The above trial estimates were based on the premise that well water would be horizontally recharged from aquifer, and since it can be expected to be vertically recharged from the ground surface during the rainy season also, the actual drawdown would be smaller than the trial estimates.

Also, since the planned annual discharge of 10,530 m^3 (28.84 m^3/day x 365 days) from four wells underruns the usable quantity of ground water of 12,000 m^3/year in the area to be developed, it means that when the trend of ground water level is estimated according to a one year cycle the water level in each year would be restored to the level of the previous year during the rainy season in June.

(5) Problems

The review in the preceding paragraph was predicated on the aquiferous constants obtained by pumping test and the mean rainfall. However, in the event the water balance is lost, for example at the time of the abnormal drought in 1983, or when recharging of ground water from the surface cannot be expected, such as during the dry season, there is a high risk that a chronic drawdown will prevail and that the well water will turn into saline water. (Refer to Ghybeu-Herzberg's law in Item (7), Paragraph 3.1.2)

In other words, it means that the water will have been obtained from a level below sea level so that in the long term the water will inevitably become saline.

It is therefore important to position the new wells to be developed only as tentative water sources until the time that a piped water supply to the Fete area will be implemented in the future.

4.4 Water Supplying Facilities

The specifications for drilling and its ancillary work, pumps, etc. are as follows.

1) Well

Depth	:	30 m
Diameter of drilling hole	:	200 - 250 mm
Diameter of casing	:	150 mm
Length of casing	:	18 m
Length of strainer (with slit)	:	12 m
Material of casing strainer	:	PVC pipe

The stratum from which ground water is to be intaken in the Fete area is the weathered quartzite which is not very good as an aquifer. The strainer, therefore, was made as long as possible to improve the efficiency of water intake.

Since the drilling work in the field is anticipated to be consigned to GWSC, the specifications for materials for casing and other things were made in order that they would be procurable by GWSC.

2) Pump

Type	:	Hand pump or foot pump
Pump head	:	30 m
Discharge	:	800 ℓ/hour

The pumps being used in Ghana today were mostly made in India. These were supplied under assistance and are not procurable in Ghana. Also, since the target area is close to the coastline so that the ground water has a high salt content, anti-corrosive considerations are necessary.

If pumps are to be incorporated in the maintenance and administration system of GWSC, then the pumps made in India are desirable. But as the pumps made in India tend to rust and also have other problems with respect to quality, the rust-resistant foot pumps were also taken into consideration. Table 4.4.1 makes comparisons of the two.

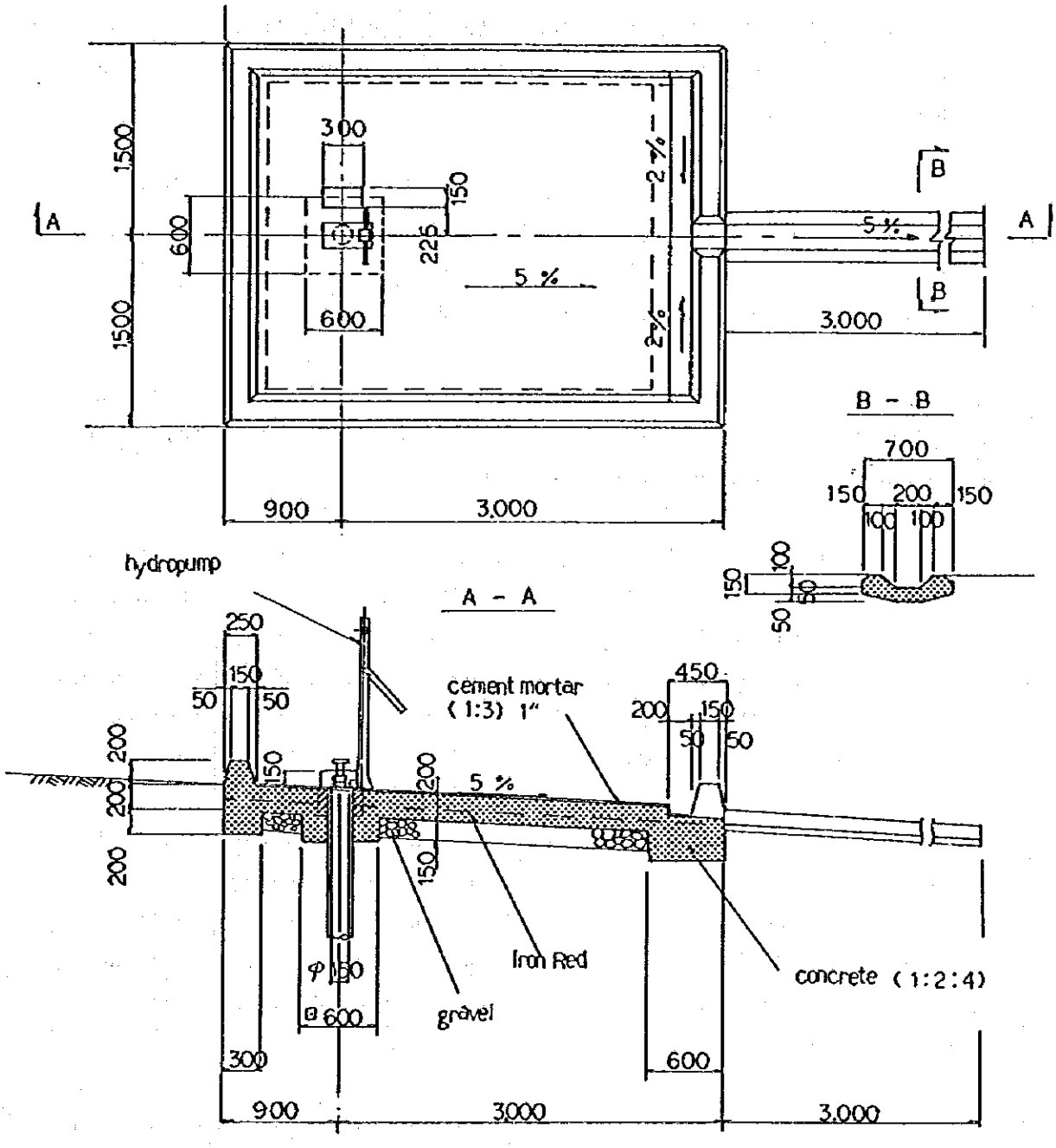
Table 4.4.1 Comparison of Pumps

Description		Hand Pump Made In India	Foot Pump
Performance	Lift	30-33 m	20-70 m
	Discharge	800-1,300 l/hour	500-1,300 l/hour
Gross Weight		(Ø12mm load, 30m) Approx. 150 kg	Approx. 50 kg
Mounting, repair		Requires tripod, etc. as heavy	Easy (can be installed by two adults)
Material, etc.		Susceptible to rust as lifting pipe and connecting rod are made of iron.	No problem of rusting as lifting pipe is made of polyethylene.
Delivery Term		If made to special specifications of GWSC, may take longer than foot pump.	Approx. 1.5 - 2 months (ex Yokohama) 3 - 4 months (ex Ghana)
Ordering		Order to be placed in India for delivery in Ghana. The intermediary of a trading company is therefore necessary.	Can be ordered in Japan.
Price		$1,500/set (ex Ghana) (GWSC's special specifications)	¥250,000/set (ex Yokohama) ¥271,600/set (ex Ghana)
Maintenance and Administration		GWSC can be totally counted on for maintenance and administration.	Local maintenance and administration possible with spare pump and spare parts. Because of simple construction, the inhabitants themselves can inspect and repair them. Periodic replacement of parts necessary.

3) Ancillary works

In order to prevent the ground water from becoming polluted due to infiltration of polluted water from the ground surface to the maximum extent possible, a large space shall be reserved for the platform around each well, and the platform shall be of the construction shown in Fig. 4.4.1.

FIG. 4.4.1 PLATFORM FOR WELL WITH FOOT PUMP AT FETE



4.5 Estimation of Construction Costs

Ghana has been suffering from chronic inflation ever since its independence. As the rise in commodity prices and wages since the beginning of 1985 has been particularly remarkable, it is quite possible that the construction costs would be quite different at the time of actual execution.

The rate of rise in prices during the past one year is estimated to have been about 2.3 times (refer to Fig. 4.5.1), and if prices should continue to rise at the same pace, the increase in construction costs between April 1985 and January 1986 would be 85%.

Costs were estimated on the assumption that drilling and its ancillary work will be ordered to GWSC and local contractors, and that pumps will be procured outside of Ghana.

The costs of drilling and its ancillary work were estimated by adding a price rise of 85% to the unit prices and quotations (for April-June, 1985) of GWSC and local contractors. For pumps, estimations were made for both hand pumps made in India and for foot pumps. In the case of foot pumps, the quantity was assumed to be five sets in all, including one spare pump.

The itemized construction costs are as presented in Table 4.5.1. The locally ordered construction costs including price escalation are estimated to be 3,613,000 cedis in all, which is equivalent to ¥9,211,000 when converted into Japanese yen as of June, 1985, and if a contingency reserve of 5% is included, the total becomes ¥9,672,000.

The costs of pumps and other materials, which are in addition to the above, would be ¥2,075,000 in the case of hand pumps and ¥1,897,500 in the case of foot pumps.

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* $1 = ¢53

  $1 = 250

FIG. 4.5.1 VARIATION OF MARKET PRICE IN GHANA (1984 - 1985)

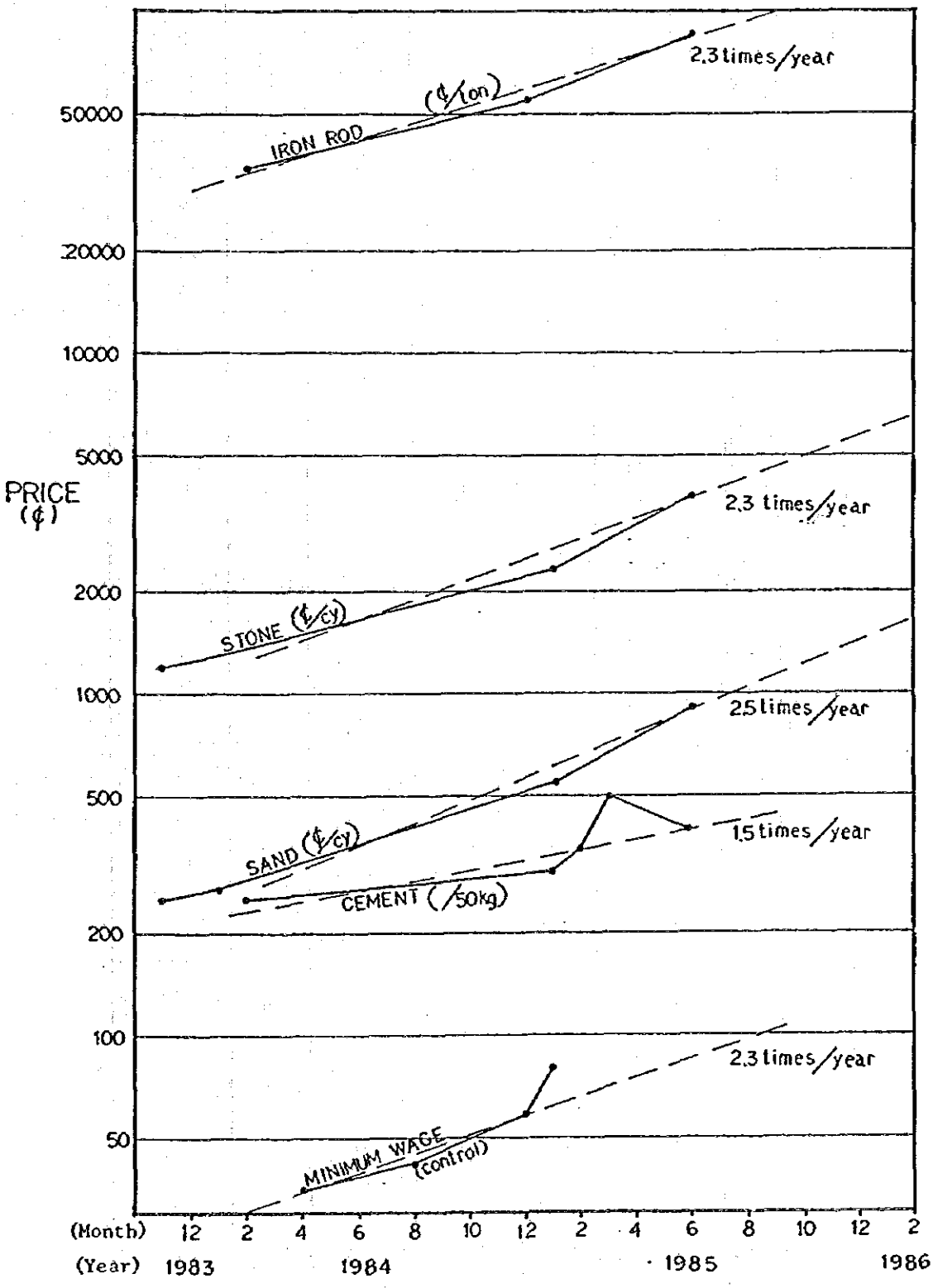


Table 4.5.1 Construction Cost of Water Supply Facility

Facility	Quantity	Unit Price	Local Currency ₡ (Apr.-Jun.1985)	Local Currency ₡ (Jan.1986)		Foreign Currency	
				Unit Price	Amount	US$	Yen
Well Construction	3	₡ 473,200	1,419,600	875,000	2,625,000	-	-
Platform Construction	4	₡ 133,280	533,120	247,000	988,000	-	-
Hand Pump with Spare Parts (25%)	4	$1,875	-	-	-	$7,500	-
Food Pump with Spare Parts (25%)	5	¥339,500	-	-	-	-	¥1,697,500
Another Materials	1 L/S	¥200,000	-	-	-	-	¥ 200,000
Total		-	1,952,720	-	3,613,000	$7,500 + ¥ 200,000 (Approx. ¥ 2,075,000) and/or ¥ 1,897,500	

4.6 Arrangement for Implementation

Price changes are quite fluid in Ghana where even rumours about a devaluation spurs inflation on to higher heights. As a result, even the construction costs which allow for inflation are quite likely to be different from the budgeted amount so that in the execution stage, it would be necessary to adjust the construction costs according to the situation then prevailing in Ghana. At the same time, as drilling will take six months or longer, the rise in prices even during drilling will become a problem.

The above, however, become problems only if payment is to be made in cedis, the currency of Ghana. If payment in some stable foreign currency is permissible, no escalation clause is considered necessary.

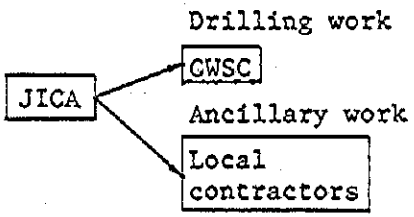
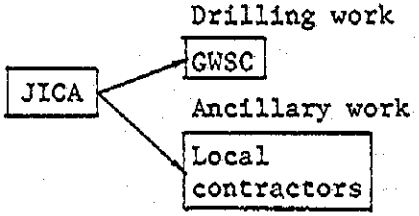
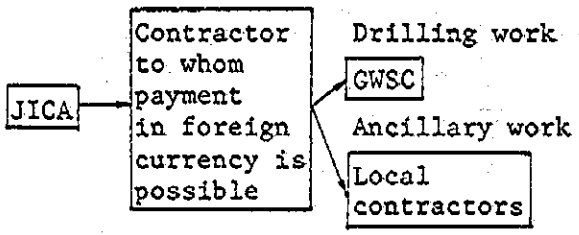
A newspaper issue (People's Daily Graphic) of July 5, 1985 reports that holding of a foreign currency account will become possible in Ghana.

Devaluations of cedis and changes in the official price of gasoline enforced during the survey period are as follows. The rate of rise in prices is larger than the rate of devaluation.

Date	Exchange rate	Gasoline price
-	$1 = ¢50	¢85/gallon
Apr. 17	$1 = ¢53 (down by 6%)	¢95/gallon (up by 12%)
Aug. 10	$1 = ¢57 (down by 7.5%)	¢105/gallon (up by 11%)

In view of the foregoing domestic situation in Ghana, the ordering systems at the stage of execution were compared in Table 4.6.1.

Table 4.6.1 Comparison of Ordering Systems

Case	Contracting form	Payment method	Problems, etc.
1		Payment in Ghana's currency	Chances are high that trouble will occur it the contract amount is determined in a lump sum since work will extend over a long period. Necessary to include an escalation clause in the payment terms or determine the contract per each well.
2		Payment in foreign currency	Possible if contractors have a bank account in foreign currency. Possibility of being able to open a foreign currency a/c was reported in the newspaper of July 5, but it is necessary to make sure that the contractors do have such an account at the stage of implementation. The advantage in this event is in being able to make bank transfers from Japan.
3		Payment in foreign currency	Contracting and payment are con sidered easiest, but because the project is small in scale as overseas construction work and the contractors must assume large risks, the question is whether there would be a contractor who would undertake such a function.

4.7 Implementation Plan and Work Schedule

This project is to be implemented by the FY 1985 budget, and allowing for the period required for exchanging notes between the two governments, the project was planned to be launched in December of this year. The execution schedule was planned as shown in Table 4.7.1 with due regard to GWSC's drilling capacity and efficiency and to the fact that the construction period includes the rainy season of May and June.

For execution of construction, it was planned that 3 supervisors would be dispatched at the time of commencing work and that 2 resident supervisors would be stationed at all times during work execution in view of the fact that rendering of technical judgement during the drilling process would become just as important as confirming the drilling sites, making arrangements with contractors and giving instructions on basic matters, etc.

Table 4.7.1 Implementation Plan and Work Schedule

	1985 Dec.	1986 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
Well Construction (1)									
(2)									
(3)									
Platform Construction (Test well)									
(1)									
(2)									
(3)									
Engineering Supervision *	3 persons			2 persons					

* If Case 3 on Table 4.6.1 is selected, it is necessary to dispatch 2 people at the time of starting construction (for 1.5 months) and in the final stage of completion (for one month) and one person to be stationed throughout the construction period.

4.8 Administration and Maintenance Plan

GWSC's basic policy with respect to the local water supply system is to educate the local inhabitants - the would-be beneficiaries of the facilities - to voluntarily participate in the administration and maintenance of the facilities so that the pumps might eventually be left to the care of the inhabitants.

Pursuant to the basic policy of GWSC, the administration and maintenance of the new water sources in the Fete area will, as a rule, be carried out by the inhabitants organization to be established for the purpose of improving the living conditions of the inhabitants, including the improvement of the sanitary habits of each individual inhabitant.

The role of GWSC is to provide education and guidance to the inhabitants to accomplish the above.

CHAPTER 5 RECOMMENDATIONS CONCERNING PROJECT IMPLEMENTATION

(1) Water sources in the Fete are

The ground water in the coastal zone facing the Gulf of Guinea is generally to have a high salinity content and so is the Fete area. Especially, the chloride content reaches as high as 1400 ppm and it is extremely beyond the maximum permissible value of 600 ppm fined by WHO.

Furthermore, the ground water in the Fete area is in danger of having a salinity content through the contineous pump operation of ground water from wells. Under these circumstances, it concludes that utilization of ground water for drinking purpose would not be favourable.

Therefore, even if a new source of water is found out in the Fete area, it would be temporary use and if lasting improvement is to be made in the living environment of the inhabitants, it is necessary to stably supply water of good quality by constructing the pipeline as soon as possible.

(2) Maintenance and administration

The wells with hand pumps which can be seen in Ghana are not adequately maintained or administered, and also due to a shortage of repair parts, they are often abandoned in broken-down condition.

The preconditions for preventing such a situation from occurring are to make the inhabitants understand the importance of maintenance and administration and to establish an autonomous administration system. In other words, it is important that a public organization (GWSC) educates and guides the inhabitants in the proper use of the facilities and in the techniques of routine inspection and simple repair work, and that by this, an organic linkage be established between the two.

(3) Hygiene education

The supply of safe water is one of the prerequisites for coping with diarrhoea, but this alone is not sufficient to attain the objective. It is necessary that the basic knowledge of health and sanitation be disseminated and practiced by every inhabitant.

(4) Arrangement for implementation

Inflation is rampant in Ghana today, and even though devaluations are enforced the prices always rise even more. Accordingly, the problem is whether the estimated amount, through allowing for inflation, will still be valid at the time of implementation. Our judgement is that some adjustments in the ordered amounts would be necessary at that time.

At the same time, as the drilling work is contingent on the executing capability of the contractors, the work is likely to extend over a long period. It would therefore be necessary to either allow for price rises in the interim period or adjust the ordered amount by each well. Too many uncertainties are involved when the contract amount has to be settled in Ghana's currency. An arrangement that allows for accounts to be settled in a relatively stable foreign currency would therefore be desirable. (Case 2 or case 3 of Table 4.6.1).

APPENDICES

Appendix 1 Formation of Survey Team

1.	Mr. Akinori TAKAKU (Hydrogeology)	Japan Engineering Consultants Co., Ltd.
2.	Mr. Tamio ISHII (Well Digging Supervision)	Japan Engineering Consultants Co., Ltd.
3.	Mr. Ryoji IMAI (Well Digging Supervision)	Japan Engineering Consultants Co., Ltd.

Appendix 2 Itinerary for Work in Ghana

Date 1985		Contents of Survey
Apr.	1 (Mon)	TAKAKU, ISHII Leave Narita 21:30 KL-868
	2 (Tue)	Arrive Amsterdam 07:05
	3 (Wed)	Leave Amsterdam 12:20 KL-577 Arrive Accra 18:50
	4 (Thu)	Meeting with Japanese experts on Noguchi Memorial Institute for Medical Research (N.M.I.M.S.) Courtesy call at Japanese Embassy. Courtesy call G.W.S.C. Meeting with G.W.S.C. Engineers
	5 (Fri)	Gomoa-Fetteh village. Courtesy call Chief of Gonioa
	6 (Sat)	Purchasing of survey materials on Accra city
	7 (Sun)	Internal meeting for negotiation of agreement with G.W.S.C.
	8 (Mon)	Meeting with Japanese experts on N.M.I.M.R. Discussed on Technical Survey
	9 (Tue)	Extension of the Visas Meeting with Japanese experts on N.M.I.M.R. for the contents of the survey and survey schedule Discussed on negotiation of agreement with G.W.S.C. for the test well drilling work
	10 (Wed)	Enter into a negotiation with G.W.S.C. Collecting several data of Geography and maps
	11 (Thu)	Negotiatins with G.W.S.C. for the test well drilling work. Meeting with Japanese experts.
	12 (Fri)	Field investigation at Gomoa-Fetteh
	13 (Sat)	Field investigation at Ashonman
	14 (Sun)	Water quality test and data arrangement

Date 1985		Contents of Survey
Apr.	15 (Mon)	Negotiation with G.W.S.C. Meeting with Japanese experts
	16 (Tue)	Electrical prospecting survey at Gomoa-Fetteh.
	17 (Wed)	Ditto
	18 (Thu)	Negotiation with G.W.S.C. Observation of local contractor in Accra city
	19 (Fri)	Negotiation with G.W.S.C.
	20 (Sat)	Visit to GWSC-DRILLING UNIT, Kumasi
	21 (Sun)	Electrical prospecting survey at Gomoa-Fetteh
	22 (Mon)	Negotiation with G.W.S.C.
	23 (Tue)	Electrical prospecting survey at Gomoa-Fetteh
	24 (Wed)	Ditto
	25 (Thu)	Meeting with Japanese experts on N.M.I.M.R. To make a revised draft document of agreement with G.W.S.C.
	26 (Fri)	Sampling water of the existing wells at Gomoa-Fetteh. Observation of material prices on Accra city
	27 (Sat)	Field investigation at Ashonman IMAI Leave Narita
	28 (Sun)	Survey (levelling) at Gomoa-Fetteh Water quality test for sample of Ashonman IMAI Arrive Amsterdam
	29 (Mon)	Made an agreement with G.W.S.C. IMAI Leave Amsterdam KL-539 Arrive Accra 18:50
	30 (Tue)	Field investigation at Gomoa-Fetteh Fixed boring point for test well
May	1 (Wed)	Courtesy call on chief of Ashonman Electrical prospecting survey at Ashonman
	2 (Thu)	The first advance payment to G.W.S.C. Meeting with Japanese experts on N.M.I.M.R. Visit to the Japanese Embassy

Date 1985		Contents of Survey
May	3 (Fri)	Meeting with boring crew of G.W.S.C. on the site Meeting with G.W.S.C. and W.R.R.I.
	4 (Sat)	Data analysis of electrical prospecting survey
	5 (Sun)	Data analysis of electrical prospecting survey
	6 (Mon)	Meeting with G.W.S.C. and W.R.R.I. Adjustment of rig and machine by G.W.S.C. crew on the site Discussed on schedule Boring work
	7 (Tue)	Meeting with G.W.S.C. and W.R.R.I. Meeting with Japanese experts on N.M.I.M.R. Start boring work Collecting data
	8 (Wed)	Meeting with G.W.S.C. Mr. TAKAKU courtesy call at Japanese Embassy, and leave Accra 20:50 KL-578 Boring work
	9 (Thu)	Boring work at Gomoa-Fetteh
	10 (Fri)	The second advance payment to G.S.W.C. Pumping test on test well used by bailer on NSAWAN Mr. TAKAKU arrive Narita 16:55 KL-863
	11 (Sat)	Meeting with G.W.S.C. (Spare parts of rig winch)
	12 (Sun)	Data arrangement
	13 (Mon)	Electrical prospecting survey at Gomoa-Fetteh
	14 (Tue)	Measurement of electrical logging on test well
	15 (Wed)	Measurement of electric conductivity on test well Electrical prospecting survey
	16 (Thu)	Electrical prospecting survey
	17 (Fri)	Visit to GWSC-DRILLING UNIT, Kumasi Discussed on spare parts of rig winch

Date 1985		Contents of Survey
May	18 (Sat)	Return to Accra Data arrangement
	19 (Sun)	Field investigation of the existing wells on Gomoa-Fetteh
	20 (Mon)	Measurement of electrical logging and electric conductivity on test well Field investigation of the existing wells Boring work restart
	21 (Tue)	Electrical prospecting survey Boring work
	22 (Wed)	Electrical prospecting survey at Gomoa-Fetteh Boring work
	23 (Thu)	Electrical prospecting survey at Gomoa-Fetteh Boring work
	24 (Fri)	Measurement of electrical logging on test well Boring work
	25 (Sat)	Pumping test on test well used by bailer Boring work
	26 (Sun)	Electrical prospecting survey Boring work at Gomoa-Fetteh
	27 (Mon)	Pumping test on test well used by bailer Boring work Electrical prospecting survey
	28 (Tue)	Data arrangement
	29 (Wed)	Electrical prospecting survey and measurement of electrical logging
	30 (Thu)	Meeting with G.W.S.C.
	31 (Fri)	Boring work is restarted.
June	1 (Sat)	Meeting with G.W.S.C. (recovery of accident) Data arrangement
	2 (Sun)	Data arrangement
	3 (Mon)	Meeting with Japanese experts on N.M.I.M.R.

Date 1985		Contents of Survey
June	4 (Tue)	Transporting machines Data arrangement
	5 (Wed)	Electrical prospecting survey and water quality test Boring work restart Data collection at G.W.S.C. and UNICEF
	6 (Thu)	Data collection at G.W.S.C., UNICEF and IGIP/GWSC
	7 (Fri)	Meeting with Japanese experts on N.M.I.M.R. Electrical prospecting survey Boring work
	8 (Sat)	Electrical prospecting survey Boring work
	9 (Sun)	Data arrangement
	10 (Mon)	Data correction at G.W.S.C. Boring work
	11 (Tue)	Boring work at Gomoa-Fetteh
	12 (Wed)	Boring work
	13 (Thu)	Boring work Data arrangement
	14 (Fri)	Meeting with G.W.S.C.-Kumashi Data arrangement of electrical prospecting survey Boring work
	15 (Sat)	Measurement of electrical logging and water quality test Pumping test on test well
	16 (Sun)	Data arrangement of yesterday's test
	17 (Mon)	Pumping test on test well at Gomoa-Fetteh
	18 (Tue)	Ditto Work to finish well
	19 (Wed)	Data arrangement of several test Boring work, cementation for lower part of test well Work to finish well

	Date 1985	Contents of Survey
June	20 (Thu)	Data arrangement and analysis made Work to finish well
	21 (Fri)	Data arrangement Work to finish well
	22 (Sat)	Work to finish well
	23 (Sun)	Data arrangement and analysis made Work to finish well
	24 (Mon)	Meeting with Japanese experts on N.M.I.M.R. Data arrangement of several test
	25 (Tue)	Pumping test on test well by bailer Work to finish well
	26 (Wed)	Meeting with Japanese experts Mr. IMAI leave Accra 20:50 KL-578 Work to finish well
	27 (Thu)	Meeting with G.W.S.C. (Liquidation of boring work cost) Work to finish well
	28 (Fri)	Ditto
	29 (Sat)	Visit to GWSC-DRILLING UNIT Discussed on liquidation of final cost of boring work Mr. IMAI arrive Narita 15:00 KL-867
	30 (Sun)	Mobilisation of boring rig and materials
July	1 (Mon)	Data arrangement
	2 (Tue)	Meeting with G.W.S.C. (Final report) Mobilisation of boring rig and materials Measurement of electric conductivity
	3 (Wed)	Ditto
	4 (Thu)	LIBATION FOR TEST WELL sponsored by chief of Gomoa-Fetteh
	5 (Fri)	Meeting with GWSC Boring Crew on the site for mobilisation of equipment
	6 (Sat)	Data arrangement
	7 (Sun)	Data arrangement

Date 1985		Contents of Survey
July	8 (Mon)	Boring work, mobilisation is almost finished.
	9 (Tue)	Final payment for G.W.S.C.
	10 (Wed)	Meeting with G.W.S.C. (Final Report) Removing machines for baring
	11 (Thu)	Receipt the Final Report made by G.W.S.C.
	12 (Fri)	Mr. ISHII courtesy call Japanese experts and leave Accra 20:20 KL-594
	13 (Sat)	Mr. ISHII arrive Amsterdam 07:15
	14 (Sun)	Mr. ISHII leave Amsterdam 14:15 KL-967
	15 (Mon)	Arrive Narita 15:00

Appendix 3 Officials Concerned

1. University of Ghana

Dr. F. C. Grant	Director, Noguchi Memorial Institute for Medical Research (NMIMR)
Mr. M. F, Robeiro	Secretary, NMIMR
Mr. I. Frempong	Chief Purchasing Officer

2. Ghana Water and Swerage Corporation (GWSC)

Mr. E. K. Y. Dovlo	Ag. Managing Director Chief Engineer
Mr. P. B. K. Agbettoh	Legal Adviser
Mr. S. Owusu	Principal Hydrogeologist, Planning and Research Department
Mr. A. D. Gyamfi	Drilling Engineer, Drilling Engineer's Office (Kumasi)
Mr. N. A. Amoh	Chief Tech. Engineer, Drilling Engineer's Office (Kumasi)
Mr. R. K. D. Van-Ess	Hydrogeologist, Drilling Engineer's Office (Kumasi)
Mr. E. Gaze Tse	Hydrogeologist, Drilling Engineer's Office (Kumasi)
Mr. G. Wollschied	Project Manager, Maintenance Unit 3000 wells (IGIP/GWSC)

3. Water Resources Research Institute (WRRI)

Mr. L. G. Quist	Head, Groundwater Division
Mr. G. K. Asiaman	Hydrogeologist

4. Meteorological Service Department

Mr. S. E. Tandoh	Ag. Director
Mr. J. E. Dankwa	1st Deputy Director
Mr. M. B. Yelifari	Principal Meteorologist
Mr. A. Lamptey	Meteorologist, Climate Division

5. United Nations International Children's Emergency Fund (UNICEF)

Mr. J. E. Quarm	Project Officer

6. Fete

Mr. Nana Abor Ewusi XIX	Chief, Fete

7. Ashonman

Mr. Aryee Anang	Chief, Ashonman

8. Embassy of Japan

Mr. Y. Kotaki	Counsellor
Mr. S. Okumura	Third Secretary

9. Japanese Experts

Dr. T. Kato	Team Leader
Dr. E. Ido	
Dr. Y. Yoshimura	
Dr. M. Ikegami	
Dr. T. Rikimaru	
Dr. S. Torigoe	

Appendix 4 List of Collected Data

1. Rural Water Supply - Use, Abuse and Community Participation
2. Five Year Development Plan (1985 – 1989) for Groundwater - Based Water Supplies
3. 1984 Population Census of Ghana Preliminary Report
4. A New Geography of Ghana
5. Volume VIII Geophysical Investigations Final Report, 3000 Well Drilling Programme in Southern and Central Ghana
6. Volume X Water Quality Final Report, 3000 Well Drilling Programme in Southern and Central Ghana
7. The Task of Renovation and Operation of Water Supply and Sanitation in Ghana (11th WEDC Conference Dares Salaam 15 – 19 April 1985)
8. Operation and Maintenance of Rural Handpump Water Supply Systems in Ghana, West Africa (11th WEDC Conference Dares Salaam 15 – 19 April 1985)
9. Organization and Participation in Rural Water Supplies Programme in Ghana (11th WEDC Conference Dares Salaam 15 – 19 April 1985)
10. Water Supply for Three District Schemes. Feasibility Studies Vol. 4
11. Republic of Ghana, Water Supply and Sanitation National Action Plan Vol. 2 1982
12. Road Map of Ghana (1:1,000,000)
13. National Atlas of Ghana (1:1,500,000) River Flow
14. National Atlas of Ghana (1:1,500,000) Population Density 1921 – 1960
15. National Atlas of Ghana (1:1,500,000) Physical
16. National Atlas of Ghana (1:1,500,000) Network of Meteorological Stations
17. Map (1:62,500) Winneba N.E. Sheet 32
18. Map (1:62,500) Winneba N.E. Sheet 33
19. Map (1:62,500) Nsaba S.E. Sheet 56
20. Map (1:62,500) Accra S.W. Sheet 59
21. Map (1:62,500) Accra S.E. Sheet 60
22. Geological map of the Accra region ; scale = 1/62,500

23. Hydro Geological map of Ghana ; scale = 1/1,000,000

24. The geology of 1/4 field sheet No. 32

25. Mean Monthly and Annual Rainfall Maps, May 1974

26. Probability Distribution of Annual Rainfall in Ghana, 1973

27. Monthly Rainfall Data (1975 –1984)
Legon, Pomadze, Kwanyako, Salt Pond, Agona Swedru, Akropong Akwapin, Aburi, Oyarifa, Ashiaman, Pokoase, Tema

28. Mean Daily Max. and Mini. Temperature (20 years av,) Data
Tema, Accra

29. Open Water Evaporation - Penman's Method Data Accra (1964 – 1981)

30. Report on Bacteriological Examination of Water at Gomoa-Fetteh, Ashonman and Ashaley-Botwe, Jan 1985

31. Report on Parasitological Results of Water from Gomoa-Fetteh, Jan 1985

32. Report on Chemical and Bacteriological Examination of Water at Gomoa-Fetteh, Jan 1985

33. List of Prices of Goods

34. Data of Open Market Price

Appendix 5 Rainfall Data

Pomadze Monthly Rainfall Totals (mm)

	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
1975	-	-	-	-	-	-	-	-	-	-	-	-
76	6.1	131.3	86.9	245.3	71.5	93.5	5.9	33.3	6.7	21.2	59.2	2.4
77	38.9	9.1	57.2	104.4	101.9	219.1	-	37.4	35.5	103.1	39.7	0.0
78	0.8	40.9	7.7	128.1	126.6	141.1	9.9	11.2	17.2	150.4	1.0	17.8
79	0.0	41.6	72.7	75.9	193.8	468.1	98.0	68.0	96.2	153.8	138.1	4.1
80	0.5	15.5	34.2	174.6	216.6	289.9	105.4	-	127.1	115.2	53.4	3.3
81	7.4	22.9	55.7	47.8	410.4	163.0	111.4	61.2	60.3	38.9	5.9	-
82	5.1	25.7	52.3	189.7	190.8	420.1	82.9	0.6	1.5	50.1	8.7	14.8
83	0.0	0.0	1.8	0.0	107.5	55.7	4.1	0.0	24.7	2.0	61.0	-
84	-	-	-	-	-	-	-	-	-	-	-	-

Kwanyako Monthly Rainfall Totals (mm)

	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
1975	0.0	65.5	144.8	62.5	171.5	162.6	156.7	13.2	14.0	75.4	125.7	27.9
76	0.0	140.5	130.1	154.9	92.9	85.1	21.7	21.2	6.4	67.4	124.1	41.9
77	62.3	72.5	65.7	100.0	189.7	146.2	64.2	23.5	75.5	83.2	38.6	38.0
78	55.6	74.9	42.7	137.6	217.6	194.0	15.4	9.1	105.3	25.6	107.0	53.0
79	0.0	17.3	54.2	82.8	195.4	393.4	199.7	88.4	160.0	105.4	97.6	1.8
80	6.6	41.7	83.9	143.8	282.5	147.3	111.8	86.4	118.2	251.7	60.6	22.6
81	16.5	45.5	90.4	90.1	287.1	196.6	184.7	73.9	75.8	115.2	40.4	72.0
82	13.5	39.6	155.6	84.6	94.7	204.1	103.5	9.6	-	-	-	-
83	0.0	0.0	4.8	0.0	127.8	161.7	103.5	9.9	2.8	59.7	145.6	16.7
84	-	-	-	-	-	-	-	-	-	-	-	-

Legon Monthly Rainfall Totals (mm)

	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
1975	0.12	2.60	5.65	2.29	3.69	9.70	3.11	0.30	0.80	1.63	2.31	2.09
76	TR	62.8	74.9	157.7	39.6	97.2	23.4	0.8	33.6	81.3	30.0	8.9
77	15.2	11.2	55.1	86.4	85.7	71.7	9.6	18.2	36.4	146.5	11.2	9.5
78	0.0	-	3.6	124.9	317.3	107.2	17.4	11.0	23.0	37.8	1.8	0.0
79	0.0	11.4	38.9	31.2	161.6	191.1	26.9	42.0	-	200.8	101.0	0.0
80	3.3	4.6	41.9	168.9	204.5	130.0	101.7	62.5	90.5	56.6	40.0	31.1
81	2.9	24.9	47.0	20.3	191.4	175.7	129.0	39.4	79.2	38.0	24.6	22.4
82	35.3	37.2	67.8	113.1	106.2	302.0	84.2	3.2	0.2	81.1	15.4	0.8
83	0.0	0.0	TR	48.7	76.2	155.9	-	14.3	47.0	1.7	35.7	10.1
84	14.0	1.3	90.6	66.9	199.4	89.9	198.6	76.5	76.4	55.8	17.6	30.0

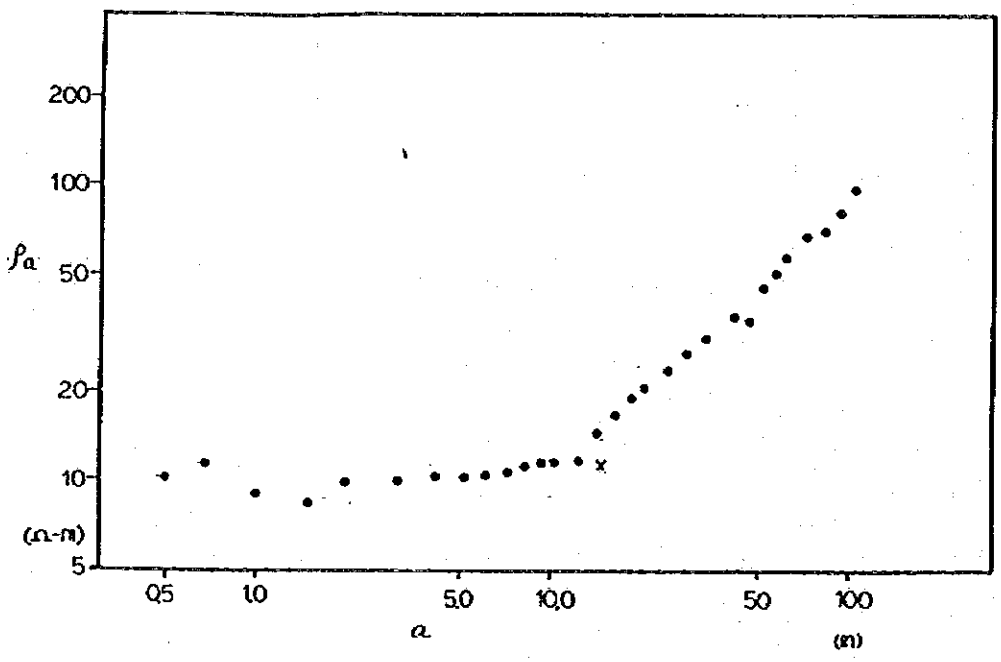
Pokoase Monthly Rainfall Totals (mm)

	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
1975	19.1	47.2	37.9	74.9	120.1	269.5	88.9	31.7	45.2	85.9	121.7	42.4
76	0.0	75.0	94.0	115.6	81.2	166.9	9.1	6.6	19.3	165.8	38.1	1.8
77	18.8	48.7	55.9	86.3	150.1	102.8	18.8	38.4	28.4	112.4	15.0	39.2
78	6.3	51.6	74.7	103.2	385.7	124.6	18.0	15.7	50.2	82.8	74.6	0.0
79	0.0	53.9	41.2	54.3	47.6	288.1	103.9	-	127.3	246.6	98.1	0.0
80	3.6	47.8	58.9	100.4	194.6	216.9	126.4	114.3	202.0	77.0	107.3	24.0
81	16.4	41.4	33.0	30.4	184.9	240.7	120.0	39.2	47.9	97.1	91.1	6.7
82	3.5	52.7	181.3	37.1	135.9	124.8	82.8	2.1	0.0	116.3	-	0.0
83	0.0	0.0	0.0	28.6	87.6	133.8	2.1	5.4	83.1	34.5	32.7	38.0
84	34.2	14.6	42.0	-	-	61.7	82.2	159.8	112.1	123.2	33.8	15.0

Appendix 6 Electric Prospecting Data

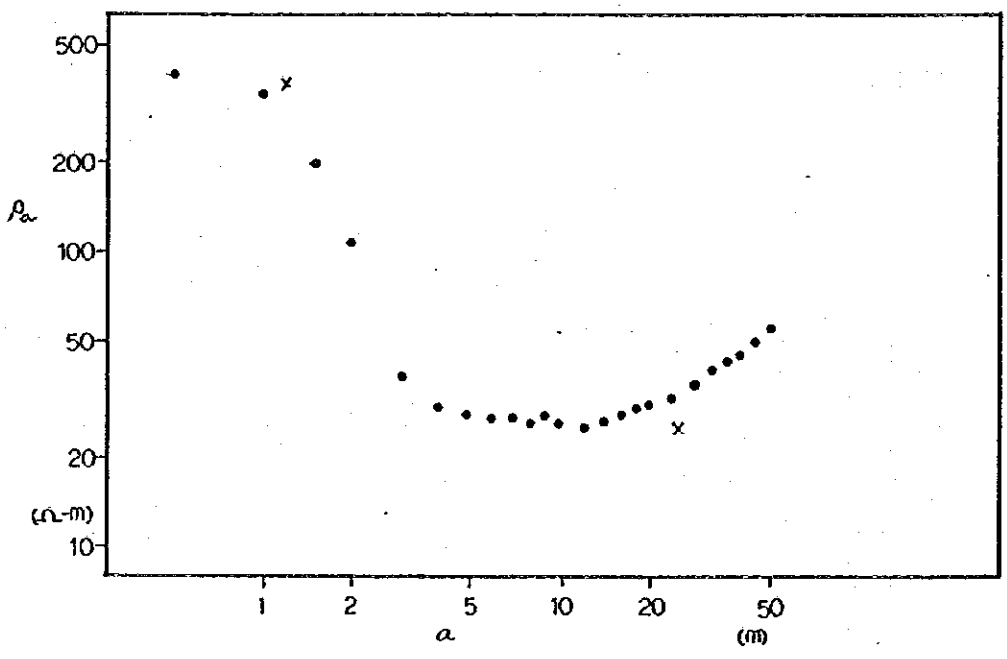
Appendix 6a ρ - a Curve (Fete)

A - 1



11	550<

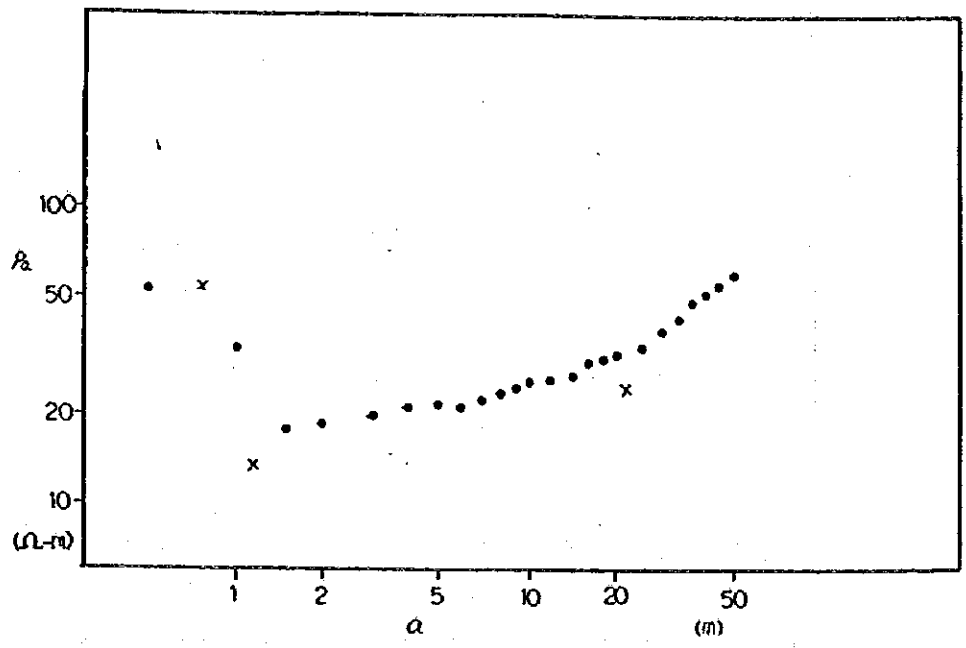
B - 1



370	25	260

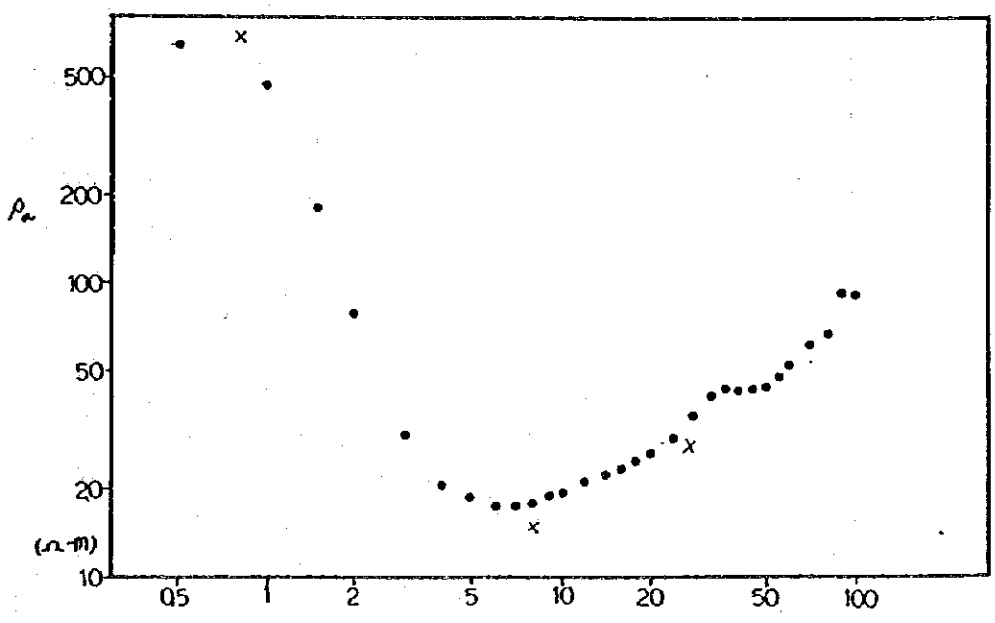
Appendix 6a ρ - a Curve (Fete)

B - 2



54	5	27	250

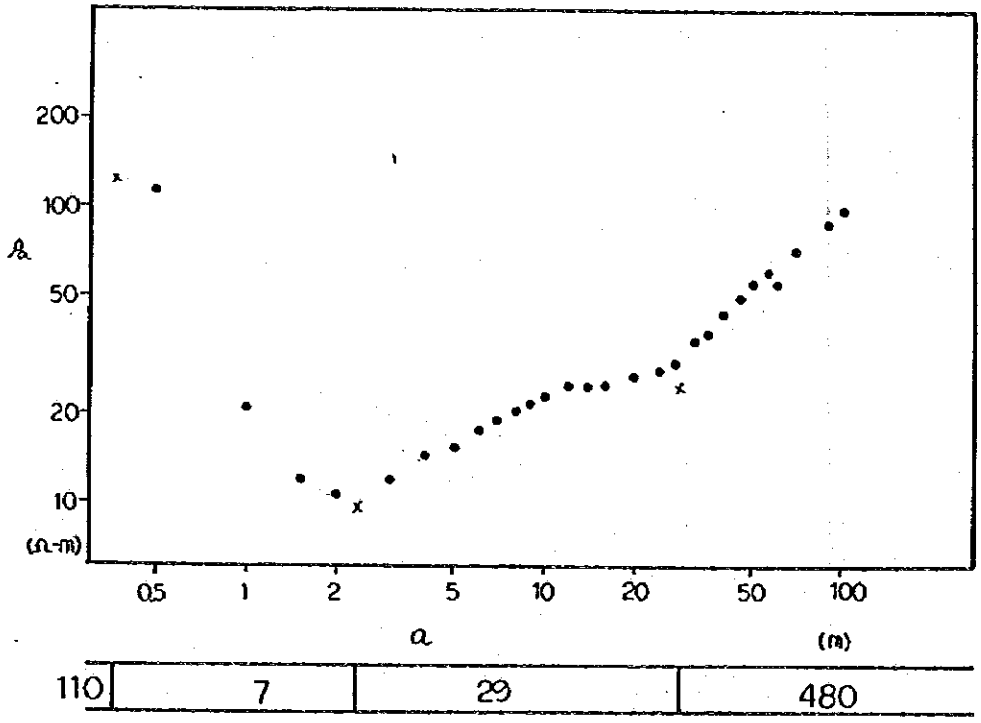
B - 3



700	14	45	196

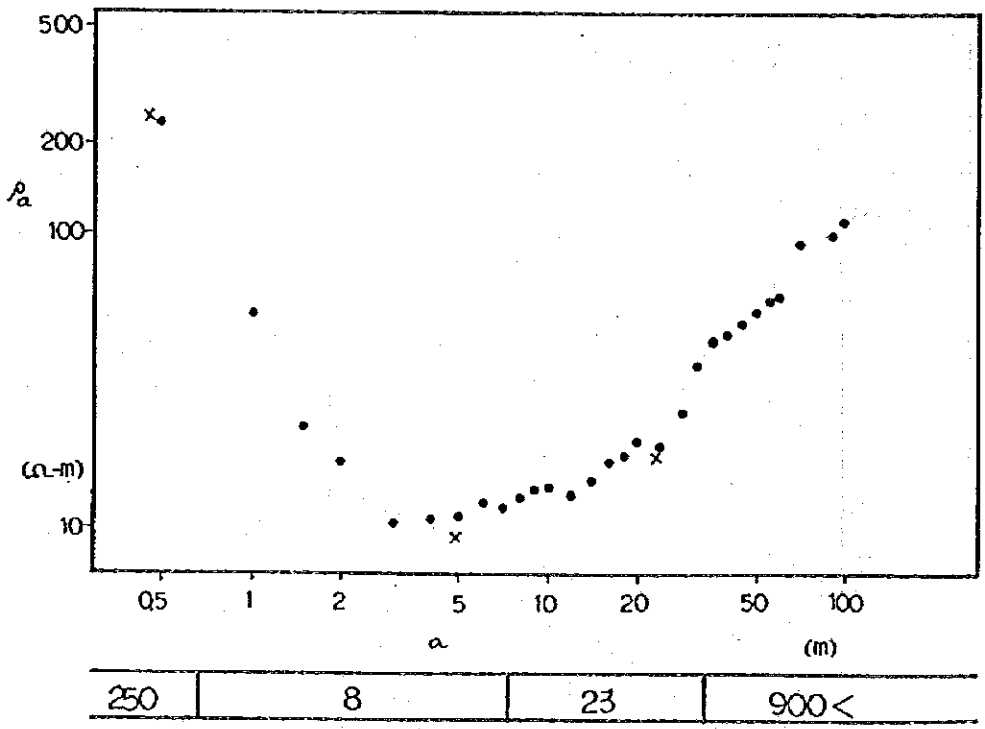
Appendix 6a ρ - a Curve (Fete)

B - 4



110	7	29	480

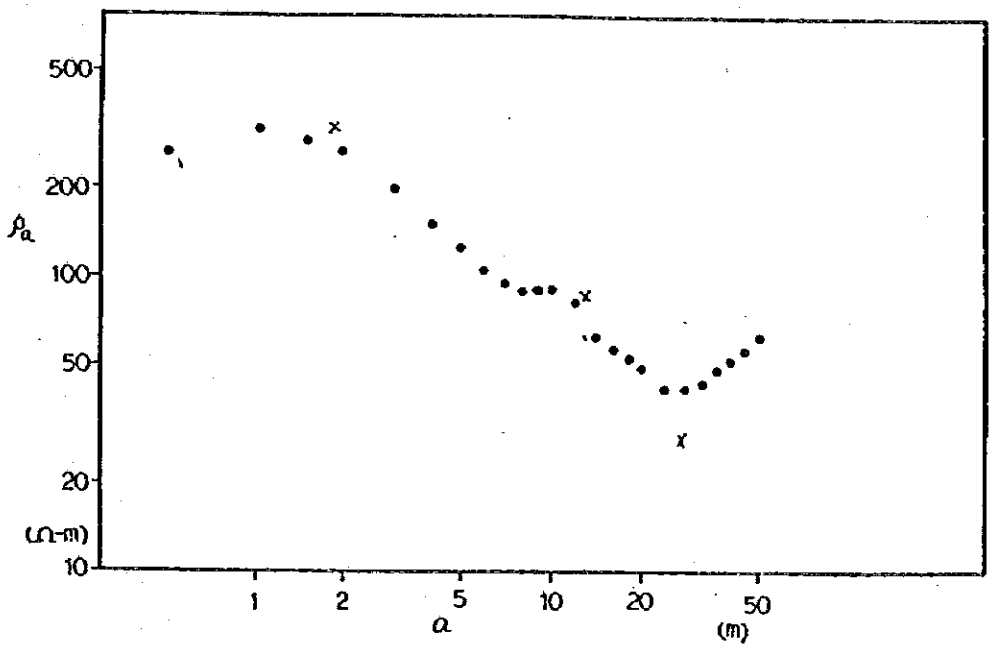
B - 5



250	8	23	900<

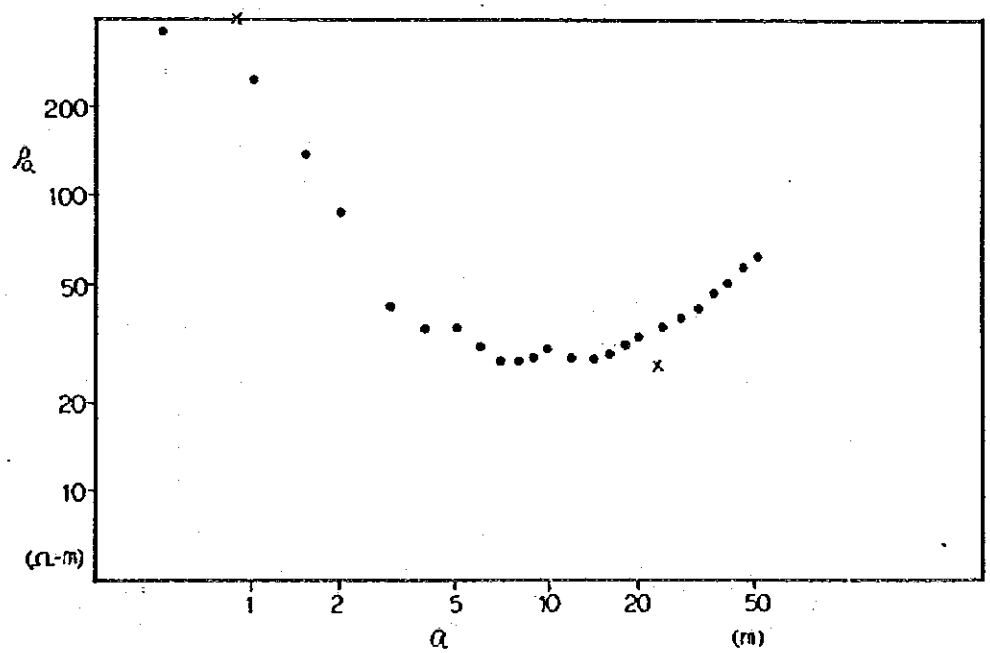
Appendix 6a ρ - a Curve (Fete)

C - 1



320	80	18	420

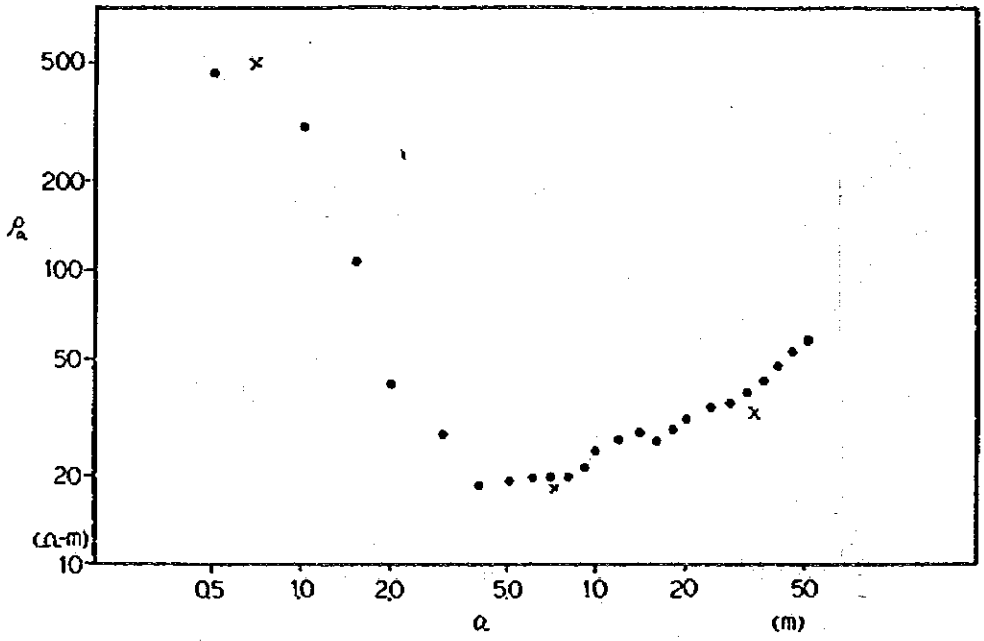
C - 2



400	27	270

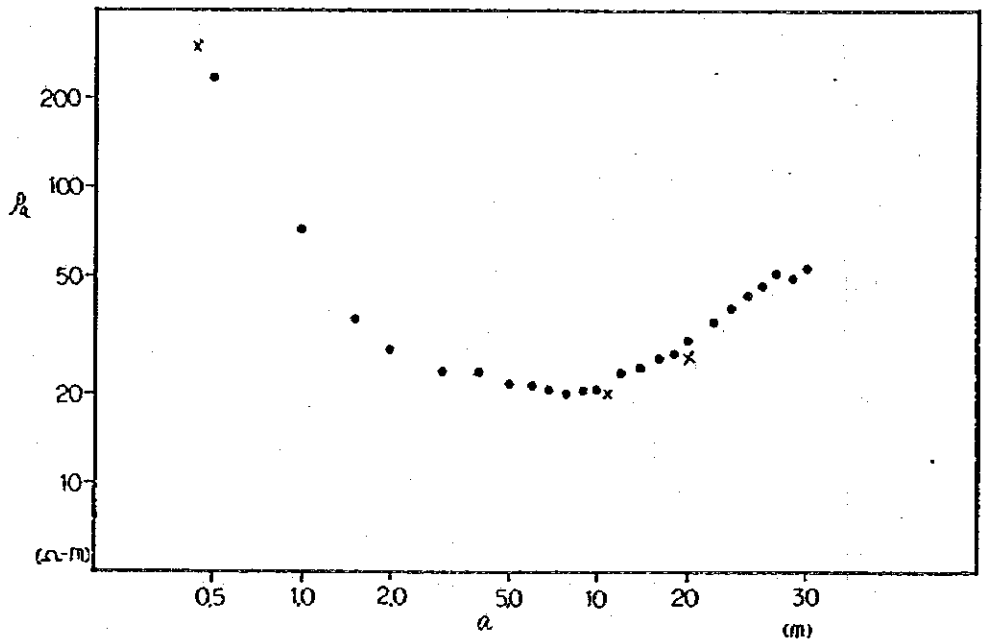
Appendix 6a ρ - a Curve (Fete)

C - 3



500	18	45	330

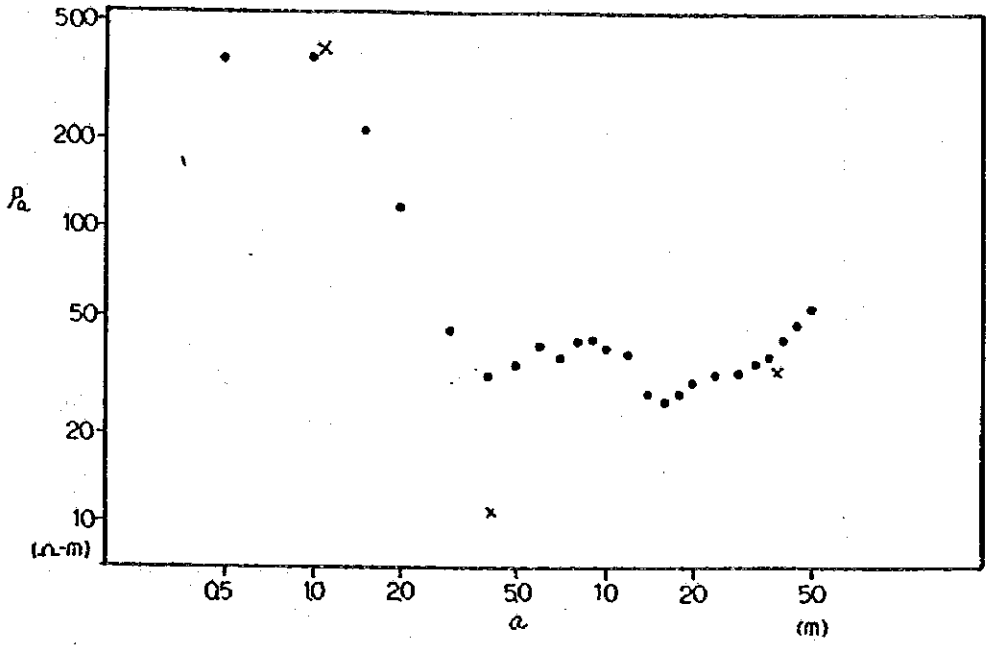
C - 4



300	20	50	108

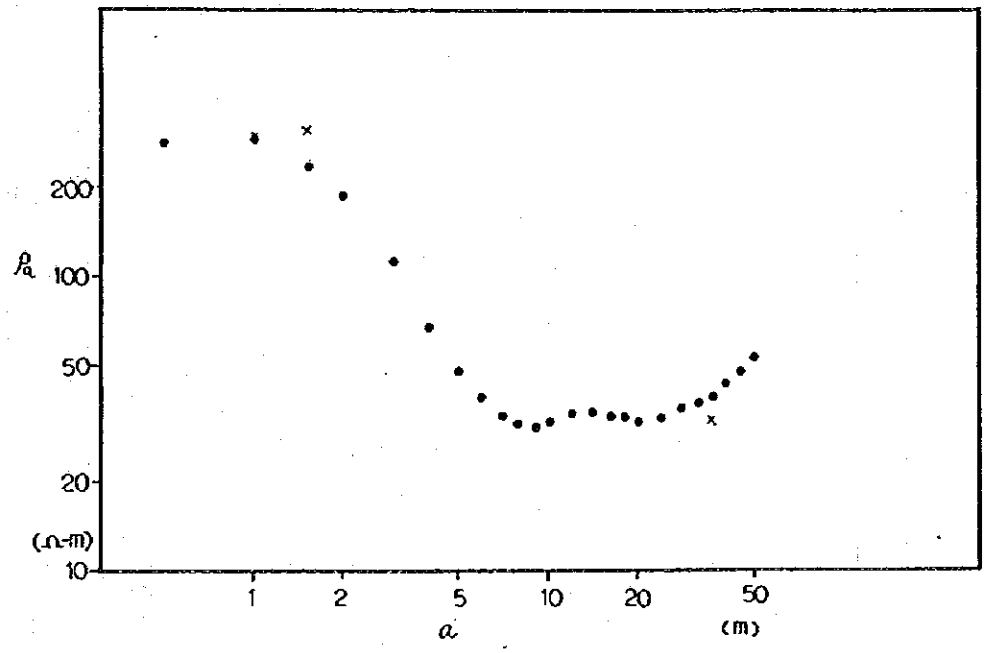
Appendix 6a ρ - a Curve (Fete)

C - 5



400	8	160	44	300~500

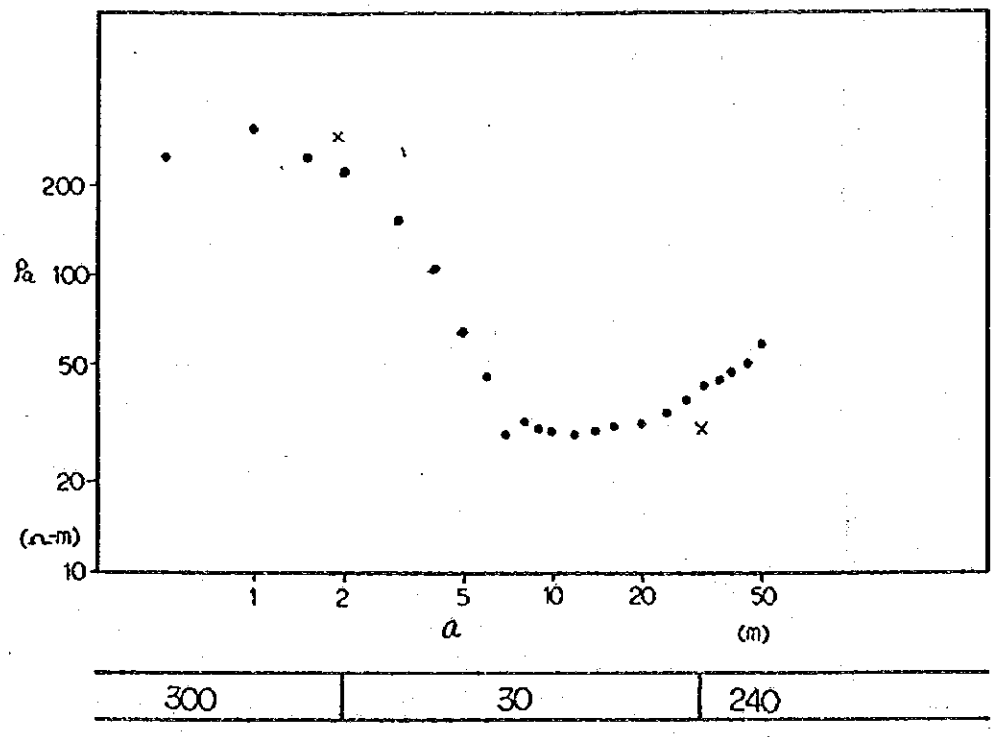
D - 1



320	32	320

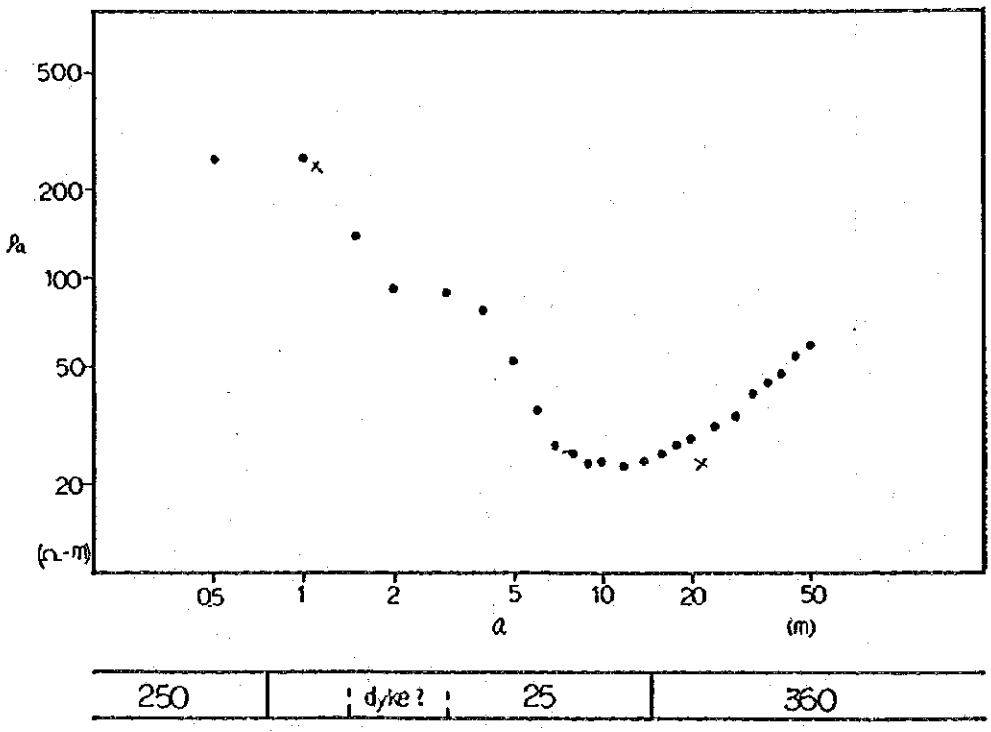
Appendix 6a ρ - a Curve (Fete)

D - 2



300	30	240

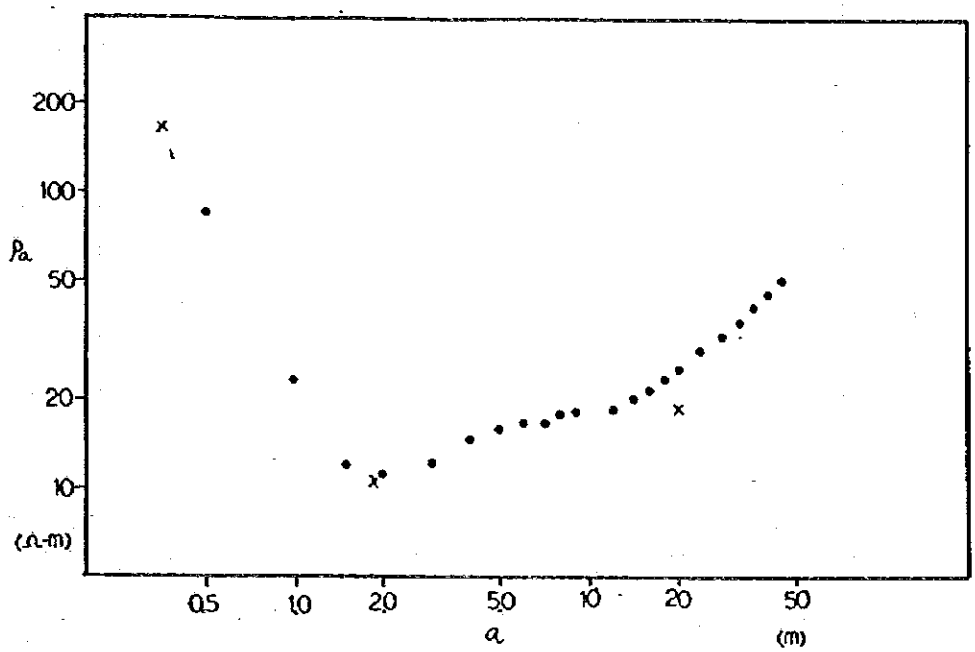
D - 3



250	dyke ?	25	360

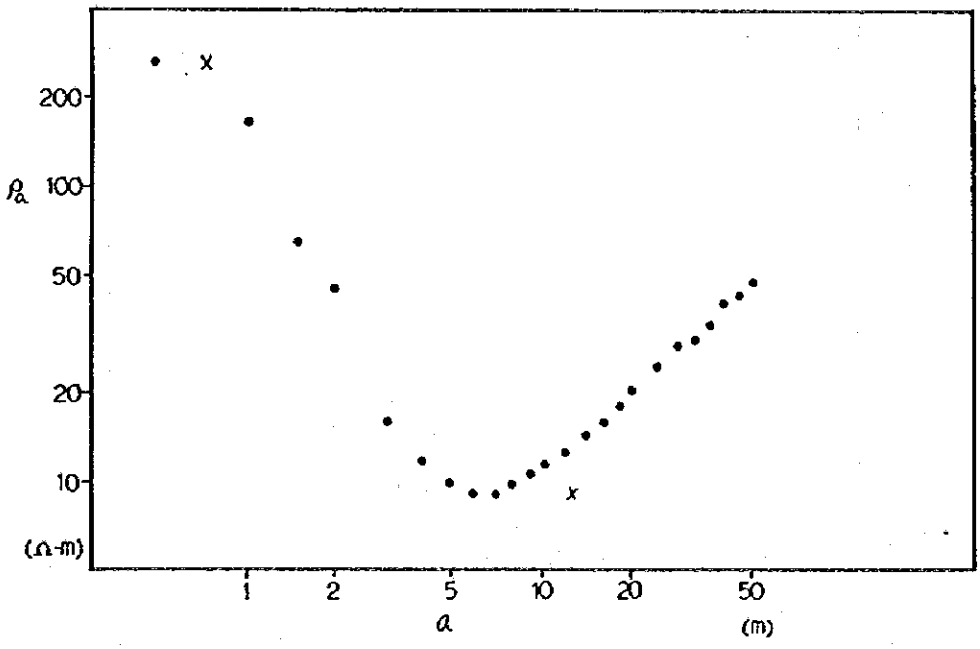
Appendix 6a ρ - a Curve (Fete)

D - 4



170	9	21	570

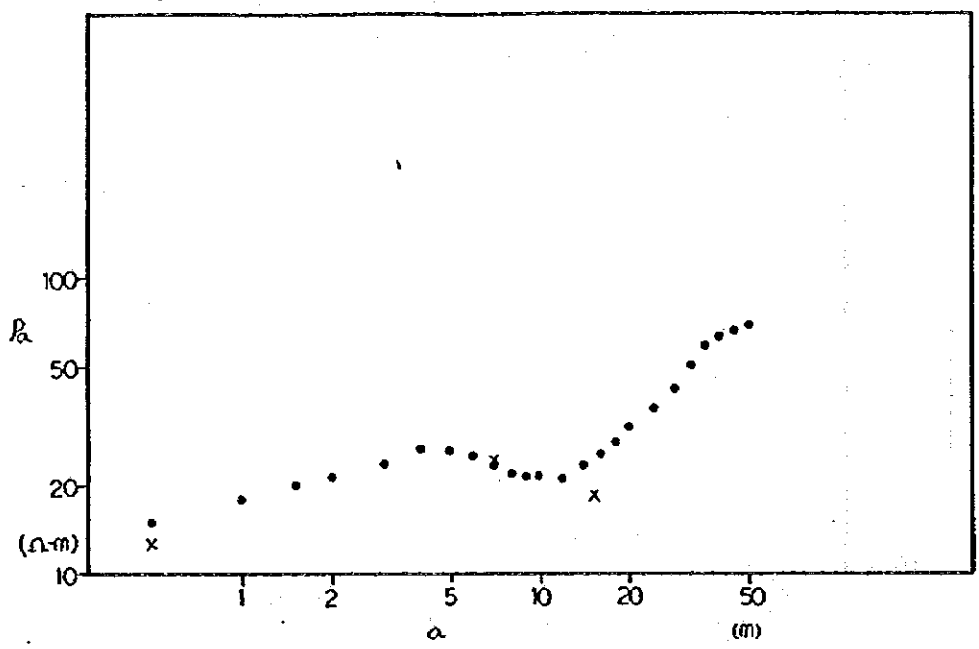
D - 5



260	9	270

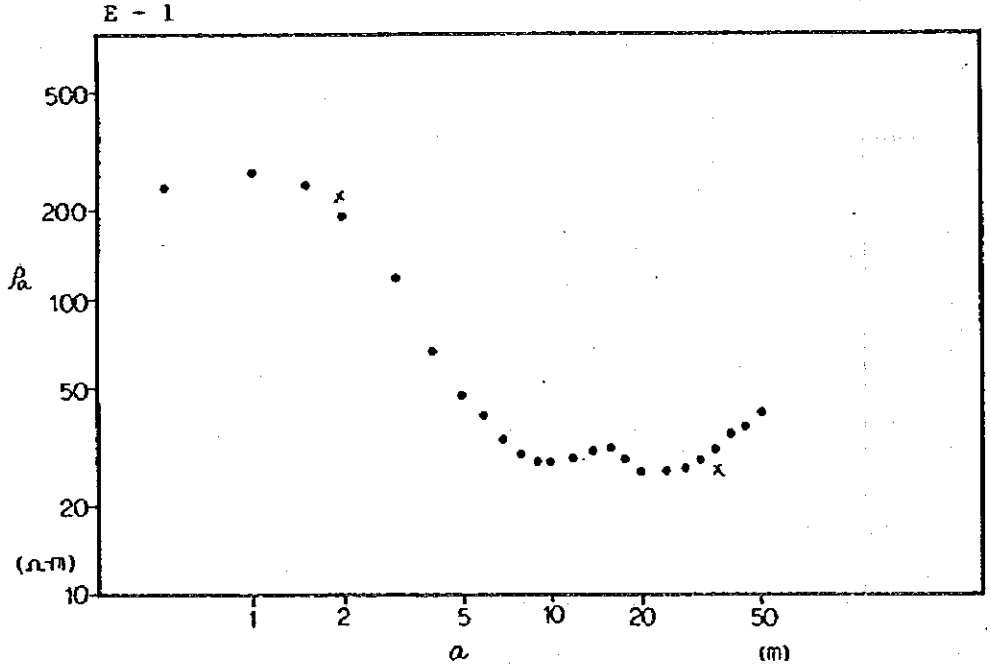
Appendix 6a ρ - a Curve (Fete)

D - 6



13	26	16	540

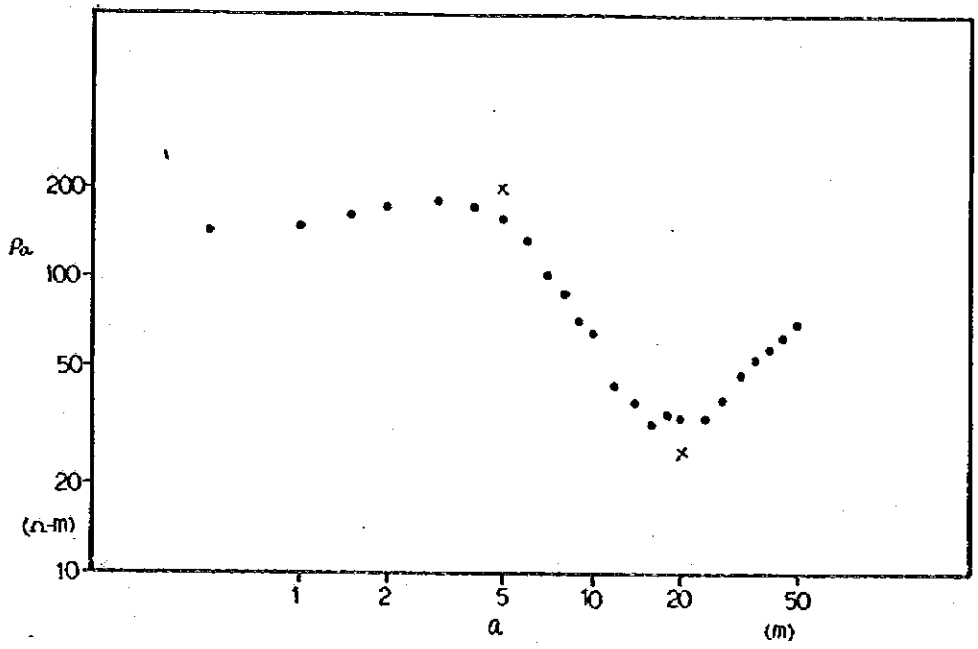
E - 1



230	26	260

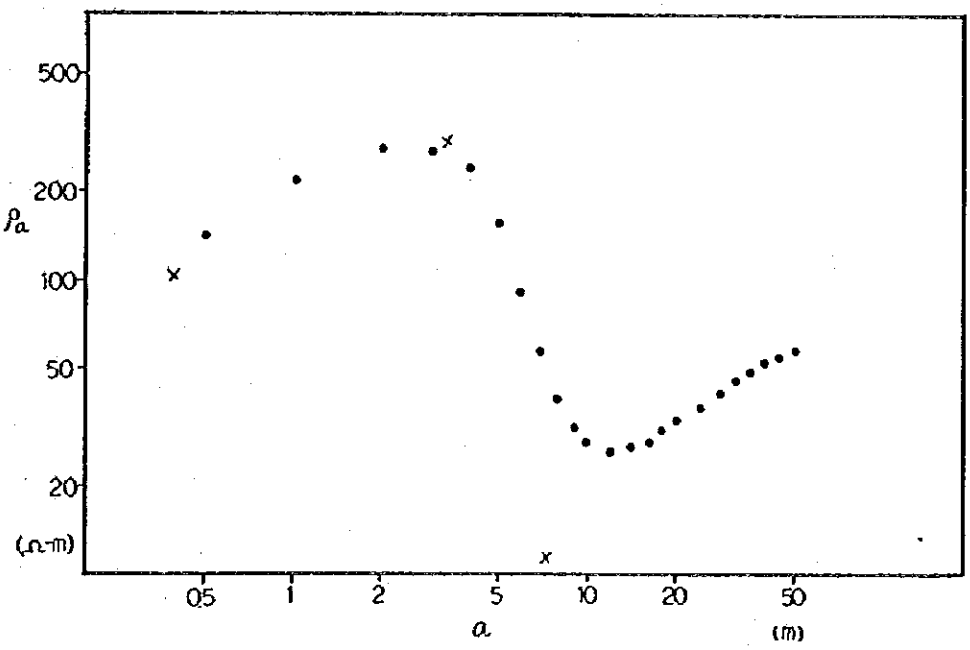
Appendix 6a ρ - a Curve (Fete)

E - 2



200	20	500

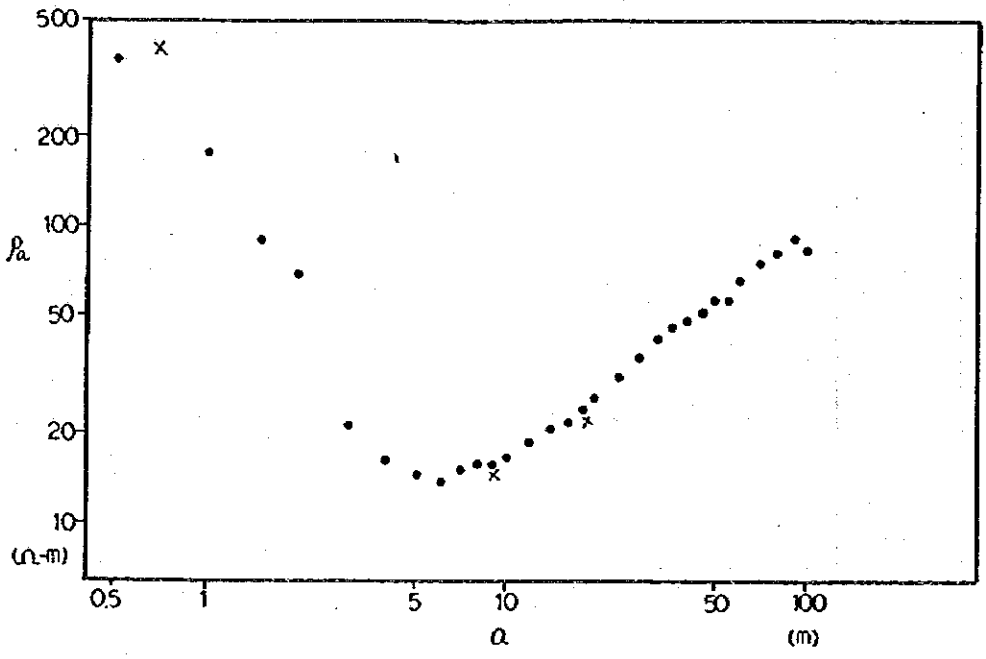
E - 3



105	420	6	115

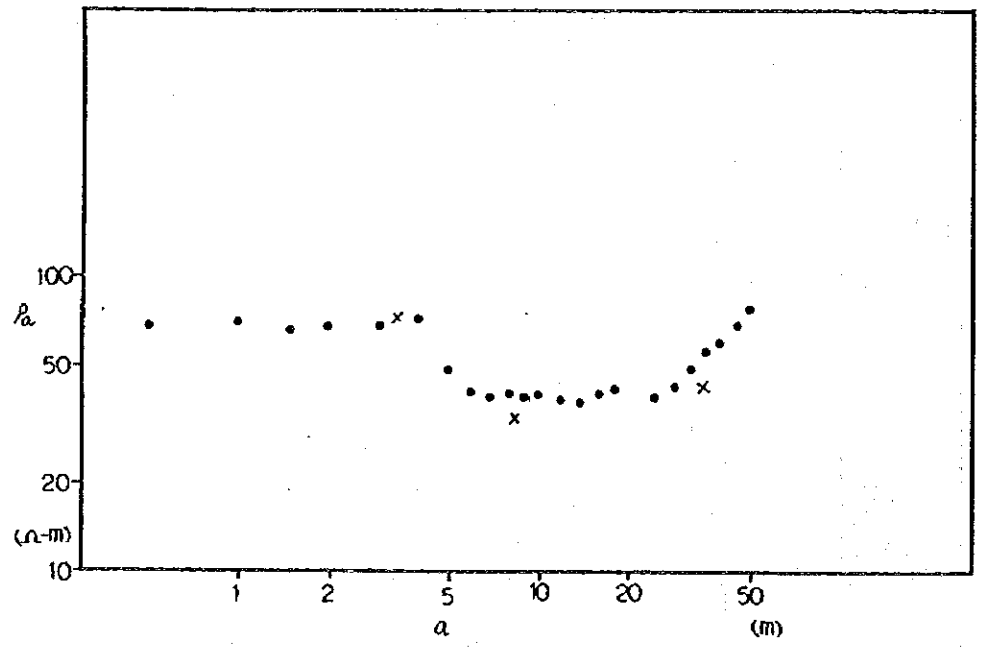
Appendix 6a ρ - a Curve (Fete)

E - 4



400	13	45	225

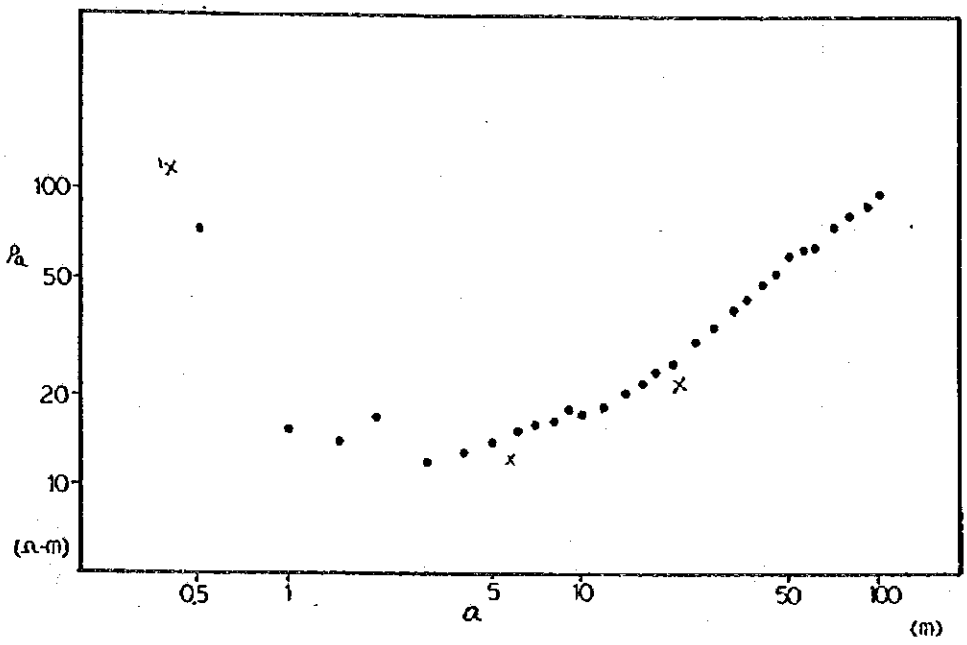
E - 5



70	23	50	420

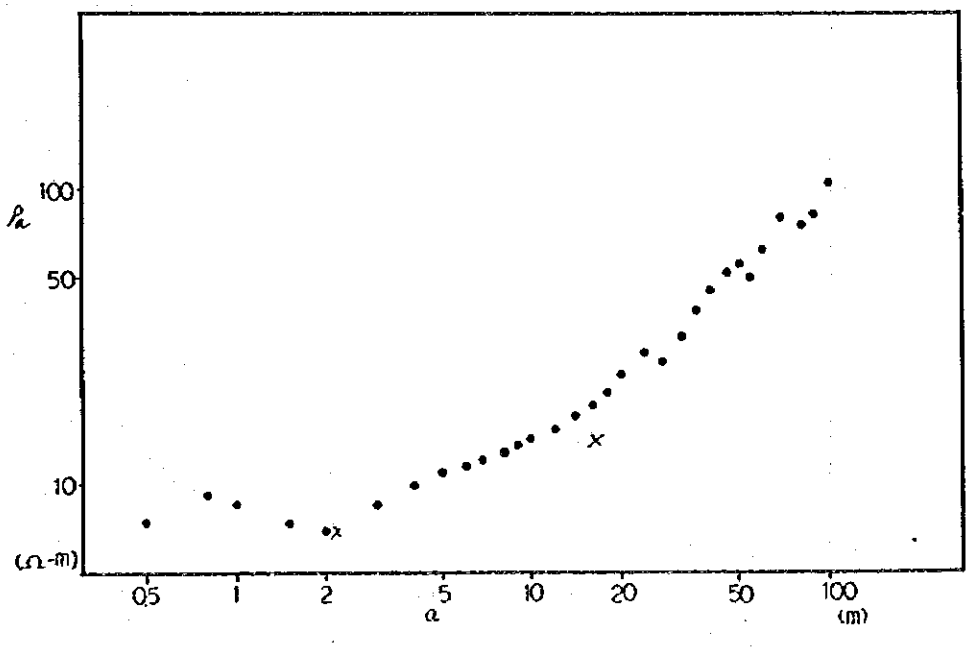
Appendix 6a ρ - a Curve (Fete)

E - 6



120	12	36	230

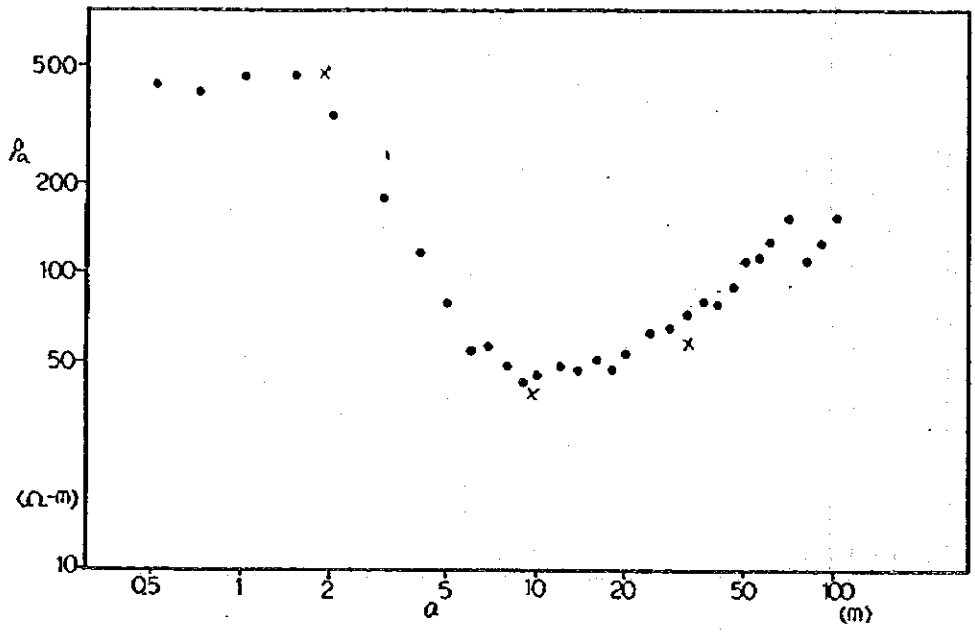
E - 7



7	18	420

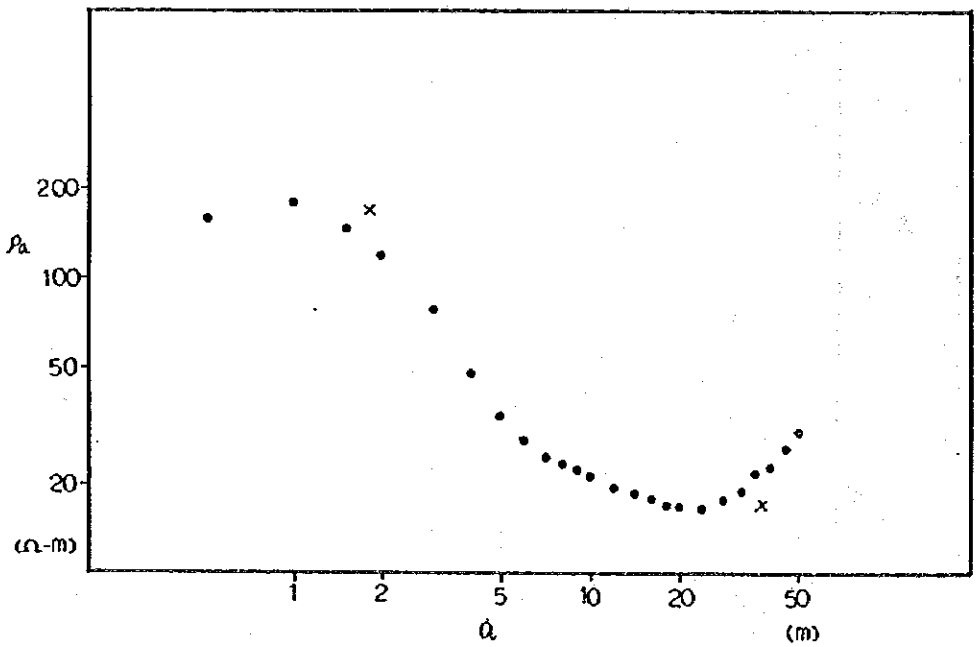
Appendix 6a ρ - a Curve (Fete)

E - 8



480	32	80	580

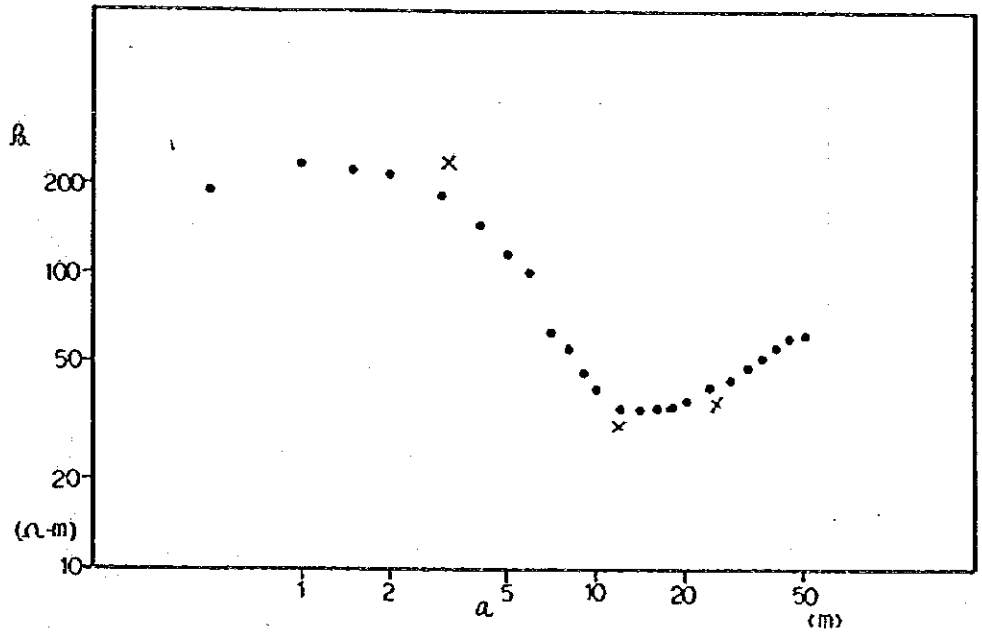
F - 1



170	17	255

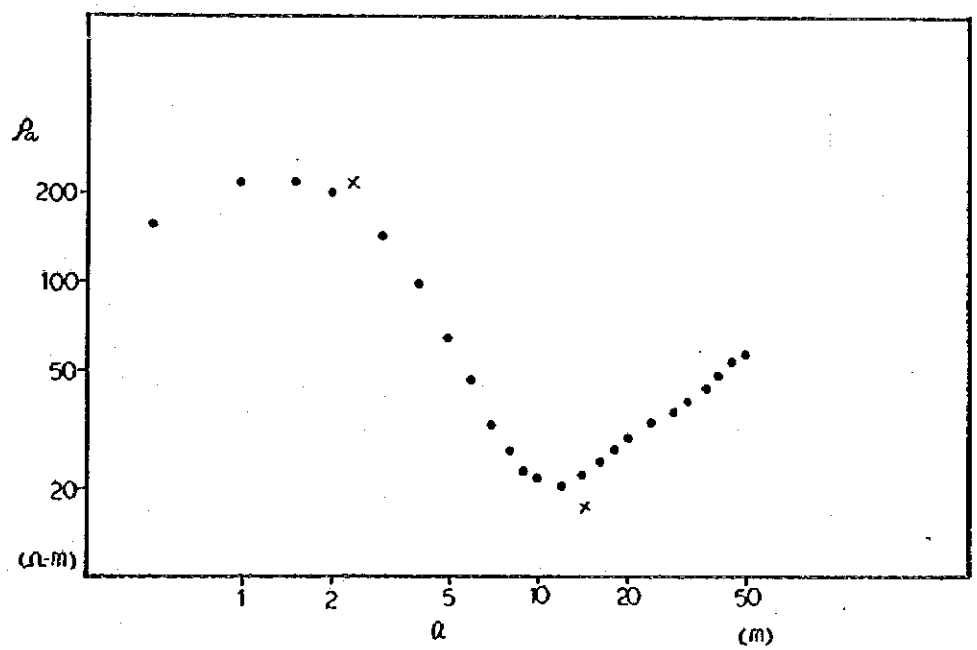
Appendix 6a ρ - a Curve (Fete)

F - 2



240	24	47	111

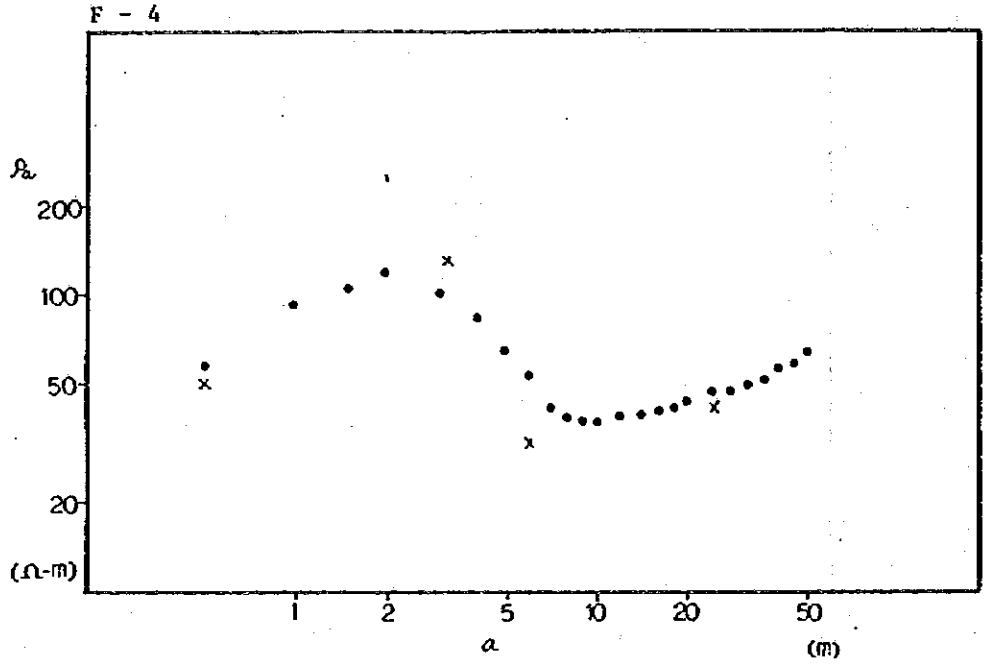
F - 3



210	14	136

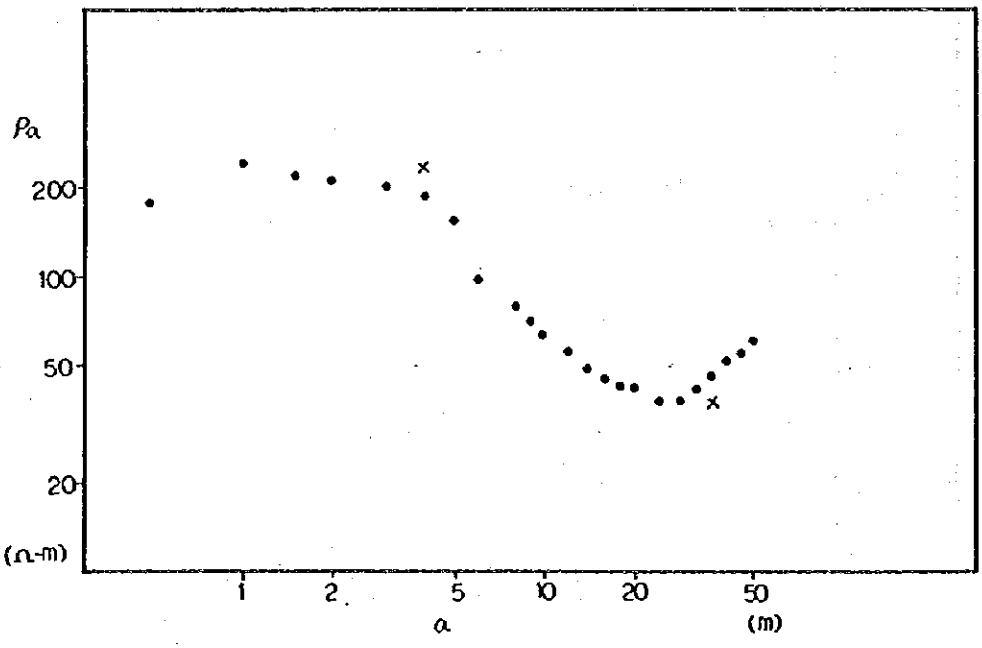
Appendix 6a ρ - a Curve (Fete)

F - 4



50	200	16	50	126

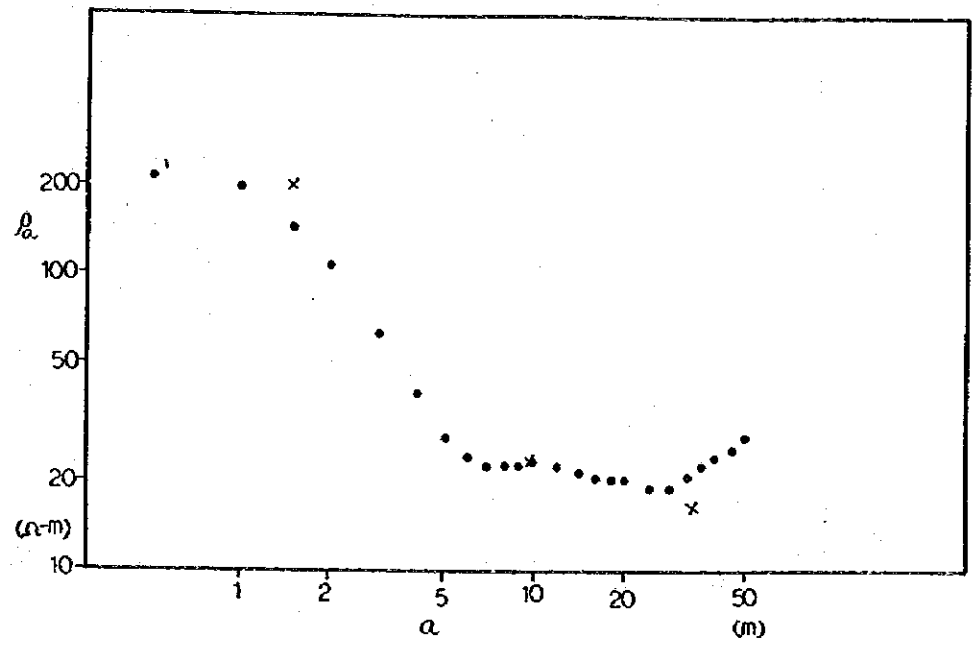
F - 5



240	34	380

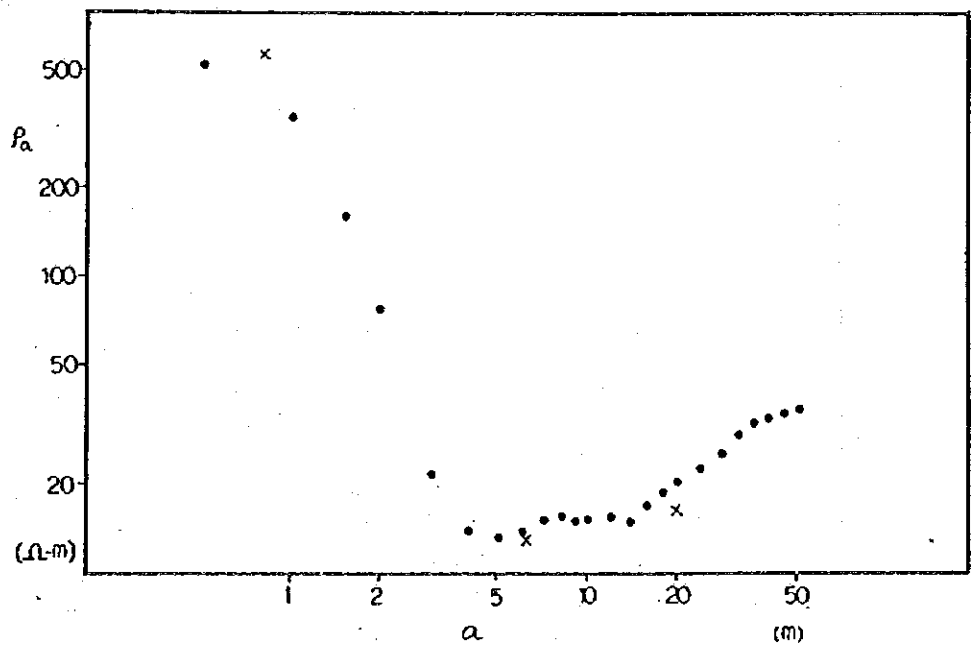
Appendix 6a ρ - a Curve (Fete)

G - 1



200	20	16	170

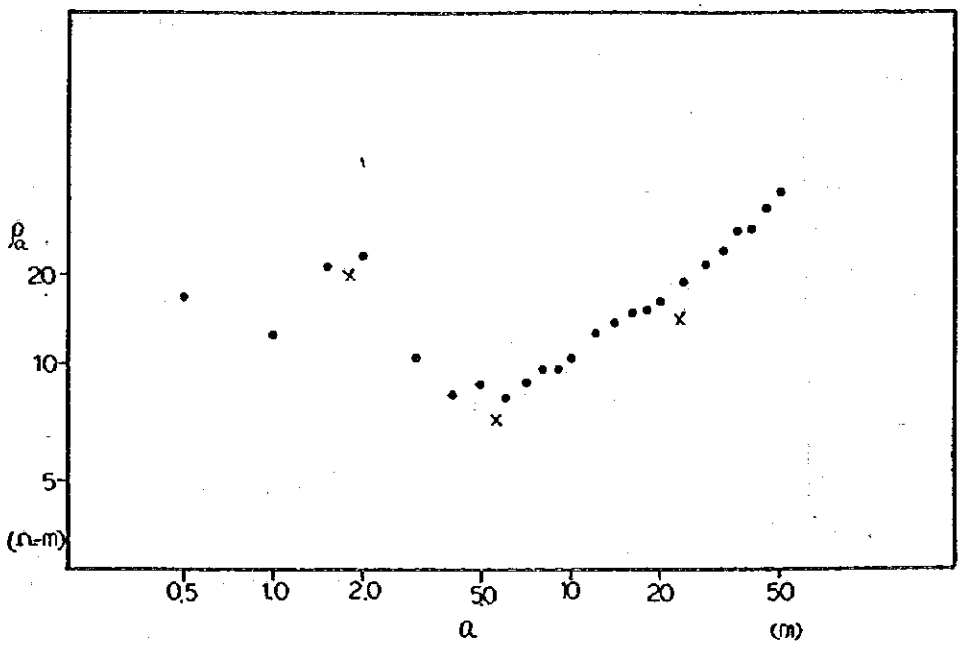
G - 2



560	11	20	128

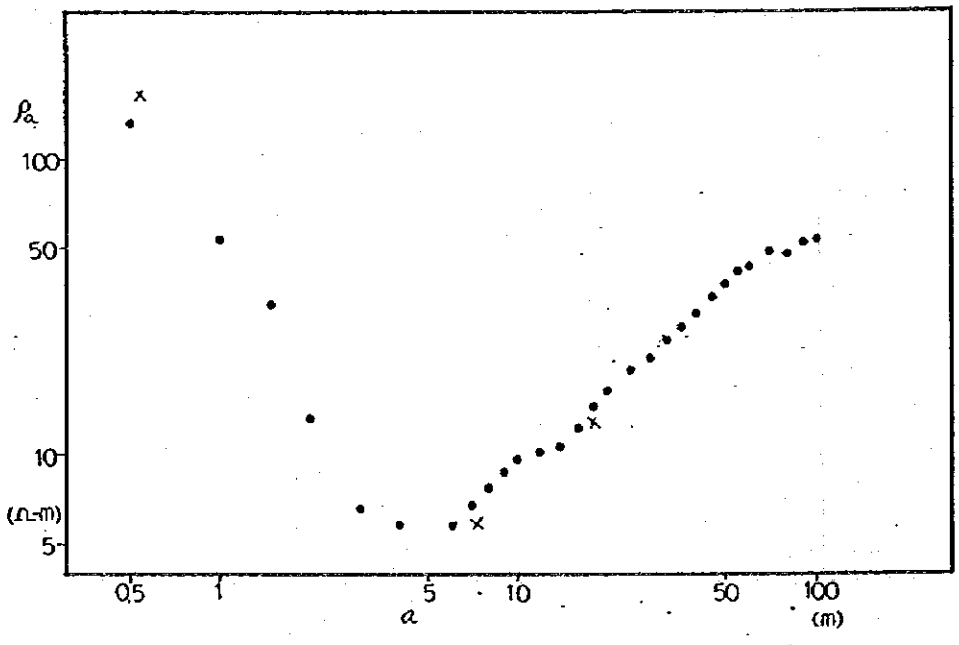
Appendix 6a ρ - a Curve (Fete)

G - 3



23	6	30	210

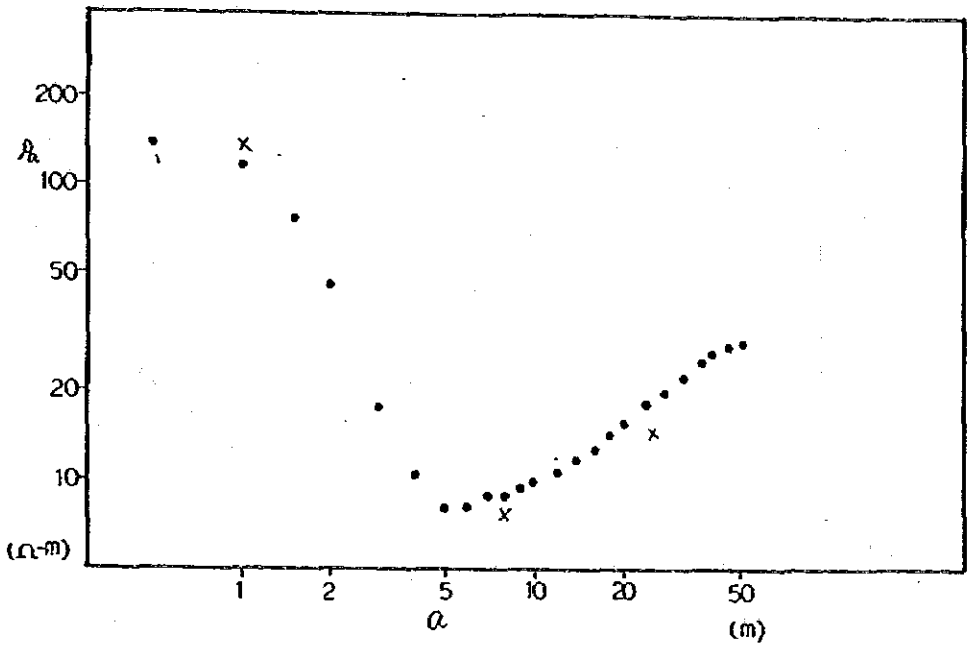
G - 4



165	6	48	130

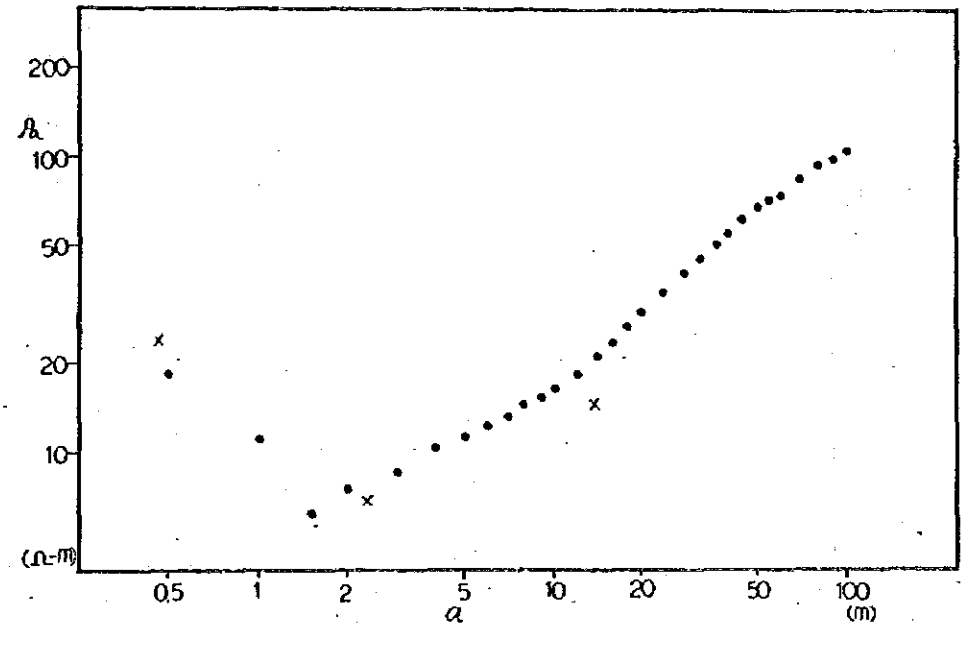
Appendix 6a ρ - a Curve (Fete)

G - 5



140	7	32	105

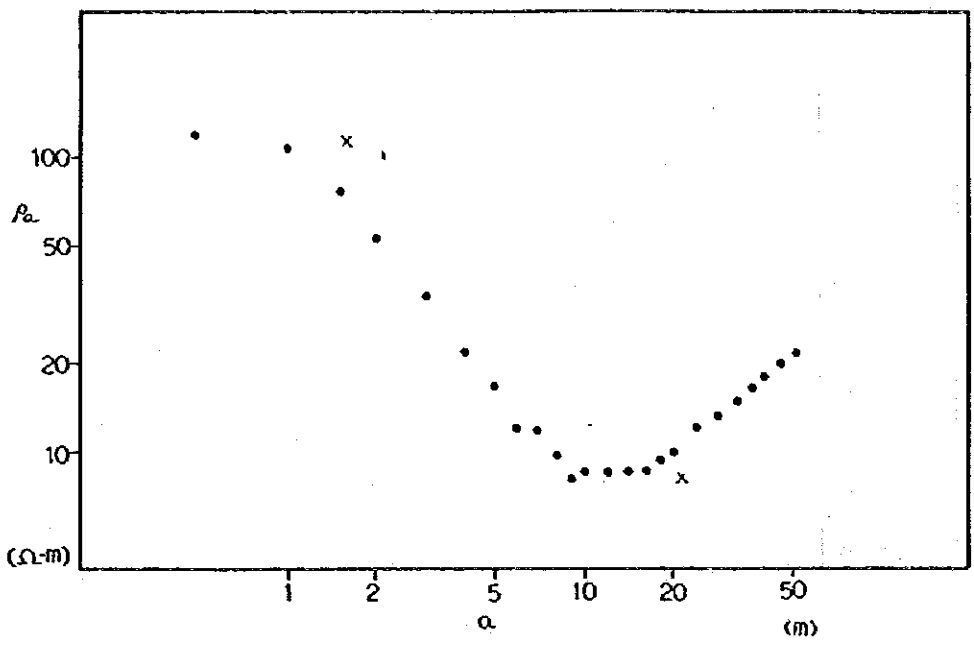
G - 6



24	6	21	420

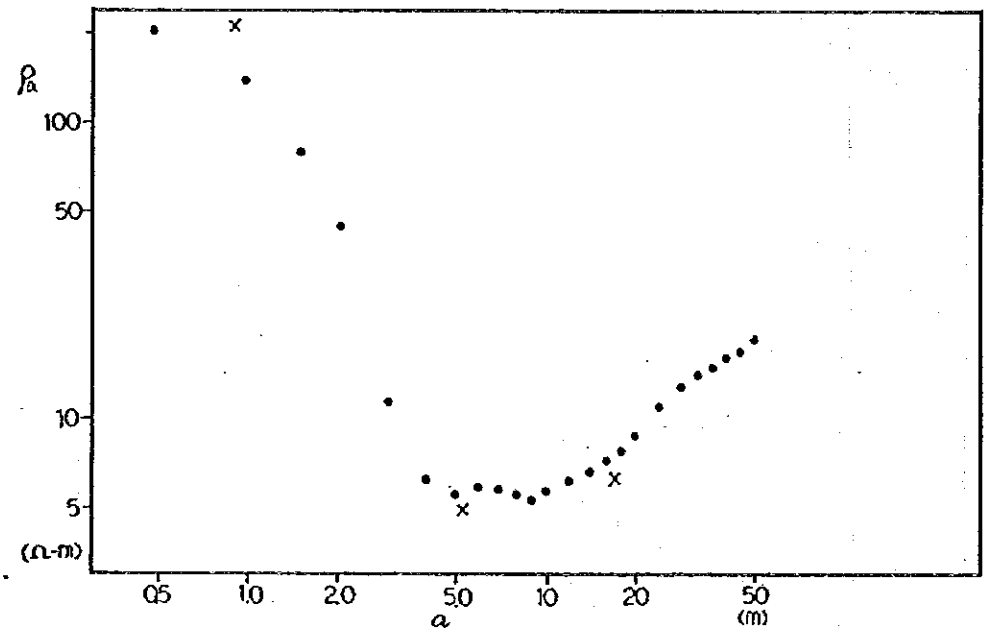
Appendix 6a ρ - a Curve (Fete)

H - 1



110	7	80

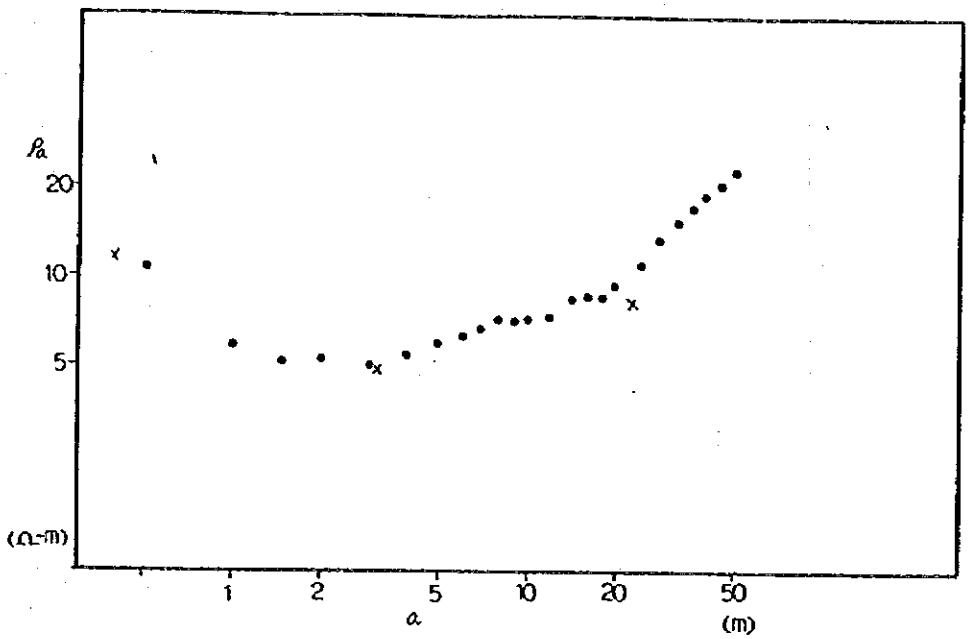
H - 2



210	4	8	60

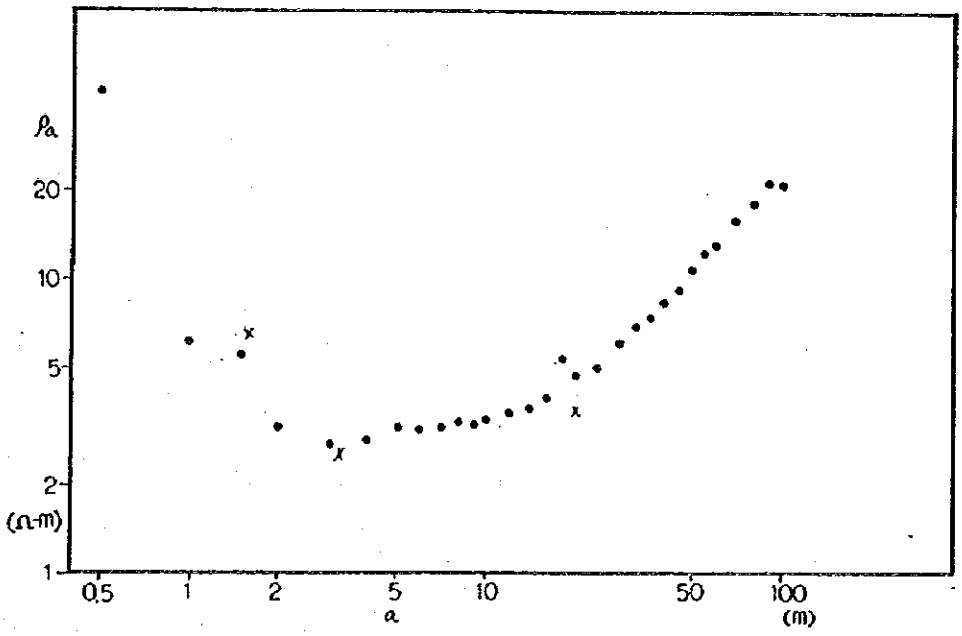
Appendix 6a ρ - a Curve (Fete)

H - 3



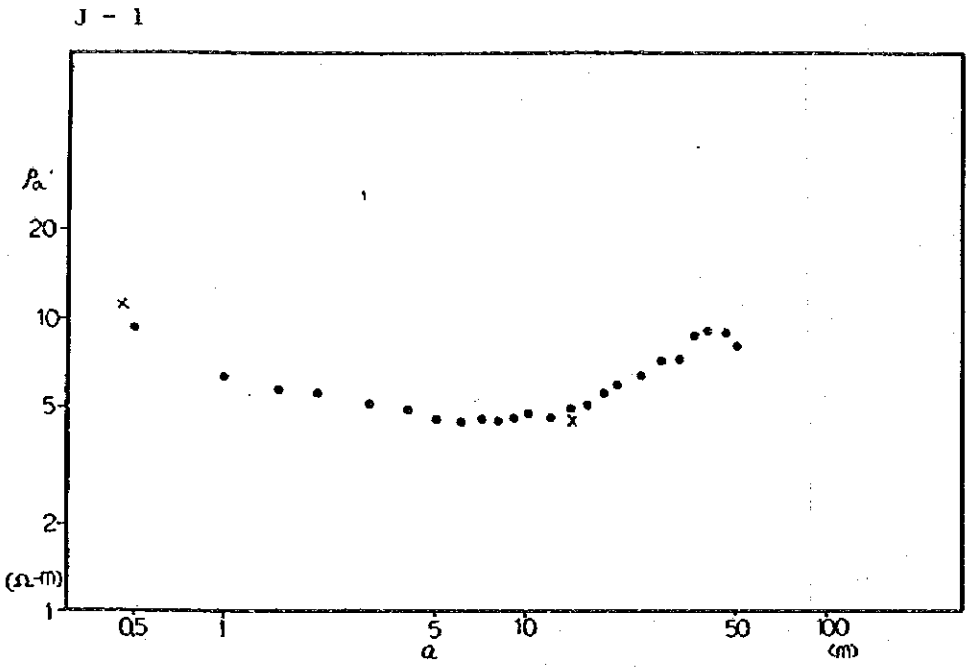
12	5	10	240

H - 4



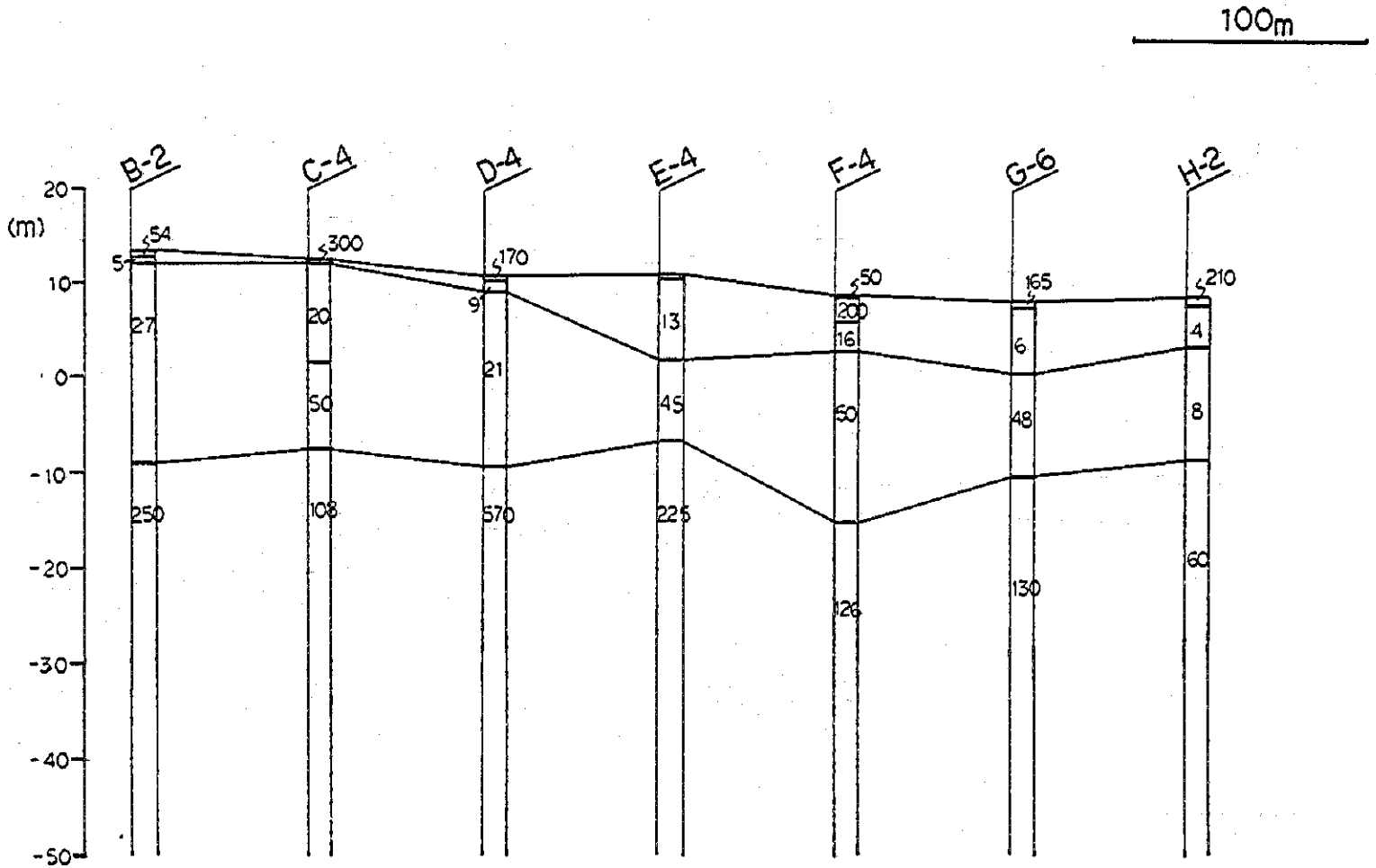
6.5	2	4	70

Appendix 6a ρ - a Curve (Fete)

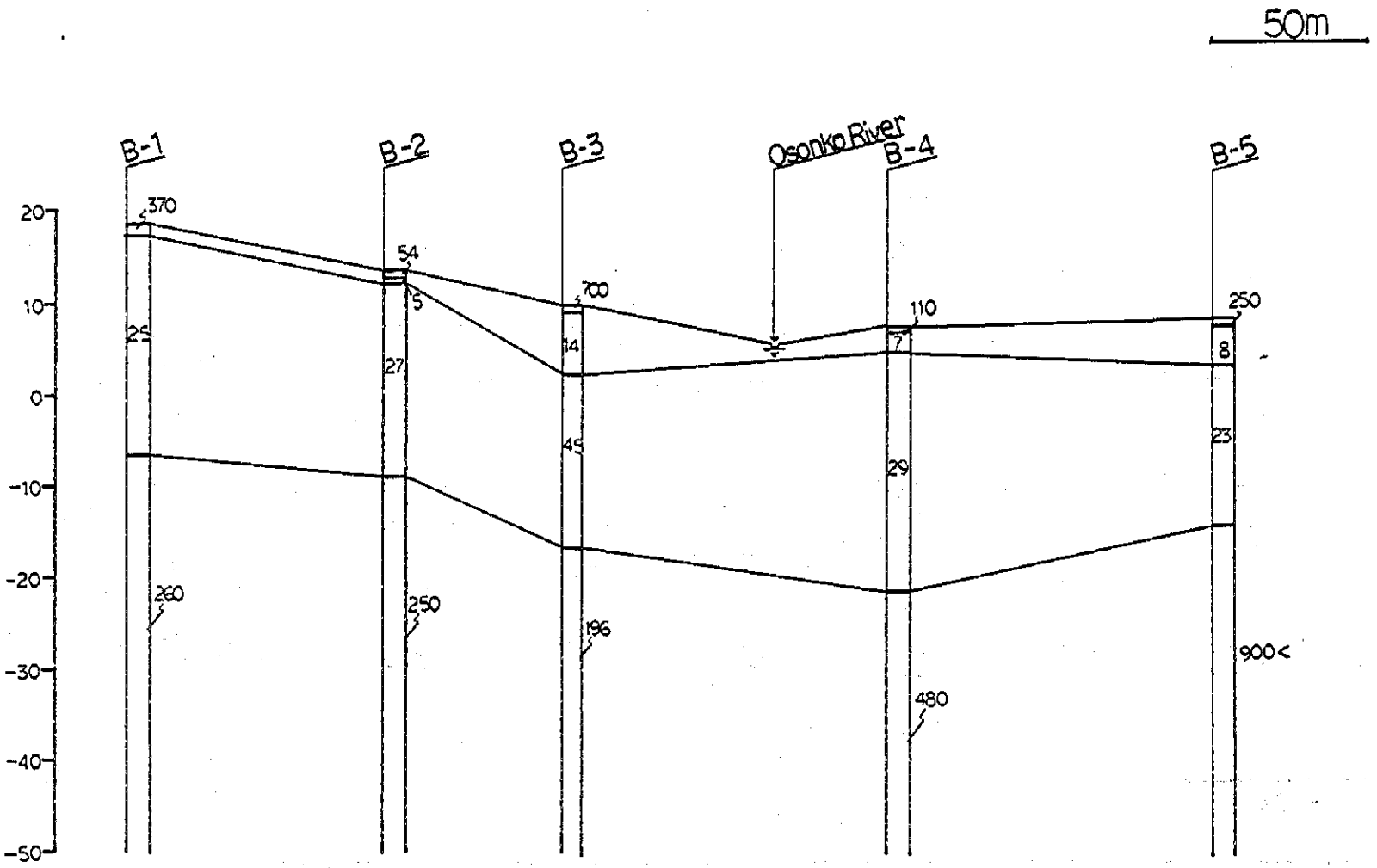


11	4	14

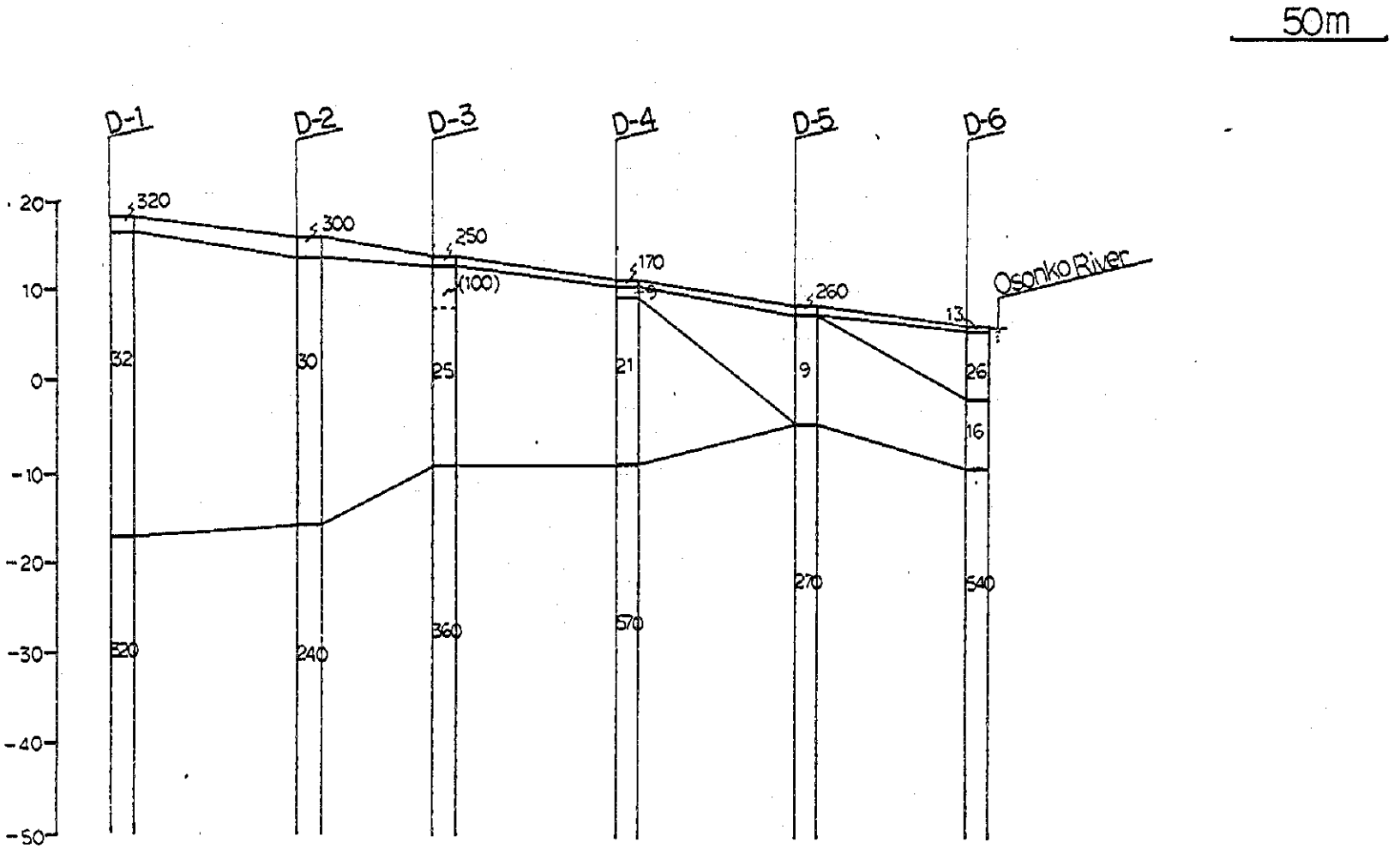
Appendix 6b Geological Section by Electric Prospecting at Fete (1)



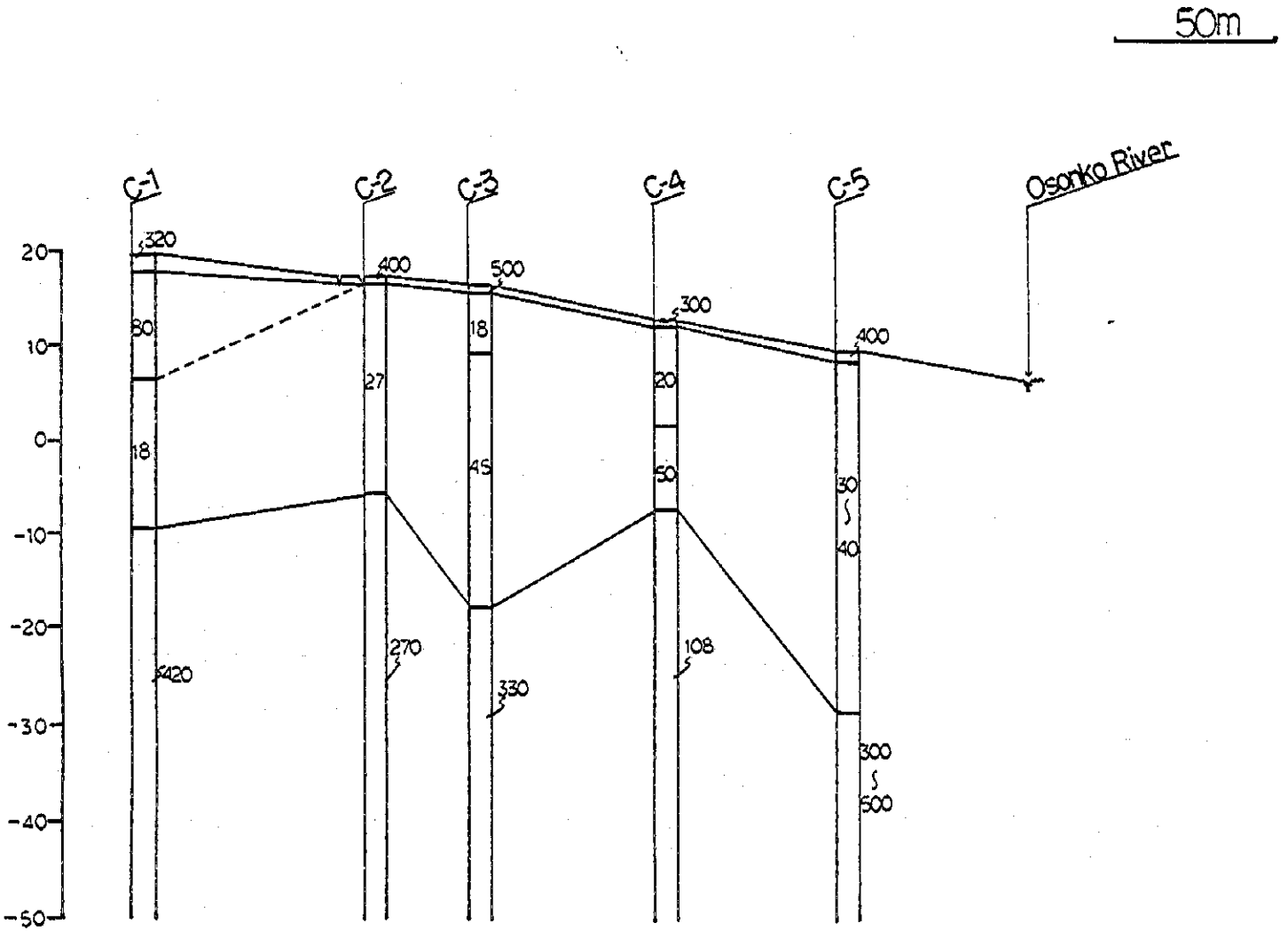
Appendix 6b Geological Section by Electric Prospecting at Fete (2)



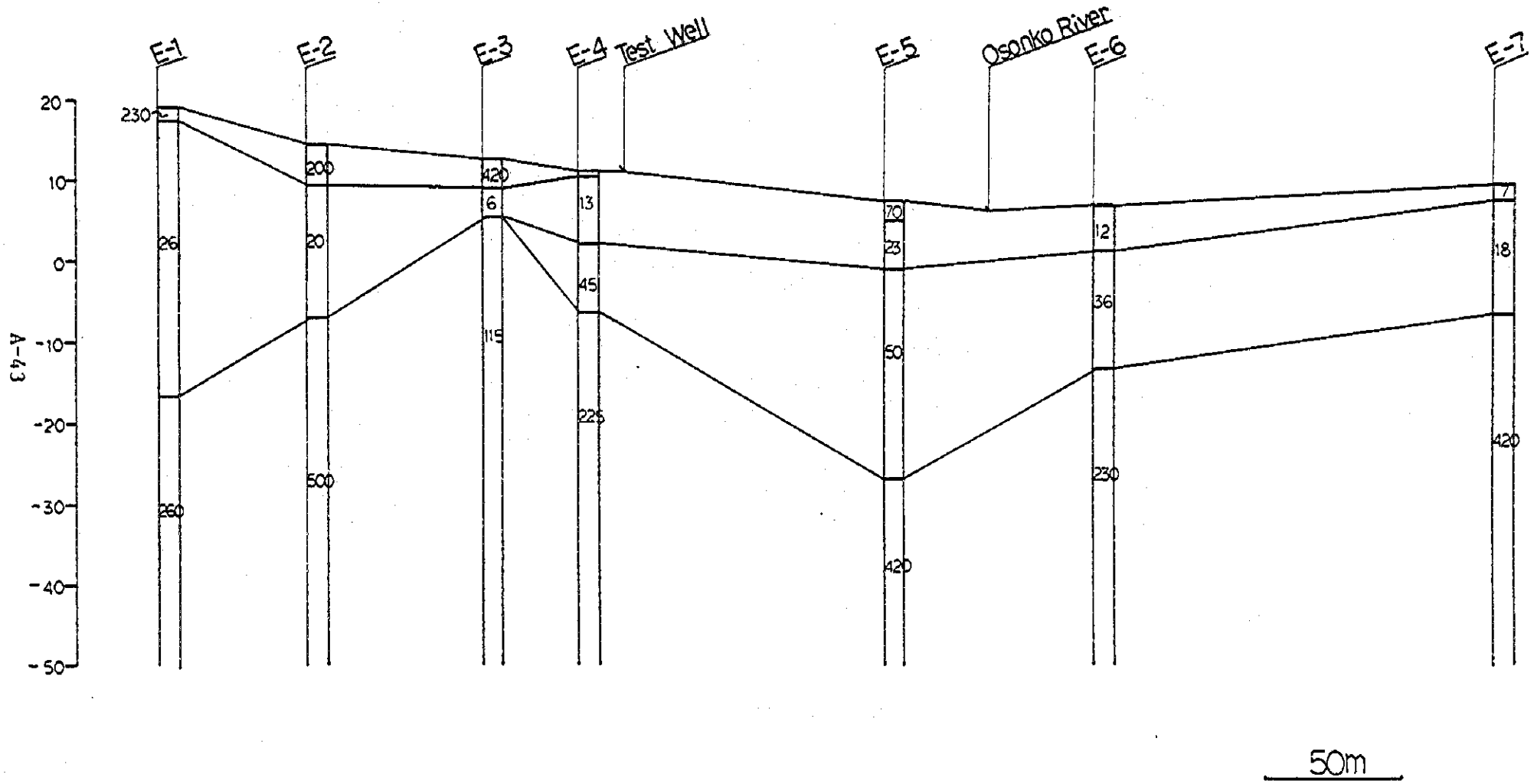
Appendix 6b Geological Section by Electric Prospecting at Fete (3)



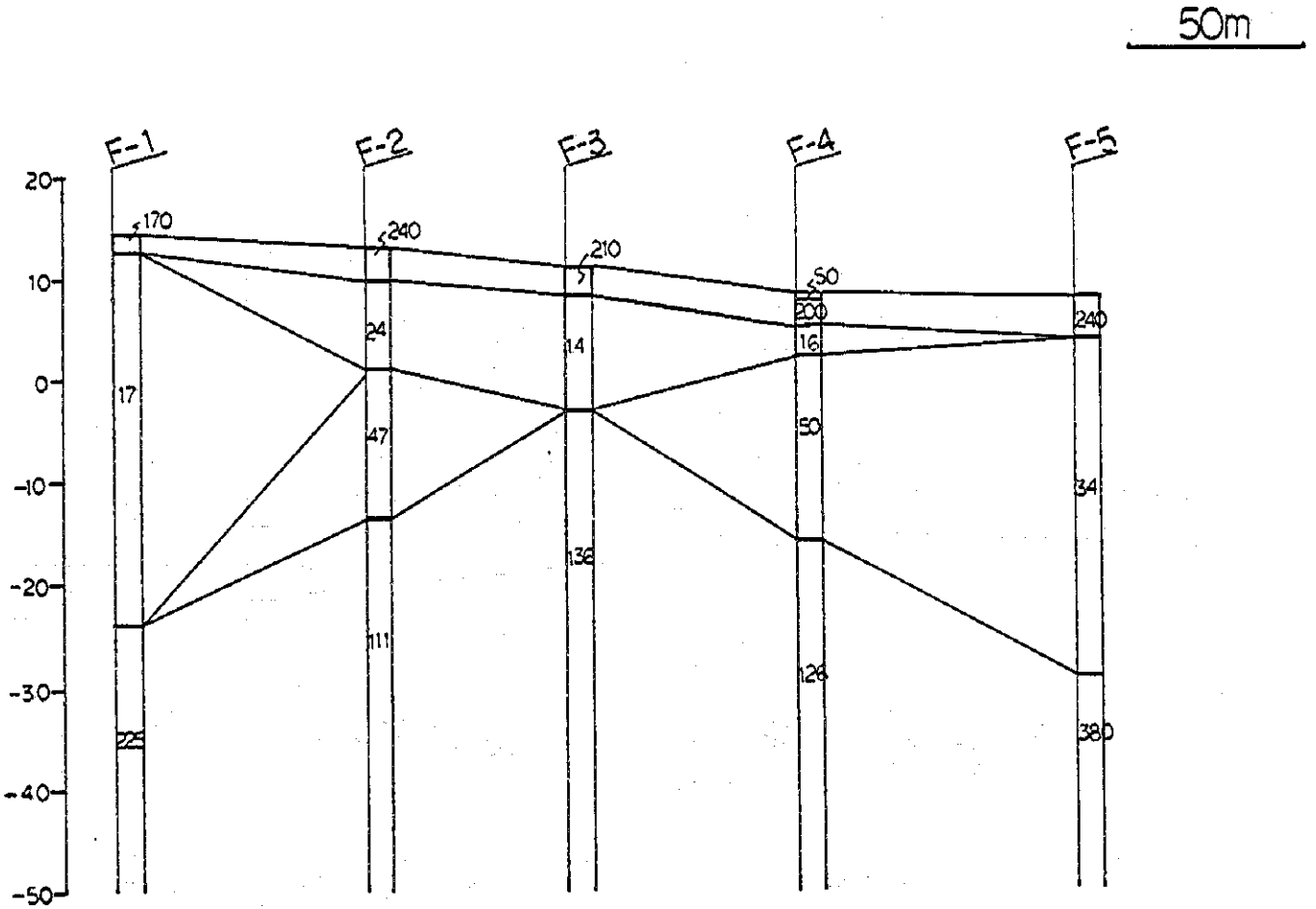
Appendix 6b Geological Section by Electric Prospecting at Fete (4)



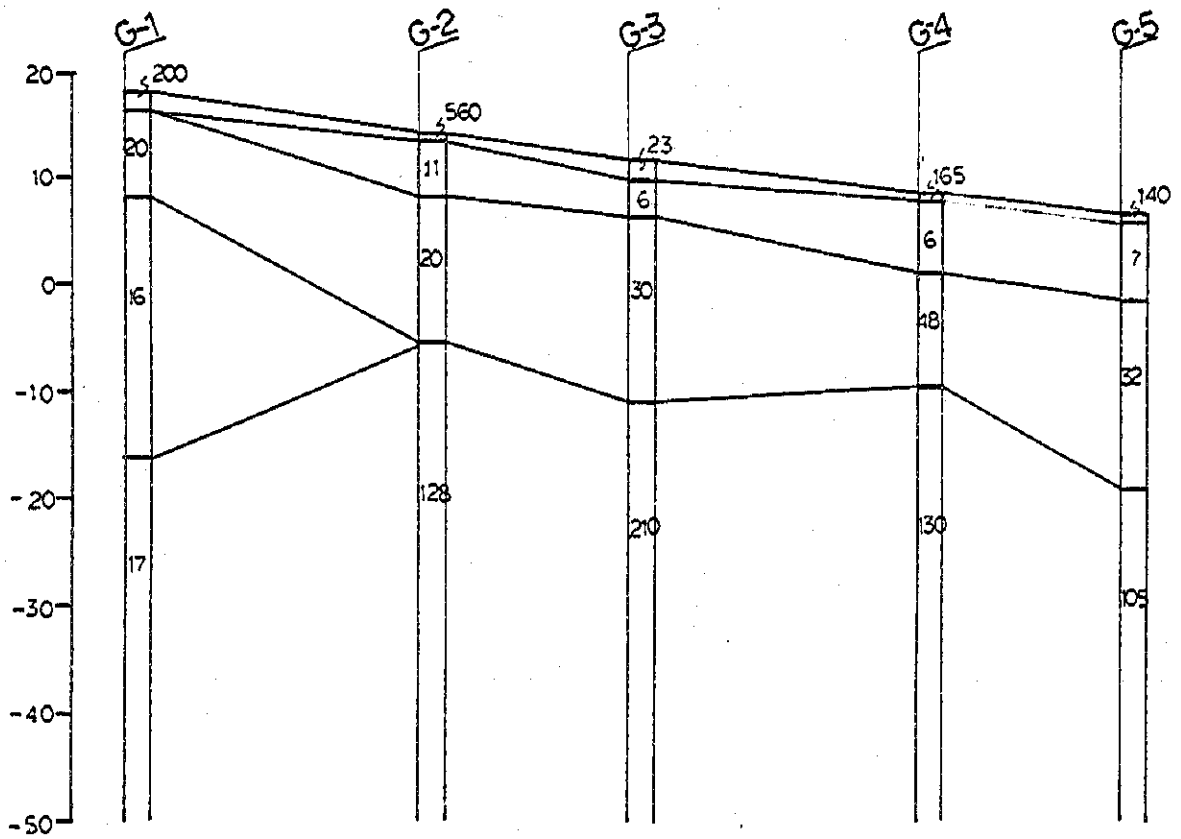
Appendix 6b Geological Section by Electric Prospecting at Fete (5)



Appendix 6b Geological Section by Electric Prospecting at Fete (6)

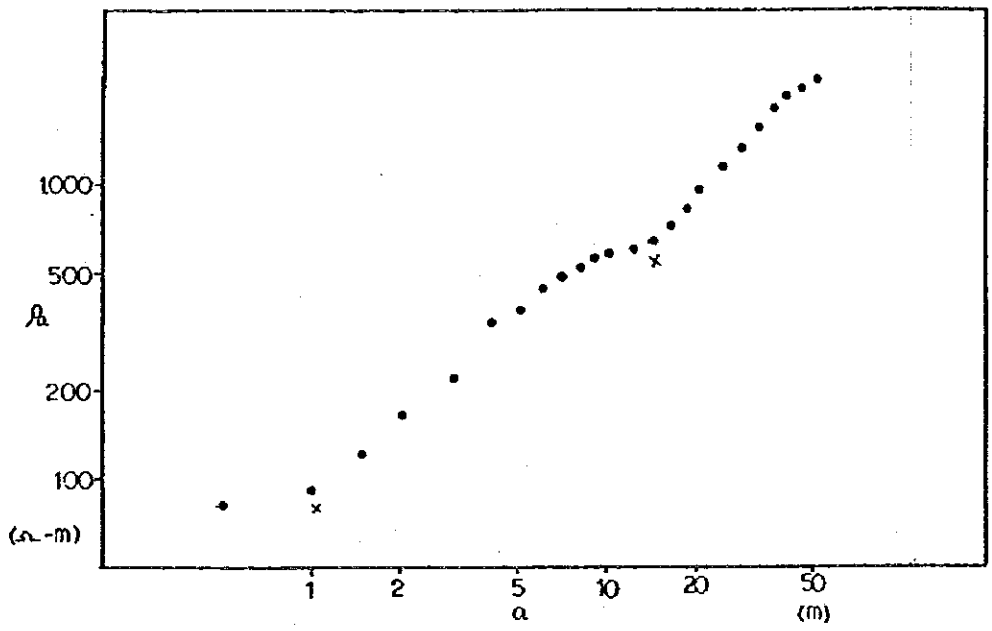


Appendix 6b Geological Section by Electric Prospecting at Fete (7)



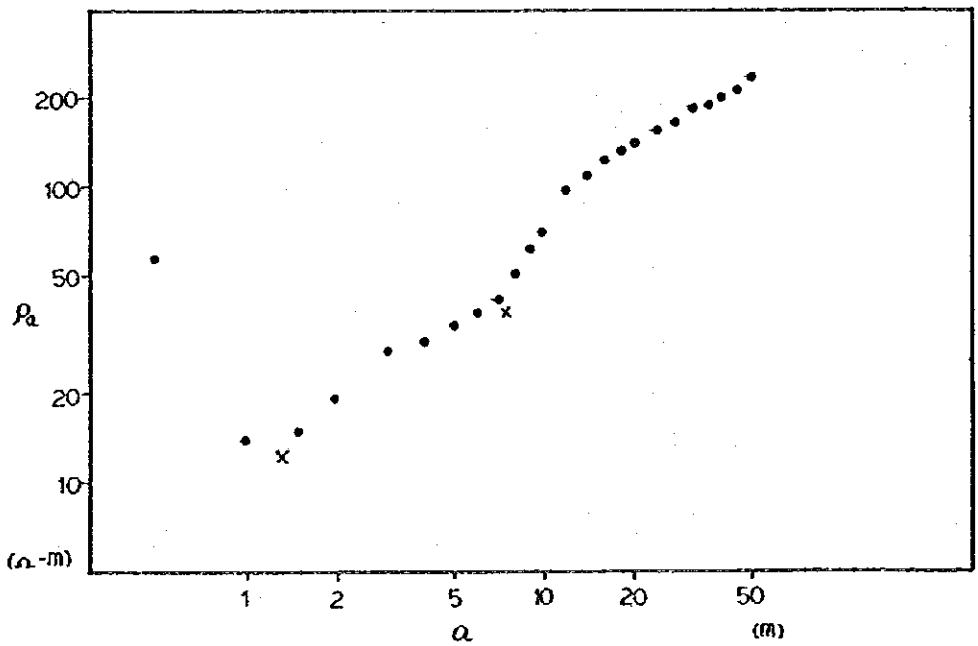
Appendix 6c ρ - a Curve (Ashonman)

A - 1



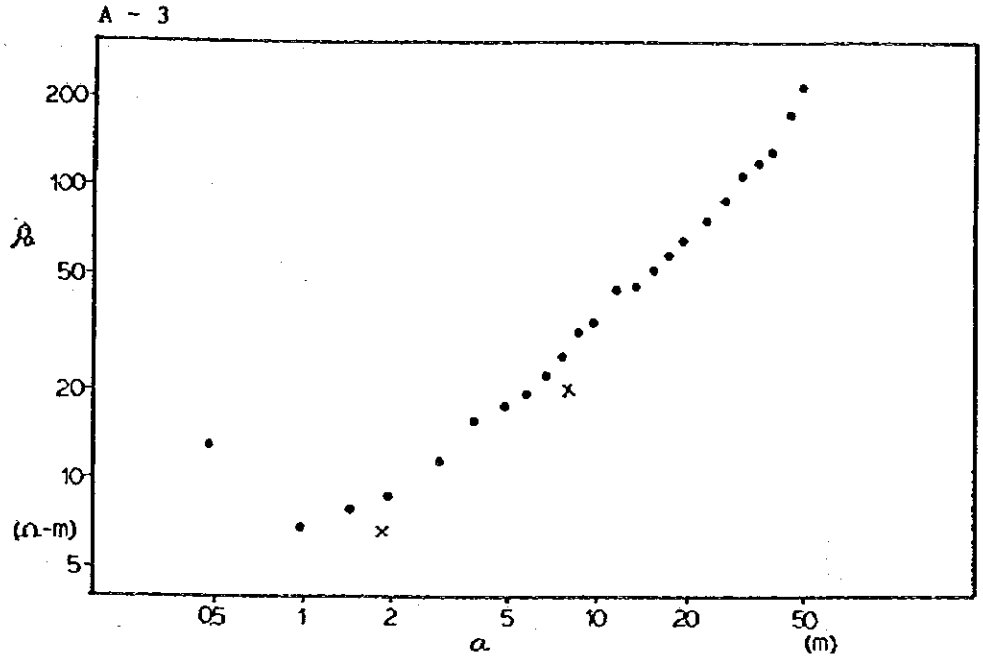
80	1200	10,000<

A - 2

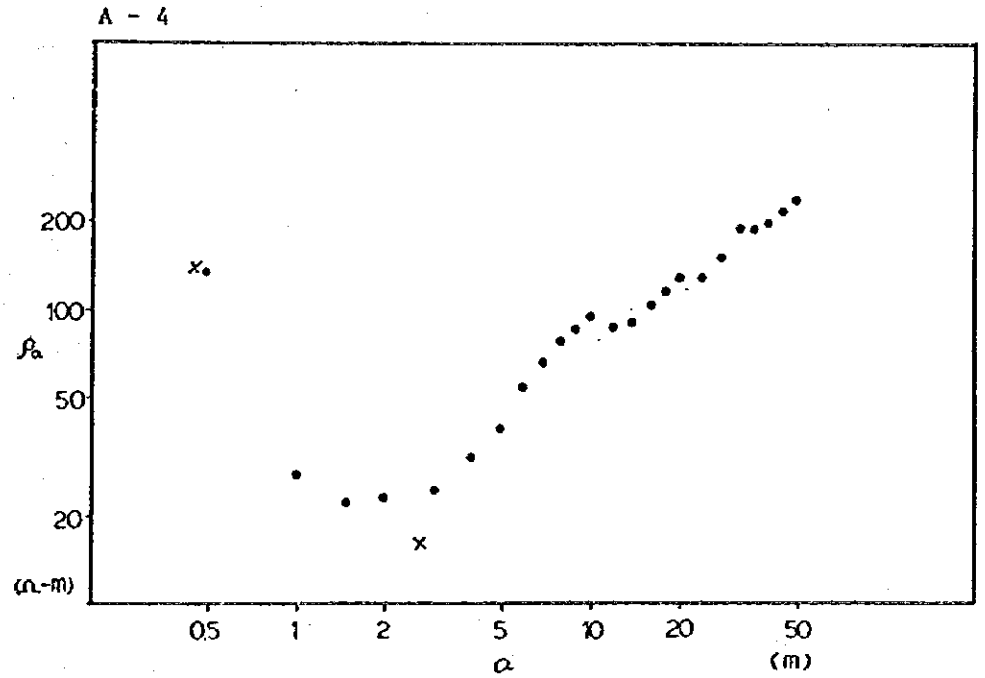


58	12	72	1,900<

Appendix 6c ρ - a Curve (Ashonman)



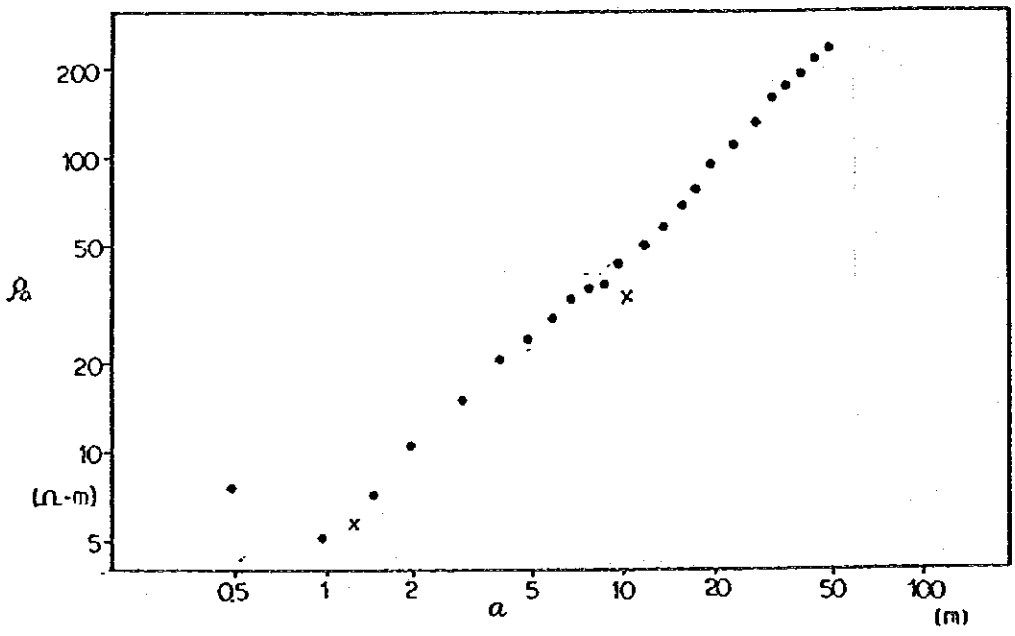
15	6	63	1000<



135	14	900<

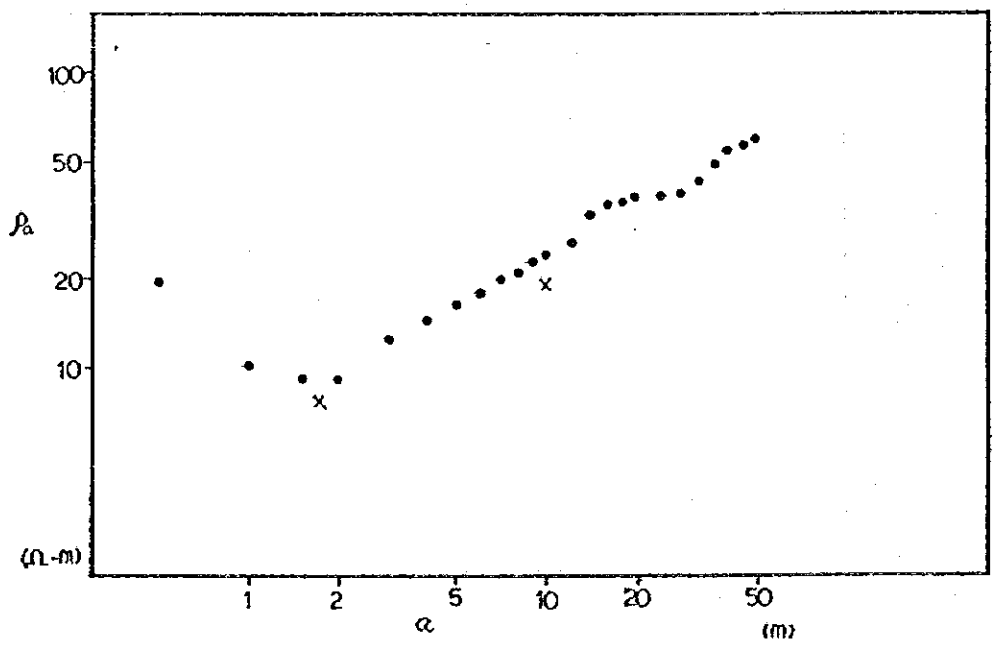
Appendix 6c ρ - a Curve (Ashonman)

A - 4



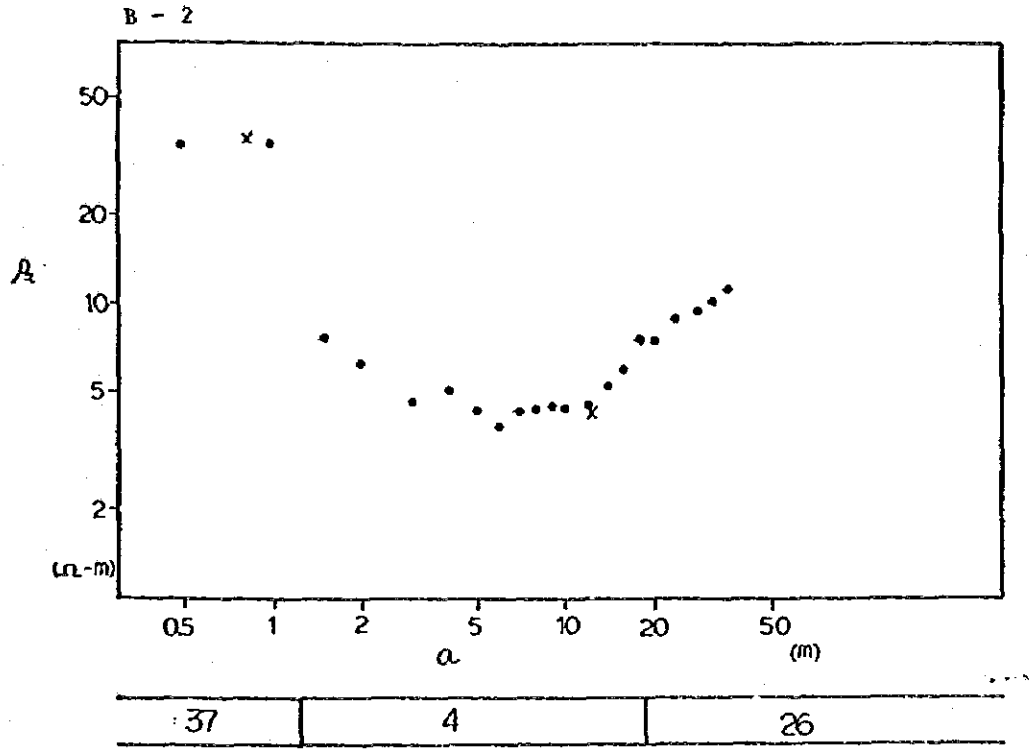
6	116	1650<

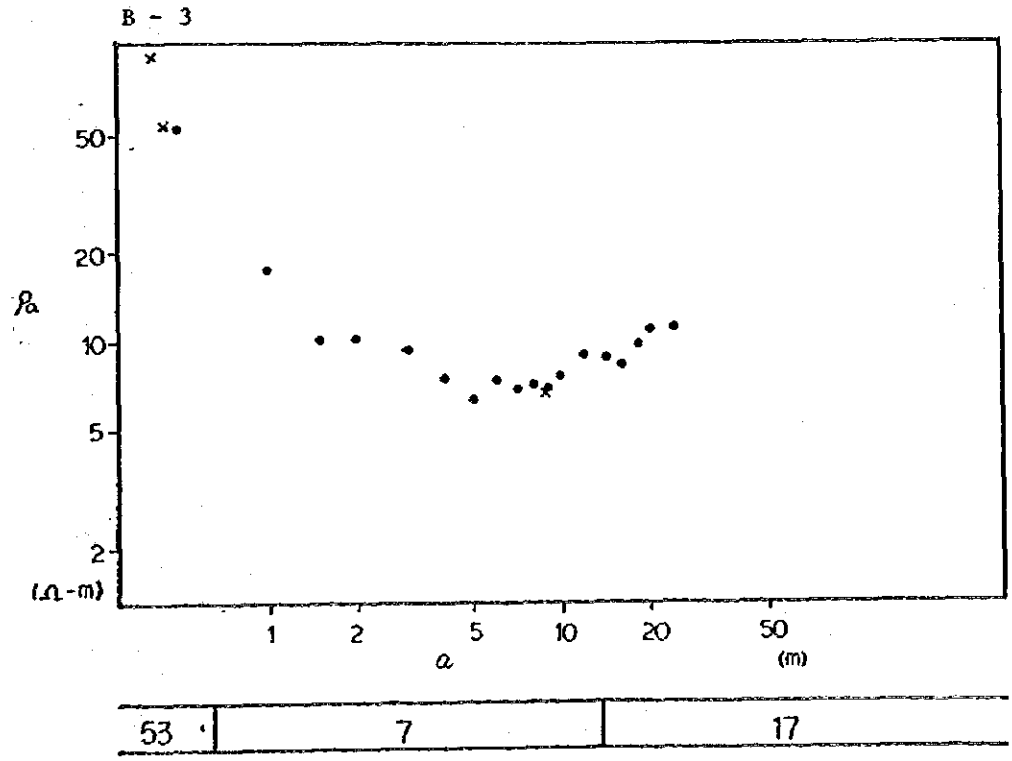
B - 1



20	8	32	95

Appendix 6c ρ - a Curve (Ashonman)

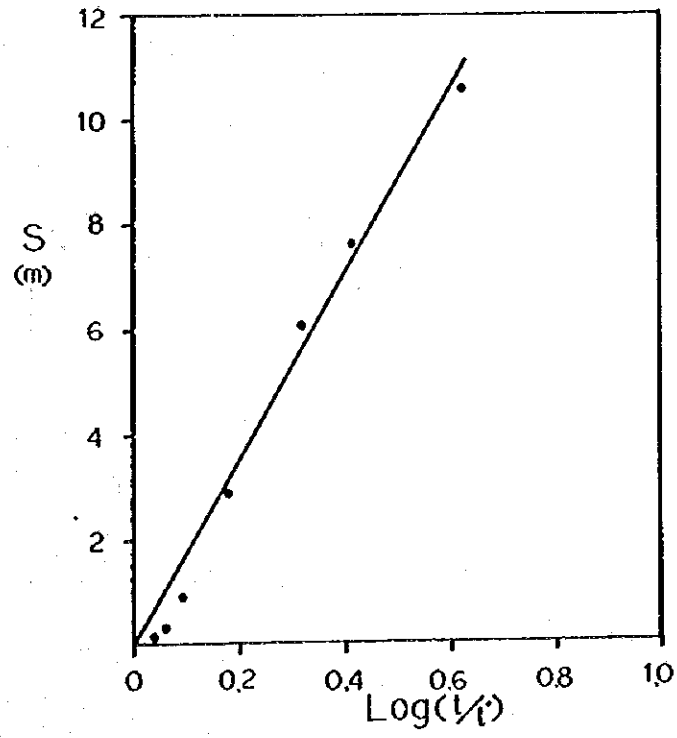




Appendix 7 Pumping Test Data

Data of Pumping Test (Recovery Method)

Time (minute)		log (t/t')	Date 27 May 1985		Remarks
			Static Water Level 8.97m		
Start from Pumping (t)	Stop after Pumping (t')		Water Level from Ground Surface	Residual Drawdown	
21	5	0.62	19.5	10.53	Q=0.18 m^3/min
26	10	0.41	16.5	7.53	
31	15	0.32	15.0	6.03	
46	30	0.18	11.88	2.91	
76	60	0.09	9.90	0.93	
136	120	0.05	9.18	0.21	
196	180	0.04	9.10	0.13	



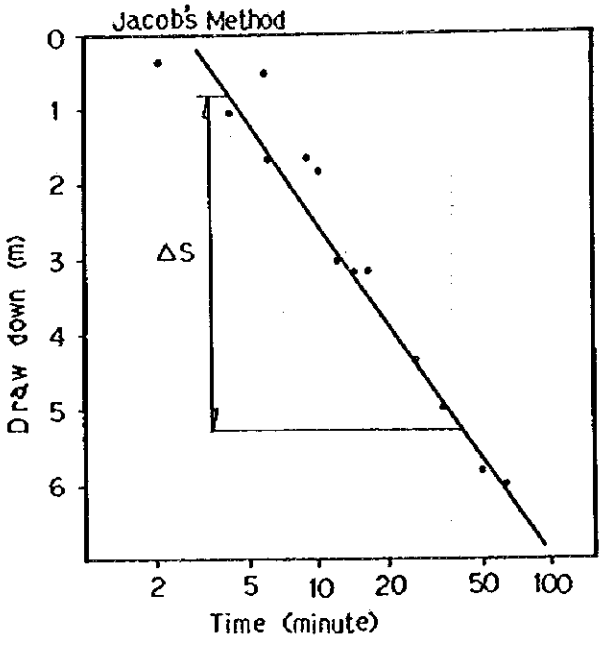
$$T = \frac{0.183 \times 0.18}{S} \times \text{Log}\ (t/t')$$

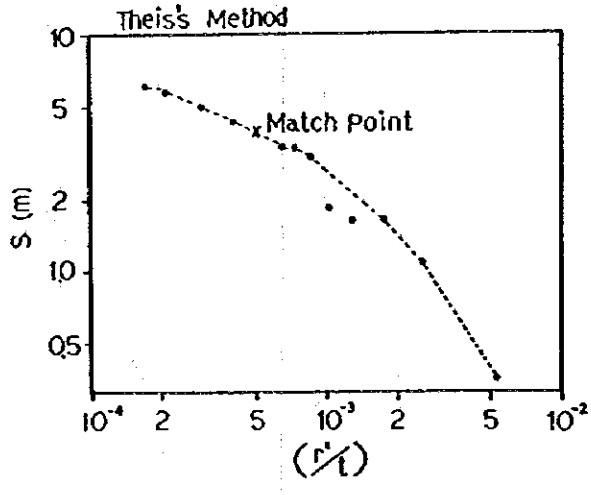
$$= \frac{0.183 \times 0.18}{10} \times 0.56$$

$$= 1.84 \times 10^{-3}\ (m/min)$$

Data of Pumping Test (Drawdown Method)

Time (min.) t	Diameter 2r = 20.32cm r^2/t	Date 15 June 1985 Static Water Level 8.66 m		Remarks
		Water Level from Ground Surface	Residual Drawdown (S)	
2	5.16×10^{-3}	9.0	0.34	Q=0.0575 (m^3/min.)
4	2.58×10^{-3}	9.7	1.04	
6	1.72×10^{-3}	10.3	1.64	
8	1.29×10^{-3}	10.3	1.64	
10	1.03×10^{-3}	10.5	1.84	
12	8.60×10^{-4}	11.7	3.04	
14	7.37×10^{-4}	12.0	3.34	
16	6.45×10^{-4}	12.0	3.34	
26	3.97×10^{-4}	13.0	4.34	
34	2.95×10^{-4}	13.66	5.00	
50	2.06×10^{-4}	14.47	5.81	
60	1.72×10^{-4}	14.70	6.04	





$$T = \frac{2.3\,Q}{4\pi \cdot \Delta S} = \frac{2.3 \times 0.0575}{4\pi \times 4.5}$$

$$= 2.33 \times 10^{-3}\ (m^2/min)$$

$$T = \frac{Q \times W(u)}{4\pi S} = \frac{0.0575 \times 3.0}{4 \times \pi \times 5.0}$$

$$= 2.75 \times 10^{-3}\ (m^2/min)$$

$$S = \frac{4Tu}{r^2/t} = \frac{4 \times 2.75 \times 10^{-3} \times 3.0 \times 10^{-2}}{5.0 \times 10^{-4}}$$

$$= 6.60 \times 10^{-1}$$

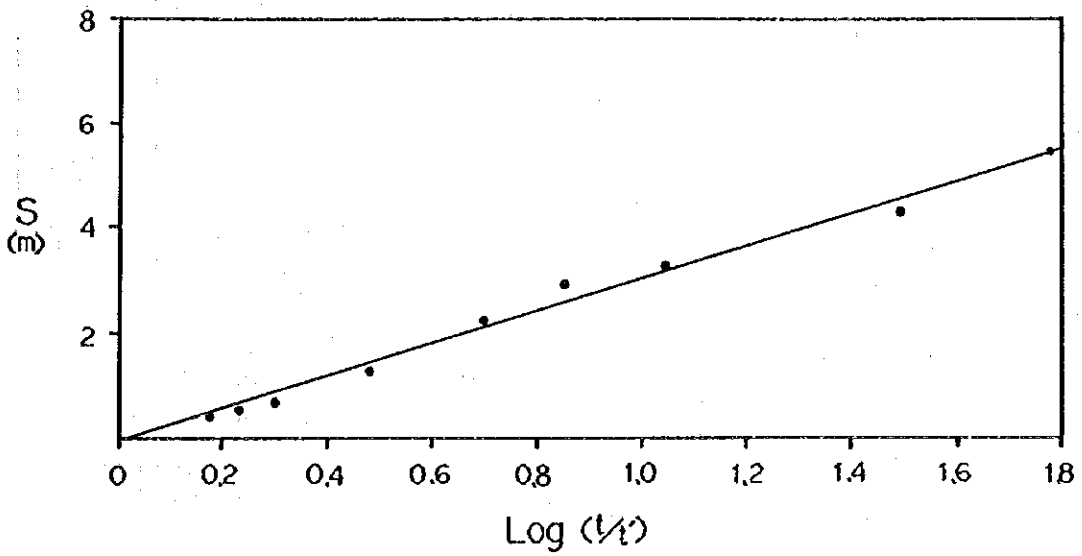
Data of Pumping Test (Recovery Method)

Time (minute)		log (t/t')	Date 15 June 1985		Remarks
			Static Water Level 8.66 m		
Start from Pumping (t)	Stop after Pumping (t')		Water Level from Ground Surface	Residual Drawdown	
61	1	1.78	14.1	5.44	Q=0.0575 (m^3/min)
62	2	1.49	12.99	4.33	
66	6	1.04	11.91	3.25	
70	10	0.85	11.58	2.92	
75	15	0.70	10.90	2.24	
90	30	0.48	9.93	1.27	
120	60	0.30	9.35	0.69	
150	90	0.23	9.18	0.52	
180	120	0.18	9.10	0.44	

$$T = \frac{0.183 \times 00575}{S} \times \text{Log}\,(t/t')$$

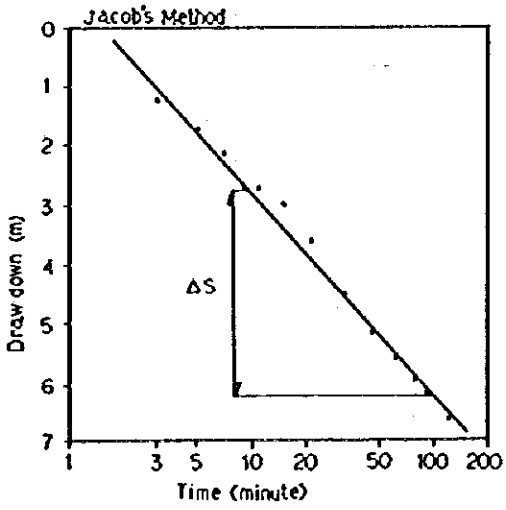
$$= \frac{0.183 \times 00575}{1} \times 0.33$$

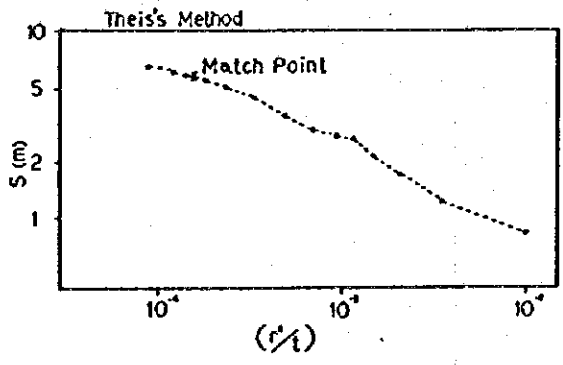
$$= 3.47 \times 10^{-3}\ (m^2/min)$$



Data of Pumping Test (Drawdown Method)

Time (min.) t	Diameter 2r=20.32cm r^2/t	Date 17 June 1985 Static Water Level 8.93 m Water Level from Ground Surface	Residual Drawdown	Remarks
1	1.03×10^{-2}	* 10.47	(S) 0.84	
3	3.44×10^{-3}	10.85	1.22	Q=0.0575 (m^3/min)
5	2.07×10^{-3}	11.35	1.72	
7	1.48×10^{-3}	11.76	2.13	*Ground Surface +0.7m
9	1.15×10^{-3}	12.35	2.72	
11	9.4×10^{-4}	12.37	2.74	
15	6.9×10^{-4}	12.61	2.98	
21	4.9×10^{-4}	13.21	3.58	
31	3.3×10^{-4}	14.13	4.50	
45	2.3×10^{-4}	14.77	5.14	
59	1.8×10^{-4}	15.16	5.53	
75	1.4×10^{-4}	15.53	5.90	
89	1.2×10^{-4}	15.76	6.13	
119	8.7×10^{-5}	16.25	6.62	





$$T = \frac{2.3Q}{4\pi \cdot \Delta S} = \frac{2.3 \times 0.0575}{4\pi \times 3.45}$$

$$= 3.05 \times 10^{-3} \ (m^2/min)$$

$$T = \frac{Q \cdot W(u)}{4\pi S} = \frac{0.0575 \times 4.70}{4\pi \times 5.8}$$

$$= 3.72 \times 10^{-3} \ (m^2/min)$$

$$S = \frac{4Tu}{(r^2/t)} = \frac{4 \times 3.72 \times 10^{-3} \times 5 \times 10^{-3}}{1.5 \times 10^{-4}}$$

$$= 1.24 \times 10^{-1}$$

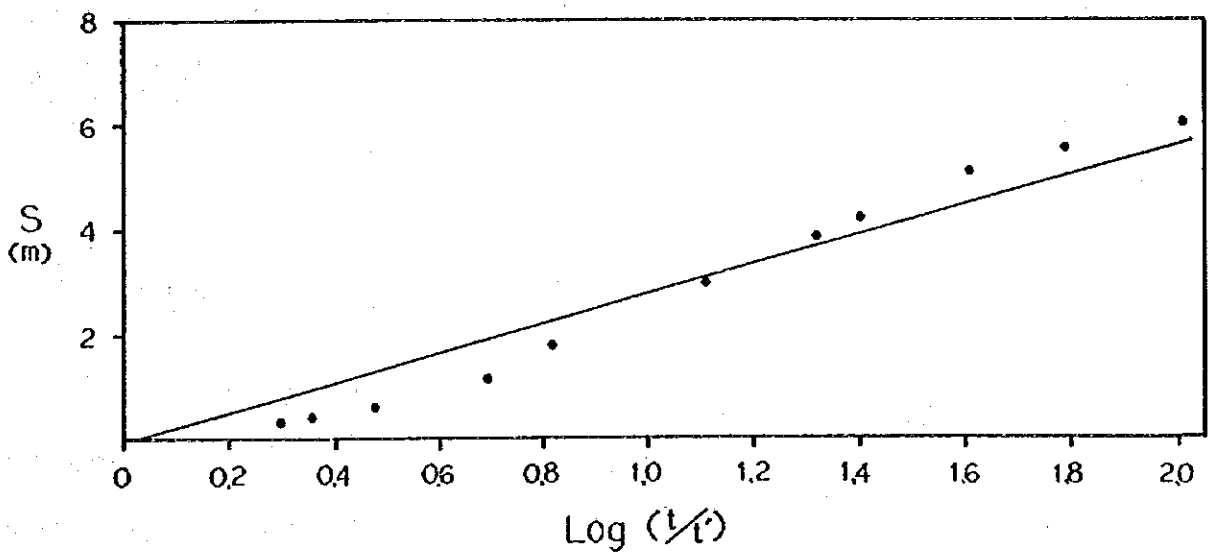
Data of Pumping Test (Recovery Method)

Time (minute)		log (t/t')	Date 17 June 1985		Remarks
			Static Water Level 8.93 m		
Start from Pumping (t)	Stop after Pumping (t')		Water Level from Ground Surface	Residual Drawdown	
121	1	2.08	15.68	6.08	Q=0.0575 (m^3/min)
122	2	1.79	15.20	5.57	
123	3	1.61	14.69	5.06	
125	5	1.40	13.82	4.19	
126	6	1.32	13.46	3.83	
130	10	1.11	12.61	2.98	
141	21	0.82	11.42	1.79	
150	30	0.70	10.78	1.15	
180	60	0.48	10.29	0.66	
210	90	0.36	10.09	0.46	
240	120	0.30	9.99	0.36	

$$T = \frac{0.183 \times 0.575}{S} \times \text{Log}\,(t/t')$$

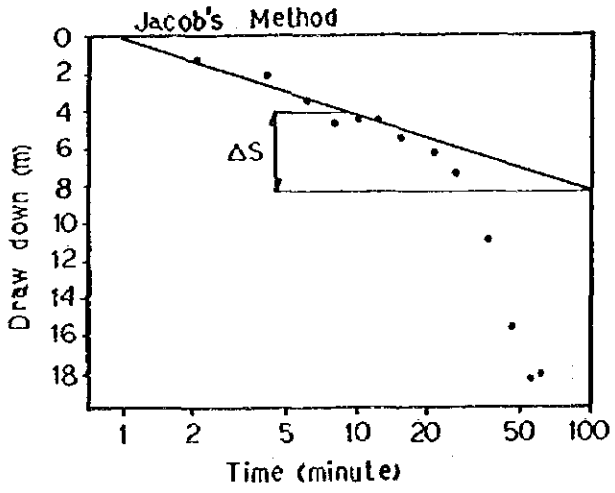
$$= \frac{0.183 \times 0.575}{5} \times 0.18$$

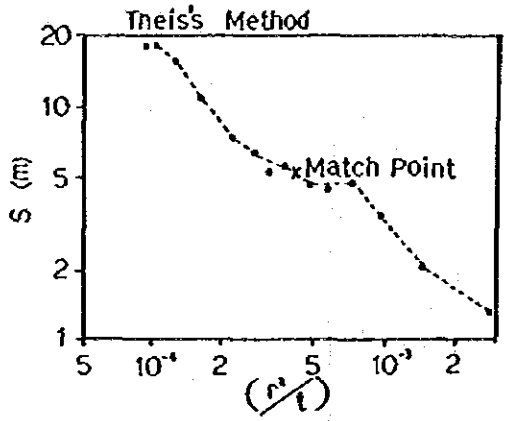
$$= 3.79 \times 10^{-3}\ (m^2/min)$$



Data of Pumping Test (Drawdown Method)

Time(min) t	Diameter 2r = 15.0cm r^2/t	Date 25 June 1985		Remarks
		Static Water Level 8.86 m		
		Water Level from Ground Surface	Residual Drawdown	
2	2.8×10^{-3}	* 11.33	(S) 1.37	Q=0.0146 (m^3/min)
4	1.4×10^{-3}	12.07	2.11	
6	9.38×10^{-4}	13.48	3.52	*Ground Surface +1.10m
8	7.04×10^{-4}	14.65	4.69	
10	5.63×10^{-4}	14.46	4.50	
12	4.69×10^{-4}	14.57	4.61	
15	3.75×10^{-4}	15.35	5.57	
18	3.13×10^{-4}	15.25	5.29	
21	2.68×10^{-4}	16.32	6.36	
26	2.17×10^{-4}	17.39	7.43	
36	1.56×10^{-4}	20.88	10.92	
46	1.22×10^{-4}	25.48	15.52	
56	1.01×10^{-4}	28.23	18.27	
60	9.38×10^{-5}	28.03	18.07	





$$T = \frac{2.3Q}{4\pi \cdot \Delta S} = \frac{0.183 \times 0.0146}{4.1}$$

$$= 6.51 \times 10^{-4} (m^2/min)$$

$$T = \frac{QW(u)}{4\pi S} = \frac{0.0146 \times 1.8}{4\pi \times 5.2}$$

$$= 4.02 \times 10^{-4} (m^2/min)$$

$$S = \frac{4Tu}{(r^2/t)} = \frac{4 \times 4.02 \times 10^{-4} \times 1.0 \times 10^{-1}}{4.0 \times 10^{-3}}$$

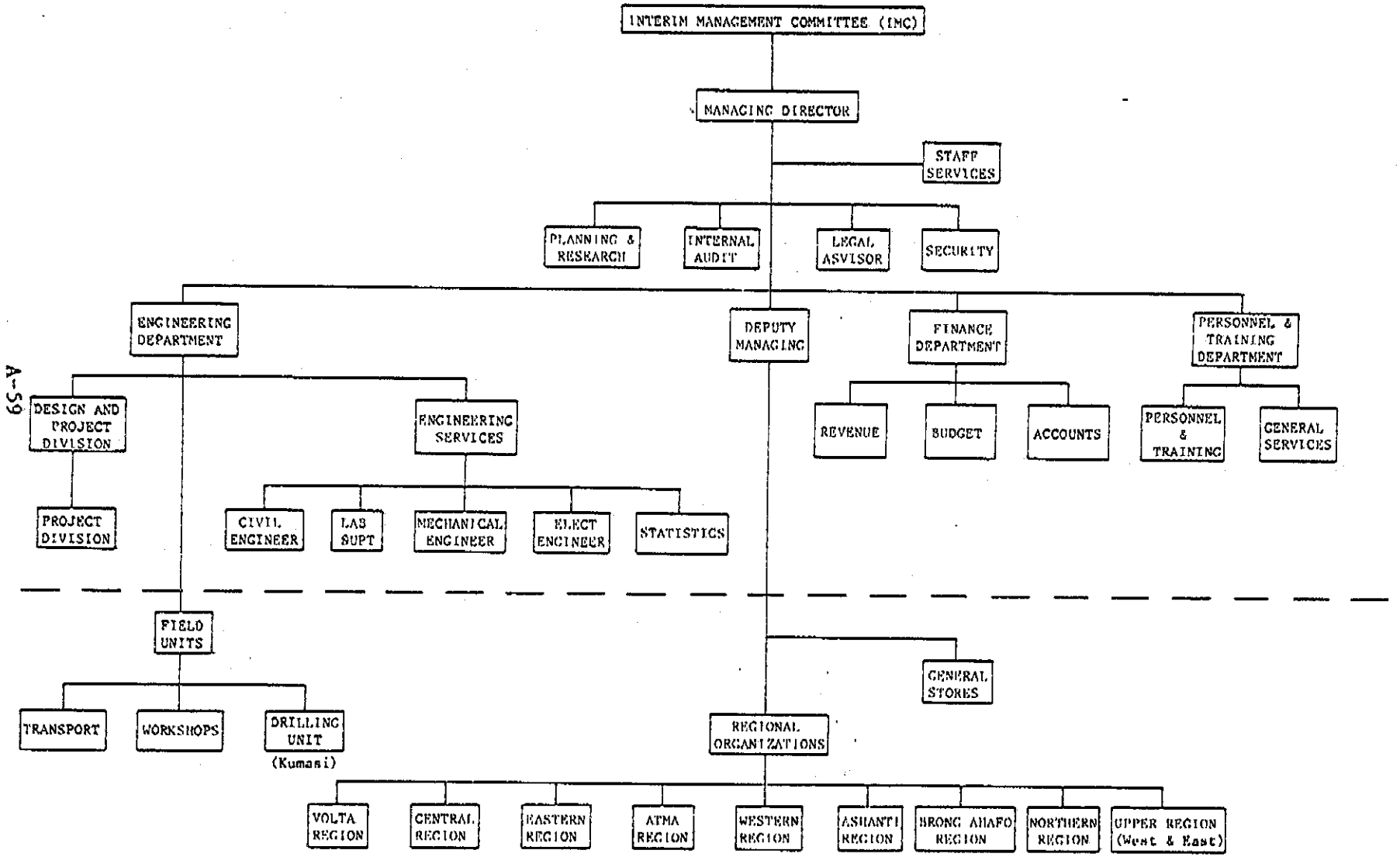
$$= 4.02 \times 10^{-2}$$

Appendix 8 Standard of Water Quality

Parameter	WHO - Highly Desirable	GWSC - Max. Acceptable	WHO - Max. Permissible	GWSC - Max. Allowable
Temperature	-	-	-	-
Odour	UO	UO	UO	UO
Turbidity	5	5	25	25
Colour	5	5	50	50
PH	7.0 - 8.5	7.0 - 8.5	6.5 - 9.2	6.5 - 9.2
Conductivity	-	-	-	-
Aggr. CO_2	-	-	-	-
Total Hardness	100	-	500	-
Alkalinity	80	0	400	-
Nitrate	45 - 50	45	100	45
Chloride	200	200	600	600
Flouride	0.7	1.5	0.8	1.5
Iron	0.1	0.3	1.0	1.0
Manganese	0.05	0.1	0.5	0.5

UO = Unobjectionable

Appendix 9 Organization of the Head Office of GWSC



Appendix 10 Data of Construction Cost

Appendix 10a Construction Cost Data, Open Market (June 1985)

	Unit	at Accra (¢)	at Fete (¢)
Cement	Bag	400.00	500.00
Iron Rod	Ton	84,000.00	95,000.00
Stone (3/4")	Ton	2,200.00	2,500.00
Stone (1 1/2")	Ton	1,920.00	2,000.00
Sand	Ton	500.00	580.00
Sand	C.Y.	900.00	1,200.00
Timber	c.ft	800.00	920.00
Binding Wire (coil)	kg	12,000.00	12,200.00
P.V.C. (6" x 10'0")		5,000.00	5,200.00
P.V.C. (4" x 10'0")		4,500.00	4,700.00
Carpenter		134.24	184.24
Mason		134.24	184.24
Operator		134.24	184.24
Driver		134.24	184.24
Steel Bender		126.30	176.30
Welder		126.30	176.30
Labourer		121.94	171.94
Electrician		134.24	184.24
Plumber		134.24	184.24
Surveyor		134.24	184.24
Foreman		194.78	244.78
Labourer Head		124.94	174.94
Concrete (240)	CM	10,300.00	10,450.00
Formwork	SM	600.00	620.00
Blinding Concretez (2")	CM	550.00	600.00
Screeding	SM	565.00	585.00
Plastering	SM	250.00	260.00
Excavation (Soil)	CM	500.00	520.00
Excavation (Laterite)	CM	1,200.00	1,320.00
Back Filling	CM	200.00	240.00

Appendix 10b Price Schedule (April 1985)

for 1 No., 6" Borehole, Depth 30 m (Approx.)

1) Labour Cost

Crew Wages & Salaries for 6 Weeks		55,900.00
Overtime		24,750.00
Night Allowance		63,750.00
20% Housing Allowance		11,200.00
12% Social Security		7,300.00
Other Allowances		13,100.00
		¢ 176,000.00

2) Material Cost

500 Galls Diesel Oil	@80 p/gal	40,000.00
4 Galls Engine Oil	@500 p/gal	2,000.00
2 Galls Kerosene	@50 p/gal	100.00
5 Ibs Grease	@48 p/Lb	240.00
6 Ibs Cotton Waste	@45 p/Lb	270.00
1 No. Wire Brush	@350	350.00
1 No. Hacksaw Blade	@100	100.00
4 Lengths of 6" P.V.C. Pipe (Plain)	@6,000 p/L	24,000.00
2 Lengths of 6" P.V.C. Pipe (Slotted)	@7,000 p/L	14,000.00
5 No. 6" P.V.C. Couplings	@500 each	2,500.00
1 Tin Tangit Cement	@2,500	2,500.00
2 No. 6" Plugs	@600 each	1,200.00
4 Cub Yrds Filter Media	@2,000 p/Cu yd	8,000.00
4 Bags Cement	@435	1,740.00
Cost of Stationery		1,000.00
Cost of Use of Rig		20,000.00
		¢ 118,000.00

3) Transport Cost

Use of 7 Ton Truck for 14 Days	@5,000 p/dy	70,000.00
Use of Pick-up for 3 Days	@2,500 p/dy	7,500.00
Moving 15 Ton Rig for 2 days	@5,000 p/dy	10,000.00
		¢ 87,500.00

4) Pumping Test & Water Analysis ¢ 30,000.00

SUMMARY

Labour Cost		176,000.00
Material Cost		118,000.00
Transport Cost		87,500.00
Pumping Test & Water Analysis		30,000.00
	sub-total	¢ 411,500.00
15% Corp. Charges		61,700.00
	GRAND TOTAL	¢ 473,200.00

Appendix 10c Price Schedule for Platform Construction

Item		Quantity	Unit Price	Amount (¢)
Earth Work:	Preparation Work	1 L/S		3,000
	Excavation	4 m^3	600	2,400
	Foundation (Cobble Stone)	1 m^3	5,500	5,500
Concrete Work:	Cement Concrete (1:2:4)	4 m^3	13,650	54,600
	Form Work	14 m^2	750	10,500
	Iron Rod	11 m^2	900	9,900
Plastering Work:	Plastering (1:3)	7.2 m^2	400	2,880
Sub-total				88,780
Contingency				19,500
Total				108,280
Overhead				25,000
Grand Total	.....			¢ 133,280.00

Appendix 11 The Letter from Chief of Fete

NANA ABOR EWUSI XIX

Twafohene Of Gomoa Akyempim Traditional Area
& Ohene of Gomoa Fetteh

Your Ref

My Ref No. NANA AEOR EWUSI XIX/GF.001/85

Abenfie
P.O. Box 1
Gomoa Fetteh
C. R
July 10, 1985.

Dear Sir,

OUR GRATEFUL THANKS

I, the undersigned, my elders and the entire citizens of Gomoa Fetteh in the Central Region of the Republic of Ghana, do hereby express our grateful thankfulness to the whole team of the Noguchi Institute of Japan, for the most remarkable work dor done to us for the building of a Health Centre and the restoration of good drinking water for the entire populace of the town.

We still need three (3) more bore holes, which we hope will be most beneficial to us and we do anticipate your co-operation to that effect.

We do thank the Government of Japan, and we do cherish that the name of "J A P A N," will ever remain in the lips of the present generation of Gomoa Fetteh, and our children yet unborn. It is a lime light of never to be forgotten history to us.

Thanking you most sincrely for your unflinching co-operation at all times.

Yours very faithfully,

.....

NANA ABOR EWUSI XIX,
OHENE OF
GOMOA FETTEH.

THE DIRECTOR,
THE NOGUCHI MEDICAL RESEARCH INSTITUTE,
A C C R A.

cc: 1. The Ambassador,
Japan Embassy in Ghana,
P.O. Box 1637,
Accra.
2. The Civil Engineer,
The Noguchi Medical
Research Institute, Accra.

People's Daily Graphic

FRIDAY, JULY 5, 1985. No. 10774 PRICE: ₵4.00

Foreign exchange accounts—overseas agents named

By Abigail Bonsu

THE Bank of Ghana has released the names of correspondent banks or agents in various overseas centres which will act as agents for seven authorised local banks in the operation of foreign exchange accounts in the country.

The local banks are the Ghana Commercial Bank, Barclays Bank (Ghana) Limited, Standard Chartered Bank (Ghana) Limited, the National Investment Bank, the Social Security Bank Limited, Bank of Credit and Commerce (Ghana) Limited and Merchant Bank (Ghana) Limited.

Each of the seven authorised banks has its specified foreign agents. For the Ghana Commercial Bank, the agent is the Ghana Commercial Bank, London.

Agents of the Social Security Bank are Midland Bank PLC, London, Banca Nazionale de Lavaro, Rome, Italy, Banque Bruselles Lambart S.A. Belgium, Amsterdam-Rotterdam Bank N.V., Amsterdam, Netherlands and BHF Bank, West Germany.

Those for the Bank of Credit and Commerce are Bank of Credit and Commerce International, Miami, Florida, Bank of Credit and Commerce International, London, Bank of Credit and Commerce (Overseas) Ltd., Lome, Togo, and Banque de Commerce et de Placements Sa, Geneva.

For the Merchant Bank, the agents are Citibank NA, Abidjan, Banque International Pour L-Afrique Occidentale, Lome-Togo, Swiss Bank Corporation, Switzerland, Grindlays Bank PLC, London and Berliner Bank AS, West Germany.

The agents for Standard Chartered Bank are Standard Chartered Bank, New York, Standard Chartered Bank, London, and Standard Chartered Bank, Zurich, while those for the Barclays Bank include Barclays Bank PLC, New York, Barclays Bank PLC, London and Barclays Bank Cote D'Ivoire.

A statement from the Bank of Ghana specified that customers may open deposit or current accounts with any of the named banks or their agents with foreign exchange except those earned from export of goods and services originating from Ghana, Agency Commission and Discounts on imports into Ghana.

The statement named the accepted convertible currency for the period as the US dollar, the pound sterling, Deutsche Mark, Swiss Franc and CFA Franc adding that interest shall be exempt from Ghana tax.

It said further that the account will be free from exchange restrictions while transfers abroad from these accounts will be made without ex-

(Contd. on Pg. 4/5)

Foreign exchange

(Contd. from P.1)

change control approval. Payments from the accounts may also be made in convertible currencies.

Mr P. K. Djainson, Secretary, Bank of Ghana, in an interview assured both Ghanaian and non-Ghanaian residents who may wish to open foreign exchange accounts of strict confidentiality in line with banking principles and regulations.

He said there was no indication that the same government which initiated the scheme would introduce measures that would adversely affect its smooth operation.

He therefore, disabused the minds of the public of rumours that statement of such accounts would be used to vet people in future.