

添付資料 6 設 計 資 料

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添付資料 6-1

計画給水区域内現在人口 (1989/1990年)

計画給水区域内現在人口（地域別データ）

Desa/Kel	I K K 名	I K K 全人口	給水計画地域人口
1. 南スラウェシ			
1-1 ULUSALU		(1990年)	
	Ralte	806	658
	Rea	654	334
	Tangaratte	614	626
	Pattan	589	481
	Rabung	462	100
	小 計	3.125	2.199

1-2 SALU		(1989年)	
	Kalindunga	860	430
	Sarre	871	436
	Sp. Bungin	997	499
	Nonongan	400	400
	小 計	3.128	1.765

1-3 KAERO		(1990年)	
	Turunan	683	546
	Suwaya	714	572
	Tuwamete	664	531
	Bau	386	309
	Pasang	392	314
	小 計	2.839	2.272

1-4 TIROMANDA		(1990年)	
	Awa	534	534
	Lalikan	774	619
	Tarondon		
	Solo	524	419
	小 計	1.832	1.572

Desa/Kel	I K K 名	I K K 全 人 口	給水計画地域人口
1-5 MALILI		(1990年)	
Raskap		1,748	1,748
Malili		3,002	3,002
Baruga		2,284	300
小 計		7,034	5,050
1-6 MASAMBA		(1990年)	
Bone		3,367	3,367
Kapuna		2,008	1,603
Bolebo		1,685	800
Kasimbong		2,611	2,611
小 計		9,671	8,381
2. 中央スラウェシ			
2-1 TOAYA		(1990年)	
Toaya		3,710	2,217
2-2 BINANGGA		(1989年)	
Binangga		1,575	1,260
Padende		643	514
Sibedi		882	706
Baliase		628	502
Boya Boliase		332	266
Porame		1,015	812
Balane		784	627
小 計		5,859	4,687
2-3 TAWAELI		(1989年)	
Panau		2,732	1,309
Balya		2,635	2,108
Lambara		2,046	1,072
Pantoloan		3,786	3,028
小 計		11,199	7,517

Desa/Kel	I K K 名	I K K 全 人 口	給水計画地域人口
2-4 BONE BOBAKAL		(1990年)	
Bone Bobakal		466	466
Lomba		664	502
小 計		1.130	968
2-5 SAMBIUT		(1990年)	
Sambiut		769	769
Abason		888	888
Tone		394	394
Sakay		433	433
Bolonan		365	365
Sobonan		256	256
小 計		3.105	3.105
2-6 BALANTAK		(1990年)	
Balantak		2.269	2.269
Mamping		459	459
Padang		132	132
小 計		2.860	2.860
2-7 SALAKAN		(1990年)	
Salakan		654	654
Baka		628	628
Bonggan		876	876
小 計		2.158	2.158
2-8 LIANG		(1990年)	
Liang		863	863
Seleati		553	553
Bajo		601	601
小 計		2.017	2.017

Desa/Kel / I K K 名	I K K 全 人 口	給水計画地域人口
3. 南東スラウェシ		
3-1 LANDONO	(1990年)	
Landono I	1,205	1,205
Tridana Mulia	1,789	1,789
Amotowo	641	0
小 計	3,635	2,994
3-2 ANDUONOHU	(1990年)	
Anduonohu	3,845	3,460
3-3 MOWEWE	(1990年)	
Mowewe I	1,469	1,469
Mowewe II	1,749	1,749
小 計	3,218	3,218
3-4 WAKADIA	(1990年)	
Wakadia	1,956	1,956
3-5 LAOMPO	(1990年)	
Laompo	2,076	2,076
Busoa	1,115	937
小 計	3,191	3,013
3-6 LAPUKO	(1990年)	
Lapuko	2,367	2,300
3-7 SANDANGPANGAN	(1990年)	
	2,408	2,408
3-8 TAKIMPO	(1990年)	
Bana Bungi	3,308	3,000
Lapanda	2,341	500
Takimpo	1,733	1,733
小 計	7,382	5,233
総 合 計	91,837	71,350

添付資料 6-2

計画時間最大給水量の検討

給水区域別計画

給水地区	2000年 給水人口	日平均給水量 (m ³ /日)	日最大給水量 (m ³ /日)	時間最大 (m ³ /時)
1. 南スラウェシ				
1-1 ULUSALU				
Ralte	692	52	57	7.1
Rea	350	26	29	3.6
Tangaratte	659	49	54	6.7
Pattan	505	38	41	5.1
Rabung	105	8	9	1.1
小計	2,311	173	190	23.5
1-2 SALU				
Kalindunga	455	34	37	4.7
Sarre	461	34	38	4.9
Sp. Bungin	527	39	43	5.5
Nonongan	422	31	34	4.3
小計	1,865	138	152	19.4
1-3 KAERO				
Turunan	574	43	47	4.7
Suwaya	601	45	49	4.9
Tuwamete	558	41	45	4.5
Bau	325	24	27	2.7
Pasang	330	24	27	2.7
小計	2,388	177	195	19.4
1-4 TIROMANDA				
Awa	561	42	45	5.8
Lalikan Tarondon	651	48	53	6.8
Solo	440	32	36	4.6
小計	1,652	122	134	17.3

給水地区	2000年 給水人口	日平均給水量 (m ³ /日)	日最大給水量 (m ³ /日)	時間最大 (m ³ /時)
1-5 MALILI				
Raskap	2,205	162	178	17.2
Malili	3,787	279	307	29.7
Baruga	378	28	31	3.0
小計	6,370	469	516	50.0
1-6 MASAMBA				
Bone	4,248	351	386	37.3
Kapuna	2,022	167	183	17.7
Bolebo	1,009	83	92	8.9
Kasimbong	3,293	272	299	28.9
小計	10,572	873	960	92.8
2. 中央スラウェシ				
2-1 TOAYA	3,026	228	251	25.5
2-2 BINANGGA				
Binangga	1,775	131	144	12.7
Padende	724	53	59	5.2
Sibedi	994	73	80	7.0
Ballase	707	52	57	5.0
Boya Boliase	374	27	30	2.6
Porama	1,144	84	93	8.2
Balane	882	65	71	6.2
小計	6,600	485	534	46.9
2-3 TAWAELI				
Panau	1,843	136	149	16.1
Baiya	2,968	218	240	26.0
Lambara	1,511	111	122	13.2
Pantoloan	4,262	314	346	37.5
小計	10,584	779	857	92.8

給水地区	2000年 給水人口	日平均給水量 (m ³ /日)	日最大給水量 (m ³ /日)	時間最大 (m ³ /時)
2-4 PENDOLO	—	—	—	—
2-5 BONE BOBAKAL				
Bone Bobakal	561	43	47	5.9
Lomba	607	46	51	6.3
小計	1,168	89	98	12.2
2-6 SANBIUT				
Sambiut	928	70	77	8.0
Abason	1,072	82	88	9.2
Tone	476	36	40	4.2
Sakay	523	40	44	4.6
Bolonan	440	33	37	3.9
Sobonan	309	23	26	2.7
小計	3,748	284	312	32.6
2-7 BALANTAK				
Balantak	2,739	202	223	24.3
Mamping	554	41	45	4.9
Padang	159	12	13	1.4
小計	3,452	255	281	30.6
2-8 SALAKAN				
Salakan	789	60	66	6.5
Baka	758	58	63	6.2
Bonggan	1,058	80	89	8.7
小計	2,605	198	218	21.4
2-9 LIANG				
Liang	1,042	79	87	10.4
Seleati	668	51	56	6.7
Bajo	725	55	61	7.3
小計	2,435	185	204	24.5

給水地区	2000年 給水人口	日平均給水量 (m ³ /日)	日最大給水量 (m ³ /日)	時間最大 (m ³ /時)
3. 南東スラウェシ				
3-1 LANDONO				
Landonno I	1,693	126	138	15.2
Tridana Mullia	2,514	186	205	22.5
小計	4,207	312	343	37.7
3-2 ANDUONOHU	4,862	360	396	39.8
3-3 MOWEWE				
Mowewe I	2,476	183	201	18.2
Mowewe II	2,948	217	239	21.6
小計	5,424	400	440	39.8
3-4 WAKADIA				
Wakadia	2,467	184	201	19.7
工業団地	2,000	148	163	16.0
小計	4,467	331	364	35.7
3-5 LAOMPO				
Laompo	2,652	197	217	23.2
Busoa	1,197	89	98	10.5
小計	3,849	286	315	33.7
3-6 LAPUKO	3,323	240	264	27.5
3-7 SANDANGPANGAN	3,076	230	253	31.6
3-8 TAKIMPO				
Bana Bungi	3,832	281	309	36.2
Lapanda	639	47	52	6.1
Takimpo	2,215	163	179	20.9
小計	6,686	491	540	63.2

添付資料 6-3

水質分析表

水 質 分 析 表

(地域別データ)

I K K 名	ULUSALU	SALU	KAERO
水 源 名	Kondongan	Lemo	Salambu
採 水 月 日	14th May, 1990	16th May, 1990	12th May, 1990
天 候	晴	晴	晴
水 温 (°C)	23	23.5	23
PH	7.5	7.5	7.5
濁 度 (カリン°)	1.5	Nil	Nil
大 腸 菌	活 性	○	○
	不活性		
	検出なし		
総硬度 (mg/l CaCO ₃)	-	-	-
アルカリ度 (mg/l)	-	-	-
全 鉄 (")	Nil	Nil	Nil
ク ロ ー ム (")	"	0	0
亜 鉛 (")	-	-	-
カルシウム (")	8	8	50.4
マグネシウム (")	14.58	4.86	23.81
マンガン (")	0	0	0
フ ッ 素 (")	0.4	0.4	0.6
硫酸イオン (")	0	0	0
塩素イオン (")	14.2	16.33	18.46
NH ₄ - N	Nil	Nil	Nil
NO ₃ - N	Nil	Nil	Nil
NO ₂ - N	Nil	Nil	Nil
備 考			

水 質 分 析 表

I K K 名	TIROMANDA	MALILI	MASAMBA
水 源 名	Parino	Karebbe	—
採 水 月 日	15th May, 1990	14th May, 1990	
天 候	雨	雨	
水 温 (°C)	19	23	
P H	7.5	7.5	
濁 度 (カリン°)	0	0	
大 腸 菌	活 性	○	○
	不活性		
	検出なし		
総硬度 (mg/l CaCO ₃)	—	76.79	
アルカリ度 (mg/l)	—	—	
全 鉄 (")	Nil	Nil	
ク ロ ー ム (")	0	0	
亜 鉛 (")	—	—	
カルシウム (")	20.8	—	
マグネシウム (")	13.12	—	
マンガン (")	0	0	
フ ッ 素 (")	0.4	0.4	
硫酸イオン (")	0	0	
塩素イオン (")	12.78	21.3	
NH ₄ - N	1.0	Nil	
NO ₃ - N	Nil	Nil	
NO ₂ - N	Nil	Nil	
備 考			

水 質 分 析 表

I K K 名	YOAYA	BINANGGA	TAWAELI
水 源 名	Kayadongo	Kurondo	Rubo
採 水 月 日	26th May, 1990	29th May, 1990	28th May, 1990
天 候	雨	晴	晴
水 温 (°C)	27	24	28
P H	7.2	7.5	7.2
濁 度 (カドム°)	0	0	0
大 腸 菌	活 性	○	○
	不活性		○
	検出なし		
総硬度 (mg/l CaCO ₃)	110	170	110
アルカリ度 (mg/l)	144.19	177.67	92.26
全 鉄 (")	0.2	Nil	0.1
ク ロ ー ム (")	0	0	0
亜 鉛 (")	0.09	0.07	0.05
カルシウム (")	-	-	-
マグネシウム (")	-	-	-
マンガン (")	0.05	0	0
フ ッ 素 (")	0.22	0.22	0.3
硫酸イオン (")	0.023	0.023	0.047
塩素イオン (")	1.5	0.5	4.0
NH ₄ - N	Nil	Nil	0.4
NO ₃ - N	Nil	Nil	Nil
NO ₂ - N	Nil	Nil	Nil
備 考			

水 質 分 析 表

1 K K 名	PENDOLO	BONE BOBAKAL	SUMIUT
水 源 名	Lake Poso	Lomba	Moang
採 水 月 日	15th May, 1990	31th May, 1990	4th June, 1990
天 候	晴	晴	晴
水 温 (°C)	32	24	27
PH	8	7.2	7.5
濁 度 (カリン°)	0	0	0
大 腸 菌	活 性		
	不活性	○	
	検出なし		○
総硬度 (mg/l CaCO ₃)	-	200	45
アルカリ度 (mg/l)	-	141.63	144.52
全 鉄 (")	Nll	Nll	Nll
ク ロ ー ム (")		0	0
亜 鉛 (")	-	0.05	0.05
カルシウム (")	8.8	-	-
マグネシウム (")	9.23	-	-
マンガン (")	0	0	0
フ ッ 素 (")	0.4	0.37	0.28
硫酸イオン (")	0	0.015	0.03
塩素イオン (")	17.4	1.0	2.5
NH ₄ - N	Nll	Nll	Nll
NO ₃ - N	Nll	Nll	Nll
NO ₂ - N	Nll	Nll	Mll
備 考			

水 質 分 析 表

I K K 名	BALANTAK	SALAKAN	LIANG
水 源 名	Di Matana	—	Kollo
採 水 月 日	1st June, 1990		5th June, 1990
天 候	雨		晴
水 温 (°C)	25		26
PH	7.0		7.5
濁 度 (カリツ°)	0		1
大 腸 菌	活 性		
	不活性		○
	検出なし	○	
総硬度 (mg/l CaCO ₃)	265		125
アルカリ度 (mg/l)	217.60		98.78
全 鉄 (")	Nil		Nil
ク ロ ー ム (")	0		0
亜 鉛 (")	0.05		0.06
カルシウム (")	—		—
マグネシウム (")	—		—
マンガン (")	0		0
フ ッ 素 (")	0.33		0.13
硫酸イオン (")	0.013		0.013
塩素イオン (")	2.50		2.50
NH ₄ - N	Nil		Nil
NO ₃ - N	Nil		Nil
NO ₂ - N	Nil		Nil
備 考			

水 質 分 析 表

I K K 名	LANDONO	ANDUONOHU	NOWEWE
水 源 名	—	Matanggonawa	Molioka
採 水 月 日		25th June, 1990	28th June, 1990
天 候		晴	晴
水 温 (°C)		27	25
P H		7.5	6.3
濁 度 (杯リツ)		1	1
大 腸 菌	活 性	○	○
	不活性		
	検出なし		
総硬度 (mg/l CaCO ₃)		299	252
アルカリ度 (mg/l)		—	—
全 鉄 (")		NII	0.3
ク ロ ー ム (")		—	—
亜 鉛 (")		0	0
カルシウム (")		—	—
マグネシウム (")		—	—
マンガン (")		0	—
フ ッ 素 (")		0	0
硫酸イオン (")		0	0
塩素イオン (")		16	0
NH ₄ - N		NII	NII
NO ₃ - N		NII	NII
NO ₂ - N		NII	MII
備 考		TDS : 360	TDS : 240

水 質 分 析 表

I K K 名	WAKADIA	LAOMPO	LAPUKO
水 源 名	Rawa	Kalangona	Lunggayropa
採 水 月 日	1st June, 1990	6th June, 1990	26th May, 1990
天 候	雨	晴	雨
水 温 (°C)	26.5	25	25
PH	7.2	7.5	7
濁 度 (NTU)	0	1.5	0
大 腸 菌	活 性		○
	不活性	○	○
	検出なし		
総硬度 (mg/l CaCO ₃)	299	286	288
アルカリ度 (mg/l)	-	-	-
全 鉄 (")	Nil	Nil	0.2
ク ロ ー ム (")	-	0	0
亜 鉛 (")	0	0	0
カルシウム (")	-	-	-
マグネシウム (")	-	-	-
マンガン (")	-	-	-
フ ッ 素 (")	0	0	0
硫酸イオン (")	0	6	33
塩素イオン (")	21	12	46
NH ₄ - N	0.3	Nil	Nil
NO ₃ - N	Nil	Nil	Nil
NO ₂ - N	Nil	Nil	Nil
備 考	TDS : 320	TDS : 380	TDS : 500

水 質 分 析 表

I K K 名	SANDANGPANGAN	TAKIMPO
水 源 名	Rano	Labeonpangule
採 水 月 日	4th June, 1990	5th June, 1990
天 候	雨	晴
水 温 (°C)	26	25
PH	7	8.5
濁 度 (カリン°)	0	0
大 腸 菌	活 性	
	不活性	○
	検出なし	
総硬度 (mg/l CaCO ₃)	287	291
アルカリ度 (mg/l)	-	-
全 鉄 (")	Nil	Nil
ク ロ ー ム (")	-	-
亜 鉛 (")	0	0
カルシウム (")	-	-
マグネシウム (")	-	-
マンガン (")	-	-
フ ッ 素 (")	0	0
硫酸イオン (")	3	11
塩素イオン (")	16	25
NH ₄ - N	Nil	0.5
NO ₃ - N	Nil	0.1
NO ₂ - N	Nil	Nil
備 考	TDS : 380	TDS : 240

添付資料 6-4

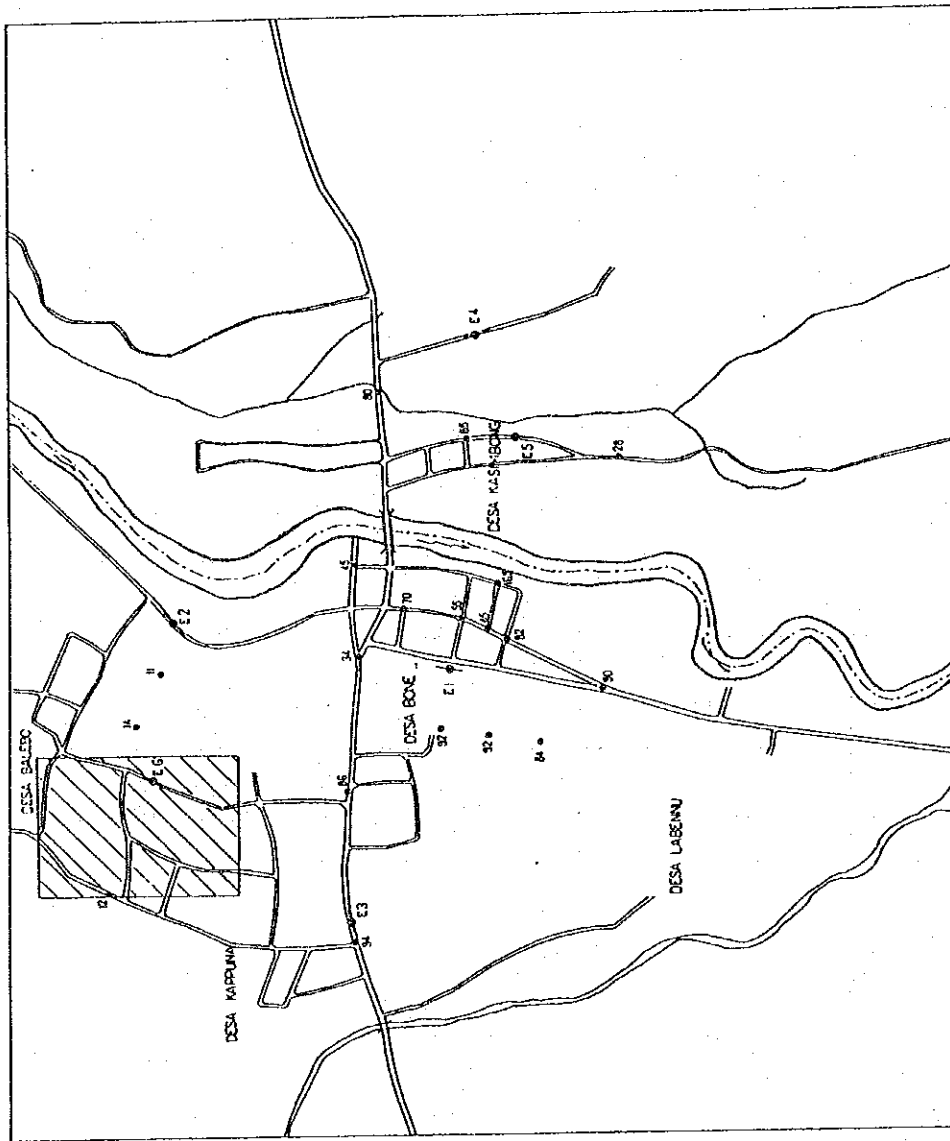
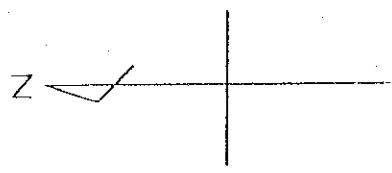
井戸掘削地点の水理地質状況

Interpretation Results of the Resistivity Sounding

Masamba

Unit	Specific Resistivity [Ω -m]	Depth [m]	Lithology
A	300 - 2000 (approximation)	5 - 10	• To be composed of fluvial sand and gravel in wet condition.
B	60 - 300	10 - 30	• To be composed of pebble to sandy silt in saturated.
C	240 - 1350	15 - 40	• To be composed of gravel in saturated.
D	15 - 153	30 - 60	• To be composed of clayey material.
E	600 - 2000	40 - 85	• To be composed of boulder or volcanic rocks of the Masamba Volcanic Sequence
F	108	60 - 70	• To be composed of intercalary sand to silt, or intercalary tuff breccia of the Masamba Volcanic Sequence
G	10 - 7	below 60 - 85	• To be composed of clay to silt, or tuff breccia of the Masamba Volcanic Sequence.

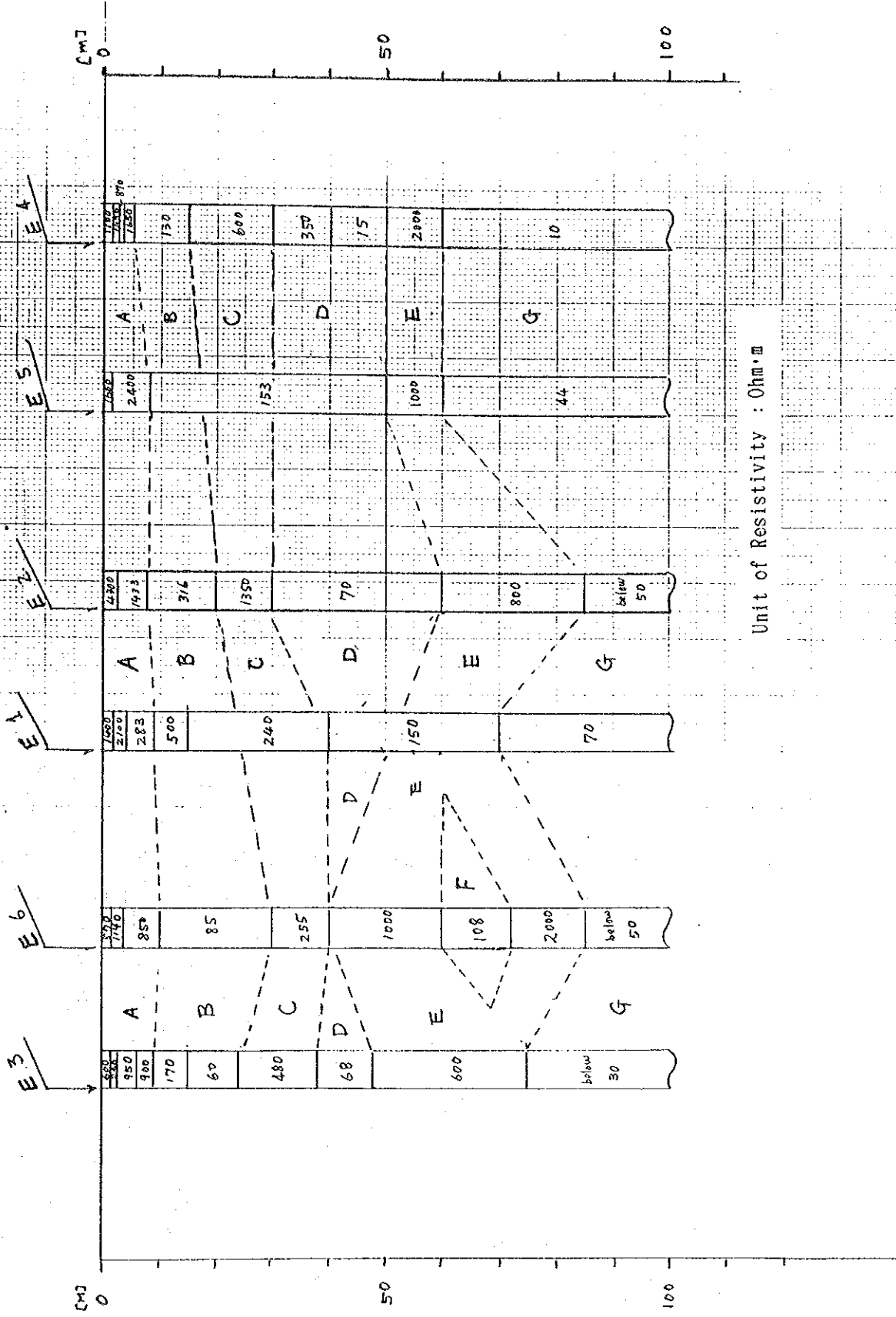
Recommended Groundwater Development Area
in Masamba



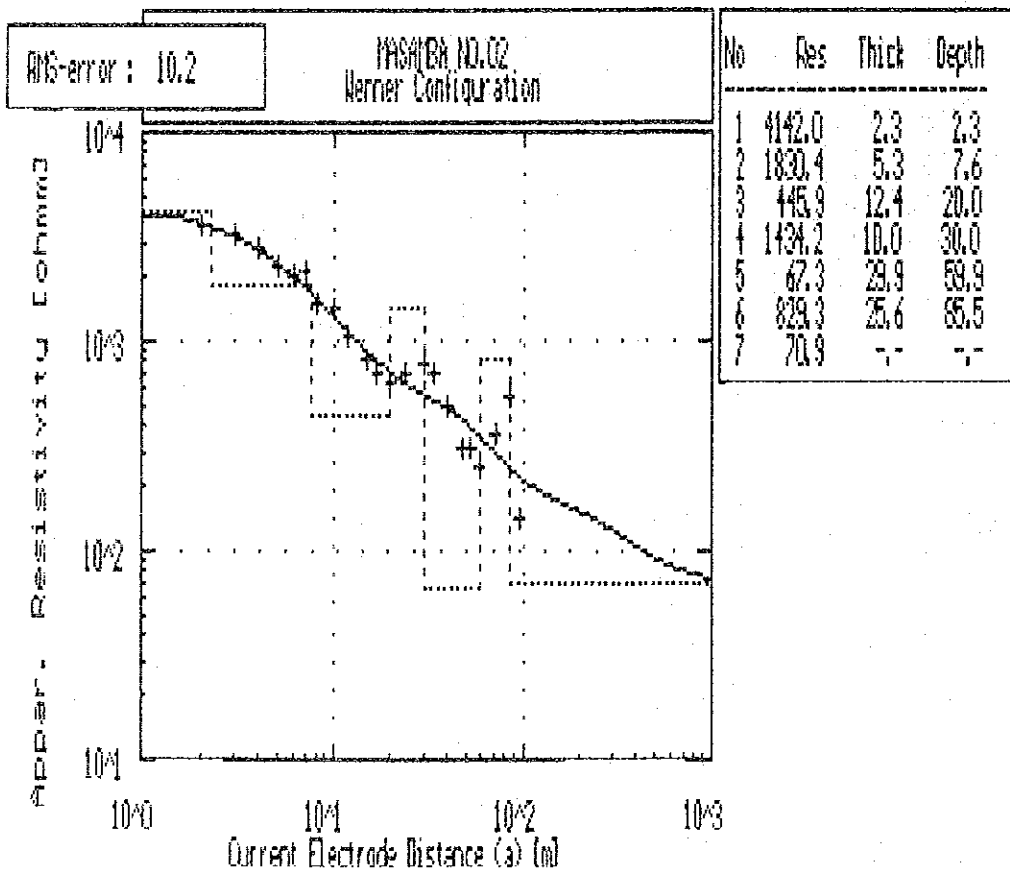
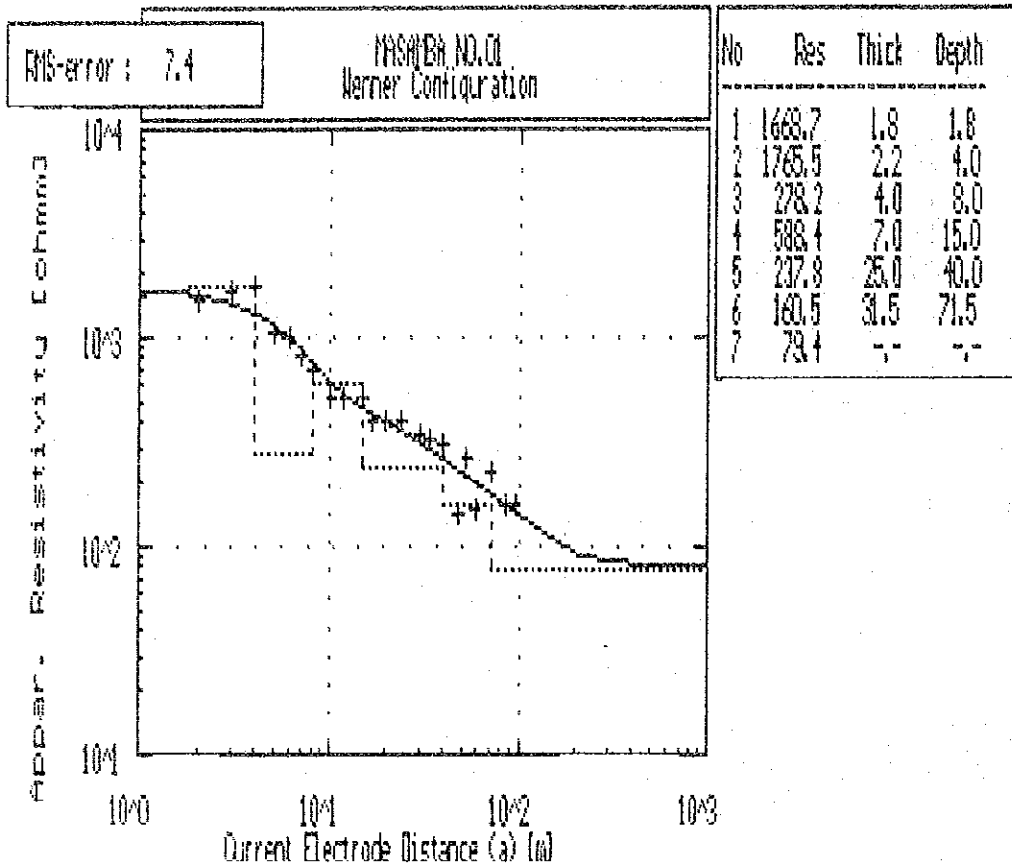
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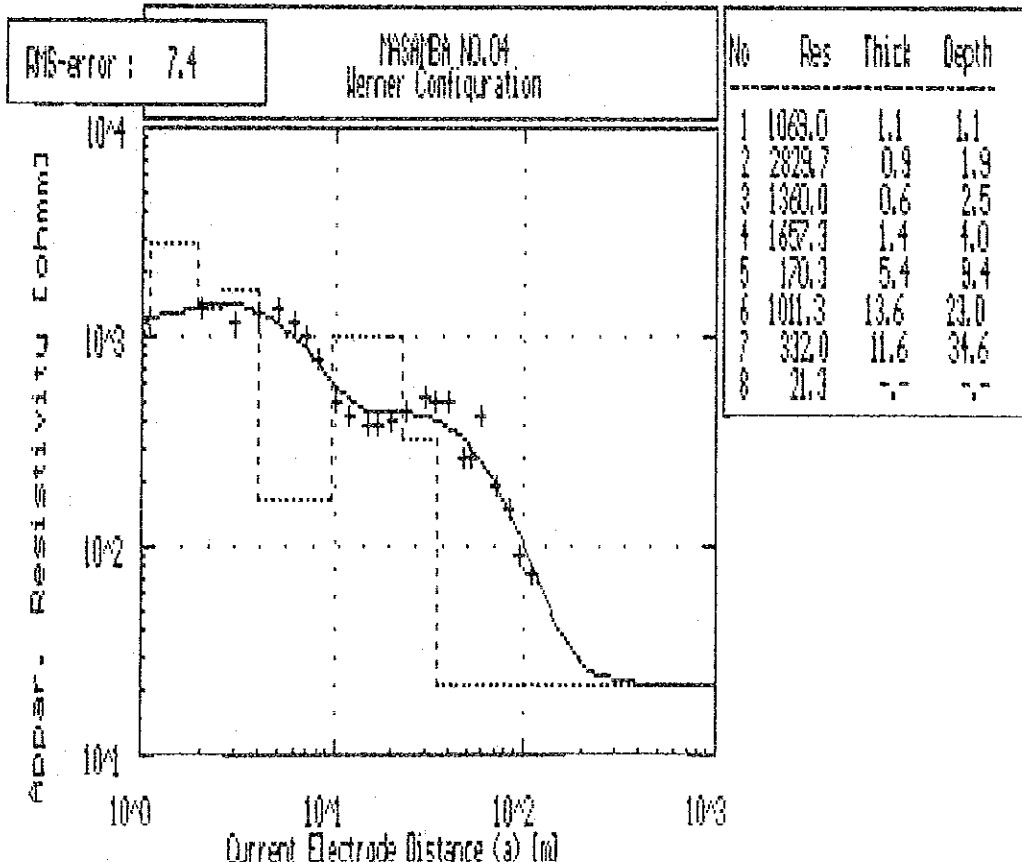
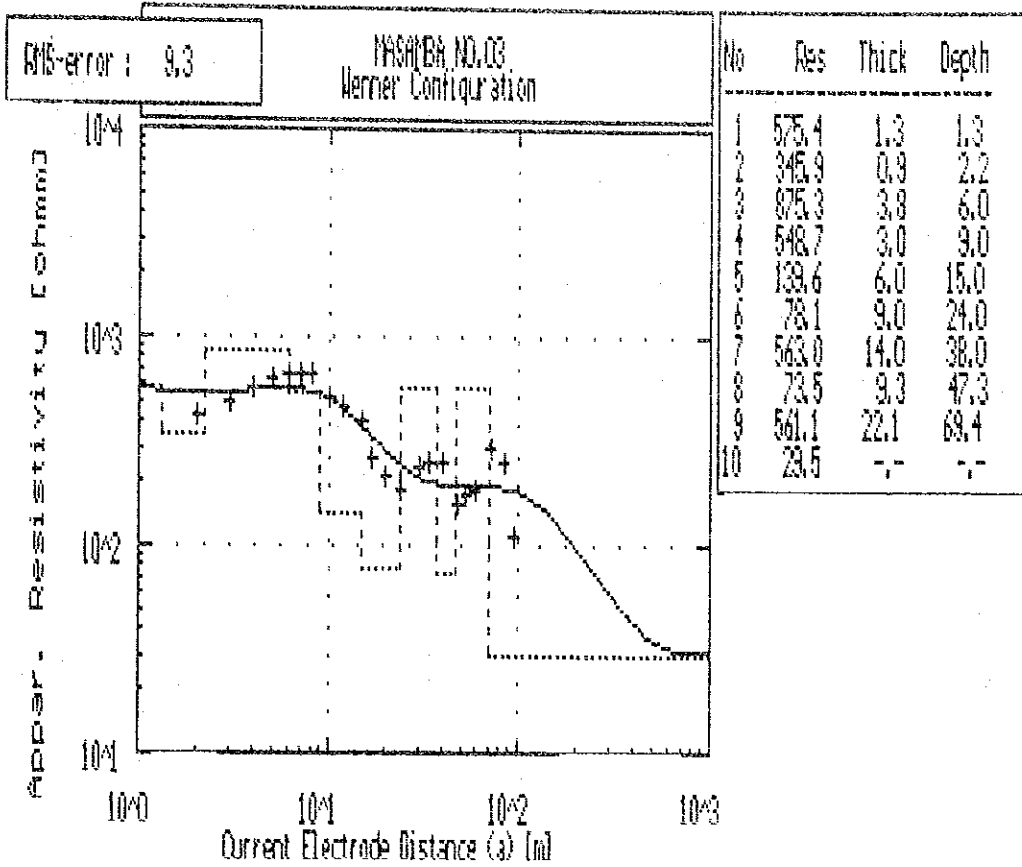
- Resistivity Sounding Point
- Electromagnetic Conductivity Measurement Point
Method : Horizontal Dipoles
Coil Separation : 40m
The Figures in mmhos/m
- ▨ Recommended Groundwater Development Area

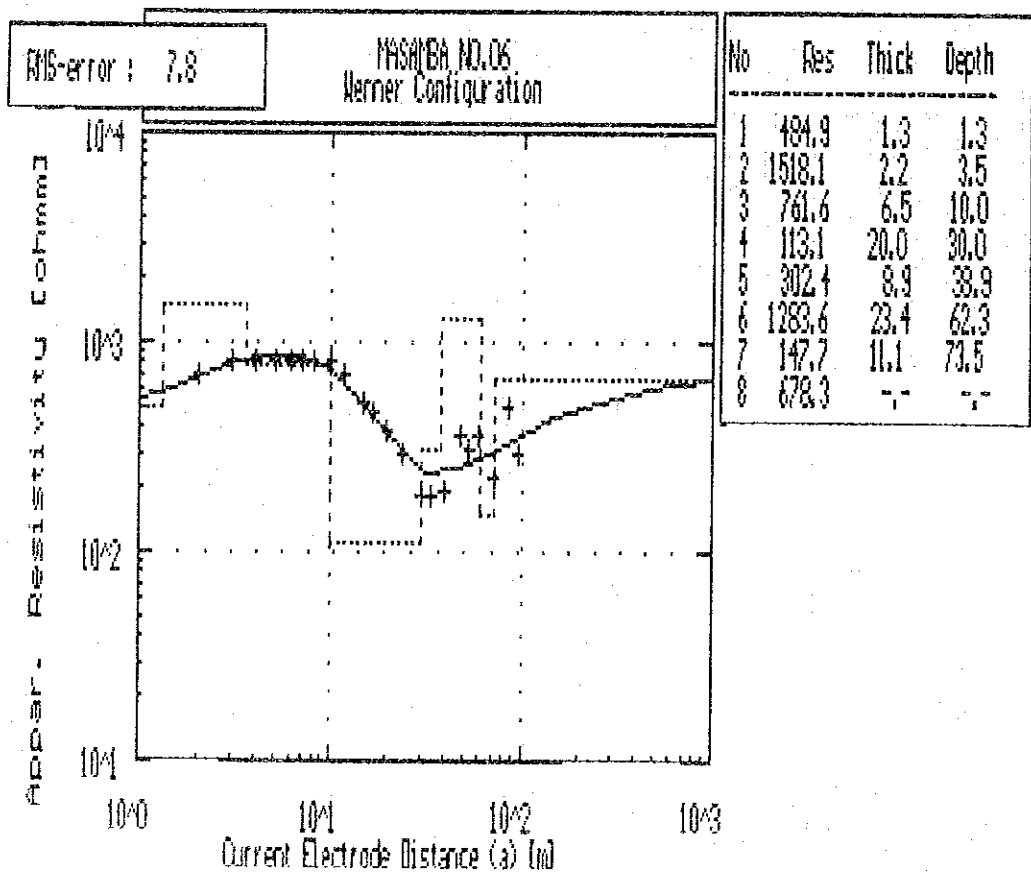
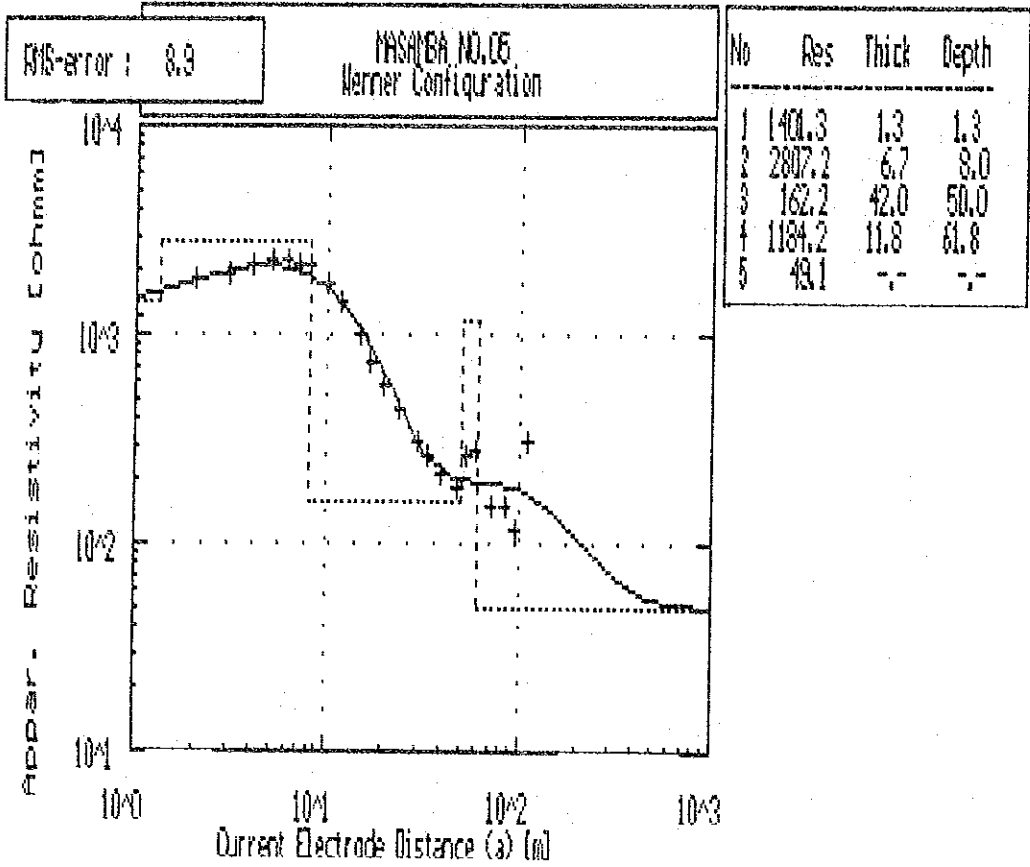
Resistivity Correlation of Masamba



Unit of Resistivity : Ohm·m





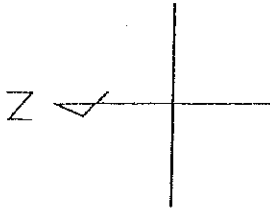
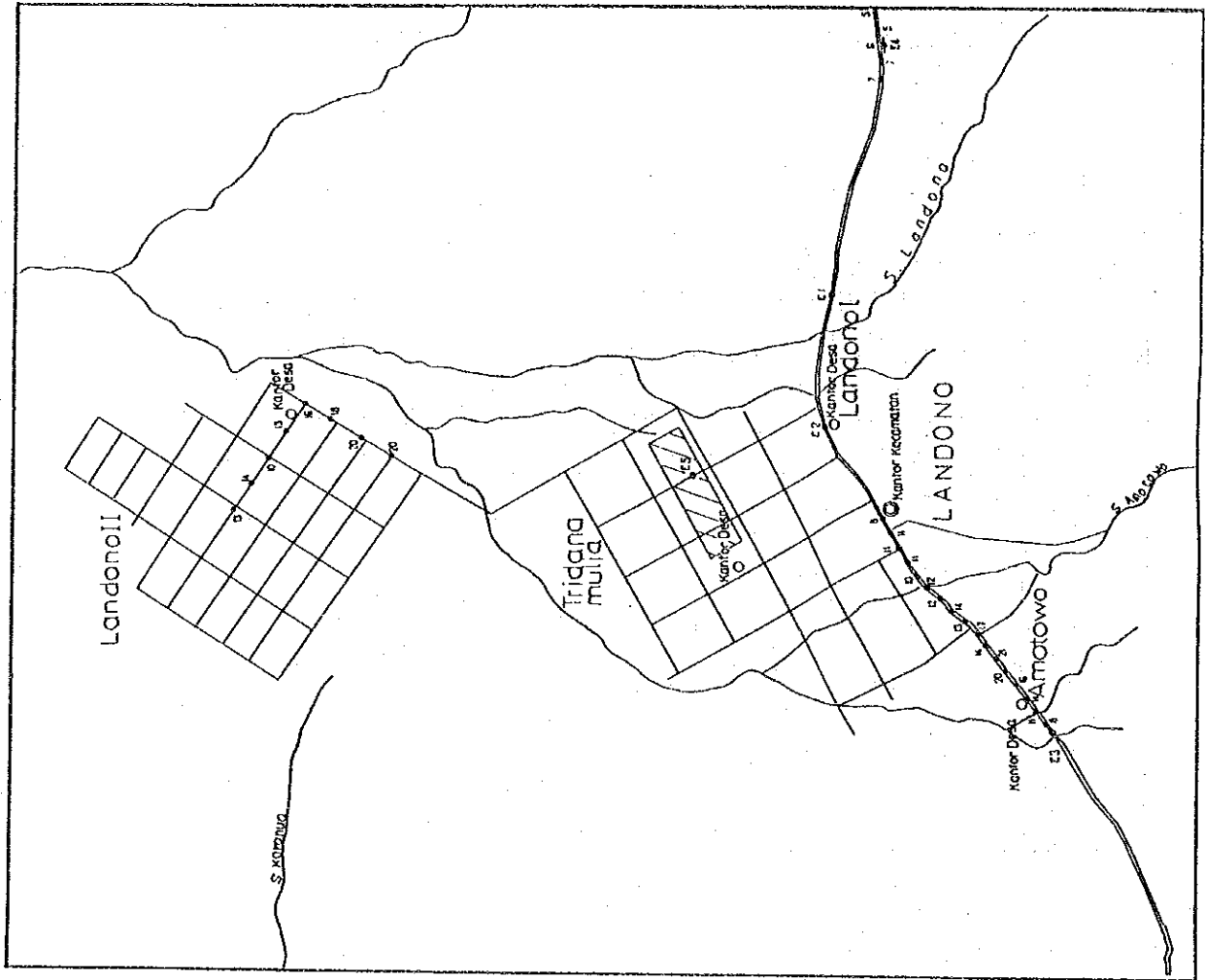


Interpretation Results of the Resistivity Sounding

Landono

Unit	Specific Resistivity [Ω -m]	Depth [m]	Lithology
A	300 - 900 (approximation)	10 - 17	<ul style="list-style-type: none">• To be composed mainly of fluvial gravel and sand in wet to saturated condition.
B	98 - 110	10 - 70	<ul style="list-style-type: none">• To be made up of pebble to sand in saturated condition.• developing thick northward.
C	26 - 50	below 10 - 20	<ul style="list-style-type: none">• To be composed of silt and silty sand with intercalary sand and pebble beds.
D	160	below 44	<ul style="list-style-type: none">• To be composed of gravel with intercalary silt and sand.• developing in the western part.

Recommended Groundwater Development Area
in Landono

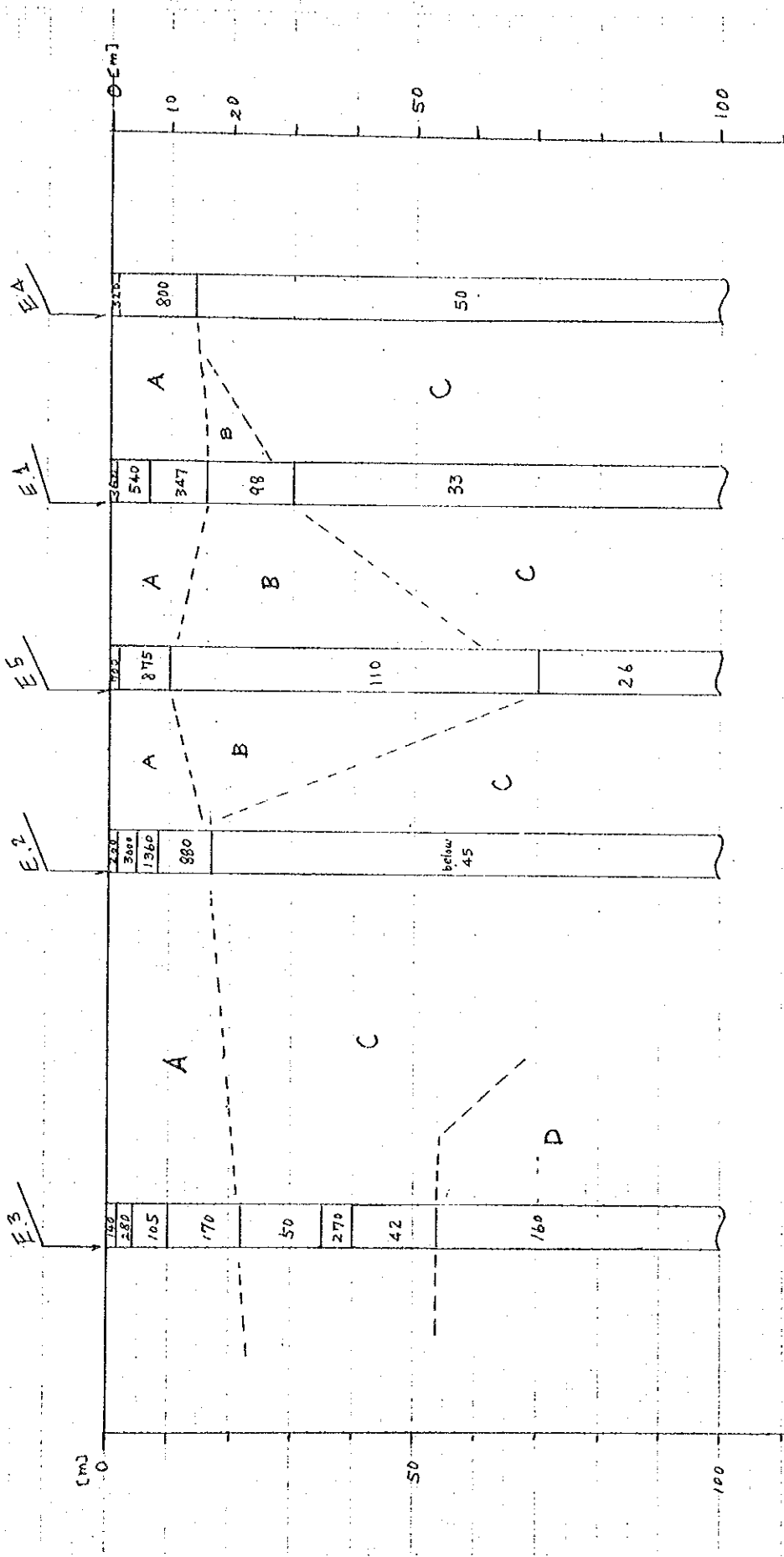


LEGEND

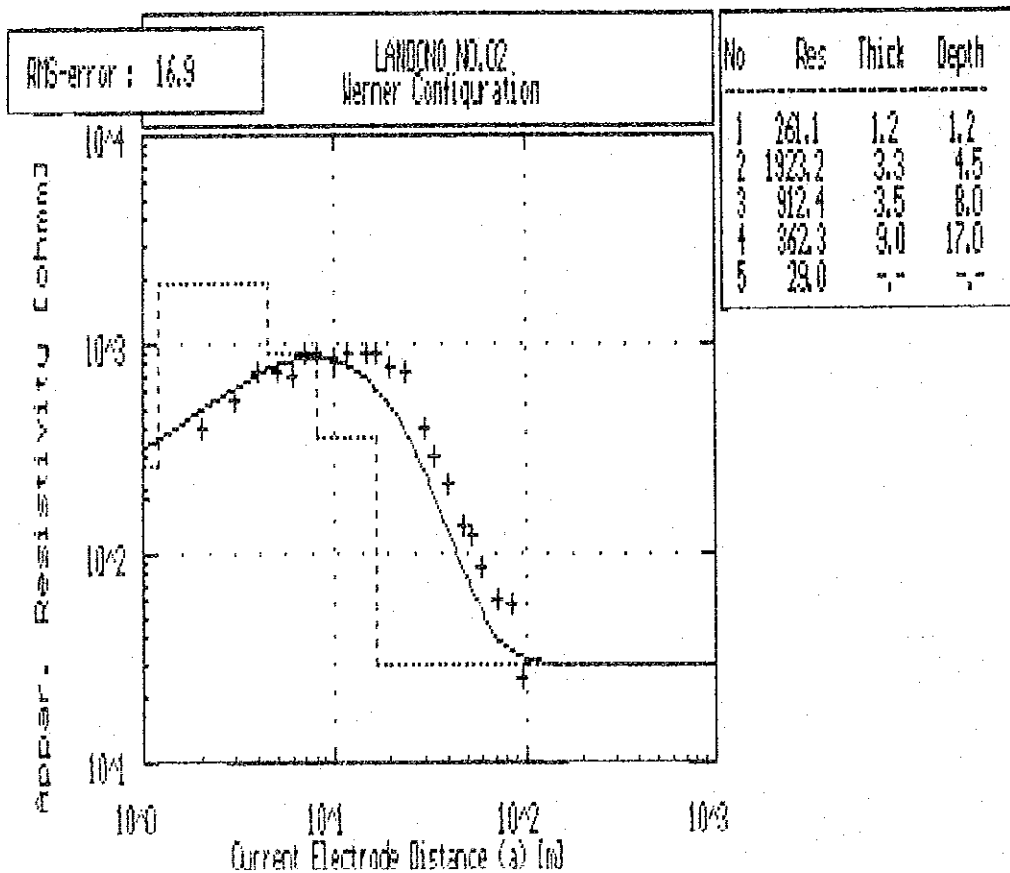
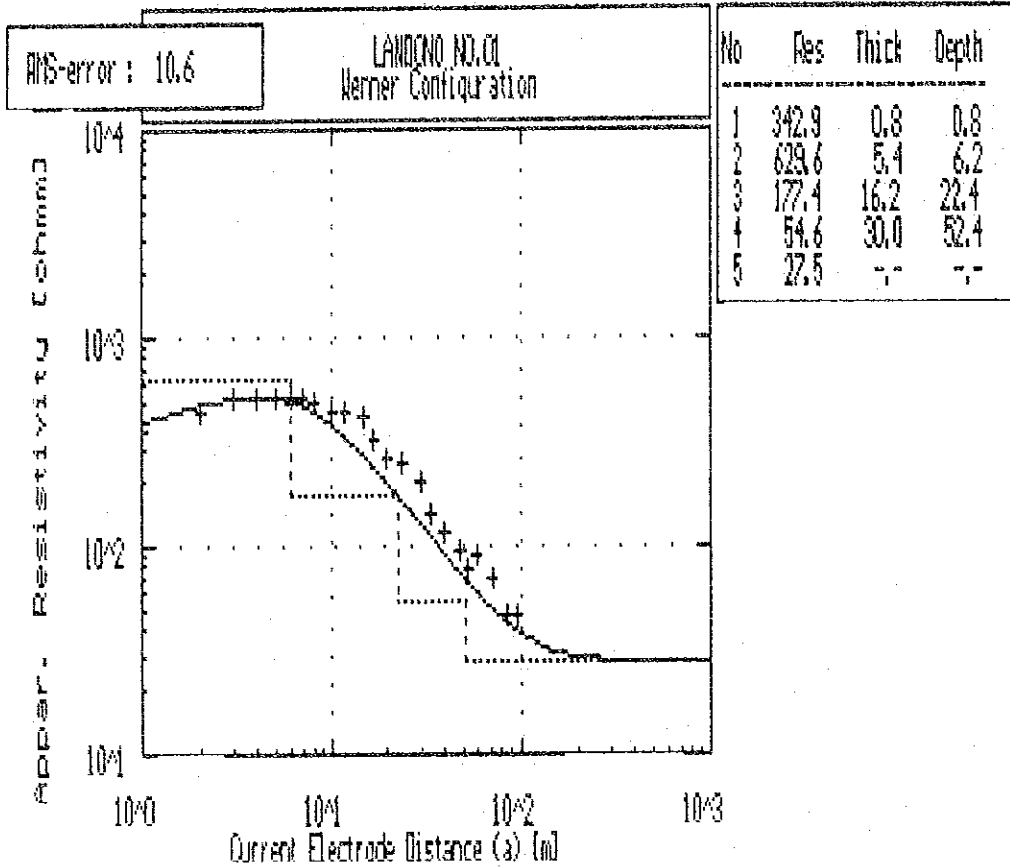
- Resistivity Sounding Point
- Electromagnetic Conductivity Measurement Point
Method : Horizontal Dipoles
Coil Separation : 40m
The Figures in mmhos/m
- Recommended Groundwater Development Area

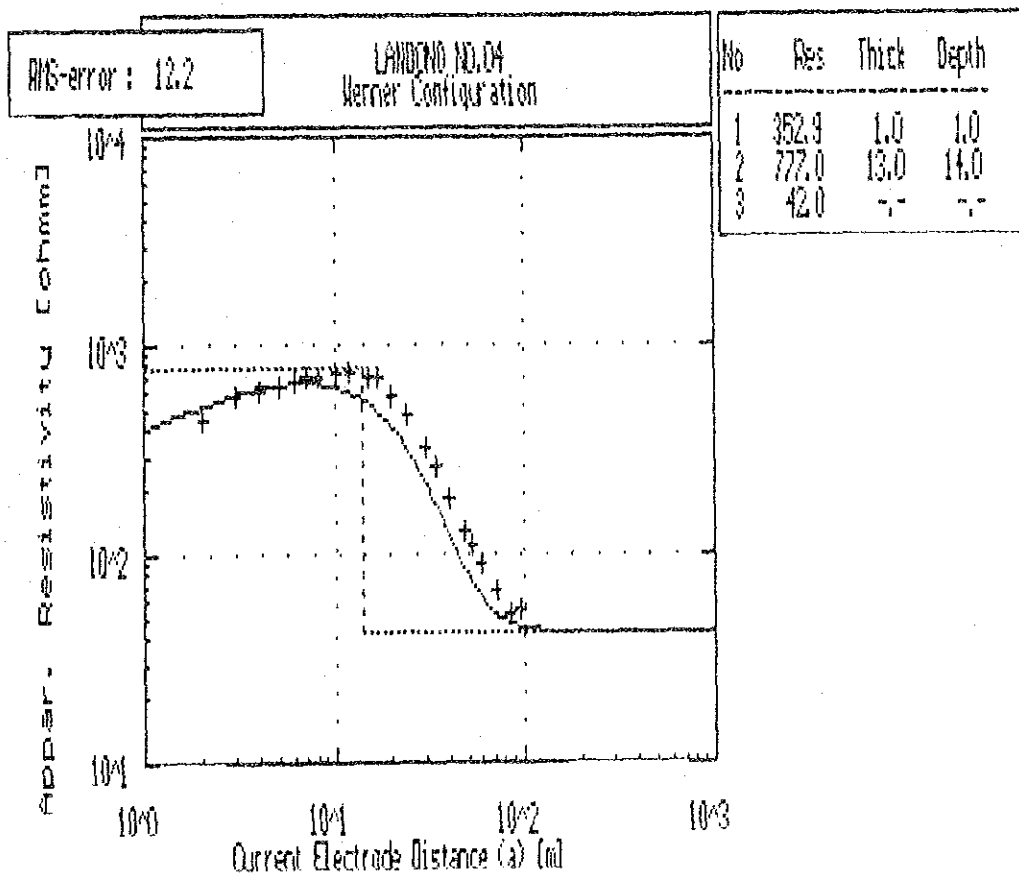
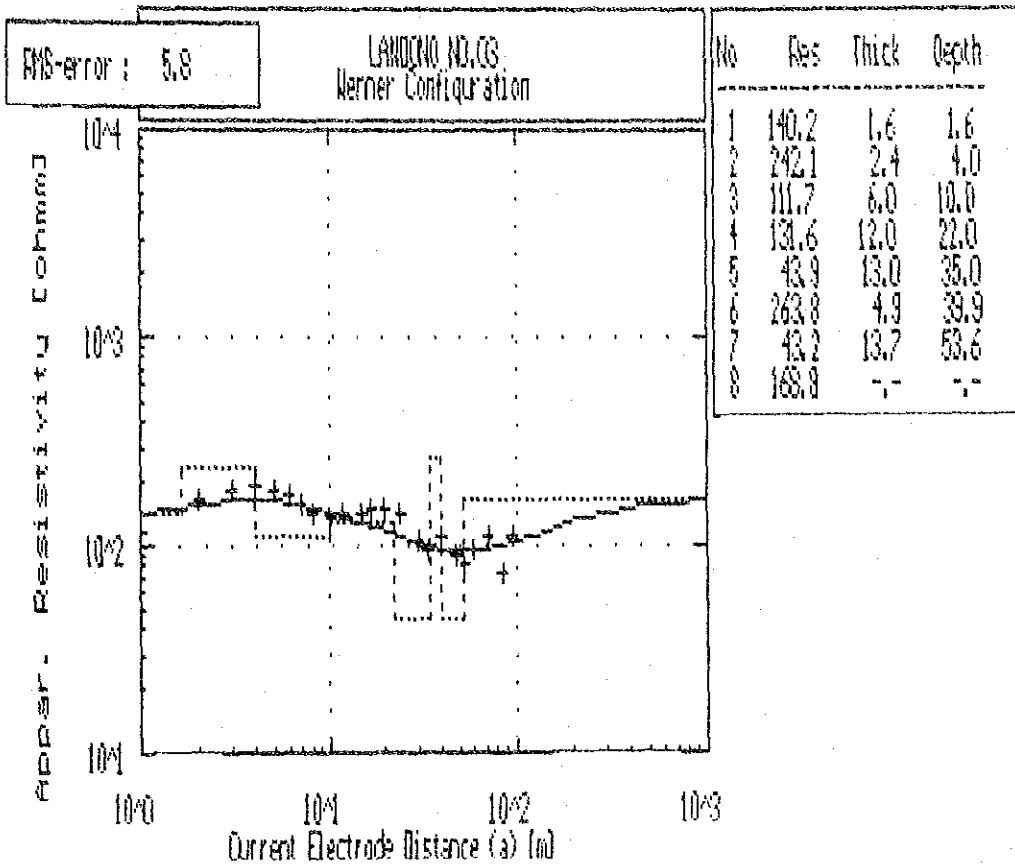


Resistivity Correlation of Landono



Unit of Resistivity : Ohm·m

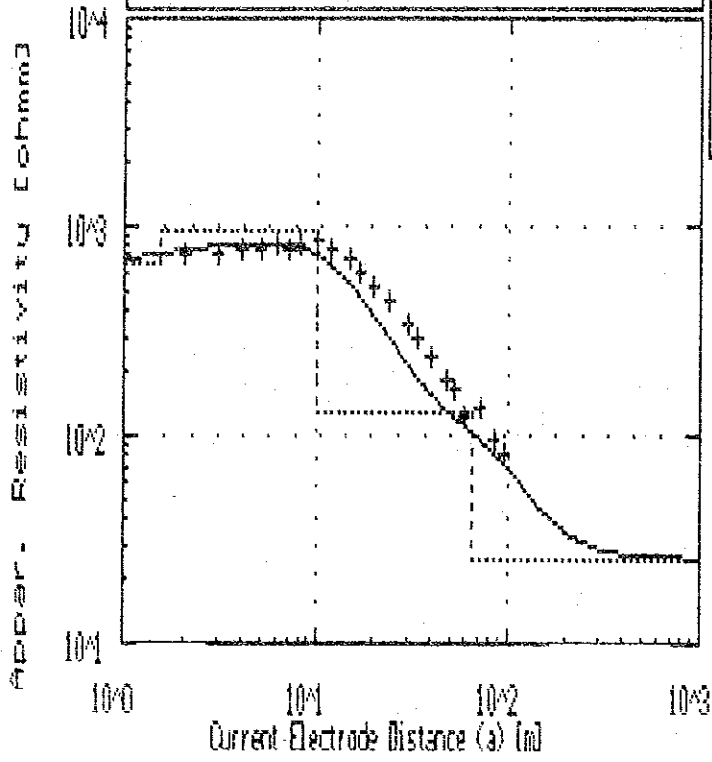




RMS-error : 11.5

LANDNO. 05
Wenner Configuration

No	Res	Thick	Depth
1	673.6	1.5	1.5
2	974.2	8.5	10.0
3	129.3	55.8	65.8
4	25.4	--	--

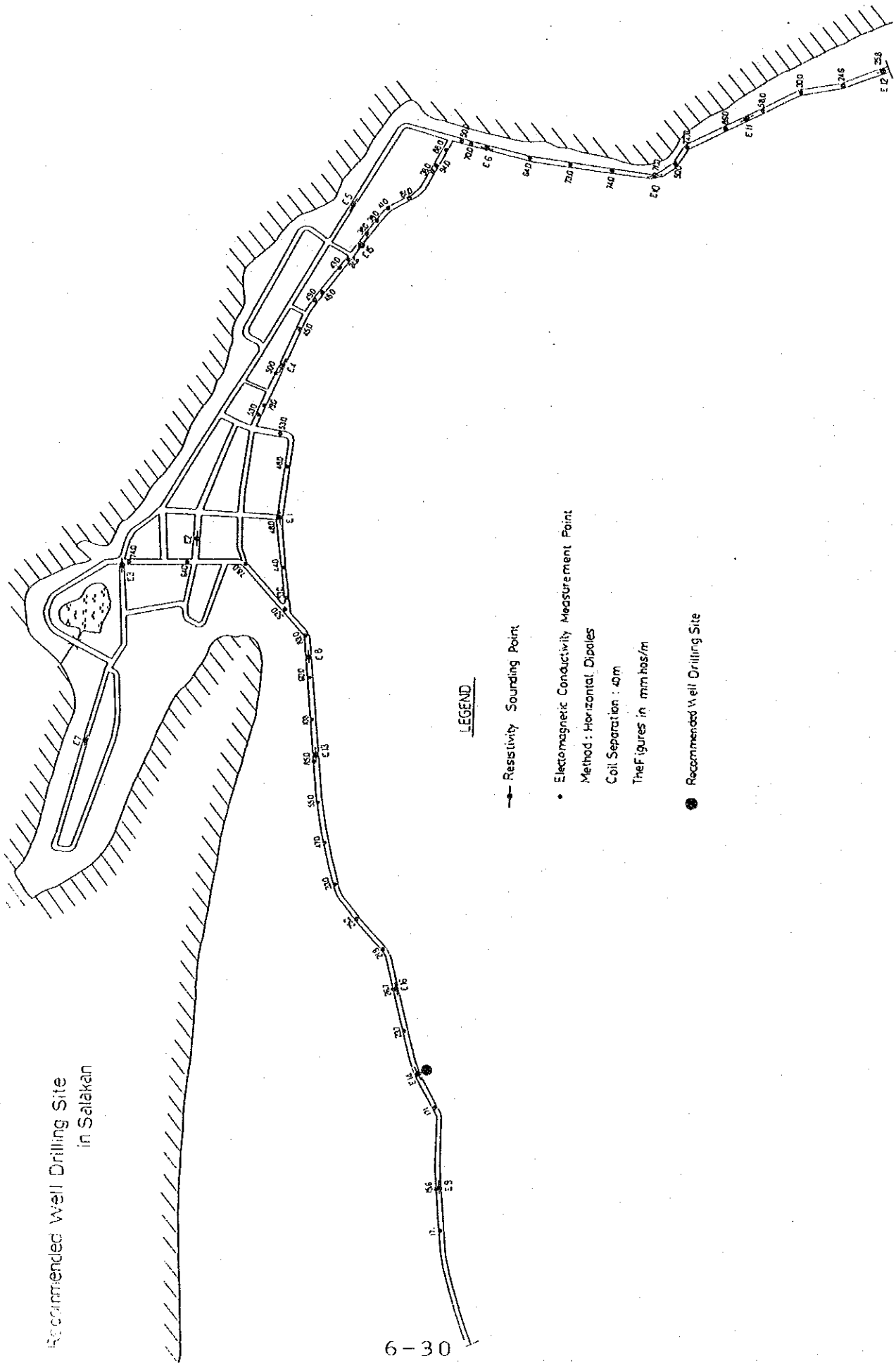


Interpretation Results of the Resistivity Sounding

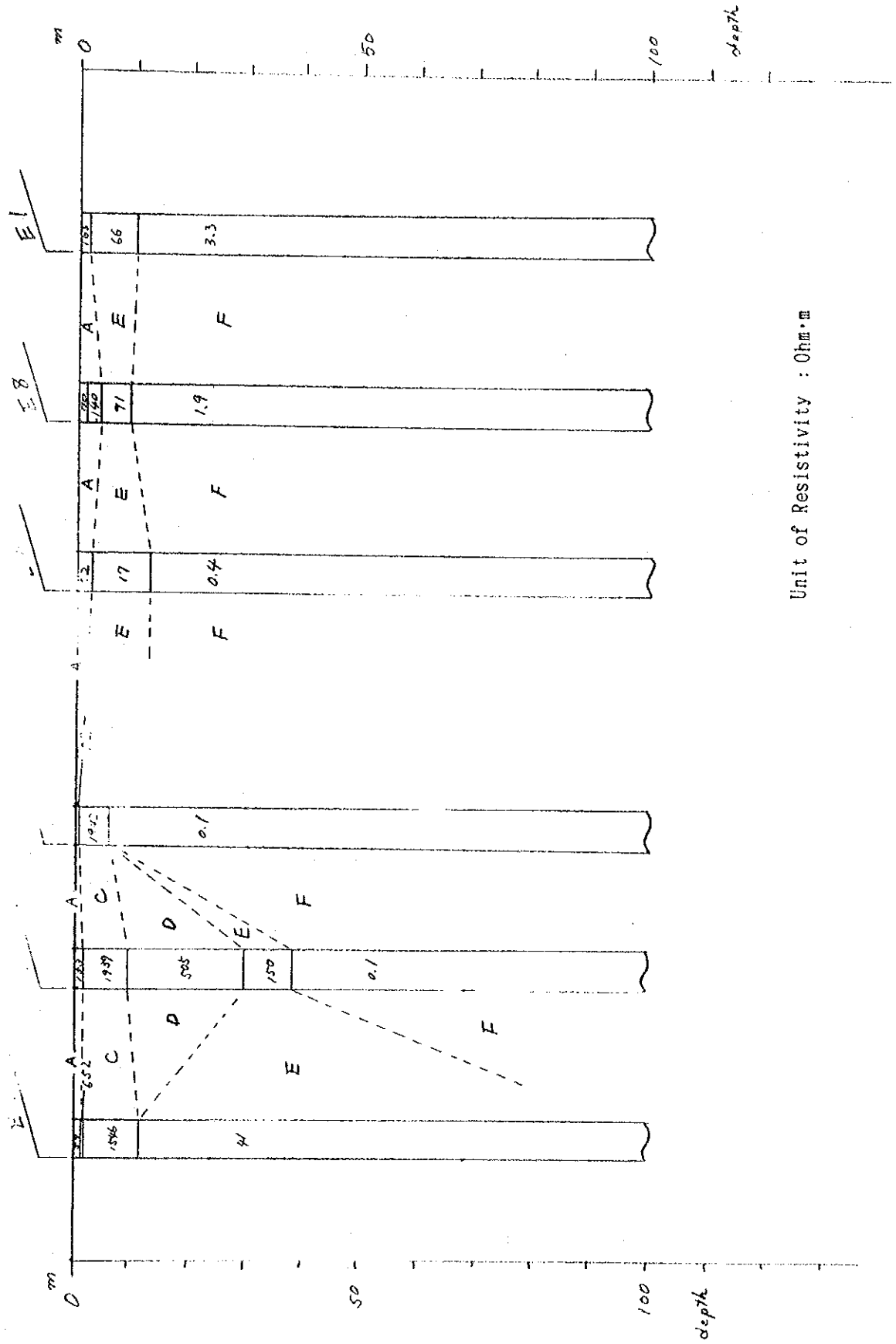
Salakan

Unit	Specific Resistivity [Ω -m]	Thickness [m]	Lithology
A	20 - 300	0 - 2	top soil or alluvial deposits
B	300 - 700	0 - 3	weathered limestone (chalk)
C	1500 - 3500	0 - 10	limestone (chalk) in wet condition
D	500 - 600	0 - 20	limestone (chalk) in fresh water
E	10 - 300	0 - 20	limestone (chalk) in brackish water
F	0 - 6	∞	limestone (chalk) in salt water

Recommended Well Drilling Site
in Salakan



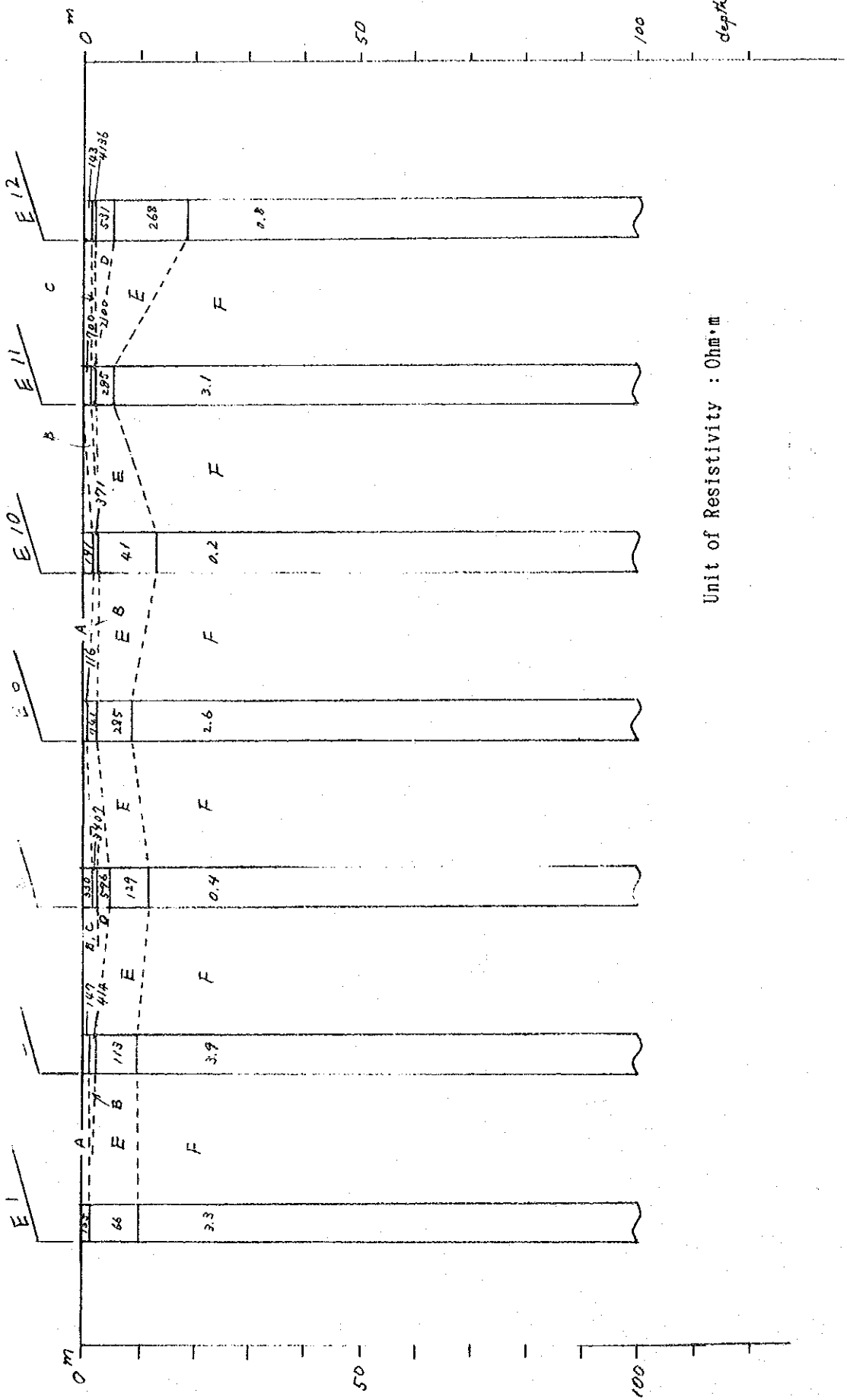
Resistivity Correlation of Salakan (1/3)



Unit of Resistivity : Ohm.m

Resistivity Correlation of Salakan (2/3)

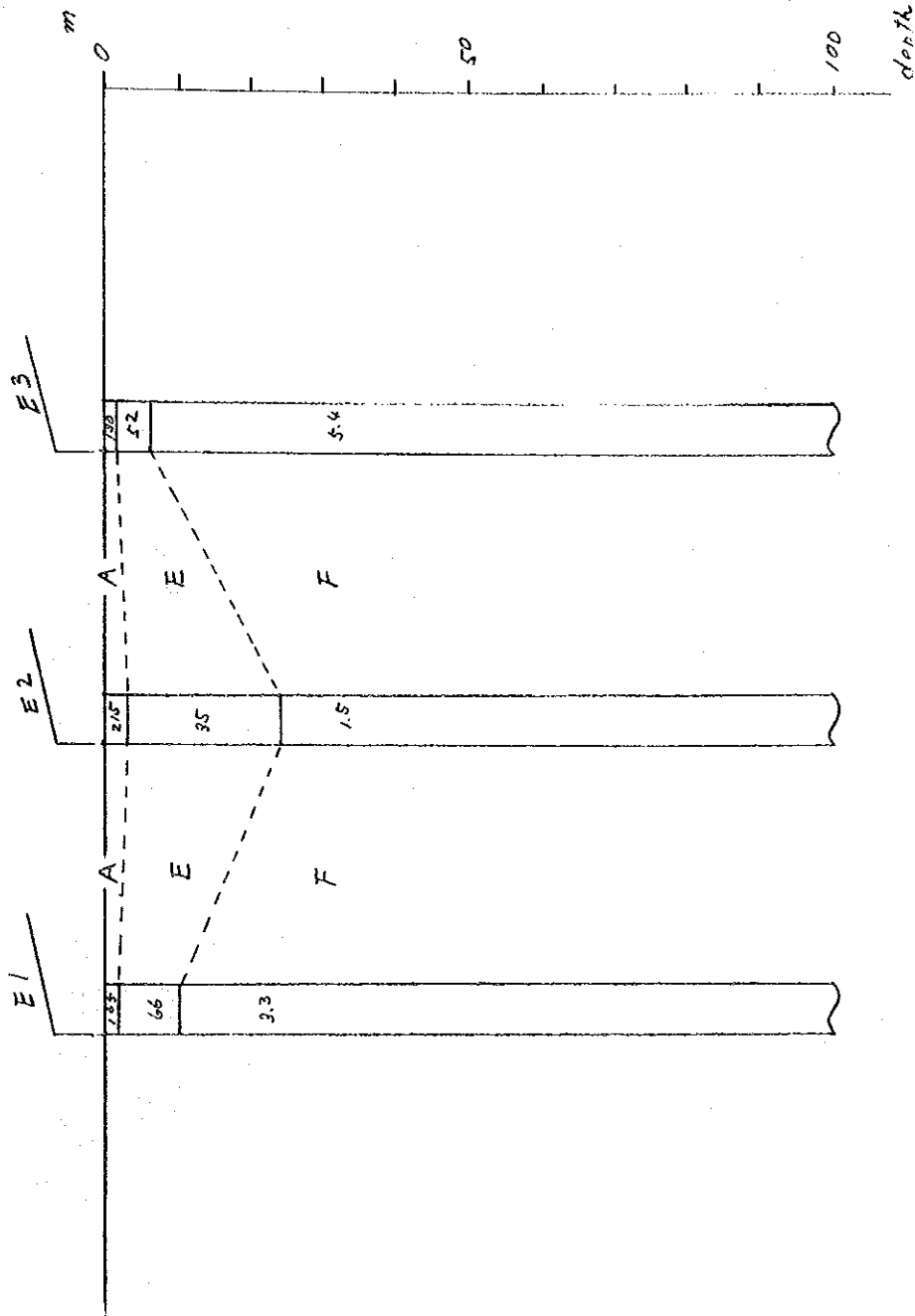
2/3



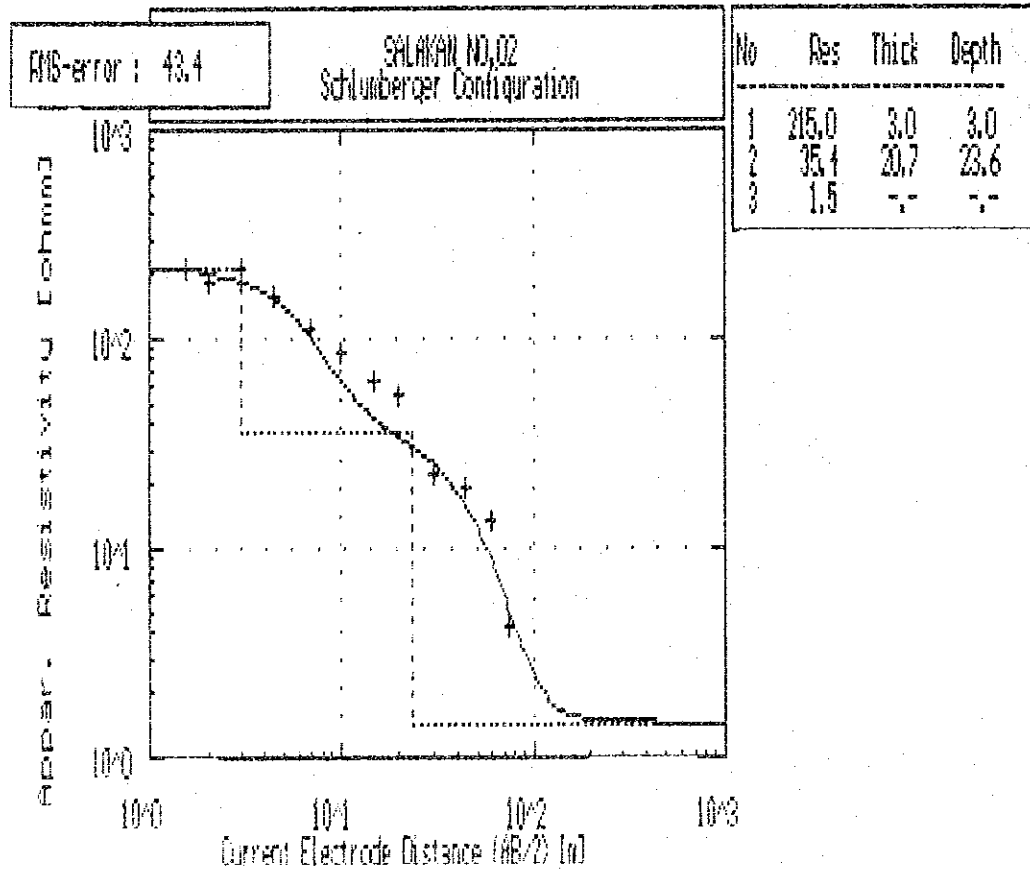
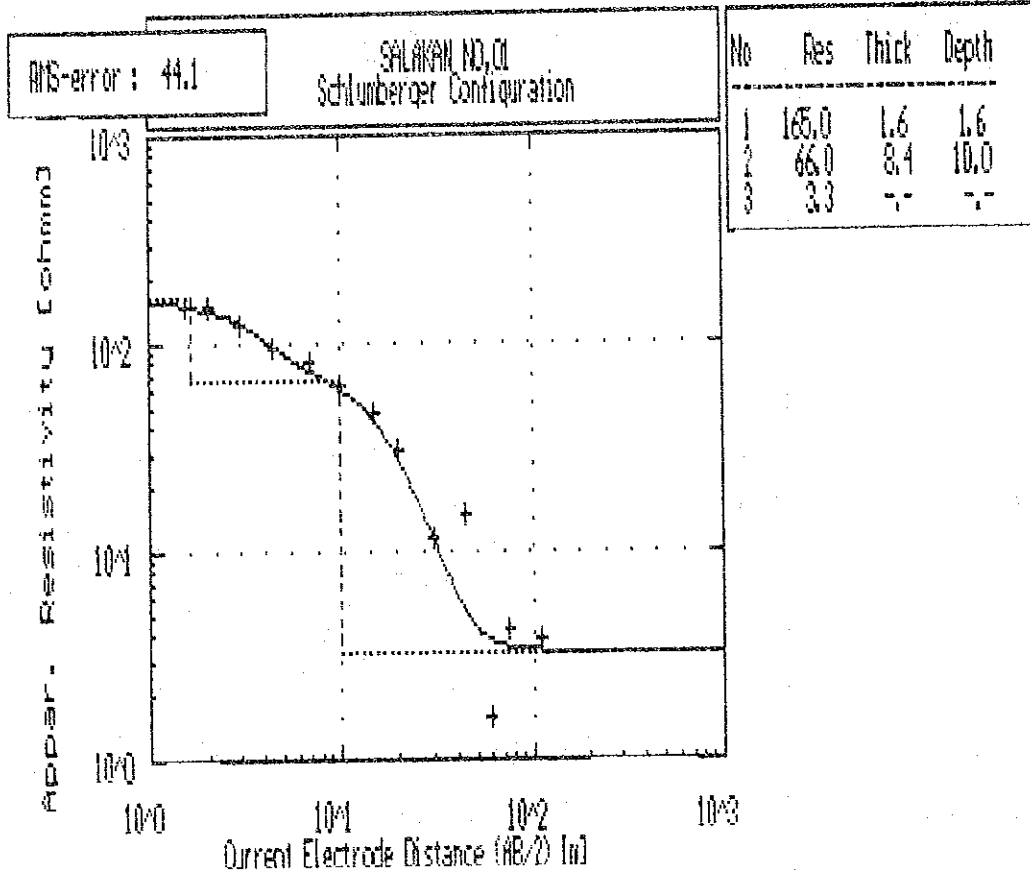
Unit of Resistivity : Ohm·m

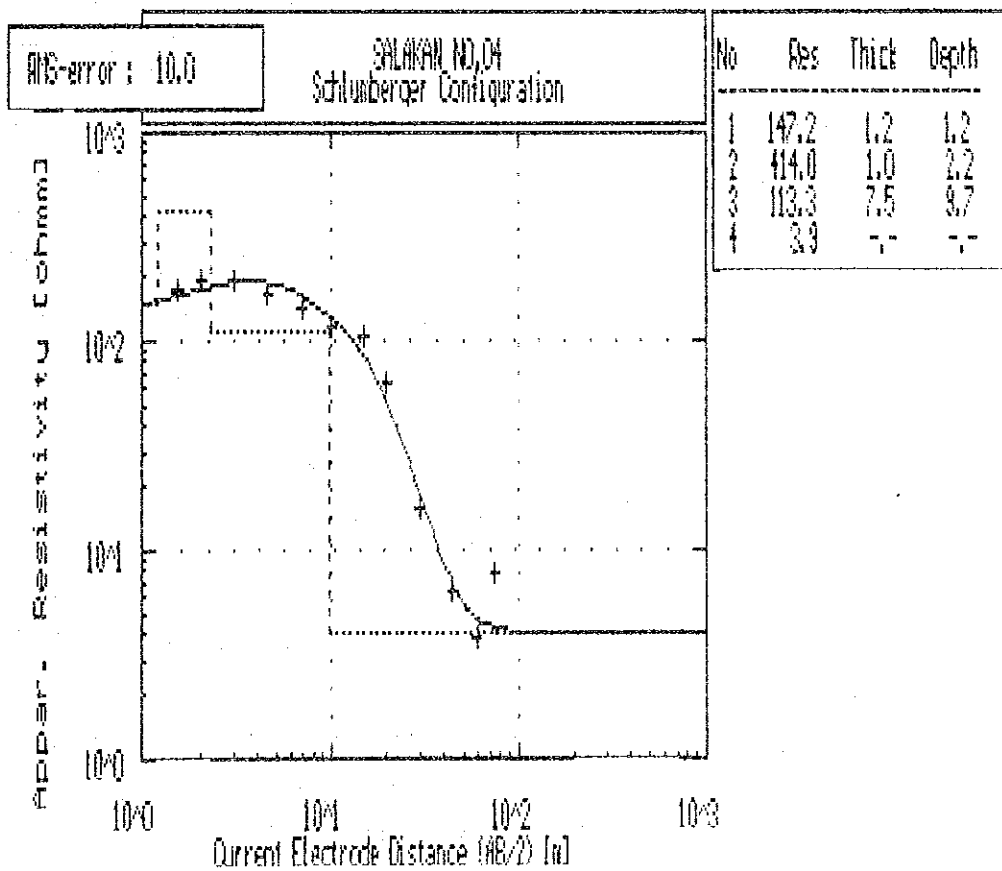
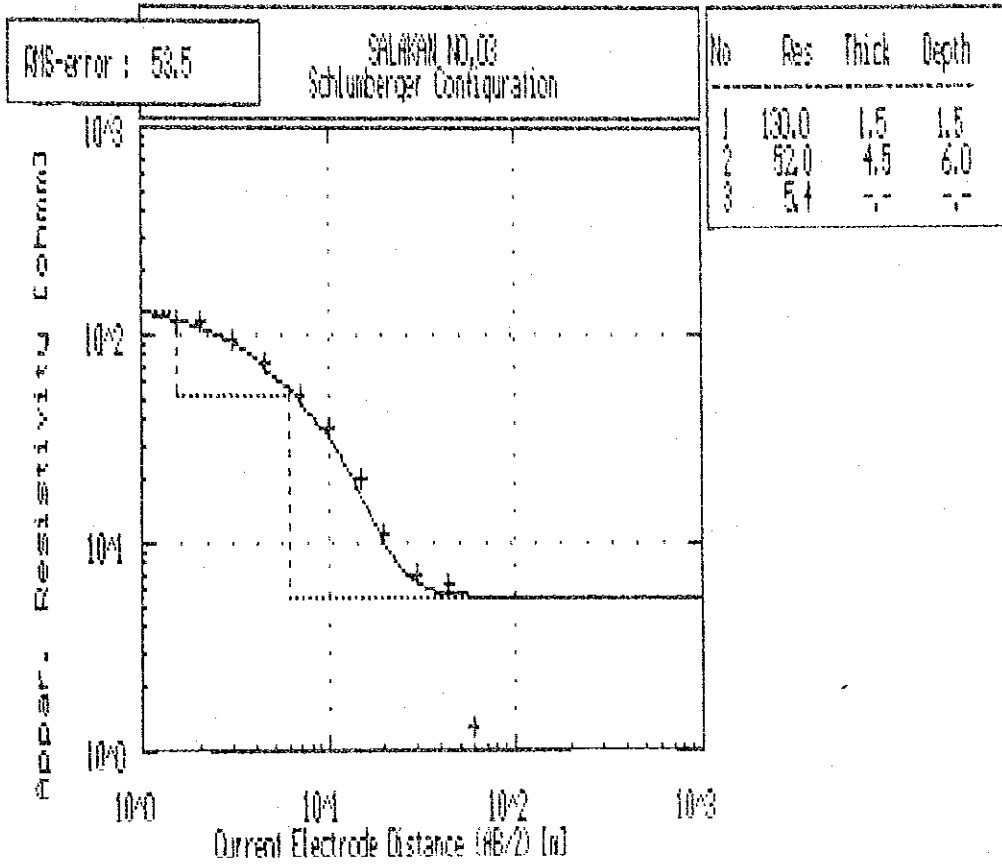
Resistivity Correlation of Salakan (3/3)

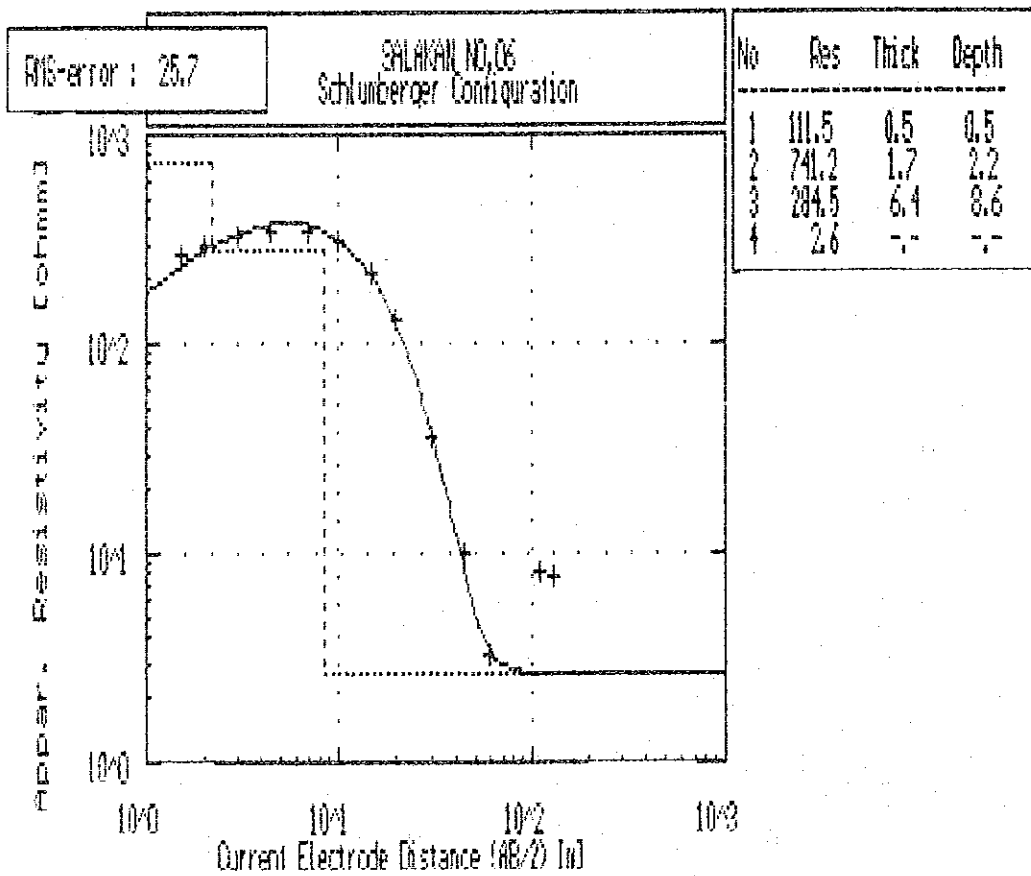
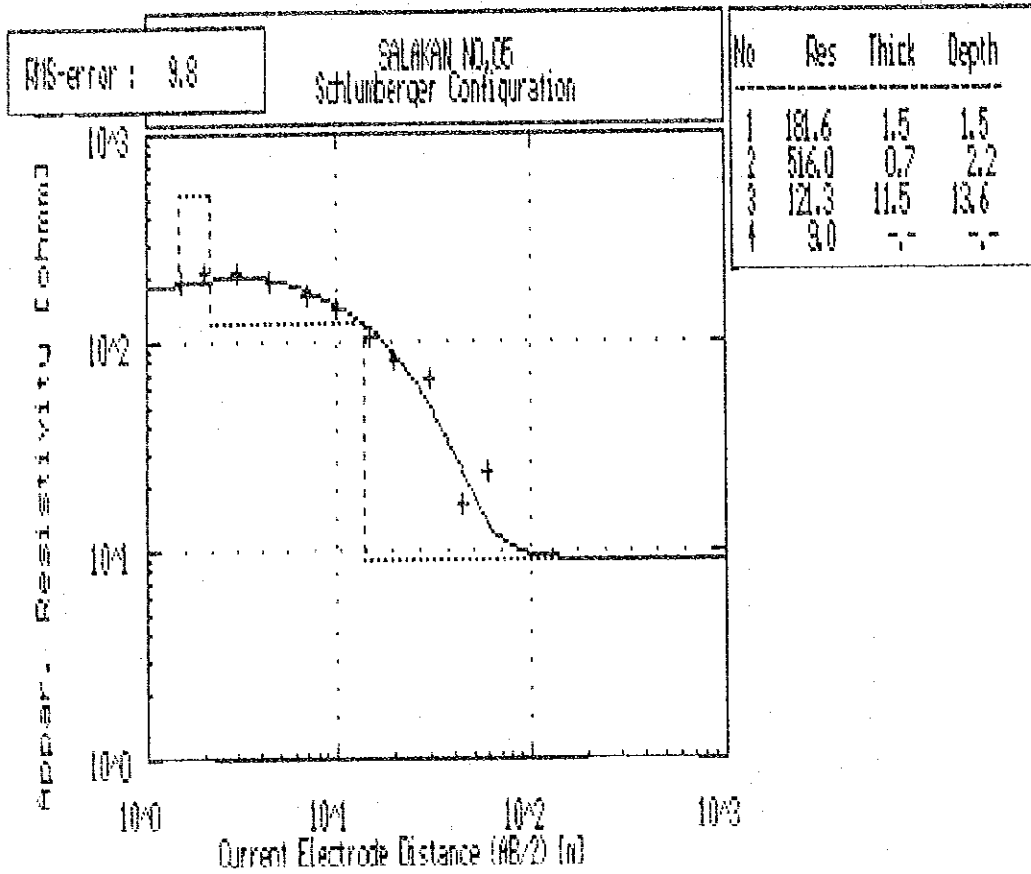
3/3

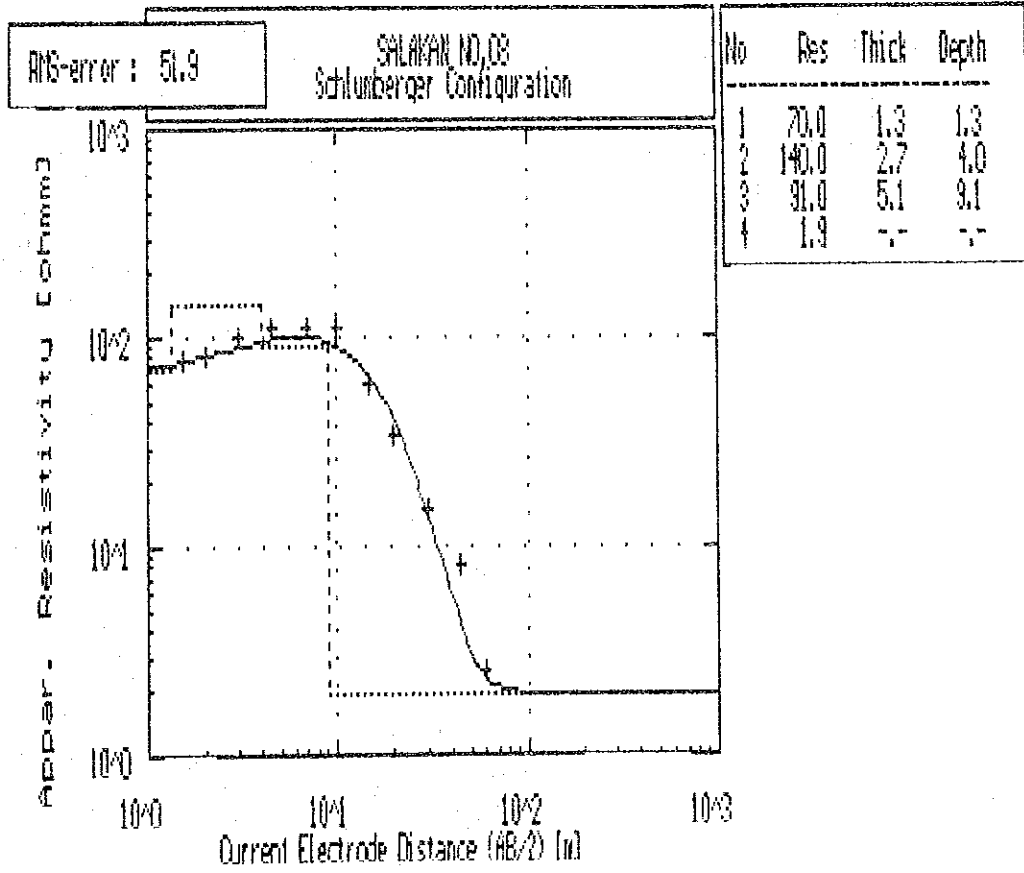
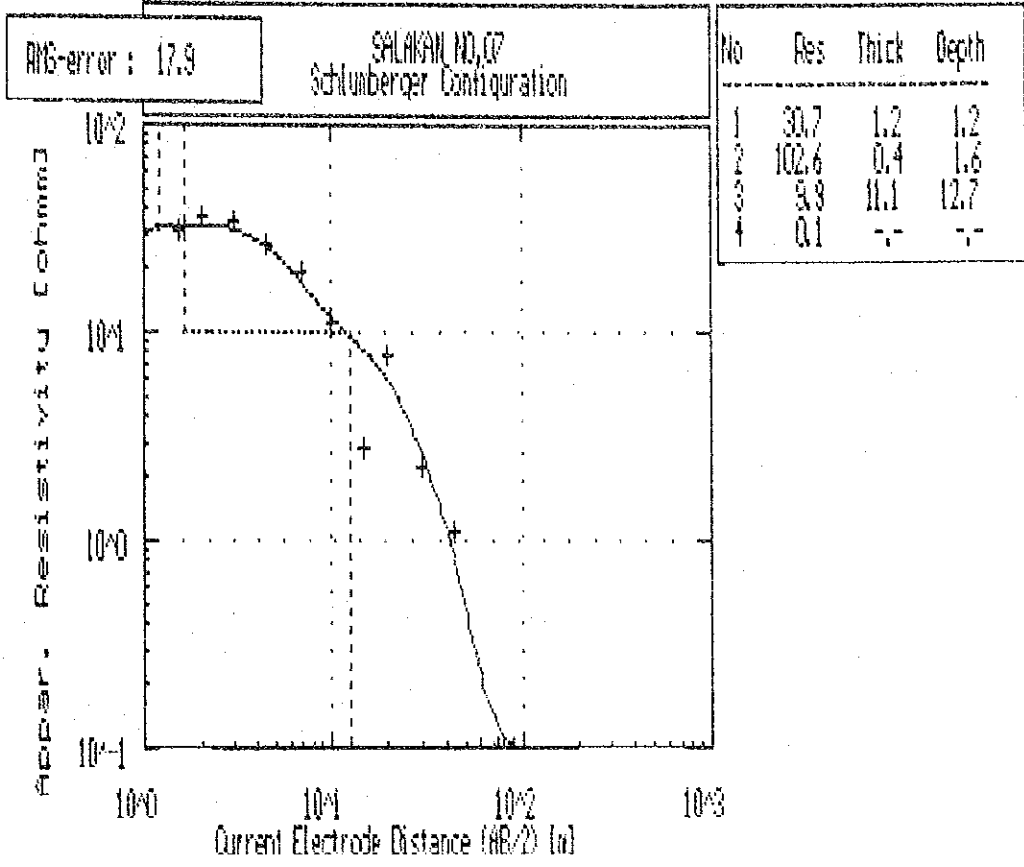


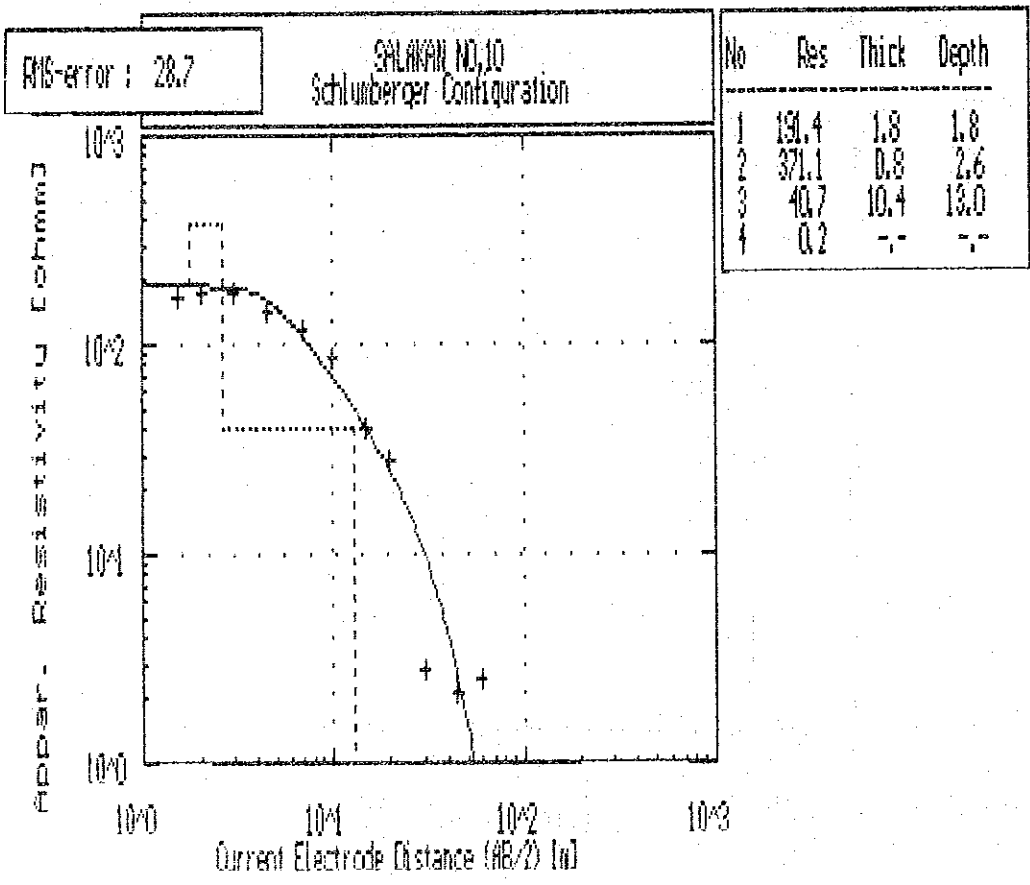
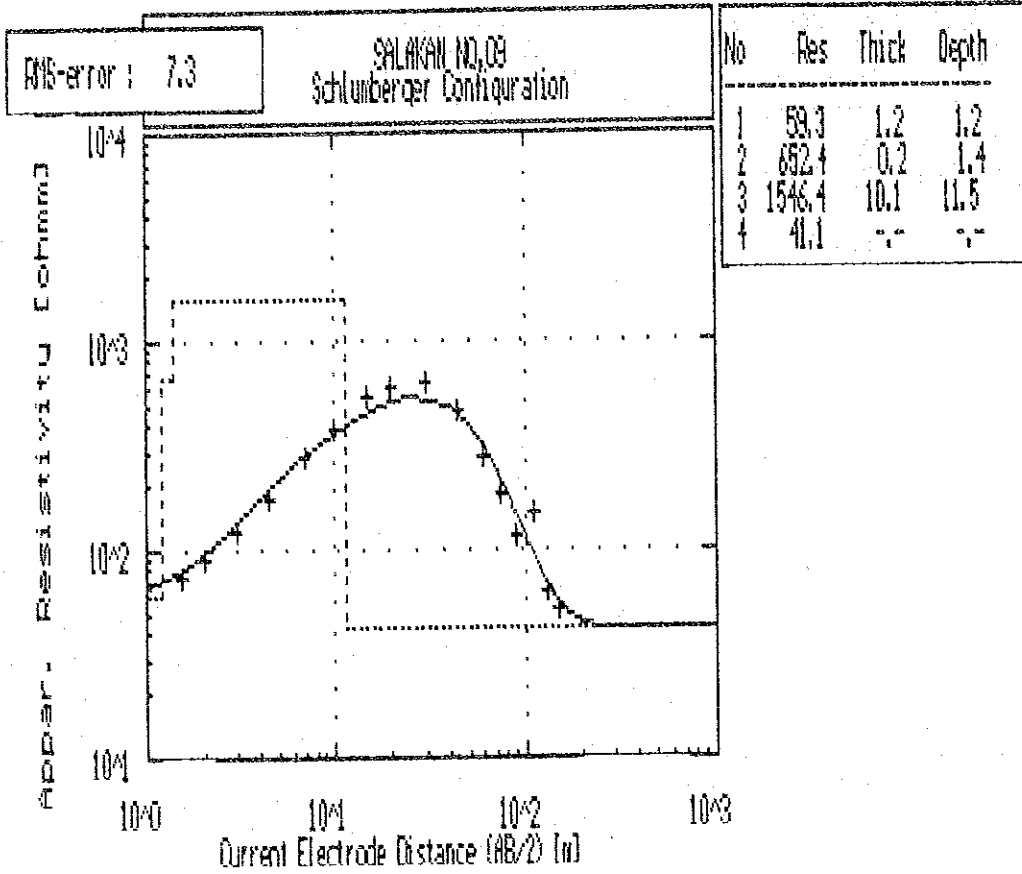
Unit of Resistivity : Ohm·m

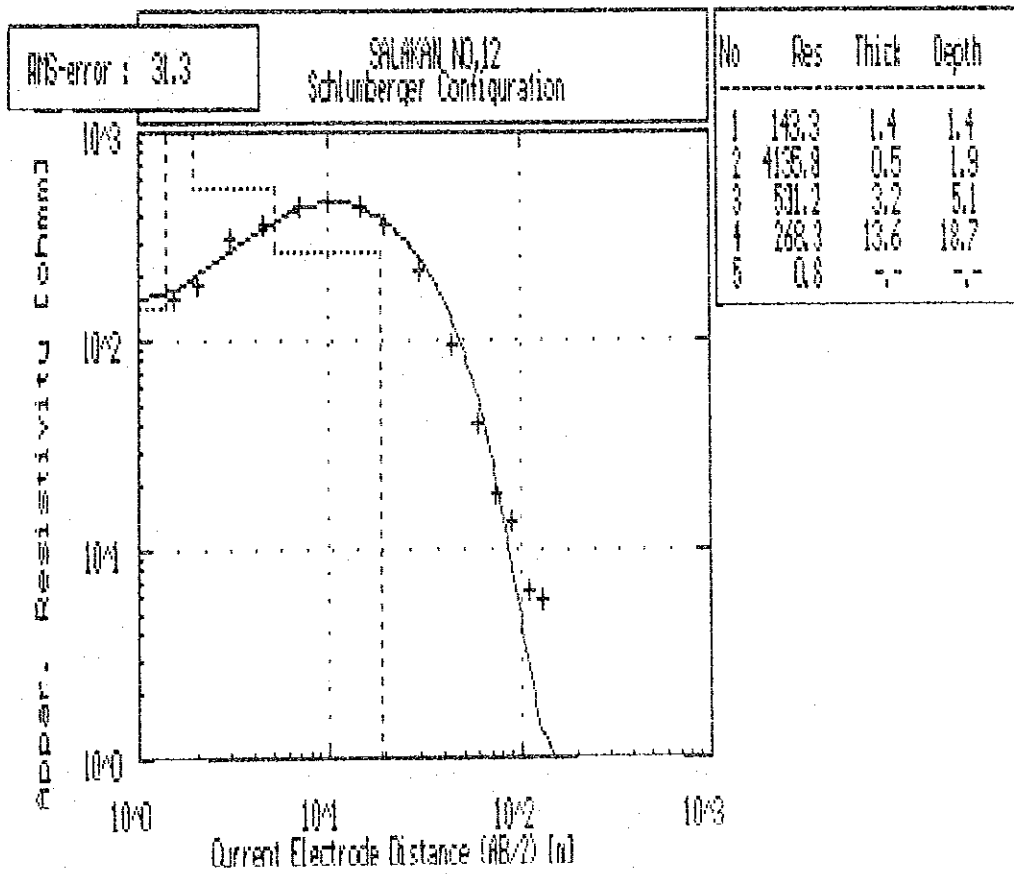
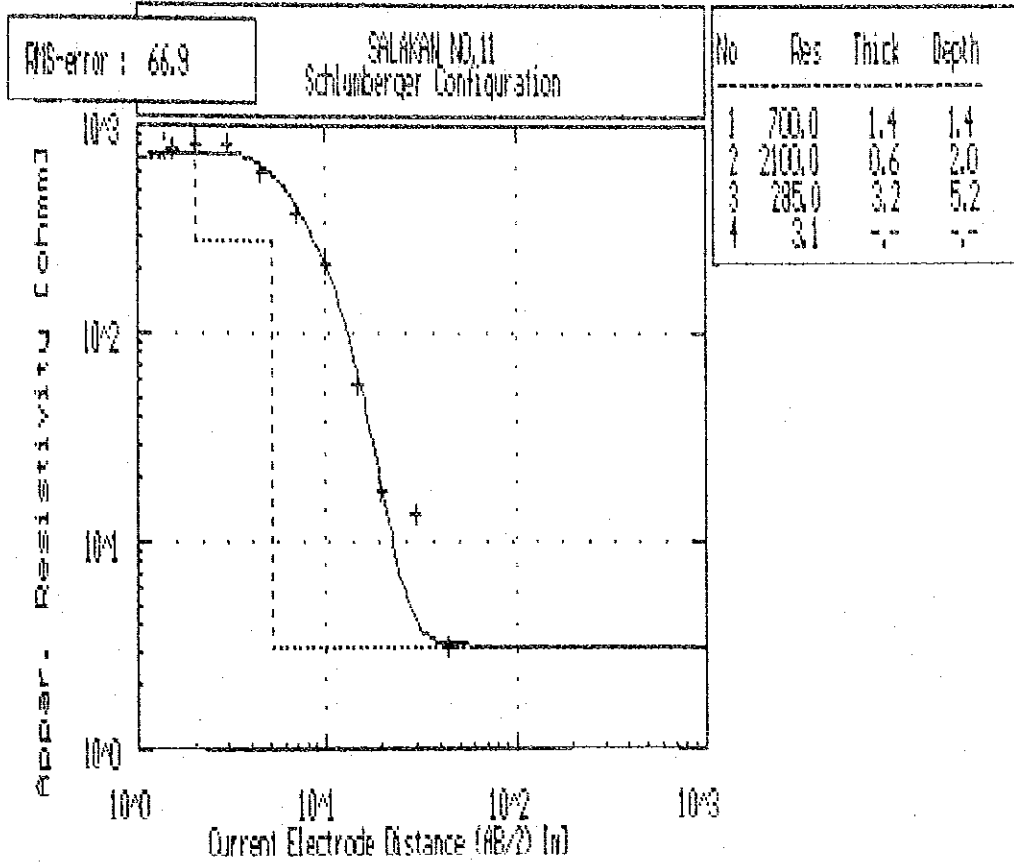


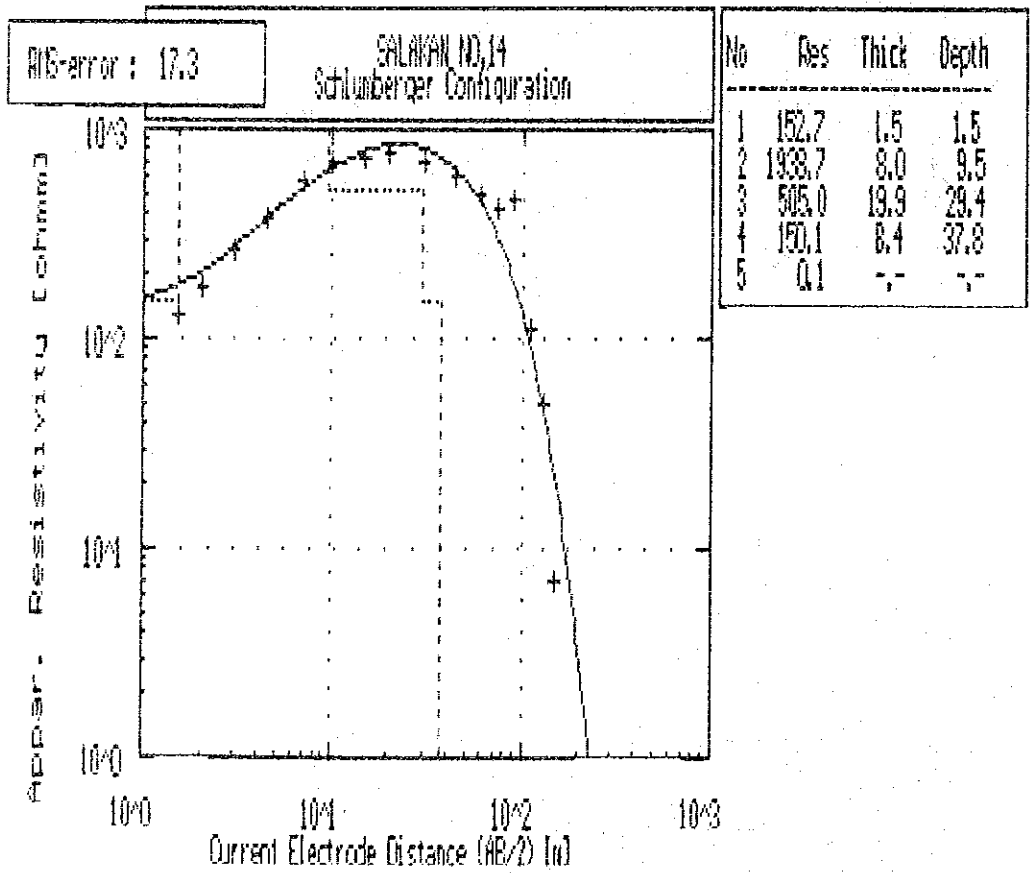
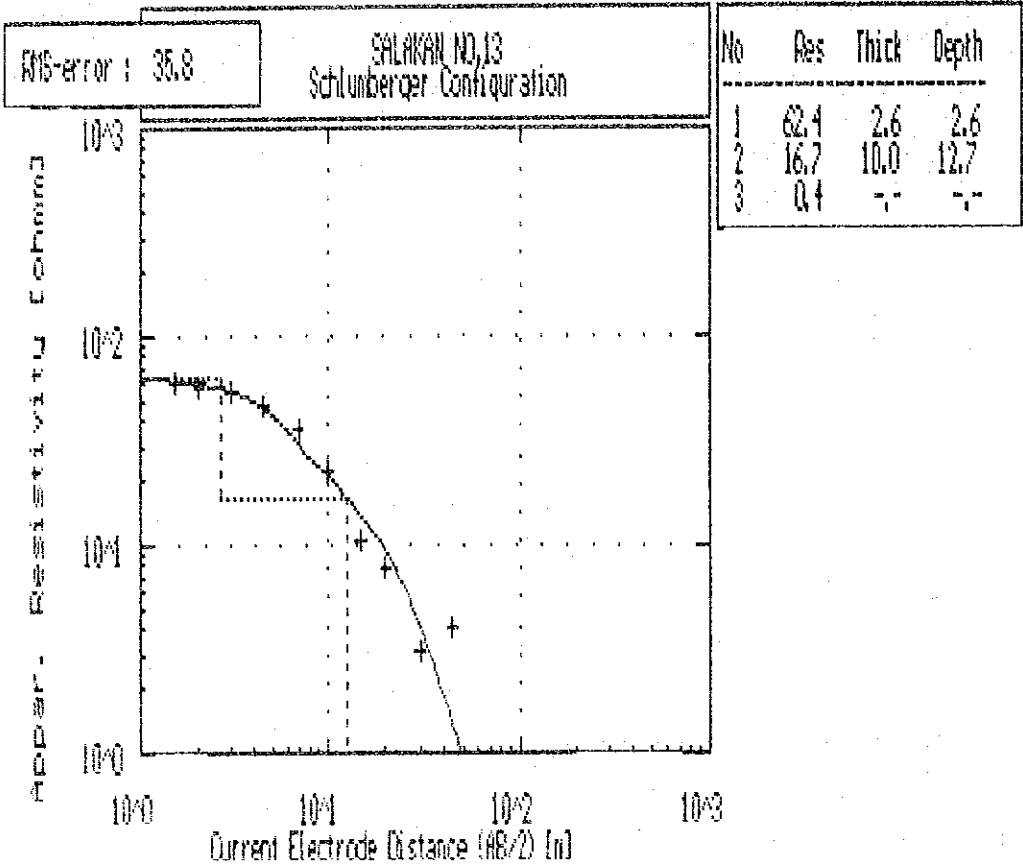


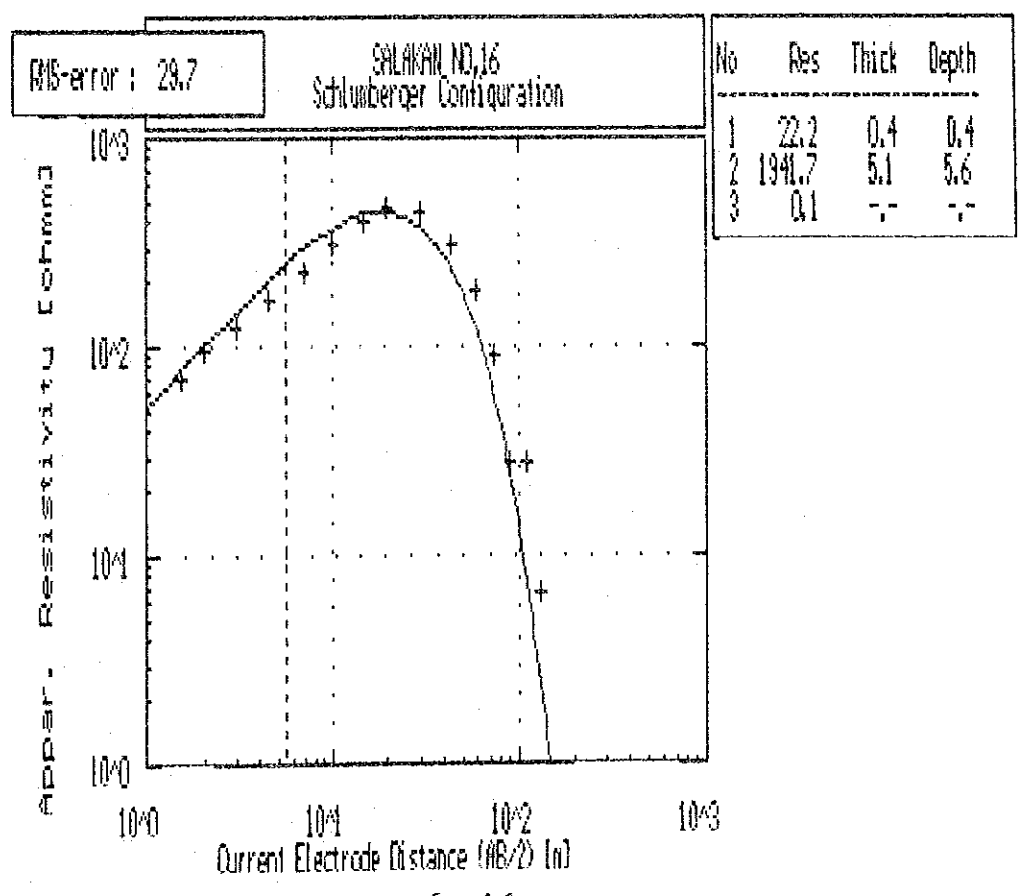
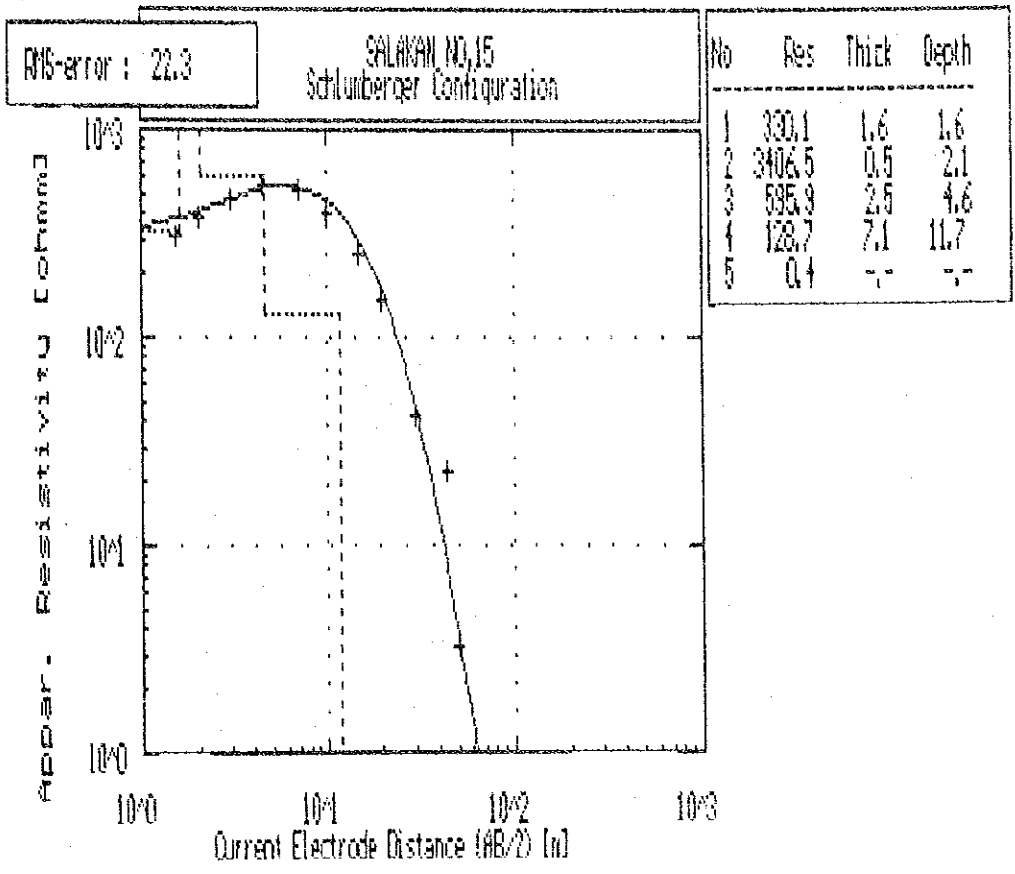










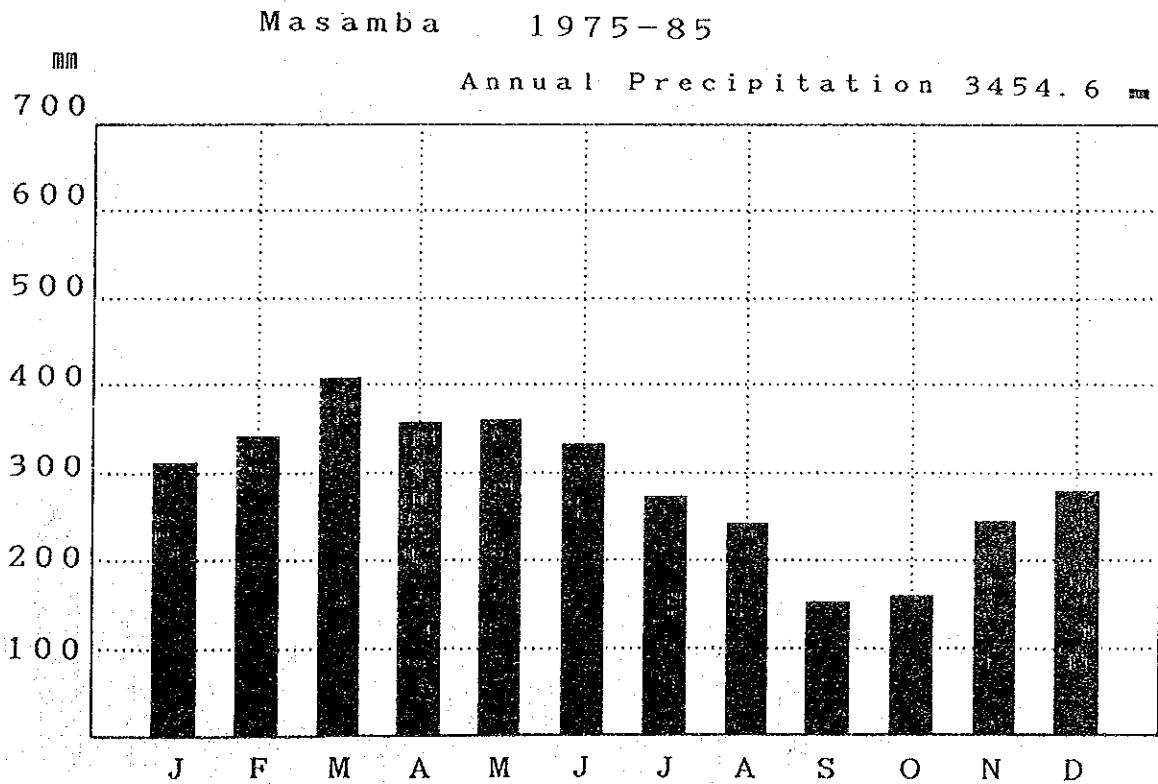
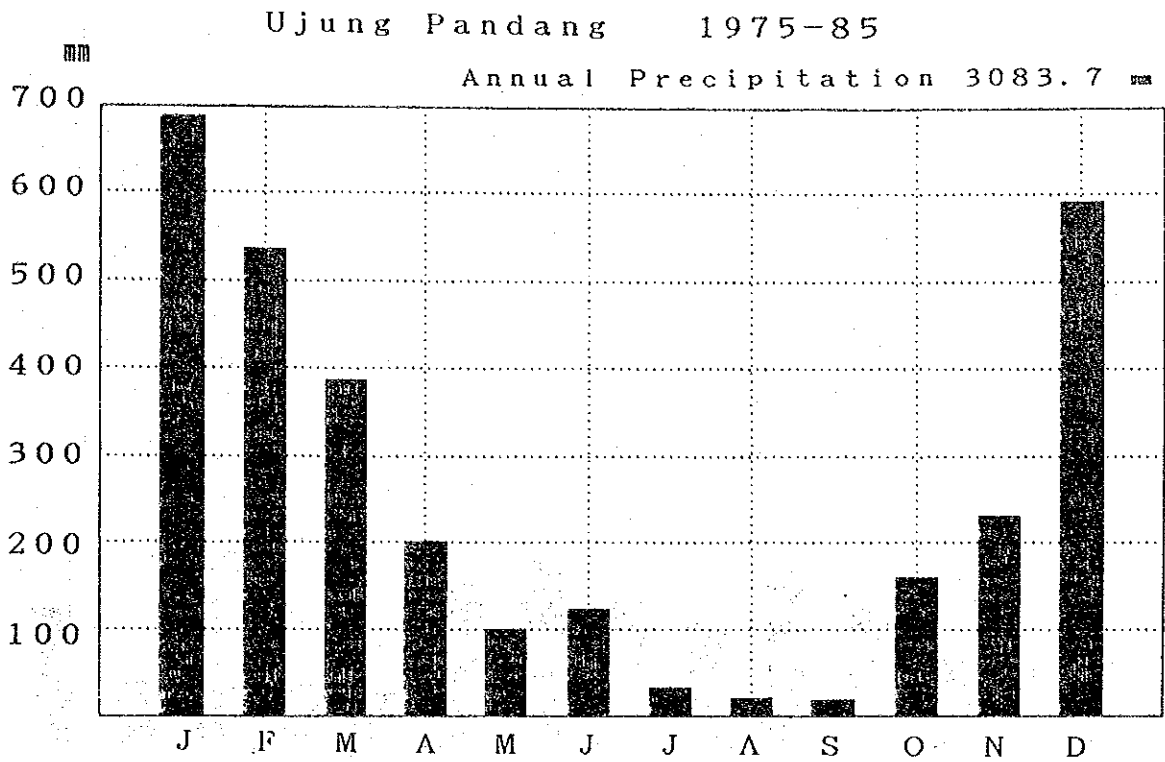


添付資料 6-5

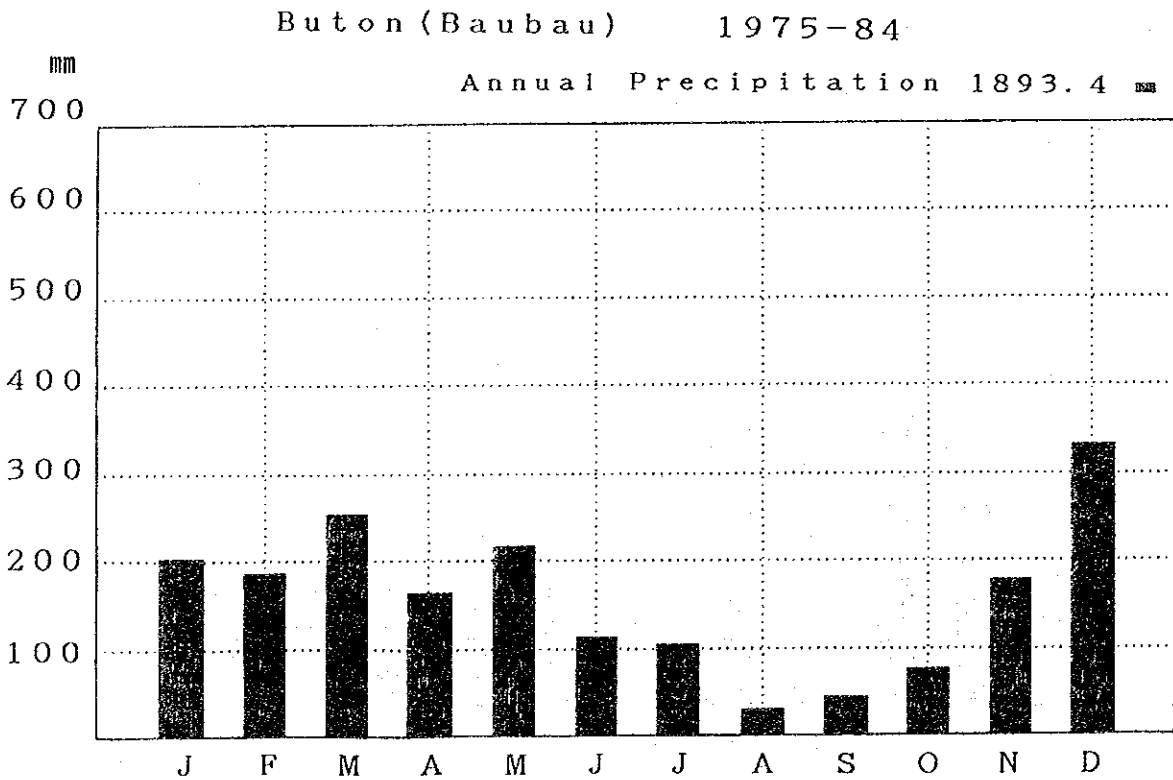
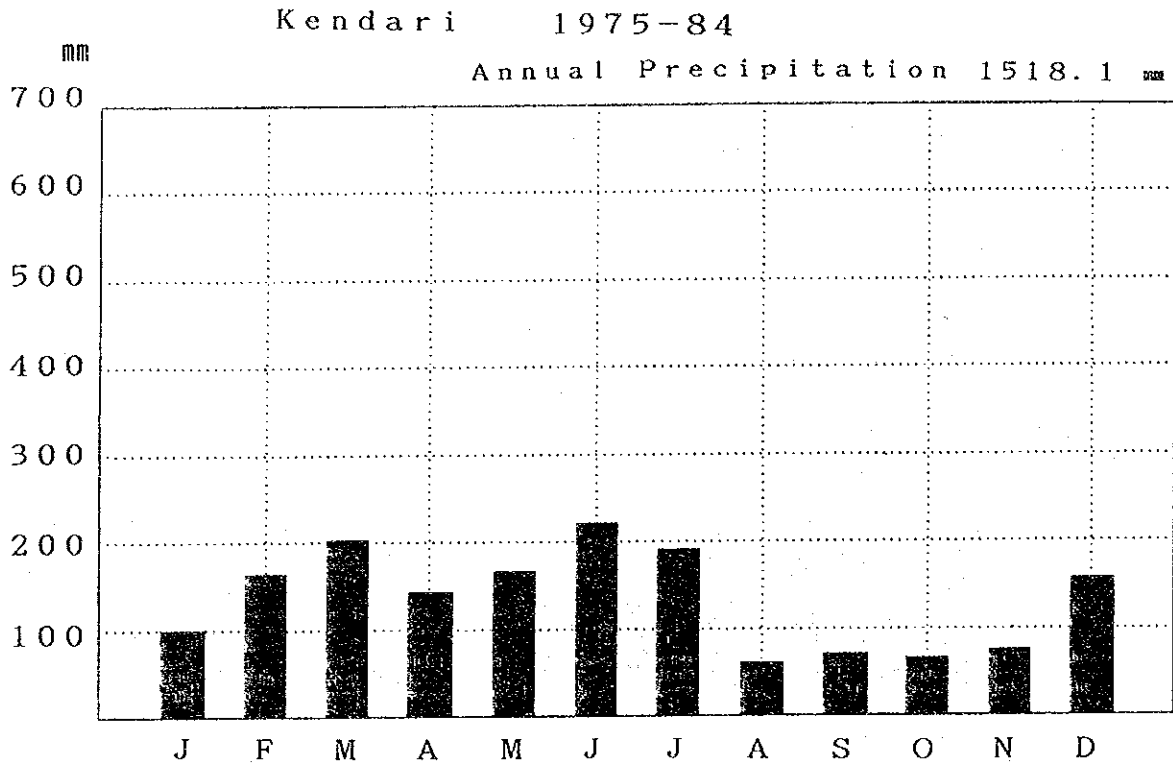
月別平均降水量

- Ujung Pandang / Masamba
- Kendari / Buton
- Palu / Tawaeli
- Luwuk

月別平均降水量 (Ujung Pandang/Masamba)



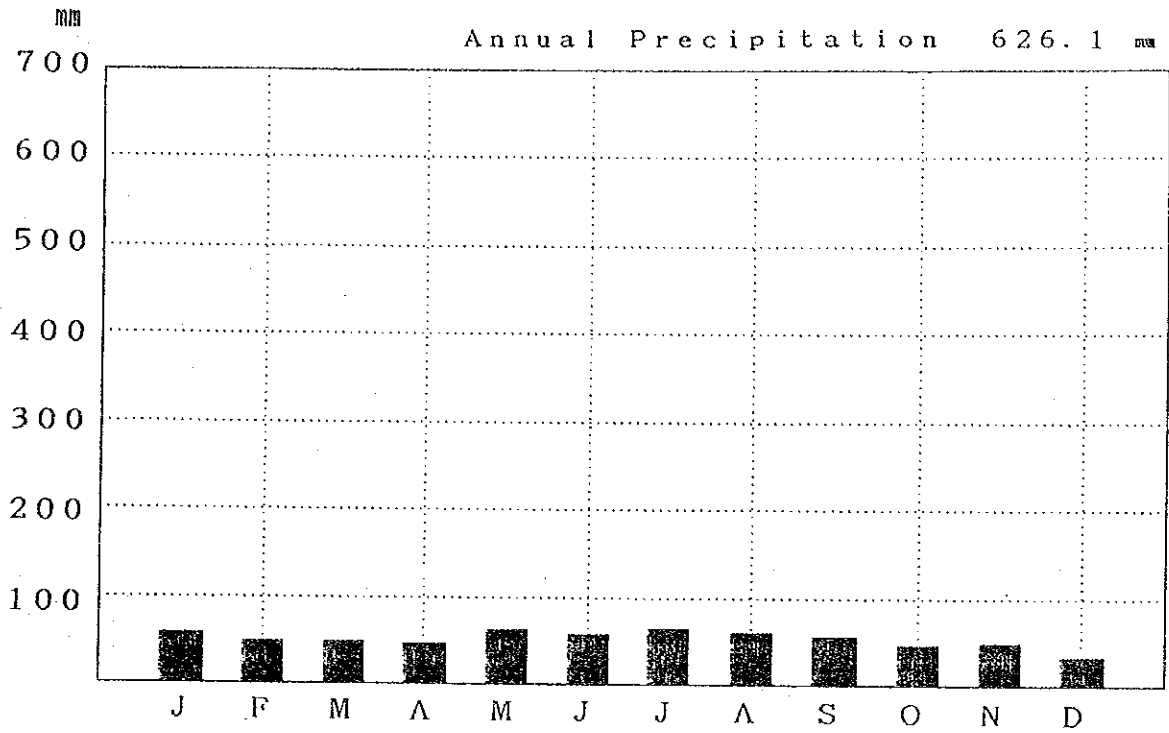
月別平均降水量 (Kendari/Buton)



月別平均降水量 (Palu/Tawaeli)

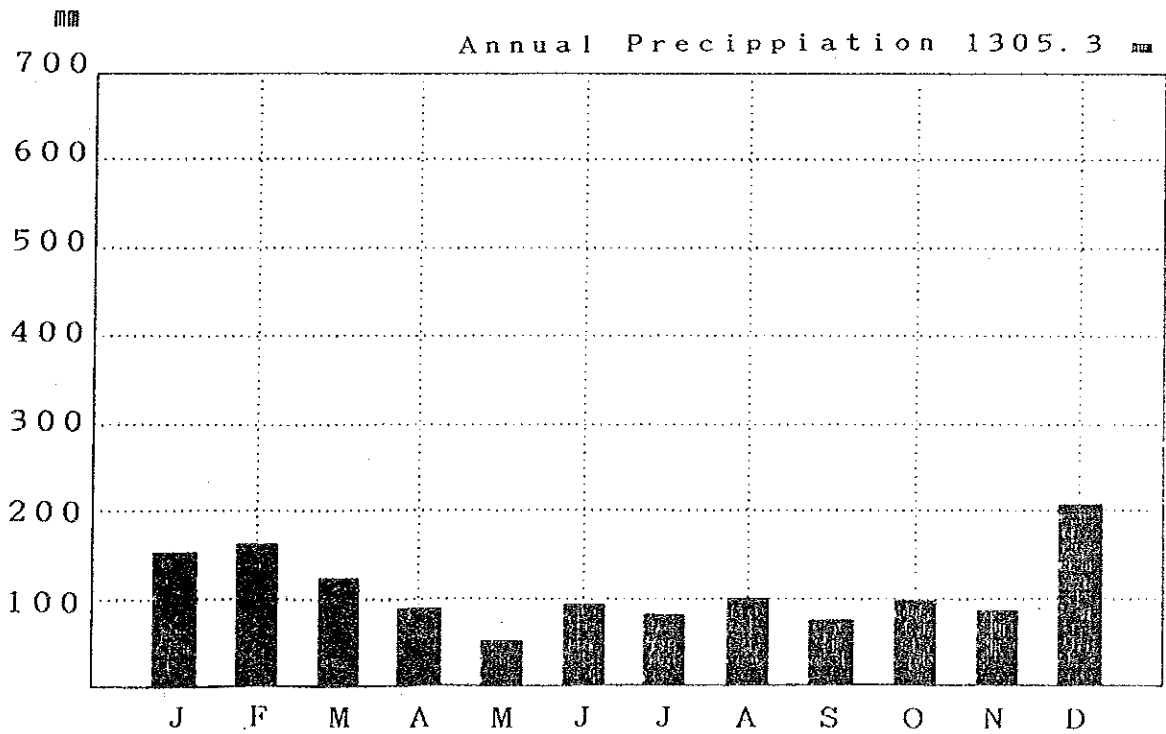
Palu 1975-84

Annual Precipitation 626.1 mm



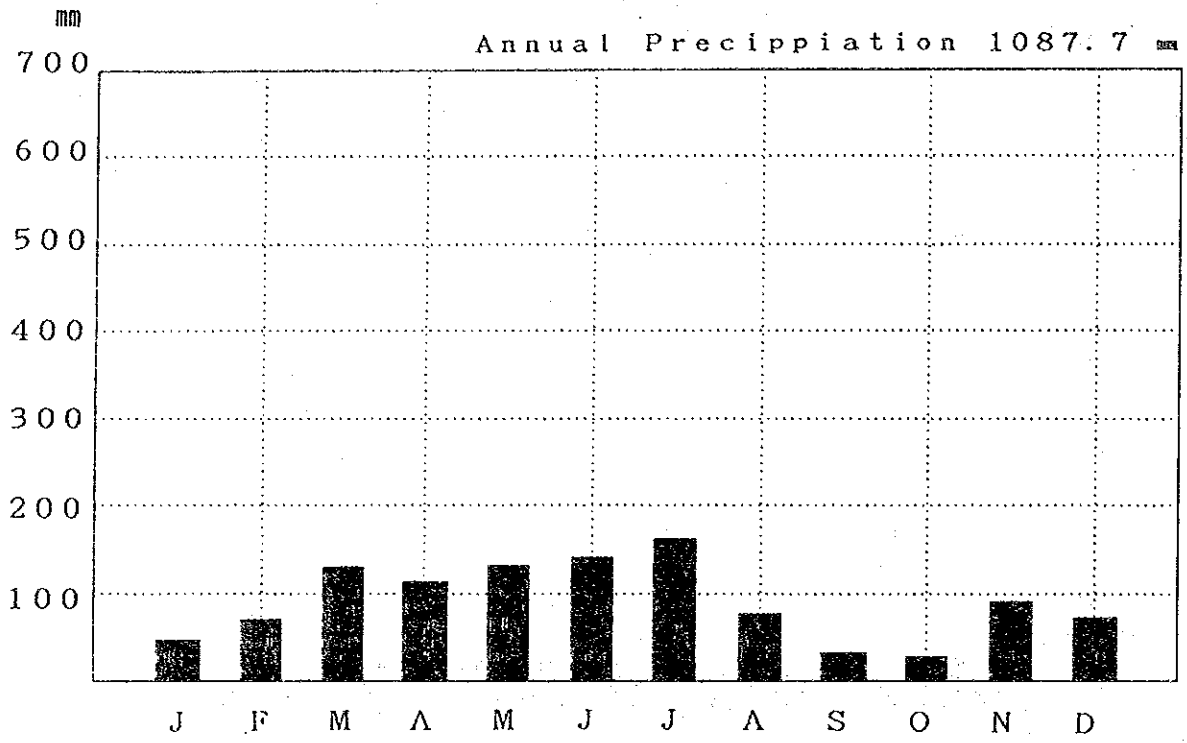
Tawaeli 1975-80

Annual Precipitation 1305.3 mm



月別平均降水量 (Luwuk)

Luwuk 1975-84



添付資料 6-6

管路水理計算

HYDRAULIC CONDITION-5

A	B	C	D	E	F	G	H	I	J	K	L	M
(ULUSALU) LOCATION	BRANCH No.	GL (m)	LENGTH (m)	Kind of Pipe	Diameter (mm)	Quantity (l/s)	Velocity (m/s)	Gradient (%)	Friction Loss (m)	Hydraulic Level (m)	Water Hydraulic Head (m)	Static Head (m)
1	INTAKE	500.0								500.0		
2	RESERVOIR	355.5	1344.8	GSP	51	2.2	1.09	27.2	36.6	463.4	107.9	144.5
3												
4	26(OUT)	353.5										
5												
6										353.5		
7												
8	29	348.4	122.3	GSP	102	6.5	0.8	6.9	0.8	352.7	4.3	5.1
9	PRESSURE 45 (IN)	298.3	731.3	GSP	76	6.5	1.45	29	21.2	331.5	33.2	55.2
10	BREAKING 45 (OUT)	298.3								298.3		
11	65	246.5	1182.4	GSP	102	6.2	0.76	6.3	7.4	290.9	44.4	51.8
12	72	242.4	771.2	PVC	81.4	4.8	0.93	11.8	9.1	281.8	39.4	55.9
13	73	241.2	134.1	PVC	57	4.8	1.9	67.1	9	272.8	31.6	57.1
14	74	238.7	175.9	PVC	57	4.8	1.9	67.1	11.8	261.0	22.3	59.6
15	75	238.1	38.0	PVC	57	4.8	1.9	67.1	2.5	258.5	20.4	60.2
16	4+700	236.1	200.0	PVC	57	2.9	1.15	26.4	5.3	253.2	17.1	62.2
17	77	230.6	249.1	PVC	57	2.0	0.79	13.3	3.3	249.9	19.3	67.7
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												

HYDRAULIC CONDITION-5

A	B	C	D	E	F	G	H	I	J	K	L	M
SALU LOCATION	BRANCH No.	G.L (m)	LENGTH (m)	Kind of Pipe	Diameter (mm)	Quantity (l/s)	Velocity (m/s)	Gradient (%)	Friction Loss (m)	Hydraulic Water Level (m)	Hydraulic Head (m)	Static Head (m)
29	1	500.0								500.0		
30	29(IN)	382.2	771.1	GSP	38	1.8	1.6	78.8	60.8	439.2	57.0	117.8
31												
32	29(OUT)	380.2										
33										380.2		
34	37	335.7	446.8	GSP	76	5.4	1.2	20.6	9.2	371.0	35.3	44.5
35	43	333.2	513.0	PVC	57	1.3	0.52	6	3.1	367.9	34.7	47.0
36	59	357.2	809.1	PVC	57	1.1	0.44	4.4	3.6	364.3	7.1	23.0
37												
38	37				76					371.0		
39	77	321.6	1356.5	PVC	81.4	4.1	0.79	8.8	11.9	359.1	37.5	11.6
40	92	315.1	1231.8	PVC	57	2.7	1.07	23.2	28.6	330.5	15.4	65.1
41	103	315.8	725.6	PVC	57	1.2	0.48	5.2	3.8	326.7	10.9	64.4
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												
56												

HYDRAULIC CONDITION-5

57	KAERO LOCATION	A	B	C	D	E	F	G	H	I	J	K	L	M
58	INTAKE		0	500.0								500.0		
59	RESERVOIR		30(IN)	462.8	1863.0	GSP	76	2.3	0.51	4.2	7.8	492.2	29.4	37.2
60														
61			30(OUT)	460.8										
62												460.8		
63														
64			40	430.1	1134.7	GSP	157	5.4	0.28	0.6	0.7	460.1	30.0	30.7
65			48	429.0	730.8	PVC	99.4	4.6	0.6	4.1	3	457.1	28.1	31.8
66			58	429.2	816.4	PVC	99.4	3.8	0.49	2.9	2.4	454.7	25.5	31.6
67			68	416.2	1095.7	PVC	81.4	2.4	0.47	3.3	3.6	451.1	34.9	44.6
68			76	429.2	720.3	PVC	57	1.1	0.44	4.4	3.2	447.9	18.7	31.6
69			89	420.5	1182.9	PVC	57	0.8	0.31	2.4	2.8	445.1	24.6	40.3
70			92	405.0	488.2	PVC	35.2	0.3	0.31	4.2	2.1	443.0	38.0	55.8
71														
72														
73														
74														
75			89				57					445.1		
76			93	419.2	35.0	PVC	35.2	0.5	0.52	10.7	0.4	444.7	25.5	41.6
77			94	418.7	135.0	PVC	35.2	0.3	0.31	4.2	0.6	444.1	25.4	42.1
78														
79			93				35.2					444.7		
80			99	417.0	253.1	PVC	35.2	0.3	0.31	4.2	1.1	443.6	26.6	43.8
81														
82														
83														
84														

HYDRAULIC CONDITION-5

A	B	C	D	E	F	G	H	I	J	K	L	M
MASAMBA LOCATION	BRANCH No.	GL (m)	LENGTH (m)	Kind of Pipe	Diameter (mm)	Quantity (l/s)	Velocity (m/s)	Gradient (%)	Friction Loss (m)	Hydraulic Water Level (m)	Hydraulic Head (m)	Static Head (m)
85												
86												
87												
88	ELEVATED											
89	TANK(500.0)	515.8								515.8		
90	7	487.1	1702.1	PVC	180.8	25.8	1.02	5.5	9.4	506.4	19.3	28.7
91	8	487.1	139.7	PVC	144.6	20.9	1.29	11	1.5	504.9	17.8	28.7
92	9	485.2	149.4	PVC	99.4	9.6	1.25	16.1	2.4	502.5	17.3	30.6
93	10	485.5	87.5	PVC	99.4	9.6	1.25	16.1	1.4	501.1	15.6	30.3
94	11	487.9	92.0	PVC	99.4	9.6	1.25	16.1	1.5	499.6	11.7	27.9
95	12	487.9	80.0	GSP	102	8.0	0.99	10.2	0.8	498.8	10.9	27.9
96	13	487.9	82.2	PVC	99.4	8.0	1.04	11.5	0.9	497.9	10.0	27.9
97	14	487.9	94.8	PVC	99.4	8.0	1.04	11.5	1.1	496.8	8.9	27.9
98	15	488.4	282.4	PVC	99.4	5.6	0.73	6	1.7	495.1	6.7	27.4
99												
100												
101	8				144.6					504.9		
102	22	484.8	776.4	PVC	99.4	10.0	1.3	17.4	13.5	491.4	6.6	31.0
103												
104												
105	7				180.8					506.4		
106	16	485.4	252.7	PVC	81.4	7.1	1.38	24.4	6.2	500.2	14.8	30.4
107	25	487.9	255.7	PVC	81.4	4.4	0.85	10.1	2.6	497.6	9.7	27.9
108												
109												
110												
111	14				99.4					496.8		
112	33	488.6	408.9	PVC	35.2	0.4	0.42	7.1	2.9	493.9	5.3	27.2
113												
114	15				99.4					495.1		
115	34	487.4	285.9	PVC	57	1.7	0.67	9.8	2.8	492.3	4.9	28.4
116												

HYDRAULIC CONDITION-5

	A	B	C	D	E	F	G	H	I	J	K		L	M
											GL (m)	LENGTH (m)		
117	TOAYA	BRANCH												
118	LOCATION	No.	(m)	(m)										
119	INTAKE	0	500.0									500.0		
120		9(IN)	492.1	718.0	GSP	102	2.9	0.36	1.6	1.1		498.9	6.8	7.9
121	RESERVOIR													
122		9(OUT)	490.1											
123												490.1		
124		22	461.5	2435.0	GSP	157	7.1	0.37	1	2.4		487.7	26.2	28.6
125		23	457.9	165.0	PVC	57	7.1	2.81	138.5	22.9		464.8	6.9	32.2
126		25	450.8	322.7	PVC	35.2	0.5	0.52	10.7	3.5		461.3	10.5	39.3
127														
128		22				157						487.7		
129		26	458.4	257.6	PVC	81.4	6.6	1.28	21.3	5.5		482.2	23.8	31.7
130		30	451.0	500.0	PVC	35.2	0.5	0.52	10.7	5.4		476.8	25.8	39.1
131														
132		22				81.4						487.7		
133		32	456.4	406.5	PVC	57	3.2	1.27	31.7	12.9		474.8	18.4	33.7
134		33	456.1	100.0	PVC	57	2.8	1.11	24.8	2.5		472.3	16.2	34.0
135														
136		26				81.4						482.2		
137		34	455.7	141.5	PVC	57	6.6	2.61	121	17.1		465.1	9.4	34.4
138		37	438.3	711.8	PVC	57	1.1	0.44	4.4	3.1		462.0	23.7	51.8
139														
140		23				57						464.8		
141		38	455.8	266.2	PVC	35.2	0.6	0.62	15	4		460.8	5.0	34.3
142														
143		32										474.8		
144		39	461.1	255.0	PVC	35.2	0.5	0.52	10.7	2.7		472.1	11.0	29.0

HYDRAULIC CONDITION-5

	A	B	C	D	E	F	G	H	I	J	K		L	M
											Kind of Pipe	Diameter (mm)		
	MALILI LOCATION	BRANCH No.	G.L. (m)	LENGTH (m)	Kind of Pipe	Diameter (mm)	Quantity (l/s)	Velocity (m/s)	Gradient (%)	Friction Loss (m)	Hydraulic Level (m)	Water Head (m)	Static Head (m)	
145														
146														
147	INTAKE	-1	515.0								515.0			
148	RESERVOIR	0(IN)	503.0	50.0	GSP	76	6.0	1.34	25	1.3	513.7	10.7	12.0	
149														
150		0(OUT)	501.0											
151											501.3			
152		50	482.8	7923.2	PVC	226.2	13.9	0.35	0.6	4.8	496.5	13.7	18.2	
153		56	481.7	1415.3	PVC	144.6	13.5	0.83	4.9	6.9	489.6	7.9	19.3	
154		63	480.0	1132.1	PVC	144.6	9.1	0.57	2.4	2.7	486.9	6.9	21.0	
155		64	481.8	36.8	PVC	144.6	9.1	0.57	2.4	0.1	486.8	5.0	19.2	
156		65	481.6	49.8	PVC	144.6	9.1	0.57	2.4	0.1	486.7	5.1	19.4	
157		66	481.3	110.0	PVC	144.6	9.1	0.57	2.4	0.3	486.4	5.1	19.7	
158		67	481.6	142.3	PVC	144.6	9.1	0.57	2.4	0.3	486.1	4.5	19.4	
159		69	481.6	208.5	PVC	144.6	9.1	0.57	2.4	0.5	485.6	4.0	19.4	
160														
161														
162														
163														
164														
165														
166														
167														
168														
169														
170														
171														
172														

HYDRAULIC CONDITION-5

	A	B	C	D	E	F	G	H	I	J	K	L	M
	BALANTAK LOCATION	BRANCH No.	G.L (m)	LENGTH (m)	Kind of Pipe	Diameter (mm)	Quantity (l/s)	Velocity (m/s)	Gradient (%)	Friction Loss (m)	Hydraulic Level (m)	Hydraulic Head (m)	Static Head (m)
173	INTAKE	0	500.0								500.0		
174	RESERVOIR	10(IN)	402.9	504.3	GSP	51	3.3	1.63	57.7	29.1	470.9	68.0	97.1
177													
178		10(OUT)	400.9								400.9		
179		18	387.6	353.3	GSP	102	8.5	1.05	11.4	4	396.9	9.3	13.3
180		23	382.4	544.9	PVC	144.6	8.1	0.5	1.9	1	395.9	13.5	18.5
181		26	381.4	603.7	PVC	99.4	7.9	1.03	11.2	6.8	389.1	7.7	19.5
182		28	374.9	427.6	PVC	99.4	6.8	0.88	8.5	3.6	385.5	10.6	26.0
183		40	355.7	2210.2	PVC	99.4	6.1	0.8	7	15.5	370.0	14.3	45.2
184		44	356.7	636.7	PVC	81.4	0.9	0.17	0.5	0.3	369.7	13.0	44.2
185													
186		18				102					396.9		
187		45	392.2	128.1	PVC	57	0.2	0.08	0.2	0	396.9	4.7	8.7
188													
189													
190													
191													
192													
193													
194													
195													
196													
197													
198													
199													
200													

HYDRAULIC CONDITION-5

	A	B	C	D	E	F	G	H	I	J	K	L	M
	LAPUKO LOCATION	BRANCH No.	G.L (m)	LENGTH (m)	Kind of Pipe	Diameter (mm)	Quantity (l/s)	Velocity (m/s)	Gradient (%)	Friction Loss (m)	Hydraulic Water Level (m)	Hydraulic Head (m)	Static Head (m)
201													
202	INTAKE	0	500.0								500.0		
203	ELEVATED	26(IN)	493.3	1427.7	GSP	157	3.1	0.16	0.2	0.3	499.7	6.4	6.7
204	TANK(473.3)												
205		26(OUT)	491.3								491.3		
206		27	469.8	88.5	GSP	102	7.6	0.94	9.2	0.8	490.5	20.7	21.5
207		35	474.4	1133.8	PVC	144.6	7.1	0.44	1.5	1.7	488.8	14.4	16.9
208		36	472.4	144.1	PVC	81.4	7.1	1.38	24.4	3.5	485.3	12.9	18.9
209		40	471.5	347.9	PVC	81.4	2.6	0.5	3.8	1.3	484.0	12.5	19.8
210													
211													
212		27				102					490.5		491.3
213		42	469.5	268.7	PVC	35.2	0.4	0.42	7.1	1.9	488.6	19.1	21.8
214													
215		35				144.6					488.8		
216		48	480.6	1000.0	PVC	57	0.6	0.23	1.4	1.4	487.4	6.8	10.7
217													
218		36				81.4					485.3		
219		51	470.4	106.1	PVC	35.2	0.5	0.52	10.7	1.1	484.2	13.8	20.9
220													
221													
222													
223													
224													
225													
226													
227													
228													

HYDRAULIC CONDITION-5

229	TAWAELI	A	B	C	D	E	F	G	H	I	J	K		L	M
												Hydraulic	Water		
230	LOCATION		BRANCH	GL	LENGTH	Kind of	Diamet-	Quant-	Veloci-	Gradi-	Friction	Level(m)	Hydraulic	Head(m)	Head(m)
231	INTAKE		No.	(m)	(m)	Pipe	er(mm)	ty(l/s)	ty(m/s)	ent(%)	Loss(m)	500.0	Head(m)		
232	RESERVOIR		8(IN)	494.7	648.0	PVC	180.8	9.9	0.38	0.9	0.6	499.4	4.7	5.3	
233			8(OUT)	492.7								492.7			
234			13	480.8	737.0	PVC	226.2	25.8	0.64	1.8	1.3	491.4	10.6	11.9	
235			22	457.4	1573.8	PVC	226.2	25.1	0.62	1.7	2.7	488.7	31.3	35.3	
236			23	456.3	246.4	PVC	180.8	23.9	0.94	4.7	1.2	487.5	31.2	36.4	
237			4+500	453.0	1294.8	PVC	180.8	17.7	0.69	2.7	3.5	484.0	31.0	39.7	
238			28	453.2	354.8	PVC	144.6	15.4	0.94	6.2	2.2	481.8	28.6	39.5	
239			30	454.3	381.6	PVC	144.6	13.4	0.82	4.8	1.8	480.0	25.7	38.4	
240			31	455.1	273.8	PVC	144.6	12.3	0.75	4.1	1.1	478.9	23.8	37.6	
241			38	470.4	1079.3	PVC	144.6	9.6	0.59	2.6	2.8	476.1	5.7	22.3	
242			39	469.7	188.0	PVC	144.6	6.9	0.42	1.4	0.3	475.8	6.1	23.0	
243			40	469.9	157.0	PVC	99.4	4.5	0.59	4	0.6	475.2	5.3	22.8	
244			41	472.3	794.2	PVC	99.4	0.2	0	0	0	475.2	2.9	20.4	
245															
246			22				144.6					488.7			
247			46	458.2	863.6	PVC	57	1.3	0.52	6	5.2	483.5	25.3	34.5	
248															
249															
250															
251															
252															
253			28				144.6					481.8			
254			50	456.4	491.0	PVC	57	1.5	0.59	7.8	3.8	478.0	21.6	36.3	
255															
256															
257															
258															
259															
260															

HYDRAULIC CONDITION-5

A	B	C	D	E	F	G	H	I	J	K	L	M
LOCATION	BRANCH No.	G.L (m)	LENGTH (m)	Kind of Pipe	Diameter (mm)	Quantity (l/s)	Velocity (m/s)	Gradient (%)	Friction Loss (m)	Hydraulic Level (m)	Water Head (m)	Static Head (m)
261	BONEBAKAL											
262												
263												
264	RESERVOIR											
265												
266	14(OUT)	532.3								532.3		
267	28	486.7	1242.8	PVC	88.4	3.4	0.56	4.2	5.2	527.1	40.4	45.6
268	32	487.3	522.0	PVC	57	1.6	0.63	8.8	4.6	522.5	35.2	45.0
269	33	488.1	263.6	PVC	57	1.6	0.63	8.8	2.3	520.2	32.1	44.2
270	37	487.2	365.5	PVC	57	1.6	0.63	8.8	3.2	517.0	29.8	45.1
271	40	487.4	339.1	PVC	35.2	0.2	0.21	2	0.7	516.3	28.9	44.9
272												
273												
274												
275												
276	33				57					520.2		
277	50	500.5	183.8	PVC	57	1.6	0.63	8.8	1.6	518.6	18.1	31.8
278	52	500.1	394.8	PVC	35.2	0.2	0.21	2	0.8	517.8	17.7	32.2
279												
280												
281												
282												
283												
284												
285												
286												
287												
288												

HYDRAULIC CONDITION-5

A	B	C	D	E	F	G	H	I	J	K	L	M
SAMBIUT LOCATION	BRANCH No.	G.L (m)	LENGTH (m)	Kind of Pipe	Diameter (mm)	Quantity (l/s)	Velocity (m/s)	Gradient (%)	Friction Loss (m)	Hydraulic Level (m)	Hydraulic Head (m)	Static Head (m)
289	INTAKE	500.0								500.0		
290	RESERVOIR	489.3	625.9	GSP	102	3.6	0.44	2.3	1.4	498.6	9.3	10.7
293												
294	13(OUT)	487.3								487.3		
295	21	429.6	558.4	GSP	76	9.1	2.02	5.4	30.2	457.1	27.5	57.7
296	30	426.3	1042.5	PVC	99.4	5.4	0.71	5.6	5.8	451.3	25.0	61.0
297	34	427.3	877.2	PVC	81.4	3.2	0.62	5.6	4.9	446.4	19.1	60.0
298	39	425.5	912.5	PVC	81.4	1.9	0.37	2.1	1.9	444.5	19.0	61.8
299	41	426.8	1054.6	PVC	57	0.8	0.31	2.4	2.5	442.0	15.2	60.5
300												
301	21									457.1		
302	42	427.0	59.4	GSP	76	3.8	0.84	10.7	0.6	456.5	29.5	60.3
303	45	427.3	561.4	PVC	81.4	3.8	0.74	7.7	4.3	452.2	24.9	60.0
304	52	430.0	1101.3	PVC	81.4	2.6	0.5	3.8	4.2	448.0	18.0	57.3
305												
306												
307												
308												
309												
310												
311												
312												
313												
314												
315												
316												

HYDRAULIC CONDITION-5

	A	B	C	D	E	F	G	H	I	J	K		L	M
											GL (m)	LENGTH (m)		
317	SALAKAN	BRANCH												
318	LOCATION	No.												
319												476.0		
320														
321														
322	RESERVOIR	1(OUT)	503.8									503.8		
323		12	468.2	1419.8	PVC	99.4	5.9	0.77	6.6	9.4		494.4	26.2	35.6
324		13	467.4	189.1	PVC	81.4	5.9	1.14	17.3	3.3		491.1	23.7	36.4
325		15	466.5	238.8	PVC	81.4	5.9	1.14	17.3	4.1		487.0	20.5	37.3
326		19	466.7	696.6	PVC	57	1.8	0.71	10.9	7.6		479.4	12.7	37.1
327														
328		12				99.4						494.4		
329		22	467.2	150.0	PVC	81.4	5.9	1.14	17.3	2.6		491.8	24.6	36.6
330		23	466.0	200.0	PVC	81.4	5.9	1.14	17.3	3.5		488.3	22.3	37.8
331		26	465.1	200.0	PVC	81.4	2.4	0.47	3.3	0.7		487.6	22.5	38.7
332		27	465.0	16.0	PVC	57	2.4	0.95	18.6	0.3		487.3	22.3	38.8
333		29	466.0	363.9	PVC	35.2	1.0	1.04	38.5	14		473.3	7.3	37.8
334														
335														
336														
337														
338														
339														
340														
341														
342														
343														
344														

HYDRAULIC CONDITION-5

A	B	C	D	E	F	G	H	I	J	K	L	M
MOWEME LOCATION	BRANCH No.	G.L (m)	LENGTH (m)	Kind of Pipe	Diameter (mm)	Quantity (l/s)	Velocity (m/s)	Gradient (%)	Friction Loss (m)	Hydraulic Level (m)	Water Head (m)	Static Head (m)
345												
346												
347												
348												
349	TANK(512.8)	523.8								523.8		
350	11	512.8	50.0	PVC	144.6	11.1	0.68	3.4	0.2	523.6	10.8	11.0
351	7	508.2	686.4	PVC	144.6	10.5	0.65	3.1	2.1	521.5	13.3	15.6
352	6	506.7	232.6	PVC	99.4	7.2	0.94	9.5	2.2	519.3	12.6	17.1
353	5	506.7	343.8	PVC	81.4	6.0	1.16	17.9	6.2	513.1	6.4	17.1
354	3	505.2	366.8	PVC	81.4	4.9	0.95	12.3	4.5	508.6	3.4	18.6
355	14	495.0	1420.5	PVC	81.4	2.0	0.38	2.3	3.3	505.3	10.3	28.8
356												
357	R				144.6					523.8		
358	15	513.8	50.0	PVC	81.4	2.0	0.38	2.3	0.1	523.7	9.9	10.0
359	17	516.2	395.0	PVC	57	0.7	0.28	1.9	0.8	522.9	6.7	7.6
360												
361	7				144.6					521.5		
362	18	508.4	95.3	PVC	81.4	2.0	0.38	2.3	0.2	521.3	12.9	15.4
363	19	510.6	250.7	PVC	57	0.7	0.28	1.9	0.5	520.8	10.2	13.2
364												
365	6				99.4					519.3		
366	20	509.6	368.1	PVC	57	1.2	0.48	5.2	1.9	517.4	7.8	14.2
367												
368	5				81.4					513.1		
369	21	507.1	373.3	PVC	57	1.2	0.48	5.2	1.9	511.2	4.1	16.7
370												
371												
372												
373												
374												
375												
376												

HYDRAULIC CONDITION-5

	A	B	C	D	E	F	G	H	I	J	K	L	M
	WAKADIA LOCATION	BRANCH No.	G.L. (m)	LENGTH (m)	Kind of Pipe	Diameter (mm)	Quantity (l/s)	Velocity (m/s)	Gradient (%)	Friction Loss(m)	Water Level (m)	Hydraulic Head(m)	Static Head(m)
377													
378													
379													
380	ELEVATED												
381	TANK(543.3)												
382		16(OUT)	564.3								564.3		
383		18	533.9	1166.4	PVC	144.6	9.9	0.61	2.8	3.3	561.0	27.1	30.4
384		29	537.5	1138.7	PVC	99.4	6.9	0.9	8.8	10	551.0	13.5	26.8
385		33	536.6	500.0	PVC	81.4	2.1	0.41	2.6	1.3	549.7	13.1	27.7
386													
387		29				99.4					551.0		
388		37	519.4	1000.0	PVC	81.4	4.4	0.85	10.1	10.1	540.9	21.5	44.9
389		2+800	516.8	1800.0	PVC	81.4	4.4	0.85	10.1	18.2	522.7	5.9	47.5
390													
391													
392													
393													
394													
395													
396													
397													
398													
399													
400													
401													
402													
403													
404													

HYDRAULIC CONDITION-5

A	B	C	D	E	F	G	H	I	J	K	L	M
LANDONO	BRANCH	GL	LENGTH	Kind of Pipe	Diameter(mm)	Quantity(l/s)	Velocity(m/s)	Gradient(%)	Friction Loss(m)	Hydraulic Water Level(m)	Hydraulic Head(m)	Static Head(m)
LOCATION	No.	(m)	(m)									
405												
406												
407												
408	ELEVATED											
409	TANK(500.0)											
410	0(OUT)	511.0								511.0		
411	12	466.9	2992.4	PVC	144.6	10.5	0.65	3.1	9.3	501.7	34.8	44.1
412	13	472.0	404.7	PVC	81.4	9.4	1.82	41	16.6	485.1	13.1	39.0
413	15	474.6	665.9	PVC	81.4	2.4	0.47	3.3	2.2	482.9	8.3	36.4
414												
415	12				144.6					501.7		
416	16	459.8	783.9	PVC	81.4	9.4	1.82	41	32.1	469.6	9.8	51.2
417												
418												
419	17									486.9		
420	18	463.1	665.4	PVC	57	1.2	0.48	5.2	3.5	483.4	20.3	47.9
421												
422												
423												
424												
425												
426												
427												
428												
429												
430												
431												
432												

HYDRAULIC CONDITION-5

A	B	C	D	E	F	G	H	I	J	K	L	M
ANDONOHU LOCATION	BRANCH No.	GL (m)	LENGTH (m)	Kind of Pipe	Diameter (mm)	Quantity (l/s)	Velocity (m/s)	Gradient (%)	Friction Loss (m)	Hydraulic Water Level (m)	Hydraulic Head (m)	Static Head (m)
433		500.0								500.0		
434		487.7	1250.0	GSP	157	4.6	0.23	0.4	0.5	499.5	11.8	12.3
435												
436												
437												
438	TANK(505.0)	526.0								526.0		
439	26	505.4	50.0	GSP	102	11.1	1.37	18.6	0.9	525.1	19.7	20.6
440	21	478.2	1415.9	PVC	144.6	7.4	0.45	1.6	2.3	522.8	44.6	47.8
441	17	477.5	1113.2	PVC	99.4	4.3	0.56	3.7	4.1	518.7	41.2	48.5
442	16	474.4	254.5	PVC	81.4	3.3	0.64	5.9	1.5	517.2	42.8	51.6
443	7	487.4	1723.0	PVC	81.4	2.4	0.47	3.3	5.7	511.5	24.1	38.6
444	5	493.6	411.5	PVC	81.4	1.9	0.37	2.1	0.9	510.6	17.0	32.4
445	0	505.3	1107.8	PVC	81.4	0.6	0.13	0.3	0.3	510.3	5.0	20.7
446	26	505.4	37.4	PVC	81.4	0.6	0.13	0.3	0	510.3	4.9	20.6
447												
448												
449												
450												
451	26				144.6					525.1		
452	30	492.6	720.2	PVC	35.2	0.6	0.62	15	10.8	514.3	21.7	33.4
453												
454												
455												
456												
457												
458												
459												
460												

HYDRAULIC CONDITION-5

A	B	C	D	E	F	G	H	I	J	K		L	M
										LIANG LOCATION	BRANCH No.		
461													
462													
463	INTAKE	0	500.0								500.0		
464	RESERVOIR	16(IN)	472.3	450.1	GSP	76	2.4	0.54	4.6	2.1	497.9	25.6	27.7
465													
466			470.3								470.3		
467		26	427.6	299.9	GSP	76	6.8	1.51	31.5	9.4	460.9	33.3	42.7
468		28	425.8	106.6	PVC	81.4	6.4	1.24	20.2	2.2	458.7	32.9	44.5
469		31	426.4	396.2	PVC	81.4	6.4	1.24	20.2	8	450.7	24.3	43.9
470		33	428.5	68.2	PVC	81.4	3.9	0.76	8.1	0.6	450.1	21.6	41.8
471		37	426.0	312.7	PVC	57	2.4	0.95	18.6	5.8	444.3	18.3	44.3
472		40	442.1	392.5	PVC	57	0.5	0.2	1	0.4	443.9	1.8	28.2
473													
474		37				57					444.3		
475		49	424.9	255.4	GSP	51	2.0	0.99	22.8	5.8	438.5	13.6	45.4
476													
477		28				81.4					458.7		
478		47	426.1	120.7	PVC	35.2	0.2	0.21	2	0.2	458.5	32.4	44.2
479													
480													
481													
482													
483													
484													
485													
486													
487													
488													

HYDRAULIC CONDITION-5

No.	A		B	C	D	E	F	G	H	I	J	K		M
	TAKIMPO LOCATION	BRANCH No.										G.L (m)	LENGTH (m)	
489														
490														
491														
492	ELEVATED													
493	TANK(511.0)													
494		19(OUT)	526.8									526.8		
495		1+100	500.5	630.9	PVC	144.6	17.6	1.08	8	5	5	521.8	21.3	26.3
496		31	508.3	780.2	PVC	144.6	17.6	1.08	8	6.2	6.2	515.6	7.3	18.5
497		36	508.2	640.5	PVC	144.6	7.6	0.47	1.7	1.1	1.1	514.5	6.3	18.6
498		37	508.3	25.6	PVC	99.4	5.9	0.77	6.6	0.2	0.2	514.3	6.0	18.5
499		39	508.3	183.5	PVC	81.4	3.0	0.58	5	0.9	0.9	513.4	5.1	18.5
500		40	507.6	146.8	PVC	81.4	3.0	0.58	5	0.7	0.7	512.7	5.1	19.2
501		42	503.4	216.6	PVC	57	1.4	0.56	6.9	1.5	1.5	511.2	7.8	23.4
502														
503														
504														
505														
506														
507														
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512														
513														
514														
515														
516														

HYDRAULIC CONDITION-5

A	B	C	D	E	F	G	H	I	J	K		M
										Hydraulic Level(m)	Water Head(m)	
SANDANGPANG LOCATION	BRANCH No.	GL (m)	LENGTH (m)	Kind of Pipe	Diameter (mm)	Quantity (l/s)	Velocity (m/s)	Gradient (%)	Friction Loss (m)	Hydraulic Level (m)	Water Head (m)	Static Head (m)
517	15(OUT)	775.5										
518												
519												
520	RESERVOIR											
521												
522										775.5		
523	17	745.7	276.1	PVC	81.4	8.8	1.71	36.3	10	765.5	19.8	29.8
524	19	746.0	239.1	PVC	81.4	6.7	1.3	21.9	5.2	760.3	14.3	29.5
525	23	742.1	215.8	PVC	81.4	4.2	0.81	9.2	2	758.3	16.2	33.4
526	47	730.8	2229.9	PVC	81.4	3.5	0.68	6.6	14.7	743.6	12.8	44.7
527												
528	17				81.4					765.5		
529	48	745.0	126.1	PVC	35.2	0.7	0.73	19.9	2.5	763.0	18.0	30.5
530												
531	17				81.4					765.5		
532	49	750.6	97.4	PVC	35.2	0.7	0.73	19.9	1.9	763.6	13.0	24.9
533												
534	19				81.4					760.3		
535	50	746.8	47.6	PVC	35.2	0.7	0.73	19.9	0.9	759.4	12.6	28.7
536												
537												
538												
539												
540												
541												
542												
543												
544												

HYDRAULIC CONDITION-5

A	B	C	D	E	F	G	H	I	J	K	L	M
LAOMPO LOCATION	BRANCH No.	G.L (m)	LENGTH (m)	Kind of Pipe	Diameter (mm)	Quantity (l/s)	Velocity (m/s)	Gradient (%)	Friction Loss (m)	Hydraulic Water Level (m)	Hydraulic Head (m)	Static Head (m)
545												
546												
547												
548	ELEVATED											
549	TANK(511.7)											
550	15(OUT)	522.4								522.4		
551	31	507.3	2274.9	PVC	144.6	9.4	0.58	2.5	5.7	516.7	9.4	15.1
552	41	503.3	2298.2	PVC	144.6	6.4	0.39	1.2	2.8	513.9	10.6	19.1
553	47	501.5	1098.0	PVC	81.4	3.2	0.62	5.6	6.1	507.8	6.3	20.9
554												
555												
556												
557												
558												
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562												
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566												
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568												
569												
570												
571												
572												

HYDRAULIC CONDITION-5

A	B	C	D	E	F	G	H	I	J	K	L	M
LOCATION	BRANCH No.	GL (m)	LENGTH (m)	Kind of Pipe	Diameter (mm)	Quantity (l/s)	Velocity (m/s)	Gradient (%)	Friction Loss (m)	Hydraulic Level (m)	Water Head (m)	Static Head (m)
573	TROMANDA-1											
574	INTAKE	0	1000.0							1000.0		
575	72(IN)	919.3	2800.1	GSP	76	1.6	0.36	3.4	9.5	990.5	71.2	80.7
576	RESERVOR											
577	72(OUT)	917.2								917.2		
578												
579												
580	PRESSURE	85	883.7	GSP	76	4.8	1.07	25.8	14.4	902.8	19.1	33.5
581	BREAKING											
582										883.7		
583	PRESSURE	93	829.2	GSP	76	4.8	1.07	25.8	10.5	873.2	44.0	54.5
584	BREAKING											
585										829.2		
586	PRESSURE	96	754.1	GSP	51	4.8	2.37	180.2	39.3	789.9	35.8	75.1
587	BREAKING											
588										754.1		
589		99	717.1	GSP	76	4.6	1.02	23.9	5.2	748.9	31.8	37.0
590		104	687.1	GSP	51	3.9	1.93	122.8	44.8	704.1	17.0	67.0
591												
592	PRESSURE	127	499.1	GSP	51	3.5	1.73	100.5	99.4	604.7	105.6	255.0
593	BREAKING											
594										499.1		
595		133	452.3	GSP	51	2.5	1.24	53.9	11.2	487.9	35.6	46.8
596												
597	PRESSURE	149	404.7	GSP	38	1.6	1.43	99	42.4	445.5	40.8	94.4
598	BREAKING											
599										404.7		
600		162	361.2	GSP	51	1.4	0.69	18.4	10.2	394.5	33.3	43.5

HYDRAULIC CONDITION-5

A	B	C	D	E	F	G	H	I	J	K	L	M
TROMANDA-2	BRANCH	GL	LENGTH	Kind of Pipe	Diameter(mm)	Quantity(l/s)	Velocity(m/s)	Gradient(%)	Friction Loss(m)	Hydraulic Water Level(m)	Hydraulic Head(m)	Static Head(m)
LOCATION	No.	(m)	(m)									
601	165	356.7	161.6	PVC	35.2	0.5	0.52	16.7	2.7	391.8	35.1	48.0
602												
603												
604												
605	177	364.3	536.8	PVC	57	0.6	0.24	2.2	1.2	393.3	29.0	40.4
606												
607												
608												
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611												
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614												
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616												
617												
618												
619												
620												
621												
622												
623												
624												
625												
626												
627												

HYDRAULIC CONDITION-5

A	B	C	D	E	F	G	H	I	J	K	L	M
BINNANGA-1 LOCATION	BRANCH No.	G.L. (m)	LENGTH (m)	Kind of Pipe	Diameter (mm)	Quantity (l/s)	Velocity (m/s)	Gradient (%)	Friction Loss(m)	Hydraulic Level(m)	Hydraulic Head(m)	Static Head(m)
628	INTAKE	500.0								500.0		
629	RESERVOIR 14(IN)	472.9	1351.5	GSP	102	6.2	0.76	6.3	8.5	491.5	18.6	27.1
630												
631	RESERVOIR 14(OUT)	470.9								470.9		
632												
633	17	440.6	579.5	PVC	144.6	13.0	0.8	4.6	2.7	468.2	27.6	30.3
634	20	431.8	211.0	PVC	81.4	11.3	2.19	57.7	12.2	456.0	24.2	39.1
635	23	382.4	798.8	PVC	81.4	11.3	2.19	57.7	46.1	409.9	27.5	88.5
636	PRESSURE 27(IN)	352.8	605.9	PVC	81.4	11.3	2.19	57.7	35	374.9	22.1	87.8
637	BREAKING 27(OUT)	352.8								352.8		
638	28	326.5	450.6	PVC	99.4	9.0	1.17	14.3	6.4	346.4	19.9	26.3
639	29	307.2	316.0	PVC	81.4	8.3	1.61	32.6	10.3	336.1	28.9	45.6
640	30	310.2	81.8	PVC	81.4	6.7	1.3	21.9	1.8	334.3	24.1	42.6
641	31	309.6	133.2	PVC	81.4	4.9	0.95	12.3	1.6	332.7	23.1	43.2
642	33	310.0	823.1	PVC	81.4	4.0	0.77	8.4	6.9	325.8	15.8	42.8
643	4+200	304.6	200.0	PVC	81.4	3.3	0.64	5.9	1.2	324.6	20.0	48.2
644	4+400	302.6	200.0	PVC	57	2.5	0.99	20.1	4	320.6	18.0	50.2
645	36	272.6	1577.8	PVC	57	1.9	0.75	12.1	19.1	301.5	28.9	80.2
646												
647												
648	29				81.4					336.1		
649	39	312.3	1248.1	PVC	57	1.9	0.75	12.1	15.1	321.0	8.7	158.6
650	41	308.4	559.0	PVC	57	1.7	0.67	9.8	5.5	315.5	7.1	162.5
651												
652	29				81.4					336.1		
653	67	293.0	362.0	PVC	35.2	0.3	0.31	4.2	1.5	334.6	41.6	177.9
654												
655	17				144.6					468.2		
656	54	430.4	943.4	PVC	57	2.1	0.83	14.5	13.7	454.5	24.1	40.5
657	56	440.6	111.9	PVC	57	1.1	0.44	4.4	0.5	454.0	13.4	30.3
658												
659												

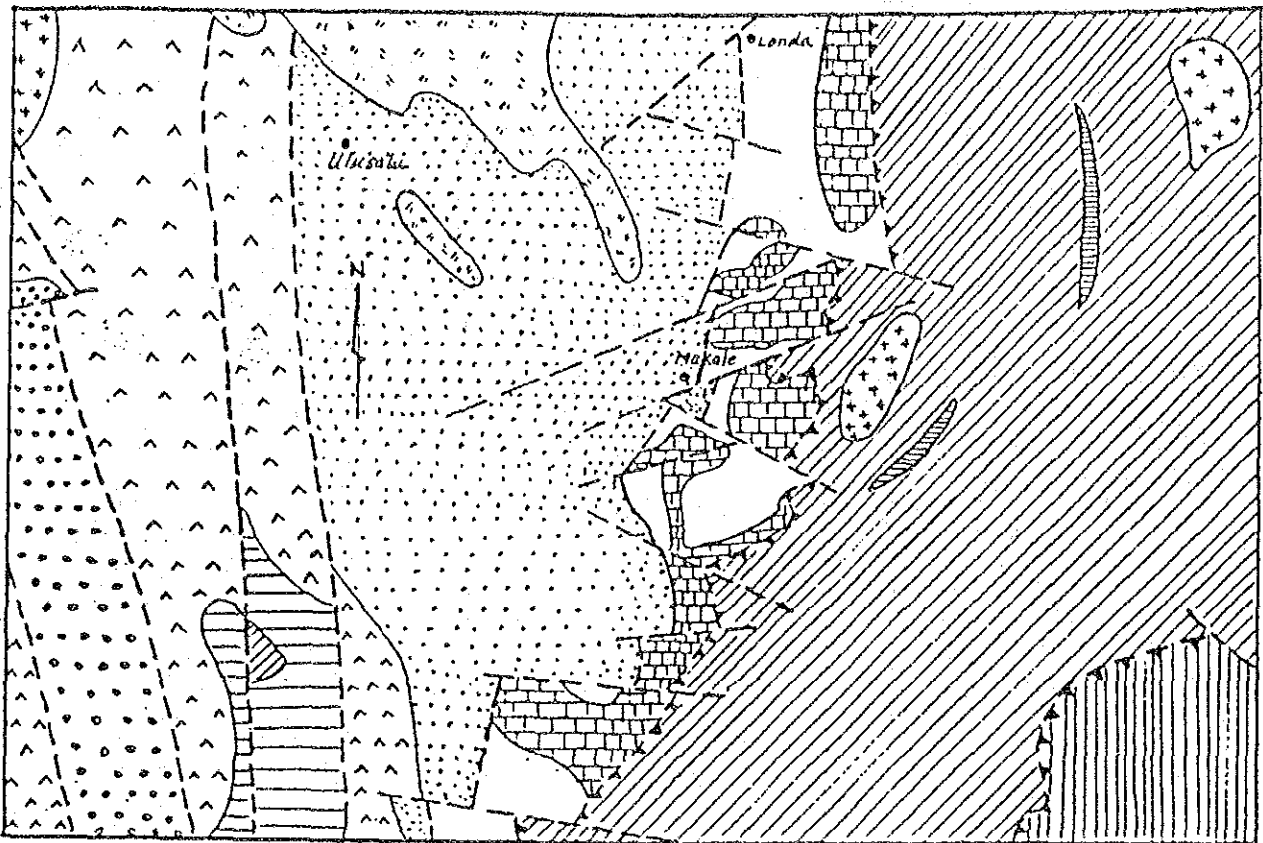
HYDRAULIC CONDITION-5

	A	B	C	D	E	F	G	H	I	J	K		L	M
											GL (m)	LENGTH (m)		
660	BINNANGA-2	BRANCH												
661	LOCATION	No.												
662		54				57						454.5		
663		58	419.5	177.6	PVC	35.2	0.3	0.31	4.2	0.7		453.8	34.3	51.4
664														
665		56				57						454.0		
666		61	438.5	264.1	PVC	35.2	0.3	0.31	4.2	1.1		452.9	14.4	32.4
667														
668		20				81.4						456.0		
669		62	433.3	200.0	PVC	35.2	0.7	0.73	19.9	4		452.0	18.7	37.6
670														
671														
672														
673														
674		30				81.4						334.3		
675		64	318.2	127.0	PVC	35.2	0.3	0.31	4.2	0.5		333.8	15.6	152.7
676														
677		30				81.4						334.3		
678		63	300.4	143.5	PVC	35.2	0.3	0.31	4.2	0.6		333.7	33.3	170.5
679														
680		31				81.4						332.7		
681		66	301.9	111.8	PVC	35.2	0.3	0.31	4.2	0.5		332.2	30.3	169.0
682														
683		31				81.4						332.7		
684		65	320.5	172.1	PVC	35.2	0.3	0.31	4.2	0.7		332.0	11.5	150.4

添付資料 6 - 7

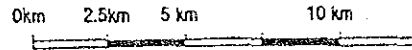
地 質 図

Geological Map of the central part of South Sulawesi province



(after "Geological Map of the Majene & Western Part of the Palopo Quadrangles," 1974)

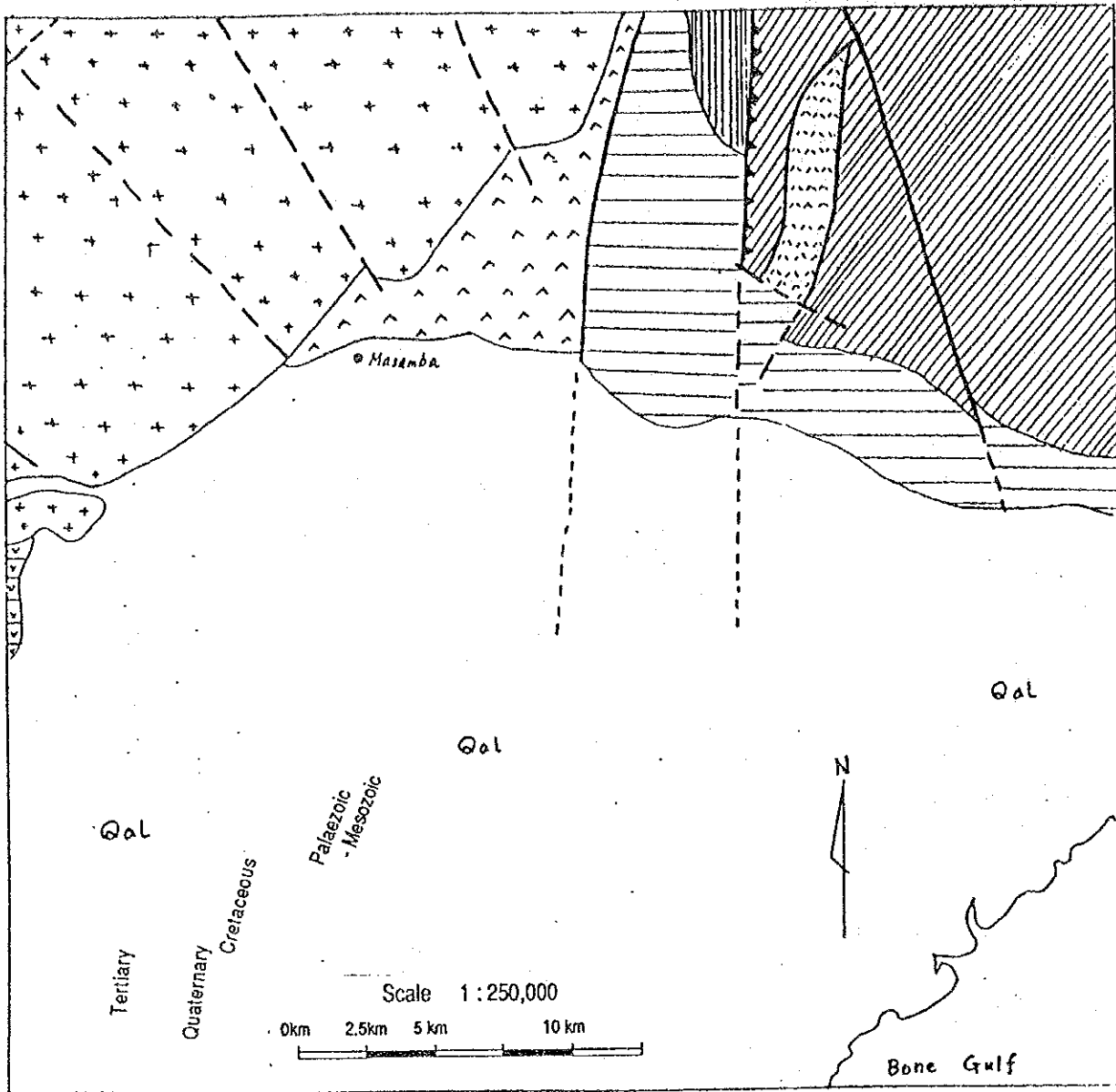
Scale 1 : 250,000



Legend

Tertiary	Makale Formation	Quaternary	: Tuff	biolite and pumice, white to light gray, soft and porous. poorly productive aquifers.
		Makale Formation	: Conglomerate	sandstone conglomerate, siltstone and tuff with intercalarily lava flows. poorly productive or no exploitable groundwater.
			: Lava flows	with a little glauconitic sandstone and shale, coquina and molluscs. poorly productive or no exploitable groundwater.
			: Sandstone	basaltic to andesitic, some pillow lava, andesitic breccia. No exploitable groundwater.
	Miocene	: Reefal Limestone	sandstone, conglomerate, siltstone and breccia with some turbidites poorly productive or no exploitable groundwater	Moderate to high productive aquifers. Groundwater flow is limited in fissures, fractures and solution channels
		: Marl		Low permeability, no exploitable groundwater
		: Limestone in large lenses		Groundwater flow is limited in fissures
	Eocene	Toraja Formation	: Shale	reddish brown and gray marly shale and limestone, quartzose sandstone and conglomerate with coal locally No exploitable groundwater
		Granodiorite	: Granodiorite	No exploit groundwater
	Cretaceous	Latimojong Formation	: Latimojong Formation	moderately metamorphosed rocks, slate, phyllite, chert, marble, quartzite and silicified breccia No exploitable groundwater
	Fault and Lineament	: Fault and Lineament		
	Thrust Fault	: Thrust Fault		

Geological Map of the central-eastern part of South Sulawesi P.

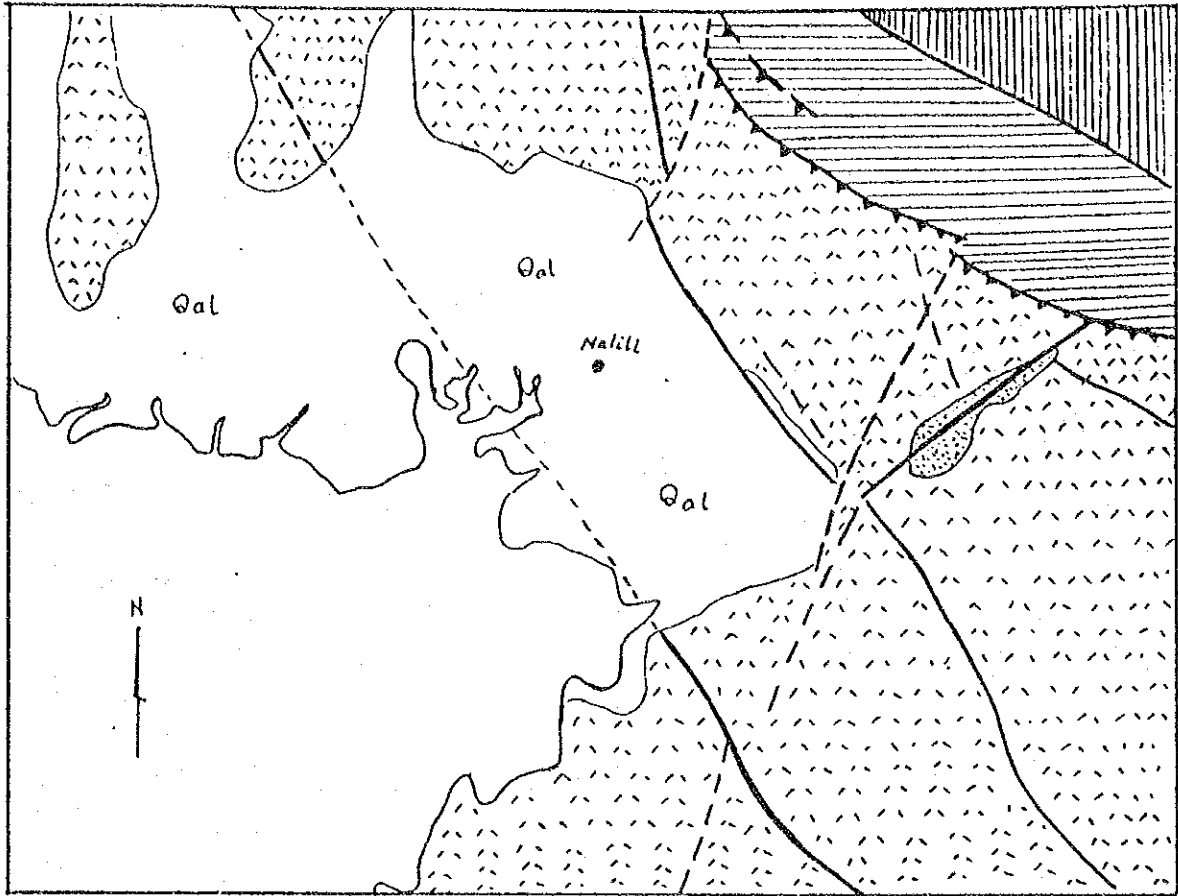


(after "Geological Map of Malili Quadrangle, Sulawesi," 1981)

Legend

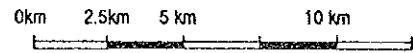
Quaternary	Alluvial	Qal	Mud, clay, sand, pebble and gravel
	Masamba Volcanic rocks		Volcanic breccia and basaltic to andesitic lava
Tertiary	Bone bone Formation		Alternation of lithic sandstone, conglomerate, marl and tuffaceous clay
	Lamasi Volcanic rocks		Basaltic to andesitic lava and volcanic breccia.
	Kambuno Granite		Granite and granodiorite
Palaeozoic - Mesozoic	Latimojong Formation		Slate, Phyllite, wacke, quartzite, limestone and siltstone with intercalary conglomerate and chert.
	Pompangeo Complex		Schist, gneiss, marble, serpentinite and quartzite
	Serpentinite Rocks		Serpentinite and picrito.
	Fault		
	Thrust Fault		

Geological Map of the eastern part of the South Sulawesi P.

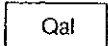
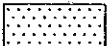
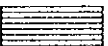

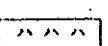




(after "Geological Map of Malili Quadrangle," 1981)

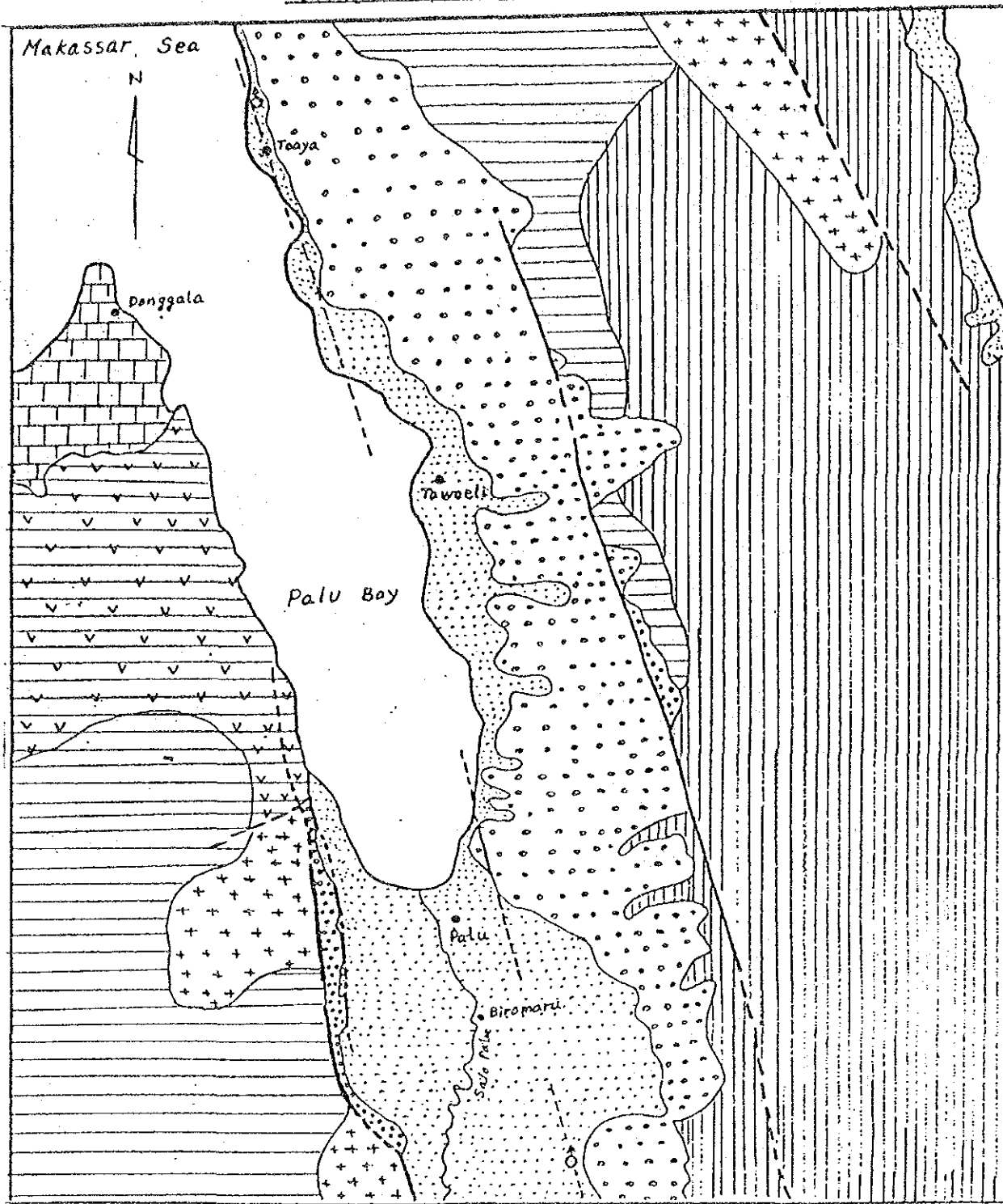
Scale 1 : 250,000



Legend

Quaternary	—	Alluvial		Qal	Mud, clay, pebble and sand
	—	Larona Formation			Sandstone, conglomerate, and claystone with intercalary tuff.
Tertiary	—	Matano Formation			Crystalline limestone, calcilutite, marl, shale with chert and slate lenses.
		Wasponda Melange			Very exotic block of serpentinite, schist, amphybolite, metagabbro, metadolerite, foliated limestone in the matrix of red clay
Cretaceous	—	Ultrabasic Complex			Harzburgite, werhlite, websterite, serpentinite, dunite gabbro and diabase
Palaeozoic - Mesozoic	—	Fault			
	—	Thrust Fault			

Geological Map of the western part of central Sulawesi P.



(after "Reconnaissance Geological Map of Palu area," 1973)

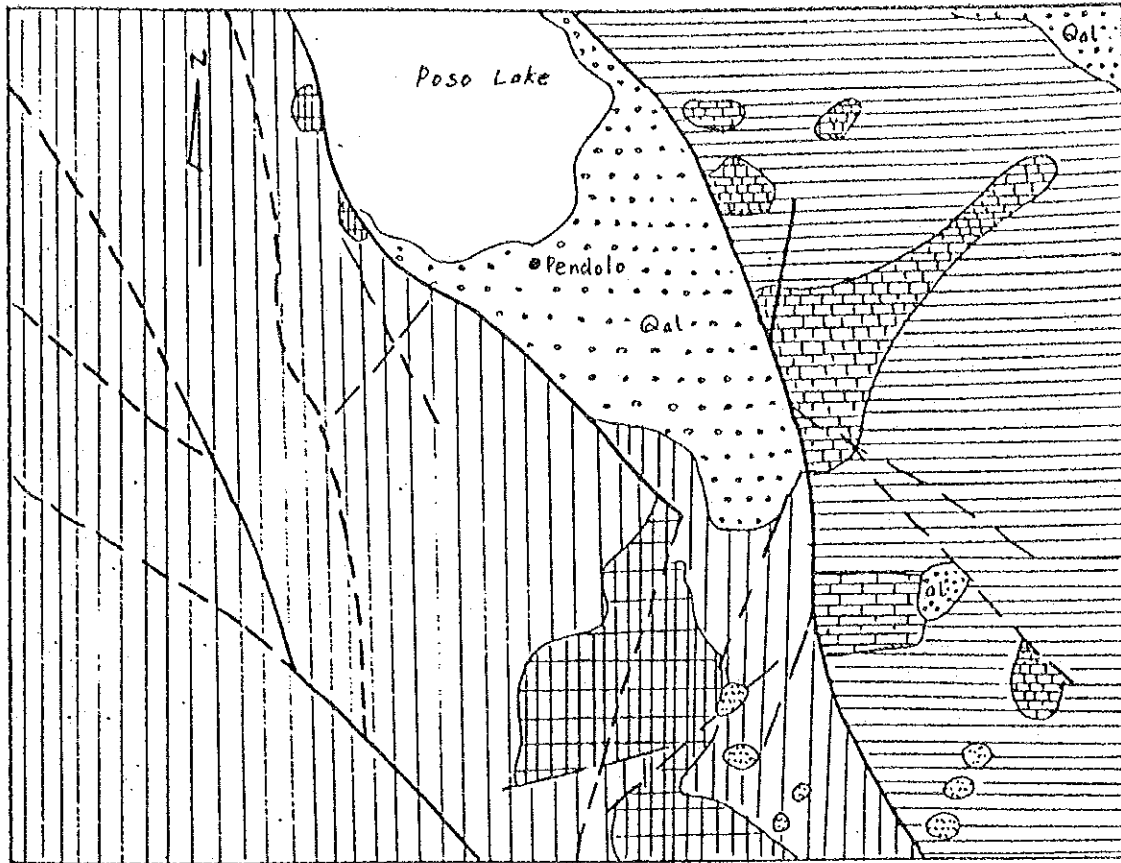
Scale 1 : 250,000

0km 2.5km 5 km 10 km

Legend

Tertiary	Quaternary	— Alluvial coastal deposits		Gravel, sand and mud with coral limestone, Low to moderate permeability
		— Celebes Mollase		Coral limestone and marl Low to moderate permeability
	Miocene	— Celebes Mollase		Conglomerate, sandstone and mudstone - weakly consolidated Low to moderate permeability
		— Tinombo Formation		Volcanic Member - Basaltic volcanics of spilitic, andesite, tuff, breccia and pillow lava - Low permeability
	Eocene	— Tinombo Formation		Shale, sandstone, conglomerate, limestone and chert with phyllite, slate and quartzite. - Low permeability
		— Metamorphic Complex		Mica schist, amphibolitic schist, gneiss and marble Generally impermeable
	Palaeozoic	— Granit and Granodiorite		Impermeable

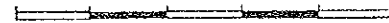
Geological Map of the central part of central Sulawesi P.



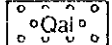
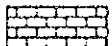
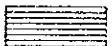
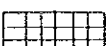
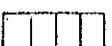
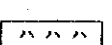
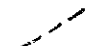
(after "Geologic Map of Malili Quadrangle," 1981)

Scale 1 : 250,000

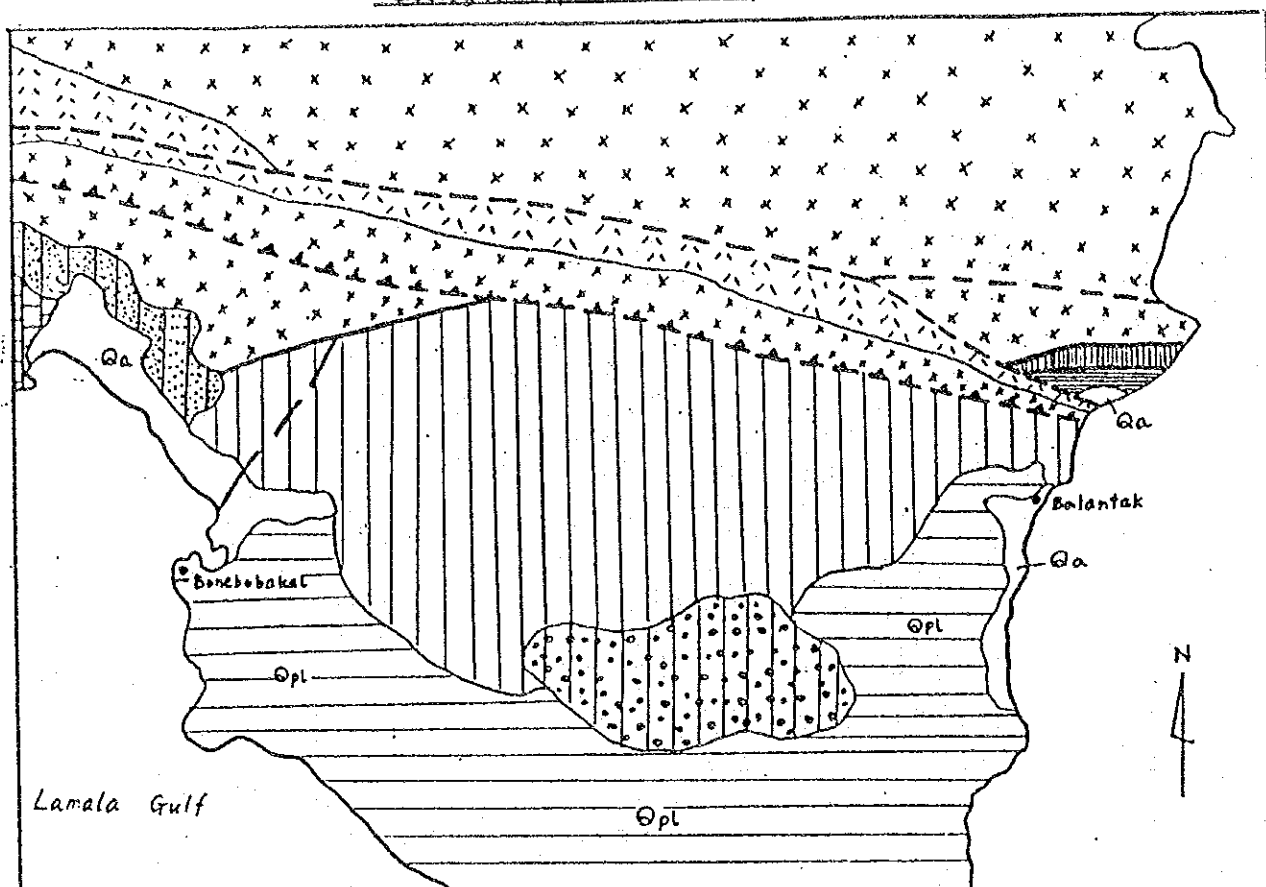
0km 2.5km 5 km 10 km



Legend

Quaternary Palaeozoic - Mesozoic Cretaceous	Alluvial 	- Crystalline limestone and calcilutite, marl, shale with chert and slate lenses.
	Matano Formation 	- crystalline limestone and calcilutite, marl, shale with chert and slate lenses.
	Lamusa Formation 	- Slate, phyllite, meta sandstone, limestone
	Meta Limestone 	- Marble and foliated limestone
	Pompangeo Complex 	- Schist, gneiss, marble, serpentinite and quartzite
	Serpentinite Rocks 	- Serpentinite or picrite
	Fault 	

Geological Map of the eastern part of central Sulawesi Province



(after "Preliminary Geological map of the LUWUK Quadrangle," 1982)

Scale 1 : 250,000

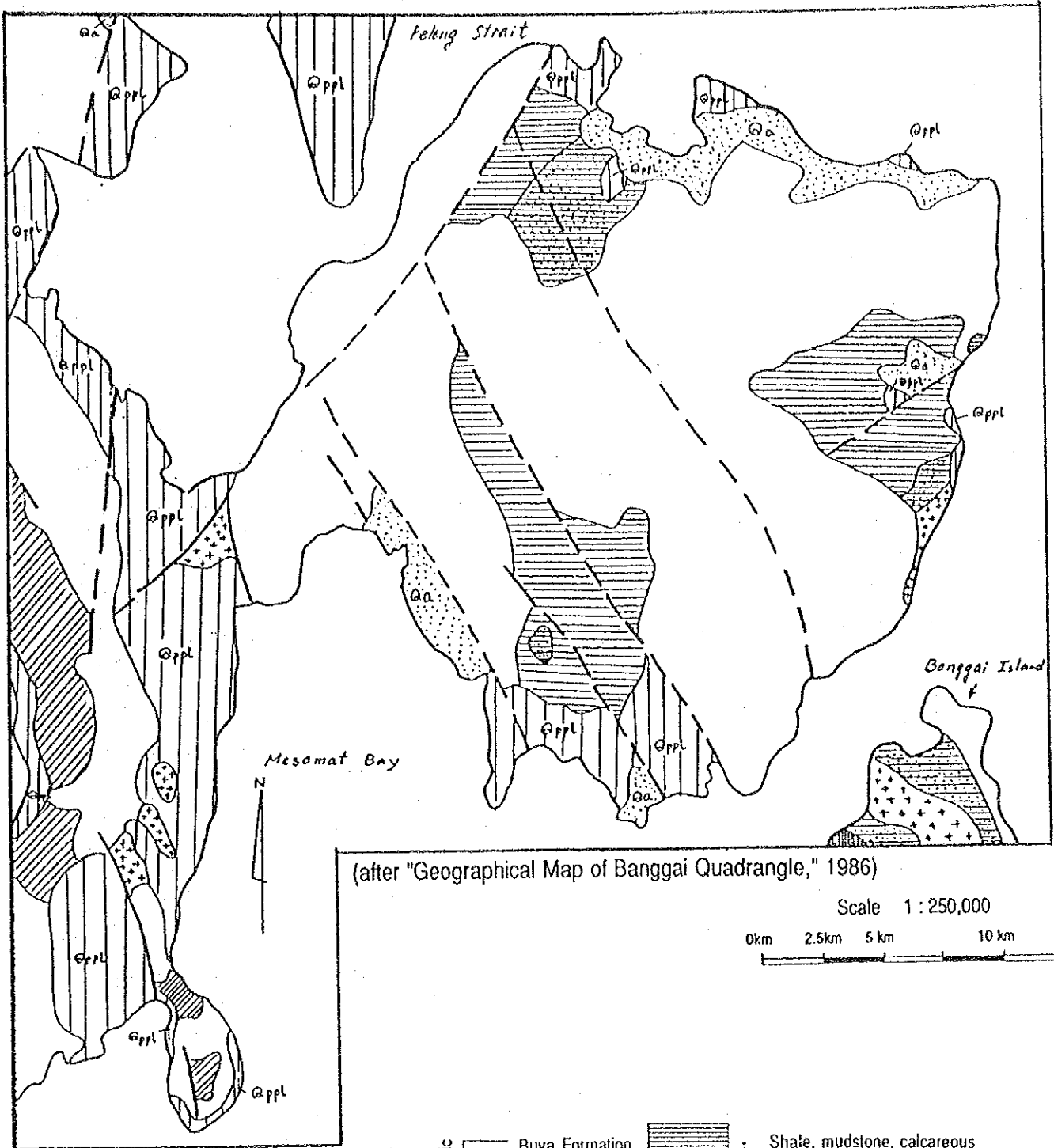
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Legend

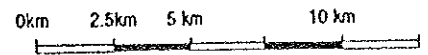
Quaternary	Alluvial Deposits	Qa	- Sand, pebble and mud - High permeability in coarse-grained material and low in fine-grained material.
	Luwuk Formation	Qpl	- Reefal limestone and minor marl - Groundwater flow is limited in fissures, fractures and solution channels.
Tertiary	Batui Formation	[Pattern]	- Conglomerate, sandstone and marl
	Bongka Formation	[Pattern]	- Conglomerate, sandstone, claystone and limestone lenses.
	Poh Formation	[Pattern]	- Marl, limestone and minor sandstone - Groundwater is limited in fissures, fractures and solution channels
	Luok Formation	[Pattern]	- Limestone and minor sandstone - Groundwater flow is limited in fissures, fractures and solution channels
Mesozoic	Malic Complex	[Pattern]	- Gabbro, basalt and diorite
	Ultramafic Complex	[Pattern]	- Serpentinized ultramafic rocks
	Telambahu Formation	[Pattern]	- Bedded limestone, marl, calcarenite and clayey limestone
	Fault	[Pattern]	
	Thrust Fault	[Pattern]	

Geological Map of the eastern part of Peleng Islands



(after "Geographical Map of Banggai Quadrangle," 1986)

Scale 1 : 250,000

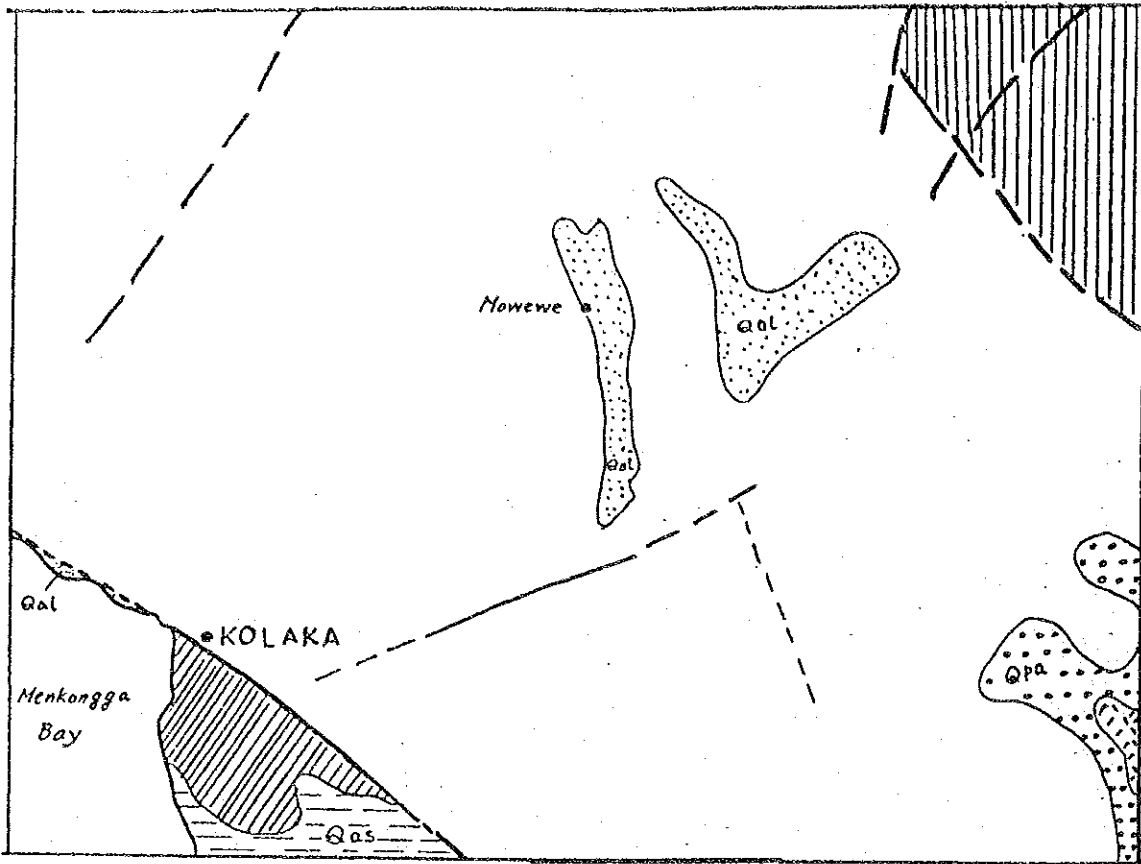


Legend

Quaternary	Alluvial	Qa	Mud, sand, pebble and gravel
	Peleng Formation	Qppl	Reelal limestone
Tertiary	Salodik Formation		Limestone and marl

Mesozoic	Jurassic	Buya Formation		Shale, mudstone, calcareous claystone with intercalary
		Bogong Formation		Conglomerate, breccia, sandstone with intercalary shale, lignite and gypsum
Triassic		Mangole Volcanic Rocks		Rhyolite, ignimbrite, lapillituff and breccia
		Banggai Granit		Granit, granodiorite, quartzdiorite and pegmatite
Palaeozoic		Metamorphic Rock Complex		Schist, gneiss, amphibolite and quartzite

Geological Map of the western part of Southeast Sulawesi P.



(after "Geographical Map of Kolaka," 1982)

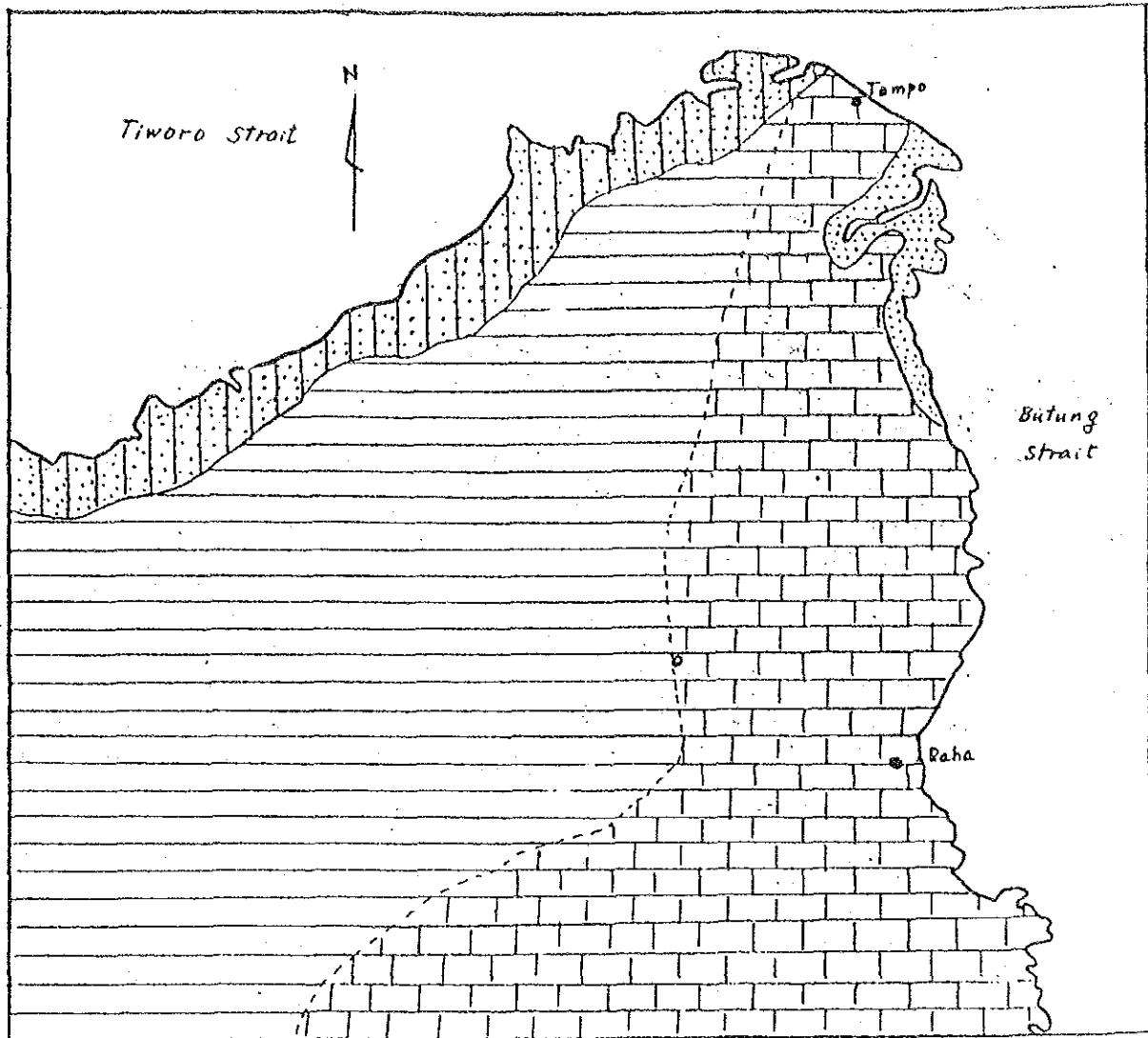
Scale 1 : 250,000

0km 2.5km 5 km 10 km

Legend

Quaternary	Alluvial Deposits		- Mud, clay, sand and gravel - Moderate to high permeability in coarse-grained material, low in fine-grained
	Swamp Deposits		- Clay and sand
	Alanga Formation		- Conglomerate and sandstone-loose to semi consolidated. - Generally low transmissibility and poor productive aquifers.
Mesozoic	Pompangeo Complex		- Mica schist, green schist glaucophane schist amphibolite schist, chlorite schist and jasperoidad chert.
	Ultramafic Complex		- Harzburgite, dunite, wherlite, serpentinite and magnesite.
Palaeozoic	Tosiasi Metamorphics		- Slate, phyllite, some schists and meta sandstone. - Generally low permeability
	Mekongga Metamorphics		- Schist, gneiss and quartzite - Generally low permeability
	Fault		

Geological Map of the northern part of Muna



(after "Hydrogeological Map of Indonesia," 1986)

Scale 1 : 250,000

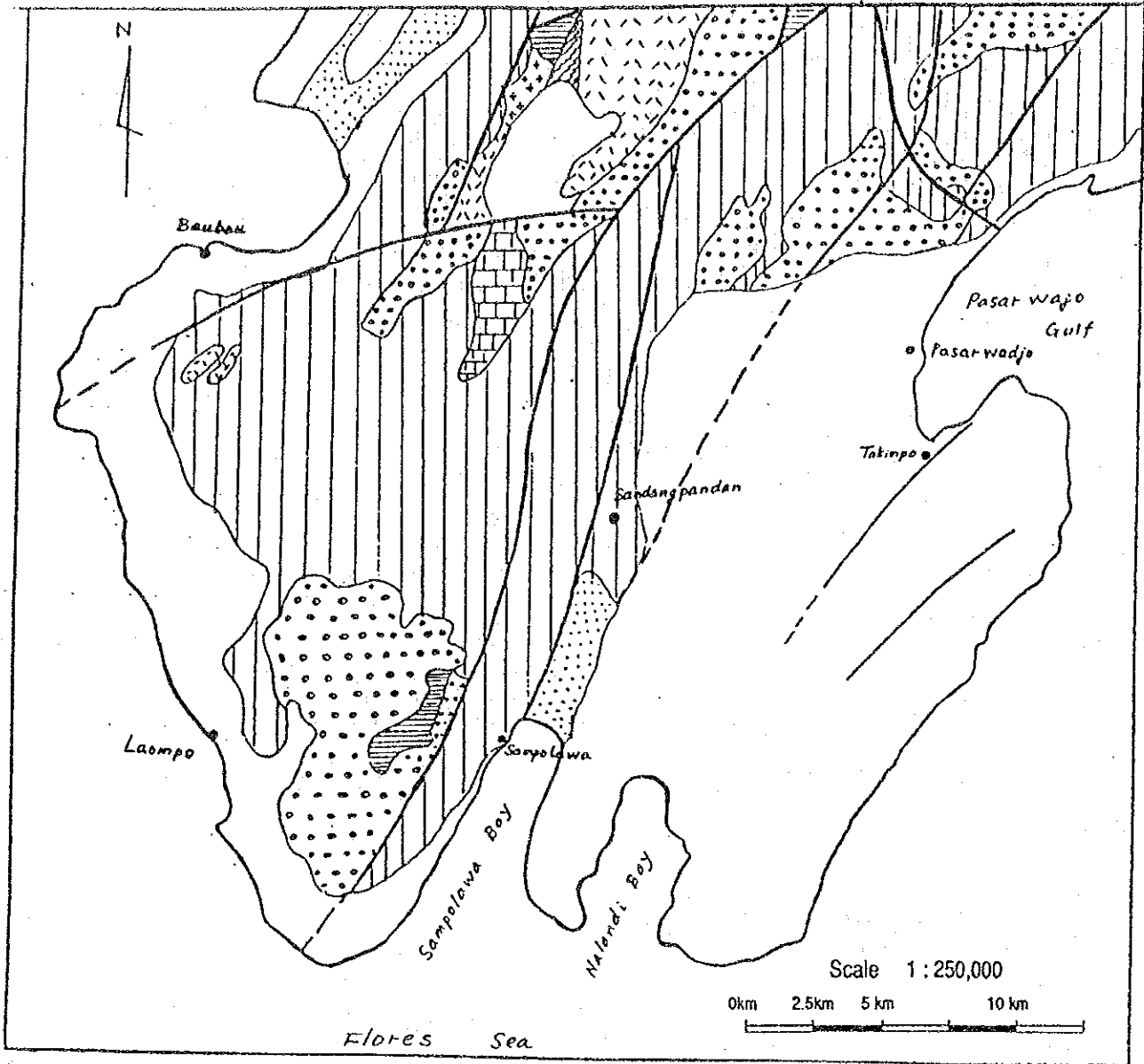
0km 2.5km 5 km 10 km



Legend

Quaternary	Alluvial		-	Composed mainly of unconsolidated sand, silt and clay
			-	Locally moderately productive aquifers, thin and transmissibility, water table generally near surface.
	Alluvial		-	Composed mainly of unconsolidated sand, silt and clay
			-	Poorly productive aquifers overlying extensive productive aquifers. Low thickness and transmissibility, and overlying reefal limestone.
	Reefal Limestone		-	Calcified to various degrees, sandy limestone and marl
			-	Moderately productive aquifers
			-	Groundwater flow is limited in fissures, fracture zones and solution channels. Well and spring discharge vary in an extremely wide range.
	Reefal Limestone		-	Calcified to various degrees, sandy limestone and marl.
			-	Highly productive aquifers
			-	Groundwater flow is limited in fissures, fracture zones and solution channels. The water table is generally deep. Well yield and spring discharge vary in an extremely wide range.

Geological Map of the southern part of Buton



(after "Hydrogeological Map of Indonesia," 1986)

Legend

Quaternary	Alluvial		composed mainly of unconsolidated sand, silt and clay Generally low to moderate permeability
	Reefal limestone		Calcified to various degrees, sandy limestone, and Moderate to high permeability
	Globigerina limestone		Composed mainly of globigerina limestones, marl and bedded limestone with asphaltite and calcilutite occasionally
Tertiary	Turbidites		Conglomerate, pebbly sandstone & turbidites consist of sandstone and siltstone very low to moderate permeability Moderate permeability
	Reefal limestone		Coral reef limestone Low to moderate permeability
Mesozoic	Terrigenous clastics		Flysch-like deposits consist of shale, sandstone and sandy limestone Generally low permeability
	Crystalline schist		Micaceous quartzite alternating with phyllite and shale, and various type of schist Generally low permeability
	Intermediate intrusive rocks		Medium-grained diorite Low permeability
	Ultramafic rocks		Peridotite, serpentinite and metabasalt Low permeability
			Fault

