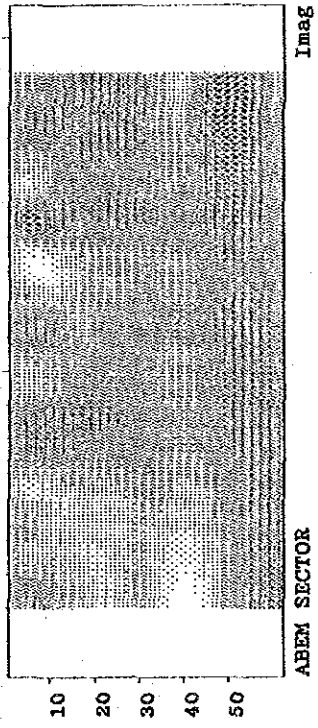
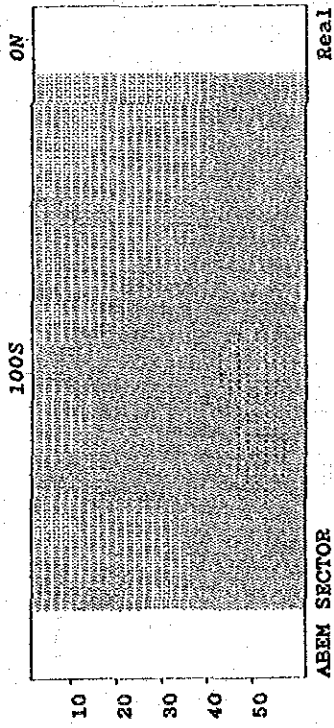
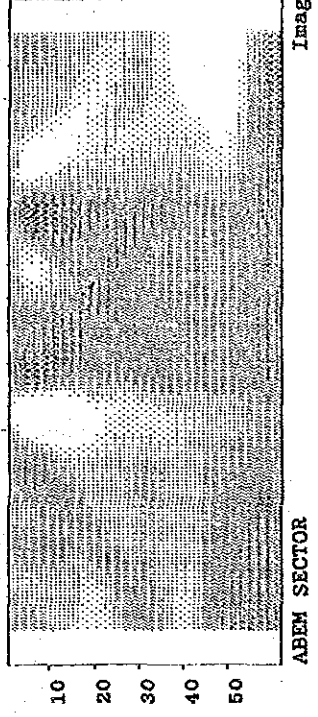
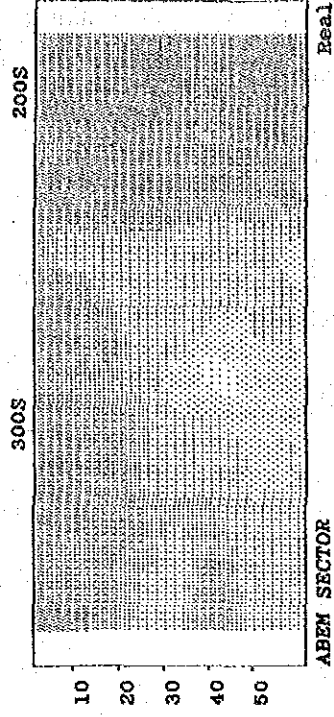




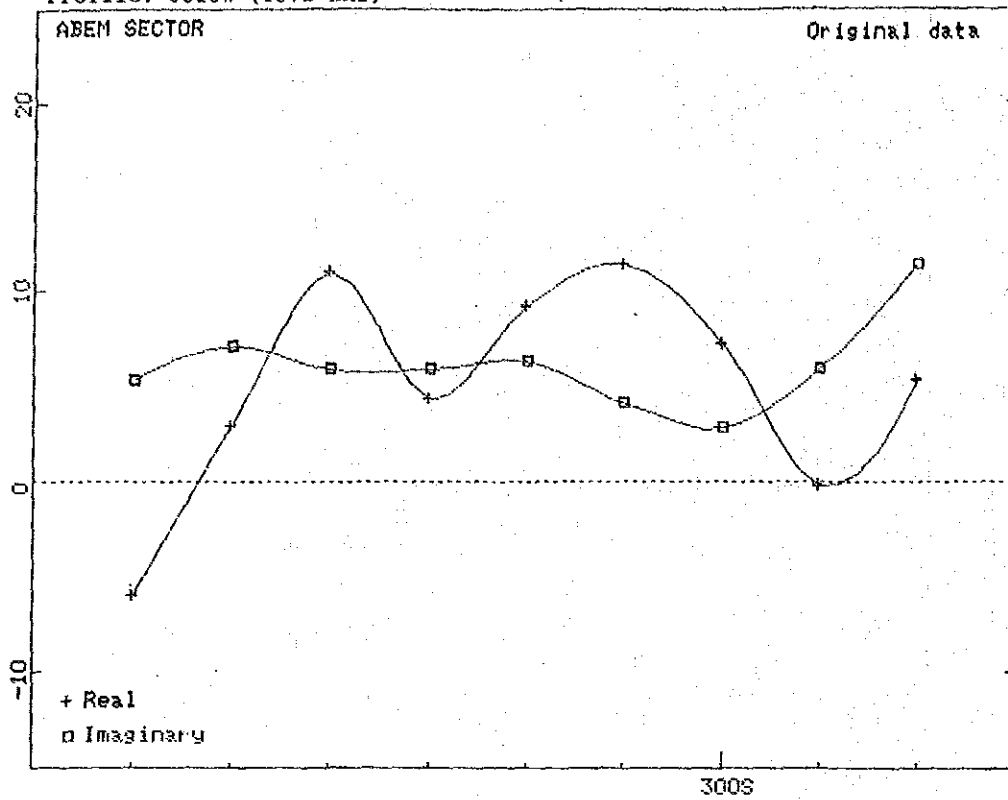
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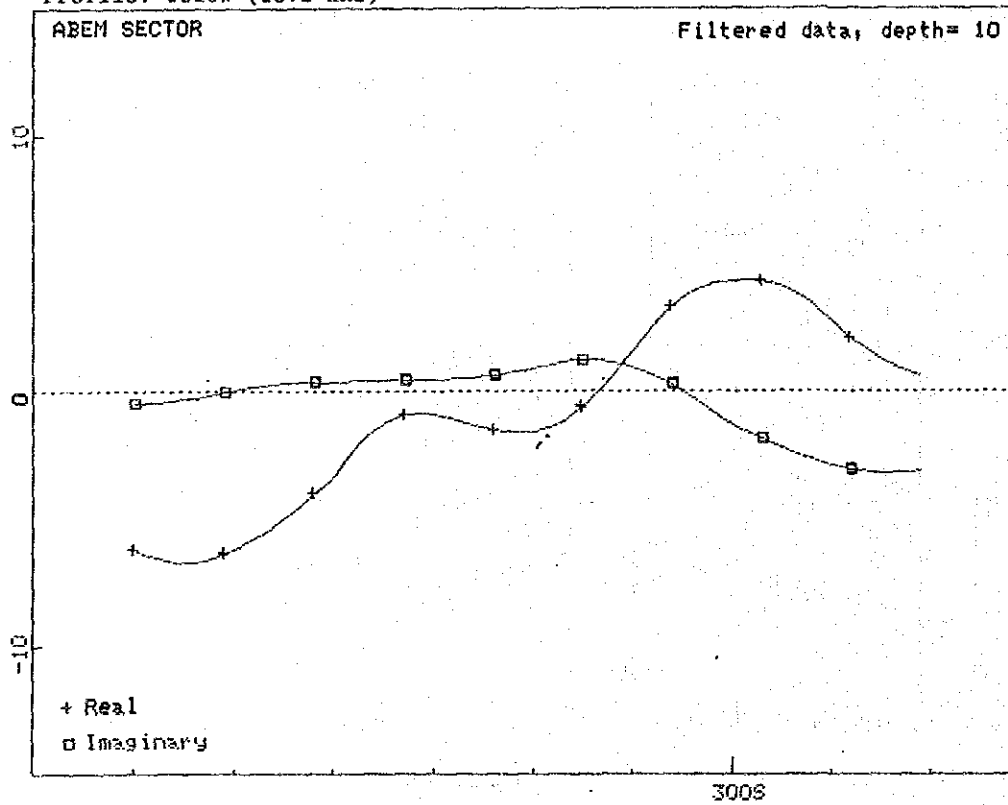
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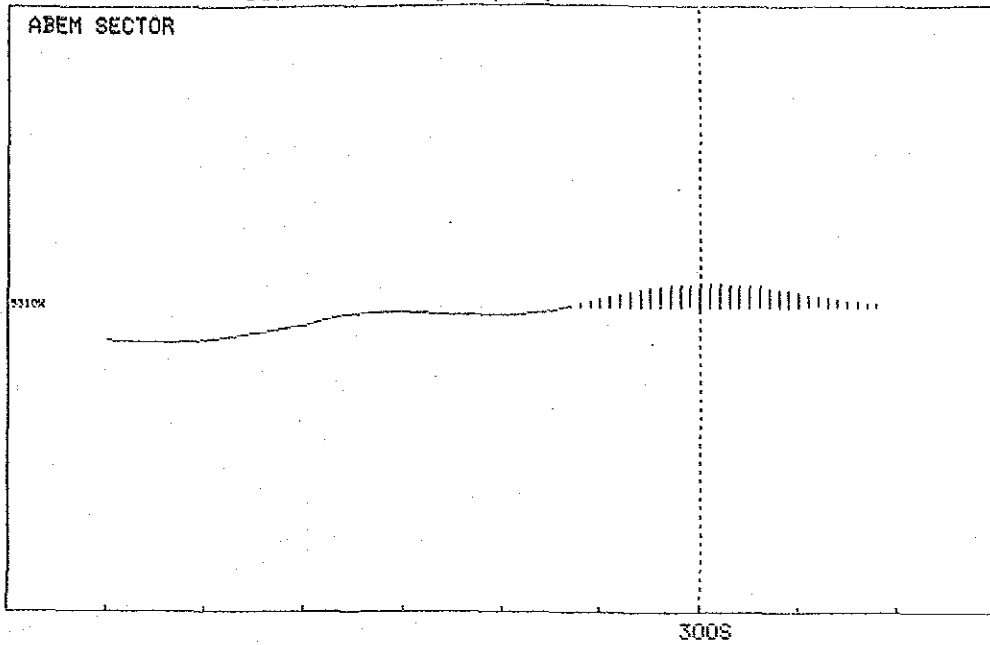
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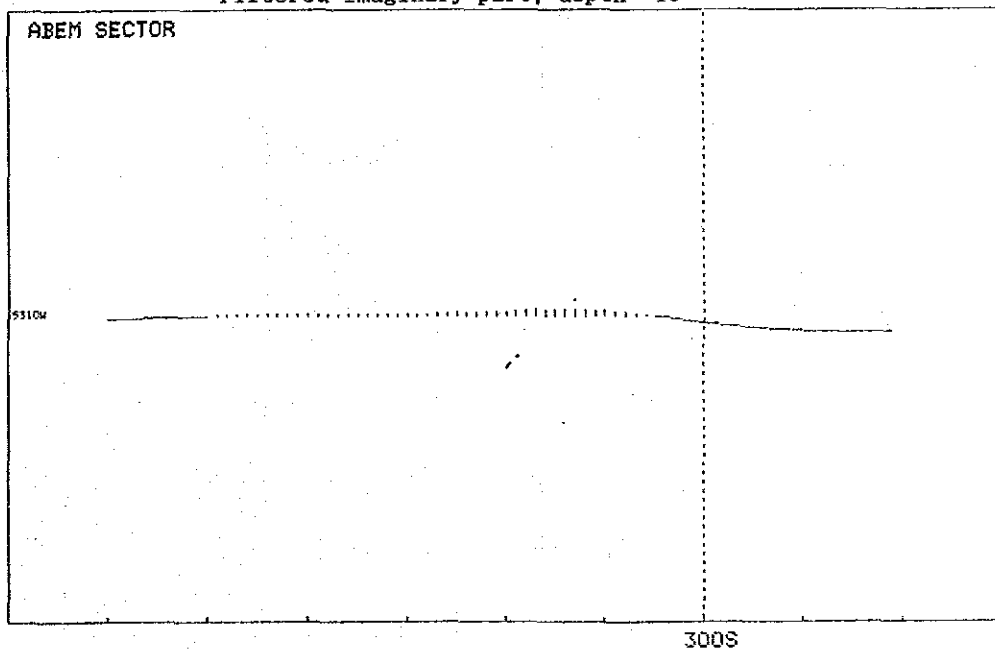
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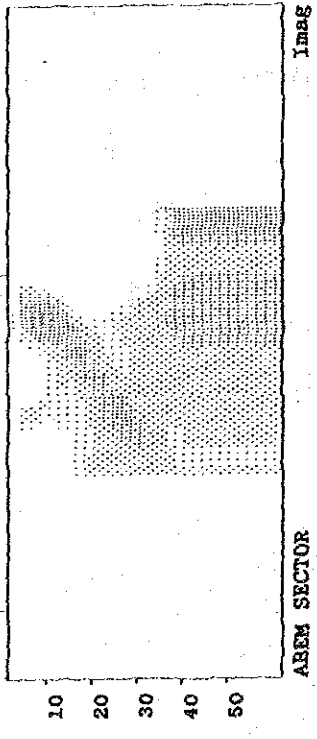
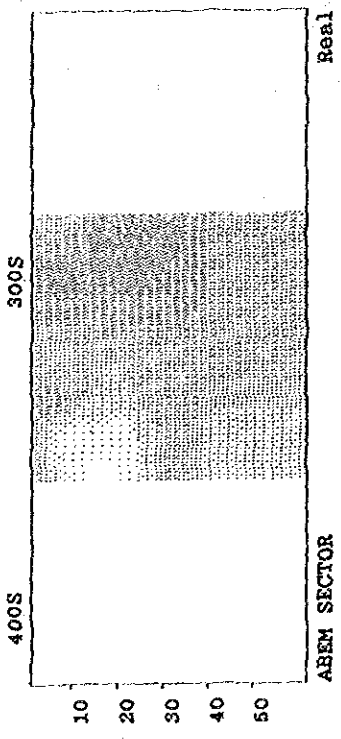
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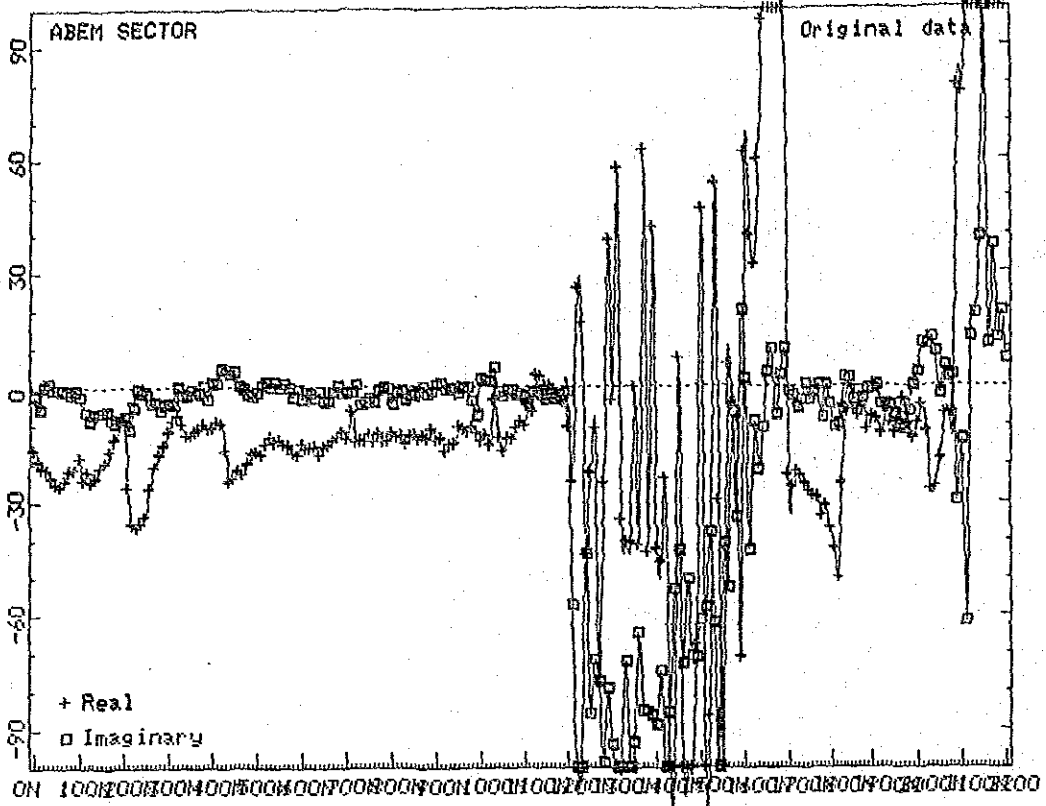


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Masiakampy

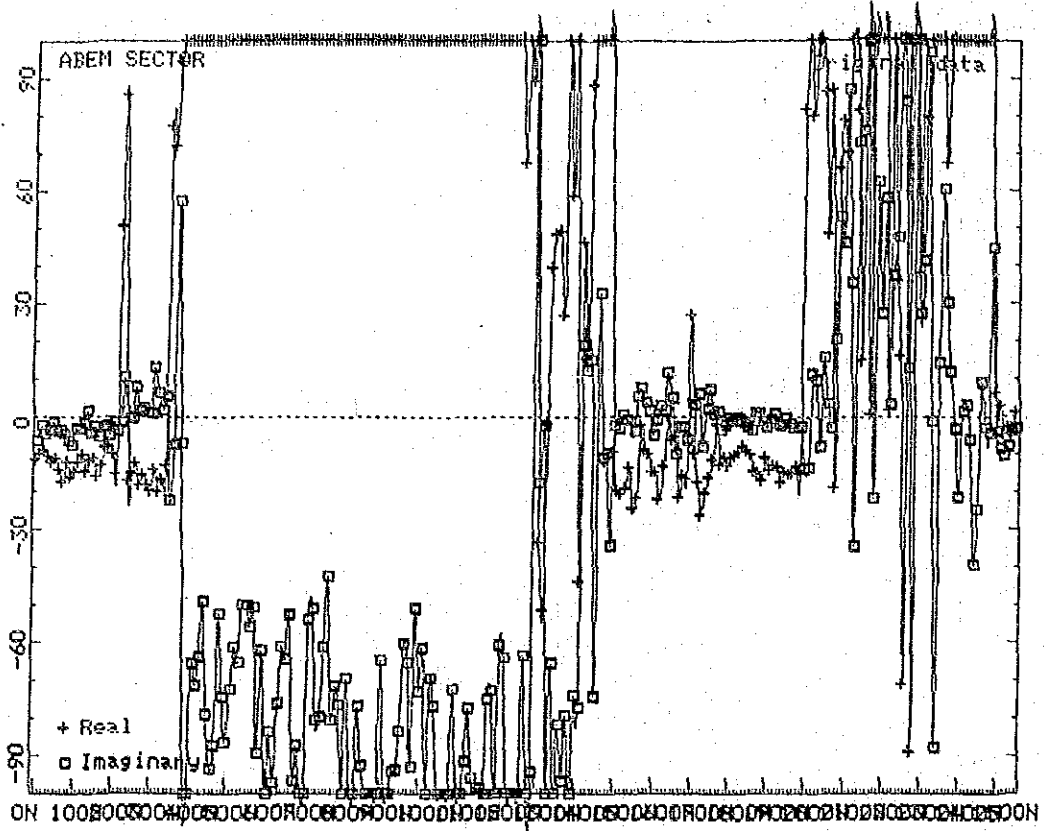
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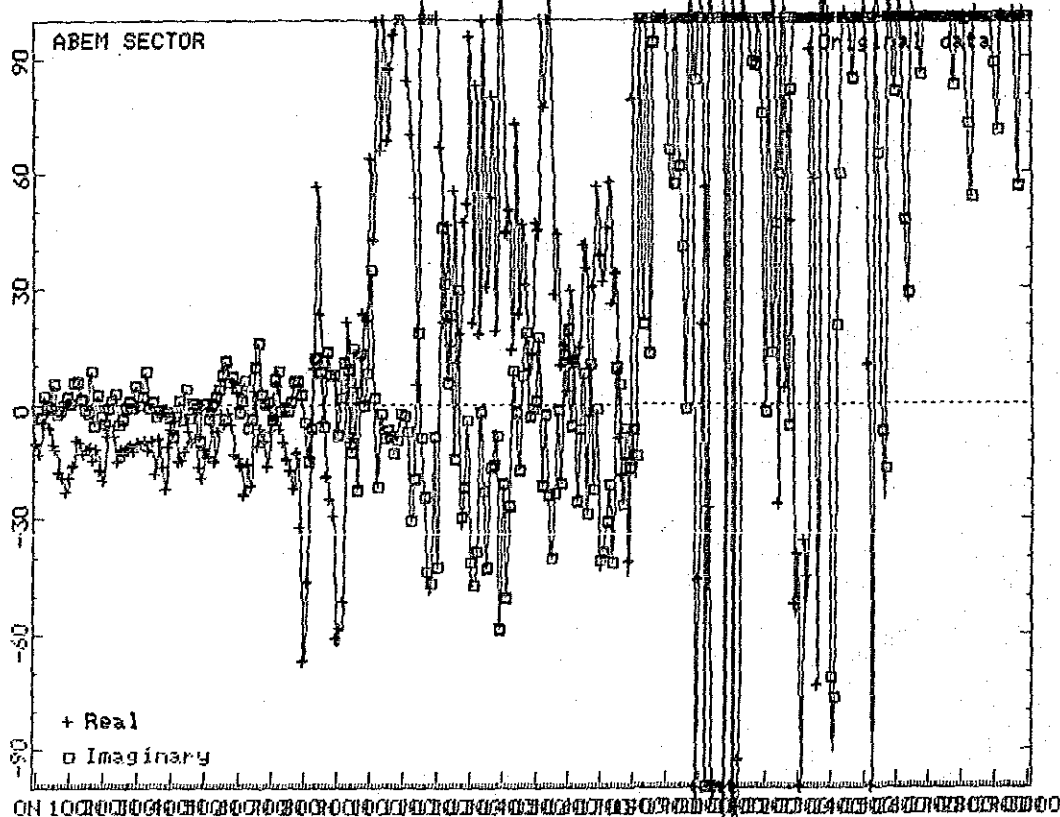


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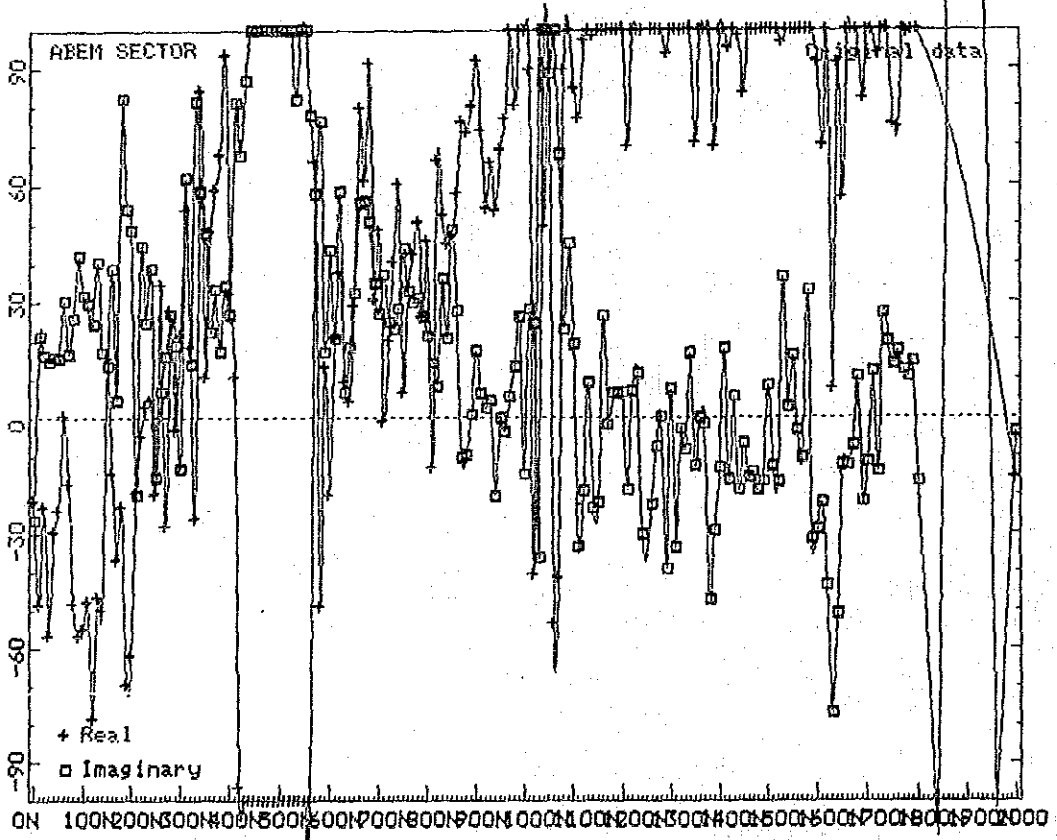
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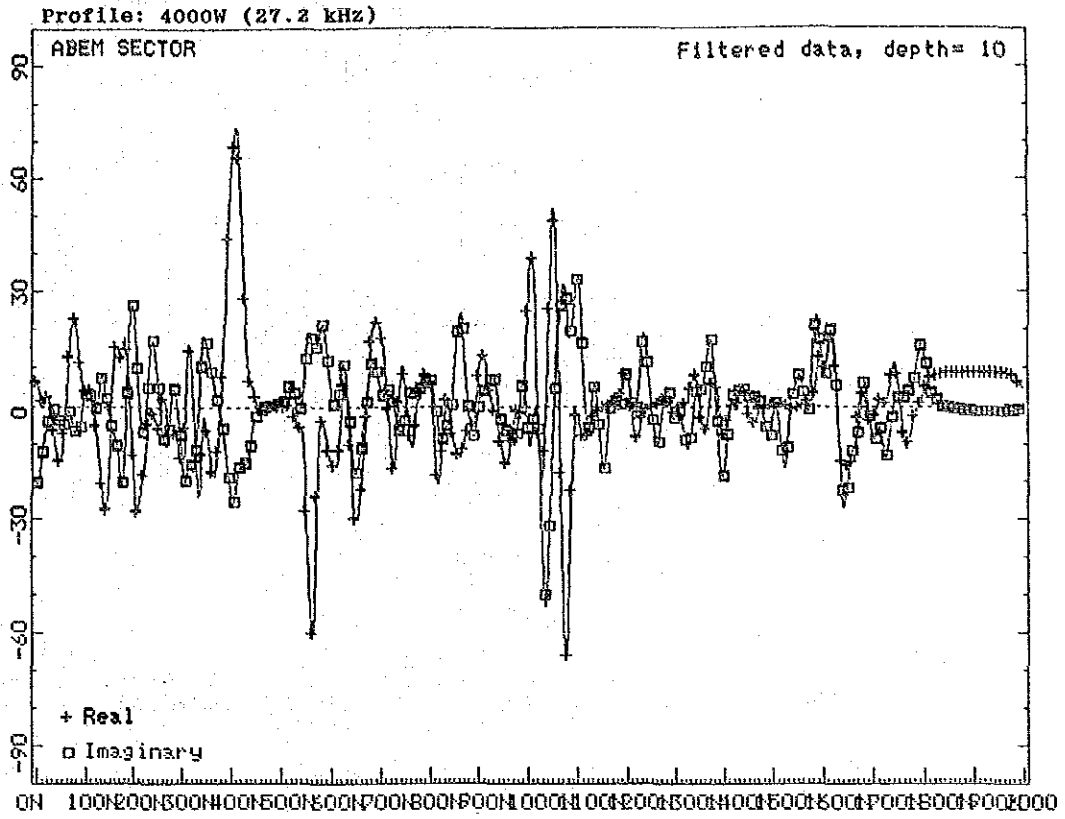
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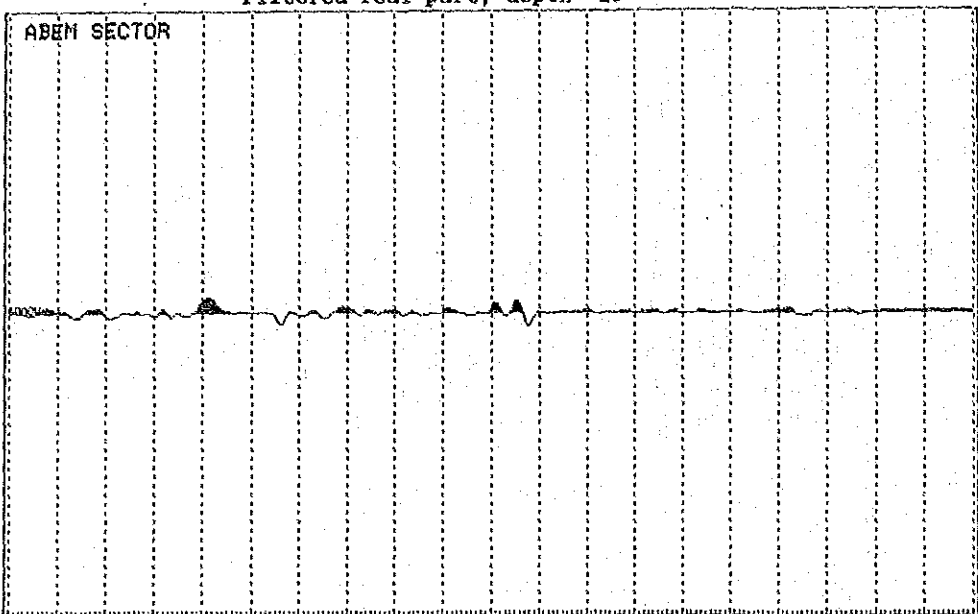
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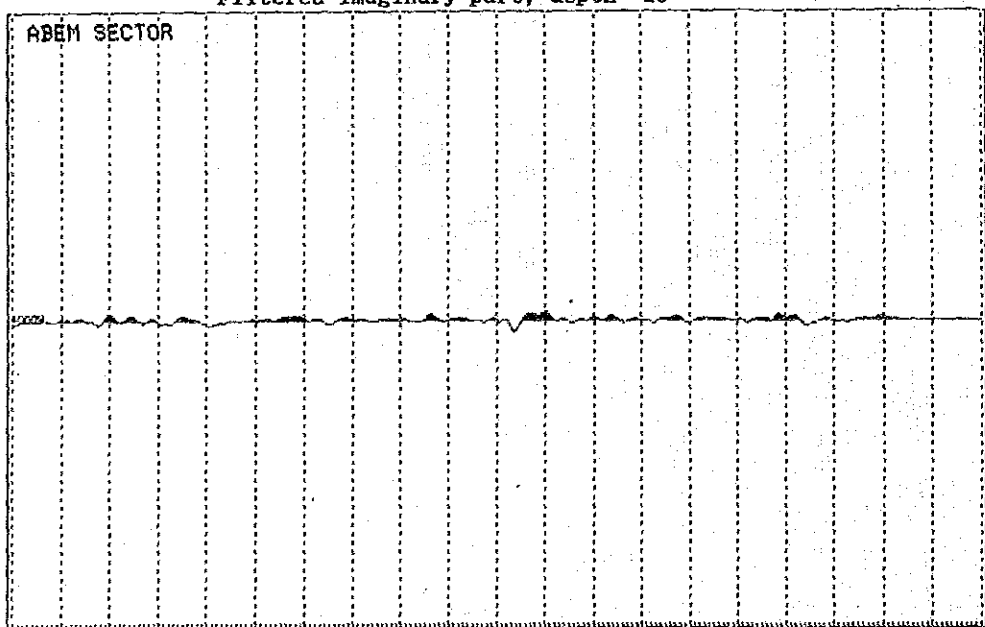


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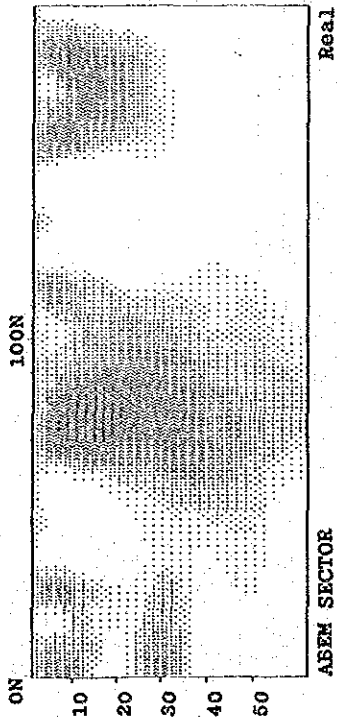
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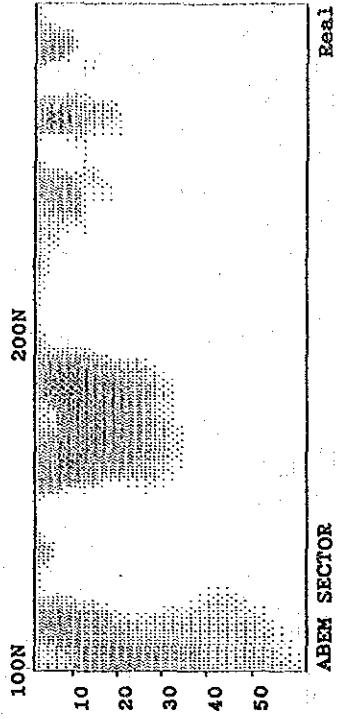


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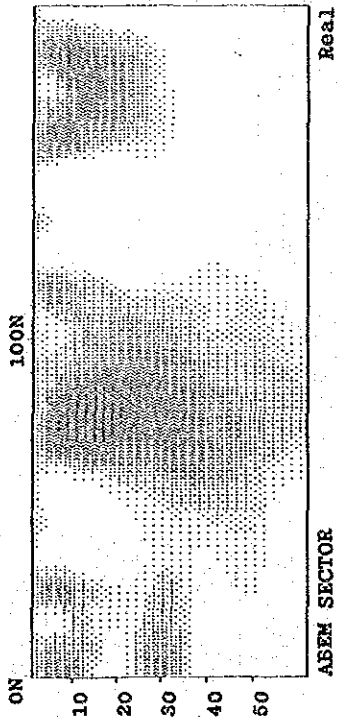
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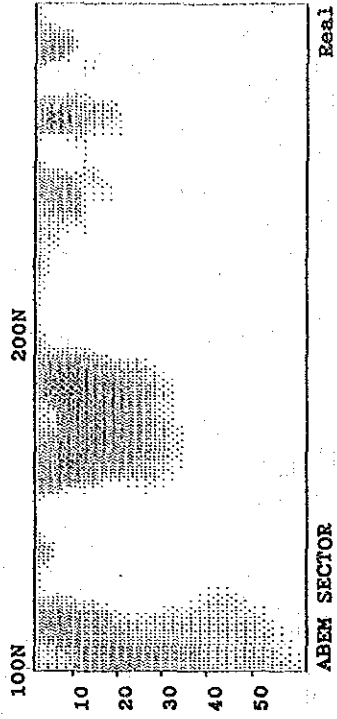
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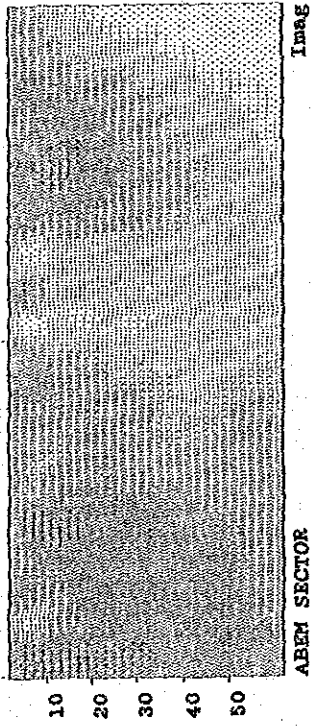
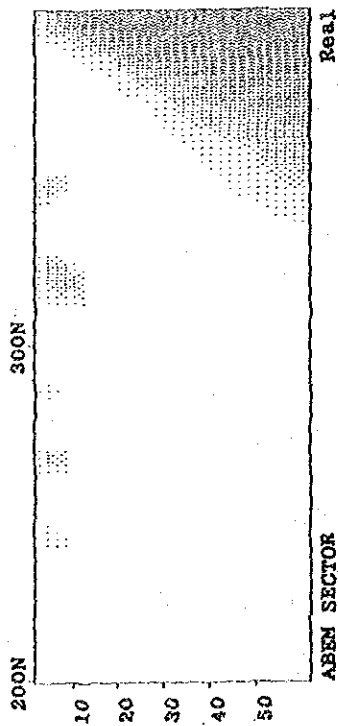


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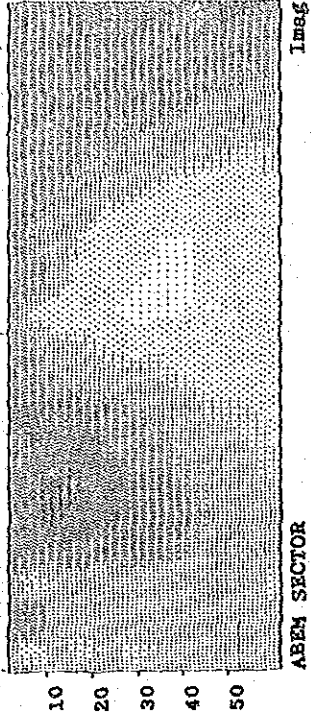
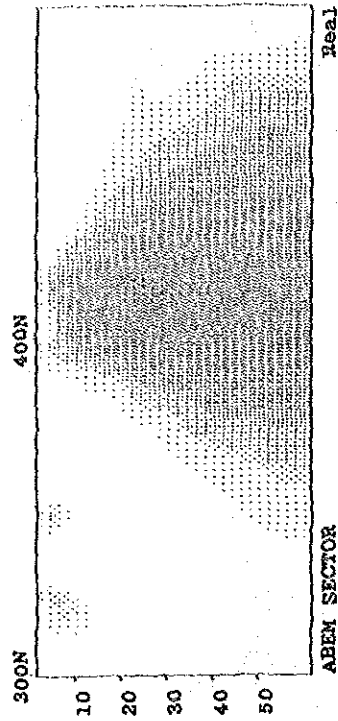




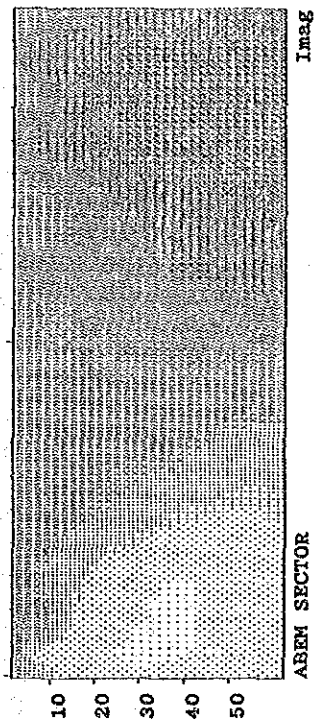
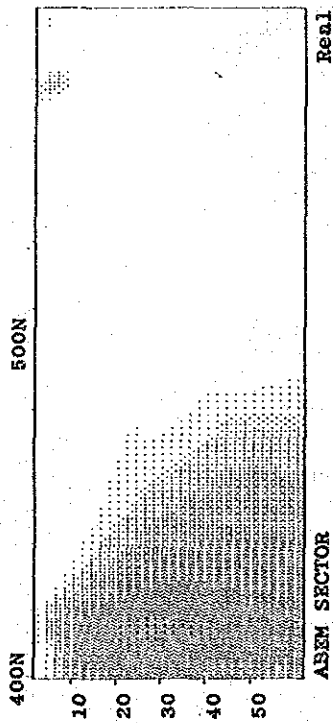
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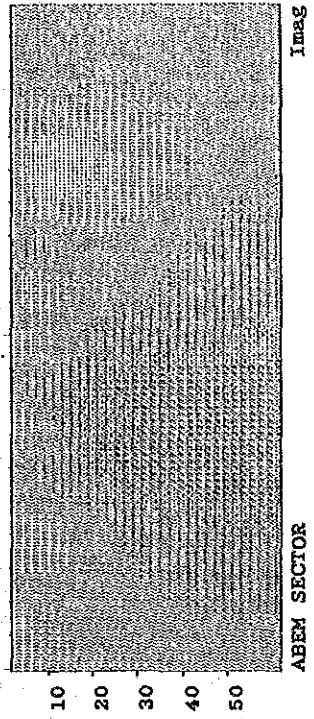
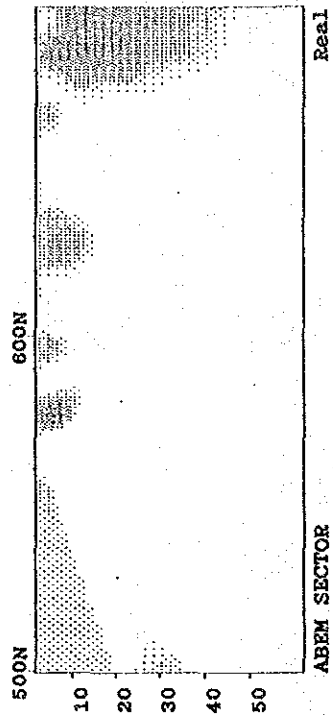
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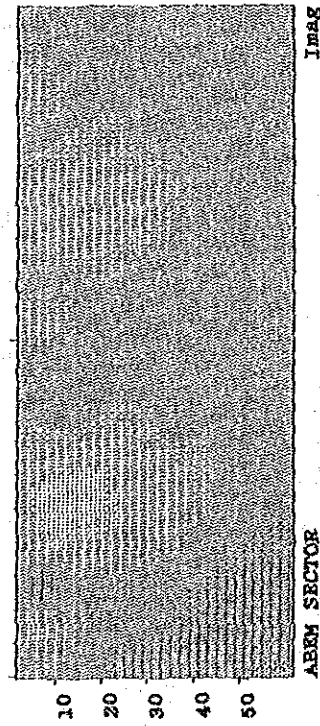
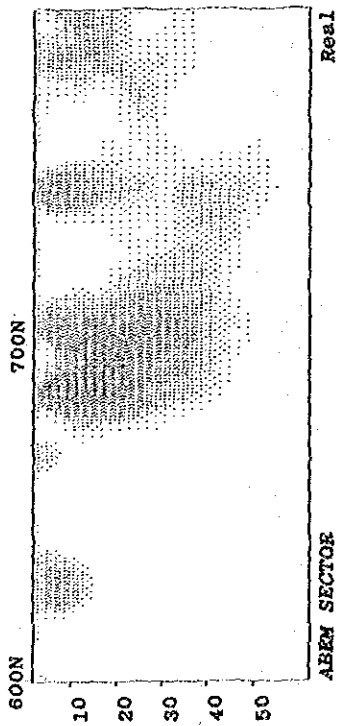
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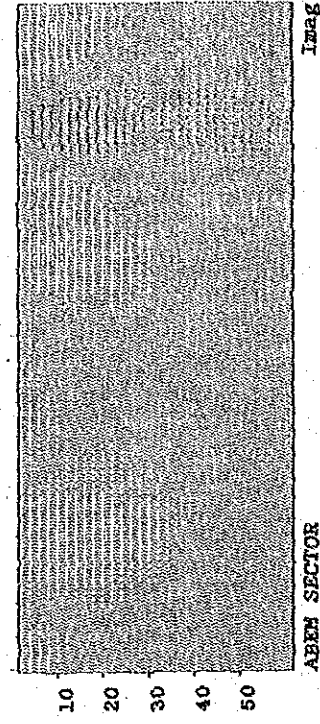
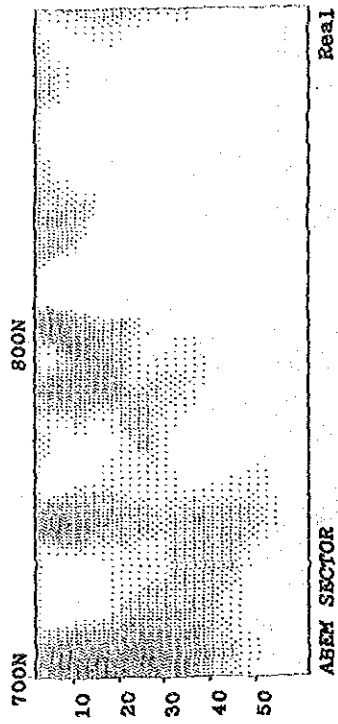
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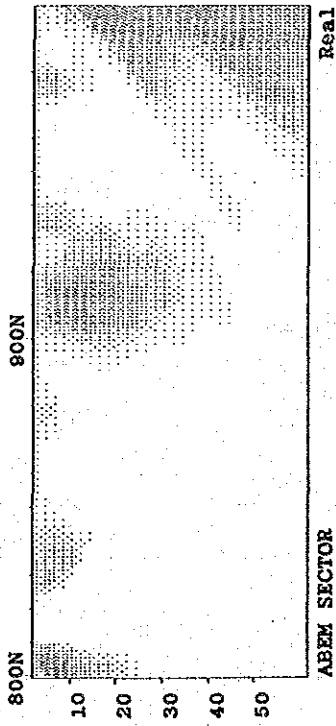
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Profile: 4000W

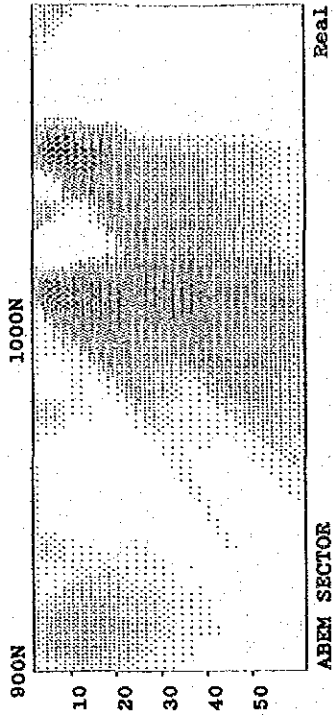


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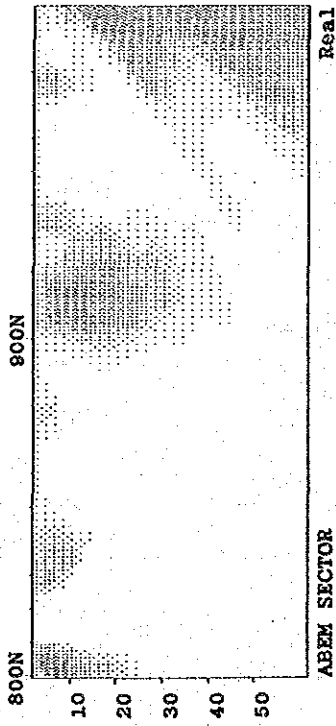
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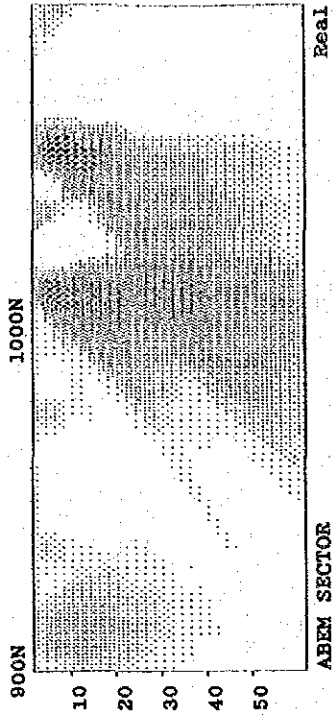
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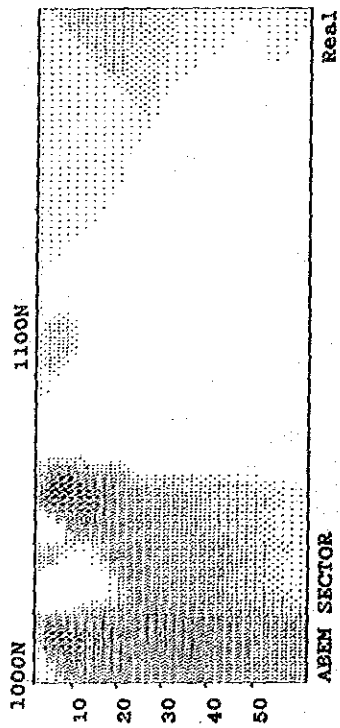
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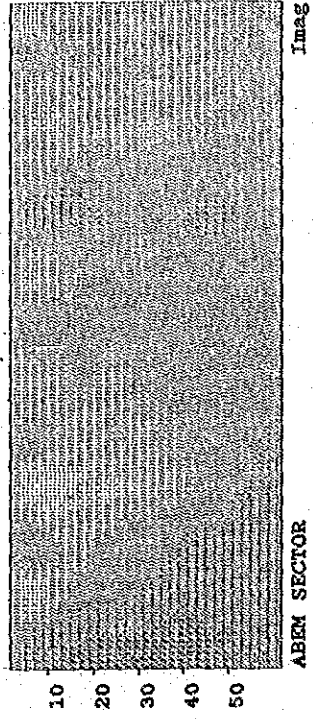
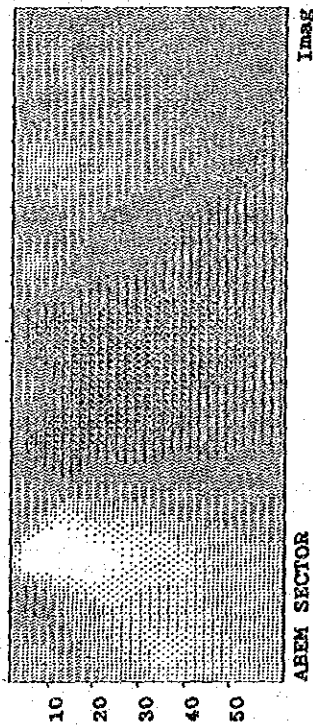
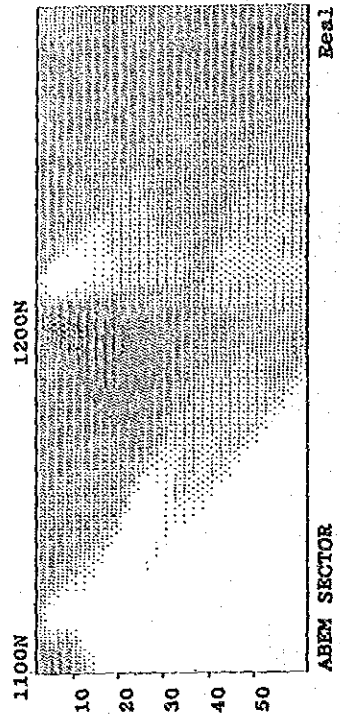


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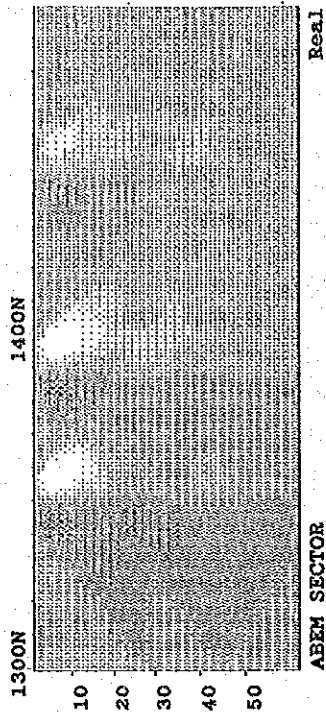
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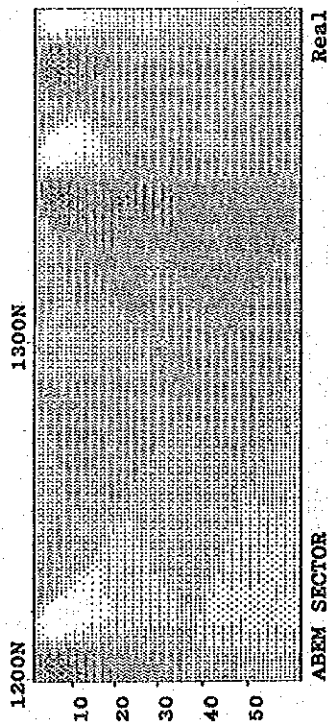


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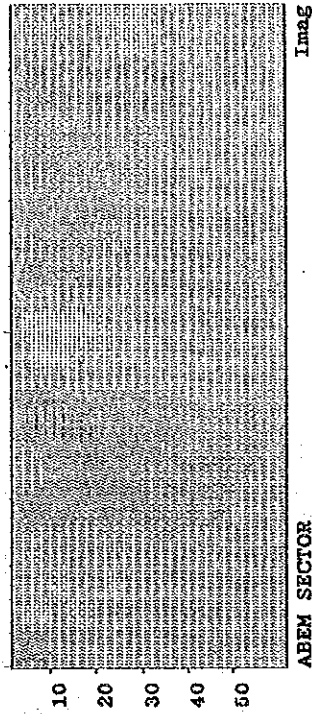


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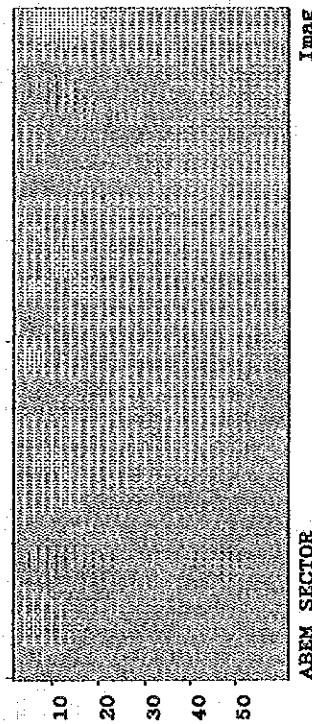
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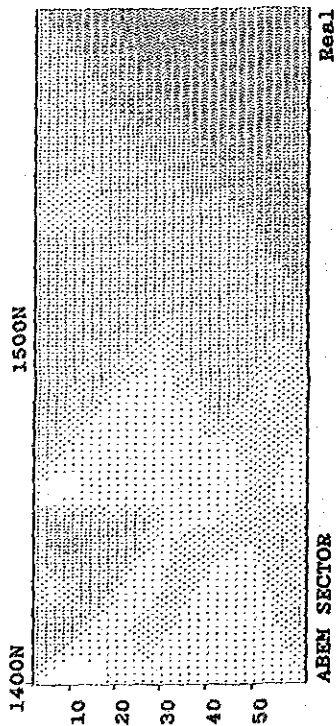


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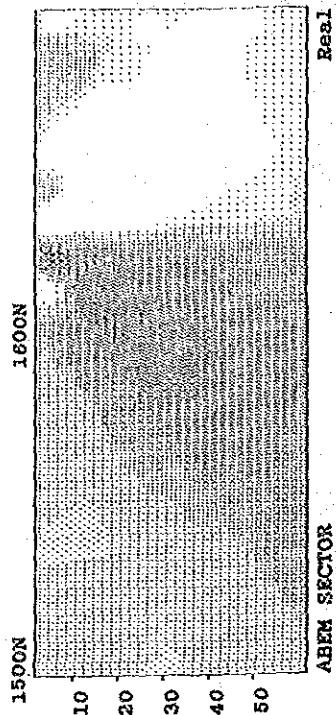


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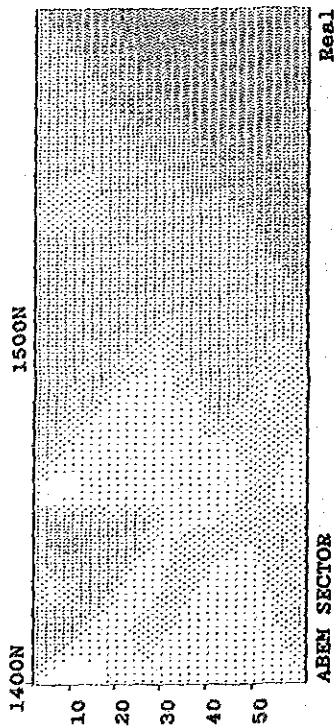
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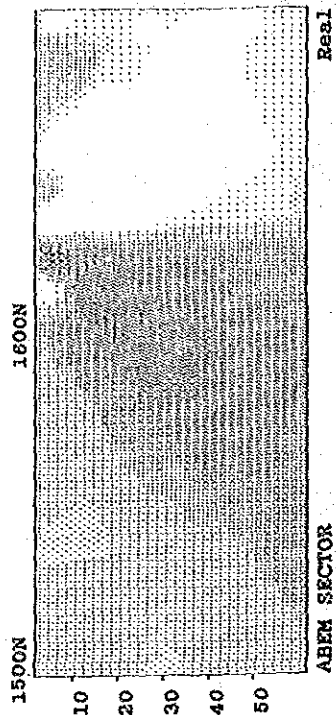
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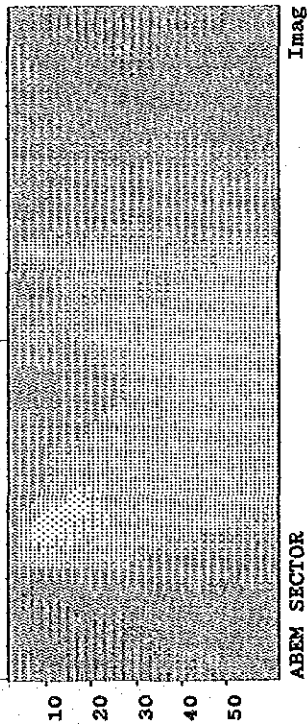
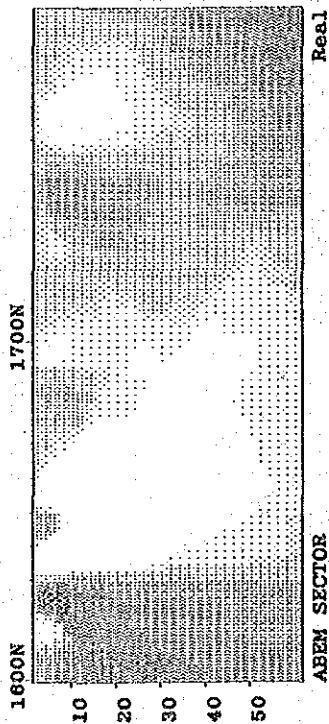
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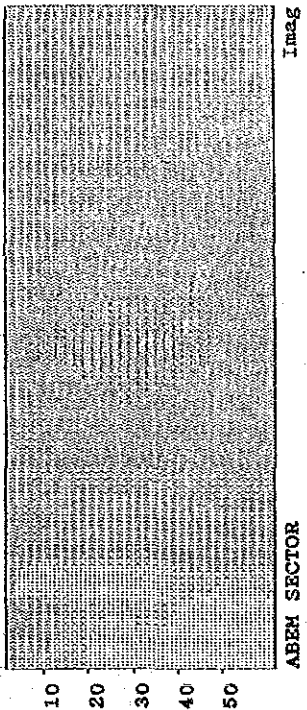
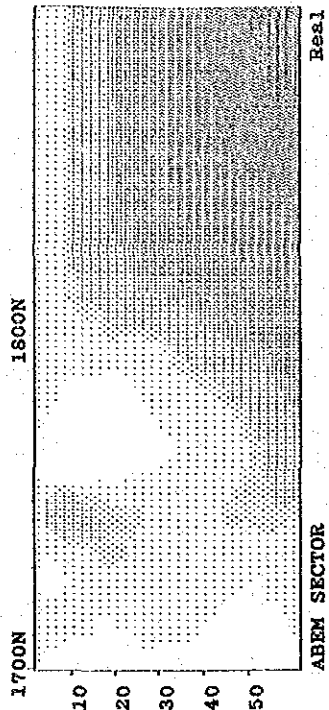
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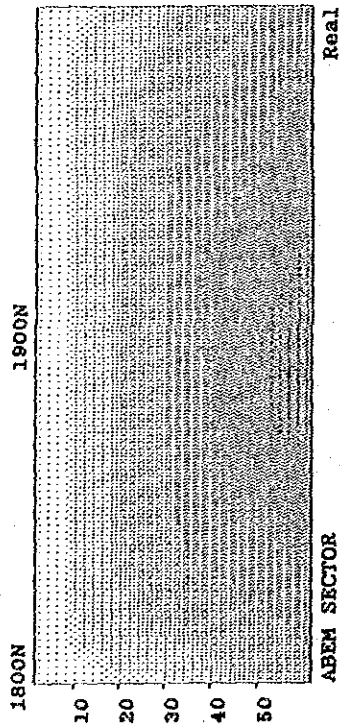


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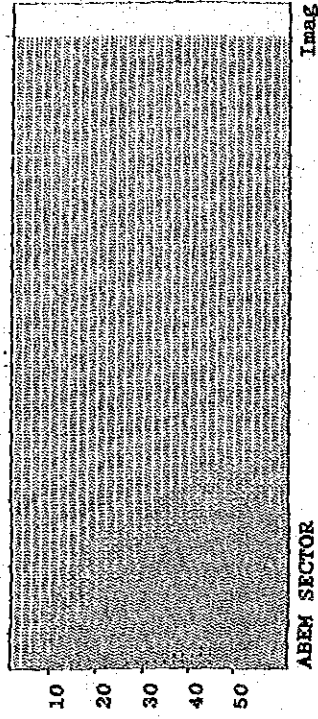
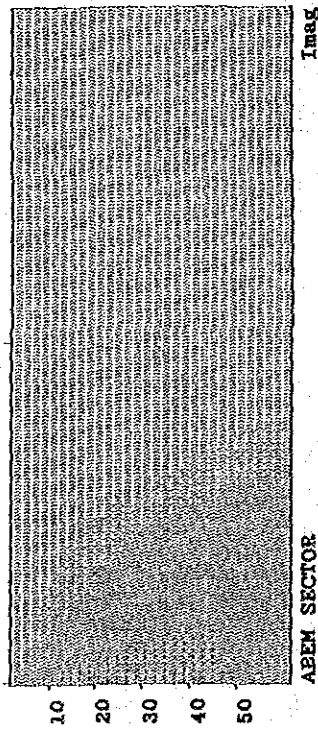
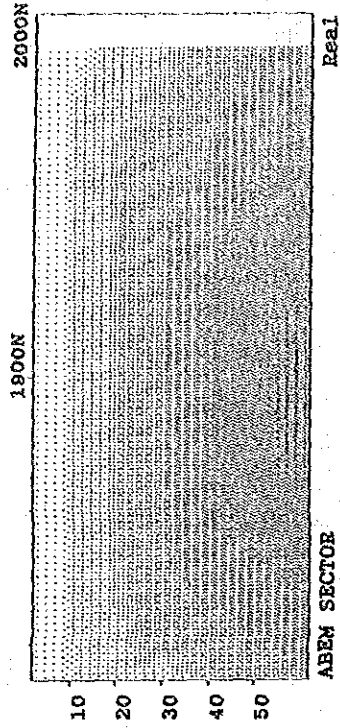




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Profile: 4000W



Andranodeoka

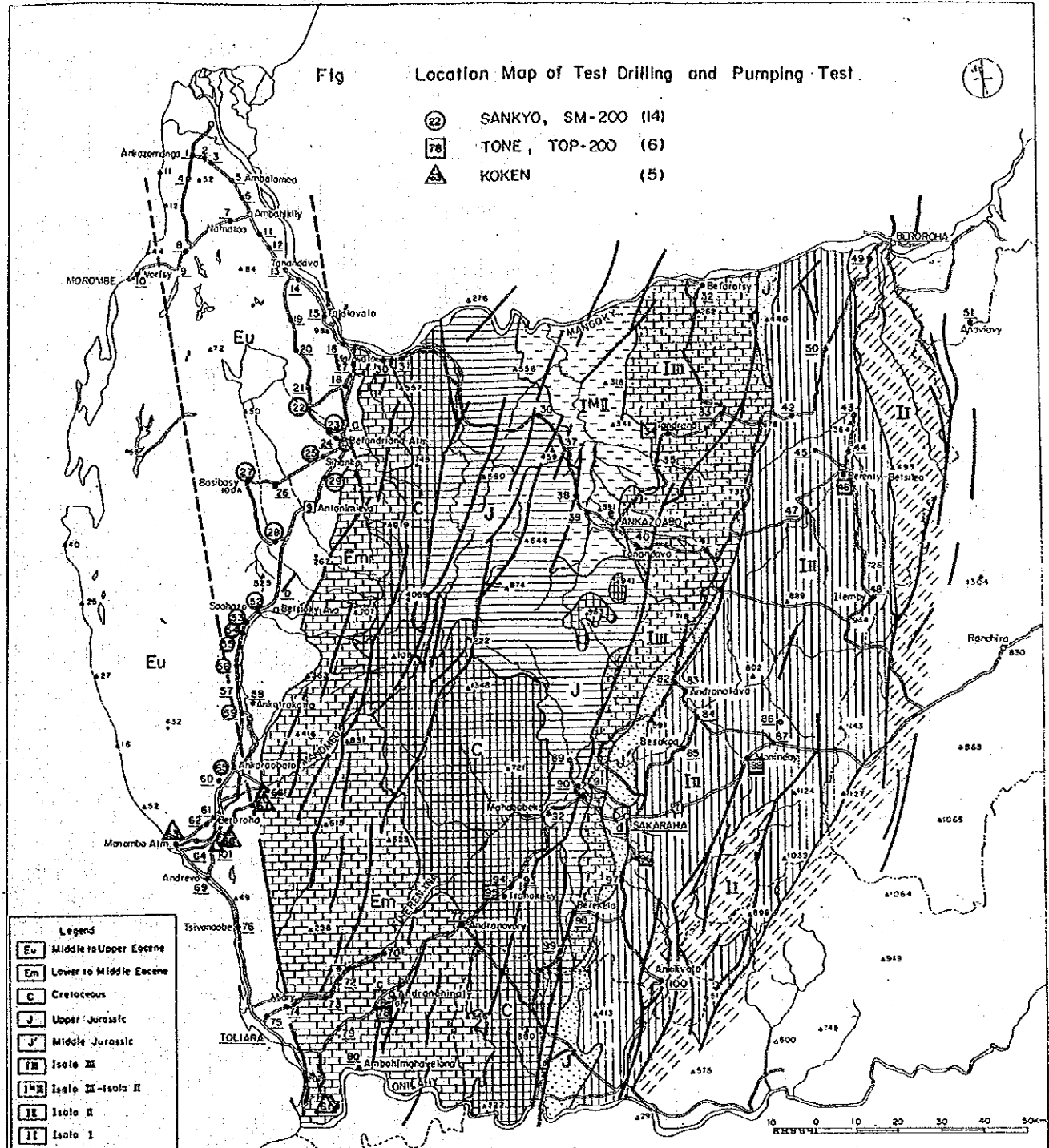


6. TEST DRILLING AND PIMPING TEST



Fig Location Map of Test Drilling and Pumping Test.

- ⊙ SANKYO, SM-200 (14)
- ⊠ TONE, TOP-200 (6)
- △ KOKEN (5)



| Legend |                        |
|--------|------------------------|
| Eu     | Middle to Upper Eocene |
| Em     | Lower to Middle Eocene |
| C      | Cretaceous             |
| J      | Upper Jurassic         |
| J'     | Middle Jurassic        |
| III    | Isalo III              |
| III'   | Isalo III - Isalo II   |
| II     | Isalo II               |
| I      | Isalo I                |

| No Villages      | 15 Talatavalo     | II. Fiv. ANTANZOABO ATM | 48 Iteaty             | 50 Anondro     | 78 Befoly           | 92 Mahaboka          |
|------------------|-------------------|-------------------------|-----------------------|----------------|---------------------|----------------------|
| I. Fiv. MOROMBE  | 16 Aebiky         | 32 Betaratsy            | III. Fiv. BEROROKA    | 51 Beroroka    | 79 Antororoka       | 93 Mahasa            |
| 1 Ankazwanga     | 17 Marovato       | 33 Andranomainty        | 49 Tanandava-Antafasy | 62 Antsomarihy | 80 Asobiasahavelona | 94 Andamasiny-Vineta |
| 2 Beadabo        | 18 Andranoboka    | 34 Tandrano             | 50 Anjamitkitra       | 63 Manabo-Ata  | 81 Manoroka         | 95 Itranolaky        |
| 3 Befasy         | 19 Sitrabondro    | 35 Ampandraelatsotaky   | 51 Anaviavy           | 64 Antandroka  | 101 Ankilialinika   | 96 Analavary         |
| 4 Ankilifolo(1)  | 20 Mahavozokely   | 36 Andranowafana        |                       | 65 Antaraobato |                     | 97 Antaninora        |
| 5 Ambalamosa     | 21 Antranosatra   | 37 Manakiala            | IV. Fiv. TOLIARA I/B  | 66 Andoharano  | V. Fiv. SAKARAHA    | 98 Bereheta          |
| 6 Tsianihy       | 22 Manoy          | 38 Berenty-Ankilimasy   | 52 Soashazo           | 67 Tsefanoka   |                     | 99 Ankilimitaloka    |
| 7 Hamatoz        | 23 Apozza         | 39 Betsinefo            | 53 Analamisampy       | 68 Benetsy     | 82 Jaborana         | 100 Ankilivalo       |
| 8 Mangolovolo    | 24 Ankilifolo(2)  | 40 Tanandava            | 54 Belitsaka          | 69 Andreyo     | 83 Andranolava      |                      |
| 9 Ankida         | 25 Sihanaka       | 41 Apozza               | 55 Apasakibo          | 70 Anjanala    | 84 Lambakandro      |                      |
| 10 Vorisy        | 26 Bemoka         | 42 Ipotsa Ata           | 56 Namaboha           | 71 Apiphalia   | 85 Besako(1)        |                      |
| 11 Andranomainty | 27 Basibasy       | 43 Mandaba Ata          | 57 Antsava            | 72 Bebospy     | 86 Besako(2)        |                      |
| 12 Berantala     | 28 Anatalato      | 44 Soatanimbary         | 58 Ankilivalotoka     | 73 Ambolonkira | 87 Ampandra         |                      |
| 13 Tanandava     | 29 Mangotroka     | 45 Sahanozy Atn         | 59 Anpihavy           | 74 niary       | 88 Maninday         |                      |
| 14 Antsakoabe    | 30 Nosy-Aabositra | 46 Berenty-Betsileo     |                       | 75 Befanasy    | 89 Bevoalavo        |                      |
|                  | 31 Tsairiaploke   | 47 Ankilivalokely       |                       | 76 Tsivonoabo  | 90 Tanabao          |                      |
|                  |                   |                         |                       | 77 Andranovory | 91 Anbahimaitty     |                      |

Table 6.1 Results of Test Drilling and Pumping Test (1/2)

| Well No. & Location | Results of Test Drilling           |                                    |                                                                                                       | Lithofacies of Aquifer                                                                                 | Results of Pumping Test     |                      |                                 |                                        | Water Quality              |                                   |
|---------------------|------------------------------------|------------------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------|----------------------|---------------------------------|----------------------------------------|----------------------------|-----------------------------------|
|                     | Drilling Started<br>Com-<br>pleted | Drilled, W.L.<br>Depth (GL-m)<br>m | Screen Position<br>(GL-m)                                                                             |                                                                                                        | P/Discharge<br>(Q)<br>/min. | Drawdown<br>(S)<br>m | Specific<br>capacity<br>/min./m | Transmissivity<br>m <sup>2</sup> /min. | Jacob<br>Recovery<br>/min. | Electric<br>Conductivity<br>μs/cm |
| 22 Manay            | SANKYO 25.08.90<br>SM-200 31.08.90 | 42.0                               | 8.37 @ 18.4-38.4 (4")                                                                                 | medium-coarse sandstone & small gravelly sandstone                                                     | 280 (~309)                  | 12.16                | 23.084                          | 4.34x10 <sup>-3</sup>                  | 1.520                      | 2887.1                            |
| 23 Ampoza           | SANKYO 18.08.90<br>SM-200 24.08.90 | 50.0                               | 5.28 @ 15.5-23.5 (4")<br>@ 31.5-47.5 (4")                                                             | medium sandstone<br>medium-coarse sandstone                                                            | 283 (~310)                  | 9.92                 | 23.534                          | 4.71x10 <sup>-3</sup>                  | 368                        | 127.3                             |
| 25 Sibahaka         | SANKYO 01.09.90<br>SM-200 06.09.90 | 41.0                               | 5.74 @ 19.5-39.5 (4")                                                                                 | medium-coarse sandstone                                                                                | 300 (~307)                  | 1.86                 | 161.238                         | 4.32x10 <sup>-3</sup>                  | 310                        | 117.5                             |
| 27 Basibasy         | SANKYO 29.09.90<br>SM-200 06.10.90 | 83.0                               | 14.49 @ 51.5-72.5 (4")                                                                                | sandy marl & limestone                                                                                 | 201 (~222)                  | 28.78                | 6.758                           | 8.9x10 <sup>-3</sup>                   | 2.740                      | 7208.8                            |
| 28 Analatelo        | SANKYO 04.09.90<br>SM-200 01.10.90 | 35.0                               | 3.18 @ 11.5-31.5 (4")                                                                                 | alternation of sandy marl, sandy limestone & limestone                                                 | 301 (~321)                  | 0.06                 | 5.016                           | -                                      | 362                        | 127.4                             |
| 29 Mangotroka       | SANKYO 07.09.90<br>SM-200 13.09.90 | 41.0                               | 3.67 @ 14.5-38.5 (4")                                                                                 | medium-coarse sandstone                                                                                | 336                         | 1.72                 | 195.35                          | 1.14x10 <sup>-3</sup>                  | 141                        | 127.0                             |
| 52 Soahazo 52-1     | SANKYO 03.07.90<br>SM-200 12.07.90 | 76.0                               | 36.17 @ 47.1-63.1 (4")                                                                                | sandy marl                                                                                             | 130 (~293)                  | 1.08                 | 120.37                          | 1.13x10 <sup>-3</sup>                  | 1.080                      | 707.3                             |
| 52 Soahazo 52-2     | SANKYO 13.07.90<br>SM-200 17.07.90 | 34.0                               | 4.90 @ 7.1-15.1 (4")<br>@ 23.1-27.1 (4")                                                              | medium-coarse sandstone<br>sandy marl                                                                  | 167                         | 5.72                 | 29.204                          | 4.89x10 <sup>-3</sup>                  | 3.630                      | 2527.4                            |
| 53 Analamisampy     | SANKYO 18.07.90<br>SM-200 25.07.90 | 71.0                               | 13.11 @ 7.5-11.5 (4")<br>@ 31.5-35.5 (4")<br>@ 43.5-47.5 (4")<br>@ 51.5-55.5 (4")<br>@ 59.5-67.5 (4") | sandy limestone<br>medium sandstone & sandy marl<br>sandstone<br>sandy marl                            | 30 (~112)                   | 8.09                 | 3.713                           | 3.20x10 <sup>-3</sup>                  | 1.350                      | 2085.2                            |
| 54 Belitsaka        | SANKYO 26.07.90<br>SM-200 31.07.90 | 66.0                               | 12.78 @ 31.5-47.5 (4")<br>@ 55.5-59.5 (4")                                                            | medium sandstone & sandy marl<br>coarse sandstone                                                      | 200 (~270)                  | 14.70                | 13.618                          | 1.08x10 <sup>-3</sup>                  | 2.080                      | 4447.0                            |
| 55 Ampasikibo       | SANKYO 01.08.90<br>SM-200 06.08.90 | 50.0                               | 9.18 @ 23.5-43.5 (4")                                                                                 | sandy marl                                                                                             | 230 (~287)                  | 6.96                 | 40.231                          | 3.71x10 <sup>-3</sup>                  | 817                        | 227.2                             |
| 56 Karaboha         | SANKYO 07.08.90<br>SM-200 15.08.90 | 83.0                               | 16.50 @ 39.5-47.5 (4")<br>@ 63.5-73.5 (4")                                                            | medium-coarse sandstone<br>sandy marl & sandy limestone                                                | 247 (~268)                  | 16.67                | 14.823                          | 3.10x10 <sup>-3</sup>                  | 975                        | 957.3                             |
| 59 Ampihany         | SANKYO 07.10.90<br>SM-200 14.10.90 | 53.0                               | 8.30 @ 23.5-51.5 (4")                                                                                 | medium-coarse sandstone                                                                                | 296 (~315)                  | 7.03                 | 42.11                           | 3.45x10 <sup>-3</sup>                  | 986                        | 867.2                             |
| 65 Ankarobato       | SANKYO 24.08.90<br>SM-200 02.07.90 | 75.5                               | 3.40 @ 15.2-19.2 (4")<br>@ 47.2-51.2 (4")<br>@ 55.2-75.2 (4")                                         | coarse sandstone<br>sandy marl<br>medium-coarse sandstone & limestone                                  | 339 (~361)                  | 2.93                 | 115.701                         | 4.9x10 <sup>-3</sup>                   | 849                        | 627.2                             |
| 66 Befandriana      | SANKYO 19.09.90<br>SM-200 22.09.90 | 53.0                               | 12.30 @ 18.0-26.0 (6")<br>@ 33.0-38.0 (6")                                                            | medium-coarse sandstone                                                                                | 300                         | 0.965                | 304.576                         | 3.54x10 <sup>-3</sup>                  | 565                        | 137.1                             |
| 63 Marombo-Atm      | KOREN 26.09.90<br>30.09.90         | 27.0                               | 4.53 @ 11.5-23.5 (6")                                                                                 | 11.5-19.0 medium-coarse sandstone<br>19.0-21.0 gravelly sandstone<br>23.0-23.5 fissured limestone      | 165 (~263)                  | 0.39                 | 423.08                          | -                                      | 1.000                      | 627.2                             |
| 67 Rsefanoka        | KOREN 08.10.90<br>12.10.90         | 45.0                               | 24.30 @ 22.0-42.0 (4")                                                                                | 23-28 marly limestone<br>28-36 coarse sandstone<br>38-42 limestone                                     | 142 (~144)                  | 3.05                 | 46.561                          | 1.18x10 <sup>-3</sup>                  | 602                        | 107.4                             |
| 68 Benetsy          | KOREN 01.10.90<br>06.10.90         | 72.0                               | 13.51 @ 39.5-43.5 (6")<br>@ 47.5-51.5 (6")<br>@ 59.5-67.5 (6")                                        | medium-coarse sandstone<br>brown coarse sandstone with<br>thine marly sandstone                        | 158 (~161)                  | 2.015                | 72.41                           | 2.33x10 <sup>-3</sup>                  | 977                        | 587.4                             |
| 70 Ankilimalinika   | KOREN 22.10.90<br>28.10.90         | 66.0                               | 14.35 @ 42.0-62.0 (4")                                                                                | 42-47 sandy marl<br>47-52 coarse sandstone<br>58-60 coarse sandstone with thine marl                   | 152 (~155)                  | 1.67                 | 91.02                           | 3.02x10 <sup>-3</sup>                  | 2.458                      | 1347.5                            |
| 81 Manoroka         | KOREN 15.10.90<br>20.10.90         | 58.0                               | 5.23 @ 30.0-50.0 (4")                                                                                 | 30-37 coarse sandstone<br>37-40 porous limestone<br>40-43 coarse sandstone<br>43-50 fissured limestone | 158                         | 0.000                | -                               | -                                      | 1.210                      | 957.4                             |

Table 6.1 Results of Test Drilling and Pumping Test (2/2)

| Well No. & Location | Drilling Started<br>Rig | Completed<br>Date    | Drilled<br>Depth<br>(GL-m) | S. W. L.<br>(GL-m) | Screen Position<br>(GL-m)                                                                                    | Lithofacies of Aquifer                                                                                                             | Results of Pumping Test                       |                      |                                 |                                        | Water Quality                     |            |        |       |
|---------------------|-------------------------|----------------------|----------------------------|--------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|----------------------|---------------------------------|----------------------------------------|-----------------------------------|------------|--------|-------|
|                     |                         |                      |                            |                    |                                                                                                              |                                                                                                                                    | Discharge<br>(Q)<br>/min.<br>(air<br>lifting) | Drawdown<br>(S)<br>m | Specific<br>capacity<br>/min./m | Transmissivity<br>m <sup>2</sup> /min. | Electric<br>Conductivity<br>µs/cm | Cl<br>mg/l |        |       |
| 78 Befoly           | TOP-200                 | 19.06.90<br>15.09.90 | 226.5                      | 178.56             | 183.5-195.5 (6")<br>224.5-226.5<br>open hole (5"/6")                                                         | Porous & fissured limestone<br>10/min. @100/min.                                                                                   | 38.7 (~110)                                   | 3.32                 | 11.658.88x10 <sup>-3</sup>      | 5.05x10 <sup>-3</sup>                  | 8.04x10 <sup>-3</sup>             | 894        | 403    | 147.8 |
| 95 Tranokaky        | TOP-200                 | 14.07.90<br>23.07.90 | 181.1                      | 16.57              | 35.5-55.5 (6")<br>59.5-63.5 (6")<br>75.5-83.5 (6")<br>99.5-103.5 (6")<br>115.5-135.5 (6")                    | fractured basalt<br>fractured basalt & fine sandstone                                                                              | 38.7 (~110)                                   | 3.32                 | 11.658.88x10 <sup>-3</sup>      | 5.05x10 <sup>-3</sup>                  | 8.04x10 <sup>-3</sup>             | 894        | 403    | 147.8 |
| 34 Pandrano         | TOP-200                 | 16.08.90<br>28.08.90 | 150.1                      | 32.72              | 35.5-39.5 (6")<br>99.5-103.5 (6")<br>107.5-119.5 (6")<br>135.5-139.5 (6")                                    | fine to medium sandstone (III)<br>fine sandstone<br>fine sandstone & silty sandstone                                               | 300 (~650)                                    | 7.20                 | 41.678.46x10 <sup>-3</sup>      | 8.45x10 <sup>-3</sup>                  | 8.36x10 <sup>-3</sup>             | 410        | 106    | 106.9 |
| 46 Berenty-Betsileo | TOP-200                 | 29.08.90<br>07.09.90 | 140.0                      | 15.54              | 39.5-43.5 (6")<br>59.5-63.5 (6")<br>71.5-75.5 (6")<br>79.5-91.5 (6")<br>107.5-111.5 (6")<br>127.5-131.5 (6") | marl to marly sandstone<br>fine sandstone (with medium s.s.)<br>silty sandstone & sandy marl<br>silty sandstone<br>marly sandstone | 68 (~80)                                      | 44.45                | 1.532.78x10 <sup>-3</sup>       | 3.55x10 <sup>-3</sup>                  | 3.27x10 <sup>-3</sup>             | 2.190      | 2488.4 |       |
| 38 Maninday         | TOP-200                 | 25.07.90<br>31.07.90 | 73.5                       | 16.29              | 15.5-31.5 (6")<br>35.5-43.5 (6")<br>51.5-55.5 (6")                                                           | weathered coarse sandstone &<br>gravelly sandstone<br>weathered coarse sandstone                                                   | 360 (~480)                                    | 8.27                 | 43.535.97x10 <sup>-3</sup>      | 8.23x10 <sup>-3</sup>                  | 8.26x10 <sup>-3</sup>             | 106        | 106.9  |       |
| 56 Analamary        | TOP-200                 | 01.08.90<br>10.08.90 | 204.0                      | 35.00              | 31.5-39.5 (6")<br>51.5-55.5 (6")<br>59.5-75.5 (6")<br>135.5-139.5 (6")<br>163.5-167.5 (6")                   | weathered coarse sandstone<br>coarse sandstone<br>coarse sandstone with fine<br>sandstone beds                                     | 360 (~600)                                    | 8.62                 | 41.765.16x10 <sup>-3</sup>      | 5.06x10 <sup>-3</sup>                  | 3.92x10 <sup>-3</sup>             | 142        | 142    | 86.4  |

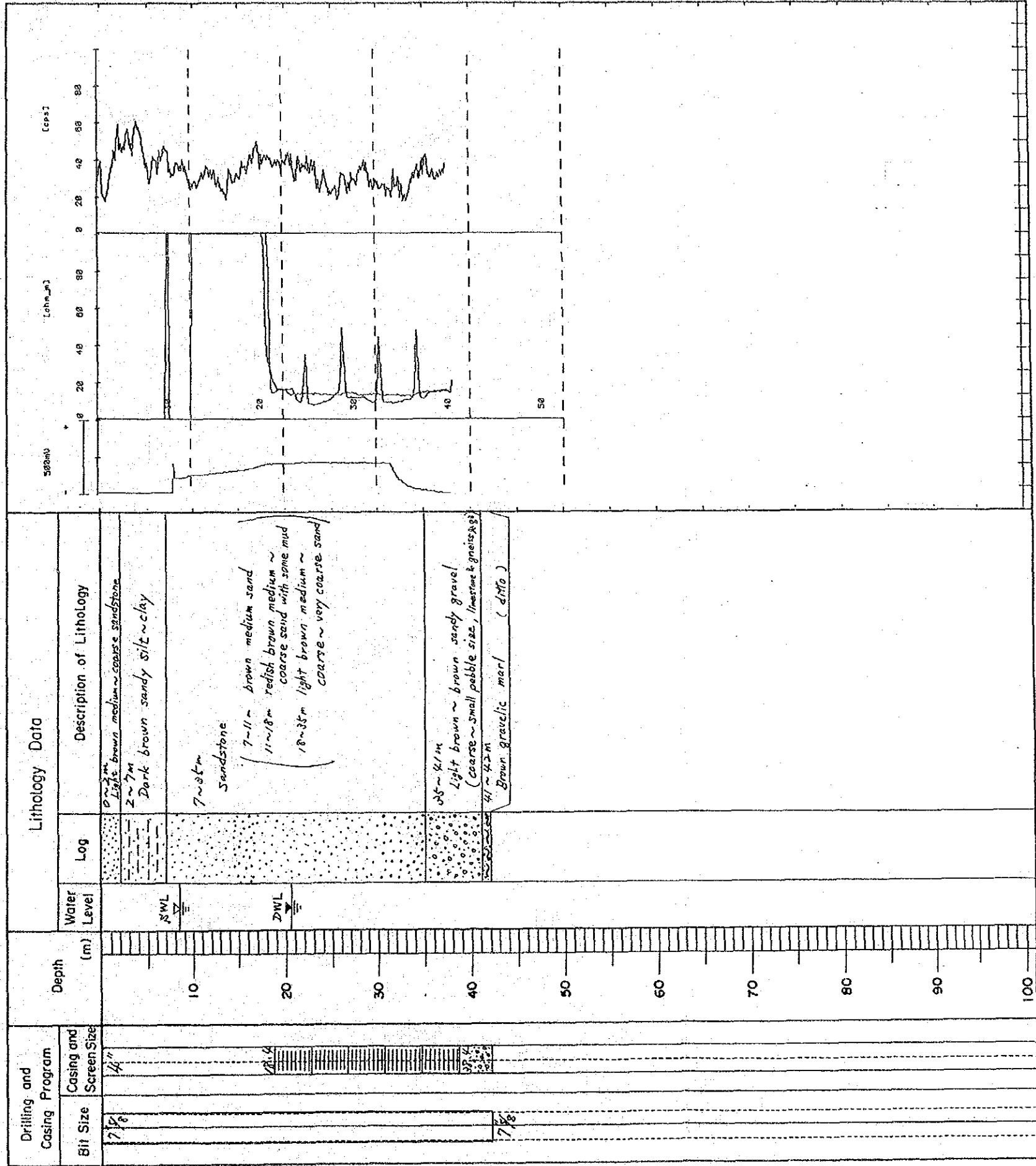




# WELL LOG

|                                                                                                                             |                                          |
|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| <b>PROJECT NAME</b><br>Groundwater Development Study<br>In South Western Region of the Democratic<br>Republic of MADAGASCAR | <b>WELL NO.</b> 22                       |
| <b>AREA AND LOCATION</b><br>Manoy (Morombe Pre.)                                                                            |                                          |
| <b>ELEVATION</b><br>840 m                                                                                                   | <b>LONGITUDE</b>                         |
| <b>TOTAL DEPTH</b><br>42.0 m                                                                                                | <b>DRILLING RIG</b> SANKYO JM-200        |
| <b>DRILLING STARTED</b><br>25. August 1990                                                                                  | <b>DRILLED BY</b> MIEM & JICA Study Team |
| <b>WELL COMPLETED</b><br>31. August 1990                                                                                    | <b>LOGGED BY</b> dHb                     |

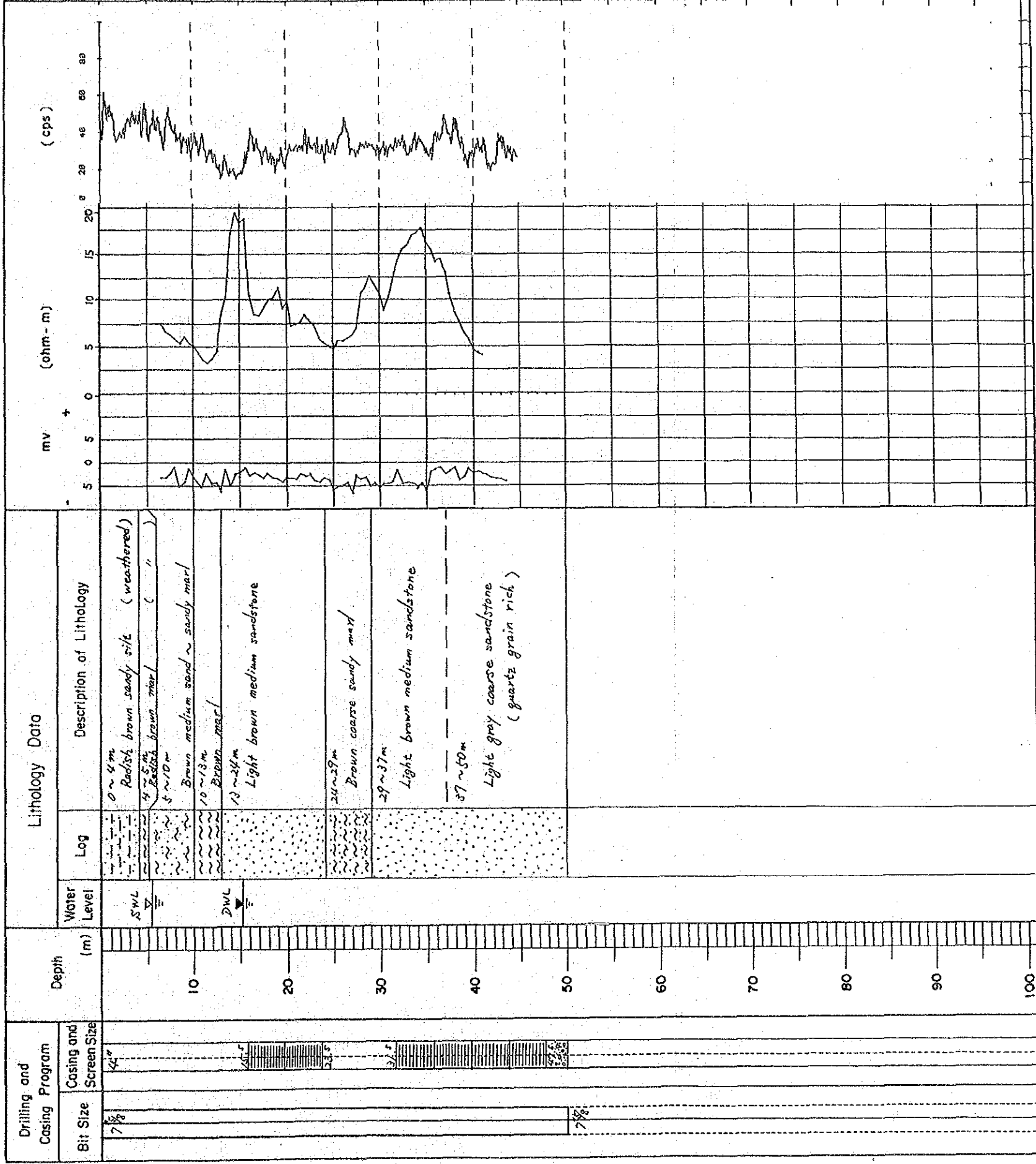
|                                                  |                                                      |
|--------------------------------------------------|------------------------------------------------------|
| <b>STATIC WATER LEVEL</b> GL - 8.37 m            | <b>WATER TEMPERATURE</b> 28.5 °C                     |
| <b>DYNAMIC WATER LEVEL</b> GFL - 20.53 m         | <b>CONDUCTIVITY</b> 1.520 $\frac{\mu S}{cm}$         |
| <b>PUMPING RATE</b> 280 (~309) $\frac{l}{min}$   | <b>pH</b> 7.1                                        |
| <b>SPECIFIC CAPACITY</b> 12.16 $\frac{l}{min/m}$ | <b>TOTAL HARDNESS</b> 530 $\frac{mg}{l}$ as $CaCO_3$ |



# WELL LOG

|                   |  |                                                                                                      |              |                        |  |
|-------------------|--|------------------------------------------------------------------------------------------------------|--------------|------------------------|--|
| PROJECT NAME      |  | Groundwater Development Study<br>In South Western Region of the Democratic<br>Republic of MADAGASCAR |              | WELL NO. 23            |  |
| AREA AND LOCATION |  | Amboza (Morombe Pre.)                                                                                |              |                        |  |
| ELEVATION         |  | 116.5 m                                                                                              | LATITUDE     | LONGITUDE              |  |
| TOTAL DEPTH       |  | 50 m                                                                                                 | DRILLING RIG | SANKYO SM-200          |  |
| DRILLING STARTED  |  | 18. August 1990                                                                                      | DRILLED BY   | MIEM & JICA Study Team |  |
| WELL COMPLETED    |  | 24. August 1990                                                                                      | LOGGED BY    | ditto                  |  |

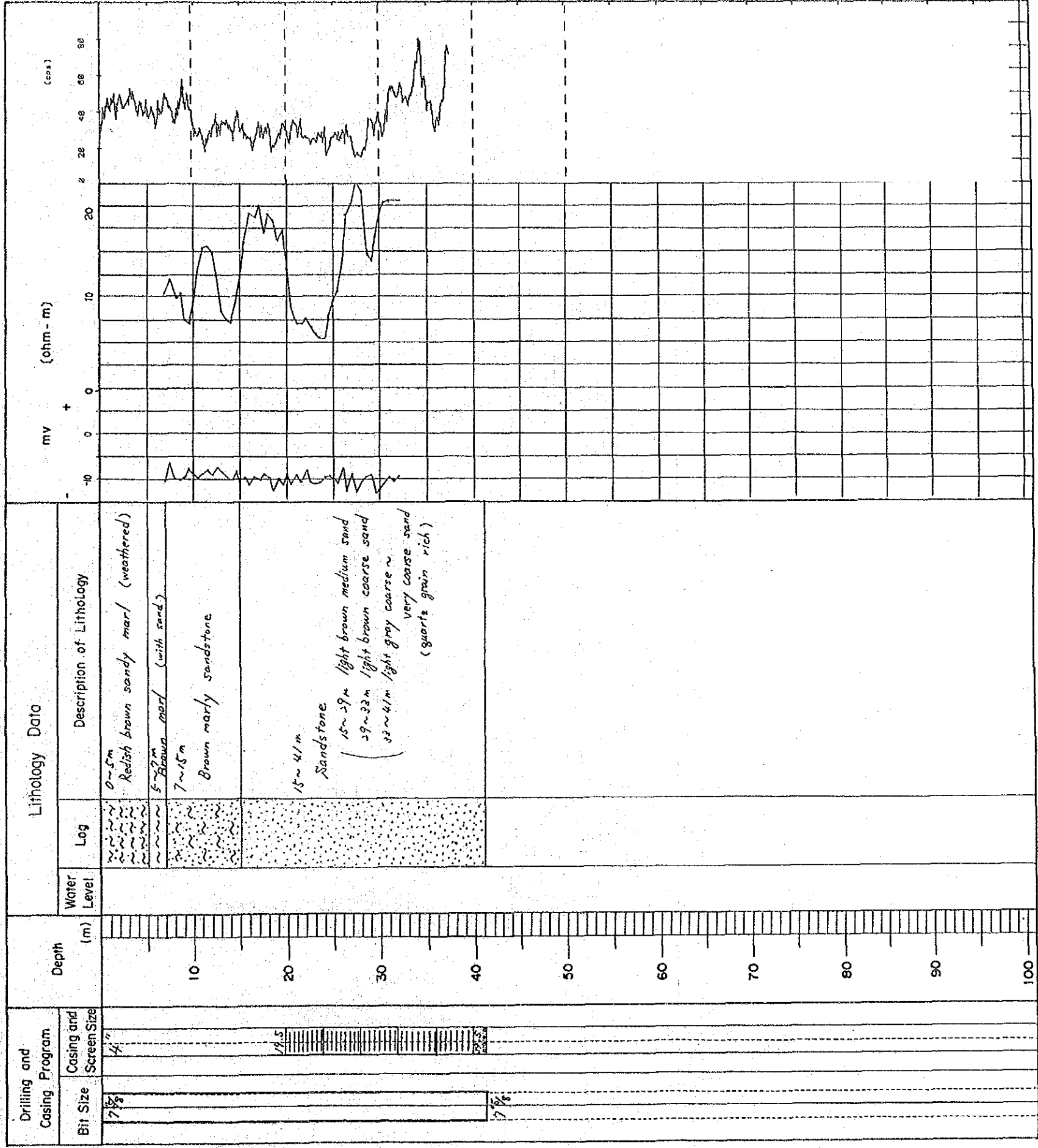
|                     |                            |                   |                        |
|---------------------|----------------------------|-------------------|------------------------|
| STATIC WATER LEVEL  | GL - 5.28 m                | WATER TEMPERATURE | 30.2 °C                |
| DYNAMIC WATER LEVEL | GL - 15.20 m               | CONDUCTIVITY      | 368 $\mu\text{S/cm}$   |
| PUMPING RATE        | 283 (2-370) $\text{l/min}$ | pH                | 7.3                    |
| SPECIFIC CAPACITY   | 28.53 $\text{l/min/m}$     | TOTAL HARDNESS    | 150 $\text{mg CaCO}_3$ |



# WELL LOG

|                   |                    |                                                                                                      |                        |             |  |
|-------------------|--------------------|------------------------------------------------------------------------------------------------------|------------------------|-------------|--|
| PROJECT NAME      |                    | Groundwater Development Study<br>in South Western Region of the Democratic<br>Republic of MADAGASCAR |                        | WELL NO. 25 |  |
| AREA AND LOCATION |                    | Sihanaka (Morombe Pre.)                                                                              |                        |             |  |
| ELEVATION         | 133.0 m            | LATTUDE                                                                                              |                        |             |  |
| TOTAL DEPTH       | 41.0 m             | DRILLING RIG                                                                                         | SANAYO SM-200          |             |  |
| DRILLING STARTED  | 01. September 1990 | DRILLED BY                                                                                           | MIEM & JICA Study Team |             |  |
| WELL COMPLETED    | 06. September 1990 | LOGGED BY                                                                                            | ditto                  |             |  |

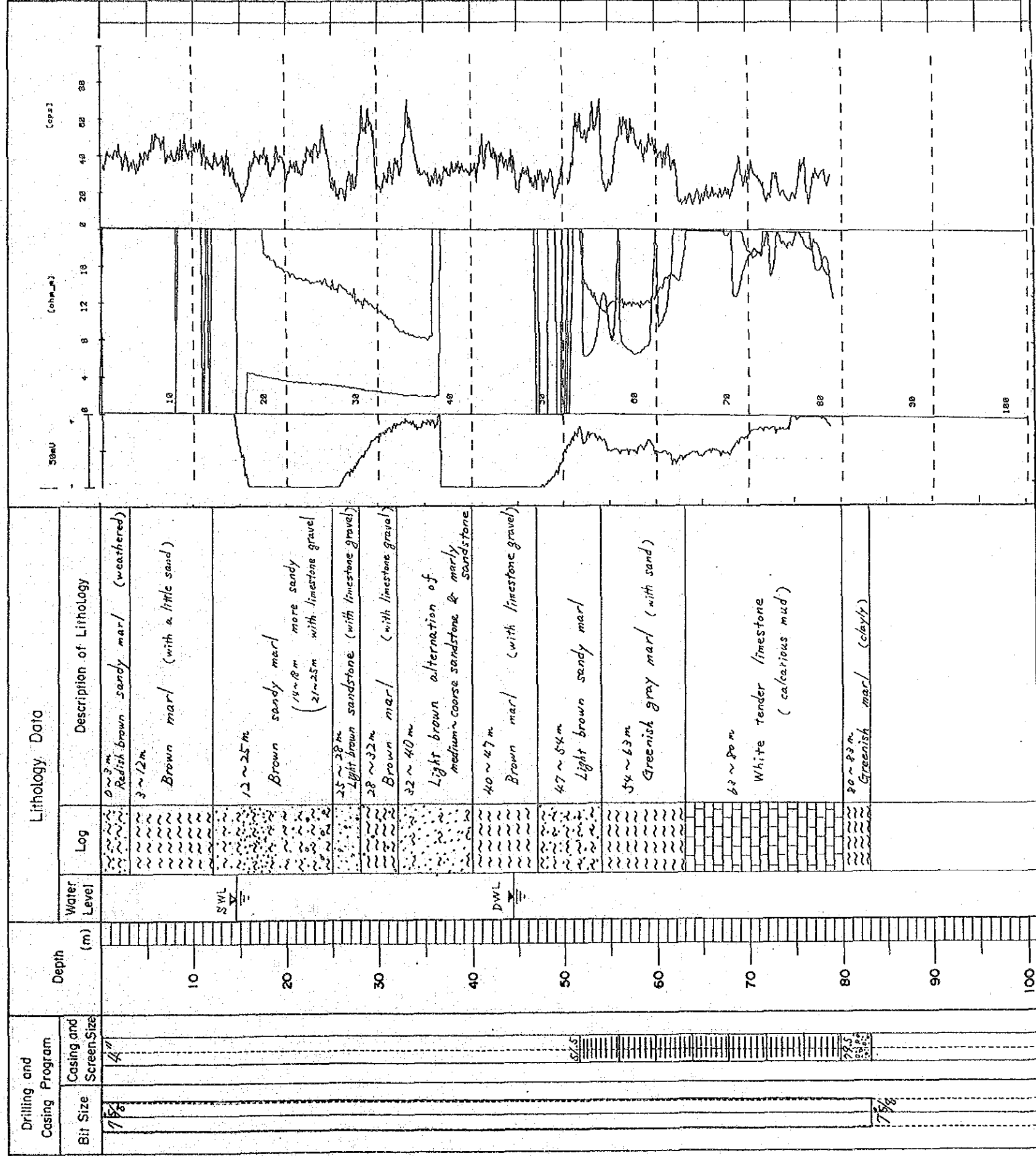
|                     |                    |                   |                   |
|---------------------|--------------------|-------------------|-------------------|
| STATIC WATER LEVEL  | GL- 5.74 m         | WATER TEMPERATURE | 29.6 °C           |
| DYNAMIC WATER LEVEL | GL- 7.60 m         | CONDUCTIVITY      | 310 $\mu S/cm$    |
| PUMPING RATE        | 300 (~307) $l/min$ | pH                | 7.5               |
| SPECIFIC CAPACITY   | 161.29 $l/min/m$   | TOTAL HARDNESS    | 122 $mg CaCO_3/l$ |



# WELL LOG

|                   |  |                                                                                                      |  |                                   |  |
|-------------------|--|------------------------------------------------------------------------------------------------------|--|-----------------------------------|--|
| PROJECT NAME      |  | Groundwater Development Study<br>In South Western Region of the Democratic<br>Republic of MADAGASCAR |  | WELL NO. 27                       |  |
| AREA AND LOCATION |  | Basibasy (Morombe Pr.)                                                                               |  |                                   |  |
| ELEVATION         |  | 95.0 m                                                                                               |  | LONGITUDE                         |  |
| TOTAL DEPTH       |  | 83.0 m                                                                                               |  | DRILLING RIG NANKYO SM-200        |  |
| DRILLING STARTED  |  | 29 September 1990                                                                                    |  | DRILLED BY MIEM & JICA Study Team |  |
| WELL COMPLETED    |  | 06 October 1990                                                                                      |  | LOGGED BY JHT6                    |  |

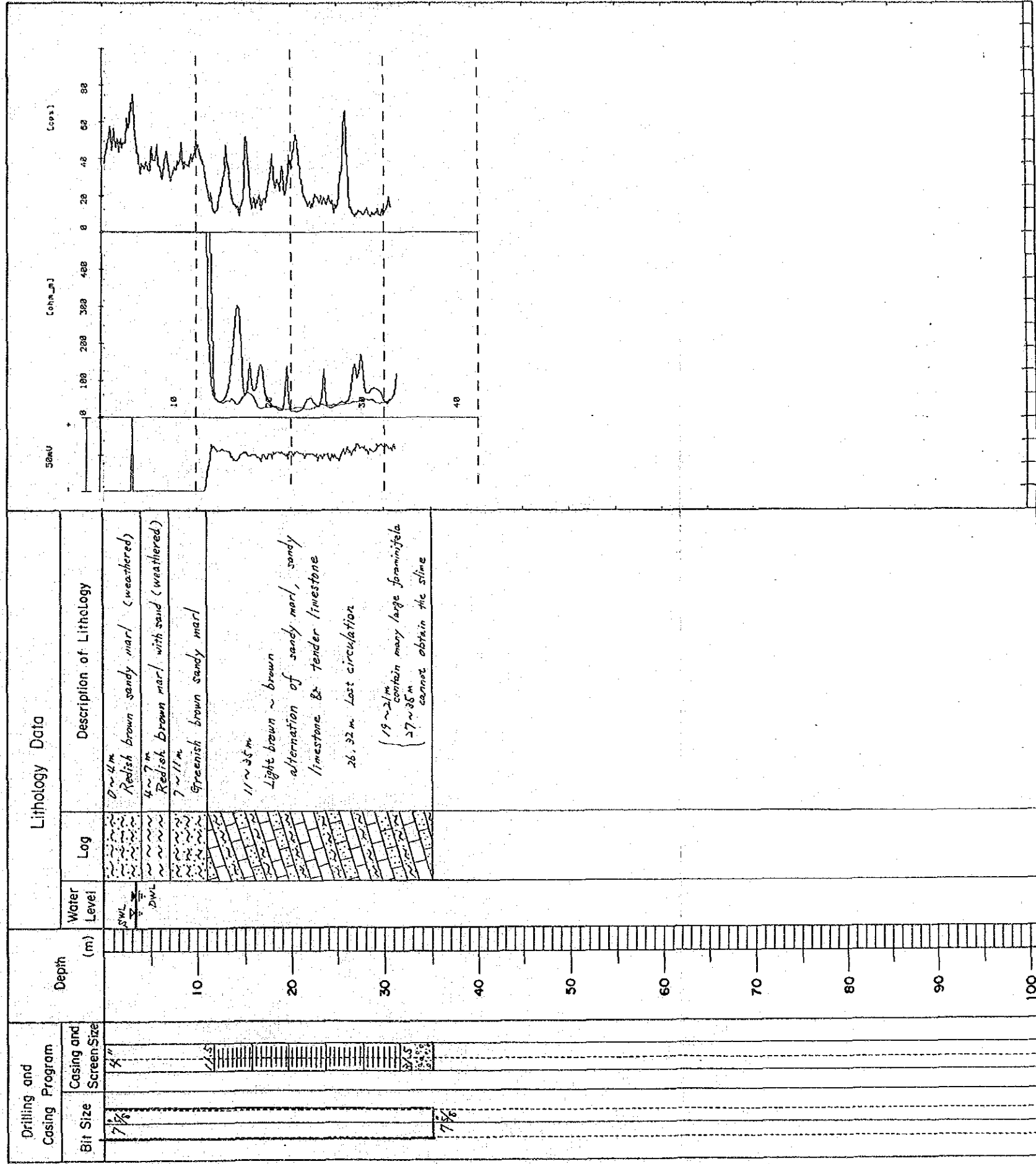
|                     |                            |                   |                               |
|---------------------|----------------------------|-------------------|-------------------------------|
| STATIC WATER LEVEL  | GL - 14.49 m               | WATER TEMPERATURE | 28.5 °C                       |
| DYNAMIC WATER LEVEL | GL - 44.27 m               | CONDUCTIVITY      | 2,740 $\mu\text{S/cm}$        |
| PUMPING RATE        | 20 l (~222) $\text{l/min}$ | PH                | 6.8                           |
| SPECIFIC CAPACITY   | 6.75 $\text{l/min/m}$      | TOTAL HARDNESS    | 1,060 $\text{mg/l as CaCO}_3$ |



# WELL LOG

|                   |                                          |                                                                                                      |               |             |  |
|-------------------|------------------------------------------|------------------------------------------------------------------------------------------------------|---------------|-------------|--|
| PROJECT NAME      |                                          | Groundwater Development Study<br>in South Western Region of the Democratic<br>Republic of MADAGASCAR |               | WELL NO. 28 |  |
| AREA AND LOCATION |                                          | Analatelo (Morombe Pre.)                                                                             |               |             |  |
| ELEVATION         | 164.0 m                                  | LATITUDE                                                                                             |               |             |  |
| TOTAL DEPTH       | 35.0 m                                   | DRILLING RIG                                                                                         | SANKYO SM-200 |             |  |
| DRILLING STARTED  | 14 September 1990 MIEM & JICA Study Team |                                                                                                      |               |             |  |
| WELL COMPLETED    | 01 October 1990 ditto                    |                                                                                                      |               |             |  |

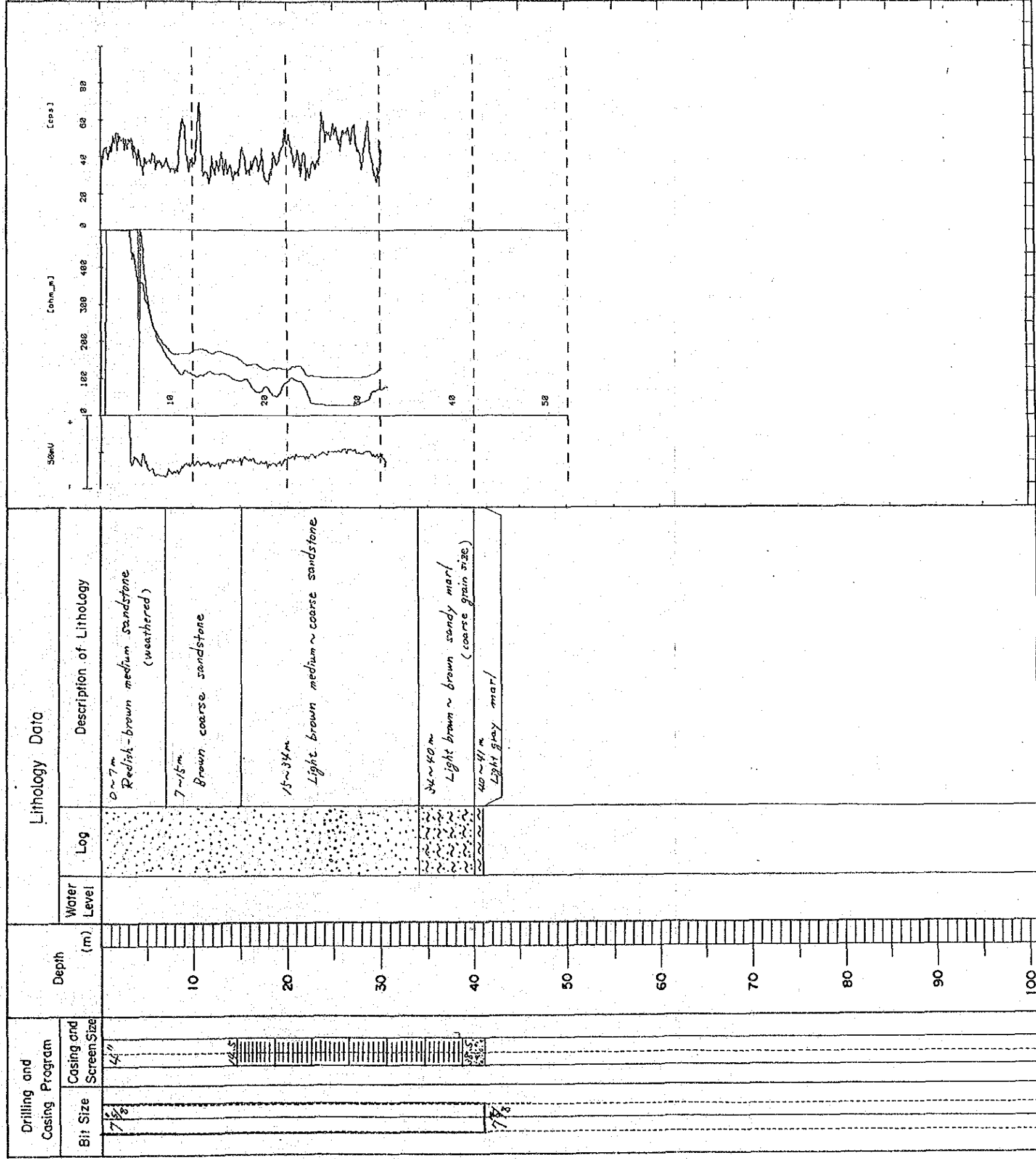
|                     |                                   |                   |                             |
|---------------------|-----------------------------------|-------------------|-----------------------------|
| STATIC WATER LEVEL  | GL - 3.18 m                       | WATER TEMPERATURE | 29.0 °C                     |
| DYNAMIC WATER LEVEL | GL - 3.24 m                       | CONDUCTIVITY      | 362 $\mu\text{S/cm}$        |
| PUMPING RATE        | 30 l (~32 l) /min                 | pH                | 7.4                         |
| SPECIFIC CAPACITY   | 5.016.67 $\mu\text{m}^3/\text{m}$ | TOTAL HARDNESS    | 145 $\text{mg/L as CaCO}_3$ |



# WELL LOG

|                   |                                                                                                      |              |                        |    |
|-------------------|------------------------------------------------------------------------------------------------------|--------------|------------------------|----|
| PROJECT NAME      | Groundwater Development Study<br>in South Western Region of the Democratic<br>Republic of MADAGASCAR |              | WELL NO.               | 29 |
| AREA AND LOCATION | Mangotroka (Morombe Pre.)                                                                            |              |                        |    |
| ELEVATION         | 147.0 m                                                                                              | LATITUDE     |                        |    |
| TOTAL DEPTH       | 41.0 m                                                                                               | DRILLING RIG | SANKYO SM-200          |    |
| DRILLING STARTED  | 07. September 1990                                                                                   | DRILLED BY   | MIEM & JICA Study Team |    |
| WELL COMPLETED    | 13. September 1990                                                                                   | LOGGED BY    | JMT                    |    |

|                     |                  |                   |                       |
|---------------------|------------------|-------------------|-----------------------|
| STATIC WATER LEVEL  | GL - 3.57 m      | WATER TEMPERATURE | 28.5 °C               |
| DYNAMIC WATER LEVEL | GL - 5.29 m      | CONDUCTIVITY      | 141 $\mu S/cm$        |
| PUMPING RATE        | 336 $l/min$      | PH                | 7.0                   |
| SPECIFIC CAPACITY   | 195.25 $l/min/m$ | TOTAL HARDNESS    | 40 $mg/l$ as $CaCO_3$ |



# WELL LOG

|                   |                                                                                                      |              |                        |      |
|-------------------|------------------------------------------------------------------------------------------------------|--------------|------------------------|------|
| PROJECT NAME      | Groundwater Development Study<br>in South Western Region of the Democratic<br>Republic of MADAGASCAR |              | WELL NO.               | 52-0 |
| AREA AND LOCATION | Soahazo (Toliara Pre.)                                                                               |              |                        |      |
| ELEVATION         | 199.0 m                                                                                              | LATITUDE     |                        |      |
| TOTAL DEPTH       | 72.0 m                                                                                               | DRILLING RIG | SANKHO SM-200          |      |
| DRILLING STARTED  | 03. July 1990                                                                                        | DRILLED BY   | MIEM & JICA Study Team |      |
| WELL COMPLETED    | 07. July 1990                                                                                        | LOGGED BY    | ditto                  |      |

|                     |   |                   |    |
|---------------------|---|-------------------|----|
| STATIC WATER LEVEL  | m | WATER TEMPERATURE | °C |
| DYNAMIC WATER LEVEL | m | CONDUCTIVITY      |    |
| PUMPING RATE        |   | PH                |    |
| SPECIFIC CAPACITY   |   | TOTAL HARDNESS    |    |

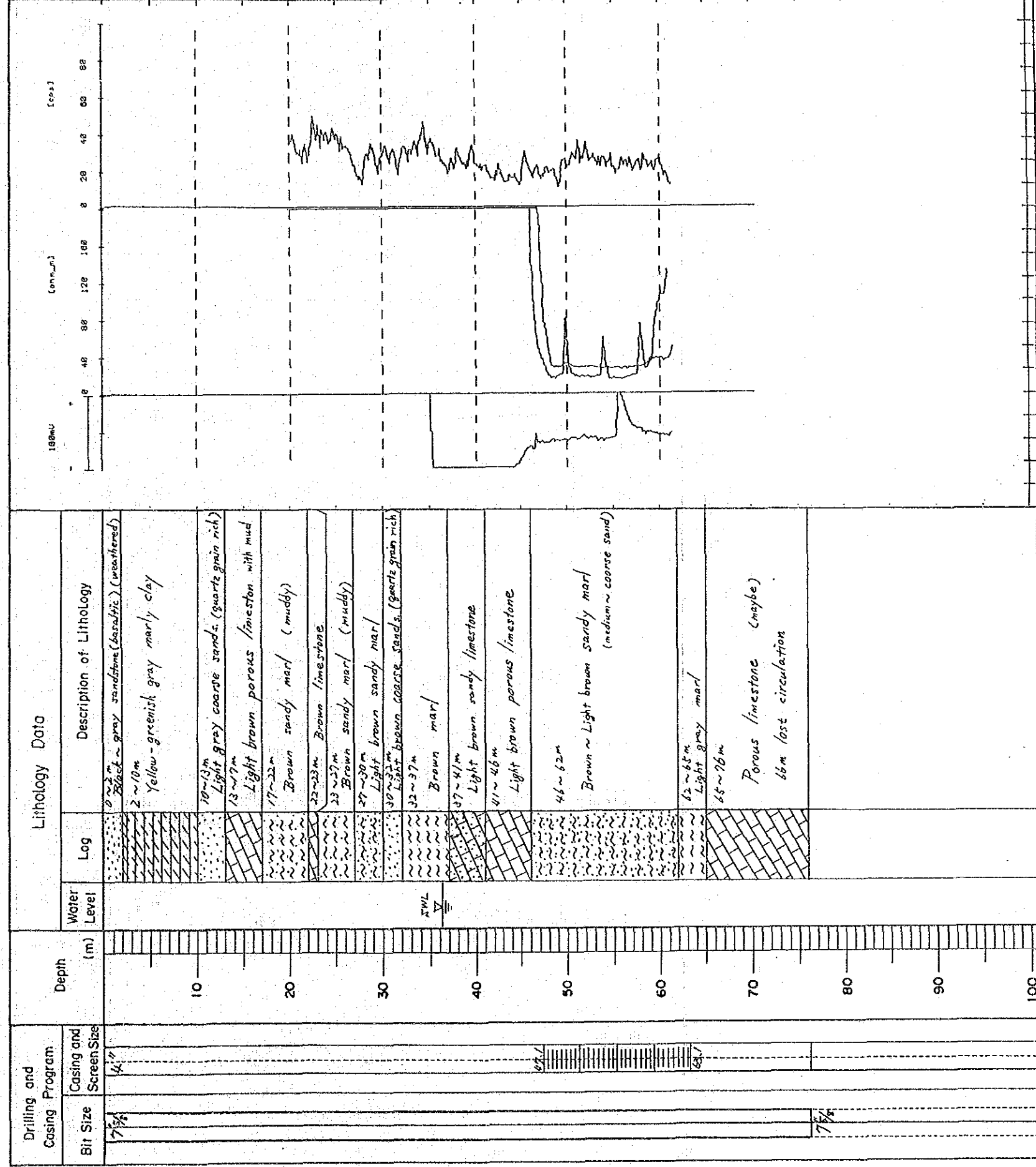
| Drilling and Casing Program | Depth (m) | Lithology Data |                                                                                             | 500mv (ohm-m) | (cps) |
|-----------------------------|-----------|----------------|---------------------------------------------------------------------------------------------|---------------|-------|
|                             |           | Water Level    | Description of Lithology                                                                    |               |       |
| Bit Size<br>75/8            |           |                | 0-2m Black-gray sands (skeletal) (weathered)                                                |               |       |
|                             |           |                | 2-4m Yellow-greenish gray marly clay                                                        |               |       |
|                             |           |                | 4-8m Gray sandy marl                                                                        |               |       |
|                             | 10        |                | 8-15m Light gray medium-coarse sandstone (quartz grain rich)                                |               |       |
|                             |           |                | 15-19m Light brown porous limestone                                                         |               |       |
|                             | 20        |                | 17-22m Brown sandy marl (fine-medium sand) (under part is more muddy)                       |               |       |
|                             |           |                | 22-27m Brown calcareous sandstone (medium-very coarse sand)                                 |               |       |
|                             | 30        |                | 27-39m Light brown alternated limestone & sandy marl (fine-medium sand) with little fossils |               |       |
|                             |           |                | 39-44m Light brown porous limestone                                                         |               |       |
|                             | 40        |                | 44-50m Light brown sandy limestone                                                          |               |       |
|                             |           |                | 50-53m Brown sandy marl (fine-medium sand)                                                  |               |       |
|                             | 50        |                | 53-65m Light brown sandy marl (medium coarse sand) with tender limestone                    |               |       |
|                             |           |                | 65-75.5m Porous limestone (maybe) 65.8m last circulation                                    |               |       |
|                             | 70        |                |                                                                                             |               |       |
|                             | 80        |                |                                                                                             |               |       |
|                             | 90        |                |                                                                                             |               |       |
|                             | 100       |                |                                                                                             |               |       |



# WELL LOG

|                   |                                                                                                      |              |                        |        |
|-------------------|------------------------------------------------------------------------------------------------------|--------------|------------------------|--------|
| PROJECT NAME      | Groundwater Development Study<br>in South Western Region of the Democratic<br>Republic of MADAGASCAR |              | WELL NO.               | 52 - 1 |
| AREA AND LOCATION | Soahazo (Toliara Per.)                                                                               |              |                        |        |
| ELEVATION         | 199.0 m                                                                                              | LATITUDE     | LONGITUDE              |        |
| TOTAL DEPTH       | 76.0 m                                                                                               | DRILLING RIG | SANKYO SM-200          |        |
| DRILLING STARTED  | 03 July 1990                                                                                         | DRILLED BY   | MIEM & JICA Study Team |        |
| WELL COMPLETED    | 12 July 1990                                                                                         | LOGGED BY    | ditto                  |        |

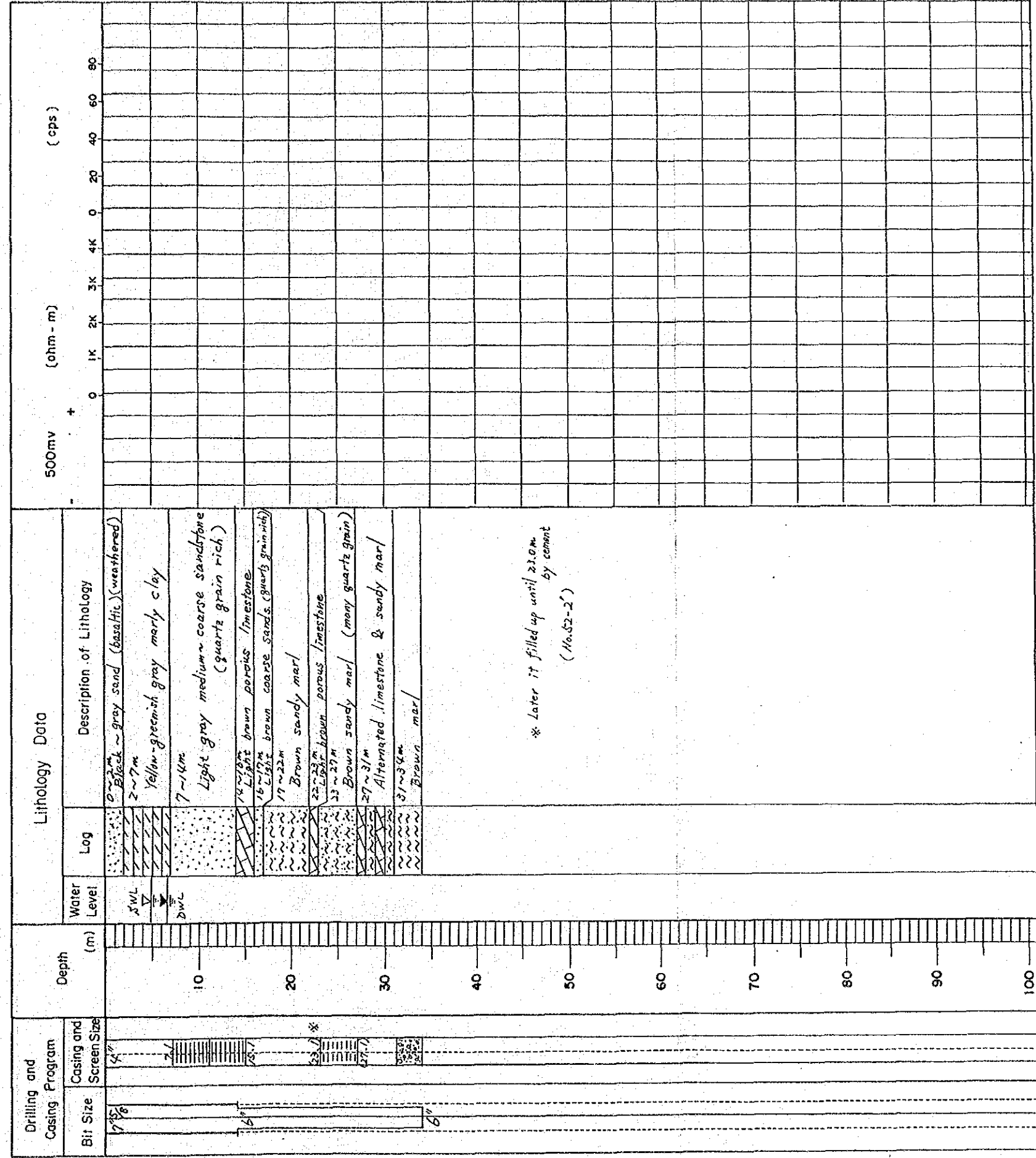
|                     |                    |                   |                                |
|---------------------|--------------------|-------------------|--------------------------------|
| STATIC WATER LEVEL  | GL--36.17 m        | WATER TEMPERATURE | 28.0 °C                        |
| DYNAMIC WATER LEVEL | GL -37.25 m        | CONDUCTIVITY      | 1,080 $\mu S/cm$               |
| PUMPING RATE        | 130 (~293) $l/min$ | PH                | 7.3                            |
| SPECIFIC CAPACITY   | 120.37 $l/min/m$   | TOTAL HARDNESS    | 342 $ppm$ as CaCO <sub>3</sub> |



# WELL LOG

|                   |                                                                                                      |              |                        |      |
|-------------------|------------------------------------------------------------------------------------------------------|--------------|------------------------|------|
| PROJECT NAME      | Groundwater Development Study<br>in South Western Region of the Democratic<br>Republic of MADAGASCAR |              | WELL NO.               | 52-2 |
| AREA AND LOCATION | Soahazo (Toliara Per.)                                                                               |              |                        |      |
| ELEVATION         | 199.0 m                                                                                              | LATTITUDE    |                        |      |
| TOTAL DEPTH       | 34.0 m                                                                                               | DRILLING RIG | SANKYO SM-200          |      |
| DRILLING STARTED  | 13 July 1990                                                                                         | DRILLED BY   | MIEM & JICA Study Team |      |
| WELL COMPLETED    | 17 July 1990                                                                                         | LOGGED BY    | ditto                  |      |

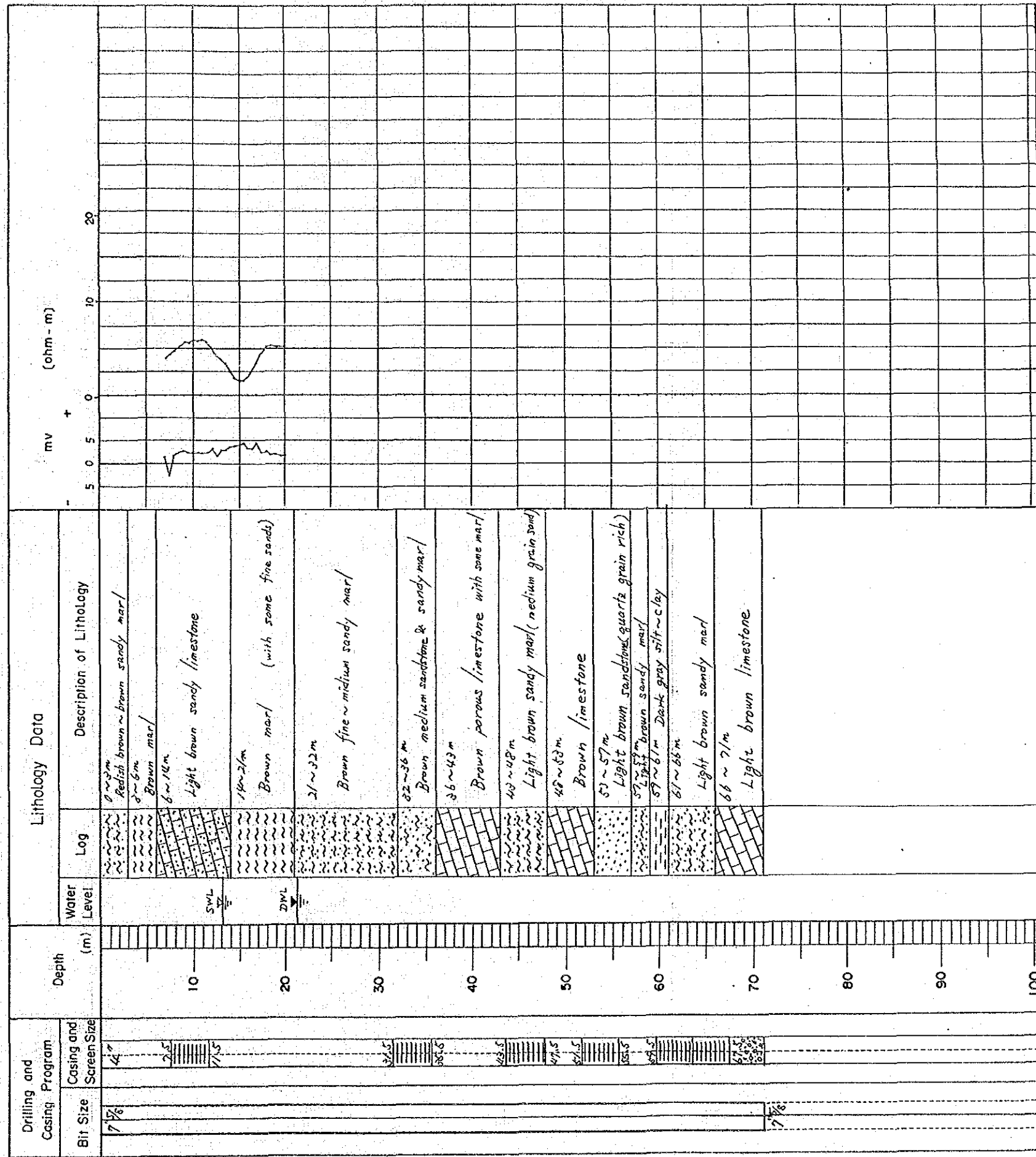
|                     |                 |                   |                   |
|---------------------|-----------------|-------------------|-------------------|
| STATIC WATER LEVEL  | GL- 4.90 m      | WATER TEMPERATURE | 27.8 °C           |
| DYNAMIC WATER LEVEL | GL- 10.62 m     | CONDUCTIVITY      | 3,630 $\mu S/cm$  |
| PUMPING RATE        | 167 $l/min$     | PH                | 7.4               |
| SPECIFIC CAPACITY   | 29.2 $l/min/cm$ | TOTAL HARDNESS    | 696 $mg/l CaCO_3$ |



# WELL LOG

|                   |              |                                                                                                      |                        |             |  |
|-------------------|--------------|------------------------------------------------------------------------------------------------------|------------------------|-------------|--|
| PROJECT NAME      |              | Groundwater Development Study<br>in South Western Region of the Democratic<br>Republic of MADAGASCAR |                        | WELL NO. 53 |  |
| AREA AND LOCATION |              | Analamisampy (Toliara Pre.)                                                                          |                        |             |  |
| ELEVATION         | 190.0 m      | LATTITUDE                                                                                            |                        |             |  |
| TOTAL DEPTH       | 71.0 m       | DRILLING RIG                                                                                         | SANKYO SM-2000         |             |  |
| DRILLING STARTED  | 18 July 1990 | DRILLED BY                                                                                           | MIEM & JICA Study Team |             |  |
| WELL COMPLETED    | 25 July 1990 | LOGGED BY                                                                                            | ditto                  |             |  |

|                     |                     |                   |                        |
|---------------------|---------------------|-------------------|------------------------|
| STATIC WATER LEVEL  | GL - 13.11 m        | WATER TEMPERATURE | 28.5 °C                |
| DYNAMIC WATER LEVEL | GL - 21.30 m        | CONDUCTIVITY      | 1,350 $\mu S/cm$       |
| PUMPING RATE        | 30.0 (~112) $l/min$ | pH                | 7.2                    |
| SPECIFIC CAPACITY   | 3.71 $l/min/m$      | TOTAL HARDNESS    | 464 $mg/l$ as $CaCO_3$ |



# WELL LOG

|                   |  |                                                                                                      |  |                                   |  |
|-------------------|--|------------------------------------------------------------------------------------------------------|--|-----------------------------------|--|
| PROJECT NAME      |  | Groundwater Development Study<br>in South Western Region of the Democratic<br>Republic of MADAGASCAR |  | WELL NO. 54                       |  |
| AREA AND LOCATION |  | Belitsaka (Toliara Pre.)                                                                             |  |                                   |  |
| ELEVATION         |  | 184.0 m                                                                                              |  | LONGITUDE                         |  |
| TOTAL DEPTH       |  | 66.0 m                                                                                               |  | DRILLING RIG SANNYO SM-200        |  |
| DRILLING STARTED  |  | 26 July 1990                                                                                         |  | DRILLED BY MIEM & JICA Study Team |  |
| WELL COMPLETED    |  | 31 July 1990                                                                                         |  | LOGGED BY ditto                   |  |

|                     |                    |                   |                        |
|---------------------|--------------------|-------------------|------------------------|
| STATIC WATER LEVEL  | GL - 12.78 m       | WATER TEMPERATURE | 28.5 °C                |
| DYNAMIC WATER LEVEL | GL - 27.48 m       | CONDUCTIVITY      | 2.080 $\mu S/cm$       |
| PUMPING RATE        | 200 (~270) $l/min$ | pH                | 7.0                    |
| SPECIFIC CAPACITY   | 13.61 $l/min/m$    | TOTAL HARDNESS    | 748 $mg/l$ as $CaCO_3$ |

| Drilling and Casing Program | Depth (m) | Lithology Data |                                                                                | 500mv + (ohm-m) | (cps) |
|-----------------------------|-----------|----------------|--------------------------------------------------------------------------------|-----------------|-------|
|                             |           | Log            | Description of Lithology                                                       |                 |       |
| 7 1/8" Bit Size             | 0-7 m     |                | Light brownish gray porous limestone                                           |                 |       |
| 4" Casing and Screen Size   | 7-10 m    |                | Brown sandy marl (fine sand)                                                   |                 |       |
|                             | 10-14 m   |                | Light brown marl                                                               |                 |       |
|                             | 14-29 m   |                | Brown sandy marl (very fine to medium sand)                                    |                 |       |
|                             | 29-34 m   |                | Gray to light brown medium sandstone (quartz grain rich)                       |                 |       |
|                             | 34-40 m   |                | Light brown sandy marl                                                         |                 |       |
|                             | 40-56 m   |                | Brown to light brown alternation of marl & sandy marl (water part: more muddy) |                 |       |
|                             | 56-61 m   |                | Light brown coarse sandstone (quartz grain rich)                               |                 |       |
|                             | 61-66 m   |                | Dark gray silt to clay                                                         |                 |       |
|                             | 66-100 m  |                |                                                                                |                 |       |