A/S NORSKE SHELL E & P

TANANGER

COMPLETION & PRODUCTION TEST PROGRAMME NUMBER 2

WELL 31/2-15

RIG "BORGNY DOLPHIN"

24 October 1984

OPERATIONS ENG

SEN.OPERATIONS ENG.

CHIEF PETR. ENG.

DRILLING SUPT.

TECHNICAL MANAGER

A/S NORSKE SHELL E & P

TANANGER

COMPLETION & PRODUCTION TEST PROGRAMME NUMBER 2

WELL 31/2-15

RIG "BORGNY DOLPHIN"

24 October 1984

OPERATIONS ENG.

SEN.OPERATIONS ENG.

CHIEF PETR. ENG.

DRILLING SUPT.

TECHNICAL MANAGER

CONTENTS

1. PRODUCTION TEST DESCRIPTION

1.1 Test Objective (Test no. 2)

The hydrocarbon bearing reservoir section will be tested in the interval 1564 - 1567 m BDF (3 m) in the consolidated, micaceous sand to determine the nature of the fluids in the zone of uncertainty (1561 - 1568 m) with respect to the GOC.

1.2 Programme Outline

The production packer from test no.1 will be pushed to bottom and the perforated interval 1572 - 1580 m will be secured with cement and bridge plug. Following an inflow test on the plug a production packer will be set. A 3½" completion string will be run with tubing conveyed guns on bottom, the guns spaced out on depth, a flowhead installed and the well perforated under drawdown. Following a clean up period, gauges may be run and the well flow tested and shut in for pressure build up.

1.3 Sequence of Operations

1.3.1 Mill packer at 1528 m BDF and push packer to bottom.

1.3.2 RIH with cement stinger and squeeze off the perforations (1572 - 1580 m BDF).

1.3.3 RIH with bit and dress down cement to 1567 m BDF.

1.3.4 RIH with GR/CCL for depth correlation.

1.3.5 RIH with bit and scraper and dress cement down to 1572 m (Schlumberger depth).

1.3.6 Set model N-1 bridge plug at 1571 m BDF.

1.3.7 Pressure test casing to 4000 psi.

1.3.8 RIH with RTTS packer and inflow test the bridge plug with +/- 370 psi drawdown.

1.3.9 Circulate well clean and displace to clean brine.

1.3.10 Set Baker "F-1" production packer.

1.3.11 Pressure test the BOP stack.

1.3.12 Run 3½" test string with tubing conveyed guns on bottom.

1.3.13 Test string to 4000 psi and land string.

1.3.14 Displace tubing with diesel to give approx. 300 psi drawdown.

1.3.15 Perforate underbalanced the interval 1564 - 1567 m BDF by running the detonating bar on wireline.

1.3.16 Flow well to clean up.

1.3.17 Run pressure gauges (if required).

1.3.18 Carry out main flow test (if required).

1.3.19 Close in well for build-up and retrieve the gauges (if required).

1.3.19 Kill well and retrieve test string.

1.4 General

The well has been drilled to a Total Depth of 1677 m BDF. The 9-5/8" casing has been set with shoe at 1663 m and float collar at 1634 m. The well was displaced to 1.20 SG brine and a production packer set at 1528 m. The well was perforated over the interval 1572 - 1580 m and production tested. The perforating assembly (28.5 m long) was dropped giving a hold up depth of +/- 1605 m BDF. Before starting this second completion/ test programme, the well will be killed and the test string pulled racking both the 4½" riser tubing and the 3½" test tubing.

2. WELL DATA

2.1 Reservoir Data

Top reservoir	1482 m BDF
Gas Oil contact (uncertain)	1561 - 1568 m
Oil Water Contact	1583 m
Reservoir pressure from RFT	+/- 2295 psia at 1564 m BDF
Estimated maximum CITHP with oil	+/- 680 psi
Oil gradient(reservoir conditions)	0.34 psi/ft
Estimated maximum CITHP with gas	+/- 2040 psi
Gas gradient	0.05 psi/ft
Water gradient	0.44 psi/ft
Water salinity	50.000 ppm
Reservoir Temperature	156 deg F

2.2 Completion fluid

The completion fluid to be used will be clean Calcium Chloride ($CaCl_2$) brine.

Density: 1.20 SG (0.520 psi/ft) - giving +/- 280 psi overbalance on the oil zone when the riser is removed.

The reservoir was drilled with 1.23 SG Calcium Chloride/ chalk mud and the 9-5/8" casing was set in same mud.

2.3 Perforation interval

The following perforation interval has been selected:

1564 - 1567 m BDF (3 m).

2.4 Depth References

All depths quoted in this programme for packer setting and perforating refer to the LDT/CNL/NGT log no. 4 of 3.10.84 made from Borgny Dolphin (see fig. 5).

Drill floor	-	Mean Sea Level	25 m
Drill floor	-	Seabed	368 m

2.5 Perforating Gun type

Tubing conveyed perforating guns will be run on bottom of the perforating string. Gun specification: 5" Deep Penetrator, 12 shot per foot, 60 deg Scalloped, 19.5 grams RDX charges.

2.6 Gauge Type

1 x Amerada RPG, 10,000 psi element, 72 hrs clock
2 x SSDP, delay and sampling rate to be advised.

3. DETAILED OPERATION

General

A. Cleanliness

The success of the test is dependent on the cleanliness of all the fluids pumped in the hole, and the cleanliness of all the equipment run in the hole. Great care should be taken to achieve an acceptable level of cleanliness. Two specific items of concern are as follows:

i) Ensure ALL relevant circulating lines are cleaned of mud, using seawater. This includes choke and kill lines, and all lines which may be used in the brine circulation system. This should be carried out whilst circulating the well clean and before running the completion testing string.

ii) DO NOT USE EXCESSIVE D.P. DOPE. - Dope pins only using a small paint brush and wipe off excess dope squeezed out of the connection.

B. Safety

i) All operations involving tripping with small bore pipe (3½", 2-7/8", etc) should be treated with a maximum of care. Hole fillup volumes are to be calculated and checked and the tallies recorded in a neat format.

ii) If evidence of swabbing is noted during tripping, install an inside BOP on the DP immediately to maintain control over the DP should it come live. Whilst the annulus remains stable, run in hole as deep as possible before shutting in the well and circulating out the influx. If the annulus starts to flow, install kelly, close in well, and circulate/ control well at that depth.

3.1 Preparation

Prior to carrying out step 3.1.1 below test no.1 will have been concluded and the production string pulled out of the hole (see item 1.4).

3.1.1 RIH with a model "CJ" packer milling tool on 5" DP and mill the packer at 1528 m. Push the packer to bottom. (Hold up depth +/- 1605 m). POH with milling tool.

NOTE : The 1.20 SG brine in the hole will be used as workover fluid, with frequent use of viscous pill to aid cleaning of the well.

3.1.2 RIH with 150 m of 2-3/8" tubing stinger on 5" DP to bottom. Circulate at least one drill pipe volume.

3.1.3 Set a balanced cement plug (abandonment plug no.1) from 1600 - 1500 m (100 m) using the following slurry:

15.8 ppg Class G cement
0.15 gps CFR-2L
4.96 gps Freswhater
1.16 cuft/sx yield
(Thickening time +/- 2 hrs)

3.1.4 POH to 30 m above estimated TOC and reverse circulate clean. Close the BOP's around the pipe and apply 2000 psi to attempt to squeeze away approx. 6 bbls of slurry by hesitation squeeze leaving the top of cement at +/- 1525 m. Maintain pressure on the cement until surface samples are hard and POH.

3.1.5 RIH with 8½" bit and locate top of cement. Dress off the cement plug down to 1567 m BDF (to within 5 m of old perfs.). POH.

3.1.6 Rig up Schlumberger and run 3-3/8" GR/CCL and record exact depth of top of the cement plug. Rig down Schlumberger.

3.1.7 RIH with bit and scraper and drill cement down to 1572 m Schlumberger depth. Scrape the interval 1572 - 1500 m. Circulate clean and POH racking the 5" DP.

3.1.8 Rig up Schlumberger and run gauge ring/ junk basket (OD = 8.300") down to top cement. Set a Baker model N-1 bridge plug at 1571 m. It is essential that the packer is not set higher than 1570 m leaving 3 m sump below next perforating interval. Rig down Schlumberger.

3.1.9 RIH with 8½" RTTS packer and one joint of drill pipe below the packer to +/- 1570 m. Break circulation.

3.1.10 Close the pipe rams around the pipe and pressure test the casing and bridge plug to 4000 psi for 30 min.

3.1.11 Circulate diesel to +/- 1500 m BDF, set packer and bleed off surface pressure to inflow test the bridge plug for 1 hr. *(Drawdown will be +/- 370 psi).* Unset packer and reverse circulate bottoms up. Check for influx (salinity/ gas/ oil). If OK, proceed with next step. If leak is observed contact base, whereon a further programme will be initiated.

3.1.12 After the successful inflow test, circulate well clean and displace the brine in the hole with new brine of 1.20 SG. POH with packer racking the DP.

NOTE : a) Use viscous pills and seawater as spacer.

b) Keep the old brine as back up on surface.

c) No filtering of the brine is required unless returns are extreemly dirty.

3.1.13 Rig up Schlumberger and run gauge ring/ junk baset (OD = 8.300") down to the bridge plug.

3.1.14 RIH on Schlumberger line and set at +/- 1532 m BDF, the Baker Model "F-1", size 192-60 retainer production packer with 6" bore and max OD = 8.218". POH and rig down Schlumberger.

NOTE : a) Setting depth will be top of packer bore (See fig. 3).

b) Setting depth is selected such that the perforating guns will be on depth when the G-22 seal assembly is spaced out, i.e. the locator 2.0 m above top locator bore.

c) The sub assembly will be re-measured on the site and the packer setting depth adjusted accordingly if required.

3.1.15 Pick up the Flopetrol EZ-tree and function test the same. A complete dummy run with the 4½" tubing riser is not required since already carried out prior to test no.1 as described in the note below.

NOTE : a) Make up fluted hanger, slick joint and SSTT. At this stage connect hydraulic hoses and test unlatching/ latching feature. Blank off injection and control line ports and run 4½", 19.2 lbs/ft, C-75, PH-6 tubing riser including lubricator valve (+/- 30 m BDF) with blanked off control line ports. Run in and land fluted hanger on wearbushing. Space out so that top of tubing riser is +/- 5 meters above rig floor. Close/ open 5" pipe rams. Pull out and stand 4½" riser back in derrick, including SSTT. Check for ram-impressions on slick joint.

b) Make up the flowhead on one single of 4½" PH-6 tubing joint and lay down same on piperack.

3.1.16 Pressure test the BOP stack according to item 3.1.4 in the drilling programme.

3.2 Running Test String with Tubing Conveyed Gun

3.2.1 Make up the guns and associated subassemblies as per fig. 2 including the first 3½" VAM single.

NOTE : a) Refer to Appendix 4 for safety precautions whilst handling the tubing conveyed guns.

b) The Sliding Side Door (SSD) will be run in closed position.

c) The PCT valve will be run in locked open position. See Appendix 12.

d) The ported-compensating disc assembly and perforated pipe will allow the string to fill with brine while running the string in the hole.

e) The length from the top shot on the gun to the G-22 locator on the Baker seal assembly, should be spaced out such that as when the string is landed with the G-22 locator 2.0 m above the top of the packer bore, the guns are in correct perforating position. (see fig. 3).

3.2.2 Rig up test sub with Flopetrol 10,000 psi wireline BOP on top on the tubing string. RIH with wireline and set the RN test tool in the 2-7/8" RN - nipple. With wireline latched onto the plug, pressure test the tubing to 4,000 psi surface pressure for 30 minutes. After successful pressure test, retrieve the test tool and rig down the wireline equipment and test sub.

NOTE : a) While pressure testing, increase pressure in stages of 1,000 psi holding each step for 1 minutes while observing pressure.Test pressure of 4,000 psi should be held for 30 minutes. If drop occurs let it stablize for 10 minutes. Then increase to 4,000 psi again which should then be held for full 30 minutes. Keep annulus open, and monitor volumes pumped and returned.

b) Make sure cable is centralized in BOP while closing the BOP to avoid cutting the wire.

3.2.3 RIH the guns and sub assembly on 3½" C-75, 10.2 lbs/ft VAM tubing in the interval between the top of the subassemblies and the wellhead.

3.2.4 Install at least two white painted joints in the BOP area and RIH the string on 5" drill pipe as riser until the perforating gun is just above the F-1 packer.

NOTE : The painted joints should be installed such that they are in the BOP area when the seal assembly locator lands on the packer.

3.2.5 Install the circulating sub and circulate with brine (minimum 1½ tubing volume) to clean any possible fill on top of the disc in the ported sub.

3.2.6 While circulating very slowly stab into the F-1 packer with the G-22 seal assembly. Stop pumping and lower tubing until locator assembly stops on top of the packer (set down 10,000 lbs for positive indication). Pick string up 2.0 m and close the rams around the white painted single. (Picking up the string and closing the rams, should only be carried out if there is no heave. If excessive heave, use drillstring compensator and close rams with the string gently landed on the packer.

NOTE : a) Record up weight and down weight of the string before entering the packer bore.

b) Check entering packer by noting pressure increase when first seals enter packer bore. Stop pumps, and open tubing.

c) Check that tubing has moved down the full length of the seal assembly (20').

d) Calculate space out requirements so that when the fluted hanger is landed in the wearbushing, the G-22 locator will be 2.0 m above the packer, and the guns will be on depth.

3.2.7 Pull back to the white painted singles and space out with 3½" C-75, VAM pup joints below the fluted hanger.

3.2.8 Install fluted hanger and 5" slick joint, and RIH the tubing string on the pre made-up 4½" PH-6 tubing riser including SSTT and lubricator valve with one joint of tubing on top and hang off string in rotary table.

NOTE : Space out so that when flowhead is installed it will be +/- 5 m above rig floor.

3.2.9 Pressure test the test string to 4,000 psi as in step 3.2.2 above. Pressure test the lubricator valve from above to 4,000 psi.

NOTE : Ensure that the seal assembly is not stabbed into the packer bore.

3.2.10 RIH the string and stab the seal assembly into packer bore. Hang off the string in the rotary table.

3.2.11 Pick up flowhead already made up on the 4½" PH-6 joint, install 50' x 2½" wire slings between bails and flowhead elevator.

3.2.12 Install chicksan lines to flow and kill sides on flowhead. Connect assembly to upfacing tubing connection in rotary table. Land fluted hanger into wearbushing. Connect the kill line to the Dowell unit and flow line to the sandfilter positioned on the rig floor.

3.2.13 Pressure test the flowhead against the lubricator valve to 4,000 psi for 30 min.

3.2.14 Pressure test all surface lines to 4,000 psi for 30 minutes.

3.2.15 Close middle 5" pipe ram and pressure test annulus to 500 psi/ 15 minutes down kill line to check packer/ seal assembly. Keep rams closed.

NOTE : The PCT valve will actuate at 2500 psi annulus pressure.

3.3 Drawdown/ Perforating

3.3.1 Pressure up annulus to maximum 2500 psi to actuate the PCT valve and bleed off pressure to zero, leaving the PCT closed.

NOTE : The PCT-valve is pre-set in open position before running in hole by a pressurized chamber keeping the valve in open position. To actuate the valve, annulus applied pressure will rupture a disc thereby relieving the pressure in the tool which allows a mandrel to move and the ball valve will close.

3.3.2 Open up the Multiple Opening Reversing Valve (MORV) by pressuring up the string against the PCT valve (approx. 2000 psi required).

NOTE : The MORV has a 9 cycle combination of index sleeves, and the valve has to be pressure cycled nine times before it opens. (This includes cycles made for pressure testing).

3.3.3 Displace the tubing to diesel taking returns up kill line, to give 300 psi drawdown on the formation, then close the MORV.

NOTE : a) Displacement rate can be 3 BPM maximum. To close the MORV increase pump rate to 4.5 BPM and note

pressure increase indicating that the valve has closed.

b) Reservoir pressure at 1564 m from RFT is 2295 psia, and diesel density assumed at 0.85 SG. Diesel/ water interface should be approximately 1350 m BDF.

3.3.4 Open up the PCT valve and keep it open for the duration of the test (approx. 1200 psi is required to keep the valve open).

3.3.5 Rig up Flopetrol lubricator on top of the flowhead with the swab valve closed, install the detonating bar connected to the slick wireline, in the lubricator. Pressure test lubricator to 4,000 psi/ 15 min.

NOTE : The wireline assembly will consist of from bottom:

- detonating bar (flat bottom) (1.25" OD)
- running tool (1.50" OD)
- wireline jar (1.50" OD)
- 13 feet stem (1.50" OD)

The length of this assembly is designed such that the top of the assembly is below the ported sub when firing the gun.

3.3.6 Open the swab valve and RIH with detonating bar on wireline and fire the gun.

NOTE : a) Firing the gun will take place in daylight.

b) While firing the gun, make sure that the flow line is open to the gauge tank bypassing the separator.

3.4 Flow Test Programme

General

This outline flow test programme is a guide only. Specific items e.g. rates and durations, lengths of build ups etc. may be varied in the light of onsite information gained during the test. The following point should however, be noted:

i) Flow through the 6"/5000 psi flowline.

ii) Inject glycol via the chemical injection line to the EZ tree and at separator and choke manifold.

iii) Once it has been ascertained that there is no sand production bypass the sand filter at high flow rates. Be prepared to switch flow through the sand filter if sand production occurs.

iv) Install errosion probes in flow line between flowhead and sand filter.

v) Maintain a pressure of at least +/- 1500 psi greater than FTHP on the ball valve of the EZ tree.

vi) In all wireline work where the swab valve or lubricator valve is closed, the lubricator is to be filled with a 50/50 water/glycol for the oil test. Prior to opening, the

lubricator is to be re-pressurized to equalize across the valve used.

vii) When using the downhole valve, always equalize pressure over the valve before opening.

3.4.1 After firing the gun, immediately back surge the well for 2 minutes before beaning back and let the well flow at a maximum rate of 300 BPD into the gauge tank for approximately 2 hrs to clean up.

NOTE : a) Due to the uncertainty of the nature of the hydrocarbons in the reservoir, gas or oil or gas/oil could be produced. It is therefore important to keep the flow rate as low as practical possible while producing back the diesel cussion to avoid possible gas break through if oil is the predominant reservoir fluid.

b) If the well dies after flowing for a while, the well will be brought live again by; closing the PCT valve, opening the multiple opening reversing valve, reversing out the tubing contents, displacing the tubing to diesel, closing the reversing valve, opening up the PCT valve and re-opening the well.

3.4.2 After 2 hrs clean up (or if the well has died) close in the well at the sandtrap and pull the wireline assembly back into the lubricator, close lubricator valve and remove WL assembly.

3.4.3 Open up the well and continue to produce clean keeping flow rate below 300 BPD until reservoir fluids are produced to surface. Take sample of reservoir fluid and inform base whereon a further clean up programme (rates, duration etc.) will be advised. When well is clean, consult with base before closing in the well.

NOTE : a) If oil is produced throughout the clean up phase, the test will proceed with item 3.4.4 below.

b) If gas is produced (not associated gas) during clean up, the well will be shut in (to be confirmed) and the test terminated.

c) Take surface samples of produced fluids and one PVT recombination sample at the separator during the clean up period.

3.4.4 Make drift run to the top of the gun. Install pressure gauges as described in step 2.6, in Flopetrol lubricator and pressure test same. When CITHP has stabilised run gauges to the Baker "F"-nipple. Make gradient stops in the lubricator and at 150 m, 100 m and 50 m above the 'F'-nipple while RIH.

3.4.5 Open up the well and flow for 24 hrs.

NOTE : a) Flow rates to be advised based on clean up performance.

b) If no gas break through has occured within the 24 hrs period, the flow period may be extended.

c) Take PVT recombination samples at the separator as required (ref. Appendix 9).

3.4.6 Close in well at PCT valve. Observe pressure drop at surface and close in at master valve. Carry out a 6 hrs pressure build-up survey.

NOTE : No work to be done on flowhead during build-up period.

3.4.7 RIH and retrieve the pressure gauges making gradient stops as above.

NOTE : Before proceding with programme, the guages will be inspected to ensure that they have worked and the results are acceptable. Inform base of results which again will confirm further programme.

3.5 Retrieving Test String

3.5.1 Bullhead tubing contents down to test interval with a viscous chalk/ brine pill followed by brine of 1.20 SG (0.520 psi/ft). Observe tubing dead.

3.5.2 Close the PCT valve and open the Multiple Opening Reversing Valve. Reverse circulate the well dead with 1.20 SG brine. When well is dead, straight circulate one hole volume through the valve.

3.5.3 Pick up "seal assembly" out of the packer and circulate normally and condition well with 1.20 SG brine.

NOTE : Spot viscous brine/ chalk pills if the well is taking fluid.

3.5.4 Lay down flowhead and POH production string laying down the test string.

Further abandonment programme will be advised.

PREPARATION OF TUBING

1. Offload and rack tubing, separating each layer with at least three evenly spaced wooden strips.

2. Number and measure each joint. WSPE and Production Test Supervisor both to check tubing tallies.

3. Remove pin and box protectors, inspect threads for damage, clean with solvent, and if possible, with steam.

4. Brush each joint to remove scale and loose solids: if any joint has excessive scale it should be rejected.

5. Drift each joint with appropriate 42" long tubing drift. All drifts should be fitted with a fishing neck.

6. Reclean pins and boxes and replace protectors. (N.B. Protectors should also be clean and only lightly doped).

7. Check that there are a reasonable number of pup joints for spacing.

8. Inform shore of any further tubing requirements.

9. Return any unsatisfactory joints.

PREPARATION OF TUBING SUB-ASSEMBLIES EQUIPMENT

1. Physically check all tubing sub-assemblies and inspect and clean threads with solvent.

2. Ensure that spares of each item are available on the rig.

3. Function test all equipment (sliding sleeves, nipples, etc.)

4. Run wireline drift through each sub-assembly paying particular attention to polished sections as these can easily be squeezed in make up. N.B. Separate drift runs should be made down to and through No-Go nipples.

5. Carry out API pressure test on each sub-assembly to 4,000 psi (to be witnessed by WSPE, TP and Production Test Supervisor).

   NOTE: Items 2 through 6 only when not carried out on-shore and witnessed by PTS.

6. Accurately measure each tubing sub-assembly and note the position of all accessories.

7. Replace protectors on each end of the tubing sub-assemblies.

8. Examine sub-assemblies for tong damage. If excessive, a new sub-assembly should be made up.

9. TP and WSPE to carry out final dimensions check.

PRESSURE TESTING SURFACE LINES AND EQUIPMENT

Before the well is flow tested (preferably prior to installation of the string) the following equipment will have been function/pressure tested on the deck as follows:

Flowhead
All inlet/outlet connections are to be blanked off with testsubs. Pressure test body with all valves open. All valves pressure tested from below.

Production Test Equipment
The following tests should be carried out before the installation of the test string in order to save rig time. Connect the cement discharge line to the 2" test line and pressure test as follows:

Lines to burners	:	1000 psi/15 min
Lines to oil and gas manifold	:	1000 psi/15 min
Separator	:	1350 psi/15 min
Relief valve(s) on separator	:	+/- 1450 psi (only if not recently done onshore and witnessed by Shell representative).

Flush the valves clean by pumping +/- 1 bbl of water and close the valve by bleeding the pressure to zero.

Lines to upstream inlet of separator and By-pass valve	:	1,350 psi/15 min
Check "P" pilot trips at +/- 1350 psi		
Lines downstream of steam heat exchanger	:	4,000 psi/15 min
Lines upstream of steam heat exchanger	:	4,000 psi/15 min

With 4,000 psi through the choke manifold close all valves on same and bleed off the pressure between the upstream and downstream valves. Observe for leakages.

Calibrate the oil and water meters while hooked-up to the pump line.

TESTS TO BE CARRIED OUT AFTER THE INSTALLATION OF THE PRODUCTION EQUIPMENT

With the flowhead mastergate closed and the kill line/flowline chicksan loops installed pressure test against the closed choke manifold to 4,000 psi/ 15 mins.

Checks should be carried out to ensure the following auxiliaries are operational:

1. Steam supply to the steam heat exchanger, the condensate feed back line to the rig system, and the steam degasser system.
2. Rig air supply to the burners.
3. Water sprays to burnerheads. Cooling water to the rig's hull/cranes etc readily available and at sufficient pressure.

NOTE: After pressure testing the burner boom oil and gas lines all valves downstream of the T-manifold must be kept open to allow for quick change-over of burners.

SAFETY PROCEDURE FOR HANDLING MERCURY

Mercury is used offshore for re-combination surface sampling and transfer of bottom hole samples in order not to modify the composition of the sample.

Mercury Handling Equipment to be used

1. The test operators who are to perform the operations utilizing mercury must report with all necessary protective equipment. Protective equipment is defined as follows:

   a) Coveralls without pockets.
   b) Snugly fitting splash goggles.
   c) Suitable breathing mask.

   Any other person(s) in the area who may come in contact with mercury or mercury vapor will be required to utilize similar protective equipment.

   d) Mercury exposure control form.
   e) Drager tube colormetric kit for checking the presence of mercury vapor.
   f) SRM Mercury spill control center.

2. The personal protective equipment shall be left separate from other items of equipment or clothing and on completion of work will be placed in sealed plastic bags which are to be labelled "Mercury Contaminated" and returned to Flopetrol for handling in accordance with statutory requirements and safety standards.

3. Used breathing masks will be handled in the same manner as equipment in item 2.

4. The test operators shall refrain from smoking, drinking or eating during rest break while engaged in testing or sampling operations. In the event that any of the prementioned are required, then a shower and change of clothing is essential.

5. Entrance to the work area will be roped off and appropriate signs displayed. No person shall enter the area without the approved equipment. The area shall remain roped off until a Dragertube colormetric environmental test is taken, within one (1) foot of the mercury source to indicate that no mercury vapor is present.

6. Should mercury come in direct contact with the skin of any person, it must be reported immediately to the operator's supervisor, who will inform the medic, the client representative, the safety officer and the company Drilling Supervisor.

   NOTE : Further procedures for operating of sampling equipment will be sent to the rig separately from the test programme.

SAFETY PROCEDURE FOR HANDLING EXPLOSIVES

Safety during loading and firing

Before gun/setting tool is armed all transmitters, cranes, welding machines, radar etc. must be switched off and remain switched off until the gun/packer is fired/set. After firing/setting, transmission can be resumed until the gun/packer setting tool has been pulled to about 100 m below the seabed, but must then cease until the gun/packer setting tool has been laid down and checked.

Portable transmitters should be placed in one room to prevent accidental transmission.

Helicopters should not be permitted to land on the platform during perforations, or to approach closer than 150 m.
Supply and standby boats to be advised that this operation is to take place, and to shut down their transmitters and stand off from the rig at this time.

Work involving explosives

Work involving the use of explosives should be carried out only by specialist personnel and should never be done during an electrical storm.

During any job involving the use of explosives, the number of personnel employed should be kept to a minimum. All other persons should be excluded from the danger area (e.g. walkway and derrick floor) throughout the operation.

Warning signs should be placed on access routes to the danger area to prevent access by unauthorised persons.

The Platform Manager (Captain) is to inspect equipment and check safety procedures.

Two hours before each perforating/packer setting run the Petroleum Engineer will telex Base with an estimate of when the radio beacon, VHF transmitter, etc. will be closed down and for how long. Actual times will be advised by the Radio Operator.

This is particulary important if a helicopter flight is scheduled for the rig concerned.

The first perforation must be carried out in daylight but later runs and packer settings may be carried out at night. However, if in the course of the production test a well is killed due to unforeseen circumstances, the first of any subsequent perforations must also be carried out in daylight.

A constant check must be made to ensure that no voltage is measured between the riser and the rig at surface. In the event that voltage is measured, all sources of electrical energy must be switched off. (N.B. This may preclude perforating/packer setting at night).

FLOWING THE WELL

Initial opening up a well to bleed off, perforating with immediately backsurge, or initial start up of a separator, must be carried out in daylight; production testing may then continue into the night.

Flaring operations may be carried out under the following conditions:

a) Weather suitable for rescue operations.

b) Wind force sufficient to carry gases away from the platform.

c) Shipping and aircraft warned to stand clear during blowing off.

d) Standby boat and supply boat(s) advised that this operation is to take place and to take the action and precautions necessary for this operations.

HYDRATE PREVENTION

To prevent hydrate formation during the flow testing, pump facilities should be hooked up to the following injection points:

a) E/Z Tree
b) Flowhead
c) Data Header
d) Gasline downstream of the separator

c) and d) may be fed by one pump with a T-manifold to allow for changeover.

NOTE: Triethylene Glycol to be used for hydrate prevention.
Methanol to be used when hydrates have been formed.

HANDLING AND MIXING OF CALCIUM CHLORIDE BRINE

A) Handling of CaCl2 brine.

$CaCl_2$, both as brine and powder can cause unpleasant skin irritation and even blistering if allowed to remain in contact with the skin. It is therefore important that personnel involved in work where they may be exposed to the brine or powder should be protected as follows:

a) Rubber gloves (gauntlet type to cover wrists).

b) Waterproof slicker suits with hoods.

c) Rubber boots (leather boots are shrivelled by the brine).

d) Full face masks for use when mixing powdered $CaCl_2$.

e) Barrier cream (e.g. "Vaseline") for use on exposed skin, particularly face, neck and wrists, to prevent direct skin contact with the brine.

Additionally, whenever brine/powder is inadvertently splashed onto clothing then the affected clothes should be changed and washed forthwith. Never allow brine to dry on the skin or clothes. If brine is splashed into the eye, wash the eye at once with copious amount of fresh water.

B) Mixing of a CaCl2 brine pill (1.20 SG) using CaCl2 powder:

The following instructions are for the mixing of 50 bbls of Calcium Chloride brine in the slug pit, the formulation is to be verified by a pilot check performed at the wellsite.

1. Thoroughly clean the slug pit and flush all the mixing lines and hoppers that are to be used for mixing with water. Also flush clean with water the transfer lines from the slug pit to the Halliburton unit.

2. Add 46 bbls of drillwater to the slug pit.

3. Add +/- 4330 lbs of Calcium Chloride (Peladow) (94 lbs/bbl) to the drill water while circulating through the mixing hopper.

NOTE: a) Fluid in the slug pit is to be thoroughly agitated during mixing or the Calcium Chloride flakes will drop out and settle on the bottom of the tank.

b) This mixing process is a exothermic reaction therefore as the brine is quite hot while being mixed it will weigh less when initially mixed than when cooled down.

C. To viscosify the above pre-mixed (50 bbls) Calcium Chloride brine.

1. Reduce the pH of the brine to below 5 by the addition of J286 powder or HCl acid.

2. Add +/- 50 lbs (50 lbs/1000 gal) of J164 (HEC) to the brine.

   NOTE: The J164 is to be added SLOWLY to the brine while circulating through the mixing hopper. If not added SLOWLY "fish eyes" will form which could possibly cause formation damage later.

   Agitate for 30 mins to ensure the J164 (HEC) is fully dispersed and hydrated. The viscosity should start to build after 15 - 30 mins dependent upon pH and ambient temperature.

3. Add caustic soda (while taking the standard precautions for handling) to the brine and increase the pH to around 8.5.

   NOTE: Ensure that the caustic soda is fully dispersed in the gelled brine before adding more as precipitates will form if the pH increases above 10.

   The Wellsite Petroleum Engineer is to conduct and monitor the above brine mixing and gelling procedures to ensure correct formulation etc.

CONTINGENCY MEASURES

A. Surface Leaks/Malfunctions

1. Minor surface leak/malfunction:

   a) Close in the well downhole at the PCT valve by bleeding off annulus pressure.

   b) Repair the minor leak/malfunction and re-pressure test the relevant surface equipment as required.

   c) Open up the well and resume testing.

2. Major surface leak/malfunction (assuming the automatic shut down system has activated).

   a) Close in the well downhole at the PCT valve by bleeding off annulus pressure.

   b) Open the MORV and reverse circulate the tubing to brine.

   c) Observe the well dead.

   d) Circulate down tubing at 4.5 BPM to close the MORV.

   e) Pressure test annulus to 500 psi.

   f) Complete repairs and re-pressure test the relevant surface equipment.

Re open the well as follows:

   a) Open the MORV valve.

   b) Circulate diesel into the tubing string to within 4 bbls of the MORV. Increase pumping rate to 4.5 BPM to close the MORV.

   c) Pressure test annulus to 500 psi/15 mins.

   d) Re-open well at the PCT valve with pressure on annulus.

B. Subsurface Tubing Leaks

1. If a tubing leak is suspected the following procedure is to be carried out:

   a) Close in the well at the flowhead and observe tubing and annulus pressures.

   b) Bullhead tubing contents with brine.

   c) RIH with RN-test tool and set same in RN-nipple. POH.

   d) Open the MORV and reverse circulate the tubing contents to brine and observe tubing dead. Close the MORV by pumping

down the tubing at 4.5 BPM. Pressure annulus to 500 psi/15 mins.

e) Attempt to pressure test the tubing to 3000 psi. If this test is OK then proceed with the test programme, if not carry out step f) below.

f) If either of the tubing or annular pressure tests fail then pull the test string and inspect the tubing and sub assemblies closely for leaks.

g) The further test programme will be advised.

C. HYDROGEN SULPHIDE (H2S)

1. If H2S is monitored in the hydrocarbons produced while testing (H2S is to be checked for immediately hydrocarbons reach surface) the following will apply.

a) Inform Shell Toolpusher and Platform Manager.

b) Air breathing apparatus is to be readily available on the rig floor and rig personnel are to be directed to keep clear of areas down wind of the test equipment and pipework.

c) A constant check is to be kept around the rig for H2S, if detected advise the Shell Drilling Supt. and Platform Manager immediately. If the presence of H2S is confirmed (in whatever quantities) the well is to be immediately closed in at the flow head and any leaks in the system traced and remedied.

NOTE: Breathing apparatus to be worn while checking for leaks.

d) If the H2S persists the test will be terminated by bull heading the tubing contents into the formation.

D. Deteriorating Weather

1. The test string will only be run once an acceptable weather window has been forecast for the duration of the test. If the weather begins to deteriorate rapidly once the string has started to be run a hang off tool will be picked up and the string hung off.

If deteriorating weather is expected once the flow testing has commenced the test will be suspended. The well will be secured as outlined below:

a) Close in well downhole at the PCT valve by bleeding off annulus pressure.

b) Open the MORV and reverse circulate the tubing to brine.

c) Close the EZ tree, bleed off any pressure in the annulus and monitor tubing pressure via the glycol injection line. Be prepared to unlatch the EZ tree.

WELL STATUS 31/2-15

1. The well has been drilled to a total depth of 1677 m BDF.

2. Casing Data

Size	Weight	Grade	Coupling	Depth m (BDF)	Collapse Strength	Internal Yield	Capacity BBL/FT
30"	310	X-52	Vetco ATD-RB	466	-	-	-
20"	129	X-52	Vetco LS-LH	800.5	1410	2930	-
13-3/8"	72	N-80	BTC	1444	2670	5380	
9-5/8"	47	N-80	BTC	1663	4750	6870	0.0732

3. Tubing Data

				Make up torque			
3½"	9.3	C-75	Hydril CS	3000 ft/lbs	10040	9520	0.0087
3½"	10.2	C-75	VAM	4900 ft/lbs	11360	10840	0.0083
4½"	19.3	C-75	Hydril PH6	7500 ft/lbs	12960	12540	0.0126
2-3/8"	4.6	P-105	VAM	2150 ft/lbs	15460	14700	0.00387

NOTE : No safety factors included in the pressure ratings. For make up torque correction factor for the particular dope used, has to be applied.

MEASUREMENTS REQUIRED

A. During flow periods

The following data should be recorded during flowing periods every 15 mins, or whenever a change occurs:

WHP, WHT, choke size flowline pressure
Separator pressure, separator temperature
Flowrate (gas) and condensate gas ratio CGR
Annulus pressure (via kill line)

In addition, all produced fluids should be measured for density. Gas should be analysed via the mud logging unit's gas chromatograph, with H2S measured with Draeger tubes. Produced water should be measured for salinity.

B. During BHP surveys

During all BHP surveys the following deadweight THP measurements are required:

a) Every 1 minutes during initial lubricator calibration stop.

b) Every 15 minutes during flow period.

c) After closing in for build up, every 1 minutes for the first hour, thereafter every ½ hour.

d) Every 5 minutes during the gradient stops at 100 m and 200 m above the mule shoe and at seabed.

e) Every 1 minutes during the final lubricator calibration stop.

SAMPLING REQUIREMENTS

1. Recombination (PVT) Samples

- 3 x 700 ml oil + 3 x 20 litres gas

PROCEDURE FOR RECOMBINATION SAMPLES

A. Gas Sample

1. The bottles should be properly evacuated with a vacuum pump.
2. The Wellsite Petroleum Engineer ensures that bottles are filled up slowly and are at separator pressure prior to being closed.
3. Check container and valves for leaks.
4. Mark bottles with sample number.
5. Fill in surface PVT sampling forms.

B. Oil/Condensate

1. Oil/Condensate sample container to be filled with mercury.
2. Slowly displace 500 cc mercury from 600 cc container with oil/condensate from separator.
3. The Shell Petroleum Engineer ensures that bottles are at separator pressure prior to being closed.
4. Draw off 50 cc of mercury to create gas cap.
5. Check containers and valves for leaks.
6. Mark bottles with sample number, date, time and well no.
7. Fill in surface PVT sampling forms.

Sample Bottle Working Pressure

Capacity	W.P.
20 litres (gas)	2,800 psi
0.7 litres (condensate)	10,000 psi

SAND DETECTION DURING OIL TESTS

Strict monitoring of the flowstream for sand will be performed using:

a) Erosion probes with pressure gauges will be placed at crucial elbows etc. Additional erosion probes connected up to the automatic shut down system will also be installed.

b) A sand trap will be installed in the flowline and should be used whenever possible.

c) Maintain record of filter size used in the sandtrap and collect and mark all sand from sandfilter.

SPECIAL TOOLS IN THE TEST STRING

PCT Pressure Controlled Tester

This valve is run in the string to facilitate downhole shut-in for wellbore storage elimination, down hole shut-in for safety, and to reduce wireline work.

The PCT is a ball valve which is opened by annulus pump pressure, and closed by a combination of spring and nitrogen gas pressure. It can be opened and closed as many times as necessary permitting multiple flow and closed-in pressure tests. The PCT valve requires approx. 1200 psi pressure on the annulus to keep open. The PCT valve run in this string is modified in such a way that it can be run into the hole in locked open position so that circulating above the flapper valve is possible. A rupture disc is installed prior to running the tool, trapping a pressure in the tool which keeps the ball valve open. When the string is installed the valve can be actuated by rupturing the disc with 2500 psi annulus pump pressure.

HRT Hydrostatic Reference Tool

This tool is run just below the PCT valve and will be run in closed position and will have no function during the test. It is run for completeness of the PCT tool (thread connections).

MORV Multiple Opening Reversing Valve

This valve is run in the string to faciliate displacement of the tubing content. To open this valve, pressure is applied through the tubing against a closed PCT valve. The valve needs 9 pressure cycles before it opens. Pumping rate through the valve should not exceed 3 BPM. To close the valve, the pumping rate is increased to 4.5 BPM and a preset function in the valve will close the ports.

SSARV Single Shot Annulus Reversing Valve

The SSARV is run in the perforating string only and will be precharged to open at 2500 psi surface pressure.

TESTING ORGANIZATION

The Shell Toolpusher will be in overall charge throughout the test. The Shell Toolpusher will be advised and assisted during the test by the Well Site P.E. The Reservoir Engineer, if onboard, will advise the Shell Toolpusher and/or Well Site P.E. on the reservoir engineering aspects of the test. The Shell Production Test Supervisor will advise and assist the Toolpusher and Well Site P.E. as and when requested by them.

SAFETY MEETINGS

Safety Meetings for each crew are to be held prior to testing activity. All personnel to be informed of the possible dangers related to explosives, mercury, hydrocarbons and hydrogen sulphide. Company representatives should be present at these meetings.

EZ TREE SPACE OUT WELL 31/2-15 RIG BORGNY DOLPHIN

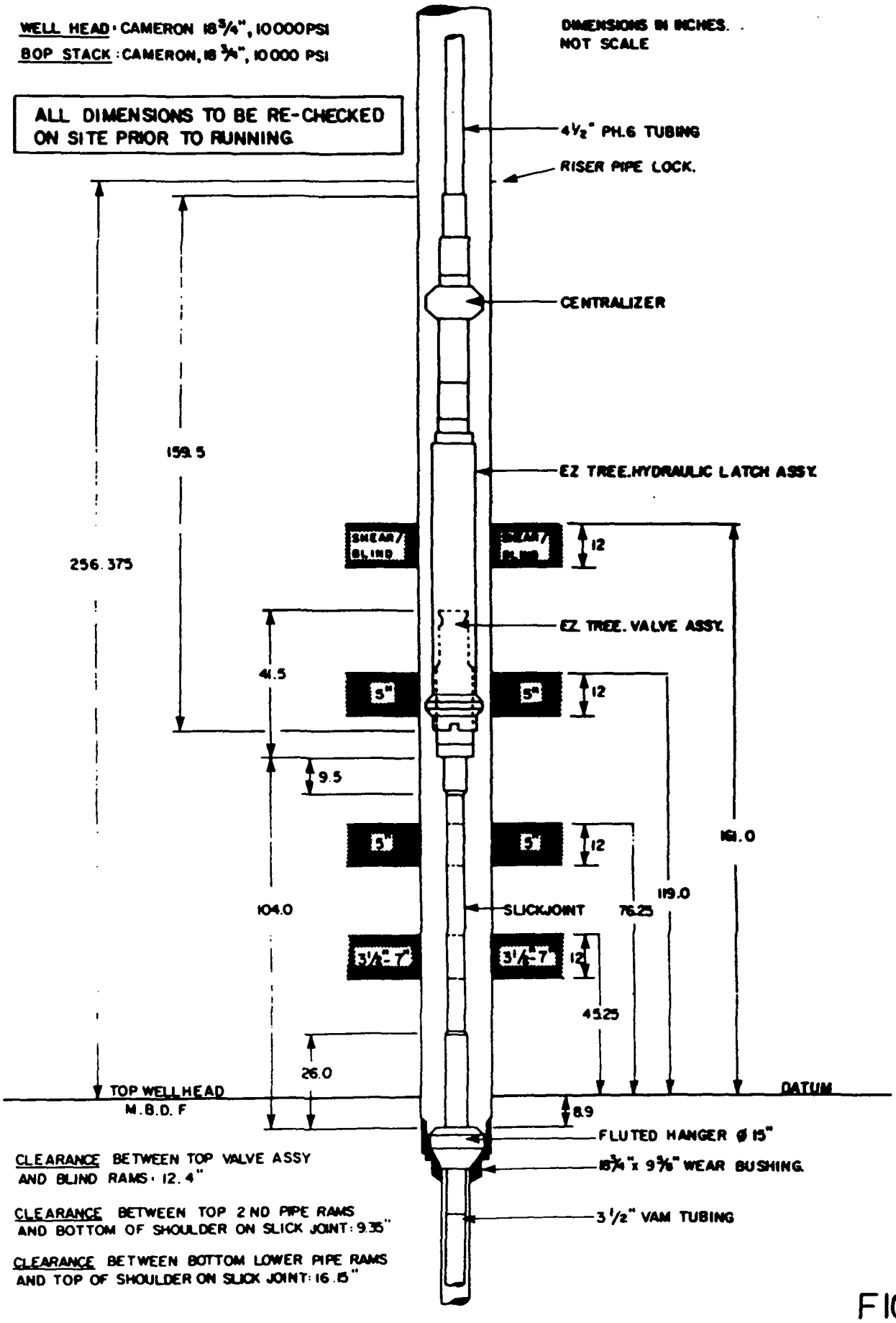
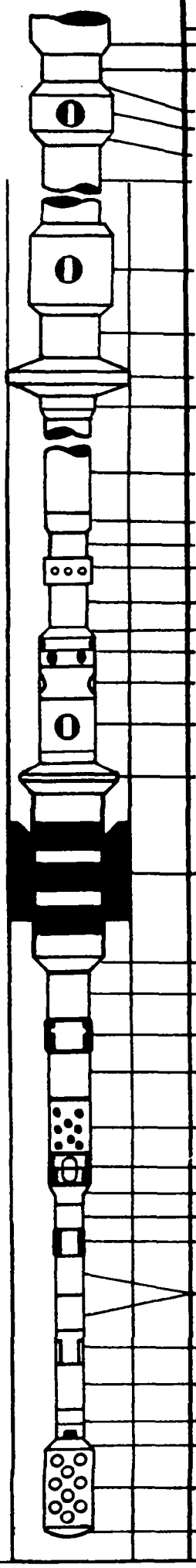


FIG. 1

PERFORATING/TEST STRING WELL N° 31/2-15.



	LENGTH/ DEPTH	MIN ID	MAX OD
X-over 6½" acme (B) x 4½" PH-6 (P)		3.515	
4½" PH-6 19.2 lb/ft tubing		3.515	5.313
X-over 4½" PH-6 (B) x 4½" acme (P)		3.000	5.313
Flopetrol lubricator valve		3.000	10.750
X-over 4½" acme (P) x 4½" PH-6 (P)		3.000	5.313
4½" PH-6 19.2 lb/ft tubing		3.515	5.313
Flopetrol E-7 SSTT		3.000	10.750
5" slick joint for 9-5/8"		3.000	5.000
Fluted hanger for 9-5/8" wear bushing		3.000	15.000
X-over 4½" acme (B) x 3½" VAM (P)		2.797	5.313
3½", 10.2 lbs/ft tubing VAM C-75		2.797	3.917
X-over 3½" VAM (B) x 3½" CS (P) C-75		2.797	3.917
3½" CS 10.3 lb/ft L-80 pup joint		2.797	3.917
Otis 3½" type XA-SSD		2.750	4.280
3½" CS 10.3 lb/ft L-80 pup joint		2.797	3.917
X-over 3½" CS (B) x 3½" IF (P)		2.250	5.000
Dowell M.O.R.V.		2.250	5.000
Dowell S.S.A.R.V.		2.250	5.000
Dowell PCT w/ shear disc. closed HRT w/ 3½" IF (P)		2.250	5.000
Baker type G-22, 190-60 seal assy w/ 3½" IF (P) x (B)		4.875	6.000
Baker F-1 packer 192-60 (40-58.4)		6.000	8.218
X-over 3½" IF (B) x 2-7/8" VAM (P)		2.347	-
2-7/8" VAM pup joint		2.347	3.197
Otis 2-7/8" type RN landing nipple		1.937	3.760
2-7/8" VAM pup joint		2.347	3.197
Perforated joint 2-7/8" VAM(B)x 2-7/8"EU(P)		2.450	3.750
Compensating disc assy (Baker)		2.375	3.687
X-over 2-7/8" EU (B) x 2-3/8" EU (P)		1.995	2.875
2-3/8" pup joint, EU		1.902	3.063
Baker type 'F' landing nipple (2-3/8")		1.875	3.063
2-3/8" pup joint, EU (min. 30 feet)		1.902	3.063
Mechanical tubing release (Baker 2-3/8")		1.880	3.125
2-3/8" pup joints, EU (min. 20 feet)		1.902	3.063
X-over 2-3/8" EU (B) - 2-7/8" EU (P)		-	-
Firing head (Baker)			
Baker 5" perforating gun 12 spf DP		-	5.000
Bull plug			

FIG. 2

GUN / SEAL ASSEMBLY SPACE OUT

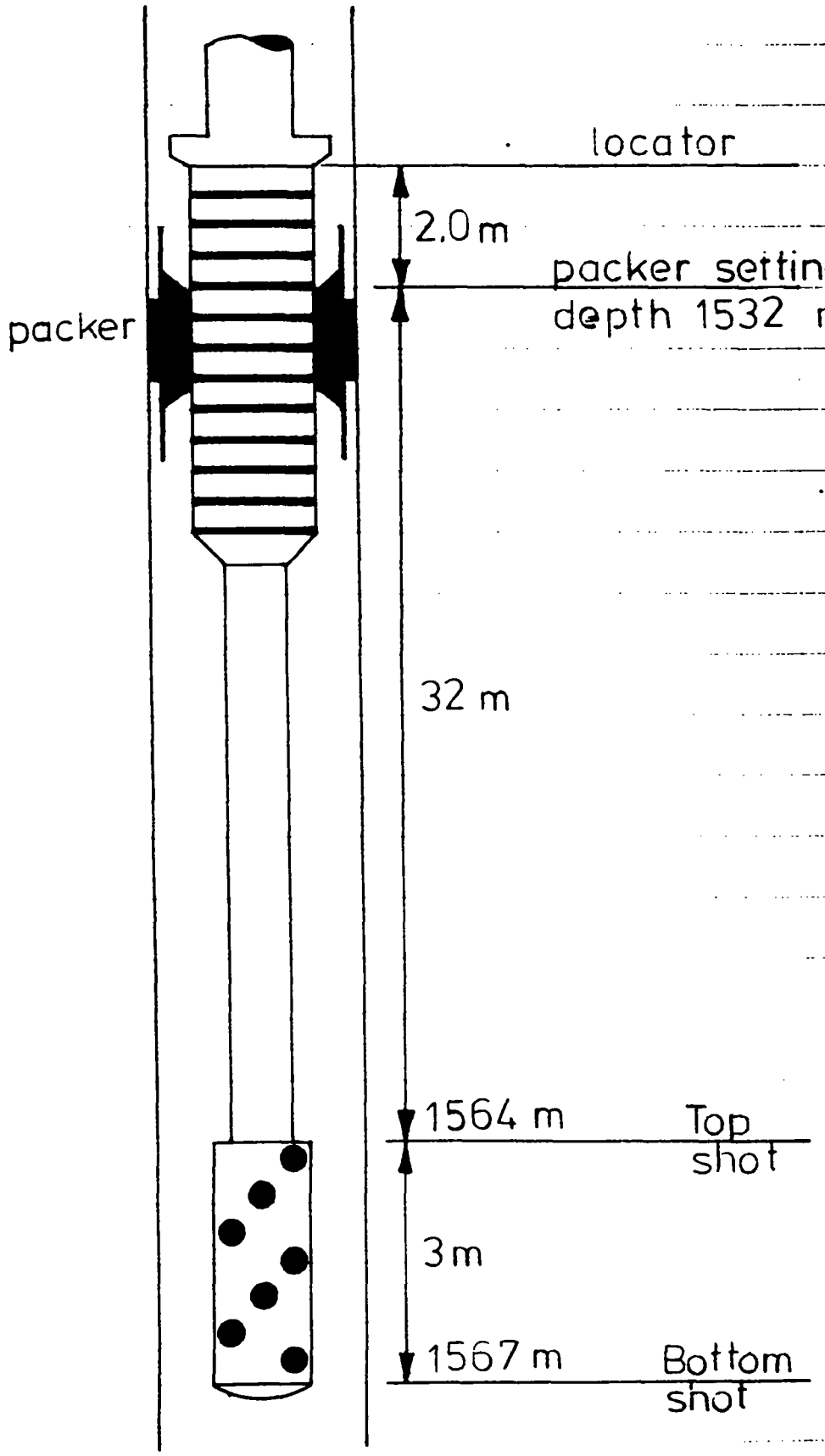


FIG. 3

LAYOUT OF SURFACE COMPLETION EQUIPMENT FOR BRINE STORAGE, GRAVEL PACKING AND ASSOCIATED STIMULATIONS ON BORGNY DOLPHIN.

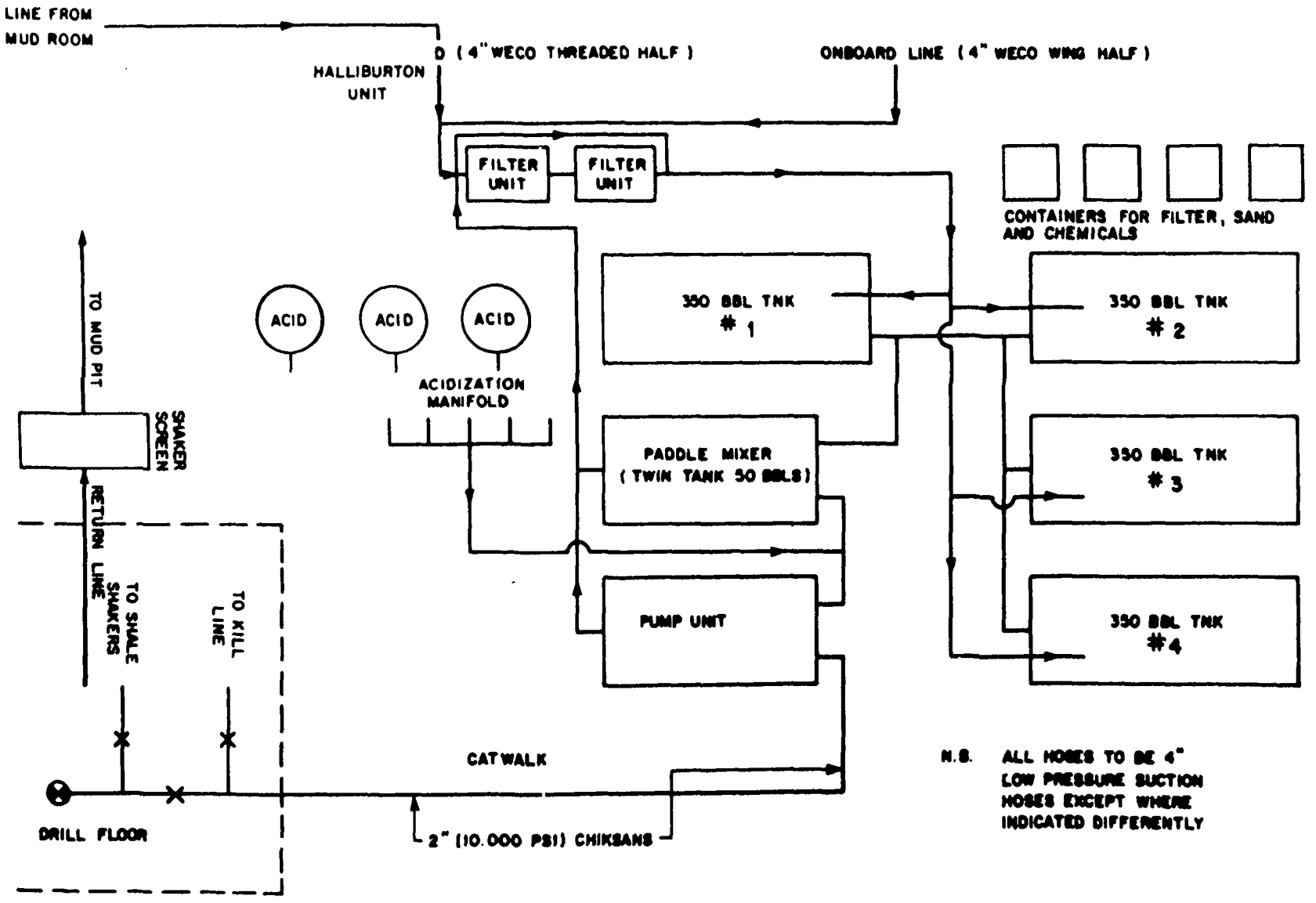


FIG. 4

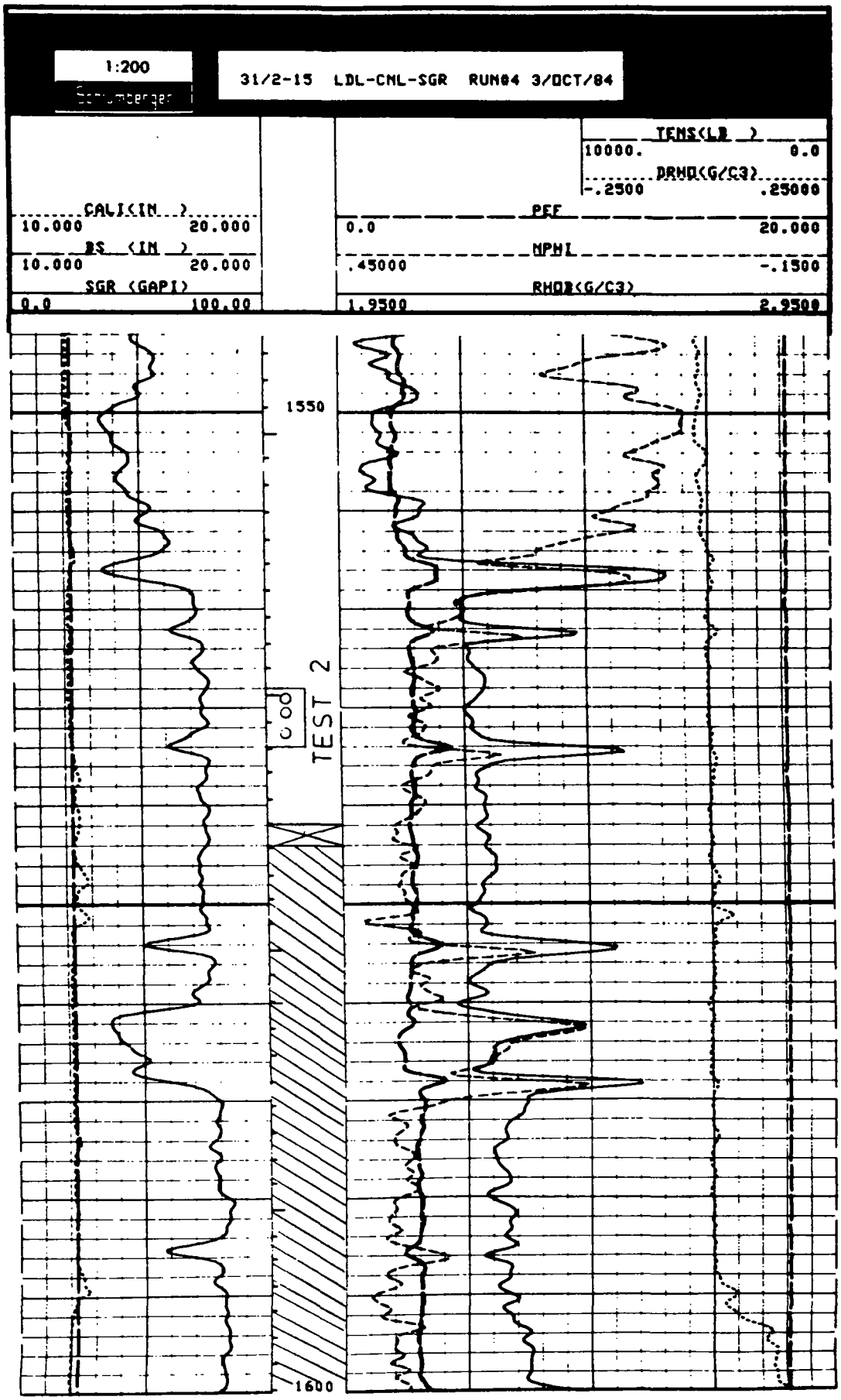

1:200
Schlumberger
31/2-15 LDL-CNL-SGR RUN#4 3/OCT/84
TENS(LB)
10000.
0.0
DRHO(G/C3)
-.2500
.25000
CALI(IN)
10.000
20.000
PEF
0.0
20.000
BS (IN)
10.000
20.000
NPHI
.45000
-.1500
SGR (GAPI)
0.0
100.00
RHOB(G/C3)
1.9500
2.9500
1550
TEST 2
1600

FIG. 5