, well sorted, well rounded, highly spherical, with abundant dark volcanic and pale coloured feldspar grains, poorly cemented with argillaceous matrix to very well cemented with calcite, matrix supported and tight when cemented with calcite, excelent visible porosity when friable, blue white mineral fluorescence. No Shows.	20	40	NN	NN	NN	NN
18	2606.0	CLAYEY SILTSTONE: pale grey to dark grey, hard, interlaminated with very dark grey Claystone, quartzose, very fine to fine grained, sub angular to rounded, moderate to highly spherical, well sorted, abundant pyrite and Tuffaceous fragments, abundant argillaceous matrix, very silty, no visible porosity. No Shows.	45	90	NN	NN	NN	NN
17	2617.5	SANDSTONE: As above, with scattederd mica, well cemented in a slightly calcareous argillaceous matrix. No Shows.	50	100	NN	NN	NN	NN
16	2683.8	TUFF: dark green to blue grey, pale grey, very hard, massive, fine to coarse grained crystals and volcanic grains in a fine grained matrix, common green amphiboles and black mafic mineerals, with common quartz shards, abundant pyrite, occasional patchy pale green crypto crystalline matrix.	45	90	NN	NN	NN	NN
15	2716.5	TUFF: As above.	40	80	NN	NN	NN	NN
14	2758.6	Not Recovered			NN	NN	NN	NN
13	2762.5	Not Recovered			NN	NN	NN	NN
12	2763.0	TUFFACEOUS SANDSTONE: pale blue grey to grey, very hard, laminated with sandy Tuff in part, very fine to fine grained quartzose sand graines with common dark mafic and pale green to off white tuffaceous grains, laminated in part with very well cemented Siltstone, poor to no visible porosity. No Shows.	40	80	NN	NN	NN	NN
11	2767.8	SILTSTONE: green to bluish grey, very hard, abundant very coarse to granular rounded to angular volcanic and tuffaceous fragments in a very fine matrix, fragments are commonly grain supported.	40	80	NN	NN	NN	NN
10	2776.0	TUFF: green grey, very hard, sparse, scattered very coarse to granular, blackish green to green, rounded volcanic grains, in a very fine grained tuffaceous matrix volcanic and mineral fragments show common alteration.	45	90	NN	NN	NN	NN
9	2877.5	AMYGDALOIDAL BASALT: black with off white and white amygdales, very fine to micro crystalline matrix, with elongate aligned zeolite filled amygdales, occasional red brown to dark orange lateritic inclusions/xenoliths floating in the matrix.	40	80	NN	NN	NN	NN
8	2915.0	VESICULAR BASALT: black to very dark grey, with common speroidal blue green and off white vesicles filled with zeolites, in a very fine crystalline feldspar and mafic matrix, with common red brown to orange alteration around vesicles.	45	90	NN	NN	NN	NN

7	2918.5	WEATHERED BASALT: red brown, orange, blue green, pale grey, granular to very coarse grained blue green, rounded tuffaceous grains in a red brown altered lateritic matrix, with common feldspar and mafic minerals.	45	90	NN	NN	NN	NN
6	2955.0	WEATHERED BASALT: red grey, pale pinkish grey, pale blue green, red brown, very hard, granular size, grain supported, very fine crystalline volcanic fragments, in a fine to crypto crystalline blue green matrix, volcanic fragments commonly with ascicular and fine tabular feldspar and mafic minerals.	50	100	NN	NN	NN	NN
5	2965.4	WEATHERED TUFF; pinkish grey to orange grey, blue green, very fine crystalline quartz and mafic minerals, with common alteration due to weathering, common very fine feldspar crystals in matrix. Possible Hyaloclastic Basalt.	50	100	NN	NN	NN	NN
4	3020.5	TUFF: blue green to green grey, coarse grained to granular size angular very fine crystalline volcanic fragments in a very fine grained to glassy matrix, occaional cream clay alteration in matrix, volcanic fragments commonly glassy with feldspar and quartz grains, occasionally vesicular.	45	90	NN	NN	NN	NN
3	3026.0	TUFF: pale blue green to green grey, very hard, very fine grained, laninated with lenticular fine grained tuffaceous laminae, abundant pyrite and acicular dark mafic minerals.	45	90	NN	NN	NN	NN
2	3049.0	TUFF: As above, with granular size volcanic and tuffaceous grains.	50	100	NN	NN	NN	NN
1	3072.0	TUFF: As above, with occasional large acicular mineral inclusions.	45	90	NN	NN	NN	NN

Remarks

Rotary Side Wall Cores - No calcimetry performed, in order to avoid any damage of the cores. Tested each samples with a drop of HCl = no reaction.
Log correlated with CMR-HRLA-TLD-APS-HNGS recorded on 25 Sep 2010
No Oil Stains observed
No Direct & Cut Fluorescence observed.

Company rep:	Ivan Tome' / Edward Homson

Date	28-Sep-10

20. APPENDIX F: ROTARY SIDEWALL CORE DESCRIPTIONS (RUN 2D)

Well Name:	6000/8a-1 (Anne Marie)		**Country:**	Faroe Islands (Offshore)			
Run Nr: 2D		From: 3145	to 3905	Date	26-Oct-10	Contractor:	Schlumberger
Bit Size	**8-1/2"**		Mud	**KCL/GLYCOL/PO**		CST Type **MSCT**	
Total depth (m)	**3491**	**3939.7 TVD**	**3491**	**1.30**	kg/l	Samples programmed	**N. 20**
Last casing (m)	**9- 5/8"**	**@ 3093.5**	Viscosity	**54**	sec	Samples attempted	**N. 23**
Max Hole Dev.	**4.13 °**	**@ 3900 m**	**4.13 °**	**58 g/l**	Cl-	Samples recovered	**N. 20** (N. 19 good recovery + N. 1 partial recovery)

N°	Depth	Description	Recovery		Shows			
			mm	%	Oil	Bit	Direct fluor.	Cut fluor.
20	**3145**	TUFFACEOUS SILTSTONE: (Broken into 3 pieces) medium grey to medium dark grey, firm in places, rarely soft. With occasional very fine to fine pale grey quartz grains. Occasionally grading to TUFFACEOUS CLAYSTONE. Slight reaction to HCI.	48	96	NN	NN	NN	NN
19	**3237**	TUFF: (Broken into 2 pieces) medium grey to dark grey, occasionally light grey, with argillaceous matrix, fine to coarse feldspar grains, rarely very coarse. Tight, poor visual porosity. No shows. Presence of white mineral, Volcanic? No reaction to HCI. Reaction only from calcite.	48	96	NN	NN	NN	NN
18	**3296.5**	TUFFACEOUS CLAYSTONE: (Broken into 3 pieces) predominantly greenish dark grey, occasionally medium grey, hard, with occasional white to light grey tuffaceous matrix, common blackish mafic inclusions. Medium brown silty fracture fill. No reaction to HCI.	45	90	NN	NN	NN	NN
17	**3340.4**	TUFFACEOUS SILTSTONE: (Broken into 2 pieces) Medium grey moderately hard, silty with tuffaceous matter and occasionally arenaceous with very fine SANDSTONES. Slight reaction to HCI. NOTE: Had to reset motor, core cut twice. Core taken just below high gamma spike on log.	61	100	NN	NN	NN	NN

16	**3349.1**	TUFF: (Complete core) medium grey to occasionally medium dark grey, moderately hard, commonly mottled, with common calcite and, occasional dark mafic inclusions, in places grading to TUFFACEOUS CLAYSTONE. HCI reaction in calcite.	46	92	NN	NN	NN	NN
15	**3387**	TUFF: (Complete core) medium grey, moderately hard to hard, rarely granular in places, very fine. Rare white inclusions of Volcanic minerals. Moderate reaction to HCI.	50	100	NN	NN	NN	NN
14	**3427.9**	REWORKED BASALT: (Complete core) light grey to green grey, with fine tuffaceous matrix, fine quartz grains, tight, poor visual porosity. No shows. Abundant rounded elements; white hard volcanic mineral. No reaction to HCI. Grading to TUFF.	48	100	NN	NN	NN	NN
13	**3454**	REWORKED BASALT: (Broken into 3 pieces) as description above plus with a darker matrix and with white mineral veins.	50	100	NN	NN	NN	NN
12	**3572.6**	REWORKED BASALT: (Broken into 2 pieces) medium grey, firm, speckled, with common mineral inclusions (calcite).	45	90	NN	NN	NN	NN
11	**3582**	FRACTURED BASALT: (Complete core) light grey to medium grey firm very fine matrix with common pyrite and calcite veins, crystal inclusions and common Olivine inclusions. Tight.	49	98	NN	NN	NN	NN
10	**3614**	SILTY CLAYSTONE: (1 small piece) medium grey, moderately hard, homogeneous, slightly calcareous, slightly silty in places.	16	32	NN	NN	NN	NN
9	**3686**	BASALT: (Complete core) medium grey to medium dark grey, very hard, speckled in places, massive, tight, with rare pyrite, fine plagioclase and feldspars. With occasional dark grey black mafic minerals.	46	92	NN	NN	NN	NN
8	**3747**	BASALT/DOLERITE?: (Complete core) light grey, very hard, mottled, massive, tight, with coarse grained crystals in a finer grained matrix.	45	90	NN	NN	NN	NN
7	**3758**	SILTSTONE with very fine SANDSTONE laminae: (Complete core) medium grey, firm, matrix supported and tight where cemented with calcite. Moderately calcareous. Fine to very fine pale grey SANDSTONE, calcite cemented, tight, very poor visual porosity. No Shows.	45	90	NN	NN	NN	NN
6	**3783.6**	SILTY SANDSTONE: (Complete core) Very fine tight pale grey SANDSTONE, very poor visual porosity, grading to TUFFACEOUS SILTSTONE.	48	96	NN	NN	NN	NN
5	**3794**	SILTY CLAYSTONE with millimetric interbedded SANDSTONE: (Broken into 3 pieces) medium dark grey hard, non calcareous with pale grey tight calcite cemented fine SILTSTONE.	46	92	NN	NN	NN	NN

4	**3818**	SILTY CLAYSTONE: (Broken into 5 pieces, largest = 35mm) medium grey to medium dark grey firm to moderately hard, homogeneous, non calcareous.	49	98	NN	NN	NN	NN
3	**3848**	SILTY SANDSTONE: (Complete core) medium grey, massive, speckled, reaction to HCL.	50	100	NN	NN	NN	NN
2	**3890.1**	CLAYSTONE: (Complete core) As description below, increasingly grading towards SANDY CLAYSTONE.	50	100	NN	NN	NN	NN
1	**3905**	SILTY CLAYSTONE: (Broken into 3 pieces) Medium grey to medium dark grey, firm to moderately hard, homogeneous, occasional mafic inclusions, very slightly calcareous, silty.	46	92	NN	NN	NN	NN

Remarks

Rotary Side Wall Cores - No calcimetry performed, in order to avoid any damage of the cores. Tested each samples with a drop of HCl = no reaction.
Log correlated with FMI-DSI-GR recorded on 25 Oct 2010
No Oil Stains observed
No Direct & Cut Fluorescence observed.

Company rep:	Sergio Deias / Simon Hutchings

Date	26-Oct-10

21. APPENDIX G: DIRECTIONAL SURVEY LISTING (PATHFINDER)

Company:	ENI Denmark	**Local Co-ordinate Reference:**	Site 6004/8a-1
Project:	Anne Marie	**TVD Reference:**	Mean Sea Level
Site:	6004/8a-1	**MD Reference:**	West Phoenix - Seadrill @ 38.65m (Seadrill West Phoenix)
Well:	6004/8a-1	**North Reference:**	True
Wellbore:	6004/8a-1	**Survey Calculation Method:**	Minimum Curvature
Design:	6004/8-A	**Database:**	EDM 2003.21 Multi User Db

Project	Anne Marie, Offshore Faroes		
Map System:	Universal Transverse Mercator	**System Datum:**	Mean Sea Level
Geo Datum:	ETRF89		
Map Zone:	Zone 30N (6 W to 0 W)		Using geodetic scale factor

Site	6004/8a-1						
Site Position:			**Northing:**	6,743,836.40 m	**Latitude:**	60° 49' 14.667 N
From:	Map		**Easting:**	414,864.60 m	**Longitude:**	4° 33' 55.327 W
Position Uncertainty:		0.00 m	**Slot Radius:**	in	**Grid Convergence:**	-1.37 °

Well	6004/8a-1					
Well Position	**+N/-S**	0.00 m	**Northing:**	6,743,836.40 m	**Latitude:**	60° 49' 14.667 N
	+E/-W	0.00 m	**Easting:**	414,864.60 m	**Longitude:**	4° 33' 55.327 W
Position Uncertainty		0.00 m	**Wellhead Elevation:**	1,106.35 m	**Water Depth:**	1,106.35 m

Wellbore	6004/8a-1				
Magnetics	**Model Name**	**Sample Date**	**Declination (°)**	**Dip Angle (°)**	**Field Strength (nT)**
	BGGM2010	01/07/2010	-5.37	73.08	50,923

Design	6004/8-A				
Audit Notes:					
Version:	1.0	**Phase:**	ACTUAL	**Tie On Depth:**	0.00
Vertical Section:	**Depth From (TVD) (m)**	**+N/-S (m)**	**+E/-W (m)**	**Direction (°)**	
	-38.65	0.00	0.00	0.00	

Survey Program **Date** 10/11/2010

From (m)	To (m)	Survey (Wellbore)	Tool Name	Description
1,145.00	1,207.00	36" (6004/8a-1)	PMWD	PMWD
1,245.00	1,580.00	26" PMWD (6004/8a-1)	PMWD	PMWD
1,625.00	2,335.00	17 1/2" PMWD (6004/8a-1)	PMWD	PMWD
2,364.00	3,039.00	12-1/4" PMWD (6004/8a-1)	PMWD	PMWD
3,116.00	3,941.00	8-1/2" PMWD (6004/8a-1)	PMWD	PMWD

Company:	ENI Denmark	Local Co-ordinate Reference:	Site 6004/8a-1
Project:	Anne Marie	TVD Reference:	Mean Sea Level
Site:	6004/8a-1	MD Reference:	West Phoenix - Seadrill @ 38.65m (Seadrill West Phoenix)
Well:	6004/8a-1	North Reference:	True
Wellbore:	6004/8a-1	Survey Calculation Method:	Minimum Curvature
Design:	6004/8-A	Database:	EDM 2003.21 Multi User Db

Survey

Measured Depth (m)	Inclination (°)	Azimuth (°)	TVD Below System (m)	+N/-S (m)	+E/-W (m)	Map Northing (m)	Map Easting (m)	Latitude	Longitude
0.00	0.00	0.00	-38.65	0.00	0.00	6,743,836.40	414,864.60	60° 49' 14.667 N	4° 33' 55.327 W
1,145.00	0.00	0.00	1,106.35	0.00	0.00	6,743,836.40	414,864.60	60° 49' 14.667 N	4° 33' 55.327 W
1,158.00	0.79	54.48	1,119.35	0.05	0.07	6,743,836.45	414,864.67	60° 49' 14.668 N	4° 33' 55.322 W
1,164.00	0.79	60.11	1,125.35	0.10	0.14	6,743,836.49	414,864.74	60° 49' 14.670 N	4° 33' 55.317 W
1,177.00	0.79	44.82	1,138.35	0.20	0.28	6,743,836.60	414,864.89	60° 49' 14.673 N	4° 33' 55.308 W
1,192.00	0.97	57.21	1,153.35	0.35	0.46	6,743,836.74	414,865.07	60° 49' 14.678 N	4° 33' 55.296 W
1,207.00	0.70	125.85	1,168.34	0.36	0.64	6,743,836.75	414,865.25	60° 49' 14.678 N	4° 33' 55.284 W
1,245.00	0.97	103.00	1,206.34	0.15	1.15	6,743,836.53	414,865.75	60° 49' 14.672 N	4° 33' 55.251 W
1,272.00	0.70	107.66	1,233.34	0.05	1.53	6,743,836.42	414,866.13	60° 49' 14.668 N	4° 33' 55.226 W
1,300.00	0.97	115.57	1,261.33	-0.10	1.90	6,743,836.25	414,866.50	60° 49' 14.663 N	4° 33' 55.201 W
1,329.00	1.14	106.25	1,290.33	-0.29	2.40	6,743,836.05	414,866.99	60° 49' 14.657 N	4° 33' 55.168 W
1,357.00	1.23	100.36	1,318.32	-0.42	2.96	6,743,835.91	414,867.55	60° 49' 14.653 N	4° 33' 55.131 W
1,385.00	0.97	94.03	1,346.32	-0.49	3.50	6,743,835.83	414,868.08	60° 49' 14.651 N	4° 33' 55.095 W
1,413.00	0.62	93.86	1,374.32	-0.52	3.88	6,743,835.79	414,868.47	60° 49' 14.650 N	4° 33' 55.070 W
1,440.00	0.35	147.74	1,401.32	-0.60	4.07	6,743,835.71	414,868.66	60° 49' 14.647 N	4° 33' 55.057 W
1,468.00	0.44	168.30	1,429.31	-0.78	4.14	6,743,835.53	414,868.72	60° 49' 14.642 N	4° 33' 55.053 W
1,496.00	0.44	161.27	1,457.31	-0.98	4.20	6,743,835.32	414,868.77	60° 49' 14.635 N	4° 33' 55.049 W
1,524.00	0.35	184.47	1,485.31	-1.17	4.22	6,743,835.13	414,868.79	60° 49' 14.629 N	4° 33' 55.047 W
1,552.00	0.53	303.75	1,513.31	-1.18	4.11	6,743,835.12	414,868.68	60° 49' 14.628 N	4° 33' 55.055 W
1,580.00	0.79	226.05	1,541.31	-1.24	3.86	6,743,835.06	414,868.43	60° 49' 14.626 N	4° 33' 55.071 W
1,625.00	0.62	171.29	1,586.31	-1.70	3.68	6,743,834.61	414,868.23	60° 49' 14.612 N	4° 33' 55.083 W
1,669.00	0.79	167.16	1,630.30	-2.23	3.78	6,743,834.08	414,868.33	60° 49' 14.595 N	4° 33' 55.076 W
1,697.00	0.70	160.83	1,658.30	-2.58	3.88	6,743,833.73	414,868.42	60° 49' 14.583 N	4° 33' 55.070 W
1,724.00	0.62	158.72	1,685.30	-2.87	3.99	6,743,833.43	414,868.52	60° 49' 14.574 N	4° 33' 55.063 W
1,752.00	0.62	161.97	1,713.30	-3.16	4.09	6,743,833.15	414,868.61	60° 49' 14.565 N	4° 33' 55.056 W
1,781.00	0.53	160.83	1,742.30	-3.43	4.18	6,743,832.87	414,868.70	60° 49' 14.556 N	4° 33' 55.050 W
1,809.00	0.44	150.99	1,770.30	-3.65	4.28	6,743,832.65	414,868.79	60° 49' 14.549 N	4° 33' 55.044 W
1,864.00	0.26	163.82	1,825.30	-3.96	4.41	6,743,832.34	414,868.92	60° 49' 14.539 N	4° 33' 55.035 W
1,891.00	0.26	165.40	1,852.30	-4.07	4.45	6,743,832.22	414,868.95	60° 49' 14.535 N	4° 33' 55.032 W
1,948.00	0.26	184.39	1,909.29	-4.33	4.47	6,743,831.97	414,868.96	60° 49' 14.527 N	4° 33' 55.031 W
1,972.00	0.35	230.09	1,933.29	-4.43	4.41	6,743,831.87	414,868.90	60° 49' 14.524 N	4° 33' 55.035 W
2,004.00	0.26	234.48	1,965.29	-4.53	4.27	6,743,831.77	414,868.76	60° 49' 14.520 N	4° 33' 55.044 W
2,030.00	0.35	301.98	1,991.29	-4.53	4.16	6,743,831.78	414,868.65	60° 49' 14.520 N	4° 33' 55.051 W
2,058.00	0.26	327.91	2,019.29	-4.43	4.05	6,743,831.88	414,868.54	60° 49' 14.524 N	4° 33' 55.059 W
2,086.00	0.26	321.58	2,047.29	-4.32	3.98	6,743,831.98	414,868.47	60° 49' 14.527 N	4° 33' 55.063 W
2,113.00	0.26	325.89	2,074.29	-4.22	3.91	6,743,832.08	414,868.40	60° 49' 14.530 N	4° 33' 55.068 W
2,142.00	0.44	308.58	2,103.29	-4.10	3.78	6,743,832.21	414,868.28	60° 49' 14.534 N	4° 33' 55.076 W
2,199.00	0.44	317.63	2,160.29	-3.80	3.46	6,743,832.52	414,867.97	60° 49' 14.544 N	4° 33' 55.097 W
2,227.00	0.35	305.41	2,188.29	-3.67	3.32	6,743,832.65	414,867.83	60° 49' 14.548 N	4° 33' 55.107 W
2,253.00	0.35	319.21	2,214.29	-3.57	3.21	6,743,832.76	414,867.72	60° 49' 14.551 N	4° 33' 55.115 W
2,283.00	0.26	309.89	2,244.29	-3.45	3.09	6,743,832.87	414,867.61	60° 49' 14.555 N	4° 33' 55.122 W
2,311.00	0.35	300.40	2,272.29	-3.37	2.97	6,743,832.96	414,867.49	60° 49' 14.558 N	4° 33' 55.130 W
2,335.00	0.35	288.54	2,296.29	-3.31	2.84	6,743,833.02	414,867.36	60° 49' 14.560 N	4° 33' 55.139 W
2,384.00	0.35	308.05	2,345.29	-3.17	2.58	6,743,833.17	414,867.10	60° 49' 14.564 N	4° 33' 55.156 W
2,412.00	0.18	229.74	2,373.29	-3.15	2.48	6,743,833.20	414,867.00	60° 49' 14.565 N	4° 33' 55.163 W
2,440.00	0.35	260.67	2,401.29	-3.19	2.36	6,743,833.16	414,866.88	60° 49' 14.564 N	4° 33' 55.171 W
2,468.00	0.35	297.24	2,429.29	-3.16	2.20	6,743,833.19	414,866.72	60° 49' 14.564 N	4° 33' 55.181 W
2,495.00	0.35	275.97	2,456.29	-3.12	2.04	6,743,833.24	414,866.57	60° 49' 14.566 N	4° 33' 55.191 W
2,523.00	0.09	257.51	2,484.29	-3.11	1.94	6,743,833.24	414,866.46	60° 49' 14.566 N	4° 33' 55.198 W
2,552.00	0.26	273.07	2,513.29	-3.11	1.85	6,743,833.24	414,866.37	60° 49' 14.566 N	4° 33' 55.204 W
2,580.00	0.26	263.05	2,541.29	-3.12	1.72	6,743,833.24	414,866.25	60° 49' 14.566 N	4° 33' 55.213 W
2,608.00	0.09	232.90	2,569.28	-3.14	1.64	6,743,833.22	414,866.17	60° 49' 14.565 N	4° 33' 55.218 W
2,620.00	0.00	192.74	2,581.28	-3.14	1.63	6,743,833.22	414,866.16	60° 49' 14.565 N	4° 33' 55.218 W
2,647.00	0.35	231.32	2,608.28	-3.20	1.57	6,743,833.17	414,866.09	60° 49' 14.563 N	4° 33' 55.223 W

Company:	ENI Denmark	Local Co-ordinate Reference:	Site 6004/8a-1
Project:	Anne Marie	TVD Reference:	Mean Sea Level
Site:	6004/8a-1	MD Reference:	West Phoenix - Seadrill @ 38.65m (Seadrill West Phoenix)
Well:	6004/8a-1	North Reference:	True
Wellbore:	6004/8a-1	Survey Calculation Method:	Minimum Curvature
Design:	6004/8-A	Database:	EDM 2003.21 Multi User Db

Survey

Measured Depth (m)	Inclination (°)	Azimuth (°)	TVD Below System (m)	+N/-S (m)	+E/-W (m)	Map Northing (m)	Map Easting (m)	Latitude	Longitude
2,675.00	0.53	182.98	2,636.28	-3.38	1.50	6,743,832.99	414,866.02	60° 49' 14.557 N	4° 33' 55.228 W
2,733.00	0.88	206.18	2,694.28	-4.05	1.29	6,743,832.33	414,865.79	60° 49' 14.536 N	4° 33' 55.242 W
2,759.00	0.70	206.71	2,720.28	-4.37	1.13	6,743,832.01	414,865.62	60° 49' 14.526 N	4° 33' 55.252 W
2,789.00	0.97	210.14	2,750.27	-4.75	0.92	6,743,831.63	414,865.40	60° 49' 14.513 N	4° 33' 55.266 W
2,815.00	0.97	189.48	2,776.27	-5.16	0.77	6,743,831.23	414,865.25	60° 49' 14.500 N	4° 33' 55.276 W
2,843.00	0.97	192.91	2,804.27	-5.62	0.68	6,743,830.76	414,865.14	60° 49' 14.485 N	4° 33' 55.282 W
2,871.00	1.14	189.66	2,832.26	-6.13	0.58	6,743,830.26	414,865.03	60° 49' 14.469 N	4° 33' 55.288 W
2,899.00	1.14	185.26	2,860.26	-6.68	0.51	6,743,829.71	414,864.95	60° 49' 14.451 N	4° 33' 55.293 W
2,955.00	0.97	190.54	2,916.25	-7.70	0.37	6,743,828.69	414,864.78	60° 49' 14.418 N	4° 33' 55.302 W
2,983.00	0.83	176.38	2,944.24	-8.14	0.34	6,743,828.26	414,864.74	60° 49' 14.404 N	4° 33' 55.304 W
3,011.00	0.72	172.15	2,972.24	-8.51	0.37	6,743,827.88	414,864.77	60° 49' 14.392 N	4° 33' 55.302 W
3,039.00	0.72	171.60	3,000.24	-8.86	0.42	6,743,827.53	414,864.81	60° 49' 14.380 N	4° 33' 55.299 W
3,116.00	1.23	159.34	3,077.23	-10.11	0.79	6,743,826.27	414,865.14	60° 49' 14.340 N	4° 33' 55.275 W
3,145.00	1.32	148.35	3,106.22	-10.69	1.07	6,743,825.69	414,865.42	60° 49' 14.321 N	4° 33' 55.256 W
3,171.00	1.67	159.95	3,132.21	-11.30	1.36	6,743,825.07	414,865.69	60° 49' 14.302 N	4° 33' 55.237 W
3,189.00	1.67	157.49	3,150.20	-11.79	1.55	6,743,824.58	414,865.87	60° 49' 14.286 N	4° 33' 55.224 W
3,226.00	1.76	149.85	3,187.19	-12.78	2.04	6,743,823.58	414,866.33	60° 49' 14.254 N	4° 33' 55.192 W
3,256.00	1.76	148.70	3,217.17	-13.57	2.51	6,743,822.78	414,866.79	60° 49' 14.228 N	4° 33' 55.160 W
3,284.00	1.67	153.36	3,245.16	-14.30	2.92	6,743,822.04	414,867.18	60° 49' 14.205 N	4° 33' 55.134 W
3,312.00	2.02	151.87	3,273.15	-15.10	3.33	6,743,821.23	414,867.57	60° 49' 14.179 N	4° 33' 55.106 W
3,367.00	2.37	143.96	3,328.11	-16.88	4.46	6,743,819.43	414,868.65	60° 49' 14.121 N	4° 33' 55.032 W
3,395.00	2.64	147.38	3,356.08	-17.89	5.15	6,743,818.40	414,869.32	60° 49' 14.089 N	4° 33' 54.986 W
3,451.00	2.73	116.10	3,412.02	-19.56	7.04	6,743,816.68	414,871.17	60° 49' 14.035 N	4° 33' 54.861 W
3,481.00	2.64	93.42	3,441.99	-19.92	8.37	6,743,816.30	414,872.49	60° 49' 14.023 N	4° 33' 54.773 W
3,533.00	2.37	104.05	3,493.94	-20.25	10.61	6,743,815.91	414,874.72	60° 49' 14.012 N	4° 33' 54.625 W
3,559.00	3.08	115.57	3,519.91	-20.68	11.76	6,743,815.45	414,875.86	60° 49' 13.998 N	4° 33' 54.548 W
3,618.00	3.52	122.95	3,578.81	-22.35	14.71	6,743,813.71	414,878.77	60° 49' 13.945 N	4° 33' 54.353 W
3,675.00	3.69	103.26	3,635.70	-23.72	17.97	6,743,812.26	414,881.99	60° 49' 13.900 N	4° 33' 54.138 W
3,726.00	3.69	97.99	3,686.60	-24.33	21.19	6,743,811.58	414,885.20	60° 49' 13.881 N	4° 33' 53.925 W
3,757.00	4.04	93.95	3,717.52	-24.54	23.27	6,743,811.32	414,887.27	60° 49' 13.874 N	4° 33' 53.787 W
3,780.00	4.04	90.69	3,740.47	-24.61	24.88	6,743,811.21	414,888.88	60° 49' 13.872 N	4° 33' 53.680 W
3,840.00	3.87	80.76	3,800.33	-24.31	29.00	6,743,811.42	414,893.00	60° 49' 13.881 N	4° 33' 53.408 W
3,868.00	4.04	78.13	3,828.26	-23.95	30.89	6,743,811.73	414,894.90	60° 49' 13.893 N	4° 33' 53.283 W
3,900.00	4.13	75.40	3,860.18	-23.43	33.11	6,743,812.19	414,897.13	60° 49' 13.910 N	4° 33' 53.136 W
3,941.00	4.13	75.40	3,901.07	-22.69	35.97	6,743,812.87	414,900.01	60° 49' 13.934 N	4° 33' 52.947 W

22. ANNEXES

22.1 WELL PROGNOSIS VS ACTUAL LOG

22.2 WELL SITE LITHOLOG

22.3 COMPOSITE WELL LOG