A P P E N D I X

APPENDIX A - 1

MINUTES OF DISCUSSION

BETWEEN LT. COL. KAMOL PRACHUABMOH OC/MOI AND MR. TERUMI IIJIMA JICA

ON

STUDY OF WATER SUPPLY PROJECT TO THE LAOTIAN DISPLACED PERSONS IN THE KINGDOM OF THAILAND

I. INTRODUCTION

In response to the request made by the Government of Thailand, the Government of Japan has made the decision to provide a study on Water Supply Project to the Laotian displaced persons in accordance with laws and regulations in force in Japan.

The Japan international Cooperation Agency (JICA) an official agency responsible for implementation of technical cooperation programmes of the Government of Japan, will carry out this Study in close cooperation with Ministry of Interia (MOI).

Interior

II. SCOPE OF WORK

2.01 The Study aims at formulating the water supply plan through underground water exploitation in each camp of Nakhon Phanom and Park Chom respectively in Kingdom of Thailand.

2.02 The underground water survey consists of the three steps as follows.

Step 1.

1. Preparation of an inception report
2. Review of the report by the Phase III Survey Team

3. Preparation of necessary equipment and materials for field survey

Step 2

1. Submission and explanation of the inception report
2. Collection of data
3. Field reconnaizance
4. Electrical exploration
5. Test Boring, 2 holes each camp
6. Electrical logging, pumping test, water quality test and etc. on above bored holes
7. Preparation and submission of progress report

Step 3

1. Technical Analysis of underground water condition
2. Planning of underground water exploitation for water supply
3. Preparation and Submission of study report

2.03 Reports:

Inception Report (10 copies in English) will be prepared until 5 February 1982 and Progress Reports (10 copies in English) will be prepared and submitted until 15 March 1982. Study Report (10 copies in English) will be prepared and submitted within one month after field survey.

2.04 Undertakings of the Government of Thailand:

1. Provision of Data

(1) Ground Water Exploitation

APPENDIX A - 3

i) All drilling data in and surrounding area of the Nakhon Phanom Camp and Pak Chom Camp

ii) Hydrogeological data on existing wells within the Nakhon Phanom Camp and Pak Chom Camp

iii) Layout drawings of the both camps' facilities

2. Security Services for the Survey Team

i) Permits/Licenses for free passage (personnel and cargo)

ii) Security measures in the survey areas

3. Local Inhabitants Agreement for Execution of the Work

i) Drilling at site

ii) Topographical survey

iii) Field investigation on irrigation and water supply

4. Arrangement for Mobilization of Local Labourers

5. Preparation of Local Materials (Water tanks, etc.)

6. Tax-exemption inthe articles to be carried in and out of Thailand for execution of the Work.

2.05 Schedule:

The survey in Thailand will be carried out form 5 February to 15 March, and from 18 April to 20 May 1982.

(Lt.Col.Kamol Prachuabmoh)
Deputy Director
Operation Centre for Displaced Persons
Ministry of Interior

(Mr. Terumi Ijimi)
Director
Social Development Cooperation Department
Japan International Cooperation Agency(JICA)

WORK SCHEDULE

Work Item	1982 February	March	April	May	June
Preparatory Work	1 — 7				
Field Work	4 ——— 16		18 ——— 20		
Home Office Work		17 — 31		21 — 31	
Report					
Inception Report	○				
Progress Report		○		○	
Study Report					○

APPENDIX A - 5

MINUTES OF DISCUSSION

ON

STUDY OF WATER SUPPLY PROJECT TO THE LAOTIAN DISPLACED PERSONS IN THE KINGDOM OF THAILAND

I. The Government of Japan sent a team (Team) from March 11 to March 16, 1982, through the Japan International Cooperation Agency (JICA), to carry out the additional study to the Study on Water Supply Project to the Laotian Displaced Persons in the Kingdom of Thailand. The meeting between the Ministry of Interior (MOI) and Team was held on March 15, 1982.

I. Both sides agreed upon followings:

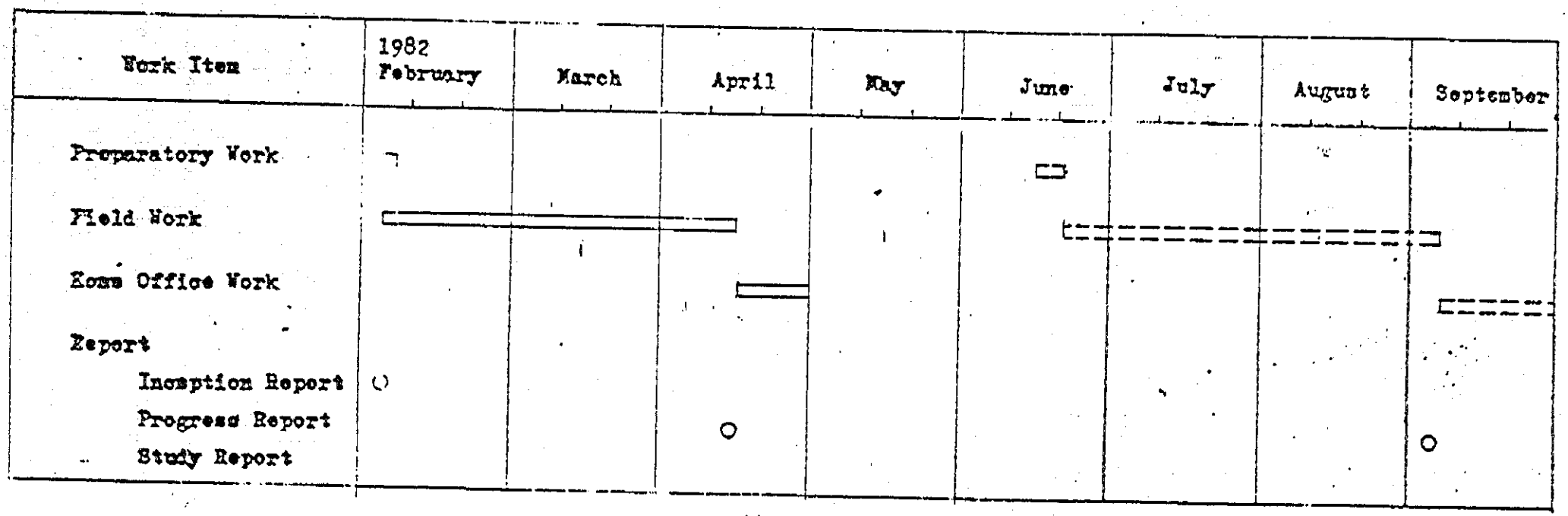
1. The additional underground water survey including 2 holes test boring will be carried out at Nakhon Phanom camp.
2. Due to technical difficulties, the underground water survey in Pak Chom Camp will be delay two months from original Schedule.
3. Consequently, Schedule for additional work in Nakhon Phanom camp and for Pak Chom Camp will be extended and adjourned accordingly, as attached Tentative Work Schedule.

P. Suwanrath

(Mr. Pranai Suwanrath)
Chief, Foreign Affairs Section,
Operation Centre for Displaced Persons.
Ministry of Interior Bangkok 2, Thailand.
March 15, 1982.

(Mr. Yukihisa Sakurada)
Deputy Head
Second Development survey Divisic
Social Development Cooperation
Department (JICA)

TENTATIVE WORK SCHEDULE



Note: Study Report shall be submitted in middle of October.

: Nakhon Phanom Camp

: Pak Chom Camp

APPENDIX B

TECHNICAL DATA

1) Geological Map of Thailand (S: 1/1,000,000):
Department of Mineral Resources, Ministry of National Development, 1969

2) Hydrogeological Map of Northeastern Thailand (S: 1/500,000):
Department of Mineral Resources, Ministry of Industry, 1973

3) Climatological Data of Thailand; 25 year Period (1951-1975):
Meteorogical Department, Ministry of Communications

4) Electric Sounding Method, Printed by Shokodo (in Japanese):
K. Simura (1965)

5) Pumping Test and Well Management, Printed by Shokodo (in Japanese):
S. Yamamoto (1979)

APPENDIX C

LIST OF COLLECTED DATA

1) Monthly and Annual Rainfall for the Period 1953-1980:
   Meteorological Department, Ministry of Communications

2) Pumping Test Records (Well No.U18, U43, U116, U337):
   Department of Mineral Resources

3) Water Analysis Report (Well No.U18, U19, U43, U116, U337):
   Department of Mineral Resources

4) Well Log (Well No.U43, U337):
   Department of Mineral Resources

5) Standard of Drinking Water (The Ministry of Public Health No.61-1981):
   Ministry of Public Health

6) Daily, Monthly and Annual Rainfall in Nakhon Phanom (1975-1981):
   Royal Irrigation Department

7) Water Balance of Somhong Reservoir:
   Royal Irrigation Department

8) Topographical Map (Scale 1:50,000):
   Royal Irrigation Department

9) Plan of Nakhon Phanom Camp (Scale 1:2,000):
   Nakhon Phanom Camp Office

10) Plan of Nakhon Phanom Camp (Scale 1:3,000):
    Nakhon Phanom Camp Office

APPENDIX D. WATER QUALITY TEST

APPENDIX D - 1

Our Ref. No 0304/ 9773

DEPARTMENT OF SCIENCE SERVICE
RAMA VI STREET, BANGKOK 4

12 April 1982

Mr.Ke-Kuwata
Japan Engineering Consultants Co.,Ltd.
No.2-6 Okubo,2 Chomo,Shinjuku-Ku
Tokyo,Japan.

Dear Sir,

With reference to your request of 31 March 1982, Ref. No.2245
we are pleased to send you the following report on the water sample/s received on 31 March 1982.

Yours truly,

Vejada Kongsiyan
(Miss Vejada Kongsiyan)
Scientist 8 and Director
for Director - General

Division of Chemistry
Tel. 817444 Ext. 02

REPORT ON PHYSICAL AND CHEMICAL EXAMINATIONS

The report is valid for the received sample/s only
and is not to be used for advertising purposes.

Deep Well Water

Laboratory No.		Collected from	By	Date	Time
KT.760	J-1	LOA CAMP, BAN	the sender	30Mar.82	2.00 pm.
KT.761	J-2	NAPOO, NAKHON	"	"	1.30 pm.
KT.762	J-3	PHANOM	"	"	2.30 pm.

	KT.760	KT.761	KT.762
Colour, in terms of Hazen units	less than 5	less than 5	less than 5
Odour	-	-	-
Taste	-	-	-
Turbidity, in terms of Silica scale	17.0	6.6	8.0
pH value	8.4	8.3	8.0
Electrical conductivity at 20°C, micromhos/cm	-	-	-
	parts per million		
Total solids	371	385	2,422
Loss on ignition	-	-	-
Suspended solids	-	-	-
Dissolved solids	-	-	-
Total hardness, expressed as calcium carbonate	134	142	484
Temporary hardness, ——do.——	-	-	-
Permanent hardness, ——do.——	-	-	-
Residual alkalinity, ——do.——	-	-	-
Chlorides, expressed as chlorine	-	-	-
Chlorides, expressed as sodium chloride	6.6	nil	514.4
Saline ammonia, expressed as ammonia	0.004	0.02	0.02
Albuminoid ammonia, expressed as ammonia	0.07	0.07	0.07
Nitrates expressed as nitrogen	0.07	0.07	0.08
Nitrites, expressed as nitrogen	nil	nil	0.005
Iron	0.20	0.25	0.14
Lead	0.01	0.002	0.01
Arsenic	0.003	not found	not found

Lavana Vasvit
(Mrs. Lavana Vasvit)
Scientist 5

APPENDIX D - 2

Our Ref. No. 0304/ 12106

DEPARTMENT OF SCIENCE SERVICE
RAMA VI STREET, BANGKOK 4

Mr. Ko-Kuwata
Japan Engineering Consultants Co.,Ltd.
No. 2-6, Okubo, 2-Chome, Shinjuku-ku
Tokyo

4 May 1982

Dear Sir,

With reference to your request of 13 April 1982, Ref. No.2349
we are pleased to send you the following report on the water sample/s received on 12 April 1982.

Yours truly,

(Mrs. Uta Antarikanonda)
Director, Division of Chemistry

Division of Chemistry
Tel. 817444 Ext. 02

for Director-General

REPORT ON PHYSICAL AND CHEMICAL EXAMINATIONS

The report is valid for the received sample/s only
Deep Well Water J-4 and is not to be used for advertising purposes.

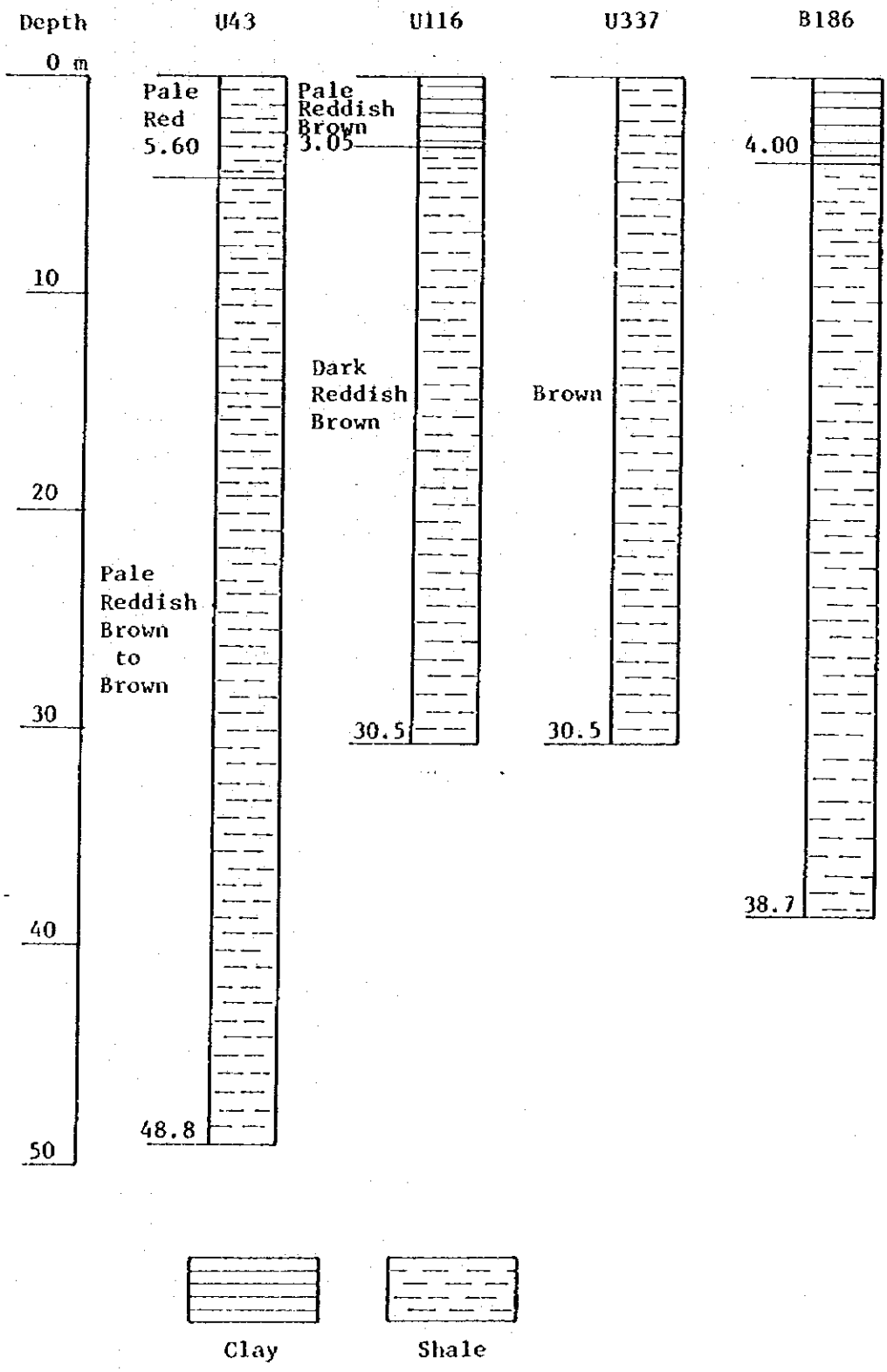
Laboratory No.	Collected from	By	Date	Time
KT.970	CAMP BAN-NA-PHO NAKHON PHANOM	The sender	-	-

Colour, in terms of Hazen units	less than 5
Odour	-
Taste	-
Turbidity, in terms of Silica scale	6.2
pH value	7.7
Electrical conductivity at 20°C, micromhos/cm	-
	parts per million
Total solids	777
Loss on ignition	-
Suspended solids	-
Dissolved solids	-
Total hardness, expressed as calcium carbonate	449
Temporary hardness, ——do.——	-
Permanent hardness, ——do.——	-
Residual alkalinity, ——do.——	-
Chlorides, expressed as chlorine	-
Chlorides, expressed as sodium chloride	145.1
Free and Saline ammonia, expressed as ammonia	0.01
Albuminoid ammonia, expressed as ammonia	0.06
Nitrates expressed as nitrogen	0.07
Nitrites, expressed as nitrogen	0.003
Iron	0.11
Lead	0.009
Arsenic	not found

(Mrs.Lavana Vasvit)
Scientist 5

APPENDIX E

COLAMNAR SECTION



APPENDIX F. DATA OF PUMPING TEST

APPENDIX F - 1

Data of Pumping Test (J-No. 1), 23 Feb. 1982

Time hr	min	sec	Time after Pumping Started t (sec)	Time after Pumping Stopped t' (sec)	Water Level (m)	Drawdown s (m)	t/t'	Log t/t'	Radius of Well r (m)	r^2/t	Pumping Rate Q(m^3/sec)	Remarks
13	55	00	0		15.44	0			0.108			Pumping Started
	55	15	15		16.21	0.77			0.108	6×10^{-4}		
	55	30	30		16.98	1.54			0.108	4×10^{-4}		
	55	45	45		17.69	2.25			0.108	2.667×10^{-4}		
	56	00	60		18.26	2.82			0.108	2×10^{-4}		
	56	30	90		19.33	3.89			0.108	1.333×10^{-4}		
	57	00	120		20.255	4.815			0.108	1×10^{-4}		
	57	30	150		21.062	5.622			0.108	8×10^{-5}		
	58	00	180		21.728	6.288			0.108	6.67×10^{-5}		
	58	30	210		22.35	6.91			0.108	5.71×10^{-5}		
	59	00	240		22.925	7.485			0.108	6×10^{-5}		
	59	30	270		23.387	7.947			0.108	4.44×10^{-5}		
14	0	00	300		23.84	8.4			0.108	4×10^{-5}		
	1	00	360		24.647	9.207			0.108	3.33×10^{-5}		
	2	00	420		25.305	9.865			0.108	2.85×10^{-5}		
	3	00	480		25.88	10.44			0.108	2.5×10^{-5}	0.002806	Q = 121.1 l/min = 0.00202 m^3/sec
	4	00	540		26.385	10.945			0.108	2.2×10^{-5}		
	5	00	600		26.833	11.393			0.108	2×10^{-5}		
	10	00	900		28.482	13.042			0.108	1.33×10^{-5}		
	15	00	1200		29.53	14.090			0.108	1×10^{-5}	0.0025081	
	20	00	1500		30.068	14.628			0.108	8×10^{-6}		
	25	00	1800		30.497	15.057			0.108	6.6×10^{-6}	0.0019903	
	35	00	2400		30.70	15.260			0.108	5×10^{-6}	0.001945	
	44	50	2990	0	30.90	15.46	0		0.108	4×10^{-6}		Pumping Stopped
	45	20	3020	30	28.615	13.175	100.667	2.0029	0.108	3.9×10^{-6}		
	46	20	3080	90	26.066	10.626	34.222	1.53431	0.108	3.8×10^{-6}		
	46	50	3110	120	25.017	9.577	25.917	1.41358	0.108	3.8×10^{-6}		
	47	20	3140	150	24.055	8.615	20.933	1.32083	0.108	3.8×10^{-6}		
	47	50	3170	180	23.187	7.747	17.611	1.24578	0.108	3.7×10^{-6}		
	48	20	3200	210	22.412	6.972	15.238	1.18293	0.108	3.7×10^{-6}		
	48	50	3230	240	21.746	6.306	13.458	1.18915	0.108	3.7×10^{-6}		
	49	20	3260	270	21.21	5.77	12.074	1.08185	0.108	3.6×10^{-6}		
	49	50	3290	300	20.599	5.159	10.967	1.04009	0.108	3.6×10^{-6}		
	50	50	3350	360	19.577	4.137	9.306	0.968763	0.108	3.5×10^{-6}		
	51	50	3410	420	19.025	3.585	8.119	0.909053	0.108	3.5×10^{-6}		
	52	50	3470	480	18.466	3.026	7.229	0.859078	0.108	3.4×10^{-6}		
	53	50	3530	540	18.038	2.598	6.537	0.815378	0.108	3.3×10^{-6}		
	54	50	3590	600	17.712	2.272	5.983	0.776919	0.108	3.3×10^{-6}		
	59	50	3890	900	16.774	1.334	4.322	0.635685	0.108	3×10^{-6}		
15	4	50	4190	1200	16.366	0.896	3.492	0.543074	0.108	2.8×10^{-6}		
	9	50	4490	1500	16.118	0.678	2.993	0.476107	0.108	2.6×10^{-6}		
	14	50	4790	1800	15.955	0.515	2.661	0.425045	0.108	2.5×10^{-6}		
	24	50	5390	2400	15.775	0.335	2.246	0.35141	0.108	2.2×10^{-6}		
	34	50	5990	3000	15.692	0.252	1.997	0.296007	0.108	2×10^{-6}		
	44	50	6590	3600	15.640	0.2	1.831	0.262688	0.108	1.8×10^{-6}		
16	14	50	8390	5400	15.56	0.12	1.554	0.191451	0.108	1.4×10^{-6}		
	44	50	10190	7200	15.512	0.072	1.415	0.150756	0.108	1.1×10^{-6}		
17	14	50	11990	9000	15.503	0.063	1.332	0.124504	0.108	1×10^{-6}		

APPENDIX F - 2

Data of Pumping Test (J-No. 2), 4 Mar. 1982

Time hr min sec	Time after Pumping Started t (sec)	Time after Pumping Stopped t'(sec)	Water Level (m)	Draw-down s(m)	t/t'	Log t/t'	Radius of Well r (m)	r^2/t	Pumping Rate $Q(m^3/sec)$	Remarks
13 55 00	0		13.67	0			0.108			Pumping Started
	15		14.40	0.73			0.108	8×10^{-4}		
	30		15.36	1.69			0.108	4×10^{-4}		
	45		-	-			0.108	-		
	60		16.64	2.97			0.108	2×10^{-4}		
	90		18.21	4.54			0.108	1.333×10^{-4}		
	120		19.24	5.57			0.108	1×10^{-4}		
	150		20.20	6.53			0.108	8×10^{-5}		
	180		21.15	7.48			0.108	6.667×10^{-5}		
	210		22.39	8.72			0.108	5.714×10^{-5}		
	240		23.43	9.76			0.108	5×10^{-5}		
	270		24.27	10.6			0.108	4.444×10^{-5}		
	300		25.12	11.45			0.108	4×10^{-5}		
	360		26.49	12.82			0.108	3.333×10^{-5}		
	420		27.675	14.005			0.108	2.857×10^{-5}		
	480		28.61	14.94			0.108	2.5×10^{-5}		
	540		29.425	15.755			0.108	2.222×10^{-5}		
	600		30.11	16.44			0.108	2×10^{-5}	0.00177	Q = 103.8 ℓ/min Q = 0.0017 m^3/sec
	900		32.16	18.49			0.108	1.333×10^{-5}		
	1200		33.40	19.73			0.108	1×10^{-5}		
	1500		34.115	20.445			0.108	8×10^{-6}		
	1800		34.84	21.17			0.108	6.667×10^{-6}		
	2400		35.24	21.57			0.108	5×10^{-6}	0.00181	
	3000		35.37	21.7			0.108	4×10^{-6}	0.00166	
	3600		34.255	20.585			0.108	3.333×10^{-6}		
	5400	0	33.530	19.86			0.108	2.222×10^{-6}	0.00167	Pumping Stopped
	5415	15	32.645	18.975	361	2.558	0.108	2.216×10^{-6}		
	5430	30	31.910	18.23	181	2.258	0.108	2.21×10^{-6}		
	5445	45	31.111	17.441	121	2.083	0.108	2.204×10^{-6}		
	5460	60	30.321	16.651	91	1.959	0.108	2.198×10^{-6}		
	5490	90	28.775	15.105	61	1.785	0.108	2.186×10^{-6}		
	5520	120	27.31	13.64	46	1.663	0.108	2.174×10^{-6}		
	5550	150	25.935	12.265	37	1.568	0.108	2.167×10^{-6}		
	5580	180	24.68	11.01	31	1.491	0.108	2.151×10^{-6}		
	5610	210	23.515	9.845	26.714	1.427	0.108	2.139×10^{-6}		
	5640	240	22.37	8.7	23.5	1.371	0.108	2.128×10^{-6}		
	5670	270	21.575	7.905	21	1.322	0.108	2.116×10^{-6}		
	5700	300	20.875	7.205	19	1.279	0.108	2.105×10^{-6}		
	5760	360	19.615	5.945	16	1.204	0.108	2.083×10^{-6}		
	5820	420	18.52	4.85	13.857	1.142	0.108	2.062×10^{-6}		
	5880	480	17.59	3.92	12.25	1.088	0.108	2.041×10^{-6}		
	5940	540	16.845	3.175	11	1.041	0.108	2.02×10^{-6}		
	6000	600	16.193	2.523	10	1	0.108	2×10^{-6}		
	6300	900	14.51	0.84	7	0.845	0.108	1.905×10^{-6}		
	6600	1200	14.074	0.404	5.5	0.740	0.108	1.818×10^{-6}		
	6900	1500	13.918	0.248	4.6	0.663	0.108	1.739×10^{-6}		
	7200	1800	13.837	0.167	4	0.602	0.108	1.667×10^{-6}		
	7800	2400	13.747	0.077	3.25	0.512	0.108	1.538×10^{-6}		
	8400	3000	13.705	0.035	2.8	0.447	0.108	1.429×10^{-6}		
	10200	4800	13.64	-0.03	2.125	0.327	0.108	1.176×10^{-6}		
17 15 00	12000	6600	13.577	-0.093	1.818	0.26	0.108	1×10^{-6}		

APPENDIX F - 3

Data of Pumping Test (J-No. 3), 29 Mar. 1982

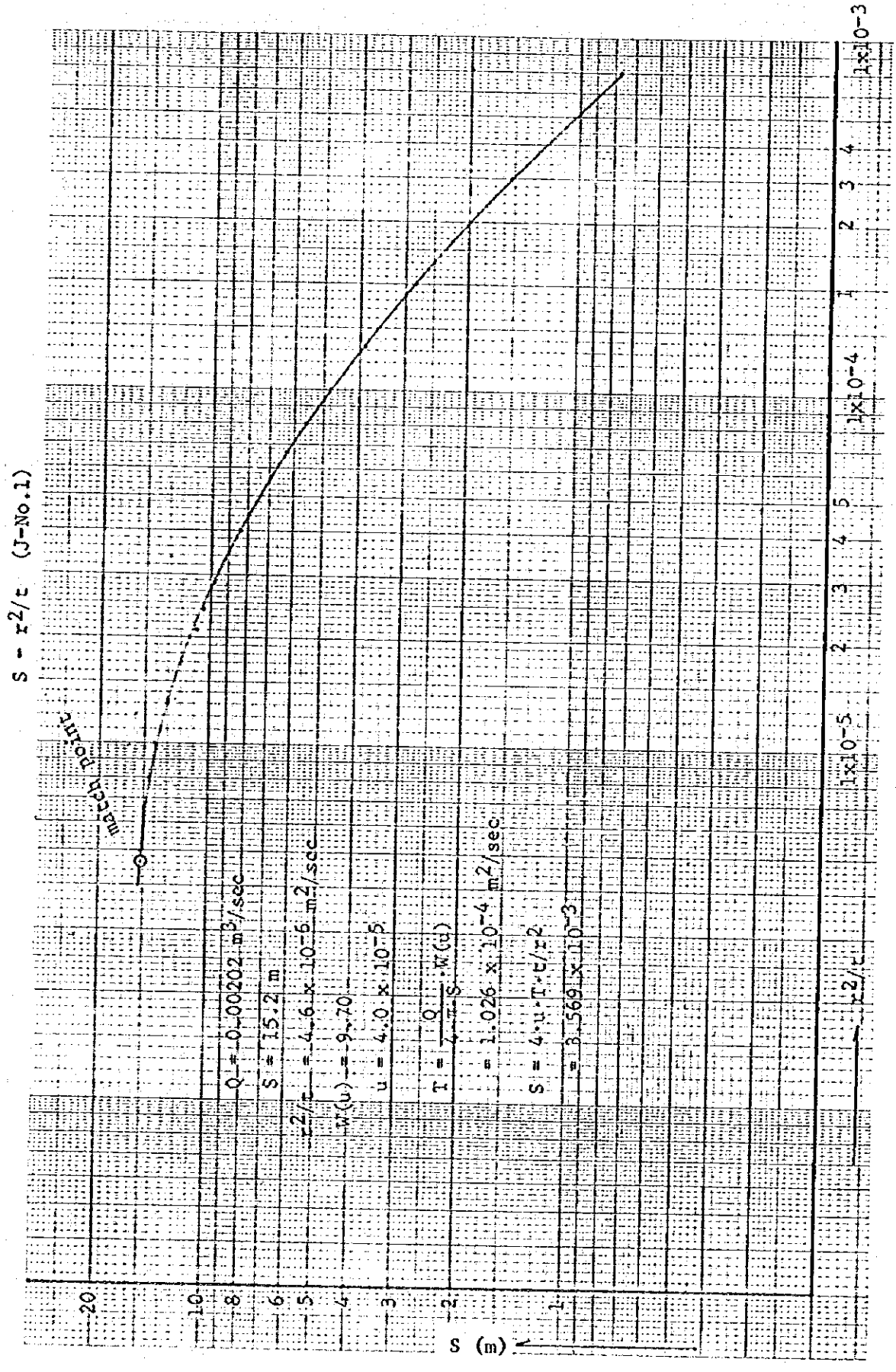
Time in sec	Time after Pumping Started t (sec)	Time after Pumping Stopped t' (sec)	Water Level (m)	Draw-down s(m)	t/t'	Log t/t'	Radius of Well r (m)	r^2/t	Pumping Rate Q(m^3/sec)	Remarks
8 00	0		13.555	0			0.108			
	30		15.71	2.155			0.108	3.888×10^{-4}		
	60		17.332	3.777			0.108	1.944×10^{-4}		
	90		19.07	5.515			0.108	1.29333×10^{-4}		
	120		20.475	6.92			0.108	9.7×10^{-5}		
	150		21.633	8.078			0.108	7.76×10^{-5}		
	180		22.663	9.108			0.108	6.46666×10^{-5}		
	210		23.437	9.882			0.108	5.54285×10^{-5}		
	240		24.131	10.576			0.108	4.85×10^{-5}		
	270		24.772	11.217			0.108	4.31111×10^{-5}		
	300		25.30	11.745			0.108	3.88×10^{-5}		
	360		26.182	12.627			0.108	3.23333×10^{-5}		
	420		26.866	13.311			0.108	2.77142×10^{-5}		
	480		27.407	13.852			0.108	2.425×10^{-5}		
	540		27.815	14.26			0.108	2.15555×10^{-5}		
	600		28.15	14.595			0.108	1.94×10^{-5}		Q = 154.9 ℓ/min
	900		29.127	15.572			0.108	1.29333×10^{-5}		= 0.00258 m^3/sec
	1200		29.61	16.055			0.108	9.7×10^{-6}		
	1500		29.895	16.34			0.108	7.76×10^{-6}		
	1800		30.04	16.485			0.108	6.46666×10^{-6}		
	2400		30.20	16.645			0.108	4.85×10^{-5}		
	3000		30.476	16.921			0.108	3.88×10^{-6}		
	3600	0	30.477	16.922			0.108	3.23338×10^{-6}		
	3660	60	28.057	14.502	61	1.78533				
	3690	90	25.717	12.162	41	1.61278				
	3720	120	23.605	10.05	31	1.49136				
	3750	150	21.838	8.283	25	1.39794				
	3780	180	20.27	6.715	21	1.32222				
	3810	210	18.977	5.422	18.142857	1.25871				
	3840	240	17.936	4.381	16	1.20412				
	3870	270	17.091	3.536	14.3333	1.15635				
	3900	300	16.437	2.882	13	1.11394				
	3930	330	15.879	2.324	11.90909	1.07588				
	3960	360	15.421	1.866	11	1.04139				
	4020	420	14.736	1.181	9.5714285	0.980977				
	4080	480	14.322	0.767	8.5	0.929419				
	4140	540	14.042	0.465	7.6666666	0.88467				
	4200	600	13.849	0.294	7	0.845098				
	4260	660	13.715	0.16	6.4545454	0.809866				
	4560	960	13.331	-0.223	4.75	0.676694				
	4860	1260	13.141	-0.414	3.8571428	0.586266				
	5160	1560	13.0	-0.555	3.3076923	0.519525				
	5460	1860	12.913	-0.625	2.9354838	0.46768				
	6060	2460	12.778	-0.777	2.4634146	0.391538				
	6660	3060	12.685	-0.87	2.1764705	0.337753				
	7260	3660	12.624	-0.931	1.9836065	0.297456				

APPENDIX F - 4

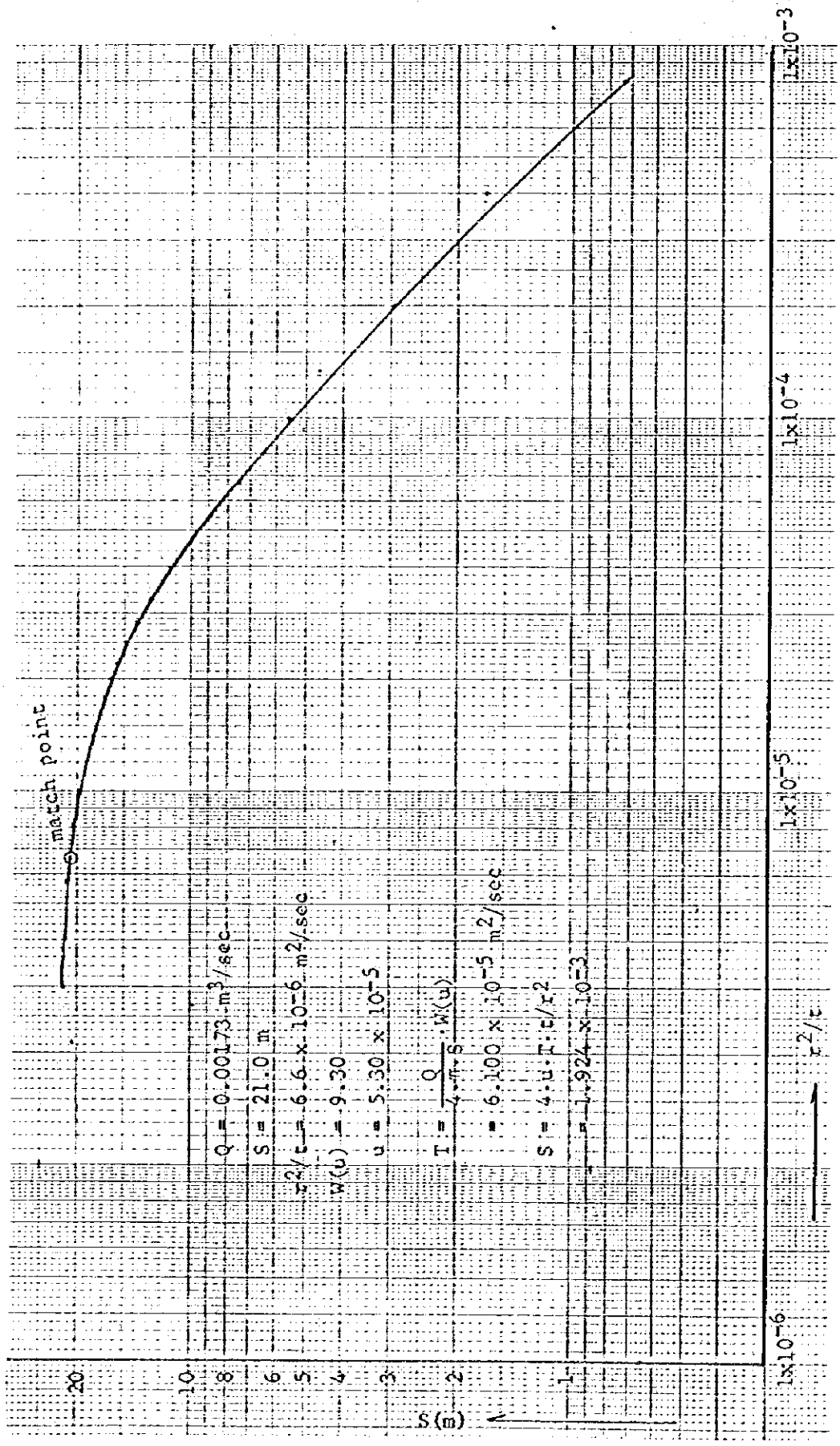
Data of Pumping Test (J-No. 4), 6 Apr. 1982

Time hr min sec	Time after Pumping Started t (sec)	Time after Pumping Stopped t' (sec)	Water Level (m)	Draw-down s (m)	t/t'	Log t/t'	Radius of Well r (m)	r^2/t	Pumping Rate Q(m^3/sec)	Remarks
9 15 00	0		5.500	0			0.108	0		Pumping Started
	15		6.325	0.825			0.108	7.78×10^{-4}		
	30		6.720	1.220			0.108	3.89×10^{-4}		
	45		6.825	1.325			0.108	2.59×10^{-4}		
	60		6.954	1.454			0.108	1.94×10^{-4}		
	90		7.092	1.592			0.108	1.30×10^{-4}		
	120		7.205	1.705			0.108	9.72×10^{-5}		
	150		7.294	1.794			0.108	7.78×10^{-5}		
	180		7.370	1.870			0.108	6.48×10^{-5}		
	210		7.430	1.930			0.108	5.55×10^{-5}		
	240		7.489	1.989			0.108	4.86×10^{-5}		
	270		7.550	2.050			0.108	4.32×10^{-5}		
	300		7.593	2.093			0.108	3.89×10^{-5}		
	360		7.670	2.170			0.108	3.24×10^{-5}		
	420		7.745	2.245			0.108	2.78×10^{-5}		
	480		7.812	2.312			0.108	2.43×10^{-5}		
	540		7.875	2.375			0.108	2.16×10^{-5}		
	600		7.912	2.412			0.108	1.94×10^{-5}		
	900		8.140	2.640			0.108	1.30×10^{-5}		
	1200		8.286	2.786			0.108	9.72×10^{-6}		
	1500		8.408	2.908			0.108	7.78×10^{-6}		
	1800		8.500	3.000			0.108	6.48×10^{-6}		Q = 244.26 l/min
	2400		8.647	3.147			0.108	4.86×10^{-6}		= 0.004071 m^3/s
	3000		8.755	3.255			0.108	3.89×10^{-6}		
	3600		8.836	3.336			0.108	3.24×10^{-6}	0.004071	
	5425		9.020	3.520			0.108	2.15×10^{-6}		
11 15 00	7200	0	9.100	3.600	0		0.108	2.62×10^{-6}		Pumping Stopped
	7215	15	8.277	2.777	481	2.682	0.108	1.62×10^{-6}		
	7230	30	7.873	2.373	241	2.382	0.108	1.61×10^{-6}		
	7245	45	7.746	2.246	161	2.207	0.108	1.61×10^{-6}		
	7260	60	7.664	2.164	121	2.083	0.108	1.61×10^{-6}		
	7290	90	7.467	1.967	81	1.908	0.108	1.60×10^{-6}		
	7320	120	7.358	1.858	61	1.785	0.108	1.59×10^{-6}		
	7350	150	7.267	1.767	49	1.690	0.108	1.59×10^{-6}		
	7380	180	7.191	1.691	41	1.613	0.108	1.58×10^{-6}		
	7410	210	7.135	1.635	35.3	1.548	0.108	1.57×10^{-6}		
	7440	240	7.071	1.571	31	1.491	0.108	1.57×10^{-6}		
	7470	270	7.030	1.530	27.7	1.442	0.108	1.56×10^{-6}		
	7500	300	6.970	1.470	25	1.398	0.108	1.55×10^{-6}		
	7560	360	6.897	1.397	21	1.322	0.108	1.54×10^{-6}		
	7620	420	6.830	1.330	18.1	1.258	0.108	1.53×10^{-6}		
	7680	480	6.765	1.265	16	1.204	0.108	1.52×10^{-6}		
	7740	540	6.710	1.210	14.3	1.155	0.108	1.51×10^{-6}		
	7800	600	6.662	1.162	13	1.114	0.108	1.50×10^{-6}		
	8400	1200	6.324	0.824	7	0.845	0.108	1.39×10^{-6}		
	9000	1800	6.146	0.646	5	0.699	0.108	1.30×10^{-6}		
	12600	5400	5.765	0.265	2.3	0.362	0.108	9.26×10^{-7}		
13 45 00	16200	9000	5.665	0.165	1.8	0.255	0.108	7.20×10^{-7}		

APPENDIX F - 5

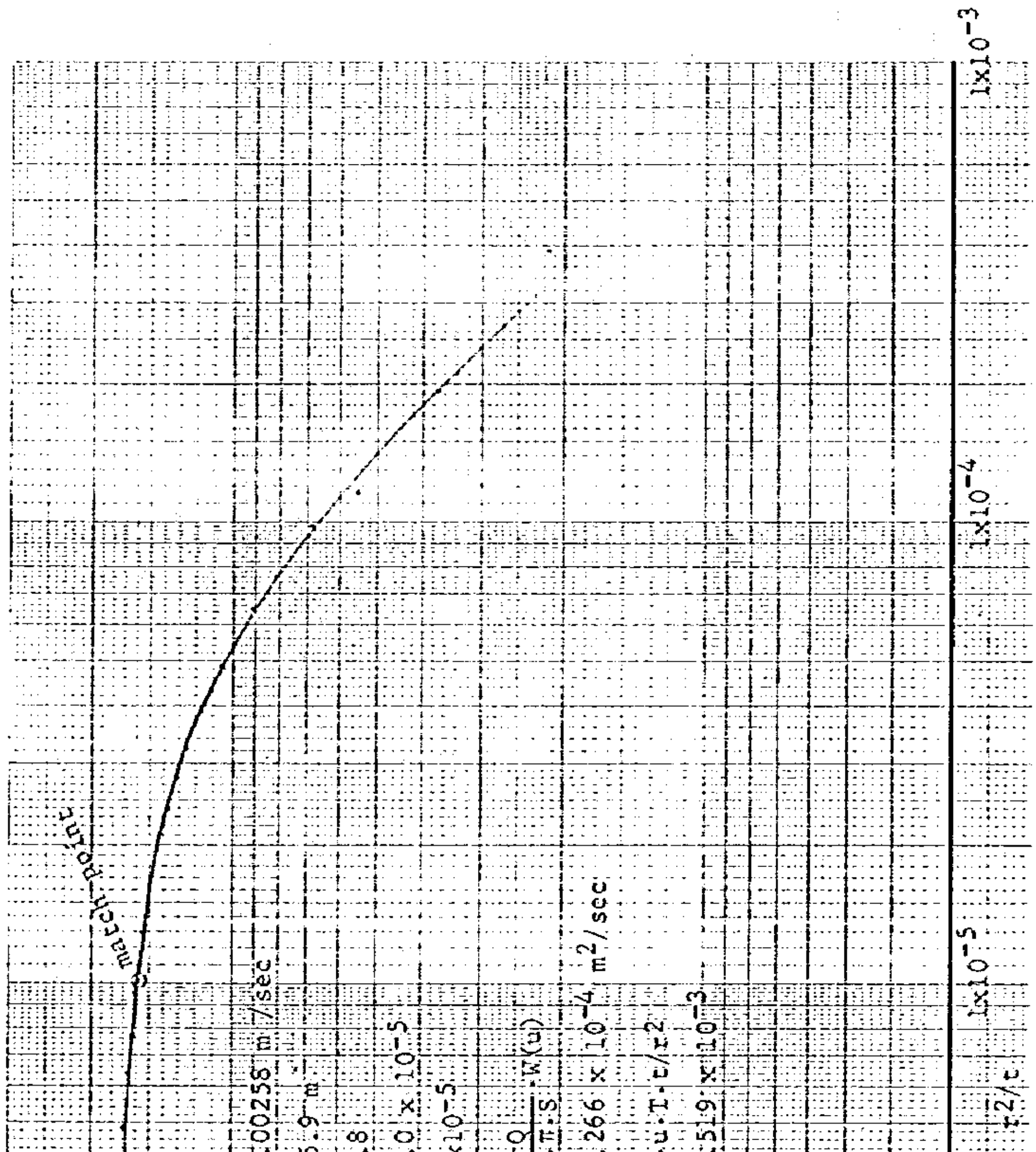

S - r2/t (J-No.1)
match point
Q = 0.00202 m3/sec
S = 15.2 m
r2/t = 4.6 x 10-6 m2/sec
W(u) = 9.70
u = 4.0 x 10-5
T = Q/4πS . W(u)
= 1.026 x 10-4 m2/sec
S = 4·u·T·t/r2
= 3.569 x 10-3
S (m)
r2/t
1x10-5
1x10-4
1x10-3

APPENDIX F - 6

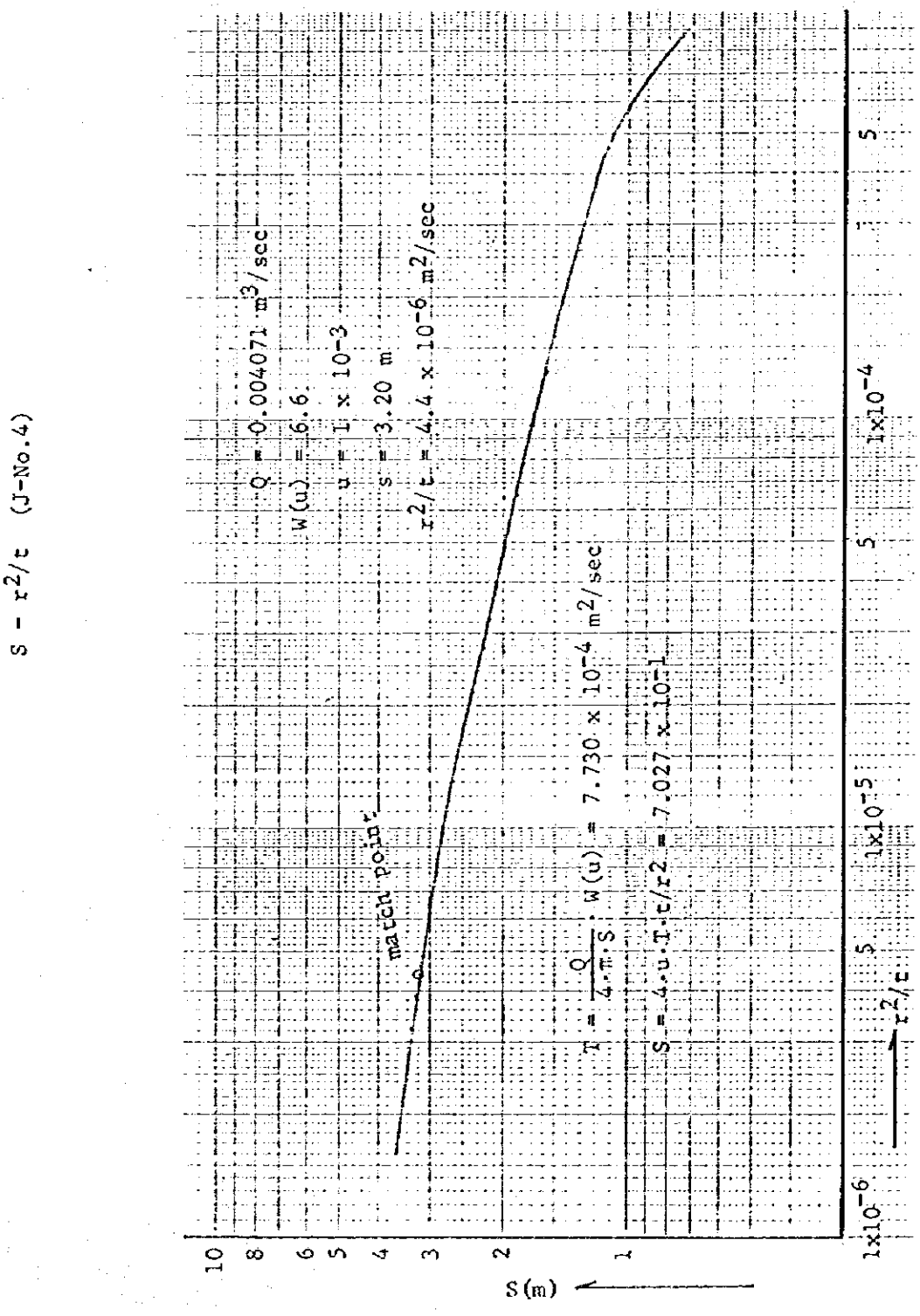

S - r2/t (J-No.2)
match point
Q = 0.00173 m3/sec
S = 21.0 m
r2/t = 6.6 x 10-6 m2/sec
W(u) = 9.30
u = 5.30 x 10-5
T = Q/(4πS) · W(u)
= 6.100 x 10-5 m2/sec
S = 4·u·T·t/r2
= 1.924 x 10-3
S(m)
r2/t
1x10-3
1x10-4
1x10-5
1x10-6

APPENDIX F - 7

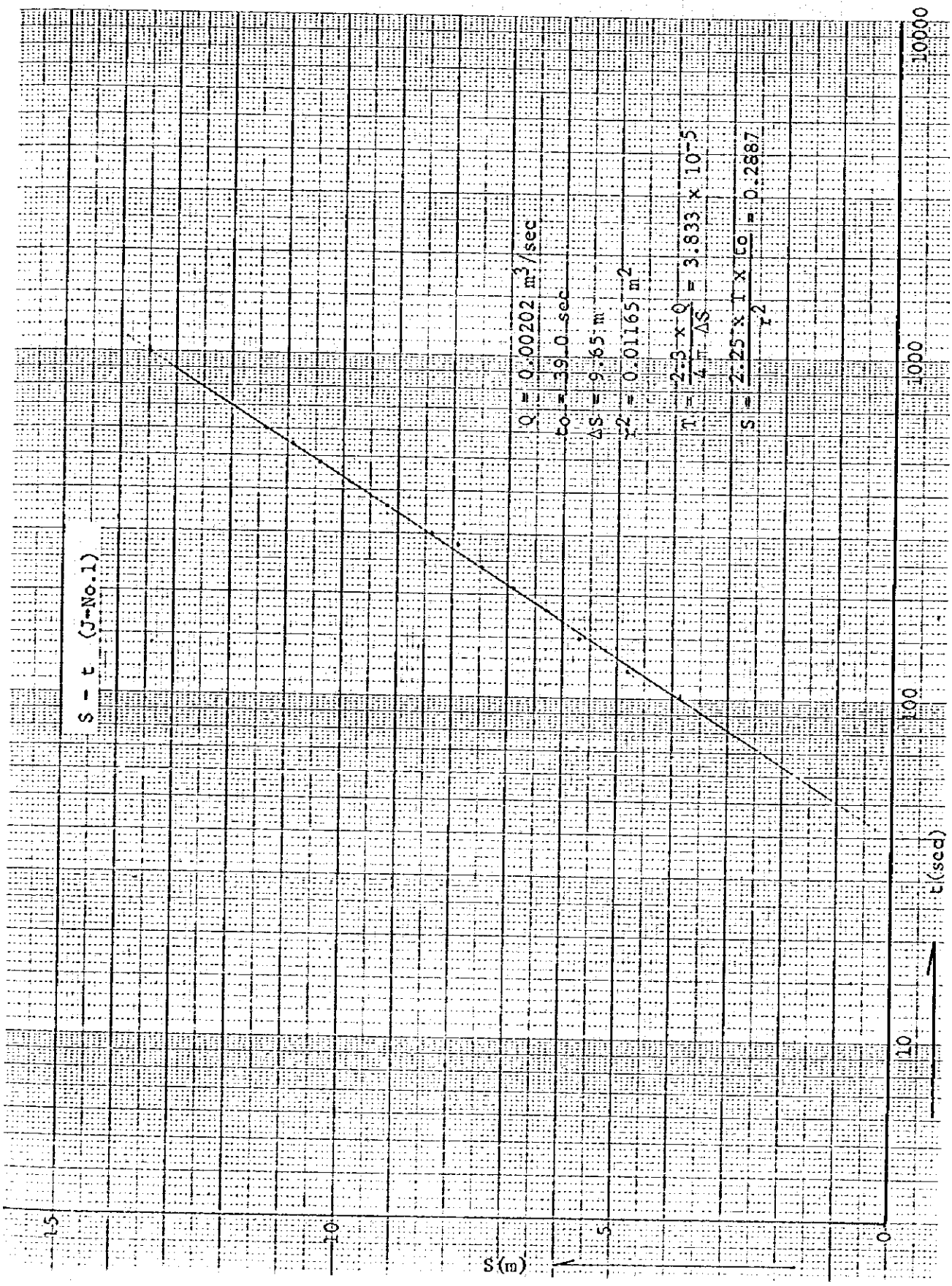
S - r²/t (J-No.3)



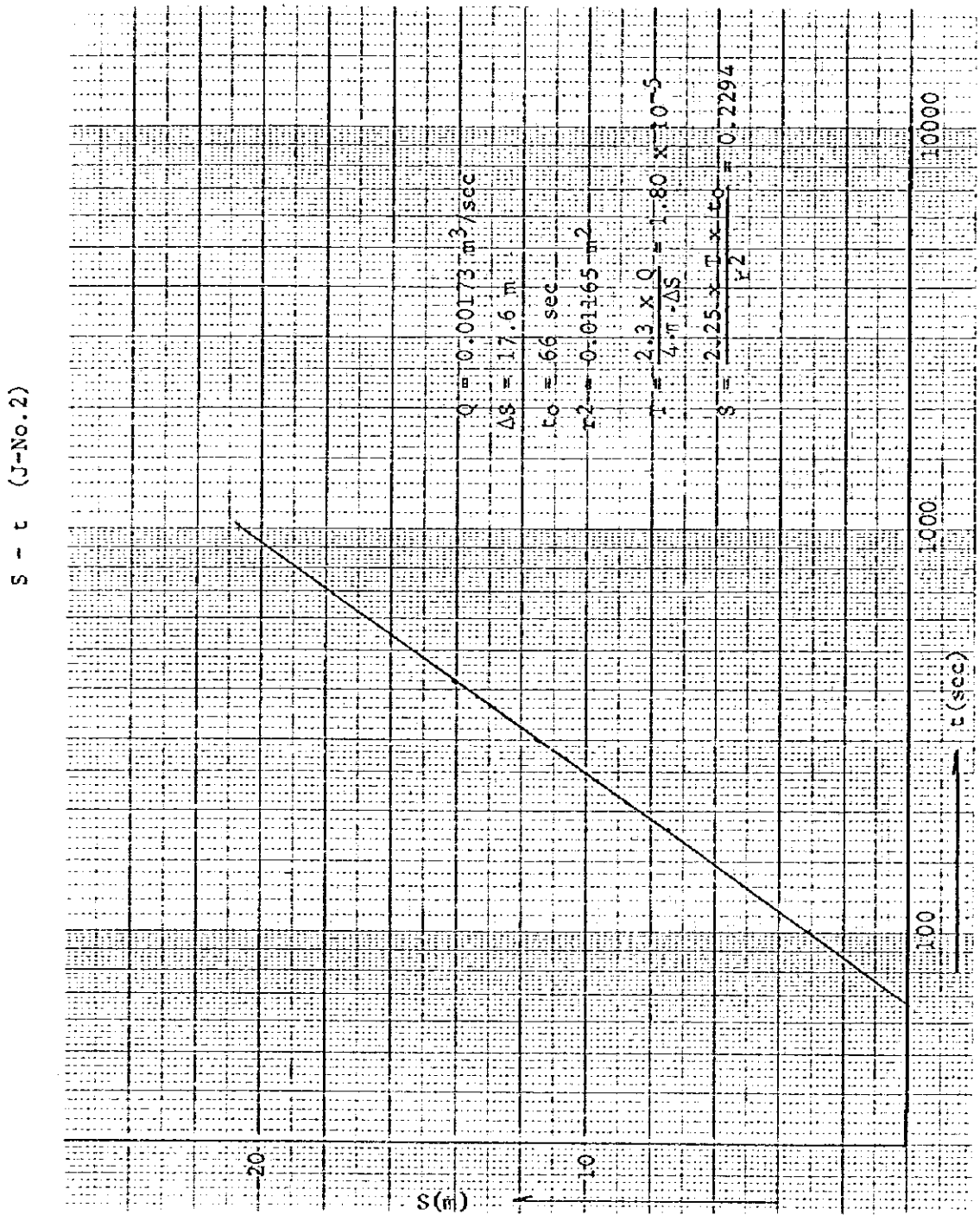
APPENDIX F - 8


S - r²/t (J-No.4)
Q = 0.004071 m³/sec
W(u) = 6.6
u = 1 x 10⁻³
s = 3.20 m
r²/t = 4.4 x 10⁻⁶ m²/sec
match point
T = Q/(4.π.S) · W(u) = 7.730 x 10⁻⁴ m²/sec
S = 4.u.T.t/r² = 7.027 x 10⁻¹
S(m)
r²/t
10
8
6
5
4
3
2
1
1x10⁻⁶
5
1x10⁻⁵
5
1x10⁻⁴
5

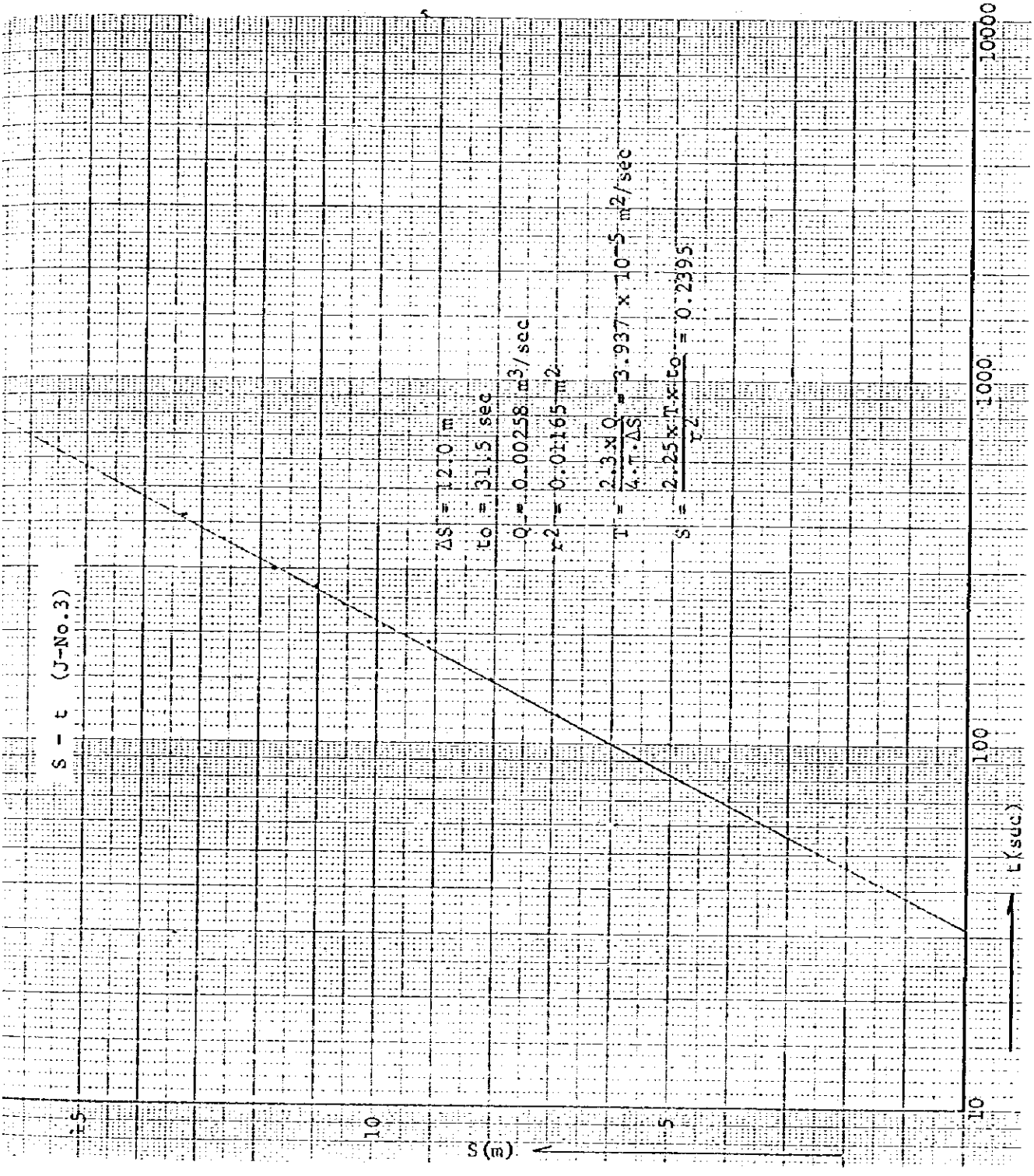
APPENDIX F - 9


S - t (J-No.1)
Q = 0.00202 m³/sec
to = 39.0 sec
ΔS = 9.65 m
r2 = 0.01165 m²
T = 2.3 x Q / 4π ΔS = 3.833 x 10⁻⁵
S = 2.25 x T x to / r² = 0.2887
S(m)
t(sec)
-15
-10
-5
0
1
10
100
1000
10000

APPENDIX F - 10

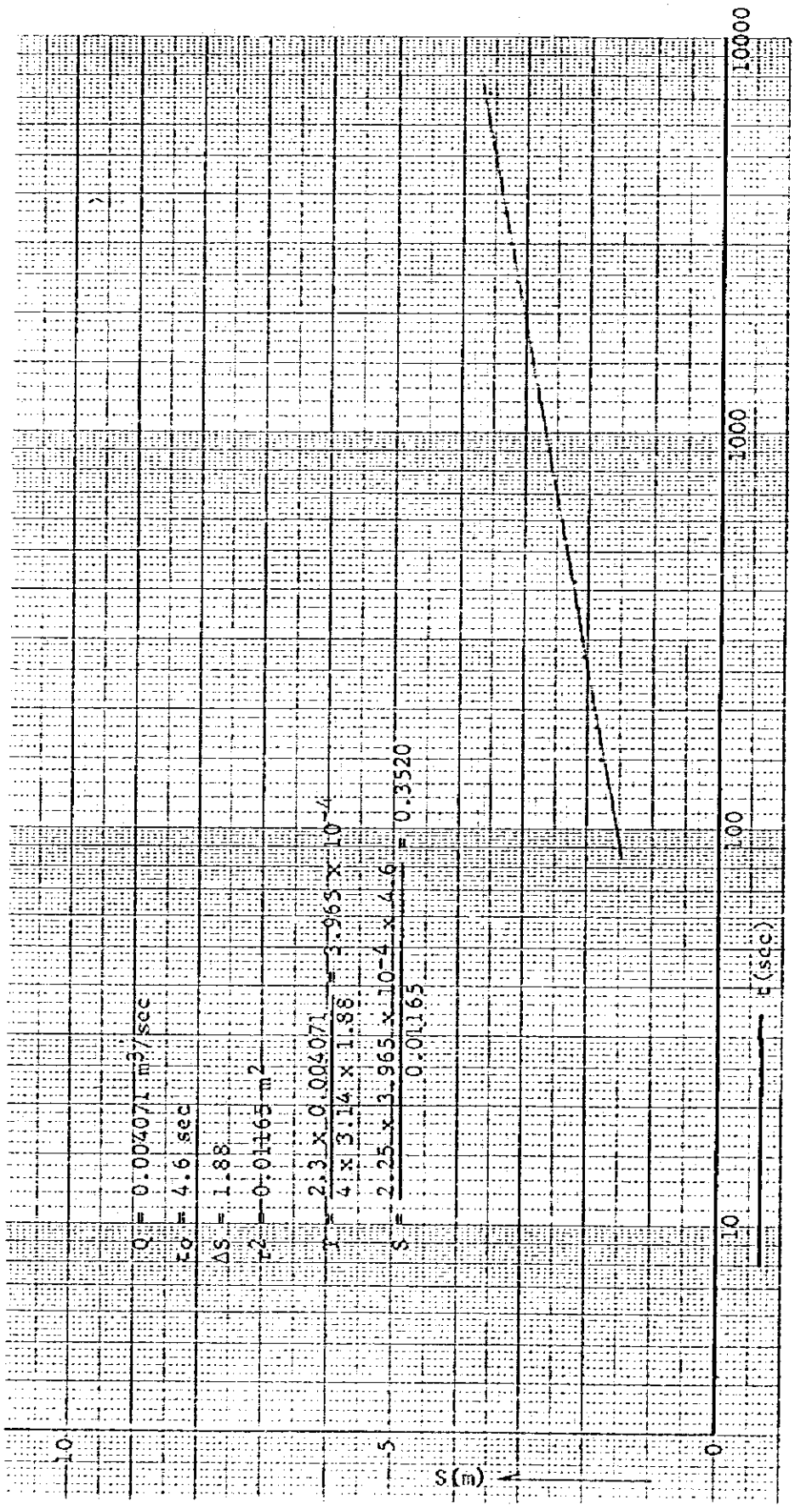


APPENDIX F - 11



APPENDIX F - 12

S - t (J-No.4)



APPENDIX G

STANDARD OF DRINKING WATER

(The Ministry of Public Health No.61, 1981)

1) Physical Properties

. Colour	not more than 20
. Odor	no other ordor (not include chlorine)
. Turbidity	not more than 5
. PH value	between 6.5 - 8.5

2) Chemical Properties

. Total solid	not more than 500 mg/kg
. Total hardness	not more than 100 mg/kg
. Arsenic	not more than 0.05 mg/kg
. Barium	not more than 1.0 mg/kg
. Cadmium	not more than 0.01 mg/kg
. Chloride (expressed as chlorine)	not more than 250 mg/kg
. Chromium	not more than 0.05 mg/kg
. Copper	not more than 1.0 mg/kg
. Iron	not more than 0.5 mg/kg
. Lead	not more than 0.1 mg/kg
. Manganese	Not more than 0.05 mg/kg
. Mercury (Hg)	not more than 0.002 mg/kg
. Nitrates (expressed as nitrogen)	not more than 4.0 mg/kg
. PL	not more than 0.001 mg/kg
. Silver	not more than 0.01 mg/kg
. Sulfate	not more than 250.0 mg/kg
. Zine	not more than 5.0 mg/kg
. Fluoride (express as fluorine)	not more than 1.5 mg/kg

3) Baeterial Properties

. Most probable number of coliform organism per 100 ml (M.P.N.) less than 2.2

. Free from Eschericha coli type 1

. There are not bacterial for illness

APPENDIX H. BORING LOG

APPENDIX H - 1

BORING LOG

~~PROJECT~~ · LOCATION BAN NA PHO

GROUND ELEVATION 161.15 m

DATE OF INVESTIGATION 13 ~ 18 FEB. 1982

BORING HOLE No. J - 1

DEPTH TO GROUND WATER LEVEL IN HOLE 16.30 m

INVESTIGATED BY K. NARITA

STAFF m	ELEVATION m	DEPTH m	THICKNESS m	FIELD OBSERVATIONAL RECORD: COLUMN SECTION (Graphic mark)	Soil or Rock NAME OF CLASSIFICATION	COLOR TONE	DESCRIPTION	DRILLING: TIME (min) 50 100	CASING: PIPE and PUMP
	160.15	1.0	1.0		Sandy Clay	Reddish Brown	Very Stiff		
	155.55	5.6	4.60		Clay	Dark Brown	Stiff and Sticky		
							5.6m to 14m Soft and Permiable (a little)		
							25m to 32m Hard		
							29.7 m Permiable		
							34.2 m Permiable		
							35m to 39m Hard		
	119.15	42.0	36.4		Shale	Pale Reddish Brown to Dark Brown			

ELECTRICAL LOG — RESISITIVITY (Ω-m): a = 25, a = 50, a = 100; 0 10 20 30

Pumping Pipe

Casing Pipe

Submersible Pump

APPENDIX H - 2

BORING LOG

~~PROJECT~~ · LOCATION BAN NA PHO

GROUND ELEVATION 160.385 m

DATE OF INVESTIGATION 19~28 FEB. 1982

BORING HOLE No. J - 2

DEPTH TO GROUND WATER LEVEL IN HOLE 13.50 m

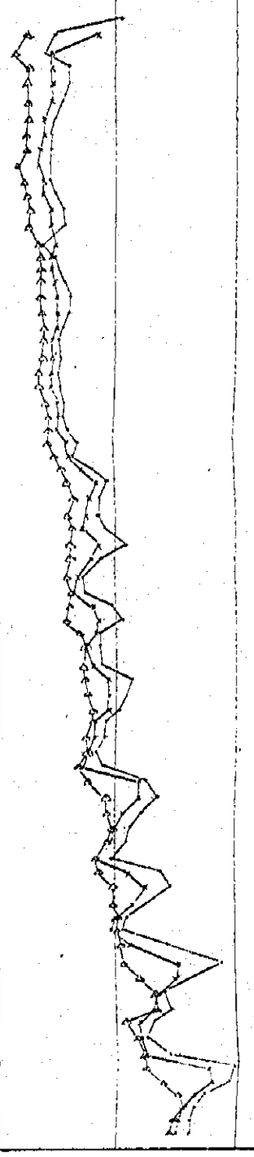
INVESTIGATED BY K. NARITA

STAFF m	ELEVATION m	DEPTH m	THICKNESS m	FIELD OBSERVATIONAL RECORD: COLUMN SECTION (Graphic mark)	Soil or Rock NAME OF CLASSIFICATION	COLOR TONE	DESCRIPTION
	159.5	0.9	0.9		Sandy Clay	Reddish Brown	Very Stiff
	156.3	4.1	3.2		Clay	Dark Brown	Stiff and Sticky
	118.4	42.0	38.8		Shale	pale Reddish Brown to Dark Brown	5.5m to 17m Soft and Permiable (a little) 17m to 29m Permiable (a little) 29m to 42m Hard

DRILLING — TIME (min): 50, 100

CASING — PIPE and PUMP: Pumping Pipe; Casing Pipe; Submersible Pump

ELECTRICAL LOG — RESISITIVITY (Ω-m): a = 25, a = 50, a = 100; 0, 10, 20, 30



APPENDIX H - 3

BORING LOG

~~PROJECT~~ · LOCATION BAN NA PHO

GROUND ELEVATION 156.035 m

DATE OF INVESTIGATION 21~25 MAR. 1982

BORING HOLE No. J - 3

DEPTH TO GROUND WATER LEVEL IN HOLE 13.50 m

INVESTIGATED BY K. NARITA

STAFF m	ELEVATION m	DEPTH m	THICKNESS m	FIELD OBSERVATIONAL RECORD: COLUMN SECTION (Graphic mark)	Soil or Rock NAME OF CLASSIFICATION	COLOR TONE	DESCRIPTION	DRILLING: TIME (min)	CASING: PIPE and PUMP
	151.5	4.50	4.50		Clay	Dark Brown	0m to 0.2m Sandy Clay Stiff and Sticky		
							9m to 31m Hard 9m to 10m Crack and Permiable (a little) 15m Permiable (a little) 27m Permiable 31m to 42m Very Hard		Pumping Pipe Casing Pipe Submersible Pump
	114.0	42.0	37.5		Shale	Pale Reddish Brown to Dark Brown	36.5m Crack and Permiable (a little)		

ELECTRICAL LOG — RESISTIVITY (Ω-m): 0, 10, 20, 30 — ○ — a = 25, × — a = 50, △ — a = 100

APPENDIX H - 4

BORING LOG

~~PROJECT~~ · LOCATION BAN NA PHO

GROUND ELEVATION 151.651 m

DATE OF INVESTIGATION 28 MAR. ~ 2 APR. 1982

BORING HOLE No. J-4

DEPTH TO GROUND WATER LEVEL IN HOLE 5.50 m

INVESTIGATED BY K. NARITA

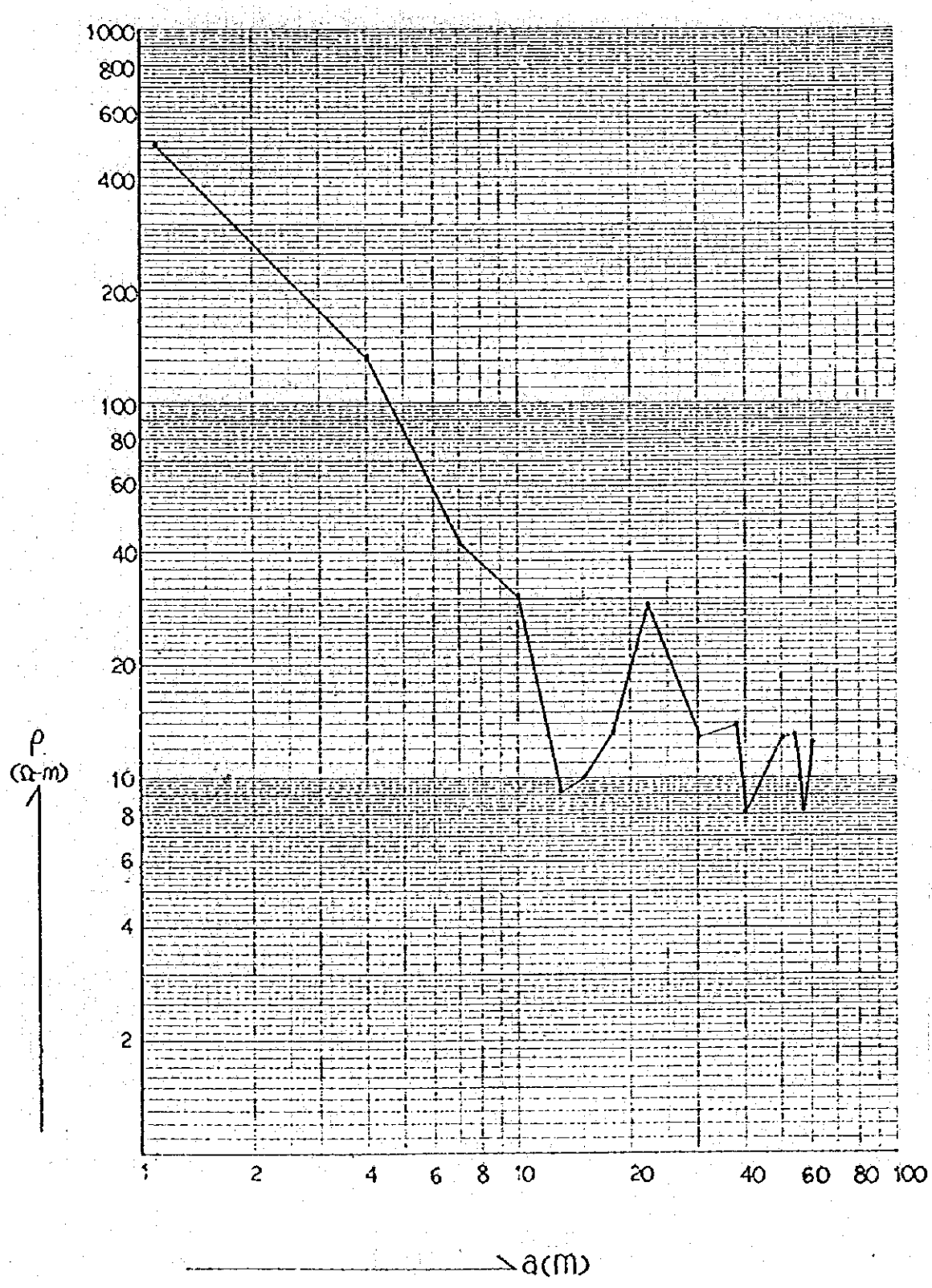
STAFF m	ELEVATION m	DEPTH m	THICKNESS m	FIELD OBSERVATIONAL RECORD: COLUMN SECTION (Graphic mark)	Soil or Rock NAME OF CLASSIFICATION	COLOR TONE	DESCRIPTION	DRILLING: TIME (min) 50 100	CASING: PIPE and PUMP
	147.9	3.70	3.70		Clay	Gley	0m to 0.2m Sandy Clay Stiff and Sticky		
							4.0m to 4.4m Very Soft 6m to 7m Crack a little		
							12.5m to 14m Crack and Permiable		Pumping Pipe
							23m Permiable		Casing Pipe
							25m to 27m Hard 27m to 29m Soft 29m to 33m Very Hard		Sabmersible Pump
	109.6	42.0	38.3		Shale	Dark Brown			

ELECTRICAL LOG — RESISTIVITY (Ω-m) 0 10 20 30 — a = 25, a = 50, a = 100

APPENDIX I. ρ-a CURVE

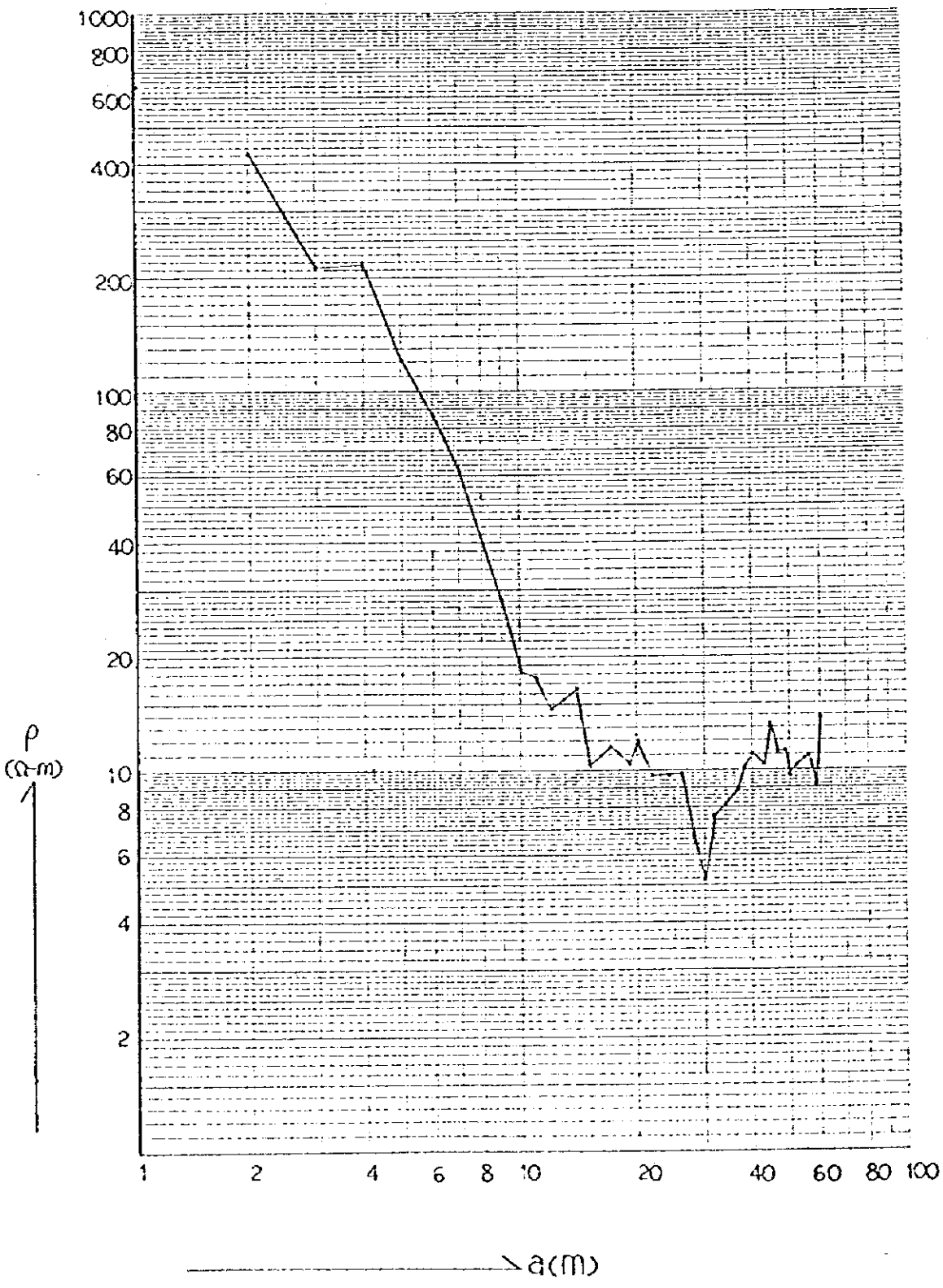
APPENDIX I - 1

ρ - a Curve (E - 1)



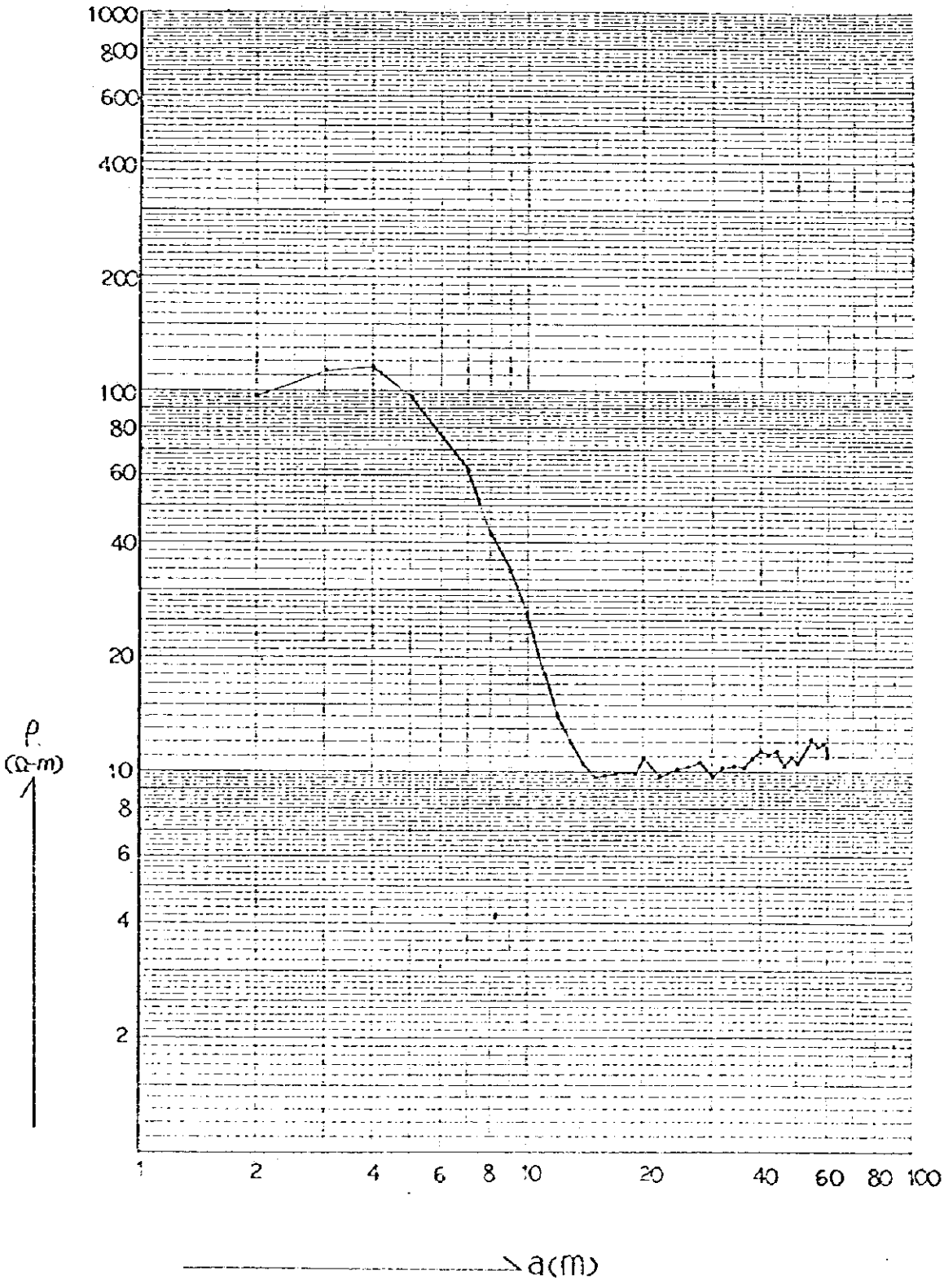
APPENDIX I - 2

ρ - a Curve (E - 2)



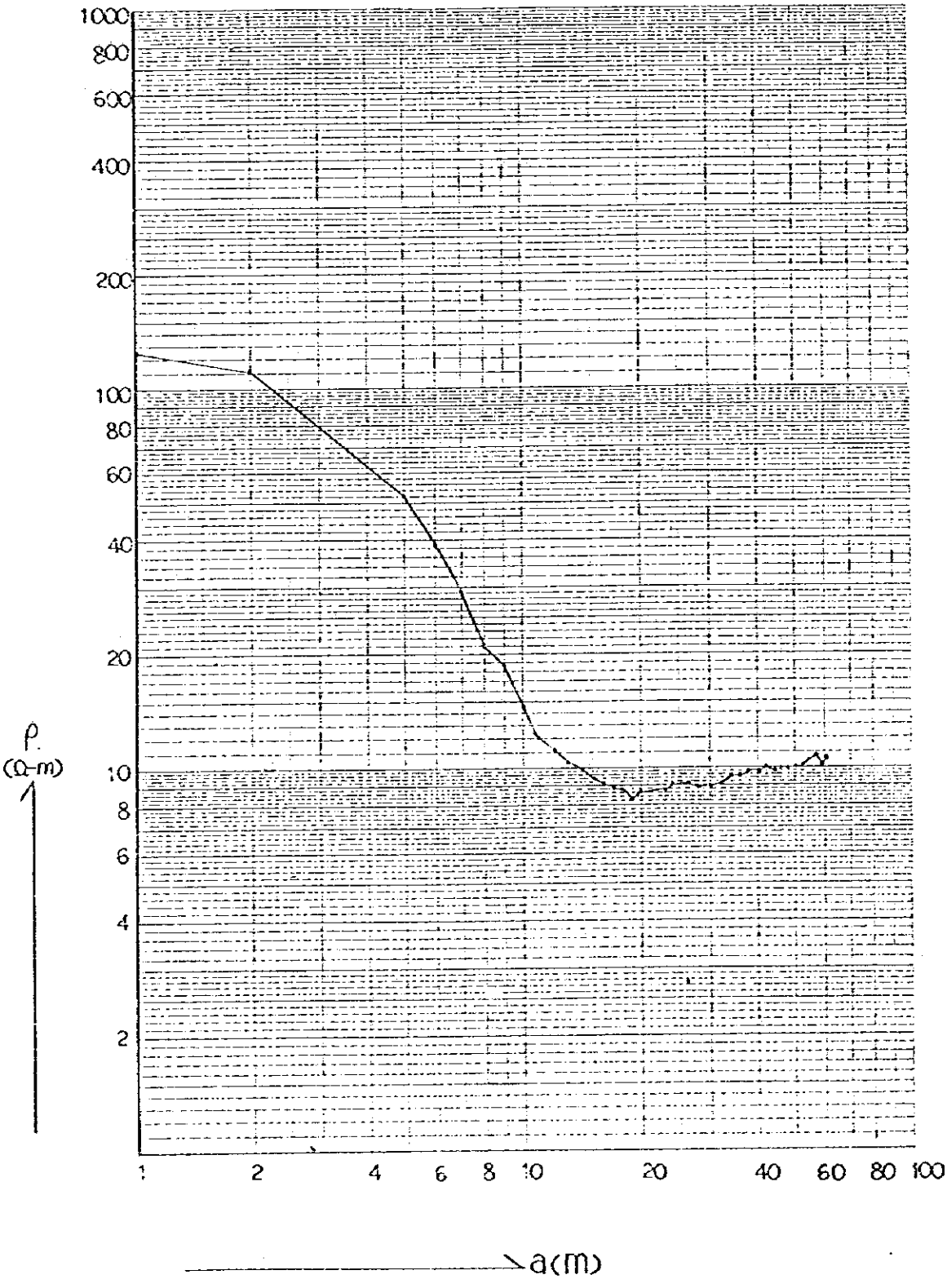
APPENDIX I - 3

ρ - a Curve (E - 3)



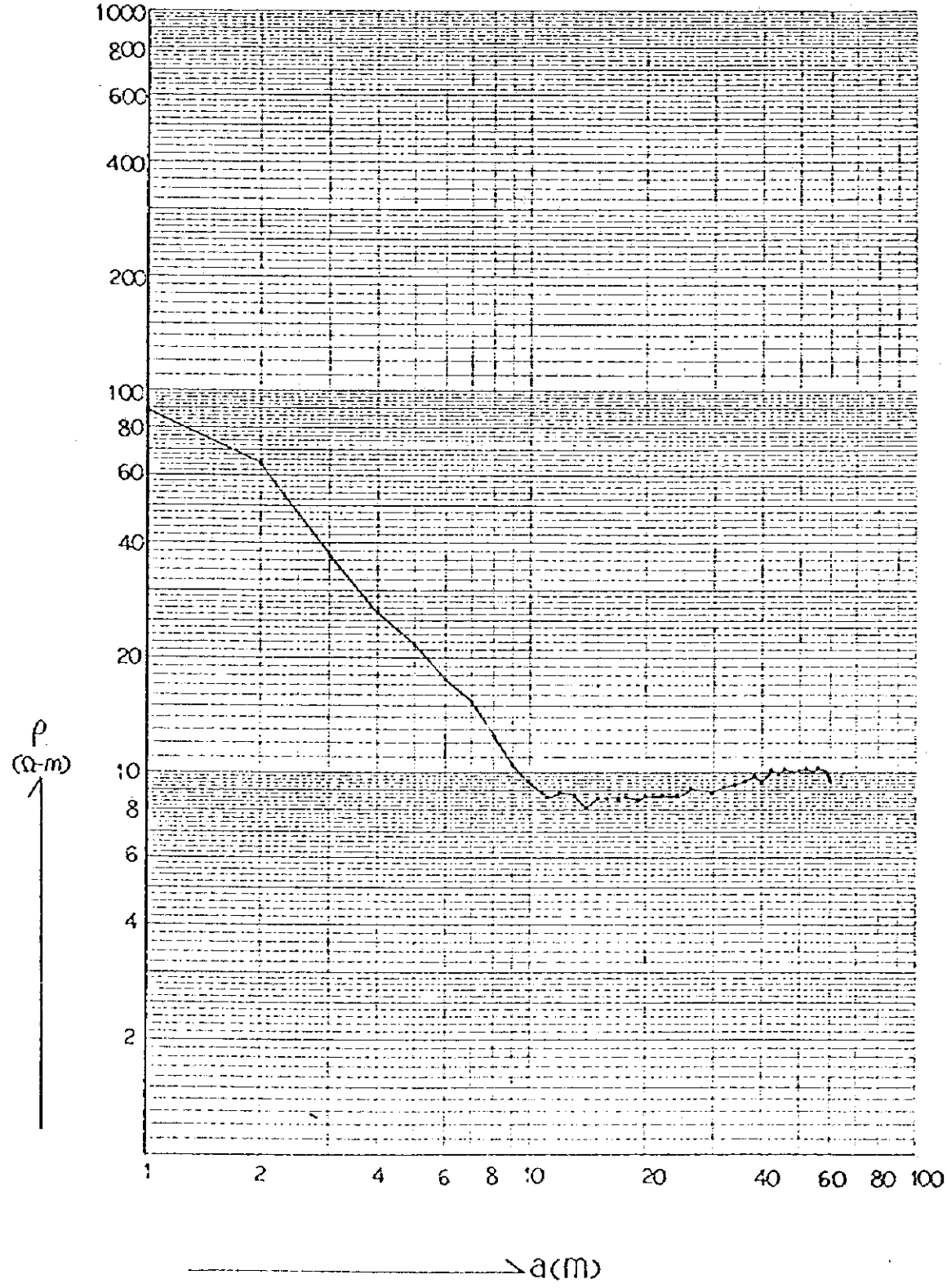
APPENDIX I - 4

ρ - a Curve (E - 4)



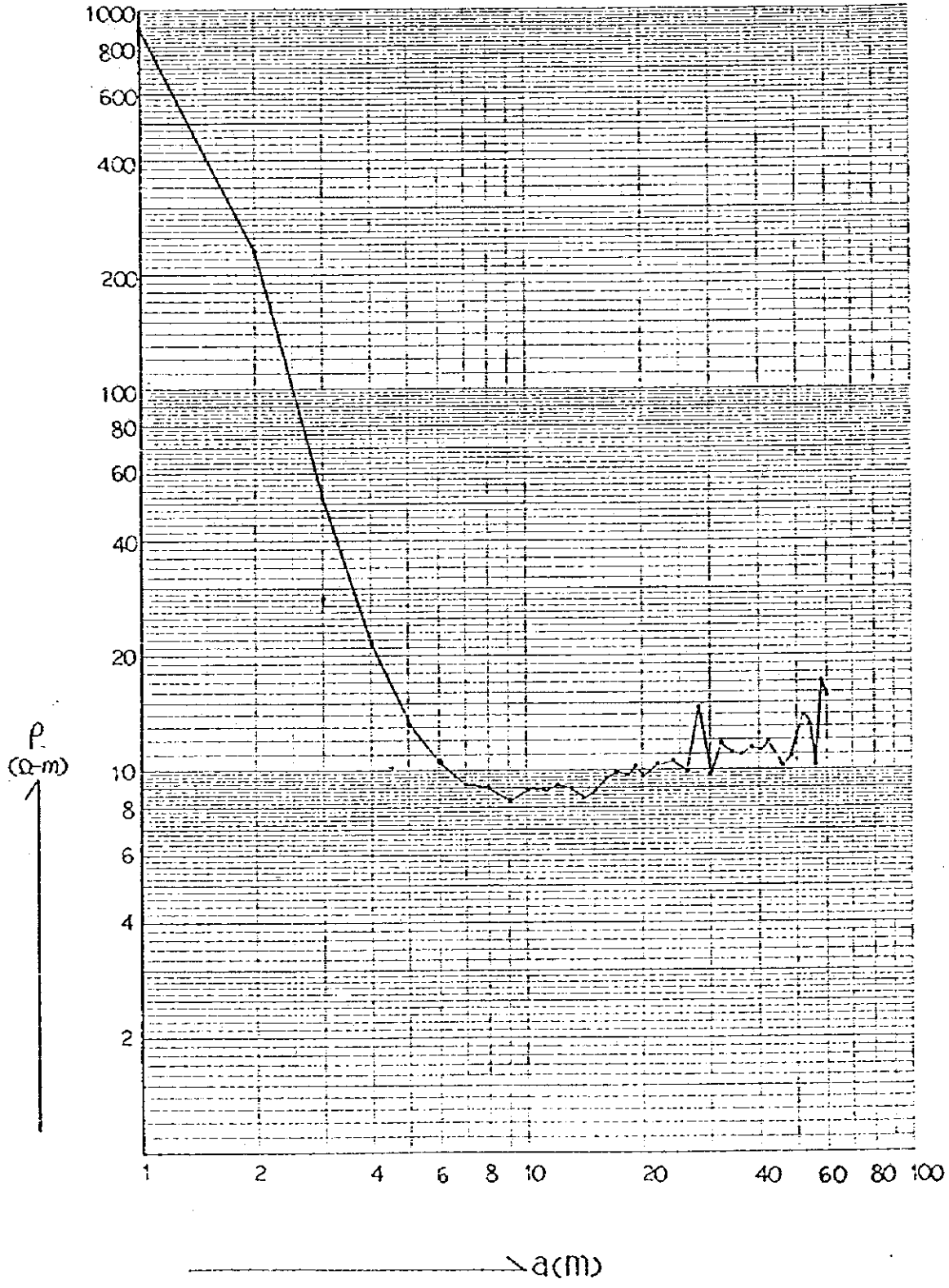
APPENDIX I - 5

ρ - a Curve (E - 5)



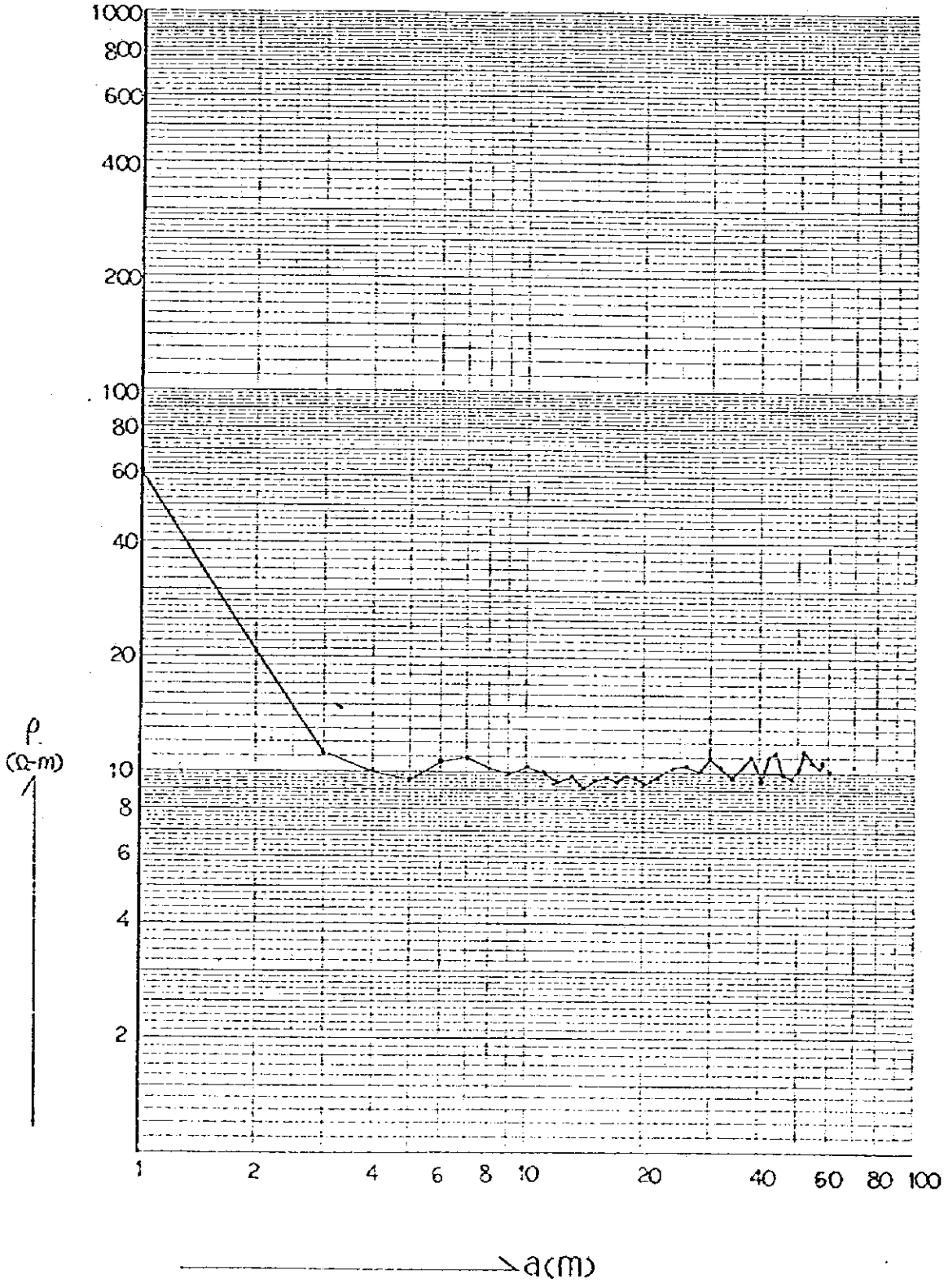
APPENDIX I - 6

ρ - a Curve (E - 6)



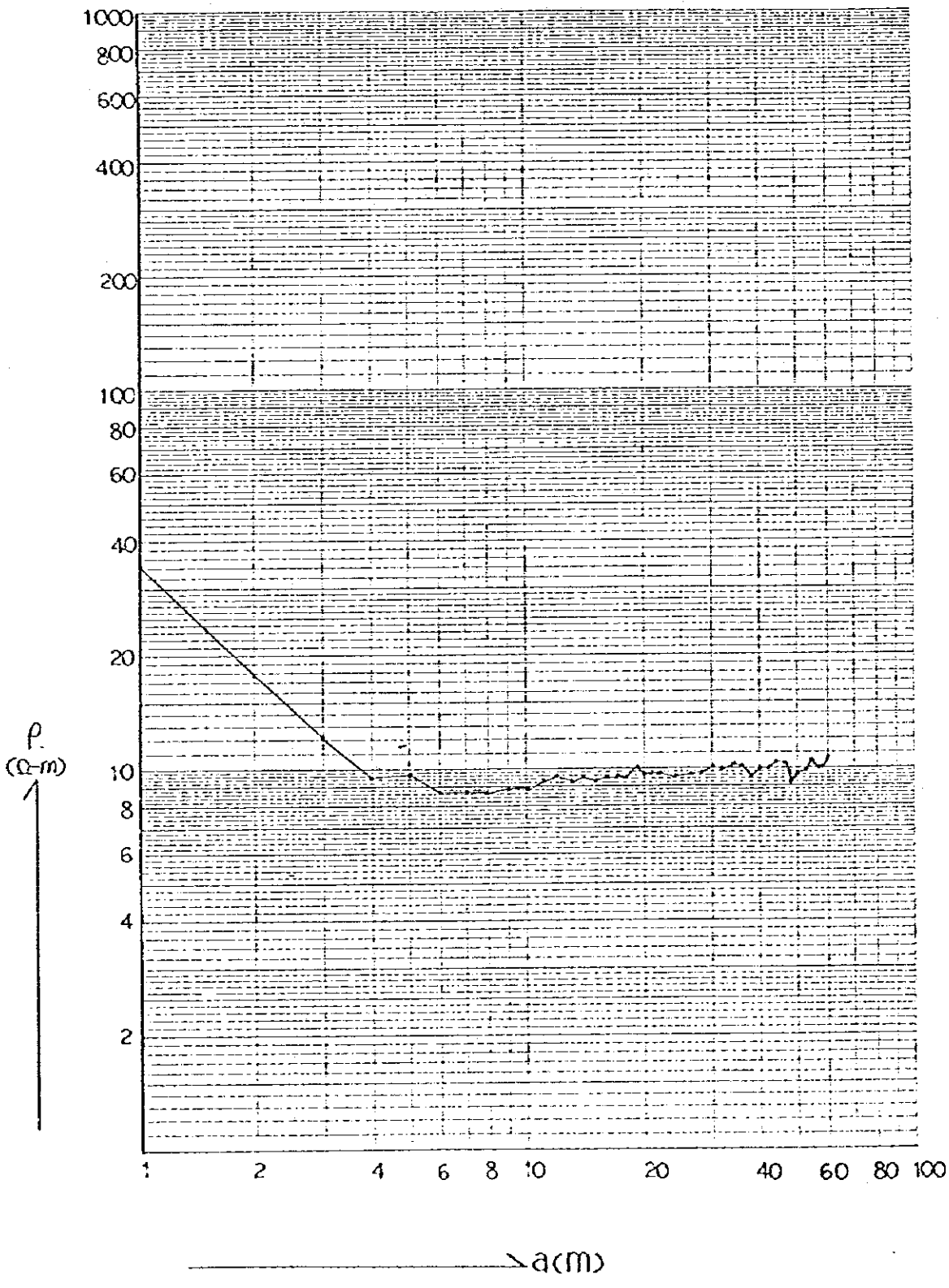
APPENDIX I - 7

ρ - a Curve (E - 7)



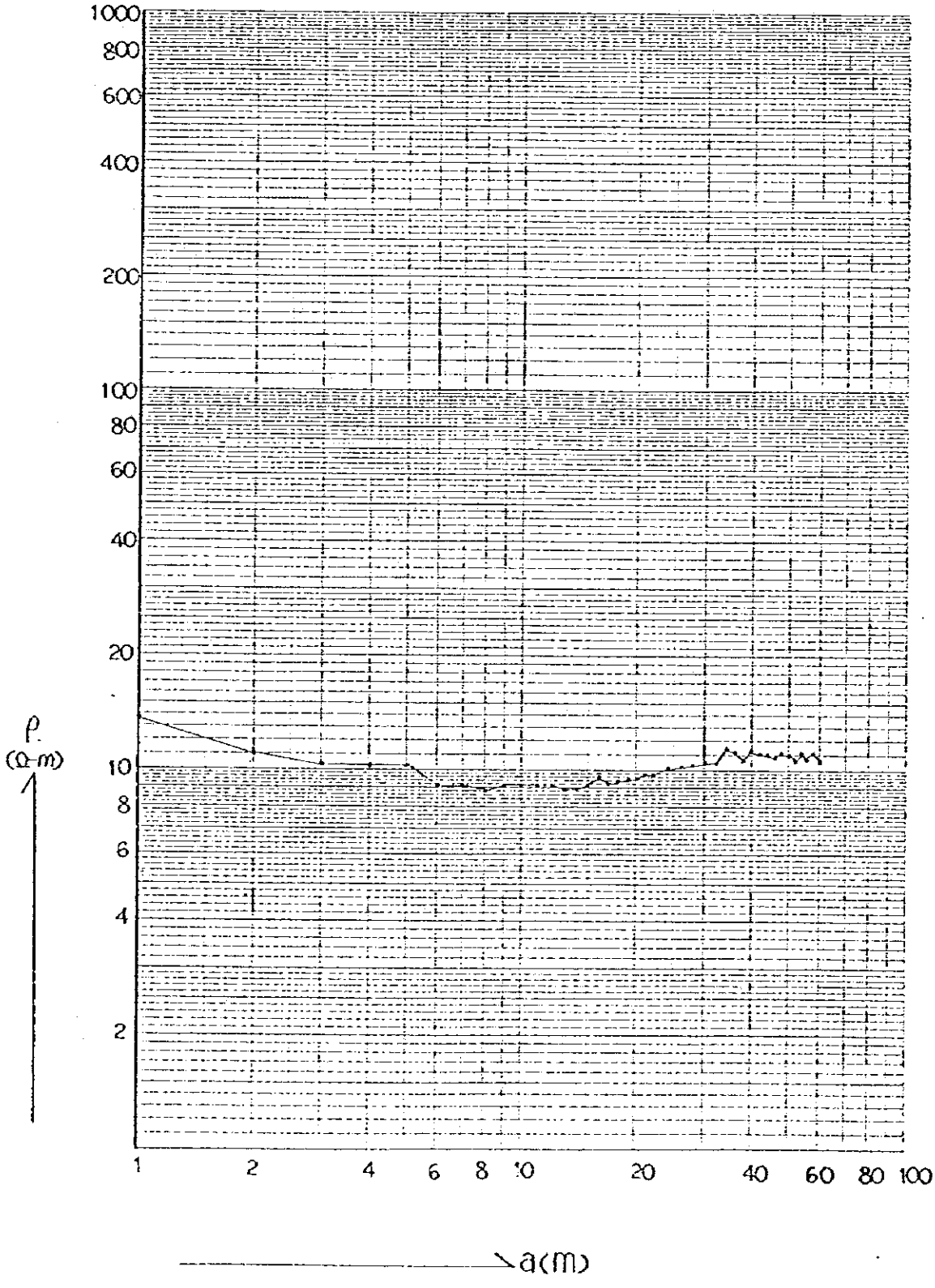
APPENDIX I - 8

ρ - a Curve (E - 8)



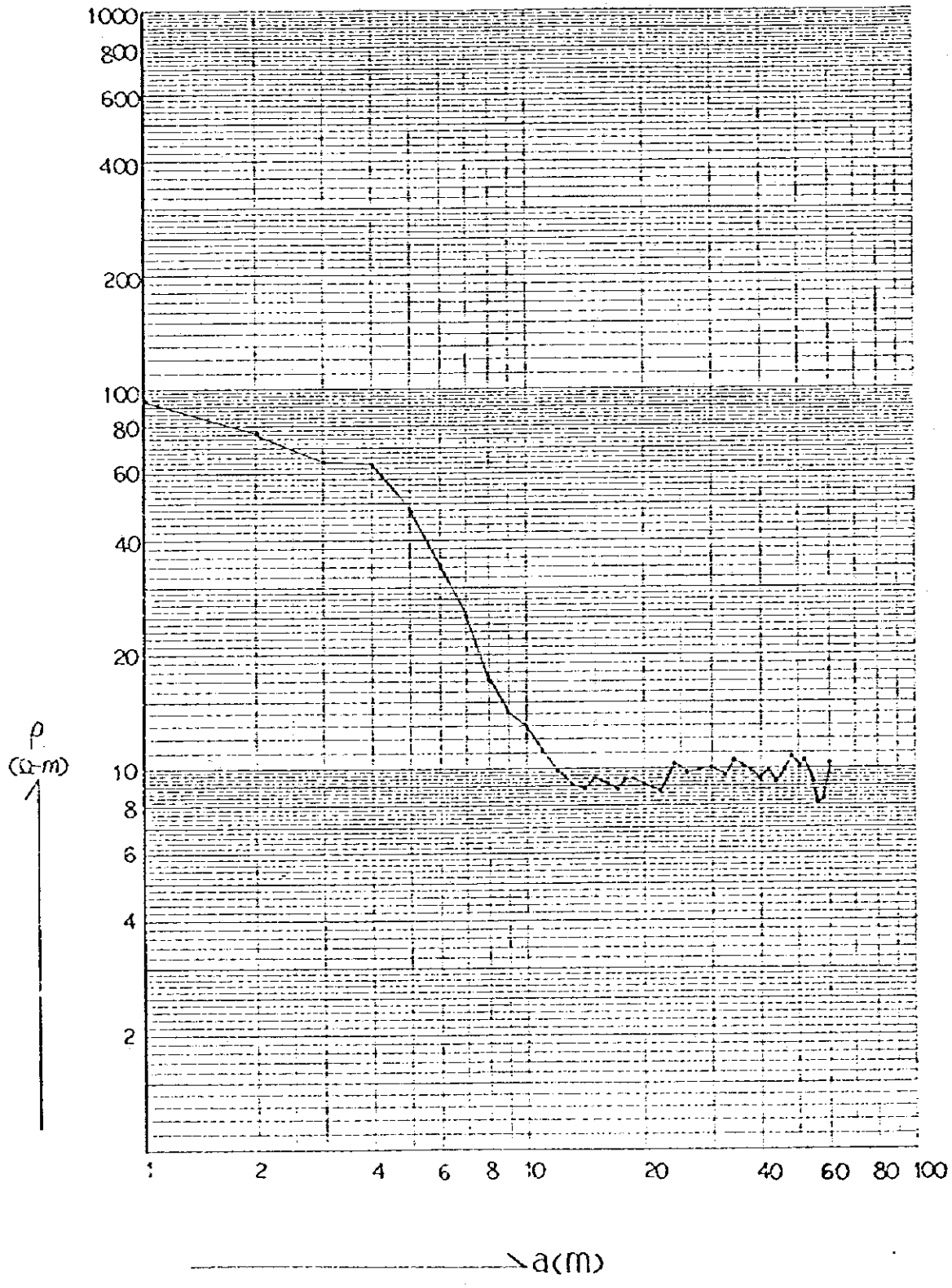
APPENDIX I - 9

ρ - a Curve (E - 9)



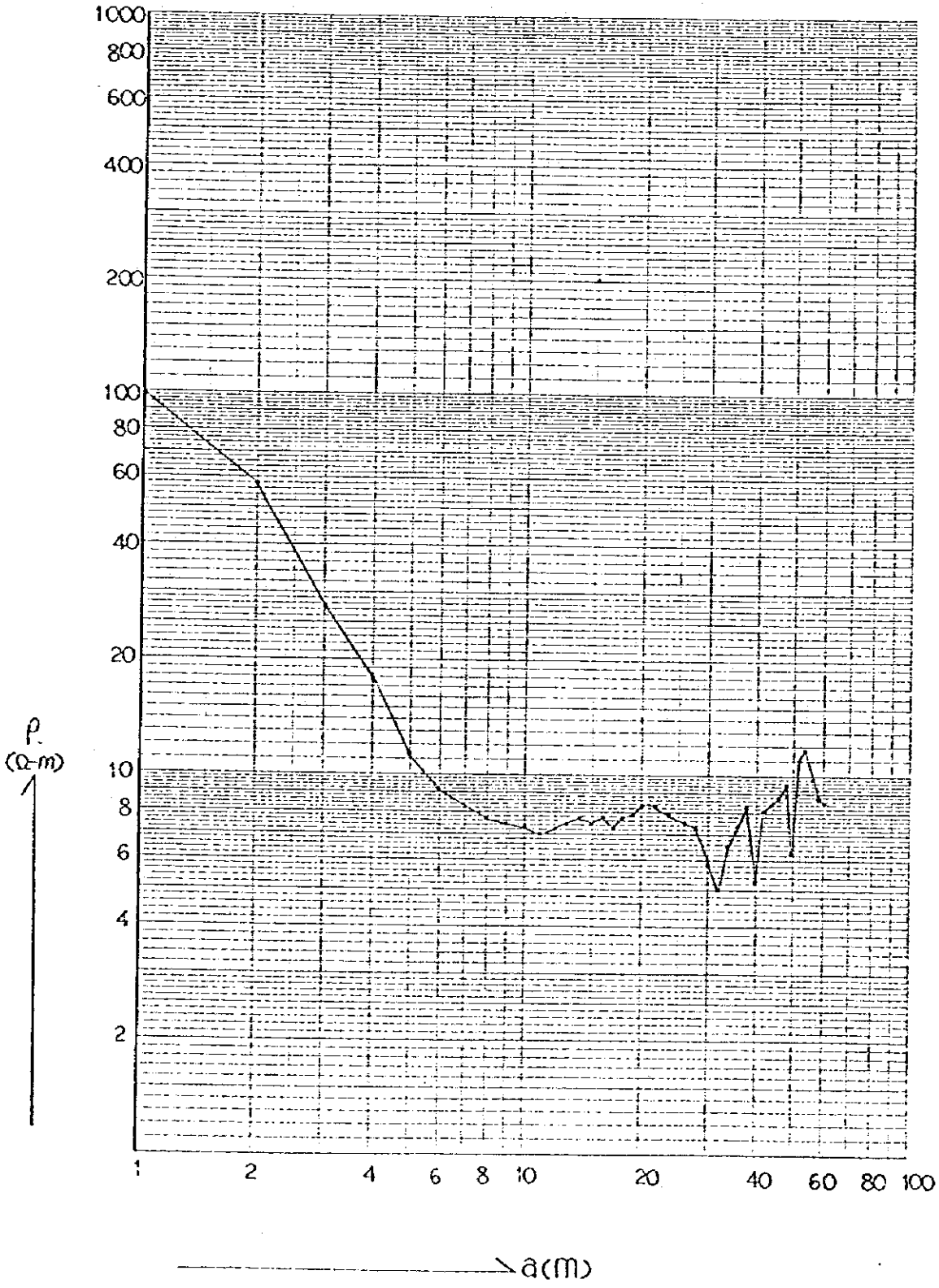
APPENDIX I - 10

ρ - a Curve (E - 10)



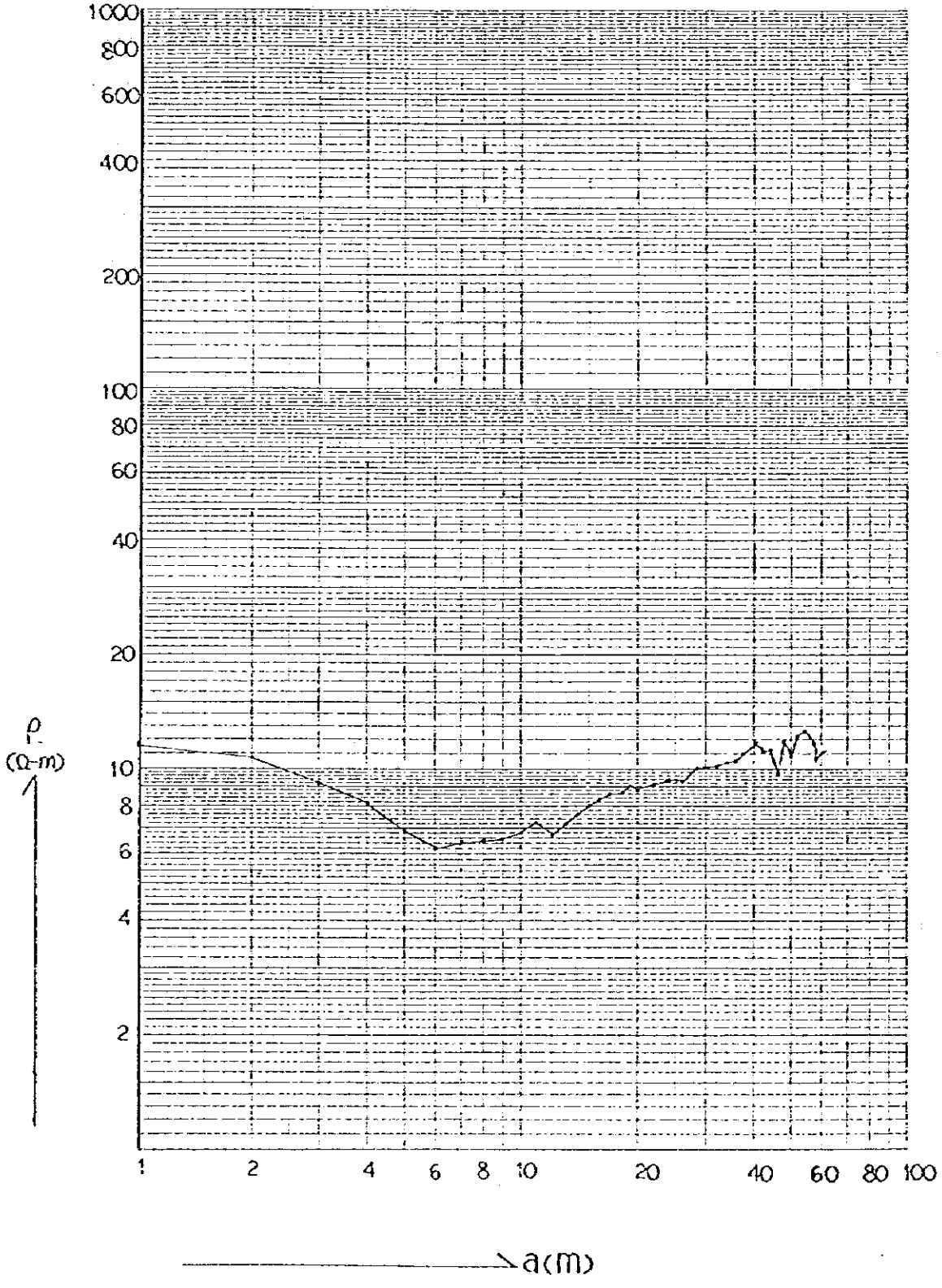
APPENDIX I - 11

ρ - a Curve (E - 11)



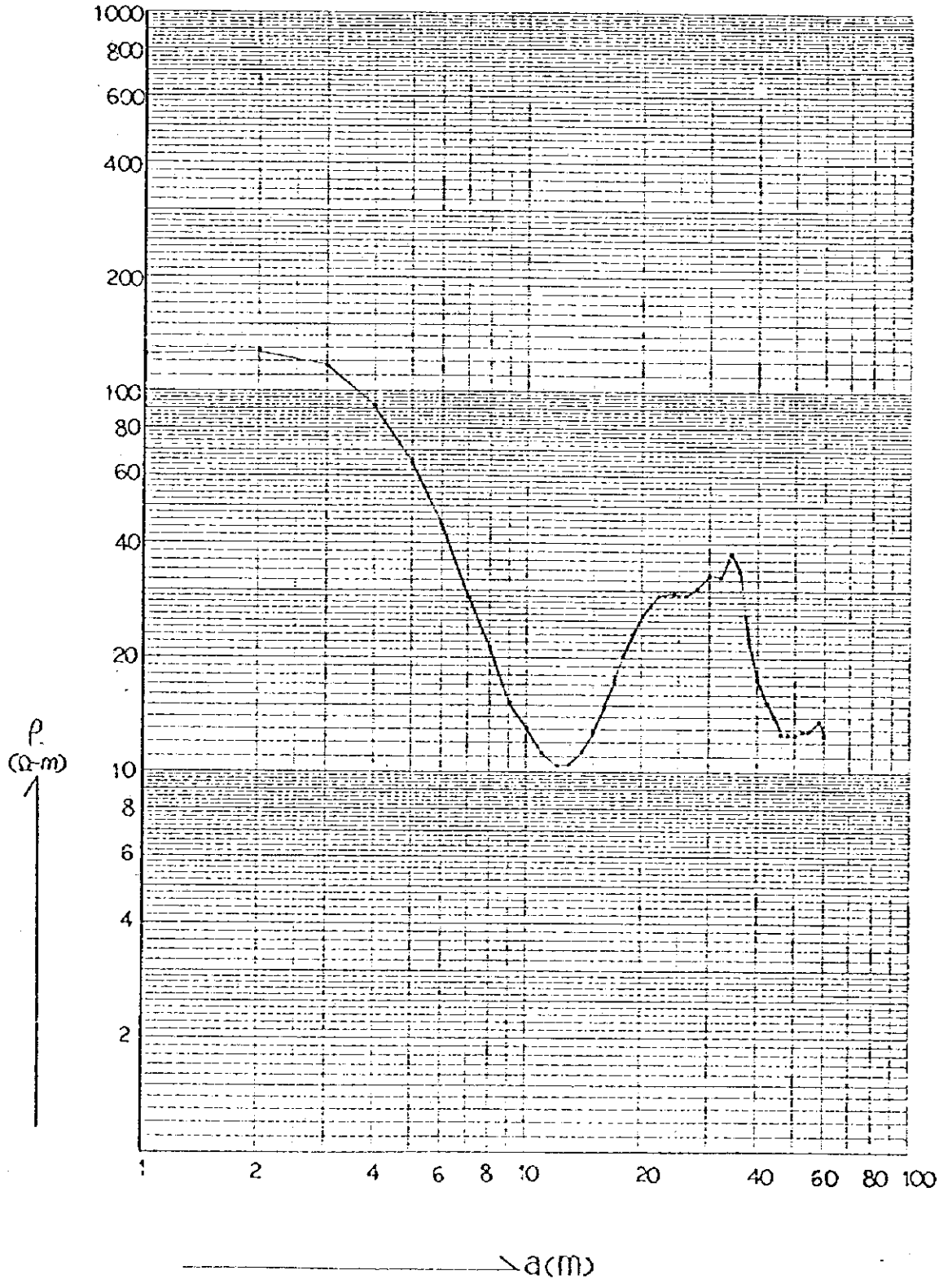
APPENDIX I - 12

ρ - a Curve (E - 12)



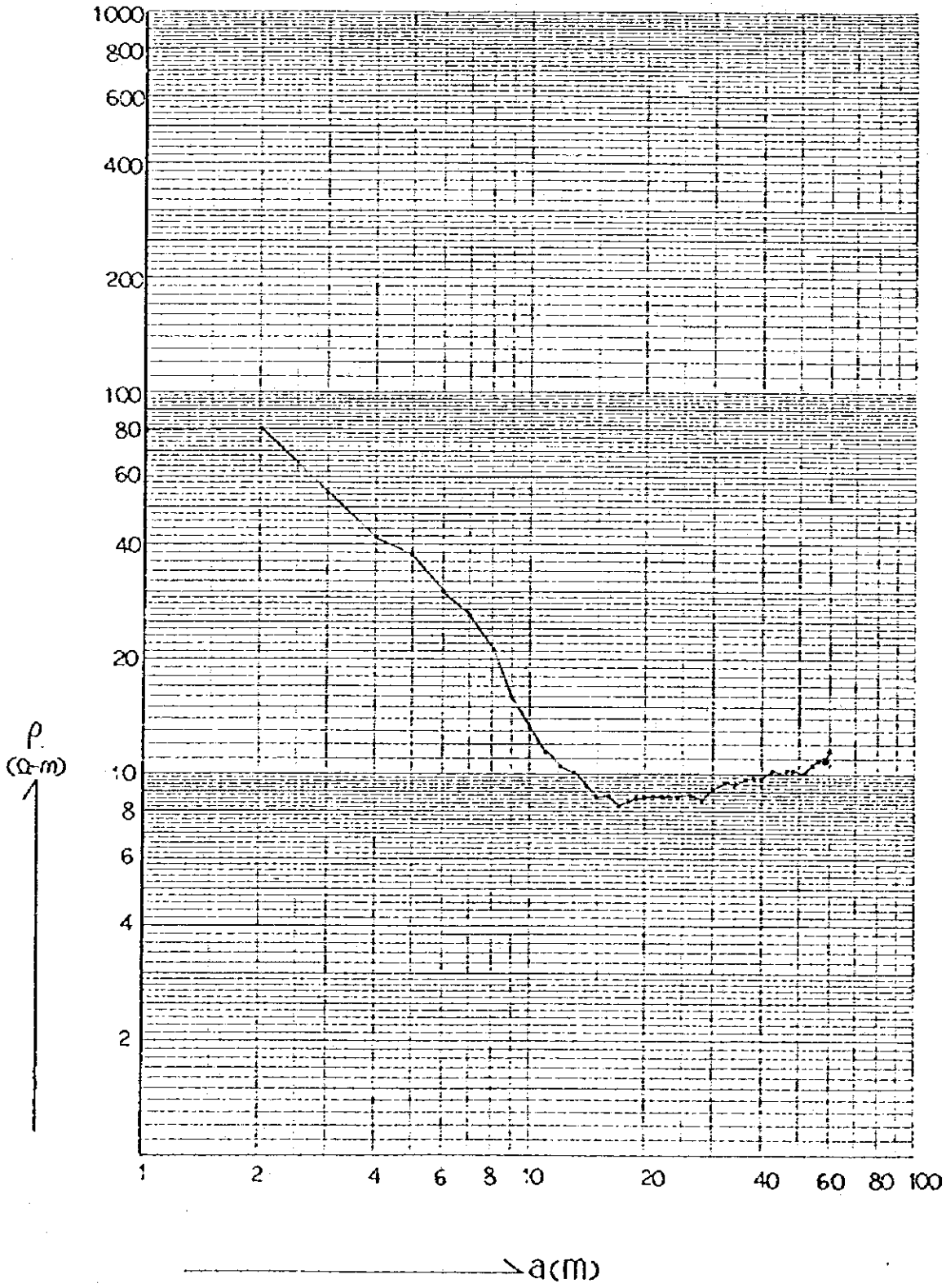
APPENDIX I - 13

ρ - a Curve (E - 13)



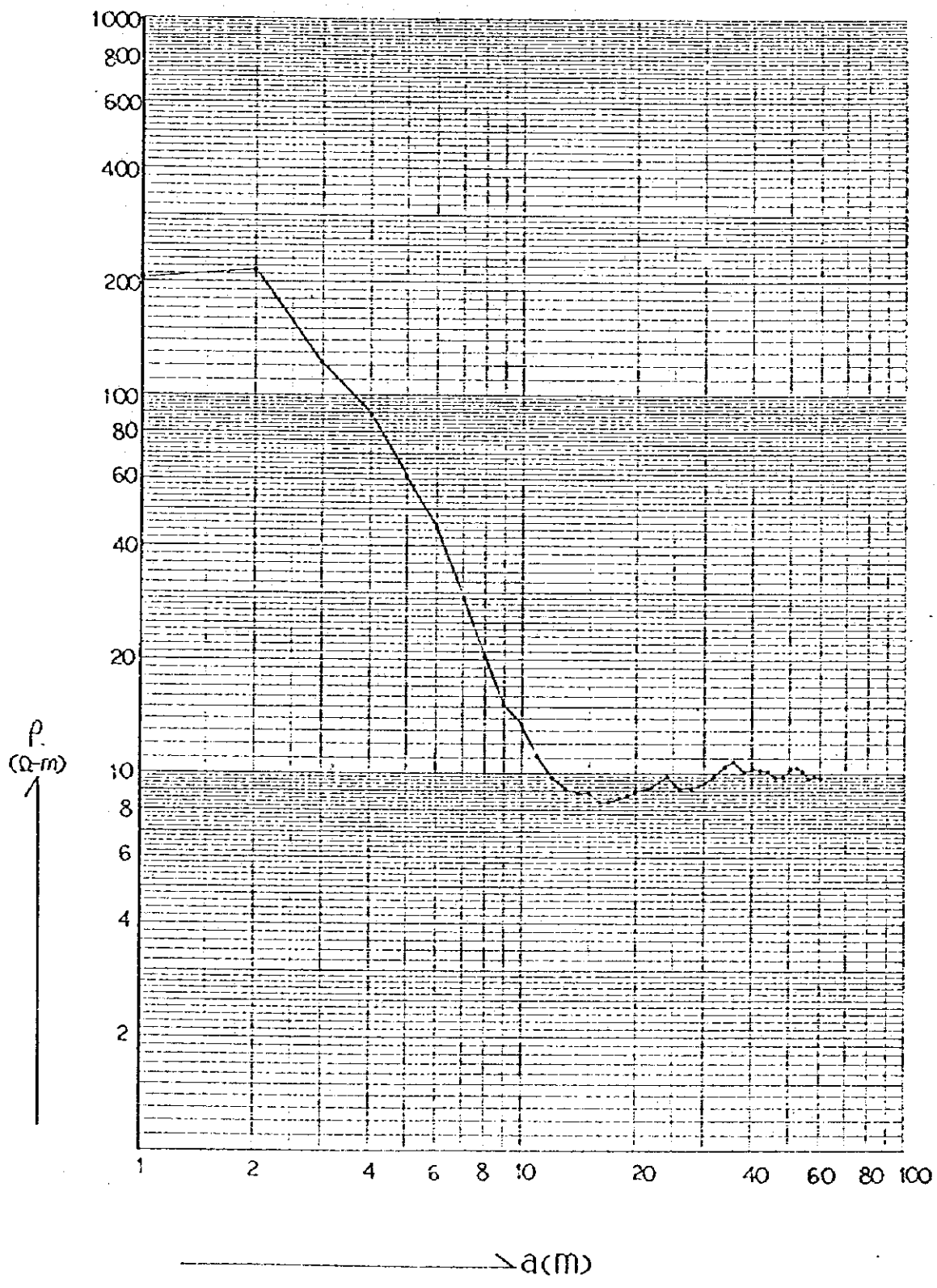
APPENDIX I - 14

ρ - a Curve (E - 14)



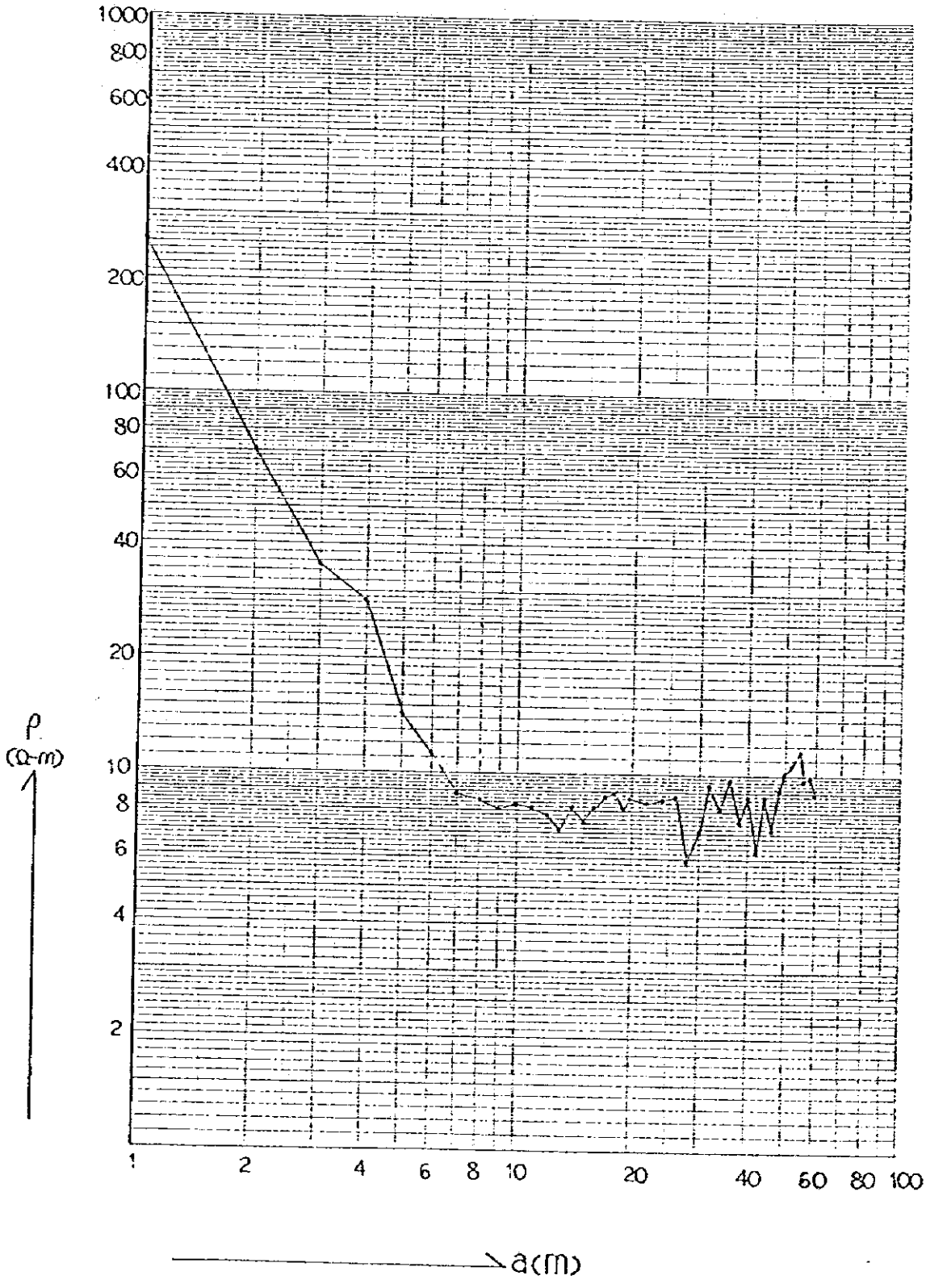
APPENDIX I - 15

ρ - a Curve (E - 15)



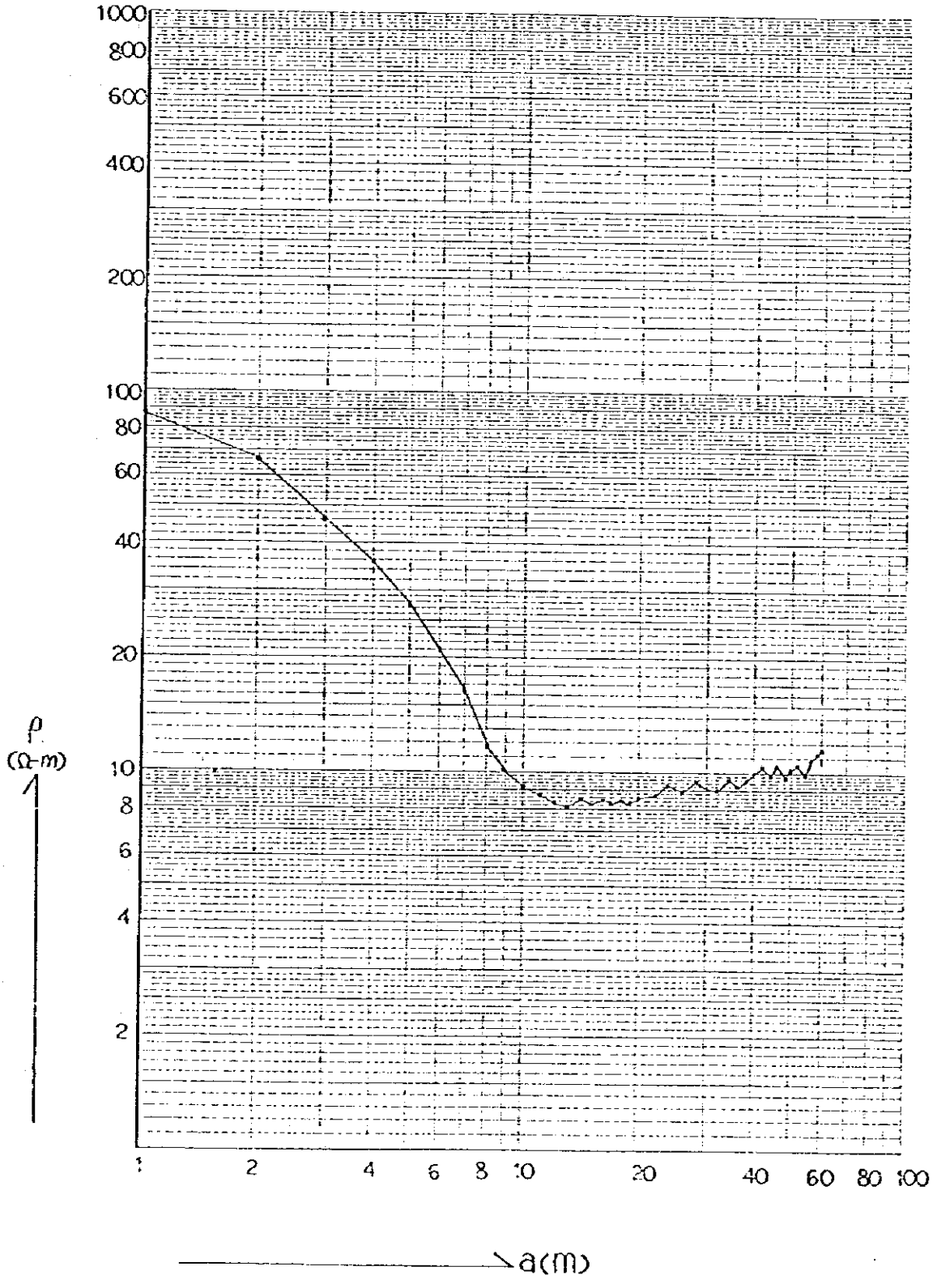
APPENDIX I - 16

ρ - a Curve (E - 16)



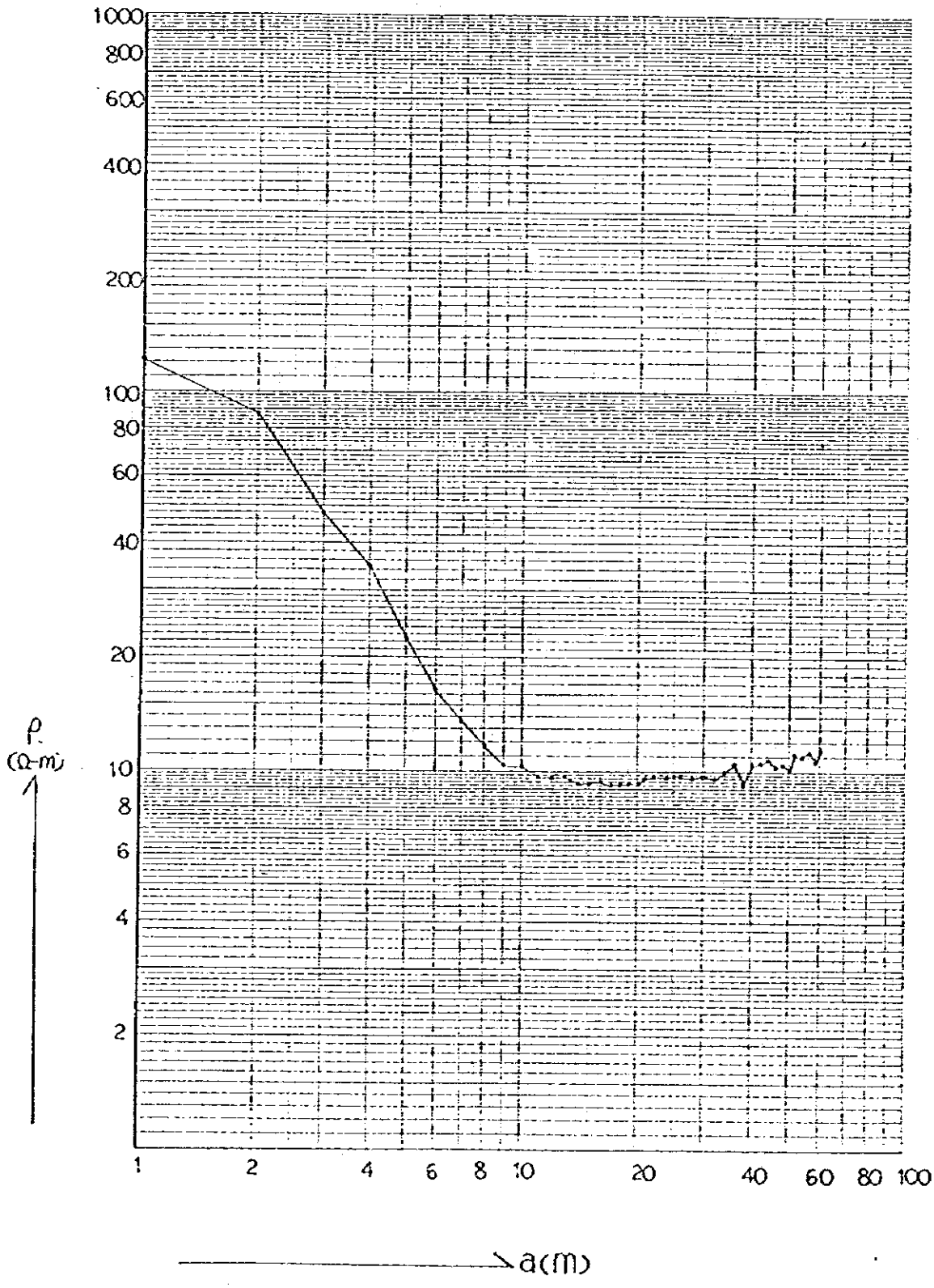
APPENDIX I - 17

ρ - a Curve (E - 17)



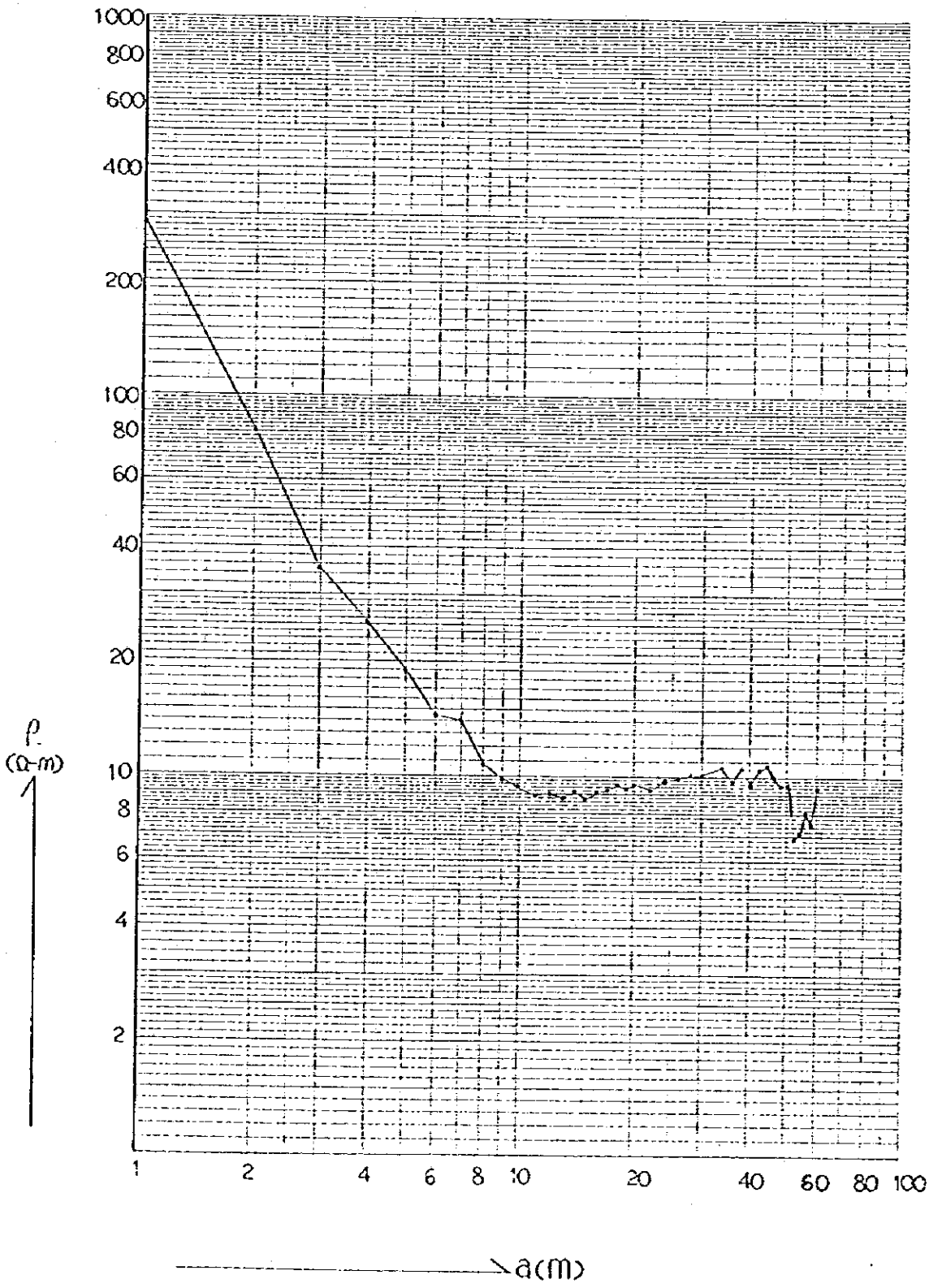
APPENDIX I - 18

ρ - a Curve (E - 18)



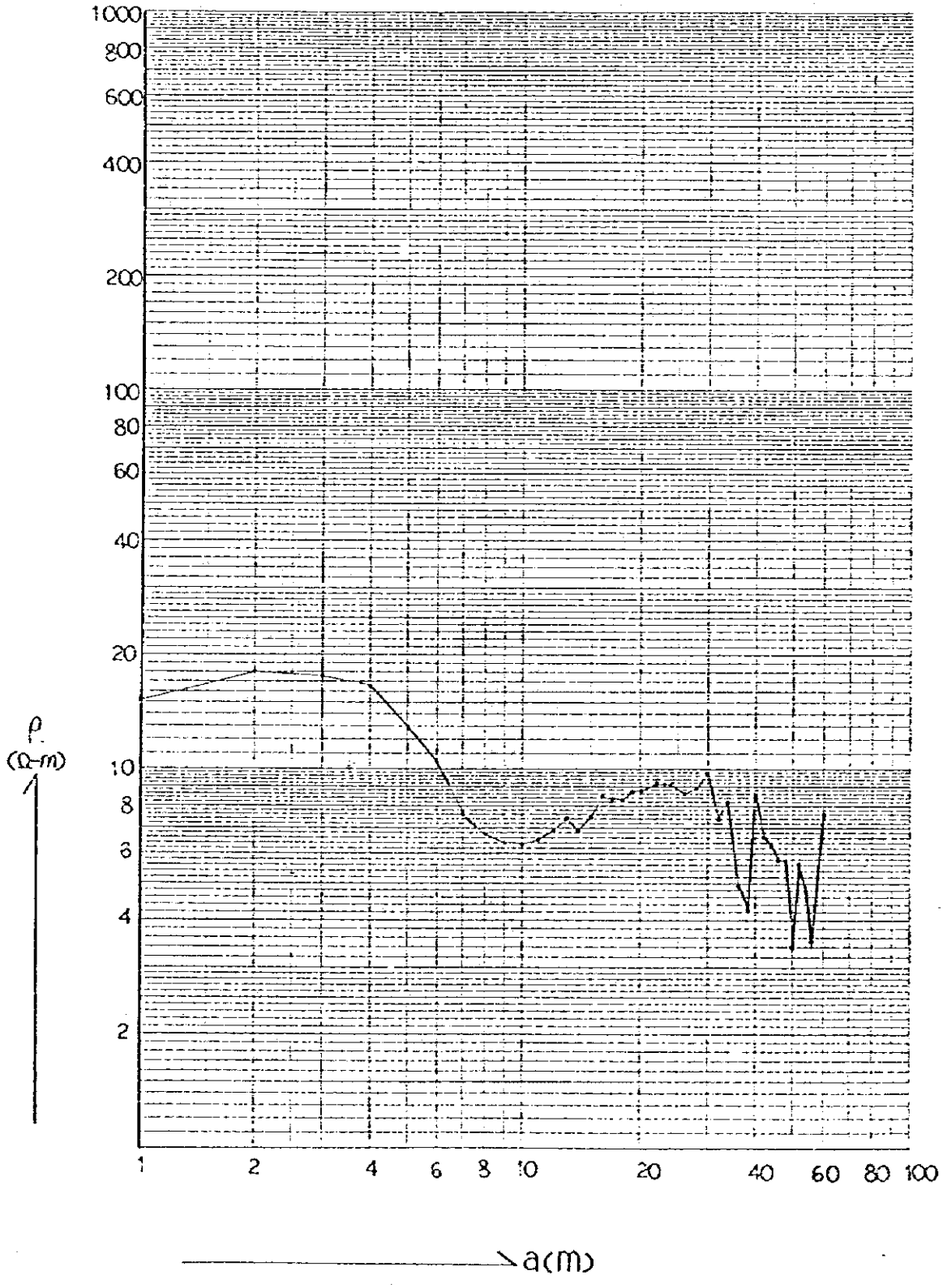
APPENDIX I - 19

ρ - a Curve (E - 19)



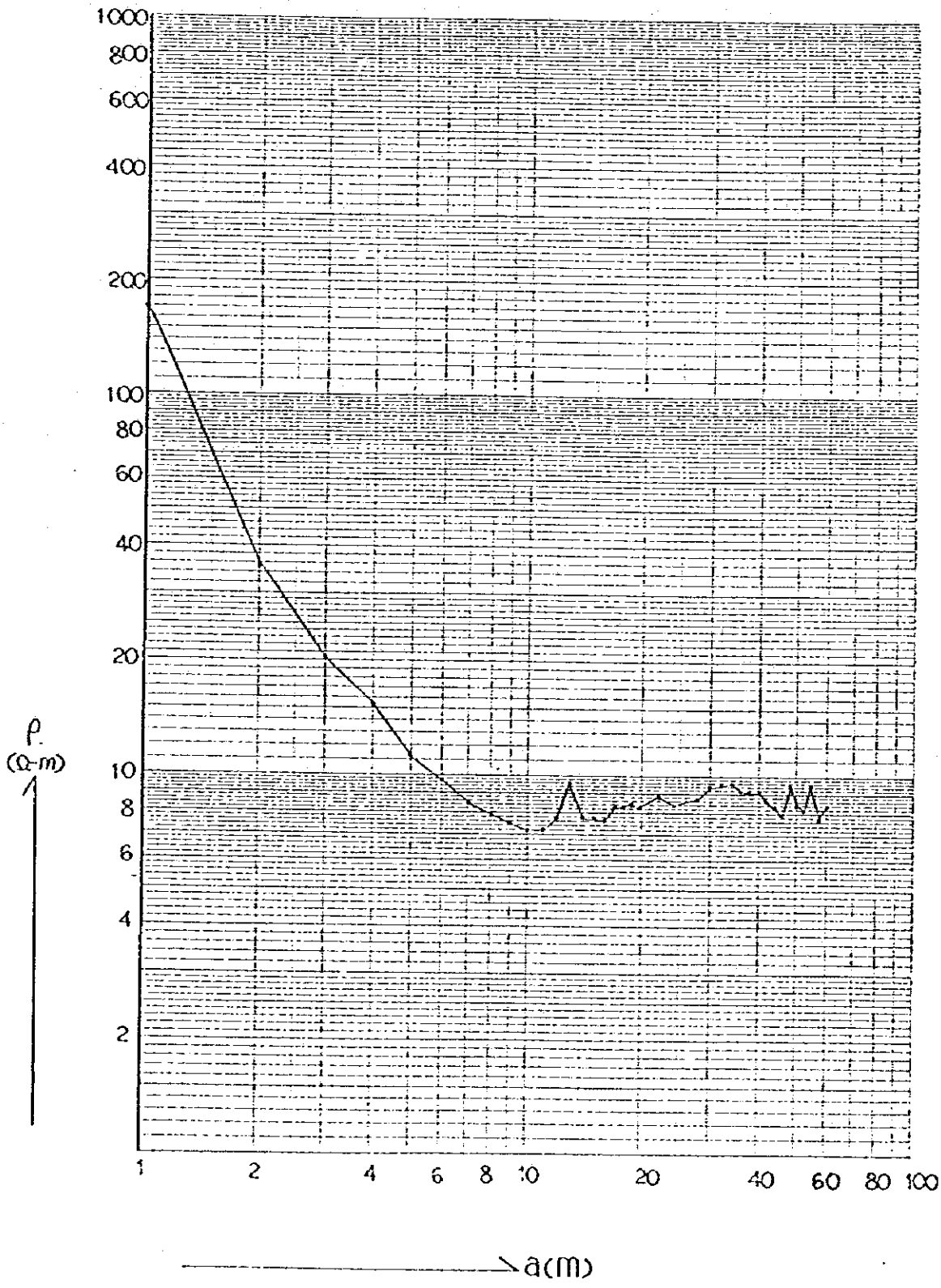
APPENDIX I - 20

ρ - a Curve (E - 20)



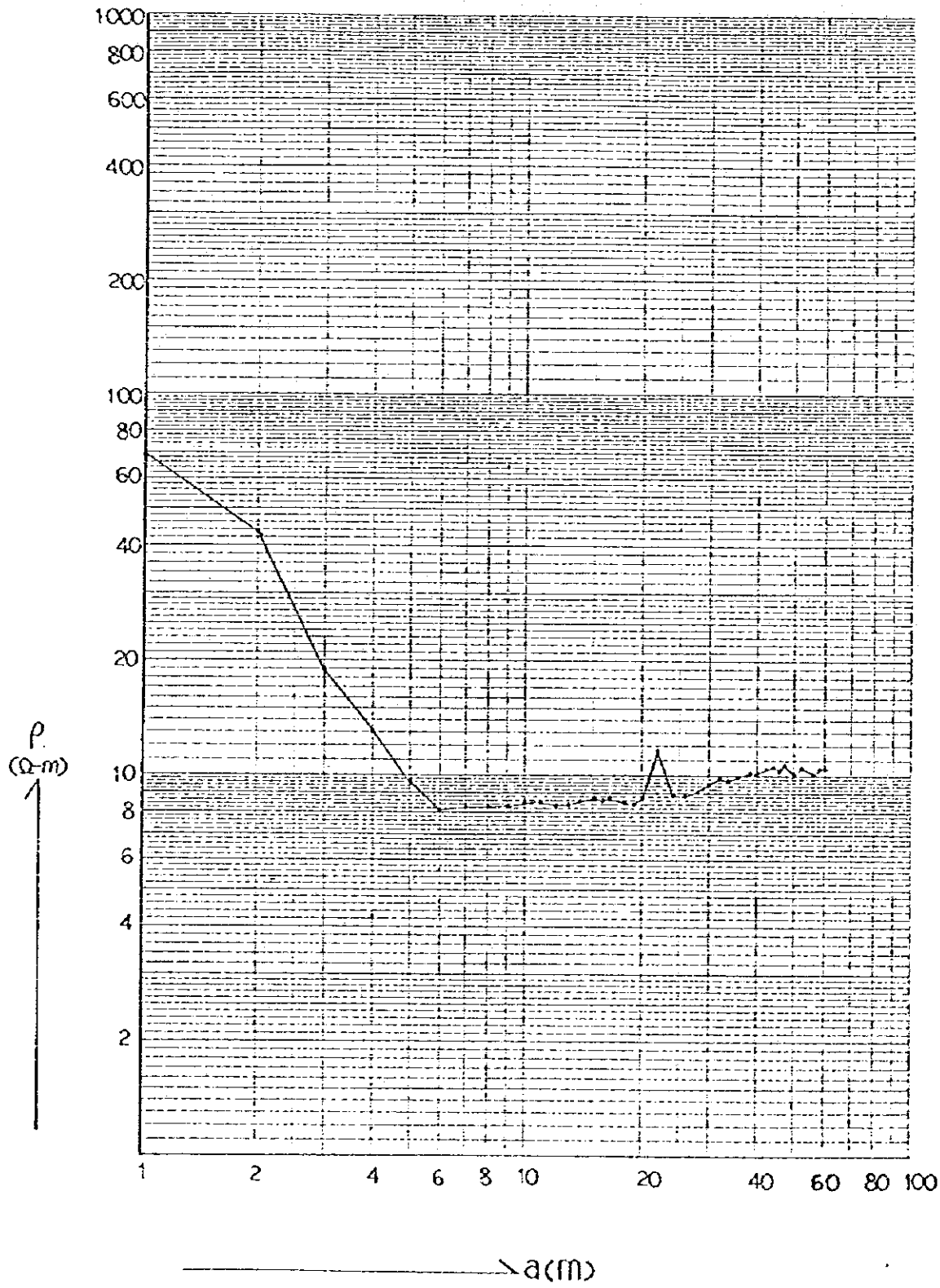
APPENDIX I - 21

ρ - a Curve (E - 21)



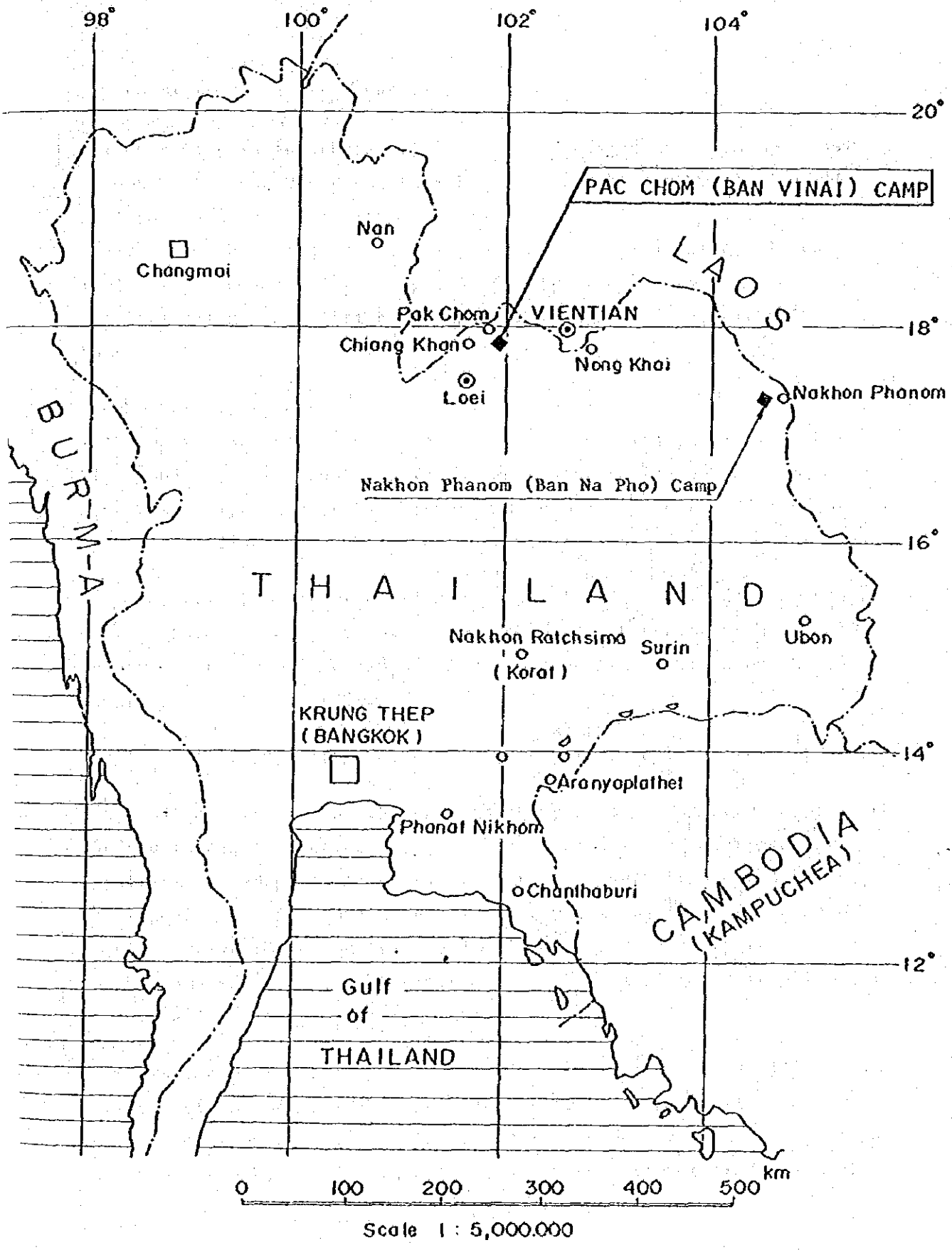
APPENDIX I - 22

ρ - a Curve (E - 22)



III: WATER SUPPLY PROJECT TO LAOTIAN DISPLACED PERSONS IN PAK CHOM CAMP (2ND STAGE)

Fig. III-1 Location of Pac Chom Camp



III: WATER SUPPLY PROJECT TO LAOTIAN DISPLACED PERSONS IN PAK CHOM CAMP (2ND STAGE)

1. Conclusion and Recommendation

Pak Chom Camp is located about 52 km (in straight line) to the northeast by north of Muang District, Loei Province in the northwest of northeastern Thailand. The camp, established in 1975 at an elevation of about 280 m above sea level, has premises of approximately 113 ha. It is surrounded by hills of partly fairly rich vegetation, and its relative height in relation to the inner valleys of the hills is about 50 m.

The houses of the camp built mainly with bamboo materials crowd the hillslopes and the valleys in a random manner. Its population, being 21,119 persons of 3,296 families housed in 180 wards as of June, 1979, grew gradually later to 33,196 persons as of September, 1982, after part of the displaced persons had been transferred from Nong Khai Camp.

The Ministry of Interior of Kingdom of Thailand, reportedly, is planning to maintain only Nakhon Phanom Camp and Pak Chom Camp after closing down other camps of Laotian displaced persons scattered along Mekong River.

Planned future population of Pak Chom Camp is said to be about 50,000.

The studies performed by the present study team at Pak Chom Camp include surface reconnaissance, survey on surface geology and hydrogeology, electrical exploration (resistivity method), test boring at 4 sites, electrical logging, pumping test and water quality test at the bore holes. Evaluation on quantity and mode of occurrence of ground water in the camp was made on the basis of the results of these actual ovservations and collected existing data.

The total economic yield of the ground water in the camp arrived at as a result of the studies is approximately 1,460 m^3/day. After subtracting the combined economic yield of 1,037 m3/day by the twelve existing deep wells and by the 4 bore holes made by the present study team from

the value, 423 m^3/day is left, which is the volume of water exploitable by further efforts of ground water development.

Judging from the location of the existing wells and hydraulic conditions of ground water, however, two more deep wells would need to be constructed in the camp in the near future, yielding about 1,026.8 m^3/day of ground water in total.

In conformity with the per capita daily requirement, i.e. 35 liter/day/person, adopted by the UN, the total daily water requirement would amount to 1,750 m^3/day for the target refugee population of 50,000.

Accordingly, of the total water requirements, only 1,026.8 m^3/day of ground water is made available and the rest (723.2 m^3/day) remains deficient. Therefore, it is impossible that the total requirements of subsistence water in the camp is met by depending entirely upon ground water alone. This deficient amount would need to be met with full use of the existing deep wells as well as surface water in and around the camp.

Consequently, a plan for subsistence water supply to the camp has been so worked out as to enable to supply subsistence water by use of 16 deep wells in total, inclusive of two newly-constructed deep wells in future.

The results of the survey conducted and the detailed plan for subsistence water supply to the camp will be subsequently stated.

2. Study Team

The names and assignments of the members of the study team are as follows.

Assignment	Name	Duration of Stay in Thailand
Team Leader	Terukazu Hagiwara	May 20, 1982 - Oct. 16, 1982
Hydrogeology	Kinzo Narita	May 20, 1982 - July 7, 1982 Sept. 2, 1982 - Oct. 1, 1982
Drilling and Equipment	Shohachi Suzuki	May 20, 1982 - Oct. 13, 1982
Drilling	Shozo Miyajima	May 20, 1982 - Oct. 13, 1982
Construction Plan & Cost Estimate	Junji Ohama	May 20, 1982 - Oct. 16, 1982

3. Actual Schedule

Date	Work Record
May, 1982	
20 (Thu)	- All study team members arrive at Bangkok
21 (Fri)	- Courtesy call to MOI, submission of inception report
22 (Sat)	- Inspection of repairing boring machine, negotiation of material procurement
23 (Sun)	- Inspection of repaired boring machine, negotiation of car renting
24 (Mon)	- Meeting with MOI officers, material procurement
25 (Tue)	- Inspection of boring machine, hireling trucks
26 (Wed)	- Meeting with MOI officers, Material procurement and preparations
27 (Thu)	- Leaving Bangkok, loading boring machine at Sa Kaeo medical center
28 (Fri)	- Arriving at Loei, visit to Provincial office and Pak Chom Camp
29 (Sat)	- Selection of site of J-No.1 test boring and installation of machine
30 (Sun)	- Surface reconnaissonce, selection of sites of electrical exploration
31 (Mon)	- Boring started at J-No.1, electrical exploration started
June, 1982	
1 (Tue)	- J-No.1 boring, electrical exploration
2 (Wed)	- J-No.1 boring, electrical exploration
3 (Thu)	- J-No.1 boring, electrical exploration
4 (Fri)	- J-No.1 boring, electrical exploration
5 (Sat)	- J-No.1 boring, electrical exploration
6 (Sun)	- Office work (interpretation of the records of boring and electrical exploration)
7 (Mon)	- J-No.1 boring, Electrical exploration

Date	Work Record
June, 1982	
8 (Tue)	- J-No.1 boring, electrical exploration
9 (Wed)	- J-No.1 boring, electrical exploration
10 (Thu)	- J-No.1 boring, electrical exploration
11 (Fri)	- J-No.1 boring, electrical exploration
12 (Sat)	- J-No.1 boring, survey of existing deep wells, water quality test
13 (Sun)	- J-No.1 boring, water quality test of surface water and shallow wells
14 (Mon)	- J-No.1 boring, surface reconnaisance, survey of shallow wells
15 (Tue)	- J-No.1 boring, water quality test of shallow wells and surface water
16 (Wed)	- J-No.1 boring, topographical survey
17 (Thu)	- J-No.1 boring completed, topographical survey
18 (Fri)	- Electrical logging in J-No.1 boring hole
19 (Sat)	- Airlifting, collection of data in Camp
20 (Sun)	- Airlifting
21 (Mon)	- Airlifting, topographical survey
22 (Tue)	- Installation of submersible motor pump, topographical survey
23 (Wed)	- Pumping test, moving boring machine to J-No.2 site
24 (Thu)	- Pumping test, J-No.2 boring started
25 (Fri)	- J-No.2 boring, pumping test at J-No.1
26 (Sat)	- J-No.2 boring, pumping test at J-No.1
27 (Sun)	- Office work (various test records and data shuffled)
28 (Mon)	- J-No.2 boring, J-No.1 bore hole and pumping facility handed over to Camp
29 (Tue)	- J-No.2 boring, J-No.1 bore hole and pumpint facility handed over to Camp

Date	Work Record
June, 1982	
30 (Wed)	- J-No.2 boring, J-No.1 bore hole and pumping facility handed over to Camp
July, 1982	
1 (Thu)	- J-No.2 boring, data and records interpreted
2 (Fri)	- J-No.2 boring, data and records interpreted
3 (Sat)	- J-No.2 boring, data and records interpreted
4 (Sun)	- Office work (various data and records interpreted)
5 (Mon)	- J-No.2 boring
6 (Tue)	- J-No.2 boring
7 (Wed)	- J-No.2 boring
8 (Thu)	- J-No.2 boring, report making on field study
9 (Fri)	- J-No.2 boring
10 (Sat)	- J-No.2 boring
11 (Sun)	- Procurement of materials, office work (data and records interpreted)
12 (Mon)	- J-No.2 boring h ole completed, electrical logging
13 (Tue)	- Installation of casing pipes
14 (Wed)	- Airlifting
15 (Thu)	- Airlifting
16 (Fri)	- Airlifting and installation of submersible motor pump
17 (Sat)	- Pumping test, preparation of boring machine and others
18 (Sun)	- Boring machine moved to J-No.3 site
19 (Mon)	- Preparation of boring at J-No.3 site
20 (Tue)	- J-No.3 boring started
21 (Wed)	- J-No.3 boring
22 (Thu)	- J-No.3 boring

Date	Work Record
July, 1982	
23 (Fri)	- J-No.3 boring, J-No.2 pumping test
24 (Sat)	- J-No.3 boring, briefing to Camp commander and UNHCR
25 (Sun)	- Office work (data and records interpreted)
26 (Mon)	- J-No.3 boring, J-No.2 bore hole and pumping system handed over to Camp
27 (Tue)	- J-No.3 boring
28 (Wed)	- J-No.3 boring, electrical exploration
29 (Thu)	- J-No.3 boring, electrical exploration
30 (Fri)	- J-No.3 boring, interpretation of records of electrical exploration
31 (Sat)	- J-No.3 boring
Aug., 1982	
1 (Sun)	- Holiday
2 (Mon)	- J-No.3 boring
3 (Tue)	- J-No.3 bore hole completed, electrical logging
4 (Wed)	- Airlifting, sampling water from J-No.1 and 2 for quality test
5 (Tue)	- Airlifting
6 (Fri)	- Airlifting, installation of submersible motor pump
7 (Sat)	- Preparation for moving machine and others
8 (Sun)	- Boring machine moved to J-No.4 site
9 (Mon)	- Preparation of boring at J-No.4 site
10 (Tue)	- J-No.4 boring started, camp officials and parties concerned joint meeting
11 (Wed)	- J-No.4 boring, J-No.3 pumping test
12 (Thu)	- Holiday (Thai national holiday)
13 (Fri)	- J-No.4 boring
14 (Sat)	- J-No.4 boring, report making

Date	Work Record
Aug., 1982	
15 (Sun)	- Office work (report making)
16 (Mon)	- J-No.4 boring, submitting report to JICA office
17 (Tue)	- J-No.4 boring
18 (Wed)	- J-No.4 boring, sampling water from J-No.3 for quality test
19 (Thu)	- J-No.4 boring
20 (Fri)	- J-No.4 boring, briefing UNHCR officer
21 (Sat)	- J-No.4 boring
22 (Sun)	- Holiday
23 (Mon)	- J-No.4 boring
24 (Tue)	- J-No.4 boring
25 (Wed)	- J-No.4 boring
26 (Thu)	- J-No.4 boring
27 (Fri)	- Boring trouble occuring at the depth of 26.50m.
28 (Sat)	- Piece of weight-rod found out, drill bit remaining in bore hole, boring restarted 1 m. away
29 (Sun)	- Discussion on adopting used drill bit and on work schedule
30 (Mon)	- J-No.4 boring continued, improvising boring equipment
31 (Tue)	- J-No.4 boring, improvising boring equipment
Sep., 1982	
1 (Wed)	- J-No.4 boring, necessary boring equipment and work schedule worked out
2 (Thu)	- J-No.4 boring, Mr. NARITA in charge of hydrogeology arriving at Bangkok
3 (Fri)	- J-No.4 boring, meeting at JICA BKK office on countermeasures to accident
4 (Sat)	- J-No.4 boring

Date	Work Record
Sep., 1982	
5 (Sun)	- J-No.4 boring
6 (Mon)	- J-No.4 boring
7 (Tue)	- J-No.4 boring
8 (Wed)	- J-No.4 boring, office work (preparation of report)
9 (Thu)	- J-No.4 boring, office work (preparation of report)
10 (Fri)	- J-No.4 boring, JICA informs on sending drill bit and extension of work ceriod
11 (Sat)	- J-No.4 boring, office work (preparation of report, work schedule replanned
12 (Sun)	- J-No.4 boring, office work (preparation of report, work schedule replanned
13 (Mon)	- J-No.4 boring, office work (procurement of equipment, procedures of extension of stay)
14 (Tue)	- J-No.4 boring, office work (report preparation)
15 (Wed)	- J-No.4 boring, office work (report preparation)
16 (Thu)	- New tungsten tri-cone bit set in place, J-No.4 boring
17 (Fri)	- J-No.4 boring
18 (Sat)	- J-No.4 boring, topographical survey
19 (Sun)	- J-No.4 boring, topographical survey
20 (Mon)	- J-No.4 boring, topographical survey
21 (Tue)	- J-No.4 boring, office work
22 (Wed)	- J-No.4 boring, surface reconnaissance
23 (Thu)	- J-No.4 boring, office work (report preparation)
24 (Fri)	- J-No.4 boring, office work
25 (Sat)	- J-No.4 boring, office work
26 (San)	- J-No.4 boring
27 (Mon)	- J-No.4 boring, communication with JICA

Date	Work Record
Sep., 1982	
28 (Tue)	- J-No.4 boring, communication with JICA
29 (Wed)	- J-No.4 bore hole completed
30 (Thu)	- Cleaning bore hole, office work
Oct., 1982	
1 (Fri)	- Cleaning bore hole, office work
2 (Sat)	- Electrical logging, casing pipes installed
3 (Sun)	- Airlifting
4 (Mon)	- Airlifting, communication with JICA & MOI
5 (Tue)	- Airlifting, installation of submersible motor pump
6 (Wed)	- Pumping test, servicing boring machine
7 (Thu)	- Transport of boring machine and materials, meeting with Pak Chom Camp and UNHCR officers
8 (Fri)	- Preparation for report making, courtesy call to LOEI governor and others
9 (Sat)	- The survey team left LOEI- Pak Chom Camp
10 (Sun)	- The survey team arrived in BANGKOK
11 (Mon)	- Preparing progress report
12 (Tue)	- Preparing progress report, meeting with JICA, meeting and coutesy call to MOI
13 (Wed)	- Boring engineers left BANGKOK, wind up the affairs, preparing progress report
14 (Thu)	- Wind up the affairs (payment, greeting and others), preparing progress report
15 (Wed)	- Submission of progress report, wind up the affairs, coutesy call to the governments concerned
16 (Thu)	- The team leader and planner left BANGKOK

4. Outline of the Study

One may reach the village of Pak Chom from Muang District of Loei Province located in the north-west of the northeastern Thailand first by going northward along the national highway 201 for about 48 km till coming to the town of Chiang Khan, and then turning east there along the provincial highway 2186 on the Mekong River for about 40 km downstreams. If the journey is continued from Pak Chom along the provincial highway 2108, now southward, for about 12 km, one will find oneself near the main gate to Pak Chom Camp, which is about 300 m away to the east of where one is (Fig. 4-1 ∿ 3). Pak Chom Camp, which is for Laotian displaced persons, is also called Ban Vinai Camp. The name of Pak Chom Camp shall be used in this report.

A series of hydrogeological studies including collection of existing data, surface reconnaissance, electrical exploration, test boring, electrical logging, pumping test, water quality test were conducted in order to find out the mode of occurrence of groundwater in the camp. The location of the sites of these studies is as shown in Fig. 4-2. The outline of what were studied, and how the studies were done is as follows.

4-1 Collection of Existing Data

Hydrogeological data on topography, geology, climate and hydrology were obtained from Ministry of interior (MOI), Department of Mineral Resources (DOMR) and Royal Irrigation Department (RID) of Thailand among others.

The major ones of such data are as follows.

a) topographical map (scale 1/50,000)

b) climatic record (precipitation, air temperature, transpiration, evaporation etc.)

c) geological map (scale 1/1,000,000)

d) hydrogeological map (scale 1/500,000)