statoil

REPORT

Repeat Formation Tester (RFT)

WELL: 15/9-11

Formation: Heimdal and Jurassic/Triassic

BY: LET-SVG

Engineer: K.A. Grini

Date: March, 1982

Den norske stats oljeselskap a.s

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INTRODUCTION

The 15/9-11 well was the second well to be drilled on the Gamma structure. One of the objectives with 15/9-11, was to delinate the hydrocarbon accumulation found in the Heimdal formation of Paleocene age in 15/9-9. Heimdal formation and the Jurassic/ Triassic* sandstone, which were encountered at a depth of 2387 m RKB and 2795 m RKB respectively, are hydrocarbon bearing in 15/9-11.

As a part of the final logging program in the 12 1/4" drilling phase two RFT runs were conducted in the Heimdal fm., and for the 8.5" hole two RFT runs were completed in the Jurassic/ Triassic aged formations.

*) Top Triassic is not yet known, therefore the sand encountered at 2795 m RKB is named Jurassic/Triassic.

OPERATION SUMMARY, HEIMDAL FM.

Pretests

Two RFT runs were conducted. In the first run 31 pretests records out of 35 were obtained.

No reliable gas gradient can be established from the plot in fig. 1. The pressure points are too scattered to draw a gradient specially in the lower part of the gas zone. By plotting the RFT pressure points from well 15/9-9 and 15/9-11, which is done in fig. 2, it seems clear that the Heimdal formation in these two wells has the same pressure regime. Therefore it is reasonable to assume a gas gradient down to 2425 m RKB, which is identical to the gradient in 15/9-9 (0.0276 bar/m, 0.122 psi/ft or 0.281 g/cc). At this depth and at 2442 m RKB there are shale layers which may act as barriers. In this interval both gas and water is mobile. This is verified by a drill stem test (perf. interval 2432 - 2440 m RKB) where gas and water was produced. No gas gradient can be established from RFT alone. Extrapolated pressures P* from Horner analysis performed on data from six pressure gauges from DST no. 2. are plotted in fig. 1. Four of these pressure points indicate the same gas gradient which has been established earlier. A gas gradient equal to 0.0276 bar/m, 0122 psi/ft can be used down to the GWC which is picked at 2442 m RKB.

Sampling

A segregated sample was taken in run no. 1 after several attempts. The purpose of run 2 was sampling, but was not successful due to tight formation.

Run no. 1: 8 x 0.0150" chokes were used to reduce flow and possible plugging.

Sampling was attempted at 2436.5 m, but aborted at the pretest stage due to slow response/low permeability.

2 3/4 gallon chamber was opened at the following depths: 2435.0, 2436.0, 2434.0, 2437.0, 2432.0, 2388.5 (m).

The tool was set at these depths, the 2 3/4 gallon chamber opened, but closed after short time due to tight formation.

Finally, at 2387.5 m the 2 3/4 gallon chamber was filled, and the 1 gallon chamber opened for a segregated sample. The 1 gallon chamber was open for flow for 80 mins. The flowing pressure was slowly increasing, 0.1 bar/min (1.5 psi/min), and was 237.172 bar (3439 psi) when shut in. Pretest pressure was 244.483 bar (3545 psi).

The 2 3/4 gallon chamber was bled off offshore.

Recovery: 5.75 l mudfiltrate (16500 ppm Cl^-, 1200 tot. hard.).
0.1 l condensate
0.91 m^3 (32 cuft.) gas

The 1 gallon chamber no. RFS-AB 1195 was sent to PRO.LAB, Statoil, for analysis. Analysis has not yet been undertaken, and will be delayed until analysis of samples from the DST's has been conducted.

Run no. 2: 4 x 0.020" chokes were used.

Sampling was attempted at 2434.0 m and 2431.5 m, but was aborted due to slow response / low permeability.

No recovery was obtained.

CONCLUSION

The pressure regime in 15/9-9 and 15/9-11 in the Heimdal fm. is the same with a gas gradient equal to 0.0276 bar/m, 0.122 psi/ft. The GWC is picked at 2442 m RKB.

PRETEST RECORDED DATA

WELL: 15/9-11
DATE: 21/10-81
RUN NO.: 1

Max. rec. temp.: 66.7°C (152°F)

Test	Depth	Log hydr. pr. before/after test	Log pretest pressure	Cor.pretest pressure	Cor.hydr.pr. after test	Remarks
No	mRKB	psig	psig	psig, gm/cc	psig, gm/cc	
1	2349.5	4157 / 4163	3531	3505 / 1.049	4138 / 1.24	Lista Formation
2	2361.0	4177 / 4180	3535	3509 / 1.045	4155 / 1.24	Lista Formation
3	2388.5	4230 / 4232	3546	3520 / 1.036	4207 / 1.24	
4	2395.0	4243 / 4242	3548	3522 / 1.034	4217 / 1.24	
5	2401.0	4254 / 4258	3554	3528 / 1.033	4233 / 1.24	
6	2405.0	4268 / 4275	3564	3538 / 1.035	4250 / 1.24	Supercharge
7	2405.0	4269 / 4276	3564	3538 / 1.035	4251 / 1.24	Supercharge
8	2410.0	4291 / 4298	-	-	4273 / 1.25	Sueprcharge
9	2416.0	4294 / 4296	3573	3547 / 1.032	4271 / 1.24	
10	2423.0	4299 / 4303	3572	3546 / 1.029	4278 / 1.24	
11	2431.0	4309 / 4318	3577	3551 / 1.027	4293 / 1.24	
12	2436.5	4316 / 4322	3578	3552 / 1.025	4297 / 1.24	
13	2439.0	4316 / 4319	3577	3551 / 1.024	4294 / 1.24	
14	2444.0	4321 / 4331	3589	3563 / 1.025	4306 / 1.24	
15	2446.0	4324 / 4332	3590	3564 / 1.025	4307 / 1.24	
16a	2469.5	4369 / 4373	-	-	4348 / 1.24	
16b	2469.5	4369 / 4373	3621	3595 / 1.024	4348 / 1.24	
17	2475.5	4373 / 4376	3623	3597 / 1.022	4351 / 1.24	
18	2483.0	4386 / 4392	3637	3611 / 1.023	4367 / 1.24	
19a	2488.5	4397 / -	-	-	-	Power shut down
19b	2488.5	4396 / 4404	3697	3671 / 1.037	4379 / 1.24	Supercharge
19c	2488.5	4404 / 4405	3650	3624 / 1.024	4380 / 1.24	

PRETEST RECORDED DATA

WELL: 15/9-11
DATE: 21/10-81
RUN NO.: 1

Max. rec. temp.: 66.7°C (152°F)

Test	Depth	Log hydr. pr. before/after test	Log pretest pressure	Cor.pretest pressure	Cor.hydr.pr. after test	Remarks
No	mRKB	psig	psig	psig, gm/cc	psig, gm/cc	
20a	2495.3	4409 / 4414	3729	3703 / 1.044	4389 / 1.24	Supercharge
20b	2495.3	4414 / 4413	3660	3634 / 1.024	4388 / 1.24	
21a	2500.0	4412 / -	-	-	-	Lost seal
21b	2500.0	4419 / 4422	3666	3640 / 1.024	4397 / 1.24	
22	2517.0	4443 / 4446	3683	3657 / 1.022	4421 / 1.24	
23	2522.0	4452 / 4457	3693	3667 / 1.023	4432 / 1.24	Supercharge
24	2414.0	4341 / -	-	-	-	Blocked eq. valve
25	2410.0	4248 / 4253	3559	3533 / 1.031	4228 / 1.23	
26a	2388.5	4205 / 4224	3556	3530 / 1.039	4199 / 1.24	
26b	2388.5	- / 4225	3560	3534 / 1.040	4200 / 1.24	
27	2351.0	4136 / 4152	3603	3577 / 1.070	4127 / 1.23	Supercharge
28	2436.5	4301 / 4299	3563	3537 / 1.021	4274 / 1.23	
29	2435.0	4294 / -	3563	3537 / 1.021	-	Att. sampling
30	2436.0	4296 / 4301	3569	3543 / 1.023	4276 / 1.23	Att. sampling
31	2434.0	4295 / -	3567	3541 / 1.023	-	Att. sampling
32	2437.0	4296 / -	3568	3542 / 1.022	-	Att. Sampling
33	2432.0	4287 / 4286	3566	3540 / 1.024	4261 / 1.23	Att. Sampling
34	2388.5	4201 / 4206	3548	3522 / 1.037	4181 / 1.23	Att. Sampling
35	2387.5	4203 / 4205	3547	3521 / 1.037	4180 / 1.23	Sampling

PRETEST RECORDED DATA

WELL: 15/9-11
DATE: 21/10-81
RUN NO.: 2

Max. rec. temp.:

Test	Depth	Log hydr. pr. before/after test	Log pretest pressure	Cor.pretest pressure	Cor.hydr.pr. after test	Remarks
No	mRKB	psig	psig	psig, gm/cc	psig, gm/cc	
1	2434.0	4305 / -	3564	3538 / 1.022	-	Att. sampling
2	2431.5	4294 / -	3559	3533 / 1.022	-	Att. sampling

RFT - sampling data

Well: 15/9-11
Date: 21/10-81
Run no: 1
Type of sample (segreg./separate): Segr.
Chamber sizes, lower: 2 3/4 gal. bottle no:
upper: 1 gal. bottle no: RFS-AB 1195
Choke sizes: 8 x 0.015"
Filter type: Standard

Depth	m	2387.5
Log hydr. pres. bef. setting	psig	4303
Log pretest pressure	psig	3547
Cor. pretest pressure	psig(g/cc)	3521 (1.037)
Lower/~~upper~~ chamber:		Opened for flow
time opened		at 2435.0, 2436.0,
log flowing pressure	psig	2434,0, 2437.0,
log shut-in pressure	psig	2432.0, 2388.5
time sealed		
cor. flowing pressure	psig	
cor. shut-in pressure	psig(g/cc)	
~~Lower~~/upper chamber		
time opened		19.37
log flowing pressure	psig	-
log shut-in pressure	psig	3439
time sealed		20.57
cor. flowing pressure	psig	-
cor. shut-in pressure	psig(g/cc)	3413
Log hydr. pres. after retracting	psig	4205
Max. recorded temp.	^{o}F	151, 152, 152
Surf. pres., lower ch.	psig	2000
Surf. pres., upper ch.	psig	-

Comments: 1 gal. chamber RFS-AB 1195 sent to Pro.Lab, Statoil for analysis.

Fig. 1

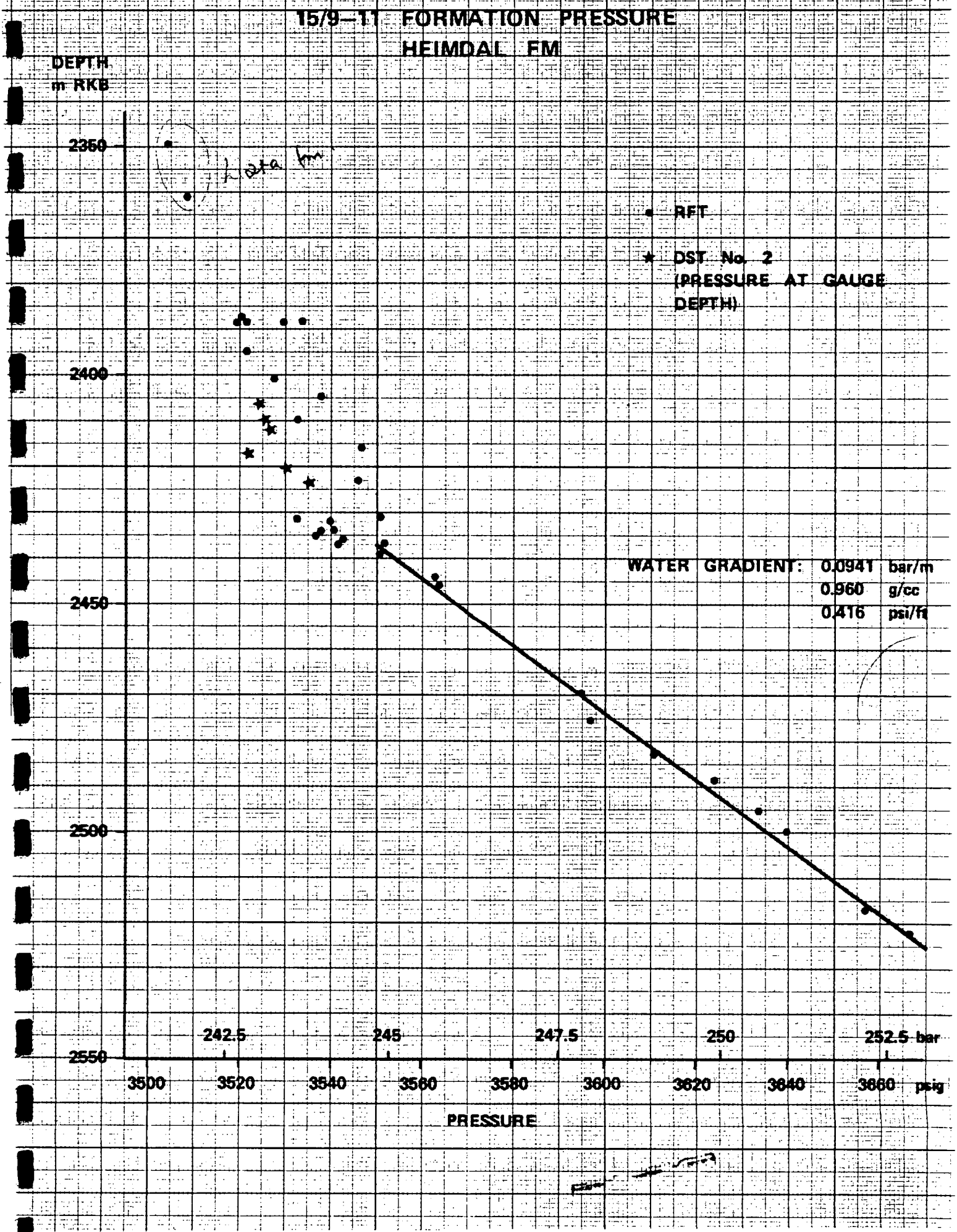
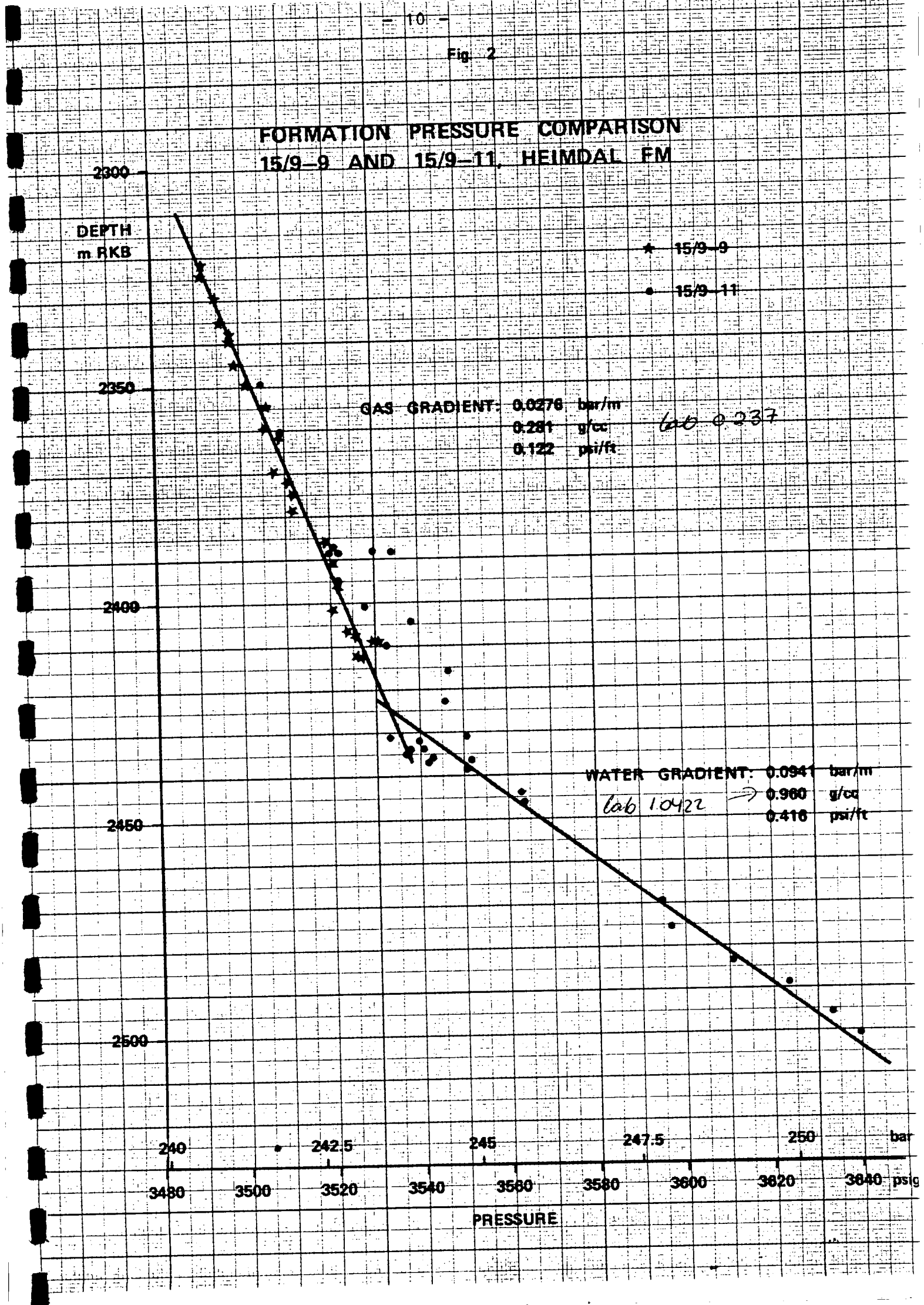

15/9-11 FORMATION PRESSURE
HEIMDAL FM
DEPTH
m RKB
2350
2400
2450
2500
2550
RFT
DST No. 2
(PRESSURE AT GAUGE
DEPTH)
WATER GRADIENT: 0.0941 bar/m
0.960 g/cc
0.416 psi/ft
242.5
245
247.5
250
252.5 bar
3500
3520
3540
3560
3580
3600
3620
3640
3660 psig
PRESSURE

Fig. 2


FORMATION PRESSURE COMPARISON
15/9–9 AND 15/9–11, HEIMDAL FM
DEPTH
m RKB
2300
2350
2400
2450
2500
15/9–9
15/9–11
GAS GRADIENT: 0.0276 bar/m
0.281 g/cc
0.122 psi/ft
lab 0.237
WATER GRADIENT: 0.0941 bar/m
lab 1.0422 ⇒ 0.960 g/cc
0.416 psi/ft
240
242.5
245
247.5
250
bar
3480
3500
3520
3540
3560
3580
3600
3620
3640
psig
PRESSURE

OPERATION SUMMARY, JURASSIC/TRIASSIC FM.

Pretests

Two RFT runs were completed. In the first run 22 pretests records out of 23 were obtained and in the second run 9 out of 11.

A gas gradient of 0.0400 bar/m (0.177 psi/ft) or a gas density of 0.409 g/cc may be established down to the GWC at 2825 m RKB. No reliable water gradient can be established out of the pretest points from 2825 m to 2831 m RKB. These pretest records cause a gradient which is totally unrealistic (0.191 bar/m, 0.844 psi/ft or 1.947 g/cc)! See fig. 3. It is hard to explain this gradient. The hydrostatic pressure obtained is stable with depth indicating the RFT tool function properly. In addition, no operation problems occured and no pressures are influenced by supercharge.

The pretests records in the inerval 2925 to 2932.5 m RKB from run 2 may indicate an oil gradient (0.0814 bar/m, 0.360 psi/ft or 0.831 g/cc). This cannot be the case. The logs indicate clearly that the Triassic sand is 100 % water bearing. The interval where the pressure points are taken is simply too short to get an accurate gradient. A change in two pressure points of two psi while disregard one pressure point gives a water gradient.

The pretest records at 2791 m and 2790.8 m indicate that the sand in the Heather formation has a higher pressure than the gas bearing sand below (0.1095 g/cc eq. mud weight compared to 1.090 g/cc eq. m.w.).

The plot in fig. 4 of RFT pretest records in 15/9-11 and 15/9-9 for Jurassic/Triassic sands indicates no pressure communication between these two wells.

Sampling

One segregated sample was taken in run no. 1 at 2812 m. The 2 3/4 gallon chamber was bled off offshore with 2200 psig opening pressure at surface (for more information see attached sampling sheet). The chamber contained 2.18 m^3 (77 ft^3) gas and 1 l condensate.

The 1 gallon chamber was sent to PRO.LAB, Statoil, for analysis. It has been decided to performe a compositional analysis of the gas from this chamber.

In run no. 2 a new segregated sample was taken. The 2 3/4 gallon chamber was plugged at 2826.5 m and almost filled at 2826.0 m. The 1 gallon chamber was plugged at 2826.0 m and filled at 2825.8 m. The 2 3/4 gallon chamber was also opened at 2925.8 m to let the mudfiltrate first enter this chamber. Both chambers were opened and sealed several times to clear the flowlines (see the attached sampling sheet).

The 2 3/4 gallon chamber was bled off offshore with 50 psig opening pressure. The volume of the recovered water decreased from 13.5 l to 9.5 l when flowed out of the chamber. Dissolved gas got out of solution and the recovered water which had a white milky colour became brown. This may indicate a high CO_2 content in the solution gas. The opening pressure of 1 gallon chamber was 200 psi and it contained 3.0 l recovered water which had the same colour and acted similar as the recovered water from the 2 3/4 gallon chamber.

Statoil production laboratory has done chemical analysis on samples from the two RFT chambers in run no. 2. The results are presented in appendix A. The samples contained probably both formation water and mudfiltrate. A thin oil film was observed on the surface of a sample from the 1 gallon chamber. The oil was extracted and analysed by gas chromatography. A comparison with the condensate chromatogram from DST no. 1, 15/9-11, 2797-2807 m shows a close similarity, specially at the higher hydrocarbon constituents (C_9-C_2). It is reasonably to assume that the sample contained condensate and that the gas / condensate system is not underlain by an oil rim.

CONCLUSION

The sand encountered at 2795 m RKB has a gas gradient of 0.0400 bar/m, 0.177 psi/ft or a gas density equal to 0.409 g/cc. The gas/water contact is picked at 2825 m RKB. No water gradient can be established from the pretest records.

PRETEST RECORDED DATA

WELL: 15/9-11
DATE: 1/11-81
RUN NO.: 1

Max. rec. temp.: 190°F (87.8°C)

Test	Depth	Log hydr. pr. before/after test	Log pretest pressure	Cor.pretest pressure	Cor.hydr.pr. after test	Remarks
No	mRKB	psig	psig	psig, gm/cc	psig, gm/cc	
1	2790.5	5124 / 5126	-	-	5097 / 1.284	Tight, Heather Fm.
2	2796.0	5045 / 5048	4367	4336 / 1.090	5019 / 1.262	Heather Formation
3	2791.0	5036 / 5040	4373	4342 / 1.094	5011 / 1.262	
4	2798.0	5051 / 5050	4368	4337 / 1.090	5021 / 1.262	
5	2801.0	5057 / 5055	4370	4339 / 1.089	5026 / 1.262	
6	2804.0	5059 / 5058	4370	4339 / 1.088	5029 / 1.261	
7	2806.0	5061 / 5062	4372	4341 / 1.088	5033 / 1.262	
8	2809.0	5065 / 5067	4373	4342 / 1.087	5038 / 1.262	
9	2812.0	5069 / 5071	4374	4343 / 1.086	5042 / 1.261	
10	2816.0	5081 / 5081	4377	4346 / 1.085	5052 / 1.262	
11	2820.0	5086 / 5088	4380	4349 / 1.085	5059 / 1.262	
12	2823.0	5090 / 5094	4383	4352 / 1.084	5065 / 1.262	
13	2825.0	5092 / 5093	4384	4353 / 1.084	5064 / 1.261	
14	2826.0	5094 / 5096	4386	4355 / 1.084	5067 / 1.261	
15	2827.0	5098 / 5098	4388	4357 / 1.084	5069 / 1.261	
16	2829.0	5100 / 5101	4397	4366 / 1.085	5072 / 1.261	
17	2830.0	5102 / 5106	4397	4366 / 1.085	5077 / 1.262	
18	2830.5	5104 / 5105	4398	4367 / 1.085	5076 / 1.262	
19	2828.0	5099 / 5099	4392	4361 / 1.085	5070 / 1.262	
20	2822.0	5088 / 5092	4382	4351 / 1.084	5063 / 1.262	
21	2813.5	5074 / 5079	4379	4348 / 1.087	5050 / 1.262	
22	2790.8	5036 / 5038	4380	4349 / 1.096	5009 / 1.262	Heather Formation
23	2812.0	5075 / 5060	4372	4341 / 1.086	5031 / 1.258	Sample

PRETEST RECORDED DATA

WELL: 15/9-11
DATE: 11/1-81
RUN NO.: 2

Max. rec. temp.: 190°F (87.8°C)

Test	Depth	Log hydr. pr. before/after test	Log pretest pressure	Cor.pretest pressure	Cor.hydr.pr. after test	Remarks
No	mRKB	psig	psig	psig, gm/cc	psig, gm/cc	
1	2925.0	5269 / 5269	-	-	5240 / 1.260	Tight
2	2926.5	5270 / 5271	-	-	5242 / 1.260	Tight
3	2927.5	5272 / 5275	4585	4554 / 1.094	5246 / 1.260	
4	2929.0	5275 / 5275	4586	4555 / 1.093	5246 / 1.260	
5	2934.0	5284 / 5279	4589	4558 / 1.092	5250 / 1.258	
6	2938.0	5289 / 5289	4597	4566 / 1.093	5260 / 1.259	
7	2936.0	5286 / 5287	4596	4565 / 1.093	5358 / 1.260	
8	2932.5	5275 / 5279	4590	4559 / 1.093	5250 / 1.259	
9	2826.5	5099 / 5153	4389	4358 / 1.084	5124 / 1.275	Sampling, plugging
10	2826.0	5092 / 5084	4384	4353 / 1.083	5055 / 1.258	Sampling, plugging
11	2825.8	5089 / 5088	4380	4349 / 1.082	5059 / 1.259	Sampling

RFT - sampling data

Well: 15/9-11
Date: 1/11-81
Run no: 1
Type of sample (segreg./separate): Segregated
Chamber sizes, lower: 2 3/4 gallon bottle no:
upper: 1 gallon bottle no:
Choke sizes: 4 x 0.020"
Filter type:

Depth	m RKB	2812
Log hydr. pres. bef. setting	psig	5075
Log pretest pressure	psig	4372
Cor. pretest pressure	psig(g/cc)	4341 (1.087)
Lower/upper chamber:		Lower
time opened		13.06
Lowest log flowing pressure	psig	4229
log shut-in pressure	psig	4359
time sealed		13.16
cor. flowing pressure	psig	4198
cor. shut-in pressure	psig(g/cc)	4334 (1.085)
Lower/upper chamber		Upper
time opened		13.17
log flowing pressure	psig	4262
log shut-in pressure	psig	4360
time sealed		13.22
cor. flowing pressure	psig	4231
cor. shut-in pressure	psig(g/cc)	4329 (1.084)
Log hydr. pres. after retracting	psig	5060
Max. recorded temp.	^{o}F	190
Surf. pres., lower ch.	psig	2200
Surf. pres., upper ch.	psig	

Comments: The lower chamber was bled off offshore. The upper chamber was sent to Pro.Lab, Statoil, for analysis. Surface pressure was not checked offshore.

RFT - sampling data

Well: 15/9-11
Date: 1/11-81
Run no: 2
Type of sample (segreg./separate): Segregated
Chamber sizes, lower: 2 3/4 gallon bottle no:
upper: 1 gallon bottle no:
Choke sizes: 4 x 0.020"
Filter type:

Depth	m RKB	2826.5 / 2826 / 2825.8 /
Log hydr. pres. bef. setting	psig	5099 / 5092 / 5089
Log pretest pressure	psig	4389 / 4384 / 4380
Cor. pretest pressure	psig (g/cc)	4358 / 4353 / 4349
Lower/upper chamber:		Lower
time opened		17.20 / 17.42 / 18.09
log flowing pressure	psig	- / - / -
log shut-in pressure	psig	- / 4384 / 4380
time sealed		17.31 / 1747 / 18.10
cor. flowing pressure	psig	- / - / -
cor. shut-in pressure	psig (g/cc)	- / 4353 / 4349
Lower/upper chamber		Upper
time opened		17.48 at 2826m/18.10 at 2825.8m
log flowing pressure	psig	Plugging / -
log shut-in pressure	psig	- / 4380
time sealed		18.02 / 18.15
cor. flowing pressure	psig	- / -
cor. shut-in pressure	psig (g/cc)	- / 4349
Log hydr. pres. after retracting	psig	5153 / 5084 / 5088
Max. recorded temp.	^{o}F	190
Surf. pres., lower ch.	psig	50
Surf. pres., upper ch.	psig	200

Comments: Both chambers were bled off offshore. The 2 3/4 gallon chamber was plugged at 2826.5 m and almost filled at 2826.0 m. The 1 gallon chamber was plugged at 2826.0 m and filled at 2825.8 m.

Fig. 3

15/9–11 FORMATION PRESSURE
JURASSIC / TRIASSIC FM

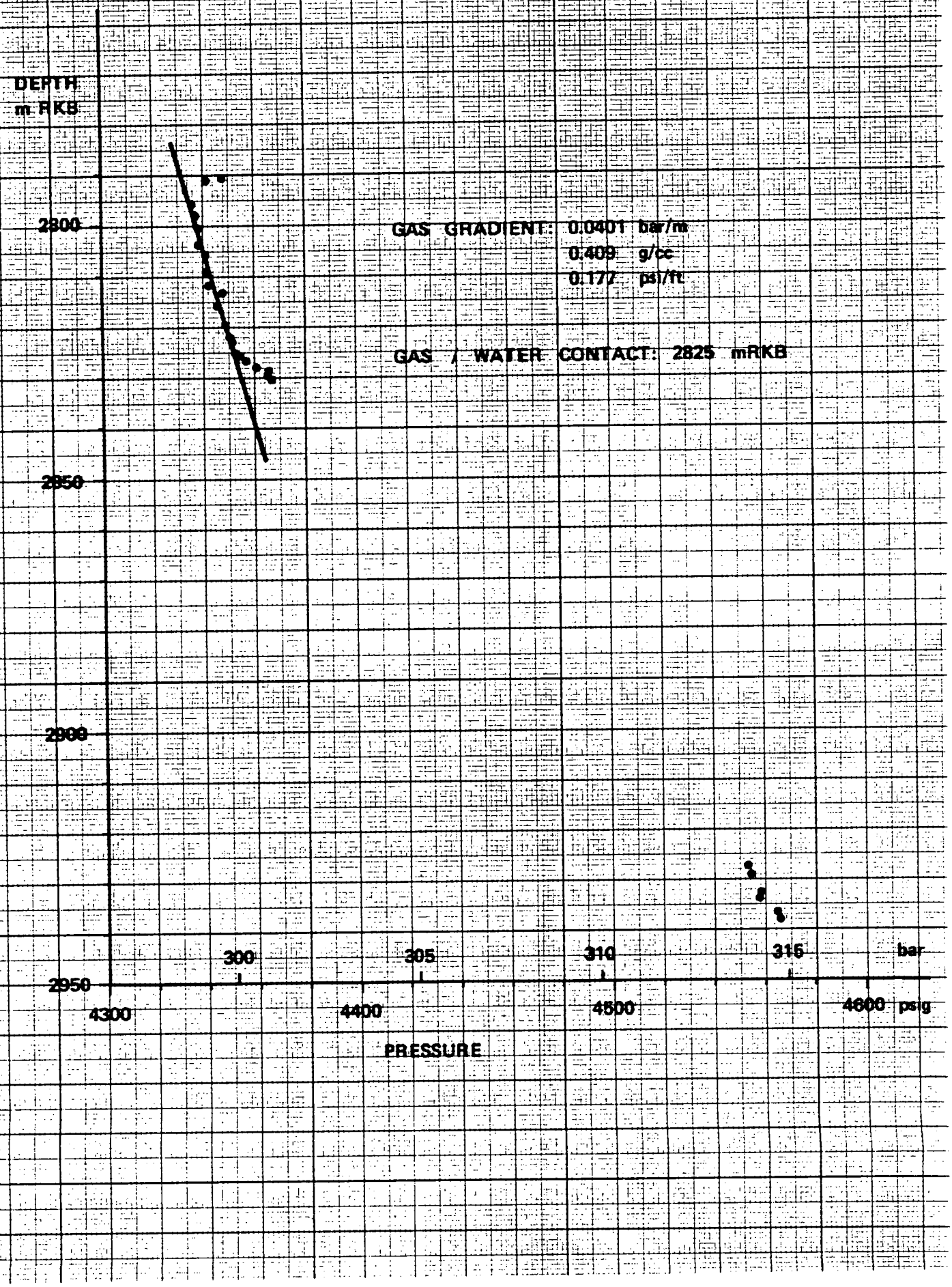
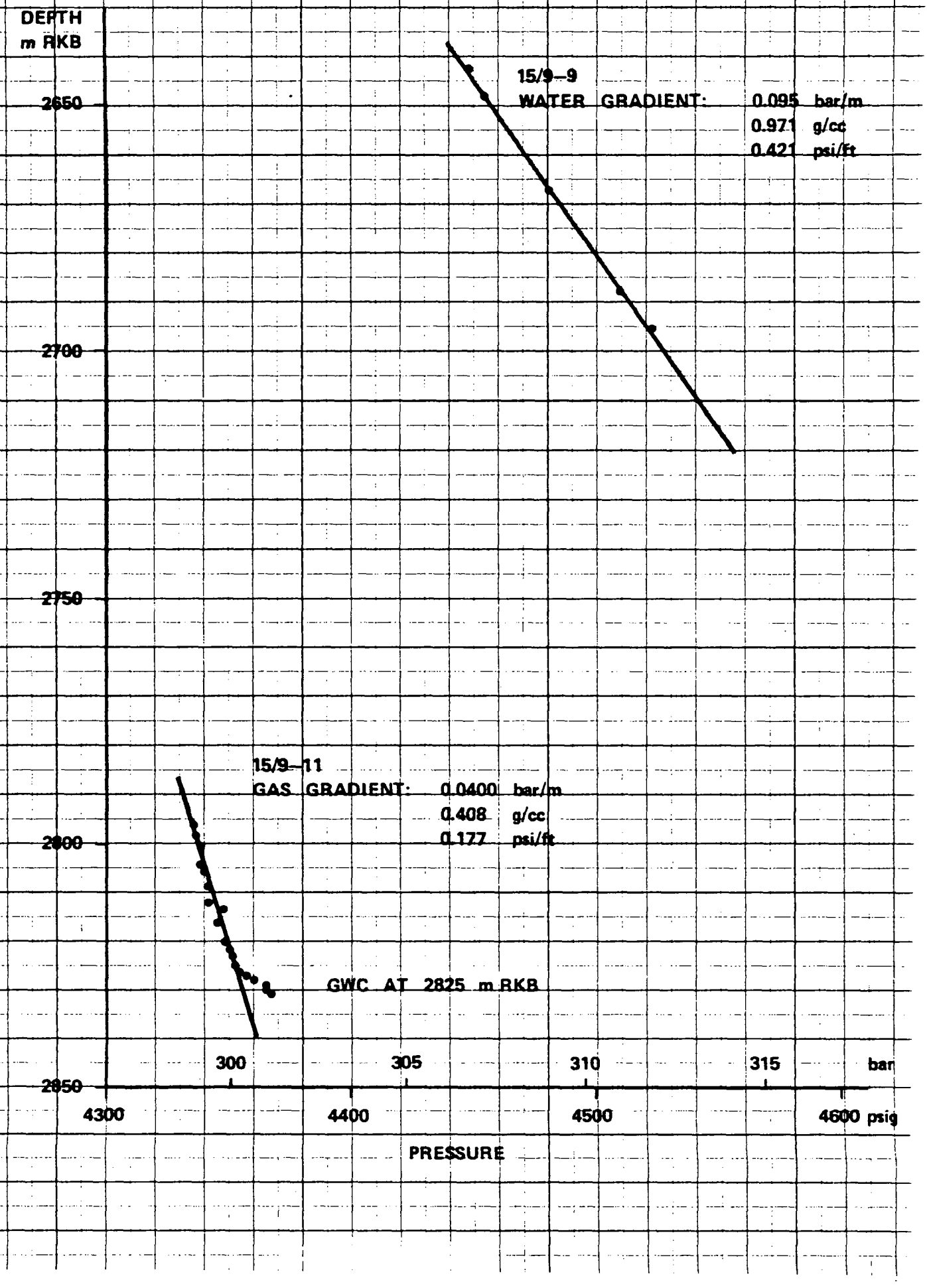


Fig. 4

FORMATION PRESSURE COMPARISON
15/9-9 AND 15/9-11, JURASSIC / TRIASSIC FM



APPENDIX A

statoil
Den norske stats oljeselskap a.s

Classification

Requested by

K. Grini

Subtitle

Co-workers

A. Lykling Berge

Title

W A T E R A N A L Y S I S

15/9-11

RFT SAMPLE AT (2825.8-2826.5)m

STATOIL
EXPLORATION & PRODUCTION
LABORATORY

A.L. Berge

FEB. 82 LAB 82.08

Prepared

22/2-82 | Axel Lykling Berge

Approved

22/2-82 | [signature]

9.03.21 A

1. INTRODUCTION

Statoil Production laboratory (Prolab) received five, 1 liters glass with RFT sample, collected from 1 gallon RFT chamber and from 2 3/4 gallon RFT chamber after run 2, at 2825.8 m - 2826.5 m on 1.11.81 in well 15/9-11.
The RFT sample was probably a mixture of formation water and mudfiltrate.

Prolab was asked to do a chemical analysis on the RFT samples, to see if the samples from the two chambers were significant different and to what degree any formation water was contaminated by mud filtrate.

2. SAMPLE DESCRIPTION

The water samples were dark brown, clody with high content of solid. In the 1 gallon chamber a thin oil film was observed on the surface of the samples. A portion of the filtrate in the 1 gallon chamber was extracted by dichloromethane to extract the oil compounds analysis on the residue.

One of the sample from 2 3/4 gallon chamber was polluted by H_2S.

3. METHODS OF ANALYSIS USED BY PROLAB

The sample was filtrated through a 0.45 µm millipore filter. Most of the analysis were carried out according to ASTM methods, using atomic absorption.

The following ions were determined by wet chemistry techniques:

ions	Methods
Cl^{-4} (including Br^- and I^-)	ASTM D 512
Lignosulphonate (LS)	Light absorption at 280 nm (1)

Total dissolved solids is determined by drying the residue at 120°C over night.
Density was measured by PAAR 401 densiometer.
Conductivity was determined by using a Philips Conductivity Meter PW 9501/01. These measurements were done at carefully controlled temperatures.

The oil in the dichloromethane extract were analysed by gas chromatography.

Relativ standard deviation, RSD, is determined (experimentally and/or theoretically on) every measured value.

$$RSD = \frac{\sigma}{\bar{x}} \quad \text{where} \quad \bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}, \; x_i \; (i=1...n)$$

is measured values in n independent measurements

$$\text{and,} \; \sigma = \left[\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1} \right]^{1/2}$$

4. RESULTS

Table 1 gives the results of the water analysis. In table 2 a comparison of the calculated and the measured values of the total dissolved solid is given.
Fig. 1 shows a chromatogram of the oil extracted from 1 gallon chamber.

In appendix 1 the daily mud report is found.
Appendix 2 shows a UV specter of Lignosulphonate compared with a UV specter of RFT sample.

Appendix 3 shows a chromatogram of oil from 15/9-11 compared with a chromatogram of oil extracted from 1 gallon chamber.

Table 1. Results of selected ion analysis of RFT samples.

Sample	2 3/4 gallon chamber	1 gallon chamber
Density at 20°C, g/cm^3	1.0367	1.0344
pH	7.78	11.0
Total dissolved solid, 7.	5.25	4.99
Conductivity at 20°C, mmho/cm	59.5	53.1
Ion	concentration (ppm)	
Ca^{2+}	443	64
Mg^{2+}	205	0.2
Cl^- (including Br^- and I^-)	20517	16809
Lignosulphonate	1030	1260
Sum ion, %	2.22	1.81

5. DISCUSSION

5.1 Analysis of RFT sample

In addition to the normal ion analysis we have also measured the amount of Lignosulphonate (LS) present in the samples.

Table 1 clearly demostrates a difference between 1 gallon and 2 3/4 gallon chamber. The low pH (7.78) in the 2 3/4 gal chamber probably explain the high Ca^{++} and Mg^{++} concentration found in the sample. The difference in Cl^{-} concentration between the 2 3/4 gallon and 1 gallon chamber is probably to small to decide if the chambers contains two different formation water in addision to the mudfiltrate.

Table 2. Comparison of calculated and measured values for the total dissolved solids.

Sample	2 3/4 gallon chamber	1 gallon chamber	RSD%
Residue after evaporation	5.25	4.99	1
Correlated from density*	5.37	5.05	0.1
Correlated from conductivity	4.16	3.68	3

* Handbook

The results from table 2 futher confirm that there is a difference between the two chambers. A slight ionbalance was also found in the measured and calculated values of TDS.

The data from the mud report Table 3 only indicate that the pH in 2 3/4 gallon chamber is much lower than in the

mudfiltrate, where as the the ion composition do not clearly tell anything about the dilution grad of formation water by mudfiltrate.

Table 3. Data taken from mudreport No. 46, Appendix 1

pH	11.0
ION	Concentration mg/l
Cl^-	21000
Ca^+ (total hardness	180

5.2 Oil extract from 1 gallon chamber

The oil was extracted from 1 gallon chamber and analysed by gas chromatography. (Fig. B in appendix 3) shows a close similarity with a similar oil chromatogram from 15/9-11 DST 1, 2797m - 2807m. The distribution at the higher oil constituents in both chromatograms are rather similar (C_9 - C_2). The lighter components in the oil is lacking in the extraction, so a good correlation is not possible to do.

CONCLUSION

The RFT sample from 1 and 2 3/4 gallon chamber probably contain both mudfiltrate and formation water. It is difficult to decide if the chambers contain different formation water, based on the ion analysis performed. Both samples contain high amount of lignosulphonate which tells that they are contaminated with mudfiltrate. Since we have not received any mudfiltrate we can not make any comparison between the two samples.

The oil extracted from 1 gallon chamber seems to contain the components of heavier hydrocarbons as found in oil from well 15/9-11 DST 1.

REFERENCES

1) Spectrophometric Determination of Lignosulphonicacid and Humic acid in water. Fregenius Z, Anal. Chem. 296,406 - 407 (1979).
2) CRC Handbook of Chemistry and Physics 60th edition page D-261.

APPENDIX 1

MUD TELEX

DATE: 1/11/81 REPORT NO: 46

1
MUD PROPERTIES

TIME:	1200	2200
DEPTH:	2950	2950
TEMP:		
WT:	1.27	1.27
FUNNEL VISC:	46	46
A.V.:	28	28
P.V.:	21	21
Y.P.:	14	14
GELS:	4/9	4/9
PH:	-	11.0
FILTRATE:	4.6	4.6
CAKE:	1	1
HPHT:		12.6
CAKE:		2
PF/MF:		.5/1.2
CL:		21000
T.H.:		180
SOLIDS:		11
OIL:		-
SAND:		TR
MBT:		32.5

2
INVENTORY

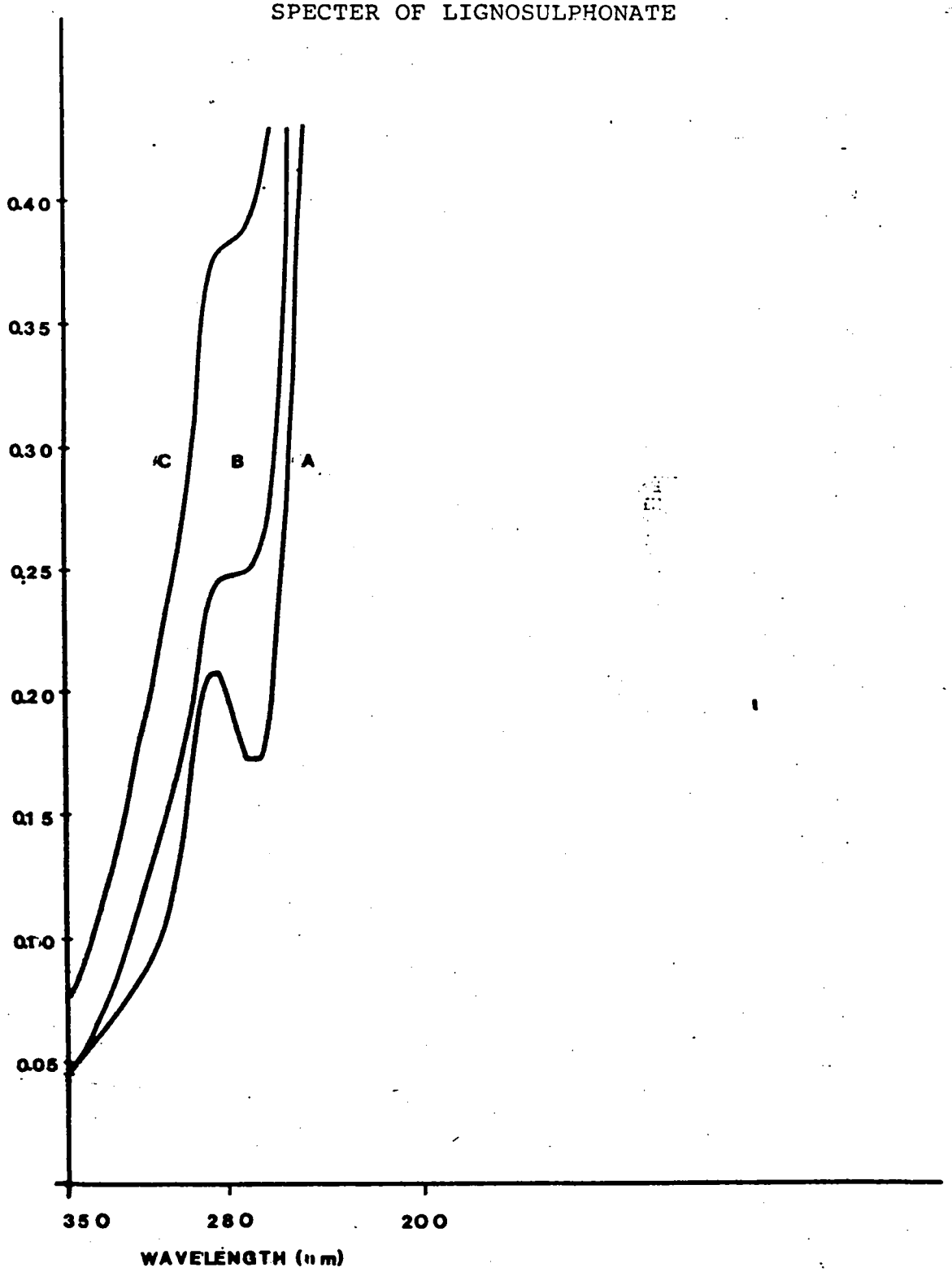
	BALANCE	MIL USED
BARITE MT:	230	
BARITE SXS:	100	
BENTONITE MT:	10	
BENTONITE SX:	361	
CAUSTIC:	218	
SODA ASH:	80	
BICARB:	71	
CHROME LIGNO:	174	
DRISPAC SL/REG:	68/86	
CMC LV/HV:	67/51	
MICA F/M:	45/100	
NUTPLUG F/M:	51/130	
LIME:	23	
CACL2/GYP:	46/27	
IMCO SPOT:	120	
B FREE/PIPELAX:	10/5	
DRLG DET:	11	
TORQ TRIM:	11	
K LIG/LIGNITE:	23/408	
AL STEARATE:	23	
DEFOAMER:	2	
MICA COARSE/POWDER:	87/36	

3
COMMENTS:

LOGGING. DUMPED AND CLEANED THE HEADER BORE AND CLEANED UNDER SHAKERS. PUT MUD GUNS ON RESERVE MUD TANK.

APPENDIX 2

UV SPECTER OF RFT SAMPLE COMPARED WITH UV SPECTER OF LIGNOSULPHONATE



A) LIGNOSULPHONATE 22mg/l

B) 2 3/4 GALLON CHAMBER 1 100 DILUTED

C) 1 GALLON CHAMBER 1 100 DILUTED

APPENDIX 3

Fig. A.

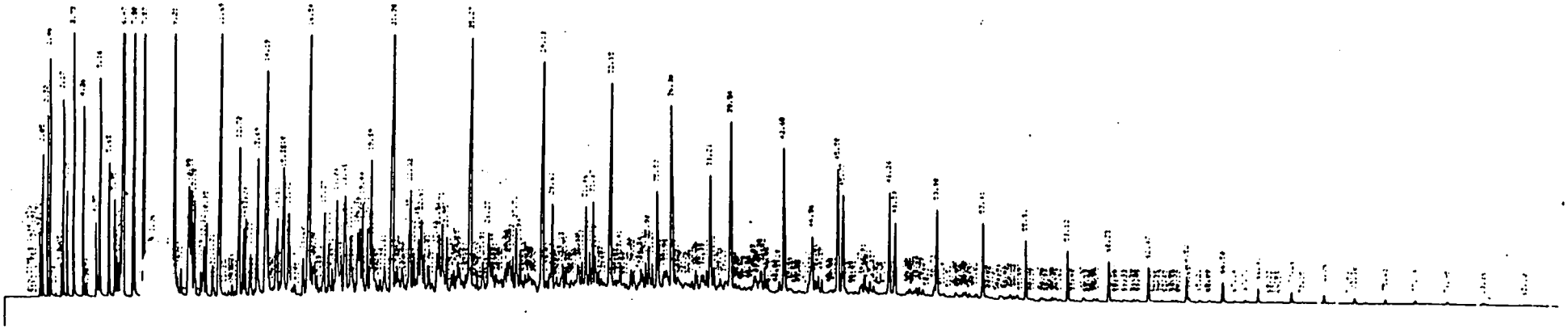


Fig. B

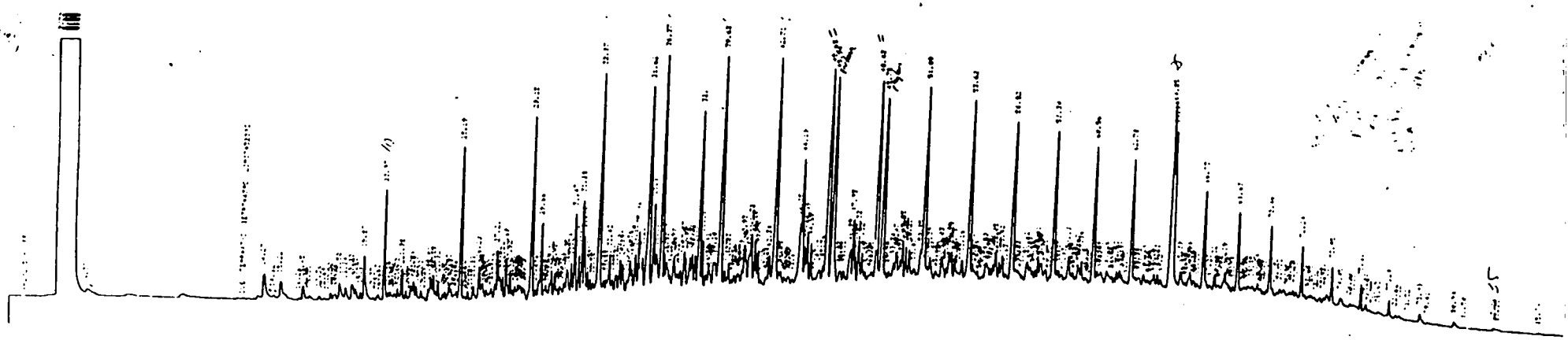


Fig. A Chromatogram of oil from 15/9-11 DST 1.

Fig. B Chromatogram of oil extracted from 1 gallon chamber.