

#### 4.10.3 Formation Pressure Measurements

A Schlumberger Repeat Formation Tester (RFT) with a Hewlett Packard crystal gauge was used to obtain pressure measurements. The crystal gauge failed on run 4B, hence the strain gauge values are used for the water zone. A correction of 16.7 psi is applied to the strain gauge, as this was the average difference between strain gauge and crystal gauge during run 3A.

A total of 4 segregated samples were taken. The results of these are summarized in table 4.22. The content of the samples corresponds to the fluid distribution indicated by the pressure measurements.

The formation pressure was measured as 5634 psia or 388.3 bar at 2550 m MSL (corresponding to 2575 m RKB) with a pressure gradient of 0.0685 bar/m in the oil zone and 0.0986 bar/m in the water zone. Pressures are plotted on fig. 4.13, and show a contact at 2586 m RKB or 2561 m MSL.

#### 4.10.4 Testing

Three drill stem tests were performed in the oil bearing section of the Lunde Formation. All three tests produced clean oil with no water or sand. The intervals tested were:

|          |                       |
|----------|-----------------------|
| DST # 1: | 2574.0 - 2581.5 m RKB |
| DST # 2: | 2455.0 - 2467.0 m RKB |
| DST # 3: | 2409.7 - 2416.5 m RKB |

(The depths refer to the LDT-CNL log, Run 3 of June 13, 1984.)

The objectives of the test were:

- To sample reservoir fluid
- To estimate reservoir pressure and temperature
- To evaluate reservoir properties
- To define reservoir productivity
- To detect possible lateral heterogeneities in the sands
- To confirm the OWC at 2586.0 m RKB

The test string was, starting from the bottom, made up of:

- Geovann tubing conveyed perforation system
- Two pressure recorders placed in an F-nipple above the perforating gun, and three recorders placed in an open bundle carrier between the packer and the LPR-N valve. Additionally, a Welex CRG strain gauge were run on wireline connecting to the tester valve (SRO-barrel) for surface read-out of the pressures.
- A Halliburton test assembly with a modified LPR-N tester valve, APR-M and RTTS circulating valves and a RTTS packer.

- 5" tubing.
- Expro subsea test tree, lubricator valve and surface test tree.

A standard Expro 1440 test separator was used for separation of gas and liquids.

DST # 1, interval 2574.0 - 2581.5 m RKB

The well was perforated with 55 bar underbalance, and immediately flowed to the tank. The 8 minutes initial flow period was followed by a build-up to obtain the formation pressure. The well was then opened for a second flow period of 3 hours, followed by a build-up. The third and main test flow was aborted after 7 hours due to subsea safety valve failure. Consequently, a fourth flow period was performed to complete the test objectives.

The main results of the test are listed in table 4.14. The flowrates and bottom hole pressures are shown in fig. 4.14, and the pressure data from the last build-up are listed in table 4.15. During the main flow period the well produced  $897 \text{ Sm}^3/\text{d}$  through a 11 mm choke with a wellhead pressure of 186 bar. The GOR was measured to  $84 \text{ Sm}^3/\text{Sm}^3$  at separator conditions of 44 bar and  $43^\circ\text{C}$ . During this flow the bottom hole temperature reached  $96.1^\circ\text{C}$ . The well produced clean oil with no water or sand after the initial clean up.

DST # 2, interval 2455.0 - 2467.0 m RKB

The well was perforated with 55 bar underbalance and immediately flowed to the tank. The 8 minutes initial flow was followed by a build-up to obtain the formation pressure. The well was then opened for a second flow period of 3 hours, followed by a second build-up. The main flow period lasted 24 hours during which the formation fluid was sampled both at the wellhead and at the separator.

The main results of the test are listed in table. 4.16. The flowrates and bottom hole pressures are shown in fig. 4.15. and the pressure data from the last build-up are listed in table 4.17. During the main flow period the well produced  $509 \text{ Sm}^3/\text{d}$  through a 9.5 mm choke, with a wellhead pressure of 167 bar. The GOR was measured to  $80 \text{ Sm}^3/\text{Sm}^3$  at separator conditions of 46 bar and  $31^\circ\text{C}$ . During this flow the bottom hole temperature reached  $92.8^\circ\text{C}$ .

The well produced clean oil with no water or sand after it cleaned up.

DST # 3, interval 2409.7 - 2416.5 m RKB

The well was perforated with 48 bar underbalance and immediately flowed to the tank. The 5 minutes initial flow was followed by a build-up to obtain the formation pressure. The well was then opened for a 3 hour second flow period, followed by a second build-up. The 24 hours main flow period was followed by a build-up. A separate sampling flow was finally performed to obtain monophasic crude samples (at wellhead).

The main results of the test are listed in table 4.18. The flowrates and bottom hole pressures are shown in fig. 4.16, and the pressure data from the main build-up are listed in table 4.19. During the main flow period the well produced  $1606 \text{ Sm}^3/\text{d}$  through a 17.5 mm choke, with a wellhead pressure of 146 bar. The GOR was measured to  $60 \text{ Sm}^3/\text{Sm}^3$  at separator conditions of 72 bar and  $63^\circ\text{C}$ . During this flow the bottom hole temperature reached  $91.7^\circ\text{C}$ . The well produced clean oil with no water or sand after it had cleaned up.

#### 4.10.5 Fluid Analysis

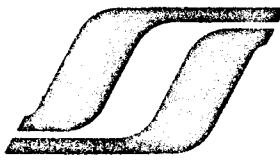
Three RFT-chambers containing pressurized reservoir oil and one RFT-chamber containing water were collected in the well. Analyses of the fluid from these four RFT-chambers are presented in table. 4.23.

In DST # 1 and DST # 2 single phase fluid samples were taken during the main flow, while in DST # 3 a separate sampling flow was performed for this purpose. The samples were taken at wellhead as bubble point determination showed the bubble point pressure of the oil to be well below the wellhead flowing pressures.

PVT-analyses have been requested from all three tests. The reports are not received to date. Preliminary data are presented in tables 4.20 and 4.21.

Fig. 4.17 shows graphically an observed change in bubble point pressures versus depth. The bubble point pressure measured on fluid from DST # 3 deviates slightly from the straight line probably because the reservoir temperature used is too high.

A preliminary determination gave a formation volume factor of 1.47 and 1.48  $Rm^3/Sm^3$  and a solution gas oil ratio of 144 and 157  $Sm^3/Sm^3$ , for the lower and upper zone respectively.



FORMATION PRESSURE MEASUREMENTS.

| DEPTH<br>(mRKB)       | HYDROSTATIC<br>MUD<br>PRESSURE<br>(PSIA) | MEASURED<br>FORMATION<br>PRESSURE<br>(PSIA) | TEMPERATURE CORRECTED<br>FORMATION<br>PRESSURE |       | EQUIVALENT<br>PRESSURE GRADIENT<br>REF TO MSL |       |
|-----------------------|--|---|--|-------|---|-------|
|                       |  |   | (PSIA)   | (BAR) | (g/cm <sup>3</sup> )                          | (ppg) |
| RUN 3A (HP GAUGE)     |  |   |  |       |   |       |
| 2394                  | 5705                                     | 5455  | 5455   | 376.1 | 1.619   | 13.51 |
| 2401                  | 5710                                     | 5463  | 5463   | 376.7 | 1.616   | 13.49 |
| 2414                  | 5734                                     | 5475  | 5475   | 377.5 | 1.611   | 13.44 |
| 2430                  | 5771                                     | 5491  | 5491   | 378.6 | 1.605   | 13.39 |
| 2460                  | 5844                                     | 5520  | 5520   | 380.6 | 1.594   | 13.30 |
| 2476                  | 5881                                     | 5536  | 5536   | 381.7 | 1.588   | 13.25 |
| 2497                  | 5931                                     | 5556  | 5556   | 383.1 | 1.580   | 13.19 |
| 2506                  | 5952                                     | 5569  | 5569   | 384.0 | 1.578   | 13.17 |
| 2520                  | 5983                                     | 5580  | 5580   | 384.7 | 1.572   | 13.12 |
| RUN 3A-II (HP-GAUGE)  |  |   |  |       |   |       |
| 2414                  | 5761                                     | 5474  | 5474   | 377.4 | 1.611   | 13.44 |
| 2552                  | 6074                                     | 5611  | 5611   | 386.9 | 1.561   | 13.03 |
| 2566                  | 6091                                     | 5625  | 5625   | 387.8 | 1.556   | 12.99 |
| 2576                  | 6116                                     | 5635  | 5635   | 388.5 | 1.553   | 12.96 |
| RUN 3A-III (HP-GAUGE) |  |   |  |       |   |       |
| 2414                  | 5762                                     | 5475  | 5475   | 377.5 | 1.611   | 13.44 |
| 2592.5                | 6185                                     | 5655  | 5655   | 389.9 | 1.549   | 12.93 |
| 2595                  | 6176                                     | 5657  | 5657   | 390.0 | 1.548   | 12.92 |
| 2616 *                | 6230                                     | 5700  | 5700   | 393.0 | 1.547   | 12.91 |
| 2619.5 *              | 6226                                     | 5699  | 5699   | 392.9 | 1.544   | 12.89 |
| 2618.5                | 6213                                     | 5693  | 5693   | 392.5 | 1.543   | 12.88 |
| 2616                  | 6207                                     | 5687  | 5687   | 392.1 | 1.543   | 12.88 |
| 2595 *                | 6155                                     | 5653  | 5653   | 389.8 | 1.546   | 12.90 |
| 2593                  | 6152                                     | 5652  | 5652   | 389.7 | 1.547   | 12.91 |
| 2592.5                | 6152                                     | 5653  | 5653   | 389.8 | 1.548   | 12.92 |
| 2397                  | 5693                                     | 5457  | 5457   | 376.2 | 1.617   | 13.49 |

\* instable

RECORDED 13.6.84

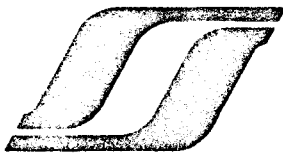
REPORTED IN SEQUENCE

1 bar = 14.5038 psi

1 g/cc = 8.34523 ppg

1 psi = 14.2233 kg/cm<sup>2</sup>

|         |        |       |    |
|---------|--------|-------|----|
| DATE    | 8.1.85 | AUTH. | PS |
| DRAW BY | ASa    | APPR. |    |
| REF     |        |       |    |



**FORMATION PRESSURE MEASUREMENTS.**

| DEPTH<br>(mRKB)       | HYDROSTATIC<br>MUD<br>PRESSURE<br>(PSIG) | MEASURED<br>FORMATION<br>PRESSURE<br>(PSIG) | TEMPERATURE CORRECTED<br>FORMATION<br>PRESSURE |       | EQUIVALENT<br>PRESSURE GRADIENT<br>REF TO MSL |       |
|-----------------------|--|---|--|-------|---|-------|
|                       |  |   | (PSIA)   | (BAR) | (g/cm <sup>3</sup> )                          | (ppg) |
| RUN 4B (STRAIN GAUGE) |  |   |  |       |   |       |
| 2580                  | 6485                                     | 5634  | 5632   | 388.3 | 1.550   | 12.94 |
| 2594                  | 6515                                     | 5659  | 5657   | 390.0 | 1.548   | 12.92 |
| 2617                  | 6556                                     | 5688  | 5686   | 392.0 | 1.542   | 12.87 |
| 2639                  | 6601                                     | 5720  | 5718   | 394.2 | 1.538   | 12.84 |
| 2683                  | 6708                                     | 5780  | 5778   | 398.4 | 1.528   | 12.75 |
| 2735                  | 6842                                     | 5857  | 5855   | 403.7 | 1.519   | 12.68 |
| 2847                  | 7122                                     | 6018  | 6016   | 414.8 | 1.499   | 12.51 |
| 2874                  | 7185                                     | 6058  | 6056   | 417.5 | 1.494   | 12.47 |
| 2497                  | 6288                                     | 5595  | 5593   | 385.6 | 1.591   | 13.28 |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |
|                       |  |   |  |       |   |       |

STRAIN GAUGE CORRECTED BY (14.7-16.7) = (atm + error)  
 TO AGREE WITH HP-GAUGE RUN 3A (RECORDED SIMULTANEOUSLY)  
 RECORDED 18.6.84

|             |          |
|-------------|----------|
| DATE 8.1.85 | AUTH. PS |
| DRAW BY ASa | APPR.    |
| REF         |          |



WELL:

34/7-1

| Flow No. | Duration<br>min. | Oil Rate<br>Sm <sup>3</sup> /day | GOR<br>Sm <sup>3</sup> /Sm <sup>3</sup> | Choke<br>mm | Sep. Press<br>bara | Sep. Temp.<br>°C | WHP<br>bara | BHP<br>bara | PI<br>Sm <sup>3</sup> /bar/day | Remarks |
|----------|------------------|----------------------------------|---|-------------|--------------------|------------------|-------------|-------------|--------------------------------|---------|
| 1        | 8                | 276                              |   | 8           |                    |                  | 118.2       | 382.0       | 57                             |         |
| 2        | 180              | 513                              | 107                                     | 11          | 14.5               | 13.3             | 98.9        | 377.6       | 56                             |         |
| 3        | 436              | 917                              | 77                                      | 11          | 43.8               | 35.0             | 187.2       | 368.4       | 50                             |         |
| 4        | 709              | 868                              | 84                                      | 11          | 44.8               | 43.3             | 186.5       | 368.3       | 47                             |         |

|         |        |       |     |
|---------|--------|-------|-----|
| DATE    | 8.1.85 | AUTH. | TT  |
| DRAW BY | Asa    | APPR. | HHØ |
| REF     |        |       |     |



Saga  
Petroleum a.s.



TAB. 4.15

BUILD-UP, FINAL FLOW,

DST # 1

WELL:

34/7-1

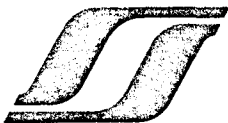
Time                      Pressure  
                                      bara

03.07.84

|          |        |
|----------|--------|
| 02:36:30 | 368.47 |
| 02:37:00 | 375.44 |
| 02:37:30 | 376.29 |
| 02:38:00 | 376.66 |
| 02:38:30 | 376.92 |
| 02:39:00 | 377.12 |
| 02:40:00 | 377.43 |
| 02:41:00 | 377.68 |
| 02:44:00 | 378.27 |
| 02:48:00 | 378.86 |
| 03:00:30 | 380.05 |
| 04:04:40 | 382.53 |
| 05:29:00 | 383.75 |
| 06:39:00 | 384.22 |
| 08:46:00 | 384.72 |
| 10:51:30 | 385.01 |
| 14:39:00 | 385.32 |
| 18:58:00 | 385.50 |
| 20:52:30 | 385.55 |

Last flowing pressure

|              |           |
|--------------|-----------|
| DATE 8.1.85  | AUTH. TT  |
| DRAW. BY ASA | APPR. HHO |
| REF          |           |



WELL:

34/7-1

| Flow No. | Duration<br>min. | Oil Rate<br>Sm <sup>3</sup> /day | GOR<br>Sm <sup>3</sup> /Sm <sup>3</sup> | Choke<br>mm | Sep. Press<br>bara | Sep. Temp.<br>°C | WHP<br>bara | BHP<br>bara | PI<br>Sm <sup>3</sup> /bar/day | Remarks |
|----------|------------------|----------------------------------|---|-------------|--------------------|------------------|-------------|-------------|--------------------------------|---------|
| 1        | 8                | 226                              |   | 9.5         |                    |                  | 73.4        | 371.6       | 27                             |         |
| 2        | 184              | 757                              | 78                                      | 9.5         | 44.8               | 32.2             | 140.6       | 357.2       | 33                             |         |
| 3        | 1440             | 509                              | 80                                      | 9.5         | 45.8               | 31.1             | 167.5       | 362.4       | 33                             |         |

|         |        |       |     |
|---------|--------|-------|-----|
| DATE    | 8.1.85 | AUTH. | TT  |
| DRAW.BY | ASa    | APPR. | HHØ |
| REF     |        |       |     |

Saga  
Petroleum a.s.



TAB. 4.17

BUILD-UP, FINAL FLOW,  
DST # 2

WELL:

34/7-1

Time                      Pressure  
                                    bara

09.07.84

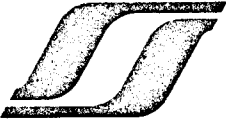
|          |        |
|----------|--------|
| 12:09:00 | 362.36 |
| 12:11:00 | 373.08 |
| 12:13:00 | 374.08 |
| 12:15:00 | 374.50 |
| 12:17:00 | 374.75 |
| 12:19:00 | 374.94 |
| 12:23:00 | 375.19 |
| 12:27:00 | 375.40 |
| 12:37:00 | 375.73 |
| 12:47:00 | 375.96 |
| 13:17:00 | 376.43 |
| 15:01:00 | 377.20 |
| 16:01.00 | 377.45 |
| 18:01:00 | 377.81 |
| 20:01:00 | 378.06 |

Last flowing pressure

10.07.84

|          |        |
|----------|--------|
| 00:01:00 | 378.36 |
| 04:01:00 | 378.55 |
| 08:01:00 | 378.71 |
| 16:01:00 | 378.90 |
| 23:59:00 | 379.05 |

|              |           |
|--------------|-----------|
| DATE 8.1.85  | AUTH. TT  |
| DRAW. BY ASA | APPR. HHØ |
| REF          |           |



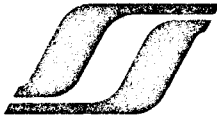
WELL:

34/7-1

| Flow No. | Duration<br>min. | Oil Rate<br>Sm <sup>3</sup> /day | GOR<br>Sm <sup>3</sup> /Sm <sup>3</sup> | Choke<br>mm | Sep. Press<br>bara | Sep. Temp.<br>°C | WHP<br>bara | BHP<br>bara | PI<br>Sm <sup>3</sup> /bar/day | Remarks |
|----------|------------------|----------------------------------|---|-------------|--------------------|------------------|-------------|-------------|--------------------------------|---------|
| 1        | 5                | 352                              |   | 9.5         |                    |                  | 109.7       | 363.3       | 28                             |         |
| 2        | 186              | 905                              | 87                                      | 12.7        | 44.1               | 43.3             | 178.6       | 347.8       | 33                             |         |
| 3        | 1510             | 1606                             | 60                                      | 17.5        | 71.7               | 62.8             | 145.4       | 325.5       | 32                             |         |
| 4        | 408              | 564                              | 80                                      | 9.5         | 42.7               | 34.4             | 189.5       | 354.4       | 27                             |         |

|         |        |       |     |
|---------|--------|-------|-----|
| DATE    | 8.1.85 | AUTH. | TT  |
| DRAW.BY | ASa    | APPR. | HHØ |
| REF     |        |       |     |

Saga  
Petroleum a.s.



TAB. 4.19

BUILD-UP, FINAL FLOW

DST # 3

WELL:

34/7-1

| Time | Pressure<br>bara |
|------|------------------|
|------|------------------|

15.07.84

|          |        |
|----------|--------|
| 17:00:00 | 325.49 |
| 17:02:00 | 355.49 |
| 17:04:00 | 356.92 |
| 17:06:00 | 357.70 |
| 17:08:00 | 357.83 |
| 17:10:00 | 358.66 |
| 17:16:00 | 359.55 |
| 17:22:00 | 360.15 |
| 17:30:00 | 360.74 |
| 18:00:00 | 362.14 |
| 19:00:00 | 363.71 |
| 20:00:00 | 364.66 |
| 22:00:00 | 365.87 |

Last flowing pressure

16.07.84

|          |        |
|----------|--------|
| 00:00:00 | 366.69 |
| 04:00:00 | 367.79 |
| 08:00:00 | 368.55 |
| 12:00:00 | 369.13 |
| 16:00:00 | 369.58 |
| 20:00:00 | 369.92 |
| 22:58:00 | 370.16 |

|              |             |
|--------------|-------------|
| DATE 8.1.85  | AUTH. TT    |
| DRAW. BY ASa | APPR. H H Ø |
| REF          |             |

Saga  
Petroleum a.s.



TAB. 4.20

COMPOSITIONAL ANALYSIS OF  
FLUID FROM DST # 2

WELL:

34/7-1

| Component        | W + % | Mol % |
|------------------|-------|-------|
| N <sub>2</sub>   | 0.21  | 0.70  |
| CO <sub>2</sub>  | 0.11  | 0.24  |
| C <sub>2</sub>   | 6.37  | 37.15 |
| C <sub>2</sub>   | 2.81  | 8.73  |
| C <sub>3</sub>   | 4.04  | 8.57  |
| i-C <sub>4</sub> | 1.06  | 1.71  |
| n-C <sub>4</sub> | 2.67  | 4.29  |
| i-C <sub>5</sub> | 1.21  | 1.57  |
| n-C <sub>5</sub> | 2.16  | 2.80  |
| C <sub>6</sub>   | 2.50  | 2.73  |
| C <sub>7+</sub>  | 76.86 | 31.51 |

Properties C<sub>7+</sub>

Molweight C<sub>7+</sub>: 228  
Density C<sub>7+</sub> [kg/m<sub>3</sub>]: 854.9

|              |           |
|--------------|-----------|
| DATE 8.1.85  | AUTH. JMH |
| DRAW. BY ASa | APPR. HHO |
| REF          |           |



| DST No. | $P_b$ [bara] | Applied lab temp. [°C] | GOR [ $\text{Sm}^3/\text{m}^3$ ] | Stock tank oil density [ $\text{kg}/\text{m}^3$ ] | F.V.F.* at Resv. pressure | Gas gravity [Air = 1] |
|---------|--------------|------------------------|----------------------------------|---|---------------------------|-----------------------|
| 1       | 173.7        | 95.6                   | 144                              | 833   | 1.47                      | 0.925                 |
| 2       | 178.8        | 92.2                   |                                  |   |                           |                       |
| 3       | 181.9        | 93                     | 157                              | 834   | 1.48                      | 0.985                 |

\* Measured from single stage flash to 1 bar and 15°C.

Other Properties on stock tank oil from DST # 1

Pour Point: 4°C  
 Cloud Point: 25°C  
 Wax Appearance Point: 18°C  
 Wax Content: 9.7 W + 90

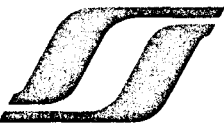
|         |        |       |     |
|---------|--------|-------|-----|
| DATE    | 8.1.85 | AUTH. | JMH |
| DRAW BY | ASa    | APPR. | HHO |
| REF     |        |       |     |



| Depth<br>(m RKB) | Contents | Opening pressure<br>at 15.6°C<br>(bar) | Estimated sample<br>volume at 377 bar<br>and 15.6°C | Volume transferred<br>for PVT-analysis<br>at 415 bar |
|------------------|----------|--|---|--|
| 2398             | oil      | 110.0                                  | 3.57 L  | 2.4 L  |
| 2497             | oil      | 100.7                                  | 3.51 L  | 1.8 L  |
| 2579             | oil      | 103.7                                  | 3.53 L  | 2.4 L  |
| 2593             | water    | 21.7                                   | 3.36 L  |  |

|             |           |
|-------------|-----------|
| DATE 8.1.85 | AUTH. JMH |
| DRAW BY ASa | APPR.     |
| REF         |           |





Data from bleed down of RFT chamber  
after PVT-samples have been transferred

| Depth<br>(m RKB) | Content | Pv at 15.6°C<br>(bar) | Gravity of residual<br>oil at 15.6°C<br>(g/cc) | GOR<br>(Sm <sup>3</sup> /Sm <sup>3</sup> ) |
|------------------|---------|-----------------------|--|--|
| 2398             | oil     | 131.3                 | 0.82   | 136  |
| 2497             | oil     | 121.2                 | 0.83   | 115  |
| 2579             | oil     | 126.5                 | 0.82   | 107  |
| 2593             | water*  |                       |  |  |

\* Chemical analysis showed the water to be diluted mud filtrate.

|              |           |
|--------------|-----------|
| DATE 8.1.85  | AUTH. JMH |
| DRAWN BY Asa | APPR.     |
| REF          |           |

Saga  
Petroleum a.s.

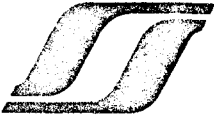


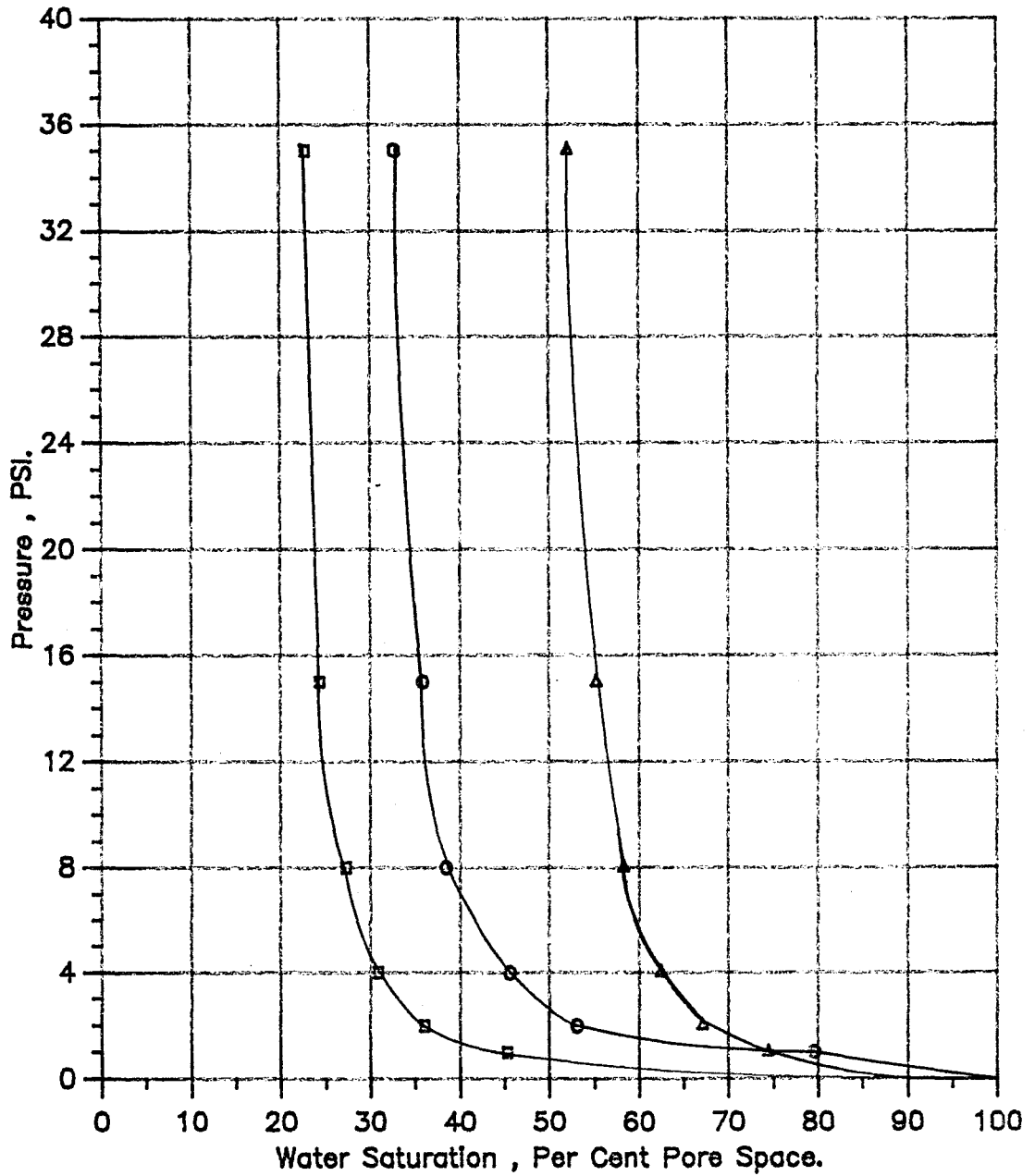
FIG. 4.11

AIR - BRINE CAPILLARY PRESSURE  
CURVES. LUNDE FORMATION

WELL:

34/7-1

- o Sample S176 Depth = 2575.5m  $k_a = 982\text{mD}$   $\phi = 30.1\%$
- △ Sample S177 Depth = 2576.5m  $k_a = 79\text{mD}$   $\phi = 15.2\%$
- Sample S179 Depth = 2578.5m  $k_a = 4130\text{mD}$   $\phi = 27.3\%$



|             |           |
|-------------|-----------|
| DATE 8.1.85 | AUTH. IN  |
| DRAW. BY IN | APPR. HHØ |
| REF         |           |

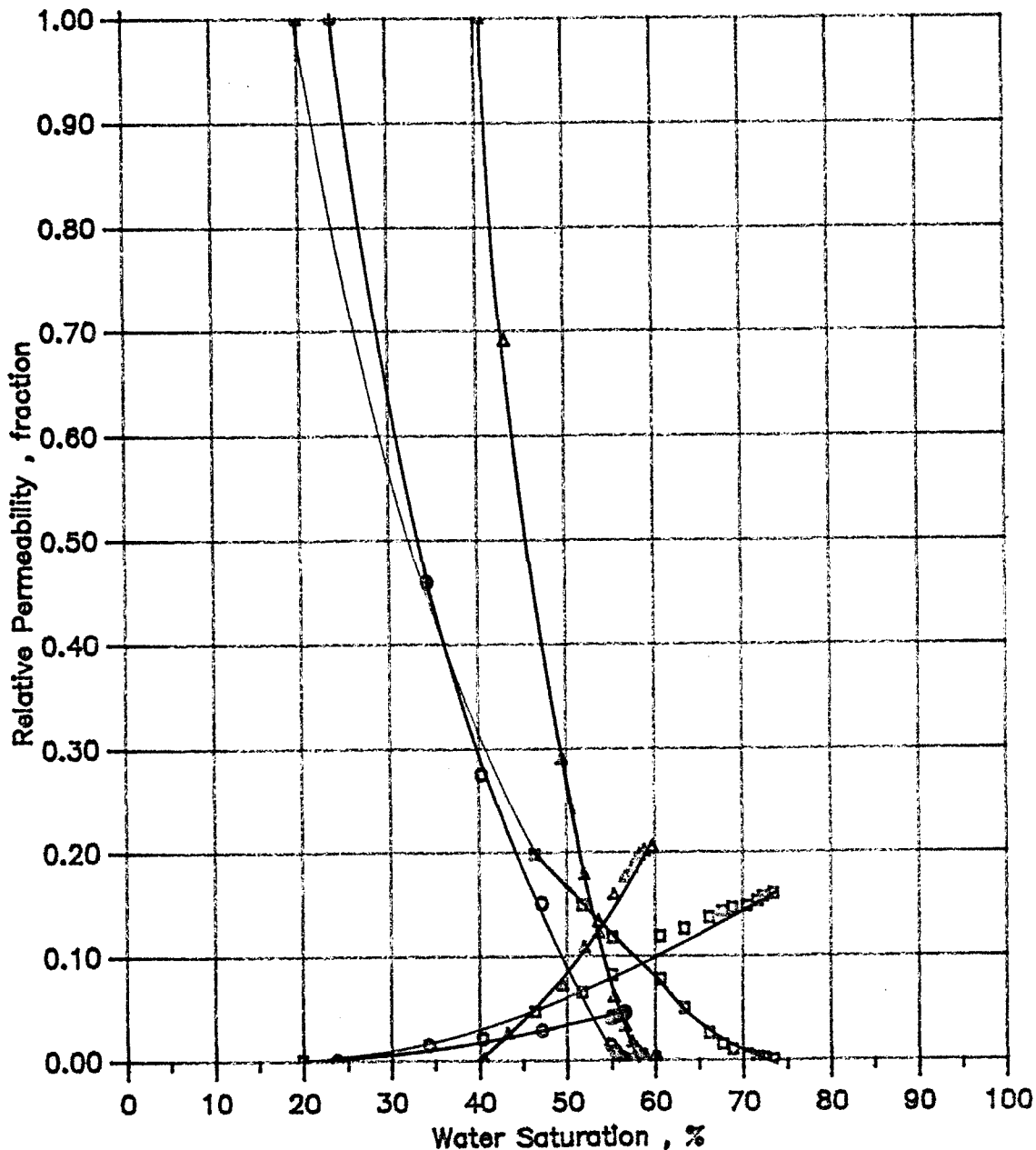
Saga  
Petroleum a.s.



FIG. 4.12

WATER - OIL RELATIV PERMEABILITY  
CURVES. LUNDE FORMATION  
WELL: 34/7-1

- o Depth = 2575.5m keo(Swi)= 865mD Swi = 23.8%
- ▲ Depth = 2576.5m keo(Swi)= 78mD Swi = 40.6%
- Depth = 2578.5m keo(Swi)=3500mD Swi = 19.8%



|             |           |
|-------------|-----------|
| DATE 8.1.85 | AUTH. IN  |
| DRAW. BY IN | APPR. HHØ |
| REF         |           |

FIG. 4.13

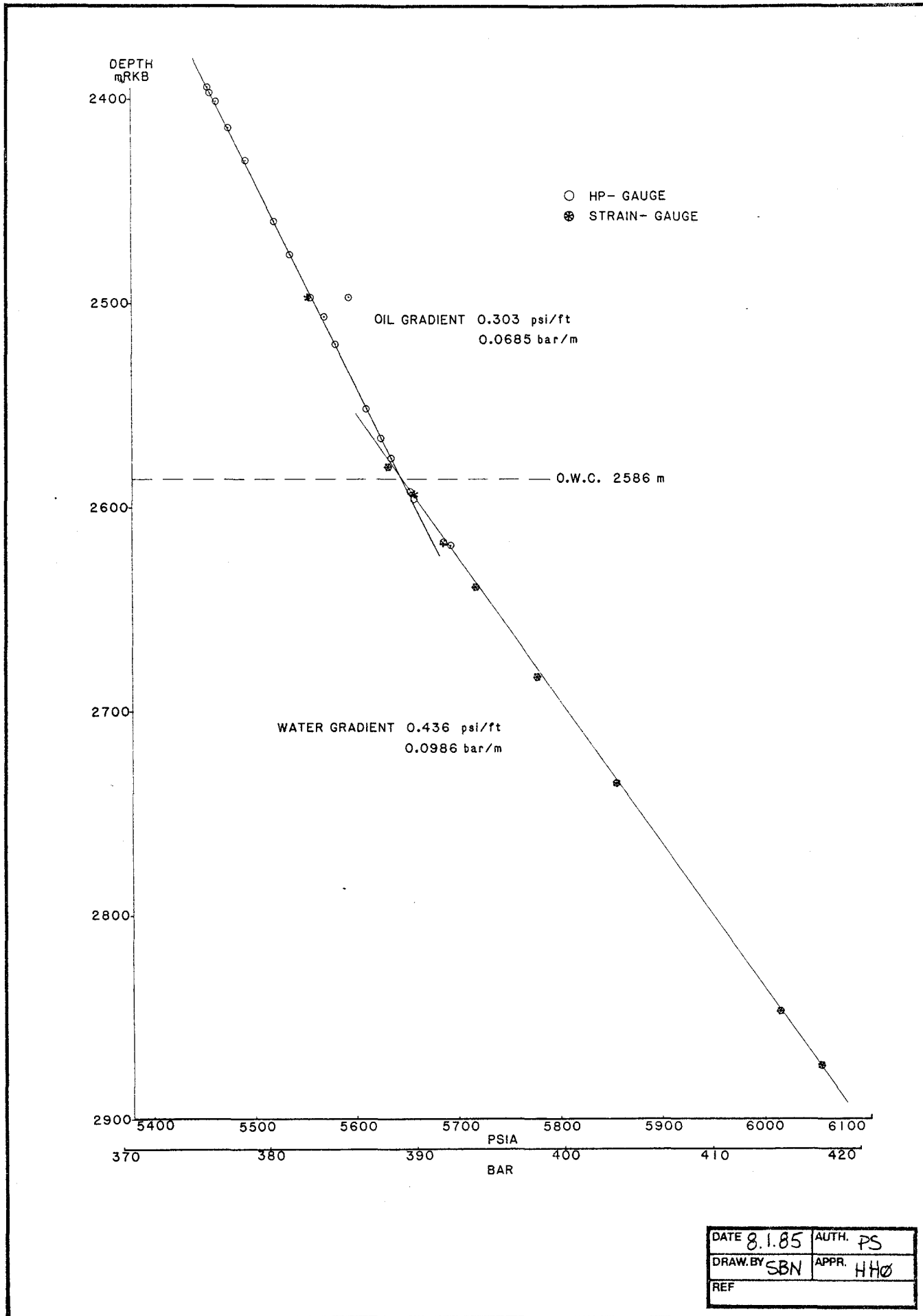
FORMATION PRESSURE VS. DEPTH

Saga Petroleum a.s.



WELL:

34/7-1



Saga Petroleum a.s.

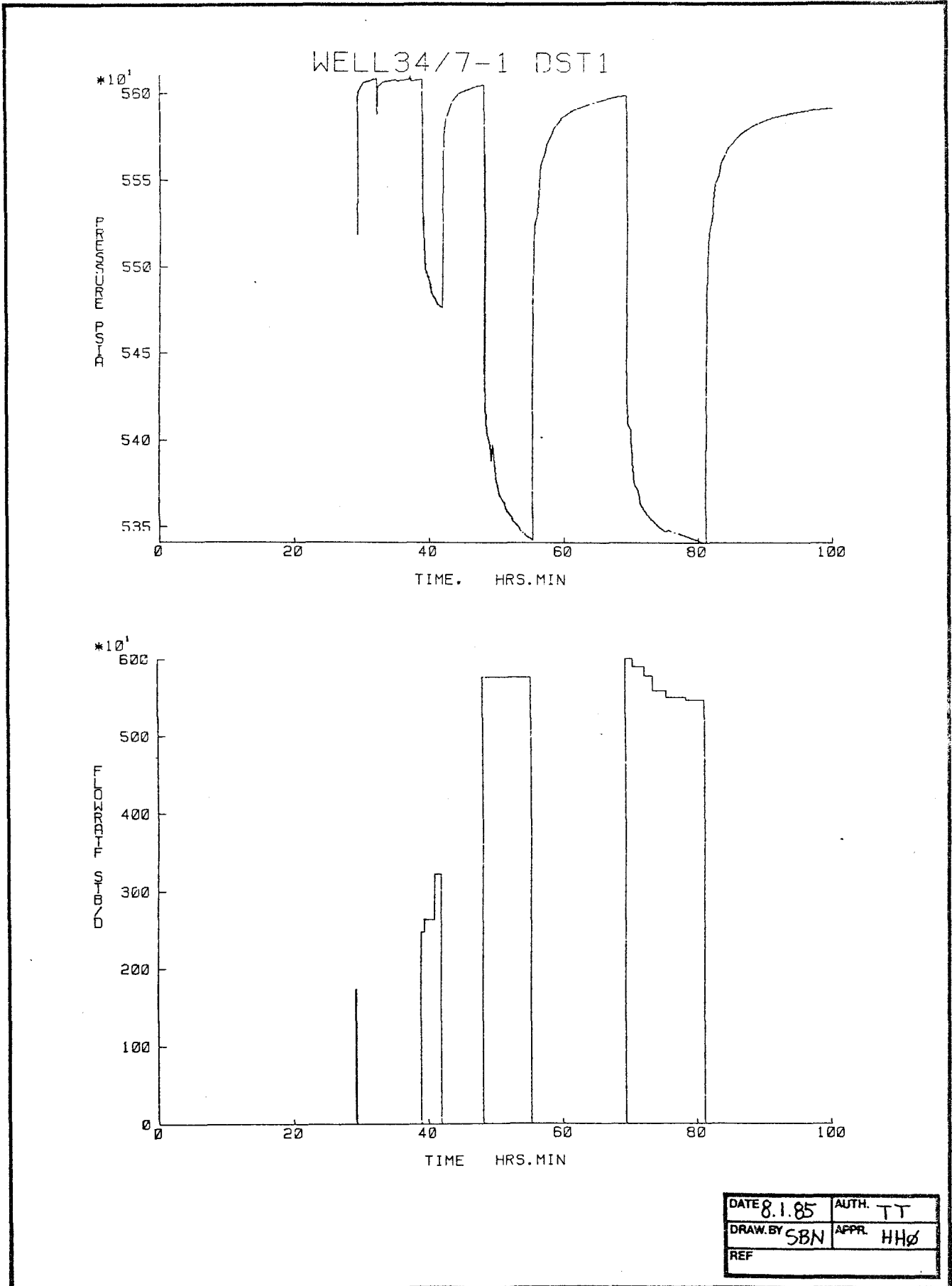


FIG. 4.14

BOTTOM HOLE PRESSURES AND FLOW RATES, DST # 1

WELL:

34/7-1



Saga  
Petroleum a.s.

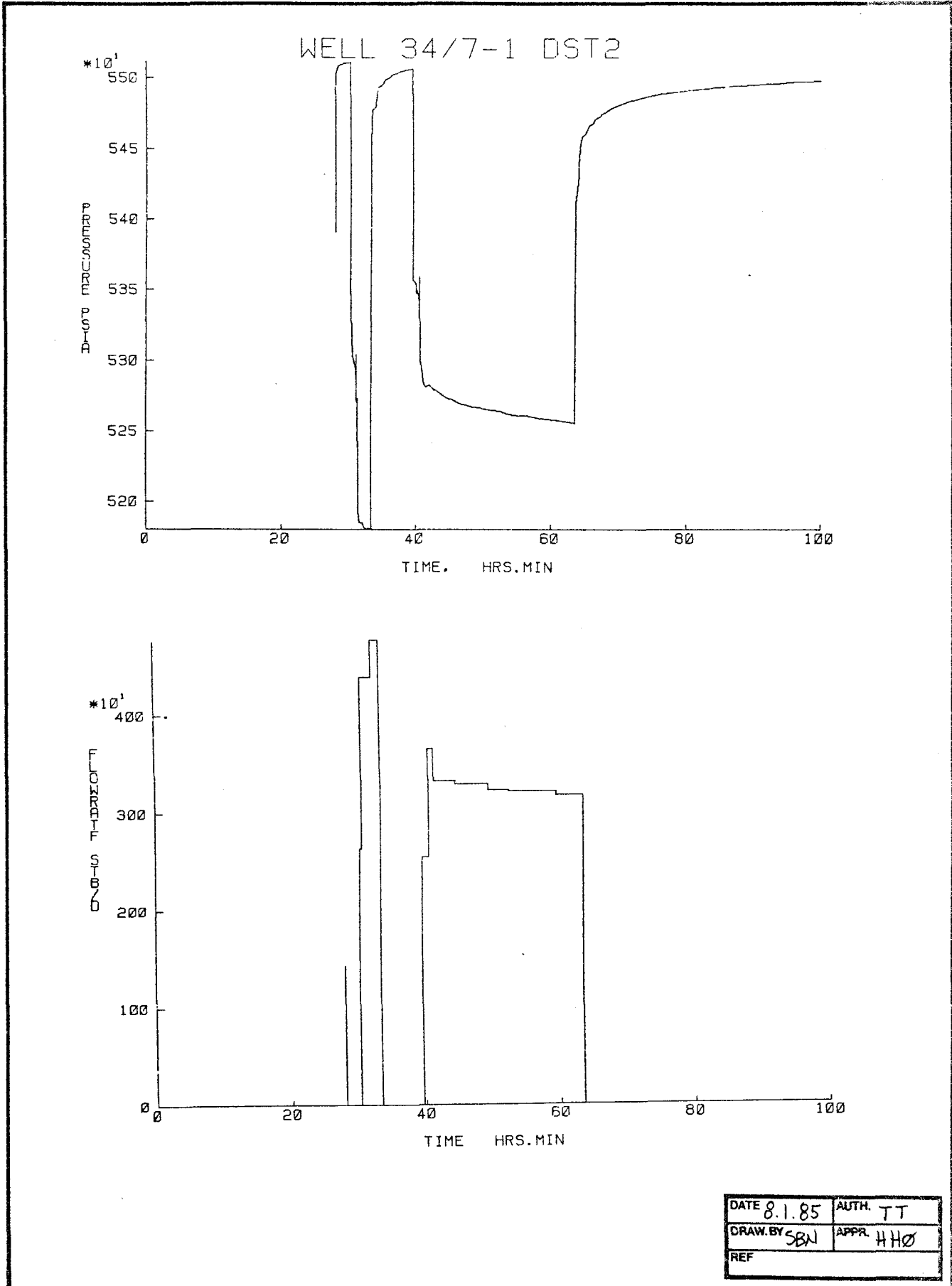


FIG. 4.15

BOTTOM HOLE PRESSURES AND  
FLOW RATES, DST # 2

WELL:

34/7-1



Saga  
Petroleum a.s.

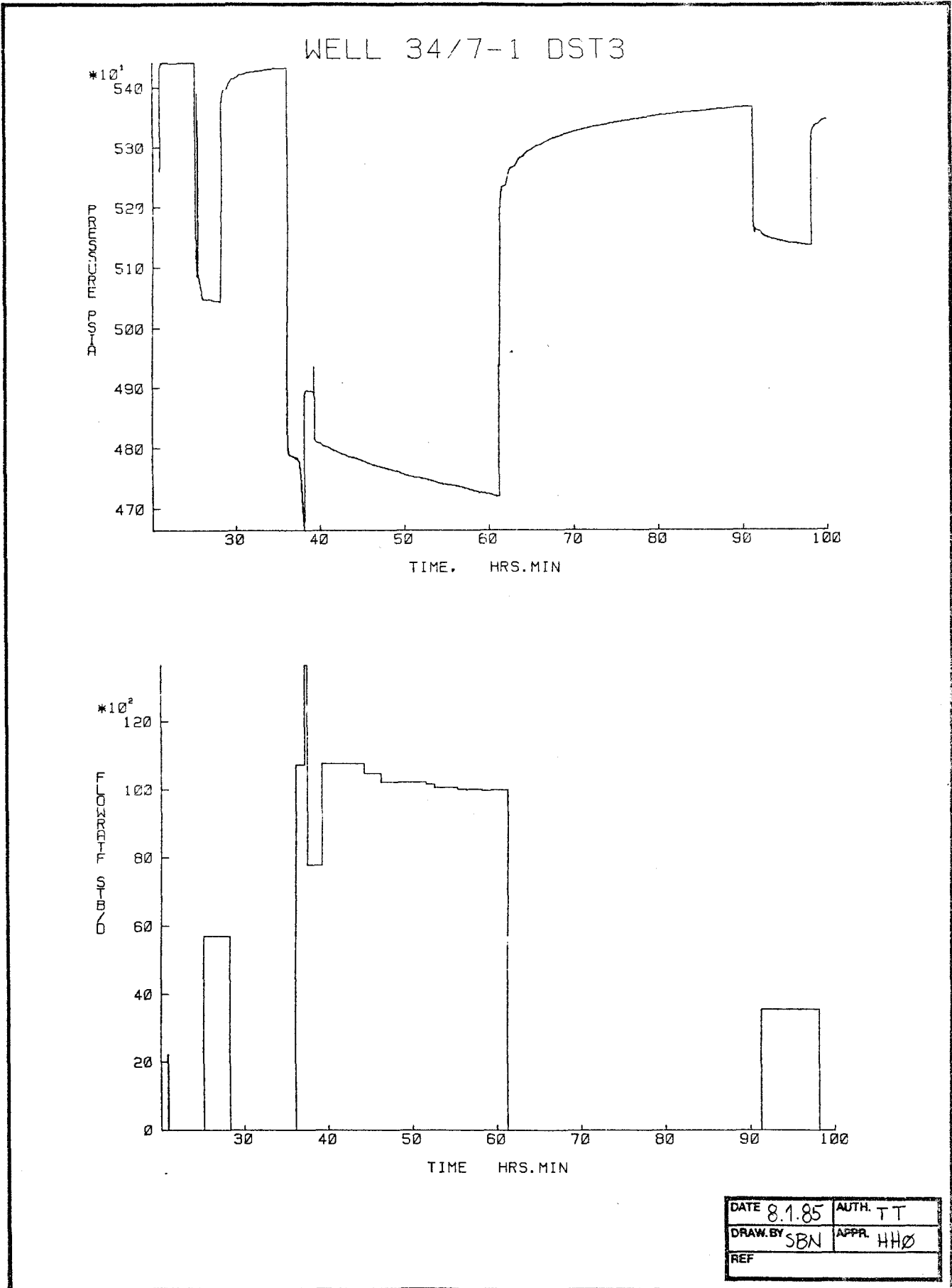


FIG. 4.16

BOTTOM HOLE PRESSURES AND  
FLOW RATES, DST # 3

WELL:

34/7-1



Saga  
Petroleum a.s.

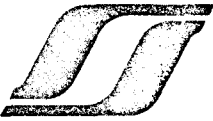
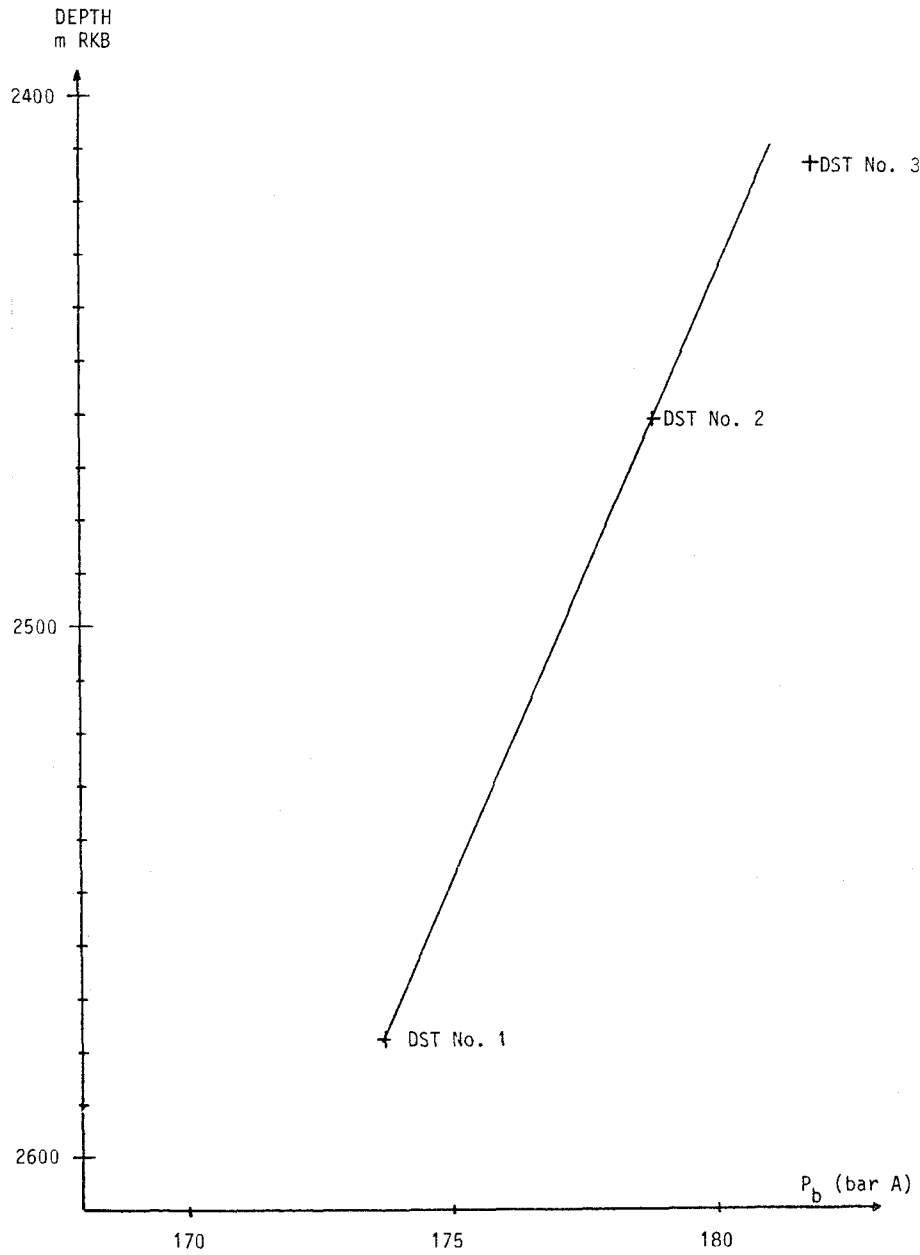


FIG. 4.17

BUBBLE POINT PRESSURE  
VS. DEPTH

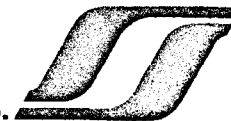
WELL:

34/7-1



|              |           |
|--------------|-----------|
| DATE 8.1.85  | AUTH. JMH |
| DRAW. BY JMH | APPR. HHØ |
| REF          |           |





5.2.1. Mud Properties, Daily Report

Well no: 34/7-1

| DATE | HOLE SIZE INCHES | DEPTH METERS | MUD WEIGHT ppg | P.V. | Y.P. | GEL STRENGTH | n | K | WATER LOSS | pH   | ALKALINITY PF/MF | Ca+ ppm | CL- ppm | SAND % | SOLIDS % | COMMENTS                 |
|------|------------------|--------------|----------------|------|------|--------------|---|---|------------|------|------------------|---------|---------|--------|----------|--------------------------|
| 9/5  | 36               | 424          | SPUD           | MUD  |      |              |   |   |            |      |                  |         |         |        |          | SPUD IN                  |
| 10/5 | 26               | 478          | 8.8            | 11   | 28   | 12/17        |   |   |            | 10.3 |                  |         |         |        |          | Set csg. Mix new mud     |
| 11/5 | 26               | 478          | 8.8            | 11   | 28   | 12/17        |   |   |            | 10.3 |                  |         |         |        |          | Run BOP and riser        |
| 12/5 | 17 1/2           | 700          | 8.9            | 11   | 42   | 20/25        |   |   |            | 9.5  |                  |         |         |        |          | Drill 17 1/2" pilot hole |
| 13/5 | 17 1/2           | 1035         | 9.5            | 10   | 30   | 21/22        |   |   |            | 9.1  |                  |         |         |        |          | Drilling                 |
| 14/5 | 17 1/2           | 1106         | 9.5            | 12   | 31   | 23/25        |   |   |            | 9.0  |                  |         |         |        |          | Log.                     |
| 15/5 | 26               | 771          | 9.7            | 11   | 55   | 22/29        |   |   | 40         | 8.8  |                  |         | 13000   |        |          | Underreamer to 26"       |
| 16/5 | 26               | 1083         | 9.8            | 11   | 53   | 21/26        |   |   | 38         | 8.8  |                  | 320     | 13000   |        |          | Underreamer to 26"       |
| 17/5 | 26               | 1083         | 9.8            | 11   | 53   | 21/26        |   |   | 38         | 8.8  |                  | 320     | 13000   |        |          | Pull riser               |
| 18/5 | 26               | 1083         | 9.2            | 12   | 30   | 15/20        |   |   |            | 9.0  |                  |         |         |        |          | Run 20" csg.             |
| 19/5 | 26               | 1070         |                |      |      |              |   |   |            |      |                  |         |         |        |          | Mix new mud              |
| 20/5 | 26               | 1106         | 8.8            | 18   | 29   | 4/9          |   |   | 31         | 9.7  | 0.3/0.7          | 200     | 40000   |        |          | Drill out cmt.           |
| 21/5 | 17 1/2           | 1320         | 9.6            | 13   | 18   | 4/9          |   |   | 13         | 9.6  | 0.3/0.7          | 80      | 48000   |        |          | Drill 17 1/2" hole       |
| 22/5 | 17 1/2           | 1320         | 10.0           | 19   | 24   | 5/9          |   |   | 11         | 9.7  | 0.3/0.7          | 80      | 47000   |        |          | Stuck                    |
| 23/5 | 17 1/2           | 1320         | 10.0           | 15   | 22   | 4/9          |   |   | 12         | 9.4  | 0.3/0.7          | 80      | 48000   |        |          | Back off string          |
| 24/5 | 17 1/2           | 1452         | 10.3           | 22   | 26   | 5/9          |   |   | 12         | 9.4  | 0.2/0.5          | 160     | 47000   | 1.0    |          | Catch fish               |
| 25/5 | 17 1/2           | 1766         | 11.4           | 23   | 28   | 7/4          |   |   | 11.8       | 9.3  | 0.1/0.4          | 200     | 50500   | .75    | 14       | Drill 17 1/2" hole       |
| 26/5 | 17 1/2           | 1869         | 12.2           | 21   | 24   | 5/12         |   |   | 13.3       | 9.0  | 0.05/0.4         | 200     | 53000   | 2.0    | 16       | Drill 17 1/2" hole       |
| 27/5 | 17 1/2           | 1869         | 12.2           | 19   | 24   | 5/11         |   |   | 13         | 9.0  | .05/0.3          | 200     | 54000   | .75    | 16       | Logging                  |
| 28/5 | 17 1/2           | 1869         | 12.2           | 19   | 23   | 5/10         |   |   | 13.5       | 9.0  | .05/0.3          | 200     | 55000   | .75    | 16       | Circulate                |
| 29/5 | 17 1/2           | 1817         | 12.2           | 19   | 24   | 5/12         |   |   | 13.6       | 9.1  | .05/.4           | 180     | 54000   | .75    | 16       | Run 13 3/8" csg.         |
| 30/5 | 12 1/4           | 2065         | 12.6           | 20   | 26   | 9/18         |   |   | 9.2        | 9.2  | .08/.5           | 280     | 55000   | 1.0    | 17       | Drill 12 1/4" hole       |
| 31/5 | 12 1/4           | 2194         | 12.8           | 21   | 23   | 10/20        |   |   | 11.1       | 9.3  | .1/.5            | 100     | 79000   | .75    | 19       | " " "                    |
| 1/6  | 12 1/4           | 2310         | 13.0           | 23   | 23   | 6/18         |   |   | 8.3        | 9.4  | .1/.6            | 160     | 84000   | .75    | 19.5     | " " "                    |
| 2/6  | 12 1/4           | 2397         | 13.2           | 22   | 24   | 7/19         |   |   | 8.0        | 9.3  | .1/.6            | 140     | 88000   | .75    | 18       | " " "                    |
| 3/6  | 12 1/4           | 2412         | 13.6           | 25   | 23   | 7/18         |   |   | 7.0        | 9.0  | .1/.5            | 160     | 84000   | 1.0    | 22       | Coring                   |
| 4/6  | 12 1/4           | 2436         | 13.6           | 23   | 22   | 6/19         |   |   | 7.0        | 9.6  | .15/.6           | 120     | 80000   | .75    | 21.5     | "                        |
| 5/6  | 12 1/4           | 2463         | 13.6           | 23   | 23   | 6/18         |   |   | 6.9        | 9.4  | .1/.6            | 160     | 80000   | .75    | 21.5     | "                        |
| 6/6  | 12 1/4           | 2463         | 13.6           | 24   | 23   | 7/19         |   |   | 7.0        | 9.2  | .1/.5            | 140     | 80000   | .5     | 21.5     | "                        |
| 7/6  | 12 1/4           | 2495         | 13.6           | 24   | 20   | 7/19         |   |   | 7.0        | 9.4  | .1/.5            | 160     | 75000   | .5     | 21       | "                        |

5.2.1. Mud Properties, Daily Report

Well no: 34/7-1



| DATE | HOLE SIZE INCHES | DEPTH METERS | MUD WEIGHT ppg | P.V. | Y.P. | GEL STRENGTH | n | K | WATER LOSS | pH   | ALKALINITY Pf/Mf | Ca+ ppm | CL- ppm | SAND % | SOLIDS % | COMMENTS                             |
|------|------------------|--------------|----------------|------|------|--------------|---|---|------------|------|------------------|---------|---------|--------|----------|--------------------------------------|
| 8/6  | 12 1/4           | 2533         | 13.7           | 27   | 24   | 7/19         |   |   | 7.0        | 9.1  | .05/.4           | 160     | 80000   | .5     | 20.5     | Coring                               |
| 9/6  | 12 1/4           | 2569         | 13.7           | 31   | 27   | 12/26        |   |   | 7.4        | 9.5  | .1/.5            | 120     | 73000   | .5     | 22.5     | "                                    |
| 10/6 | 12 1/4           | 2589         | 13.7           | 31   | 32   | 14/28        |   |   | 8.1        | 9.4  | .1/.4            | 140     | 73000   | .4     | 21.5     | Coring                               |
| 11/6 | 12 1/4           | 2604         | 13.7           | 29   | 28   | 14/29        |   |   | 9.2        | 9.5  | .1/.5            | 160     | 73000   | .5     | 20.5     | Coring                               |
| 12/6 | 12 1/4           | 2623         | 13.7           | 27   | 27   | 12/30        |   |   | 8.6        | 9.3  | .1/.5            | 120     | 7000    | .25    | 22       | Coring. Logging                      |
| 13/6 | 12 1/4           | 2623         | 13.7           | 26   | 26   | 10/27        |   |   | 8.4        | 9.4  | .1/.5            | 130     | 69.000  | .25    | 22       | Logging                              |
| 14/6 | 12 1/4           | 2623         | 13.7           | 27   | 27   | 12/30        |   |   | 9.1        | 9.1  | .07/.3           | 120     | 69000   | .25    | 22       | Logging                              |
| 15/6 | 12 1/4           | 2762         | 14.4           | 21   | 23   | 4/28         |   |   | 9.2        | 9.1  | .08/.3           | 160     | 67000   | .75    | 27       | Drilling 12 1/4" hole                |
| 16/6 | 12 1/4           | 2838         | 14.4           | 22   | 22   | 11/40        |   |   | 9.7        | 9.1  | .07/.3           | 160     | 64000   | .75    | 25       | Drilling (Added Ligcon)              |
| 17/6 | 12 1/4           | 2905         | 14.7           | 26   | 23   | 12/50        |   |   | 9.8        | 9.0  | .05/.3           | 160     | 62000   | .75    | 26       | Trip drilling to TD                  |
| 18/6 | 12 1/4           | 2905         | 14.7           | 26   | 23   | 12/50        |   |   | 9.8        | 9.0  | .05/.3           | 160     | 62000   | .75    | 26       | Logging                              |
| 19/6 | 12 1/4           | 2905         | 14.7           | 24   | 26   | 13/47        |   |   | 10.2       | 9.1  | .06/.3           | 160     | 62000   | .75    | 26       | Logging - circ. & cond. mud          |
| 20/6 | 12 1/4           | 2905         | 13.9           | 20   | 22   | 8/20         |   |   | 10.4       | 9.1  | .04/.3           | 160     | 50000   | .60    | 22       | Run 9 5/8" csg. Lost return.         |
| 21/6 | 12 1/4           | 2905         | 13.7           | 23   | 14   | 4/10         |   |   | 10         | 9.4  | .11/1.2          | 100     | 46000   |        | 16       | Circ. & Cond. mud. Lost mud.         |
| 22/6 | 12 1/4           | 2905         | 13.7           | 23   | 14   | 4/10         |   |   | 10         | 9.3  | .1/1.2           | 100     | 42000   |        | 16       | Pulled 9 5/8" csg. RIH w/BHA         |
| 23/6 | 12 1/4           | 2905         | 13.8           | 22   | 17   | 8/28         |   |   | 10.8       | 9.3  | .13/1.2          | 160     | 47000   | .75    | 1        | Circ. & cond. Mud all way.           |
| 24/6 | 12 1/4           | 2905         | 13.8           | 19   | 16   | 7/25         |   |   | 10         | 9.5  | .3/1.0           | 160     | 57000   | .75    | 22.5     | Logging                              |
| 25/6 | 12 1/4           | 2640         | 13.7           | 22   | 17   | 4/27         |   |   | 10.4       | 11   | .07/1.6          | 240     | 55000   | .75    | 22.5     | Cmt. 2 plugs-circ                    |
| 26/6 | 12 1/4           | 2632         | 13.8           | 21   | 16   | 4/23         |   |   | 10         | 10.8 | .3/1.9           | 240     | 53000   | .75    | 23.0     | Run 9 5/8" csg.                      |
| 27/6 | 12 1/4           | 2605         | 14.5           | 23   | 14   | 4/22         |   |   | 10.4       | 10.5 | .6/2.0           | 300     | 52000   | 1.0    | 23       | Run bit & scraper MW up to 14.5 ppg. |
| 28/6 | 12 1/4           | 2605         | 14.5           | 20   | 12   | 5/23         |   |   | 10.6       | 10.5 | .7/1.8           | 360     | 49000   | .75    | 23       | RIH with teststring                  |
| 29/6 | 12 1/4           | 2605         | 14.5           | 22   | 12   | 6/23         |   |   | 10.8       | 10.5 | .6/1.8           | 360     | 48000   | .5     | 23       | RIH w/teststring + logging           |
| 30/6 | 12 1/4           | 2605         | 14.5           | 20   | 12   | 5/21         |   |   | 10.6       | 10.5 | .6/1.8           | 380     | 48000   | .5     | 23       | Log + RIH Start test.                |

5.2.1. Mud Properties, Daily Report

Well no: 34/7-1



| DATE | HOLE SIZE INCHES | DEPTH METERS | MUD WEIGHT ppg | P.V. | Y.P. | GEL STRENGHT | n | K | WATER LOSS | pH   | ALKALINITY Pf/Mf | Ca+ ppm | CL- ppm | SAND % | SOLIDS % | COMMENTS                          |
|------|------------------|--------------|----------------|------|------|--------------|---|---|------------|------|------------------|---------|---------|--------|----------|-----------------------------------|
| 1/7  | 12 1/4           | 2605         | 14.5           | 21   | 12   | 5/22         |   |   | 10.6       | 10.5 | .6/1.7           | 400     | 48000   | .5     | 23       | Testing                           |
| 2/7  | 12 1/4           | 2605         | 14.5           | 20   | 12   | 6/24         |   |   | 10.7       | 10.5 | .6/1.7           | 400     | 47000   | .5     | 23       | Testing                           |
| 3/7  | 12 1/4           | 2605         | 14.5           | 24   | 14   | 5/24         |   |   | 11.2       | 10.5 | .6/1.6           | 600     | 46000   | .5     | 23       | Finish test. Inset packer         |
| 4/7  | 12 1/4           | 2605         | 14.5           | 24   | 13   | 4/24         |   |   | 11.4       | 10.5 | .6/1.5           | 600     | 46000   | .5     | 23       | POOH w/test str. Run Schlumberger |
| 5/7  | 12 1/4           | 2569         | 14.5           | 21   | 12   | 6/25         |   |   | 11.8       | 10.5 | .6/1.5           | 620     | 46000   | .5     | 23       | Set ez-packer cmt.                |
| 6/7  | 12 1/4           | 2569         | 14.5           | 22   | 12   | 6/26         |   |   | 11.8       | 10.5 | .5/1.5           | 620     | 45000   | .5     | 23       | Test BOP RIH w/test str.          |
| 7/7  | 12 1/4           | 2569         | 14.5           | 21   | 12   | 6/25         |   |   | 11.9       | 10   | .5/1.4           | 620     | 45000   | .5     | 23       | RIH w/test string                 |
| 8/7  | 12 1/4           | 2569         | 14.5           | 21   | 11   | 6/24         |   |   | 12         | 10   | .5/1.8           | 620     | 45000   | .5     | 23       | Testing well                      |
| 9/7  | 12 1/4           | 2569         | 14.5           | 21   | 11   | 5/24         |   |   | 12         | 10   | .5/1.8           | 620     | 44000   | .5     | 23       | Testing well                      |
| 10/7 | 12 1/4           | 2569         | 14.5           | 22   | 12   | 5/24         |   |   | 12         | 10   | .5/1.8           | 600     | 44000   | .5     | 23       | Testing well                      |
| 11/7 | 12 1/4           | 2569         | 14.5           | 23   | 12   | 6/24         |   |   | 14         | 9.5  | .5/1.8           | 540     | 44000   | .5     | 23       | POOH. Run scraper                 |
| 12/7 | 12 1/4           | 2448         | 14.5           | 24   | 12   | 6/24         |   |   | 14         | 9.7  | .4/1.4           | 540     | 44000   | 0.5    | 23       | Cmt./Displace cmt.                |
| 13/7 | 12 1/4           | 2448         | 14.5           | 23   | 14   | 7/25         |   |   | 15         | 9.9  | .5/1.5           | 600     | 44000   | 0.5    | 23       | Well test. (equi. test)           |
| 14/7 | 12 1/4           | 2448         | 14.5           | 24   | 14   | 7/25         |   |   | 15         | 9.8  | .5/1.5           | 600     | 44000   | 0.5    | 23       | Well testing                      |
| 15/7 | 12 1/4           | 2448         | 14.5           | 24   | 13   | 7/24         |   |   | 15         | 9.8  | .4/1.4           | 580     | 44000   | 0.5    | 23       | Well testing                      |
| 16/7 | 12 1/4           | 2448         | 14.5           | 23   | 12   | 6/23         |   |   | 15.7       | 9.8  | .5/1.5           | 560     | 42000   | 0.5    | 23       | Well testing                      |
| 17/7 | 12 1/4           | 2448         | 14.5           | 23   | 12   | 6/24         |   |   | 15         | 9.8  | .5/1.5           | 580     | 42000   | 0.5    | 23       | Well testing                      |
| 18/7 | 12 1/4           | 2402         | 14.5           | 23   | 13   | 6/25         |   |   | 15         | 9.8  | .5/1.5           | 580     | 42000   | 0.5    | 23       | Plug & abandon program            |
|      |                  |              |                |      |      |              |   |   |            |      |                  |         |         |        |          |                                   |
|      |                  |              |                |      |      |              |   |   |            |      |                  |         |         |        |          |                                   |
|      |                  |              |                |      |      |              |   |   |            |      |                  |         |         |        |          |                                   |
|      |                  |              |                |      |      |              |   |   |            |      |                  |         |         |        |          |                                   |
|      |                  |              |                |      |      |              |   |   |            |      |                  |         |         |        |          |                                   |
|      |                  |              |                |      |      |              |   |   |            |      |                  |         |         |        |          |                                   |
|      |                  |              |                |      |      |              |   |   |            |      |                  |         |         |        |          |                                   |
|      |                  |              |                |      |      |              |   |   |            |      |                  |         |         |        |          |                                   |
|      |                  |              |                |      |      |              |   |   |            |      |                  |         |         |        |          |                                   |
|      |                  |              |                |      |      |              |   |   |            |      |                  |         |         |        |          |                                   |
|      |                  |              |                |      |      |              |   |   |            |      |                  |         |         |        |          |                                   |
|      |                  |              |                |      |      |              |   |   |            |      |                  |         |         |        |          |                                   |

130

5.2.2. Mud Materials used

Well no: 34/7-1

Saga  
Petroleum a.s.



| MATERIAL            | UNIT  | 36"<br>HOLE | 26"<br>HOLE | 17 1/2"<br>HOLE | 12 1/4"<br>HOLE | 8 1/2"<br>HOLE | 5 7/8"<br>HOLE | TOTAL   |
|---------------------|-------|-------------|-------------|-----------------|-----------------|----------------|----------------|---------|
| Bentonite           | MT    | 47,5        | 24,5        |                 |                 |                |                | 72      |
| Bentonite           | 50 kg |             | 90          | 36              | 26              |                |                | 152     |
| Barite              | MT    |             | 59          | 340             | 679,5           |                |                | 1.096,5 |
| Caustic Soda        | 25 kg | 5           | 20          |                 | 24              |                |                | 49      |
| Soda Ash            | 50 kg | 3           | 7           | 11              | 16              |                |                | 37      |
| Bicarbonate of Soda | 50 kg |             | 4           | 23              | 13              |                |                | 40      |
| Pro-pol reg         | 25 kg |             |             | 60              | 70              |                |                | 130     |
| Pro-pol             | 25 kg |             |             | 31              | 122             |                |                | 153     |
| Milpolymer 302      | 25 kg |             |             | 156             | 129             |                |                | 285     |
| KCL                 | 50 kg |             |             | 460             | 1.255           |                |                | 1.715   |
| KCL Brine           | bb1s  |             |             | 1.500           |                 |                |                | 1.500   |
| KOH                 | 50 kg |             |             | 14              | 32              |                |                | 46      |
| Permalose           | 25 kg |             |             | 59              | 246             |                |                | 305     |
| Defoamer            | 25 l  |             |             | 2               | 12              |                |                | 14      |
| Milspot             | 50 lb |             |             | 27              |                 |                |                | 27      |
| Ligcon              | 25 kg |             |             |                 | 80              |                |                | 80      |
| Unical              | 25 kg |             |             |                 | 20              |                |                | 20      |
| Drispac S/L         | 50 lb |             |             |                 | 17              |                |                | 17      |
| Drispac Reg         | 50 lb |             |             |                 | 11              |                |                | 11      |