A/S NORSKE SHELL E&P

TANANGER

DRILLING PROGRAMME

LOCATION 31/2-P

(WELL 31/2-15)

RIG: BORGNY DOLPHIN

27.07.84.

A/S NORSKE SHELL
LICENCE 054

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A/S NORSKE SHELL
LICENCE 054

NORSKE SHELL E&P, FORUS.

DRILLING PROGRAMME

CONFIDENTIAL

LOCATION: 31/2-P
WELL: 31/2-15
RIG: Borgny Dolphin

PRODUCTION LICENCE No.: 054
ESTIMATED DAYS: 64 (incl. prod. test).

CO-ORDINATES OF LOCATION
60 deg 55' 25.58" N
03 deg 34' 02.50" E

DERRICK FLOOR ELEVATION: 25 M. ABOVE MSL; 368 M. ABOVE SEA BED

HOLE SIZE (INS)	HOLE DEPTH (metres) / Casing depth	CASING SIZE/WT/GRAD/CPLG	CEMENT Req'd on Board (Tons)	CEMENT Type/Mixwater	CEMENT REMARKS	MUD S.G. (PSI/1000')	MUD REMARKS	LOGGING
36"	470/ 460	30"/1"WT/310/X-52 ATD-RB/ST-2	150	Class"G" S'water	See Enclosure 2A	1.03 (445)	Seawater + Viscous Pills (+/- 100 MF)	None
26" See note 3	810/ 800	20"/129/X-52 Vetco LS-LH	220	Class"G" S'water	See Enclosure 2B	1.03 (44)	Gelled seawater + viscous pills	(In 14-3/4" pilot hole) ISF/SONIC/SP/GR (GR to seabed) LDT/CNL/CAL/GR
17-1/2"	1460/ 1450	13-3/8"/72/N80/BTC	150	Class"G" F'water	See Enclosure 2C	1.26 (545) to 1.35 (585)	KCL/Polymer system KCL: +/_ 35 ppb MF: 50-60 secs PV/YP: 20-25/15-20 WL: Less than 10 ccs	ISF/SONIC/SP/GR LDT/CNL/CAL/GR
12-1/4" See note 8	1675/ 1665	9-5/8"/47/N-80/ BTC	100	Class"G" F'water	See Enclaoure 2D	1.21 (524)	Non-damaging calcium chloride/ calcium carbonate	ISF/SONIC/SP/GR LDT/CNL/CAL/NGT MSFL/DLL/CAL/SP/GR SHDT RFT's (as required) Velocity Survey SWS (as required) CBL (on 13-3/" and 9-5/8" casing)

FORMATION TOP	m. T.V. B.D.F
Seabed (Quarternary/Pliocene/ Miocene)	368 +/-1
Oligocene	679 +/-1(
Eocene	967+/-10
Balder Formation	1167+/-10
Paleocene	
Sele Formation	1229+/-10
Lista Formatin	1300+/-10
Upper Cretaceous (may be absent)	1471+/-10
Jurassic Sandstone	
*Top reservoir	1481+/-10
Zone I	1481+/-10
Zone II	1625+/-10
TD (approx.)	1675
*Primary Target	
Expected GOC	1571
Expected OWC	1582

NOTES:

1) All mud weights are to be adjusted in the light of hole problems (i.e. sloughing shales, high mud gas readings etc.).

2) Formation leak off tests are required below 20" and 13-3/8" casing shoes.

3) 14-3/4" pilot hole is to be drilled to 20" casing depth and logged for shallow gas prior to pulling the MR and opening the hole to 26".

4) Cutting Collection: Every 10 m below the 30" casing shoe. Every 3 m below 13-3/8" casing.

5) Estimate pore pressure is +/-2280 psi at 1481 m BDF.

NOTES:

6) Coring is to commence from top of the reservoir in the Jurassic sandstone, and is to continue until just below top of continuous micaceous sands. Approximate interval to be cored is 1481-1561 m BDF.

7) Testing is subject to confirmation upon receipt of logs.

8) 9-5/8" casing will be set only if testing is required.

SIGNED BY
[signature]
PRODUCTION MANAGER

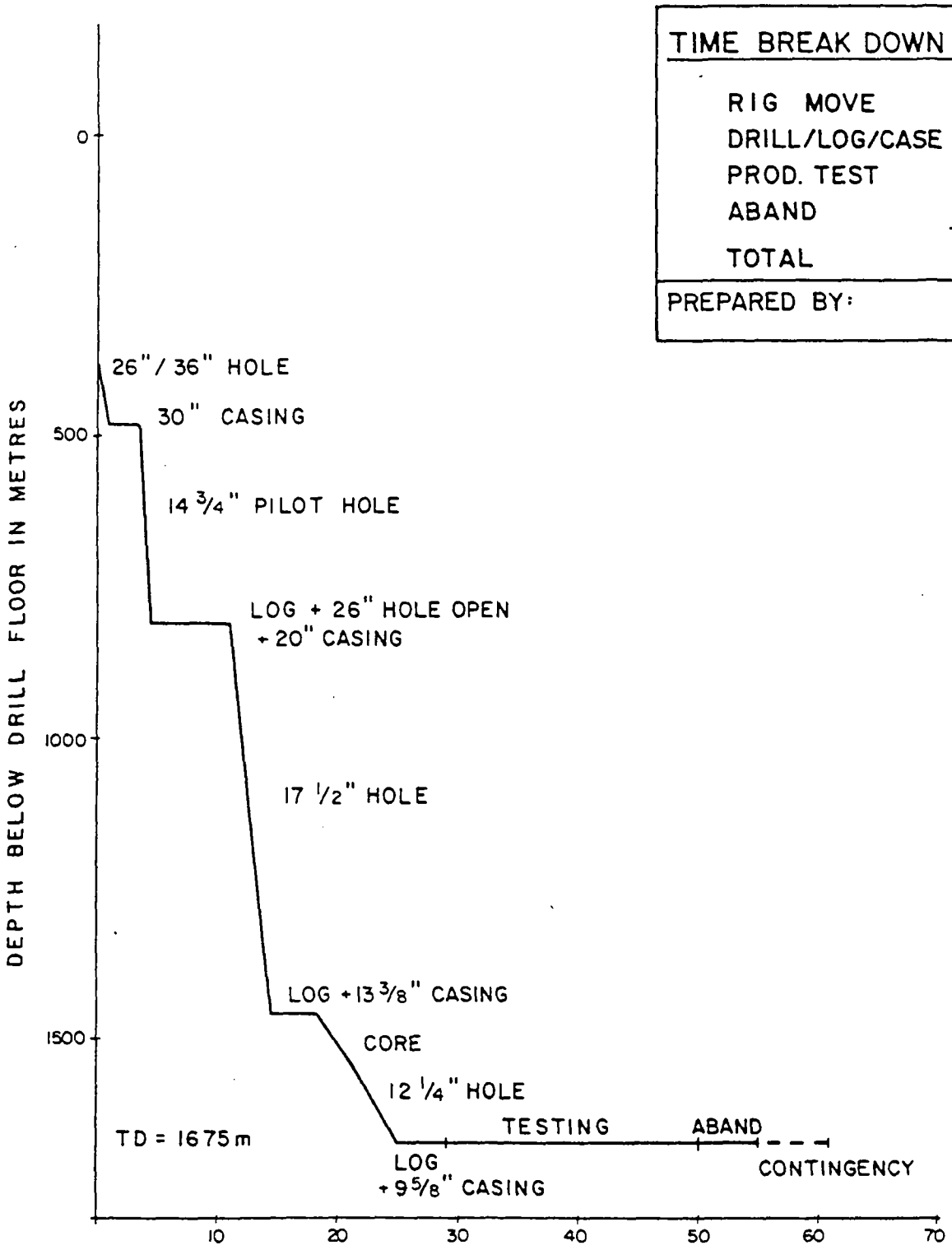
CHIEF PETROLEUM ENGINEER [signature] DATE: 27.07.84
Operations Supt. [signature] 27.7.84
HEAD OF DRILLING [signature] EPPP, FORUS. 27/07/84

TROLL WEST

DRILLING PROGRESS CURVE 31/2-P

TIME BREAK DOWN (DAYS)	
RIG MOVE	3
DRILL/LOG/CASE	29
PROD. TEST	21
ABAND	5
TOTAL	58

PREPARED BY:



A/S Norske Shell EXPLORATION & PRODUCTION FORUS	
TROLL WEST	
31/2-P	
DRILLING PROGRESS CURVE	
AUTHOR EPPP/11	FIG 1. DATE APRIL 84
REPORT NO NSEP 216	DRAWING NO G 1623/9

NHJ

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A/S NORSKE SHELL

DRILLING PROGRAMME - LOCATION 31/2-P

1. GENERAL

1.1 Location

a) A/S Norske Shell - Block 31/2 - Production Licence 054

b) Preliminary surface co-ordinates (centre of location) corresponding to SP 290 on seismic line 8007-154.

GEOGRAPHICAL	UTM (ZONE 31)
60 deg. 55' 25.58" N	NORTHING 6754590 M
03 deg. 34' 02.50" E	EASTING 530761 M

Tolerance: 25 meter radius from proposed location.

1.2 Base

Tananger Shore Base to Location 272 kms.
Bergen Shore Base to Location 124 kms

1.3 Depth References

a) All depths are given with respect to the rotary table (derrick floor) of the drilling vessel at the specified drilling draught.

b) The drilling draught will be ca. 21.0 m.

c) Expected water depth at location is +/- 343 m (MSL-seabed)

d) Distance from rotary table to MSL is taken as +/- 25 m for this programme but will be measured on site. Distance from rotary table to seabed is taken as +/- 368 m for this programme but will be measured on site.

1.4 Type of well

Appraisal well.

1.5 Total Depth

TD in Callovian Sandstones (Zone II), is anticipated to be +/- 1675 m BDF (+/- 1650 m SS).

1.6 Drilling Installation

"Borgny Dolphin" - Aker H-3 semi-submersible.

1.7 Objectives

a) To evaluate reservoir quality and development in the northern part of the Troll West accumulation.

b) To establish fluid contacts in the undrilled fault compartment to the west of 31/2-6.

c) To calibrate the seismic velocity model in the area to the west of 31/2-6.

1.8 Prognosis

Formation Tops	Lithology	Depth TVBDF (m) (Thickness m)	Seismic Tolerance (m)
Seabed (Quarternary-Pliocene-Miocene)	Clay, Claystones, Occasionally sandy.	368 (311)	+/- 1
Oligocene	Claystones.	679 (288)	+/- 10
Eocene	Claystones.	967 (200)	+/- 10
Balder formation	Claystones, Tuffaceous claystone.	1167 (62)	+/- 10
Paleocene			
Sele formation	Claystones,silty claystones.	1229 (71)	+/- 10
Lista formation	Claystones, silty. Marls.	1300 (171)	+/- 10
Upper Cretaceous	Mudstone,silty mudstone. Limestones.	1471 (0-10) (may be absent)	+/- 10
Jurassic Sandstones			
Top reservoir		1481	+/- 10
Humber group Zone I	Fine to coarse unconsolidated sandstone. Fine micaceous sandstone. Occasional carbonate cemented bands.	1481 (144)	+/- 10
GOC	Expected in Zone 1	1571	
OWC	Expected in Zone 1	1582	
Zone II	Fine to medium, sandstone. Siltstone. Occasionally strongly micaceous.	1625	+/- 20
TD	Zone II	1675 (approx.)	

1.9 Pressure Regime

Data gained from drilling, electric logging, RFT pressure measurements and production tests show that the wells drilled to-date in block 31/2 are hydrostatically pressured. (See enclosure 3)

The proposed location 31/2-P is some 4.9 km West/North West of 31/2-6 and 5.5 km South East of well 31/2-8 and is considered to be in the same hydrostatically pressured regime.

1.10 Mud Resumé

36" Hole

The 36" hole section is to be drilled with a seawater and viscous pill combination. Some 350 bbls of prehydrated bentonite viscous mud will be used to drill the first 10 - 20 m into seabed.

26" Hole

The 14-3/4" pilot hole for the 26" hole section is to be drilled with an unweighted gelled-seawater mud combined with the frequent spotting of viscous pills. The 14-3/4" pilot hole will be opened up to 26" using seawater and viscous pills, with the riser removed and returns to seabed. (See section 2.4).

NOTE : Prior to pulling out of the 14-3/4" pilot hole and 26" hole for logging and the running of 20" casing respectively, mud of 1.35 SG is to be spotted in the open hole section, to ensure hole stability.

17½" Hole

The 17½" hole section will be drilled with a KCL/Polymer mud system with a mud weight of 1.26 - 1.35 SG (.545 - .585 psi/ft).

NOTE : From experience gained on other vertical wells drilled in the block a mud weight of 1.35 SG was required to stabilize this hole section.

12-1/4" Hole

The KCl mud system will be displaced with a non-damaging calcium chloride/ chalk mud which will be used to drill to the 9-5/8" casing setting depth. A mud weight of 1.21 SG (0.524 psi/ft) will be required in this section.

NOTE : 1) Mud weights mentioned are a guide only and are liable to change if hole conditions dictate.

2) The mud weight used in the 12-1/4" hole will exert +/- 130 psi overbalance on top of the reservoir in the event of the riser being disconnected.

1.11 Well Control

A diverter will be hooked up to the riser during the drilling of the 14-3/4" pilot hole for 20" casing. In addition, 1.35 SG mud (.585 psi/ft) should be available during this diverter drilling in case flows are encountered. Cement will be available on the rig for use in an emergency. Pressure control will be maintained from the 20" casing point to TD in accordance with the well control policy manual EP 58000.

1.12 Deviation Control

Totcos are to be taken in 36", 26" and 17½" hole sections to coincide with bit trips only. A magnetic multi shot (M.M.S.) survey will be taken across the 17½" open hole section prior to running the 13-3/8" casing. The MMS survey will give both direction and inclination over the open hole, and inclination only inside the 20" casing. Magnetic single shots are to be taken in 12-1/4" hole sections at intervals not exceeding 100 m.

1.13 Casing Summary

Size	Grade	Weight	Coupling	Interval BDF	Casing requirements
30"	X-52,1"WT	310 lbs/ft	ATD-RB/ST-2	Seabed - 460 m	(91 m)
20"	X-52	129 lbs/ft	Vetco LS-LH	Seabed - 800 m	(432 m)
13-3/8"	N-80	72 lbs/ft	BTC	Seabed - 1450 m	(1082 m)
9-5/8"	N-80	47 lbs/ft	BTC	Seabed - 1665 m	(1297 m)

NOTE : 1) The 9-5/8" casing will only be set if the well is to be tested.

2) The 13-3/8", L-80, 72 lbs/ft, BTC casing has been specially drifted at the mill and will again be drifted on the pipe rack of the rig (before running) to ensure a 12-1/4" bit will pass.

1.14 Wellhead Equipment

Vetco SG-5 18-3/4", 10,000 psi wellhead equipment.

1.15 Formation Leak-off Tests

Leak-off tests will be made after drilling 5 metres of new hole below 20" and 13-3/8" casing shoes.

1.16 Casing Accessories

30" Float shoe.

20" Guide shoe (B & W Trico) and baffle collar one joint above shoe. Two spring centralizers on the shoejoint and 3 on the next 6 joints (one per two joints). Two spring centralizers equally spaced inside 30" conductor.

13-3/8" Float shoe + float collar one joint above shoe. 10 spring centralizers - 2 on shoe joint, 6 on the next 12 joints (one every second joint) and 2 inside 20" shoe, spaced 1 joint apart.

9-5/8" Float shoe + float collar 2 joints above the shoe. Two spring centralizers on the shoe track, 1 centralizer per joint up to the base of the OWC, no centralizers across the oil zone, 1 centralizer per joint up to the 13-3/8" shoe and 1 centralizer per 3 joints over the first 100 m of 9-5/8" inside the 13-3/8" casing.

1.17 Casing Test Pressures

Casing test pressures will be as follows:

20"	1000 psi for 15 mins
13-3/8"	2500 psi for 15 mins
9-5/8"	3500 psi for 15 mins

Pressure tests on the 20", 13-3/8" and 9-5/8" casings to be carried out immediately after bumping the top plug. The casing may be retested using an RTTS packer set below the top of cement around the particular casing if there is concern over the casing being worn.

1.18 Cement Calculations: See enclosure 2.

1.19 Contingency Plans - Stand-by vessel

The current A/S Norske Shell Exploration & Production Emergency Contingency Plans are valid for this drilling operation.

The name of the stand-by vessel which will be used is M/V "Myrevåg".

2. SUMMARY OF OPERATION

2.1 Pre-Spud Phase

Site Survey

2.1.1 Objectives

A site survey for location 31/2-P has been carried out by Aqua Tronic.

The Site Survey report was not available at the time of issue of the programme, and will be issued as a separate report before start of drilling.

2.2 Rig Positioning

The rig will be brought on to location utilizing SYLEDIS equipment. All anchors will be run out plus/minus 1400 m. The rig will be positioned with a heading of 290 deg True North. After anchors have been set, each anchor will be tested to plus/minus 400,000 lbs for 1 hour. After a satisfactory mooring test, approximately 250,000 lbs tension will be maintained on all anchor chains.

2.3 Spudding in, drilling 36" hole and running 30" Casing

2.3.1 Check the seabed condition by lowering underwater TV on the guide lines prior to setting the TGB on seabed.

2.3.2 Set TGB (with 5 m skirt). A Regan slope indicator is to be run on the TGB running tool to give an indication of the TGB angle. The TGB guide lines are to be marked at the spider deck level so that any subsequent sinking or tilting will be detected.

NOTE : Calculate the DF - seabed distance and Mean Sea Level (MSL) after tagging seabed, taking into account the drilling draught and tidal variation.

2.3.3 Make up a 36" hole opener and 26" pilot bit assembly. Spud the well using approximately 350 bbls of viscous mud for the first 5 - 10 m and drill down to 30" casing setting depth with seawater and viscous pills. Take a survey (Totco) after the first kelly down. Additional surveys will be carried out as necessary, depending on hole angle. If hole angle is greater than 1½ degree then contact Base.

Before POH to run 30" casing circulate high viscosity mud (60 MF) in the hole, using 100% excess.

2.3.4 Run 30" casing plus PGB equipped with a Regan slope indicator (to be installed in the middle of a side beam, as close to the beam as possible). Install a second Regan slope indicator on the 30" running tool. Ensure that the slope indicators are properly level and zeroed and will be visible on the subsea TV.

2.3.5 When the 30" casing is landed observe the angle with the subsea TV camera. If the angle is 1 degree or less, cement the casing using 150% excess cement. (For cement calculations see enclosure 2A.).

NOTE : If excessive cratering is observed, re-cementing around the guide base or seabed may be considered prior to drilling out of the 30" casing, or if this problem is anticipated, consideration given to using 300 % excess cement instead of 150 %.

2.3.6 WOC. RIH with jetting sub and wash in and around the wellhead housing. Divers to check around the guide bases with an observation dive, if thought necessary.

General

a) For the single stack system the angle of the PGB and the BOP stack, and the base being level, are of utmost importance and good support is required to carry the heavy load of the stack.

b) Observe operations such as placing of the TGB and PGB, spudding in, stabbing in, drilling with returns to seabed, cementing of the 30" and 20" casings, with the rig's underwater TV camera.

c) Adjust anchor tension to facilitate stabbing, running and cementing of the 30" casing.

d) Ensure that the tension of the guide lines is optimum so that the TGB will not be lifted on one side or be tilted by excessive uneven guide line tension.

e) In previous wells, the guide bases have sunk into the soft sea bed when landing the 30" casing/PGB. In the case that this phenomena is observed, the 30" casing should be kept in tension whilst cementing and W.O.C.

2.4 Drilling 26" hole and running 20" casing

2.4.1 Drill out cement in 30" casing and 36" pocket with 26" hole opener and 14-3/4" pilot bit with a stabilizer at 20 m and start 14-3/4" pilot hole. POH and lay down 26" hole opener and stabilizer.

2.4.2 Run 30" hydraulic latch and dump valve complete with ball joint on 21" riser. Fill up riser with seawater and observe fluid level.

2.4.3 Make up 14-3/4" pilot hole drilling assembly. Use a float sub, with the float installed, and run in hole.

2.4.4 Close diverter around drill pipe, and circulate through both diverter lines to check the diverter equipment, gradually building up to maximum circulating rate. Open diverter packing.

2.4.5 Drill 14-3/4" pilot hole to the 20" casing setting depth, allowing for a 10 m pocket and taking Totco surveys as required.

NOTE : This section is to be drilled using an unweighted gelled mud and the weight of annular returns is to be continuously monitored. If the weight of annular returns causes losses or exceeds 1.15 SG (.498 psi/ft) stop drilling and circulate the hole clean. ROP must be controlled whilst drilling this section.

2.4.6 Perform a check trip to the 30" shoe and back to bottom, clean out any fill and spot viscous mud of 1.35 SG (.585 psi/ft) in the open hole section prior to pulling out of hole for logging.

2.4.7 Rig up Schlumberger and log as per section 4.3.

NOTE : Inspect the logs for indications of shallow gas prior to continuing with the programme. If any indications of shallow gas are observed then call Base and a revised programme will be issued.

2.4.8 Rig down Schlumberger and run in hole to 30" shoe and displace the casing and riser to seawater. Continue to RIH to TD. Circulate the hole volume to seawater and open the dump valve (close kelly cock). Observe well static for ½ hour and then spot viscous mud in the open hole section. If flow occurs, the 14-3/4" pilot hole will be under-reamed as described under "Notes on Diverter Drilling", section 2.5.3.

NOTE : The 1.35 SG mud spotted prior to logging, should be circulated out in steps and dumped via the dump valve to prevent losses to the formation due to the heavy mud entering the marine riser.

2.4.9 Pull out of hole and retrieve the 30" hydraulic latch on the marine riser.

2.4.10 Make up the 18-3/4" housing with running tool, B.J. stinger and top plug and stand back in derrick, also make up the cement head on a joint of HWDP.

2.4.11 Pick up a 14-3/4" pilot bit and 26" hole opener with a 26" stabilizer at 20 m above the bit. Open the hole up to 26" using seawater and viscous pills as required.

2.4.12 Perform a check trip to the 30" shoe and back to bottom, clean out any fill and spot viscous mud of 1.35 SG (.585 psi/ft) in the open hole section prior to pulling out of hole for running casing.

2.4.13 Run and cement 20" casing as per enclosure 2B.

NOTE : a) Guide shoe and baffle collar with special profile will be used. The baffle collar will be installed between the first and second casing joints and 1 subsea plug (top plug) will be used for cement displacement and will subsequently latch into the baffle collar.

b) If gas has been encountered in the pilot hole a regular float shoe will be used instead of the guide shoe.

2.4.14 Unlatch the running tool and POH.

2.4.15 RIH with a jetting sub and wash in and around the 18-3/4" wellhead housing. POH and lay down the jetting sub.

2.4.16 Install the 18-3/4" BOP stack and 21" Marine Riser. Test BOP stack, complete with casing. For stack test procedure see "Blowout Prevention Equipment Testing" section 3. Make up drill pipe hang off assembly and circulating head assembly. Install seat protector.

2.5 Notes on Diverter Drilling/ Shallow gas drilling

2.5.1 Diverter

A diverter system is fitted on the "Borgny Dolphin" to provide a means of controlling the flow should shallow pressures be encountered whilst drilling for the first casing string (20" surface casing).

The diverter system is not a blowout preventer. It is not designed to hold pressure, but instead, to direct the flow overboard. The controls of the flowline valves are manifolded in such a way that it is impossible to hold any pressure in the diverter. The downwind blow-off line must always be open.

2.5.2 Severe Losses

If severe losses are encountered while drilling with returns to surface, pull out and drill a 8½" pilot hole instead of 14-3/4" and restrict penetration rates to obtain the lightest possible annular returns. If severe losses continue, open the dump valve and drill a 8½" pilot hole with returns to seabed.

If gas is encountered whilst drilling 8½" pilot hole with seawater and returns to seabed, spot heavy mud and inform Base.

2.5.3 Gas Flow (No Losses)

If there are any signs of gas having been encountered whilst drilling the 14-3/4" pilot hole, carry out the following programme: -

i) Drill to 20" casing setting depth with the mud weight required.

ii) Circulate the hole clean and make a wiper trip to the 30" shoe and back to bottom. Circulate bottoms-up and spot weighted viscous mud as required. POH.

iii) Run logs as programmed.

iv) RIH with 14-3/4" bit and displace hole to mud with required weight for under-reaming. Dump heavy mud via dump valve. POH.

v) RIH with 26" hydraulic under-reamer with a 14-3/4" pilot bit and 17½" stabilizer.

vi) Under-ream the 14-3/4" hole to 26". POH. Check hole size with a BGT log.

vii) RIH with 14-3/4" bit and under reamer and circulate the hole clean.

viii) Increase the weight of the mud in the interval TD - seabed, to give an overbalance to any potential gas zones and thus compensate for removing the riser.

ix) POH to seabed. Circulate the drillpipe and marine riser to seawater and close kelly cock. Open the dump valve and observe the well static for 30 mins. POH. Unlatch the 30" hydraulic latch and pull the marine riser.

x) Make up the 18-3/4" housing with running tool, B.J. stinger and top plug and stand back in derrick.

xi) Run a BGT to check hole size. If hole size is under gauge, re-run the under reamer.

xii) Rig up and run 20" casing.

NOTE : - Regular float shoe will be used together with the baffle collar.

- Casing will be filled with mud, weight as in step viii) above, whilst RIH.

- If the casing has to be circulated down and when circulating prior to cementing, weighted mud (as used in step viii) above is to be used.

2.5.4 Gas Flow and Severe Losses

If any flow of gas is encountered whilst drilling the 14-3/4" pilot hole with returns to surface, and the required increased mud weight to counteract the gas flow causes severe losses, then inform Base and the various options will be considered.

NOTE : There should be sufficient barytes (200 m/t) and SAPP (1500) kg onboard the rig to allow for the setting of baryte plugs. Further programme will be advised in this case.

2.6 Drilling 17½" hole and running 13-3/8" casing

2.6.1 Drill out shoe track and shoe with a 17½" bit. Drill 5 m of new hole, and carry out a formation leak-off test.

2.6.2 Drill 17½" hole to 13-3/8" setting depth.

NOTE : This hole section will be drilled with a KCL/Polymer mud starting off with a mud weight of 1.26 SG which will be increased to 1.35 SG before reaching casing setting depth.

2.6.3 Log as per section 4.3.

2.6.4 Make up 13-3/8" casing hanger with seal assembly and subsea cementing assembly (use two plugs) and stand back in derrick.

2.6.5 Make checktrip to casing setting depth and wash wellhead area on the way out. Pull seat protector and run 13-3/8" casing. Install the subsea cementing head and run the casing to landing point on HWDP, leaving 10 m pocket below the 13-3/8" shoe.

2.6.6 Cement 13-3/8" casing as per enclosure 2C, testing casing to 2500 psi after bumping the plug. Energize the seal assembly and test to 4250 psi as per "Blowout Prevention Equipment Testing" Section 3. Clean out the stack area prior to pulling out with the running string.

2.6.7 Carry out stack test as per "Blowout Prevention Equipment Testing" section 3. Install wearbushing. Make up drillpipe hang-off assembly and circulating head assembly. Carry out a kickdrill.

2.7 Drilling 12-1/4" hole and running 9-5/8" casing

2.7.1 Drill out float collar, cement and shoe and displace to chalk mud. Drill 5 m of new hole, and carry out a formation leak-off test.

2.7.2 Drill 12-1/4" hole to TD. Bit weight, RPM, bit selection and bottom hole assembly to be determined on site for optimum penetration rate.

NOTE : Coring will commence, using fibreglass inner core-barrel and 12-1/4" core head, from the top of the reservoir in the Upper Jurassic sandstone. Approximate interval to be cored is 1481 - 1561 m BDF (80 m).

2.7.3 Carry out logging programme, including wire line tests.

NOTE : Dependent upon the results of the logs the well will either be abandoned or 9-5/8" casing will be run to allow for testing. If the well is to be tested, then proceed with step 2.7.4 below.

2.7.4 Make up 9-5/8" casing hanger with seal assembly and subsea cementing assembly (using two plugs) and stand back in derrick.

2.7.5 Make check trip and wash wellhead on the way out. Pull seat-protector and run 9-5/8" casing to landing point, leaving a 10 m pocket below the 9-5/8" shoe.

2.7.6 Cement the 9-5/8" casing as per enclosure 2D. Whilst displacing at maximum rate, (in turbulent flow at 250 ft/min or higher), returns are to be monitored closely. If losses are observed adjust pump rates until full returns are obtained. Test casing to 3500 psi after bumping the plug. Energize the seal assembly and test to 4250 psi. Clean out the stack area prior to pulling out the running tool.

2.7.7 Carry out stack test as per "Blowout Prevention Equipment Testing" Item 3. Install seatprotector. Carry out a kickdrill.

2.8 Production Testing

Testing of the well is subject to confirmation upon receipt of the logs. Also see section 4.4.

2.9 Abandonment

A specific abandonment/suspension programme will be prepared and issued when the well reaches total depth, but the general points below will apply:

2.9.1 If there is open hole below the last casing then all porous zones in the open hole interval will be isolated with cement plugs extending 50 m above and below each zone. In addition a cement plug, extending 50 m above and below the casing shoe, shall be set. The top of the cement plug shall be located and load tested. A mechanical bridge plug may be set in the lower part of the casing but not more than 50 m above the shoe. A 20 m cement plug must be placed on top of the bridge plug. The plugs at the last casing shoe shall be tested to 1000 psi (70 bar) differential pressure.

2.9.2 Perforations shall be isolated by means of a mechanical bridge plug and squeeze cemented, or a cement plug shall be placed across the perforations extending 50 metres above and below the perforated interval or down to a casing plug whichever is less.

2.9.3 Cement plugs of at least 50 metres shall be placed in the smallest casing string extending to seabed. These plugs shall be placed at the level of the 13-3/8" casing shoe and the 20" casing shoe.

2.9.4 A cement plug of at least 200 metres, with the top of the plug not more than 50 metres below the sea floor, shall be placed in the smallest string of casing extending to the sea floor.

2.9.5 Casing strings and other installations extending above the sea floor will be removed to a depth of at least 5 metres below the ocean floor.

2.9.6 The sea floor in the vicinity of the borehole will be inspected by underwater TV/observation dive to ensure that no obstructions remain on the sea bed which may cause danger or impediment to fishing or shipping.

3. BLOWOUT PREVENTION EQUIPMENT TESTING

3.1 18-3/4" 10.000 psi BOP stack

3.1.1 Stack configuration

Upper Annular preventer	7500 psi WP
Lower Annular preventer	7500 psi WP
Blind/ Shear Rams	10000 psi WP
Choke line outlet	
Upper Pipe Rams	10000 psi WP
Middle Pipe Rams	10000 psi WP
Variable Pipe Rams 3½" - 7-5/8"	10000 psi WP
Kill line outlet	

3.1.2 Test pressures required on test stump

Annular preventers	5000 psi
Blind/ Shear rams	10000 psi
Pipe Rams	10000 psi
Variable Pipe Rams	10000 psi
Kill/ choke lines and valves	10000 psi

3.1.3 First test after landing BOP stack on the 18-3/4" housing

Pipe Rams	5000 psi
Variable Pipe Rams	5000 psi
Blind Rams	Function test only (Will be tested to 10,000 psi at surface).
Kill/Choke lines and valves	5000 psi
Annular preventers	2500 psi

3.1.4 Subsequent tests

Pipe Rams	4000 psi
Variable pipe ram	4000 psi (Also see note c)
Blind Rams	Function test only (Also see note b).
Kill/choke lines and valves	4000 psi
Annular preventers	2500 psi around 5" DP 1500 psi around 3½" DP

NOTE : a) Tests to be carried out with a test tool run on DP and landed in the wellhead.

b) Blind/shear rams will be function tested only. During the BOP test before commencing production testing the blind rams will be tested to 4000 psi by backing off the test plug.

c) The 13-3/8" and 9-5/8" seal assemblies are to be tested to 5250 psi using the variable pipe rams. Note that the collapse pressure of the 13-3/8" and 9-5/8" casings are 2670 psi and 4750 psi respectively, thus an accurate check of the volume required to pressure up is required to ensure that any leak is observed, and a collapse situation is not created.

Accumulator Tests

The accumulators should have sufficient capacity to be able to close, open and close all preventers with both air and electric charge pumps off, and then still have enough pressure left to provide working fluid for 25% of one closing function. Minimum recharge time from above condition with both air and electric pumps running should be in accordance with manufacturer's specifications.
Accumulator tests should be performed either on request of Base, or after repairs have been made to the accumulator system, i.e. bottles, bladders, pumps, etc.

Notes on Testing

a) The BOP stack must be tested on all functions using both pods and all rams tested to the full rated WP (10,000 psi) at surface prior to running the stack. After the surface tests all Cameron clamp connections and all studded connections must be checked for tightness.

b) All presssure tests to be carried out with water, unless differently advised by Base.

c) All surface equipment (manifolds, pumps etc.) has to be satisfactorily pressure tested prior to testing the BOP stack underwater.

d) When running the Marine Riser with integral kill and choke lines, the kill and choke lines can be tested while running in at various stages. This should be done approximately every five joints, firstly as soon as the stack is below sea level, and lastly, just before landing the stack.

e) When testing the BOP stack underwater with a test tool in the wellhead, use the vented blank test sub.

f) Pressure tests on seal assemblies should be done in 1000 psi stages up to the required test pressure. Pressure tests on the BOP should be carried out at a low pressure (1000 psi) for 5 minutes and to the required test pressure for 15 mins.

g) All pressure tests to be recorded on pressure recorder charts. A record is to be kept of the volumes required to obtain the test pressure, and of the volumes returned when bleeding off.

h) For all pressure tests the Shell TP must be present at the pumping unit to monitor volumes pumped and pressures. He must also witness the operation of each function.

i) The opening/closing times and the volumes of hydraulic operating fluid required for the operation of the various underwater stack components (such as: rams, kill and choke valves, annular preventers, hydraulic connectors, etc.) should be recorded during testing of the stack underwater. These results should be compared with the normal opening/closing times and volumes required of the hydraulic system. Any major differences are an indication that the system is not operating "normally" and may require further investigation and/ or repairs.

j) The testing of 10,000 psi BOP stack will be done to 5000 psi for the first test, and to 4000 psi only, at the subsequent weekly routine BOP test underwater. If higher test pressures are required then, depending on the well programme, the test pressure will be increased to the value required and carried out with test tool, e.g. subjecting the seals of the seal assembly to the same pressure as the BOP stack.

4. EVALUATION REQUIREMENTS

4.1 Cuttings Samples

Ditch cuttings to be collected every 10 m below 30" casing down to 13-3/8" casing depth, and every 3 m thereafter. The following bags of samples are required to be taken at each sample depth to enable distribution to all partners and government bodies:

a) 5 x full large bags (2 kg each) of wet cuttings.
b) 1 x medium large bag (1 kg) of wet cuttings for biostratigraphy.

1 of the above 5 x 2 kilogram large bags of wet samples from each interval should be kept on board until the well has reached TD when the complete set should be sent in. 4 x 2 kilogram samples should be sent ashore ASAP by boat, marked for attention of EPXV/1, Tananger. Biostratigraphy samples should be in cardboard boxes and sent in by the first available helicopter.

4.2 Coring

Coring will commence from top of the reservoir in the Upper Jurassic sandstone, and will continue until just below top of the continuous micaceous sands. Approximate interval to be cored is 1481 - 1561 m BDF.

NOTE : Top continuous micaceous sands may occur below 1561 m BDF. Last 18 m core should be totally micaceous to ensure that all clean sands have been penetrated.

12-1/4" core-head and fiberglass innerbarrels will be used.

NOTE : A 150 gram sand sample will be taken from each 90 cm length of core taken across the oil bearing sand and properly labelled. This sample will be used in sieve analysis to optimize sand size for a possible gravelpack completion.

4.3 Logging Programme

At 20" casing depth	ISF/SONIC/SP/GR (GR to seabed) LDT/CNL/CAL/GR
At 13-3/8" casing depth	ISF/SONIC/SP/GR LDT/CNL/CAL/GR
At 9-5/8" casing depth (TD logging)	ISF/SONIC/SP/GR LDT/CNL/CAL/NGT DLL/MSFL/CAL/SP/GR SHDT RFT's (as required) Velocity Survey SWS (as required) CBL (on 13-3/8" casing and 9-5/8" casing).

4.4 Testing Programme

RFT pressure data will be required across the total reservoir section. Fluid samples will be obtained from both the gas and oil layers, given suitable geological conditions.

Full scale production tests are not required to meet the prime objective of reservior quality control, provided that adequate core recovery is obtained throughout the section. Production tests to determine gas zone inflow characteristics are also not required in this well.

Provision will be made however to test the production behaviour of the thin oil column with respect to the restrictive nature of tight carbonate layers on gas coning. Such a test will clearly require favourable geological conditions of good reservior quality in the oil zone with a suitably positioned tight layer identified from cores or log data.

5. CASING DESIGN

Casing designs are presented for the 20", 13-3/8" and 9-5/8" casings (See Encl. 1).

The following assumptions apply:

5.1 For tension, a design safety factor of 1.6 is used, neglecting buoyancy in the drilling fluid.

5.2 Bi-axial effects have been neglected except in the case of the lowering of collapse resistance caused by tension. No allowance is given for the increase of burst resistance caused by tension.

5.3 For burst, a design safety factor of 1.1 is employed. The pressure distribution for the burst loading assumes a 40% evacuation of mud from the well by a kick. (This is equivalent to a kick volume in excess of 100 bbls).

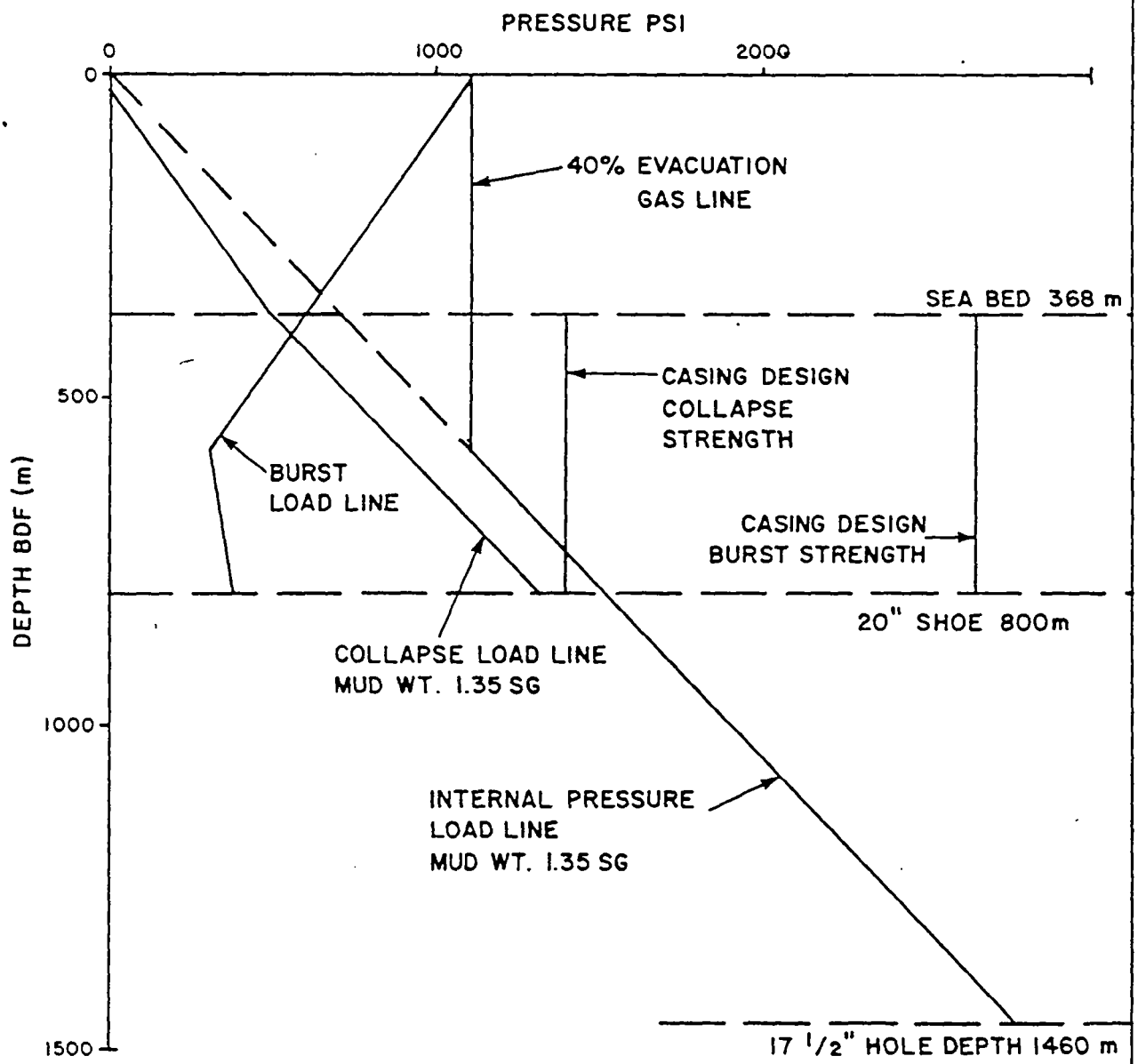
In the production test design for casing burst, a tubing leak is assumed putting full THP on the tubing/casing annulus, filled with 1.21 SG compeletion fluid and seawater outside the casing.

5.4 For collapse, a design safety factor of 1.0 is employed. For the 20" and 9-5/8" casings total evacuation has been assumed for the design. For the 13-3/8" casing, evacuation of 90 % has been assumed for the design.

6. GLOSSARY OF ABREVIATIONS

BDF	:	below derrick floor
BGT	:	borehole geometry tool
BOP	:	blow out preventer
DF	:	Derrick Floor
FS	:	fail safe (as in FS valve)
GOC	:	gas oil contact
HWDP	:	heavy weight drillpipe
ID	:	internal diameter
MF	:	Marsh funnel (mud viscosity)
MMS	:	Magnetic Multi Shot
MR	:	Marine riser
MSL	:	mean sea level
MSS	:	magnetic single shot
OD	:	outside diameter
OWC	:	oil water contact
PGB	:	permanent guide base
PPG	:	pounds per US gallon
PV	:	plastic viscosity
ROP	:	rate of penetration
SS	:	sub sea
TD	:	total depth
TGB	:	temporary guide base
THP	:	tubing head pressure
TMCM	:	Transverse Mercator Central Meridian
UGF	:	universal guide frame
YP	:	yield point
WHP	:	wellhead pressure
WP	:	working pressure
WOC	:	wait on cement
UTM	:	Universal Transverse Mercator

20" CASING DESIGN 31/2-P



	BURST (psi)		COLLAPSE (psi)	TENSION (lbs)	
	API	SF 1.1	API (SF 1.0)	API	SF 1.6
20" X-52 129.3 lb/ft	2930	2663	1410	1,978,000	1,236,250

MAX TENSILE LOAD = 18 3269 LBS

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EXPLORATION & PRODUCTION FORUS

31/2-P

20" CASING DESIGN

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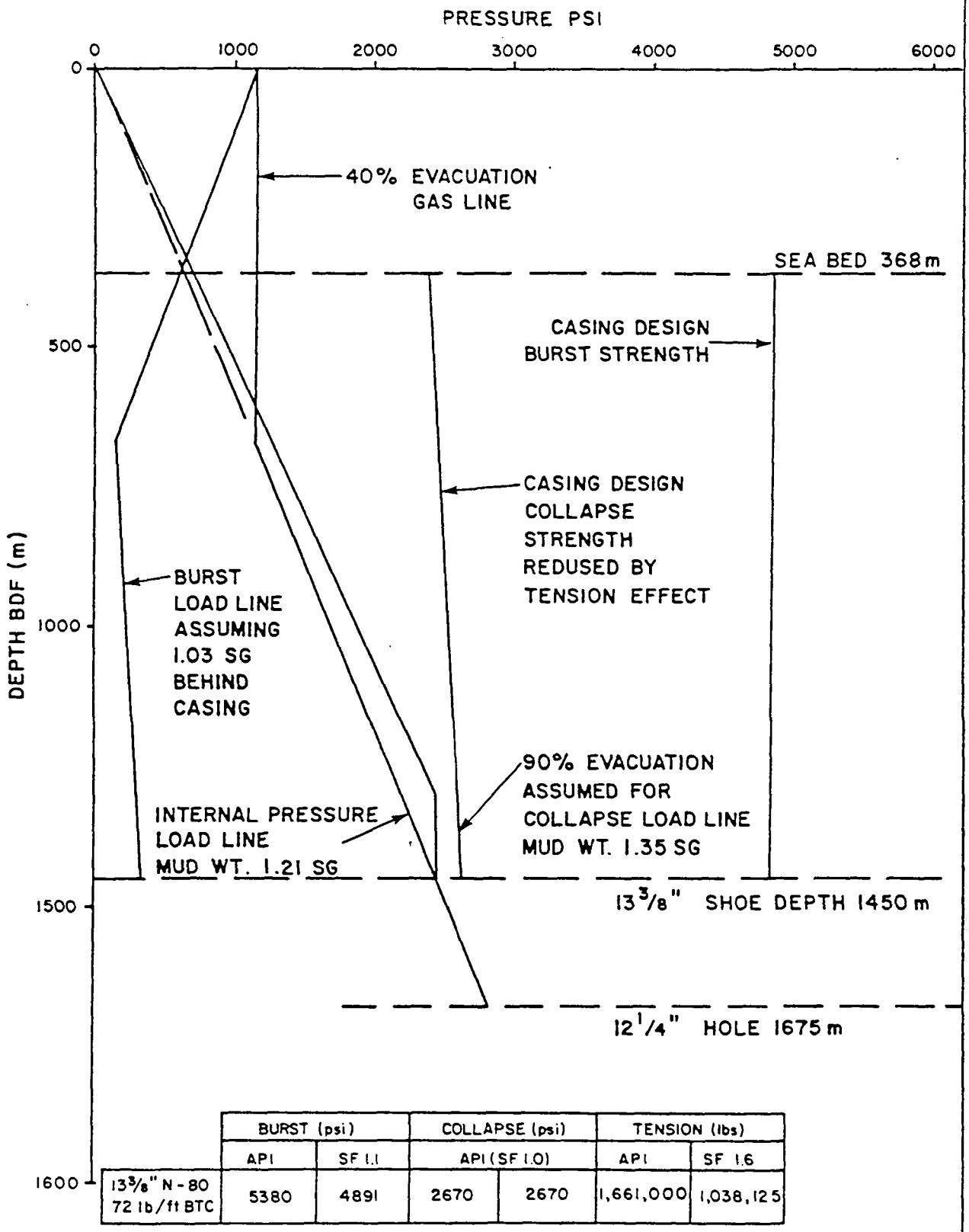
REPORT NO | DRAW NO G.1683/3

13 3/8" CASING DESIGN 31/2-P



	BURST (psi)		COLLAPSE (psi)		TENSION (lbs)	
	API	SF 1.1	API (SF 1.0)		API	SF 1.6
13 3/8" N-80 72 lb/ft BTC	5380	4891	2670	2670	1,661,000	1,038,125

MAX TENSILE LOAD = 255 600 LBS

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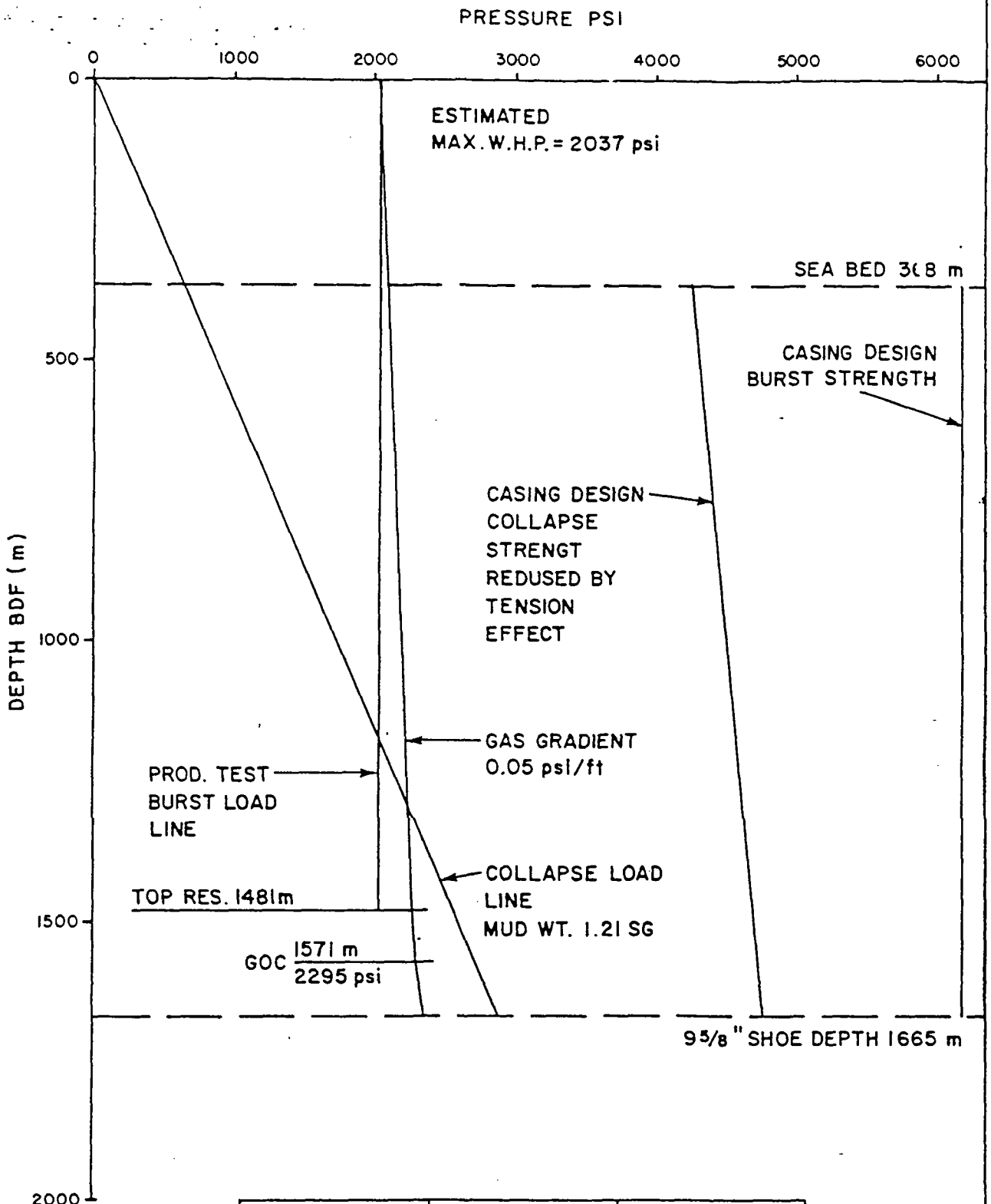
31/2-P

13 3/8" CASING DESIGN

AUTHOR EPPP/11 ENGL. 1b DATE JULY'84 REPORT NO DRAW NO G1683/4

9 5/8" CASING DESIGN 31/2-P



	BURST (psi)		COLLAPSE (psi)		TENSION (lbs)	
	API	SF 1.1	API (SF 1.0)		API	SF 1.6
9 5/8" N-80 47 lb/ft	6870	6245	4750	4750	1,086,000	678,750

MAX TENSILE LOAD = 200 000 LBS

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31/2-P

9 5/8" CASING DESIGN.

EPPP/11 ENCL JULY'84
1 C G.1683/5

CEMENT CALCULATIONS

30" Cementation

Extended Norcem Class "G" cement of lead slurry weight 13.2 ppg(1.58 SG) and 10 m of 15.8 ppg(1.90 SG) tail slurry above the shoe are to be used. The casing is to be cemented back to seabed, and an excess of 150 % is to be used over open hole intervals. Cement displaced to 10 m above shoe.

Data: Casing 30" 1" WT/VETCO "ATD-RB"
Seabed 368 m BDF
30" shoe 460 m BDF
36" hole 470 m BDF

13.2 ppg Lead Slurry Volumes

i)	36" x 30" annulus	= (460-368)x3.281x2.1598x2.5	=	1629.9 cu.ft.
	Cement required	= 1629.9/1.89	=	862.4 sxs
			=	36.8 m/t
	Seawater required	= 862.4 x 10/42	=	205.3 bbls
	Econolite required	= 862.4 x 0.36	=	310.5 gals.

15.8 ppg Tail Slurry Volume

i)	36" x 30" annulus	= (460-450)x3.281x2.1598x2.5	=	177.2 cu.ft.
ii)	36" pocket	= (470-460)x3.281x7.0686x2.5	=	579.8 cu.ft.
iii)	30" casing fill	= 10 x 3.281 x 4.2761	=	140.3 cu.ft
		Total slurry	=	897.3 cu.ft.
	Cement required	= 897.3/1.17	=	766.9 sxs
			=	32.7 m/t
	Seawater required	= 766.9 x 5.15/42	=	94.0 bbls
	$CaCl_2$ required 3%(BWOC)	= 766.9 x 94 x 0.03/2205	=	1.00 m/t

20" Cementation

Extended Norcem Class "G" cement of lead slurry weight 13.2 ppg(1.58 SG), and 60 m of tail slurry above the shoe, of weight 15.8 ppg(1.90 SG) are to be used. The casing is to be cemented back to seabed and an excess of 100% is to be used over open hole intervals. Cement to be displaced to the baffle collar approximatly 12 m above the guide shoe using 1 subsea cement plug.

Data: Casing 20"/129 lbs/ft/X-52/Vetco LS-LH
30" shoe at 460 m BDF
36" hole at 470 m BDF
20" shoe at 800 m BDF
26" hole at 810 m BDF

13.2 ppg Lead Slurry Volumes

i)	30" x 20" annulus	= (460-368)x3.281x2.0944	=	632.2 cu.ft.
ii)	36" x 20" annulus	= (470-460)x3.281x4.8869x2	=	320.7 cu.ft.
iii)	26" x 20" annulus	= (740-470)x3.281x1.5053x2	=	2667.0 cu.ft.
		Total slurry volume	=	3619.9 cu.ft.
Cement required		= 3619.9/1.89	=	1915.3 sxs
			=	81.6 mt
Seawater required		= 1915.3 x 10/42	=	456.0 bbls
Econolite required		= 1915.3 x 0.36	=	689.5 gals

15.8 ppg Tail Slurry Volumes

i)	26" x 20" annulus	= (800-740)x3.281x1.5053x2	=	592.7 cu.ft.
ii)	26" pocket	= 10 x 3.281 x 3.6870 x 2	=	241.9 cu.ft.
iii)	20" casing fill	= 12 x 3.281 x 1.9133	=	75.3 cu.ft.
		Total slurry volume	=	909.9 cu.ft.
Cement required		= 909.9/1.17	=	777.7 sxs
			=	33.2 mt
Seawater required		= 777.7 x 5.15/42	=	95.4 bbls
$CaCl_2$ required 2% (BWOC)		= 777.7 x 94 x 0.02/2205	=	0.66 mt

13-3/8" Cementation

Extended Norcem Class "G" cement of lead slurry weight 13.2 ppg (1.58 SG), and 100 m of tail slurry above the shoe, of weight 15.8 ppg (1.90 SG) to be used. The casing is to be cemented back to 150 m inside the 20" casing using 20 % excess on open hole volumes. If caliper is available, use 10 % excess over and above the estimated caliper volume. Cement will be displaced to a float collar c. 13 m above the shoe.

Data: Casing 13-3/8"/72 lb/ft/L80/BTC
20" shoe at 800 m BDF
26" hole at 810 m BDF
13-3/8" shoe at 1450 m BDF
17-1/2" hole at 1460 m BDF

13.2 ppg Lead Slurry Volumes

i)	20" x 13-3/8" annulus	= (800-650)x3.281x0.9377	=	461.5 cu.ft
ii)	26" x 13-3/8" annulus	= (810-800)x3.281x2.7113x1.1	=	97.9 cu.ft
iii)	17½"x 13-3/8" annulus	=(1350-810)x3.281x0.6946x1.1	=	1353.7 cu.ft
		Total slurry volume	=	1913.1 cu.ft
Cement required		= 1913.1/1.79	=	1068.8 sxs
			=	45.6 mt
Mixwater required		= 1068.8 x 9.47/42	=	241.0 bbls

Additives to be advised.

15.8 ppg Tail Slurry Volumes

i)	17½"x 13-3/8" annulus	=(1450-1350)x3.281x0.6946x1.1	=	250.7 cu.ft
ii)	17½" pocket	= 10 x 3.281 x 1.6703 x 1.1	=	60.3 cu.ft
iii)	13-3/8" shoe track	= 13 x 3.281 x .8314	=	35.5 cu.ft
		Total slurry volume	=	346.5 cu.ft
Cement required		= 346.5/1.15	=	301.3 sxs
			=	12.8 mt
Mixwater required		= 301.3 x 5.07/42	=	36.4 bbls

Additives to be advised.

9.5/8" Cementation

Norcem Class "G" cement at 15.4 ppg(1.85 SG) slurry weight will be used as the main slurry up to 1275 m BDF. 50 bbls (262 m) of 13.5 ppg(1.62 SG) scavenger slurry (Class "G") is to be pumped ahead of the main 15.4 ppg slurry. A 10% excess is to be used over and above estimated caliper volume over open hole intervals, and cement is to be displaced to a float collar c.24 m above the shoe.

Data: Casing 9-5/8"/47 lb/ft/N80/BTC
13-3/8" shoe at 1450 m BDF
17-1/2" hole at 1460 m BDF
9-5/8" shoe at 1665 m BDF
12-1/4" hole at 1675 m BDF

15.4 ppg Slurry Volume

i)	13-3/8"x9-5/8" annulus (1450-1275)3.281x.3262	=	187.3 cu.ft.
ii)	17-1/2"x9-5/8" annulus (1460-1450)3.281x1.1651x1.1	=	42.1 cu.ft.
iii)	12-1/4"x9-5/8" annulus (1665-1460)3.281x.3132x1.1	=	231.7 cu.ft.
iv)	12-1/4" pocket 10x3.281x0.8185x1.2	=	32.2 cu.ft.
v)	9-5/8" shoe track 24 x 3.281 x 0.4180	=	32.1 cu.ft.
	Total slurry volume	=	524.4 cu.ft.

Cement required	= 524.4/1.24	=	422.9 sxs
		=	18.0 mt
Mixwater required	= 422.9 x 5.67/42	=	57.0 bbls

Additives to be advised.

13.5 ppg Scavenger Slurry Volumes

i)	13-3/8" x 9-5/8" annulus (1275-1013)3.281x.3262	=	280.4 cu.ft.

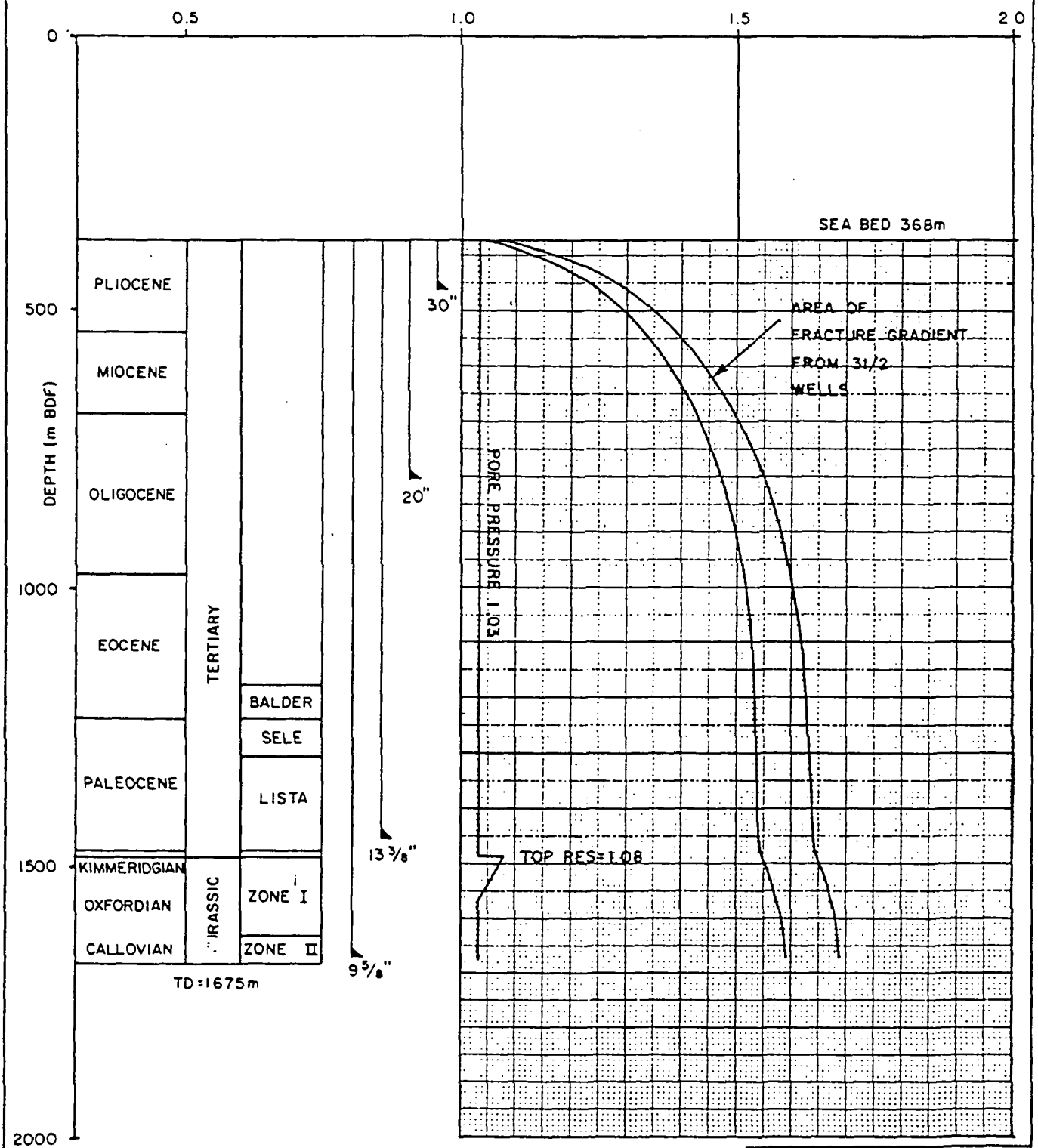
Cement required	= 280.4/1.71	=	164.0 sxs
		=	7.0 mt
Mixwater required	= 164.0 x 9.27/42	=	36.2 bbls

Additives to be advised.

WELL 31/2-P

ESTIMATED PORE PRESSURE AND FRACTURE GRADIENTS SHOWING THE DEGREE OF UNCETAINTY

MUD WEIGHTH S.G.



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PORE PRESSURE

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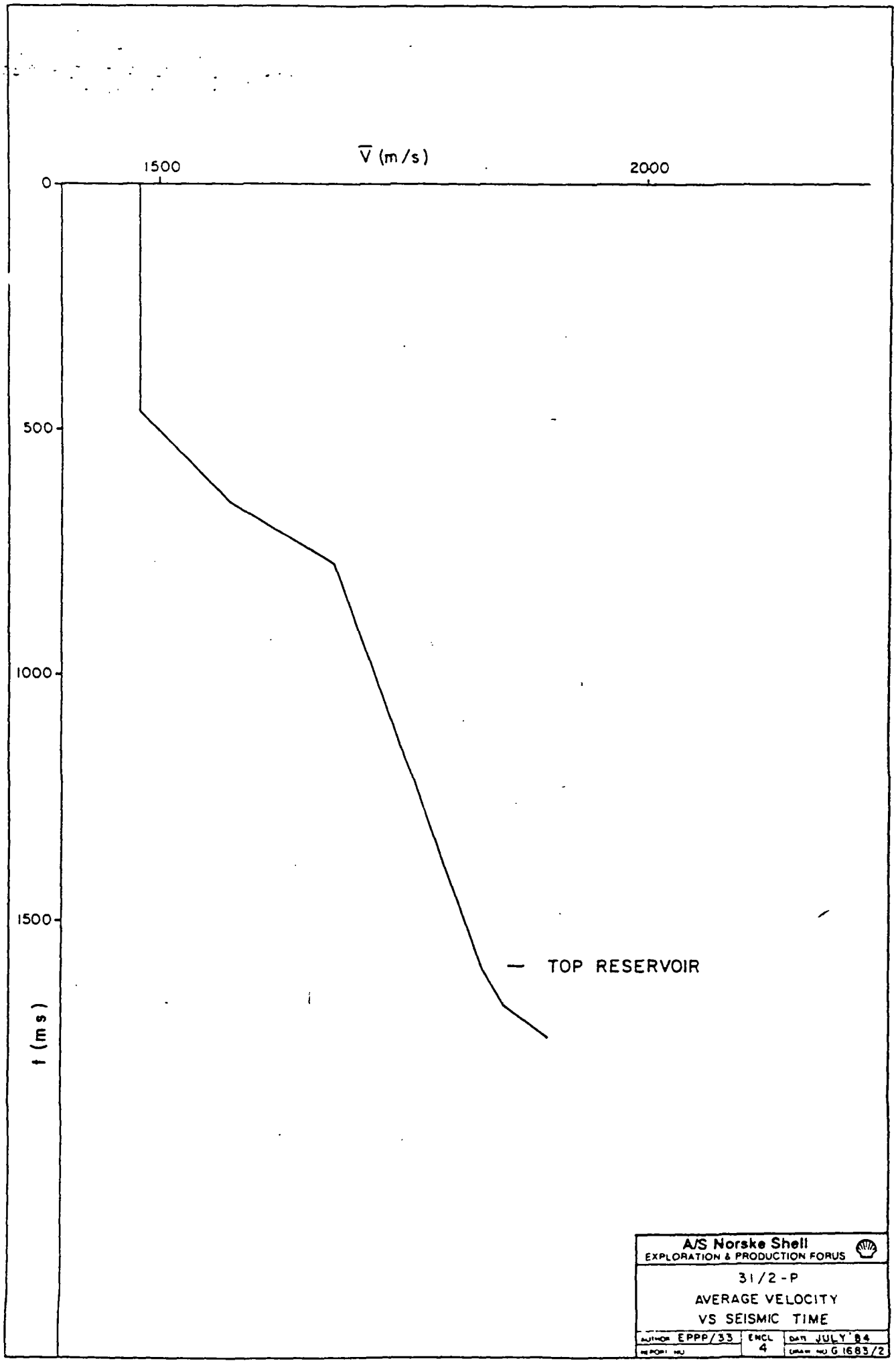
REPORT NO DRAW NO G 1683/6



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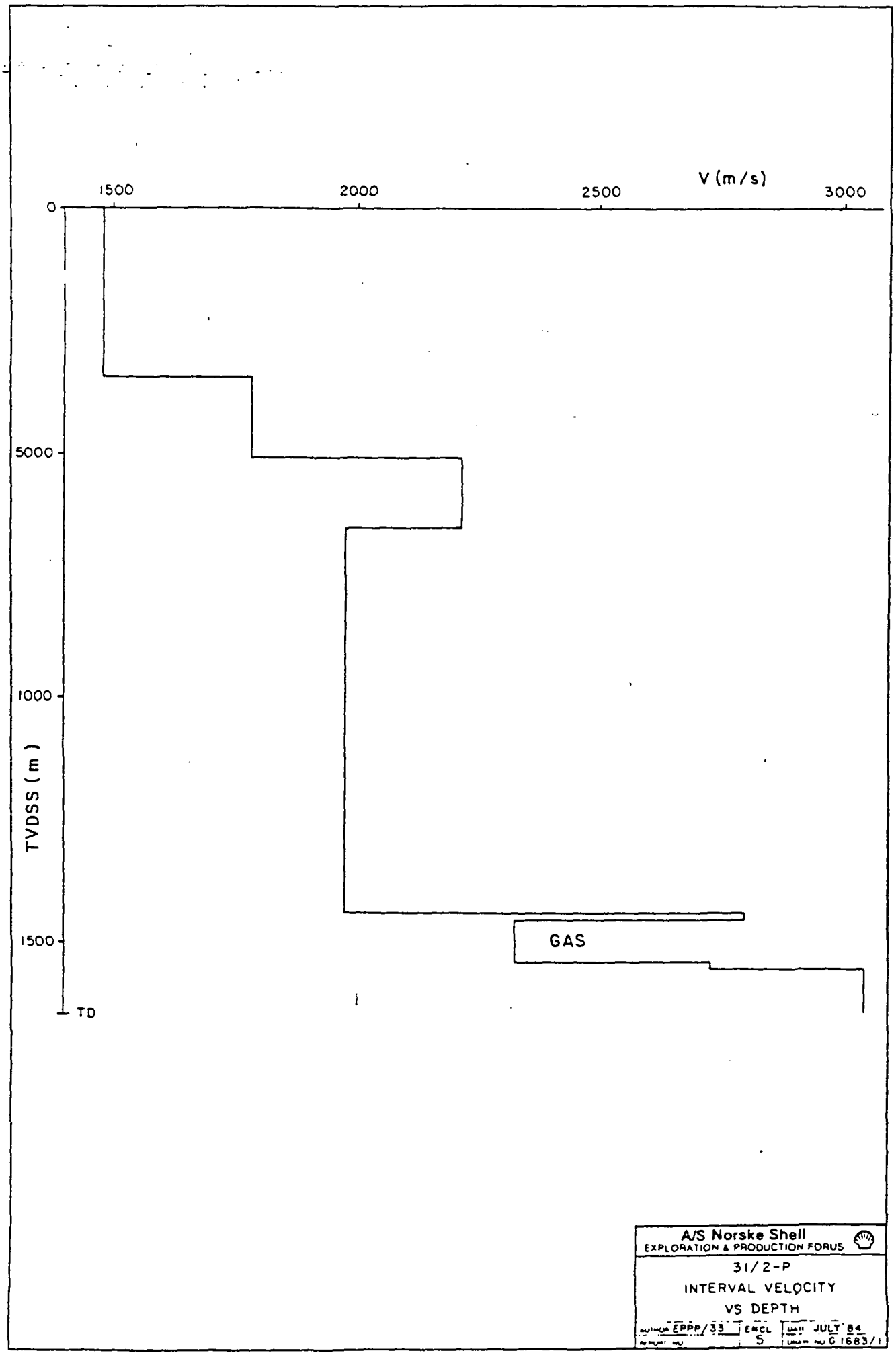
31/2-P
AVERAGE VELOCITY
VS SEISMIC TIME

AUTHOR EPPP/33	ENCL 4	DATE JULY '84
REPORT NO		DRAW NO G 1683/2


V (m/s)
1500
2000
2500
3000
0
5000
1000
1500
TVDSS (m)
TD
GAS
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31/2-P
INTERVAL VELOCITY
VS DEPTH
EPPP/33
ENCL
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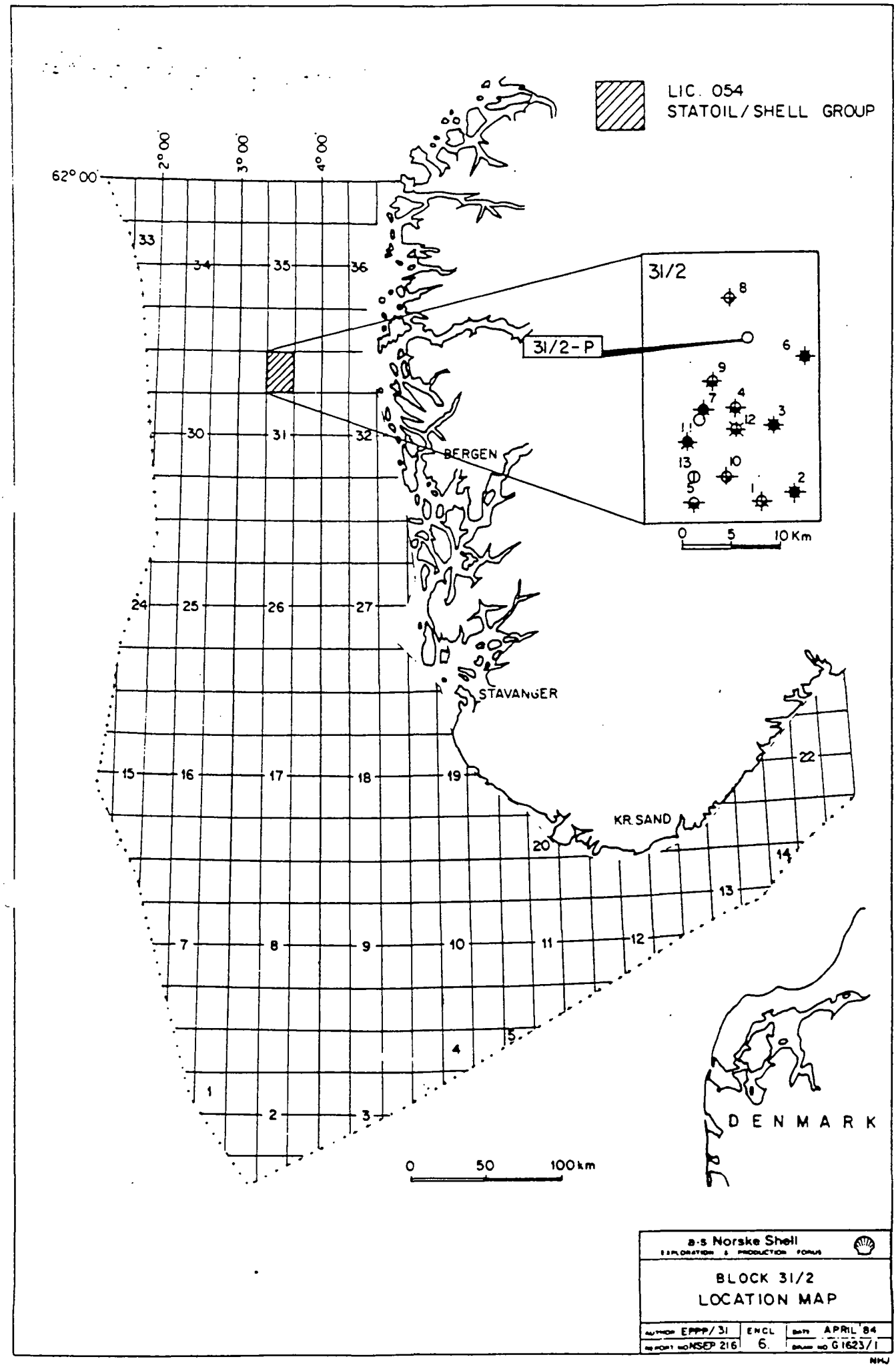

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BLOCK 31/2
LOCATION MAP

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REPORT NO NSEP 216		DRAWING NO G 1623/1

NHJ