Final Well Report

PL 128, Well 6608/11-5

Valkyrie 1

Foto: Ketil Sollid

STATOIL

Eni Norge

petoro

HYDRO

STATOIL

Final Well Report
Well 6608/11-5
Valkyrie 1 PL 128

STATOIL

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Table of contents

1 Summary ... 6
1.1 Well data record ... 6
1.2 Well objectives ... 7
1.3 Result of the well ... 7
1.4 Drilling summary ... 7
1.4.1 Casing ... 7
1.4.2 Drilling fluids ... 7
1.5 Data acquisition summary ... 7
2 Exemptions and non-conformances ... 10
3 Health, safety, environment and quality (HSE&Q) ... 11
3.1 Incident Reports (RUH's) ... 11
3.2 Comments to the reports ... 11
3.3 Experience listing ... 12
3.4 Incidents by service companies, contractor and operator ... 13
3.5 Time distribution 6608/11-5 ... 16
4 Geology and formation data report ... 18
4.1 Geological setting and results ... 18
4.2 Shallow gas results ... 18
4.3 Stratigraphy ... 18
4.3.1 Table of chronostratigraphy ... 19
4.3.2 Table of lithostratigraphy ... 20
4.4 Lithostratigraphic descriptions ... 25
4.5 Geophysical results ... 31
4.6 Data acquisition ... 31
4.6.1 Cuttings and mud samples ... 31
4.6.2 Conventional coring ... 32
4.6.3 MWD logging ... 32
4.6.4 Wire line logging ... 33
4.6.5 Data quality ... 33
4.7 Formation pressure ... 34
4.7.1 Reservoir pressure summary ... 33
4.8 Reservoir fluid sampling ... 36
4.9 Leak off test ... 36
4.10 Formation temperature ... 37
4.11 Experiences/Recommendations ... 38
5 Drilling operations report ... 44
5.1 Rig move and positioning ... 44
5.2 Drilling top hole section ... 44
5.3 Drilling 12 1/4" pilot hole ... 45

5.6.1 Well bore schematic and permanent plug and abandonment ... 50
5.6.2 Time/depth curve ... 51
5.6.3 Time planner ... 52
5.6.4 Drilling fluids data ... 54
5.6.5 Cementing data ... 55
5.6.6 Bit record and BHA summary ... 56
5.6.6.1 Bit record ... 56
5.6.6.2 BHA summary ... 58
6 Appendices ... 63
App A Directional data, survey listing ... 63
App B List of contractors ... 68
App C NPD standard sheet for reporting shallow gas ... 69
App D Wellsite sample description ... 71
App E Conventional core description ... 85
7 Enclosures ... 89
7.1 Composite log (Statoil) ... 89
7.2 Formation Evaluation Log (Geoservices) ... 91
7.3 Pressure Evaluation Log (Geoservices) ... 93

List of figures and tables

Figure 1-1 Location map
Figure 1-2 Formation evaluation
Figure 3-1 Time distribution
Figure 3-2 Drilling performance – hole sections
Figure 4-1 Regional structural setting
Figure 4-2 Stratigraphy
Figure 4-3 Stratigraphy in the reservoir section
Figure 4-4 Observed versus prognosed stratigraphy
Figure 4-5 XLOT values
Figure 4-6 Final pore pressure
Figure 4-7 Final temperature
Figure 4-8 Composite plot
Figure 4-9 Composite plot
Figure 4-10 Gradient plot
Figure 5-1 Well schematic and permanent plug and abandonment
Figure 5-2 Time/Depth curve

Table 1-1 Casing programme summary
Table 1-2 Drilling fluids summary
Table 3-1 Incident reports (RUH's)
Table 3-2 Comments to the incident reports
Table 3-3 Experience listing
Table 3-4 Incidents by service companies, contractor and operator
Table 3-5 Time distribution, 6608/11-5
Table 3-6 Cost
Table 3-7 Time distribution based on activities
Table 4-1 Chronostratigraphy
Table 4-2 Lithostratigraphy
Table 4-3 Gas peaks
Table 4-4 Coring summary
Table 4-5 MWD logging
Table 4-6 Wire line logging in the 8 ½" section
Table 4-7 MDT pressure summary, Run 1A, pretests and water sampling
Table 4-8 MDT pressure summary, Run 1B, sampling with dual packer
Table 4-9 MDT pressure summary, Run 1C, pretest and sampling with dual packer.
Table 4-10 Samples collected from run 1A 6608/11-5
Table 4-11 Pressures in different periods of the XLOT
Table 4-12 Measured and evaluated temperatures
Table 5-1 Timeplanner
Table 5-2 Summary of drilling fluids programme
Table 5-3 Summary of cementing data

1 Summary

The Valkyrie 1 well was drilled in the northern part of block 6608/11. The well was designed as a vertical well with a simplified casing design including a 30” casing at 410 m and a 9 5/8” casing set at 1297.6 m above a prognosed pressure build-up zone. An 8 ½” hole was drilled to the well TD at 2270 m RKB. The well was drilled, logged, plugged and abandoned in 33 days (days of operation). See figure 1.1 for well location.

1.1 Well data record

Well name:	6608/11-5	
Type of well:	Exploration	
Prospect:	Valkyrie	
Area:	Nordland II	
Country:	Norway	
Licence:	PL 128	
Licensees:	Statoil ASA	50.45 %
	Petoro AS	24.55 %
	Norsk Hydro ASA	13.50 %
	Eni Norge AS	11.50 %
Drilling unit:	Ocean Vanguard	
Type:	Semi submersible drilling rig	
Water depth:	342 mMSL	
RKB-MSL:	22 m	
TD:	2270 m MD RKB/2270 m TVD RKB	
On contract:	12.06.2005	
Off contract:	15.07.2005	
Formation at TD:	Red beds (Middle Triassic)	
Surface coordinates:	Latitude	66º 11’ 09.57”
	Longitude	08º 28’ 50.39”
Datum/spheroid:	ED-50, INT 1924	
UTM Coordinates:	7 340 924.8 m N	
	476 600.0 m E	
	UTM zone 32, CM 09º E	
Seismic reference:	Seismic survey ST04M17, Inline 1244, Cross line 3788	

All depths in this report refer to RKB (Rotary Kelly Bushing) unless otherwise stated.

1.2 Well objectives

The objective of well 6608/11-5 was to prove oil in the Lower Jurassic Åre 1 Formation, Båt Group, and in the Triassic Grey Beds.

1.3 Result of the well

Well 6608/11-5 was spudded in a water depth of 342 m MSL and drilled to a total depth of 2270 m TVD RKB. TD of the well was set in the Red Beds Formation. No shallow gas was observed.

Only traces of hydrocarbons were proven in well 6608/11-5, and well is classified as dry. The observed stratigraphy was close to the prognosis, except for the presences of the Tang Formation which is part of the Rogaland Group and the Springar Formation which is part of the Shetland Group. The latter interval (Upper Cretaceous) was not expected to be present at the location. Only one core was cut in this well. This was performed in the Båt Group, Åre Formation. MDT water samples were attempted collected in the Åre Formation, Grey Beds and Red Beds with only limited success.

1.4 Drilling summary

1.4.1 Casing

Table 1-1 Casing programme summary.

Casing	Shoe depth (mMD / mTVD RKB)	LOT / FIT (Equivalent mud weight)
30”	410 / 410	NA
9 5/8” casing	1298.8 / 1297.6	LOT 1.57 sg

1.4.2 Drilling fluids

Table 1-2 Drilling fluids summary.

Section	Section (mMD RKB)	Maximum mud weight (sg)	Mud type
36”	416	1.03	Seawater / high visc. sweeps
12¼” hole	1305.5	1.03	Seawater / high visc. Sweeps
8 ½”	2270	1.30	Glydril WBM (99 % KCl)

1.5 Data acquisition summary

See Figure 1-2.

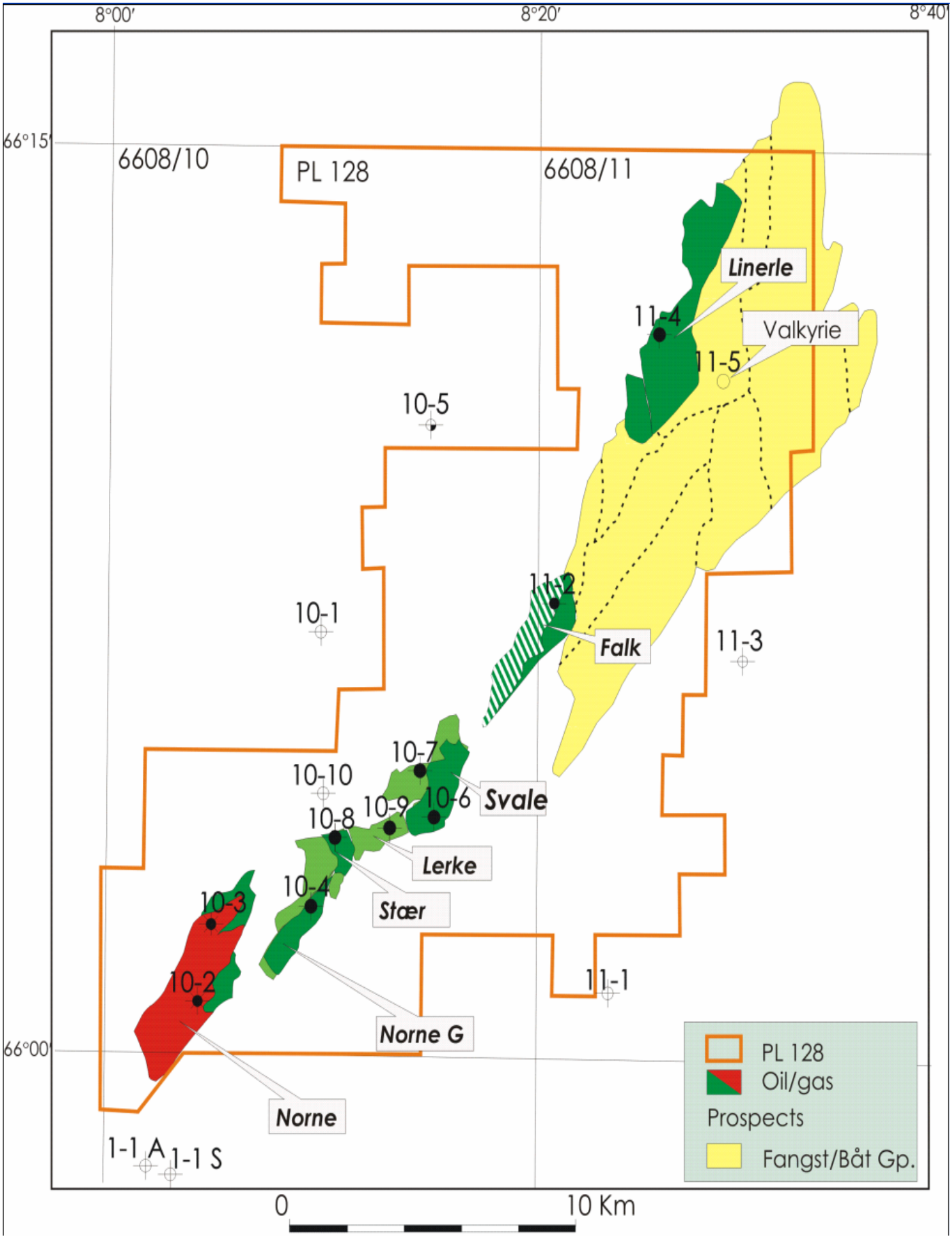
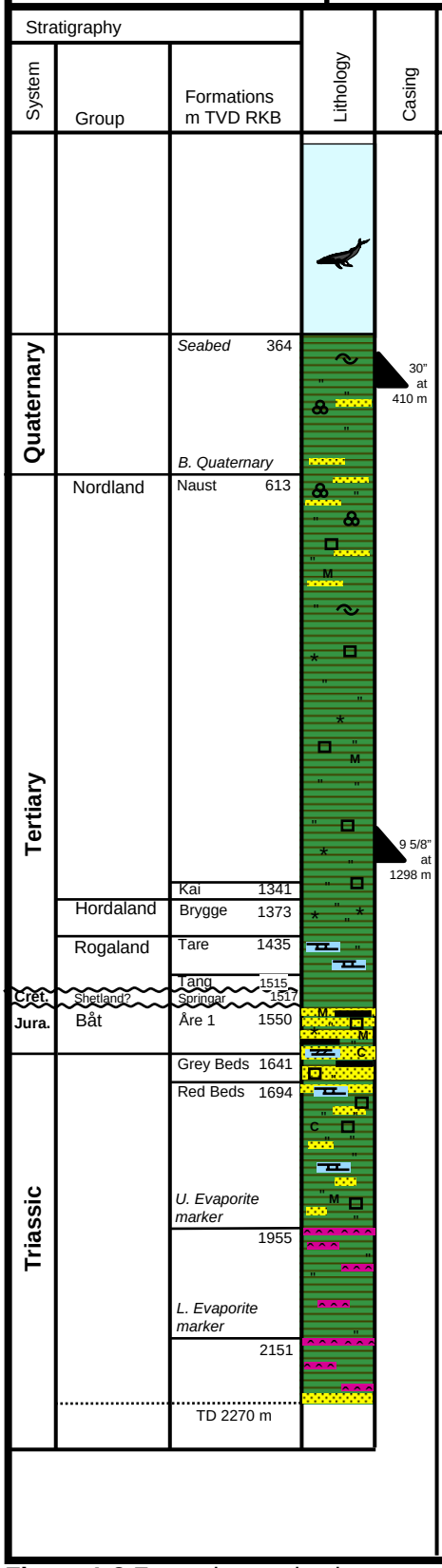


Figure 1-1 Location map for well 6608/11-5 Valkyrie 1

PL 128	Data Acquisition Well 6608/11-5 Valkyrie 1	STATOIL
RKB - MSL: 22 m		Made by: BEP / Date: 15.11.2006
Water Depth: 342 m MSL		



Coring	Sampling	MWD/LWD	Wireline Logging
	Returns to seabed	GR - MPRlite - Dir	No wireline logging
Core 15 m (1559-1574m MD) 85% rec.	One bulk (ca. 5 l) and one washed and dried sample every 10 m from the 9 5/8" casing shoe down to 1450 m One bulk (ca. 5 l), one wet (bag) and one washed and dried sample every 3 m from 1450 m to Top Red Beds & from 2150 m to TD One bulk (ca. 5 l), one wet (bag) and one washed and dried sample every 6 m from Top Red Beds to 2150 m One 1 l mud-sample every 100 m down to TD Two 1 l mud samples every 20 m in all HC-bearing zones	*Baker:* GR - MPR - Dir *Schlumberger:* GR - ARC - Dir Periscope	Intermediate logging: (6. runs) -PEX, Den, Neu, Res -ECS, Elemental Capture Spectroscopy -DSI, Sonic -MDT, Pressure points and sampling -CMR, Combinable Magnetic Resonance -VSP, Vertical seismic profile -FMI, Formation Micro Imager No logging at TD:

Figure 1-2 Formation evaluation

2 Exemptions and non-conformances

Exception from	Report no	Date	Title
NPD	None		
WR	None		
Drilling program	None		

3 Health, safety, environment and quality (HSE&Q)

3.1 Incident Reports (RUH's)

Table 3-1 Incident reports (RUH's)

Type (color code)	Synergy code	Number of
Yellow	3	1
Green	4	1
Green	5	3
Sum		5

3.2 Comments to the reports

Table 3-2 Comments to the incident reports

Synergy no	Hazard	Description
396193	3	Synergy 396193 (Closed) - 18.06.2006 - Accident - Dislocated left shoulder The Deck crew were assisting the Sub Sea department with re-installing a ram block for the BOP stack. The ram block was being lowered down through the roof of the BOP house. The IP was looking up at the load, he then stepped back, and stood on a hose which was laid down to deck. The IP fell backwards, resulting in a broken left hand. When the IP pushed himself upright he felt a sharp pain in his shoulder.
399276	4	Synergy 399276 (Closed) - 07.07.2006 - Accident - Laceration to left hand middle finger Laceration to left hand middle finger. Whilst closing Geoservices sliding door I/P accidentally closed door on left hand middle finger
396402	5	Synergy 396402 (Closed) - 15.06.2006 - Condition - Potential Dropped Object Noticed bolts in bolt storage area in port 2 column that were close to the hatch. With rig motion the bolts could have fallen to the lower level. Move the bolts to a more secure place.
396541	5	Synergy 396541 (Closed) - 14.06.2006 - Condition - Big bolt rolling around on BOP While working in the moon pool area I observed a big bolt rolling around on the BOP with the potential to fall.
396546	5	Synergy 396546 (Closed) - 08.06.2006 - Condition - Loose dog collar on top of pipe bundle When lifting a spaghetti bundle from starboard pipe deck a roustabout discovered a loose dog collar lying on top of bundle.

3.3 Experience listing

Table 3-3 Experience listing

Subject:	Conductor landed on cuttings heap 1m above seabed before we took weight running in with the conductor		
Section:	NO 6608/11-5, 36"		
Rep date:	20.06.2006		
Keywords:	DRILLING		
Downtime:		**Pot time improvements:**	
Comp inv:	Statoil		
References:			
Synergy no:		**Cost:**	
Synergy title:			

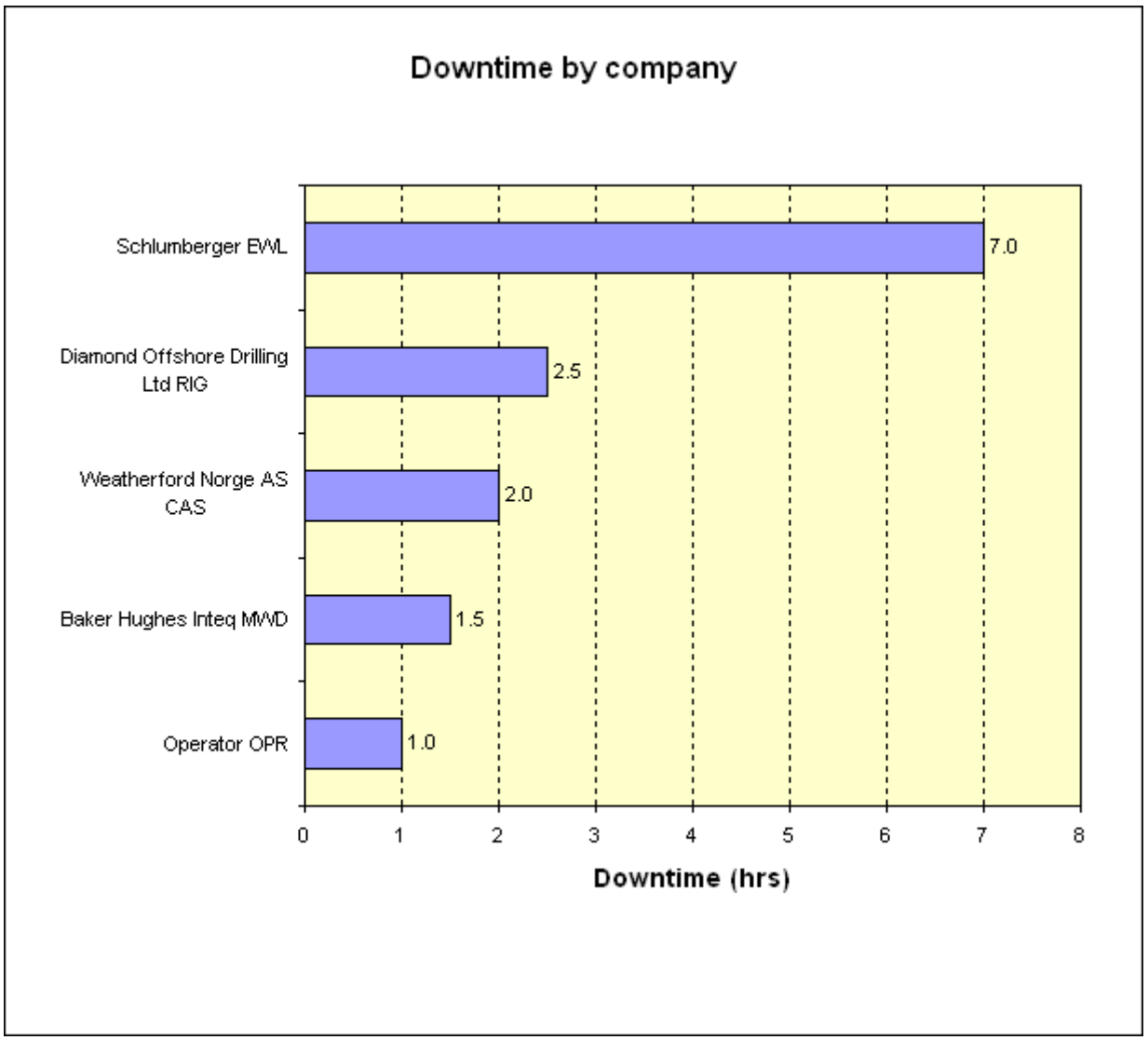
Description:
When running in with the 30" conductor we landed the PGB on the cuttings heap 1 m above seabed, without getting any indications on the weight gauge that we had tagged bottom with the shoe. It was planned for a 3 m stick-up. Seabed was found to be 364.5 m when spudding the well. The conductor was 50.5 m, so the 36" hole opener was drilled to 412 m.

Immediate solution:
Picked up string 2 m to give 3 m stick-up. Tensioned up/slacked off guide wires in attempt to improve bulls eye readings. Cemented 30" conductor in tension. WOC for 7 hrs before backing out running tool. Bulls eye readings: 1 deg. and 2m stick-up

Future recommended solution:
Planned 3 m stick-up on 30" conductor. LET OPR to decide on best practice on how to place 30" conductor (26" / 36" hole) and releasing (RT) procedures

3.4 Incidents by service companies, contractor and operator

Table 3-4 Incidents by service companies, contractor and operator



SERVICE COMPANY: Casing Crew Service CAS Weatherford Norge AS
WELL BORE: NO 6608/11-5

Incident start time	Failure code	Synergy no	Title	Quality cost		Downtime		
				NOK	NOK/d	Total hrs	Comp share %	Comp share hrs
23.06.2006 00:00:00	CAS-03 Procedure not followed	396860	Started to run casing with manual elevators (backup) and changed to automatic elevators when we got those from other rig.			1,0	100	1,0
23.06.2006 06:00:00	CAS-E03 Hydraulic operated tongs	397120	Had to stop running casing due to wrong alignment on Power Scope and problem with backup door on casing tong.			1,0	100	1,0
			Total					2,0

SERVICE COMPANY: Electric Wire line Logging EWL Schlumberger
WELL BORE: NO 6608/11-5

Incident start time	Failure code	Synergy no	Title	Quality cost		Downtime		
				NOK	NOK/d	Total hrs	Comp share %	Comp share hrs
30.06.2006 20:30:00	EWL-E05 Down hole electronic	398253	VSP logging string			2,0	100	2,0
01.07.2006 18:30:00	EWL-E03 Acquisition/Computers	398318	Schlumberger e-line, data transfer problems			1,0	100	1,0
01.07.2006 21:30:00	EWL-E03 Acquisition/Computers	398318	Schlumberger e-line, data transfer problems			2,0	100	2,0
02.07.2006 01:30:01	EWL-E03 Acquisition/Computers	398318	Schlumberger e-line, data transfer problems			1,0	100	1,0
06.07.2006 00:30:00	EWL-E06 D/H Mechanical equipment	399048	MDT logging string. Negative to set isolation packer.			1,0	100	1,0
			Total					7,0

SERVICE COMPANY: Measurement While Drilling MWD Baker Hughes Inteq
WELL BORE: NO 6608/11-5

Incident start time	Failure code	Synergy no	Title	Quality cost		Downtime		
				NOK	NOK/d	Total hrs	Comp share %	Comp share hrs
21.06.2006 06:00:00	MWD-03 Procedure not followed	396651	Not able to decode MWD signal			1,5	100	1,5
			Total					1,5

SERVICE COMPANY: Operator OPR Operator
WELL BORE: NO 6608/11-5

Incident start time	Failure code	Synergy no	Title	Quality cost		Downtime		
				NOK	NOK/d	Total hrs	Comp share %	Comp share hrs
02.07.2006 22:00:00	DRF-05 Stuck pipe	398506	Stuck MDT logging toolstring at 1697 m			1,0	100	1,0
			Total					1,0

SERVICE COMPANY: Rig Operations RIG Diamond Offshore Drilling Ltd
WELL BORE: NO 6608/11-5

Incident start time	Failure code	Synergy no	Title	Quality cost		Downtime		
				NOK	NOK/d	Total hrs	Comp share %	Comp share hrs
03.07.2006 17:30:00	RIG-E09 Electric power system	398716	Unable to assign power to draw work			2,0	100	2,0
10.07.2006 00:00:00	RIG-E386 Riser handling	399564	Pulling BOP and riser. Observed flow on BOP panel			0,5	100	0,5
			Total					2,5

3.5 Time distribution 6608/11-5

Table 3-5 Time distribution 6608/11-5

		Length	Budget		TL		Actual		Ops
Section	Start time	m	hrs	days	hrs	days	hrs	days	(f)
NO 6608/11-5 MOVE	12.06.2006 06:30	364,0	115,0	4,8	127,0	5,3	146,0	6,1	100,0
NO 6608/11-5 36"	18.06.2006 08:30	52,0	55,0	2,3	55,0	2,3	67,0	2,8	100,0
NO 6608/11-5 12 1/4"	21.06.2006 03:30	889,0	173,0	7,2	137,0	5,7	142,0	5,9	97,5
NO 6608/11-5 8 1/2"	27.06.2006 01:30	970,0	235,0	9,8	113,0	4,7	249,5	10,4	96,0
NO 6608/11-5 PERM P&A	07.07.2006 11:00	0,0	129,0	5,4	177,0	7,4	204,5	8,5	99,6
Sum			707,0	29,5	609,0	25,4	809,0	33,7	

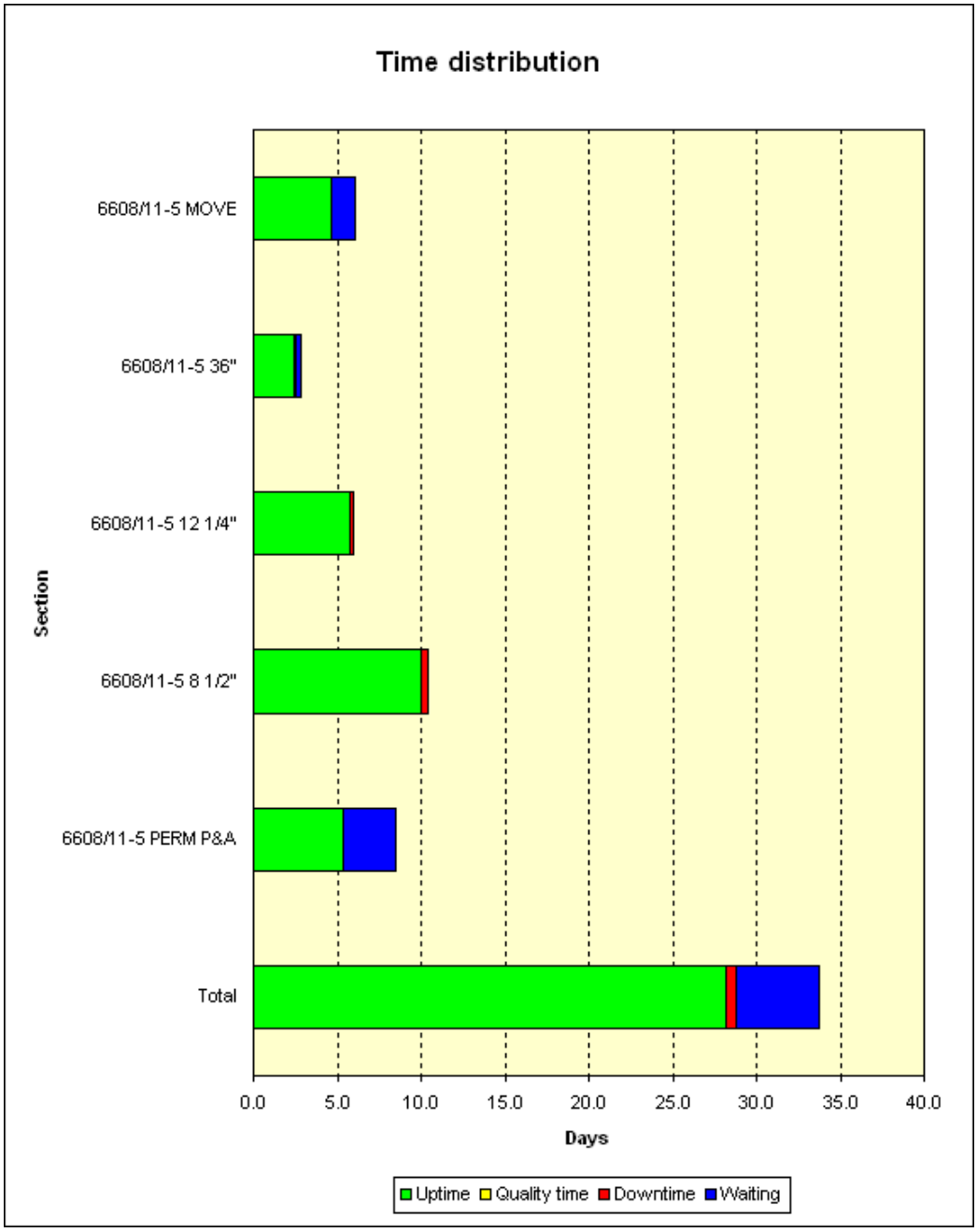


Figure 3-1 Time distribution

Table 3-7 Time distribution based on activities,

Section	Downtime	Uptime	Quality time	Waiting time	Total time
6608/11-5 MOVE	0,0	4,6	0,0	1,4	6,1
6608/11-5 36"	0,0	2,4	0,1	0,3	2,8
6608/11-5 12 1/4"	0,1	5,8	0,0	0,0	5,9
6608/11-5 8 1/2"	0,4	10,0	0,0	0,0	10,4
6608/11-5 PERM P&A	0,0	5,3	0,0	3,2	8,5
Total	0,6	28,2	0,1	4,9	33,7

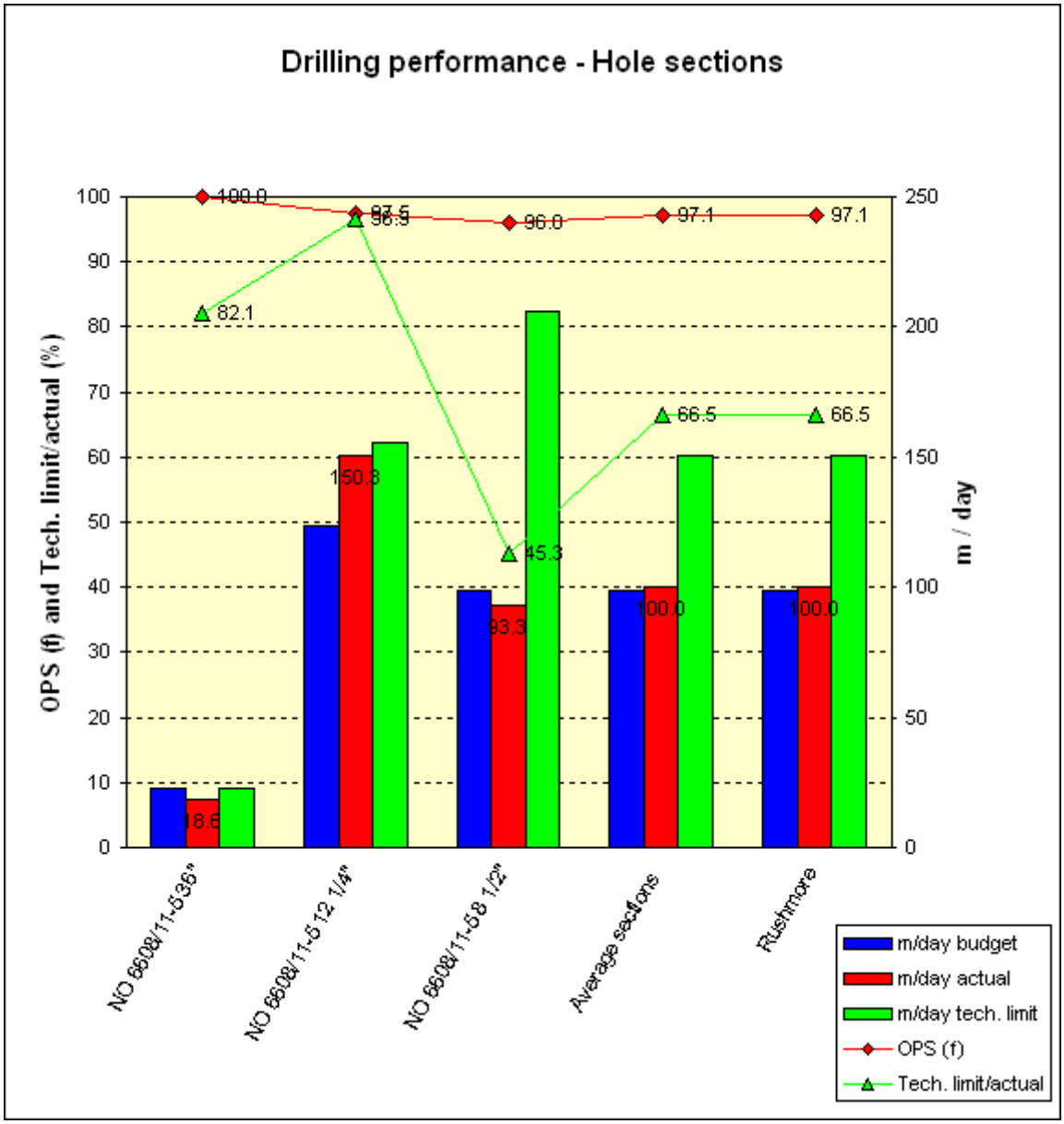


Figure 3-2 Drilling performance – hole sections

4 Geology and formation data report

4.1 Geological setting and results

The Valkyrie 1 well was drilled in the northern part of block 6608/11. The well is located 2.7 km south-east of the Linerle well (6608/11-4), on an up-thrown horst block compared to the Linerle discovery, NNE of the Norne field.

Block 6608/11 is situated in the southern part of the Nordland II area. The NE-SW trending Revfallet fault complex separates the block in two structural provinces, the Dønna Terrace and the bounding Nordland Ridge to the east. To the west the Ytreholmen Fault Zone bound the Dønna Terrace towards the Træna Basin.

The structural framework of the Dønna Terrace was mainly established during the upper Jurassic/lower Cretaceous extensional tectonics in the region. Later on structuring is mainly related to the Cretaceous and Tertiary basinal subsidence. The Valkyrie prospect is located on the Dønna Terrace in the northern part of block 6608/11. This block and block 6608/10 comprises the PL128 wheras Norne field is situated towards SW in block 6608/10.

The Valkyrie 1 well was drilled on a horst east of the Linerle discovery that is situated at a downfaulted block. Åre Formation and Grey beds constitutes the reservoir interval. The Triassic Red Beds under the Lower Evaporite marker represented the second target.

Well 6608/11-5 penetrated rocks of Quaternary to Triassic age. TD of the well is in rocks of Triassic age in the Red beds beneath the Lower Evaporite marker (Figure 4-2).

4.2 Shallow gas results

The well was drilled with seawater and returns to seafloor down to 1305 m. No shallow gas was observed. MWD logs were used in the evaluation and ROV was used to observe at the wellhead.

4.3 Stratigraphy

The stratigraphical division is based on interpretation of the biostratigraphic report, log curves and correlation to nearby wells. The stratigraphy of the well is shown in Figure 4-2 and Figure 4-3. Observed versus prognosed stratigraphy is shown in Figure 4-4.

4.3.1 Table of chronostratigraphy

Table 4-1 Chronostratigraphy

Stratigraphic succession		mMD RKB	
Studied interval 1310 – 2270 mMD RKB		**From**	**To**
Tertiary	Early Oligocene	1310	1350
	Late Eocene	1360	1370
	Middle Eocene	1380	1423
	Early Eocene	1430	1500
	Late Palaeocene	1503	1533
---------- Base Tertiary Unconformity ----------		1535	
Cretaceous	Early Maastrichtian	1536	1539
	Middle Campanian	1542	1548
	---------- Base Cretaceous Unconformity ----------	1550	
Triassic	Rhaetian	1560	1563.5
	Mid-Late Rhaetian	1563.5	1641
	Early Rhaetian	1641	1694
	Early Rhaetian – Late Norian	1694	1770
	Norian - Carnian	1770	1950
	Carnian	1950	2270
	TD	2270	

4.3.2 Table of lithostratigraphy

Table 4-2 Lithostratigraphy

FORMATION TOPS	PROGNOSED			OBSERVED			DIFF. PROGN.
	m MD RKB	m TVD RKB	m MSL	m MD RKB	m TVD RKB	m MSL	m TVD
QUATERNARY (seabed)	363.0	363.0	341.0	364.0	364.0	342.0	-
TERTIARY NORDLAND GP	363	363	341	364.0	364.0	342.0	+1
Naust Fm	667	667	645	613	613	591	- 54
Kai Fm	1326	1326	1304	1341	1341	1319	+15
HORDALAND GP	1359	1359	1337	1373	1373	1351	+14
Brygge Fm	1359	1359	1337	1373	1373	1351	+14
ROGALAND GP	1430	1430	1408	1435	1435	1413	+5
Tare Fm	1430	1430	1408	1435	1435	1413	+5
Tang Fm				1515	1515	1493	
CRETACEOUS SHETLAND GP				1517	1517	1495	
Springar Fm				1517	1517	1495	
JURASSIC BÅT GP	1507	1507	1485	1550	1550	1528	+43
Åre 1? Fm	1507	1507	1485	1550	1550	1530	+43
TRIASSIC Grey Beds Fm	1622	1622	1600	1641	1641	1619	+19
Red beds Fm	1683	1683	1661	1694	1694	1672	+ 11
U. Evaporite marker	1952	1952	1930	1955	1955	1933	+3
L. Evaporite marker	2172	2172	2150	2151	2151	2129	-21
TD	2252	2252	2230	2270	2270	2248	+18

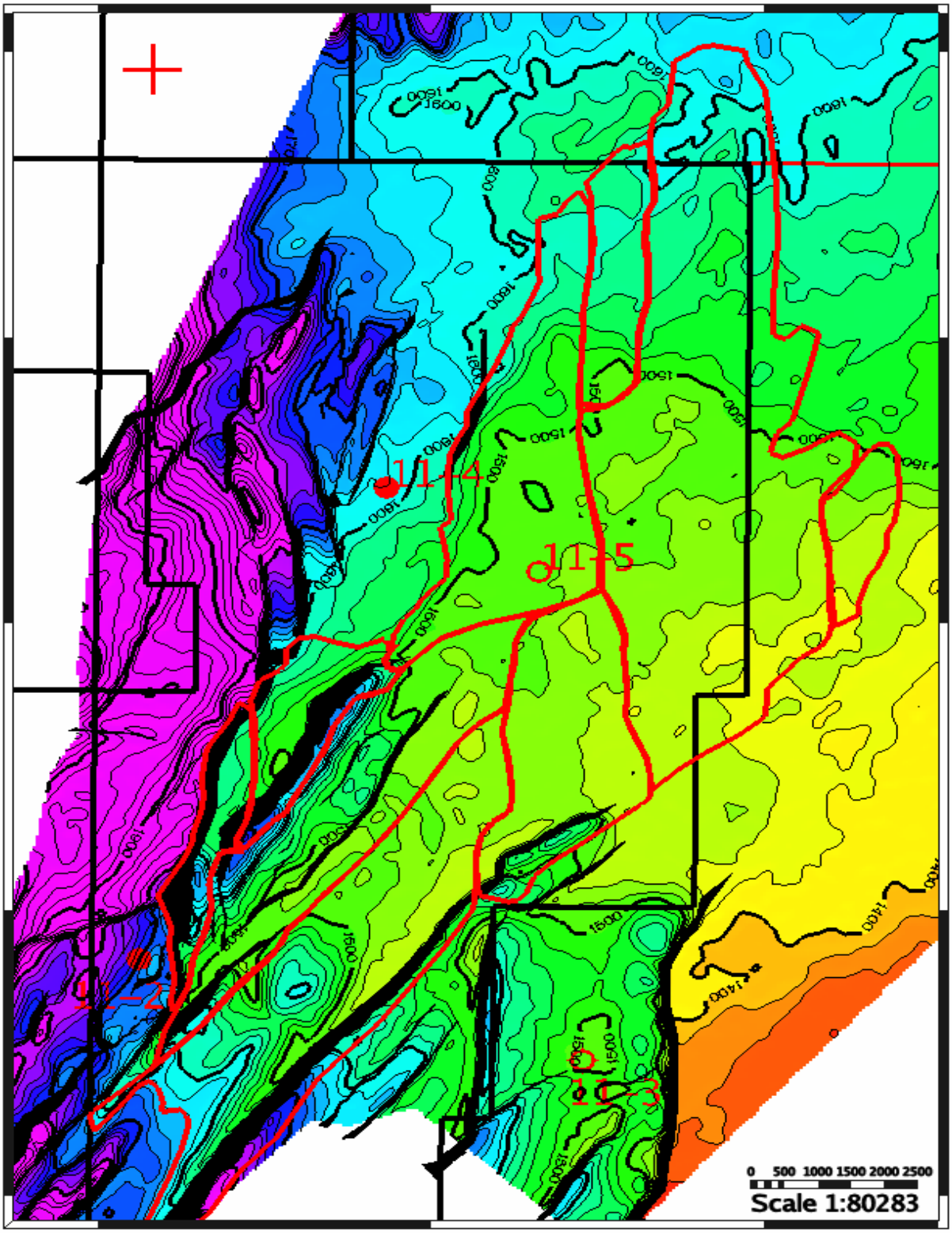
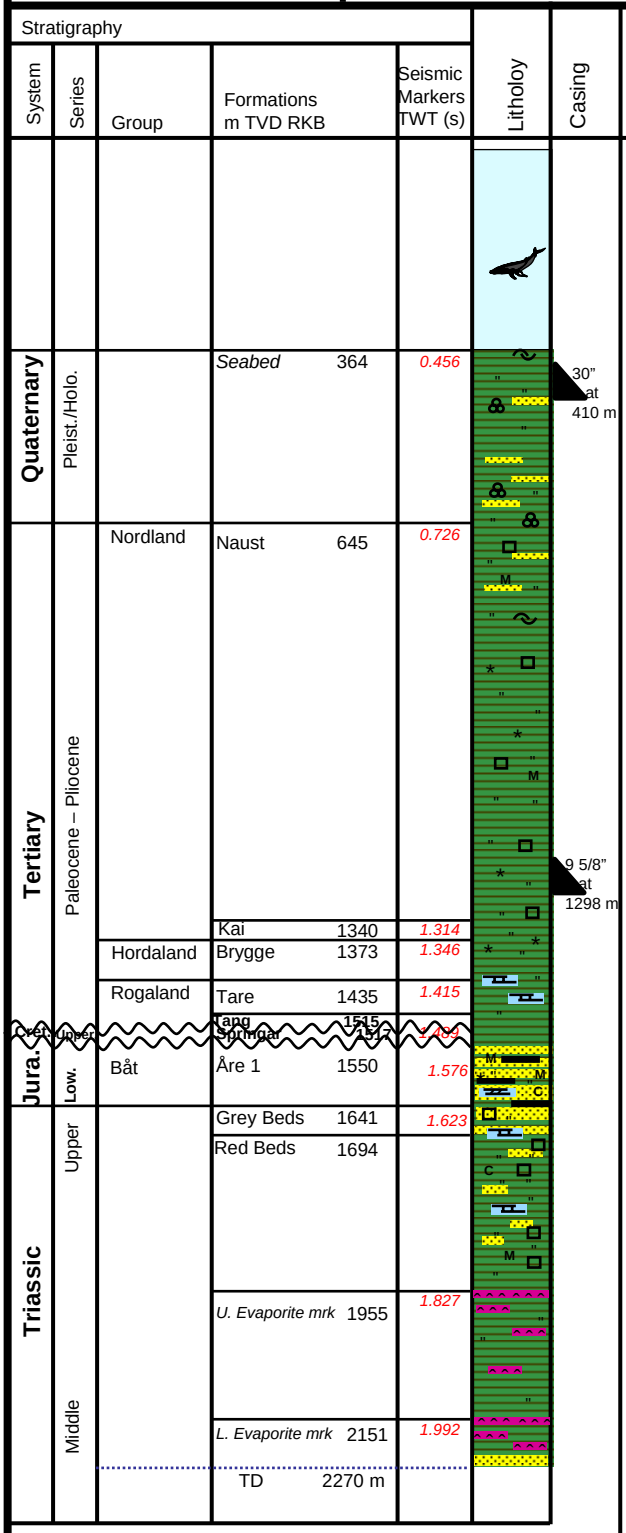


Figure 4-1 Regional structural setting

PL 128	Lithology Prognosis Well 6608/11-5 Valkyrie 1	STATOIL
RKB - MSL: 22 m		Made by: BPAU / Date: 15.11.2006
Water Depth: 342 m MSL		



Lithology Descriptions

NORDLAND GROUP

NAUST FORMATION:

Clay: medium grey to occasionally olive grey, soft to firm, slightly to moderately silty, slightly to very sandy, moderately micaceous, slightly calcareous

Sand: clear to translucent quartz, very fine, subangular to subrounded, loose, poor to moderate sorted

KAI FORMATION:

Clay/claystone: medium grey to medium dark grey, olive grey, soft to very soft, sticky, moderately silty to very silty, slightly sandy in part, moderately micaceous, slightly to very calcareous

Sand/Sandstone: loose, clear to translucent quartz, very fine to medium, occasionally very fine to coarse, moderately to poorly sorted, sub angular to sub rounded

Limestone: white to yellowish brown, moderately hard to hard, argillaceous in part, microcrystalline

HORDALAND GROUP

BRYGGE FORMATION:

Claystone: medium light grey to medium dark grey, brownish grey to olive grey, light bluish grey in places, soft to firm, occasionally sticky, silty in places, sub blocky, flaky in places, calcareous to non-calcareous, micromicaceous

Sandstone: clear to translucent, loose, very fine to fine, occasionally coarse to very coarse, moderately to poorly sorted, sub angular to sub rounded

Limestone: very light grey, soft to firm, sub blocky, silty in part, contains argillaceous lamina

ROGALAND GROUP

TARE FORMATION:

Claystone: medium dark grey to medium light grey, occasionally medium bluish grey to medium grey, sub blocky to blocky, firm to very hard, slightly silty in places, non to slightly calcareous, traces of glauconite and kaolinite, micromicritic

Sandstone: loose quartz grains, clear to translucent, fine to medium, occasionally medium to coarse, moderately sorted, sub angular to sub rounded, non calcareous, abundant pyrite in places

SHETLAND GROUP

SPRINGAR FORMATION:

Claystone: medium grey to medium light grey, occasionally reddish brown to dusky brown, occasionally greenish grey to greenish black, light to medium brown in part, soft to firm, silty in parts, non to slightly calcareous, glauconitic and pyritic in parts, kaolinite locally present

BÅT GROUP

ÅRE FORMATION:

Sandstone: clear to translucent, trace off white opaque, very fine to coarse, trace very coarse, loose I.P., mainly sub rounded to angular. Locally medium light grey to medium grey argillaceous matrix, non calcareous, pyritic in places, micromica and traces of micropyrite and glauconite present.

Claystone: medium dark to dark grey, greenish to dark greenish grey and olive grey to brownish grey, sub blocky to blocky, soft to firm, moderately hard in places, occasionally sticky, kaolinitic, very silty grading siltstone in places, slightly calcareous in parts, carbonaceous in parts, occasionally glauconitic in parts, traces of micromica in places.

TRIASSIC

GREY BEDS:

Sandstone: clear to translucent, fine to medium, occasionally medium to very coarse, sub angular to sub rounded, poor to moderately sorted, argillaceous matrix in parts and siliceous cement in parts, glauconite and pyrite in parts.

Claystone: light brownish grey to brownish grey, olive grey in parts, predominantly soft, sticky, slightly calcareous in places, micromicaceous and glauconitic.

Limestone: white to yellowish white, yellowish brown in parts, soft to firm and microcrystalline.

RED BEDS:

Sandstone: clear to translucent, loose, medium to coarse, sub angular to sub rounded, moderately sorted, locally siliceous cement

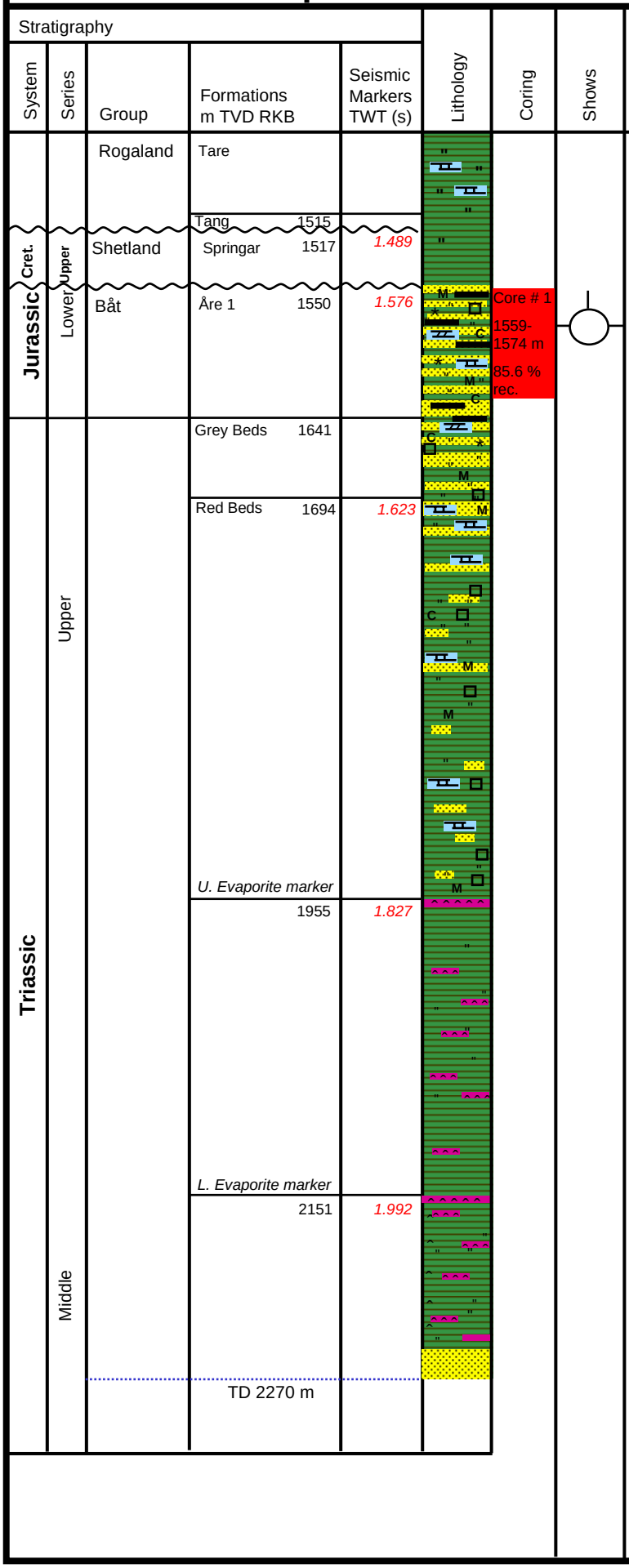
Claystone: multi coloured, soft to firm, sticky in parts, sub blocky to blocky, moderately to very calcareous, locally grading marl, slightly silty in parts, occasionally glauconitic, trace of pyrite and kaolinite.

Limestone: white to yellowish white, yellowish brown in parts, soft to moderately hard, locally argillaceous, laminated, sub blocky and microcrystalline.

Evaporite: Anhydrite: soft to firm, amorphous and blocky. Halite: clear to translucent crystals, white to grey, hard and coarse crystalline.

Figure 4-2 Stratigraphy

PL 128	Reservoir section Well 6608/11-5 Valkyrie 1	STATOIL
RKB - MSL: 22 m		Made by: BPAU / Date: 15.11.06
Water Depth: 342 m MSL		



Lithology Descriptions

NORDLAND GROUP

NAUST FORMATION:

Clay: medium grey to occasionally olive grey, soft to firm, slightly to moderately silty, slightly to very sandy, moderately micaceous, slightly calcareous

Sand: clear to translucent quartz, very fine, subangular to subrounded, loose, poor to moderate sorted

KAI FORMATION:

Clay/claystone: medium grey to medium dark grey, olive grey, soft to very soft, sticky, moderately silty to very silty, slightly sandy in part, moderately micaceous, slightly to very calcareous

Sand/Sandstone: loose, clear to translucent quartz, very fine to medium, occasionally very fine to coarse, moderately to poorly sorted, sub angular to sub rounded

Limestone: white to yellowish brown, moderately hard to hard, argillaceous in part, microcrystalline

HORDALAND GROUP

BRYGGE FORMATION:

Claystone: medium light grey to medium dark grey, brownish grey to olive grey, light bluish grey in places, soft to firm, occasionally sticky, silty in places, sub blocky, flaky in places, calcareous to non calcareous, micromicaceous

Sandstone: clear to translucent, loose, very fine to fine, occasionally coarse to very coarse, moderately to poorly sorted, sub angular to sub rounded

Limestone: very light grey, soft to firm, sub blocky, silty in part, contains argillaceous lamina

ROGALAND GROUP

TARE FORMATION:

Claystone: medium dark grey to medium light grey, occasionally medium bluish grey to medium grey, sub blocky to blocky, firm to very hard, slightly silty in places, non to slightly calcareous, traces of glauconite and kaolinite, micromicritic

Sandstone: loose quartz grains, clear to translucent, fine to medium, occasionally medium to coarse, moderately sorted, sub angular to sub-rounded, non calcareous, abundant pyrite in places

SHETLAND GROUP

SPRINGAR FORMATION:

Claystone: medium grey to medium light grey, occasionally reddish brown to dusky brown, occasionally greenish grey to greenish black, light to medium brown in part, soft to firm, silty in parts, non to slightly calc-areous, glauconitic and pyritic in parts, kaolinite locally present

BÅT GROUP

ÅRE FORMATION:

Sandstone: clear to translucent, trace off white opaque, very fine to coarse, trace very coarse, loose I.P., mainly sub rounded to angular. Locally medium light grey to medium grey argillaceous matrix, non calcareous pyritic in places, micromica and traces of micropyrite and glauconite present.

Claystone: medium dark to dark grey, greenish to dark greenish grey and olive grey to brownish grey, sub blocky to blocky, soft to firm, moderately hard in places, occasionally sticky, kaolinitic, very silty grading silt-stone in places, slightly calcareous in parts, carbonaceous in parts, occasionally glauconitic in parts, traces of micromica in places.

TRIASSIC

GREY BEDS:

Sandstone: clear to translucent, fine to medium, occasionally medium to very coarse, sub angular to sub rounded, poor to moderately sorted, argilla-ceous matrix in parts and siliceous cement in parts, glauconite and pyrite in parts.

Claystone: light brownish grey to brownish grey, olive grey in parts, pre-dominantly soft, sticky, slightly calcareous in places, micromicaceous and glauconitic.

Limestone: white to yellowish white, yellowish brown in parts, soft to firm and microcrystalline.

RED BEDS:

Sandstone: clear to translucent, loose, medium to coarse, sub angular to sub-rounded, moderately sorted, locally siliceous cement

Claystone: multi coloured, soft to firm, sticky in parts, sub blocky to blocky, moderately to very calcareous, locally grading marl, slightly silty in parts, occasionally glauconitic, trace of pyrite and kaolinite.

Limestone: white to yellowish white, yellowish brown in parts, soft to moderately hard, locally argillaceous, laminated, sub blocky and microcrystalline.

Evaporite: Anhydrite: soft to firm, amorphous and blocky. Halite: clear to translucent crystals, white to grey, hard and coarse crystalline.

Figure 4-3 Stratigraphy in the reservoir section

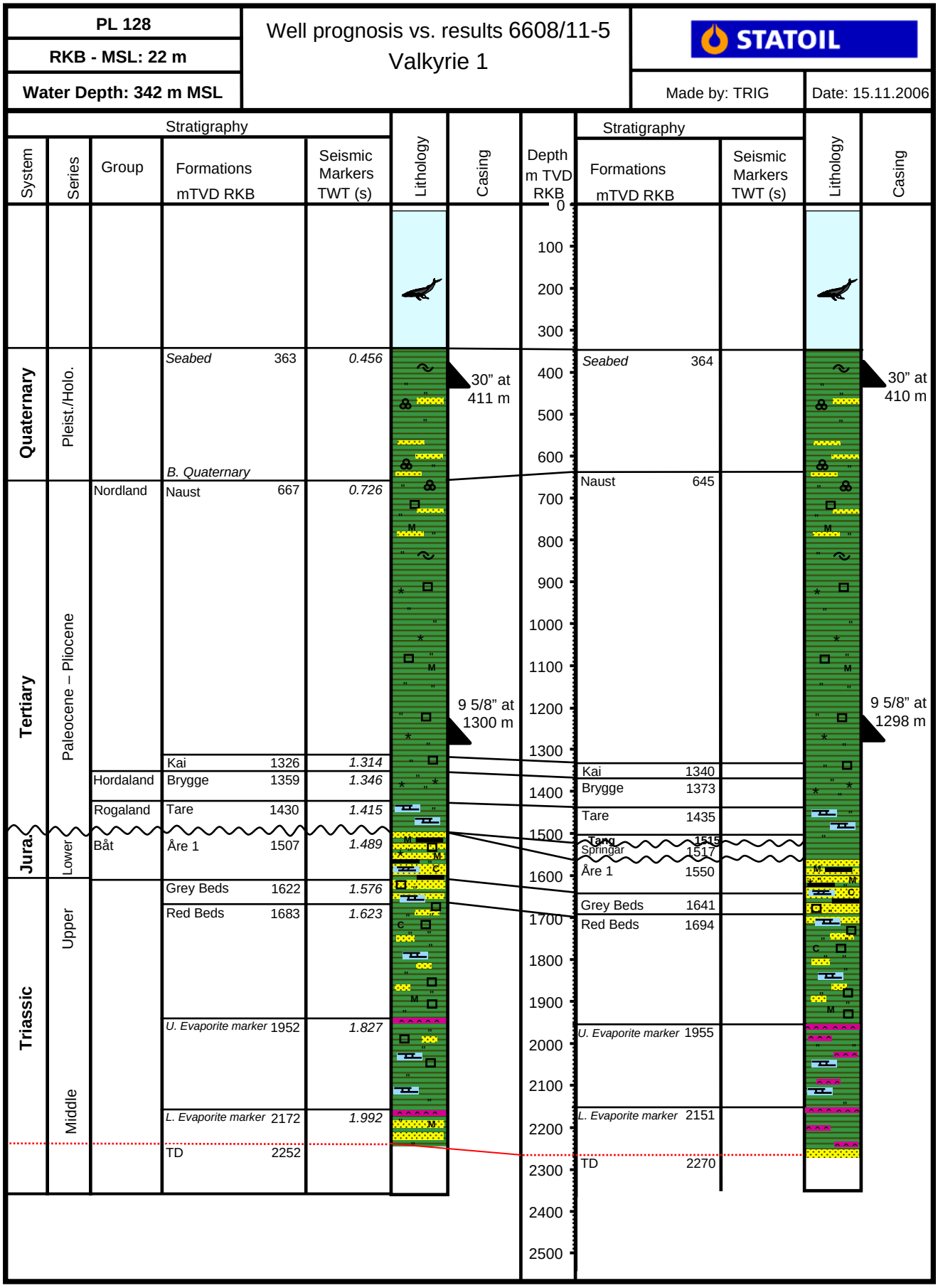


Figure 4-4 Observed versus prognosed stratigraphy

4.4 Lithostratigraphic descriptions

QUATERNARY 364.0 m – 613.0 m MD RKB, (342.0 m – 591.0 m TVD MSL)

System: Quaternary
Series: Pleistocene - Holocene

Quaternary sediments were drilled with returns to the sea floor and lithology is inferred from the MWD logs, gamma ray and resistivity, drilling parameters and info from the offset wells. The sediments are dominated by firm clay, with a few possibly sand layers.

NORDLAND GROUP 613 m – 1373 m MD RKB (591 m – 1351 m TVD MSL)
Naust Formation 613 m – 1341 m MD RKB (591 m – 1319 m TVD MSL)
System: Tertiary
Series: –Pleistocene - Pliocene
Depositional environment: Marine to inner shelf

Naust formation sediments were drilled with returns to the sea floor and lithology is inferred from the MWD logs, gamma ray and resistivity, drilling parameters and info from the offset wells. The sediments are dominated by uniform claystone with a few silty and sandy sections.

Kai Formation 1341 m – 1373 m MD RKB (1319 m – 1351 m TVD MSL)
System: Tertiary
Series: Upper Pliocene – Upper Miocene ?
Depositional environment: Marine to inner shelf

This formation comprises claystone interbedded with sandstone and traces of limestone.

The claystone is predominantly medium grey to medium dark grey, olive grey in colour. It is predominantly soft to very soft, sticky and in part very silty. It is also characterized by being calcareous to very calcareous and micromicaceous.

The sandstone consists of loose clear to translucent quartz grains. They are very fine to medium, occasionally fine to very coarse, moderately to poorly sorted and subangular to subrounded.

The limestone is white to yellowish brown in colour, moderately hard to hard, argillaceous in part and microcrystalline.

HORDALAND GROUP
Brygge formation **1373 m – 1435 m MD RKB (1351 m – 1413m TVD MSL)**
System: Tertiary
Series: Upper Oligocene – Lower Eocene
Depositional environment: Marine to inner shelf

This formation is dominated by claystone, interbedded with minor sandstones in some parts and traces of limestone.

The claystone is predominantly medium light grey to medium dark grey in colour and occasionally, brownish grey to olive grey and light bluish grey in places. The claystone is characterized of being soft to firm, occasionally sticky, subblocky and flaky in places. The clay is silty in places and is calcareous to non calcareous. Traces of micromica occurs.

The sandstone consists of clear to translucent, loose quartz grains. They are predominantly very fine to fine, occasionally coarse to very coarse, moderately to poorly sorted and in general subanular to subrounded.

The limestone is presominantly very light grey in colour, soft to firm and subblocky. The limestone is silty in parts and contains argillaceous lamina.

ROGALAND GROUP **1435 m – 1517 m MD RKB (1413 m – 1495 m TVD MSL)**
Tare Formation **1435 m – 1515 m MD RKB (1413 m – 1493 m TVD MSL)**
System: Tertiary
Series: Lower Eocene - Upper Palaeocene
Depositional environment: Marine to inner shelf deposits.

The Tare Formation consists of claystone with limestone stringers and some thin sandstone beds.

The claystone is presominantly medium dark to medium light grey, occasionally medium bluish grey to medium grey in colour. It is subblocky to blocky, firm to very hard, slightly silty in places and is non to slightly calcareous. Traces of glauconite and kaolinite are present. The claystone is in general micromicritic.

The sandstone consists of loose quartz grains. They are clear to translucent fine to medium and occasionally medium to coarse. The grains are moderately sorted and subangular to subrounded. The sandstone is in general non calcareous. In places abundant pyrite was observed.

Tang formation **1515 m – 1517 m MD RKB (1493 m – 1495 m TVD MSL)**
System: Tertiary
Series: Palaeocene
Depositional environment: Marine, outer shelf to upper bathyal.

The Tang Formation comprises of claystone and some traces of sandstone .

The claystone is dominanly dark greenish grey to greenish black, dark grey to greyish black in colour. In places it is medium dark grey to light-/moderate brown. The claystone is caracterized of being blocky and in part soft . It is slightly silty in places and non to slightly calcareous. Traces of glauconite and pyrite are present in places and micromica occurs.

The sandstone consists of loose quartz grains which are clear to translucent and varies between fine to medium in size. The grains are occasionally medium to coarse, moderately sorted and subangular to subrounded. The sandstone is described to be non calcareous with abundant pyrite in places.

SHETLAND GROUP
Springar Formation **1517 m– 1550 m MD RKB (1495 m – 1528 m TVD MSL)**
System: Upper Cretaceous
Series: Lower Campanian
Depositional environment: Marine, outer shelf to upper bathyal

The Springar Formation consists of claystone which is presominantly medium grey to medium light grey in colour, occasionally reddish brown to dusky brown and greenish grey to greenish black. The colour is also light to medium brown in parts. The claystone is soft to firm, predominantly soft and silty in parts and non to slightly calcareous. Glauconite and pyrite occurs and kaolinite is locally present.

BÅT GROUP
Åre 1 Formation **1550 m – 1641 m MD RKB (1528 m – 1619 m TVD MSL)**
System: Jurassic - Upper Triassic
Series: Sinemurian - Norian
Depositional environment: Non marine to transitional environment / marine/brackish environment

The Åre 1 Formation comprises of sandstone, claystone and coal beds.

The claystone is generally medium dark to dark grey, greenish to dark greenish grey and olive grey to brownish grey in colour. It is subblocky to blocky, soft to firm, moderately hard in places and occasionally sticky. It is slightly calcareous and carbonaceous in parts. Glauconite is present and traces

of micromica and kaolin occurs. The claystone is very silty, grading to siltstone in the lower part of the formation.

The sandstone consists of clear to translucent to opaque loose quartz grains which are very fine to coarse and occasionally coarse to very coarse. The grains are very poor to well sorted and subrounded to angular with locally medium light grey to medium grey argillaceous matrix. The sandstone is non calcareous, micromicaceous and traces of micropyrite and glauconite occurs.

The coal is black, hard to very hard and brittle.

The sediments in the Åre 1 formation are deposited in a non marine to transitional environment. The upper part represents a coal swamp with some marine influences while the lowermost part is deposited in a marine/brackish environment.

TRIASSIC GROUP 1641 m – 2270 m TD RKB (1619 m – 2248 m TVD MSL)
Grey beds 1641 m – 1694 m MD RKB (1619 m – 1672 m TVD MSL)
System: Triassic
Series: Rhaetian - Upper Norian
Depositional environment: Terrestrial/fluvial, occasional marine to brackish influence

The Grey beds comprise sandstone, claystone and limestone.

The sandstone consists of fine to medium, occasionally medium to very coarse grains. They are subangular to subrounded and poor to well sorted. Argillaceous, and siliceous matrix was observed in parts of this interval. Glauconite and pyrite are present.

The claystone is in general light brownish grey to brownish grey and olive grey in colour. It is predominantly soft, sticky and, in places, slightly calcareous, micromicaceous and glauconitic .

The limestone is observed in the lower parts of the Grey beds. It is white to yellowish white and yellowish brown in colour and soft to firm and microcrystalline.

The depositional environment in this part of the well is terrestrial/fluvial with occasional marine to brackish influence.

Red beds 1694 m – 1955 m MD RKB (1672 m – 1933 mTVD MSL)
System: Triassic
Series: Rhaetian - Upper Norian
Depositional environment: Non marine to transitional environment with some brackish influence.

The Red beds consist of claystone, some limestone stringers and small traces of sandstone.

The claystone is varicoloured including moderate brown to greyish red, light brownish grey to brownish grey, light grey to medium dark grey, greenish grey to dark greenish grey, light olive grey to olive grey.

It is soft to firm, occasionally sticky, subblocky to blocky, very calcareous in parts and locally grading to marl. The clay is slightly silty in parts and occasionally glauconitic. Traces of pyrite and kaolinite are also present.

The limestone is white to yellowish white, yellowish brown in colour, soft to moderately hard and locally argillaceous. It is subblocky and microcrystalline.

The sandstone consists of clear to translucent and mostly loose quartz grains. They are medium to coarse, subangular to subrounded and moderately sorted. Locally siliceous cement appears.

Upper Evaporite marker (Part of Red Beds) **1955 m – 2151 m MD RKB (1933 m – 2129 m TVD MSL)**

The Upper Evaporite marker comprises alternating claystone, anhydrite and halite layers. Rare traces of sandstone occur.

The claystone is medium to dark grey, soft to occasionally firm, sticky and partly mixed with halite. In the lower part of the Upper Evaporite marker, the claystone becomes multi-coloured as in the Red beds, firm to moderately hard, blocky to splintery and moderately calcareous.

The anhydrite is present throughout the whole interval and is white, soft to firm, amorphous and blocky.

Halite occurs in the upper part of the Evaporite marker and consists of clear to translucent crystals, has white to grey, occasionally light brown matrix, and is hard and coarse crystalline.

The traces of sandstone is occasionally pyretic and consist of loose quartz grains that are clear to translucent. They are medium to coarse and angular.

Lower Evaporite marker (Part of Red Beds) **2151 m – 2250 m MD RKB (2129 m – 2228 m TVD MSL)**

The Lower Evaporite marker comprises alternating claystone, anhydrite and halite. Some traces of sandstone and pyrite are observed.

The claystone is medium grey, dark grey, light brownish grey, and in parts greyish red. It is characterized to be soft to firm, soluble in parts, subblocky to amorphous and, to certain extent, slightly calcareous. Towards the lower part of this interval, the multi-coloured greyish red/red brown claystone, as described above, becomes more abundant.

The anhydrite is white, soft to firm, amorphous and blocky.

The halite becomes abundant in the lower part of the Lower Evaporite marker. It comprises clear translucent crystals, has a white to light grey matrix, is hard and coarse crystalline. Occasionally the halite occurs as light orange amorphous aggregates.

The traces of sandstone appear as loose quartz grains with clear to translucent grains that are very fine to fine in size, is well rounded and in general well sorted.

Red beds (below evaportite markers) 2250 m – 2270 m MD RKB (2228 m – 2248 m TVD MSL)

The last interval of this well consists of claystone, sandstone and limestone stringers. Rare traces of glauconite are observed.

The claystone is red brown, light jade green and occasionally dark greyish green in colour. It is soft to firm, blocky to platy, subfissile to fissile and non calcareous. The claystone is also slightly sticky in parts.

The sandstone comprises of loose quartz grains. They are clear to milky white, very fine to medium, rounded to well rounded, only rarely having a subangular shape. The grains are moderately to well sorted and occasionally they appears in a dark carbonaceous matrix.

The limestone is white, occasionally beige, soft, amorphous and microcrystalline.

TD **2270 m MD RKB, 2270 m TVD RKB (2248 m MSL)**

HYDROCARBON INDICATIONS / SHOWS:

No direct fluorescence was seen in the core chips. Slow, very weak, yellowish, milky white cut fluorescence was observed in sandstones of the cored interval from 1559-1563 m MD and 1568-1571.8 m MD.

No direct or cut fluorescence was observed in the sandstones of the interval from 2250 m MD to 2270 m MD.

Table 4-3 Gas peaks

Depth MD	Depth TVD	Gas content	C1	C2	C3	iC4	nC4	iC5	nC5	Description	Background Gas
1553.0	1553.0	2.04 %	15551	39	0	1	0	0	0	Formation gas	0.3 %
1559.0	1559.0	0.57 %	4736	9	2	0	0	0	0	Trip gas	0.3 %
1566.0	1566.0	0.55 %	4240	13	2	0	0	0	0	Formation gas	0.3 %
1573.0	1573.0	0.31 %	2424	8	4	2	2	1	1	Formation gas	0.25 %
1585.0	1585.0	0.49 %	3750	12	5	3	3	1	1	Formation gas	0.32 %
1900.0	1900.0	0.76 %	7300	15	2	0	0	0	0	Trip gas	0.2 %
2175.0	2175.0	0.05 %	229	1	1	0	0	0	0	Formation gas	0.04 %
2194.0	2194.0	0.08 %	433	2	1	0	0	0	0	Formation gas	0.05 %

4.5 Geophysical results

The observed formation tops in the well were encountered within the depth uncertainties of the prognosis. The only exemption was the Springar Formation which was not interpreted to be present in this well. Due to the presence of Cretaceous deposits the Åre Formation came in 43 meter deeper than predicted (figure 4.4). The reservoir sand of the Åre Formation was 24 m thinner than expected while the Grey bed sands were 8 meter thinner than noted in the prognosis.

4.6 Data acquisition

4.6.1 Cuttings and mud samples

A standard mud logging unit were used for the well (details in Final Well Report, Geoservices).

- Cuttings were sampled every 10 m from 1300 m MD to 1450 m MD (Figure 1-2) and every 3 meter from 1450 m MD to 2270 m MD (TD)
- Mud samples were taken every 100 m from 1300 m MD to 2270 m MD (TD). In addition two 1 litre mud samples were taken in all hydrocarbon bearing zones.

The ROP was limited to approximately 20 m/hr due to extensive sampling. The service from the mud logging personnel was very good.

4.6.2 Conventional coring

CONTRACTORS: Halliburton Security (coring)
Reslab (core plugs + core handling)

Table 4-4 Coring summary

Core no	Bit no	Top core m	Base core m	Rec m	Rec %	Barrel length m	Barrel type	Preservation	Utilization %
1	3	1559	1574	12.8	85.6	18	Fiber glass	None	68.3

Coring was performed by Halliburton Security. Core plugs were attempted drilled at the well-site by Reslab, but due to loose formation no plugs could be retrieved.

Very good service was provided from both Halliburton Security (coring) and Reslab (core plugs).

4.6.3 MWD logging

The MWD-logging was performed by Baker Hughes Inteq from 412 m MD-1900 m MD when Schlumberger took over with their Periscope tool from 1900 mMD to 2270 mMD (TD).

Table 4-5 MWD logging

RUN no.	DEPTH INTERVAL m RKB	SECTION	TOOL TYPE	COMMENTS
1	412 - 1305	12¼”	MPR	Baker Hughes Inteq (DIR/PWD/GR/MPRlite) decoding problems
2	1305 – 1559	8 ½”	MPR	Baker Hughes Inteq
3	1559 – 1900	8 ½”	MPR	Baker Hughes Inteq
4	1900 – 2270	8 ½”	ARC Periscope	Schlumberger

4.6.4 Wire line logging

Schlumberger performed intermediate wire line logging operation in the 8 ½" open hole section (see Table 4.6). The logs are graphically represented in Figure 4-8 and 4-9.

Table 4-6 Wire line logging in the 8 ½" section

LOGGING PROGRAM			
#	**TOOL COMBINATION**	**RUN**	**INTERVAL m MD RKB**
1	VSP (zero offset)	1A	1890 – 423 m
2	PEX-HRLA-CMR-ECS	1A	1890 – 1300 m (PEX) 1770 – 1529 m (CMR, full porosity uplog) 1300 – 1695 m (down log)
3	MDT-GR pressure points, sampling	1A	1553.5 – 1697.5 m (sampling) 1553.5 – 1739m (pressure pretest)
4	DSI-FMI-GR	1A	1300 – 1885 m (down log) 1885 – 1290 m (DSI main log)
5	MDT-GR, sampling	1B	1553.8 m (probe depth for sampling)
6	MDT-GR, sampling	1C	1551.8 – 1588.3 m (sampling)

A zero offset VSP was performed in the Valkyrie 1 well, 6608/11-5. 104 levels were shot from 1890 m to 423 m MD RKB with a VSI tool. Due to problems with receivers, VSP-GR was performed with only two receivers instead of four. A GR down log was recorded from seabed to 1800 m, which is the depth reference log for all subsequent runs.

4.6.5 Data quality

The quality of the data from the wire line logging operation was generally good. Water samples were collected, and analysis results conclude that there is too much contamination in two of the samples, see chapter 4.8.

There were some problems when logging the VSP due to two out of four receivers failed, and the VSP-GR was performed with only two receivers. The data obtained was good.

Several software problems occurred during logging of PEX-HRLA-CMR-ECS, resulting in failure to record a continuous CMR down and main log.
No neutron curve calculated after start of main PEX-HRLA-ECS log, but raw count rates from SS and LS sensors were still registered.

The LFA (Live Fluid Analyzer) failed in MDT-GR run 1A, no downtime reported since no seal could be obtained during HC sampling due to large washouts.
There were registered high internal hydraulic pump pressures during MDT-GR, run 1B and damaged mud filters and pump piston were found inside the tool, probably due to packing caused by loose formation. The internal packer pressure was lost after pumping up to 25 bars at 1553.8mMD sampling depth, during MDT-GR run 1C. There were some unsuccessful attempts on inflating packers again at

1553.8, 1554.8 and 1588.3 mMD. Due to the fact that no washout was observed in borehole at 1588.3m, it was suspected that the packers might be damaged. Unsuccessful sampling attempts at 1551.8 and 1585.7 mMD were experienced, probably due to plugging of the probe caused by the loose formation.

4.7 Formation pressure

The pore pressure profile shows a normal trend down to approximately 1340 mTVD RKB were rapid increase starts. The highest pore pressure is estimated in the Brygge and Tare Formation, with a maximum gradient of 1.19 sg at 1430 mTVD RKB, based on measurements in the Linerle well. Below this point the pore pressure gradient decreases. In top Åre Formation the pore pressure is measured to be normal, 1.03 sg. The pore pressure profile is interpreted to increase to 1.10 sg at 1999 mTVD RKB in the Triassic formations, and to keep this pore pressure profile down to TD. This increase is based on log interpretations from this well and the reference wells. Calculations of the pore pressure in the software programme Predict, using resistivity, confirms this trend. See Figure 4.6 for more details.

The pore pressure has also been calculated using the sonic and resistivity applying different methods. All of them follow the same trend as the measured pore pressure. The D-exponent is not used for pore pressure evaluation, due to drilling with PDC bit in this well. The formation pressure in the Brygge and Tare Formations is well known in this area, and the formation pressure is therefore expected to be the same as the prognosed pressure. The evaluation of the pore pressure from the resistivity log is slightly higher than the predicted pressure from the sonic log. The sonic log gives the lowest pore pressure gradient and the best prediction compared to the measured pressure in the Brygge, Tare and reservoir Formations.

The overburden gradient is calculated applying the density log from wire line run 1A from 1320m down to 1881m. Above the 9 5/8” casing shoe, density data from the wells 6608/11-3 and 6506/12-1 is used, below 1881m data from 6608/11-2 and 6608/11-3 is used, see Figure 4.6.

4.7.1 Reservoir pressure summary

In the first MDT run a total of 17 pretests were attempted (7 good, 4 tight, 3 no seal, and 3 with Dual packer) and 1 water sample obtained (see table 4.7).
In the second MDT run (1B) one pretest was attempted, but plugging problems were observed (see table 4.8).
5 pretests were attempted in MDT run 1C (3 Dual packer tests with no inflation of packers, and 2 pretests with plugging problems). See table 4.9 for more information.
A standard quartz gauge was used in the MDT logging.

The pressure measurements from the pretest were used to define a gradient in the water wet sandstone in the Åre1 Formation using linear regression. The water gradient was calculated to be 1.020 sg (see Figure 4.10).

Table 4.7 MDT pressure summary, Run 1A, pretests and water sampling.

Test no	Form-ations	Depth m TVD RKB	Depth m MSL	Hydro pressure Before (Bar)	Hydro pressure After (Bar)	Formation pressure (Bar)	Mobility (mD/cp)	Temp (°C)	Gradient sg	Comments
1	Åre	1553.2	1553.5	202.34	202.72	157.072	63.4	45.3	1.031	good
2	Åre	1561.2	1561.5	203.00	203.28	157.797	161.4	45.9	1.030	good
3	Åre	1583.0	1583.3	206.17		-				no seal
4	Åre	1585.4	1585.7	206.45	206.42	160.157	172.2	47.8	1.030	good
5	Åre	1589.7	1590.0	207.00	206.96	160.595	26.2	48.4	1.030	good
6	Åre	1621.7	1622.0	211.17	211.13	163.809	472.4	49.3	1.030	good
7	Grey Beds	1660.2	1660.5	216.19	216.10	167.683	1107.9	50.5	1.030	good
8	Grey Beds	1697.2	1697.5	220.97	220.97	172.335	161.5	52.1	1.035	good
9	Red Beds	1733.6	1734.0	225.72	220.51	-		54.0		tight
10	Red Beds	1738.6	1739.0	226.33	226.32	-		54.8		tight
11	Åre	1558.7	1559.0	202.90	202.93	-		50.0		tight
12	Åre	1556.7	1557.0	202.67	202.70	-		50.0		tight
13	Åre	1553.1	1553.4	202.13		-		48.1		Dual packer no seal
14	Åre	1553.1	1553.4	202.13		-		48.1		Dual packer no seal
15	Åre	1553.2	1553.5			-				no seal
16	Åre	1553.5	1553.8			-				no seal
17	Åre	1631.7	1632.0			-				Dual packer no seal
Sampling										
18	Grey Beds	1697.2	1697.5	220.94	#N/A	172.21	83	52.3	1.034	Water sample

Table 4.8 MDT pressure summary, run 1B, sampling with dual packer.

Test no	Forma-tions	Depth m TVD RKB	Depth m MSL	Hydro pressure Before (Bar)	Hydro pressure After (Bar)	Formation pressure (Bar)	Mobility (mD/cp)	Temp (°C)	Gradient sg	Comments
19	Åre	1553.5	1553.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dual Packer, plugging

Table 4.9 MDT pressure summary, run 1C, pretest and sampling with dual packer.

Test no	Forma-tions	Depth m TVD RKB	Depth mMSL	Hydro pressure Before (Bar)	Hydro pressure After (Bar)	Formation pressure (Bar)	Mobility (mD/cp)	Temp (°C)	Gradient sg	Comments
20	Åre	1553.5	1553.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dual packer, no seal
21	Åre	1554.5	1554.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dual packer, no seal
22	Åre	1551.5	1551.8	203.53	#N/A	156.85	29.6	46.3	1.03	Pretest okay, plugging
23	Åre	1585.4	1585.7	208.07	#N/A	160.25	28.0	49.2	1.03	Pretest okay, plugging
24	Åre	1588.0	1588.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dual Packer, no seal

4.8 Reservoir fluid sampling

The water samples were collected in Åre Formation using a dual packer. Based on the criterias from the sampling programme, two samples had a slightly high contamination. See Appendix G for reports regarding analysis of samples.

Table 4.10 Samples collected from Run 1A 6608/11-5

Sample depth (m MD)	Run No.	Bottle Number	Chamber (volume)	Drawdown (bar)	Formation Pressure (bar)	Pump Volume (liters)	Mobility (mD/CP)	Opening pressure (bar)	Transferred to
1697.5	1A	MPSR-644	420 cc	80	172.2	6	83	10	TS 9013
1697.5	1A	MPSR-695	420 cc	90	172.2	7	83	10	C 19605
1697.5	1A	MRSC-194	1 gallon	65	172.2	7.5	83	115	TS 47306

The water samples from MRSC-194 were the only sample that was qualified, containing 7.2% contamination. The water samples from MPSR-644 and MPSR-695 contained 31.3 % and 11.7% contamination. The degree of mud contamination was analysed using Tritium as a tracer.

4.9 Leak off test

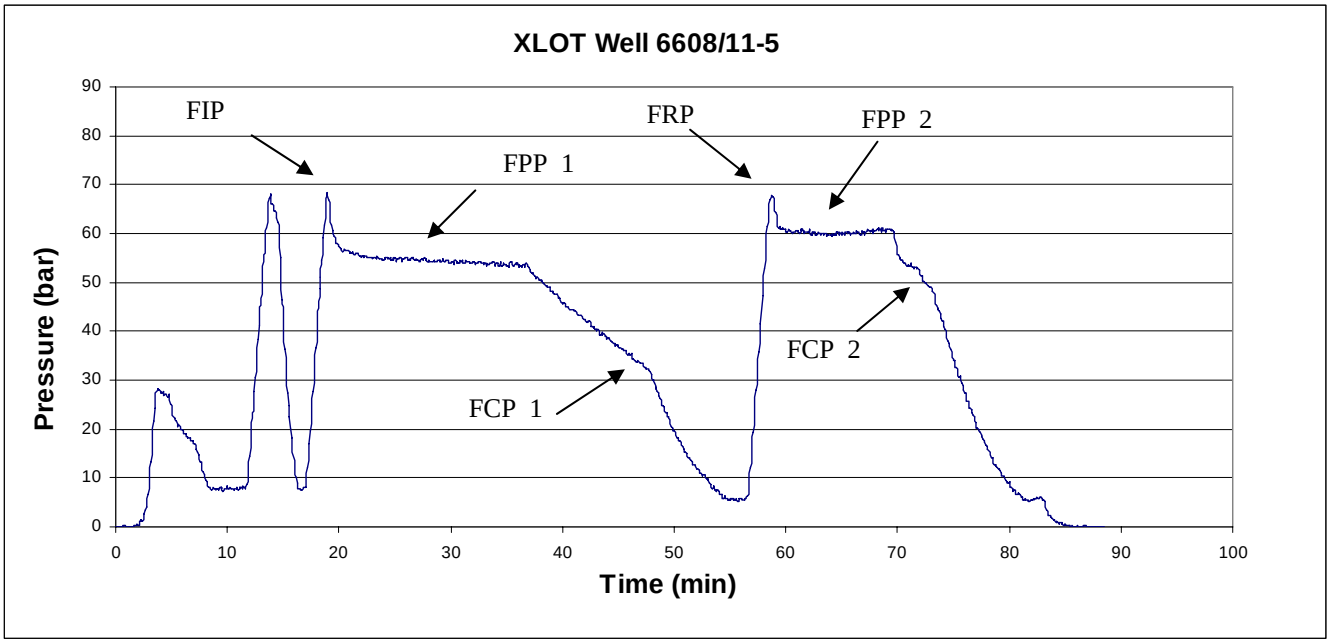
One extended leak off test (XLOT) was performed with a mud weight of 1.04 sg with two cycles below the 9 5/8" casing shoe. The XLOT value is measured to be 1.57 sg at 1297.6 mTVD RKB. The two cycles in the extended leak off test is plotted in Figure 4.5, the XLOT value is plotted in Table 4.11

Table 4.11 Pressure in different periods of the XLOT

	First cycle		Second cycle	
	Bar	sg	Bar	sg
FIP	66.9	1.57		
FPP	55	1.47	60	1.51
FCP	32	1.29	52	1.45
FRP			67.9	1.57

FIP Fracture Initiating Pressure
FPP Fracture Propagation Pressure
FCP Fracture Closure Pressure
FRP Fracture Reopening Pressure

Figure 4.5 XLOT values



4.10 Formation temperature

The evaluated temperature is interpreted using gradients from nearby wells, using temperature measurements from wire line run and also calculated by using an in-house (Hermansrud, 1999) equation that takes into consideration the time since circulation and the measured temperature from the logging tool.

$$VRT = T_f + 75 \cdot EXP\left(\frac{-t}{8}\right)^{0.5} \qquad t < 50 \text{ hours}$$

VRT: Virgin Rock Temperature
T_f: Measured Formation Temperature
t: Time since circulation

The evaluated temperature appears to be a little higher than the regional gradient for the Norne area. The temperatures from the MDT tests are slightly lower than the regional gradient, but they follow the same trend as this gradient. The regional gradient is 4.2^{o}C/100 m down to top reservoir. From top reservoir and down to TD, the temperature decreases with a lower gradient, approximately 3.8^{o}C/100 m. See Figure 4.7 for the temperature profile.

Table 4.12 Measured and evaluated temperatures

Tool combination	Depth of measurement m TVD RKB	Recorded max temperature ^{0}C	Time since last circulation hrs	Evaluated temperature ^{0}C
PEX-HRLA-CMR-ECS	1768	60	36.5	68.9
VSP	1890	56	16.6	73.8
DSI-FMI-GR	1867	60	72.8	-

4.11 Experiences/Recommendations

The wireline operation in this well had some issues, especially concerning MDT jobs in loose formations. Detailed planning is necessary to avoid plugging of probe and flowlines in such formations.

A large washout was observed below 9 5/8” casing shoe after circulation in loose sands, resulting the packers to fail when trying to obtain a good seal during the MDT job.
Circulation with bit located in unconsolidated sands must be avoided due to potentional large washouts; this should be done in stable sands or stable shaly formations for a vertical hole.

Periscope for anisotropy in a vertical hole was run in this well with succes, good data were obtained and anisotropy was observed. The Periscope tool is for the time being not qualified for anisotropy studies in Statoil.

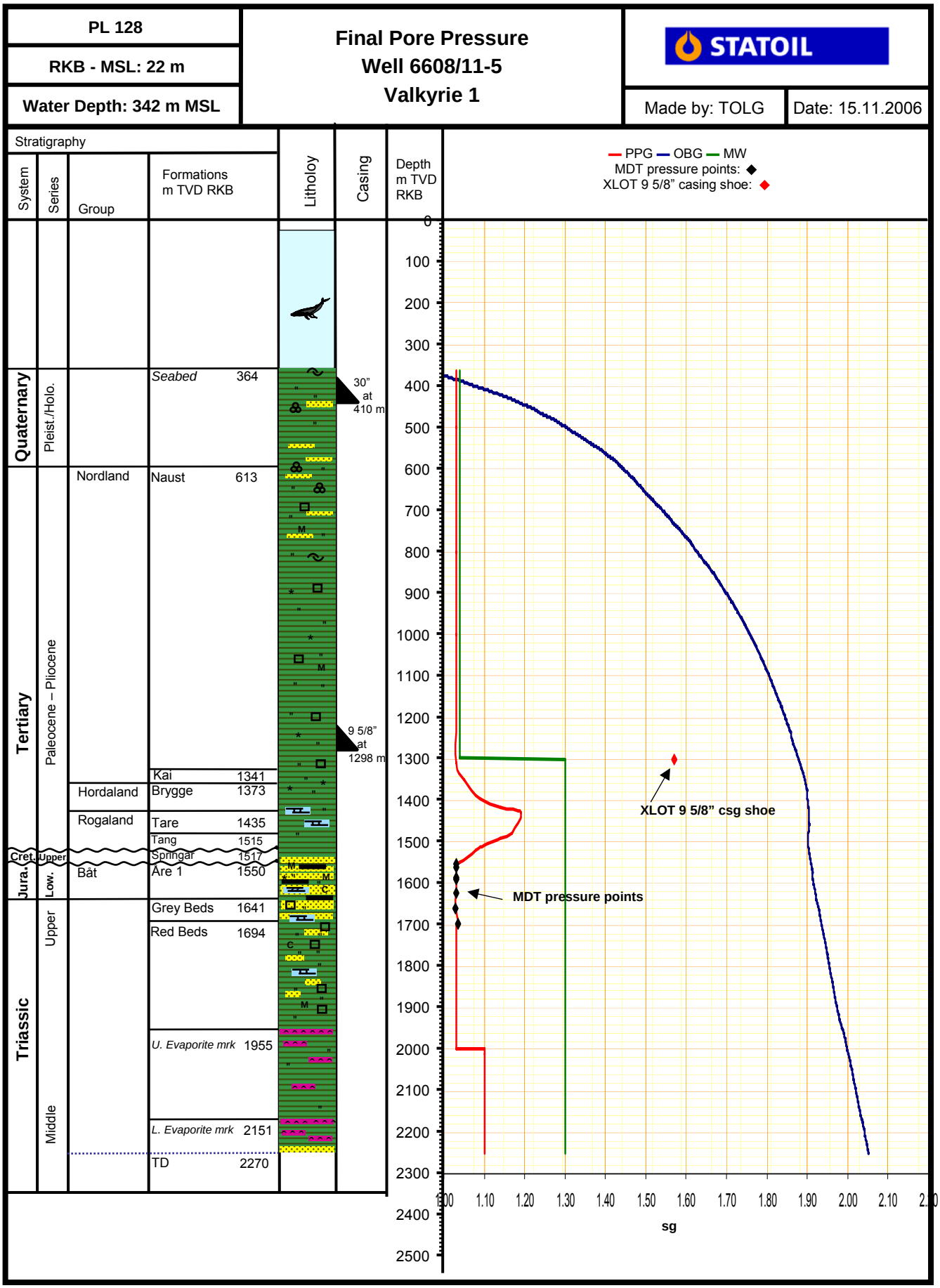


Figure 4-6 Final Pore Pressure

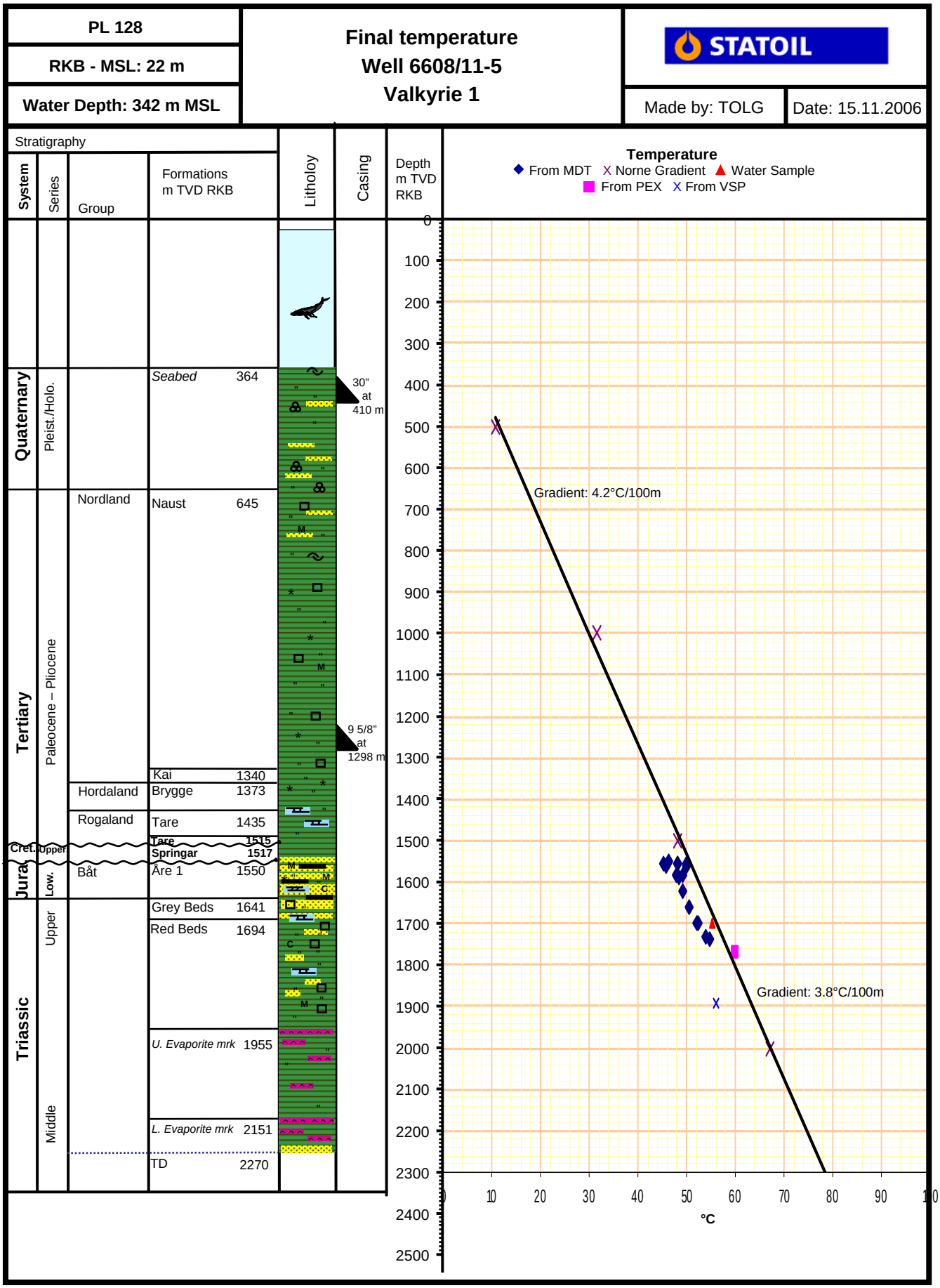


Figure 4-7 Final temperature

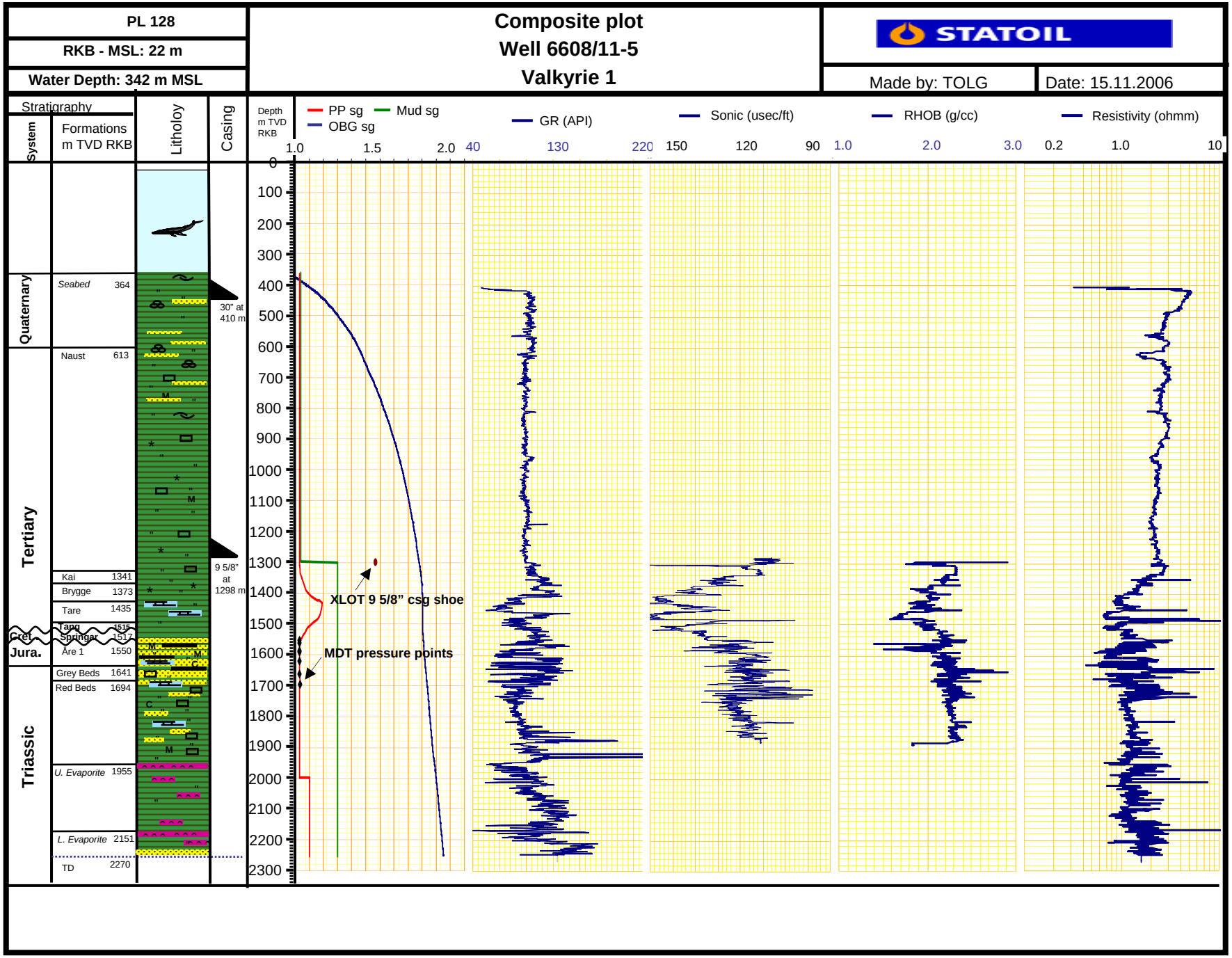


Figure 4-8 Composite plot

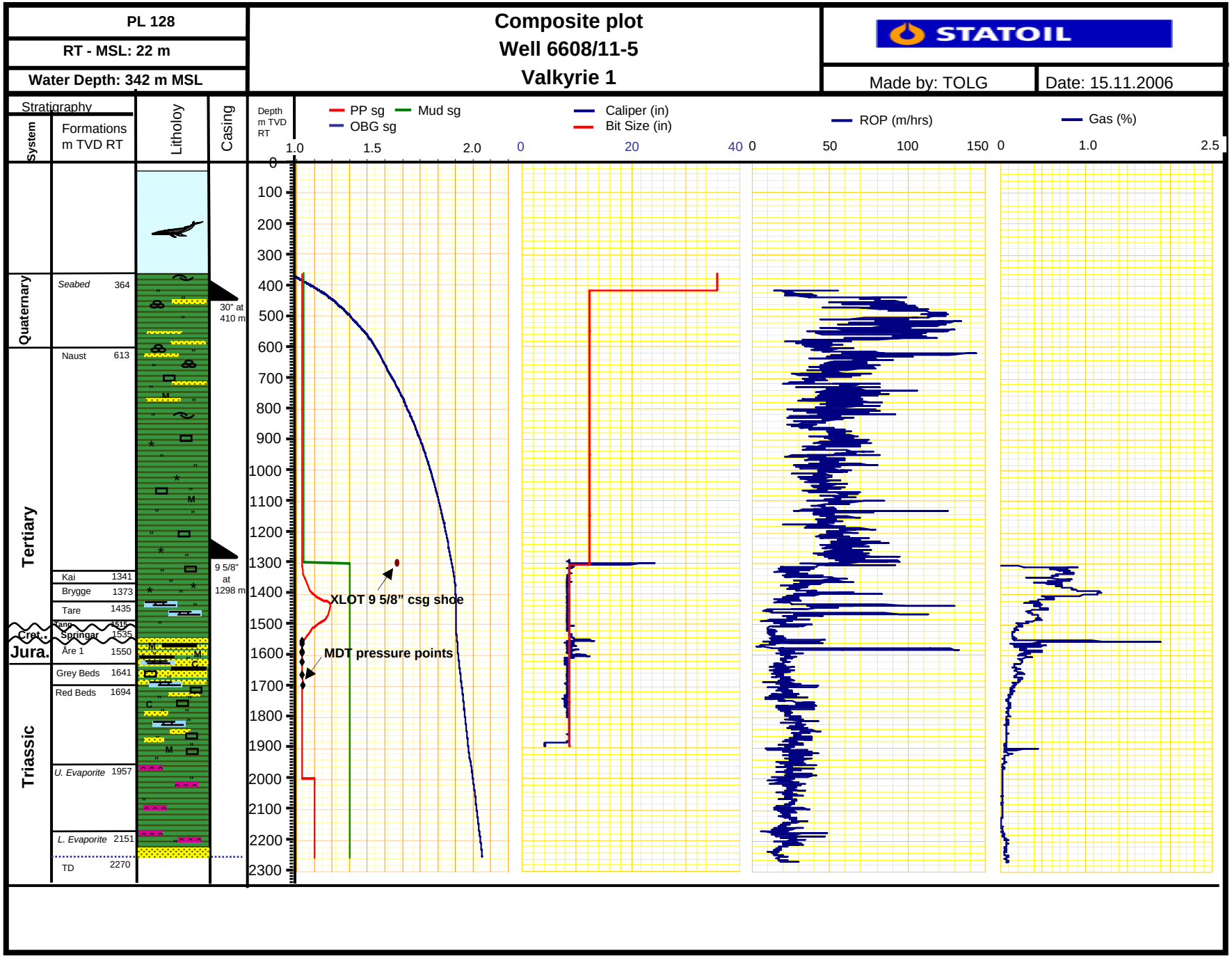


Figure 4-9 Composite plot

PL 128	Gradient plot Well 6608/11-5 Valkyrie 1	STATOIL
RKB - MSL: 22 m		Made by: TOLG / Date: 08.11.2006
Water Depth: 342 m MSL		

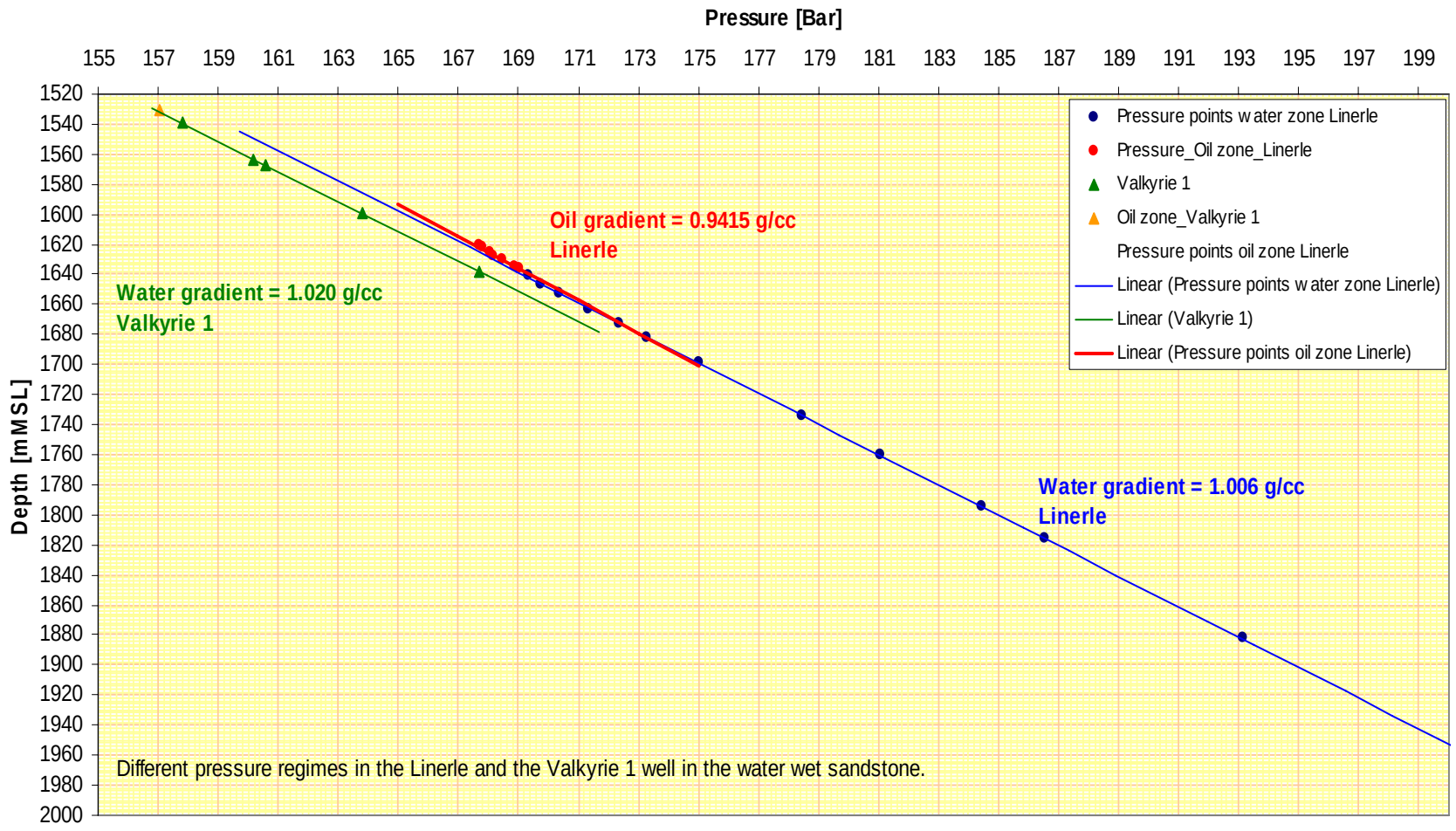


Fig. 4-10 Gradient plot

5 Drilling operations report

5.1 Rig move and positioning

START: 12.06.2006, 06:30, 0 mMD
END : 18.06.2006, 08:30, 364 mMD

OBJECTIVE
Move rig from Apollo location to Valkyrie 1 location.

SUMMARY
The rig was handed over from 34/10-49A well to the Valkyrie 1 project at 06:30 hrs on the 12 June 2006. The distance of 355 Nm to Valkyrie 1 location was made in 65.5 hrs given an average transit speed of 5.4 knots. WOW for 34.5 hrs prior to running anchors. Ran and set anchors, cross tensioned same and de-ballasting rig to operational draft in 24 hrs.

5.2 Drilling top hole section

START: 18.06.2006, 08:30, 364 mMD
END : 21.06.2006, 03:30, 416 mMD

OBJECTIVE
Drill 36" top hole from seabed to 412 m. Run in hole and cement 30" conductor with 3.0 m stick up. Release conductor running tool directly after cementing.

SUMMARY
RIH and tagged seabed with 1 ton weight at 364 m RKB without pumping and with no rotation.
The 36" section was drilled in 30 hrs, 1.8 m/hr. Problems with high angle/boulders.
Drilled 36" hole to 371 m; WOB 0-5 T, 1000 lpm and 40-50 RPM. Survey: depth 361 m - 0.5 deg.
Drilled 36" hole to 383m, WOB 5-10 T, 4400 lpm and 80-100 RPM. Survey: depth 371 m - 1.75 deg.
Drilled 36" hole to 386 m, WOB 3 T, 3100 lpm and 60-150 RPM. Survey: depth 375 m - 0.5 deg. (Mud pump #2 down)
Drilled 36" hole to 400 m, WOB 3-8 T, 4100 lpm and 150-160 RPM. Survey: depth 379 m - 1 deg., depth 390 m - 2 deg.
Pumped 5 m3 hi-vis pill every single and ream the hole for 1.5 hrs in attempt to lose angle. Survey: depth 390 m – 1.5 deg.
Drilled 36" hole to 412 m (17 1/2" hole at 416 m); WOB 3-5 T, 4500 lpm and 120-160 RPM. Survey: depth 395 m – 1.75 deg., depth 400 m – 1.5 deg. and depth 406 m – 1.75 deg.
Circulated the hole clean and displaced hole to 1.35 sg mud prior to pulling out.
Run 4 joints (50.45 m) of 30" X-52 conductor.

PGB / 30" conductor was held in tension while cementing (WOC for 7 hours) to ensure low angle on PGB (1 deg) and 2 m stick-up (plan was 3 m stick-up). The 30" conductor was not set on bottom, 36" hole. 30" conductor shoe at 410 m.
Run in hole with 12 1/4" BHA. Drilled hard cement from 406 to 412 m and easily reamed to bottom at 416 m.
Reamed through shoe and rat hole several times, no resistance observed.

BIT RUNS
Section drilled with 1 bit run. BHA consisted of 17 1/2" bit and 26" x 36" HO from Odfjell. As directional service an Ander drift tool was run. Surveys varied within same station but was in section between 0.5 - 2 deg. Due to boulders the section was not reamed.

DRILLING FLUID
The section was drilled with SW and CMC sweeps. The hole was displaced to WBM with 1.35 sg MW before pulling out prior to running 30" conductor.

CASING
4 joints (50.45 m) of 30" X-52 conductor were run.

MWD/BHA
An Ander drift tool was used as survey tool and worked ok.

CEMENTING
1.52 sg Tune-Light slurry was used to cement 30" conductor, 300 % excess of OH volume.
PGB / 30" conductor was held in tension for 7 hours to ensure low angle on PGB (1 deg) and 2 m stick-up (plan was 3 m stick-up).

LOGGING
N/A

5.3 Drilling 12 1/4" pilot hole

START: 21.06.2006, 03:30, 416m MD
END : 27.06.2006, 01:30, 1305m MD

OBJECTIVE
The objective for the 12 1/4" section was to place the 9 5/8" casing shoe at sufficient depth (1300 m) to provide formation integrity to be able to drill 8 1/2" hole into the possible reservoir.

SUMMARY
Drilled 12 1/4" hole from 416 to 428 m with restricted RPM until all stabilizers in open hole.
Drilling parameters: WOB 3-5 ton, 60-80 RPM and flow 3000 lpm.
At 550 m unable to get good survey data from Baker MWD tool. 1.5 hrs were spent on rigging up Baker pressure skid to standpipe manifold and tested out same for good survey data.

The 12 1/4" section was drilled to 1305 mMD into Naust formation. No boulders were experienced.
Drilling parameters: WOB 5-15 ton, 140-150 RPM and flow 3000-3500 lpm.
After drilled to 1305 m, section TD, the well was displaced to 1.35 sg WBM prior to running casing. The casing was run and cemented, shoe at 1299 m. Took 20 ton weight at 1280 m, washed casing down to 1299 m.
Run / landed and locked BOP/Riser to 18 3/4" well head. Pressured tested connector / 9 5/8" casing to 172 bars against BSR. New 8 1/2" BHA was made up and 5" DP was PU from deck while RIH. Tagged cement at 1267 m. Drilled cement, float and shoe in 6 hrs. Drilling parameters: WOB 3-5 ton, 60-80 RPM and flow 1500-2000 lpm. A LOT was performed after drilling 3 m new formation. LOT was logged to 1.57 sg EMW.

BIT RUNS
The section was drilled in 1 bit run (29.2 m/hrs). A milled tooth tricone bit, Security DBS (EBXLC1) was used and did the job well. The bit was worn but drilled at good ROP. Grading: 5-3-WT-M-E-I-NO-TD. Drilled 4 m cement inside 30" conductor.

DRILLING FLUID
The section was drilled with seawater and CMC pills. At TD the well was cleaned with a CMC pill before it was displaced to 1.35 sg WBM prior to pulling out of hole to run casing.

CASING
A 9 5/8" casing with x-over to 20" casing joint (9 m) with 18 3/4" well head was run. The shoe track was 27.3 m and the 5 lowermost joints had 1 centralizer installed on each joint. The casing was run without problems and the annulus displaced back to seawater before cementing.

MWD/BHA
The MWD services were covered by the use of a Baker Hughes Inteq MPR Lite combination. A survey was taken after each stand with the exemption of the first 100 m below the 30" shoe. Problems with decoding of the signal caused this interval to be the maximal allowed by regulation. The problem was solved by down linking and changing the transmission rate.

CEMENTING
The 9 5/8" casing was cemented with a lead and a tail slurry. The lead slurry volume included 50% open hole excess. The tail slurry was 15 m3 (as best practice). The plug in the float collar was bumped and no backflow was confirmed before the running tool was released. When drilling shoe track, top of cement was confirmed at 1267 m (we had 500 l cement behind the plug). The cement was very hard in the upper 5 m but was drilled with good ROP from this point to the shoe. The plugs were drilled without any problems.

LOGGING
Reference to chapter 4.6.

5.4 Drilling 8 1/2” section

START: 27.06.2006, 01:30, 1300 mMD
END : 07.07.2006, 11:00 2270 mMD

OBJECTIVE
The objective for the 8 1/2" section was to penetrate Åre fm (primary objective) and possible sandstone below Triassic evaporates (secondary objective).

SUMMARY
Continued drilling from 1308 m with good ROP (30 - 50 m/hr). Drilling parameters: WOB 3-5 ton, flow 2500 lpm, 150 rpm and torque 4-7 kNm.
Limited ROP to 20 m/hr from 1400 m due to sampling/picking coring point at 1559 m. Top Åre at 1552 m.
Cut one core from 1559 m to 1574 m, core jammed off. Drilling (coring) parameters: 900 lpm, 90 -110 rpm and 2-6 ton WOB.
Circulated hole clean at 1200 lpm and flow checked at TD. POOH, got 12.8 m core, 85.3 % recovery.
RIH with same drilling bit and BHA (Baker).Reamed and logged cored interval. Drilled from 1574 m to 1900 m with limited ROP to 20 m/hr due to sampling/picking coring point. Drilling parameters: 2500 lpm, 140 -160 rpm, 3-10 ton WOB and ECD 1.43-1.45 sg. Flow checked and POOH.
Had some tight spots from 1787 to 1654 m and from 1594 to 1561m, worked through tight spots and cleared before pulling out of hole. Lay down Baker BHA.

Electric wireline logging:
Reference to chapter 4.6.

Run in hole with new 8 1/2" bit and new BHA/MWD (PERISCOPE/TELESCOPE) from Schlumberger. Worked through tight spots from 1550 to 1560 m, at 1630 and at 1670 m, no pumping. Max 40 tons. Washed down through tight spots from 1760 to 1770 m.
Drilled from 1900 to 2270 m (TD), with ROP limited to 20 m/hr due to sampling/picking coring point. Drilling parameters : WOB 1-8 ton, flow 2500 lpm, 140-160 rpm, ECD 1.43-1.45 sg. Flow checked and circulated bottom up at 2172 m, no gas at bottom up. At TD flow checked, circulated hole clean and POOH. Worked (rotated and circulated) BHA through tight area from 1963 to 1955 m, top of evaporites.

Electric wire line logging :
Reference to chapter 4.6.

BIT RUNS
The 8 1/2" section from 9 5/8" casing shoe to 2270 m was drilled with two bits and one coring bit.

The upper part of the section to 1559 m and from 1574 to 1900 m was drilled with BHI assembly. It consisted of core point finder (near bit GR) and Annulus pressure sensor. A

resistivity tool was run slightly behind the MWD (D&I sensors). 2 stands and 6 1/2" DC below and 1 stand 6 1/2" DC above the jar.
The same bit was run to 1559 m and from 1574 to 1900 m, the grading of the bit after drilled to 1900 m was: 2-2-BT-A-X-I-WT-TD
Cut one core from 1559 m to 1574 m, core jammed off. Drilling parameters : 900 lpm, 90 -110 rpm and 2-6 ton WOB.
Circulated hole clean at 1200 lpm and flow checked at TD. POOH, got 12,8 m core, 85,3 % recovery.
Grading on core bit:
0-0-NO-A-X-I-TD, no wear on bit at all

DRILLING FLUID
The well was displaced to low sulphate KCl mud (Glydril 99% KCl) after performing the X-LOT operation without any problems. Tracer was added (Tritium) from the start. All seawater taps in pump room was locked off and secured as the mud would be contaminated with seawater. The mud weight was 1.30 sg from start and throughout the section.

CASING
Optional: 7" liner.
No 7" liner was run.

MWD/BHA
Reference to chapter 4.6.

For the upper part of the section to 1900 m a Baker Hughes Inteq MPR Lite assembly was used. The assembly behaved well. When pumping 2000 lpm or higher the decoding was good.

For the lower part of the section, from 1900 to 2270 m, a new Schlumberger Periscope / Telescope assembly was used.

CEMENTING
Optional: 7" liner else P&A.
No 7" liner was run/cemented.

LOGGING
Reference to chapter 4.6.

5.5 Permanent plug & Abandon

START: 07.07.2006, 11:00, 2270 mMD
END : 15.07.2006 23:30, 2270 mMD

OBJECTIVE
Permanent P&A the Valkyrie 1 well

SUMMARY
RIH with 290 m (30 joints, open ended) 3 1/2" DP and 920 m 5" DP on 5 1/2" DP to 2270 m (TD). Set cement plug #1, #2, #3 and #4 from 2270 m to 1180 m, all cement plugs 11 m3 1,90 sg. 8 m3 spacer were pumped with rig pumps before each 11 m3 cement slurry. (9 5/8" casing shoe at 1299 m). POOH, washed area from 610 to 590 m. WOC for 15 hrs, meanwhile laid down 3 1/2, 5" and 5 1/2" DP. Pressure tested plug # 4 to 110 bar/1.30 sg mud.

Installed 9 5/8" EZSV(as bridge plug) on DP at 603 m. Weight and pressure tested EZSV to 5 ton/110 bar. Displaced well to seawater.

Set cement plug #5 on top of EZSV, from 600 m to 385 m, 7.9 m3 1.95 sg. Pulled above cement plug to 375 m, dropped two sponge balls and circulated hole volume. POOH.

RIH with jet sub and wear bushing retrieving assembly, washed BOP and wellhead area, pulled 9 5/8" WB.

Pulled riser and BOP to surface.

Ran in hole 20" x 30" cutting assembly and MOST tool. Cut 20" casing joint / 30" conductor at 369 m (5 m below sea bed) and retrieved BHA & casing cut to surface. Released 30" housing from PBG in moon pool. Pulled 30"/18 3/4" WH to drill floor with use of 18 3/4" WHRT.

ROV performed seabed survey.

5.6 Figures and tables

5.6.1 Well bore schematic and permanent plug and abandonment

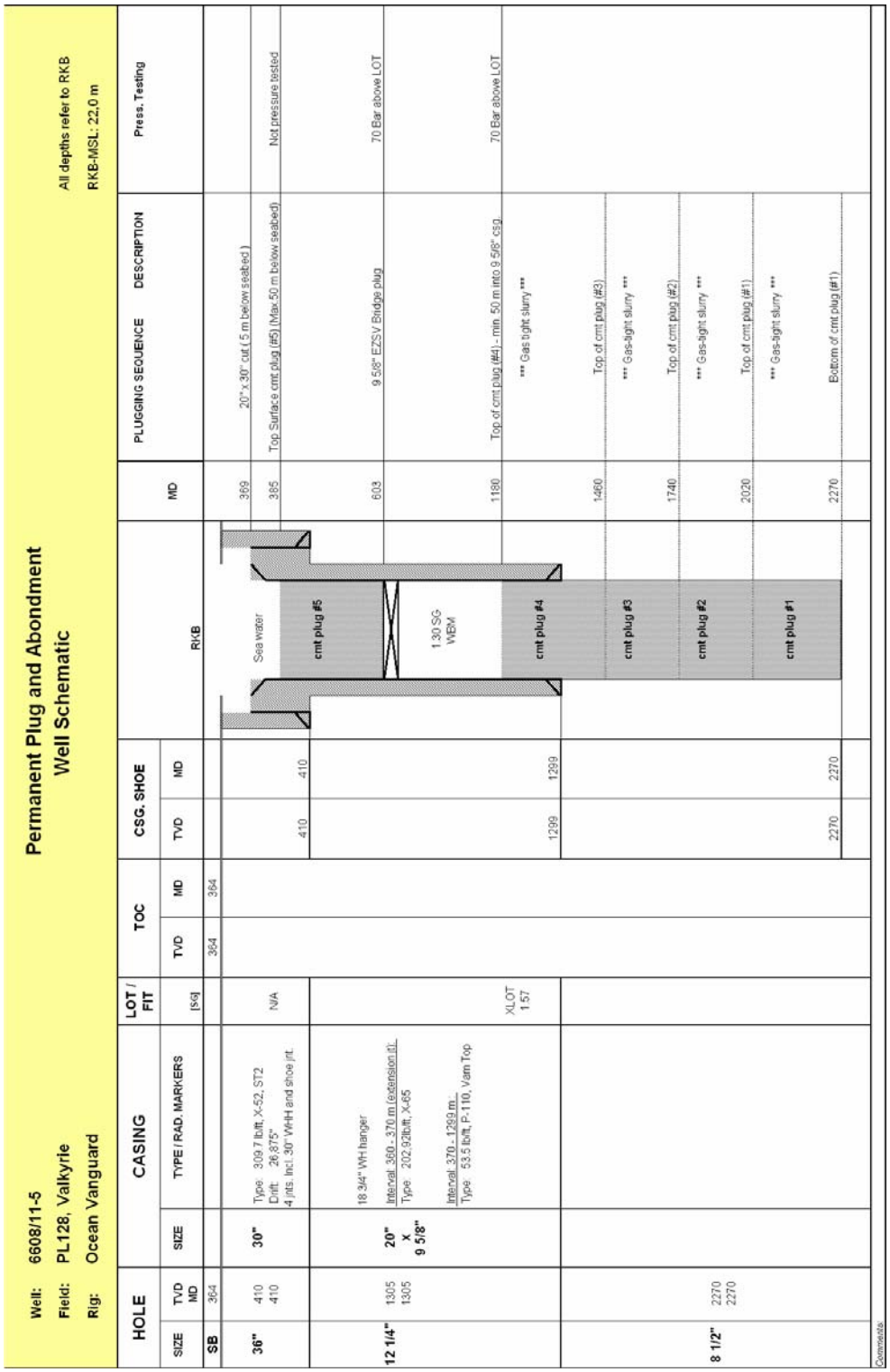


Figure 5-1 Well schematic and permanent plug and abandonment.

5.6.2 Time/depth curve

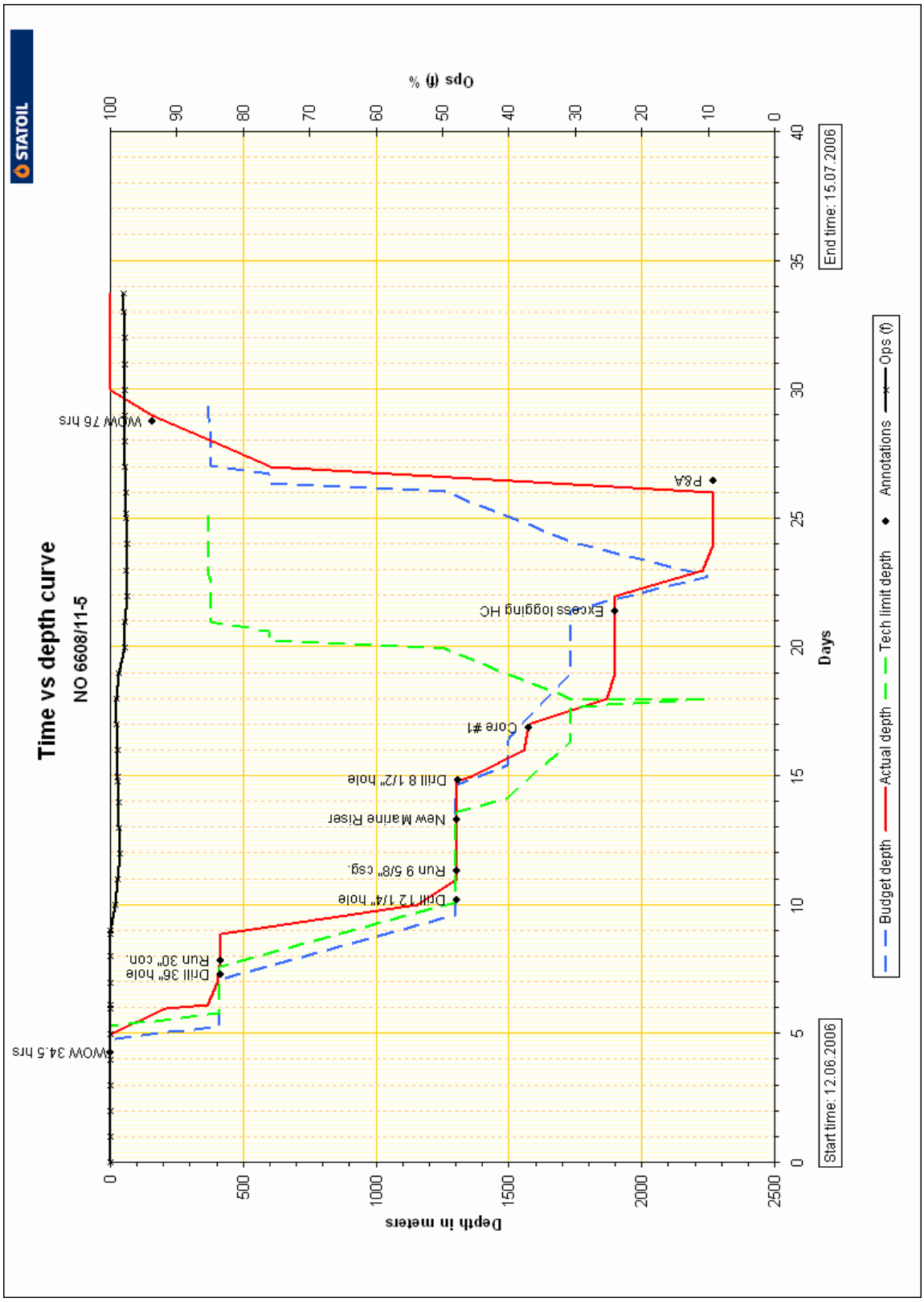


Figure 5-2 Time/Depth curve.

5.6.3 Time planner

PROJECT NAME: Valkyrie 1; 6608/11-5

Table 5-1 Time planner

Start time	End time	Budget time hrs	Acc budget days	Tech limit hrs	Acc tech days	Plan time hrs	Act time hrs	Acc actual days	Down time	Description	Companies
12.06.2006 06:30	18.06.2006 08:30	115,0	4,8	127,0	5,3	127,0	146,0	6,1	0,0	MOVE [NO 6608/11-5]	
12.06.2006 06:30	16.06.2006 13:30	89,0	3,7	89,0	3,7	89,0	103,0	4,3	0,0	1 Transit Apollo to Valkyrie location (355 Nm)WOW 34,5 hrs	DODI
16.06.2006 13:30	17.06.2006 10:30	18,0	4,5	18,0	4,5	18,0	21,0	5,2	0,0	2 Anchor handling. Ballasting rig.	DODI
17.06.2006 10:30	18.06.2006 00:30	0,0	4,5	12,0	5,0	12,0	14,0	5,8	0,0	2a Pick up and rack 1300m of 5 1/2" drill pipe.	DODI
18.06.2006 00:30	18.06.2006 08:30	8,0	4,8	8,0	5,3	8,0	8,0	6,1	0,0	3 MU 36" BHA and RIH to seabed at 364 m	DODI,BHI,Ocean
18.06.2006 08:30	21.06.2006 03:30	55,0	2,3	55,0	2,3	61,0	67,0	2,8	0,0	36" [NO 6608/11-5]	
18.06.2006 08:30	19.06.2006 14:30	12,0	5,3	12,0	5,8	12,0	30,0	7,3	0,0	4 Drill 36" hole from 364 to 412 m (17 1/2" at 416 m)1,8 m/hr	BHI,DODI,Geo,MI,Ocean
19.06.2006 14:30	19.06.2006 16:00	4,0	5,5	4,0	6,0	4,0	1,5	7,4	0,0	5 Circulate hole clean and displace to 1,35 sg mud	BHI,DODI,Geo,MI,Ocean
19.06.2006 16:00	19.06.2006 20:30	5,0	5,7	5,0	6,2	5,0	4,5	7,6	0,0	6 POOH, top up hole with 1,35 sg mud. LD 36" BHA.	BHI,DODI,Geo,MI,Ocean
19.06.2006 20:30	20.06.2006 03:00	10,0	6,1	10,0	6,6	10,0	6,5	7,9	0,0	7 RU and run 30" conductor to seabed	DODI,DQ,Ocean
20.06.2006 03:00	20.06.2006 05:00	2,0	6,2	2,0	6,7	2,0	2,0	7,9	0,0	8 Stab in and land 30" conductor. 30" shoe at 410 m	DODI,DQ,Ocean
20.06.2006 05:00	20.06.2006 08:30	3,0	6,3	3,0	6,8	3,0	3,5	8,1	0,0	9 Circulate, pump and displace 1,52 sg Tuned light cement	DODI,Geo,Hall,MI,Ocean,DQ
20.06.2006 08:30	20.06.2006 15:30	0,0	6,3	0,0	6,8	6,0	7,0	8,4	0,0	10 OPTIONAL : WOC if required	
20.06.2006 15:30	20.06.2006 18:30	3,0	6,4	3,0	6,9	3,0	3,0	8,5	0,0	11 Release RT and wash 30" conductor housing. POOH	DODI,DQ,Ocean
20.06.2006 18:30	20.06.2006 22:00	4,0	6,6	4,0	7,1	4,0	3,5	8,6	0,0	12 MU cmt.stand and 18 3/4" WH housing	DODI,DQ,Hall
20.06.2006 22:00	21.06.2006 02:00	6,0	6,8	6,0	7,3	6,0	4,0	8,8	0,0	13 MU and RIH with 12 1/4" BHA to 406 m (top cement)	BHI,DODI,Ocean
21.06.2006 02:00	21.06.2006 03:30	6,0	7,1	6,0	7,6	6,0	1,5	8,9	0,0	14 Drill out and ream 30" conductor shoe (406-416 m)	BHI,DODI,Geo,MI,Ocean
21.06.2006 03:30	27.06.2006 01:30	173,0	7,2	137,0	5,7	169,0	142,0	5,9	3,5	12 1/4" [NO 6608/11-5]	
21.06.2006 03:30	22.06.2006 11:30	60,0	9,6	60,0	10,1	60,0	32,0	10,2	1,5	15 Drill 12 1/4" hole to 1305 m (ROP= 27,8 m/hr)	BHI,DODI,Geo,MI,Ocean
22.06.2006 11:30	22.06.2006 15:30	5,0	9,8	2,0	10,2	5,0	4,0	10,4	0,0	16 Circulate hole clean and displace to 1,35 sg mud	BHI,DODI,Geo,MI,Ocean
22.06.2006 15:30	22.06.2006 21:00	10,0	10,2	8,0	10,5	10,0	5,5	10,6	0,0	17 POOH, top up hole. Wash 30" con.housing. Rack BHA	BHI,DODI,Geo,MI,Ocean
22.06.2006 21:00	23.06.2006 15:00	32,0	11,5	1,0	10,5	32,0	18,0	11,4	2,0	18 RU and run 9 5/8" csg./18 3/4" WH housing on 5 1/2" DP	DODI,DQ,Geo,Ocean,Weath
23.06.2006 15:00	23.06.2006 21:00	5,0	11,7	5,0	10,7	5,0	6,0	11,6	0,0	19 Circulate, pump and displace cement	DODI,DQ,Geo,Hall,Ocean
23.06.2006 20:59	23.06.2006 21:00	0,0	11,7	0,0	10,7	0,0	0,0	11,6	0,0	20 OPTIONAL : WOC if required	
23.06.2006 21:00	24.06.2006 03:00	4,0	11,9	4,0	10,9	4,0	6,0	11,9	0,0	21 Release RT and wash 18 3/4" WH. POOH	DODI,DQ,Ocean

Start time	End time	Budget time hrs	Acc budget days	Tech limit hrs	Acc tech days	Plan time hrs	Act time hrs	Acc actual days	Down time	Description	Companies
24.06.2006 03:00	25.06.2006 14:30	24,0	12,9	24,0	11,9	24,0	35,5	13,3	0,0	22 RU and run BOP/RISER	DODI,Ocean
25.06.2006 14:30	25.06.2006 16:30	4,0	13,1	4,0	12,1	4,0	2,0	13,4	0,0	23 Land, lock and test connector/9 5/8" csg. against BSR	DODI,Ocean
25.06.2006 16:30	25.06.2006 22:30	6,0	13,3	6,0	12,3	6,0	6,0	13,7	0,0	24 RD BOP landing joint and install diverter	DODI
25.06.2006 22:29	25.06.2006 22:30	4,0	13,5	4,0	12,5	0,0	0,0	13,7	0,0	25 Install HWB protector if not preinstalled (Done onshore)	DODI,DQ
25.06.2006 22:30	26.06.2006 16:00	10,0	13,9	10,0	12,9	10,0	17,5	14,4	0,0	26 MU/RIH with 8 1/2" BHA. Function test BOP on both pods	BHI,DODI,Geo,MI
26.06.2006 16:00	26.06.2006 23:00	6,0	14,2	6,0	13,2	6,0	7,0	14,7	0,0	27 Drill out shoe track and 3 m new formation	BHI,DODI,Geo,MI
26.06.2006 23:00	27.06.2006 01:30	3,0	14,3	3,0	13,3	3,0	2,5	14,8	0,0	28 Circulate hole clean,spot WBM pill on bottom. XLOT	BHI,DODI,Geo,MI
27.06.2006 01:30	07.07.2006 11:00	235,0	9,8	113,0	4,7	181,0	249,5	10,4	10,0	8 1/2" [NO 6608/11-5]	
27.06.2006 01:30	27.06.2006 03:00	8,0	14,6	8,0	13,6	8,0	1,5	14,9	0,0	29 Displace well to 1,30 sg low sulphate WBM	BHI,DODI,Geo,MI
27.06.2006 03:00	28.06.2006 04:00	19,0	15,4	12,0	14,1	12,0	25,0	15,9	0,0	30 Drill 8 1/2" hole to 1559m.(coring point)POOH,rack BHA	BHI,DODI,Geo,MI
28.06.2006 04:00	29.06.2006 04:00	24,0	16,4	0,0	14,1	20,0	24,0	16,9	0,0	30A OPTIONAL : Coring, 1559-1573 m (one core)	MI,DODI,BHI,Geo
29.06.2006 04:00	30.06.2006 19:30	60,0	18,9	53,0	16,3	33,0	39,5	18,5	0,0	30B: Continue drilling to 1900m.POOH,LD Baker BHA.	BHI,DODI,Geo,MI
30.06.2006 19:30	03.07.2006 16:30	60,0	21,4	32,0	17,7	52,0	69,0	21,4	7,0	31RU, perform wire line logging. 4 runs	DODI,Geo,MI,Schlum
03.07.2006 16:30	05.07.2006 22:00	32,0	22,8	8,0	18,0	32,0	53,5	23,6	2,0	32 Continue drill to 2270m. POOH,LD Schlum.BHA & core brl.	DODI,Geo,MI,Schlum
05.07.2006 22:00	07.07.2006 11:00	32,0	24,1	0,0	18,0	24,0	37,0	25,2	1,0	33 Wireline logging: MDT for sample	Schlum
07.07.2006 11:00	15.07.2006 23:30	129,0	5,4	177,0	7,4	178,0	204,5	8,5	0,5	PERM P&A [NO 6608/11-5]	
07.07.2006 11:00	08.07.2006 18:30	48,0	26,1	48,0	20,0	36,0	31,5	26,5	0,0	34 RIH w/3 1/2"cem.stngr.Set 4 plugs 2270-1180. LD DP	DODI,Geo,Hall,MI
08.07.2006 18:30	08.07.2006 19:00	6,0	26,3	6,0	20,2	4,0	0,5	26,5	0,0	35 Test cmt to 70bar above LOT.	DODI,Geo,Hall,MI
08.07.2006 18:59	08.07.2006 19:00	0,0	26,3	0,0	20,2	0,0	0,0	26,5	0,0	36 OPTIONAL : WOC if required	
08.07.2006 19:00	09.07.2006 00:00	5,0	26,5	5,0	20,5	5,0	5,0	26,7	0,0	37 RIH w/ 9 5/8" EZSV on DP. set @ 603m. Press test.	DODI,Geo,Hall,MI
09.07.2006 00:00	09.07.2006 01:00	4,0	26,7	4,0	20,6	3,0	1,0	26,8	0,0	38 Displace well to SW.	DODI,Geo,MI
09.07.2006 01:00	09.07.2006 11:00	8,0	27,0	8,0	21,0	6,0	10,0	27,2	0,0	39 Set surface cem.plug 600 to 385 m. Wash BOP. POOH	DODI,Geo,Hall
09.07.2006 11:00	09.07.2006 14:30	2,0	27,1	2,0	21,0	2,0	3,5	27,3	0,0	40 Retrieve WB	DODI,DQ
09.07.2006 14:30	10.07.2006 16:00	24,0	28,1	24,0	22,0	18,0	25,5	28,4	0,5	41 Pull RISER and BOP	DODI,Ocean
10.07.2006 16:00	11.07.2006 02:00	12,0	28,6	12,0	22,5	12,0	10,0	28,8	0,0	42 RIH w/MOST cut assy. cut WH 5 m below seabed.POOH	DODI,Ocean,Weath
11.07.2006 02:00	11.07.2006 19:30	6,0	28,9	6,0	22,8	20,0	17,5	29,5	0,0	43 LD 18 3/4" WH and tubulars from derrick. Backload equip.	DODI,Ocean
11.07.2006 19:30	14.07.2006 11:30	0,0	28,9	48,0	24,8	48,0	64,0	32,2	0,0	43a Waiting on weather	DODI,Ocean
14.07.2006 11:30	15.07.2006 23:30	14,0	29,5	14,0	25,4	24,0	36,0	33,7	0,0	44Deballast rig and pull anchors. Insp.seabed w/ROV	DODI,Ocean

5.6.4 *Drilling fluids data*

Table 5-2 Summary of drilling fluids programme

Well: 6608/11-5
Field: Valkyrie
Rig: Ocean Vanguard

DRILLING FLUIDS SUMMARY

HOLE SIZE	HOLE TVD MD	CASING SIZE	CASING TVD MD	MUD TYPE	MW [SG]	LGS [KG/m³]	10 sec. [Pa]	10 min. [Pa]	Funnel Visc.	Fann 3 rpm	O / W ratio	PV [mPa]	API FL [ml]	HTHP FL [ml]	MBT [KG/m³]	pH	Kcl [KG/m³]	Glyc. [%]	Ca ++ [mg/l]	Sulphate [mg/l]	Usage Volume [m³]
36"	416 416	30"	412 412	SW/polymer Bentonite WBM	1.03 - 1.35				100 +							8.8 - 9					163
				COMMENTS: Mixed Bentonite /CMC EHV /drill water mud for Hi-vis pills. Pumped mainly approxim. 7 m³ Hi-vis a number of times per single, a final pill of 22 m3 at TD and finally displaced the hole with 1,35 sg mud (Bentonite/ CMC EHV, Barite, Drill Water) prior to pull out of hole. Used 114m3 Hi-Vis pills and 80m3 1,35 sg mud. The 30" conductor was ran, landed and cemented without problems. The use of high viscous Bentonite/CMC EHV sweeps to clean the hole, worked satisfactorily for this section. The reason why Bentonite was used was to consume excess from previous wells left in the Bentonite tank. To increase the Funnel Viscosity further, additional CMC EHV was added in some pits. This quickly increased the FV.																		
12 1/4"	1305 1305	9 5/8"	1303 1303	SW/polymer Bentonite WBM	1.03 - 1.30				100 +							7.5 - 8.8					768
				The section was drilled from 416 m to 1305 m using seawater and HiVis-sweeps as programmed. At TD displaced whole with 1,4 hole volume of 1.35 SG Bentonite/polymer mud. The standard use of high viscous CMC EHV sweeps to clean the hole, worked satisfactory for this section. The Funnel Viscosity couldn't been increased higher than 100 sec because of restricted efficiency of the mixing facilities.																	
8 1/2"	2270 2270	N/A	Plugged back	Glydril WBM w/ 99% KCl	1.30	5 - 13	6 - 7	11.5 - 12	na	6 - 7	na	10 - 19	2 - 2.8	na	5	8 - 9	160 - 165	4.5 - 4.7	250	<200	405
				COMMENTS: The 99% KCl/ Glydril was premixed onshore and was weighted up to 1.30 SG and slightly viscosified prior to displacing. During drilling, coring and logging down to 1900 m no maintenance was required as mud properties stayed very stable within specifications. From logging depth and down to TD at 2270 m the formation tended to be rather sticky and more reactive than earlier in this section. KCl powder was added to maintain K+ level in the mud and unweighted premix was added to maintain the weight at 1.30 SG. Drop in K+ level was partly due to hosing the sticky clay off the shakerscreens; partly due to reactive formation. All cement plugs caused the mud to deteriorate and was in no state to be re-used on other operations and was operationally discharged. The total amount of discharged Glydril MC exceeded the discharge permit. This was not discovered and reported until after the discharge was done.																	

5.6.5 *Cementing data*

Table 5-3 Summary of the cement programme

CEMENT SUMMARY

Well: 6608/11-5
Field: Valkyrie
Rig: Ocean Vanguard

HOLE		CASING SHOE		TOC	VOLUME/ EXCESS	CEMENT SLURRY DESIGN										SPACER	DISPLACEMENT
SIZE	TVD MD	SIZE	TVD MD	TVD MD		Components	Lead [ltr/100kg]	Tail [ltr/100kg]	Density [SG]	Yield [ltr/100kg]	Stat. / Circ. Temp [°C]	Thickening time [hrs to 30 Bc]	API Free Water [%]	API Fluid loss [cc/30min]	24 hrs C.S. [psi]		Fluids and Rates
36"	410 410	**30"**	410 410	Sea bed Sea bed	± 47.8 m3 incl 300% excess	**Slurry 10 - DWLSP** X-lite cement NF-6 Seawater		0.10 60.05	1.52	104.14	6-8 API	05:21 (to 70 Bc)	n/a	n/a	800	Min. 30 m3 Sea water	Sea water
12 1/4"	1299 1299	**20" x 9 5/8"**	1299 1299	Sea bed Sea bed	Lead: 40 m³ incl 50% OH excess Tail: ±15 m³	**L: Slurry 5 - STL40** **T: Slurry 24 B-MPT14** Norcem "G" + 0,1 % EZ-FLO Econolite HR-4L Halad-99LE+ NF-6 Sea water Fresh water	3.20 2.00 - 0.10 93.46 -	- 1.00 0.50 0.10 - 42.34	L: 1,56 T: 1,92	L: 129.94 T: 75,12	44/36 API	L : 5:00 T: 3:32	L: < 0.8 T: < 0.9	n/a	L:400 T: 1500	2 well volumes Sea Water	Sea water 1800 lpm
P&A Plugs 1-3		**8 1/2"**	2270 2270 1990 1990 1710 1710	2020 2020 1740 1740 1460 1460	11 m3 on each incl. 20% OH excess	**Slurry 16B - GTT90** Norcem "G" + 0,1 % EZ-FLO Gascon HR-5L Halad-400L CFR-8L NF-6 Fresh water		3.50 1.30 2.50 1.00 0.10 38.15	1.90	77.73	81/60	04:53	0	52	2500	8 m3 Tuned spacer 3T on each plug 1.60 SG	WBM
P&A Plug 4		**8 1/2"**	1430 1430	1180 1180	11 m3 incl. 20% OH excess	**Slurry 40 - KOPMP** Norcem "G" + 0,1 % EZ-FLO Gascon HR-5L Halad-400L CFR-8L NF-6 Fresh water		3.00 1.30 2.50 1.50 0.10 34.09	1.95	73.67	53/42	04:54	0	n/a	2720	8 m3 Tuned spacer 3T 1.60 SG	WBM
P&A Plug 5			600 600	385 385	7.9 m3 incl. 20% excess	**Slurry 4 - STTLT** Norcem "G" + 0,1 % EZ-FLO NF-6 Fresh water		0.10 41.46	1.95	72.64	15/13	±4	n/a	n/a	n/a	Sea water	Sea water

5.6.6 Bit record and BHA summary

5.6.6.1 Bit record

WELL: NO 6608/11-5

Run no	Bit size	Bit no	BHA no	Bit type	IADC code	Bit manufacturer
1	17 1/2"	1	1	EBXT02DSLC	415W	Security DBS
2	12 1/4"	2	2	EBXLC1	117W	Security DBS
3	8 1/2"		3	FS2565E	S424	Security DBS
4	8 1/2"	1	4	CT103	M623	DIAMANT BOART S
5	8 1/2"	5 RR	5	FS2565E	S424	Security DBS
10	8 1/2"		9	FM2665	M323	Security DBS

					Nozzles (n/32")				
Run no	Bit size	Bit no	BHA no	Serial no	no x n	no x n	no x n	no x n	Flow area in
1	17 1/2"	1	1	742172	3 x 18	1 x 14	x	x	0,8960
2	12 1/4"	2	2	10763378	2 x 16	1 x 18	x	x	0,6420
3	8 1/2"		3	10795401	5 x 13	x	x	x	0,6490
4	8 1/2"	1	4	10849395	x	x	x	x	
5	8 1/2"	5 RR	5	10795401	5 x 13	x	x	x	0,6490
10	8 1/2"		9	5013666	1 x 11	5 x 12	x	x	0,6460

Run no	Bit size	Pump rate l/min	Pump press bar	Depth in mMD	Depth out mMD	Form drld m	Total drld m	Drld hrs	Circ hrs	ROP m/hrs
1	17 1/2"			364,5	416,0	51,5	51,5	20,9	30,0	2,5
2	12 1/4"	3450	242	416,0	1305,0	889,0	889,0	21,4	33,7	41,5
3	8 1/2"			1267,0	1559,0	292,0	292,0	292,0	25,4	1,0
4	8 1/2"			1559,0	1574,0	15,0	15,0	3,2	6,9	4,7
5	8 1/2"	2500		1574,0	1900,0	326,0	326,0			
10	8 1/2"			1900,0	2270,0	370,0	370,0			

Run no	Bit size	Min WOB ton	Max WOB ton	Min RPM	Max RPM	Torque Min Nm	Torque Max Nm	Con drag Min 1000 daN	Con drag Max 1000 daN
1	17 1/2"								
2	12 1/4"	10	15	124	149	6	10		
3	8 1/2"								
4	8 1/2"								
5	8 1/2"	3	10	140	160				
10	8 1/2"								

Run no	Bit size	I	O	DC	L	B	G	OC	RP
1	17 1/2"	1	1	WT	A	E	I	NO	TD
2	12 1/4"	5	3	WT	M	E	I	NO	TD
3	8 1/2"	2	3	CT	A			BT	CP
4	8 1/2"	1	4	CT	T	F	i	BT	TD
5	8 1/2"	3	3	BT	A	X	I	LT	TD

Run no	Bit size	I	O	DC	L	B	G	OC	RP
10	8 1/2"	0	0	NO	A	X	I		TD

Run no	Bit size	Remarks
1	17 1/2"	Ran to spud well ahead of 26" x 36" hole opener. Bit to 36" cutters - 4.06 m.
2	12 1/4"	Drilled 4m cement inside 30" conductor
3	8 1/2"	
4	8 1/2"	The core head jammed off at 1573,8mMD
5	8 1/2"	
10	8 1/2"	NO wear on bit at all.

5.6.6.2 BHA summary

WELL BORE: NO 6608/11-5
BHA NO: 1
BHA KIND:
DESCRIPTION: 17 1/2" x 26" x 36" HO assy
BHA NAME: 1

String component	OD in	ID in	Length m	Acc length m
EBXT02DSLC~17 1/2"	17,500	2,000	0,41	0,41
WEIGHT SUB W/FLOAT	9,500	3,000	2,01	2,42
HOLE OPENER~38 1/4"	36,000	3,000	3,86	6,28
BIT SUB W/FLOAT	9,500	3,000	0,84	7,12
ANDERDRIFT	9,500	3,000	3,02	10,14
DRILL COLLAR	9,500	3,000	54,90	65,04
XO SUB	8,000	3,000	1,21	66,25
DRILL COLLAR	8,250	2,875	54,62	120,87
XO SUB	8,000	3,000	1,11	121,98
HW DRILL PIPE	5,500	3,375	85,90	207,88

BHA NO: 2
BHA KIND:
DESCRIPTION: 12 1/4"
BHA NAME: 2

String component	OD in	ID in	Length m	Acc length m
EBXLC1~12 1/4"	12,250		0,30	0,30
BIT SUB W/FLOAT	8,250	3,000	0,81	1,11
STOP SUB	8,250	3,000	0,72	1,83
ON TRAK	8,250	3,000	5,74	7,57
STAB MODULAR	8,250	3,000	1,85	9,42
BCPM	8,250	3,000	3,58	13,00
STOP SUB	8,000	2,825	0,78	13,78
STRING STAB, NM	8,250	3,000	2,04	15,82
DRILL COL	8,000	2,825	72,81	88,63
JAR	8,000	2,825	9,70	98,33
DRILL COL	8,000	2,825	28,02	126,35
X-OVER	7,500	2,825	1,11	127,46
HW DRILL PIPE	5,500	3,500	95,59	223,05
DART SUB	7,250	2,825	0,64	223,69

BHA NO: 3
BHA KIND:
DESCRIPTION: 8 1/2" Drilling BHA
BHA NAME: 3

String component	OD in	ID in	Length m	Acc length m
FS2565E~8 1/2"	8,500		0,50	0,50
STAB STRING	8,250	2,250	1,50	2,00
ON TRAK	6,750	3,000	5,70	7,70
MWD, STAB	7,000	2,250	1,30	9,00
BCPM	6,750	1,000	3,70	12,70
FLOAT SUB	6,500	2,750	1,00	13,70
STAB STRING	8,375	2,250	2,00	15,70
COLLAR	6,750	2,250	54,00	69,70
JAR	6,500	2,250	10,00	79,70
DRILL COLLAR	6,750	2,250	27,00	106,70
HW DRILL PIPE	5,000	3,000	81,00	187,70
DP 5"	5,000	4,276	9,00	196,70
FLOAT SUB	6,500	2,750	1,00	197,70
DP 5"	5,000	4,276	900,00	1097,70

BHA NO: 4
BHA KIND:
DESCRIPTION: Coring BHA
BHA NAME: 4

String component	OD in	ID in	Length m	Acc length m
CT103~NA	8,500	4,000	0,36	0,36
CORE BARREL W/FLOAT	6,750	4,000	20,59	20,95
DRILL COL	6,750	2,250	54,00	74,95
JAR	6,500	2,250	10,00	84,95
DRILL COL	6,750	2,250	27,00	111,95
HW DRILL PIPE	5,000	3,000	81,00	192,95
DP 5"	5,000	4,276	900,00	1092,95

BHA NO: 5
BHA KIND:
DESCRIPTION: 8 1/2" drilling BHA
BHA NAME: 5

String component	OD in	ID in	Length m	Acc length m
FS2565E~8 1/2"	8,500		0,50	0,50
STAB STRING	8,250	2,250	1,50	2,00
ON TRAK	6,750	3,000	5,70	7,70
MWD, STAB	7,000	2,250	1,30	9,00
BCPM	6,750	1,000	3,70	12,70
FLOAT SUB	6,500	2,750	1,00	13,70
STAB STRING	8,375	2,250	2,00	15,70
COLLAR	6,750	2,250	54,00	69,70
JAR	6,500	2,250	10,00	79,70
DRILL COLLAR	6,750	2,250	27,00	106,70
HW DRILL PIPE	5,000	3,000	81,00	187,70
DP 5"	5,000	4,276	9,00	196,70
FLOAT SUB	6,500	2,750	1,00	197,70
DP 5"	5,000	4,276	900,00	1097,70

BHA NO: 7
BHA KIND:
DESCRIPTION: PEX-HRLA-CMR-ECS
BHA NAME: 7

String component	OD in	ID in	Length m	Acc length m
CMR			4,74	4,74
HRLA			8,00	12,74
PEX			6,00	18,74
ECS			2,00	20,74
SGT-N			3,35	24,09
ACTS-B1			3,43	27,52

BHA NO: 8
BHA KIND:
DESCRIPTION: MDT logging
BHA NAME: 8

String component	OD in	ID in	Length m	Acc length m
LEH-ECRD	6,750		0,89	0,89
TCC-BF			0,91	1,80
ACTS-B1			1,22	3,02
SGT-L			1,68	4,70
MRPC			1,52	6,22
MRHY			2,57	8,79
MRPS			7,53	16,32
LFA			1,55	17,87
MRPO			3,24	21,11
MRPO			3,24	24,35
MRSC			1,86	26,21
MRSC			1,86	28,07
MRSC			2,88	30,95
MRMS			4,29	35,24

BHA NO: 9
BHA KIND:
DESCRIPTION: 8 1/2" Drilling BHA
BHA NAME: 10

String component	OD in	ID in	Length m	Acc length m
FM2665~NA	8,500		0,31	0,31
NB STAB W/FLOAT	6,750		1,89	2,20
PERISCOPE	6,750		6,61	8,81
IN LINE STAB (ILS)	6,875		1,52	10,33
TELESCOPE 675	6,750		8,40	18,73
ARC 675	6,750		5,97	24,70
STABILIZER	6,500		1,45	26,15
NM DRILL COLLAR	6,625		9,40	35,55
COLLAR	6,500		57,90	93,45
JAR	6,500		9,52	102,97
COLLAR	6,500		29,24	132,21
HW DRILL PIPE			81,21	213,42

BHA NO: 10
BHA KIND:
DESCRIPTION: FMI-DSI logging
BHA NAME: 9

String component	OD in	ID in	Length m	Acc length m
FBST-B			7,43	7,43
DSST-B			15,53	22,96
SGT-N			1,70	24,66
DTC-H			0,63	25,29
ACTS-B1			1,50	26,79
SAH-F			1,49	28,28
LEH-ECRD			0,66	28,94

BHA NO: 11
BHA KIND:
DESCRIPTION: MDT logging second run
BHA NAME: 11

String component	OD in	ID in	Length m	Acc length m
MRMS			18,67	18,67
LFA			9,89	28,56
MRPC			11,62	40,18
ACTS-B1			4,70	44,88

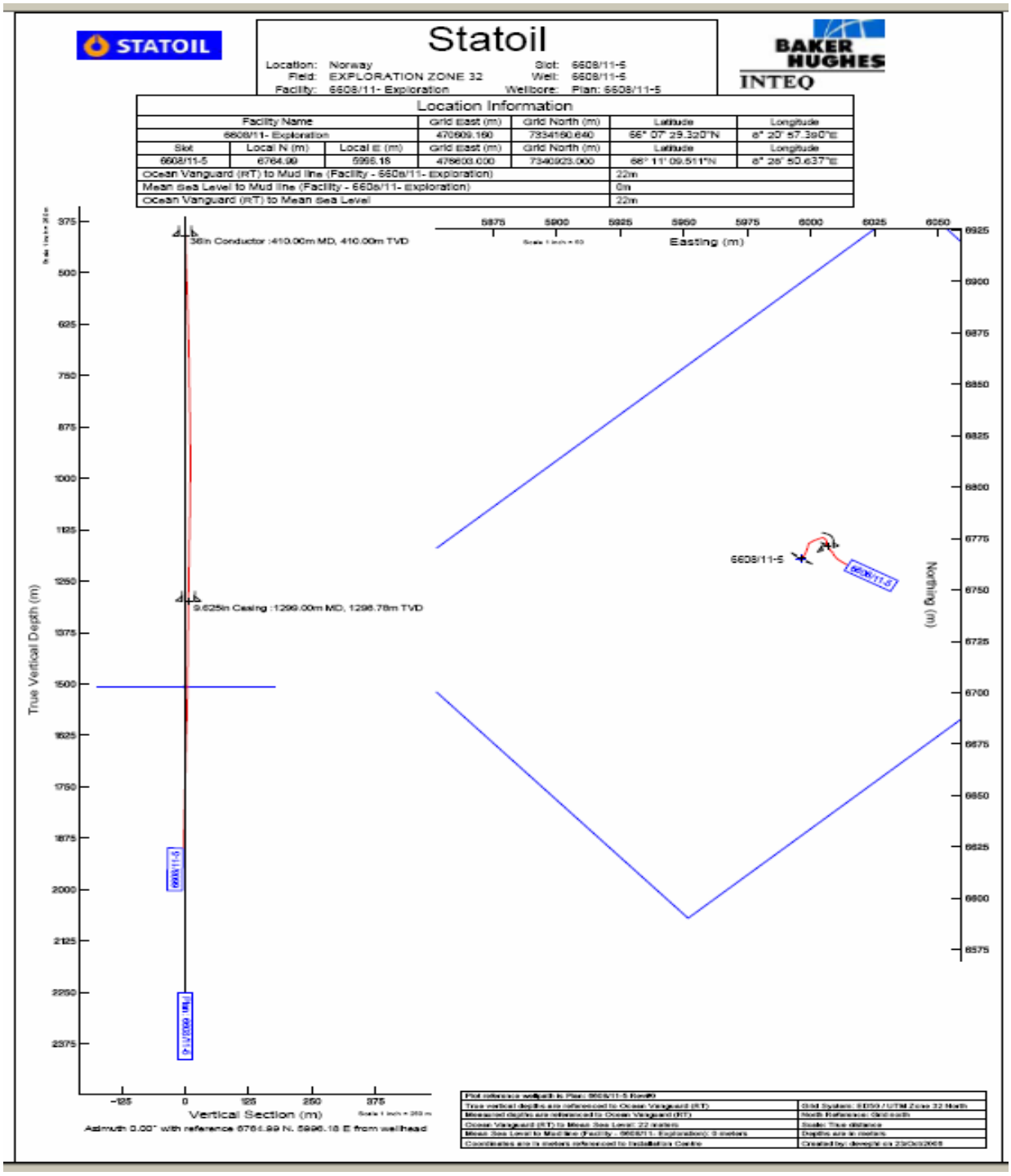
BHA NO: 12
BHA KIND:
DESCRIPTION:
BHA NAME: 12

String component	OD in	ID in	Length m	Acc length m
MRMS			18,67	18,67
LFA			9,89	28,56
MRPC			11,62	40,18
ACTS-B1			4,70	44,88

6 Appendices

App A Directional data, survey listing

Well plot



STATOIL - Norway

EXPLORATION - UTM Zone 32
6608/11-5
6608/11-5
5

Design: 5

Standard Survey Report

, 08 januar, 2007

Statoil
Survey Report

Company:	STATOIL - Norway	**Local Co-ordinate Reference:**	Site 6608/11-5
Project:	EXPLORATION - UTM Zone 32	**TVD Reference:**	WELL @ 22,00m (Ocean Vanguard)
Site:	6608/11-5	**MD Reference:**	WELL @ 22,00m (Ocean Vanguard)
Well:	6608/11-5	**North Reference:**	Grid
Wellbore:	5	**Survey Calculation Method:**	Minimum Curvature
Design:	5	**Database:**	EDM Oracle

Project	EXPLORATION - UTM Zone 32, Norway		
Map System:	Universal Transverse Mercator	**System Datum:**	Mean Sea Level
Geo Datum:	European 1950 - Mean		Using Well Reference Point
Map Zone:	Zone 32N (6 E to 12 E)		Using geodetic scale factor

Site 6608/11-5, 6608/11-5

Site Position:		**Northing:**	7 340 923,00 m	**Latitude:**	66° 11' 9,511 N
From:	Lat/Long	**Easting:**	476 603,00 m	**Longitude:**	8° 28' 50,637 E
Position Uncertainty:	0,00 m	**Slot Radius:**	in	**Grid Convergence:**	-0,48 °

Well 6608/11-5

Well Position	**+N/-S**	0,00 m	**Northing:**	7 340 923,00 m	**Latitude:**	66° 11' 9,511 N
	+E/-W	0,00 m	**Easting:**	476 603,00 m	**Longitude:**	8° 28' 50,637 E
Position Uncertainty		0,00 m	**Wellhead Depth:**	342,00 m	**Water Depth:**	342,00 m

Wellbore 5

Magnetics	**Model Name**	**Sample Date**	**Declination (°)**	**Dip Angle (°)**	**Field Strength (nT)**
	GEOMAGNETICR	21.12.2006	0,12	76,21	52 057

Design 5

Audit Notes:

Version:	1.0	**Phase:**	ACTUAL	**Tie On Depth:**	386,00

Vertical Section:	**Depth From (TVD) (m)**	**+N/-S (m)**	**+E/-W (m)**	**Direction (°)**
	386,00	0,00	0,00	58,68

Survey Program **Date** 05.01.2007

From (m)	**To (m)**	**Survey (Wellbore)**	**Tool Name**	**Description**
448,90	1 279,80	12 1/4" BHI MWD (5)	Magnetic, std, mag-corr	Magnetic Tools (MWD, EMS)
1 900,80	2 255,05	8 1/2" SLB (5)	Magnetic, std, mag-corr	Magnetic Tools (MWD, EMS)

Survey

Measured Depth (m)	Inclination (°)	Azimuth (°)	Vertical Depth (m)	+N/-S (m)	+E/-W (m)	Vertical Section (m)	Dogleg Rate (°/30m)	Build Rate (°/30m)	Turn Rate (°/30m)
386,00	0,00	0,00	386,00	0,00	0,00	0,00	0,000	0.00	0.00
448,90	1,75	33,84	448,89	0,80	0,53	0,87	0,835	0.83	0.00
536,30	1,62	18,70	536,25	3,08	1,67	3,03	0,159	-0.04	-5.20
564,80	1,73	15,67	564,74	3,87	1,92	3,65	0,149	0.12	-3.19
593,90	1,43	16,46	593,83	4,64	2,14	4,24	0,310	-0.31	0.81
622,10	1,31	13,75	622,02	5,29	2,32	4,73	0,145	-0.13	-2.88
650,60	1,43	10,22	650,51	5,96	2,46	5,20	0,154	0.13	-3.72
679,90	1,18	9,29	679,81	6,62	2,57	5,64	0,257	-0.26	-0.95
710,60	0,96	33,92	710,50	7,14	2,77	6,08	0,493	-0.21	24.07
738,70	1,57	52,00	738,59	7,58	3,20	6,67	0,771	0.65	19.30
767,50	1,26	56,76	767,38	7,99	3,78	7,38	0,345	-0.32	4.96
798,80	1,47	56,34	798,68	8,40	4,40	8,13	0,202	0.20	-0.40

Statoil

Survey Report

Company:	STATOIL - Norway	**Local Co-ordinate Reference:**	Site 6608/11-5
Project:	EXPLORATION - UTM Zone 32	**TVD Reference:**	WELL @ 22,00m (Ocean Vanguard)
Site:	6608/11-5	**MD Reference:**	WELL @ 22,00m (Ocean Vanguard)
Well:	6608/11-5	**North Reference:**	Grid
Wellbore:	5	**Survey Calculation Method:**	Minimum Curvature
Design:	5	**Database:**	EDM Oracle

Survey

Measured Depth (m)	Inclination (°)	Azimuth (°)	Vertical Depth (m)	+N/-S (m)	+E/-W (m)	Vertical Section (m)	Dogleg Rate (°/30m)	Build Rate (°/30m)	Turn Rate (°/30m)
826,10	1,70	63,42	825,97	8,78	5,05	8,88	0,331	0.25	7.78
854,30	1,70	66,61	854,15	9,13	5,81	9,71	0,101	0.00	3.39
883,80	1,56	67,44	883,64	9,46	6,58	10,54	0,144	-0.14	0.84
912,90	1,24	62,44	912,73	9,76	7,23	11,25	0,353	-0.33	-5.15
941,60	0,92	72,19	941,43	9,97	7,72	11,78	0,385	-0.33	10.19
970,70	0,85	71,41	970,52	10,11	8,15	12,22	0,073	-0.07	-0.80
999,70	1,23	131,27	999,52	9,97	8,59	12,52	1,126	0.39	61.92
1 028,80	0,86	128,46	1 028,61	9,63	8,99	12,69	0,385	-0.38	-2.90
1 057,80	0,70	146,07	1 057,61	9,35	9,26	12,77	0,296	-0.17	18.22
1 086,80	0,91	136,50	1 086,61	9,04	9,52	12,83	0,257	0.22	-9.90
1 115,70	0,85	174,45	1 115,51	8,66	9,70	12,78	0,597	-0.06	39.39
1 144,70	1,07	169,38	1 144,50	8,18	9,77	12,60	0,244	0.23	-5.24
1 174,10	0,88	179,34	1 173,90	7,68	9,82	12,38	0,259	-0.19	10.16
1 202,70	0,96	196,13	1 202,49	7,23	9,76	12,10	0,294	0.08	17.61
1 231,80	0,97	159,07	1 231,59	6,77	9,78	11,87	0,632	0.01	-38.21

1 260,80	0,83	159,16	1 260,59	6,34	9,94	11,79	0,145	-0.14	0.09
1 279,80	0,70	138,09	1 279,59	6,13	10,07	11,78	0,486	-0.21	-33.27
1 900,80	1,97	120,70	1 900,41	-2,15	21,78	17,49	0,064	0.06	-0.84
1 931,31	1,99	117,78	1 930,90	-2,66	22,70	18,01	0,101	0.02	-2.87
1 960,55	2,10	111,39	1 960,12	-3,09	23,65	18,59	0,260	0.11	-6.56
1 989,01	2,30	106,86	1 988,56	-3,45	24,68	19,29	0,279	0.21	-4.78
2 017,76	2,32	99,97	2 017,28	-3,72	25,80	20,11	0,290	0.02	-7.19
2 046,58	2,27	101,43	2 046,08	-3,93	26,94	20,97	0,080	-0.05	1.52
2 074,76	2,35	106,43	2 074,24	-4,20	28,04	21,77	0,231	0.09	5.32
2 105,11	2,37	109,51	2 104,56	-4,59	29,23	22,58	0,127	0.02	3.04
2 134,59	2,34	108,13	2 134,02	-4,98	30,37	23,36	0,065	-0.03	-1.40
2 163,52	2,17	102,66	2 162,93	-5,29	31,47	24,14	0,284	-0.18	-5.67
2 191,79	2,18	101,21	2 191,18	-5,51	32,52	24,92	0,059	0.01	-1.54
2 220,52	2,15	92,01	2 219,89	-5,63	33,59	25,77	0,364	-0.03	-9.61
2 249,62	2,40	95,77	2 248,96	-5,71	34,75	26,71	0,300	0.26	3.88
2 255,05	2,34	93,69	2 254,39	-5,73	34,97	26,89	0,579	-0.33	-11.49

App B List of contractors

Service	Contract no	Contractor
Plug	SAP4600004878	Weatherford Norge AS
Measurement While Drilling	SAP4600004881	Schlumberger
Mud Logging	SAP4600002064	Geoservices
Sub sea WH/X-mas tree	SAP4600005076	Drill Quip
Rig Operations	SAP4600006269	Diamond Offshore Drilling Ltd
Cementing	SAP4600002160	Halliburton
Casing Crew Service	SAP4600004001	Weatherford Norge AS
Electric Wire line Logging	SAP4600007180	Schlumberger
ROV Systems	SAP4600002882	Oceaneering
Drilling Fluids	SAP4600002159	M-I Drilling Fluids
Measurement While Drilling	SAP4600002063	Baker Hughes Inteq

App C NPD standard sheet for reporting shallow gas

WELL DATA: 6608/11-5

1.	**Distance from drill floor to sea level:**	22 m
2.	**Water depth:**	342 m MSL
3a.	**Setting depth for conductor:**	410 m TVD RKB
3b.	**Leak Off/Formation Integrity Test:**	N/A
4a	**Setting depth for casing on which BOP is installed:**	1298.8 mTVD RKB
4b.	**Leak Off/Formation Integrity test:**	1.57 sg (XLOT)

5. Depth (mTVD RKB) and TWT to formation/section/layer tops:

Seabed	364.0 mTVD RKB / 0.456 s
Top Naust Formation	613.0 m TVD RKB / 0.712 s
Top Kai Formation	1341.0 mTVD RKB / 1.314 s
Top Brygge Formation	1373.0 mTVD RKB / 1.346 s
Top Tare Formation	1435.0 mTVD RKB / 1.415 s
Top Tang Formation	1515.0 mTVD RKB / 1.479 s

6. Depth interval (mTVD RKB and TWT) and age of sand layers shallower than 1000 m below seabed. State which layers, if any, contain gas.

No returns of cuttings and gas until 9 5/8” casing was set at 1297.6 m TVD. First distinct sand layers observed on the MWD log are in the upper part of the Brygge Formation at 1373 m TVD RKB.

7. How was presence of gas proven?

Shallow gas was not found in the well.

8. Composition and origin of gas:

N/A

9. Describe all measurements performed in gas bearing layers:

N/A

10. Indicate the depths (mTVD RKB and TWT) of unconformities in the well bore:

N/A

11. Indicate depth and extension of sand layers (communication, continuity, truncation, etc.):

N/A.

12. Indicate depth and extension of any gas blanking, seismic anomalies, etc:

N/A

13. State possible seismic indications that the gas originates from deeper levels. Description if gas originates from deeper levels:

N/A

14. How does the interpretation of the site survey correspond with well data with respect to:

Shallow gas: No shallow gas was prognosed in the 36” and 12 1/4” sections, and no shallow gas was observed.
Sand layers: No distinct sand layers were prognosed, and neither was observed above target.
Unconformities: Base Quaternary was encountered close to the prognosis
Correlation with adjacent wells: The nearest well is 6608/11-4, which is located 2.7 km south-east of the Valkyrie 1 well. Shallower sands can not be correlated.

The site survey interpretation and the observations correlated well.

App D Wellsite sample description

STATOIL

WELLSITE SAMPLE DESCRIPTION

Country:	Norway	Area:	Norwegian Sea	Field:	Valkyrie
Well no:	6608/11-5	Company:	Statoil ASA, Petoro AS, Norsk Hydro ASA, ENI Norge A.S		
RKB:	22 meters	Geologist:	Jan Tore Samlanes, Bjørn Egil Paulsen		
Hole size:	8 ½”	Cut solvent:	Iso Propyl Alcohol	Date:	27.06.2006

Depth (m RKB)	Lithology (%)	Lithological Description: Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Remarks: Shows, cavings, mud additives, etc.
1310	60	Clst	Med dk gry-dk gry, olv gry-olv blk, frm-hd, pred mod hd, blky-sbblky, V slty/sdy grd Sltst/Sst i.p., sl calc, micromic
	40	Sst	Clr-trnsl Qtz, vf-m, occ crs v crs, pr srt, lse, sbang-sbrnd, no vis por
1320	70	Clst/Sltst	Sft-frm, else a/a.
	30	Sst	Clr-trnsl Qtz gr, vf-m, occ crs-v crs, pr srt, lse Qtz gr, sbang-sbrnd, no Vis por
1330	60	Clst/Sltst	Sft, stky, else a/a.
	40	Sst	f-m, occ crs-v crs, pr srt, else a/a.
	Tr	Ls	Wh-yelsh brn, m hd-hd, microxln
1340	80	Clst	Med gry-med dk gry, olv gry, sft-v sft, stky, v slty i.p., calc- v calc, micromic
	20	Sst	a/a.
	Tr	Ls	Wh-yelsh brn, mod hd-hd, microxln
1350	90	Clst	Dom a/a, sft, stky
	10	Sst	Pred a/a.
1360	80	Clst	Dom. a/a.
	20	Sst	Lse Qtz gr, f-v crs, pr srt, sbang-sbrnd, trnsl
1370	100	Clst	a/a, slty-v slty, i.p., sdy
1380	90	Clst	a/a., slty-v slty
	10	Sst	f-med, lse Qtz gr, occ v crs
1390	90	Clst	a/a.
	10	Sst	a/a.
1400	60	Clst	Med dk gry-med gry, olv gry, sft, occ stky, slty
	40	Sst	Vf-f, occ crs, lse Qtz gr, trnsl, sbang
1410	95	Clst	Med dk gry-brnsh gry, olv gry, sft, stky, slty
	5	Sst	a/a.
1420	100	Clst	Med dk gry-med lt gry, lt blsh grn i.p., non calc, sft-frm, occ stky,
	Tr	Ls	a/a.
1430	100	Clst	Med blsh gry-med gry, grnsh gry, frm, sbblky, flky, slty
	Tr	Ls	V lt gry, sft-frm, sbblky, arg lam i.p., slty
1440	100	Clst	a/a., also med blsh gry-med dk gry, med gry
1450	100	Clst	Med gry-med blsh gry, olv gry, frm, flky, sbblky-blky, mica, sl slty, Non calc
	Tr	Ls	V lt gry-off wh, blky, frm-hd, arg
1452	100	Clst	a/a., also med dk gry
	Tr	Ls	a/a, med brn, lt brn

Country: Norway	Area: Norwegian Sea	Field: Valkyrie
Well no: 6608/11-5	Company: Statoil ASA, Petoro AS, Norsk Hydro ASA, ENI Norge A.S	
RKB: 22 meters	Geologist: Jan Tore Samlanes, Bjørn Egil Paulsen	
Hole size: 8 ½”	Cut solvent: Iso Propyl Alcohol	Date: 27.06.2006

Depth (m RKB)	Lithology (%)	Lithological Description: Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Remarks: Shows, cavings, mud additives, etc.
1455	100 Clst	Med gry-med blsh gry, olv gry, frm, flky, sbblky-blky, mica, slty v slty i.p., frm, occ sft, occ stky, non-sl calc	
1470	100 Clst	a/a	
1473	100 Clst	a/a	
1476	100 Clst	med grey-med blsh gry-olv gry. Blky, non calc, else a/a	
1479	100 Clst	a/a	
	Tr Ls	Off wh-lt gry, frm-hd, blky-sbblky	
1485	100 Clst	a/a, also brnsh gry	
1490	100 Clst	Dk gry-olv blk-brnsh blk, also med dk gry, blky-sbblky	
	Tr Ls	a/a	
1494	100 Clst	Med gry-gnsh gry, occ med dk gry-dk gry, dom non calc, frm-occ mod hd, occ sft	
	Tr Ls	a/a	
1497	100 Clst	a/a, med gry-med lt gry-med blsh gry, glauc, else a/a	
	Tr Ls	a/a	
1500	100 Clst	Med gry-gnsh gry, occ med dk gry-dk gry, dom non calc, frm-occ mod hd, occ sft	
1503	100 Clst	a/a	
	Tr Ls	V lt gry, frm-mod hd, arg, occ lt brn, sbblky-blky, arg-v arg	
1506	100 Clst	a/a	
1509	100 Clst	a/a, pred med-med lt gry, lt gnsh gry	
	Tr Sst	f-med, lse Qtz, gr, trnsl, pr srt, sbang-ang,	
1512	100 Clst	a/a	
1518	100 Clst	Varic, a/a, also mod rdsh brn-dk rdsh brn	
	Tr Sst	a/a	
1521	100 Clst	Gnsh gry-dk gnsh gry, lt brn-mod brn, frm-mod hd, blky, sl slty i.p., non-sl calc, micromic, glauc I.P.	
1524	100 Clst	a/a	
	Tr Sst	Clr-trnsl Qtz gr, vf-f, pred vf, wl srt, sbang-ang	
1527	100 Clst	a/a	
1530	100 Clst	Non calc, else ; a/a	
1533	100 Clst	Dk gnsh gry-gnsh blk, dk gry-grysh blk, med dk gry, mod brn-dsky Brn, dk rd brn, sft-frm, pred sft, slty i.p., non calc, glauc i.p., Micromic, tr pyr	

Country:	Norway	Area:	Norwegian Sea	Field:	Valkyrie
Well no:	6608/11-5	Company:	Statoil ASA, Petoro AS, Norsk Hydro ASA, ENI Norge A.S		
RKB:	22 meters	Geologist:	Jan Tore Samlanes, Bjørn Egil Paulsen		
Hole size:	8 ½”	Cut solvent:	Iso Propyl Alcohol	Date:	27.06.2006

Depth (m RKB)	Lithology (%)		Lithological Description: Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Remarks: Shows, cavings, mud additives, etc.
1536	100	Clst	Dk gnsh gry-gnsh blk, dk gry-grysh blk, med dk gry, mod brn-dsky brn, dk rd brn, sft-frm, pred sft, slty i.p., non calc, glauc i.p.,	
1539	100	Clst	Dk gnsh gry-gnsh blk, med gry-gnsh gry, sft-frm, blky i.p., else a/a	
1542	100	Clst	Med dk gry-dk gry, gnsh gry-dk gnsh gry, else; a/a	
	Tr	Sst	Clr-trnsl Qtz gr, lse, f- v crs, pr srt, ang-sbrnd	
1545	100	Clst	a/a	
1548	100	Clst	a/a	
1551	100	Clst	Med dk gry-dk gry, gnsh gry-dk gnsh gry, kaol??else; a/a	
1554	100	Clst	Med gry-med dk gry, gnsh gry-dk gnsh gry, sl calc i.p., kaol?, else; a/a	
	Tr	Sst	Clr-trnsl lse Qtz gr, vf-m, occ crs-v crs, mod- pr srt, sbang-ang, non calc, else; a/a	
1557	95	Clst	Gnsh gry-dk gnsh gry, kaol?, else; a/a	
	5	Sst	Pred med-crs, mod-wl srt, sbang-sbrnd, else; a/a	
1558	60	Clst	a/a	
	40	Sst	Clr-trnsl lse Qtz gr, pred f-med, wl-mod srt, sbang-sbrnd, pyr, else a/a	W yelsh nat fluor, coating gns
			PULLED OUT FOR CORING, CORED 1559 – 1574 mMD See “Conventional core description” for details	

Country: Norway	Area: Norwegian Sea	Field: Valkyrie
Well no: 6608/11-5	Company: Statoil ASA, Petoro AS, Norsk Hydro ASA, ENI Norge A.S	
RKB: 22 meters	Geologist: Jan Tore Samlanes, Bjørn Egil Paulsen	
Hole size: 8 ½”	Cut solvent: Iso Propyl Alcohol	Date: 29.06.2006

Depth (m RKB)	Lithology (%)		Lithological Description: Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Remarks: Shows, cavings, mud additives, etc.
1575	100	Clst	Olv gry-med gry, sft-frm, occ stky, sbblky, slty, non calc, micromic	
	Tr	Sst	Lse Qtz gr, vf-f, trnsl, sbang-ang, pr srt	
	Tr	C	Blk, pred hd, brit	
1581	80	Clst	Olv gry-med gry, sft-frm, occ stky, sbblky, slty, non calc, micromic, sft, sbblky, slty	
	20	Sst	Lse Qtz gr, v pr srt, vf-crs, occ v crs, clr, sbang-sbrnd	
	Tr	Ls	Lt brn-mod brn, blky, mod hd, also lt gry	
	10	C	Blk, shny, brit	
1584	90	Clst	a/a	
	10	Ls	a/a	
	Tr	C	a/a	
	Tr	Sst	a/a	
1587	60	Clst	a/a	
	40	Sst	Pred vf-f, occ med, lse Qtz gr	
1590	80	Clst	a/a. dom lse, sft	
	20	Sst	a/a, lse, clr, f-med, occ crs, pr srt	
1593	60	Clst	a/a	
	40	Sst	a/a	
1596	60	Sst	Dom med-crs, clr-opq, pr srt, lse Qtz gr, sbang-ang, pyr nod i.p.	
	40	Clst	a/a	
1599	80	Sst	Med-crs, occ v crs, mod srt, lse Qtz gr, clr-trnsl, pyr nod	
	20	Clst	a/a	
	Tr	C	a/a	
1602	90	Sst	a/a, med-crs, pr-mod srt, pyr, ang-sbang	
	10	Clst	a/a	
1605	95	Sst	a/a, pyr, ang-sbang, f-med, clr-trnsl	
	5	Clst	a/a	
1608	60	Sst	a/a	
	40	Clst	Grysh blk-olv blk, blky, frm-mod hd, else a/a	
1611	70	Clst	Grnsh gry-olv gry, sft-frm, i.p., stky, sbblky, non calc, micromic, Slty I.P., micropyr	
	30	Sst	Lse, f-med, occ crs, opq-clr, sbang, pr srt	
1614	70	Sst	a/a; dom f-med, mod srt, occ v crs, ang-sbang	
	30	Clst	a/a	
1617	100	Sst	a/a, lse Qtz gr, f-v crs, sbang, opq-clr, pyr	
1620	90	Sst	a/a	
	10	Clst	a/a; dk grnsh gry, sft, stky, non calc	

Country:	Norway	Area:	Norwegian Sea	Field:	Valkyrie
Well no:	6608/11-5	Company:	Statoil ASA, Petoro AS, Norsk Hydro ASA, ENI Norge A.S		
RKB:	22 meters	Geologist:	Jan Tore Samlanes, Bjørn Egil Paulsen		
Hole size:	8 ½”	Cut solvent:	Iso Propyl Alcohol	Date:	29.06.2006

Depth (m RKB)	Lithology (%)	Lithological Description: Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination		Remarks: Shows, cavings, mud additives, etc.
1623	80	Sst	Med-crs, pred crs, clr, trnsl	
	20	Clst	Grysh blk-brnsh blk, hd, flky, micromic	
1626	100	Sst	a/a	
	Tr	Clst	a/a	
1629	100	Sst	f-crs, clr-opq, pr srt, sbang-ang, pyr	
1632	100	Sst	a/a; arg mtrx, dom med-crs	
1635	100	Sst	Clr-trnsl lse Qtz gr, pred m-crs, pr srt, sbang-sbrnd, pyr	
1638	100	Sst	a/a	
1641	90	Sst	Pred med, occ med-v crs, mod-pr srt, arg mtrx i.p., else a/a	
	10	Clst	Dk gnsh gry-gnsh blk, frm-hd, blky, sl calc, micromic, v slty grd Sltst	
1644	80	Sst	Arg mtrx, else; a/a	
	20	Clst	Lt brnsh gry-brnsh gry, olv gry i.p., pred sft, stky, micromic	
1647	70	Sst	Pred f-med, occ med-crs, mod-pr srt, sil cmt i.p, else a/a	
	30	Clst	Olv gry-olv blk, brnsh gry, else a/a	
1650	70	Sst	a/a	
	30	Clst	Sl calc, else; a/a	
1653	40	Sst	Pyr, else; a/a	
	60	Clst	a/a	
1656	50	Sst	Clr-trnsl lse Qtz gr, vf-med, pred f-med occ crs-v crs, mod- pr srt, sbang· non calc, Pred f-med, occ med-crs, mod-pr srt, sil cmt i.p, Glauc.	
	50	Clst	a/a	
	Tr	Ls	Wh, sft, microxln	
1662	30	Sst	a/a	
	70	Clst	Med gry-med dk gry, non calc, else; a/a	
1674	20	Sst	Pred f-crs, no mtrx, lse, else; a/a	
	80	Clst	Olv gry-olv blk, pred sft, stky, non calc, micromic	
1686	100	Clst	Gnsh gry, else; a/a	
	Tr	Sst	a/a	
1692	90	Clst	Med dk gry-dk gry, olv gry, pred sft, stky, sl slty i.p., non calc, glauc	
	5	Sst	Clr-trnsl lse Qtz gr, crs-c crs, sbang-sbrnd, mod srt, pyr, sil cmt i.p.,	
	5	Ls	Wh-yelsh wh, sft-frm, microxln	
1698	80	Clst	Sl calc, else; a/a	
	10	Sst	a/a	
	10	Ls	a/a	

Country:	Norway	Area:	Norwegian Sea	Field:	Valkyrie
Well no:	6608/11-5	Company:	Statoil ASA, Petoro AS, Norsk Hydro ASA, ENI Norge A.S		
RKB:	22 meters	Geologist:	Jan Tore Samlanes, Bjørn Egil Paulsen		
Hole size:	8 ½”	Cut solvent:	Iso Propyl Alcohol	Date:	29.-30.06.2006

Depth (m RKB)	Lithology (%)		Lithological Description: Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Remarks: Shows, cavings, mud additives, etc.
1704	80	Clst	Dk gry-grysh blk, med gry-med dk gry, sft-frm, slty i.p., calc, micromic	
	Tr	Sst	Clr-trnsl lse Qtz gr med-crs, sbang-sbrnd, mod srt, pyr, sil cmt i.p., calc cmt,	
	20	Ls	Wh-yelsh wh, yelsh brn i.p., sft-frm, microxln	
1710	75	Clst	Med brn-gry rd, else; a/a	
	5	Sst	a/a	
	20	Ls	a/a	
1716	60	Clst	Lt brnsh gry-brn gry, med gry-med dk gry, med brn-gry rd, dk gnsh Gry-gnsh gry, sft-frm, v calc i.p., glauc i.p.	
	40	Ls	a/a	
	Tr	Sst	a/a	
1722	60	Clst	a/a	
	40	Ls	a/a	
	Tr	Sst	a/a	
1728	80	Clst	a/a	
	20	Ls	a/a	
1734	60	Clst	Lt brn gry-brn gry, gnsh gry-dk gnsh gry, sft-frm, else; a/a	
	40	Ls	a/a	
1740	70	Clst	Lt olv gry-olv gry, med gry-med dk gry, gnsh gry-dk gnsh gry, v calc grd mrl i.p., sl slty i.p., sft-frm, pred sft, stky i.p., blky i.p.	
	30	Ls	Wh-yelsh wh, yelsh brn i.p., sft-frm, lams, microxln	
	Tr	Sst	Sil cmt/calc cmt i.p., f-med, sbang-sbrnd, mod srt	
1746	70	Clst	a/a	
	30	Ls	a/a	
1752	90	Clst	Lt brn gry-pl brn, else; a/a	
	10	Ls	a/a	
1758	95	Clst	Gry rd, lt brn gry-pl brn, glauc, else; a/a	
	5	Ls	a/a	
1764	100	Clst	Incr. gry rd, lt brn gry-pl brn, else; a/a	
1770	100	Clst	a/a	
1776	100	Clst	a/a	
1782	100	Clst	Dk gnsh gry-gnsh blk, else; a/a	
1788	100	Clst	a/a	
1794	100	Clst	a/a	
	Tr	Ls	Wh-brn wh, sft-frm, arg, microxln	

Depth (m RKB)	Lithology (%)	Lithological Description: Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Remarks: Shows, cavings, mud additives, etc.
1800	100	Clst	Lt olv gry-olv gry, med gry-med dk gry, gnsh gry-dk gnsh gry, v calc grd mrl i.p., sl slty i.p., sft-frm, pred sft, stky i.p., blky i.p.
1806	100	Clst	a/a
1812	100	Clst	a/a
1824	100	Clst	a/a
	Tr	Ls	a/a
1830	95	Clst	a/a
	5	Ls	a/a
1836	95	Clst	a/a
	5	Ls	a/a
1842	60	Ls	Med lt gry-lt gry, occ med lt brn, sbblky, sft-mod hd
	40	Clst	Varic, dk yelsh brn-med yelsh brn, med gry-brnsh gry-olv gry, Sbblky, calc I.P., slty
1848	90	Clst	Calc-v calc, grd arg ls, else; a/a
	10	Ls	a/a
1854	100	Clst	a/a
	Tr	Ls	a/a
1860	100	Clst	a/a, med yelsh brn-dk yelsh brn, occ med gry-med dk gry, sft-frm, sbblky, calc, occ slty
1866	100	Clst	a/a
1872	100	Clst	a/a
1878	100	Clst	a/a; also med gry-med lt gry, calc-v calc
1884	100	Clst	Dom med lt gry-lt gry, med yelsh brn, blky-sbblky, sft-frm, glauc, calc, i.p. slty
1890	90	Clst	a/a
	10	Ls	Off wh-lt gry, arg, frm-mod hd, sbblky
1896	90	Clst	Mod brn; else a/a
	10	Ls	a/a
1902	100	Clst	vario colored : light – dk jade grn, brn red, lt – med gry, ochre – lt brn lt – med gry, ochre – lt brn, with traces of Pyrite and Kaolinte

Country:	Norway	Area:	Norwegian Sea	Field:	Valkyrie
Well no:	6608/11-5	Company:	Statoil ASA, Petoro AS, Norsk Hydro ASA, ENI Norge A.S		
RKB:	22 meters	Geologist:	Andreas Neitzel, Lena Nilssen		
Hole size:	8 ½”	Cut solvent:	Iso Propyl Alcohol	Date:	04.07.2006

Depth (m RKB)	Lithology (%)	Lithological Description: Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination		Remarks: Shows, cavings, mud additives, etc.
1908	100	Clst	varic: light – dk jade grn, brn red, lt – med gry, ochre – lt brn lt – med gry, ochre – lt brn, with traces of Pyrite and Kaolinte	
1914	100	Clst	a/a	
1920	100	Clst	a/a.	
1926	100	Clst	a/a.	
1932	100	Clst	a/a.	
1938	100	Clst	a/a.	
1944	100	Clst	a/a.	
1950	90	Clst	a/a.	
	10	Salt	clear trnsl crystals, white – gry, wh to gry occ lt brn mtrx, hd, coarse crystalline	
	Tr	Anhy	white, frm, amorphous, blky	
1956	80	Clst	Varic a/a.	
	10	Sst	clear trnsl Qtz, loose grns, med crs – crs, sbang-ang, mod srt	no shows
	10	Salt	a/a.	
	Tr	Anhy	a/a.	
1968	30	Clst	varic a/a.	
	20	Clst	lt – med grey, sft – frm, ptly blky, non calc, silty, sticky	
	30	Salt	a/a.	
	20	Anhy	a/a.	
	Tr	Sst	a/a.	
1974	60	Clst	grey a/a.	
	30	Salt	a/a.	
	10	Anhy	white, frm, amor, blky	
1980	60	Clst	med – dk gry, sft occ frm, sticky, partly mixed w salt	
	20	Salt	a/a.	
	20	Anhy	a/a.	
1986	80	Clst	a/a.	
	10	Salt	a/a.	
	10	Anhy	a/a.	
1992	70	Clst	a/a.	
	30	Anhy	a/a.	
1998	80	Clst	a/a.	
	20	Anhy	a/a.	

Country:	Norway	Area:	Norwegian Sea	Field:	Valkyrie
Well no:	6608/11-5	Company:	Statoil ASA, Petoro AS, Norsk Hydro ASA, ENI Norge A.S		
RKB:	22 meters	Geologist:	Andreas Neitzel, Lena Nilssen		
Hole size:	8 ½”	Cut solvent:	Iso Propyl Alcohol	Date:	04.07.2006

Depth (m RKB)	Lithology (%)	Lithological Description: Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination		Remarks: Shows, cavings, mud additives, etc.
2004	20	Clst	med – dk gry, sft occ frm, sticky, partly mixed w salt	
	70	Clst	varic: rd brn–ochre–med gry-brn gry-grsh grn-lt jade grn, frm-mod hd, blky-splintery-mod calc	
	10	Anhy	white, frm, amor, blky.	
2010	90	Clst	a/a.	
	10	Anhy		
2016	80	Clst	a/a.	
	20	Anhy	a/a.	
2022	80	Clst	a/a. with traces of glauconite	
	20	Anhy		
2028	90	Clst	a/a.	
	10	Anhy	a/a.	
2034	90	Clst	a/a.	
	10	Anhy	a/a.	
	Tr	Sst	clear trnsl Qtz, loose grns, med crs – crs, angular, occ pyritic	
2040	90	Clst	a/a.	
	10	Anhy	a/a.	
	Tr	Sst	a/a.	
2046	100	Clst	a/a.	
	Tr	Anhy	a/a.	
	Tr	Sst	a/a.	
2052	100	Clst	a/a.	
	Tr	Anhy	a/a.	
	Tr	Sst	a/a.	
2058	100	Clst	a/a.	
	Tr	Anhy	a/a.	
	Tr	Hal	clear trnsl crystals, white – gry, wh to gry occ lt brn mtrx, hd, coarse crystalline	
2064	100	Clst	varic, grysh red, grysh gn, brnsh gry, v lt gry, gnsh gry, soft-frm, sol, v sticky, sbblky-amor, r slily calc, Tr Glauc.	
	Tr	Anhy	white, sft-frm, amor, blky	
	Tr	Hal	a/a.	
2070	100	Clst	a/a.	
	Tr	Anhy	a/a.	
	Tr	Hal	a/a.	
2076	100	Clst	a/a.	
	Tr	Anhy	a/a.	
	Tr	Hal	a/a.	

Country:	Norway	Area:	Norwegian Sea	Field:	Valkyrie
Well no:	6608/11-5	Company:	Statoil ASA, Petoro AS, Norsk Hydro ASA, ENI Norge A.S		
RKB:	22 meters	Geologist:	Andreas Neitzel, Lena Nilssen		
Hole size:	8 ½”	Cut solvent:	Iso Propyl Alcohol	Date:	04.07.2006

Depth (m RKB)	Lithology (%)		Lithological Description: Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Remarks: Shows, cavings, mud additives, etc.
2082	100	Clst	varic, grysh red, grysh gn, brnsh gry, v lt gry, gnsh gry, soft-frm, sol, v sticky, sbblky-amor, r slily calc, Tr Glauc.	
	Tr	Anhy	white, sft-frm, amor, blky	
	Tr	Hal	clear trnsl crystals, white – gry, wh to gry occ lt brn mtrx, hd, coarse crystalline	
2088	100	Clst	varic, grysh red, grysh gn, brnsh gry, v lt gry, gnsh gry, soft-frm, sol, v sticky, sbblky-amor, r slily calc, Tr Glauc.	
	Tr	Anhy	white, sft-frm, amor, blky.	
	Tr	Hal	a/a.	
2094	100	Clst	a/a.	
	Tr	Anhy	a/a. + lt brn	
	Tr	Hal	a/a.	
2100	100	Clst	a/a.	
	Tr	Anhy	a/a.	
	Tr	Hal	a/a.	
2106	100	Clst	a/a.	
	Tr	Anhy	a/a.	
	Tr	Hal	a/a.	
2112	100	Clst	a/a. + Tr micropyr	
	Tr	Anhy	a/a.	
	Tr	Hal	a/a.	
2118	100	Clst	a/a. no micropyr	
	Tr	Anhy	a/a.	
	Tr	Hal	a/a.	
2124	100	Clst	a/a. + Tr Glauc	
	Tr	Anhy	a/a.	
	Tr	Hal	a/a.	
2130	100	Clst	a/a. + blky-amor, no Glauc	
	Tr	Anhy	a/a.	
	Tr	Hal	a/a.	
2136	100	Clst	a/a.	
	Tr	Anhy	a/a.	
	Tr	Hal	a/a.	
2142	90	Clst:	a/a.	Top of lower evaporite marker?
	5	Anhy:	a/a.	
	5	Hal:	a/a. + dk yelsh brn	
	Tr	Pyr		
2148	95	Clst:	a/a.	
	5	Anhy:	a/a.	
	Tr	Hal:	a/a.	

Country:	Norway	Area:	Norwegian Sea	Field:	Valkyrie
Well no:	6608/11-5	Company:	Statoil ASA, Petoro AS, Norsk Hydro ASA, ENI Norge A.S		
RKB:	22 meters	Geologist:	Andreas Neitzel, Lena Nilssen		
Hole size:	8 ½”	Cut solvent:	Iso Propyl Alcohol	Date:	05.07.2006

Depth (m RKB)	Lithology (%)	Lithological Description: Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination		Remarks: Shows, cavings, mud additives, etc.
2151	100	Clst:	varic, grysh red, grysh gn, brnsh gry, v lt gry, gnsh gry, soft-frm, sol, v sticky, sbblky-amor, r slily calc, Tr Glauc.	
	Tr	Anhy:	white, sft-frm, amor, blky	
	Tr	Hal:	clear trnsl crystals, white – gry, wh to gry occ lt brn mtrx, hd, coarse crystalline	
2154	80	Clst:	a/a.	
	20	Anhy:	a/a.	
	Tr	Hal:	a/a.	
2157	Lost			
2160	Lost			
2163	70	Clst:	a/a.	
	30	Anhy:	a/a.	
	Tr	Hal:	a/a.	
2166	80	Clst:	less grysh red, else a/a.	
	20	Anhy:	a/a.	
	Tr	Hal:	a/a.	
2169	Lost			
2172	80	Clst:	a/a.	
	20	Anhy:	white, sft-frm, amor, blky	
2175	60	Clst:	med gry, dk gry, lt brnsh gry, grysh red i.p., sft-frm, sol i.p., sbblky-amor, slily calc i.p.	Drilling break, circ B/U
	40	Anhy:	a/a.	
2178	70	Clst:	a/a.	
	30	Anhy:	a/a.	
2181	70	Clst:	a/a.	
	30	Anhy:	a/a.	
2184	70	Clst:	a/a.	
	30	Anhy:	a/a.	
2187	70	Clst:	a/a.	
	30	Anhy:	a/a.	
	Tr	Sst:	mky wh lse Qtz Gr, v crs, rndd.	
	Tr	Pyr		
2190	70	Clst:	a/a.	
	30	Anhy:	a/a.	
	Tr	Sst:	clr lse Qtz Gr, crs-v crs, rndd.	
2193	Lost			
2196	80	Clst:	a/a.	
	20	Anhy:	a/a.	

Country:	Norway	Area:	Norwegian Sea	Field:	Valkyrie
Well no:	6608/11-5	Company:	Statoil ASA, Petoro AS, Norsk Hydro ASA, ENI Norge A.S		
RKB:	22 meters	Geologist:	Andreas Neitzel, Lena Nilssen		
Hole size:	8 ½”	Cut solvent:	Iso Propyl Alcohol	Date:	05.07.2006

Depth (m RKB)	Lithology (%)	Lithological Description: Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination		Remarks: Shows, cavings, mud additives, etc.
2199	80	Clst:	med gry, dk gry, lt brnsh gry, grysh red i.p., sft-frm, sol i.p., sbblky-amo slily calc i.p.	
	20	Anhy:	white, sft-frm, amor, blky	
2202	80	Clst:	a/a.	
	20	Anhy:	a/a.	
2205	80	Clst:	a/a.	
	20	Anhy:	a/a.	
	Tr	Sst:	a/a.	
2208	80	Clst:	a/a.	
	20	Hal/Anhy:	a/a.	
2211	50	Clst	a/a.	
	20	Anhy	a/a.	
	30	Hal	a/a.	
2217	50	Clst	lt – med gry, sft, occ frm and blky, ptly mixed with salt	
	20	Clst	pred rd brn, occ lt grnsh gry, sft, sl calc, partly silty	
	20	Anhy	pred white, frm, amor, rare v lt brn, hd, microcrystalline	
	10	Hal	clear trnsl crystals, wh – lt grey mtrx, hd, crs crystalline	
2220	30	Clst	grey a/a.	
	50	Clst	red a/a.	
	10	Anhy	a/a.	
	10	Hal	a/a.	
	Tr		Glauconite	
2223	30	Clst	grey a/a.	
	50	Clst	red a/a.	
	10	Anhy	a/a.	
	10	Hal	a/a.	
2226	10	Clst	grey a/a.	
	90	Clst	red a/a.	
	Tr	Anhy	a/a.	
2229	100	Clst	red a/a.	
	Tr	Anhy	a/a.	
2232	100	Clst	red a/a.	
	Tr	Anhy	a/a.	
2235	100	Clst	pred rd brn, occ lt grnsh gry, sft, sl calc, partly silty	
	Tr	Anhy	a/a.	
2238	100	Clst	red a/a.	

WELLSITE SAMPLE DESCRIPTION

Country:	Norway	Area:	Norwegian Sea	Field:	Valkyrie
Well no:	6608/11-5	Company:	Statoil ASA, Petoro AS, Norsk Hydro ASA, ENI Norge A.S		
RKB:	22 meters	Geologist:	Andreas Neitzel, Lena Nilssen		
Hole size:	8 ½”	Cut solvent:	Iso Propyl Alcohol	Date:	05.07.2006

Depth (m RKB)	Lithology (%)	Lithological Description: Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination		Remarks: Shows, cavings, mud additives, etc.
2241	70	Clst	red brown, soft, non calc, sl sticky	
	20	Clst	pred lt jade grn, occ dk grysh grn, frm, blky-platey, subfis-fis, non calc	
	10	Hal	wh-v lt brn, mod hd, pred crs crystl, occ as lt orange amor agg	
	Tr	Sst	clear tranls Qtz, loose grains, vf-f, well rounded, well sorted	
2244	80	Clst	red a/a.	
	20	Clst	green a/a.	
	Tr	Hal	a/a.	
	Tr	Sst	a/a.	
2247	90	Clst	red a/a.	No direct Fluorescence
	10	Clst	green a/a.	No Cut Fluorescence
	Tr	Hal	a/a.	
	Tr	Sst	a/a.	
2250	70	Clst	red-green a/a.	a/a.
	30	Sst	clear trnsl-milky Qtz, loose grains, vf-med, rounded-w rounded, rare sbang, mod-w srt, rare dark carbonaceous mtrx	
	Tr		Glauconite	
2256	70	Clst	red-green a/a.	**a/a.**
	20	Sst	occ med coarse, else a/a.	
	10	Hal	a/a.	
2259	50	Clst	red-green a/a.	**a/a.**
	40	Sst	clr trnsl-milky Qtz, loose grains, v lt brn, vf-coarse, sbang-sbrnd, poor-mod srt, sl calc, rare carbonaceous mtrx	
	10	Lst	white, occ beige, soft, amor, occ micro-fine crystalline	
2262	50	Clst	a/a.	**a/a.**
	40	Sst	a/a.	
	10	Lst	a/a.	
	Tr		Glauconite	
2265	40	Clst	a/a.	**a/a.**
	50	Sst	a/a.	
	10	Lst	a/a.	
2268	40	Clst	a/a.	
	50	Sst	a/a.	
	10	Lst	a/a.	
2270	30	Clst	a/a.	**a/a.**
	70	Sst	a/a.	
	Tr	Lst	a/a.	Circulated two times BU

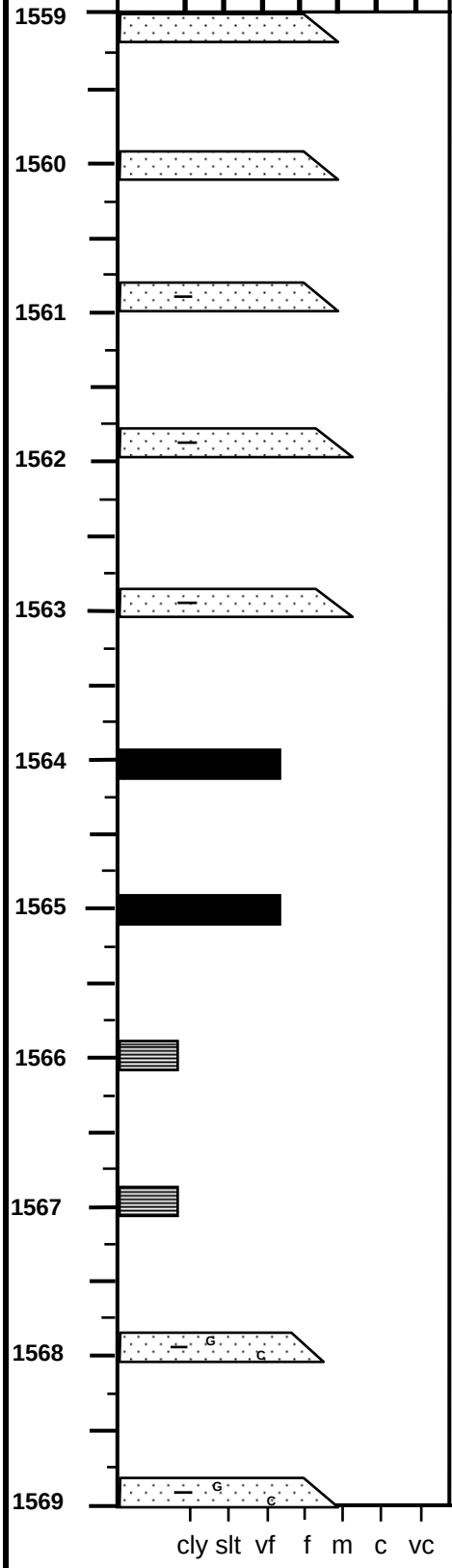
TD at 2270 m

App E Conventional core description

STATOIL

CONVENTIONAL CORE DESCRIPTION

Country: Norway	**Area: Nordland II**	**Prospect: Valkyrie**
Well no: 6608/11-5	**Formation:** Åre 1	
Core no:1	**Interval:** 1559–1574mMD	**Cored:** 12,8 m **Rec: 85,3%**
Core size: 4”	**Geologists:** JT Samlanes/BE Paulsen	**Date**: 29.06.2006



Shows: STAIN	FLUOR	CUT	POOR	FAIR	GOOD	Lithological Description (Rock name, mod. lith., colour, grain size, sorting, roundness, matrix, cementation, hardness, sed. struct.,accessories, fossils, porosity, contamination)	Remarks (Shows, etc)
			▌			**SST:** med lt gry – med gry, clr – trnsl qtz grn, pred f – med, v occ crs, mod – wl srt, sbang – sbrnd, i.p. arg mtx, v lse, arg cmt, abd micromic, tr micropyr, tr glauc, vis por	No direct fluor. Yelsh, mlky wh v wk cut flur
			▌			**SST:** a.a., also lt gry, occ v f	a.a
			▌			**SST:** a.a, ang – sbang, no pyr	a.a
			▌			**SST:** a.a.	a.a
			▌			**SST:** a.a.	a.a
						COAL: blk, hd – v hd, i.p. brit	
						COAL: a.a.	
						CLST: olv gry – brn gry, sft – frm, pred frm, Blky – sbblky, sl slty i.p., non calc, tr micromic	
						CLST: olv gry – brn gry, sft – frm, pred frm, Blky – sbblky, sl slty i.p., non calc, tr micromic	
			▌			**SST:** lt olv gry – olv gry, clr – trnsl qtz gr, pred f – med, ang – sbang, i.p. arg mtx, lse arg mtrx, carb i,.p., abd micromic, tr glauc	a.a
			▌			**SST:** a.a, v arg, arg mtrx	a.a

STATOIL

CONVENTIONAL CORE DESCRIPTION

Country: Norway	**Area:** Barents Sea	**Field:** Valkyrie
Well no: 6608/11-5	**Formation:** Åre Formation	
Core no: 1	**Interval**: 1559–1574mMD	**Cored:** 15 m **Rec:** 12.8m 85.3 %
Core size: 4”	**Geologists:** JT Samlanes/BE Paulsen	**Date**: 29.06.2006

Depth (mRKB)	Lithology/Grain size (cly slt vf f m c vc)	APPARENT DIP	Shows: STAIN	FLUOR	CUT	POOR	FAIR	GOOD	Lithological Description (Rock name, mod. lith., colour, grain size, sorting, roundness, matrix, cementation, hardness, sed. struct.,accessories, fossils, porosity, contamination)	Remarks (Shows, etc)
1570									**CLST:** med dk gry – dk gry, sft – frm, occ hd, blky – sbblky, slty, carb i.p., non calc, micromic	
1571	M G C								**SST:** lt olv gry – olv gry, clr – trnsl qtz gr, pred f – med, ang – sbang, i.p. arg mtx, lse arg mtrx, carb i,.p., abd micromic, tr glauc	No direct fluor. Yelsh, mlky wh v wk cut flur
1571.8									**CLST:** brnsh gry – olv gry, sft – frm, pred sft, stky i.p., blky i.p., slty, sl calc, micromic	
1573									No recovery from 1571.8m to 1574m	
1574										

cly slt vf f m c vc

App F Other reports

Title	Company
Location survey at Valkyrie planned Well Location 6608/11-5	Fugro Survey AS
Well Program PL128, Well 6608/11-5, Valkyrie	Statoil
PL 128 – Borestartsnotat brønn 6608/11-5, Valkyrie segment 1	Statoil
Location Report Valkyrie Planned Well Location 6608/11-X & 6608/11-Y	Fugro Survey AS
Permanent P&A Programme, Well 66608/11-5, Valkyrie 1	Statoil
Data Description; Well 6608/11-5 Valkyrie, Logs files; Processing of FMI Images	Schlumberger
Data Description; Well 6608/11-5 Valkyrie VISION Resistivity – Dual Frequency RM MD Periscope Resistivity - Dual Frequency RM MD	Schlumberger
Navigation and Positioning to 6608/11-5 Valkyrie	Fugro Survey AS
Zero Offset VSP Survey, Well 6608/11-5 Valkyrie	Schlumberger
Final LWD Data , Well: 6608/11-5 Valkyrie	Baker Hughes Inteq
Processed FMI data Well: 6608/11-5 Valkyrie	Schlumberger
Wire line – Log Well 6608//11-5 Valkyrie CMR-HRLA-TLD-CNL-ECS-GR-ACTS-DSI-FMI-GR	Schlumberger
Corimag; Well 6608/11-5 Valkyrie; Depth:1559,00 – 1571,83 White light / UV-light	ResLab
Pre spud survey Valkyrie 6608/11-5 job nr 38100	Oceaneering
Kjerneboringsrapport Brønn 6608/11-5; Ocean Vanguard	Halliburton
End of Well Report Well 6608/11-5 (MWD)	Baker Hughes Inteq
End of Well Report Well 6608/11-5 (MWD, in progress)	Schlumberger
FMI image Structural Dip and Sedimentary Structures Analysis	Schlumberger
End of Well Report Well 6608/11-5 (Mudlogging)	Geoservices
Conventional Core Analysis Well 6608/11-5 Valkyrie	ResLab
Dry Well Evaluation Report, Exploration Well 6608/11-5	Statoil
Transfer & Qualification Of Reservoir Fluid Samples, 6608/11-5 Valkyrie 1	Altinex

7 Enclosures

7.1 Composite log (Statoil)

7.2 Formation Evaluation Log (Geoservices)

7.3 Pressure Evaluation Log (Geoservices)

STATOIL

Petoro AS, Norsk Hydro ASA, EM Norge AS

PARTNERS

WELL **6608/11-5**

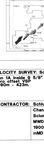
COMPOSITE LOG
1 : 500

PROJECT STRUCTURE

Valkyrie 1

AREA:	Norwegian Sea
LICENCE:	PL 128
COORDINATES:	68° 17' 08.5"N 09° 09' 55.4"E
ST:	6608/11-5
WATER DEPTH:	343.0 m MD
TOTAL DEPTH:	2270 m MD
SPUD DATE:	16.06.2006
RIG RELEASE:	16.07.2006
WELL STATUS:	P&A
RIG:	Ocean Vanguard
CONTRACTOR:	Diamond Drilling
GEOLOGIST:	J. E. Lee, J. T. Sandaves, S. E. Paulsen, L. C. Nilsson, A. Nolozd
PREPARED BY:	Espen Egil Pedersen

LOCATION MAP



CASING DATA		LEAK OFF TESTS	
SIZE	**LEAD in MD**	**SLOT**	**1.57 sg**
9" 5/8"	1202.0 m MD		

VELOCITY SURVEY: Schlumberger
Run 1A, Incline, 9 5/8" Gear
Shot Interval: 1000 - 2270 m
Sensor - Source Offset: 40.0 m

CONTRACTOR: Schlumberger / BHI (MWD)
Run 1 Schlumberger
Schlumberger
MWD from
1800-2270
mMD

LOG RUNS

Run	Date	Depth Interval	Hole Size	Comments
Run 1 - 9 5/8 - 1202m	Date: 16.06.2006	Depth Interval: 1202 - 2270 m MD	Hole Size: 8 1/2"	
		Run 1 - 9 5/8 - 1202m: 1202 - 1800 m MD	Hole Size: 8 1/2"	
		Run 2 - 9 5/8 - 1202m: 1800 - 2270 m MD	Hole Size: 8 1/2"	
		Run 1 - 9 5/8 - 1202m: 1202 - 1800 m MD	Hole Size: 8 1/2"	
		Run 2 - 9 5/8 - 1202m: 1800 - 2270 m MD	Hole Size: 8 1/2"	

Run 1 - 9 5/8 - 1202m
Run 2 - 9 5/8 - 1202m

COMMENTS

One core was cut in the Bøl Group, Are 1 Formation.

The well was permanently plugged and abandoned.

LITHOLOGICAL SYMBOLS

CONGLOMERATE
BRECCIA
COAL
GYPSUM
ANHYDRITE
SALT
CHERT
FLINT
CHALK
MARL
DOLOMITE
LIMESTONE
SILTSTONE
SANDSTONE
MUDSTONE
SHALE
CLAYSTONE
MARLSTONE
BASALT
TUFF
VOLC. BRECCIA
VOLCANIC ASH
PYROCLASTIC
IGNEOUS
METAMORPHIC
PLUTONIC
BASEMENT
OIL SHOW
GAS SHOW
LOST CIRCULATION
OIL FLARE
SHOW
CORE
DRILL STEM TEST
CORE SHOT
CORE SHOT
CORE SHOT

FORMATION EVALUATION LOG

Well : 6608/11-5

MA32_N1Q.PR1

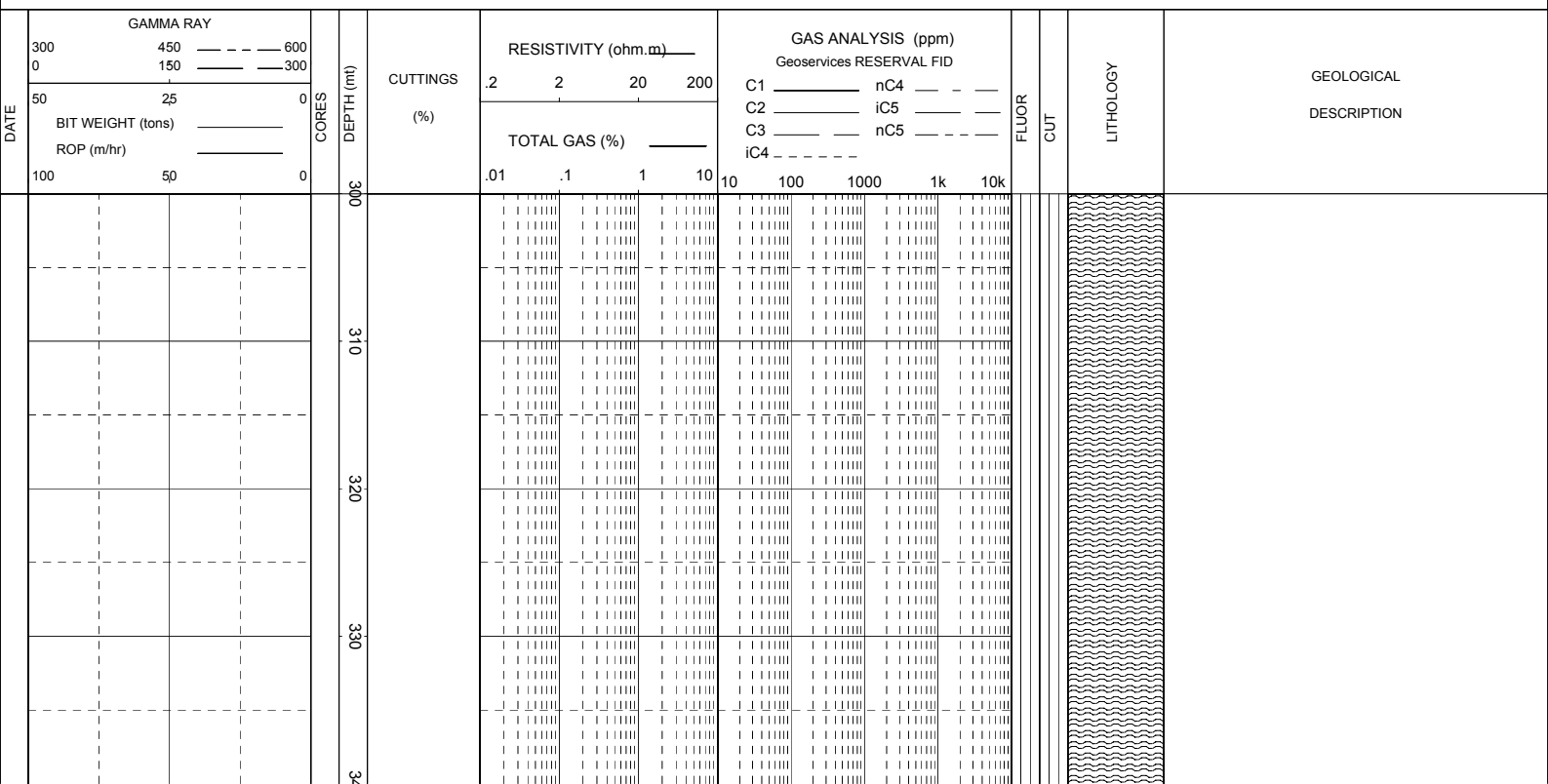
Well name	: 6608/11-5	Location lat	: 66 11' 09.60" N	Rig Name	: OCEAN VANGUARD
Client name	: STATOIL	Location long	: 08 28' 50.40" E	Rig Type	: Semi-Submersible
Field	: Valkyrie	UTM loc [N] (m)	: 7 340 923	Contractor	: Diamond Offshore
Country	: NORWAY	UTM loc [E] (m)	: 476 603		
Area	: Nordland II			Total Depth (m)	: 2270
Block	: 6608/11	Spud Date	: 18-06-2006	TVD (m)	: 2269.3
				RT - MSL (m)	: 22
		TD reached	: 05-07-2006	MSL - Seabed (m)	: 342
				Depth Reference	: Rotary table

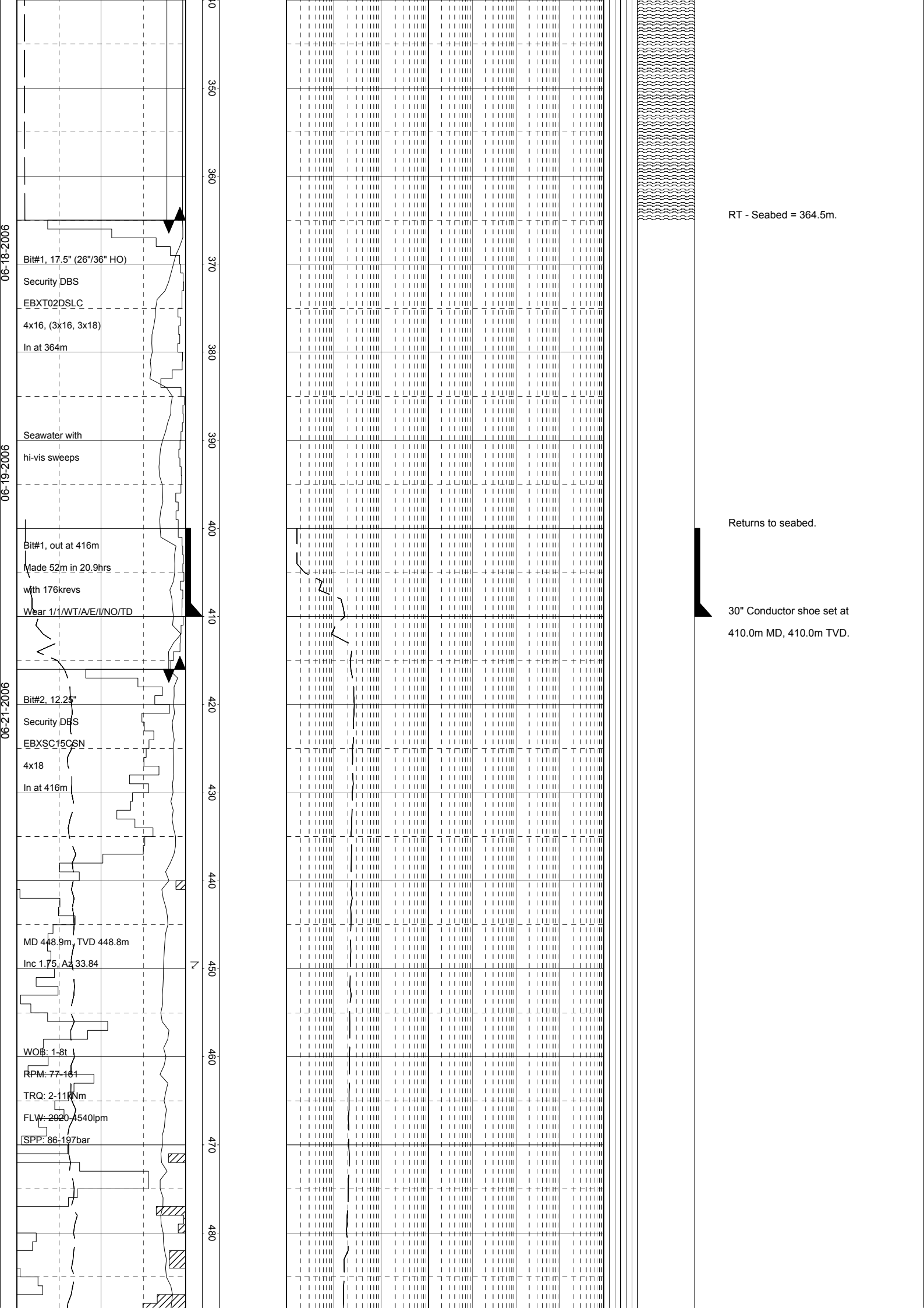
Plot Scale : 1/ 500

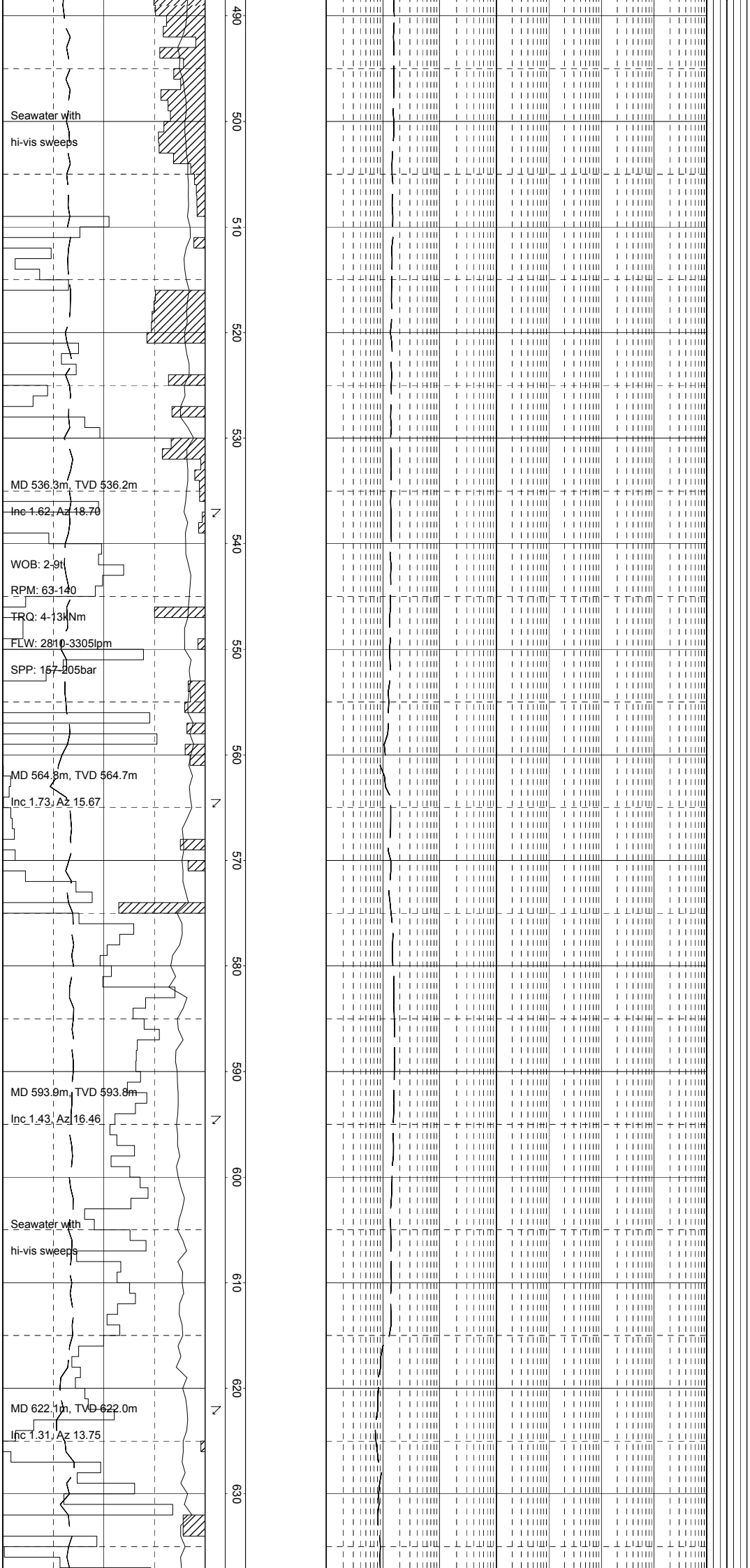
Limestone, re. Limestone rec, lime Mudstone, Wackestone, Packstone, Grainstone, Boundstone, Dolomite in, Sandstone in
fine Dolomite, Rocks fragments, Boulders, Cobbles, Sandstone in, f Sandstone fine, m Sandstone m, c Sandstone, do. Shale d
fine Sand, Silt s, Breccia in, Conglomerate i, silty Shale, sandy Shale, sandy Marl, Gypsum or a, Chert nodules
oo. Limestone, re.Limestone, co. Limestone, bi. Limestone, no. Limestone, ar. Limestone arg, si. Limestone si, Cargneule, Sand in
Quartzite, Diatomite, Radiolarite, ar. Silt argi, ar. Sandstone ar, ca. Sandstone ca, do. sandstone, ca. Sandstone ca, bi. Sandstone bi
gy. Shale gyp, bi. Shale bi, sa,ca Shale, ca,do Shale, sa,do Shale, sh. Sandstone, Coal in, Marl, silty Marl
Megafossils in ge, Algae in, Radiolaria, Sporomorphs, Tintinnids, Rudist fragments, Plant remains, Wood silicified, Fossils fragments

Mud loss, Mud gain, Deviation survey, Core, Sidewall Core, DST, FIT, RFT

Casing Shoe (b), TG Trip Gas, CG Pipe connection gas

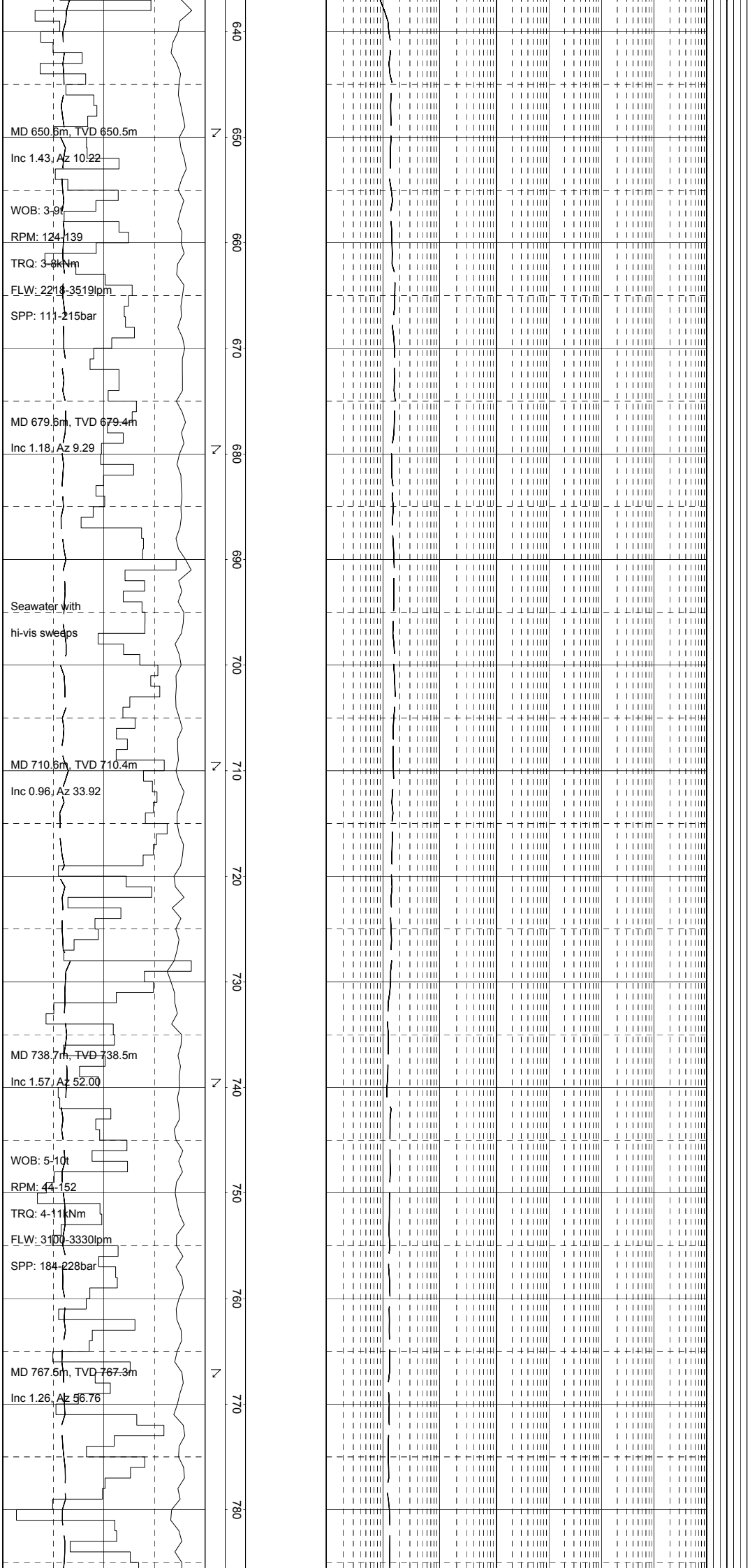



06-18-2006
06-19-2006
06-21-2006
Bit#1, 17.5" (26"/36" HO)
Security DBS
EBXT02DSLC
4x16, (3x16, 3x18)
In at 364m
Seawater with
hi-vis sweeps
Bit#1, out at 416m
Made 52m in 20.9hrs
with 176krevs
Wear 1/1/WT/A/E/I/NO/TD
Bit#2, 12.25"
Security DBS
EBXSC15CSN
4x18
In at 416m
MD 448.9m, TVD 448.8m
Inc 1.75, Az 33.84
WOB: 1-8t
RPM: 77-161
TRQ: 2-11kNm
FLW: 2920-4540lpm
SPP: 86-197bar
350
360
370
380
390
400
410
420
430
440
450
460
470
480
RT - Seabed = 364.5m.
Returns to seabed.
30" Conductor shoe set at
410.0m MD, 410.0m TVD.

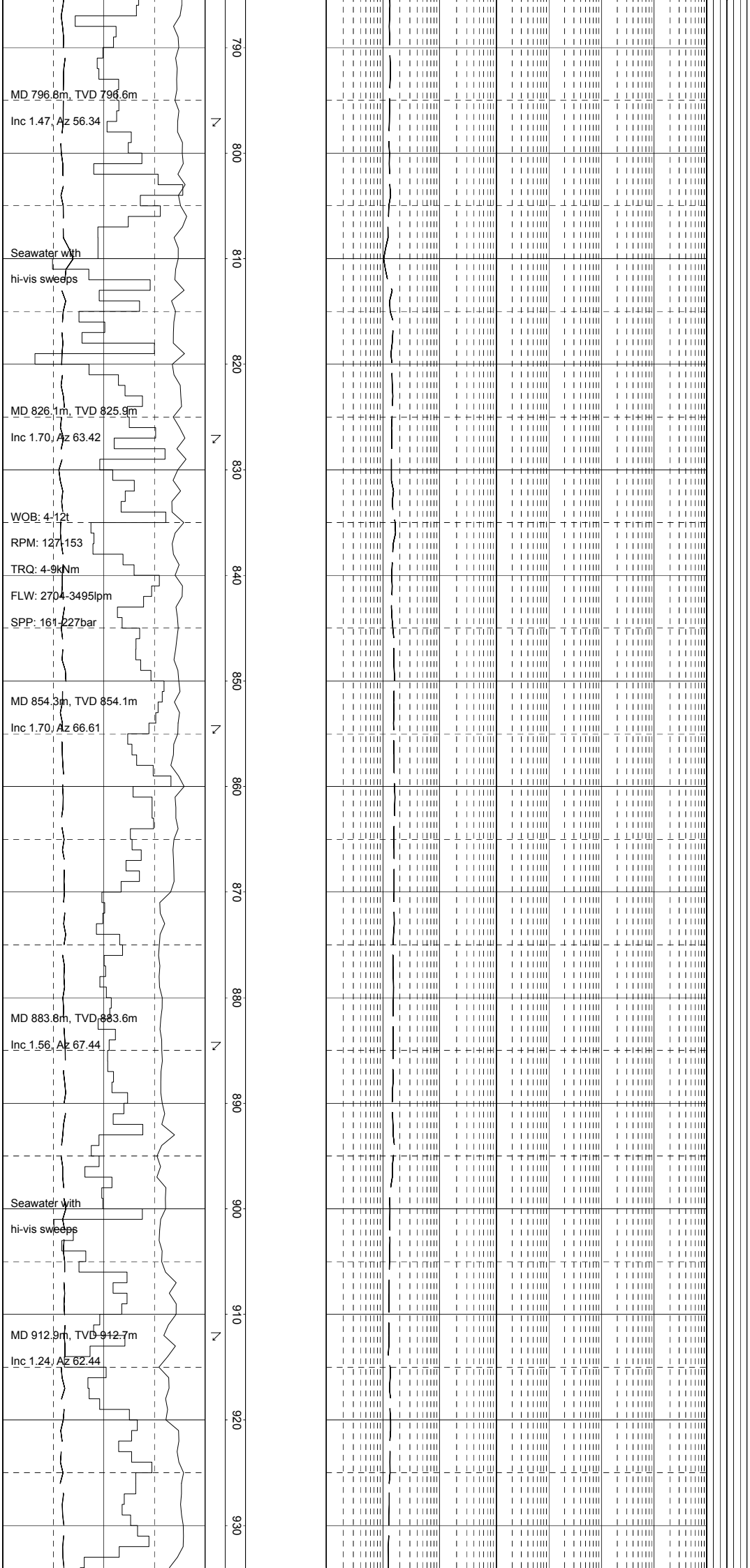


Returns to seabed.

Returns to seabed.



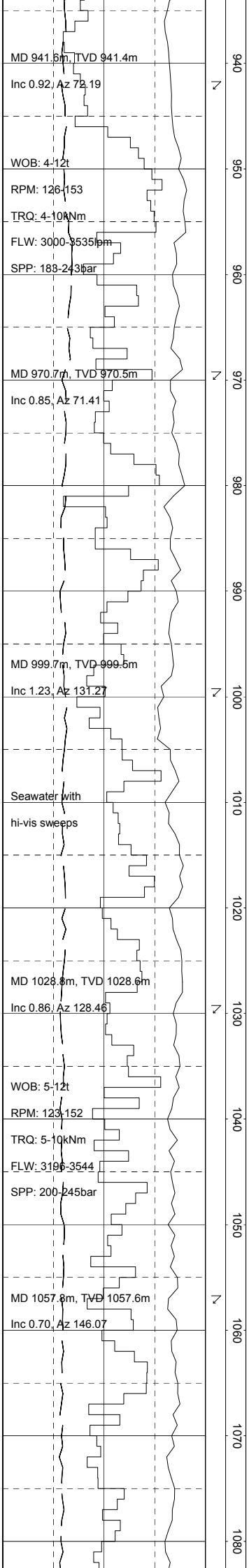
Returns to seabed.



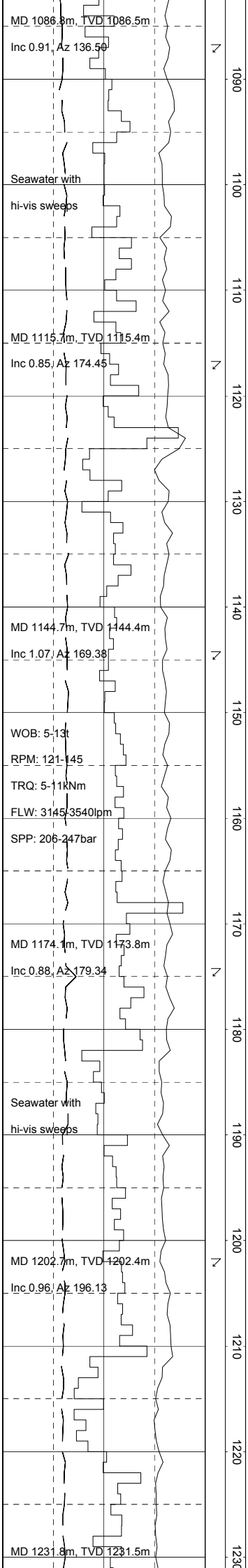
Returns to seabed.

Returns to seabed.

06-22-2006



Returns to seabed.



Returns to seabed.

Returns to seabed.

Inc 0.97, Az 159.07

WOB: 7-14t

RPM: 93-149

TRQ: 6-12kNm

FLW: 3295-3550lpm

SPP: 186-251bar

MD 1260.8m, TVD 1260.5m

Inc 0.93, Az 159.16

Seawater with

hi-vis sweeps

MD 1289.8m, TVD 1289.5m

Inc 0.70, Az 138.09

Bit#2, out at 1305m

Made 889m in 20.6hrs

with 181krevs

Wear 5/3/WT/M/E/I/NO/TD

Bit#3 Security DBS

FS2565Z, 8 1/2"

5x13

In at 1305m

1309.7 md, 0.63

inc, 147.86 azim,

1309.41md,

Mw 1.3 Pv 12

Yp 9.5 gel 7/11

1338.9md, 0.62

inc, 156.97 azm

1308.62 tvd

1368.1md, 0.56

inc, 156.06 azim

1367.82 tvd

Mw 1.3 Pv 10

Yp 12.5 gel 5/10

1240 1250 1260 1270 1280 1290 1300 1310 1320 1330 1340 1350 1360 1370

9 5/8 Casing shoe

Set at 1299 m TD 1299 m MD

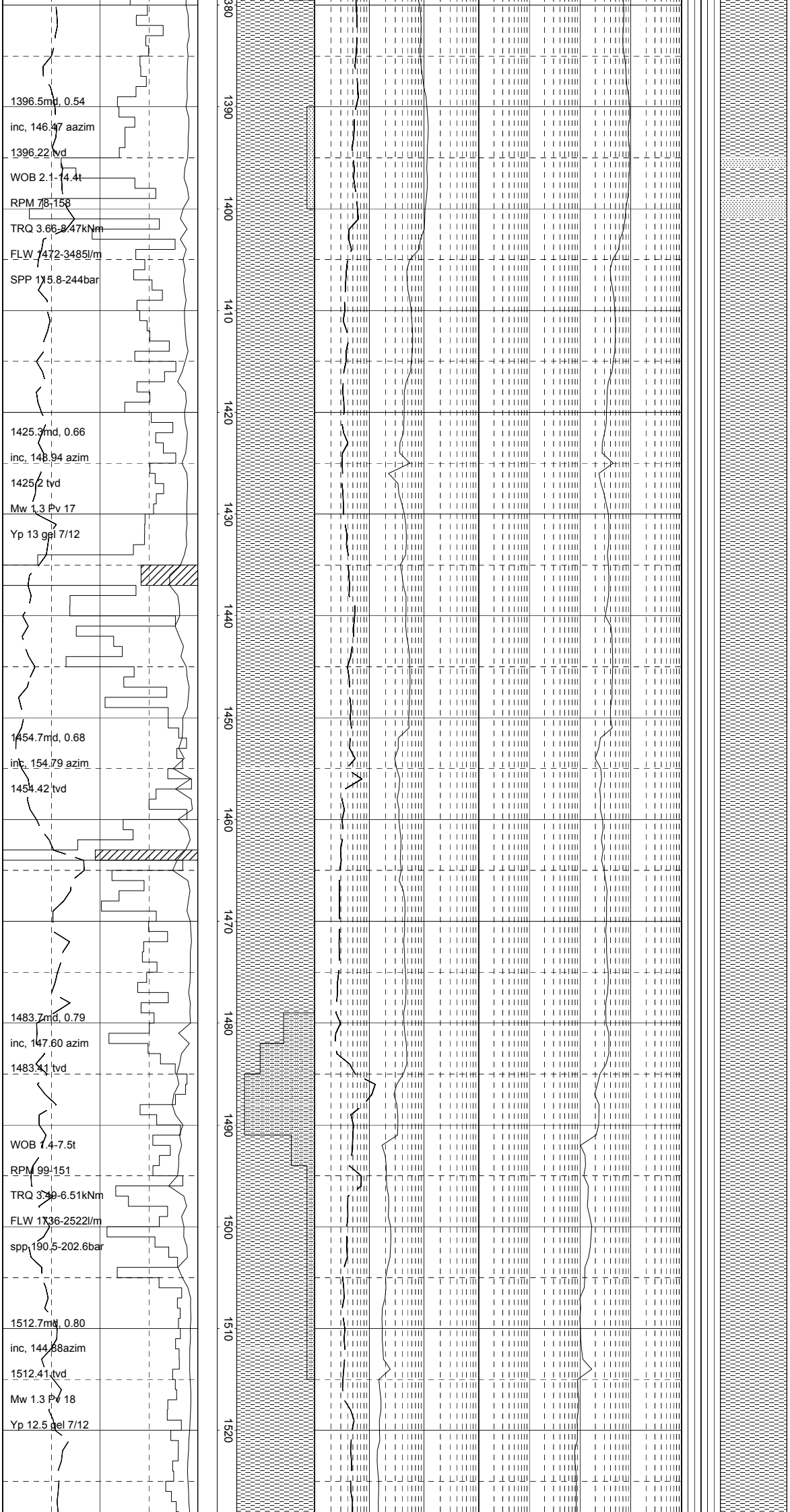
Returns to seabed.

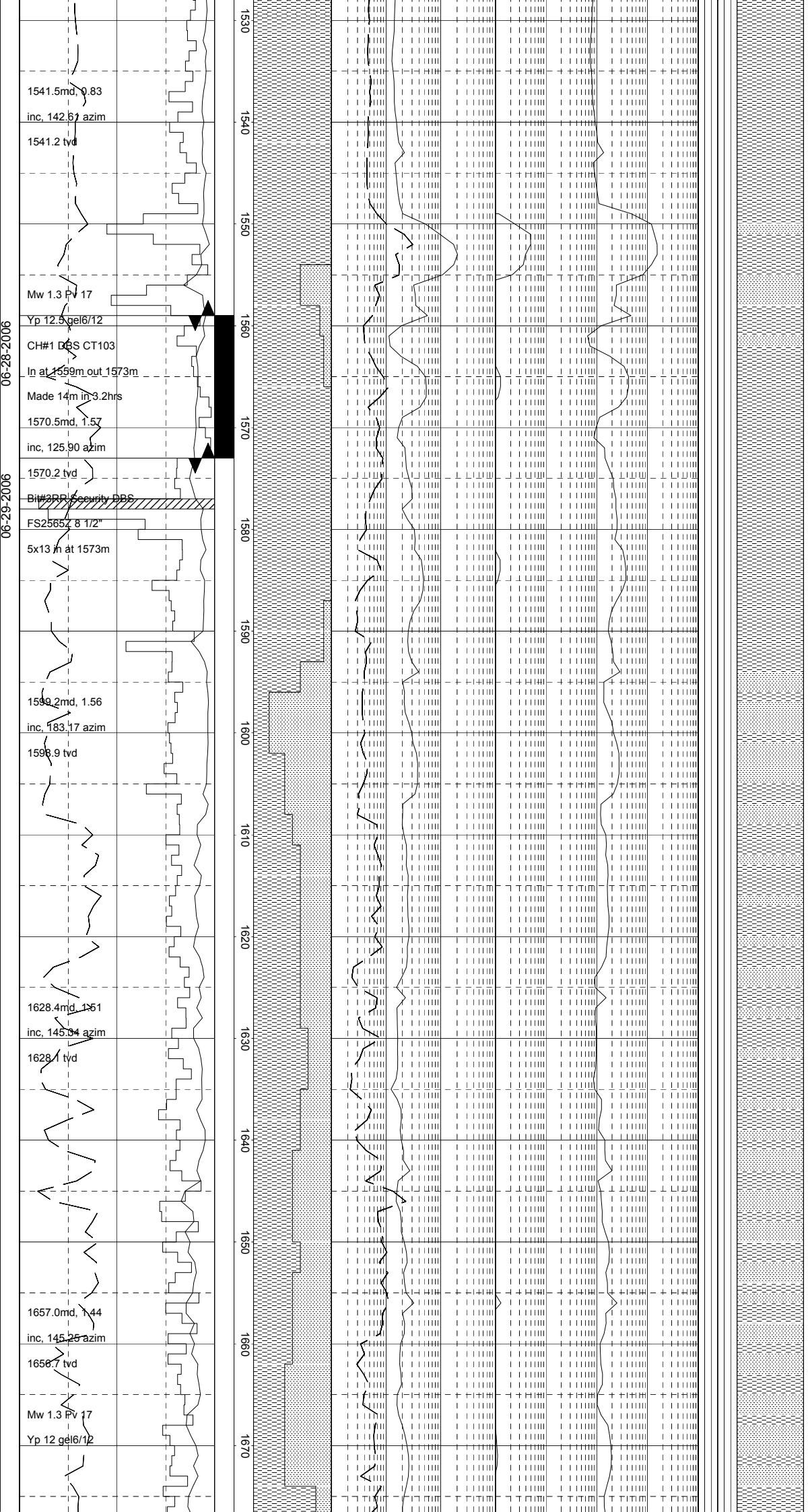
CLST: md dk gry- dk gry,olv gry-olv blk mod hd-hd, blky-sbblky, calc i.p

SST: clr-trnsl, vf-f, mod hd, wl srt, gr-slst i.p

CLST: med dk gry-med gry, sft-frm, blky, calc, glau i.p

06-27-2006


1396.5md, 0.54
inc, 146.47 aazim
1396.22 tvd
WOB 2.1-14.4t
RPM 78-158
TRQ 3.66-8.47kNm
FLW 1472-3485l/m
SPP 115.8-244bar
1425.3md, 0.66
inc, 148.94 azim
1425.2 tvd
Mw 1.3 Pv 17
Yp 13 gel 7/12
1454.7md, 0.68
inc, 154.79 azim
1454.42 tvd
1483.7md, 0.79
inc, 147.60 azim
1483.41 tvd
WOB 1.4-7.5t
RPM 99-151
TRQ 3.49-6.51kNm
FLW 1736-2522l/m
spp 190.5-202.6bar
1512.7md, 0.80
inc, 144.88azim
1512.41 tvd
Mw 1.3 Pv 18
Yp 12.5 gel 7/12
1380
1390
1400
1410
1420
1430
1440
1450
1460
1470
1480
1490
1500
1510
1520
CLST: grysh bl grn-lt bl grn, frm, ang, non calc
Tr SLTST: brn gry, sft, amor
Tr LS: weh, sft, amor, microxln, arg, nil-pr
CLST: dk gry, frm, ang, slty, calc
CLST: grysh bl grn-lt bl grn, frm, ang
Tr LS: wh, sft, amor, microxln, arg, nil-pr


06-28-2006
06-29-2006
1541.5md, 0.83
inc, 142.61 azim
1541.2 tvd
Mw 1.3 Pv 17
Yp 12.5 gel6/12
CH#1 DBS CT103
In at 1559m out 1573m
Made 14m in 3.2hrs
1570.5md, 1.57
inc, 125.90 azim
1570.2 tvd
Bit#3RR Security DBS
FS2565Z 8 1/2"
5x13 in at 1573m
1599.2md, 1.56
inc, 183.17 azim
1598.9 tvd
1628.4md, 1.51
inc, 145.04 azim
1628.1 tvd
1657.0md, 1.44
inc, 145.25 azim
1656.7 tvd
Mw 1.3 Pv 17
Yp 12 gel6/12
1530
1540
1550
1560
1570
1580
1590
1600
1610
1620
1630
1640
1650
1660
1670
Tr SST: clr-trnsl, crs, lse
qtz gr
CLST: md dk gry-dk gry,
olv gry-olv blk, md gry,
mod brn, sft-frm, sbblky, arg,
calc i.p
SST: clr-trnsl, crs, lse Qtz gr
CLST: md dk gry-dk gry,
olv gry-olv blk,
md gry, mod brn, sft-frm,
sbblky, arg, Tr Calc and Glauc
SST: clr-trnsl, crs, lse Qtz gr

06-30-2006

1686.4md, 1.53
inc, 146.78 azim
1686.1 tvd

1715.5md, 1.53
inc, 137.40 azim
1715.2 tvd

1743.7md, 1.62
inc, 131.43 azim
1743.3 tvd

WOB 0.1-10t
RPM 110-153
TRQ 4.1-7.3kNm
FLW 2100-2481l/m
SPP 202-213bar

1773.1md, 1.64
inc, 128.25 azim
1772.7 tvd

Mw 1.30 Pv 17
Yp 12 gel6/11

1802.0md, 1.667
inc, 127.00 azim
1801.6 tvd

1680
1690
1700
1710
1720
1730
1740
1750
1760
1770
1780
1790
1800
1810
1820

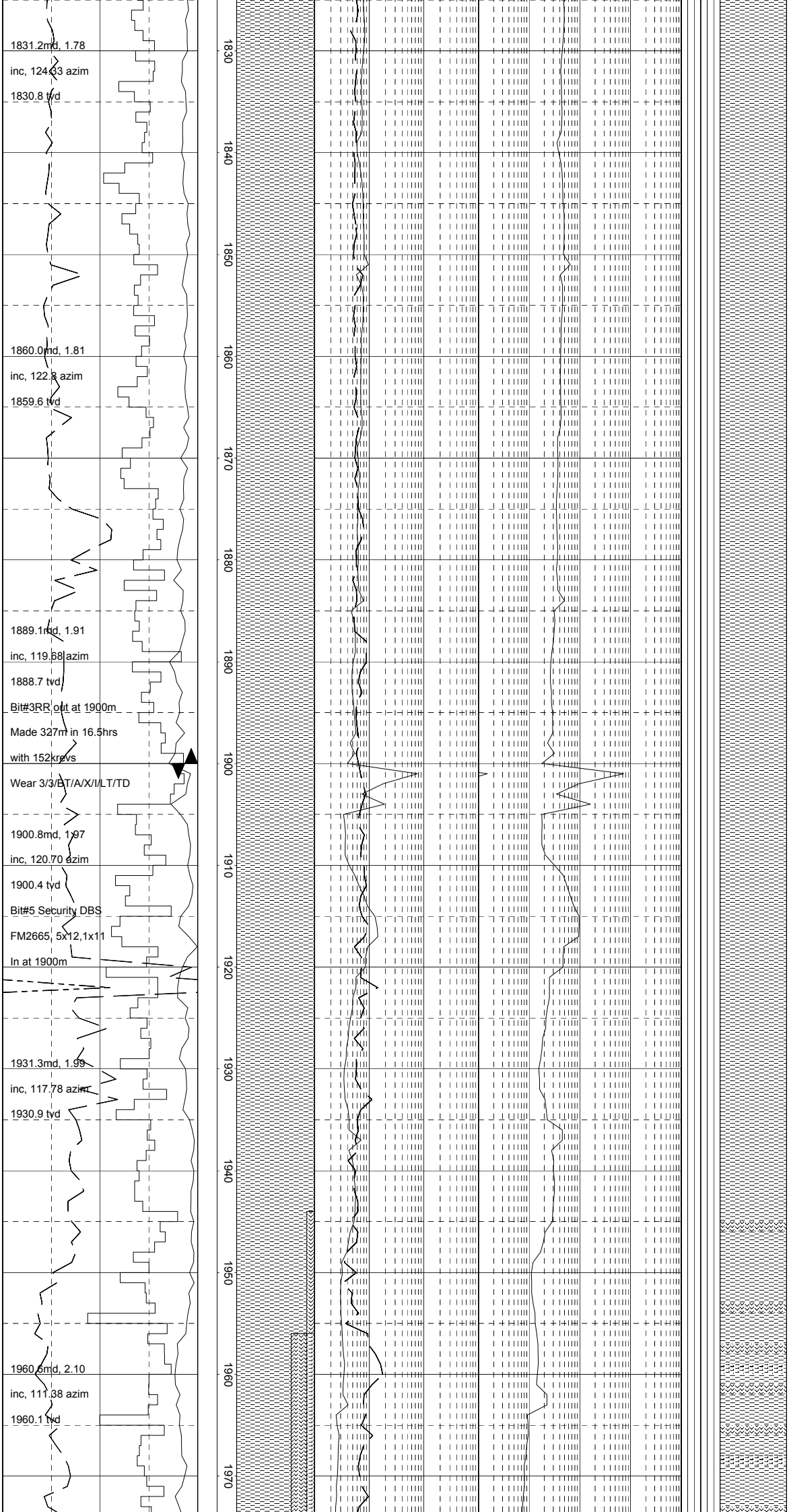
CLST: md gry-dk gry, olv gry, dk grnsh gry, sft-frm, sbblky, calc i.p

LS: wh, hd, amor, arg

CLST: md gry-dk gry, olv gry, dk grnsh gry, lt brn-mod brn, sft-frm, sbblky, calc i.p

CLST: lt brn, dk grnsh gry, sft-frm, blky, calc

Tr LS: wh, sft-mod hd, amor,



arg, slty

CLST: lt brn, dk grnsh gry, sft-frm, blky

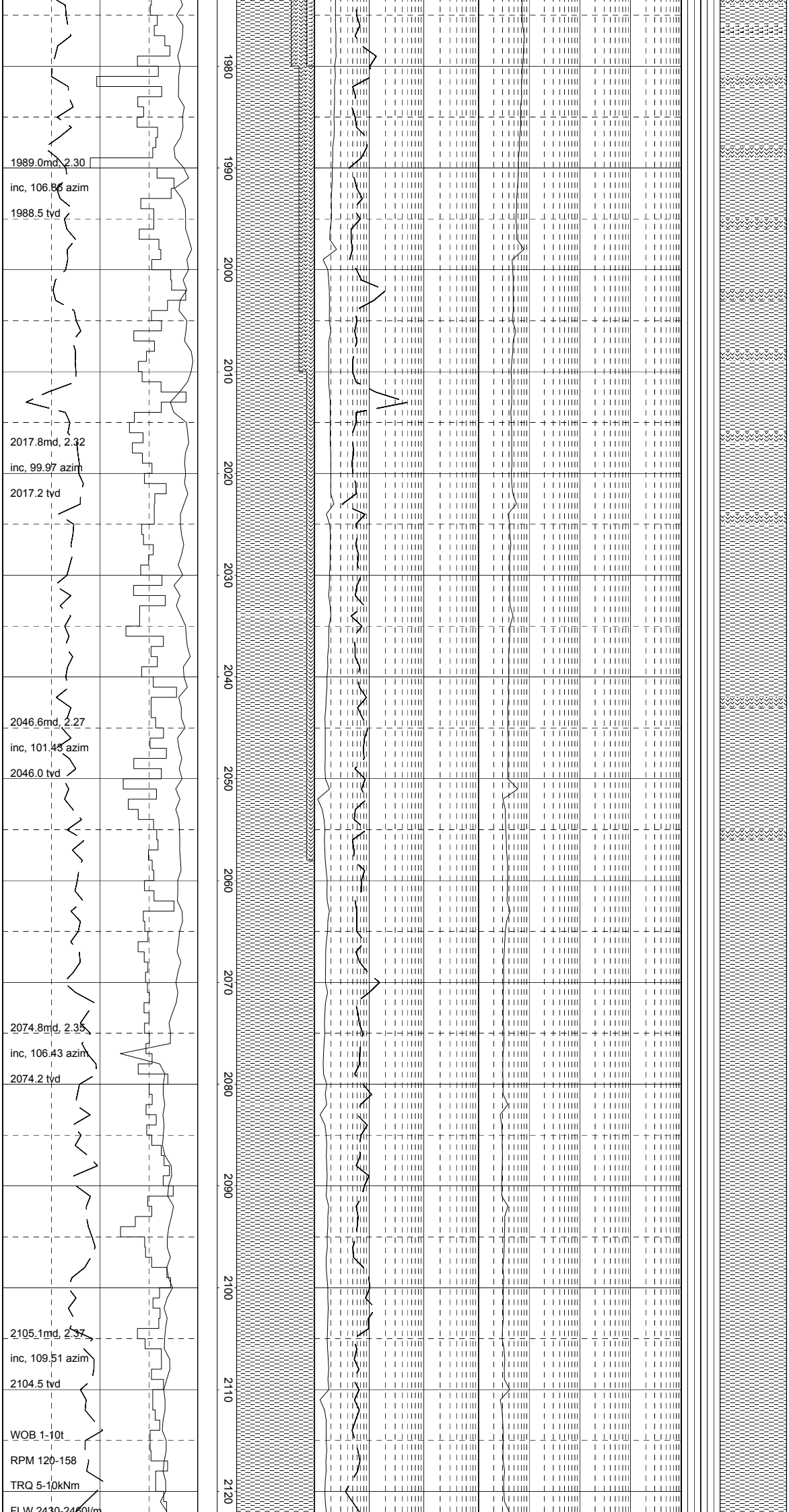
Tr LS: wh, sft-mod hd, amor, arg, slty

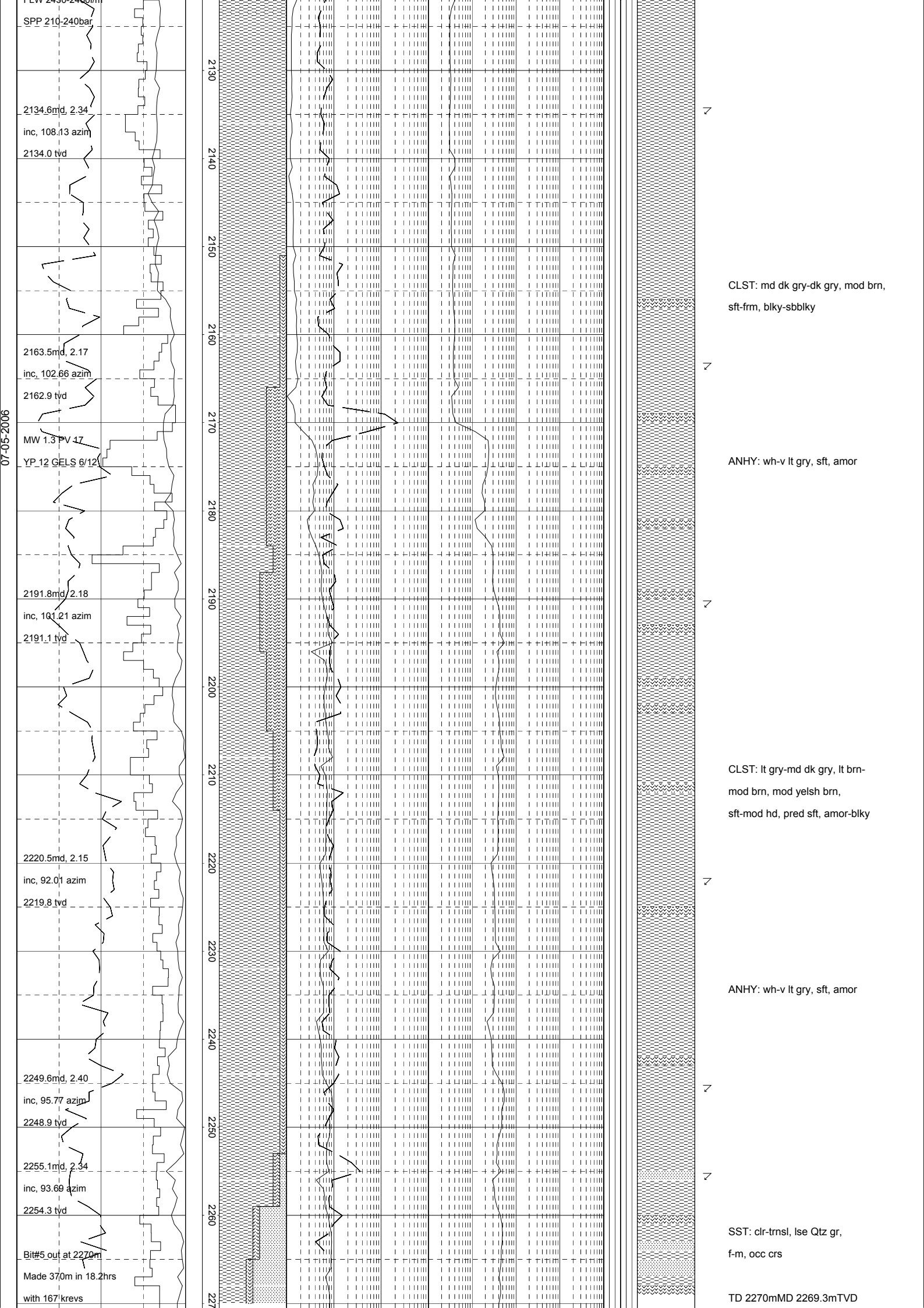
CLST: lt gry-md dk gry, lt brn-mod brn, mod yelsh brn, sft-mod hd, sbblky, calc i.p

ANHY: wh-v lt gry, sft, amor

SA: wh, hd, amor

07-04-2006


1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
2110
2120
1989.0md, 2.30
inc, 106.86 azim
1988.5 tvd
2017.8md, 2.32
inc, 99.97 azim
2017.2 tvd
2046.6md, 2.27
inc, 101.43 azim
2046.0 tvd
2074.8md, 2.35
inc, 106.43 azim
2074.2 tvd
2105.1md, 2.37
inc, 109.51 azim
2104.5 tvd
WOB 1-10t
RPM 120-158
TRQ 5-10kNm
FLW 2430-2460l/m
CLST: lt gry-md dk gry,
dk grnsh gry, lt brn-mod brn,
dk yelsh brn, lt blsh gr,
sft-frm, sbblky, calc
ANHY: wh-v lt gry, sft, amor
CLST: lt gry-md dk gry,
dk grnsh gry, lt brn-mod brn,
dk yelsh brn, sft-frm, sbblky,
calc
CLST: lt gry-md dk gry,
dk grnsh gry, lt brn-mod brn,
dk yelsh brn, sft-frm, sbblky,
calc


07-05-2006
PLW 2430-2480m
SPP 210-240bar
2134.6md, 2.34
inc, 108.13 azim
2134.0 tvd
2163.5md, 2.17
inc, 102.66 azim
2162.9 tvd
MW 1.3 PV 17
YP 12 GELS 6/12
2191.8md, 2.18
inc, 101.21 azim
2191.1 tvd
2220.5md, 2.15
inc, 92.01 azim
2219.8 tvd
2249.6md, 2.40
inc, 95.77 azim
2248.9 tvd
2255.1md, 2.34
inc, 93.69 azim
2254.3 tvd
Bit#5 out at 2270m
Made 370m in 18.2hrs
with 167 krevs
2130
2140
2150
2160
2170
2180
2190
2200
2210
2220
2230
2240
2250
2260
CLST: md dk gry-dk gry, mod brn,
sft-frm, blky-sbblky
ANHY: wh-v lt gry, sft, amor
CLST: lt gry-md dk gry, lt brn-
mod brn, mod yelsh brn,
sft-mod hd, pred sft, amor-blky
ANHY: wh-v lt gry, sft, amor
SST: clr-trnsl, lse Qtz gr,
f-m, occ crs
TD 2270mMD 2269.3mTVD

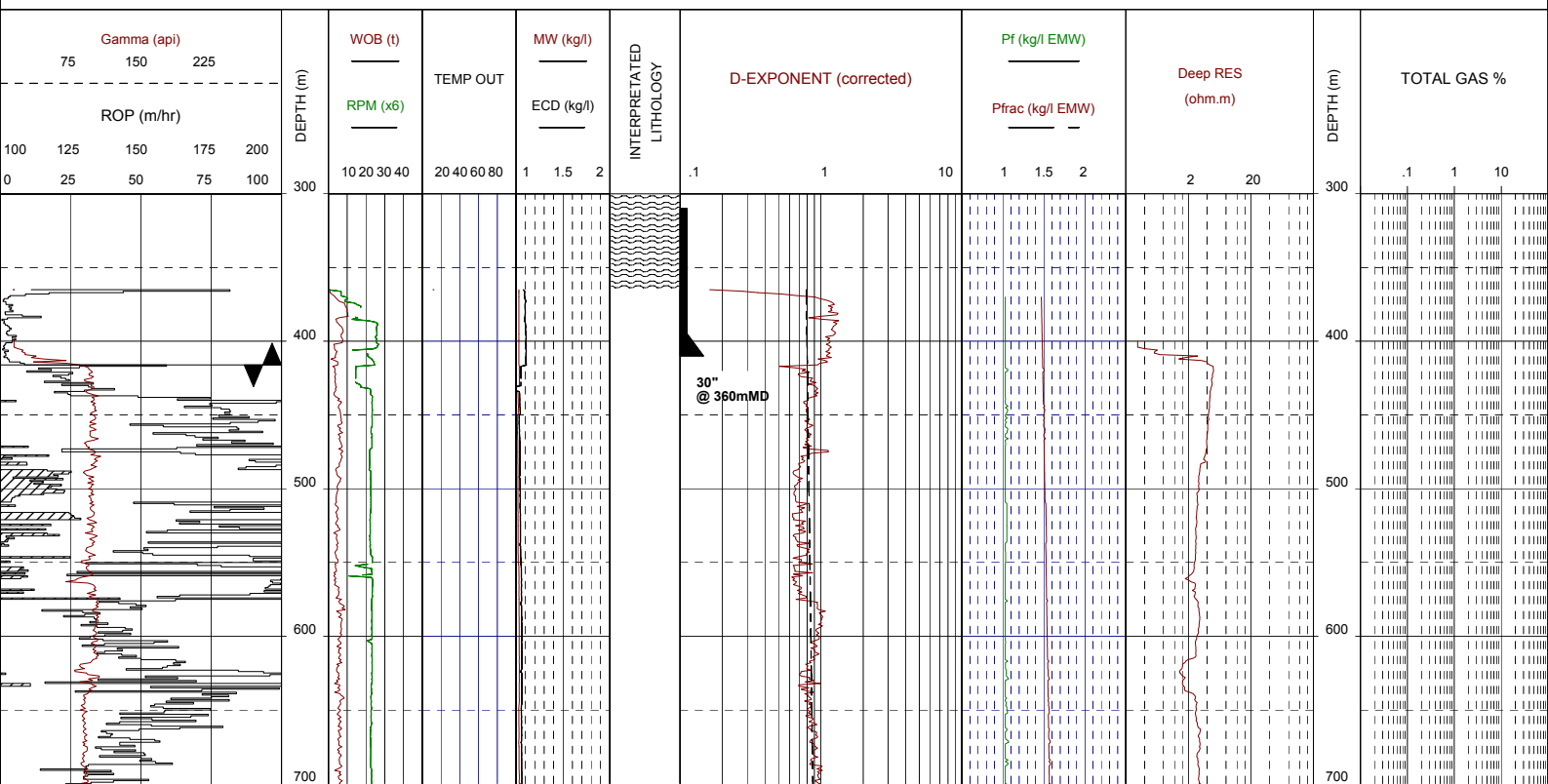
PRESSURE EVALUATION LOG

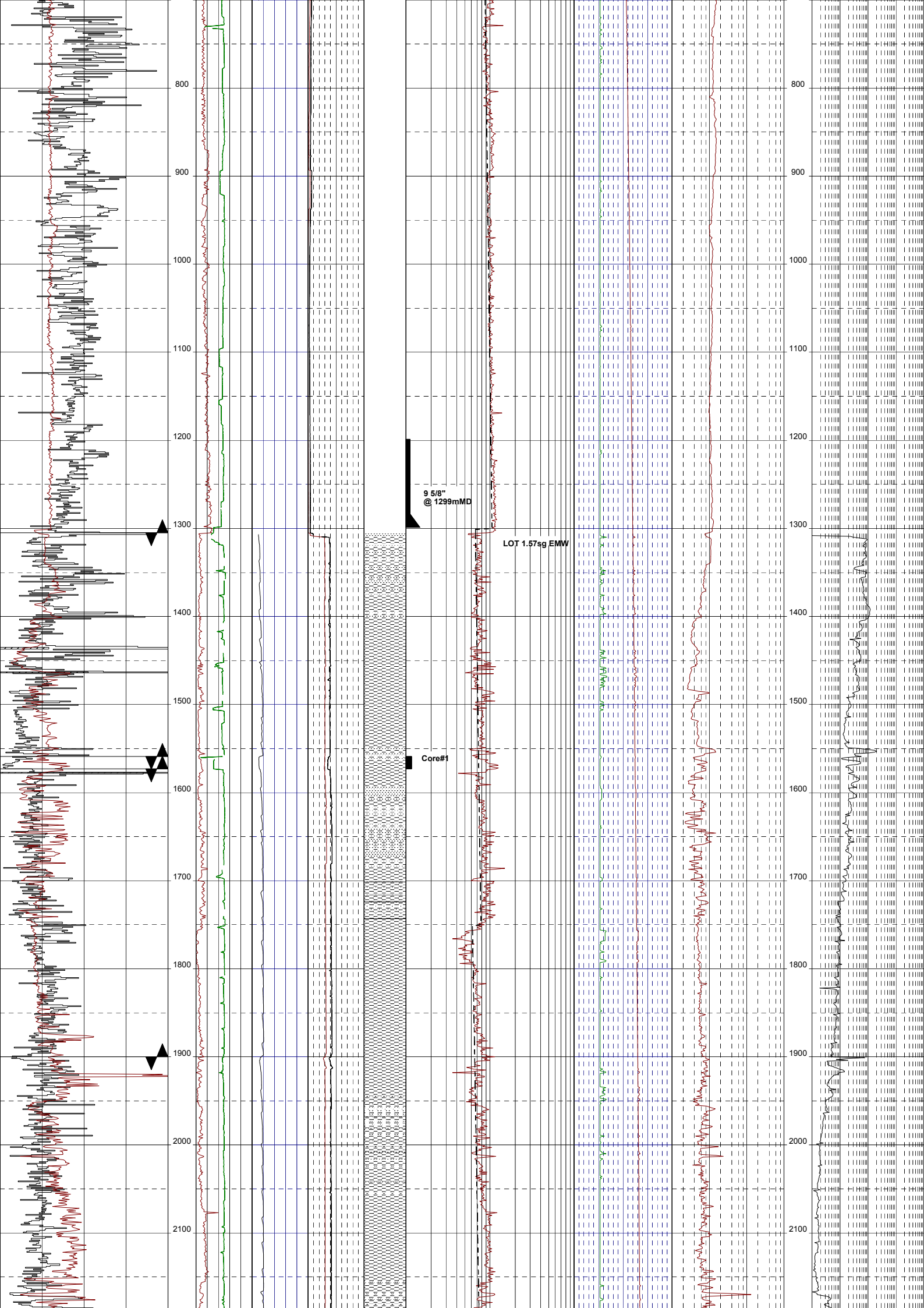
Well : 6608/11-5

FROM :(mt) 300 TO :(mt) 280 SCALE : 1/ 5000

Well Name	: 6608/11-5	Location	: 08 28' 50.600" 66 11' 09.500"	Rig Name	: OCEAN VANGUARD
Company Name	: STATOIL	Country	: NORWAY	Rig Type	: Semi-Submersible
Depth Reference	: Rotary Table	Final TD (m)	: 2270.0	UTM coordinate N (m)	: 7 340 923
Permit	: PL128	Final TVD (m)	: 2269.3	UTM coordinate E (m)	: 476 603
RT - MSL (m)	: 22	Spudded	: 18-06-2006	Field	: Valkyrie
MSL - Seabed (m)	: 342	TD Reached	: 05-07-2006	Area	: Nordland II

Limestone, re. Limestone r, lime Mudstone, Wackestone, Packstone, Grainstone, Boundstone, Dolomite in, Sandstone in
fine Dolomite, Rocks fragments, Boulders, Cobbles, Sandstone, f Sandstone fi, m Sandstone me, c Sandstone, do. Shale
fine Sand, Silt, Breccia, Conglomerate, silty Shale, sandy Shale, sandy Marl, Gypsum or, Chert nodules
oo. Limestone, re.Limestone, co. Limestone, bi. Limestone, no. Limestone, ar. Limestone a, si. Limestone, Cargneule, Sand
Quartzite, Diatomite, Radiolarite, ar. Silt ar, ar. Sandstone a, ca. Sandstone c, do. sandstone, ca. Sandstone c, bi. Sandstone
gy. Shale g, bi. Shale, sa,ca Shale, ca,do Shale, sa,do Shale, sh. Sandstone, Coal, Marl, silty Marl
Megafossils in, Algae, Radiolaria, Sporomorphs, Tintinnids, Rudist fragment, Plant remains, Wood silicified, Fossils fragmen
Deviation surve, Mud loss, Mud gain, Shoe, Core, Sidewall Core, FIT




800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
9 5/8"
@ 1299mMD
LOT 1.57sg EMW
Core#1

2200
2200