ConocoPhillips

CONOCOPHILLIPS NORGE

COMPOSITE WELL LOG

Statoil / Norske Agip / Total E/P Norge AS

WELL: 1/9-7 Tommeliten

LOCATION :

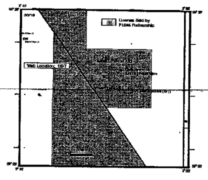
Latitude: 56° 24' 31.226" N
Longitude: 02° 52' 55.084" E

ELEVATIONS :

RT-MSL	:	**45.0m**
Water Depth	:	**75.75m**
RT- Sea Floor	:	**120.75m**
Total Depth - Driller	:	**3040m MD (-2994.4m TVDSS)**
Total Depth / Logger>		**3044m MD (-2998.4m TVDSS)**

Country	:	**Norway**
Area	:	**Southern North Sea**
Licence	:	**PL 044**
Field	:	**n/a**
Date Spudded	:	**22nd March 2003**
TD Date	:	**21st April 2003**
Date Completed	:	**27th April 2003**
Completion Status	:	**Plugged & Sidetracked as 1/9-7 T2 on 27/04/03. Well 1/9-7 T2 Plugged & Sidetracked on 04/05/03 as 1/9-7 T3.**

LOCATION MAP



GEOLOGIST	COMPANY
Chris Greene	Cambrian
Graham Heyes	Cambrian
Dave Jobson	Cambrian
Mike Henderson	Aker Geo

ELECTROPHYSICAL LOGS

TYPE	RUN NO	INTERVAL
Schlumberger Wireline		
AIT/DSI/IPLT/HNGS	1A	3040m - 1039m
DSI/GR	1A	1039m - 300m*
* logging abandoned due to losses		
Sperry Sun LWD		
PWD/EWR/DGR	3	310m - 1210m
PWD/EWR/DGR	5-6	1025m - 3040m

Mnemonics
AIT=Induction Resisitivity
DSI=Sonic
IPLT=Density/Neutron
HNGS=Spectral Gamma Ray
PWD=Pressure While Drilling
EWR=Resistivity
DGR=Gamma Ray

PLUG NO	INTERVAL	PURPOSE
1	1210m - 1019m	Wellcontrolat 9 7/8" TD
2	308m - 228m	Loss control at 30" shoe
3	1070m - 1005m	Loss controlo at 20" shoe
4	1215m - 1057m	Plug & Sidetrack Well 1/9-7 T2
5	1080m - 1028m	Plug & Sidetrack Well 1/9-7 T2

MUDLOG SERVICE

Sperry Sun (Halliburton)

MWD LOGGING SERVICE

Sperry Sun (Halliburton)

WIRELINE LOGGING SERVICE

Schlumberger

RIG

Maersk Giant (Jack-up)

MUD TYPE	INTERVAL
Seawater with hi-vis gel sweeps	121m - 310m
CMC polymer (9 7/8" pilot hole)	310m - 1210m
Spud Mud (26" hole opening)	307m - 1042m
Versavert LTOBM (17 1/2" hole)	1042m - 3040m

HOLE SIZE	HOLE INTERVAL
36"	120.75m - 310m
9 7/8" Pilot	310m - 1210m
26"	310m - 1042m
17 1/2"	1042m - 3040m

CASING DETAILS

SIZE	SHOE DEPTH
30"	307.6m
20"	1039m

WELLSITE CORE DATA

CORE NO	INTERVAL	CUT	REC	REC%	TYPE
NONE					

CORE DATA CORRECTED TO GR LOG

CORE NO	INTERVAL	DEPTH SHIFT

PREPARED BY :
C.M.T. Grieve
R. Pawlyn

APPROVED :
I. Toenne/M. Bowman

DATE :
February 2004

REMARKS

A separate composite log has been produced for sidetrack 1/9-7 T3 (1040m – 4986m).
Note, no composite was drawn for the short, inadvertent 1/9-7 T2 sidetrack (1042m – 1215m).

A 9 7/8" pilot hole was drilled out of the 30" casing to a TD of 1210m. Due to a well control event, the pilot hole was cemented back to 1019m. The hole was then opened to 26" down to 1042m, and 20" casing run to a shoe depth of 1039m. At the start of the 17½" section cement was drilled out down to 1210m (base of the pilot hole) and new formation drilled to a section TD of 3040m, on the 21st April 2003. The well was logged. While logging GR inside casing at 300m, the hole started to lose mud. The casing was filled with lighter mud and the static losses, suspected to be at the 20" shoe, stabilized. LCM was pumped with no effect. Two cement jobs were performed to cure the losses at/below the 20" shoe (at 1039m). The cement plug was drilled out down to the shoe at 1039m. While drilling out cement (prior to running 14" casing), the well was inadvertently sidetracked on the 27th April 2003 as 1/9-7 T2. This sidetrack was drilled to a TD of 1215m on the 1st May, in an unsuccessful attempt to re-enter the original 1/9-7 wellbore. 1/9-7 T2 was plugged, by the setting of 2 cement plugs, and successfully and intentionally sidetracked, on the 4th May 2003, as 1/9-7 T3.

MAIN LITHOLOGICAL SYMBOLS

▤	SHALE, CLAYSTONE, CLAY, MUDSTONE	▦	HALITE	▩	BASALT
▤	SILTSTONE, SILT	P	POLYHALITE	V	SEDIMENTARY VOLCANICS (TUFFS, AGGLOMERATES, ETC.)
⁘	SANDSTONE, SAND	C	CARNALLITE	+	IGNEOUS (UNDIFFERENTIATED)
○	CONGLOMERATE LOOSE PEBBLES	S	SYLVITE	△	BRECCIA
▬	COAL, LIGNITE, ETC.	K	POTASSIUM SALTS (UNDIFFERENTIATED)	▨	METAMORPHIC ROCKS
▦	LIMESTONE (UNDIFFERENTIATED)	▨	ANHYDRITE	☐	
▦	DOLOMITIC LIMESTONE	≈	MARL	☐	
▱	DOLOMITE	▦	LITHOCLASTS INTRACLASTS	☐	
▱	CALCAREOUS DOLOMITE	○	ONCOLITHS	☐	

SECONDARY LITHOLOGICAL SYMBOLS

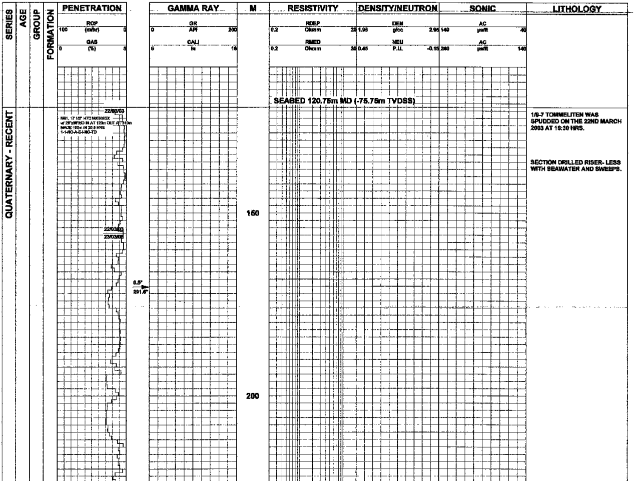
—	ARGILLACEOUS	#	HALITE	△	CHERT
·	ARENACEOUS	Ka	KAOLINITE	V	VOLCANIC
-·-	SILTY	□	PYRITIC	+	IGNEOUS (UNDIFFERENTIATED)
▬	CARBONACEOUS	Fe	IRONSTONE	☐	
⊥	CALCAREOUS	M	MICACEOUS	☐	
⊿	DOLOMITIC	▲	BITUMEN	☐	
//	ANHYDRITIC	∴	PELLETS	☐	
○	RUDACEOUS	∴	OOLITHS	☐	
*	GLAUCONITE	~	MARLY	☐	

GENERAL WELL SYMBOLS

12/03/00 13/03/00 MIDNIGHT DEPTH	29.7° / 136.9° HOLE DEVIATION AND AZIMUTH	▮ (RECOVERED) CORED INTERVAL	DRILL STEM TEST REGULAR
◢ CASING SHOE	●→ PERCUSSION SWC RECOVERED	☒ (NO RECOVERY)	DRILL STEM TEST RE-RUN OR ADDITIONAL INTERVAL
◥ LINER HANGER	○→ PERCUSSION SWC UNRECOVERED	☼ GAS SHOW (CONTINUOUS)	PRODUCTION PERFORATIONS
☒ BRIDGE PLUG OR DRILLABLE PLUG	▶→ ROTARY SWC RECOVERED	● OIL SHOW (CONTINUOUS)	PRODUCTION PERFORATIONS TESTED & SQUEEZED
☒ CEMENT PLUG	▷→ ROTARY SWC UNRECOVERED	→□ RFT / FMT TEST	

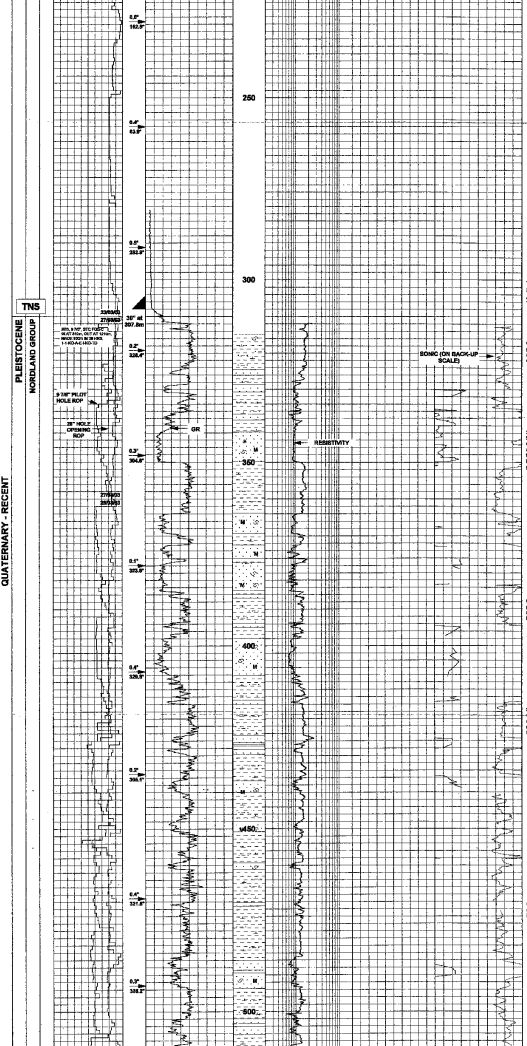
FOSSIL SYMBOLS

⅊	AMMONITES
◊	BELEMNITES
B	BRACHIOPODS
Y	BRYOZOANS
⊛	CORAL
∑	CRINOID STEMS
♦	ECHINOID SPINES
○	FORAMINIFERA
୫	GASTROPODS
♧	MICROFOSSILS
○	OSTRACODS
℘	SHELL FRAGMENTS
⊕	NO PALAEONTOLOGICAL AGE DETERMINATIONS



1/9-7 TOMMELITEN WAS SPUDDED ON THE 22ND MARCH 2003 AT 18:30 HRS.

SECTION DRILLED RISER- LESS WITH SEAWATER AND SWEEPS.



THE SECTION BENEATH THE 30" SHOE WAS DRILLED INITIALLY AS A 9 7/8" PILOT HOLE AND THEN OPENED TO 26".

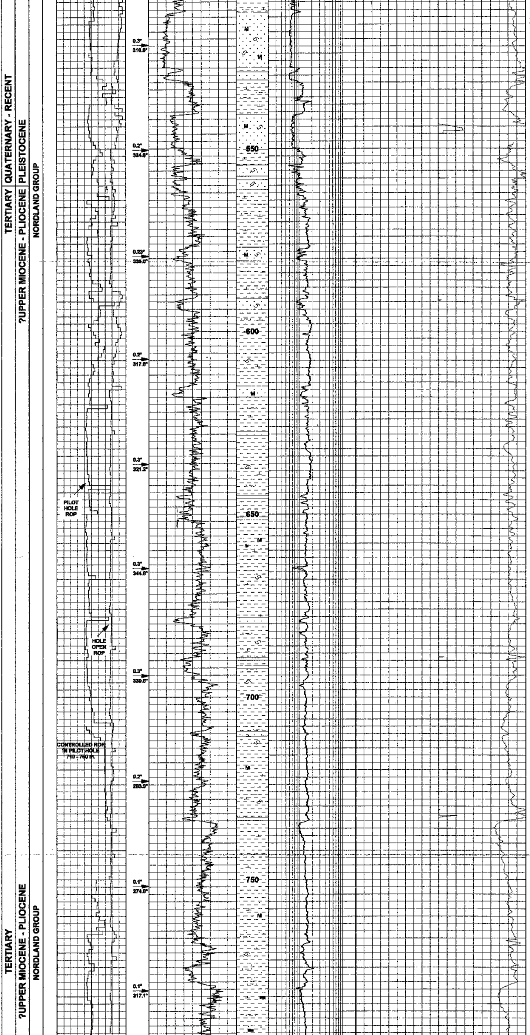
CLAYSTONE: medium dark grey to olive grey, soft, very sticky, amorphous to rarely sub blocky, calcareous, occasionally silty, shell fragments.

SAND: loose quartz, clear to translucent, fine to rarely medium, unconsolidated, with rare calcite cement, inferred argillaceous matrix, trace glauconite, trace mica, trace lithic fragments, shell fragments, trace orange heamatitic grains.

CLAYSTONE: medium dark grey to dark greenish grey, soft, very sticky, amorphous, rarely sub blocky, very silty in parts, with coarse quartz grains.

SAND: loose quartz, clear to translucent, very fine to fine, unconsolidated, with rare calcite cement, inferred argillaceous matrix, trace glauconite, trace mica, trace lithic fragments, shell fragments.

CLAYSTONE: medium dark grey, very soft, sticky, amorphous, hydroturgid, silty in parts, calcareous..



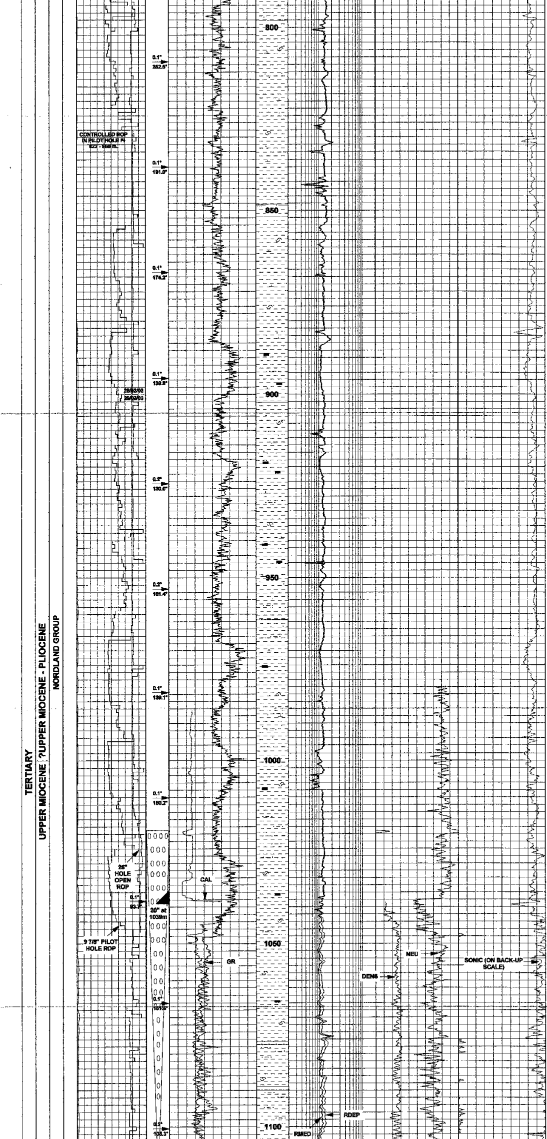
SAND: loose quartz, very fine to fine, well sorted, rounded to subangular, micaceous, lithic fragments, trace glauconite, abundant shell fragments.

CLAYSTONE: medium dark grey, soft, sticky, amorphous, hydroturgid, silty in parts, calcareous.

SAND: as loose quartz, very fine to fine, well sorted, rounded to subangular, micaceous, no visible cement, lithic fragments, trace glauconite, abundant shell fragments.

CLAYSTONE: medium grey to medium dark grey, very soft, sticky, amorphous, hygroturgid, silty in parts, calcareous abundant shell fragments.

PILOT HOLE ROP CONTROLLED OVER ZONE OF POSSIBLE SHALLOW GAS ANOMALY - NO GAS INDICATIONS SEEN.



CLAYSTONE: medium grey to medium dark grey, very soft, sticky, amorphous, hygroturgid, very silty grading to very fine sand in parts, calcareous, occasional trace shell fragments.

PILOT HOLE CROP CONTROLLED OVER ZONE OF POSSIBLE SHALLOW GAS ANOMALY - NO GAS INDICATIONS SEEN.

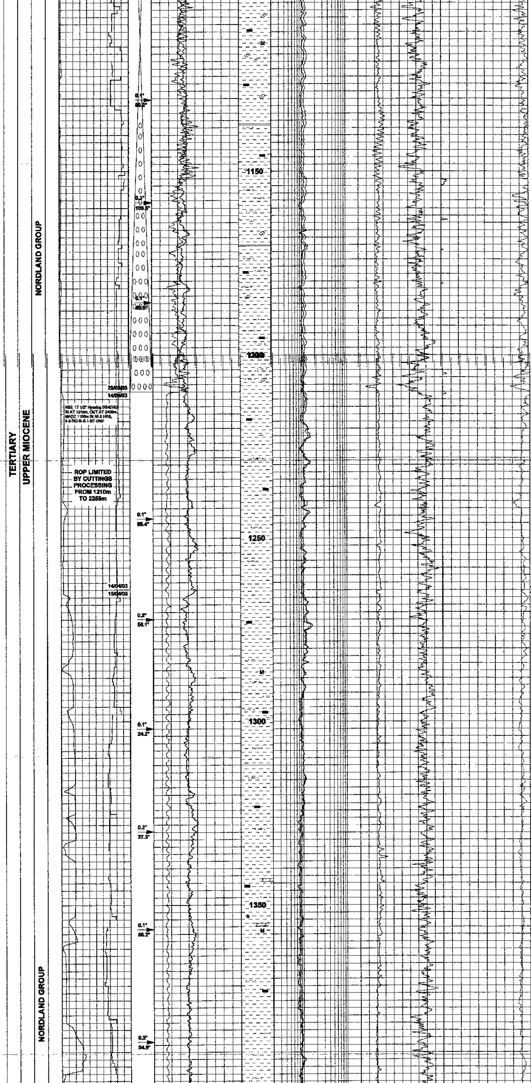
CLAYSTONE: medium dark grey to dark green grey, very soft, sticky, amorphous, hygroturgid, very silty grading to very fine sand in parts, calcareous, trace shell fragments, trace black carbonaceous specks.

CLAYSTONE: medium dark grey, very soft, sticky, amorphous, hygroturgid, silty grading to very fine sand in parts, calcareous, trace shell fragments, trace, black carbonaceous specks.

9 7/8" PILOT HOLE DRILLED TO 1210m

CEMENT PLUG SET IN PILOT HOLE FROM 1210m TO 1019m. PILOT HOLE OPENED TO 26" DOWN TO 1042m AND 20" CASING SET AT 1039m. 17 1/2" HOLE DRILLED (DOWN THE SIDE OF THE CEMENT PLUG TO 1210m) AND IN NEW HOLE TO SECTION TD OF 3040m.

LEAK-OFF TEST: INITIAL LEAK-OFF AT 16.82 ppg (2.02 sg). TEST CONT TO 18.25 ppg (2.19 sg) WHEN THE FORMATION BROKE DOWN WITH A RESULTANT FIT OF 14.25 ppg (1.71 sg).



CLAYSTONE: predominantly medium grey to medium dark grey, occasionally olive grey, very soft, sticky, amorphous, rarely subblocky, very fine limestone fragments, shell fragments, carbonaceous specks, trace pyrite, trace mica, very calcareous.

TD OF 9 7/8" PILOT HOLE AT 1210m. CBU, FLOW CHECK +VE: WELL FLOWED 1.1 bbls IN 30 MINS. PUMP 9.6 ppg MUD AND SWITCH "ON FLY" TO 12.5 ppg KILL MUD. WELL KILLED, BUT 30" CASING SHOE FRACTURED WITH SEVERELOSSES.

SET CEMENT PLUG AT THE TD OF THE 9 7/8" PILOT HOLE FROM 1210m - 1019m.

OPEN PILOT HOLE TO 26" DOWN TO 1042m AND SET 20" CASING AT 1039m. DRILL 17 1/2" HOLE (DOWN THE SIDE OF THE CEMENT PLUG TO 1210m) AND IN NEW FORMATION TO SECTION TD OF 3040m.

MUD SYSTEM CHANGED FROM WATER BASE TO OIL BASE FROM START OF 17 1/2" SECTION.

Versavert LTOBM
MW: 12.1 V: 68 Cl: 96k O/W:73/28

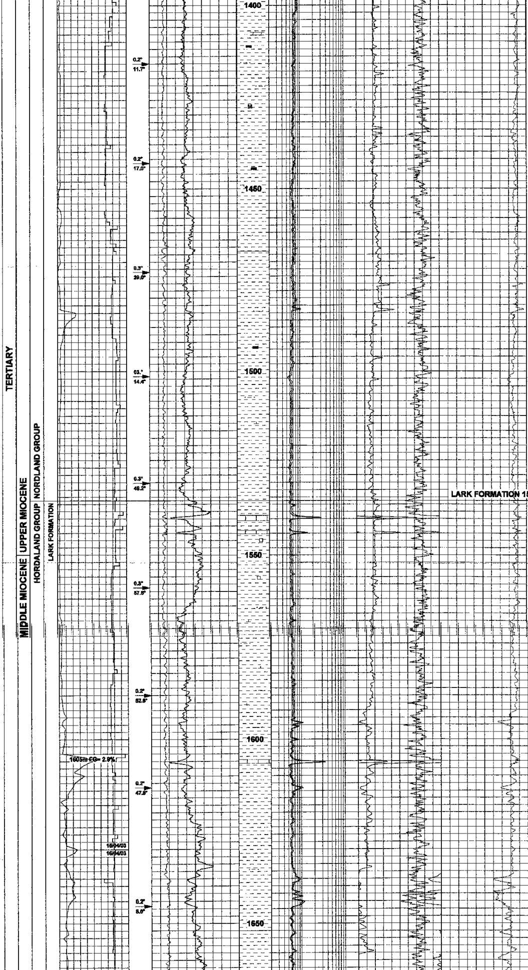
ROP LIMITED BY CUTTINGS PROCESSING FROM 1210m TO 2255m

CLAYSTONE: dark grey to greyish black, occasionally olive grey to olive black, firm to moderately hard, subblocky, moderately calcareous, slightly silty, rare carbonaceous specks.

RAISE MW TO 12.4 ppg

Rare LIMESTONE: very light grey, buff, firm, blocky, chalky texture.

CLAYSTONE: olive black to dark grey, moderately hard, brittle to slightly plastic, deformed, non to predominantly slightly calcareous, slightly silty, trace to rare carbonaceous or possibly glauconitic specks, rare micromicaceous.



Trace DOLOMITE: pale to dark yellow brown buff, moderately hard to hard, brittle, blocky, crypto to microcrystalline, slightly to moderately calcarecue occasionally grading to LIMESTONE.

CLAYSTONE: olive black to olive grey to dark greenish grey, moderately hard, brittle to slightly plastic, deformed, non to predominantly slightly calcareous, slightly silty, rare carbonaceous or possibly glauconitic specks.

RAISE MW TO 13.1 ppg

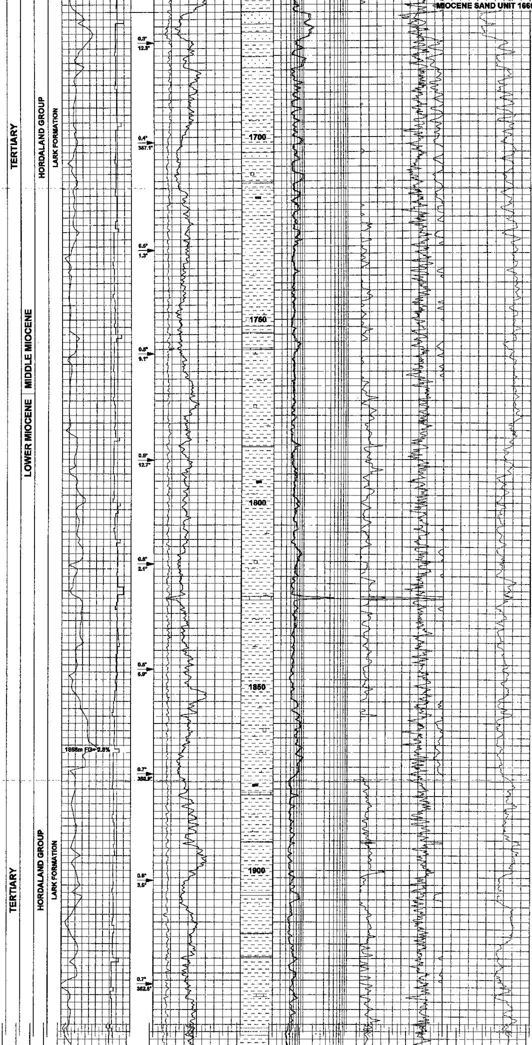
LARK FORMATION 1535m MD (1490.0m TVDSS)

CLAYSTONE: predominantly dark greenish grey to olive grey, greenish black to dark grey, moderately hard to hard, blocky to subblocky, silty, slightly to moderately calcareous.

RAISE MW TO 14.2 ppg

Versavert LTOBM
MW: 14.2 V: 76 CI: 144k
O/W:72/28

LIMESTONE: olive grey, hard to very hard, blocky, brittle occasionally splintery, microcrystalline.



TR SANDSTONE: clear quartz, very fine, subrounded, loose, no shows.

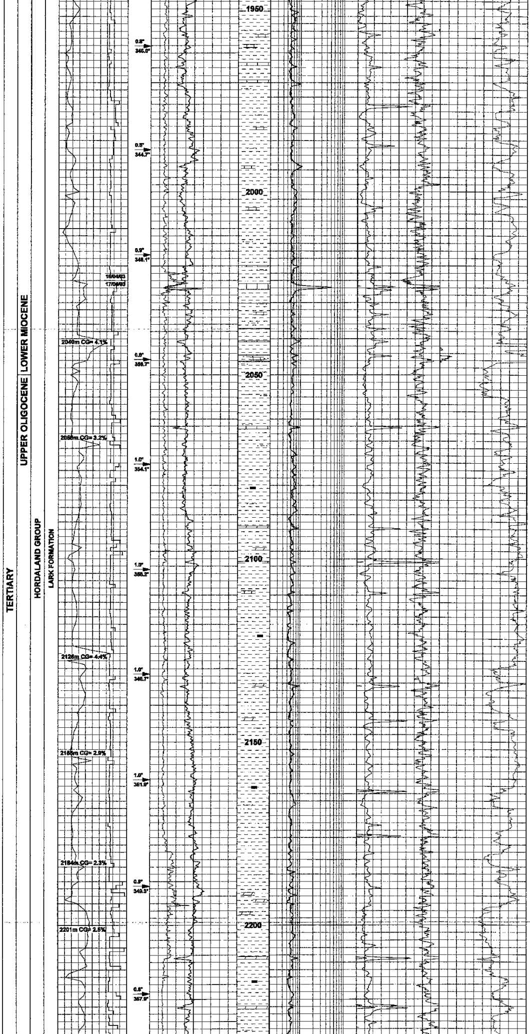
CLAYSTONE: olive black to olive grey, moderately hard to firm, friable to brittle, deformed, non calcareous, locally slightly silty, rare carbonaceous, rare micropyrite.

CLAYSTONE: olive black to olive grey, moderately hard to firm, friable to brittle, deformed, slightly to predominantly moderately to occasionally very calcareous, locally slightly silty, rare carbonaceous, rare micropyrite.

LIMESTONE: light grey, moderately hard, friable, deformed, microcrystalline, slightly argillaceous, trace very fine sandy.

CLAYSTONE: olive black to olive grey, moderately hard to firm, friable to brittle, deformed, moderately calcareous, locally slightly silty, rare carbonaceous, rare micropyrite.

CLAYSTONE: olive black, moderately hard to hard, occasionally brittle, subblocky, locally silty, slightly calcareous in parts, rare pyrite, Good Trace loose sand, clear to translucent quartz grains, fine grained, moderately to well sorted, subangular to subrounded, subspherical, occasional weak silica cement.



LIMESTONE: buff, hard occasionally very hard, dolomitic in parts, microcrystalline, slightly argillaceous, trace very fine sand.

RAISE MW TO 14.6 ppg

Versavert LTOBM
MW: 14.6 V: 74 Cl: 149k
O/W:75/25

LIMESTONE: light grey, buff, moderately hard, friable, deformed, microcrystalline, slightly argillaceous, trace very fine sandy.

CONNECTION GAS (CG) WAS RECORDED FROM 2040m.
NOTE CG= Absolute Peak Value%.

CLAYSTONE: brown grey to olive grey, olive black, firm occasionally moderately hard, subblocky, locally very silty.

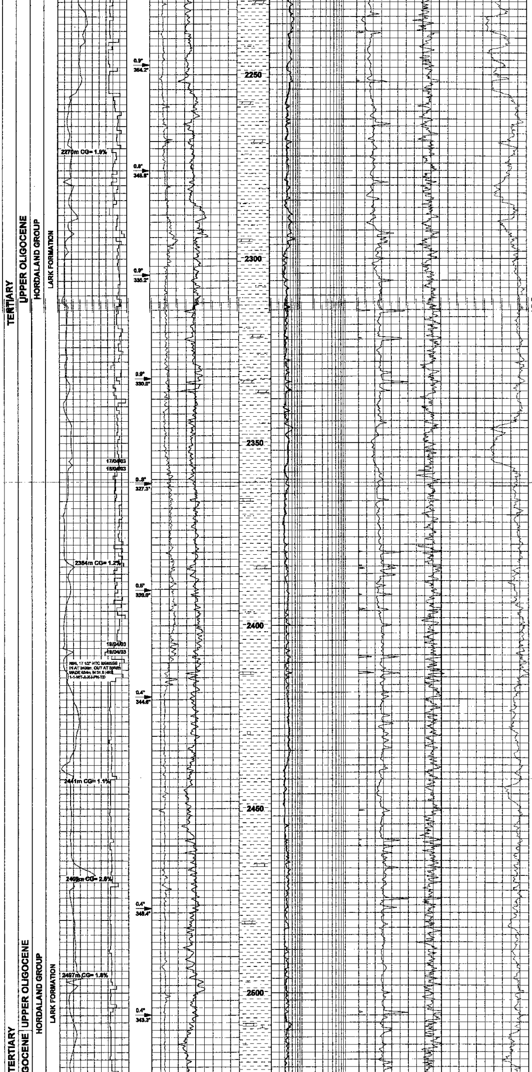
CLAYSTONE: olive black to occasionally olive grey, moderately hard, friable to brittle, deformed to subblocky, non to locally slightly calcareous, slightly silty, rarely carbonaceous.

Trace LIMESTONE: light grey to pale yellow brown, very hard, brittle, subblocky, microcrystalline, dolomitic.

DOLOMITE: pale to dark yellow brown buff, moderately hard to occasionally hard, brittle to friable, deformed to blocky, crypto to microcrystalline, calcareous partly grading to LIMESTONE.

DOLOMITE: pale to dark yellow brown buff, moderately hard to occasionally hard, brittle to friable, deformed to blocky, crypto to microcrystalline, calcareous partly grading to LIMESTONE.

CLAYSTONE: olive black, moderately hard, friable to brittle, deformed to subblocky, non to locally slightly calcareous, slightly silty, rarely carbonaceous.



Versavert LTOBM
MW: 14.6 V: 72 Cl: 131k
O/W:77/23

CLAYSTONE: olive black, dark greenish grey, moderately hard, locally very silty, non to very slightly calcareous in parts.

Trace Dolomitic Limestone: light grey to pale yellowish brown, soft to firm, occasionally very hard, angular, microcrystalline.

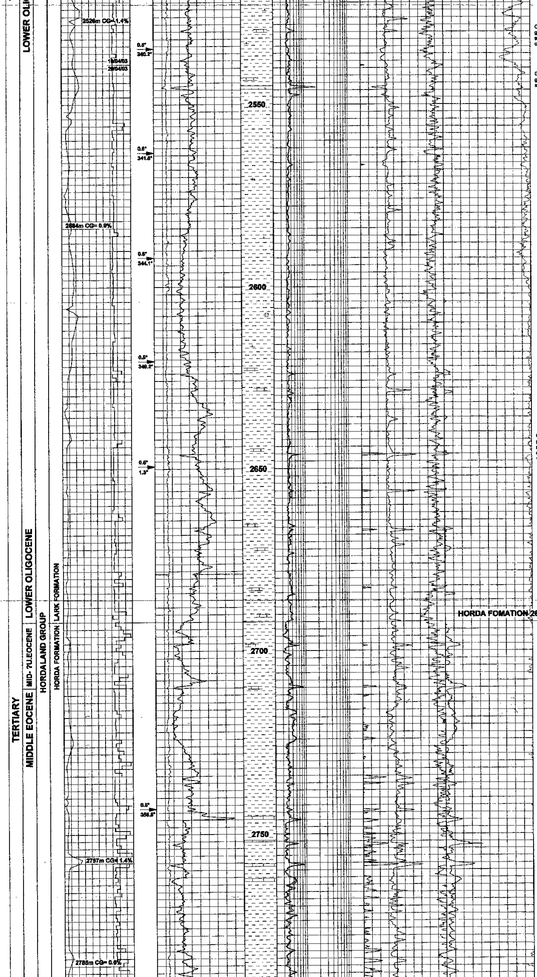
CLAYSTONE: olive black, dark greenish grey, moderately hard, slightly silty, non to very slightly calcareous in parts.

Trace Dolomitic Limestone: light grey to pale yellowish brown, soft to firm, occasionally very hard, angular, dolomitic in parts microcrystalline.

Versavert LTOBM
MW: 14.7 V: 72 Cl: 131k
O/W:77/23

CLAYSTONE: olive black, becoming olive grey, occasionally dark greenish grey, generally firm, slightly silty, waxy texture, non to very slightly calcareous in parts, rare pyrite.

Versavert LTOBM
MW: 14.9 V: 70 Cl: 153k
O/W:79/21



CLAYSTONE: dark greenish grey, olive grey, firm to moderately hard, subblocky, slightly silty in parts, locally moderately calcareous to calcareous, rare pyrite.

Good Trace SAND: clear, loose, fine grained quartz, moderately sorted, subangular to subrounded.

CLAYSTONE: dark greenish grey to greenish black, olive black, firm to moderately hard, non to very slightly calcareous, rare trace pyrite, rare trace very fine loose sand.

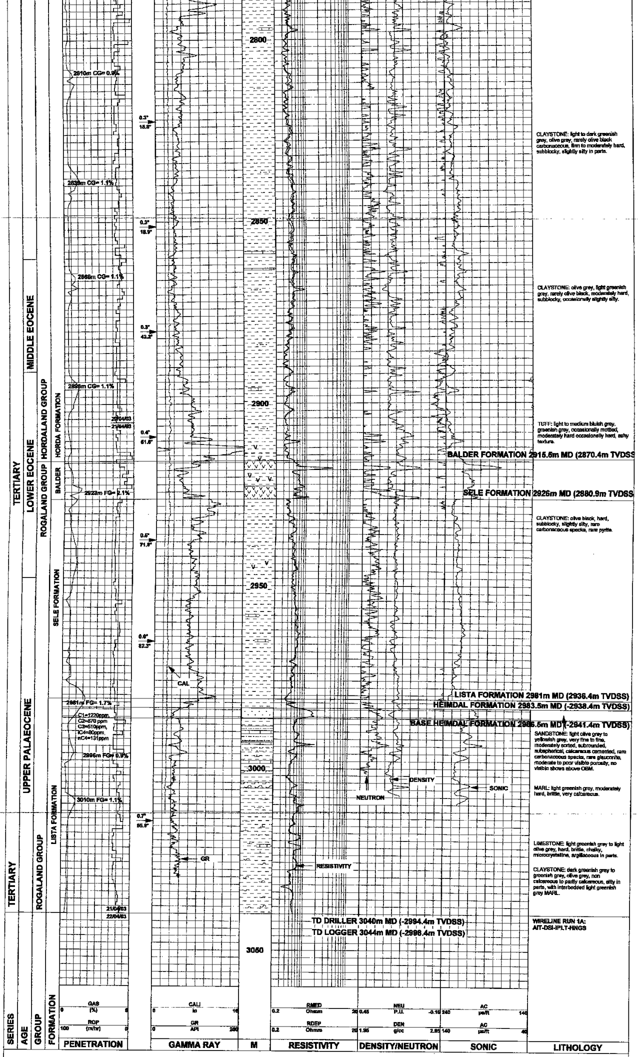
LIMESTONE: moderate yellowish brown, firm to hard, crumbly in parts, microcrystalline, argillaceous in parts.

HORDA FOMATION 2692m MD (2646.9m TVDSS)

CLAYSTONE: greenish grey to dark greenish grey, olive grey, becoming lighter, firm to moderately hard, subblocky, non calcareous, rare trace very fine sand.

LIMESTONE: medium light grey, yellowish grey to yellowish brown, hard, blocky to crumbly in parts, argillaceous laminae, microcrystalline.

CLAYSTONE: greenish grey to olive grey, rarely olive black carbonaceous, firm to moderately hard, subblocky, slightly silty in parts.



CLAYSTONE: light to dark greenish grey, olive grey, rarely olive black carbonaceous, firm to moderately hard, subblocky, slightly silty in parts.

CLAYSTONE: olive grey, light greenish grey, rarely olive black, moderately hard, subblocky, occasionally slightly silty.

TUFF: light to medium bluish grey, greenish grey, occasionally mottled, moderately hard occasionally hard, ashy texture.

CLAYSTONE: olive black, hard, subblocky, slightly silty, rare carbonaceous specks, rare pyrite.

SANDSTONE: light olive grey to yellowish grey, very fine to fine, moderately sorted, subrounded, subspherical, calcareous cemented, rare carbonaceous specks, rare glauconite, moderate to poor visible porosity, no visible shows above OBM.

MARL: light greenish grey, moderately hard, brittle, very calcareous.

LIMESTONE: light greenish grey to light olive grey, hard, brittle, chalky, microcrystalline, argillaceous in parts.

CLAYSTONE: dark greenish grey to greenish grey, olive grey, non calcareous to partly calcareous, silty in parts, with interbedded light greenish grey MARL.

WIRELINE RUN 1A:
AIT-DSI-IPLT-HNGS

COMPOSITE LOG CURVES

The log curves presented on the log are the final HQLD composite curves compiled by Logtek. These curves are derived from depth-matched and spliced wireline and LWD data, as detailed in the following summary:

The Gamma Ray curve (GR) consists of the following:

Log	Curve	Run	Top	Bottom	Splice
AIT-DSI-EMS-IS-IPLT-HNGS	HSGR	1A	281.0	308.0	308.0
MWD EWR-DGR	SGRC	300	308.0	1048.3	1048.3
AIT-DSI-EMS-IS-IPLT-HNGS	HSGR	1A	1048.3	2996.5	2996.5
MWD EWR-DGR	SGRC	700	2996.5	3030.2	

The Sonic curve (AC) consists of the following:

Log	Curve	Run	Top	Bottom	Splice
AIT-DSI-EMS-IS-IPLT-HNGS	DTCO	1A	312.6	3909.9	N/A

The Deep Resistivity curve (RDEP) consists of the following:

Log	Curve	Run	Top	Bottom	Splice
MWD EWR-DGR	SEDP	300	311.8	1041.0	1041.0
AIT-DSI-EMS-IS-IPLT-HNGS	AT90	1A	1041.0	3040.1	

The Medium Resistivity curve (RMED) consists of the following:

Log	Curve	Run	Top	Bottom	Splice
MWD EWR-DGR	SEMP	300	311.8	1041.0	1041.0
AIT-DSI-EMS-IS-IPLT-HNGS	AT30	1A	1041.0	3040.1	

The Density curve (DEN) consists of the following:

Log	Curve	Run	Top	Bottom	Splice
AIT-DSI-EMS-IS-IPLT-HNGS	RHOM	1A	1038.8	3007.6	N/A

The Neutron curve (NEU) consists of the following:

Log	Curve	Run	Top	Bottom	Splice
AIT-DSI-EMS-IS-IPLT-HNGS	RHOM	1A	979.9	3001.5	N/A

WELL 1/9-7 Tommeliten

ConocoPhillips Norge / Statoil / Norske Agip / Total E/P Norge AS