The plant factor of the Tiger Hill Project without diversion (three units 28 MW each) would be 34 percent, for a power station with peak duration of 8 hours. If the amount of diversion from the Essequibo River were to be increased, Tiger Hill Power Station would serve as a base load station. In this case other power generating facilities will be necessary to supply peak load.

In determining the amount of diversion from the Essequibo River and the plant factors of power generating facilities, it will be necessary for through examinations to be made from the aspect of reservoir operation also.

9.4 OTHER HYDRO POWER DEVELOPMENT SITES

Potential hydro power development sites in Guyana are almost all concentrated in the basins of the Mazaruni River and the Essequibo River. There have been 59 hydro power sites, approximately 4,500 MW, investigated from the beginning of the century up to the present time. Representative among the projects are Upper Mazaruni (1,320 MW), Tiboku (40 MW), Amaila (103 MW), Kaiteur (216 MW), and Tumatumari (50 MW). (see Fig. 9-1).

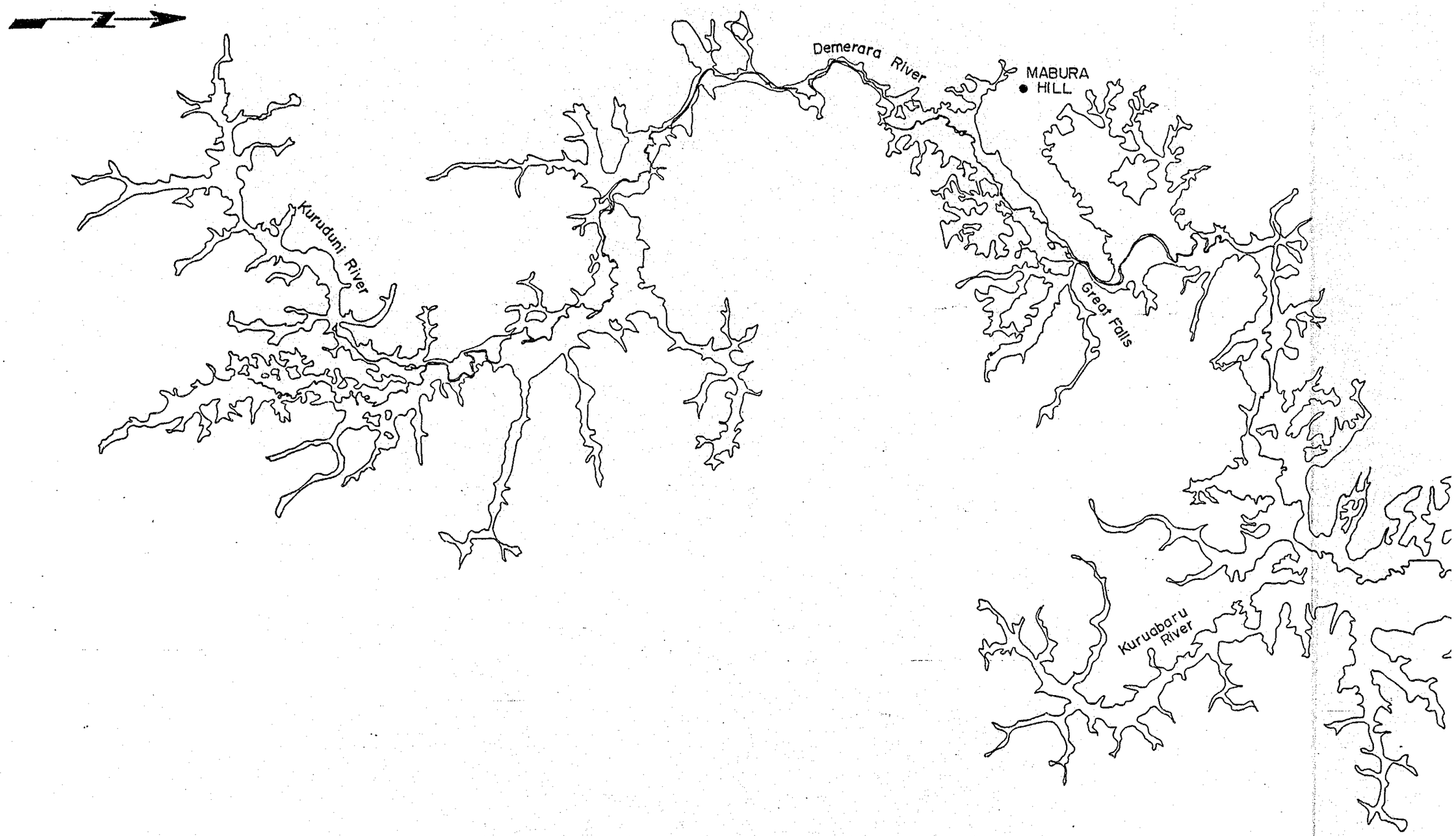
The Anarika site, which was investigated in the present study, is on the right bank of the Essequibo River on the Linden-Suribana Road 35 km from Linden toward Suribana, and surveys were made from 1977 to 1978 for the development of this site. The flow conditions at the Anarika site are given below and a mini hydro plant was planned at that time.

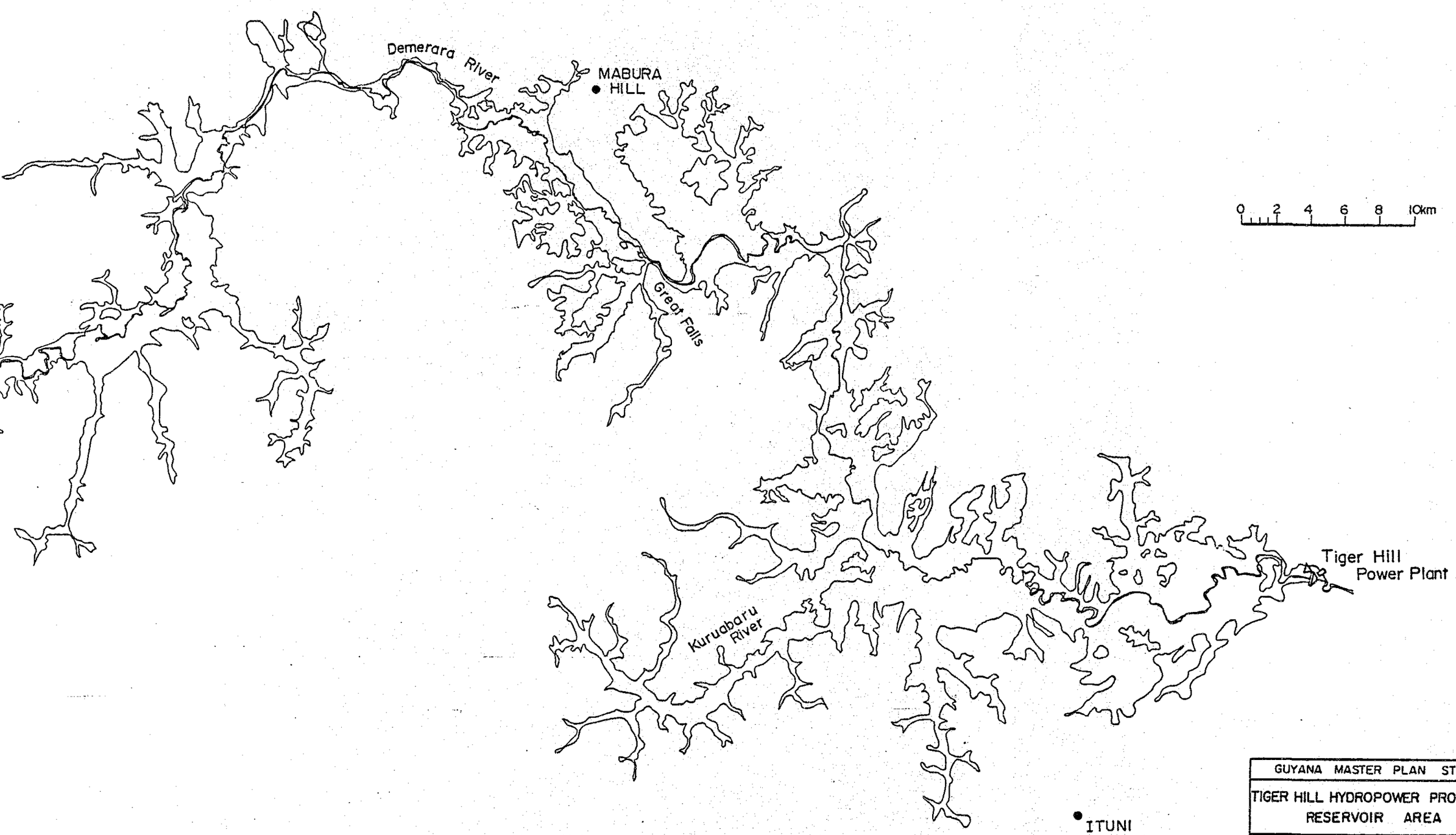
Maximum runoff	22.5 m^3/sec
Minimum run off	2.1 m^3/sec
Average runoff	5.7 m^3/sec

There is a sawmill in the vicinity of the Anarika site at present, where approximately 100 labourers are working. This sawmill has its own power generation facility and electricity is being supplied to the labourers' quarters also.

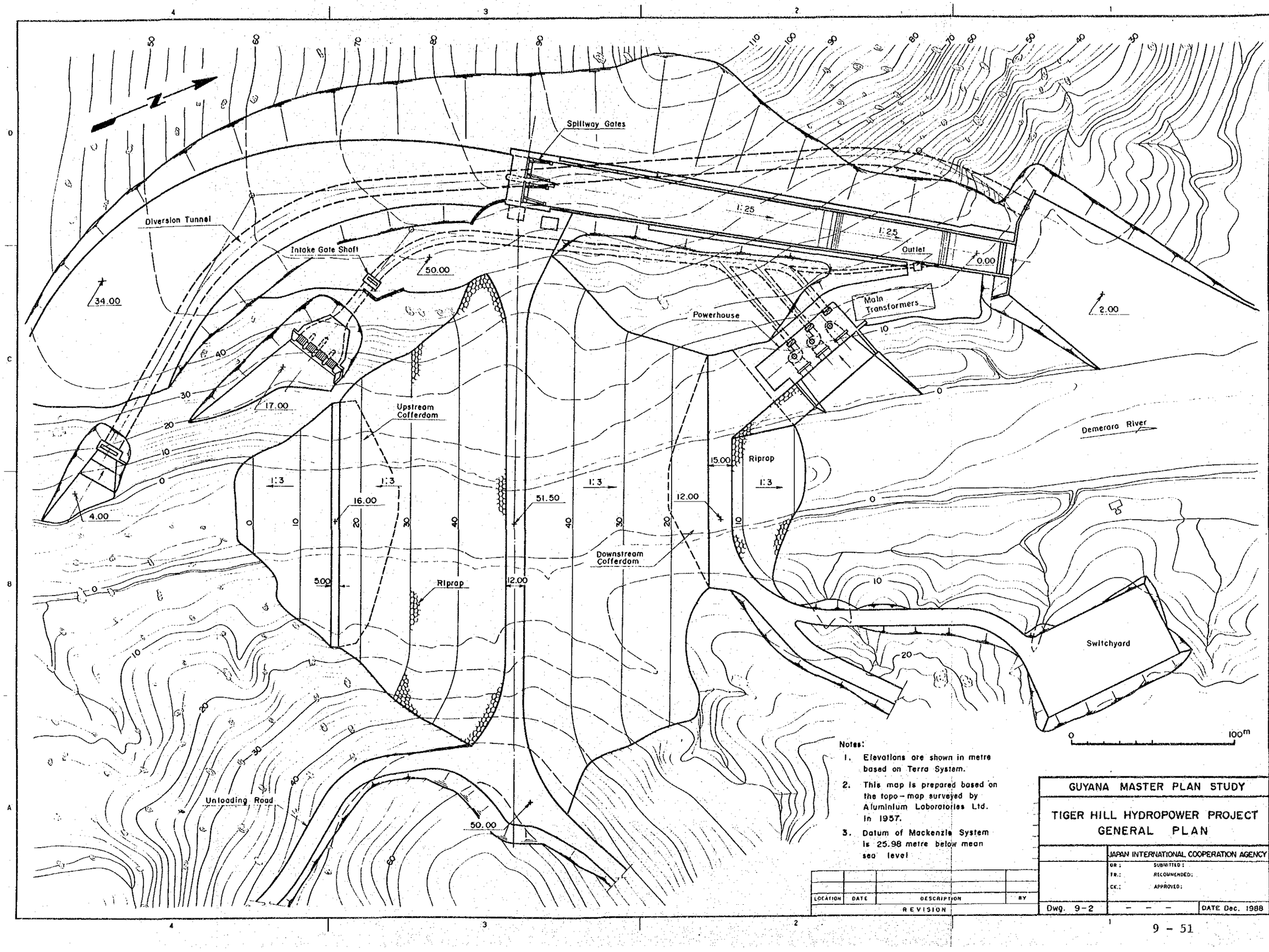
Anarika site can be developed into a 100 to 200 kW mini hydroelectric power station.

LIST OF DRAWINGS


N
Demerara River
MABURA HILL
Great Falls
Kuruduni River
Kuruabaru River



GUYANA MASTER PLAN STUDY		
TIGER HILL HYDROPOWER PROJECT RESERVOIR AREA		
	JAPAN INTERNATIONAL COOPERATION AGENCY	
	D.R.; SUBMITTED; T.R.; RECOMMENDED; C.R.; APPROVED;	
Dwg. 9-1	- - -	Jan. 1989



Notes:

1. Elevations are shown in metre based on Terra System.
2. This map is prepared based on the topo-map surveyed by Aluminium Laboratories Ltd. in 1957.
3. Datum of Mackenzie System is 25.98 metre below mean sea level

LOCATION	DATE	DESCRIPTION	BY

REVISION

GUYANA MASTER PLAN STUDY

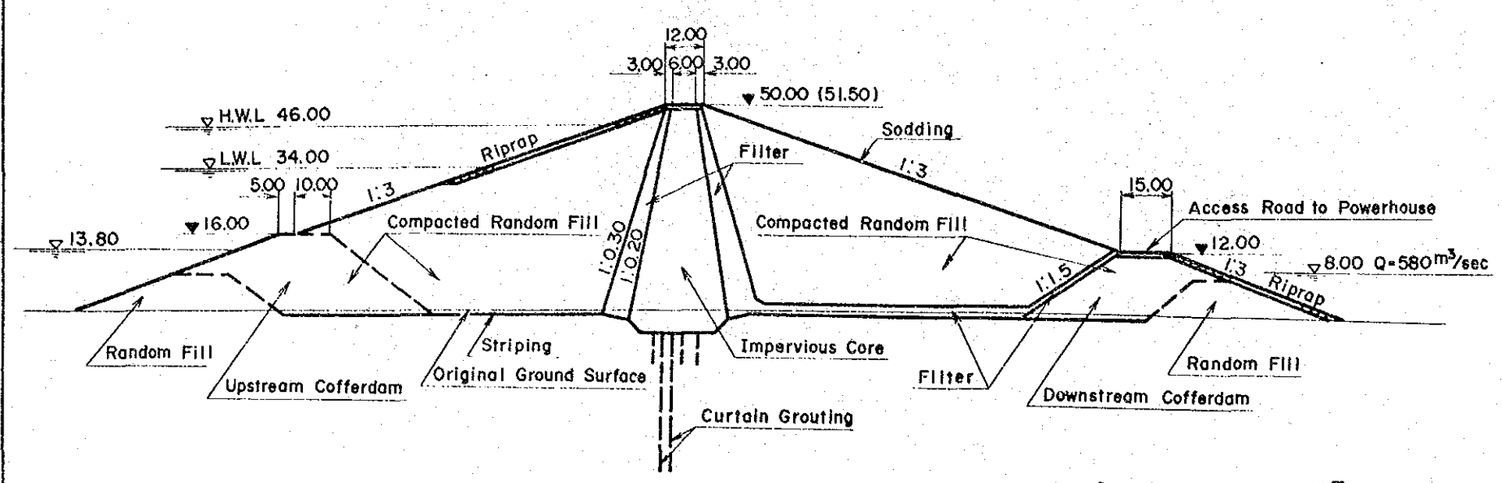
TIGER HILL HYDROPOWER PROJECT GENERAL PLAN

JAPAN INTERNATIONAL COOPERATION AGENCY

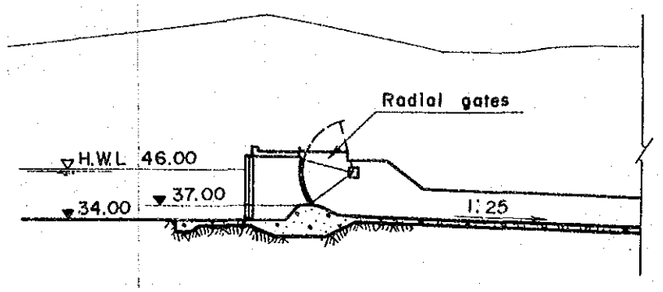
DR.: SUBMITTED:
FR.: RECOMMENDED:
CK.: APPROVED:

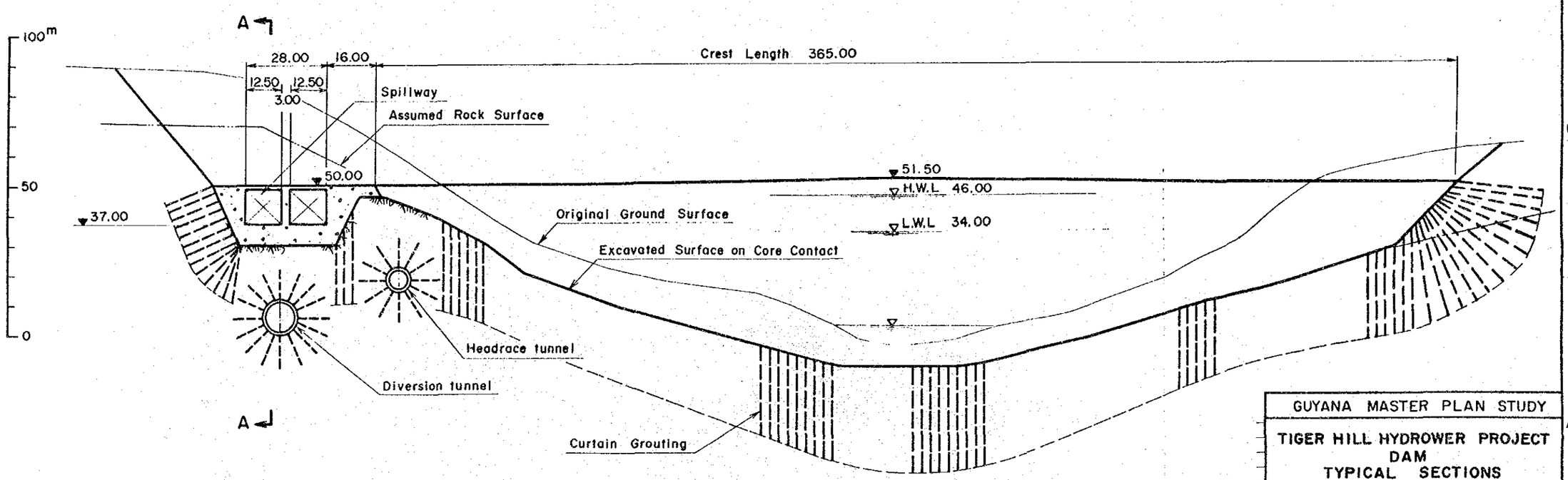
Dwg. 9-2 | - - - | DATE Dec. 1988

TYPICAL SECTIONS



A-A SECTION





LOCATION	DATE	DESCRIPTION	BY
		REVISION	

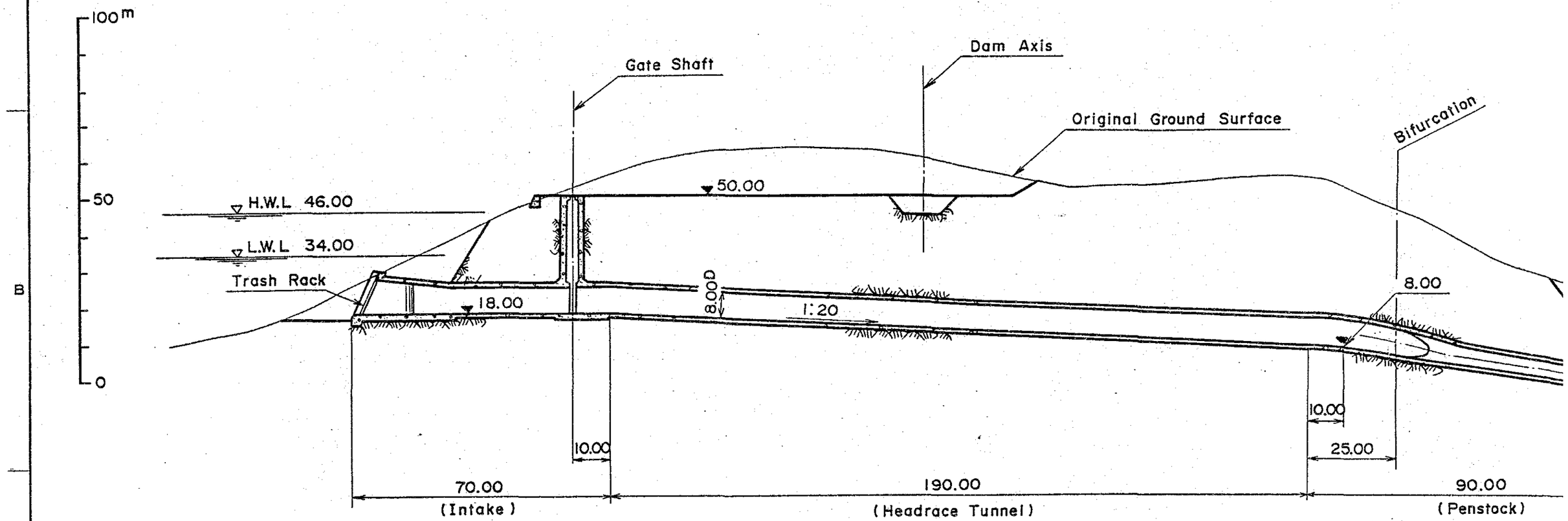
GUYANA MASTER PLAN STUDY

TIGER HILL HYDROWER PROJECT
DAM
TYPICAL SECTIONS

JAPAN INTERNATIONAL COOPERATION AGENCY

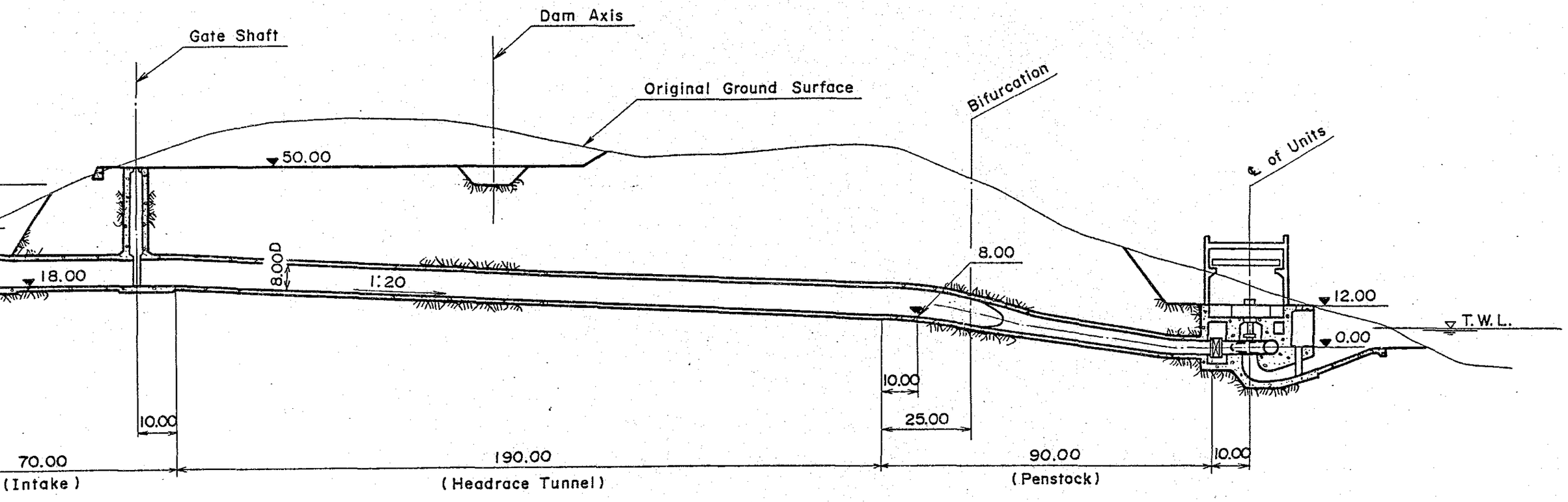
D.R. SUBMITTED:
T.R. RECOMMENDED:
C.K. APPROVED.

Dwg. 9-3 — — — Jan. 1989



LOCATION	DATE	DESCRIPTION

REVISION



0 50m

LOCATION	DATE	DESCRIPTION	BY

REVISION

GUYANA MASTER PLAN STUDY

TIGER HILL HYDROPOWER PROJECT

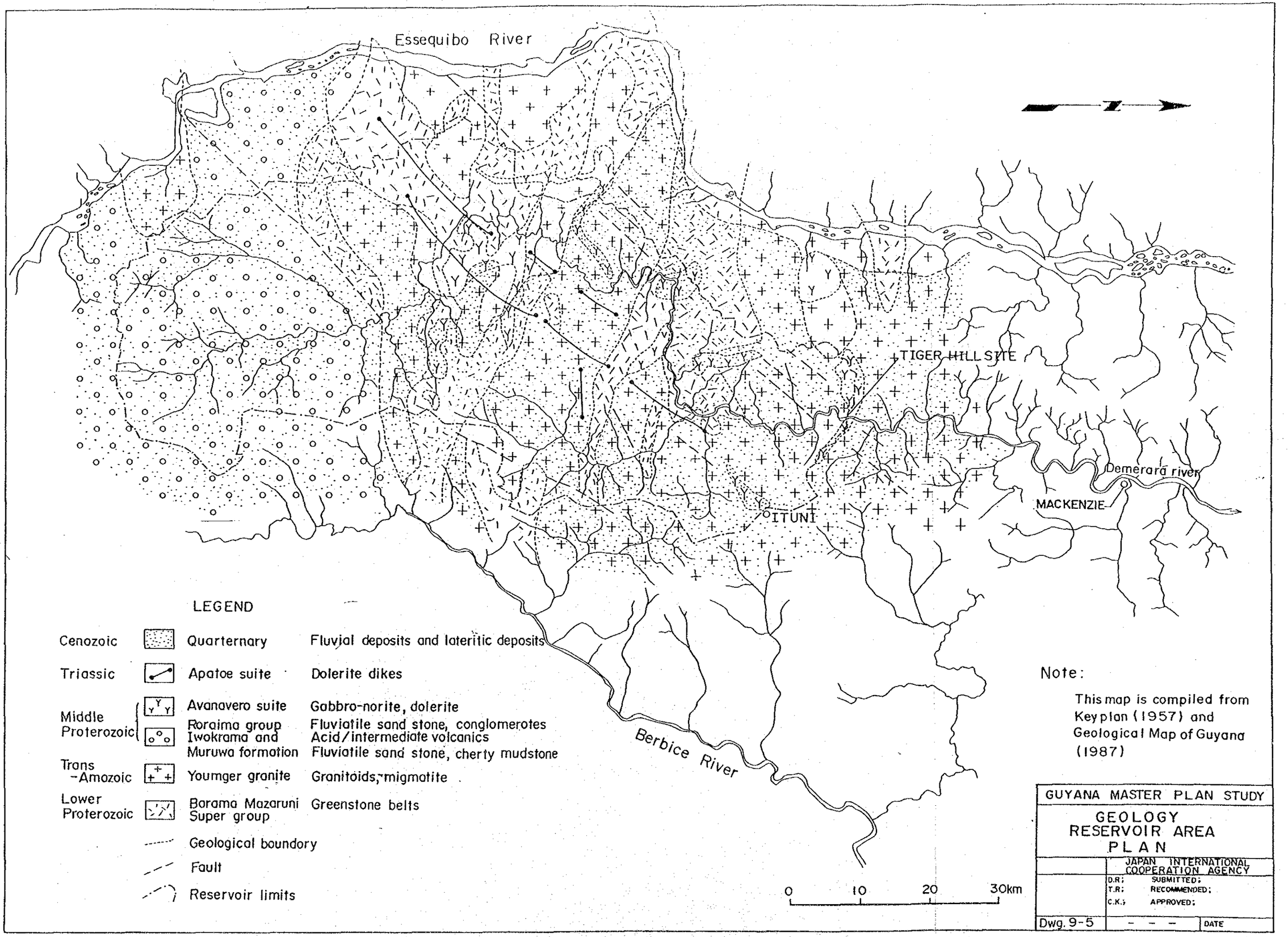
PROFILE OF WATERWAY

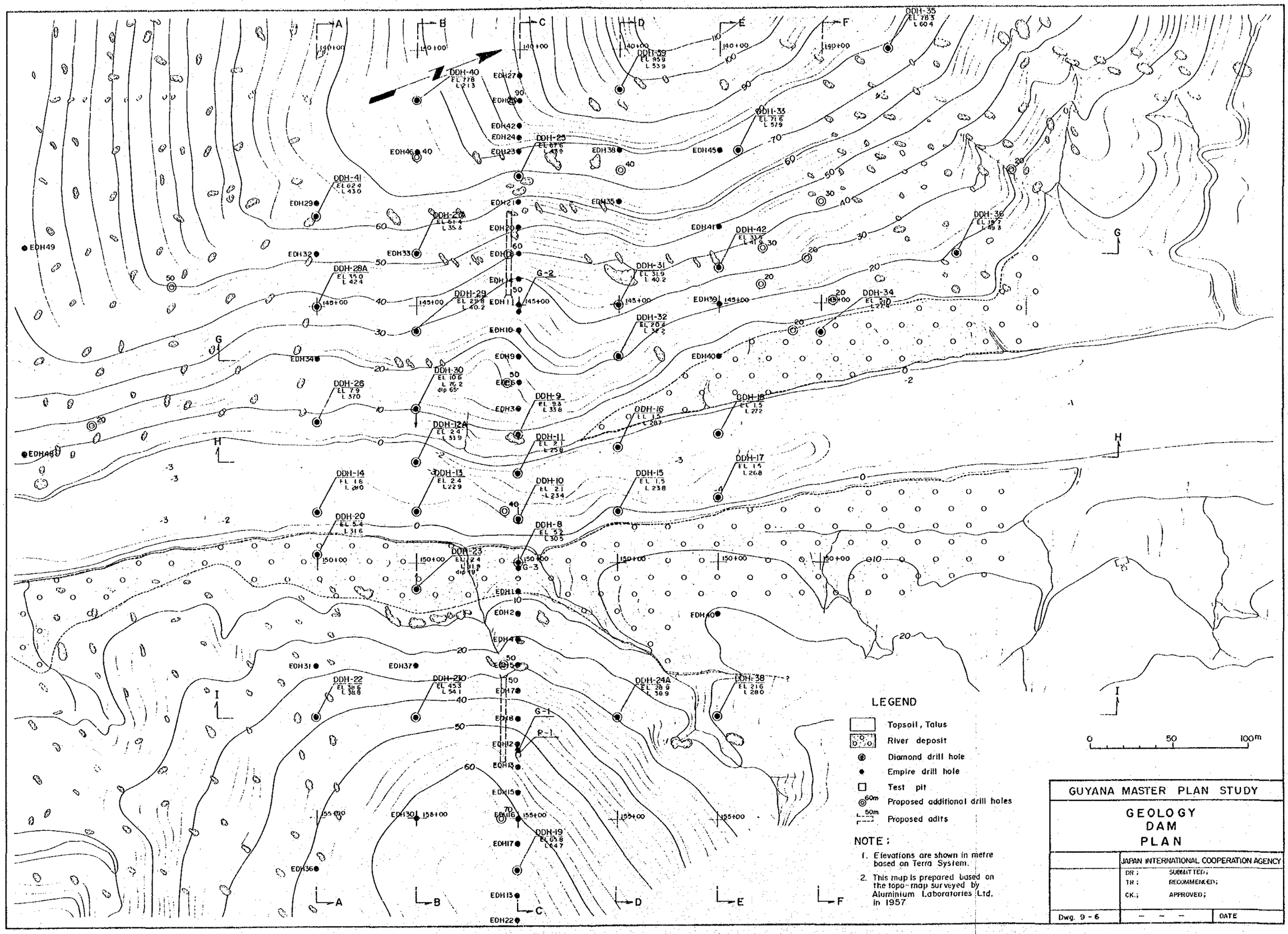
JAPAN INTERNATIONAL COOPERATION AGENCY

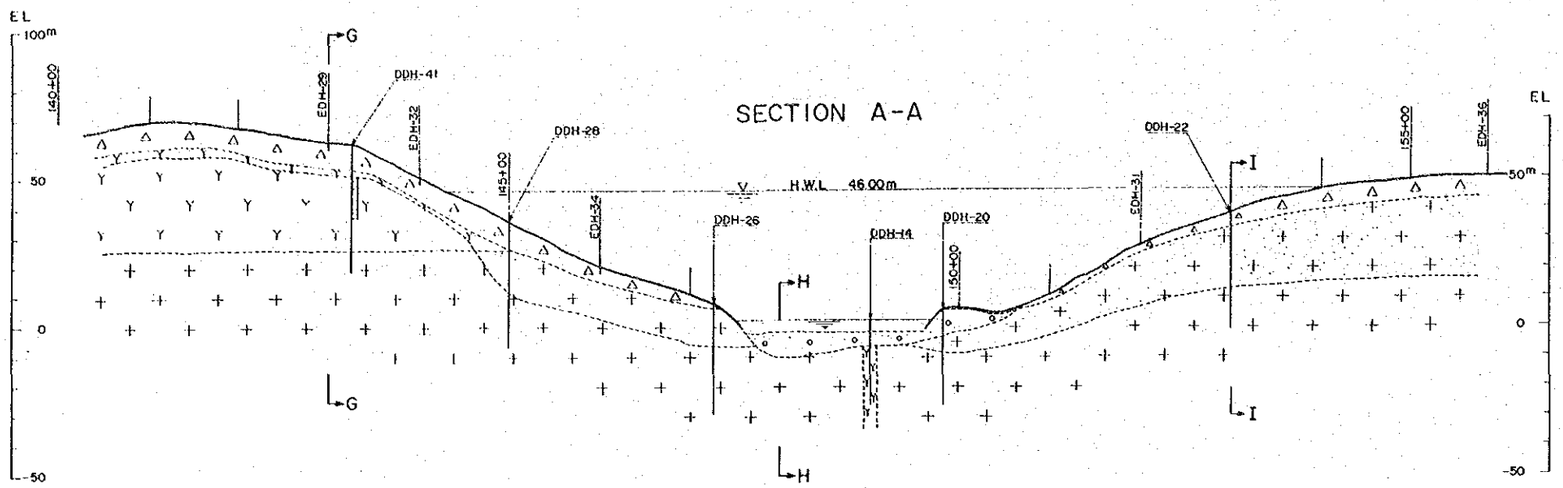
D.R.: SUBMITTED:
T.R.: RECOMMENDED:
C.K.: APPROVED:

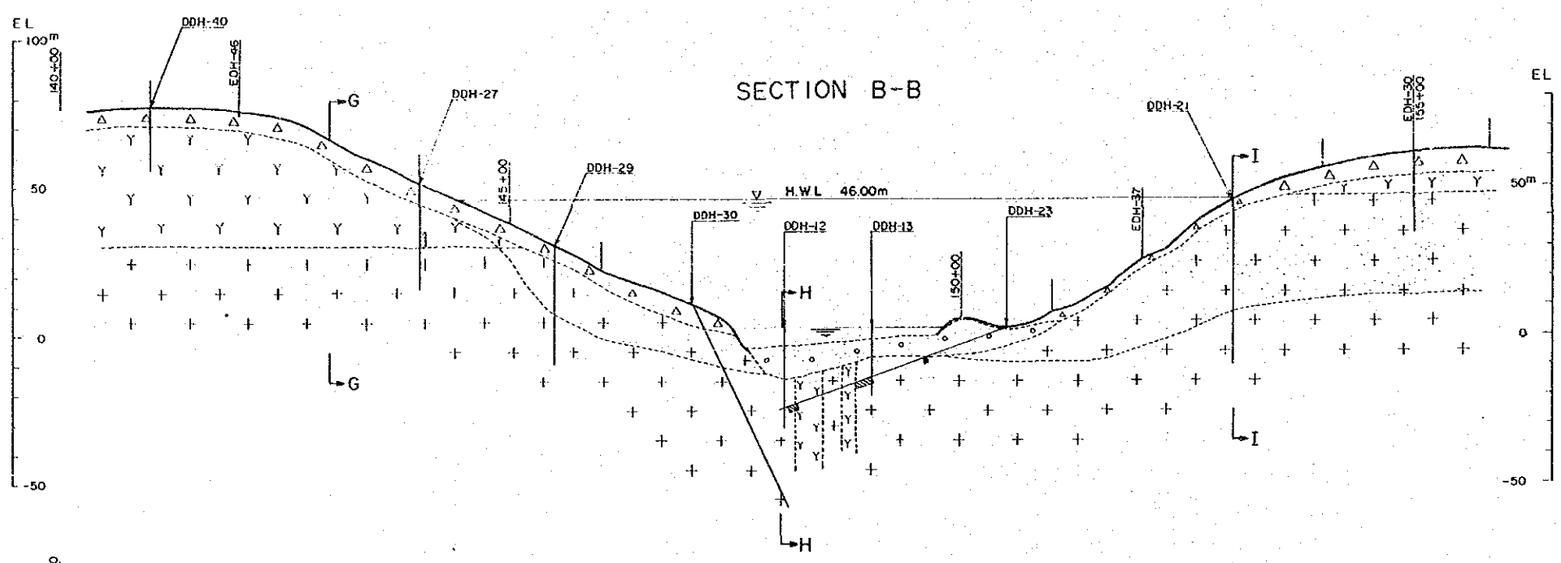
Dwg. 9-4 | — — — | Jan. 1989

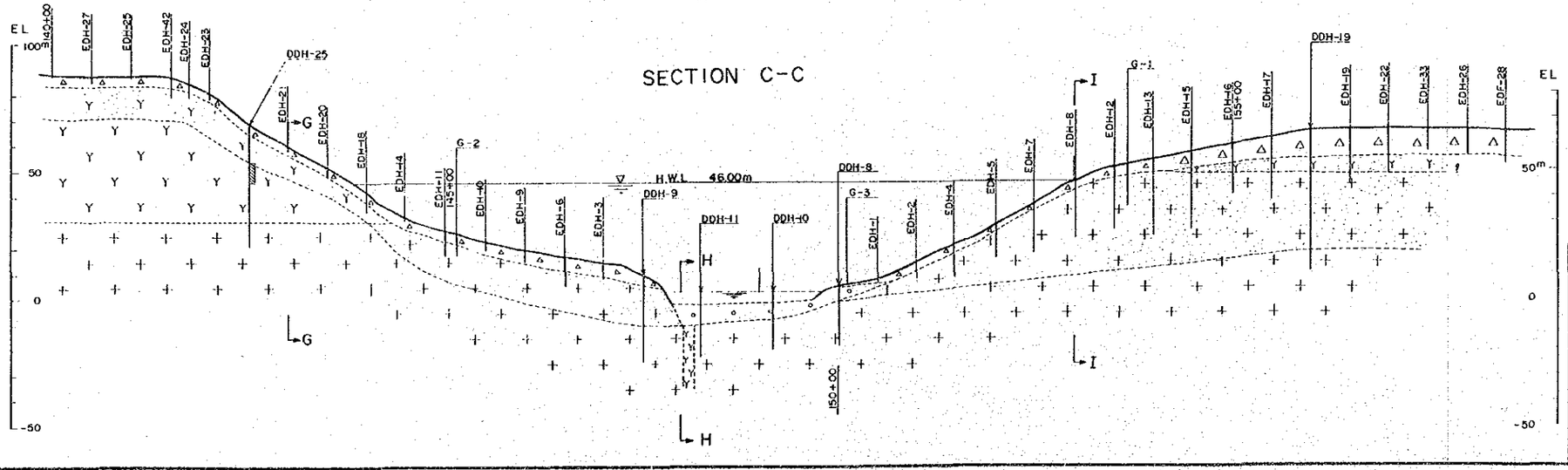
SHEET NO. 9 - 55


Essequibo River
TIGER HILL SITE
Demerara river
MACKENZIE
ITUNI
Berbice River
LEGEND
Cenozoic
Quarternary
Fluvial deposits and lateritic deposits
Triassic
Apatoe suite
Dolerite dikes
Middle Proterozoic
Avanavero suite
Gabbro-norite, dolerite
Roraima group
Iwokrama and
Muruwa formation
Fluviatile sand stone, conglomerotes
Acid/intermediate volcanics
Fluviatile sand stone, cherty mudstone
Trans -Amozoic
Youmger granite
Granitoids,-migmatite
Lower Proterozoic
Barama Mazaruni Super group
Greenstone belts
Geological boundory
Fault
Reservoir limits
0
10
20
30km
Note:
This map is compiled from Keyplan (1957) and Geological Map of Guyana (1987)
GUYANA MASTER PLAN STUDY
GEOLOGY
RESERVOIR AREA
PLAN
JAPAN INTERNATIONAL COOPERATION AGENCY
D.R.; SUBMITTED;
T.R.; RECOMMENDED;
C.K.; APPROVED;
Dwg. 9-5
- - -
DATE


DDH-35 EL 78.5 L 60.4
DDH-40 EL 77.8 L 21.3
DDH-39 EL 95.9 L 53.9
DDH-33 EL 71.6 L 57.9
DDH-25 EL 87.6 L 47.9
DDH-41 EL 62.4 L 43.0
DDH-28A EL 55.0 L 42.4
DDH-29 EL 29.8 L 40.2
DDH-31 EL 31.9 L 40.2
DDH-42 EL 31.5 L 41.9
DDH-36 EL 19.7 L 49.8
DDH-34 EL 5.0 L 27.4
DDH-32 EL 20.4 L 34.2
DDH-30 EL 10.5 L 76.2 dip 65°
DDH-26 EL 7.9 L 37.0
DDH-9 EL 9.8 L 33.8
DDH-12A EL 2.4 L 33.9
DDH-11 EL 2.1 L 25.8
DDH-16 EL 1.5 L 20.7
DDH-18 EL 1.5 L 27.2
DDH-14 EL 1.5 L 24.0
DDH-13 EL 2.4 L 22.9
DDH-10 EL 2.1 L 23.4
DDH-15 EL 1.5 L 23.8
DDH-17 EL 1.5 L 26.8
DDH-20 EL 5.4 L 31.6
DDH-23 EL 2.4 L 31.9 dip 19°
DDH-8 EL 3.2 L 30.5
DDH-22 EL 39.6 L 38.8
DDH-21 EL 45.3 L 54.1
DDH-24A EL 28.9 L 38.9
DDH-38 EL 21.6 L 28.0
DDH-19 EL 0.8 L 24.7
EDH1 EDH2 EDH3 EDH4 EDH5 EDH6 EDH7 EDH8 EDH9 EDH10 EDH11 EDH12 EDH13 EDH15 EDH16 EDH17 EDH18 EDH19 EDH20 EDH21 EDH22 EDH23 EDH24 EDH27 EDH29 EDH30 EDH31 EDH32 EDH33 EDH34 EDH35 EDH36 EDH37 EDH38 EDH39 EDH40 EDH41 EDH42 EDH45 EDH46 EDH48 EDH49
G-1 G-2 G-3 P-1
A B C D E F G H I
140+00 145+00 150+00 155+00
LEGEND
Topsoil, Talus
River deposit
Diamond drill hole
Empire drill hole
Test pit
60m Proposed additional drill holes
60m Proposed adits
NOTE:
1. Elevations are shown in metre based on Terra System.
2. This map is prepared based on the topo-map surveyed by Aluminium Laboratories Ltd. in 1957
0 50 100m
GUYANA MASTER PLAN STUDY
GEOLOGY
DAM
PLAN
JAPAN INTERNATIONAL COOPERATION AGENCY
DR.; SUBMITTED;
TR.; RECOMMENDED;
CK.; APPROVED;
Dwg. 9 - 6
DATE







LEGEND

Talus	Top soil, Laterite and Clay
River deposit	Silt, Sand with some gravels
Weathered Gabbro	Sandy Clay with boulders
Gabbro	
Weathered Granite	Clayey silt at the surface mainly sand with gravels
Granite	
Geologic boundary	
DDH-10 — Diamond drill hole; More jointed part	
EDH-9 — Empire drill hole	
G-1 — Empire drill hole	

0 50 100m

GUYANA MASTER PLAN STUDY

GEOLOGY
DAM
PROFILE A-A, B-B and C-C

JAPAN INTERNATIONAL COOPERATION AGENCY

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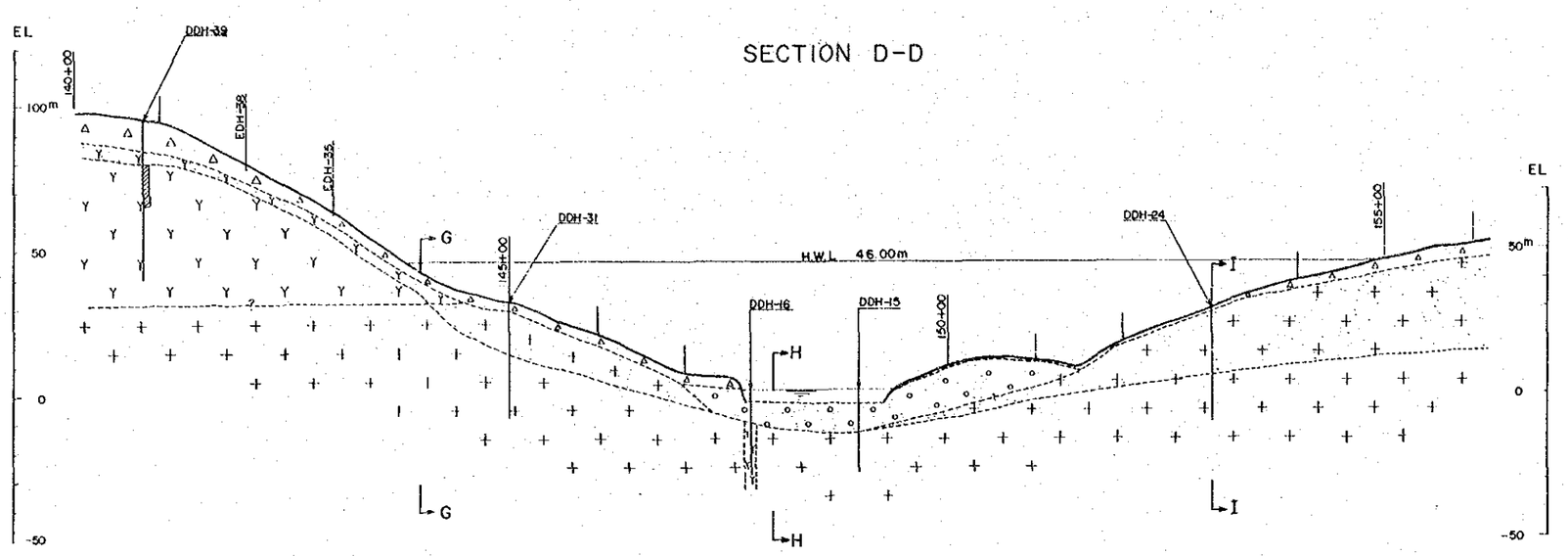
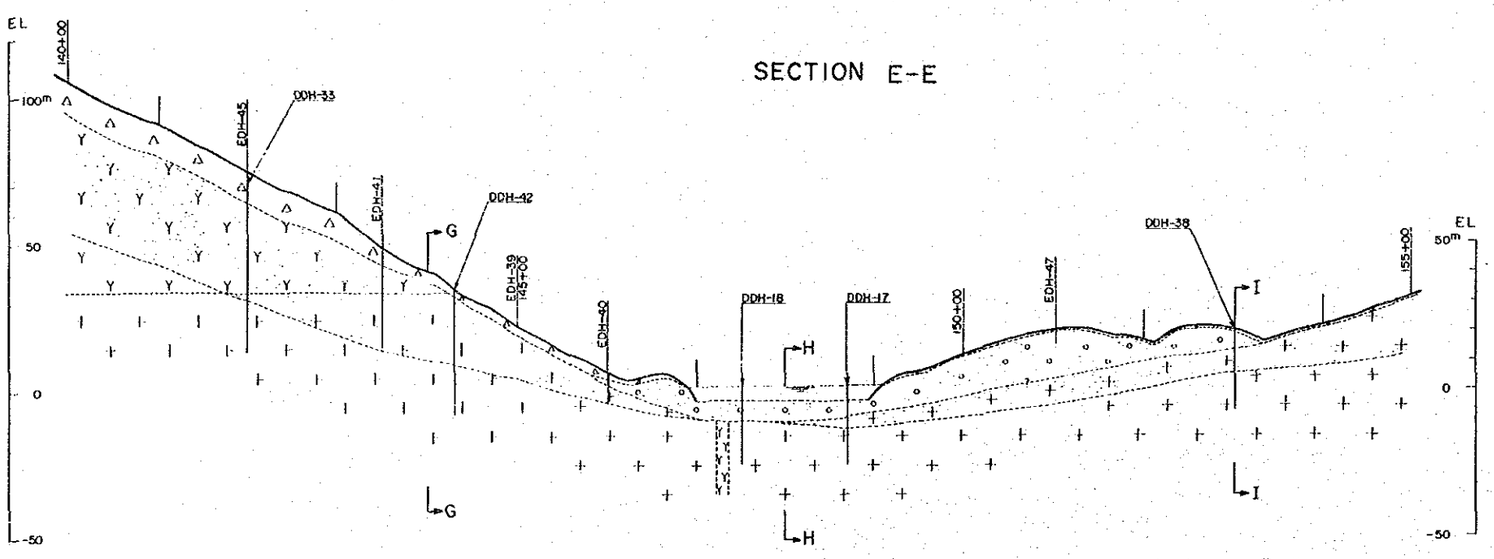
CK.; APPROVED;

Dwg. 9 - 7 | - - - | DATE

SECTION D-D



SECTION E-E



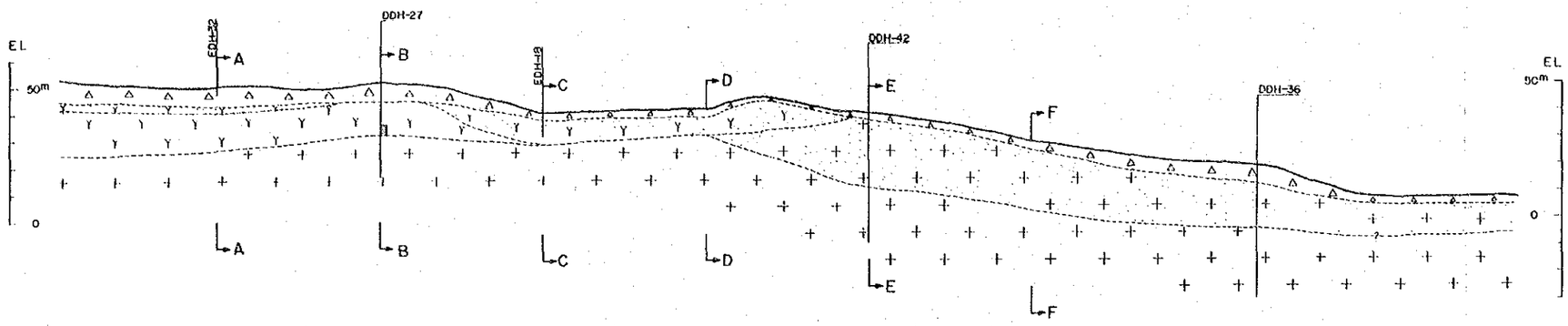
LEGEND

Talus	Top soil, Laterite and Clay
River deposit	Silt, Sand with some gravels
Weathered Gabbro	Sandy Clay with boulders
Gabbro	
Weathered Granite	Clayey silt at the surface mainly sand with gravels
Granite	
Geologic boundary	
DDH-10 Diamond drillhole	More jointed part
EDH-8 Empire drillhole	
G-I Empire drillhole	

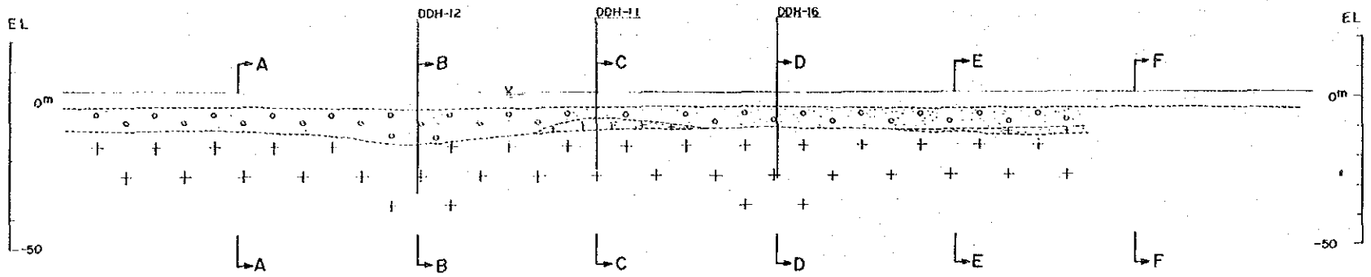
0 50 100m

GUYANA MASTER PLAN STUDY		
GEOLOGY DAM PROFILE D-D and E-E		
	JAPAN INTERNATIONAL COOPERATION AGENCY	
	DR.; SUBMITTED; TR.; RECOMMENDED; CK.; APPROVED;	
Dwg. 9-8	- - -	DATE

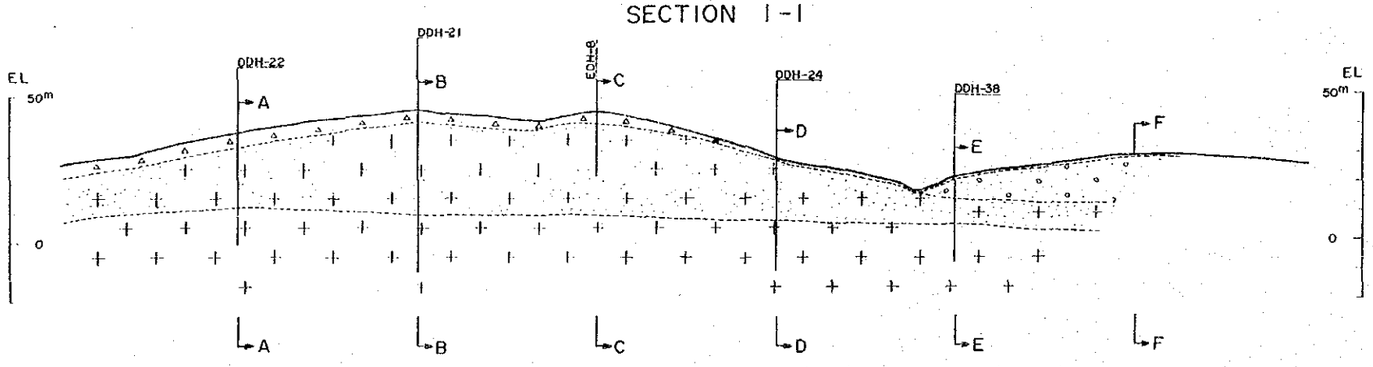
SECTION G-G



SECTION H-H



SECTION I-I



LEGEND

	Talus	Top soil, Laterite and Clay
	River deposit	Silt, Sand with some gravels
Y Y Y	Weathered Gabbro	Sandy Clay with boulders
Y Y Y	Gabbro	
+ + +	Weathered Granite	Clayey silt at the surface mainly sand with gravels
+ + +	Granite	
	Geologic boundary	
DDH-10	Diamond drillhole	
	More jointed part	
EDH-8	Empire drillhole	
G-1	Empire drillhole	

0 50 100m

GUYANA MASTER PLAN STUDY

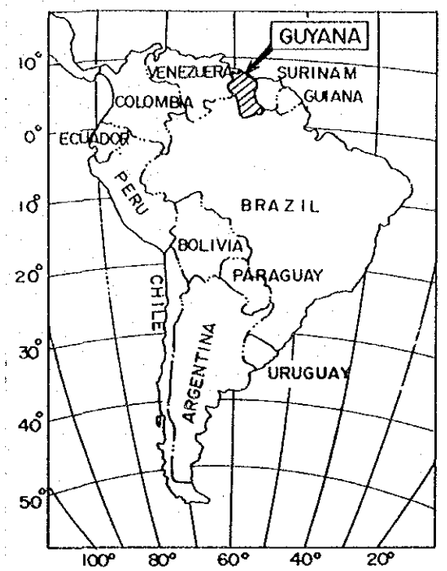
GEOLOGY
DAM
PROFILE G-G,H-H and I-I

JAPAN INTERNATIONAL COOPERATION AGENCY

DR.: SUBMITTED:
TR.: RECOMMENDED:
CK.: APPROVED:

Dwg. 9 - 9 | - - - | DATE

LIST OF FIGURES



VENEZUELA

GUYANA

ATLANTIC OCEAN

Cuyuni River

Mazaruni River

TIBOKU

Puruni River

Dam

Power Plant

UPPER MAZARUNI

Essequibo River

Bartica

Georgetown

Timehri

ANARIKA

Demerara River

Linden

New Amsterdam

Leeds

Corriverton

TIGER HILL

Dam

Berbice River

Courantyne River

SURINAM

Kurlbrong River

AMAILA

Dam

TUMATUMARI

Potaro

Dam

Dam

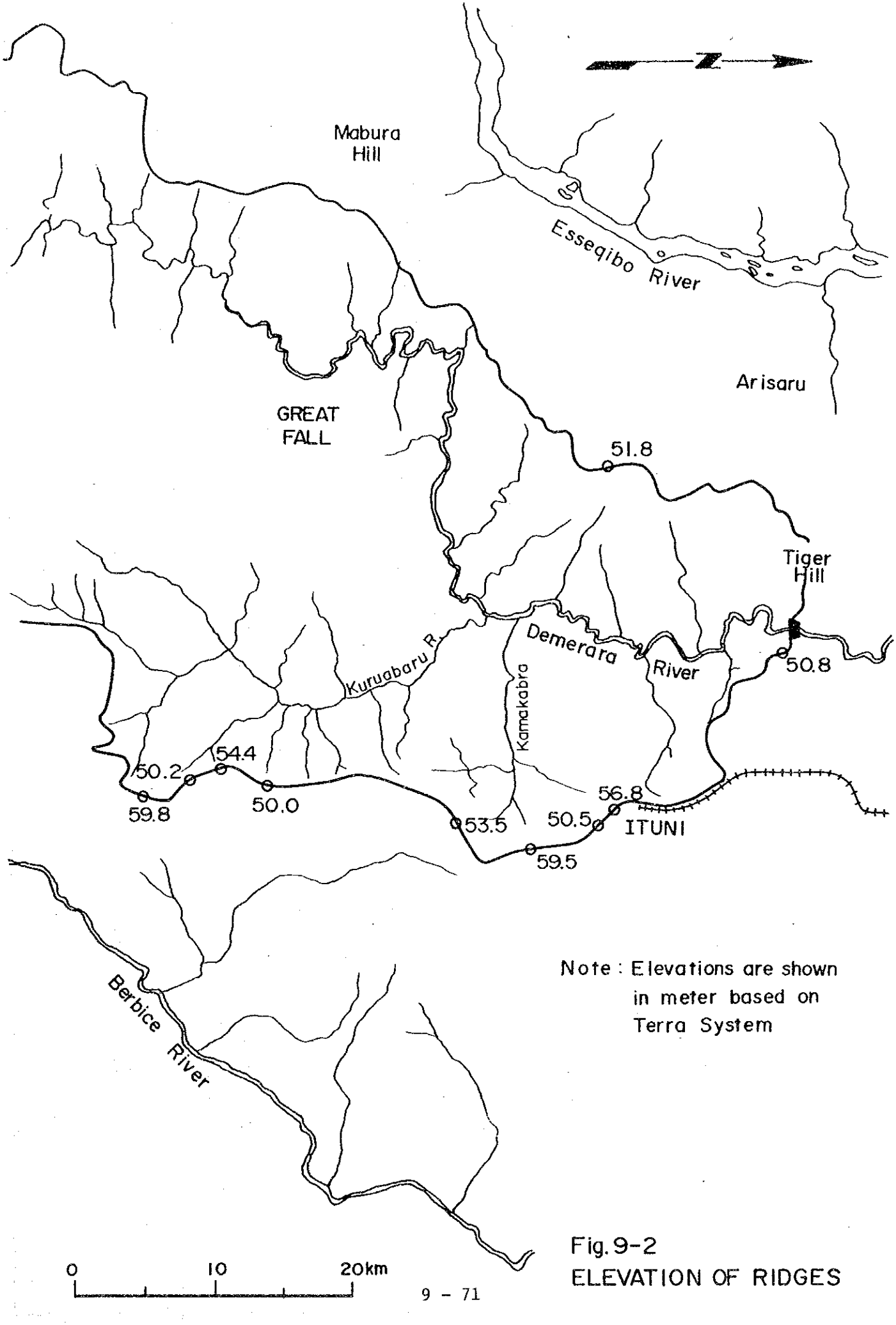
KAIETEUR

Other Potential Sites	Installed Capacity
Upper Mazaruni	1320 MW
Tiboku	40 MW
Amaila	103 MW
Kaieteur	216 MW
Tumatumari	50 MW
Anarika	0.1 MW

N

0 100km

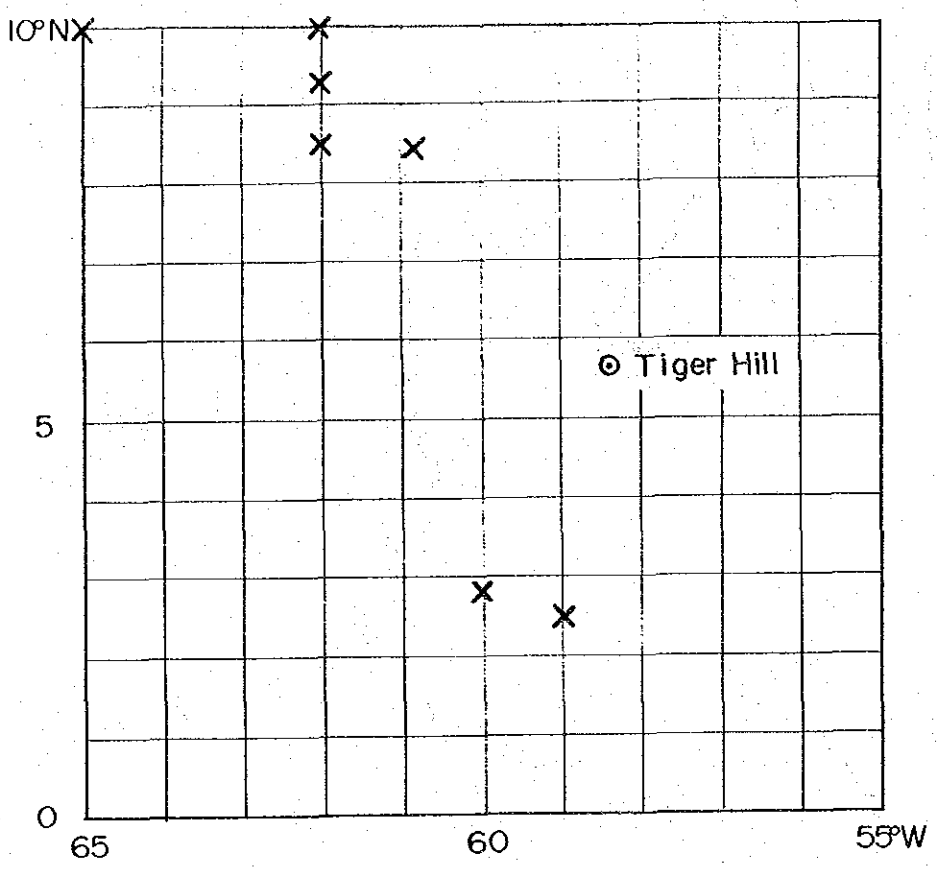
Fig.9-1 KEY AND LOCATION MAP



Note : Elevations are shown in meter based on Terra System

Fig. 9-2
ELEVATION OF RIDGES

Fig. 9-3 EARTHQUAKES Since 1940



X ; Location of EARTHQUAKES

Date	Epicenter	Focal depth km	Magnitude M	Acceleration at epicenter cm/sec²	Distance from Tiger Hill km	Acceleration at Tiger Hill cm/sec²
27 / 2 / 40	8.5N, 62.0W	about 30	6.0	80	500	1.4
6 / 5 / 42	10.0N, 65.0W	about 30	6.0	80	870	0.4
23 / 12 / 45	10.0N, 62.0W	100	6.5	50	620	3.1
24 / 1 / 63	8.4N, 60.9W	52	5.3	20	400	1.1
19 / 6 / 64	2.5N, 58.9W	65	5.3 – 5.8	40	360	2.8
10 / 7 / 64	9.2N, 62.0W	51	5.3 – 5.8	40	570	1.1
15 / 8 / 65	2.7N, 60.1W	33	5.3 – 5.8	60	370	1.6

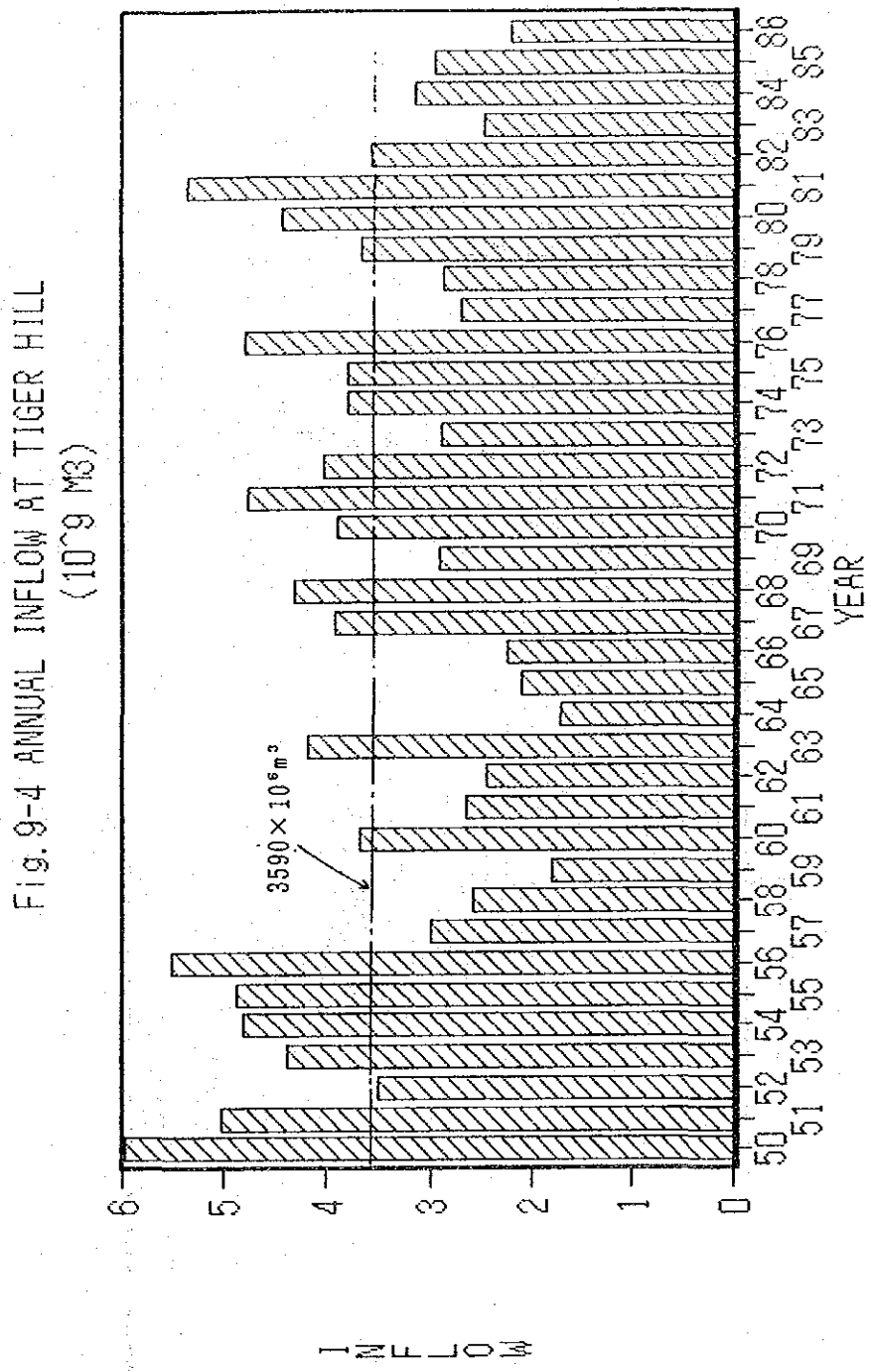


Fig.9-4 ANNUAL INFLOW AT TIGER HILL
(10^9 M3)
3590×10⁶m³
INFLOW
YEAR
0
1
2
3
4
5
6
50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86

Fig.9-5 TYPICAL DAILY DISCHARGE
AT TIGER HILL (m3/sec)

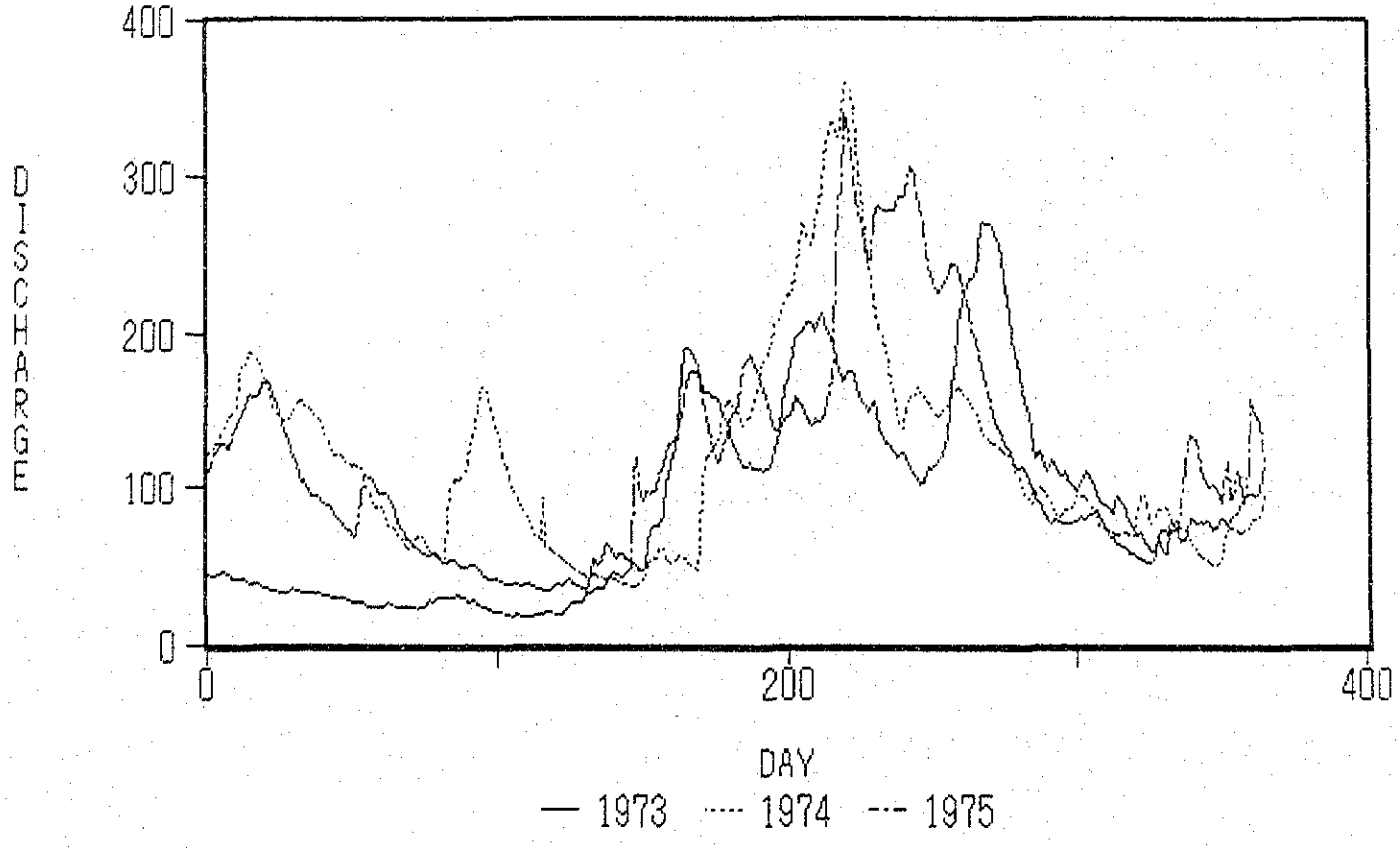


Fig. 9-6 FLOW DULATION CURVE
in 1973, 1974 and 1975 (m3/sec)

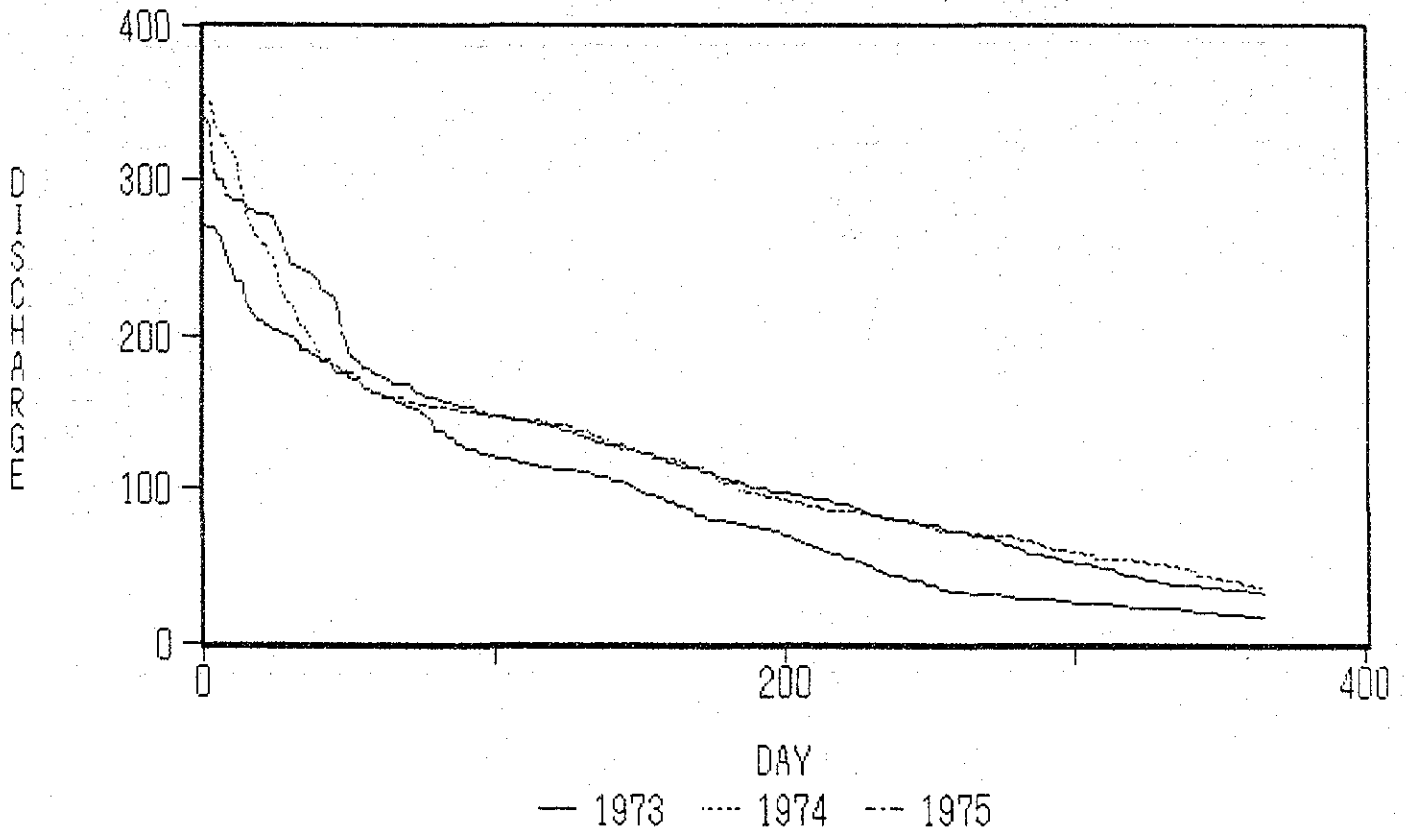


Fig.9-7 MASS CURVE AT TIGER HILL
1950 - 1986 (m3/sec·day)

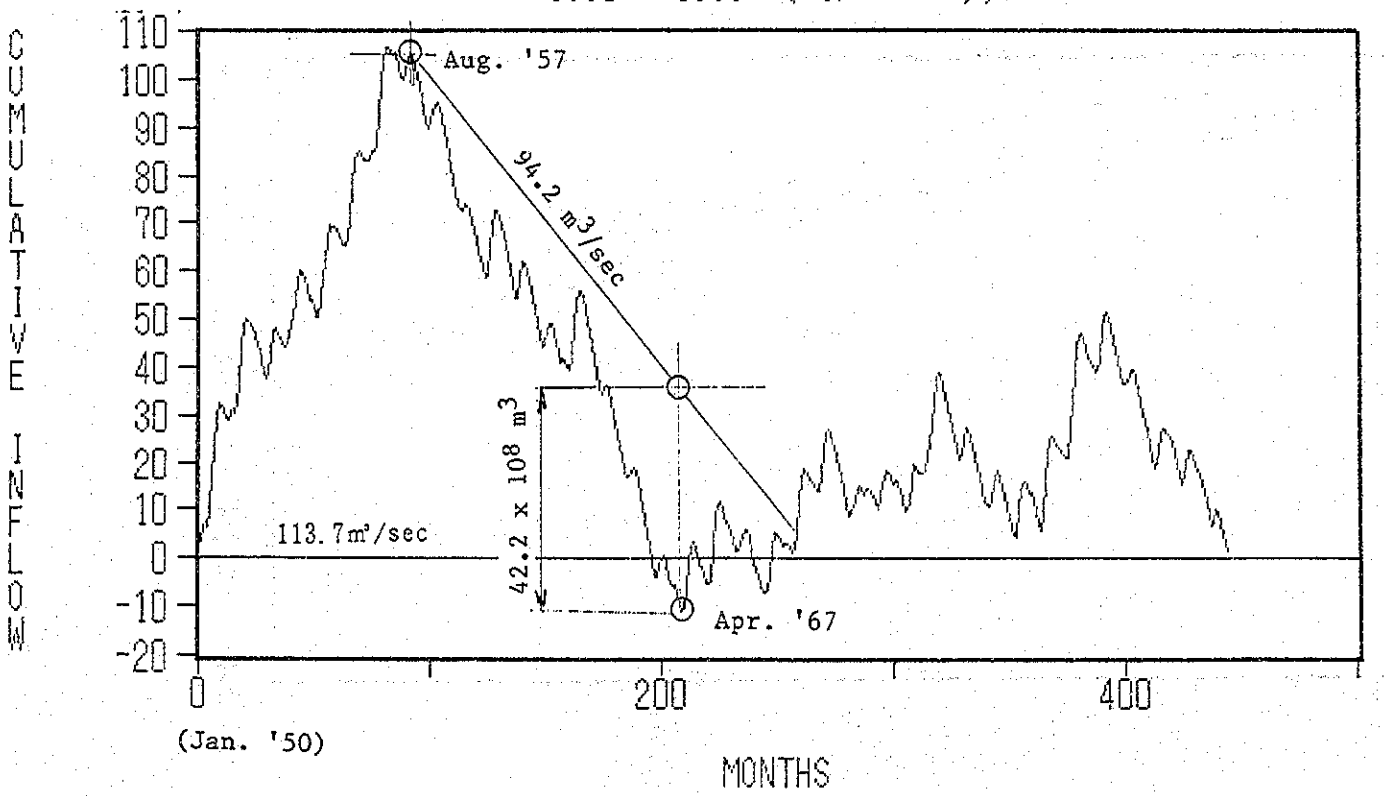


Fig. 9-8 STORAGE CAPACITY AT TIGER HILL

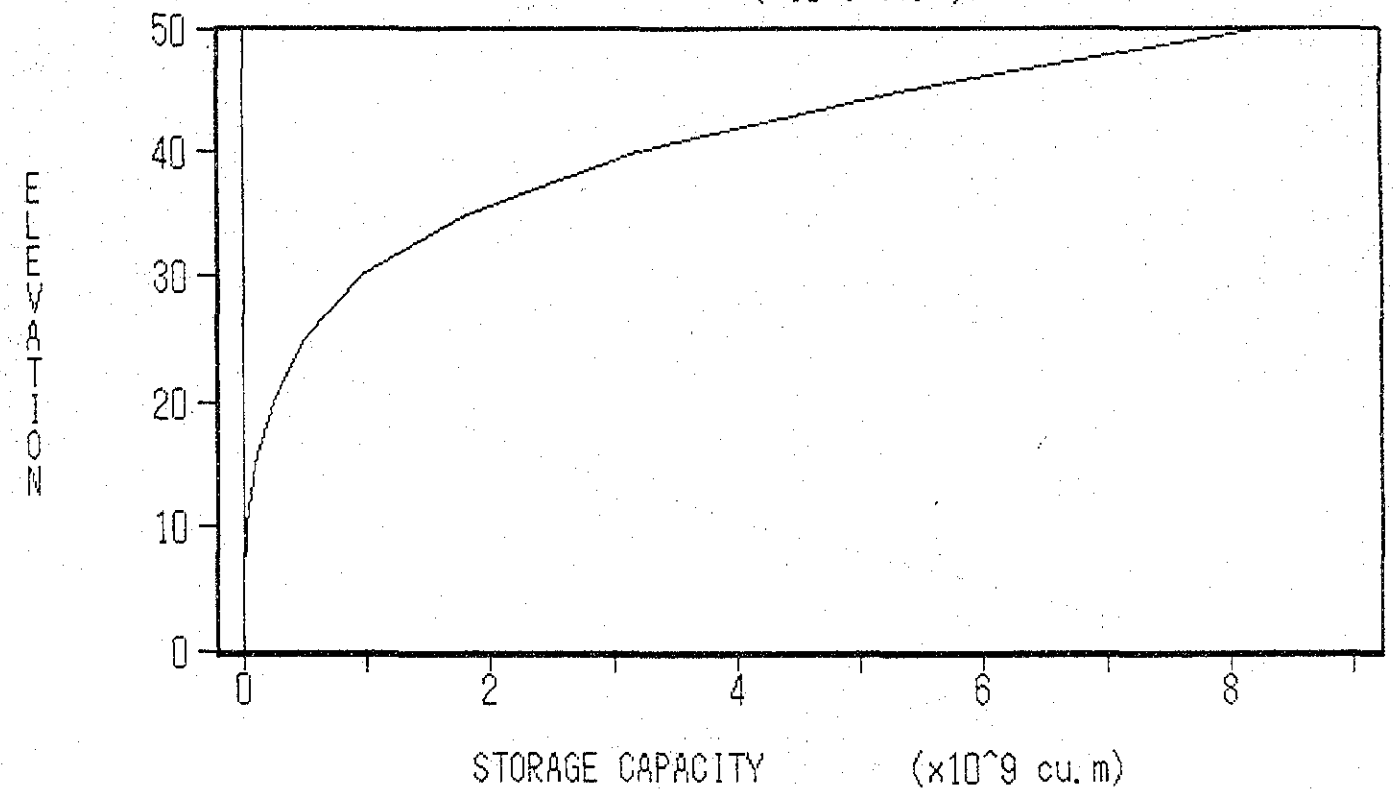


Fig.9-9 RESERVOIR SURFASE AREA
AT TIGER HILL SITE (sq.km)

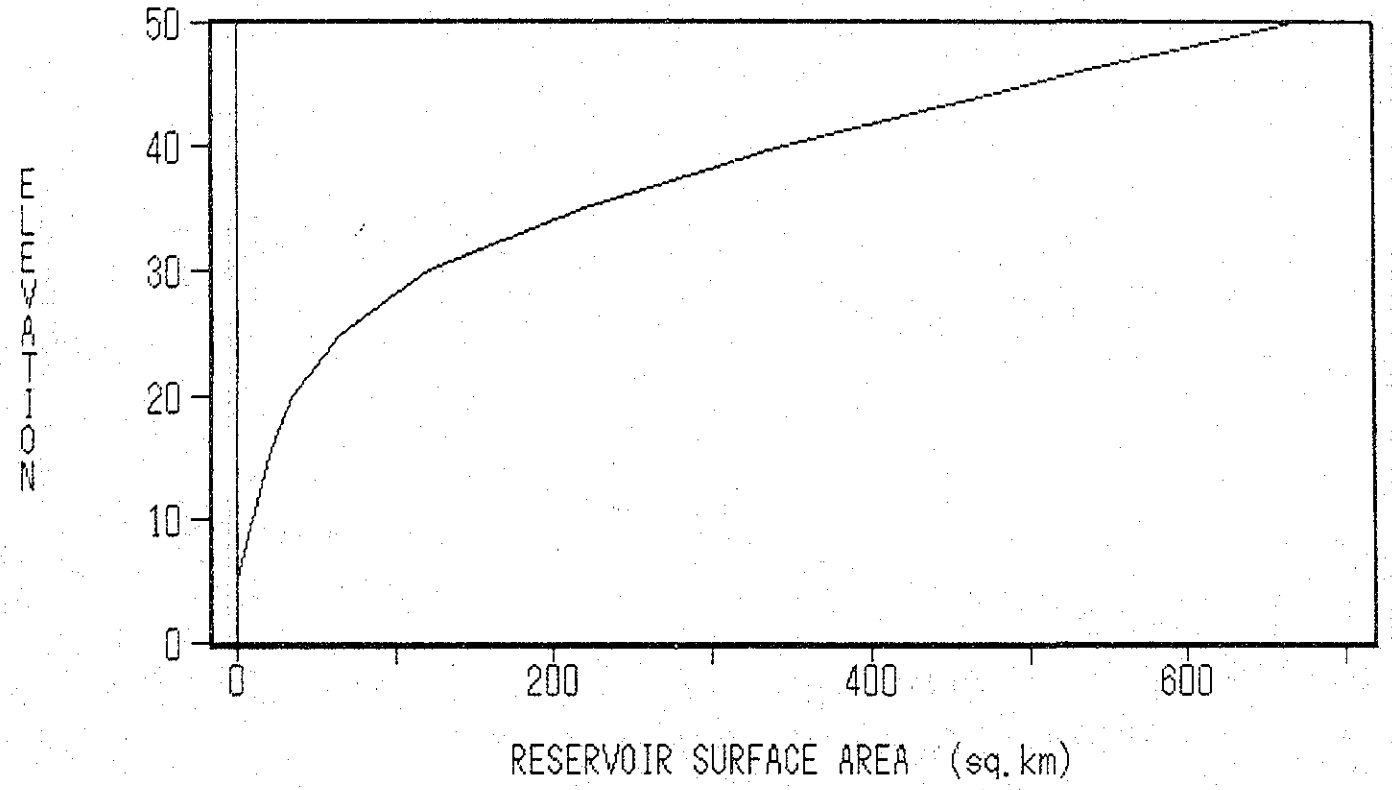
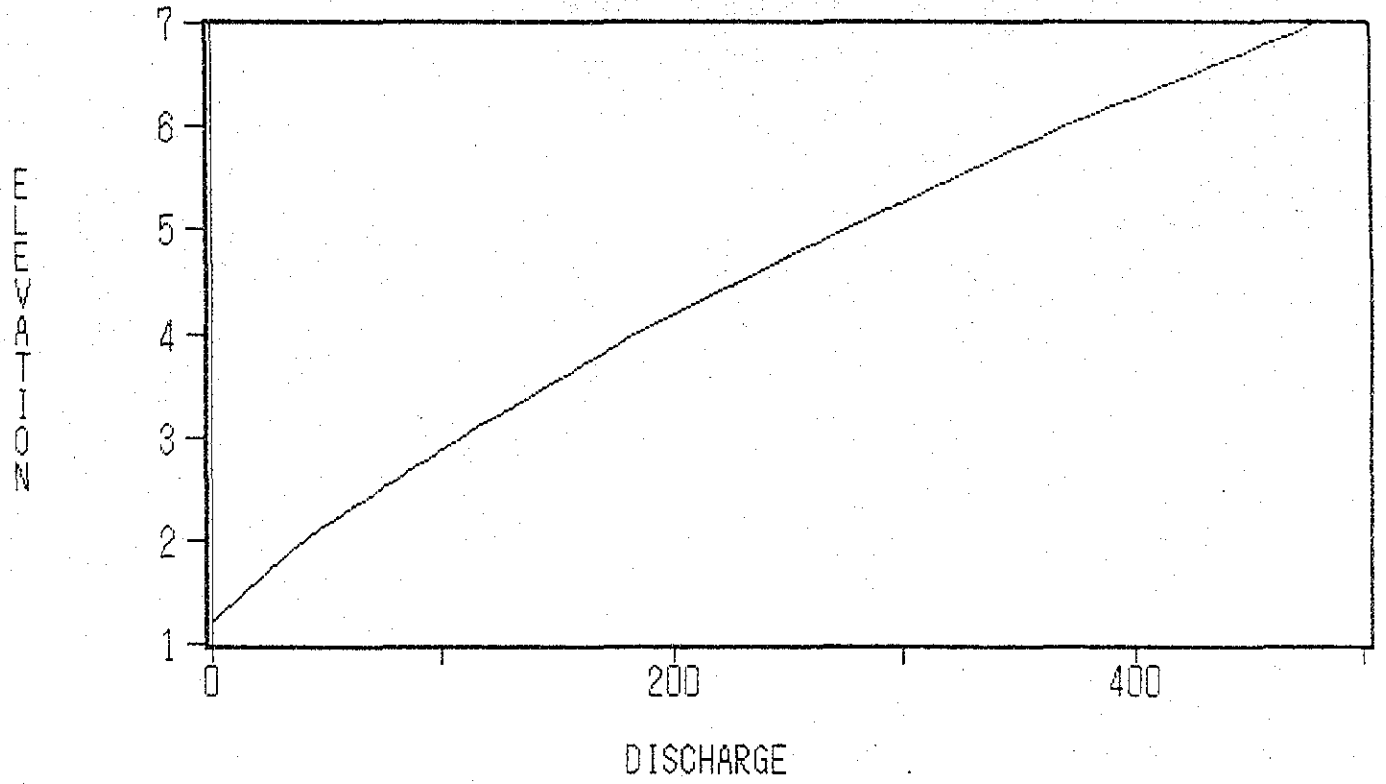
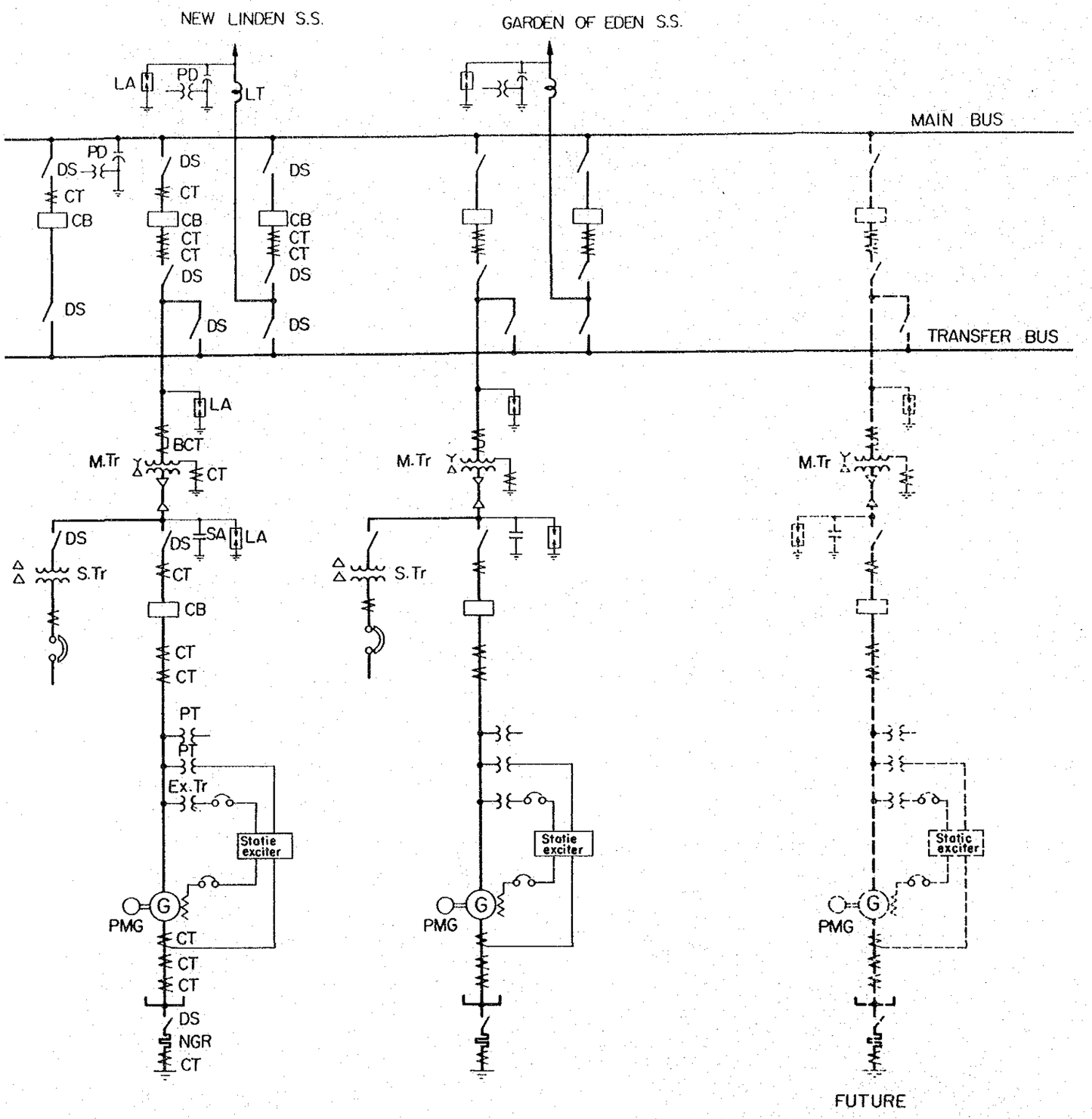


Fig. 9-10 RATING CURVE AT TIGER HILL
POWER STATION OUTLET (cu. m/sec)





LEGEND

G	: Generator
M.Tr	: Main transformer
S.Tr	: Station service transformer
Ex.Tr	: Excitation transformer
CB	: Circuit breaker
DS	: Disconnecting switch
CT	: Current transformer
PD	: Coupling capactitor potential device
PT	: Potential transformer
LA	: Lightning arrester
LT	: Line trap
SA	: Surge absorber
NGR	: Neutral grounding resister
PMG	: Permanent magnet generator

Fig. 9-11
SINGLE LINE DIAGRAM OF
TIGER HILL POWER STATION

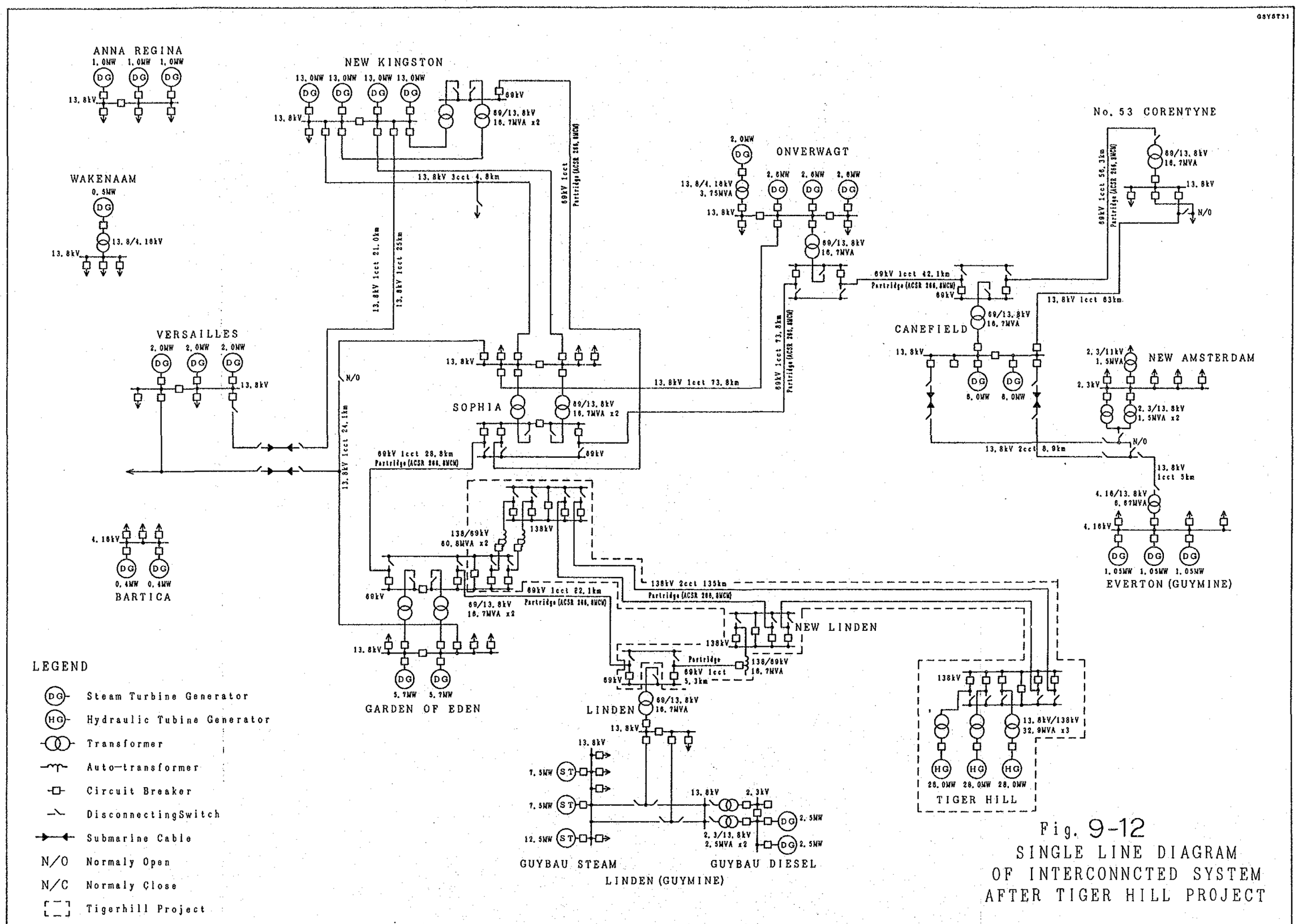


Fig. 9-12
SINGLE LINE DIAGRAM
OF INTERCONNCTED SYSTEM
AFTER TIGER HILL PROJECT

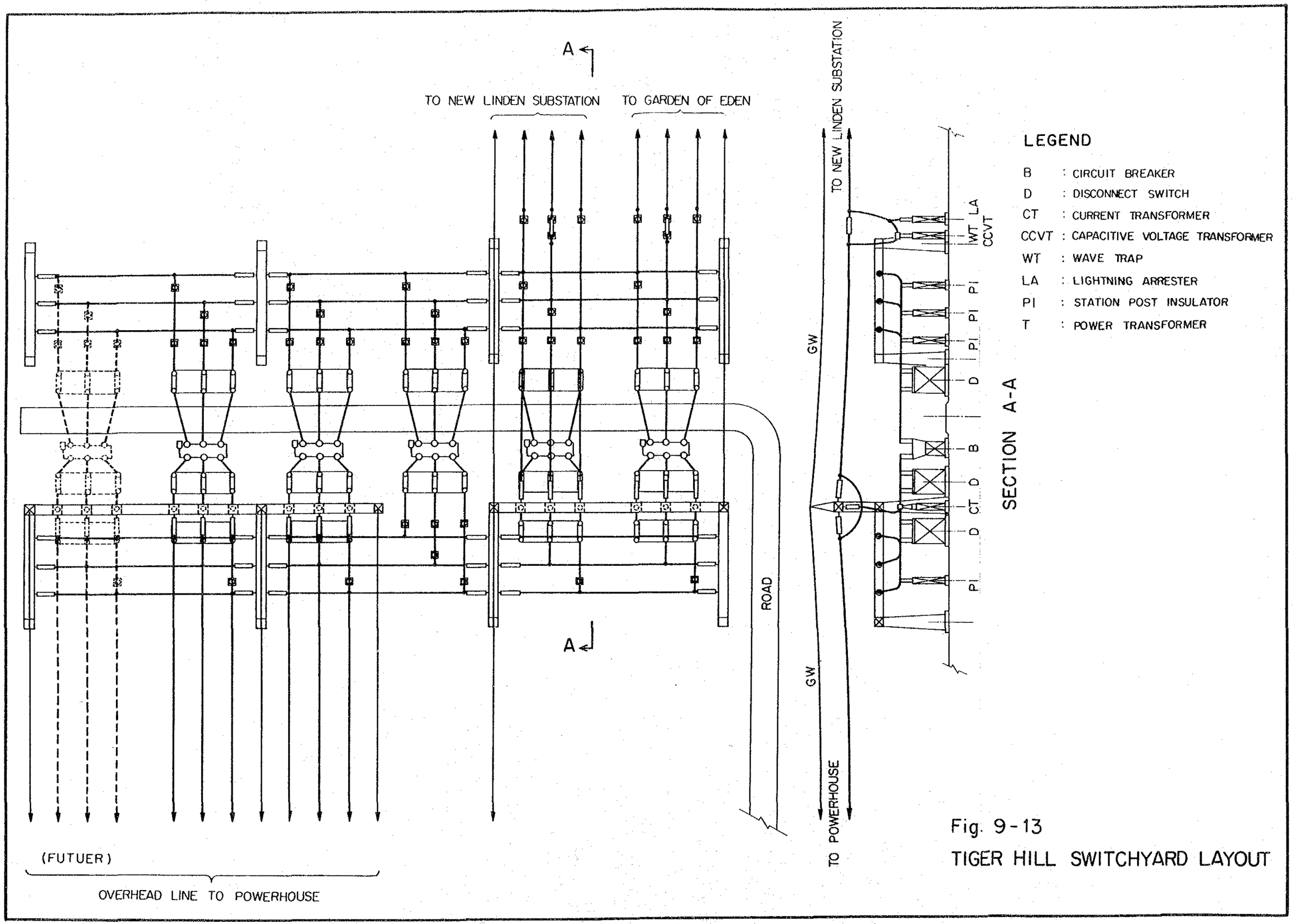
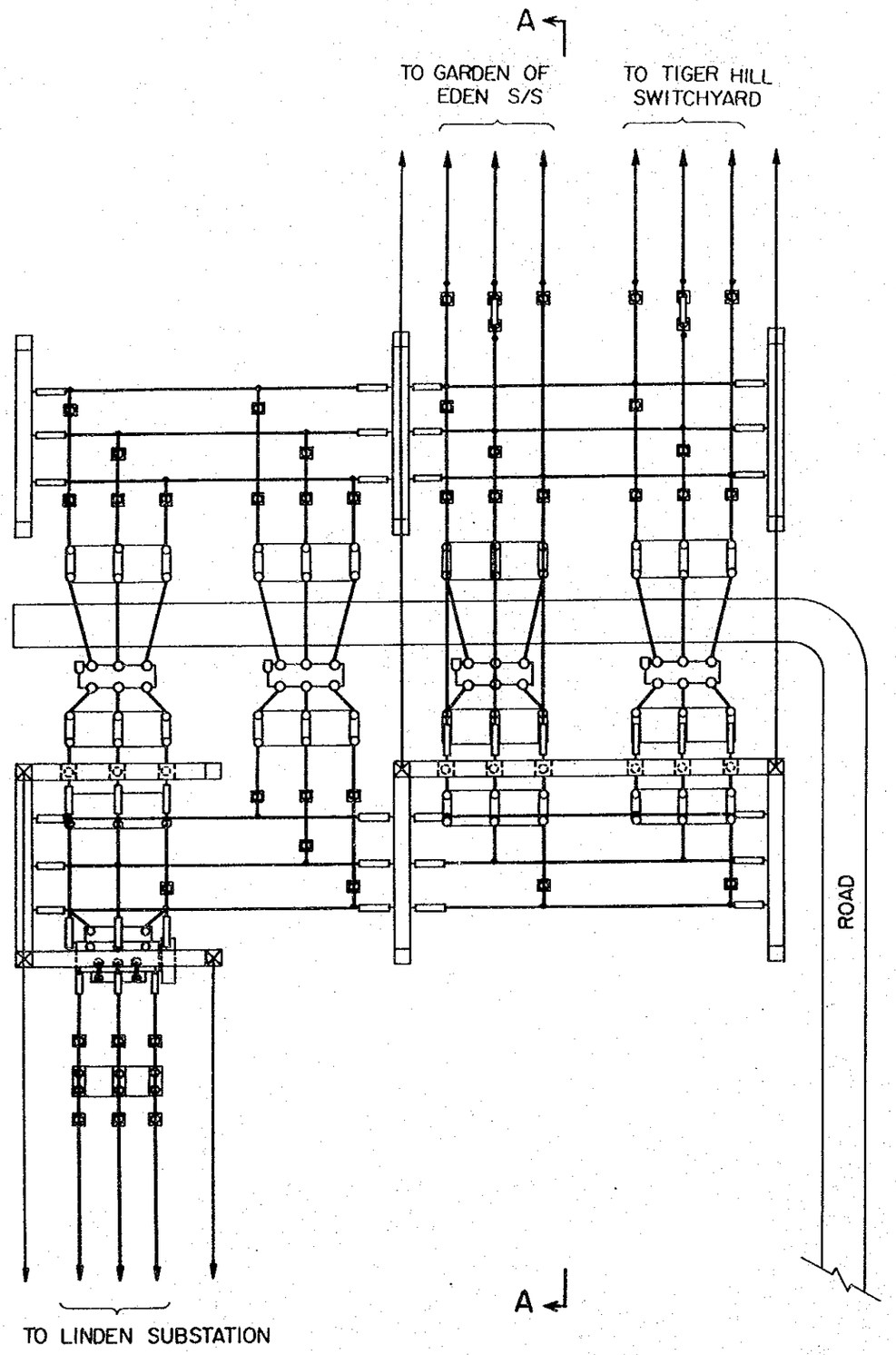
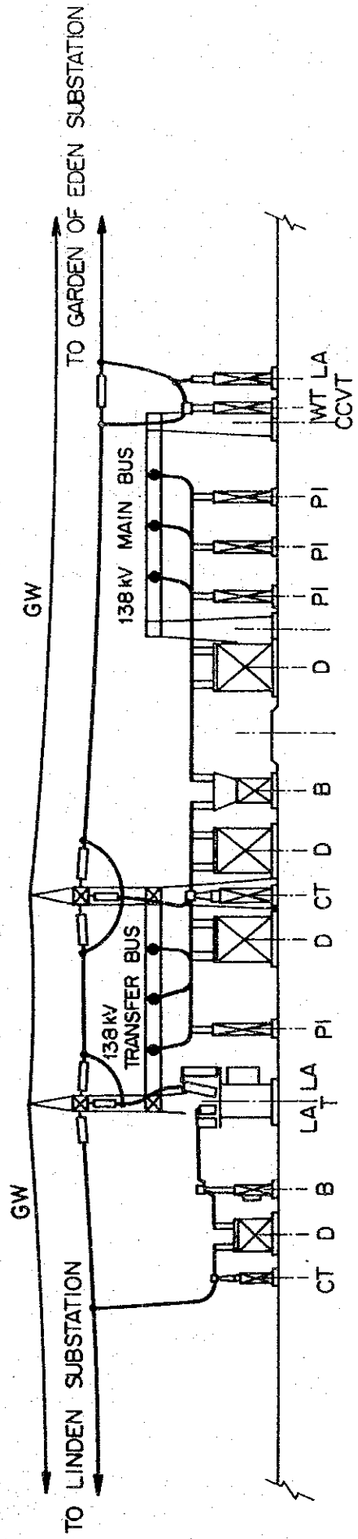


Fig. 9-13
TIGER HILL SWITCHYARD LAYOUT



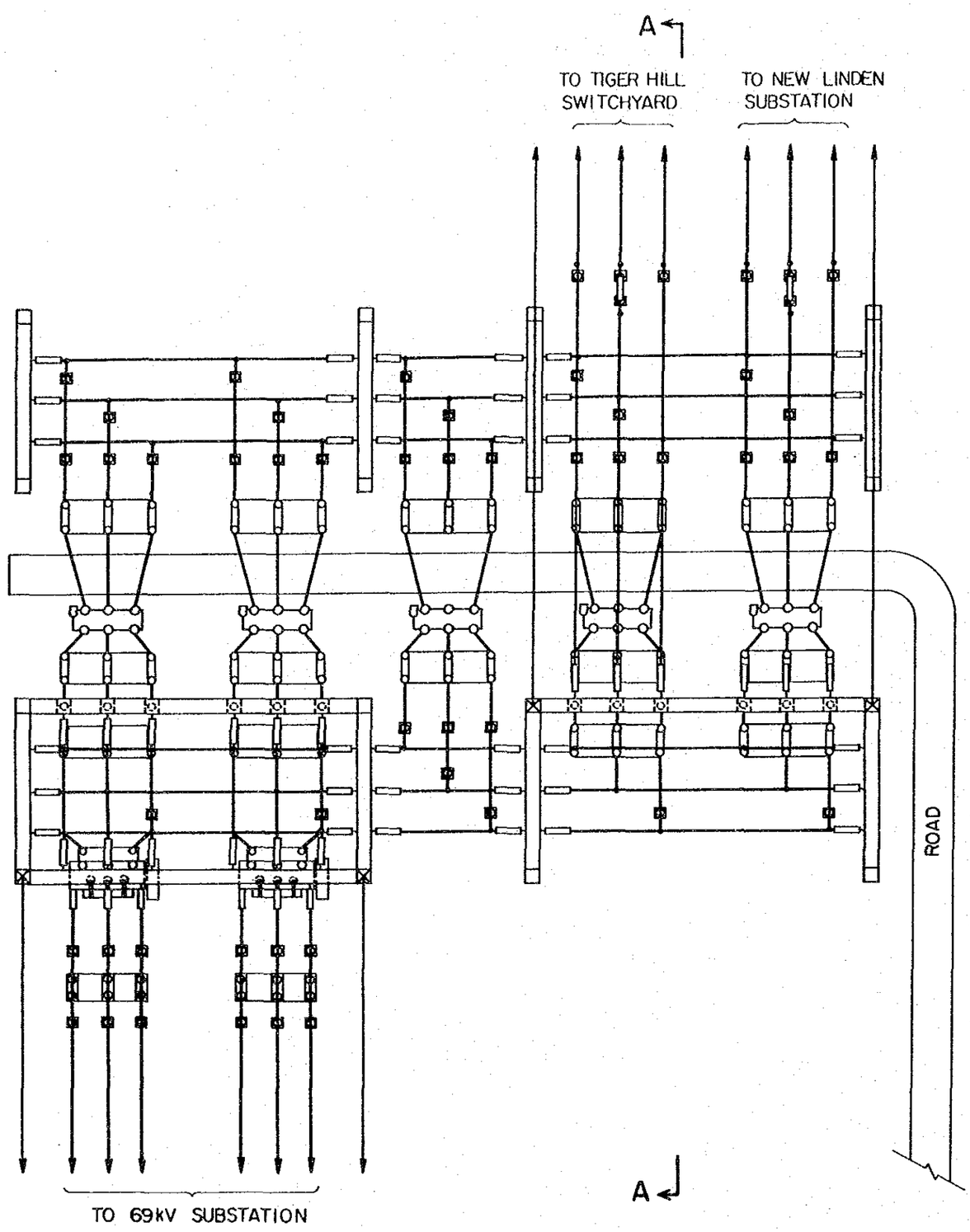


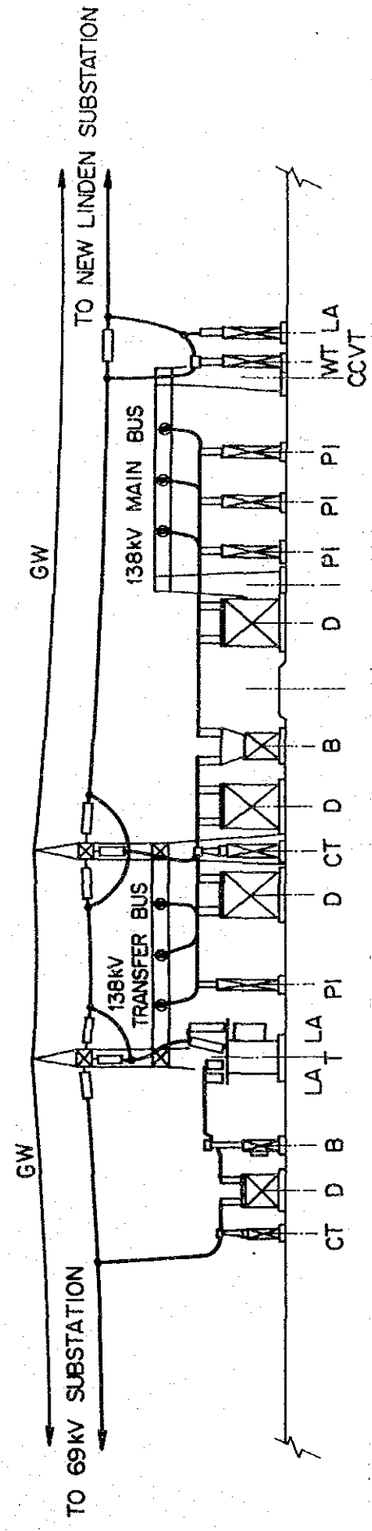
SECTION A-A

LEGEND

B	: CIRCUIT BREAKER
D	: DISCONNECT SWITCH
CT	: CURRENT TRANSFORMER
CCVT	: CAPACITIVE VOLTAGE TRANSFORMER
WT	: WAVE TRAP
LA	: LIGHTNING ARRESTER
PI	: STATION POST INSULATOR
T	: POWER TRANSFORMER

Fig. 9-14
NEW LINDEN SUBSTATION
LAYOUT





SECTION A-A

LEGEND

B	: CIRCUIT BREAKER
D	: DISCONNECT SWITCH
CT	: CURRENT TRANSFORMER
CCVT	: CAPACITIVE VOLTAGE TRANSFORMER
WT	: WAVE TRAP
LA	: LIGHTNING ARRESTER
PI	: STATION POST INSULATOR
T	: POWER TRANSFORMER

Fig. 9-15
GARDEN OF EDEN 138kV SUBSTATION LAYOUT

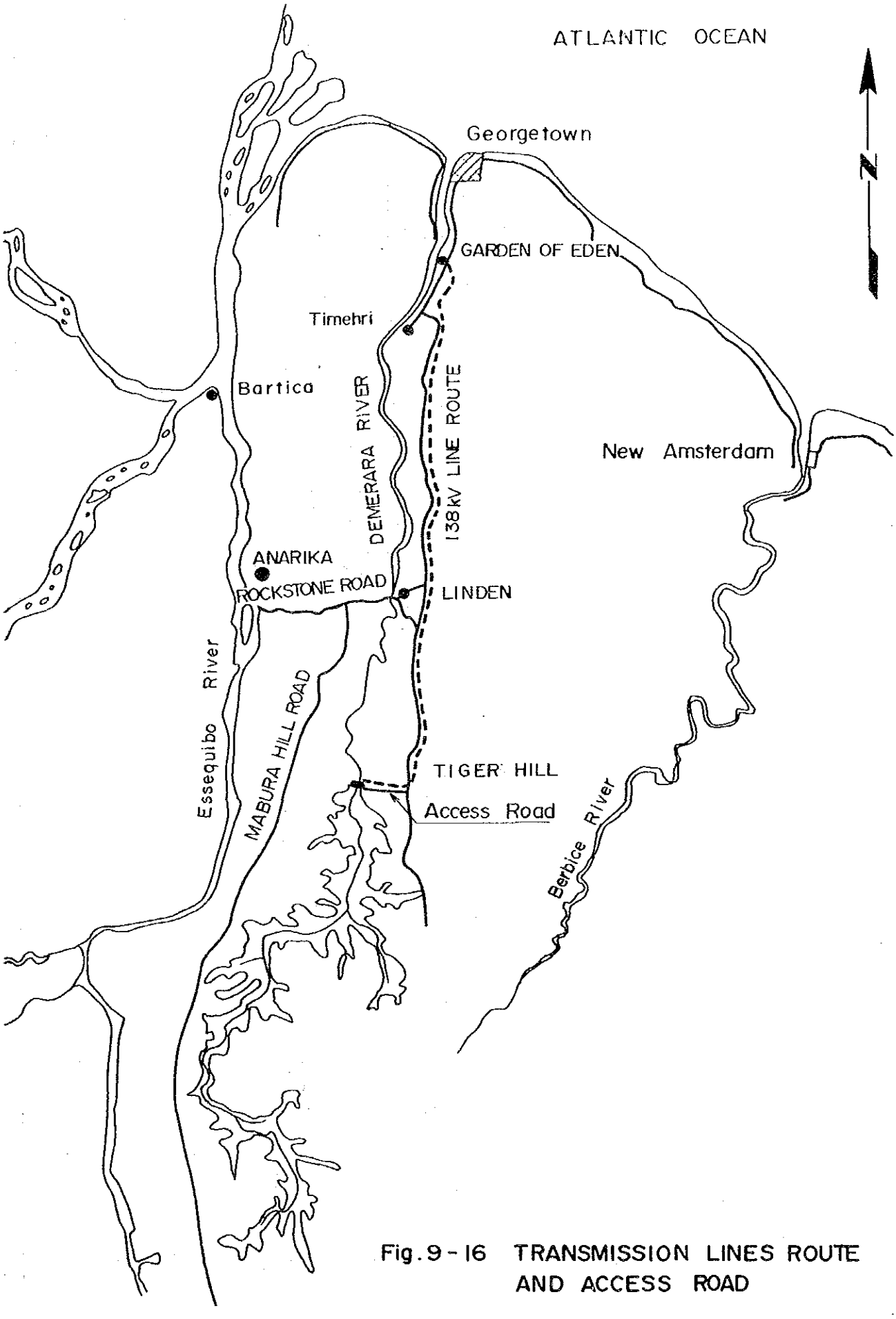


Fig. 9 - 16 TRANSMISSION LINES ROUTE AND ACCESS ROAD

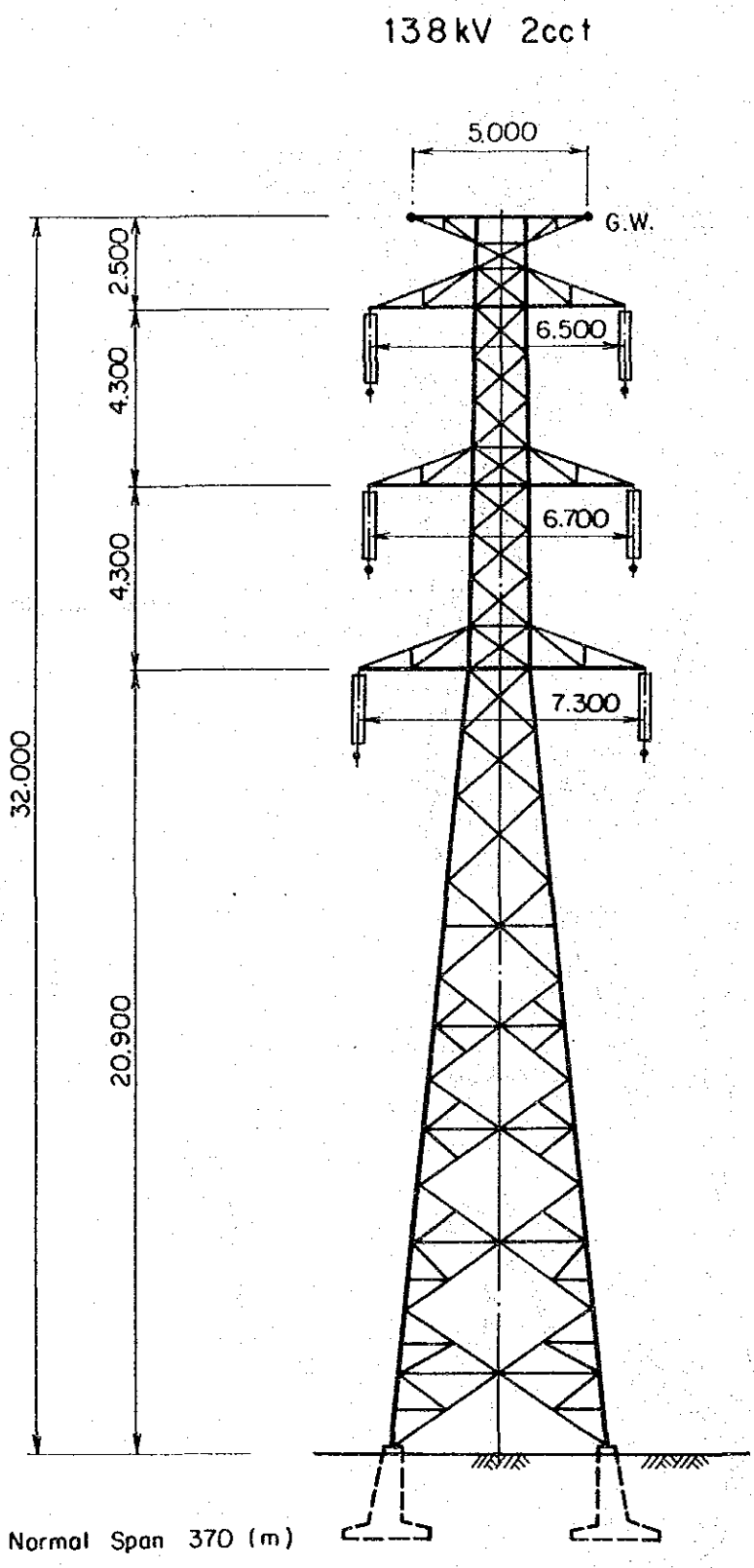


Fig. 9-17 TYPICAL TRANSMISSION TOWER

Fig.9-18 TIGER HILL HYDROPOWER PROJECT
PROPOSED CONSTRUCTION SCHEDULE

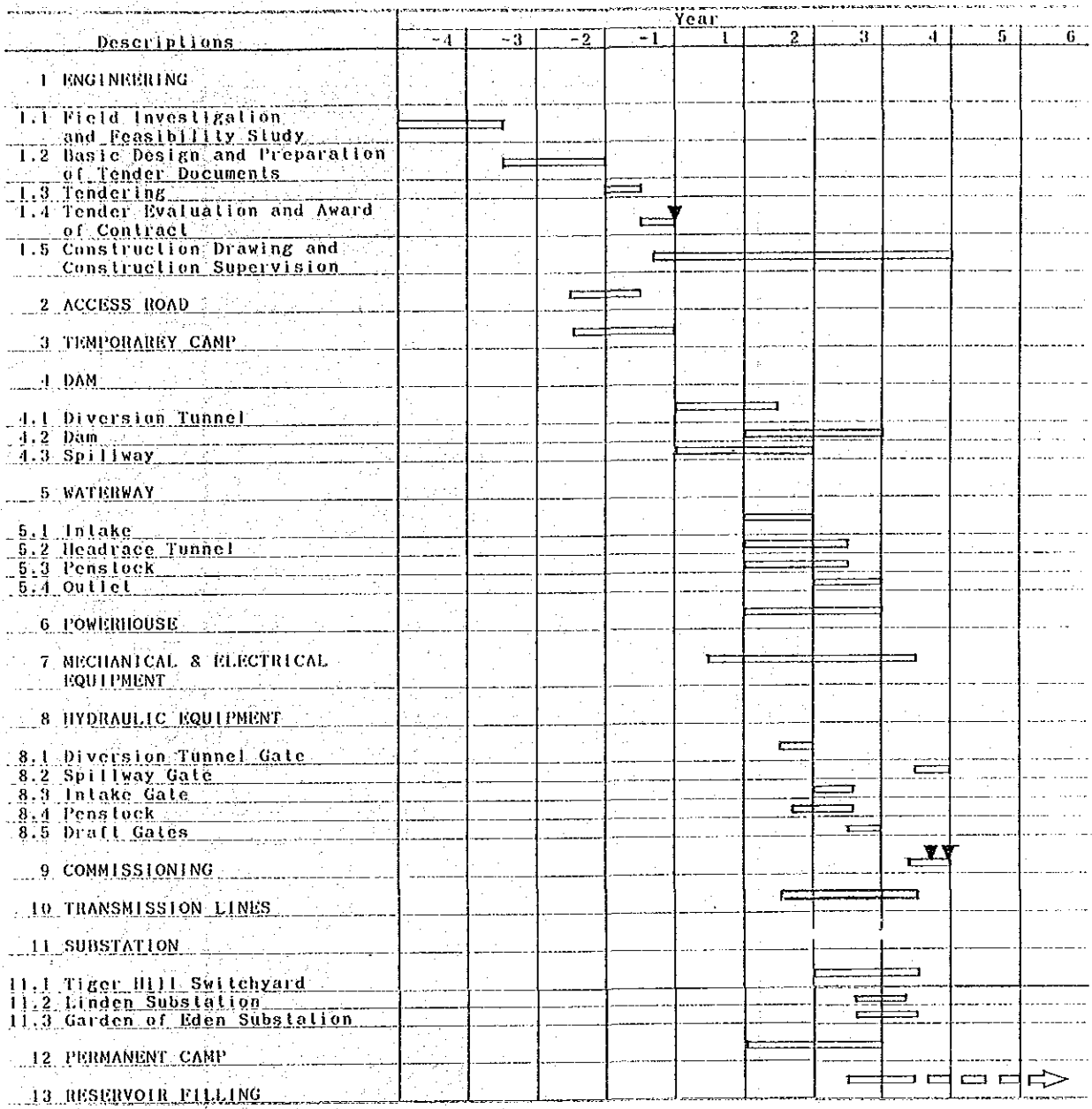


Fig. 9-19 MONTHLY MEAN PRECIPITATION
AT BOTANIC GARDENS, GEORGETOWN (mm)

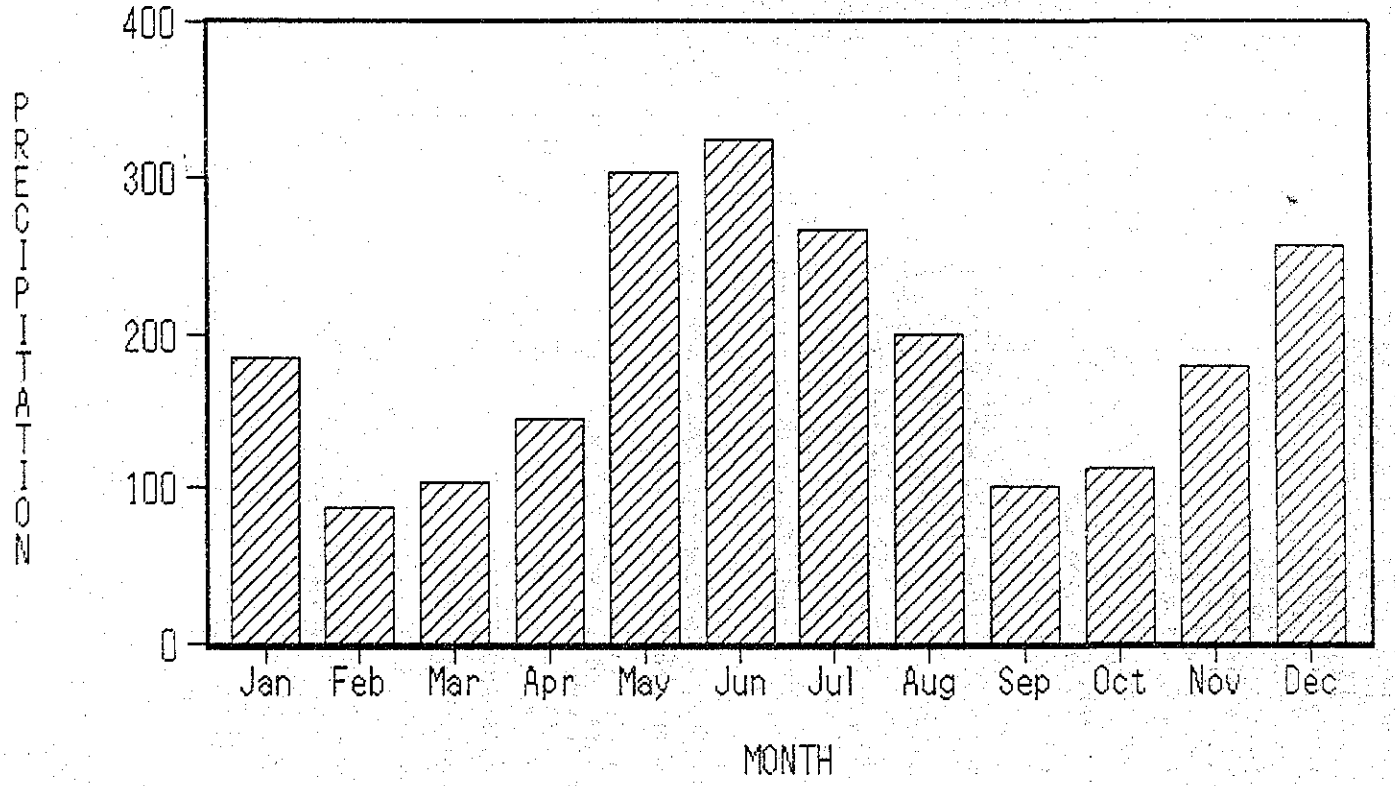


Fig. 9-20 MONTHLY DISCHARGE (cu. m/sec)
AT TIGER HILL (1950 -1986)

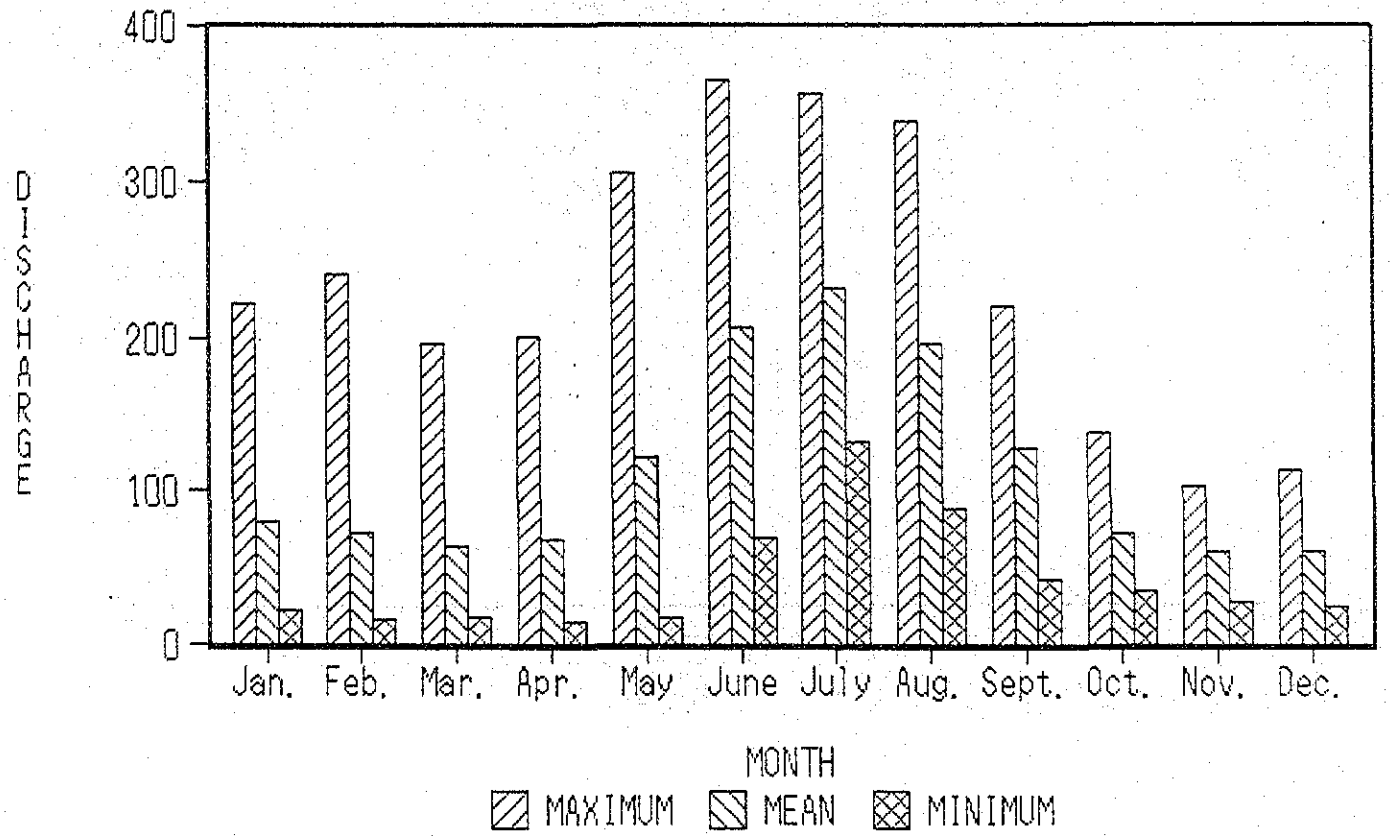


Fig.9-21 MONTHLY MEAN DISCHARGE
AT GREAT FALLS G/S (cu.m/sec)

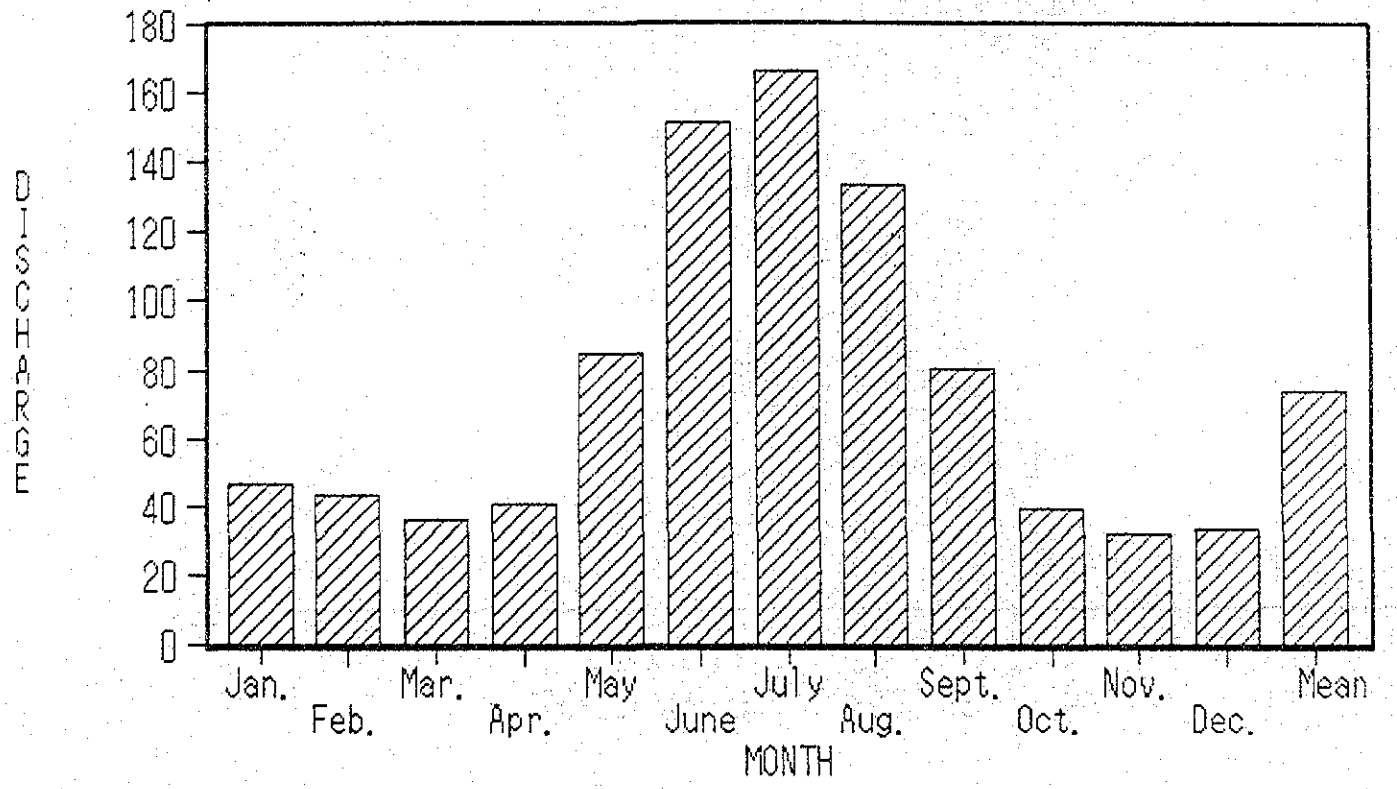
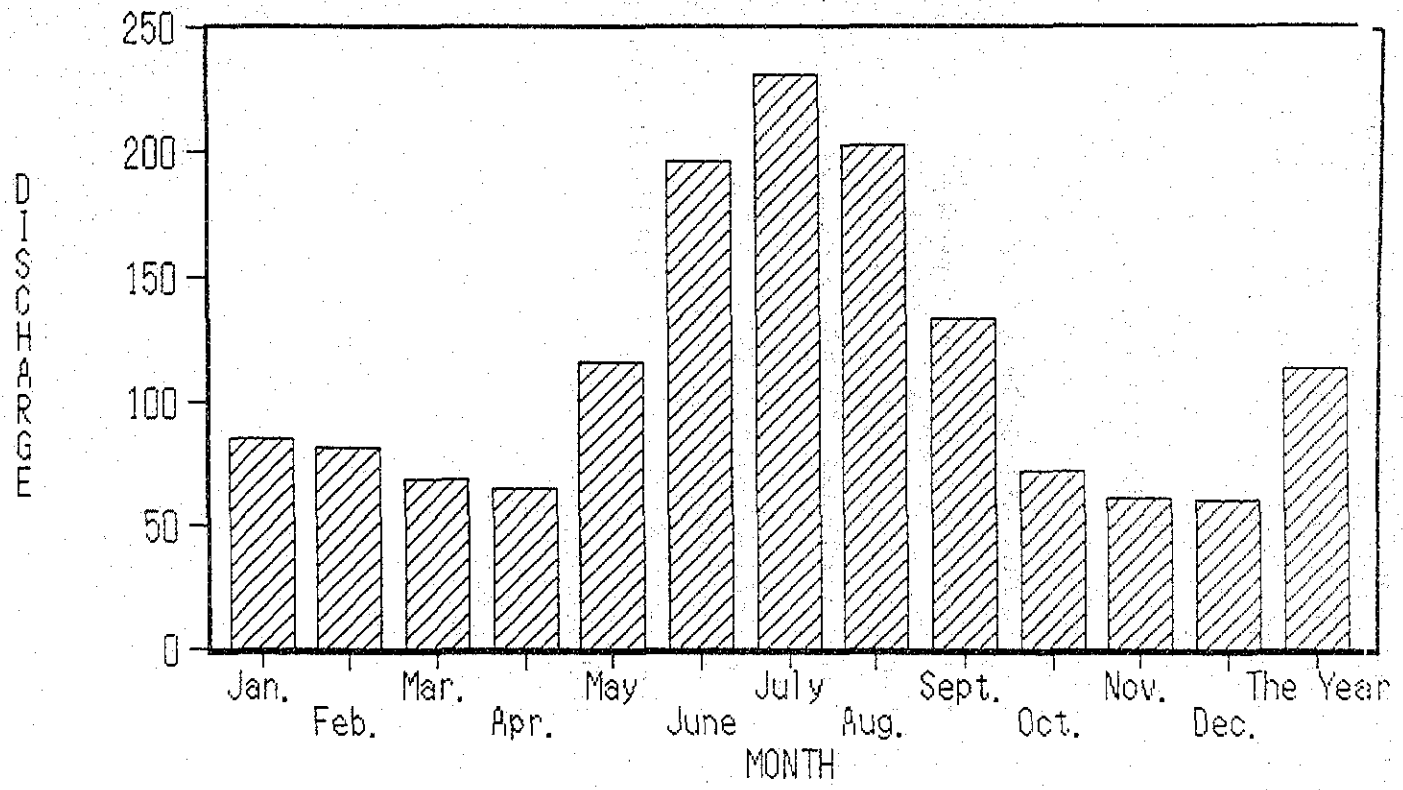


Fig. 9-22 MONTHLY MEAN DISCHARGE
AT SAKA G/S (cu. m/sec)



LIST OF TABLES

Table 9-1 Monthly Mean Discharge at Great Falls G/S

(cu.m/sec)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The Year
1950	141	137	71	34	143	267	215	235	111	56	43	34	124
1951	58	129	73	51	131	181	241	172	99	54	34	27	104
1952	42	38	20	14	56	119	157	197	80	39	49	44	71
1953	58	91	115	97	123	160	179	114	54	30	22	24	89
1954	60	40	36	74	171	179	159	172	125	52	52	44	97
1955	47	28	58	69	117	187	224	194	95	54	44	67	99
1956	78	73	102	59	113	227	225	189	128	70	44	48	113
1957	72	49	24	17	70	129	150	96	43	26	22	23	60
1958	15	13	11	47	118	118	114	90	41	19	18	13	52
1959	13	14	10	14	18	61	110	68	55	20	24	24	36
1960	28	34	38	30	114	204	190	131	63	30	25	23	76
1961	27	15	9	6	8	104	208	147	60	31	24	33	34
1962	26	16	12	10	37	115	119	127	69	25	24	20	50
1963	40	100	48	45	144	276	171	129	66	29	22	21	91
1964	12	8	7	6	7	46	108	92	49	22	14	17	33
1965	30	21	18	10	42	95	87	84	53	20	14	11	40
1966	9	6	8	9	12	73	151	114	72	30	20	32	45
1967	59	30	21	51	98	171	213	138	77	38	27	32	80
1968	52	44	24	82	105	277	248	118	73	44	34	36	95
1969	61	58	22	30	95	119	96	115	67	28	16	15	60
1970	32	42	25	36	75	78	157	215	128	45	52	34	77
1971	84	67	53	51	113	143	264	168	125	55	45	43	101
1972	59	50	58	68	145	222	160	69	44	22	48	32	82
1973	19	14	12	9	24	99	123	106	159	87	45	49	62
1974	99	80	46	69	23	55	170	166	103	61	46	42	80
1975	95	54	36	19	23	108	116	189	149	53	36	61	78
1976	80	101	132	142	179	189	193	110	49	27	21	22	104
1977	28	18	20	20	26	102	156	127	59	32	19	28	53
1978	22	27	10	11	48	118	154	117	99	35	24	26	58
1979	26	20	25	40	53	236	169	104	80	53	39	67	76
1980	38	18	14	40	176	228	234	156	77	54	47	58	95
1981	49	52	63	78	226	211	244	201	144	73	39	30	118
1982	41	28	36	77	142	237	149	78	42	26	16	19	75
1983	29	13	20	62	86	110	99	69	33	18	12	18	48
1984	26	31	10	6	23	108	154	137	111	53	62	46	64
1985	55	20	17	12	28	138	119	144	80	32	27	36	59
1986	20	25	25	12	21	108	127	52	22	17	28	39	42
Average	46.8	43.4	35.9	40.7	84.7	151.3	166.3	133.2	80.6	39.5	31.8	33.5	73.5

Table 9-2 Monthly Mean Discharge at Saka G/S (cu.m/sec)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The Year
1950	218	236	125	76	233	348	299	333	190	98	79	63	186
1951	97	177	126	88	181	239	350	250	159	97	65	52	157
1952	72	67	40	29	76	164	210	280	133	70	87	74	109
1953	93	142	173	154	195	211	242	181	96	59	46	48	137
1954	99	66	58	109	231	254	225	253	216	96	101	86	150
1955	90	59	94	120	156	264	297	302	160	91	79	107	152
1956	119	120	168	110	156	310	320	268	193	120	83	94	172
1957	119	84	50	39	95	166	205	141	74	51	47	48	94
1958	36	31	26	76	168	152	166	131	65	41	36	29	80
1959	28	29	22	28	29	80	151	99	83	38	43	44	56
1960	46	53	53	54	147	274	271	208	114	60	51	46	115
1961	48	32	22	15	17	115	263	211	100	56	46	55	82
1962	46	31	26	21	51	149	174	169	110	47	44	40	76
1963	60	138	80	71	183	358	251	176	108	58	48	41	131
1964	29	21	18	16	17	68	155	127	79	41	31	32	53
1965	53	38	32	20	60	139	131	128	86	42	32	24	66
1966	22	16	18	18	24	106	190	163	117	55	42	59	70
1967	92	53	40	67	135	245	302	209	131	73	57	59	123
1968	91	74	48	105	137	342	323	185	114	76	61	60	135
1969	92	90	42	48	110	163	146	160	111	54	36	35	91
1970	66	69	46	62	116	121	226	283	216	86	95	67	122
1971	125	108	85	78	153	197	341	243	198	96	77	76	149
1972	96	81	88	114	207	294	239	121	83	51	77	57	126
1973	38	29	26	20	43	136	152	151	182	136	77	82	90
1974	153	122	75	104	43	82	205	246	148	96	78	67	118
1975	140	89	64	39	49	134	153	264	215	92	65	111	118
1976	122	143	194										
Average	84.8	81.4	68.1	64.7	115.8	196.6	230.3	203.2	133.9	72.3	60.9	59.8	113.7

Table 9-5 DEMERARA RIVER YEARLY MEAN DISCHARGE

	at Saka G/S	at Great Falls G/S	Tiger Hill
Station No.	4280	4250	
Latitude	05°34'10"	05°18'	05°40'
Longitude	58°21'55"	58°32'	58°10'
Catchment Area	4040 km2	2460 km2	4100 km2
	(m3/sec)	(m3/sec)	(m3/sec)
1950	186	124	189
1951	157	104	159
1952	109	69	110
1953	137	89	139
1954	150	97	152
1955	152	99	154
1956	172	113	175
1957	94	60	95
1958	80	52	81
1959	56	36	57
1960	115	76	117
1961	82	34	83
1962	76	50	77
1963	131	91	133
1964	53	33	54
1965	66	40	67
1966	70	45	71
1967	123	80	124
1968	135	95	137
1969	91	60	92
1970	122	77	123
1971	149	101	152
1972	126	82	128
1973	90	62	91
1974	118	80	120
1975	118	78	120
1976		104	152
1977		53	85
1978		58	91
1979		76	116
1980		95	140
1981		118	170
1982		75	113
1983		48	78
1984		64	100
1985		59	93
1986		41	69
Maximum	186	124	189
Minimum	53	33	54
Mean	114	73.5	113.7

Table 9-6 YEARLY MEAN DISCHARGE AT TIGER HILL

Year	Yearly Mean Discharge '(m3/sec·day)	Annual Inflow (million m3)
1950	189.2	5967
1951	159.3	5024
1952	110.4	3491
1953	138.9	4380
1954	152.3	4803
1955	154.5	4872
1956	174.6	5521
1957	95.1	2999
1958	81.2	2561
1959	57.2	1804
1960	116.5	3684
1961	83.3	2627
1962	77	2428
1963	132.7	4185
1964	53.7	1698
1965	66.6	2100
1966	70.6	2226
1967	124.4	3923
1968	136.8	4326
1969	92	2901
1970	123.5	3895
1971	150.8	4756
1972	127.6	4035
1973	91	2870
1974	120.2	3791
1975	120	3784
1976	151.5	4791
1977	84.8	2674
1978	90.7	2860
1979	116.1	3661
1980	140.3	4437
1981	170.1	5364
1982	112.7	3554
1983	77.8	2454
1984	99.6	3150
1985	93.4	2945
1986	69.7	2198

Average Flow (m3/sec)	113.7
Average Inflow (10^6 m3)	3587.5
Maximum Flow (m3/sec)	189.2
Minimum Flow (m3/sec)	53.7

Table 9-7 Discharge at Tiger Hill Damsite (cu.m/sec)
(1950 - 1986)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	The Year
1950	222	240	127	77	237	354	304	338	192	100	80	64	189.2
1951	99	180	128	89	184	242	355	254	162	99	66	53	159.3
1952	73	68	40	29	78	167	213	285	135	71	88	75	110.4
1953	95	144	176	156	198	214	246	184	98	59	47	49	138.9
1954	100	67	59	111	234	258	228	257	219	98	103	87	152.3
1955	91	59	96	122	159	268	301	306	162	93	80	108	154.5
1956	121	122	170	111	158	315	325	272	196	122	85	96	174.6
1957	121	85	51	40	96	169	208	144	75	52	48	49	95.1
1958	37	31	26	77	171	154	169	133	66	42	37	29	81.2
1959	28	29	22	28	30	81	153	101	85	39	44	45	57.2
1960	47	53	54	55	149	278	275	211	115	61	52	46	116.5
1961	49	33	22	15	18	117	267	214	101	56	46	56	83.3
1962	47	31	26	21	52	151	177	171	111	47	45	40	77
1963	61	140	81	72	186	364	255	178	110	59	49	42	132.7
1964	29	21	18	16	17	69	157	129	80	42	31	33	53.7
1965	54	38	32	21	61	141	133	130	87	43	33	25	66.6
1966	22	16	18	18	25	107	193	165	118	56	43	60	70.6
1967	94	54	41	68	137	249	307	212	133	74	58	60	124.4
1968	92	75	49	106	139	347	328	188	116	78	62	61	136.8
1969	93	92	43	49	111	166	148	162	112	55	37	35	92
1970	67	70	47	63	118	123	229	287	220	87	97	68	123.5
1971	127	110	86	79	155	200	346	247	201	98	78	78	150.8
1972	98	82	90	116	210	298	242	123	84	52	78	58	127.6
1973	39	29	26	20	43	139	154	153	185	139	78	83	91
1974	155	124	76	106	44	83	208	250	150	97	79	68	120.2
1975	142	90	64	40	50	136	155	268	218	94	66	113	120
1976	124	145	197	201	247	259	265	161	84	51	41	42	151.5
1977	51	37	40	39	49	151	218	183	98	57	38	51	84.8
1978	42	50	24	26	83	170	216	170	147	62	46	49	90.7
1979	49	39	47	69	90	318	235	153	124	89	69	108	116.1
1980	67	37	30	70	243	309	316	218	119	91	82	95	140.3
1981	84	88	103	120	306	287	328	275	203	115	68	56	170.1
1982	71	51	63	120	201	319	210	121	74	48	34	38	112.7
1983	53	28	39	101	131	161	147	110	60	36	28	36	77.8
1984	48	56	25	19	44	158	216	194	163	90	101	80	99.6
1985	92	40	35	28	51	196	173	204	124	58	51	64	93.4
1986	40	47	48	27	40	158	182	89	43	36	52	69	69.4
Maximum	222	240	197	201	306	364	355	338	220	139	103	113	189.2
Minimum	22	16	18	15	17	69	133	89	43	36	28	25	53.7
Average	79	73	63	68	123	207	232	196	129	72	60	61	113.7

Table 9-8 Maximum Discharge in Demerara River

(cu.m/sec)

	Great Falls G/S		Saka G/S		Tiger Hill
1950	323	Jun.18	388	Aug.19	394
1951	314	Jun.26,27	447	Jul.02	454
1952	240	Aug.06	337	Aug.06	342
1953	217	Jun.21,28	292	Jun.27	296
1954	240	Aug.27	374	Aug.31	379
1955	368	Jul.27	425	Aug.04	431
1956	320	Jun.26	396	Jun.28	402
1957	207	Jul.11	317	Jul.24	322
1958	212	Jun.30	255	Jul.05	259
1959	129	Jul.23	172	Jul.18	175
1960	276	Jun.04	320	Jun.07,08	325
1961	289	Jul.17	326	Jul.19,20	331
1962	154	Jun.29	231	Jul.05	235
1963	311	Jun.08	385	Jun.24	391
1964	140	Jul.17	180	Jul.20	183
1965	110	Jun.17	183	Jun.16,17	186
1966	188	Jul.29	232	Jul.31	235
1967	275	Jul.09	351	Jul.12	356
1968	320	Jun.29	405	Jun.11	411
1969	195	Jun.26	262	Aug.28	266
1970	306	Aug.16	357	Aug.21	362
1971	317	Jul.16	391	Jul.20	397
1972	360	Jun.16	396	Jun.20	402
1973	240	Sep.24	266	Sep.25	270
1974	281	Jul.31	357	Aug.09	362
1975	238	Aug.26	340	Aug.08	345
1976	241	Jun.02			315
1977	227	Jul.20			301
1978	229	Jul.12			303
1979	334	Jun.27			412
1980	294	Jun.22			370
1981	297	Jul.06			373
1982	303	Jun.20			380
1983	236	Jun.09			310
1984	206	Jul.25			279
1985	198	Jun.20			271
1986	186	Jul.02			258
1987					
Maximum	368		447		454
Minimum	110		172		175
Average	251.9		322.5		326.6

Table 9-9 Minimum Discharge in Demerara River

(m3/sec)

	at Great Falls G/S		at Saka G/S		at Tiger Hill Site (from SK)
1950	25	Apr.24	57	Dec.31	58
1951	21	Dec.21	44	Dec.21	45
1952	11	Apr.25	23	Apr.21	23
1953	18	Dec.17,18	36	Dec.18	37
1954	24	Mar.31	45	Mar.31	46
1955	24	Feb.27	51	Feb.27	52
1956	32	Dec.16	68	Dec.16	69
1957	15	Apr.18	35	Apr.18	36
1958	9	Mar.16	20	Mar.27	20
1959	6	Apr.04	17	Apr.07,08	17
1960	11	Apr.01	18	Mar.27	18
1961	5	May 07,08	13	May 16	13
1962	7	Apr.03	16	Apr.03,04	16
1963	15	Dec.31	34	Dec.31	35
1964	5	May 12-15	12	May 13	12
1965	7	May 05	15	May 06	15
1966	5	Feb.18	12	Apr.17,18	12
1967	11	Apr.13	25	Apr.14	25
1968	21	Mar.07	43	Mar.24	44
1969	13	Dec.02,03	31	Dec.06	31
1970	17	Mar.20	36	Mar.20	37
1971	29	Apr.05	54	Apr.06	55
1972	19	Oct.25	43	Oct.25	44
1973	7	Apr.19	18	Apr.20,21	18
1974	18	May 26	37	May 26-28	38
1975	14	May 13	33	May 12	33
1976	18	Nov.26			
1977	13	Feb.14,15			
1978	7	Mar.31-03			
1979	11	Mar.01			
1980	11	Mar.08			
1981	23	Apr.03,04			
1982	14	Nov.26			
1983	9	Nov.30			
1984	5	Apr.14			
1985	10	Apr.23,24			
1986	8	May 02			
Average	14		32.2		32.7

Table 9-14 WATER ANALYSIS, TIGER HILL, DEMERARA RIVER

INSTITUTE OF APPLIED SCIENCE AND TECHNOLOGY
University Campus, Turkeyen, Greater Georgetown

CLIENT: D.I.E.C. c/o Office of the President Attn: Cde D. Ballers

DATE OF REQUEST: 1988-08-23

DATE OF ISSUE: 1988-08-29

ASR. 88/08/134

ANALYTICAL SERVICES

RESULT SHEET

for Water sample submitted

SAMPLE NUMBER		ELEMENTS												
		pH	Conductivity	Cl^-	Alkalinity HCO_3^-	Total Solids	Na^+	K^+	Ca^{2+}	Mg^{2+}	Fe^{2+}			
	UNITS		$\mu\Omega^{-1}cm^{-1}$	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm			
Tiger Hill area Mon 22nd Aug 1988 15:30 hrs (Demerara River)		4.43	35	5	21	100	1.67	0.15	0.46	0.30	0.66			

Checked by

Analyst

Research Assistant

Table 9-16 Estimated Capital Cost (Tiger Hill P/S)

Estimated Capital Cost (Case : B)
Installed Capacity : 28 MW x 2 Unit : 1000 US $

Item of Work	Local	Foreign	Total
Power plant :			
- Civil works	14014	56056	70070
- Hydromechanical equipment	2160	5840	8000
- Mechanical equipment	4995	13505	18500
- Electrical equipment	5805	15695	21500
- Contingencies	2750	10160	12910
Sub total	29724	101256	130980
Permanent roads *	3000	2400	5400
Compensation *	5000	0	5000
Permanent camp *	3850	1650	5500
Transmission Line *	1716	11484	13200
Engineering, supervision and administration *	3144	11274	14418
Estimated total cost	46434	128064	174498

* contingency included

Table 9-17 Benefit/Cost Ratio (Steam)

Name of Project	Tiger Hill		
Case No.	B		
<INPUT DATA>			
Firm capacity of Hydro	56000	kW	
Hydro energy generation	265	Gwh	
Hydro investment cost	174498	1000 US $	
Discount rate	7	%	
Service life			
Hydro	50	Year	
Thermal	25	Year	
Station service loss factor			
Hydro (kW)	1	%	
Hydro (kWh)	1.3	%	
Thermal (kW)	3.5	%	
Thermal (kWh)	4.5	%	
Ratio of O&M cost to investment cost			
Hydro	1.3	%	
Thermal	3.5	%	
Unit construction cost (Thermal)	1500	US $	
Fuel price	13	US$/barrel	
Thermal efficiency	34	%	
**********			
Thermal equivalence	2529.4117	kcal/kWh	
Unit fuel cost	0.0232367	US$/kWh	
Capital recovery factor			
Hydro	0.0724598		
Thermal	0.0858105		
**********			
<OUTPUT>			
** Cost **			
Capital cost	12644		
O & M cost	2268		
Total (C)	14912	1000 US$	
** Benefit **			
Capital cost	7395		
O & M cost	3016		
Fuel cost	6364		
Total (B)	16775	1000 US$	
B/C	1.125		
B-C	1863	1000 US$	
Unit cost of energy (Hydro)	0.056	US$/kWh	

Table 9-18 Disbursement Schedule

Unit : thousand US$

Descriptions	Years									Total
	-4	-3	-2	-1	1	2	3	4	5	
1 ENGINEERING		1200	2200	2200	2200	2200	2200	2218		14418
2 CIVIL WORKS										
ACCESS ROAD			3000	2400						5400
TEMPORARY CAMP			2700	3000						5700
DAM					20000	22670	6400			49070
WATERWAY						3810	1440			5250
POWERHOUSE						5000	4600			9600
SUB TOTAL			5700	5400	20000	31480	12440	0		75020
3 HYDRAULIC EQUIPMENT						2000	3000	3000		8000
4 MECHANICAL EQUIPMENT					4000	5000	5000	4500		18500
5 ELECTRICAL EQUIPMENT					1000	4000	4000	1800		10800
6 TRANSMISSION LINE						3000	7000	3200		13200
7 SUBSTATIONS							5700	5450		11150
8 PERMANENT CAMP							3000	2500		5500
9 COMPENSATION			1000	1000	1000	1000	1000			3000
10 OTHERS							2910	5000	5000	12910
TOTAL	0	1200	8900	8600	28200	51680	45750	25168	5000	174498