FIG.-3.3.3 INUNDATION AREA BY FLOOD OF TYPHOON "DALING" IN 1981

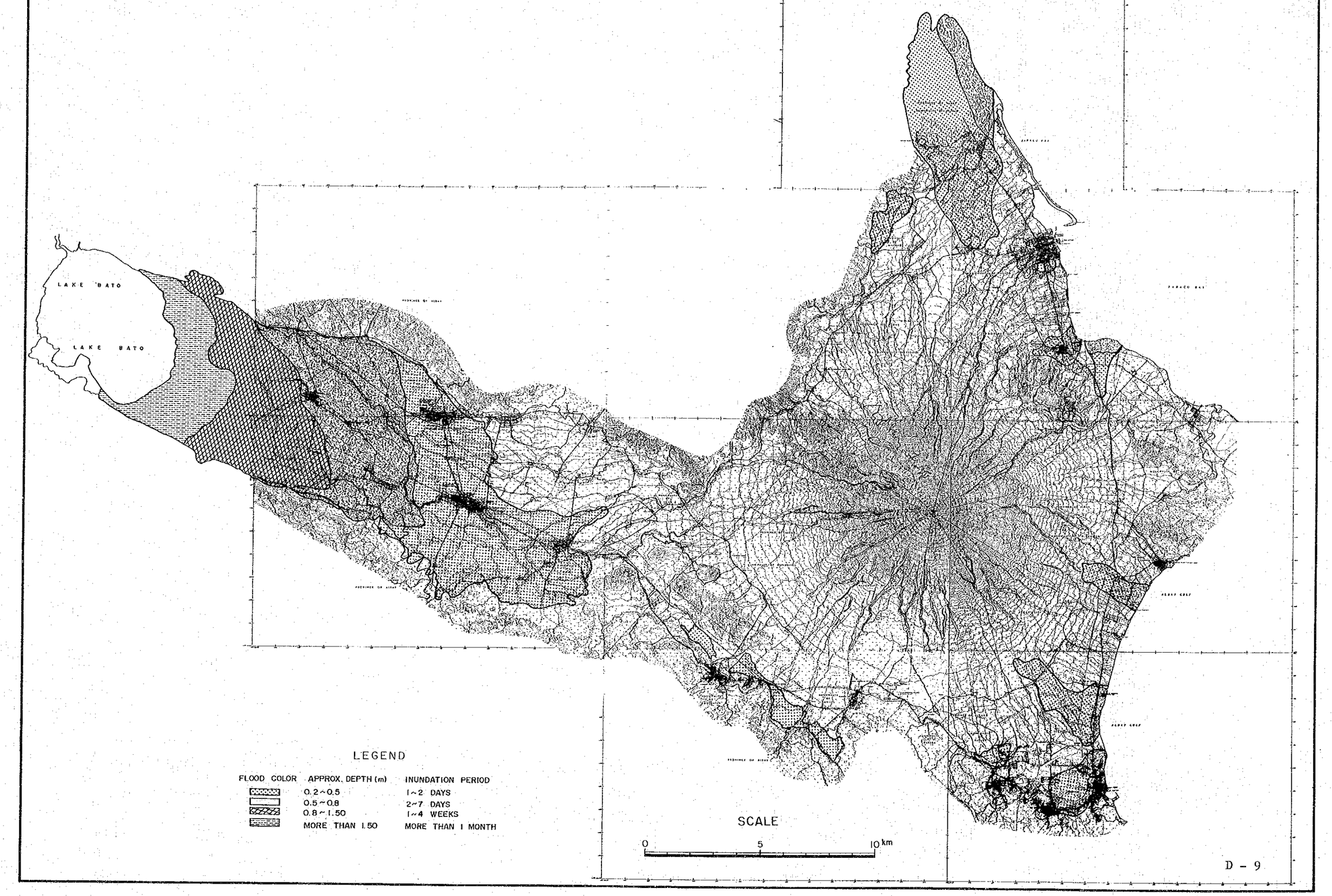
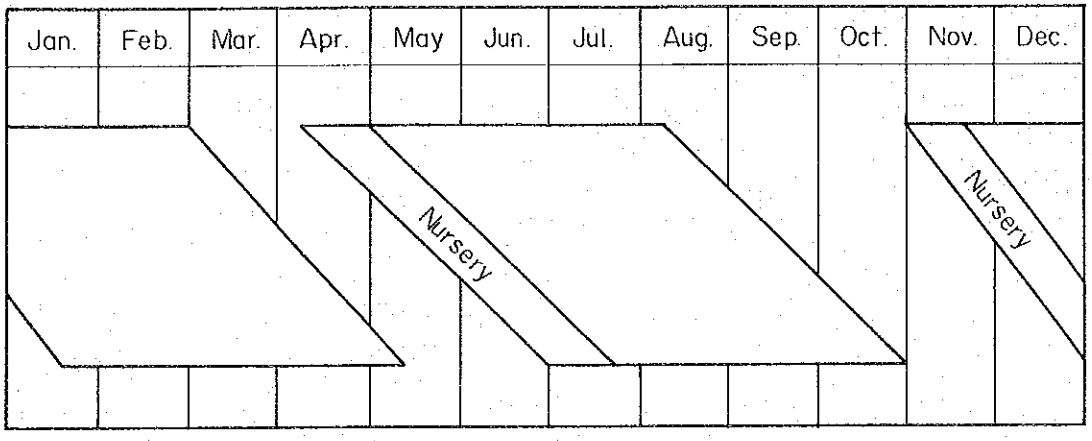


FIG.- 3.4.1 PRESENT CROPPING PATTERN OF PALAY

QUINALI (A) RIVER BASIN



QUINALI (B) RIVER BASIN

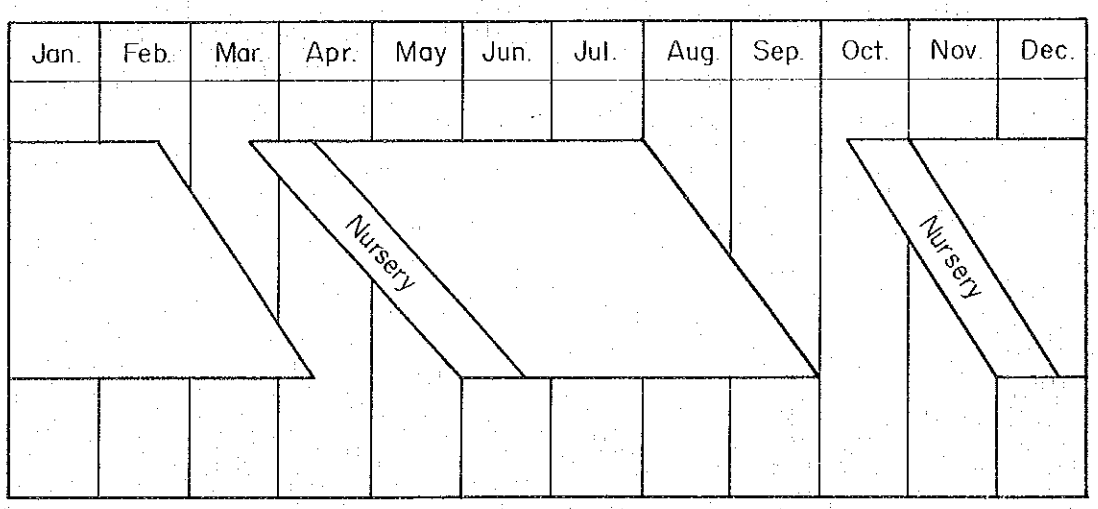
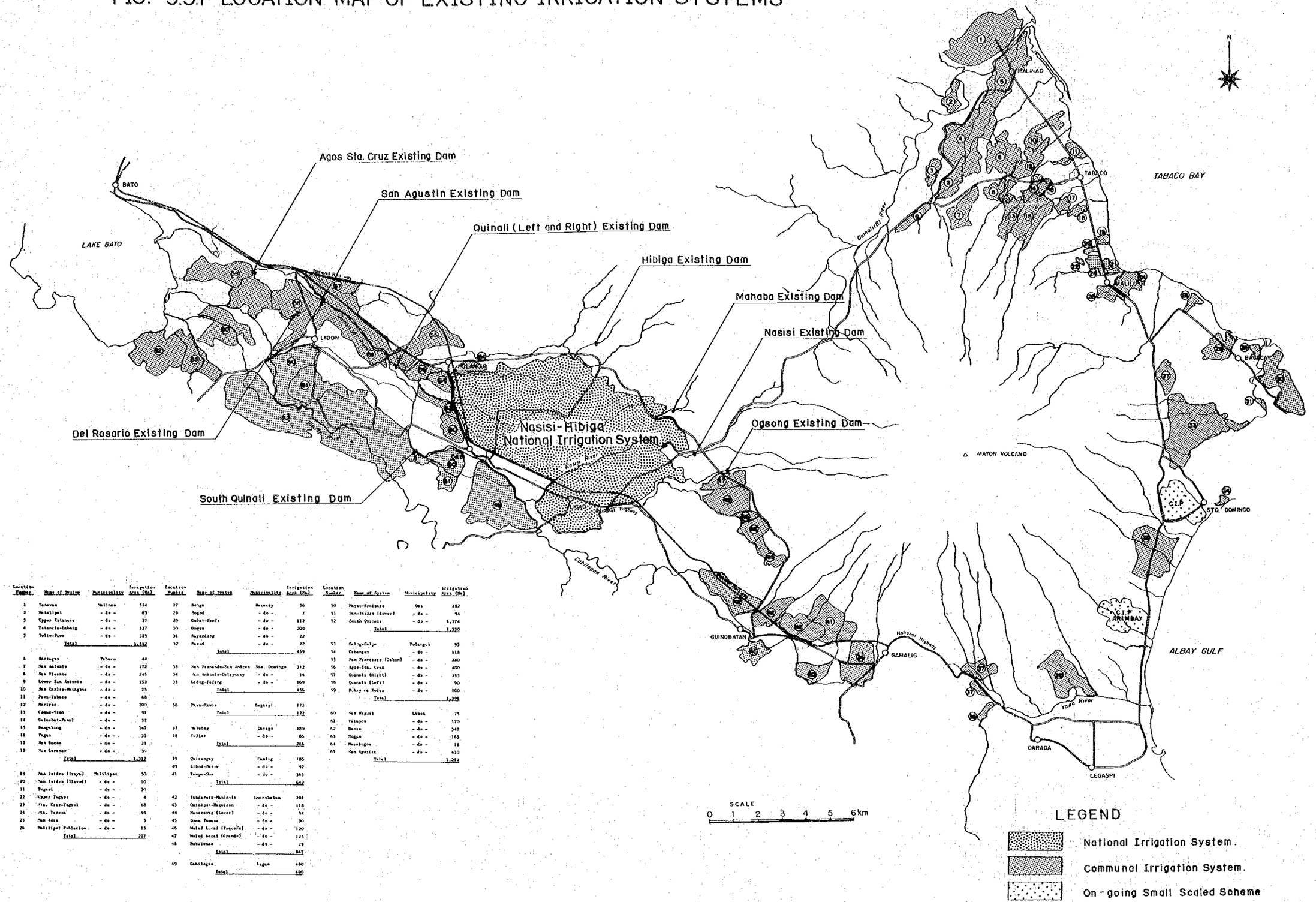
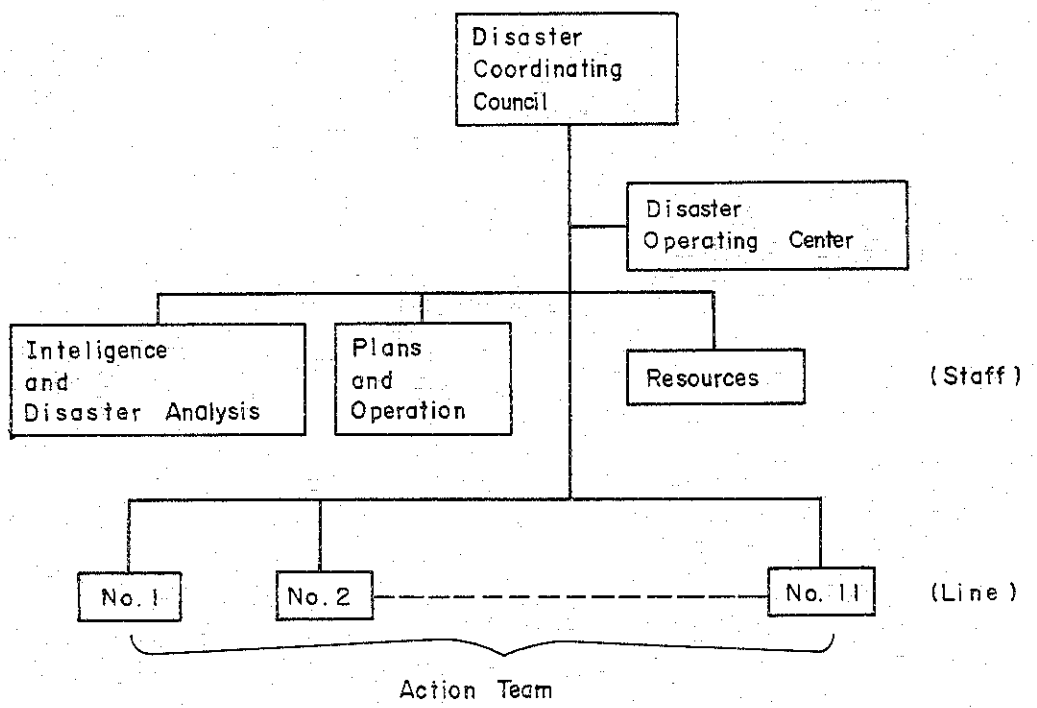


FIG.- 3.5.1 LOCATION MAP OF EXISTING IRRIGATION SYSTEMS



Location Number	Name of System	Municipality	Irrigation Area (Ha)
1	Tamaoan	Malinao	524
2	Matalipai	- do -	69
3	Upper Estancia	- do -	37
4	Estancia-Labaig	- do -	527
5	Tulin-Pawa	- do -	385
	Total		1,542
6	Bantagan	Tabaco	44
7	San Antonio	- do -	172
8	San Vicente	- do -	245
9	Lower San Antonio	- do -	153
10	San Carlos-Malaghoc	- do -	73
11	Pawa-Tabaco	- do -	48
12	Mariroc	- do -	209
13	Comun-Yoan	- do -	97
14	Guinobat-Panal	- do -	37
15	Bongabong	- do -	147
16	Tagas	- do -	33
17	San Bacon	- do -	21
18	San Lorenzo	- do -	30
	Total		1,312
19	San Isidro (Frayn)	Malilipot	50
20	San Isidro (Ilawod)	- do -	10
21	Tagoel	- do -	30
22	Upper Tagoel	- do -	4
23	Sta. Cruz-Tagoel	- do -	68
24	Sta. Teresa	- do -	95
25	San Jose	- do -	5
26	Malilipot Pablacion	- do -	35
	Total		777
27	Bonga	Manoocy	96
28	Sogod	- do -	7
29	Gubat-Binos	- do -	112
30	Gogon	- do -	200
31	Bayandong	- do -	22
32	Marad	- do -	22
	Total		459
33	San Fernando-San Andres	Sta. Domingo	312
34	San Antonio-Calayucay	- do -	34
35	Lidog-Tadang	- do -	160
	Total		486
36	Pawa-Rawis	Legazpi	122
	Total		122
37	Malabog	Daraga	280
38	Cullat	- do -	86
	Total		366
39	Quiroangay	Camalig	185
40	Libod-Baray	- do -	92
41	Tumpa-Sua	- do -	365
	Total		642
42	Tandarora-Maninila	Guinobatan	281
43	Quinipit-Maquiron	- do -	118
44	Masarawag (Lower)	- do -	54
45	Doon Tomas	- do -	90
46	Malad Surad (Pagurite)	- do -	120
47	Malad Surad (Grande)	- do -	125
48	Bubulusan	- do -	79
	Total		847
49	Cabilogan	Ligao	480
	Total		480
50	Mayac-Benipayo	Oas	282
51	San-Isidro (Lower)	- do -	94
52	South Quinali	- do -	1,174
	Total		1,550
53	Salog-Calpe	Polangui	95
54	Cabangan	- do -	118
55	San Francisco (Gabon)	- do -	280
56	Agos-Sta. Cruz	- do -	400
57	Quinali (Right)	- do -	333
58	Quinali (Left)	- do -	90
59	Bikay na Kodos	- do -	200
	Total		1,396
60	San Miguel	Libon	75
61	Velasco	- do -	170
62	Danao	- do -	347
63	Naga	- do -	165
64	Marabagon	- do -	18
65	San Agustin	- do -	439
	Total		1,212

FIG.-3.7.1 ORGANIZATION AND FUNCTION OF DCC

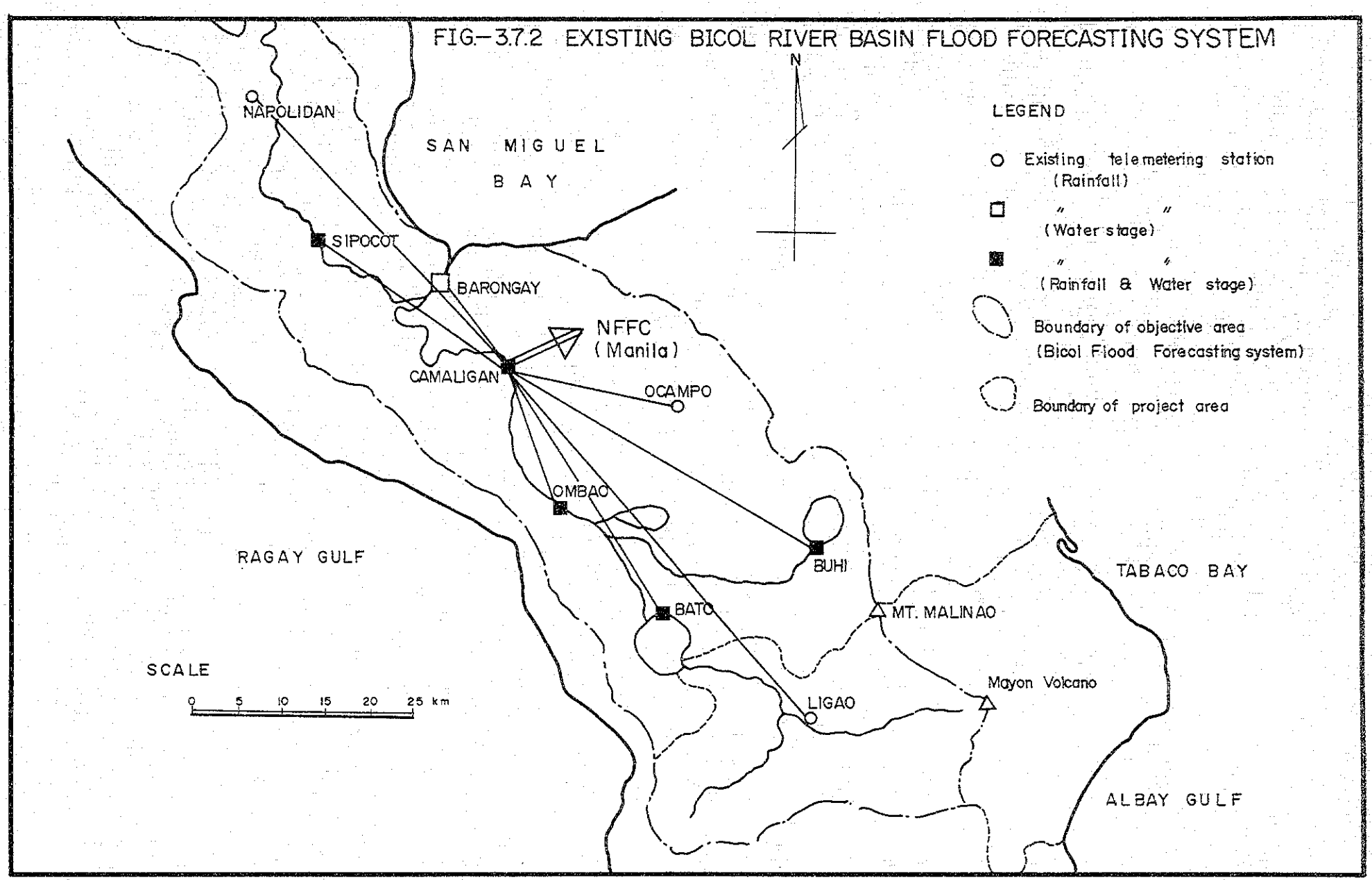


The regional, provincial and munincipal DCC do not hold the functions specified as No.2 and 4 among 11 functions. The barangay DCC holds the whole of 11 functions.

FUNCTIONS

No.	Activities
1	Communication and warning
2	Evacuation
3	Transportation
4	Damage control
5	Relief and rehabilitation
6	Rescue and recovery
7	Health
8	Welfare and rehabilitation
9	Fire
10	Police or security
11	Public information

FIG.-3.7.2 EXISTING BICOL RIVER BASIN FLOOD FORECASTING SYSTEM



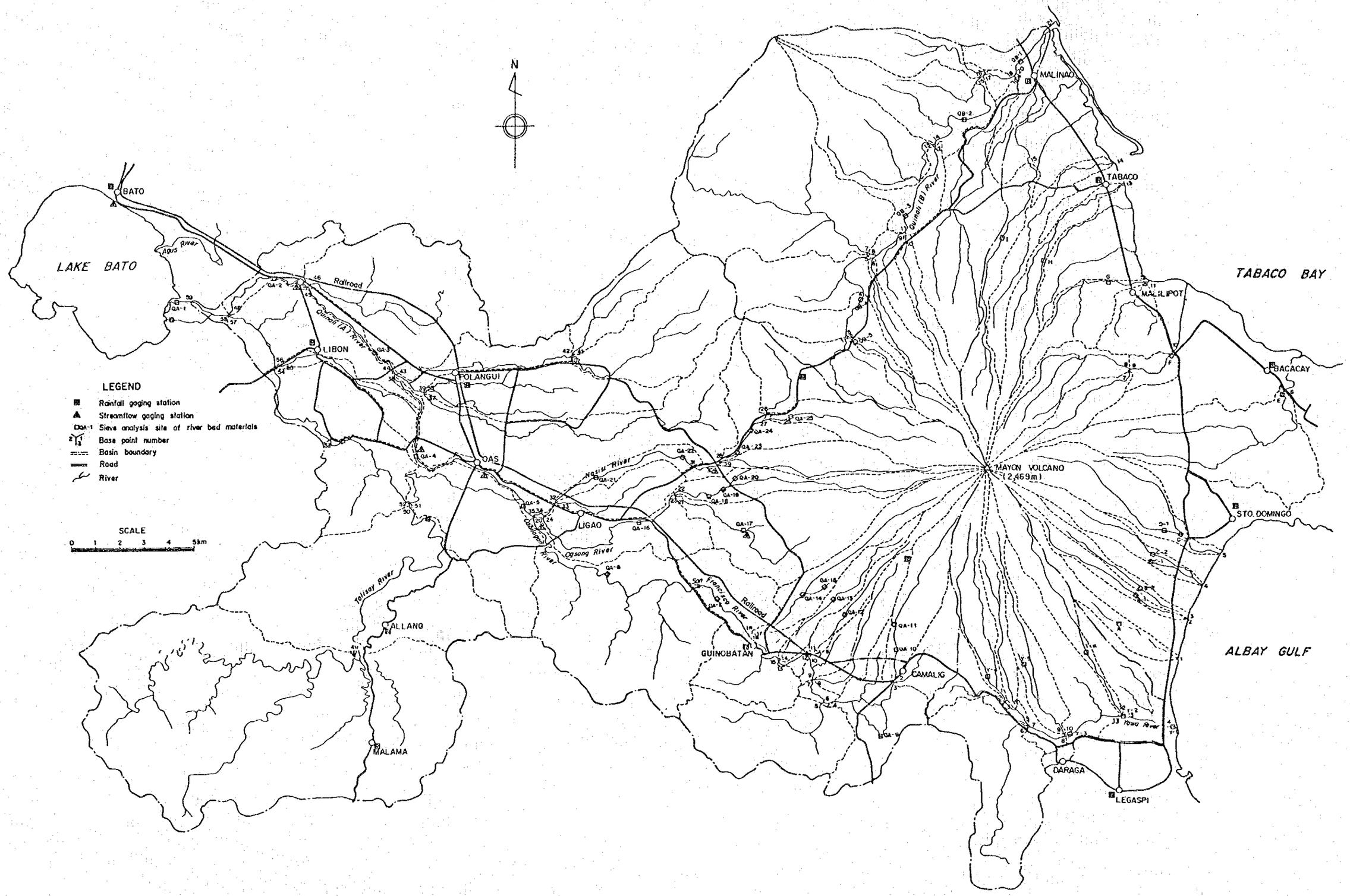


FIG.- 5.2.1 BASIN MAP

FIG.-5.2.2 PROBABLE 50-YR RAINFALL INTENSITY-DURATION CURVES FOR LEGAZPI

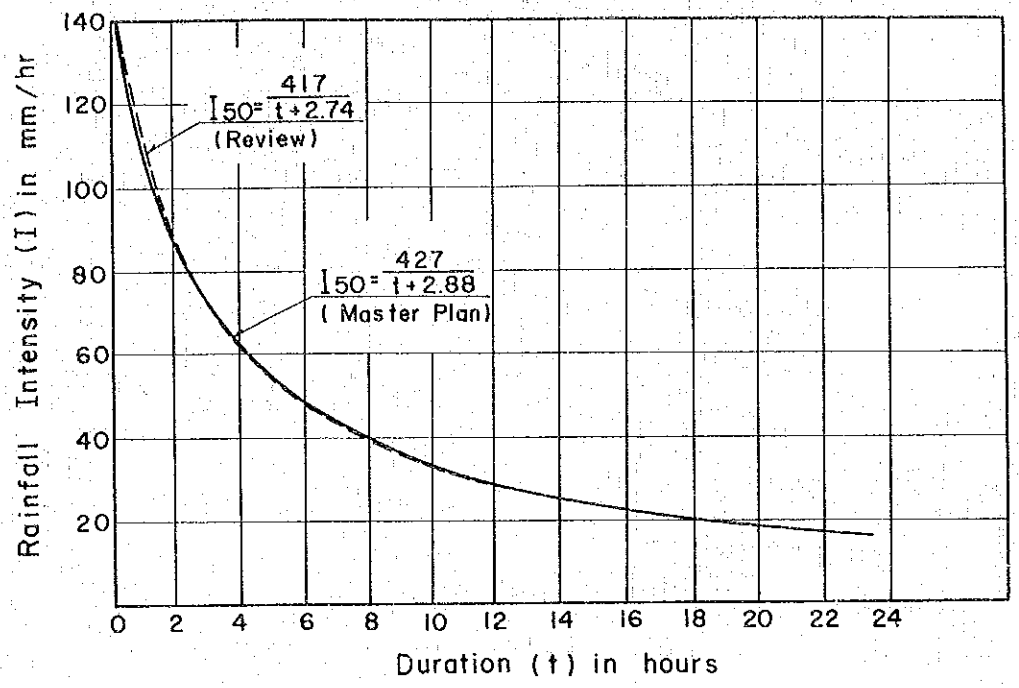
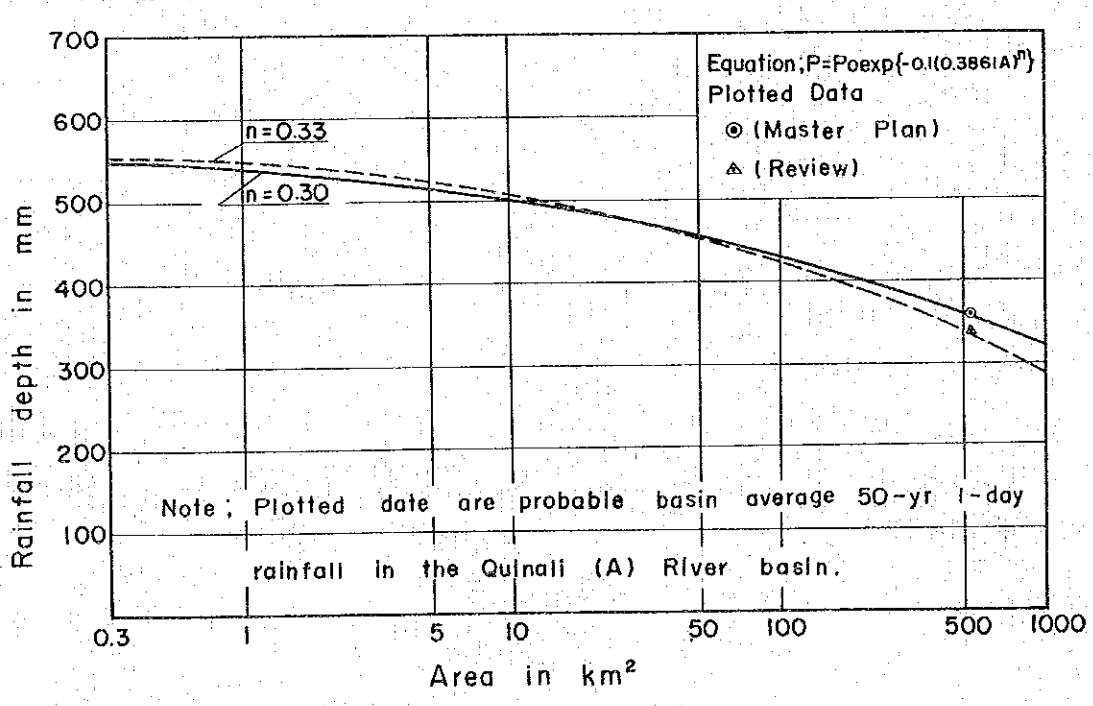


FIG.-5.2.3 PROBABLE 50-YR DAILY RAINFALL DEPTH-AREA CURVES FOR THE QUINALI (A) RIVER BASIN



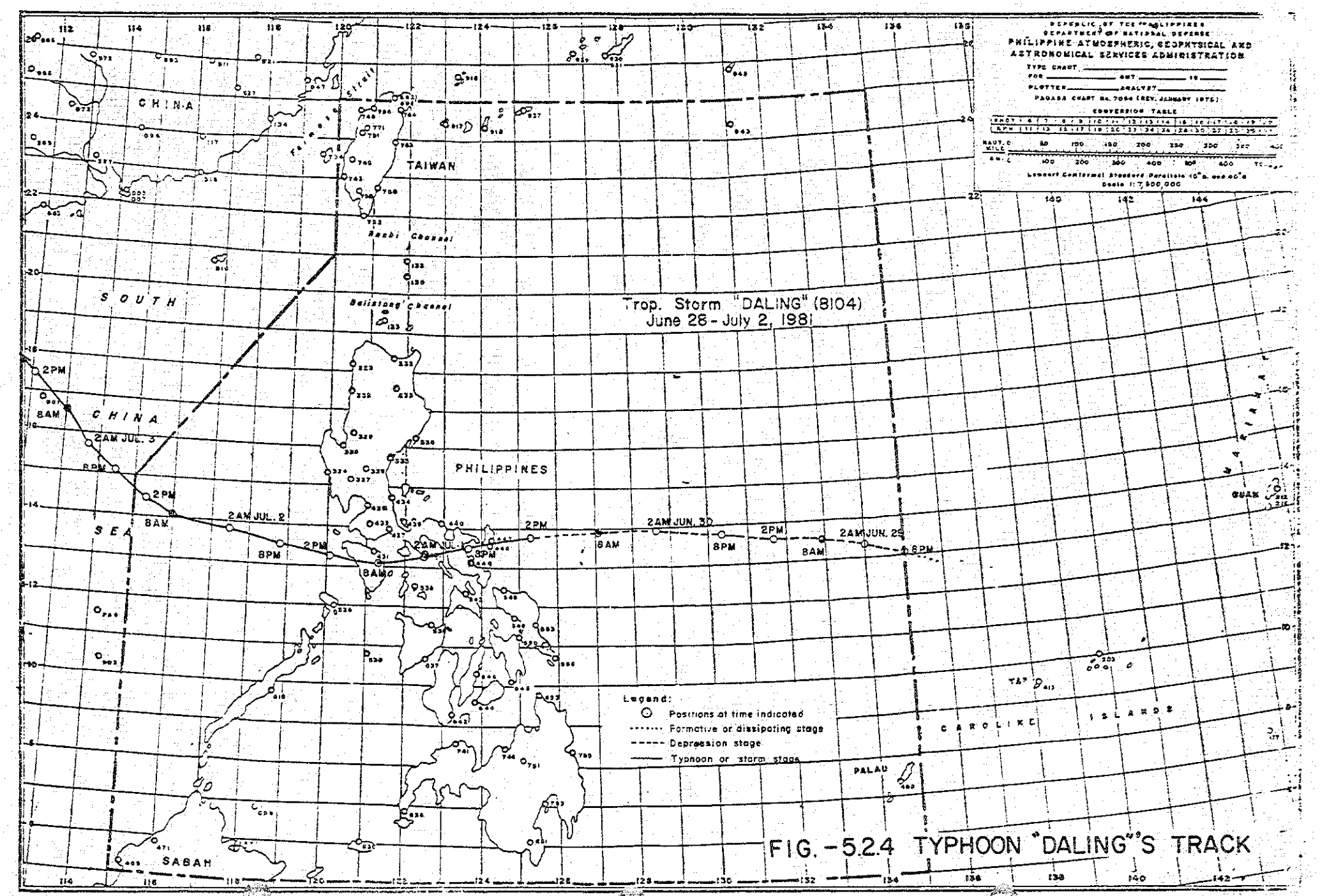
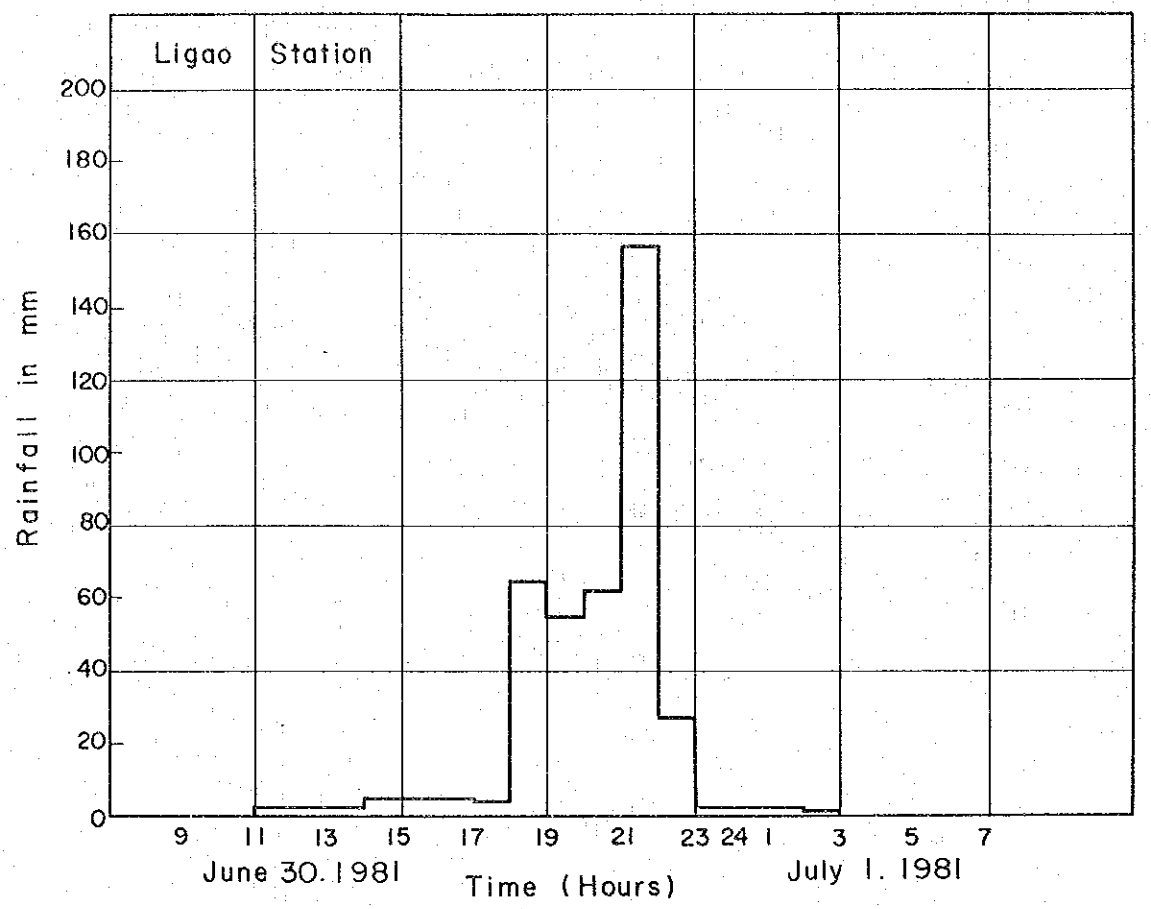


FIG. -5.2.4 TYPHOON "DALING"'S TRACK

FIG.-5.2.5 HOURLY RAINFALL DISTRIBUTION



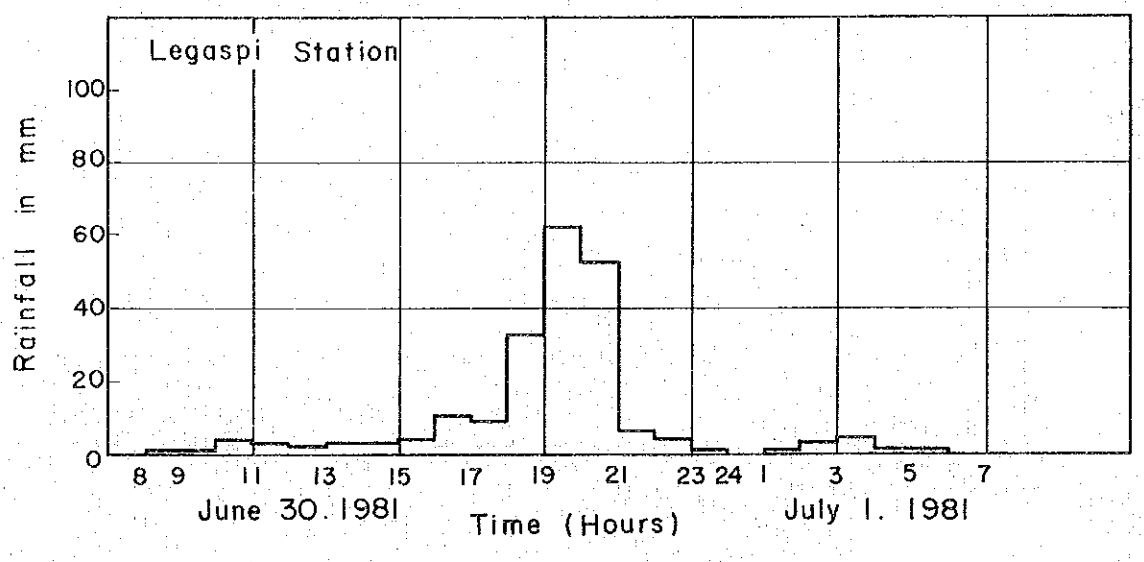
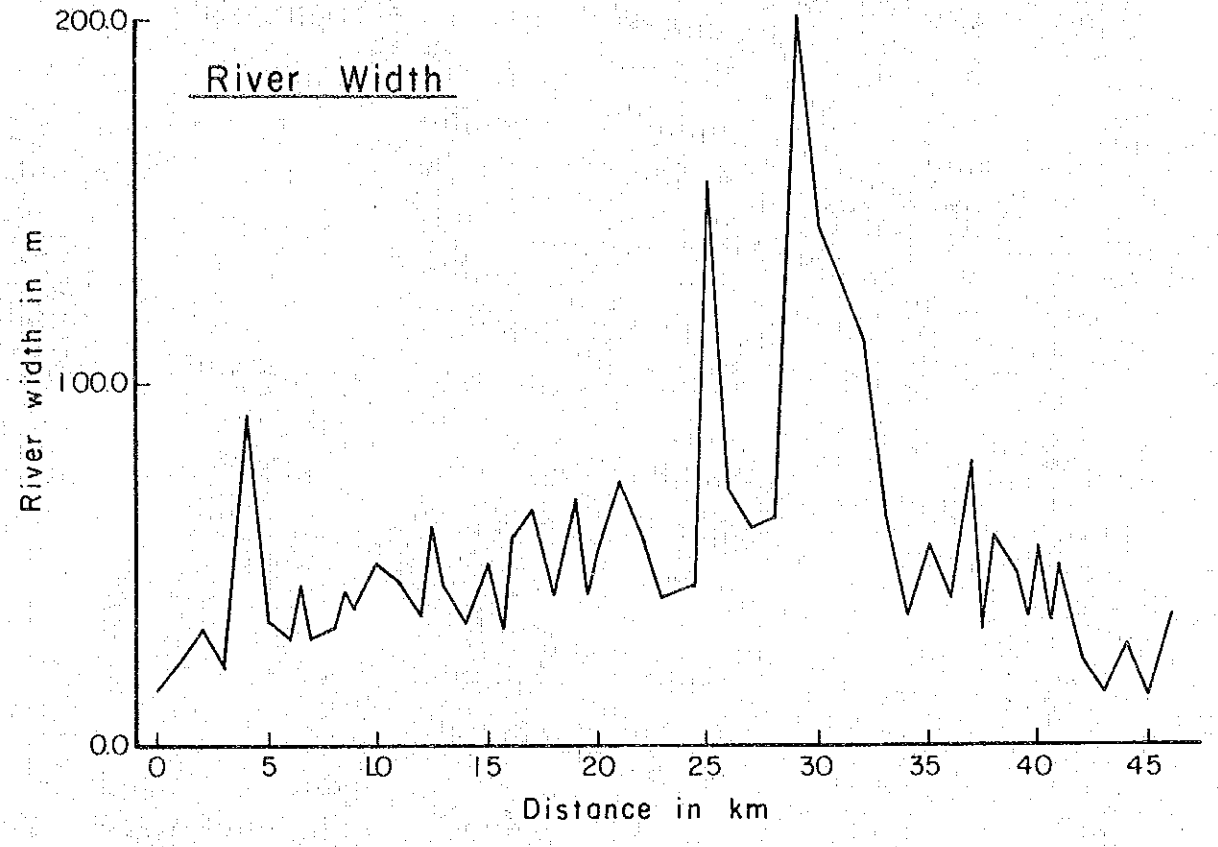


FIG.-5.4.1 RIVER WIDTH AND DISCHARGE CAPACITY OF THE PRESENT RIVER CHANNEL, THE QUINALI (A) RIVER, MAIN COURSE



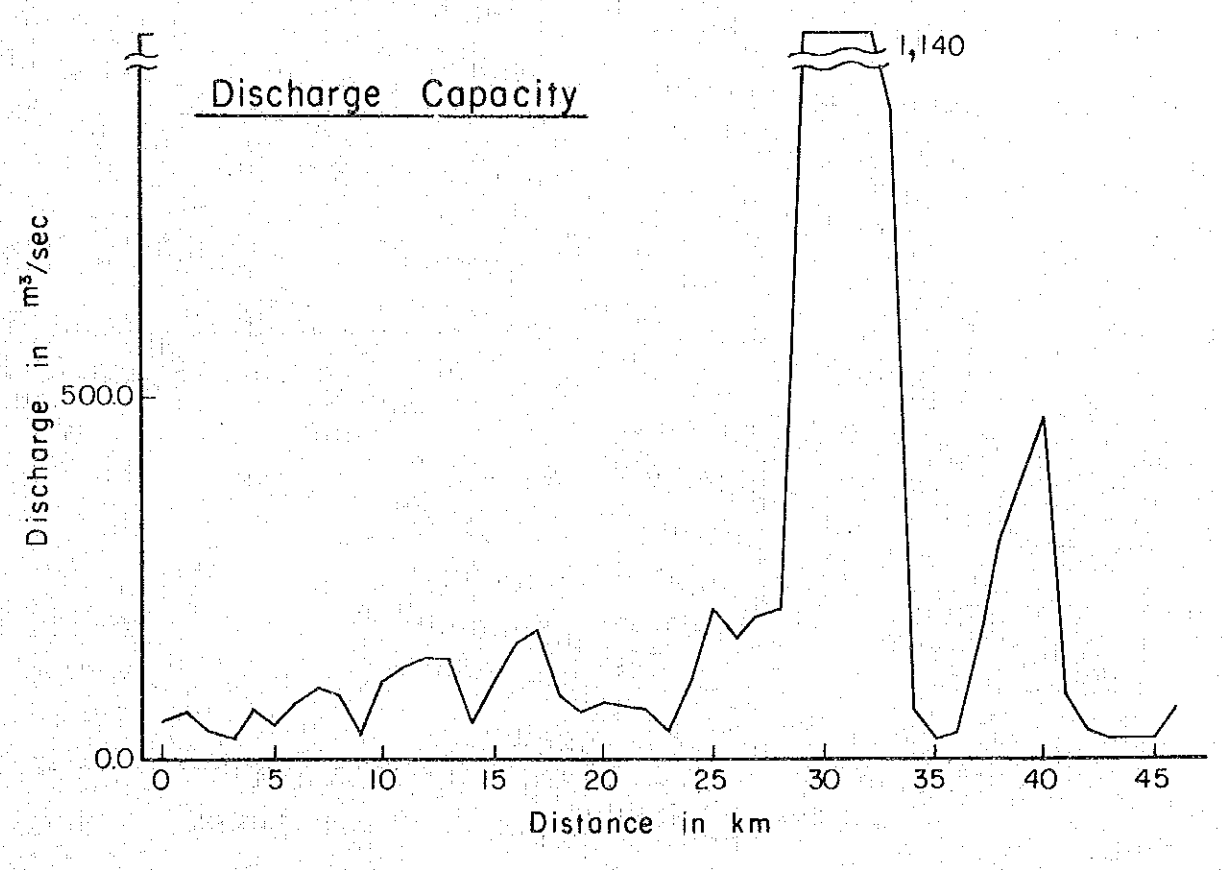
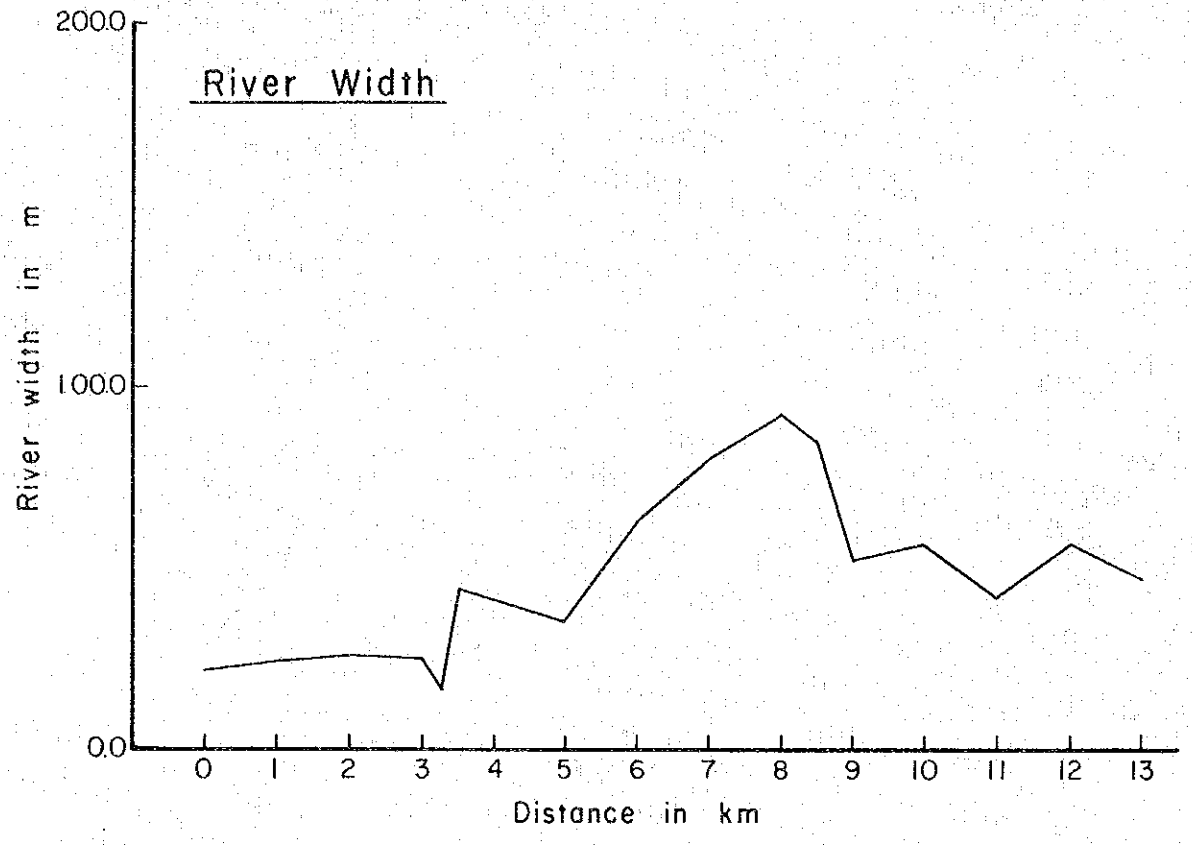


FIG.-5.4.2 RIVER WIDTH AND DISCHARGE CAPACITY OF THE PRESENT RIVER CHANNEL, THE TALISAY RIVER



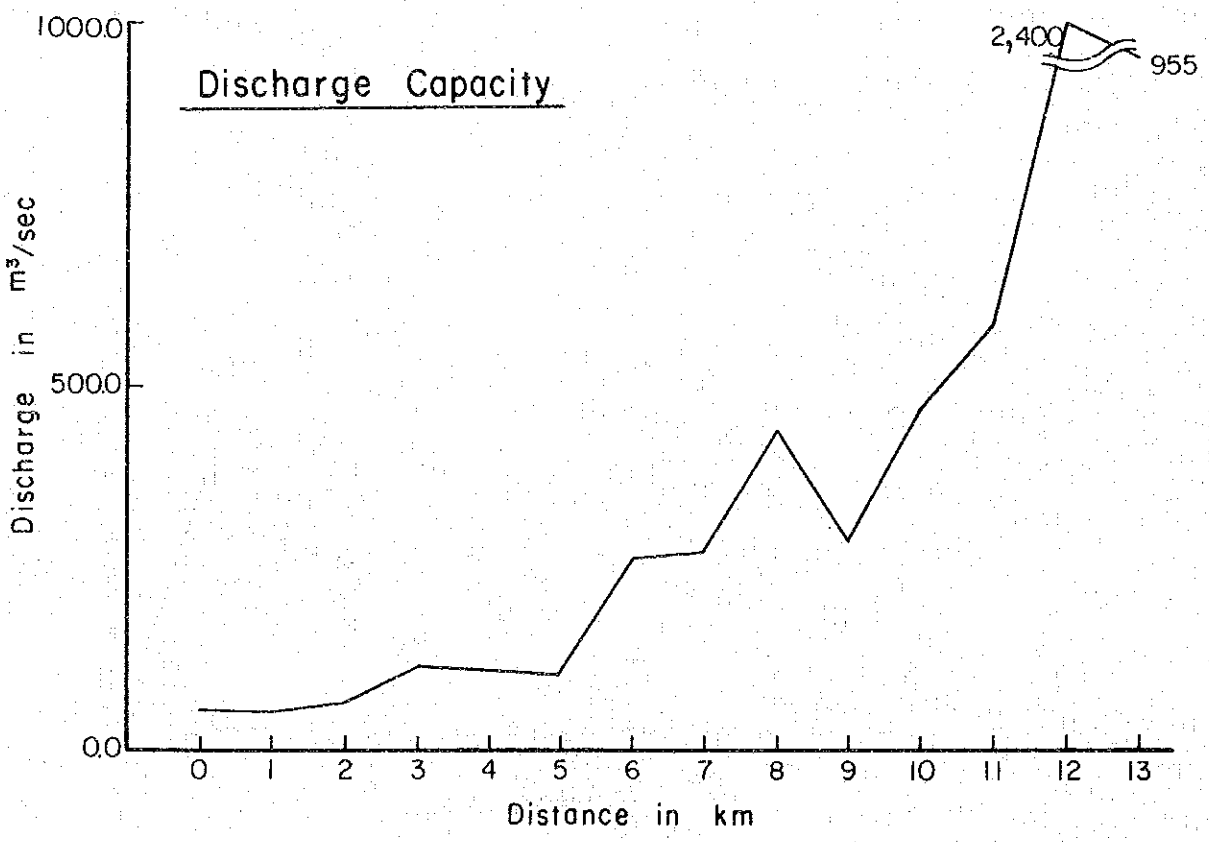
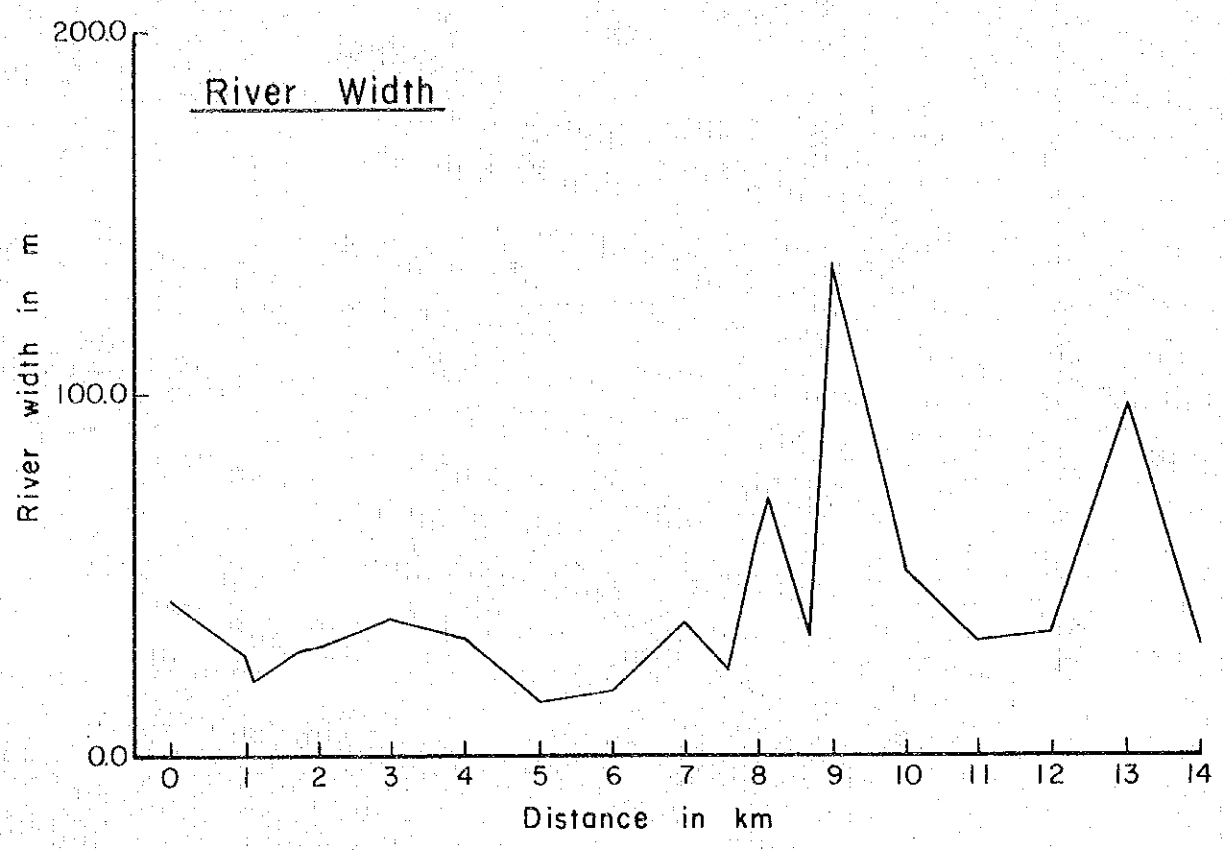


FIG.-5.4.3 RIVER WIDTH AND DISCHARGE CAPACITY OF THE PRESENT RIVER CHANNEL, THE NASISI RIVER



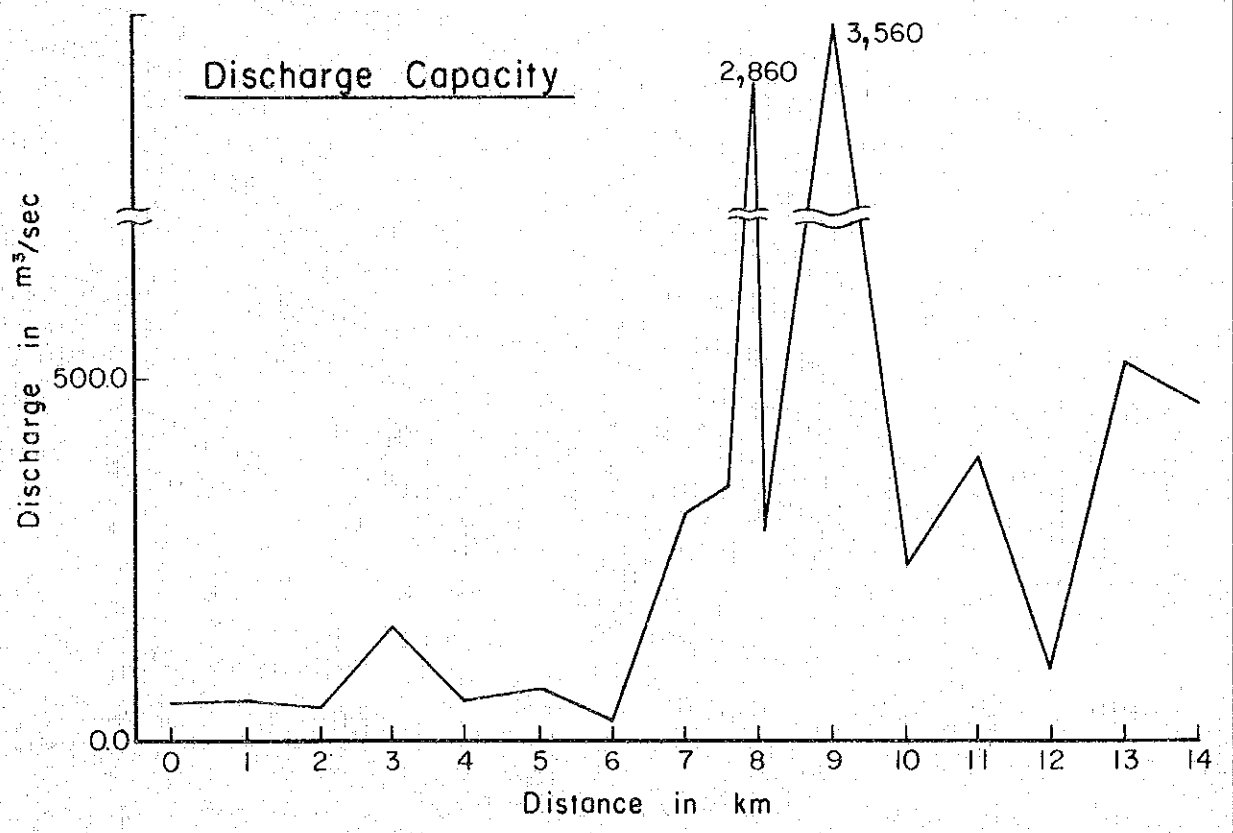


FIG.-5.4.4 DESIGN DISCHARGE DISTRIBUTION DIAGRAM, THE QUINALI (A) RIVER

(PROPOSED SCHEME RETURN PERIOD 50-YEAR)

Unit : m^3/sec

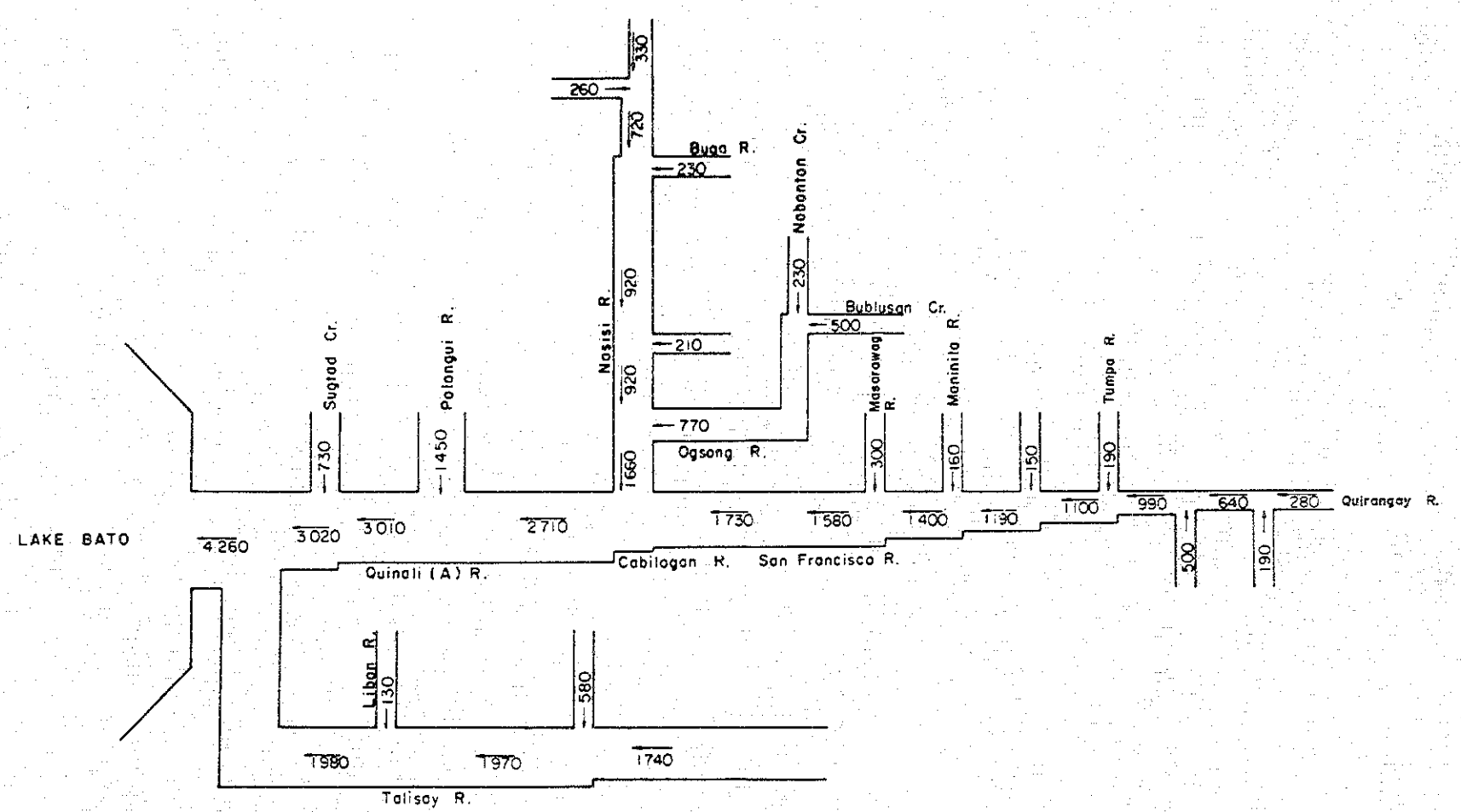


FIG.-5.4.5 ALTERNATIVES FOR ROUTE SELECTION

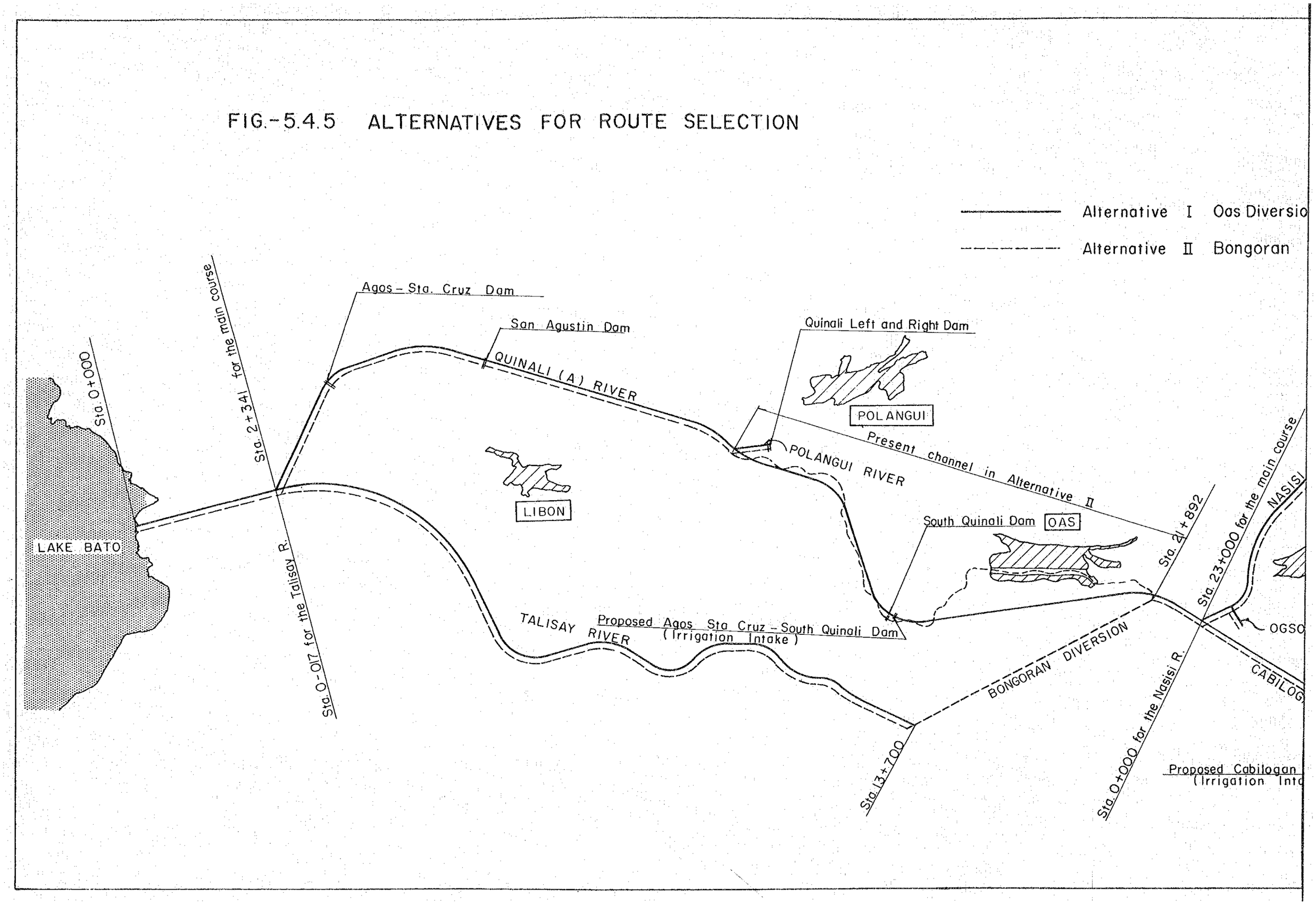


FIG.-5.4.5 ALTERNATIVES FOR ROUTE SELECTION

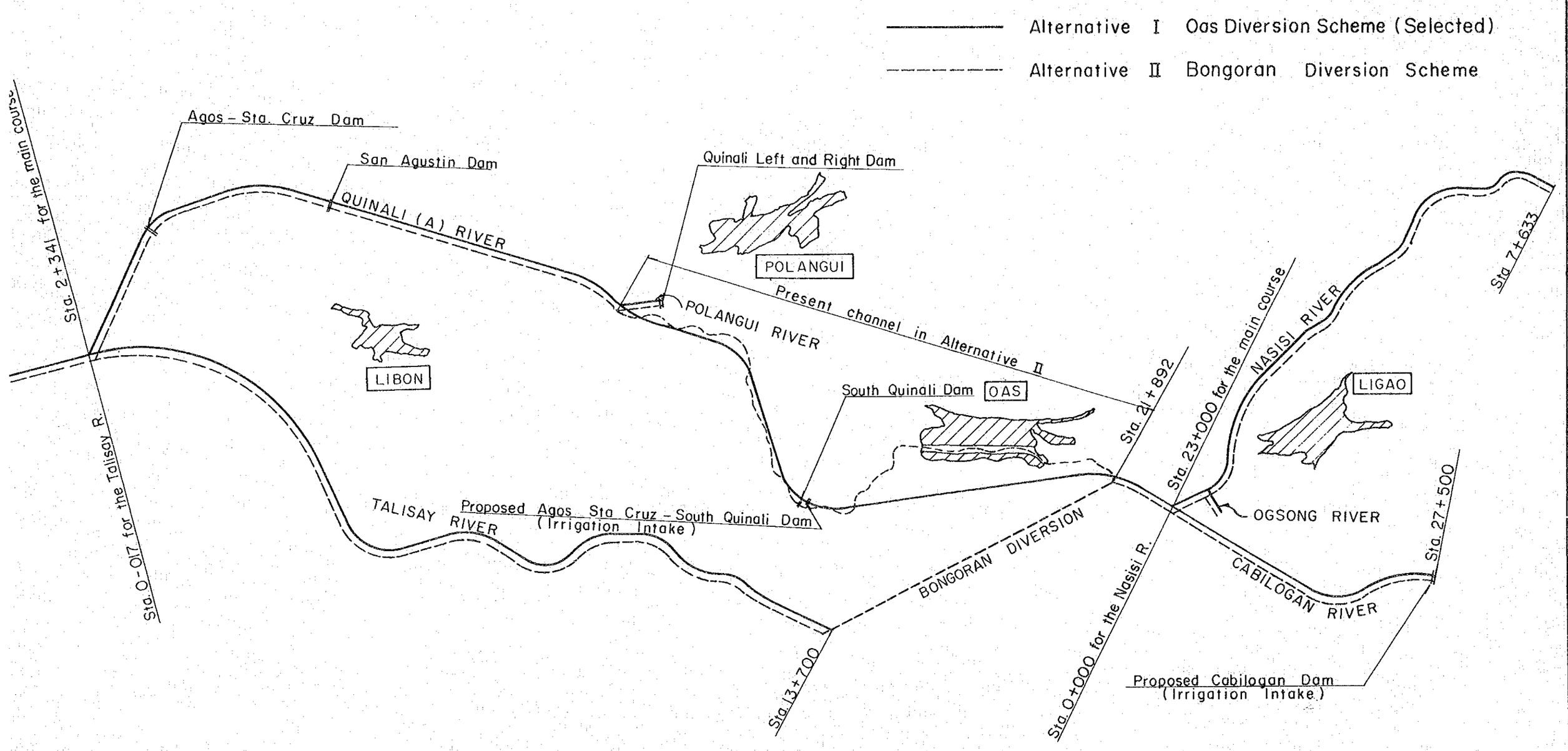


FIG.-5.4.6 DESIGN DISCHARGE DISTRIBUTION DIAGRAM, THE QUINALI (A) RIVER
BONGORAN DIVERSION SCHEME (RETURN PERIOD 50 - YEAR)

Unit : m^3/sec

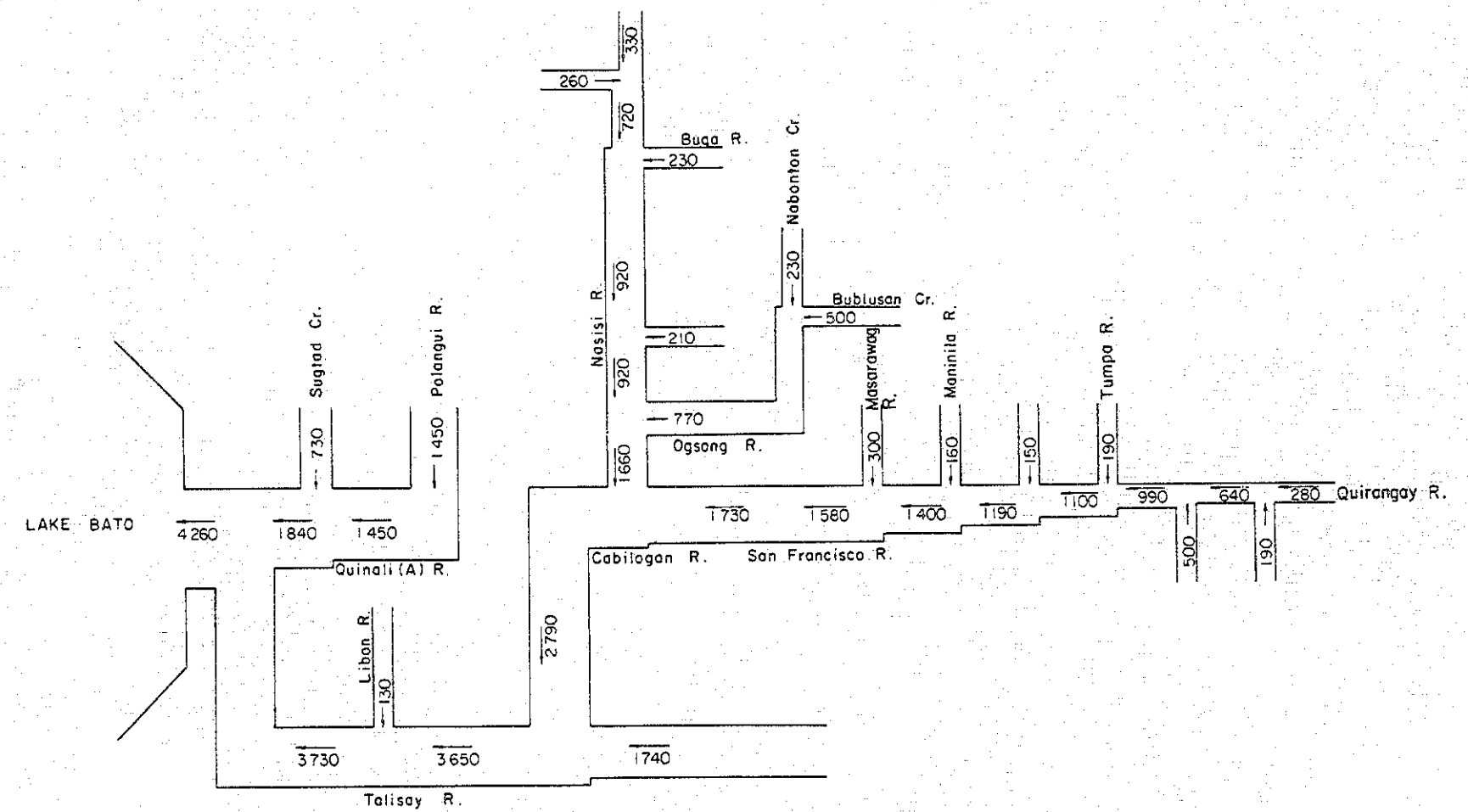
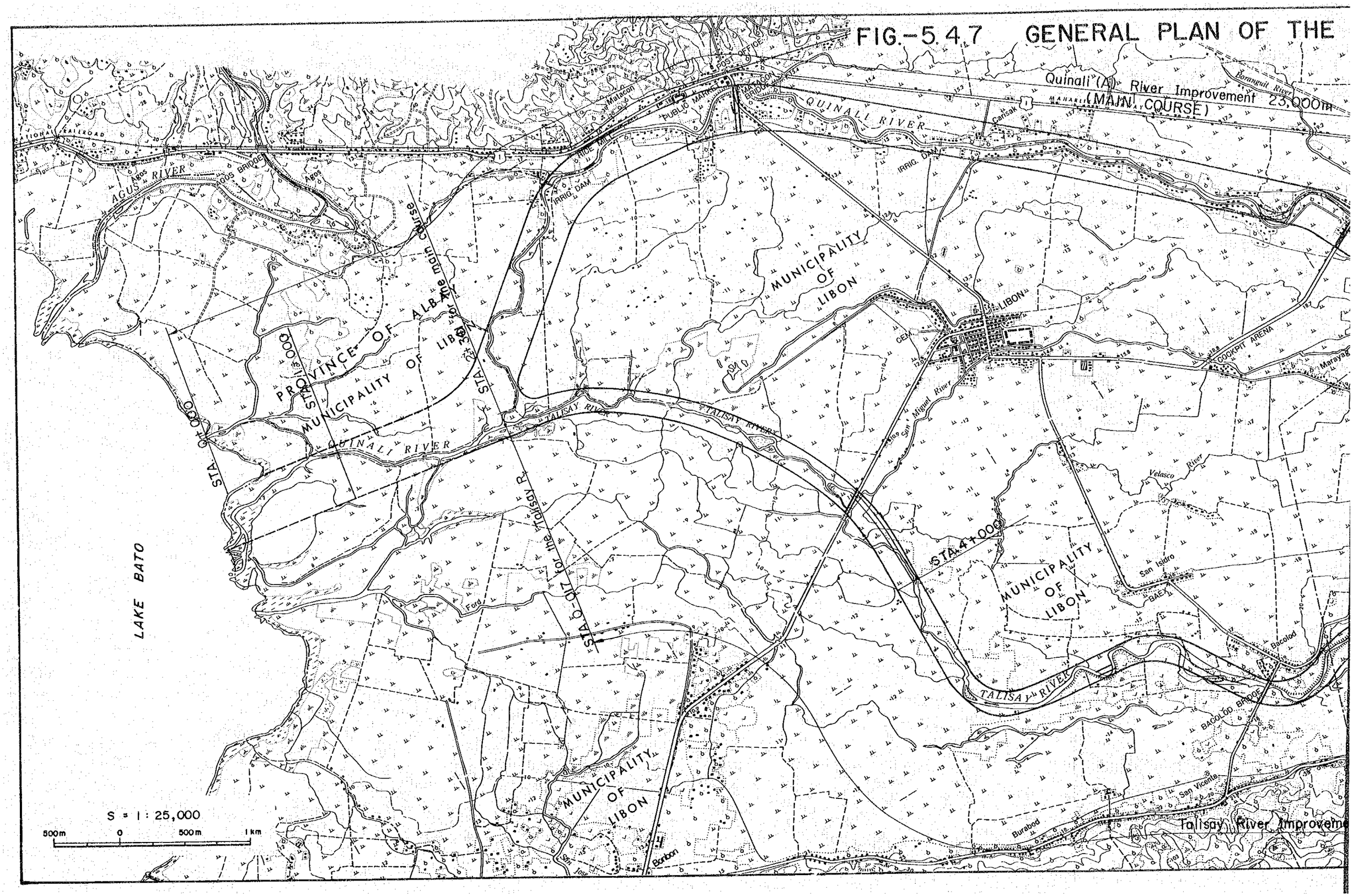
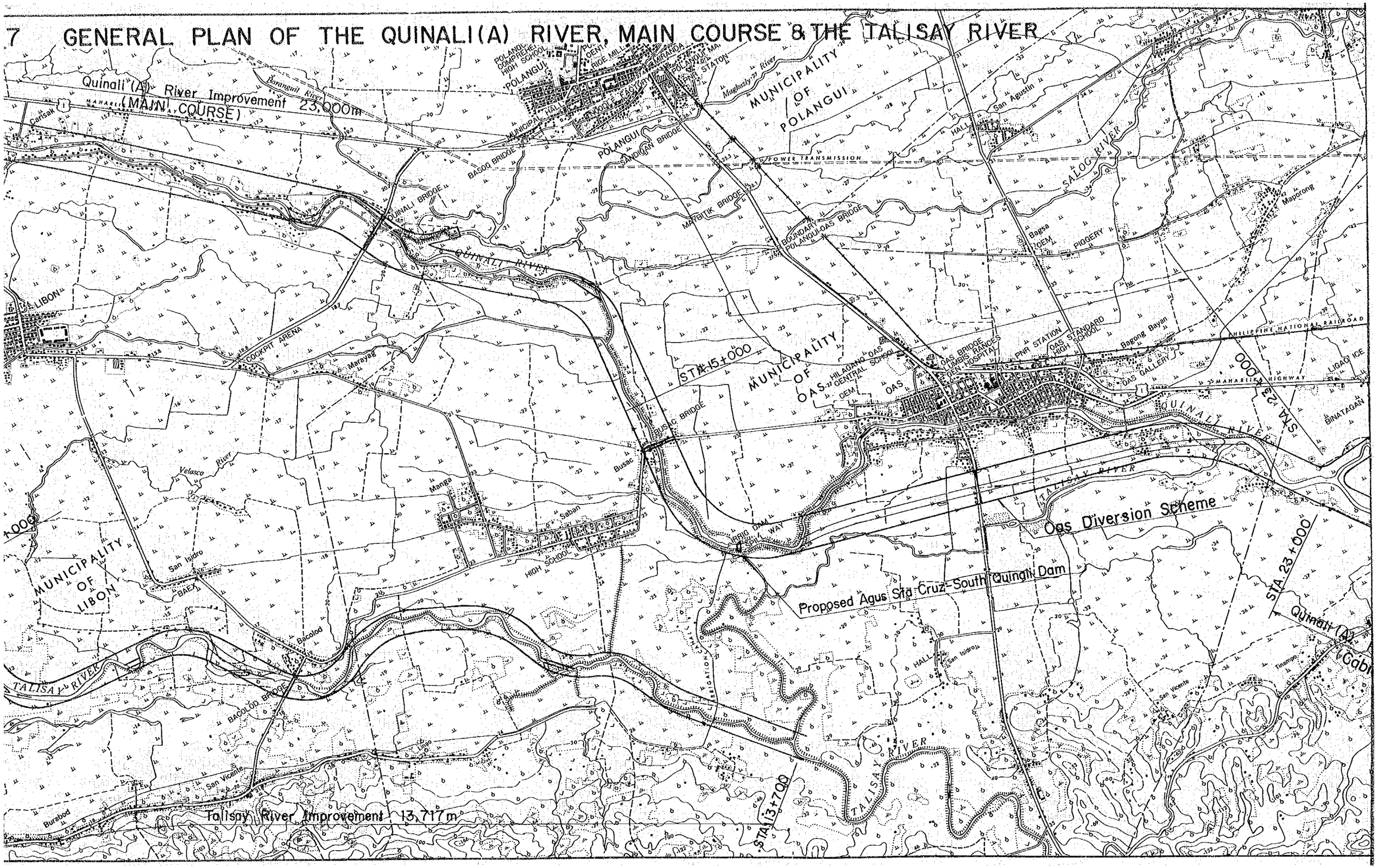


FIG.-5.4.7 GENERAL PLAN OF THE



7 GENERAL PLAN OF THE QUINALI(A) RIVER, MAIN COURSE & THE TALISAY RIVER



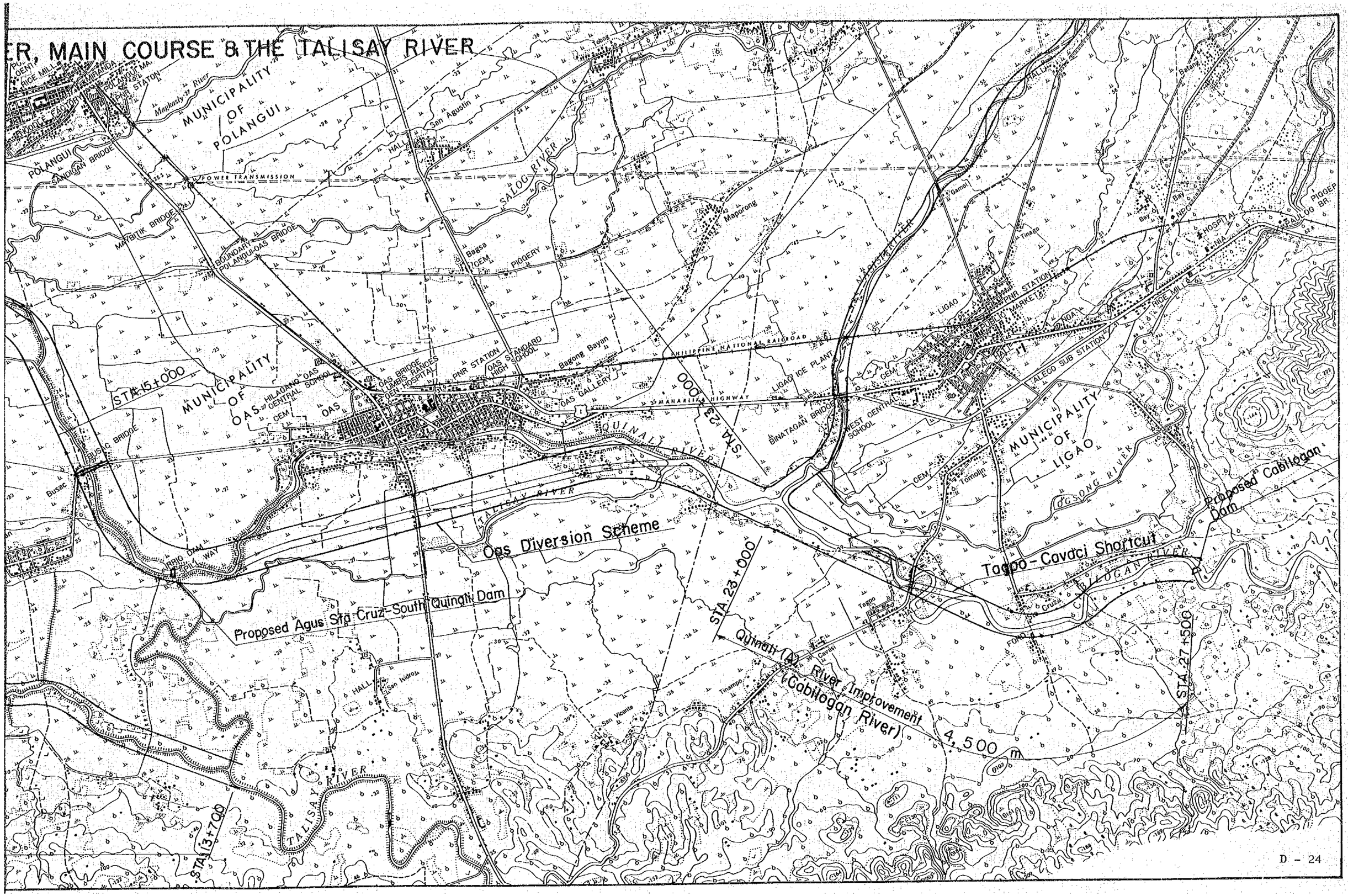

ER, MAIN COURSE & THE TALISAY RIVER
MUNICIPALITY OF POLANGUI
POLANGUI SANDIGAN BRIDGE
POWER TRANSMISSION
MAYBITIK BRIDGE
BOUNDARY POLANGUI-OAS BRIDGE
SALOG RIVER
Maporong
Bagsa
PIGGERY
STA 15+000
MUNICIPALITY OF OAS
HILAGANG OAS CENTRAL SCHOOL
OAS BRIDGE
OAS STANDARD HIGH SCHOOL
PNR STATION
Bagong Bayan
PHILIPPINE NATIONAL RAILROAD
OAS GALLERY
MAHARLIKA HIGHWAY
LIGAO ICE PLANT
BINATAGAN BRIDGE
WEST CENTRAL SCHOOL
QUINALI RIVER
STA 23+000
MUNICIPALITY OF LIGAO
ALECO SUB STATION
PNR STATION
PUBLIC MARKET
RICE MILL
HOSPITAL
NDC
PIGGEP BR.
BUSAC BRIDGE
IRRIG DAM
SPILL WAY
TALISAY RIVER
Oas Diversion Scheme
Proposed Agus Sta Cruz-South Quinali Dam
Tagpo - Cavaci Shortcut
CABILOGAN RIVER
Proposed Cabilogan Dam
STA 23+000
Quinali (A) River Improvement (Cabilogan River)
4,500 m
STA 27+500
STA 13+700
IRRIGATION CANAL
San Isidro
San Vicente
Tinampo
Tagpo
Cavaci
Tomolin
Gamol
Tinago
Batang
Bay
LIGAO

FIG.-5.4.8 GENERAL PLAN OF THE NASISI RIVER

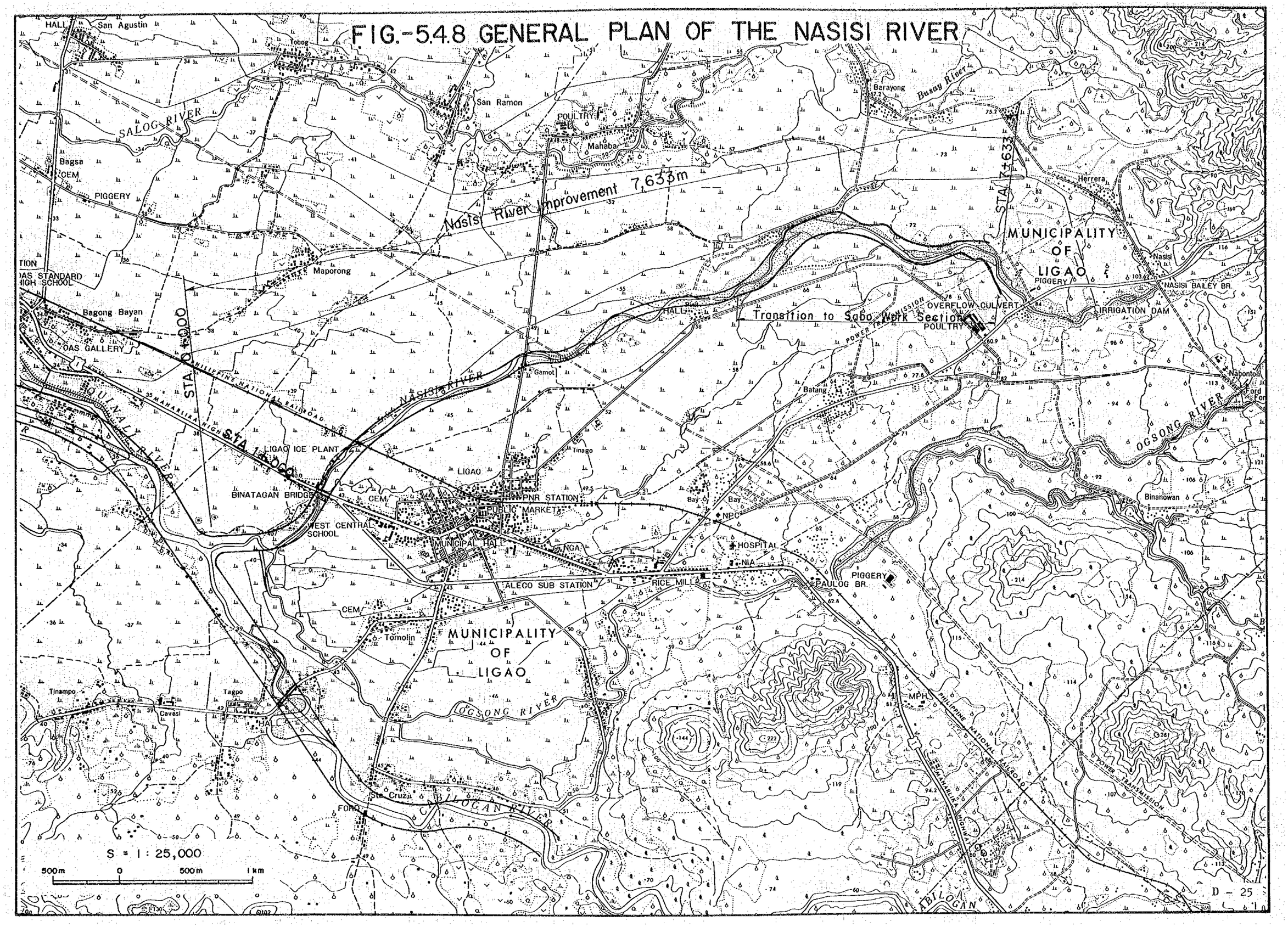
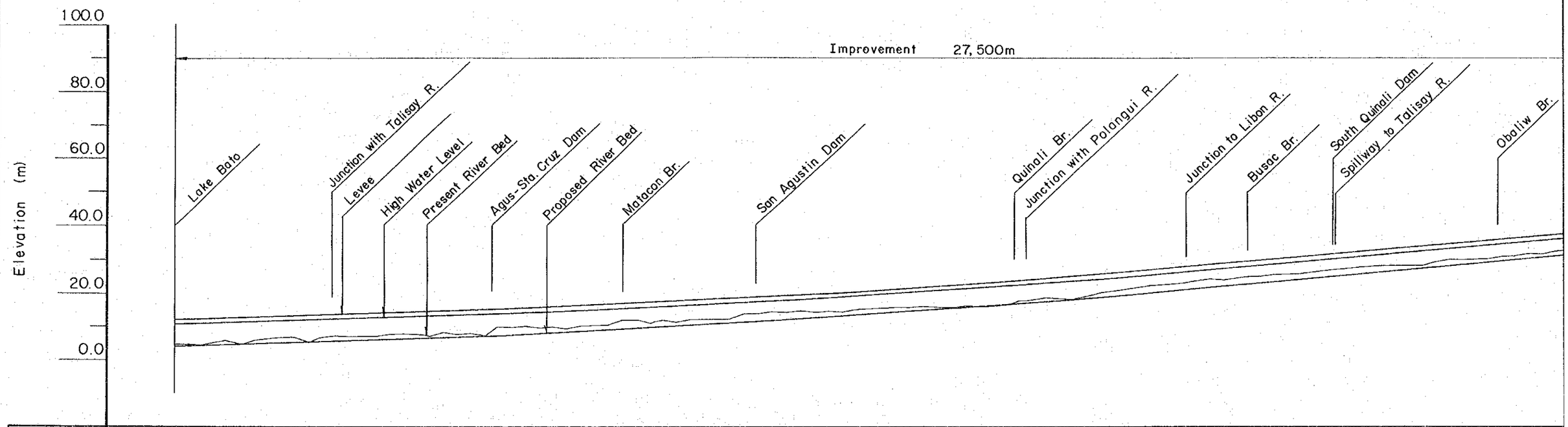


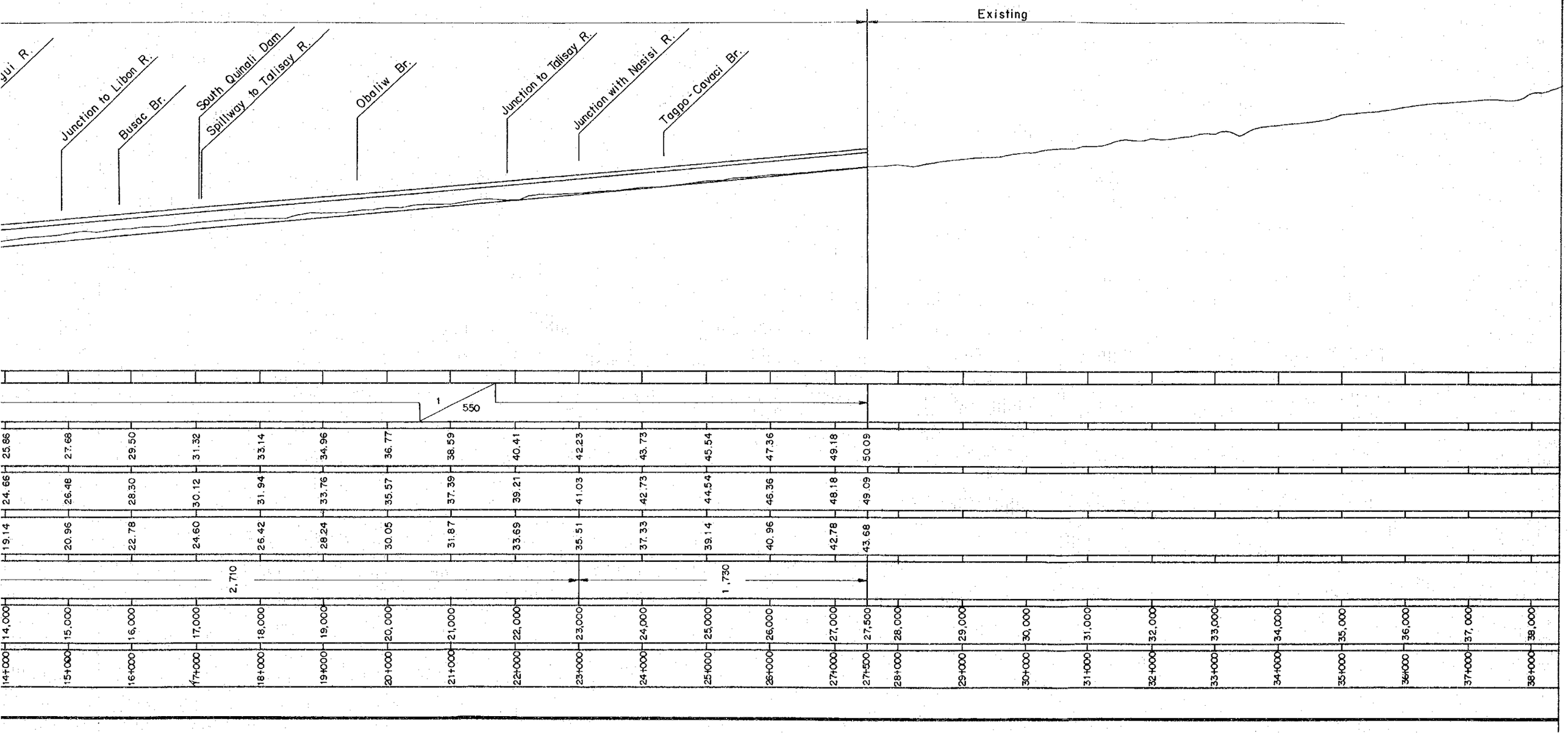
FIG.-5.4.9 PROFILE OF QUINALI (A) RIVER, MAIN COURSE



Proposed River Bed Gradient	1/1,550					1/1,000					1/700										
Formation Height of Levee (EL.m)	12.00	12.64	13.28	13.66	14.30	14.53	15.53	16.52	17.52	18.67	20.10	21.53	22.96	24.40	25.86	27.68	29.50	31.32	33.14	34.96	36.77
High Water Level (EL.m)	10.80	11.44	12.08	12.46	13.10	13.33	14.33	15.32	16.32	17.47	18.90	20.33	21.76	23.20	24.66	26.48	28.30	30.12	31.94	33.76	35.57
Formation Height of River Bed (EL.m)	3.98	4.63	5.27	5.92	6.56	7.35	8.35	9.35	10.35	11.69	13.12	14.55	15.98	17.41	19.14	20.96	22.78	24.60	26.42	28.24	30.05
Discharge (m^3/s)	4,260			3,020				3,010						2,710							
Cumulative Distance (m)	0	1,000	2,000	2,341	3,000	4,000	4,600	5,000	6,000	7,000	8,000	8,200	9,000	10,000	11,000	12,000	12,512	13,000	13,200	14,000	15,000
Station No.	0+000	1+000	2+000	2+341	3+000	4+000	4+600	5+000	6+000	7+000	8+000	8+200	9+000	10+000	11+000	12+000	12+512	13+000	13+200	14+000	15+000

Formation Height of Levee (EL.m)	16.00	17.00	18.00	19.00	20.00																
High Water Level (EL.m)	16.00	17.00	18.00	19.00	20.00																
Formation Height of River Bed (EL.m)	16.00	17.00	18.00	19.00	20.00																
Discharge (m^3/s)																					
Cumulative Distance (m)	16,000	17,000	18,000	19,000	20,000																
Station No.	16+000	17+000	18+000	19+000	20+000																

LE OF QUINALI (A) RIVER, MAIN COURSE



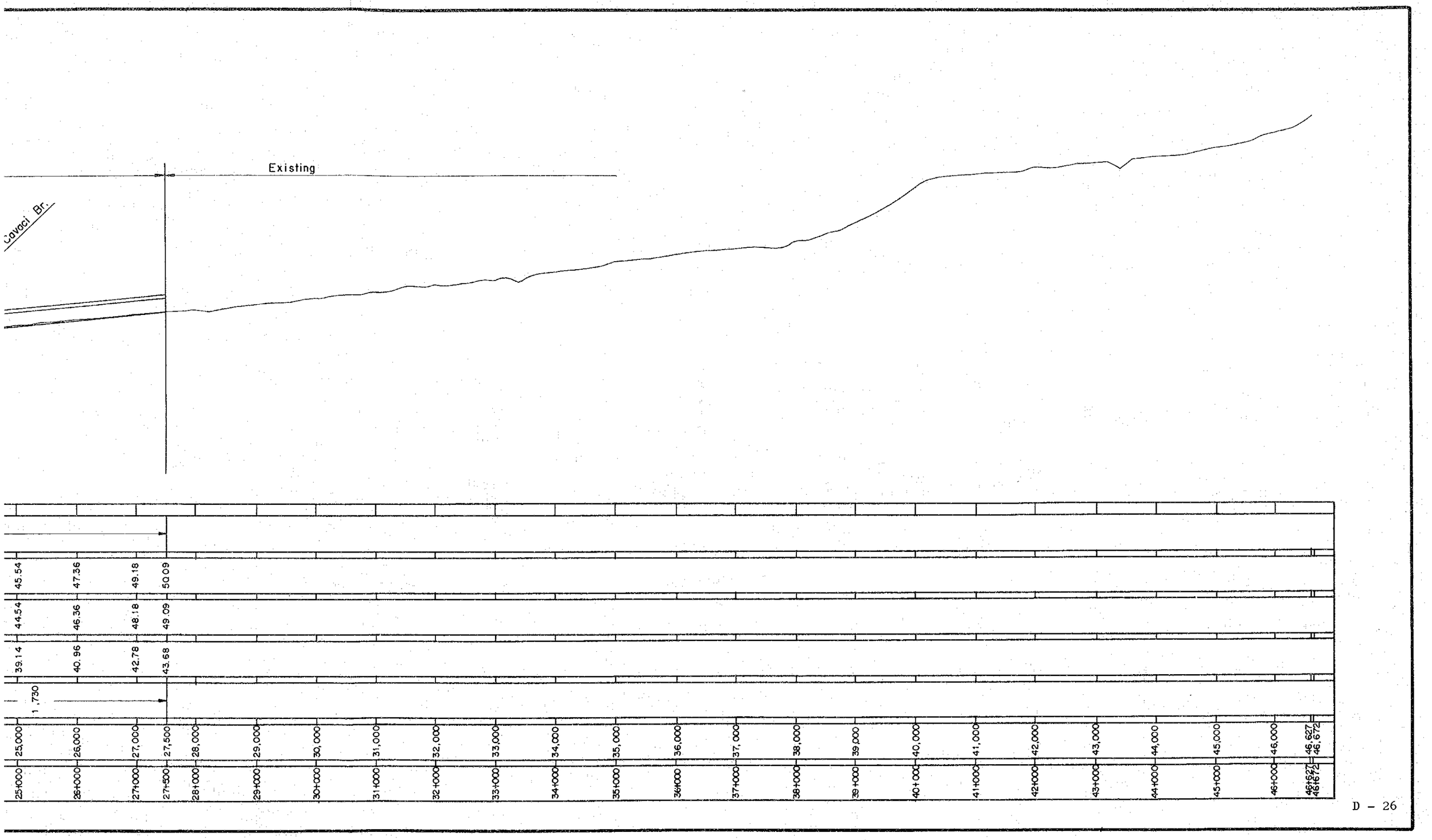
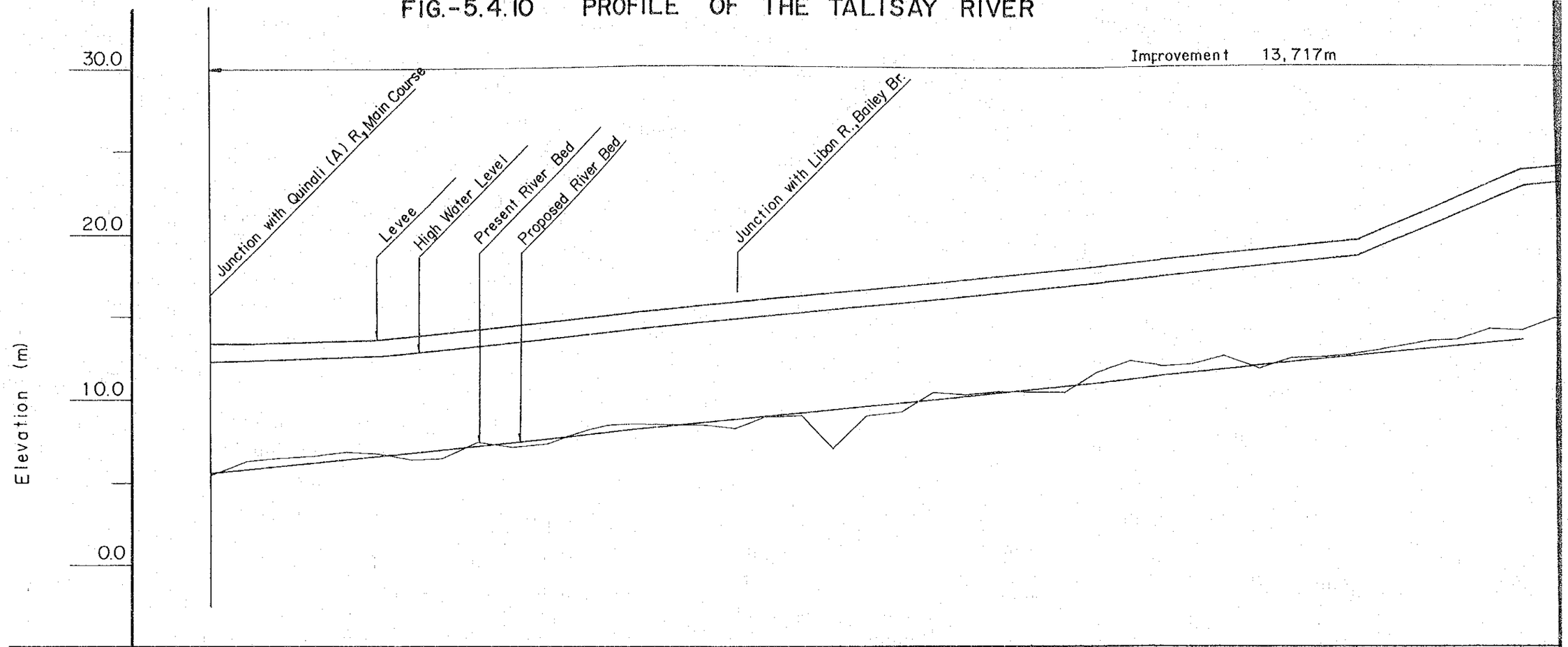

Existing
Cavaci Br.
45.54
44.54
39.14
47.36
46.36
40.96
49.18
48.18
42.78
50.09
49.09
43.68
1,730
25+000
26+000
27+000
27+500
28+000
29+000
30+000
31+000
32+000
33+000
34+000
35+000
36+000
37+000
38+000
39+000
40+000
41+000
42+000
43+000
44+000
45+000
46+000
46+627
46+672
25,000
26,000
27,000
27,500
28,000
29,000
30,000
31,000
32,000
33,000
34,000
35,000
36,000
37,000
38,000
39,000
40,000
41,000
42,000
43,000
44,000
45,000
46,000
46,627
46,672

FIG.-5.4.10 PROFILE OF THE TALISAY RIVER



Proposed River Bed Gradient	1/1,000									
Formation Height of Levee (EL.m)	13.50 13.50	13.64	14.64	15.64	16.63	17.63	18.63	19.63	23.77
High Water Level (EL.m)	12.30 12.32	12.64	13.64	14.64	15.63	16.63	17.63	18.63	22.77
Formation Height of River Bed (EL.m)	5.49 5.51	6.51	7.51	8.51	9.51	10.51	11.51	12.51	13.51
Discharge (m^3/s)	1,980				1,970				
Cumulative Distance (m)	-17 0	1,000	2,000	3,000	3,266	4,000	5,000	6,000	7,000	8,000
Station No.	0-017 0+000	1+000	2+000	3+000	3+266	4+000	5+000	6+000	7+000	8+000

RIVER

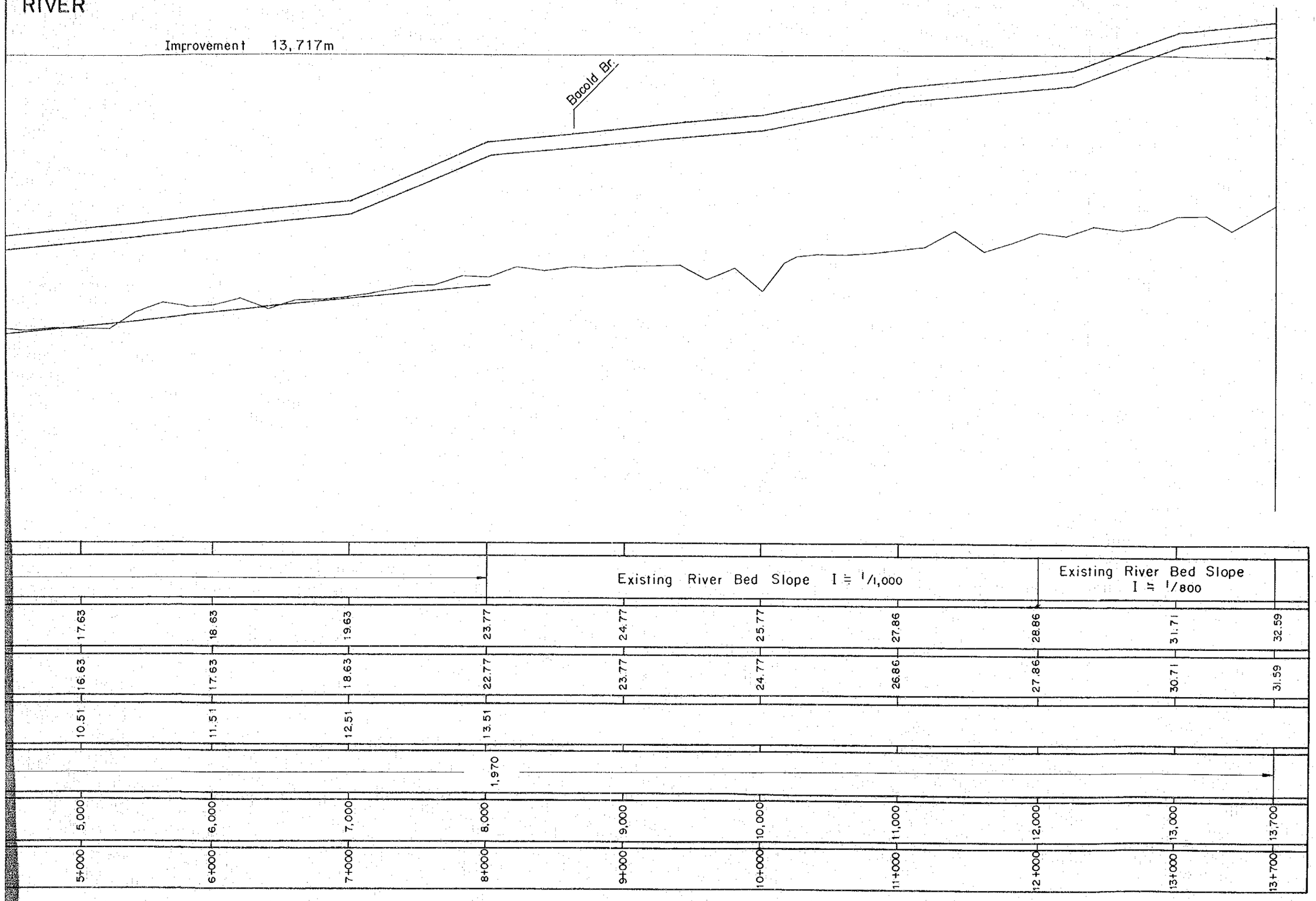
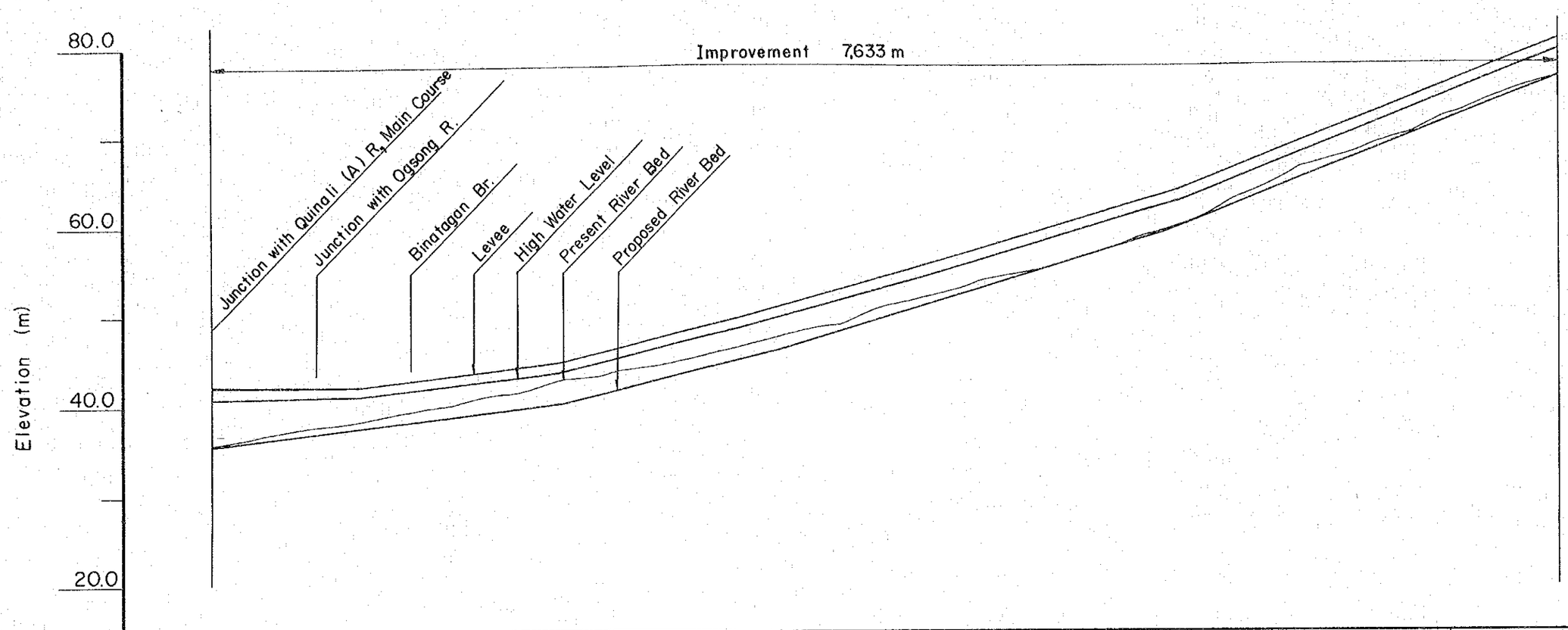
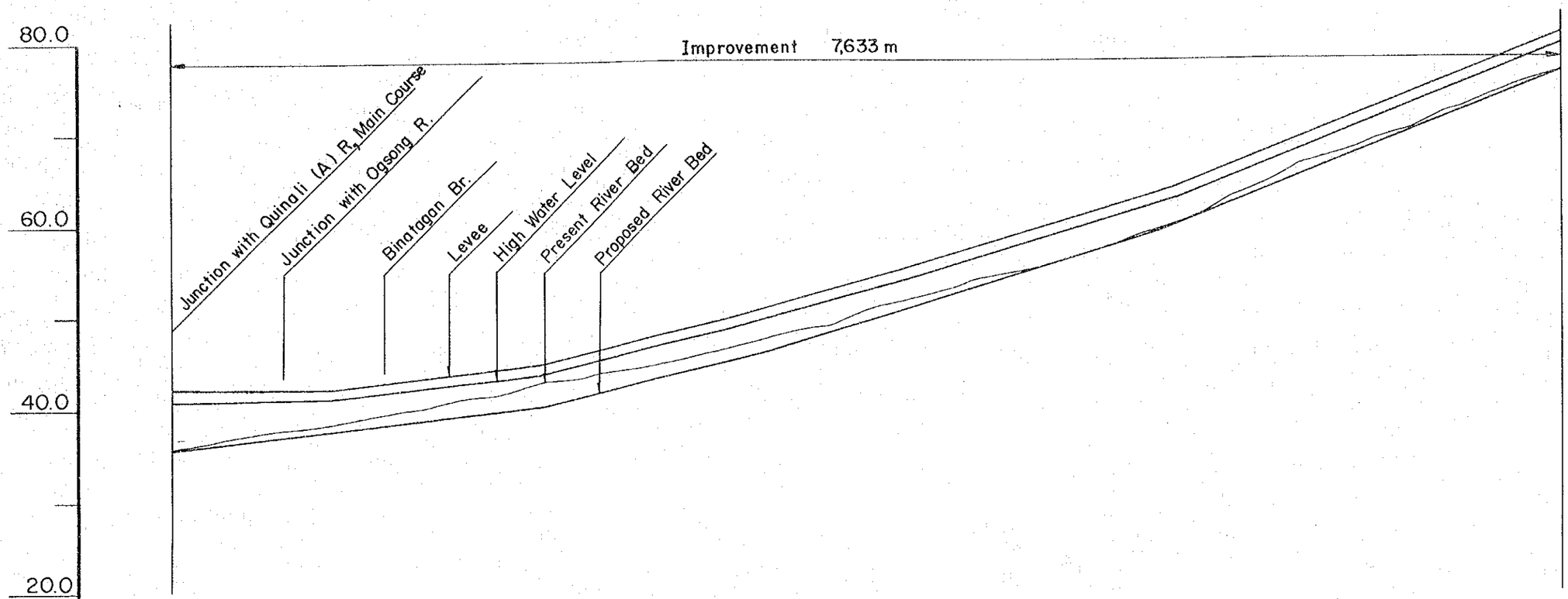

Improvement 13,717m
Bacold Br.
Existing River Bed Slope I = 1/1,000
Existing River Bed Slope I = 1/800
17.63
18.63
19.63
23.77
24.77
25.77
27.86
28.86
31.71
32.59
16.63
17.63
18.63
22.77
23.77
24.77
26.86
27.86
30.71
31.59
10.51
11.51
12.51
13.51
1,970
5,000
6,000
7,000
8,000
9,000
10,000
11,000
12,000
13,000
13,700
5+000
6+000
7+000
8+000
9+000
10+000
11+000
12+000
13+000
13+700

FIG.-5.4.11 PROFILE OF THE NASISI RIVER



Proposed River Bed Gradient			1/400				1/200				1/170				1/130							
Formation Height of Levee (EL.m)	42.23		42.23	42.46		44.05	44.96			49.83		55.38		61.26		67.99		75.68		80.55		
High Water Level (EL.m)	41.03		41.03	41.46		43.09	43.96			48.83		54.38		60.26		66.99		74.68		79.55		
Formation Height of River Bed (EL.m)	35.51		37.01	38.01		39.60	40.51			45.51		51.22		57.10		64.07		71.76		76.63		
Discharge (m³/s)		1,660										920										
Cumulative Distance. (m)	0		600	1,000		1,636	2,000			3,000		4,000		5,000		6,000		7,000		7,633		8,000
Station No.	0+000		0+600	1+000		1+636	RAIL-ROAD BRIDGE 2+000			3+000		4+000		5+000		6+000		7+000		7+633	BOX CULVERT	8+000

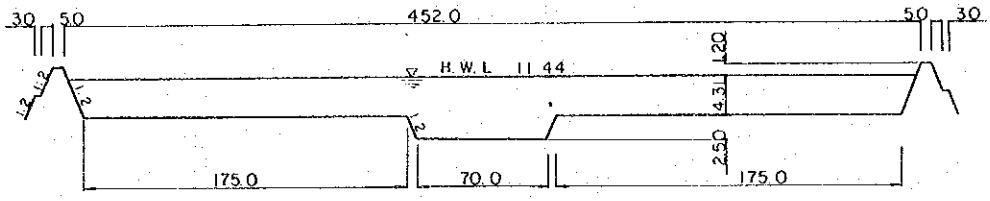
FIG.-5.4.11 PROFILE OF THE NASISI RIVER



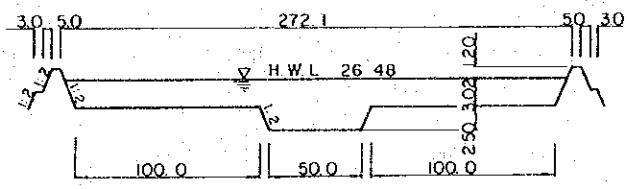
posed River Gradient		1/400		1/200		1/170			1/130				
nation Height Levee (EL.m)	42.23	42.23	42.46	44.05	44.96	49.83	55.38	61.26	67.99	75.68	80.55		
h Water el (EL.m)	41.03	41.03	41.46	43.09	43.96	48.83	54.38	60.26	66.99	74.68	79.55		
nation Height River Bed (EL.m)	35.51	37.01	38.01	39.60	40.51	45.51	51.22	57.10	64.07	71.76	76.63		
Discharge (m^3/s)		1,660	920										
mulative stance. (m)	0	600	1,000	1,636	2,000	3,000	4,000	5,000	6,000	7,000	7,633	8,000	
ation No.	0+000	0+600	1+000	1+636 RAIL-ROAD BRIDGE	2+000	3+000	4+000	5+000	6+000	7+000	7+633 BOX CULVERT	8+000	

FIG.-5.4.12 TYPICAL CROSS SECTION OF THE QUINALI (A) RIVER

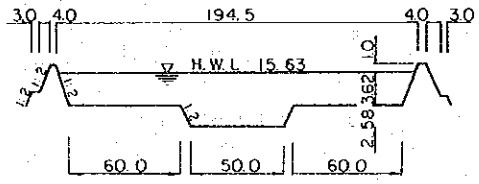
STA. 1 + 000 (Main Course)



STA. 15 + 000 (Main Course)



STA. 4 + 000 (Talisay R.)



STA. 1 + 000 (Nasisi R.)

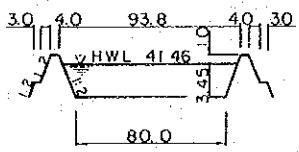
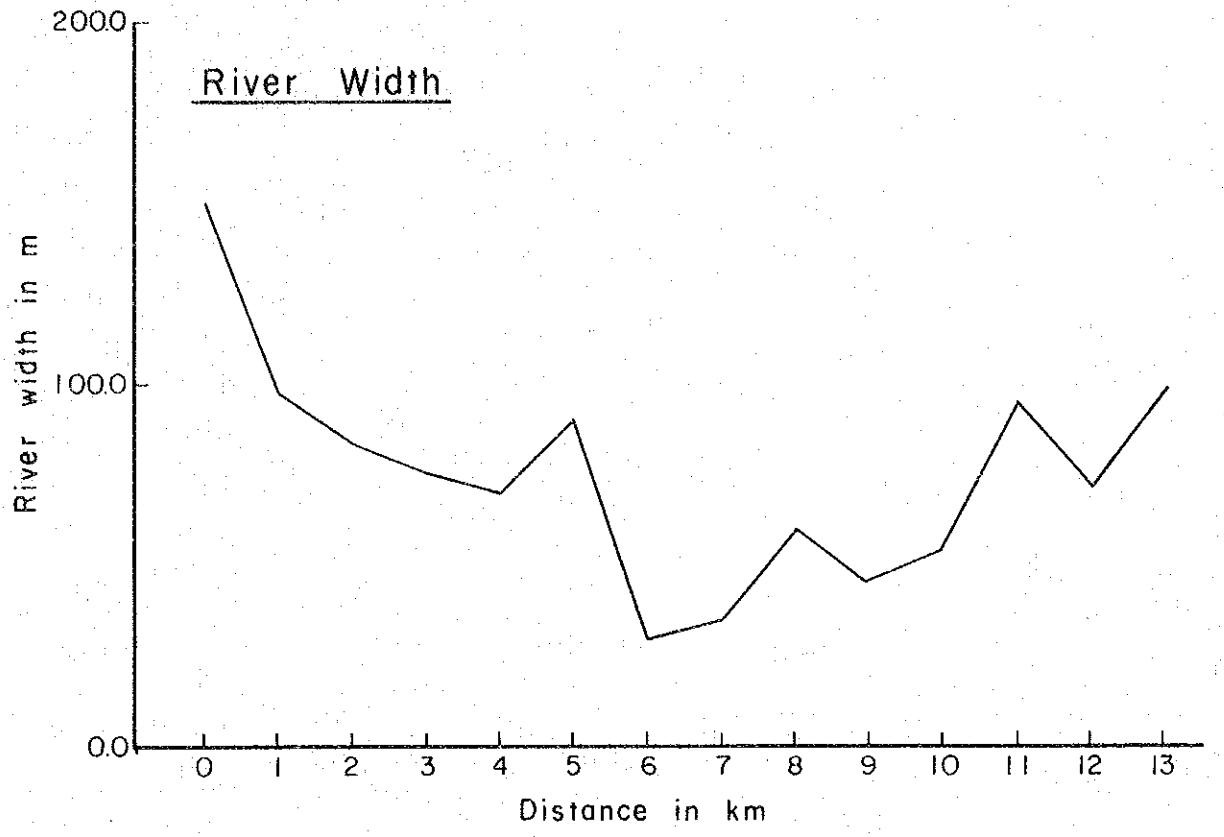


FIG.-5.4.13 RIVER WIDTH AND DISCHARGE CAPACITY OF THE PRESENT RIVER CHANNEL, THE QUINALI (B) RIVER



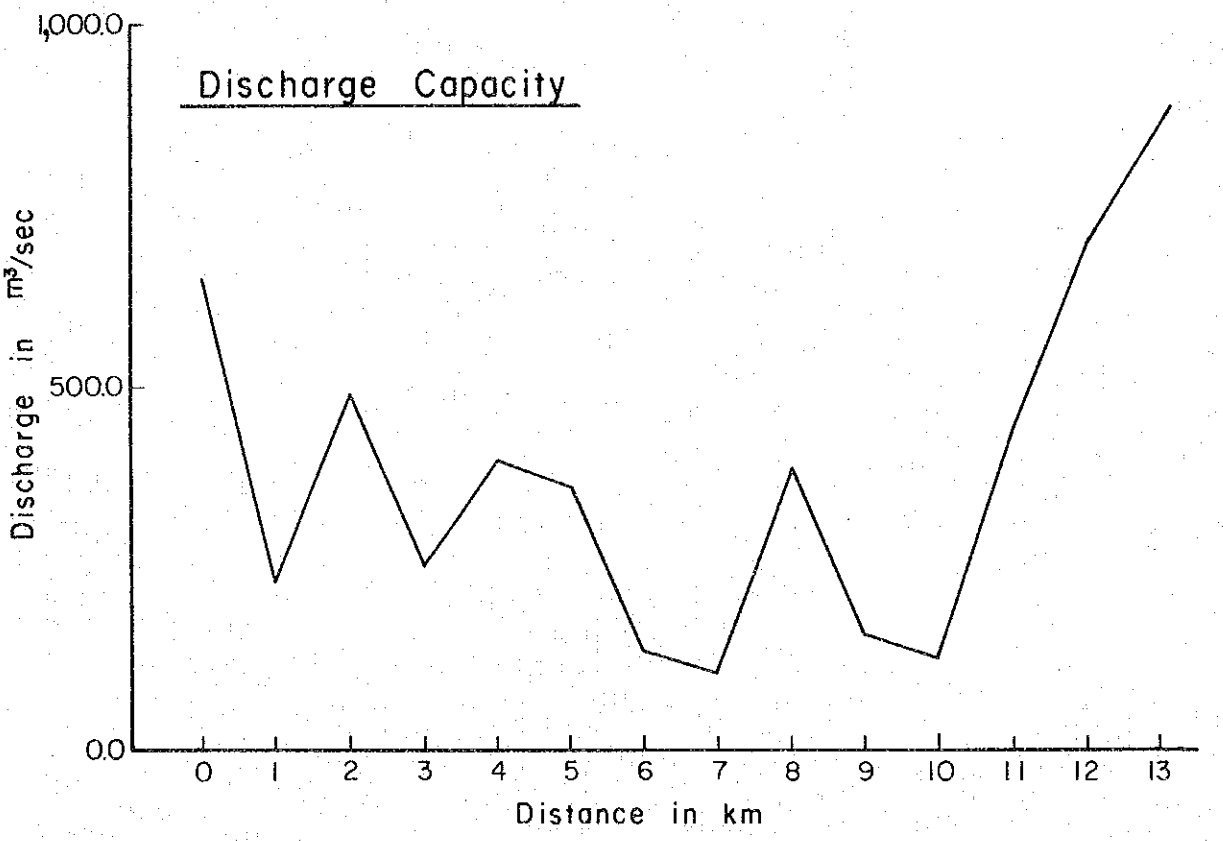


FIG.-5.4.14 DESIGN DISCHARGE DISTRIBUTION DIAGRAM, THE QUINALI (B) RIVER (RETURN PERIOD 50 - YEAR)

Unit : m^3/sec

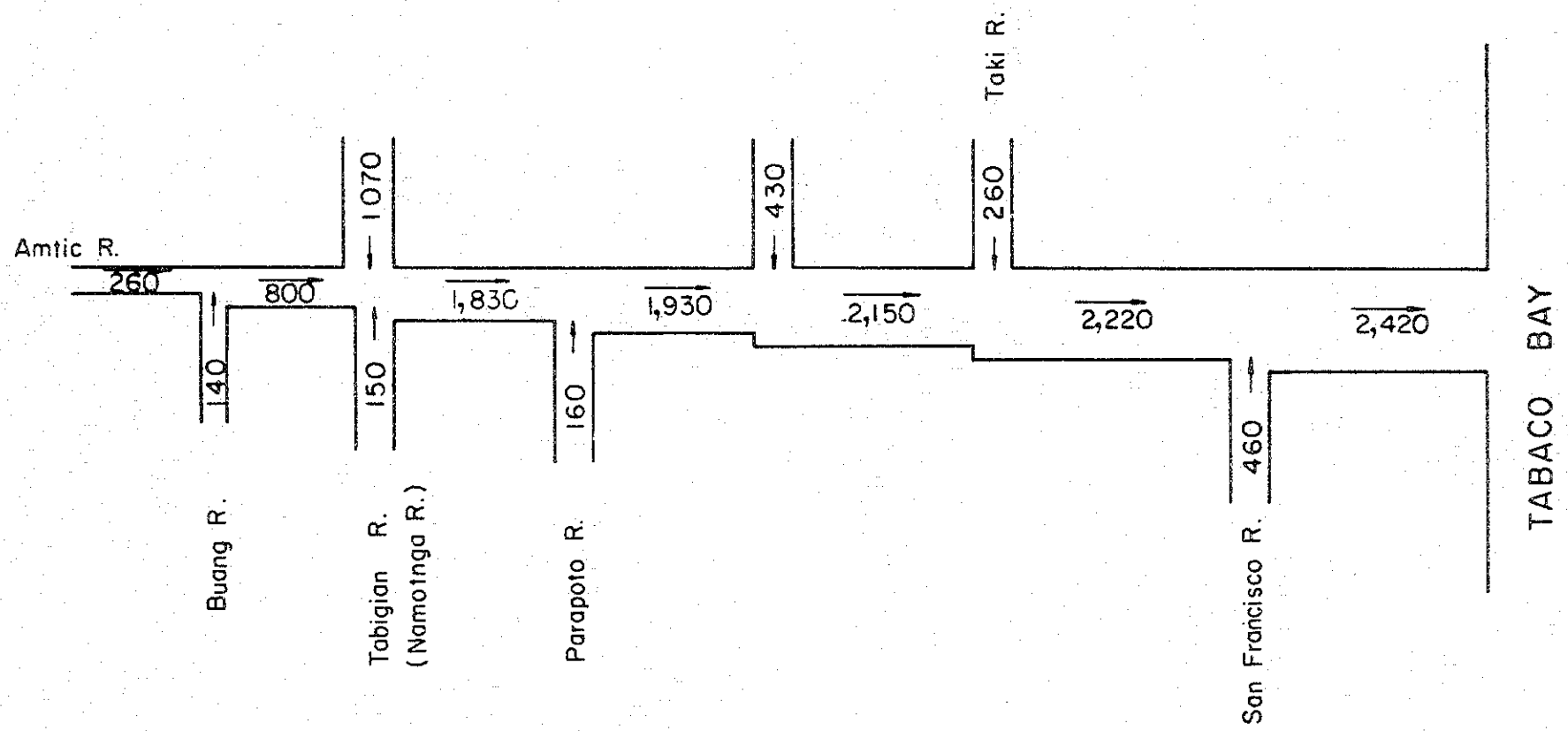


FIG.-5.4.15 GENERAL PLAN OF THE QUINALI (B) RIVER

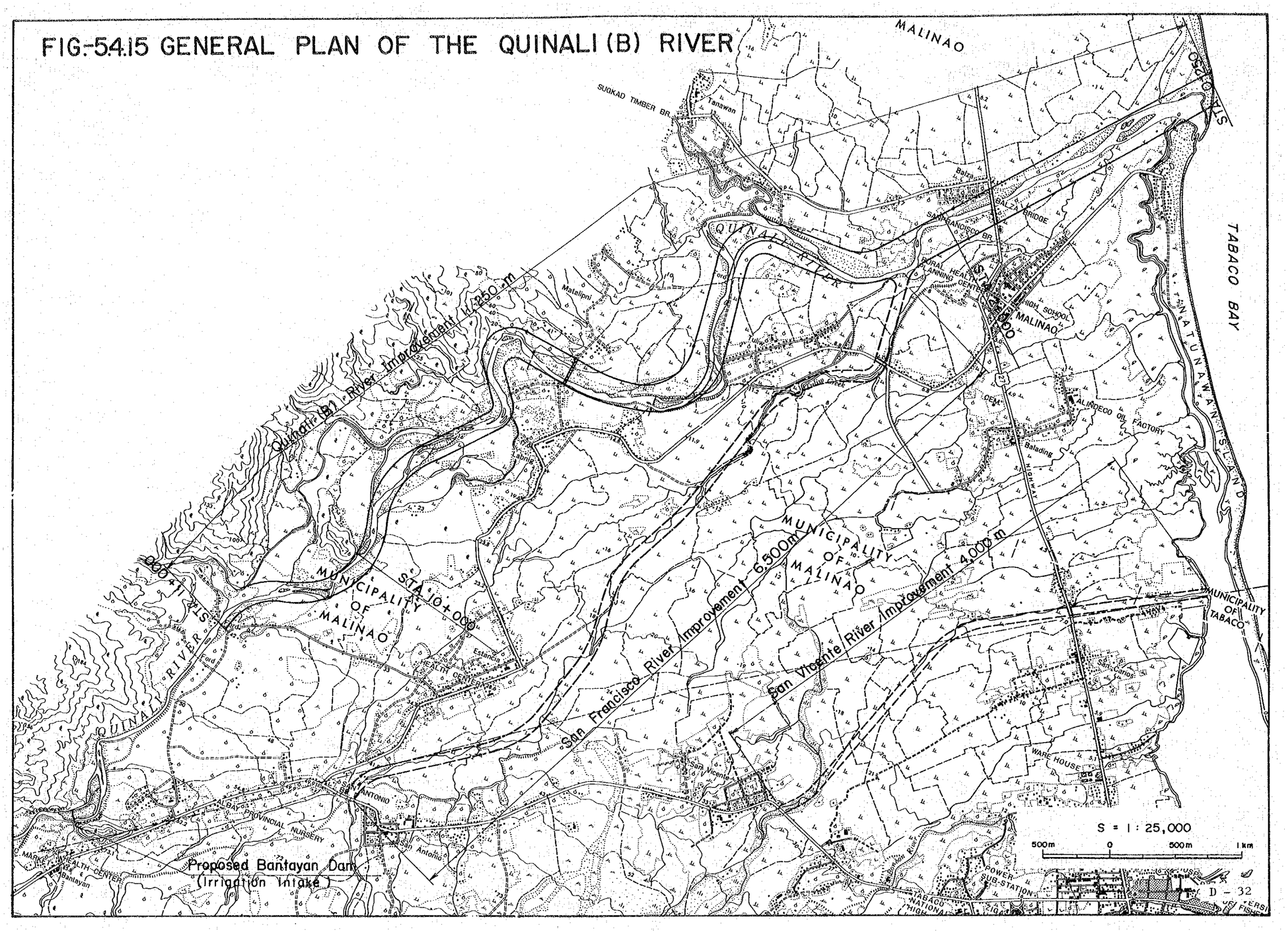
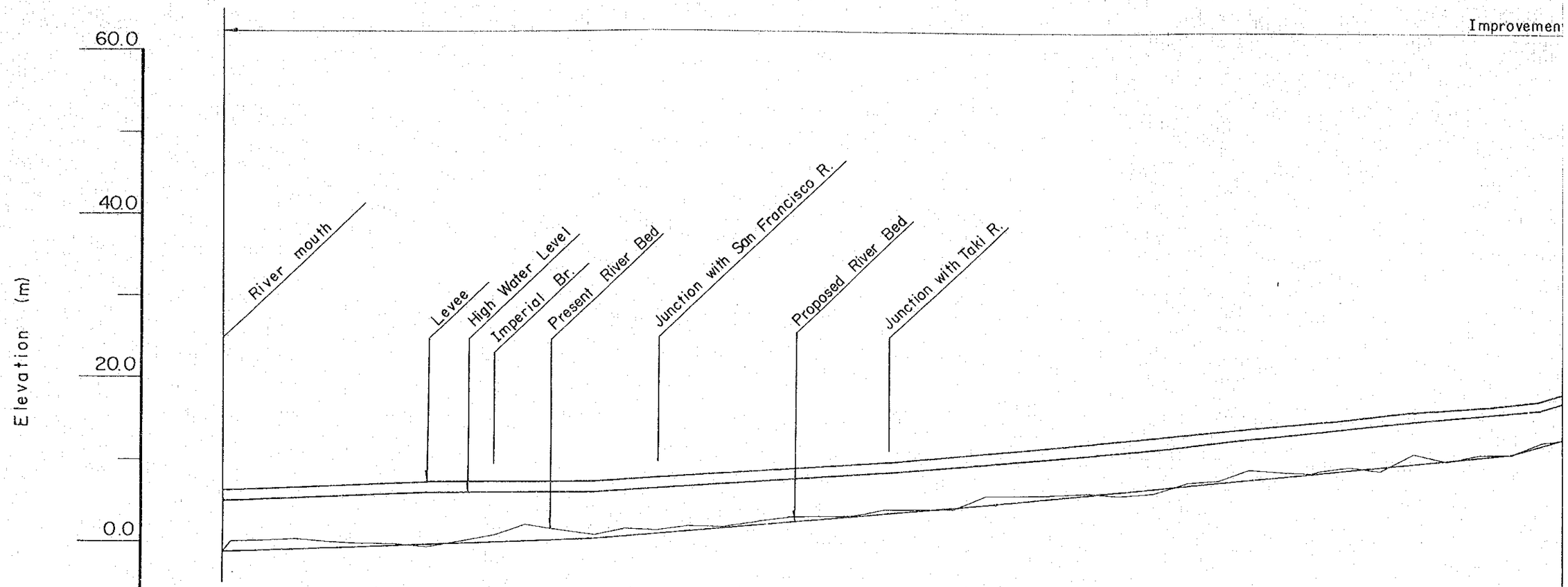


FIG.-5.4.16 PROFILE OF THE QUINALI (B) RIVER



Proposed River Bed Gradient			1/1,200				1/660					1/470					
Formation Height of Levee (EL.m)	6.33	6.54	7.38		7.60		8.91		10.36		12.33		14.45		16.58		
High Water Level (EL.m)	5.13	5.34	6.18		6.40		7.71		9.16		11.13		13.25		15.38		
Formation Height of River Bed (EL.m)	-1.02	-0.81	0.03		0.85		2.36		3.88		5.89		8.01		10.14		
Discharge (m^3/s)			2,420				2,220								2,150		
Cumulative Distance (m)	-250	0	1,000		2,000	2,400	3,000	3,800	4,000	4,200	5,000		6,000		7,000	7,600	
Station No.	0-250	0+000	1+000		2+000	2+400	3+000	3+800	4+000	4+200	5+000		6+000		7+000	7+600	

UINALI (B) RIVER

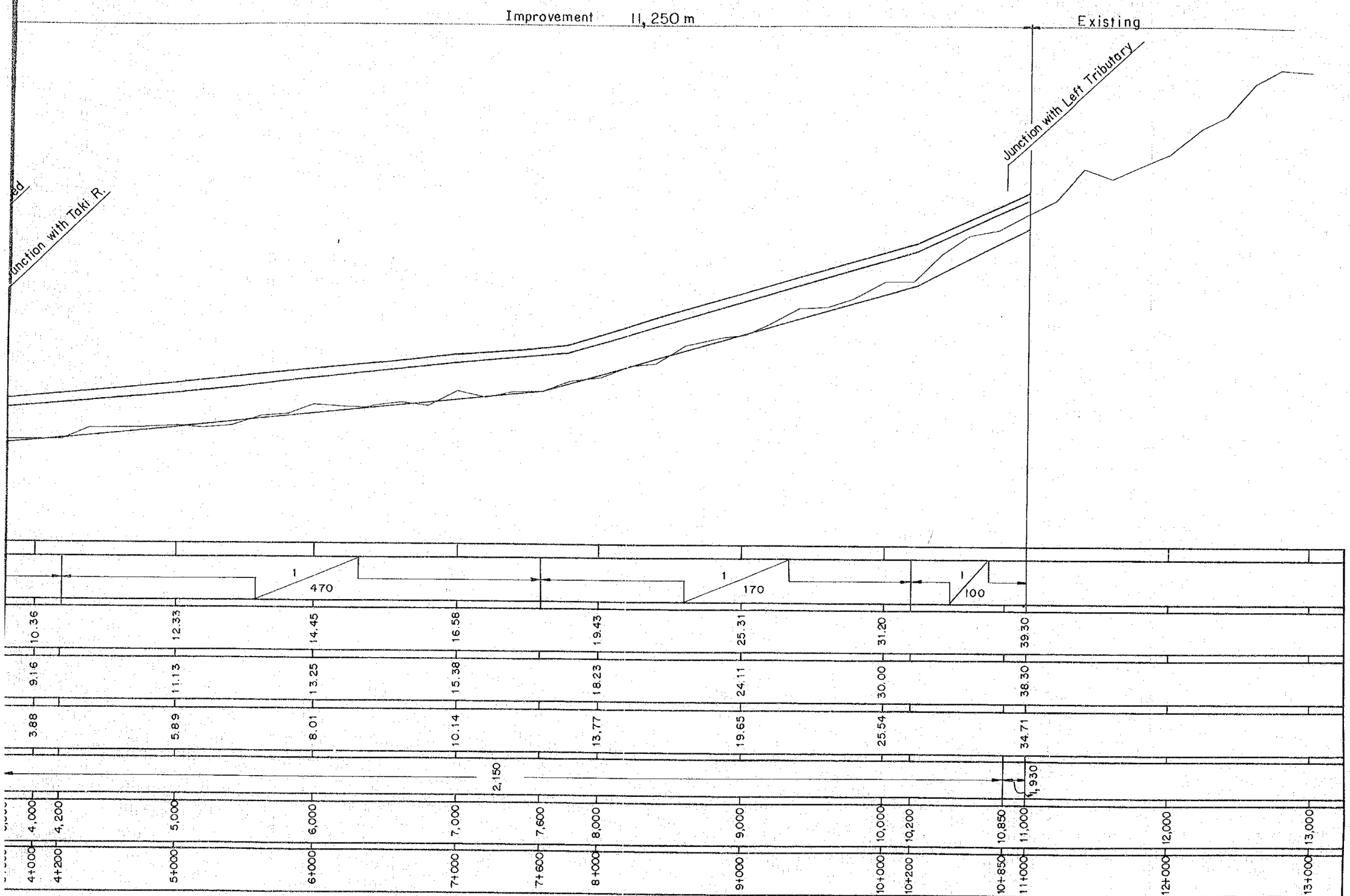
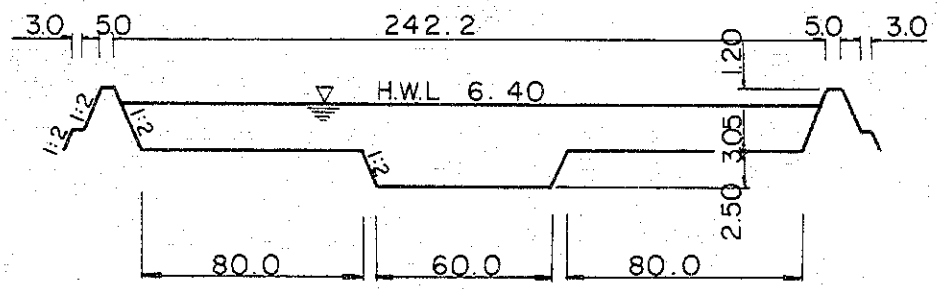
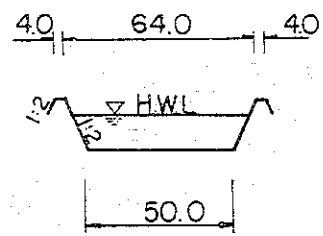


FIG.-5.4.17 TYPICAL CROSS SECTION OF THE QUINALI (B) RIVER

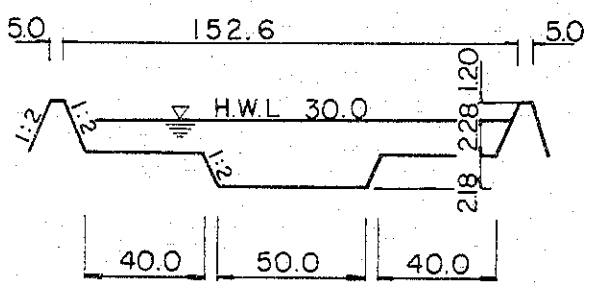
STA. 2 + 000 (Main Course)



THE SAN FRANCISCO RIVER



STA. 10 +000 (Main Course)



THE SAN VICENTE RIVER

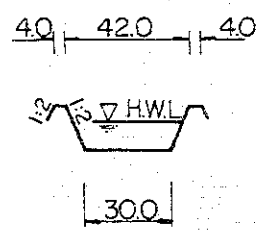
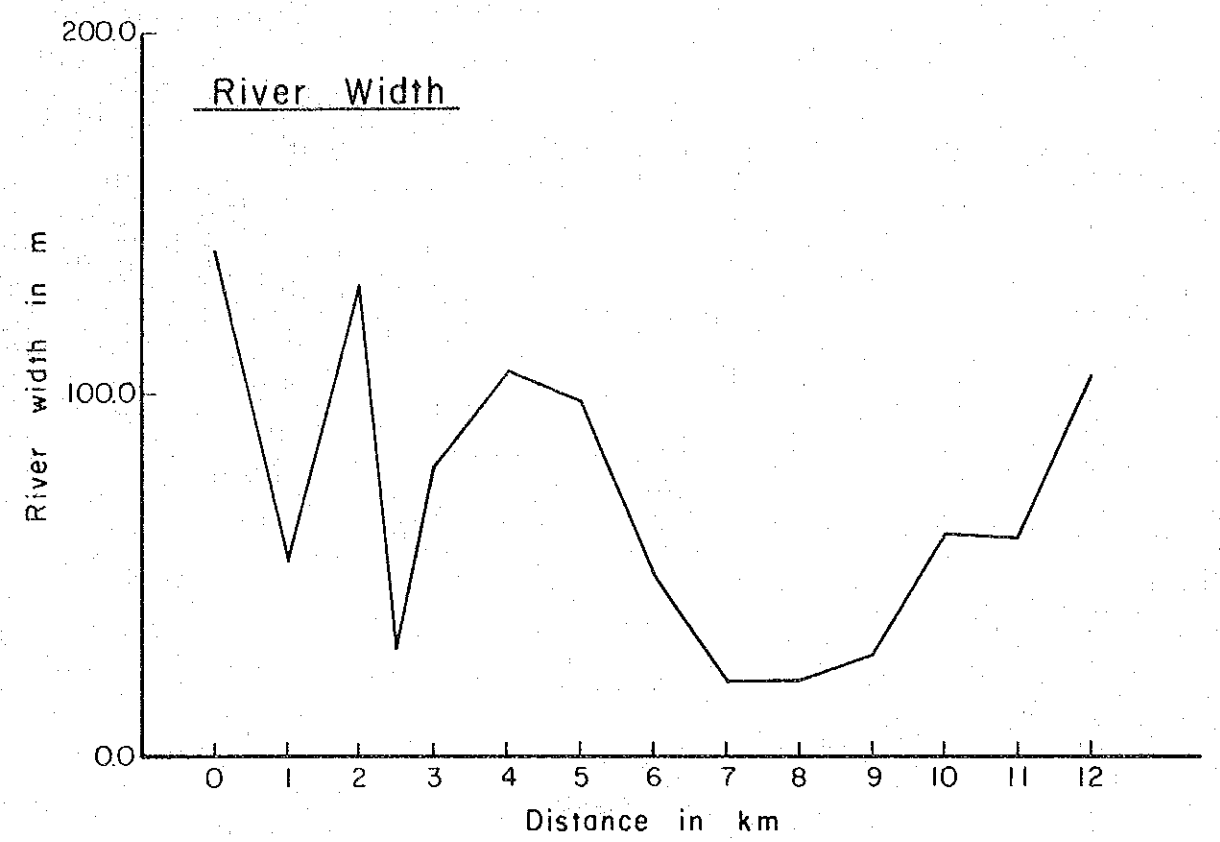


FIG.-5.4.18 RIVER WIDTH AND DISCHARGE CAPACITY OF THE PRESENT RIVER CHANNEL, THE YAWA RIVER



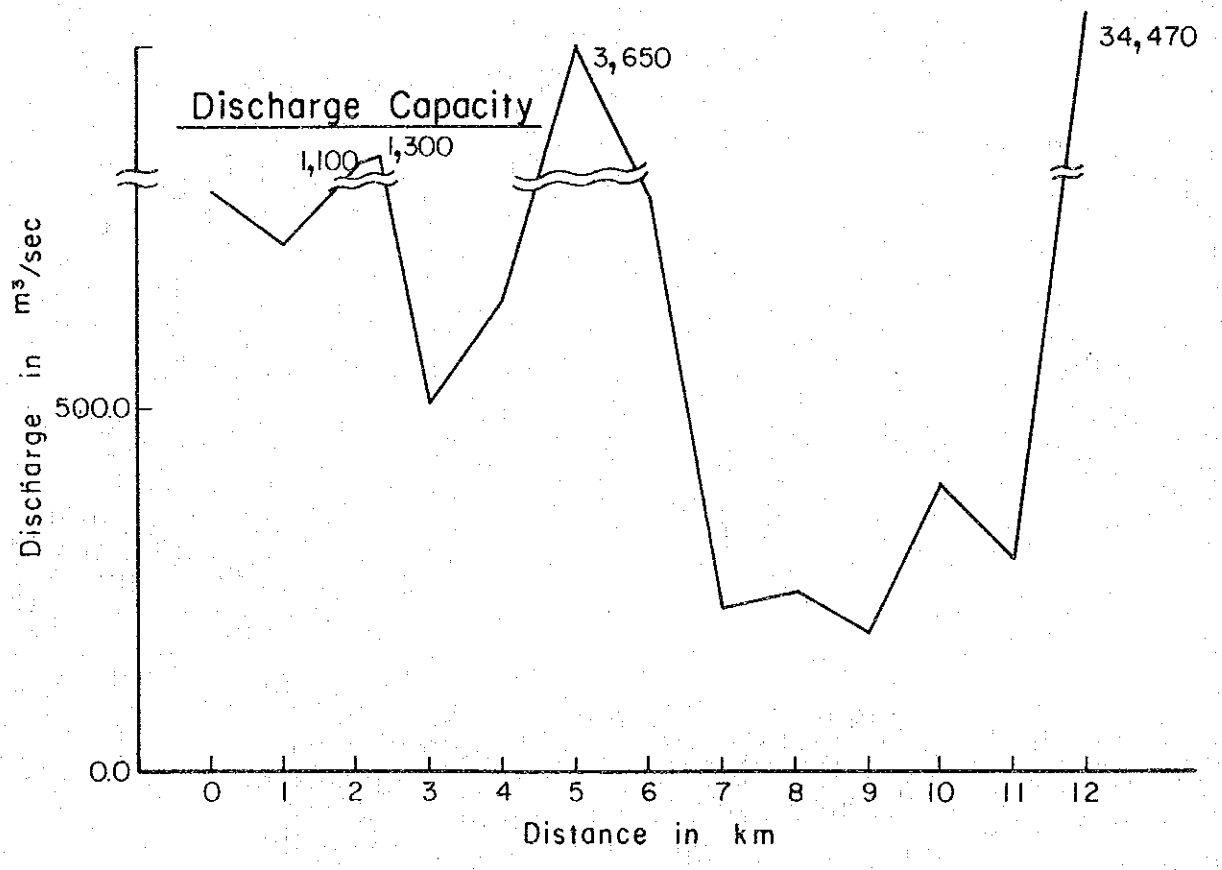


FIG-5.4.19 DESIGN DISCHARGE DISTRIBUTION DIAGRAM, THE YAWA RIVER
(RETURN PERIOD 50 - YEAR)

Unit : m^3/sec