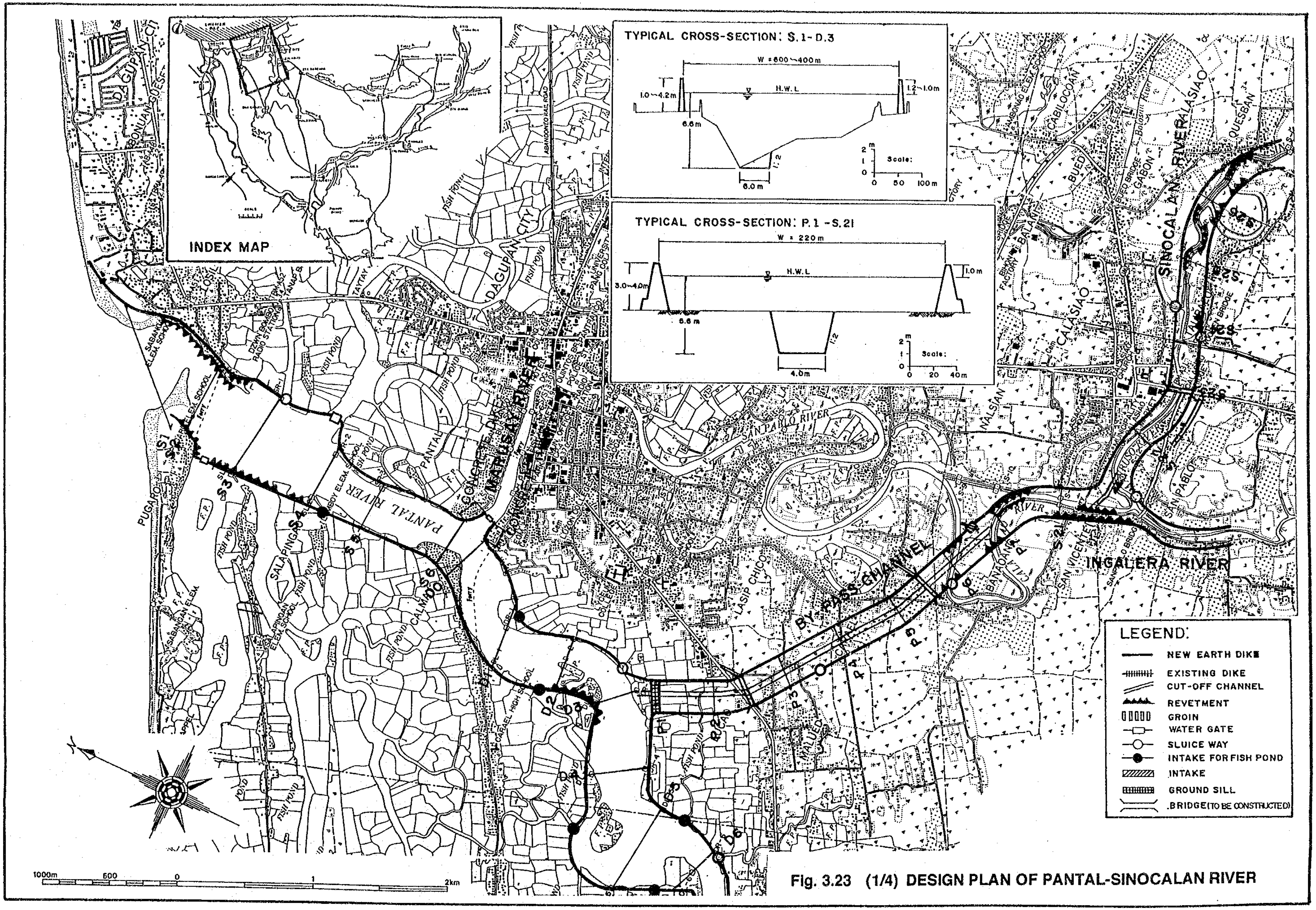


Fig. 3.23 (1/4) DESIGN PLAN OF PANTAL-SINOCALAN RIVER

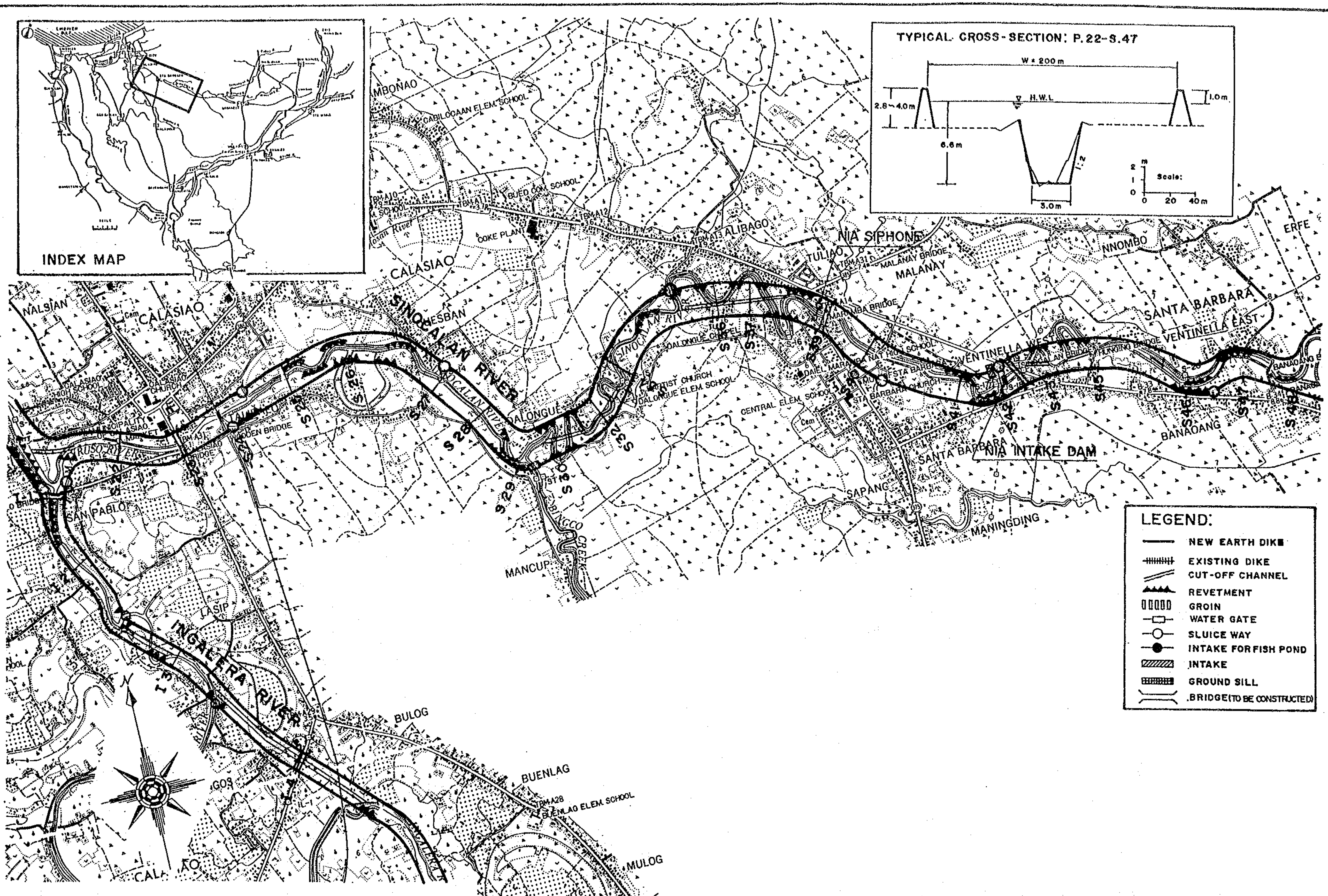


Fig. 3.23 (2/4) DESIGN PLAN OF PANTAL-SINOCALAN RIVER

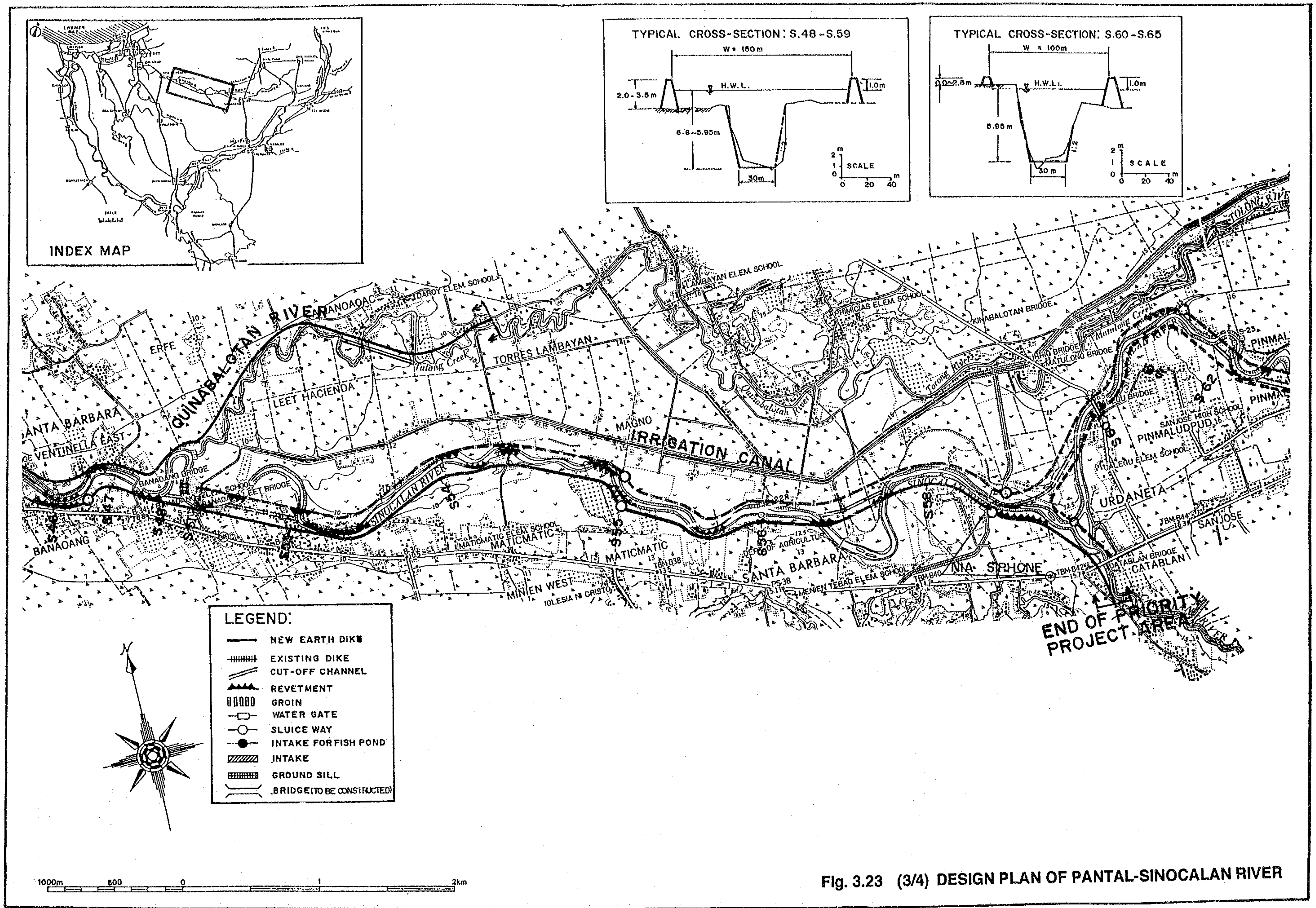


Fig. 3.23 (3/4) DESIGN PLAN OF PANTAL-SINOCALAN RIVER

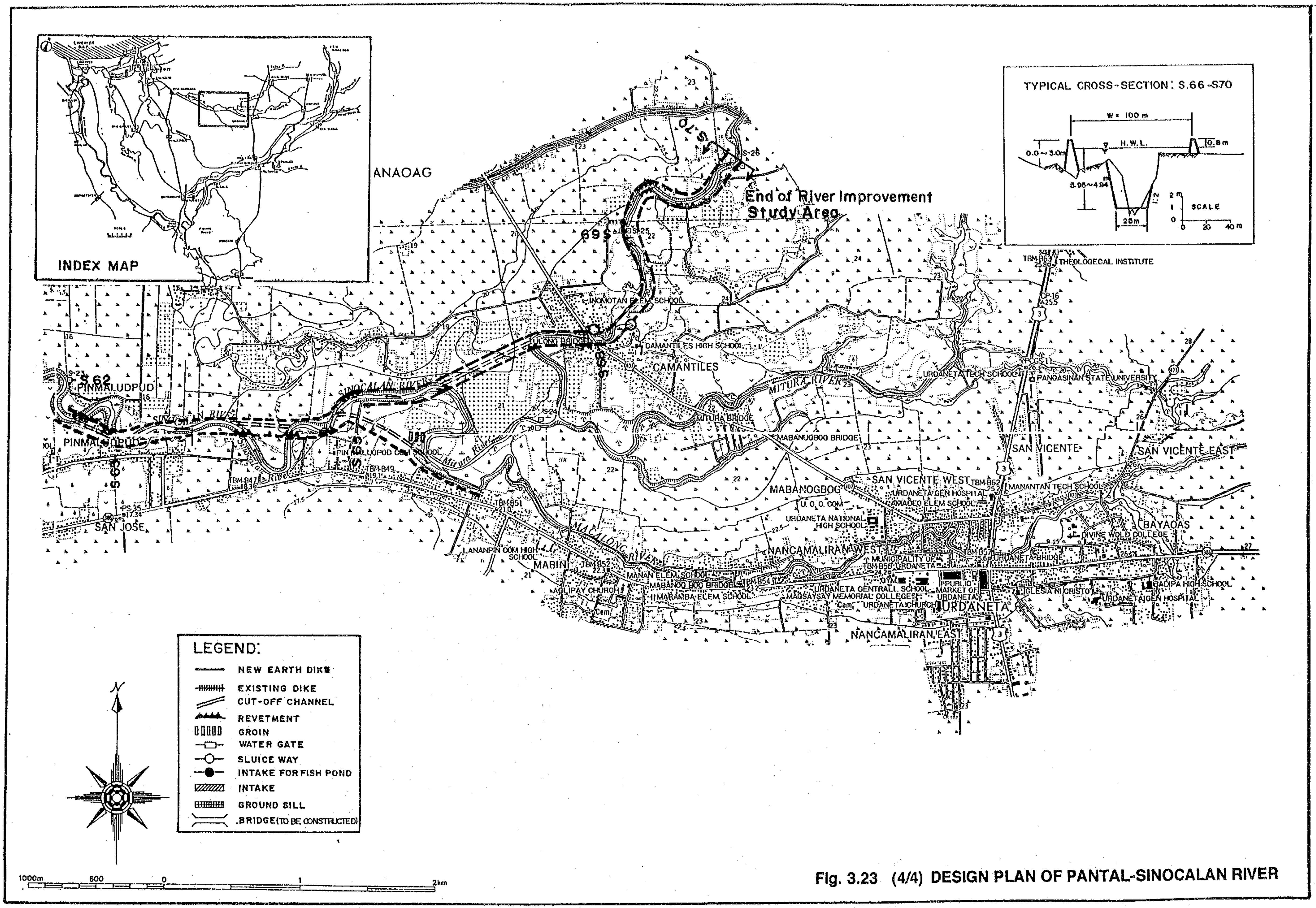


Fig. 3.23 (4/4) DESIGN PLAN OF PANTAL-SINOCALAN RIVER

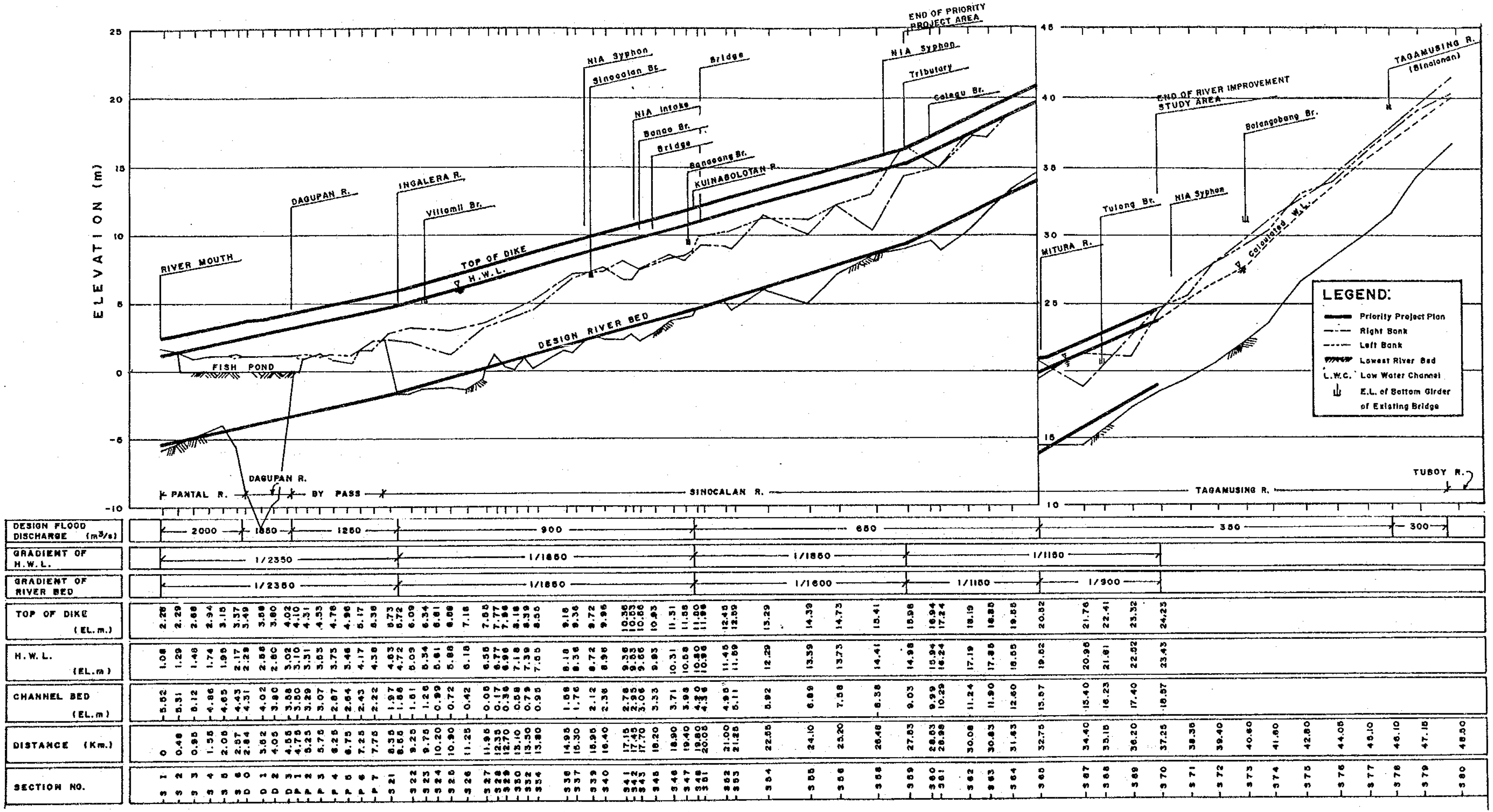


Fig. 3.24 LONGITUDINAL PROFILE OF PANTAL-SINOCALAN RIVER

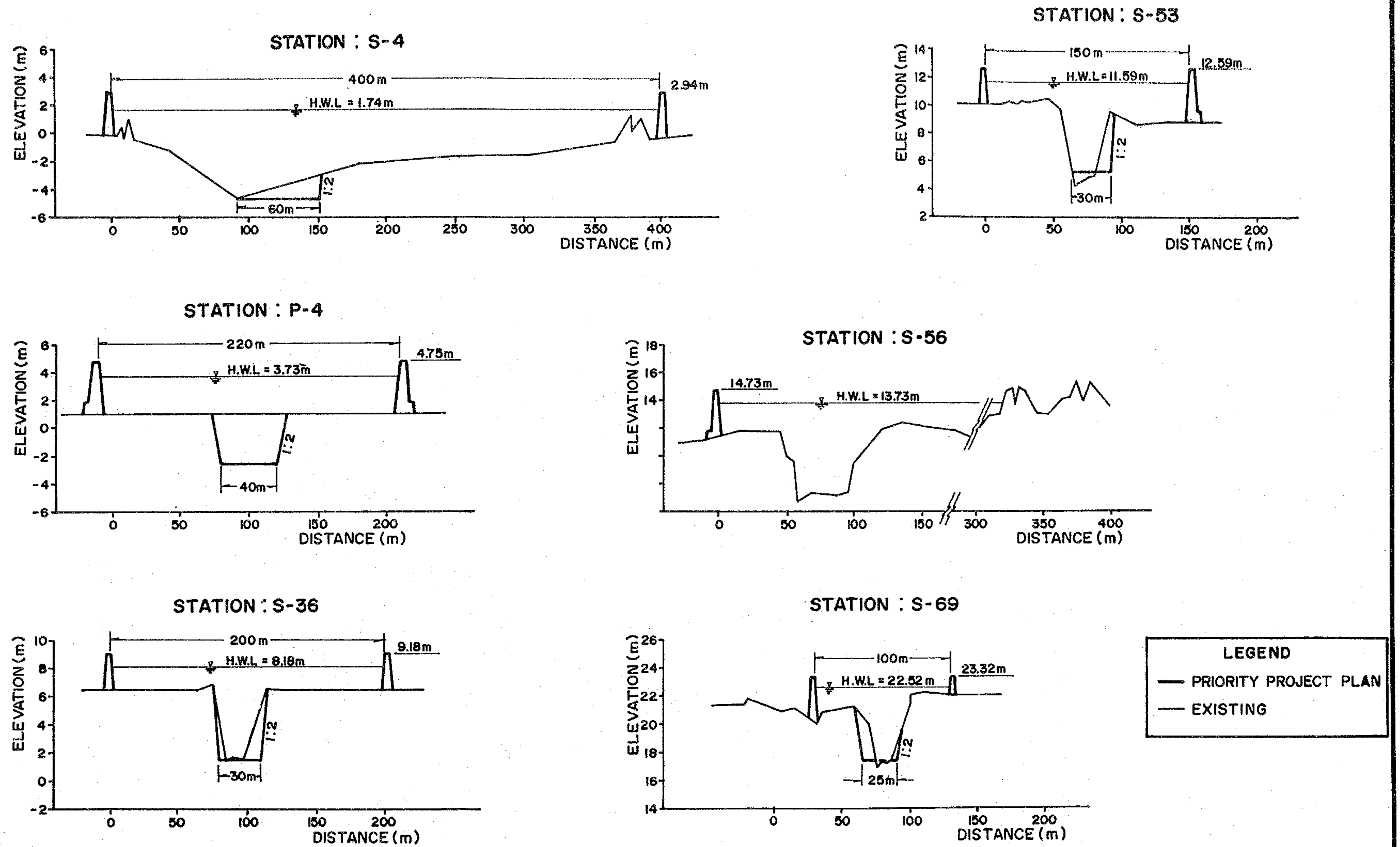


Fig. 3.25 TYPICAL CROSS-SECTION OF PANTAL-SINOCALAN RIVER

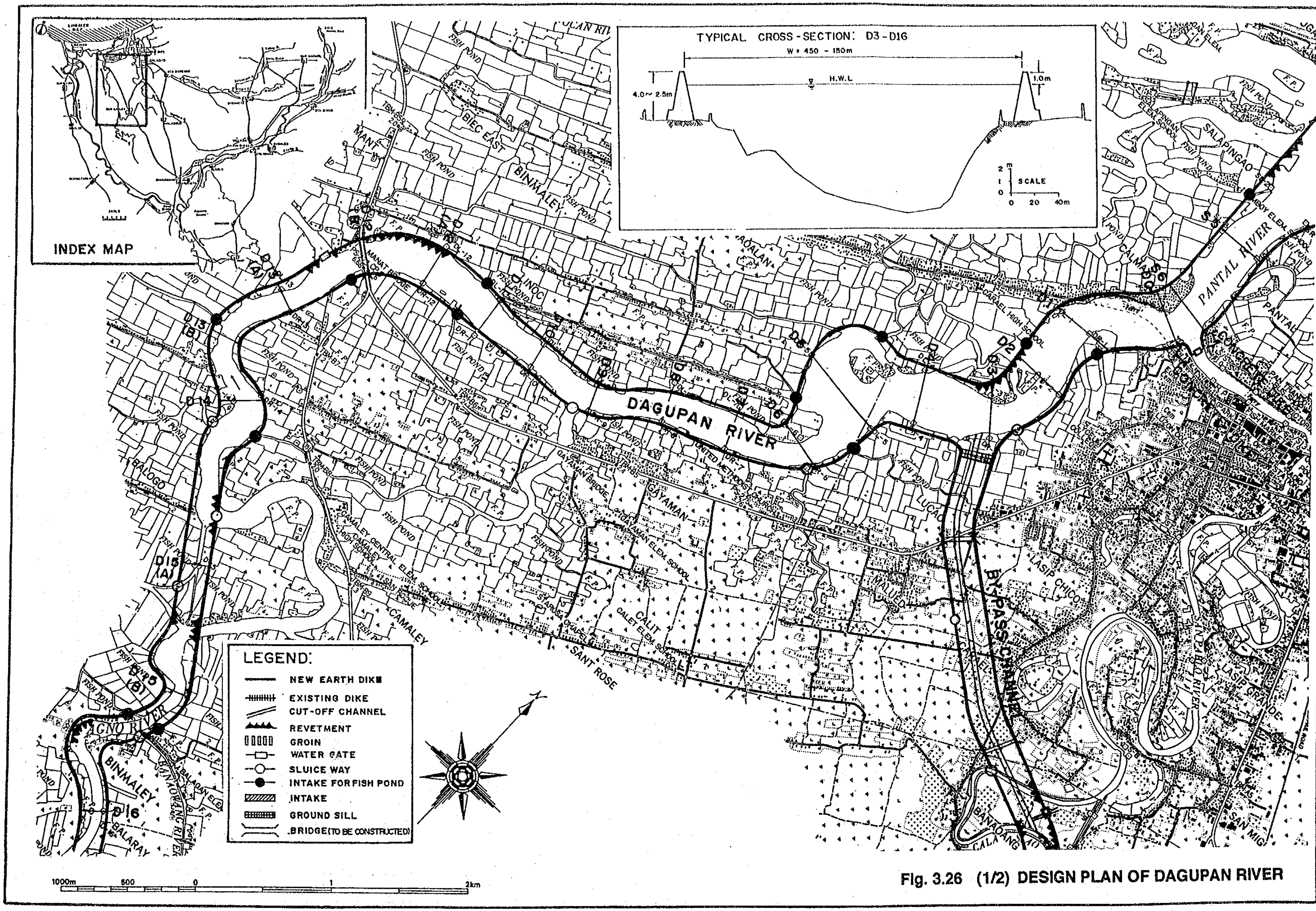


Fig. 3.26 (1/2) DESIGN PLAN OF DAGUPAN RIVER

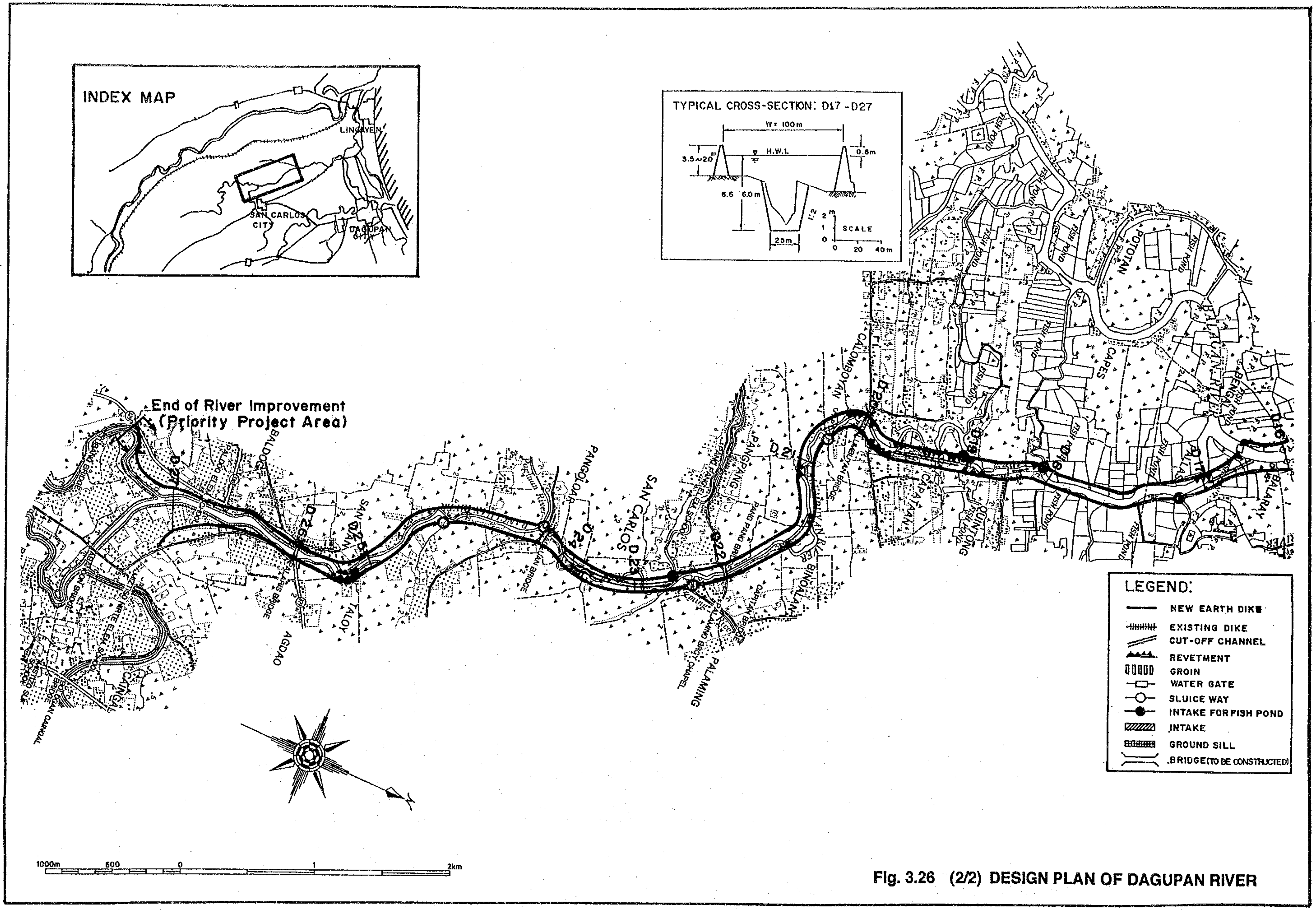
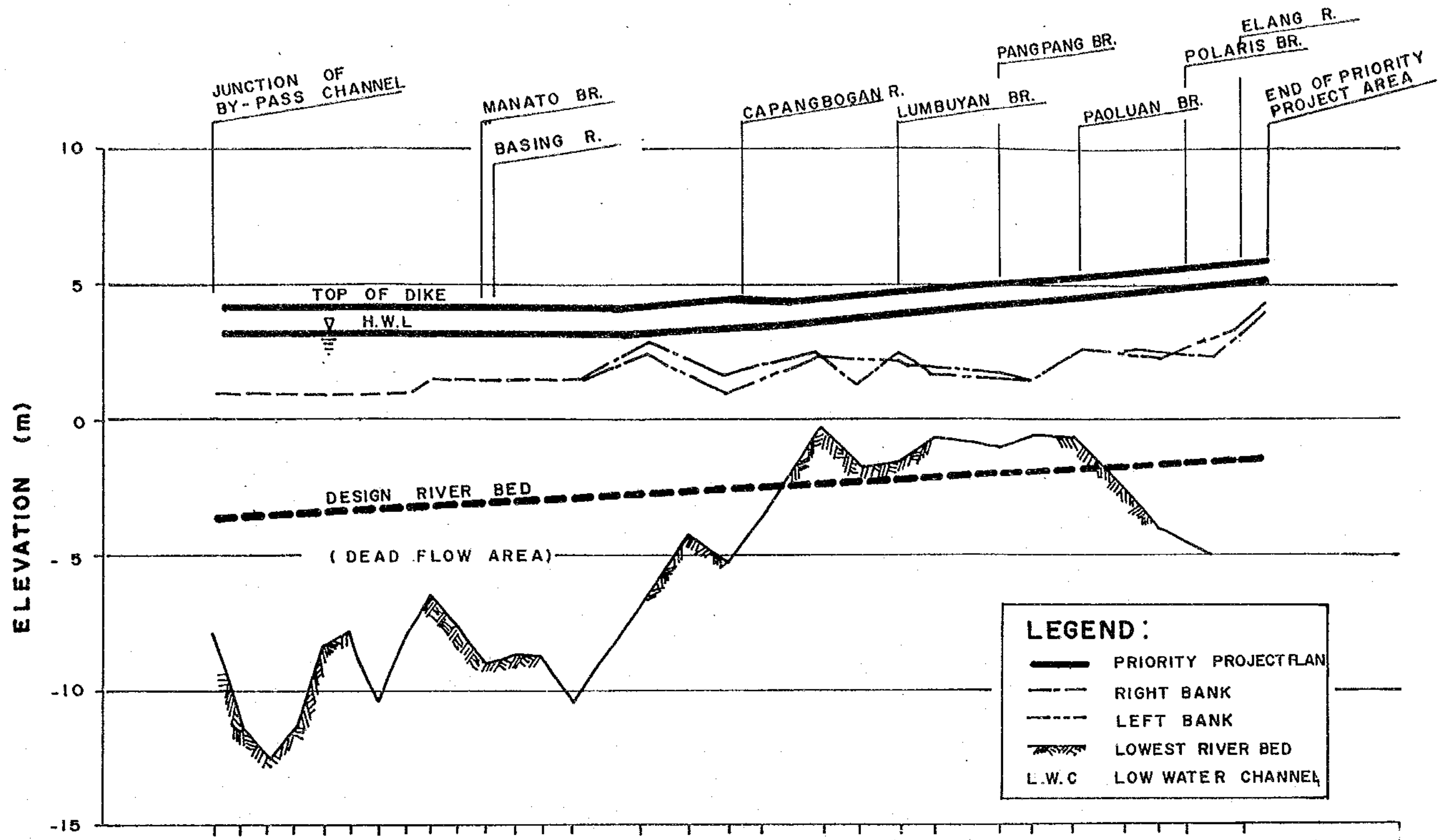


Fig. 3.26 (2/2) DESIGN PLAN OF DAGUPAN RIVER



DESIGN IN FLOOD DISCHARGE (m^3/s)	← 700 →										← 550 →			
GRADIENT OF H.W.L	← (LEVEL) →													
GRADIENT OF RIVER BED	← 1/10 000 →													
TOP OF DIKE (El. m)		4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10
H. W. L. (El. m)		3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10
CHANNEL BED (El. m)	- 3.58	- 3.53	- 3.48	- 3.43	- 3.38	- 3.33	- 3.28	- 3.23	- 3.18	- 3.13	- 3.08	- 3.03	- 2.97	- 2.92
DISTANCE (Km)	0.00	0.50	1.00	1.45	2.00	2.50	3.00	3.50	3.95	4.45	4.95	5.55	6.05	6.55
SECTION NO.	D.3	D 4	D.5	D 6	D7	D8	D9	D10	D11	D12(A)	D12(B)	D13(A)	D13(B)	D14

DESIGN IN FLOOD DISCHARGE (m^3/s)				← 400 →											
GRADIENT OF H.W.L	← 1/10 000 →			← 1/5800 →											
GRADIENT OF RIVER BED															
TOP OF DIKE (El. m)	4.20	4.29	4.37	4.43	4.43	4.54	4.68	4.78	4.99	5.10	5.23	5.53	5.61	5.78	
H. W. L. (El. m)	3.20	3.29	3.37	3.43	3.63	3.74	3.88	3.98	4.19	4.30	4.43	4.71	4.81	4.98	
CHANNEL BED (El. m)	- 2.80	-2.71	- 2.63	- 2.57	-2.46	-2.39	-2.31	-2.25	-2.13	-2.07	-2.00	-1.83	-1.77	-1.67	
DISTANCE (Km)	7.80	8.70	9.45	10.05	11.20	11.85	12.65	13.25	14.45	15.10	15.85	17.50	18.05	19.05	19.50
SECTION NO.	D15(A)	D15(B)	D16	D17	D18	D19	D20	D21	D22	D23	D24	D25	D26	D27	

Fig. 3.27 LONGITUDINAL PROFILE OF DAGUPAN RIVER

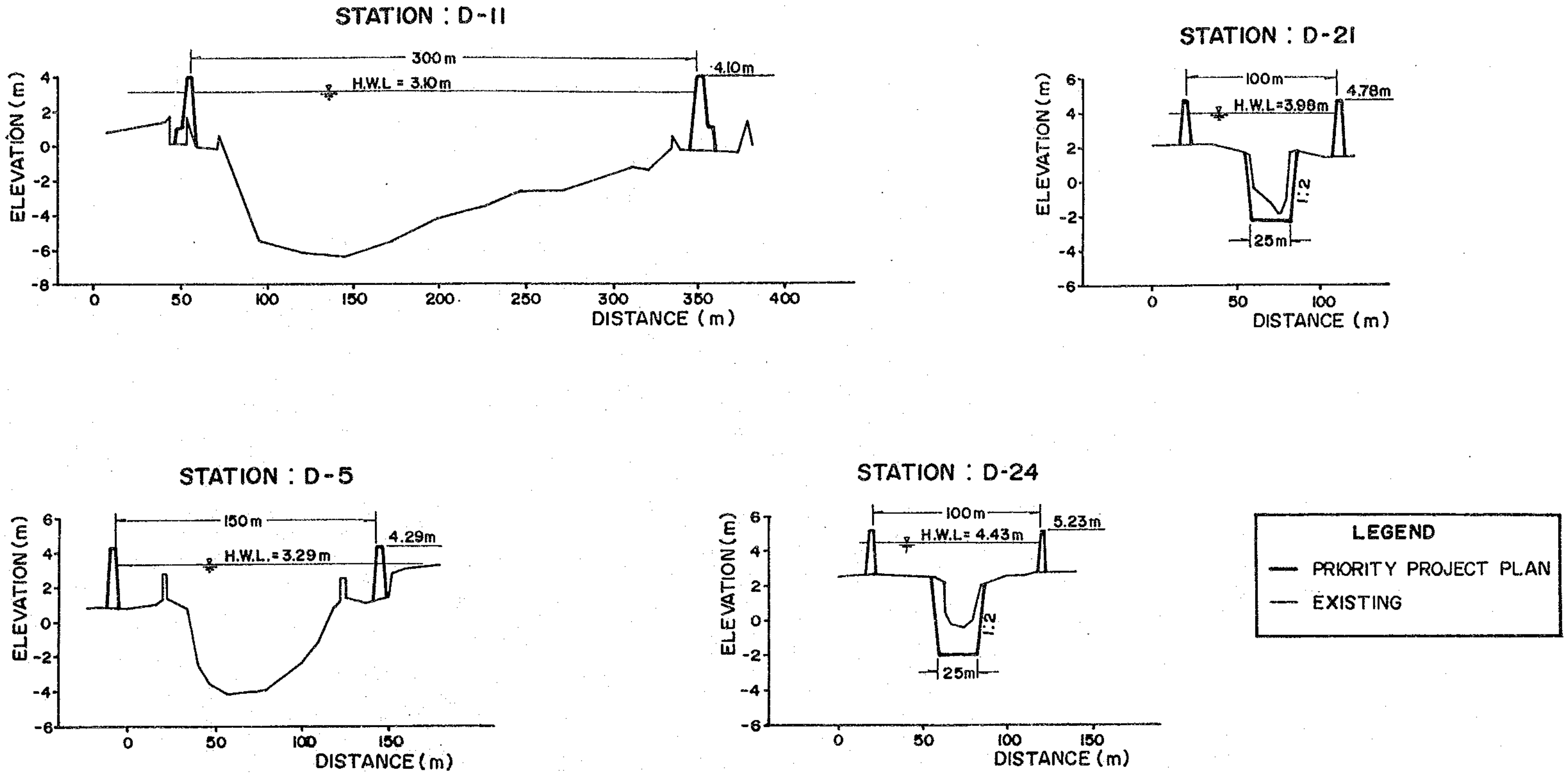


Fig. 3.28 TYPICAL CROSS-SECTION OF DAGUPAN RIVER

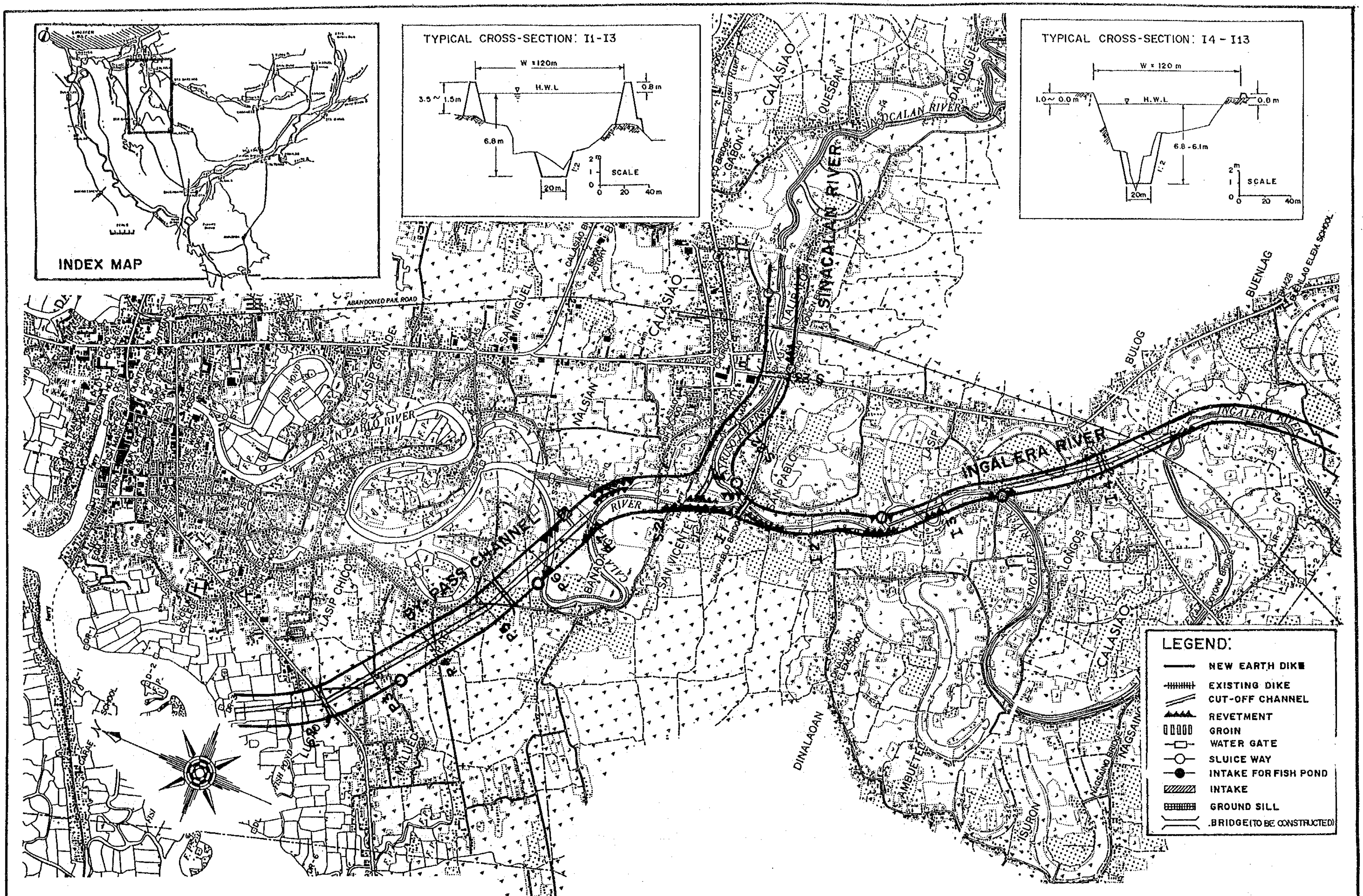


Fig. 3.29 (1/2) DESIGN PLAN OF INGALERA RIVER

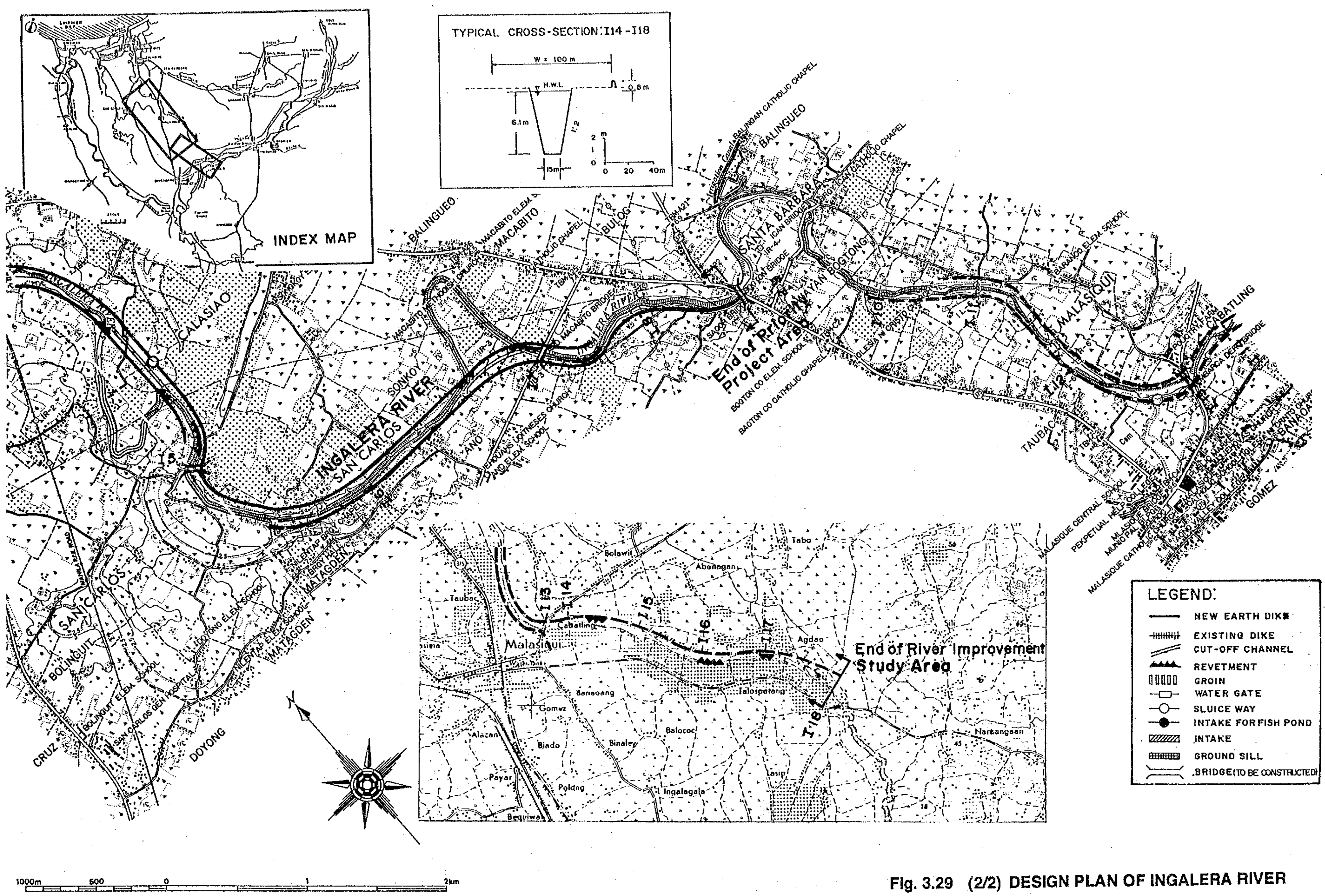
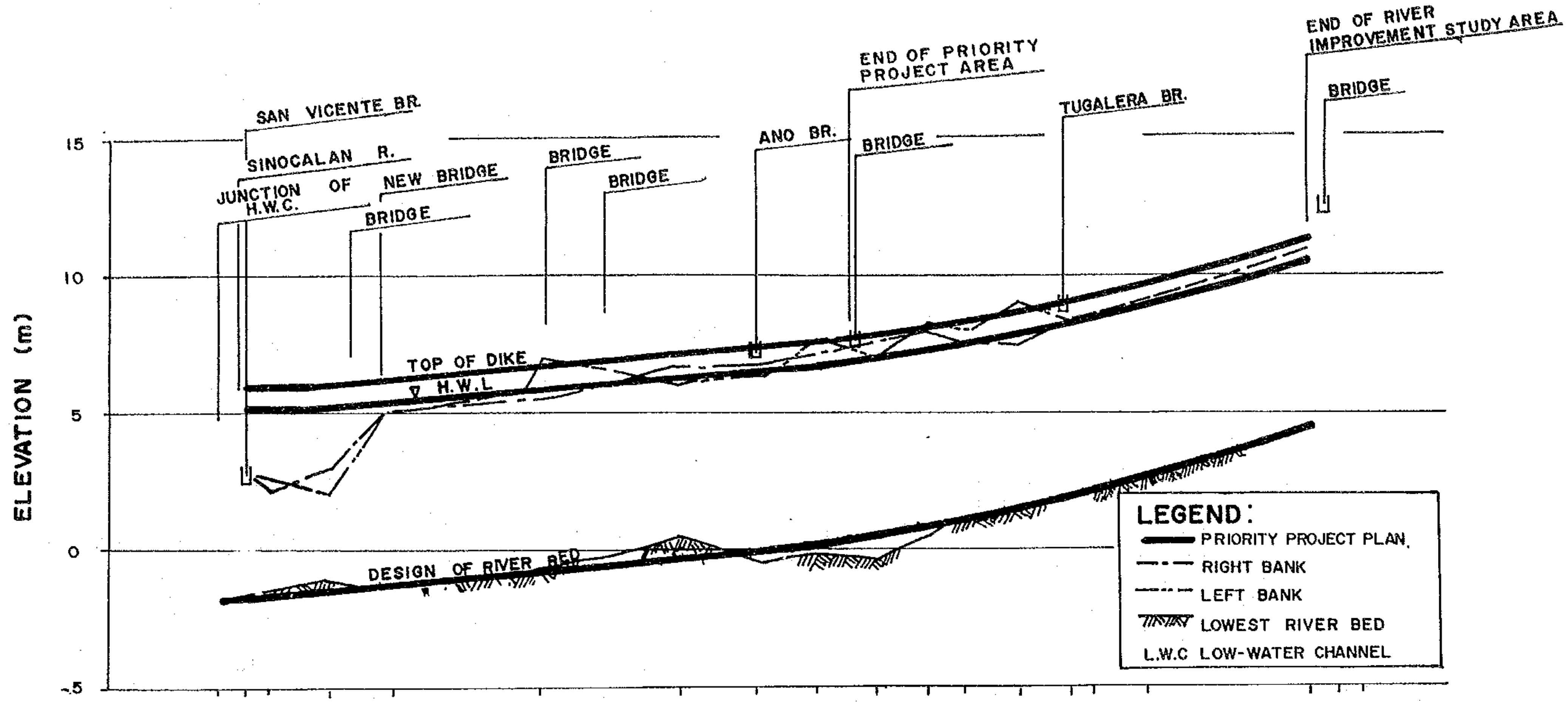


Fig. 3.29 (2/2) DESIGN PLAN OF INGALERA RIVER



DESIGN IN FLOOD DISCHARGE (m³/s)		360													260						
GRADIENT OF H.W.L.		1/5000								1/3400					1/1800						
GRADIENT OF RIVER BED	1/5000									1/2500					1/1800						
TOP OF DIKE (El. m)		5.80	5.80	5.93	6.16	6.69	7.01	7.27	7.50	7.79	8.11	8.31	8.60	8.88	9.10	9.61	10.21	10.76	11.32	11.49	11.87
H.W.L. (El. m)		5.00	5.00	5.13	5.36	5.89	6.21	6.47	6.70	6.99	7.31	7.51	7.80	8.08	8.30	8.81	9.41	9.96	10.32	10.69	11.07
CHANNEL BED (El. m)	-1.88	-1.80	-1.69	-1.47	-1.24	-0.71	-0.38	-0.12	0.10	0.55	0.93	1.20	1.60	1.98	2.20	2.71	3.31	3.86	4.42	4.59	4.97
DISTANCE (Km)	0.00	0.41	0.93	2.04	3.19	5.86	7.48	8.78	9.92	11.04	11.98	12.67	13.66	14.61	15.00	16.00	17.00	18.00	19.00	19.30	20.00
SECTION NO.		I-1	I-2	I-3	I-4	I-5	I-6	I-7	I-8	I-9	I-10	I-11	I-12	I-13	I-14	I-15	I-16	I-17	I-18		I-19

Fig. 3.30 LONGITUDINAL PROFILE OF INGALERA RIVER

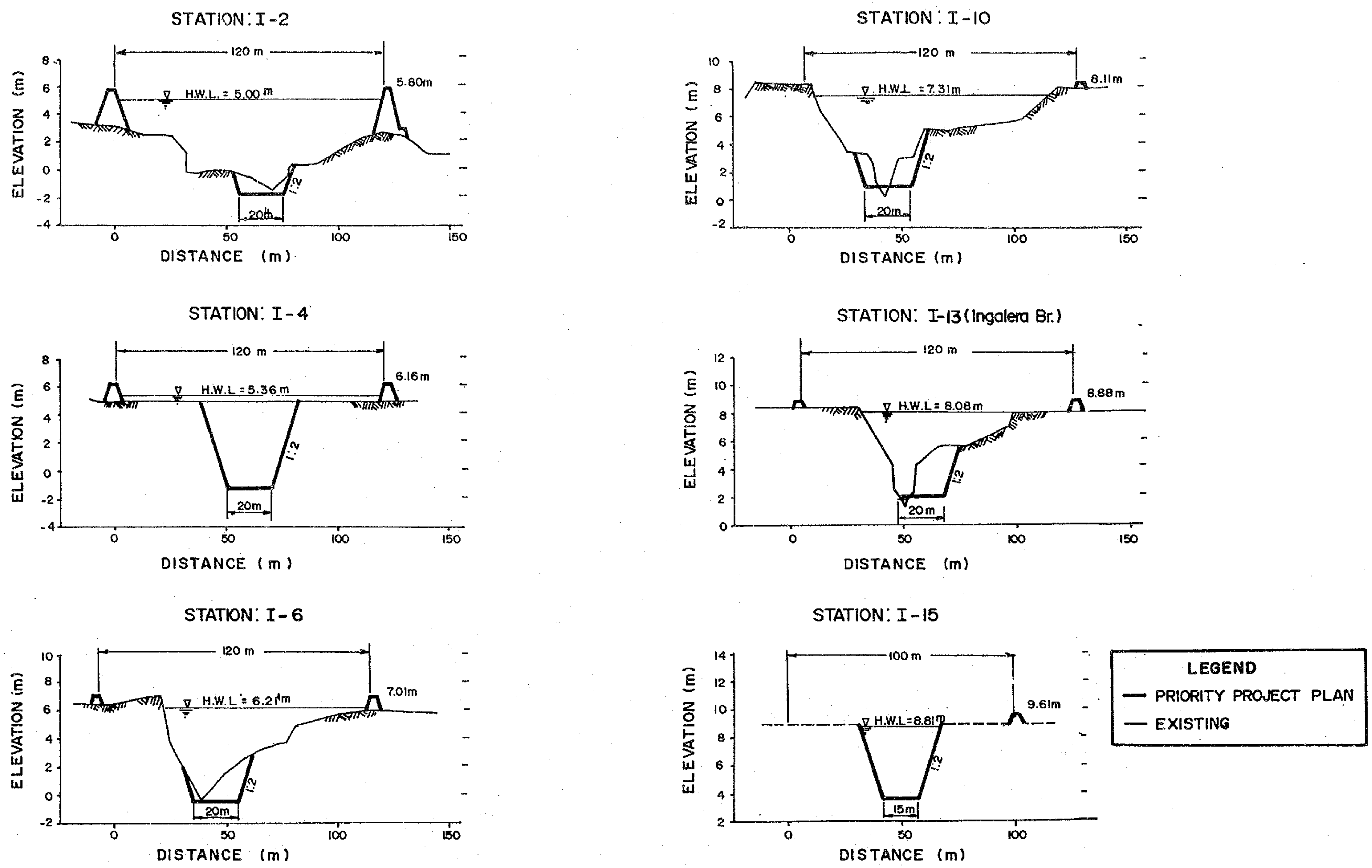
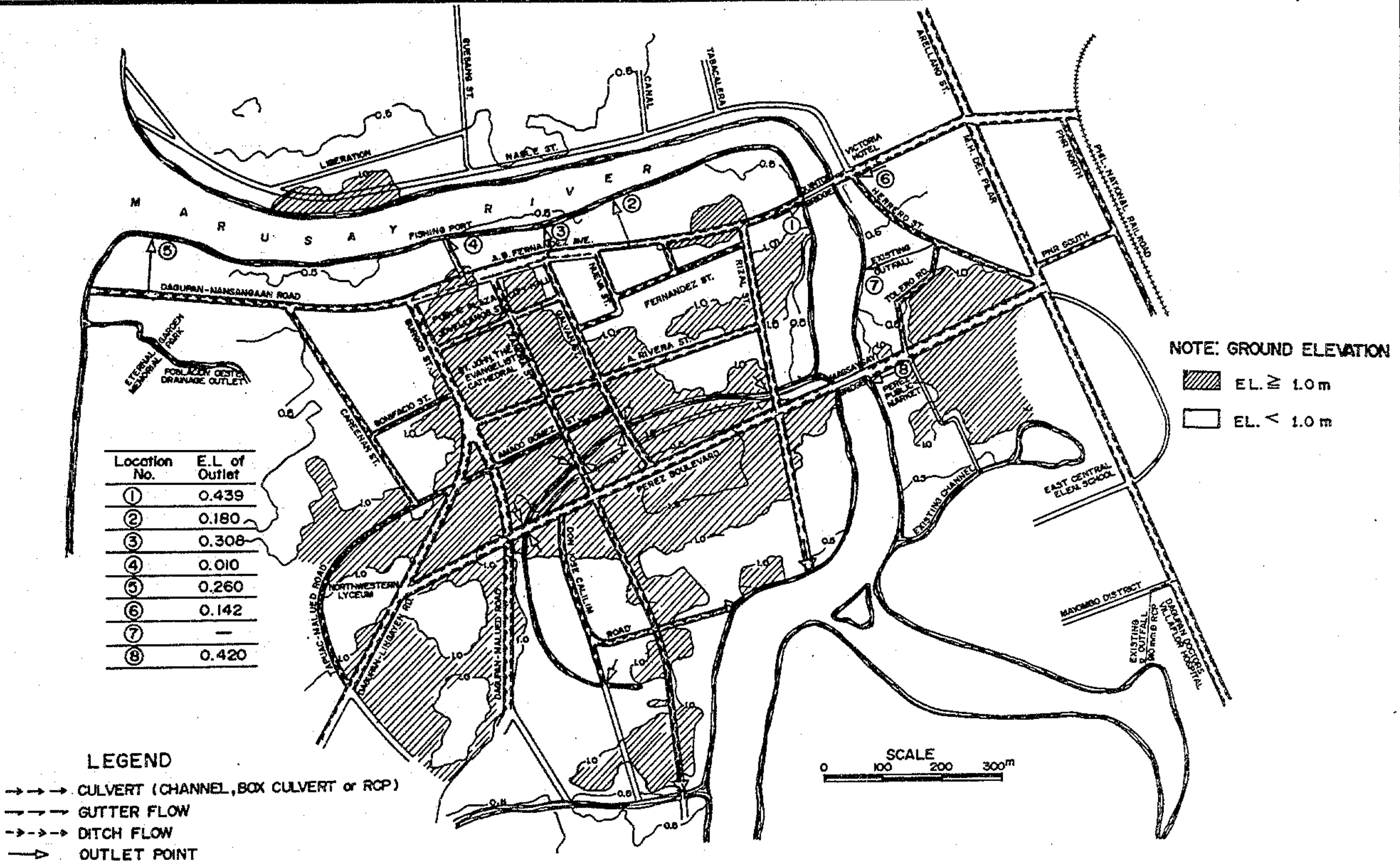


Fig. 3.31 TYPICAL CROSS-SECTION OF INGALERA RIVER



Location No.	E.L of Outlet
①	0.439
②	0.180
③	0.308
④	0.010
⑤	0.260
⑥	0.142
⑦	—
⑧	0.420

LEGEND

- →→→ CULVERT (CHANNEL, BOX CULVERT or RCP)
- →→→ GUTTER FLOW
- -→-→- DITCH FLOW
- —▷ OUTLET POINT

Fig. 3.32 GENERAL LAYOUT DRAINAGE MASTER PLAN IN DAGUPAN CITY

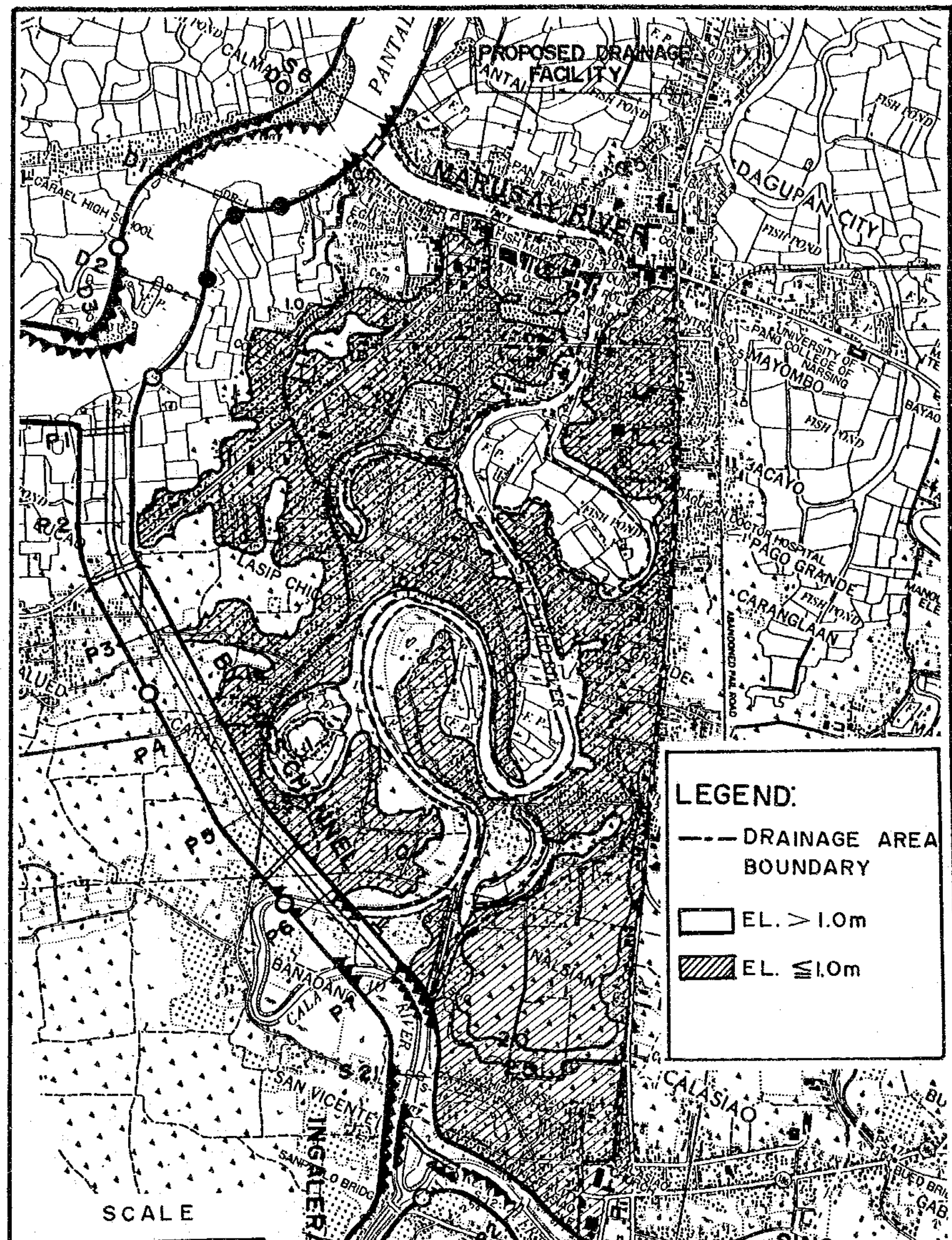
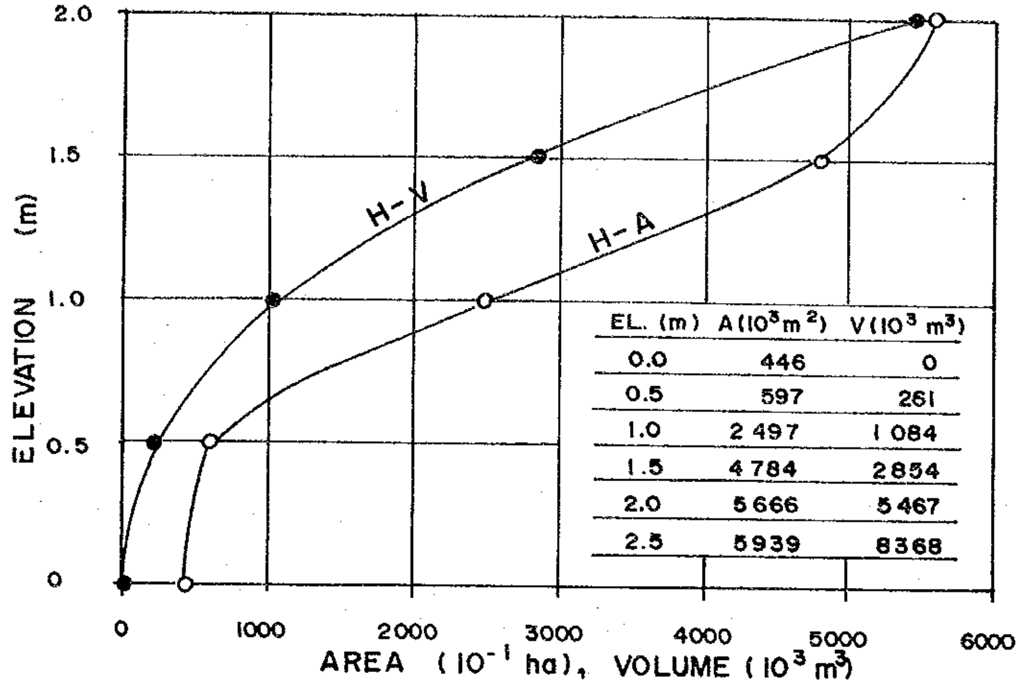


Fig. 3.33 DRAINAGE AREA IN DAGUPAN CITY



EL. (m)	A ($10^3 m^2$)	V ($10^3 m^3$)
0.0	446	0
0.5	597	261
1.0	2 497	1 084
1.5	4 784	2 854
2.0	5 666	5 467
2.5	5 939	8 368

Fig. 3.34 ELEVATION - AREA AND CAPACITY CURVE IN DAGUPAN AREA

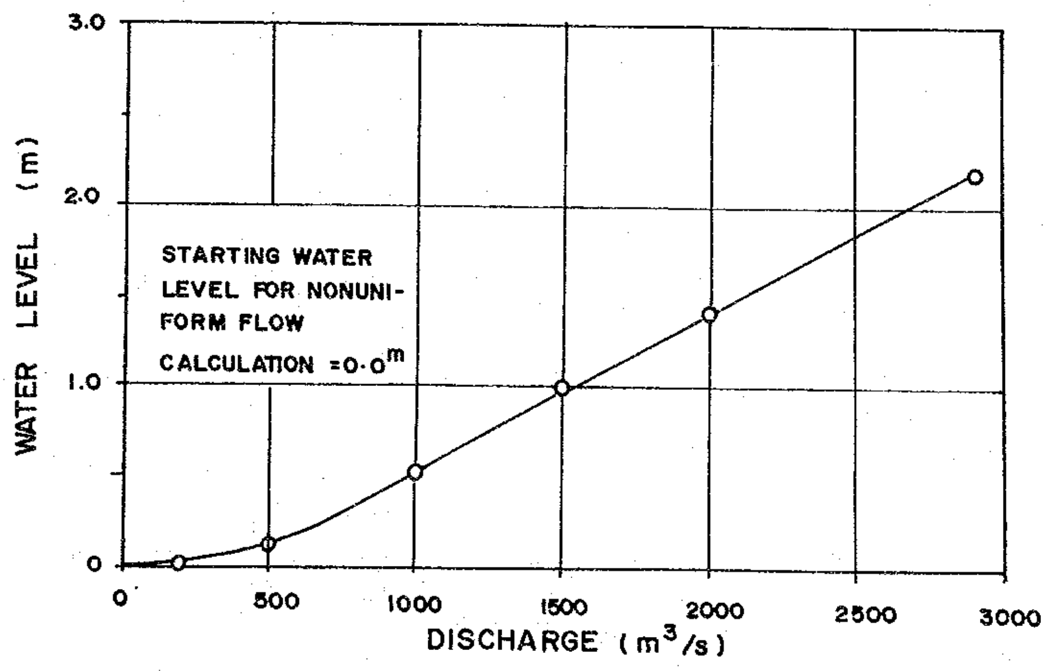


Fig. 3.35 WATER LEVEL - DISCHARGE RATING CURVE AT DRAINAGE FACILITY SITE

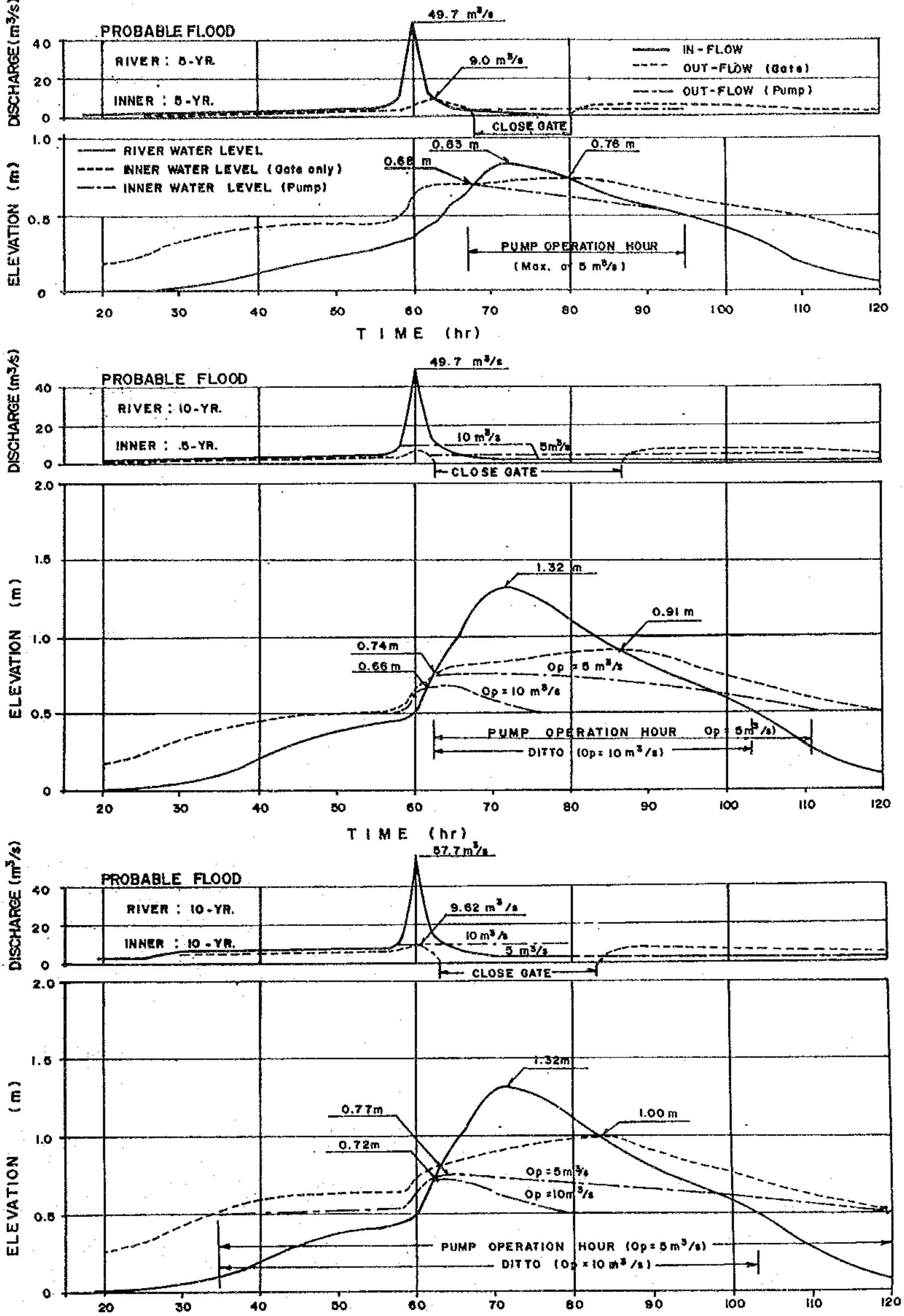


Fig. 3.36 CALCULATION RESULT FOR INNER-WATER DRAINAGE IN DAGUPAN CITY AREA

10. DM

10. DM DAM AND RETARDING BASIN PLAN

DM. RETARDING BASIN PLAN

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

In the Master Plan,the Poponto swamp was formulated as a natural retarding basin to regulate peak flood from the upstream in the Agno River basin.

During the stage of Feasibility Study,new topographical mapping of the swamp area was executed with a scale of 1/25,000. The retarding effect of the swamp planned in the Master Plan was initially re-assessed by the use of the new maps to proceed feasibility planning.

This Supporting Report presents the results of the retarding basin planning carried out during the Feasibility study stage.

Major work items are enumerated below.

(1) Re-assessment of the retarding capacity and effect of the Poponto swamp

(2) Feasibility design in natural retarding basin area

- ring levee design
- protection measures in the innundation area
- ressettlement
- heightening of roads and bridges

2. NEW STORAGE AREA AND CAPACITY CURVES OF POPONTO SWAMP

Storage area and capacity curves of the Poponto swamp were established using the new topographic maps with a scale of 1/25,000. These were compared with those made in the Master Plan stage as shown in Fig.2.1.

These curves indicates that the new storage area and the storage capacity decreased by about 35% and 40 % respectively at the elevation of 16.0m. It is assessed that this reduction is brought about by the difference in accuracy of two different maps. Difference of contour lines of these maps is illustrated in Fig.2.2 and Fig.2.3. The contour interval of the 1/50,000 maps is 20m while that of the 1/25,000 maps is 2.5m. The supplemental contour lines (2.5m interval) of the 1/50,000 maps are interpolated by use of the point elevations on the maps. The revised area and capacity curves are adopted based on the following standpoint:

a) The ground elevation of the 1/50,000 maps were surveyed around 1950 - 1960 and there is no way to verify its accuracy at present,while that of the 1/25,000 maps were surveyed in 1989.
b) The elevation difference can not be explained by historical ground transformation, such as sedimentation in the swamp area in the past 20 - 30 years.
c) Error limit of the 1/25,000 maps is smaller than that of the 1/50,000 maps.

3. REASSESSMENT OF NATURAL RETARDING BASIN PLAN

3.1 Reassessment of natural retarding effect

As mentioned in the preceding Chapter, the storage capacity of the Poponto swamp is considerably redused. This implies that expected flood control effect in the downstream reaches of Wawa in the Agno River is to be decreased due to reduction of natural retarding capacity of the swamp.

The natural retarding effect by the Poponto swamp was re-assessed for the design flood of 25-year (Long Term Plan) and 10-year by use of the new storage capacity curve. The difference of peak discharge at Wawa and high water level of the swamp is compared as follows:

Probable Flood	Peak dischage at Wawa (m_3/s)		H.W.L of Swamp (EL.m)	
	Old	New	Old	New
25-year (Long Term Plan)	7,500	8,400	15.6	15.9
10-year (Long Term Plan)	5,500	6,200	14.8	15.1

The simulated conditions are:

- The flood run off from the Upper Agno River are discharged into the swamp through the new floodway and no overflow is allowed at the Bayambang stretch.
- The probable flood at the base point of Wawa is generated.
- Horizontal sedimentation volume of 50-year period is assumed as the dead storage.
- All of the river stretches are under the river improvement condition (confining dike system).
- The Balog-Balog dam and San Roque dam are assumed to be existing.

As shown in the above, about 13% for the flood peak discharge at Wawa and 0.3 m for the high water level in the swamp are increased compared with values in the case of 10-year flood estimated by use of the old storage capacity curve increased due to reduction of natural retarding capacity in the swamp.

3.2 Design high water level of Poponto Swamp

The design high water level (H.W.L) of the retarding basin is determined for the priority project (Upper Agno River) under the following conditions:

- The 10-year design flood at Wawa base point
- New diversion facilities (diversion channel and floodway) are proposed to prevent the Bayambang stretch from overtopping of flood.Thus 3,500 m^3/s of the design flood of 4,000 m^3/s from the Upper Agno River is diverted into the swamp while 500 m^3/s is discharged into the Bayambang stretch .
- The downstream reaches of Wawa is under present river condition.
- The Balog-Balog and San Roque dams are assumed to be existing.
- Horizontal sediment volume of 50 years(261 x $10^6 m^3$) is assumed as the dead storage.

The simulated water level and discharge hydrographs of the Poponto swamp are illustrated in Fig.3.1. The flood peak discharge distribution is shown in the lower part of Fig.3.2. Based on the simulation results,the elevation of 16.00 m is adopted as the design high water level for the Poponto retarding basin.

3.3 Natural Retarding Effect of Poponto Swamp Without Project

The natural retarding effect at the Poponto swamp without priority project in the Upper Agno River is assessed for the case of probable 10-year flood under the following conditions:

- The probable flood at Wawa base point is generated.
- All of the river stretches are under the present condition.
- The river dike is assumed to be breached when the flood water level

rises to the level corresponding to the 50% of free board.

- The flood runoff from the Upper Agno river are diverted into the swamp through the present floodway without improvement and into the Bayambang stretch based on the hydraulic condition of existing diversion facilities.
- The present discharge capacity of the Agno river at the Wawa station is kept unchanged.
- The Balog-Balog dam and San Roque dam are assumed to be existing.
- No future sedimentation in the swamp is taken into account.

The simulation result is expressed in terms of flood discharge distribution as shown in the upper part of Fig.3.2. The high water level at the Poponto swamp under the present natural retarding condition is thus assessed to be about EL.14.50 m in case of the 10-year flood.

4. AFFECTED RESIDENTS, INFRASTRUCTURES AND LAND USE

The affected land use, population and properties in the expected inundation area of the Poponto retarding basin is roughly estimated for the high water level of El. 16.00 m as summarized below:

a) Affected Residents

Municipality	Inundation Area (km^2)	Number of Houses	Population
Moncada	104.1	5,530	33,180
Bautista	39.3	780	4,680
Paniqui	32.4	4,260	25,740
Camiling	21.7	440	2,640
Bayambang	2.5	370	2,220
Alcala	1.7	10	60
Anao	1.3	0	0
Total	203.0	11,390	68,340

b) Affected Infrastructures

Road	National	9.0	km
	Provincial	7.5	km
	Municipal	10.5	km
	Barangay	24.5	km
Bridge	San Isidro (length 62.4 m, width 7.4 m)		
	Camangahan (box curvert)		
	Morong (length 30.1 m, width 6.9 m)		
Rail Road	(non-operational)	23.3	km

c) Affected Land

Agriculture	Irrigated Paddy	8.7	km^2
	Rainfed Paddy	122.0	km^2
	Sugar Cane	7.5	km^2
	Corn	25.8	km^2
	Tobacco, root crops		

Legume, etc..	32.7	km^2
Fish pond	0.8	km^2
Residential/Commercial	5.5	km^2

The present land use in the Poponto swamp area is illustrated by stages of the ground as shown in Fig.4.1.

The high water level of the existing retarding basin without project is estimated to be around El. 14.50 m in case of the 10-year design flood. The corresponding inundation area and affected quantities of houses, residents and infrastructures are roughly estimated in Table 4.1 for comparison.

5. PROTECTION MEASURES AND RESETTLEMENT

5.1 Basic concept

Protection measures and resettlement plan is made for the following items.

(1) Commercial area and residential area

In the expected inundation area of Poponto retarding area, there are 11,300 houses. The densely built-up areas are Moncada,Paniqui and the area around the wawa bridge. Besides,there are many farmer's houses along both sides of roads.

The residents inside the retarding basin are planned to be protected by either of the ring levees or resettlement.

The protection plans of the areas are determined by following criterions.

a) Ring levees are provided to :

- The area in which its inundation water depth is less than 2m during the high water level (EL.16.00m).
- The area in which an access road for refuge during the high water level (EL.16.00m)is required.
- The area in which ring levee plan is less expensive than resettlement.

b) Mounds for resettlement are provided to :

- The area where is far from the planned ring levees and area outside the inundation area except the areas inside the ring levee.

c) Resettlement to the areas inside the ring levees is planned for:

- The area where is near the ring levee except the areas inside the ring levee.

d) Resettlement to the areas outside the retarding basin is planned for:

- The area where locates near the fringe of near the outside the retarding basin except the areas inside the ring levee.

The number of residents and houses planned to be protected by the ring levee and resettlement are summarized below.

Protection Measures	Number of Houses	Number of Residents	Share (%)
1) Ring levees	7,430	44,580	65
2) Resettlement			
a) Resettlement to the planned mounds	640	3,840	6
b) Resettlement to the areas inside the ring levees	2,120	12,720	19
c) Resettlement to the areas outside the retarding basin	1,200	7,200	10
Total	11,390	68,340	100

(2) Roads and bridges

In the expected inundation area of the planned Poponto retarding basin,there are National,Provincial and Municipal roads. Among these roads,traffic of the main roads is planned to be maintained as an access for refuge during a flood with the high water level(EL.16.00m).

Heightening is planned for the selected major road systems as set out below.

Road class	Route	Length (km)
National road	Moncada - Paniqui	5.3
Provincial road	Babilang - Paniqui	4.4
	Amancasiling-San Vicente	1.6
Municipal road	Sapang - Moncada	6.9

THe three affected bridges are planned for improvement works.

5.2 Ring Levees

Ring levees are provided for Bautista, Moncada and Paniqui municipalities as set out below. The locations and alignment are illustrated in Fig.5.1 and 5.2.

Municipality	Municipality Barangay	Protected Area (Km^2)	Levee Length (Km)	Protected Houses (Nos.)
BAUTISTA	Poponto	0.11	1.49	240
MONCADA	Moncada	5.07	9.76	3,530
	Tubectubang	0.12	1.40	240
	San Julian	0.69	4.20	430
PANIQUI	Paniqui	2.09	3.78	360
	Ines	0.14	1.92	250
	Pance	0.10	1.98	550
	Salomague	0.39	3.70	500
	Baladang	0.20	1.70	450
	Ventemilla	3.17	6.78	880
Total		12.08	36.71	7,430

The design feature of the ring levee is

. Crest width	6.0 m
. Crest elevation	EL.17.20 m
. Slope	1:3.0
. Freeboard against wind, etc	60 cm
. Sod facing	
. Gravity type inland drainage facility	5-year design flood

Crest elevation of ring levee is determined with consideration of high water level of retarding basin and wave height.

The wave height due to wind is calculated to be 0.6 m. However, the ring levee freeboard was desided to be 1.20 m. Because the freeboard of dikes in the Bayamban area was determined to be 1.20 m against the discharge of the Agno River; i.e., the crest elevation of ring levee is EL.17.20 m.

[Caluculation of waves are cause by wind]

A wave height generated by wind in shallow water depth is smaller than a wave height in deep water depth, because of the friction loss of water and the energy loss which are cause by the permeate to the bottom of retarding basin.

A wave height and cycle time in shallow water depth , there is estimated by Ijima's formula:

$$gH_{1/3}/U_{10}^{2}=0.30A[1-\{1+0.004(gF/U_{10}^{2})^{1/2}/A^{-2}]$$

$$gT_{1/3}/(2*3.14*U_{10})=1.37B[1-\{1+0.008(gF/U_{10}^{2})_{1/3}/B\}^{-5}]$$

$$A=\tanh\{0.578(gh/U_{10}^{2})^{3/4}\}$$

$$B=\tanh\{0.520(gh/U_{10}^{2})^{3/8}\}$$

g	: Acceleration of gravity (m/s^2)
H	: Wave height (m)
U_{10}	: Average velocity of wind in ten minutes
F	: Blowing distance (m)
T	: cycle time (s)
h	: depth of water (m)

Each numerical value is assumed as set out below to caluculate a wave height which is cause by wind in the retarding basin.

- -THe average wind velocity in ten minuttes is 30 m/s.
- -Blowing distance is 10 km as the longest straight distance in the retarding basin at the H.W.L(EL.16.00).
- -The average water depth in the retarding basin is 4.0 m.

The results of caluculation is summarised below

Wave height	:	H = 1.03 m
Cycle time	:	T = 4.57 s
Wave length	:	L = 32.6 m
Velocity of wave	:	C = 7.12 m/s

The critical water depth of wave breakage is 1.60 m which is obtained form Fig.5.3.

The top elevation of the wave in the retarding basin is

EL.16.00 m + 1.03/2 m = EL.16.52 m

The wind wave height is estimated to be about 0.6 m.

Required drainage facilities are shown in Table 5.1 .

The work quantities of the ring levee plan are shown in Table 5.2.

5.3 Resettlement Program

Resettlement program is prepared for the residents who can not be protected by ring levees. The inundation area other than those protected by the ring levee plan is divided into 14 blocks (from A to N). Appropriate resettlement program is formulated for each block by classifying three types as set out below.

Type of Resettlement	Block No.	Number of Houses	Requirement of Acreage (m^2)	Number of Residents
a) Resettlement to the mounds	E	480	111,000	2,880
	L	160	40,000	960
Sub-total		640	151,000	3,840
b) Resettlement to the areas inside the ring levees	A	1,040	232,000	6,240
	F	350	75,000	2,100
	G	150	32,000	900
	I	280	50,000	1,600
	J	300	59,000	1,800
Sub-total		2,120	448,000	12,720
c) Resettlement to the areas outside the retarding basin	B	400	90,000	2,400
	C	70	16,000	420
	D	90	21,000	540
	H	250	45,000	1,500
	K	200	52,000	1,200
	M	150	33,000	900
	N	40	8,000	240
Sub-total		1,200	265,000	7,200
Total		3,960	864,000	23,760

Each houses is divided to four classes as set out below.

Class	Avarage acreage of floor (m2)	Requirement of acreage (m2)	Unit cost of houses (pesos/m2)
I. Concrete	100	300	3,500
II. Concrete & wood	90	270	2,300
III.Wood	70	210	1,500
IV. Nippa & Bamboo	40	120	800

The numbers of housese in each classes are shown in Table 5.3.
The movilization flow of the resettlement is illustrated in Fig.5.4.

5.4 Mounds for Resettlement

Mound construction is planned for the residents of Barangay Spang and San Isidro as set out below.

The locations and alignment are illustrated in Fig.5.1 and Fig.5.2.

Municipality	Barangay	Acreage of Mound (m^2)	Resettled Houses (Nos.)
Moncada	Spang	111,000	480
Paniqui	San Isidro	40,000	160
Total		151,000	640

The design feature of the mound is

- . Crest elevation EL. 16.60 m
- . Slope 1 : 3.0
- . Freeboard 60 cm
- . Sod facing

The work quantities of the Mound construction plan are shown in Table 5.4.

5.5 Road Heightening

Heightening is planned for the selected major road systems as setout below. The subjected parts are illustrated in Fig.5.1.

Road Class	Route	Length (km)	Width (m)	Type of Pavement	Maximum Heightening (m)
National	Moncada-Paniqui	5.3	7.3	Asphalt	1.40
Provincial	Babilang-Paniqui	4.4	6.1	Concrete	1.45
	Aman Casiling -San Vicente	1.6	7.3	Asphalt	3.60
Municipal	Sapang-Moncada	6.9	5.5	Gravel	2.60

The box culvert under the heightening road is kept the present discharge capasity.

The design feature of the road heightening is

.Crest elevation EL.16.60 m

.Freeboard 0.60 m

The work quantities of the road heightening are shown in Table 5.5.

5.6 Bridge Improvement

Improvement works of the three affected bridges are planned as setout below. These bridge locations are illustrated in Fig.5.1.

Bridge	Existing condition	Plan
Extension of San Isidro Bridge	Top elevation El. 16.5 m Width 7.4 m Length 35.0 m Discharge capacity 120.0 m^3/s (drainage 409 km^2)	Top elevation El. 16.5 m Width 7.4 m Extension length 22.0 m Discharge capacity 240.0 m^3/s (2 year Probable flood)
Replacement of Camangahan Bridge with New one	Top elevation El. 15.4 m Width 7.4 m Box culvert 4.00m x 2.20m x 1 Discharge capacity 18.0 m^3/s (drainage area 78 km^2)	Top elevation El.16.6 m Width 7.4 m New bridge length 21.0 m Discharge capacity 70.0 m^3/s (2 year Probable flood)
Replacement of Morong Bridge with a new dike	Top elevation El. 16.3 m Width 6.9 m Length 30.1 m Discharge Capacity 107.0 m^3/s	Top elevation El. 16.6 m Width 6.9 m Box culvert 4.0 x 20 x 2

The top and bottom elevation of the Wawa bridge was surveyed by the Study Team because the design drawings are not available at present. The bottom elevation of the bridge girder is El. 17.85 which provides 1.85 m clearance to the H.W.L 16.00 m, and thus replacement of the bridge will not be required unless the Framework Plan is implemented.

The section of Wawa bridge is illustrated in Fig.5.5.

TABLES

Table 5.1 REQUIRED STRUCTURES OF DRAINAGE FACILITY

Location	Catchment area (km2)	Specific Discharge (m3/s)	Peak discharge (m3/s)	Drainage Fcility type
MONCADA	5.07	1.7	8.62	C1,C2
PANIQUI	2.09	1.8	3.76	C1,C1
POPONTO	0.11	2.6	0.29	A1,A2
TUBECTUBANG	0.12	2.6	0.31	A1,A2
SAN JULIAN	0.69	2.2	1.52	A1,B,B
INES	0.14	2.5	0.35	A2
PANCE	0.10	2.6	0.26	A2
SALOMAGUE	0.39	2.3	0.90	A1,A2,A2
BALADANG	0.20	2.4	0.48	A1,A2
VENTEMILLA	3.17	1.8	5.71	C2

* Type A1 : 800 mm X 1
Type A2 : 800 mm X 2
Type B : 1.50m X 1.50mm X 1
Type C1 : 2.00m X 2.00m X 1
Type C2 : 2.00m X 2.00m X 2

Table 5.2 WORK QUANTITIES OF RING LEVEE

Name of Municipality	Location	Catchment Area (km^2)	Length (km)	Height (m)	Embankment (m^3)	Riverwall (m^3)	Turf (m^2)	Gutter (km)	Drainage facility	Land (m^2)
BAUTISTA	POPONTO	0.11	1.49	2.3	44,200	-	21,700	1.49	. 800x2 . 800x1	29,500
MONCADA	MONCADA	5.07	9.76	1.3-2.3	281,500	-	143,800	9.76	.20x20x2 .20x20x1	203,200
	TUBECTUBANG	0.12	1.40	2.3-2.8	44,300	-	21,200	1.40	. 800x2 . 800x1	28,500
	SAN JULIAN	0.69	4.20	1.8	86,200	-	47,800	4.20	.1.5x1.5x1 .1.5x1.5x1 . 800x1	70,600
PANIQUI	PANIQUI	2.09	3.78	0 - 1.8	64,200	-	36,800	3.78	.2.0x2.0x1 .2.0x2.0x1	57,600
	INES	0.14	1.92	2.3	57,000	1,200	27,000	1.92	. 800X2	38,000
	PANCE	0.10	1.98	1.8	40,600	3,000	22,500	1.98	. 800x2	33,300
	SALOMAGUE	0.39	3.70	1.8	75,900	-	42,100	3.70	. 800x1 . 800x1 . 800x2	62,200
	BALADANG	0.20	1.70	2.3	50,400	750	24,700	1.70	. 800x1 . 800x2	33,700
	VENTEMILLA	3.17	6.78	1.3-3.3	196,100	-	92,800	6.78	.2.0x2.0x2	128,700
TOTAL		12.08	36.71		940,400	4,950	481,300	36.71	-	685,300

Table 5.3 NUMBER OF HOUSES IN REMOVAL PLAN

Area	Number of house	Class of house I	II	III	IV	School	Church	Requirement of acreage (m2)
A	1,040	34	176	383	436	7	4	232,000
B	400	13	68	147	168	3	1	90,000
C	70	4	12	19	35	0	0	16,000
D	90	0	26	28	36	0	0	21,000
E	480	22	158	45	235	1	19	111,000
F	350	17	38	123	170	2	0	75,000
G	150	7	16	53	73	1	0	32,000
H	250	3	23	38	186	0	0	45,000
I	280	0	53	81	140	1	5	50,000
J	300	6	33	63	189	1	8	59,000
K	200	10	66	70	50	1	3	52,000
L	160	18	54	18	64	1	5	40,000
M	150	2	36	36	74	0	2	33,000
N	40	1	0	12	27	0	0	8,000
Total	3,960	137	759	1,160	1,883	18	47	864,000

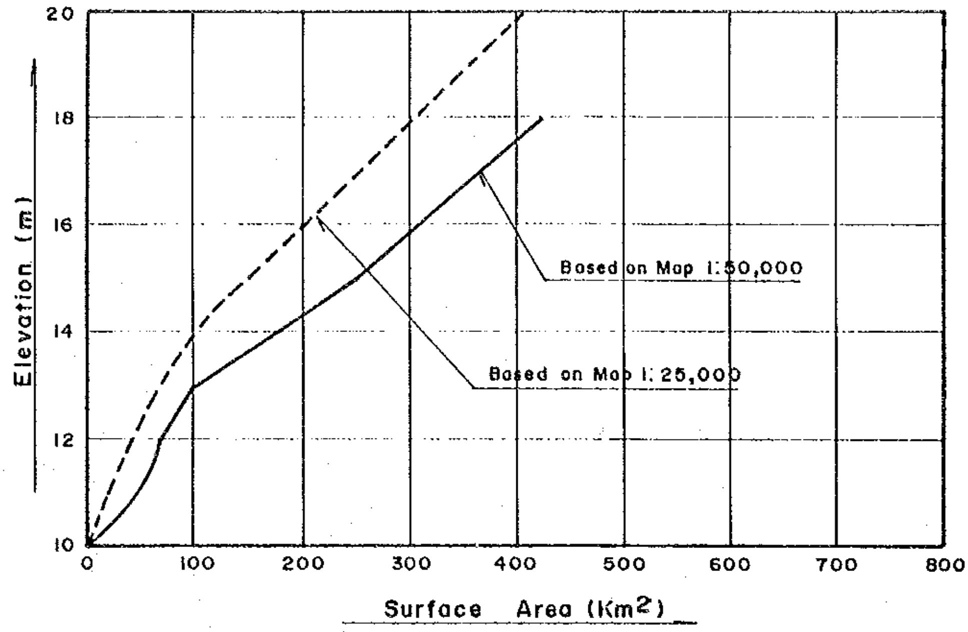
Table 5.4 WORK QUANTITIES OF MOUNDS CONSTRUCTION

Name of Municipality	Location	Area of mound (m^2)	Height (m)	Embankment (m^3)	Turf (m^2)	Land (m^2)
MONCADA	SAPANG	111,000	3.60	429,000	17,200	127,800
PANIQUI	SAN ISIDRO	40,000	1.60	67,000	3,100	43,000
TOTAL				469,000	20,300	170,800

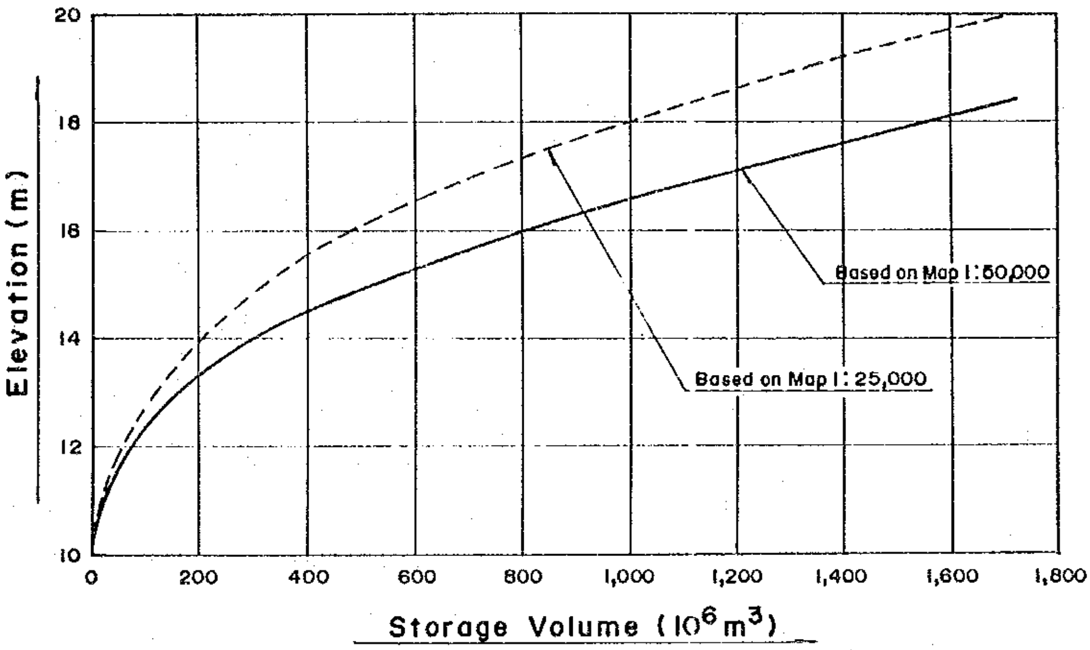
Table 5.5 WORK QUANTITIES OF ROAD HEIGHTENING

Class	Section	Length (km)	Type	Width (m)	Embankment (m^3)	Pavement area (m^2)	Land (m^2)	Box culvert
National road	Moncada-Paniqui	5.3	Asphalt	7.3	124,000	38,690	17,300	4.5mx2.2m - 12 2.4mx1.8m - 4
Provincial road	Babilang-Paniqui	4.4	Concrete	6.1	38,000	26,840	2,400	-
	Amancaciling -San Vicente	1.6	Asphalt	7.3	121,000	11,680	16,500	-
Municipal road	Sapang-Moncada	6.0	Gravel	5.5	227,000	37,950	53,000	4.5mx2.2m - 2

FIGURES



STORAGE AREA CURVES



STORAGE CAPACITY CURVES

Fig. 2.1 COMPARISON OF STORAGE AREA AND VOLUME CURVES OF POPONTO SWAMP

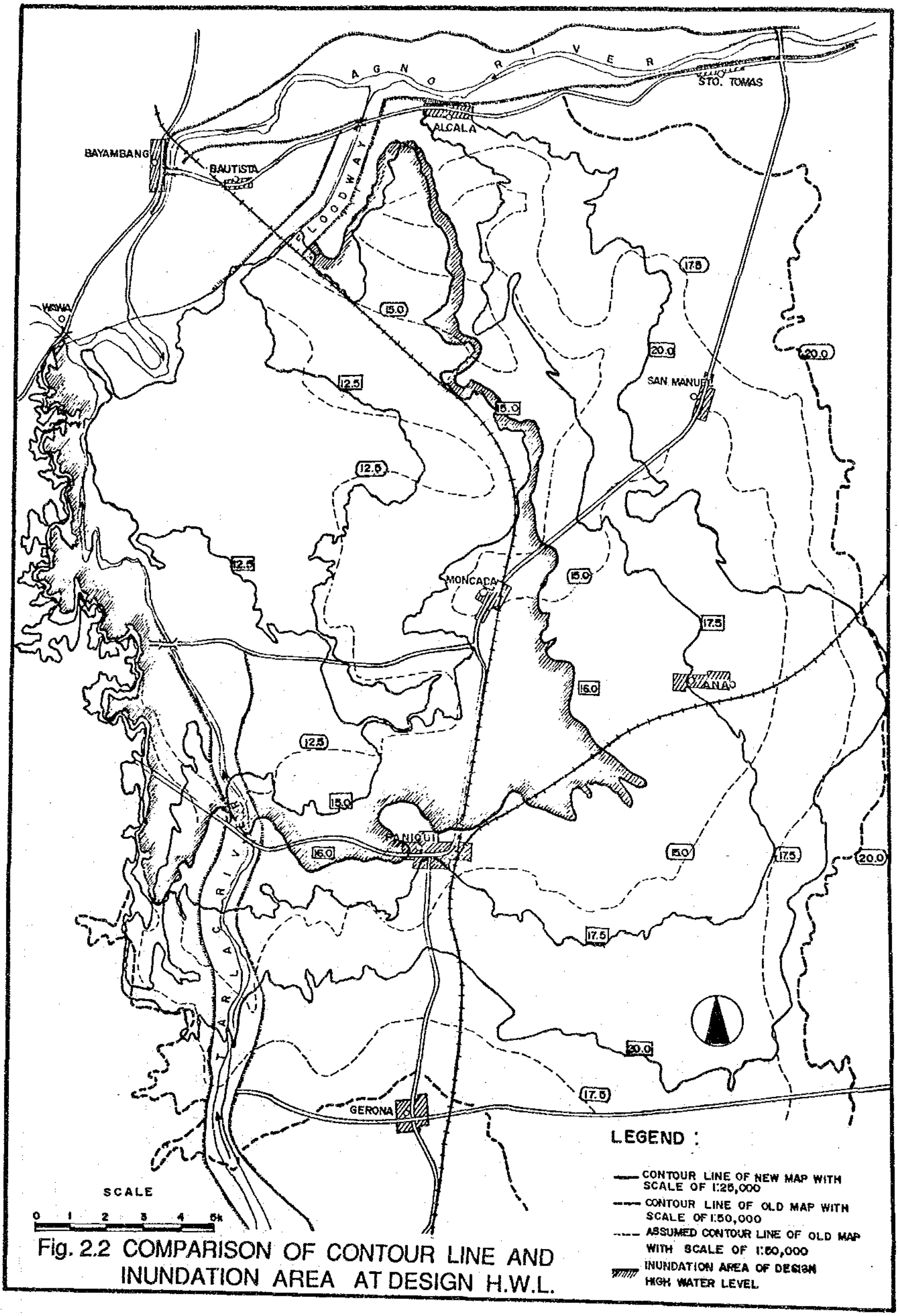
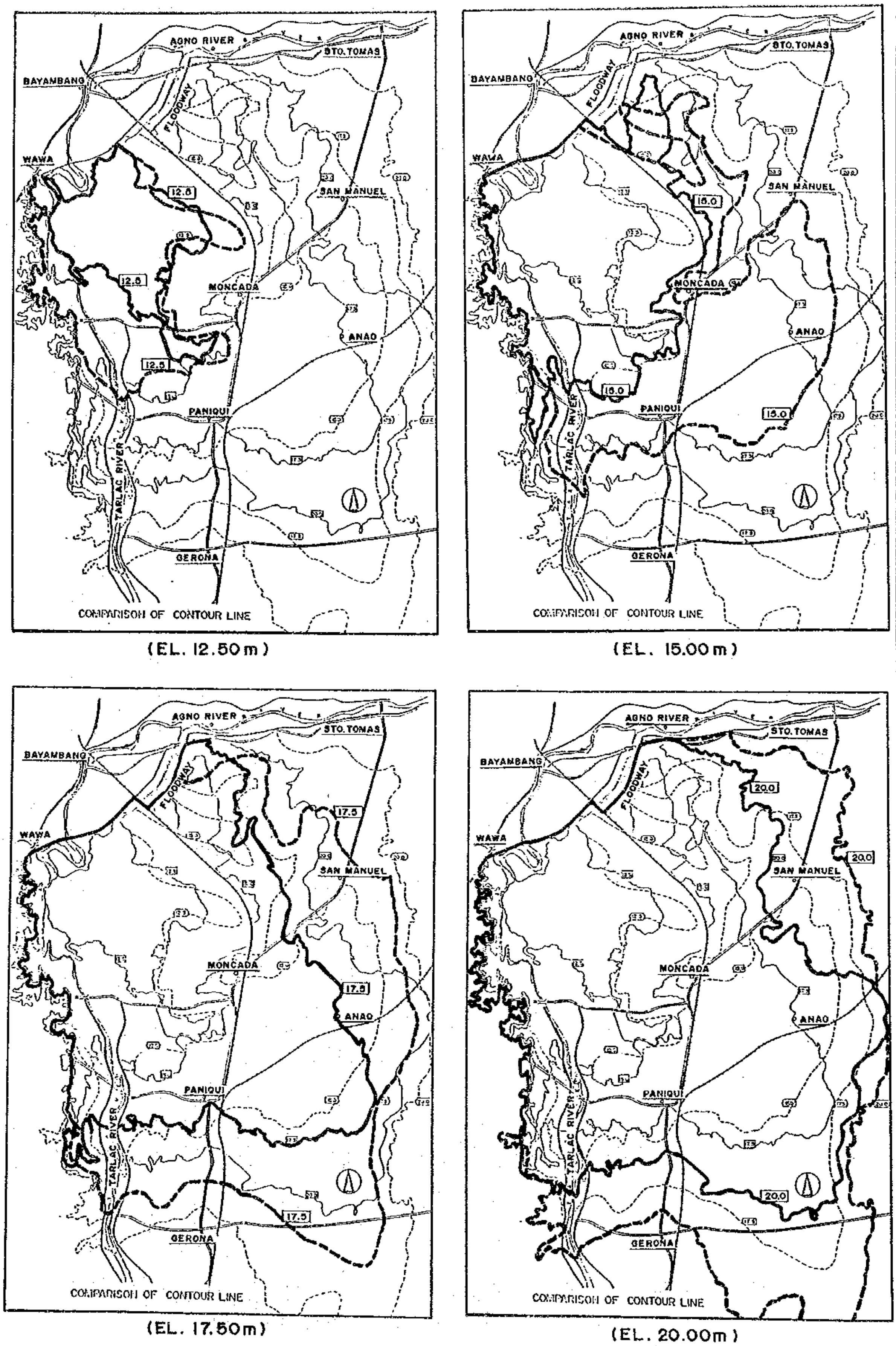


Fig. 2.2 COMPARISON OF CONTOUR LINE AND INUNDATION AREA AT DESIGN H.W.L.



LEGEND : —— CONTOUR LINE OF NEW MAP WITH SCALE OF 1:25,000

- - - - ASSUMED CONTOUR LINE OF OLD MAP WITH SCALE OF 1:80,000

Fig. 2.3 COMPARISON OF CONTOUR LINES

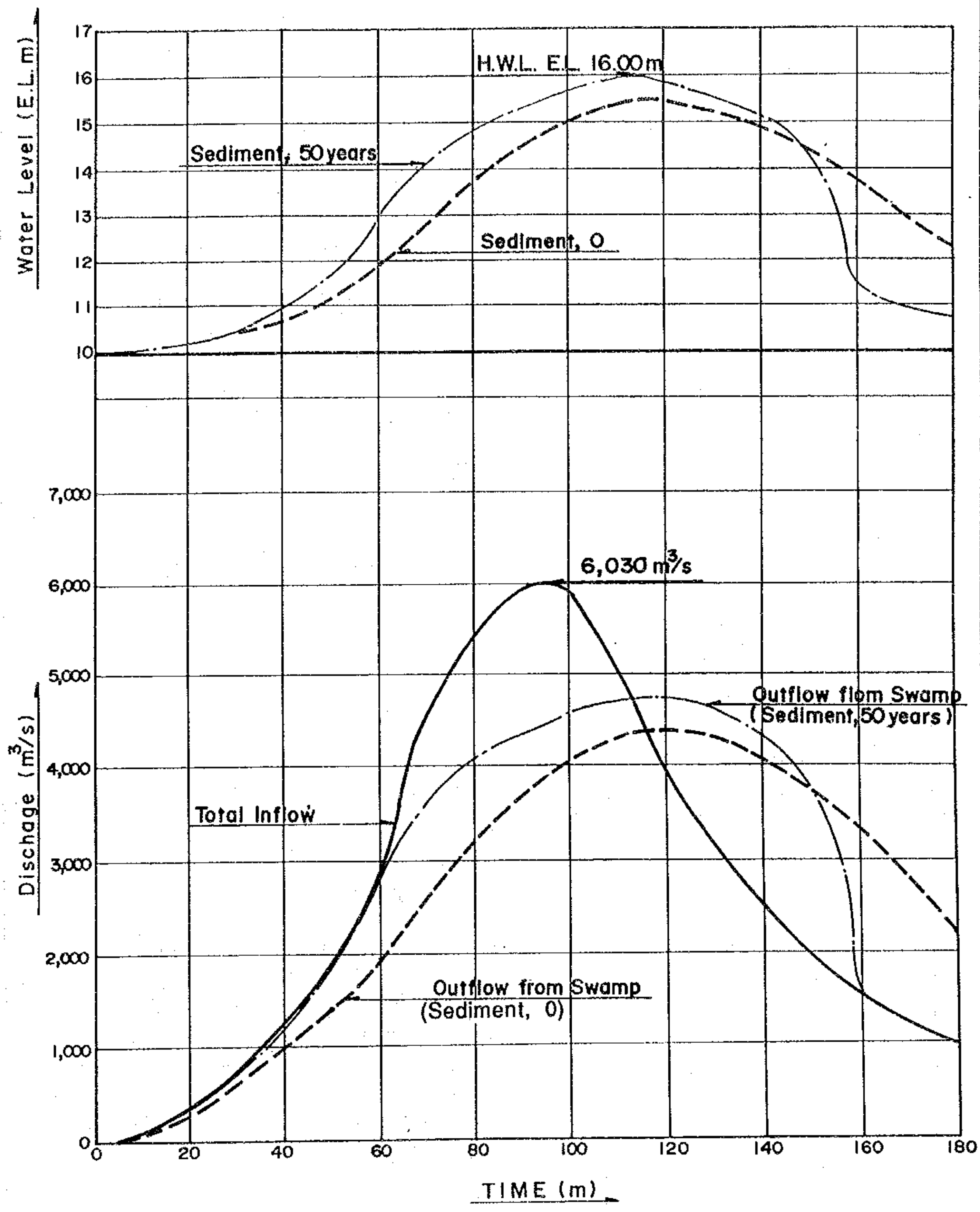


Fig. 3.1 DISCHARGE AND WATER LEVEL HYDROGRAPHS AT POPONTO RETARDING BASIN

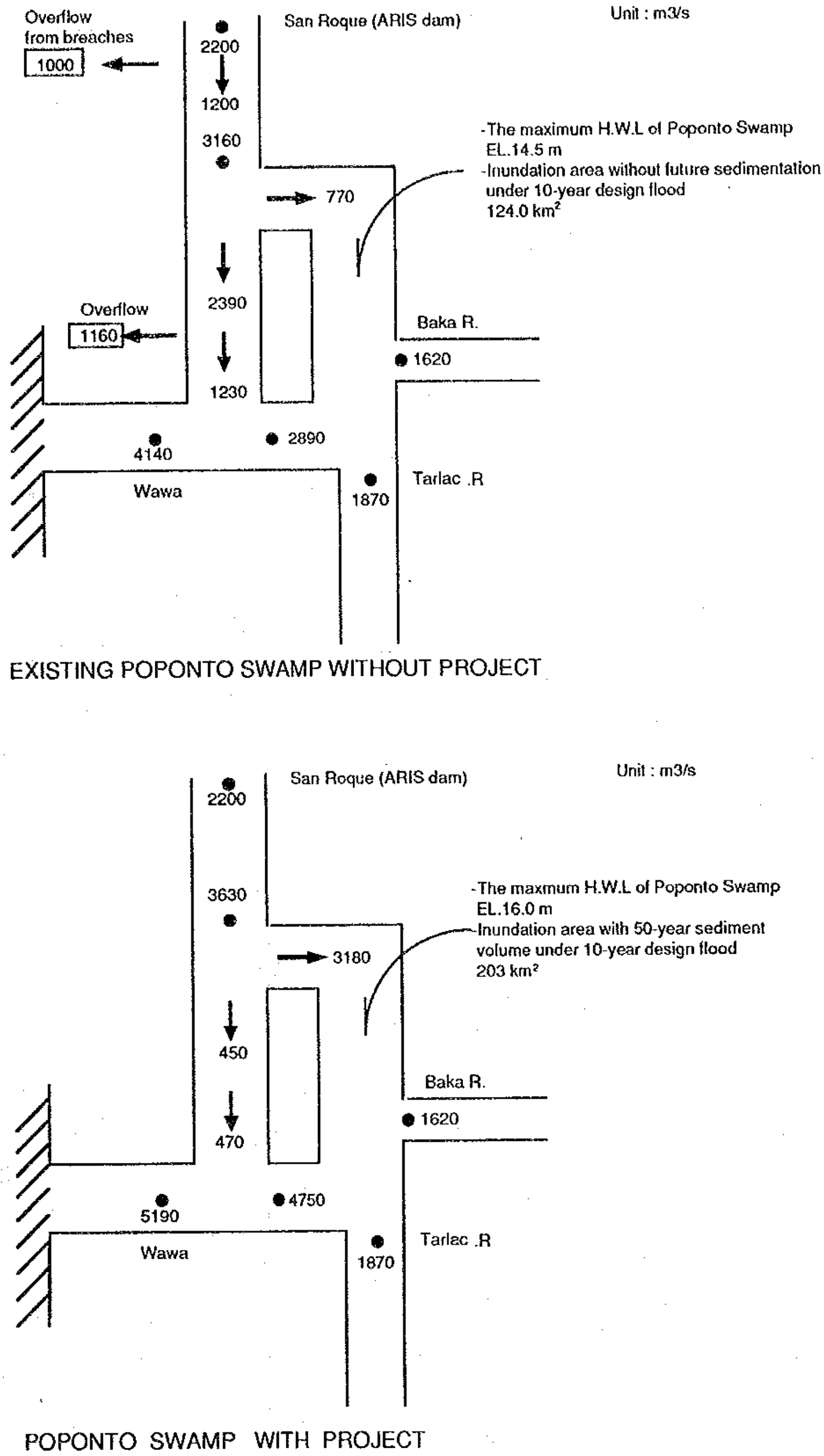


Fig. 3.2 SIMULATED FLOOD DISCHAREGE DISTRIBUTION AND HIGH WATER LEVEL OF POPONTO SWAMP WITH AND WITHOUT PRIORITY PROJECT

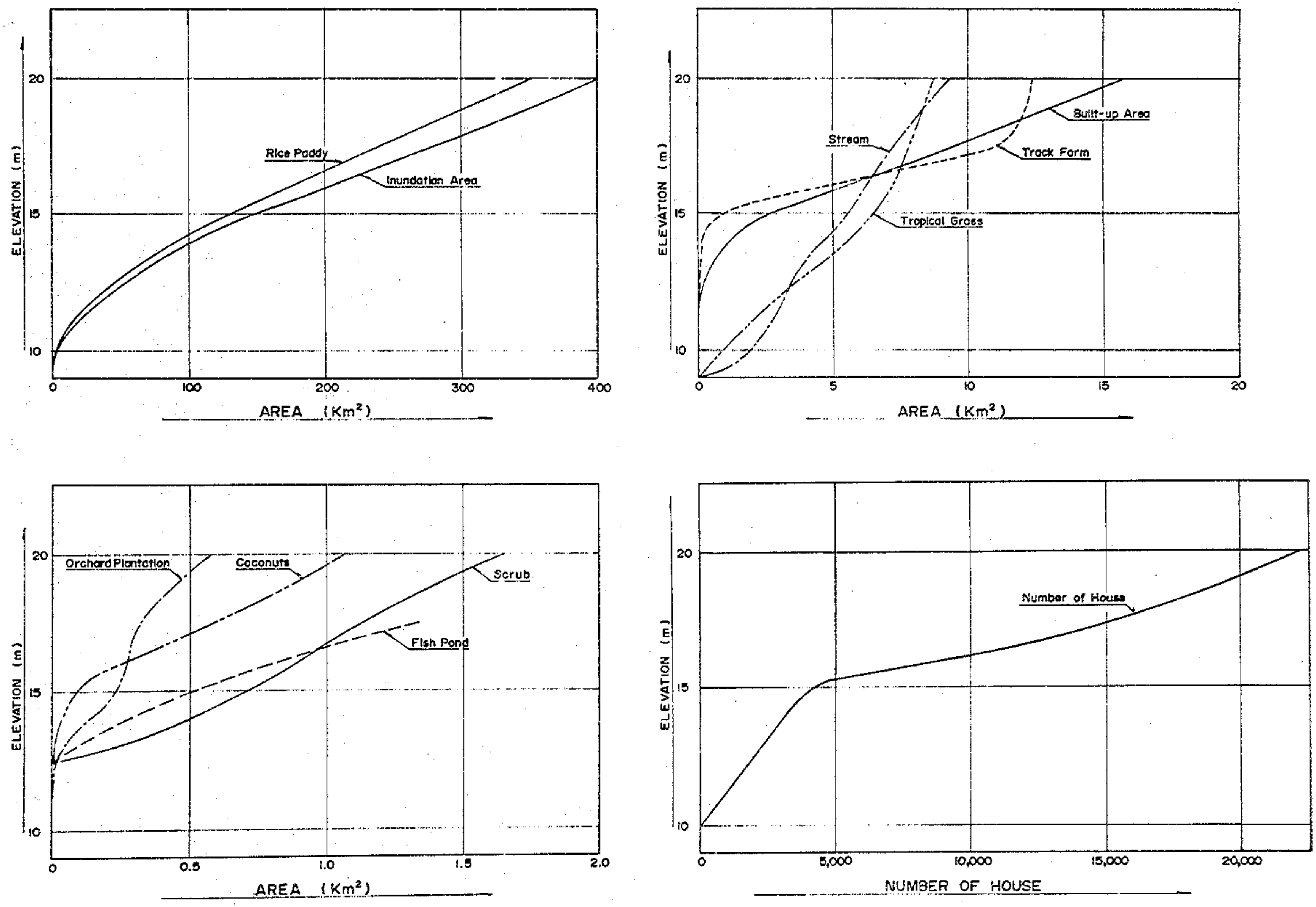


Fig. 4.1 LAND UTILIZATION IN THE POPONTO SWAMP

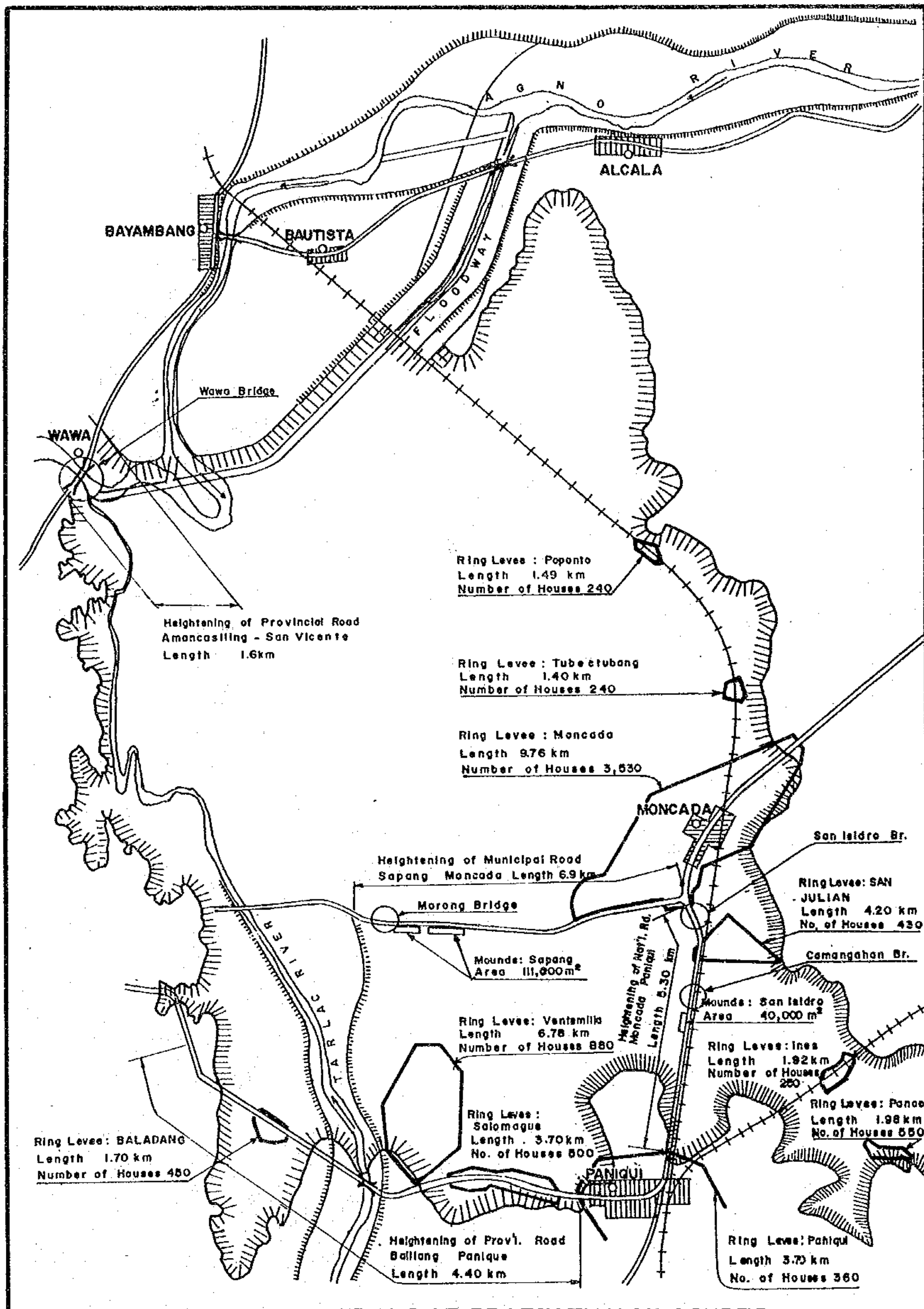


Fig. 5.1 LOCATIONS OF PROTECTION MEASURES

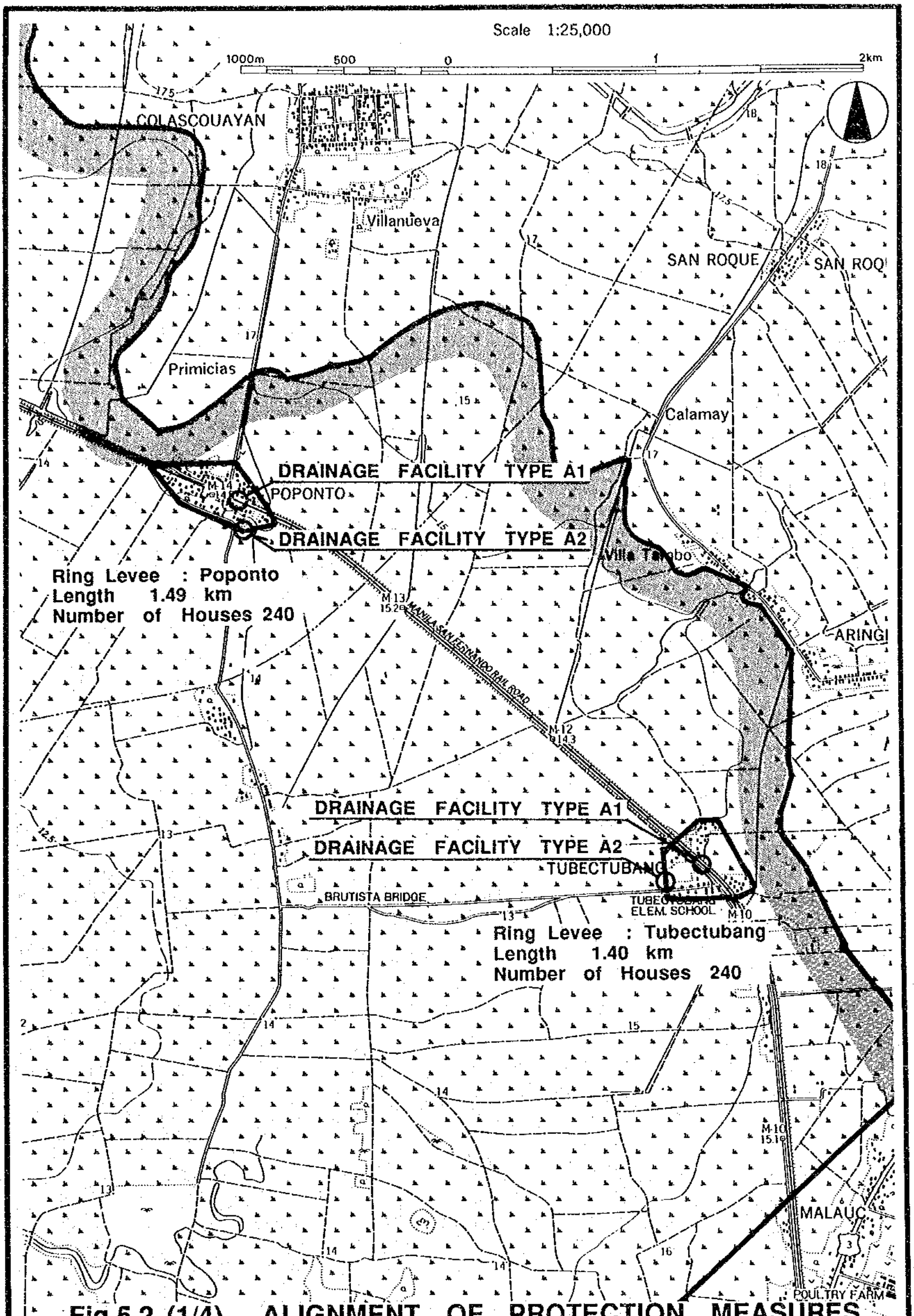


Fig.5.2 (1/4) ALIGNMENT OF PROTECTION MEASURES