

WELLBLOG

W-00749

CONOCO/BP/PELICAN

NORWAY NORTH SEA WELL

16/8-1

FINAL WELL REPORT

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Location: NOCS 16/8-1 W28 W48
01014934-1

Geologist: T. Sullivan

Engineer: T.H. Øvrevik

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N O R T H S E A N O R W A Y

16/8-1

I. ESSENTIAL WELL DATA

LOCATION: 58° 27' 24.8" N
02° 25' 56.8" E

CLASSIFICATION: WILDCAT

OBJECTIVE: To test Upper Jurassic Sands in Thrust-Faulted Anticline

DRILLING PERIOD: SPUDED: 25 September 1976
COMPLETED: 21 October 1976

KB ELEVATION: 25 Metres

WATER DEPTH: 81 Metres

RIG: Norskald

TOTAL DEPTH: 2301.3 Metres

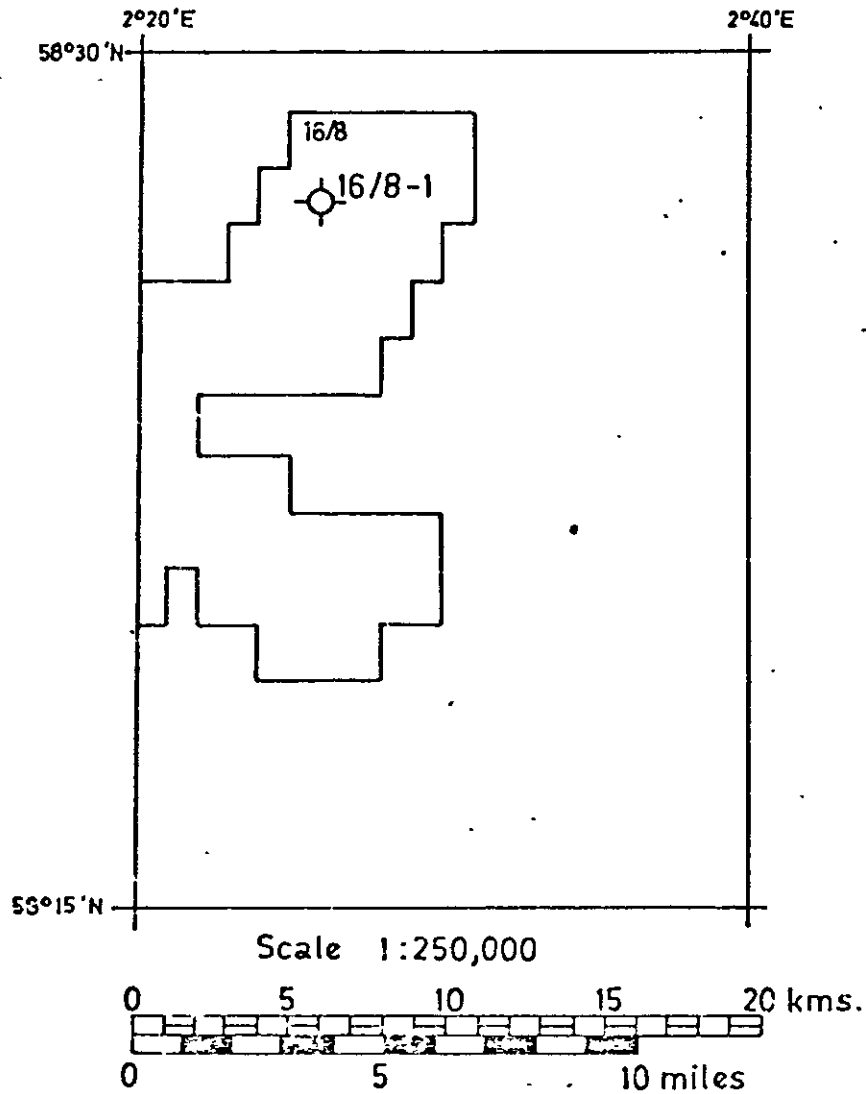
PAY ZONES ENCOUNTERED: None

COMPLETION STATUS: P & A as a dry hole

(All depths in this report are in Metres KB unless otherwise stated)

WELL LOCATION PLAT

CONOCO / BP / PELICAN 16/8-1



LATITUDE	58°27' 24,8''N
LONGITUDE	02°25' 56,8''E
KB MEAN SEA LEVEL	25M
WATER DEPTH	81M
TOTAL DEPTH	2301,3M

II. WELL SUMMARY

IIIi) Objectives and Results

The 16/8-1 exploratory well was drilled by Conoco as operators for the Conoco/BP/Pelican group.

The well was located to test a thrust-faulted structure in a NE-SW trending sub-basin to the south-east of the Utsira High. The primary objective was the basal Upper Jurassic sand. This sand was estimated to have an approximate gross thickness of 71 metres.

The well penetrated a gross thickness of 43.5 metres of Upper Jurassic sand. The sand were of high porosity but were water bearing.

The well was plugged and abandoned as a dry hole after reaching a total depth of 2302 metres in Trias.

IIIii) Well history

The well was spudded on 25th September 1976 and reached TD on 21st October 1976. Cutting samples were collected every 6 metres from sea floor to 13.3/8" casing shoe (1313.4 m KB). Below 13.3/3" casing shoe to TD samples were collected every 3 metres. Sampling and mudlogging were performed by Exploration Logging. BP Research did the palaeontological analysis of the whole well. Canned samples for source rock/maturity analysis by Robertson Research were collected every 100 m from 1000 m, and every 30 m from 2000 m to TD.

Wireline logs were run according to programme at 20", 13.3/8" casing points and at TD. Details of Schlumberger logs, lithological and drilling data are recorded on the Composite well log. Sidewall core descriptions are also included on the base of the log.

III. STRATIGRAPHY

IIIi) Table of Lithostratigraphic Units

Interval in metres	Group	Formation	Age (as determined by BP Research)
106-954	"Nordland"	-	Miocene to Pleistocene
954-1568	"Hordaland"	-	Eocene to Oligo-Miocene
1568-1749.5	"Rogaland"	"Balder" 1568-1608	L. Eocene
		"Sele" 1608-1708	Paleocene to L. Eocene
		"Lista" 1708-1749.5	Paleocene
1749.5-1829.5	Chalk	Ekofisk 1749.5-1769	Early Paleocene
		Hod 1769-1829.5	Upper Cretaceous
1829.5-2044	Cromer Knoll	Rødby 1829.5-1928.5	E. Barrem. to Late Albia
		"Valhall" 1928.5-2044	E. Hauter. to Late Barre
2044-2072	unnamed	Bream 2044-2072 (Førglum member)	Tithonian-E. Valanginian
2072-2307.3		Haldager 2072-2115.5	Early-L. Kimmeridgian
		Flekkefjord 2115.5-2307.3	Triassic

Formation names correspond to those established by the North Sea stratigraphic nomenclature committees. Where final agreement has not been reached the names are enclosed by inverted commas.

IIIii) Table of Paleontological Divisions
 (age determinations by BP Research)

System	Sub-System	Stage	Interval
Pleistocene-Recent			178-338m
Pliocene			394-892m
Miocene			898-958m
Oligo-Miocene			964-1108m
Oligocene			1120-1375m
Eocene			1384-1621m
Paleocene	Early Eocene		1513-1621m 1633-1777m
	Early Paleocene		1753-1768m
	Early Paleocene	Danian	1771-1777m
Cretaceous	Upper Cretaceous	Maastrichtian-Campanian	1780-1792m
		Campanian	1795-1810m
		Santonian-Coniacian	1822m
	Lower Cretaceous	Late-Middle Albian	1840-1822-1894m
		Early Aptian	1960-1918m
		Early Barremian	1921-1930m
		Late Hauterivian	1939-1970m
	Early Hauterivian	2005-2041m	
	Early Valanginian	2050m	
Jurassic	Upper Jurassic	Tithonian	2055-2065m
		E. Tithonian/L. Kimmeridgian	2074.5m
		E. Kimmeridgian	2083-2112m

IIIIii) STRATIGRAPHIC SUMMARY

"Nordland" Group 106m - 954m (Miocene to Pleistocene)

The section 106m to 178m was drilled without returns. Between 178m and 350m the section consists of interbedded sand and clay plus lignite. The sands are loose, fine to coarse grained with abundant shell fragments. The clay is light to medium grey, slightly calcareous, with microfossils. Below 300m to 765m clay is the predominant lithology. This clay is as above, with shell fragments and forams. From 765m to 954m fine to medium, rarely coarse grained, unconsolidated sand is present with grey-brown shale towards the base.

"Hordaland" Group 954m - 1568m (Eocene to Oligo-Miocene)

The top of this group is marked by the base of the deepest sand in the "Nordland" group. Claystone is the dominant lithology, with occasional thin interbedded limestones and traces of dolomite, sandstone siltstone and shale. The claystones vary from light grey to brown in the upper part becoming increasingly green with depth. The claystones are slightly silty throughout, and variably micaceous and glauconitic. The limestones are grey, green, and pink, brown, blocky and frequently micritic.

"Rogaland" Group 1568m-1749.5m (Paleocene to L. Eocene)

"Balder" Formation 1568-1608m (L. Eocene)

This formation is characterised by a low sonic travel time reflecting volcanic tuffs and ash. The tuffs are light to dark grey, lilac, speckled with white and black spots. The ash is varicolored-purple, lilac, brown-red, white and green, grey. Abundant microcrystalline pyrite is present.

"Sele" Formation 1608m-1708m (Paleocene to L. Eocene)

Below the volcanics of the "Balder" formation, volcanic tuffs and ash are interbedded with claystone. The claystone is grey, brown, soft and sticky, non calcareous and occasionally shaly, green firm and subfissile. The base of the "Sele" formation is marked by an increase in the gamma ray reading which reflects a decrease in volcanics and an increase in claystone content.

Lista Formation 1708m-1749.5m (Paleocene)

This formation is principally claystone with only a trace of volcanics and sandstone. Thin limestones are interbedded with

the claystone.

The claystone is light grey, purplish grey, grey brown and predominantly non calcareous and glauconitic. The limestone is white, buff, hard, microcrystalline and grading in part to calcite. The traces of sandstone are white, fine to very fine grained and poorly cemented.

Chalk group 1749.5m-1829.5m (Upper Cretaceous to Early Paleocene)

Ekofisk formation 1749.5m-1770m (Early Paleocene)

The top of this formation is easily picked by the decrease in GR and sonic travel time values. This is a chalky formation with decreasing claystone content with depth. The chalk is white, light grey, soft to firm, becoming firm, with depth. The claystone is dark to light grey, soft to firm and moderately calcareous.

Hod formation 1769m-1829.5m (Upper Cretaceous)

This formation is characterised by fairly constant sonic values. This is a massive chalk unit. The chalk is white, light grey, soft and pastey to hard, with rare calcite and pyrite.

Cromer Knoll Group 1829.5m-2044m (Early Hauterivian to Late Albian)

Rødby Formation 1829.5m-1928.5m (Early Barremian to Late Albian)

This is a claystone formation characterised by an increase in GR and sonic travel time values. The claystone is light to dark grey at the top but becomes red brown with depth. It is soft, sticky and moderately to very calcareous, occasionally silty.

"Valnall" formation 1928.5-2044 (Early Hauterivian to Early Barremian)

This formation is predominantly claystone, with thin limestone and rare dolomite. The claystone is light brown, grey brown, becoming light, medium to dark grey with depth. The claystone is calcareous throughout with occasional dark grey carbonaceous fragments and rare microfossils and shell fragments. It is silty in parts. The dolomite is buff, tan, very hard and massive. The limestone is at the base of the formation and is white, light grey, soft to firm and argillaceous.

The interval 2044m-2302m has not been given a group name

Bream formation 2044m-2072m (Tithonian-E. Valanginian)

The Bream formation is represented here by the Børglum member (Hot shale), which is a dark grey shale, firm to hard, subfissile, pyritic and slightly calcareous in places.

Haldager formation 2072m-2115.5m (Early to Late Kimmeridgian)

This is a sandstone formation which becomes silty towards the base and top. The sandstone is fine grained, fairly well sorted, subangular, very glauconitic, and is interbedded with firm to hard siltstone laminae. However, log analysis indicates high porosities for the major part of this formation.

Flekkefjord formation 2115.5-2302 (Triassic)

This is predominantly a claystone formation with some silty sandstone and loose sand. The claystone is variably red to light grey in the upper part to predominantly red-brown with depth, and is generally silty and slightly calcareous. The sand content is as loose quartz grains, fine to coarse, predominantly subrounded. Traces of sandstone are seen as white, light grey, fine grained well cemented and hard.

IV. FORMATION EVALUATION

IVi) Hydrocarbon indications

No evidence of hydrocarbons was encountered whilst drilling, and log analysis confirmed that all intervals with significant porosity are water bearing

IVii) Formation Evaluation

Interval logged in metres (below KB)

<u>Schlumberger Logs</u>	<u>SUITE 1</u>	<u>SUITE 2</u>	<u>SUITE 3</u>
BHC Sonic/GR	528.5-100 (GR)	1322.5-524	2301.8-1312
ISF/SP (in combination with BHC/GR)		1322.5-524	2301.8-1312
FDC/CNL/GR/CAL			2301.7-1312 2301.7-1312
Velocity Survey			Shot 30 Recovered 26 Lost 3 Empty 1 Recorded 14 levels

Intervals with significant porosity

1) Upper Cretaceous Chalk 1769m-1829.5m

Rw was calculated to be 0.055 ohm-metre at an estimated formation temperature of 155° F.

<u>Interval (m.KB)</u>	<u>Ave. Porosity % (From Neutron-Density)</u>
1769-1775	34
1775-1799.5	23
1799.5-1829.7	17

Each interval calculates to be water bearing

2) Upper Jurassic Sands 2072m-2115.5m

Logs indicate a gross thickness of 43.5m and a net sand with greater than 10% porosity of 41m. Rw was calculated to be 0.044 ohm-metre at 182° F (70,000 ppm NaCl equivalent). Calculated porosities are greater than were visually apparent in the cuttings and sidewall cores.

<u>Interval</u> (M.KB)	<u>Ave.Porosity</u> (Neutron-Density)
2072-2078	19%
2078-2080	23%
2080-2089	33%
2089-2102.5	31%
2102.5-2115.5	19%

Each interval calculates to be waterbearing.

No reservoir sand was encountered in either the Paleocene or the Trias.

WELL 16/8-1

FINAL WELL REPORT

ENGINEERING

Prepared by:
T.H. Øvrevik

November 1976

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Appendix 1: Pressure Prediction Data

Appendix 2: Mud Records

STATISTICAL SUMMARY

Well Name: 16/8-1

Permit No. 166

Classification: Exploratory

Location: Final Sat. Nav.: 58 deg. 27' 24.8" North
02 deg. 25' 56.8" East

Rig	Norskald
Water Depth	266 ft.
RKB to WL	82 ft.
RKB to M.L.	348
Rig accepted	23 Sept. 1976
Rig released	31 Oct. 1976
Well spudded	25 Sept. 1976
Total rig days	38 days 17½ hrs.
Status of Well	Permanently P&A
Casing Setting depths (from RKB)	30" at 555 ft.
	20" at 1,722 ft.
	13 3/8" at 4,309 ft.
	T.D. at 7,550 ft.
Partners	Conoco BP Pelican Statoil

WELL SUMMARY

The well 16/8-1 was drilled using the semisubmersible "Norskald" (ODECO Design). The rig was towed from 7/12-2 location on 23 Sept.

After running anchors on present location, the 30" csg. was run and hung on spider beams, while the 36" hole was drilled to 565 ft.

The temporary guidebase was hooked and tilted by hole opener arms when tripping out of the hole. Slings were attached around the structure by divers, and the TGB was pulled using drillpipe. Then 30" conductor pipe was run and cemented.

A 17½" hole was drilled and logged and opened up with a 26" under-reamer before the 20" surface casing was run and cemented to the surface.

After running the BOP stack and riser, a 17½" hole was drilled to 4,352". While drilling this interval, the rig was shut down 11.5 hrs. (1.24%) to clean out gumbo balls from flow lines, possum belly and shale shakers.

The interval was logged, and 13 3/8" casing was run and cemented to the surface.

The 12 1/4" hole was then drilled to 7,550 ft. with 11.5 ppg mud without any drilling problems.

During this well 147.5 hrs. rig time (15.87% of total) was lost waiting on weather. Pulling the riser and the anchors were the most critical operations, but a storm also caused 36 hours delay hanging off the drillstring while drilling the 12 1/4" hole.

After logging, the well was permanently plugged and abandoned as a dry hole on 25 Oct. 1976. The anchors were pulled and the rig towed to shore and anchored in Sandnes harbor before it was released at 23.00 hrs. 31 Oct. 1976.

DAYS/DATE	DEPTH/PROGRESS	DAILY ACTIVITY SUMMARY
1/23 Sept.	-	Last anchor up at 05.35 hrs. Rig under tow from 7/12-2 location. Replacing pennant line on anchor no. 7. Waiting on daylight to move on location.
2/24 Sept.	348/0	Picked up pennant line on no. 1 anchor. Running anchors. Ballasting down to 70' draft. Tensioning anchors to 350,000 lbs. Rerun anchor no. 8.
3/25 Sept.	458/110	Running temporary guide base. Ran and landed 30" csg. in Perm. G.B. with stinger inside, PGB. hanging on spider beams. Stabbed into T.G.B. with T.V. Well spud at 2030 hrs. Surveyed at 360' 1 3/4°. Drilled to 458'. 348' RKB to ML. 82' RKB-S.L.
4/26 Sept.	565/107	Drilled to 565. Survey 3/4°. POOH. Rih. 1' fill. Hole opener hung on TGB. Came free. Base tilted at 45° angle. Could not pull TGB with guide lines. Jump divers.
5/27 Sept.	565/0	Divers attached slings from D.P. around TGB. Recovered TGB. TiH with bit and hole opener. 2' fill. Ran 30" conductor. Cemented with 1400 sx. class G neat + 2% CaCl. Rig up and running 20" riser and pin connector. GiH.
6/28 Sept.	1,750/1,185	Displaced hole with mud. Cement top at 541 inside csg. Shoe at 555. Drilling and survey to T.D. conditioned hole. Made short trip to 30" shoe.
7/29 Sept.	1,750/0	Ran gr-sonic. Tool stopped at 1,250. GiH to T.D. Ran logs. P.U. under-reamer. GiH. Opening cmt. and hole to 865'.
8/30 Sept.	1,750/0	Opened hole to 26". Circulated, Displaced riser with seawater. POOH. WOW to release riser and run 20" csg.
9/ 1 Oct.	1,750/0	Pulled riser. Ran 20" csg. 9(jnts) Ran 20" guide frame. Worked through bridge at 599.
10/ 2 Oct.	1,750/0	Finished running 35 jnts. 94 lb. X-52 casing. Landed in 30" housing. Circulated. Mixed and pumped cement. Had lines blocked. Pumped 2,727 sx class G. cement with 8% Gel plus 500 sx. neat cmt. Sheared and bumped plug. Backed off running tool. WOW to run BOP.

DAYS/DATE	DEPTH/PROGRESS	DAILY ACTIVITY SUMMARY
11/ 3 Oct.	1,750/0	Tested upper hydrill and riser connector to 3,500 psi. on test stump. WOW.
12/ 4 Oct.	1,750/0	Nippled up riser. Installed bullseye and beacon on stack. Running riser, testing choke and kill-lines to 5,000 psi.
13/ 5 Oct.	1,750/0	Made observation dive. Guidebase was free of obstructions. Ran slip joint. Weight for T.V. was picked up by stack, was disconnected by picking up wt. at surface. Latched stack connector onto wellhead. Installed diverter housing. Tested lines choke manifold etc. to 5,000 psi. Hydrils to 2,500. POOH with test plug. GiH. Tagged cmt. at 1,685. Shoe at 1,722.
14/ 6 Oct.	2,627/ 876	Drilled 5 ft. new formation. Tested form. to 12 ppg. mud wt. equivalent. 185 psi with 10 ppg. mud. No leakoff occurred. Drilled and surveyed to T.D. 1° N 77 W at 2,050. 1½° N 72 W at 2,397.
15/ 7 Oct.	3,101/ 475	Dumped possum belly. Drilling. Lost pump press. Repaired valve in pump no. 1. Drilling. POOH for washout. Body of bit washed out at center. GiH. Drilling.
16/ 8 Oct.	4,070/ 969	Drilling, survey. Cleaning possum belly and flow-lines several times. Drilling to T.D.
17/ 9 Oct.	4,352/ 282	Drilling and survey. Cleaning possum belly. Drilling to T.D. Taking multishot. POOH. Wash and ream to T.D. Circulate, cleaning surface equipment of gumbo.
18/10 Oct.	4,352/0	Circulate. Clean diverter, etc. Increased mud wt. to 11.3 ppg. POOH to log. Logs stopped at 1,755'. GiH. Circulate and cond. mud, increase wt. to 11.6 ppg. POOH to log. Ran ISF/GR/Sonic.
19/11 Oct.	4,352/0	Washed out stack and riser. Pulled wearbushing. WOW to run 13 3/8" csg.
20/12 Oct.	4,352/0	Circulate, conditioning hole. POOH. Ran 100 jnts. 13 3/8" csg. Shoe at 4,314'. Landed in hanger at 344'.

DAYS/DATE

DEPTH/PROGRESS

DAILY ACTIVITY SUMMARY

21/13 Oct.

4,478/ 126

Circulating. Mixed and pumped 2,057 sx. class 'G' with 8.5% Gel. 0.5% CFR-2 and 0.2% HR-7 plus 500 sx. class G neat, + 1% CFR-2. Bumped plug with 2,500 psi. Released press. floats held. OK. Had approx. 500 sx. cement returns to surface. Washed out cement from riser thro' kill/choke lines. Washed wellhead and BOP. Ran 20" x 13 3/8" seal assembly. Tested rams to 1,800 psi. C/K. lines to 3,500 psi. GiH. Drilled shoe and 5' of new formation. Tested form. to 14.3 ppg. mud wt. equivalent. Drilled to T.D.

22/14 Oct.

5,613/1,135

Drilling and survey to 5,613. Pulled 18 stds. Picked up test plug and inside BOP. GiH. Hang off on wear bushing. Backed off D.P. Prepare to release upper package and riser if necessary. WOW.

23/15 Oct.

5,613

WOW. Maintaining position with propulsion assistance.

24/16 Oct.

5,613

WOW. Displacing riser. Screwing into hangoff tool. Bit plugged, POOH. Change bit. RiH. Reaming at 4,522-4,677. Laying down 30 jnt. D.P. RiH. Reaming to 5,055'.

25/17 Oct.

6,295/ 682

Cleaning possum belly and flowline. Reaming to T.D. Increasing mud wt. to 11.5 ppg. Drilling and survey to 6,023. Drilling break at 6,009 (190 ft/hr.) Circulated samples up. Drilling to 6,295.

26/18 Oct.

6,682/ 387

Drilling and survey to T.D.

27/19 Oct.

7,192/ 510

Drilling to 6,727. (22 ft/hr.) Drilling break at 6,715. Circulated samples up. Drilling. Attempt survey. Tool would not go down due to high gels in mud. Drilling from 6,853 to 7,192 (Aver. 24 ft/hr.)

28/20 Oct.

7,550/ 358

Slug and POOH to change bits. GiH with new bit. Drilling to 7,550 (20 ft/hr.)

29/21 Oct.

7,550/0

Circulating and conditioning hole. Drop multishot. Slug and POOH to dart sub. Retrieve multishot. GiH to 7,550, Circ. and cond. hole for logging, POOH strapping pipe. Rig up Schlumberger. Tension indicator failed. Had new cable for Sch. at the rig at 01.11 hrs. Replaced cable. Ran GR-ISF-Sonic, and FDC/CNL/GR/CAL.

DAYS DATE	P.B.T.D.	DAILY ACTIVITY SUMMARY
30/22 Oct.	7,550/0	Ran dipmeter log. First attempt failed. Repaired tool. Ran velocity survey. Ran sidewall cores, 30 shots. 26 recovered. Laying down BHA. GiH openended.
31/23 Oct.	400/-	GiH to 6,850. Circulating ½ hr. Mixed and pumped 250 sx. class 'G' cement with 1% CFR-W, 0.1% HR12, 15.6 ppg. Pulled six stands. Reversed out. POOH. Ran and set HALL EZ drill squeeze retainer at 4,200' on Sch. line. GiH with stinger. Sting into retainer. Break down formation with 15.51 ppg mud wt. equivalent. (900 psi WHP) Pumped 330 sx. class 'G' with 1% CFR-2, and 0.1% HR12. Pumped 250 sx. thru retainer. Picked up and spotted 80 sx. (112 ft) on top of retainer. Pulled 5 stands and reversed out. POOH. GiH open ended to 1,750'. Spot plug no. 3 1,750 to 1,600', with 110 sx. class 'G' neat cement. POOH to 550.. Displaced hole with seawater. Plug no. 5 - 550' to 400' (110 sx) POOH. Wash stack, choke and kill lines.
32/24 Oct.	-	L.D. Drill pipe. Washing stack with washing tool. LD.D.P. removed diverter. Pulled stack and riser. Ran and shot charge 20' below mud line. GiH with D.P. and screwing into, but could not pull guidebase. Ran and shot 20' second charge 20' below mud line. Screw into guidebase.
33/25 Oct.	-	Hooked guide base, and retrieved 20" and 13 3/8" csg. 30" fractured and cracked, leaving some 30" at seabed. Inspecting by T.V. and divers. 30" protruding 2' above sea bed. Made up 1 gallon nitromethene. Divers placed charge inside 30" at mud line. Fired charge. Ran T.V. twice to observe - 360° around hole with diving supervision. Conductor pipe definitely gone and bottom is cleared. Ballasting rig up. Anchor handling, pulling no. 2, 3 and 6. WOW. Ballasting rig to 58' draft.
34/26 Oct.		24 hrs. WOW to pull anchors.
35/27 Oct.		24 hrs. WOW to pull anchors.

DAYS/DATE

DAILY ACTIVITY SUMMARY

36/28 Oct.

9 hrs. waiting on weather. Ballasting rig to 28' draught. Handling anchors no. 1, 7 and 4. (See note)

37/29 Oct.

Pulling anchors. Installing new pennant line on no. 5 anchor. Rig under tow.

38/30 Oct.

Towing to Gansfjord - Sandnes. Running all anchors. Ballasting down. Backloading from rig.

39/31 Oct.

Backloading. Retensioning anchors to 200,000 lbs. Backloading. Rig released at 23,00 hrs. 31 Oct.

Note: While W.O.W., 11 hrs. were used searching with sidescan sonar for portion of temporary guide base that was lost during transfer to supply boat. No obstruction seen in vicinity of location. Portion of TGB most likely buried in sand.

RIG TIME ANALYSIS

Well: 16/8-1

RIG: NORSKALD

<u>ACTIVITY</u>	<u>Hrs.</u>	<u>Percent</u>
Under tow	42.5	4.57
Running/picking up anchors	57	6.13
Rigging up/down	33	3.55
Running/pulling stack or riser	50.5	5.43
Stack repairs	2.5	0.27
Surveying	14.5	1.56
Drilling	169.5	18.24
RU/LD drillstring	18	1.94
Reaming	9	0.97
Redrilling	25.5	2.74
Tripping	113.5	12.21
Circulating	30.5	3.28
Testing equipment/formation	13.5	1.45
Run/pull casing/wellhead eqpt.	91	9.79
Cementing	21.5	2.32
Diving	19	2.04
Cleaning gumbo at surface	11.5	1.24
Running wireline retainer, casing cutters etc.	8	0.86
Logging	44	4.73
Repairing rig equipment	7.5	0.81
waiting on weather	<u>147.5</u>	<u>15.87</u>
TOTAL	929.5	100.00

<u>Time lost due to:</u>	<u>Hrs.</u>	<u>% of Total</u>
Waiting on weather	147.5	15.87
Wellhead eqpt. failure/repair	11.0	1.18
Downhole tool failures	7.0	0.75
Cleaning gumbo at surface	<u>11.5</u>	<u>1.24</u>
<u>TOTAL</u>	177.0	19.04

DEPTH VS. DAYS CURVE

WELL: 16/8-1
RIG: NORSVALD
TOTAL RIG DAYS: 39
RIG ACCEPTED: 23 SEPT. 1976
RIG RELEASED: 31 OCT. 1976

VIEW
PULL ANCHORS
RIG ON TOW
PROPOSED
ACTUAL

RUN 20" CSG.

RUN 3 3/8" CSG.

NSW

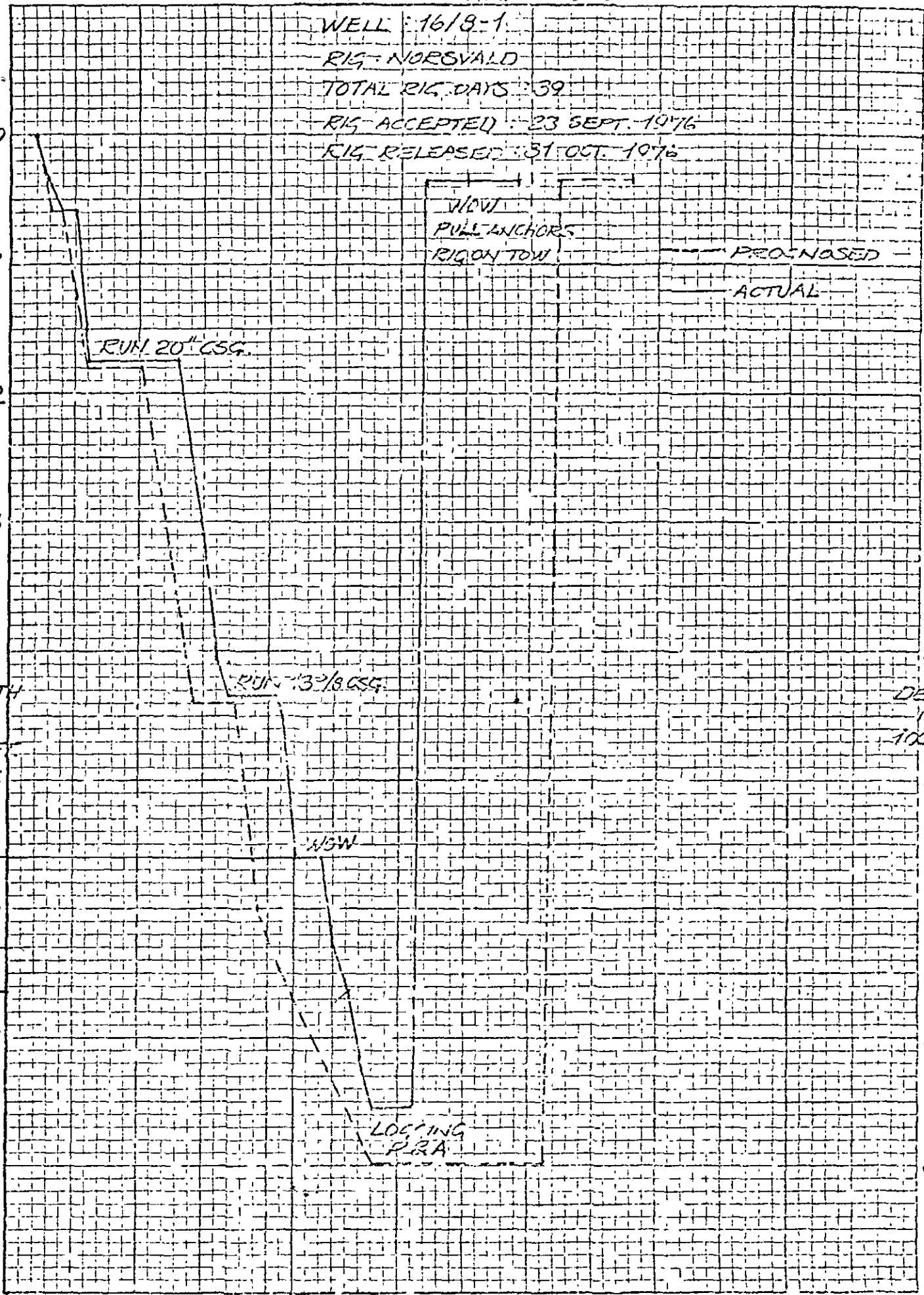
LOCKING
P.R.A.

DEPTH
IN

1000 FT

DEPTH
IN
1000

10 20 30 40 50
DAYS



DEPTH VS. DAYS CURVE

WELL: 16/B-1

RIG: NORSVALD

TOTAL RIG DAYS: 39

RIG ACCEPTED: 23 SEPT. 1976

RIG RELEASED: 31 OCT. 1976

W/DW

PULL ANCHORS

RIG ON TOW

PROPOSED

ACTUAL

RUN 20" CSG.

RUN 13 3/8" CSG.

NEW

LOCKING P.R.A.

DEPTH IN 1000'

DEPTH IN 1000'

10

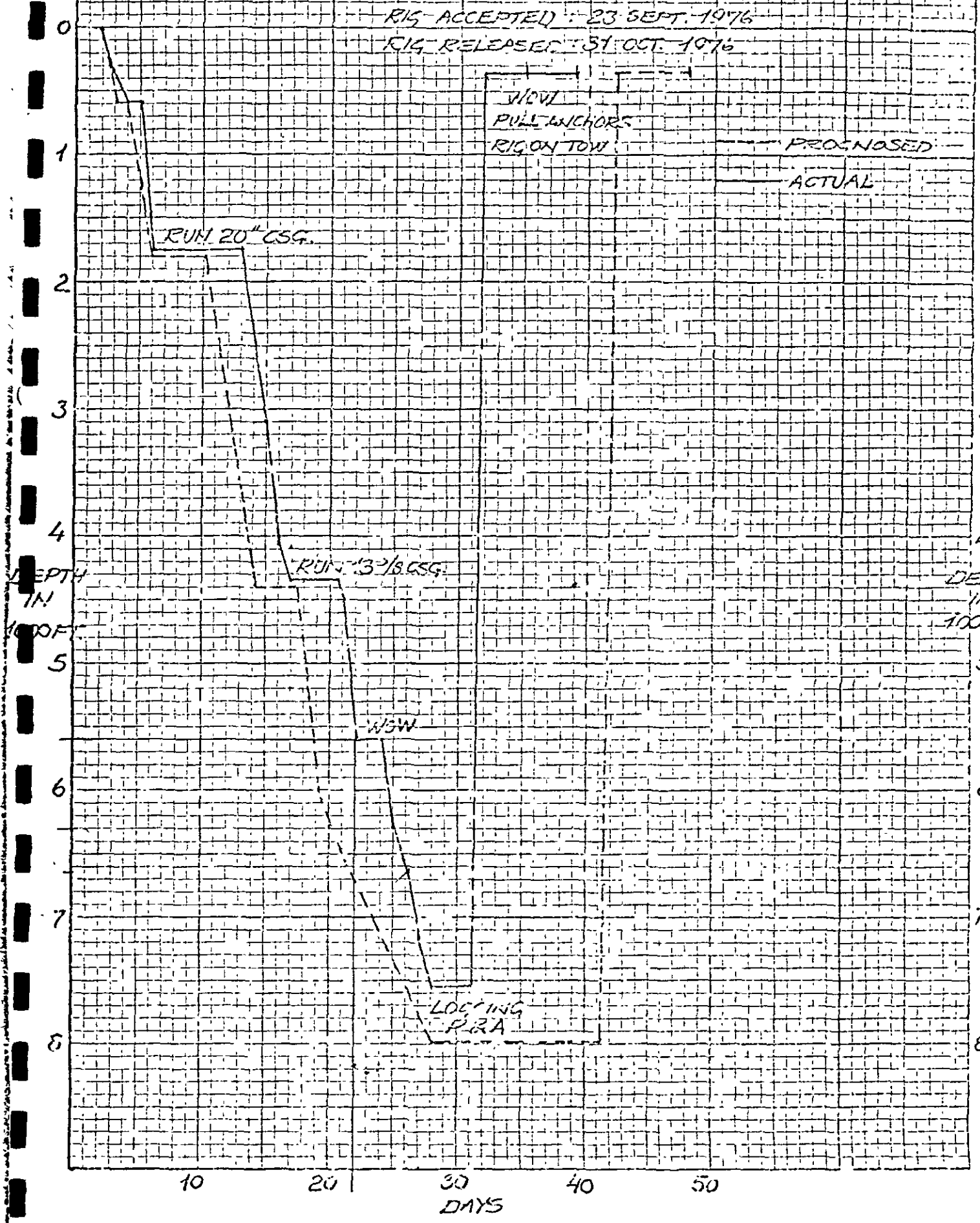
20

30

40

50

DAYS



ABANDONMENT SKETCH

WELL: 16/8-1

RIG: NORSKALD

PERMANENTLY P/A 25 OCT. 76

WATER DEPTH
266'

30" AT 555'

20" AT 1722'

13 3/8" AT 4309'

T.D. AT 7550'

ALL CSG. SHOT OFF BELOW
MUD LINE

400' 110 SX. CLASS "G" NEAT

550'

1600'

110 SX. CLASS "G" NEAT

1750'

4090' SPOTTED 80 SX. ON TOP OF RET.
(40 FT)

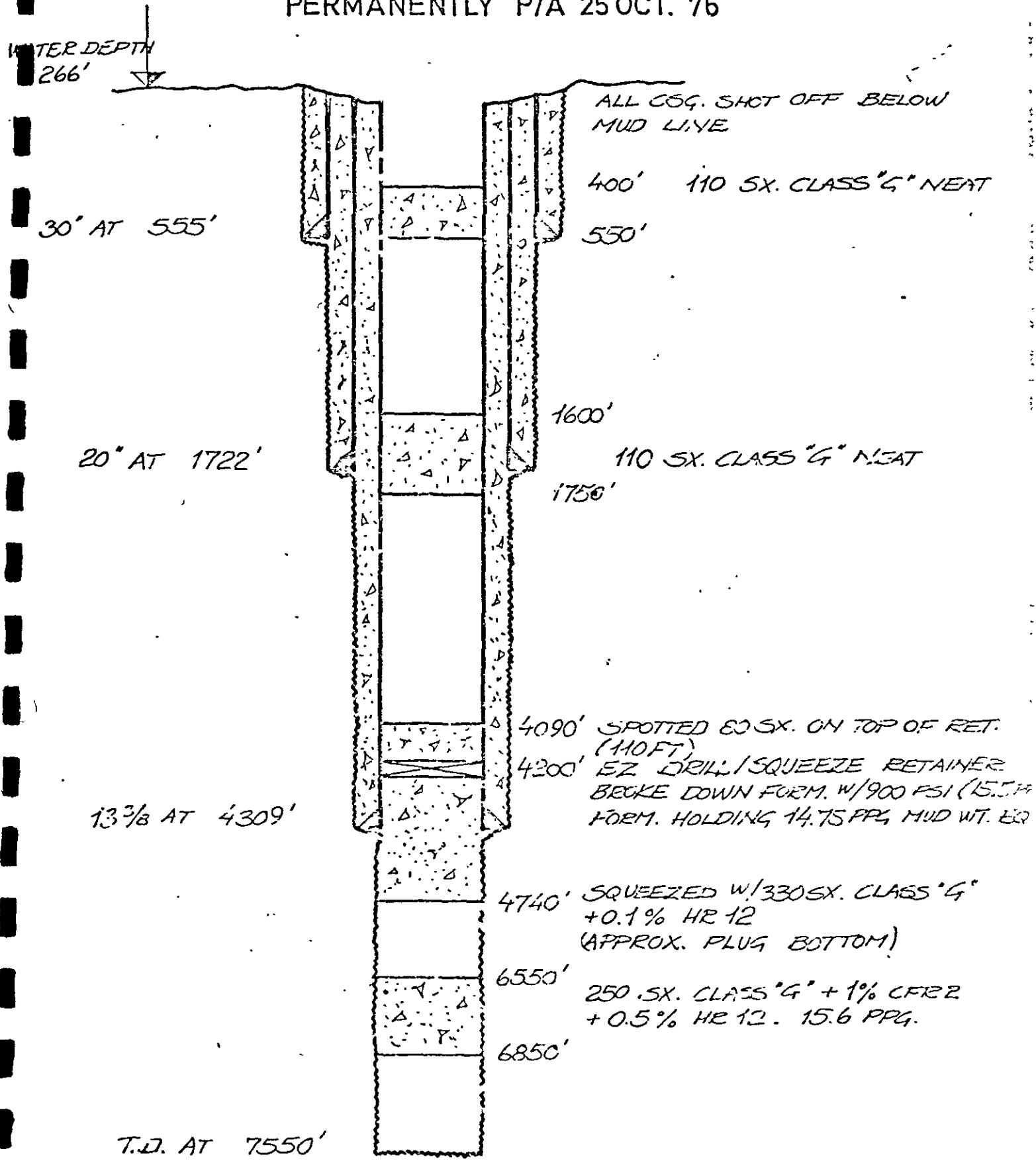
4200' EZ DRILL / SQUEEZE RETAINER
BECKE DOWN FORM. W/900 PSI (15.5 PP)
FORM. HOLDING 14.75 PPG MUD WT. EQ

4740' SQUEEZED W/330 SX. CLASS "G"
+0.1% HR 12
(APPROX. PLUG BOTTOM)

6550'

250 .SX. CLASS "G" + 1% CFR 2
+ 0.5% HR 12. 15.6 PPG.

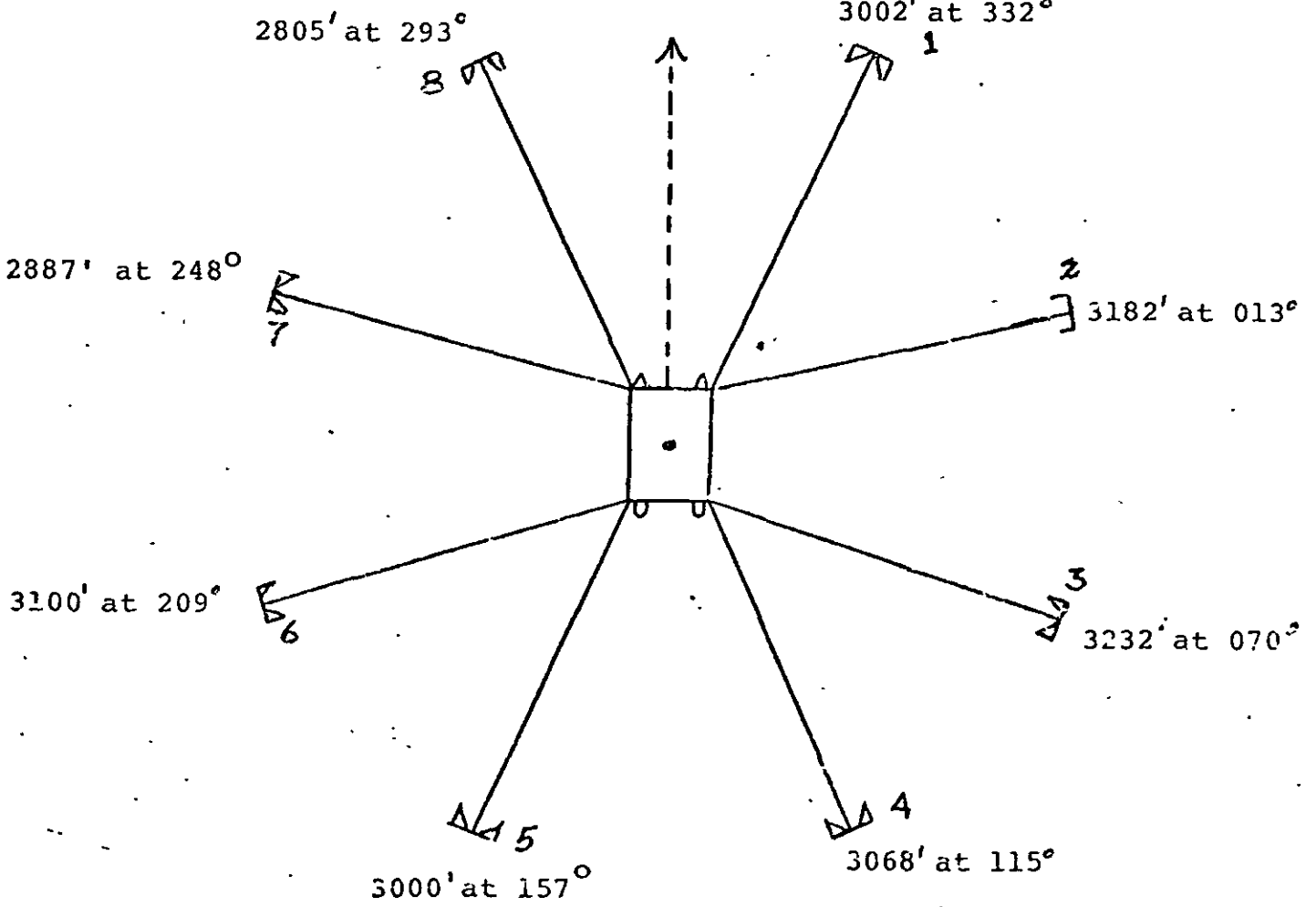
6850'



RIG NAME NORSKALD

RIG HEADING

315°



WELL: 16/8-1

LOCATION :Lat:58° 27' 24.8" North

Long:02° 25' 56.8" East

31110CR... WEL... 16...

BIT	SIZE	MAKE	TYPE	DEPTH FEET CUT DRUD	DRLG HFS	ROP AV.	REVS	JETS	GPM	PUMP PSI	RPM MIN MAX	WOB MIN MAX	DULL CODE T B C	WOB MIN MAX	PROP W FV	
1	17.50	SMITH	DS	565	217	16.5	66985	** ** *	650	400	40	80	DULL	3	5	8.4
2	17.50	SMITH	DTJ	1750	1185	13.0	45820	18 18 18	1250	2500	120	180	2 1 I	10	25	9.4
RR 2	17.50	SMITH	DTJ	1750	0	0.0	0	** ** *	0	0	0	0	GOOD	0	0	8.4
3	17.50	SMITH	DTJ	2782	1032	28.5	132098	18 18 18	1200	3000	100	120	5 6 I	20	25	10.8
4	17.50	SMITH	DTJ	4352	1570	31.0	154455	18 18 18	1200	3000	110	130	3 2 I	10	35	11.0
5	12.25	SMITH	SES	5613	1261	15.5	62885	16 16 16	750	3000	110	130	2 3 I	30	45	11.2
6	12.25	SMITH	SDS	6559	946	24.0	166120	16 16 16	750	3100	110	145	4 7 O/I	35	55	11.5
7	12.25	SMITH	SDS	7192	633	22.5	145348	16 16 16	750	3150	100	145	6 7 I	15	52	11.5
8	12.25	SMITH	SDGH	7550	358	17.5	114939	16 16 16	750	3250	120	140	3 8 I	40	55	11.5

COMMENTS:

- Bit No. 1 - Seawater
- Bit No. RK2 - Under Reaming
- Bit No. 3 - Gumbo Problem
- Bit No. 4 - Gumbo Problem
- Bit No. 6 - Ream. Hrs. 7.5

BOTTOM HOLE ASSEMBLIES

WELL: 16/8-1

Bit No.	BHA
1	26" Bit, 36" H0, BS, 9 ½" MONEL, 5 x 9" DC, x 0, 3 x 8" DC.
2	Bit, BS, 9 ½" MONEL, 2 x 9" DC, Stab, 3 x 9" DC, x 0, 3 x 8" DC, XO, Jars, 14 HW.
2RR	Bit, x 0, Bit Sub, 9 ½" MONEL, 2 x 9" DC, Stab, 3 x 9" DC, XO 3 x 8" DC, Jars, 14 HW.
3	BT. NB Sub, MONEL, Stab, 5 x 9" DC, XO, 1 x 8" DC, XO, Jars, XO, 2 x 8" DC, XO, 14 HW.
4	Bit, BS, MONEL, 2 x 9" DC, 17 1/4" Stab, 3 x 9" DC, XO, 1 x 8" DC, XO, Jars, XO, 2 x 8" DC, XO, 14 HW.
5	Bit, BS, 9 ½" MONEL, 1 x 9" DC, Stab, 3 x 9" DC, Stab 1 x 9" DC. XO, 6 x 8" DC, Jars, 1 jt. HW, Dart Sub, 13 HW.

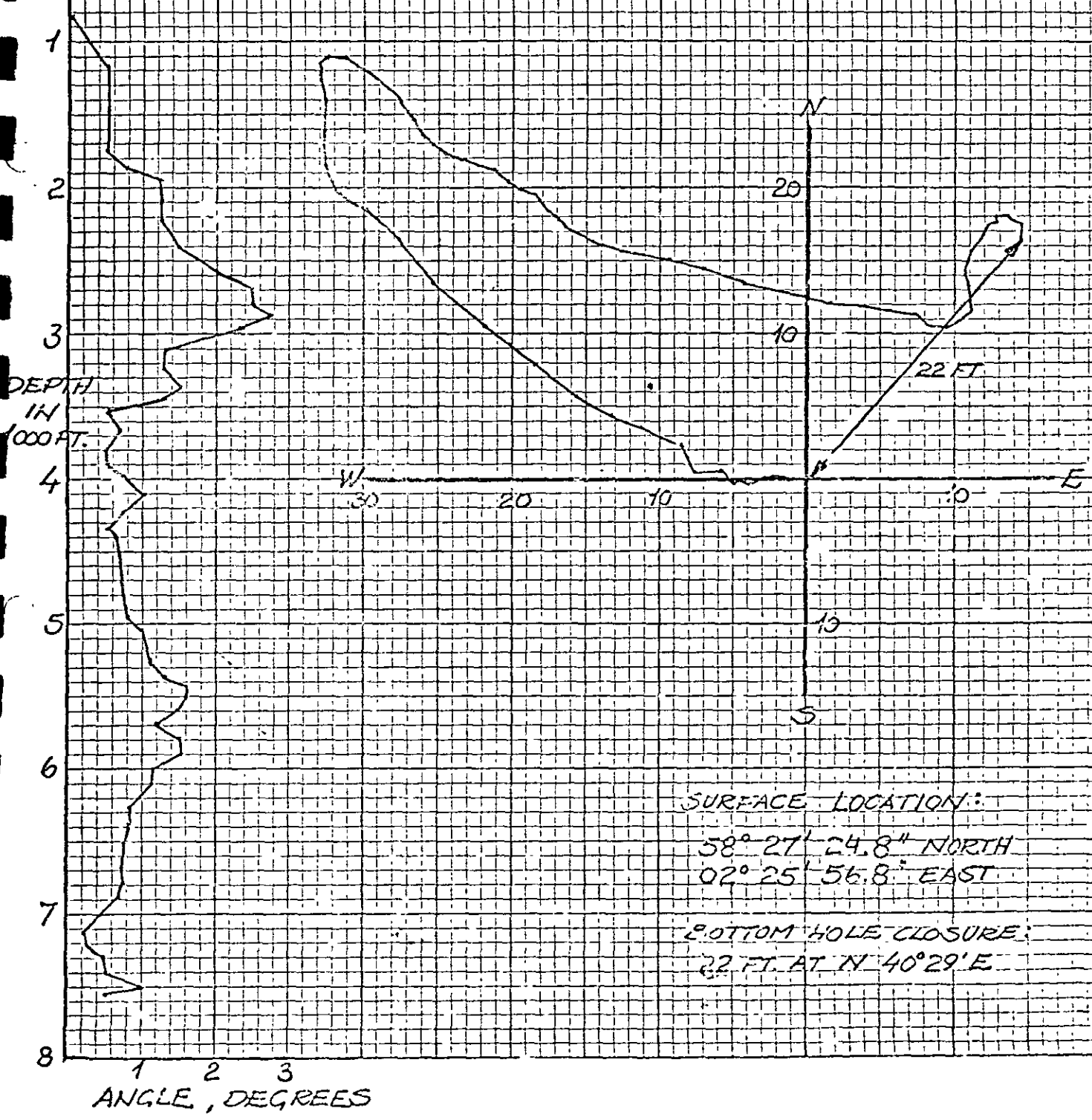
DEVIATION SKETCH

WELL : 16/8-1

RIG : NORSKALD

DRIFT ANGLE

HORIZONTAL COORDINATES (FT)



SURFACE LOCATION:

58° 27' 24.8" NORTH
02° 25' 56.8" EAST

BOTTOM HOLE CLOSURE:

22 FT. AT N 40° 29' E

KUEFFEL & ESSER CO. MADE IN U.S.A.

PRESSURE PREDICTION SUMMARY

Well 16/8-1

Prognosis

Based on seismic velocity survey and nearby well history two transition zones were expected. The upper transition was expected near 4,000 ft., and 13 3/8" casing was set at this depth (4,309 ft.) to seal off the overpressured shales before drilling a 12 1/4" hole to T.D.. Another transition was expected near T.D. of the well.

Detection on the Wellsite

The modified 'D'-exponent was plotted and the upper transition zone was seen at 3,500-4,200 ft.. Before running logs and casing, the mud weight was increased to 11.5 to keep back overpressured shales caving in. The pore pressure was calculated to be around 10.8 ppg.

The second transition zone was less clear due to the turf and chalk formation, and the short U. Jurassic shale sections and the tertiary formation below.

Analysis of Logs

The sonic log plot shows an increase from the trend line established above, indicating a transition zone at 4,000 ft. approximately.

This agrees basically with the prognosis and the detection on 'D'-exponent, although the transition is showing up 500 ft. below where the DXC is picking it up. The increase is 60 Micro sec., and is probably caused by both pore pressure increase and formation change.

In the last 400 ft. of the well, the sonic time is constant, indicating some transition zone, but the geology at this depth makes this indication uncertain.

The resistivity log does not show any clear transition. But a small decrease from the trend at 4,000 ft. is indicated. Bulk density log was not run above 13 3/8" csg. point and does not show anything of interest for pore pressure purposes.

Conclusion Log

Pore pressures are calculated using matrix stress techniques on DXC plots, with separate trend lines for each geological interval.

These values together with the actual mud weight used and the fracture gradients obtained at csg. shoes are plotted on the conclusion log (see appendix 1).

The two transition zones expected are seen, but no DST's or FIT's were made to verify the actual value of the pore pressure. However, caving shales (before logging) does indicate some overpressure at approx. 4,000 ft.

The second transition is less certain, but a pore pressure of 11.2 at 7,500 is calculated assuming the Jurassic trend line applies in the Triassic formations, since only a very thin Jurassic interval is penetrated.

APPENDIX 1

Pore Pressure Data

PTH
ETI

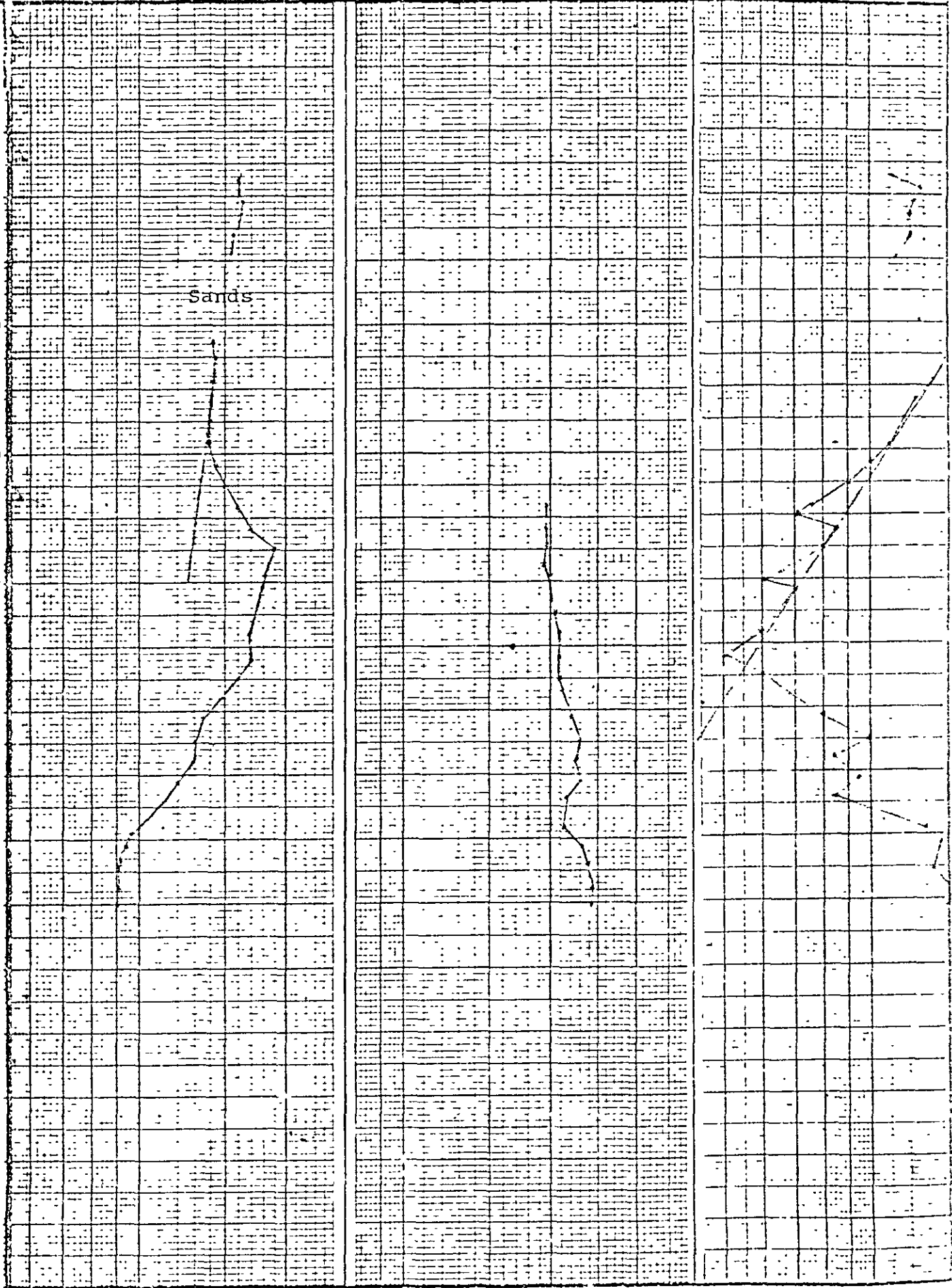
SONIC Δt (SHALE) μ sec/ft.
70 80 90 100 200

BULK DENSITY (SHALE)
10 20 30

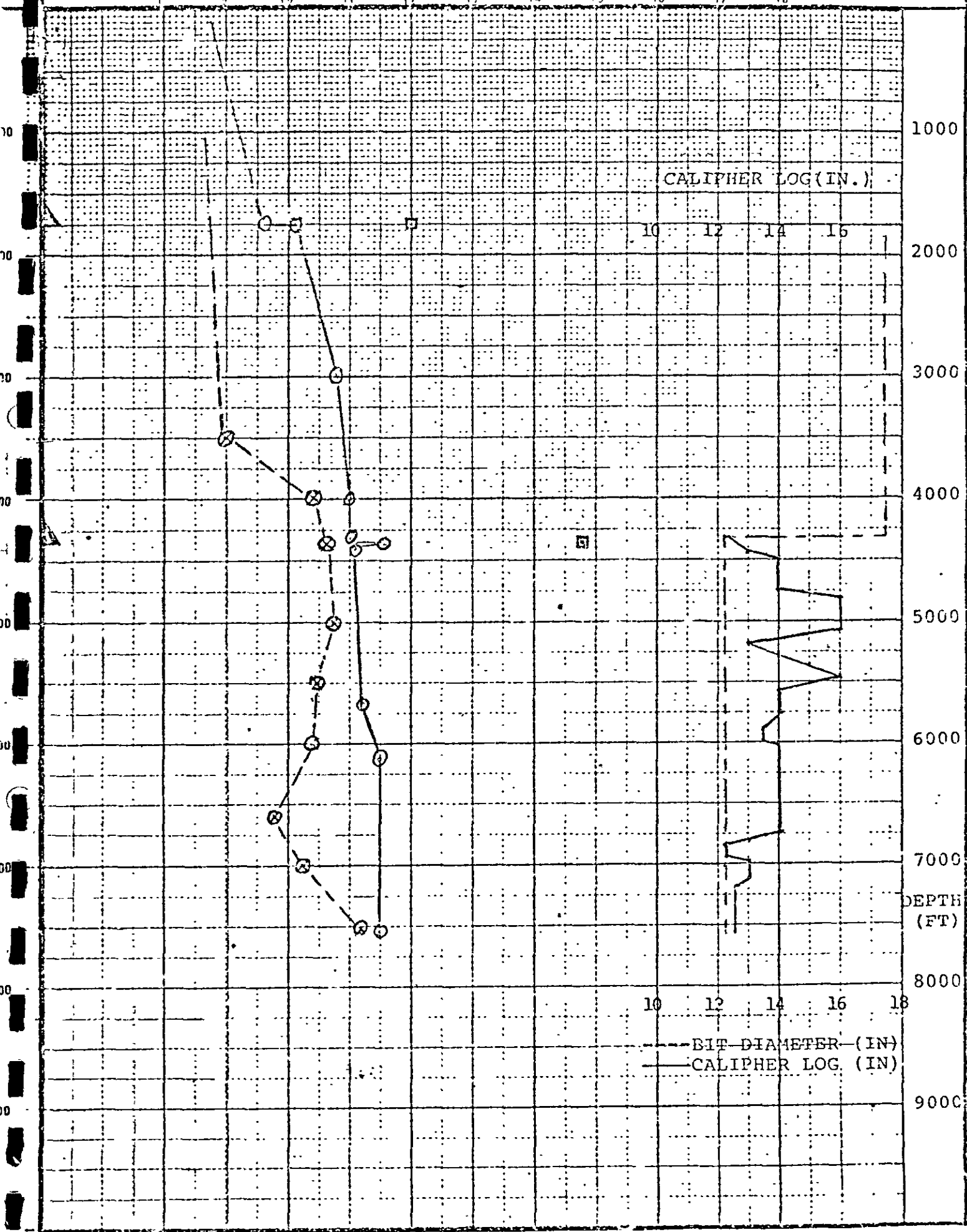
RESISTIVITY (INDUCTION LOG)
1 05 06 07 08 09 10

1000
2000
3000
4000
5000
6000
7000
8000
9000

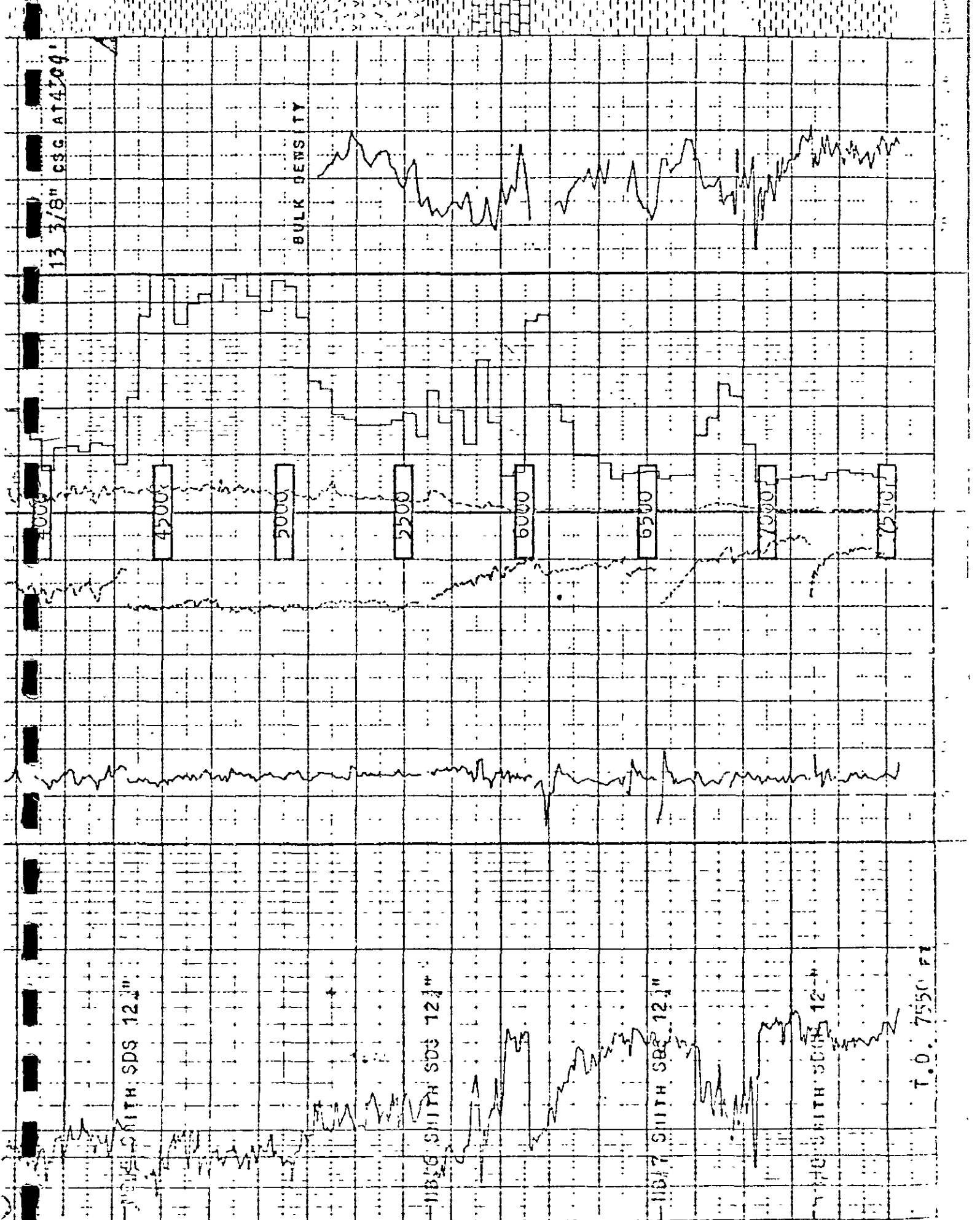
Sands

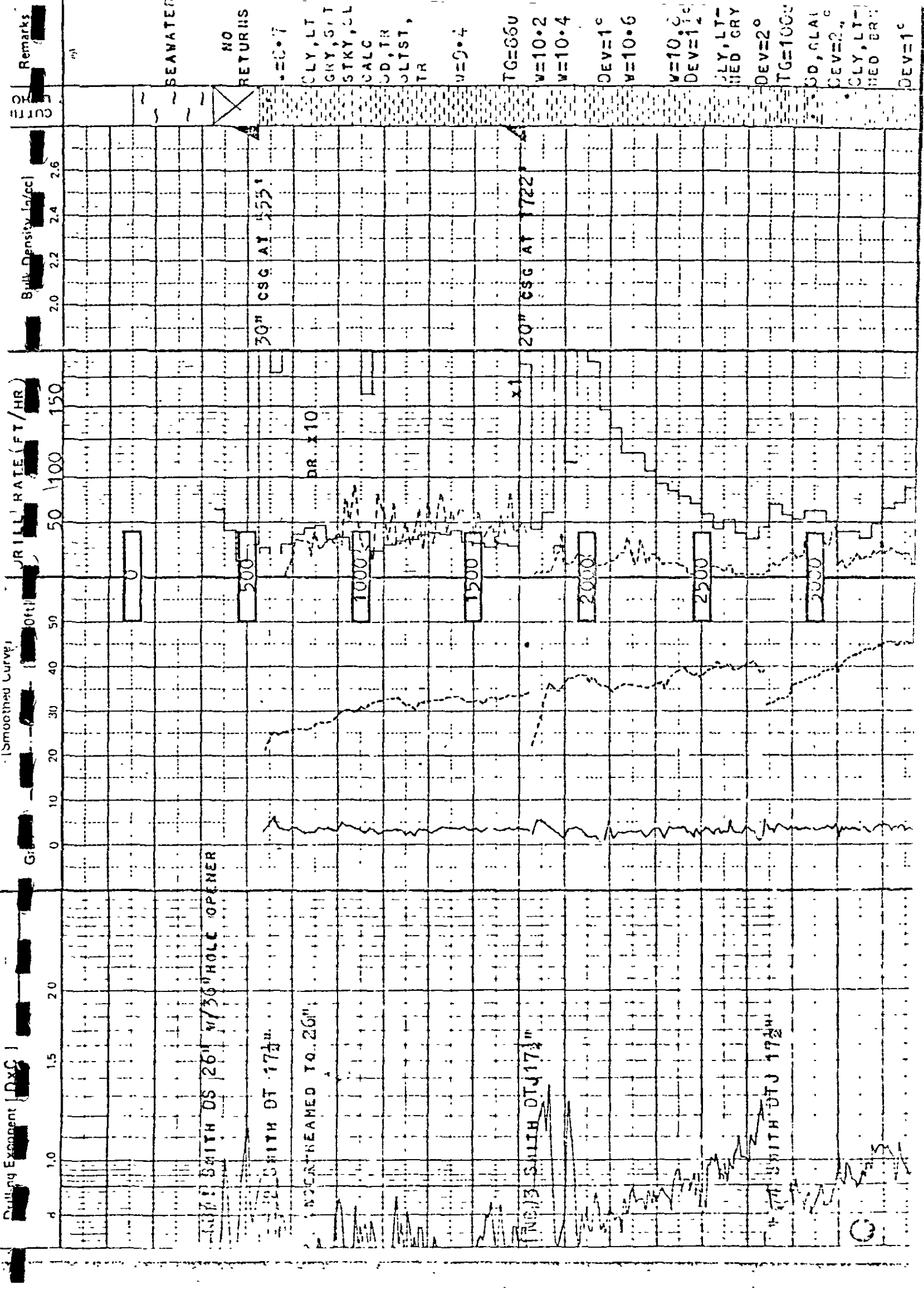


PORE PRESSURE GRADIENT (---) --- MUD WEIGHT 8
 (ESTIMATED FROM DXC) POUNDS PER GALLON EQUIVALENT FRACTURE GRADIENT (□)



GUMBO
 DEV=1
 GUMBO
 CLY, A,
 TGE=3
 VE=11
 DEV=1
 CLYST
 DEV=1
 VOLCS
 TUFFS
 DEV=2
 TGE=14
 DEV=1
 CHAL
 DEV=1
 CLAYS
 DEV=1
 TGE=14
 VE=11
 JS
 CLAYS
 TGE=12
 SHALE





Remarks
 CUTTING RATE

Bulk Density (lb/cc)

DRILLING RATE (FT/HR)

(Smoother Curve)

DULLING EXPONENT (Dxc)

CUTTING RATE

SEAWATER

NO RETURNS
 = 0.7

CLY, LT
 GRN, S, T
 STKY, LL
 CALC
 JD, TR
 ULTST,
 TR

V=9.4

TG=66U

V=10.2

V=10.4

DEV=1°

V=10.6

V=10.5

DEV=1.2°

CLY, LT
 MED GRN

DEV=2°

TG=100°

SD, CLAY

DEV=2.4°

CLY, LT
 MED BRN

DEV=1°

30" CSG AT 155'

20" CSG AT 172'

DR. X10

26" SMITH OS 26" W/30" HOLE OPENER

26" SMITH OTJ 17 1/2"

NO. 2 REAMED TO 26"

26" SMITH OTJ 17 1/2"

26" SMITH OTJ 17 1/2"

0

APPENDIX 2

Mud Records

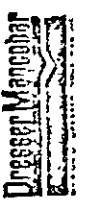
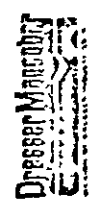
WELL SUMMARY-- MUD RECAP, PREPARED BY MAGCOBAR

Well 16/8-1 was spudded on September 25, 1976. 36" hole was drilled to 565' and 30" casing was run and cemented. A 17.1/2" hole was drilled to 1,750' and opened to 26". 20" casing was run to 1,722' and cemented. No notable hole problems were encountered during this section of the hole.

A 17.1/2" hole was drilled out from under the 20" casing. A Drispac/Spersene mud was mixed and used from this and the subsequent section of hole. Hole was drilled to 2,750' with center jet bit, pressure loss was encountered at this depth. Bit was pulled and center jet was found to be washed out. Abundant and troublesome gumbo was encountered to 4,352' both flowline and possum belly. Heavy water dilution resulted to maintain volume due to losses, unplugging gumbo from possum belly and flowline. Mud weight was increased to aid logging by Schlumberger. 100 joints of 13.3/8" casing was landed and cemented at 4,309'.

A 12.1/4" hole was drilled out below the 13.3/8" casing. Drilling was halted at 5,316' due to inclement weather. When drilling was resumed, calcium concentrations were found to be unusually high and a resultant precipitation of Drispac was noted, causing a reversal of rheological properties and a lessening of fluid loss control. Cement contaminated barite was found to be responsible. Phosphate additions were made to precipitate cement and heavy additions of thinners were necessitated to stabilize rheological properties. T.D. of 7,550' was reached with no hole problems, an extensive logging program was likewise trouble-free.

Plug and abandonment procedures were begun on October 24 and the Magco-bar mud engineer was released.

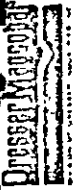


WELL DATA SHEET

DATE	DEPTH	WT.	VISCOSITY		CORR 115°F	GELS	PH	FLUID LOSS		CL	ALKALINITY		Mg ppm	RETORT			ACTIVITY	RATIO		# Bbl	
			SEC	CPS.				100 PSI API	500 PSI 300 °F HT-HP		PF	PM		MF	CA ppm	% OIL		% SOL	% WATER		A _s
25/9	457	8.7	100+																		
26	565	8.7	100+																		
27	565	8.7	45																		
28	1750	9.2	40																		
29	1750	9.5	55																		
30	1750	9.5	55																		
1/10	1750	9.5	55																		
2	1750	8.6	41		12.16	2	7	10.0	12	19,000	1.6	2.6	1000								
3	1750	10.1	40		16.23	3	8	10.0	8	19,000	1.0	3.4	710		5	95					
4	1750	10.0	40		16.23	3	8	10.0	8	19,000	1.0	3.4	710		5	95					
5	1750	10.2	40		16.23	3	8	10.0	8	19,000	1.0	3.4	720		5	95					
6	2559	10.8	45		18.25	2	9	10.0	5.5	19,000	.3	1.8	120		9	91					
7	3024	10.8	46		17.25	2	8	10.0	5.0	20,000	.5	1.8	80		10	90					
8	4024	11.0	47		19.25	2	11	10.5	5.5	20,000	.8	2.0	80		10	90					
9	4352	11.0	47		17.23	4	17	10.5	6.0	20,000	.4	1.0	80		10	90					
10	4352	11.6	46		21.25	2	12	10.0	6.0	18,000	.3	.7	100		11	89					
11	4352	11.6	46		21.25	2	12	10.0	6.0	18,000	.3	.7	100		11	89					
12	4352	11.1	42		33.19	2	9	9.5	5.5	20,000	.4	1.0	120		11	89					
13	4450	11.1	45		22.17	2	8	9.5	5.5	20,000	.4	1.1	100		10	90					
14	5613	11.2	47		25.16	2	10	9.5	5.0	20,000	.5	1.0	80		12	88					
15	5613	11.2	47		25.16	2	10	9.5	5.0	20,000	.5	1.0	80		12	88					
16	5213	11.2	53		12.22	15	30	9.0	14.0	20,000	.1	.5	1120		13	87					
17	6213	11.5	42		15.15	5	15	9.5	9.0	20,000	.6	1.0	320		14	84					
18	6600	11.5	49		15.21	4	20	9.5	11.0	20,000	.5	1.0	321		15	85					
19	7192	11.5	58		15.75	15	30	9.5	12.0	20,000	.6	1.1	400		15	85					
20	1535	11.5	49		15.20	2	20	9.5	9.5	20,000	.5	1.6	320		15	85					
21	7550	11.5	49		15.20	2	20	9.5	9.5	20,000	.5	1.6	340		15	85					

DATE SPUD: 1/10
 DATE TD: 1/10
 COMPLETION FLUID TYPE: OIL
 COST: 15.85

PAID-345-A OPERATOR: CONOCO
 SURVEY SEC.: FIELD: OFFSHORE
 COUNTY: N. SEA
 STATE: NORWAY
 COUNTRY: NORWAY
 CASING SIZE: SURFACE 20" INTERMEDIATE 13 3/8" PRODUCTION 7550'
 DEPTH: 1722' 3
 DRLG. DAYS: 17 1/2
 BIT SIZE: 26"



WELL DATA SHEET

HAS-949-1-A

EQUIPMENT	MAKE		CHOKE (L.P.)	CHOKE (SUPER)	CLAYJECTOR	FINE SCREEN	MILCHEM	TOTAL MUD COST:	TOTAL DEPTH.	REMARKS						
	DEMCO	DEMCO									SWACO	SWACO	OTHER			
MAGCOBAR	MAGCOGEL	SFERSENE	XP-20	CAUSTIC	SODA ASH	LIME	DRISPAC	DRISPAC	DRISPAC	DRISPAC	DESCO	SAPP	C.M.C.	TOTAL MUD COST		
16.9	220		4	2	1									3173	3173	Spud
17.9	25	1	1		2									541	3714	Drilling 36" hole
18.9	170		3	2	1									2158	6973	Run 30" csg. - M.D.C.
19.9	180		5	2										2289	9263	Mix 650 bbl mud- Drlg. - Losses due to heavy seas
20.9	204		2	1	3									1386	10650	Drlg. - Log - Raise vis. to 55
21.0	334		2	1	6									3182	13833	Log
22.0	100		2	1										1360	15193	Run 20" csg.
3.10		24	7	16	28									5027	20221	Run csg.
4.10	784		1	3	4									5218	25439	W.O.W.
5.10						NONE								25439		Run riser & stack
6.10			2		9									1449	26962	R.I.H. - Drlg. out cement
7.10	1881		12	8	49									17967	44910	Drlg. out cement - Drlg.
8.10	538	13	30	1	28									7742	52652	Drlg. - Bit trip
9.10	291		44	1	18	1	12							5528	58180	Drlg. - Gumbo problems
10.10			27	4	4		4							1760	59941	Drlg. - P.O.H. - Strap out
11.10	948		4		2	23								7230	67171	P.O.H. - Log - Increase mud wt. 11.6
12.10	1290													7428	74599	W.C.W.
13.10	89													979	75578	Run 13.3/8" csg.
14.10						NONE								75578		Cmt. csg. - R.I.H. to drlg.
15.10		11	4	9	7	9	19							3767	79576	Drlg.
16.10	1500													8600	88176	W.C.W.
17.10	270													1736	89921	W.O.W. - Ream to btm.
18.10	1410		6	30	2	8								18370	100283	Ream - Drlg.
19.10	269		6		4	4	4							3101	11918	Drlg.
20.10		90	13		2	16	86							6150	116069	Drlg.
21.70	1366	10	13	8	2	21						5		7190	128717	J.D.
22.10																

FINAL COST



TOTAL MATERIAL CONSUMPTION

PRODUCT	UNITS	UNIT PRICE	COST
Magcohar	12,294 sx (100 lb)	\$ 5.58	\$ 68,600.52
Magcogel	785 sx (100 lb)	\$ 10.81	\$ 8,485.85
Spersene	334 sx (50 lb)	\$ 14.37	\$ 4,799.58
Desco	197 sx (25 lb)	\$ 25.52	\$ 5,027.44
Drispac Reg.	150 sx (50 lb)	\$ 131.05	\$ 19,657.50
Drispac S/L	43 sx (50 lb)	\$ 131.05	\$ 5,635.15
Caustic Soda	202 sx (25 kg)	\$ 14.82	\$ 2,993.64
Soda Ash	86 sx (50 kg)	\$ 20.00	\$ 1,720.00
Lime	29 sx (40 kg)	\$ 6.16	\$ 178.64
Sapp	4 sx (100 lb)	\$ 46.50	\$ 186.00
C.M.C. L/V	5 sx (25 kg)	\$ 53.95	\$ 269.75
Aluminum Stearate	1 sx (25 kg)	\$ 33.82	\$ 33.82
			<u>\$ 117,537.89</u>
Engineering Services	31 days	\$ 230.00	\$ 7,130.00
Total Material and Engineering Cost for Intervals			<u>\$ 124,717.89</u>

MUD COSTS BY INTERVAL

INTERVAL (FT)	DAYS	COST/FT	COST/DAY	TOTAL COST \$
0- 555	4	6.70	929	3,715
555-1,750	5	8.66	2,070	10,349
1,750-4,352	12	22.83	4,950	59,398
4,392-7,550	10	16.09	5,146	51,255