

REPUBLIC OF BOPHUTHATSWANA
DEPARTMENT OF WATER AFFAIRS

**REPORT ON THE SITING
DRILLING AND TESTING OF BOREHOLES,
AND THE TESTING OF EXISTING
BOREHOLES - DITSOBOTLA DISTRICT
JUNE 1991 - FEBRUARY 1993**

**VOLUME 1 - TEXT
AND APPENDIX I**

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APPENDIX I

Locality Maps, Drilling and
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APPENDIX II

Raw Geophysical Data

1. INTRODUCTION

At the request of the Bophuthatswana Department of Water Affairs a groundwater development programme has been undertaken in the Ditsobotla District. This work has been carried out as part of the ongoing Rural Water Supply Programme (RWSP) to upgrade village, school and clinic water supplies throughout Bophuthatswana. A total of 36 beneficiary communities were included in the programme.

The work was carried out from June 1991 to February 1993 and involved the siting, drilling and controlled test pumping of 36 boreholes, the drilling and testing of 2 boreholes sited by the Department, the rehabilitation and testing of 8 boreholes, and the controlled testing of 17 existing boreholes. The position of each of these boreholes is shown on the locality maps in the relevant section of Appendix I. Sketch maps for the geophysically sited boreholes are also included in Appendix I. Specific details of the 63 boreholes dealt with in this report, including co-ordinates, elevations and relevant 1:50 000 topographic maps, are given in Table 1.

This report describes the siting, drilling and testing programmes undertaken, discusses the results obtained and presents detailed management recommendations of the optimum exploitation of the groundwater resources. Supporting tables, figures and appendices are included.

The report is presented in two separately bound volumes: Volume 1 includes the text and Appendix I while Volume 2 includes Appendix II, (the Raw Geophysical Data).

TABLE 1**CO-ORDINATES OF BOREHOLES DRILLED AND/OR TESTED IN THE DITSOBOTLA DISTRICT -
JUNE 1991 TO FEBRUARY 1993**

Request No	Borehole No	Locality	Co-ordinates		1: 50,000 Map	Elevation (m)	Status
			X	Y			
77.1.V	10-77283	Bapong	+2899525	-63405	2625BA	1382	SDT
143.1.V	10-77299	Bapong (Gelukspan)	+2898975	-66380	2625BA	1382	SDT
31.2.E	10-77251	Brooksby P/S	+2904575	-66800	2625BC	1375	RT
42.1.V	10-77296	Deelpan	+2914100	-58775	2625BC	1348	SDT
41.1.V	10-77297	Deelpan	+2913750	-59300	2625BC	1348	SDT
137.3.A	10-77341	Deelpan	+2913800	-61025	2625BC	1350	ET
2.2.E	10-77249	Diretsane Mateane P/S	+2925825	-50975	2625BC	1375	DT
17.1.V	10-77294	Doornlaagte	+2921610	-53140	2625BC	1375	SDT
18.3.E	10-77307	Doornlaagte Kelebogile P/S	+2921950	-52925	2625BC	1379	ET
49.1.E	10-77275	Goedgevonden Creche	+2901225	-51855	2625BA	1357	SDT
50.1.A	10-77298	Kaalpan	+2899905	-68855	2625BA	1390	SDT
142.1.A	10-77300	Kaalpan Veg. Garden	+2899555	-69490	2625BA	1390	SDT
1.2.E	10-77248	Kopela Noto H/S	+2923300	-50975	2625BC	1380	DT
57.3.H	10-77306	Kopela Clinic	+2923550	-52475	2625BC	1375	ET
40.1.E	10-77287	Kraaipan Ghaena P/S	+2909265	-29010	2625AD	1280	SD
46.1.E	10-77288	Kraaipan Aron P/S	+2908095	-30160	2625AD	1285	SDT
47.1.E	10-77289	Kraaipan Creche	+2907680	-29740	2625AD	1260	SD*
35.2.V	10-77252	Lombardslaagte	+2909000	-58050	2625BC	1360	RT
51.1.A	10-77281	Louisdal	+2903705	-47305	2625AB	1365	SDT
23.1.V	10-77282	Louisdal	+2904350	-47500	2625AB	1360	SDT
38.3.A	10-77187	Lynplaats	+2929200	-26825	2625AD	1380	ET
34.2.H	10-77253	Madibogopan Clinic	+2931175	-14425	2625AC	1350	RT
72.1.E	10-77290	Madibogopan Kgathwang ELC	+2931775	-14755	2625AC	1360	SD
27.1.V	10-77293	Majeng	+2925155	-28125	2625AD	1365	SDT
33.2.E	10-77137	Manamolela Konopo P/S	+2933000	-45225	2625CB	1385	RT
59.1.V	10-77276	Mareetsane	+2898270	-46645	2625AB	1343	SDT

Table 1 (Cont)

Request No	Borehole No	Locality	Co-ordinates		1: 50,000 Map	Elevation (m)	Status
			X	Y			
58.1.V	10-77277	Mareetsane	+2897600	-46820	2625AB	1338	SDT
61.1.E	10-77278	Mareetsane Mpoetsile P/S	+2898550	-46950	2625AB	1342	SDT
62.1.V	10-77279	Mareetsane	+2900230	-47105	2625AB	1355	SDT
60.1.V	10-77280	Mareetsane	+2900950	-48345	2625AB	1343	SDT
39.1.H	10-77267	Matila 1 Clinic	+2885550	-75550	2625BB	1425	SDT
48.1.V	10-77268	Matila 2	+2883375	-73250	2625BA	1422	SD
126.1.V	10-77302	Matila 2	+2883400	-73050	2625BA	1421	SDT
63.1.E	10-77291	Middleton B M/S	+2930150	-33060	2625AD	1370	SDT
43.1.E	10-77292	Middleton C - Manonyane Creche	+2930025	-36815	2625AD	1400	SDT
132.3.A	10-77338	Middleton C	+2928325	-36275	2625AD	1390	ET
133.3.A	10-77339	Middleton B	+2929025	-32775	2625AD	1379	ET
100.2.V	10-77246	Modiboa	+2918000	-32000	2625AD	1330	RT
206.2.A	10-77348	Mooimeisiesfontein	+2874000	-84875	2525DD	1420	DT
29.2.A	10-77247	Mooipan	+2915775	-52650	2625BC	1375	RT
125.1.V	10-77295	Mooipan	+2915625	-51650	2625BC	1382	SDT
28.3.A	10-77183	Naauwpoort	+2897825	-57600	2625BA	1365	ET
139.2.A	10-77332	Naauwpoort	+2896750	-57900	2625BA	1365	ET
153.3.A	10-77340	Naauwpoort	+2897760	-57625	2625BA	1365	ET
5.1.V	10-77274	Nooigedacht	+2893375	-63600	2625BA	1380	SD*
22.3.A	10-77342	Rakgwedi	+2928925	-49875	2625BC	1375	ET
189.3.A	10-77343	Rakgwedi	+2931675	-52425	2625BC	1369	ET
54.1.H	10-77271	Schoongezicht Clinic	+2881750	-71150	2625BA	1390	SDT
53.1.V	10-77272	Schoongezicht	+2881680	-70745	2625BA	1388	SDT
44.1.V	10-77303	Shaleng	+2922455	-34180	2625AD	1340	SDT
25.2.E	10-77250	Siberia Gontse P/S	+2906050	-45950	2625AD	1370	RT
26.1.V	10-77284	Siberia	+2906045	-45745	2625AD	1365	SD
127.1.V	10-77285	Siberia	+2905425	-46155	2625AD	1372	SDT
190.3.V	10-77344	Sione	+2915950	-42375	2625AD	1384	ET
6.1.V	10-77301	Springbokpan	+2889625	-78125	2625BB	1430	SDT

Table 1 (Cont)

Request No	Borehole No	Locality	Co-ordinates		1: 50,000 Map	Elevation (m)	Status
			X	Y			
134.3.A	10-77333	Springbokfontein	+2913125	-61550	2625BC	1360	ET
135.3.A	10-77334	Springbokfontein	+2913350	-61450	2625BC	1350	ET
45.1.E	10-77286	Tlhakajeng Ketletseng M/S	+2909705	-31740	2625AD	1290	SDT
138.2.A	10-77331	Uitkyk	+2899525	-56050	2625BA	1360	ET
111.2.H	10-77121	Weltevrede Clinic	+2911850	-49050	2625AD	1385	RT
3.1.V	10-77265	Wolverdiend	+2882300	-75575	2625BB	1410	SDT
52.1.A	10-77266	Wolverdiend	+2881675	-75550	2625BB	1410	SDT
56.3.H	10-77336	Wolverdiend Clinic	+2881725	-75525	2625BB	1410	ET

S = sited by the Consultants
D = drilled under the supervision of the Consultants
T = tested under the supervision of the Consultants
R = rehabilitated
E = existing borehole
* = not yet tested

At the time of preparing this report 2 boreholes remained to be tested (Table 1).

2. GENERAL GEOLOGICAL AND HYDROGEOLOGICAL APPRAISAL

Allanridge Lava of the Ventersdorp Supergroup underlies the northern, central and eastern portions of the District. It forms a flat regional plain from Mafikeng in the north to Mareetsane, Atamelang and Kopela in the south. These lavas occur also in the south west of the District, south of Madibogo.

Malmani dolomite underlies the far north-east of the District around Itsoseng. This dolomite is intruded by regional east-west trending dolerite dykes.

The central western part of the District is underlain by Granite of the Basement Complex and forms an undulating topography.

Belts of the older Kraaipan Formation occur within the Archaean Granites trending discontinuously in a north-south direction, from Kraaipan to the east of Madibogo. These rocks, comprising predominately banded ironstone, chert and amphibolite, have been highly metamorphosed, both dynamically and through contact with the intruding granite. They are cut by numerous faults and are intensely veined by quartz.

The main lithologies at each of the 36 localities included in this project are briefly discussed in the short locality discussions of Section 8.

The water bearing characteristics of the main rock types present in the District are always associated with the development of secondary permeability features. These include weathering pockets, fracturing and extensive jointing zones and karst solutional features.

Groundwater occurrence in the Malmani Dolomite is controlled to a large extent by the stratigraphic sequence. The Monte Christo Formation is chert rich and as such karst weathering is present. Borehole yields of up to 40 l/s have been developed in the Polfontein Compartment near Itsoseng. The groundwater potential in the stratigraphically lower chert poor Oaktree Formation on the other hand, is poor, and yields above 0,5 l/s are rarely encountered. Large areas underlain by dolomite of the Oaktree Formation are therefore devoid of any significant groundwater potential, e.g. around the village of Verdwaal.

Groundwater occurrence in the dolomites is enhanced along dyke contacts where strip aquifers are found.

The groundwater resources of the Allanridge Lavas are generally confined to poorly to moderately developed, relatively shallow, weathering and fracturing. Aquifers are generally areally restricted and transmissivities low. Borehole yields vary from <0,5 l/s to >2 l/s.

The occurrence, movement and storage of groundwater within the granite is associated with secondary features such as weathering pockets and fractures. Much of the granite area is marginally developed and the groundwater potential of these areas, eg. Madibogo, is virtually nil. Elsewhere, yields of 0,5 l/s to 1 l/s may be available.

Within the Kraaipan Formation groundwater is often associated with contact zones along intrusive bodies, faults and geological contacts. Locally extensive weathering is present also, e.g. along the flood plain of the river at Kraaipan where average sustainable yields of 1 l/s were found.

The groundwater occurrence and development potential within Ditsobotla District therefore varies from high, in the Monte Christo dolomite Formation to poor in the Archaean granite. Overall, with the exception of areas underlain by the Monte Christo Formation, the groundwater development potential of the District is poor.

3. HYDROGEOLOGICAL INVESTIGATION

In order to optimize the groundwater development of each locality, a co-ordinated investigation programme was formulated. This programme comprised the following steps:

- The photo-interpretation of 1:15 000 and/or 1:30 000 scale aerial coverage of the relevant villages. Here prominent features of hydrogeological importance such as weathered and fractured zones, dykes, geological contacts and faults were delineated.
- The running of a geophysical survey, firstly in primary target areas delineated from the stereo air photo coverage followed by infilling work carried out elsewhere around the beneficiary locality as warranted.

- The drilling of boreholes in positions with the most favourable groundwater development potential according to the interpretation of the hydrogeophysical data, morphological assessment and geology.
- The controlled test pumping of successful boreholes for prescribed lengths of times.
- The compilation of this report describing the various stages of the investigation, commenting on the results obtained and presenting management recommendations for the optimum exploitation of the identified resources within each beneficiary locality.

In the ensuing sections the geophysical survey, drilling operations and test pumping programme are discussed in some detail. Further discussion may be found in Section 8 dealing with each locality included in the programme.

4. GEOPHYSICAL SURVEY AND DISCUSSION OF THE RESULTS

During this development programme geophysical methods were applied widely in the localities surveyed by the Consultants. The choice of the method adopted was controlled by the local topography and geology of the site investigated.

The geophysical technique mainly used during this investigation comprised geo-electrical resistivity soundings, also known as Vertical Electrical Soundings (VES).

This technique was supported by magnetic traversing and/or electromagnetic traversing where warranted.

Details of all the geophysical work carried out are given in Table 2. A geophysical survey was run in all 20 localities where boreholes were sited by the Consultants. A survey was also run at Longaneng Creche in Madibogo, at Rakgwedi and Verdwaal but drill sites were not selected in these villages.

A copy of the field geophysical data is presented in Appendix II, as per the instructions of the Department.

Owing to the availability of geophysical data gathered during previous investigations in the District, combined with experience in similar geological regimes elsewhere, the geophysical survey data could be interpreted semi-quantitatively, using standard curve matching techniques. Subsequently, the VES curves were checked using computer enhanced methods. The VES curves selected for each drilling position are included with the locality sketches of Appendix I, together with the plots of all the magnetic traverses run.

Ten magnetic traverses, totalling a distance of 4240m, were run in 5 localities where the air photo interpretation indicated the presence of a dyke or photo lineament. The objective of running the magnetic traverses was to locate dyke contacts and to determine the dip direction. Where traverses were run across visible dyke outcrops, the magnetometric data indicated the presence of these dykes. Elsewhere, magnetic anomalies were not recorded (Appendix I). Where anomalies were recorded, VES were also run as indicated on the profiles included in Appendix I.

TABLE 2

DETAILS OF LOCALITIES GEOPHYSICALLY SURVEYED AND DRILLING SITES SELECTED - DIUSOBOTLA DISTRICT

Locality	Geology	Magnetic traverses (No) (m)	Calibration VES (No.)	Exploratory VES (No.)	VES chosen (No.)	Designated Borehole Number
Bapong	Lava	--	02	05	02	10-77283
Bapong (Gelukspan)	Lava	--	01	04	01	10-77299
Declpan	Lava	--	02	08	02	10-77296
Doornlaagte	Lava	--	02	06	06	10-77297
Goedgevonden P/S	Lava	--	02	06	04	10-77294
Kaalpan	Dolomite/Lava	--	02	06	05	10-77275
Kraaipan Ghaena P/S	Diorite	--	02	12	03	10-77298
Kraaipan Aron P/S	Gneiss	--	01	09	10	10-77300
Kraaipan Creche	Lava/Schist	--	01	10	02	10-77287
Louisdal	Lava	--	01	11	09	10-77288
Madibogo Longaneng Creche	Granite	--	02	11	19	10-77289
		--	02	07	11	10-77281
		--	02	07	02	10-77282
		--			--	No site selected

Table 2 (cont)

Locality	Geology	Magnetic traverses		Calibration VES (No.)	Exploratory VES (No.)	VES chosen (No.)	Designated Borehole Number
		(No)	(m)				
Madibogo Pan Kgathwang ELC	Granite	--	--	01	02	02	10-77290
Majeng	Granite	--	--	02	08	02	10-77293
Mareetsane Village	Lava/ Granite	4	1050	04	39	05	10-77276
Mareetsane Village						08	10-77277
Mareetsane Mpoetsile P/S						18	10-77278
Mareetsane Village						21	10-77279
Mareetsane Village						36	10-77280
Matila 1 Clinic	Dolomite	--	--	01	05	05	10-77267
Matila 2	Dolomite			02	06	06	10-77268
						03	10-77302
Middleton B M/S	Granite	1	250	01	03	02	10-77291
Middleton C Manonyane Clinic	Granite	--	--	02	04	01	10-77292
Mooipan	Lava	--	--	02	10	10	10-77295
Noogedacht	Dolomite	--	--	02	06	05	10-77274
Rakgwedi	Lava	--	--	02	04	--	Test existing holes.

Table 2 (cont)

Locality	Geology	Magnetic traverses (No)	(m)	Calibration VES (No.)	Exploratory VES (No.)	VES chosen (No.)	Designated Borehole Number
Schoongezicht Clinic	Quartzite	--	--	02	09	03	10-77271
Schoongezicht Village						07	10-77272

Table 2 (cont)

Locality	Geology	Magnetic traverses		Calibration VES (No.)	Exploratory VES (No.)	VES chosen (No.)	Designated Borehole Number
		(No)	(m)				
Schoongezicht Clinic Schoongezicht Village	Quartzite	--	--	02	09	03 07	10-77271 10-77272
		1	250	--	10	01	10-77303
Shaleng	Granite	--	--	02	08	02 08	10-77284 10-77285
Siberia	Lava	--	--	03	17	10	10-77301
Springbokpan	Dolomite	2	1690				
		(EM) 2	1550				
Tlhakajeng Kettleiseng M/S	Granite	--	--	02	09	06	10-77286
Verdwaal	Dolomite	2	1000	02	10	--	No site selected.
		(EM) 2	1900				
Welverdiend	Dolomite	--	--	01	02	01	10-77265
Welverdiend Village	Dolomite	--	--	01	06	01	10-77266

Four electromagnetic traverses, totalling a distance of 3450m, were run in Springbokpan and Verdwaal to identify fracturing and karst features in the dolomite. VES were run on these traverse lines as indicated on the plots in the relevant section of Appendix I.

A total of 247 exploration VES were run in the 23 localities surveyed. Fifty calibration VES were undertaken at existing boreholes in 22 of the localities to assist with the interpretation of the exploration VES. Exploration VES were first run in target areas identified during the photogeological study, with additional VES run in surrounding areas as necessary. Where the borehole was required for a school or clinic, VES were first run within the grounds of the building. The survey was expanded away from these facilities only if groundwater resources within the property were considered absent.

The geo-electrical response obtained from the various lithologies is somewhat different. A brief discussion for each lithology is given below:

Ten of the boreholes were drilled into lava. Variable geo-electrical responses were obtained with H, K and A curves, and combinations of these shapes, being obtained. The resistivity selected for drilling was between 20 and 75 ohm-metres where this was developed over 30m or more. The variable curve shapes obtained are a reflection of the variable soil cover which ranges from calcrete to clay. The lava was mostly weathered and fractured to a shallow depth and resistivities of several hundred ohm-metres are common below a depth of 15 to 20m.

Four of the boreholes were drilled into dolomite of the Oaktree Formation. Resistivities of 150 to 1000 ohm-metres were widespread. No significant karst features could be detected, either with the VES or EM traversing, in the villages underlain by dolomite.

Six boreholes were drilled through dolomite into the underlying Allanridge lava, and 2 through dolomite into quartzite. Weathering of the dolomite was more advanced in these areas close to the geological contact and lower resistivities within the dolomite, 30 to 150 ohm-metres, were found. KH and HA curves were typical of these areas.

Ten boreholes were drilled into granite. HA curves were recorded almost without exception, the fracturing zone below the surface weathering being recognized by the ascending A curve above the bedrock curve. The resistivity of the granite, where boreholes were drilled, ranged from 60 to 120 ohm-metres over depths averaging 40 to 60m. Elsewhere, the resistivity of the granite indicates shallow bedrock conditions, unfavourable for groundwater occurrence, are widespread. It is of interest that borehole 10-77290 at Kgatlhwang ELC, Madibogopan, was dry, notwithstanding the deep weathering (in excess of 70m) of the granite.

Three boreholes were also sited in the Kraaipan Formation at Kraaipan. H or HA curves were obtained and resistivities varying from 50 to 130 ohm-metres, from <5m to >70m depth were recorded. Variable geo-electrical conditions are characteristic of the Kraaipan Formation.

A total of 36 boreholes were selected for drilling in 20 of the 23 beneficiary localities where a geophysical survey was carried out. Drill Sites were not selected at Longaneng Creche, Madibogo and Verdwaal, due to the unfavourable hydrogeological conditions. No drilling was recommended also at Rakgwedi where the existing boreholes should be tested first.

5. DRILLING PROGRAMME AND DISCUSSION OF RESULTS

The interpretation of the geophysical survey results allowed for the selection of hydrogeophysically favourable drill site(s). The VES chosen for drilling are listed in Table 2 and their positions are shown in the relevant sketch maps of Appendix I.

Drilling was undertaken by either Messrs. Mmabatho Drilling, or Messrs. Saamstaan Bore, the annual contractors appointed by the Department of Water Affairs for the Molopo Region during 1991/92 and 1992/93. One or two air percussion down-the-hole drilling rigs were fielded.

The drilling operations were carried out between June 1991 and February 1992 under the continuous supervision of the Consultants field personnel. A total of 46 boreholes were drilled, which included 8 rehabilitation boreholes. Details of the drilling results are given in Table 3.

TABLE 3

SUMMARY OF DRILLING RESULTS - DITSOBOTLA DISTRICT

Borehole No.	Locality	Drilled depth (m)	Plain casing (Dia) (From-to) (m)	Slotted casing (Dia) (From-to) (m)	Depth of water strike(s) (mbgl)	Yield of individual strike(s) (l/s)	Main geology intersected	Date drilled
10-77283	Bapong	81	165 0 - 12.4	165 12.4 - 16.0	15 30 59	0.2 0.2 0.6	Lava	13.01.92
10-77299	Bapong (Gelukspan)	76	165 0 - 11	----	16 35	0.1 0.35	Dolomite/ Lava	11.02.92
10-77251	Brooksby (Rehab)	51	----	----	35	3.5	Lava	10.07.91
10-77296	Deelpan	91	165 0 - 26	----	40 66	0.1 0.15	Lava	03.02.92
10-77297	Deelpan	96	165 0 - 17.4	165 17.4 - 21.0	41 79	0.1 0.2	Lava	03.02.92
10-77249	Diretsane Mateane P/S	111	165 0 - 24.7 28.5 - 31.0	165 24.7 - 28.5	28	<0.1	Lava	08.07.91
10-77294	Doornlaagte	81	165 0 - 40.2	165 40.2 - 51.0	42 61	0.1 3.7	Lava	28.01.92
10-77275	Goedgevonden P/S	71	165 0 - 12.4	165 12.4 - 16.0	16 39	0.2 0.5	Lava	11.12.91
10-77298	Kaalpan	76	165 0 - 6.4 28 - 46	165 6.4 - 28.0	16 49	0.5 0.25	Dolomite/ Lava	06.02.92

Table 3 (cont)

Borehole No.	Locality	Drilled depth (m)	Plain casing (Dia) (From-to) (m)	Slotted casing (Dia) (From-to) (m)	Depth of water strike(s) (mbgl)	Yield of individual strike(s) (l/s)	Main geology intersected	Date drilled
10-77300	Kaalpan Veg. Garden	81	165 0 - 12.8 30.8 - 56.0	165 12.8 - 30.8	14 24	0.3 1.5	Dolomite/ Lava	12.02.92
10-77248	Kopela Noto H/S (Rehab)	61	165 0 - 19.5 24 - 31	165 19.5 - 25	22	0.5	Lava	03.07.91
10-77287	Kraaipan Ghaena P/S	101	---	---	Dry		Diorite	17.01.92
10-77288	Kraaipan Aron P/S	61	165 0 - 11	---	23	0.4	Gneiss	18.01.92
10-77289	Kraaipan Creche	61	165 0 - 12.4	165 12.4 - 16.0	15 22	0.1 2.4	Lava/Schist	20.01.92
10-77252	Lombardslaagte (Rehab)	76	165 0 - 10.25 14 - 19.75 23.5 - 27.25	165 10.25 - 14.0 19.75 - 23.50 27.25 - 31.0	12 22	0.1 1.5	Lava	12.07.91
10-77281	Louisdal	91	165 0 - 33.8	165 33.8 - 41	37 64	0.2 0.4	Lava	08.01.92
10-77282	Louisdal	86	165 0 - 26	---	59	0.33	Lava	09.01.92
10-77253	Madibogo Pan Clinic (Rehab)	91	165 0 - 36.5 40.35 - 46	165 36.5 - 40.25	38 59 73	0.1 0.6 1.5	Granite	16.07.91

Table 3 (cont)

Borehole No.	Locality	Drilled depth (m)	Plain casing (Dia) (From-to) (m)	Slotted casing (Dia) (From-to) (m)	Depth of water strike(s) (mbgl)	Yield of individual strike(s) (l/s)	Main geology intersected	Date drilled
10-77290	Madibogo Pan Kgathwang ELC	121	---	---	Dry		Granite	21.01.92
10-77293	Majeng	91	165 0 - 41	---	69	0.1	Granite	27.01.92
10-77137	Manamolele Konopo P/S (Rehab)	61	Borehole cleaned out only		--	1.0	Granite	08.07.91
10-77276	Mareetsane	81	165 0 - 31	---	52	0.25	Granite	13.12.91
10-77277	Mareetsane	81	165 0 - 26	---	41 57	0.2 0.5	Granite	12.12.91
10-77278	Mareetsane Mpoetsile P/S	81	165 0 - 21	---	36	0.22	Granite	13.12.91
10-77279	Mareetsane	81	165 0 - 26.6	165 26.6 - 41	41 48	0.2 0.8	Lava	18.12.91
10-77280	Mareetsane	71	165 0 - 18.8	165 18.8 - 26	24 27	0.2 0.5	Lava	06.01.92
10-77267	Matila 1 Clinic	71	165 0 - 20.2 140 0 - 21.9 42.5 - 47.3	165 20.2 - 31 140 21.9 - 42.5 67.3 - 71	23	0.2	Dolomite	02.12.91
10-77268	Matila 2	101	---	---	Dry		Dolomite/ Quartzite	02.12.91

Table 3 (cont)

Borehole No.	Locality	Drilled depth (m)	Plain casing (Dia) (From-to) (m)	Slotted casing (Dia) (From-to) (m)	Depth of water strike(s) (mbgl)	Yield of individual strike(s) (l/s)	Main geology intersected	Date drilled
10-77302	Matila 2	151	165 0 - 31		101	0.2	Dolomite/Lava	17.02.92
10-77291	Middleton B M/S	81	165 0 - 38.8	165 38.8 - 46.0	43	1.4	Granite	22.01.92
10-77292	Middleton C Manonyane Creche	81	165 0 - 48.8	165 48.8 - 56.0	54	2.5	Granite	23.01.92
10-77246	Moditboa (Rehab)	71	165 0 - 22.3	165 22.3 - 26.0	41 46	1.0 1.5	Lava	27.06.91
10-77247	Mooipan (Rehab)	51	165 0 - 22.6	165 22.6 - 30.0	21	0.7	Lava	02.07.91
10-77295	Mooipan	71	165 0 - 17.4	165 17.4 - 21.0	37	4.1	Lava	30.01.92
10-77274	Nooigedacht	81	165 0 - 16.6	165 16.6 - 31	17	3.4	Dolomite	11.12.91
10-77271	Schoongezicht Climic	71	165 0 - 28.8	165 28.8 - 36.0	31	0.1	Quartzite	09.12.91
10-77272	Schoongezicht	76	165 0 - 18.8	165 18.8 - 26.0	22	0.4	Quartzite	10.12.91
10-77303	Shaleng	101	165 0 - 21	---	71	0.1	Granite	19.02.92
10-77250	Siberia Gontse P/S (Rehab)	91	165 0 - 26	---	42	0.25	Lava	10.07.91
10-77284	Siberia	106	---	---	Dry		Lava	13.01.92

Table 3 (cont)

Borehole No.	Locality	Drilled depth (m)	Plain casing (Dia) (From-to) (m)	Slotted casing (Dia) (From-to) (m)	Depth of water strikes(s) (mbgl)	Yield of individual strike(s) (l/s)	Main geology intersected	Date drilled
10-77285	Siberia	81	165 0 - 36	---	40 64	0.3 0.1	Lava	15.01.92
10-77301	Springbokpan	71	165 0 - 88	165 8.8 - 16.0	14 28	0.4 0.1	Dolomite	13.02.92
10-77286	Tlhakajeng Kettleseng M/S	81	165 0 - 11	---	53	0.1	Granite	16.01.92
10-77121	Weltevrede Clinic (Rehab)	51	---	---	---	0.7	---	26.06.91
10-77265	Welverdiend	81	165 0 - 17.4	165 17.4 - 21.0	20 39 72	0.1 0.2 0.2	Dolomite	27.11.91
10-77266	Welverdiend	81	165 0 - 11.8	165 11.8 - 19.0	19 38 49 66	0.2 0.2 0.7 0.2	Dolomite	28.11.91

During the drilling operations samples were collected at 1 metre intervals. Logs prepared for each of the 38 newly drilled boreholes and 6 of the 8 rehabilitated boreholes, where the existing hole was drilled deeper or a new borehole drilled alongside, are included in the relevant parts of Appendix I. The borehole logs detail the geology intersected, depths of water strike(s) with corresponding blowing yield(s) and final borehole construction.

On the basis of the drilling results obtained and with reference to Table 3, the following general comments apply:

- A minimum depth of 50 metres was adopted for the drilling programme.
- Boreholes range from 51m to 151m in depth, with the average depth being 85 metres. In all applicable cases the borehole was drilled a minimum of 10 metres below the main water strike.
- Of the 38 new boreholes drilled, 4 were dry, giving a success ratio of 89%. Final blowing yields varied from 0,1 to 12 l/s. Fifteen boreholes had yields >1,0 l/s but no blowing yield >5,0 l/s were recorded. Seventeen boreholes had blowing yields <0,5 l/s.
- The variation of blowing yields obtained is indicative of the anisotropic and heterogeneous nature of these secondary aquifers.
- The depths of the main water strikes varied from as shallow as 14 metres to as deep as 101 metres. The average main water strike

depth was 43 metres. The spatial variation in the depths of the water strikes is a further indication of the anisotropic and heterogeneous nature of the aquifers. The rise of the water level above the depth of the water strike indicates that the aquifers are confined.

Two or more water strikes were recorded in 20 boreholes (Table 3).

The results of the drilling programme have confirmed the large variability of the groundwater resources of the District both in terms of yields encountered as well as depth of water strikes. Furthermore, the good success rate has once again confirmed the applicability of the photogeological and geophysical methods used to locate borehole positions. In general, the groundwater resources are poorly to moderately developed, (in terms of blowing yield), in the 31 localities drilled during the programme.

6. TEST PUMPING PROGRAMME

The controlled testing of the boreholes was carried out by Messrs. AB Pumps, the annual test pumping contractors for the Molopo Region as appointed by the Department of Water Affairs for both 1991/92 and 1992/93. Two test pumping units were fielded by the contractor. Each unit comprised a positive displacement pump element with power provided to the pump head from the engine via a clutch and gearbox assembly.

The testing was carried out between April 1992 and January 1993 under the continuous supervision of the Consultant's field personnel.

The controlled test pumping programme consisted of a step drawdown test run on each borehole, followed by a constant discharge test, where the yield obtained during the step drawdown test indicated that this was warranted, i.e. $>0,5$ l/s.

The step drawdown test comprises (preferably) 4 (or more) different discharge rates, each of 1 hours duration. During each hour the discharge is held constant, but is increased at the beginning of each subsequent hour. Measurements of both the discharge and the drawdown are taken at regular intervals during the test.

During the constant discharge test the yield as determined from the step drawdown test data is maintained constant for a period of between 24 and 48 hours. Measurements of both discharge and drawdown are taken at regular intervals.

The plots of drawdown (s) versus time (t) for the step drawdown tests are included in Appendix I. These plots include the water level recovery data as a qualitative indication of the recovery characteristics of the aquifer. The field data collected during the running of the constant discharge tests have been used to plot drawdown (s) versus time (t) for the pumping phase and residual drawdown (res.s) versus the ratio t/t_1 (where t = total time since the test commenced and t_1 total time since pumping ceased) for the

recovery phase. All of these plots are included in the relevant sections of Appendix I.

Details of the 57 step drawdown tests and 35 constant discharge tests run are summarized in Tables 4 and 5 respectively. Two of the boreholes drilled, 10-77289 at Kraaipan Creche and 10-77274 at Nooigedacht, remain to be tested.

Comments concerning the behaviour of each tested borehole are given in the discussion of each locality in Section 8 below.

The constant discharge rate test data have been analysed to calculate the hydraulic parameters of transmissivity and specific capacity. These data are given by geology in Table 6. The geology detailed in Table 6 is differentiated between the lithology known from drilling records, and that obtained from inspection of the published geological maps by a 'D' and 'M' respectively.

Data from 6 boreholes drilled into dolomite are available and comprise a range of transmissivity values varying from 0,5 to 50 m²/d. These generally low transmissivity values reflect poor weathering development and a lack of karst features in the Oak Tree Formation. Here water bearing horizons or zones comprise relatively minor fracturing. The data thus confirms the dolomite of the Oak Tree Formation as having a poor hydrogeological potential.

TABLE 4

SUMMARY OF STEP DRAWDOWN TEST DATA - DIISOBOTLA DISTRICT

Borehole No.	Locality	Date of Test	Borehole depth (m)	Pump setting (m)	Water level (mbgl)	Step number	Test duration (mins)	Yield (l/s)	Drawdown at end of each step (m)	Remarks
10-77283	Bapong	23.04.92	78	65	6.97	1	60	0.6	4.65	
						2	60	0.55	9.19	
						3	60	1.10	51.56	
10-77299	Bapong Gelukspan	25.04.92	68	59	5.35	1	60	0.18	3.67	
						2	60	0.40	12.15	
						3	40	0.80	53.89	
10-77251	Brooksby	06.08.92	51	47	6.08	1	60	0.28	0.43	
						2	60	0.62	1.07	
						3	60	1.30	2.48	
						4	60	2.65	11.79	
10-77296	Deelpan	04.08.92	91	77	5.01	1	60	0.27	20.14	
						2	60	0.48	60.37	
10-77297	Deelpan	03.08.92	96	77	5.00	1	60	0.25	16.82	
						2	60	0.52	49.58	
						3	5	1.10	60.58	

Table 4 (cont)

Borehole No.	Locality	Date of Test	Borehole depth (m)	Pump setting (m)	Water level (mbgl)	Step number	Test duration (mins)	Yield (l/s)	Drawdown at end of each step (m)	Remarks
10-77341	Deelpan	08.08.92	20.40	17	4.83	1	60	1.0	0.17	
						2	60	2.11	0.31	
						3	60	3.95	0.60	
						4	60	7.60	3.22	
10-77249	Diretsane Mateane P/S	15.07.92	106	83	10.70	1	60	0.23	20.62	
						2	20	0.60	52.12	
10-77294	Doomlaagte	19.07.92	80	71	14.36	1	60	0.5	2.72	
						2	60	1.17	6.74	
						3	60	2.10	14.96	
						4	60	4.0	32.83	
10-77307	Doomlaagte	21.07.92	43	41	13.36	1	60	0.26	2.79	
						2	60	0.56	5.26	
						3	60	1.10	10.49	
						4	60	2.10	17.74	
10-77275	Goedgevonden P/S	25.04.92	70	65	7.70	1	60	0.14	0.55	
						2	60	0.34	1.99	
						3	60	0.70	13.39	
						4	60	1.20	55.79	

Table 9 (cont)

Borehole No.	Request No.	Locality	Co-ordinates X (m)	Co-ordinates Y (m)	1:50 000 Map	Test type	Borehole depth (m)	Static water level (mbgl)	Pump setting (m)	Recommended abstraction facility, yield and pumping period
10-77282	23.1.V	Louisdal	+2904350	-47500	2625AD	SDT	84	19.02	50	Handpump to yield 0,3 l/s Water Quality Good.
10-77187	38.3.A	Lynplaats	+2929200	-26825	2625AD	SDT	47	22.83	40	Windpump (or handpump) to yield 0,1 l/s. NB: MARGINAL Water Quality Good
10-77253	34.2.H	Madibogo Pan Clinic	+2931175	-14425	2625AC	CDT	90	24.58	50	Motorpump to yield 1 l/s for 12 hours per day. Water Quality Good.
10-77293	27.1.V	Majeng	+2925150	-28125	2625AD	SDT	91	27.36	50	Handpump to yield 0,1 l/s. NO ₃ = 45 mg/l. Low Risk.
10-77137	33.2.E	Manamolela Konopo P/S	+2933000	-45225	2625CB	CDT	60	10.03	30	Motorpump to yield 0,5 l/s for 12 hours per day. Water Quality Good.
10-77276	59.1.V	Mareetsane	+2898270	-46645	2625AB	CDT	81	25.25	50	Motorpump to yield 0,5 l/s for 12 hours per day. Water Quality Good.

Table 9 (cont)

Borehole No.	Request No.	Locality	Co-ordinates X (m)	Y (m)	1:50 000 Map	Test type	Borehole depth (m)	Static water level (mbgl)	Pump setting (m)	Recommended abstraction facility, yield and pumping period
10-77277	58.1.V	Mareetsane	+2897600	-46820	2625AB	CDT	81	17.96	50	Motorpump to yield 0,5 l/s for 12 hours per day. Water Quality Good.
10-77278	61.1.E	Mareetsane Mpoetsile P/S	+2898550	-46950	2625AB	SDT	81	22.12	40	Handpump to yield 0,3 l/s Water Quality Good.
10-77279	62.1.V	Mareetsane	+2900230	-47100	2625AB	CDT	80	18.2	60	Motorpump to yield 0,5 l/s for 12 hours per day. Water Quality Good.
10-77280	60.1.V	Mareetsane	+2900950	-48345	2625AB	CDT	70	10.74	30	Motorpump to yield 0,5 l/s for 12 hours per day. <u>WARNING</u> : Sudden drawdown at higher discharges. NO ₃ = 61 mg/l. Low Risk.
10-77267	39.1.H	Matile I Clinic	+2885550	-75550	2625BB	CDT	69	10.66	60	Motorpump to yield 0,5 l/s for 12 hours per day. Water Quality Good.
10-77302	126.1.V	Matile 2	+2883400	-73050	2625BA	SDT	102	13.74	50	Handpump to yield 0,1 l/s <u>MARGINAL</u> Water Quality Good

Table 9 (cont)

Borehole No.	Request No.	Locality	Co-ordinates X (m)	Y (m)	1:50 000 Map	Test type	Borehole depth (m)	Static water level (mbgl)	Pump setting (m)	Recommended abstraction facility, yield and pumping period
10-77291	63.1.E	Middleton B M/S	+2930150	-33060	2625AD	CDT	81	18.87	40	Motorpump to yield 0,5 l/s for 12 hours per day. Water Quality Good.
10-77292	43.1.E	Middleton C Manonyane Creche	+2930025	-36825	2625AD	CDT	80	34.89	50	Motorpump to yield 3 l/s for 12 hours per day. Water Quality Good.
10-77338	132.3.A	Middleton C	+2928325	-36275	2625AC	CDT	53	10.74	40	Motorpump to yield 0,5 l/s for 12 hours per day. Water Quality Good.
10-77339	133.3.A	Middleton B	+2929025	-32775	2625AD	SDT	57	26.13	50	Windpump to yield 0,3 l/s Water Quality Good.
10-77246	100.2.V	Modiboa	+2918000	-32000	2625AD	CDT	70	21.19	40	Motorpump to yield 1,5 l/s for 12 hours per day. NB: NO ₃ = 53 mg/l. Mg = 116 mg/l. Low Risk.
10-77348	206.2.A	Mooimeisiesfontein	+2874000	-84875	2525DD	CDT	47	5.89	30	Motorpump to yield 2 l/s for 12 hours per day. NO ₃ = 67 mg/l. Low Risk.

Table 9 (cont)

Borehole No.	Request No.	Locality	Co-ordinates X (m)	Co-ordinates Y (m)	1:50 000 Map	Test type	Borehole depth (m)	Static water level (mbgl)	Pump setting (m)	Recommended abstraction facility, yield and pumping period
10-77247	29.2.A	Mooipan	+2915775	-52650	2625BC	SDT	50	8.18	30	Windpump to yield 0,3 l/s Water Quality Good.
10-77295	125.1.V	Mooipan	+2915625	-51650	2625BC	CDT	70	9.82	35	Motorpump to yield 2 l/s for 12 hours per day. Water Quality Good.
10-77183	28.3.A	Naaunwpoort	+2897825	-57600	2625BA	SDT	74	7.4	30	Windpump (handpump) to yield 0,3 l/s. Water Quality Good. NB: Equipped with windpump.
10-77332	139.2.A	Naaunwpoort	+2896750	-57900	2625BA	CDT	12.6	7.55	--	Hole must be deepened to 30m. Motorpump to yield 1 l/s for 12 hours per day. Water Quality Good.
10-77340	153.3.A	Naaunwpoort	+2897760	-57625	2625BA	SDT	19	7.34	18	Handpump to yield 0,3 l/s Water Quality Good NB: Equipped with handpump. 30m from 10-77183

Table 9 (cont)

Borehole No.	Request No.	Locality	Co-ordinates X (m)	Co-ordinates Y (m)	1:50 000 Map	Test type	Borehole depth (m)	Static water level (mbgl)	Pump setting (m)	Recommended abstraction facility, yield and pumping period
10-77342	22.3.A	Rakgwedi	+2928925	-49875	2625BC	SDT	24	5.93	22	Windpump to yield 0,3 l/s (NB: Already equipped with windpump). Water Quality Good.
10-77343	189.3.A	Rakgwedi	+2931675	-52425	2625BC	CDT	34	5.76	30	Motorpump to yield 1 l/s for 12 hours per day. Water Quality Good.
10-77271	54.1.H	Schoongezicht Clinic	+2881750	-71120	2625BA	SDT	71	9.34	40	Handpump to yield 0,3 l/s Water Quality Good
10-77272	53.1.V	Schoongezicht	+2881680	-70745	2625BA	CDT	75	9.44	40	Motorpump to yield 0,5 l/s for 12 hours per day. Water Quality Good.
10-77303	44.1.V	Shaleng	+2922450	-34180	2625AD	SDT	99	7.84	40	Handpump to yield 0,1 l/s Water Quality Good.
10-77250	25.2.E	Siberia Gontse P/S	+2906050	-45950	2625AD	SDT	88	26.89	50	Handpump to yield 0,3 l/s Water Quality Good

Table 9 (cont)

Borehole No.	Request No.	Locality	Co-ordinates X (m)	Y (m)	1:50 000 Map	Test type	Borehole depth (m)	Static water level (mbgl)	Pump setting (m)	Recommended abstraction facility, yield and pumping period
10-77285	127.1.V	Siberia	+2905425	-46150	2625AD	CDT	81	29.89	70	Motorpump to yield 0,5 l/s for 12 hours per day Water Quality Good
10-77344	190.3.V	Sione	+2915950	-42375	2625AD	SDT	30	16.52	28	Handpump to yield 0,1 l/s Water Quality Good
10-77333	134.3.A	Springbokfontein	+2913125	-61550	2625BC	CDT	22	5.90	20	Motorpump to yield 1 l/s for 12 hours per day. <u>NB:</u> Borehole should be deepened to 30m. Water Quality Good.
10-77334	135.3.A	Springbokfontein	+2913250	-61450	2625DB	CDT	12	5.06	--	Motorpump to yield 0,5 l/s for 12 hours per day. <u>NB:</u> Borehole must be deepened to 30m before being equipped. Water Quality Good.
10-77301	6.1.V	Springbokpan	+2889625	-78125	2625BB	SDT	70	6.02	30	Handpump to yield 0,3 l/s Water Quality Good
10-77286	45.1.E	Tlhakajeng Ketletseng M/S	+2900700	-31740	2625AD	SDT	81	11.6	40	Handpump to yield 0,1 l/s NO ₃ = 56 mg/l. Low Risk

Table 9 (cont)

Borehole No.	Request No.	Locality	Co-ordinates X (m)	Co-ordinates Y (m)	1:50 000 Map	Test type	Borehole depth (m)	Static water level (mbgl)	Pump setting (m)	Recommended abstraction facility, yield and pumping period
10-77331	138.2.A	Uitkyk	+2899525	-56050	2625BA	CDT	9.4	5.45	--	Hole must be deepened to 30m. Motorpump to yield 1 l/s for 12 hours per day. Water Quality Good.
10-77121	111.2.H	Weltevrede Clinic	+2911850	-49050	2625AD	SDT	50	12.1	40	Handpump to yield 0,3 l/s Water Quality Good
10-77265	3.1.V	Welverdiend	+2882300	-75575	2625BB	CDT	86	6.06	60	Motorpump to yield 0,5 l/s for 12 hours per day. Water Quality Good.
10-77266	52.1.A	Welverdiend	+2881675	-75550	2625BB	CDT	81	6.88	40	Motorpump to yield 1 l/s for 12 hours per day. Water Quality Good.
10-77336	56.3.H	Welverdiend Clinic	+2881725	-75525	2625BB	SDT	18	7.04	--	Handpump (or solar pump) to yield 0,3 l/s. <u>NB:</u> Borehole must be deepened to 30m. (The borehole is presently equipped with a handpump). Water Quality Good.

Handpumps are recommended for installation in 13 of the boreholes to the depths indicated. The yield given for the hand pump is indicative and reflects the optimum pump size that should be installed, i.e. 0,1 l/s equates to a small cylinder and 0,3 l/s equates to a large cylinder, bearing in mind the head against which the pump must operate.

Windpumps are recommended for installation in 5 boreholes where the water is required for cattle watering.

Of the 13 boreholes recommended for equipping with a handpump, 1, (10-77302 at Matila 2) is considered marginal and barely able to support even a small handpump. Borehole 10-77249 at Diretsane Mateane Primary School is so poorly developed that it is recommended that this borehole is not equipped. Furthermore, the water quality in 2 of the holes tested is too poor for use, these are 10-77296 and 10-77297 at Deelpan where saline water was encountered.

It is recommended that all boreholes be disinfected with at least 0,5Kg of HTH before being equipped.

It is noted that handpumps (or windpumps) may be installed in boreholes where a motorpump is recommended, but a motorpump must not be installed in boreholes that are suitable only for handpumps (or windpumps).

The programme has confirmed that the groundwater resources of the localities investigated in Ditsobotla are variable, both in terms of quantity and quality. The groundwater resources are generally well developed in the Allanridge Lavas and

Kraaipan Formation. The resources in the granite and dolomite are more variable and two localities investigated, Longaneng Creche in Madibogo, underlain by granite, and Verdwaal, underlain by dolomite, were considered too poor to warrant any drilling.

The groundwater resources over most of the District are generally suitable for exploitation for primary water supplies. Exceptions are Longaneng and Verdwaal as mentioned above where the search for additional supplies will need to be extended some kilometres away from the villages to potentially more favourable areas, eg. at Verdwaal the search should be extended approximately 3Km to the north into the areas underlain by the chert rich Monte Christo Dolomite Formation where large yielding boreholes can be anticipated.

Finally, where boreholes equipped with motorpumps are located in villages of high growth, it is recommended that strict monitoring procedures be adhered to. Monitoring should be carried out by installing a flow metre to measure the discharge of the borehole on a weekly basis. The water level must also be recorded weekly. In order to achieve this a 20mm ID plastic tube must be fitted to the pump column at the time of pump installation for use as a piezometer measuring tube. These data should be submitted to the consultants on a 6 monthly basis so that any decline in the water level can be counteracted.

APPENDIX I

**Locality Maps, Drilling and
Test Pumping Data by Village**

BAPONG

Including boreholes

10-77283

10-77299

2625BA

VLAKPAN 72 IO

Nooitgedacht 1384

1391

NOOITGEDACHT 76 IO

1377

Vlakpan

1388

1383

△ 121
1380.8

Gelukspan

BAPONG

1384

GELUKSPAN 83 IO

10-77299

Gelukspan

Gelukspan

10-77283

Gelukspan

1375

1371

Gelukspan

1382

BROOKSBY 90 IO

1374

0725

0724

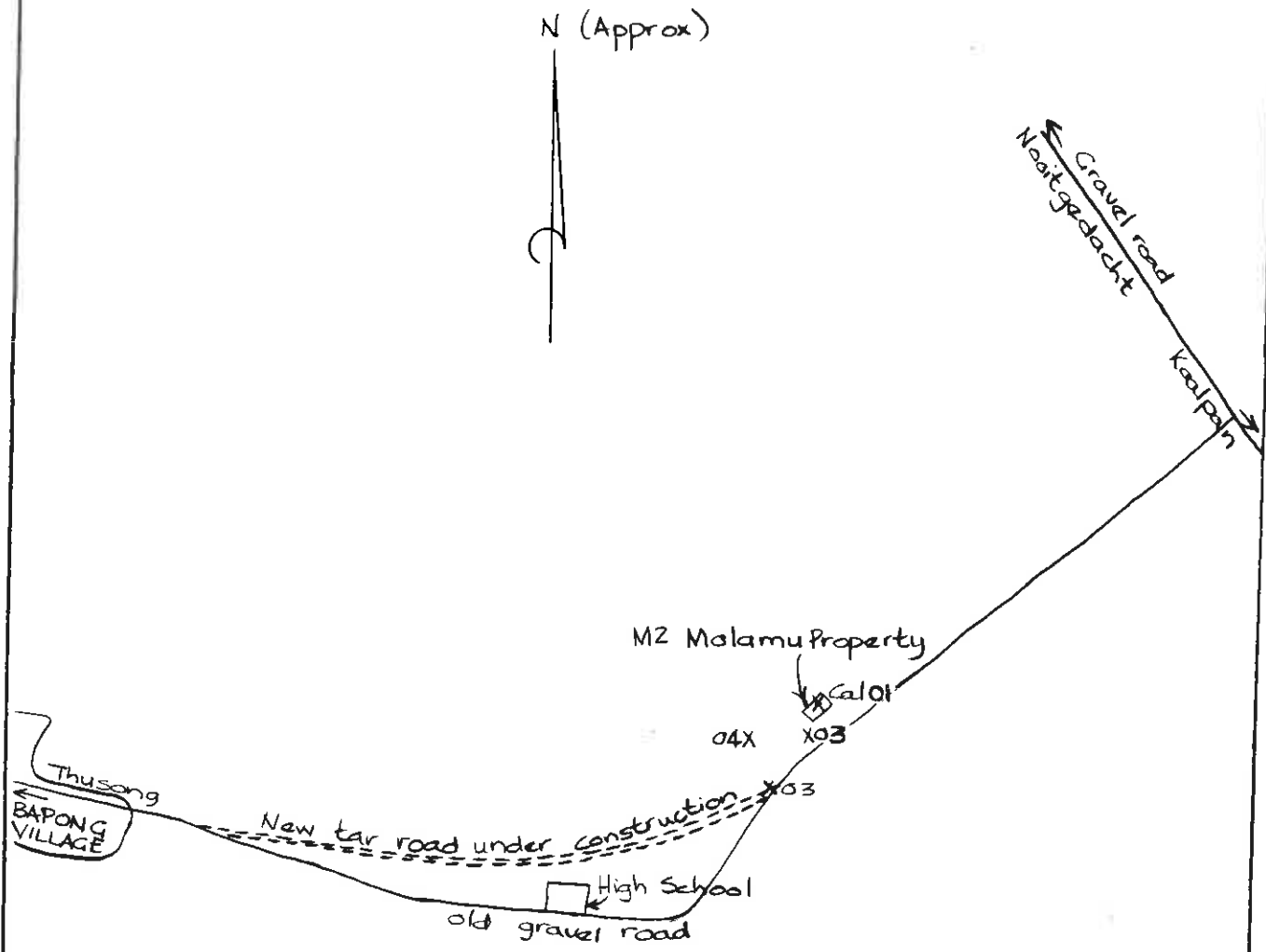
Symmetrisch
42km

40'

1:50 000

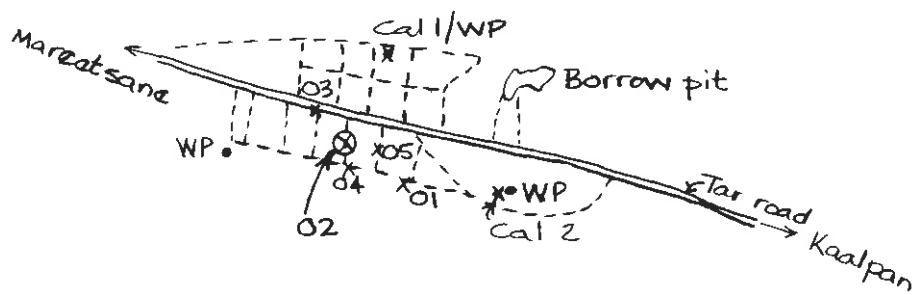
113

0 1 000 2 000 3 000 4 000 5 000 Meter



Locality Plan of Bapong
 Overlay to Photo No 864 (strip 14)
 Approx Scale 1:30 000

N (Approx)



Locality Plan of Bapong
Overlay to Photo No 864 (strip 14)
Approx Scale 1 : 30 000

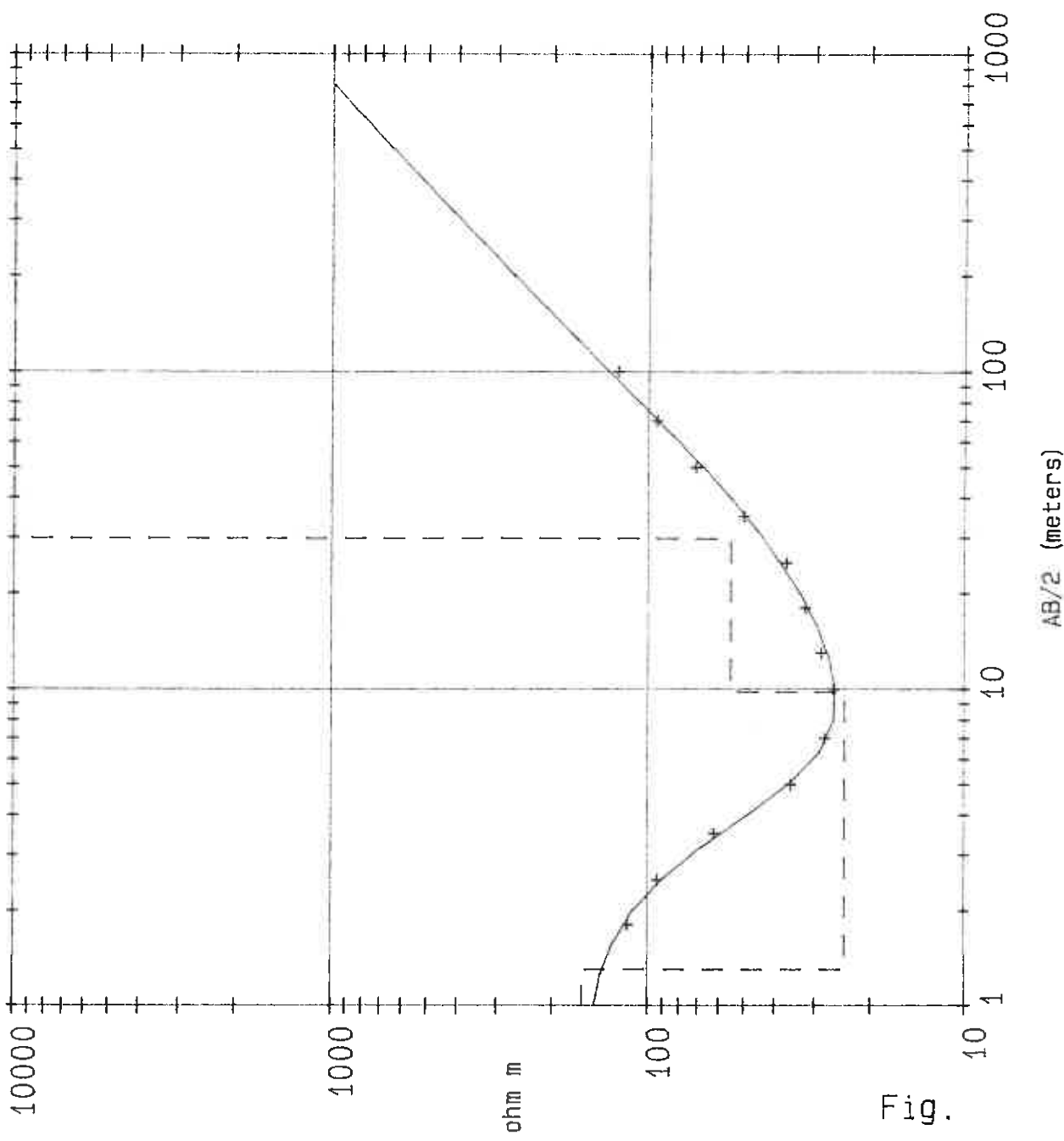


Fig.

+ Field data
 — Computer model
 - - - r model

BAPONG

V.E.S. 02

CO-ORDINATES
 +2899525X -63405Y

GEOLOGY
 LAVA

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

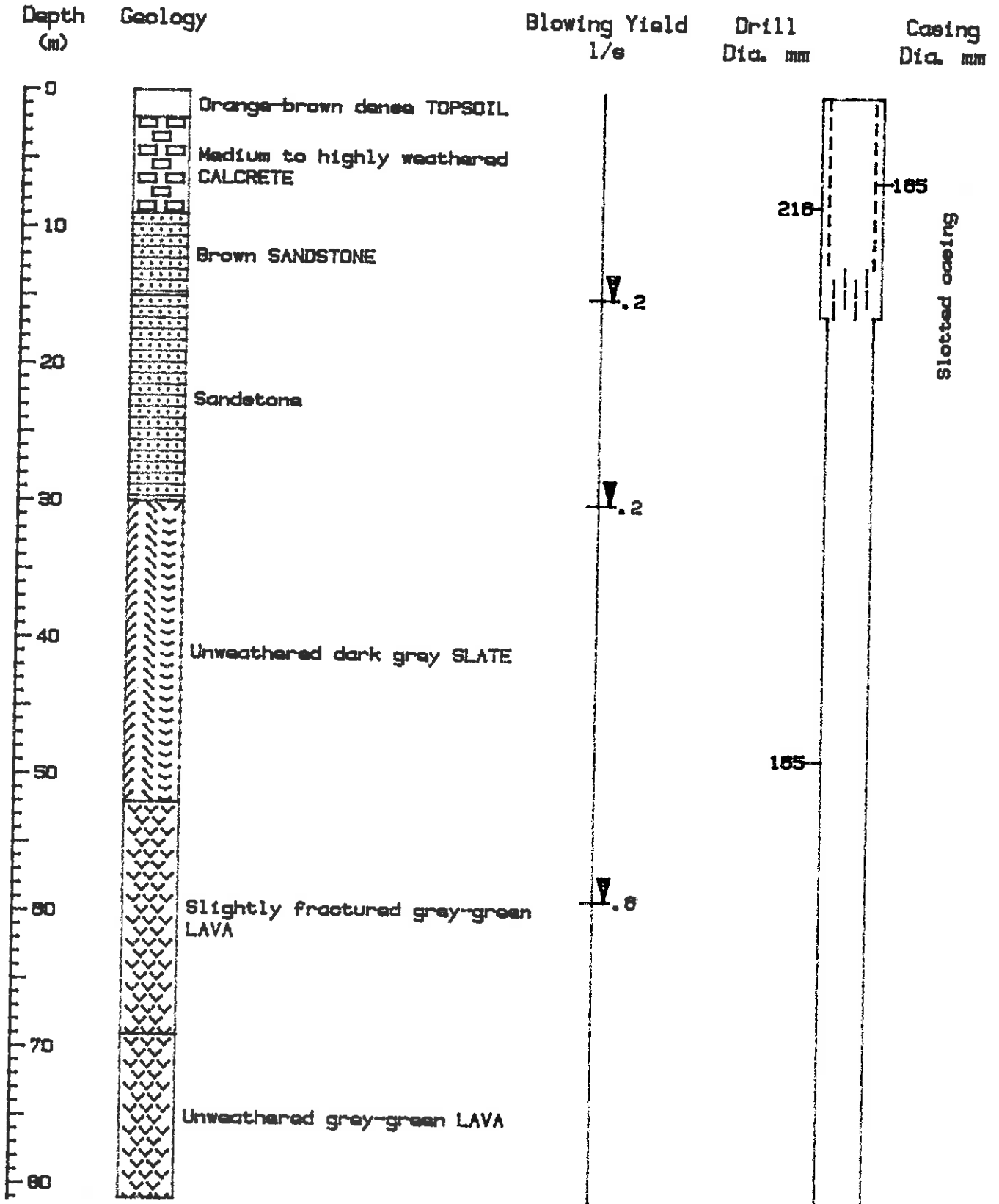
LOCALITY: BAPONG

BH. No. 10-77283

Geoph. Peg No. 02

Coordinates +2899525X -63400Y

Elev. (m) 1378



End of Hole 81

STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

BAPONG

23 04 1992

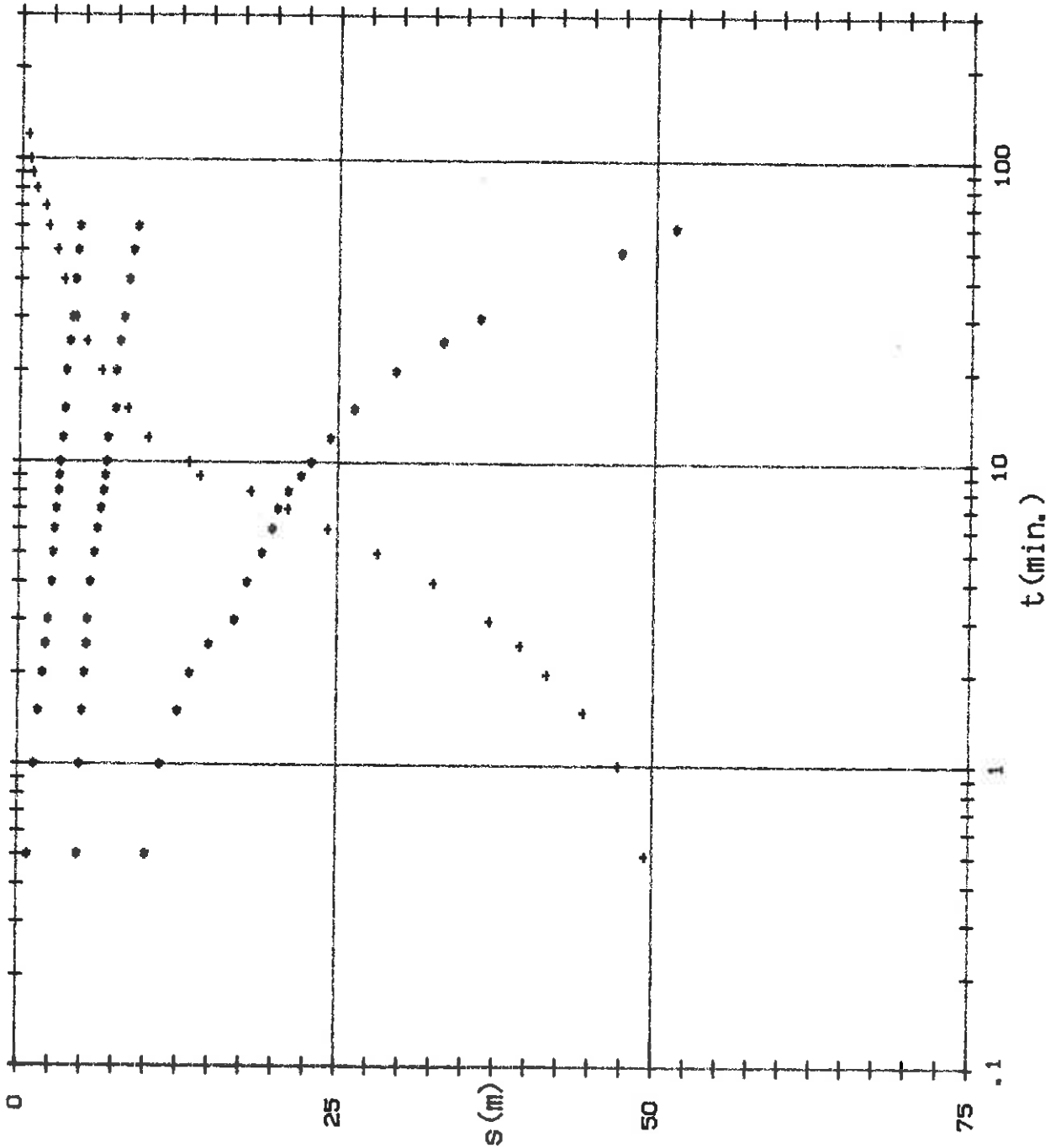
B.H. No. 10-77283

$Q_1 = .6 \text{ l/s}$

$Q_2 = .55 \text{ l/s}$

$Q_3 = 1.1 \text{ l/s}$

S.W.L. = 6.97 m



CONSTANT DISCHARGE TEST

- + Drawdown data.
- * Recovery data.

BAPONG

24 04 1992

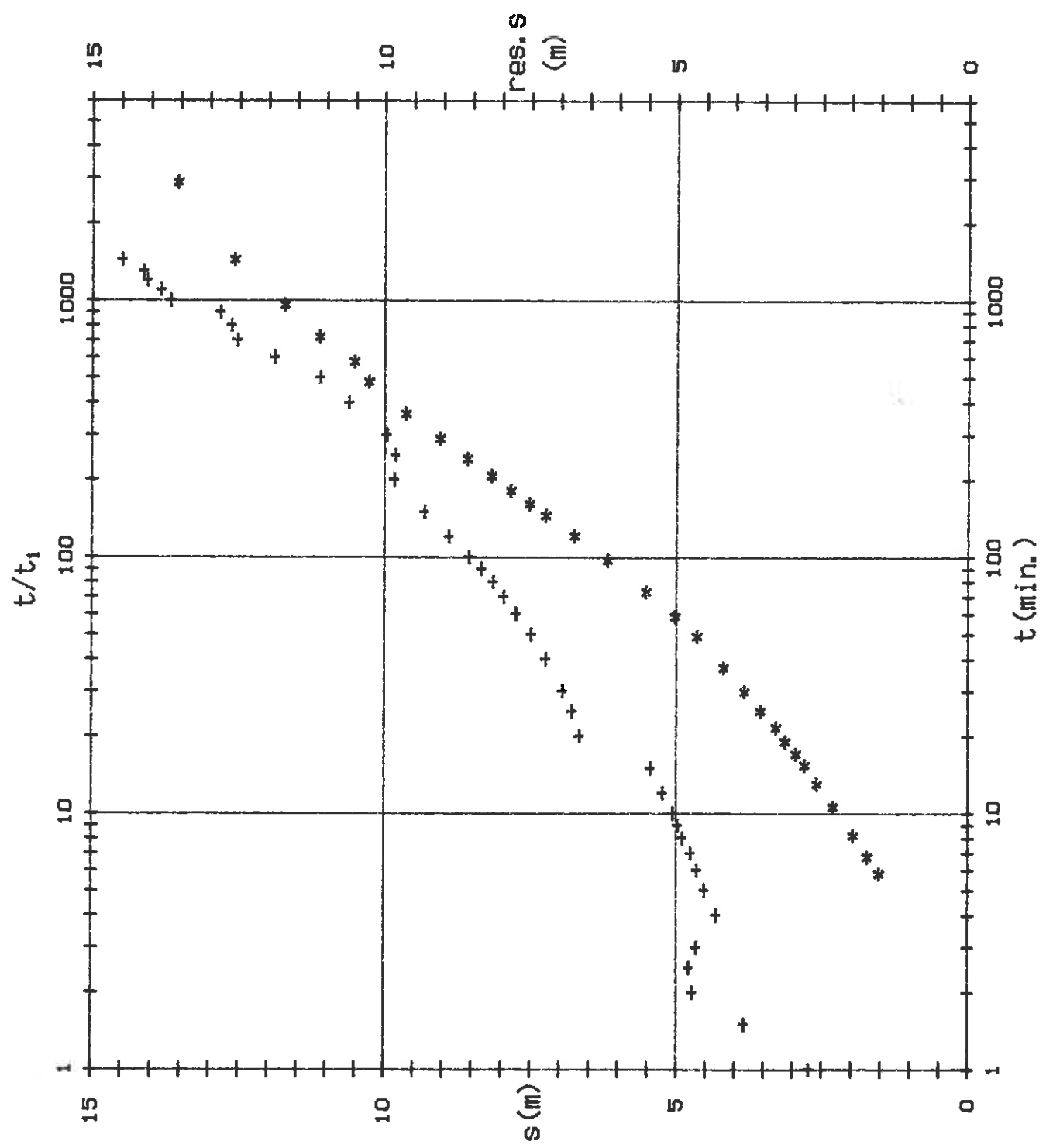
Pumped Borehole
10-77283

Readings on Borehole
10-77283

$Q = .74 \text{ l/s}$

S.W.L. = 6.97 m

$T = 5 \text{ m}^2/\text{d}$



+ Field data
 --- Computer model
 - - - d - r model

BAPONG

V.E.S. 01

CO-ORDINATES
 +2898975X -66380Y

GEOLOGY
 LAVA

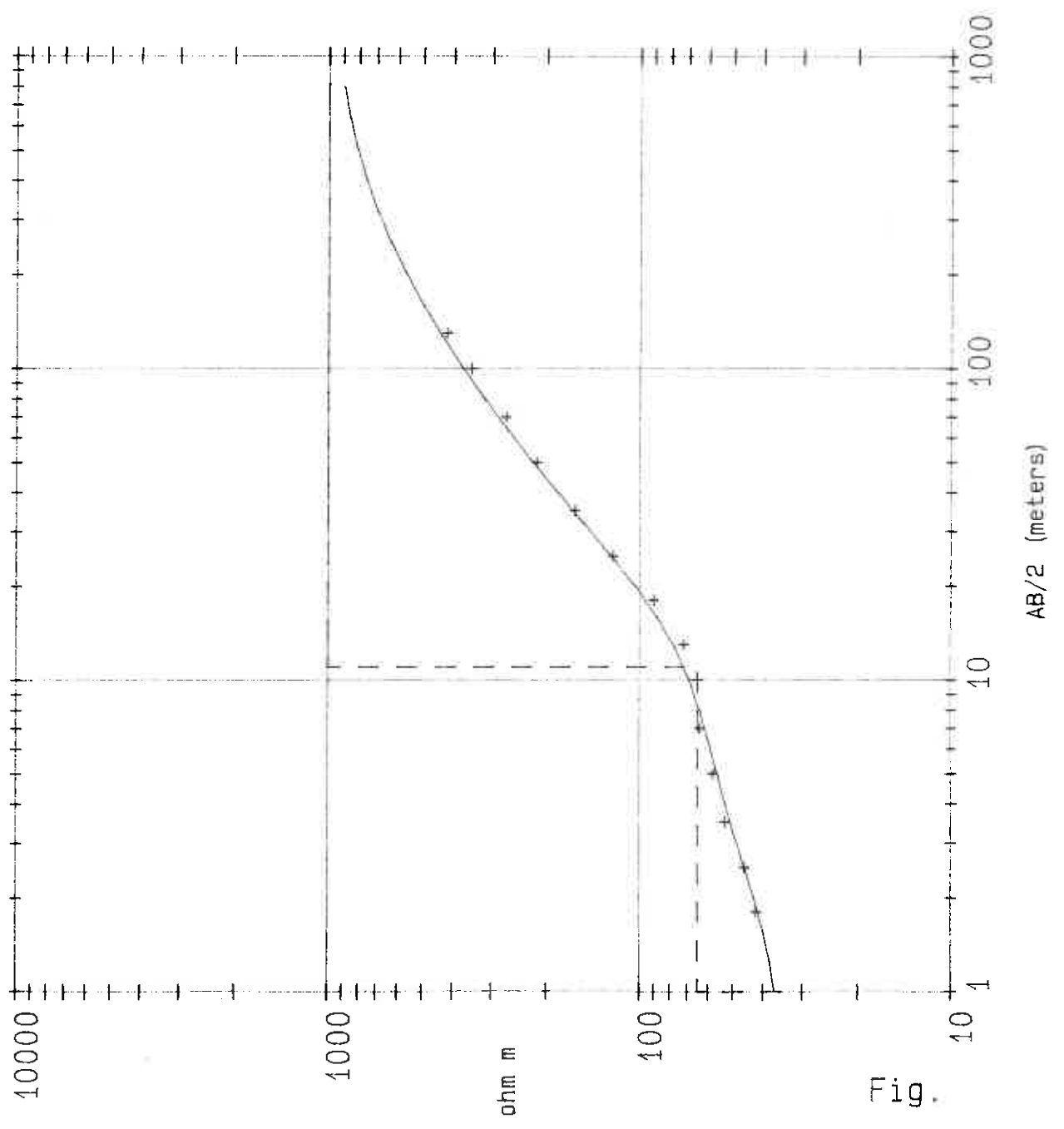


Fig.

Table 4 (cont)

Borehole No.	Locality	Date of Test	Borehole depth (m)	Pump setting (m)	Water level (mbgl)	Step number	Test duration (mins)	Yield (l/s)	Drawdown at end of each step (m)	Remarks
10-77298	Kaalpan	28.04.92	75	65	5.66	1	60	0.20	1.05	
						2	60	0.40	4.66	
						3	60	0.94	54.64	
10-77300	Kaalpan Veg. Garden	29.04.92	73	65	15.44	1	60	0.16	0.99	
						2	60	0.45	2.87	
						3	60	0.89	5.53	
						4	25	3.40	58.19	
10-77248	Kopela Noto H/S	16.07.92	61	53	11.35	1	60	0.22	3.12	
						2	60	0.51	9.24	
						3	60	1.10	22.43	
						4	12	2.10	38.32	
10-77306	Kopela	17.07.92	37	35	15.72	1	60	0.15	0.17	
						2	60	0.45	1.62	
						3	60	0.90	3.47	
						4	60	1.81	7.45	
10-77288	Kraaipan Aron P/S	22.05.92	60	53	11.50	1	60	0.21	1.18	
						2	60	0.40	2.80	
						3	60	0.81	10.52	
						4	15	1.30	41.57	

Table 4 (cont)

Borehole No.	Locality	Date of Test	Borehole depth (m)	Pump setting (m)	Water level (mbgl)	Step number	Test duration (mins)	Yield (l/s)	Drawdown at end of each step (m)	Remarks
10-77252	Lombardslaagte	05.08.92	75	65	6.68	1	60	0.54	2.38	
						2	60	1.02	6.45	
						3	60	2.17	29.63	
						4	5	4.0	54.92	
10-77281	Louisdal	16.05.92	91	71	19.25	1	60	0.23	7.83	
						2	60	0.44	17.29	
						3	40	0.81	51.64	
10-77282	Louisdal	19.05.92	84	71	19.02	1	60	0.16	4.84	
						2	60	0.39	19.21	
						3	40	0.65	54.20	
10-77187	Lynplaats	22.07.92	47	41	22.83	1	60	0.18	3.15	
						2	15	0.45	11.04	
10-77253	Madibogo Pan Clinic	02.07.92	90	71	24.58	1	60	0.21	0.85	
						2	60	0.54	1.66	
						3	60	1.10	3.62	
						4	60	2.70	12.19	

Table 4 (cont)

Borehole No.	Locality	Date of Test	Borehole depth (m)	Pump setting (m)	Water level (mbgl)	Step number	Test duration (mins)	Yield (l/s)	Drawdown at end of each step (m)	Remarks
10-77293	Majeng	25.05.92	91	77	27.36	1	60	0.11	7.35	
						2	60	0.22	15.92	
						3	60	0.40	45.15	
10-77137	Manamolela Konopo P/S	14.07.92	60	53	10.03	1	60	0.25	3.80	
						2	60	0.51	8.72	
						3	50	1.10	32.48	
10-77276	Mareetsane	12.05.92	81	71	25.25	1	60	0.11	1.42	
						2	60	0.38	4.89	
						3	60	0.55	7.89	
						4	25	1.50	34.49	
10-77277	Mareetsane	11.05.92	81	71	17.96	1	60	0.20	1.52	
						2	60	0.41	4.02	
						3	60	0.81	11.90	
						4	60	1.50	44.06	
10-77278	Mareetsane Mpoetsile P/S	09.05.92	81	71	22.12	1	60	0.13	3.02	
						2	60	0.32	7.58	
						3	60	0.45	44.88	
						4	10	0.94	48.88	

Table 4 (cont)

Borehole No.	Locality	Date of Test	Borehole depth (m)	Pump setting (m)	Water level (mbgl)	Step number	Test duration (mins)	Yield (l/s)	Drawdown at end of each step (m)	Remarks
10-77279	Mareetsane	08.05.92	80	71	18.20	1	60	0.20	2.96	
						2	60	0.50	7.38	
						3	60	1.0	19.97	
						4	30	2.0	51.75	
10-77280	Mareetsane	11.05.92	70	65	10.74	1	60	0.16	1.35	
						2	60	0.43	4.06	
						3	60	0.85	27.57	
						4	15	1.50	55.16	
10-77267	Mantle 1 Clinic	12.08.92	69	65	10.66	1	60	0.11	0.54	
						2	60	0.29	2.63	
						3	60	0.59	17.64	
						4	5	1.20	29.27	
10-77302	Mantle 2	12.08.92	102	83	13.74	1	60	0.22	19.92	
						2	60	0.48	68.84	
10-77291	Middleton B M/S	06.07.92	81	71	18.87	1	60	0.25	0.26	
						2	60	0.59	0.59	
						3	60	1.22	4.10	
						4	60	2.45	16.21	

Table 4 (cont)

Borehole No.	Locality	Date of Test	Borehole depth (m)	Pump setting (m)	Water level (mbgl)	Step number	Test duration (mins)	Yield (l/s)	Drawdown at end of each step (m)	Remarks
10-77292	Middleton C Manonyane Creche	09.07.92	80	71	34.89	1	60	0.28	0.16	
						2	60	0.60	0.52	
						3	60	1.22	1.16	
						4	60	2.40	2.82	
						5	60	4.0	9.31	
10-77338	Middleton C	12.07.92	53	47	10.74	1	60	0.19	1.57	
						2	60	0.41	3.52	
						3	60	0.81	7.97	
						4	45	1.86	28.60	
10-77339	Middleton B	07.07.92	57	41	26.13	1	60	0.26	3.68	
						2	50	0.54	9.45	
10-77246	Modiboa	08.07.92	70	65	21.19	1	60	0.20	0.65	
						2	60	0.41	1.26	
						3	60	0.90	2.82	
						4	60	1.84	5.80	
						5	60	3.50	11.95	

Table 4 (cont)

Borehole No.	Locality	Date of Test	Borehole depth (m)	Pump setting (m)	Water level (mbgl)	Step number	Test duration (mins)	Yield (l/s)	Drawdown at end of each step (m)	Remarks
10-77348	Mooineisiesfontein	27.01.93	47	35	5.89	1	60	0.47	0.62	
						2	60	1.01	1.86	
						3	60	1.97	5.85	
						4	20	4.04	30.40	
10-77247	Mooipan	02.08.92	50	65	9.82	1	60	0.25	6.16	
						2	60	0.53	26.97	
						3	5	1.10	35.35	
10-77295	Mooipan	01.08.92	70	65	9.82	1	60	0.51	0.97	
						2	60	1.02	2.68	
						3	60	1.97	5.98	
						4	60	3.96	14.54	
10-77183	Naauwpoort	06.05.92	74	65	7.40	1	60	0.16	1.84	
						2	60	0.43	10.44	
						3	60	0.85	49.20	
10-77332	Naauwpoort	02.05.92	12.60	11	7.55	1	60	0.19	0.20	
						2	60	0.45	0.39	
						3	60	0.90	0.82	
						4	60	2.10	1.56	

Table 4 (cont)

Borehole No.	Locality	Date of Test	Borehole depth (m)	Pump setting (m)	Water level (mbgl)	Step number	Test duration (mins)	Yield (l/s)	Drawdown at end of each step (m)	Remarks
10-77340	Naauwpoort	07.05.92	19	17	7.34	1	60	0.18	1.46	
						2	60	0.43	7.06	
						3	5	0.85	9.98	
10-77342	Rakgvedi	20.08.92	24	20	5.93	1	60	0.29	4.1	
						2	60	0.60	12.72	
10-77343	Rakgvedi	21.08.92	34	29	5.76	1	60	0.21	0.59	
						2	60	0.40	1.32	
						3	60	0.85	3.34	
						4	60	1.74	9.55	
						5	3	4.0	18.94	
10-77271	Schoongezicht Clinic	04.05.92	71	65	9.34	1	60	0.27	22.57	
						2	60	0.50	50.02	
10-77272	Schoongezicht	05.05.92	75	65	9.44	1	60	0.18	1.93	
						2	70	0.35	5.02	
						3	60	0.65	17.85	
						4	30	1.06	55.85	
10-77303	Shaleng	25.05.92	99	83	7.84	1	60	0.16	12.08	
						2	60	0.30	46.96	

Table 4 (cont)

Borehole No.	Locality	Date of Test	Borehole depth (m)	Pump setting (m)	Water level (mbgl)	Step number	Test duration (mins)	Yield (l/s)	Drawdown at end of each step (m)	Remarks
10-77250	Siberia Gontse H/S	21.05.92	88	71	26.89	1	60	0.27	6.40	
						2	60	0.43	18.32	
						3	30	0.71	44.76	
10-77285	Siberia	21.05.92	81	71	29.89	1	60	0.09	1.50	
						2	60	0.34	7.38	
						3	60	0.60	24.79	
						4	10	1.30	40.18	
10-77344	Sione	22.08.92	30	29	16.52	1	60	0.25	5.82	
						2	3	0.55	8.98	
10-77301	Springbokpan	10.08.92	70	65	6.02	1	60	0.18	0.87	
						2	60	0.39	20.97	
						3	40	0.68	58.99	
10-77333	Springbokfontein	03.09.92	22	20	5.90	1	60	0.23	0.30	
						2	60	0.50	0.62	
						3	60	1.40	3.02	
						4	4	2.65	10.95	

Table 4 (cont)

Borehole No.	Locality	Date of Test	Borehole depth (m)	Pump setting (m)	Water level (mbgl)	Step number	Test duration (mins)	Yield (l/s)	Drawdown at end of each step (m)	Remarks
10-77334	Springbokfontein	04.09.92	12.12	11	5.06	1	60	0.19	0.23	
						2	60	0.56	1.16	
						3	30	1.1	5.40	
10-77286	Tlhakajeng Ketletseng M/S	24.05.92	81	65	11.60	1	60	0.22	18.93	
						2	60	0.40	51.09	
						3	5	0.80	53.75	
10-77331	Uitkyk	01.05.92	9.4	8	5.45	1	60	0.2	0.24	
						2	60	0.5	0.33	
						3	60	1.0	0.53	
						4	60	2.12	1.16	
10-77121	Weltevrede Clinic	24.05.92	50	41	12.10	1	60	0.15	3.87	
						2	60	0.40	20.76	
						3	9	0.80	28.90	
10-77265	Welverdiend	13.05.92	86	77	6.06	1	60	0.24	7.25	
						2	60	0.49	18.38	
						3	30	1.0	58.63	

Table 4 (cont)

Borehole No.	Locality	Date of Test	Borehole depth (m)	Pump setting (m)	Water level (mbgl)	Step number	Test duration (mins)	Yield (l/s)	Drawdown at end of each step (m)	Remarks
10-77266	Welverdiend	16.08.92	81	71	6.88	1	60	0.21	1.35	
						2	60	0.41	3.39	
						3	60	0.99	16.33	
						4	20	2.0	53.29	
10-77336	Welverdiend Clinic	15.08.92	18.07	17	7.04	1	60	0.20	2.12	
						2	60	0.43	6.02	
						3	10	0.89	10.98	

TABLE 5

SUMMARY OF CONSTANT TEST DATA - DITSBOTLA DISTRICT

Borehole No.	Locality	Date of test	Borehole depth (m)	Depth of pump (m)	Water level (mbgl)	Test duration (mins)	Test yield (l/s)	Drawdown at end of test (m)	Period over which recovery is measured (mins)	Residual at end of recovery period (m)	Remarks
10-77283	Bapong	24.04.92	78	65	6.97	1440	0.74	14.50	300	1.52	
10-77299	Bapong (Gelukspan)	26.04.92	68	59	5.35	1440	0.5	13.89	300	0.12	
10-77251	Brooksby	07.08.92	51	47	6.08	2880	1.50	4.42	300	0.00	
10-77341	Deelpan	08.10.92	20.40	17	4.83	2880	4.0	0.72	20	0.00	
10-77294	Doornlaagte	20.07.92	80	71	14.36	2880	2.0	16.94	300	1.15	
10-77307	Doornlaagte	21.07.92	43	41	13.36	2880	1.0	13.80	300	1.20	
10-77275	Goedgevonden P/S	26.04.92	70	65	7.70	1440	0.5	4.53	200	0.05	
10-77298	Kaalpan	28.04.92	75	65	5.66	1440	0.51	15.91	60	0.00	
10-77300	Kaalpan	29.04.92	73	65	15.44	2880	1.20	8.76	250	0.10	
10-77248	Kopela Noto H/S	17.07.92	61	53	11.35	1440	0.50	8.61	300	0.26	
10-77306	Kopela Clinic	18.07.92	37	35	15.72	2880	1.0	4.60	300	0.36	

Table 5 (cont)

Borehole No.	Locality	Date of test	Borehole depth (m)	Depth of pump (m)	Water level (mbgl)	Test duration (mins)	Test yield (l/s)	Drawdown at end of test (m)	Period over which recovery is measured (mins)	Residual drawdown at end of recovery period (m)	Remarks
10-77288	Kraipan Aron P/S	22.05.92	60	53	11.50	1440	0.5	4.18	300	0.36	
10-77252	Lombardslaagte	06.08.92	75	65	6.68	2880	1.13	8.89	120	0.04	
10-77253	Madibogo Pan Clinic	02.07.92	90	71	24.58	2880	1.35	7.69	300	1.31	
10-77137	Mamamolela Konopo P/S	15.07.92	60	53	10.03	1440	0.50	8.62	300	0.32	
10-77276	Mareetsane	14.05.92	81	71	25.25	1440	0.5	9.29	300	0.10	
10-77277	Mareetsane	11.05.92	81	71	17.96	2880	1.0	15.74	300	2.45	
10-77279	Mareetsane	09.05.92	80	71	22.12	1440	0.89	35.60	300	4.95	
10-77280	Mareetsane	11.05.92	70	65	10.74	1440	0.52	6.25	300	0.25	
10-77267	Matile 1 Clinic	13.08.92	69	65	10.66	1440	0.50	32.47	300	0.00	
10-77291	Middleton B M/S	06.07.92	81	71	18.84	2880	1.50	7.10	15	0.07	

Table 5 (cont)

Borehole No.	Locality	Date of test	Borehole depth (m)	Depth of pump (m)	Water level (mbgl)	Test duration (mins)	Test yield (l/s)	Drawdown at end of test (m)	Period over which recovery is measured (mins)	Residual at end of recovery period (m)	Remarks
10-77292	Middleton C Manonyane Creche	10.07.92	80	71	34.89	2880	3.0	5.55	300	0.82	
10-77338	Middleton C	13.07.92	53	47	10.74	1440	0.82	13.97	400	0.52	
10-77246	Modiboa	08.07.92	70	65	21.19	2880	2.0	43.54	300	0.91	
10-77348	Mooimeisiesfontein	28.01.92	47	35	5.89	2880	2.21	9.07	300	0.00	
10-77295	Mooipan	01.08.92	70	65	9.82	2880	3.0	11.25	300	1.48	
10-77332	Nauwpoort	03.05.92	12.60	11	7.55	2880	1.4	1.38	300	0.19	
10-77343	Rakgwedi	22.08.92	34	29	5.76	2880	1.0	4.60	300	0.21	
10-77272	Schoongezicht	06.05.92	75	65	9.44	1440	0.5	7.78	300	0.42	
10-77285	Siberia Gontse P/S	21.05.92	81	71	29.89	1440	0.5	26.89	300	0.01	
10-77333	Springbokfontein	03.09.92	22	20	5.90	2880	1.0	2.19	60	0.00	
10-77334	Springbokfontein	05.09.92	12.12	11	5.06	1440	0.5	1.29	8	0.00	

Table 5. (cont)

Borehole No.	Locality	Date of test	Borehole depth (m)	Depth of pump (m)	Water level (mbgl)	Test duration (mins)	Test yield (l/s)	Drawdown at end of test (m)	Period over which recovery is measured (mins)	Residual drawdown at end of recovery period (m)	Remarks
10-77331	Uitkyk	01.05.92	9.40	8.0	5.45	2880	1.4	0.98	300	0.10	
10-77265	Welverdiend	14.08.92	86	77	6.06	1440	0.85	36.97	300	0.42	
10-77266	Welverdiend	18.08.92	81	71	6.88	2880	1.10	18.71	200	0.07	

TABLE 6

SUMMARY OF HYDRAULIC PARAMETERS

Borehole No.	Transmissivity (m ² /d)	Specific Capacity*		Geology	Status
		(l/s/m)	(m ³ /d/m)		
10-77265	0.5	0.01	1.17	Dolomite	D
10-77266	2	0.06	5.5	Dolomite	D
10-77267	0.5	0.02	1.3	Dolomite	D
10-77333	50	0.48	41.7	Dolomite	M
10-77334	15	0.39	33.5	Dolomite	M
10-77348	8	0.25	22.0	Dolomite	D
10-77288	3	0.12	10.3	Gneiss	D
10-77137	1.5	0.06	5.0	Granite	D
10-77253	7	0.19	16.3	Granite	D
10-77276	1	0.05	4.6	Granite	D
10-77277	2	0.07	5.6	Granite	D
10-77291	4	0.22	19.3	Granite	D
10-77292	50	0.59	50.8	Granite	D
10-77338	3	0.06	4.9	Granite	M
10-77246	8	0.11	9.5	Lava	D
10-77248	2	0.06	5.0	Lava	D
10-77251	10	0.36	31.0	Lava	D
10-77252	5	0.14	11.9	Lava	D
10-77275	3	0.11	9.5	Lava	D
10-77279	1	0.03	2.2	Lava	D
10-77280	3	0.08	7.3	Lava	D
10-77283	5	0.05	4.4	Lava	D
10-77285	0.5	0.02	1.6	Lava	D
10-77294	6	0.12	10.5	Lava	D
10-77295	11	0.29	25.4	Lava	D
10-77298	1.5	0.03	2.7	Clay/Lava	D
10-77299	1	0.04	3.1	Dolomite/Lava	D
10-77300	4	0.14	11.9	Clay/Lava	D
10-77306	7	0.23	19.9	Lava	D
10-77307	3	0.07	6.40	Lava	M
10-77331	110	1.52	131.5	Lava	M
10-77332	25	1.17	100.8	Lava	M
10-77341	200	5.56	480	Lava	M
10-77343	5	0.25	21.6	Lava	M
10-77272	3	0.06	5.5	Quartzite	D

* Calculated at 1440 minutes
D = Geological information from drilling log
M = Geological information from published maps

A similarly unfavourable situation is seen in the granite with transmissivities, of 7 of the 8 boreholes tested, ranging from 1 to 7 m²/d. Only 10-77292 at Manonyane Creche, Middleton possesses a higher transmissivity of 50 m²/d. Again, this is a reflection of poor development of the weathering and fracturing occurring in the granite.

Twenty boreholes drilled into the Allanridge Lavas were tested and transmissivity values calculated. Of these, 17 have T values of <11 m²/d, one a T of 25 m²/d and only 2 have high values, (boreholes 10-77331 at Uitkyk with T = 100 m²/d, and borehole 10-77241 at Deelpan with T = 200 m²/d). The transmissivity values are mirrored by the specific capacities (Table 6). Once again, this is a reflection of the generally limited and poor weathering and fracturing associated with these rocks. Overall, low permeation characteristics are characteristic of the District, and the groundwater resources must be considered poor on a regional scale.

7. GROUNDWATER QUALITY

7.1. General Comments

One litre water samples were collected by the contractor from each boreholes at the end of the pumping test.

The samples were submitted to Messrs. McLachlan and Lazar (Pty) Ltd in Johannesburg for analyses. The results received are tabulated in Table 7.

7.2. Groundwater Quality

The water quality of the tested boreholes is generally good with the exception of the two boreholes, (10-77296 and 10-77297), drilled at Deelpan, where saline water was encountered. The water quality throughout the District does not appear to be affected by the geological formations.

The waters are generally slightly alkaline with pH values ranging from 7,1 to 8,14. Only 2 boreholes, 10-77137 at Manamolela and 10-77348 at Mooimeisiesfontein, have pH values below 7, ie. 6,96 and 6,93 respectively.

The Total Dissolved Solids (TDS) of the groundwater is below 2000 mg/l, except for the 2 saline boreholes. The conductivity of the groundwater is always below the low risk limit of 300 mS/m, except for 10-77296 and 10-77297.

TABLE 7
CHEMICAL ANALYTICAL RESULTS OF WATER SAMPLES

Borehole No.	pH	Conductivity (mS/m 25°C)	TDS	Total Hardness (as CaCO ₃)	Total Alkalinity (as CaCO ₃)	Ca	Mg	Na	K	HCO ₃	Cl	SO ₄	NO ₃	F	Fe
10-77121	7.49	63.6	640	204	142	39	26	37	<0.1	173	69	1	42	0.4	<0.01
10-77137	6.96	82.7	620	380	240	96	34	18.9	3.4	292	116	20	14.9	0.2	<0.01
10-77183	7.34	66.1	484	265	248	65	25	18.0	6.4	302	26	7	16.8	0.5	<0.01
10-77187	7.43	33.8	230	145	168	27	18.9	13.1	1.3	205	10.5	<1	1.0	0.2	<0.01
10-77246	7.16	167.4	1300	742	468	106	116	83	1.0	570	242	100	53	0.3	<0.01
10-77247	7.73	39.9	255	166	184	45	13.0	32	0.4	224	16.0	8	12.0	0.4	<0.01
10-77248	7.39	60.8	410	228	256	50	25	43	1.4	312	32	6	23	0.6	<0.01
10-77249	6.93	93.6	745	304	116	90	19.2	52	1.1	141	200	10	34	0.4	<0.01
10-77250	7.72	77.6	688	301	328	63	35	43	1.8	400	33	5	25	0.4	<0.01
10-77251	7.53	59.7	485	315	324	52	45	25	5.1	395	16.0	11	24	0.5	<0.01
10-77252	7.50	67.5	460	286	320	80	21	44	5.2	390	32	19	13.8	0.3	<0.01
10-77253	8.14	54.3	360	224	220	50	24	28	4.3	268	27	4	34	0.3	0.16
10-77265	7.38	64.7	410	369	376	90	35	8.5	3.1	458	12.0	5	8.6	0.3	<0.01
10-77266	7.37	63.9	690	364	350	88	35	13.5	0.1	427	12.0	4	24	0.3	<0.01
10-77267	7.50	58.0	425	333	320	84	30	16.3	1.5	390	16.0	5	7.8	0.3	<0.01
10-77271	7.55	69.1	476	335	304	60	45	21	1.8	371	55	5	8.7	0.4	<0.01
10-77272	7.51	63.6	284	294	292	60	35	9.4	5.3	356	6.3	3	19.3	0.5	<0.01
10-77275	7.43	105.5	804	369	276	77	43	65	5.0	337	158	26	12.8	0.8	<0.01
10-77276	7.24	106.7	752	377	408	77	45	73	3.0	498	74	27	17.4	0.3	<0.01
10-77277	7.24	88.4	572	269	302	50	35	70	3.9	368	53	17	32	0.4	<0.01
10-77278	7.26	90.8	696	352	338	75	40	45	4.5	412	65	16	18.9	0.3	<0.01
10-77279	7.30	73.3	504	270	348	57	31	53	2.2	424	15.8	9	11.0	0.3	<0.01
10-77280	7.58	90.7	604	282	290	60	32	45	1.9	244	75	10	61	0.3	<0.01

Table 7 (cont)

Borehole No.	pH	Conductivity (mS/m 25°C)	TDS	Total Hardness (as CaCO ₃)	Total Alkalinity (as CaCO ₃)	Ca	Mg	Na	K	HCO ₃	Cl	SO ₄	NO ₃	F	Fe
10-77281	8.42	54.3	500	203	234	40	25	30	1.6	285	15.8	1	17.8	0.3	<0.01
10-77282	7.84	50.4	560	181	180	38	21	23	<0.1	220	11.6	3	34	0.4	<0.01
10-77283	7.53	60.1	412	248	260	50	30	20	6.5	317	21	1	15.8	0.7	<0.01
10-77285	7.78	74.0	768	281	356	55	35	40	1.0	434	8.4	2	12.6	0.3	<0.01
10-77286	7.43	88.4	844	168	234	33	21	95	0.9	285	54	17	56	0.9	<0.01
10-77288	8.03	94.7	792	263	276	56	30	85	3.8	337	73	83	4.9	0.7	<0.01
10-77291	7.13	20.6	175	55	80	10.8	6.8	22	0.8	98	14.7	<1	8.4	0.4	<0.01
10-77292	7.86	18.8	140	70	85	15.0	8.0	15.0	2.7	104	12.6	<1	1.4	0.3	<0.01
10-77293	7.92	46.2	548	144	120	18.0	24	19.7	1.3	146	13.0	6	45	0.2	<0.01
10-77294	7.38	56.5	485	220	256	55	20	31	1.3	312	29	6	0.3	0.2	<0.01
10-77295	7.61	50.3	470	207	276	55	17.0	50	0.3	336	12.0	9	1.3	0.5	<0.01
10-77296	6.61	2770	26540	26413	208	2270	5040	4690	44	254	26100	1424	12.9	0.3	0.24
10-77297	7.10	1122	12015	3835	256	359	714	1740	92	312	4620	976	<0.1	0.6	<0.01
10-77298	7.69	73.8	468	252	332	35	40	49	6.2	405	14.8	16	4.4	0.5	<0.01
10-77299	7.66	94.4	636	294	340	50	41	91	8.8	415	53	48	20	1.0	<0.01
10-77300	7.46	72.7	500	294	344	57	37	42	5.2	420	34	17	1.8	0.4	<0.01
10-77301	7.43	73.8	500	398	370	77	50	30	3.2	451	45	26	4.5	0.4	<0.01
10-77302	8.04	69.0	445	318	296	68	36	35	2.1	360	46	20	1.8	0.4	<0.01
10-77303	7.96	155.7	1312	302	413	55	40	240	1.4	504	163	169	21	0.6	<0.01
10-77306	7.13	110.1	935	456	260	100	50	40	3.9	317	190	20	25	0.5	<0.01
10-77307	7.29	69.8	415	265	312	65	25	45	3.2	380	36	10	5.3	0.3	<0.01
10-77331	7.50	119.7	816	331	404	50	50	121	12.8	493	86	38	24	0.7	<0.01
10-77332	7.52	56.2	484	253	260	60	25	11.0	5.5	317	11.6	3	7.2	0.4	<0.01
10-77333	7.70	64.1	480	306	356	45	47	30	5.4	434	17.1	8	1.3	0.6	<0.01
10-77334	7.81	65.4	500	278	324	42	42	31	5.6	395	23	7	4.3	0.6	<0.01

Table 7 (cont)

Borehole No.	pH	Conductivity (mS/m 25°C)	TDS	Total Hardness (as CaCO ₃)	Total Alkalinity (as CaCO ₃)	Ca	Mg	Na	K	HCO ₃	Cl	SO ₄	NO ₃	F	Fe
10-77336	7.56	77.2	555	361	360	90	33	42	1.6	439	44	28	11.2	0.4	<0.01
10-77338	8.13	71.8	465	299	296	72	29	36	0.2	361	42	4	39	0.2	<0.01
10-77339	7.88	27.7	255	70	114	15.0	8.0	30	1.6	139	16.0	5	<0.1	0.2	<0.01
10-77340	7.49	63.3	456	277	244	65	28	19.0	5.6	298	29	1	40	0.5	<0.01
10-77341	7.70	79.7	525	330	380	63	42	61	7.9	463	58	24	6.5	0.5	<0.01
10-77342	7.54	74.3	560	327	312	80	31	48	4.0	380	58	29	23	0.3	<0.01
10-77343	7.44	90.6	660	323	320	80	30	85	4.7	390	80	68	41	0.5	<0.01
10-77344	7.49	66.8	475	315	288	80	28	36	0.1	351	32	8	49	0.2	<0.01
10-77348	6.93	103	975	620	448	146	62	7.4	<0.1	546	78	20	67	0.2	<0.01

All values in mg/l unless specified

TABLE 8

**CSIR - MARCH 1991- RECOMMENDED CRITERIA FOR
DRINKING WATER QUALITY FOR BOPHUTHATSWANA**

(provisionally accepted by the Department of Water Affairs - May 1992)

	LOW RISK	HIGH RISK
pH.....	<5,5 >9,0	<4,0 >11,0
Conductivity.	>300 mS/m	>400 mS/m
Mg.....	>100	>200
Na.....	>400	>800
Cl.....	>600	>1200
SO ₄	>600	>1200
Total Hardness as (CaCO ₃).....	>650	>1300
Fe.....	>1	>2
N as NO ₃	>45	>80
F.....	>1,5	>3
TDS as per SABS 241 - 1971:		
	Recommended Limit	Maximum Limit
TDS.....	500	2000

Values expressed as mg/l where applicable

The cations and anions fall within the no risk category as per the specification "Recommended Criteria of Drinking Water Quality", as adopted by the Republic of Bophuthatswana (Table 8). Exceptions include the 2 boreholes with excessive TDS (high risk) and 10-77246 at Modiboa with Mg of 116 mg/l (low risk). The NO₃ content in only 4 boreholes, 10-77246 at Modiboa, 10-77280 at Mareetsane, 10-77286 at Ketletseng Middle School, Tlhakajeng and 10-77248 at Mooimeisiesfontein falls within the low risk category ie. 53 mg/l, 61 mg/l, 56 mg/l and 67 mg/l respectively. No boreholes have an NO₃ above 80 mg/l (the high risk limit).

With exception of the boreholes discussed above, there are no constraints to the use of these waters for human consumption.

8. DISCUSSION OF RESULTS

8.1. Bapong (Boreholes 10-77283 and 10-88299 - Gelukspan)

The village of Bapong is situated in the central eastern part of the District some 5km east of Thusong and is close to Gelukspan. The area is flat and underlain by Allanridge Lava with a calcrete capping. One borehole (10-77283) was requested for the village. A second borehole (10-77299) was to replace a private borehole expropriated during road construction.

The hydrogeophysical survey undertaken for the village borehole comprised 2 calibration VES run at 2 existing windpumps, and five exploratory VES. These indicated generally shallow weathering, <15m, with low resistivities, <30 ohm-metres. VES 02 was selected for drilling. Here a 30m deep zone with a resistivity of 60 ohm-metres indicated more favourable conditions.

The survey run to locate an alternative borehole for Mr. Molamu comprised 1 calibration VES and 4 exploratory VES. Borehole 10-77299 was drilled at VES 01 in the position selected by Mr. Molamu.

Borehole 10-77283 was drilled to a final depth of 81m and intersected a sequence of calcrete, sandstone, slate and lava. The three water strikes were associated with weathering and minor fracturing (Table 3). A final blowing yield of 1 l/s was obtained. In contrast 10-77299 intersected 20m of calcrete, underlain by 21m of residual dolomite with slate and lava at depth. The final depth was 76m, and a total blowing yield of 0.45 l/s was obtained from 2 water strikes.

The recorded water levels were 6,97mbgl and 5,35mbgl on 23rd April 1992 and 25th April 1992 for the two boreholes respectively. The fact that the groundwater has risen above the main water strike, indicates that the aquifers are confined.

Step tests followed by 24 hour constant rate tests at 0,7 l/s (10-77283) and 0,5 l/s (10-77299) were run. The step tests showed that at the highest yields of 1,1 l/s on 10-77283, and 0,8 l/s on 10-77299, the capacity of the boreholes was exceeded and the water levels plunged to pump suction. Recovery of the water levels was good.

A steep and continuous drawdown occurred during the constant rate test run on 10-77283 as a result of the low permeation properties. Recovery trended to completion. The water level in 10-77299 tended to stabilize after 200 minutes at 14m of drawdown indicating an areally extensive aquifer with active recharge. Recovery of the water level was complete.

Both boreholes may be equipped with a motorpump as per Table 9. The water quality is good and poses no constraints to use.

8.2. Brooksby (Borehole 10-77251)

Brooksby is situated in the central eastern portion of the District close to the border with South Africa, and approximately 8km south east of Thusong.

The existing borehole at the school (T3484) was rehabilitated and re-numbered 10-77251. The original depth of the borehole was 27m, and the hole was deepened to 51m. The initial blowing yield

improved to 3,5 l/s due to the intersection of a fault between from 30 and 35m in the Allanridge Lava.

The static water level on 6th August 1992 was recorded as 6,68mbgl. A step test comprising 4 discharges, with a maximum of 2,65 l/s, was followed by a 48 hour constant rate test run at 1,5 l/s. This produced a steady drawdown indicating the fracture zone intersected is areally extensive. The transmissivity of 10 m²/d shows the permeation properties of the aquifer are moderately poor. Recovery of the water level was complete, confirming the long term sustainability of the borehole at the recommended production yield of 1 l/s (Table 9). The water quality is good and suitable for human consumption.

8.3. Deelpan (Boreholes 10-77296, 10-77297 and 10-77341)

The village of Deelpan lies along the western, northern, and north eastern edge of Deelpan in the east of the District, close to the South African border, and adjacent to the main tar road from Sannieshof to Mareetsane railway station. The area is underlain by Allanridge Lava with a calcrete capping. Two boreholes were requested.

The hydrogeophysical survey comprised the running of 2 calibration VES (one at the windpump in the primary school and 1 at a handpump on the east side of the village) and 8 exploration VES. Borehole 10-77296 was drilled at VES 02 where the VES indicated

40m of unconsolidated material with a resistivity of 30 ohm-metres. Borehole 10-77297 was drilled at VES 06 where the interpretation showed 80m of material with a resistivity of 200 ohm-metres.

Borehole 10-77296 was drilled to 91m and 10-77297 to 96m. Both intersected weathered and fractured lava to the depths indicated by the geophysical survey. Final blowing yields of 0,15 l/s (10-77296) and 0,3 l/s (10-77297) were obtained from water strikes in the lava (Table 3).

The static water levels were recorded as 5,01mbgl (10-77296) and 5,00mbgl (10-77297) on 4th August and 3rd August 1992 respectively. Step tests only were run on these boreholes. Unfortunately the water is saline and neither borehole can be utilized due to the unacceptable water quality.

An existing borehole to the east of the main tar road, designated 10-77341, was also tested. This borehole is only 20,4m deep and the water level, on 8th August 1992, was recorded as 4,83mbgl.

The step test produced very little drawdown at yields up to 3,95 l/s, but during the fourth step run at 7,6 l/s, the water level was pulled below the base of the aquifer and the rate of drawdown increased sharply. A 48 hour test was run at 4 l/s. This produced a drawdown of 0.75m by the end of the test, and this, combined with the high T of 200 m²/d, indicates the presence of a shallow highly permeable aquifer. Recovery of the water was rapid and complete.

Before the borehole is equipped, however, the hole should be deepened to 30m. It is not recommended the hole be drilled deeper than this in view of the poor quality water intersected at depth in the other two boreholes. The water quality at present is good. Management recommendations are given in Table 9.

8.4. Diretsane (Borehole 10-77249 - Mateane P/S)

This village is located immediately south of Kopela in the south-east of the District.

A borehole sited by the DWA was drilled to the north east of the school yard to a final depth of 111m in lava. A minor water strike of <0,1 l/s was made at 28m at the base of the weathered zone.

The static water level was recorded on 15th July 1992 as 10,7mbgl. A step test was run at 0,23 l/s and at 0,6 l/s, at which rate the water level plunged to pump suction. The borehole was very severely dewatered and has no usable yield.

8.5. Doornlaagte (Boreholes 10-77294 and 10-77307 (Kelebogile P/S)

Doornlaagte is in the south east of the District 6km north of Kopela. The area is flat and underlain by Allanridge Lava. One

new borehole, allocated 10-77294, was requested, and one existing borehole at Kelebogile Primary School, allocated 10-77307, was tested.

The hydrogeophysical survey comprised 2 calibration VES, (one run at 10-77307 and one at a windpump in the centre of the village), and 6 exploratory VES. The soundings indicated generally moderate weathering, <30 metres. VES 04 was selected for drilling of 10-77294 where weathering of the lava to a depth of 40m, with a low resistivity of 20 ohm-metres, was indicated.

Borehole 10-77294 intersected completely weathered lava to 41m, fractured lava to 62m and unweathered gabbro to the end of the hole at 81m. A minor water strike with a blowing yield of 0,3 l/s was made at 42m at the base of the weathering. A strong water strike with a blowing yield of 3,7 l/s, was encountered at 62m on the contact with the gabbro.

The static water level was measured on 19th July 1992 as 14,36mbgl, confirming the confined nature of the aquifer.

A step test comprising 4 discharges with a maximum rate of 4 l/s was run, followed by a 48 hour test at 2 l/s. A steady drawdown, with a slight decline in the rate of drawdown after 1200 minutes, was recorded. The aquifer is areally extensive with no limiting hydraulic barrier boundaries, but with relatively low permeability

characteristics ($T = 6 \text{ m}^2/\text{d}$). Recovery of the water level trended to completion, confirming the long term reliability of this borehole.

A similar hydraulic response was obtained at 10-77307 (Kelebogile Primary School) where a step test followed by a 48 hour constant rate test at 1 l/s were run.

The water quality in both boreholes is good, and each borehole may be equipped with motor pumps as per the recommendations of Table 9.

8.6. Goedgevonden (Borehole 10-77275 Pre-School)

This village is 14km south-east of Mareetsane along the Mareetsane/Sannieshof tar road. The area is flat and underlain by Allanridge Lava.

A new borehole was requested for the Pre-School. The hydrogeophysical survey (2 calibration and 6 exploratory VES) indicated shallow weathering (<20m), was present everywhere. VES 05, in the south-east corner of the school yard, was drilled.

Borehole 10-77275 intersected calcrete and sand to 12m, weathered and fractured lava to 16m, and occasionally fractured lava to the full depth of 71m. A moderate water strike with a

blowing yield of 0,5 l/s was made in fracturing at 39m. The water level rose to 7,7mbgl, as measured on 25th April 1992.

A severe drawdown of 56m was produced by the end of the fourth step of the step test at 1,2 l/s, indicating the capacity of the borehole was exceeded. A rate of 0,5 l/s was selected for the 24 hour test, and at this yield a final drawdown of only 4,53m was obtained. The water level tended to stabilize after an initial steeper rate of drawdown. Recovery of the water level was complete, indicating the reliability of the borehole at the tested yield.

The borehole may be pumped at 0,5 l/s for 12 hours per day as per Table 9. The water quality is good and poses no constraints to use.

8.7. Kaalpan (Borehole 10-77298 and 10-77300 Vegetable Garden)

Kaalpan is 10km east of Thusong. The village lies on flat ground and several pans are present in the vicinity. The area is underlain by dolomite with lava at depth.

The hydrogeophysical survey comprised 2 calibration VES and 12 exploratory VES. A similar geo-electrical response was obtained throughout the surveyed area, with 4 or 5 layer curves, comprising a layer of near surface weathering (<10m), followed by a 20 or 30m thick layer with a resistivity of 300 ohm-metres, underlain by a lower resistivity layer. Hydrogeophysical bedrock was not

encountered. The boreholes were drilled at VES 03 (10-77298) and VES 01 (10-77300) where the contact between the dolomite and clay and underlying lava was deepest (<40m).

Both boreholes intersected a sequence of 25 to 30m of dolomite and 15 to 20m of clay, underlain by lava. Borehole 10-77298 was drilled to a final depth of 76m. A blowing yield of 0,75 l/s was obtained from 2 water strikes, one in the dolomite at 16m and one in the lava at 49m. Borehole 10-77300 was drilled to 81m, and a blowing yield of 1,8 l/s was obtained from 2 water strikes in the dolomite (Table 3).

Similar hydraulic responses were obtained in both boreholes. During the step tests only small drawdowns were produced at the lower yields, but at the highest yields of 0,94 l/s in 10-77298 and 3,4 l/s in 10-77300 the water level plunged towards pump suction. This is a characteristic response of thin fractured aquifers. A 24 hour test at 0,5 l/s was run on 10-77298, and a 48 hour test, at 1,2 l/s, on 10-77300. After an initial steep drawdown in both boreholes the rate of drawdown stabilized, indicating the aquifers intersected are areally extensive but of low transmissivity ($T = 1,5 \text{ m}^2/\text{d}$ and $4 \text{ m}^2/\text{d}$ respectively). Recovery of the water levels was complete in both boreholes, confirming the reliability of the borehole yield provided the management recommendations of Table 9 are adhered to. The water quality of both boreholes is good and poses no constraint to potable or irrigation use.

8.8. Kopela (Boreholes 10-77248 Noto H/S, and 10-77306 Clinic)

Kopela is a large settlement in the south-east of the District located around a large pan. The area is underlain by Allanridge Lava with a thick sand cover.

A borehole sited by the DWA was drilled to the north-east of Noto High School to a final depth of 61m. The borehole intersected residual lava to 14m, followed by fractured lava to 61m. A blowing yield of 0,5 l/s was obtained from a water strike at 22m. The water level rose to 11,35mbgl as measured on 17th July 1992.

A step test run at a maximum discharge of 2,1 l/s resulted in the water level plunging to pump suction. During the 24 hour test run at 0,5 l/s the rate of drawdown stabilized, indicating the aquifer is areally extensive. The transmissivity is low at 2 m²/d. Recovery was good and complete.

The existing borehole at Kopela Clinic, designated 10-77306 is 37m deep. The static water level was measured on 18th July 1992 as 15,72mbgl. The hydraulic response was similar to that obtained in 10-77248. The permeation properties are slightly better developed, however, (T = 7 m²/d), and this is seen by the higher test yield of 1 l/s and lower drawdown obtained. The trend of the water level recovery is to completion.

Both boreholes may be equipped with a motorpump to yield 0,5 l/s for 12 hours per day. The water quality is good and poses no limitations to the use of either borehole.

- 8.9. Kraaipan (Boreholes 10-77387 Ghaena P/S, 10-77288 Aron P/S and 10-77289 Creche)

Kraaipan is a large village in the central west of the District straddling the Mafikeng/Vryburg railway line and the Khunwana River. An outcrop of banded ironstone forms a ridge of north/south trending hills. These ironstones are surrounded by granite.

Ghaena Primary School is on the west side of Kraaipan on gently sloping ground some 400m west of the main north/south ironstone ridge.

The hydrogeophysical survey comprised 1 calibration VES and 9 exploratory VES run in and around the school. These all showed generally unfavourable conditions. Borehole 10-77287 was drilled in the school yard at VES 02 where 30m of 55 ohm-metres unconsolidated material was detected. The borehole intersected weathered granite to 36m, followed by unweathered granite to the final depth of 101m. No water strikes were made and the borehole was abandoned as dry.

Aron Primary School is located in the north-east of Kraaipan on ground sloping to the west towards the Khunwana River. Granite outcrops and sub-outcrops in the area, with Kraaipan schists outcropping in the flood plain of the river.

The geophysical survey comprised 1 calibration VES, run at a windpump 1,4km north of the school, and 10 exploration VES. The survey showed that in and around the school the groundwater potential was nil, and VES 09 approximately 1km to the west was selected for drilling. Here 70m of 150 ohm-metres appeared favourable.

Borehole 10-77288 was drilled to a final depth of 61m through Kraaipan Formation gneiss and lava. A water strike with a blowing yield of 0,4 l/s was made at 23m. The water level rose to 11,5mbgl as measured on 22nd May 1992.

A step test run on this borehole showed only small drawdowns at the lower yields, but at 1,3 l/s the water level plunged to pump suction. During the 24 hour test run at 0,5 l/s, the water level stabilized at around 4m drawdown indicating that the aquifer is areally extensive, although as seen by the step test, thin. The transmissivity is a low 3 m²/d. Recovery of the water level trended to very slight dewatering, and this could be a constraint to the long term exploitation of this borehole.

The borehole may be pumped at 0,5 l/s for 12 hours per day (Table 9). The water quality is good and suitable for human consumption.

The geomorphological and geological situation at Kraaipan Creche is similar to that at Aron Primary School. The hydrogeophysical survey comprised 1 calibration and 11 exploratory VES. As with Aron Primary School the granite has no potential and VES 19 on the flood plain of the Khunwana River was selected for drilling.

Borehole 10-77289 intersected lava and schist of the Kraaipan Formation to the final depth of 61m. A strong water strike with a blowing yield of 2,4 l/s was made at 22m.

At the time of preparing this report the borehole remained to be tested.

8.10. Lombardslaagte (Borehole 10-77252)

This village is some 7km north of Deelpan in the central eastern part of the District. The area is flat and underlain by Allanridge Lava. An old borehole, T17021, required rehabilitation. However, this was not possible due to a metal obstruction at 33m and a new borehole, allocated 10-77252, was drilled alongside.

The borehole was drilled through 10m of surface calcrete followed by lava to the final depth of 76m. A good water strike was made at 22m with a blowing yield 1,5 l/s.

A step test with a maximum discharge of 4 l/s was run. At the highest discharge the water level plunged to pump suction at 60m. A 48 hour constant discharge test was run at 1,13 l/s. After an initial steep rate of drawdown to 6,5m by 30 minutes, the rate of drawdown reduced and the final drawdown recorded was 9m. This is indicative of an areally extensive fracture network. Recovery of the water level was complete, confirming the long term reliability of the borehole.

The borehole may be pumped at 1,5 l/s for 12 hours per day as per Table 9. The water quality is good.

8.11. Louisdal (Boreholes 10-77281 and 10-77282)

This village is 3km south of Mareetsane in the central part of the District. The village is situated on a high flat plain underlain by lava. Two boreholes were requested.

The hydrogeophysical survey comprised the running of 2 calibration VES (one at the borehole equipped with an engine at Agricor's office and one at the windpump in the north-east of the village) and 11 exploration VES. The survey showed generally moderate

weathering with resistivities of 20 to 40 ohm-metres over a depth of 20 to 30m. VES 11 and VES 2 were chosen for the drilling of 10-77281 and 10-77282 respectively.

The boreholes were drilled to 91m (10-77281) and 86m (10-77282). Both intersected lava below the surface calcrete, clay and sand. Final blowing yields of 0,6 l/s (10-77281) and 0,33 l/s (10-77282) were obtained (Table 3). The static water levels were measured as 19,25mbgl and 19,2mbgl for 10-77281 and 10-77282 on 16th May 1992 and 19th May 1992 respectively.

A step test comprising 3 discharge rates was run on both boreholes. At the maximum yields of 0,81 l/s for 10-77281 and 0,56 l/s for 10-77282 the water levels plunged to pump suction at approximately 60m. Recovery of the water levels was good. Constant rate tests were not run due to the large drawdowns recorded in the step tests and the poorly developed aquifers present. Both boreholes may be equipped with handpumps delivering 0,3 l/s. The ground water quality is good.

8.12 Lynplaats (Borehole 10-77187)

An unequipped borehole in the farm Lynplaats was requested to be tested. The borehole is 47m deep and the static water level, as measured on 22nd July 1992, was 22,83mbgl.

The borehole was tested at 0,18 l/s for one hour, followed by 0,45 l/s for 15 minutes. At this rate the water level trended steeply towards pump suction. Recovery of the water level was poor and dewatering occurred. The aquifer is very poorly developed and the borehole is barely able to support a windpump (or handpump) over the long term (Table 9). The water quality is good.

8.13. Madibogo

Madibogo is a large village in the south-west of the District underlain by granite which forms high lying ground.

A borehole was requested for Longaneng Creche. The area around the creche is underlain by granite pavement and sub-outcropping granite. A dry borehole had already been drilled in the yard of the creche.

The hydrogeophysical survey comprised the running of 2 calibration VES, (one at the handpump in the yard of the Primary School 300m to the north and one at the dry borehole), and 7 exploratory VES. Interpretation of these VES showed that the granite pavement was ubiquitous and the groundwater resources were nil

No drilling site was selected.

8.14. Madibogopan (Boreholes 10-77253 Clinic and 10-77290 Kgatlwang ELC)

This village is in the far south-west of the District 10km south of Madibogo. The area is underlain by granite and is generally flat with a gentle slope towards the pan.

The existing borehole at Madibogopan Clinic (10-77103) could not be rehabilitated and a new borehole was drilled nearby. This borehole, designated 10-77253, was drilled to 91m through surface material and granite. Two good water strikes, at 59m and 73m with blowing yields of 0,6 l/s and 1,5 l/s respectively, were made. The static water level was measured on 2nd July as 24,58mbgl.

A step test comprising 4 discharges with a maximum yield of 2,7 l/s was run resulting in a steep drawdown towards pump suction at the highest pumping rate. On the basis of the step test results a 48 hour test was run at 1,35 l/s. This produced a steady rate of drawdown with no evidence of hydraulic barrier or recharge boundaries. The permeation characteristics of the fractured aquifer are moderately poor with $T = 7 \text{ m}^2/\text{d}$. Recovery of the water level trended to pump suction.

The water quality is good and poses no limitations to use. The borehole may be equipped with a motorpump as per Table 9.

A request was also made for a new borehole to be drilled Kgathlwang ELC. A geophysical survey comprising 1 calibration VES at the borehole at the primary school, and 2 exploration VES was run. These VES showed deep weathering of the granite, ie. >70m at 50 ohm-metres, a potentially very favourable geo-electrical situation.

Borehole 10-77290 was drilled to a final depth of 121m. Weathered granite was intersected to 71m as anticipated, however, no water was encountered and the borehole is declared dry.

8.15. Majeng (Borehole 10-77293)

This settlement is in the south of the District 12km east of Madibogo and 15km south of Kraaipan. A large hill formed of banded ironstone lies in the centre of the village with granite to the west. One borehole was requested for the village.

Two calibration VES were run at an existing windpump and handpump, followed by 8 exploration VES run on either side of the hill. These showed variable geo-electrical conditions with depths to bedrock ranging from <15m to >50m and resistivities from 10 ohm-metres to >250 ohm-metres. VES 02, with 50m of 65 ohm-metres was selected for drilling in the western part of the village, the preferred location for the borehole.

Borehole 10-77293 was drilled to 91m. Below 5m of surface sand, quartzite was penetrated to 29m, followed by weathered and partly fractured granite. A minor water strike with a blowing yield of 0,1 l/s was made at 69m. The static water level rose to 27,36mbgl as measured on 25th May 1992. This indicates the confined nature of the aquifer.

A step test comprising 3 discharges (0,11 l/s, 0,22 l/s and 0,4 l/s) was run. During the third step the rate of drawdown increased rapidly and the water level plunged towards pump suction due to the capacity of the borehole being exceeded. Recovery of the water level indicated minor dewatering. The borehole is able to support a low yielding handpump (Table 9). The nitrate content of the water is 45 mg/l, and hence the water is classified as low risk.

8.16. Manamolela (Borehole 10-77137 Konopo P/S)

Manamolela is in the south of the District approximately 3km north of Atamelang. The area is flat and underlain by lava.

The existing borehole at Konopo Primary School required cleaning and the hole was deepened from 43m to 61m. The static water level was recorded as 10,03mbgl on 14th July 1992.

A step test with a maximum discharge of 1,1 l/s was run. At this rate the water level plunged to pump suction and a rate of 0,5 l/s

was selected for the 24 hour test. After an initial steep rate of drawdown to 8,5m after 1 hour, the rate of drawdown decreased rapidly and the water level attained semi-equilibrium. This is indicative of an areally extensive aquifer with active recharge, although the exploitation potential is constrained by the low transmissivity of 1,5 m²/d. Recovery of the water level trended to completion.

The borehole is able to support a motorpump delivering 0,5 l/s for 12 hours per day, as per Table 9. The water quality is good and suitable for potable use.

8.17. Mareetsane (Boreholes 10-77276, 10-77277, 10-77278 (Mpoetsile P/S) 10-77279 and 10-77280)

This is a large village in the central north-west of the District on the west bank of the Mareetsane river some 6 to 10km south-east of Mareetsane railway station.

This village is named Maipeing on the 1:250000 topographic map 2624 Vryburg. The area is flat with a gentle slope towards the Mareetsane river to the east. The northern and central areas are underlain by granite, while Allanridge Lava underlies the southern portion of the village. Five boreholes were requested, including one for Mpoetsile Primary School.

A total of 39 exploration and 4 calibration VES, and 4 magnetic traverses totalling 1050m, were run. The 4 magnetic traverses were run to locate the dykes seen on the air photos in the southern part of the village. The exploratory VES run on the traverses are shown on the plots included in Appendix I. No boreholes were, however, sited to intersect the dyke contacts.

Interpretation of the VES showed that weathering and fracturing of the granite and lava is variable with depths of <10m to 50m with resistivities from 30 to 120 ohm-metres. There is a resistivity overlap between the granite and lava. The drilling sites were selected, where the geophysical and topographic situation appeared favourable, so as to spread the boreholes throughout the village. Borehole 10-77276 was drilled at VES 05 (33m at 38 ohm-metres), 10-77277 at VES 08 (40m at 120 ohm-metres), 10-77278 at VES 18 (40m at 80 ohm-metres), 10-77279 at VES 21 (50m at 80 ohm-metres) and 10-77280 at VES 36 with 30m at 30 ohm-metres.

Boreholes 10-77276, 10-77277 and 10-77278 were all drilled in granite to a depth of 81m. Water strikes were made in each borehole in fractured granite and the final blowing yields were 0,25 l/s, 0,7 l/s and 0,2 l/s respectively.

Borehole 10-77279 was drilled through 40m of sand followed by lava to 81m, and 10-77280 intersected dolerite to 27m followed by lava to the final depth of 71m. Final blowing yields of 1 l/s and 0,7 l/s were obtained from 10-77279 and 10-77280 respectively.

Step tests comprising 4 pumping rates were run on each borehole. The hydraulic responses obtained were similar with relatively small drawdowns being produced at the lower rates, but with a plunge in the water levels towards pump suction at 40m or deeper at the highest yields of 1,5 l/s in 10-77276, 10-77277 and 10-77280, 0,45 l/s in 10-77298 and 2 l/s in 10-77279. This was due to the water level being drawn below the aquifer horizon. Recovery of the water levels after the step tests was good in all cases.

Twenty four hour constant discharge tests were run on 10-77276 at 0,5 l/s, 10-77279 at 0,89 l/s and 10-77280 at 0.53 l/s, while a 48 hour test was run on 10-77277 at 1 l/s. A constant rate test was not feasible on 10-77278. The water level drawdown in boreholes 10-77276, 10-77277 and 10-77280 was similar with an initial steep rate of drawdown followed by a gentle drawdown after 10 to 60 minutes of pumping. This indicates the fracture zones are areally extensive although a slight increase in the rate of drawdown towards the end of the tests signifies the intersection of hydraulic barrier boundaries. In the case of 10-77279 a continuous and steep rate of drawdown occurred throughout the test. The transmissivities of the aquifer are very low at 1 to 3 m²/d, thus restricting the sustainable yields available from the boreholes. Recovery of the water level trended to completion with the exception of 10-77277 where slight dewatering occurred.

The water quality is good except in borehole 10-77280 where the nitrate content of 61 mg/l places this borehole water in the low risk category.

Borehole 10-77298 at Mpoetsile Primary School must be equipped with a handpump, the remaining 4 boreholes are able to support a motorpump as per Table 9.

- 8.18. Matila 1 (Boreholes 10-77267 Clinic and Matila 2 (Boreholes 10-77268 and 10-77302)

These two settlements are 4km apart and lie some 7 to 10km west of Bodibe. The area is flat. The villages are underlain by dolomite with a calcrete capping.

One borehole was requested for the Clinic in Matila 1 and one for Matila 2 village.

Matila 1

The hydrogeophysical survey for the clinic comprised the running of two calibration and 6 exploration VES. Borehole 10-77267 was drilled in the clinic yard at VES 05 where dolomite with a resistivity of 105 ohm-metres to a depth of 40m was present.

The borehole was drilled through calcrete to 16m, and dolomite to the final depth of 71m. A water strike with a blowing yield of 0,2 l/s was made at 23m. The water level rose to 10,66mbgl, as measured on 12th August 1992.

A step test with a maximum yield of 1,2 l/s was run. At this rate the water level was drawn down to pump suction after 5 minutes of pumping. However, at the lower discharges of 0,11 l/s and 0,29 l/s only 2m of drawdown was produced. A 24 hour test at 0,5 l/s produced a steady and continuous drawdown to 32,5m by the end of the test. The large drawdown is a result of the very poor transmissivity of the aquifer (0,5 m²/d). Recovery was complete and the borehole can reliably sustain a motorpump yield 0,5 l/s for 12 hours per day (Table 9).

Matila 2

The hydrogeophysical survey comprised 2 calibration and 6 exploration VES. These showed similar geo-electrical responses throughout the village and VES 06 was selected for the drilling of 10-77268 where 70m of weathered dolomite, with a resistivity of 170 ohm-metres, occurred.

Borehole 10-77268 was drilled through calcrete and chert to 22m, dolomite to 57m, slate to 67m followed by quartzite to the final depth of 101m. No water strikes were made and the borehole is declared dry.

Borehole 10-77302 was later drilled at VES 03, approximately 200m to the west of 10-77268. The borehole penetrated calcrete and clay to 26m, dolomite to 66m, mudstone to 80m and lava to the final depth of 151m. A minor water strike with a blowing yield 0,2 l/s was made at 101m. The water level rose to 13,74mbgl (12th August 1992) confirming the high confining head on the fractured zone.

A 24 hour step test run on the borehole with a maximum yield of 0,48 l/s proved the aquifer is marginal. A drawdown of 70m was recorded by the end of the second step. Dewatering of the aquifer occurred.

Owing to the high water level the borehole is marginally able to support a small handpump. The water quality is good.

- 8.19 Middleton B (Boreholes 10-77291 Middleton High School and 10-77339) and Middleton C (Borehole 10-77292 Manonyane Creche and 10-77338)

These two villages are 5km apart and are 5 and 10km north-west of Atamelang in the south of the District. Both villages are underlain by granite. The area is flat with a gentle slope to the west at Middleton B. One new borehole was required in each village, and one existing borehole in each village was test pumped.

The hydrogeophysical survey in Middleton B comprised 1 calibration VES run at a handpump, 3 exploration VES and one 250m long magnetic traverse. The magnetic traverse was run to investigate a photo lineament but no anomalies were detected. The VES indicated moderately deep weathering of the granite. VES 02 was selected for the drilling of 10-77291 where 42m of 70 ohm-metres was detected in the south-west corner of the middle school yard.

The survey of Manonyane Creche involved 2 calibration VES and 4 exploratory VES. Similarly moderately deep weathering of the granite was identified and borehole 10-77292 was drilled at the south-east of the creche yard where 60m of 70 ohm-metres was recorded.

Both boreholes were drilled in granite to 81m. A water strike with blowing yield of 1,4 l/s was made in 10-77291 at 43m while in 10-77292 a blowing yield of 2,5 l/s was made at 54m.

The static water levels of 10-77291 and 10-77292 was recorded as 18,87mbgl and 34,89mbgl on 6th July 1992 and 9th July 1992 respectively, indicating the aquifers intersected are confined. The static water levels of the existing boreholes 10-77228 (depth 53m) and 10-77339 (depth 57m) were measured as 10,74mbgl and 26,13mbgl on 12th July and 7th July respectively.

Step tests were run on each borehole and these confirmed that constant rate tests were feasible except for 10-77339 where the drawdown trended to pump suction at 0,54 l/s. This borehole is suitable for the installation of a windpump.

Boreholes 10-77291 and 10-77292 were tested for 48 hours at 1,5 l/s and 3 l/s respectively. The hydraulic responses obtained were similar and characteristic of areally extensive aquifers with no limiting hydraulic barrier boundaries. The permeation properties of 10-77292 are good with $T = 50 \text{ m}^2/\text{d}$. Recovery of the water levels was complete and the long term reliability of the boreholes assured.

Borehole 10-77338 was tested at 0,8 l/s for 24 hours. A continuous drawdown occurred with an increase in the rate of drawdown towards the end of the tests, a constraint to continuous pumping. Recovery of the water level trended to completion.

These three boreholes can support motorpumps as per Table 9. The water quality in all four boreholes is good and poses no constraints to use.

8.20. Modiboa (Borehole 10-77246)

This village is approximately 10km south of Kraaipan in the centre of the District. An existing borehole, 10-77127, filled with stones required rehabilitation. However, the driller was unable to dislodge

the blocking stones and a new borehole, allocated 10-77246, was drilled nearby as a replacement.

Borehole 10-77246 was drilled to 71m in lava. A final blowing yield of 2,6 l/s was recorded from three water strikes made in fractured zones (Table 3).

The water level was measured as 21,19mbgl on 8th July 1992. The step test comprised 5 discharges with a maximum of 3,5 l/s, at which yield the water level trend was towards pump suction.

A 48 hour test was run at 2 l/s. A steady drawdown of 20m 2000 minutes into the test was followed by an abrupt plunge of the water level towards pump suction. This was caused by the water level being drawn below the main water bearing horizon and is a significant constraint to continuous long term exploitation of the borehole. The recovery of the water level was complete.

The borehole is able to support a motorpump to yield 1,5 l/s for 12 hours per day. The water quality is affected by the nitrate value of 53 mg/l and magnesium of 116 mg/l, which places the water in the low risk category.

8.21. Mooimeisiesfontein (Borehole 10-77348)

Mooimeisiesfontein is approximately 10km north of Itsoseng and Bodibe. The borehole was cleaned out to 47m and a blowing yield of 3 l/s is reported from a water strike at 36m in dolomite. The borehole is for agricultural use.

The borehole was test pumped under the supervision of the Consultants. The water level was measured as 5,89mbgl on 27th January 1993.

A step test comprising 4 discharges at 0,47 l/s, 1,01 l/s, 1,97 l/s and 4.04 l/s was run. At the highest yield the water level plunged to the pump with a total drawdown of 30m after 20 minutes. Recovery of the water level was good and the hole was tested for 48 hours at 2,21 l/s. A steady rate of drawdown occurred with a slight decrease in the rate after 20 minutes of pumping. The aquifer is areally extensive and the complete recovery recorded confirms the long term reliability of the borehole.

The borehole can support a motorpump yielding 2 l/s for 12 hours per day. The water quality is affected by nitrate of 67 mg/l which places the water in the low risk category. This is not, however, a constraint to agricultural use.

8.22. Mooipan (Boreholes 10-77247 and 10-77295)

Mooipan village is 10km north of Kopela in the central part of the District. The area is flat and underlain by lava.

An attempt was made to rehabilitate existing borehole 10-77146 which was blocked. This was unsuccessful when it was found that the obstruction in the borehole was metallic. A new borehole, allocated 10-77247, was drilled alongside as a replacement. The final depth of the borehole was 51m and the geology lava. A water strike with a blowing yield of 0,7 l/s was made at 22m.

The water level was measured as 8,18mbgl on 2nd August 1992. A step test run on this borehole showed the permeation characteristics of the water bearing zone are poorly developed. During the second step at 0,53 l/s the trend of the water level was towards pump suction and a drawdown of 26m occurred. Recovery of the water level was good. A constant rate test was not run.

The borehole may be equipped with a windpump as per Table 9.

A new borehole was also requested for the village. Two calibration and 10 exploration VES were run. These showed generally shallow weathering, <20m, with resistivities between 15 and 30 ohm-metres. VES 10 was selected for drilling where the weathering appeared deeper, 38m at 50 ohm-metres.

Borehole 10-77295 was drilled through lava to a final depth of 71m. A water strike with a blowing yield of 4,1 l/s was made at 37m. The water level rose to 9,82mbgl as measured on 1st August 1992.

A step test with a maximum discharge of 3,96 l/s, followed by a 48 hour constant rate test at 3 l/s were run on 10-77295. A generally steady rate of drawdown occurred during the constant rate test until 1000 minutes, after which the rate of drawdown increased due to the intersection of an hydraulic barrier boundary. The transmissivity is moderately low at 11 m²/d. Recovery of the water level trended to completion.

The borehole can support a motorpump discharging 2 l/s for 12 hours per day as per the management recommendations of Table 9.

The water quality in both 10-77247 and 10-77295 is good and poses no constraint to use.

8.23. Naauwpoort (Boreholes 10-77183, 10-77332 and 10-77340)

Naauwpoort lies 3km north-west of Thusong. The area is flat and underlain by lava. The programme involved the testing of three existing boreholes.

Borehole 10-77183 is 74m deep and was equipped with a windpump at the time of testing. Boreholes 10-77332 and 10-77340 were measured as 12,6m deep and 19m deep respectively. Borehole 10-77340 is approximately 30m from 10-77183 and is equipped with a handpump.

The static water levels of the three boreholes are very similar and were measured as 7,4mbgl (10-77183), 7,55mbgl (10-77332) and 7,34mbgl (10-77340), on 6th, 2nd and 7th May 1992 respectively.

Step tests run on 10-77183 and 10-77340 showed the aquifers to be poorly developed. The maximum yield pumped in 10-77183 was 0,85 l/s which resulted in the water level plunging 50m towards pump suction. The maximum discharge obtained from 10-77340 was also 0,85 l/s, which caused the water level to hit the pump with a drawdown of 10m. Testing of this borehole was severely limited by the shallow depth and lack of pumpable drawdown, although it is evident the aquifer is unsuitable for a motorpump. The step test indicated that the aquifer intersected in 10-77340 is very shallow. Recovery of the water levels was good in both boreholes. These boreholes are already equipped with suitable equipment. (Table 9). The water quality is good and poses no constraint for either agricultural or potable use.

The aquifer intersected by 10-77332 is better developed. A step test was run at a maximum yield of 2 l/s, and produced only 1,6m of drawdown. The borehole was tested at 1,4 l/s for 48 hours. At

this rate the water level drew down 1m virtually instantaneously, after which the dynamic level was in semi-equilibrium for approximately 24 hours. During the latter part of the test the trend of the drawdown increased. The transmissivity is moderate at 25 m²/d. Recovery trended to completion.

The borehole is able to support a motorpump. However, the borehole must be deepened to a minimum of 30m before being equipped. The water quality is good.

8.24. Nooigedacht (Borehole 10-77274)

This village is 7km north-east of Thusong in the central northern part of the District. The village is on a flat plain underlain by dolomite. One borehole was requested for the south-west corner of the village.

A geophysical survey comprising 2 calibration VES and 6 exploratory VES was run. These indicated shallow weathering of the dolomite in the central part of the village with deeper weathering in the south-west. Borehole 10-77274 was drilled at VES 05 where a thick sequence (<100m) of 75 ohm-metres was recorded.

The borehole intersected completely weathered dolerite to 38m, dolomite to 65m followed by lava to the final depth of 81m. A strong water strike of 3,4 l/s was made at 17m.

At the time of preparing this report the borehole remained to be tested.

8.25. Rakgwedi (Boreholes 10-77342 and 10-77343)

Rakgwedi is in the south of the District 5km south of Kopela. The area is flat and, to the north of the village, swampy. The geology comprises Allanridge Lava.

Originally one new borehole was requested for agricultural purposes. A geophysical survey was run to the north of the village comprising 2 calibration and 4 exploration VES. These showed shallow to moderate (<30m) weathering of the lava with resistivities of 30-50 ohm-metres. However, the new borehole was requested in the same area as the existing boreholes and it was recommended the existing boreholes be tested rather than drill a new one.

Two boreholes, one 2,5km west of Rakgwedi allocated 10-77342 and 10-77343 north of the village, were tested at the request of Agricor. The water level in 10-77342 was measured as 5,93mbgl and the depth as 24m on 20th August 1992. Borehole 10-77343 was measured on 21st August 1992 as 34m deep and to have a water level of 5,76mbgl.

A step test only was carried out on 10-77342. This comprised 2 discharges, with the highest pumping rate being 0,6 l/s. At this yield the water level was drawn rapidly down the borehole towards pump suction. The recovery was good. The borehole was

equipped with a windpump at the time of the test which is compatible with the hydraulic performance of the borehole. The water quality is good.

A 48 hour constant rate test was run on borehole 10-77343 at 1 l/s, following a step test with a maximum yield 4 l/s. After an initial rapid drawdown to 3,2m at 10 minutes the water level stabilized and a final drawdown of 4,5m was recorded by the end of the test. The aquifer is areally extensive and the good recovery confirms the reliability of the borehole over the long term. The borehole may be equipped with a motorpump as per Table 9. The water quality is good and poses no constraint to use.

8.26. Schoongezicht (Boreholes 10-77271 Clinic and 10-77272)

This village is 15km west of Bodibe and Itsoseng in the north east of the District. The village is situated on a flat plain and underlain by dolomite with a calcrete capping. Black Reef Quartzite outcrops to the west. Two boreholes were required, one for the clinic (10-77271) and one for the village (10-77272).

The geophysical survey comprised 2 calibration VES (run at a windpump near the clinic and at a windpump 500m north west of the village), followed by 9 exploration VES. These indicated the dolomite has a resistivity of 70 to 100 ohm-metres, and is underlain by the quartzite at between 20 and 40m below surface. VES 03,

just to the north of the clinic, and VES 07 in the north-west corner of the village, were selected for drilling.

Both boreholes intersected quartzite below the dolomite, at 31m in 10-77271 where a minor water strike with a blowing yield of 0,1 l/s was made on the contact. A water strike of 0,4 l/s was made in 10-77272 immediately above the contact at 22m. The boreholes were drilled to final depths of 71m and 76m respectively.

The water level rose in 10-77271 to 9,34mbgl, measured on 4th May 1992, and to 9,44mbgl in 10-77272 as measured on 5th May 1992, indicating a low confining head on the aquifers.

A step test only was run on the clinic borehole at yields of 0,27 l/s and 0,5 l/s. The trend of the water level was towards pump suction and a drawdown of 50m was recorded by the end of the test. Recovery was good. The aquifer is poorly developed but the borehole is able to support a handpump yielding 0,3 l/s, as per Table 9.

The aquifer intersected in 10-77272 is better developed and a 24 hour test at 0,5 l/s was feasible, notwithstanding the excessive drawdowns of 60m recorded in the step tests. A steady drawdown was observed throughout the 24 hour test with a trend towards semi-equilibrium by the end. This is indicative of an areally extensive aquifer with no limiting hydraulic barrier boundaries. The

transmissivity of the aquifer is low at 3 m²/d. Recovery of the water level trended to completion.

The aquifer is sufficiently well developed to support a motorpump delivering 0,5 l/s for 12 hours per day.

The water quality is good in both boreholes.

8.27. Shaleng (Borehole 10-77303)

Shaleng is a scattered settlement some 5km south of Khunwana in the centre of the District. The village is situated on a hilltop with the ground sloping to the east, north and west. The area is underlain by sub-outcropping granite. One borehole was requested for the northern part of the village.

The hydrogeophysical survey comprised 10 exploratory VES concentrated in the area of the drainage line to the north-east of the village. These showed that the granite is sub-outcropping from close to the surface with weathering of <5m. An exception was VES 01 run in the drainage line below the small dam where 26m of weathered granite with a resistivity of 140 ohm-metres was recorded. A magnetic traverse run across the lower slopes over a photo lineament detected a magnetic anomaly. However, the 4 VES run over this anomaly failed to confirm any weathering or fracturing of hydrogeological interest.

Borehole 10-77303 was drilled at VES 01 to 101m in granite. A minor water strike with a blowing yield of 0,1 l/s was made at the base of slightly weathered granite at 71m. The water level was measured as 7,84mbgl on 25th May 1992, indicating a high confining head.

A step test was run at 0,16 l/s and 0,3 l/s. The water level was drawn down 45m by the second discharge and the trend was towards pump suction. Recovery of the water level showed slight dewatering occurred. The aquifer is poorly developed but is able to support a low yielding handpump (Table 9). The water quality is good and poses no limitations to use.

8.28. Siberia (Boreholes 10-77250 Gontse P/S, 10-77284 and 10-77285)

This village is located on a flat plain some 7km south of Mareetsane. The area is underlain by lava. One borehole was to be rehabilitated at Gontse Primary School and one new borehole was requested for the village.

The existing borehole at Gontse Primary School could not be rehabilitated and a replacement hole designated 10-77250, was drilled alongside. Borehole 10-77250 was drilled to 91m through lava. A final blowing yield of 0,35 l/s was recorded from 2 small water strikes (Table 3).

The geophysical survey comprised 2 calibration VES, (one at 10-77250 and one at a broken windpump 600m south of the village), and 8 exploration VES. VES 02 and VES 08 were selected as priority and alternative drilling sites where weathering and fracturing of approximately 40m at 40 and 30 ohm-metres respectively was identified.

Borehole 10-77284 was drilled at VES 02 to a final depth of 106m in lava. No water strike was made. Borehole 10-77285 was drilled at the alternative site to 81m. Surface sands to 27m followed by lava were intersected. A final blowing yield of 0,4 l/s was obtained from two small water strikes (Table 3 and the log in Appendix I).

The water level was measured in 10-77250 as 26,89mbgl and in 10-77285 as 29,89mbgl, both on 21st May 1992. A step test run on 10-77250 at a maximum yield of 0,71 l/s produced a plunging drawdown towards pump suction as the capacity of the borehole was exceeded. Recovery was complete and the borehole can support a handpump yielding 0,3 l/s.

A step test run on 10-77285 indicated a 24 hour constant rate test at 0,5 l/s was feasible. A steady but rapid drawdown was recorded throughout the test until 1000 minutes, after which the dynamic level began to plunge down the borehole. The transmissivity is poor at 1 m²/d, and is the reason for the large drawdowns recorded. Recovery of the water level was complete.

The borehole can support a motorpump to yield 0,5 l/s for 12 hours per day.

The water quality in both boreholes is good and poses no constraints to use.

8.29. Sione (Borehole 10-77344)

Sione is 10km north east of Khunwana in the central part of the District. The programme involved the testing of an existing borehole to which the number 10-77344 was allocated. The borehole was measured on 22nd August 1992 as 30m deep and the static water level as 16,52mbgl.

A step test only was feasible on this borehole. The dynamic water level during the first step run at 0,25 l/s began to plunge down the borehole by the end of the first hour, and pump suction was hit 3 minutes into the second step at 0,55 l/s. The permeation properties of the aquifer are poorly developed. Recovery of the water level was good and the borehole may be equipped with a low yielding handpump (Table 9). The water quality is good.

8.30. Springbokfontein (Boreholes 10-77333 and 10-77334)

This grazing area lies to the north-east of Springbokfontein. Two existing boreholes were test pumped at the request of Agricolor. These were designated 10-77333 and 10-77334.

Borehole 10-77333 was measured as 22m deep with a static water level of 5,9mbgl on 3rd September 1992, and 10-77334 as 12m deep with a static water level of 5,06mbgl, on 5th September 1992. A step test followed by a constant rate test was run on each borehole. The step tests indicated the aquifers intersected by the boreholes were thin. This is compatible with the shallow borehole depths, and once the water level was pulled below the water bearing horizon the dynamic level plunged to pump suction.

A 48 hour test at 1 l/s was run on 10-77333 and a 24 hour test at 0,5 l/s on 10-77334. A similar hydraulic response was obtained with a relatively stable drawdown after an initial steep drawdown. The rate of drawdown began to increase towards the end of the tests. The transmissivities of the aquifer is moderate, $T = 50 \text{ m}^2/\text{d}$, in 10-77333, and moderately poor, $T = 15 \text{ m}^2/\text{d}$, in 10-77334. Recovery of the water levels was rapid and complete in both boreholes.

The shallow depth of these boreholes is a serious constraint to long term exploitation. Both boreholes must be deepened to a minimum

of 30m before being equipped, as per the management recommendations of Table 9. The water quality in both boreholes is good.

8.31. Springbokpan (Borehole 10-77301)

Springbokpan is a small village 10km west of Itsoseng. The village is located on a flat plain with a wide gentle depression immediately to the north. The geology comprises dolomite of the Oaktree Formation with a calcrete capping. One borehole was required for the eastern section of the village.

A detailed geophysical survey was run in this village comprising 2 magnetic traverses, over a distance of 1690m, 2 EM traverses, over a distance of 1550m, 3 calibration VES and 17 exploratory VES. The magnetic traverses were run over photo lineations thought to be dykes. No magnetic anomalies were, however, identified on either traverse. The VES that were run showed the dolomite below the calcrete cover was unweathered and resistivities were consistently above 1000 ohm-metres, with the exception of Calibration No 1 to the west of the village and VES 10 where 40m of 400 ohm-metres was measured. Two EM traverses were run in a north-south direction (ref.: sketch map in Appendix I) in an attempt to locate fracturing or karst development within the Oaktree Formation. No significant anomalies were recorded. The small anomaly on EM 10 where VES 14 was run, appeared to be

associated with the surface calcrete, while the EM readings did not detect any anomaly at VES 10. The entire area surveyed appeared typical of the Oaktree Formation with poor groundwater potential.

Borehole 10-77301 was drilled at VES 10 to a final depth of 71m in dolomite. A final blowing yield of 0,5 l/s was recorded from two water strikes, one at 14mbgl with a blowing yield of 0,4 l/s, and the second at 28m with 0,1 l/s. The water level was measured on 10th August 1992 as 6,02mbgl, indicating a confining head of only 8m.

A step test run at 0,18 l/s, 0,39 l/s and 0,68 l/s confirmed the aquifer intersected was poorly developed. The water level trended down the borehole during the second step, and during the third step at 0,68 l/s plunged 60m to pump suction. Recovery of the water level was good and the borehole can support a handpump to yield 0,3 l/s.

The water quality is good and poses no constraint to use.

8.32. Tlhakajeng (Borehole 10-77286 Ketletseng M/S)

Tlhakajeng is situated immediately east of Kraaipan. The Middle School is 3km east of Kraaipan station. The area is high lying and underlain by granite. The granite outcrops and sub-outcrops around the school. One borehole was required to replace the existing borehole which had become polluted.

The geophysical survey comprised 2 calibration VES, one of which was run at the existing borehole in the school yard, and 9 exploration VES. These showed generally shallow to very shallow weathering, (<10m), of the granite with the exception of VES 06 where the granite appeared fractured to approximately 60m , but with a high resistivity of 350 ohm-metres.

Borehole 10-77286 was drilled at VES 06 in granite to 81m. A minor water strike with a blowing yield of 0,1 l/s was made at 52m in occasionally fractured granite.

The water level rose to 11,6mbgl, as measured on 24th May 1992. A step test confirmed the aquifer is poorly developed and a drawdown of over 50m was produced by the end of the second step at 0,4 l/s. Recovery of the water level was slow and dewatering occurred.

The borehole is able to support a low yielding handpump set at 40m as per Table 9. The water quality falls within the low risk category with a nitrate value of 56 mg/l.

8.33. Uitkyk (Borehole 10-77331)

This village is 8km east of Mareetsane. An existing agricultural borehole required testing. Computer number 10-77331 was allocated to this borehole.

The borehole is only 9,4m deep. The static water level was measured on 1st May 1992 as 5,45mbgl, thus giving a pumpable drawdown of only 4m.

A step test run on this borehole with a maximum discharge of 2,12 l/s indicated the shallow aquifer intersected by the borehole is highly transmissive. This was confirmed by the 48 hour test run at 1,4 l/s which showed $T = 110 \text{ m}^2/\text{d}$. A very gentle rate of drawdown occurred during the test with a maximum of 0,98m recorded. Recovery of the water level was to completion.

The borehole is able to support a motorpump yielding 1 l/s for 12 hours per day. The borehole must be deepened to a minimum of 30m before being equipped, however. The water quality is good.

8.34. Verdwaal

This village is 3km south-east of Itsoseng. The village lies in a flat plain and is underlain by dolomite of the Oaktree Formation capped

by calcrete. One new borehole was requested for the village to augment the existing windpump in the centre of the village. This borehole is reported to fail during the dry season.

A geophysical survey comprising 2 calibration and 10 exploration VES, 2 magnetic traverses totalling 1000m and 2 EM traverses over a distance of 1900m was run.

The VES showed that the dolomite below the calcrete capping is solid with resistivities of several thousand ohm-metres. No weathering or fracturing of the dolomite could be detected. Two magnetic traverses were run to the west of the village to investigate a suspected dyke seen on the air photography. However, these traverses failed to detect any magnetic anomalies. Two EM traverses were also run to the west of the village, EM 7 in a south-east/north-west direction parallel to magnetic traverse 1 across the photolineation, and EM 8 in a south-west/north-east direction. No significant anomalies were detected on either EM traverse.

It is concluded that the groundwater development potential of the Oaktree Formation dolomite is too poor to warrant any drilling, and no drilling site was selected.

8.35. Weltevrede (Borehole 10-77121 Clinic)

This small village is approximately 10km south of Mareetsane. The existing borehole at the clinic required cleaning out.

The borehole was cleaned to 34m and then deepened to 51m. The static water level was measured on 24th May 1992 as 12,1mbgl.

A step test run showed the aquifer intersected by the borehole is poorly developed, and the water level began to plunge down the borehole at 0,4 l/s. Recovery was good and the borehole is able to support a handpump yielding 0,3 l/s. The water quality is good.

8.36. Welverdiend (Boreholes 10-77265 Pre-School, 10-77266 and 10-77336 Clinic)

Welverdiend is 10km west of Bodibe. The village is on a flat plain underlain by dolomite of the Oaktree Formation, with a calcrete capping. Two boreholes were to be drilled and one existing hole at the clinic, designated 10-77336, test pumped.

A geophysical survey comprising 2 calibration and 8 exploratory VES was run. Interpretation of the VES indicated that the dolomite underlying Welverdiend is characterized by 70-80m of 200 to 400 ohm-metres, the resistivity range in dolomite associated

with good groundwater potential. Borehole 10-77285 was drilled at VES 01 and borehole 10-77286 at the VES next to the creche on the north-east side of the village, also numbered VES 01.

Borehole 10-77265 was drilled to 86m in dolomite and 10-77266 to 81m, also in dolomite. A final blowing yield of 0,5 l/s was recorded in 10-77265 (from 3 water strikes as given in Table 3) and 1,3 l/s in 10-77266, from 4 water strikes (Table 3).

The static water level in 10-77265 and 10-77266 was measured as 6,06mbgl and 6,88mbgl on 13th May and 16th August 1992 respectively. Borehole 10-77336 was measured on 15th August 1992 as 18m deep only, and the static water level as 7,04mbgl, thus giving a pumpable drawdown of only 11m.

Step tests run on all three boreholes confirmed the hydraulic characteristics of the water bearing horizons are poorly developed. The water level plunged towards pump suction in 10-77265 and 10-77266 at the highest pump yields of 1 l/s and 2 l/s respectively. The test run on 10-77336 showed the hole was too shallow and the transmissivity too low to warrant the running of a constant rate test.

A 24 hour test was run on 10-77265 at 0,5 l/s and a 48 hour test at 1,1 l/s on 10-77266. The hydraulic responses were similar with the water level tending to stabilize after an initial large drawdown due to the low transmissivities of 0,5 m²/d and 2 m²/d respectively. In the case of 10-77265 the rate of drawdown began to increase

towards the end of the test due to the intersection of an hydraulic boundary. The water level recovery in both boreholes was complete.

Borehole 10-77265 and 10-77266 may be equipped with motorpumps as per Table 9. Borehole 10-77336 at the clinic must be deepened to a minimum of 30m before being equipped with a handpump (or solar pump) as per Table 9.

The water quality in all three boreholes is good and poses no constraint to human consumption.

9. MANAGEMENT RECOMMENDATIONS

Management recommendations for the 57 tested boreholes are given in Table 9. These are based upon the hydraulic data obtained from both the step drawdown and constant discharge test data. Boreholes with excessive chemical constraints are noted on the management table.

Motorpumps are recommended for installation in 35 of the boreholes. Five of these must be deepened to a minimum of 30m before being equipped. These boreholes must not be pumped for longer than 12 hours per day at the recommended discharge, except for 10-77341 at Deelpan which may be pumped for 18 hours per day.

TABLE 9

MANAGEMENT RECOMMENDATIONS BASED UPON STEP DRAWDOWN TEST (SDT) OR CONSTANT DISCHARGE TEST (CDT)

Borehole No.	Request No.	Locality	Co-ordinates X (m)	Co-ordinates Y (m)	1:50 000 Map	Test type	Borehole depth (m)	Static water level (mbgl)	Pump setting (m)	Recommended abstraction facility, yield and pumping period
10-77283	77.1.V	Bapong	+2899525	-63405	2625BA	CDT	78	6.97	40	Motorpump to yield 0,5 l/s for 12 hours per day. Water Quality Good.
10-77299	143.1.V	Bapong (Gelukspan)	+2898975	-66380	2625BA	CDT	68	5.35	40	Motorpump to yield 0,5 l/s for 12 hours per day. Water Quality Good.
10-77251	31.2.V	Brooksby P/S	+2904575	-66800	2625BC	CDT	51	6.08	30	Motorpump to yield 1 l/s for 12 hours per day. Water Quality Good.
10-77296	42.1.V	Deelpan	+2914100	-58775	2625BC	SDT	91	5.01	--	mS/m = 2770, TDS = 26540 mg/l Cl = 26100 mg/l. High Risk. Not to be equipped.
10-77297	41.1.V	Deelpan	+2913750	-59300	2625BC	SDT	96	5.00	--	mS/m = 1112, TDS = 12015 mg/l Na = 1740 mg/l, Cl = 4620 mg/l High Risk. Not to be equipped.

Table 9 (cont)

Borehole No.	Request No.	Locality	Co-ordinates X (m)	Co-ordinates Y (m)	1:50 000 Map	Test type	Borehole depth (m)	Static water level (mbgl)	Pump setting (m)	Recommended abstraction facility, yield and pumping period
10-77341	137.3.A	Deelpan	+2913800	-61025	2625BC	CDT	20.40	4.83	--	Motorpump to yield 4,0 l/s for 18 hours per day. <u>NB:</u> Boreholes must be deepened to 30m. Water Quality Good.
10-77249	2.2.E	Diretsane Mateane P/S	+2925825	-50975	2625BC	SDT	106	10.70	---	No useable yield..
10-77294	17.1.V	Doornlaagte	+2921600	-53150	2625BC	CDT	80	14.36	40	Motorpump to yield 2 l/s for 12 hours per day. Water Quality Good.
10-77307	18.3.E	Doornlaagte (Kelebogile P/S)	+2921950	-52925	2625BC	CDT	43	13.36	40	Motorpump to yield 1,0 l/s for 12 hours per day. Water Quality Good.
10-77275	49.3.E	Goedgevonden P/S	+2901225	-51855	2625BA	CDT	70	7.7	40	Motorpump to yield 0,5 l/s for 12 hours per day. Water Quality Good.
10-77298	50.3.A	Kaalpan	+2899905	-68855	2625BA	CDT	75	5.66	40	Motorpump to yield 0,5 l/s for 12 hours per day. Water Quality Good.

Table 9 (cont)

Borehole No.	Request No.	Locality	Co-ordinates X (m)	Co-ordinates Y (m)	1:50 000 Map	Test type	Borehole depth (m)	Static water level (mbgl)	Pump setting (m)	Recommended abstraction facility, yield and pumping period
10-77300	142.3.A	Kaalpan Veg. Garden	+2899555	-69490	2625BA	CDT	73	15.44	40	Motorpump to yield 1,0 l/s for 12 hours per day. Water Quality Good.
10-77248	1.2.E	Kopela Noto H/S	+2923300	-50975	2625BC	CDT	61	11.35	40	Motorpump to yield 0,5 l/s for 12 hours per day. Water Quality Good.
10-77306	57.3.H	Kopela Clinic	+2923550	-52475	2625BC	CDT	37	15.72	30	Motorpump to yield 0,5 l/s for 12 hours per day. Water Quality Good.
10-77288	46.3.E	Kraaipan Aron P/S	+2908100	-30160	2625AC	CDT	60	11.5	40	Motorpump to yield 0,5 l/s for 12 hours per day. Water Quality Good.
10-77252	35.2.V	Lombardslaagte	+2909000	-58050	2625BC	CDT	75	6.68	30	Motorpump to yield 1,5 l/s for 12 hours per day. Water Quality Good.
10-77281	51.1.A	Louisdal	+2903700	-47300	2625AB	SDT	91	19.25	50	Handpump to yield 0,3 l/s Water Quality Good

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

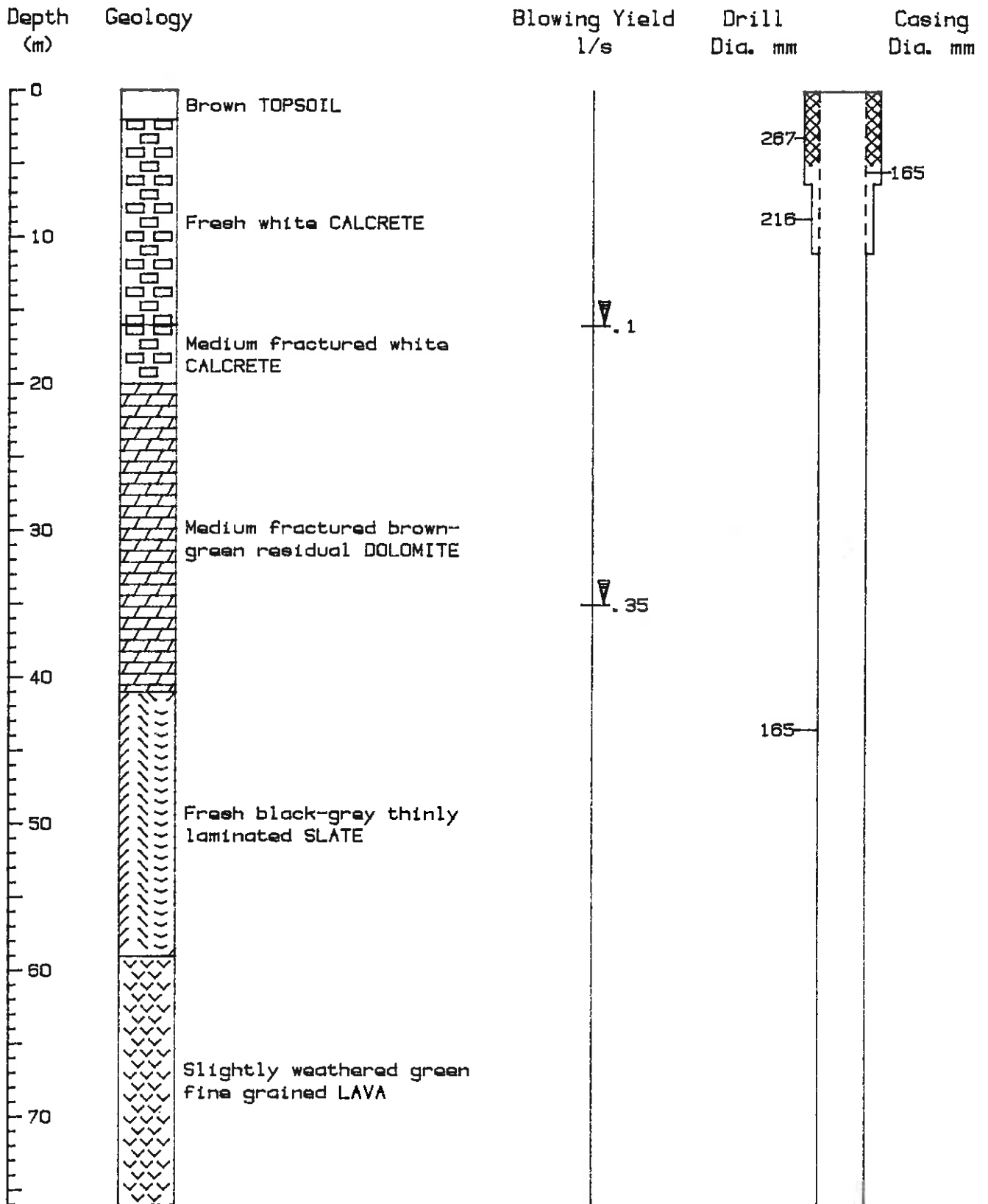
LOCALITY: BAPONG

BH. No. 10-77299

Geoph. Peg No. 01

Coordinates +2898975X -066380Y

Elev. (m) 1388



End of Hole 76

STEP DRAWDOWN TEST

* Pumping data
 + Recovery data

BAPONG (GELUKSPAN)

25 04 1992

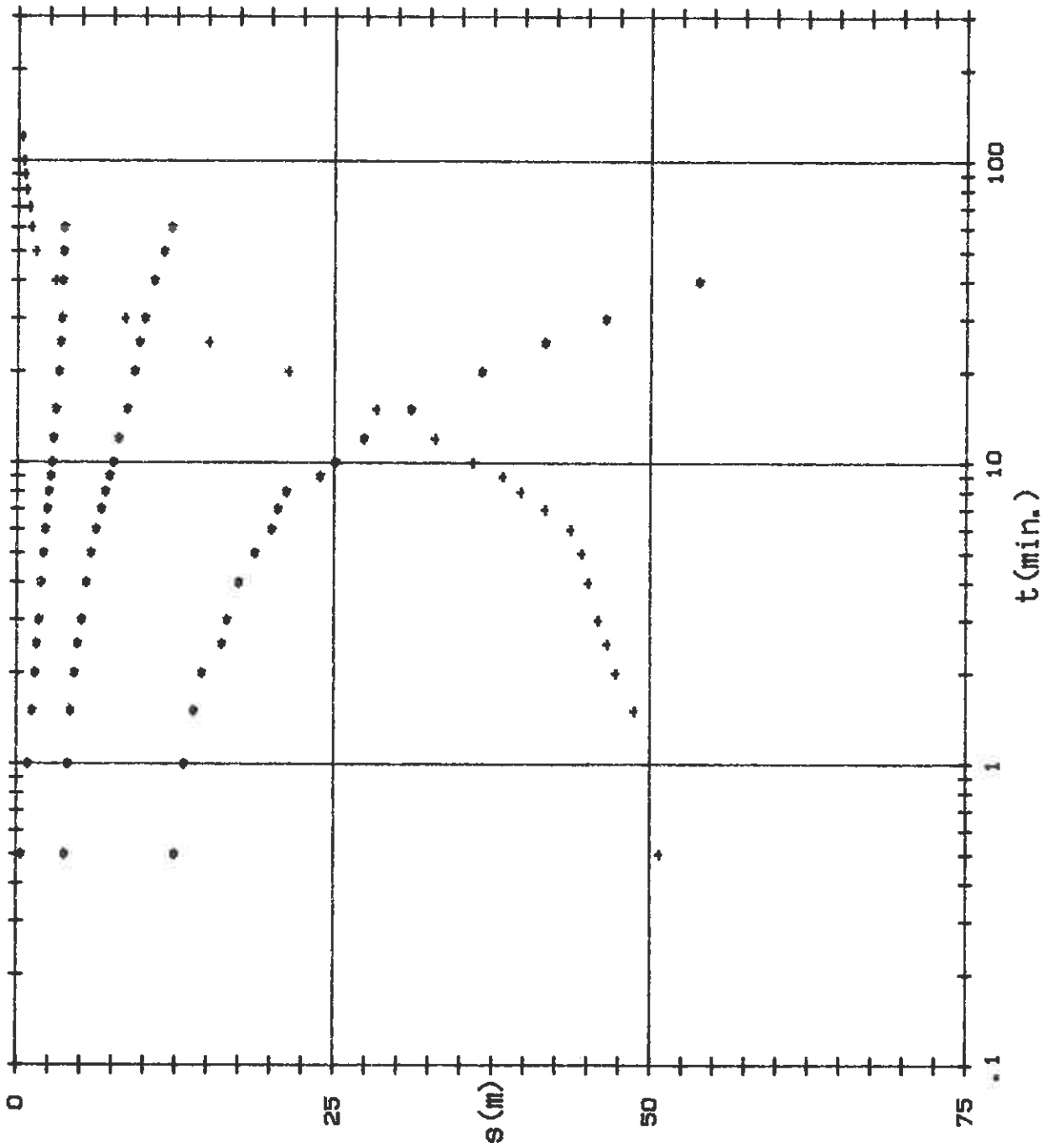
B.H. No. 10-77299

$Q_1 = .18 \text{ l/s}$

$Q_2 = .4 \text{ l/s}$

$Q_3 = .8 \text{ l/s}$

S.W.L. = 5.35 m



CONSTANT DISCHARGE TEST

- + Drawdown data.
- * Recovery data.

BAPONG (GELUKSPAND)

26 04 1992

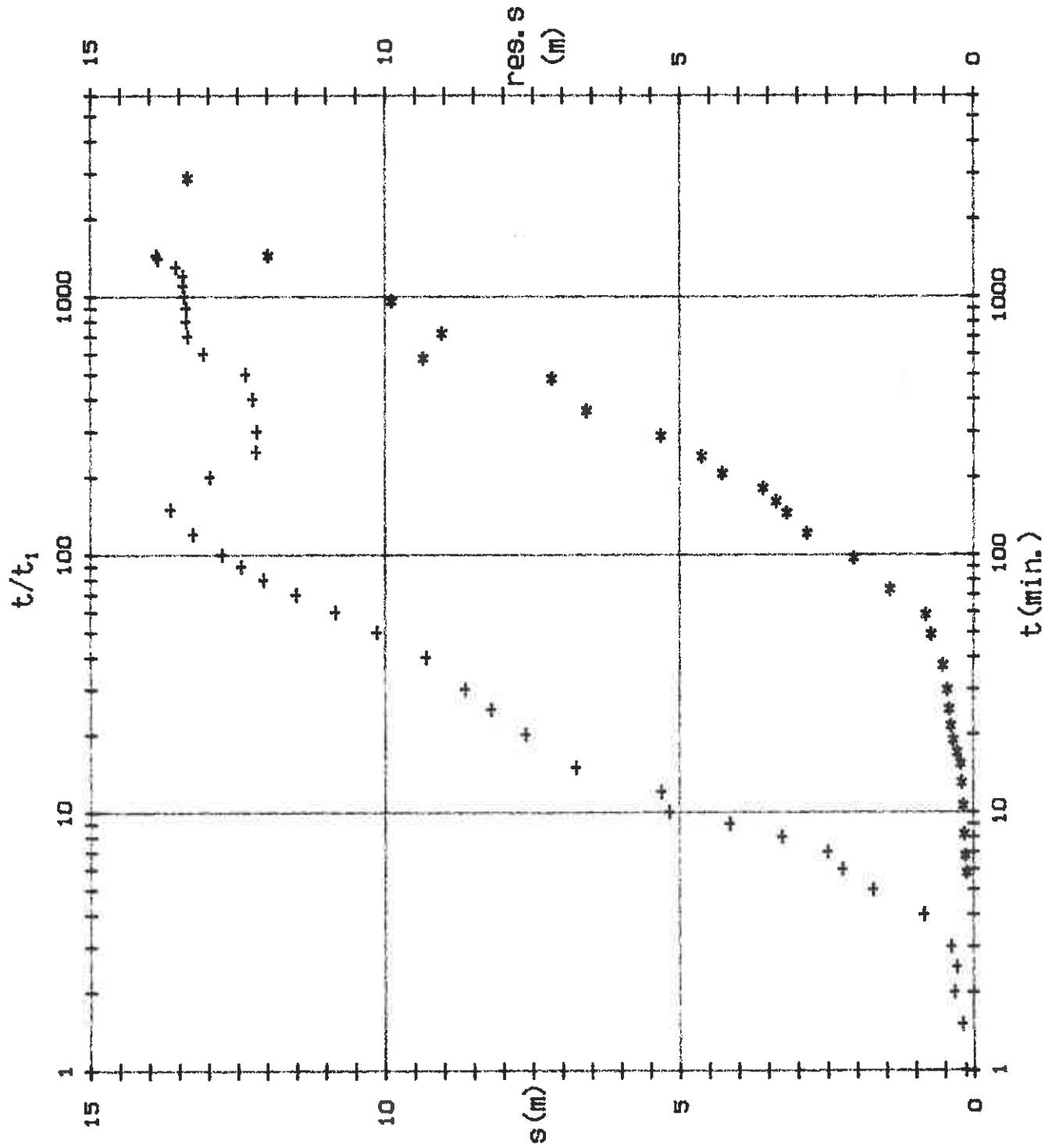
Pumped Borehole
10-77299

Readings on Borehole
10-77299

$Q = .5 \text{ l/s}$

$S.W.L. = 5.35 \text{ m}$

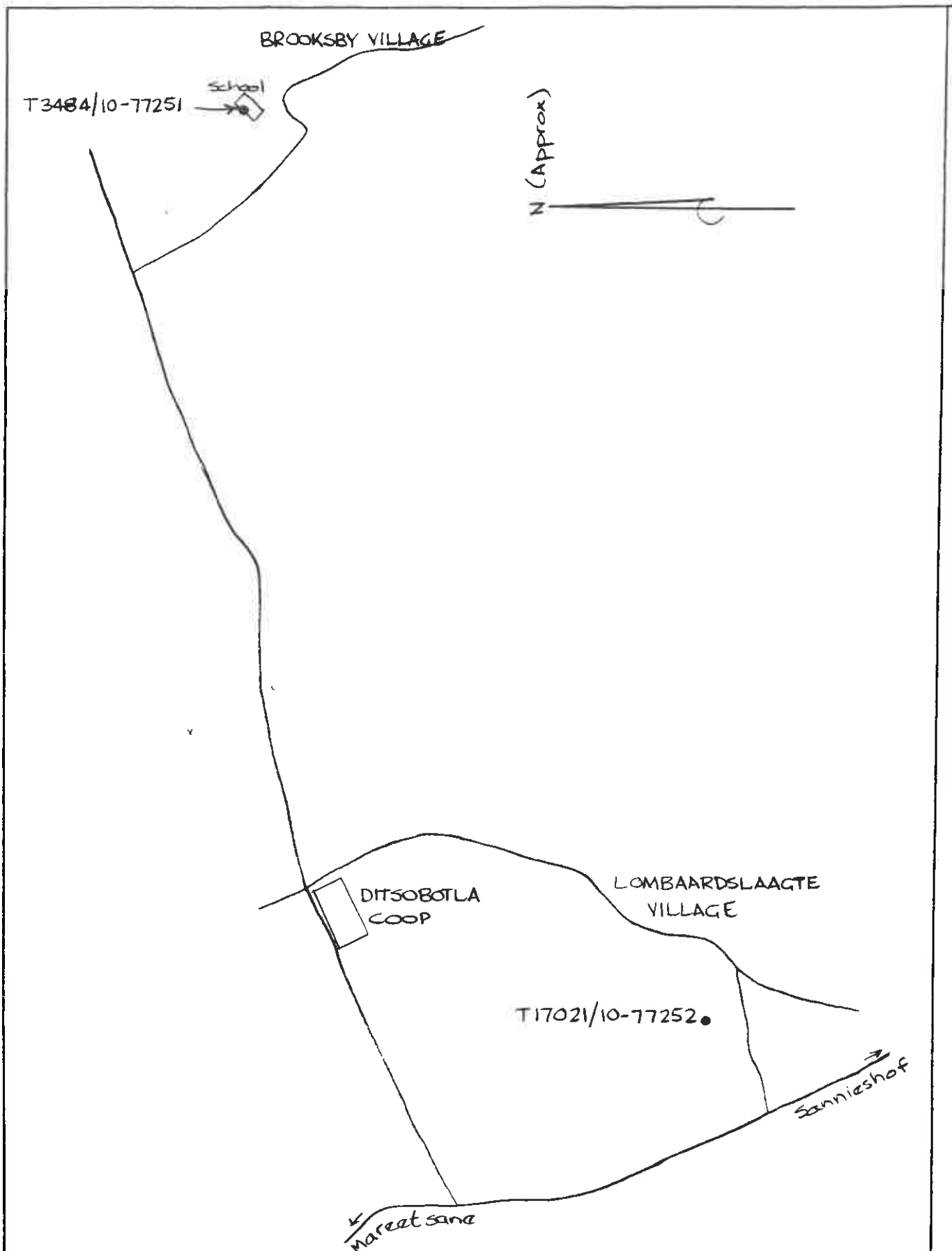
$T = 1 \text{ m}^2/\text{d}$



BROOKSBY

Including borehole

10-77251



Locality Plan of Boreholes 10-77251 and 10-77252
 Topographical sheet 2625 BC DEELPAN
 Approx Scale 1:50 000

STEP DRAWDOWN TEST

* Pumping data
 + Recovery data

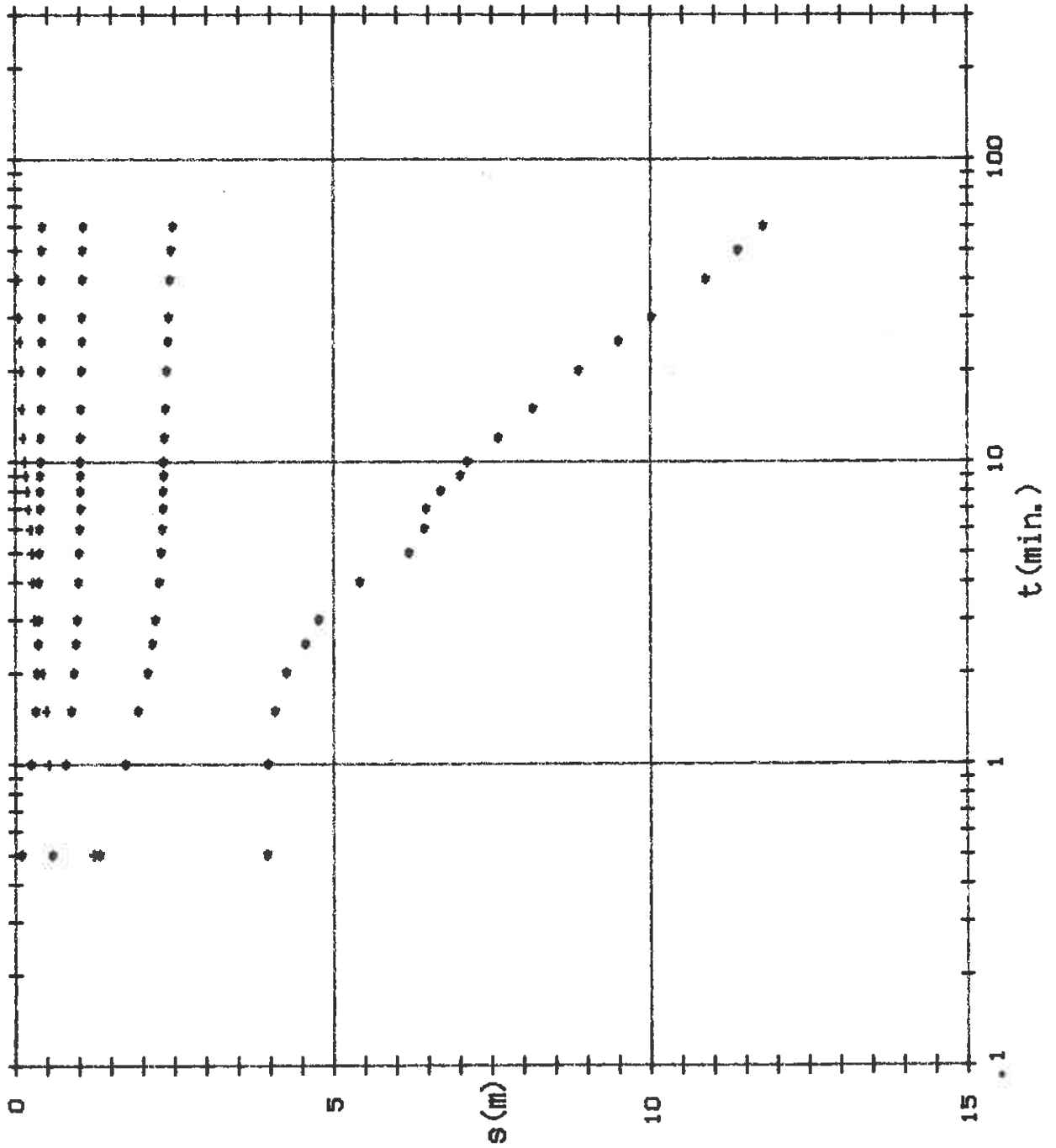
BROOKSBY

06 08 1992

B.H. No. 10-77251

$Q_1 = .28 \text{ l/s}$
 $Q_2 = .62 \text{ l/s}$
 $Q_3 = 1.3 \text{ l/s}$
 $Q_4 = 2.65 \text{ l/s}$

S.W.L. = 6.08 m



CONSTANT DISCHARGE TEST

+ Drawdown data.
* Recovery data.

BROOKSBY

07 08 1992

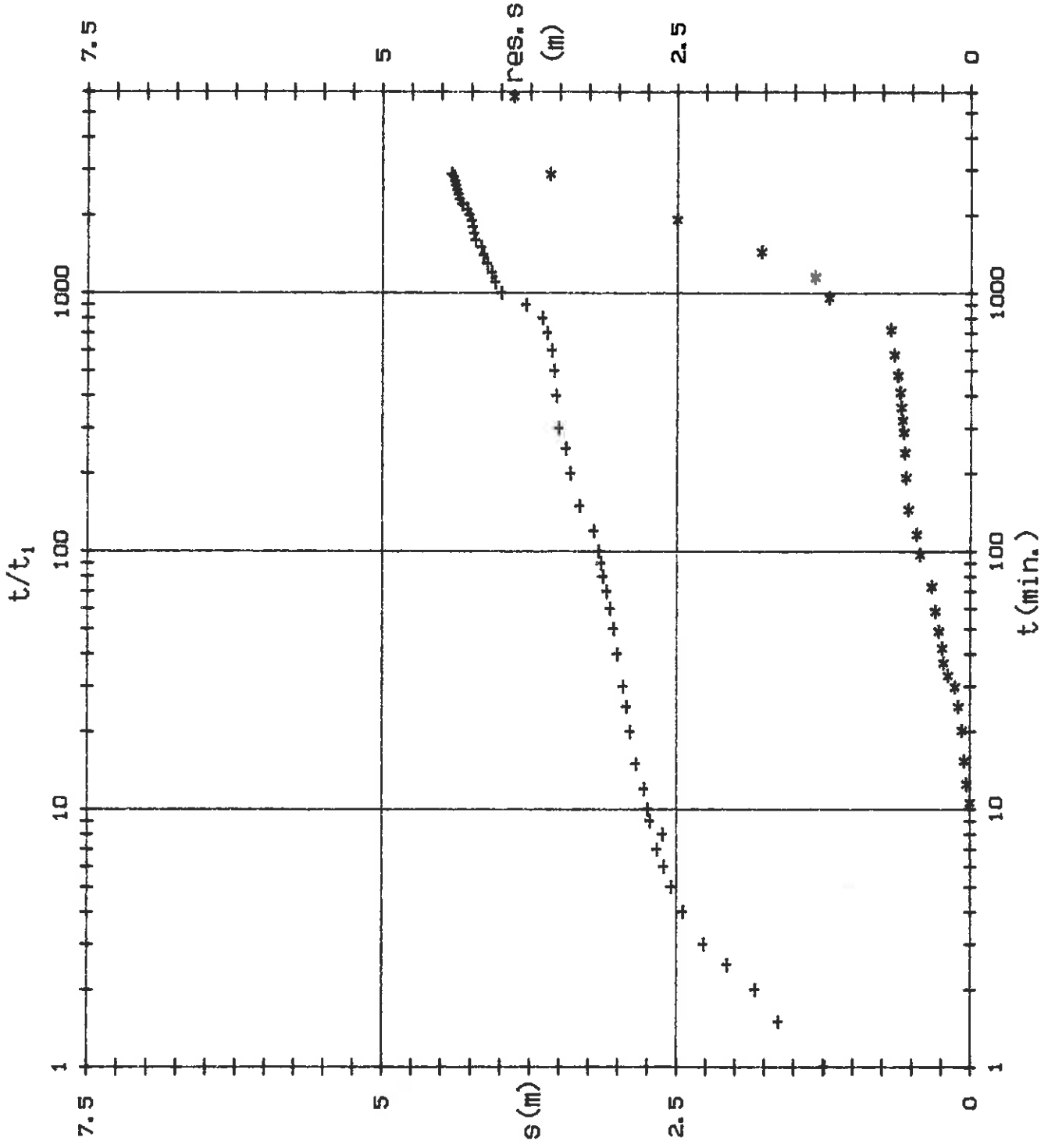
Pumped Borehole
10-77251

Readings on Borehole
10-77251

Q = 1.5 l/s

S.W.L. = 6.08 m

T = 10 m²/d



DEELPAN

Including boreholes

10-77296

10-77297

10-77341

2625BC

DEELPAN

DEELPAN

Deelpan

Deelpan

Deelpan

Deelpan

Deelpan

Deelpan

Schoongezicht

Ugapan

Schoongezicht

Schoongezicht

Klein Zoutpan

Klein Zoutpan

Klein Zoutpan

Klein Zoutpan

Klein Zoutpan

Witpan

Witpan

Kalkfontein

Klippan

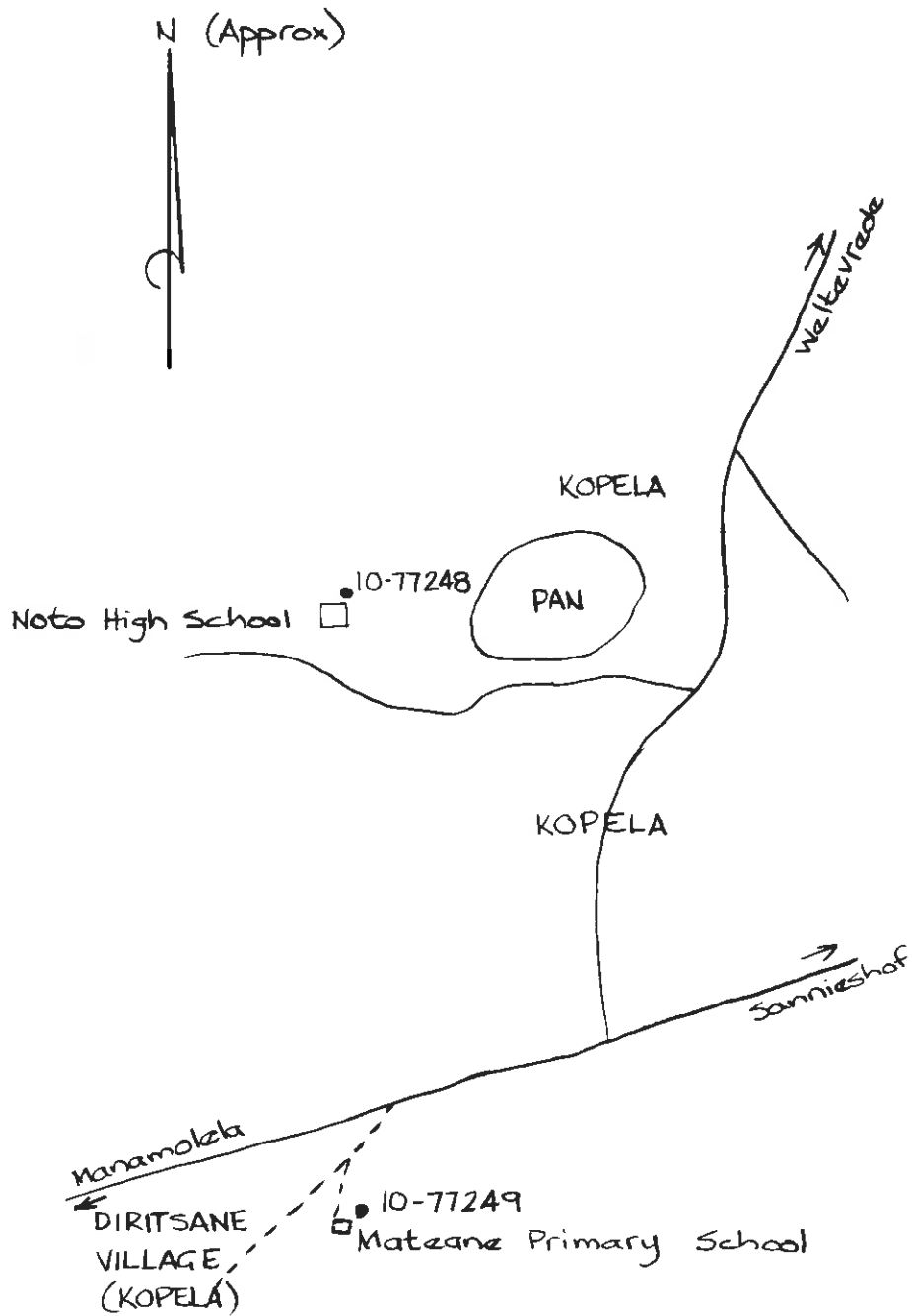
110
1372.8

10-77341

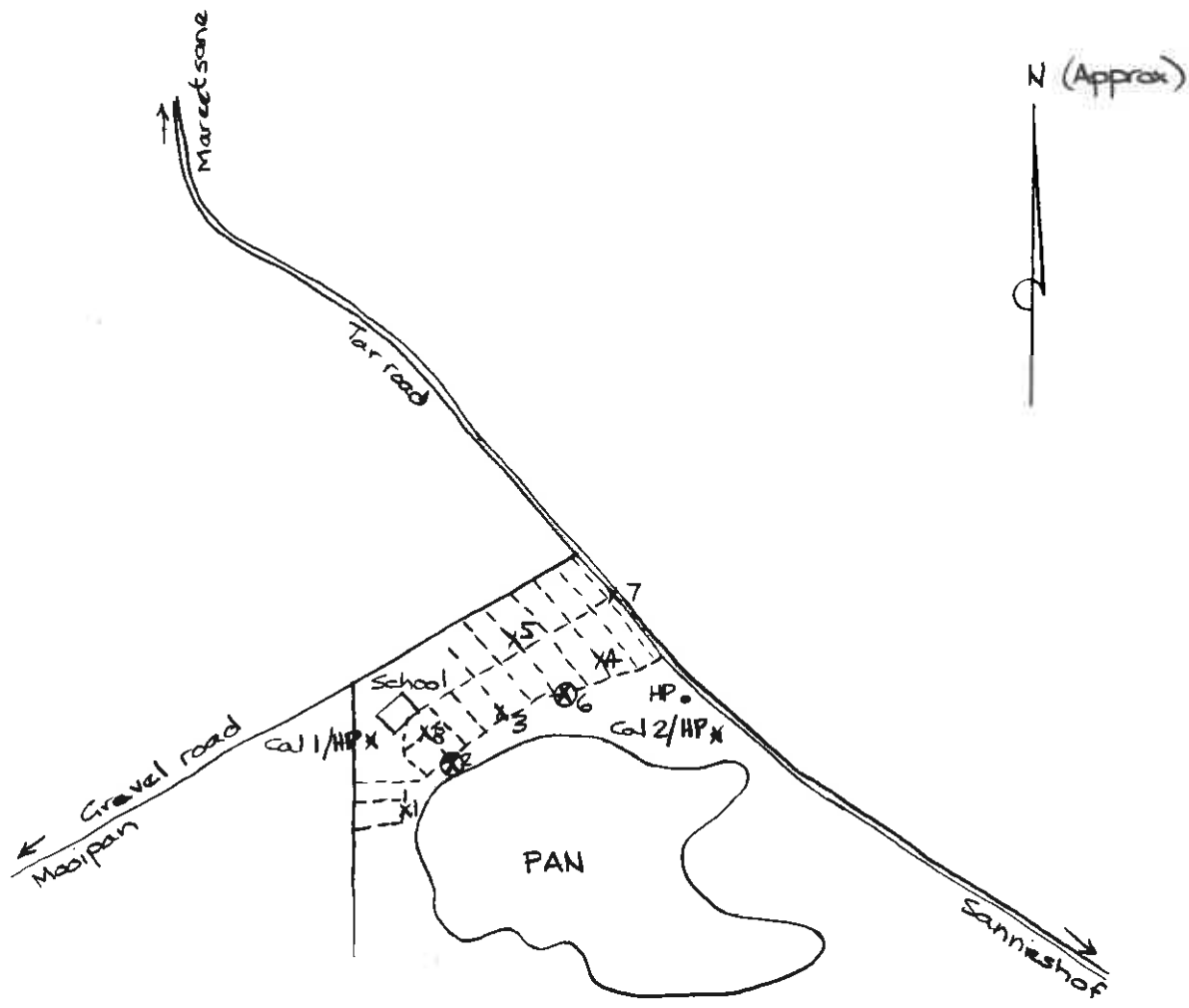
10-77296

1388

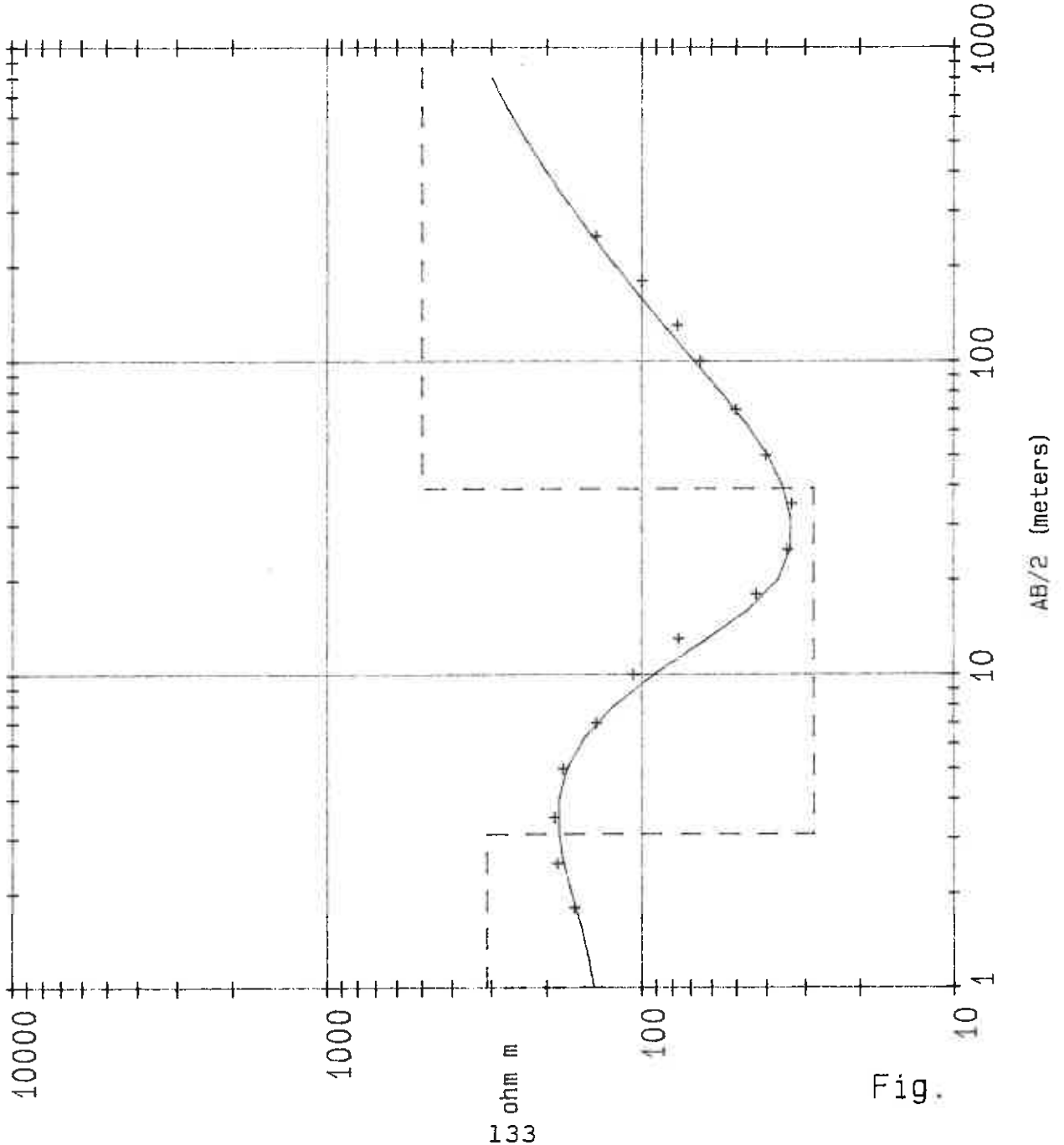
1372.4



Locality Plan of Boreholes 10-77248 and 10-77249
 Overlay to Photo No 288 (strip 19)
 Topographic sheet 2625 BC DEELPAN
 Approx Scale 1:30 000



Locality Plan of Deelpan
 Overlay to Photo No 506 (strip 17)
 Approx Scale 1:30 000



+ Field data
 --- Computer model
 - - - d - r model

DEELPAN

V.E.S. 02

CO-ORDINATES
 +2914100X -58775Y

GEOLOGY
 LAVA

Fig.

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

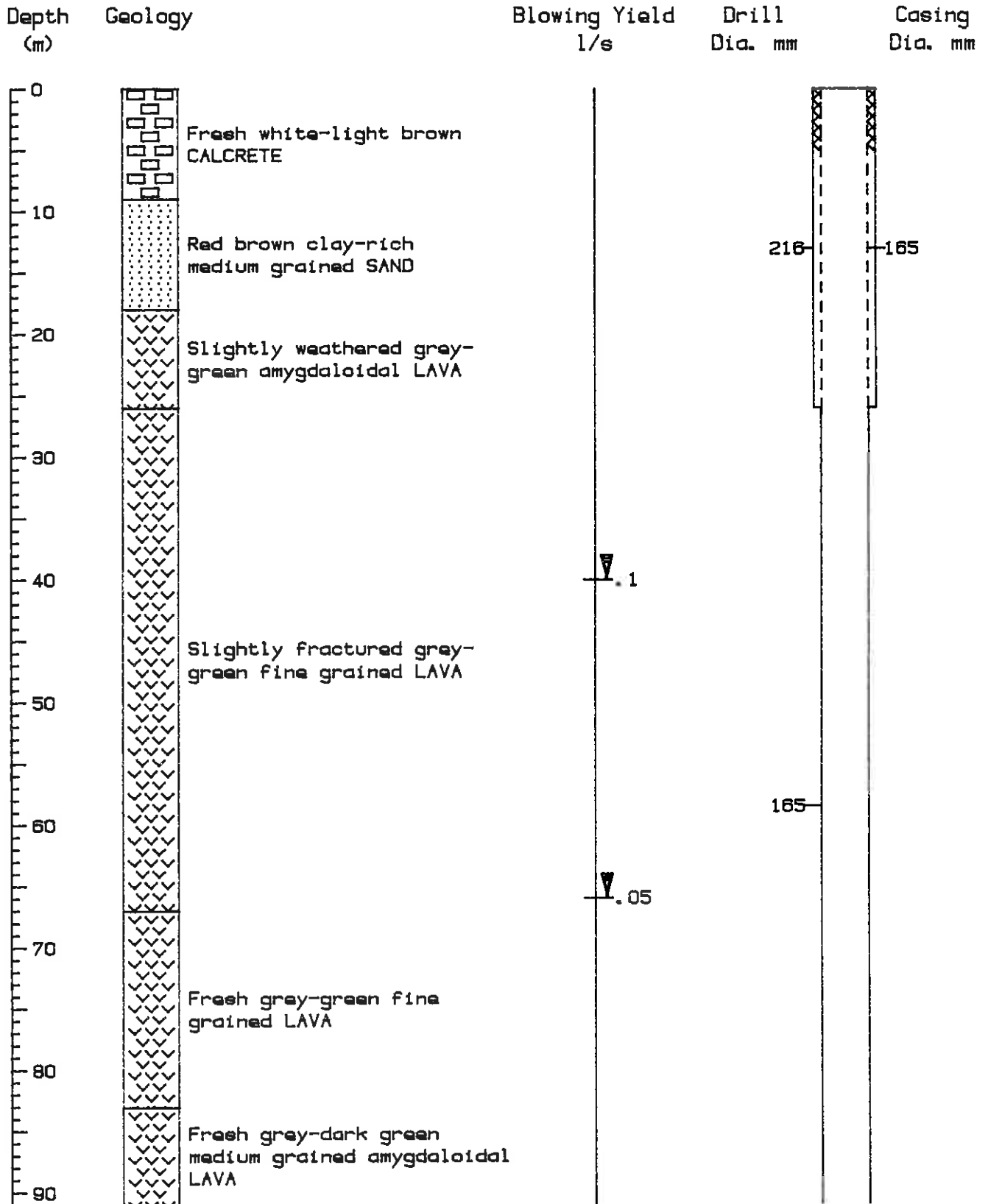
LOCALITY: DEELPAN

BH. No. 10-77296

Geoph. Peg No. 02

Coordinates +2914110X -058780Y

Elev. (m) 1351



End of Hole 91

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

DEELPAN

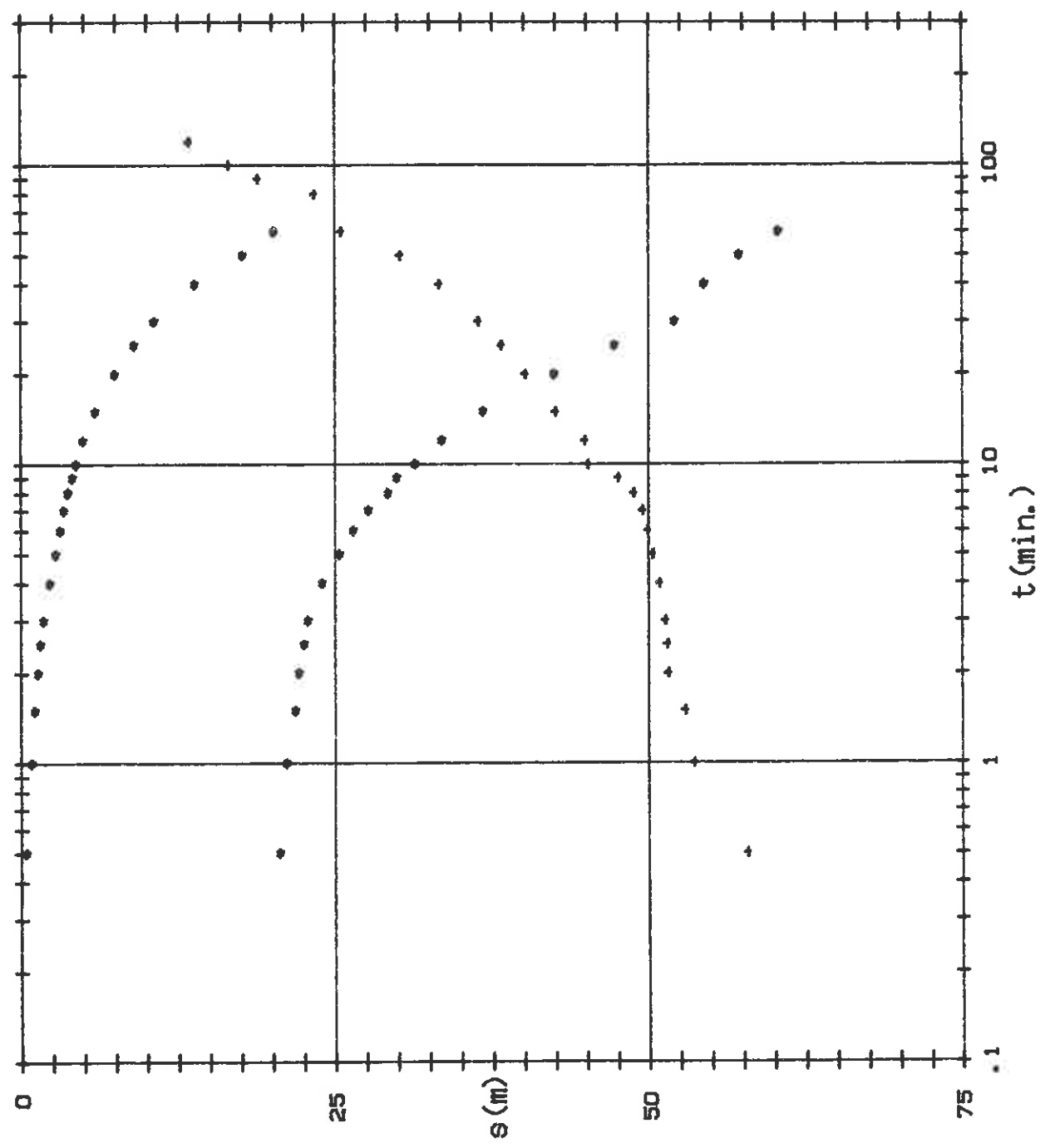
04 08 1992

B.H. No. 10-77296

$Q_1 = .27 \text{ l/s}$

$Q_2 = .48 \text{ l/s}$

S.W.L. = 5.01 m



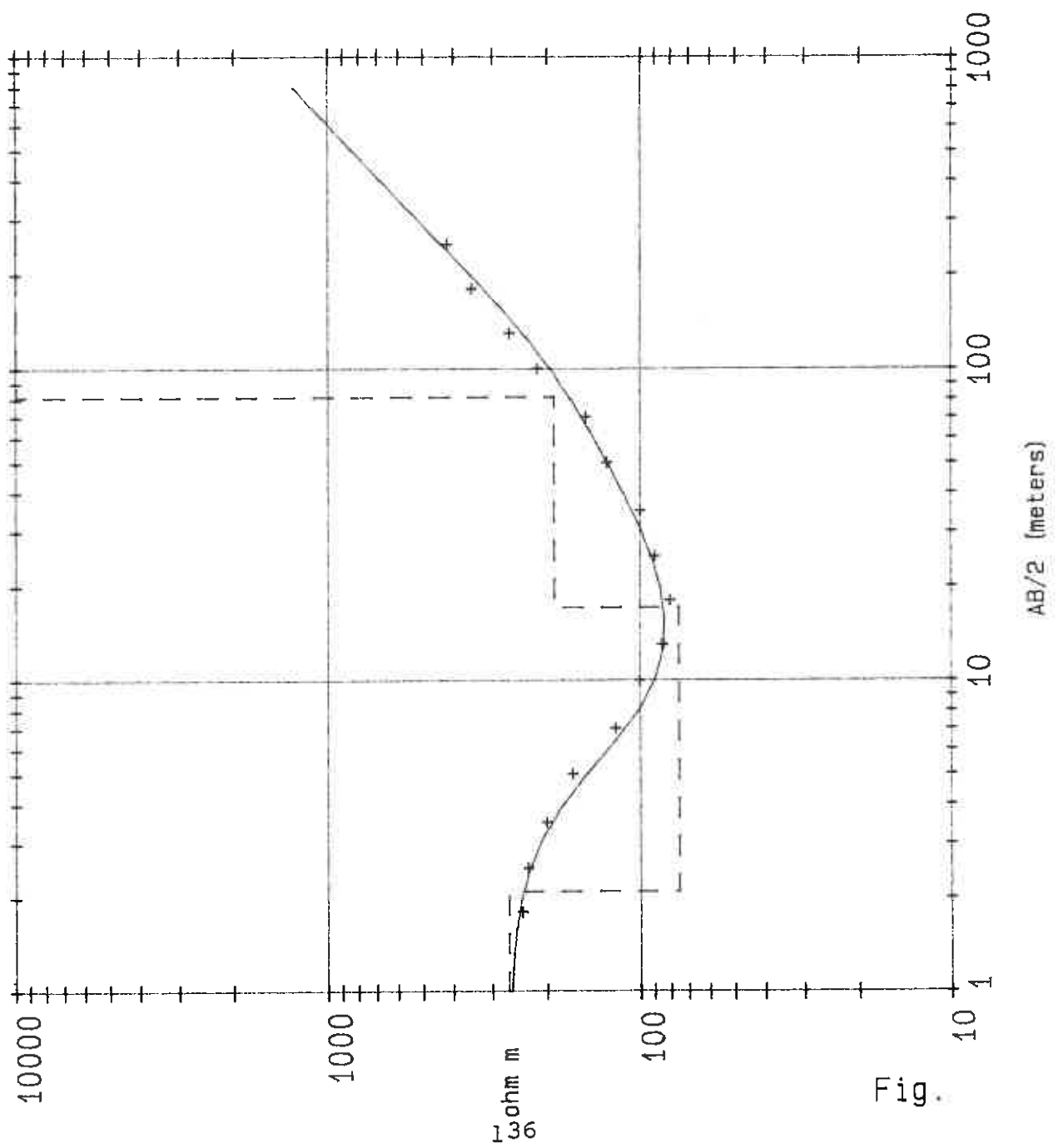


Fig.

+ Field data
 — Computer model
 - - - d - r model

DEELPAN

V.E.S. 06

CO-ORDINATES
 +2913750X -59300Y

GEOLOGY
 LAVA

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

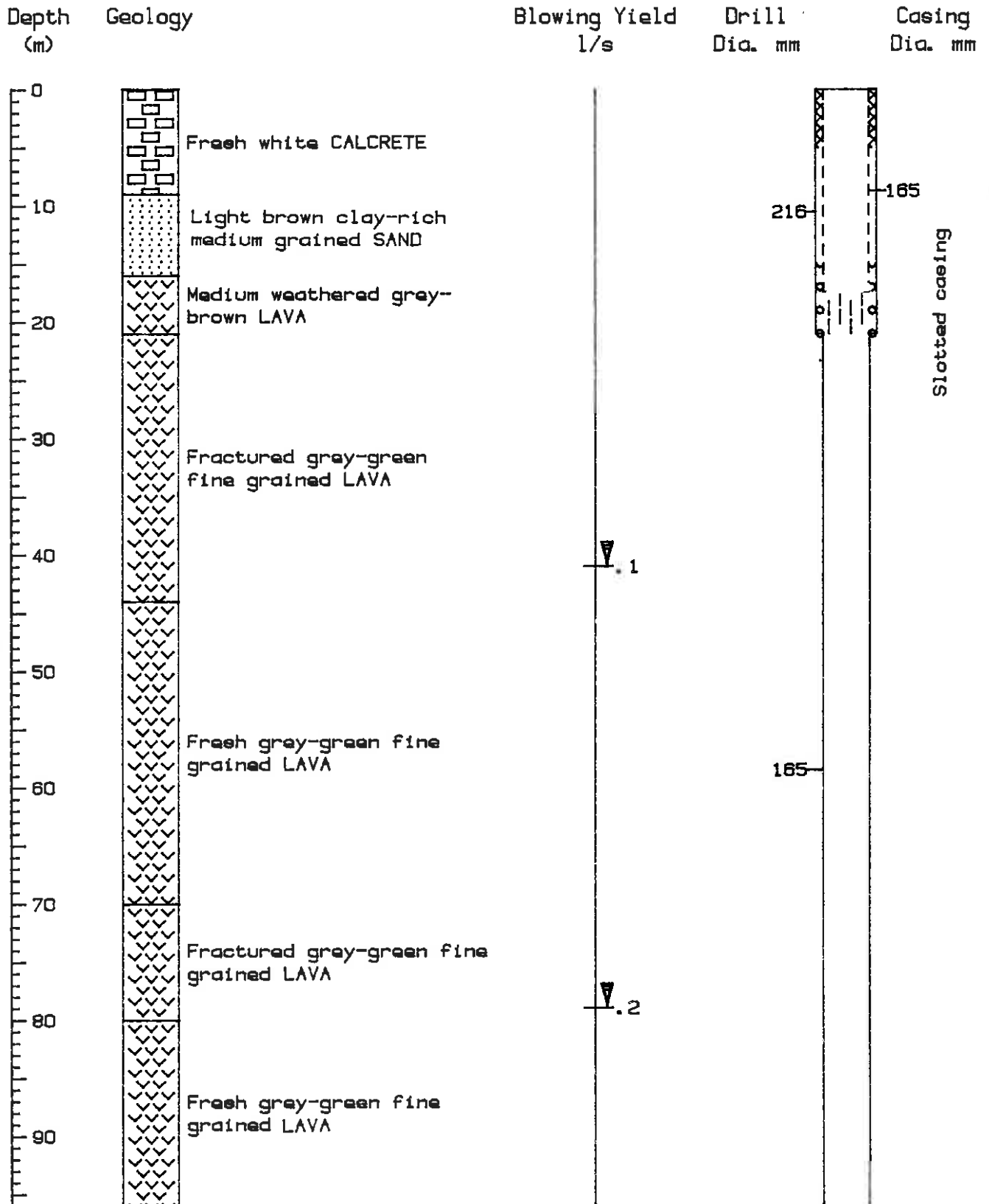
LOCALITY: DEELPAN

BH. No. 10-77297

Geoph. Peg No. 06

Coordinates +2913760X -059305Y

Elev. (m) 1351



End of Hole 96

STEP DRAWDOWN TEST

* Pumping data
 + Recovery data

DEELPAN

03 08 1992

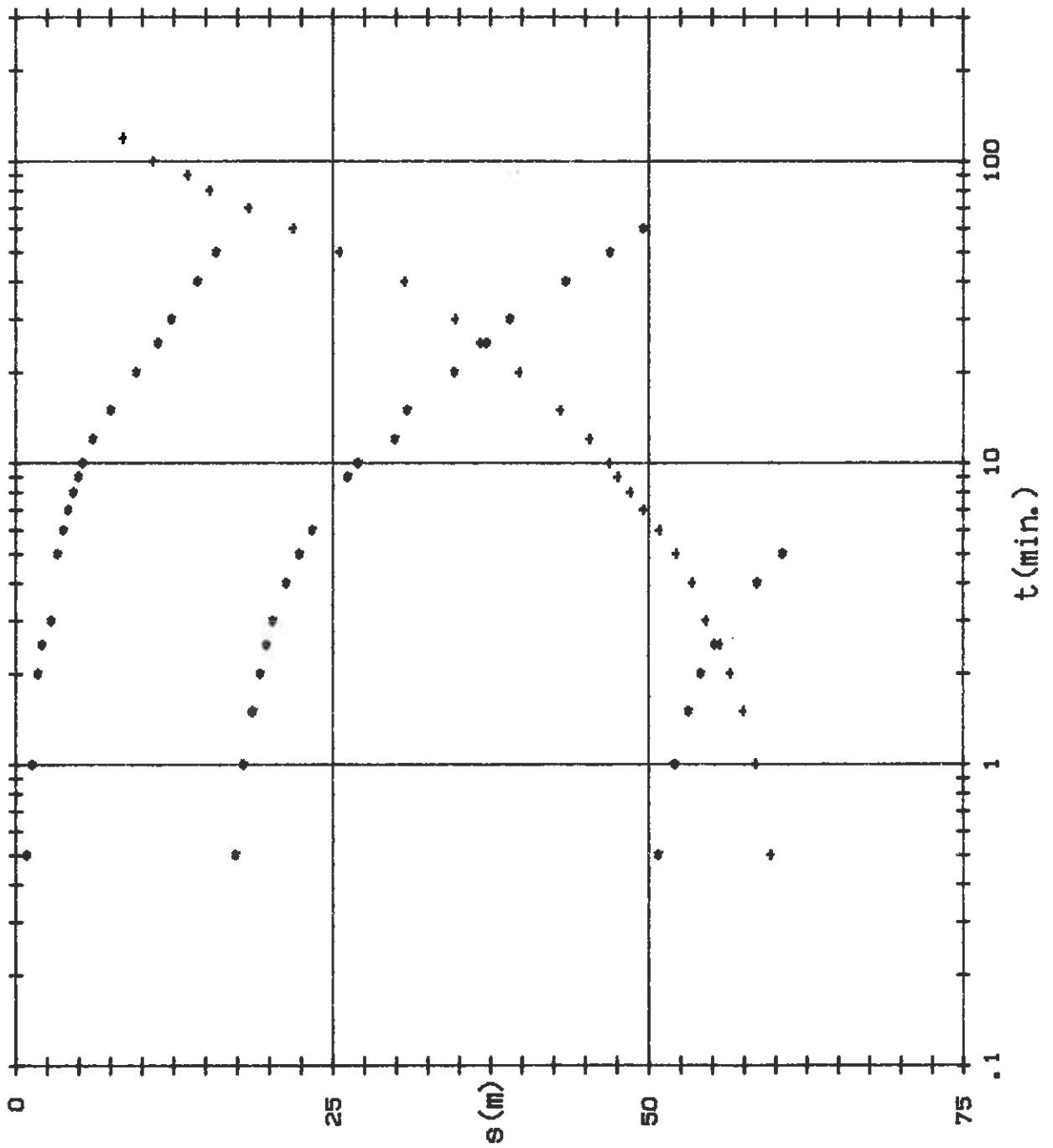
B.H. No. 10-77297

$Q_1 = .25 \text{ l/s}$

$Q_2 = .52 \text{ l/s}$

$Q_3 = 1.1 \text{ l/s}$

S.W.L. = 5 m



STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

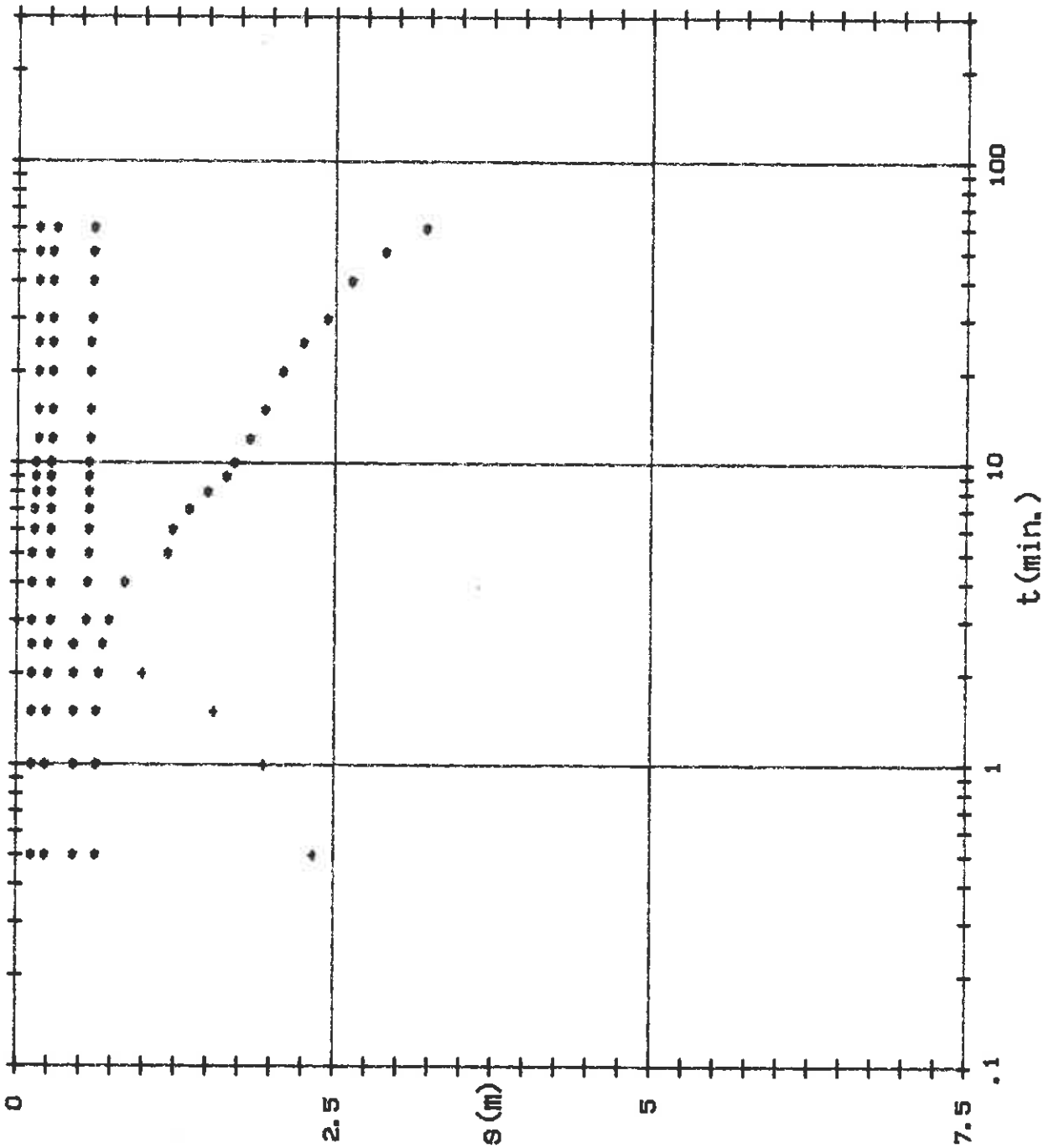
DEELPAN

08 08 1992

B.H. No. 10-77341

$Q_1 = 1 \text{ l/s}$
 $Q_2 = 2.11 \text{ l/s}$
 $Q_3 = 3.95 \text{ l/s}$
 $Q_4 = 7.6 \text{ l/s}$

S.W.L. = 4.83 m



CONSTANT DISCHARGE TEST

+ Drawdown data.
* Recovery data.

DEELPAN

08 10 1992

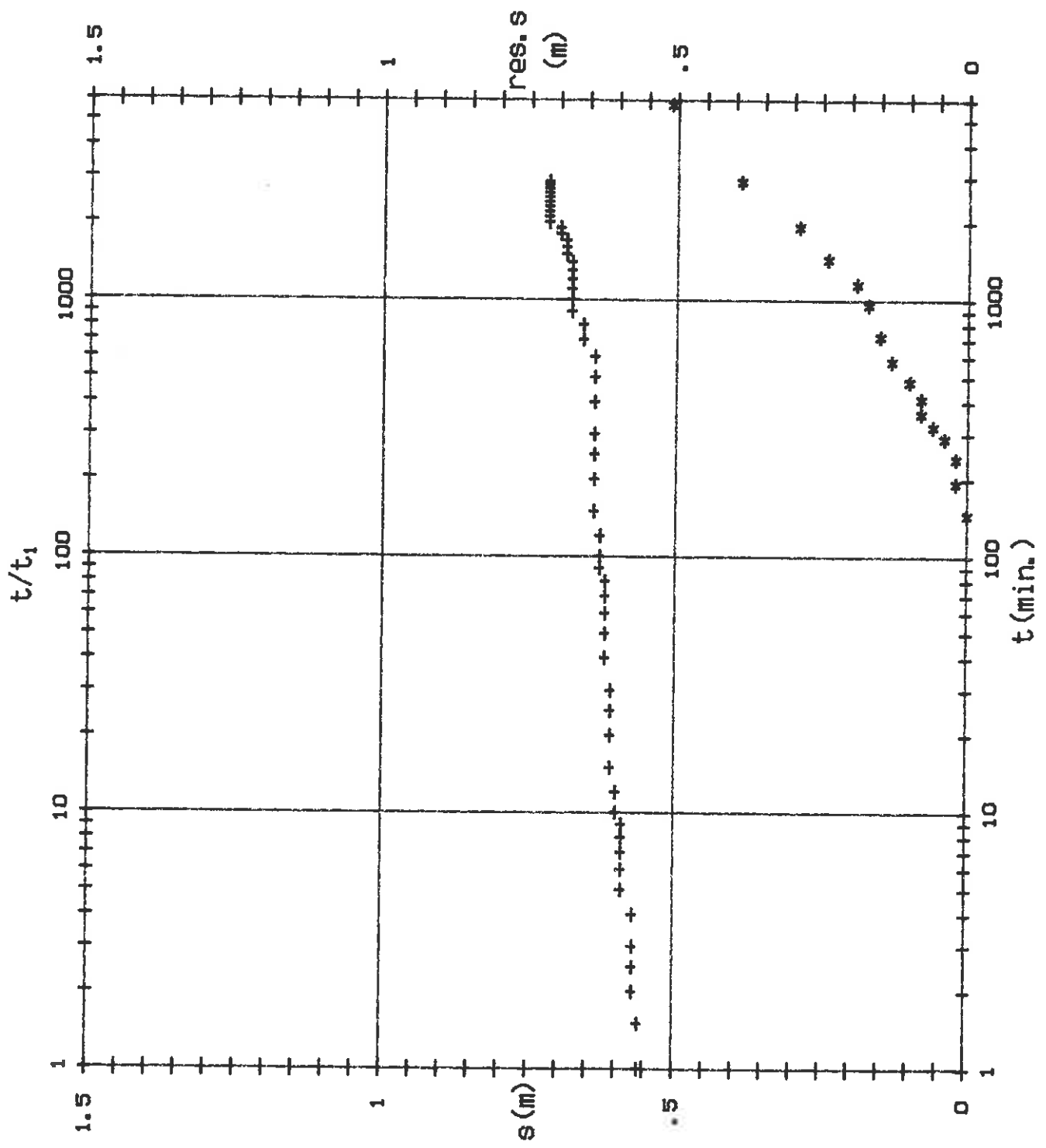
Pumped Borehole
10-77341

Readings on Borehole
10-77341

Q = 4 l/s

S.W.L. = 4.83 m

T = 200 m²/d



DIRETSANE

Including borehole

10-77249- Mateane P/S

of True North (1973.0). Mean annual change:
2' Eastwards (1966-1970).

104 IO
-1386

2625BC

DOORNLAAGTE 123 IO

Doornlaagte

Doornlaagte
1379

KUNANA LOCATION 4 IO

Kopela

1381.9

Gannaagte

Kopela

DIRETSANE

● 10-77249

Geysdorp
28km

GANNALAAGTE 5 IO

123 IO

Nougedacht

Bevingsdorp
8km

Gannaagte

Nougedacht

NOUGEDACHT 127 IO

Nougedacht

Vlakte

Vlakte

Vlakte

TABLE
TAFEL
FEET
VOET

12 000
11 000
10 000
9 000
8 000
7 000
6 000
5 000
4 000
3 000
2 000
1 000

+ 292X

25'

+ 293X

1361

1356

1387

1386

1361

0840

1380

1376

1370

1376

1364

1365

1362

1359

1358

REINZONTPA

WIJAN 120 IO

VLAKPLAAS 128 IO

VLAKPLAAS 129 IO

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

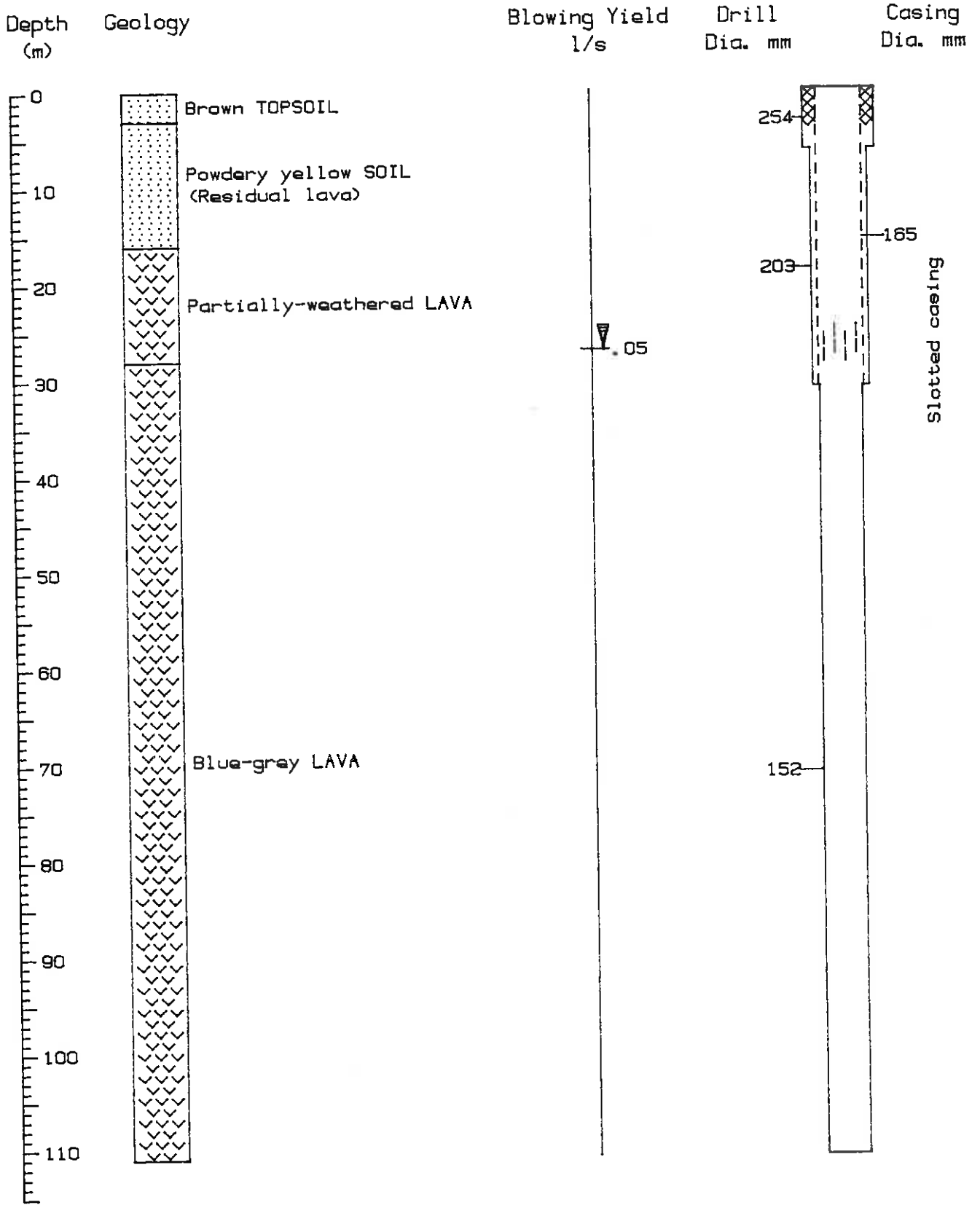
LOCALITY: MATEANE P/S (KOPELA)

BH. No. 10-77249

Geoph. Peg No. BDWA

Coordinates +2925825X -50975Y

Elev. (m) 1375



End of Hole 111

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

DIRETSANE

MATEANE P/S

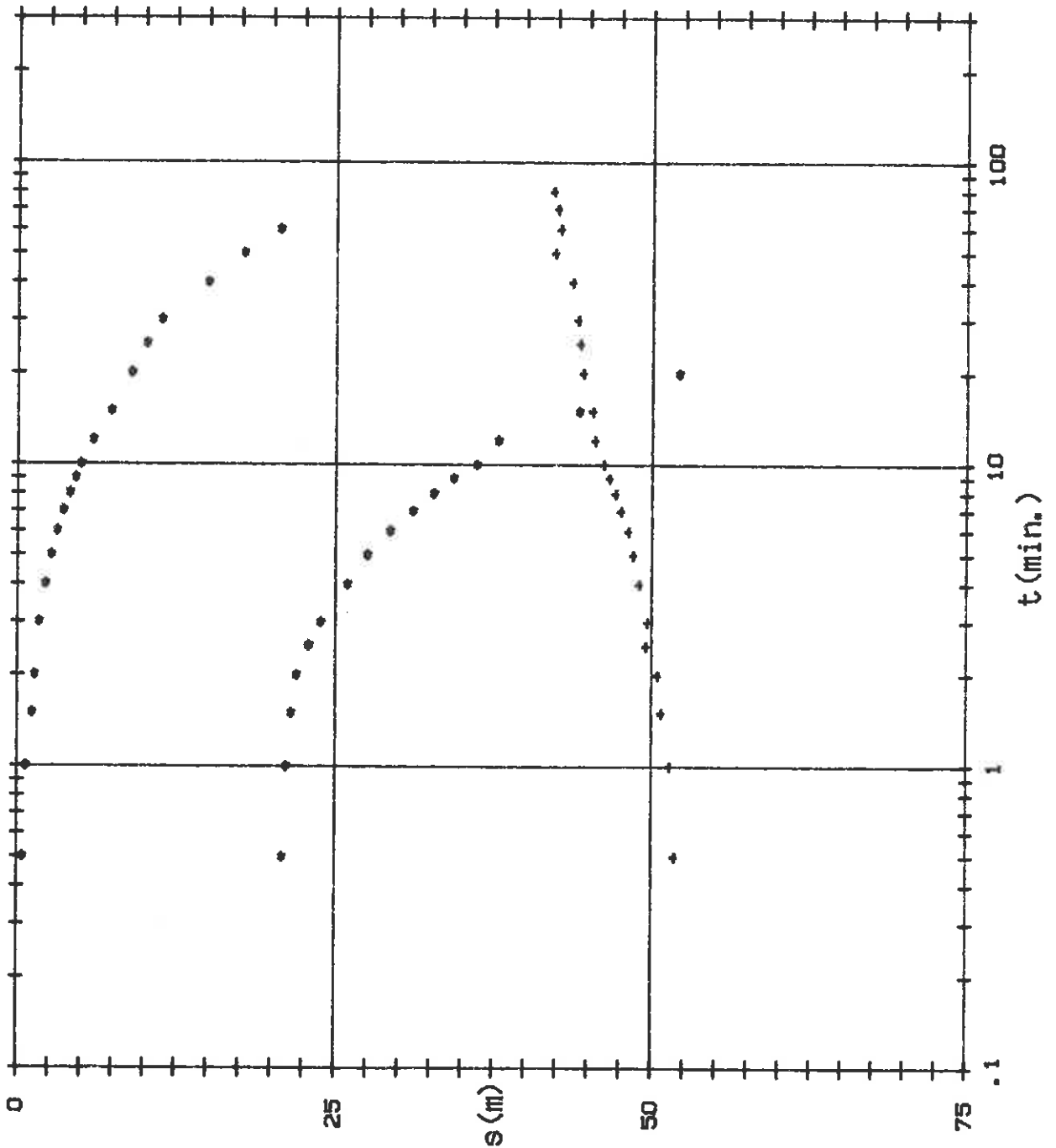
15 07 1992

B.H. No. 10-77249

$Q_1 = .23 \text{ l/s}$

$Q_2 = .6 \text{ l/s}$

S.W.L. = 10.7 m



DOORNLAAGTE

Including boreholes

10-77294

10-77307 - Kelebogile P/S

2' Eastwards 1966-1970

1386

2625BC

DOORNLAAGTE 123 IO

10-77307
Doornlaagte
1379

10-77294

DOORNLAAGTE

KUNANA LOCATION 4 IO

Kopela

13619

Gannaagte

Kopela

123 IO

Geysdorp
28km

Kopela

GANNALAAGTE IO

Nooragedacht

Bathshevan
18km

Gannaagte

Nooragedacht

NOORGEDACHT 127 IO

1362

Vlakteas

Nooragedacht

Vlakteas

Vlakteas

Vlakteas

Vlakteas

Vlakteas

Vlakteas

Vlakteas

Vlakteas

TABLE
IAFEL
FEET
VOET
12 000
11 000
10 000
9 000
8 000
7 000
6 000
5 000
4 000
3 000
2 000
1 000

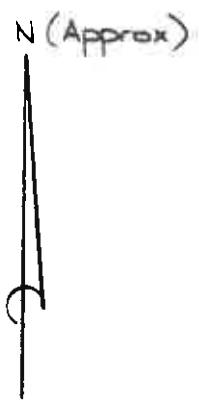
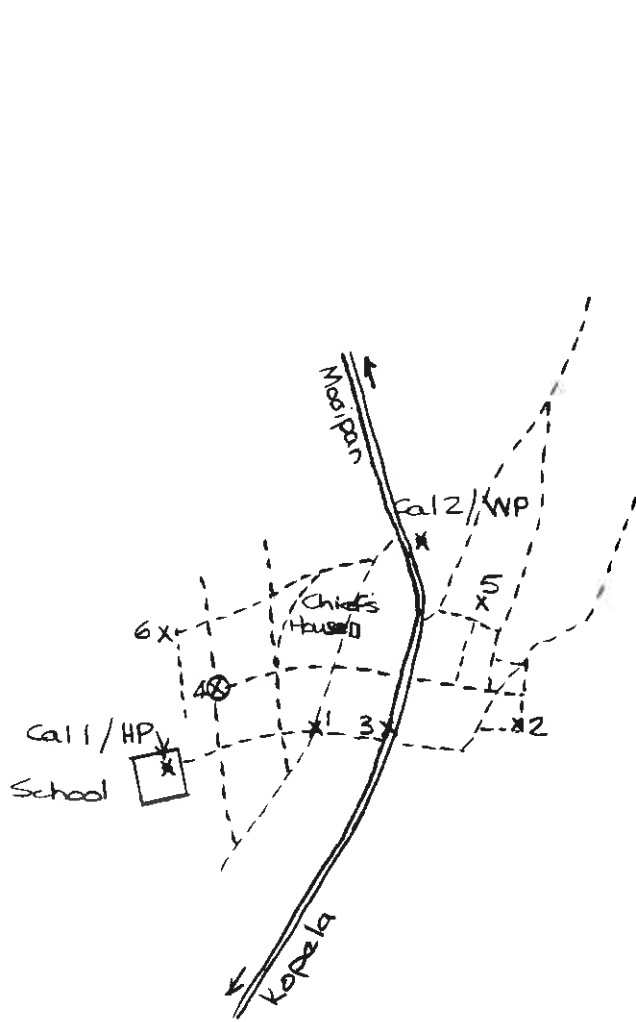
1 292X

25'

293X

145

1354



Locality Plan of Doornlaagte
 Overlay to Photo No III (strip 13)
 Approx Scale 1:15 000

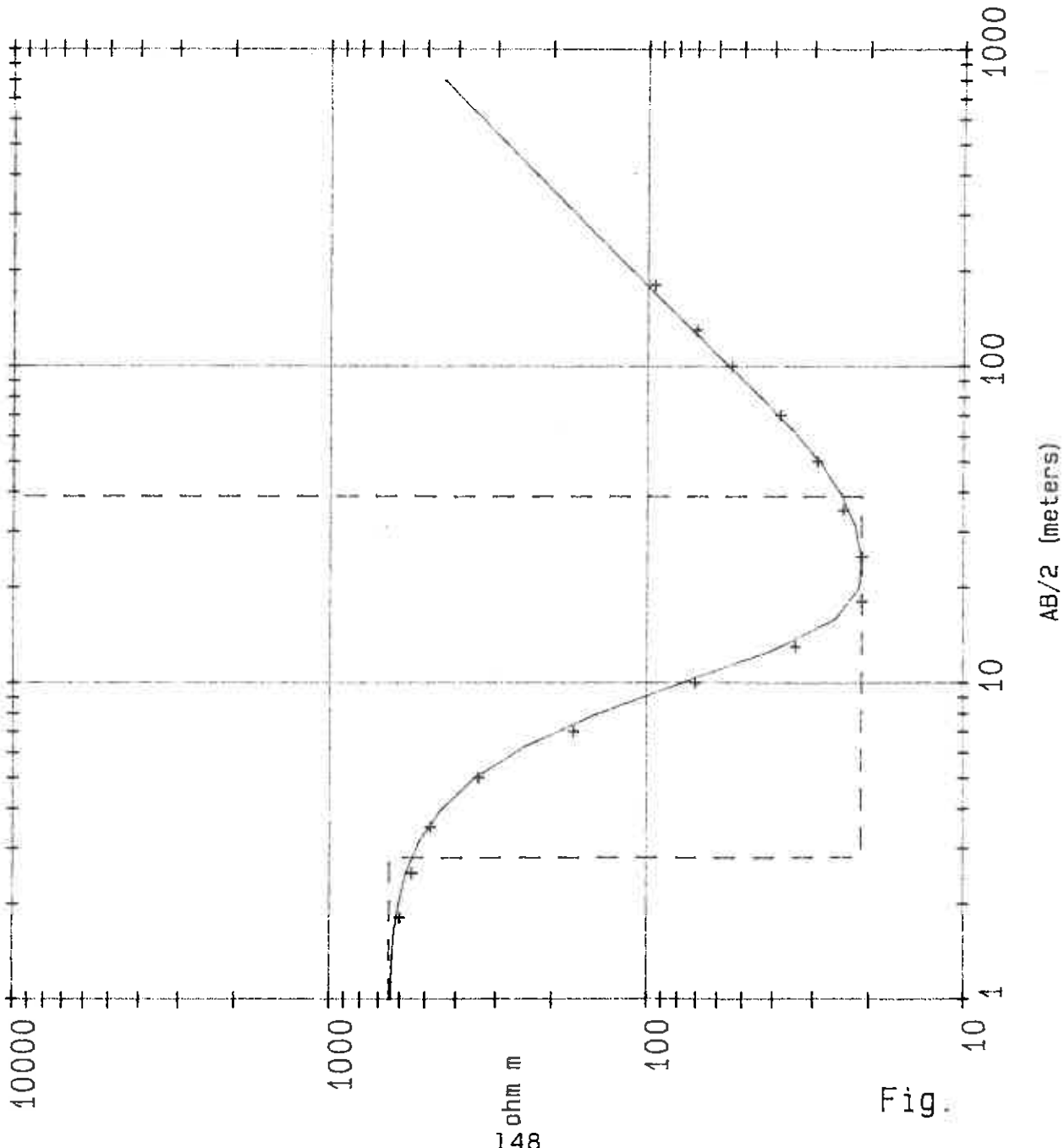


Fig.

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

LOCALITY: DOORNLAAGTE

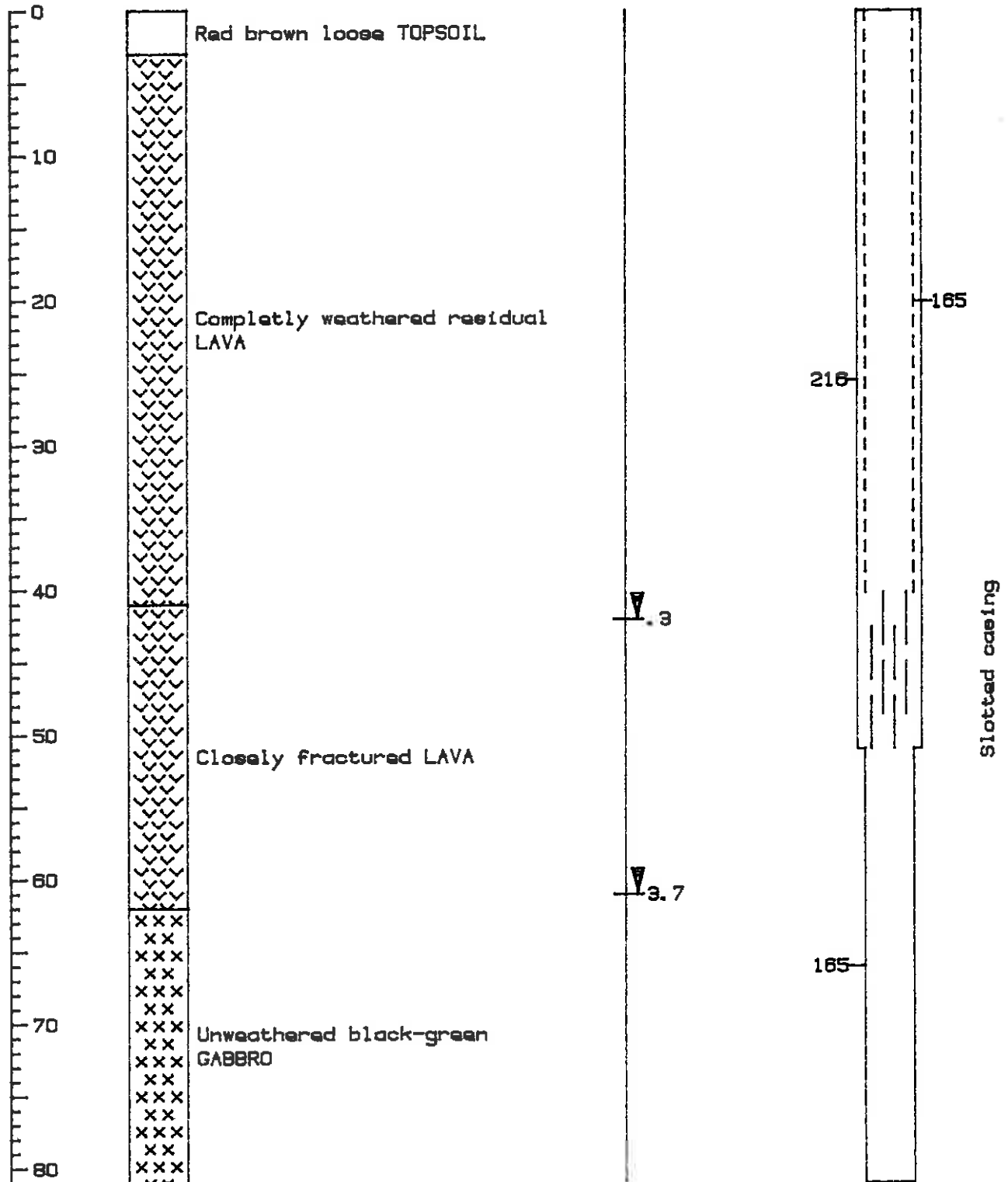
BH. No. 10-77294

Geoph. Peg No. 04

Coordinates +2921600X -53150Y

Elev. (m) 1375

Depth (m)	Geology	Blowing Yield l/e	Drill Dia. mm	Casing Dia. mm
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End of Hole 81

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

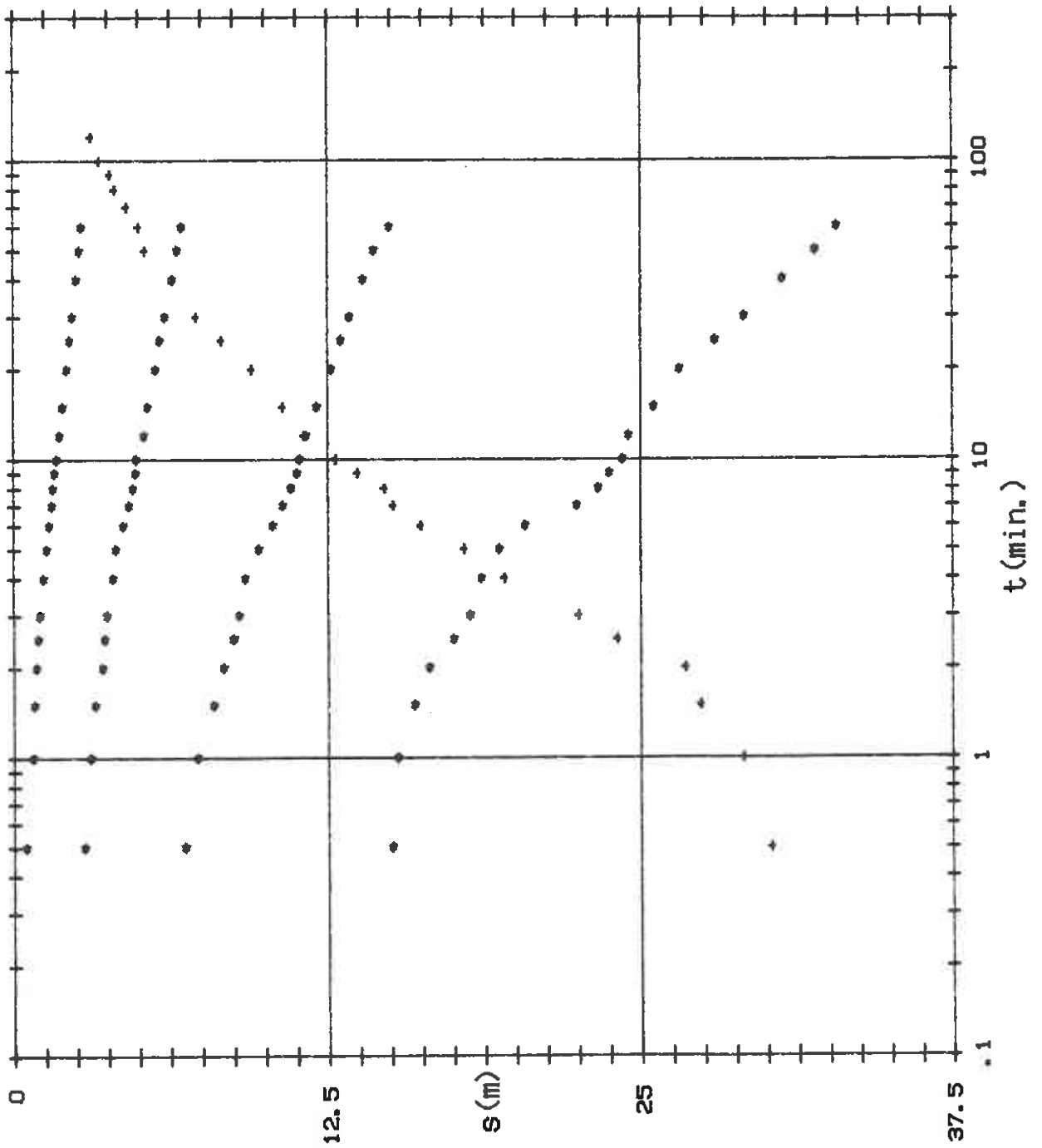
DOORNLAAGTE

19 07 1992

B.H. No. 10-77294

- $Q_1 = .5 \text{ l/s}$
- $Q_2 = 1.17 \text{ l/s}$
- $Q_3 = 2.1 \text{ l/s}$
- $Q_4 = 4 \text{ l/s}$

S.W.L. = 14.36 m



CONSTANT DISCHARGE TEST

- + Drawdown data.
- * Recovery data.

DOORNLAAGTE

20 07 1992

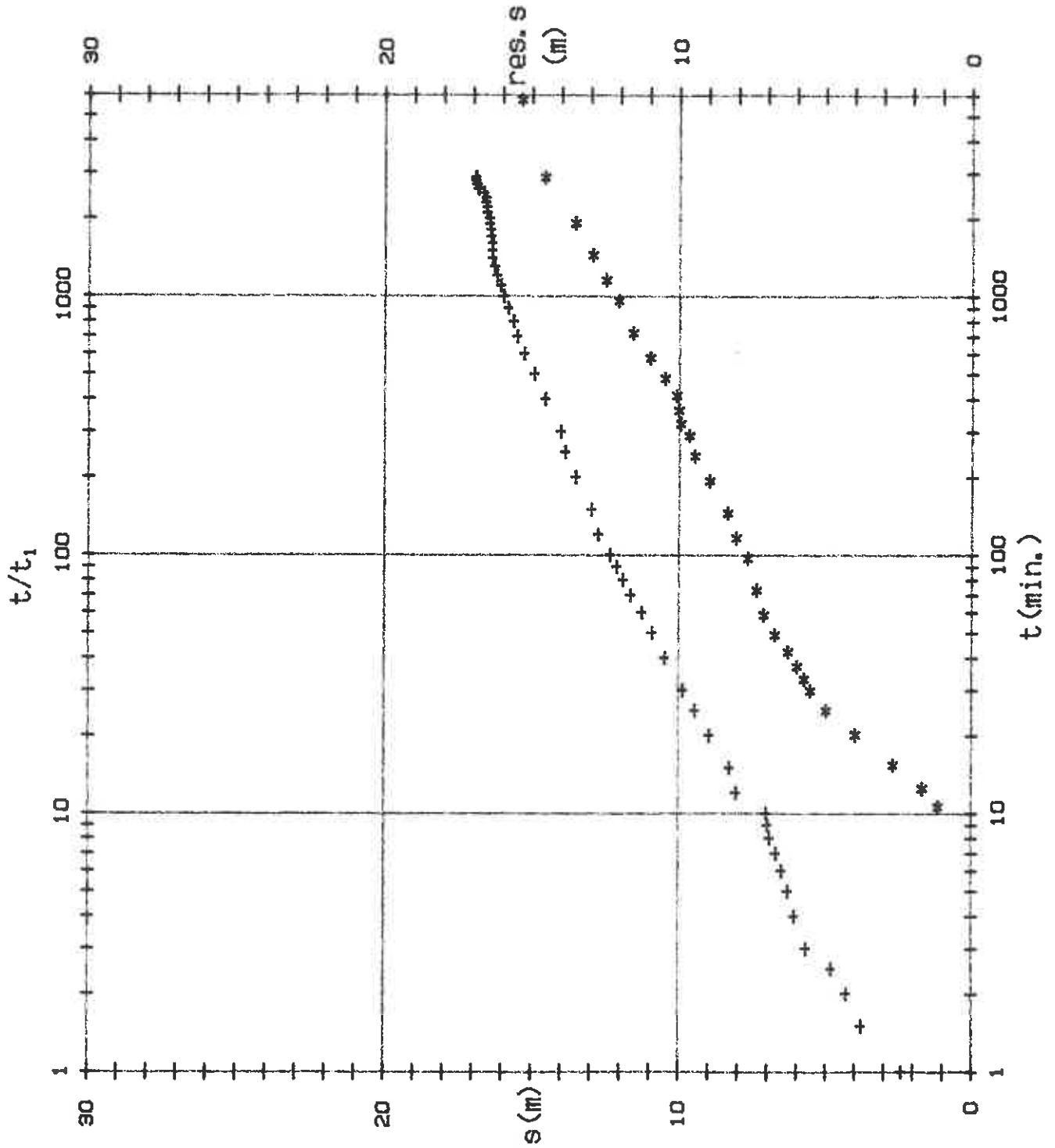
Pumped Borehole
10-77294

Readings on Borehole
10-77294

Q = 2 l/s

S. W. L. = 14.36 m

T = 6 m²/d



STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

DOORNLAAGTE

21 07 1992

B.H. No. 10-77307

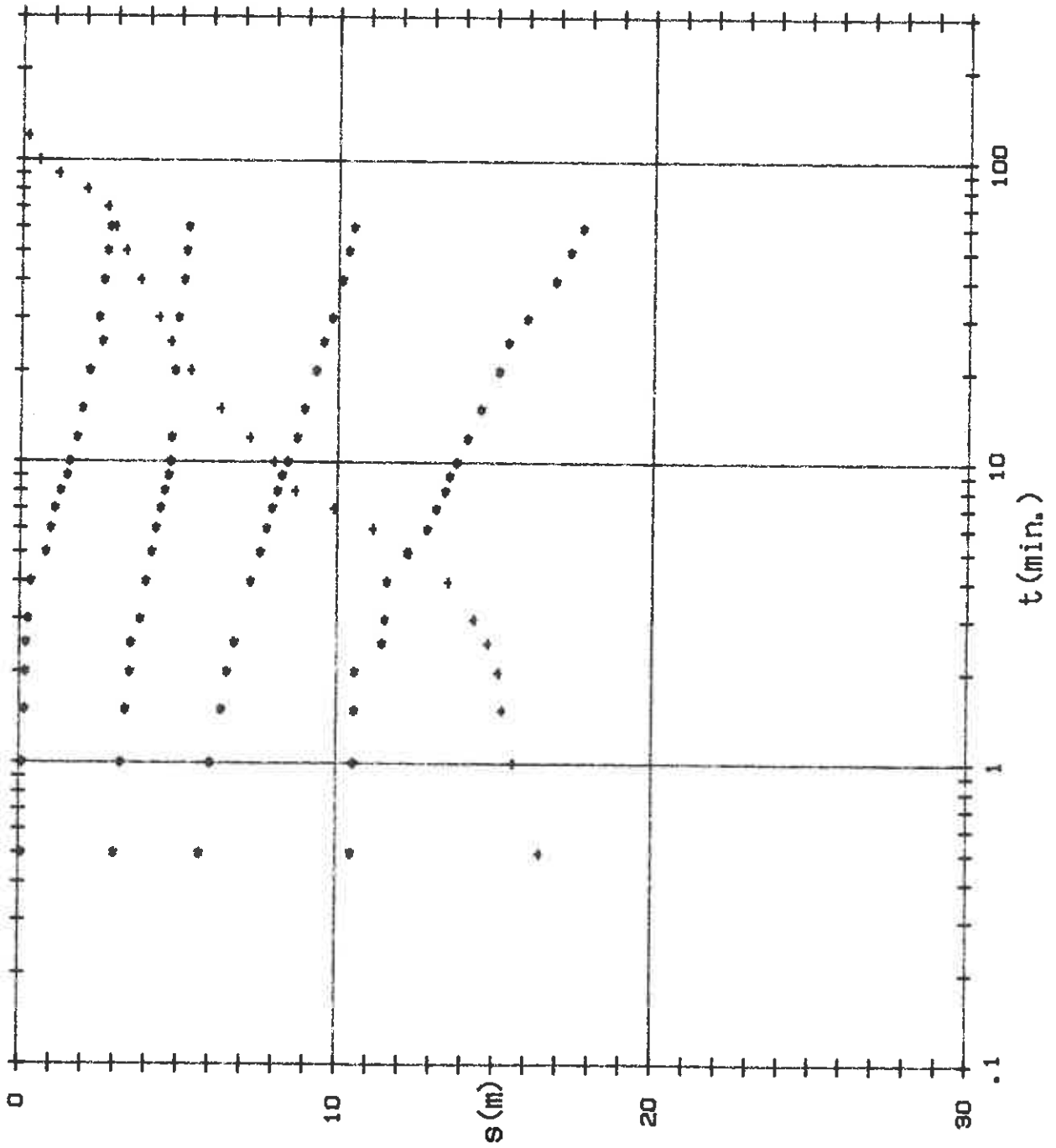
$Q_1 = .26 \text{ l/s}$

$Q_2 = .56 \text{ l/s}$

$Q_3 = 1.1 \text{ l/s}$

$Q_4 = 2.1 \text{ l/s}$

S.W.L. = 13.36 m



CONSTANT DISCHARGE TEST

- + Drawdown data.
- * Recovery data.

DOORNLAAGTE

21.07 1992

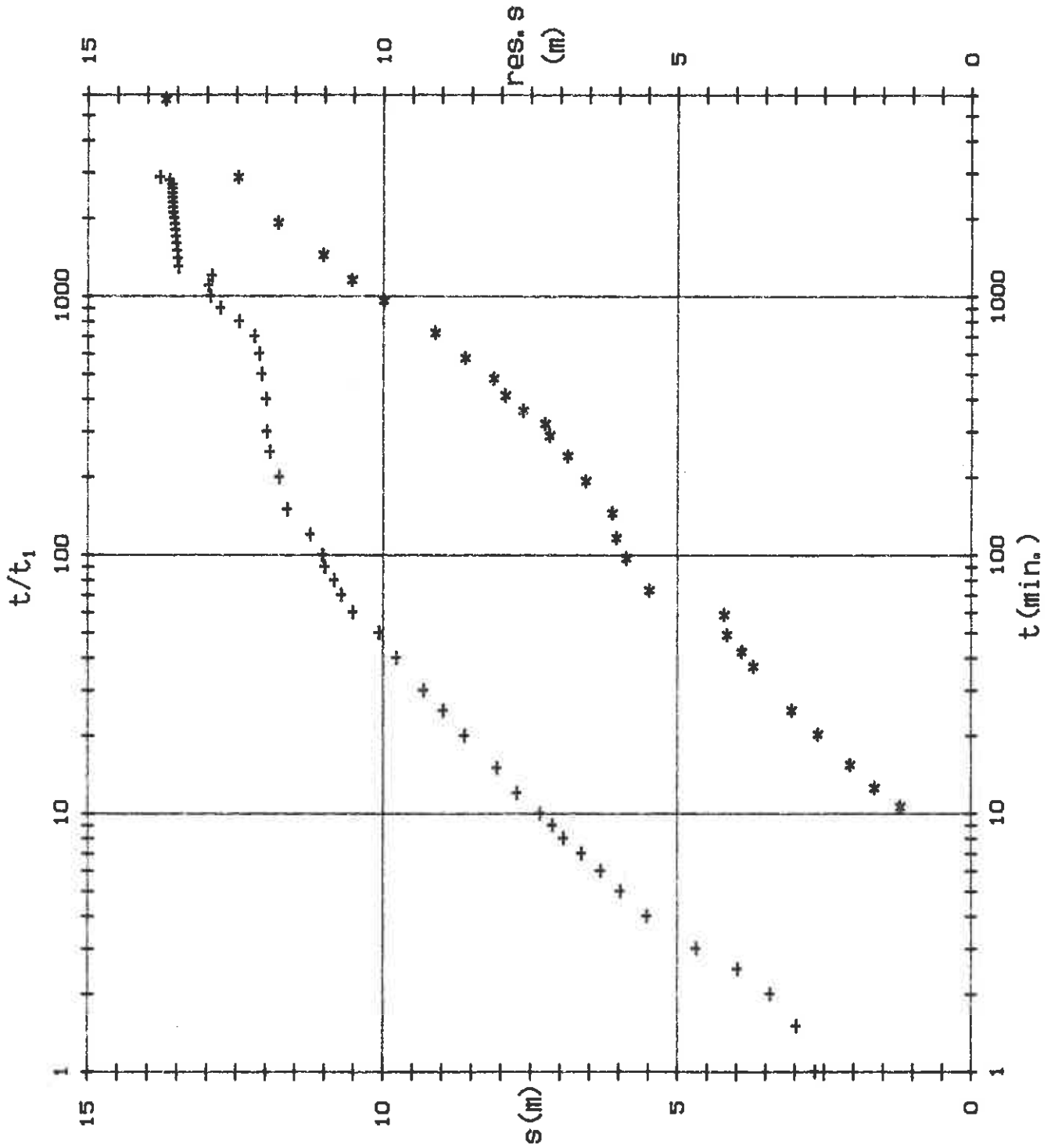
Pumped Borehole
10-77307

Readings on Borehole
10-77307

Q = 1 l/s

S.W.L. = 13.36 m

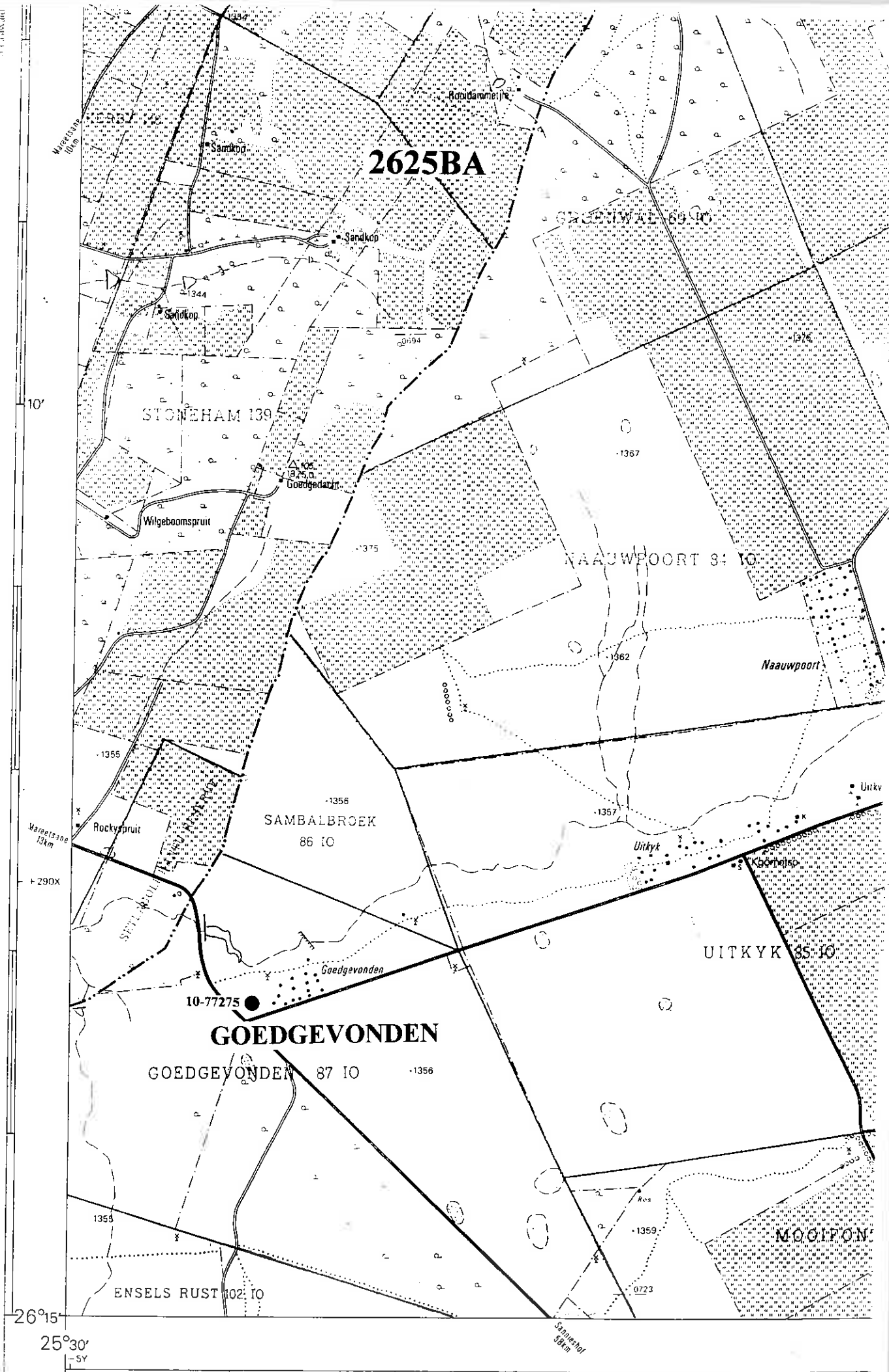
T = 3 m²/d



GEODGEVONDEN

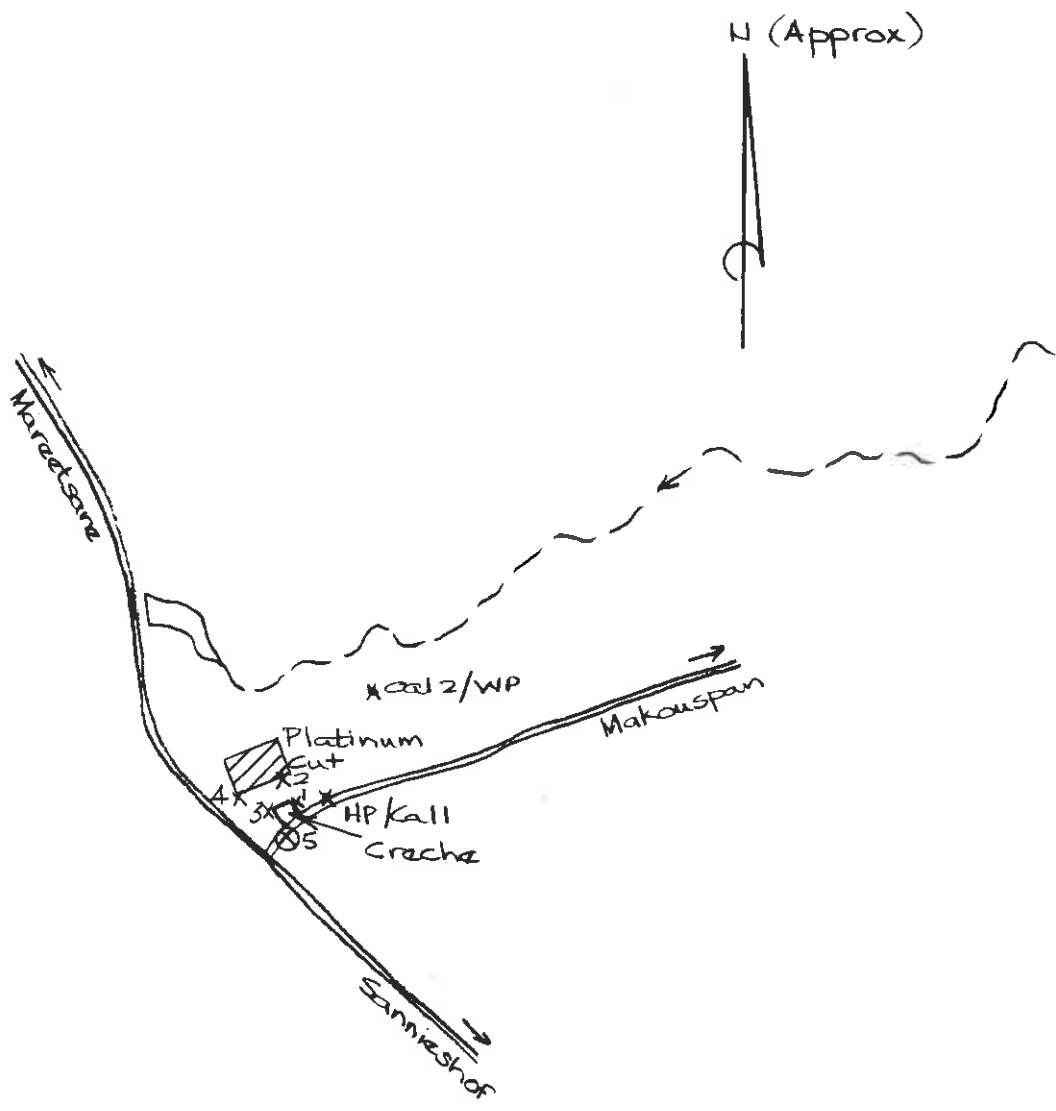
Including boreholes

10-77275 - Pre-School



CONVERSION TABLE
OMSETTINGSTAFEL

METRES METER	FEET VOET
0	0
500	1500
1000	3000
1500	4500
2000	6000
2500	7500
3000	9000
3500	10500
	11000
	11500
	12000



Locality Plan of Goedgevonden (creche)
 Overlay to Photo No 751 (strip 15)
 Approx Scale 1:30 000

+ Field data
 — Computer model
 - - - d - r model

GOEDGEVONDEN PRE-SCHOOL

V.E.S. 05

CO-ORDINATES
 +2901225X -51855Y

GEOLOGY
 LAVA

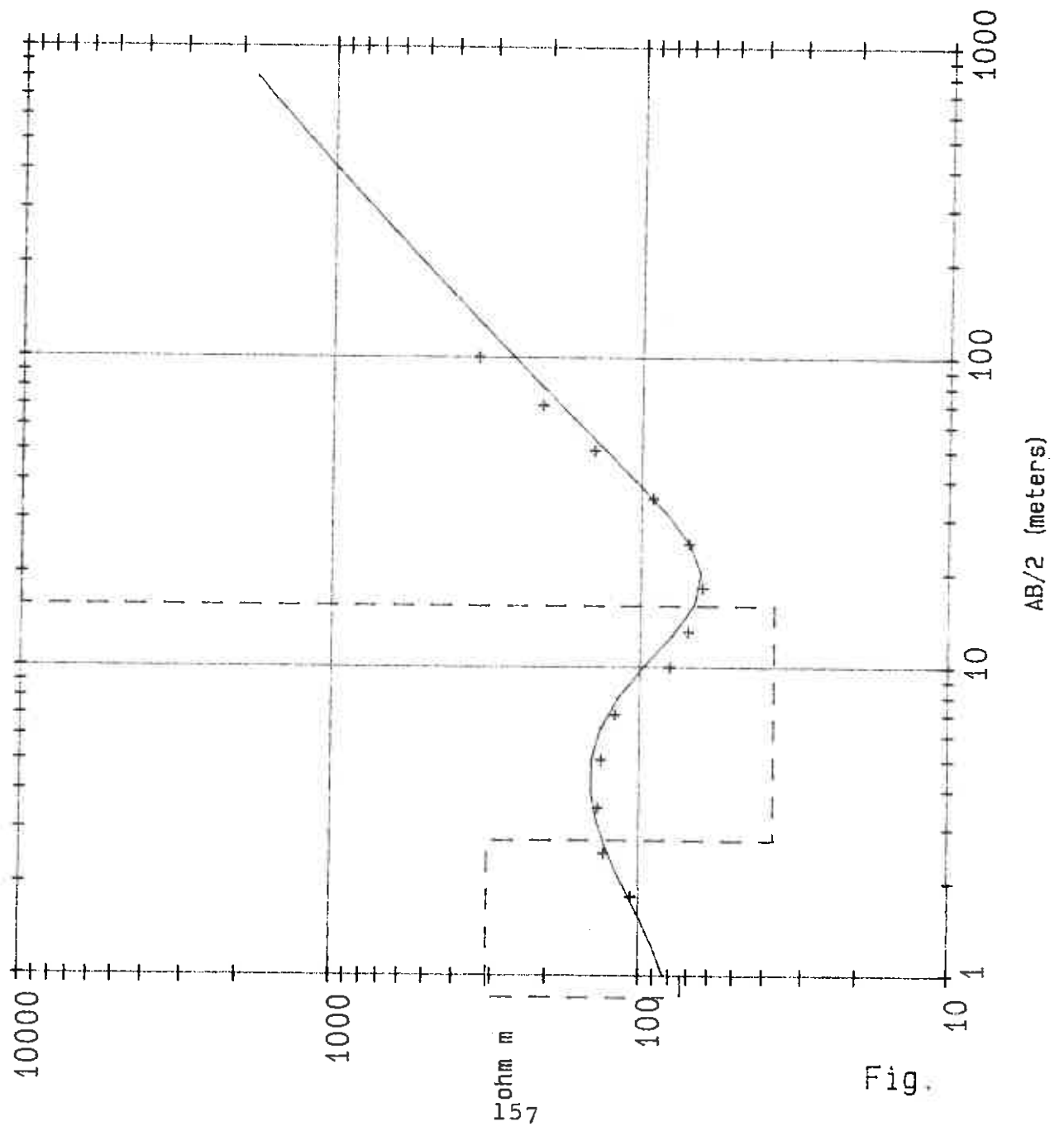


Fig.

BOREHOLE LOG

Page 1 of 1

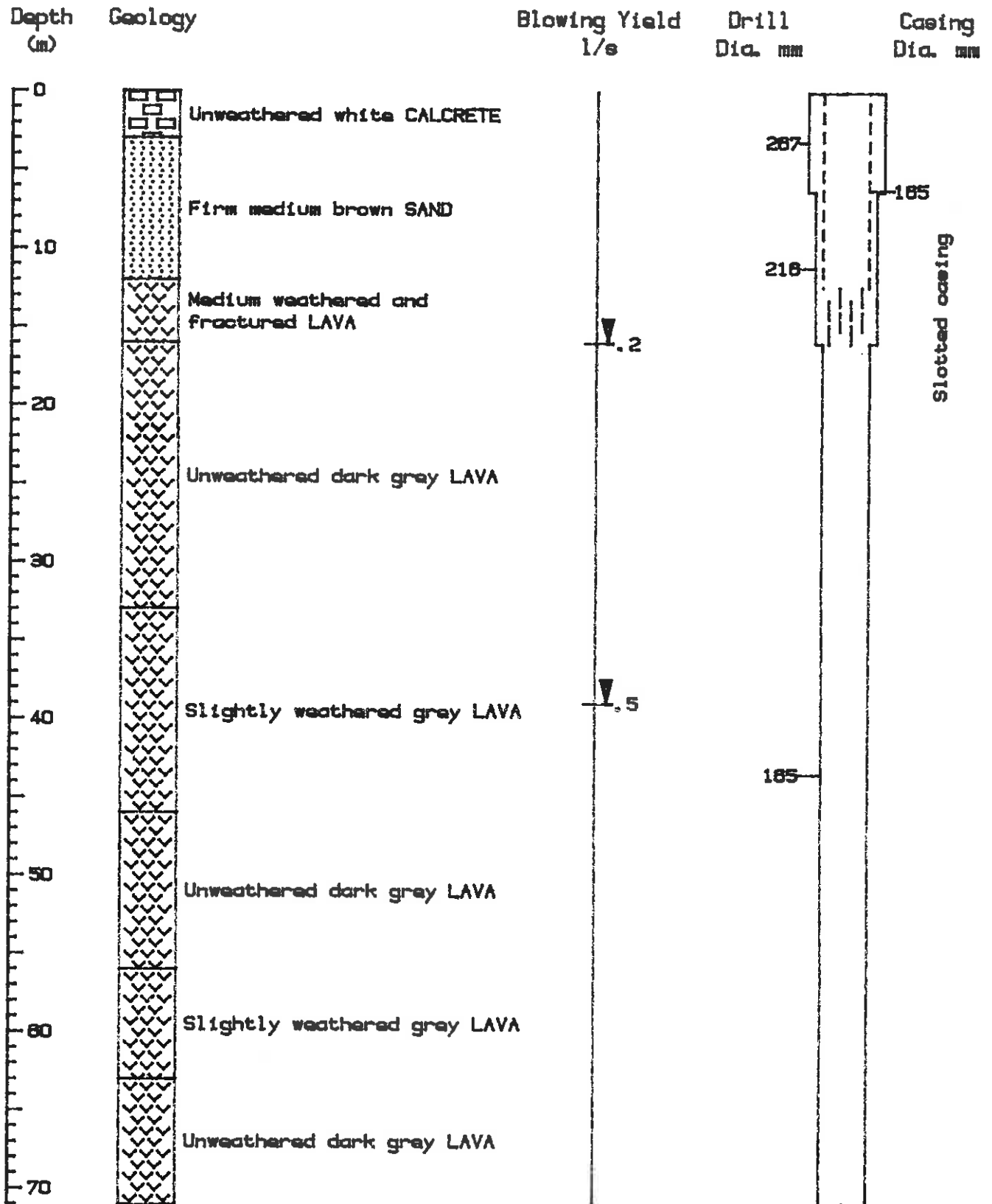
DISTRICT: DITSOBOTLA

LOCALITY: GOEDGEVONDEN PRE/SCHOOL BH. No. 10-77275

Geoph. Peg No. 05

Coordinates +2901225X -51850Y

Elev. (m) 1357



End of Hole 71

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

GOEDGEVONDEN

GOEDGEVONDEN PRE-SCHOOL

25 04 1992

B.H. No. 10-77275

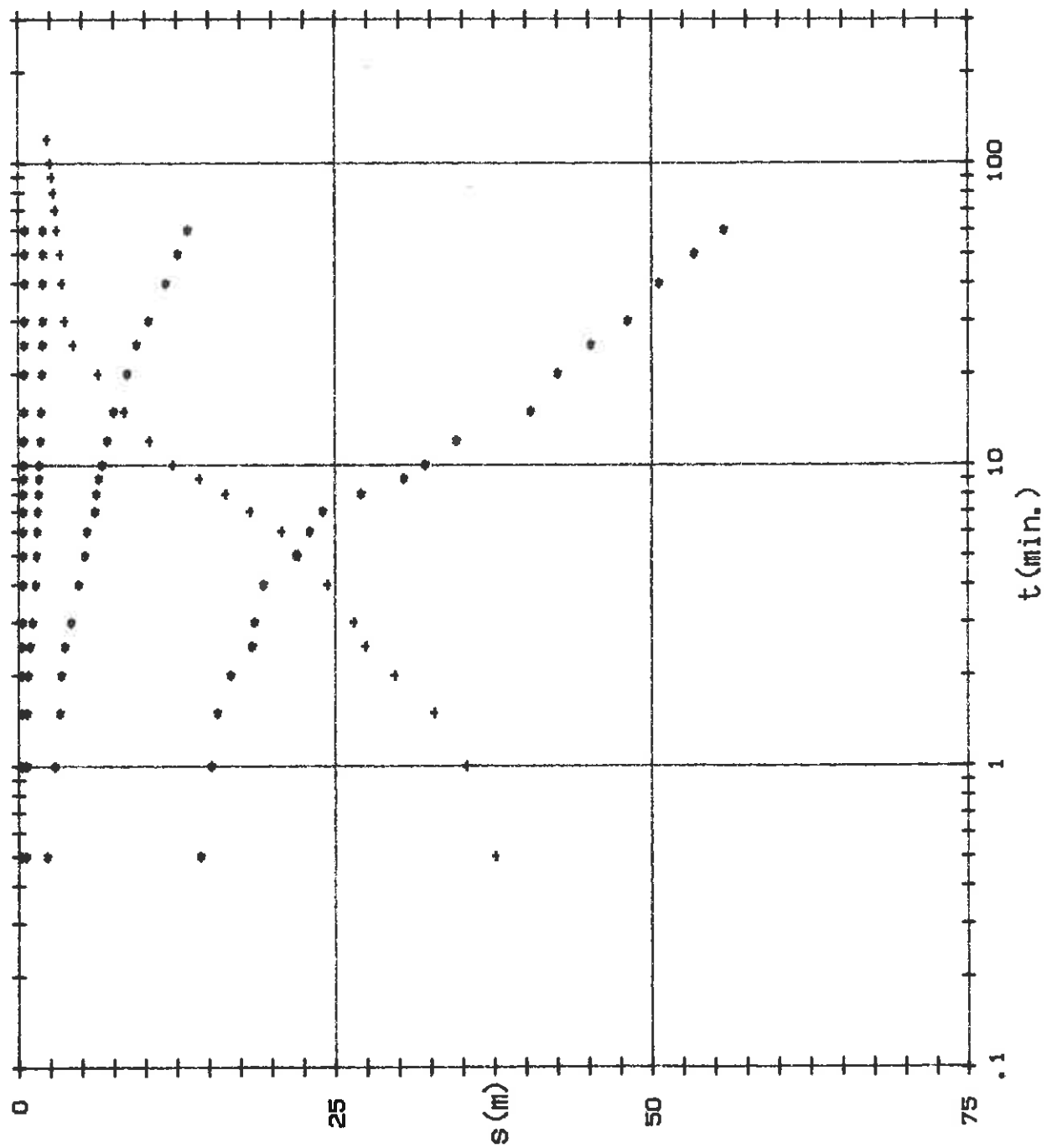
$Q_1 = .14 \text{ l/s}$

$Q_2 = .34 \text{ l/s}$

$Q_3 = .7 \text{ l/s}$

$Q_4 = 1.2 \text{ l/s}$

S.W.L. = 7.7 m



CONSTANT DISCHARGE TEST

- + Drawdown data.
- * Recovery data.

GOEDGEVONDEN

GOEDGEVONDEN PRE-SCHOOL

26 04 1992

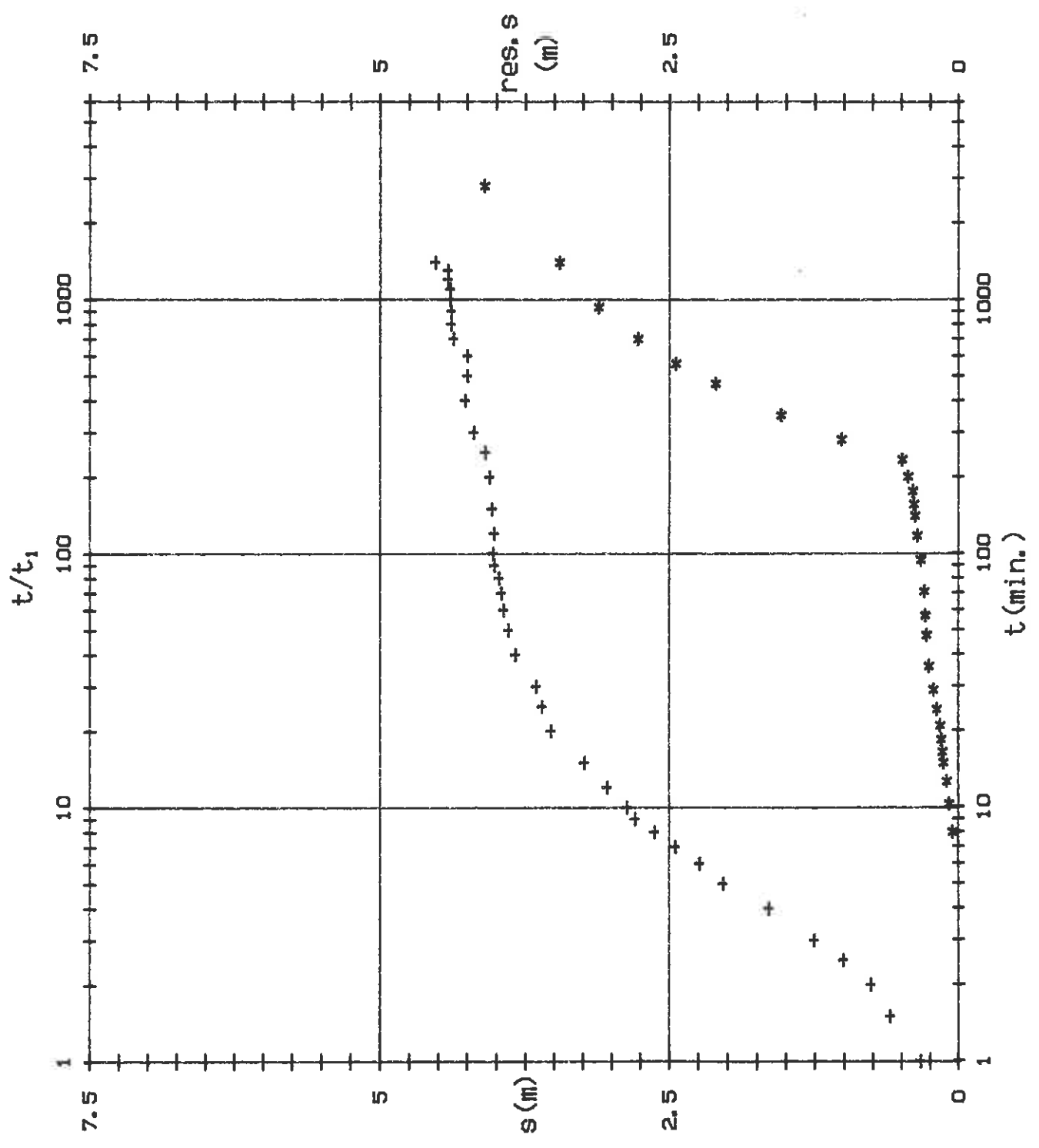
Pumped Borehole
10-77275

Readings on Borehole
10-77275

$Q = 0.5 \text{ l/s}$

S.W.L. = 7.7 m

$T = 3 \text{ m}^2/\text{d}$



KAALPAN

Including boreholes

10-77298
10-77300

2625BA

VLAKPAN 7E IO

Driehaek

1391

1405

Vlakpan

1405

KAPSTEEL 8 IO

1388

1383

1403

KAALPAN 82 IO

125
1401.3

Bloedzuigerspan

Kaalpan

Kaalpan

1394

1384

Gelukspan

KAALPAN

Gelukspan

10-77300

10-77298

1393

BLOEDZUIGERSPAN 91 IO

Bloedzuigerspan

1382

BROOKSBY 90 IO

Rietkolk 99 IO

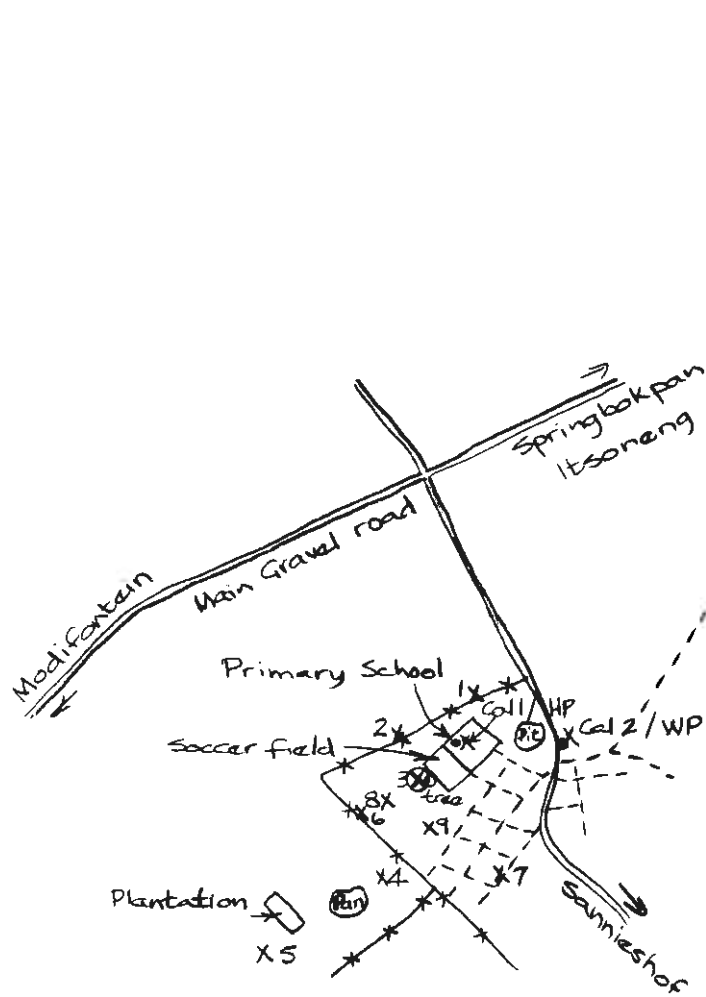
Bloedzuigerspan

0725

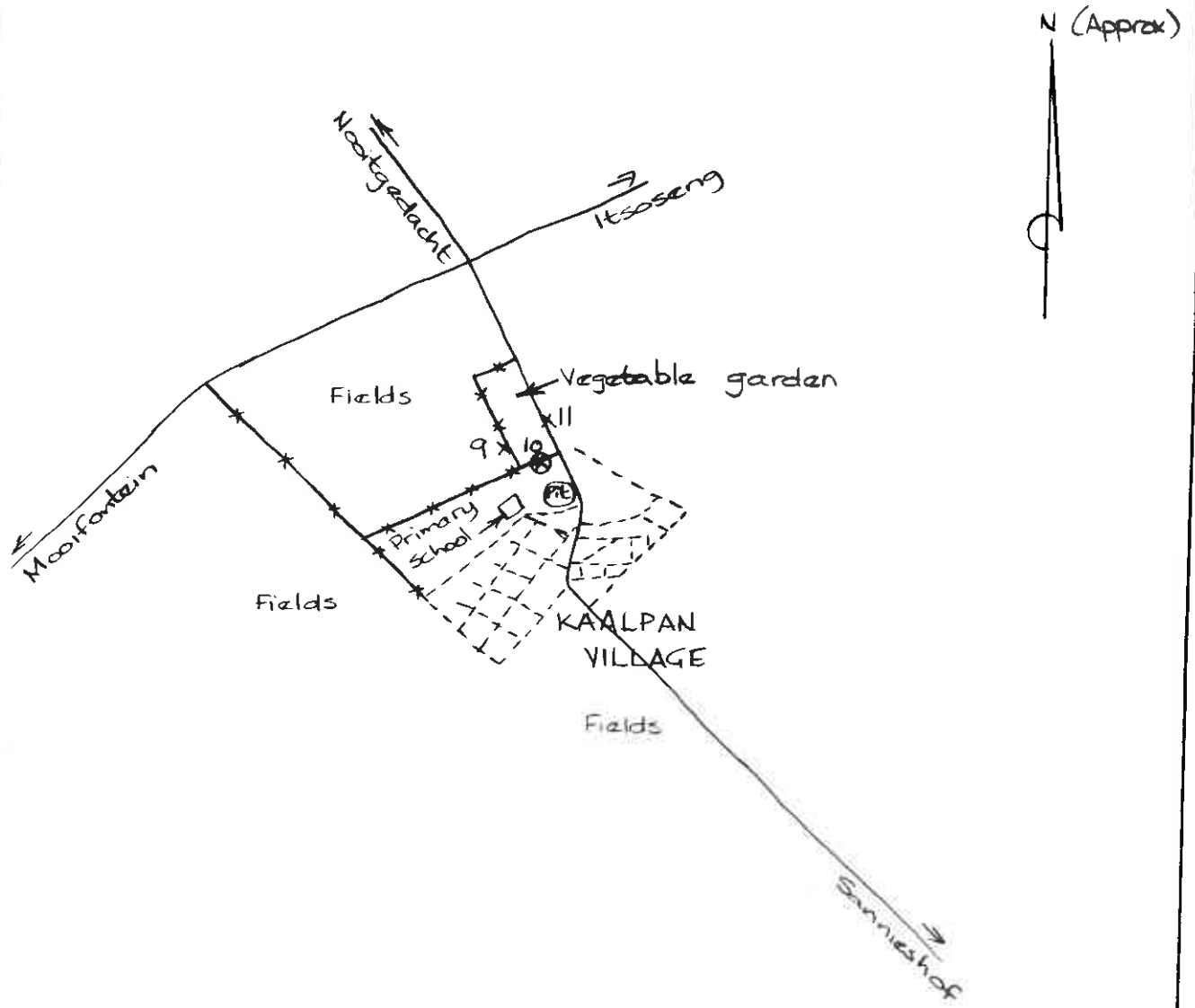
Rietkolk

Rietkolk
0726

Bloedzuigerspan



Locality Plan of Kaalpan
 Overlay to Photo No 723 (strip 15)
 Approx Scale 1:30 000



Locality Plan of Kaalpan Vegetable Garden
 Overlay to Photo No 723 (strip 15)
 Approx Scale 1:30 000

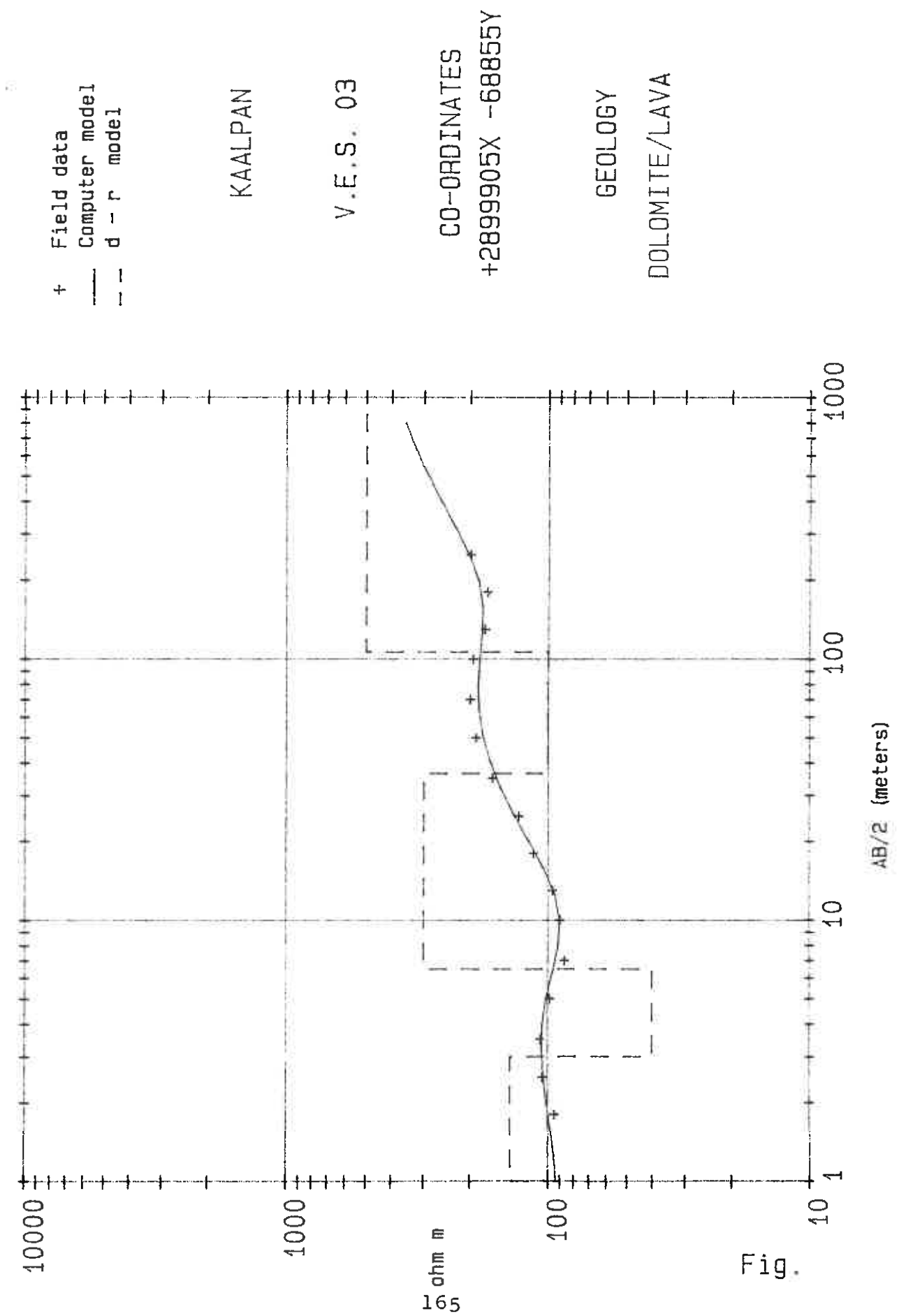


Fig.

BOREHOLE LOG

DISTRICT: DITSOBOTLA

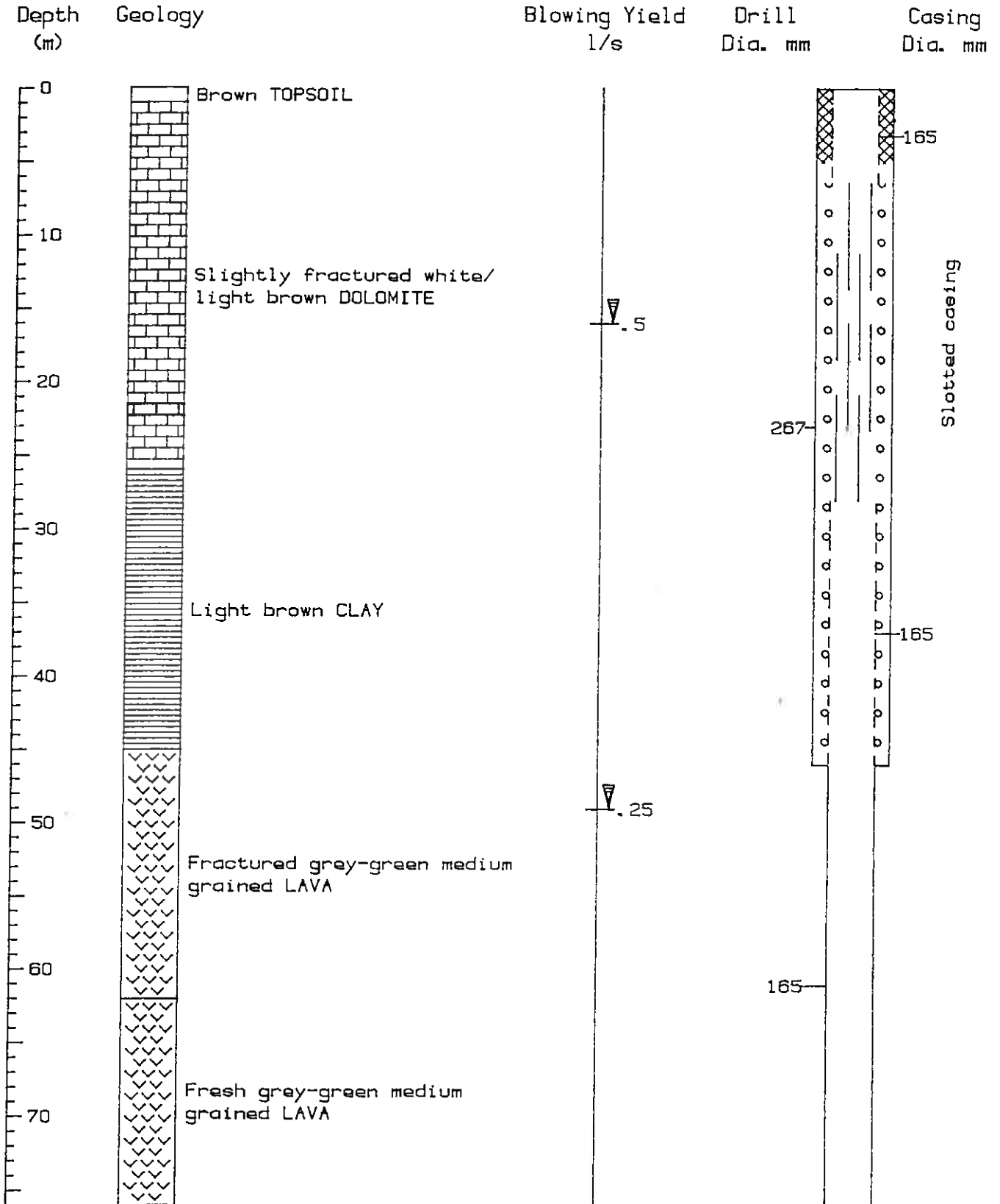
LOCALITY: KAALPAN

BH. No. 10-77298

Geoph. Peg No. 03

Coordinates +2899905X -068855Y

Elev. (m) 1390



End of Hole 76

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

KAALPAN

28 04 1992

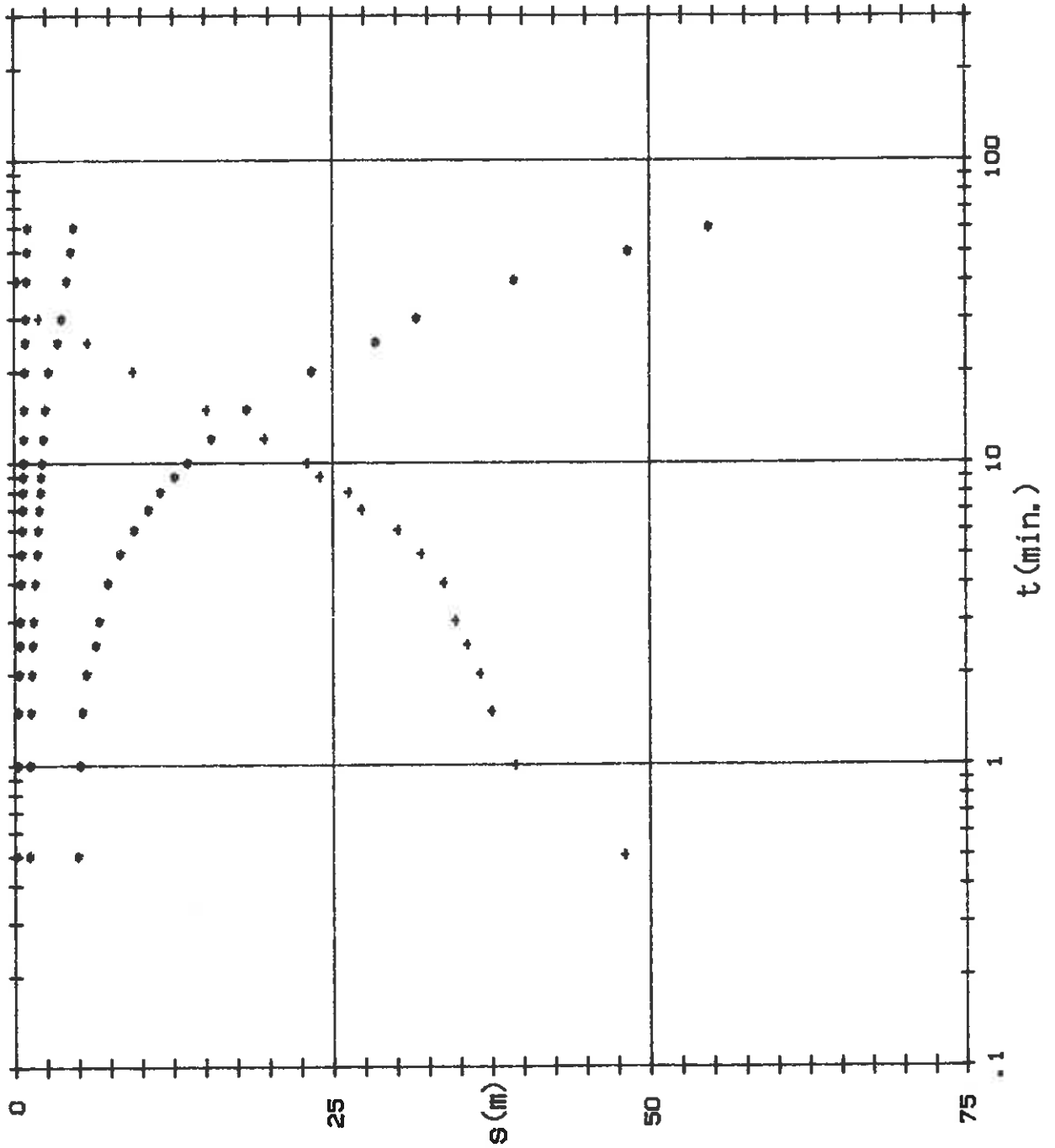
B.H. No. 10-77298

$Q_1 = .2 \text{ l/s}$

$Q_2 = .4 \text{ l/s}$

$Q_3 = .94 \text{ l/s}$

S.W.L. = 5.66 m



CONSTANT DISCHARGE TEST

- + Drawdown data.
- * Recovery data.

KAALPAN

28 04 1992

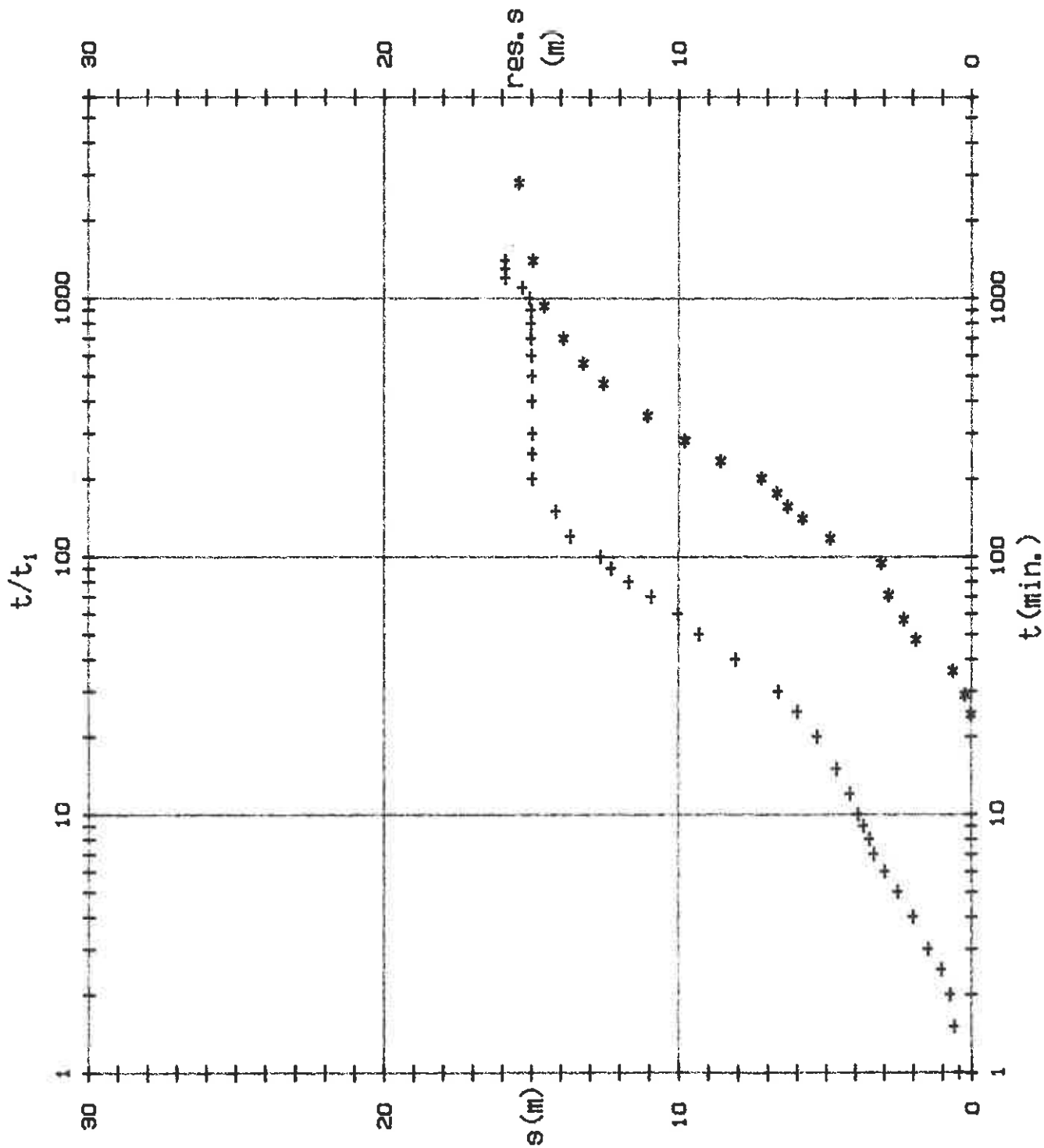
Pumped Borehole
10-77298

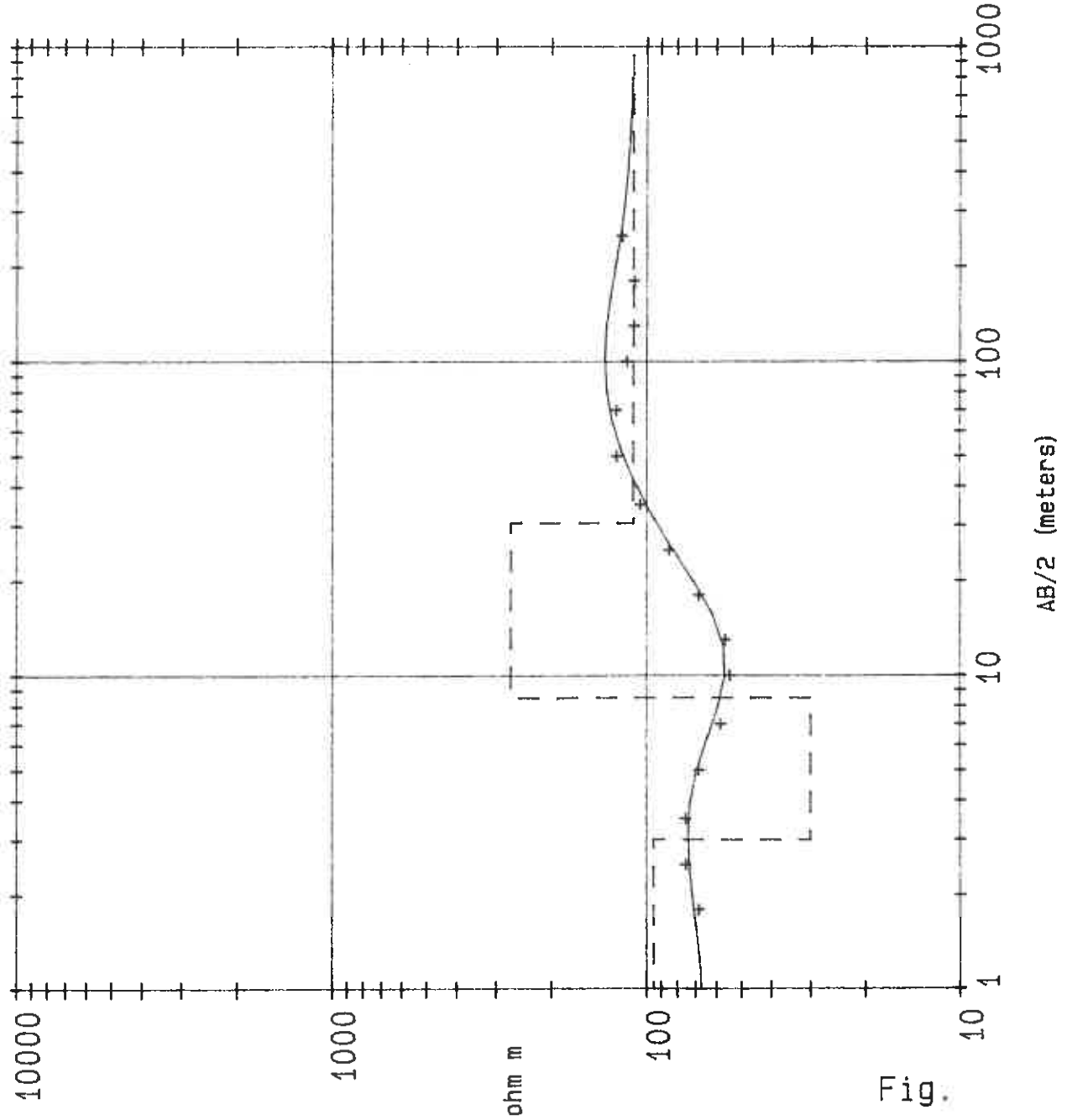
Readings on Borehole
10-77298

Q = .5 l/s

S.W.L. = 5.66 m

T = 1.5 m²/d





+ Field data
 — Computer model
 - - - d - r model

KAALPAN VEG. GARDEN

V.E.S. 10

CO-ORDINATES
 +2899555X -69490Y

GEOLOGY
 DOLOMITE/LAVA

Fig.

BOREHOLE LOG

DISTRICT: DITSOBOTLA

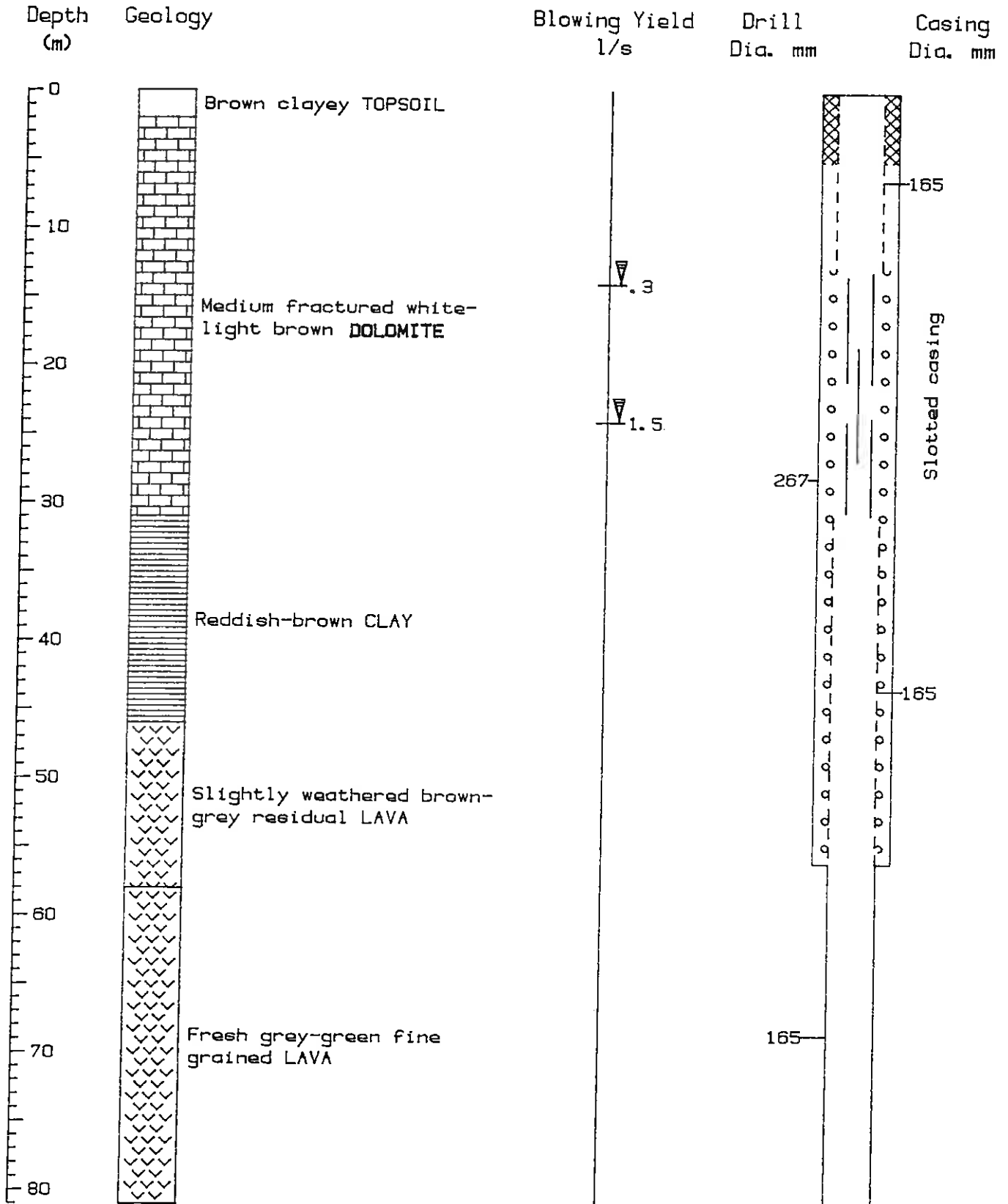
LOCALITY: KAALPAN

BH. No. 10-77300

Geoph. Peg No. 01

Coordinates +2899555X -069490Y

Elev. (m) 1388



End of Hole 81

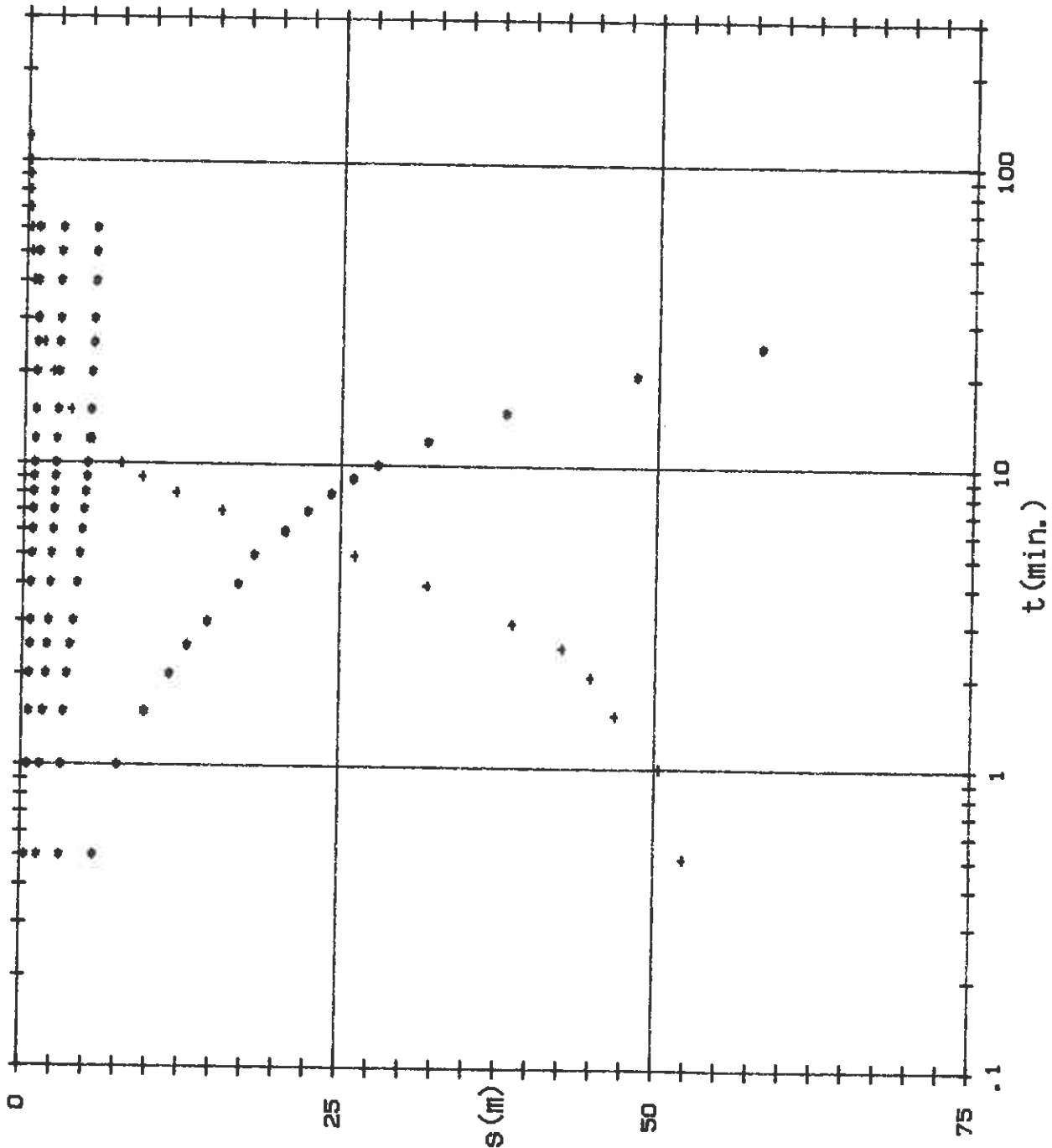
STEP DRAWDOWN TEST

* Pumping data
 + Recovery data

KAALPAN
 VEG. GARDEN
 29 04 1992
 B.H. No. 10-77300

$Q_1 = .16 \text{ l/s}$
 $Q_2 = .45 \text{ l/s}$
 $Q_3 = .89 \text{ l/s}$
 $Q_4 = 3.4 \text{ l/s}$

S.W.L. = 15.44 m



CONSTANT DISCHARGE TEST

- + Drawdown data.
- * Recovery data.

KAALPAN

VEG. GARDEN

29 04 1992

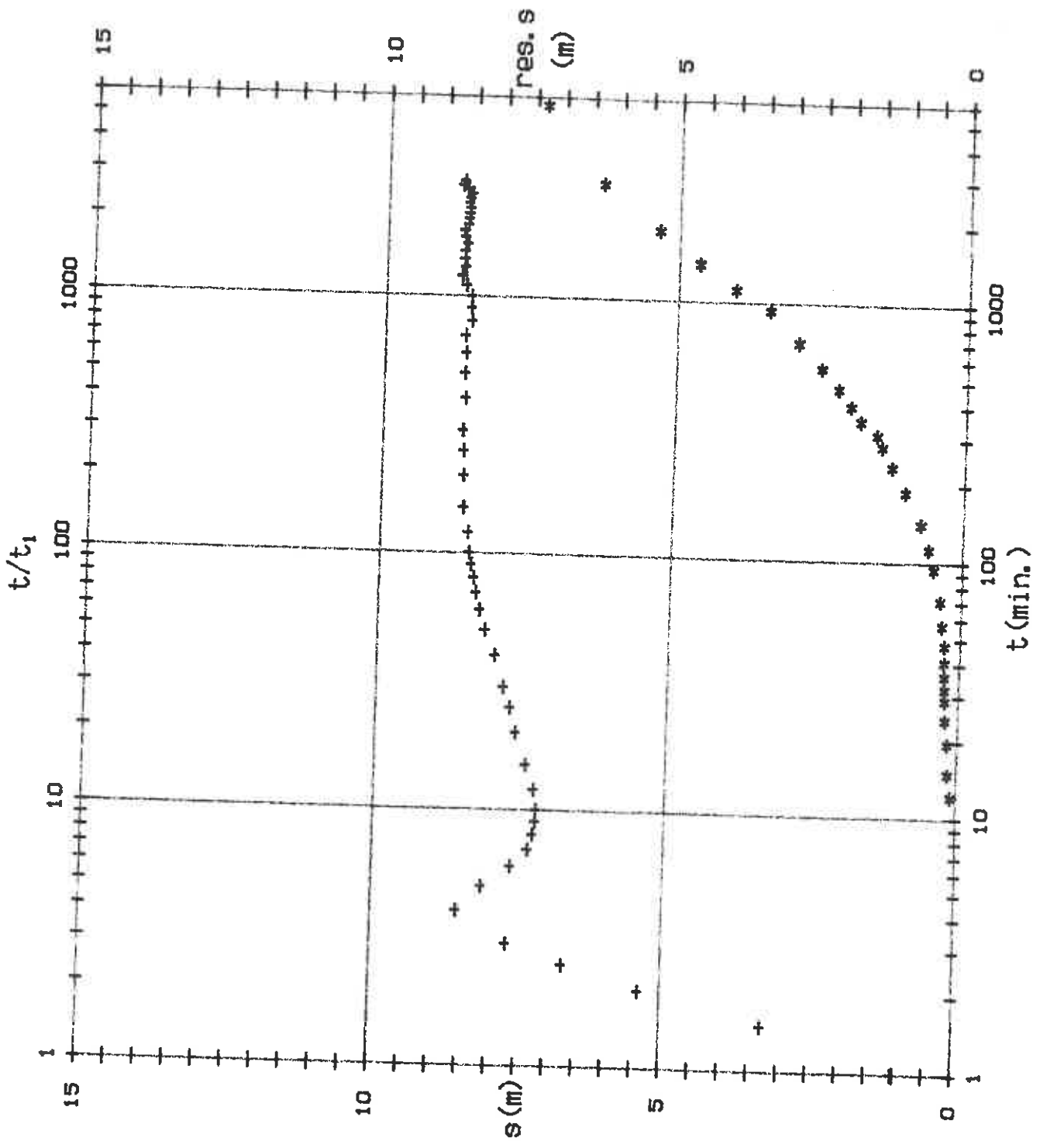
Pumped Borehole
10-77300

Readings on Borehole
10-77300

$Q = 1.2 \text{ l/s}$

S.W.L. = 15.44 m

$T = 4 \text{ m}^2/\text{d}$

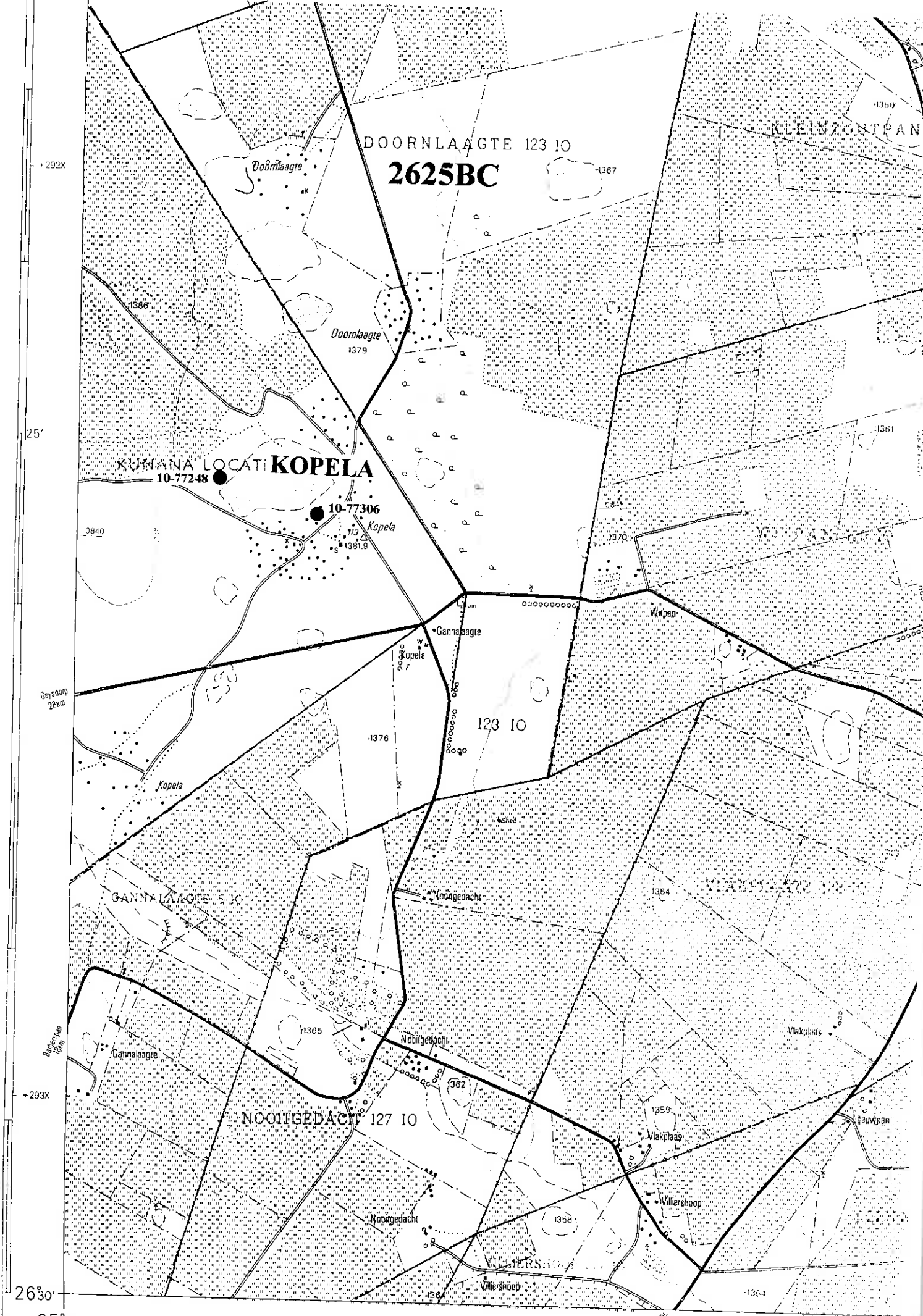


KOPELA

Including boreholes

10-77248 - Noto H/S

10-77306 - Clinic



DOORNLAAGTE 123 IO

2625BC

KLEINZONTPAN

Doornlaagte

Doornlaagte
1379

KUNANA LOCATI **KOPELA**

10-77248

10-77306

Kopela

0840

13819

Gannaagte

Kopela

123 IO

1376

GANNALAAGTE 5 IO

Nooitgedacht

Gannaagte

NOOITGEDACHT 127 IO

Nooitgedacht

1362

Nooitgedacht

VLIERSHOOP

Vliershoop

Vliershoop

Vlakplaas

Vlakpluis

EBURPAN

292X

25'

Geydorp
28km

Breda
18km

293X

2630'

2530'

-5Y

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

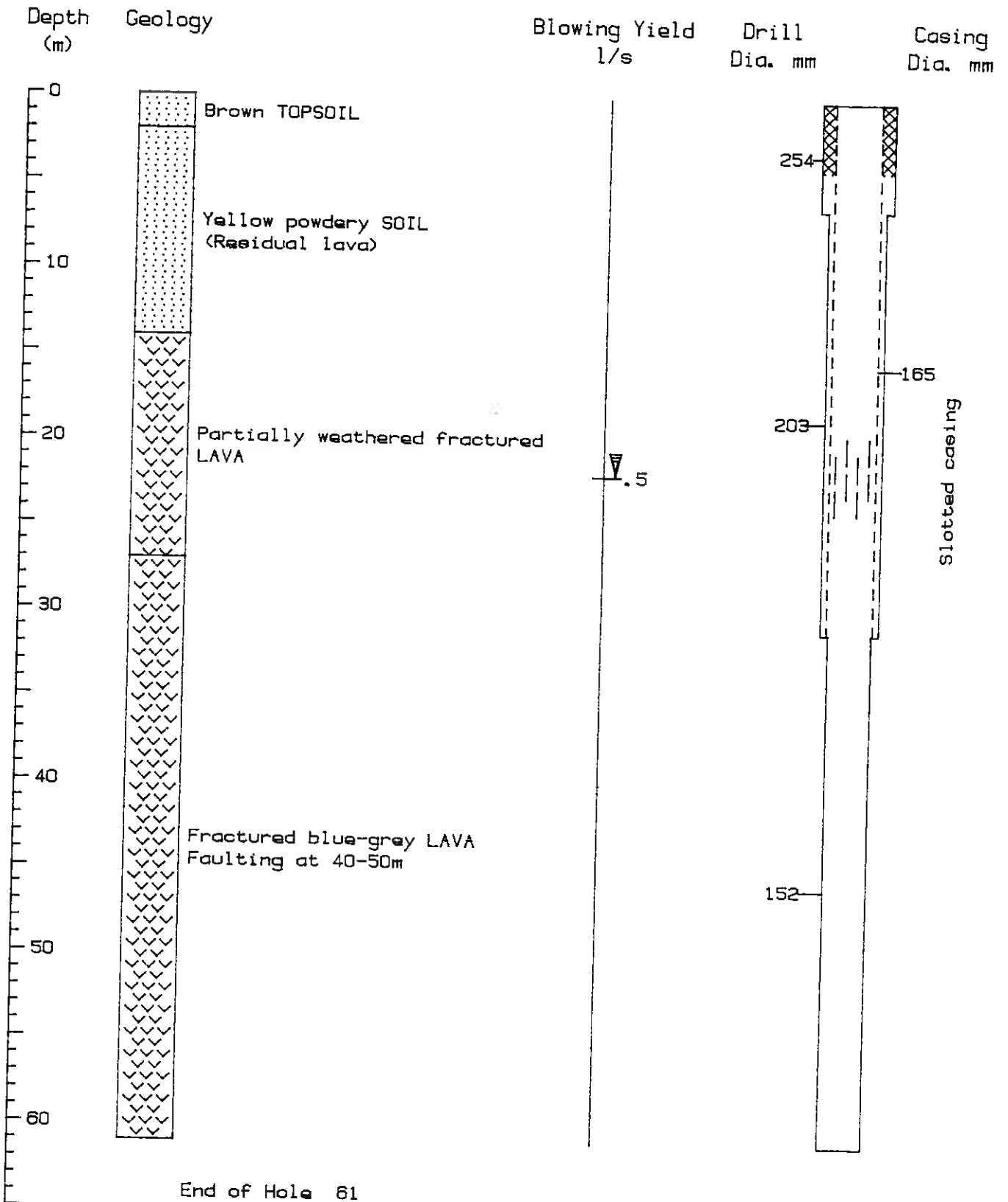
LOCALITY: NOTO H-SCHOOL (KOPELA)

BH. No. 10-77248

Geoph. Peg No. BDWA

Coordinates +2923300X -50975Y

Elev. (m) 1380



STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

KOPELA

NOTO H/S

16 07 1992

B.H. No. 10-77248

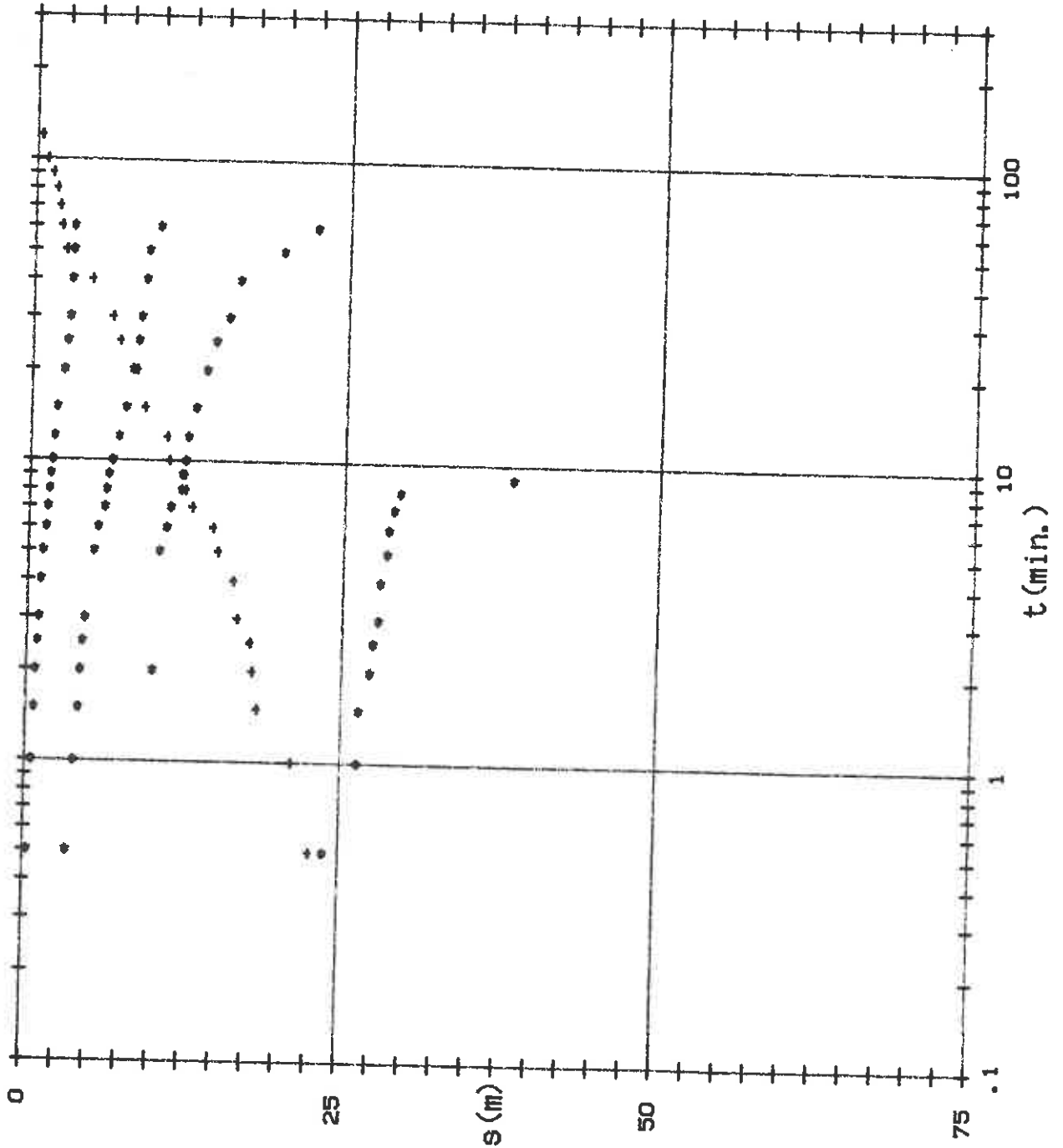
$Q_1 = .22 \text{ l/s}$

$Q_2 = .51 \text{ l/s}$

$Q_3 = 1.1 \text{ l/s}$

$Q_4 = 2.1 \text{ l/s}$

S.W.L. = 11.35 m



CONSTANT DISCHARGE TEST

+ Drawdown data.
* Recovery data.

KOPELA

NOTO H/S

17 07 1992

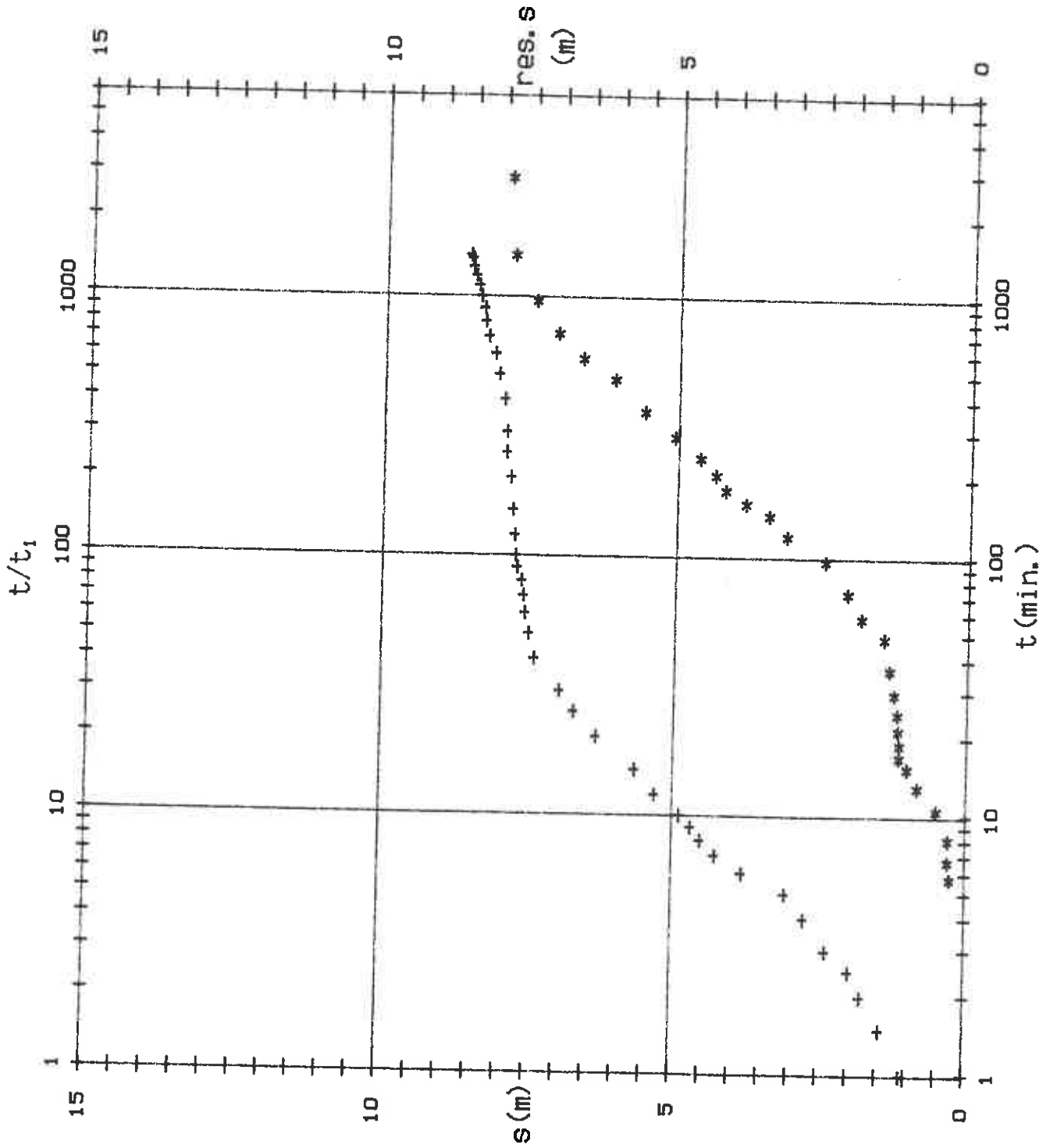
Pumped Borehole
10-77248

Readings on Borehole
10-77248

$Q = .5 \text{ l/s}$

S.W.L. = 11.35 m

$T = 2 \text{ m}^2/\text{d}$



STEP DRAWDOWN TEST

* Pumping data
 + Recovery data

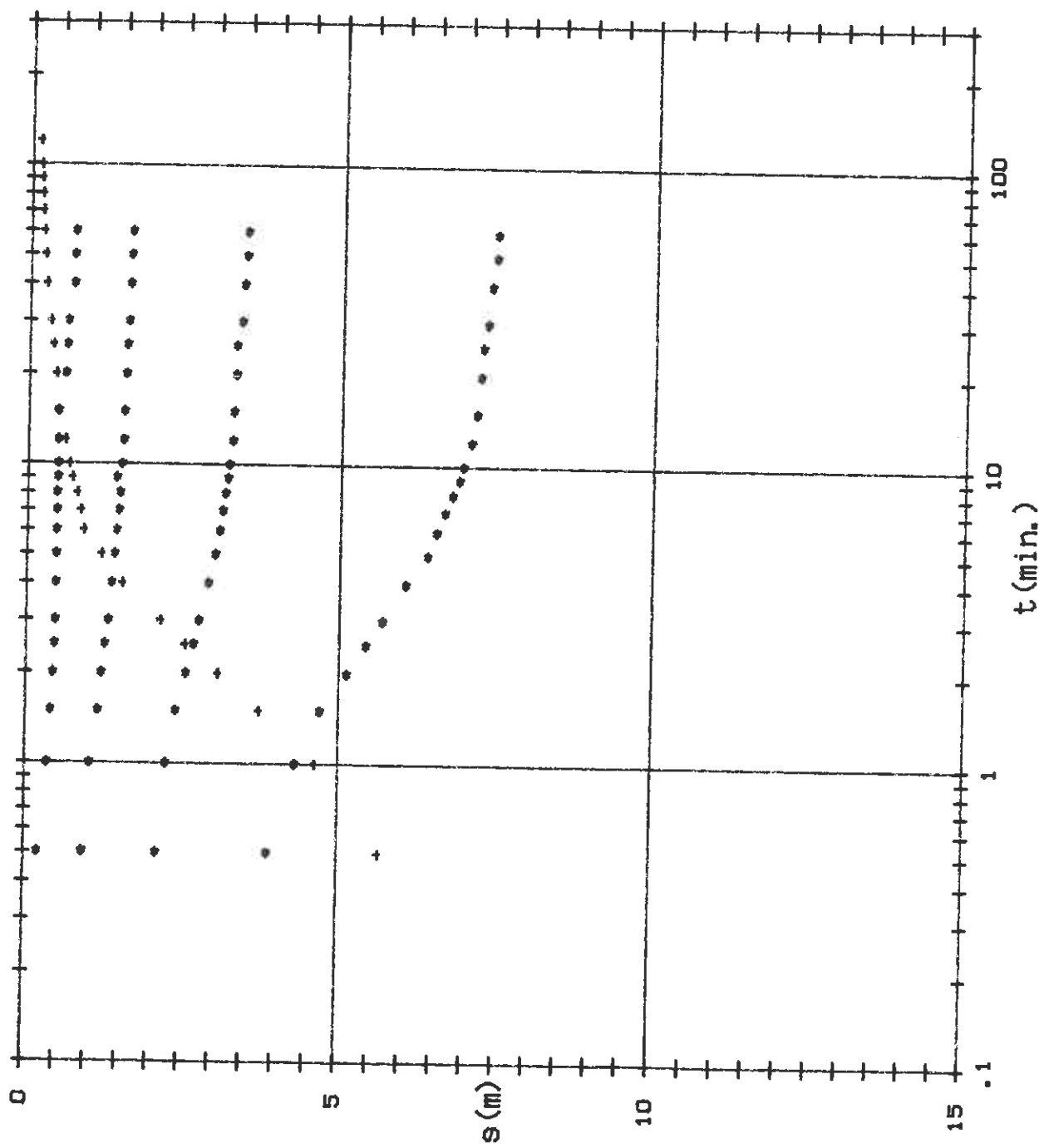
KOPELA

17 07 1992

B.H. No. 10-77306

$Q_1 = .15 \text{ l/s}$
 $Q_2 = .45 \text{ l/s}$
 $Q_3 = .9 \text{ l/s}$
 $Q_4 = 1.81 \text{ l/s}$

S.W.L. = 15.72 m



CONSTANT DISCHARGE TEST

+ Drawdown data.
* Recovery data.

KOPELA

18 07 1992

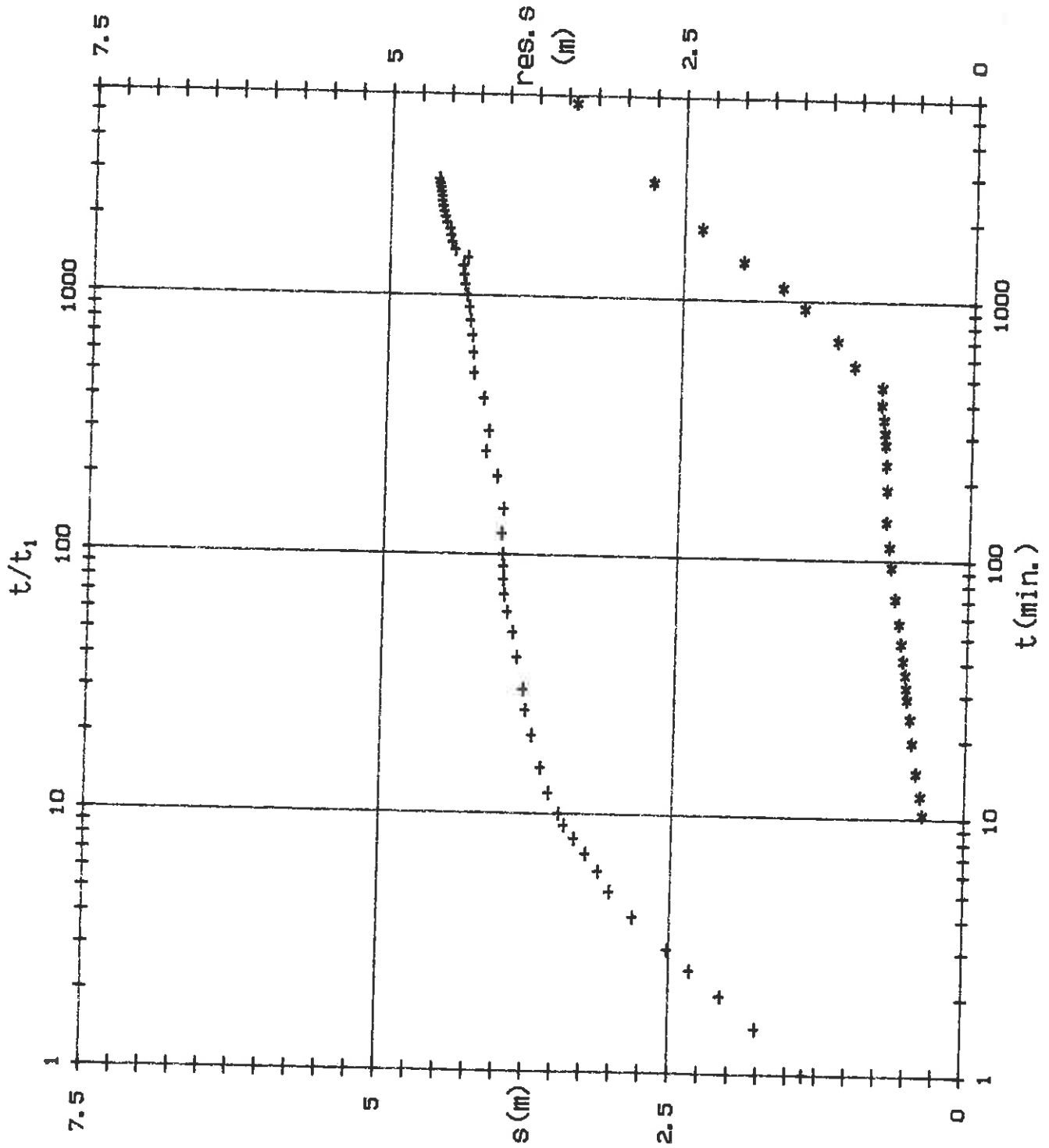
Pumped Borehole
10-77306

Readings on Borehole
10-77306

Q = 1 l/s

S.W.L. = 15.72 m

T = 7 m²/d



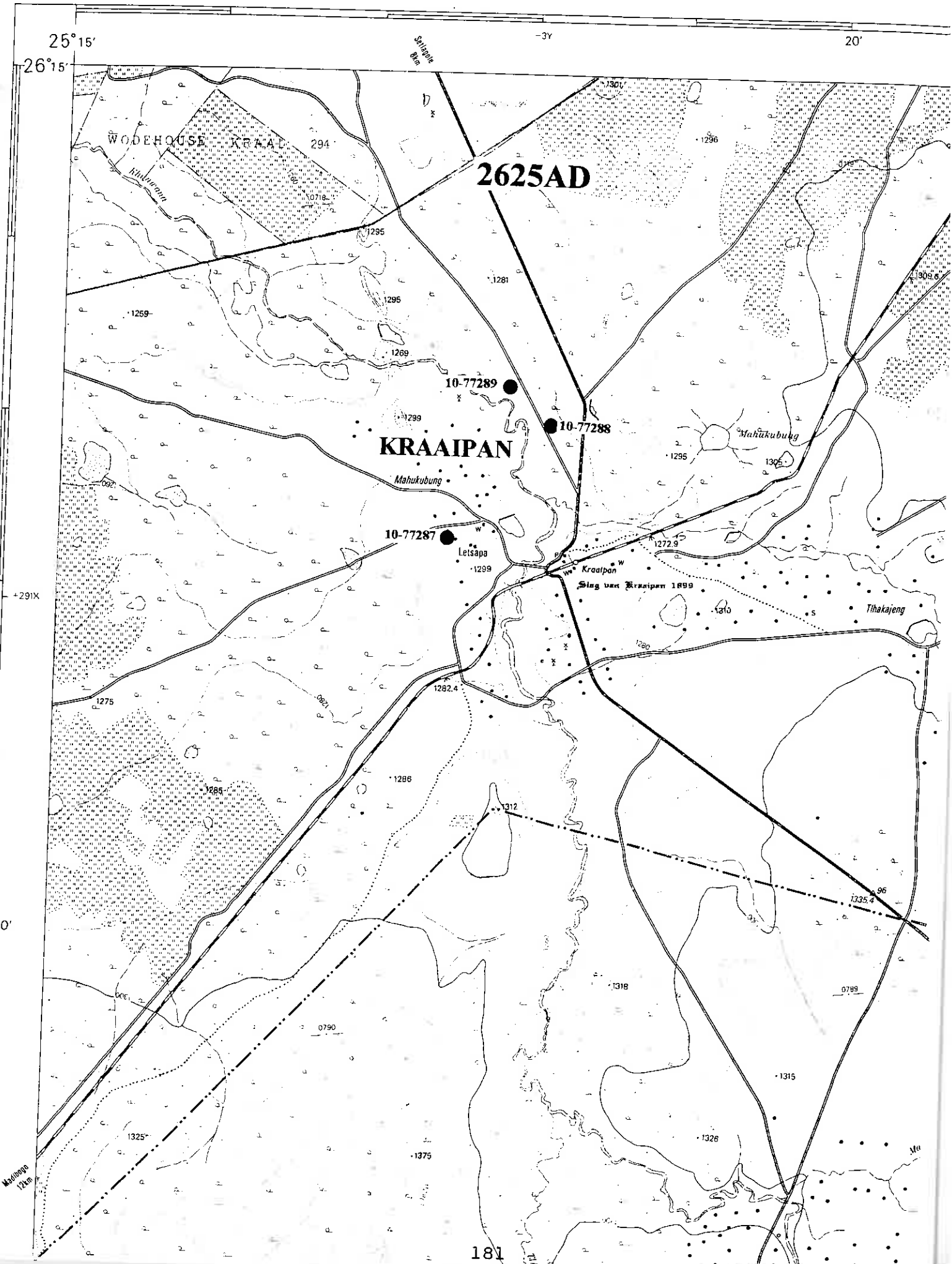
KRAAIPAN

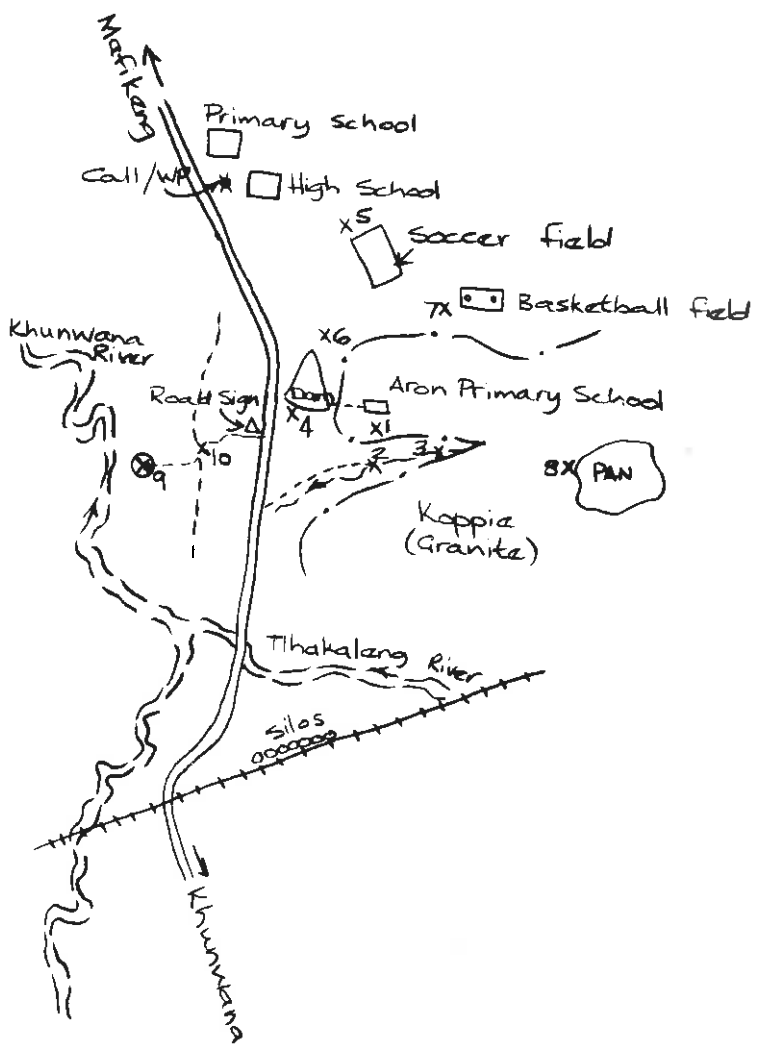
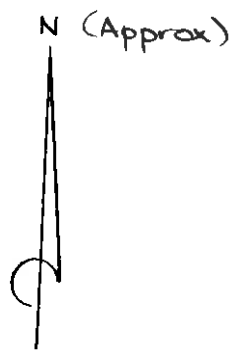
Including boreholes

10-77287 - Ghaena P/S

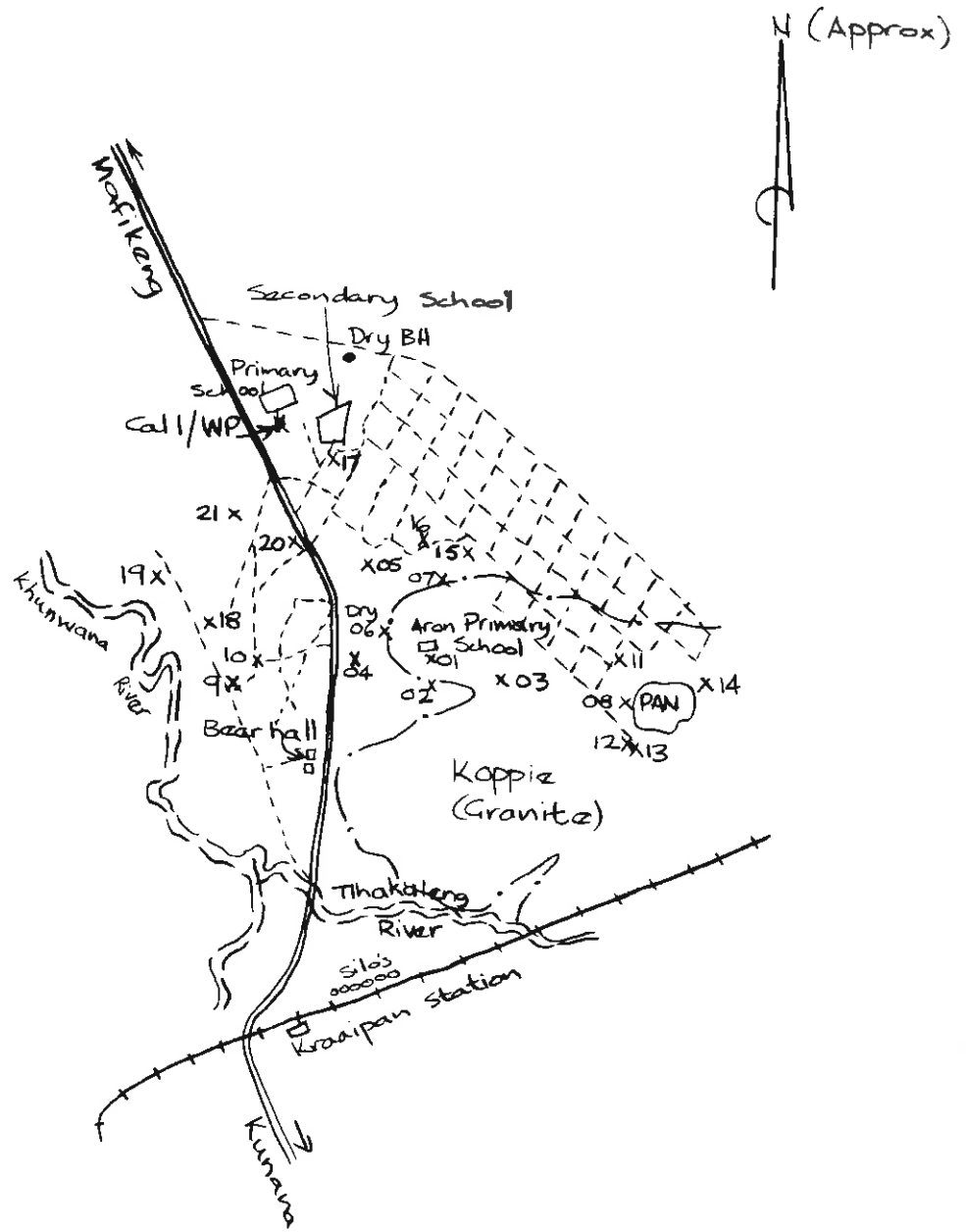
10-77288 - Aron P/S

10-77289 - Creche





Locality Plan of Aron Primary School (Kraaipan)
Overlay to Photo No 639 (strip 16)
Approx Scale 1:30 000



Locality Plan of Kraaipan (crache)
 Overlay to Photo No 639 (strip 16)
 Approx Scale 1:30 000

+ Field data
 — Computer model
 - - - d - r model

KRAAIPAN GHAENA P/S

V.E.S. 02

CO-ORDINATES
 +2909265X -29010Y

GEOLOGY
 DIORITE

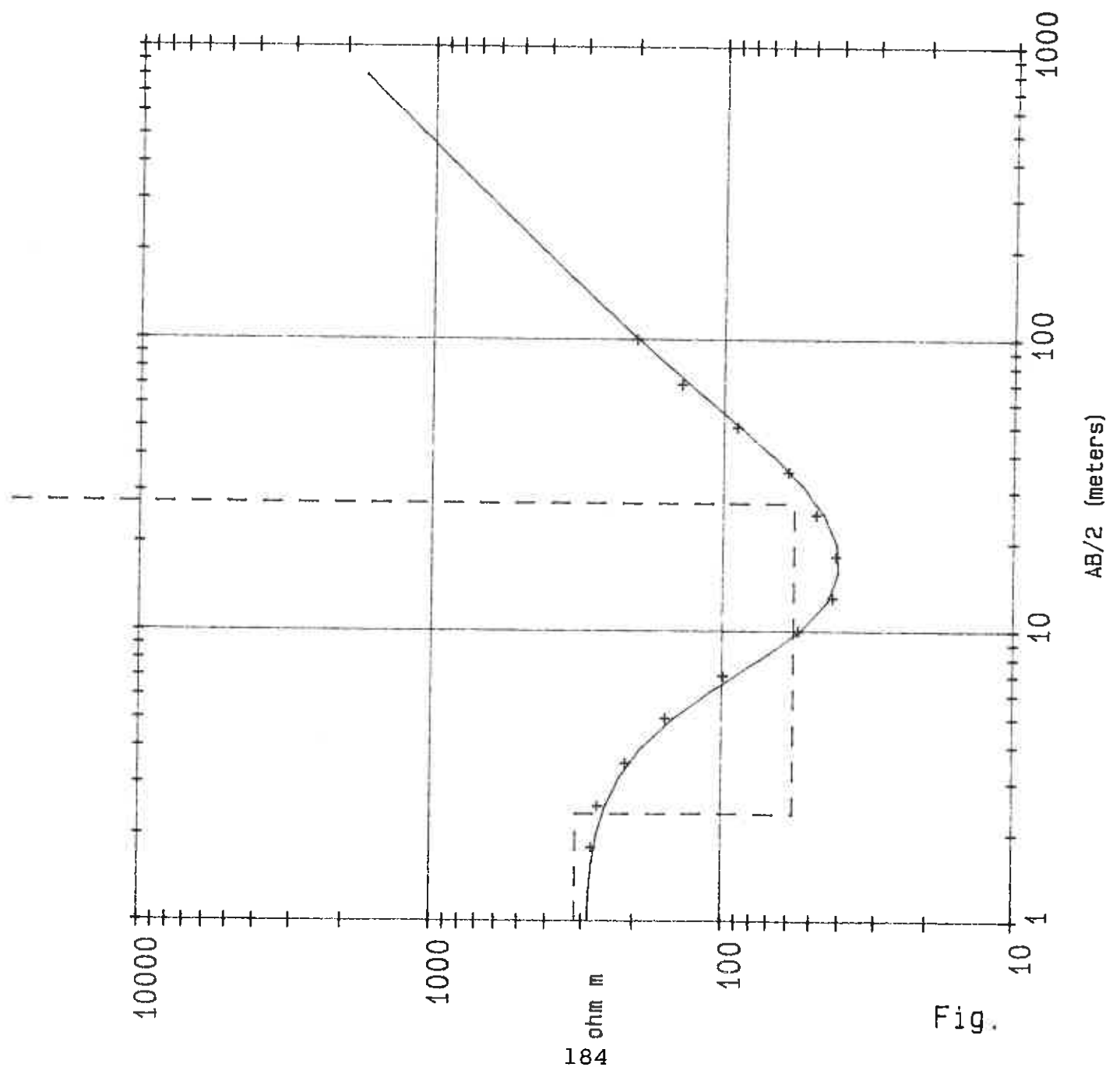


Fig.

BOREHOLE LOG

DISTRICT: DITSOBOTLA

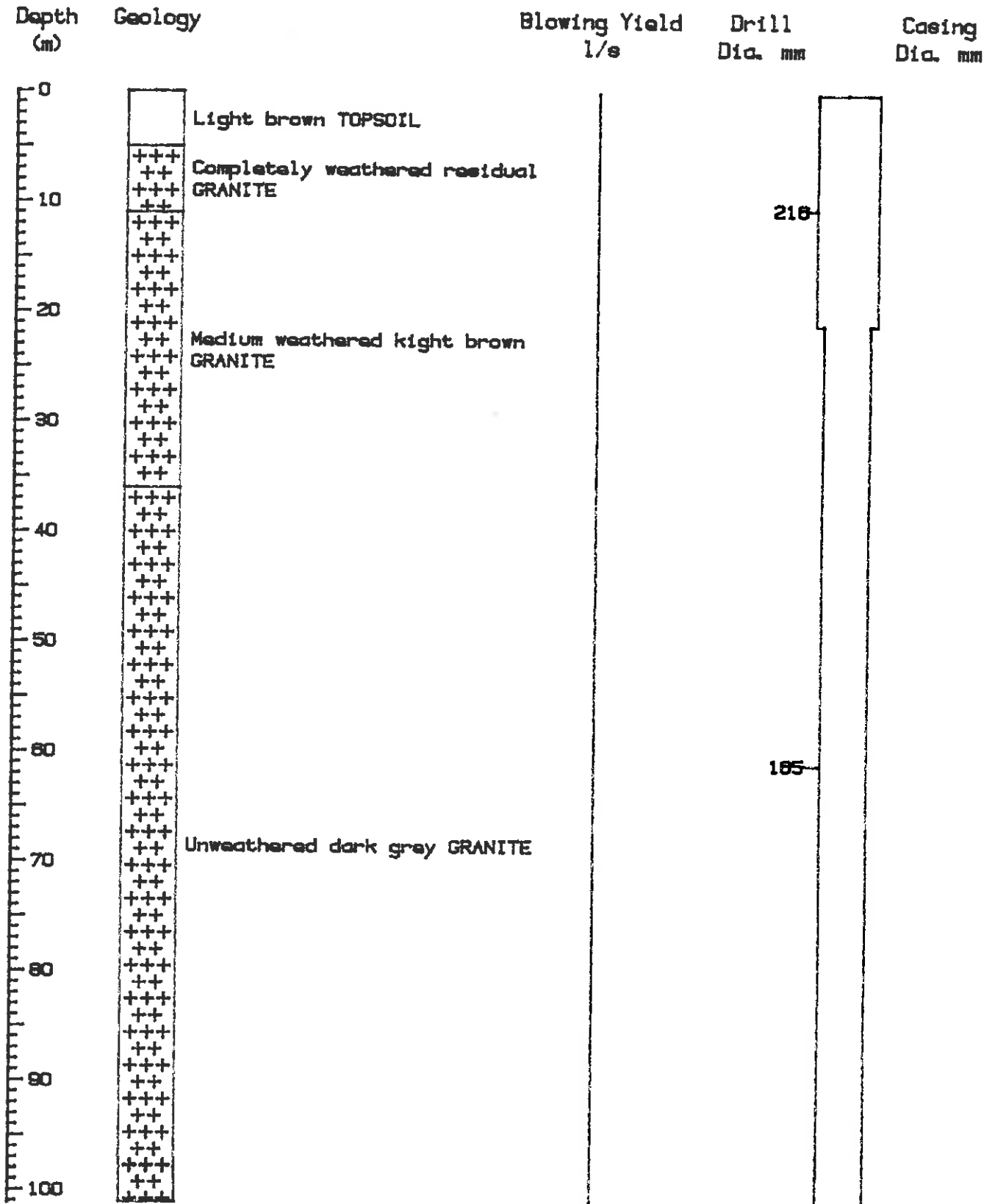
LOCALITY: KRAAIPAN GHAENA P/SCH

BH. No. 10-77287

Geoph. Peg No. 02

Coordinates +2909275X -29000Y

Elev. (m) 1279



End of Hole 101

+ Field data
 — Computer model
 - - - d - r model

KRAAIPAN ARON P/S

V.E.S 09

CO-ORDINATES
 +2908095X -30160Y

GEOLOGY
 GNEISS

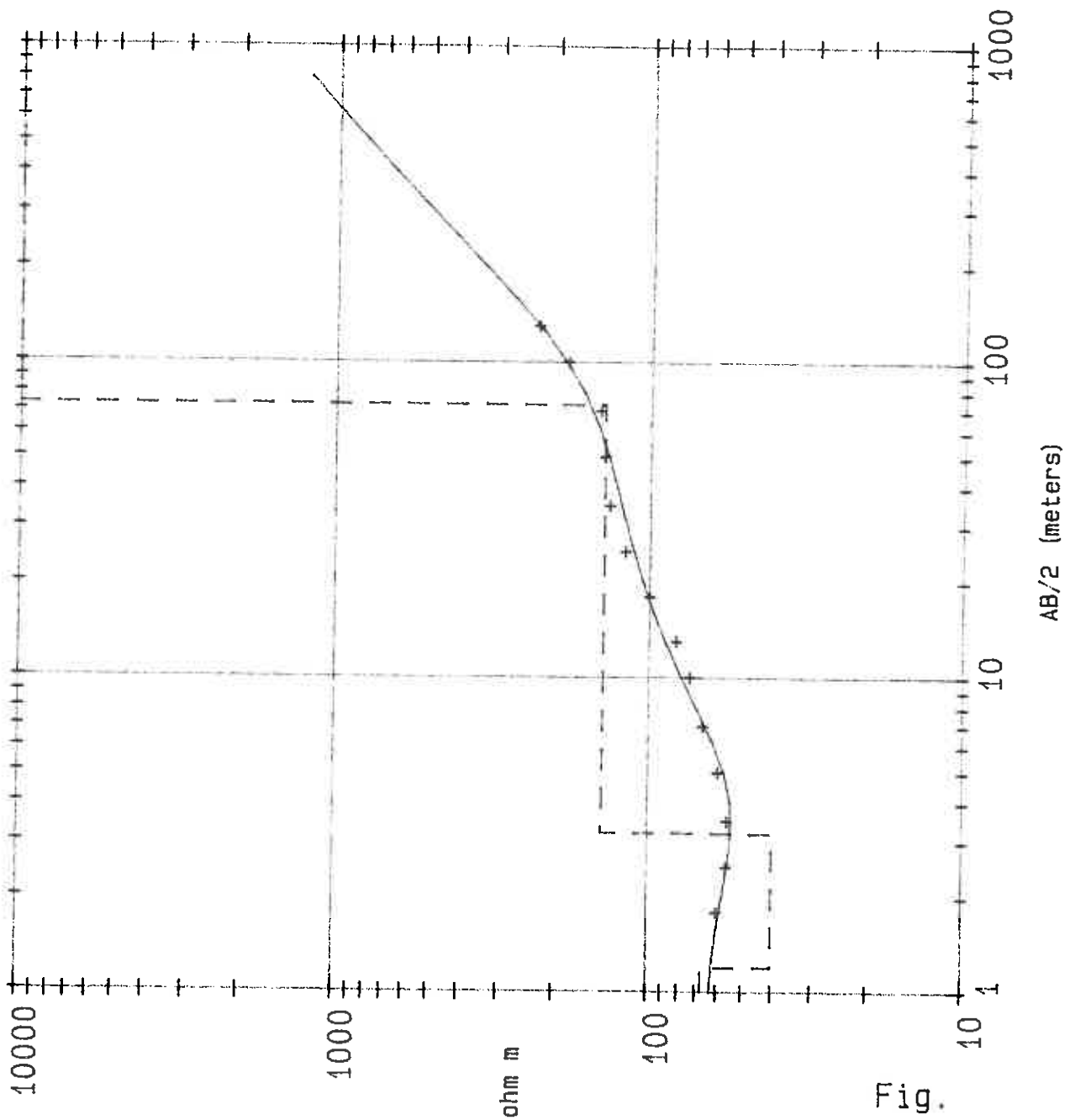


Fig.

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

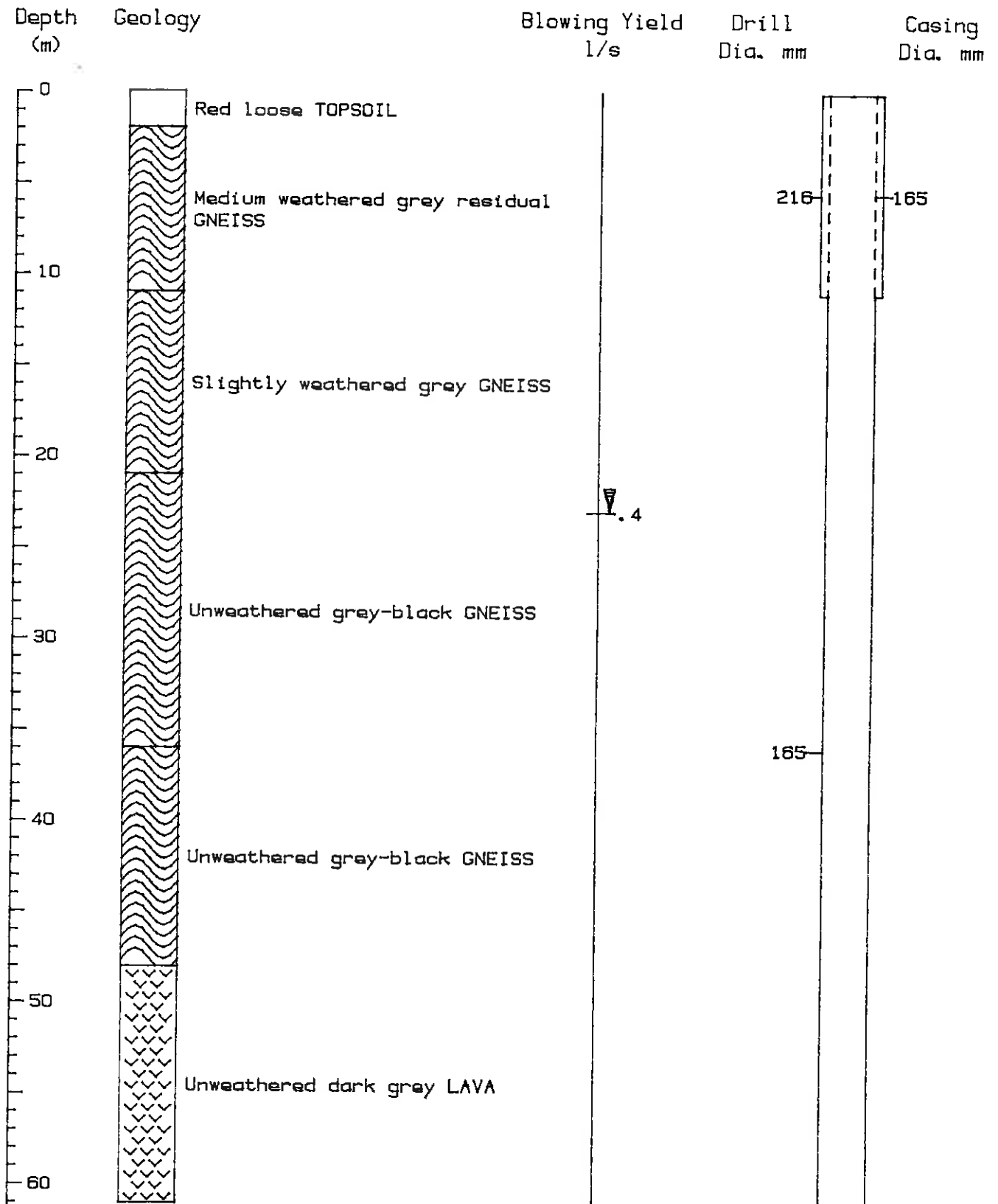
LOCALITY: KRAAIPAN ARON PRE/SCH

BH. No. 10-77288

Geoph. Peg No. 09

Coordinates +2908100X -30150Y

Elev. (m) 1268



End of Hole 61

STEP DRAWDOWN TEST

* Pumping data
 + Recovery data

KRAAIPAN

ARON P/S

22 05 1992

B.H. No. 10-77288

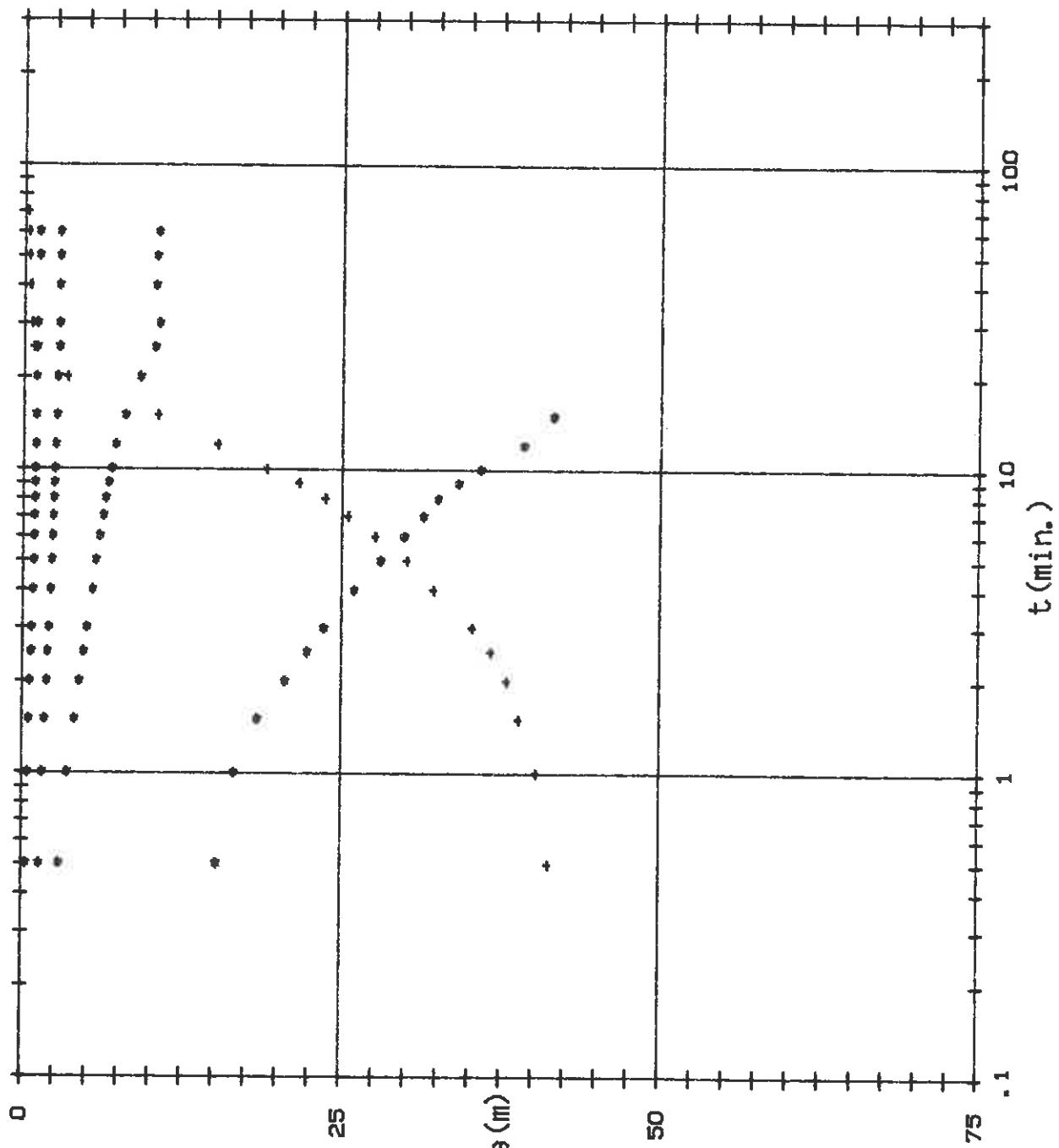
$Q_1 = .21 \text{ l/s}$

$Q_2 = .4 \text{ l/s}$

$Q_3 = .81 \text{ l/s}$

$Q_4 = 1.3 \text{ l/s}$

S.W.L. = 11.5 m



CONSTANT DISCHARGE TEST

+ Drawdown data.
* Recovery data.

KRAAIPAN

ARON P/S

22 05 1992

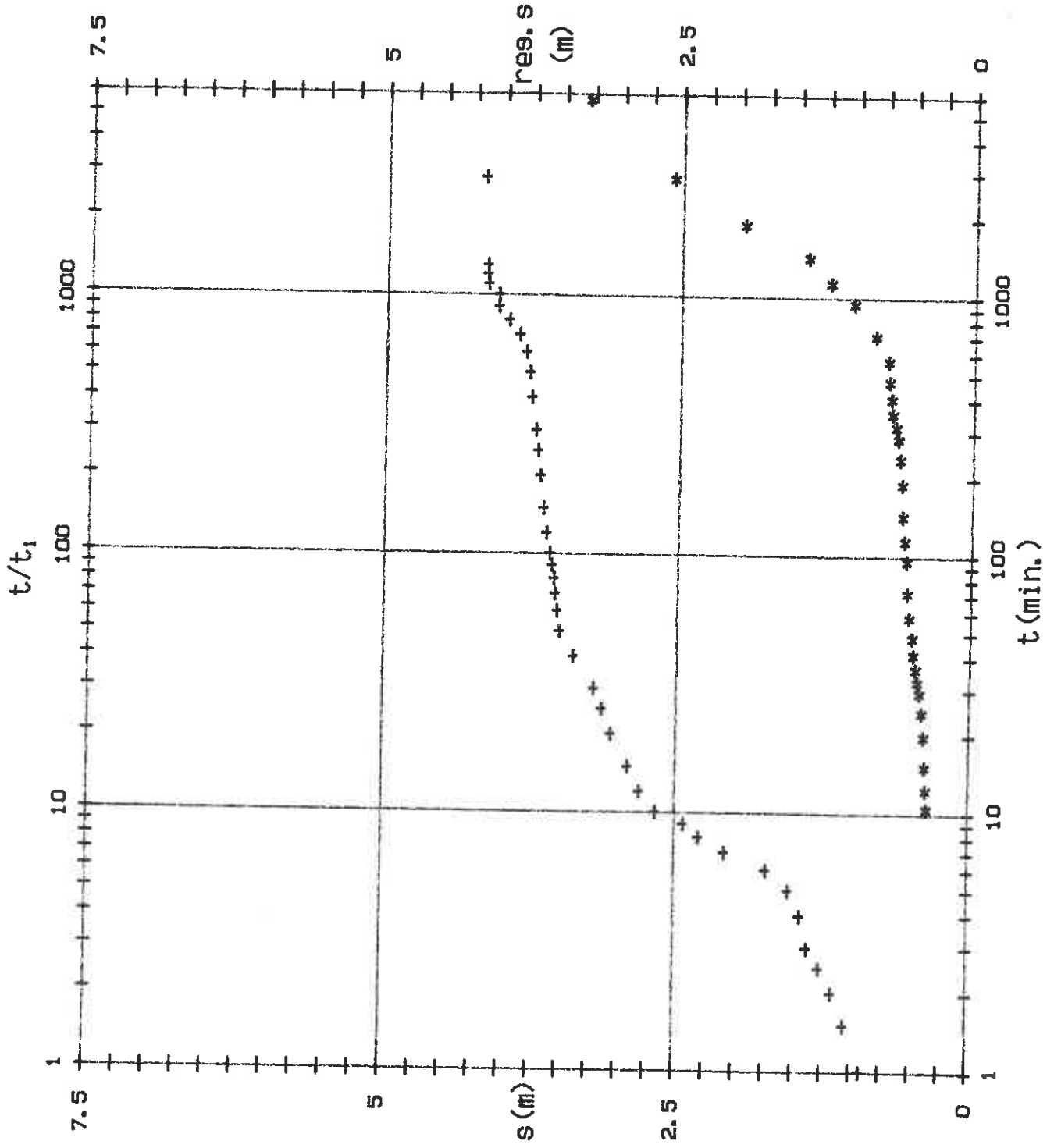
Pumped Borehole
10-77288

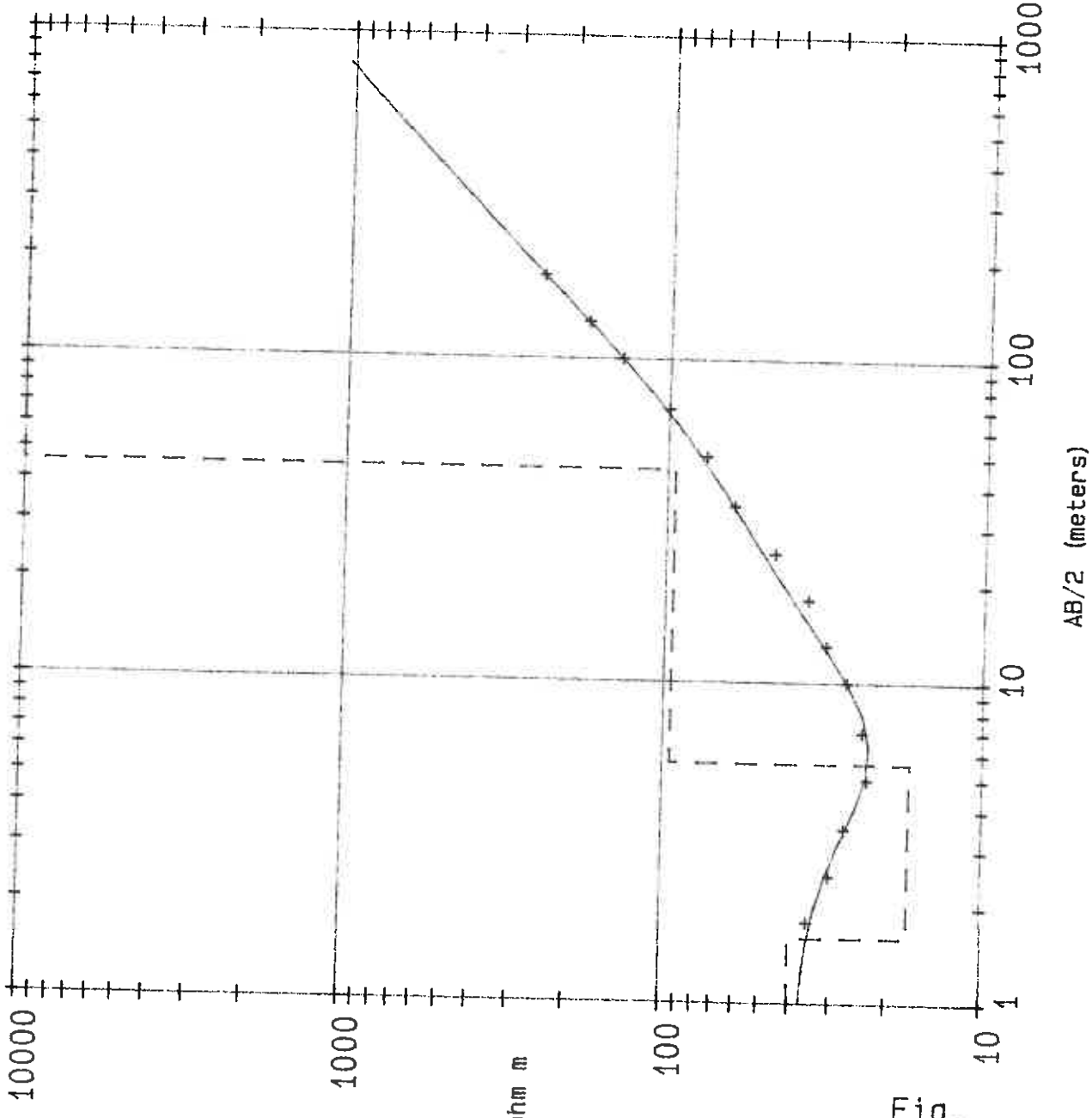
Readings on Borehole
10-77288

Q = .5 l/s

S.W.L. = 11.5 m

T = 3 m²/d





+ Field data
 — Computer model
 - - - d - r model

KRAAIPAN CRECHE

V.E.S. 19

CO-ORDINATES
 +2907680X -29740Y

GEOLOGY
 LAVA/SCHIST

Fig.

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

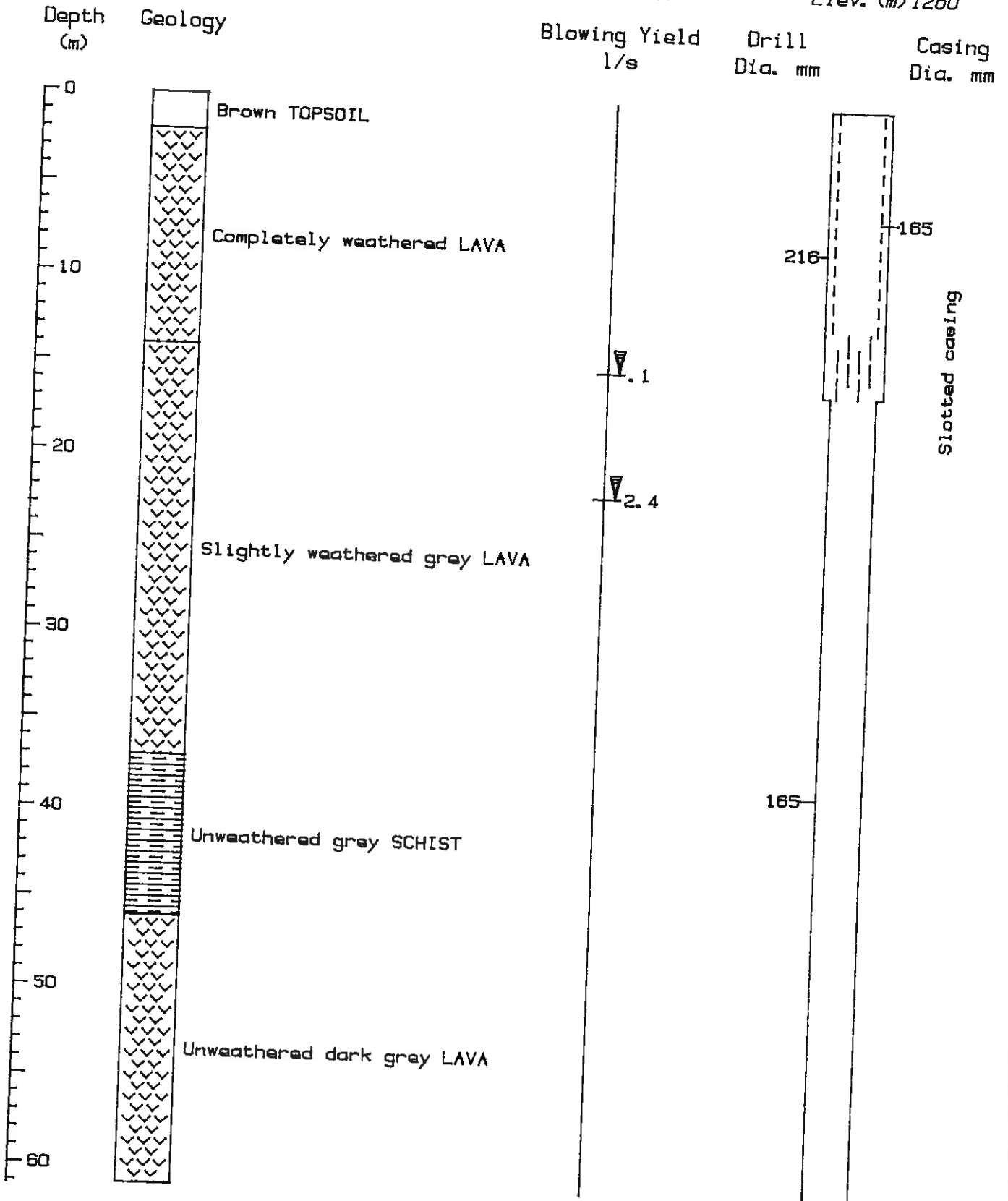
LOCALITY: KRAAIPAN CRECHE

Geoph. Peg No. 19

Coordinates +2907675X -29750Y

BH. No. 10-77289

Elev. (m) 1260



End of Hole 61

LOMBARDSLAAGTE

Including borehole

10-77252

Enselrust

T 102 10

2625BC

1364
△ 120
1364.1

Kopme
Stoekop

Roosplaas

1368

1365

1363

LOMBAARDS LAAGTE 106 10

1367

10-77252 ●

Lombaardslaagte

1363

VREDE 103 10

LOMBAARDSLAAGTE

1356

1369

1365

1362

110
1372.8

SPRINGBOKKOP

Deelpan

Deelpan

Springbokfontein

1366

Springbokfontein

Deelpan

Deelpan

Springbokfontein

1359

1364

1358

1374

Klein Zoutpan

Schoongezicht
Deelpan
Schoongezicht

1360

1348

1350

Schoongezicht

Klein Zoutpan

1361

Klein Zoutpan

193

1356

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

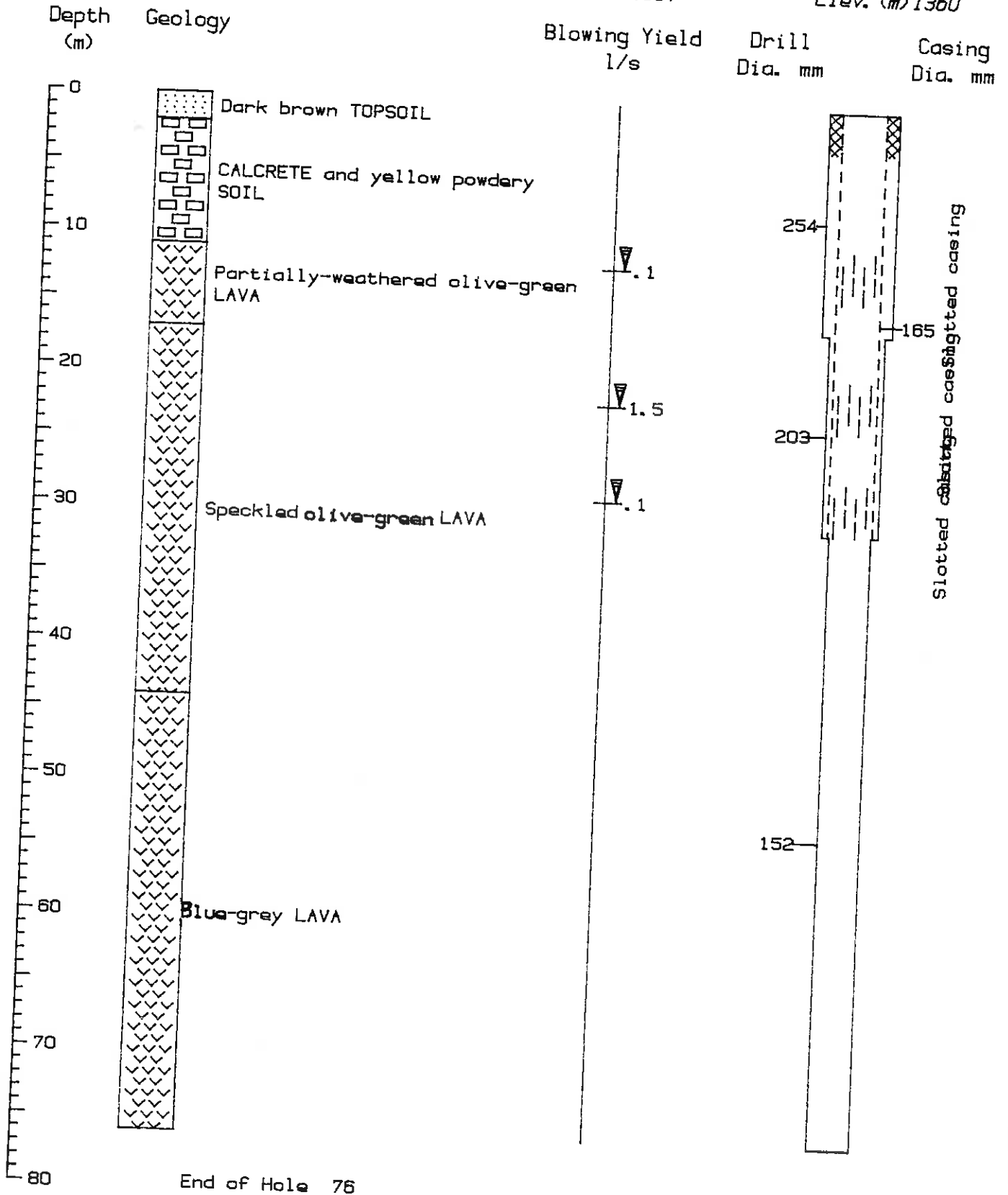
LOCALITY: LOMBAARDSLAAGTE

Geoph. Peg No. REHAB

Coordinates +2909000X -58050Y

BH. No. 10-77252

Elev. (m) 1360



STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

LOMBARDSLAGTE

05 08 1992

B.H. No. 10-77252

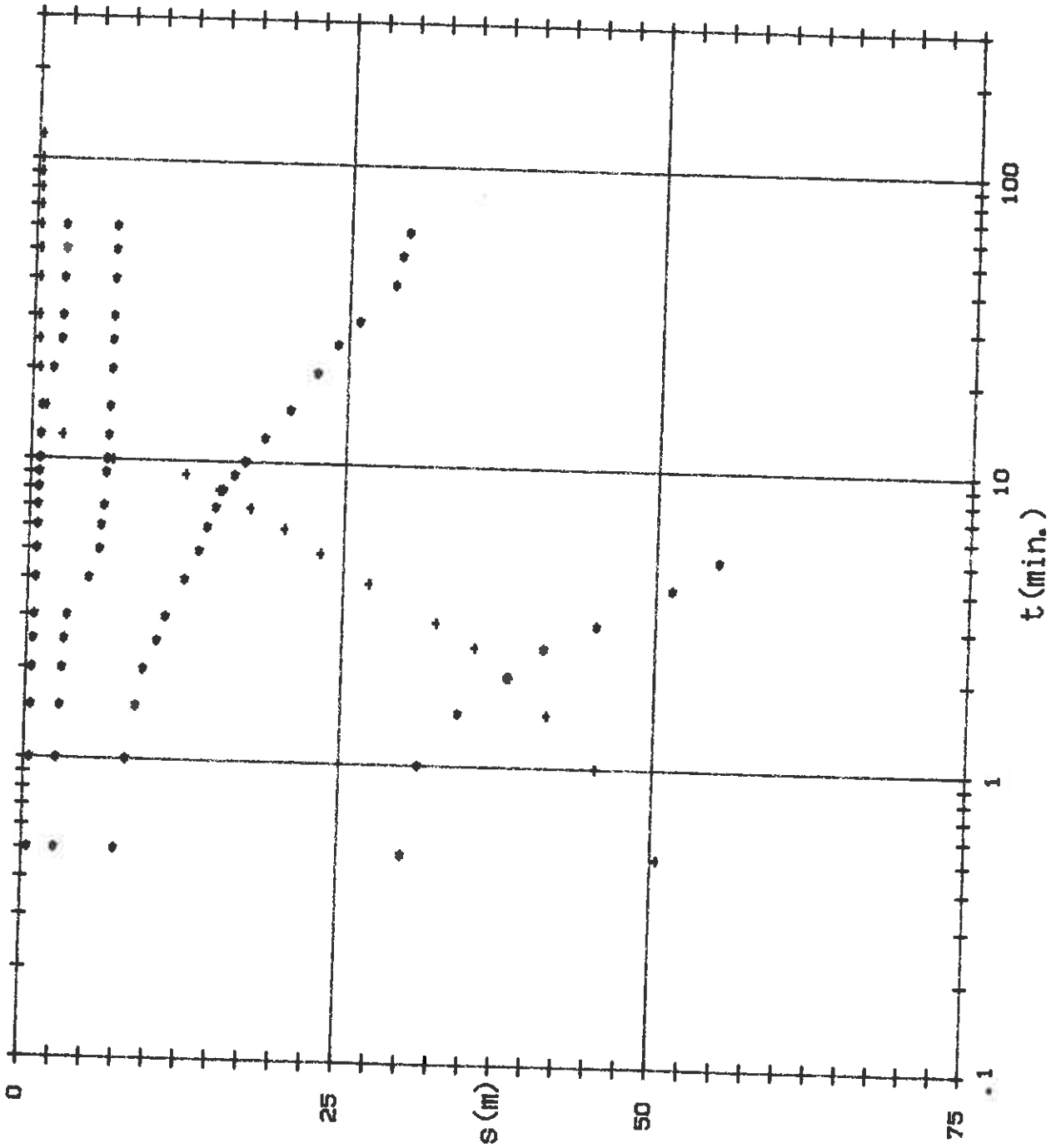
$Q_1 = .54 \text{ l/s}$

$Q_2 = 1.02 \text{ l/s}$

$Q_3 = 2.17 \text{ l/s}$

$Q_4 = 4 \text{ l/s}$

S.W.L. = 6.68 m



CONSTANT DISCHARGE TEST

- + Drawdown data.
- * Recovery data.

LOMBARDSLAAGTE

06 08 1992

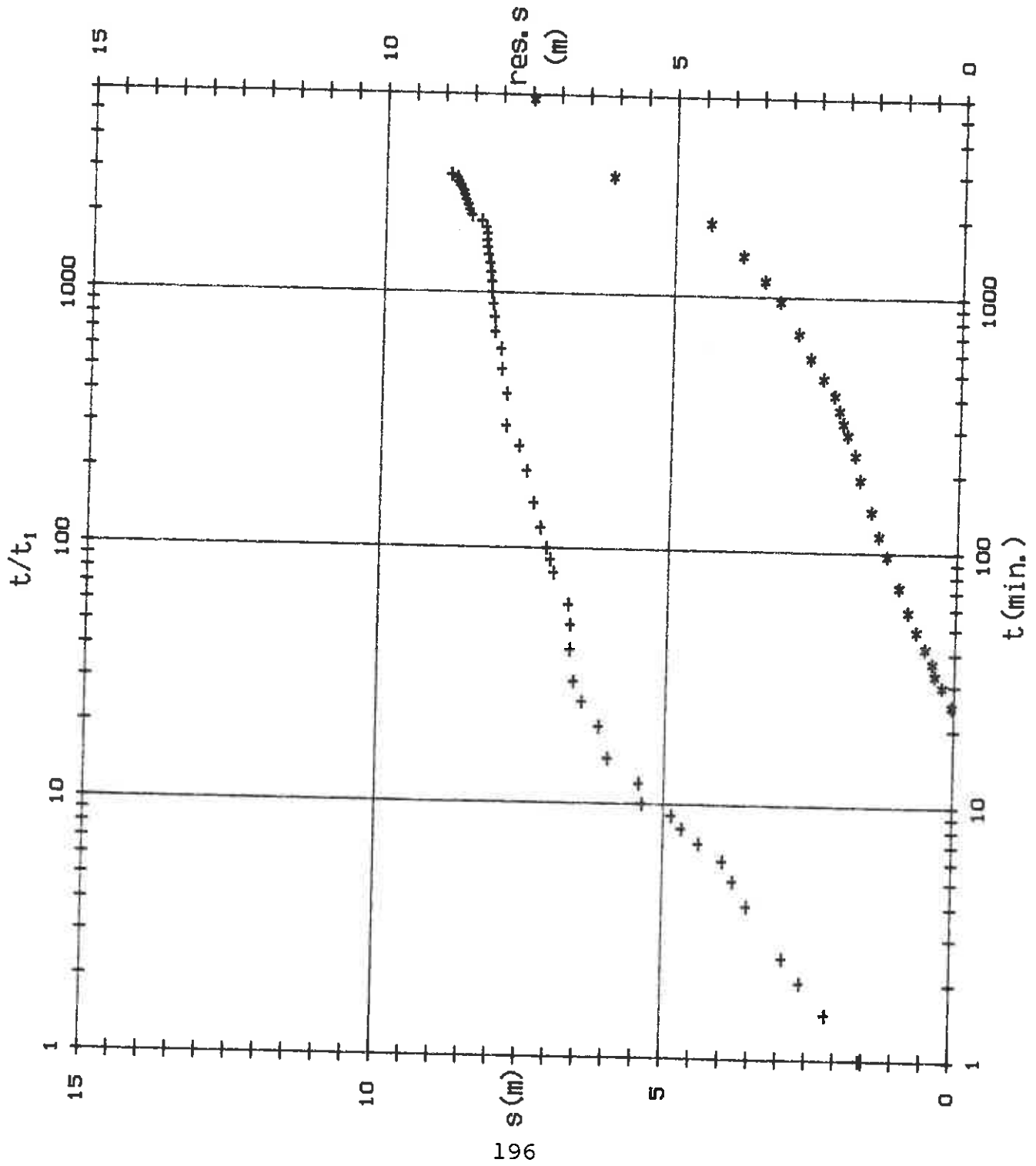
Pumped Borehole
10-77252

Readings on Borehole
10-77252

Q = 1.13 l/s

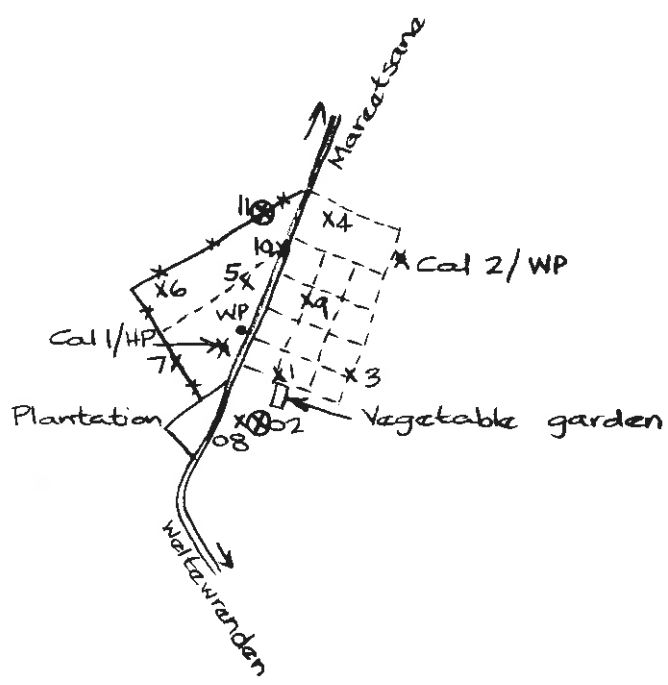
S. W. L. = 6.68 m

T = 5 m²/d





11



Locality Plan of Louisdal
Overlay to Photo No 759 (strip 15)
Approx Scale 1:30 000

+ Field data
 — Computer model
 - - - r model

LOUISDAL

V.E.S. 11

CO-ORDINATES
 +2903705X -47305Y

GEOLOGY
 LAVA

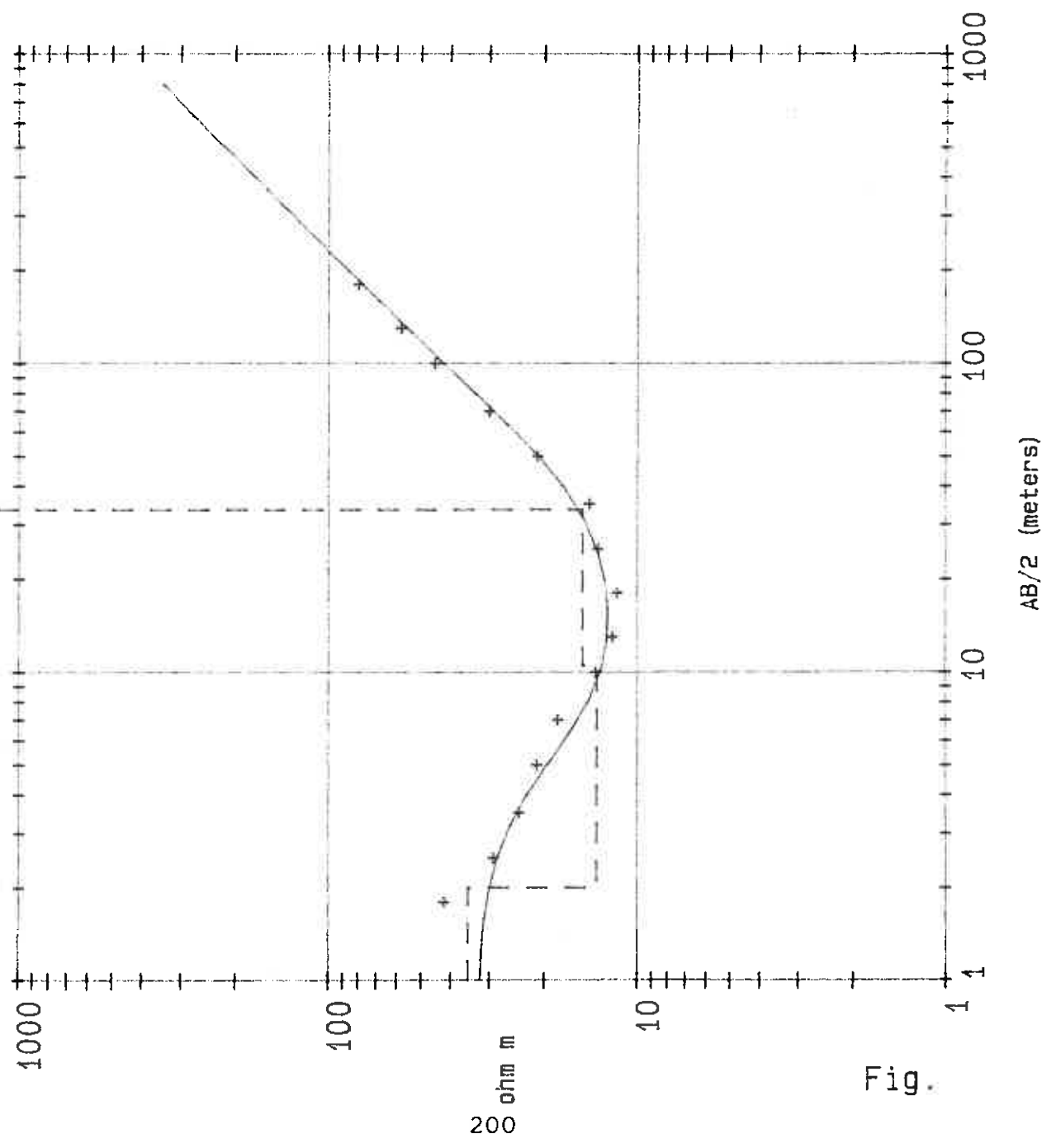


Fig.

BOREHOLE LOG

DISTRICT: DITSOBOTLA

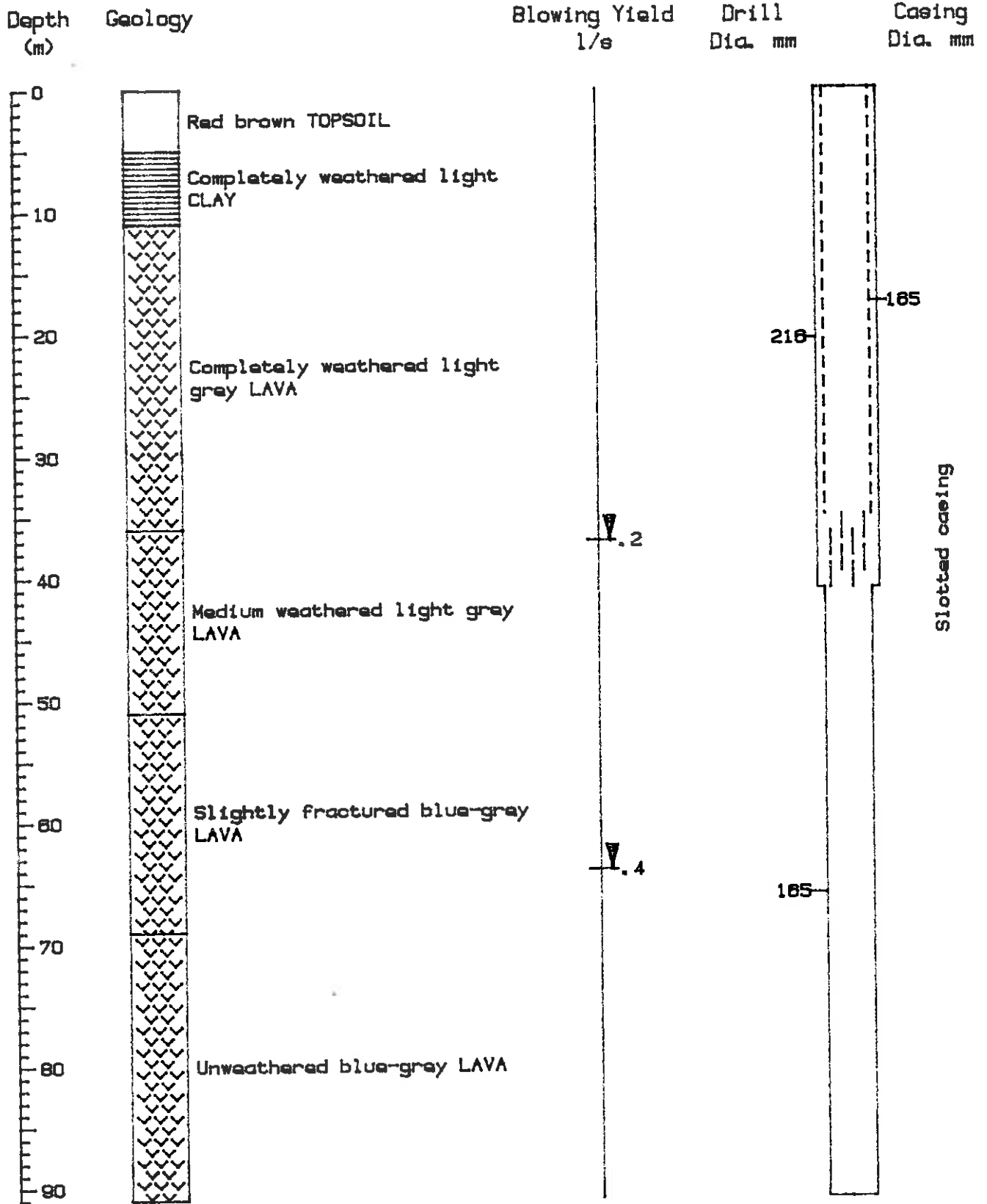
LOCALITY: LOUISDAL

BH. No. 10-77281

Geoph. Peg No. 11

Coordinates +2903700X -47300Y

Elev. (m) 1366



End of Hole 91

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

LOUISDAL

16 05 1992

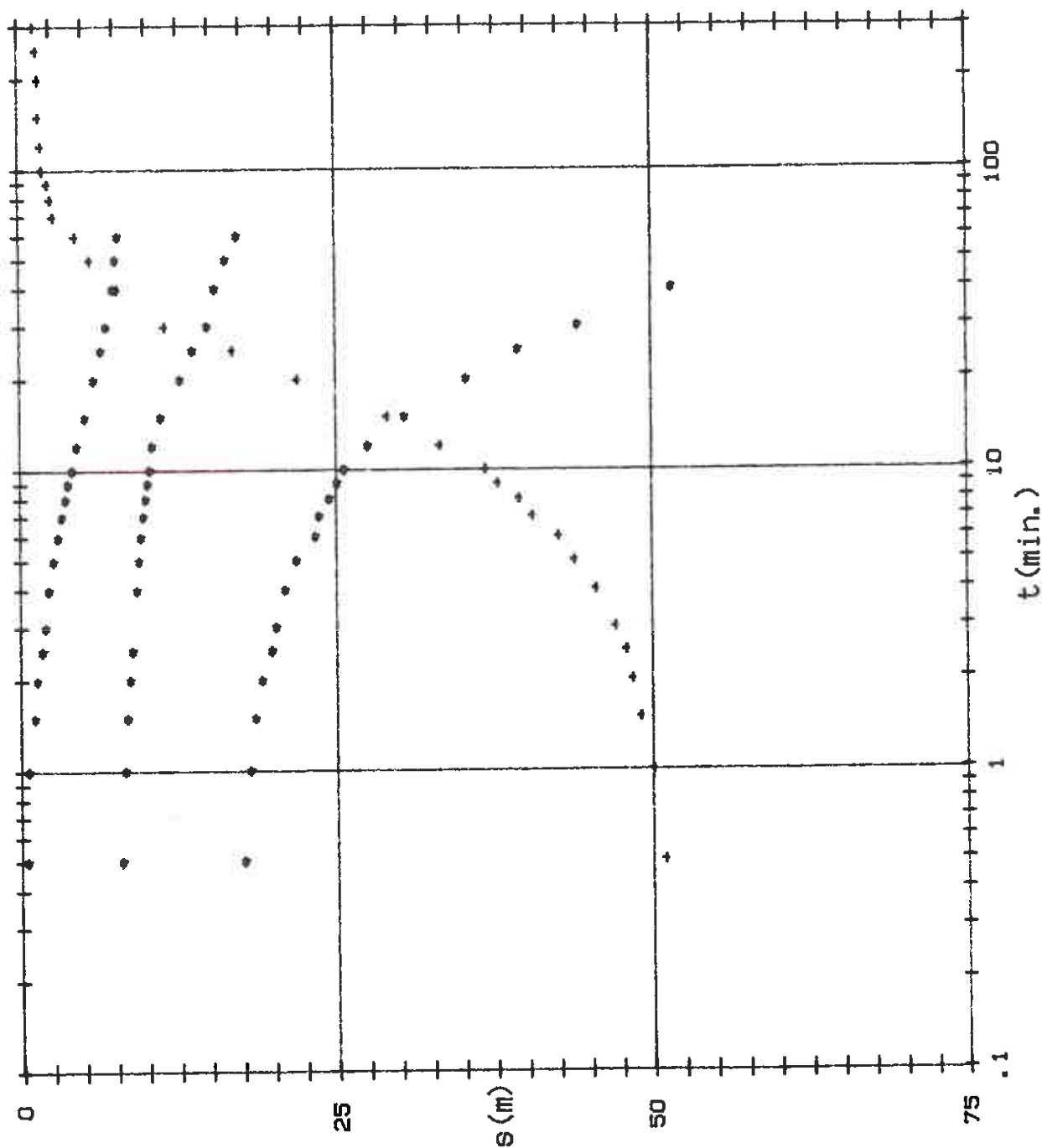
B.H. No. 10-77281

$Q_1 = .23 \text{ l/s}$

$Q_2 = .44 \text{ l/s}$

$Q_3 = .81 \text{ l/s}$

S.W.L. = 19.25 m



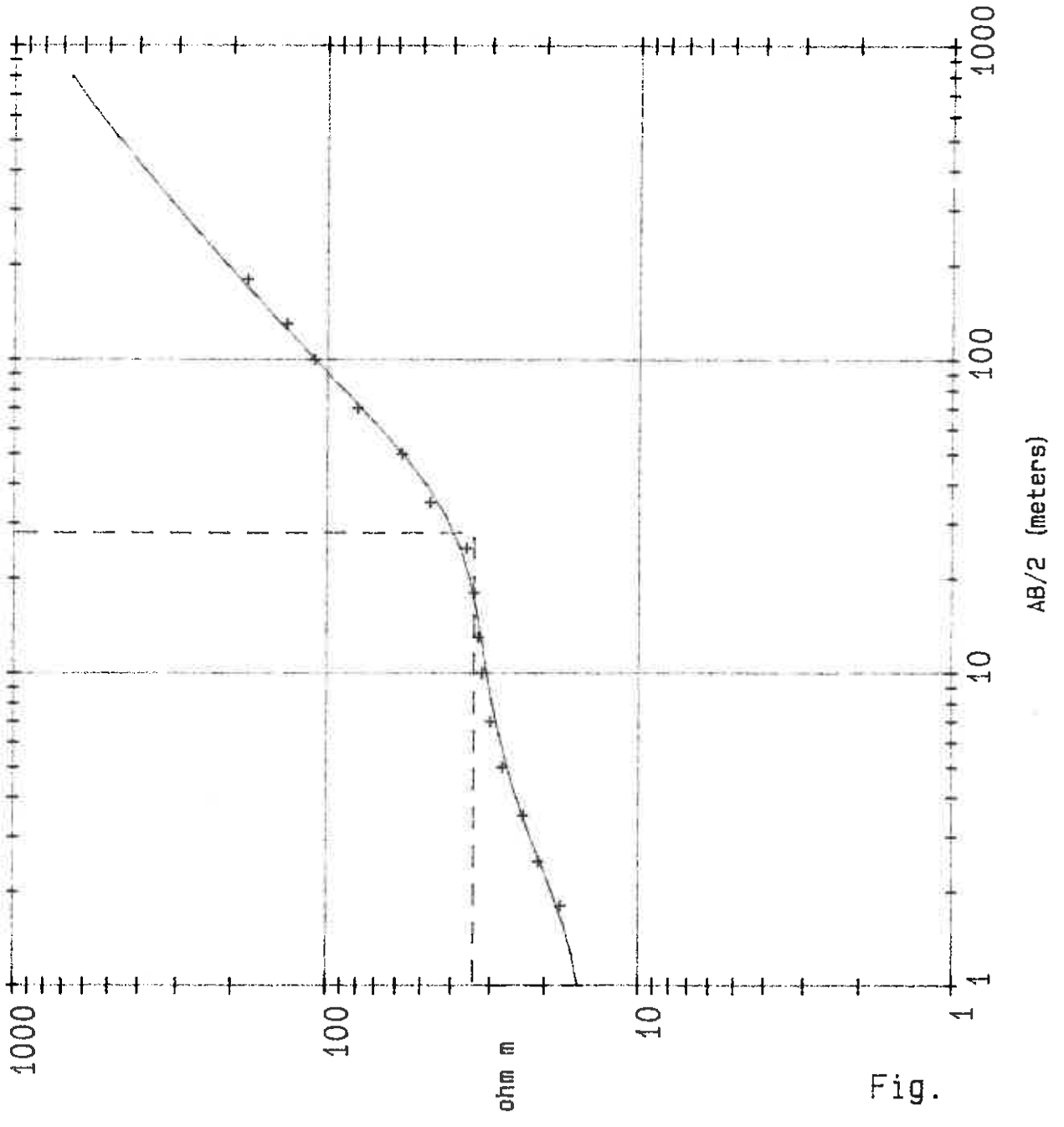


Fig.

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

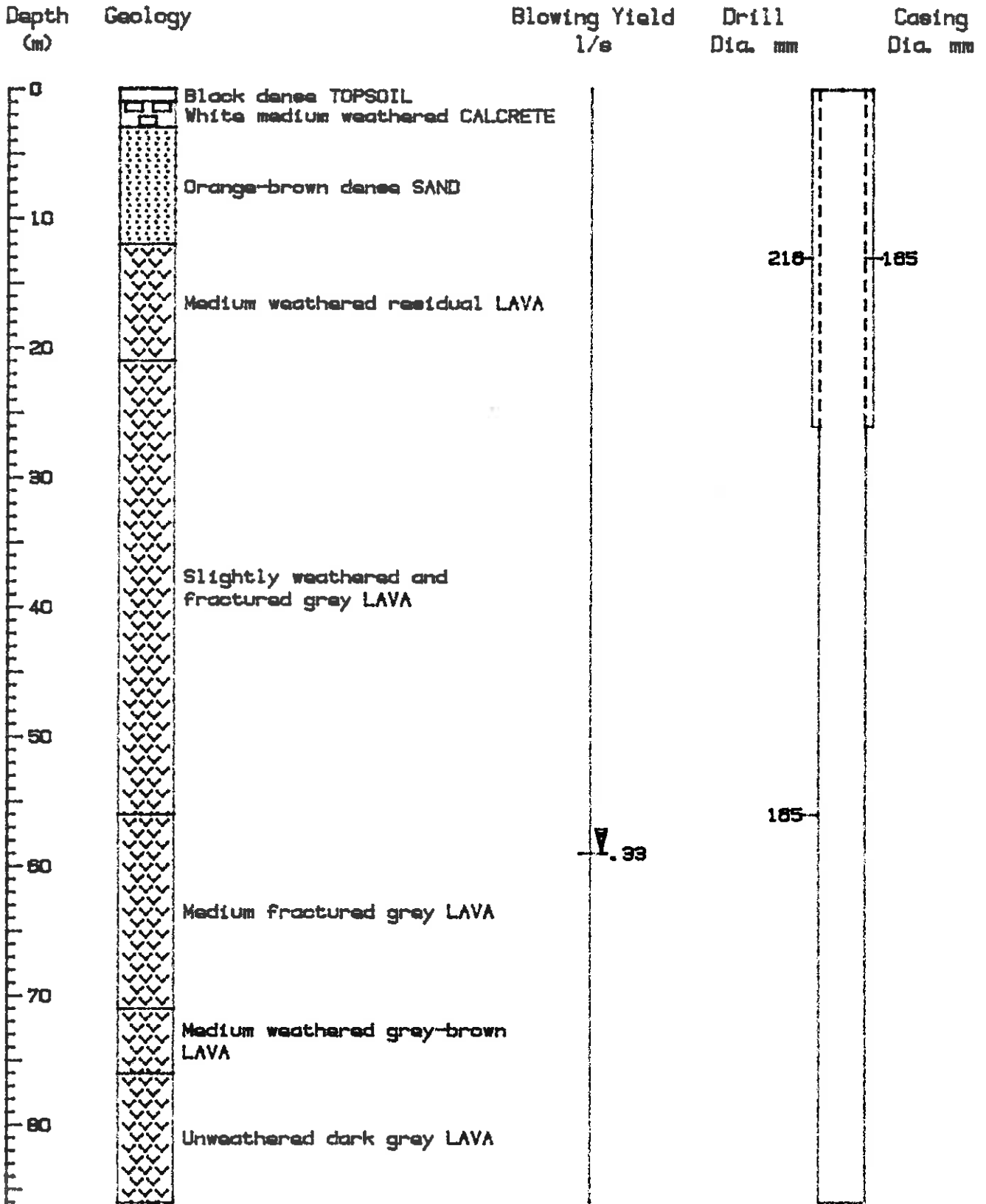
LOCALITY: LOUISDAL

BH. No. 10-77282

Geoph. Peg No. 02

Coordinates +2904350X -47500Y

Elev. (m) 1361



End of Hole 88

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

LOUISDAL

19 05 1992

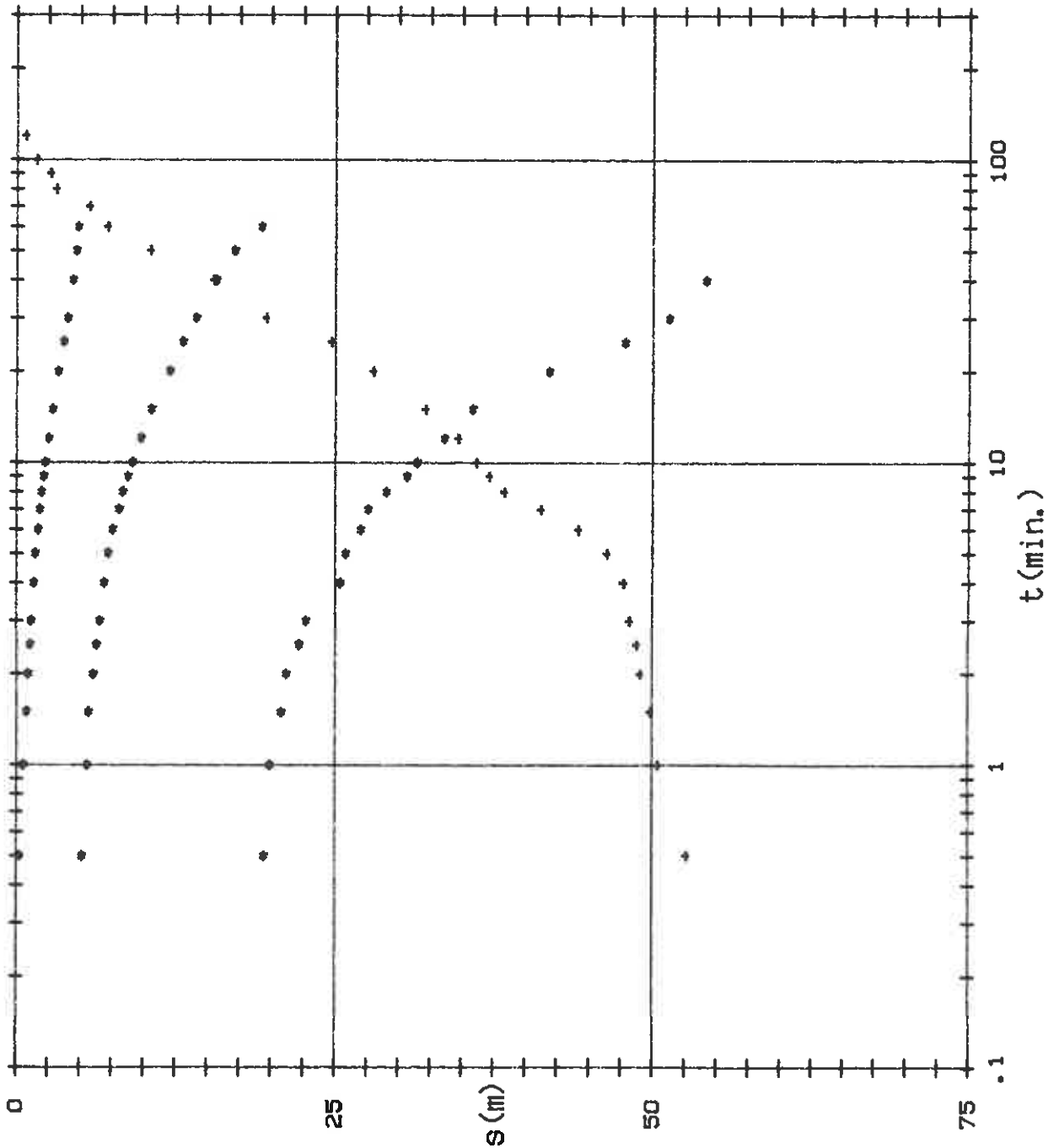
B.H. No. 10-77282

$Q_1 = .16 \text{ l/s}$

$Q_2 = .39 \text{ l/s}$

$Q_3 = .65 \text{ l/s}$

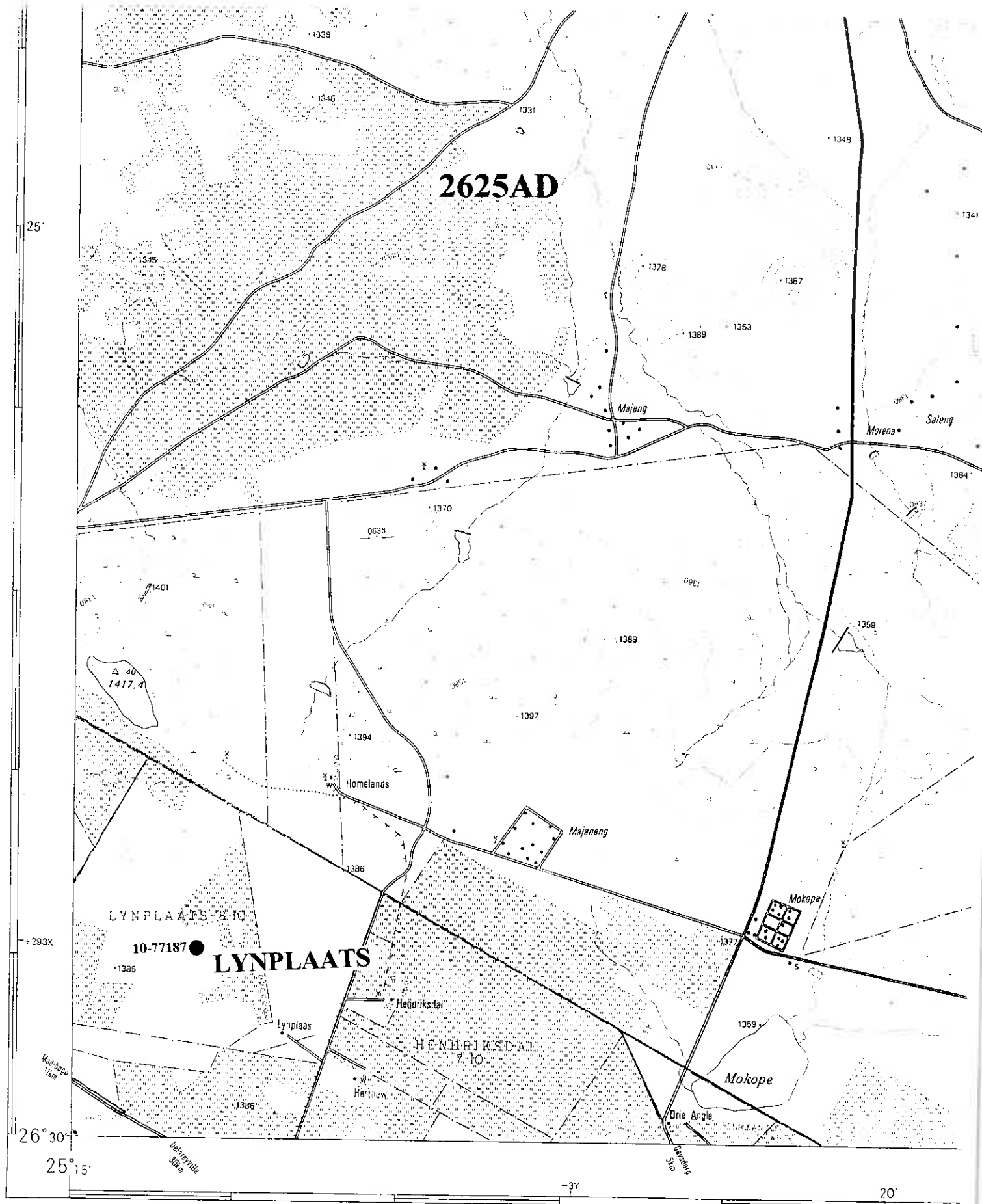
S.W.L. = 19.02 m



LYNPLAATS

Including borehole

10-77187



Gepubliseer deur die Hoofdirekteur van Opmetings en Kartering Privaatsak Mowbray
 Published by the Chief Director of Surveys and Mapping Private Bag Mowbray

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VERKLARING REFERENCE

Internasionale Grense.....		International Boundaries
Provinsiale Grense.....		Provincial Boundaries
Veelvoudige Spoorlyne.....		Multiple Track Railways
Enkelspoorlyne.....		Single Track Railways
Geelektreïseerde Spoorlyne.....		Electrified Railways
Smalspoorlyne.....		Narrow Gauge Railways

Engelse Vo

Landmy

Die ruitlyne van die Suid-Afrikaanse Koördinaatstelsel is aangetoon deur kort swart strepies. 10 000 meter se koördinaatwaardes is ongeveer van 10 000 met

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

LYNPLAATS

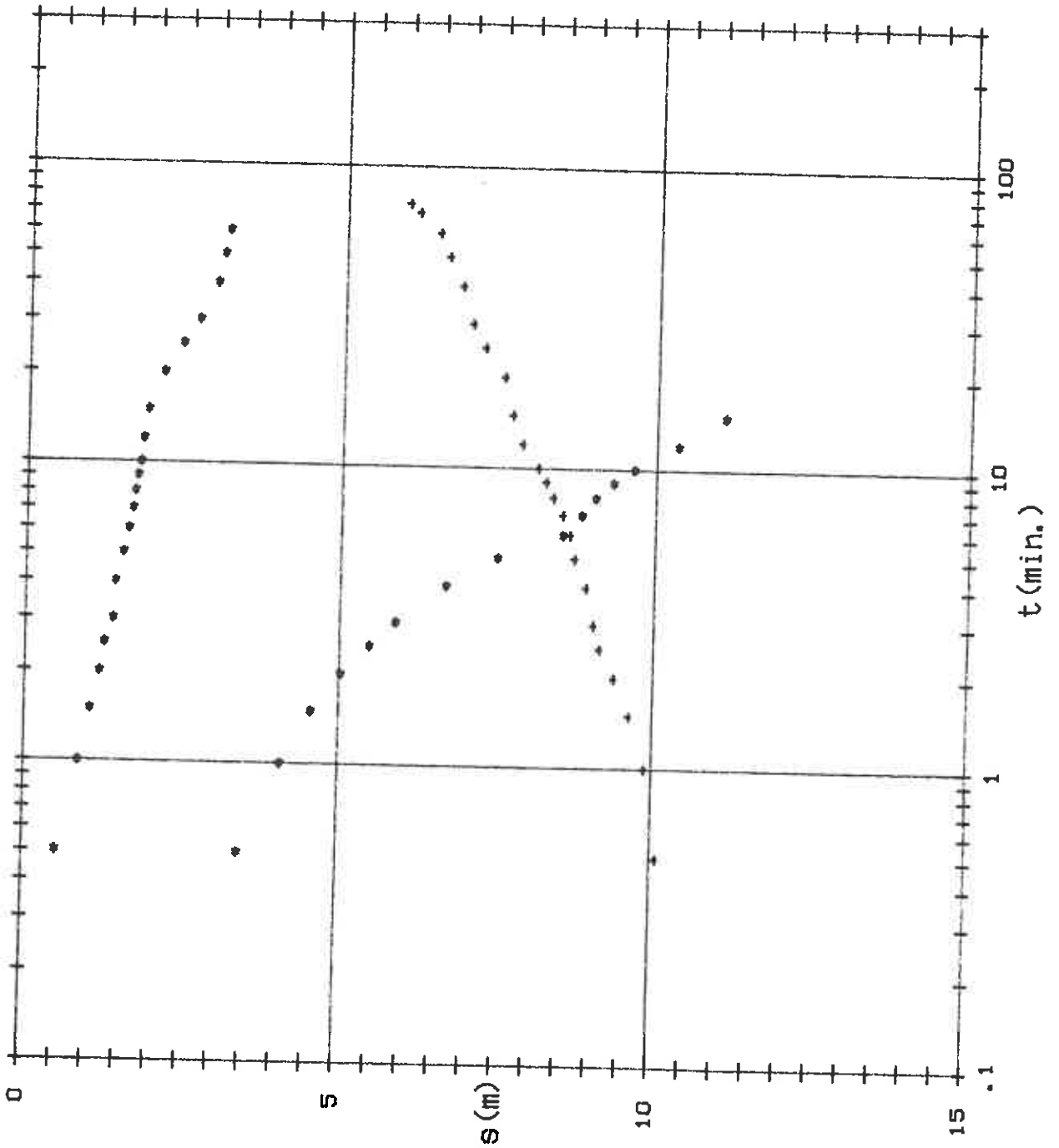
22 07 1992

B.H. No. 10-77187

$Q_1 = .18 \text{ l/s}$

$Q_2 = .45 \text{ l/s}$

S.W.L. = 22.83 m

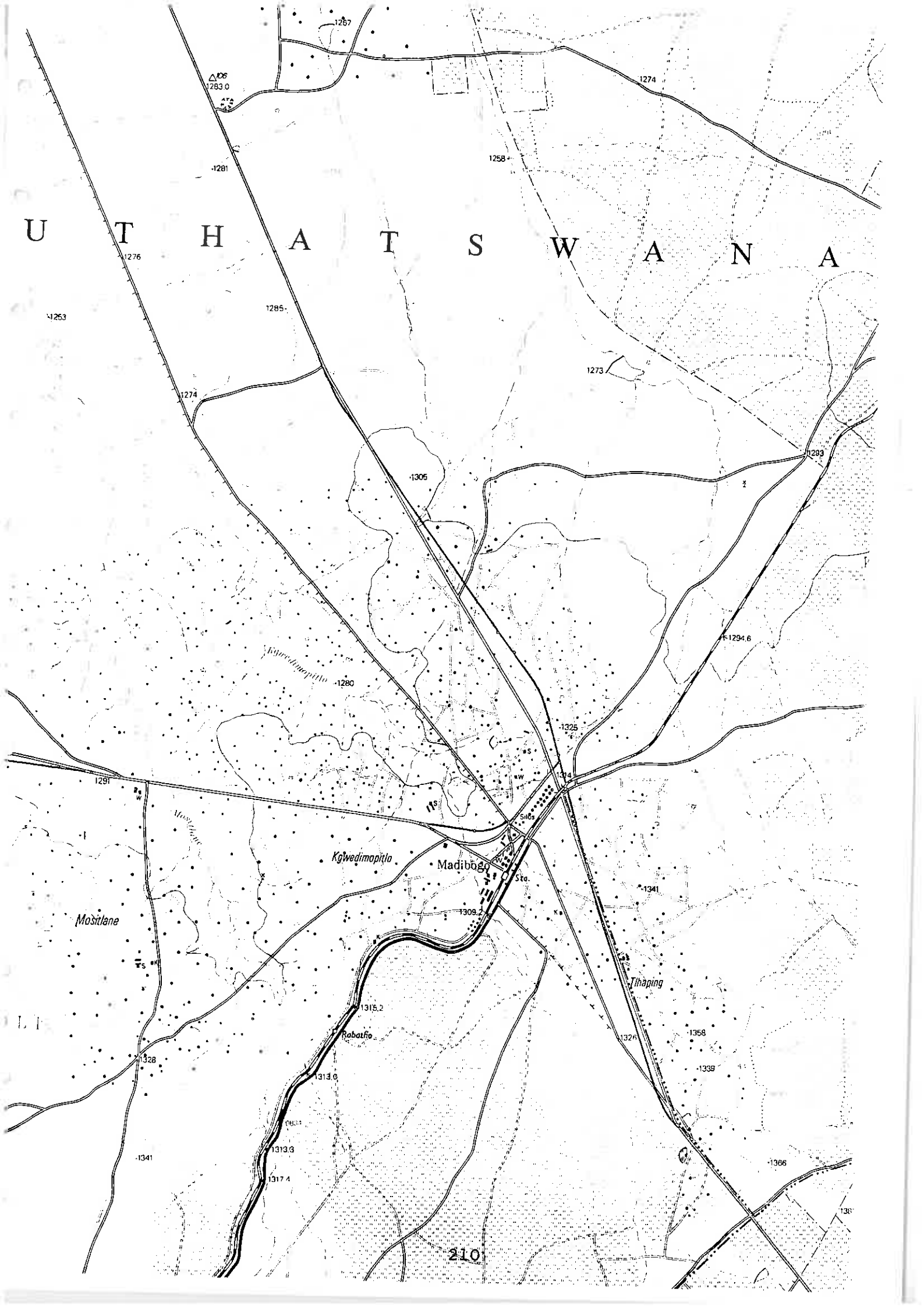


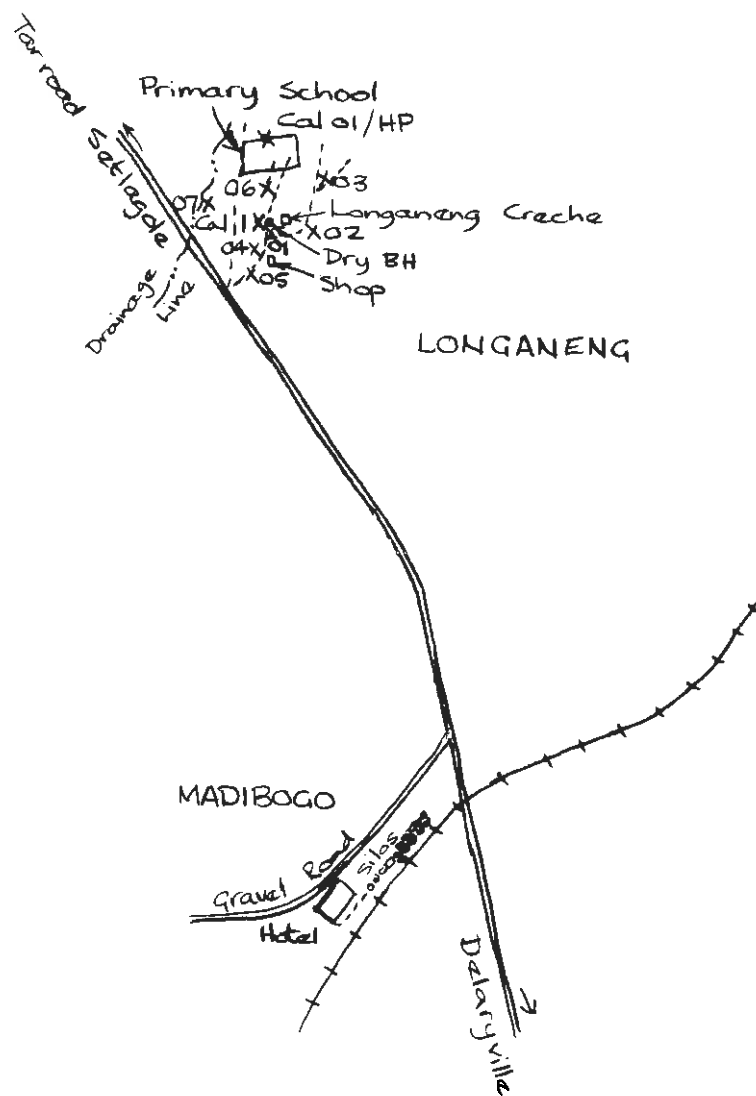
MADIBOGO

Longaneng Creche

No site selected

U T H A T S W A N A





Locality Plan of Longaneng

Overlay to Photo No 332 (strip 19)

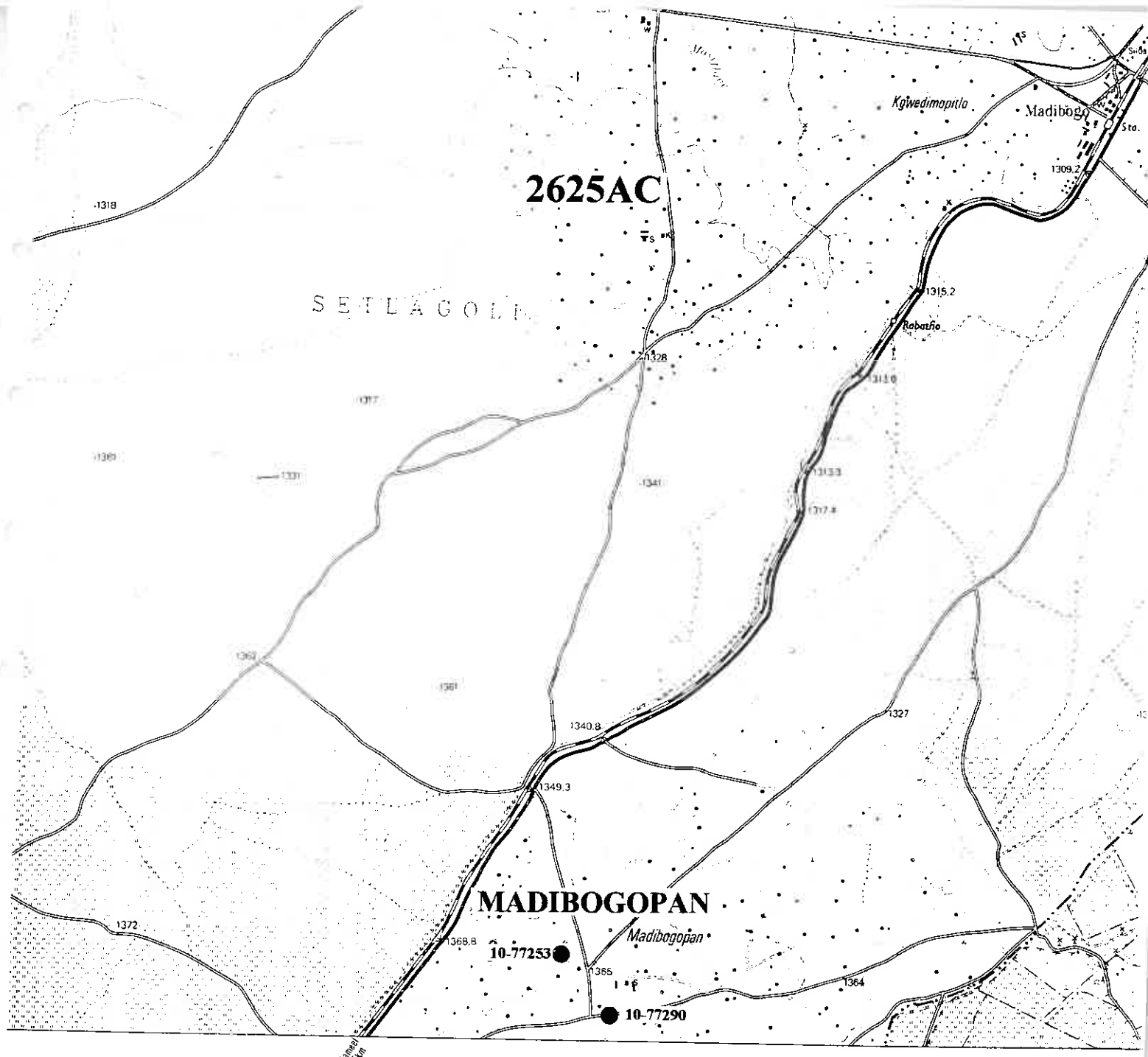
Approx Scale 1:30 000

MADIBOGO PAN

Including boreholes

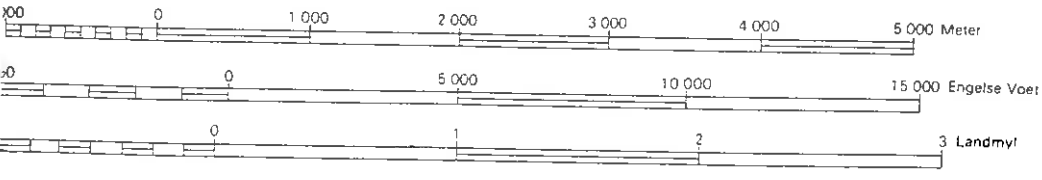
10-77253 - Clinic

10-77290 - Kgathwang ELC



1:50 000

KONTOREKLEINSTE RUIMTE 100 METER

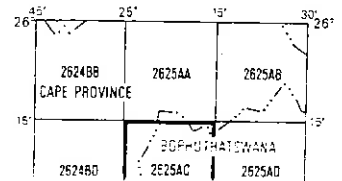


Heights are in metres to ground level
Hoogtes is in meter op grondhoogte

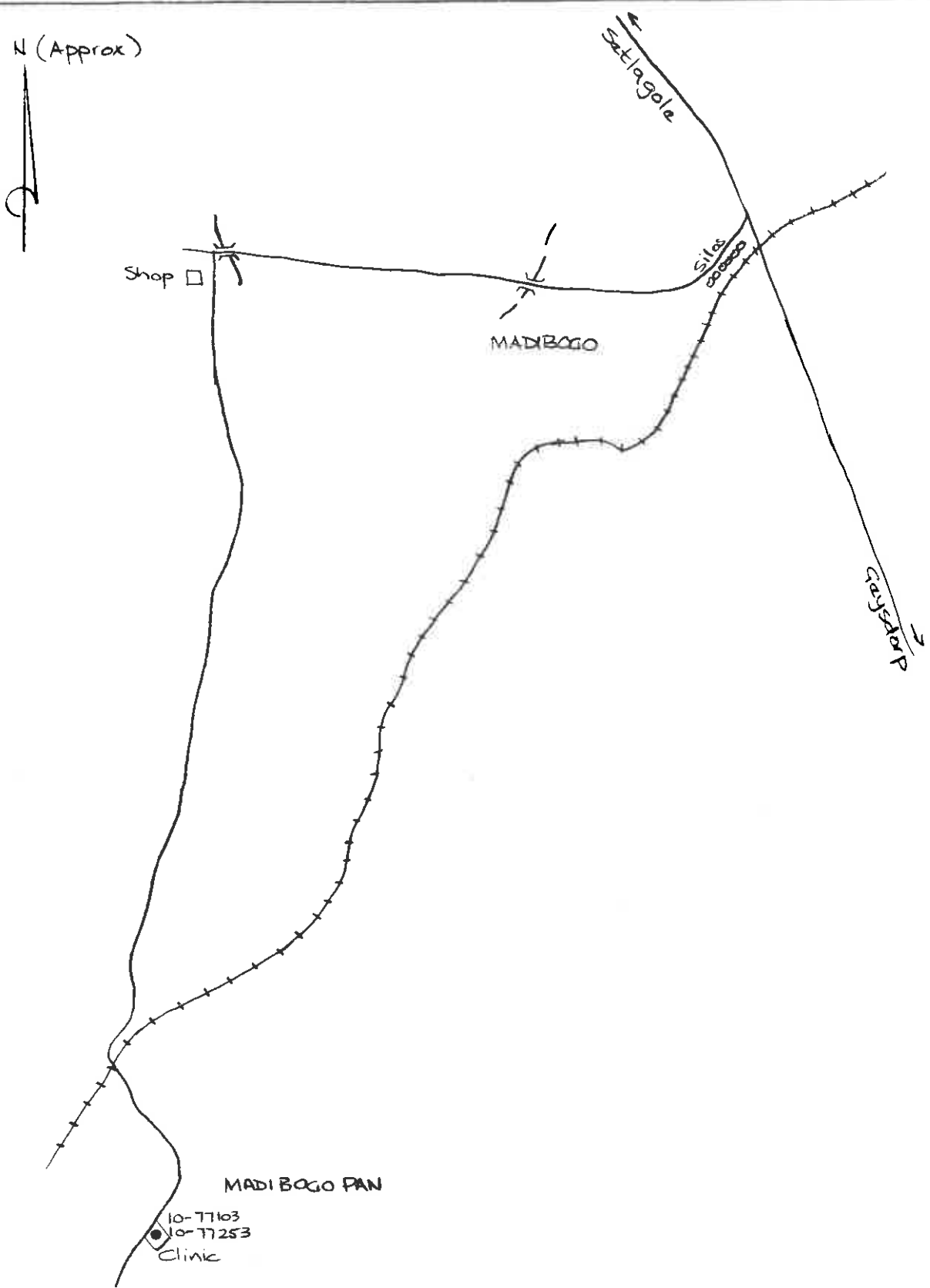
...
...
...
...

Gauss Conform Projection, Central Meridian 25° East, Clarke 1880 Spheroid
Gauss se Konforme Projeksie, Middellmeridiaan 25° Oos Clarke 1880 Stereoid

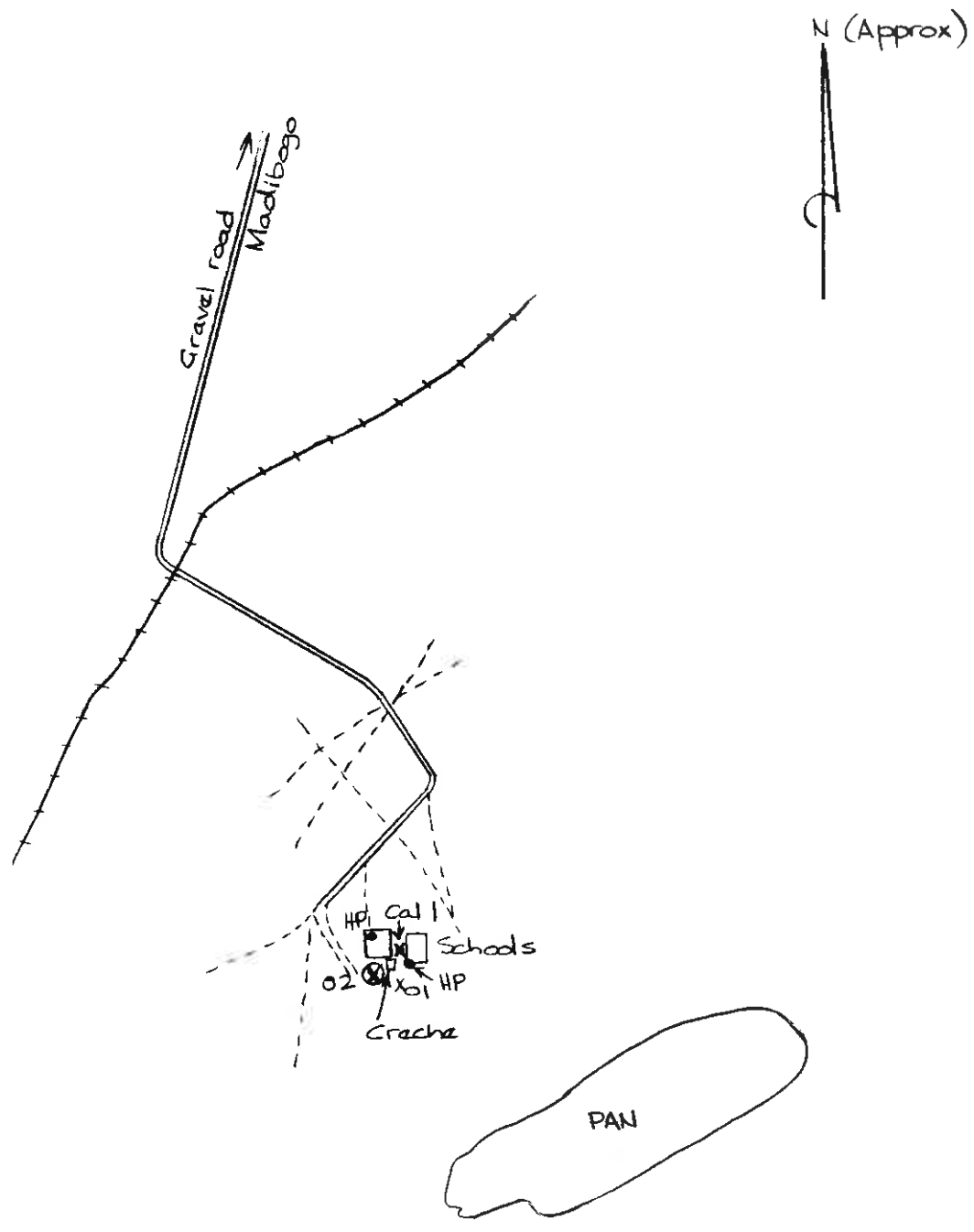
INDEX TO SHEETS INDEKS VAN VELLE



- Magnet
- Huts
- Monume
- Dipping
- Windmi
- Walls
- Anti-ero
- Excavati
- Perenni
- Non-per
- Dry Pan
- Springs
- Marshes
- Pipeline
- Photo C
- Promine
- Terraces
- Culvert



Locality Plan of Borehole 10-77253
 Topographic sheet 2625 AC MADIBOGO
 Approx Scale 1:50 000



Locality Plan of Kgathawang Pre-school (Madibogopan)
 Overlay to Photo No 177 (strip 20)
 Approx Scale 1 : 30 000

BOREHOLE LOG

DISTRICT: DITSOBOTLA

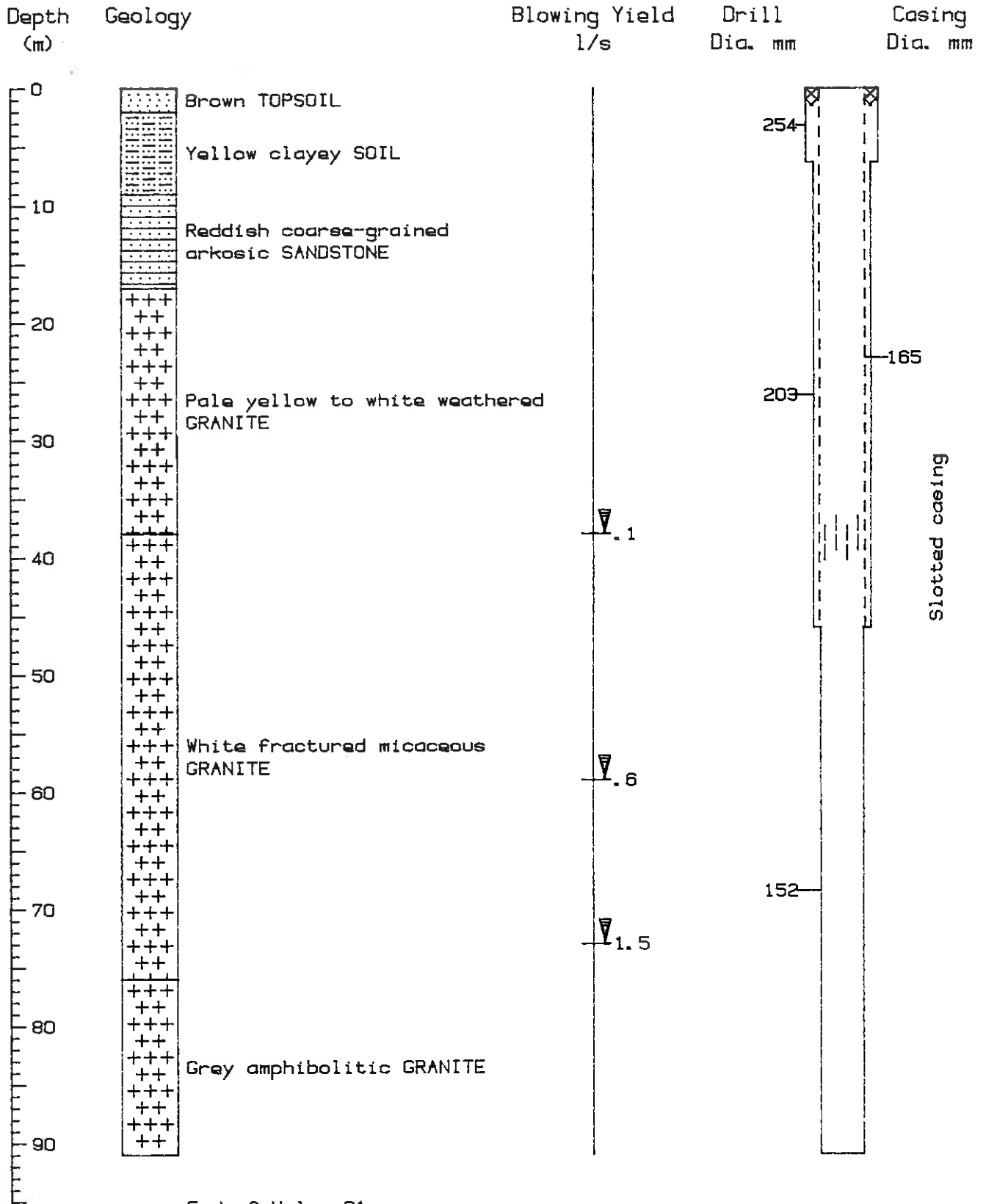
LOCALITY: MADIBOGOPAN CLINIC

BH. No. 10-77253

Geoph. Peg No. REHAB

Coordinates +2931175X -14425Y

Elev. (m) 1350



STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

MADIBOGO PAN

CLINIC

02 07 1992

B.H. No. 10-77253

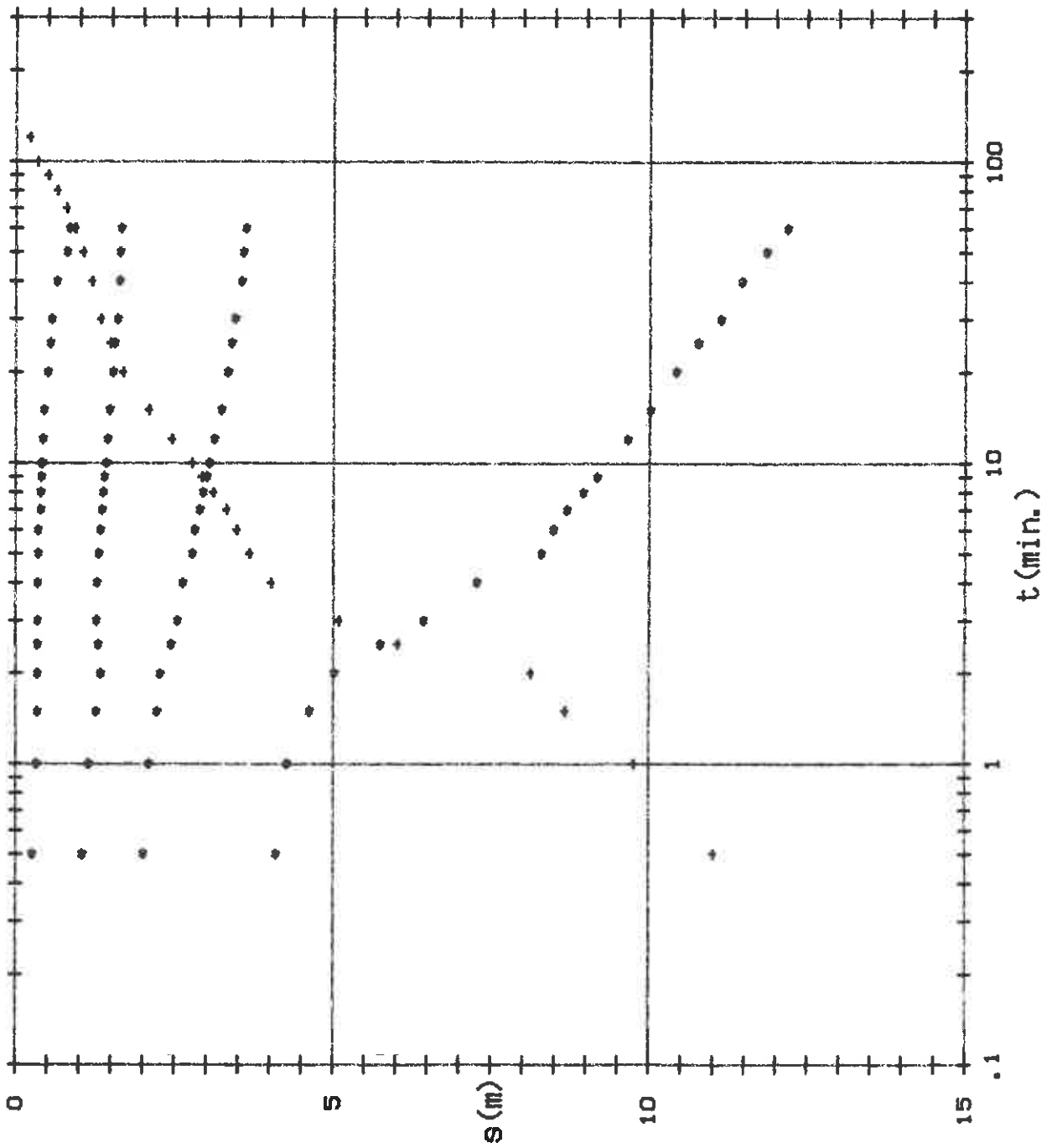
$Q_1 = .21 \text{ l/s}$

$Q_2 = .54 \text{ l/s}$

$Q_3 = 1.1 \text{ l/s}$

$Q_4 = 2.7 \text{ l/s}$

S.W.L. = 24.58 m



CONSTANT DISCHARGE TEST

+ Drawdown data.

* Recovery data.

MADIBOGO PAN

CLINIC

02 07 1992

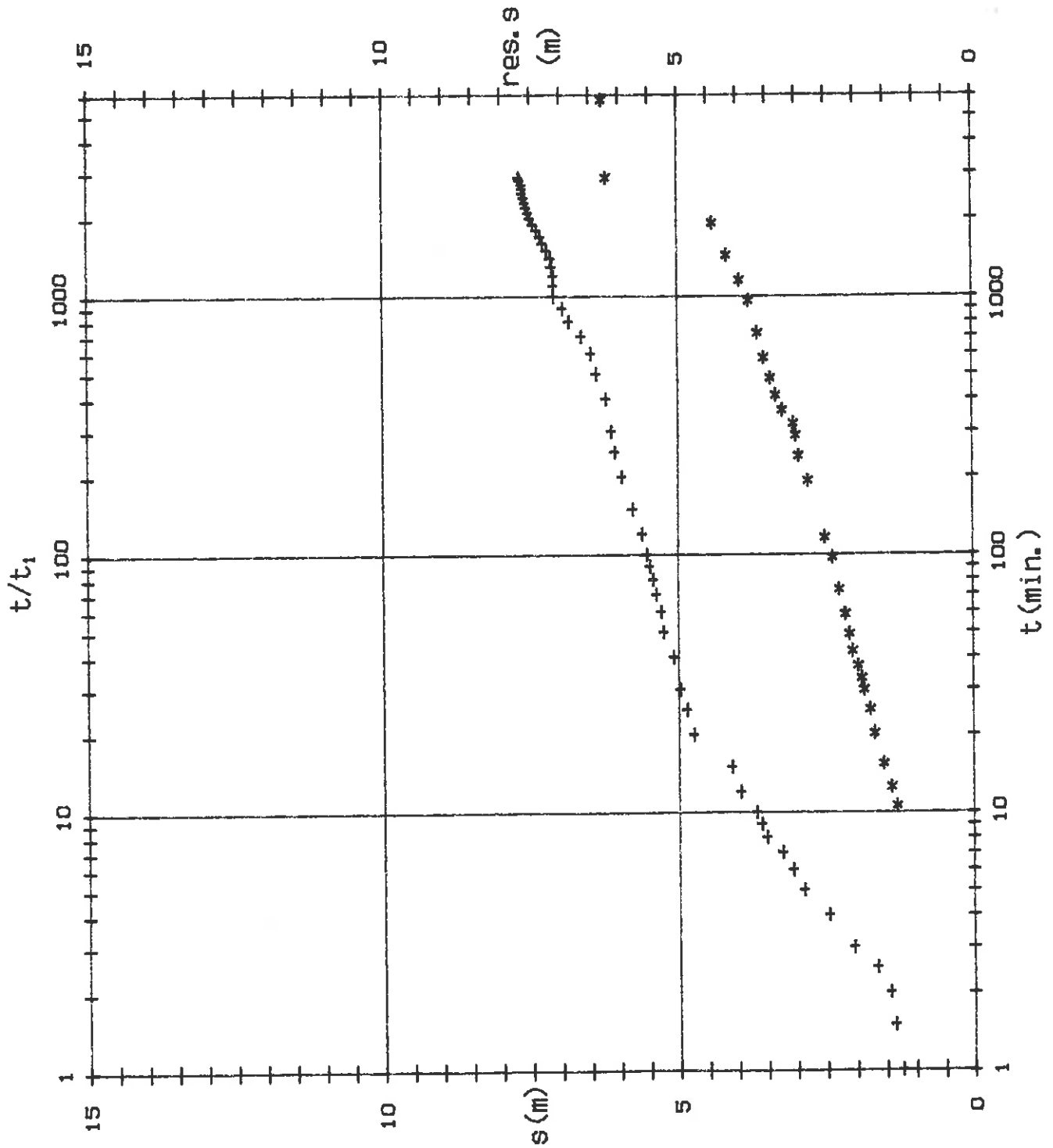
Pumped Borehole
10-77253

Readings on Borehole
10-77253

$Q = 1.35 \text{ l/s}$

S.W.L. = 24.58 m

$T = 7 \text{ m}^2/\text{d}$



+ Field data
 --- Computer model
 - - - d - r model

MADIBOGOPAN KGATLHWANG ELC

V.E.S. 02

CO-ORDINATES
 +2931775X -14755Y

GEOLOGY
 GRANITE

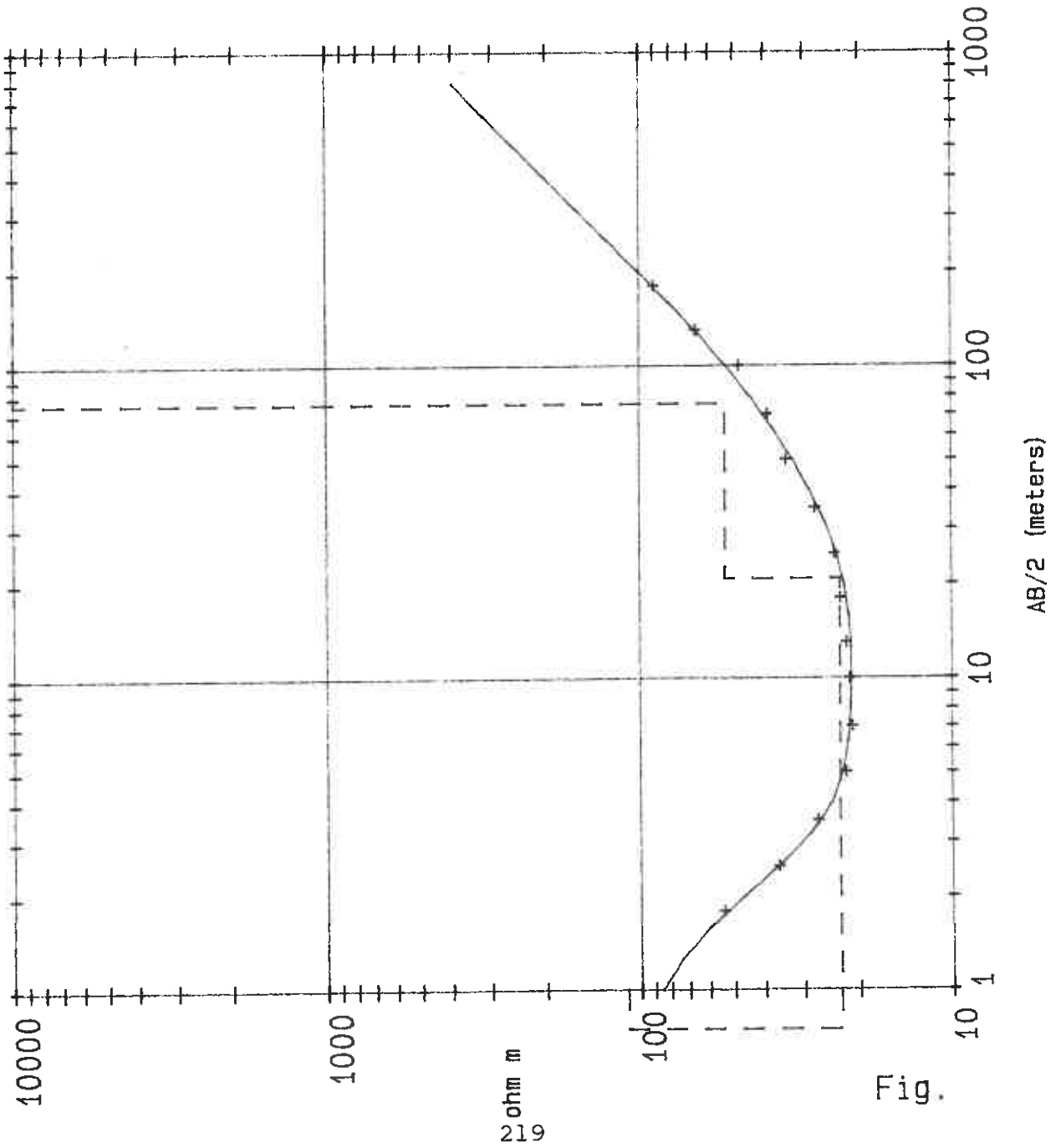


Fig.

BOREHOLE LOG

DISTRICT: DITSOBOTLA

LOCALITY: MADIBOGOPAN E. L. C.

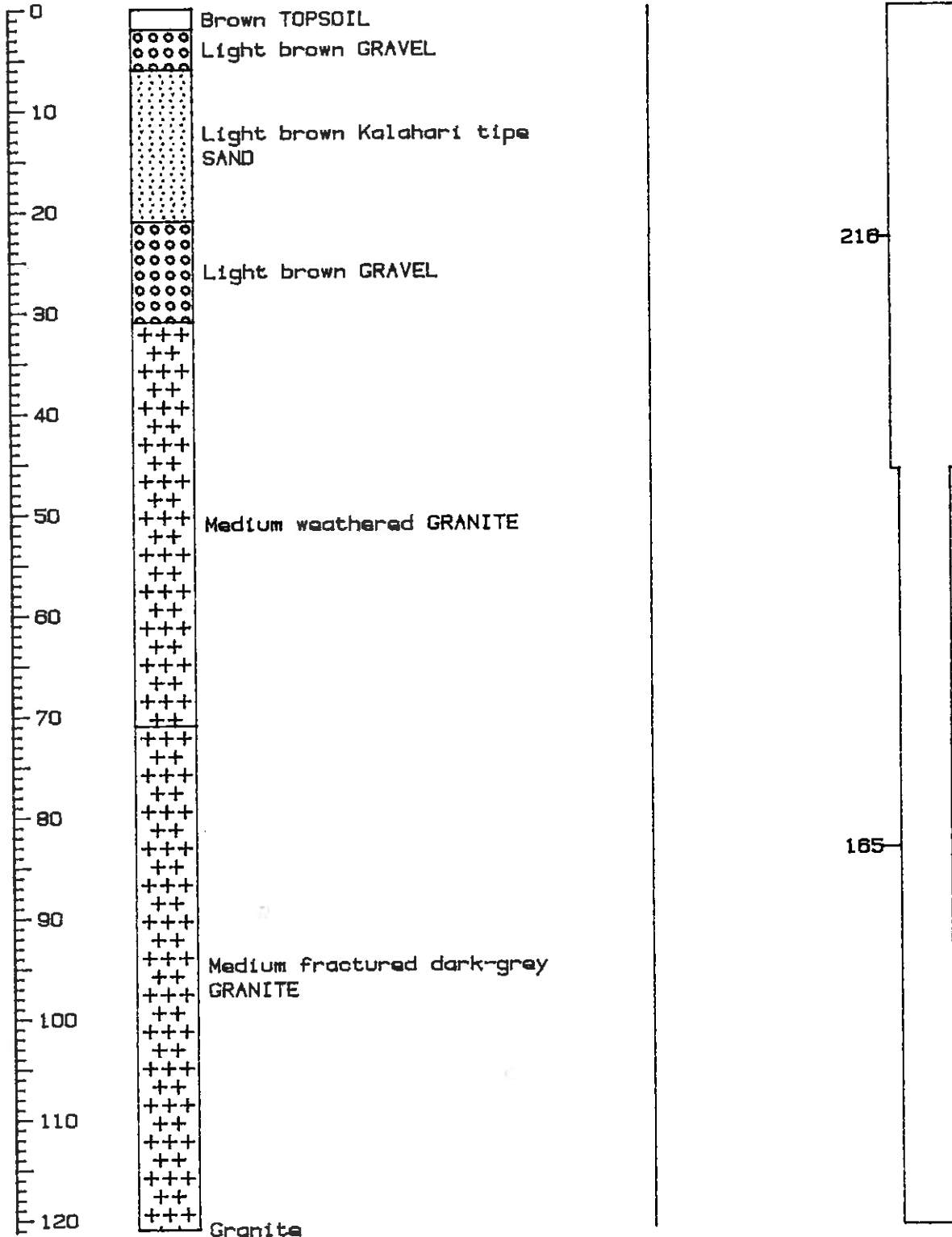
BH. No. 10-77290

Geoph. Peg No. 02

Coordinates +2931775X -14755Y

Elev. (m) 1362

Depth (m)	Geology	Blowing Yield l/s	Drill Dia. mm	Casing Dia. mm
-----------	---------	-------------------	---------------	----------------

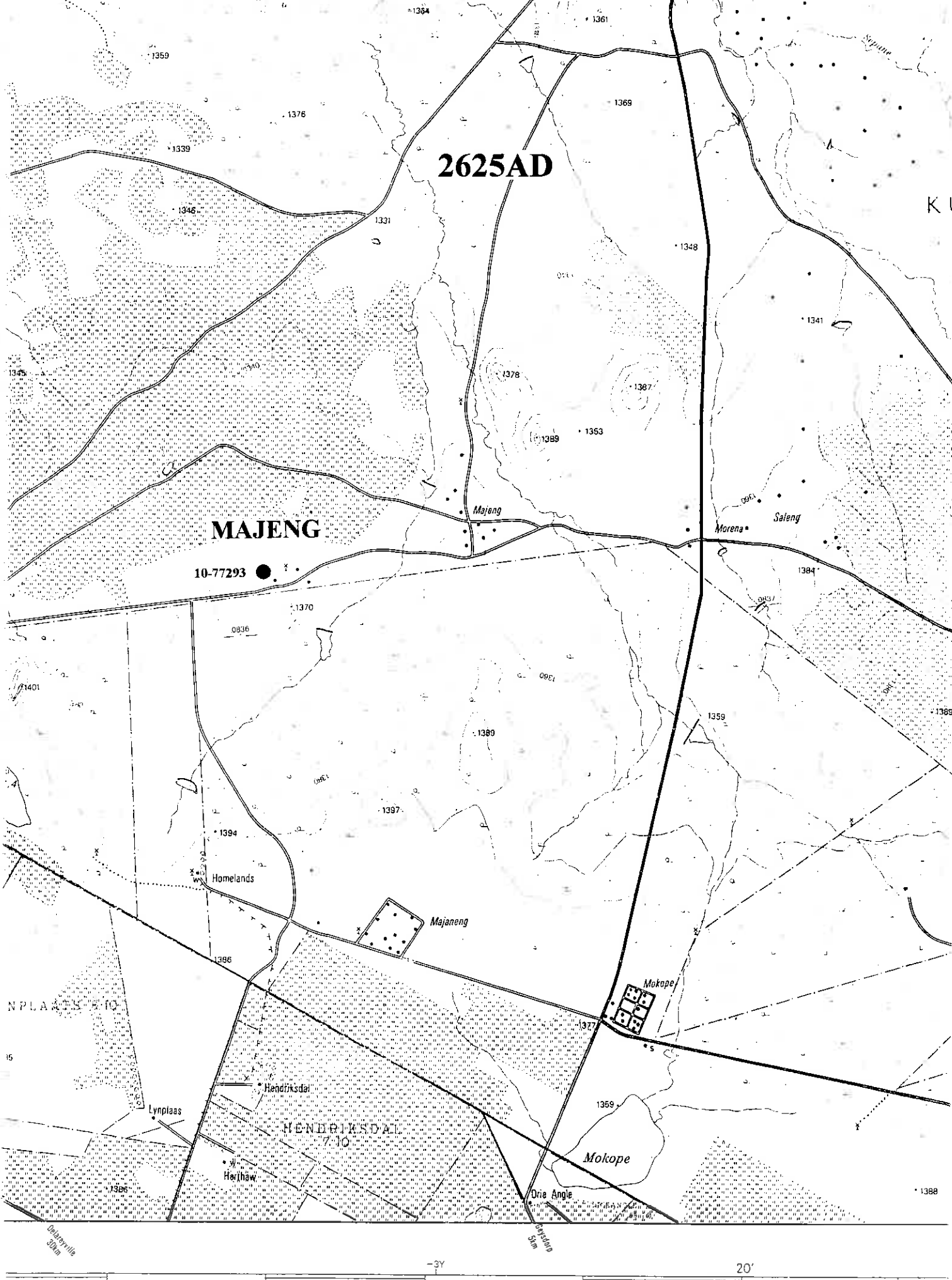


End of Hole 121

MAJENG

Including borehole

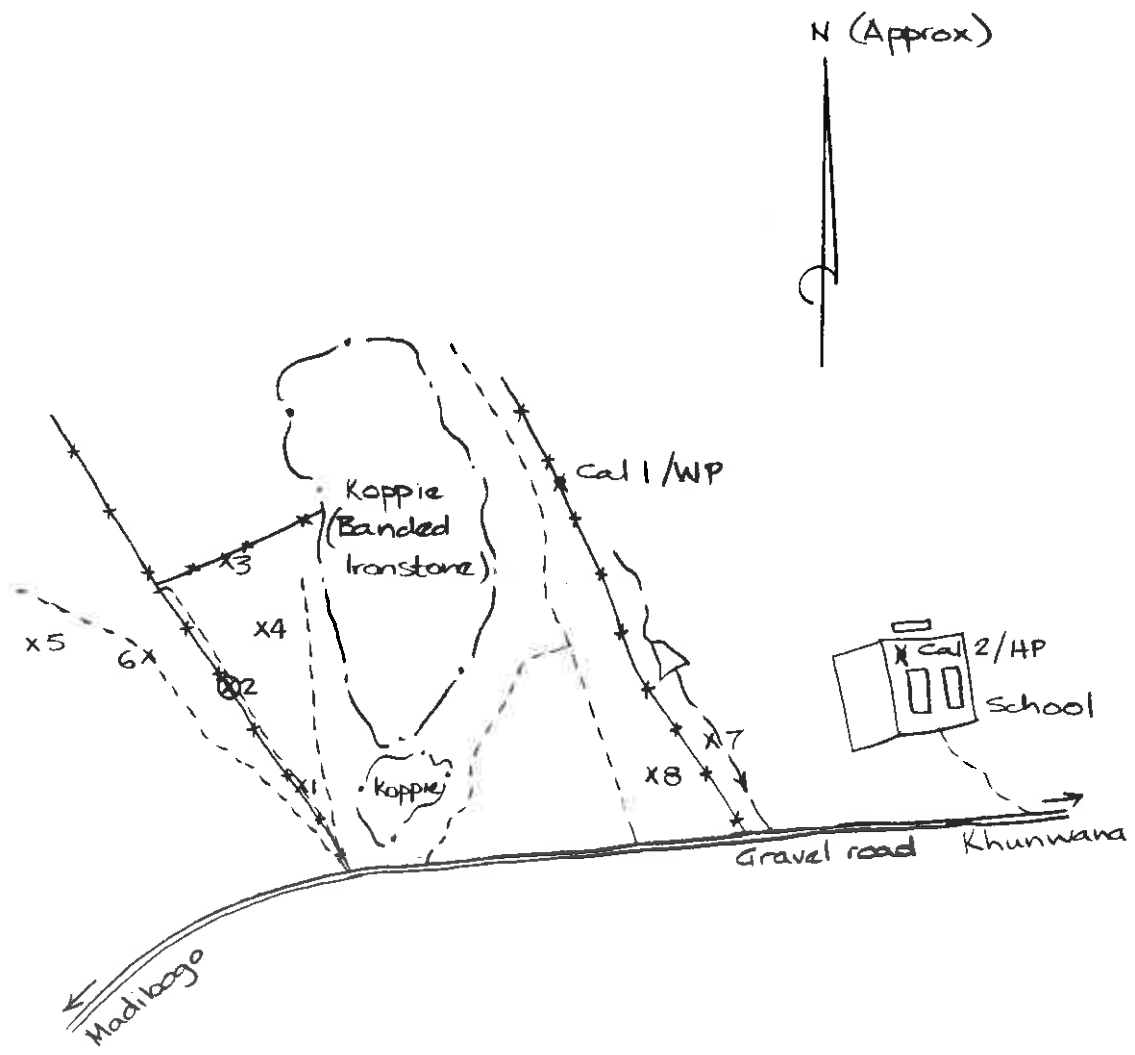
10-77293



deur die Hoofdirekteur van Opmetings en Kartering Privaatsak Mowbray
 by the Chief Director of Surveys and Mapping Private Bag Mowbray

uteursreg State Copyright

Meter 1 000 0



Locality Plan of Majeng
 Overlay to Photo No 315 (strip 14)
 Approx Scale 1:15 000

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

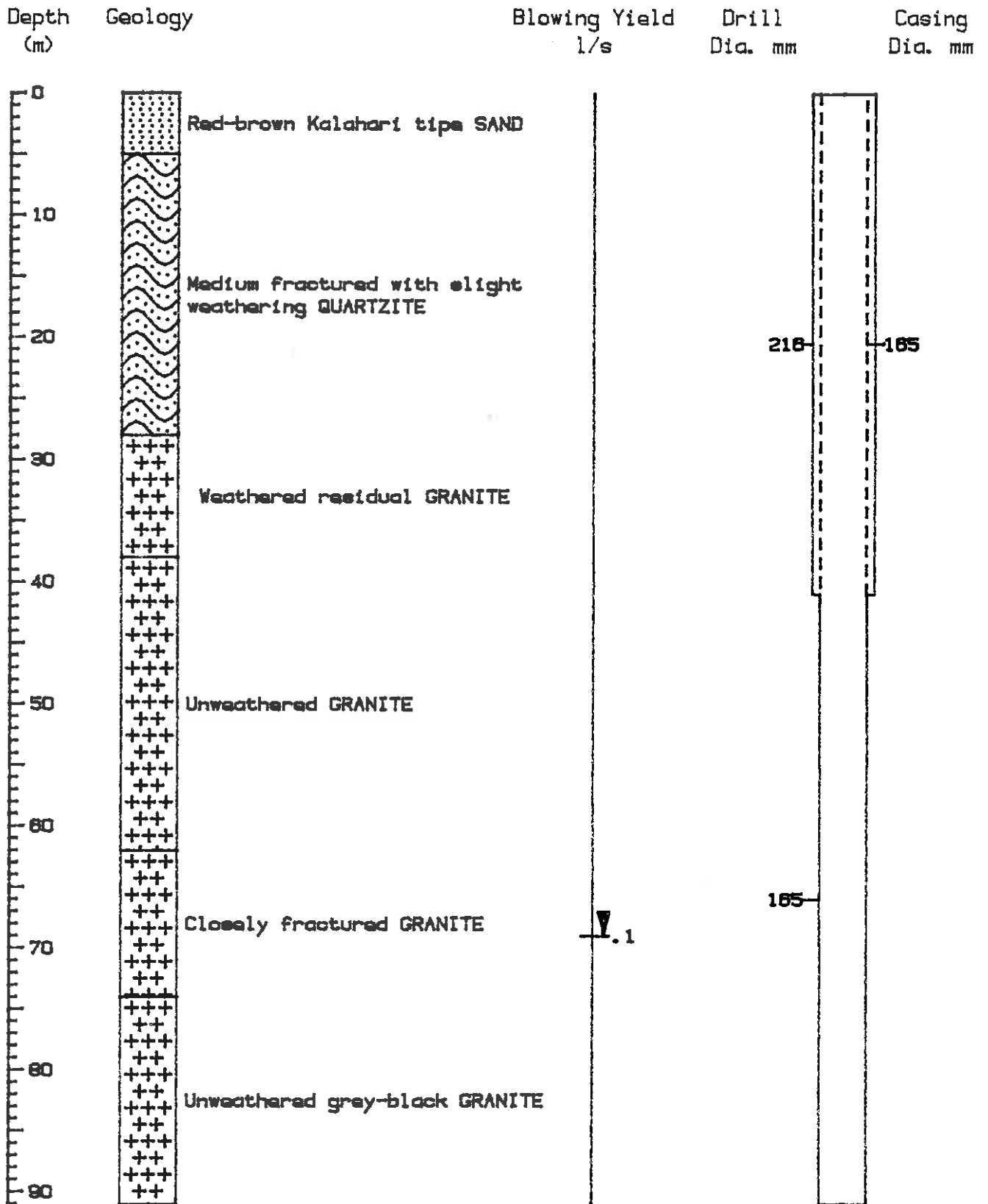
LOCALITY: MAJENG

BH. No. 10-77293

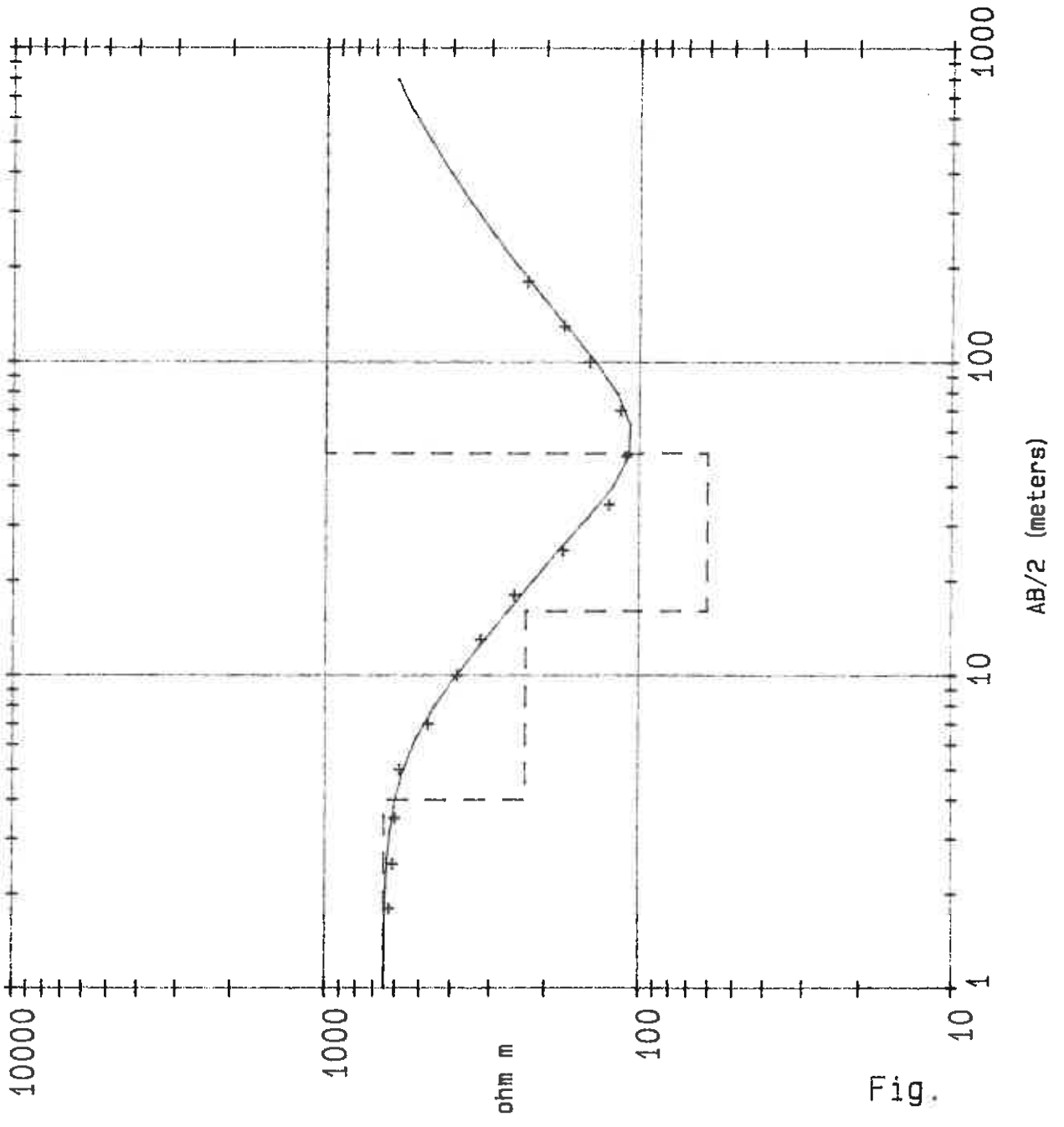
Geoph. Peg No. 02

Coordinates +2925155X -28125Y

Elev. (m) 1351



End of Hole 91



+ Field data
 — Computer model
 - - - r model

MAJENG

V.E.S. 02

CO-ORDINATES
 +2925155X -28125Y

GEOLOGY
 GRANITE

Fig.

STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

MAJENG

25 05 1992

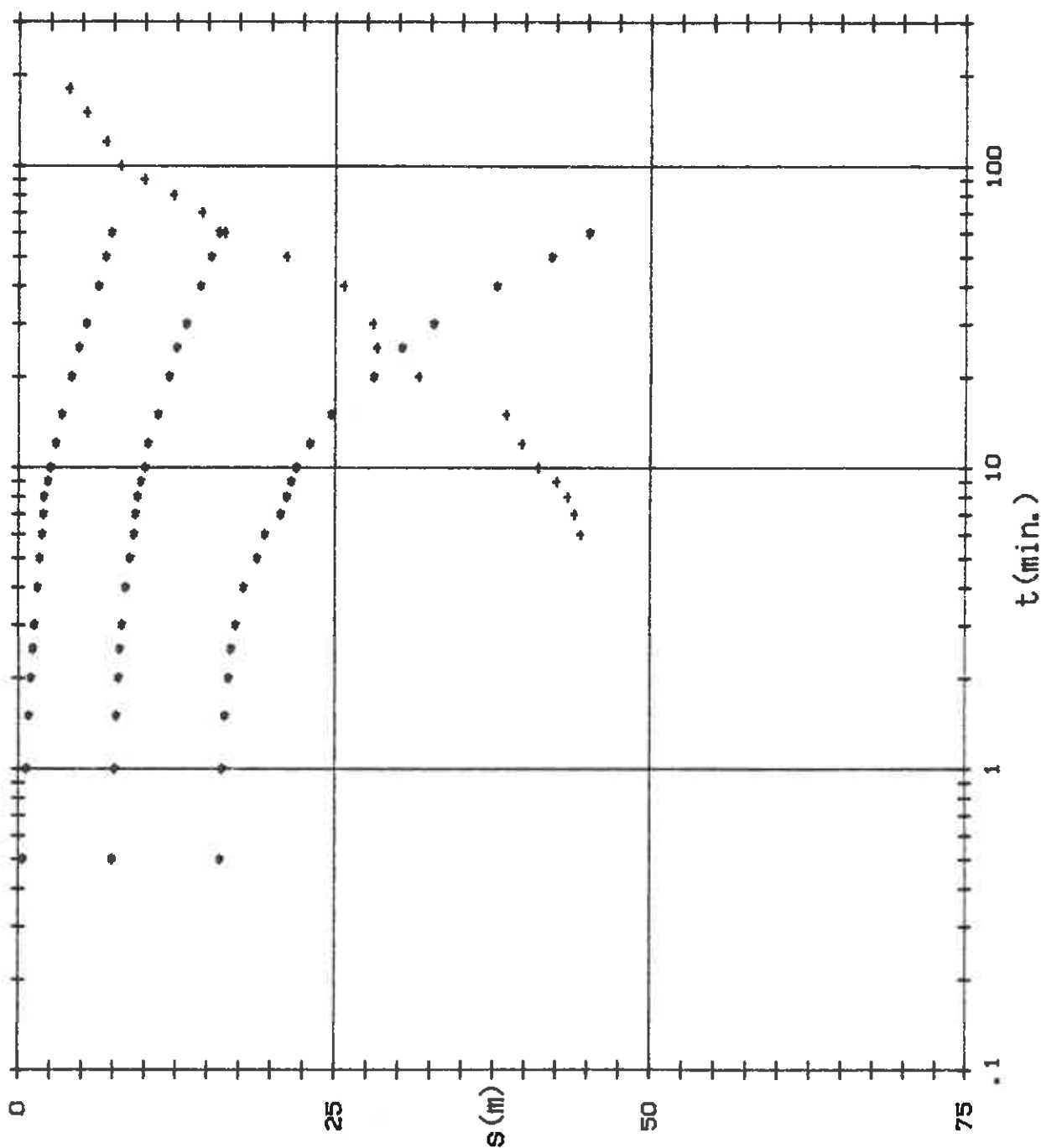
B.H. No. 10-77293

$Q_1 = .11 \text{ l/s}$

$Q_2 = .22 \text{ l/s}$

$Q_3 = .4 \text{ l/s}$

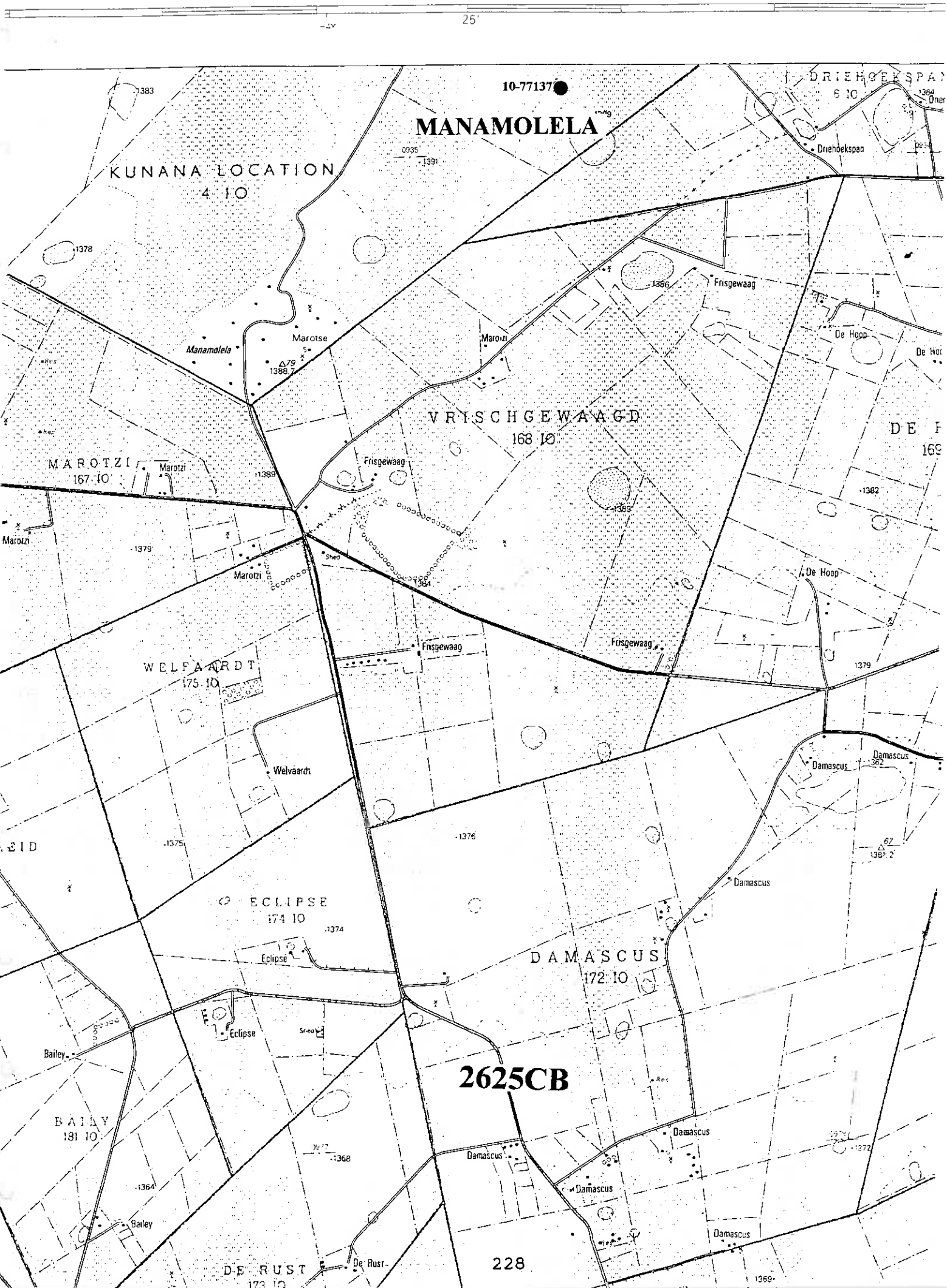
S.W.L. = 27.36 m



MANAMOLELA

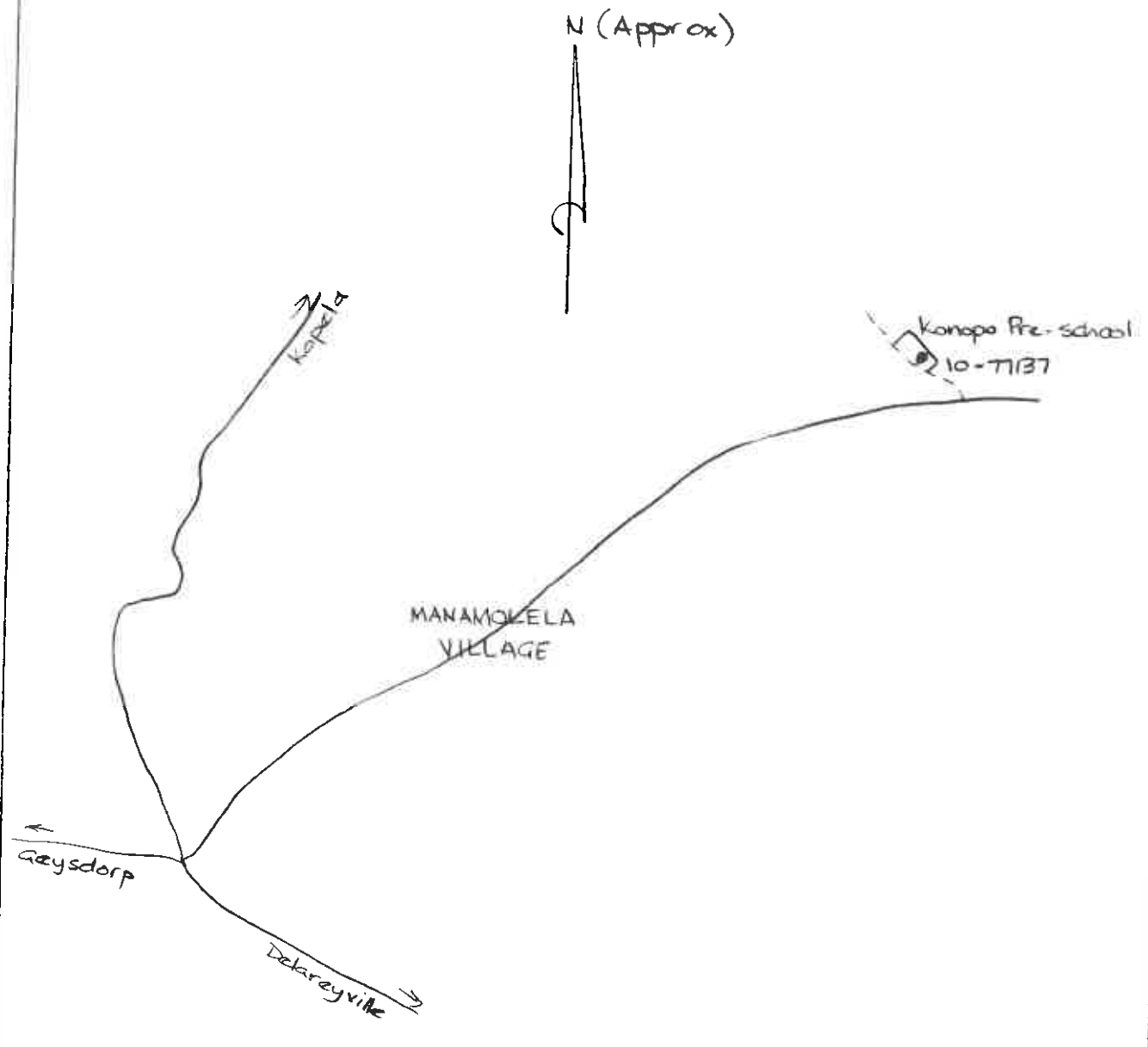
Including borehole

10-77137 - Konopo P/S



2625CB

228



Locality Plan of Borehole 10-77137
Topographic sheet 2625 CB DELAREYVILLE
Approx Scale 1:50 000

STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

MANAMOLELA

KONOPO P/S

14 07 1992

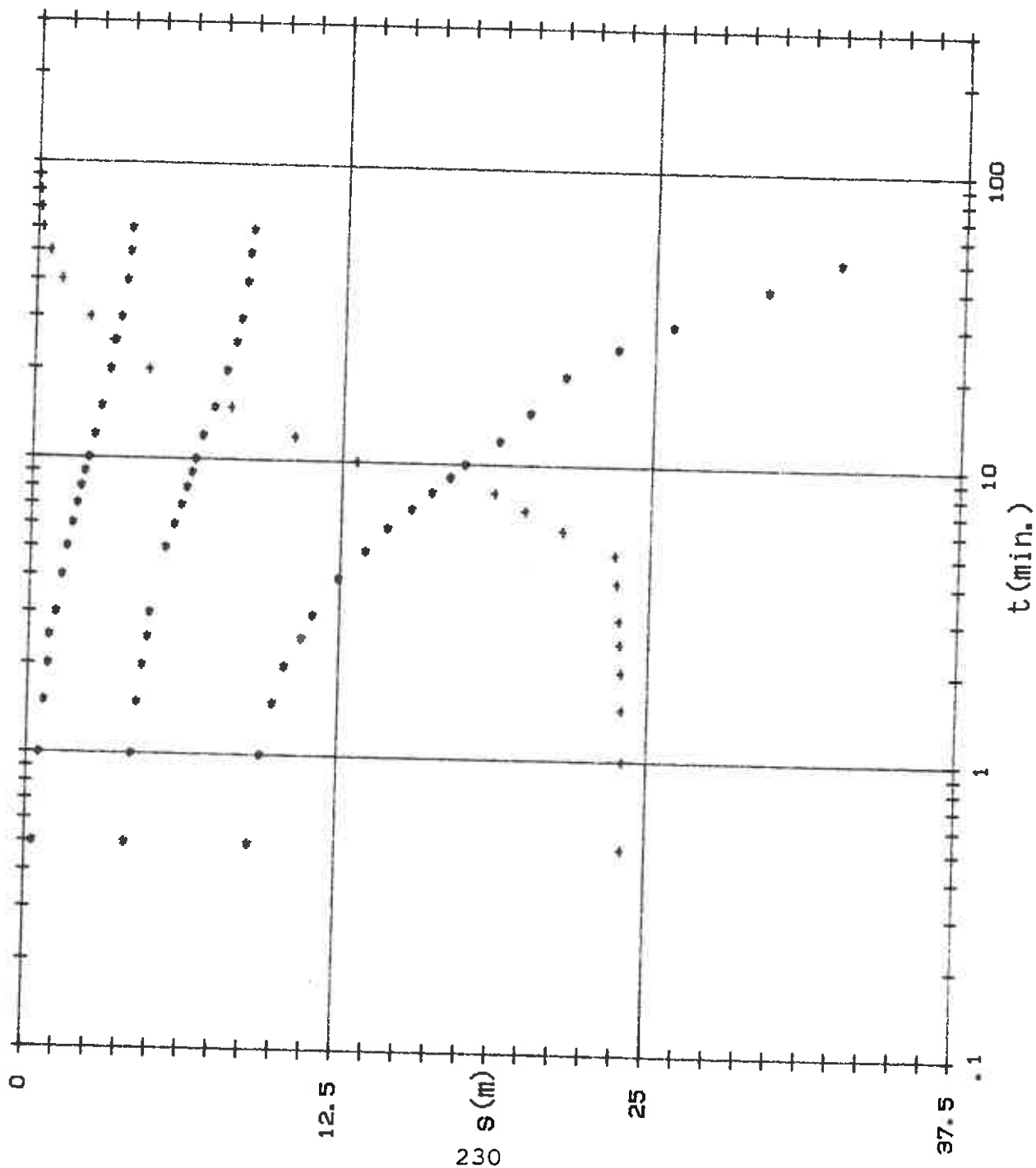
B.H. No. 10-77137

$Q_1 = .25 \text{ l/s}$

$Q_2 = .51 \text{ l/s}$

$Q_3 = 1.1 \text{ l/s}$

S.W.L. = 10.03 m



CONSTANT DISCHARGE TEST

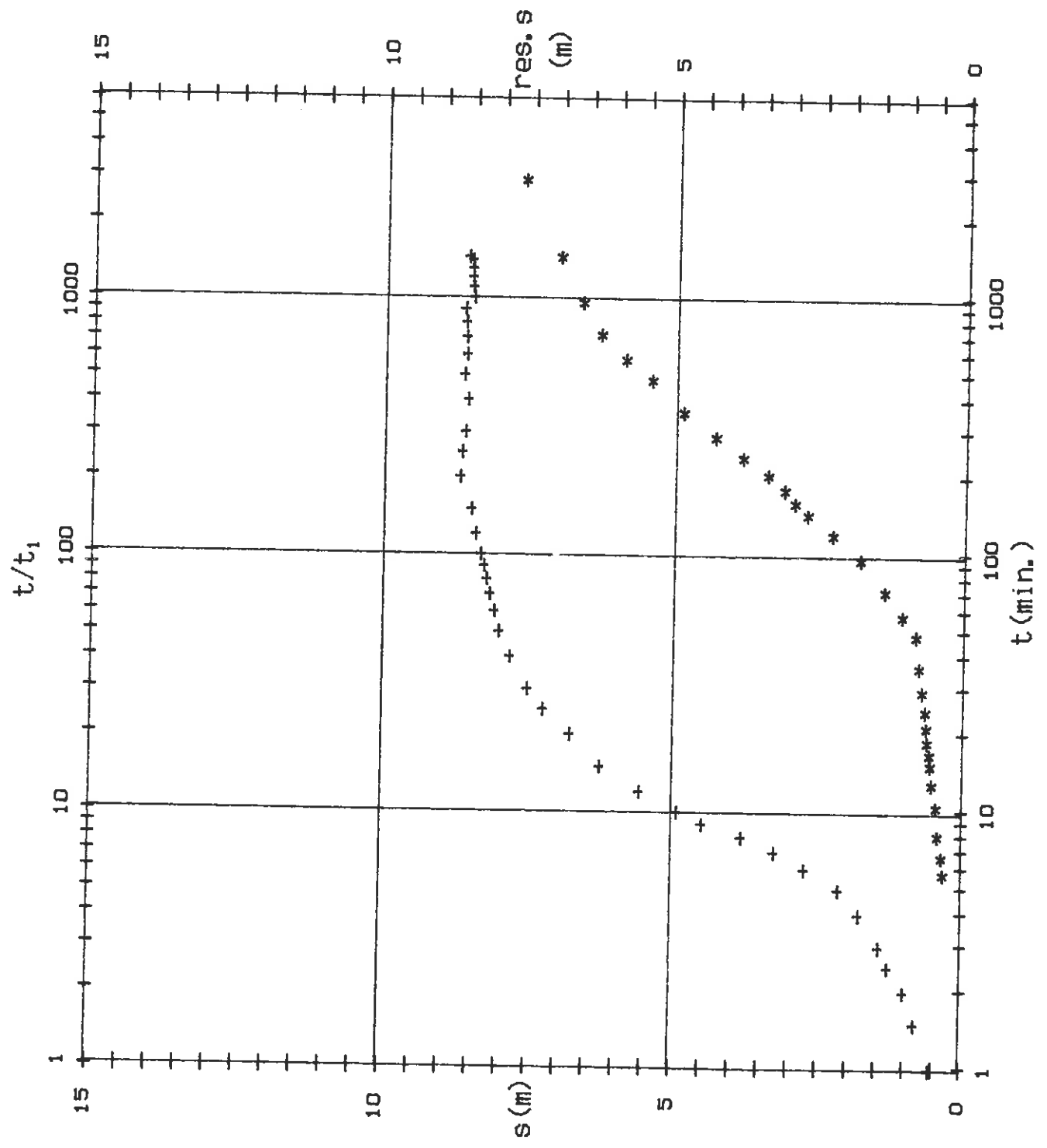
+ Drawdown data.
* Recovery data.

MANAMOLELE
KONOPO P/S
15 07 1992

Pumped Borehole
10-77137

Readings on Borehole
10-77137

$Q = 15 \text{ l/s}$
 $S.W.L. = 10.03 \text{ m}$
 $T = 1.5 \text{ m}^2/\text{d}$



MAREETSANE

Including boreholes

10-77276

10-77277

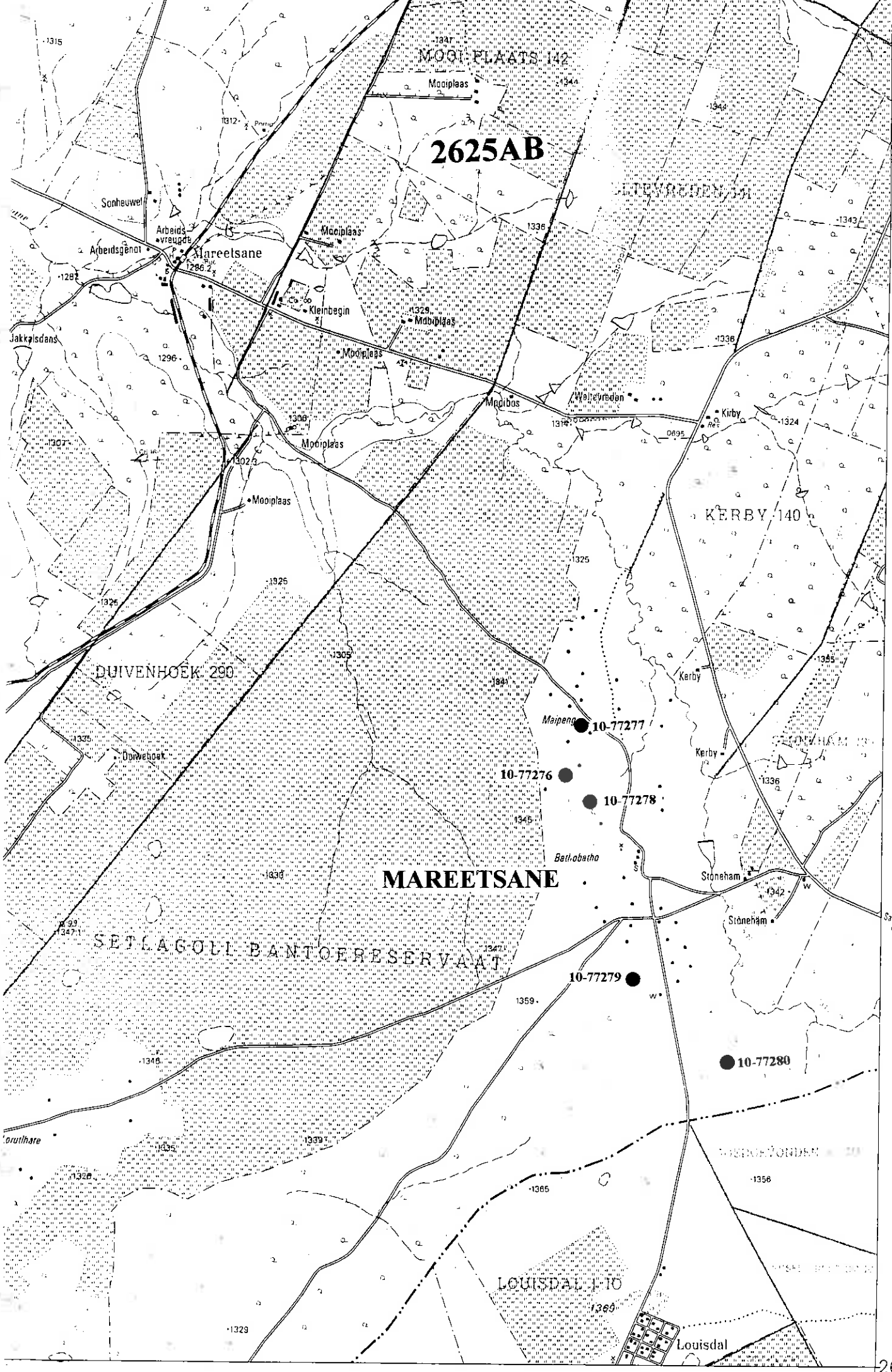
10-77278 - Mpoetsile P/S

10-77279

10-77280

MOOI PLAATS 142

2625AB

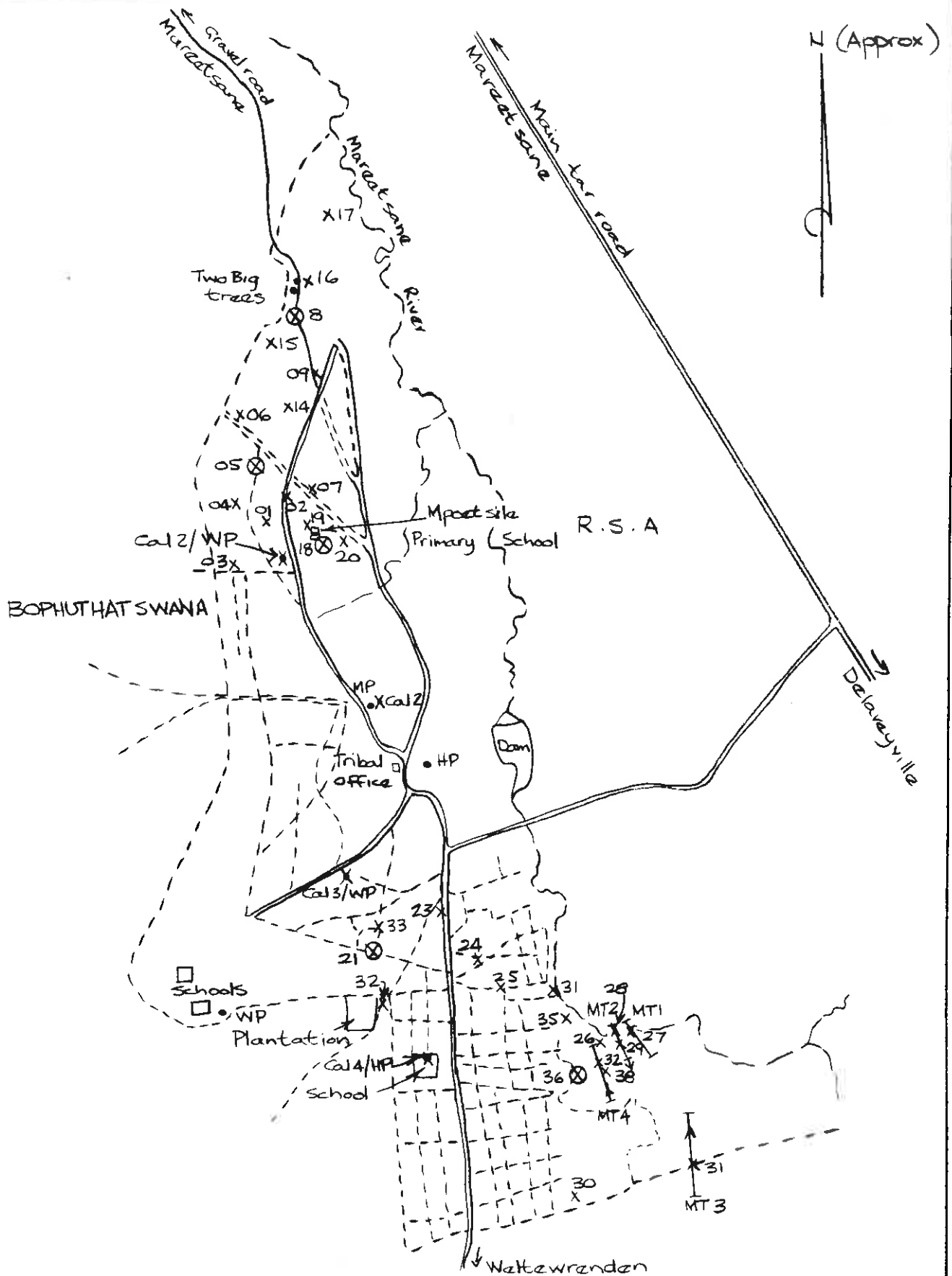


10'

Sannieshof 86km

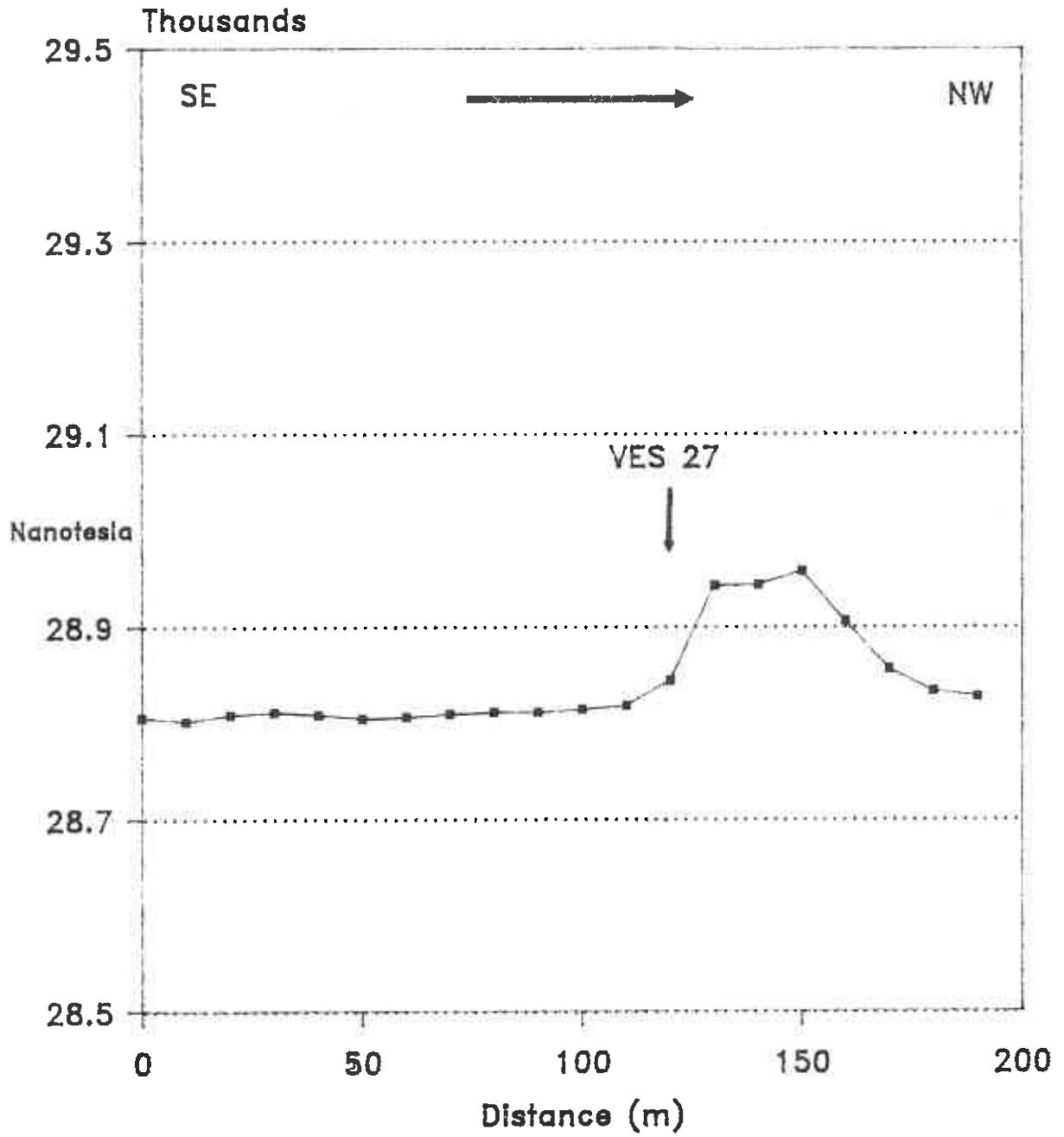
20°X

26°15'

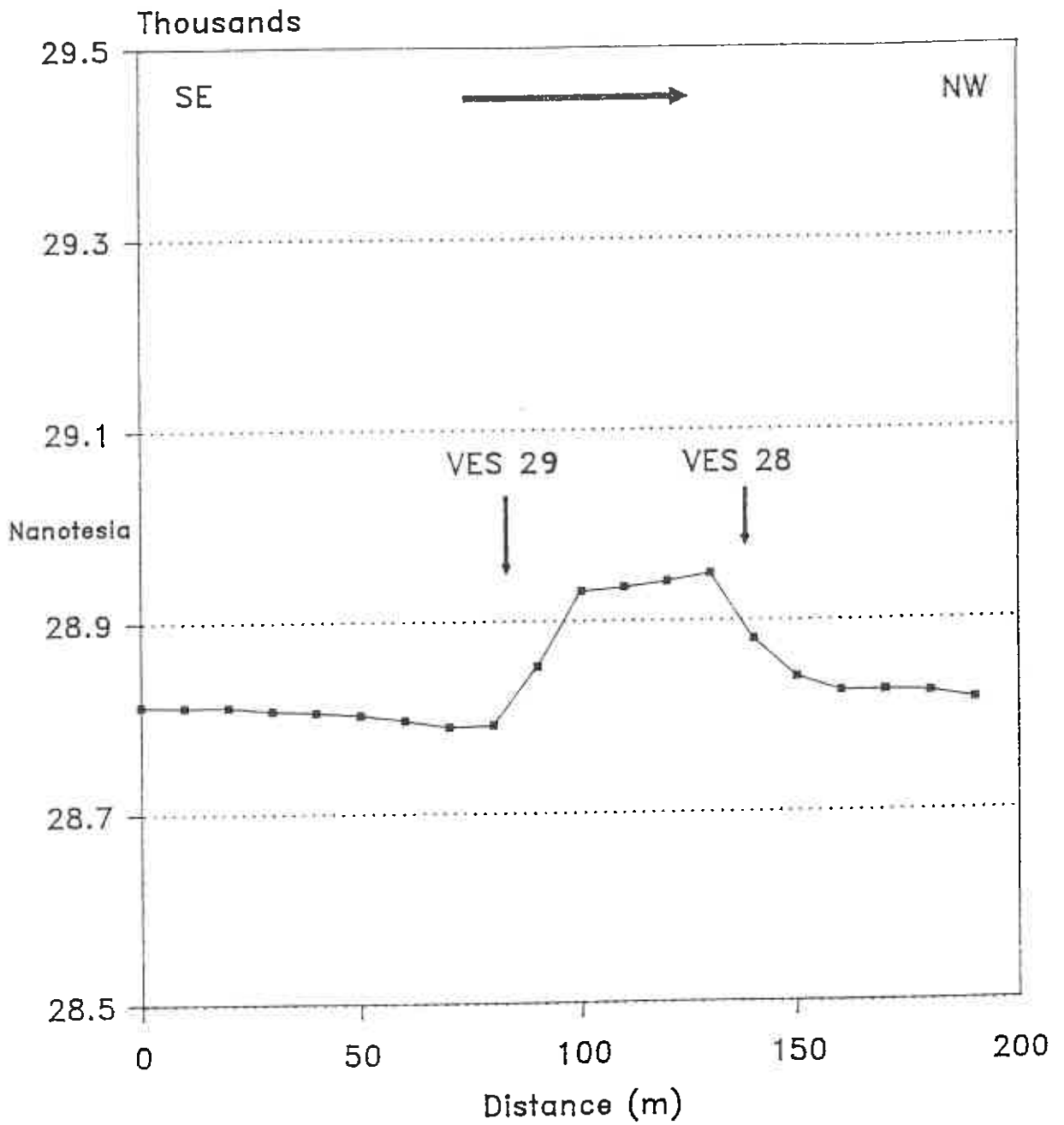


Locality Plan of Mareat sane
 Overlay to Photo Nos 840 (strip 14) and 755 (strip 15)
 Approx Scale 1:30 000

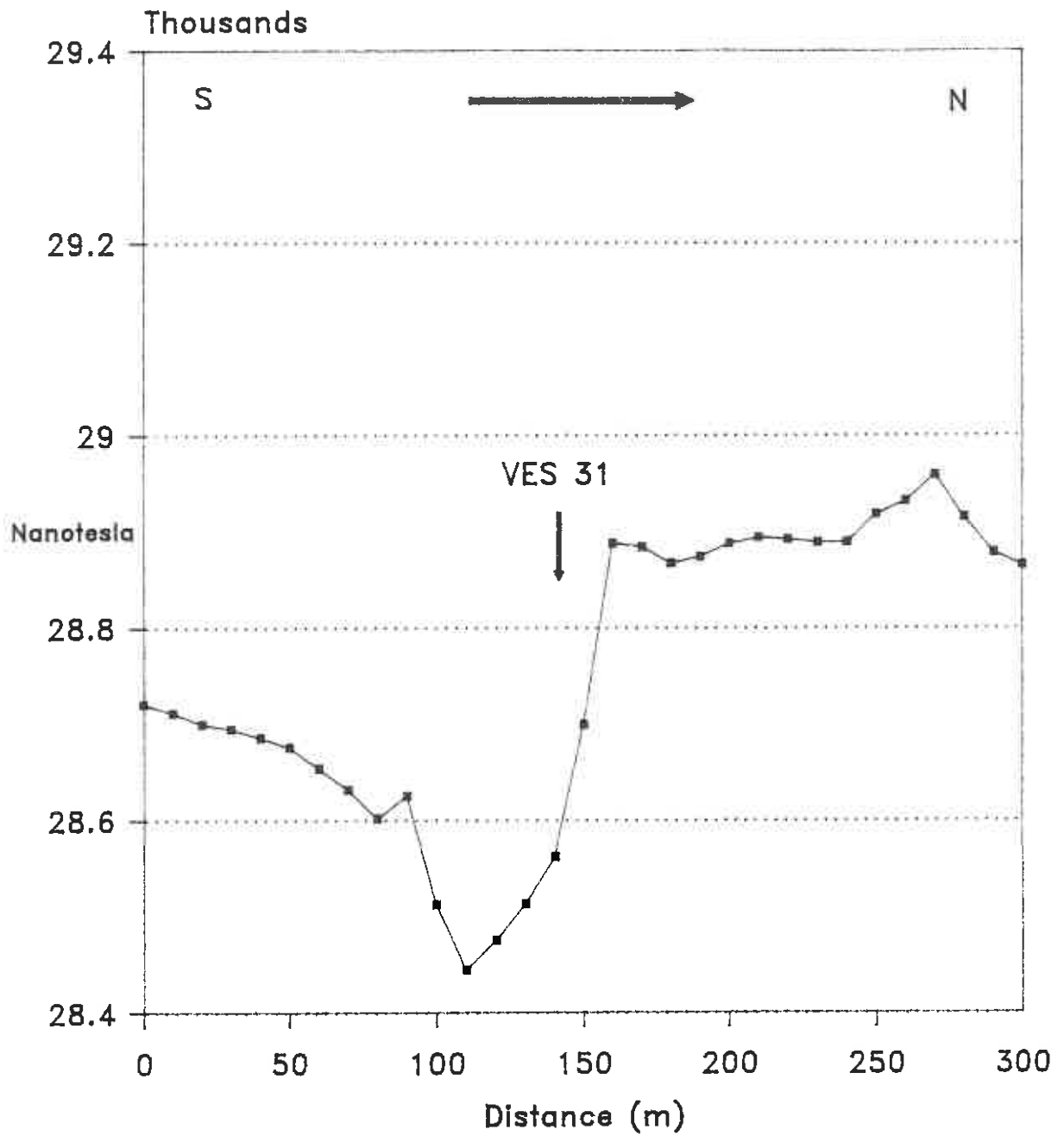
Magnetic Traverse #01
District: Ditsobotla
Locality: Mareetsane



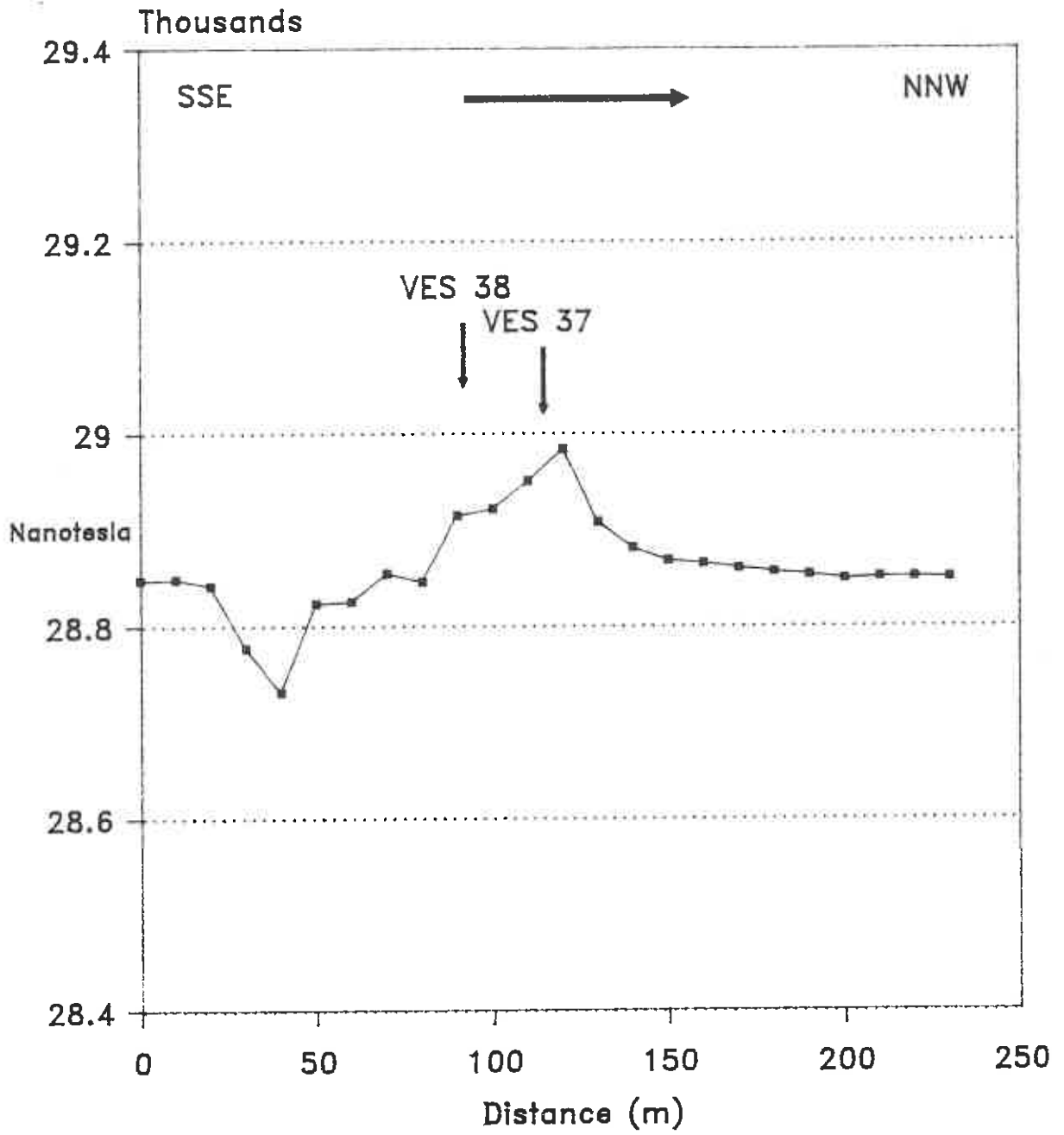
Magnetic Traverse #02
District: Ditsobotla
Locality: Mareetsane



Magnetic Traverse #03
District: Ditsobotla
Locality: Mareetsane



Magnetic Traverse #04
District: Ditsobotla
Locality: Mareetsane



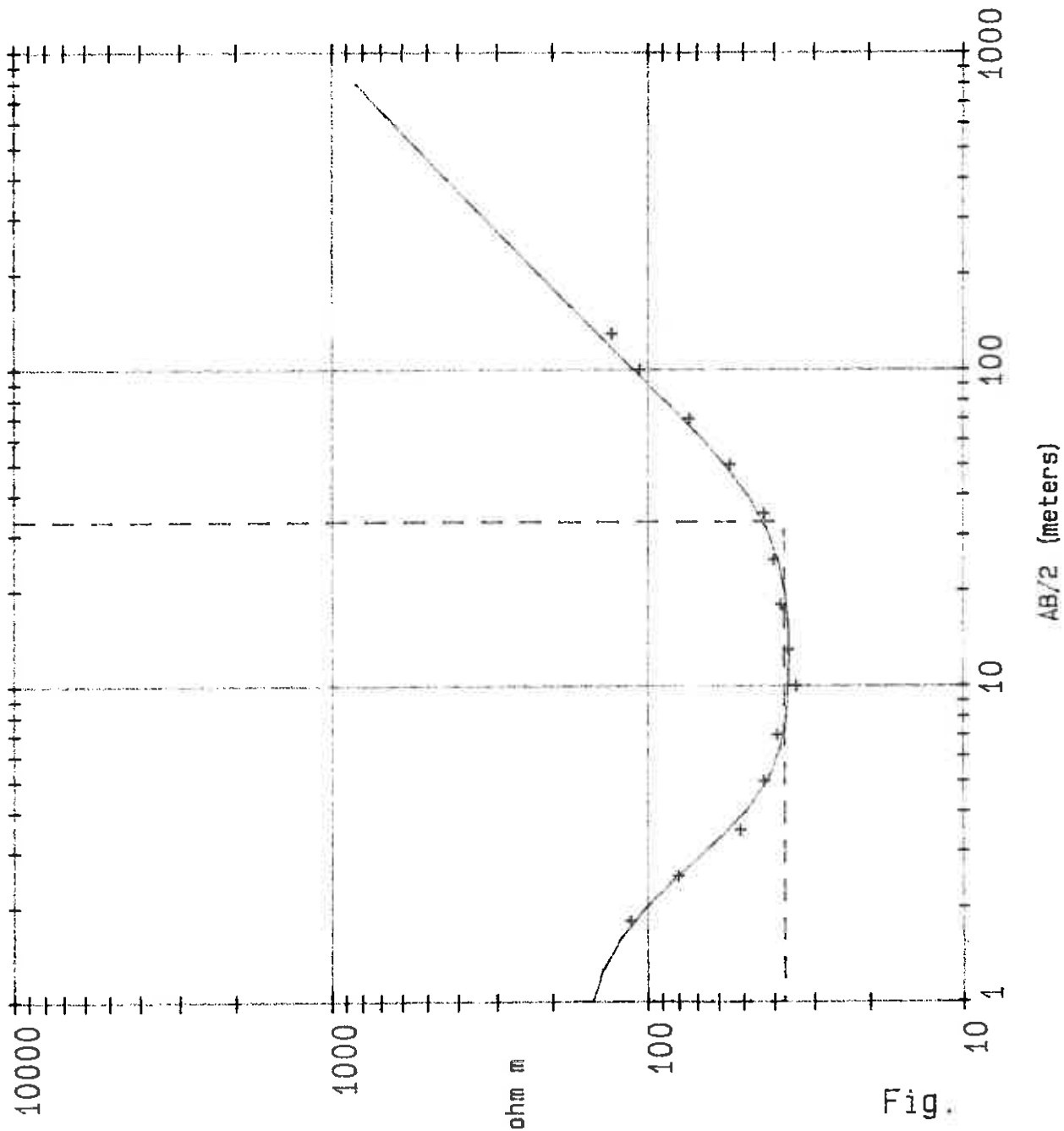


Fig.

+ Field data
 — Computer model
 - - - d - r model

MAREETSANE

V.E.S. 05

CO-ORDINATES
 +2898270X -46645Y

GEOLOGY
 GRANITE

BOREHOLE LOG

DISTRICT: DITSOBOTLA

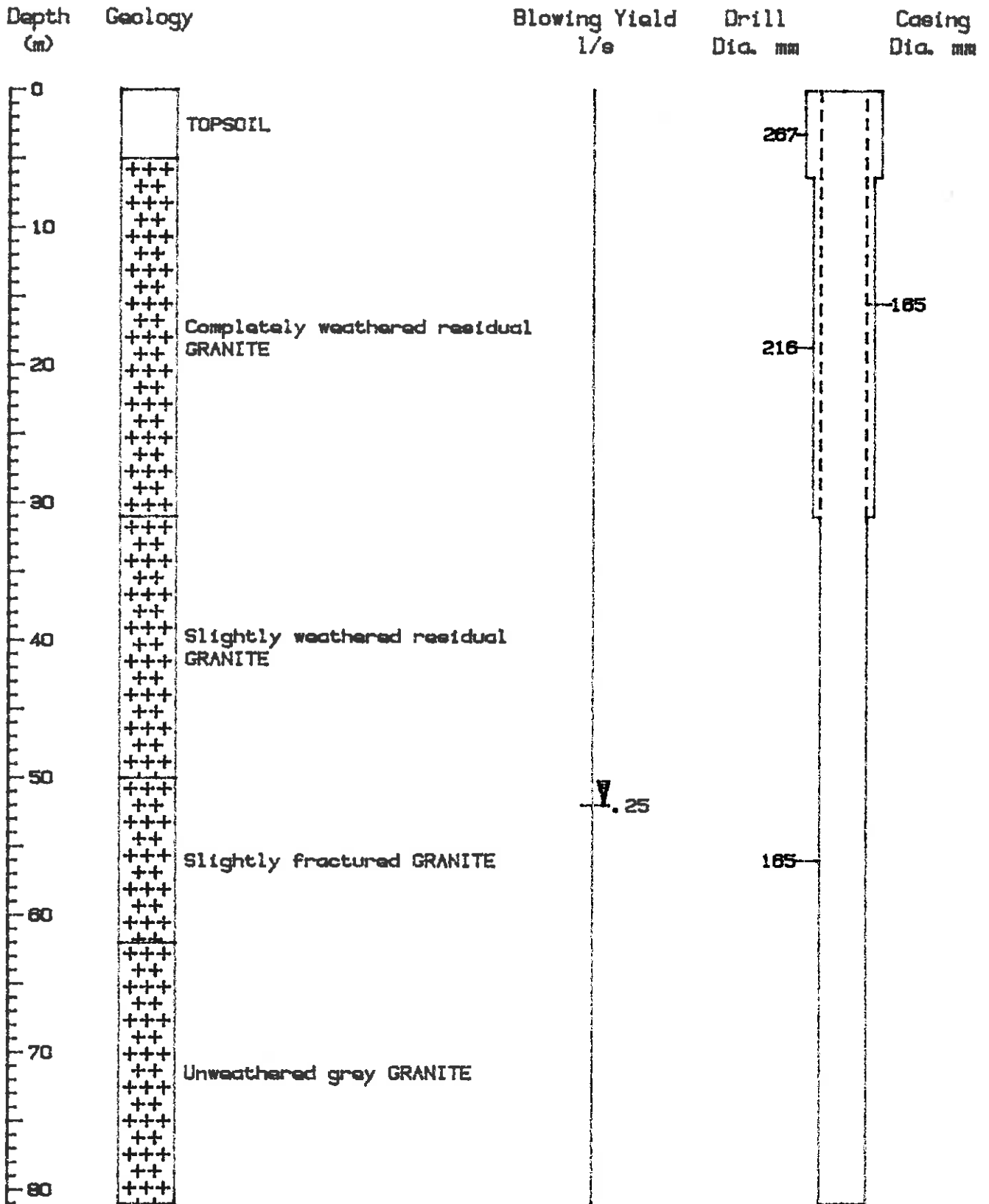
LOCALITY: MAREETSANE

BH. No. 10-77276

Geoph. Peg No. D5

Coordinates +2898275X -46650Y

Elev. (m) 1341



End of Hole 01

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

MAREETSANE

12 05 1992

B.H. No. 10-77276

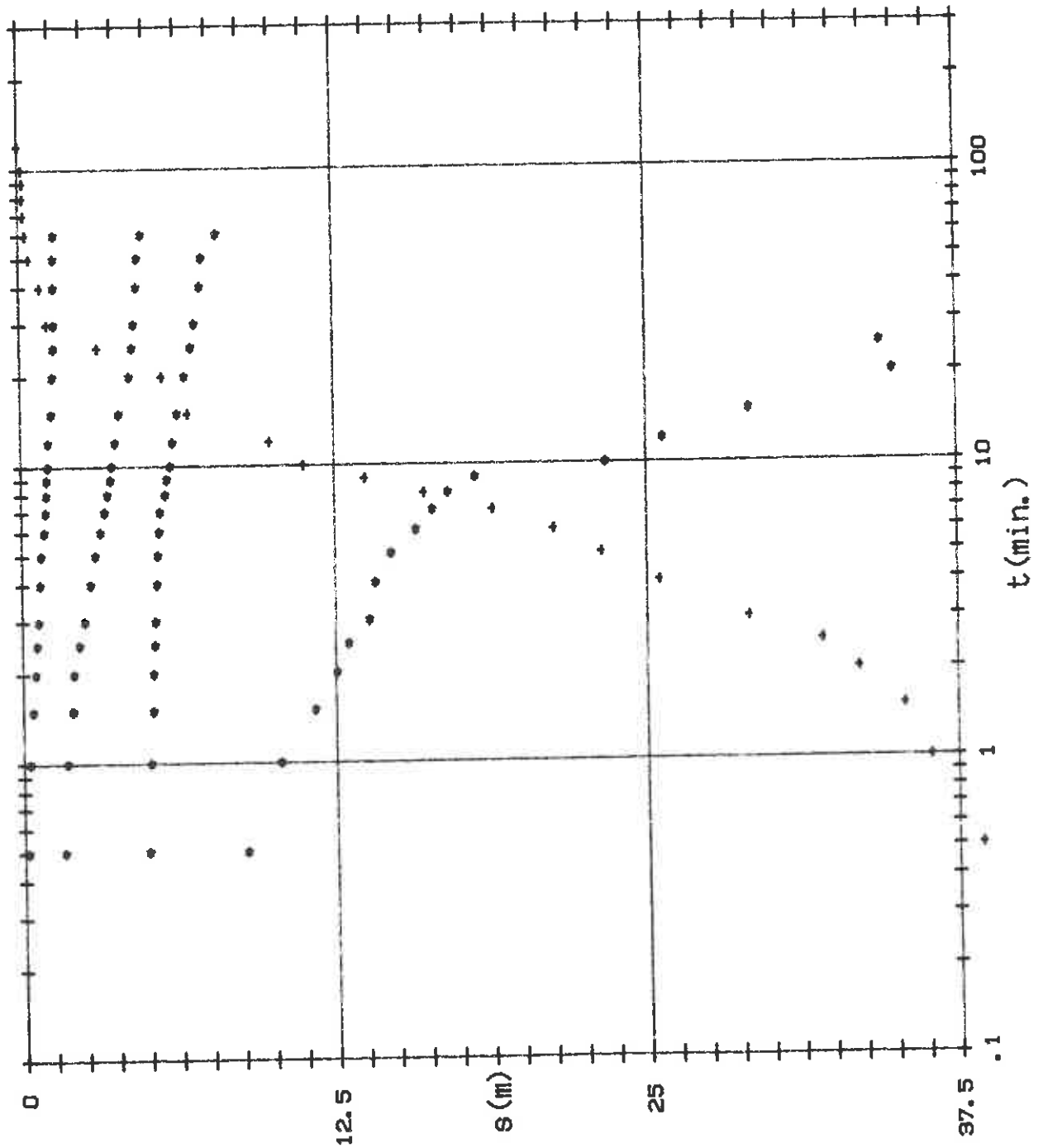
$Q_1 = .11$ l/s

$Q_2 = .38$ l/s

$Q_3 = .55$ l/s

$Q_4 = 1.5$ l/s

S.W.L. = 25.25 m



CONSTANT DISCHARGE TEST

- + Drawdown data.
- * Recovery data.

MAREETSANE

14 05 1992

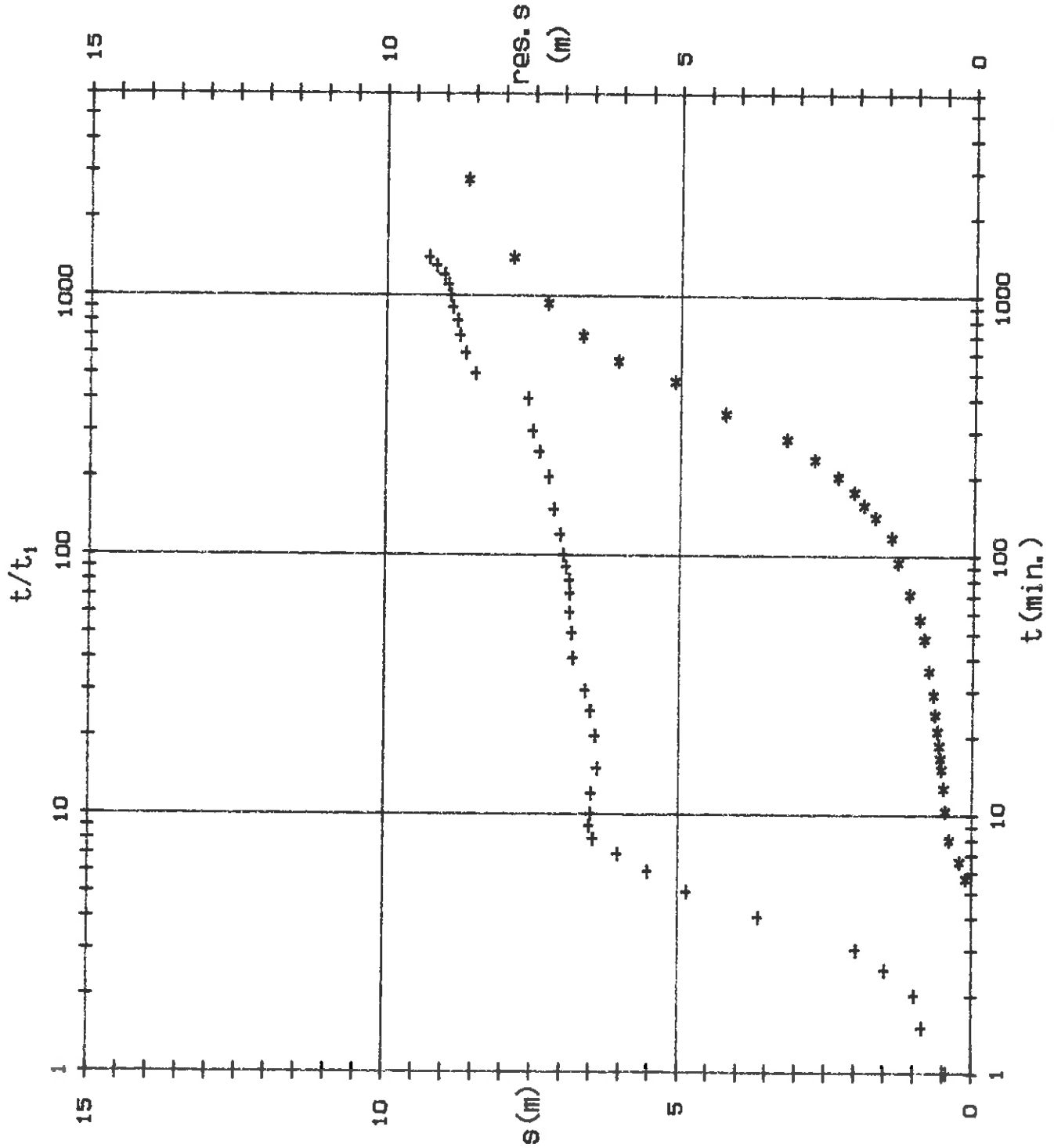
Pumped Borehole
10-77276

Readings on Borehole
10-77276

$Q = .5 \text{ l/s}$

S.W.L. = 25.25 m

$T = 1 \text{ m}^2/\text{d}$



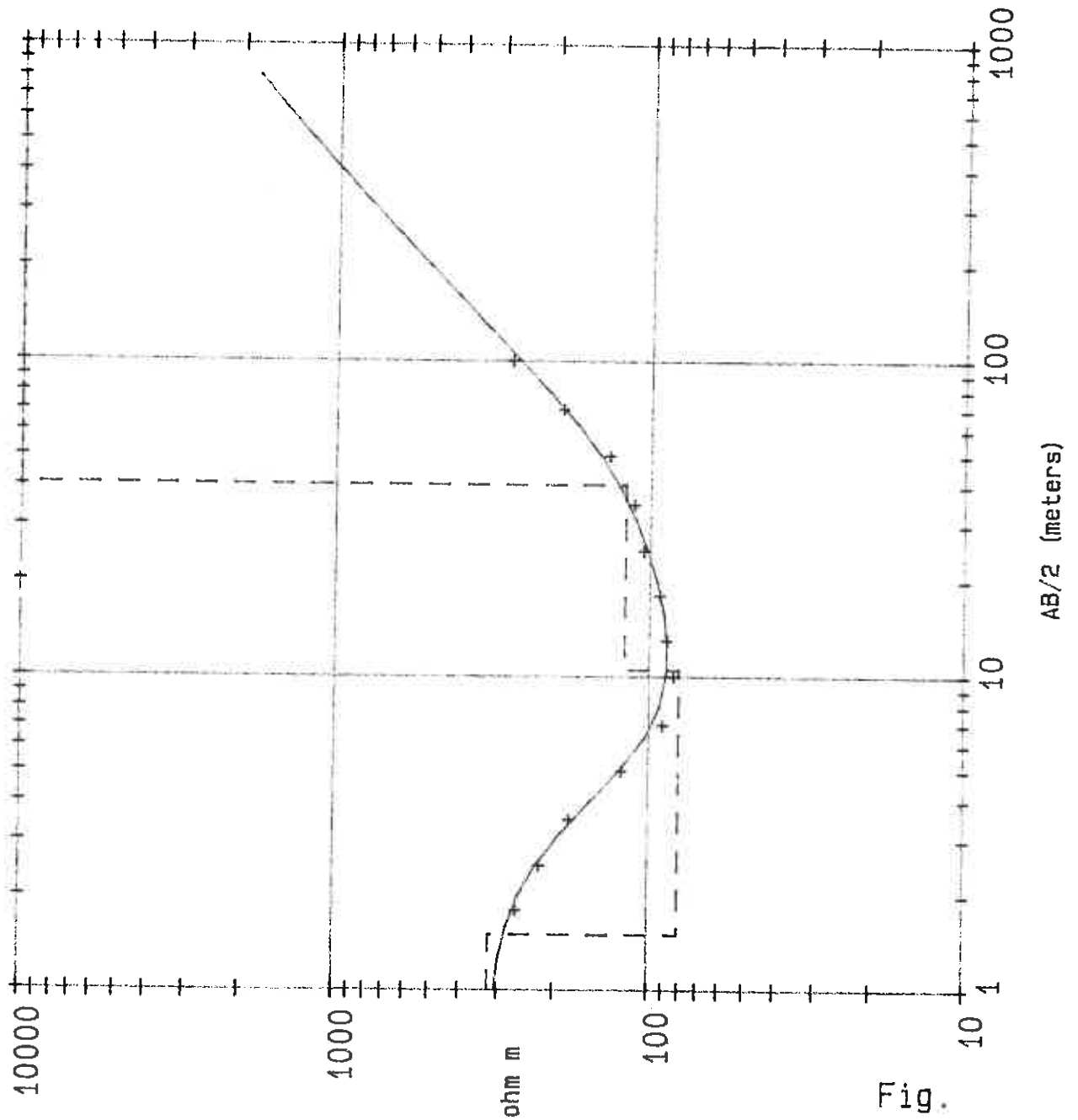


Fig.

+ Field data
 — Computer model
 - - - r model

MAREETSANE

V.E.S. 08

CO-ORDINATES
 +2897600X -46820Y

GEOLOGY
 GRANITE

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

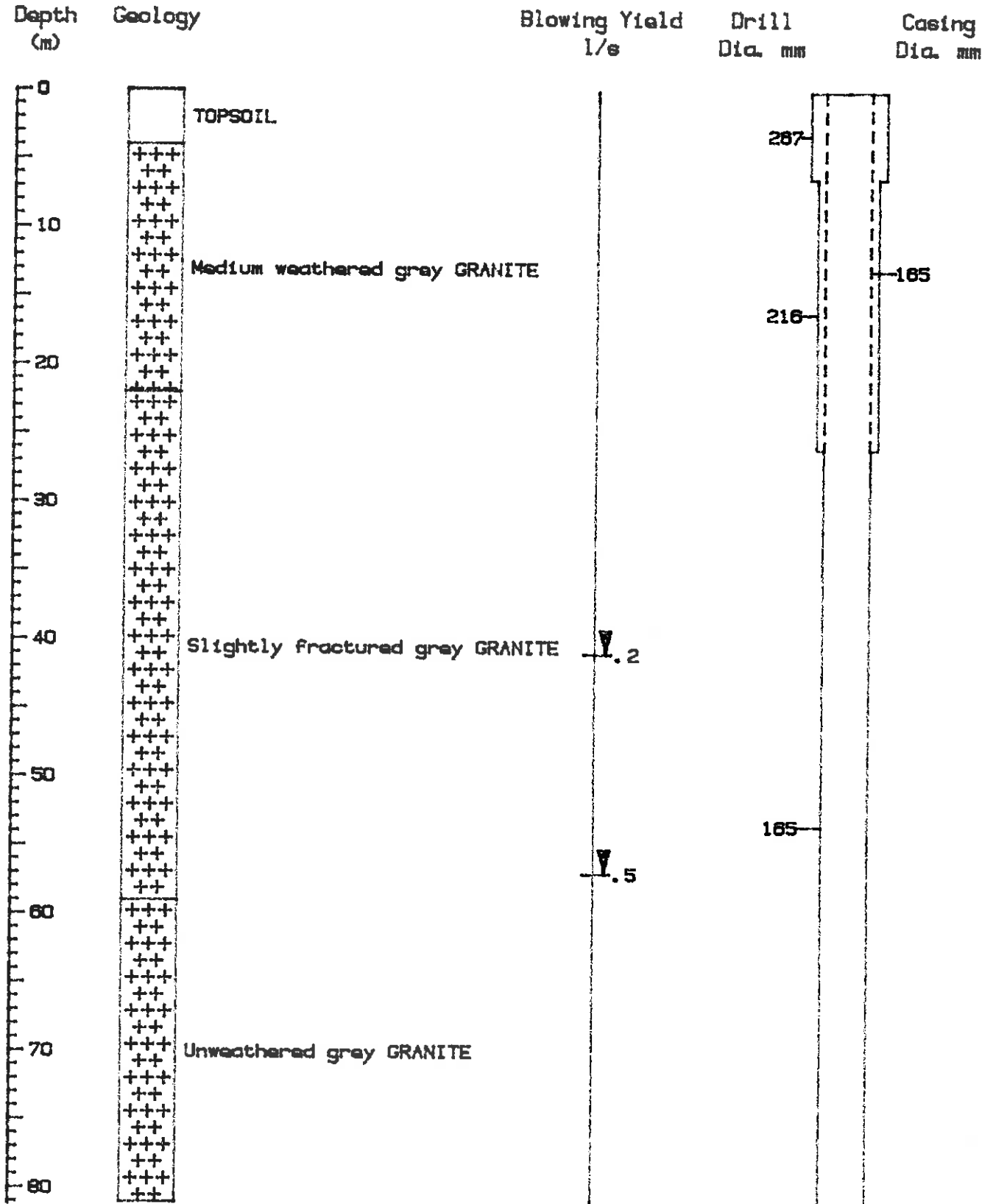
LOCALITY: MAREETSANE

BH. No. 10-77277

Geoph. Peg No. 08

Coordinates +2897500X -46825Y

Elev. (m) 1336



End of Hole 81

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

MAREETSANE

11 05 1992

B.H. No. 10-77277

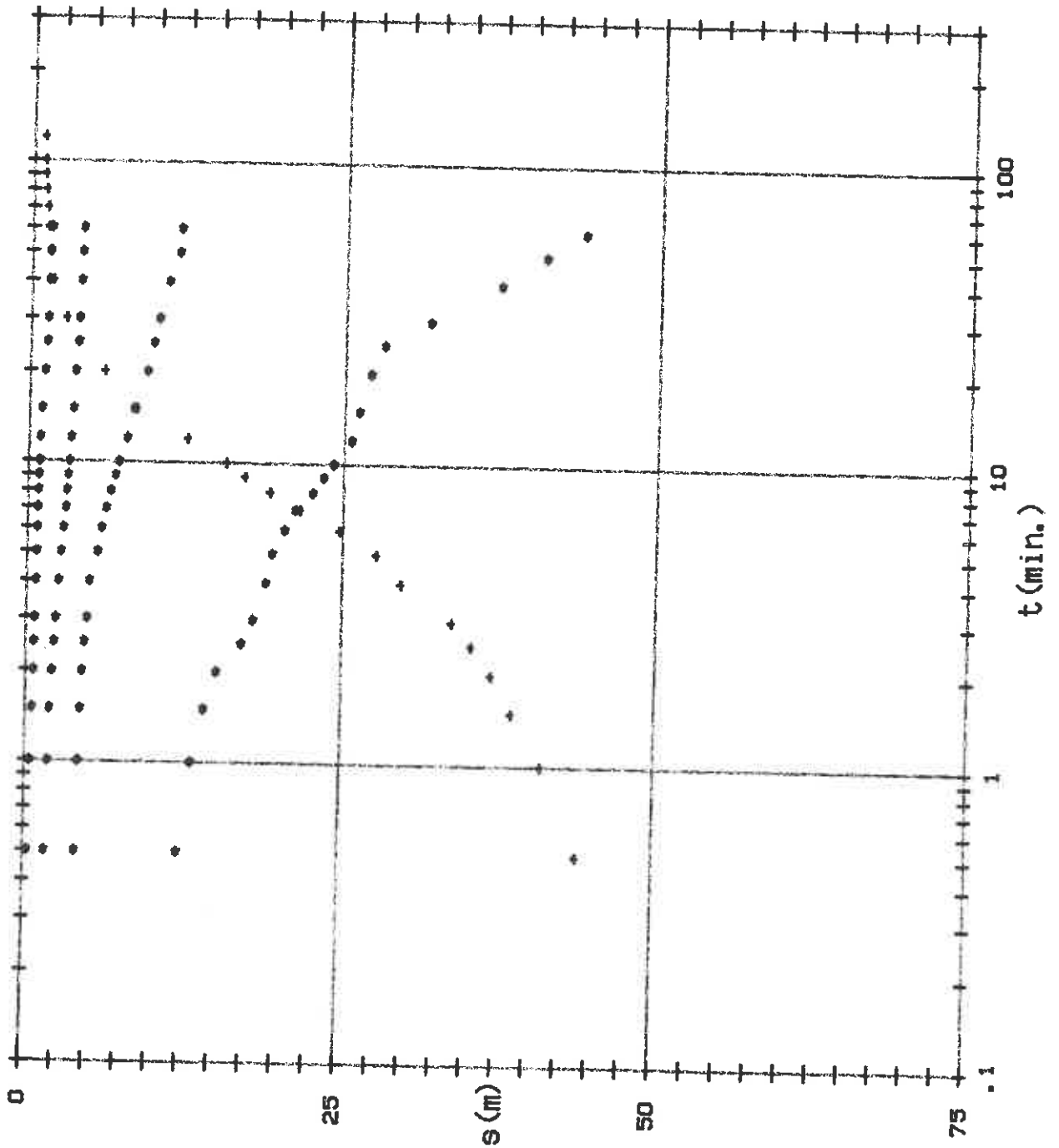
$Q_1 = .2 \text{ l/s}$

$Q_2 = .41 \text{ l/s}$

$Q_3 = .81 \text{ l/s}$

$Q_4 = 1.5 \text{ l/s}$

S.W.L. = 17.96 m



CONSTANT DISCHARGE TEST

- + Drawdown data.
- * Recovery data.

MAREETSANE

11 05 1992

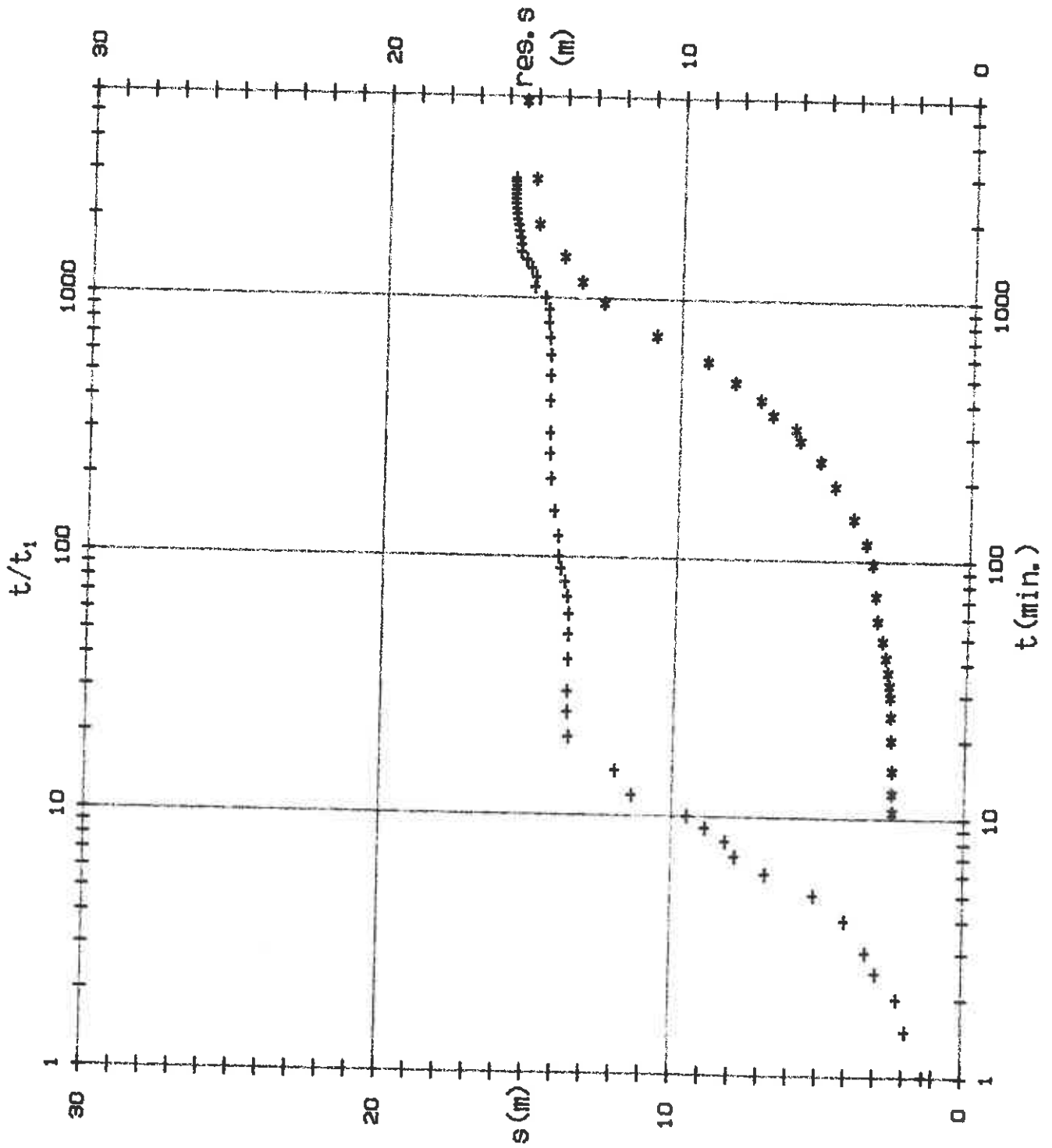
Pumped Borehole
10-77277

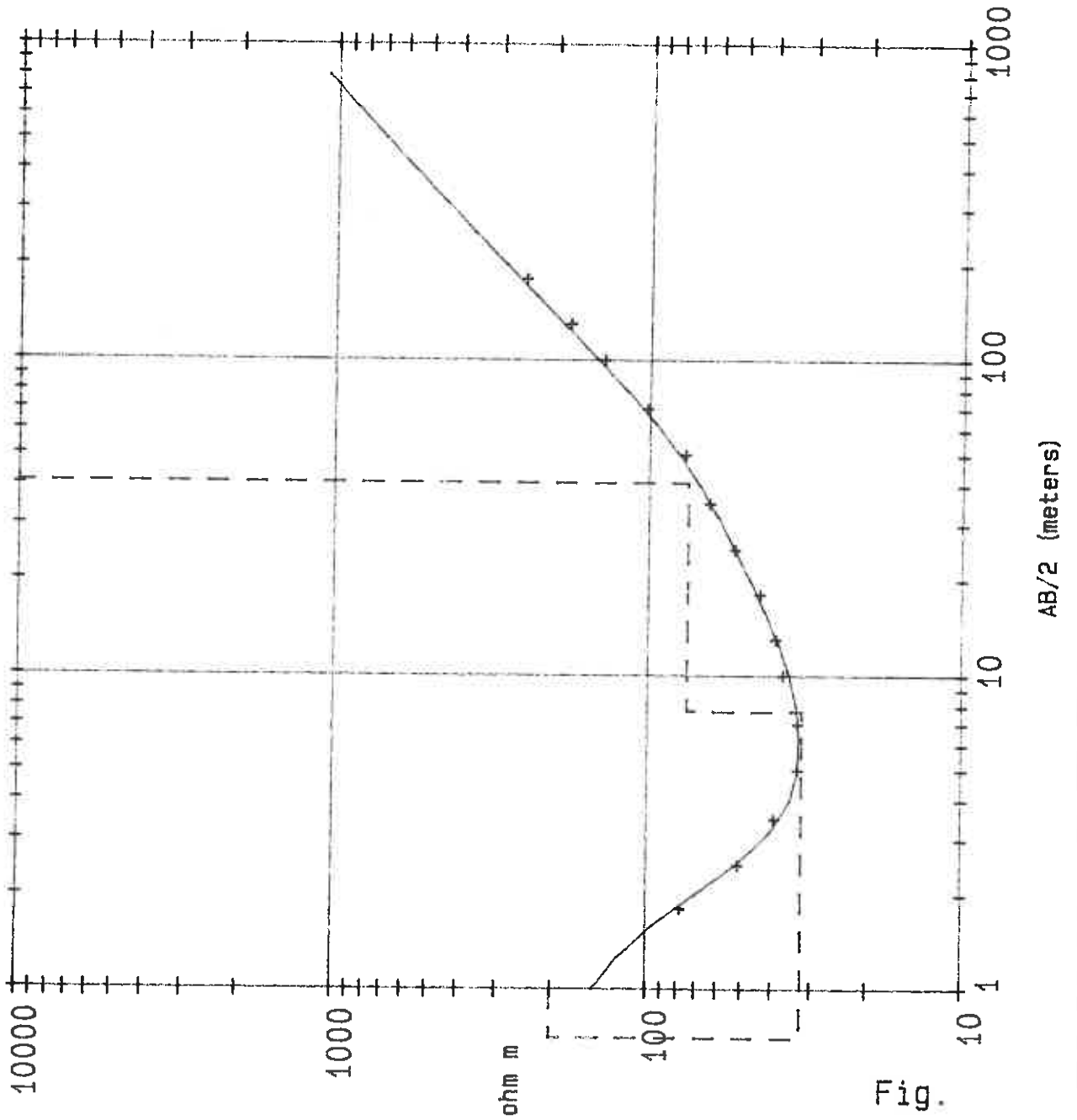
Readings on Borehole
10-77277

$Q = 1 \text{ l/s}$

S.W.L. = 17.96 m

$T = 2 \text{ m}^2/\text{d}$





MAREETSANE MPOETSILE P/S

V.E.S. 18

CO-ORDINATES
 +2898550X -46950Y

GEOLOGY
 GRANITE

Fig.

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

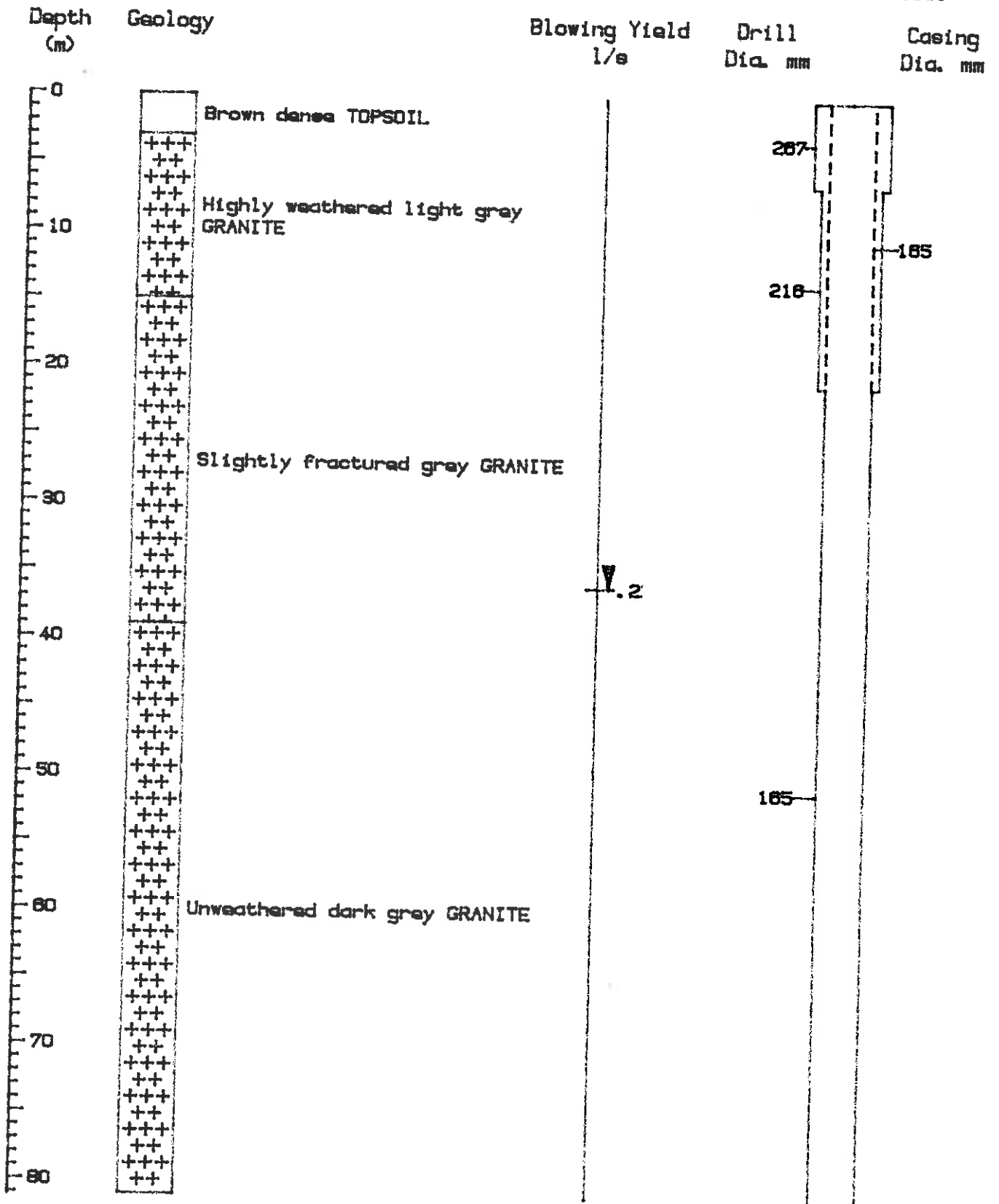
LOCALITY: NAREETSANE MPOETSI

BH. No. 10-77278

Geoph. Peg No. 18

Coordinates +2898550X -46950Y

Elev. (m) 1339



End of Hole 81

STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

MAREETSANE

MPOETSILE P/S

09 05 1992

B.H. No. 10-77278

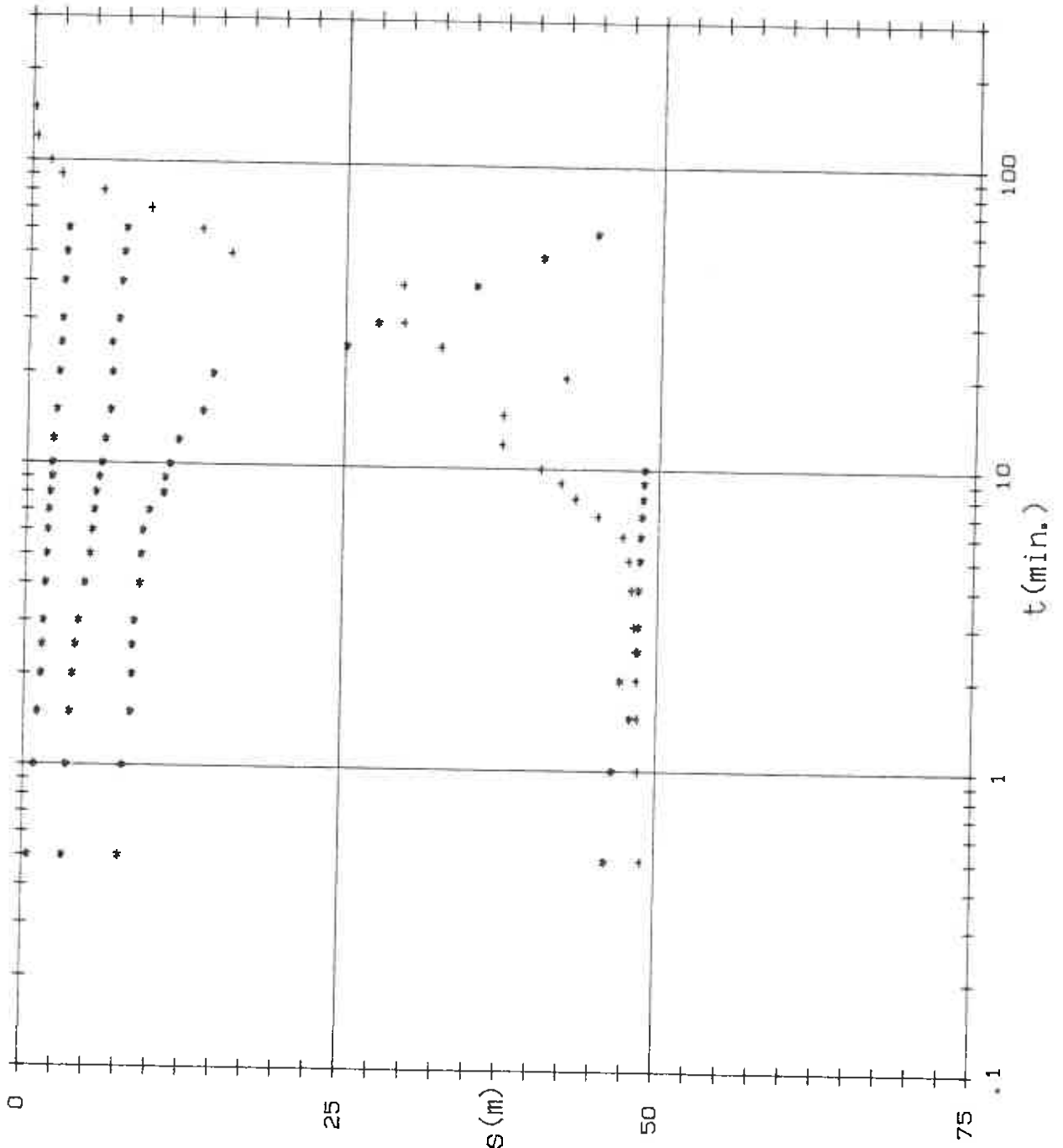
$Q_1 = .13 \text{ l/s}$

$Q_2 = .32 \text{ l/s}$

$Q_3 = .45 \text{ l/s}$

$Q_4 = .94 \text{ l/s}$

S.W.L. = 22.12 m



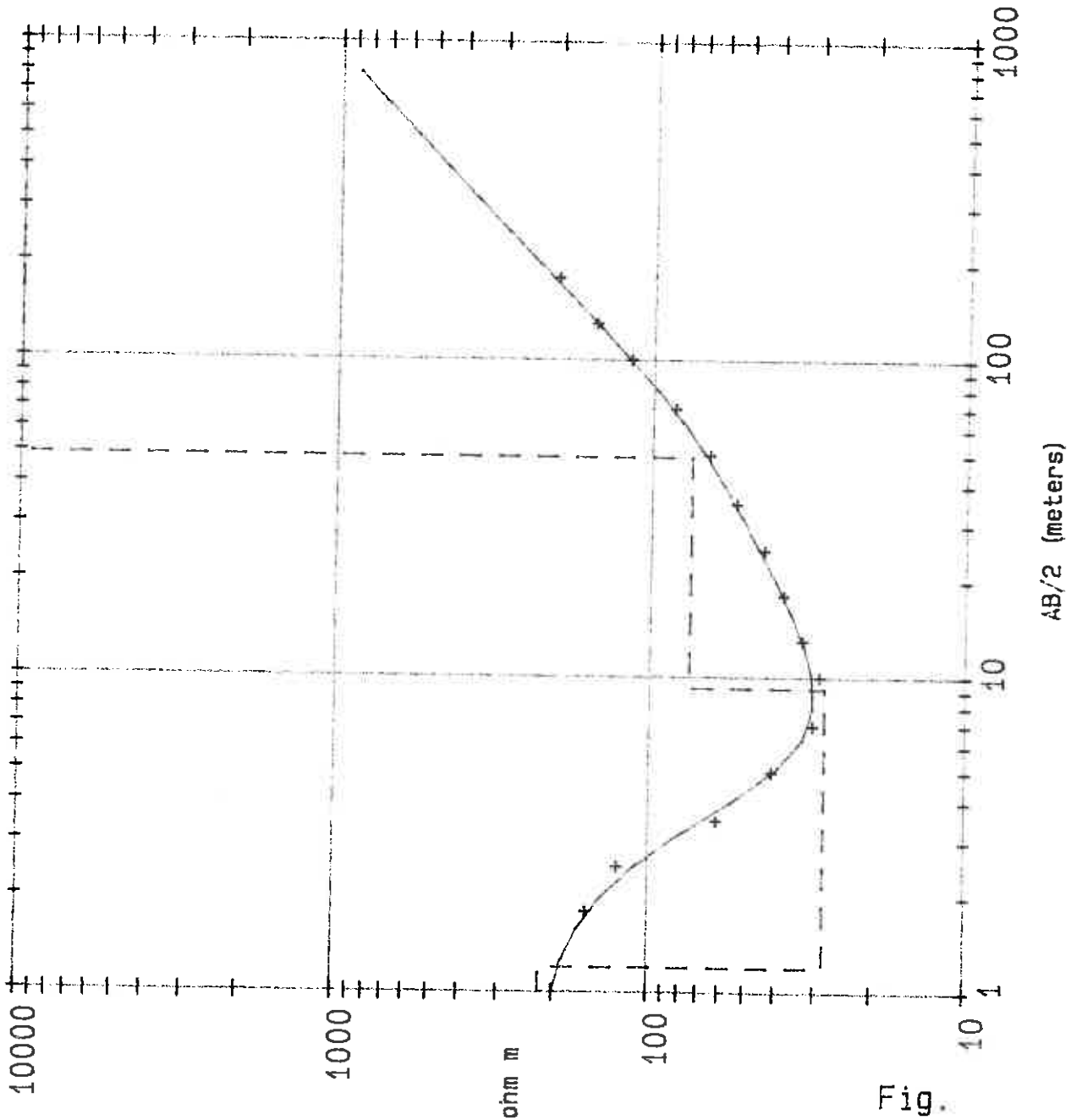


Fig.

+ Field data
 — Computer model
 - - - r model

MAREETSANE

V.E.S. 21

CO-ORDINATES
 +2900230X -47105Y

GEOLOGY
 LAVA

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

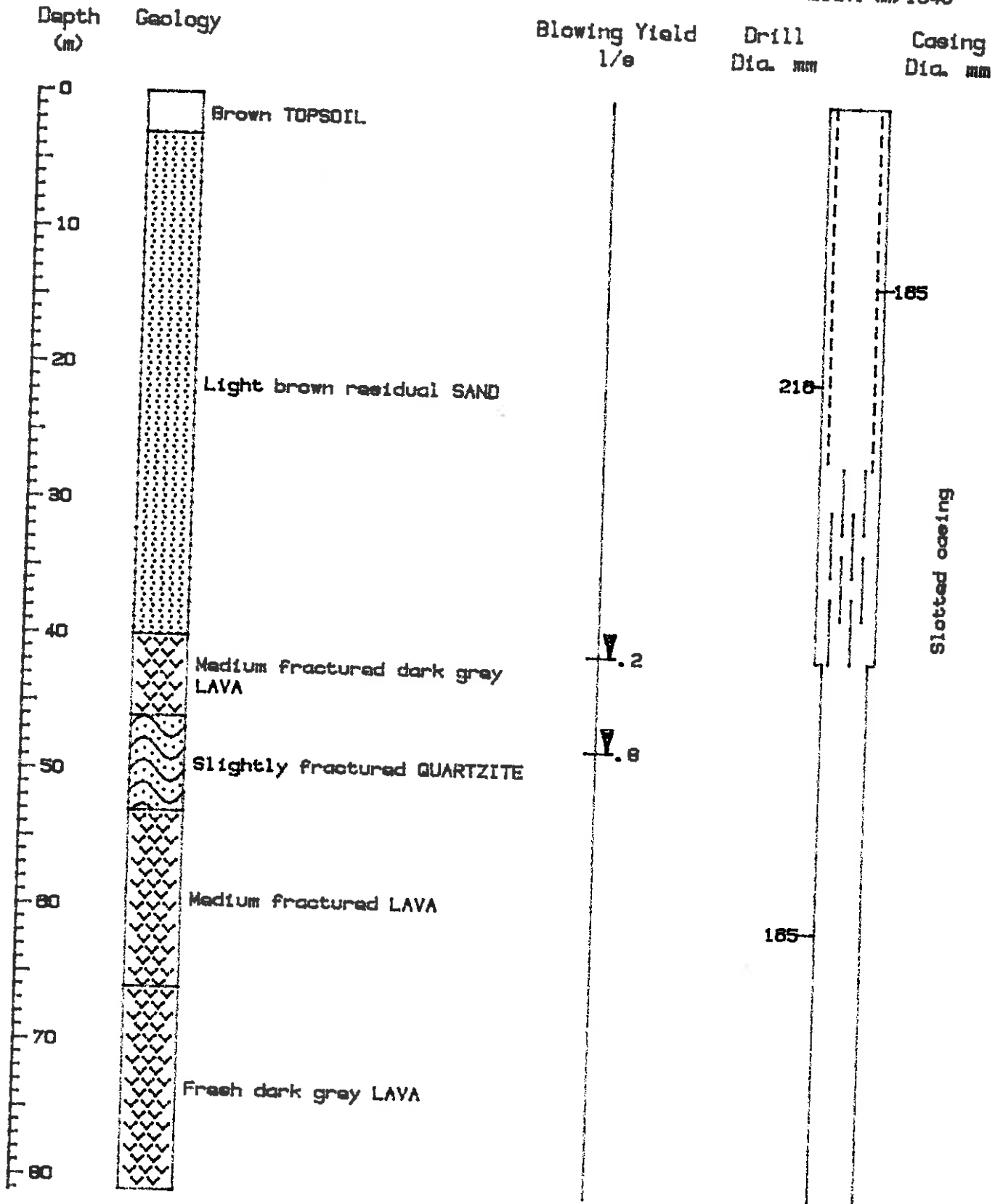
LOCALITY: MAREETSANE VILLAGE

BH. No. 10-77279

Geoph. Peg No. 21

Coordinates +2900225X -47100Y

Elev. (m) 1346



End of Hole 81

STEP DRAWDOWN TEST

* Pumping data

+ Recovery data

MAREETSANE

08 05 1992

B.H. No. 10-77279

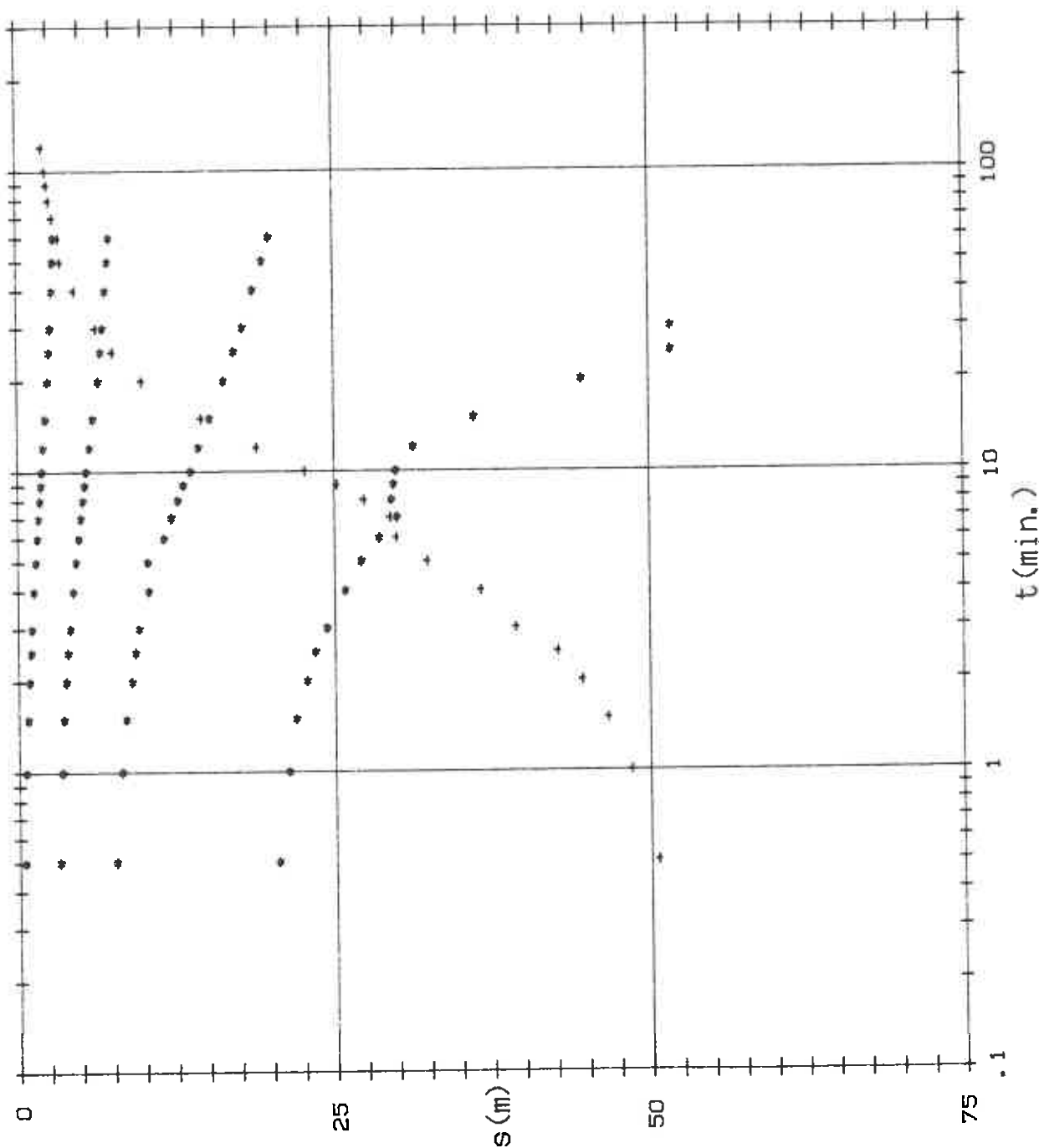
$Q_1 = .2 \text{ l/s}$

$Q_2 = .5 \text{ l/s}$

$Q_3 = 1 \text{ l/s}$

$Q_4 = 2 \text{ l/s}$

S.W.L. = 18.2 m



CONSTANT DISCHARGE TEST

- + Drawdown data.
- * Recovery data.

MAREETSANE

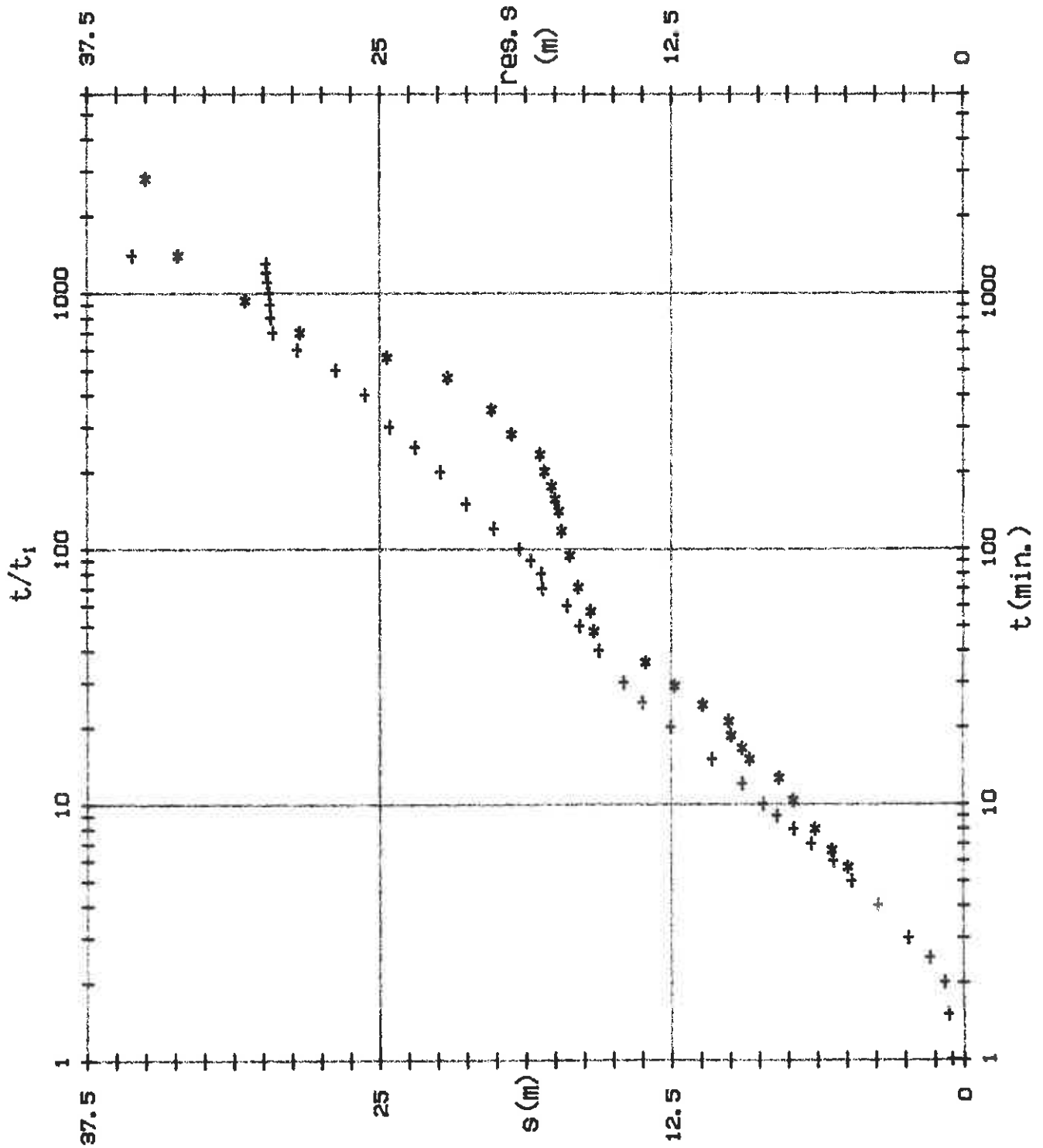
09 05 1992

Pumped Borehole
10-77279
Readings on Borehole
10-77279

$Q = .89 \text{ l/s}$

S.W.L. = 22.12 m

$T = 1 \text{ m}^2/\text{d}$



+ Field data
 --- Computer model
 - - - r model

MAREETSANE

V.E.S. 36

CO-ORDINATES
 +2900950X -48345Y

GEOLOGY
 LAVA

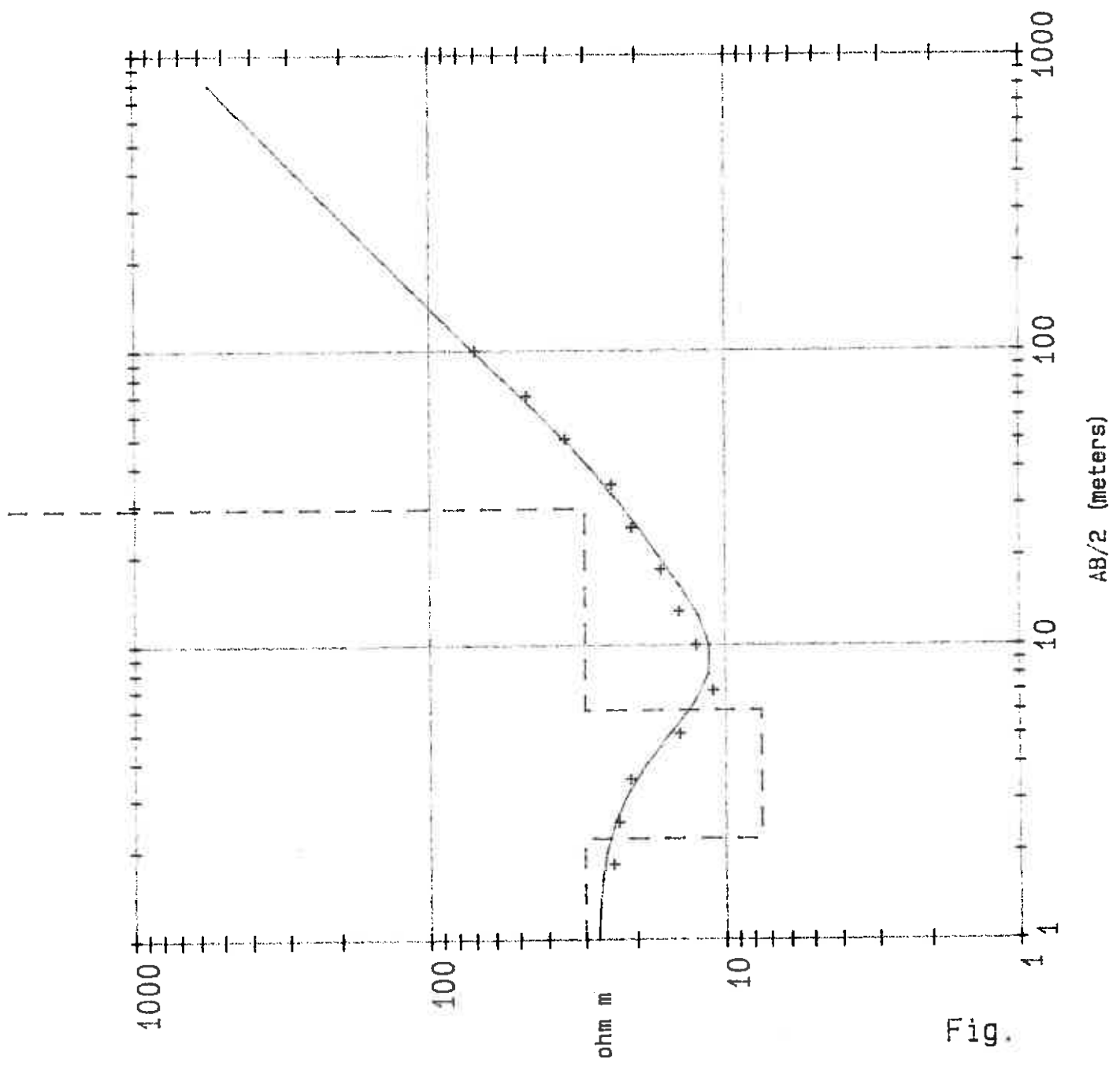


Fig.

BOREHOLE LOG

DISTRICT: DITSOBOTLA

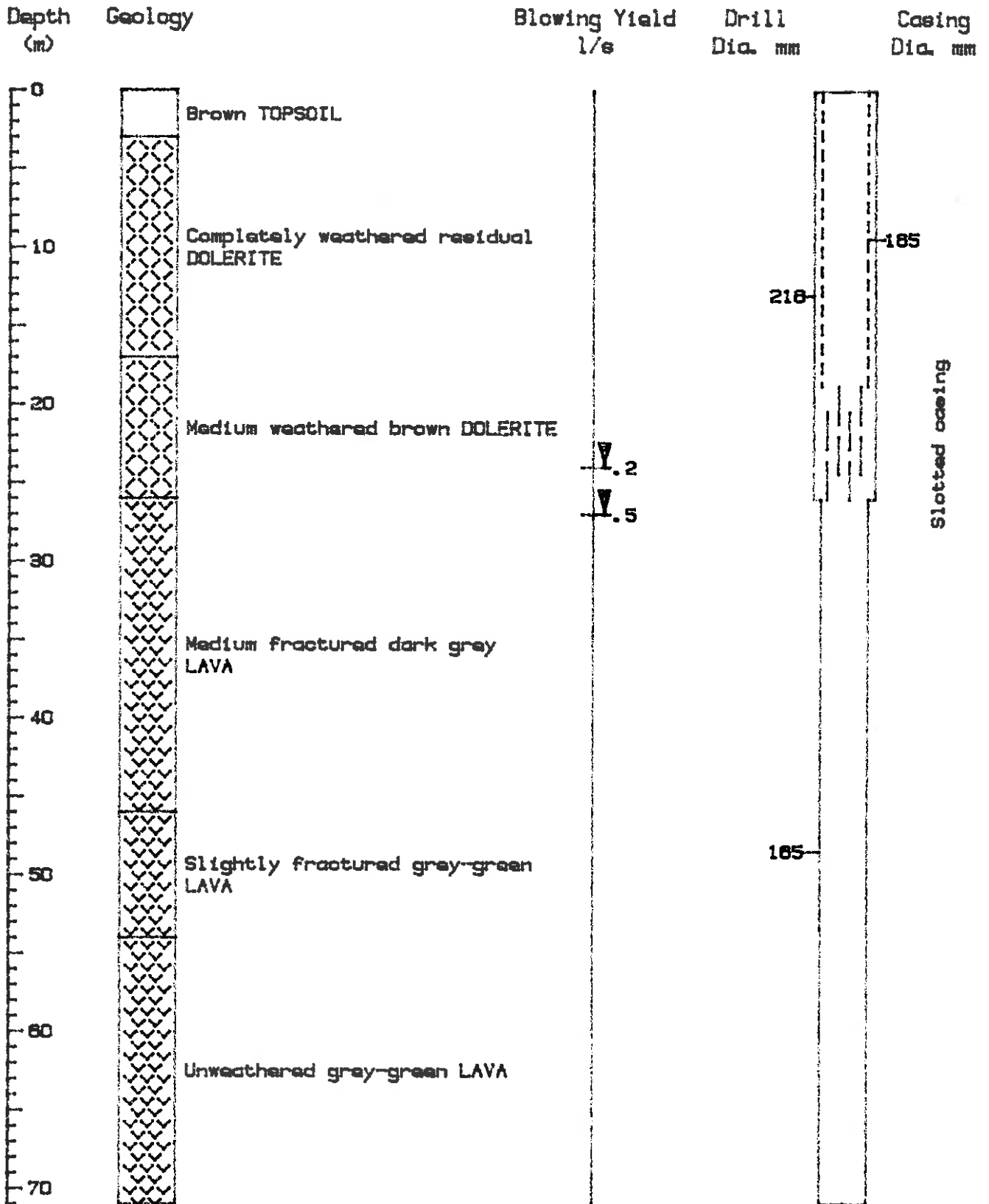
LOCALITY: MAREETSANE VILLAGE

BH. No. 10-77280

Geoph. Peg No. 36

Coordinates +2900950X -48350Y

Elev. (m) 1343



End of Hole 71

STEP DRAWDOWN TEST

* Pumping data
 + Recovery data

MAREETSANE

11 05 1992

B.H. No. 10-77280

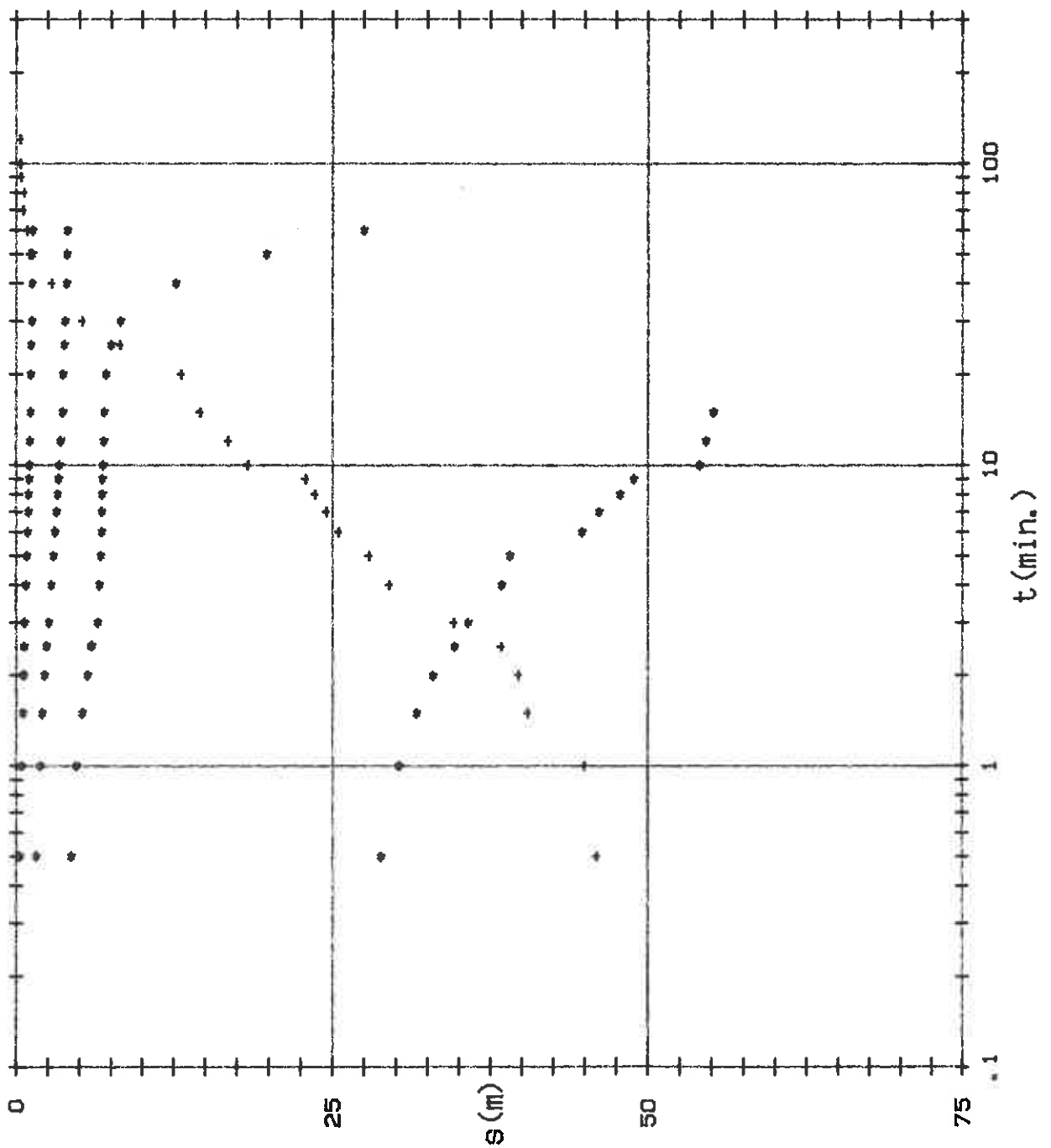
$Q_1 = .16 \text{ l/s}$

$Q_2 = .43 \text{ l/s}$

$Q_3 = .85 \text{ l/s}$

$Q_4 = 1.5 \text{ l/s}$

S.W.L. = 10.74 m



CONSTANT DISCHARGE TEST

- + Drawdown data.
- * Recovery data.

MAREETSANE

11 05 1992

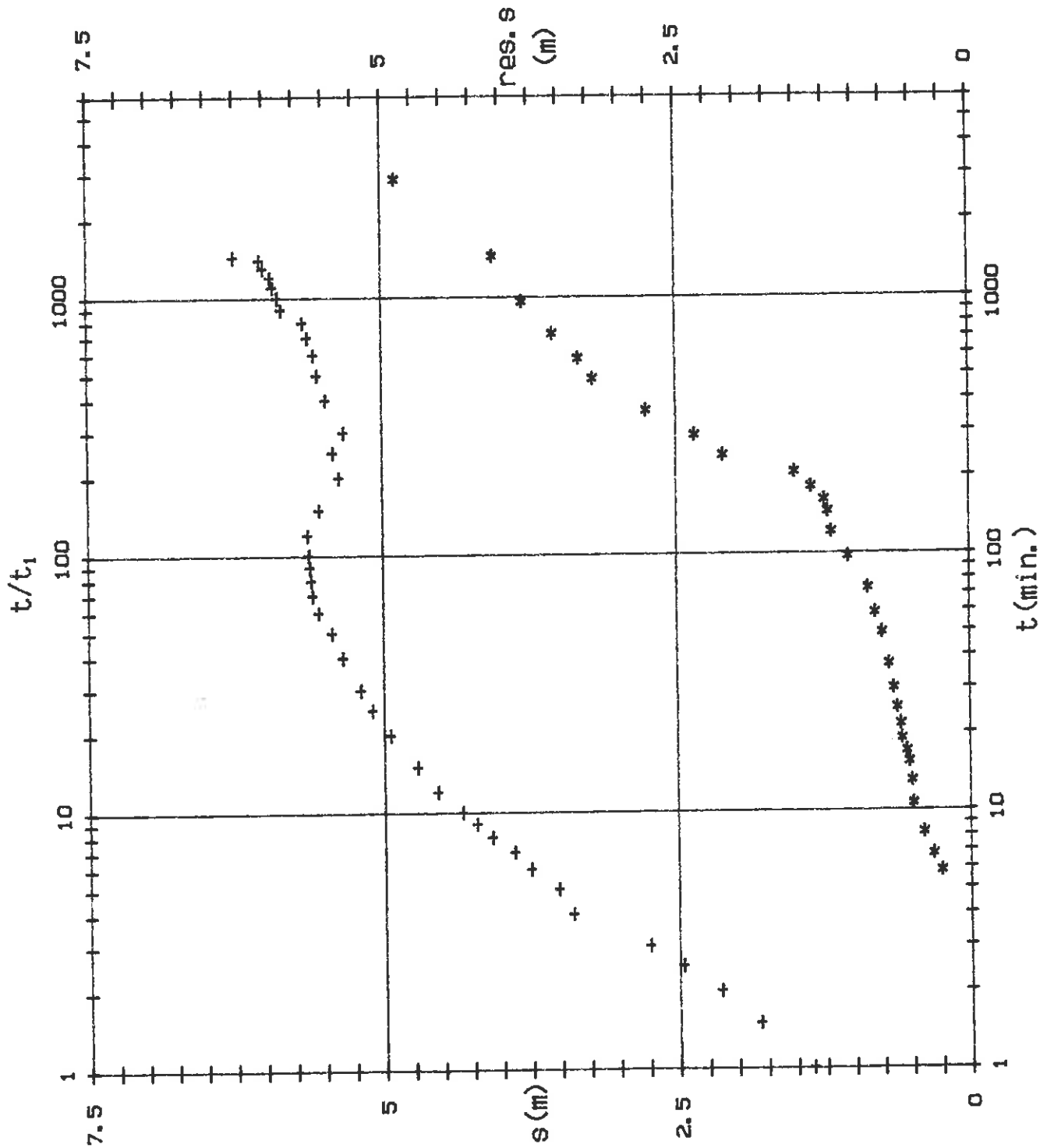
Pumped Borehole
10-77280

Readings on Borehole
10-77280

$Q = .53 \text{ l/s}$

S.W.L. = 10.74 m

$T = 3 \text{ m}^2/\text{d}$



MATILA 1 AND 2

Including boreholes

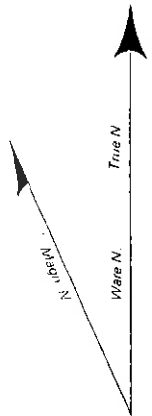
10-77267 - 1 - Clinic

10-77268 - 1

10-77302 - 2

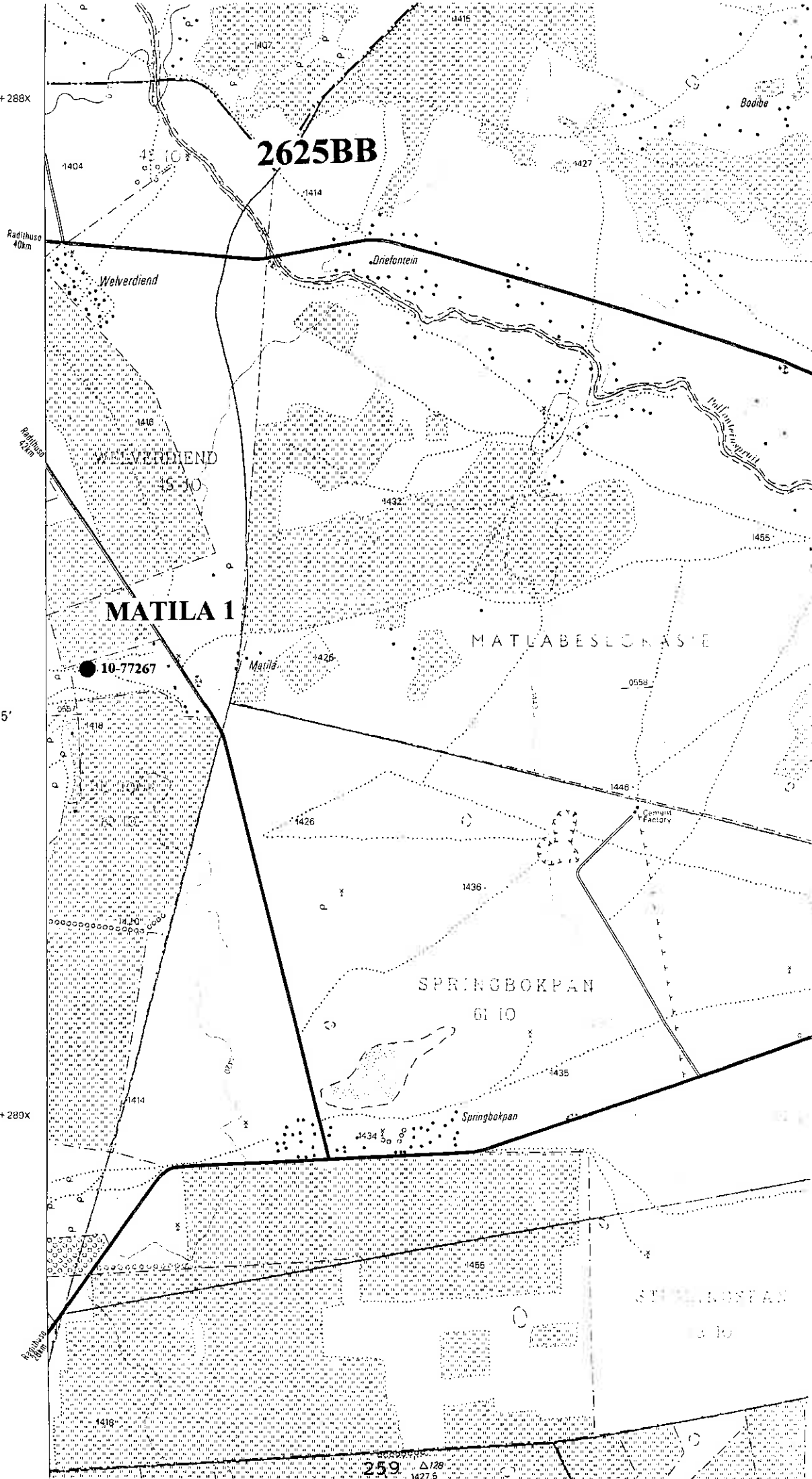
+286X
+288X

Mean magnetic declination 17° 5 West
of True North (1974.0) Mean annual change
3' Eastwards (1966 - 1971)



+289X
+289X

Gemiddelde magnetiese afklynasie 17° 5 West
van Ware Noorde (1974.0) Gemiddelde jaantlike
verandering 3' Ooswaarts (1966 - 1971)

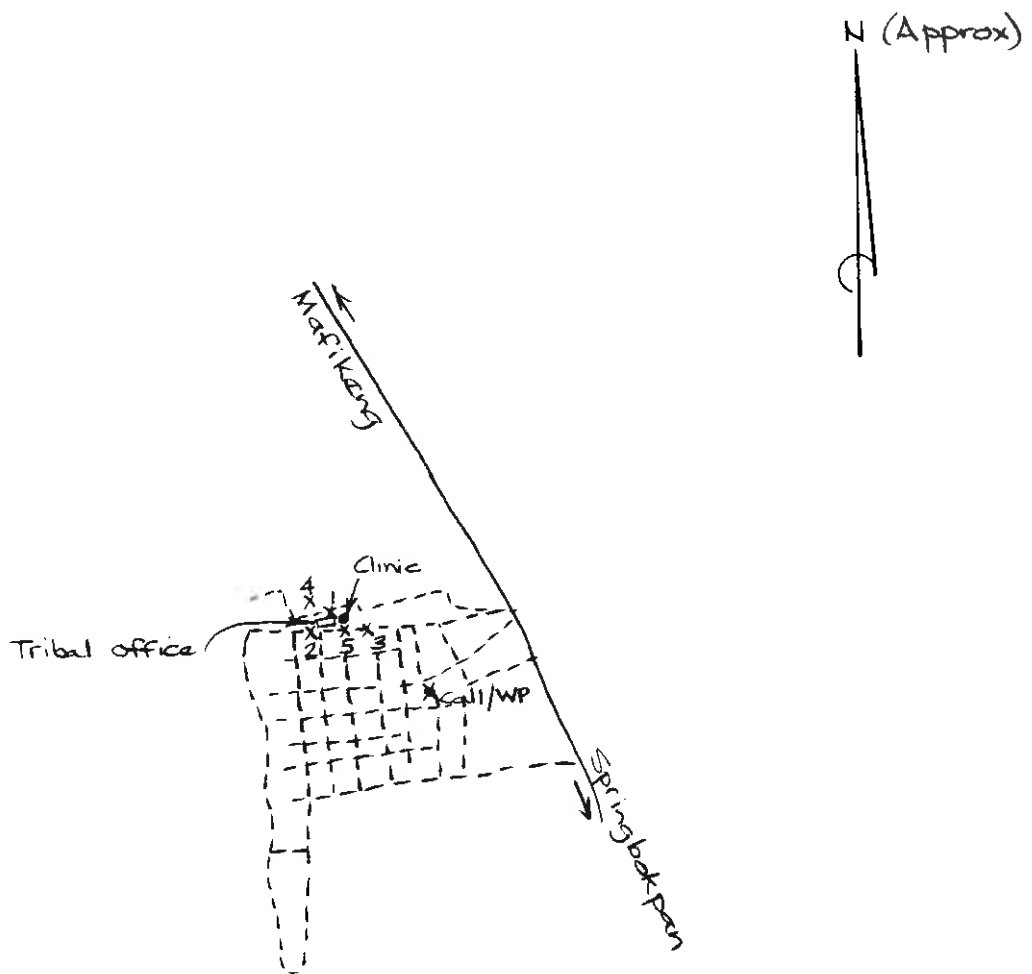


2625BB

MATILA 1

10-77267

259 Δ128
1427.5



Locality Plan of Matila 1 (clinic)
 Overlay to Photo No 049 (strip 12)
 Approx Scale 1:30 000

+ Field data
 --- Computer model
 - - - d - r model

MATILA 1 CLINIC

V.E.S. 05

CO-ORDINATES
 +2885550X -75550Y

GEOLOGY
 DOLOMITE

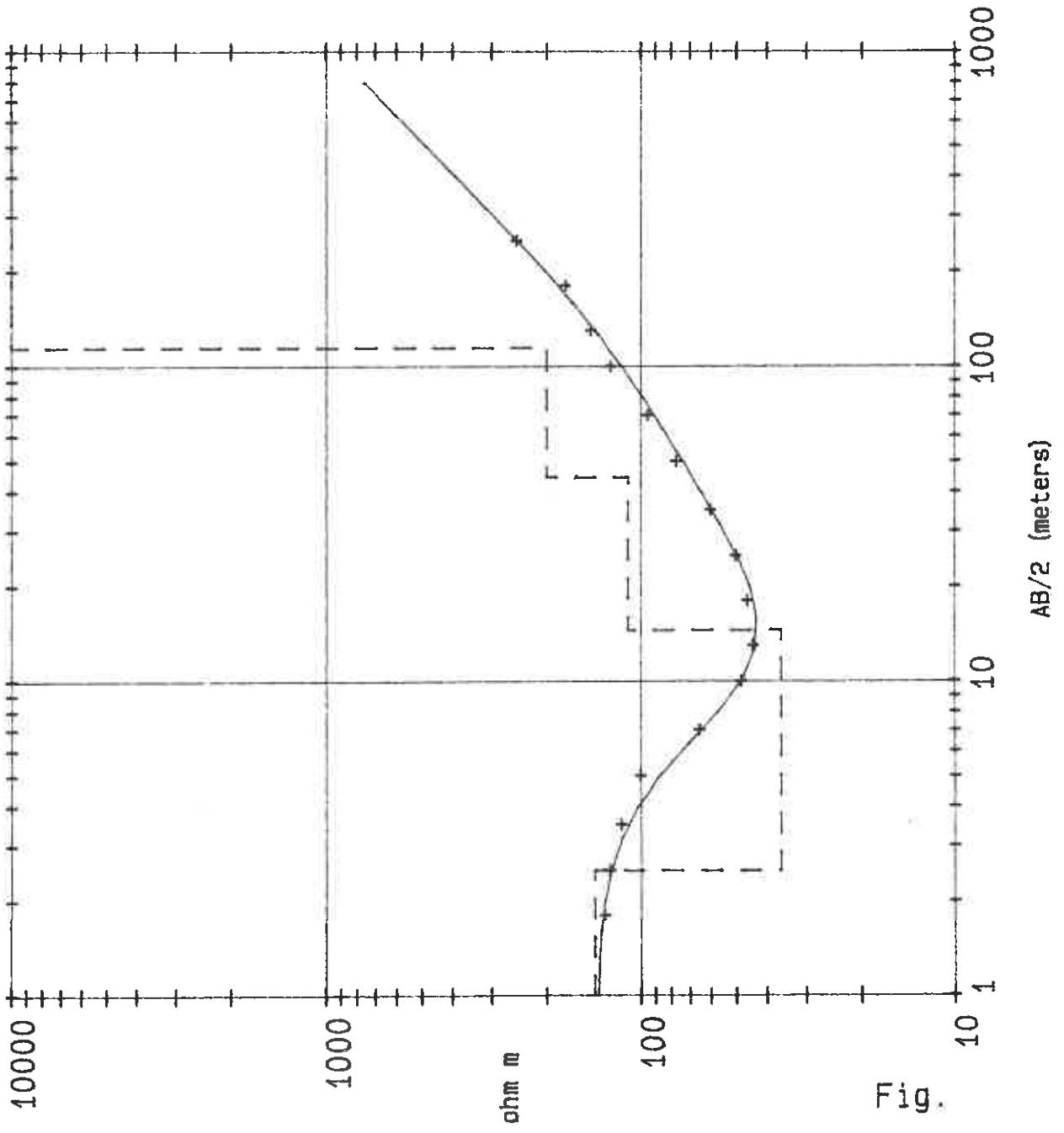


Fig.

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

LOCALITY: MATILA 1 - CLINIC

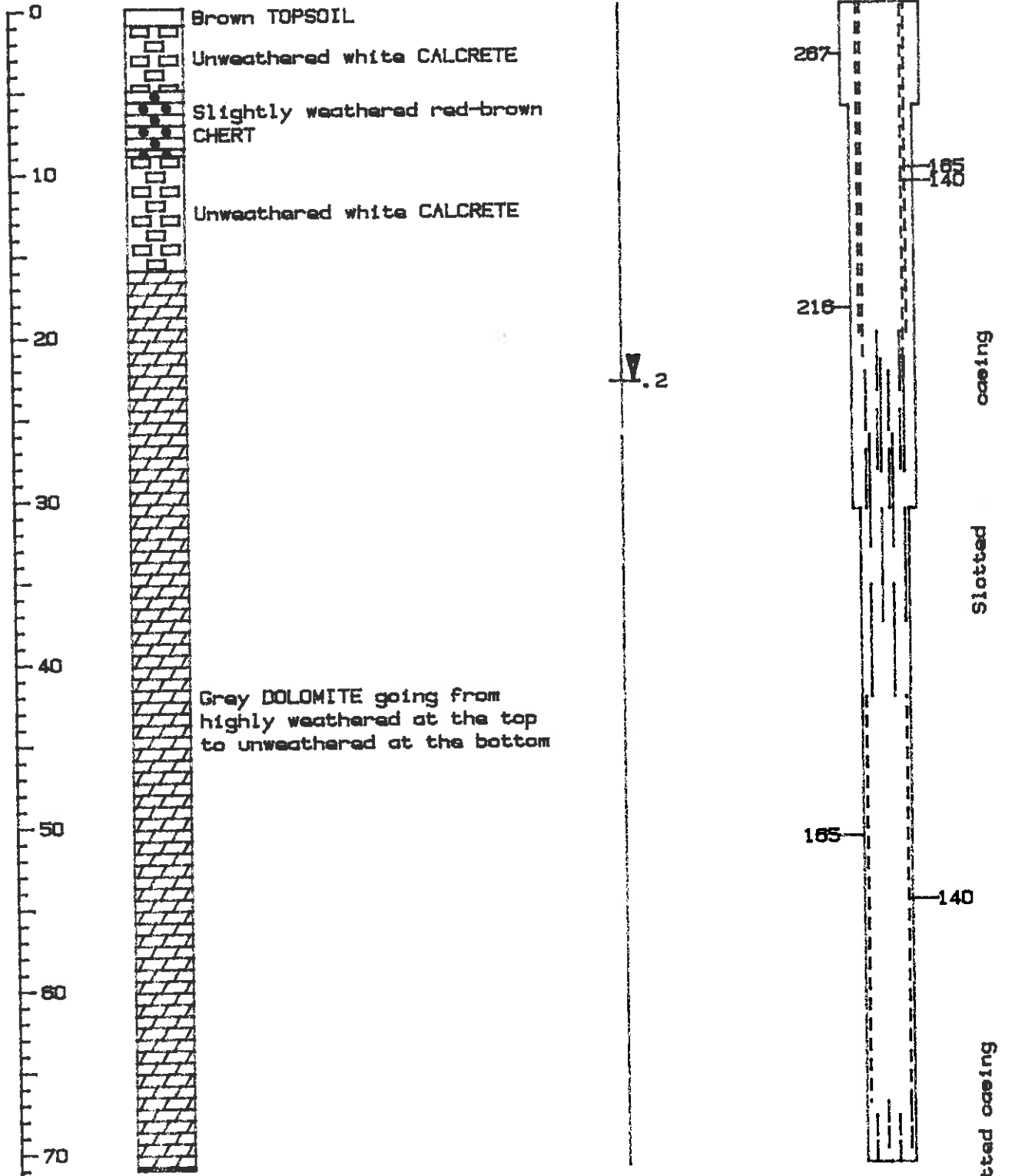
BH. No. 10-77267

Geoph. Peg No. 05

Coordinates +288555DX -75550Y

Elev. (m) 1421

Depth (m)	Geology	Blowing Yield l/s	Drill Dia. mm	Casing Dia. mm
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End of Hole 71

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

MATILA I

12 08 1992

B.H. No. 10-77267

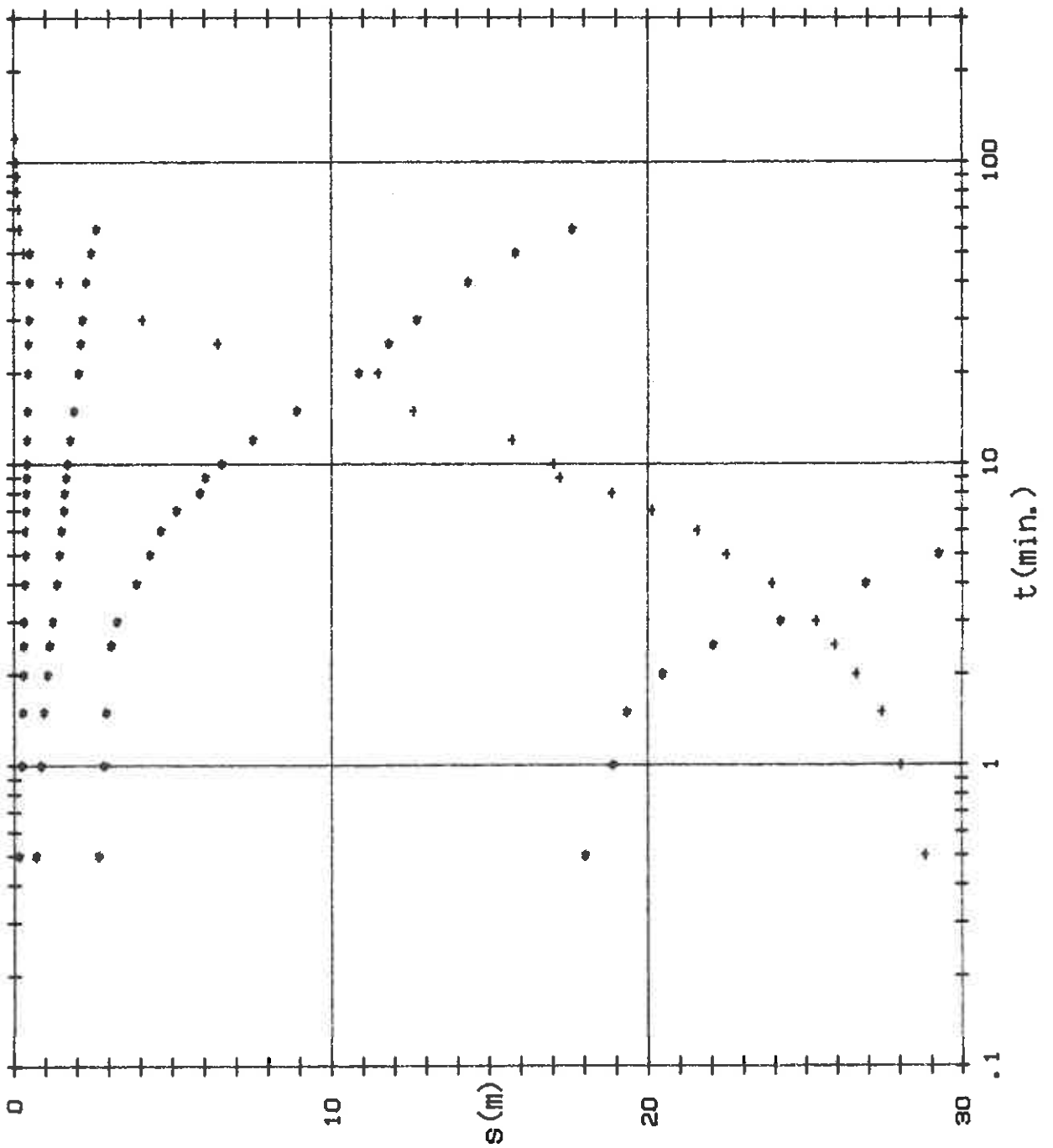
$Q_1 = .11$ l/s

$Q_2 = .29$ l/s

$Q_3 = .59$ l/s

$Q_4 = 1.2$ l/s

S.W.L. = 10.66 m



CONSTANT DISCHARGE TEST

+ Drawdown data.

* Recovery data.

MATILA I

13 08 1992

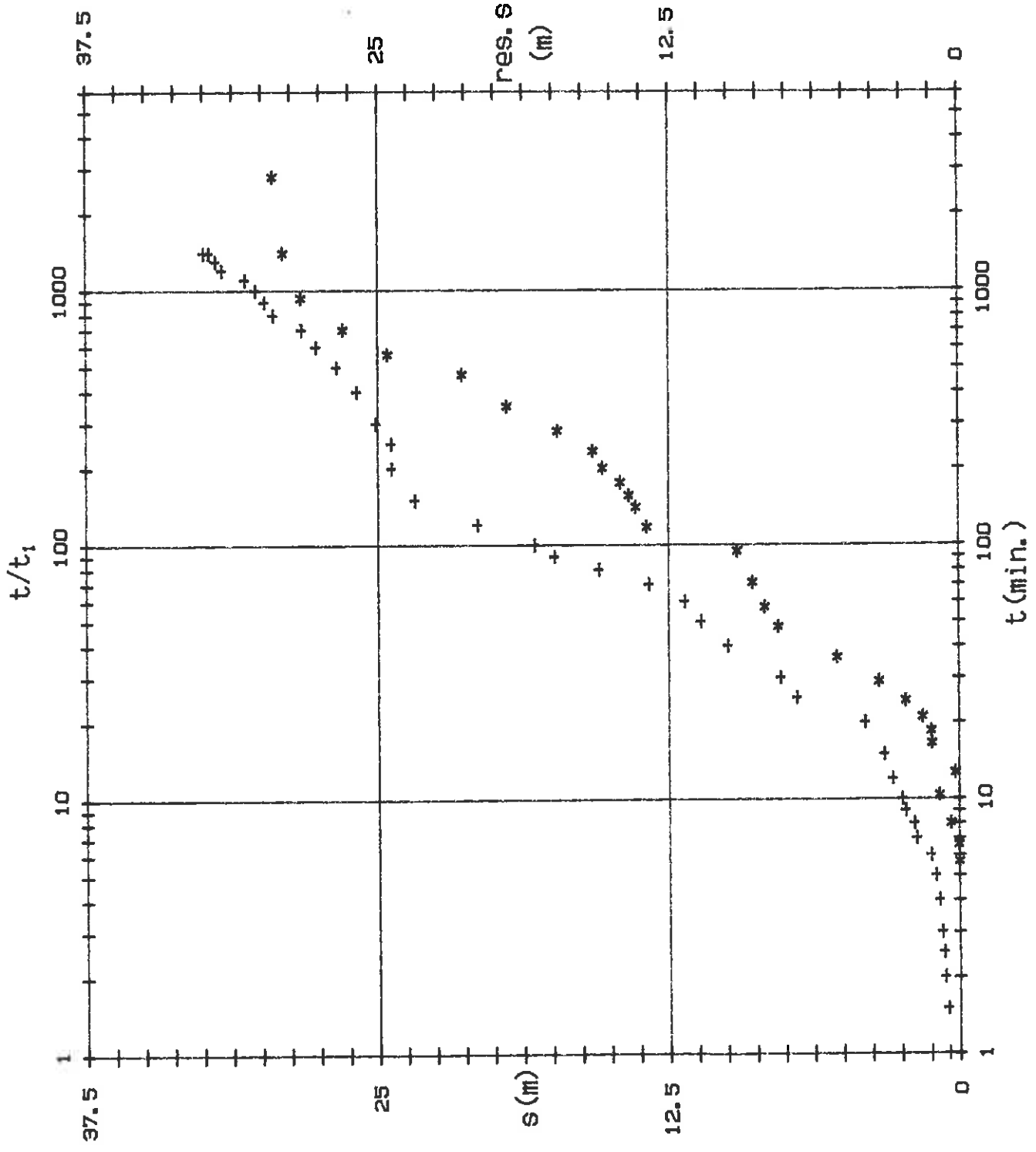
Pumped Borehole
10-77267

Readings on Borehole
10-77267

$Q = .5 \text{ l/s}$

S.W.L. = 10.66 m

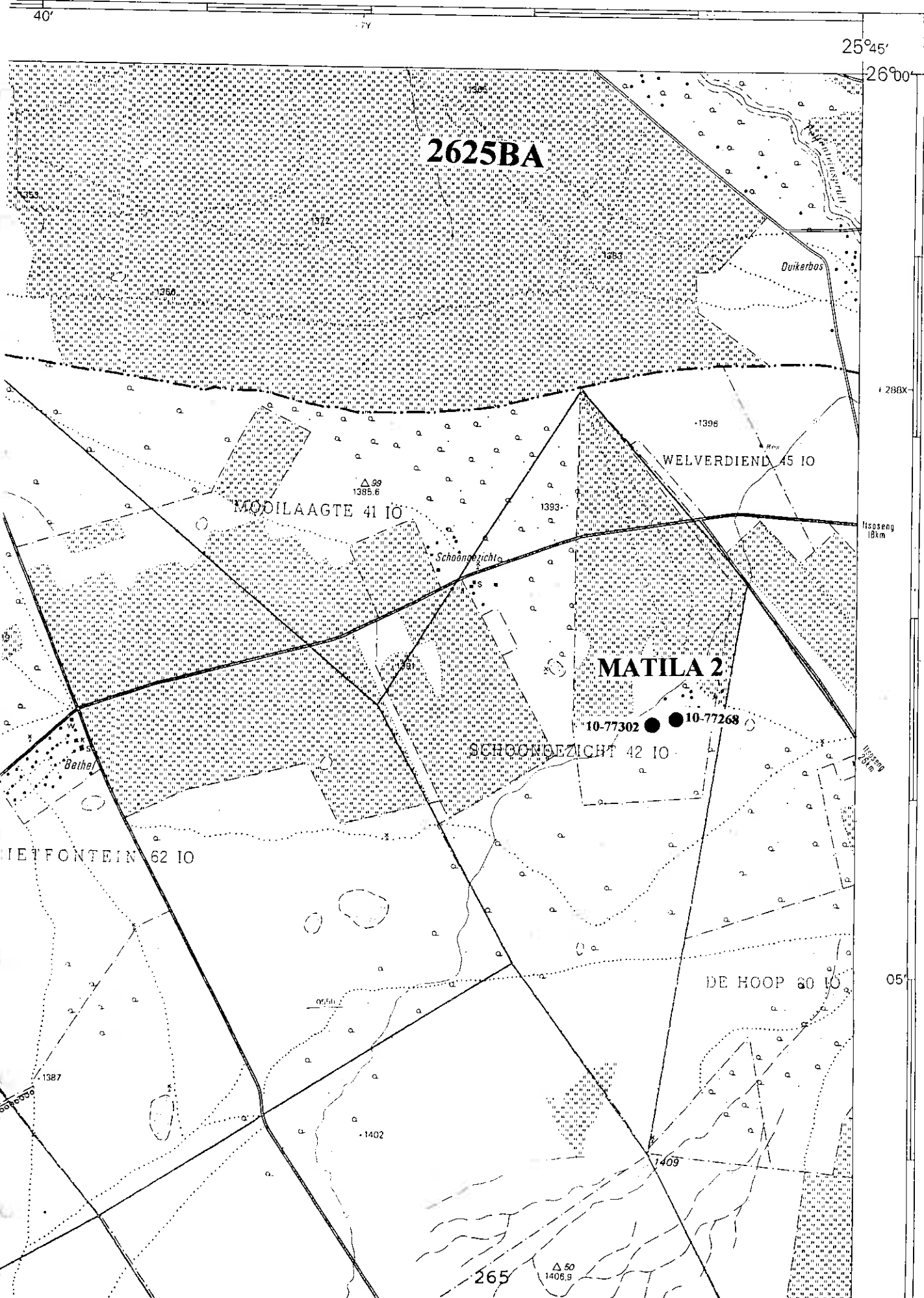
$T = .5 \text{ m}^2/\text{d}$



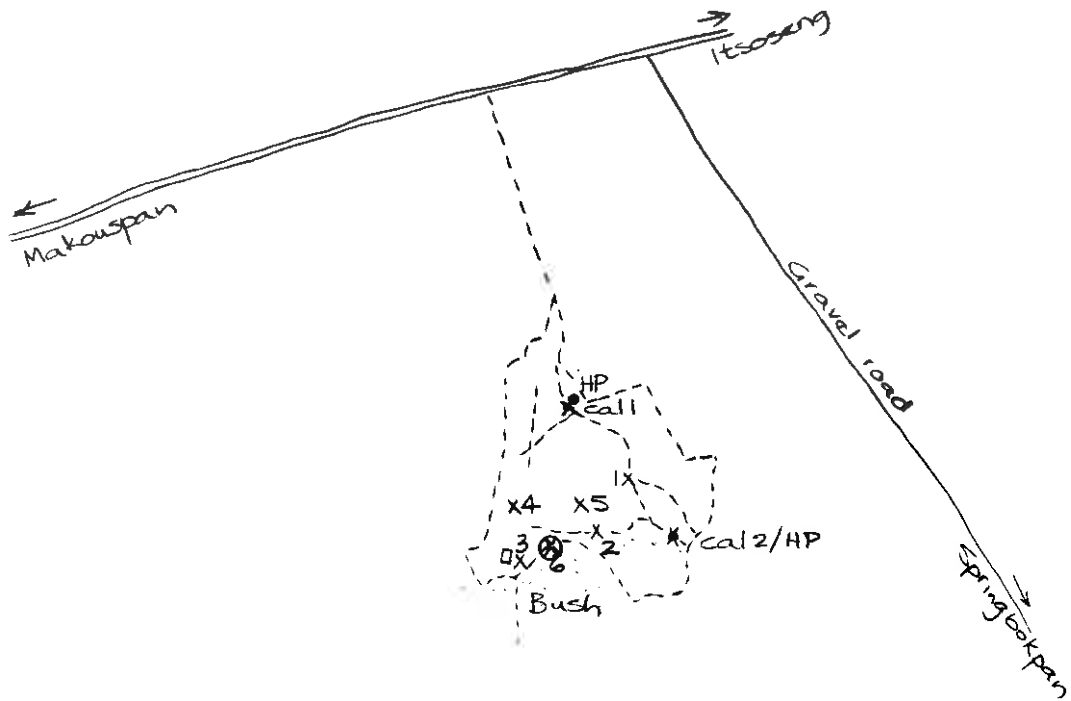
S IN METER

Refer to this Map as SOUTH AFRICA 1:50 000 Sheet
Verwys na hierdie Kaart as SUID-AFRIKA 1:50 000 Vel

2625 BA THUSONG
FIRST EDITION EERSTE UITGAWI

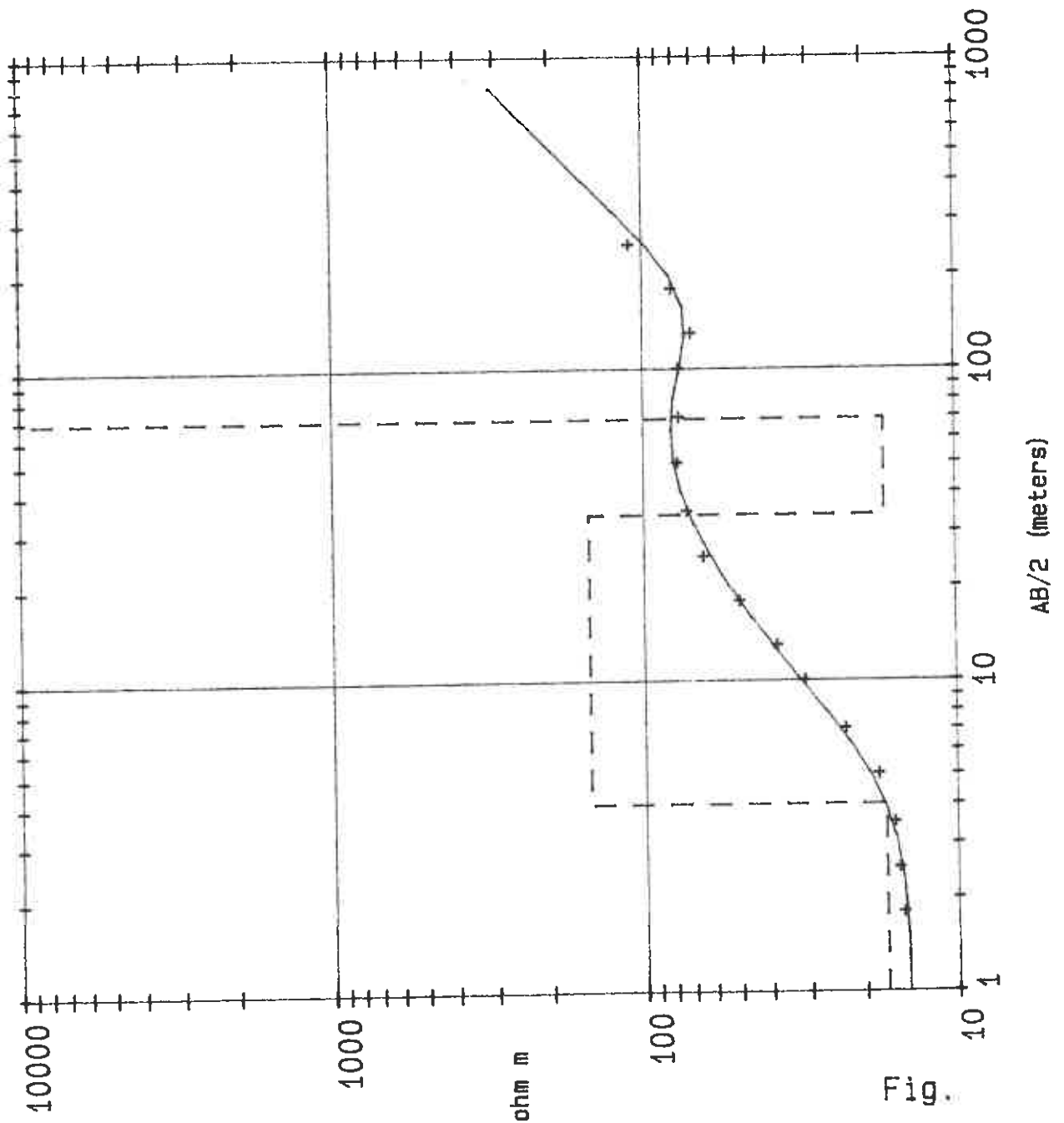


N (Approx)



Locality Plan of Matila 2
Overlay to Photo No 049 (strip 12)

Approx Scale 1:30 000



+ Field data
 — Computer model
 - - - d - r model

MATILA 2

V.E.S. 06

CO-ORDINATES
 +2883375X -73250Y

GEOLOGY
 DOLOMITE

Fig.

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

LOCALITY: MATILA 2 VILLAGE

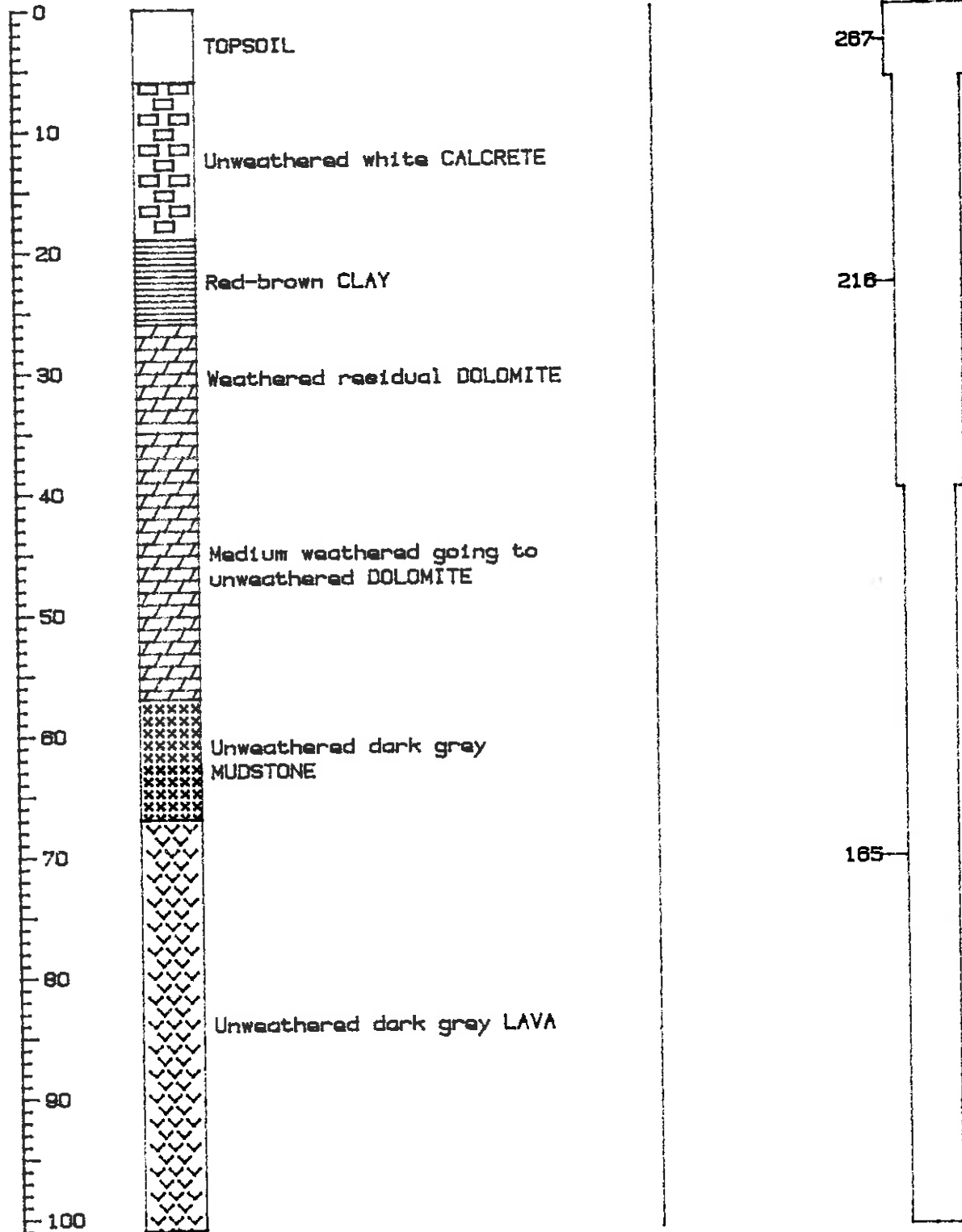
BH. No. 10-77268

Geoph. Peg No. 06

Coordinates +2883375X -73250Y

Elev. (m) 1422

Depth (m)	Geology	Blowing Yield l/s	Drill Dia. mm	Casing Dia. mm
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End of Hole 101

+ Field data
 --- Computer model
 - - - r model

MATILA 2

V.E.S. 03

CO-ORDINATES
 +2883400X -73050Y

GEOLOGY
 DOLOMITE

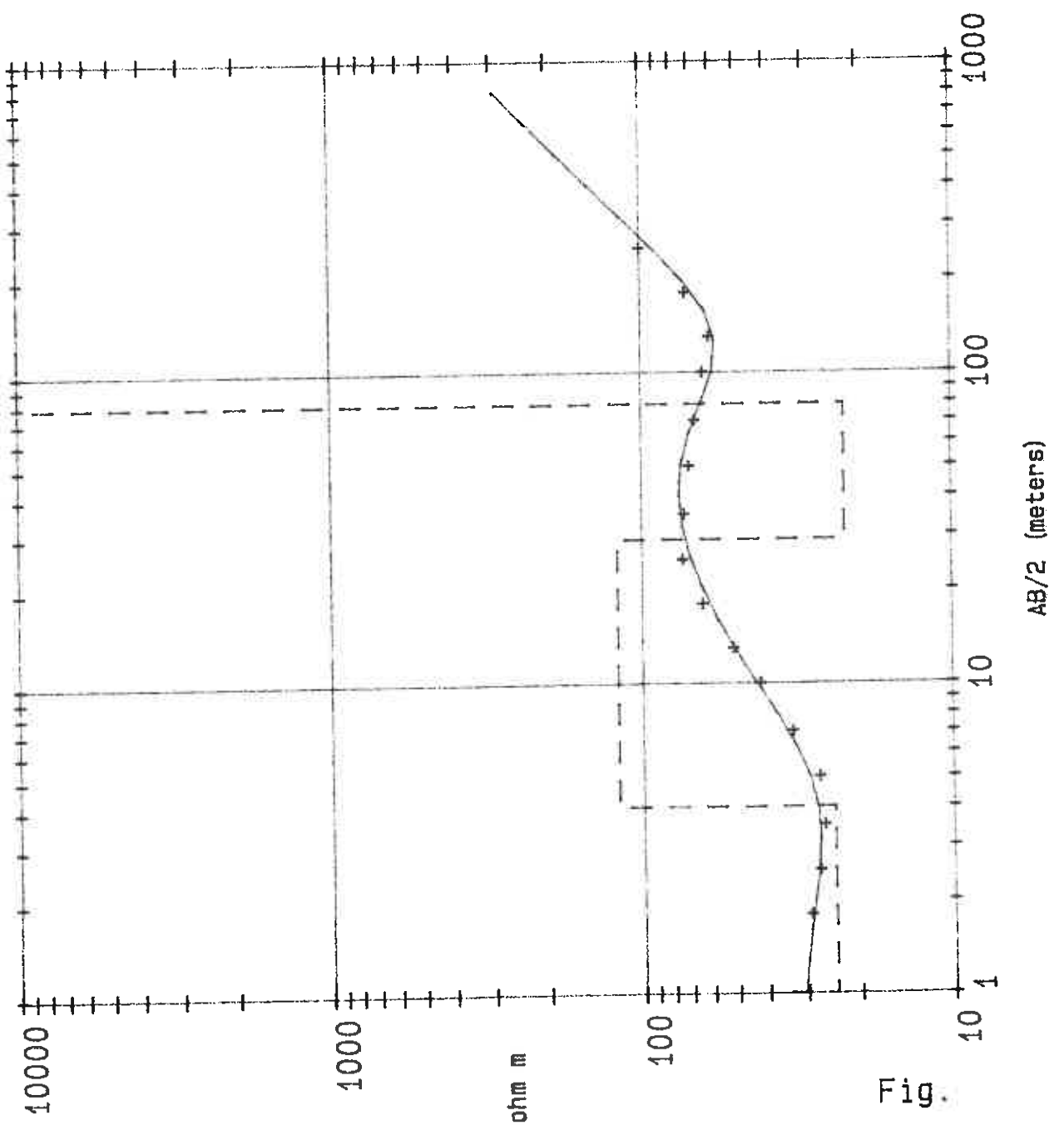


Fig.

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

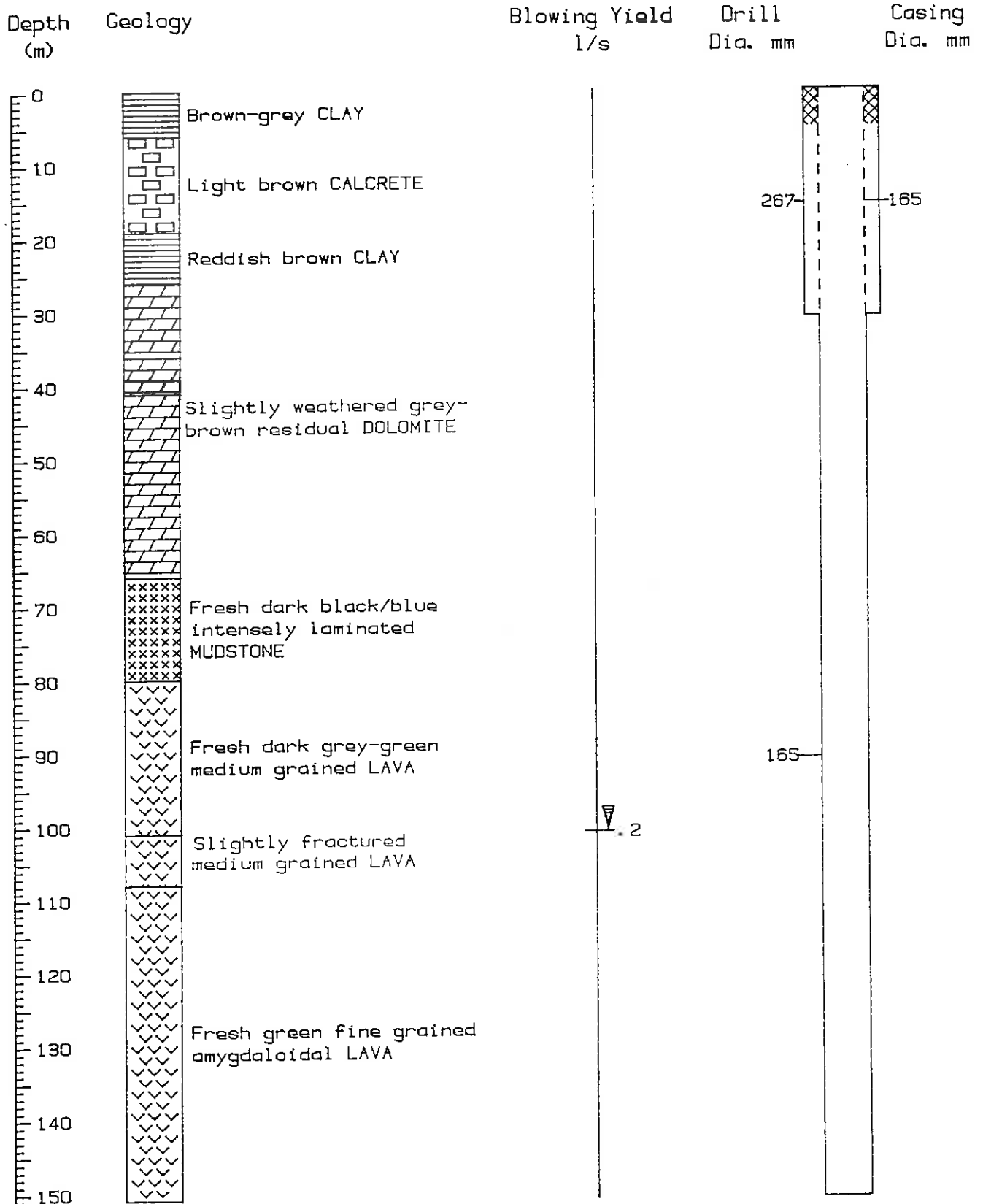
LOCALITY: MATILA 2

BH. No. 10-77302

Geoph. Peg No. 03

Coordinates +2883400X -73050Y

Elev. (m) 1421



End of Hole 151

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

MATILA 2

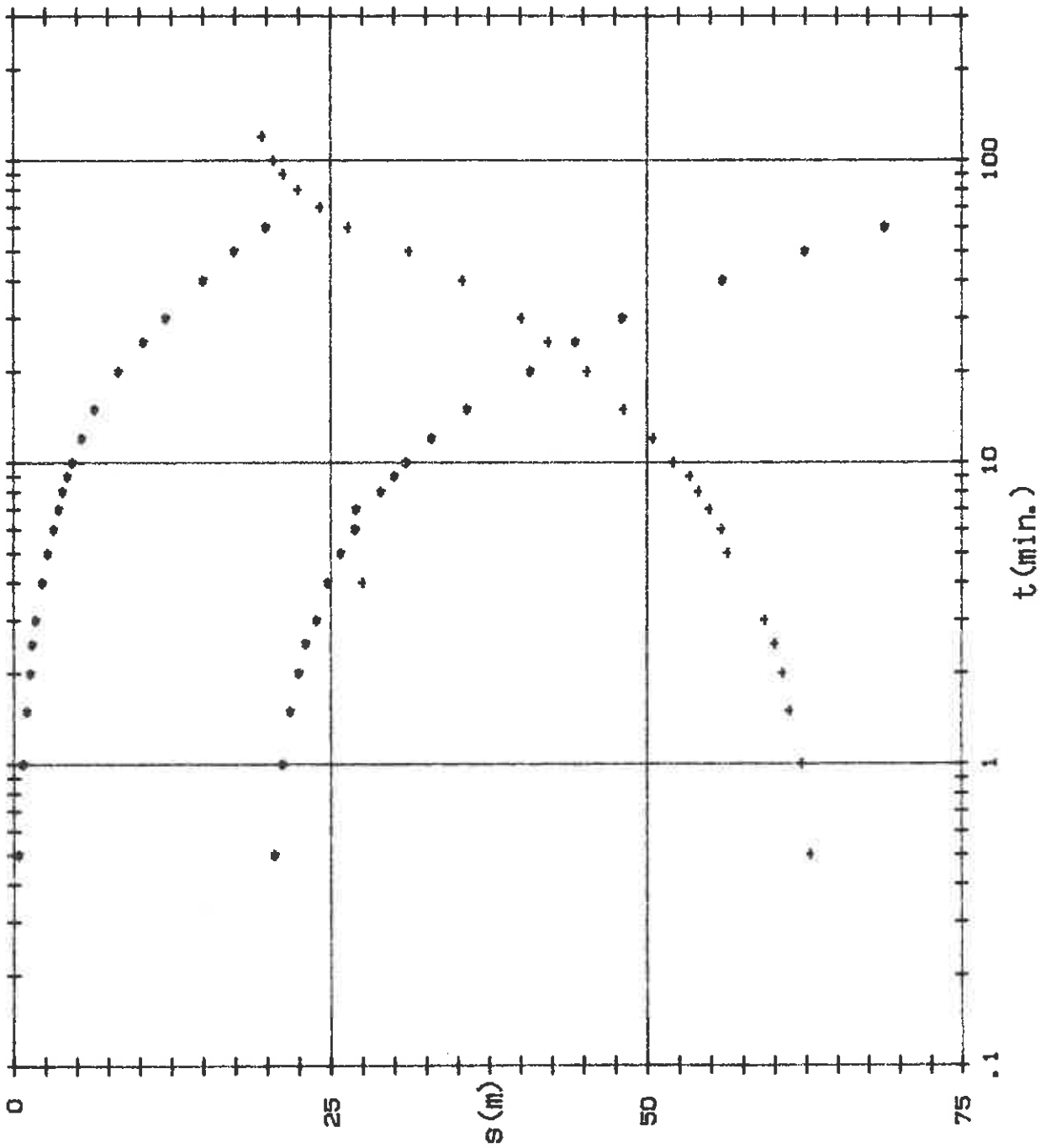
12 08 1992

B.H. No. 10-77302

$Q_1 = .22 \text{ l/s}$

$Q_2 = .48 \text{ l/s}$

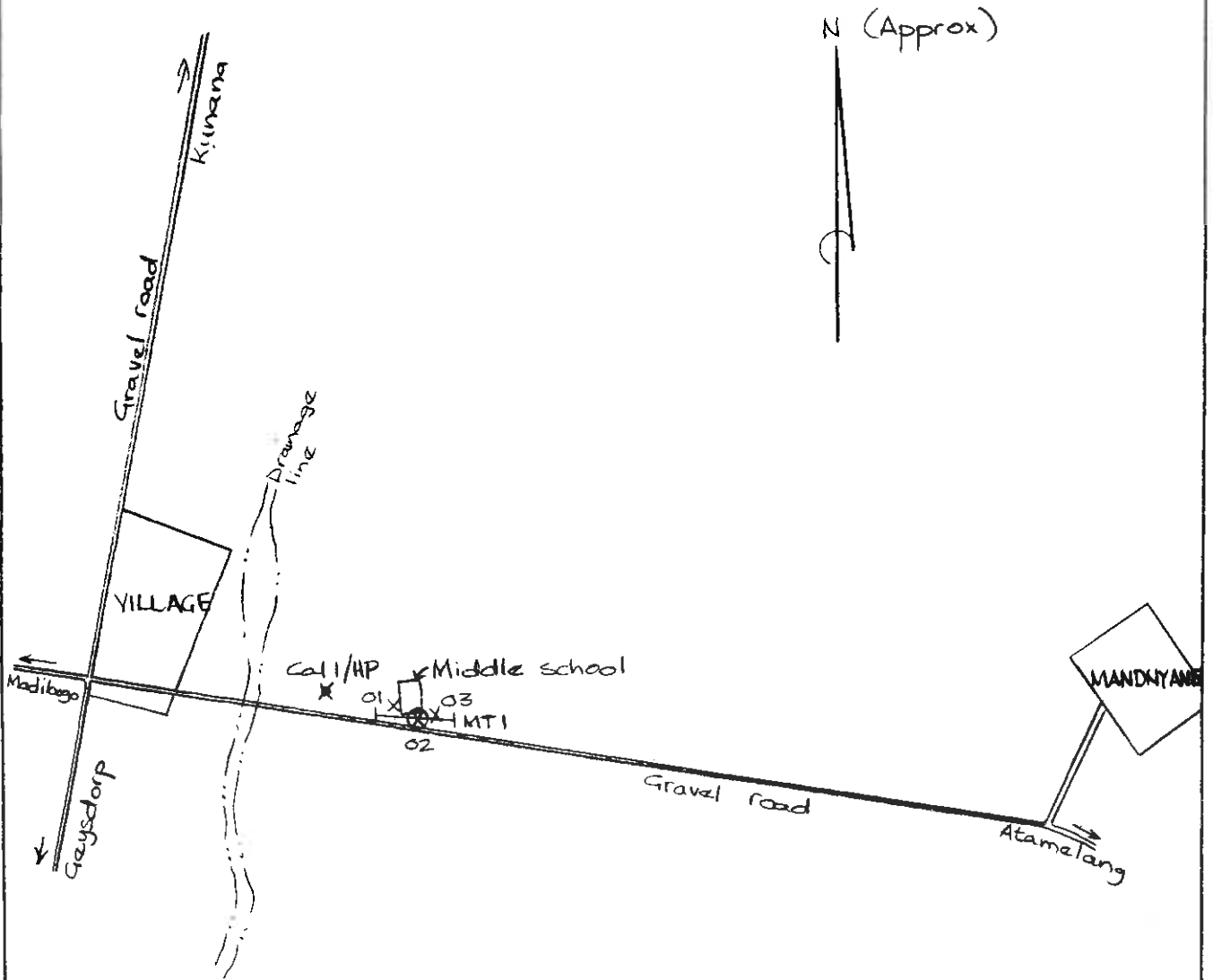
S.W.L. = 13.74 m



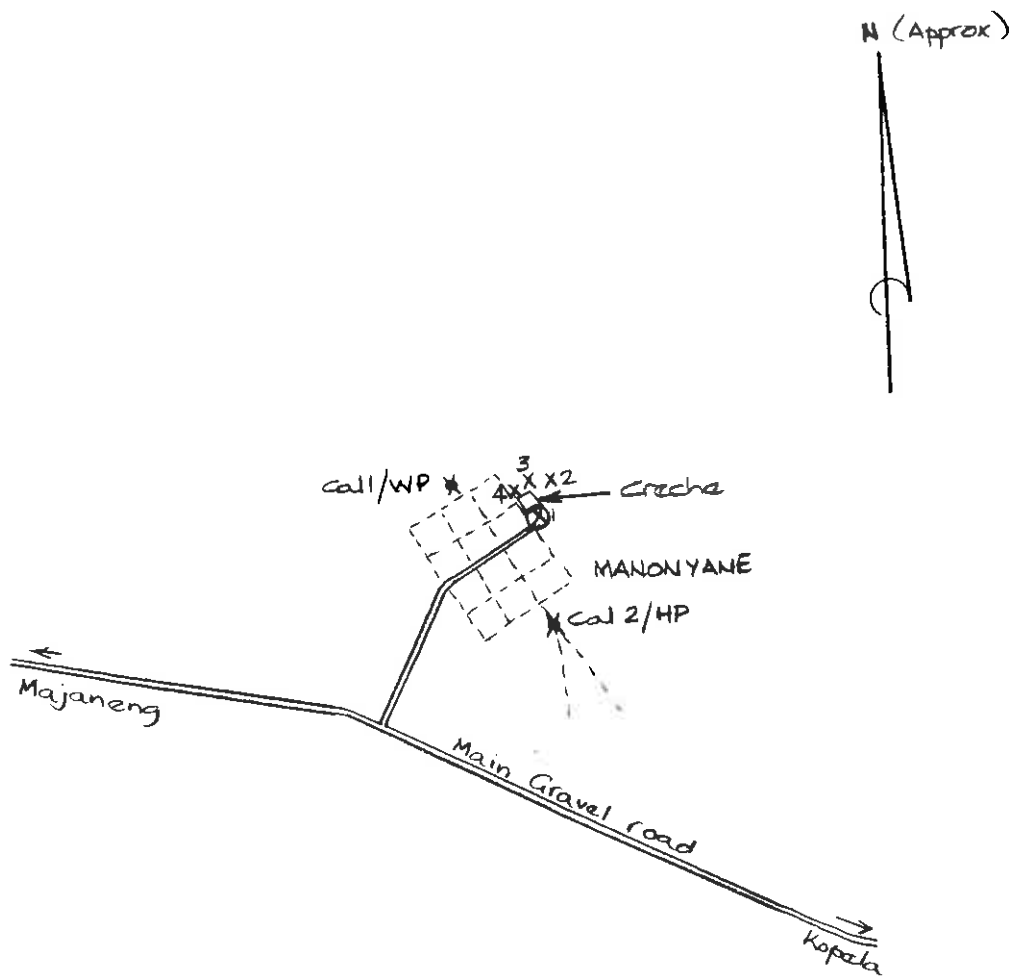
MIDDLETON B AND C

Including boreholes

10-77291 - B H/S
10-77292 - C Manonyane Creche
10-77338 - C
10-77339 - B

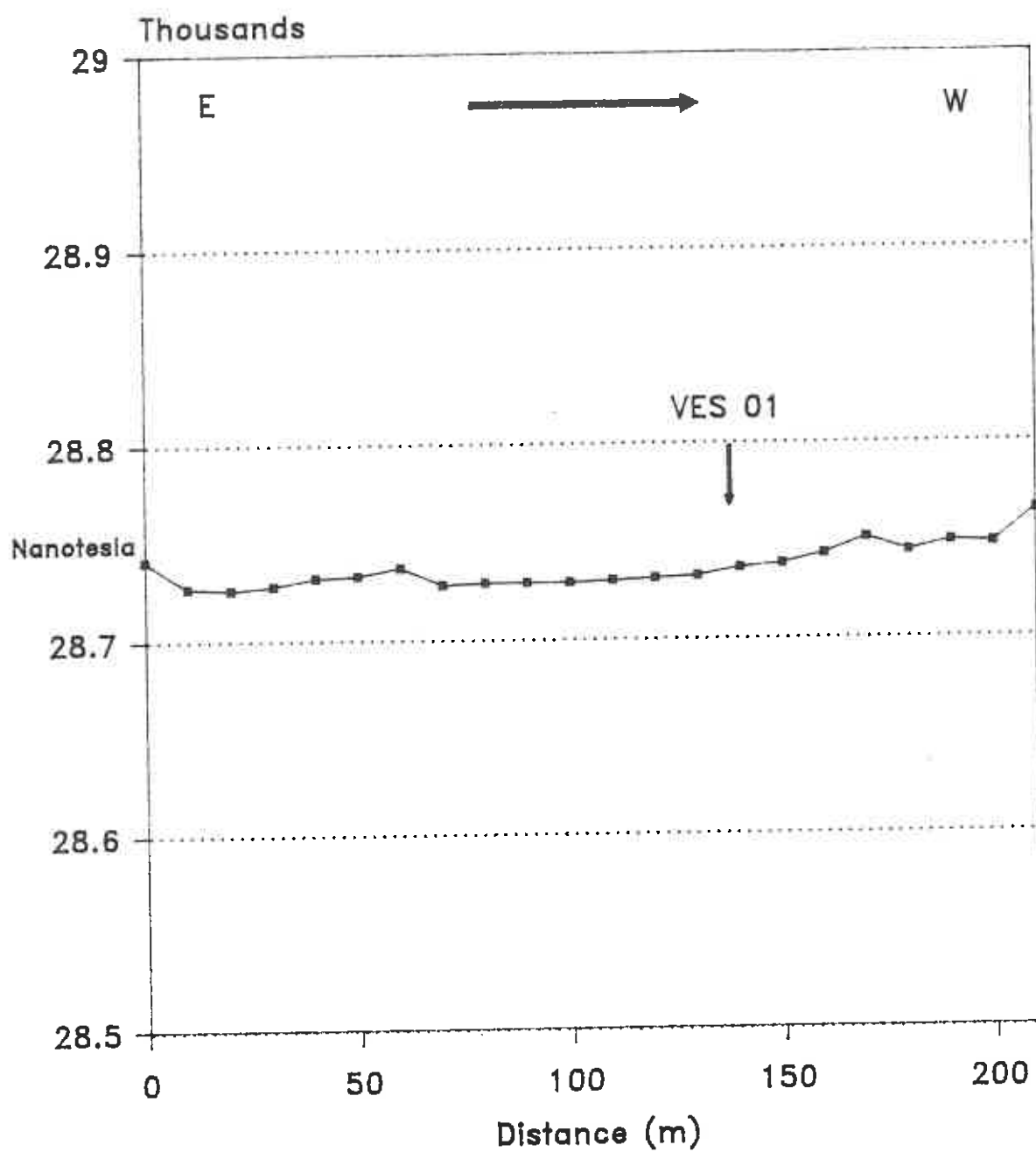


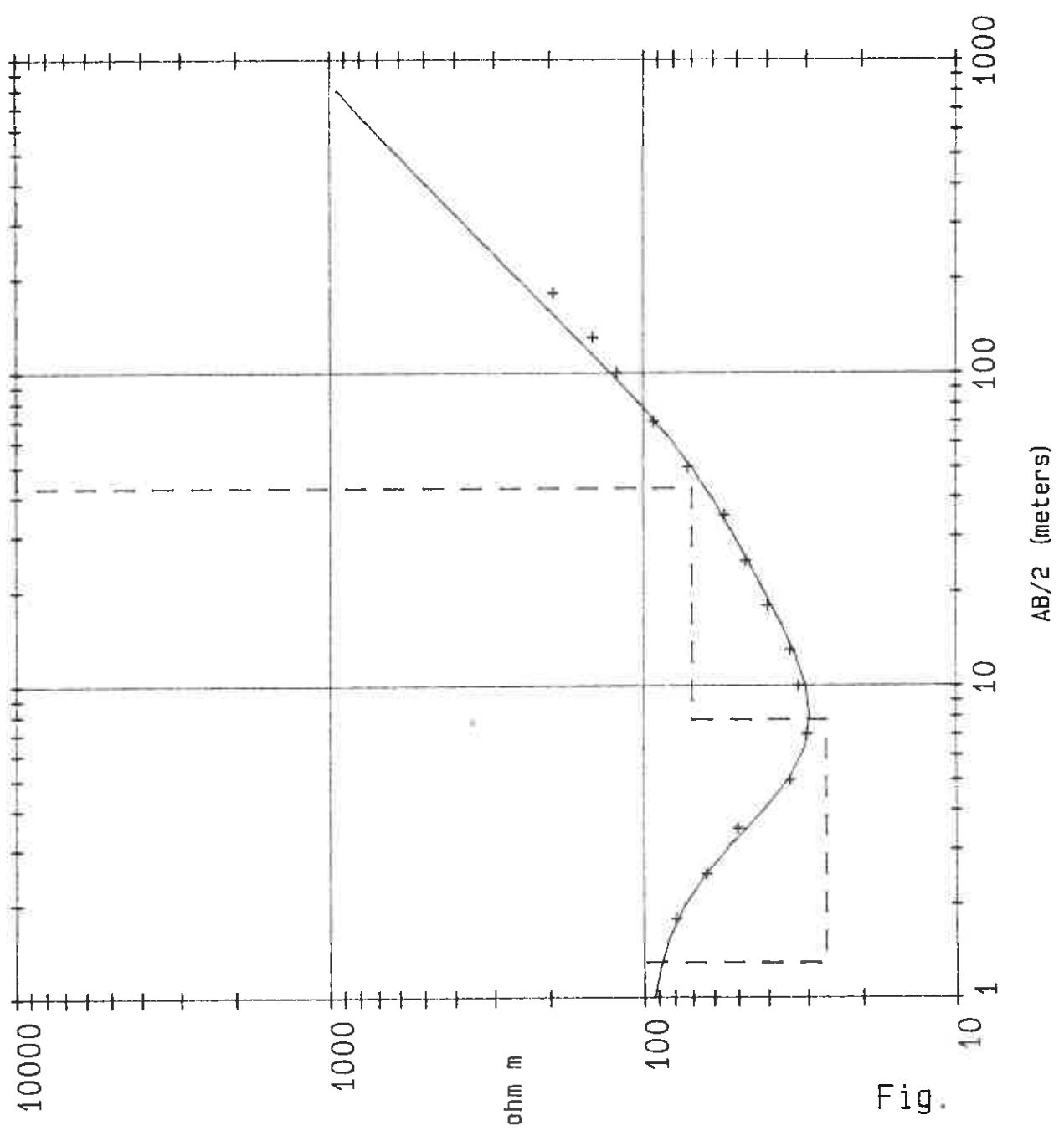
Locality Plan of Middleton B Middle School
 Overlay to Photo No 209 (strip 20)
 Approx Scale 1:30 000



Locality Plan of Manonyane Creche (Middletown C)
 Overlay to Photo No 213 (strip 20)
 Approx Scale 1:30 000

Magnetic Traverse #01
District: Ditsobotla
Locality: Middleton B M/S





+ Field data
 — Computer model
 - - - d - r model

MIDDLETON B M/S

V.E.S. 02

CO-ORDINATES
 +2930150X -33060Y

GEOLOGY
 GRANITE

Fig.

BOREHOLE LOG

DISTRICT: DITSOBOTLA

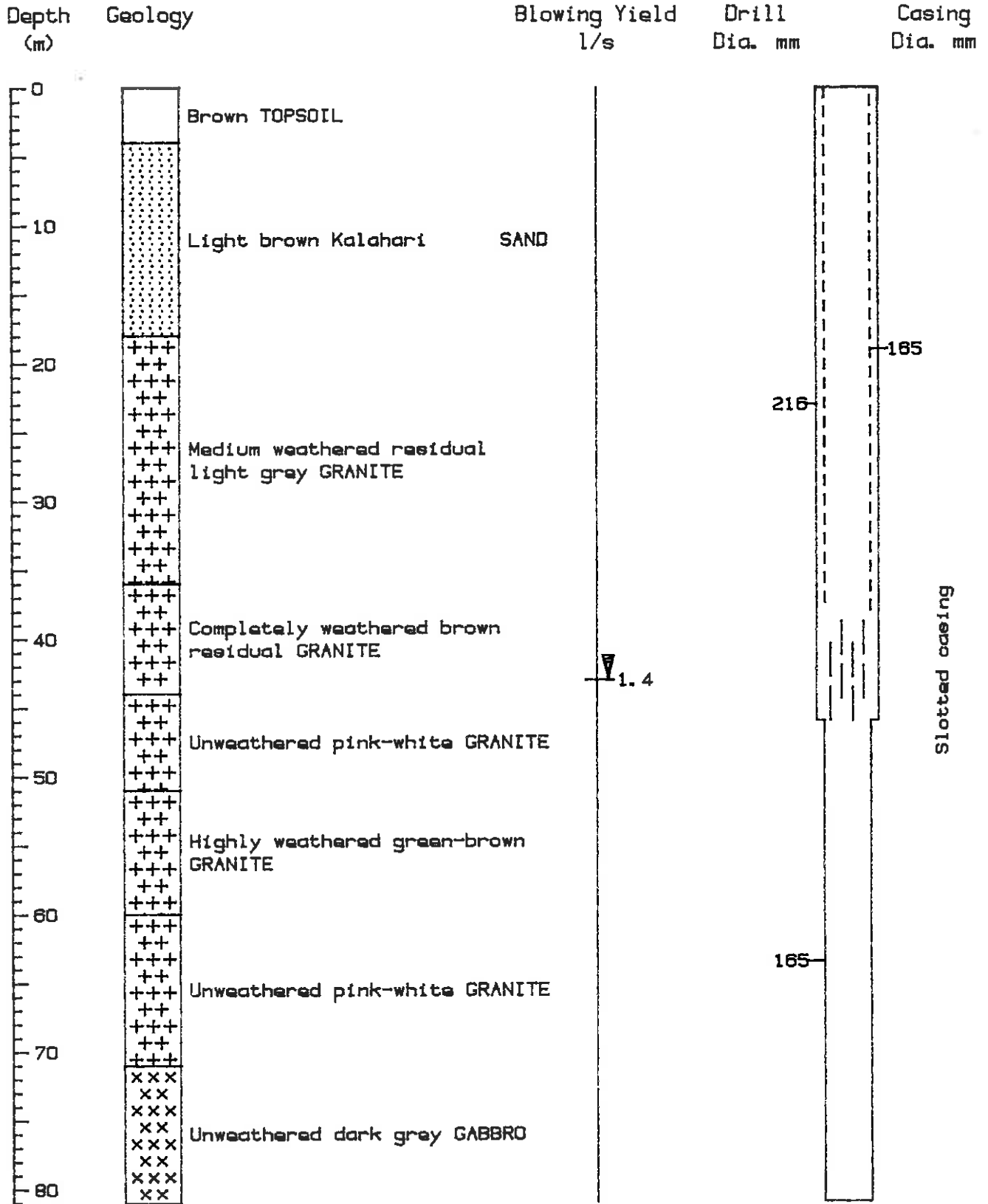
LOCALITY: MIDDLETON B M/SCH

BH. No. 10-77291

Geoph. Peg No. 02

Coordinates +2930150X -33050Y

Elev. (m) 1369



End of Hole 81

STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

MIDDLETON B M/S

06 07 1992

B.H. No. 10-77291

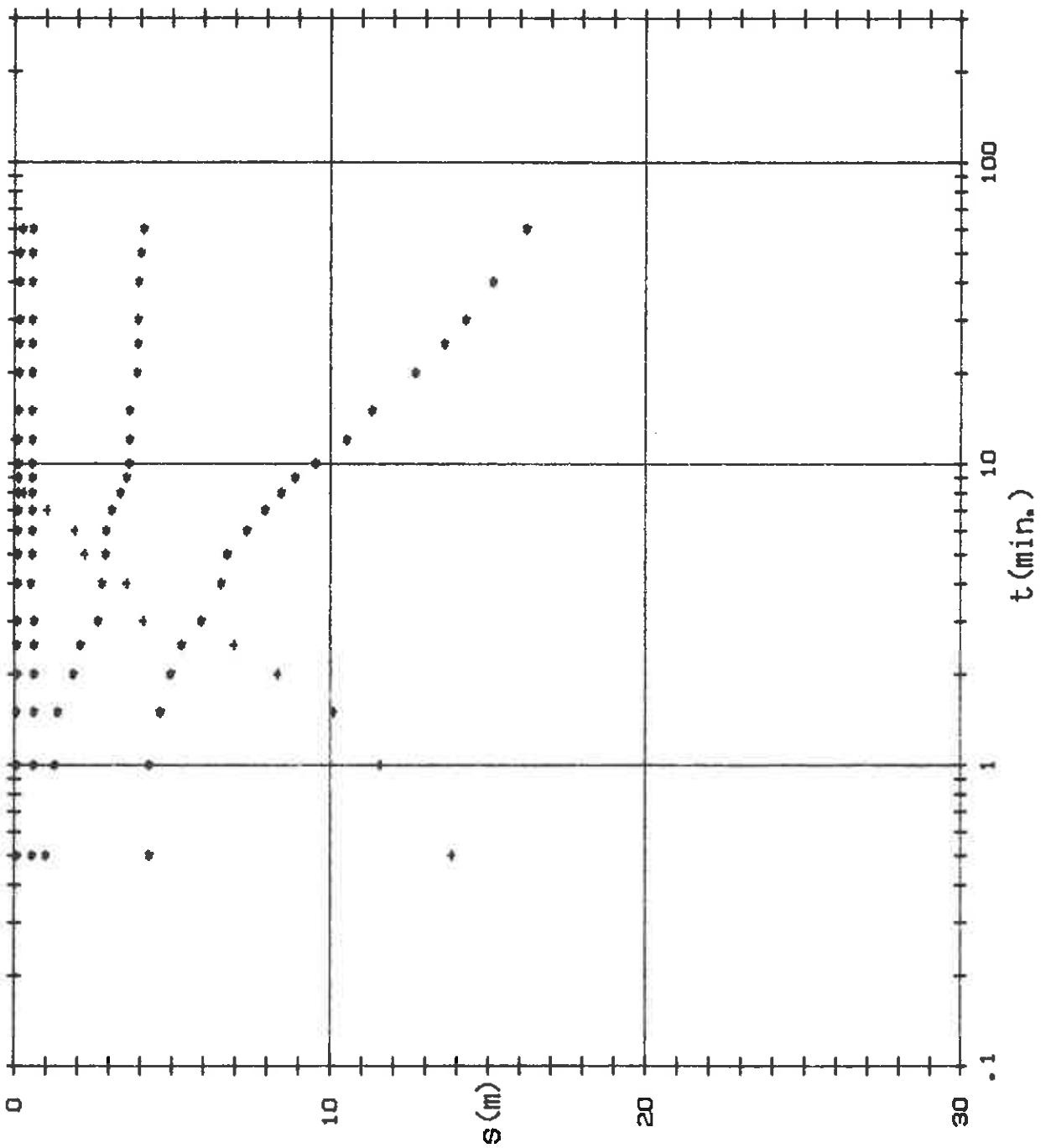
$Q_1 = .25 \text{ l/s}$

$Q_2 = .59 \text{ l/s}$

$Q_3 = 1.22 \text{ l/s}$

$Q_4 = 2.45 \text{ l/s}$

S.W.L. = 18.87 m



CONSTANT DISCHARGE TEST

+ Drawdown data.
* Recovery data.

MIDDLETON B M/S

06 07 1992

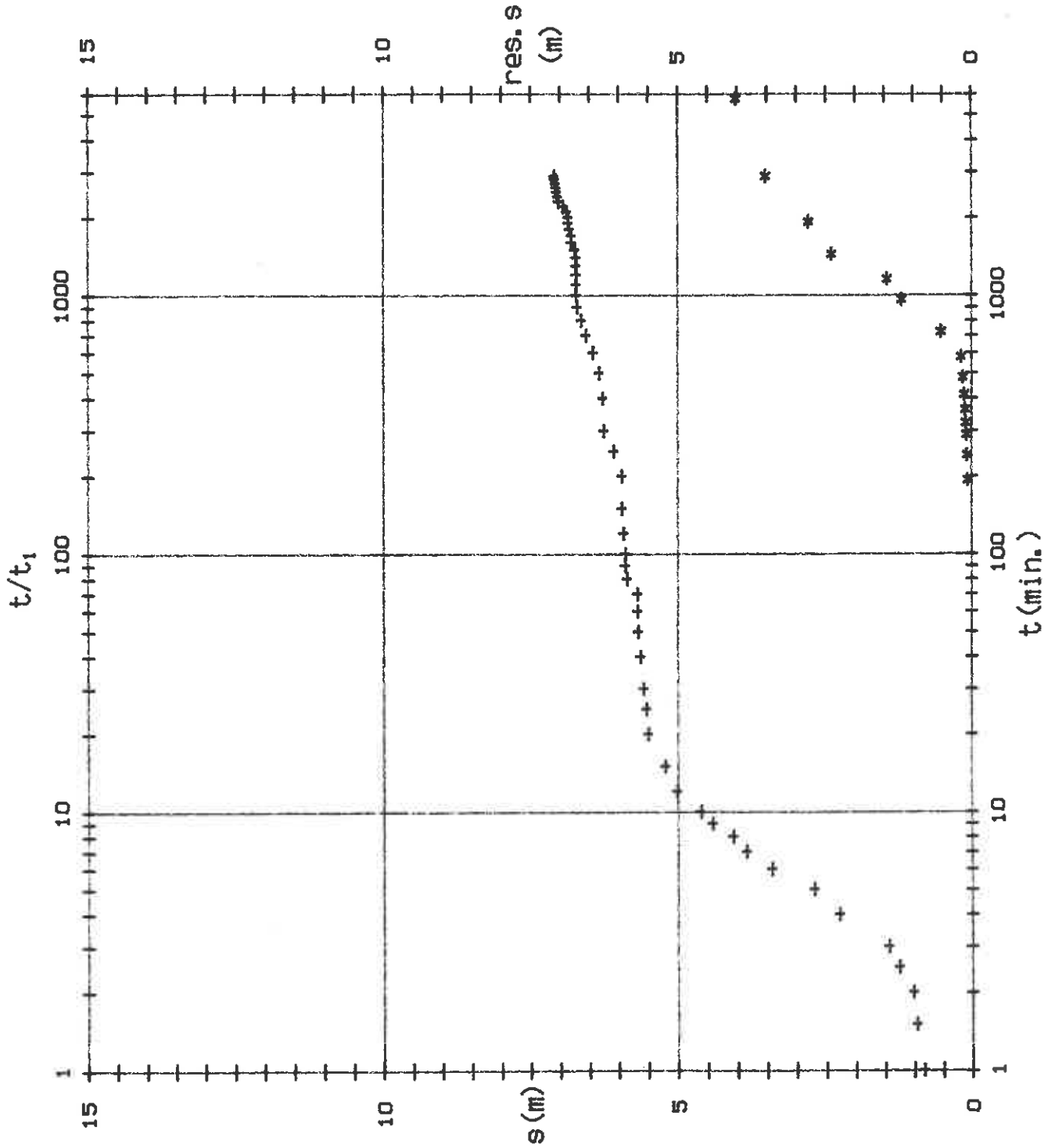
Pumped Borehole
10-77291

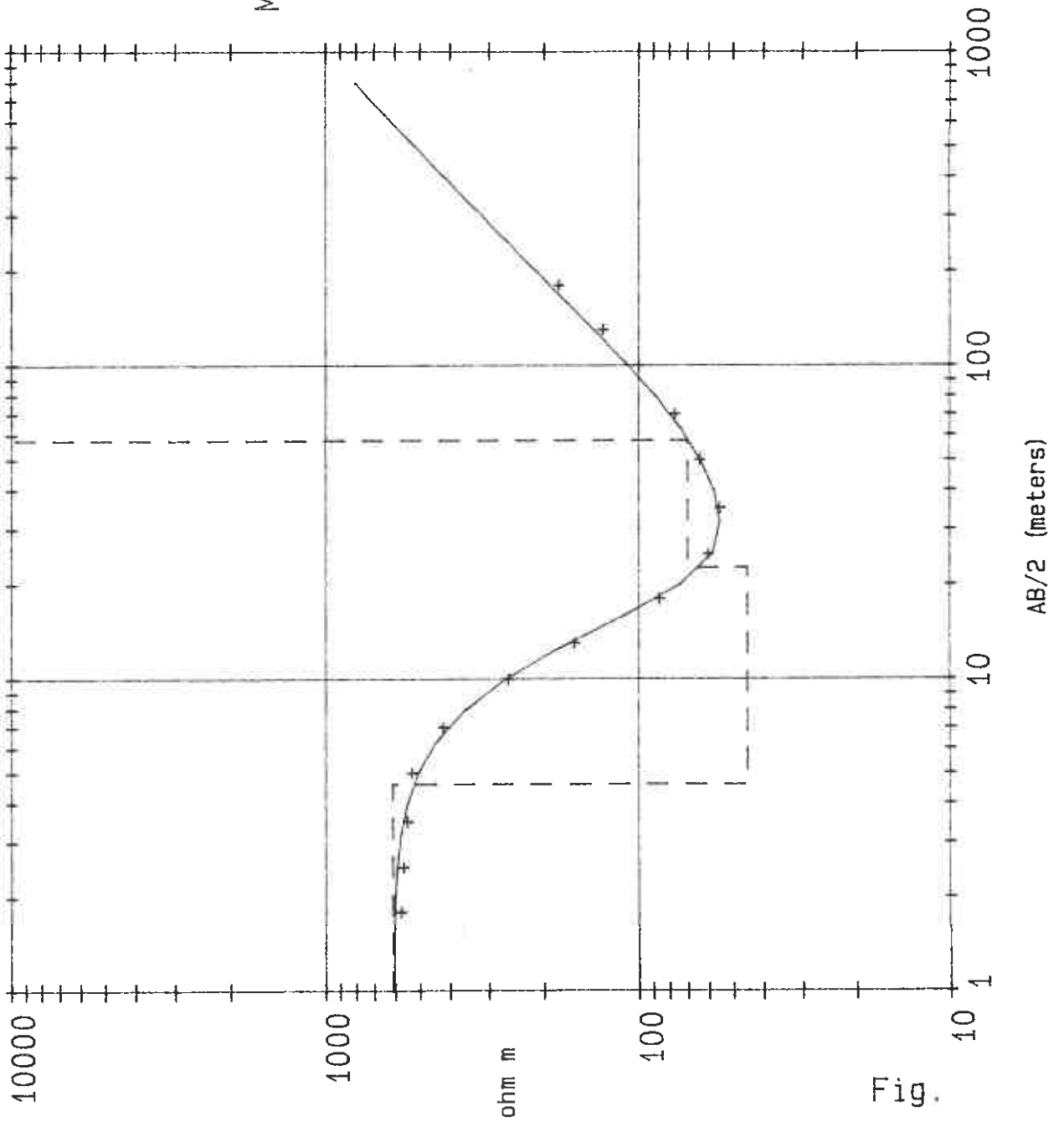
Readings on Borehole
10-77291

$Q = 1.5 \text{ l/s}$

S.W.L. = 18.87 m

$T = 4 \text{ m}^2/\text{d}$





+ Field data
 — Computer model
 - - - r model

MIDDLETON C MANDONYANE CRECHE

V.E.S. 01

CO-ORDINATES
 +2930025X -36815Y

GEOLOGY
 GRANITE

Fig.

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

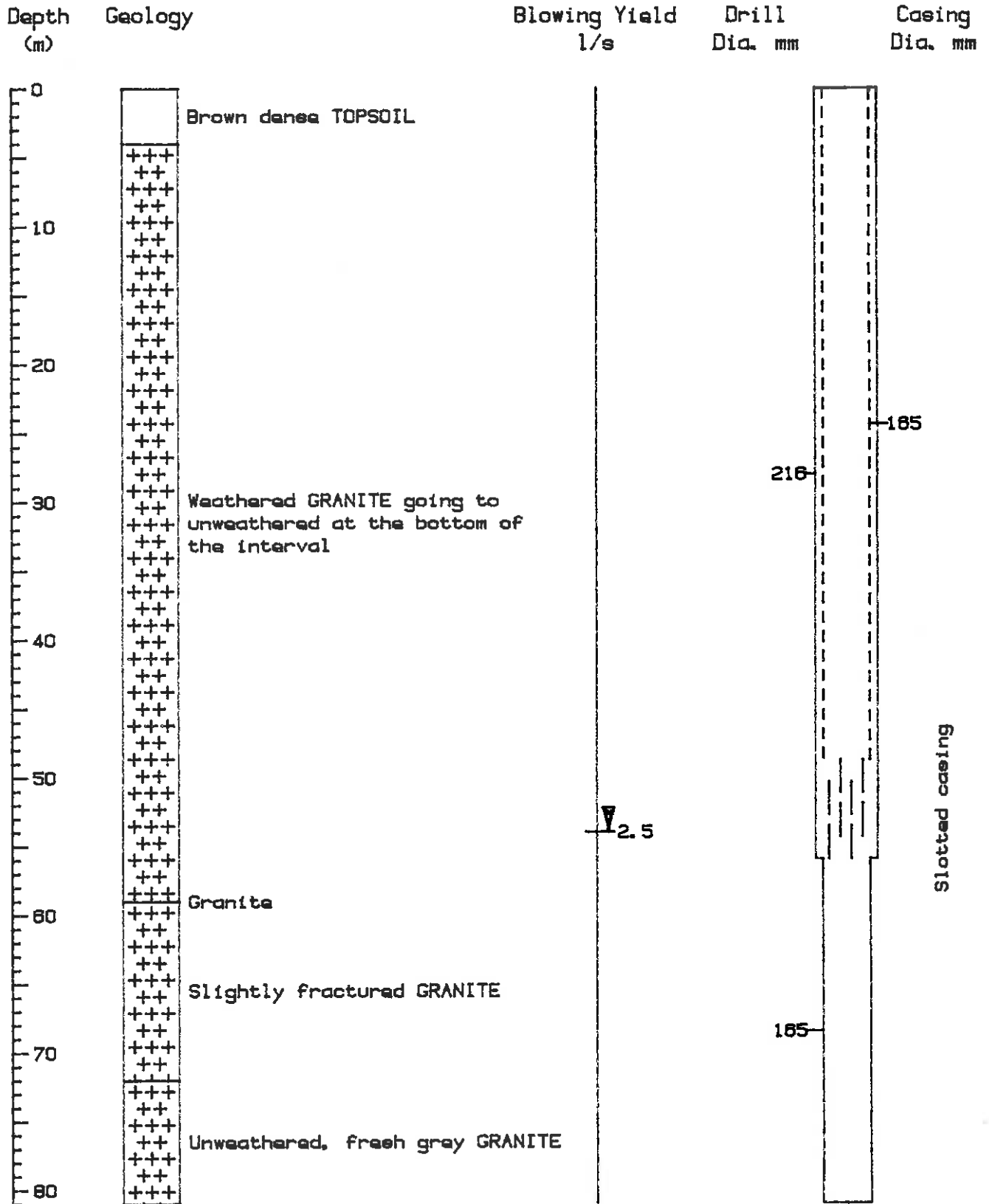
LOCALITY: MIDDLETON C-MANONYANE

BH. No. 10-77292

Geoph. Peg No. 01

Coordinates +2930025X -36825Y

Elev. (m) 1400



End of Hole 81

STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

MIDDLETON C
MANONYANE CRECHE

09 07 1992

B.H. No. 10-77292

$Q_1 = .28 \text{ l/s}$

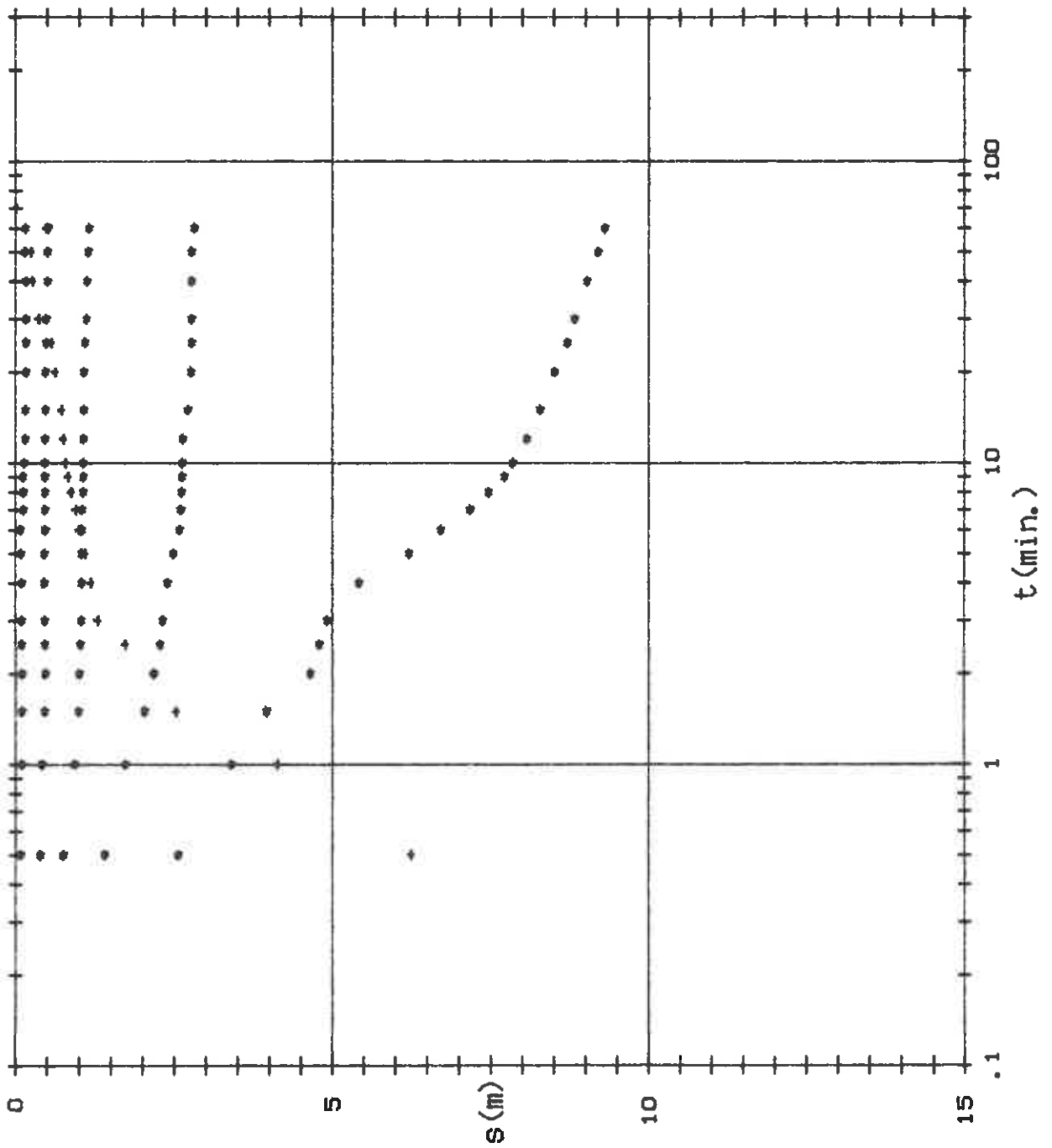
$Q_2 = .6 \text{ l/s}$

$Q_3 = 1.22 \text{ l/s}$

$Q_4 = 2.4 \text{ l/s}$

$Q_5 = 4 \text{ l/s}$

S.W.L. = 34.89 m



CONSTANT DISCHARGE TEST

+ Drawdown data.
* Recovery data.

MIDDLETON C

MANONYANE CRECHE

10 07 1992

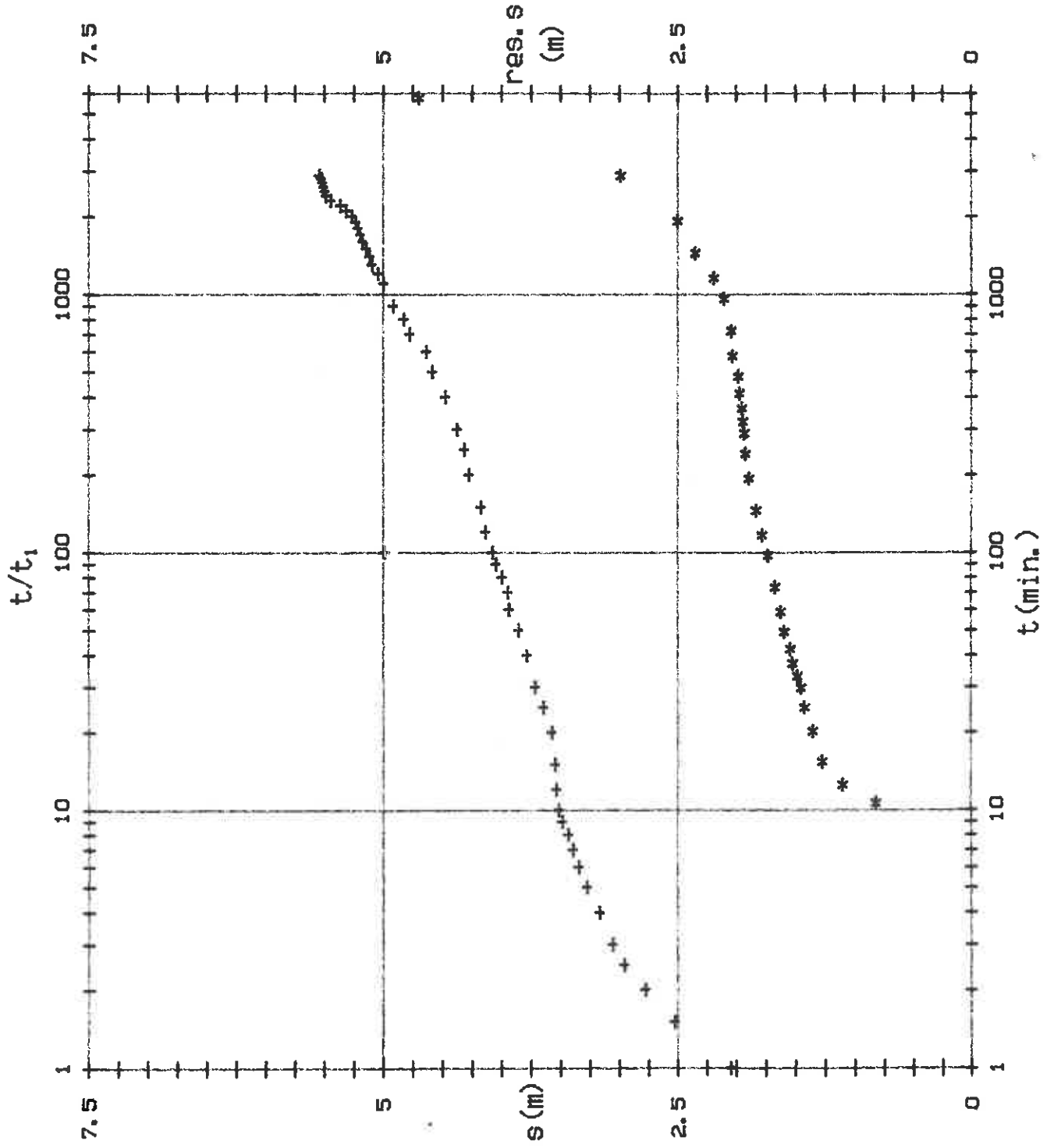
Pumped Borehole
10-77292

Readings on Borehole
10-77292

Q = 3 l/s

S.W.L. = 34.89 m

T = 50 m²/d



STEP DRAWDOWN TEST

* Pumping data
 + Recovery data

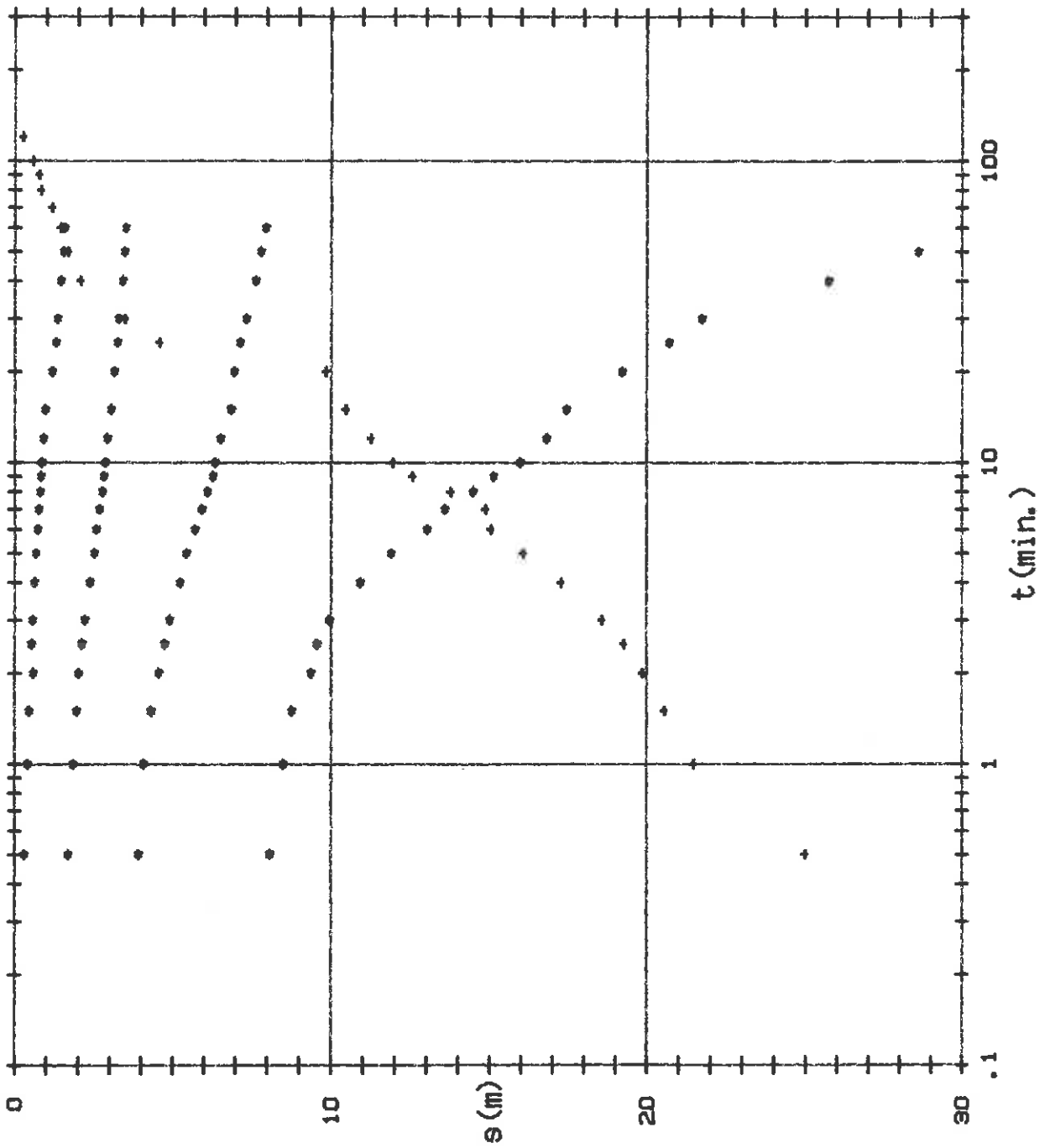
MIDDLETON C

12 07 1992

B.H. No. 10-77338

$Q_1 = .19 \text{ l/s}$
 $Q_2 = .41 \text{ l/s}$
 $Q_3 = .81 \text{ l/s}$
 $Q_4 = 1.86 \text{ l/s}$

S.W.L. = 10.74 m



CONSTANT DISCHARGE TEST

+ Drawdown data.
* Recovery data.

MIDDLETON C

13 07 1992

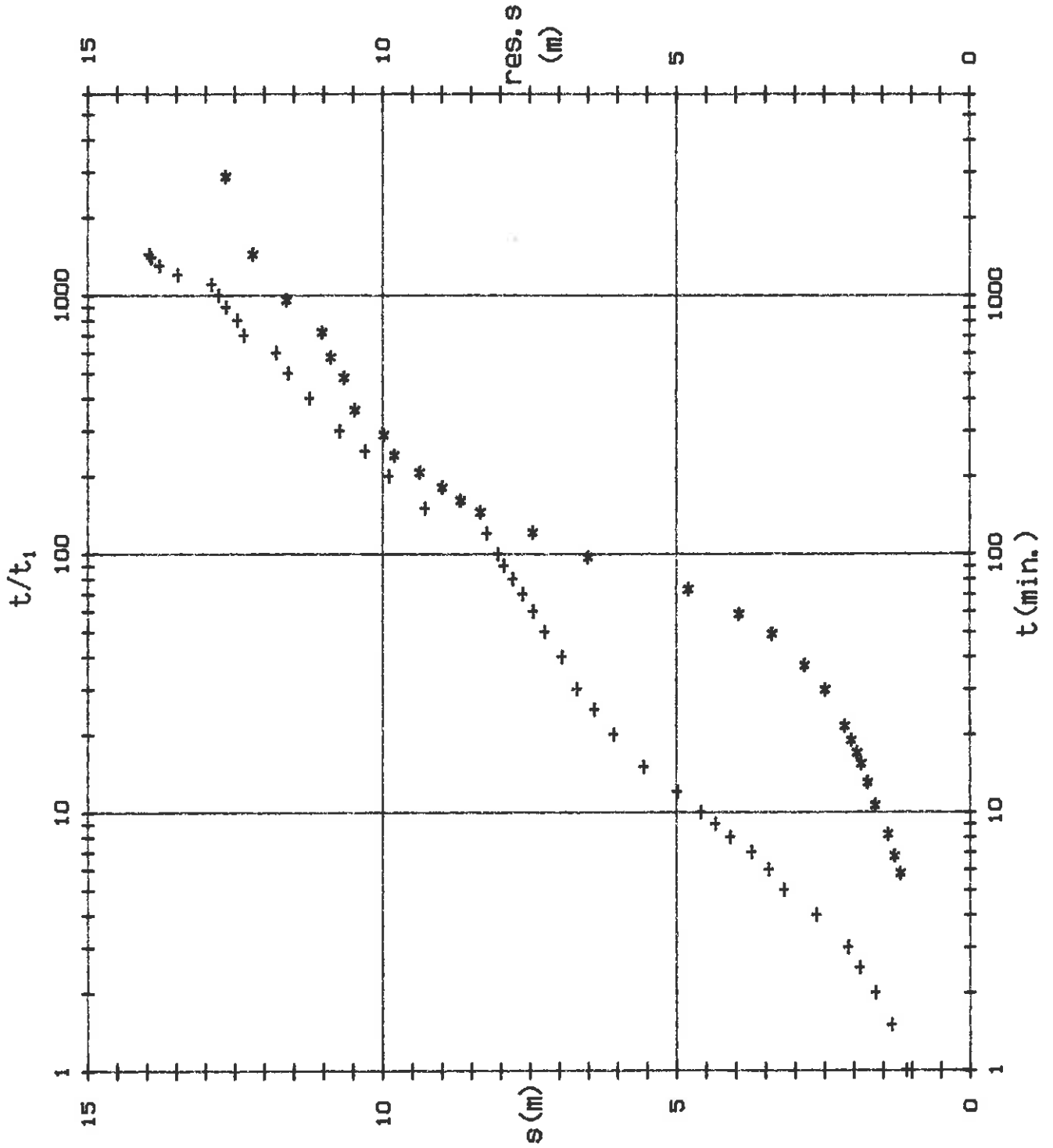
Pumped Borehole
10-77338

Readings on Borehole
10-77338

$Q = .8 \text{ l/s}$

S.W.L. = 10.74 m

$T = 3 \text{ m}^2/\text{d}$



STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

MIDDLETON B

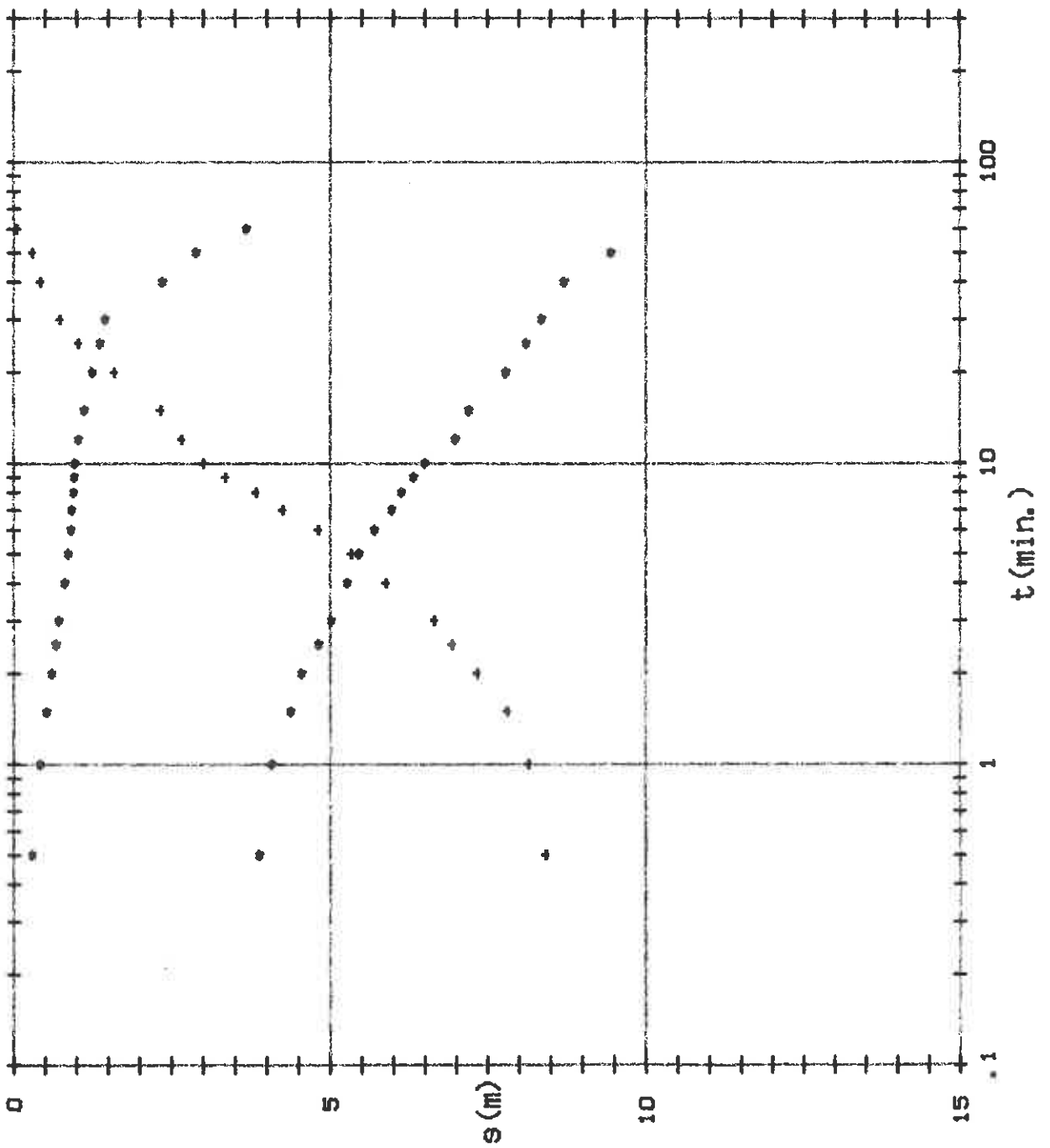
07 07 1992

B.H. No. 10-77339

$Q_1 = .26 \text{ l/s}$

$Q_2 = .54 \text{ l/s}$

S.W.L. = 26.13 m



MODIBOA

Including borehole

10-77246

2625AD

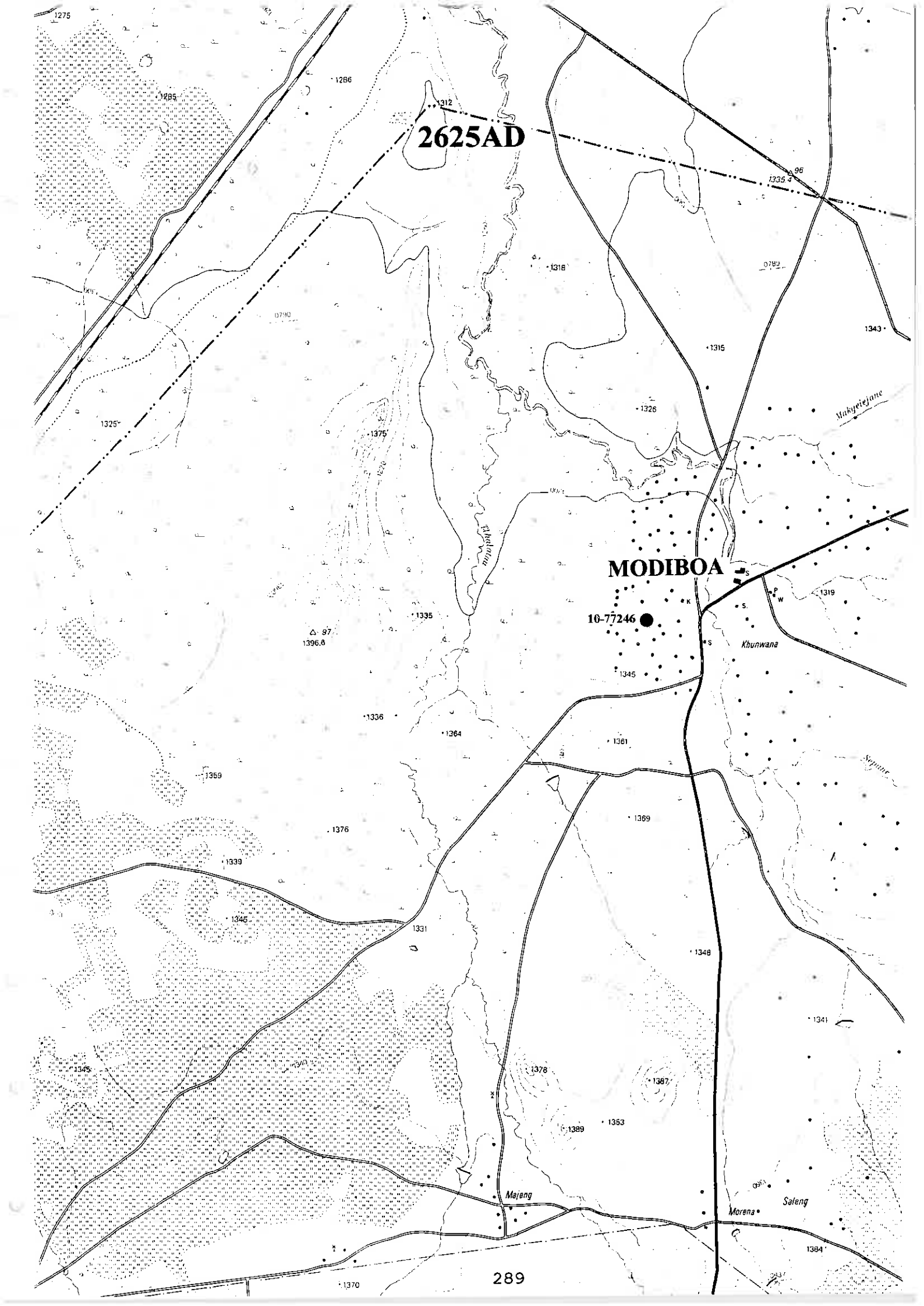
MODIBOA

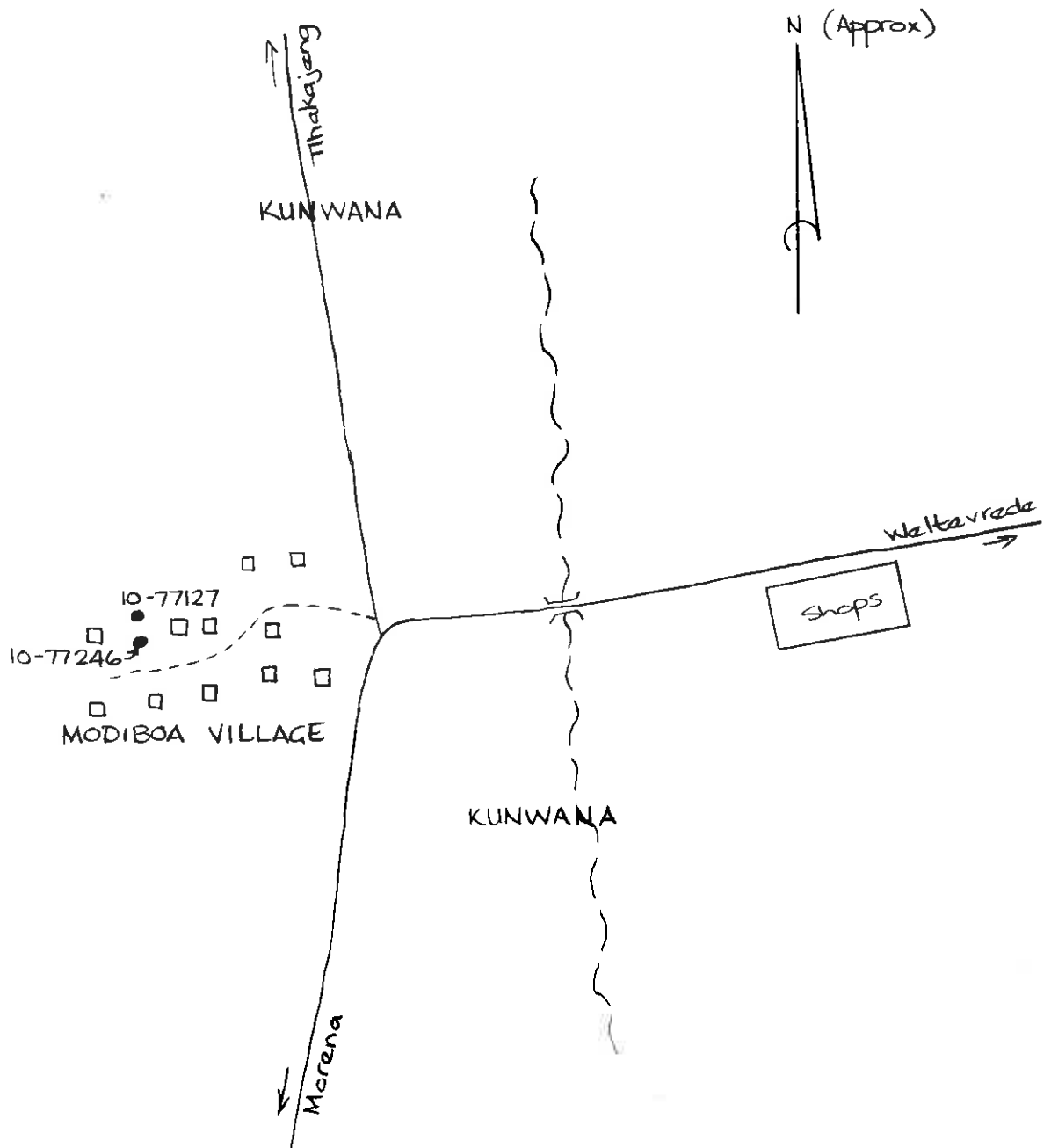
10-77246

Majeng

Morena

Saleng





Locality Plan of Boreholes 10-77127 (collapsed) and 10-77246

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

LOCALITY:

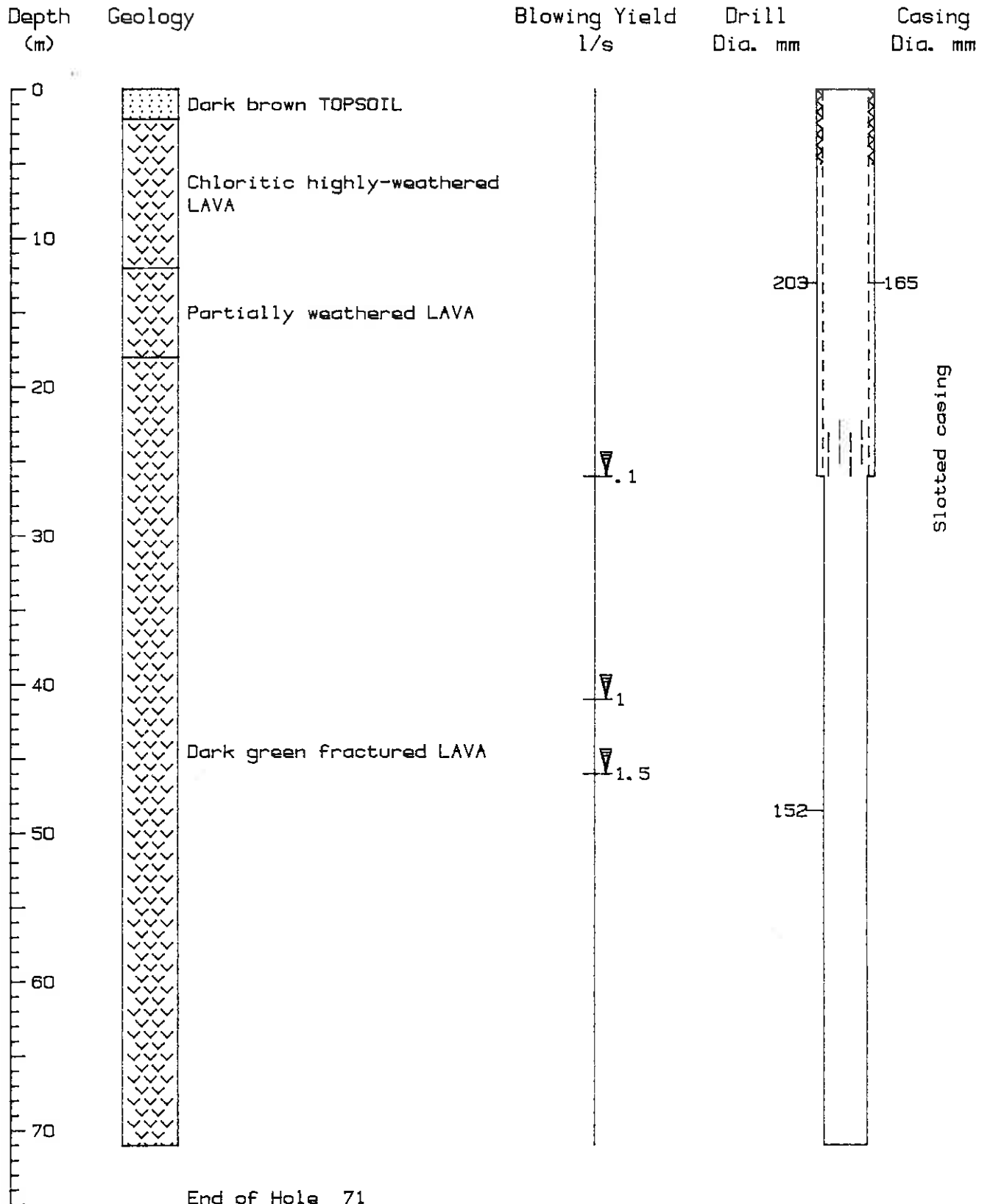
MODIBOA

BH. No. 10-77246

Geoph. Peg No. REHAB

Coordinates +2918000X -32000Y

Elev. (m) 1330



STEP DRAWDOWN TEST

* Pumping data
 + Recovery data

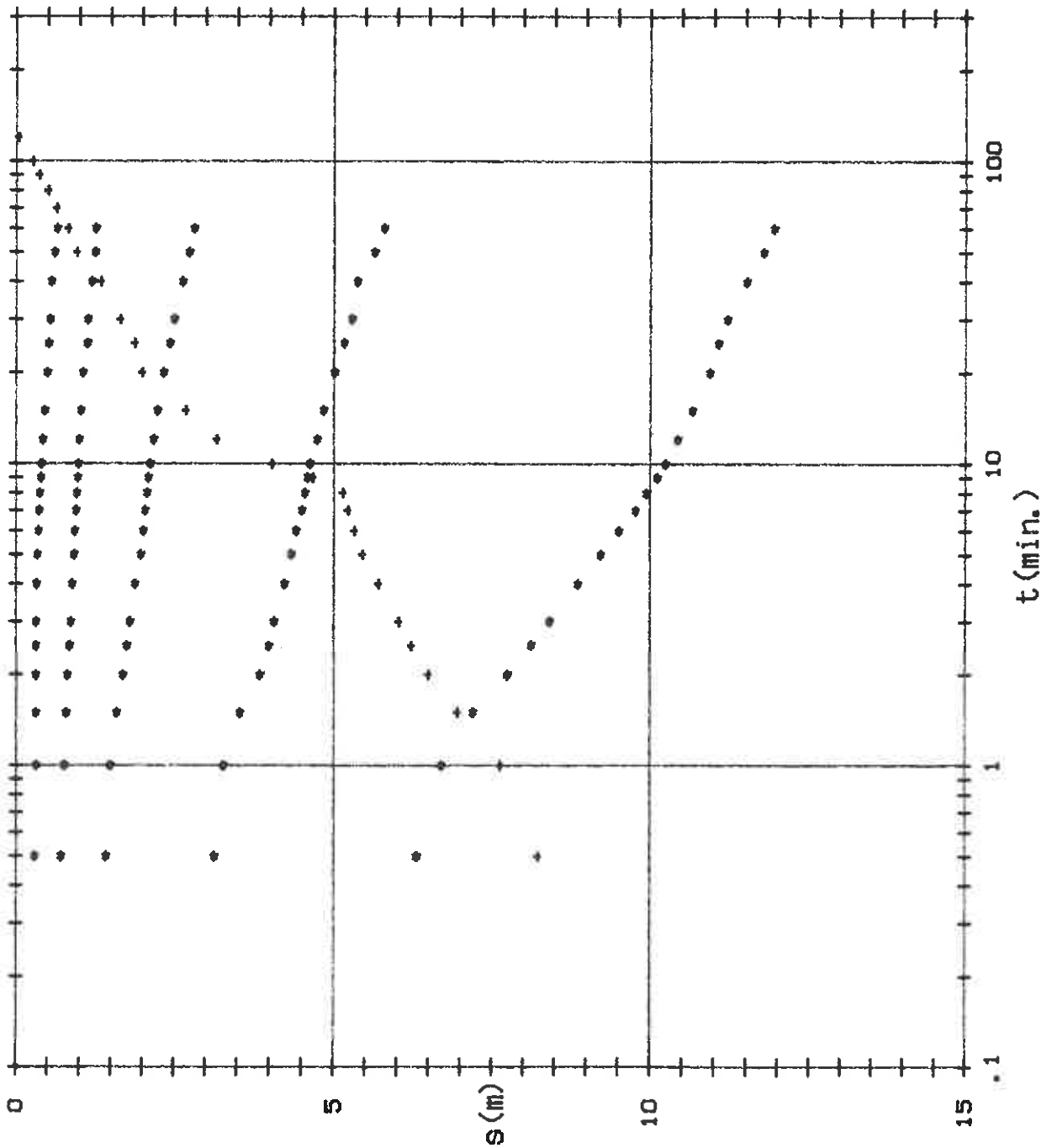
MODIBOA

08 07 1992

B.H. No. 10-77246

$Q_1 = .2 \text{ l/s}$
 $Q_2 = .41 \text{ l/s}$
 $Q_3 = .9 \text{ l/s}$
 $Q_4 = 1.84 \text{ l/s}$
 $Q_5 = 3.5 \text{ l/s}$

S.W.L. = 21.19 m



CONSTANT DISCHARGE TEST

+ Drawdown data.
* Recovery data.

MODIBOA

08 07 1992

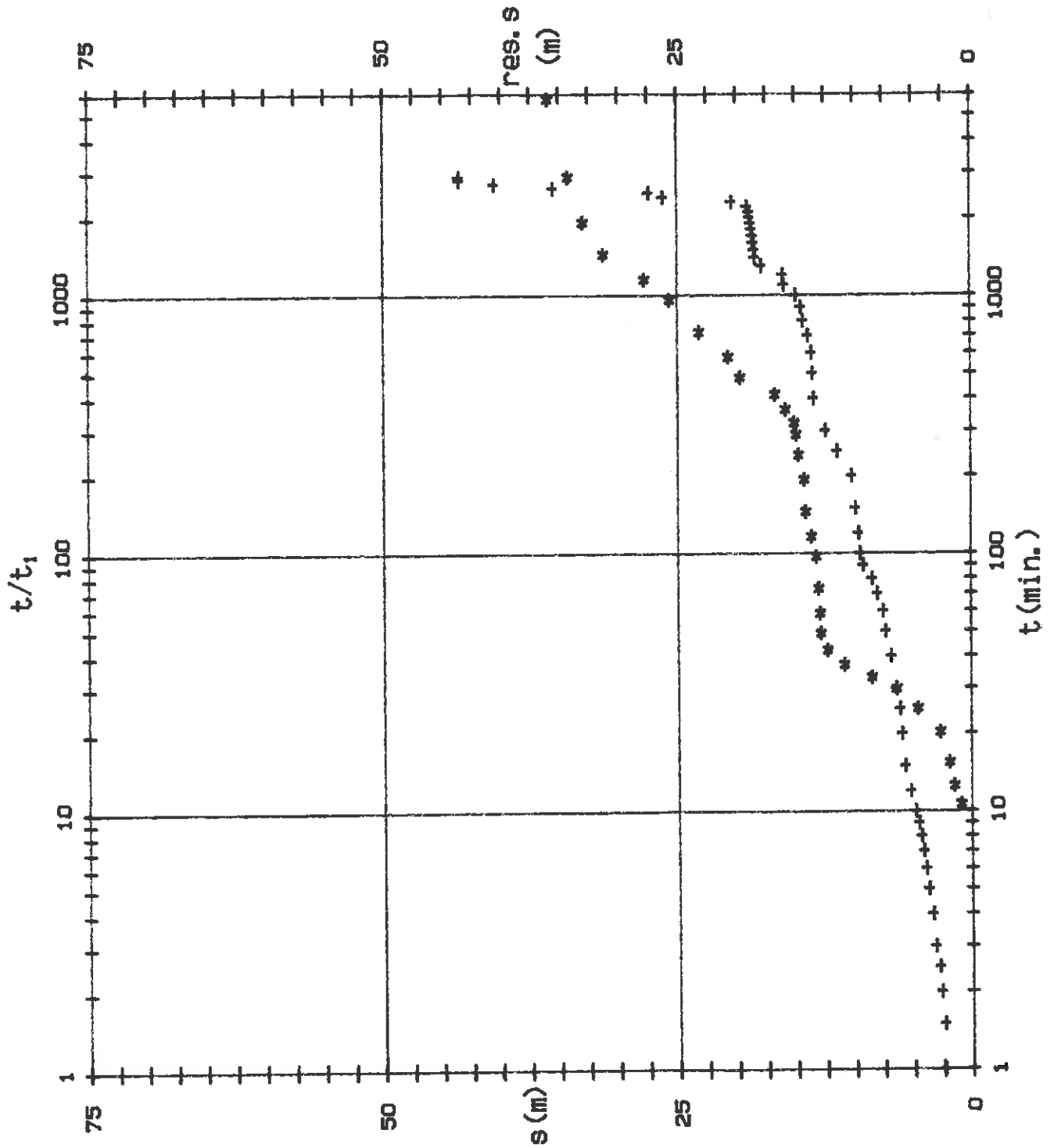
Pumped Borehole
10-77246

Readings on Borehole
10-77246

Q = 2 l/s

S.W.L. = 21.19 m

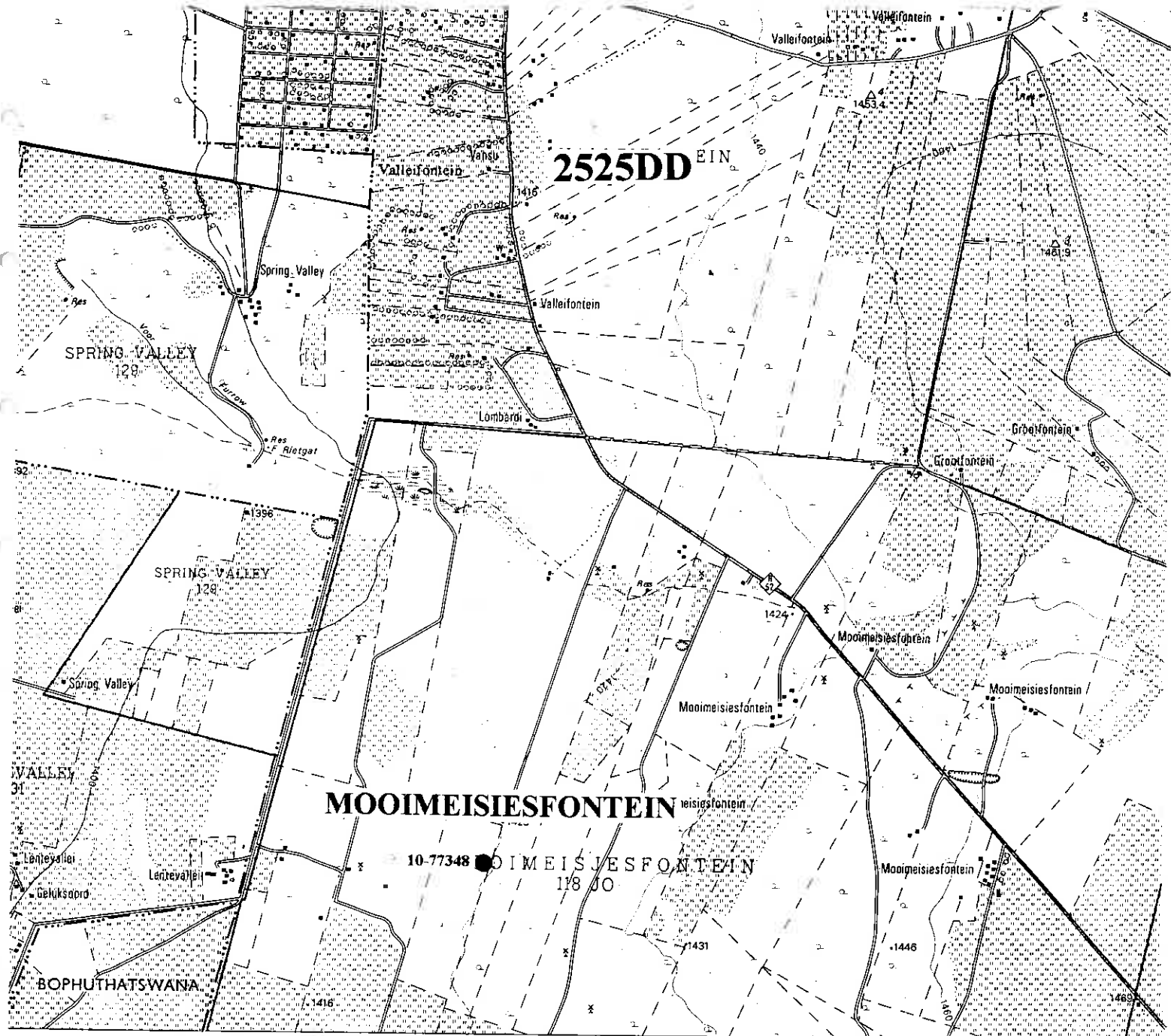
T = 8 m²/d



MOOIMEISIESFONTEIN

Including borehole

10-77348



igs en Kartering Privaatsak Mowbray.
Mapping Private Bag Mowbray.

KONTOERTUSSENRUIMTE 20 METER

1:50 000

REFERENCE

- International Boundaries
- Provincial Boundaries
- Multiple Track Railways
- Single Track Railways
- Electrified Railways
- Narrow Gauge Railways
- Service Railways
- Freeways and Arterial Roads
- Main Roads
- Secondary Roads
- Other Roads
- Tracks and Hiking Trails
- Power Lines
- Telephone Lines
- Post Offices, Police Stations and Posts.
- Stores, Hotels, Schools and Places of Worship
- Lighthouses and Marine Lights
- Marine Beacons

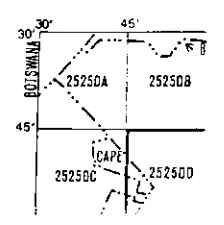
Die ruitlyne van die Suid-Afrikaanse Koördinaatstelsel word in die kantruimte
aangetoon deur kort swart strepies. 10 000 meter van mekaar, met
koördinaatwaardes in eenhede van 10 000 meter in blou.

Die ruitlyne van die aangrensende rutnet word op dieselfde manier aan
die buitekant van die graadnetkanteling aangetoon

Hoogtes is in meter bo see
Heights are in metres above sea level

Gauss se Konforme Projeksie Middelmerid
Gauss Conform Projection, Central Meridian

INDEKS VAN VELLE



STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

MOOIMEISIESFONTEIN

27 01 1993

B.H. No. 10-77348

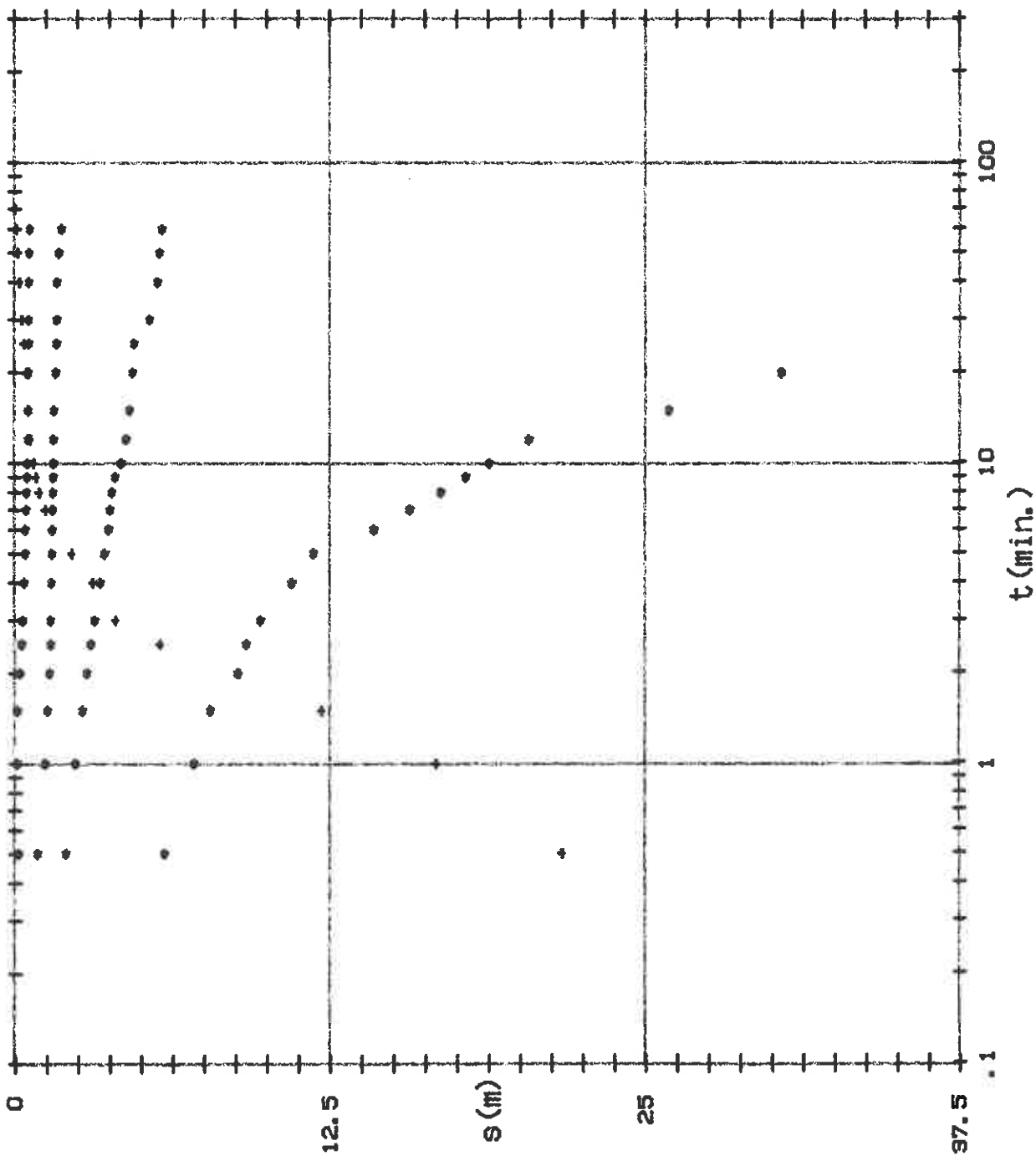
$Q_1 = .47$ l/s

$Q_2 = 1.01$ l/s

$Q_3 = 1.97$ l/s

$Q_4 = 4.04$ l/s

S.W.L. = 5.89 m



CONSTANT DISCHARGE TEST

- + Drawdown data.
- * Recovery data.

MOOIMEISIESFONTEIN

28 01 1993

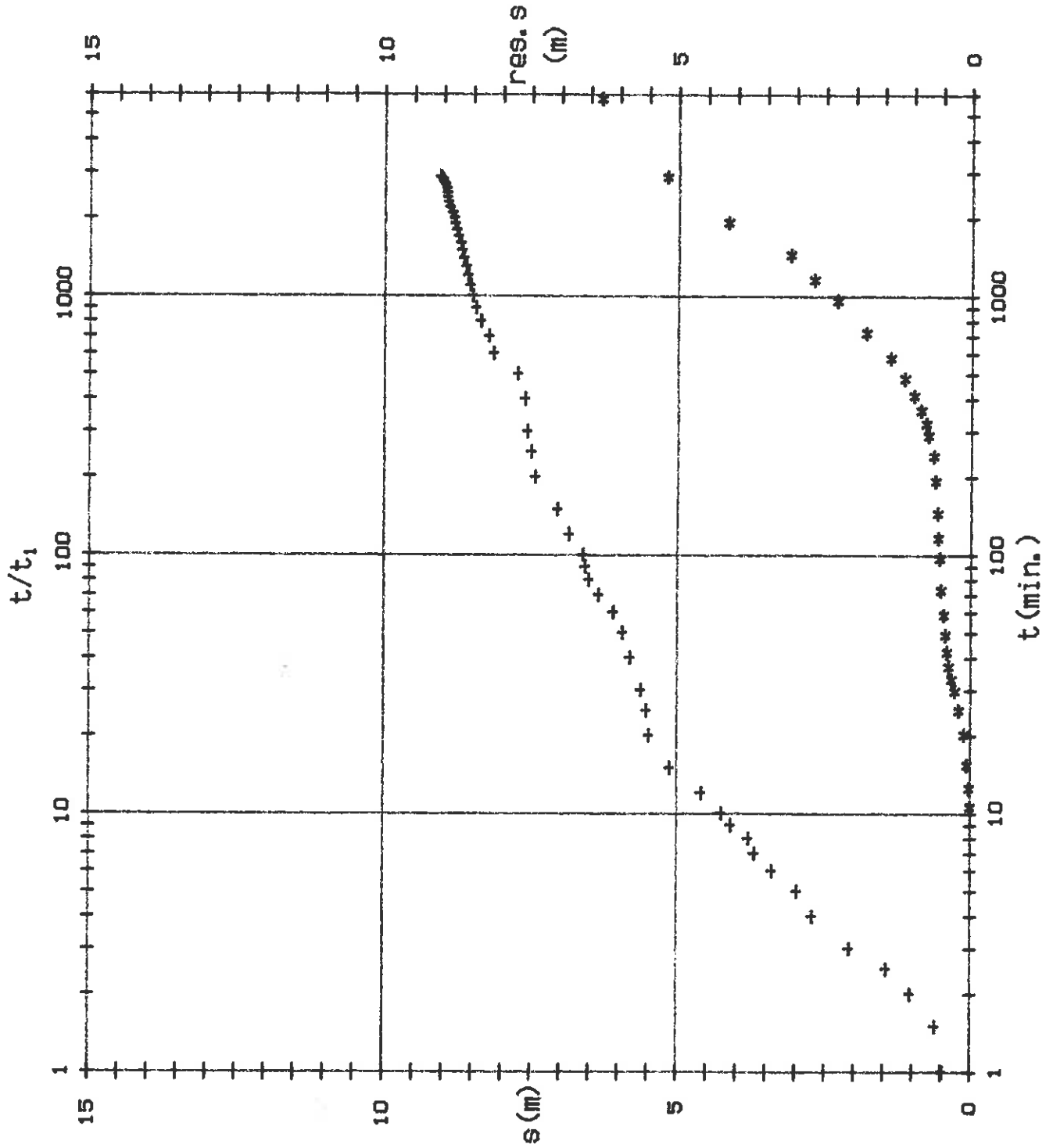
Pumped Borehole
10-77348

Readings on Borehole
10-77348

$Q = 2.21 \text{ l/s}$

S.W.L. = 5.89 m

$T = 8 \text{ m}^2/\text{d}$



MOOIPAN

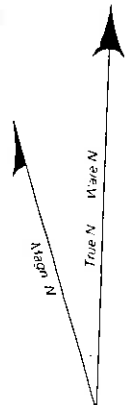
Including boreholes

10-77247

10-77295

Gemiddelde magnetiese deklinasie 17° 8' Wes
van Ware Noorde (1973.0) Gemiddelde jaarlikse
verandering 2' Ooswaarts (1966-1970).

Mean magnetic declination 17° 8' West
of True North (1973.0) Mean annual change
2' Eastwards (1966-1970).



2625BC

MOOIPAN 104 IO
MOOIPAN

10-77295

10-77247

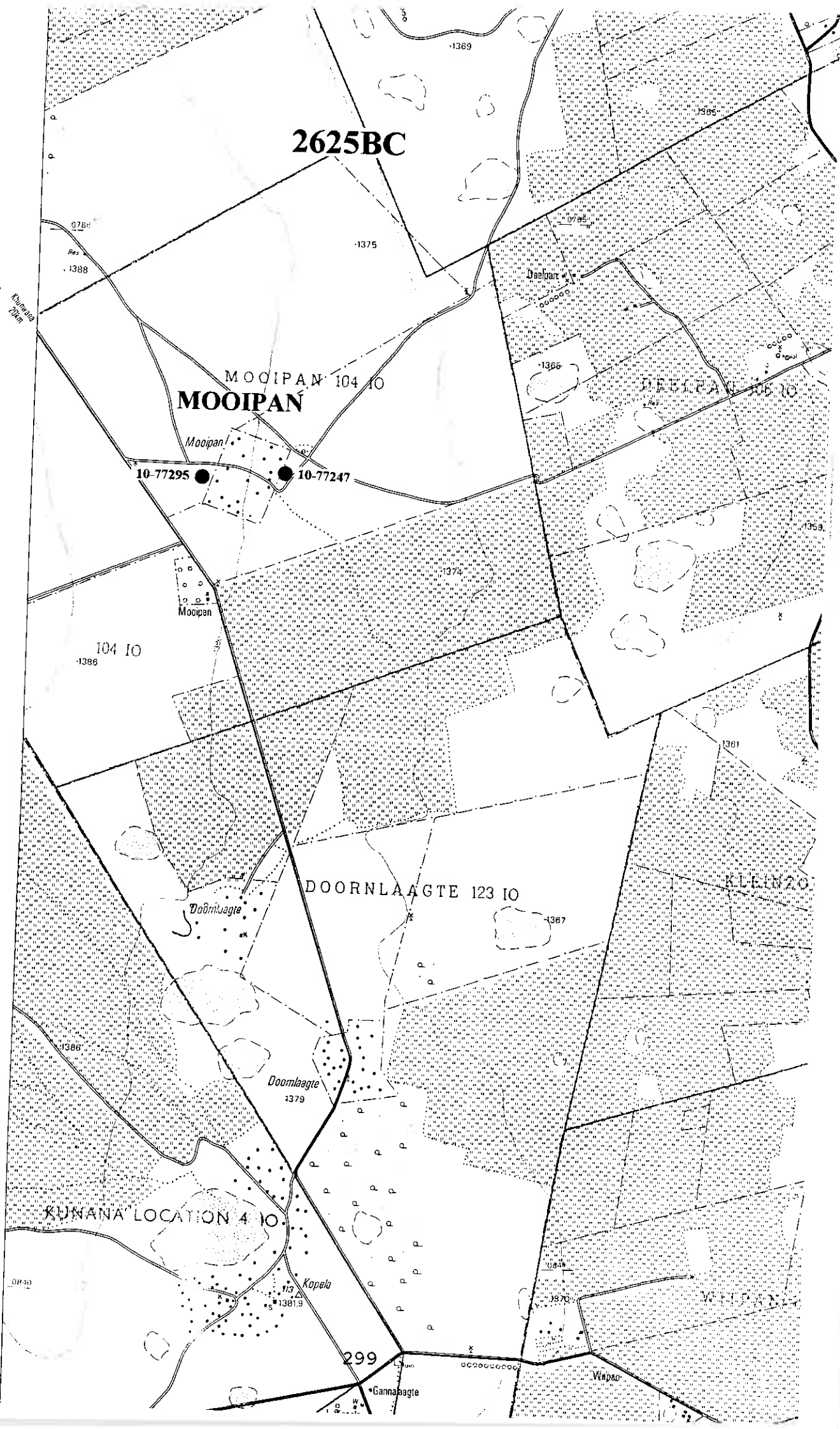
DOORNLAAGTE 123 IO

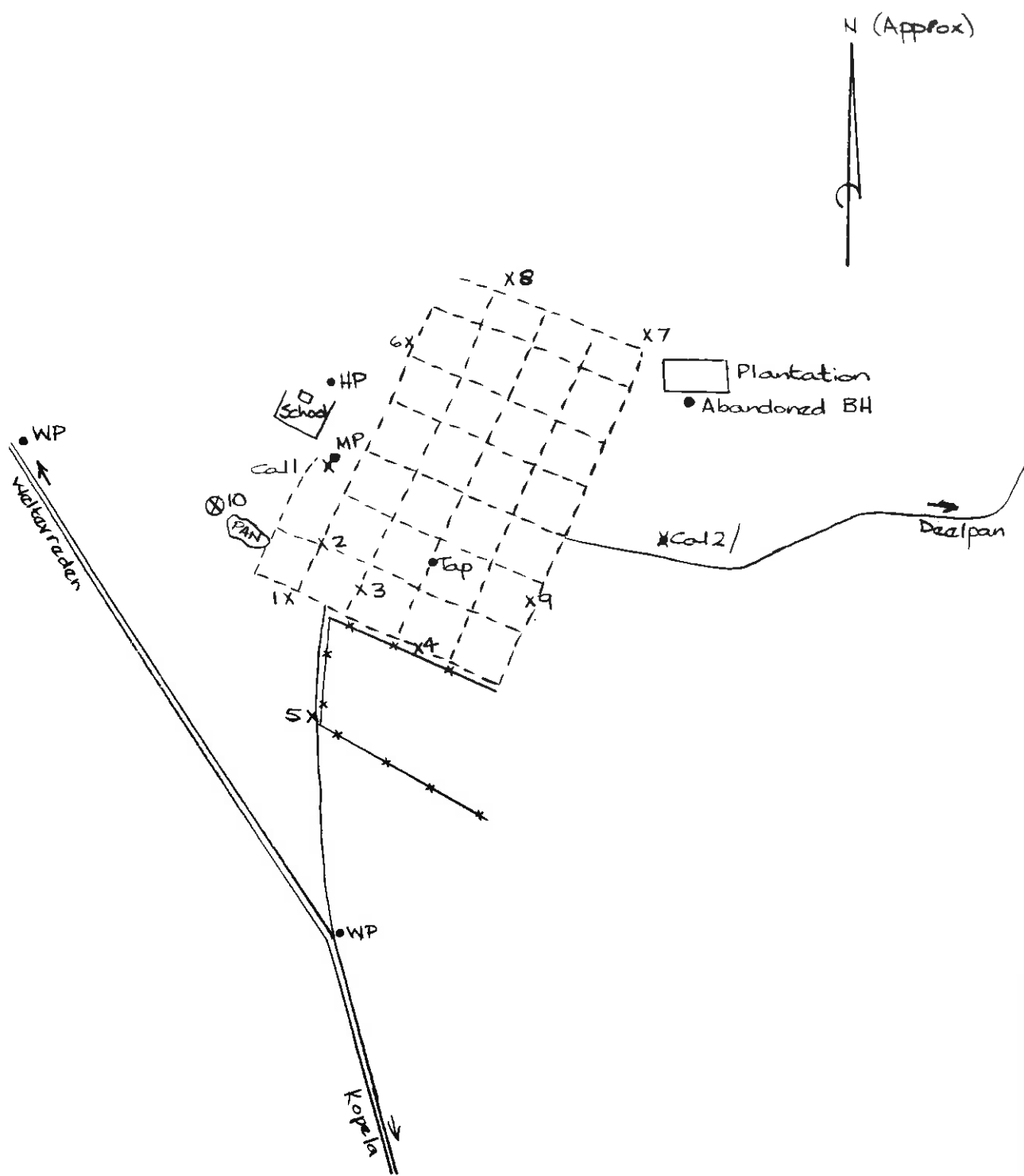
KUNANA LOCATION 4 IO

20'

292X

25'





Locality Plan of Mooipan
 Overlay to Photo Nos 2840 (strip 11) and 2576 (strip 10)
 Approx Scale 1:15 000

BOREHOLE LOG

DISTRICT: DITSOBOTLA

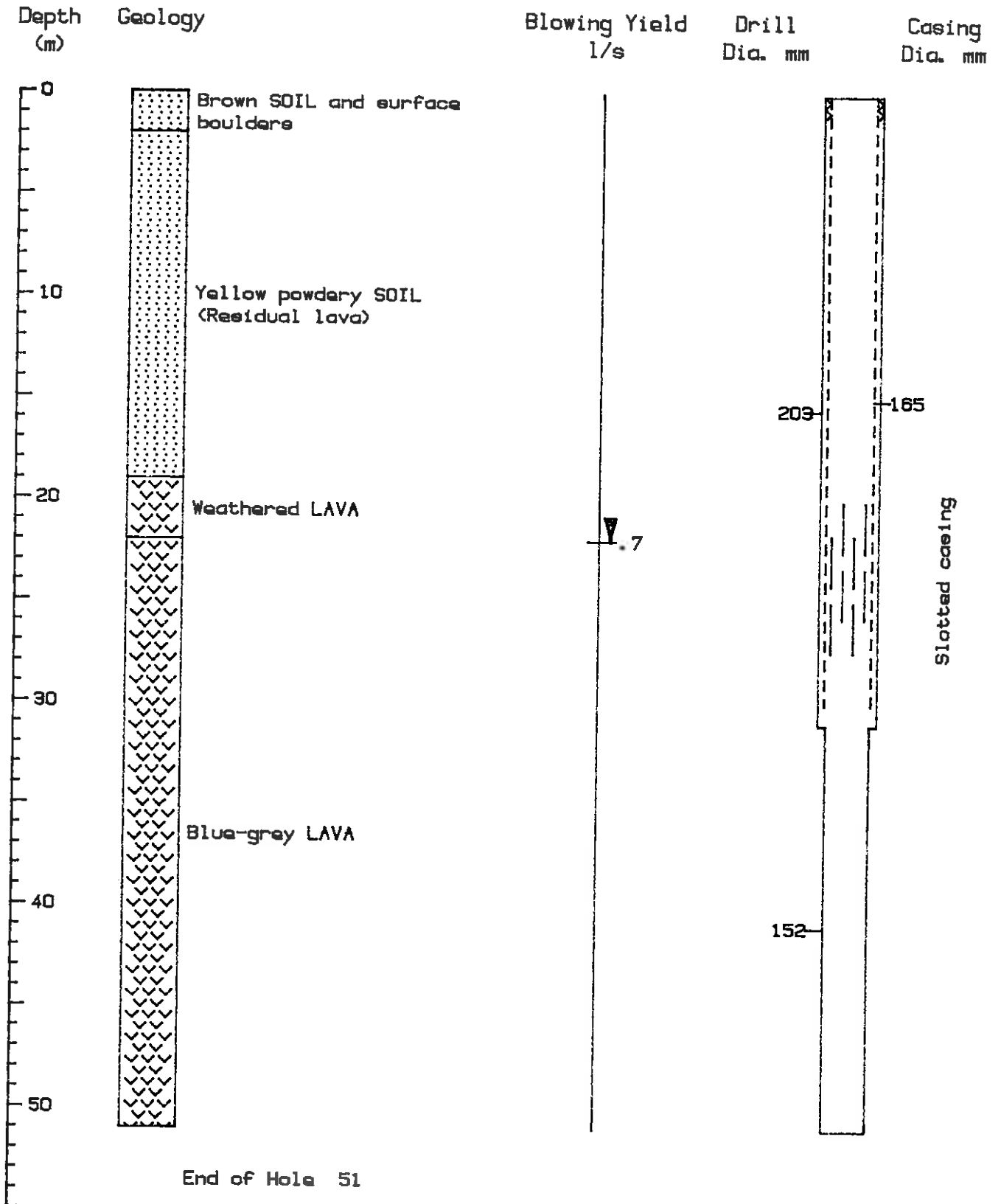
LOCALITY: MOOIPAN

BH. No. 10-77247

Geoph. Peg No. REHAB

Coordinates +2915775X -52650Y

Elev. (m) 1375



STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

MOOIPAN

02 08 1992

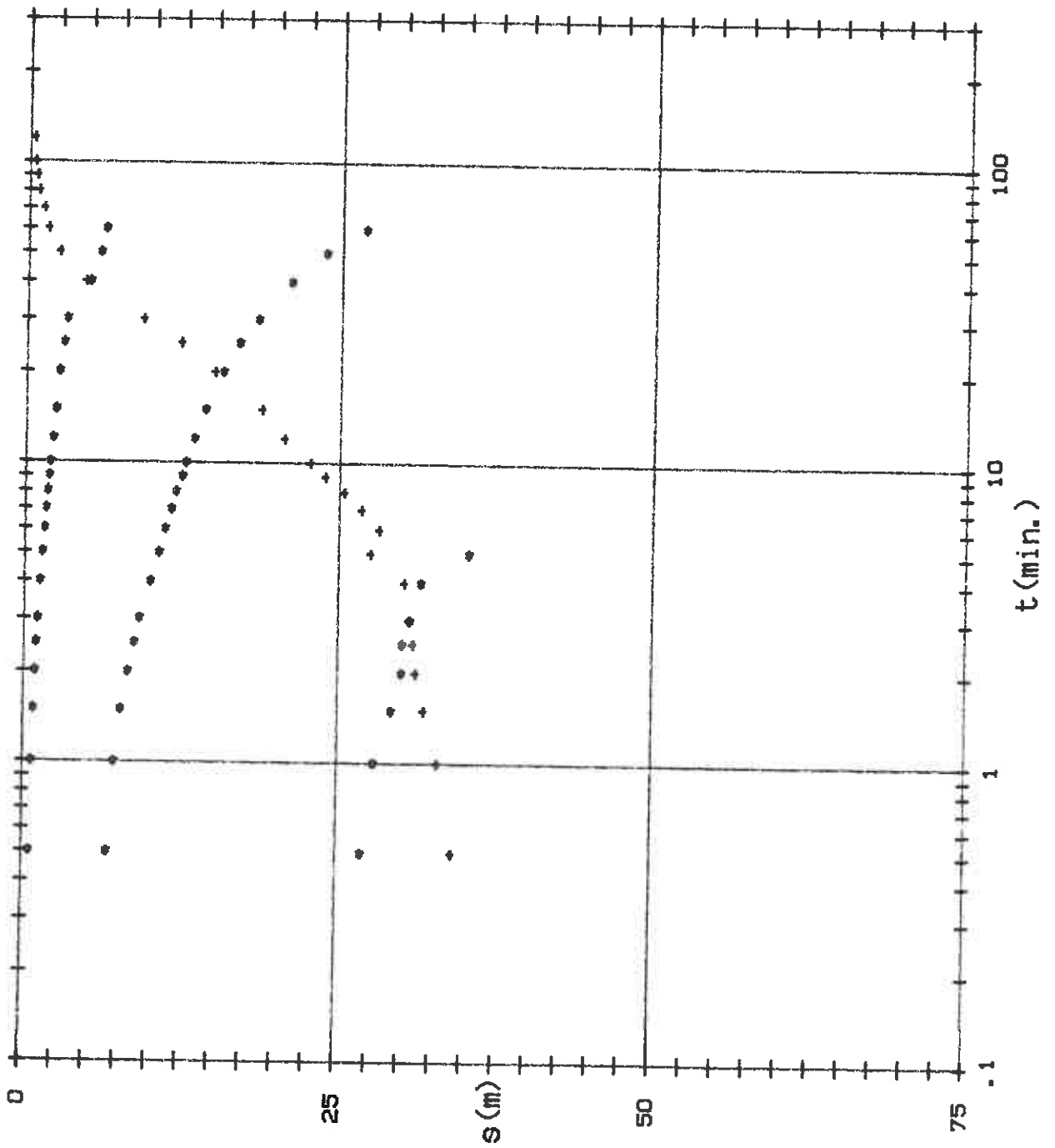
B.H. No. 10-77247

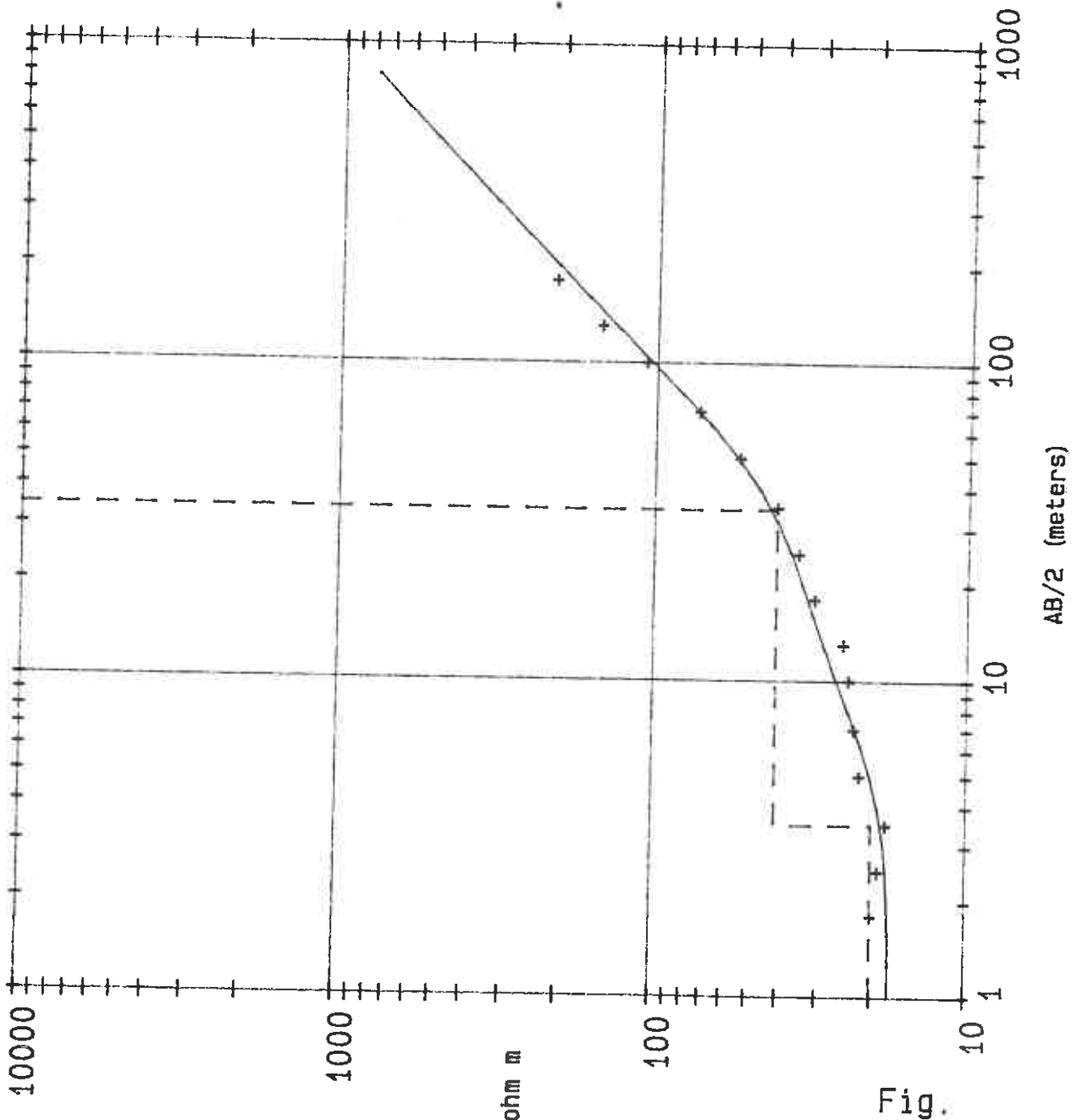
$Q_1 = .25 \text{ l/s}$

$Q_2 = .53 \text{ l/s}$

$Q_3 = 1.1 \text{ l/s}$

S.W.L. = 8.18 m





+ Field data
 — Computer model
 - - - d - r model

MOOIPAN

V.E.S. 10

CO-ORDINATES
 +2915625X -51650Y

GEOLOGY
 LAVA

Fig.

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

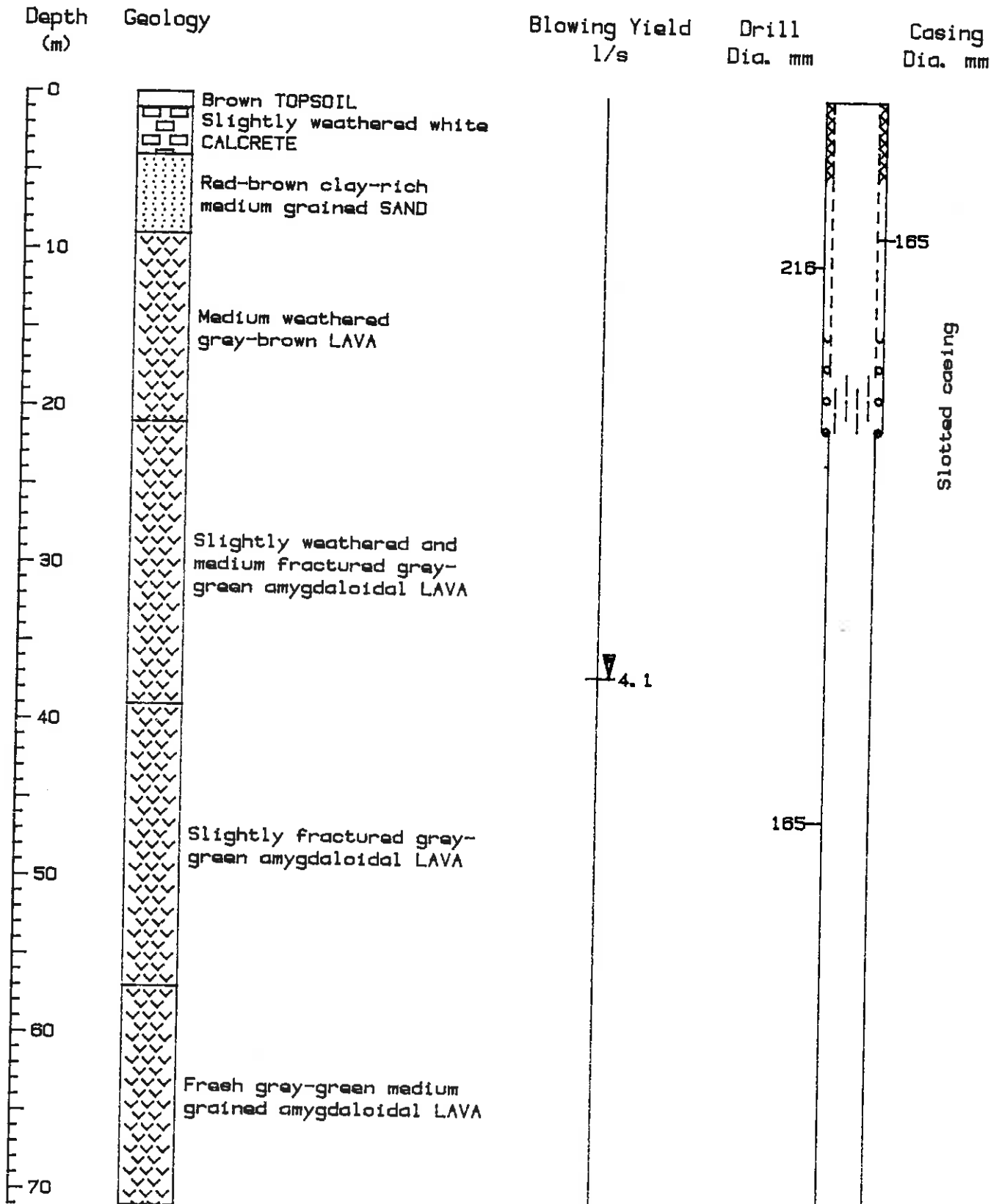
LOCALITY: MOOIPAN

BH. No. 10-77295

Geoph. Peg No. 10

Coordinates +2915635X -051655Y

Elev. (m) 1383



End of Hole 71

STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

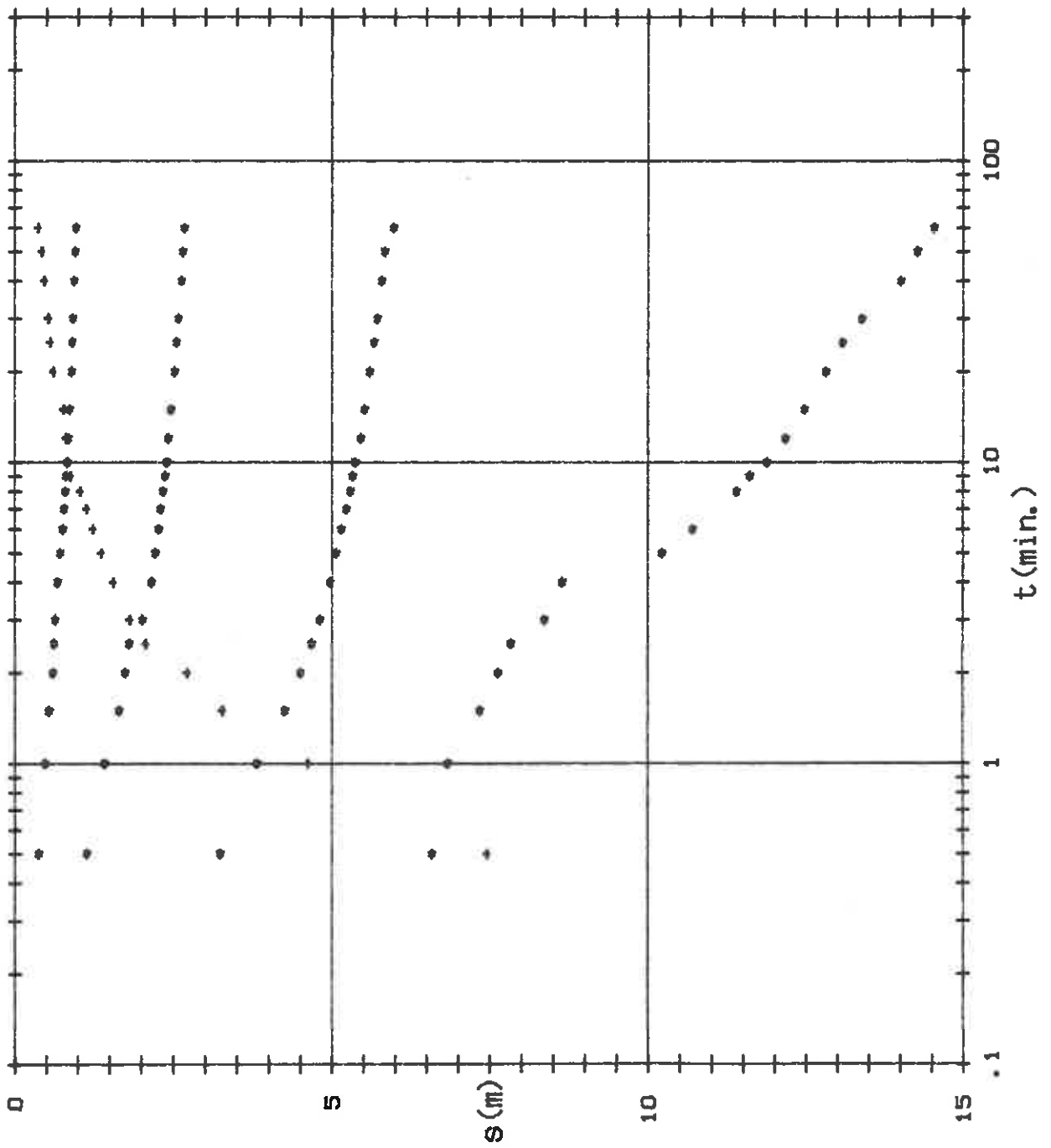
MOOIPAN

01 08 1992

B.H. No. 10-77295

$Q_1 = .51 \text{ l/s}$
 $Q_2 = 1.02 \text{ l/s}$
 $Q_3 = 1.97 \text{ l/s}$
 $Q_4 = 3.96 \text{ l/s}$

S.W.L. = 9.82 m



CONSTANT DISCHARGE TEST

+ Drawdown data.
* Recovery data.

MOOIPAN

01 08 1992

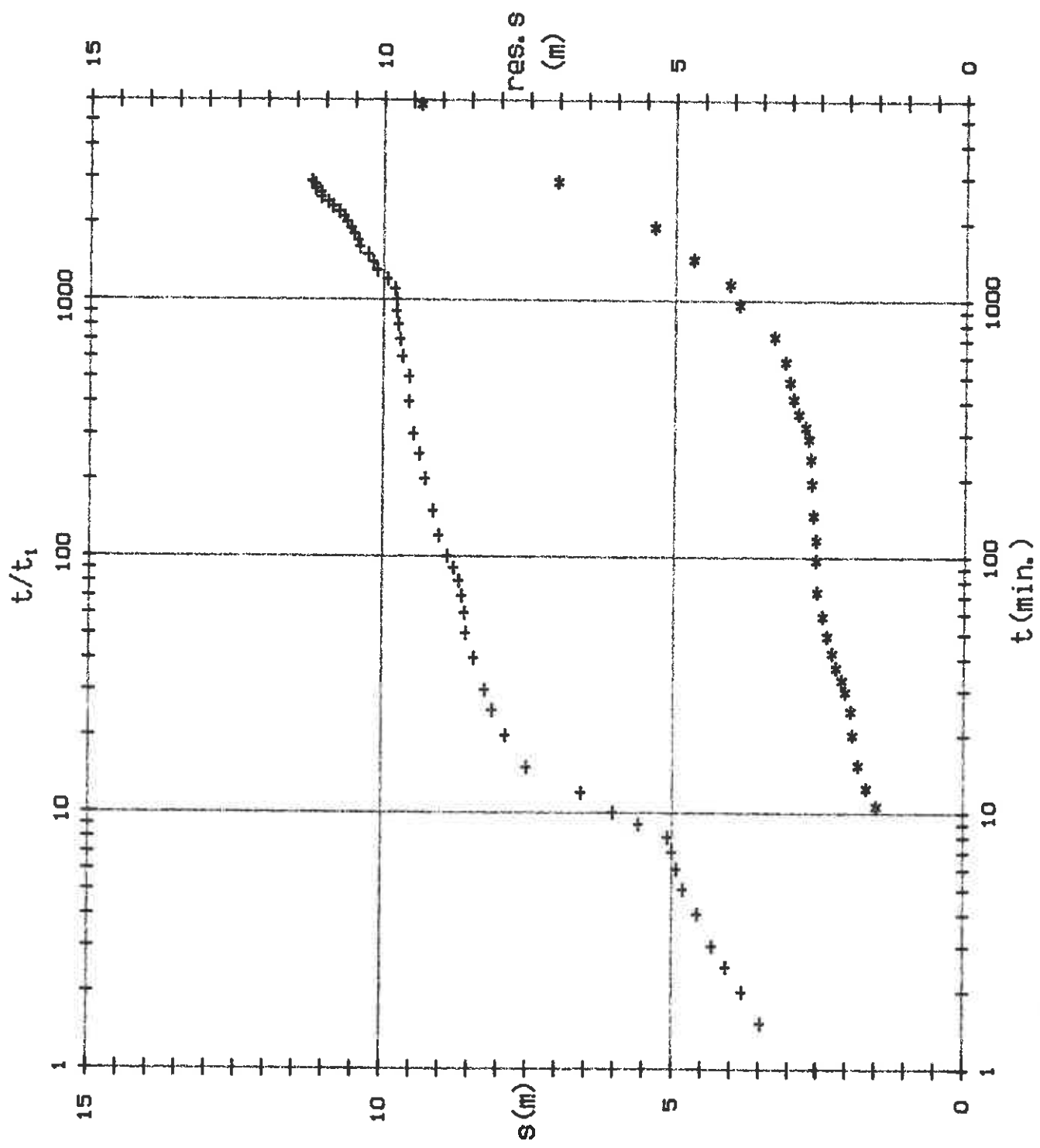
Pumped Borehole
10-77295

Readings on Borehole
10-77295

Q = 3 l/s

S.W.L. = 9.82 m

T = 11 m²/d



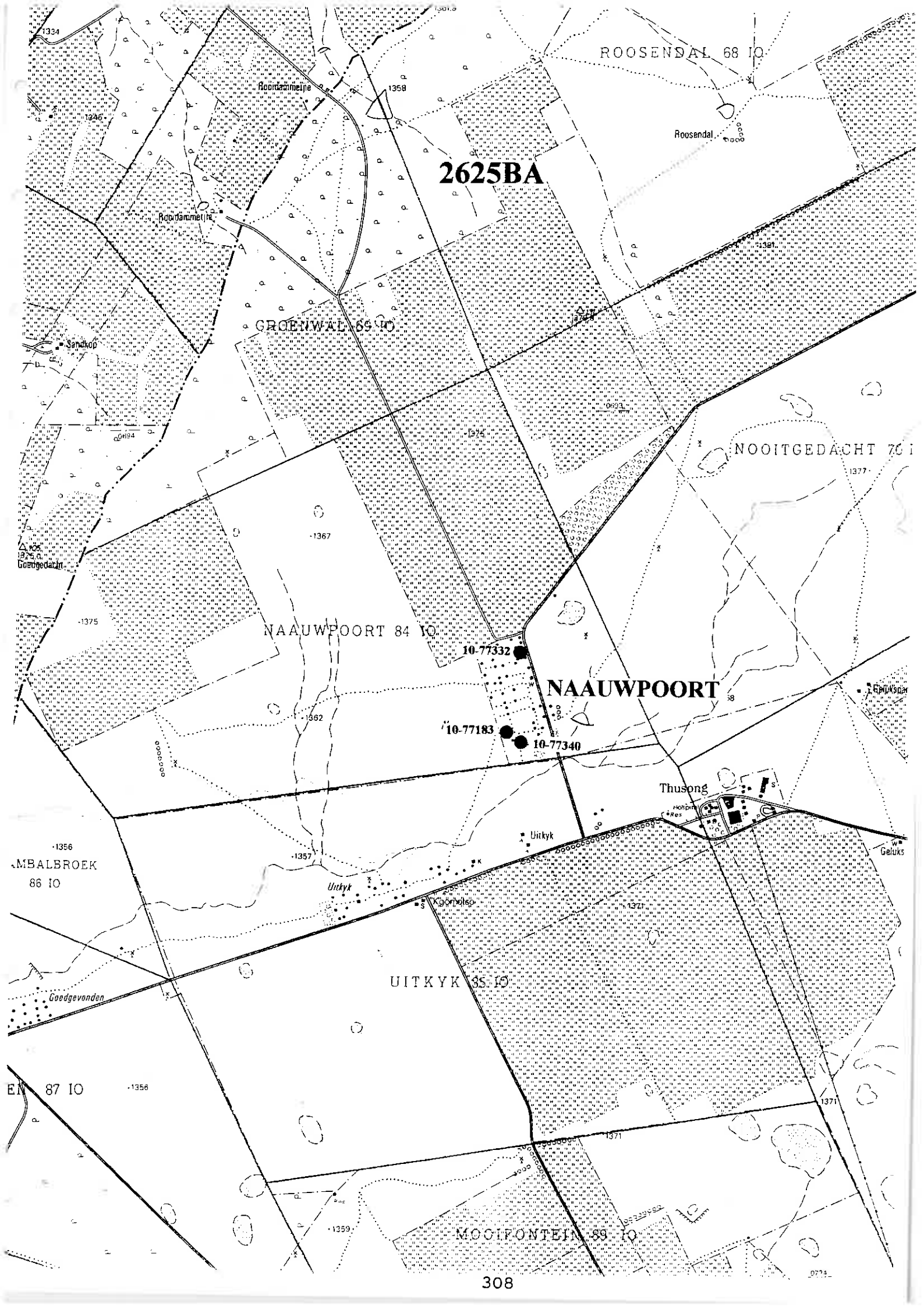
NAAUWPOORT

Including boreholes

10-77183

10-77332

10-77340



2625BA

ROOSDAL 68 IO

GROENWAL 69 IO

NAAUWPOORT 84 IO

NOOITGEDACHT 70 IO

NAAUWPOORT

UITKYK 35 IO

AMBALBROEK 86 IO

MOOIFONTEIN 89 IO

STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

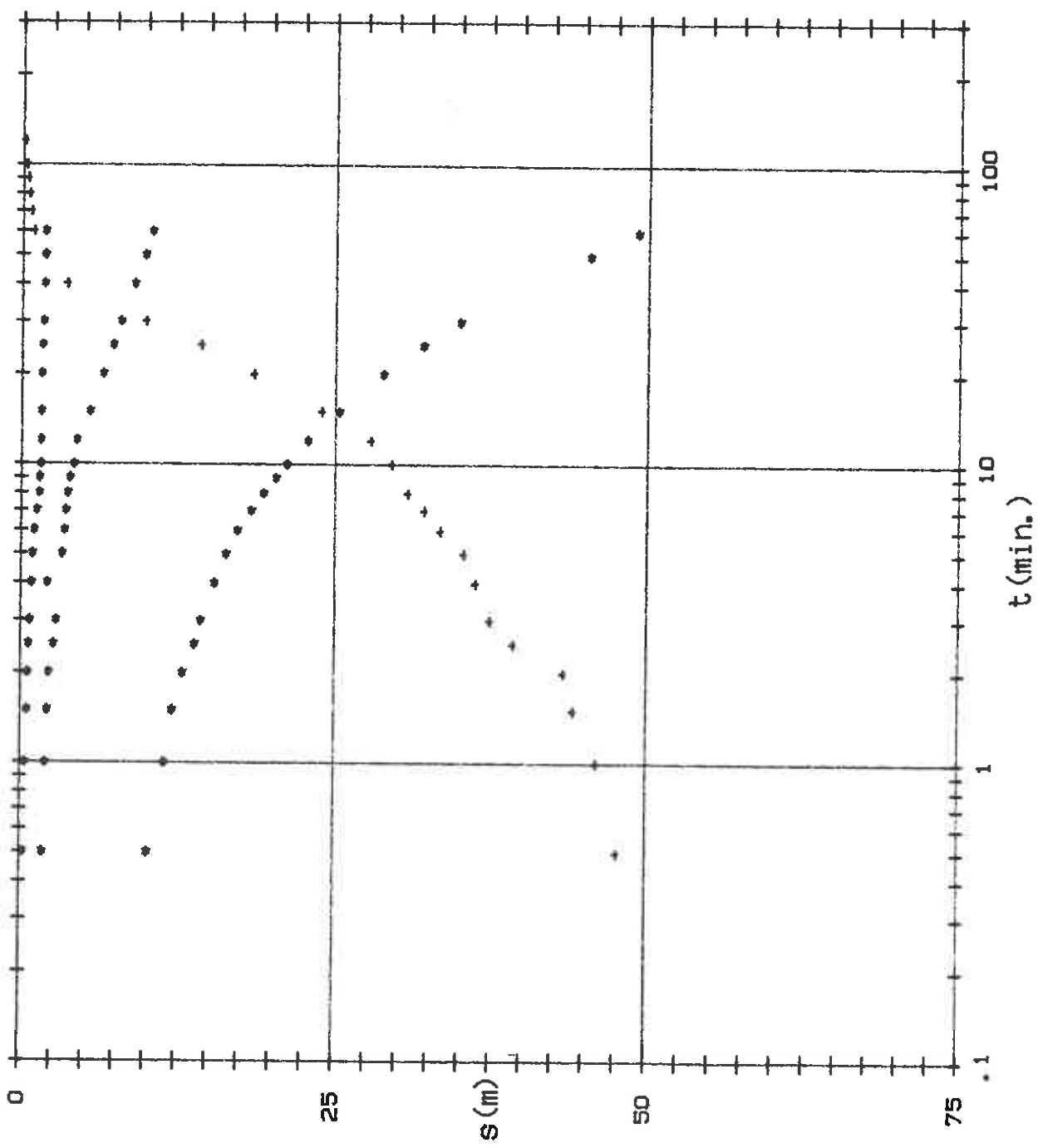
NAAUWPOORT

06 05 1992

B.H. No. 10-77183

$Q_1 = .16 \text{ l/s}$
 $Q_2 = .43 \text{ l/s}$
 $Q_3 = .85 \text{ l/s}$

S.W.L. = 7.4 m



STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

NAAUWPOORT

02 05 1992

B.H. No. 10-77332

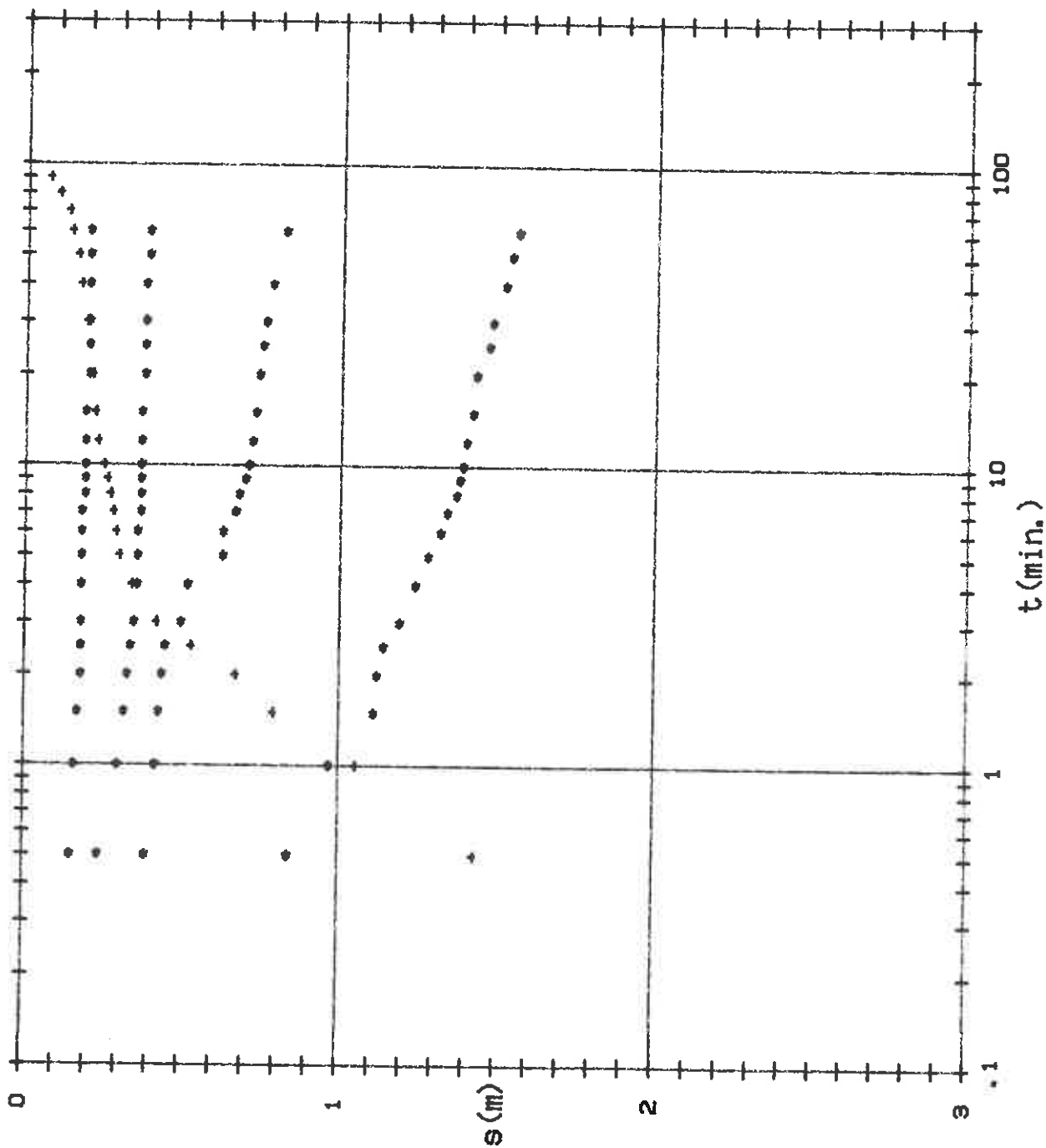
$Q_1 = .19 \text{ l/s}$

$Q_2 = .4 \text{ l/s}$

$Q_3 = .9 \text{ l/s}$

$Q_4 = 2 \text{ l/s}$

S.W.L. = 7.55 m



CONSTANT DISCHARGE TEST

+ Drawdown data,
* Recovery data.

NAAUWPOORT

03 05 1992

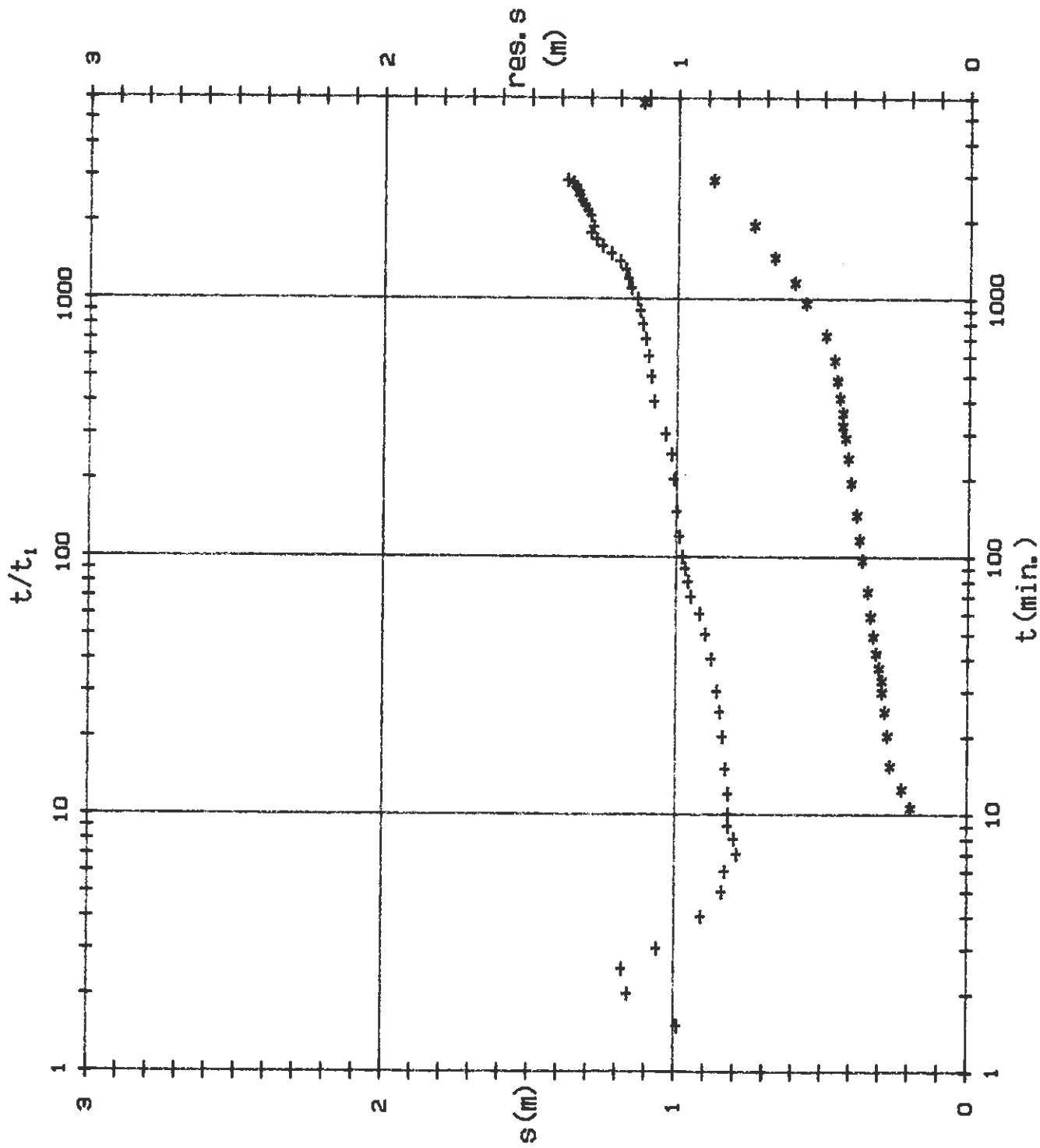
Pumped Borehole
10-77332

Readings on Borehole
10-77332

Q = 1.4 l/s

S.W.L. = 7.55 m

T = 25 m²/d



STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

NAAUWPOORT

07 05 1992

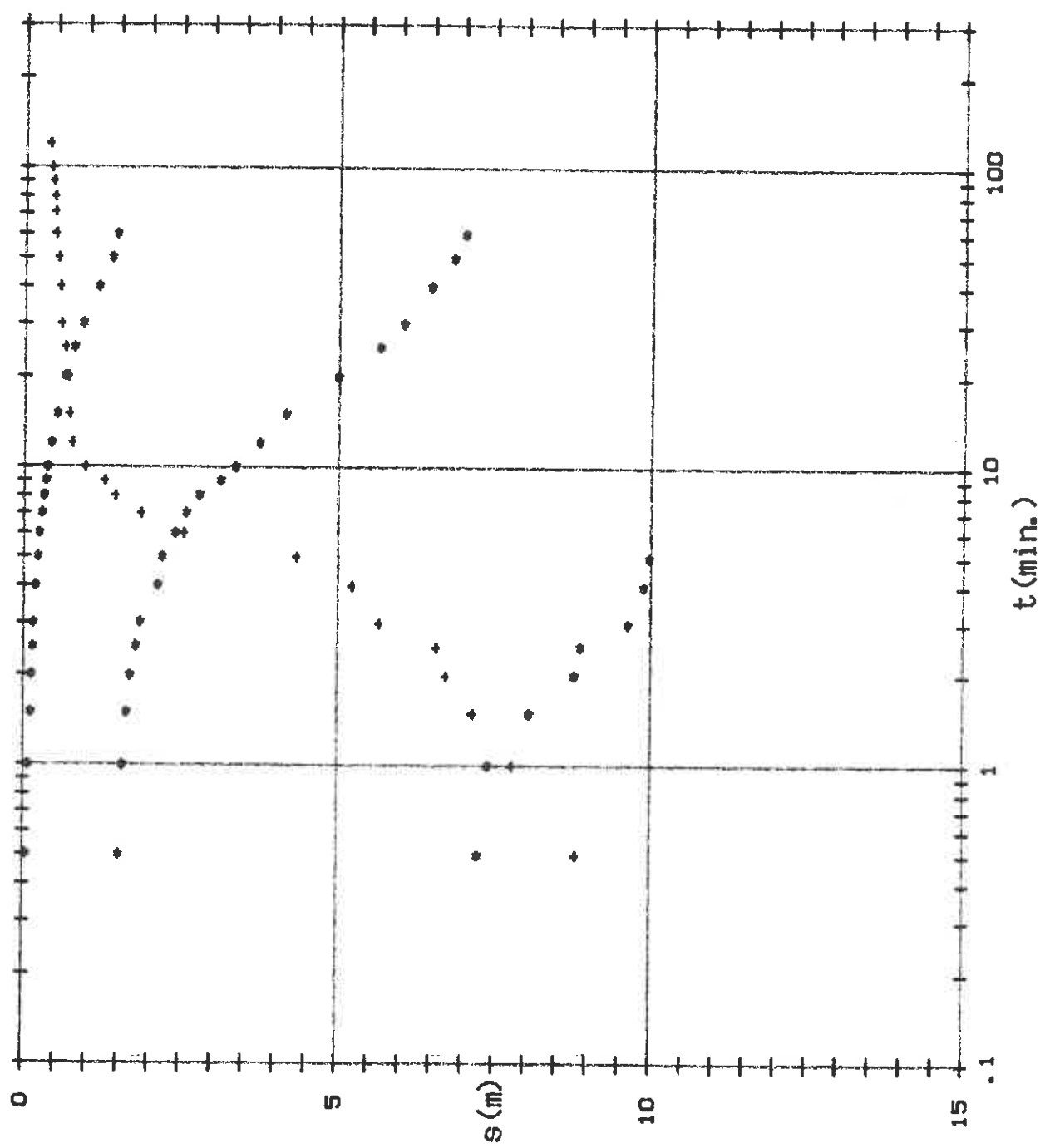
B.H. No. 10-77340

$Q_1 = .18 \text{ l/s}$

$Q_2 = .43 \text{ l/s}$

$Q_3 = .85 \text{ l/s}$

S.W.L. = 7.34 m



NOOIGEDACHT

Including borehole

10-77274

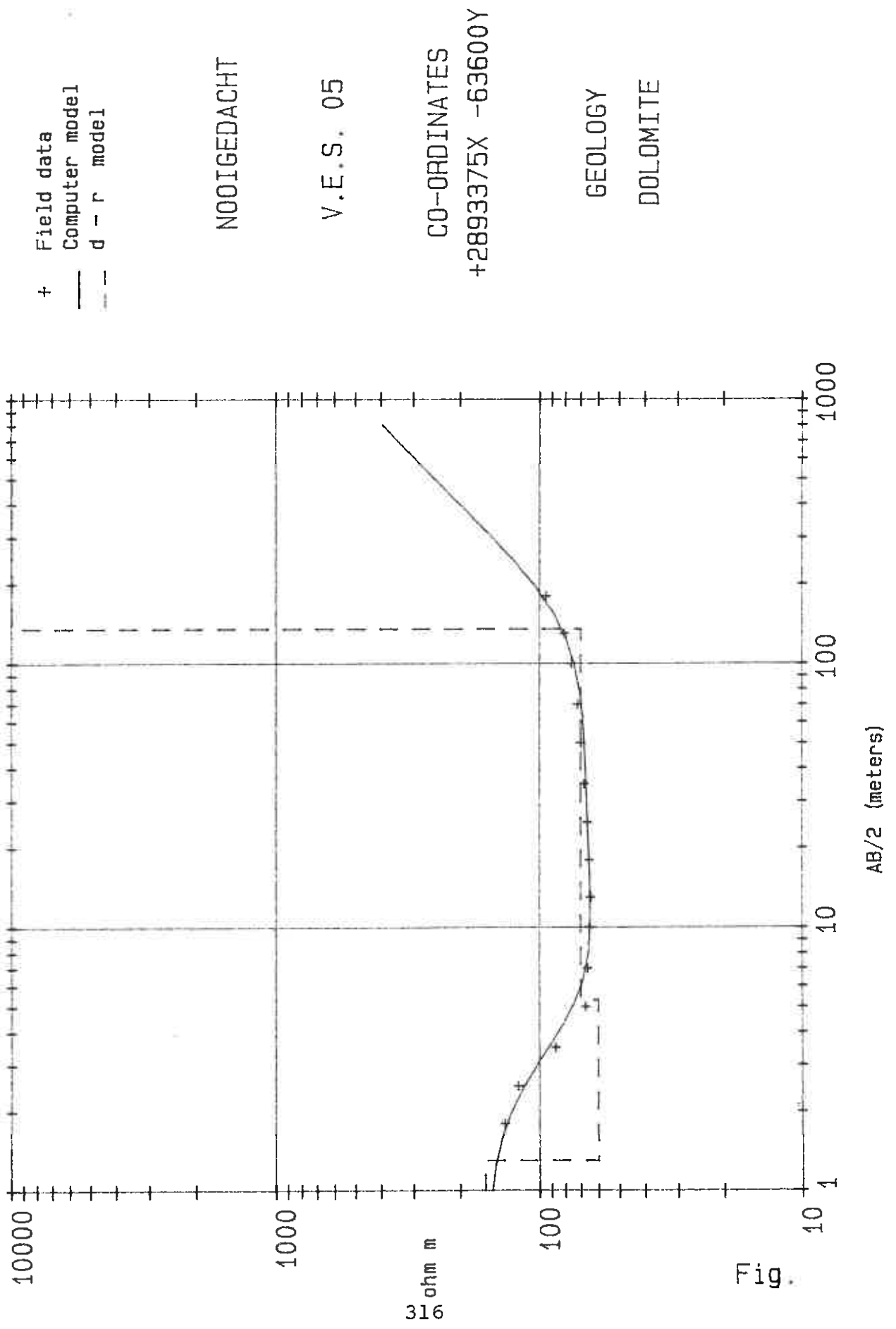


Fig.

BOREHOLE LOG

DISTRICT: DITSOBOTLA

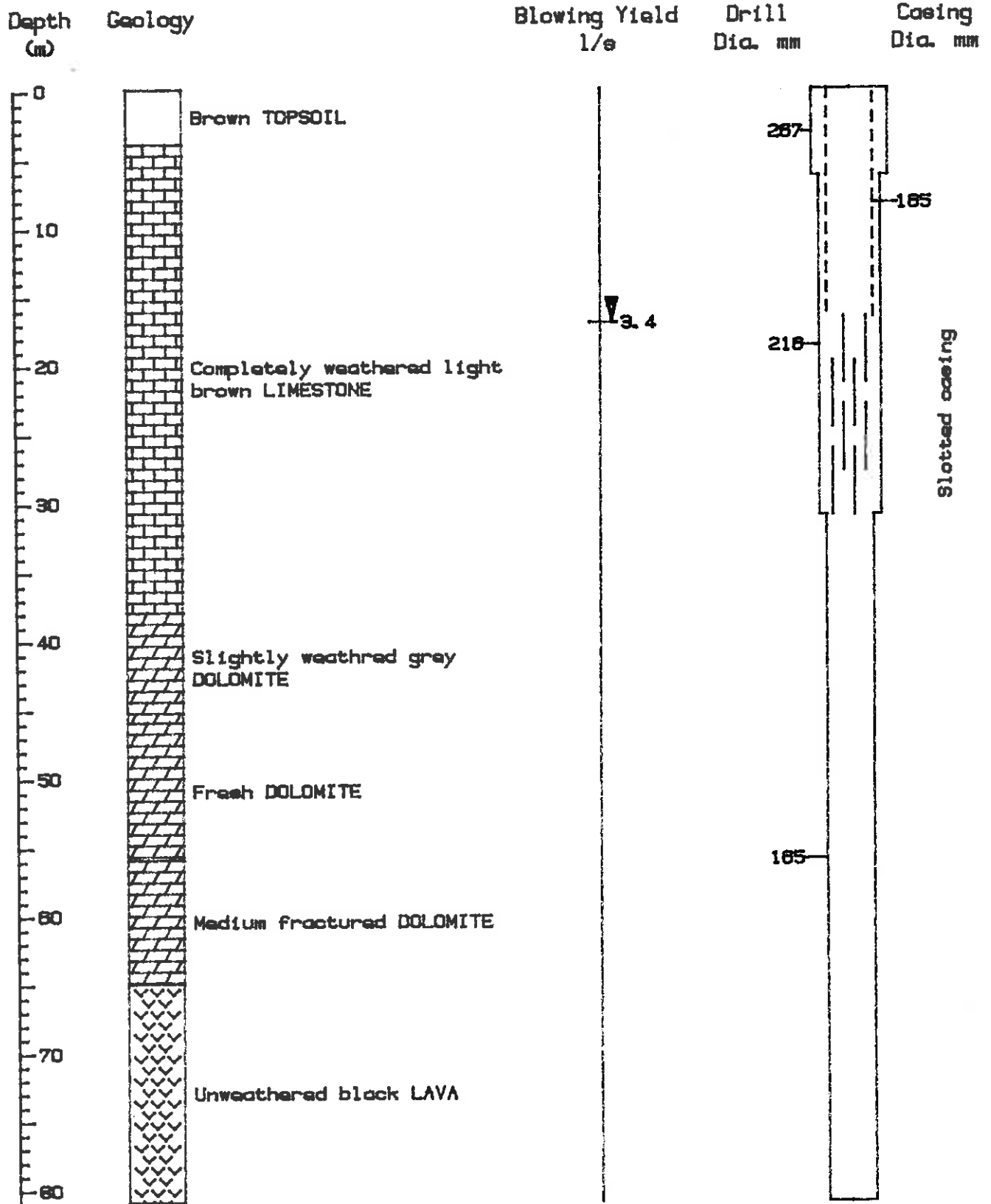
LOCALITY: NOOITGEDACHT

BH. No. 10-77274

Geoph. Peg No. 05

Coordinates +2893975X -63600Y

Elev. (m) 1381



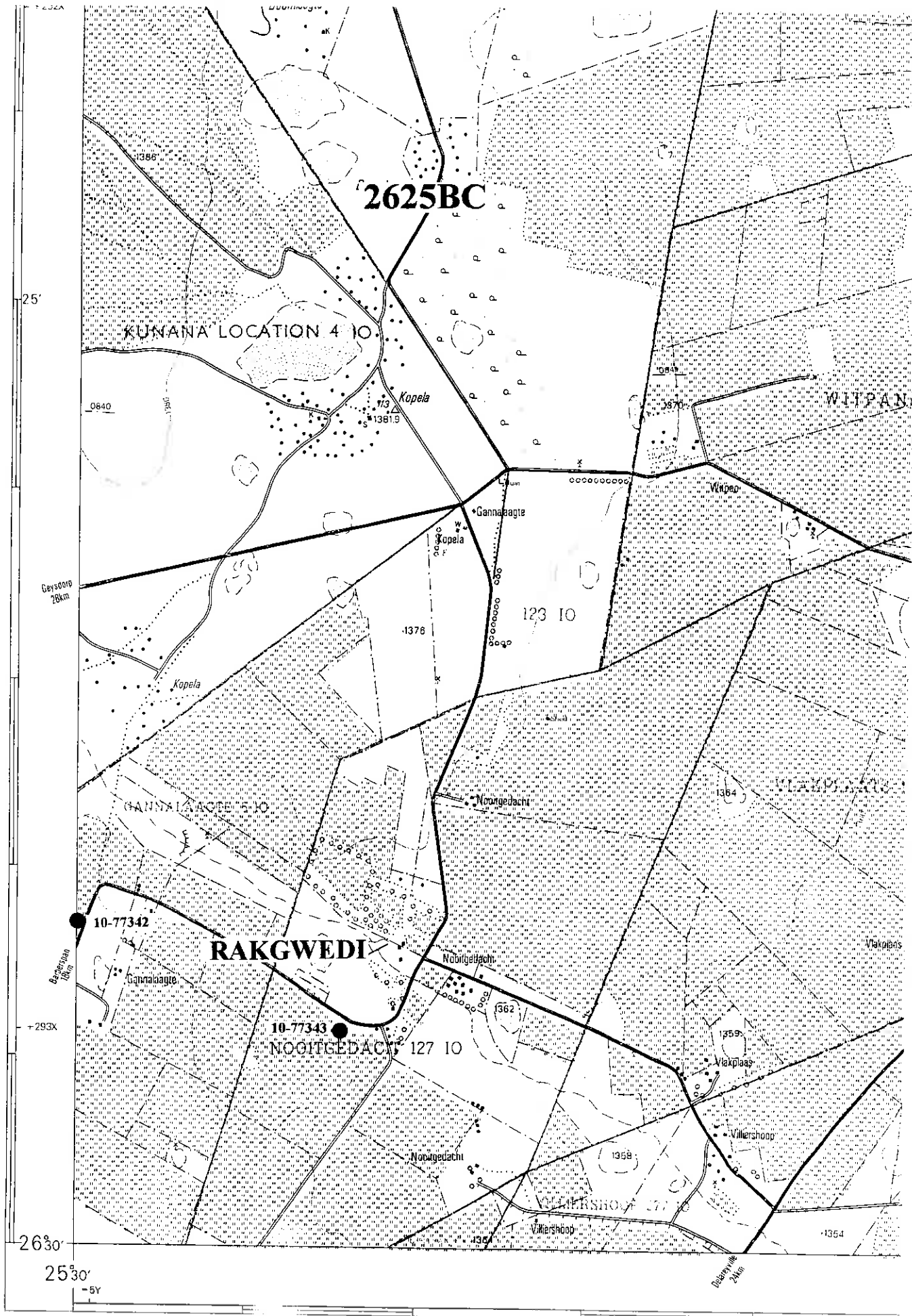
End of Hole 81

RAKGWEDI

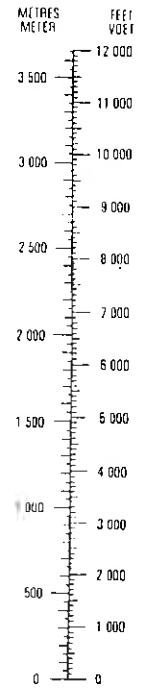
Including boreholes

10-77342

10-77343



CONVERSION TABLE
OMSETTINGSTAFEL



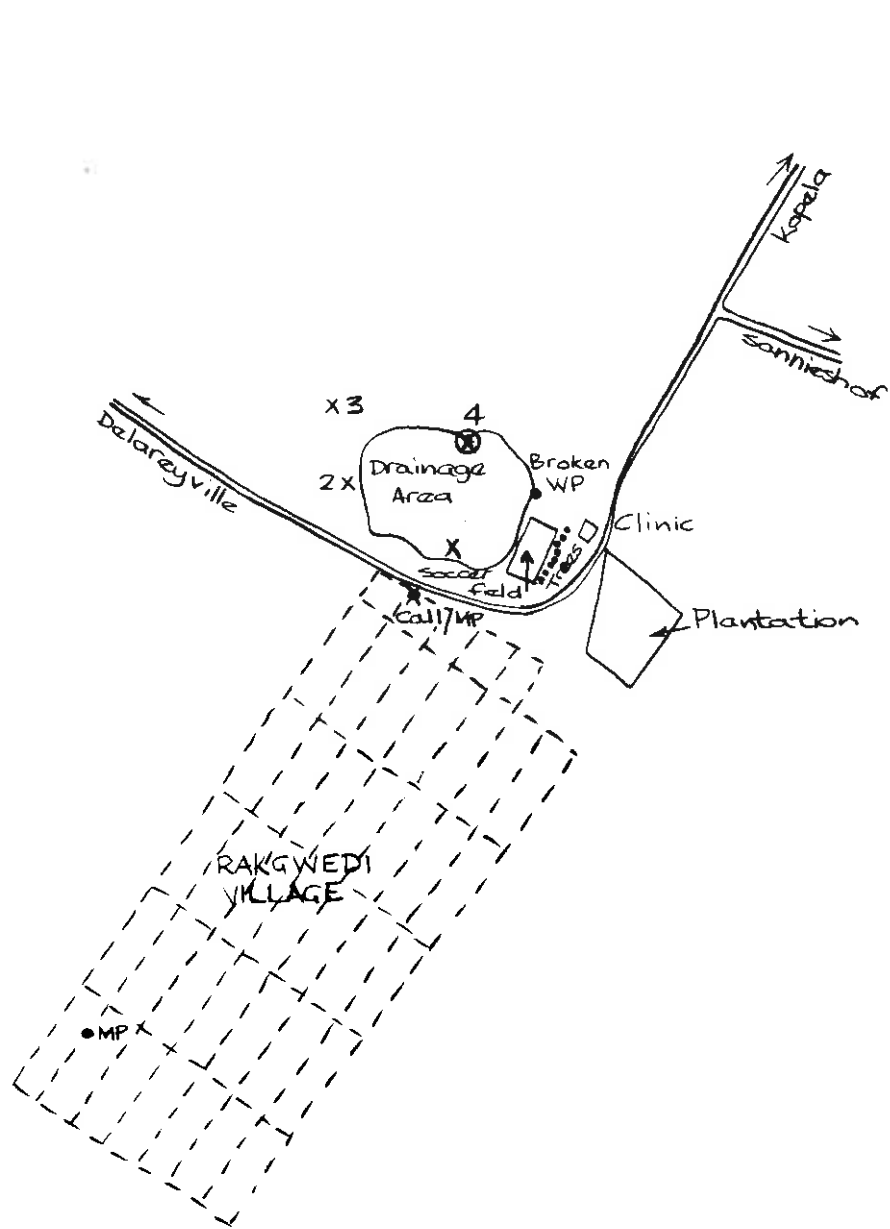
Published by the Chief Director of Surveys and Mapping Private Bag Mowbray
 Gepubliseer deur die Hoofdirekteur van Opmetings en Kartering Privaatsak Mowbray

CONTOUR INTERVAL 20 METRES
 METRE SUB CONTOURS

© State Copyright Staatsreursreg

REFERENCE VERKLARING

International Boundaries Internasionale Grense
 Provincial Boundaries Provinsiale Grense



Locality Plan of Rakgwedi
 Overlay to Photo No 037 (strip 16)
 Approx Scale 1:15 000

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

RAKGWEDI

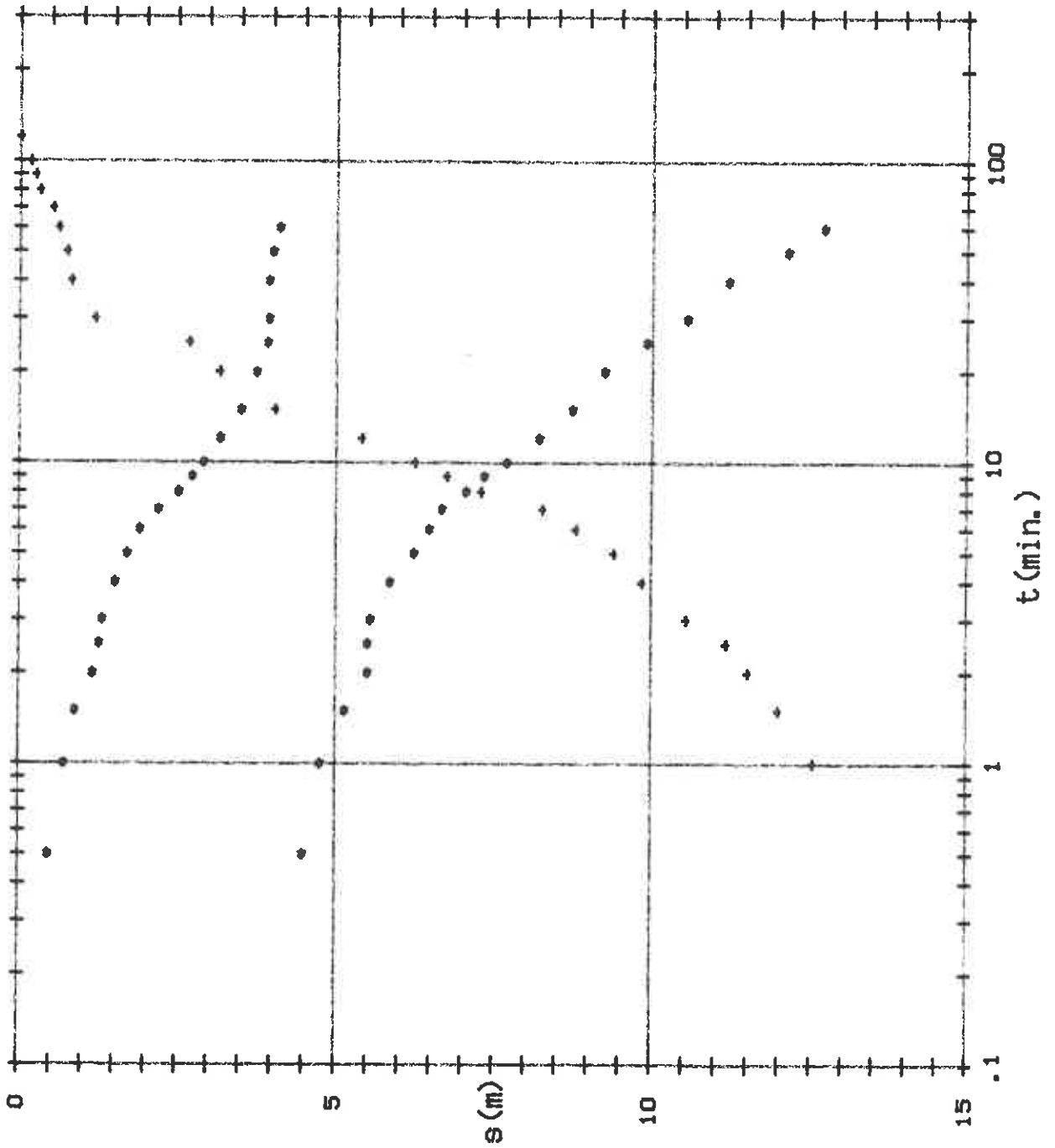
20 08 1992

B.H. No. 10-77342

$Q_1 = .29 \text{ l/s}$

$Q_2 = .6 \text{ l/s}$

S.W.L. = 5.93 m



STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

RAKGWEDI

21 08 1992

B.H. No. 10-77343

$Q_1 = .21 \text{ l/s}$

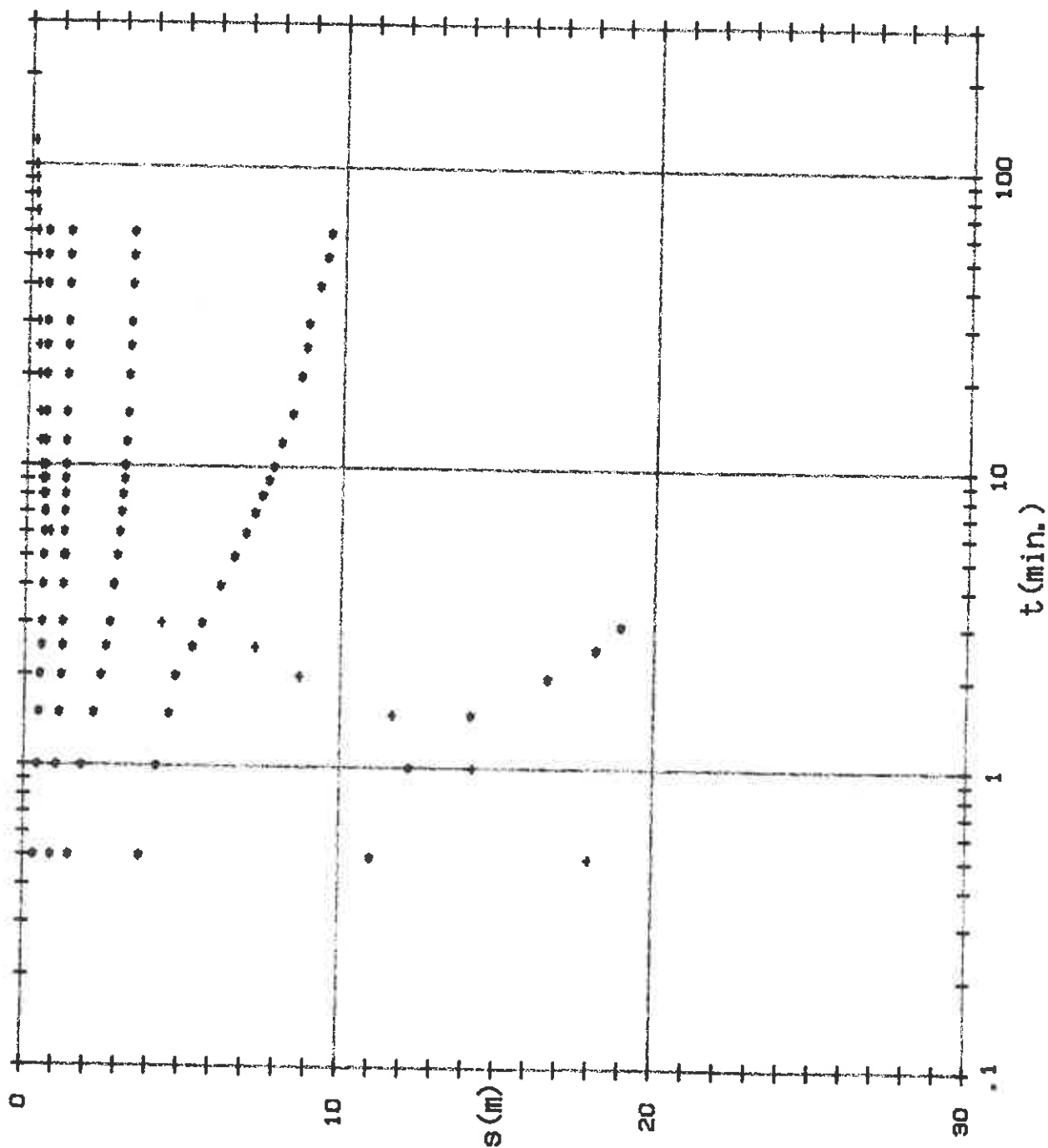
$Q_2 = .4 \text{ l/s}$

$Q_3 = .85 \text{ l/s}$

$Q_4 = 1.74 \text{ l/s}$

$Q_5 = 4 \text{ l/s}$

S.W.L. = 5.76 m



SCHOONGEZICHT

Including boreholes

10-77271 - Clinic

10-77272

26°00

2625BA

Duikerbos

WELVERDIEND 45 IO

MODILAAGTE 41 IO

10-77272

10-77271

SCHOONGEZICHT

SCHOONGEZICHT 42 IO

Bethel

RIETFORTEIN 62 IO

DE HOOP 60 IO

DRINKDEK 63 IO

1:25000

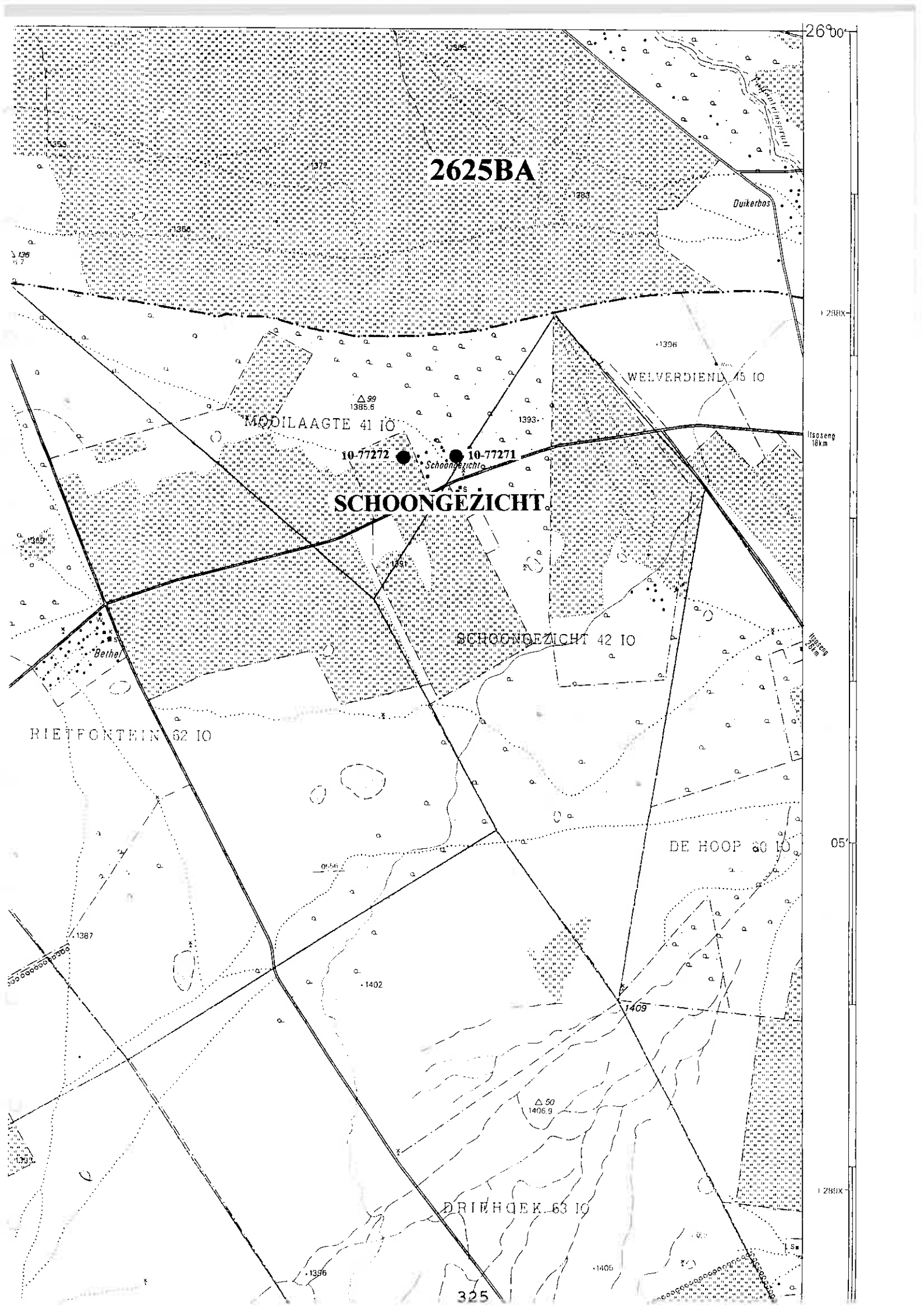
Itsoeng 18km

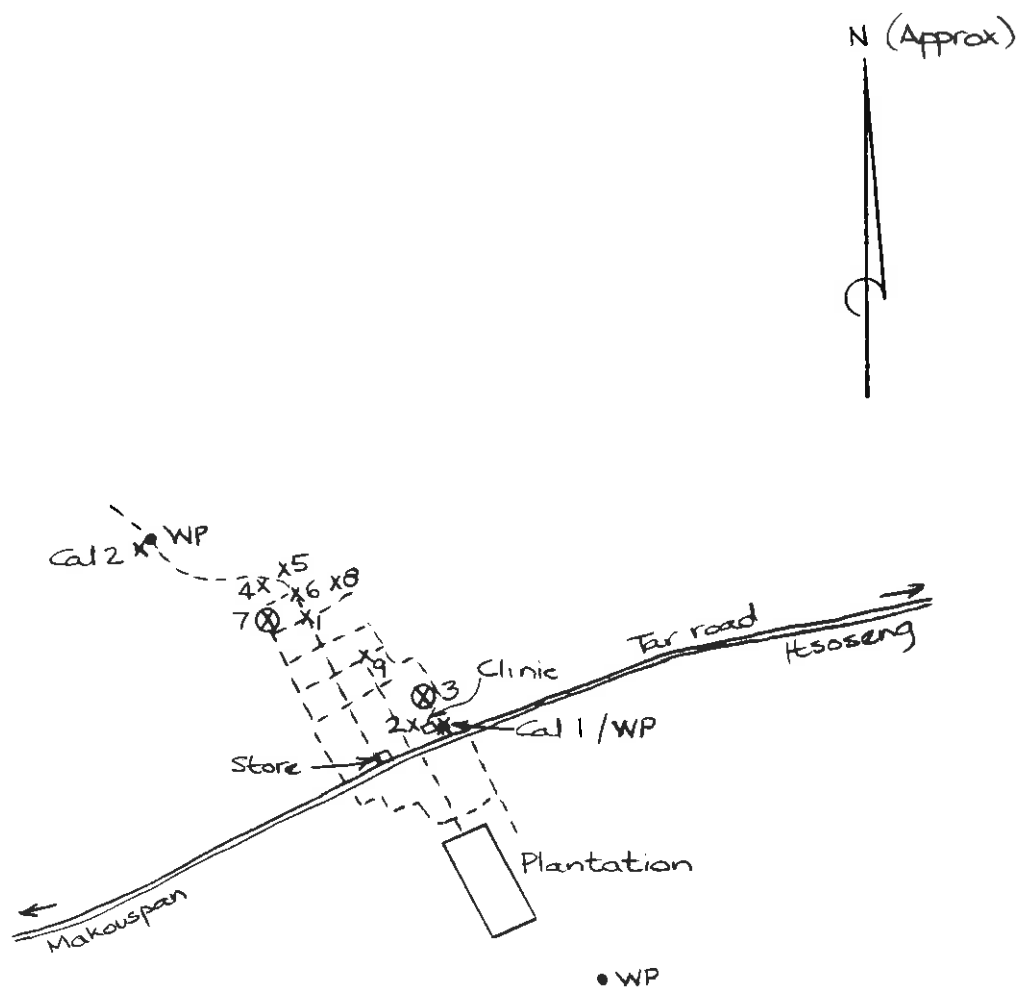
Ngweneng 16km

05

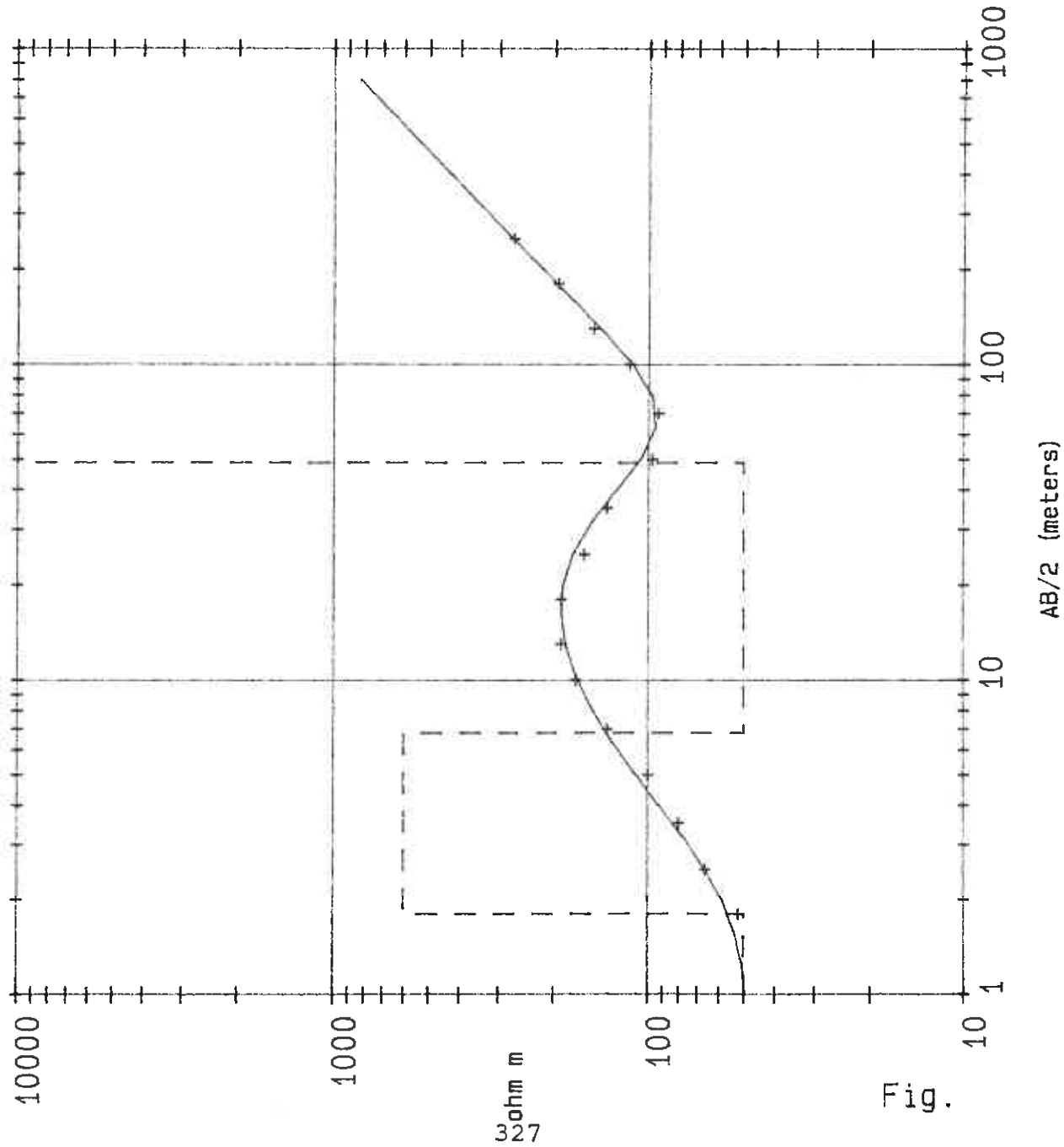
1:25000

325





Locality Plan of Skoongezicht
 Overlay to Photo No 050 (strip 11B)
 Approx Scale 1:30 000



+ Field data
 — Computer model
 - - d - r model

SCHOONGEZICHT CLINIC

V.E.S. 03

CO-ORDINATES
 +2881750X -71150Y

GEOLOGY
 QUARTZITE

Fig.

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

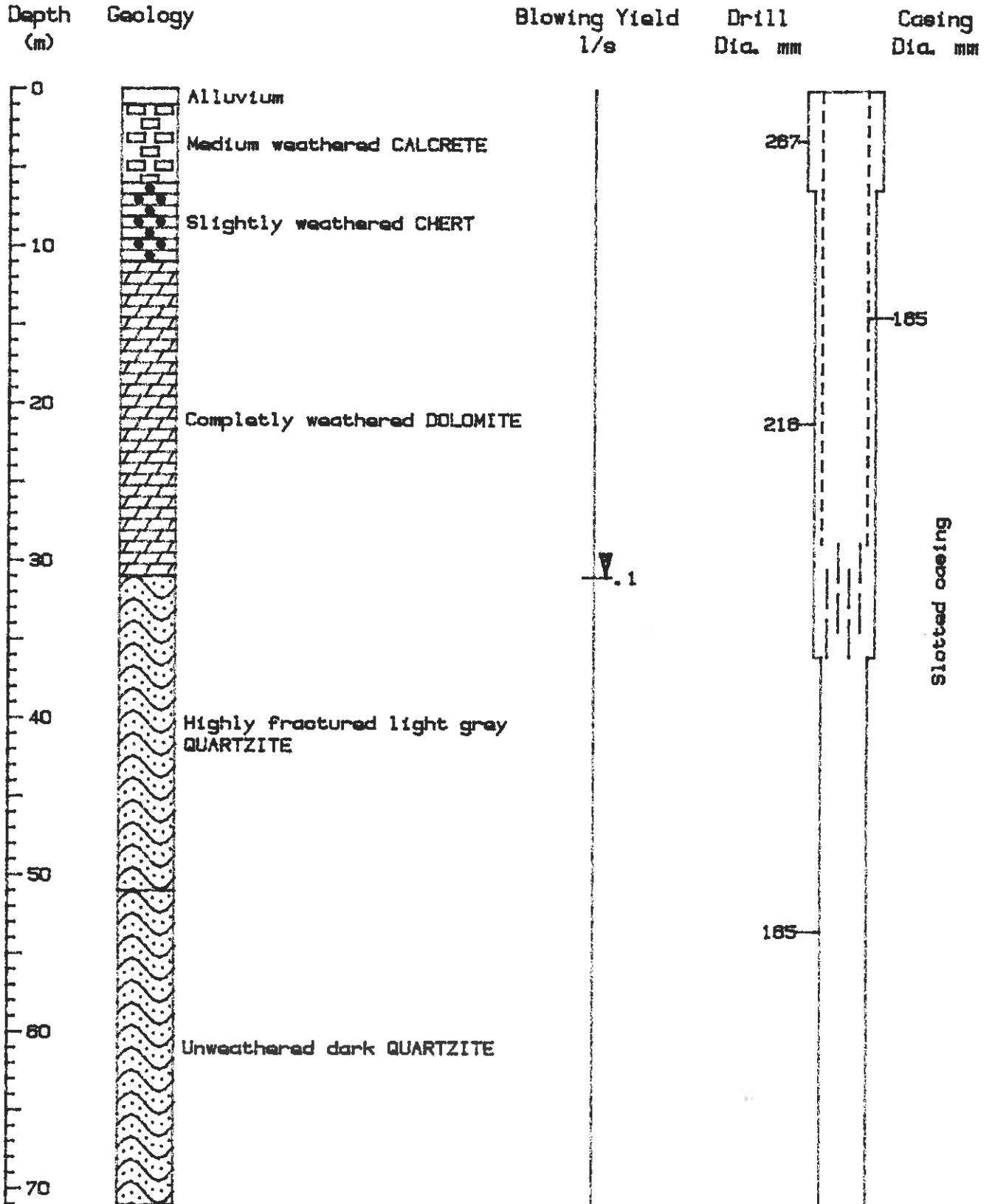
LOCALITY: SCHOONGEZICHT CLINIC

BH. No. 10-77271

Geoph. Peg No. 03

Coordinates +2881750X -71125Y

Elev. (m) 1389



End of Hole 71

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

SCHOONGEZICHT

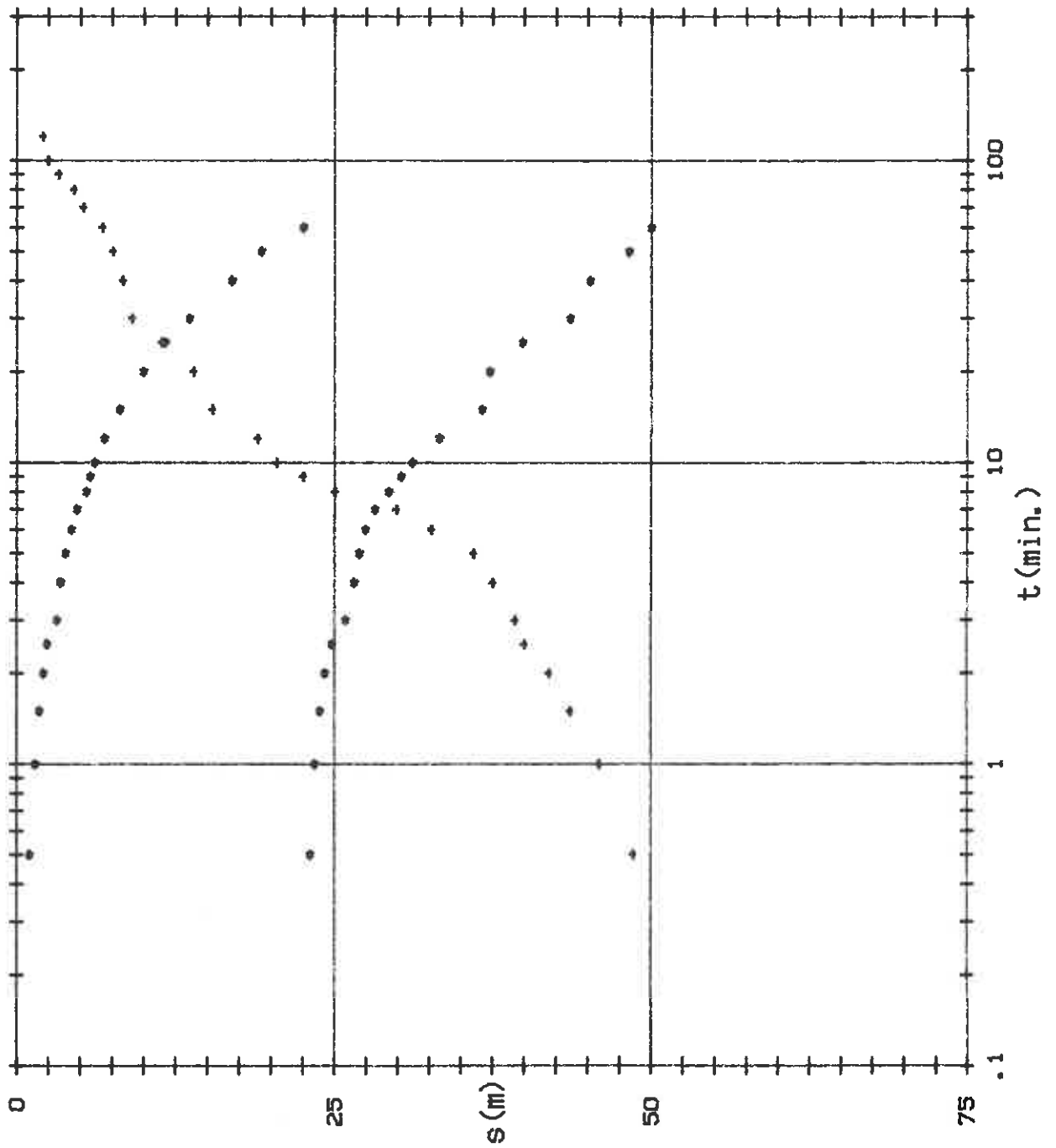
04 05 1992

B.H. No. 10-77271

$Q_1 = .27 \text{ l/s}$

$Q_2 = .5 \text{ l/s}$

S.W.L. = 9.34 m



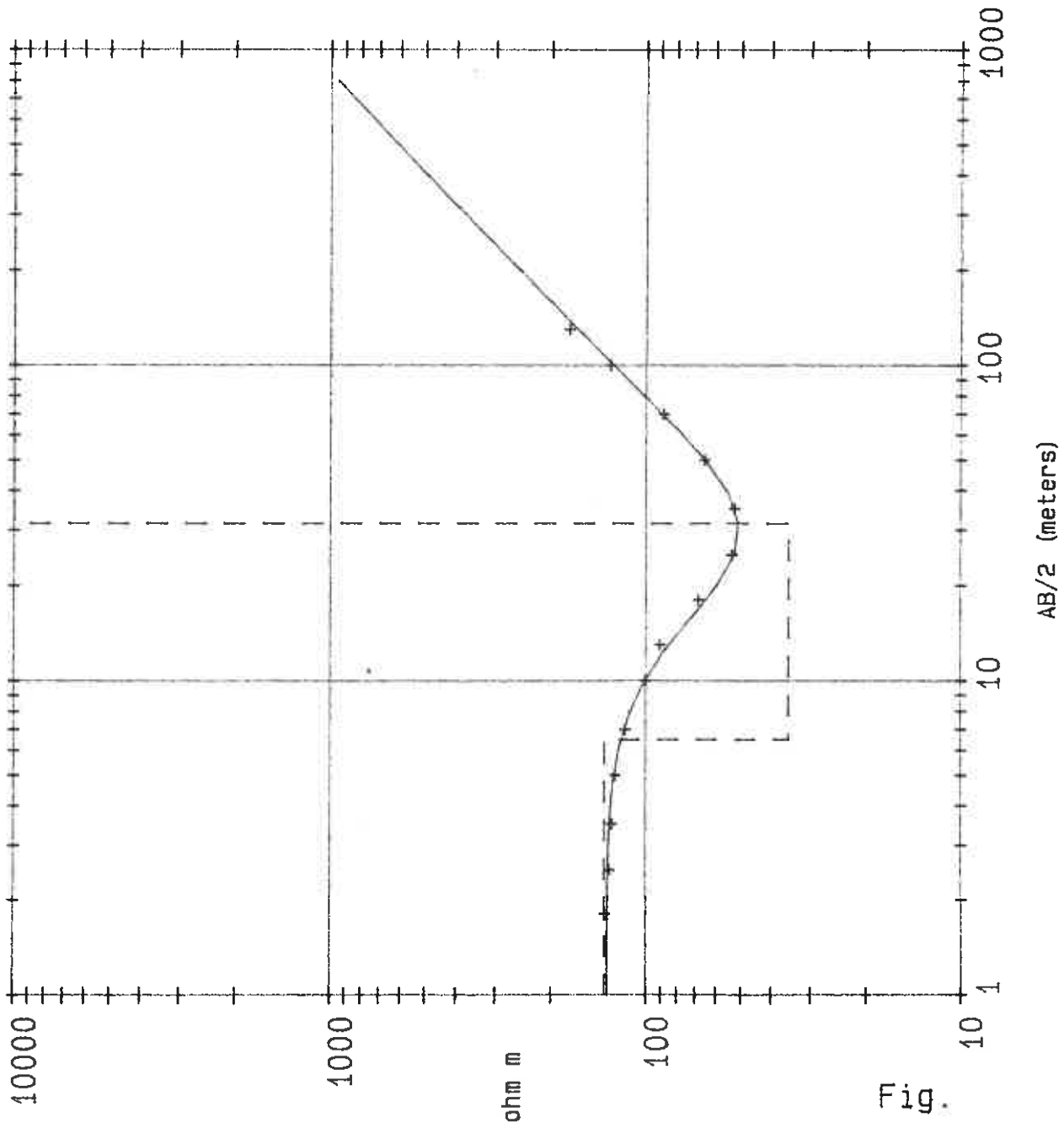


Fig.

+ Field data
 — Computer model
 - - - d - r model

SCHOONGEZICHT

V.E.S. 07

CO-ORDINATES
 +2881680X -70745Y

GEOLOGY
 QUARTZITE

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

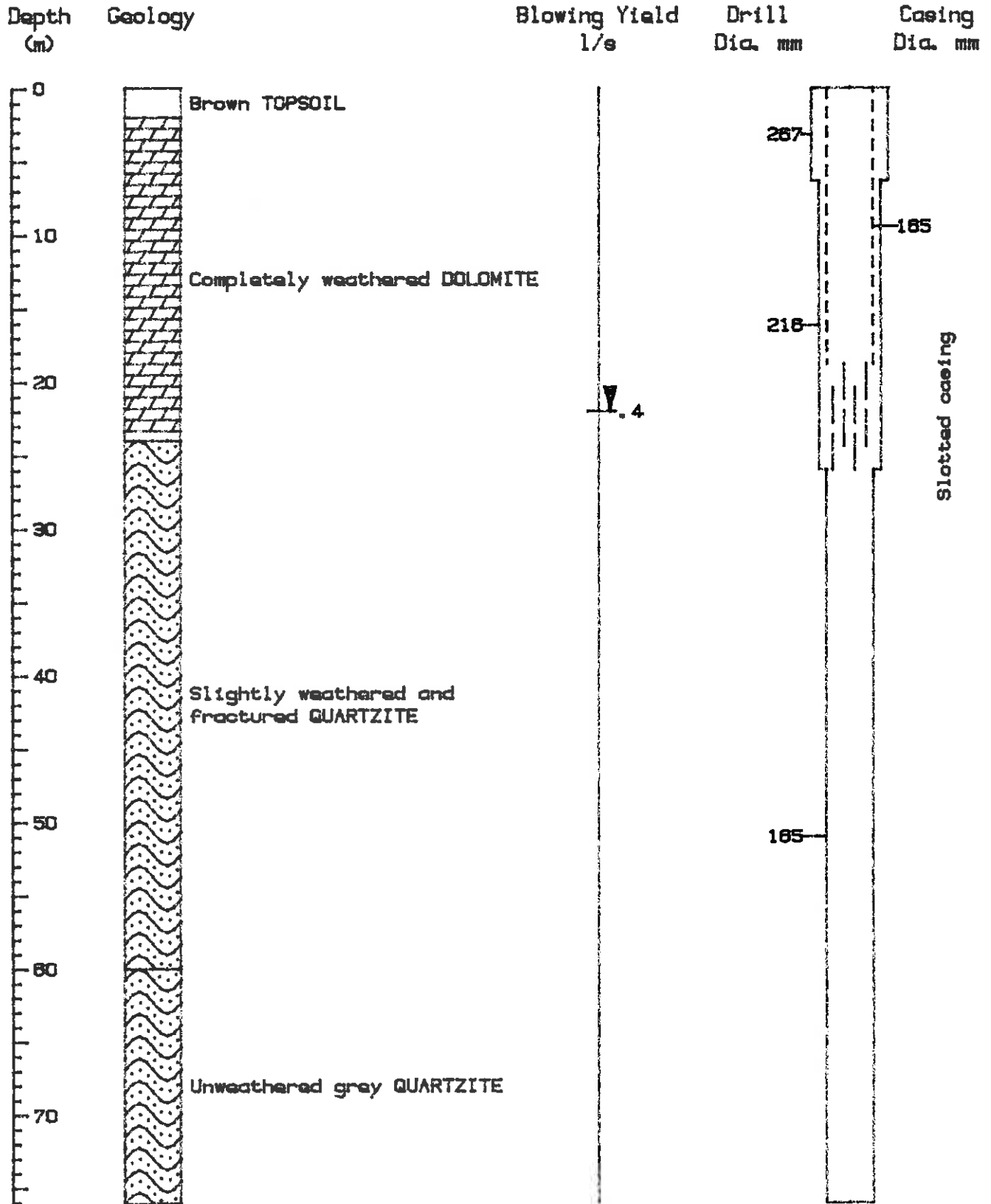
LOCALITY: SCHOONGEZICHT

BH. No. 10-77272

Geoph. Peg No. 07

Coordinates +2881675X -70750Y

Elev. (m) 1389



End of Hole 76

STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

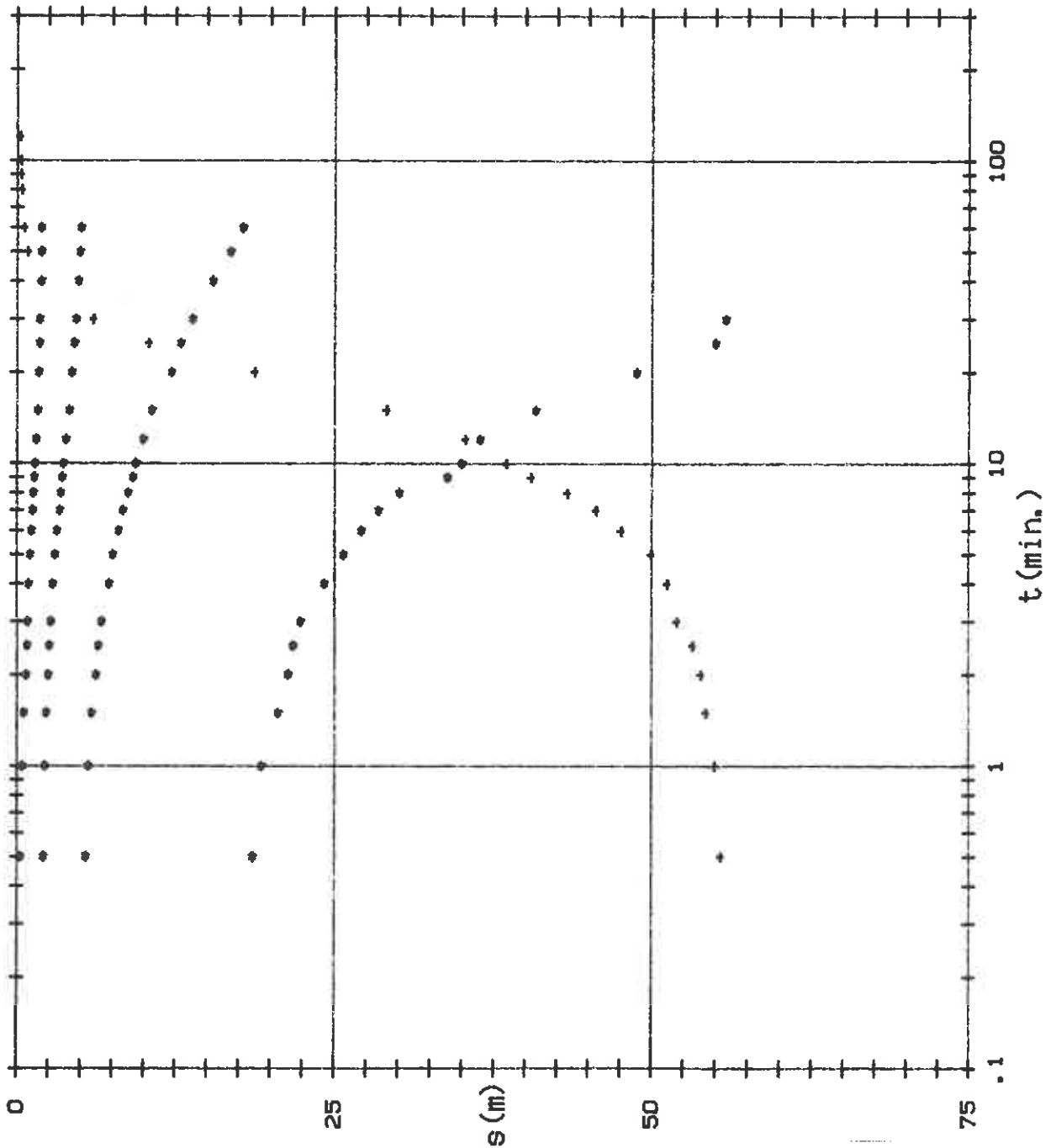
SCHOONGEZICHT

05 05 1992

B.H. No. 10-77272

$Q_1 = .18 \text{ l/s}$
 $Q_2 = .35 \text{ l/s}$
 $Q_3 = .65 \text{ l/s}$
 $Q_4 = 1.06 \text{ l/s}$

S.W.L. = 9.44 m



CONSTANT DISCHARGE TEST

+ Drawdown data.
* Recovery data.

SCHOONGEZICHT

06 05 1992

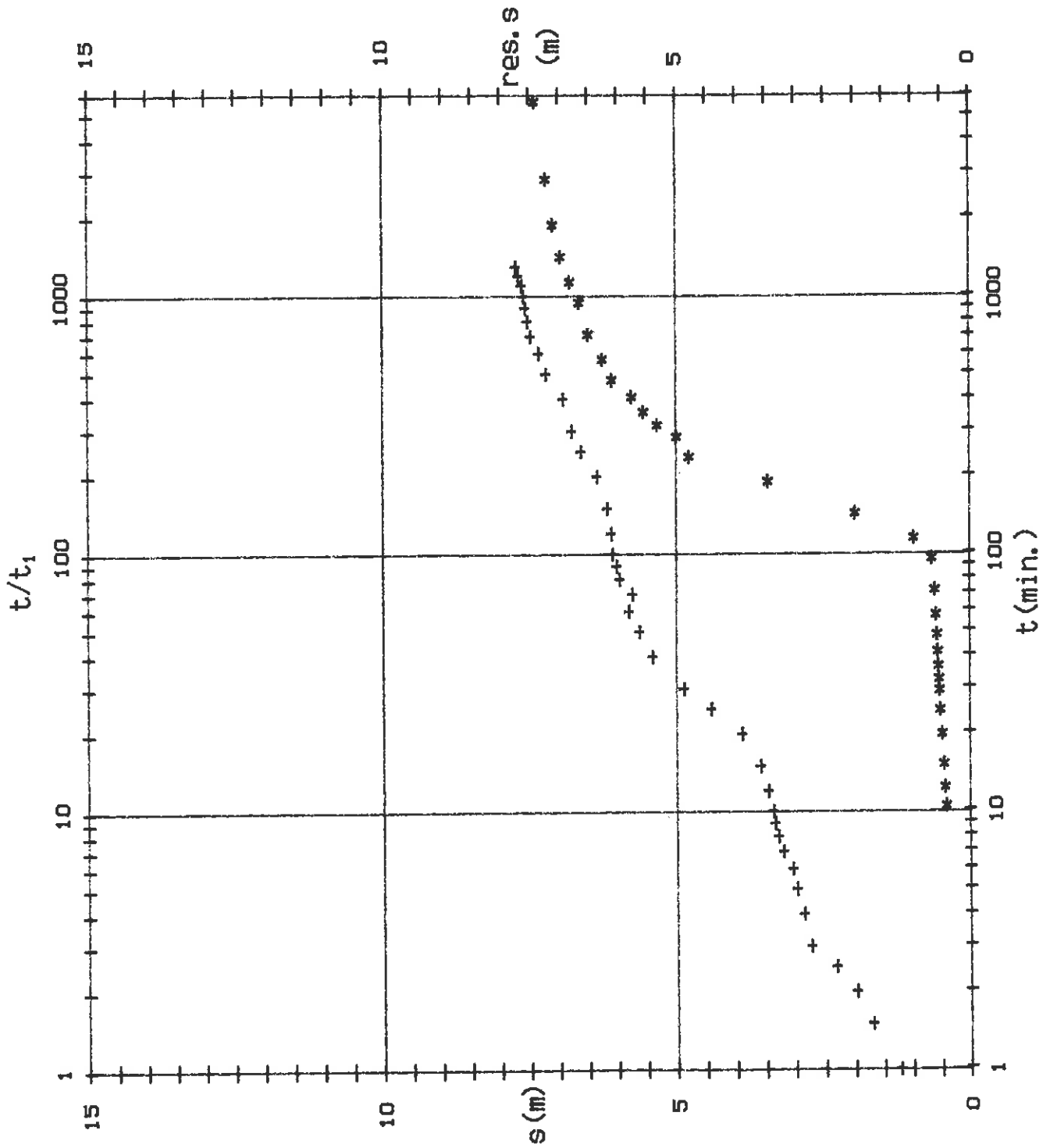
Pumped Borehole
10-77272

Readings on Borehole
10-77272

$Q = .5 \text{ l/s}$

S.W.L. = 9.44 m

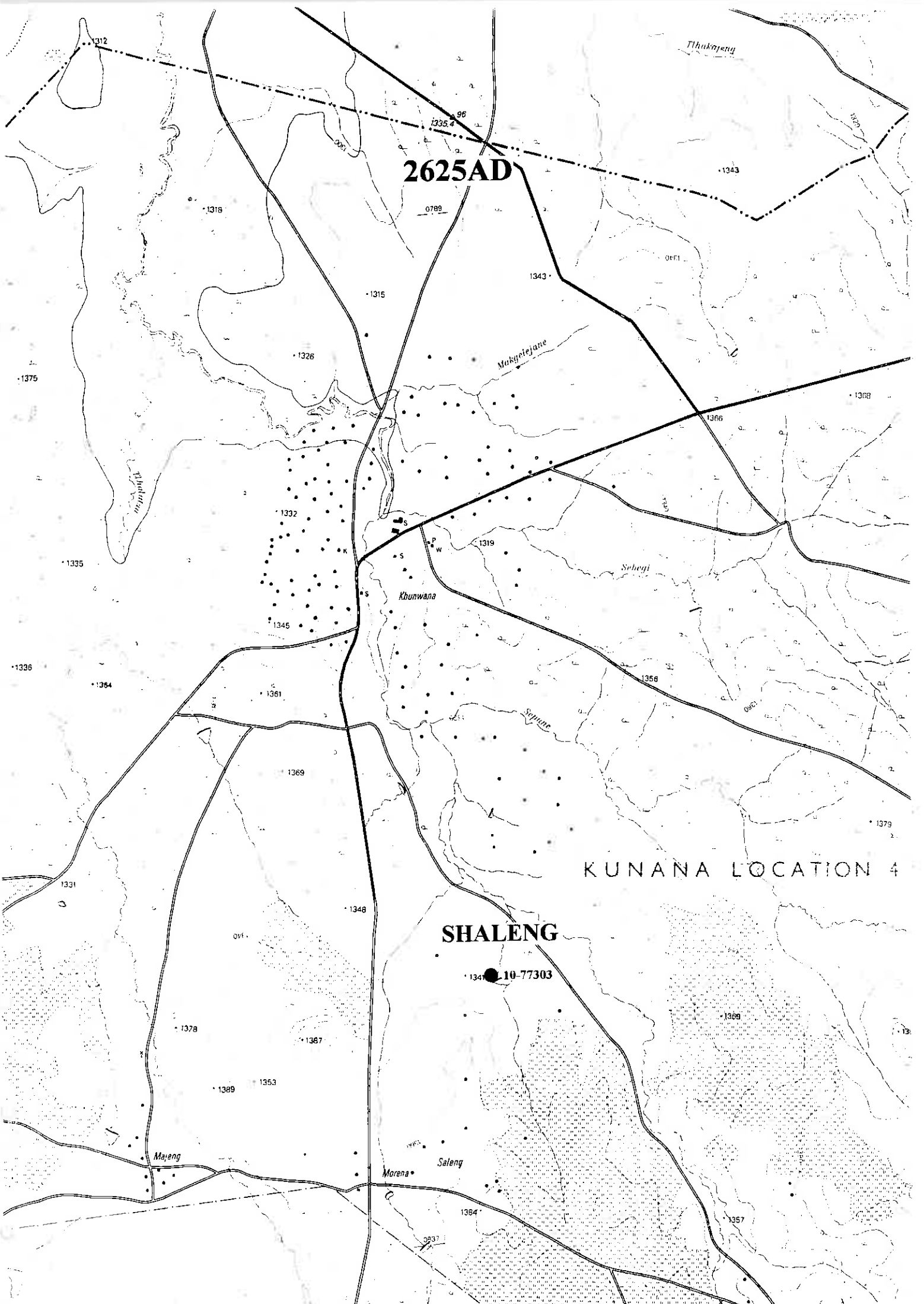
$T = 3 \text{ m}^2/\text{d}$



SHALENG

Including borehole

10-77303



2625AD

KUNANA LOCATION 4

SHALENG

1341 ● 10-77303

Thukajeng

Mokgetjane

Schegj

Snyde

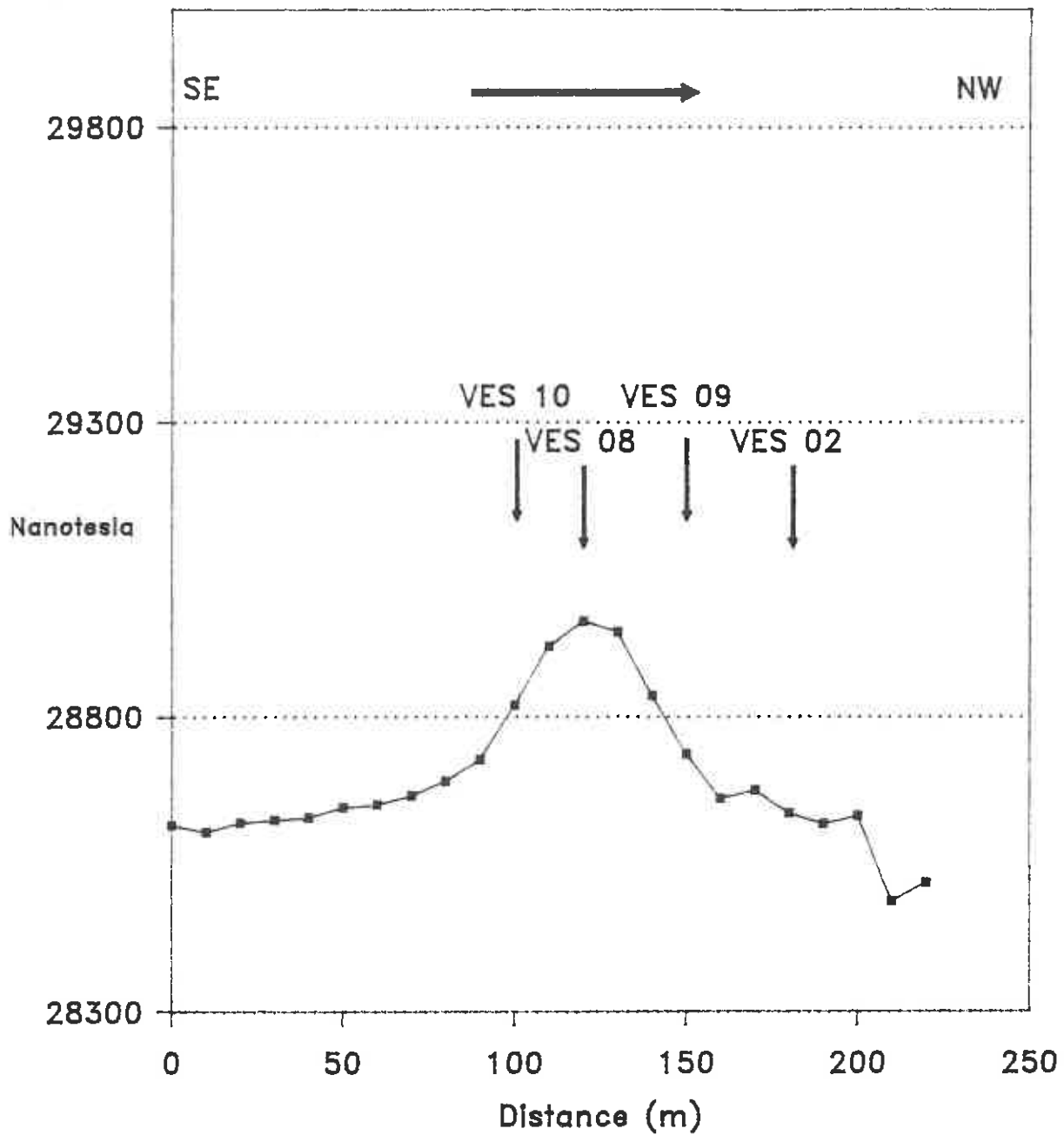
Kunwana

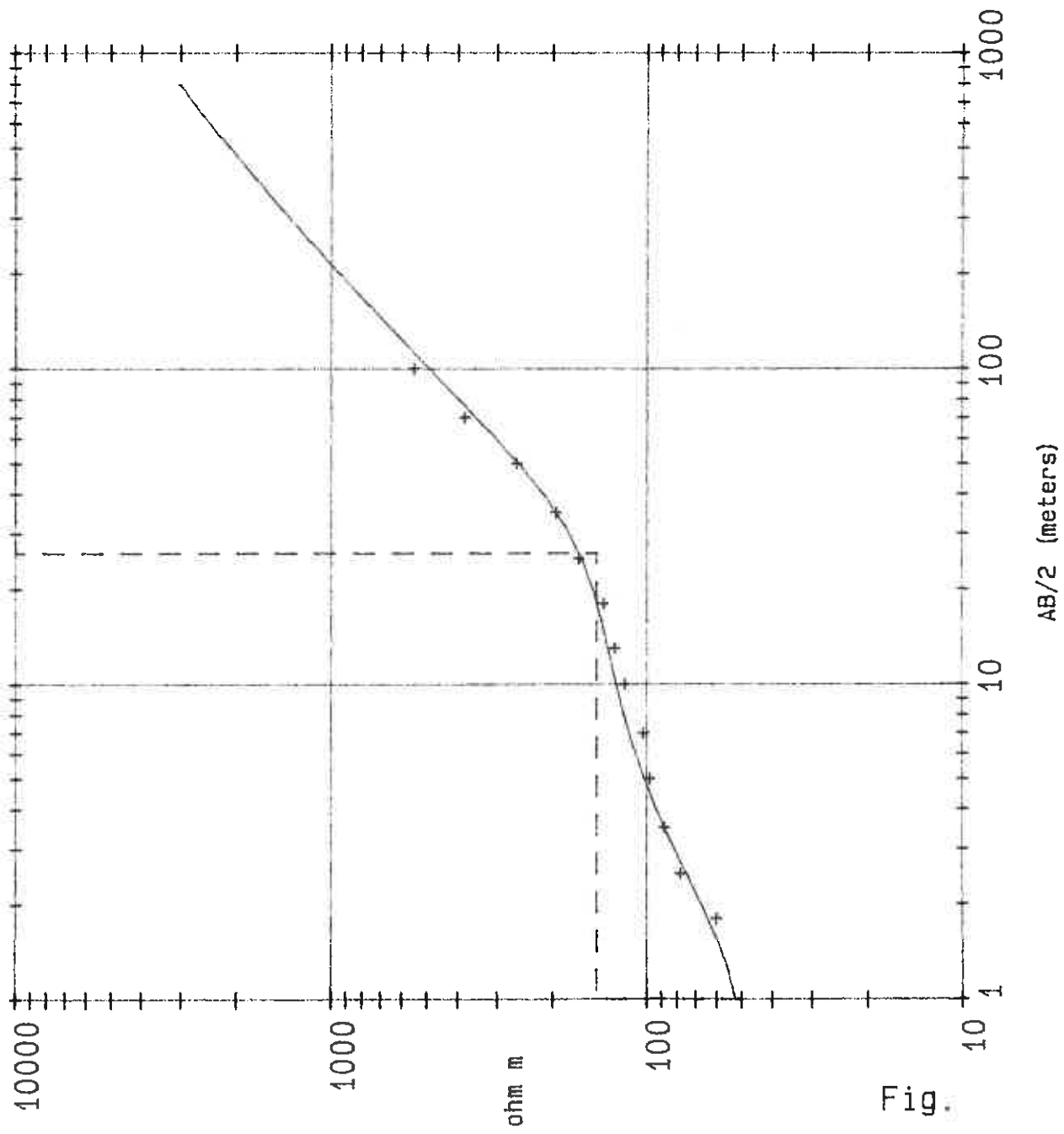
Majeng

Morena

Saleng

Magnetic Traverse #01
District: Ditsobotla
Locality: Shaleng





+ Field data
 — Computer model
 - - - d - r model

SHALENG

V.E.S. 01

CO-ORDINATES
 +2922455X -34180Y

GEOLOGY
 GRANITE

Fig.

BOREHOLE LOG

DISTRICT: DITSOBOTLA

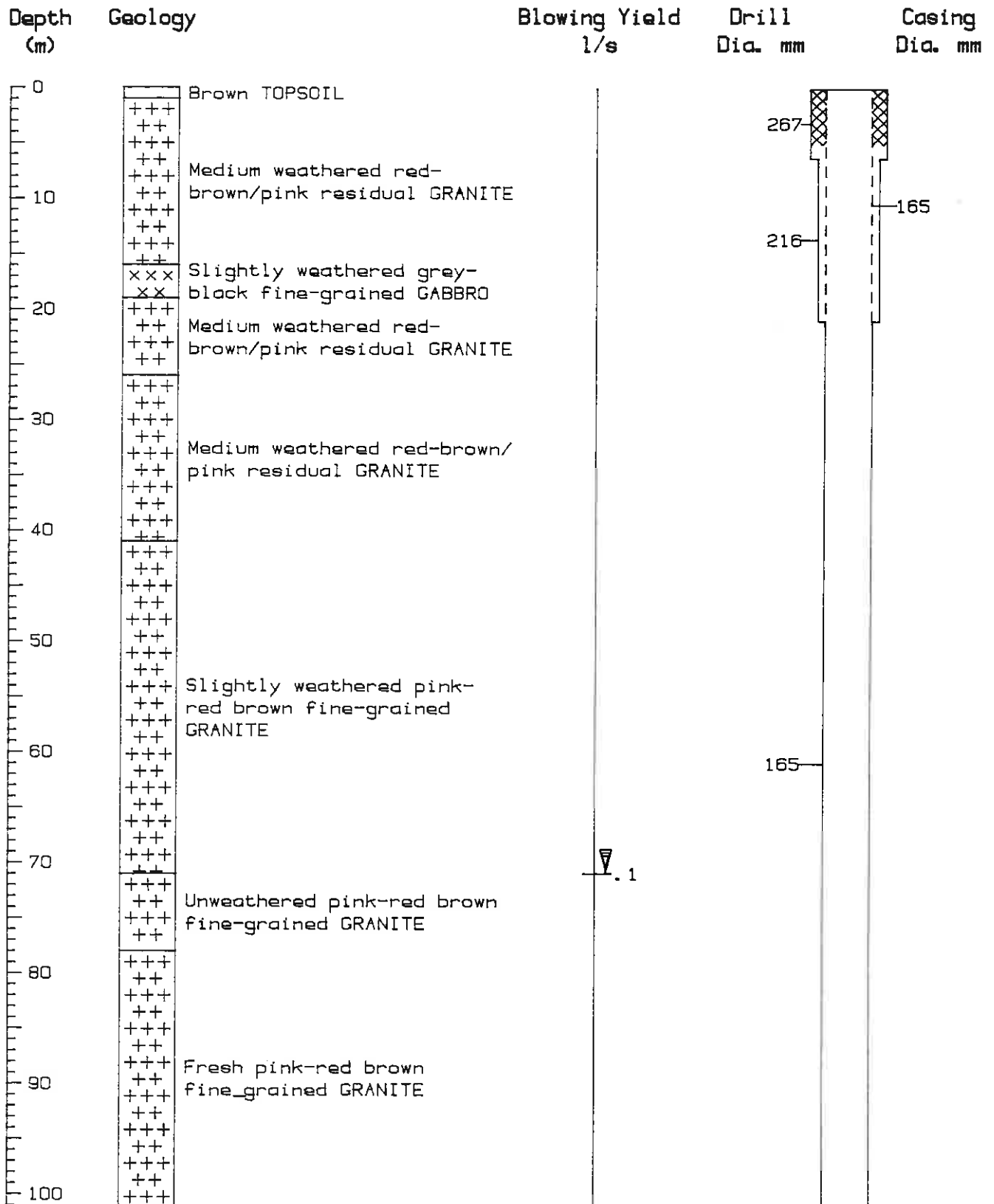
LOCALITY: SHALENG

BH. No. 10-77303

Geoph. Peg No. 01

Coordinates +2922455X -034180Y

Elev. (m) 1339



End of Hole 101

STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

SHALENG

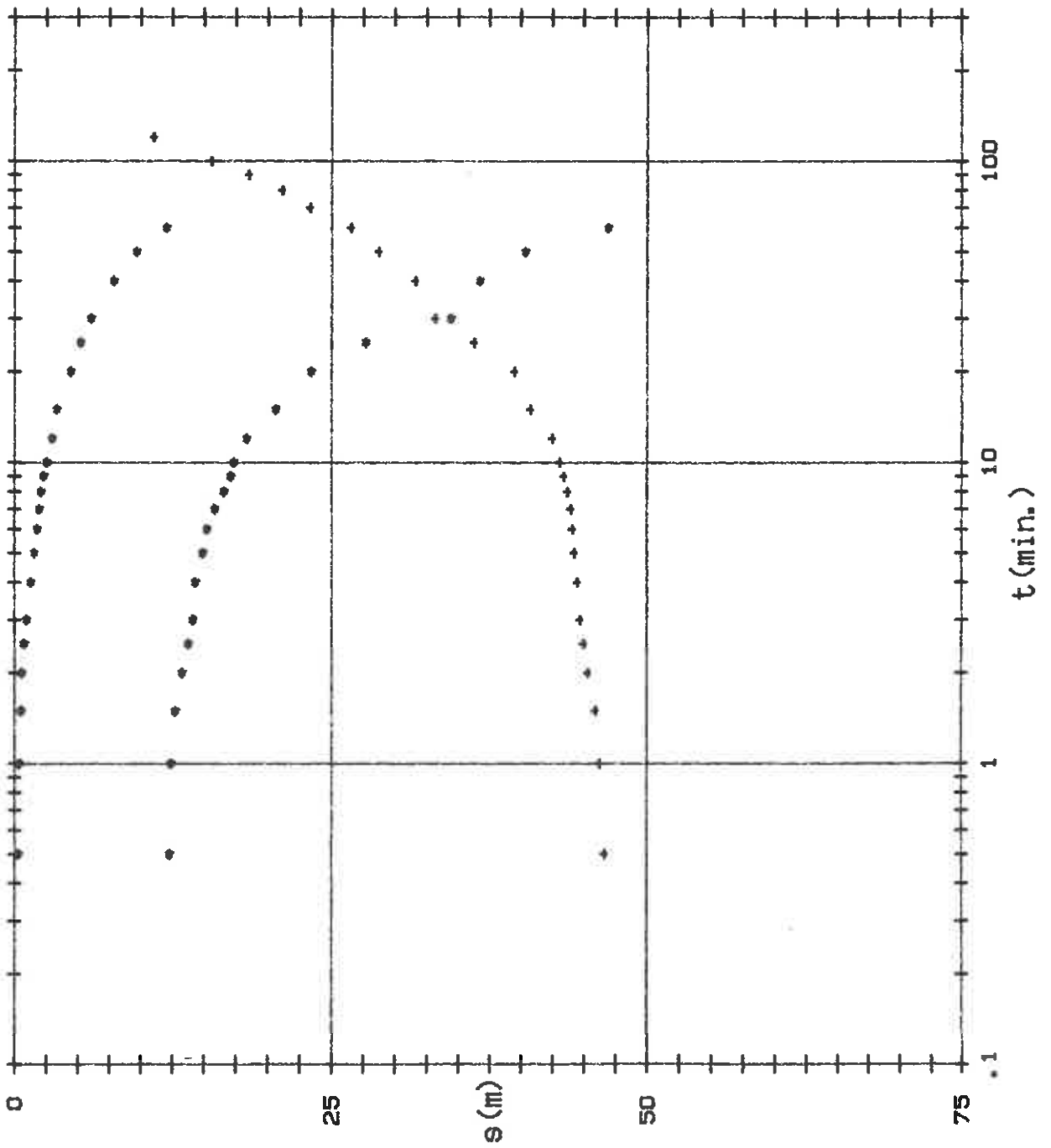
25 05 1992

B.H. No. 10-77303

$Q_1 = .16 \text{ l/s}$

$Q_2 = .3 \text{ l/s}$

S.W.L. = 7.84 m



SIBERIA

Including boreholes

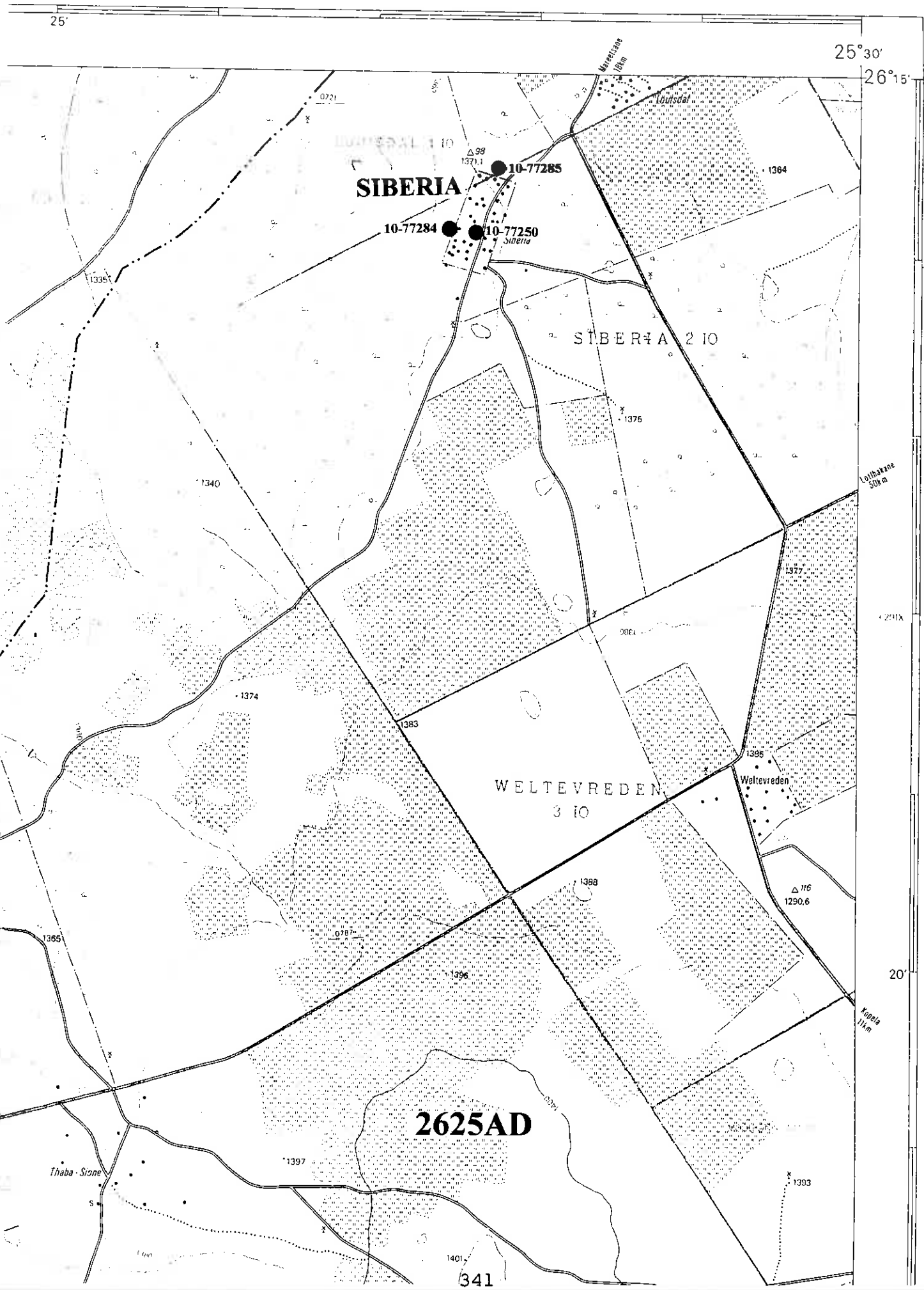
10-77250 - Gontse P/S

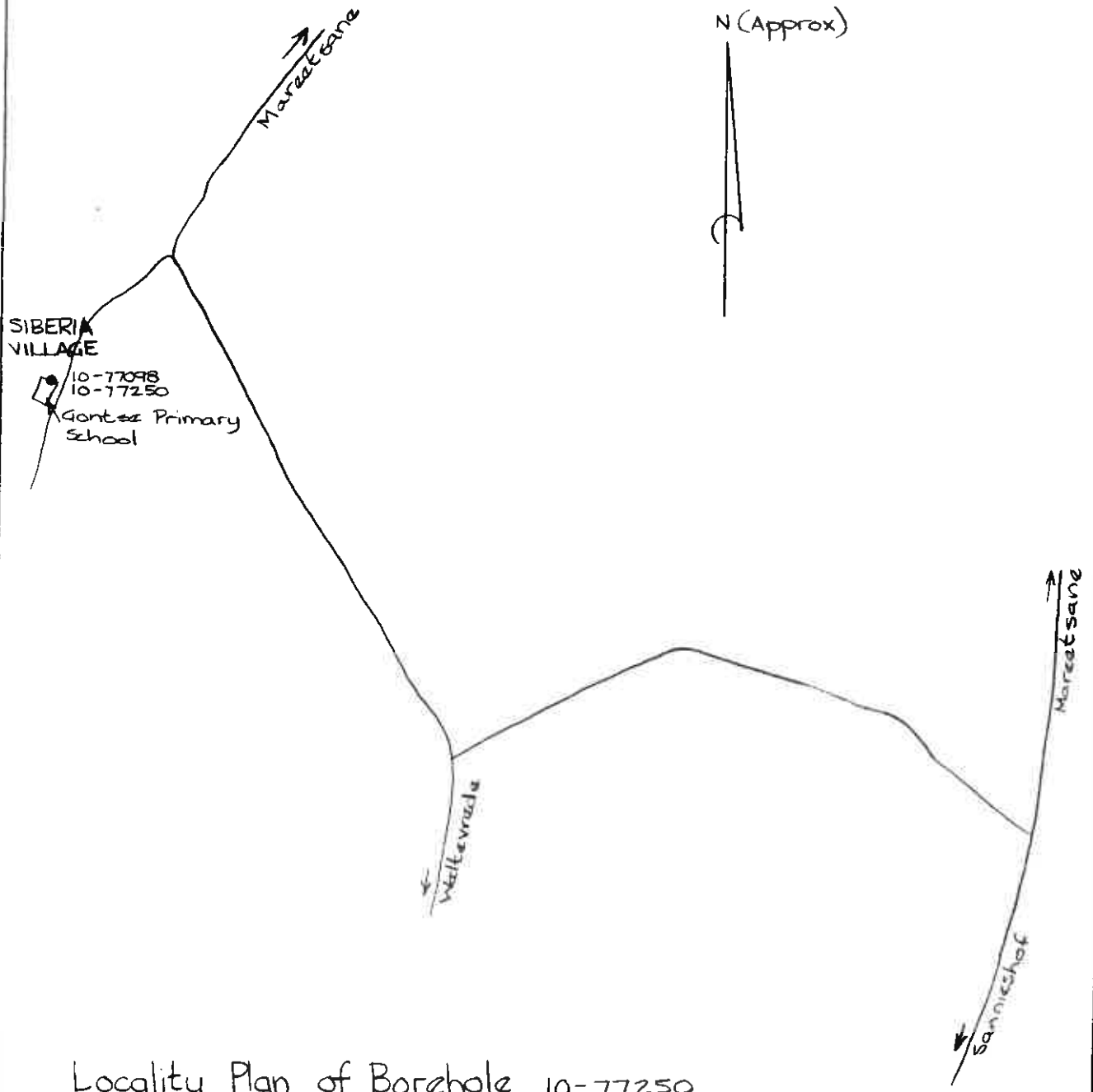
10-77284

10-77285

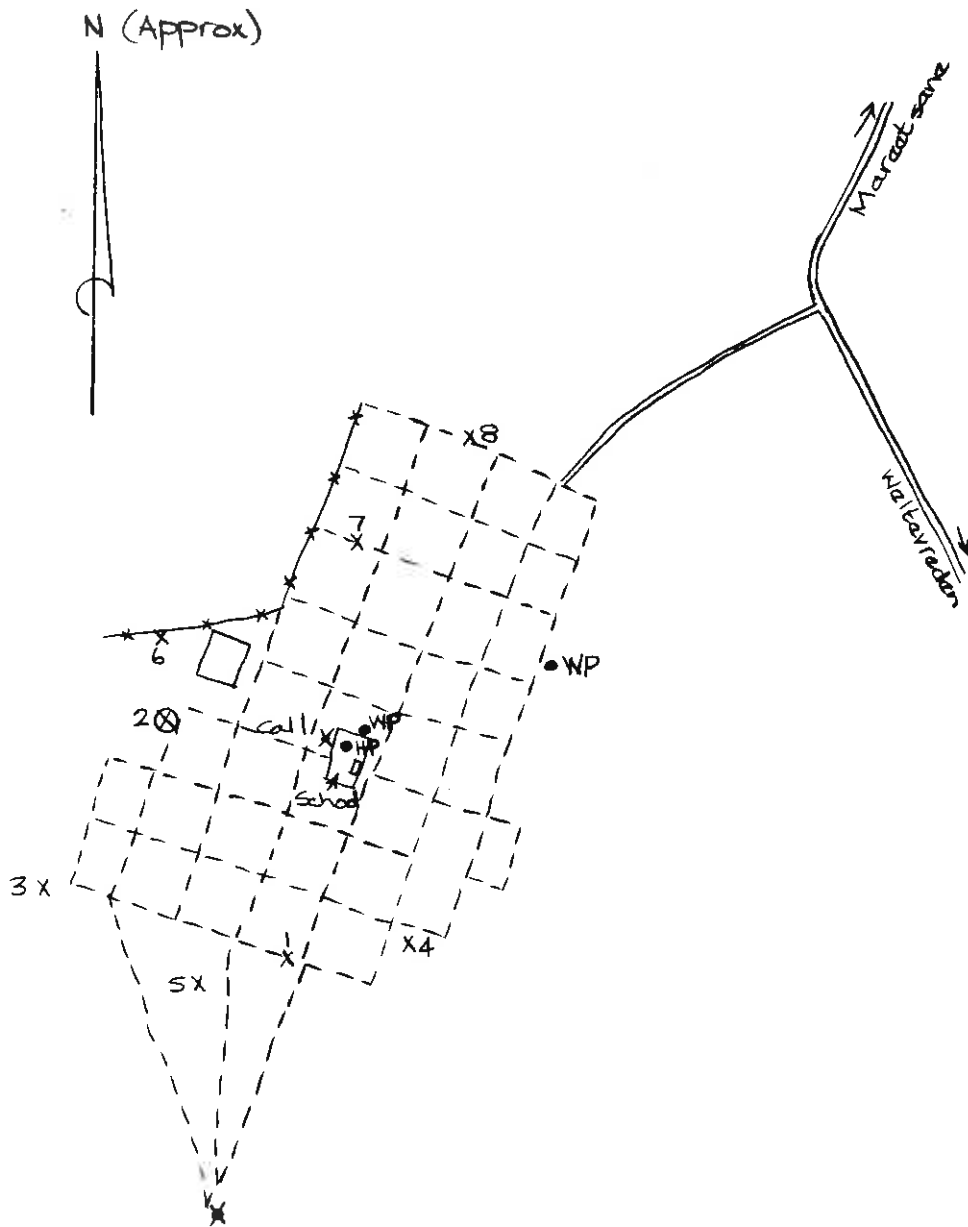
HEIGHTS IN METRES

Verwys na hierdie Kaart as SUID-AFRIKA 1:50 000 Vel 2625 AD KRAAIPAN
Refer to this Map as SOUTH AFRICA 1:50 000 Sheet EERSTE UITGAWE FIRST EDITION





Locality Plan of Borehole 10-77250
 Topographic sheet 2625 AD KRAAIPAN
 Approx Scale 1:50 000



Locality Plan of Siberia
 Overlay to Photo No. 1429 (strip 7)
 Approx Scale 1:15 000

BOREHOLE LOG

DISTRICT: DITSOBOTLA

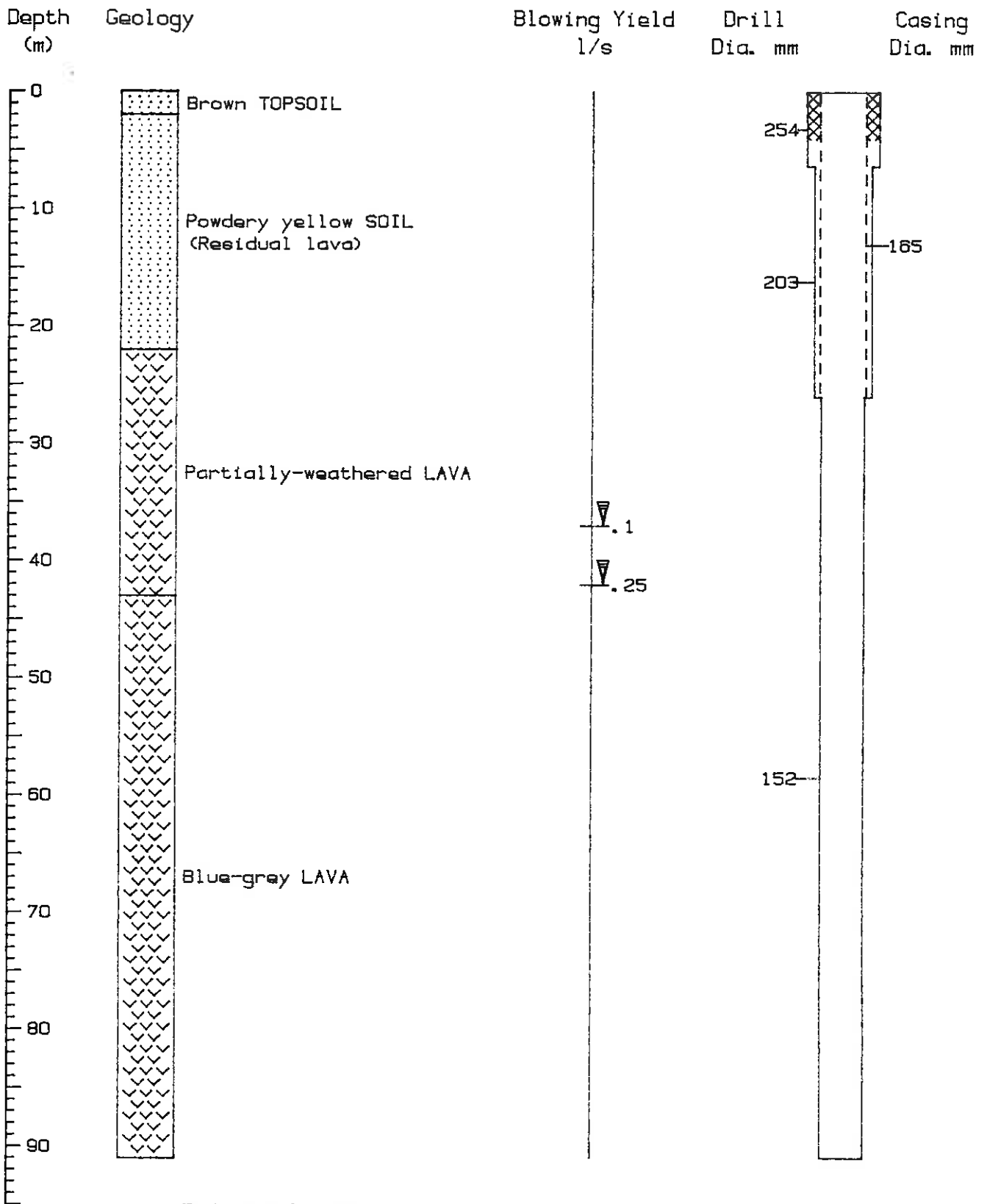
LOCALITY: GONTSE P-SCH (SIBERIA)

BH. No. 10-77250

Geoph. Peg No. REHAB

Coordinates +2906050X -45950Y

Elev. (m) 1370



STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

SIBERIA

21 05 1992

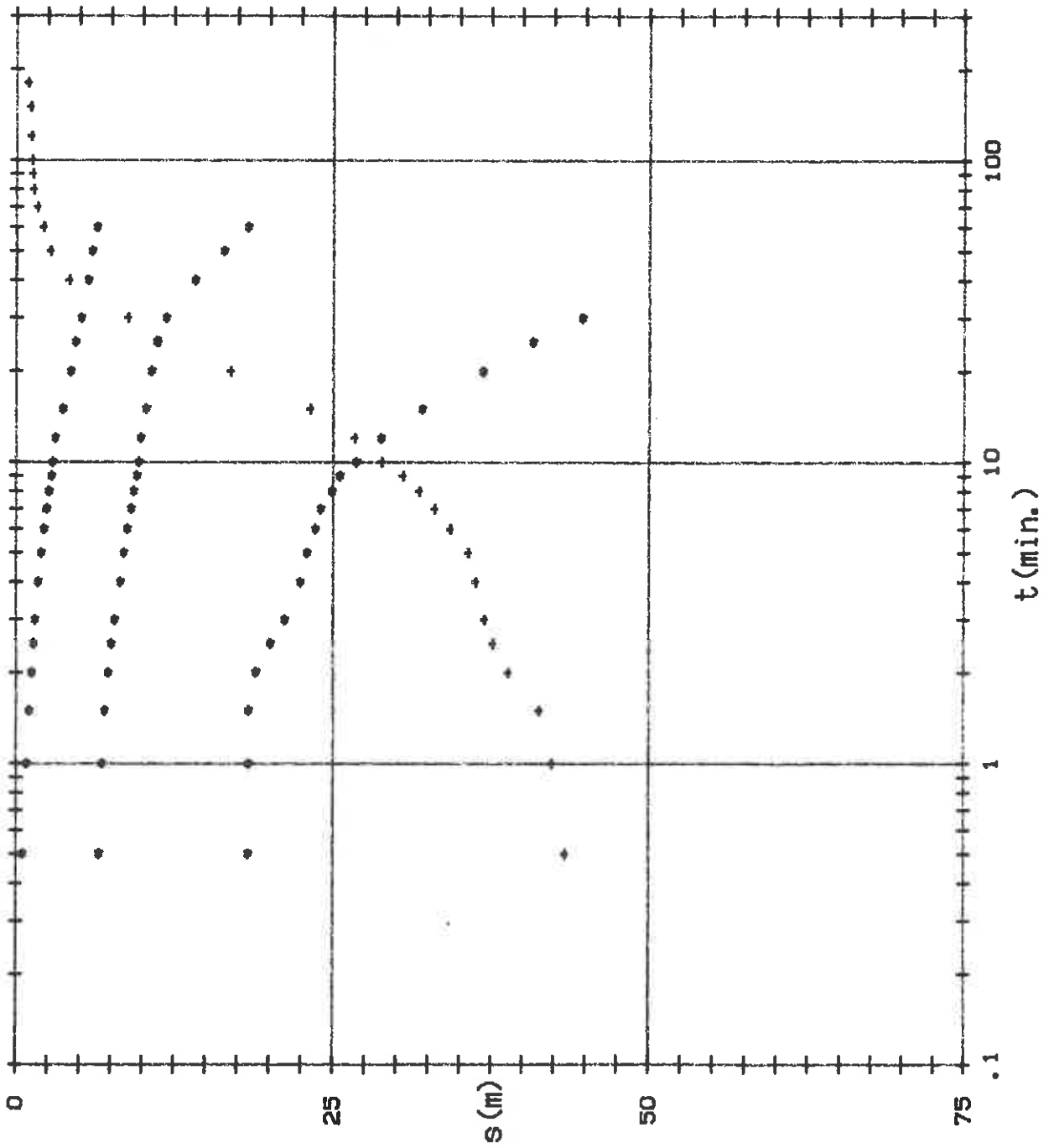
B.H. No. 10-77250

$Q_1 = .27 \text{ l/s}$

$Q_2 = .43 \text{ l/s}$

$Q_3 = .71 \text{ l/s}$

S.W.L. = 26.89 m



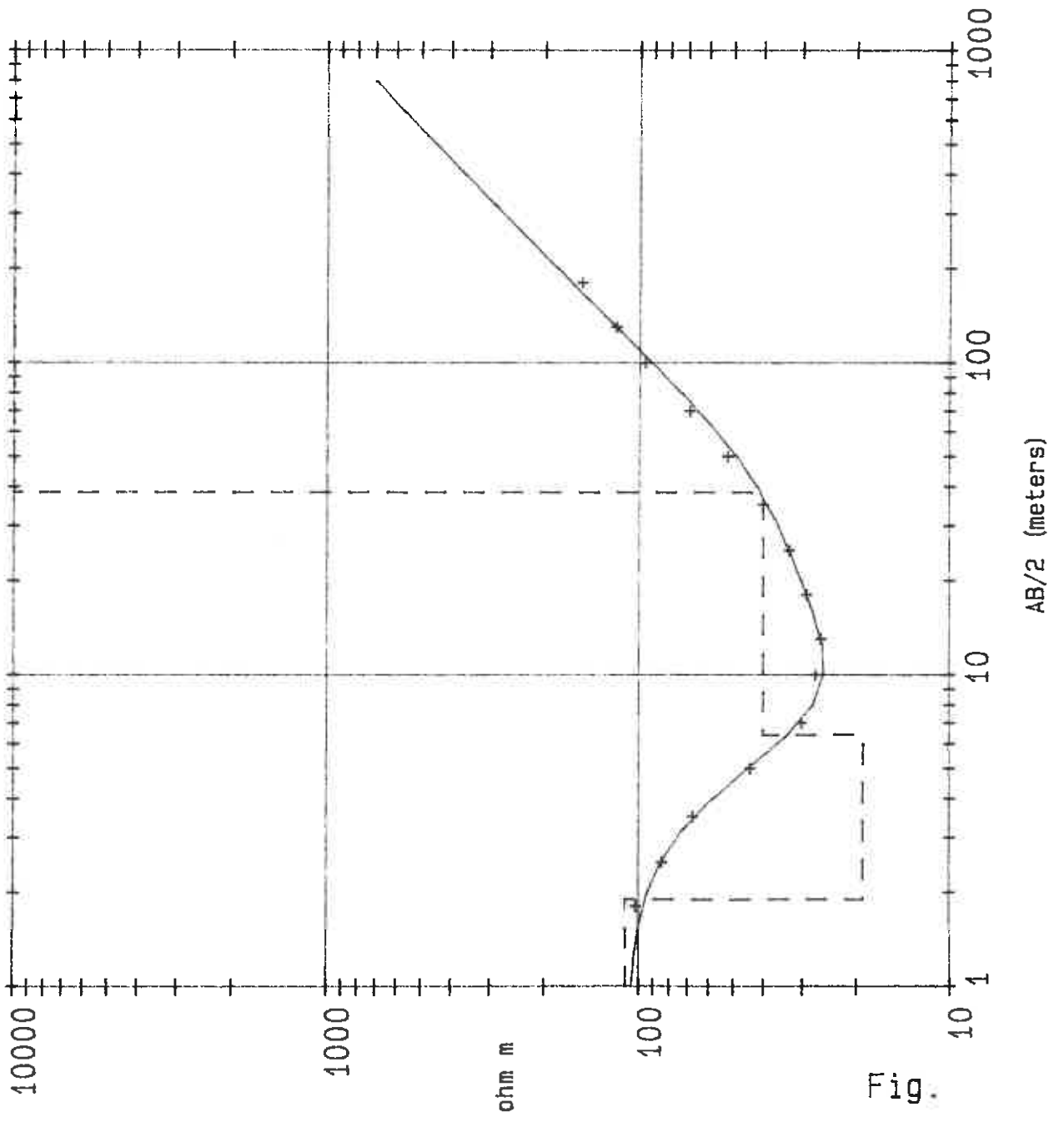


Fig.

+ Field data
 — Computer model
 - - - d - r model

SIBERIA

V.E.S. 02

CO-ORDINATES
 +2906045X -45745Y

GEOLOGY
 LAVA

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

LOCALITY: SIBERIA

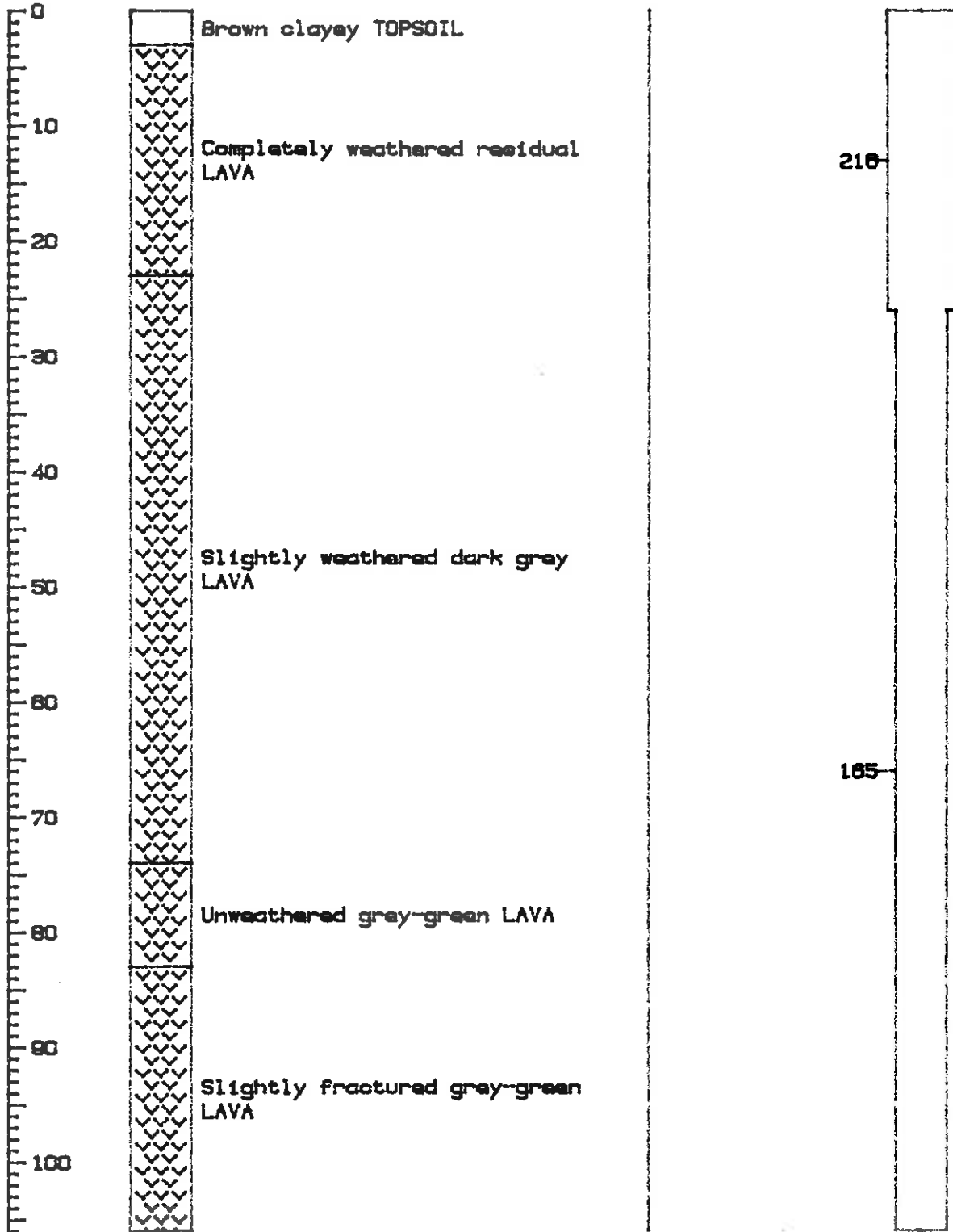
BH. No. 10-77284

Geoph. Pag No. 02

Coordinates +2906050X -45750Y

Elev. (m) 1364

Depth (m)	Geology	Blowing Yield l/s	Drill Dia. mm	Casing Dia. mm
-----------	---------	-------------------	---------------	----------------



End of Hole 108

+ Field data
 — Computer model
 - - - d - r model

SIBERIA

V.E.S. 08

CO-ORDINATES
 +2905425X -46155Y

GEOLOGY
 LAVA

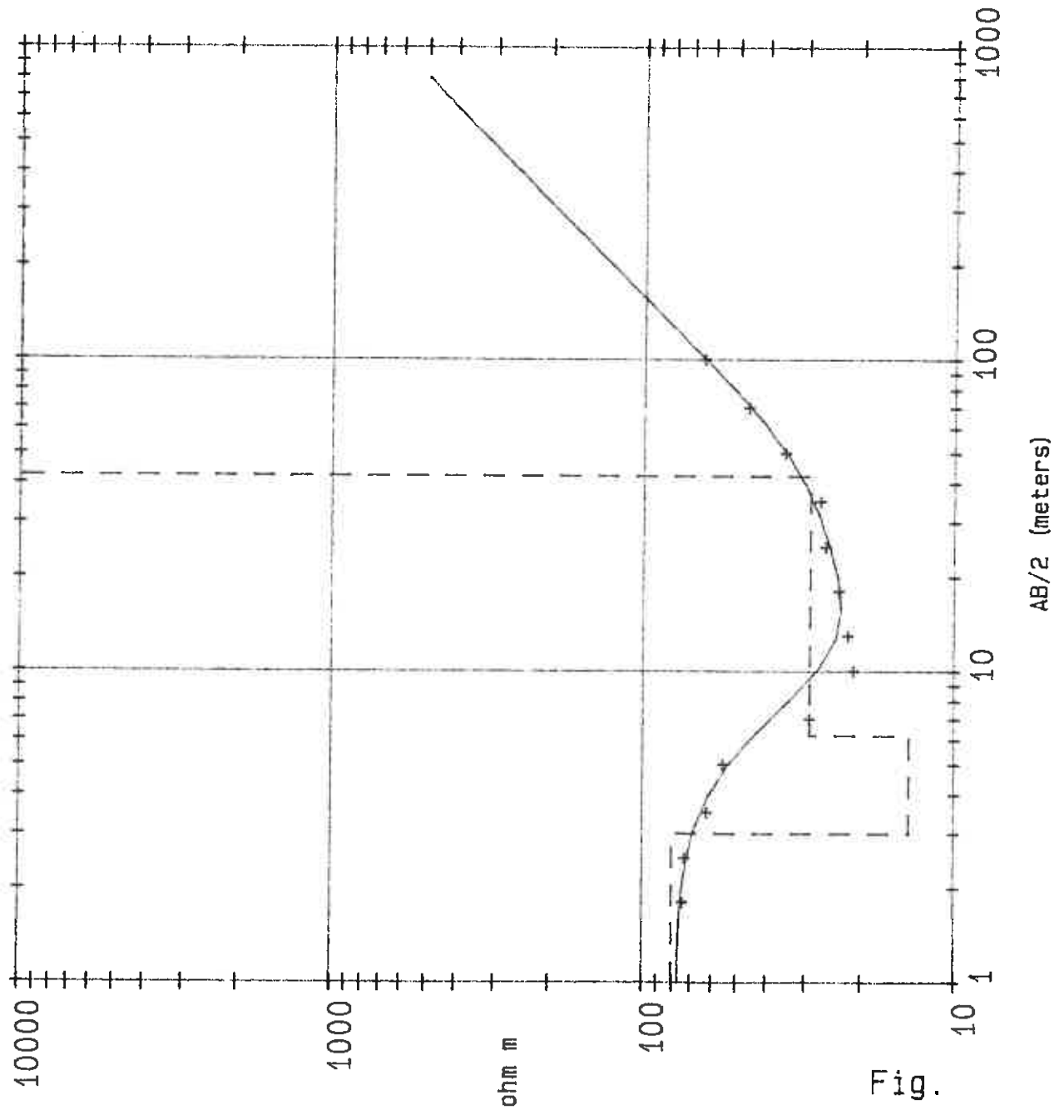


Fig.

BOREHOLE LOG

DISTRICT: DITSOBOTLA

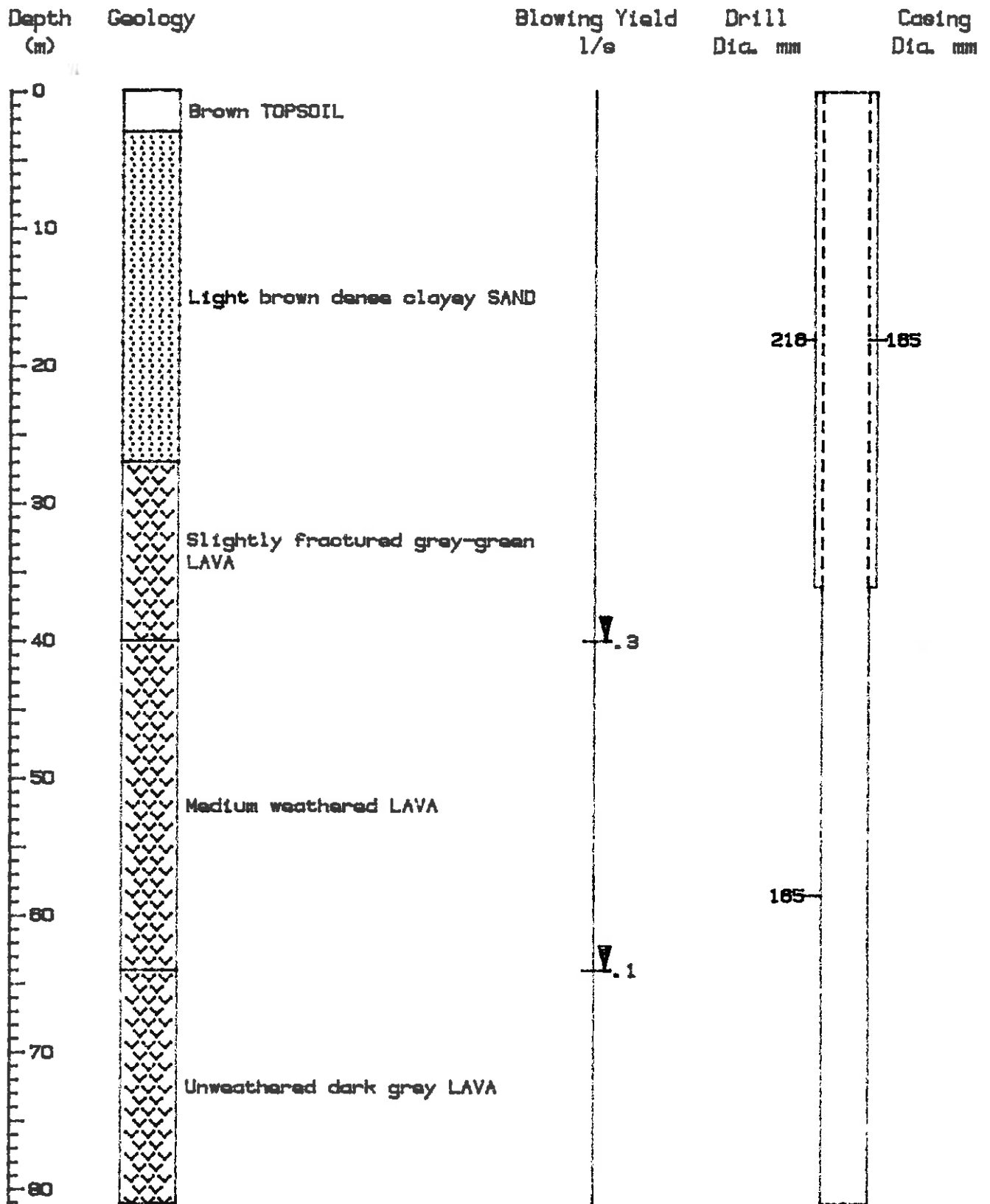
LOCALITY: SIBERIA

BH. No. 10-77285

Geoph. Peg No. 08

Coordinates +2905425X -46150Y

Elev. (m) 1372



End of Hole 81

STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

SIBERIA

21 05 1992

B.H. No. 10-77285

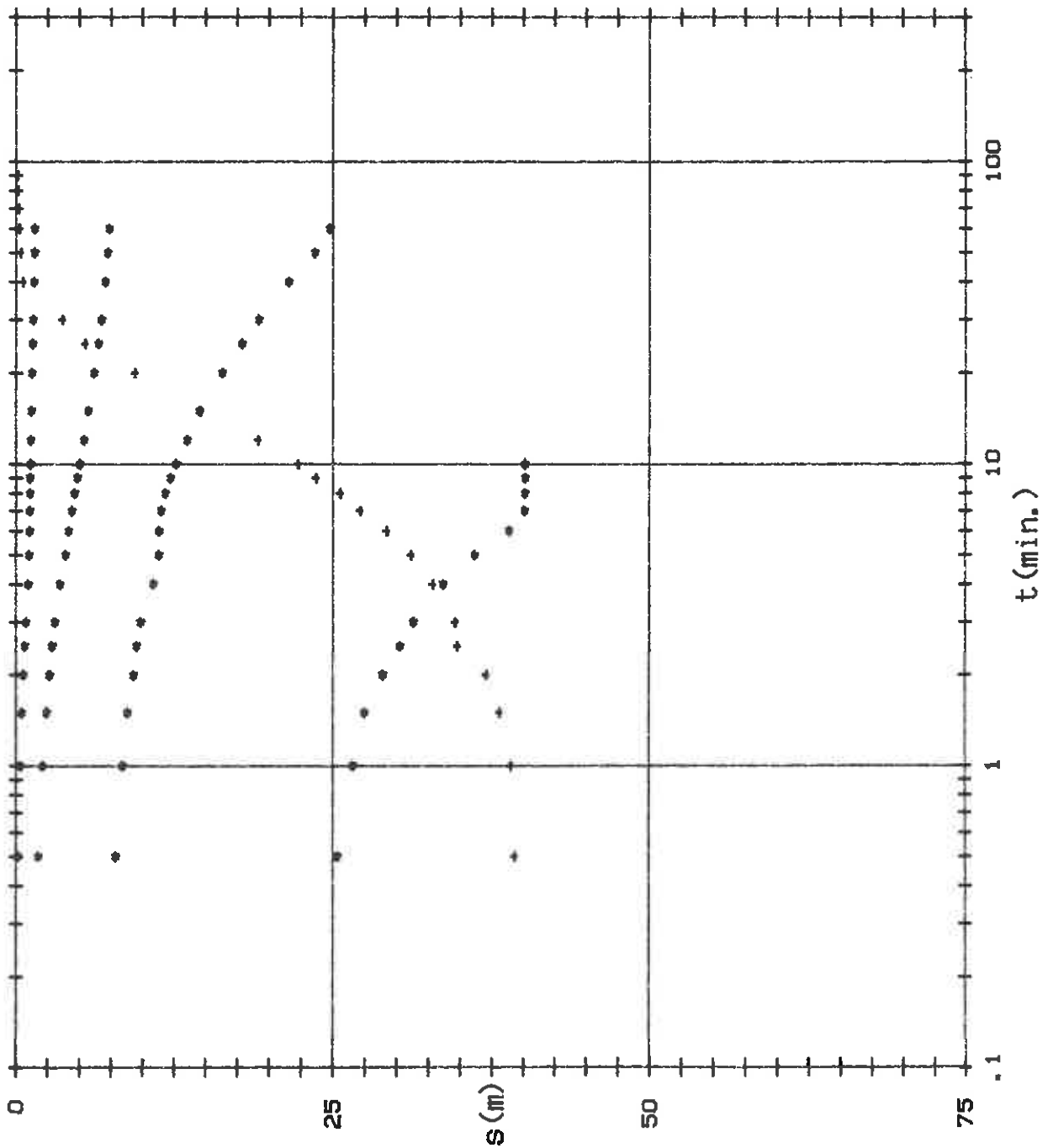
$Q_1 = .09$ l/s

$Q_2 = .34$ l/s

$Q_3 = .6$ l/s

$Q_4 = 1.3$ l/s

S.W.L. = 29.89 m



CONSTANT DISCHARGE TEST

+ Drawdown data.
* Recovery data.

SIBERIA

21 05 1992

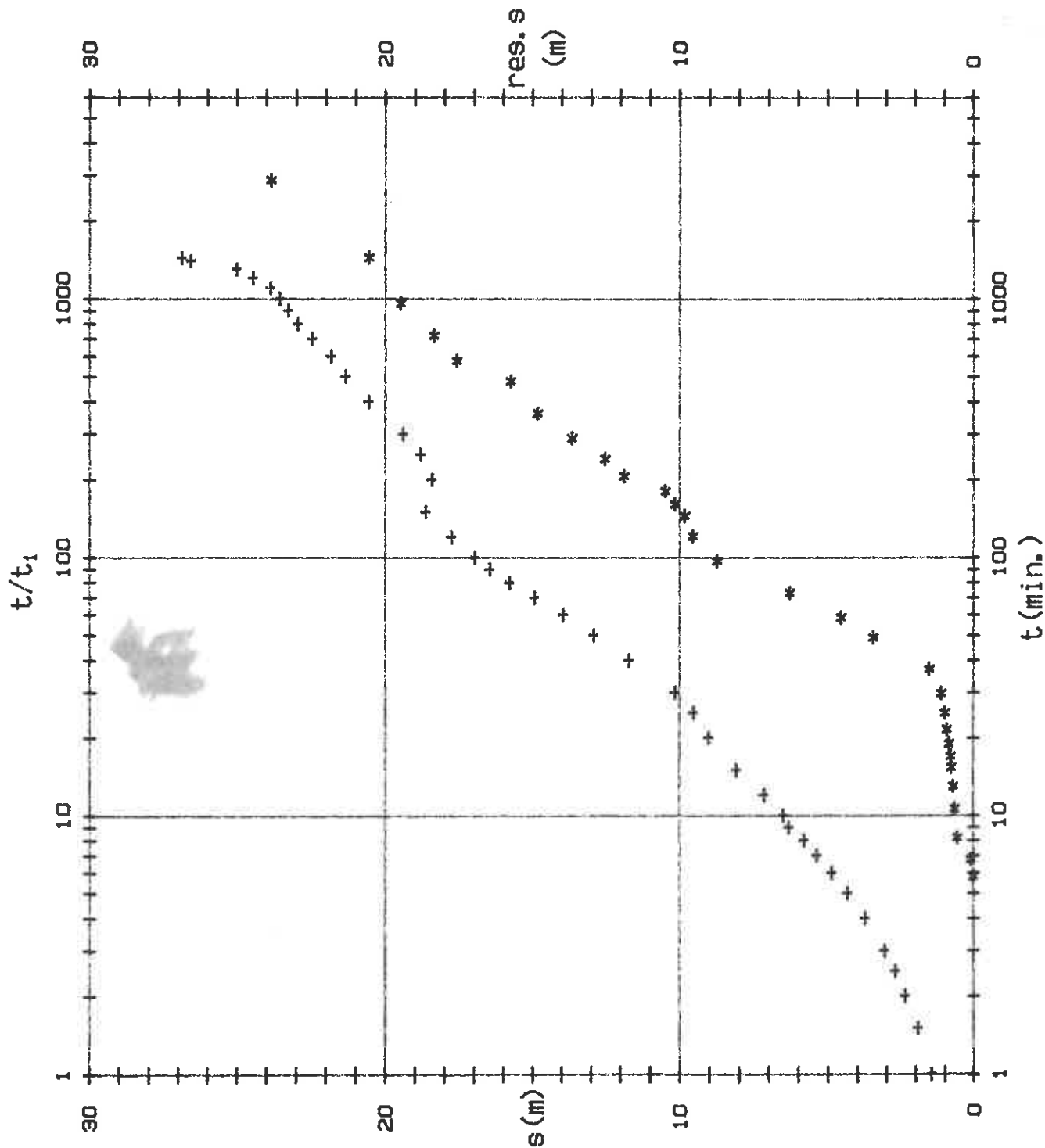
Pumped Borehole
10-77285

Readings on Borehole
10-77285

$Q = .5 \text{ l/s}$

S. W. L. = 29.89 m

$T = 1 \text{ m}^2/\text{d}$



SIONE

Including borehole

10-77344

2625AD

WELT

SIONE

Thaba Stone

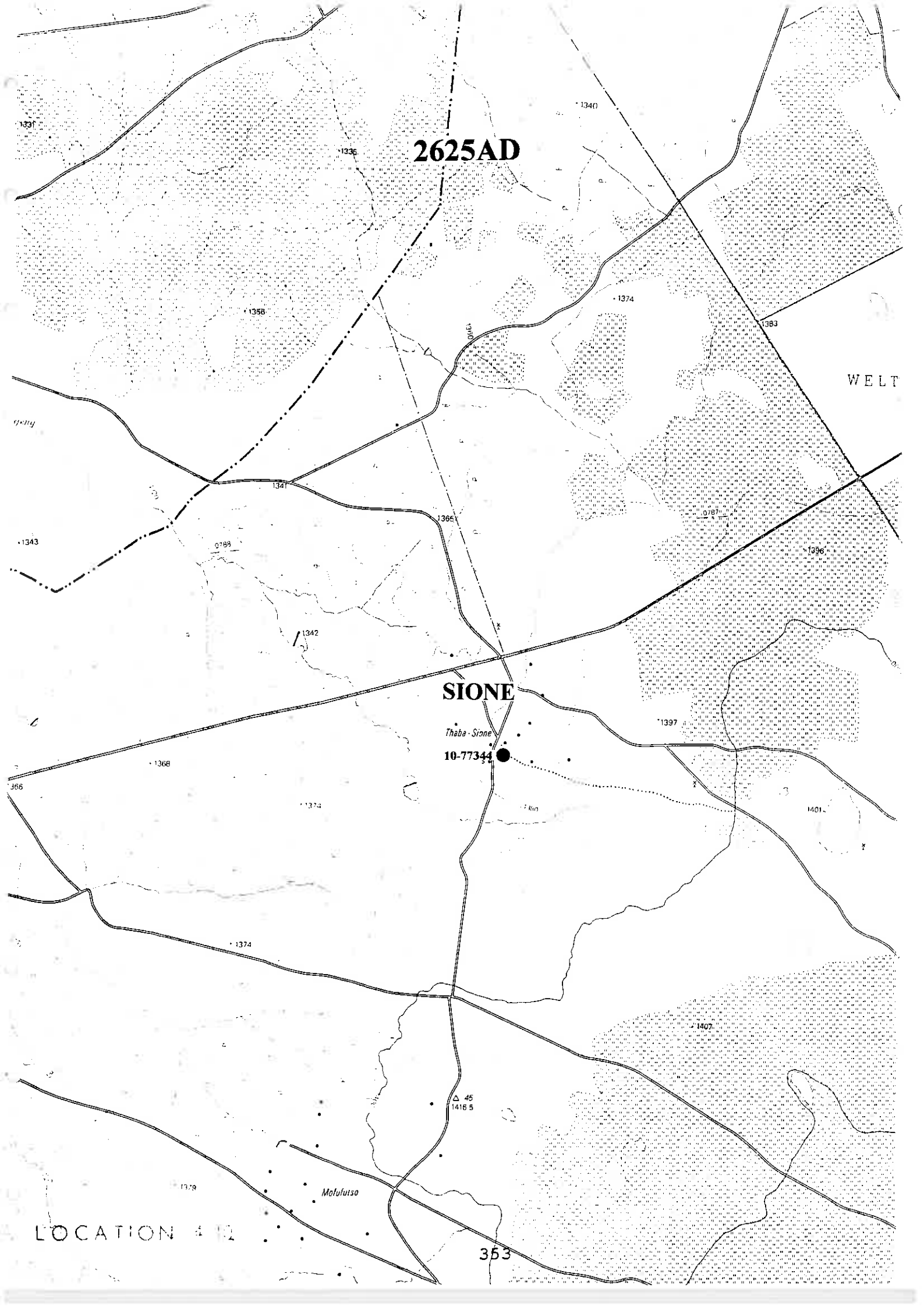
10-77344

△ 45
1416.5

Mofutso

LOCATION 4 12

353



STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

SIONE

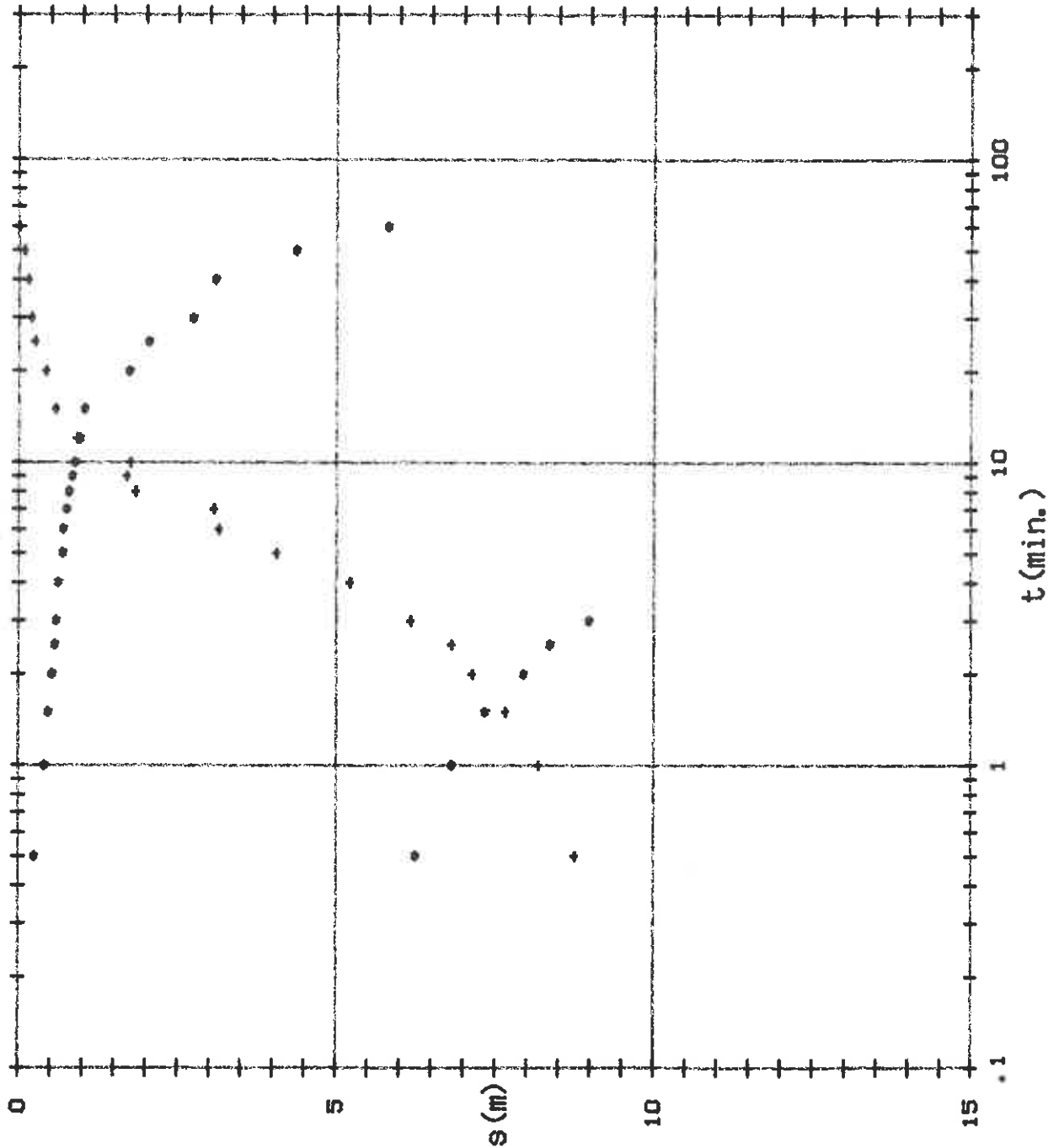
22 08 1992

B.H. No. 10-77344

$Q_1 = .25 \text{ l/s}$

$Q_2 = .55 \text{ l/s}$

S.W.L. = 16.52 m



SPRINGBOKFONTEIN

Including boreholes

10-77333

10-77334

△ 120
1364.1

BY 90

2625BC

LOMBAARDS LAAGTE 100-101

Lombaardslaagte

SPRINGBOKFONTEIN

● 10-77333

● 10-77334

SPRINGBOKFONTEIN

Deelpan

Deelpan

Springbokfontein

Deelpan

Deelpan

Springbokfontein

Deelpan

Schoongezicht
Deelpan
Schoongezicht

Schoongezicht

Schoongezicht

Klein-
Zoutpan

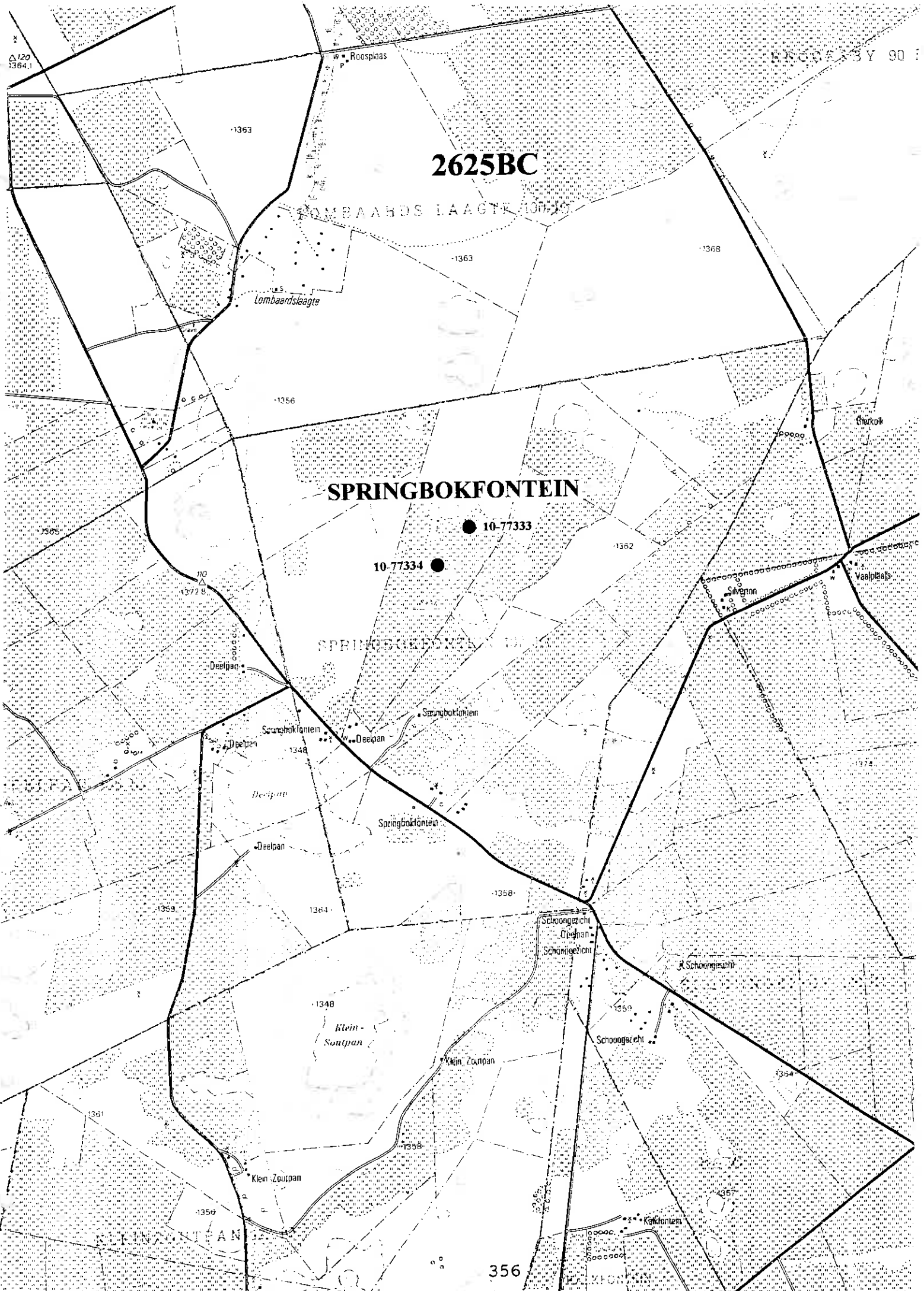
Klein Zoutpan

Klein Zoutpan

Kleinfontein

REINWOUTPAN

356



STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

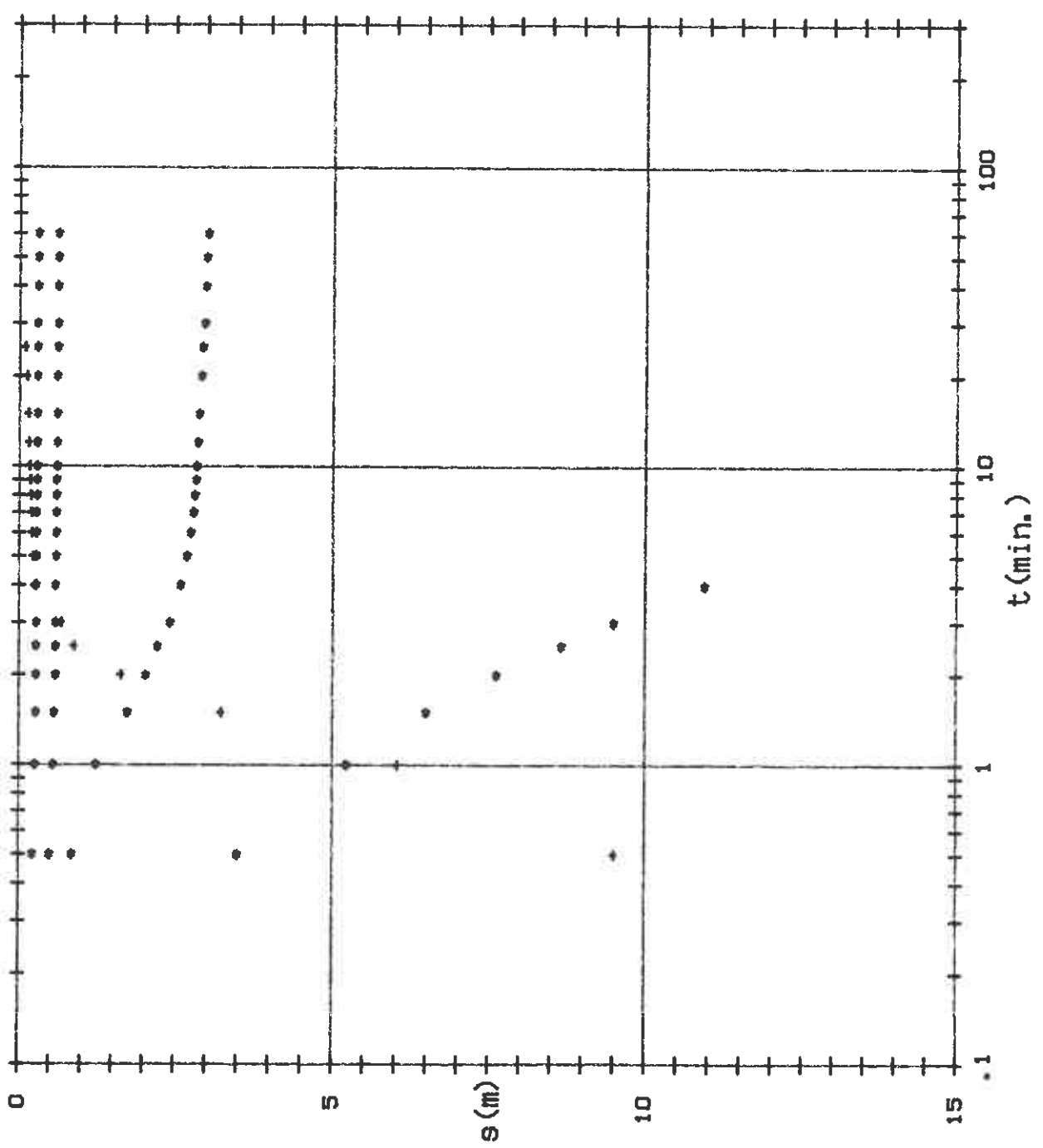
SPRINGBOKFONTEIN

03 09 1992

B.H. No. 10-77333

$Q_1 = .23 \text{ l/s}$
 $Q_2 = .5 \text{ l/s}$
 $Q_3 = 1.4 \text{ l/s}$
 $Q_4 = 2.65 \text{ l/s}$

S.W.L. = 5.9 m



CONSTANT DISCHARGE TEST

- + Drawdown data.
- * Recovery data.

SPRINGBOKFONTEIN

03 09 1992

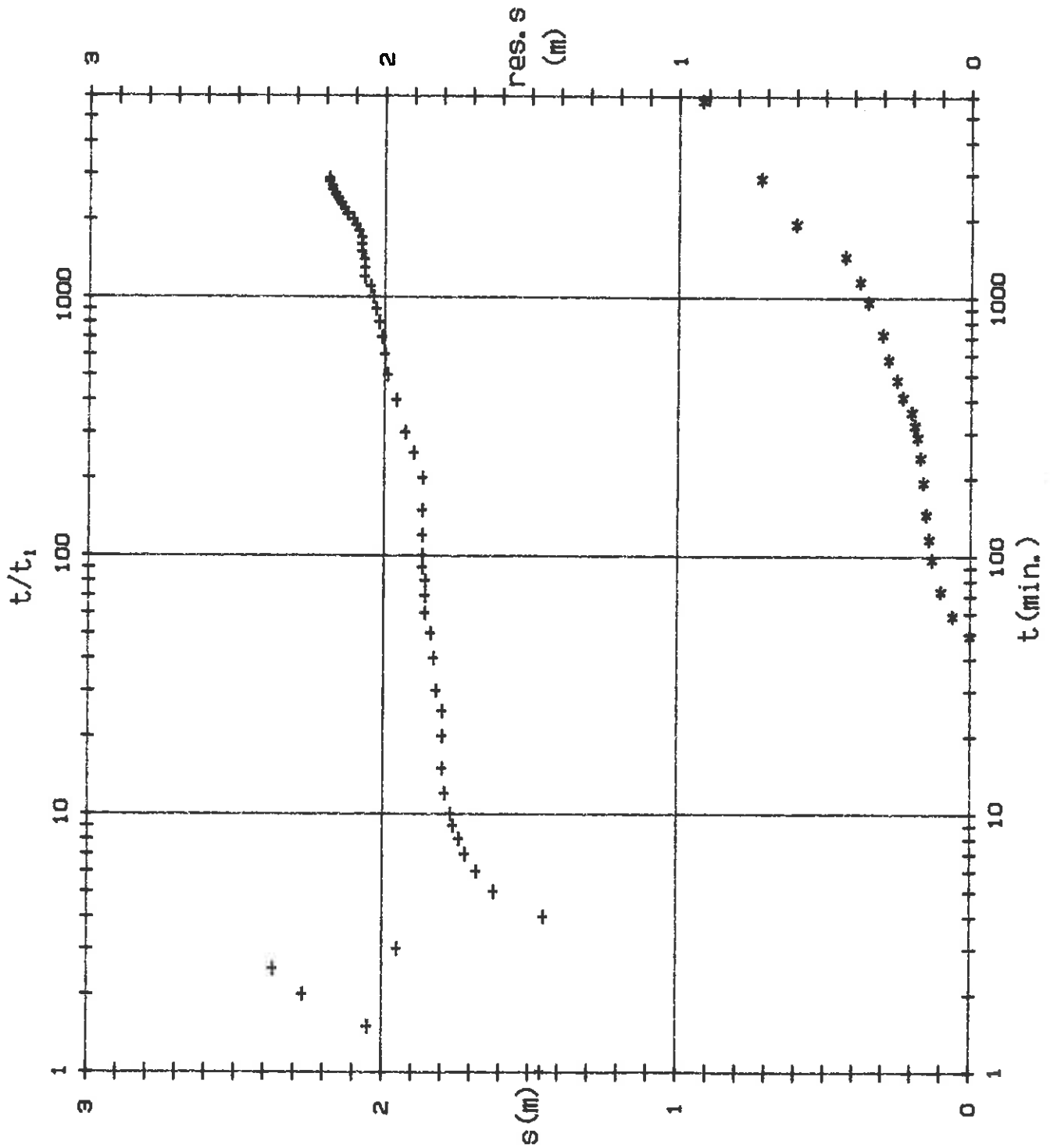
Pumped Borehole
10-77333

Readings on Borehole
10-77333

$Q = 1 \text{ l/s}$

S.W.L. = 5.9 m

$T = 50 \text{ m}^2/\text{d}$



STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

SPRINGBOKFONTEIN

04 09 1992

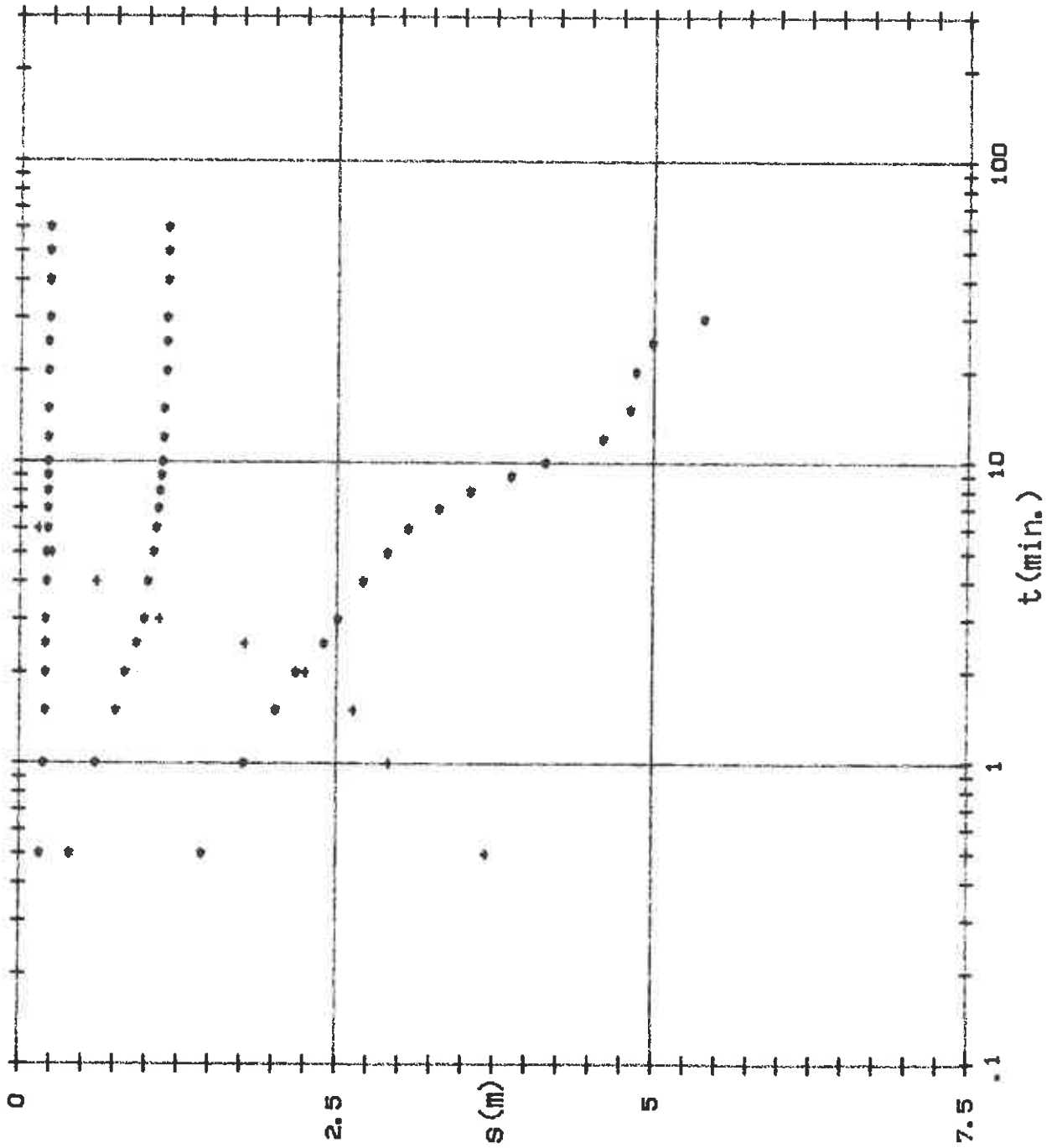
B.H. No. 10-77334

$Q_1 = .19 \text{ l/s}$

$Q_2 = .56 \text{ l/s}$

$Q_3 = 1.1 \text{ l/s}$

S.W.L. = 5.06 m



CONSTANT DISCHARGE TEST

- + Drawdown data.
- * Recovery data.

SPRINGBOKFONTEIN

05 09 1992

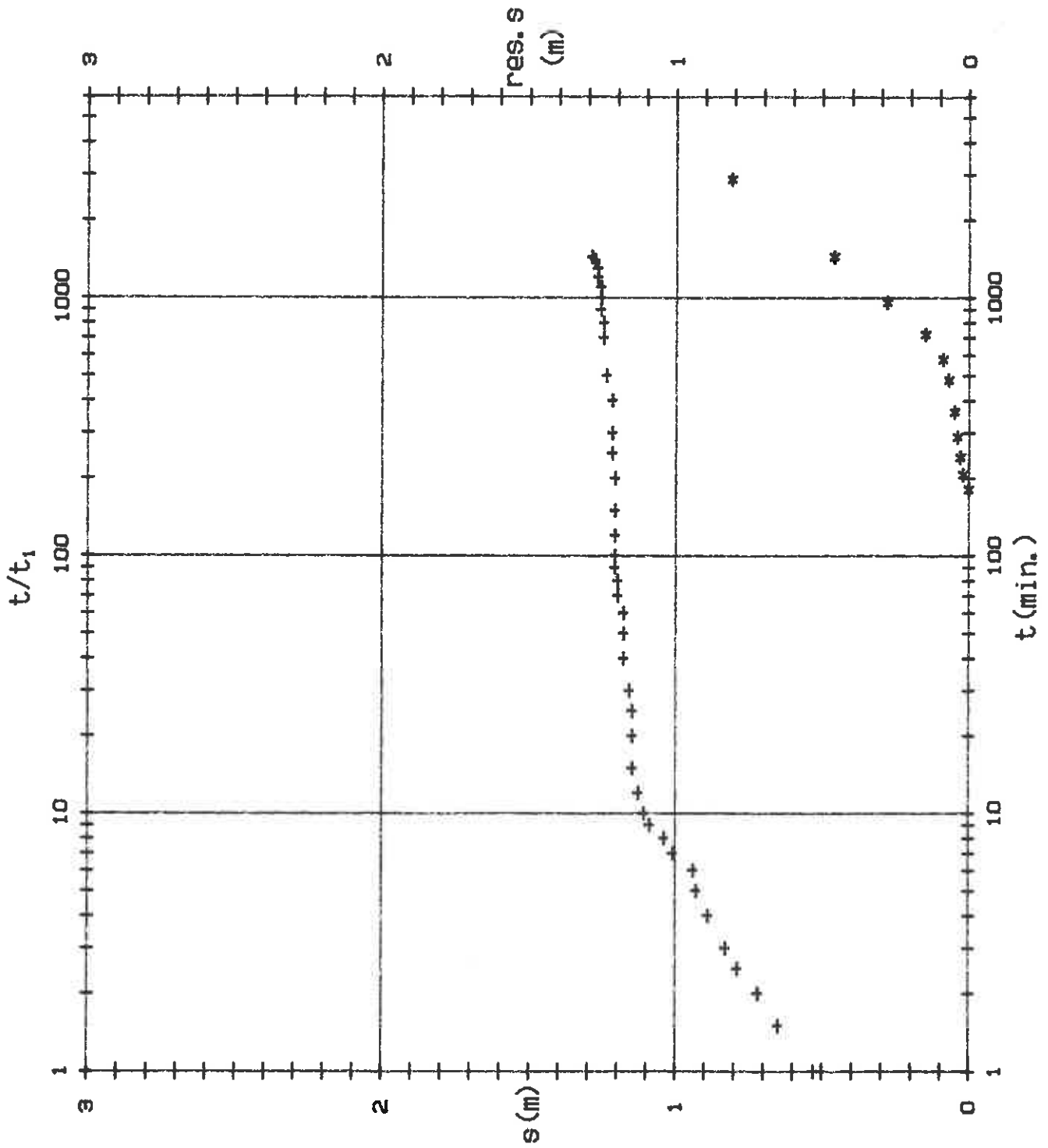
Pumped Borehole
10-77334

Readings on Borehole
10-77334

$Q = .5 \text{ l/s}$

S.W.L. = 5.06 m

$T = 15 \text{ m}^2/\text{d}$

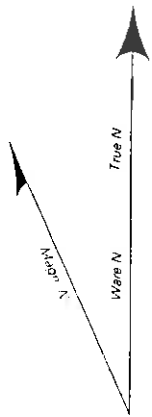


SPRINGBOKPAN

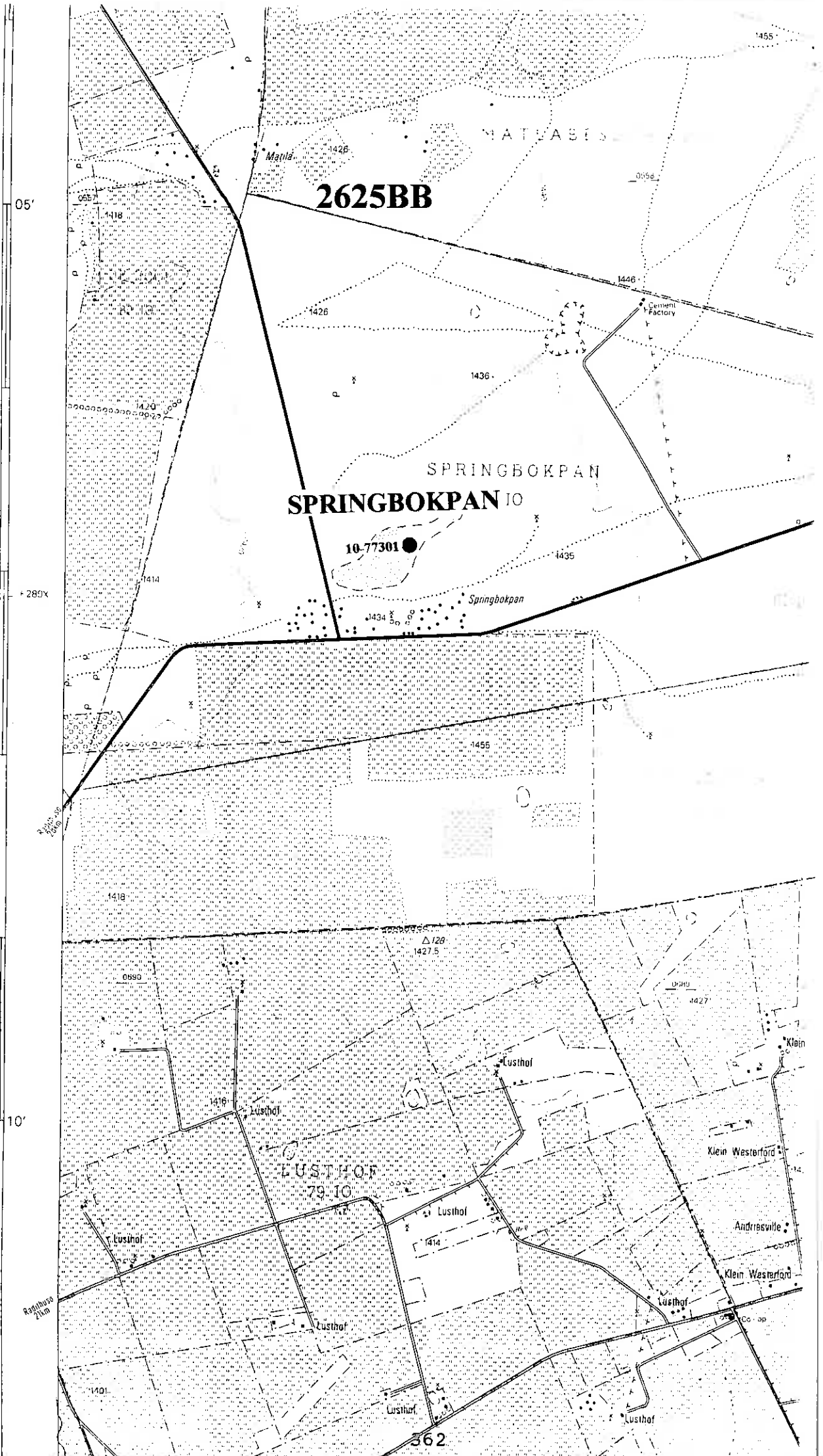
Including borehole

10-77301

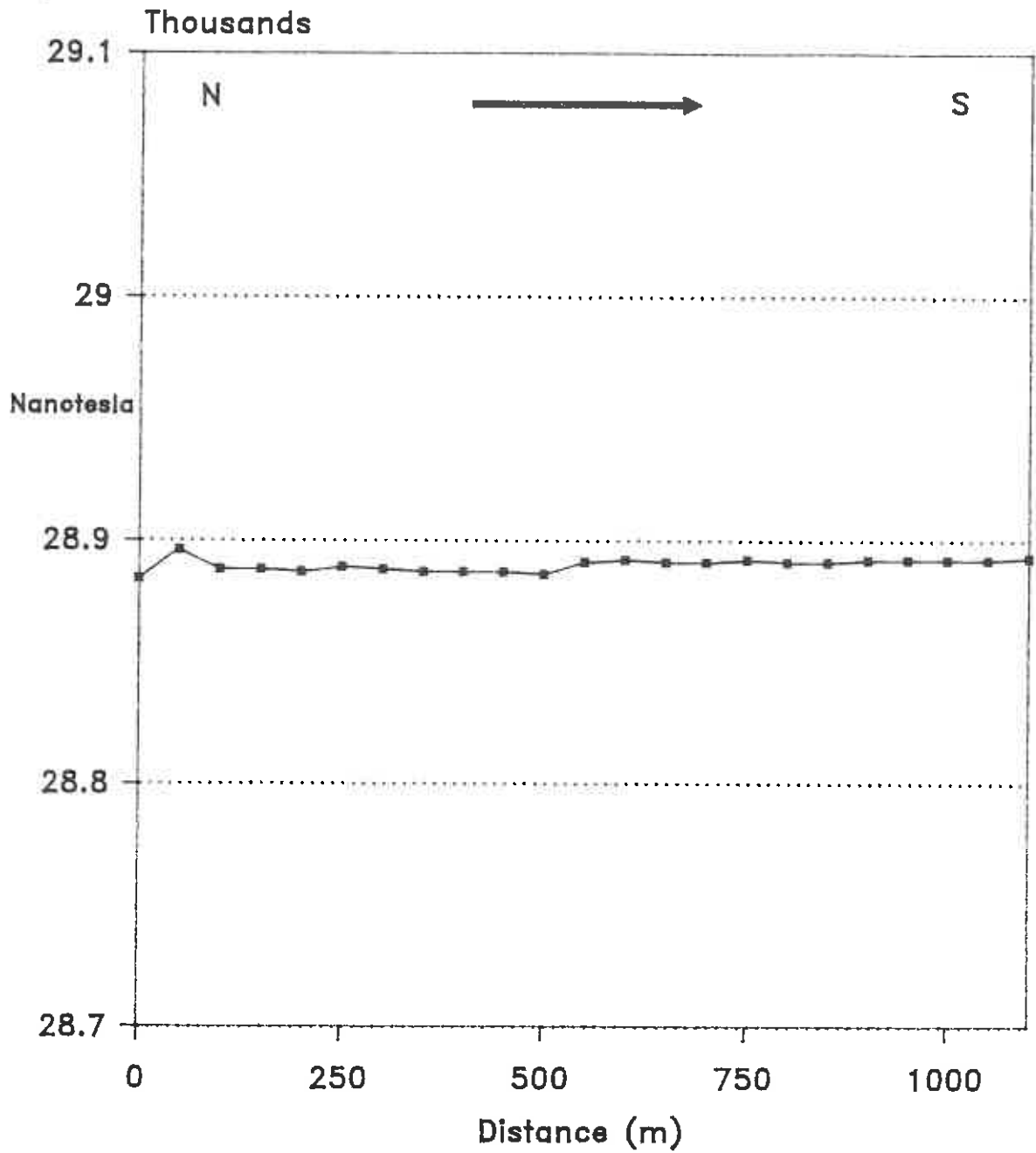
Mean magnetic declination 17° 5 West
of True North (1974 0). Mean annual change
3" Eastwards (1966 - 1971)



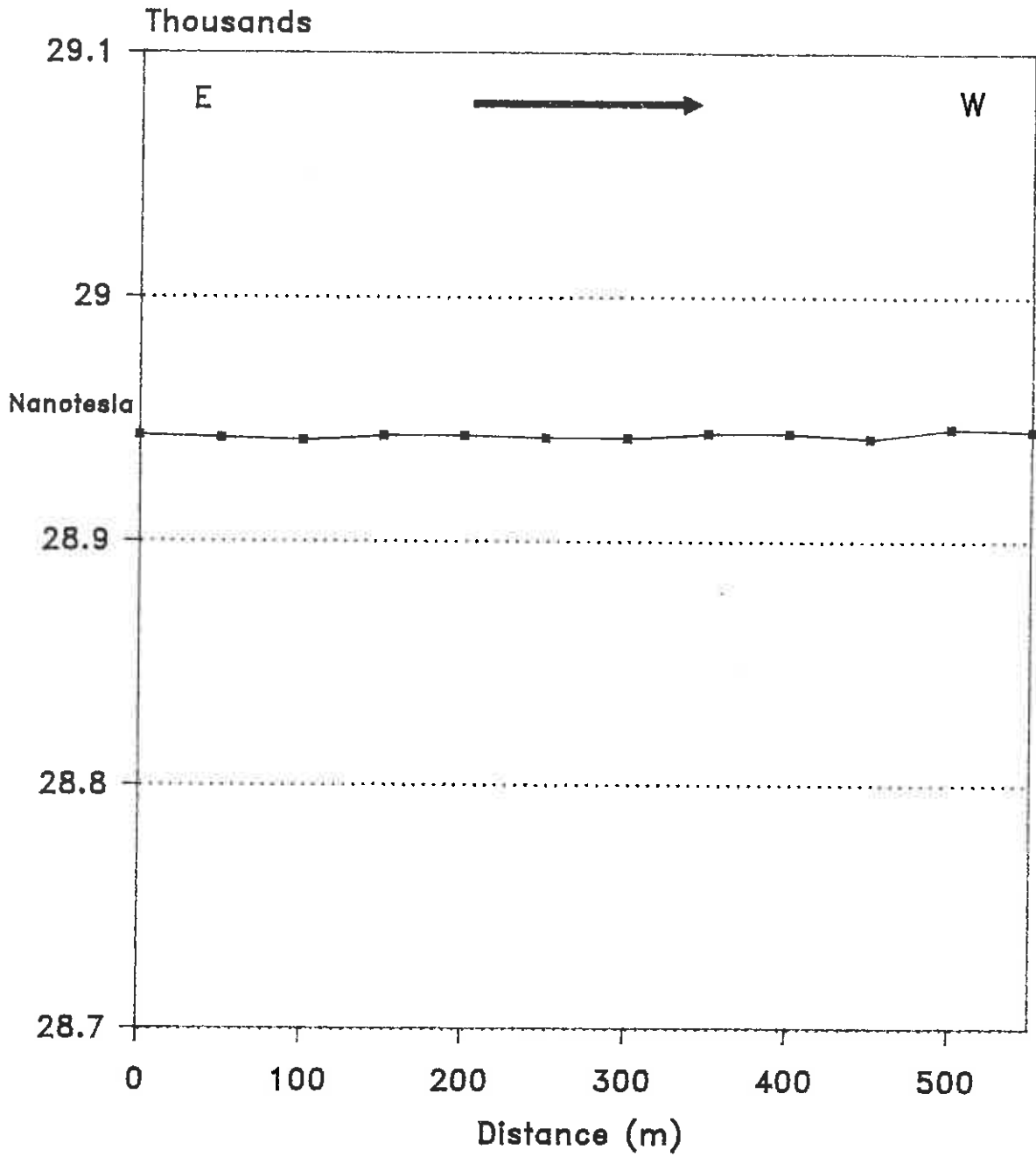
Gemiddelde magnetiese deklinasie 17° 5 Wes
van Ware Noorde (1974 0). Gemiddelde jaarlikse
verandering 3" Ooswaarts (1966 - 1971)



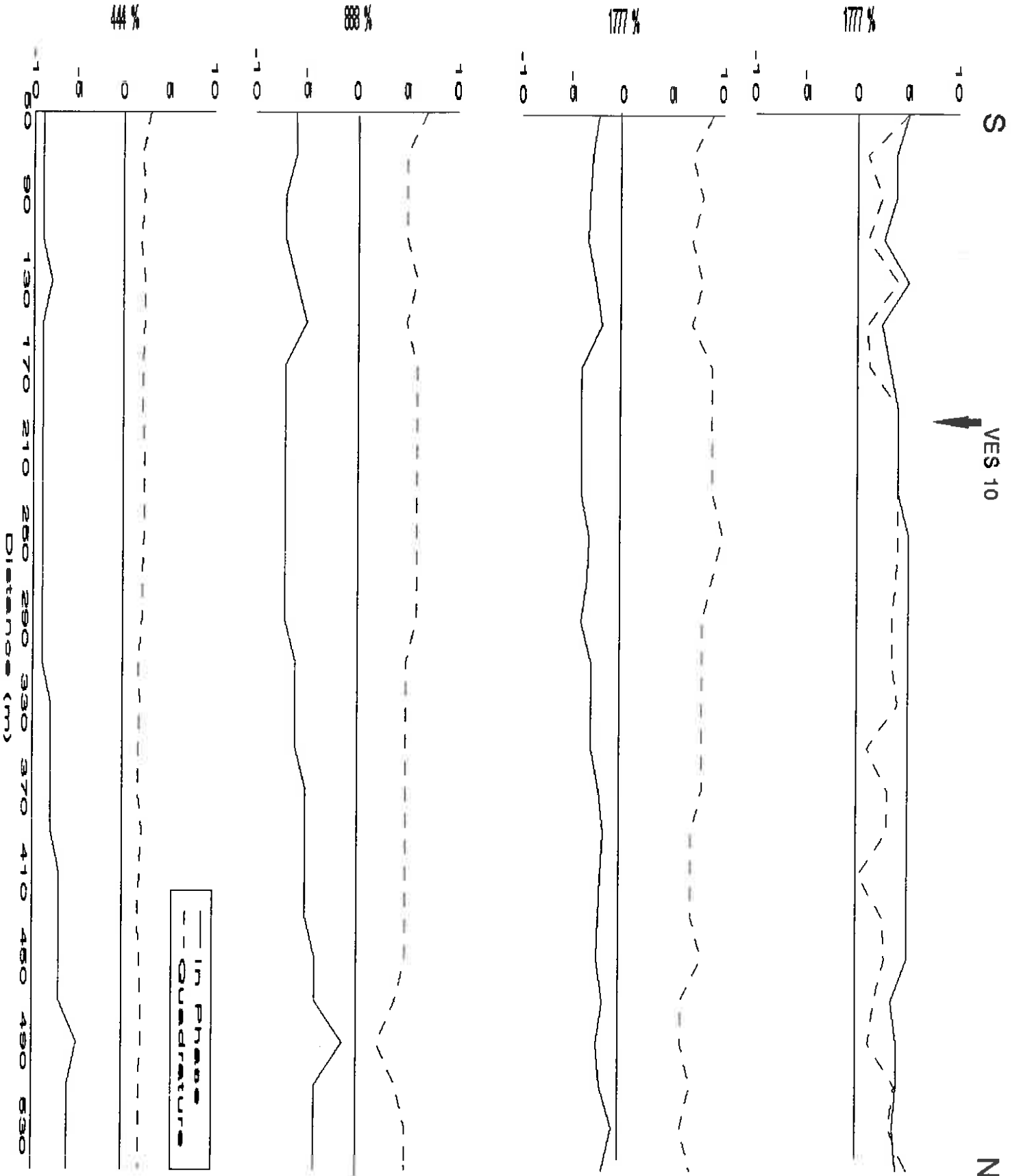
Magnetic Traverse #01
District: Ditsobotla
Locality: Springbokpan



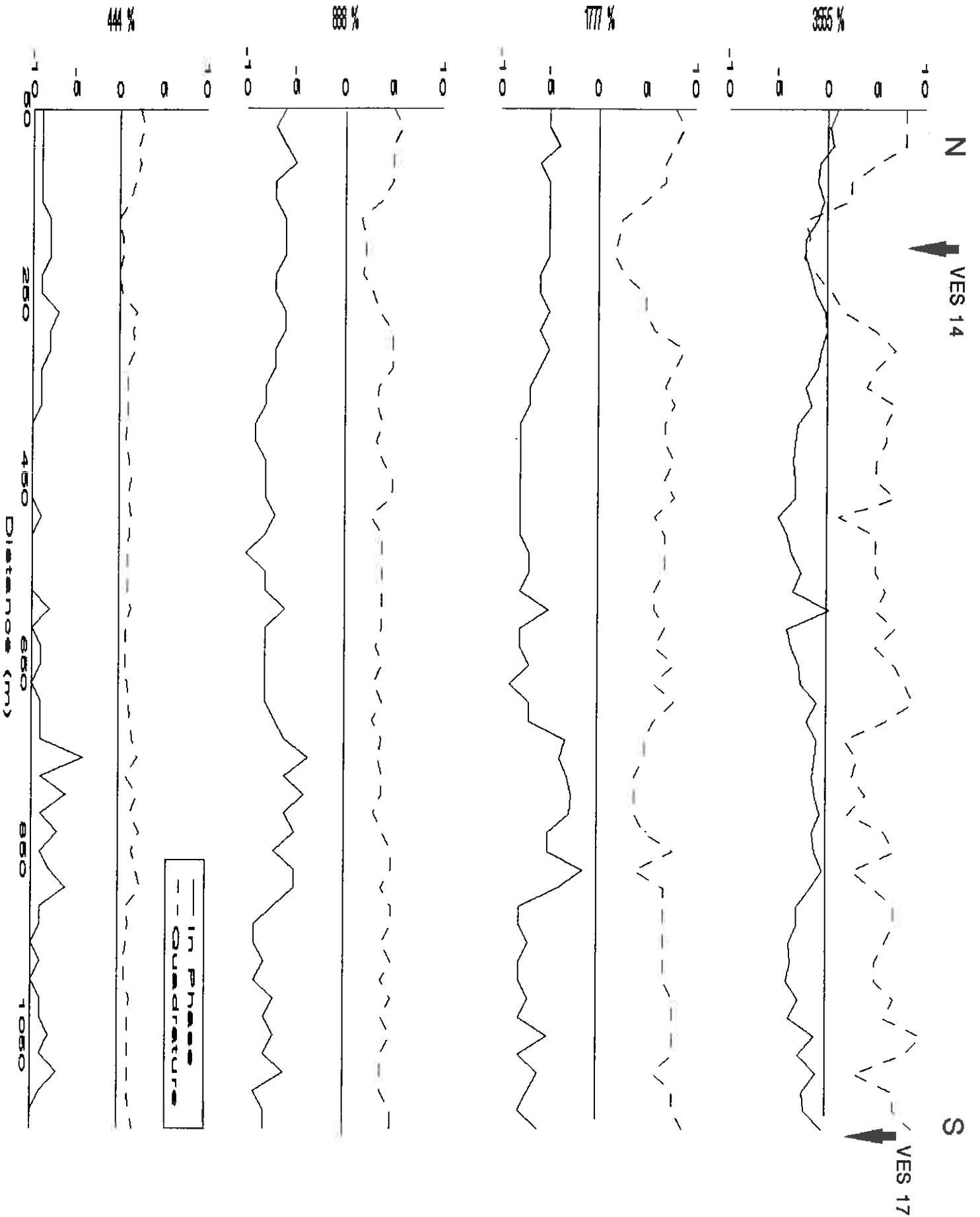
Magnetic Traverse #02
District: Ditsobotla
Locality: Springbokpan



EM-9 Springbokpan



EM-10 Springbokpan



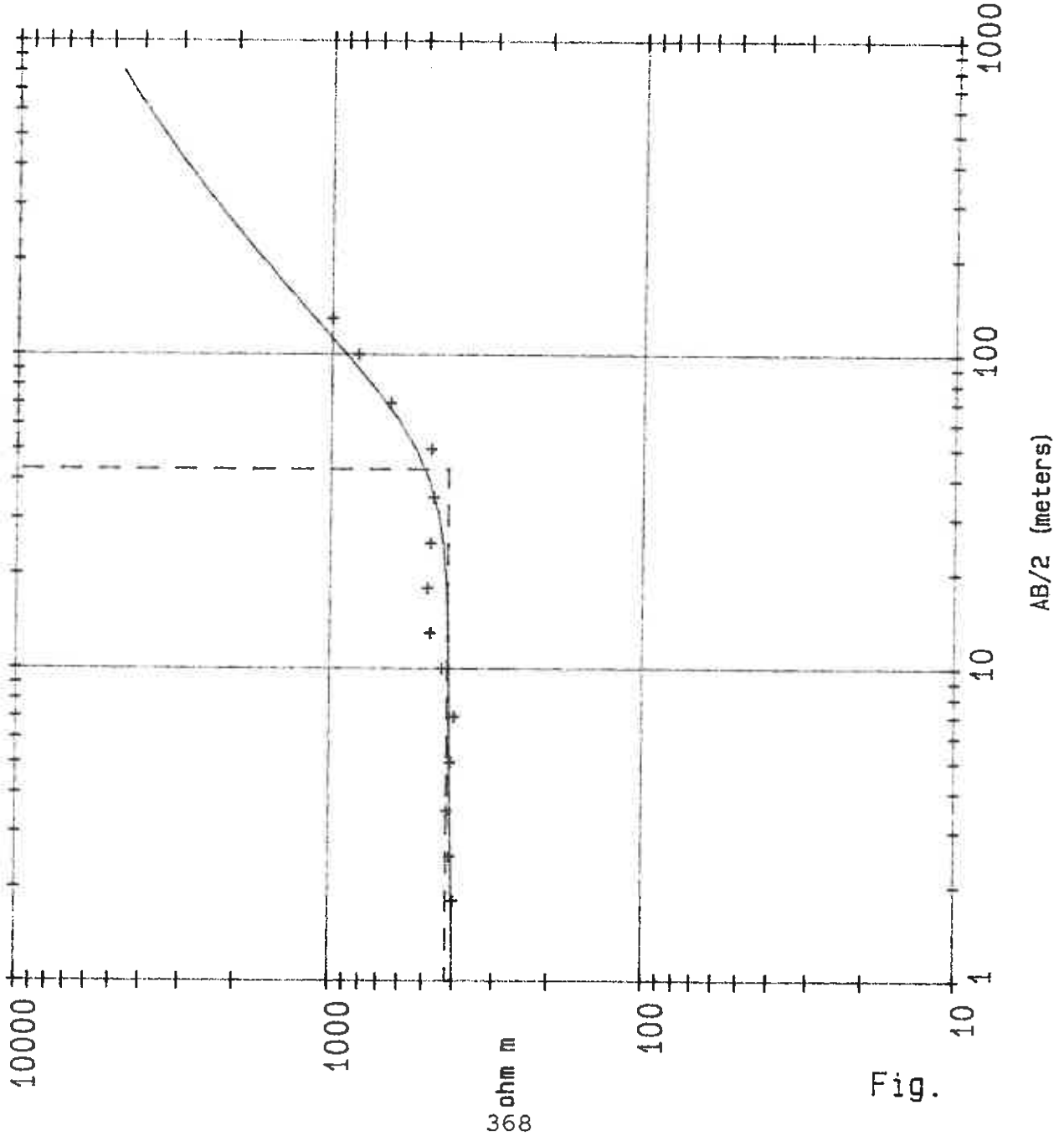


Fig.

368

+ Field data
 — Computer model
 - - - r model

SPRINGBOKPAN

V.E.S. 10

CO-ORDINATES
 +2889625X -78125Y

GEOLOGY
 DOLOMITE

BOREHOLE LOG

DISTRICT: DITSOBOTLA

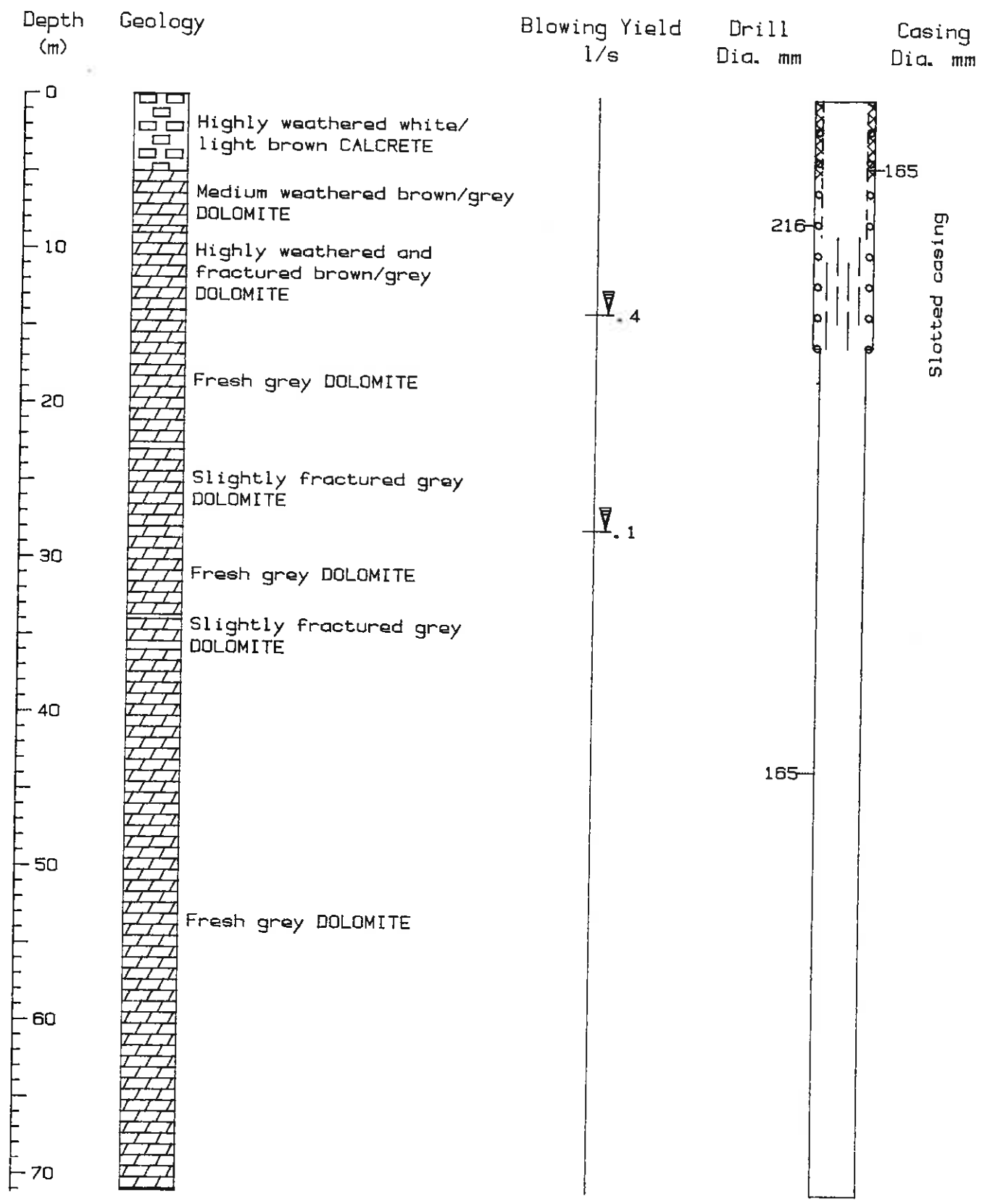
LOCALITY: SPRINGBOKPAN

BH. No. 10-77301

Geoph. Peg No. 10

Coordinates +2889630X -078115Y

Elev. (m) 1425



End of Hole 71

STEP DRAWDOWN TEST

* Pumping data
+ Recovery data

SPRINGBOKPAN

10 08 1992

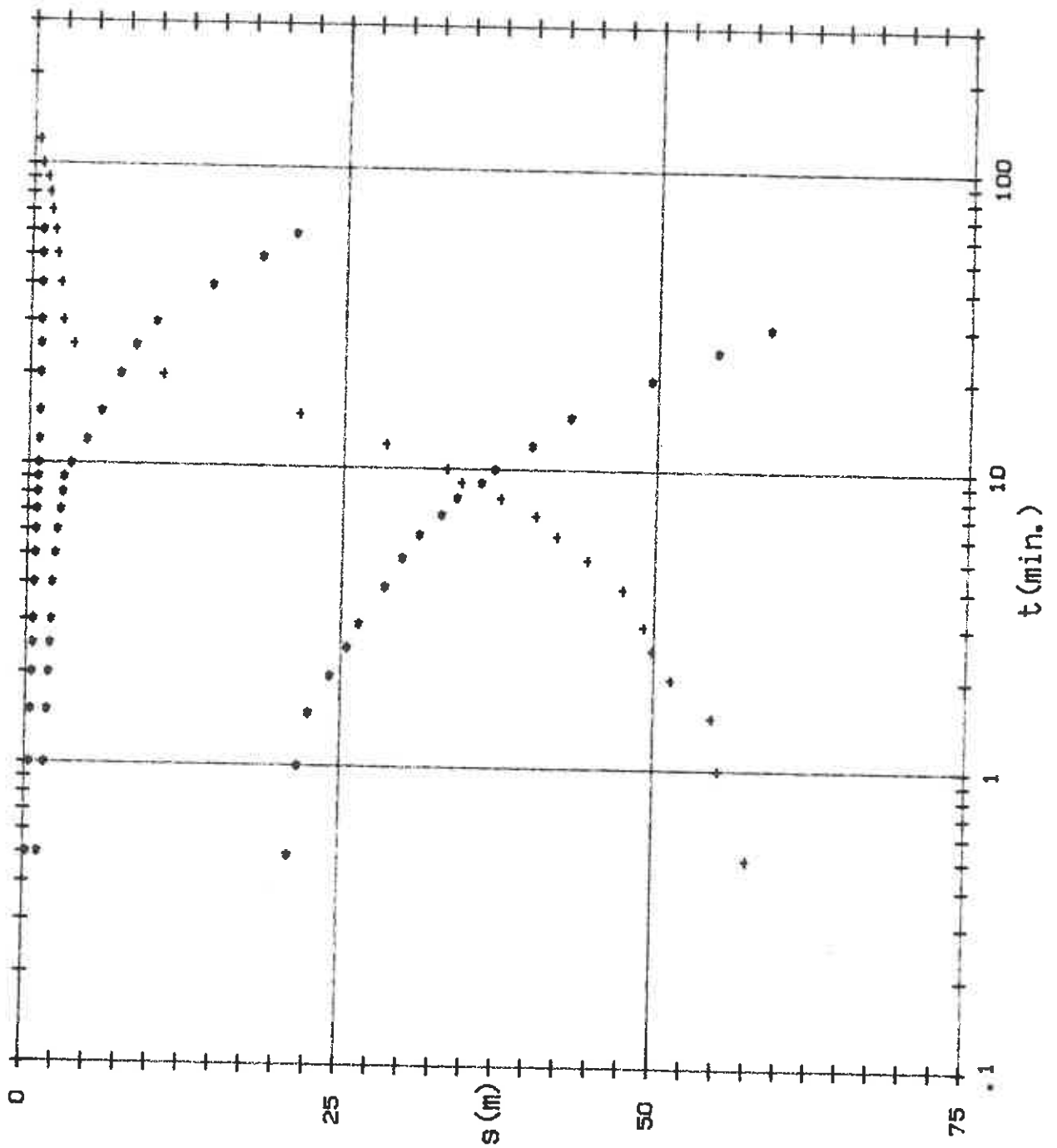
B.H. No. 10-77301

$Q_1 = .18 \text{ l/s}$

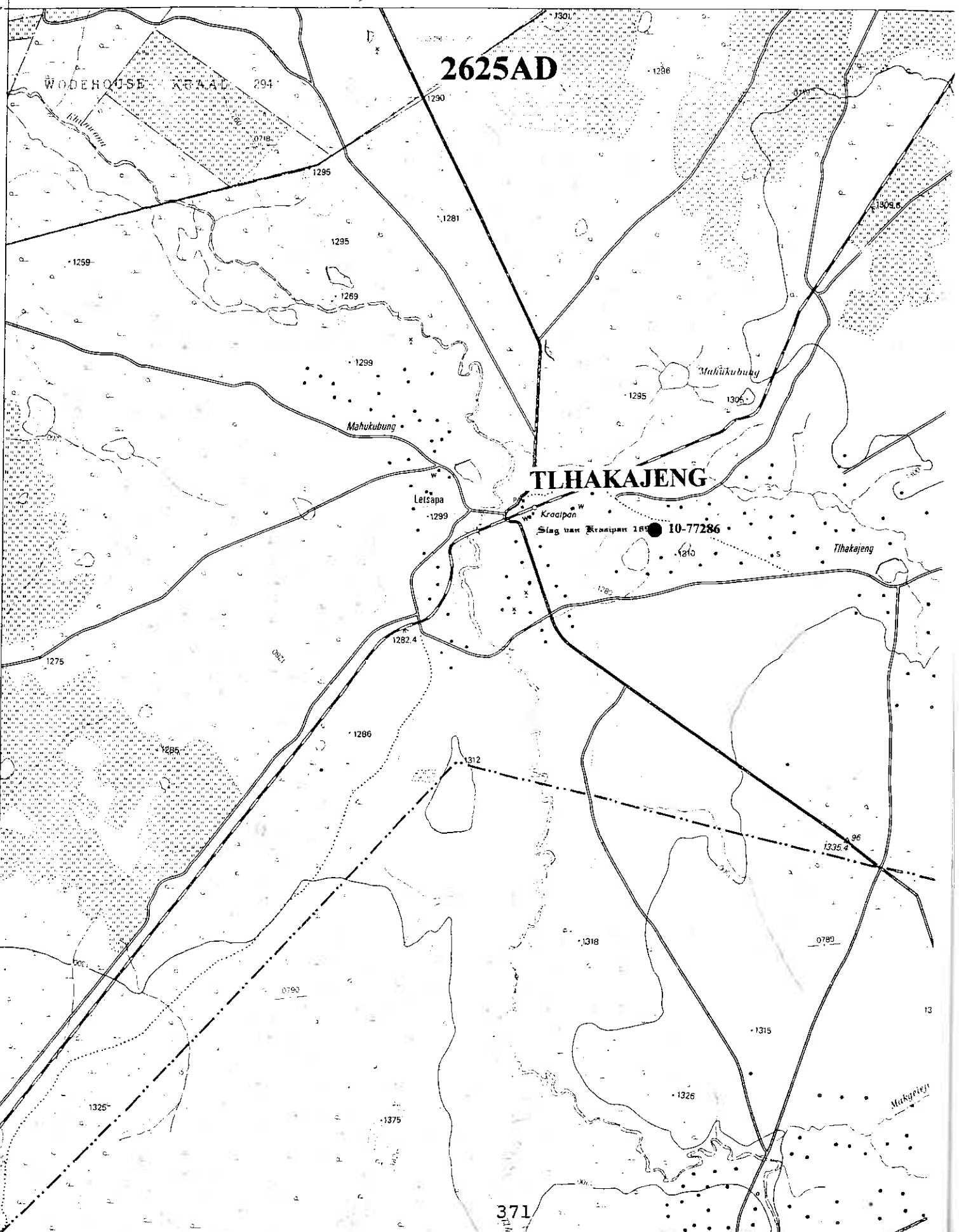
$Q_2 = .39 \text{ l/s}$

$Q_3 = .68 \text{ l/s}$

S.W.L. = 6.02 m



25° 15' 15' -3Y 20'



2625AD

TLHAKAJENG

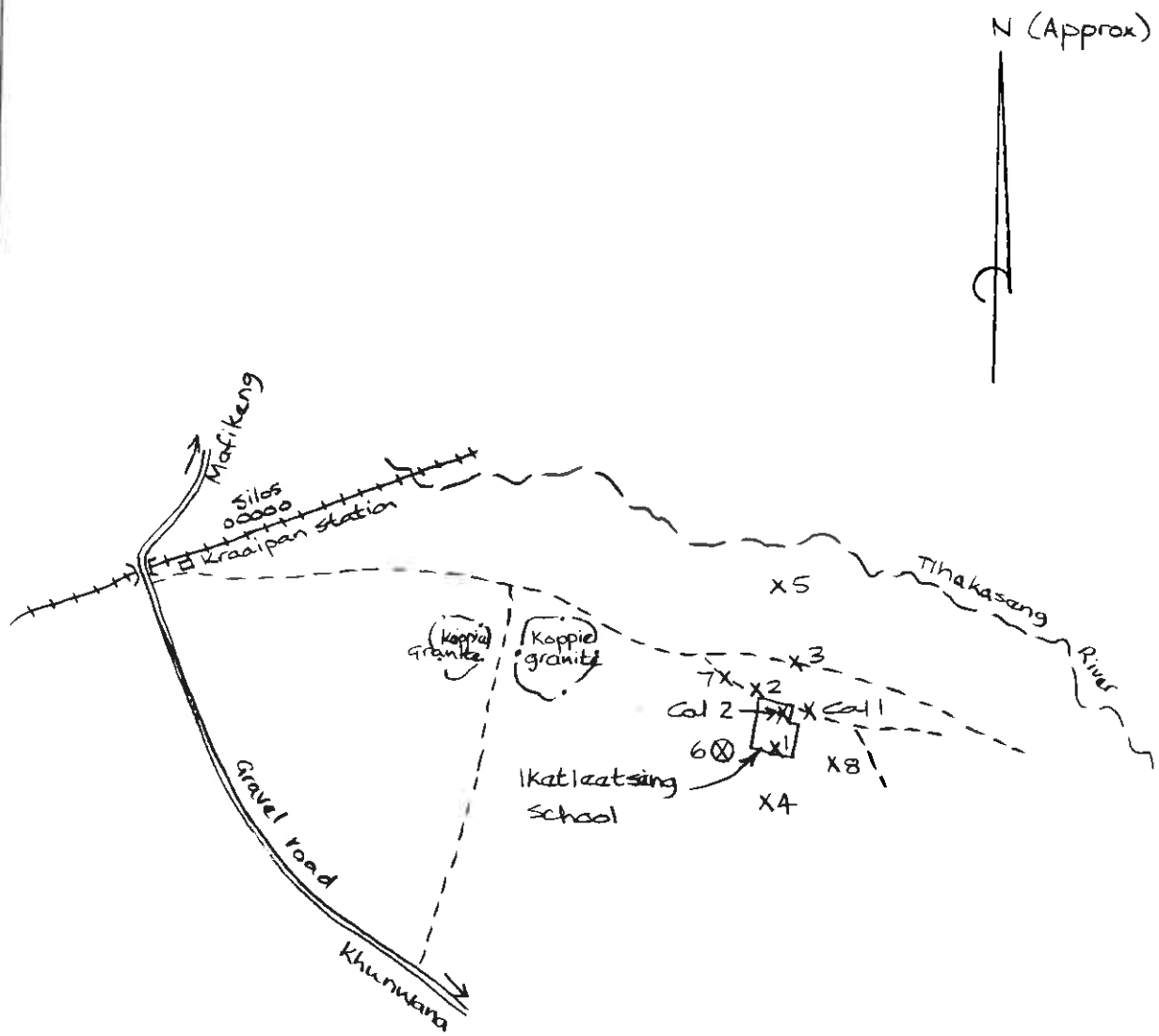
Sing van Kraaipan 185 10-77286

371

TLHAKAJENG

Including borehole

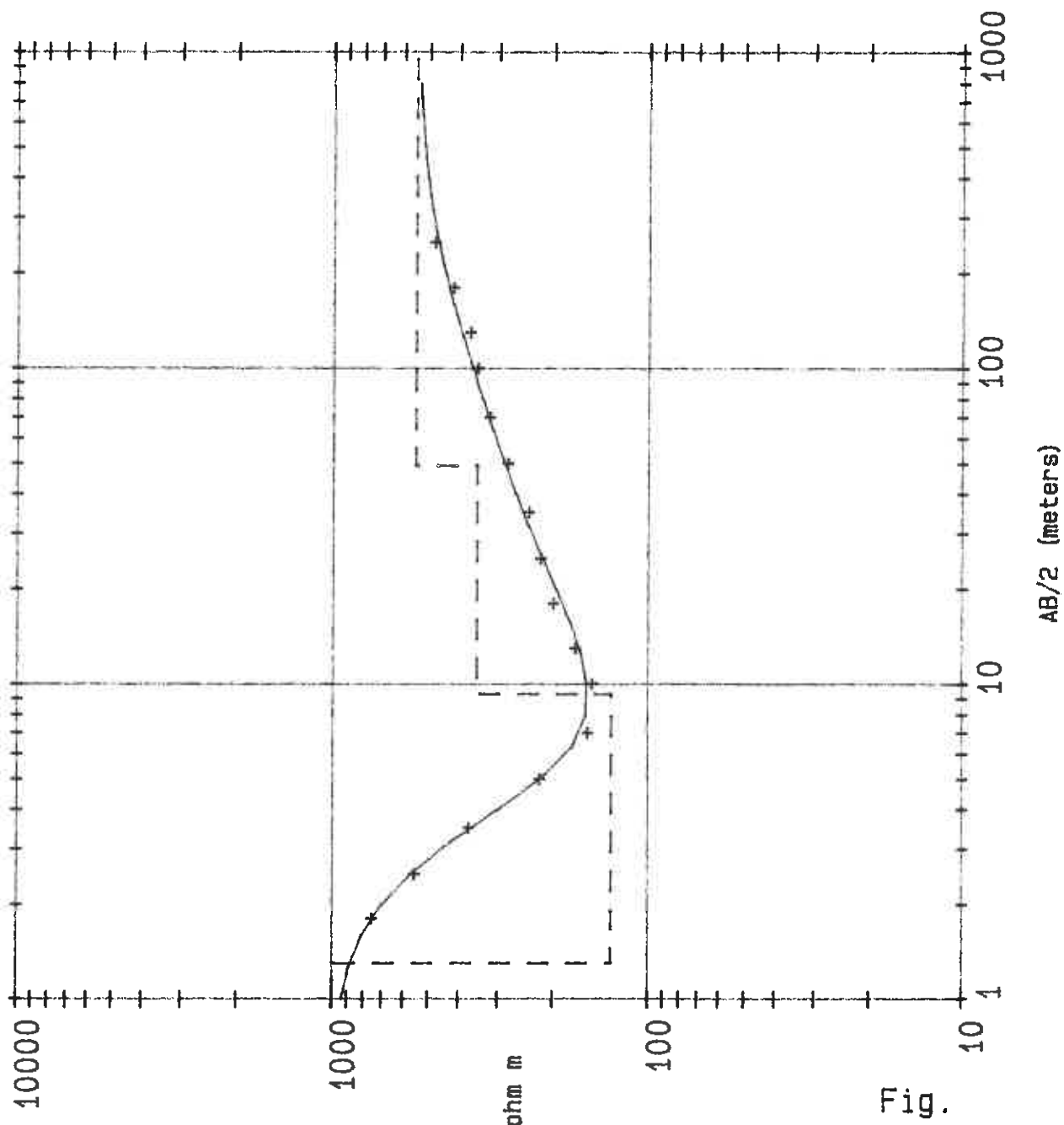
10-77286 - Ketletseng M/S



Locality Plan of Ikatleatsang Middle School
(Thlakajeng)

Overlay to Photo No 546 (strip 17)

Approx Scale 1 : 30 000



+ Field data
 --- Computer model
 - - - r model

TLHAKAJENG KETLETSENG M/S

V.E.S. 06

CO-ORDINATES
 +2909705X -31740Y

GEOLOGY
 GRANITE

Fig.

BOREHOLE LOG

DISTRICT: DITSOBOTLA

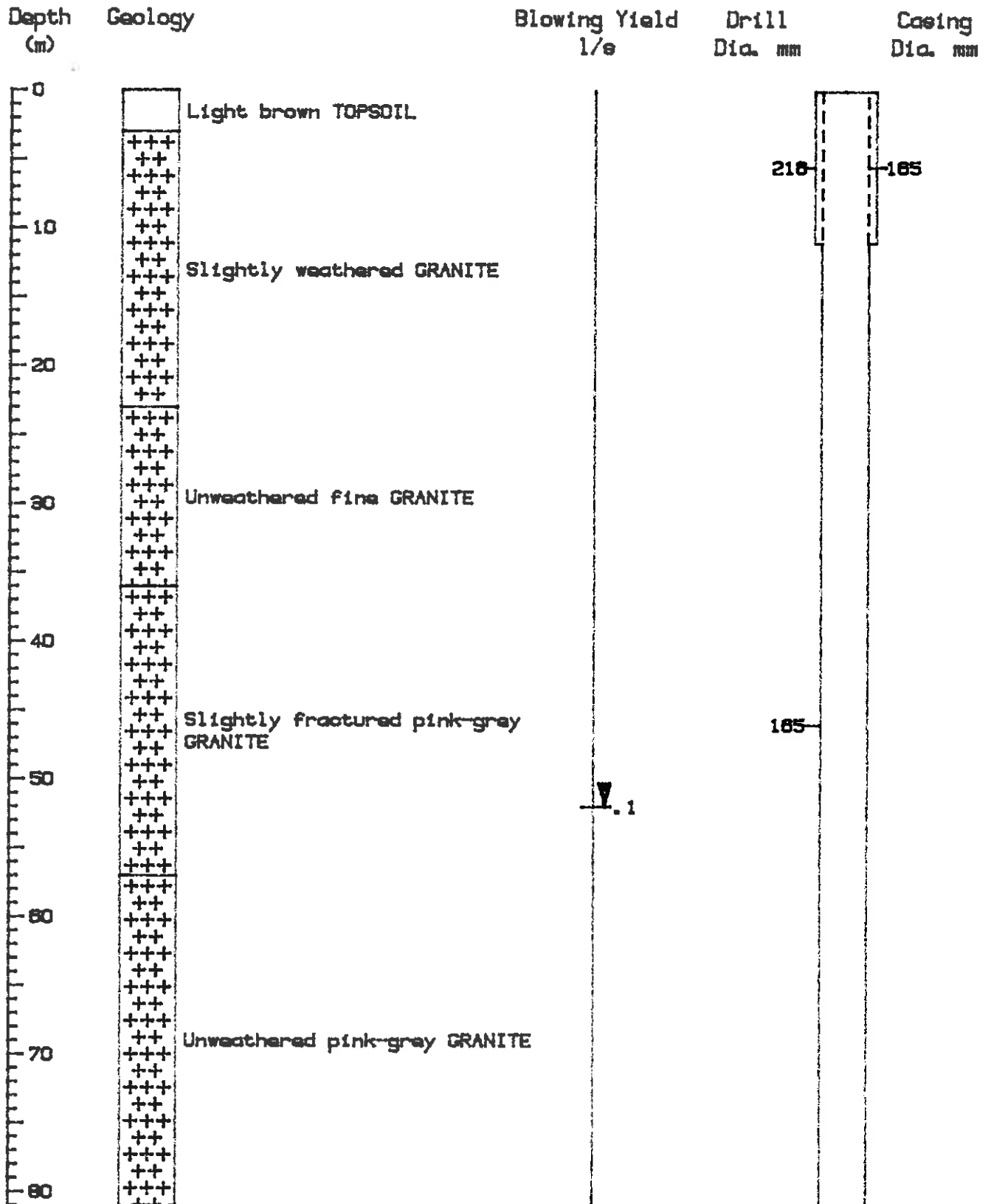
LOCALITY: TLHAKAJENG M/SCH

BH. No. 10-77286

Geoph. Pag No. 06

Coordinates +2909700X -31750Y

Elev. (m) 1281



End of Hole 81

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

TLHAKAJENG

KETLETSENG M/S

24 05 1992

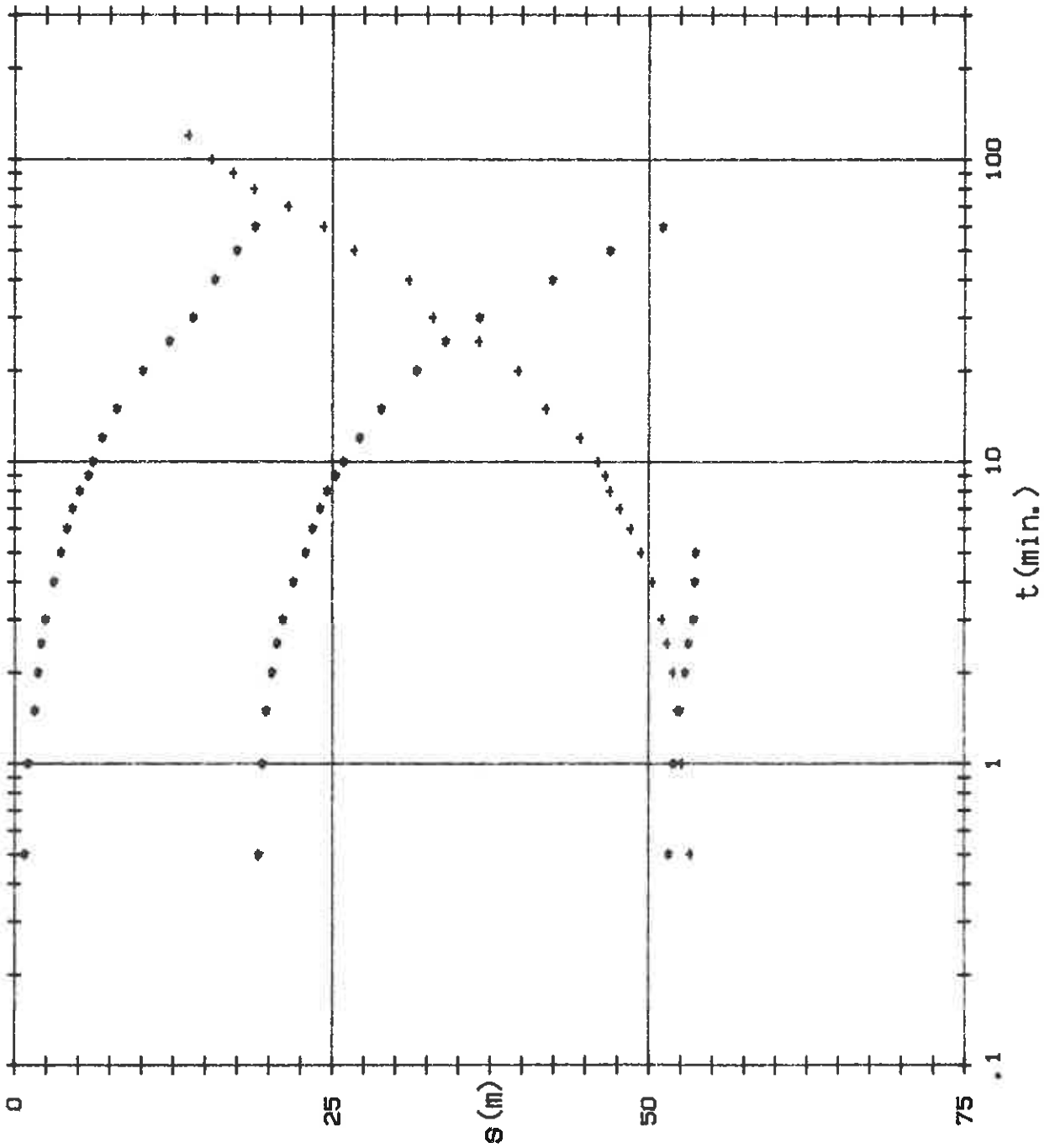
B.H. No. 10-77286

$Q_1 = .22 \text{ l/s}$

$Q_2 = .4 \text{ l/s}$

$Q_3 = .8 \text{ l/s}$

S.W.L. = 11.6 m



UITKYK

Including borehole

10-77331

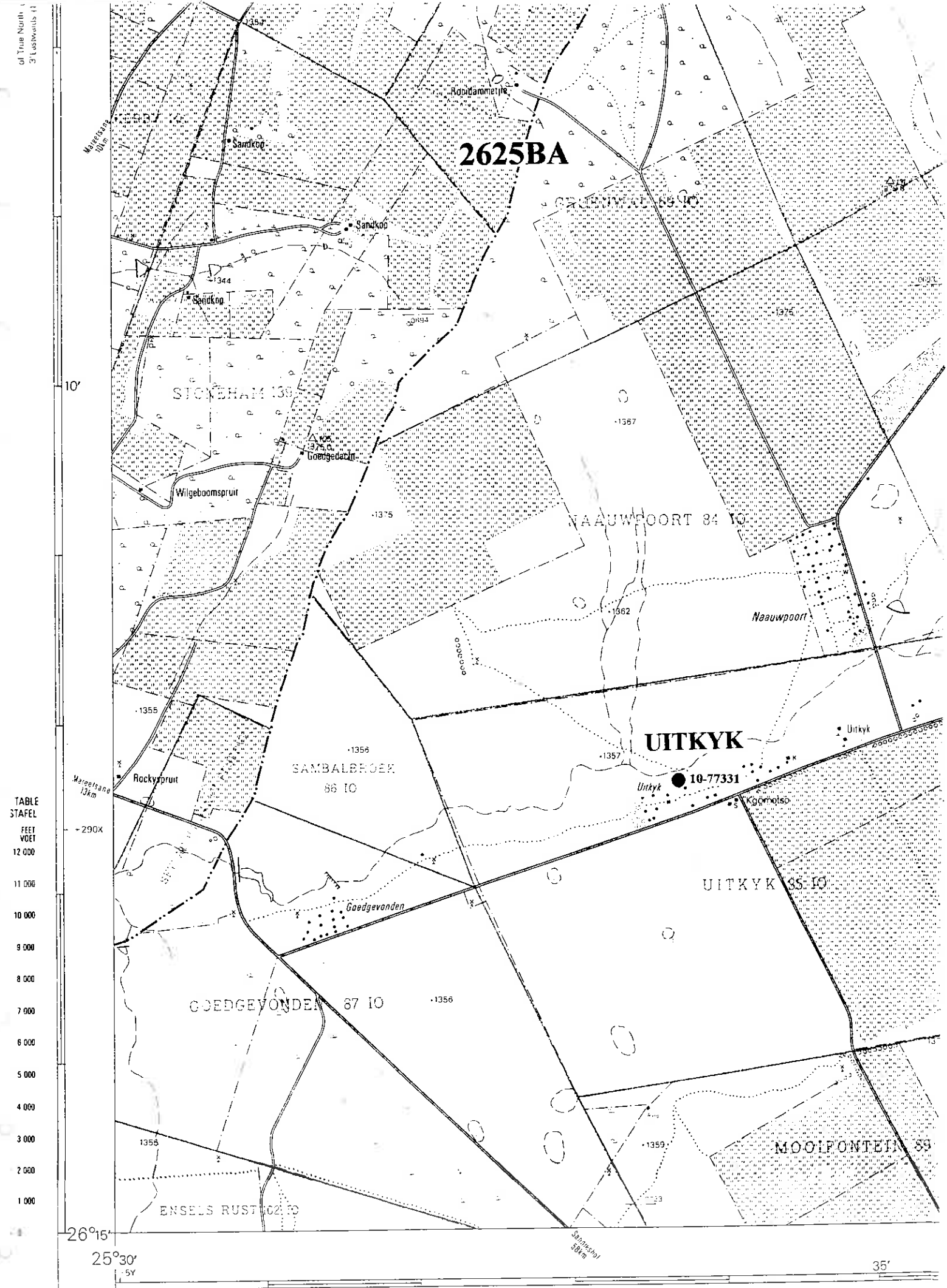


TABLE
STAFEL
FEET
VOET

2900

11 000

10 000

9 000

8 000

7 000

6 000

5 000

4 000

3 000

2 000

1 000

26°15'

25°30'

5Y

35'

STEP DRAWDOWN TEST

* Pumping data
 + Recovery data

UITYKYK

01 05 1992

B.H. No. 10-77331

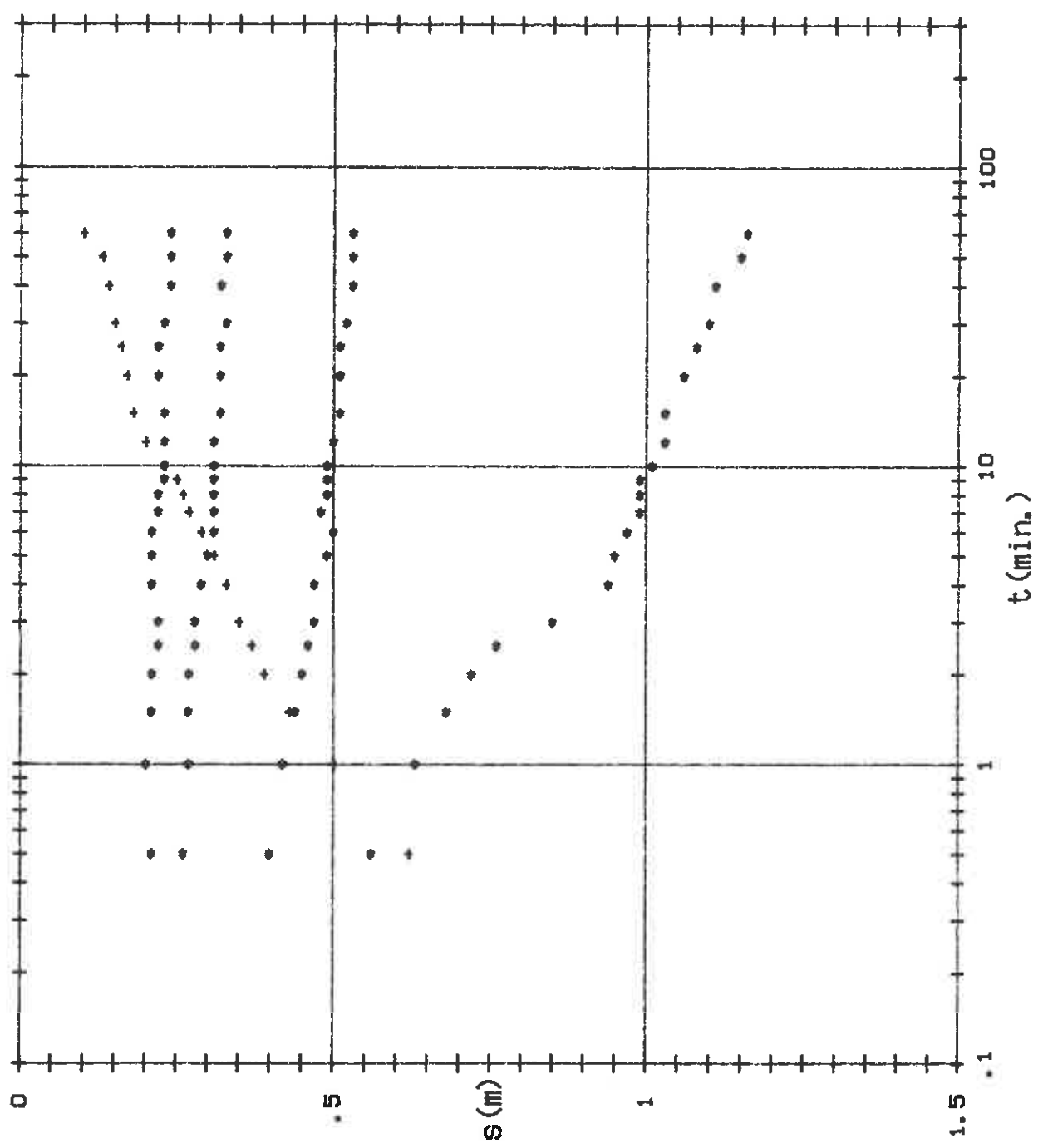
$Q_1 = .2 \text{ l/s}$

$Q_2 = .5 \text{ l/s}$

$Q_3 = 1 \text{ l/s}$

$Q_4 = 2.12 \text{ l/s}$

S.W.L. = 5.45 m



CONSTANT DISCHARGE TEST

- + Drawdown data.
- * Recovery data.

UITKYK

01 05 1992

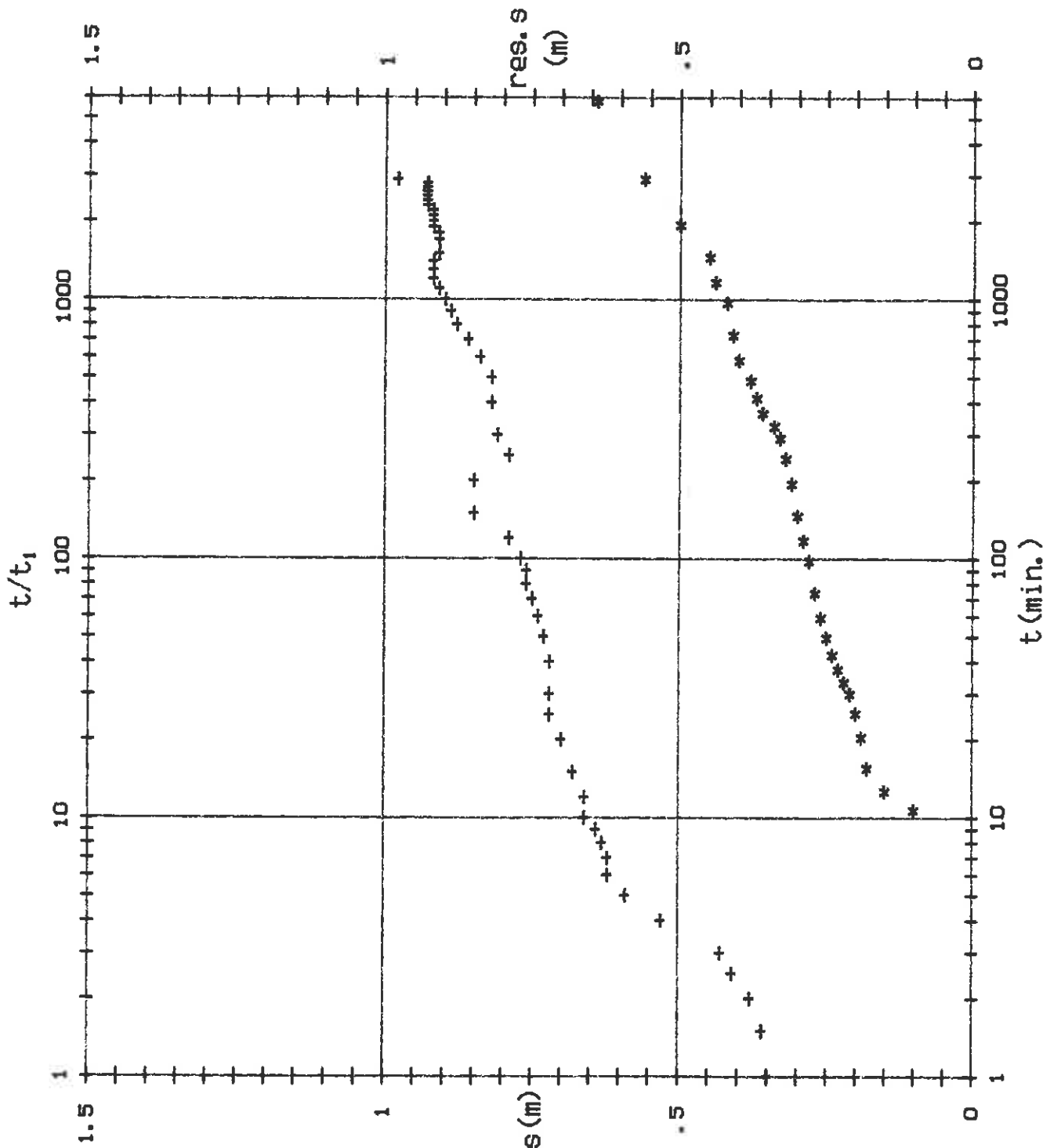
Pumped Borehole
10-77331

Readings on Borehole
10-77331

Q = 1.4 l/s

S.W.L. = 5.45 m

T = 110 m²/d



VERDWAAL

No site selected

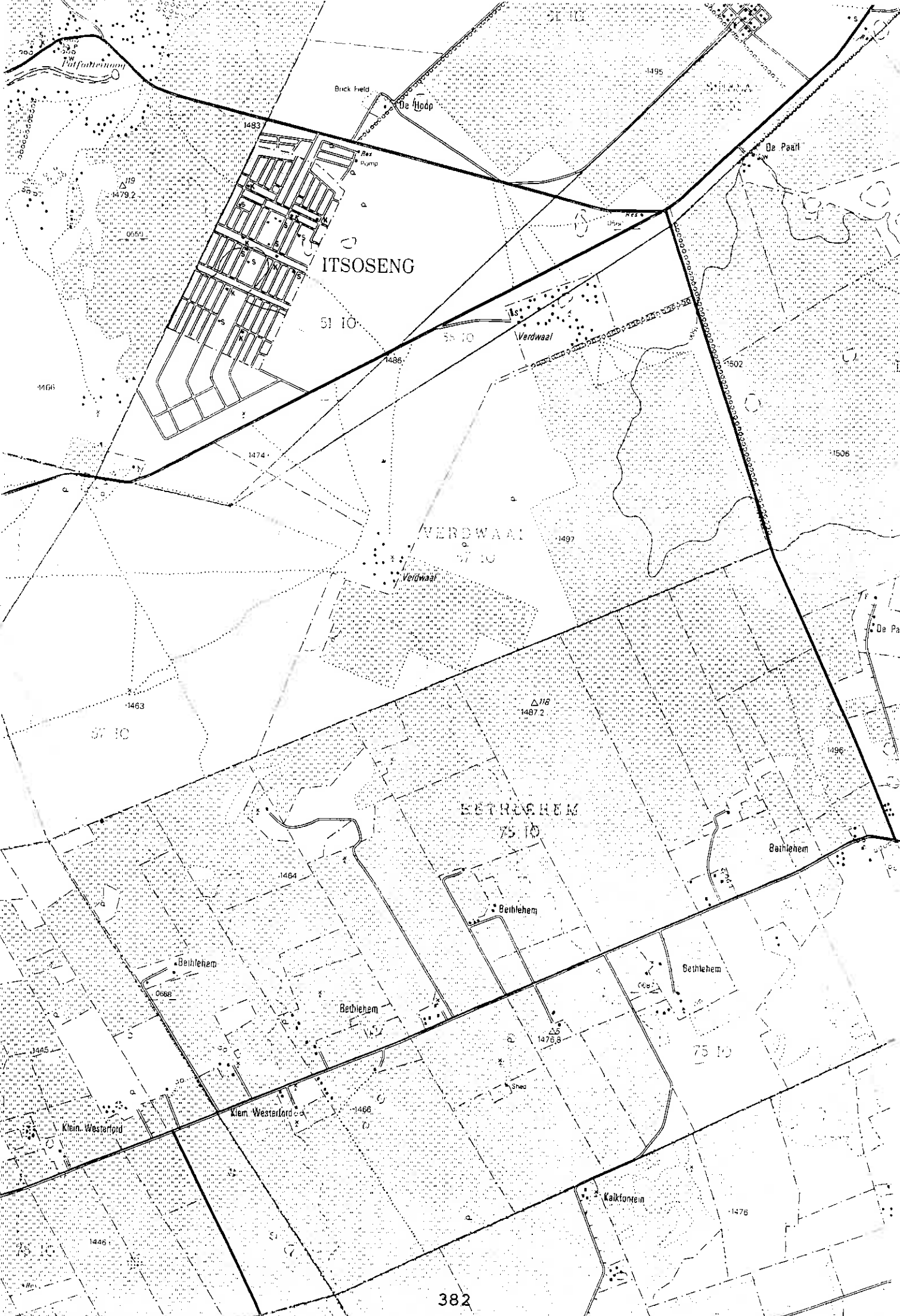
ITSOSENG

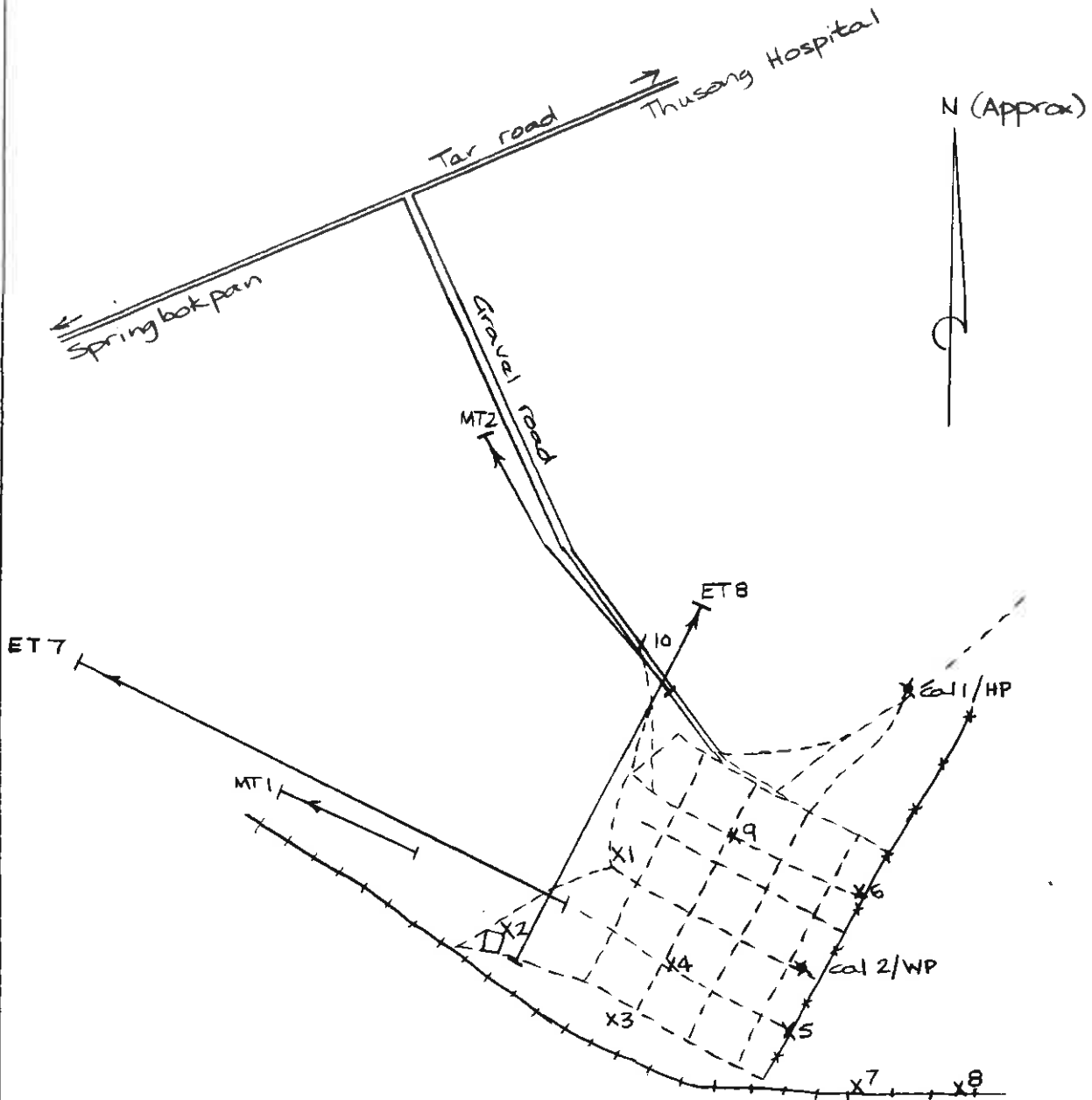
51 10

VERDWAAL

BETHLEHEM

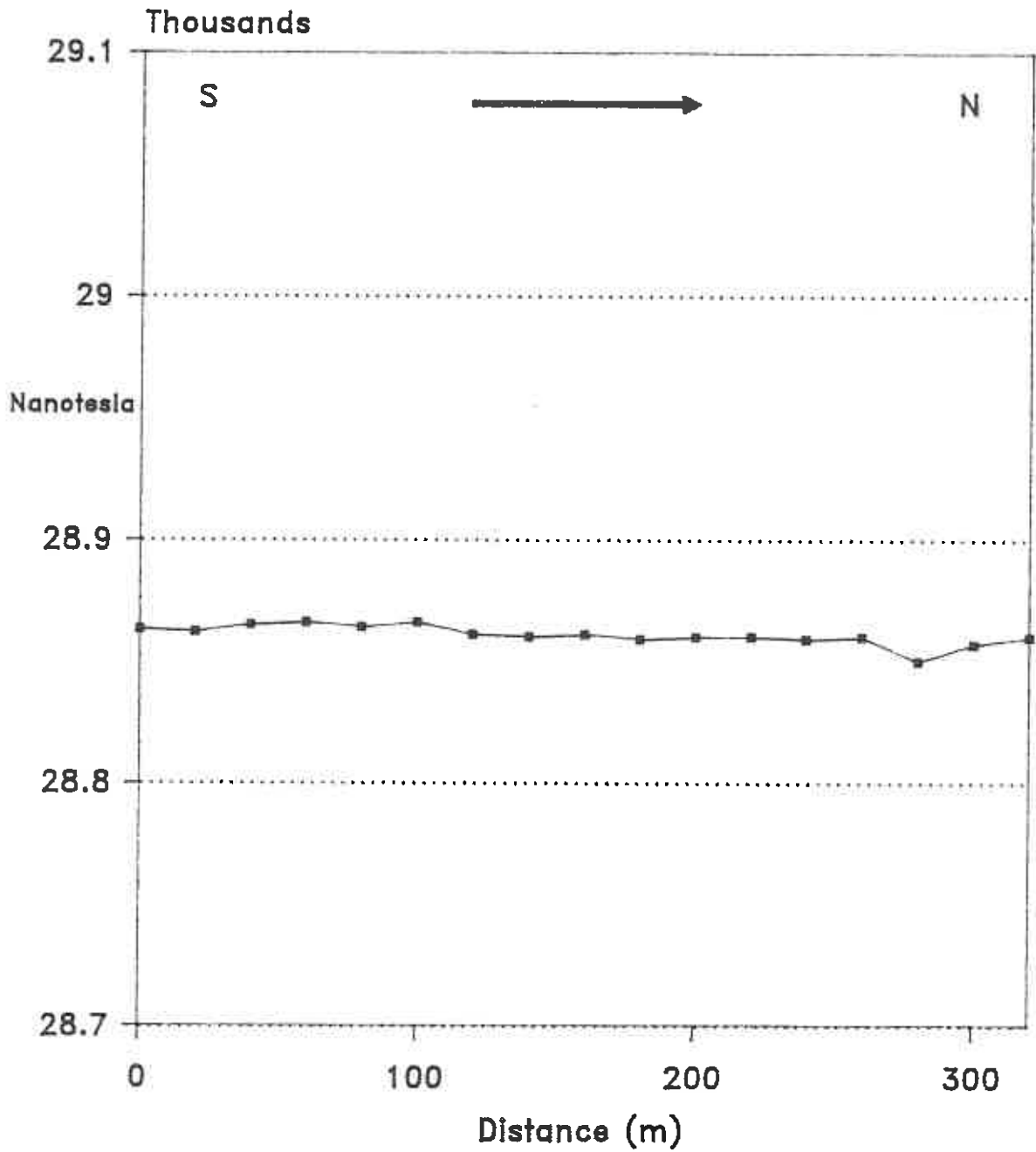
75 10



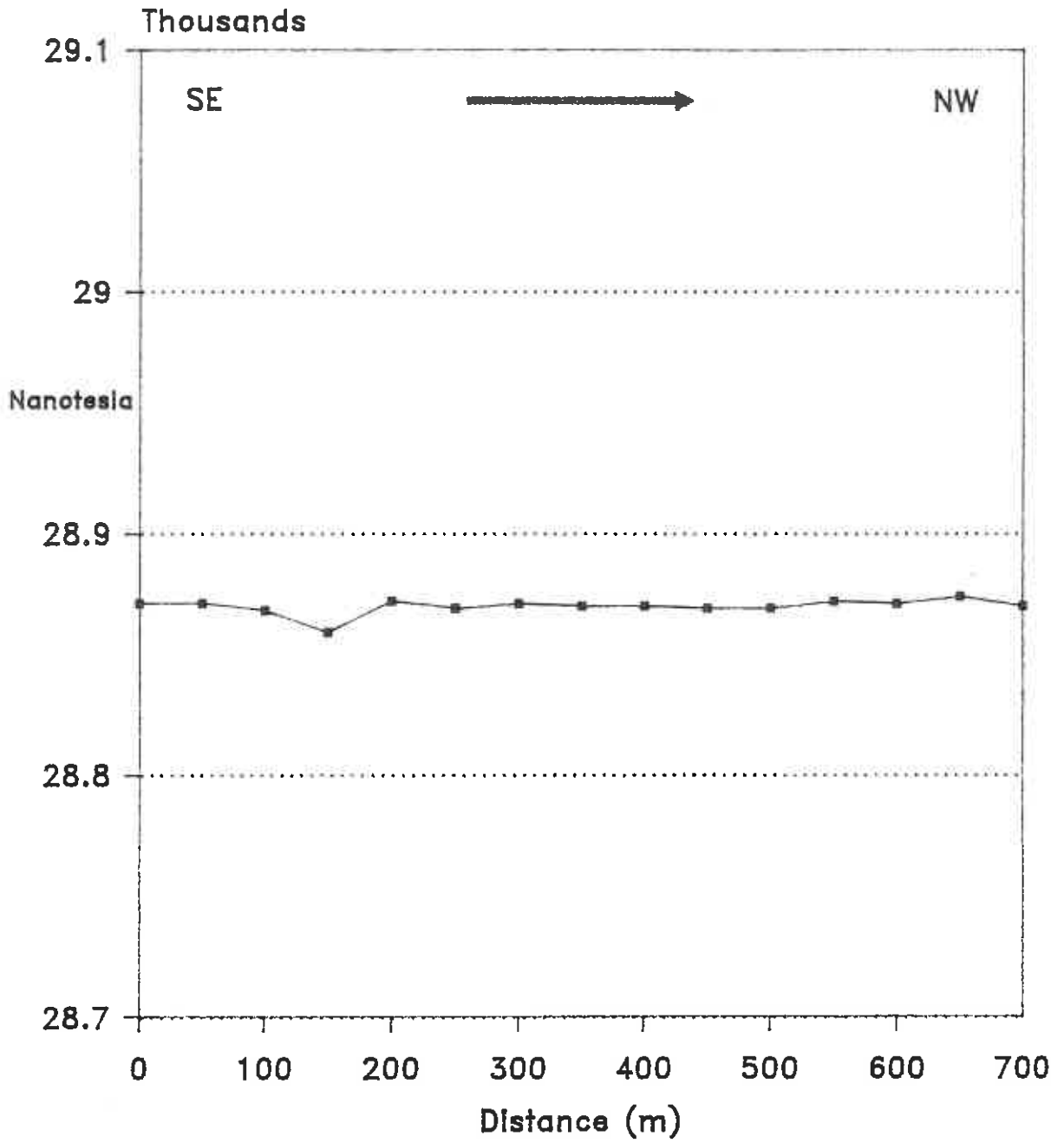


Locality Plan of Verdwall
 Overlay to Photo No. 2210 (strip 1)
 Approx Scale 1:15 000

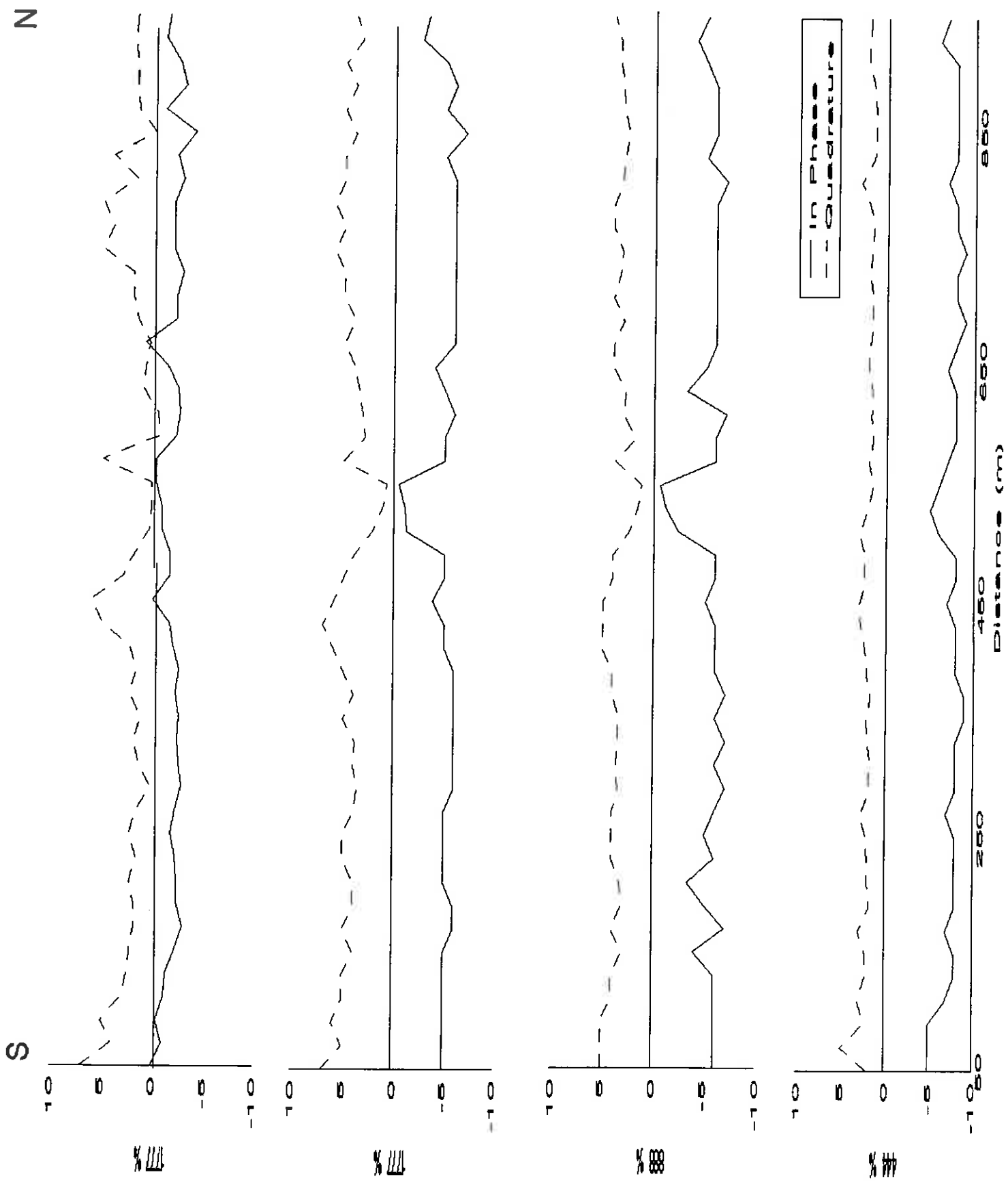
Magnetic Traverse #01
District: Ditsobotla
Locality: Verdwaal



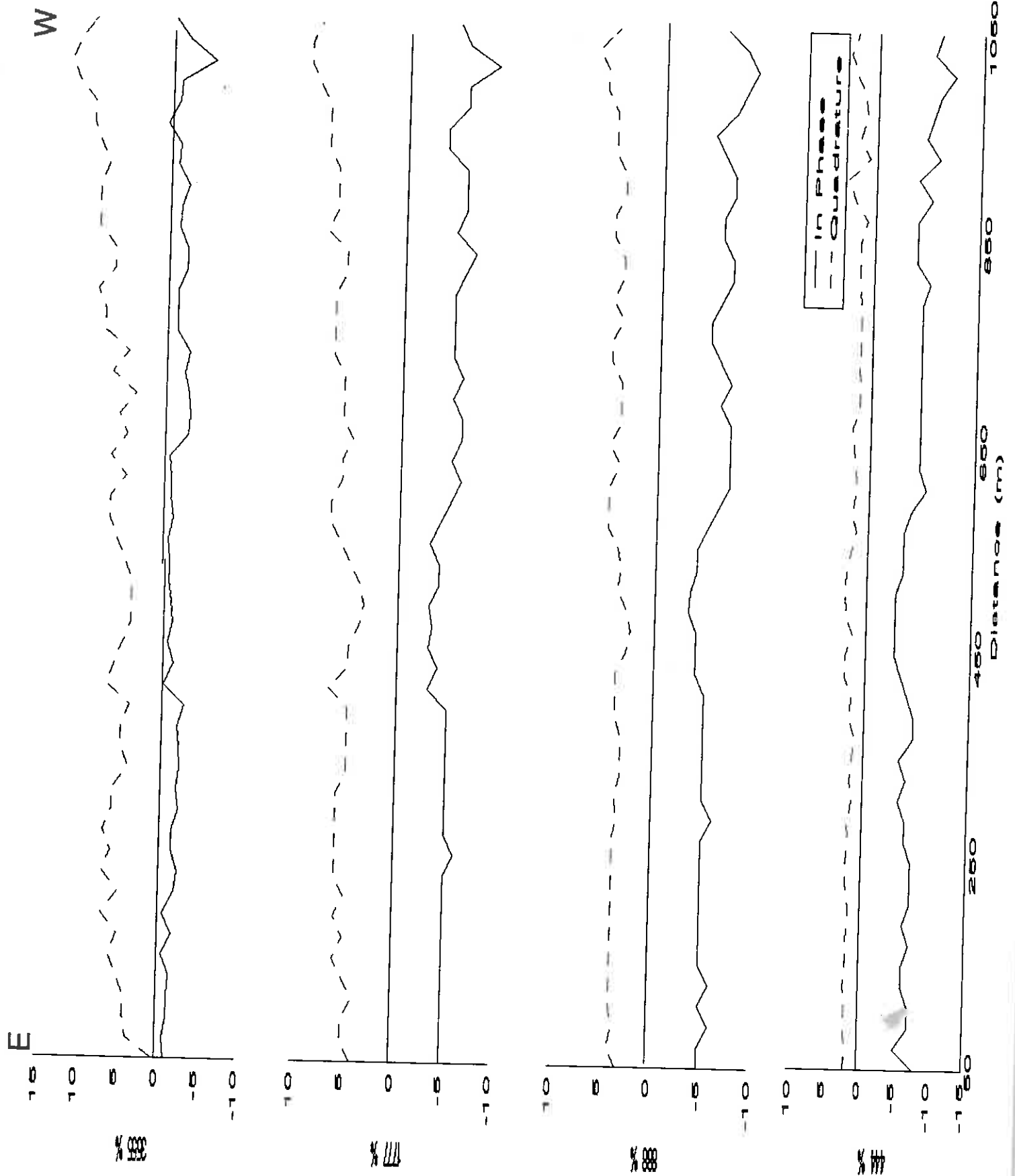
Magnetic Traverse #02
District: Ditsobotla
Locality: Verdwaal



EM-8 Verdwaal



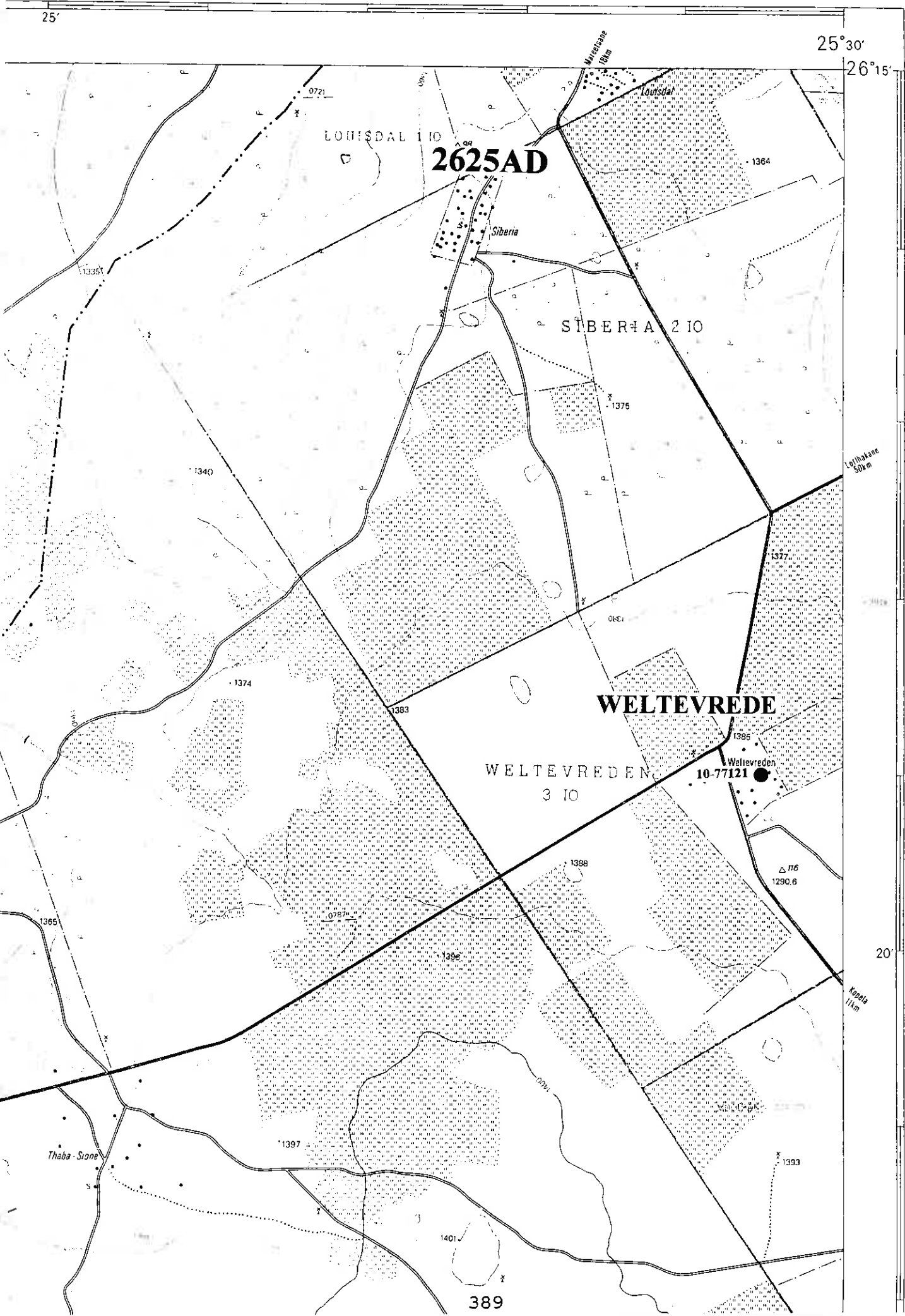
EM-7 Verdwaal

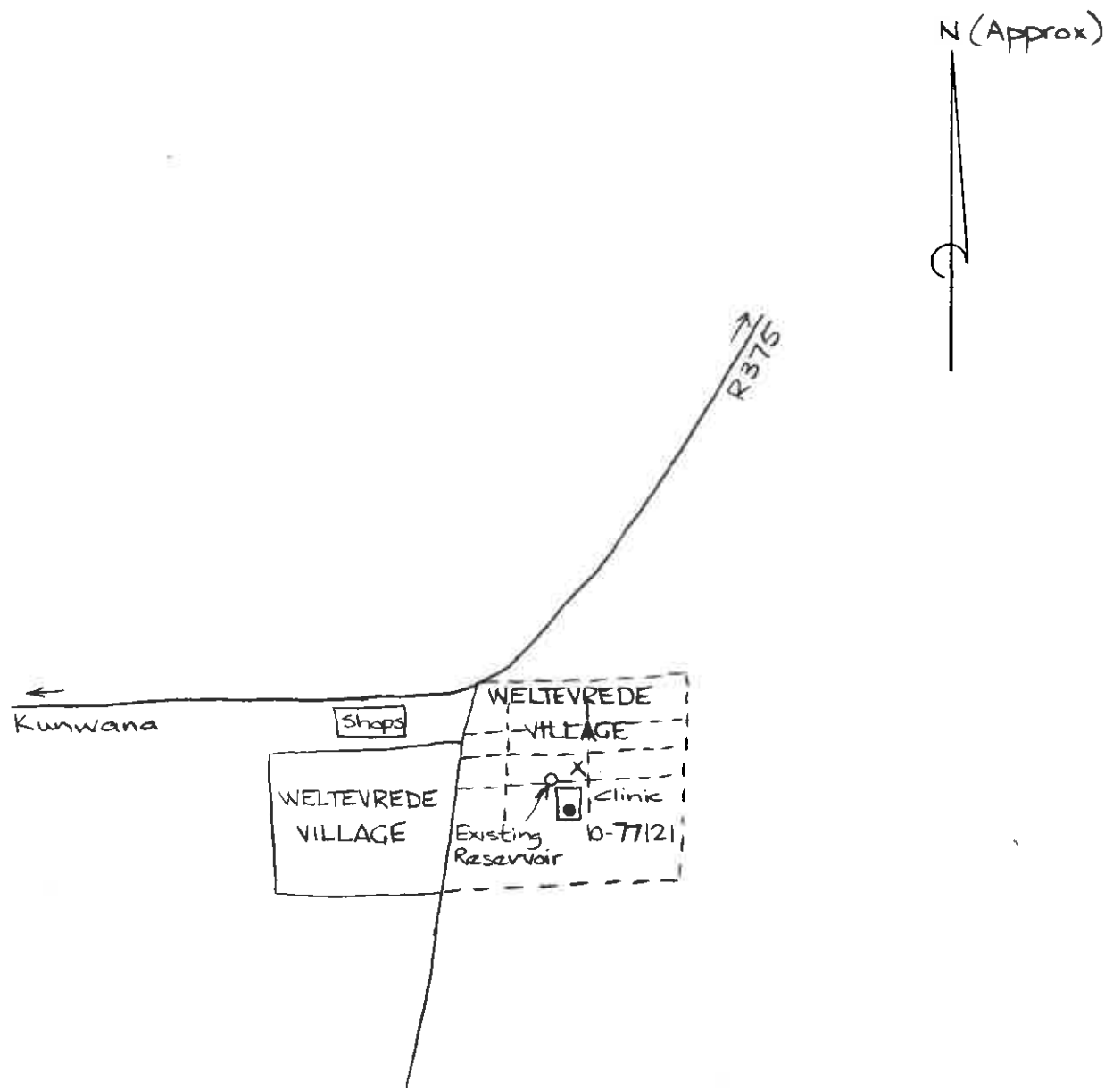


WELTEVREDE

Including borehole

10-77121 - Clinic





Locality Plan of Borehole 10-77121 - Weltevrede

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

WELTEVREDE CLINIC

24 05 1992

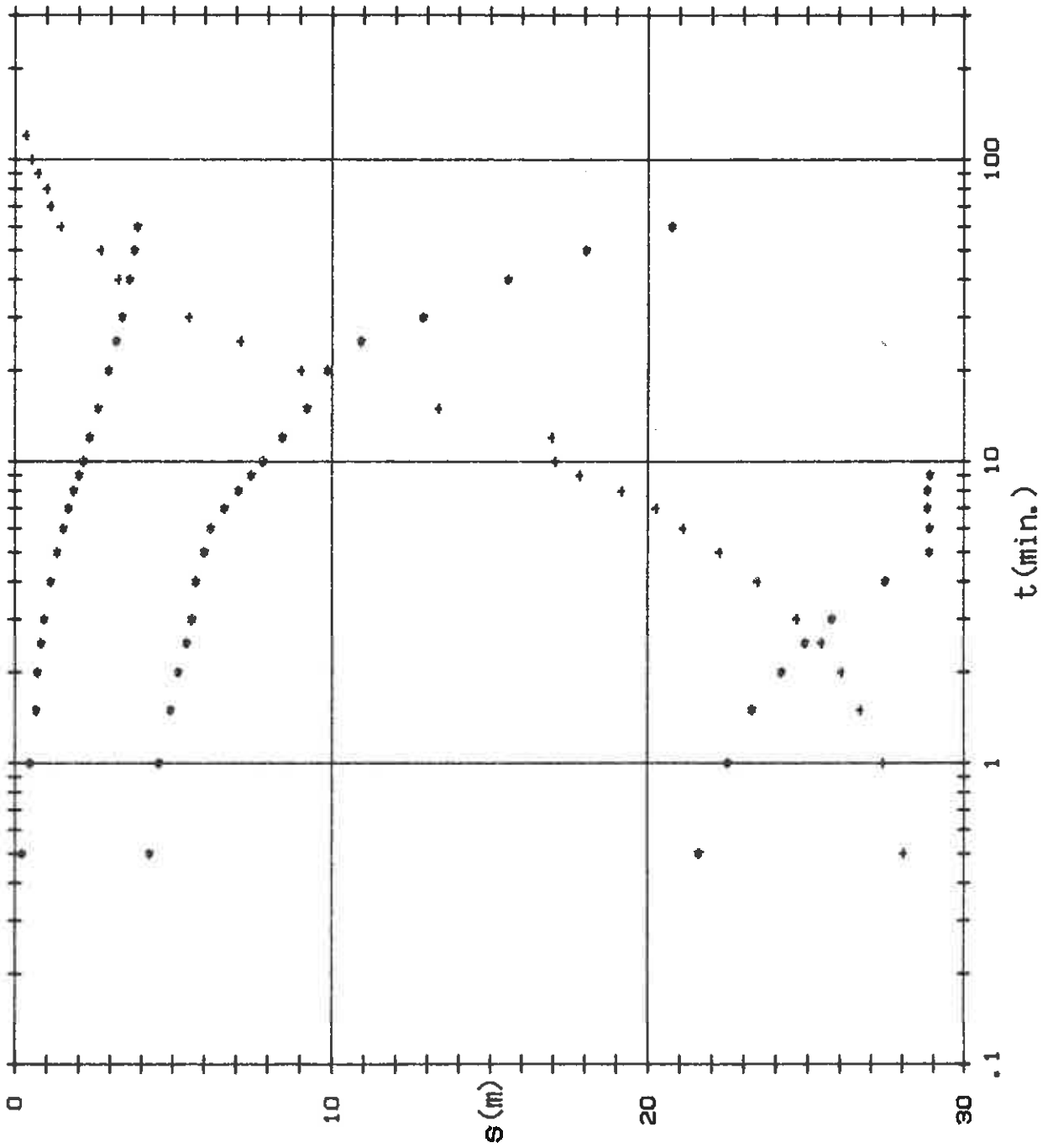
B.H. No. 10-77121

$Q_1 = .15 \text{ l/s}$

$Q_2 = .4 \text{ l/s}$

$Q_3 = .8 \text{ l/s}$

S.W.L. = 12.1 m



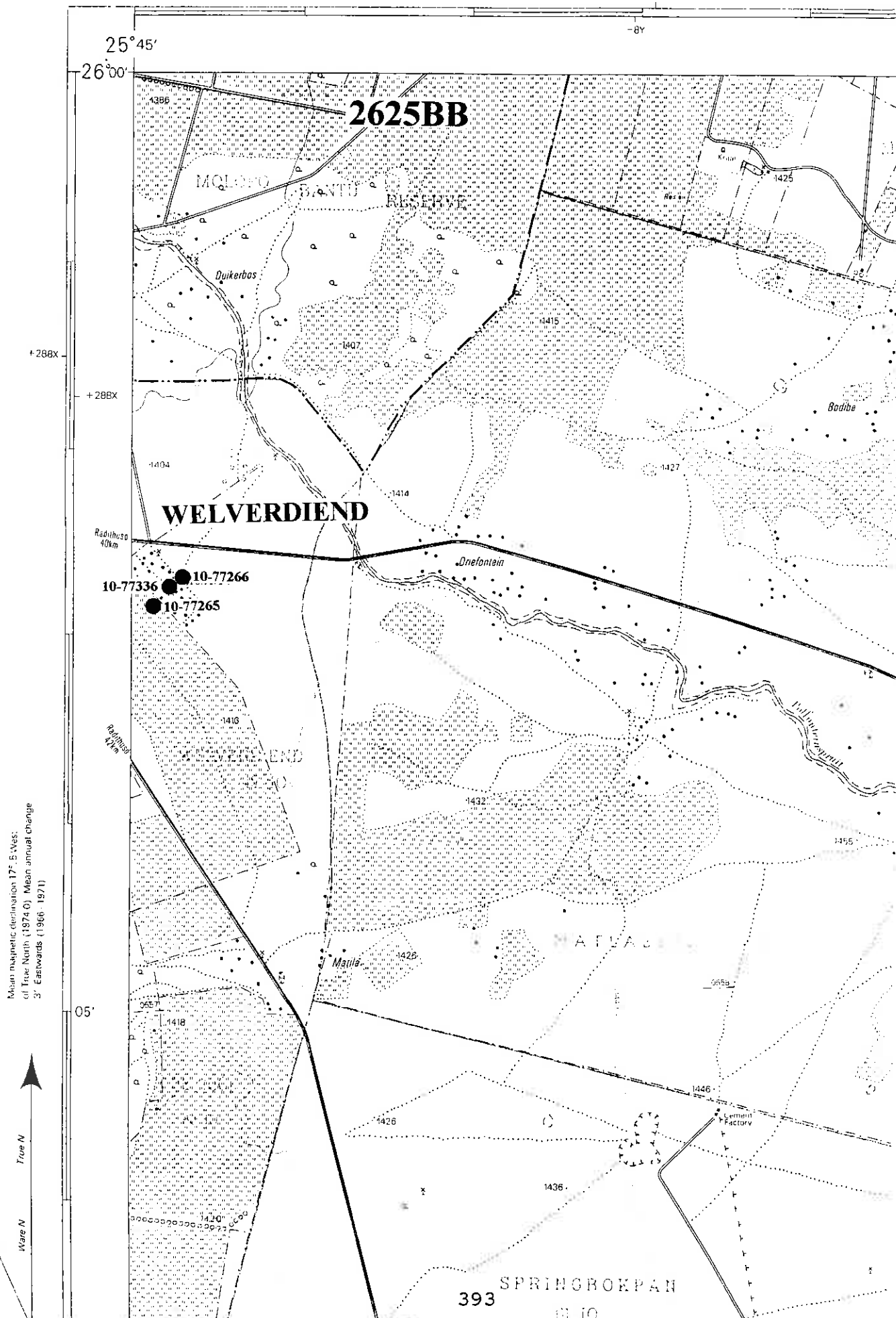
WELVERDIEND

Including boreholes

10-77265

10-77266

10-77336



25°45'

26°00'

2625BB

MOLONG BRANCH RESERVE

WELVERDIEND

10-77336
10-77266
10-77265

WELVERDIEND

AFRICA

393 SPRINGBOKPAN

Mean magnetic declination 17° 5' West
of True North (1974 0). Mean annual change
3' Eastwards (1966-1971)

True N
Magnet N

Radhuco
40km

Radhuco
40km

-8Y

-12Y

Magnet N

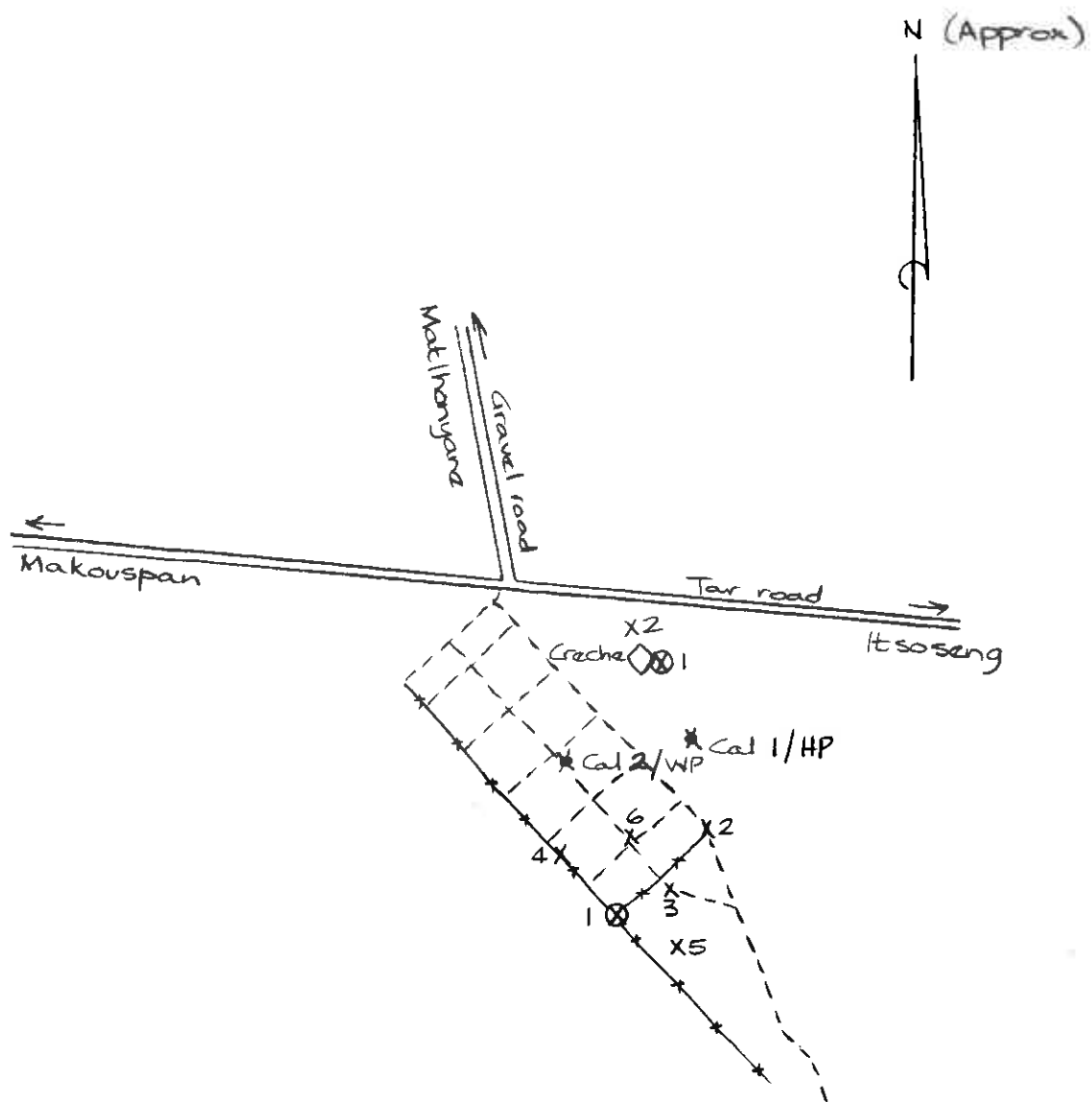


Lemaitre
Factory

Badibe

393

© 10



Locality Plan of Wilverdiend

Overlay to Photo No 9938 (strip 17)

Approx Scale 1:15 000

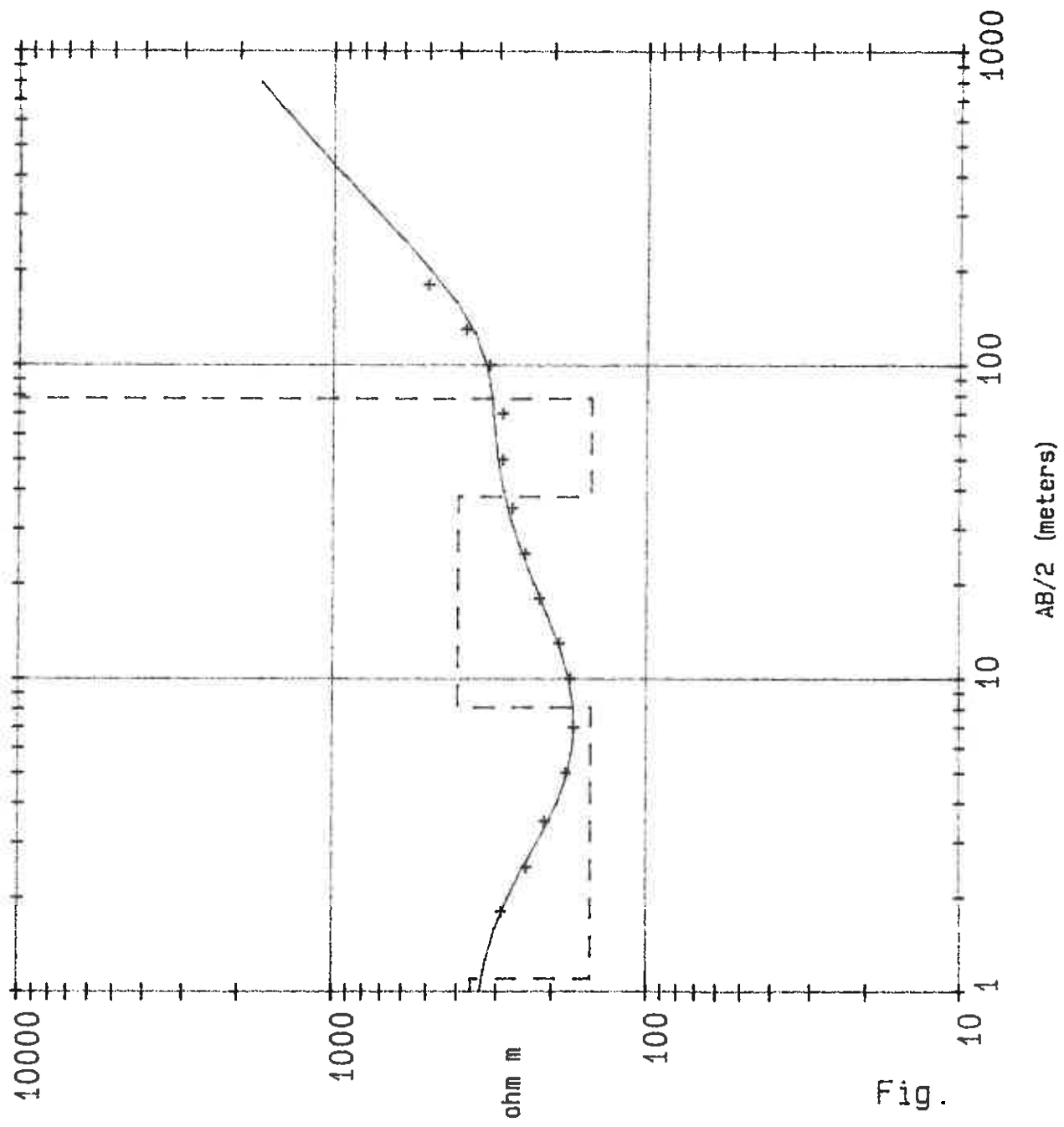


Fig.

+ Field data
 — Computer model
 - - - d - r model

WELVERDIEND

V.E.S. 01

CO-ORDINATES
 +2882300X -75575Y

GEOLOGY
 DOLOMITE

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

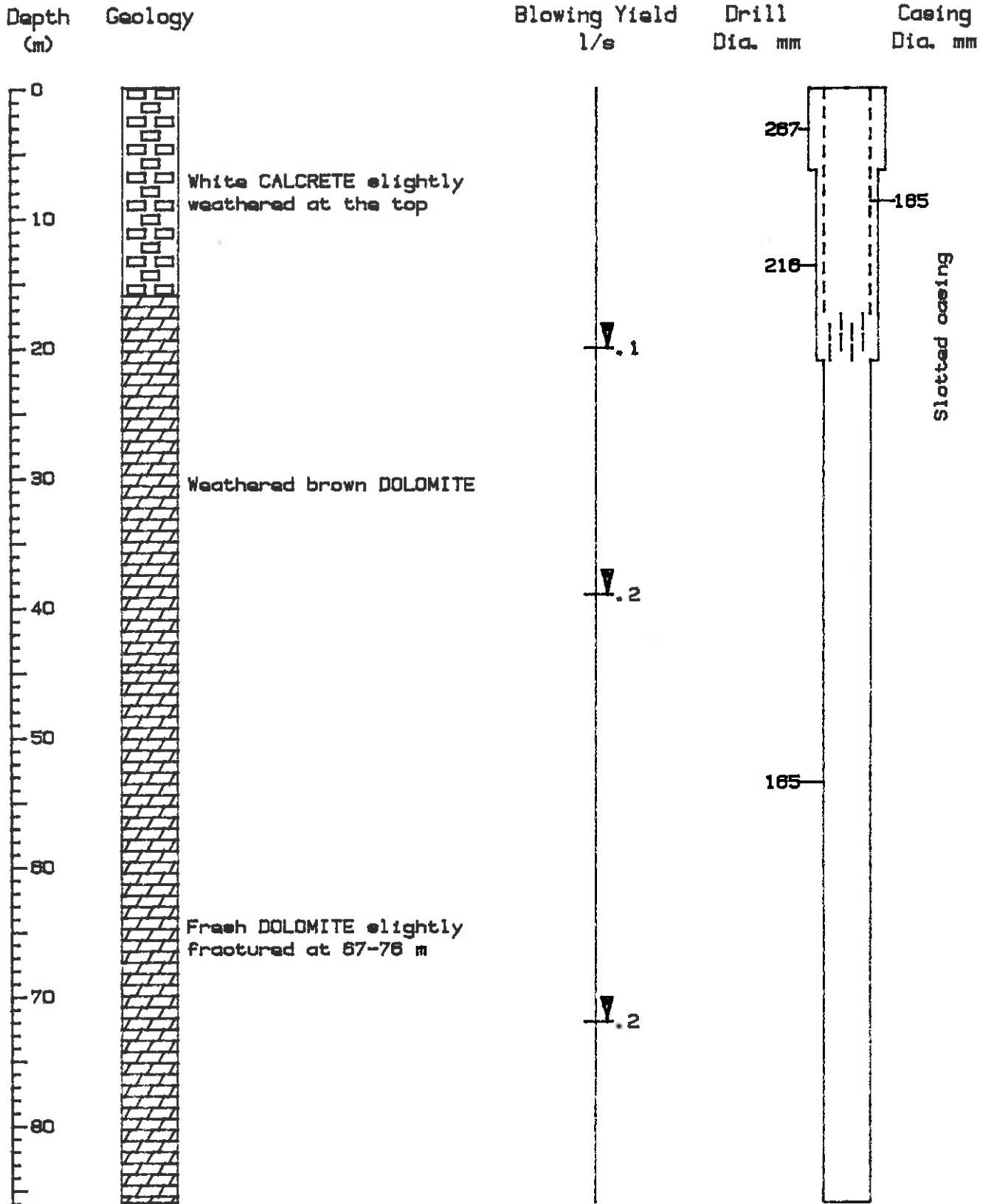
LOCALITY: WELVERDIEND

BH. No. 10-77265

Geoph. Peg No. 01

Coordinates +2882300X -75575Y

Elev. (m) 1410



End of Hole 86

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

WELVERDIEND

13 05 1992

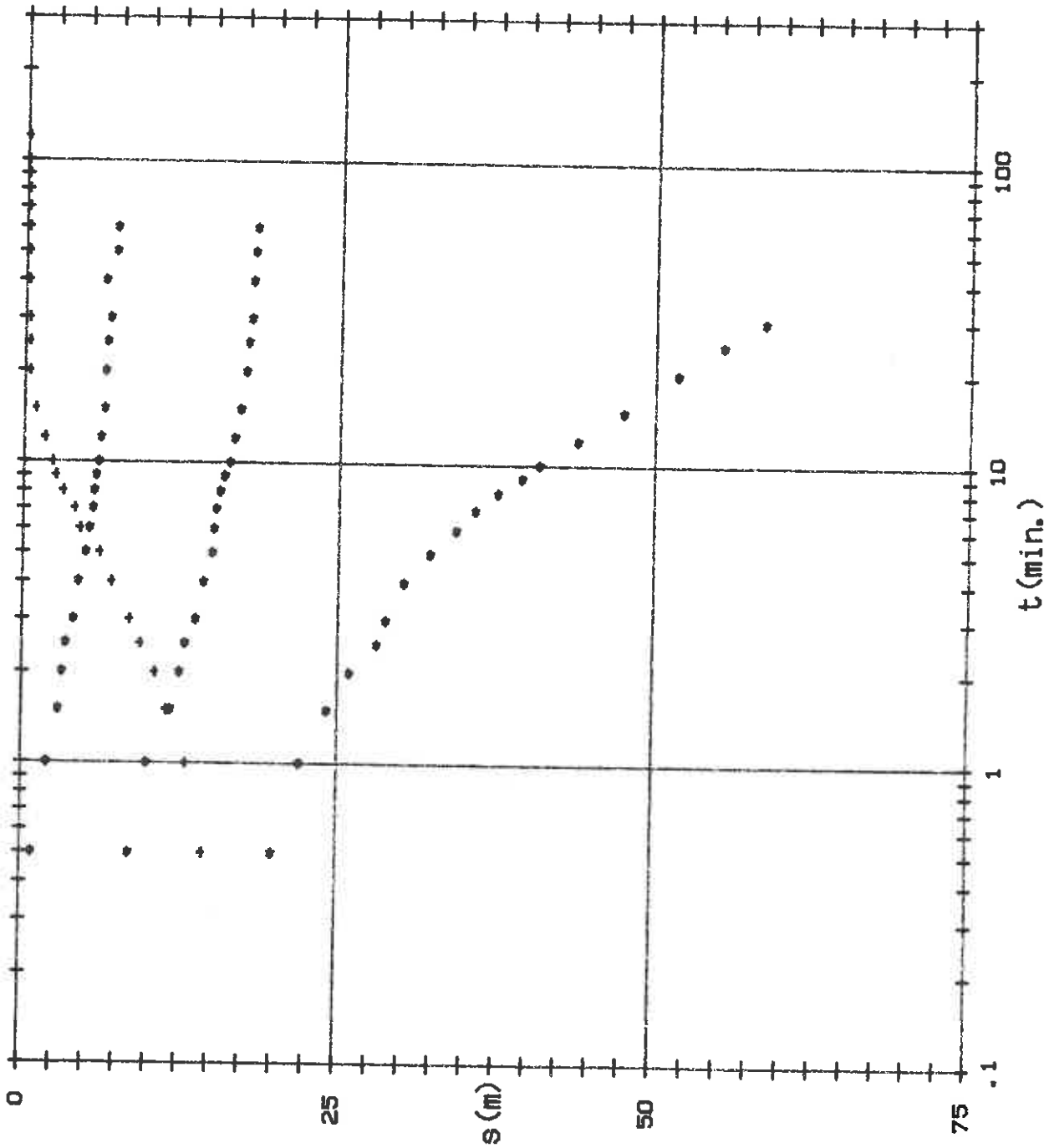
B.H. No. 10-77265

$Q_1 = .24 \text{ l/s}$

$Q_2 = .49 \text{ l/s}$

$Q_3 = 1 \text{ l/s}$

S.W.L. = 6.06 m



CONSTANT DISCHARGE TEST

+ Drawdown data.
* Recovery data.

WELVERDIEND

14 08 1992

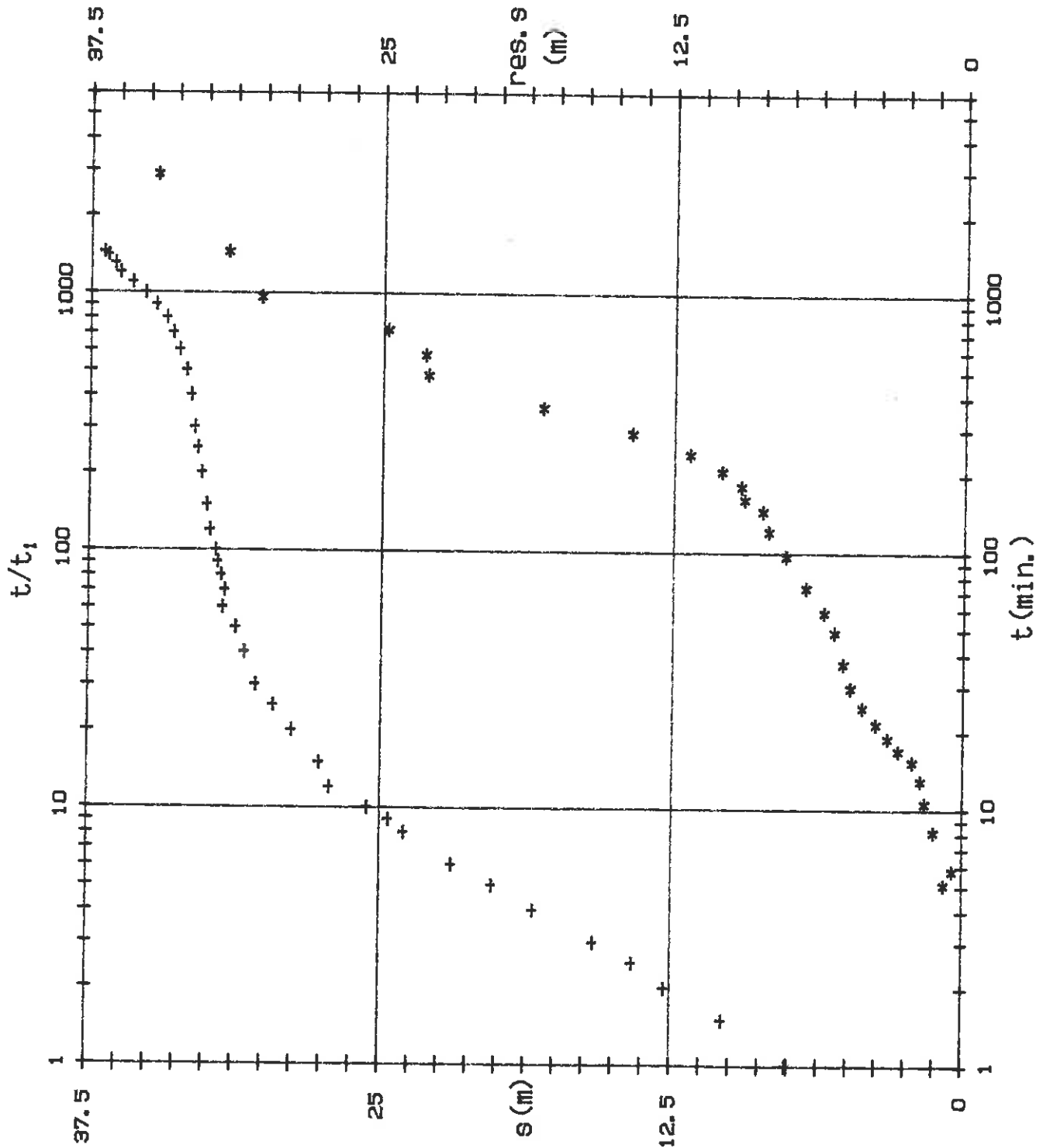
Pumped Borehole
10-77265

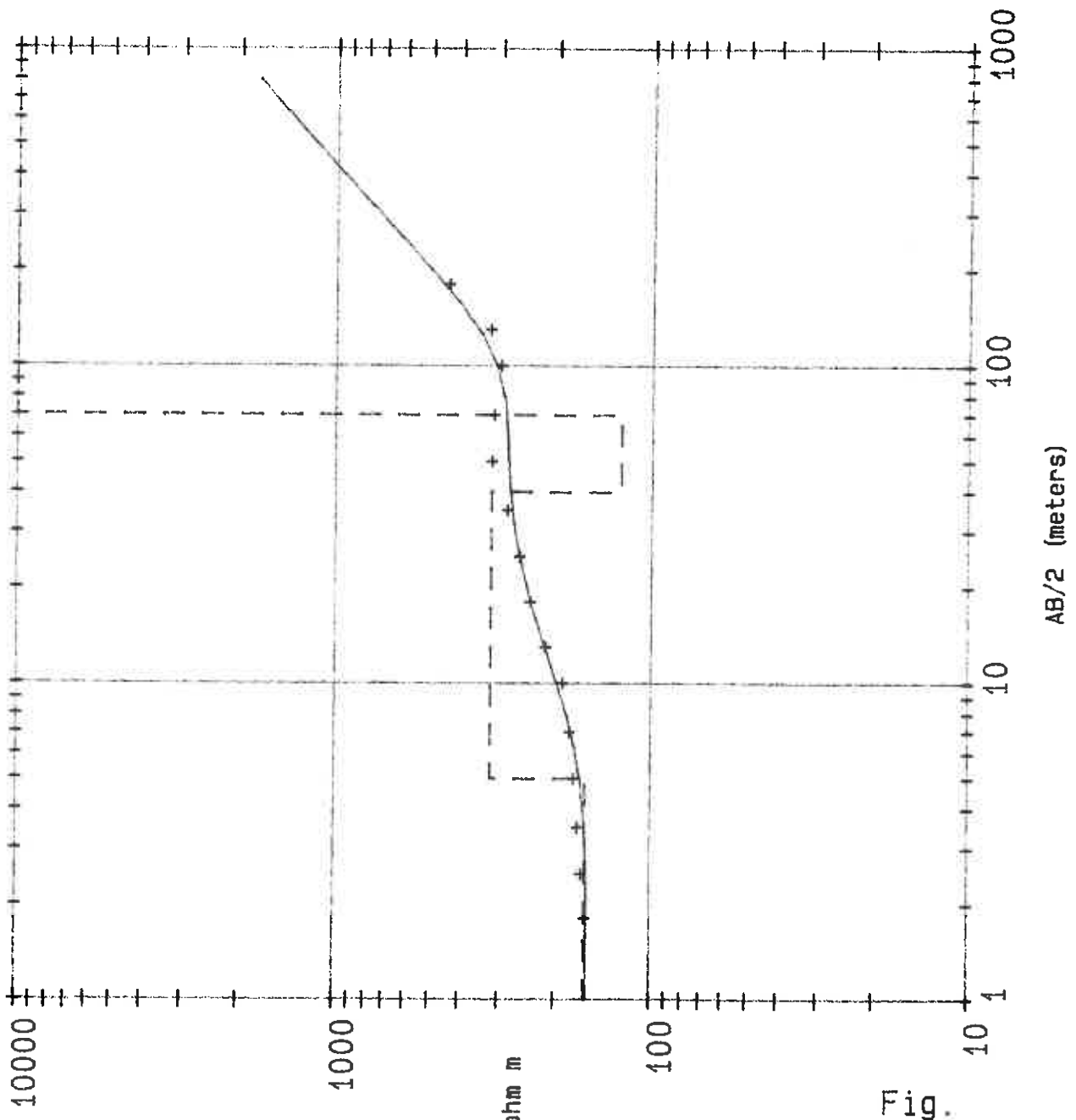
Readings on Borehole
10-77265

$Q = .5 \text{ l/s}$

S.W.L. = 6.06 m

$T = .5 \text{ m}^2/\text{d}$





+ Field data
 — Computer model
 - - - Computer model

WELVERDIEND

V.E.S. 01

CO-ORDINATES
 +2881675X -75550Y

GEOLOGY
 DOLOMITE

Fig.

BOREHOLE LOG

Page 1 of 1

DISTRICT: DITSOBOTLA

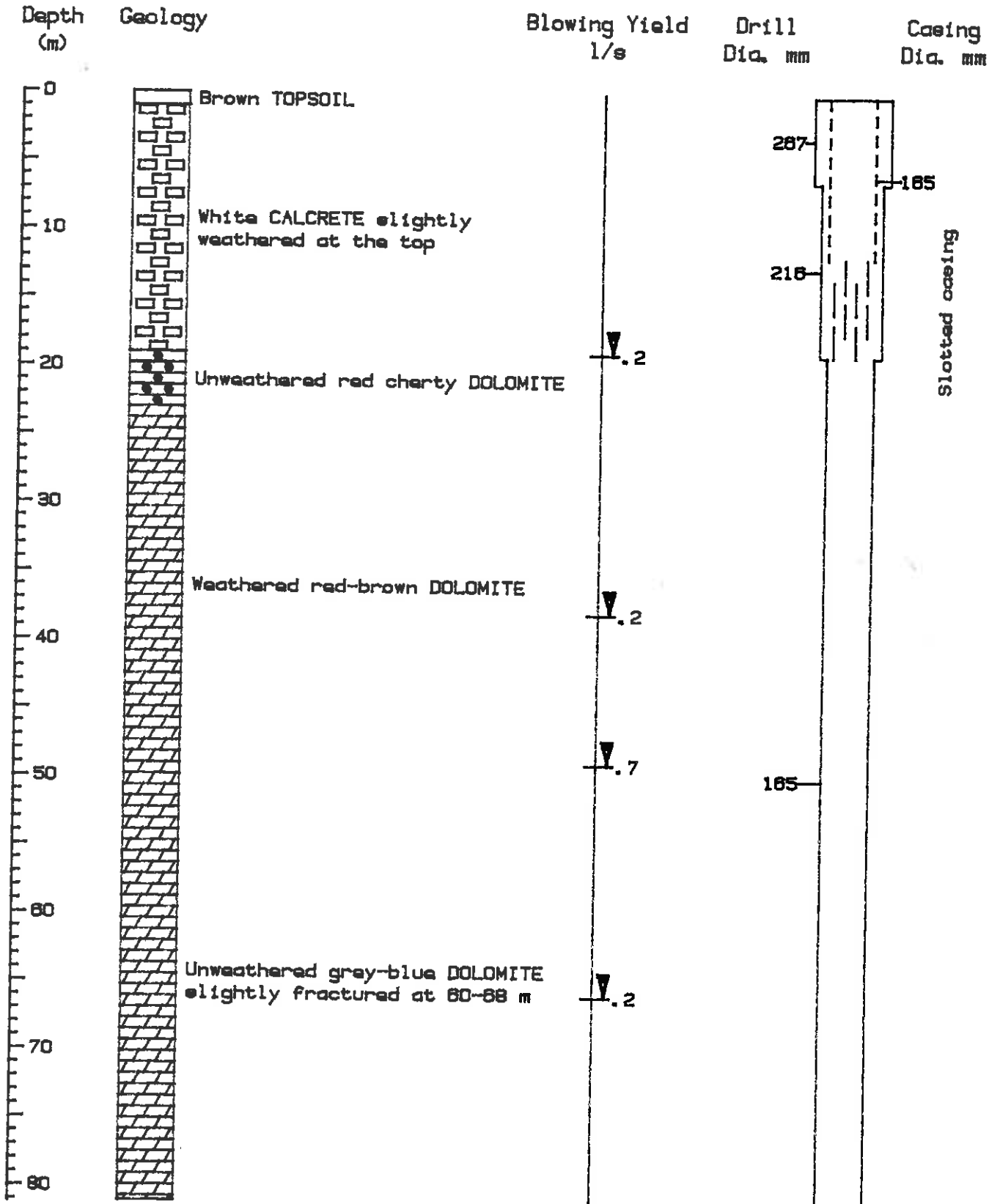
LOCALITY: WELVERDIEND

BH. No. 10-77266

Geoph. Peg No. 01

Coordinates +2881675X -75550Y

Elev. (m) 1410



End of Hole 81

STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

WELVERDIEND

16 08 1992

B.H. No. 10-77266

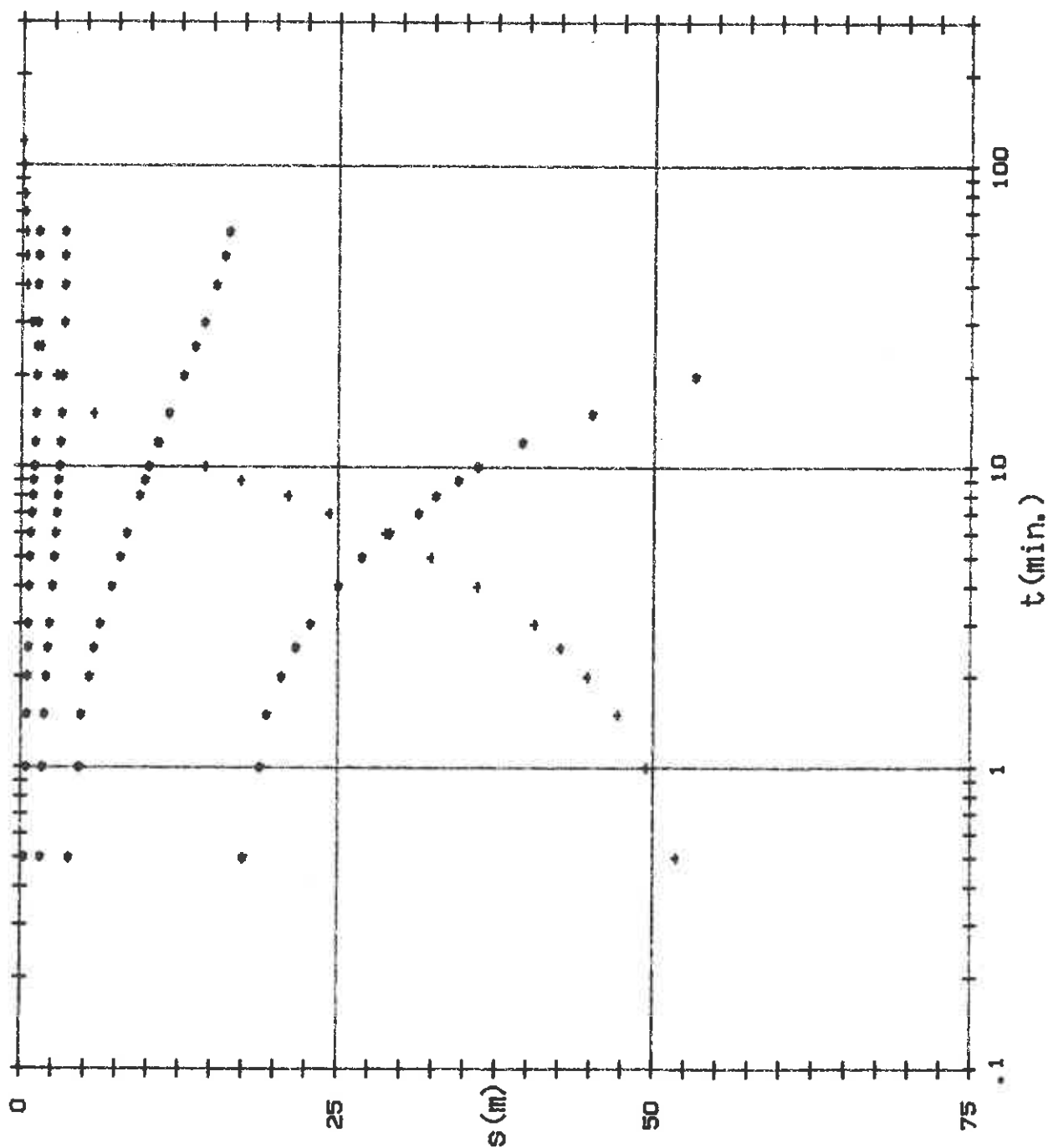
$Q_1 = .21 \text{ l/s}$

$Q_2 = .41 \text{ l/s}$

$Q_3 = .99 \text{ l/s}$

$Q_4 = 2 \text{ l/s}$

S.W.L. = 6.88 m



CONSTANT DISCHARGE TEST

+ Drawdown data.
* Recovery data.

WELVERDIEND

18 08 1992

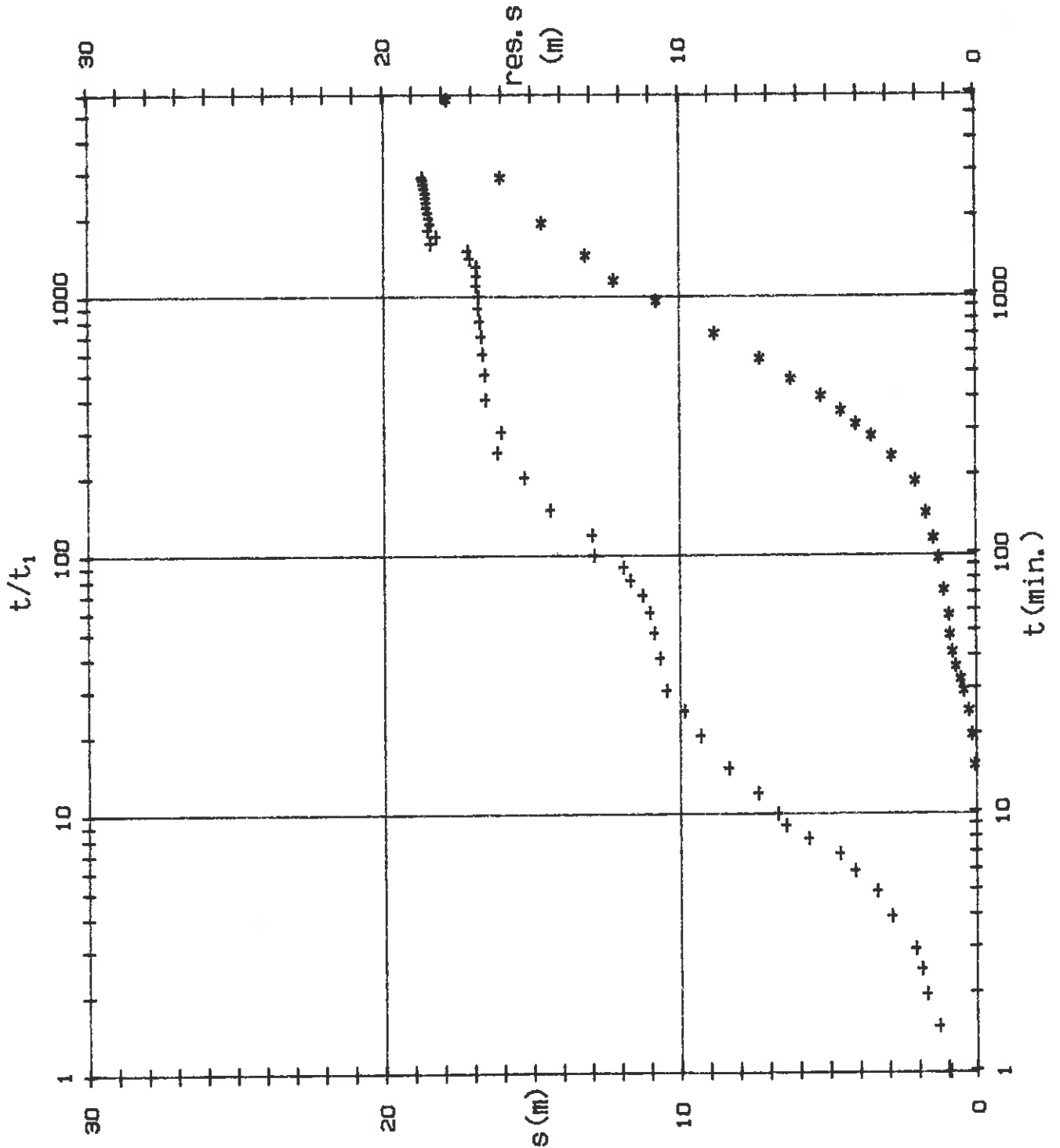
Pumped Borehole
10-77266

Readings on Borehole
10-77266

$Q = 1.1 \text{ l/s}$

S.W.L. = 6.88 m

$T = 2 \text{ m}^2/\text{d}$



STEP DRAWDOWN TEST

- * Pumping data
- + Recovery data

WELVERDIEND CLINIC

15 08 1992

B.H. No. 10-77336

$Q_1 = .2 \text{ l/s}$

$Q_2 = .43 \text{ l/s}$

$Q_3 = .89 \text{ l/s}$

S.W.L. = 7.04 m

