

4.10.4 RFT - Measurements

The formation pressure measurements were carried out over the interval 2947 - 3774.5 mRKB (Run 6B, 29/7-82). The formation and mud pressure together with the calculated permeability are listed in table 4.12. Formation pressure versus depth are plotted in fig. 4.11. The plot gives a water gradient of 0.105 bar/m (0.46 psi/ft), and shows the different zones to belong to the same pressure regime. The Middle Jurassic Sandstone has a pressure of 295 bar (4283 psi) at 2975 mRKB. This corresponds to a hydrostatic pressure gradient of 0.102 bar/m (0.45 psi/ft) to surface.

Table 4.12 RFT-Measurements

| DEPTH<br>mRKB | MUD<br>PRESSURE, Bar (Psi) | FORMATION<br>PRESSURE, Bar (Psi) | PERMEABILITY mD |
|---------------|----------------------------|----------------------------------|-----------------|
| 2947.0        | 359.6 (5216)               | 292.2 (4238.5)                   | 100             |
| 2962.0        | 361.9 (5249)               | 293.8 (4260.5)                   | 1400            |
| 2977.5        | 363.8 (5277)               | 295.3 (4283.5)                   | 1000            |
| 3019.0        | 369.0 (5352)               | 299.6 (4345.5)                   | 400             |
| 3038.0        | 371.3 (5385)               | 301.6 (4374.5)                   | 800             |
| 3057.0        | 373.4 (5415.5)             | 303.5 (4402.5)                   | ?               |
| 3178.0        | 388.1 (5629.5)             | 316.8 (4595.5)                   | 500             |
| 3194.0        | 390.0 (5656.5)             | 318.6 (4620.5)                   | 900             |
| 3281.0        | 400.4 (5807)               | 327.5 (4750.5)                   | 130             |
| 3319.0        | 404.9 (5872)               | 331.5 (4808.5)                   | 20              |
| 3416.0        | 416.1 (6035.5)             | 342.4 (4965.5)                   | 60              |
| 3455.0        | 421.0 (6106)               | 346.6 (5027.5)                   | 40              |
| 3514.0        | 428.0 (6207)               | 354.4 (5139.5)                   | 6               |
| 3587.0        | 436.4 (6329.5)             | 362.1 (5252.5)                   | 25              |
| 3630.5        | 441.3 (6401)               | 365.6 (5302.5)                   | 100             |
| 3678.0        | 446.7 (6479)               | 370.8 (5377.5)                   | 170             |
| 3737.0        | 453.3 (6575)               | 377.3 (5472.5)                   | 50              |
| 3747.0        | 454.2 (6588)               | 380.4 (5517.5)                   | 1               |
| 3767.0        | 456.3 (6618.5)             | 380.6 (5520.5)                   | 30              |
| 3774.5        | Plugged                    |                                  |                 |
| 3774.5        | Plugged                    |                                  |                 |

### 5.2.1. Mud Properties, Daily Report

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| 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   |
|------|------------------|--------------|----------------|------|------|--------------|-----|------|------------|------|------------------|---------|---------|--------|----------|--|
| 1/6  |                  |              | 8.6            | 13   | 56   | 35/64        | .22 | 2.9  | N/C        | 10.1 |                  | 40      | 3000    | TR     |          | Prehydrated 1600 bbls. bentonite (20 ppb.)         |
| 2/6  |                  |              | 8.6            | 13   | 56   | 34/64        | .22 | 2.9  | N/C        | 10.1 |                  | 40      | 3000    | TR     |          | Waiting for TGB                                    |
| 3/6  | 36               | 360          | 8.6            | 13   | 47   | 40/65        | .28 | 2.0  | N/C        | 10.1 |                  | 40      | 300     | TR     |          | Spotted fills of 11.5 ppg. mud on com at bouleters |
| 4/6  | 30               | 409          |                |      |      |              |     |      |            |      |                  |         |         |        |          | Mixing gyp mud                                     |
| 5/6  | 30               | 409          | 9.1            | 7    | 14   | 7/11         | .29 | 1.4  | N/C        | 9.6  | .05/.1           | 1360    | 11500   | TR     |          | Mixed 2200 bbls gyp mud                            |
| 6/6  | 14 3/4           | 750          | 9.4            | 8    | 23   | 5/8          | .34 | 9.8  | N/C        | 9.6  | .2/.4            | 1560    | 13000   | TR     | 11       | Mixed 400 bbl. 10.5 killmud. No leak off.          |
| 7/6  | 14 3/4           | 1013         | 9.5            | 8    | 24   | 5/6          | .31 | 10.8 | N/C        | 9.2  | .05/.2           | 1560    | 13500   | TR     | 15       | Pumped or hi vis pill at 1010M                     |
| 8/6  | 14 3/4           | 1013         | 9.4            | 10   | 23   | 4/6          | .38 | 8.2  | N/C        | 9.2  | .1/.4            | 1360    | 15000   | TR     | 10       | Added 30 bbls. diesel to reduce mud w.             |
| 9/6  | 26               | 580          | 9.3            | 12   | 34   | 6/15         | .33 | 13   | N/C        | 10.3 | .2/.6            | 800     | 15000   | TR     | 11       | Added diesel                                       |
| 10/6 | 26               | 787          | 9.6            | 11   | 21   | 7/10         | .42 | 7.2  | N/C        | 10   | .1/.2            | 1440    | 14000   | TR     | 12       | Added diesel                                       |
| 11/6 | 26               | 1014         | 9.5            | 9    | 21   | 3/5          | .38 | 7.8  | N/C        | 10   | .1/.2            | 1200    | 14000   | TR     | 15       | Added diesel                                       |
| 12/6 | 26               | 1014         | 11.1           | 13   | 28   | 5/10         |     |      | N/C        | 9.5  | .1/.2            | 800     | 14000   | TR     | 16       | Weighting up system                                |
| 13/6 | 26               | 1014         | 12.0           | 11   | 27   | 3/7          |     |      | N/C        | 9.5  | .1/.2            | -       | -       | -      | 12       | Mixing new mud                                     |
| 14/6 | 26               | 1014         | 12.0           | 14   | 29   | 10/20        |     |      | N/C        | 9.5  | -                | -       | -       | -      | 13       | Mixing new mud                                     |
| 15/6 |                  |              |                |      |      |              |     |      |            |      |                  |         |         |        |          | Mixing new (gyp/ polymor) system                   |
| 16/6 |                  | 1014         | 9.1            | 11   | 21   | 7/15         |     |      | 21         | 9.8  | .02/.04          | 1600    | 18500   | -      | 8        | Test BOP   |
| 17/6 | 17 1/2           | 1232         | 9.5            | 11   | 28   | 10/15        |     |      | 22         | 10   | .02/.04          | 600     | 18500   | TR     | 10       | Drilling ahead W/Gyp polymor mud                   |
| 18/6 | 17 1/2           | 1381         | 9.8            | 13   | 24   | 10/20        |     |      | 19         | 9.5  | .02/.04          | 1600    | 19000   | TR     | 11       | Drilling ahead                                     |
| 19/6 | 17 1/2           | 1760         | 9.8*           | 12   | 28   | 10/20        |     |      | 20         | 9.5  | .02/.04          | 1600    | 19000   | TR     | 11       | Drilling ahead                                     |

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Saga Petroleum a.s.



| 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  |
|------|------------------|--------------|----------------|------|------|--------------|---|---|------------|------|------------------|---------|---------|--------|----------|---|
| 20/6 | 17 1/2           | 1937         | 10.0           | 13   | 30   | 10/20        |   |   | 20         | 9.5  | .02/.04          | 1600    | 20000   | TR     | 13       | Drilling ahead                                    |
| 21/6 | 17 1/2           | 1994         | 11.1           | 18   | 36   | 15/30        |   |   | 16         | 9.2  | .02/.04          | 1600    | 20000   | TR     | 17       | Tight how weight up                               |
| 22/6 | 17 1/2           | 2065         | 11.2           | 21   | 40   | 15/30        |   |   | 16         | 9.2  | .02/.04          | 1200    | 20000   | TR     | 19       | Weight up, add water. Tight hole on trip          |
| 23/6 | 17 1/2           | 2200         | 10.9           | 16   | 32   | 15/30        |   |   | 15.5       | 9.6  | .04/.06          | 1560    | 20000   | TR     | 19       | Dispersing the system w. unical (lignosulfonate)  |
| 24/6 | 17 1/2           | 2215         | 11.3           |      |      |              |   |   | 14.5       | 9.4  | .1/.5            | 1520    | 20000   | TR     |          | Hole slogged. Drilled to T.D.                     |
| 25/6 | 17 1/2           | 2215         | 11.3           | 20   | 34   | 14/29        |   |   | 14.8       | 9.6  | .1/.25           | 1230    | 18500   | TR     | 19       | Wiper trips prior to logsand csg. raised M.W.     |
| 26/6 | 17 1/2           | 2215         | 11.3           | 20   | 33   | 14/28        |   |   | 15.0       | 9.5  | .1/.3            | 1200    | 19000   | TR     | 19       | Cir. ran 13 3/8" casing                           |
| 27/6 | -                | 2215         | 11.3           | 19   | 33   | 15/27        |   |   | 16.1       | 9.6  | .1/.5            | 1210    | 19000   | TR     | 18       | Cmt. Pumped 910 bbl. cmt 640 bbls. mud in return. |
| 28/6 | 12 1/4           | 2251         | 11.3           | 17   | 28   | 14/25        |   |   | 17.4       | 10.8 | .15/.4           | 1420    | 16500   | TR     | 17       | Leak off 14.5 ppg.                                |
| 29/6 | 12 1/4           | 2330         | 12.2           | 20   | 28   | 14/28        |   |   | 14.3       | 10.6 | .1/.2            | 620     | 1210    | TR     | 20       | Hole sloughed, weight up to 12.2, hole good       |
| 30/6 | 12 1/4           | 2417         | 12.5           | 20   | 16   | 6/32         |   |   | 4.8        | 11.5 | 1.2/1.0          | 200     | 1400    | TR     | 21       | Gas, weight up to 12.5                            |
| 1/7  | 12 1/4           | 2424         | 12.5           | 26   | 24   | 7/20         |   |   | 7.8        | 11.5 | 1.1/2.1          | 80      | 12000   | TR     | 20       | Cored   |
| 2/7  | 12 1/4           | 2566         | 13.2           | 26   | 19   | 6/16         |   |   | 7.9        | 10.9 | .1/.2            | 80      | 11800   | TR     | 21       | Gas, weight up to 12.8 and to 13.2 ppg            |
| 3/7  | 12 1/4           | 2608         | 13.2           | 26   | 20   | 7/16         |   |   | 7.1        | 11.0 | .1/.2            | 80      | 11900   | TR     | 22       | Drilled. Ran sch. logs. cic. 80% gas              |
| 4/7  | 12 1/4           | 2701         | 13.5           | 30   | 23   | 8/19         |   |   | 4.9        | 10.8 | .1/.2            | 80      | 12900   | TR     | 23       | Weight up to 13.5 ppg.                            |

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| 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   |
|------|------------------|--------------|----------------|------|------|--------------|---|---|------------|------|------------------|---------|---------|--------|----------|--|
| 5/7  | 12 1/4           | 2729         | 13.5           | 30   | 25   | 8/19         |   |   | 5.1        | 10.4 | .1/.2            | 80      | 13000   | TR     | 22       | Drilled to T.D.  |
| 6/7  | 12 1/4           | 2729         | 13.4           | 36   | 34   | 12/32        |   |   | 5.8        | 9.8  | .1/.2            | 80      | 13000   | TR     | 24       | Schlumb. berger logs                                     |
| 7/7  | 12 1/4           | 2729         | 13.5           | 40   | 25   | 9/15         |   |   | 5.6        | 11.2 | .2/.5            | 100     | 14000   | TR     | 24       | Logging. R.I.H. Circ. & cond. mud. P.O.O.H.              |
| 8/7  |                  | 2729         | 13.5           | 32   | 38   | 10/25        |   |   | 5.8        | 11   | .2/.5            | 120     | 14000   | TR     | 24       | Ran 9 5/8" casing Cmt., displaced with mud               |
| 9/7  |                  | 27209        | 12.1           | 20   | 32   | 9/15         |   |   | 7          | 10.3 | .2/.5            | 120     | 14000   | TR     | 24       | Tested kelly/ Seal assy/BOP OK! Drop mud weight to 11.0  |
| 10/7 | 8 1/2            | 2742         | 11.3           | 15   | 13   | 7/13         |   |   | 5.6        | 11.6 | 2/3              | 60      | 13000   | TR     | 24       | Drilled through cement. Leak off test, drill 8 1/2" hole |
| 11/7 | 8 1/2            | 2878         | 10.5           | 14   | 18   | 6/11         |   |   | 5.2        | 11   | .5/1.0           | 80      | 13000   | TR     | 15       | Drilling 8 1/2" hole, survey, flow check neg. drg.       |
| 12/7 | 8 1/2            | 2940         | 10.5           | 18   | 22   | 7/12         |   |   | 5.4        | 10.7 | .18/1.0          | 80      | 13000   | TR     | 14       | Drilling with new bit. P.O.O.H. to core                  |
| 13/7 | 8 1/2            | 2943         | 10.5           | 20   | 25   | 7/13         |   |   | 5.6        | 10.4 | .16/1.0          | 80      | 13000   | TR     | 14       | Coring. Trip. cleaning hole. trip                        |
| 14/7 | 8 1/2            | 2960         | 10.5           | 20   | 23   | 7/13         |   |   | 5.6        | 11.2 | .4/1.0           | 60      | 13000   | TR     | 14       | Trip. Coring. trip R.I.H. with B.H.A.                    |
| 15/7 | 8 1/2            | 3076         | 10.6           | 19   | 23   | 5/11         |   |   | 5.6        | 11   | .4/1.4           | 80      | 13500   | TR     | 14       | Drilling, survey drilling                                |

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| 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   |
|------|------------------|--------------|----------------|------|------|--------------|---|---|------------|------|------------------|---------|---------|--------|----------|--|
| 16/7 | 8 1/2            | 3092         | 10.5           | 21   | 24   | 7/15         |   |   | 5.6        | 11.3 | 1/2.5            | 80      | 14000   | TR     | 14       | Drilling, trip drilling w/new bit, trip, coring  |
| 17/7 | 8 1/2            | 3121         | 10.5           | 21   | 25   | 8/16         |   |   | 5.8        | 11   | .8/2.4           | 80      | 14000   | TR     | 14       | Coring, trip, test BOP, set W.B. trip, drilling  |
| 18/7 | 8 1/2            | 3204         | 10.5           | 22   | 26   | 8/17         |   |   | 6.0        | 10.9 | .6/2.1           | 80      | 14500   | TR     | 14       | Drilling to 3204M P.O.O.H. to change bit.        |
| 19/7 | 8 1/2            | 3325         | 10.5           | 21   | 23   | 7/12         |   |   | 5.2        | 11   | .4/2.0           | 60      | 15000   | TR     | 14       | R.I.H. with bit no.21. Drilled to 3308M.         |
| 20/7 | 8 1/2            | 3394         | 10.5           | 20   | 22   | 7/17         |   |   | 5.2        | 11   | .4/1.9           | 80      | 15000   | TR     | 14       | Drilled to 3331M Trip/changed bit. Drg. to 3394M |
| 21/7 | 8 1/2            | 3478         | 10.5           | 20   | 16   | 6/14         |   |   | 5.4        | 9.8  | .05/.15          | 60      | 16500   | TR     | 14       | Drilled to 3478M P.O.O.H.                        |
| 22/7 | 8 1/2            | 3498         | 10.6           | 20   | 19   | 7/15         |   |   | 5.5        | 9.6  | .05/.15          | 90      | 17000   | TR     | 14       | Cored, trip, cored Adding water.                 |
| 23/7 | 8 1/2            | 3552         | 10.5           | 20   | 21   | 8/16         |   |   | 5.4        | 10.0 | .05/.2           | 60      | 14500   | TR     | 14       | P.O.O.H. hole good R.I.H. Drill add gel          |
| 24/7 | 8 1/2            | 3608         | 10.4           | 20   | 20   | 8/15         |   |   | 5.7        | 9.5  | .05/.15          | 100     | 15500   | TR     | 14       | Drilled to 3608M P.O.O.H. hole good Test B.O.P.  |
| 25/7 | 8 1/2            | 3685         | 10.4           | 19   | 20   | 7/15         |   |   | 5.9        | 9.6  | .05/.2           | 70      | 16000   | TR     | 14       | Test B.O.P. Drilling                             |
| 26/7 | 8 1/2            | 3748         | 10.4           | 19   | 20   | 7/14         |   |   | 6.0        | 9.5  | .05/.2           | 70      | 16900   | TR     | 13       | Drill ahead                                      |
| 27/7 | 8 1/2            | 3835         | 10.3           | 15   | 20   | 8/16         |   |   | 6.1        | 9.8  | .1/.2            | 60      | 17100   | TR     | 13       | Round trip hole good, drill ahead                |
| 28/7 | 8 1/2            | 3870         | 10.2           | 15   | 20   | 8/14         |   |   | 6.3        | 9    | .1/.4            | 80      | 16800   | TR     | 13       | Drill to 3870M Circ. BTM up. drop surry P.O.O.H. |



5.2.2. Mud Materials used

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| 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  |
|-------------------|-------|-------------|-------------|-----------------|-----------------|----------------|----------------|--------|
| W. Bentonite      | M/T   | 18          | 58.5        | 3               | 17              | 11             |                | 107.5  |
| Barite            | M/T   | 17          | 658         | 198.5           | 384             | 15             |                | 1272.5 |
| Caustic           | 25kgs | 10          | 90          | 182             | 109             | 106            |                | 499    |
| Soda Ash          | 50kgs | 6           | 9           | 5               | 43              | 5              |                | 68     |
| Lime              | 50kgs | 1           |             | 3               | 16              |                |                | 20     |
| Milgel            | 50kgs |             | 210         |                 |                 |                |                | 210    |
| Gypsum            | 40kgs |             | 242         | 334             |                 |                |                | 576    |
| CMC H/v           | 50kgs |             | 39          |                 |                 |                |                | 39     |
| CMC L/v           | 25kgs |             |             |                 |                 | 30             |                | 30     |
| M.D. Drum         | 55gal |             | 1           | 3               | 1               |                |                | 5      |
| Milpolymer 302    | 25kgs |             | 26          | 125             |                 |                |                | 151    |
| Drispac S/C       | 25kgs |             |             | 59              | 9               | 2              |                | 70     |
| LD-8              | 5gal  |             |             | 1               | 1               | 6              |                | 8      |
| Unical            | 25kgs |             |             | 285             | 130             | 120            |                | 535    |
| Ligcon            | 25kgs |             |             | 110             | 334             |                |                | 444    |
| Bicard            | 50kgs |             |             |                 | 9               | 12             |                | 21     |
| Drillaid          | 25kgs |             |             |                 | 152             | 8              |                | 160    |
| Defoamer (Promud) | 20ltr |             |             |                 |                 | 4              |                | 4      |
| Propoll           | 25kgs |             |             |                 |                 | 27             |                | 27     |