4.6 RADON EMANATION TECHNIQUE

In collaboration with Dr Manie Levin of Africon Engineering Inc. a radon emanation technique was used at PHYS 7. The fracture zone was identified using geological mapping and it was attempted to locate the same fracture of PHYS 7 where soil cover made it impossible to visually identify the fracture at the given position. EM-34 and magnetic surveys gave little indication of the position of the fracture and a radon traverse was set out over the approximate locality of the fracture. The cups with radon films were placed 10 m apart at a depth of 50 cm and were left for 3 weeks, after which they were retrieved.

Three boreholes were drilled using the results obtained from the radon emanation results and all the boreholes intersected faults and had blow yield in excess of 0.9 l/s (Figure 17). These boreholes served as observation boreholes during the pump testing at PHYS 7.

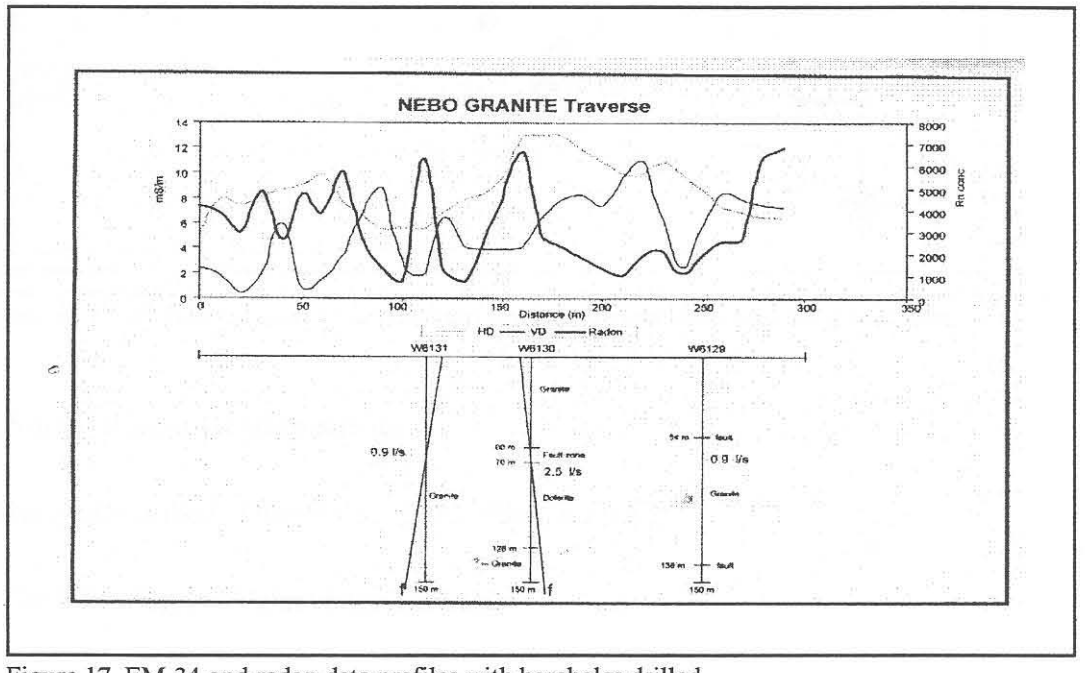

Figure 17. EM-34 and radon data profiles with boreholes drilled.

4.7 CONSTRUCTION OF NEW BOREHOLES

The boreholes sited as mentioned above, were drilled with percussion drilling rigs supplied by the Department of Water Affairs and Forestry. At each position several boreholes were drilled to ensure that the specific target is intersected (Figure 18). Additional observation boreholes were also drilled. In total ninety five boreholes were drilled which include the boreholes drilled for the geophysical project. The boreholes have an average blow yield of 2.25 l/s.

A short description of the borehole profiles drilled during the structural investigation and the final drilling setup at each PHYS follows:

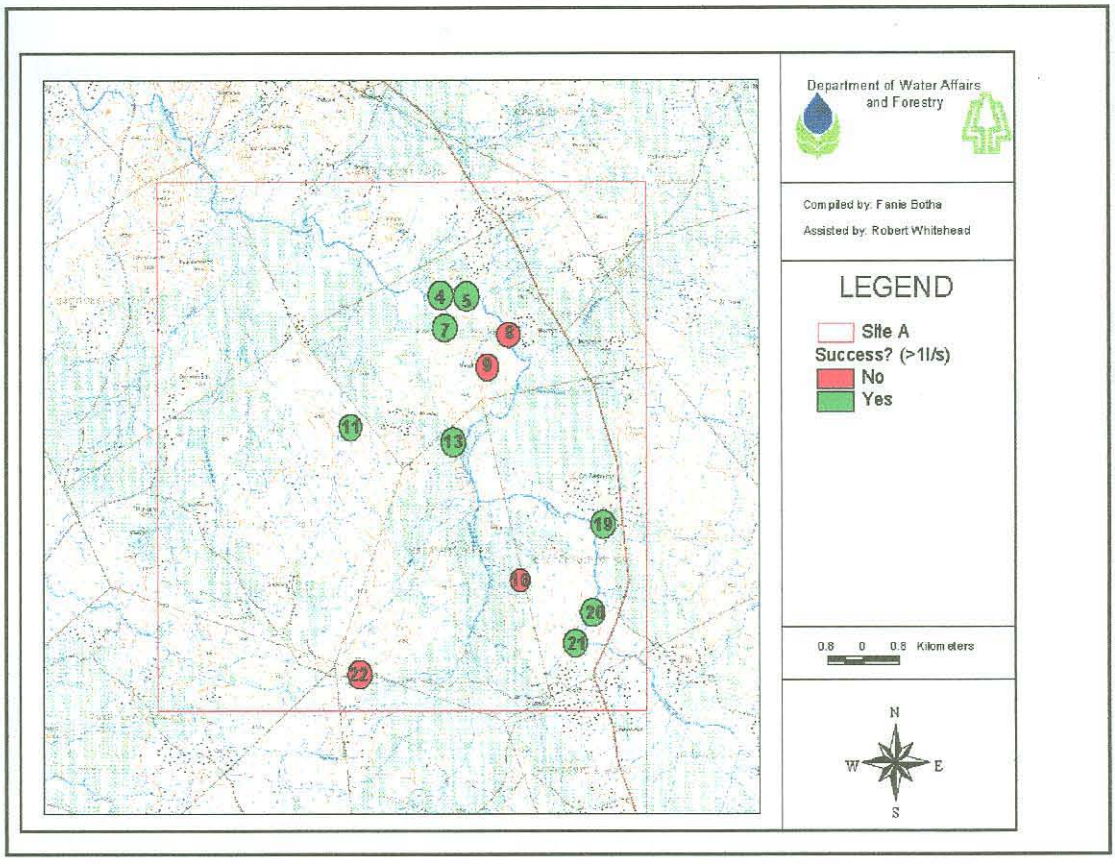

Figure 18. PHYS selected during the structural investigation and also indicating successes.

4.7.1 Potential high yielding site no. 4

Boreholes drilled : H06-1043, -1042,-1080 & -1081.

The following geological horizons occur:

Colluvium	Brown to orange brown, silty to clayey medium sand with fine to coarse quartz gravel.
Slightly weathered granite	White grey sand
Fresh granite	White grey coarse sand with medium quartz and orthoclase gravel.

The profile consists of a thin colluvium layer, followed by a slightly weathered granitic layer with a gradual decrease in weathering, until fresh granite is intersected. Boreholes H06-1043 and H06-1042 were each drilled on a prominent joint structure identified in the field. Both boreholes have basically the same geological profile. Jointing do occur and quartz rich fractures were intersected at depths from 67 to 109 metres in borehole H06-1043. H06-1043 had a major water strike at 67 metres with a blow yield of 3 l/s. Two additional observation boreholes were drilled. H06-1080 was drilled 100 metres from H06-1043 and H06-1081 25 metres from H06-1043 (Appendix 1, PHYS 4).

4.7.2 Potential high yielding site no.5

Borehole drilled: H06-0907.

The following geological horizons occur:

Colluvium	Brown to orange brown, silty to clayey medium sand with fine to coarse quartz gravel.
Moderately weathered granite	Yellow to white grey sand
Slightly weathered granite	White grey sand
Fresh granite	White grey coarse sand with medium quartz and orthoclase gravel.

Only one borehole H06-0907 was drilled. The borehole profile typically consists of a thin colluvium layer, followed by a moderately to slightly weathered layer and terminates in fresh granite. The strike was within a fracture zone consisting of coarse quartz gravel (20 mm). The borehole was drilled to a depth of 60 metres with water strikes recorded at 34, 35 and 36 metres. A blow yield of 1.8 l/s was measured and additional observation boreholes were drilled (Appendix 1, PHYS 5).

4.7.3 Potential high yielding site no.7

Boreholes drilled: H06-0908, -0909,-0910,-1491,-1492,-1493,-1494,-1040,-1061 & -1076.

The following geological horizons occur:

Colluvium	Brown to orange brown, silty to clayey medium sand with fine to coarse quartz gravel.
Moderately weathered granite	Yellow to white grey sand
Slightly weathered granite	White grey sand
Fresh granite	White grey coarse sand with medium quartz and orthoclase gravel.
Fractured dolerite	Black grey coarse grained sand with gravel (30 mm)
Fresh dolerite	Grey black fine grained sand

Ten boreholes were drilled to investigate the structural linear feature. The borehole profiles typically consist of a thin colluvium layer, followed by a moderately to slightly weathered granite layer and terminates in fresh granite. Initially four exploration boreholes were drilled H06-0908, 0909, 0910 and -1492. H06-0910 had the highest blow yield and was drilled to a depth of 96 metres with water strikes recorded from 52 metres up to 62 metres and at 80 metres. The water strikes occur in fracture zones consisting of white coarse quartz sand. A blow yield of 25 l/s was recorded. Three additional observation boreholes were drilled. Three boreholes, H06-1040,-1493 &-1494 were drilled for the radon emanation project. The linear feature striking 120° were intersected and identified as a dolerite dyke. At H06-1492 water strikes were recorded at 42 to 56 metres, yielding 2 l/s (Appendix 1, PHYS 7).

4.7.4 Potential high yielding site no.8

Boreholes drilled: H06-1022, -1034, -1035, -1036, & -1037.

The following geological horizons occur:

Colluvium	Brown to orange brown, silty to clayey medium sand with fine to coarse quartz gravel.
Fresh granite	White grey coarse sand with medium quartz and orthoclase gravel.

Five boreholes were drilled and the profiles typically consist of a thin colluvium layer followed by fresh granite. The boreholes were drilled to depths of up to 90 metres with no water strikes recorded (Appendix 1, PHYS 8).

4.7.5 Potential high yielding site no.9

Borehole drilled: H06-1041.

The following geological horizons occur:

Colluvium	Brown to orange brown, silty to clayey medium sand with fine to coarse quartz gravel.
Moderately weathered Granite	Yellow brown to grey, medium to fine grained sand.
Fresh granite	White grey coarse sand with medium quartz and orthoclase gravel.

One borehole was drilled which intersected a thin colluvium layer, followed by moderately weathered granite and fresh granite. The borehole was drilled to a depth of 150 metres with no water strikes recorded (Appendix 1, PHYS 9).

4.7.6 Potential high yielding site no.11

Boreholes drilled: H06-0913, -0914, -1495, -1496, -1497, -1064, -1065 and -1066.

The following geological horizons occur:

Colluvium	Brown, clayey medium sand with fine to coarse quartz gravel.
Alluvium	Dark grey silty clay.
Residual granite	Yellow brown grey clayey sand.
Fresh granite	Pinkish grey medium grained quartz and orthoclase sand
Highly weathered dolerite	Dark brown silty clay.
Slightly weathered dolerite	Grey black coarse sand with gravel (20 mm).
Fresh dolerite	Grey black coarse sand with gravel (20 mm).

Initially boreholes H06-0913, -0914, -1495, -1496 and -1497 were drilled with the

profiles showing a thin colluvial or alluvial layer, followed by a highly weathered dolerite or granite layer and progressing through alternating layers of fresh granite and dolerite. No water strikes were recorded on the contacts. Water strikes typically occur in the fracture zone consisting of coarse quartz gravel. The boreholes were drilled to depths of up to 150 metres with water strikes in H06-1496 recorded at 87 metres, 100 metres and 102 metres. A blow yield of 3 l/s was recorded at H06-1496. Three additional observation boreholes were drilled (Appendix 1, PHYS 11).

4.7.7 Potential high yielding site no.13

Boreholes drilled: H06-0911, -1038, -1039, -1062 & -1063.

The following geological horizons occur:

Colluvium	Brown, clayey medium sand with fine to coarse quartz gravel.
Alluvium	Dark grey silty clay.
Highly weathered granite	Yellow brown coarse sand with gravel.
Fresh granite	Grey white medium grained quartz and orthoclase sand.
Fresh dolerite	Grey black coarse sand with gravel (20 mm).
Fracture zone	Yellow grey medium to fine grained sand.

Three exploration boreholes were drilled. Boreholes H06-0911, -1038 & 1039 typically intersect a thin colluvial layer, followed by a highly weathered dolerite or granite layer and progressing through alternating layers of fresh granite and dolerite. In borehole H06-1038 strikes occurred at 30m, 33m, 39m, 51m and 98 metres. Strikes occur in fracture zones consisting of coarse quartz gravel (20 mm). No strikes were recorded on the contact between the granite and dolerite. H06-1038 was drilled to a depth of 102 metres and a blow yield of 36 l/s was recorded. Two additional observation boreholes were drilled (Appendix 1, PHYS 13).

4.7.8 Potential high yielding site no.16

Boreholes drilled: H06-1477.

The following geological horizons occur:

Colluvium	Brown brown, silty medium sand with fine to coarse quartz gravel.
Fresh granite	White grey coarse sand with medium quartz and orthoclase gravel.
Fractured dolerite	Black grey gravel(50 - 10 mm)

Only one borehole was drilled. The borehole profile typically consists of a thin colluvium layer, followed by a moderately to slightly weathered granite layer and terminates in fresh granite. No water strikes were recorded and no additional observation boreholes were drilled (Appendix 1, PHYS 16).

4.7.9 Potential high yielding site no.19

Boreholes drilled: H06-1049, -1059, -1060, -1450 & 1451.

The following geological horizons occur:

Colluvium	Brown to orange brown, silty to clayey medium sand with fine to coarse quartz gravel.
Moderately weathered granite	Yellow to white grey sand
Slightly weathered granite	White grey sand
Fresh granite	White grey coarse sand with medium quartz and orthoclase gravel.
Fractured dolerite	Black grey gravel (50 - 10 mm)

Three exploration boreholes were drilled (H06-1049, -1050 & -1051). The borehole profiles consist of a thin colluvium layer, followed by a moderately to slightly weathered layer of granite and terminates in fresh granite. H06-1049 and H06-1060 terminate in fractured dolerite, both boreholes having their water strikes in the fracture dolerite. H06-1049 was drilled to a depth of 72 metres with water strikes recorded at 55 metres and 65 metres. A blow yield of 12 l/s was measured in borehole H06-1049. Two additional observation boreholes were drilled (Appendix 1, PHYS 19).

4.7.10 Potential high yielding site no.20

Boreholes drilled: H06-1055, -1054, -1048, -1056, -1057, -1058 & -1422

The following geological horizons occur:

Colluvium	Brown to orange brown, silty to clayey medium sand with fine to coarse quartz gravel.
Moderately weathered granite	Yellow to white grey sand
Slightly weathered granite	White grey sand
Fresh granite	White grey coarse sand with medium quartz and orthoclase gravel.
Fracture zone	White pink, coarse sand with gravel.

Three exploration boreholes were drilled (H06-1054, -1055 and -1056). The borehole profiles consist of a thin colluvium layer, followed by fresh granite and intersecting a fracture zone right at the bottom. The boreholes are all artesian with H06-1054 yielding 0.5 l/s. H06-1054 was drilled to a depth of 126 metres with water strikes recorded at 101 metres, 121 metres and 126 metres. A blow yield of 6 l/s was measured. Four additional observation boreholes were drilled (Appendix 1, PHYS 20).

4.7.11 Potential high yielding site no.21

Boreholes drilled: H06-1420 & H06-1423

The following geological horizons occur:

Colluvium	Brown to orange brown, silty to clay medium sand with fine to coarse quartz gravel.
Residual Granite	Yellow brown clayey sand
Fresh granite	White grey coarse sand with medium quartz and orthoclase gravel.

One exploration borehole was drilled (H06-1423). The borehole profile consists of a thin colluvium layer, followed by a residual granite layer and almost immediately terminates in fresh granite. The borehole intersected a deep fractured. The borehole was drilled to a depth of 106 metres with a water strike recorded at 96 metres. A blow yield of 3.8 l/s was measured. One additional observation borehole was drilled (Appendix 1, PHYS 21).

4.7.12 Potential high yielding site no.22

Borehole drilled: H06-0915.

The following geological horizons occur:

Colluvium	Brown, silty to clay with coarse dolerite gravel.
Moderately weathered dolerite	Black brown, fine clayey sand
Fresh dolerite	Grey black fine sand
Fresh granite	White grey coarse sand with medium quartz and orthoclase gravel.

One exploration borehole was drilled. The borehole profile consists of a thin colluvium layer, followed by a moderately to slightly weathered dolerite layer, followed by a fresh dolerite layer and terminating in fresh granite. No water strike was recorded and no futher boreholes were drilled (Appendix 1, PHYS 22).

4.8 CORE DRILLING

One core borehole was drilled at PHYS 20 next to percussion borehole H06-1054. The borehole was drilled to a depth of 149 metres after which the drilling equipment were flooded due to an intensive rain storm. The core was extracted with the wire-line method, measured and placed into core boxes. The core was inspected during drilling and notes were taken. However, only limited information was obtained due to the fact that most of the core was lost due to the sudden flood. The core was not

Frame 11 Artesian borehole drilled.

described and most of the results obtained were destroyed during the flood. The borehole was artesian and had a yield of 3.5 l/s (Frame 11). Prominent vertical joints and shear plains were identified in the core. Sulphate minerals were also observed in the vertical fractures.

4.9 BOREHOLE EVALUATION

4.9.1 Pump testing

After completion of the drilling programme some of the boreholes some were selected for pump testing (Table 8).

Table 8. Boreholes selected for pump testing.

Region borehole number	PHYS	Depth of borehole (m)	Casing Height above ground level (m)	Casing Depth (m)	Deepest water strike(m)	Static Water level (m)	Air lift (l/s)	Type of test
H06 0881	1	-	-	12	34	-	4.1	72hrs
H06 0882	2	33.3	-	12	14	2.35	6	72hrs
H06 1043	4	126	0.37	6	67	3.25	3	72hrs
H06 0907	5	60	0	3	60	2.69	1.8	72hrs
H06 0910	7	96	0.58	5.5	82	2.55	25	72hrs
H06 1028	10	72	0.3	3	60	4.63	3.4	72hrs
H06 1496	11	150	0.4	15	100	1.55	3	36hrs
H06 1038	13	102	0.35	3	98	13.04	36	72hrs
H06 1046	16	150	0.37	20	24	9.88	3	72hrs
H06 1448	18	138	0.45	18	66	22.47	3	72hrs
H06 1049	19	72	0.45	12	72	17.9	12	72hrs
H06 1054	20	135	0.42	12	126	0	6	72hrs
H06 1420	21	106	-	18	106	10.8	3.6	72hrs

Structural geology	Geophysical

Thirteen boreholes were pump tested which included four boreholes drilled during the geophysical investigation. The drilling results of these boreholes are not discussed in any detail in this thesis. Most boreholes tested had several observation boreholes available. All the boreholes were tested for 72 hours, except boreholes H06-1496 & H06-0907. All boreholes were allowed to recover to at least 95 % recovery or until no further significant recovery could be measured. The pump tests included a stepped draw down test, constant draw down test and a recovery test (Table 9). The observation boreholes were only monitored during the constant draw down and the recovery tests. All the data were recorded and was captured in a database (Appendix 2).

Table 9. Basic pump test results

Regional borehole number	PHYS	Number of observation boreholes	S.W.L.	Pump test						Number of water samples
				Number of steps	CD			Recovery		
					L/s	Draw down (m)	Duration (min)	%	min	
H06 0881	1	0	7.5	4	2	4.1	1440	100	480	1
H06 0882(A)	4	0	2.35	4	5.1	4	1440	88	2880	1
H06 0882(B)	4	4	1.69	4	5	3.8	4320	82	5720	3
H06 1043(A)	4	4	3.25	4	1.9	17.81	1440	84	2280	1
H06 1043(B)	4	3	3.58	3	3	4.68	4320	88	10080	3
H06 0907	5	0	2.43	4	2.1	29.7	2880	100	1760	3
H06 0910(A)	7	3	2.05	3	5.1	47	4320	75	4320	1
H06 0910(B)	7	5	3.63	5	7	54.13	4320	97	10080	3
H06 1028	10	3	5.48	3	1.4	37.23	4320	99	2760	3
H06 1496	11	5	2.43	3	1	65.87	2160	100	2160	2
H06 1038	14	6	10.28	4	16	81.43	4320	72	8640	3
H06 1046	16	1	In	community	land					3
H06 1448	19	4	22.6	4	2.1	29.7	4320	100	540	3
H06 1049	20	3	3.2	4	10	37.49	4320	55	4320	3
H06 1054	21	4	0	3	5.1	68.09	4320	100	10	3
H06 1420	22	3	11.68	3	2.1	24.28	4320	100	1200	3

Boreholes H06-0882, -1043 and -0907 were all tested during a community water supply project but it was decided to repeat the pumping tests and compare the results.

A summary of the results at each pumped borehole follows:

- H06-0881 The borehole was tested during a previous project and is already incorporated into a community water supply programme. The borehole has a depth of 50,5 m with a static water level measured at 7.50 m. A stepped draw down test was conducted consisting of 3 steps yielding 1, 2 and 4 l/s. Recovery was reached after completion and a constant discharge test was conducted with a pump rate of 2 l/s (Appendix 2).The constant discharge test was stopped after 24 hours and 100% recovery was reached after 480 minutes. No observation boreholes were monitored (Table 10).

- H06 0882(A) Initially the borehole was drilled to a depth of 27.30 m with a static water level measured at 2.35 m. The pump was installed at

a depth of 27.00 m. A stepped draw down test was conducted consisting of 4 steps yielding 1.1, 2.5, 5.1, and 9.36 l/s. Recovery was reached after completion and a constant discharge test was conducted with a pump rate of 5.1 l/s (Appendix 2). The constant discharge test was stopped after 24 hours and 88% recovery was reached after 2880 minutes. No observation boreholes were monitored.

- H06 0882(B) The borehole was tested previously and will be incorporated into a community water supply programme. The borehole however was drilled deeper to a depth of 33.75 metres from its original depth of 27.3 metres. It had a static water level at 1.69 m and the pump was installed at 32 m. A stepped draw down test was conducted consisting of 4 steps yielding 1, 2, 4, and 8.4 l/s. Recovery was reached after completion and a constant draw down test was conducted with a pumping rate of 5.1 l/s (Appendix 2). The constant discharge test was stopped after 72 hours and 82% recovery was reached after 5720 minutes. Four observation boreholes were monitored (Table 10).

- H06 1043(A) The borehole has a depth of 124 m with a static water level at 3.25m. The pump was installed at a depth of 45 m. A stepped draw down test was conducted consisting of 4 steps yielding 1.1, 2.2, 3 and 3.47 l/s. Recovery was reached after completion and a constant discharge test was conducted at a pump rate of 1.89 l/s (Appendix 2). The constant discharge test was stopped after 24 hours and 84% recovery was reached after 1440 minutes. No observation boreholes were monitored.

- H06 1043(B) This borehole was tested previously and may still be incorporated into a community water supply programme. The borehole however was only tested for a 24 hour constant discharge period and a longer test was required. The borehole has a depth of 124.0 m with a static water level measured at 3.5 m. The pump was installed at a depth of 68.00 m. A stepped draw down test was conducted consisting of 4 steps yielding 1, 2, 4, and 8.4 l/s. Recovery was reached after completion and a constant draw down test was conducted at a pump rate of 3.02 l/s (Appendix 2). The constant discharge test was stopped after 72 hours and 88% recovery was reached after 10080 minutes. Three observation boreholes were monitored (Table 10).

- H06 0907 The borehole has a depth of 60.74 m with a static water level measured at 2.33 m. The pump was installed at a depth of 56.67 m. A stepped draw down test was conducted consisting of 3 steps yielding 0.5, 1 and 2.14 l/s. Recovery was reached after

completion and a constant draw down test was conducted at a pump rate of 1.22 l/s. The constant discharge test was stopped after 24 hours. Recovery was measured for 24 hours and another constant discharge test was conducted and stopped after 24 hours. Recovery was limited for 24 hours and 100% recovery of the second constant discharge test was reached after 1760 minutes (Appendix 2). No observation boreholes were available.

- H06 0910(A) The borehole has a depth of 72 m with a static water level measured at 2.05 m. The pump was installed at a depth of 60 m. A stepped draw down test was conducted consisting of 3 steps yielding 5.5, 10.1 and 10.45 l/s. Recovery was reached after completion and a constant discharge test was conducted at a pump rate of 5.12 l/s (Appendix 2). The constant discharge test was stopped after 72 hours and 84% recovery was reached after 4320 minutes. No observation boreholes were monitored.

- H06 0910(B) Again this borehole was tested previous, it was however drilled deeper and had to be tested again. The borehole has a depth of 96 metres with a static water level measured at 4.88 m. The pump was installed at a depth of 86 m. A stepped draw down test was conducted consisting of 5 steps yielding 1, 2, 4,8.4 & 16 l/s. Recovery was reached after completion and a constant discharge test was conducted at a pump rate of 7.2 l/s (Appendix 2). The constant discharge test was stopped after 72 hours and 97% recovery was reached after 10080 minutes. Five observation boreholes were monitored (Table 10).

- H06 1028 The borehole has a depth of 72 m with a static water level measured at 7.01 m. The pump was installed at a depth of 64 m. A stepped draw down test was conducted consisting of 3 steps yielding 1, 2 and 4 l/s. Recovery was reached after completion and a constant discharge test was conducted at a pump rate of 3 l/s (Appendix 2). The constant discharge test was stopped after 72 hours and 99% recovery was reached after 2760 minutes. Three observation boreholes were monitored (Table 10).

- H06 1496 The borehole has a depth of 150 m with a static water level measured at 2.43 m. The pump was installed at a depth of 96 m. A stepped draw down test was conducted consisting of 3 steps yielding 1, 2 and 4 l/s. Recovery was reached after completion and a constant draw down test was conducted at a pump rate of 1.04l/s (Appendix 2). The constant discharge test was stopped after 36 hours and 100% recovery was reached after 2160 minutes. Five observation boreholes were monitored (Table 10).

- H06 1038 The borehole has a depth of 102 m with a static water level measured at 10.39 m. The pump was installed at a depth of 90 m. A stepped draw down test was conducted consisting of steps yielding 3.1, 7, 14 and 28 l/s. Recovery was reached after completion and a constant draw down test was conducted at a pump rate of 16.07 l/s. The constant discharge test was stopped after 72 hours and 82% recovery was reached after 8640 minutes (Appendix 2). Four observation boreholes were monitored (Table 10).

- H06 1448 The borehole has a depth of 132 m with a static water level measured at 22.6 m. The pump was installed at a depth of 57.94 m. A stepped draw down test was conducted consisting of 4 steps yielding 1.1, 2.1 2.3 and 4.1 l/s. Recovery was reached after completion and a constant draw down test was conducted at a pump rate of 2.1 l/s (Appendix 2). The constant discharge test was stopped after 72 hours and 100% recovery was reached after 540 minutes. Four observation boreholes were monitored (Table 10).

- H06 1049 The borehole has a depth of 72 m with a static water level measured at 13.2 m. The pump was installed at a depth of 64 m. A stepped draw down test was conducted consisting of 4 steps yielding 3.1, 6, 12.21 and 22.2 l/s. Recovery was reached after completion and a constant draw down test was conducted at a pump rater of 10.1 l/s (Appendix 2). The constant discharge test was stopped after 72 hours and 55% recovery was reached after 4320 minutes. Four observation boreholes were monitored (Table 10). Three weeks past and the borehole was tested again. A constant discharge test was conducted at a pump rate of yielding 10.1 l/s. After 24 hours the test was stopped and 73 % recovery was reached after 1800 minutes.

- H06 1054 The borehole has a depth of 126 m with a static water level measured at 0 m. The pump was installed at a depth of 67 m. A stepped draw down test was conducted consisting of 3 steps yielding 2.5, 4 and 8 l/s. Recovery was reached after completion and a constant discharge test was conducted at a pump rate of 5.1 l/s. The constant discharge test was stopped after 72 hours and 100% recovery was reached after 10 minutes(Appendix 2). Four observation boreholes were monitored(Table 10).

- H06 1420 The borehole has a depth of 106 m with a static water level measured at 11.6 m. The pump was installed at a depth of 46 m. A stepped draw down test was conducted consisting of 3 steps yielding 1, 2 and 4 l/s. Recovery was reached after completion and a constant draw down test was conducted at a pump rate of 2.05

l/s. The constant discharge test was stopped after 72 hours and 100% recovery was reached after 1200 minutes (Appendix 2). Three observation boreholes were monitored (Table 10).

Table 10. Summary of observation boreholes.

Boreholes tested	Observation boreholes	Distance to pumping borehole (m)	Draw down during constant test (m)	Recovery (%)
H06-0882(B)	H06-1072	343	0.07	57
	H06-1070	30.58	2.49	80
	H06-1069	98.65	1.83	64
	H06-1071	19.23	1.7	73
H06 1043(B)	H06-1081	42.07	5.04	92
	H06-1080	274	10.18	53
	H06-1042	552	0.02	100
H06-0910 (B)	H06-0908	38.29	21.1	49
	H06-1076	62.03	16.4	43
	H06-1494	188	21.72	49
	H06-1492	123	0.03	100
	H06-1061	293	0	0
H06-1028	H06-1027	101	0.07	0
	H06-1031	101	0	0
	H06-1073	280	0	0
H06-1496	H06-1065	31.52	0.18	100
	H06-1497	107	0.04	100
	H06-1064	149	0.02	100
	H06-1495	101	0.03	100
	H06-1066	311	0.04	100
H06-1038	H06-1039	55.53	50.81	80
	H10-0912	50.49	46.68	78
	H06-1053	79.68	38.17	73
	H06-1062	307	0	0
H06-1448	H06-1424	22.47	0.02	0
	H06-1452	39.75	0.06	0
	H06-1075	47.58	0	0
	H06-1074	147	0.03	0
H06-1049	H06-1060	13.67	26.36	52
	H061451	106	20.54	100
	H061059	174	0	0

Boreholes tested	Observation boreholes	Distance to pumping borehole (m)	Draw down during constant test (m)	Recovery (%)
	H06-1450	101	0.53	100
H06-1059	H06-1048	9.34	5.94	100
	H06-1422	27	4.13	100
	H06-1057	259	1.47	100
	H06-1058	217	0	0
H06-1420	H06-1423	36.4	1.39	100
	H06-1057	436	0.03	100
	H06-1056	438	0.03	100

4.9.2 Chemical analysis

During the pump testing at least three samples were taken at each borehole, with only two samples taken at H06-1496. Water samples from those boreholes utilized in community water supply programmes were analysed at Waterlab (PTY) Ltd (Table 11). Samples retrieved during the final pumping tests were sent to H&I Pretoria for chemical analysis. Samples were tested for macro elements and classified according to the Quality of Domestic Water Supplies: Volume 1: Assessment Guide (DWAF, 1999).

Table 11. Summary of chemical classes and sample dates.

Borehole no.	Date sampled			Chemical Class	Quality Problem
	Waterlab	1st Batch	2nd Batch		
H06 0881	4 August 1998	-	-	Class 1	-
H06 0882	4 August 1998	10 February 1999	12 February 1999	Class 4	F
H06 1043	04//08/98	17 February 1999	19 February 1999	Class 4	F
H06 0907	-	24 June 1998	-	Class 4	F
H06 0909	-	2 June 1998	-	Class 4	F
H06 0910	4 August 1998	2 June 1998	5 February 1999	Class 4	F
H06 1028	-	17 March 1999	19 March 1999	Class 4	F
H06 1496	-	ì March 1999	2 March 1999	Class 1	-
H06 0918	-	6 July 1998	-	Class 4	N
H06 0919	-	2 July 1998	-	Class 3	N
H06 0920	-	7 July 1998	-	Class 4	N
H06 1448	-	-	-	Class 3	F
H06 1054	-	-	-	Class 4	F
H06 1049	-	-	-	Class 4	F
H06 1038	-	2 June 1998	-	Class 3	F
H06 1420	-	12 March 1999	14 March 1999	Class 4	N

*Quality problem - Highest element of risk for human use.

*Class 0 - Ideal water quality
*Class 1 - Good water quality
*Class 2 - Marginal water quality
*Class 3 - Poor water quality
*Class 4 - Unacceptable water quality