TABLES

Table 5-1 (1/2). FEATURES OF RIVERS IN THE STUDY AREA

Basin Number	Name of Basin	River Length (km)	Longitudinal /1 Gradient	Catchment Area (ha)	Subbasin Number	Existing Flow Capacity (m^3/s)	Flow Capacity Per Catchment Area ($m^3/s/km^2$)	Remarks
Basins With River Channels								
Group I								
B-4	Jaen	1.90	1/79	247	-	30	12	
B-6	Salamanca	1.83	1/46	143	-	15	13	
B-7	Zanja Moroti	2.35	1/43	161	1	60	85	
					2	90	76	
B-8	Ferreira	3.34	1/68	400	1	170	59	
					2	190	48	
B-19	Lambare	7.03	1/107	2,566	1	10	3	
					2	15	6	
					3	150	11	
					4	35	2	
					7	150	6	
					5	210	43	
					6	200	28	
B-21	Villa Elisa	5.20	1/68	1,153	1	20	7	
					3	75	7	
B-22	Nemby	7.55	1/101	4,417	1	85	15	
					2	20	2	
					3	25	2	
					4	260	28	
					5	25	1	
Group II								
B-2	Jardin	0.78	1/46	60	-	30	50	
B-10	Las Mercedes	1.35	1/45	212	-	20	9	
B-12	Bella Vista	0.86	1/34	75	-	30	40	
B-14	Mburicao	11.04	1/100	1,645	1	20	5	
					2	35	6	
					4	130	11	
					6	120	7	
					3	30	8	
					5	20	9	
B-15	Ycua Carrillo	3.00	1/78	401	1	20	11	
					2	30	7	
B-16	Santa Rosa	2.40	1/87	313	-	20	6	
B-17	Tres Puentes Cue	5.99	1/171	680	-	10	1.5	
B-18	Itay	25.50	1/318	13,613	3-1	3	0.9	
					5	5	0.7	
					2-2	15	1.3	
					6	60	1.4	
					3-2	3	0.9	
					4	5	1.2	
					1	30	2.2	
					2-1	15	0.9	
					7-2	10	2.1	
					7-1	5	0.4	
					7-3	5	1.8	
					8	23	1.2	
					9	-	-	
					10	20	0.5	
B-26	Zeballos Cue	1.23	1/68	213	-	10	5	
B-27	Paso Cai	4.00	1/129	549	-	10	2	

Note: /1 Longitudinal gradient is the ratio of the height difference between beginning and end points and the total river length.

Table 5-1 (2/2). FEATURES OF RIVERS IN THE STUDY AREA

Basin Number	Name of Basin	River Length (km)	Longitudinal /1 Gradient	Catchment Area (ha)	Subbasin Number	Existing Flow Capacity (m^3/s)	Flow Capacity Per Catchment Area ($m^3/s/km^2$)	Remarks
Group III								
B-23	San Lorenzo	9.60	1/142	3,369	1	5	0.3	
					2-1	5	0.2	
					2-3	10	0.3	
					2-2	10	1.3	
B-24	Tayazuape	8.80	1/163	3,013	1	55	4	
					3	15	0.5	
					2	25	5	
B-25	Ycua Dure	4.50	1/113	1,257	-	42	3	
Basins Without River Channels								
B-1	Varadero	-	-	325	-	-	-	No river
B-3	Centro	-	-	724	-	-	-	-do-
B-5	Tacumbu	-	-	170	-	-	-	-do-
B-9	Villa Universitaria	-	-	240	-	-	-	-do-
B-11	Mariscal Lopez	-	-	66	-	-	-	-do-
B-13	Tablada	-	-	103	-	-	-	-do-
B-20	Valle Apua	-	-	1,063	-	-	-	-do-
B-28	Mariano Alonso	-	-	1,565	-	-	-	-do-
B-29	Villa Hayes	-	-	895	-	-	-	-do-
B-30	Petropar	-	-	523	-	-	-	-do-
B-31	Achucarro	-	-	1,335	-	-	-	-do-

Table 5-2. ROUGHNESS COEFFICIENTS OF EXISTING RIVER CHANNELS

Type of River Channel	Roughness Coefficient
With Concrete Revetment and Invert	0.020
With Masonry Revetment and Concrete Invert	0.025
With Masonry Revetment and Without Invert	0.030
With Revetment and Weeds on the Banks	0.035
Without Revetment and With Weeds on the Banks	0.040
Without Revetment and With Weeds and Shrubs on the Banks	0.045

Table 5-3. FEATURES OF DETENTION FACILITIES

Type	Facility	Flood Control Effect	Economic Consideration	Maintenance Requirement	Safety Consideration	Legislation Requirement
Storage	Parking Lot Storage	Highly effective in discharge retardation over parking lot	Higher in cost due to shallow depth of storage (45)	No special problem	No danger at the time of collapse due to simple construction	Require legislation for enforcement of installation
	Between-House Storage	Highly effective in discharge retardation in multiple dwelling area	Relatively lower in cost (35)	Require maintenance to eliminate sanitary problems	Require safety measures to keep off small children	-ditto-
	Storage in Park	Good possibilities for discharge retardation not only in park but also in vicinities; highly effective	-ditto-	Require precaution against accidents	Require safety measures to prevent accidents and to keep off small children	Problem on legislation may be less because it will be under the control of government authorities
	Storage in Public Compound	Larger compound: discharge retardation over its vicinity can also be expected; highly effective	-ditto-	-ditto-	-ditto-	-ditto-
	Storage in House Lot	Discharge retardation against an increase caused by housing lot development is great	Costwise, it is generally higher, however, cost may become lower by the introduction of different construction methods (55)	For maintenance, require close cooperation of residents	- - -	Require legislation for enforcement of installation
Infiltration	Infiltration Inlet Infiltration Trench	-ditto-	Generally higher in cost when compared with storage type (85)	Require maintenence for clogging prevention	- - -	Require legislation for installation in private lot; installation along roads by government authorities may be simpler in procedure
	Infiltration Well	-ditto-	-ditto-	Difficult to maintain	Possibility of subsidence at fill-up ground	Require legislation for enforcement of installation

Note: Numbers in parenthesis show the cost of detention facilities in Million Guaranies to control 1.0 m^3/s of runoff discharge.

Table 5-4. DESIGN STANDARD OF RIVER CHANNEL IMPROVEMENT

Type of Channel	Maximum Allowable Velocity (m/s)	Roughness Coefficient	Freeboard /1 Q>30m^3/s	Freeboard /1 Q<30m^3/s
Channel Without Revetment (Type A)	3.0	0.035	0.6	0.3
Channel With Revetment and Without Invert (Type B)	4.0	0.025	0.6	0.3
Channel With Revetment and Invert (Type C)	5.0	0.020	0.6	0.3
Box Culvert (Type D)	5.0	0.020	0.6	- /2
Channel With Embankment and Revetment (Type E)	4.0	0.025	0.6	- /2

Note:

/1 Q: Design Discharge

/2 : Design discharges of Channel with Embankment and Revetment, and Box Culvert are bigger than 30 m^3/s.

Table 5-5. AREAS TO BE PROVIDED WITH DRAINAGE FACILITIES AND THEIR RUNOFF COEFFICIENTS

Basin Number	Name of Basin or River	Catchment Area (ha)	Urbanized Area (ha)	Runoff Coefficient (%) 1984	1995	2005
B-1	Varadero	325	314	63	65	67
B-2	Jardin	60	60	67	68	68
B-3	Centro	724	706	61	64	67
B-4	Jaen	247	247	65	66	67
B-5	Tacumbu	170	117	63	63	63
B-6	Salamanca	143	143	57	58	58
B-7	Zanja Moroti	161	161	64	65	65
B-8	Ferreira	400	400	63	65	66
B-9	Villa Universitaria	240	240	44	52	60
B-10	Las Mercedes	212	212	59	61	62
B-11	Mariscal Lopez	66	66	64	64	64
B-12	Bella Vista	75	75	63	64	65
B-13	Tablada	103	103	64	64	64
B-14	Mburicao	1,645	1,645	50	54	57
B-15	Ycua Carrillo	401	401	44	54	63
B-16	Santa Rosa	313	229	49	59	68
B-17	Tres Puentes Cue	680	224	51	63	75
B-18	Itay	5,455	4,064	45	51	56
B-19	Lambare	2,566	2,566	51	59	67
B-20	Valle Apua	1,063	968	42	47	52
B-21	Villa Elisa	955	955	42	47	51
B-22	Nemby /1	558	371	41	47	52
B-23	San Lorenzo	3,369	1,759	43	48	52
B-24	Tayazuape /2	2,465	701	40	45	49
B-26	Zeballos Cue	213	117	40	45	49
B-27	Paso Cai	549	375	43	53	63
	Total	23,158	17,219			

/1 Only sub basin No.1 is included in the planning area.

/2 Sub basins No.1 and 3 are included in the planning area.

Table 5-6. ROOFTOP AND IMPERMEABLE AREA IN RESIDENTIAL AREA

Item	Rooftop Area (ha)	Impermeable Area (ha)
High Density Residential Area	9.1 (60%)	5.3 (40%)
Medium Density Residential Area	4.8 (40%)	6.7 (60%)
Low Density Residential Area	2.8 (60%)	1.6 (40%)

Table 5-7. CAPACITY OF DETENTION FACILITIES TO CONTROL ONE CUBIC METER OF RUNOFF DISCHARGE

Basin Number	Name of Basin or River	Storage in Public Compounds (ha)	Infiltration Trench (m)	Storage in House Lots (m^3)
With Drainage Facilities				
B-2	Jardin	1.4	12,800	1,000
B-4	Jaen	1.7	12,000	1,000
B-6	Salamanca	1.6	12,300	980
B-7	Zanja Moroti	1.3	9,800	990
B-8	Ferreira	1.7	12,300	1,000
B-10	Las Mercedes	1.7	12,900	1,010
B-12	Bella Vista	1.3	10,000	1,060
B-14	Mburicao	2.3	12,500	1,030
B-15	Ycua Carrillo	1.4	8,300	1,000
B-16	Santa Rosa	1.7	11,100	1,000
B-17	Tres Puentes Cue	1.9	8,400	1,030
B-18	Itay	2.6	8,900	1,010
B-19	Lambare	2.4	11,600	990
B-21	Villa Elisa	2.1	10,700	1,010
B-22	Nemby	2.0	11,800	1,010
B-23	San Lorenzo	2.7	11,000	990
B-24	Tayazuape	2.9	11,100	1,020
B-26	Zeballos Cue	1.6	11,700	1,030
B-27	Paso Cai	1.9	10,200	1,000
Without Drainage Facilities				
B-2	Jardin	1.4	9,700	1,000
B-4	Jaen	1.9	12,700	1,000
B-6	Salamanca	1.8	12,000	980
B-7	Zanja Moroti	1.5	9,300	990
B-8	Ferreira	1.9	10,500	1,000
B-10	Las Mercedes	2.0	12,600	1,010
B-12	Bella Vista	1.5	10,600	1,010
B-14	Mburicao	2.5	9,800	1,020
B-15	Ycua Carrillo	2.2	11,500	1,000
B-16	Santa Rosa	1.9	10,300	1,010
B-17	Tres Puentes Cue	2.7	12,700	1,010
B-18	Itay	2.8	10,100	1,010
B-19	Lambare	2.6	10,400	1,000
B-21	Villa Elisa	2.5	10,200	980
B-22	Nemby	2.3	10,600	1,010
B-23	San Lorenzo	3.2	7,800	1,010
B-24	Tayazuape	4.0	11,100	950
B-26	Zeballos Cue	1.7	11,000	1,030
B-27	Paso Cai	2.1	10,300	1,000

Note: Detention facilities are not employed in basins without rivers.

Table 5-8. LIST OF BASINS IN THE PLANNING AREA

Basin Number	Name of Basin	Area (ha)	Remarks
B-1	Varadero	325	
B-2	Jardin	60	
B-3	Centro	724	
B-4	Jaen	247	
B-5	Tacumbu	170	
B-6	Salamanca	143	
B-7	Zanja Moroti	161	
B-8	Ferreira	400	
B-9	Villa Universitaria	240	
B-10	Las Mercedes	212	
B-11	Mariscal Lopez	66	
B-12	Bella Vista	75	
B-13	Tablada	103	
B-14	Mburicao	1,645	
B-15	Ycua Carrillo	401	
B-16	Santa Rosa	313	
B-17	Tres Puentes Cue	680	
B-18	Itay	5,455	Subbasin No. 8, No. 9 and No. 10 are excluded.
B-19	Lambare	2,566	
B-20	Valle Apua	1,063	
B-21	Villa Elisa	955	Subbasin No. 2 is excluded.
B-22	Nemby	558	Subbasin No. 2 to No. 5 are excluded.
B-23	San Lorenzo	3,369	
B-24	Tayazuape	2,465	Subbasin No. 2 is excluded.
B-26	Zeballos Cue	213	
B-27	Paso Cai	549	
	Total	23,158	

Table 5-9. DISCHARGE DISTRIBUTION OF ALTERNATIVES FOR BASIC PLAN

(Unit: m3/sec)

Basin Number	Name of Basin	Case I	Case II-1 & III-1		Case II-2 & III-2		Remarks
		River Channel	River Channel	Detention Facilities	River Channel	Detention Facilities	
B-1	Varadero	-	-	-	-	-	No River
B-2	Jardin	20	19	1	16	4	
B-3	Centro	-	-	-	-	---	No River
B-4	Jaen	70	67	3	60	10	
B-5	Tacumbu	-	-	-	-	-	No River
B-6	Salamanca	35	33	2	28	7	
B-7	Zanja Moroti	36	34	2	31	5	
B-8	Ferreira	115	109	6	96	19	
B-9	Villa Universitaria	-	-	-	-	-	No River
B-10	Las Mercedes	56	53	3	48	8	
B-11	Mariscal Lopez	-	-	-	-	-	No River
B-12	Bella Vista	25	24	1	22	3	
B-13	Tablada	-	-	-	-	-	No River
B-14	Mburicao	320	302	18	262	58	
B-15	Ycua Carrillo	110	103	7	87	23	
B-16	Santa Rosa	75	70	5	59	16	
B-17	Tres Puentes Cue	105	99	6	85	20	
B-18	Itay	770	732	38	651	119	
B-19	Lambare	590	552	38	501	89	
B-20	Valle Apua	-	-	-	-	-	No River
B-21	Villa Elisa	220	206	14	175	45	
B-22	Nemby	90	85	5	74	16	
B-23	San Lorenzo	410	384	26	329	81	
B-24	Tayazuape	300	284	16	251	49	
B-26	Zeballos Cue	17	16	1	14	3	
B-27	Paso Cai	115	108	7	91	24	

Note: Detention facilities are not employed in basins without rivers.

Table 5-10 (1/6). STRUCTURAL DIMENSIONS OF RIVER CHANNEL

Basin No.	River Name	Sub-Basin No.	Discharge (m^3/s)	Channel Type	Width(B) (m)	Depth(H) (m)
B-2	Jardin		- No Improvement -			
B-4	Jaen		35	B	4.1	2.0
			50	B	6.0	2.0
			65	B	7.9	2.0
			80	B	9.8	2.0
B-6	Salamanca	1	10	B	2.3	2.0
			15	B	3.2	2.0
			20	B	4.1	2.0
			25	B	5.0	2.0
B-7	Zanja Moroti	1	- No Improvement -			
		2	20	E	4.5	1.0
			30	E	6.0	1.1
			40	E	7.0	1.2
			50	E	7.6	1.3
B-8	Ferreira	1	- No Improvement -			
		2	45	E	7.0	1.5
			70	E	10.3	1.6
			95	E	12.8	1.7
			120	E	14.9	1.8
B-10	Las Mercedes	1	25	C	3.5	1.5
			40	C	5.1	1.5
			55	C	7.2	1.5
			70	C	9.2	1.5
B-12	Bella Vista		- No Improvement -			
B-14	Mburicao	1	25	C	3.1	1.5
			50	C	6.2	1.6
			75	C	8.7	1.7
			100	C	11.0	1.8
		2	40	C	3.8	2.0
			75	C	7.2	2.0
			110	C	10.7	2.0
			145	C	14.3	2.0
		3	40	C	3.8	2.0
			60	C	5.7	2.0
			80	C	7.7	2.0
			100	C	9.8	2.0

Note:
/1 Type of River Channel;
- A: Channel Without Revetment
- B: Channel With Revetment and Without Invert
- C: Channel With Revetment and Invert
- D: Box Culvert
- E: Channel with Embankment

Table 5-10 (2/6). STRUCTURAL DIMENSIONS OF RIVER CHANNEL

Basin No.	River Name	Sub-Basin No.	Discharge (m^3/s)	Channel Type	Width(B) (m)	Depth(H) (m)
B-14 (Cont.)		4	140	B	13.7	2.5
			170	B	16.7	2.5
			200	B	19.6	2.5
			230	B	22.7	2.5
		5	20	B	3.2	1.5
			30	B	4.8	1.5
			40	B	6.5	1.5
			50	B	8.2	1.5
		6	150	B	12.2	3.0
			200	B	16.2	3.0
			250	B	20.4	3.0
			300	B	24.7	3.0
B-15	Ycua Carrillo	1	25	B	4.0	1.5
			35	B	5.6	1.5
			45	B	7.3	1.5
			55	B	9.1	1.5
		2	40	B	4.6	2.0
			70	B	8.5	2.0
			100	B	12.2	2.0
			130	B	16.2	2.0
B-16	Santa Rosa	1	30	B	5.7	1.5
			45	B	7.4	1.6
			60	B	8.8	1.7
			75	B	10.2	1.8
B-17	Tres Puentes Cue	1	15	B	3.4	1.5
			45	B	7.4	1.7
			75	B	10.0	1.9
			105	B	12.2	2.1
B-18	Itay	1	100	D	3.4	3.0 (2-BOX)
			180	D	4.3	4.3 (3-BOX)
			260	D	4.2	4.2 (3-BOX)
			340	D	4.2	4.1 (4-BOX)

Table 5-10 (3/6). STRUCTURAL DIMENSIONS OF RIVER CHANNEL

Basin No.	River Name	Sub-Basin No.	Discharge (m^3/s)	Channel Type	Width(B) (m)	Depth(H) (m)
B-18 (Cont.)		2-1	150	B	12.2	3.0
			220	B	17.9	3.0
			290	B	24.0	3.0
			360	B	29.6	3.0
		2-2	100	A	4.3	3.0
			130	A	7.0	3.0
			160	A	10.6	3.0
			190	A	13.7	3.0
		2-3	200	A	12.8	4.0
			300	A	22.0	4.0
			400	A	31.0	4.0
			500	A	39.8	4.0
		3-1	20	B	3.1	1.5
			30	B	4.8	1.5
			40	B	6.5	1.5
			50	B	8.2	1.5
		3-2	20	B	2.5	2.0
			30	B	3.5	2.0
			40	B	4.7	2.0
			50	B	6.0	2.0
		4	40	A	3.5	2.0
			55	A	3.5	2.3
			70	A	4.0	2.5
			85	A	4.2	2.7
		5	50	B	6.2	2.0
			70	B	8.5	2.0
			90	B	11.1	2.0
			110	B	13.6	2.0
		6	150	A	8.5	3.5
			300	A	15.7	4.0
			450	A	22.7	4.5
			600	A	27.8	5.0

Table 5-10 (4/6). STRUCTURAL DIMENSIONS OF RIVER CHANNEL

Basin No.	River Name	Sub-Basin No.	Discharge (m^3/s)	Channel Type	Width(B) (m)	Depth(H) (m)
B-18 (Cont.)		7-1	40	A	4.6	2.0
			80	A	8.6	2.3
			120	A	10.8	2.6
			160	A	11.9	2.9
		7-2	20	A	2.1	1.5
			30	A	4.3	1.5
			40	A	6.5	1.5
			50	A	8.5	1.5
		7-3	10	A	1.3	1.2
			15	A	2.9	1.2
			20	A	4.5	1.2
			25	A	6.0	1.2
		8	150	A	15.0	3.5
			300	A	26.5	4.0
			450	A	32.9	4.5
			600	A	36.8	5.0
		10	210	A	23.0	3.5
			340	A	30.4	4.0
			470	A	34.6	4.5
			600	A	36.8	5.0
B-19	Lambare	1	30	B	3.5	2.0
			50	B	6.0	2.0
			70	B	8.5	2.0
			90	B	11.1	2.0
		2	20	B	3.1	1.5
			35	B	5.6	1.5
			50	B	8.2	1.5
			65	B	10.7	1.5
		3	200	B	11.9	4.0
			230	B	13.7	4.0
			260	B	15.6	4.0
			290	B	17.5	4.0

Table 5-10 (5/6). STRUCTURAL DIMENSIONS OF RIVER CHANNEL

Basin No.	River Name	Sub-Basin No.	Discharge (m^3/s)	Channel Type	Width(B) (m)	Depth(H) (m)
B-19 (Cont.)		4	150	B	8.8	4.0
			210	B	12.4	4.0
			270	B	16.3	4.0
			330	B	20.2	4.0
		5	- No Improvement -			
		6	- No Improvement -			
		7	200	B	10.3	4.5
			290	B	15.3	4.5
			380	B	20.5	4.5
			470	B	25.4	4.5
B-21	Villa Elisa	1	30	A	3.5	1.5
			40	A	5.5	1.5
			50	A	5.5	1.8
			60	A	6.0	2.0
		2	90	A	6.0	2.5
			120	A	8.0	2.8
			150	A	10.0	3.0
			180	A	11.4	3.2
B-22	Nemby	1	30	A	4.0	1.6
			50	A	5.5	1.8
			70	A	7.3	2.0
			90	A	8.7	2.2
B-23	San Lorenzo	1	60	B	5.6	2.5
			100	B	9.0	2.7
			180	B	15.0	2.9
			260	B	20.7	3.1
		2-1	10	A	4.8	1.5
			50	A	6.3	3.0
			90	A	9.8	3.5
			130	A	11.4	4.0

Table 5-10 (6/6). STRUCTURAL DIMENSIONS OF RIVER CHANNEL

Basin No.	River Name	Sub-Basin No.	Discharge (m^3/s)	Channel Type	Width(B) (m)	Depth(H) (m)
B-23 (Cont.)		2-2	50	A	3.0	2.0
			90	A	5.4	2.5
			130	A	8.3	2.8
		2-3	10	A	3.5	1.5
			50	A	8.2	2.5
			90	A	11.4	3.0
			130	A	12.5	3.5
B-24	Tayazuape	1	80	A	5.1	2.5
			100	A	8.0	2.5
			120	A	10.3	2.5
			140	A	13.0	2.5
		3	140	A	14.5	3.5
			170	A	18.5	3.5
			200	A	22.6	3.5
			230	A	26.8	3.5
B-26	Zeballos Cue	1	10	A	2.0	1.5
			15	A	4.0	1.5
			20	A	6.0	1.5
B-27	Paso Cai	1	30	A	4.0	2.0
			50	A	6.4	2.2
			70	A	8.2	2.4
			95	A	10.0	2.6

Table 5-11. LENGTH OF DRAINAGE CONDUITS IN MODEL BASINS

(Unit: m)

Return Period	Runoff Coefficient	Pipe (Diameter) 0.5 - 1.0	1.2 - 2.0	2.2 - 2.5	Box culvert
1. Ferreira River Basin (400 ha)					
	40%	6,290	4,580	450	120
10-year	60%	3,410	6,810	660	560
	80%	1,920	7,910	650	960
	40%	7,400	3,920	120	-
5-year	60%	4,270	6,210	840	120
	80%	2,720	7,400	590	730
	40%	27,190	14,160	3,850	980
3-year	60%	17,370	20,060	4,430	4,320
	80%	10,660	25,200	3,420	6,900
	40%	9,080	2,240	120	-
2-year	60%	6,710	4,370	360	-
	80%	4,270	6,210	840	120
2. Mburicao River Basin (1,645 ha)					
	40%	20,230	18,780	3,280	3,890
10-year	60%	11,070	24,120	3,290	7,700
	80%	3,160	29,360	4,810	8,850
	40%	24,090	15,510	4,550	2,030
5-year	60%	13,180	23,280	3,080	6,640
	80%	7,120	27,060	3,930	8,070
	40%	8,370	2,950	120	-
3-year	60%	5,540	5,220	560	120
	80%	3,490	6,910	740	300
	40%	30,310	12,200	3,200	470
2-year	60%	20,950	17,700	4,470	3,060
	80%	13,760	23,750	2,790	5,880
3. Total (2,045 ha)					
	40%	26,520	23,360	3,730	4,010
10-year	60%	14,480	30,930	3,950	8,260
	80%	5,080	37,270	5,460	9,810
	40%	31,490	19,430	4,670	2,030
5-year	60%	17,450	29,490	3,920	6,760
	80%	9,840	34,460	3,980	8,800
	40%	35,560	17,110	3,970	980
3-year	60%	22,910	25,280	4,990	4,440
	80%	14,150	32,110	4,160	7,200
	40%	39,390	14,440	3,320	470
2-year	60%	27,660	22,070	4,830	3,060
	80%	18,030	29,960	3,630	6,000

Note: Drainage Conduits of 10-year return period are provided for Basic Plan Study.
Drainage Conduits of 5-year, 3-year and 2-year return period are provided for Master Plan Study.

Table 5-12. DETENTION FACILITIES OF ALTERNATIVES FOR BASIC PLAN

Basin Number	Name of Basin or River	Detained Discharge (m^3/sec)	Storage in Public Compounds (ha)	Infiltration Trench (m)	Storage in House Lots (m^3)
Study Case II-1 & III-1)					
B-2	Jardin	1	0.7	6,400	500
B-4	Jaen	3	2.6	18,000	1,500
B-6	Salamanca	2	1.6	12,300	980
B-7	Zanja Moroti	2	1.3	9,800	990
B-8	Ferreira	6	5.1	36,900	3,000
B-10	Las Mercedes	3	2.6	19,400	1,520
B-12	Bella Vista	1	0.7	5,000	530
B-14	Mburicao	18	20.7	112,500	9,270
B-15	Ycua Carrillo	7	4.9	29,100	3,500
B-16	Santa Rosa	5	4.3	27,800	2,500
B-17	Tres Puentes Cue	6	5.7	25,200	3,090
B-18	Itay	38	49.4	169,100	19,190
B-19	Lambare	38	45.6	220,400	18,810
B-21	Villa Elisa	14	14.7	74,900	7,070
B-22	Nemby	5	5.0	29,500	2,530
B-23	San Lorenzo	26	35.1	143,000	12,870
B-24	Tayazuape	16	23.2	88,800	8,160
B-26	Zeballos Cue	1	0.8	5,900	520
B-27	Paso Cai	7	6.7	35,700	3,500
Study Case II-2 & III-2					
B-2	Jardin	4	2.8	25,600	2,000
B-4	Jaen	10	8.5	60,000	5,000
B-6	Salamanca	7	5.6	43,100	3,430
B-7	Zanja Moroti	5	3.3	24,500	2,480
B-8	Ferreira	19	16.2	116,900	9,500
B-10	Las Mercedes	8	6.8	51,600	4,040
B-12	Bella Vista	3	2.0	15,000	1,590
B-14	Mburicao	58	66.7	362,500	29,870
B-15	Ycua Carrillo	23	16.1	95,500	11,500
B-16	Santa Rosa	16	13.6	88,800	8,000
B-17	Tres Puentes Cue	20	19.0	84,000	10,300
B-18	Itay	119	154.7	529,600	60,100
B-19	Lambare	89	106.8	516,200	44,060
B-21	Villa Elisa	45	47.3	240,800	22,730
B-22	Nemby	16	16.0	94,400	8,080
B-23	San Lorenzo	81	109.4	445,500	40,100
B-24	Tayazuape	49	71.1	272,000	24,990
B-26	Zeballos Cue	3	2.4	17,600	1,550
B-27	Paso Cai	24	22.8	122,400	12,000

Note: Detention facilities are not employed in basins without rivers.
Study Cases II-1 and II-2 are combination of storage in public com pounds and infiltration trench.
Study Cases III-1 and III-2 are combination of storage in public compounds and storage in house lots.

Table 5-13 (1/5). CONSTRUCTION COST OF ALTERNATIVES FOR BASIC PLAN (CASE I)

(Unit: ¢ Million)

Basin Number	Name of Basin or River	River	Drainage Facilities	Total
1.	Basins with River Channel			
B-2	Jardin	-	620	620
B-4	Jaen	590	2,530	3,120
B-6	Salamanca	230	1,320	1,550
B-7	Zanja Moroti	860	1,610	2,470
B-8	Ferreira	890	3,210	4,100
B-10	Las Mercedes	780	2,030	2,810
B-12	Bella Vista	-	750	750
B-14	Mburicao	5,800	15,860	21,660
B-15	Ycua Carrillo	1,720	3,920	5,640
B-16	Santa Rosa	1,120	2,380	3,500
B-17	Tres Puentes Cue	2,540	2,480	5,020
B-18	Itay	25,170	36,820	61,990
B-19	Lambare	7,530	26,470	34,000
B-21	Villa Elisa	1,000	8,090	9,090
B-22	Nemby	1,420	3,200	4,620
B-23	San Lorenzo	5,880	15,060	20,940
B-24	Tayazuape	3,930	5,780	9,710
B-26	Zeballos Cue	20	960	980
B-27	Paso Cai	660	3,680	4,340
	Sub-Total	60,140	136,770	196,910
2.	Basins without River Channel /1			
B-1	Varadero	-	3,220	3,220
B-3	Centro	-	7,390	7,390
B-5	Tacumbu	-	1,150	1,150
B-9	Villa Universitaria	-	2,270	2,270
B-11	Mariscal Lopez	-	650	650
B-13	Tablada	-	1,020	1,020
B-20	Valle Apua	-	8,330	8,330
	Sub-Total	-	24,030	24,030
	Total	60,140	160,800	220,940

Note: /1 Only drainage facilities are applied to these basins because the cost is absolutely less than that of combination with detention facilities.

Table 5-13 (2/5). CONSTRUCTION COST OF ALTERNATIVES FOR BASIC PLAN (CASE II-1)

(Unit: ¢ Million)

Basin Number	Name of Basin or River	River	Drainage Facilities	Detention Facilities	Total
1. Basins With River Channel					
B-2	Jardin	-	600	110	710
B-4	Jaen	570	2,460	270	3,300
B-6	Salamanca	210	1,300	180	1,690
B-7	Zanja Moroti	800	1,580	100	2,480
B-8	Ferreira	840	3,110	490	4,440
B-10	Las Mercedes	730	1,970	230	2,930
B-12	Bella Vista	-	730	60	790
B-14	Mburicao	5,350	15,040	1,690	22,080
B-15	Ycua Carrillo	1,540	3,800	430	5,770
B-16	Santa Rosa	1,030	2,300	400	3,730
B-17	Tres Puentes Cue	2,280	2,420	410	5,110
B-18	Itay	23,870	35,730	2,960	62,560
B-19	Lambare	6,860	25,680	3,380	35,920
B-21	Villa Elisa	930	7,840	1,130	9,900
B-22	Nemby	1,360	3,100	420	4,880
B-23	San Lorenzo	5,770	14,560	2,280	22,610
B-24	Tayazuape	3,800	5,610	1,410	10,820
B-26	Zeballos Cue	20	940	60	1,020
B-27	Paso Cai	630	3,570	570	4,770
	Sub-Total	56,590	132,340	16,580	205,510
2. Basins Without River Channel /1					
B-1	Varadero	-	3,220	-	3,220
B-3	Centro	-	7,390	-	7,390
B-5	Tacumbu	-	1,150	-	1,150
B-9	Villa Universitaria	-	2,270	-	2,270
B-11	Mariscal Lopez	-	650	-	650
B-13	Tablada	-	1,020	-	1,020
B-20	Valle Apua	-	8,330	-	8,330
	Sub-Total	-	24,030	-	24,030
	Total	56,590	156,370	16,580	229,540

Note: /1 Only drainage facilities are applied to these basins because the cost is absolutely less than that of combination with detention facilities.

Table 5-13 (3/5). CONSTRUCTION COST OF ALTERNATIVES FOR BASIC PLAN (CASE II-2)

(Unit: ¢ Million)

Basin Number	Name of Basin or River	River	Drainage Facilities	Detention Facilities	Total
1.	Basins With River Channel				
B-2	Jardin	-	570	360	930
B-4	Jaen	540	2,290	860	3,690
B-6	Salamanca	190	1,230	570	1,990
B-7	Zanja Moroti	720	1,500	280	2,500
B-8	Ferreira	750	2,910	1,560	5,220
B-10	Las Mercedes	540	1,840	720	3,100
B-12	Bella Vista	-	670	230	900
B-14	Mburicao	4,880	14,360	5,340	24,580
B-15	Ycua Carrillo	1,120	3,550	1,390	6,060
B-16	Santa Rosa	820	2,150	1,250	4,220
B-17	Tres Puentes Cue	1,730	2,260	1,320	5,310
B-18	Itay	20,880	33,190	9,390	63,460
B-19	Lambare	4,860	23,830	7,920	36,610
B-21	Villa Elisa	750	7,310	3,610	11,670
B-22	Nemby	1,200	2,900	1,340	5,440
B-23	San Lorenzo	4,990	13,590	7,240	25,820
B-24	Tayazuape	3,400	5,230	4,480	13,110
B-26	Zeballos Cue	10	920	190	1,120
B-27	Paso Cai	510	3,330	1,800	5,640
	Sub-Total	47,890	123,630	49,850	221,370
2.	Basins Without River Channel /1				
B-1	Varadero	-	3,220	-	3,220
B-3	Centro	-	7,390	-	7,390
B-5	Tacumbu	-	1,150	-	1,150
B-9	Villa Universitaria	-	2,270	-	2,270
B-11	Mariscal Lopez	-	650	-	650
B-13	Tablada	-	1,020	-	1,020
B-20	Valle Apua	-	8,330	-	8,330
	Sub-Total	-	24,030	-	24,030
	Total	47,890	147,660	49,850	245,400

Note: /1 Only drainage facilities are applied to these basins because the cost is absolutely less than that of combination with detention facilities.

Table 5-13 (4/5). CONSTRUCTION COST OF ALTERNATIVES FOR BASIC PLAN (CASE III-1)

(Unit: ¢ Million)

Basin Number	Name of Basin or River	River	Drainage Facilities	Detention Facilities	Total
1. Basins With River Channel					
B-2	Jardin	-	600	60	660
B-4	Jaen	570	2,450	180	3,200
B-6	Salamanca	210	1,300	110	1,620
B-7	Zanja Moroti	800	1,580	80	2,460
B-8	Ferreira	840	3,100	330	4,270
B-10	Las Mercedes	730	1,970	150	2,850
B-12	Bella Vista	-	730	50	780
B-14	Mburicao	5,350	15,040	1,180	21,570
B-15	Ycua Carrillo	1,540	3,790	390	5,720
B-16	Santa Rosa	1,030	2,310	280	3,620
B-17	Tres Puentes Cue	2,280	2,420	380	5,080
B-18	Itay	23,870	35,730	2,590	62,190
B-19	Lambare	6,860	25,680	2,460	35,000
B-21	Villa Elisa	930	7,830	870	9,630
B-22	Nemby	1,360	3,110	290	4,760
B-23	San Lorenzo	5,770	14,550	1,760	22,080
B-24	Tayazuape	3,800	5,610	1,100	10,510
B-26	Zeballos Cue	20	940	40	1,000
B-27	Paso Cai	630	3,570	430	4,630
	Sub-Total	56,590	132,310	12,730	201,630
2. Basins Without River Channel /1					
B-1	Varadero	-	3,220	-	3,220
B-3	Centro	-	7,390	-	7,390
B-5	Tacumbu	-	1,150	-	1,150
B-9	Villa Universitaria	-	2,270	-	2,270
B-11	Mariscal Lopez	-	650	-	650
B-13	Tablada	-	1,020	-	1,020
B-20	Valle Apua	-	8,330	-	8,330
	Sub-Total	-	24,030	-	24,030
	Total	56,590	156,340	12,730	225,660

Note: /1 Only drainage facilities are applied to these basins because the cost is absolutely less than that of combination with detention facilities.

Table 5-13 (5/5). CONSTRUCTION COST OF ALTERNATIVES FOR BASIC PLAN (CASE III-2)

(Unit: ¢ Million)

Basin Number	Name of Basin or River	River	Drainage Facilities	Detention Facilities	Total
1. Basins With River Channel					
B-2	Jardin	-	560	230	790
B-4	Jaen	540	2,290	580	3,410
B-6	Salamanca	190	1,220	380	1,790
B-7	Zanja Moroti	720	1,500	260	2,480
B-8	Ferreira	750	2,910	1,050	4,710
B-10	Las Mercedes	540	1,840	470	2,850
B-12	Bella Vista	-	680	180	860
B-14	Mburicao	4,880	14,360	3,740	22,980
B-15	Ycua Carrillo	1,120	3,550	1,230	5,900
B-16	Santa Rosa	820	2,150	900	3,870
B-17	Tres Puentes Cue	1,730	2,260	1,190	5,180
B-18	Itay	20,880	33,190	8,230	62,300
B-19	Lambare	4,860	23,830	5,770	34,460
B-21	Villa Elisa	750	7,310	2,770	10,830
B-22	Nemby	1,200	2,900	950	5,050
B-23	San Lorenzo	4,990	13,590	5,550	24,130
B-24	Tayazuape	3,400	5,230	3,490	12,120
B-26	Zeballos Cue	10	930	130	1,070
B-27	Paso Cai	510	3,330	1,390	5,230
	Sub-Total	47,890	123,630	38,490	210,010
2. Basins Without River Channel /1					
B-1	Varadero	-	3,220	-	3,220
B-3	Centro	-	7,390	-	7,390
B-5	Tacumbu	-	1,150	-	1,150
B-9	Villa Universitaria	-	2,270	-	2,270
B-11	Mariscal Lopez	-	650	-	650
B-13	Tablada	-	1,020	-	1,020
B-20	Valle Apua	-	8,330	-	8,330
	Sub-Total	-	24,030	-	24,030
	Total	47,890	147,660	38,490	234,040

Note: /1 Only drainage facilities are applied to these basins because the cost is absolutely less than that of combination with detention facilities.

Table 5-14. LAND ACQUISITION AND HOUSE EVACUATION OF ALTERNATIVES FOR BASIC PLAN

Basin Number	Name of Basin	Land Acquisition (m^2)		House Evacuation (No.)		Remarks
		Case I	Case II and III /1	Case I	Case II and III /1	
B-1	Varadero	-	-	-	-	No river
B-2	Jardin	-	-	-	-	River improvement is not required
B-3	Centro	-	-	-	-	No river
B-4	Jaen	9,500	5,900	14	7	
B-5	Tacumbu	-	-	-	-	No river
B-6	Salamanca	3,700	3,700	0	0	
B-7	Zanja Moroti	8,400	7,900	24	12	
B-8	Ferreira	16,800	14,800	20	15	
B-9	Villa Universitaria	-	-	-	-	No river
B-10	Las Mercedes	7,500	4,900	18	11	
B-11	Mariscal Lopez	-	-	-	-	No river
B-12	Bella Vista	-	-	-	-	River improvement is not required
B-13	Tablada	-	-	-	-	No river
B-14	Mburicao	42,300	36,500	40	24	
B-15	Ycua Carrillo	17,500	8,600	26	12	
B-16	Santa Rosa	14,400	7,600	21	10	
B-17	Tres Puentes Cue	6,000	6,000	-	-	
B-18	Itay	354,000	287,800	146	110	
B-19	Lambare	47,700	23,300	51	27	
B-20	Valle Apua	-	-	-	-	No river
B-21	Villa Elisa	62,800	62,800	-	-	
B-22	Nemby	14,200	14,200	-	-	
B-23	San Lorenzo	320,500	320,500	-	-	
B-24	Tayazuape	183,600	183,600	-	-	
B-26	Zeballos Cue	4,000	4,000	-	-	
B-27	Paso Cai	64,000	64,000	-	-	
	Total	1,160,900	1,056,100	360	228	

Note:

/1 : Results of Case II-2 and III-2 are shown.

Table 5-15 (1/2). DESIGN DISCHARGE FOR BASIC PLAN

No. of Basin	Name of Basin	No. of Subbasin	Design Discharge (m^3/s)	Remarks
B-1	Varadero	-	-	No River
B-2	Jardin	-	20	
B-3	Centro	-	-	No River
B-4	Jaen	-	70	
B-5	Tacumbu	-	-	No River
B-6	Salamanca	-	35	
B-7	Zanja Moroti	1	25	
		2	36	
B-8	Ferreira	1	85	
		2	115	
B-9	Villa Universitaria	-	-	No River
B-10	Las Mercedes	-	56	
B-11	Mariscal Lopez	-	-	No River
B-12	Bella Vista	-	25	
B-13	Tablada	-	-	No River
B-14	Mburicao	1	100	
		2	135	
		3	95	
		4	260	
		5	40	
		6	320	
B-15	Ycua Carrillo	1	50	
		2	110	
B-16	Santa Rosa	-	75	
B-17	Tres Puentes Cue	-	105	

Table 5-15 (2/2). DESIGN DISCHARGE FOR BASIC PLAN

No. of Basin	Name of Basin	No. of Subbasin	Design Discharge (m^3/s)	Remarks
B-18	Itay	1	320	
		2-1	360	
		2-2	200	
		3-1	50	
		3-2	50	
		4	95	
		5	110	
		6	670	Subbasins 8 to 10 are outside the Planning area
		7-1	160	
		7-2	60	
		7-3	35	
B-19	Lambare	1	115	
		2	75	
		3	340	
		4	450	
		5	130	
		6	190	
		7	590	
B-20	Valle Apua	-	-	No River
B-21	Villa Elisa	1	70	Subbasin 2 is outside the Planning Area
		3	220	
B-22	Nemby	1	90	Subbasins 2 to 5 are outside the planning Area
B-23	San Lorenzo	1	230	
		2-1	290	
		2-2	95	
		2-3	410	
B-24	Tayazuape	1	170	Subbasin 2 is outside the Planning Area
		3	300	
B-26	Zeballos Cue	-	17	
B-27	Paso Cai	-	115	

Table 5-16. FEATURES OF PROPOSED STORM WATER CONTROL SYSTEM FOR BASIC PLAN

Basin Number	Name of Basin	River			Drainage Facilities Improvement Area (ha)	Detention Facilities		Remarks
		Design Discharge (m^3/s)	Type of /1 Channel	Improvement Length (km)		Storage in Public Compounds (ha)	Storage in House Lots (m^3)	
B-1	Varadero	-	-	-	314	-	-	No river.
B-2	Jardin	20	-	-	60	-	-	Improvement not necessary.
B-3	Centro	-	-	-	706	-	-	No river.
B-4	Jaen	62	B	1.9	247	6.8	4,000	
B-5	Tacumbu	-	-	-	117	-	-	No river.
B-6	Salamanca	35	B	1.8	143	-	-	
B-7	Zanja Moroti	30	E	0.6	161	3.9	3,000	
B-8	Ferreira	100	E	0.7	400	12.8	7,500	
B-9	Villa Universitaria	-	-	-	240	-	-	No river.
B-10	Las Mercedes	48	C	1.4	212	6.8	4,000	
B-11	Mariscal Lopez	-	-	-	66	-	-	No river.
B-12	Bella Vista	25	-	-	75	-	-	Improvement not necessary.
B-13	Tablada	-	-	-	103	-	-	No river.
B-14	Mburicao	270	B	6.5				
			C	2.2				
	Sub-Total			8.7	1,645	57.5	25,800	
B-15	Ycua Carrillo	85	B	3.0	401	17.5	12,500	
B-16	Santa Rosa	64	B	2.4	229	9.4	5,500	
B-17	Tres Puentes Cue	105	B	6.0	224	-	-	
B-18	Itay	650	A	12.6				
			B	10.4				
			D	2.5				
	Sub-Total			25.5	4,064	135.0	50,500	
B-19	Lambare	470	B	6.2				
			C	1.4				
			D	0.8				
	Sub-Total			8.4	2,566	144.0	59,400	
B-20	Valle Apua	-	-	-	968	-	-	No river.
B-21	Villa Elisa	70	A	3.4	955	-	-	
B-22	Nemby	90	A	3.5	371	-	-	
B-23	San Lorenzo	410	A	14.2				
			B	1.6				
	Sub-Total			15.8	1,759	-	-	
B-24	Tayazuape	300	A	8.1	701	-	-	
B-26	Zeballos Cue	17	A	0.4	117	-	-	
B-27	Paso Cai	115	A	4.0	375	-	-	
	Total			95.6	17,219	393.7	172,200	

/1 Type of Channel; A : Channel Without Revetment
B : Channel With Revetment and Without Invert
C : Channel With Revetment and Invert
D : Box Culvert
E : Channel With Embankment

Table 5-17 (1/2). REQUIRED WIDTH OF RIVER IMPROVEMENT FOR BASIC PLAN

Basin Number	Name of Basin	Subbasin Number	Type of River /1 Channel	Length of River Channel Impv't. (km)	Required Width (m) River Width	Maintenance Road	Total	Remarks
B-2	Jardin	-	-	0	5.3	2.0	7.3	River improvement is not necessary
B-4	Jaen	-	B	1.9	9.6	2.0	11.6	
B-6	Salamanca	-	B	1.8	7.5	2.0	9.5	
B-7	Zanja Moroti	1	-	0	5.3	2.0	7.3	River improvement is not necessary
		2-1	-	0	5.5	2.0	7.5	-do-
		2-2	E	0.6	25.1	(6.0)/2	25.1	
B-8	Ferreira	1	-	0	9.0	2.0	11.0	River improvement is not necessary
		2-1	-	0	10.4	2.0	12.4	-do-
		2-2	E	0.7	36.1	(6.0)/2	36.1	
B-10	Las Mercedes	1	C	1.2	6.5	2.0	8.5	
		2	C	0.2	6.0	2.0	8.0	
	Total -			1.4				
B-12	Bella Vista	-	-	0	6.0	2.0	8.0	River improvement is not necessary
B-14	Mburicao	1	C	0.2	11.7	2.0	13.7	
		2	C	0.7	12.7	2.0	14.7	
		3	C	1.3	10.6	2.0	12.6	
		4	B	2.5	20.6	2.0	22.6	
		5	B	1.0	8.3	2.0	10.3	
		6	B	3.0	25.0	2.0	27.0	
	Total -			8.7				
B-15	Ycua Carrillo	1	B	0.7	6.4	2.0	8.4	
		2	B	2.3	10.4	2.0	12.4	
	Total -			3.0				
B-16	Santa Rosa	-	B	2.4	9.8	2.0	11.8	
B-17	Tres Puentes Cue	-	B	6.0	12.2	2.0	14.2	

Note:
/1 Type of Channel;
A : Channel Without Revetment
B : Channel With Revetment and Without Invert
C : Channel With Revetment and Invert
D : Box Culvert
E : Channel With Embankment
/2 The crown of the embankment will serve as maintenance road.

Table 5-17 (2/2). REQUIRED WIDTH OF RIVER IMPROVEMENT FOR BASIC PLAN

Basin Number	Name of Basin	Subbasin Number	Type of River /1 Channel	Length of River Channel Impv't. (km)	Required Width (m) River Width	Required Width (m) Maintenance Road	Required Width (m) Total	Remarks
B-18	Itay	1	D	2.5	19.2	-	19.2	
		2-1	B	2.2	24.4	1.0	25.4	
		2-2	A	1.2	33.0	4.0	37.0	
		3-1	B	2.7	7.5	1.0	8.5	
		3-2	B	2.3	8.0	4.0	12.0	
		4	B	0.5	27.7	4.0	31.7	
		5	B	1.7	12.6	4.0	16.6	
		6	A	3.5	51.0	4.0	55.0	
		7-1	A	2.7	24.0	4.0	28.0	
		7-2	A	2.3	15.9	4.0	19.9	
		7-3	A	1.4	13.0	4.0	17.0	
	Total -			25.5				
B-19	Lambare	1	C	0.8	8.6	2.0	10.6	
		2	C	0.6	7.7	2.0	9.7	
			D	0.8	8.0	-	8.0	
		3	B	2.5	17.7	4.0	21.7	
		4	B	2.6	21.3	4.0	25.3	
		5	-	-	-	-	-	River Improvement is not necessary
		6	-	-	-	-	-	-do-
		7	B	1.1	28.0	4.0	32.0	
	Total -			8.4				
B-21	Villa Elisa	1	A	1.6	19.9	4.0	23.9	
		3	A	1.8	31.8	4.0	35.8	
	Total -			3.4				
B-22	Nemby	1	A	3.5	23.5	4.0	27.5	
B-23	San Lorenzo	1	A	4.1	25.2	4.0	29.2	
			B	1.6	16.2	4.0	20.2	
		2-1	A	3.5	49.0	4.0	53.0	
		2-2	A	5.1	25.0	4.0	29.0	
		2-3	A	1.5	60.9	4.0	64.9	
	Total -			15.8				
B-24	Tayazuape	1	A	4.1	29.0	4.0	33.0	
		3	A	4.0	52.0	4.0	56.0	
	Total -			8.1				
B-26	Zeballos Cue	-	A	0.4	14.0	4.0	18.0	
B-27	Paso Cai	-	A	4.0	26.0	4.0	30.0	

Table 5-18 PROPOSED STRUCTURAL TYPES OF RIVER CHANNEL IMPROVEMENT FOR BASIC PLAN

(Unit: km)

Basin Number	Name of Basin	River Length (including tributary)	Total Length of Improvement	Type of Channel Improvement					Remarks
				Channel without Revetment	Channel with Revetment without Invert	Channel with Revetment and Invert	Channel with Embankment	Box Culvert	
B-1	Varadero	-	-	-	-	-	-	-	No River
B-2	Jardin	0.8	-	-	-	-	-	-	Not necessry to be improved
B-3	Centro	-	-	-	-	-	-	-	No River
B-4	Jaen	1.9	1.9	-	1.9	-	-	-	
B-5	Tacumbu	-	-	-	-	-	-	-	No River
B-6	Salamanca	1.8	1.8	-	1.8	-	-	-	
B-7	Zanja Moroti	2.4	0.6	-	-	-	0.6	-	
B-8	Ferreira	3.3	0.7	-	-	-	0.7	-	
B-9	Villa Universitaria	-	-	-	-	-	-	-	No River
B-10	Las Mercedes	1.4	1.4	-	-	1.4	-	-	
B-11	Mariscal Lopez	-	-	-	-	-	-	-	No River
B-12	Bella Vista	0.9	-	-	-	-	-	-	Not necessary to be improved
B-13	Tablada	-	-	-	-	-	-	-	No River
B-14	Mburicao	11.0	8.7	-	6.5	2.2	-	-	
B-15	Ycua Carrillo	3.0	3.0	-	3.0	-	-	-	
B-16	Santa Rosa	2.4	2.4	-	2.4	-	-	-	
B-17	Tres Puentes Cue	6.0	6.0	-	6.0	-	-	-	
B-18	Itay	25.5	25.5	12.6	10.4	-	-	2.5	
B-19	Lambare	12.2	8.4	-	6.2	1.4	-	0.8	
B-20	Valle Apua	-	-	-	-	-	-	-	No River
B-21	Villa Elisa	5.2	3.4	3.4	-	-	-	-	
B-22	Nemby	19.3	3.5	3.5	-	-	-	-	
B-23	San Lorenzo	15.8	15.8	14.2	1.6	-	-	-	
B-24	Tayazuape	8.1	8.1	8.1	-	-	-	-	
B-26	Zeballos Cue	1.2	0.4	0.4	-	-	-	-	
B-27	Paso Cai	4.0	4.0	4.0	-	-	-	-	

Table 5-19. LAND ACQUISITION AND HOUSE EVACUATION OF PROPOSED PLAN FOR BASIC PLAN

Basin Number	Name of Basin	Land Acquisition (m^2)	House Evacuation (No.)
B-1	Varadero	-	-
B-2	Jardin	-	-
B-3	Centro	-	-
B-4	Jaen	5,900	7
B-5	Tacumbu	-	-
B-6	Salamanca	3,700	0
B-7	Zanja Moroti	7,900	12
B-8	Ferreira	14,800	15
B-9	Villa Universitaria	-	-
B-10	Las Mercedes	4,900	11
B-11	Mariscal Lopez	-	-
B-12	Bella Vista	-	-
B-13	Tablada	-	-
B-14	Mburicao	36,500	24
B-15	Ycua Carrillo	8,600	12
B-16	Santa Rosa	7,600	10
B-17	Tres Puentes Cue	6,000	-
B-18	Itay	287,800	110
B-19	Lambare	23,300	27
B-20	Valle Apua	-	-
B-21	Villa Elisa	62,800	-
B-22	Nemby	14,200	-
B-23	San Lorenzo	320,500	-
B-24	Tayazuape	183,600	-
B-26	Zeballos Cue	4,000	-
B-27	Paso Cai	64,000	-
	Total	1,056,100	228

Table 5-20 (1/2). DESIGN DISCHARGE FOR MASTER PLAN

No. of Basin	Name of Basin	No. of Subbasin	Design Discharge (m^3/s)	Remarks
B-1	Varadero	-	-	No River
B-2	Jardin	-	15	
B-3	Centro	-	-	No River
B-4	Jaen	-	45	
B-5	Tacumbu	-	-	No River
B-6	Salamanca	-	20	
B-7	Zanja Moroti	1	15	
		2	25	
B-8	Ferreira	1	55	
		2	70	
B-9	Villa Universitaria	-	-	No River
B-10	Las Mercedes	-	35	
B-11	Mariscal Lopez	-	-	No River
B-12	Bella Vista	-	20	
B-13	Tablada	-	-	No River
B-14	Mburicao	1	65	
		2	80	
		3	55	
		4	150	
		5	25	
		6	190	
B-15	Ycua Carrillo	1	35	
		2	65	
B-16	Santa Rosa	-	50	
B-17	Tres Puentes Cue	-	60	

Table 5-20 (2/2). DESIGN DISCHARGE FOR MASTER PLAN

No. of Basin	Name of Basin	No. of Subbasin	Design Discharge (m^3/s)	Remarks
B-18	Itay	1	190	
		2-1	210	
		2-2	110	
		3-1	30	
		3-2	30	
		4	60	
		5	65	
		6	390	Subbasins 8 to 10 are outside the Planning area
		7-1	95	
		7-2	35	
		7-3	25	
B-19	Lambare	1	70	
		2	45	
		3	200	
		4	250	
		5	80	
		6	110	
		7	330	
B-20	Valle Apua	-	-	No River
B-21	Villa Elisa	1	45	Subbasin 2 is outside the Planning Area
		3	120	
B-22	Nemby	1	60	Subbasins 2 to 5 are outside the planning Area
B-23	San Lorenzo	1	130	
		2-1	160	
		2-2	45	
		2-3	230	
B-24	Tayazuape	1	95	Subbasin 2 is outside the Planning Area
		3	170	
B-26	Zeballos Cue	-	12	
B-27	Paso Cai	-	70	

Table 5-21 (1/4) DIMENSION OF DRAINAGE CONDUITS OF ALTERNATIVES FOR MASTER PLAN

(For Case II-1 and III-1)

(Unit : m)

Location No.	Length	Return Period 2-year	3-year	5-year
1-1	490	(P) 2.0	(P) 2.2	(P) 2.5
1-2	1,170	(P) 1.6	(P) 1.6	(P) 1.8
2-1	150	(P) 1.6	(P) 1.8	(P) 2.0
4-1	510	(P) 1.8	(P) 1.8	(P) 2.0
4-2	710	(B) 2.0 x 2.0	(B) 2.5 x 2.0	(B) 2.5 x 2.0
5-1	550	(P) 1.4	(P) 1.6	(P) 1.8
6-1	100	(P) 2.0	(P) 2.2	(P) 2.2
7-1	250	(P) 1.8	(P) 1.8	(P) 2.0
8-1	800	(B) 2.0 x 2.0	(B) 2.0 x 2.0	(B) 2.5 x 2.0
8-2	620	(P) 1.8	(P) 2.0	(P) 2.2
8-3	320	(P) 1.4	(P) 1.4	(P) 1.6
8-4	600	(P) 2.0	(P) 2.2	(P) 2.5
8-5	200	(P) 1.2	(P) 1.2	(P) 1.2
9-1	130	(P) 1.0	(P) 1.0	(P) 1.2
10-1*	150	(P) 1.0	(P) 1.0	(P) 1.2
11-1	730	(P) 1.8	(P) 2.0	(P) 2.2
12-1	350	(P) 2.0	(P) 2.2	(P) 2.2
13-1	400	(P) 1.8	(P) 2.0	(P) 2.2
14-1*	-	-	-	-
14-2*	2,370	(B) 2.5 x 2.0	(B) 3.0 x 2.0	(B) 3.5 x 2.0
14-3	305	(P) 1.4	(P) 1.4	(P) 1.6
14-4	100	(P) 1.0	(P) 1.2	(P) 1.2
14-5*	540	(P) 1.6	(P) 1.8	(P) 1.8
14-6	1,310	(P) 2.5	(B) 2.0 x 2.0	(B) 2.0 x 2.0
14-7	795	(P) 2.2	(P) 2.2	(P) 2.5
14-8*	310	(P) 2.2	(P) 2.5	(P) 2.5
14-9	150	(P) 1.2	(P) 1.2	(P) 1.2
14-10*	180	(P) 2.5	(P) 2.5	(B) 2.0 x 2.0
14-11*	655	(P) 1.6	(P) 1.8	(P) 2.0
14-12	560	(P) 1.4	(P) 1.6	(P) 1.6
14-13	1,490	(P) 2.5	(P) 2.5	(B) 2.0 x 2.0
14-14	545	(P) 1.4	(P) 1.6	(P) 1.6
15-1	650	(B) 2.5 x 2.0	(B) 3.0 x 2.0	(B) 3.5 x 2.0
16-1	320	(P) 1.8	(P) 1.8	(P) 2.0
16-2*	100	(P) 1.4	(P) 1.4	(P) 1.6
17-1	420	(P) 2.2	(P) 2.2	(P) 2.5
18-1*	100	(B) 3.5 x 2.0	(B) 4.0 x 2.0	(B) 4.0 x 2.5
18-2*	1,675	(B) 3.0 x 2.0	(B) 4.0 x 2.0	(B) 3.5 x 2.5
18-3	1,775	(B) 4.0 x 2.5	(B) 4.5 x 2.5	(B) 5.0 x 2.5
18-4	100	(P) 1.4	(P) 1.4	(P) 1.6
18-5	100	(P) 1.0	(P) 1.2	(P) 1.2
18-6	140	(P) 1.8	(P) 1.8	(P) 2.0
18-7*	410	(B) 2.0 x 2.0	(B) 2.5 x 2.0	(B) 2.5 x 2.0
18-8	80	(P) 2.5	(B) 2.0 x 2.0	(B) 2.0 x 2.0
18-9*	2,395	(O) 2.5 x 2.0	(O) 3.0 x 2.0	(O) 4.0 x 2.0
18-10*	2,865	(O) 3.0 x 2.0	(O) 4.0 x 2.0	(O) 4.5 x 2.0

Table 5-21 (2/4) DIMENSION OF DRAINAGE CONDUITS OF ALTERNATIVES FOR MASTER PLAN

(For Case II-1 and III-1)

(Unit : m)

Location No.	Length	Return Period 2-year	3-year	5-year
19-1	580	(B) 3.5 x 2.0	(B) 3.5 x 2.5	(B) 4.0 x 2.5
19-2	340	(P) 2.2	(P) 2.5	(P) 2.5
19-3	130	(B) 2.5 x 2.0	(B) 2.5 x 2.0	(B) 3.0 x 2.0
19-4*	250	(P) 1.6	(P) 1.8	(P) 1.8
19-5*	250	(P) 1.8	(P) 2.0	(P) 2.0
19-6	1,000	(P) 2.2	(P) 2.5	(P) 2.5
19-7	200	(B) 3.0 x 2.0	(B) 3.5 x 2.0	(B) 4.0 x 2.0
19-8	250	(P) 2.2	(P) 2.5	(P) 2.5
19-9	590	(P) 1.8	(P) 2.0	(P) 2.2
19-10*	920	(P) 2.0	(P) 2.2	(P) 2.5
19-11*	80	(P) 1.4	(P) 1.6	(P) 1.6
19-12*	470	(B) 2.5 x 2.0	(B) 2.5 x 2.0	(B) 3.0 x 2.0
19-13*	700	(B) 3.5 x 2.0	(B) 4.0 x 2.0	(B) 4.0 x 2.5
19-14	120	(P) 1.8	(P) 1.8	(P) 2.0

Note: All drainage facilities are provided for Case II-1, and drainage facilities with * are provided for Case III-1.

P, B, O represent Pipe Culvert, Box Culvert and Open Channel, respectively.

The figure of Pipe Culvert type gives the diameter.

The first and second figures of Box Culvert and Open Channel types give the bottom width and the height, respectively.

Improvement works of Location No.14-1 consist of only inlets.

Table 5-21 (3/4) DIMENSION OF DRAINAGE CONDUITS OF ALTERNATIVES FOR MASTER PLAN

(For Case II-2, II-3, III-2 and III-3)

(Unit : m)

Location No.	Length	Return Period 2-year	3-year	5-year
1-1	490	(P) 2.0	(P) 2.2	(P) 2.5
1-2	1,170	(P) 1.6	(P) 1.6	(P) 1.8
2-1	150	(P) 1.6	(P) 1.8	(P) 2.0
4-1	510	(P) 1.8	(P) 1.8	(P) 2.0
4-2	710	(B) 2.0 x 2.0	(B) 2.0 x 2.0	(B) 2.5 x 2.0
5-1	550	(P) 1.4	(P) 1.6	(P) 1.8
6-1	100	(P) 2.0	(P) 2.0	(P) 2.2
7-1	250	(P) 1.8	(P) 1.8	(P) 2.0
8-1	800	(P) 2.5	(B) 2.0 x 2.0	(B) 2.0 x 2.0
8-2	620	(P) 1.8	(P) 2.0	(P) 2.2
8-3	320	(P) 1.4	(P) 1.4	(P) 1.6
8-4	600	(P) 2.0	(P) 2.2	(P) 2.2
8-5	200	(P) 1.0	(P) 1.2	(P) 1.2
9-1	130	(P) 1.0	(P) 1.0	(P) 1.2
10-1*	150	(P) 0.9	(P) 1.0	(P) 1.2
11-1	730	(P) 1.8	(P) 2.0	(P) 2.2
12-1	350	(P) 2.0	(P) 2.2	(P) 2.2
13-1	400	(P) 1.8	(P) 2.0	(P) 2.2
14-1*	-	-	-	-
14-2*	2,370	(B) 2.5 x 2.0	(B) 3.0 x 2.0	(B) 3.5 x 2.0
14-3	305	(P) 1.4	(P) 1.4	(P) 1.6
14-4	100	(P) 1.0	(P) 1.2	(P) 1.2
14-5*	540	(P) 1.6	(P) 1.8	(P) 1.8
14-6	1,310	(P) 2.2	(P) 2.5	(P) 2.5
14-7	795	(P) 1.8	(P) 2.0	(P) 2.2
14-8*	310	(P) 2.0	(P) 2.0	(P) 2.2
14-9	150	(P) 0.9	(P) 1.0	(P) 1.2
14-10*	180	(P) 2.5	(P) 2.5	(B) 2.0 x 2.0
14-11*	655	(P) 1.6	(P) 1.8	(P) 1.8
14-12	560	(P) 1.4	(P) 1.6	(P) 1.6
14-13	1,490	(P) 2.0	(P) 2.2	(P) 2.5
14-14	545	(P) 1.4	(P) 1.4	(P) 1.6
15-1	650	(B) 2.0 x 2.0	(B) 2.0 x 2.0	(B) 2.5 x 2.0
16-1	320	(P) 1.4	(P) 1.6	(P) 1.8
16-2*	100	(P) 1.2	(P) 1.2	(P) 1.4
17-1	420	(P) 1.8	(P) 2.0	(P) 2.0
18-1*	100	(B) 2.5 x 2.0	(B) 3.0 x 2.0	(B) 3.5 x 2.0
18-2*	1,675	(B) 2.5 x 2.0	(B) 3.0 x 2.0	(B) 3.5 x 2.0
18-3	1,775	(B) 4.0 x 2.0	(B) 3.5 x 2.5	(B) 4.0 x 2.5
18-4	100	(P) 1.2	(P) 1.4	(P) 1.4
18-5	100	(P) 0.9	(P) 0.9	(P) 1.0
18-6	140	(P) 1.6	(P) 1.6	(P) 1.8
18-7*	410	(P) 2.5	(B) 2.0 x 2.0	(B) 2.0 x 2.0
18-8	80	(P) 2.2	(P) 2.5	(P) 2.5
18-9*	2,395	(O) 2.0 x 2.0	(O) 2.5 x 2.0	(O) 3.0 x 2.0
18-10*	2,865	(O) 2.5 x 2.0	(O) 3.0 x 2.0	(O) 3.5 x 2.0

Table 5-21 (4/4) DIMENSION OF DRAINAGE CONDUITS OF ALTERNATIVES FOR MASTER PLAN

(For Case II-2, II-3, III-2 and III-3)

(Unit : m)

Location No.	Length	Return Period 2-year	3-year	5-year
19-1	580	(B) 3.0 x 2.0	(B) 3.5 x 2.0	(B) 4.0 x 2.0
19-2	340	(P) 2.0	(P) 2.2	(P) 2.5
19-3	130	(B) 2.0 x 2.0	(B) 2.5 x 2.0	(B) 3.0 x 2.0
19-4*	250	(P) 1.4	(P) 1.4	(P) 1.6
19-5*	250	(P) 1.4	(P) 1.6	(P) 1.8
19-6	1,000	(P) 1.8	(P) 2.0	(P) 2.2
19-7	200	(B) 2.0 x 2.0	(B) 2.5 x 2.0	(B) 3.0 x 2.0
19-8	250	(P) 1.8	(P) 2.0	(P) 2.2
19-9	590	(P) 1.8	(P) 2.0	(P) 2.0
19-10*	920	(P) 2.0	(P) 2.0	(P) 2.2
19-11*	80	(P) 1.4	(P) 1.4	(P) 1.6
19-12*	470	(B) 2.0 x 2.0	(B) 2.5 x 2.0	(B) 3.0 x 2.0
19-13*	700	(B) 3.0 x 2.0	(B) 3.5 x 2.0	(B) 3.5 x 2.5
19-14	120	(P) 1.8	(P) 1.8	(P) 2.0

Note: All drainage facilities are provided for Case II-2 and Case II-3, and drainage facilities with * are provided for Case III-2 and Case III-3.

P, B, O represent Pipe Culvert, Box Culvert and Open Channel, respectively.

The figure of Pipe Culvert type gives the diameter.

The first and second figures of Box Culvert and Open Channel types give the bottom width and the height, respectively.

Improvement works of Location No.14-1 consist of only inlets.

Table 5-22. DISCHARGE TO BE CONTROLLED BY DETENTION FACILITIES IN ALTERNATIVES FOR MASTER PLAN

(Unit: m3/sec)

Basin Number	Name of Basin or River	Return Period 2-year	3-year	5-year
Case I-2 & Case I-3				
B-2	Jardin	1	1	1
B-4	Jaen	4	5	6
B-6	Salamanca	2	2	2
B-7	Zanja Moroti	2	2	3
B-8	Ferreira	12	13	16
B-10	Las Mercedes	4	4	6
B-12	Bella Vista	2	2	2
B-14	Mburicao	49	57	73
B-15	Ycua Carrillo	27	32	33
B-16	Santa Rosa	18	19	21
B-17	Tres Puentes Cue	20	20	26
B-18	Itay	157	186	234
B-19	Lambare	122	156	167
B-21	Villa Elisa	40	56	59
B-22	Nemby	20	26	30
B-23	San Lorenzo	77	92	117
B-24	Tayazuape	61	78	106
B-26	Zeballos Cue	4	4	5
B-27	Paso Cai	37	41	46
Case II-2, II-3, III-2 and III-3				
B-2	Jardin	0	0	0
B-4	Jaen	1	1	2
B-6	Salamanca	1	1	1
B-7	Zanja Moroti	1	1	1
B-8	Ferreira	3	3	4
B-10	Las Mercedes	1	2	2
B-12	Bella Vista	1	1	1
B-14	Mburicao	19	32	41
B-15	Ycua Carrillo	18	22	27
B-16	Santa Rosa	12	15	17
B-17	Tres Puentes cue	9	12	14
B-18	Itay	85	92	114
B-19	Lambare	87	92	114
B-21	Villa Elisa	26	31	39
B-22	Nemby	14	18	21
B-23	San Lorenzo	41	56	70
B-24	Tayazuape	29	42	47
B-26	Zeballos Cue	2	3	4
B-27	Paso Cai	28	32	40

Note: Detention facilities are not employed in basins without rivers.

Table 5-23 (1/9). CONSTRUCTION COST OF ALTERNATIVES FOR MASTER PLAN (RETURN PERIOD: 2-YEAR)

(Unit: ¢ Million)

Basin Number	Name of Basin or River	Case I-1	Case I-2/2	Case I-3/2
1.	Basins With River Channel			
B-2	Jardin	440	540	500
B-4	Jaen	2,220	2,470	2,350
B-6	Salamanca	1,110	1,240	1,180
B-7	Zanja Moroti	1,700	1,780	1,760
B-8	Ferreira	3,050	3,910	3,580
B-10	Las Mercedes	1,820	2,100	1,990
B-12	Bella Vista	550	650	630
B-14	Mburicao	14,260	16,590	15,230
B-15	Ycua Carrillo	2,930	3,920	3,730
B-16	Santa Rosa	2,330	3,120	2,760
B-17	Tres Puentes Cue	2,820	3,490	3,370
B-18	Itay	37,160	41,580	40,060
B-19	Lambare	23,410	30,130	27,170
B-21	Villa Elisa	6,490	8,630	7,900
B-22	Nemby	3,110	4,250	3,740
B-23	San Lorenzo	14,430	19,410	17,820
B-24	Tayazuape	4,950	9,510	8,280
B-26	Zeballos Cue	700	980	890
B-27	Paso Cai	3,100	5,170	4,530
	Sub-Total	126,580	159,470	147,470
2.	Basins Without River Channel/1			
B-1	Varadero	2,350	2,350	2,350
B-3	Centro	1,630	1,630	1,630
B-5	Tacumbu	840	840	840
B-9	Villa Universitaria	1,660	1,660	1,660
B-11	Mariscal Lopez	480	480	480
B-13	Tablada	740	740	740
B-20	Valle Apua	6,150	6,150	6,150
	Sub-Total	13,850	13,850	13,850
	Total	140,430	173,320	161,320

Note: /1 Only drainage facilities are applied to these basins in all the study cases, because the cost is absolutely less than that of the combination with detention facilities.

/2 Costs have been estimated on the assumption that the runoff discharge under the land use condition as of 1984 is confined by drainage system and the incremental discharge for future urbanization up to 2005 by detention facilities.

Table 5-23 (2/9). CONSTRUCTION COST OF ALTERNATIVES FOR MASTER PLAN (RETURN PERIOD: 3-YEAR)

(Unit: ¢ Million)

Basin Number	Name of Basin or River	Case I-1	Case I-2/2	Case I-3/2
1.	Basins With River Channel			
B-2	Jardin	500	610	560
B-4	Jaen	2,560	2,870	2,730
B-6	Salamanca	1,260	1,400	1,340
B-7	Zanja Moroti	1,920	2,010	1,970
B-8	Ferreira	3,330	4,270	3,910
B-10	Las Mercedes	2,100	2,340	2,220
B-12	Bella Vista	620	730	700
B-14	Mburicao	16,220	18,900	17,330
B-15	Ycua Carrillo	4,030	4,720	4,500
B-16	Santa Rosa	2,650	3,510	3,110
B-17	Tres Puentes Cue	3,220	3,800	3,690
B-18	Itay	47,670	50,430	48,640
B-19	Lambare	26,050	35,090	31,320
B-21	Villa Elisa	7,300	10,780	9,750
B-22	Nemby	3,620	5,110	4,470
B-23	San Lorenzo	16,450	22,320	20,420
B-24	Tayazuape	7,470	13,490	11,920
B-26	Zeballos Cue	800	1,090	1,000
B-27	Paso Cai	3,470	5,790	5,080
	Sub-Total	151,240	189,260	174,660
2.	Basins Without River Channel/1			
B-1	Varadero	2,640	2,640	2,640
B-3	Centro	1,820	1,820	1,820
B-5	Tacumbu	940	940	940
B-9	Villa Universitaria	1,860	1,860	1,860
B-11	Mariscal Lopez	540	540	540
B-13	Tablada	840	840	840
B-20	Valle Apua	6,840	6,840	6,840
	Sub-Total	15,480	15,480	15,480
	Total	166,720	204,740	190,140

Note: /1 Only drainage facilities are applied to these basins in all the study cases, because the cost is absolutely less than that of the combination with detention facilities.

/2 Costs have been estimated on the assumption that the runoff discharge under the land use condition as of 1984 is confined by drainage system and the incremental discharge for future urbanization up to 2005 by detention facilities.

Table 5-23 (3/9). CONSTRUCTION COST OF ALTERNATIVES FOR MASTER PLAN (RETURN PERIOD: 5-YEAR)

(Unit: ₲ Million)

Basin Number	Name of Basin or River	Case I-1	Case I-2/2	Case I-3/2
1.	Basins With River Channel			
B-2	Jardin	560	660	630
B-4	Jaen	2,820	3,260	3,090
B-6	Salamanca	1,390	1,550	1,480
B-7	Zanja Moroti	2,170	2,300	2,250
B-8	Ferreira	3,650	4,810	4,380
B-10	Las Mercedes	2,030	3,030	2,850
B-12	Bella Vista	670	810	780
B-14	Mburicao	19,240	22,540	20,510
B-15	Ycua Carrillo	4,660	5,330	5,100
B-16	Santa Rosa	2,960	4,070	3,610
B-17	Tres Puentes Cue	3,990	4,480	4,320
B-18	Itay	54,060	62,040	59,770
B-19	Lambare	28,700	38,150	34,130
B-21	Villa Elisa	8,060	11,700	10,610
B-22	Nemby	4,090	5,800	5,040
B-23	San Lorenzo	18,580	26,300	23,880
B-24	Tayazuape	8,630	16,720	14,610
B-26	Zeballos Cue	880	1,210	1,110
B-27	Paso Cai	3,840	6,410	5,620
	Sub-Total	170,980	221,170	203,770
2.	Basins Without River Channel/1			
B-1	Varadero	2,910	2,910	2,910
B-3	Centro	2,010	2,010	2,010
B-5	Tacumbu	1,030	1,030	1,030
B-9	Villa Universitaria	2,050	2,050	2,050
B-11	Mariscal Lopez	580	580	580
B-13	Tablada	920	920	920
B-20	Valle Apua	7,520	7,520	7,520
	Sub-Total	17,020	17,020	17,020
	Total	188,000	238,190	220,790

Note: /1 Only drainage facilities are applied to these basins in all the study cases, because the cost is absolutely less than that of the combination with detention facilities.

/2 Costs have been estimated on the assumption that the runoff discharge under the land use condition as of 1984 is confined by drainage system and the incremental discharge for future urbanization up to 2005 by detention facilities.

Table 5-23 (4/9). CONSTRUCTION COST OF ALTERNATIVES FOR MASTER PLAN (RETURN PERIOD: 2-YEAR)

(Unit: ¢ Million)

Basin Number	Name of Basin or River	Case II-1	Case II-2/2	Case II-3/2
1.	Basins With River Channel			
B-2	Jardin	50	50	50
B-4	Jaen	940	980	960
B-6	Salamanca	170	190	180
B-7	Zanja Moroti	580	590	580
B-8	Ferreira	1,640	1,810	1,760
B-10	Las Mercedes	320	440	410
B-12	Bella Vista	130	160	150
B-14	Mburicao	6,050	6,600	6,330
B-15	Ycua Carrillo	940	2,160	1,730
B-16	Santa Rosa	620	1,280	1,100
B-17	Tres Puentes Cue	1,090	1,840	1,560
B-18	Itay	17,920	21,270	20,060
B-19	Lambare	8,430	14,610	13,040
B-21	Villa Elisa	430	2,230	1,760
B-22	Nemby	640	1,590	1,350
B-23	San Lorenzo	2,820	5,830	5,670
B-24	Tayazuape	1,950	4,790	4,110
B-26	Zeballos Cue	10	180	130
B-27	Paso Cai	390	2,470	1,970
	Sub-Total	45,120	69,070	62,900
2.	Basins Without River Channel/1			
B-1	Varadero	440	440	440
B-3	Centro	-	-	-
B-5	Tacumbu	130	130	130
B-9	Villa Universitaria	20	20	20
B-11	Mariscal Lopez	230	230	230
B-13	Tablada	130	130	130
B-20	Valle Apua	-	-	-
		-		
	Sub-Total	950	950	950
	Total	46,070	70,020	63,850

Note: /1 Only drainage facilities are applied to these basins in all the study cases, because the cost is absolutely less than that of the combination with detention facilities.

/2 Costs have been estimated on the assumption that the runoff discharge under the land use condition as of 1984 is confined by drainage system and the incremental discharge for future urbanization up to 2005 by detention facilities.

Table 5-23 (5/9). CONSTRUCTION COST OF ALTERNATIVES FOR MASTER PLAN (RETURN PERIOD: 3-YEAR)

(Unit: ₲ Million)

Basin Number	Name of Basin or River	Case II-1	Case II-2/2	Case II-3/2
1.	Basins With River Channel			
B-2	Jardin	60	60	60
B-4	Jaen	1,090	1,180	1,130
B-6	Salamanca	210	230	220
B-7	Zanja Moroti	650	660	660
B-8	Ferreira	1,840	2,020	1,960
B-10	Las Mercedes	390	500	460
B-12	Bella Vista	160	180	170
B-14	Mburicao	7,520	8,890	8,400
B-15	Ycua Carrillo	1,160	2,560	2,050
B-16	Santa Rosa	760	1,710	1,470
B-17	Tres Puentes Cue	1,260	2,220	1,870
B-18	Itay	21,790	25,060	23,730
B-19	Lambare	9,420	15,670	14,030
B-21	Villa Elisa	540	2,930	2,380
B-22	Nemby	840	2,070	1,760
B-23	San Lorenzo	3,540	7,550	7,320
B-24	Tayazuape	2,330	6,550	5,560
B-26	Zeballos Cue	10	240	180
B-27	Paso Cai	430	2,790	2,240
	Sub-Total	54,000	83,070	75,650
2.	Basins Without River Channel/1			
B-1	Varadero	520	520	520
B-3	Centro	-	-	-
B-5	Tacumbu	150	150	150
B-9	Villa Universitaria	20	20	20
B-11	Mariscal Lopez	250	250	250
B-13	Tablada	150	150	150
B-20	Valle Apua	-	-	-
	Sub-Total	1,090	1,090	1,090
	Total	55,090	84,160	76,740

Note: /1 Only drainage facilities are applied to these basins in all the study cases, because the cost is absolutely less than that of the combination with detention facilities.

/2 Costs have been estimated on the assumption that the runoff discharge under the land use condition as of 1984 is confined by drainage system and the incremental discharge for future urbanization up to 2005 by detention facilities.

Table 5-23 (6/9). CONSTRUCTION COST OF ALTERNATIVES FOR MASTER PLAN (RETURN PERIOD: 5-YEAR)

(Unit: ¢ Million)

Basin Number	Name of Basin or River	Case II-1	Case II-2/2	Case II-3/2
1.	Basins With River Channel			
B-2	Jardin	60	60	60
B-4	Jaen	1,260	1,380	1,320
B-6	Salamanca	240	260	250
B-7	Zanja Moroti	790	790	790
B-8	Ferreira	2,050	2,290	2,210
B-10	Las Mercedes	520	940	880
B-12	Bella Vista	160	190	180
B-14	Mburicao	9,420	11,000	10,390
B-15	Ycua Carrillo	1,580	3,350	2,720
B-16	Santa Rosa	890	2,080	1,800
B-17	Tres Puentes Cue	1,440	2,580	2,180
B-18	Itay	26,190	30,460	28,820
B-19	Lambare	10,030	18,110	16,070
B-21	Villa Elisa	660	3,660	2,970
B-22	Nemby	980	2,410	2,040
B-23	San Lorenzo	4,310	9,380	9,090
B-24	Tayazuape	2,680	7,370	6,270
B-26	Zeballos Cue	10	280	200
B-27	Paso Cai	490	3,490	2,800
	Sub-Total	63,760	100,080	91,040
2.	Basins Without River Channel/1			
B-1	Varadero	560	560	560
B-3	Centro	-	-	-
B-5	Tacumbu	170	170	170
B-9	Villa Universitaria	20	20	20
B-11	Mariscal Lopez	310	310	310
B-13	Tablada	160	160	160
B-20	Valle Apua	-	-	-
	Sub-Total	1,220	1,220	1,220
	Total	64,980	101,300	92,260

Note: /1 Only drainage facilities are applied to these basins in all the study cases, because the cost is absolutely less than that of the combination with detention facilities.

/2 Costs have been estimated on the assumption that the runoff discharge under the land use condition as of 1984 is confined by drainage system and the incremental discharge for future urbanization up to 2005 by detention facilities.

Table 5-23 (7/9). CONSTRUCTION COST OF ALTERNATIVES FOR MASTER PLAN (RETURN PERIOD: 2-YEAR)

(Unit: ¢ Million)

Basin Number	Name of Basin or River	Case III-1	Case III-2/1	Case III-3/1
1.	Basins With River Channel			
B-2	Jardin	-	-	-
B-4	Jaen	-	-	-
B-6	Salamanca	-	-	-
B-7	Zanja Moroti	-	-	-
B-8	Ferreira	-	-	-
B-10	Las Mercedes	20	150	100
B-12	Bella Vista	-	-	-
B-14	Mburicao	3,420	4,590	4,300
B-15	Ycua Carrillo	-	-	-
B-16	Santa Rosa	350	1,070	870
B-17	Tres Puentes Cue	-	-	-
B-18	Itay	10,320	15,080	13,870
B-19	Lambare	4,300	11,200	9,620
B-21	Villa Elisa	-	-	-
B-22	Nemby	-	-	-
B-23	San Lorenzo	-	-	-
B-24	Tayazuape	-	-	-
B-26	Zeballos Cue	-	-	-
B-27	Paso Cai	-	-	-
	Sub-Total	18,410	32,090	28,760
2.	Basins Without River Channel*			
B-1	Varadero	-	-	-
B-3	Centro	-	-	-
B-5	Tacumbu	-	-	-
B-9	Villa Universitaria	-	-	-
B-11	Mariscal Lopez	-	-	-
B-13	Tablada	-	-	-
B-20	Valle Apua	-	-	-
	Sub-Total	-	-	-
	Total	18,410	32,090	28,760

Note: /1 Costs have been estimated on the assumption that the runoff discharge under the land use condition as of 1984 is controlled by drainage system and the incremental discharge for future urbanization up to 2005 by detention facilities.

Table 5-23 (8/9). CONSTRUCTION COST OF ALTERNATIVES FOR MASTER PLAN (RETURN PERIOD: 3-YEAR)

(Unit: ¢ Million)

Basin Number	Name of Basin or River	Case III-1	Case III-2/1	Case III-3/1
1.	Basins With River Channel			
B-2	Jardin	-	-	-
B-4	Jaen	-	-	-
B-6	Salamanca	-	-	-
B-7	Zanja Moroti	-	-	-
B-8	Ferreira	-	-	-
B-10	Las Mercedes	20	160	110
B-12	Bella Vista	-	-	-
B-14	Mburicao	4,380	6,590	6,070
B-15	Ycua Carrillo	-	-	-
B-16	Santa Rosa	550	1,400	1,160
B-17	Tres Puentes Cue	-	-	-
B-18	Itay	12,630	18,840	17,310
B-19	Lambare	4,680	11,820	10,170
B-21	Villa Elisa	-	-	-
B-22	Nemby	-	-	-
B-23	San Lorenzo	-	-	-
B-24	Tayazuape	-	-	-
B-26	Zeballos Cue	-	-	-
B-27	Paso Cai	-	-	-
	Sub-Total	22,260	38,810	34,820
2.	Basins Without River Channel			
B-1	Varadero	-	-	-
B-3	Centro	-	-	-
B-5	Tacumbu	-	-	-
B-9	Villa Universitaria	-	-	-
B-11	Mariscal Lopez	-	-	-
B-13	Tablada	-	-	-
B-20	Valle Apua	-	-	-
	Sub-Total	-	-	-
	Total	22,260	38,810	34,820

Note: /1 Costs have been estimated on the assumption that the runoff discharge under the land use condition as of 1984 is controlled by drainage system and the incremental discharge for future urbanization up to 2005 by detention facilities.

Table 5-23 (9/9). CONSTRUCTION COST OF ALTERNATIVES FOR MASTER PLAN (RETURN PERIOD: 5-YEAR)

(Unit: ₡ Million)

Basin Number	Name of Basin or River	Case III-1	Case III-2/1	Case III-3/1
1.	Basins With River Channel			
B-2	Jardin	-	-	-
B-4	Jaen	-	-	-
B-6	Salamanca	-	-	-
B-7	Zanja Moroti	-	-	-
B-8	Ferreira	-	-	-
B-10	Las Mercedes	30	210	160
B-12	Bella Vista	-	-	-
B-14	Mburicao	5,590	8,710	8,050
B-15	Ycua Carrillo	-	-	-
B-16	Santa Rosa	740	1,660	1,390
B-17	Tres Puentes Cue	-	-	-
B-18	Itay	15,020	22,950	21,040
B-19	Lambare	5,570	13,930	11,880
B-21	Villa Elisa	-	-	-
B-22	Nemby	-	-	-
B-23	San Lorenzo	-	-	-
B-24	Tayazuape	-	-	-
B-26	Zeballos Cue	-	-	-
B-27	Paso Cai	-	-	-
	Sub-Total	26,950	47,460	42,520
2.	Basins Without River Channel			
B-1	Varadero	-	-	-
B-3	Centro	-	-	-
B-5	Tacumbu	-	-	-
B-9	Villa Universitaria	-	-	-
B-11	Mariscal Lopez	-	-	-
B-13	Tablada	-	-	-
B-20	Valle Apua	-	-	-
	Sub-Total	-	-	-
	Total	26,950	47,460	42,520

Note: /1 Costs have been estimated on the assumption that the runoff discharge under the land use condition as of 1984 is controlled by drainage system and the incremental discharge for future urbanization up to 2005 by detention facilities.

Table 5-24 (1/3). COST COMPARISON OF COMBINATION OF FACILITIES IN STUDY CASE II-2 FOR MASTER PLAN

(Unit: ¢ Million)

River Basin	Case No.	River Channel (Q:m^3/s)		Storage /1	Drainage Facilities	Infiltration Trench	Total
B-1 /2	1		-	-	427	-	427
B-2	1	12.6	0	1	51	5	57
	2	12.6	0	1	51	5	57
	3	12.7	0	0	52	0	52
	4	12.7	0	0	52	0	52
	5	12.7	0	0	52	0	52
B-3 /3	1				0		0
B-4	1	42.3	334	24	553	72	983
	2	42.6	338	18	557	54	967
	3	43.0	342	13	560	37	952
	4	43.3	344	6	564	18	932
	5	43.6	345	0	567	0	912
B-5 /2	1		-	-	125	-	125
B-6	2	19.0	127	6	43	16	192
	3	19.1	129	5	43	13	190
	4	19.2	130	3	43	8	184
	5	19.2	130	3	43	8	184
	3	19.3	132	0	43	0	175
B-7	1	21.5	460	6	78	16	560
	2	21.6	463	5	78	13	559
	3	21.7	466	3	79	8	556
	4	21.8	469	1	79	5	554
	5	21.9	472	0	79	0	551
B-8	1	61.8	529	53	835	133	1,550
	2	62.5	536	40	841	100	1,517
	3	63.3	543	26	845	67	1,481
	4	64.0	551	14	851	33	1,449
	5	64.7	558	0	856	0	1,414
B-9 /2	1		-	-	22	-	22

Note: Direct cost in shown in this Table.

/1 : Storage in public compound.

/2 : Only drainage facilities are applied to the basin because the cost is absolutely less than that of combination with detention facilities.

/3 : The basin has no trouble spot for drainage facilities.

Table 5-24 (2/3). COST COMPARISON OF COMBINATION OF FACILITIES IN STUDY CASE II-2 FOR MASTER PLAN

(Unit: ¢ Million)

River Basin	Case No.	River Channel (Q:m^3/s)		Storage /1	Drainage Facilities	Infiltration Trench	Total
B-10	1	33.0	265	31	18	89	403
	2	33.4	271	23	18	67	379
	3	33.8	278	16	20	45	359
	4	34.2	290	8	20	22	340
	5	34.6	311	0	20	0	331
B-11 /2	1		-	-	214	-	214
B-12	1	14.7	0	6	127	18	151
	2	14.8	0	5	128	14	147
	3	14.9	0	3	129	9	141
	4	15.0	0	1	129	5	135
	5	15.1	0	0	130	0	130
B-13 /2	1		-	-	128	-	128
B-14	1	157.5	1,624	823	3,258	1,395	7,100
	2	165.6	1,853	617	3,375	1,046	6,891
	3	173.7	2,082	411	3,492	697	6,683
	4	181.8	2,312	206	3,607	349	6,474
	5	189.9	2,541	0	3,725	0	6,266
B-15	1	40.4	265	458	342	1,075	2,140
	2	45.8	322	344	370	806	1,842
	3	51.2	374	229	400	538	1,541
	4	56.5	443	115	429	269	1,256
	5	61.9	506	0	458	0	964
B-16	1	31.5	385	270	71	659	1,385
	2	35.2	414	202	77	495	1,188
	3	38.9	449	136	82	330	997
	4	42.5	489	68	87	164	808
	5	46.2	541	0	92	0	633
B-17	1	48.2	765	309	124	652	1,850
	2	51.1	794	232	136	489	1,651
	3	54.1	822	155	146	327	1,450
	4	57.0	849	77	158	163	1,247
	5	59.9	874	0	168	0	1,042
B-18	1	336.3	9,305	3,032	3,171	4,768	20,276
	2	359.4	10,470	2,274	3,427	3,576	19,747
	3	382.4	11,634	1,516	3,683	2,384	19,217
	4	405.5	12,798	758	3,939	1,192	18,687
	5	428.5	13,963	0	4,195	0	18,158

Table 5-24 (3/3). COST COMPARISON OF COMBINATION OF FACILITIES IN STUDY CASE II-2 FOR MASTER PLAN

(Unit: ¢ Million)

River Basin	Case No.	River Channel (Q:m^3/s)		Storage /1	Drainage Facilities	Infiltration Trench	Total
B-19	1	237.6	2,540	2,556	3,394	4,410	12,900
	2	260.5	2,704	1,917	3,710	3,308	11,639
	3	283.4	2,867	1,278	4,025	2,205	10,375
	4	306.3	3,031	639	4,341	1,103	9,114
	5	329.2	3,192	0	4,658	0	7,850
B-20/3	1				0		0
B-21/3	1	88.3	304	761	0	1,381	2,446
	2	96.0	340	572	0	1,036	1,948
	3	103.7	377	381	0	691	1,449
	4	111.4	414	191	0	345	950
	5	119.1	450	0	0	0	450
B-22/3	1	38.5	518	397	0	814	1,729
	2	42.9	564	298	0	611	1,473
	3	47.4	610	199	0	407	1,216
	4	51.8	656	99	0	204	959
	5	56.2	702	0	0	0	702
B-23/3	1	166.0	2,651	1,726	0	1,918	6,295
	2	179.9	2,720	1,295	0	1,439	5,454
	3	193.8	2,789	864	0	959	4,612
	4	207.7	2,870	431	0	480	3,781
	5	221.6	2,950	0	0	0	2,950
B-24/3	1	123.7	1,791	1,642	0	2,029	5,462
	2	134.2	1,830	1,232	0	1,521	4,583
	3	144.7	1,869	821	0	1,014	3,704
	4	155.2	1,907	411	0	507	2,825
	5	165.7	1,944	0	0	0	1,944
B-26/3	1	8.2	6	51	0	145	202
	2	9.0	7	38	0	109	154
	3	9.7	8	25	0	72	105
	4	10.5	9	13	0	37	59
	5	11.2	10	0	0	0	10
B-27/3	1	33.9	259	652	0	1,413	2,324
	2	41.8	288	489	0	1,060	1,837
	3	49.7	311	327	0	707	1,345
	4	57.5	334	163	0	353	850
	5	65.4	351	0	0	0	351

Table 5-25. LAND AQUISITION AND HOUSE EVACUATION OF ALTERNATIVES FOR MASTER PLAN

(Unit: m^2)

Basin Number	Name of Basin	Case I			Case II			Case III		
		I-1	I-2	I-3	II-1	II-2	II-3	III-1	III-2	III-3
Land Acquisition										
B-1	Varadero	-	-	-	-	-	-	-	-	-
B-2	Jardin	-	-	-	-	-	-	-	-	-
B-3	Centro	-	-	-	-	-	-	-	-	-
B-4	Jaen	4,200	3,000	3,000	3,300	3,000	3,000	3,000	3,000	3,000
B-5	Tacumbu	-	-	-	-	-	-	-	-	-
B-6	Salamanca	500	-	-	100	-	-	-	-	-
B-7	Zanja Moroti	7,200	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
B-8	Ferreira	14,600	13,800	13,800	14,000	13,800	13,800	13,800	13,800	13,800
B-9	Villa Universitaria	-	-	-	-	-		-	-	-
B-10	Las Mercedes	3,700	2,900	2,900	3,200	2,900	2,900	2,900	2,900	2,900
B-11	Mariscal Lopez	-	-	-	-	-	-	-	-	-
B-12	Bella Vista	-	-	-	-	-	-	-	-	-
B-13	Tablada	-	-	-	-	-	-	-	-	-
B-14	Mburicao	34,400	30,000	30,000	32,500	30,000	30,000	30,000	30,000	30,000
B-15	Ycua Carrillo	10,100	4,000	4,000	8,200	4,000	4,000	4,000	4,000	4,000
B-16	Santa Rosa	8,500	4,100	4,100	7,600	4,100	4,100	4,100	4,100	4,100
B-17	Tres Puentes Cue	2,100	-	-	1,200	-	-	-	-	-
B-18	Itay	276,300	217,900	217,900	246,900	217,900	217,900	217,900	217,900	217,900
B-19	Lambare	26,500	9,600	9,600	19,500	9,600	9,600	9,600	9,600	9,600
B-20	Valle Apua	-	-	-	-	-	-	-	-	-
B-21	Villa Elisa	50,900	42,200	42,200	47,000	42,200	42,200	42,200	42,200	42,200
B-22	Nemby	7,200	-	-	4,900	-	-	-	-	-
B-23	San Lorenzo	228,500	172,800	172,800	206,400	172,800	172,800	172,800	172,800	172,800
B-24	Tayazuape	116,500	62,900	62,900	91,700	62,900	62,900	62,900	62,900	62,900
B-26	Zeballos Cue	3,900	3,800	3,800	3,900	3,800	3,800	3,800	3,800	3,800
B-27	Paso Cai	52,800	41,200	41,200	50,100	41,200	41,200	41,200	41,200	41,200
	Total	847,900	592,700	592,700	747,500	592,700	592,700	592,700	592,700	592,700
House Evacuation										
B-1	Varadero	-	-	-	-	-	-	-	-	-
B-2	Jardin	-	-	-	-	-	-	-	-	-
B-3	Centro	-	-	-	-	-	-	-	-	-
B-4	Jaen	6	4	4	4	4	4	4	4	4
B-5	Tacumbu	-	-	-	-	-	-	-	-	-
B-6	Salamanca	-	-	-	-	-	-	-	-	-
B-7	Zanja Moroti	10	8	8	8	8	8	8	8	8
B-8	Ferreira	13	11	11	11	11	11	11	11	11
B-9	Villa Universitaria	-	-	-	-	-	-	-	-	-
B-10	Las Mercedes	9	7	7	8	7	7	7	7	7
B-11	Mariscal Lopez	-	-	-	-	-	-	-	-	-
B-12	Bella Vista	-	-	-	-	-	-	-	-	-
B-13	Tablada	-	-	-	-	-	-	-	-	-
B-14	Mburicao	26	18	18	23	18	18	18	18	18
B-15	Ycua Carrillo	17	10	10	15	10	10	10	10	10
B-16	Santa Rosa	12	6	6	11	6	6	6	6	6
B-17	Tres Puentes Cue	-	-	-	-	-	-	-	-	-
B-18	Itay	123	101	101	112	101	101	101	101	101
B-19	Lambare	33	21	21	28	21	21	21	21	21
B-20	Valle Apua	-	-	-	-	-	-	-	-	-
B-21	Villa Elisa	-	-	-	-	-	-	-	-	-
B-22	Nemby	-	-	-	-	-	-	-	-	-
B-23	San Lorenzo	-	-	-	-	-	-	-	-	-
B-24	Tayazuape	-	-	-	-	-	-	-	-	-
B-26	Zeballos Cue	-	-	-	-	-	-	-	-	-
B-27	Paso Cai	-	-	-	-	-	-	-	-	-
	Total	249	183	183	220	183	183	183	183	183

Table 5-26 (1/2). FEATURES OF PROPOSED STORM WATER CONTROL SYSTEM FOR MASTER PLAN

Basin Number	Name of Basin	River			Length of Drainage conduits (km)	Detention Facilities		Remarks
		Design Discharge (m^3/s)	Type of /1 Channel	Improvement Length (km)		Storage in Public Compounds (ha)	Infiltration Trench (km)	
B-1	Varadero	-	-	-	1.7	-	-	No river.
B-2	Jardin	15	-	-	0.2	-	-	Improvement not necessary.
B-3	Centro	-	-	-	-	-	-	No river.
B-4	Jaen	45	B	1.9	1.2	-	-	
B-5	Tacumbu	-	-	-	0.5	-	-	No river.
B-6	Salamanca	20	B	1.3	0.1	-	-	
B-7	Zanja Moroti	25	E	0.6	0.3	-	-	
B-8	Ferreira	70	E	0.7	2.5	-	-	
B-9	Villa Universitaria	-	-	-	0.1	-	-	No river.
B-10	Las Mercedes	35	C	1.4	0.2	-	-	
B-11	Mariscal Lopez	-	-	-	0.7	-	-	No river.
B-12	Bella Vista	20	-	-	0.4	-	-	Improvement not necessary.
B-13	Tablada	-	-	-	0.4	-	-	No river.
B-14	Mburicao	175	B	4.1				
			C	1.5				
	Sub-Total			5.6	9.3	19	74	
B-15	Ycua Carrillo	65	B	1.9	0.8	-	-	
B-16	Santa Rosa	50	B	2.4	0.3	-	-	
B-17	Tres Puentes Cue	60	B	6.0	0.4	-	-	
B-18	Itay		A	12.6				
			B	10.4				
			D	2.5				
	Sub-Total			25.5	9.6	70	253	

Note:
/1 Type of Channel; A : Channel Without Revetment
B : Channel With Revetment and Without Invert
C : Channel With Revetment and Invert
D : Box Culvert
E : Channel With Embankment

Table 5-26 (2/2). FEATURES OF PROPOSED STORM WATER CONTROL SYSTEM FOR MASTER PLAN

Basin Number	Name of Basin	River			Length of Drainage conduits (km)	Detention Facilities		Remarks
		Design Discharge (m^3/s)	Type of /1 Channel	Improvement Length (km)		Storage in Public Compounds (ha)	Infiltration Trench (km)	
B-19	Lambare		B	4.7				
			C	1.4				
			D	0.8				
	Sub-Total			6.9	5.9	59	234	
B-20	Valle Apua	-	-	-	-	-	-	No river.
B-21	Villa Elisa	120	A	3.4	-	-	-	
B-22	Nemby	60	A	3.5	-	-	-	
B-23	San Lorenzo	230	A	14.2				
			B	1.6				
	Sub-Total			15.8	-	-	-	
B-24	Tayazuape	170	A	8.1	-	-	-	
B-26	Zeballos Cue	12	A	0.4	-	-	-	
B-27	Paso Cai	70	A	4.0	-	-	-	
	Total			89.4	34.6	148	561	

Table 5-27 (1/2). FEATURES OF PROPOSED RIVER CHANNEL FOR MASTER PLAN

Basin Number	Name of Basin	Subbasin Number	Type of River /1 Channel	Length of River Channel Impv't. (km)	Required Width (m) River Width	Maintenance Road	Total	Remarks
B-2	Jardin	-	-	0	-	-	-	River improvement is not necessary
B-4	Jaen	-	B	1.9	7.7	2.0	9.7	
B-6	Salamanca	-	B	1.3	4.7	2.0	6.7	
B-7	Zanja Moroti	1	-	0	-	-	-	River improvement is not necessary
		2-1	-	0	-	-	-	-do-
		2-2	E	0.6	24.5	(6.0)/2	24.5	
B-8	Ferreira	1	-	0	-	-	-	River improvement is not necessary
		2-1	-	0	-	-	-	-do-
		2-2	E	0.7	33.7	(6.0)/2	33.7	
B-10	Las Mercedes	1	C	1.2	5.4	2.0	7.4	
		2	C	0.2	6.4	2.0	8.4	
	Total -			1.4				
B-12	Bella Vista	-	-	0	-	-	-	River improvement is not necessary
B-14	Mburicao	1	C	0.1	3.6	2.0	5.6	
		2	C	0.4	8.1	2.0	10.1	
		3	C	1.0	7.0	2.0	9.0	
		4	B	1.2	15.7	2.0	17.7	
		5	B	0.4	7.1	2.0	9.1	
		6	B	2.5	19.1	2.0	21.1	
	Total -			5.6				
B-15	Ycua Carrillo	1	B	0.7	6.4	2.0	8.4	
		2	B	1.2	10.1	2.0	12.1	
	Total -			1.9				
B-16	Santa Rosa	-	B	2.4	8.2	2.0	10.2	
B-17	Tres Puentes Cue	-	B	6.0	9.4	2.0	11.4	

Note:
/1 Type of Channel;
A : Channel Without Revetment
B : Channel With Revetment and Without Invert
C : Channel With Revetment and Invert
D : Box Culvert
E : Channel With Embankment
/2 The crown of the embankment will serve as maintenance road.

Table 5-27 (2/2). FEATURES OF PROPOSED RIVER CHANNEL FOR MASTER PLAN

Basin Number	Name of Basin	Subbasin Number	Type of River /1 Channel	Length of River Channel Impv't. (km)	Required Width (m) River Width	Required Width (m) Maintenance Road	Required Width (m) Total	Remarks
B-18	Itay	1	D	2.5	14.1	-	14.1	
		2-1	B	2.2	17.4	1.0	18.4	
		2-2	A	1.2	26.6	4.0	30.6	
		3-1	B	2.7	9.8	2.0	11.8	
		3-2	B	2.3	7.6	4.0	11.6	
		4	B	0.5	5.1	2.0	7.1	
			B	1.0	9.1	4.0	13.1	
			A	1.2	22.2	4.0	26.2	
		5	B	1.7	10.0	4.0	14.0	
		6	A	3.5	40.5	4.0	44.5	
		7-1	A	2.7	21.0	4.0	25.0	
		7-2	A	2.3	16.0	4.0	20.0	
		7-3	A	1.4	13.0	4.0	17.0	
	Total -			25.5				
B-19	Lambare	1	C	0.8	7.8	2.0	9.8	
		2	C	0.6	6.6	2.0	8.6	
			D	0.8	8.0	-	8.0	
		3	B	0.9	12.6	4.0	16.6	
		4	B	2.7	14.4	4.0	18.4	
		5	-	0	-	-	-	River Improvement is not necessary
		6	-	0	-	-	-	-do-
		7	B	1.1	19.4	4.0	23.4	
	Total -			6.9				
B-21	Villa Elisa	1	A	1.6	15.8	4.0	19.8	
		3	A	1.8	24.3	4.0	28.3	
	Total -			3.4				
B-22	Nemby	1	A	3.5	18.1	4.0	22.1	
B-23	San Lorenzo	1	A	5.7	13.2	4.0	17.2	
		2-1	A	3.5	26.7	4.0	30.7	
		2-2	A	5.1	17.2	4.0	21.2	
		2-3	A	1.5	31.9	4.0	35.9	
	Total -			15.8				
B-24	Tayazuape	1	A	4.1	22.2	4.0	26.2	
		3	A	4.0	28.1	4.0	32.1	
	Total -			8.1				
B-26	Zeballos Cue	-	A	0.4	13.5	4.0	17.5	
B-27	Paso Cai	-	A	4.0	19.8	4.0	23.8	

Table 5-28. LAND ACQUISITION AND HOUSE EVACUATION OF OPTIMUM PLAN FOR MASTER PLAN

Basin Number	Name of Basin	Land Acquisition (m^2)	House Evacuation (No.)
B-1	Varadero	-	-
B-2	Jardin	-	-
B-3	Centro	-	-
B-4	Jaen	3,300	4
B-5	Tacumbu	-	-
B-6	Salamanca	100	-
B-7	Zanja Moroti	7,000	8
B-8	Ferreira	14,000	11
B-9	Villa Universitaria	-	-
B-10	Las Mercedes	3,200	8
B-11	Mariscal Lopez	-	-
B-12	Bella Vista	-	-
B-13	Tablada	-	-
B-14	Mburicao	30,000	20
B-15	Ycua Carrillo	8,200	11
B-16	Santa Rosa	7,600	10
B-17	Tres Puentes Cue	1,200	-
B-18	Itay	217,900	92
B-19	Lambare	9,600	18
B-21	Valle Apua	-	-
B-22	Villa Elisa	47,000	-
B-23	Nemby	4,900	-
B-24	San Lorenzo	206,400	-
B-25	Tayazuape	91,700	-
B-26	Zeballos Cue	3,900	-
B-27	Paso Cai	50,100	-
	Total	706,100	182

Table 5-29 (1/2). DESIGN DATA AND FEATURES OF PROPOSED DRAINAGE FACILITIES FOR MASTER PLAN

Location No.	Drain Design							Drain Details				Remarks
	Drainage Area (ha)	/1 Distance (m)	/2 Average Gradient (%)	Concentration Time (min)	Runoff Coefficient	Rainfall Intensity (mm/hr)	Runoff Discharge (m^3/s)	/3 Structural Type	/4 Size (m)	Length (m)	Capacity (m^3/s)	
1-1	51	1,400	2.14	25.7	0.67	101.4	9.63	P	2.2	490	11.40	
1-2	30	1,900	2.37	29.0	0.67	96.4	5.38	P	1.6	1,170	6.03	
2-1	29	900	3.33	18.9	0.68	114.0	6.24	P	1.8	150	7.63	
4-1	34	1,300	2.69	23.6	0.67	105.1	6.65	P	1.8	510	7.63	
4-2	107	2,400	2.29	32.6	0.67	91.3	18.19	B	2.5 x 2.0	710	22.50	
5-1	29	1,150	2.61	22.4	0.63	107.1	5.44	P	1.6	550	6.03	
6-1	48	1,100	3.64	20.3	0.58	111.1	8.59	P	2.2	100	11.40	
7-1	35	1,200	2.92	22.3	0.65	107.4	6.79	P	1.8	250	7.63	
8-1	86	1,600	2.50	26.4	0.66	100.3	15.81	B	2.0 x 2.0	800	18.00	
8-2	40	1,200	3.33	21.6	0.66	108.6	7.97	P	2.0	620	9.42	
8-3	19	800	2.50	19.1	0.66	113.5	3.95	P	1.4	320	4.62	
8-4	49	1,500	2.67	25.2	0.66	102.2	9.18	P	2.2	600	11.40	
8-5	13	1,150	3.04	21.6	0.66	108.6	2.59	P	1.2	200	3.39	
9-1	11	800	3.13	18.1	0.60	115.5	2.12	P	1.0	130	2.36	
10-1	10	750	3.33	17.3	0.62	117.2	2.02	P	1.0	150	2.36	
11-1	44	1,300	3.08	22.8	0.64	106.4	8.32	P	2.0	730	9.42	
12-1	42	1,050	2.86	21.0	0.65	109.7	8.32	P	2.0	350	9.42	
13-1	39	1,150	2.61	22.4	0.64	107.1	7.42	P	2.0	400	9.42	
14-1 /5	55	900	2.44	20.3	0.59	111.1	10.00	-	-	-	-	
14-2	205	3,650	0.96	48.6	0.59	74.2	24.91	B	3.0 x 2.0	2,370	27.00	
14-3	27	1,250	2.00	24.8	0.53	102.9	4.09	P	1.6	305	6.03	
14-4	14	650	3.08	16.5	0.53	119.0	2.45	P	1.2	100	3.39	
14-5	42	2,050	2.44	29.8	0.53	95.1	5.88	P	1.8	540	7.63	
14-6	102	2,050	1.63	35.6	0.52	87.5	12.89	P	2.5	1,310	14.72	
14-7	66	1,500	1.33	29.7	0.52	95.3	9.09	P	2.2	795	11.40	
14-8	75	2,300	1.88	33.1	0.52	90.6	9.82	P	2.2	310	11.40	
14-9	14	950	2.50	20.5	0.52	110.8	2.24	P	1.2	150	3.39	
14-10	38	1,600	1.88	28.2	0.58	97.5	5.97	P	1.8	180	7.63	
14-11	83	1,750	1.71	30.1	0.58	94.8	12.67	P	2.5	655	14.72	
14-12	26	1,200	2.17	24.1	0.58	104.1	4.36	P	1.6	560	6.03	
14-13	101	2,400	1.25	37.5	0.46	85.2	11.00	P	2.5	1,490	14.72	
14-14	27	1,150	2.40	22.4	0.53	107.1	4.26	P	1.6	545	6.03	
15-1	145	1,950	1.79	31.3	0.63	93.1	23.61	B	3.0 x 2.0	650	27.00	
16-1	34	1,300	2.69	23.6	0.68	105.1	6.75	P	1.8	320	7.63	
16-2	20	1,000	2.00	22.3	0.68	107.2	4.05	P	1.4	100	4.62	
17-1	51	1,550	1.61	28.8	0.75	96.6	10.26	P	2.2	420	11.40	
18-1	234	2,650	1.51	37.6	0.55	85.1	30.43	B	3.5 x 2.0	100	31.50	
18-2	231	3,000	1.17	42.3	0.55	80.0	28.24	B	3.5 x 2.0	1,675	31.50	

Table 5-29 (2/2). DESIGN DATA AND FEATURES OF PROPOSED DRAINAGE FACILITIES FOR MASTER PLAN

Location No.	Drain Design							Drain Details				Remarks
	Drainage Area (ha)	/1 Distance (m)	/2 Average Gradient (%)	Concentration Time (min)	Runoff Coefficient	Rainfall Intensity (mm/hr)	Runoff Discharge (m^3/s)	/3 Structural Type	/4 Size (m)	Length (m)	Capacity (m^3/s)	
18-3	390	4,050	1.23	48.0	0.55	74.6	44.45	B	2.5 x 2.0	1,775	45.00	
18-4	24	1,500	2.00	27.0	0.55	99.4	3.64	P	1.4	100	4.62	
18-5	11	800	2.50	19.1	0.55	113.5	1.91	P	1.0	100	2.36	
18-6	39	1,600	2.19	27.2	0.55	99.0	5.90	P	1.8	140	7.63	
18-7	139	3,400	1.23	46.2	0.55	76.3	16.20	B	2.0 x 2.0	410	18.00	
18-8	94	2,550	1.37	37.8	0.55	84.9	12.20	P	2.5	80	14.72	
18-9	187	3,800	1.05	48.4	0.57	74.3	21.99	O	3.0 x 2.0	2,395	24.19	With invert
18-10	218	3,600	0.97	48.1	0.57	74.6	25.74	O	3.5 x 2.0	2,865	27.79	With invert
19-1	205	1,900	1.32	33.2	0.64	90.5	32.97	B	2.0 x 2.0	580	36.00	
19-2	54	1,150	2.17	23.4	0.64	105.4	10.11	P	2.2	340	11.40	
19-3	117	1,500	2.33	26.0	0.64	100.9	20.99	B	2.5 x 2.0	130	22.50	
19-4	29	1,600	2.50	26.4	0.59	100.3	4.77	P	1.6	250	6.03	
19-5	37	1,750	2.29	28.1	0.59	97.6	5.92	P	1.8	250	7.63	
19-6	62	1,650	1.82	28.9	0.59	96.5	9.81	P	2.2	1,000	11.40	
19-7	153	2,000	2.25	30.0	0.59	94.8	23.78	B	3.0 x 2.0	200	27.00	
19-8	59	1,550	3.55	24.0	0.55	104.3	9.40	P	2.2	250	11.40	
19-9	40	1,450	3.10	24.0	0.55	104.3	6.38	P	1.8	590	7.63	
19-10	54	1,650	1.52	30.1	0.64	94.7	9.09	P	2.2	920	11.40	
19-11	21	850	1.76	21.3	0.64	109.1	4.07	P	1.4	80	4.62	
19-12	133	2,100	1.43	34.2	0.64	89.3	21.11	B	2.5 x 2.0	470	22.50	
19-13	202	2,300	2.17	32.3	0.64	91.7	32.92	B	2.0 x 2.0	700	36.00	
19-14	37	950	1.05	25.3	0.55	102.0	5.77	P	1.8	120	7.63	

/1 : Distance used in Kerby's Formula.

/2 : Average gradient used in Kerby's Formula.

/3 : P, B, O repesent Pipe Culvert, One-Box Culvert, and Open Channel, respectively.

/4 : The first and second figures of Box Culvert and Open Channel types give the bottom width and the height, respectively.

/5 : Improvement works of Location No.14-1 consist of only inlet.

Table 5-30. FLOW CAPACITY OF EXISTING RIVER CHANNELS

River Basin	River Channel	Sub-Basin No.	Flow Capacity Minimum (m^3/s)	Flow Capacity Average (m^3/s)	Design Discharge (m^3/s)
Mburicao	Mburicao	1	11	115	60
		2	30	140	80
		4	44	150	140
		6-1	42	105	155
		6-3	38	190	175
	San Martin	3	14	60	50
	Santo Domingo	5	16	40	25
	Jose Lombardo	6-2	1	10	11
Itay	Itay	3-1	1	2	15
		3-3	1	7	35
		5	2	8	65
		2-2	10	20	110
		2-3	85	100	250
	Orilla	3-2	1	10	30
	Madame Lynch	1-1	6	22	75
		1-3	14	40	155
		2-1	10	35	170
	Santa Teresa	4-1	1	15	15
		4-2	1	8	35
		4-4	1	7	50
	San Pablo	4-3	4	10	10

Table 5-31(1/2). FEATURES OF ALTERNATIVES FOR FIRST STAGE PROJECT

Alternative Route	Drainage Facilities		Related River Section				
	Total Length (m)	Draiange Area (ha)	Beginning Point (km)	Terminal Point (km)	Section Length (m)	Improvement Section Length (m)	Non-improvement Section Length (m)
(Mburicao river)							
A-1	-	55	8.071 (B.P.)	7.782 (1-3S)	289	90	199
A-2	560	47	--- d i t t o ---			0	289
(Mburicao river)							
B-1	4,150	409	7.238 (1-1S)	5.176 (4-1S)	2,062	568	1,494
B-2	5,365	443	--- d i t t o ---			400	1,662
B-3	4,465	415	--- d i t t o ---			440	1,622
B-4	4,250	404	--- d i t t o ---			440	1,622
B-2 & B-3	5,680	449	--- d i t t o ---			200	1,862
B-2 & B-4	5,465	438	--- d i t t o ---			200	1,862
(San Martin river)							
C-1	2,415	292	1.613 (B.P.)	0.834 (3-1S)	779	687	92
C-2	2,905	292	--- d i t t o ---			600	179

NOTE ( ) : Number of reference point.
B.P. : Beginning point of the river section.
Drainage facilities of A-1 consist of only inlet.

Table 5-31(2/2). FEATURES OF ALTERNATIVES FOR FIRST STAGE PROJECT

Alternative Plan	Type of Facilities	Related River Section				
		Beginning Point (km)	Terminal Point (km)	Section Length (m)	Improvement Section Length (m)	Non-improvement Section Length (m)
(Mburicao river)						
D-1	Rivre improvement	2.526	1.956	570	570	0
D-2	Short-cut channel (180m)					
(Madame Lynch, San Pablo and Santa Teresa rivers)						
E-1	River improvement	2.609 (1-2-1S)	0.0 (2-1)	2,609	2,609 (Madame Lynch)	0
		0.670 (B.P.)	0.323 (2-2)	3,070	3,062 (San Pablo, Santa Teresa and Itay)	0
E-2	Diversion channel (270m)					
E-3	Diversion channel (700m)					
(Itay and Santa Teresa rivers)						
F-1	River improvement	3.231 (3-3)	0.0 (2-3)	3,231	3,231 (Itay)	0
		1.342 (4-2)	0.153 (4-4)	1,189	1,189 (Santa Teresa)	0
F-2	Retarding basin (50,000m^3)					
F-3	Retarding basin (30,000m^3)					
F-2 & F-3	Retarding basins (80,000m^3)					

NOTE ( ) : Number of reference point.
B.P. : Beginning point of the river section.

Table 5-32(1/3). DISCHARGE DISTRIBUTION OF ALTERNATIVES FOR FIRST STAGE PROJECT

Mburicao river 7.78 km (1-3S) to 8.07 km (B.P.)

Alternative Plan		Discharge to be Controlled (m3/s)
(Minimum Flow Capacity)		6
A-1	River	15
A-2	River	6
	Drainage	9

Mburicao river 5.18 km (4-1S) to 7.24 km (1-1S)

Alternative Plan		Discharge to be Controlled (m3/s)			
		1-1S to 1	1 to 2-1S	2-1S to 2	2 to 4-1S
(Minimum Flow Capacity)		43	24	30	100
B-1	River	60	75	80	130
B-2	River	24	35	39	-
	Drainage	36	40	41	-
B-3	River	-	-	73	110
	Draiange	-	-	7	20
B-4	River	-	-	74	111
	Drainage	-	-	6	19
B-2 and B-3	River.	24	35	32	110
	Drainage	36	40	48	20
B-2 and B-4	River	24	35	33	111
	Drainage	36	40	47	19

Table 5-32(2/3). DISCHARGE DISTRIBUTION OF ALTERNATIVES FOR FIRST STAGE PROJECT

San Martin river 0.83 km (3-1S) to 1.61 km (B.P.)

Alternative Plan		Discharge to be Controlled (m3/s)
(Minimum Flow Capacity)		14
C-1	River	35
C-2	River	23
	Drainage	22

Mburicao river 1.96 km to 2.53 km

Alternative Plan		Discharge to be Controlled (m3/s)
(Minimum Flow Capacity)		40
D-1	River	155
D-2	River (Short-cut)	155

Madame Lynch river 0.0 km (2-1) to 2.61 km (1-2-1S)

Alternative Plan		Discharge to be Controlled (m3/s)		
		2-1 to 2-1-1S	2-1-1S to 1-2	1-2 to 1-2-1S
(Minimum Flow Capacity)		9	19	15
E-1	River	170	155	155
E-2	River	30	20	5
	Diversion	-	-	155
E-3	River	15	-	-
	Diversion	155	-	-

Table 5-32(3/3). DISCHARGE DISTRIBUTION OF ALTERNATIVES FOR FIRST STAGE PROJECT

Itay river 0.32 km (2-2) to 1.38km (5)
Santa Teresa river 0.0 km (4-4) to 1.34 km (4-2)
San Pablo river 0.0 (4-3) to 0.67 km (B.P.)

Alternative Plan		Discharge to be Controlled.(m3/s) Santa Teresa River 4-4 to 4-2	San Pablo River 4-3 to B.P.	Itay River 2-2 to 5
(Minimum Flow Capacity)		1	4	4
E-1	River	50	10	110
E-2	River	185	160	230
E-3	River	4-4 to 4-4-1s 185	-	230

Itay river 0.0 km (2-3) to 3.23 km (3-3)
Santa Teresa river 0.15 km(4-4) to 1.34 km (4-2)

Alternative Plan		Discharge to be Controlled (m3/s) Itay River 2-3 to 2-2	2-2 to 5	5 to 3-3	Santa Teresa River 4-4 to 4-2
(Minimum Flow Capacity)		85	4	1	1
F-1	River	250	110	65	50
F-2	River	230	90	65	30
F-3	River	240	100	50	50
F-2 & F-3	River	220	80	50	30

Table 5-33 (1/7). TYPE SELECTION FOR RIVER CHANNEL OF ALTERNATIVES FOR FIRST STAGE PROJECT

Reference Point		Design Discharge (m^3/s)	Improvement Length (m)	Construction Cost ($\phi 10^6$)			Land Acquisition (m^2)			House Evacuation (No.)		
				Type A	Type B	Type C	Type A	Type B	Type C	Type A	Type B	Type C
B-1												
Mburicao River												
1-1S	to 1	60	0	0	0	0	0	0	0	0	0	0
1	to 2-1S	75	98	251	213	189	1,200	800	600	4	0	0
2-1S	to 2	80	344	211	179	159	5,100	2,900	2,500	2	0	0
2	to 4-1S	130	126	277	255	265	1,500	400	200	7	3	3
B-2												
Mburicao River												
1-1S	to 1	24	0	0	0	0	0	0	0	0	0	0
1	to 2-1S	35	30	11	10	11	900	400	300	3	0	0
2-1S	to 2	39	318	92	84	87	4,200	2,100	1,600	1	0	0
2	to 4-1S	130	126	277	255	265	1,500	400	200	7	3	3
B-3												
Mburicao River												
1-1S	to 1	60	0	0	0	0	0	0	0	0	0	0
1	to 2-1S	75	98	251	213	189	1,200	800	600	4	0	0
2-1S	to 2	73	318	193	154	147	4,800	2,600	2,200	2	0	0
2	to 4-1S	110	110	261	237	249	1,200	300	100	6	3	3

Table 5-33 (2/7). TYPE SELECTION FOR RIVER CHANNEL OF ALTERNATIVES FOR FIRST STAGE PROJECT

Reference Point	Design Discharge (m^3/s)	Improvement Length (m)	Construction Cost ($¢10^6$)			Land Acquisition (m^2)			House Evacuation (No.)		
			Type A	Type B	Type C	Type A	Type B	Type C	Type A	Type B	Type C
B-4											
Mburicao River											
1-1S to 1	60	0	0	0	0	0	0	0	0	0	0
1 to 2-1S	75	98	251	213	189	1,200	800	600	4	0	0
2-1S to 2	74	318	196	156	149	4,900	2,700	2,300	2	0	0
2 to 4-1S	111	110	265	240	252	1,300	300	100	6	3	3
B-2 + B-3											
Mburicao River											
1-1S to 1	24	0	0	0	0	0	0	0	0	0	0
1 to 2-1S	35	30	11	10	11	900	400	300	3	0	0
2-1S to 2	32	188	88	74	78	1,700	1,100	900	1	0	0
2 to 4-1S	110	110	261	237	249	1,200	300	100	6	3	3
B-2 + B-4											
Mburicao River											
1-1S to 1	24	0	0	0	0	0	0	0	0	0	0
1 to 2-1S	35	30	11	10	11	900	400	300	3	0	0
2-1S to 2	33	188	91	76	80	1,800	1,100	900	1	0	0
2 to 4-1S	111	110	263	239	251	1,200	300	100	6	3	3
C-1											
San Martin River											
B.P. to 3-1S	35	687	462	325	295	3,600	1,900	1,300	6	4	4

Table 5-33 (3/7). TYPE SELECTION FOR RIVER CHANNEL OF ALTERNATIVES FOR FIRST STAGE PROJECT

Reference Point	Design Discharge (m^3/s)	Improvement Length (m)	Construction Cost ($\phi 10^6$)			Land Acquisition (m^2)			House Evacuation (No.)		
			Type A	Type B	Type C	Type A	Type B	Type C	Type A	Type B	Type C
C-2											
San Martin River											
B.P. to 3-1S	23	257	280	183	169	3,900	1,400	1,100	6	4	4
D-1											
Mburicao River											
No. 19 to No. 24+60	155	570	148	120	135	5,300	2,600	2,100	4	1	1
D-2											
Diversion Channel	155	180	258	187	200	8,100	4,800	3,700	10	5	5
E-1											
Madame Lynch River											
2-1-1S to 2-1	170	1,707	1,087	850	892	32,700	14,300	7,800	15	7	7
1-2 to 2-1-1S	155	517	421	384	411	9,800	3,200	1,600	7	0	0
1-2-1S to 1-2	155	383	-	-	794 (Type D)	-	-	2,200 (Type D)	-	-	0 (Type D)
San Pablo River											
B.P. to 4-3	10	670	128	102	104	3,100	1,500	1,200	3	0	0
Santa Teresa River											
4-2 to 4-4	50	1,189	408	489	508	23,000	12,700	10,300	11	7	6

Table 5-33 (4/7). TYPE SELECTION FOR RIVER CHANNEL OF ALTERNATIVES FOR FIRST STAGE PROJECT

Reference Point	Design Discharge (m^3/s)	Improvement Length (m)	Construction Cost ($10^6)			Land Acquisition ($m^2)			House Evacuation (No.)		
			Type A	Type B	Type C	Type A	Type B	Type C	Type A	Type B	Type C
Itay River											
5 to 2-2	110	1,203	346	465	526	25,300	11,500	8,500	9	5	5
E-2											
Madame Lynch River											
2-1-1S to 2-1	30	803	136	126	148	5,200	1,500	600	6	1	1
1-2 to 2-1-1S	20	100	37	28	30	1,700	0	0	0	0	0
1-2-1S to 1-2	5	0	0	0	0	0	0	0	0	0	0
San Pablo River											
B.P. to 4-3	160	670	653	586	602	11,800	5,900	4,900	19	10	9
Santa Teresa River											
4-2 to 4-4	185	1,189	780	1,018	1,039	42,400	23,000	13,700	33	12	8
Itay River											
5 to 2-2	230	1,203	670	829	890	43,600	22,500	17,400	14	9	8
Diversion Channel	155	270	-	-	710 (Type D)	-	-	1,200 (Type D)	-	-	10 (Type D)

Table 5-33 (5/7). TYPE SELECTION FOR RIVER CHANNEL OF ALTERNATIVES FOR FIRST STAGE PROJECT

Reference Point	Design Discharge (m^3/s)	Improvement Length (m)	Construction Cost ($10^6)			Land Acquisition (m^2)			House Evacuation (No.)		
			Type A	Type B	Type C	Type A	Type B	Type C	Type A	Type B	Type C
E-3											
Madame Lynch River											
2-1-1S to 2-1	15	100	9	11	14	500	100	0	1	0	0
1-2 to 2-1-1S	155	517	421	384	411	9,800	3,200	1,600	7	0	0
1-2-1S to 1-2	155	383	-	-	794 (Type D)	-	-	2,200 (Type D)	-	-	0 (Type D)
San Pablo River											
B.P. to 4-3	10	670	128	102	104	3,100	1,500	1,200	3	0	0
Santa Teresa River											
4-2 to 4-4-1S	50	519	156	213	222	10,300	5,500	4,500	5	3	3
4-4-1S to 4-4	185	614	398	426	434	31,300	15,800	12,100	12	4	2
Itay River											
5 to 2-2	230	1,203	670	829	890	43,600	22,500	17,400	14	9	8
Diversion Channel	155	700	870	838	860	25,800	12,600	10,300	1	1	1

Table 5-33 (6/7). TYPE SELECTION FOR RIVER CHANNEL OF ALTERNATIVES FOR FIRST STAGE PROJECT

Reference Point	Design Discharge (m^3/s)	Improvement Length (m)	Construction Cost ($\$10^6$)			Land Acquisition (m^2)			House Evacuation (No.)		
			Type A	Type B	Type C	Type A	Type B	Type C	Type A	Type B	Type C
F-1											
Itay River											
2-2 to 2-3	250	323	202	223	235	13,300	6,600	4,700	0	0	0
5 to 2-2	110	1,203	346	465	526	25,300	11,500	8,500	9	5	5
3-3 to 5	65	1,705	854	692	835	24,000	14,400	9,800	21	5	4
Santa Teresa River											
4-2 to 4-4	50	1,189	408	489	508	23,000	12,700	10,300	11	7	6
F-2											
Itay River											
2-2 to 2-3	230	323	181	202	215	12,100	5,700	4,100	0	0	0
5 to 2-2	90	1,203	326	391	442	22,500	9,000	7,900	7	4	3
3-3 to 5	65	1,705	854	692	835	24,000	14,400	9,800	21	5	4
Santa Teresa River											
4-2 to 4-4	30	1,189	263	314	336	17,200	5,200	4,000	8	3	2

Table 5-33 (7/7). TYPE SELECTION FOR RIVER CHANNEL OF ALTERNATIVES FOR FIRST STAGE PROJECT

Reference Point	Design Discharge (m^3/s)	Improvement Length (m)	Construction Cost ($\phi 10^6$)			Land Acquisition (m^2)			House Evacuation (No.)		
			Type A	Type B	Type C	Type A	Type B	Type C	Type A	Type B	Type C
F-3											
Itay River											
2-2 to 2-3	240	323	190	214	225	12,700	6,200	4,400	0	0	0
5 to 2-2	100	1,203	341	428	484	23,900	10,300	8,200	8	5	4
3-3 to 5	50	1,705	738	602	721	22,500	10,600	6,500	17	5	4
Santa Teresa River											
4-2 to 4-4	50	1,189	408	489	508	23,000	12,700	10,300	11	7	6
F-2 + F-3											
Itay River											
2-2 to 2-3	220	323	172	193	205	11,400	5,200	3,800	0	0	0
5 to 2-2	80	1,203	311	410	463	20,700	7,800	5,500	7	4	3
3-3 to 5	50	1,705	738	602	721	22,500	10,600	6,500	17	5	4
Santa Teresa River											
4-2 to 4-4	30	1,189	263	314	336	17,200	5,200	4,000	8	3	2

Note: Type A : Excavated Channel without Revetment
Type B : Excavated Channel with Revetment without Invert
Type C : Excavated Channel with Revetment and Invert
Type D : Box Culvert

Table 5-34 (1/3). TYPE SELECTION OF RIVER CHANNEL OF ENTIRE RIVER SECTION FOR FIRST STAGE PROJECT

Reference Point	Design Discharge (m^3/s)	Improvement Length (m)	Construction Cost (¢Million)			Land Acquisition (m^2)			House Evacuation (No.)		
			Type A	Type B	Type C	Type A	Type B	Type C	Type A	Type B	Type C
Mburicao River											
B.P. to 1-3S	15	90	100	79	70	800	400	250	0	2	1
1-3S to 1-2S	20	0	-	-	-	-	-	-	-	-	-
1-2S to 1-1S	25	0	-	-	-	-	-	-	-	-	-
1-1S to 1	60	0	-	-	-	-	-	-	-	-	-
1 to 2-1S	75	98	251	213	189	1,200	800	600	4	0	0
2-1S to 2	80	344	211	179	159	5,100	2,900	2,500	2	0	0
2 to 4-1S	130	126	277	255	265	1,500	400	200	7	3	3
4-1S to 4	140	1,079	347	272	294	6,500	4,100	3,200	12	4	3
4 to 6-1	155	1,340	590	393	579	12,600	9,300	7,600	15	1	1
6-1 to 6-3	175	527	492	436	449	5,600	3,100	1,500	10	0	0
Sub-Total		3,604									
Jose Lombarde River											
B.P. to 6-2	11	622	212	143	149	4,200	1,900	1,300	4	1	1
Santo Domingo River											
B.P. to 5	25	355	234	172	181	2,400	1,300	700	4	1	1
San Martin River											
B.P. to 3-1S	35	687	462	325	295	3,600	1,900	1,300	6	4	4
3-1S to 3	50	355	415	292	265	4,100	2,200	1,500	4	2	2
Sub-Total		1,042									
Total	11,040	5,623									

Note: Type A : Excavated Channel without Revetment
Type B : Excavated Channel with Revetment without Invert
Type C : Excavated Channel with Revetment and Invert

Table 5-34 (2/3). TYPE SELECTION OF RIVER CHANNEL OF ENTIRE RIVER SECTION FOR FIRST STAGE PROJECT

Reference Point	Design Discharge (m^3/s)	Improvement Length (m)	Construction Cost (¢Million)			Land Acquisition (m^2)			House Evacuation (No.)		
			Type A	Type B	Type C	Type A	Type B	Type C	Type A	Type B	Type C
Itay River											
B.P. to 3-1-1S	10	369	29	25	28	2,400	1,400	1,000	5	0	0
3-1-1S to 3-1	15	679	163	127	140	5,700	3,300	1,800	7	0	0
3-1 to 3-3	35	952	228	223	230	3,900	1,200	900	10	0	0
3-3 to 5	65	1,705	854	692	835	24,000	14,400	9,800	21	5	4
5 to 2-2	110	1,203	346	465	526	25,300	11,500	8,500	9	5	5
2-2 to 2-3	250	323	202	223	235	13,300	6,600	4,700	0	0	0
Sub-Total		5,231									
Orilla River											
B.P. to 3-2-1S	25	438	129	114	117	4,300	1,600	1,300	5	2	2
3-2-1S to 3-2	30	1,817	472	411	429	17,800	6,200	5,200	7	4	4
Sub-Total		2,255									
Santa Teresa River											
B.P. to 4-1	15	482	160	108	115	3,100	1,500	1,100	8	1	1
4-1 to 4-2	35	1,031	476	417	425	15,100	8,800	6,800	8	6	5
4-2 to 4-4	50	1,189	408	489	508	23,000	12,700	10,300	11	7	6
Sub-Total		2,702									
San Pablo River											
B.P. to 4-3	10	670	128	102	104	3,100	1,500	1,200	3	0	0

Table 5-34 (3/3). TYPE SELECTION OF RIVER CHANNEL OF ENTIRE RIVER SECTION FOR FIRST STAGE PROJECT

Reference Point		Design Discharge (m^3/s)	Improvement Length (m)	Construction Cost ($\phi 10^6$)			Land Acquisition (m^2)			House Evacuation (No.)		
				Type A	Type B	Type C	Type A	Type B	Type C	Type A	Type B	Type C
Madame Lynch River												
B.P.	to 1-1S	75	211	-	-	220 (Type D)	-	-	700 (Type D)	-	-	0 (Type D)
1-1	to 1-2	155	2,310	-	-	4,900 (Type D)	-	-	7,400 (Type D)	-	-	15 (Type D)
1-2	to 2-1-1S	155	517	421	384	411	9,800	3,200	1,600	7	0	0
2-1-1S	to 2-1	170	1,707	1,087	850	892	32,700	14,300	7,800	15	7	7
Sub-Total			4,745									
Total			15,603									

Note: /1 : Figures for Type D (Box Culvert).

Table 5-35 (1/2). OPTIMUM STRUCTURAL TYPE OF RIVER CHANNEL OF ALTERNATIVES FOR FIRST STAGE PROJECT

Alternative Case	River Name	Reference Point		Design Discharge (m3/s)	Optimum Channel Type /1	Cost (G106)	Land Acquisition (m2)	House Evacuation (No.)
B-1	Mburicao	1-1S	to 1	60	- /2	0	0	0
		1	to 2-1S	75	C	189	600	0
		2-1S	to 2	80	C	159	2,500	0
		2	to 4-1S	130	B	255	400	3
	Sub-Total					603	3,500	3
B-2	Mburicao	1-1S	to 1	24	- /2	0	0	0
		1	to 2-1S	35	B	10	400	0
		2-1S	to 2	39	B	84	2,100	0
		2	to 4-1S	130	B	255	400	3
	Sub-Total					349	2,900	3
B-3	Mburicao	1-1S	to 1	60	- /2	0	0	0
		1	to 2-1S	75	C	189	600	0
		2-1S	to 2	73	C	147	2,200	0
		2	to 4-1S	110	B	237	300	3
	Sub-Total					573	3,100	3
B-4	Mburicao	1-1S	to 1	60	- /2	0	0	0
		1	to 2-1S	75	C	189	600	0
		2-1S	to 2	74	C	149	2,300	0
		2	to 4-1S	111	B	240	300	3
	Sub-Total					578	3,200	3
B-2 + B-3	Mburicao	1-1	to 1	24	- /2	0	0	0
		1	to 2-1S	35	B	10	400	0
		2-1S	to 2	32	B	74	1,100	0
		2	to 4-1S	110	B	237	300	3
	Sub-Total					321	1,800	3
B-2 + B-3	Mburicao	1-1S	to 1	24	- /2	0	0	0
		1	to 2-1S	35	B	10	400	0
		2-1S	to 2	33	B	76	1,100	0
		2	to 4-1S	111	B	239	300	3
	Sub-Total					325	1,800	3
C-1	San Martin	B.P.	to 3-1S	35	C	295	1,300	4
C-2	San Martin	B.P.	to 3-1S	23	C	169	1,100	4
D-1	Mburicao	No. 19	to No. 24+60	155	B	120	2,600	1
D-2	Diversion Channel			155	B	187	4,800	5
E-1	Madame Lynch	2-1-1S	to 2-1	170	B	850	14,300	7
		1-2	to 2-1-1S	155	B	384	3,200	0
		1-2-1S	to 1-2	155	D	794	2,200	0
	Sub-Total					2,028	19,700	7
	San Pablo	B.P.	to 4-3	10	B	102	1,500	0
	Santa Teresa	4-2	to 4-4	50	A	408	23,300	11
	Itay	5	to 2-2	110	A	346	25,300	9
	Total of E-1					2,884	69,500	27
E-2	Madame Lynch	2-1-1S	to 2-1	30	B	126	1,500	1
		1-2	to 2-1-1S	20	B	28	0	0
		1-2-1S	to 1-2	5	- /2	0	0	0
	Sub-Total					154	1,500	1

Note:
/1 Type of River Channel;
- A : Channel Without Revetment
- B : Channel With Revetment and Without Invert
- C : Channel With Revetment and Invert
- D : Box Culvert

/2 River improvement is not necessary.

Table 5-35 (2/2). OPTIMUM STRUCTURAL TYPE OF RIVER CHANNEL OF ALTERNATIVES FOR FIRST STAGE PROJECT

Alternative Case	River Name	Reference Point		Design Discharge (m3/s)	Optimum Channel Type /1	Cost (G106)	Land Acquisition (m2)	House Evacuation (No.)
E-2	San Pablo	B.P.	to 4-3	160	B	586	5,900	10
	Santa Teresa	4-2	to 4-4	185	A	780	42,400	33
	Itay	5	to 2-2	230	A	670	43,600	14
	Diversion Channel			155	D	710	1,200	10
	Total of E-2					2,900	94,600	68
E-3	Madame Lynch	2-1-1S	to 2-1	15	A	9	500	1
		1-2	to 2-1-1S	155	B	384	3,200	0
		1-2-1S	to 1-2	155	D	794	2,200	0
	Sub Total					1,187	5,900	1
	San Pablo	B.P.	to 4-3	10	B	102	1,500	0
	Santa Teresa	4-2	to 4-4-1S	50	A	156	10,300	5
		4-4-1S	to 4-4	185	A	398	31,300	12
	Sub Total					554	41,600	17
	Itay	5	to 2-2	230	A	670	43,600	14
	Diversion Channel			155	B	838	12,600	1
	Total of E-3					3,351	105,200	33
F-1	Itay	2-2	to 2-3	250	A	202	13,300	0
		5	to 2-2	110	A	346	25,300	9
		3-3	to 5	65	B	692	14,400	5
	Sub Total					1,240	53,000	14
	Santa Teresa	4-2	to 4-4	50	A	408	23,000	11
	Total of F-1					1,648	76,000	25
F-2	Itay	2-2	to 2-3	230	A	181	12,100	0
		5	to 2-2	90	A	326	22,500	7
		3-3	to 5	65	B	692	14,400	5
	Sub Total					1,199	49,000	12
	Santa Teresa	4-2	to 4-4	30	A	263	17,200	8
	Retarding Basin			V = 50,000 m^3		290	25,000	0
	Total of F-2					1,752	91,200	20
F-3	Itay	2-2	to 2-3	240	A	190	12,700	0
		5	to 2-2	100	A	341	23,900	8
		3-3	to 5	50	B	602	10,600	5
	Sub Total					1,133	47,200	13
	Santa Teresa	4-2	to 4-4	50	A	408	23,000	11
	Retarding Basin			V = 30,000 m^3		110	20,000	0
	Total of F-3					1,651	90,200	24
F-2 + F-3	Itay	2-2	to 2-3	220	A	172	11,400	0
		5	to 2-2	80	A	311	20,700	7
		3-3	to 5	50	B	602	10,600	5
	Sub Total					1,085	42,700	12
	Santa Teresa	4-2	to 4-4	30	A	263	17,200	8
	Retarding Basin			V = 80,000 m^3		400	45,000	0
	Total of F-2 + F-3					1,748	104,900	20

Table 5-36. OPTIMUM STRUCTURAL TYPE OF PROPOSED RIVER CHANNEL FOR FIRST STAGE PROJECT

River Name	Reference Point		Design Discharge (m^3/s)	Improvement Length (m)	Optimum Channel Type /1	Land Acquisition (m^2)	House Evacuation (No.)	Bridge (place)	Groundsill with Head (place)
Mburicao River Basin									
Mburicao	B.P.	to 1-3S	15	90	C	800	1	1	0
	1-3S	to 1-2S	20	0	- /2	-	-	0	0
	1-2S	to 1-1S	25	0	- /2	-	-	0	0
	1-1S	to 1	60	0	- /2	-	-	1	0
	1	to 2-1S	75	98	C	600	0	2	1
	2-1S	to 2	80	344	C	2,500	0	0	2
	2	to 4-1S	130	126	B	400	3	1	0
	4-1S	to 4	140	1,079	B	4,100	4	0	1
	4	to 6-1	155	1,340	B	9,300	1	1	2
	6-1	to 6-3	175	527	B	3,100	0	2	1
Sub-Total				3,604		20,800	9	8	7
Jose Lombarde	B.P.	to 6-2	11	622	B	1,900	1	2	2
Santo Domingo	B.P.	to 5	25	355	B	1,300	1	2	0
San Martin	B.P.	to 3-1S	35	687	C	1,300	4	4	2
	3-1S	to 3	50	355	C	1,500	2	0	1
Sub-Total				1,042		2,800	6	4	3
Total				5,623		26,800	17	16	12
Itay River Basin									
Itay	B.P.	to 3-1-1S	10	369	B	1,400	0	0	1
	3-1-1S	to 3-1	15	679	B	3,300	0	2	1
	3-1	to 3-3	35	952	B	1,200	0	3	4
	3-3	to 5	65	1,705	B	14,400	5	5	5
	5	to 2-2	110	1,203	A	25,300	9	0	0
	2-2	to 2-3	250	323	A	13,300	0	0	0
Sub-Total				5,231		58,900	14	10	11
Orilla	B.P.	to 3-2-1S	25	438	B	1,600	2	2	1
	3-2-1S	to 3-2	30	1,817	B	6,200	4	5	4
Sub-Total				2,255		7,800	6	7	5
Santa Teresa	B.P.	to 4-1	15	482	B	1,500	1	2	3
	4-1	to 4-2	35	1,031	B	8,800	6	3	3
	4-2	to 4-4	50	1,189	A	23,000	11	1	0
Sub-Total				2,702		33,300	18	6	6
San Pablo	B.P.	to 4-3	10	670	B	1,500	0	2	1
Madame Lynch	B.P.	to 1-1S	75	211	D	700	0	0	0
	1-1	to 1-2	155	2,310	D	7,400	15	0	0
	1-2	to 2-1-1S	155	517	B	3,200	0	3	0
	2-1-1S	to 2-1	170	1,707	B	14,300	7	4	4
Sub-total				4,745		25,600	22	7	4
Total				15,603		127,100	60	32	27
Grand Total				21,226		153,900	79	48	39

Note: /1 Channel Type; A : Channel Without Revetment
B : Channel With Revetment and Without Invert
C : Channel With Revetment and Invert
D : Box Culvert

/2 River improvement is not necessary.

Table 5-37 (1/2). OPTIMUM STRUCTURAL TYPES OF PROPOSED DRAINAGE FACILITIES FOR FIRST STAGE PROJECT

Location/1 No.	Section	Structural Type	Present Use	Reason for Adoption
Mburicao River Basin				
14-1 /2	-	-	Road	-
14-2	Whole Section	Underground Conduit	Road	No space for open channel; underground utilities existing.
14-3	-do-	-do-	Road	-do-
14-4	-do-	-do-	Road	-do-
14-5	-do-	-do-	Road	-do-
14-6	-do-	-do-	Road	-do-
14-7	-do-	-do-	Road	-do-
14-8	-do-	-do-	Road	-do-
14-9	-do-	-do-	Road	-do-
14-10	-do-	-do-	Road	-do-
14-11	-do-	-do-	Road	-do-
14-12	440m of Upper Section	-do-	Road	-do-
	120m of Lower Section	-do-	Open space	Economically justified.
14-13	Whole Section	-do-	Road	No space for open channel; underground utilities existing.
14-14	365m of Upper Section	-do-	Road	-do-
	180m of Lower Section	Open Channel	Existing channel	Sufficient open space available.

Note

/1 : The location of drainage facilities is shown in Fig. 5-47.
/2 : Improvement works of Location No. 14-1 consist of only inlets.

Table 5-37 (2/2). OPTIMUM STRUCTURAL TYPES OF PROPOSED DRAINAGE FACILITIES FOR FIRST STAGE PROJECT

Location/1 No.	Section	Structural Type	Present Use	Reason for Adoption
Itay River Basin				
18-1	Whole Section	Underground Conduit	Road	No space for open channel.
18-2	190m of Upper Section	Open Channel	Existing channel	Sufficient open space available.
	1,485m of Lower Section	Underground Conduit	Road	No space for open channel.
18-3	915m of Upper and Middle Section	-do-	Road	-do-
	860m of Middle and Lower Section	Open Channel	Existing channel	Sufficient open space available.
18-4	Whole Section	Underground Conduit	Road	No space for open channel.
18-5	-do-	-do-	Road	-do-
18-6	-do-	-do-	Road	-do-
18-7	250m of Upper Section	Open Channel	Existing channel	Sufficient open space available.
	160m of Lower Section	Underground Conduit	Road	No space for open channel.
18-8	Whole Section	-do-	Road	-do-
18-9	-do-	Open Channel	Existing channel	Sufficient open space available.
18-10	-do-	-do-	Existing channel	-do-

Table 5-38. CONSTRUCTION COST AND HOUSE EVACUATION OF ALTERNATIVES FOR FIRST STAGE PROJECT

Alternative Plan	Cost (in million Guarani)					Land Acquisition (m^2)	House Evacuation (No.)
	River Channel	Diversion Channel	Retarding Basin	Drainage Facilities	Total		
A-1	70	-	-	29	99	200	1
A-2	-	-	-	242	242	0	0
B-1	603	-	-	1,941	2,544	3,500	3
B-2	349	-	-	3,215	3,564	2,900	3
B-3	573	-	-	2,032	2,605	3,100	3
B-4	578	-	-	1,982	2,560	3,200	3
B-2 & B-3	321	-	-	3,306	3,627	1,800	3
B-2 & B-4	325	-	-	3,256	3,581	1,800	3
C-1	295	-	-	928	1,223	1,300	4
C-2	169	-	-	1,218	1,387	1,100	4
D-1	120	-	-	-	120	2,600	1
D-2	187	-	-	-	187	4,800	5
E-1	2,884	-	-	-	2,884	69,500	27
E-2	2,190	710	-	-	2,900	94,600	68
E-3	2,513	838	-	-	3,351	105,200	33
F-1	1,648	-	-	-	1,648	76,500	25
F-2	1,462	-	290	-	1,752	91,200	20
F-3	1,541	-	110	-	1,651	90,200	24
F-2 & F-3	1,348	-	400	-	1,748	104,900	20

Table 5-39 (1/2). DESIGN DISCHARGE FOR FIRST STAGE PROJECT

River	Reference Point		Section Length (m)	Design Discharge (m^3/s)
Mburicao River Basin				
Mburicao River	B.P.	to 1-3S	289	15
	1-3S	to 1-2S	191	20
	1-2S	to 1-1S	354	25
	1-1S	to 1	241	60
	1	to 2-1S	1,169	75
	2-1S	to 2	458	80
	2	to 4-1S	194	130
	4-1S	to 4	1,437	140
	4	to 6-1	1,527	155
	6-1	to 6-3	1,612	175
Sub-Total			7,472	
Jose Lombarde River	B.P.	to 6-2	802	11
Santo Domingo River	B.P.	to 5	1,130	25
San Martin River	B.P.	to 3-1S	779	35
	3-1S	to 3	857	50
Sub-Total			1,636	
Total (Mburicao River Basin)			11,040	
Itay River Basin				
Itay River	B.P.	to 3-1-1S	369	10
	3-1-1S	to 3-1	679	15
	3-1	to 3-3	952	35
	3-3	to 5	1,705	65
	5	to 2-2	1,203	110
	2-2	to 2-3	323	250
Sub-Total			5,231	
Orilla River	B.P.	to 3-2-1S	438	25
	3-2-1S	to 3-2	1,817	30
Sub-Total			2,255	

Table 5-39 (2/2). DESIGN DISCHARGE FOR FIRST STAGE PROJECT

River	Reference Point		Section Length (m)	Design Discharge (m^3/s)
Santa Teresa River	B.P.	to 4-1	482	15
	4-1	to 4-2	1,031	35
	4-2	to 4-4	1,189	50
Sub-Total			2,702	
San Pablo River	B.P.	to 4-3	670	10
Madame Lynch River	B.P.	to 1-1	211	75
	1-1	to 1-2	2,310	155
	1-2	to 2-1-1S	517	155
	2-1-1S	to 2-1	1,707	170
Sub-Total			4,745	
Total (Itay River Basin)			15,603	

Table 5-40(1/2). FEATURES OF PROPOSED RIVER CHANNEL FOR FIRST STAGE PROJECT (MBURICAO RIVER BASIN)

River and Reference Point	Section Length (m)	Design Discharge (m3/s)	Structure Type	Dimension/1 (m)	Cross-sectional Type /2
Mbruricao river					
B.P. to 1-3S	289	15	channel with revetments and Invert	2.0 x 1.4	C
1-3S to 1-2S	191	20	no improvement	-	-
1-2S to 1-1S	354	25	no improvement	-	-
1-1S to 1	241	60	no improvement	-	-
1 to 2-1S	1,169	75	channel with revetments and invert	5.6 x 2.5	C
2-1S to 2	458	80	- ditto -	6.1 x 2.5	C
2 to 4-1S	194	130	channel wtih revetments	12.7 x 2.5	B
4-1S to 4	1,437	140	- ditto -	13.7 x 2.5	B
4 to 6-1	1,527	155	- ditto -	15.2 x 2.5	B
6-1 to 6-3	1,612	175	- ditto -	17.1 x 2.5	B
Jose Lombarde river					
B.P. to 6-2	802	11	- ditto -	3.3 x 1.0	B
Santo Domingo river					
B.P. to 5	1,130	25	- ditto -	5.6 x 1.1	B
San Martin river					
B.P. to 3-1S	779	35	channel with revetments and invert	4.5 x 1.6	C
3-1S to 3	847	50	- ditto -	5.3 x 1.8	C

NOTE /1 : Breadth x Height
/2 : Types B and C are drawn below.

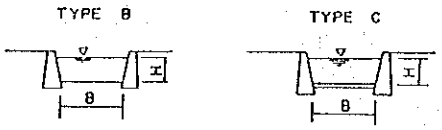


Table 5-40(2/2), FEATURES OF PROPOSED RIVER CHANNEL FOR FIRST STAGE PROJECT (ITAY RIVER BASIN)

River and Reference Point	Section Length (m)	Design Discharge (m3/s)	Structure Type	Dimension/1 (m)	Cross-sectional Type/2
Itay river					
B.P. to 3-1-1S	369	10	channel with revetments	2.7 x 1.0	B
3-1-1S to 3-1	679	15	- ditto -	3.0 x 1.2	B
3-1 to 3-3	952	35	- ditto -	5.6 x 1.5	B
3-3 to 5	1,705	65	- ditto -	8.0 x 2.0	B
5 to 2-2	1,203	110	channel without protection	11.1 x 2.5	A
2-2 to 2-3	323	250	channel without revetments	45.5 x 2.5	A
Orilla river					
B.P. to 3-2-1S	438	25	- ditto -	5.1 x 1.3	B
3-2-1S to 3-2	1,817	30	- ditto -	6.0 x 1.3	B
Santa Teresa					
B.P. to 4-1-1S	482	15	- ditto -	3.6 x 1.0	B
4-1-1S to 4-2	1,032	35	- ditto -	7.4 x 1.5	B
4-2 to 4-4	1,189	50	channel without protection	9.2 x 2.0	A
San Pablo river					
B.P. to 4-3	670	10	channel with revetments	3.7 x 1.0	B
Madame Lynch river					
B.P. to 1-1-S	211	75	underground culvert	3.0 x 2.6 x 2 boxes	D(1)
1-1-S to 1-2	2,310	155	underground culvert	4.1 x 3.0 x 3 boxes	D(2)
1-2 to 2-1-1S	517	155	channel with revetments	12.4 x 3.0	B
2-1-1S to 2-1	1,707	170	- ditto -	13.7 x 3.0	B

NOTE /1 : Breadth x Height
/2 : Types A, B and D are drawn below.

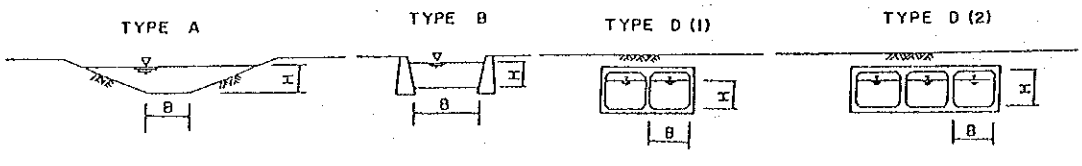


Table 5-41 (1/4). DESIGN DATA AND FEATURES OF PROPOSED DRAINAGE FACILITIES FOR FIRST STAGE PROJECT

Location No.	Pipe No.	Area (ha)	Accumulated Area (ha)	Concentration Time (min)	Runoff Coefficient	Rainfall Intensity (mm/hr)	Runoff Discharge (m^3/s)	Grade (%)	Structural Type /1	Size /2 (m)	Length (m)	Capacity (m^3/s)	Velocity (m/s)	Remarks /3
MBURICAO RIVER BASIN														
14-1 /4	(0)		55.0	20.3	0.59	111.1	10.0	-	-	-	-	-	-	D=900 m; S=0.024
14-2	(0)	48.1		32.4										D=1,250 m; S=0.0064
	1	18.9	67.0	34.4	0.59	89.0	9.77	0.32	P	2.2	350	11.28	2.92	
	2	28.2	95.2	35.2	0.59	88.0	13.74	0.45	B	2.0 x 2.0	175	13.84	3.84	
	3	53.5	148.7	35.9	0.59	87.1	21.22	0.65	B	2.4 x 2.0	220	21.52	4.98	
	4	14.0	162.7	36.8	0.59	86.1	22.96	0.60	B	2.6 x 2.0	260	23.12	4.94	
	5	14.2	176.9	37.9	0.59	84.8	24.60	0.57	B	2.8 x 2.0	315	24.96	4.95	
	6	15.5	192.4	39.1	0.59	83.4	26.31	0.55	B	3.0 x 2.0	365	26.95	4.99	
	7	12.6	205.0	41.4	0.59	81.0	27.21	0.52	B	3.1 x 2.0	685	27.66	4.96	
14-3	(0)	19.8		21.3										D=950 m; S=0.022
	1	7.2	27.0	23.0	0.53	106.0	4.21	0.50	P	1.6	305	5.94	2.95	
14-4	(0)	13.7		15.4										D=550 m; S=0.030
	1	0.3	14.0	16.0	0.53	120.3	2.48	0.75	P	1.2	100	3.38	2.98	
14-5	(0)	38.8		25.9										D=1,500 m; S=0.024
	1	3.2	42.0	28.9	0.53	96.4	5.96	0.43	P	1.8	540	7.54	2.96	
14-6	(0)	46.7		23.8										D=1,150 m; S=0.020
	1	0.6	47.3	24.5	0.52	103.4	7.07	0.37	P	2.0	125	9.26	2.95	
	2	16.8	64.1	26.1	0.52	100.8	9.33	0.32	P	2.2	285	11.10	2.92	
	3	37.6	101.7	27.6	0.52	98.4	14.46	0.50	B	2.0 x 2.0	370	14.59	4.05	
		Discharge from 80.1 ha out of the 101.7 ha flows into the pipe constructed by IDB Project.												
	4	19.3	40.9	29.4	0.52	95.8	5.66	0.40	P	1.8	305	7.27	2.86	
	5	17.1	58.0	30.6	0.52	94.0	7.88	0.35	P	2.0	210	9.01	2.87	
		Pipe No. 3 of 14-7 joins with the following pipe:												
	6	-	124.0	30.7	0.52	94.0	16.83	0.70	B	2.0 x 2.0	15	17.26	4.79	

/1 : P, B, 2B, O represent Pipe Culvert, one Box Culvert, 2-Box Culvert and Open Channel, respectively.
/2 : The first and second figures of Box Culvert and Open Channel types give the bottom width and the height, respectively.
/3 : D and S in the remarks column represent distance and average gradient used in Kerby's Formula, respectively.
/4 : Improvement works of Location No.14-1 consist of only inlet.

Table 5-41 (2/4). DESIGN DATA AND FEATURES OF PROPOSED DRAINAGE FACILITIES FOR FIRST STAGE PROJECT

Location No.	Pipe No.	Area		Drain Design				Drain Details						Remarks /3
		Area (ha)	Accumulated Area (ha)	Concentration Time (min)	Runoff Coefficient	Rainfall Intensity (mm/hr)	Runoff Discharge (m^3/s)	Grade (%)	Structural Type /1	Size /2 (m)	Length (m)	Capacity (m^3/s)	Velocity (m/s)	
14-7	(0)	31.3		19.4										D=700 m; S=0.018
	1	3.1	34.4	20.7	0.52	110.4	5.49	0.43	P	1.8	225	7.54	2.96	
	2	11.8	46.2	22.8	0.52	106.5	7.11	0.37	P	2.0	365	9.25	2.95	
	3	19.8	66.0	24.0	0.52	104.4	9.95	0.32	P	2.2	205	11.10	2.92	
		Pipe No. 3 of 14-7 joins with Pipe No. 6 of 14-6.												
14-8	(0)	48.0		30.5										D=2,000 m; S=0.021
	1	15.9	63.9	31.7	0.52	92.6	8.54	0.37	P	2.0	205	9.26	2.95	
	2	11.1	75.0	32.3	0.52	91.7	9.93	0.32	P	2.2	105	11.10	2.92	
14-9	(0)	13.1		19.0										D=850 m; S=0.029
	1	0.9	14.0	19.8	0.52	112.0	2.27	0.75	P	1.2	150	3.38	2.99	
14-10	1	36.9		27.7										D=1,500 m; S=0.018
		1.1	38.0	28.7	0.58	96.8	5.92	0.43	P	1.8	180	7.54	2.96	
14-11	(0)	51.6		23.1										D=1,100 m; S=0.021
	1	7.2	58.8	23.9	0.58	104.5	9.90	0.32	P	2.2	140	11.10	2.92	
	2	24.2	83.0	26.1	0.58	100.7	13.47	0.45	B	2.0 x 2.0	515	13.84	3.84	
14-12	(0)	7.2		16.0										D=600 m; S=0.030
	1	3.7	10.9	18.5	0.58	114.7	2.01	0.90	P	1.0	440	2.27	2.89	
	2	15.1	26.0	19.3	0.58	113.2	4.74	0.40	P	1.6	120	5.31	2.64	
14-13	(0)	14.2		20.1										D=800 m; S=0.020
	1	6.2	20.4	21.8	0.46	108.2	2.82	0.75	P	1.2	305	3.38	2.99	
	2	21.0	41.4	23.5	0.46	105.2	5.56	0.43	P	1.8	300	7.54	2.96	
	3	33.2	74.6	24.7	0.46	103.1	9.82	0.32	P	2.2	215	11.10	2.92	
	4	12.1	86.7	26.3	0.46	100.5	11.14	0.35	B	2.0 x 2.0	320	12.20	3.39	
	5	14.3	101.0	27.9		98.0	12.64	0.40	B	2.0 x 2.0	350	13.05	3.62	
14-14	(0)	13.1		18.7										D=700 m; S=0.021
	1	8.6	21.7	20.8	0.53	110.2	3.52	0.60	P	1.4	365	4.56	2.96	
	2	2.3	24.0	21.8	0.53	108.2	3.82	1.50	O	1.5 x 1.0	180	4.37	2.89	

Table 5-41 (3/4) DESIGN DATA AND FEATURES OF PROPOSED DRAINAGE FACILITIES FOR FIRST STAGE PROJECT

Location No.	Pipe No.	Area (ha)	Accumulated Area (ha)	Concentration Time (min)	Runoff Coefficient	Rainfall Intensity (mm/hr)	Runoff Discharge (m^3/s)	Grade (%)	Structural Type /1	Size /2 (m)	Length (m)	Capacity (m^3/s)	Velocity (m/s)	Remarks /3
ITAY RIVER BASIN														
18-1	(0)	234.0		37.0										D=2,550 m; S=0.015
	1	-	234.0	37.3	0.55	85.4	30.54	0.75	2B	2.5 x 1.4	100	30.76	4.88	
18-2	(0-1)	79.3		27.5										D=850 m; S=0.0059
	1	3.7	83.0	28.8	0.55	96.7	12.26	0.50	O	2.5 x 2.0	190	12.90	2.51	
	(0-2)	36.7		28.9										D=1,400 m; S=0.013
	2	1.2	37.9	29.5	0.55	95.7	5.54	0.43	O	1.8	100	7.54	2.96	
	3	37.1	158.0	31.6	0.55	92.6	22.35	0.63	B	2.5 x 2.0	640	22.43	4.98	
	4	69.5	227.5	33.3	0.55	90.4	31.41	0.80	2B	1.8 x 2.0	505	31.72	4.89	
	5	3.5	231.0	34.2	0.55	89.2	31.47	0.50	2B	2.2 x 2.0	240	33.40	4.22	
18-3	(0)	235.7		36.1										D=2,250 m; S=0.013
	1	10.5	246.2	37.0	0.55	85.8	32.27	0.75	2B	1.9 x 2.0	270	33.20	4.85	
	2	3.9	250.1	37.4	0.55	85.4	32.63	0.94	O	4.2 x 2.0	90	32.73	3.99	
	3	80.3	330.4	39.5	0.55	83.0	41.90	0.76	O	4.3 x 2.5	500	42.14	3.94	
	4	55.3	385.7	41.7	0.55	80.7	47.53	0.60	2B	2.2 x 2.5	645	48.21	4.87	
	5	4.3	390.0	42.8	0.55	79.5	47.38	0.72	P	4.9 x 2.5	270	47.88	3.97	
18-4	(0)	22.4		27.2										D=1,450 m; S=0.018
	1	1.6	24.0	27.8	0.55	98.2	3.60	0.60	P	1.4	100	4.56	2.96	
18-5	(0)	9.8		19.5										D=750 m; S=0.020
	1	1.2	11.0	20.1	0.55	111.6	1.88	0.95	P	1.0	100	2.34	2.98	
18-6	(0)	34.9		27.0										D=1,500 m; S=0.020
	1	4.1	39.0	27.8	0.55	98.1	5.85	0.43	P	1.8	140	7.54	2.96	
18-7	(0)	128.7		41.3										D=3,000 m; S=0.013
	1	7.5	136.2	42.6	0.55	79.8	16.60	0.85	O	2.5 x 2.0	250	16.82	3.27	
	2	2.8	139.0	43.2	0.55	79.2	16.82	0.70	B	2.0 x 2.0	160	17.26	4.79	
18-8	(0)	92.2		37.9										D=2,500 m; S=0.013
	1	1.8	94.0	38.3	0.55	84.3	12.11	0.35	B	2.0 x 2.0	80	12.20	3.39	

Table 5-41 (4/4). DESIGN DATA AND FEATURES OF PROPOSED DRAINAGE FACILITIES FOR FIRST STAGE PROJECT

Location No.	Pipe No.	Area		Drain Design				Drain Details						Remarks /3
		Area (ha)	Accumulated Area (ha)	Concentration Time (min)	Runoff Coefficient	Rainfall Intensity (mm/hr)	Runoff Discharge (m^3/s)	Grade (%)	Structural Type /1	Size /2 (m)	Length (m)	Capacity (m^3/s)	Velocity (m/s)	
18-9	(0)	94.6		29.3										D=1,600 m; S=0.016
	1	18.6	113.2	31.4	0.57	92.9	16.65	0.90	0	2.1 x 2.0	500	17.60	3.97	With invert
	2	24.7	137.9	33.3	0.57	90.4	19.74	0.80	0	2.5 x 2.0	450	20.40	3.96	-do-
	3	24.2	162.1	35.2	0.57	88.0	22.59	0.75	0	2.8 x 2.0	450	22.60	3.97	-do-
	4	20.0	182.1	38.0	0.57	84.6	24.40	0.70	0	3.1 x 2.0	675	24.64	3.96	-do-
	5	4.9	187.0	39.4	0.57	83.1	24.60	0.60	0	3.4 x 2.0	320	25.46	3.76	-do-
18-10	(0)	19.6		24.8										D=800 m; S=0.0082
	1	17.9	37.5	27.3	0.57	98.9	5.87	1.00	0	2.0 x 1.0	475	6.27	3.20	With invert
	2	70.5	108.0	29.4	0.57	95.7	16.37	0.70	0	2.2 x 2.0	455	16.40	3.57	-do-
	3	16.6	124.6	31.5	0.57	92.8	18.31	0.80	0	2.3 x 2.0	485	18.48	3.86	-do-
	4	24.8	149.4	32.1	0.57	92.0	21.76	0.65	0	2.9 x 2.0	135	21.94	3.74	-do-
	5	42.4	191.8	34.3	0.57	89.1	27.07	0.60	0	3.6 x 2.0	500	27.24	3.82	-do-
	6	26.2	218.0	36.1	0.57	86.9	29.99	0.60	0	4.0 x 2.0	425	30.86	3.93	-do-
	7	-	218.0	36.1	0.57	86.9	29.99	0.50	0	4.3 x 2.0	390	30.68	3.66	-do-

FIGURES

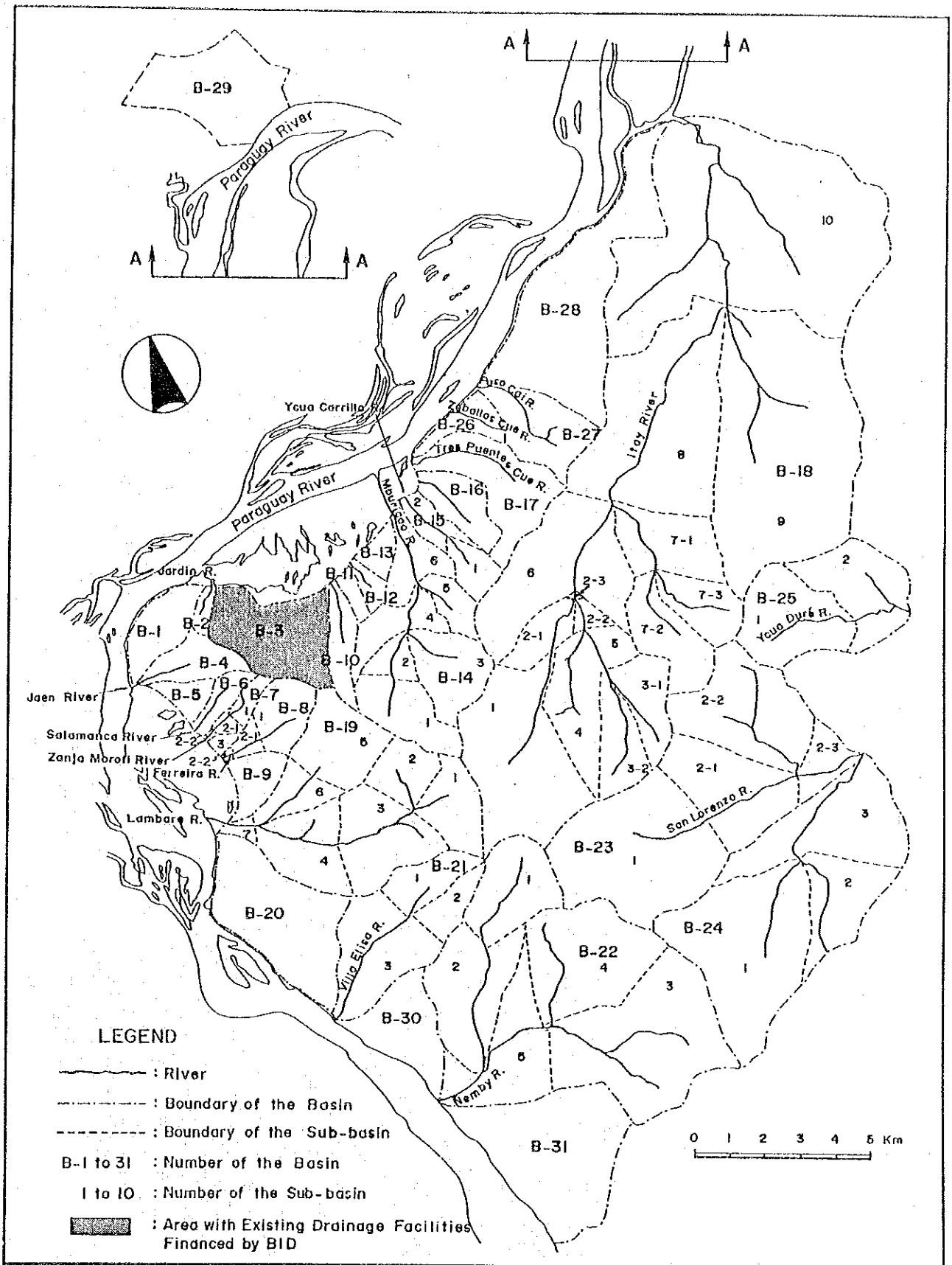


Fig. 5-1. ASUNCION CITY AND THE NEIGHBORHOOD AREA

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

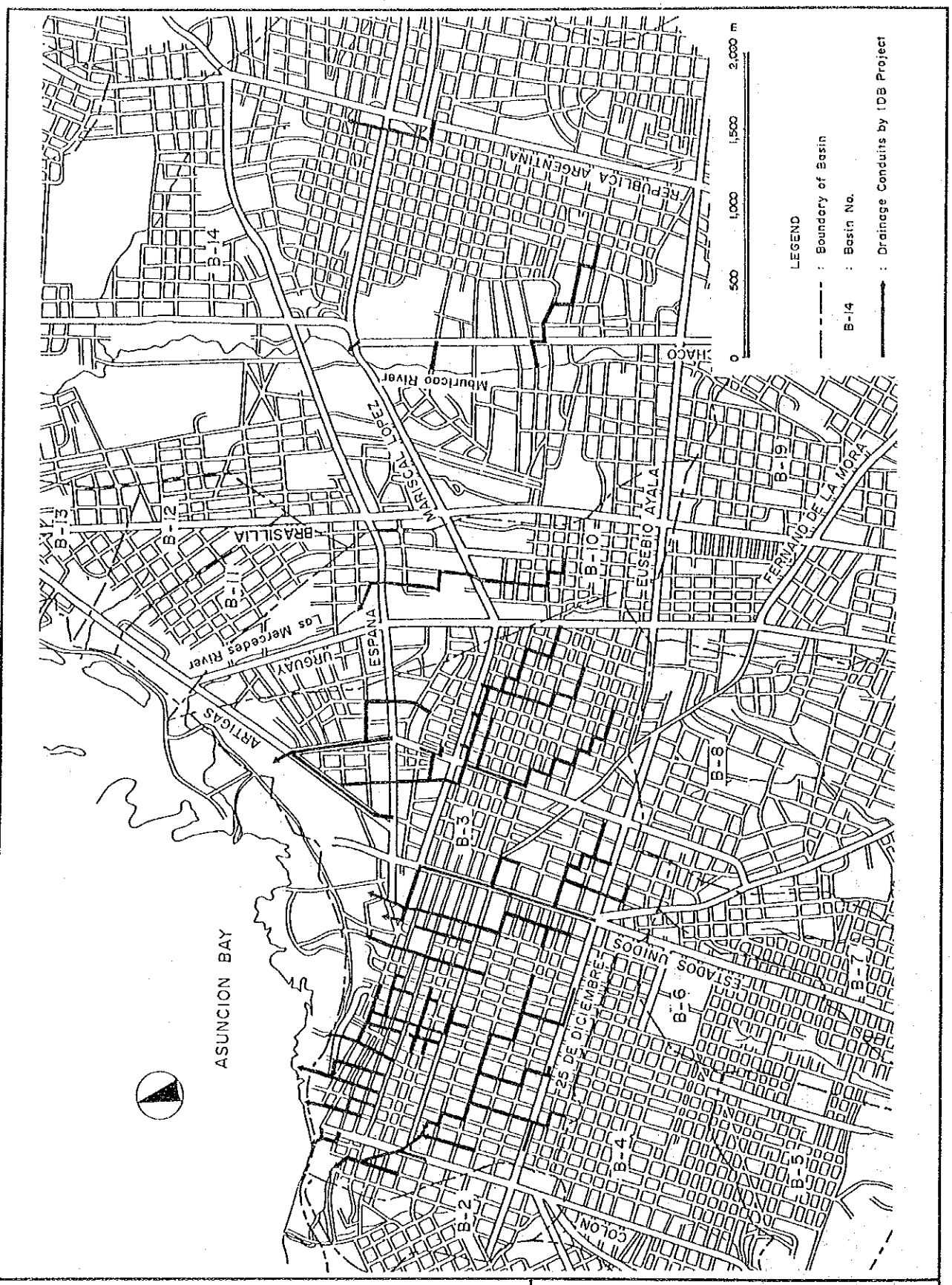


Fig. 5-2. LOCATION OF DRAINAGE SYSTEM BY IDB PROJECT

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

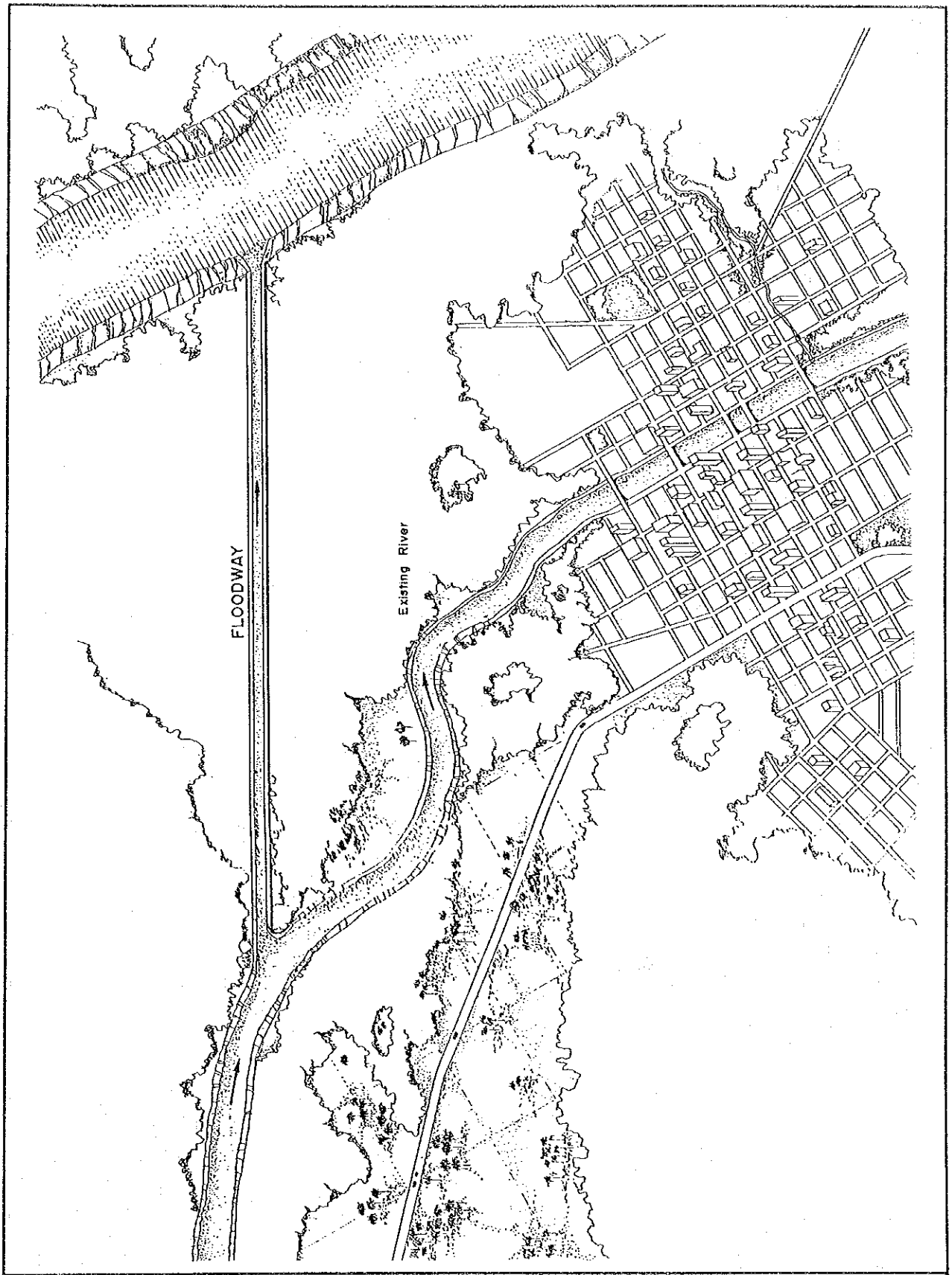


Fig. 5-3. EXAMPLE OF FLOODWAY

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY
JAPAN INTERNATIONAL COOPERATION AGENCY

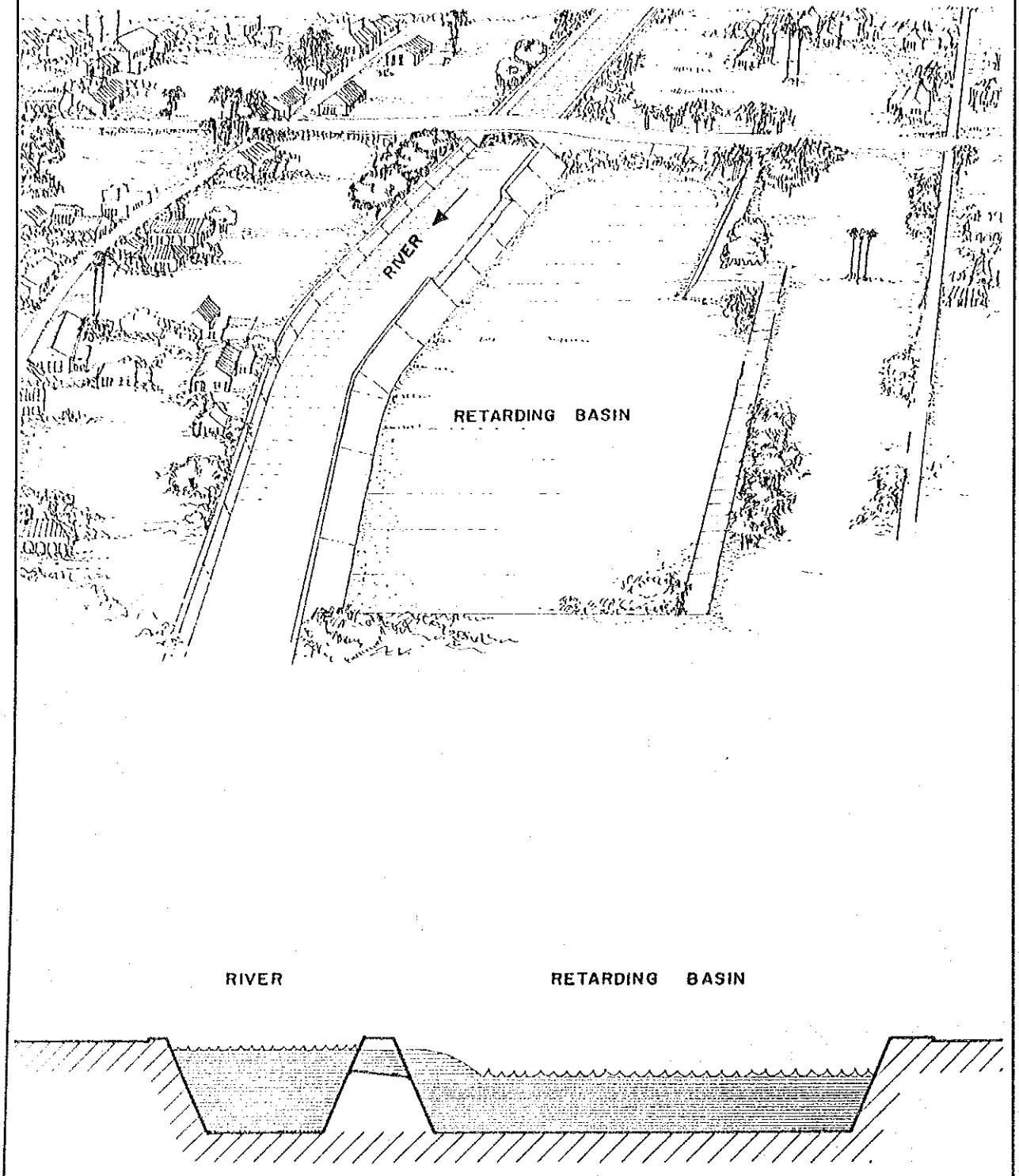
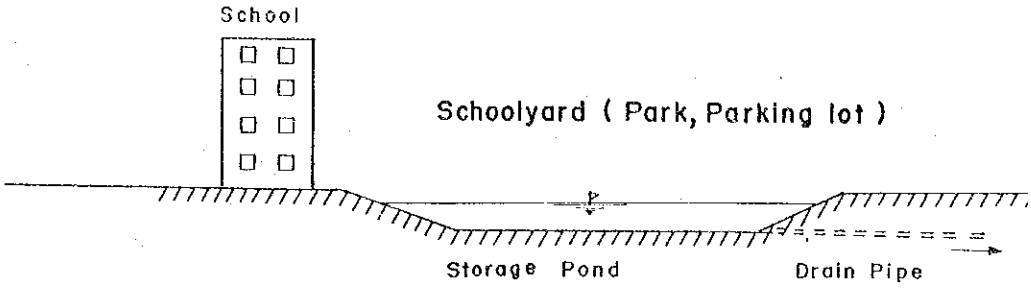
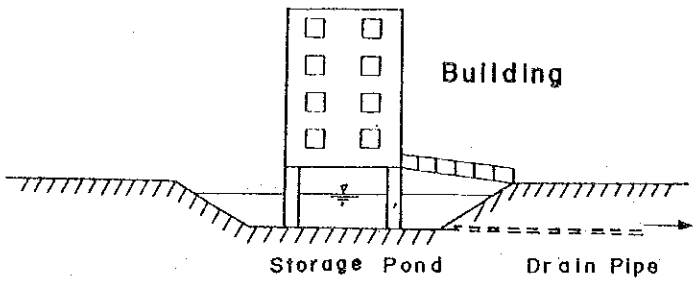
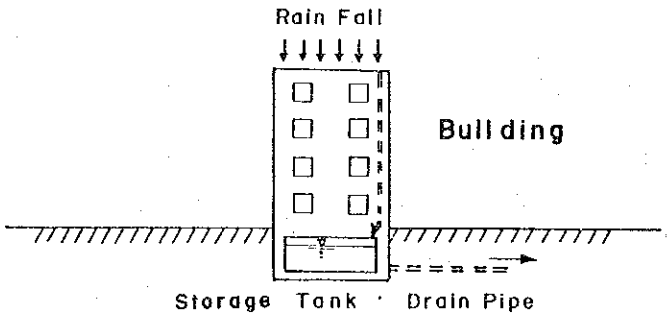


Fig. 5-4. EXAMPLE OF RETARDING BASIN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY
JAPAN INTERNATIONAL COOPERATION AGENCY







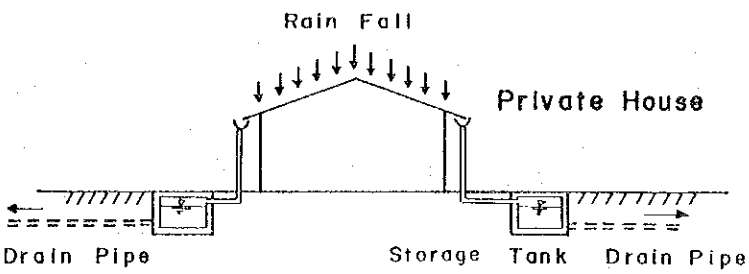
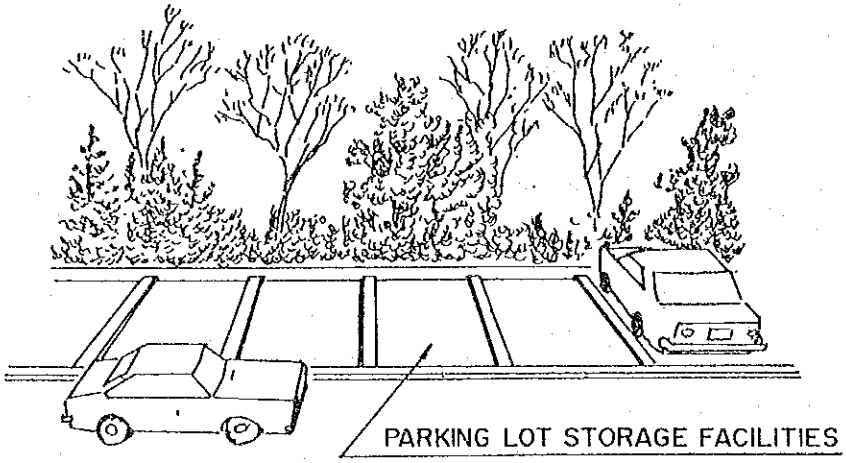


Fig. 5-5(1/2). TYPICAL STORAGE FACILITIES

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY



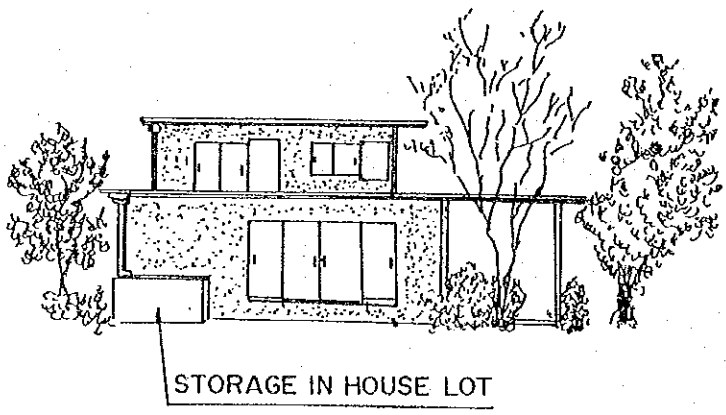


Fig. 5-5(2/2). TYPICAL STORAGE FACILITIES

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY
JAPAN INTERNATIONAL COOPERATION AGENCY

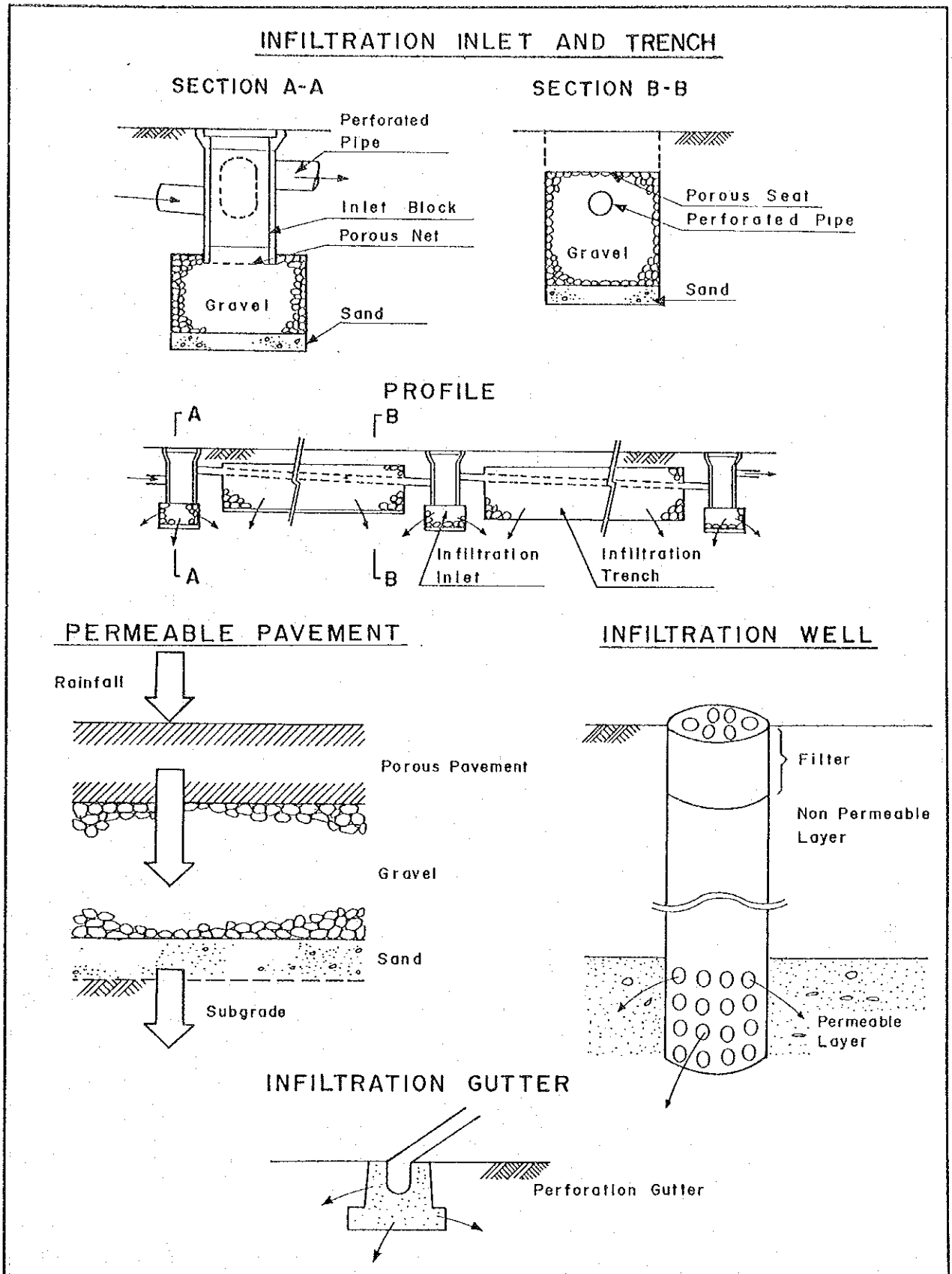
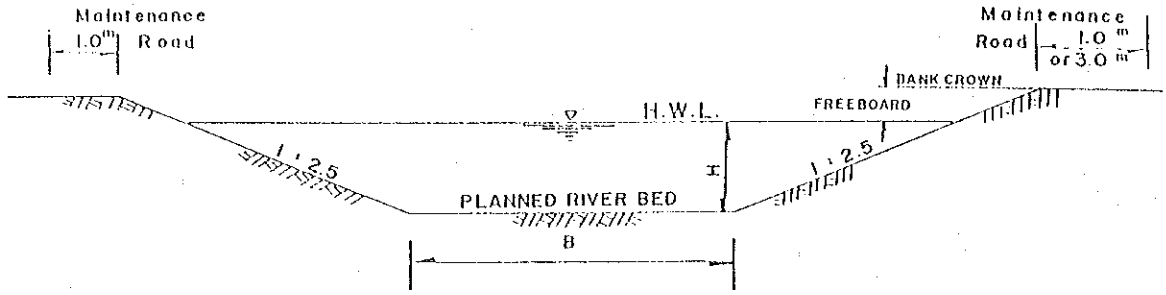


Fig. 5-6. TYPICAL INFILTRATION FACILITIES

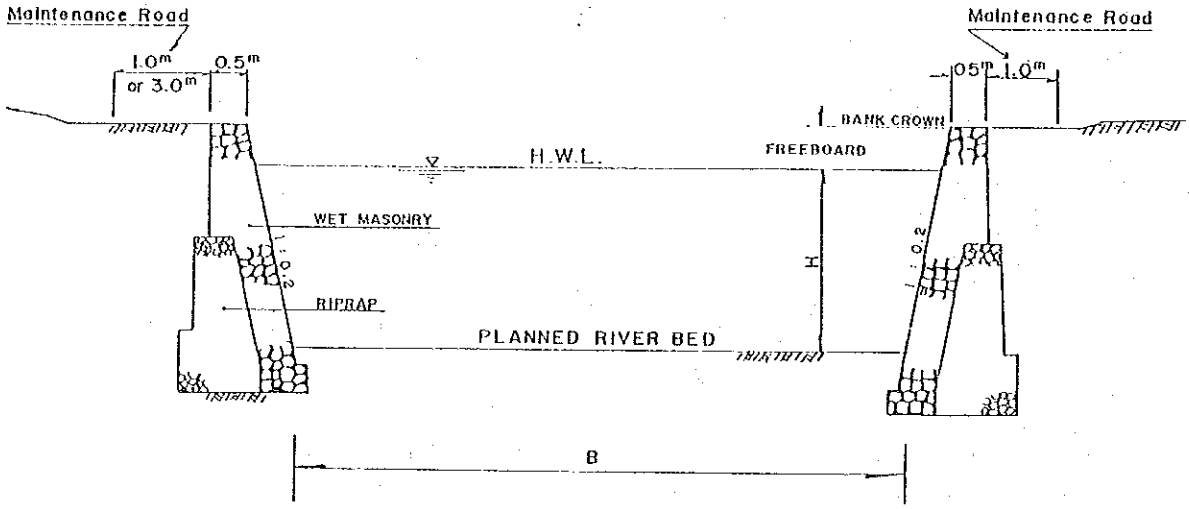
STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

Channel without Revetment (TYPE A)



Channel with Revetment and without Invert (TYPE B)



Channel with Revetment and Invert (TYPE C)

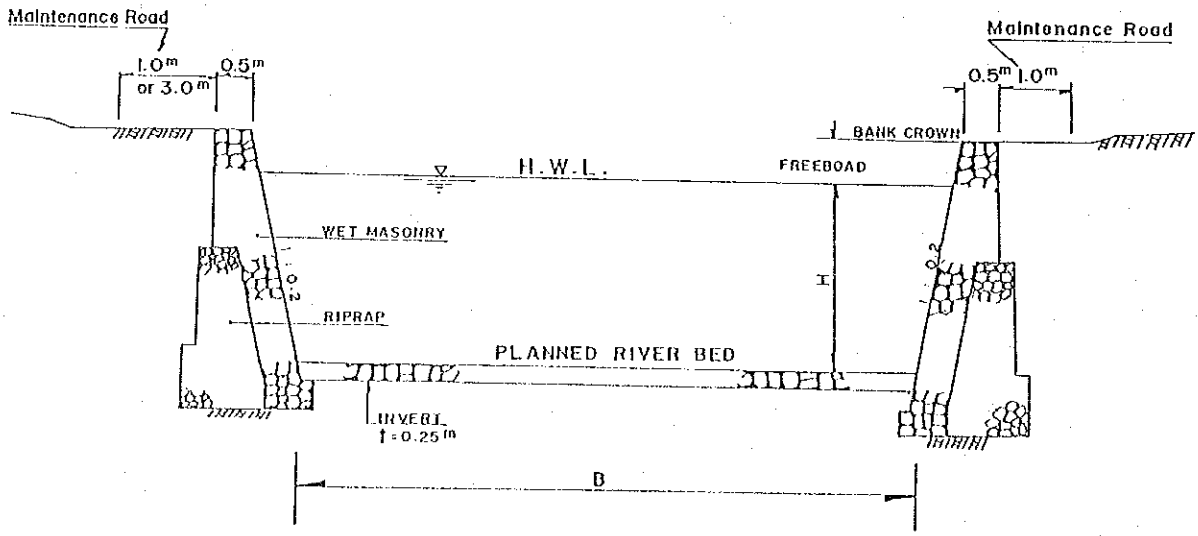
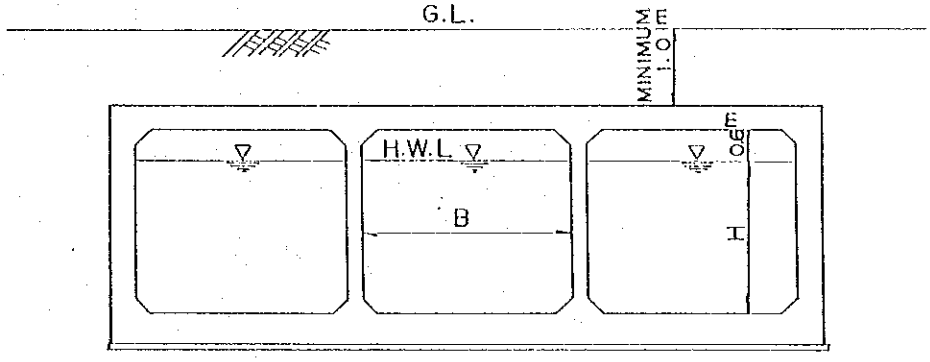


Fig. 5-7 (1/2). STANDARD DRAWING OF RIVER IMPROVEMENT

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

Box Culvert (TYPE D)



Channel with Embankment (TYPE E)

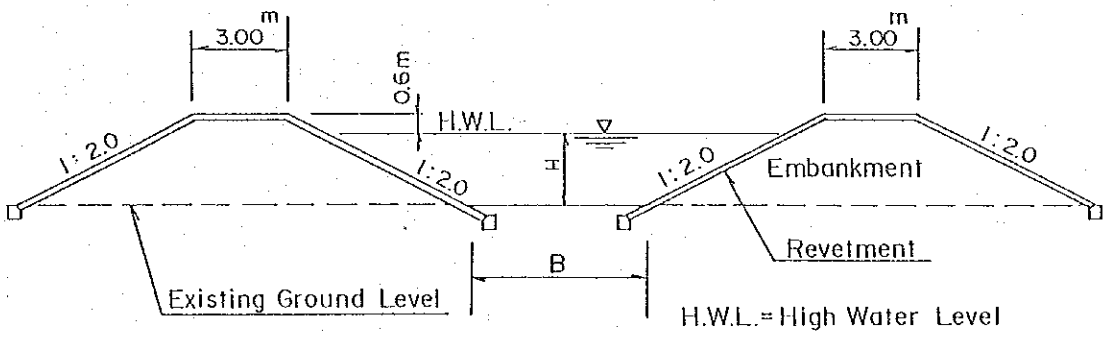


Fig. 5-7 (2/2). STANDARD DRAWING OF RIVER IMPROVEMENT

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

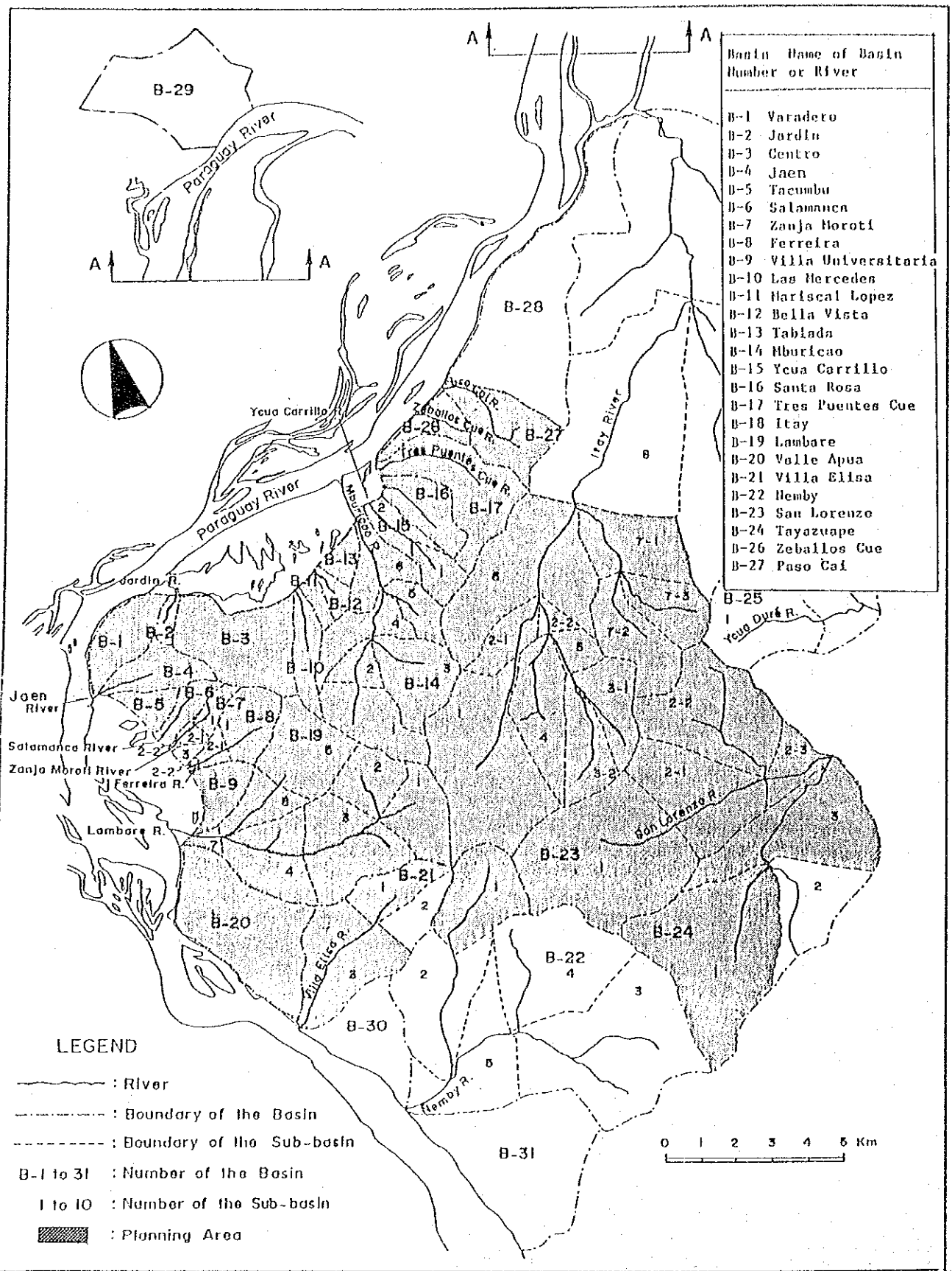


Fig. 5-8. PLANNING AREA

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

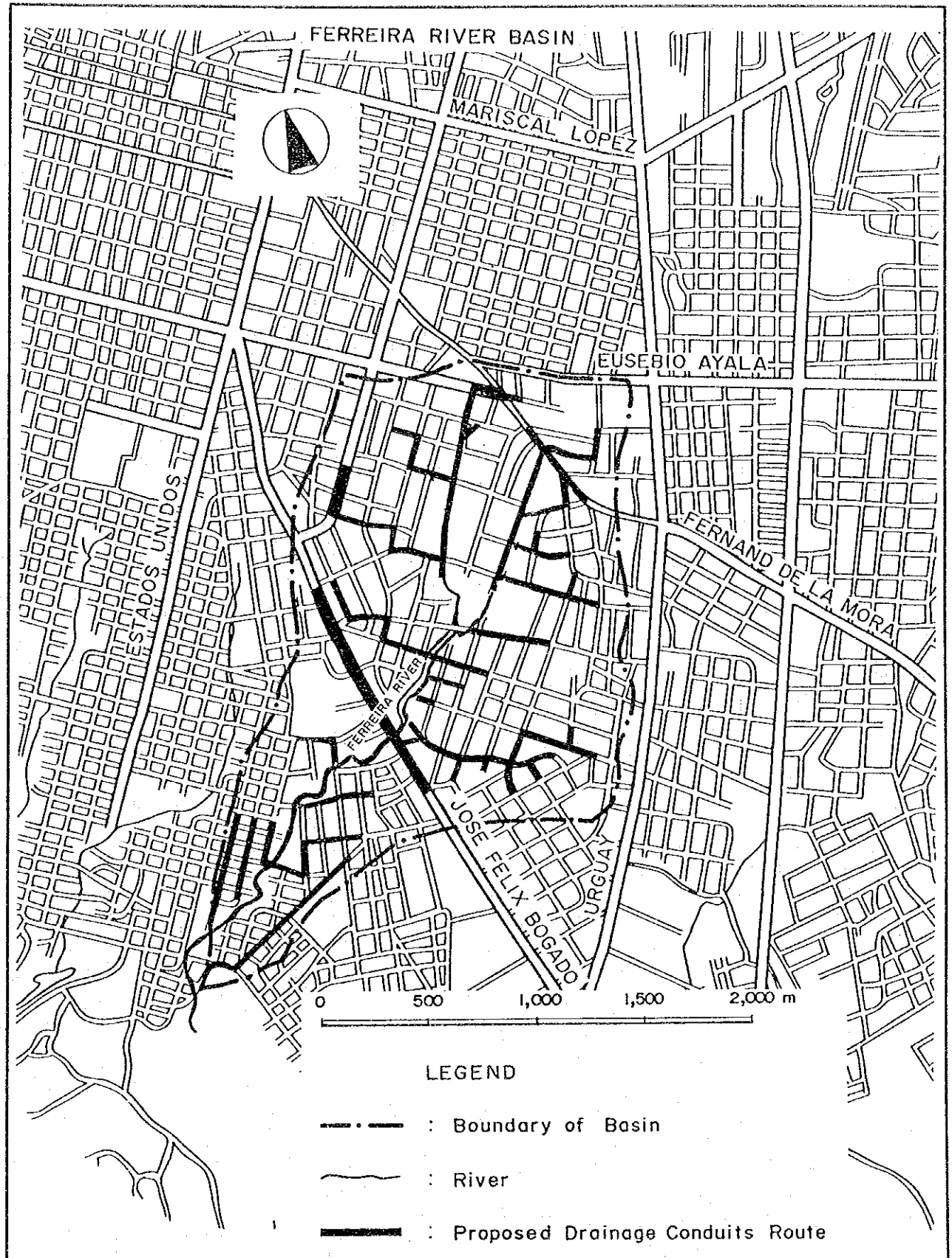


Fig. 5-9(1/2). LAYOUT OF DRAINAGE FACILITIES PROPOSED IN MODEL BASIN (FERREIRA RIVER BASIN)

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

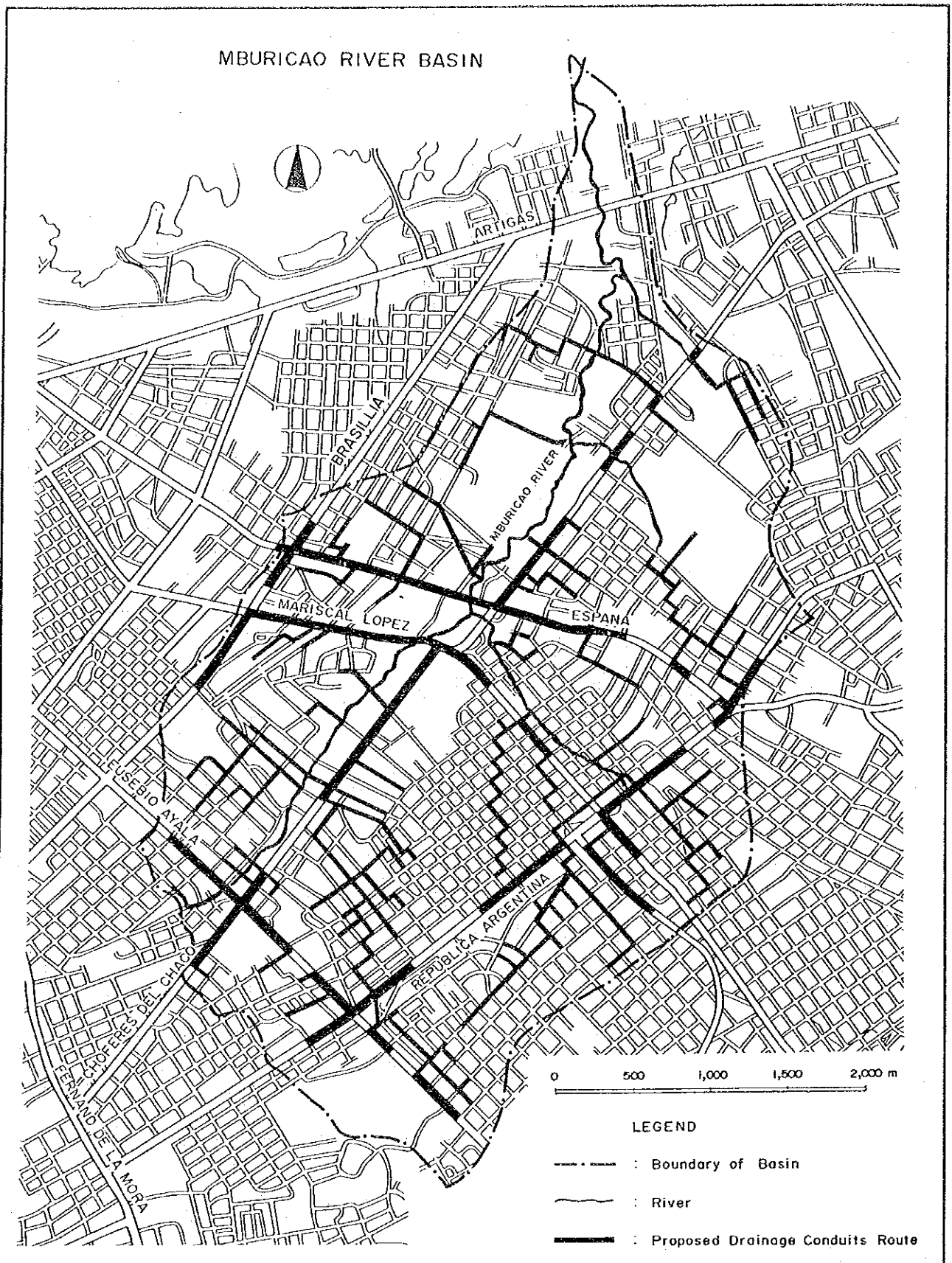


Fig. 5-9(2/2). LAYOUT OF DRAINAGE FACILITIES PROPOSED IN MODEL BASIN (MBURICAO RIVER BASIN)

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

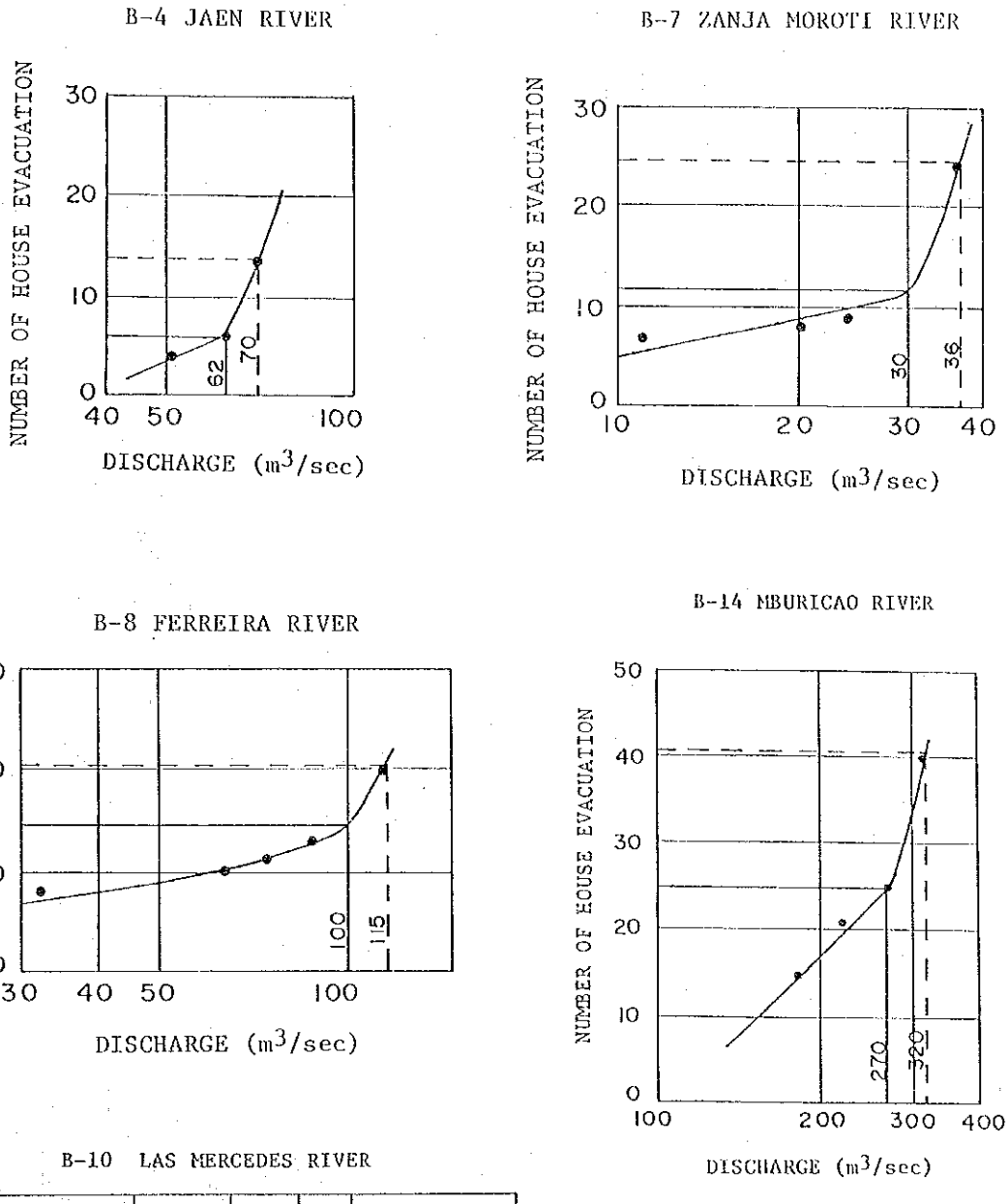
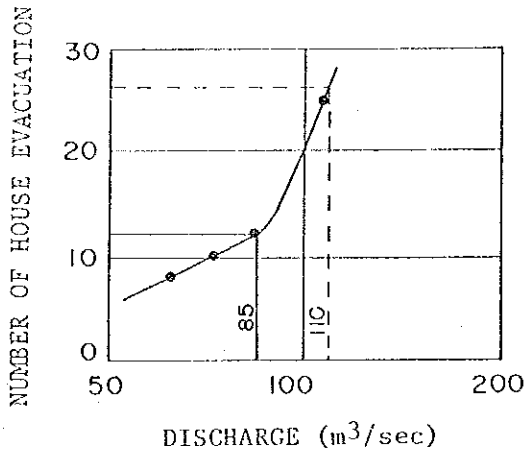


Fig. 5-10(1/2). DISCHARGE AND NUMBER OF HOUSE EVACUATION

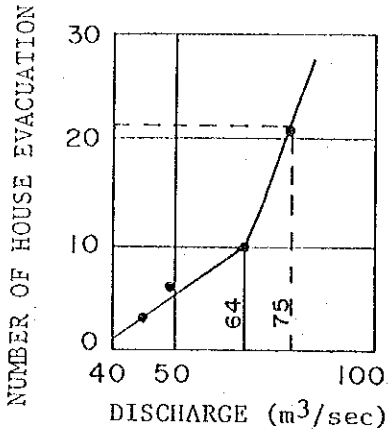
STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

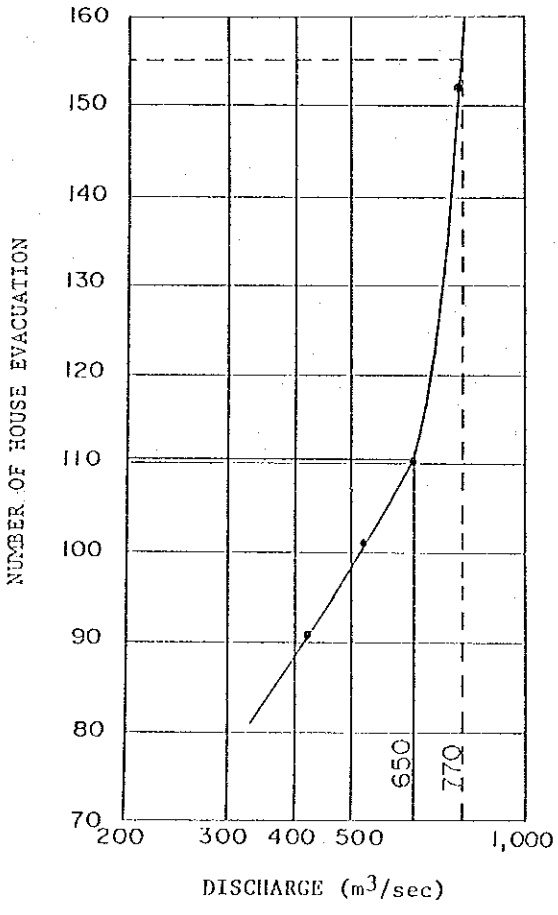
B-15 YCUA CARRILLO RIVER



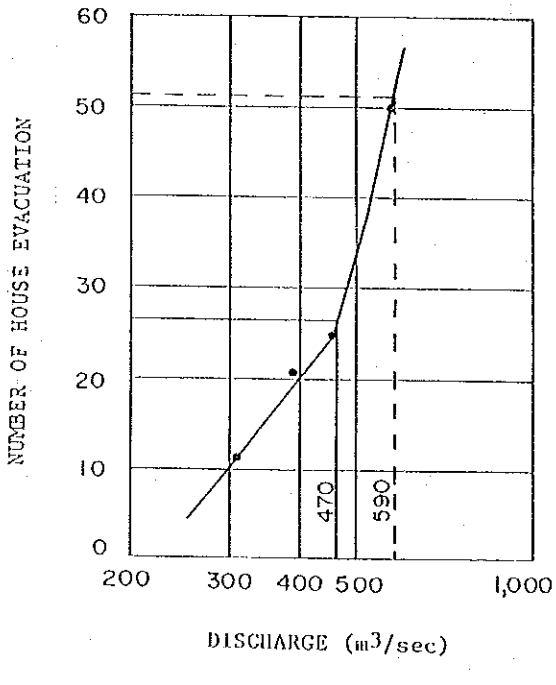
B-16 SANTA ROSA RIVER



B-18 ITAY RIVER



B-19 LAMBARE RIVER



LEGEND

——— : DESIGN DISCHARGE FOR OPTIMUM PLAN

- - - - : DESIGN DISCHARGE FOR CASE I

Fig. 5-10(2/2). DISCHARGE AND NUMBER OF HOUSE EVACUATION

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

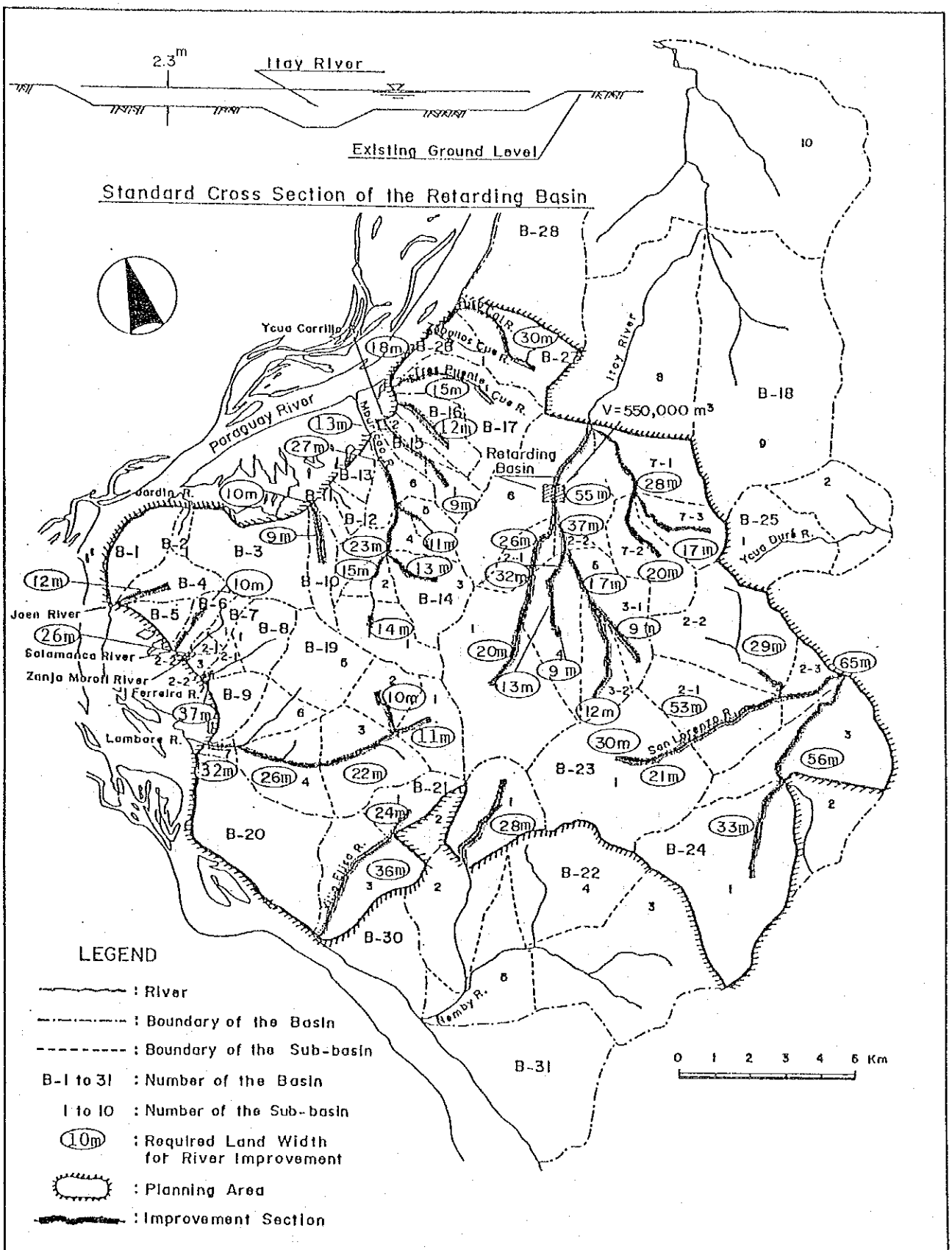


Fig. 5-11. REQUIRED WIDTH OF RIVER CHANNEL FOR BASIC PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

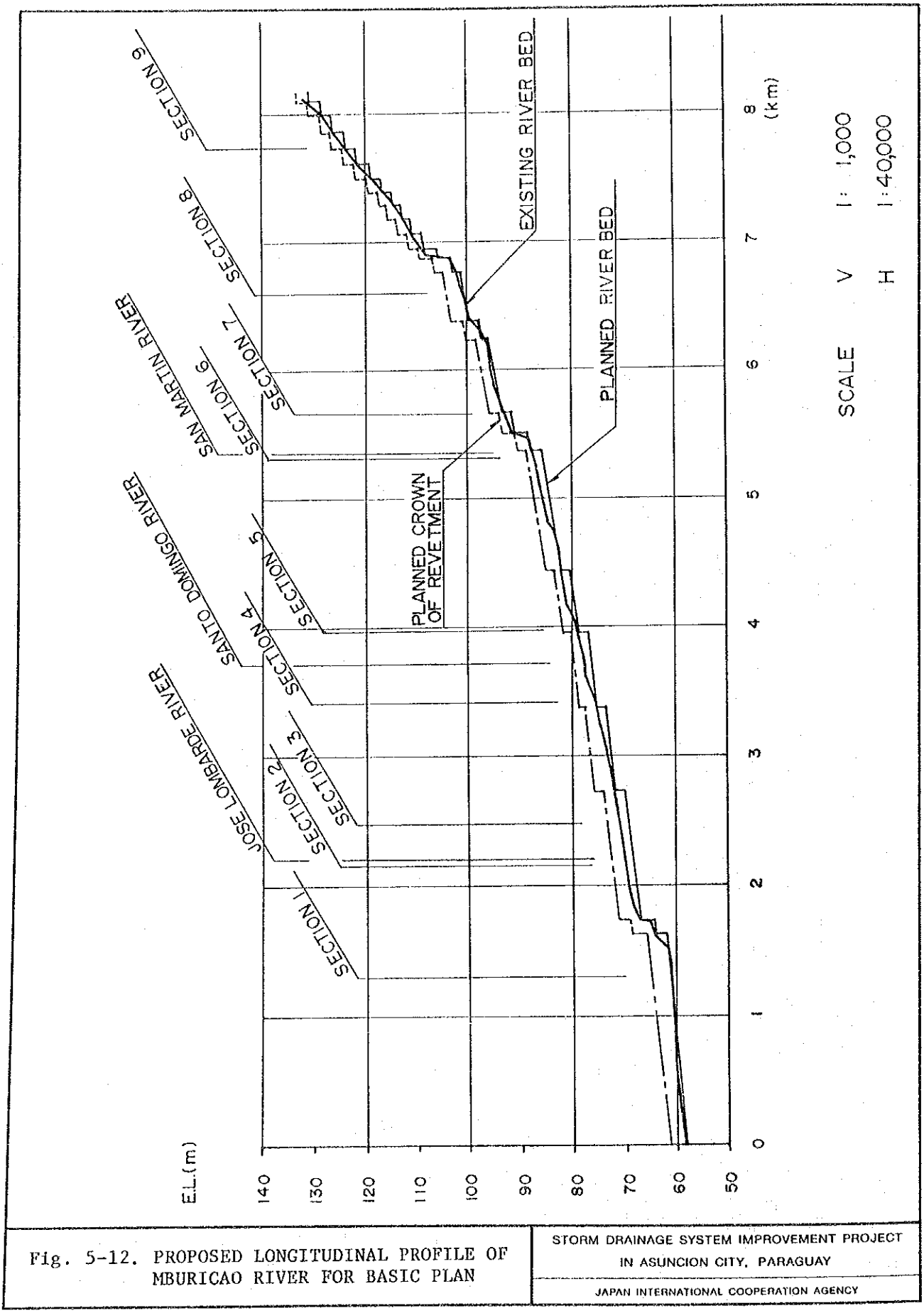


Fig. 5-12. PROPOSED LONGITUDINAL PROFILE OF MBURICAO RIVER FOR BASIC PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

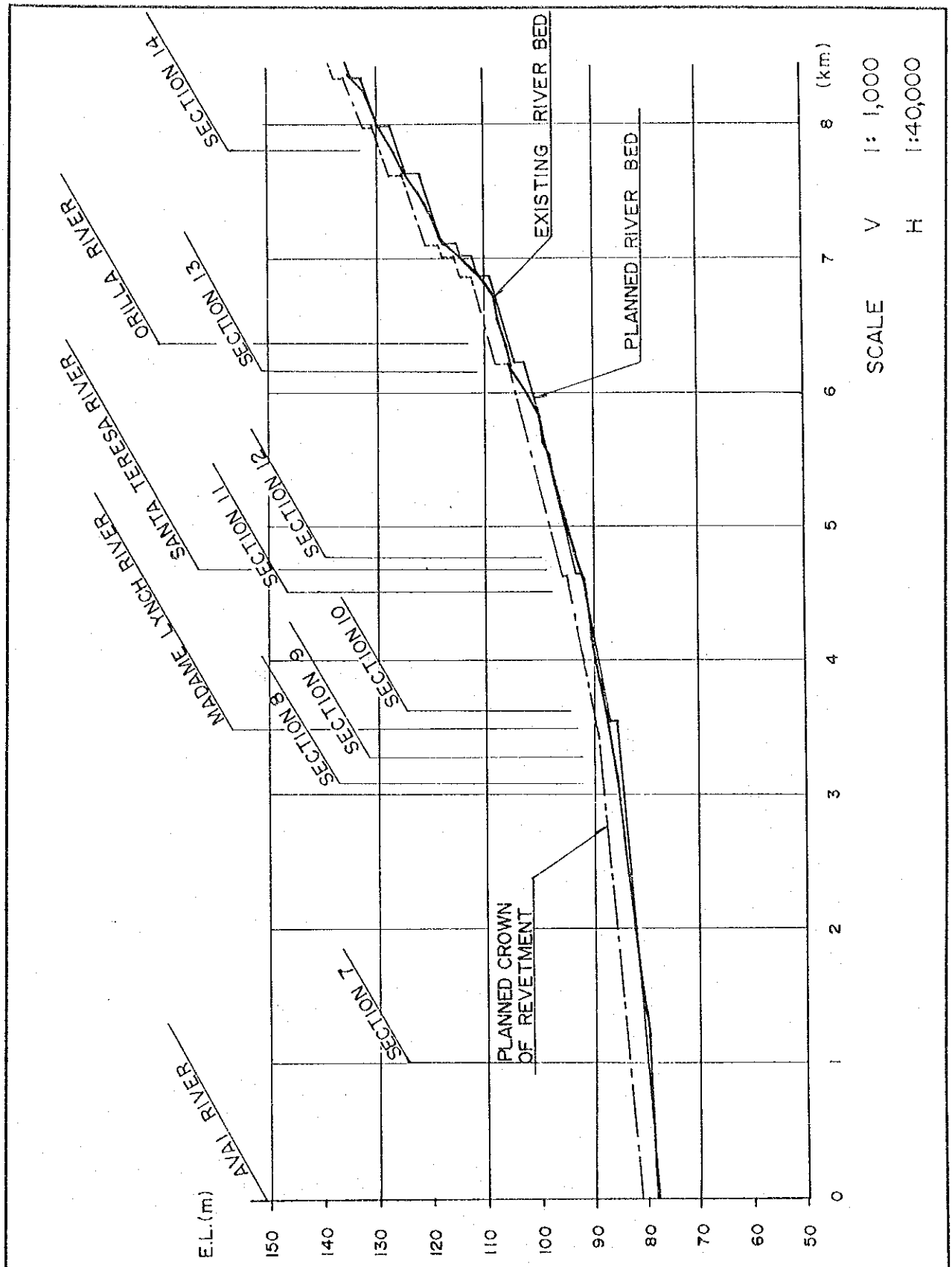


Fig. 5-13. PROPOSED LONGITUDINAL PROFILE OF ITAY RIVER FOR BASIC PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

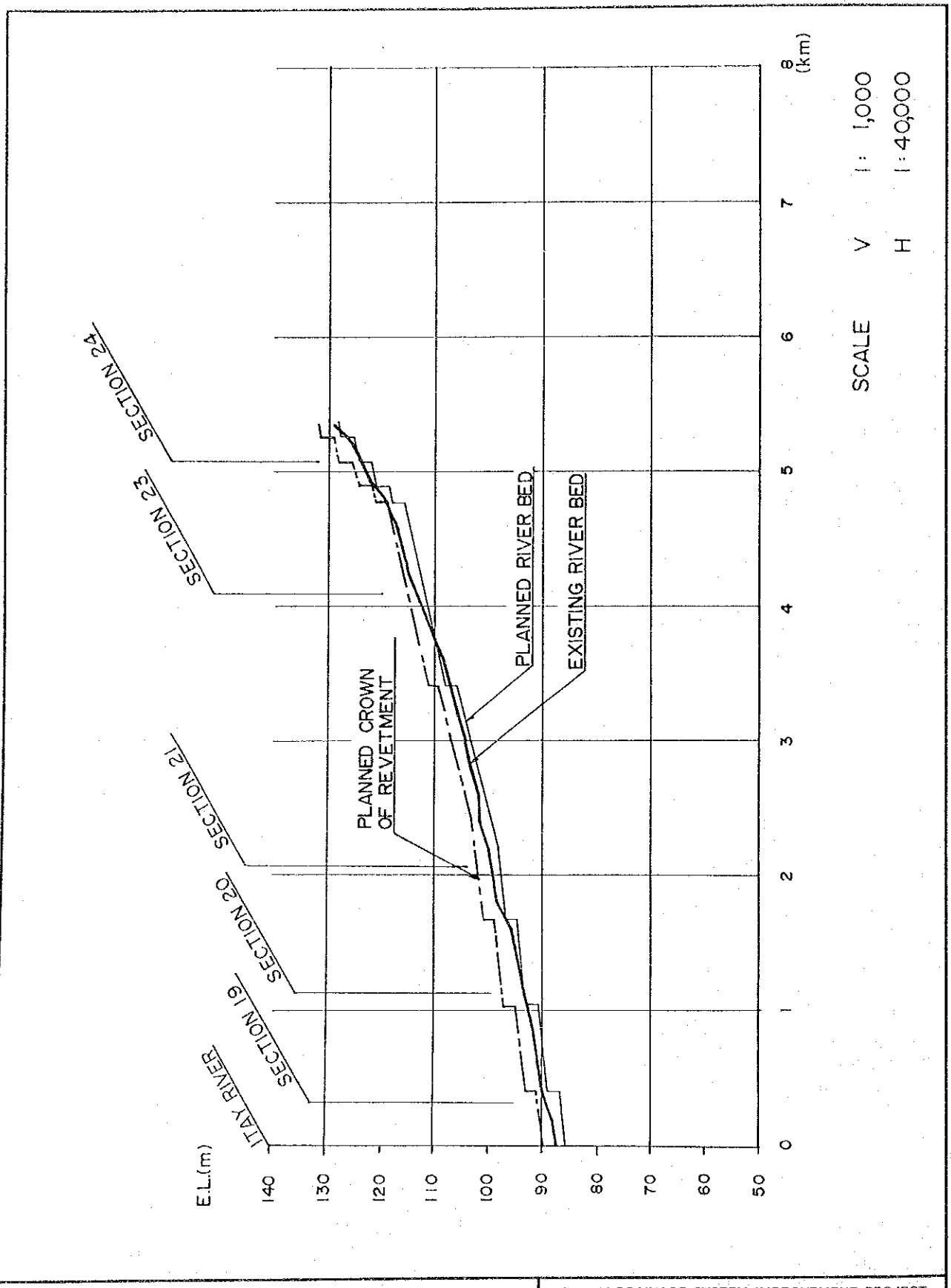


Fig. 5-14. PROPOSED LONGITUDINAL PROFILE OF MADAME LYNCH RIVER FOR BASIC PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY
JAPAN INTERNATIONAL COOPERATION AGENCY

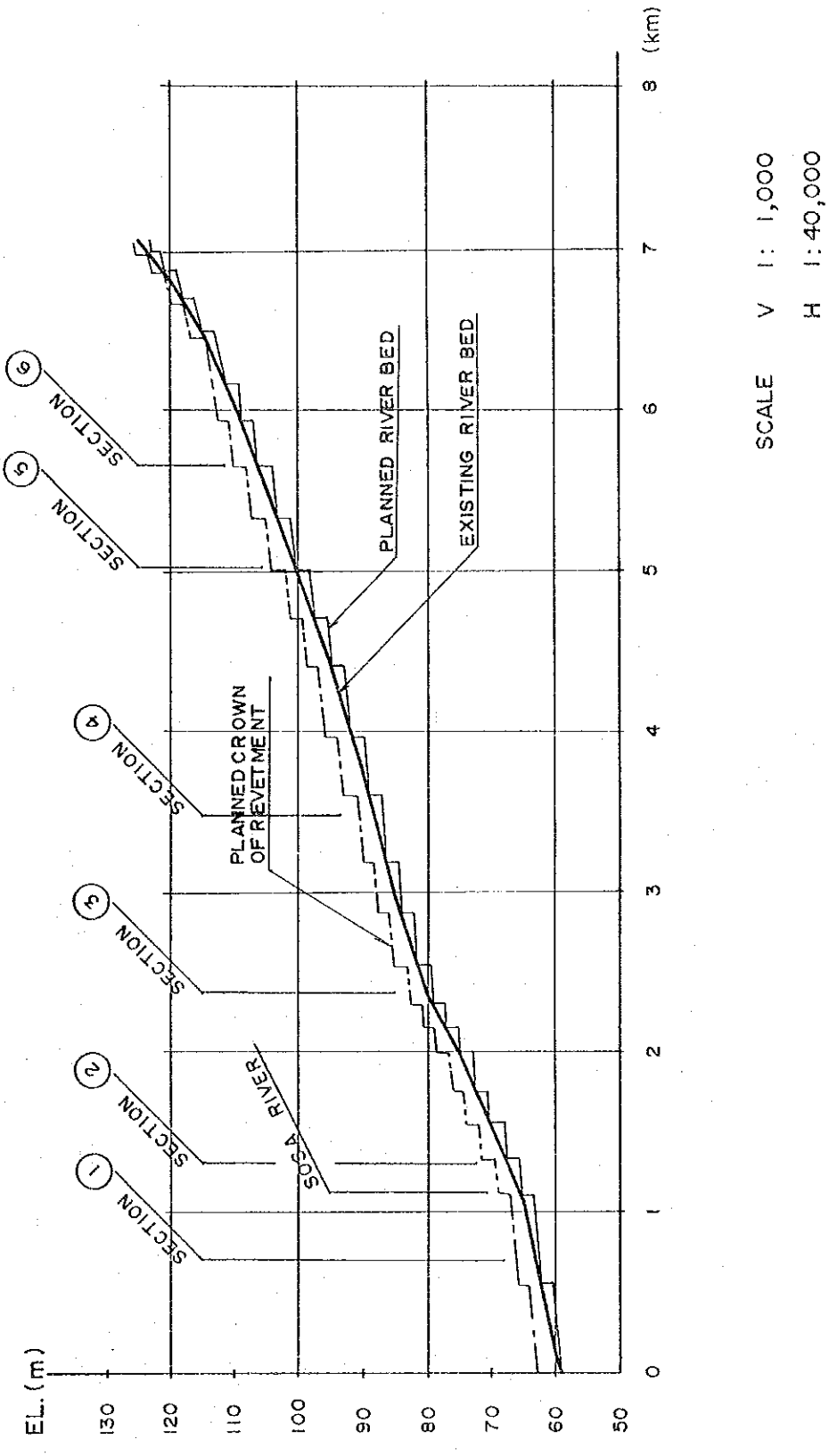


Fig. 5-15. PROPOSED LONGITUDINAL PROFILE OF LAMBARE RIVER FOR BASIC PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

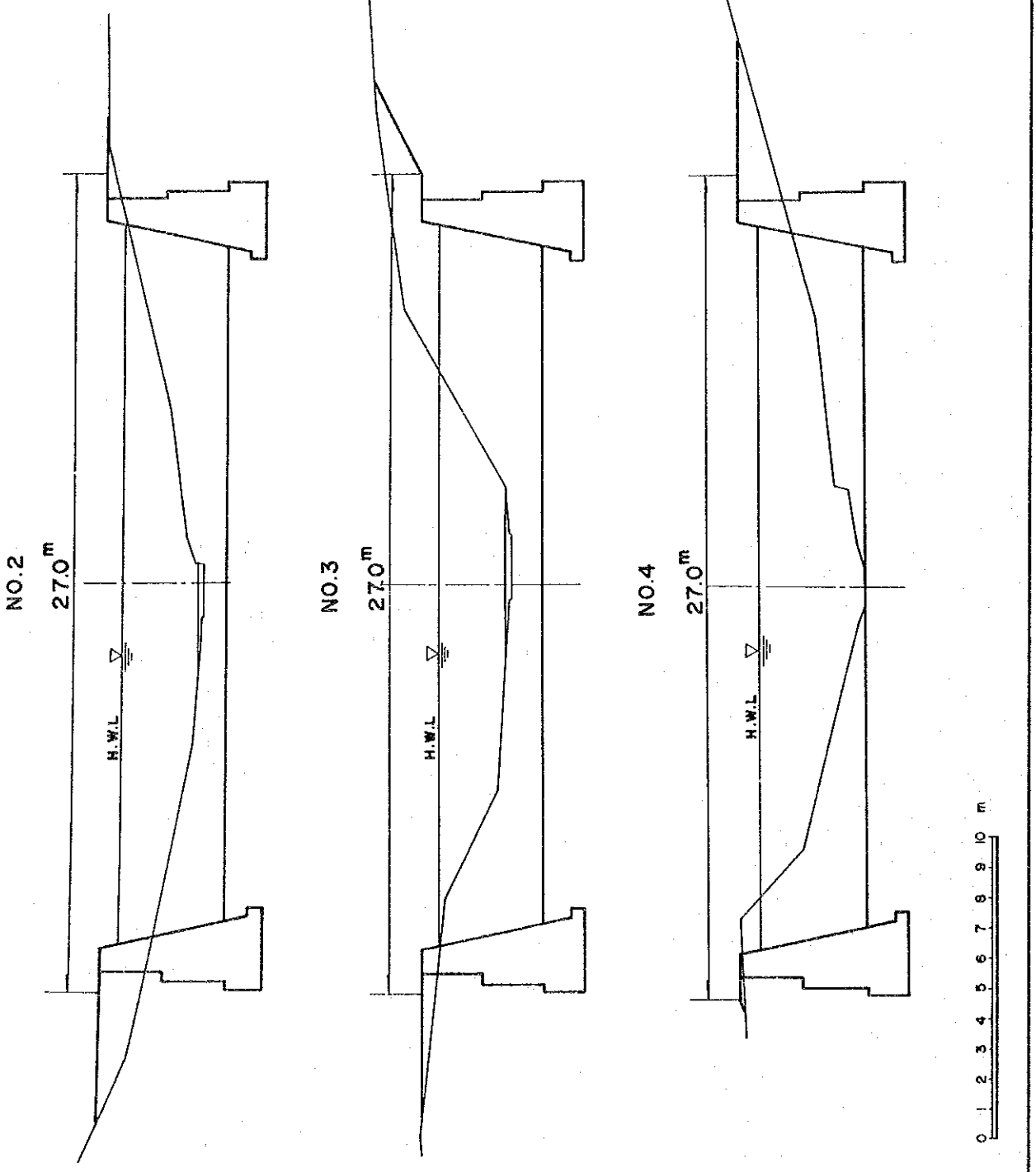


Fig. 5-16 (1/2). PROPOSED CROSS SECTION OF MBURICAO RIVER FOR BASIC PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

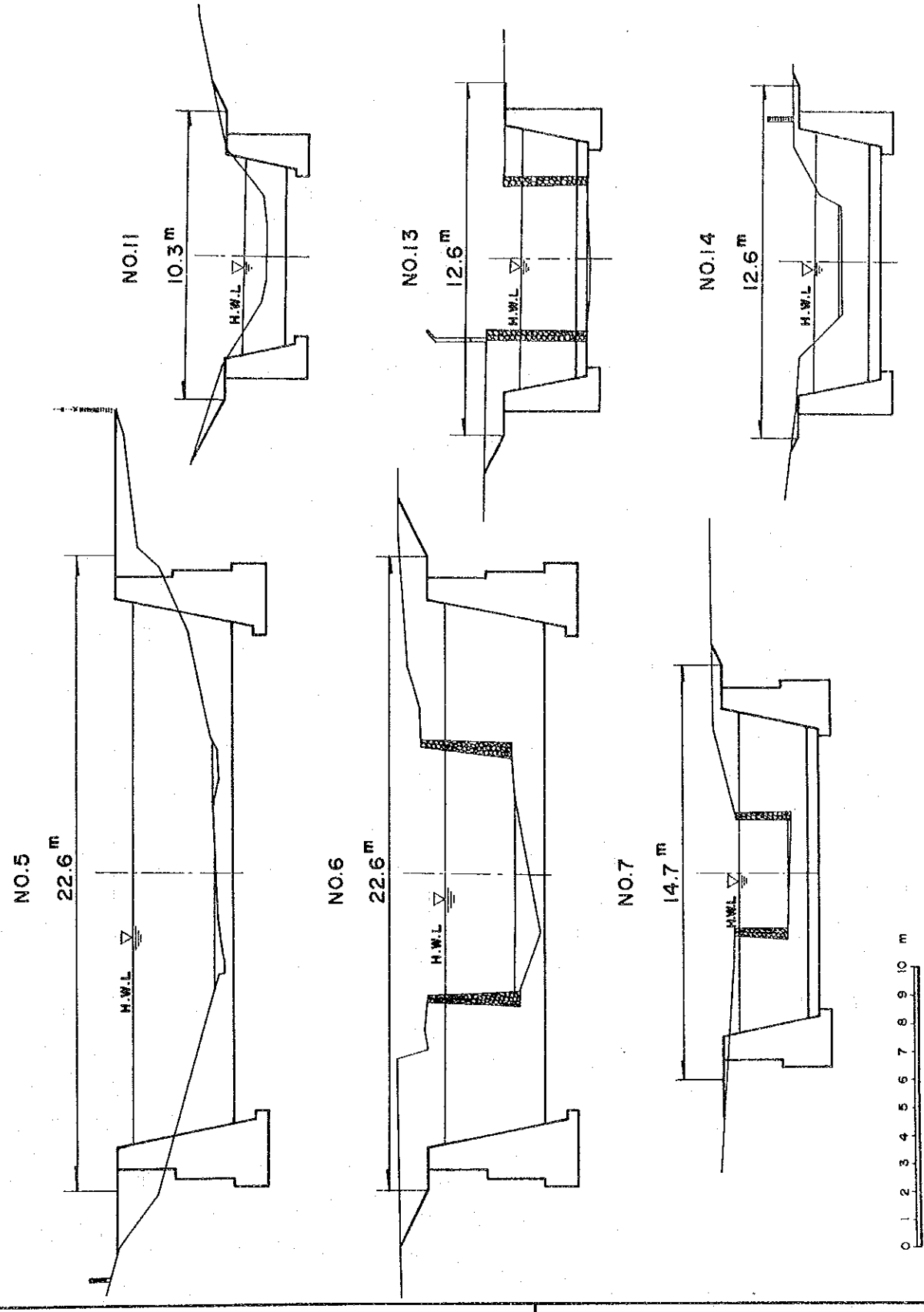


Fig. 5-16 (2/2). PROPOSED CROSS SECTION OF MBURICAO RIVER FOR BASIC PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

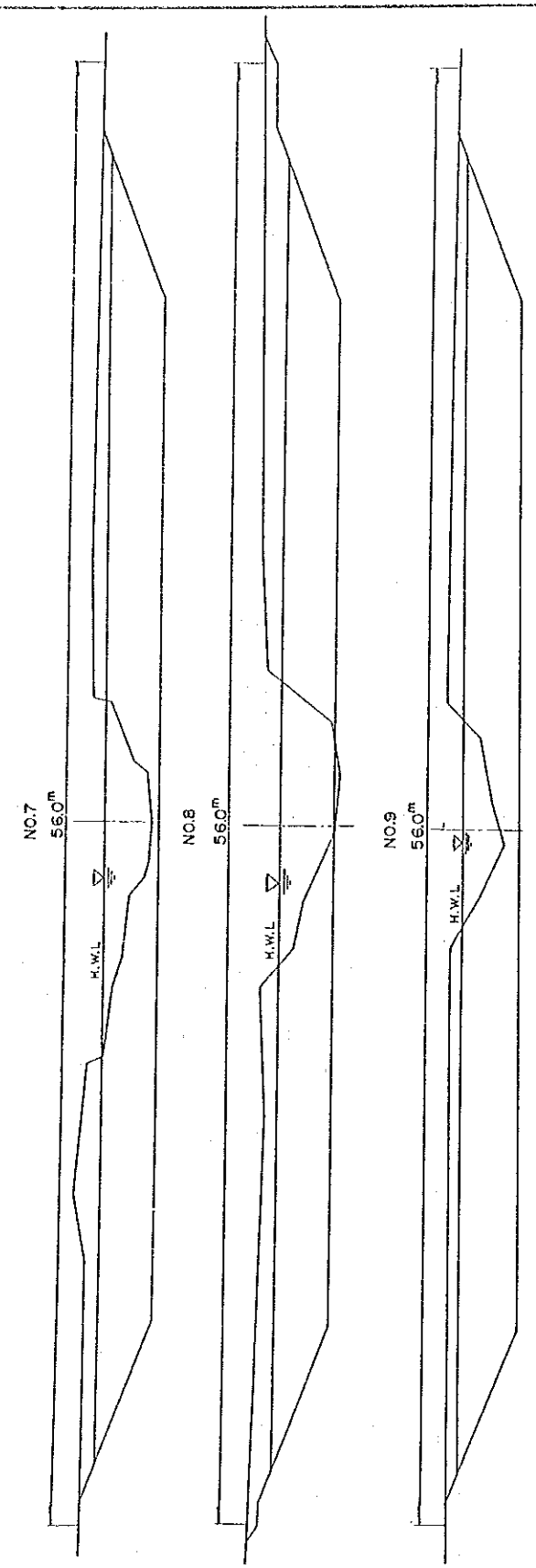


Fig. 5-17 (1/6). PROPOSED CROSS SECTION OF ITAY RIVER FOR BASIC PRAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

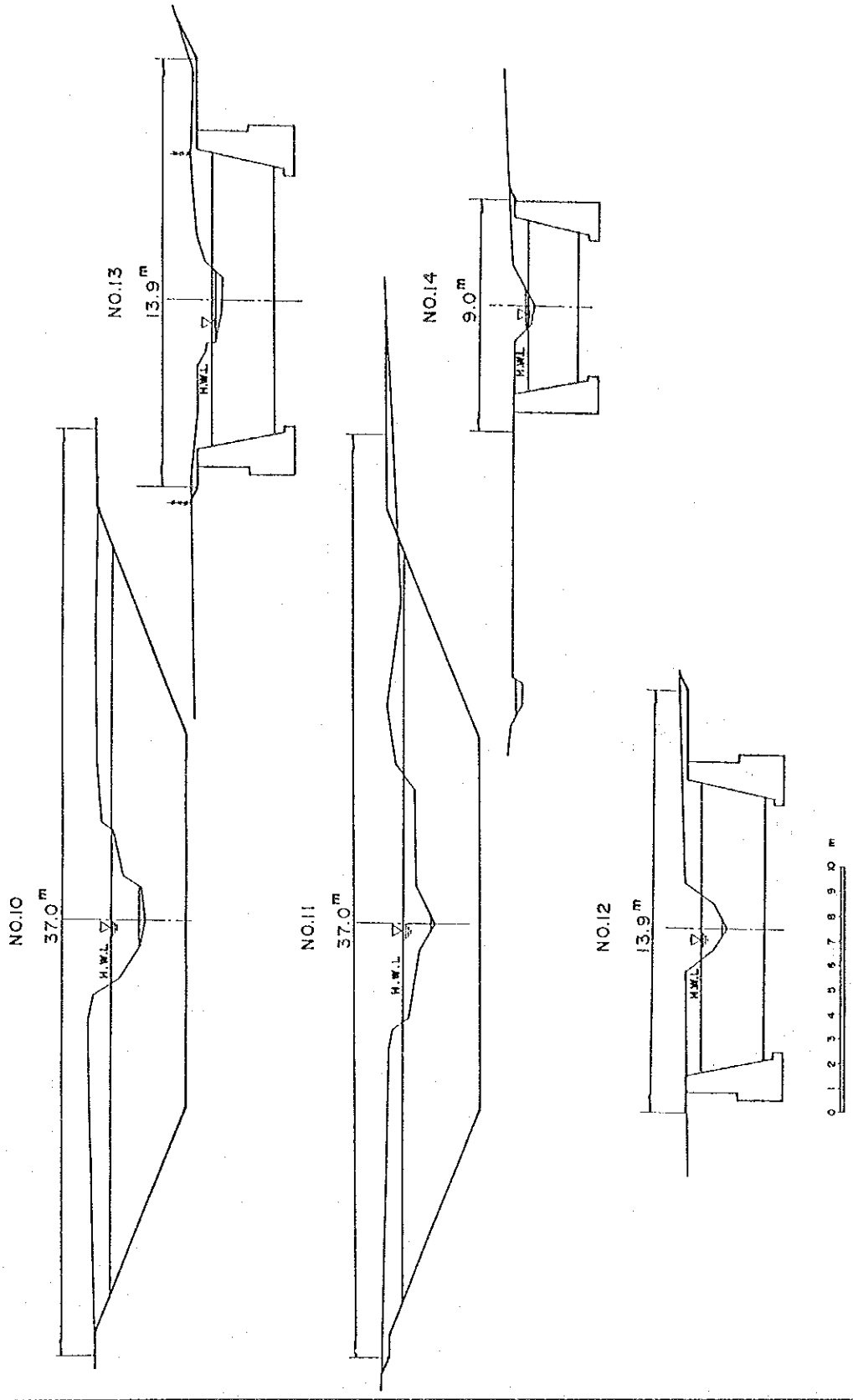


Fig. 5-17 (2/6). PROPOSED CROSS SECTION OF ITAY RIVER FOR BASIC PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY
JAPAN INTERNATIONAL COOPERATION AGENCY

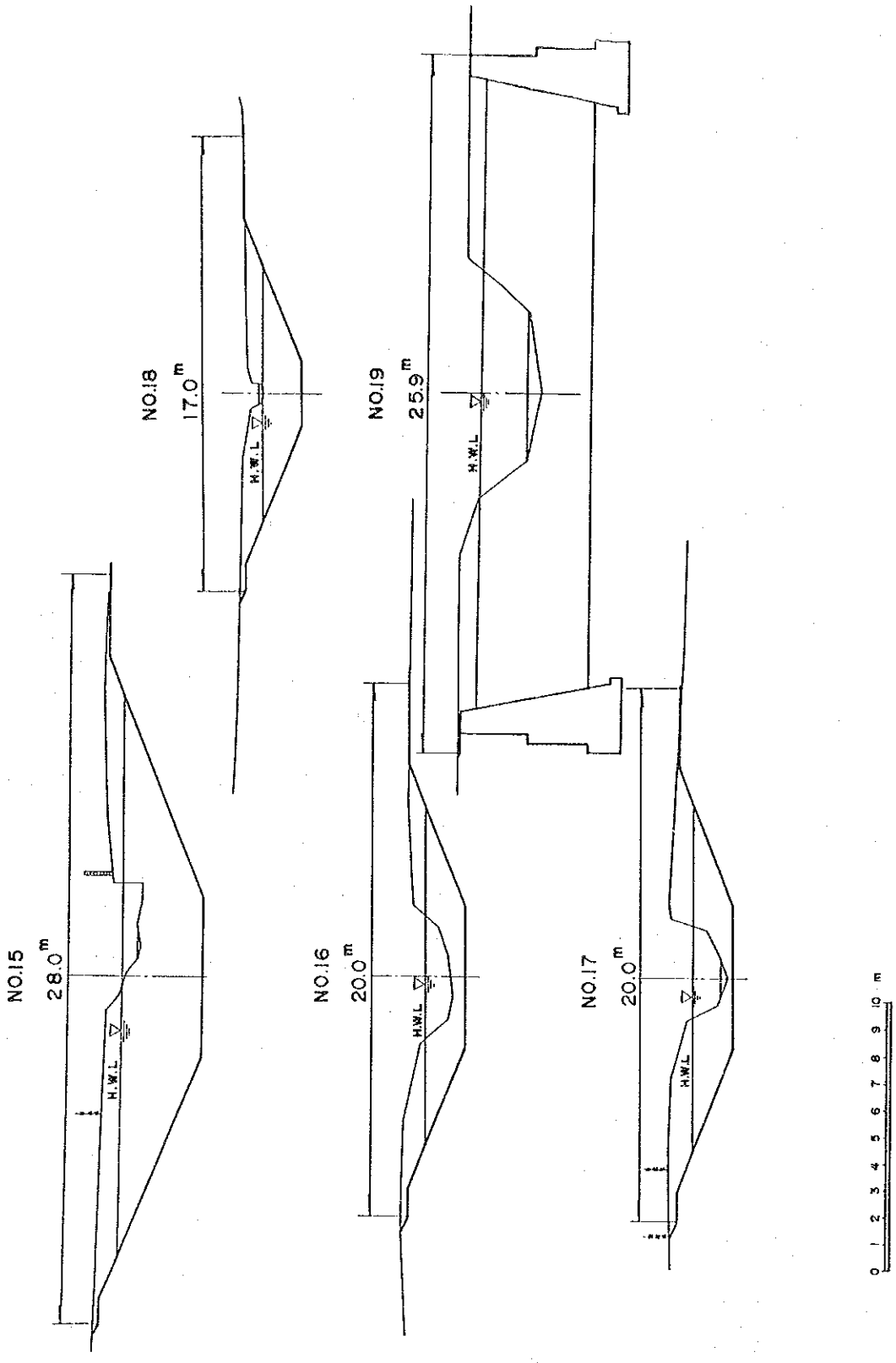


Fig. 5-17 (3/6). PROPOSED CROSS SECTION OF ITAY RIVER FOR BASIC PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

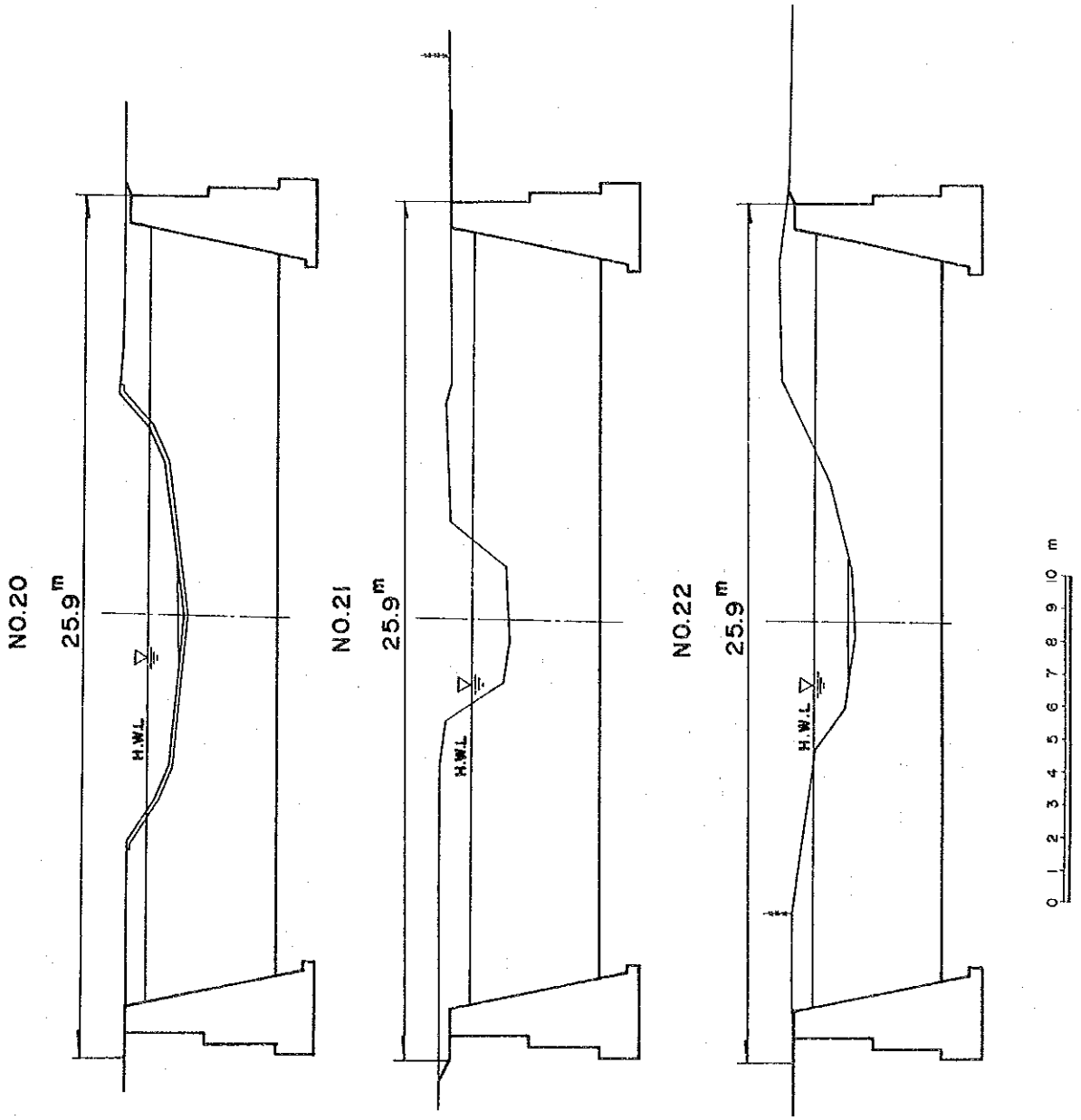
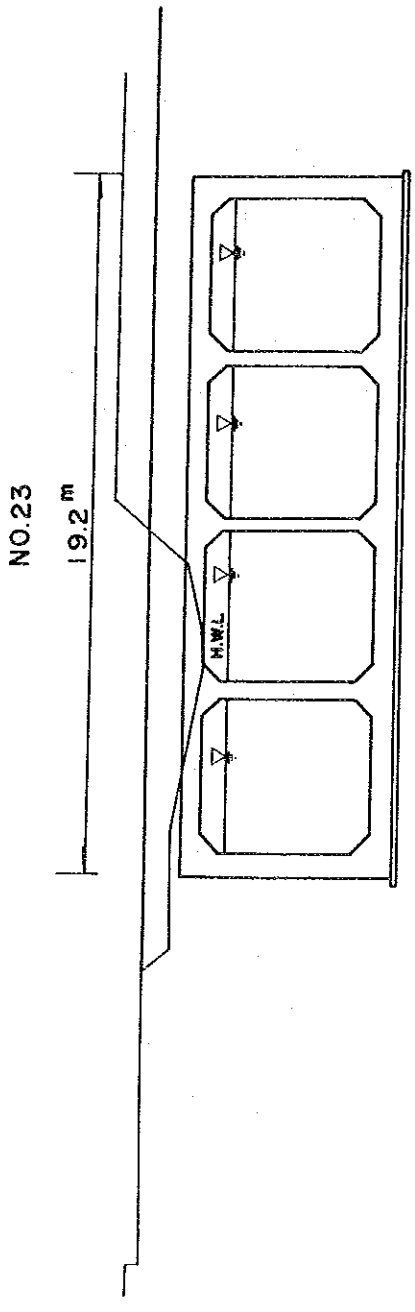


Fig. 5-17 (4/6). PROPOSED CROSS SECTION OF ITAY RIVER FOR BASIC PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY



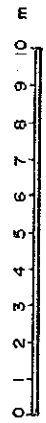


Fig. 5-17 (5/6). PROPOSED CROSS SECTION OF ITAY RIVER FOR BASIC PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

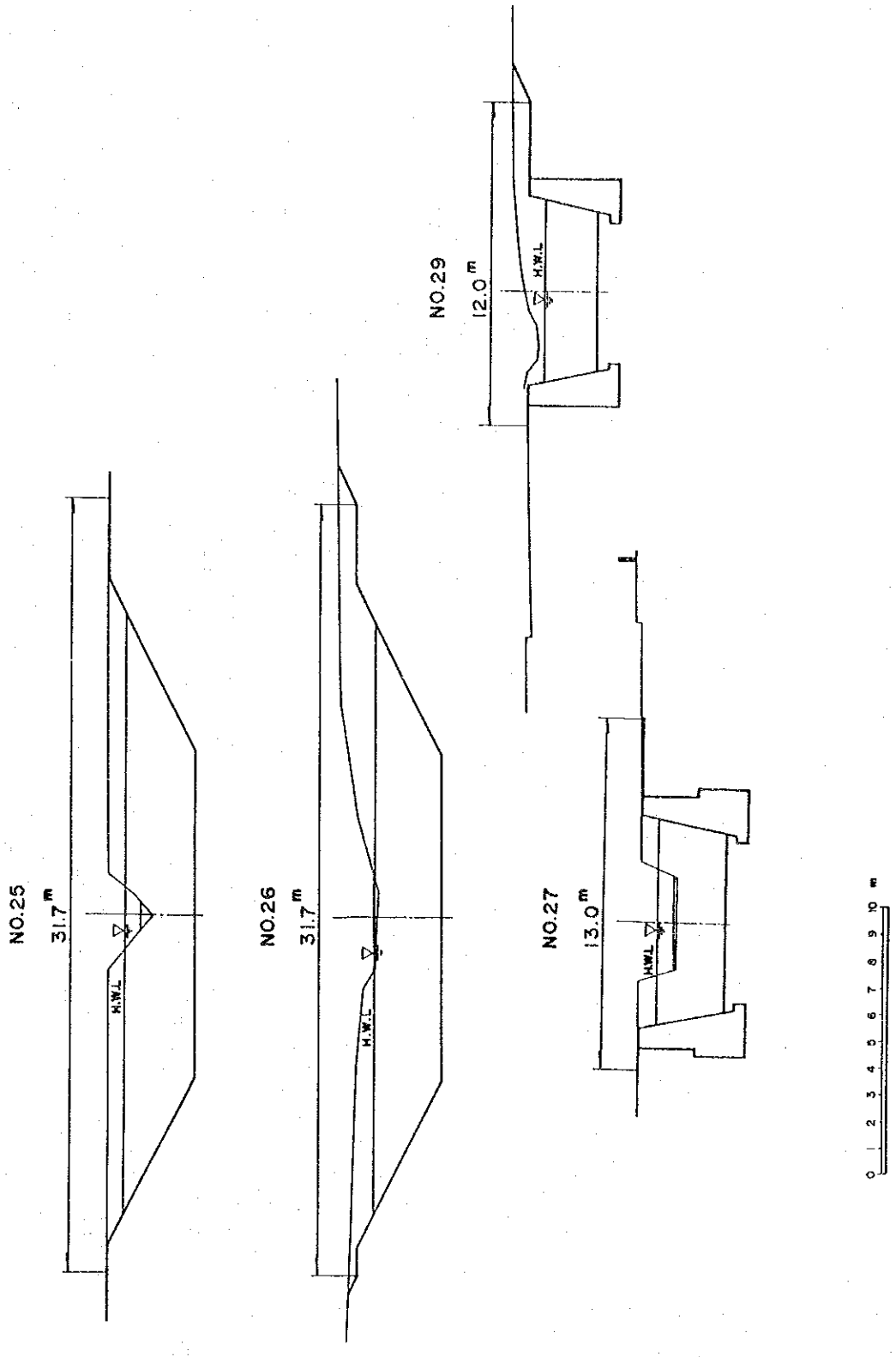


Fig. 5-17 (6/6). PROPOSED CROSS SECTION OF ITAY RIVER FOR BASIC PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

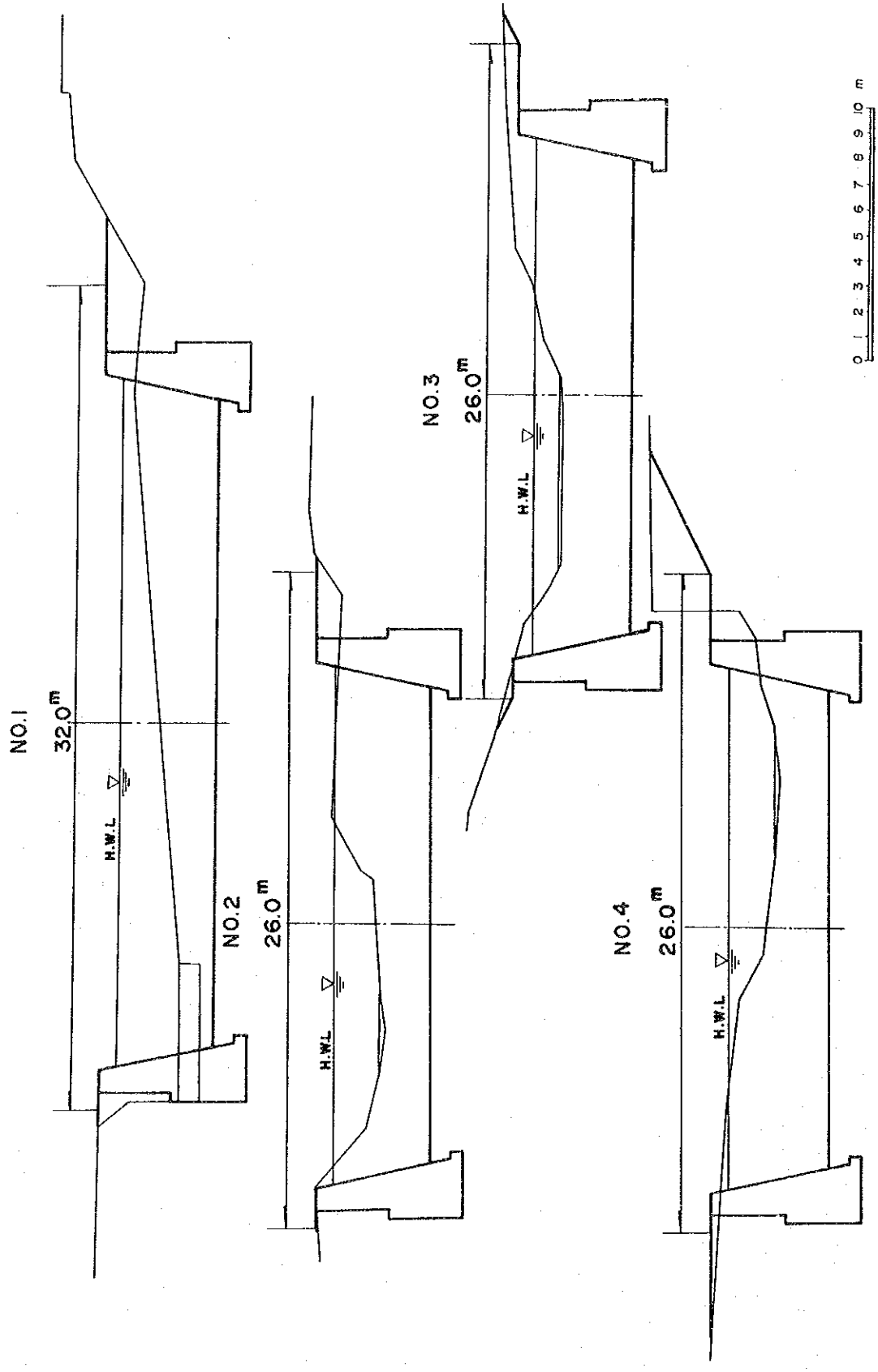


Fig. 5-18 (1/2). PROPOSED CROSS SECTION OF LAMBARE RIVER FOR BASIC PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

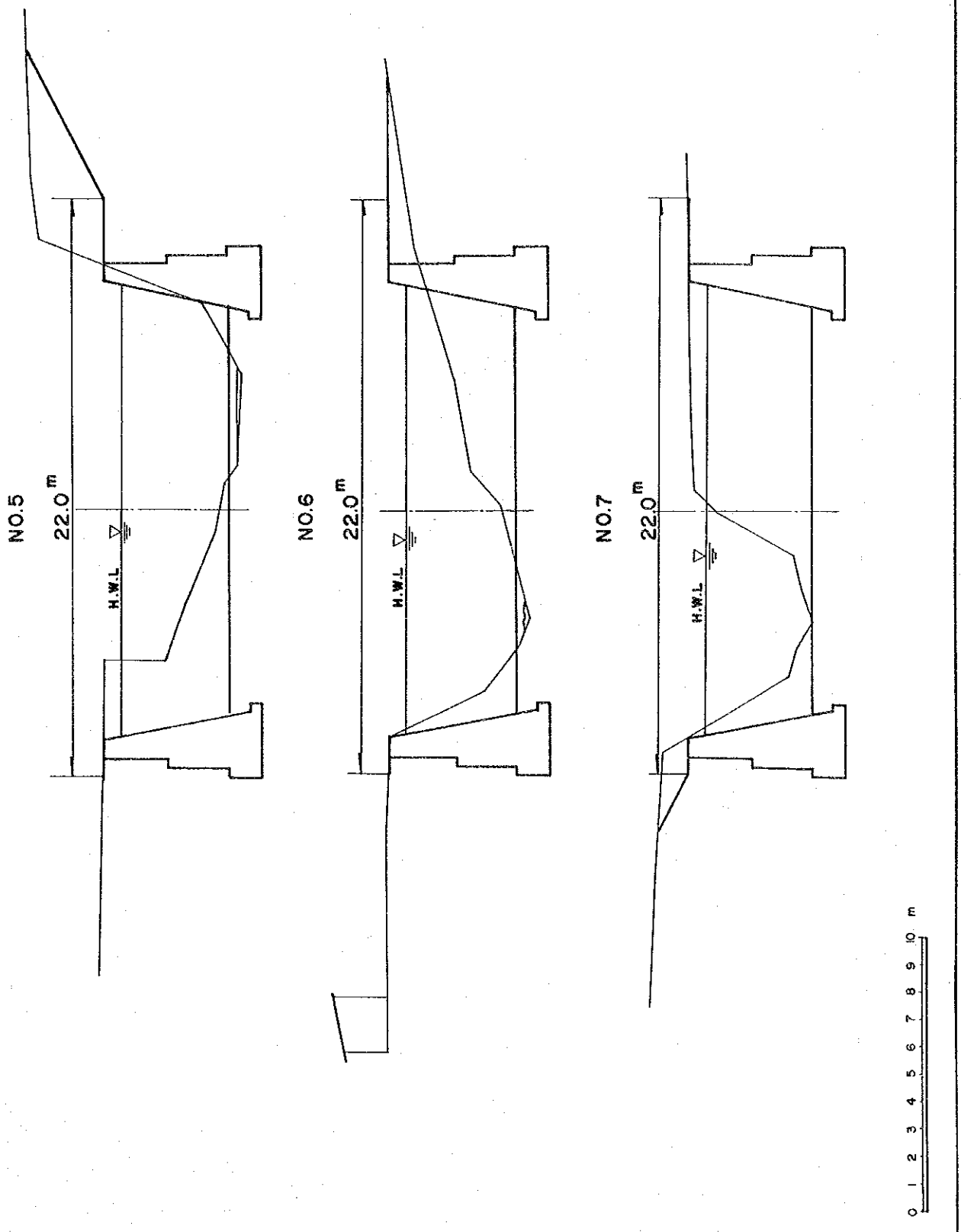


Fig. 5-18 (2/2). PROPOSED CROSS SECTION OF LAMBARE RIVER FOR BASIC PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

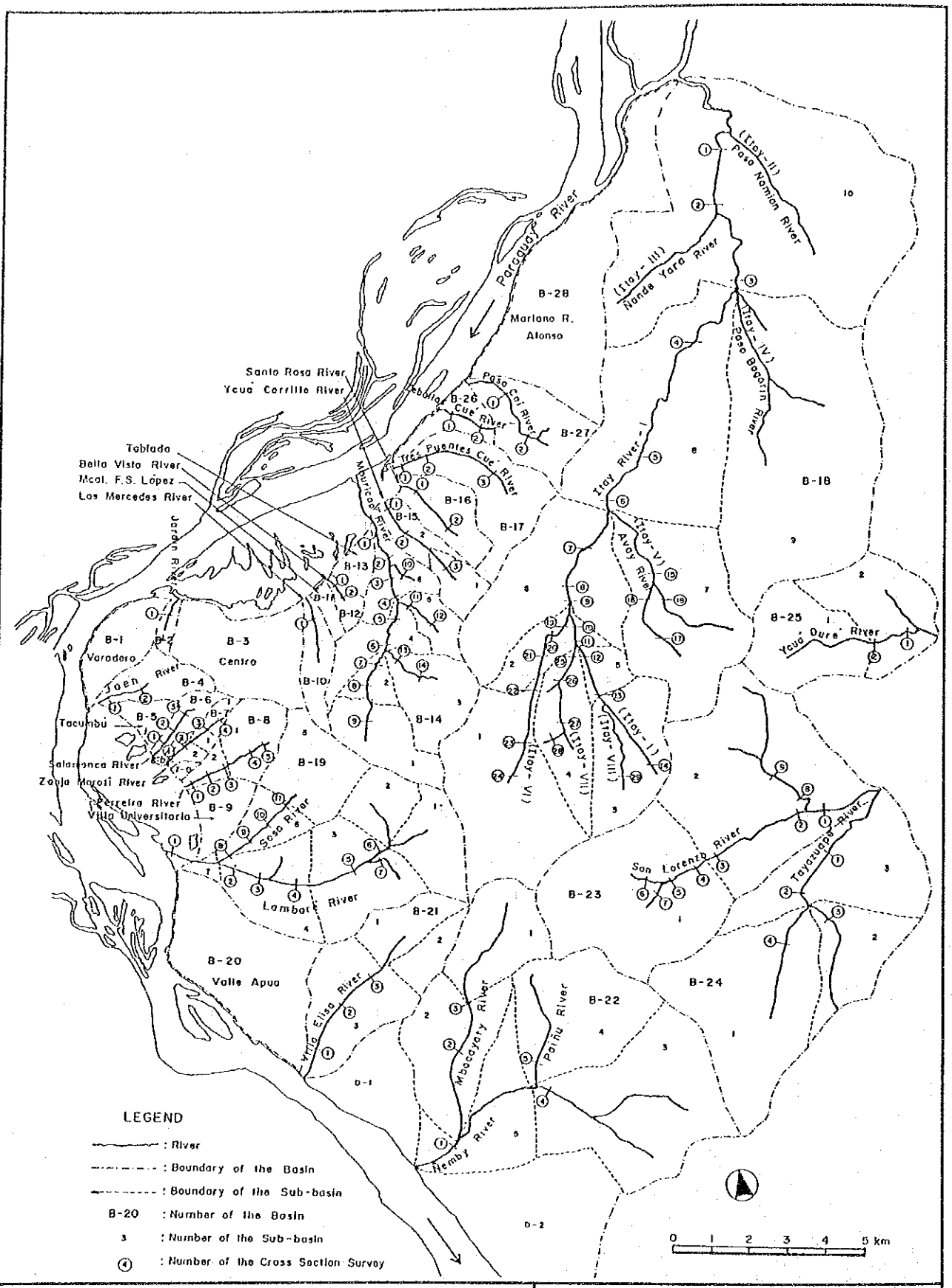
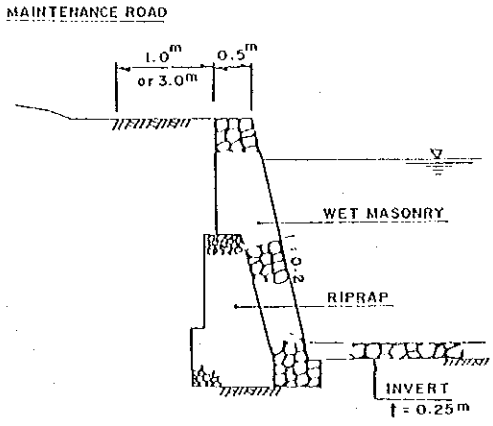


Fig. 5-19. LOCATION OF CROSS SECTION SURVEY FOR BASIC AND MASTER PLAN

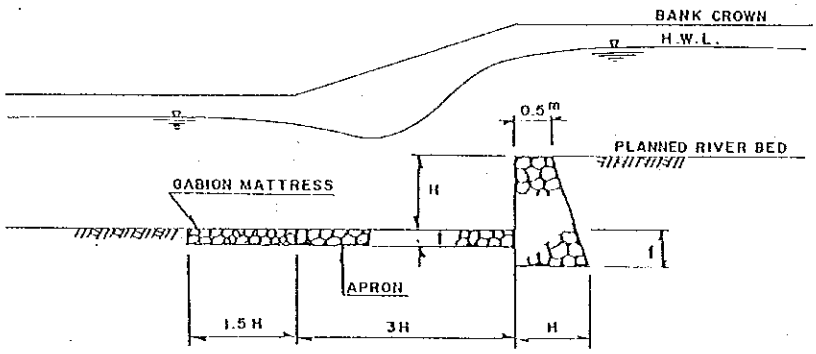
STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

REVETMENT



GROUNDSILL WITH HEAD



BRIDGE

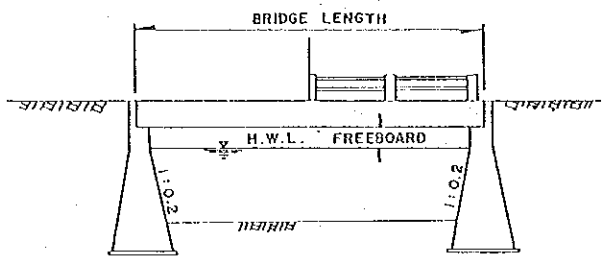


Fig. 5-20. STANDARD DRAWING OF RIPARIAN STRUCTURES

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

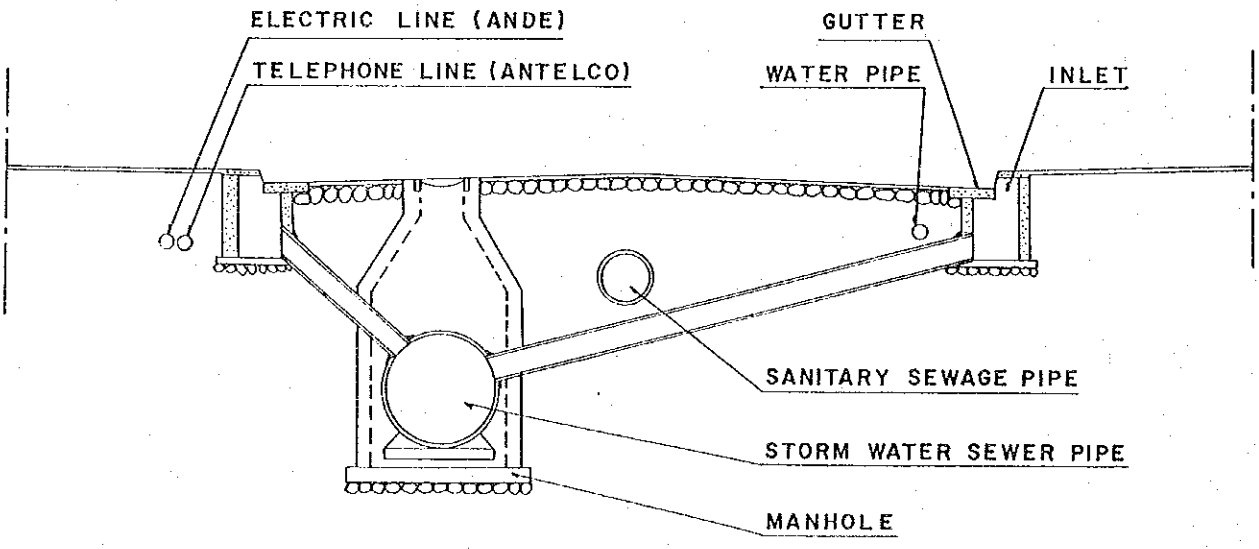
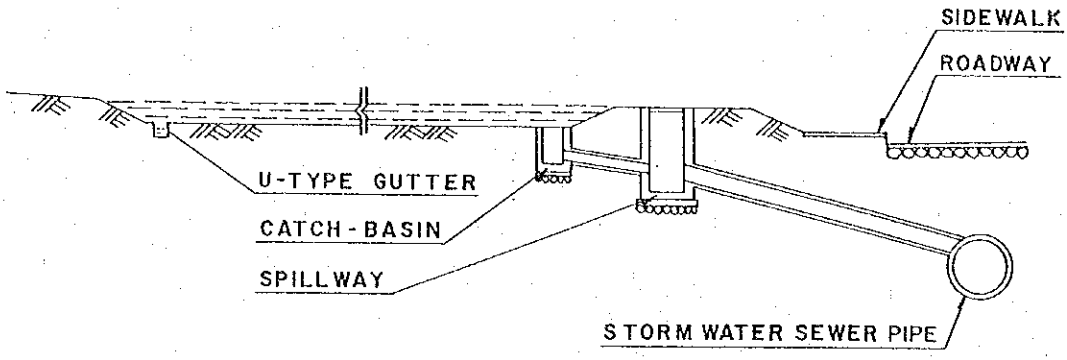


Fig. 5-21. STANDARD DRAWING OF DRAINAGE FACILITIES

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

STORAGE IN PUBLIC COMPOUNDS



STORAGE IN HOUSE LOTS

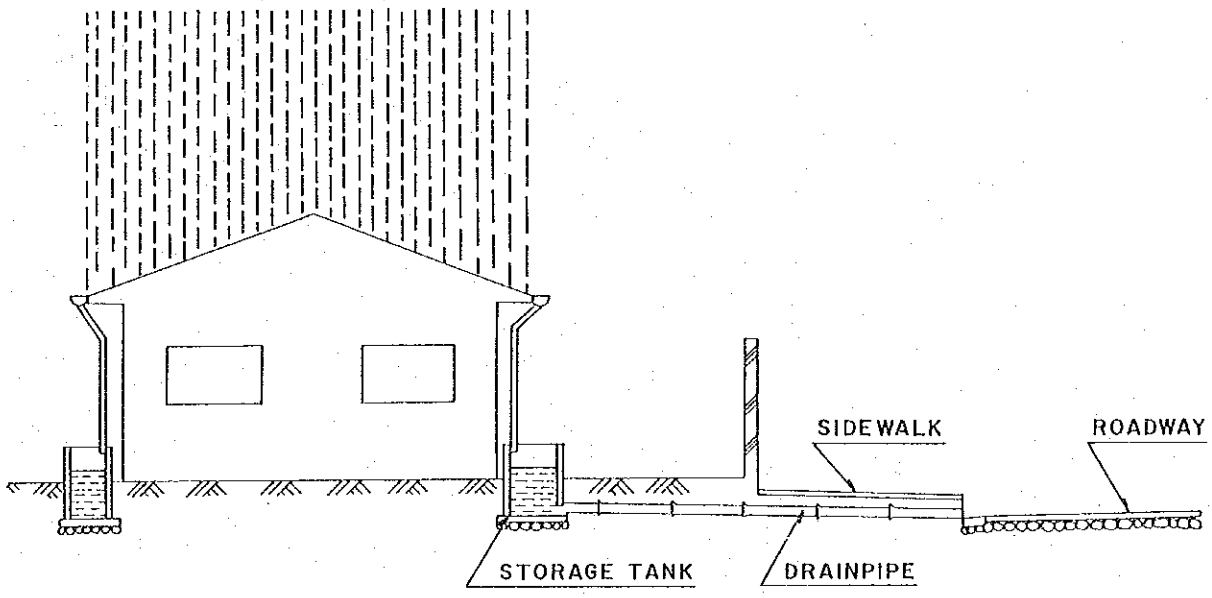


Fig. 5-22. STANDARD DRAWING OF STORAGE FACILITIES

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

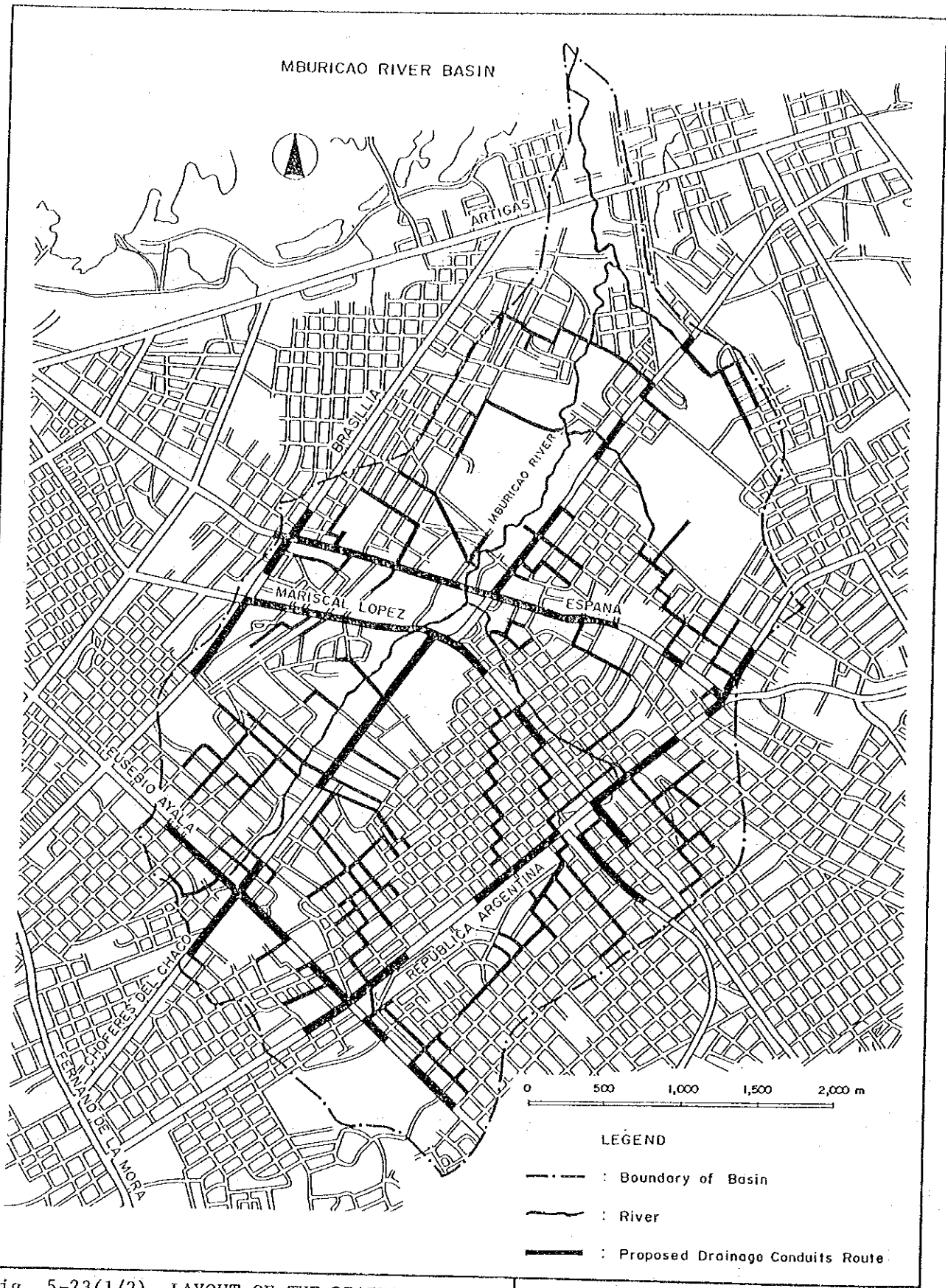


Fig. 5-23(1/2). LAYOUT OF THE DRAINAGE FACILITIES FOR STUDY CASE I FOR MASTER PLAN (MBURICAO RIVER BASIN)

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

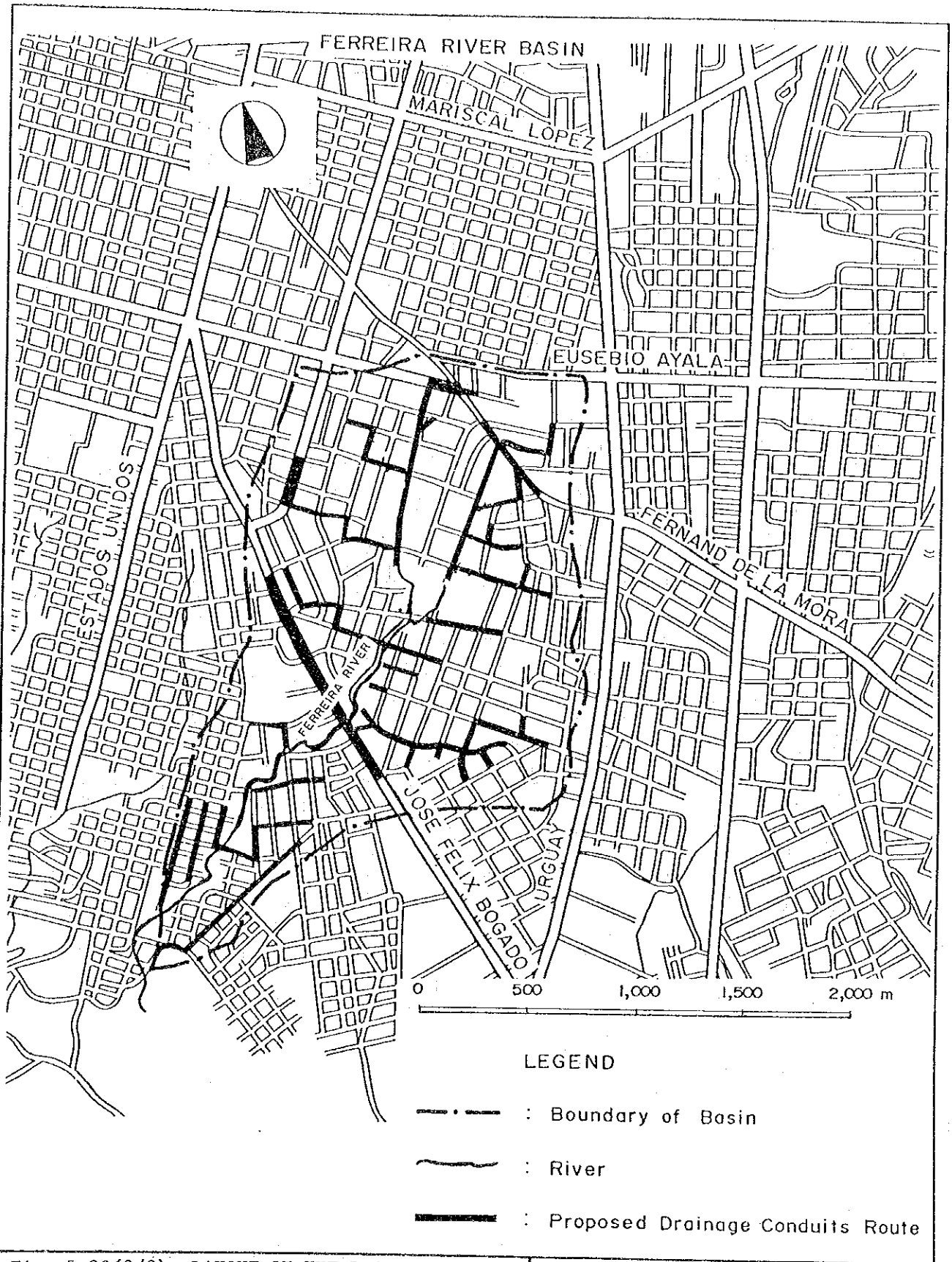


Fig. 5-23(2/2). LAYOUT OF THE DRAINAGE FACILITIES FOR STUDY CASE I FOR MASTER PLAN (FERREIRA RIVER BASIN)

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

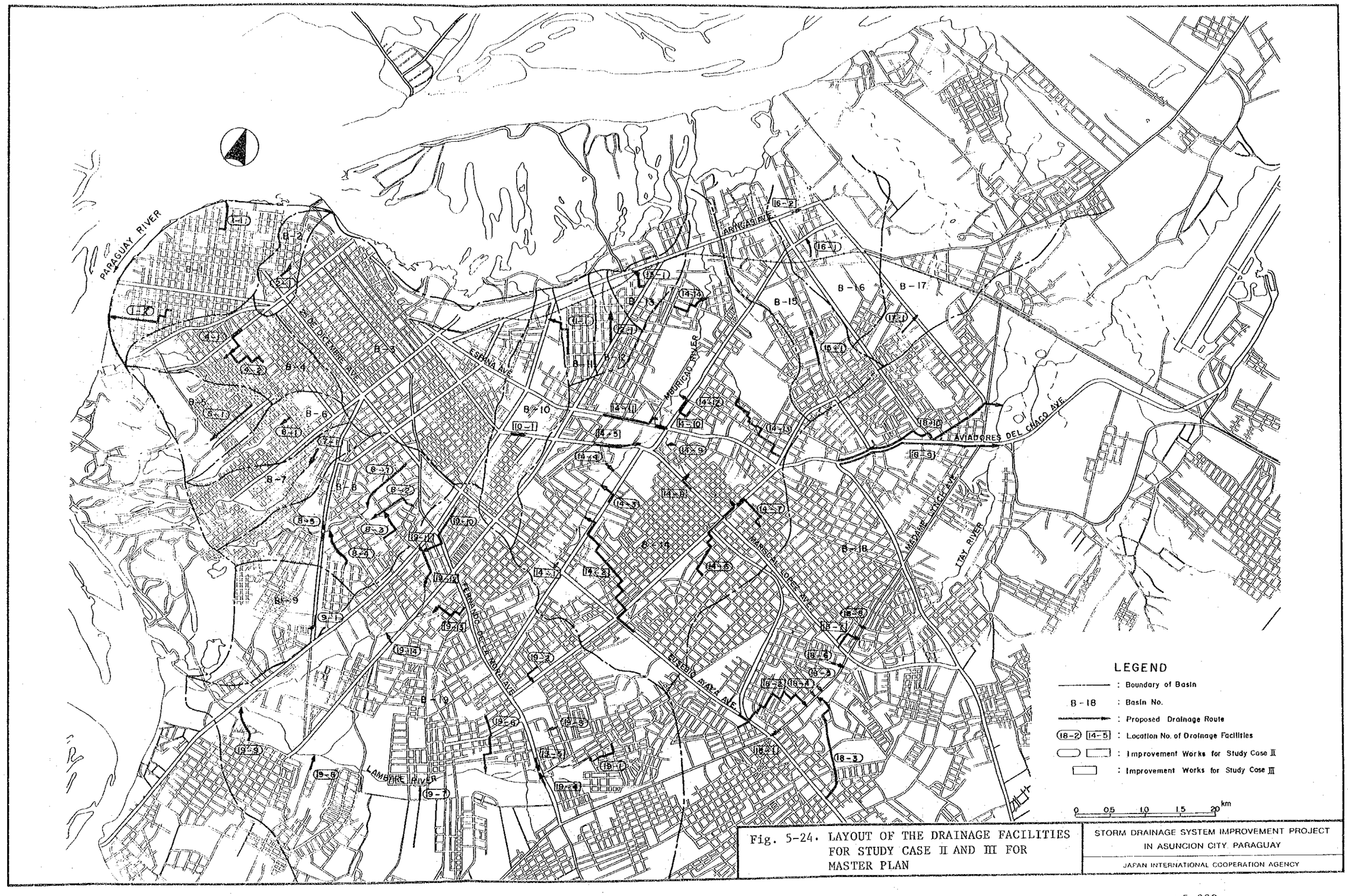


Fig. 5-24. LAYOUT OF THE DRAINAGE FACILITIES FOR STUDY CASE II AND III FOR MASTER PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

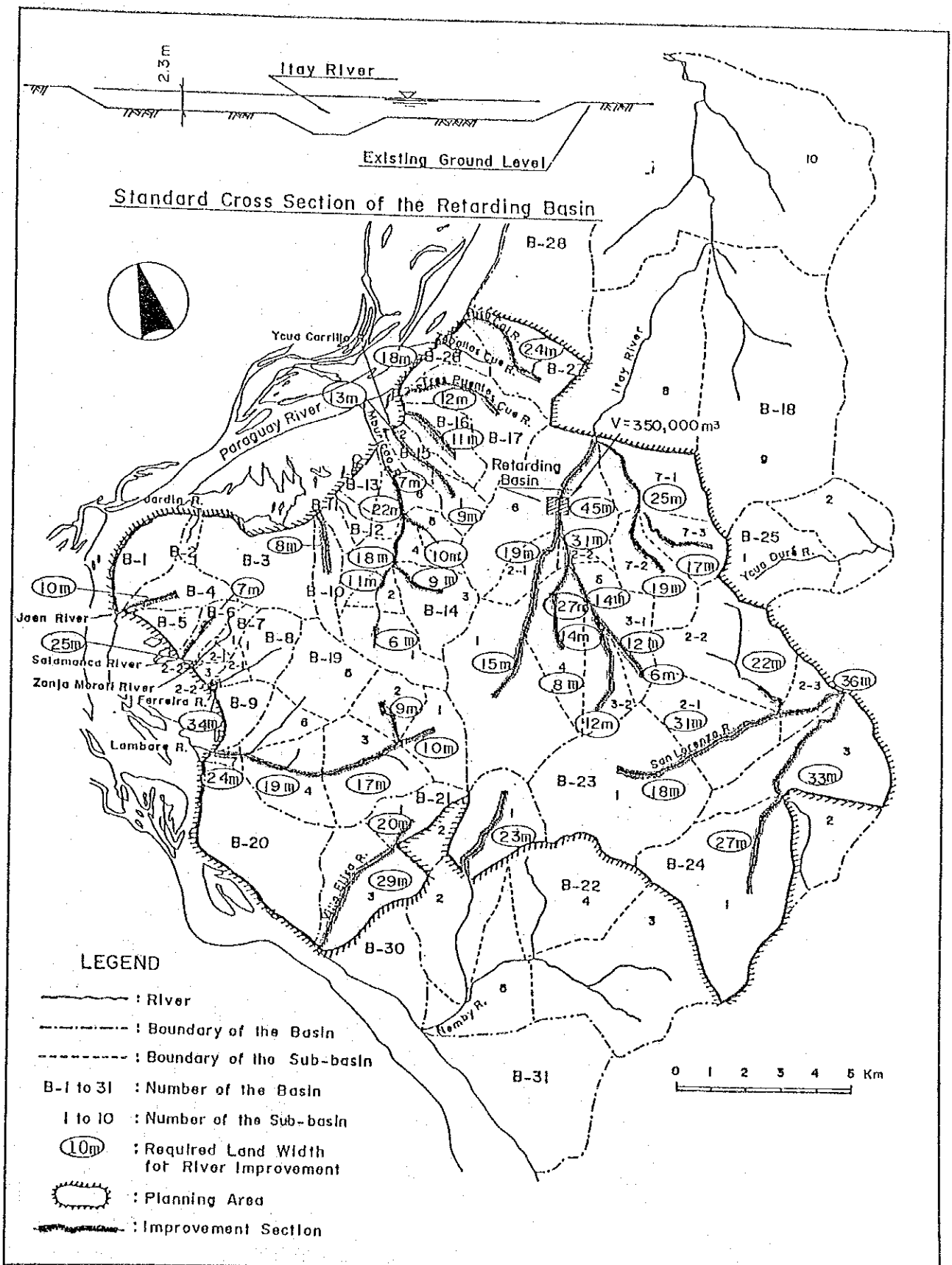


Fig. 5-25. LAYOUT OF PROPOSED RIVER CHANNEL IMPROVEMENT PORTION FOR MASTER PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

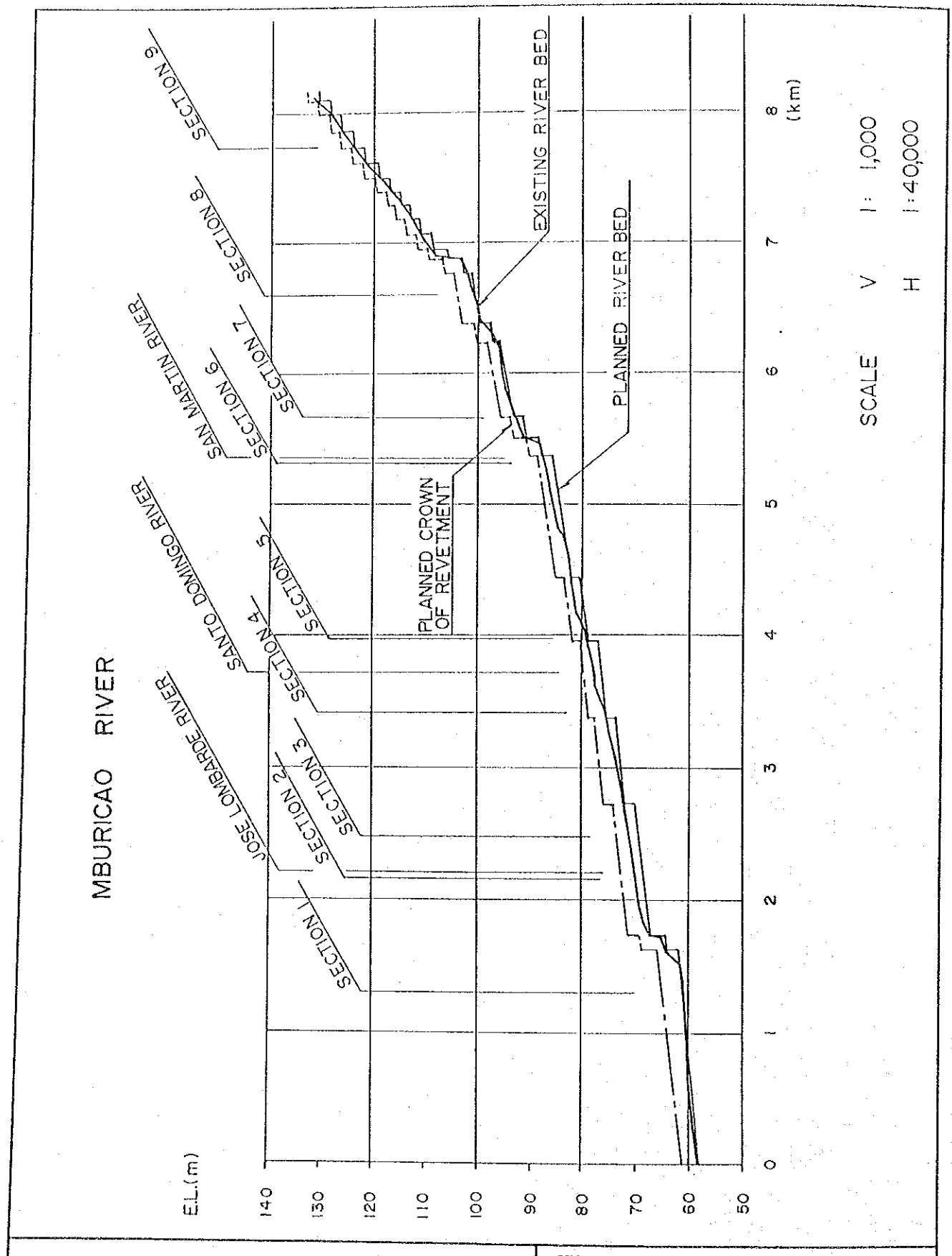


Fig. 5-26. PROPOSED LONGITUDINAL PROFILE OF MBURICAO RIVER FOR MASTER PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

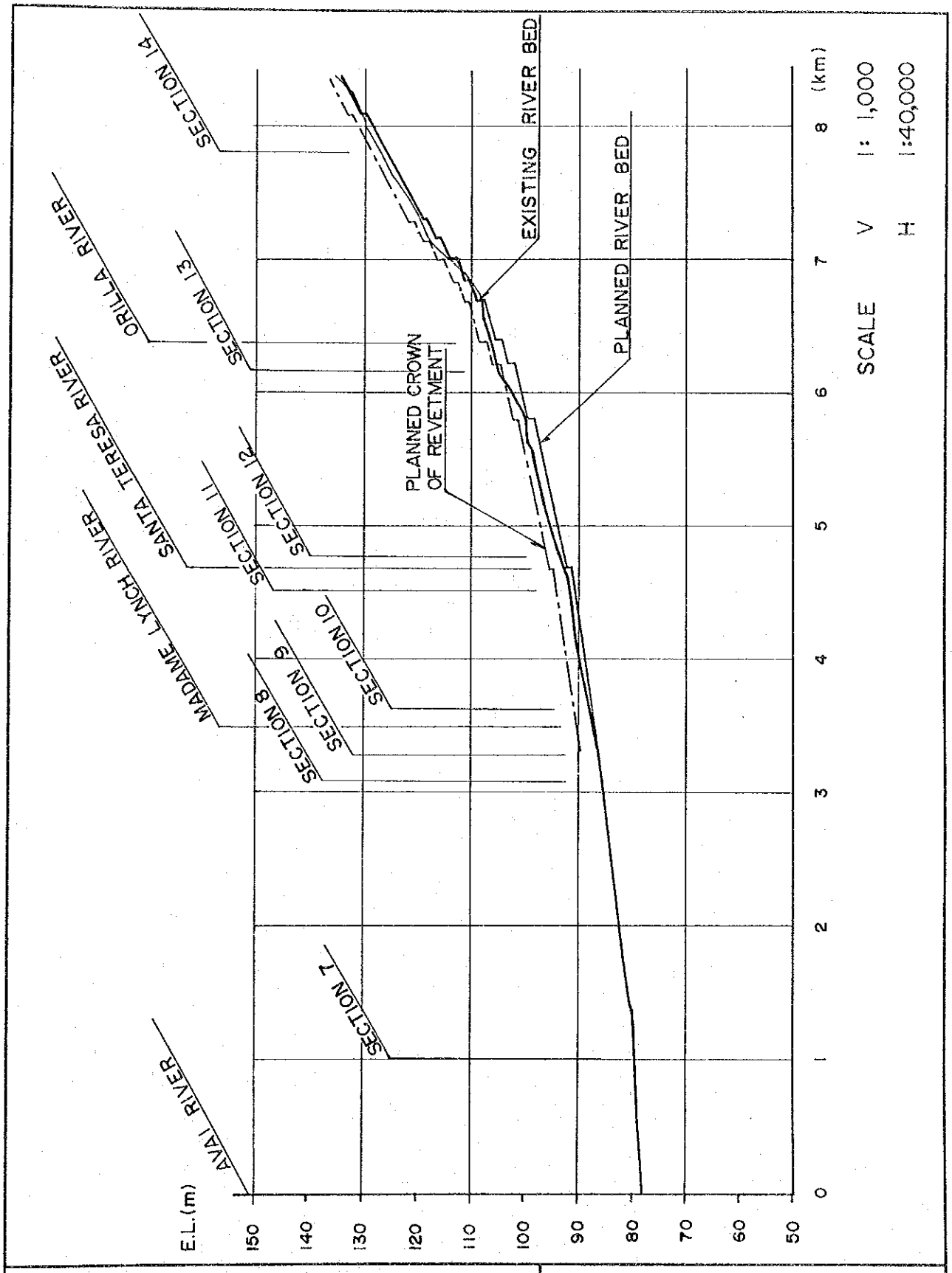


Fig. 5-27. PROPOSED LONGITUDINAL PROFILE OF ITAY RIVER FOR MASTER PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

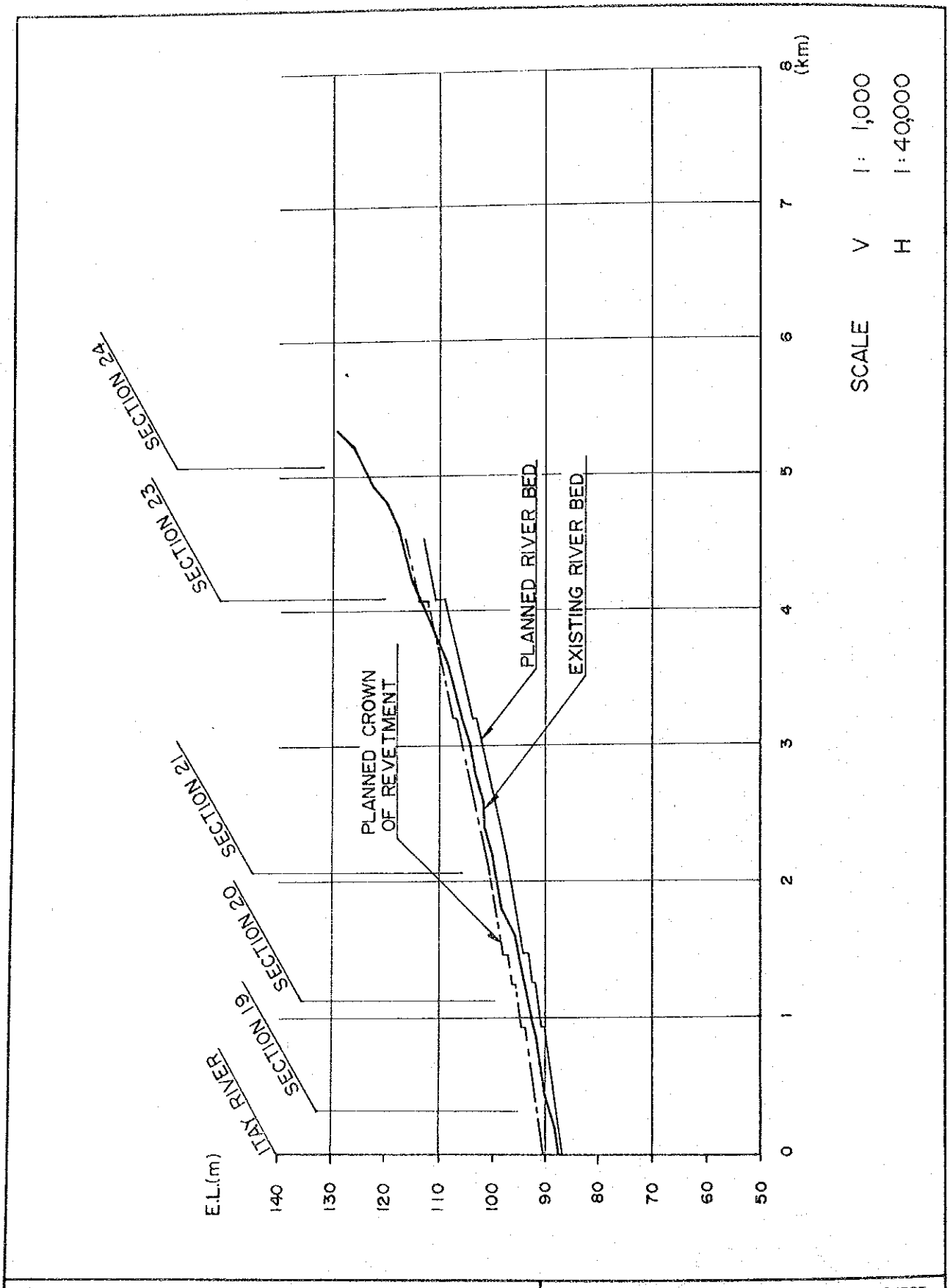


Fig. 5-28. PROPOSED LONGITUDINAL PROFILE OF MADAME LYNCH RIVER FOR MASTER PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

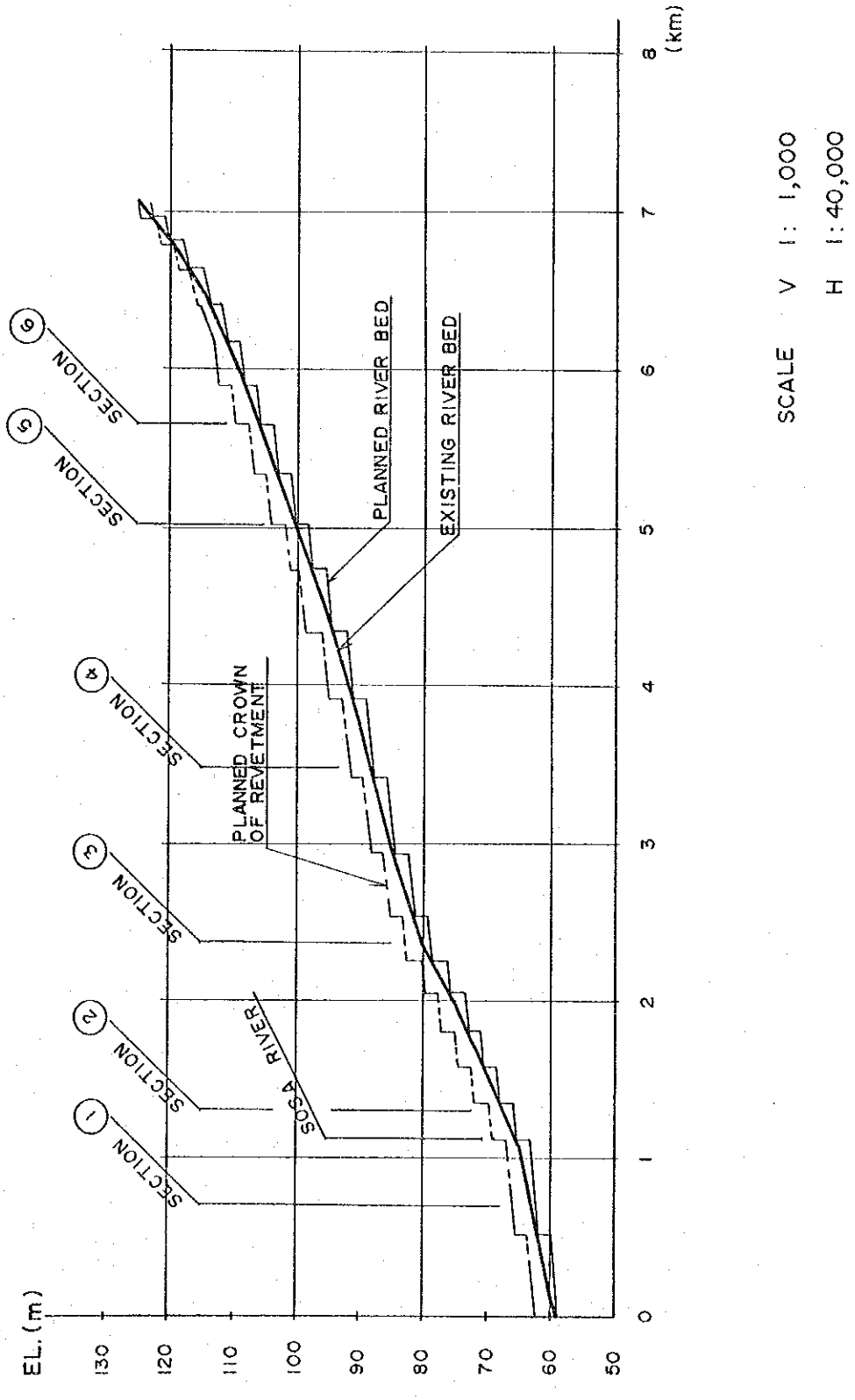


Fig. 5-29. PROPOSED LONGITUDINAL PROFILE OF LAMBARE RIVER FOR MASTER PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

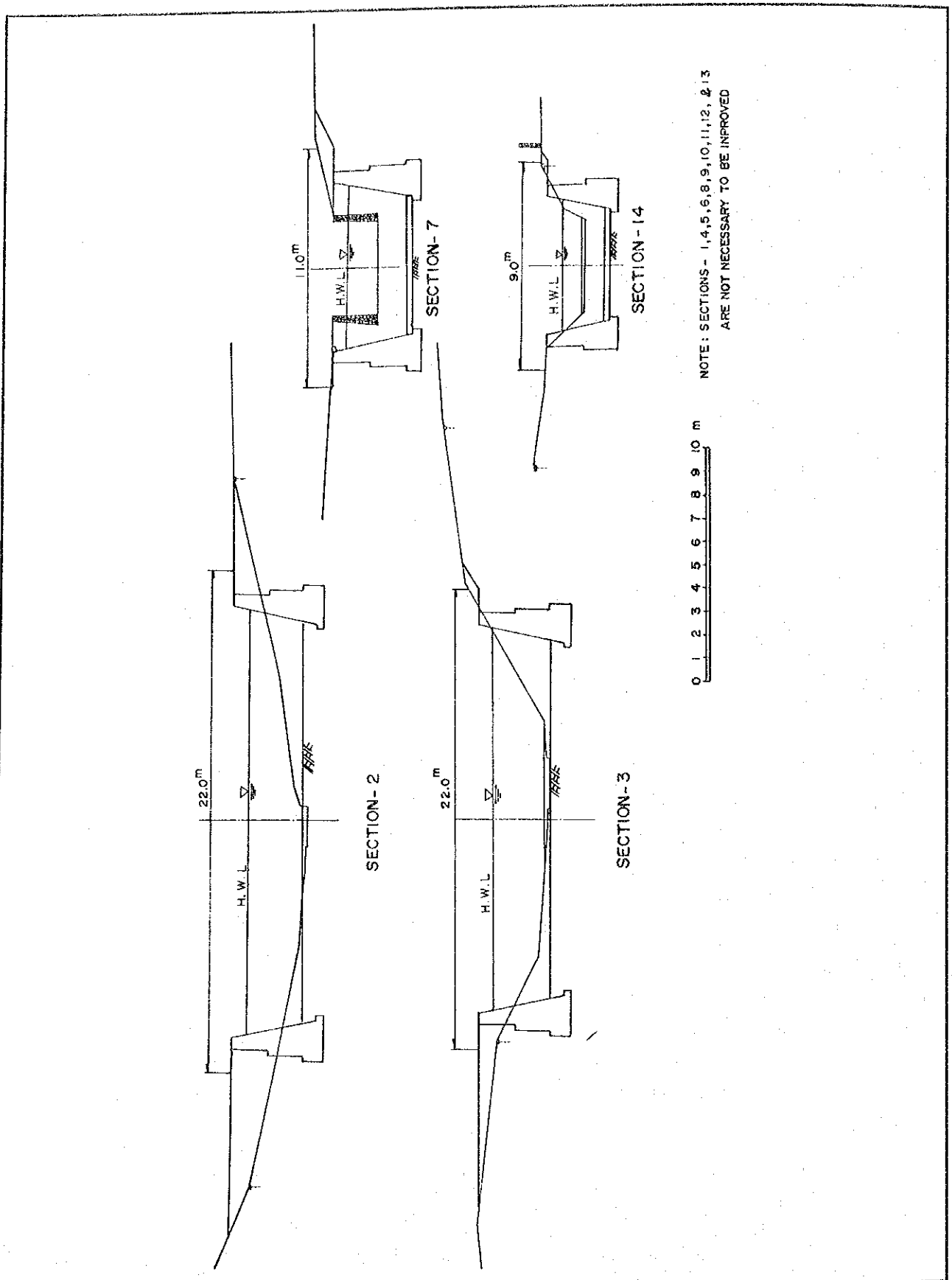


Fig. 5-30. PROPOSED CROSS SECTION OF MBURICAO RIVER FOR MASTER PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT
IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

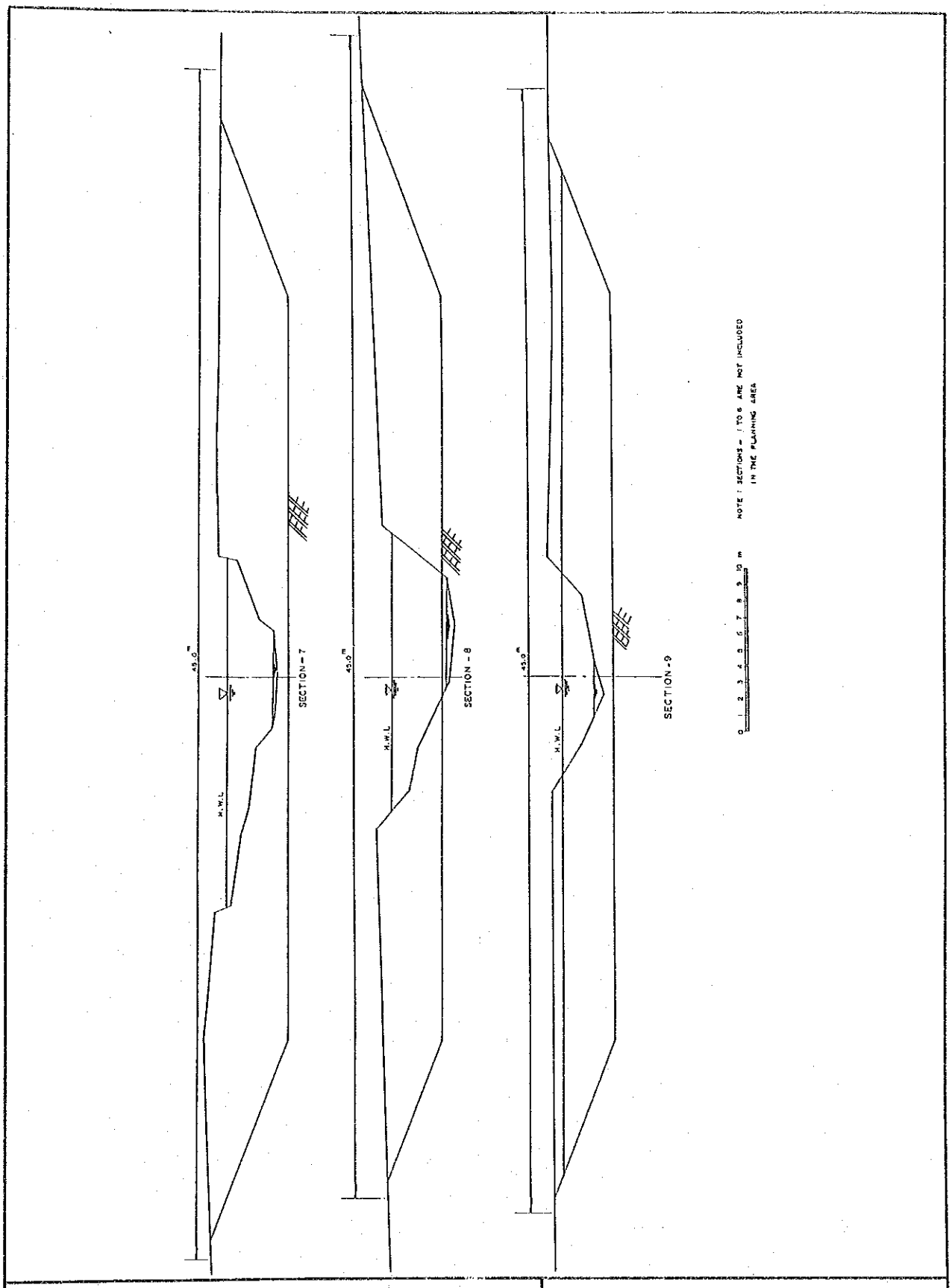


Fig. 5-31 (1/5). PROPOSED CROSS SECTION OF ITAY RIVER FOR MASTER PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

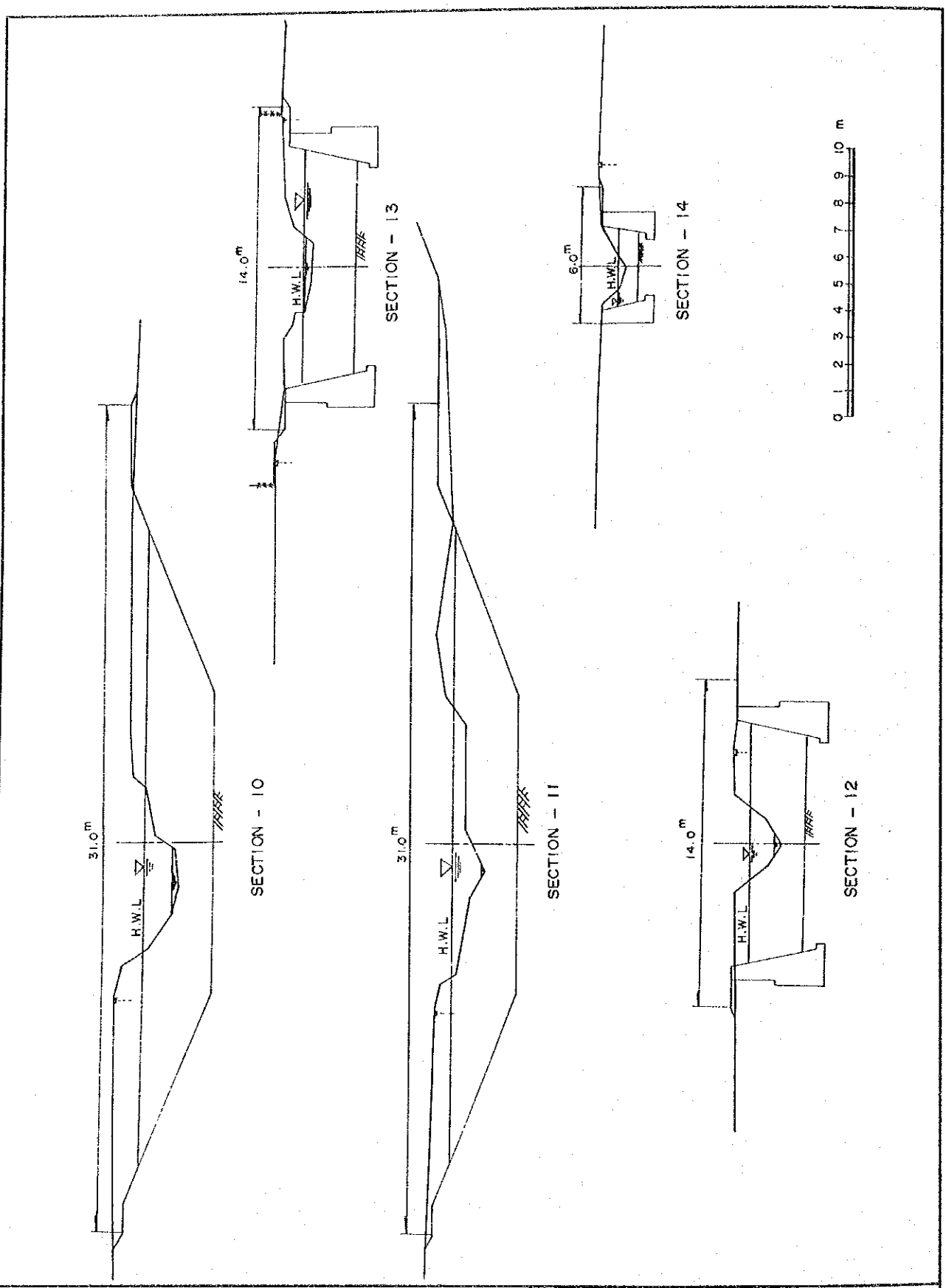


Fig. 5-31(2/5). PROPOSED CROSS SECTION OF ITAY RIVER FOR MASTER PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

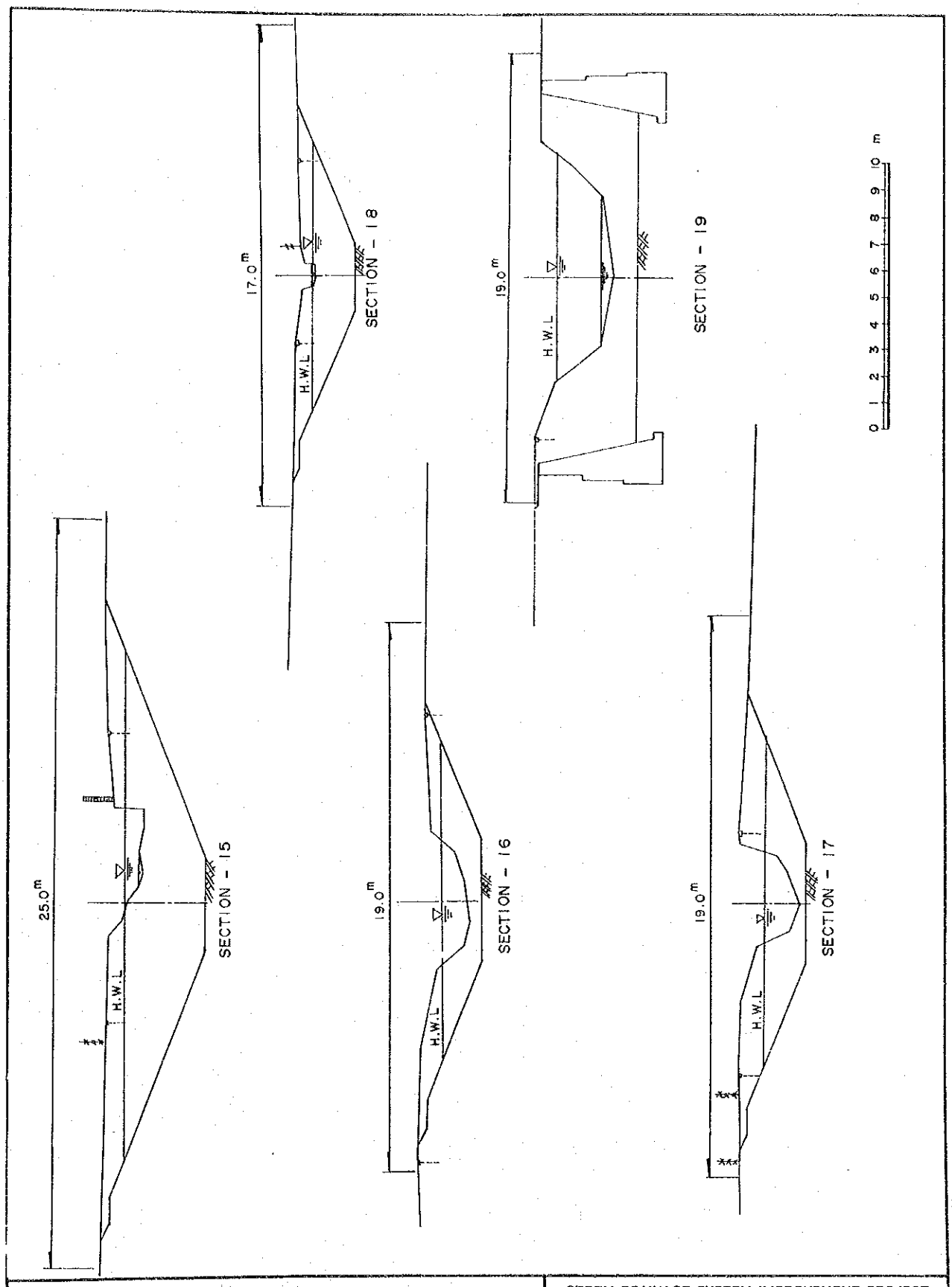
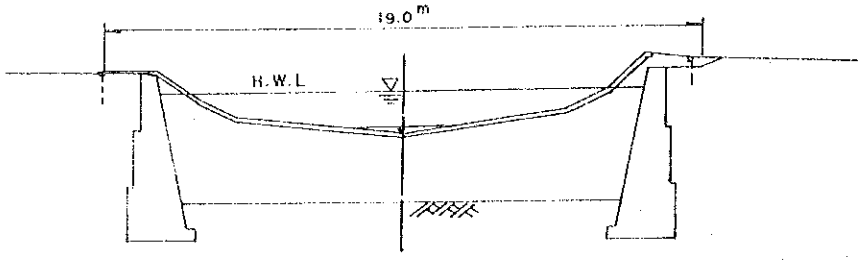


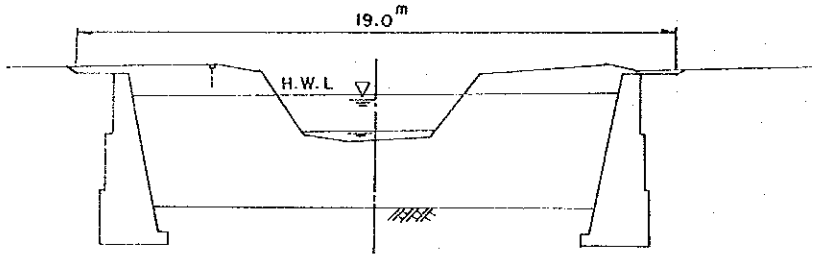
Fig. 5-31(3/5). PROPOSED CROSS SECTION OF ITAY RIVER FOR MASTER PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY



SECTION - 20



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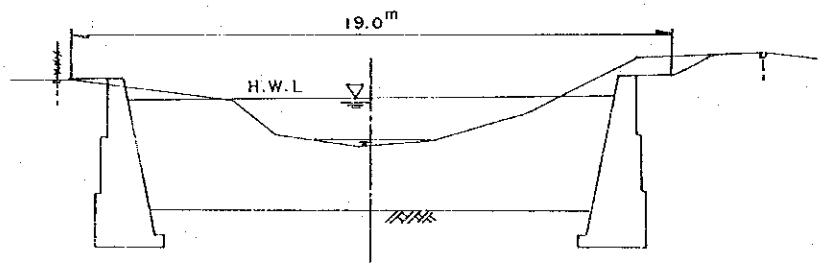

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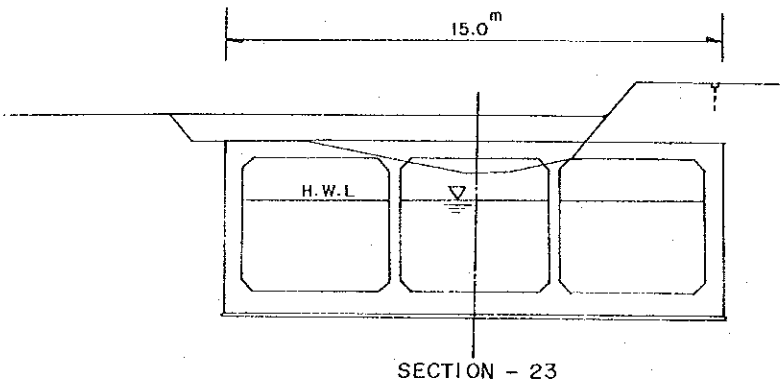


SECTION - 23

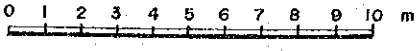
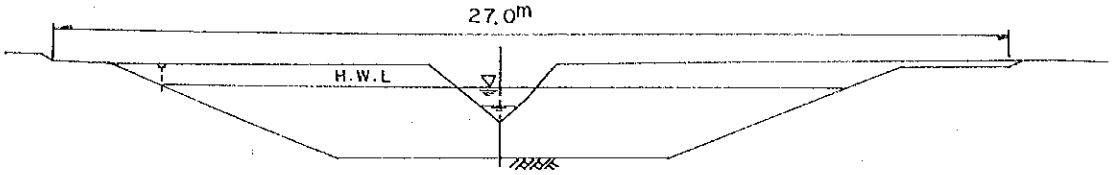


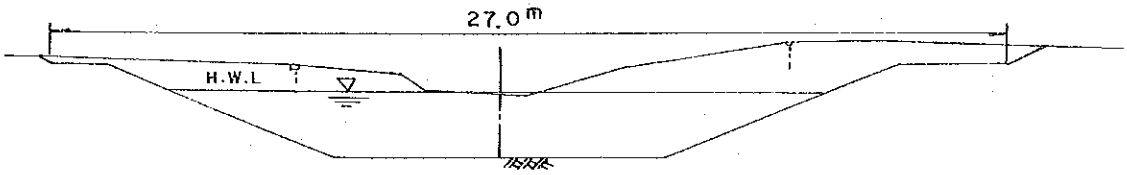
Fig. 5-31(4/5). PROPOSED CROSS SECTION OF ITAY RIVER FOR MASTER PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY



SECTION - 25



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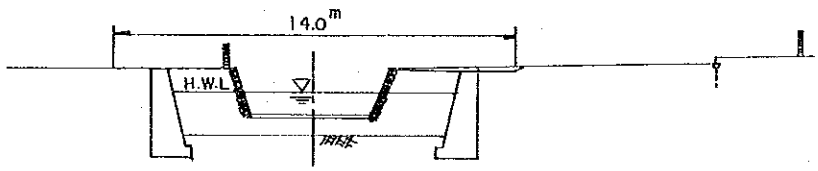

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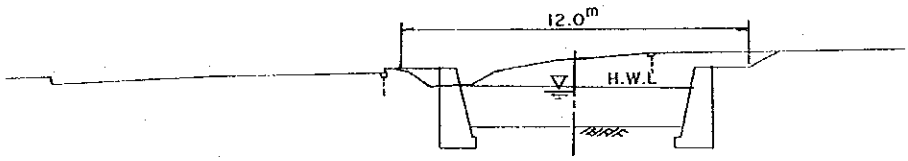

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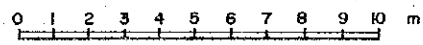


Fig. 5-31(5/5). PROPOSED CROSS SECTION OF ITAY RIVER FOR MASTER PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

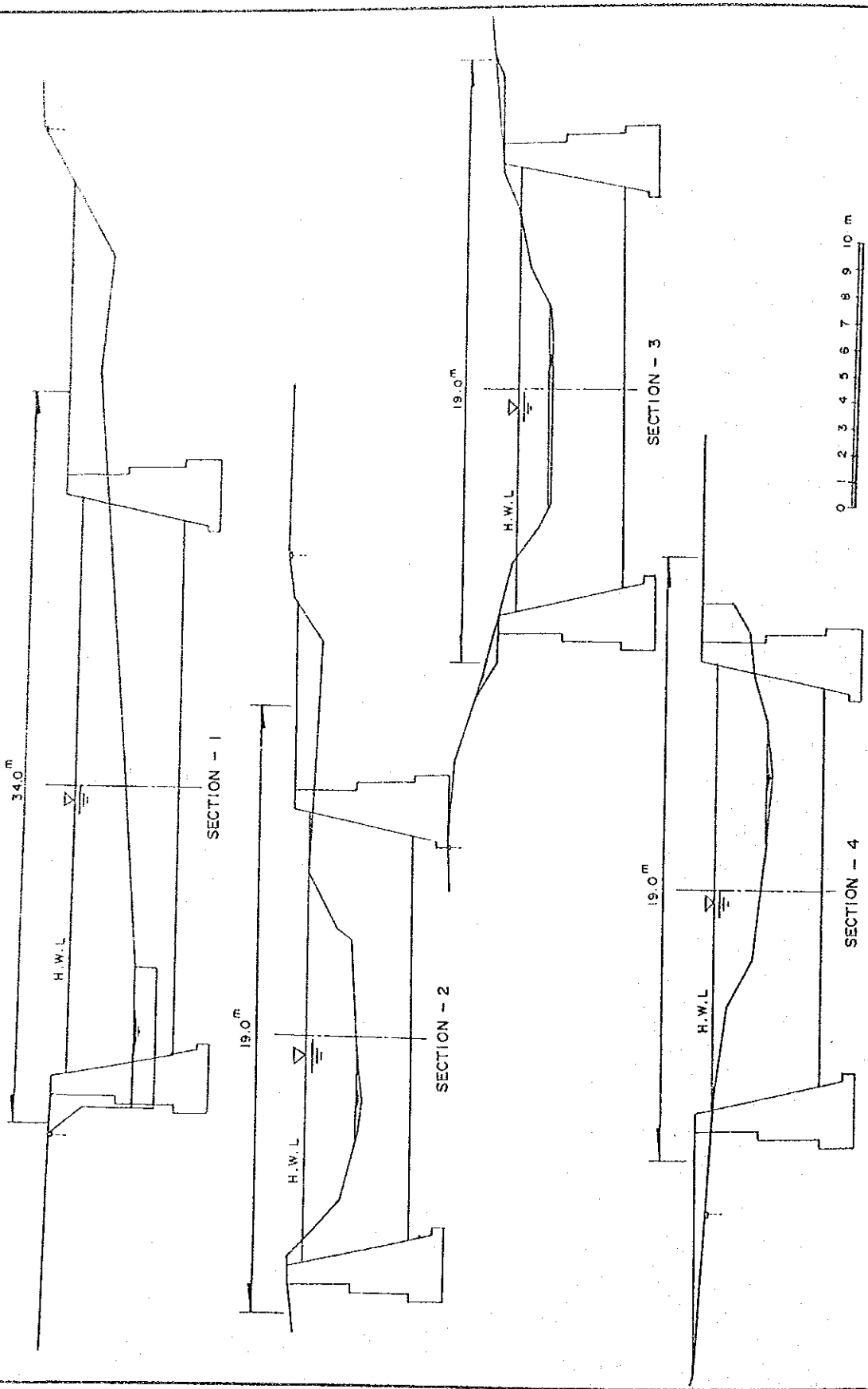


Fig. 5-32(1/2). PROPOSED CROSS SECTION OF LAMBARE RIVER FOR MASTER PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

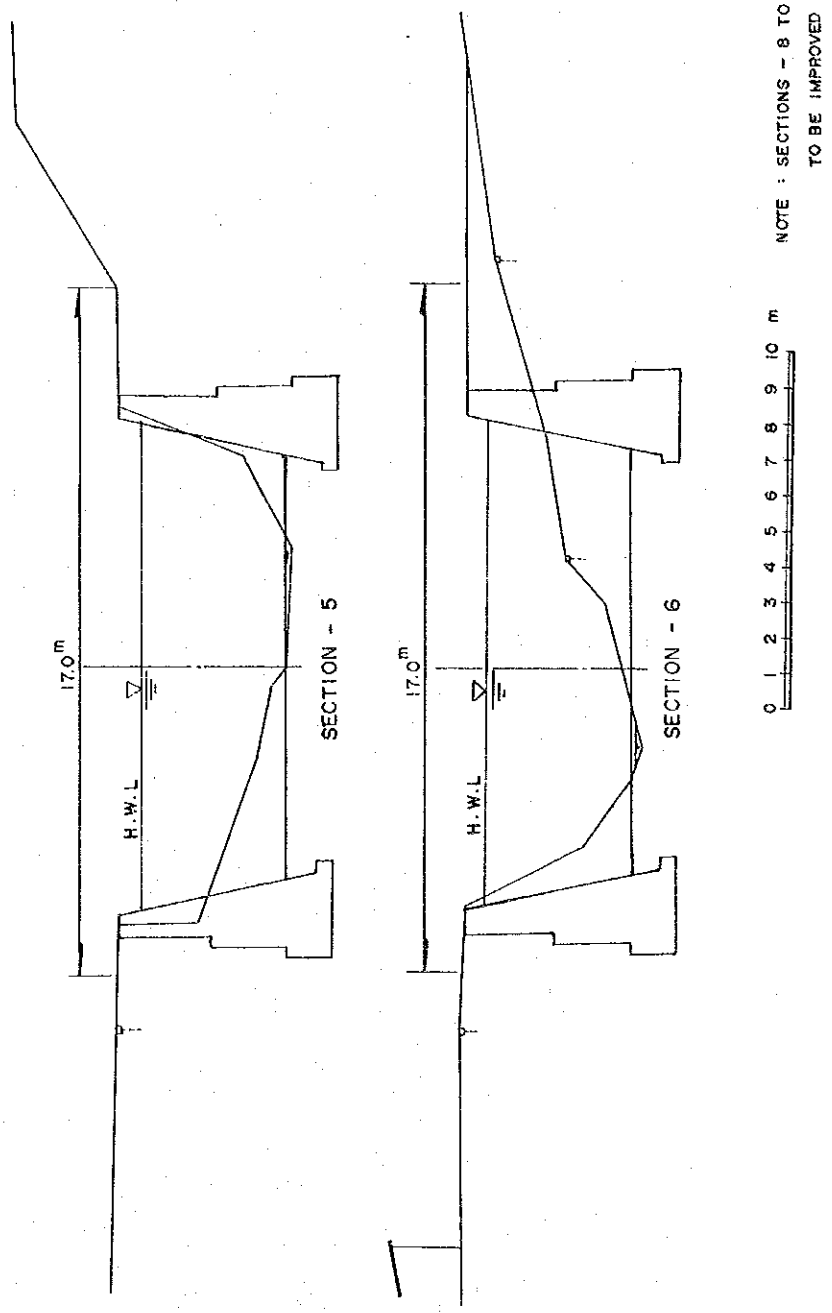


Fig. 5-32(2/2). PROPOSED CROSS SECTION OF LAMBARE RIVER FOR MASTER PLAN

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

INFILTRATION INLET AND TRENCH

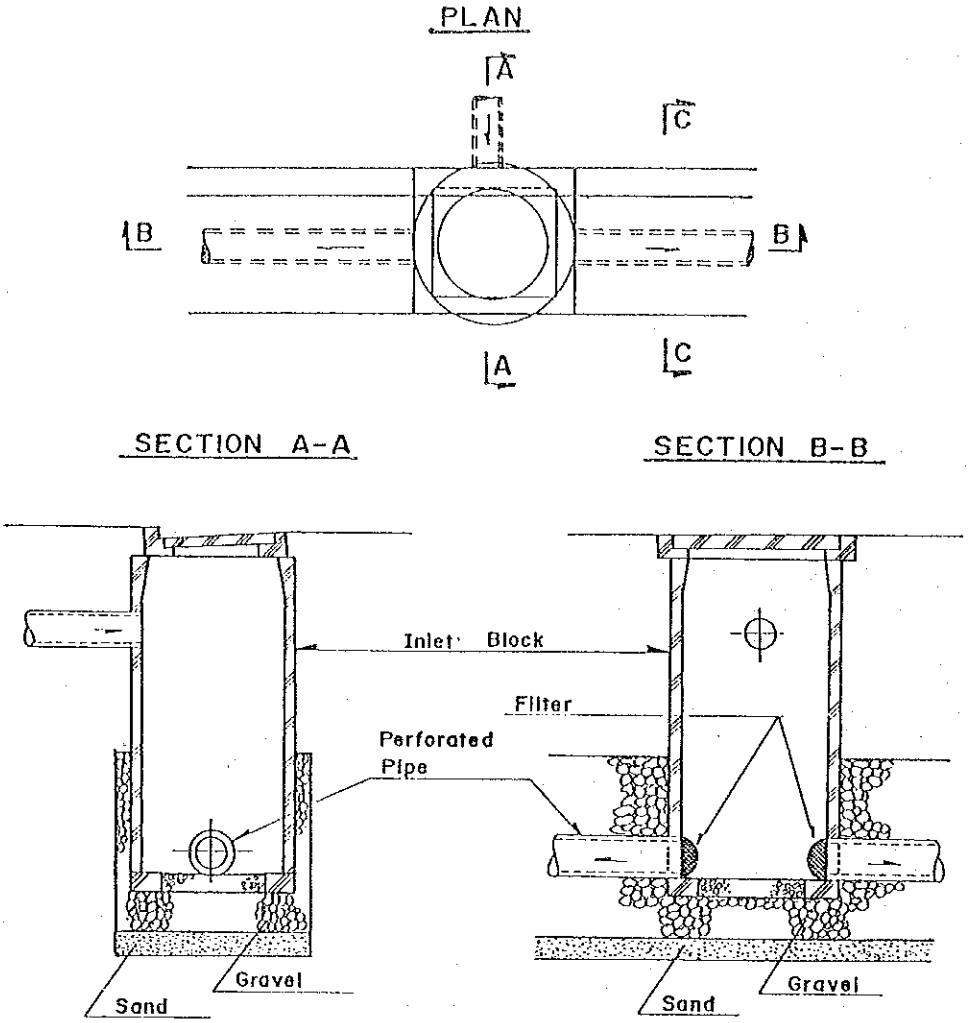


Fig.5-33. STANDARD DRAWING OF INFILTRATION TRENCH

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

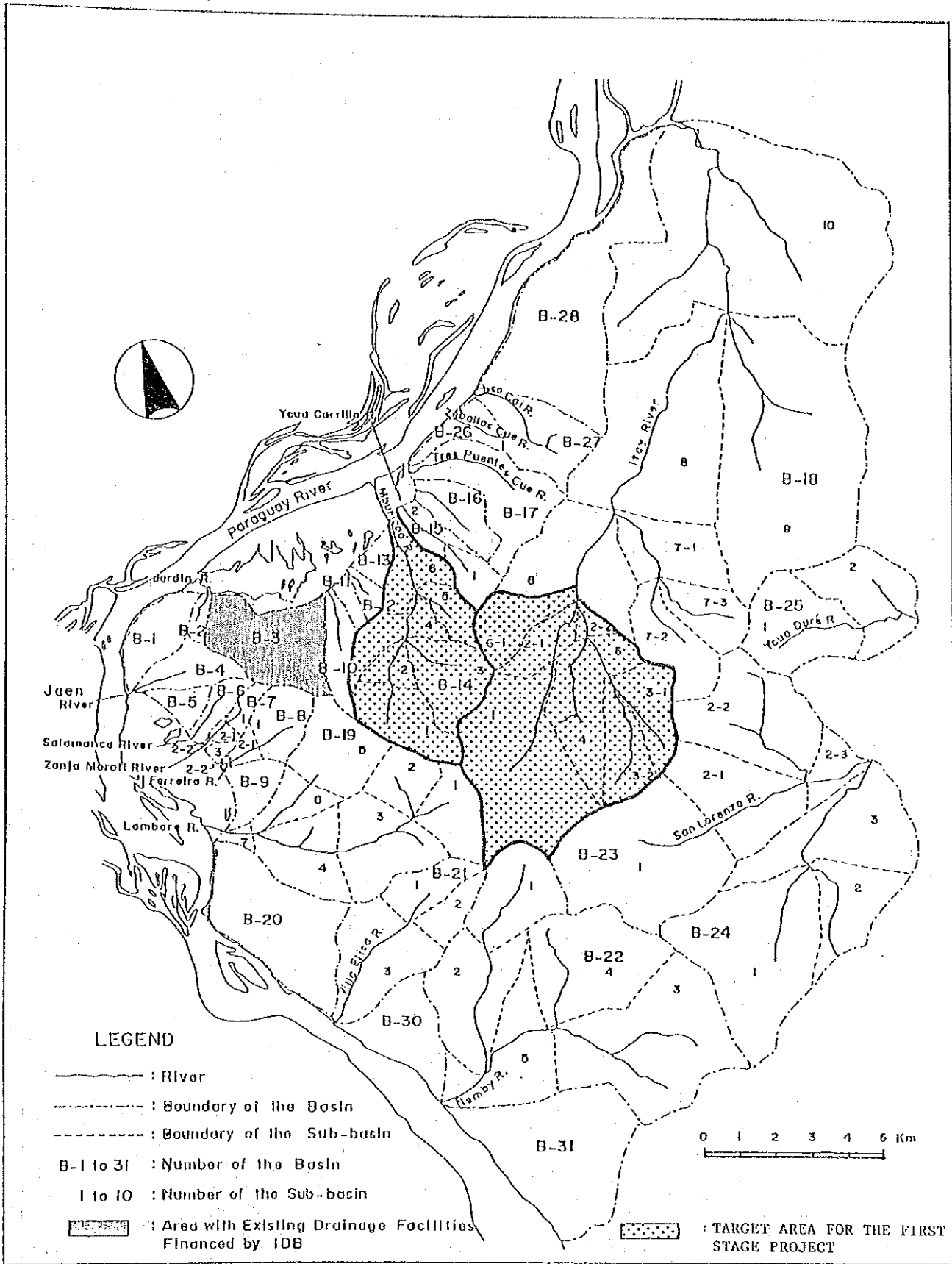


Fig.5-34. TARGET AREA FOR THE FIRST STAGE PROJECT

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

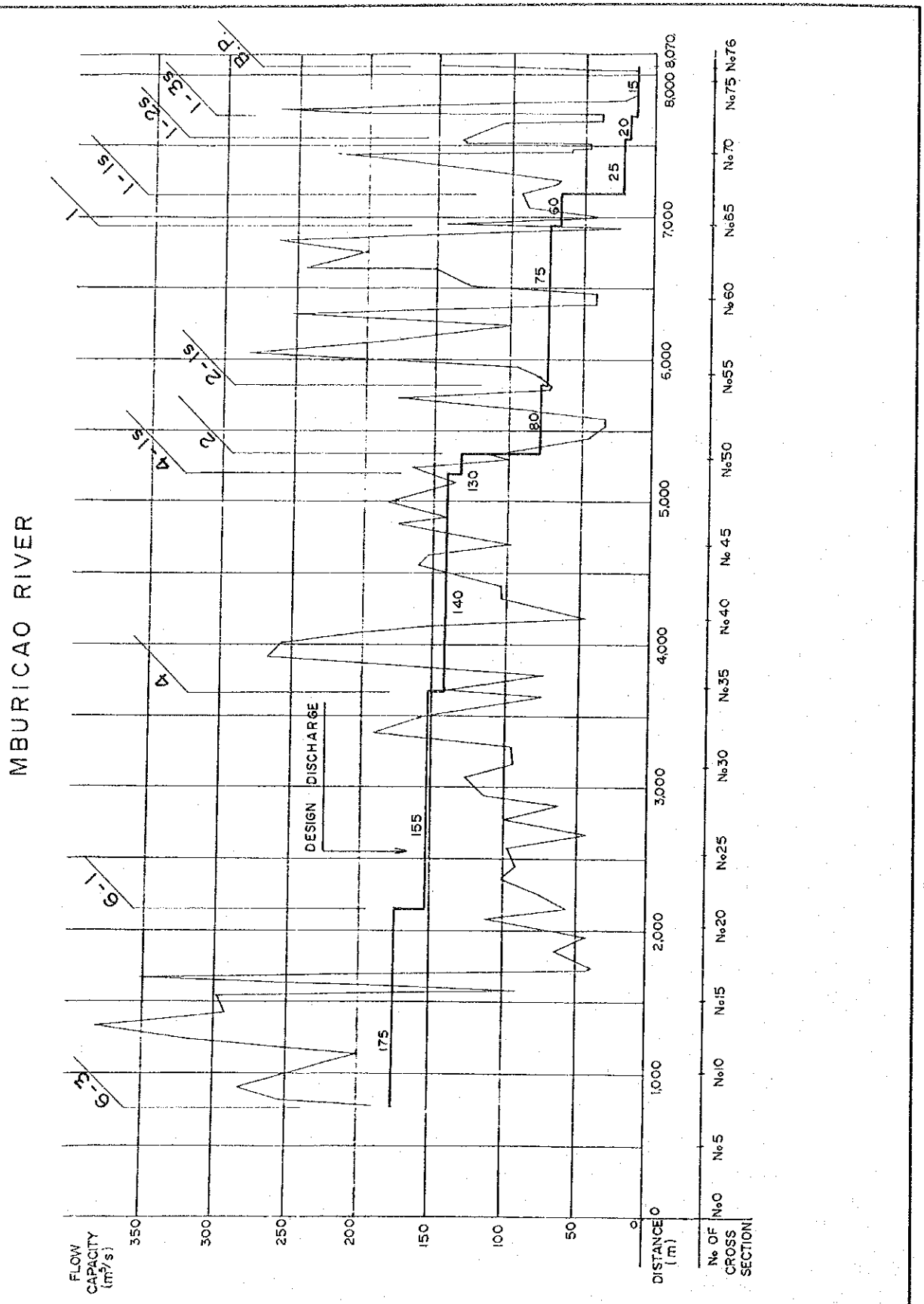


Fig. 5-35(1/2). EXISTING FLOW CAPACITY OF MBURICAO RIVER AND ITS TRIBUTARIES

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

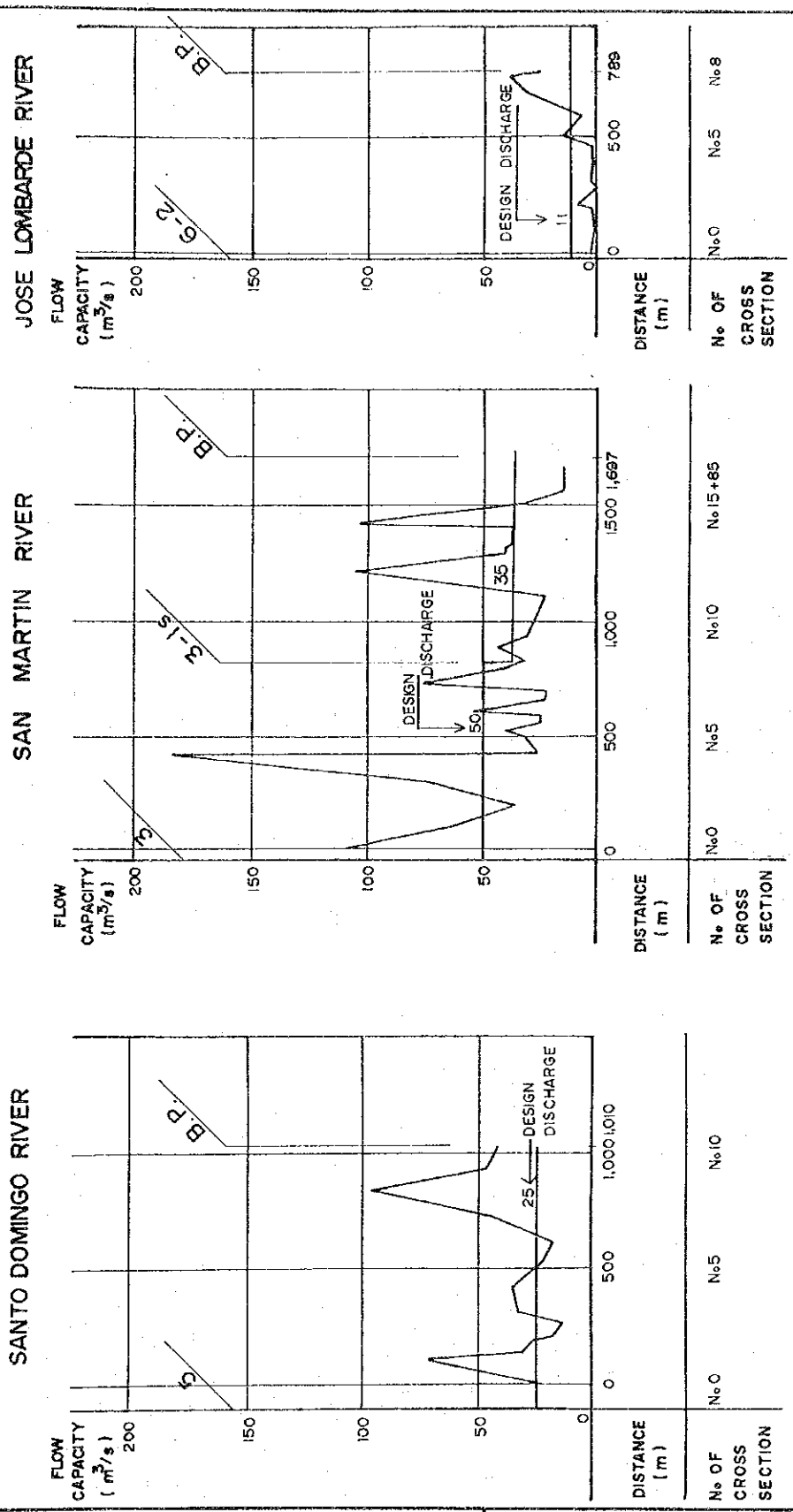


Fig. 5-35(2/2). EXISTING FLOW CAPACITY OF MBURICAO RIVER AND ITS TRIBUTARIES

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

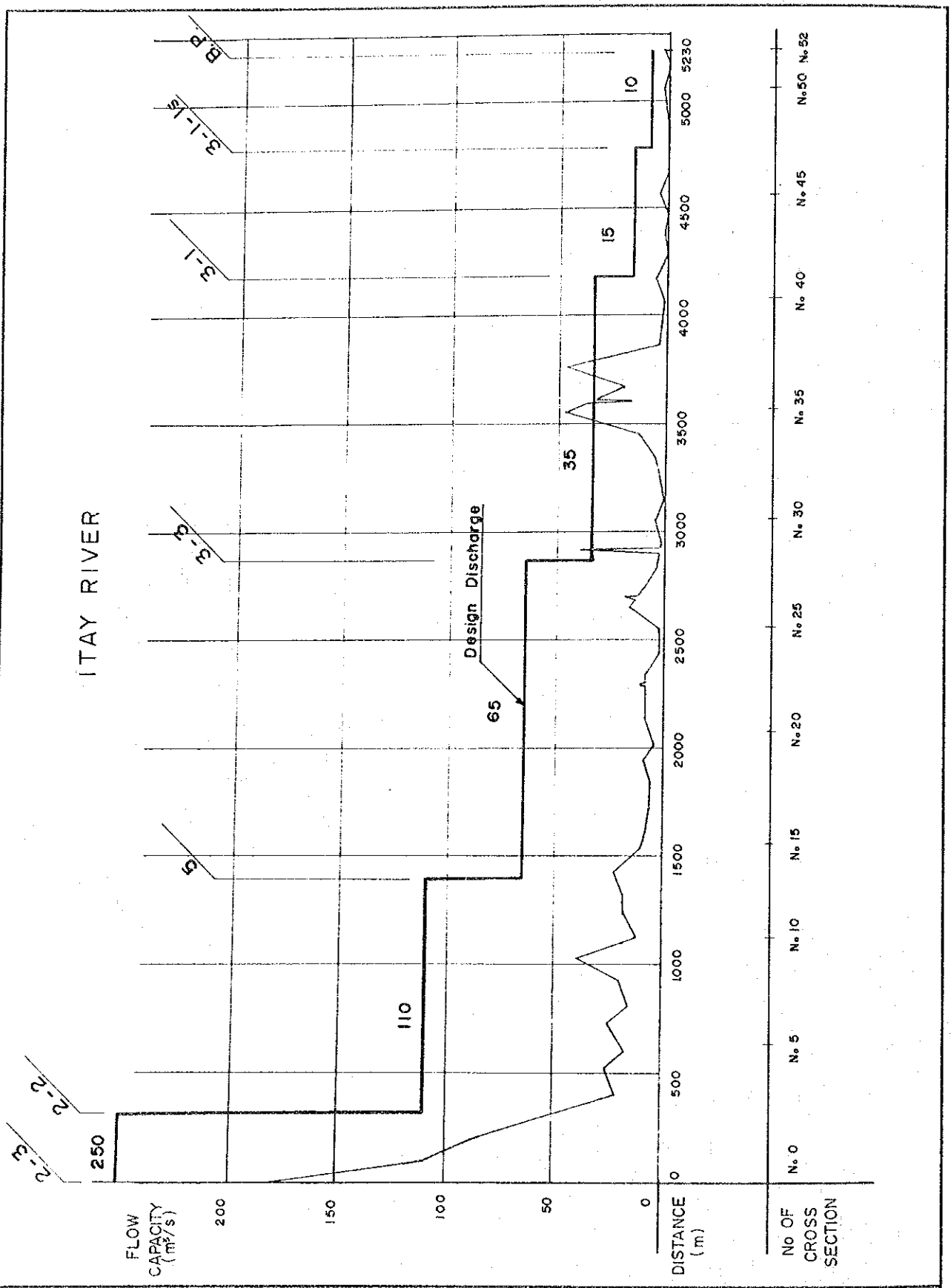


Fig. 5-36(1/4). EXISTING FLOW CAPACITY OF ITAY RIVER AND ITS TRIBUTARIES

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

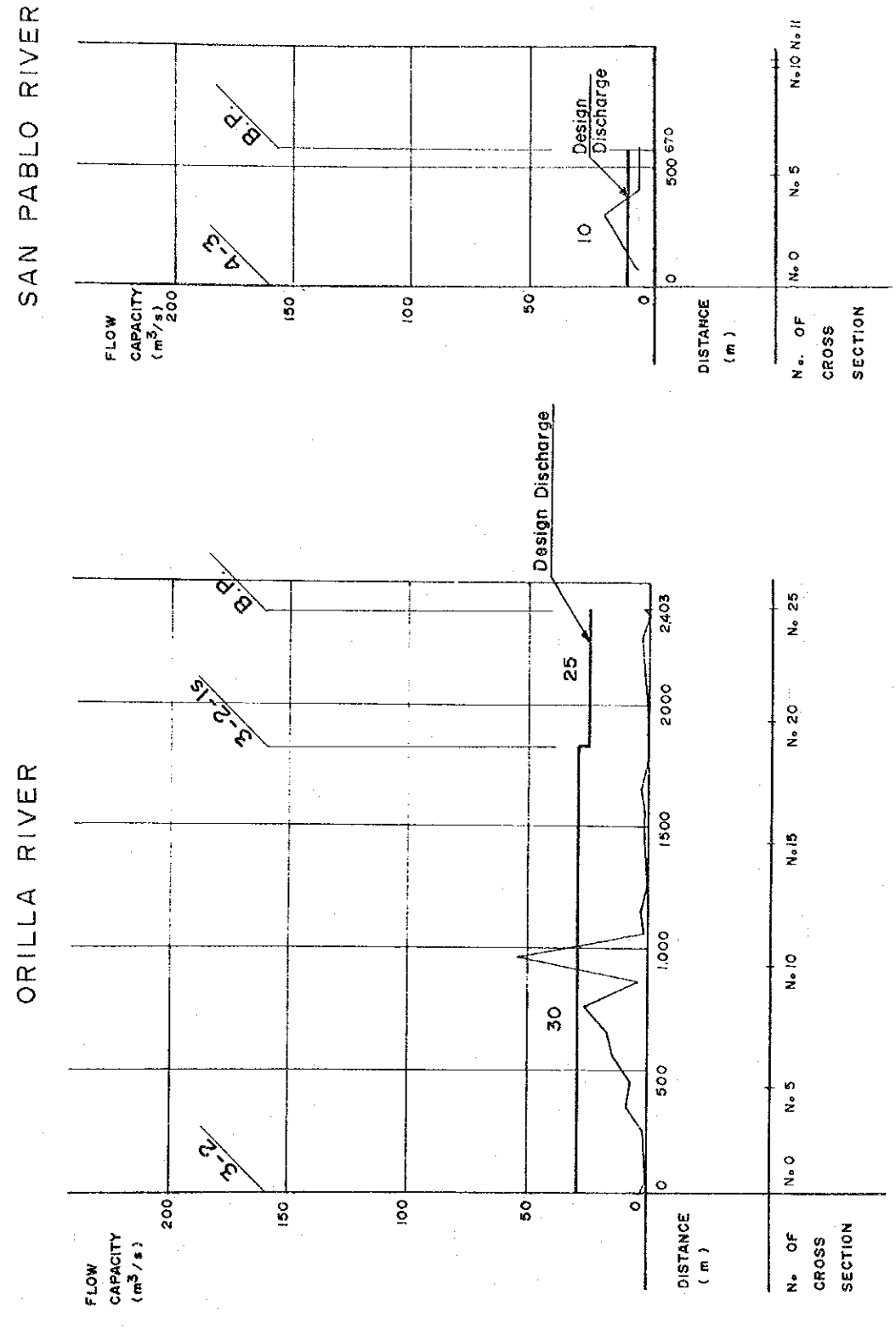


Fig. 5-36(2/4). EXISTING FLOW CAPACITY OF ITAY RIVER AND ITS TRIBUTARIES

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

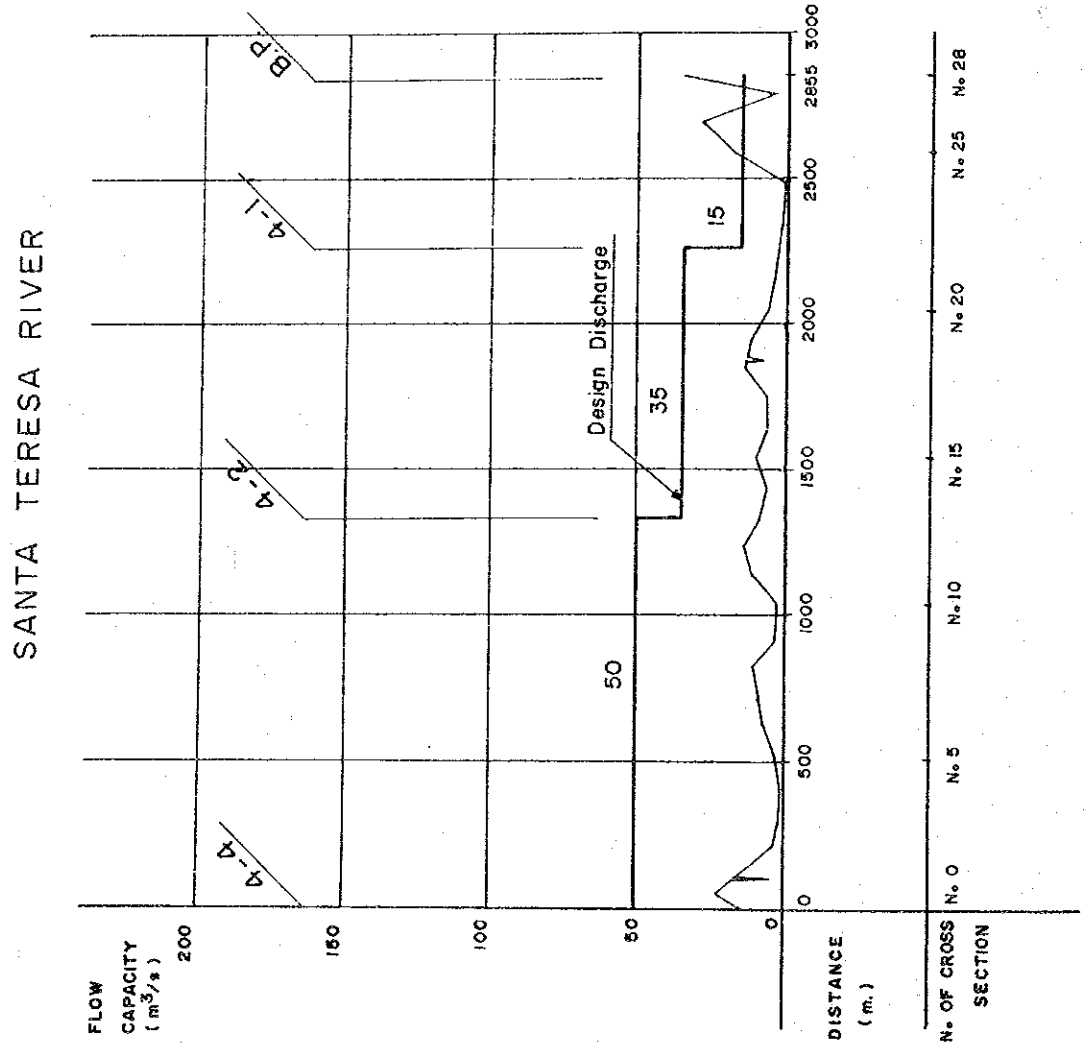


Fig. 5-36(3/4). EXISTING FLOW CAPACITY OF ITAY RIVER AND ITS TRIBUTARIES

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

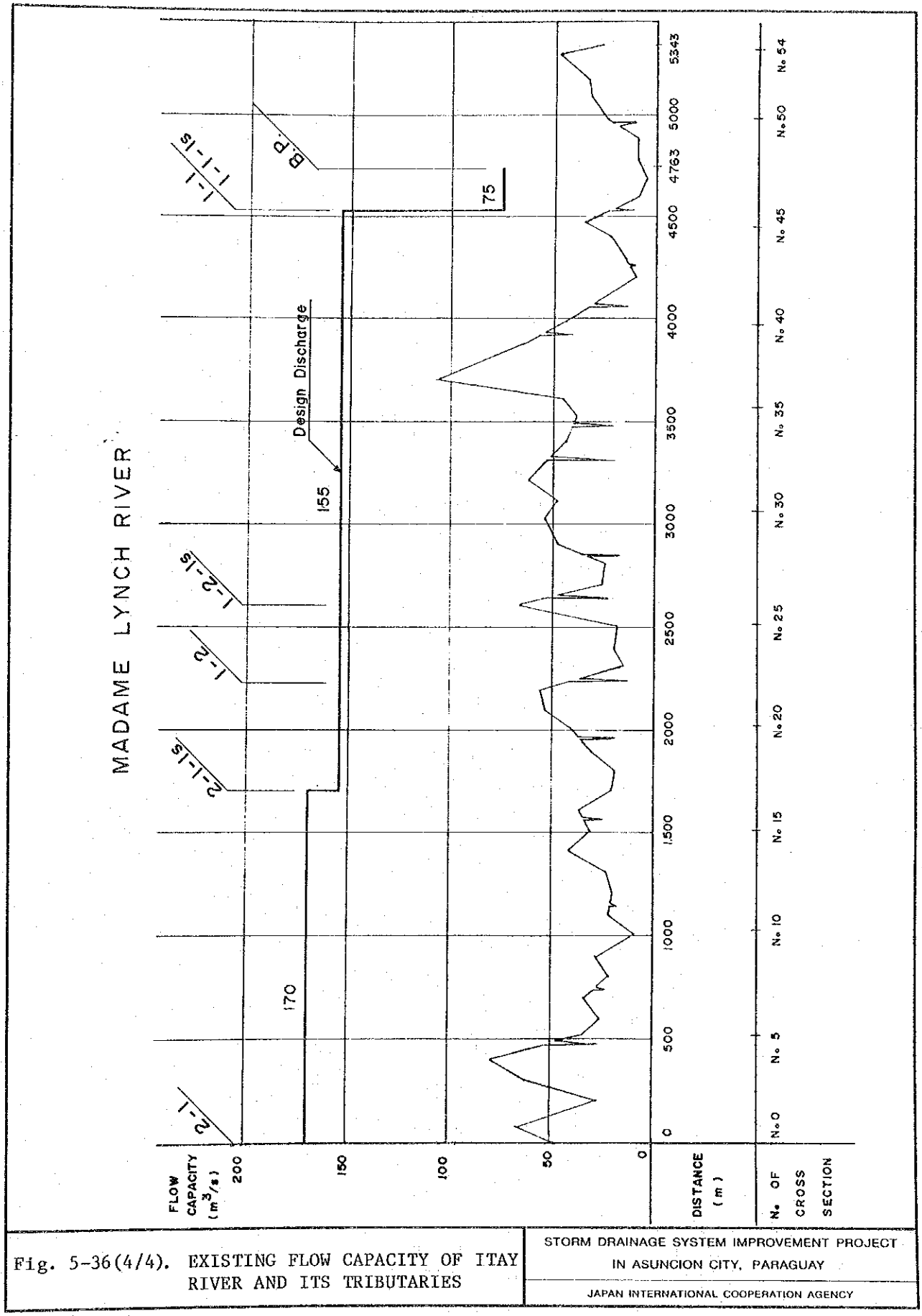
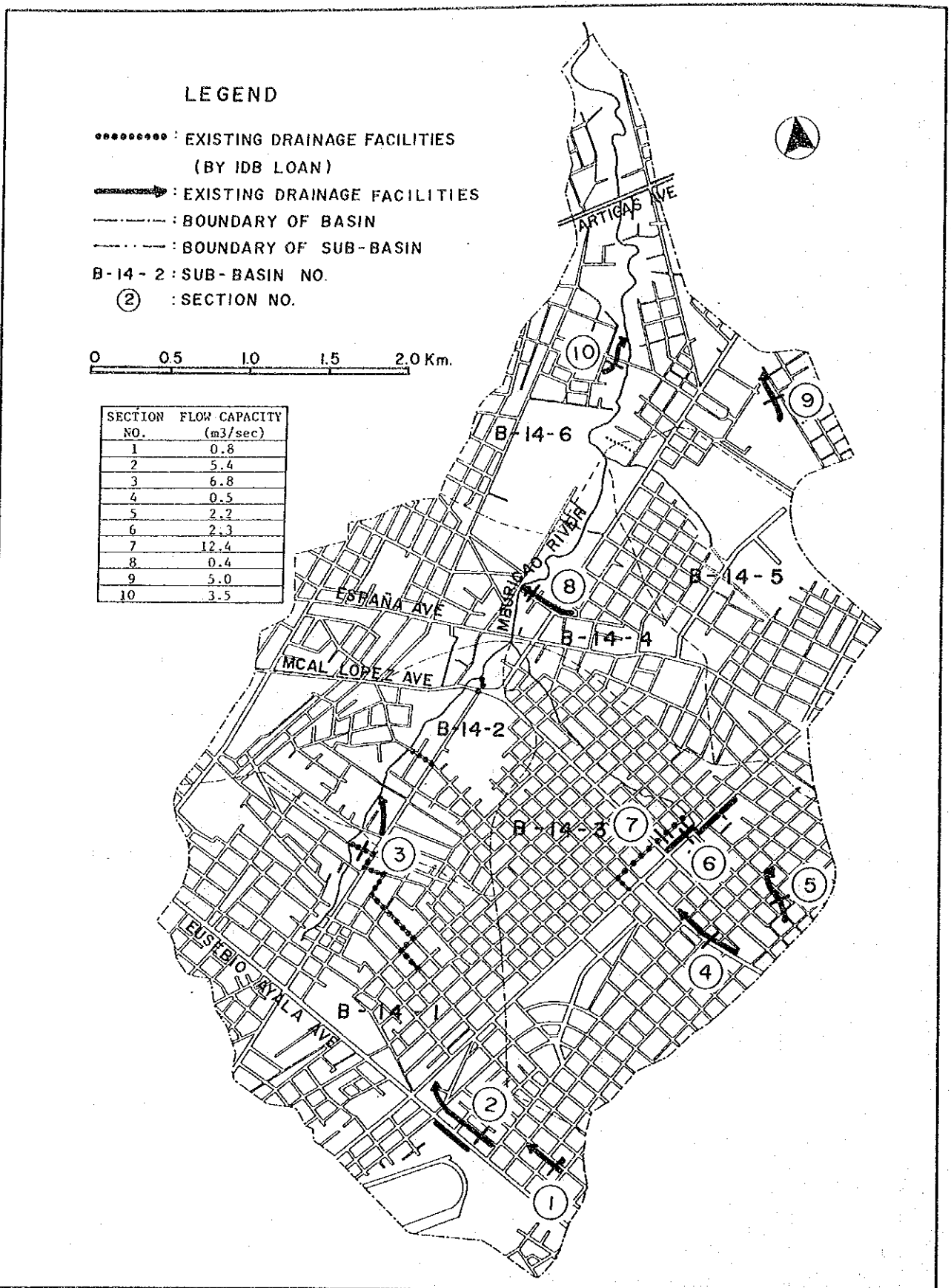


Fig. 5-36(4/4). EXISTING FLOW CAPACITY OF ITAY RIVER AND ITS TRIBUTARIES

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

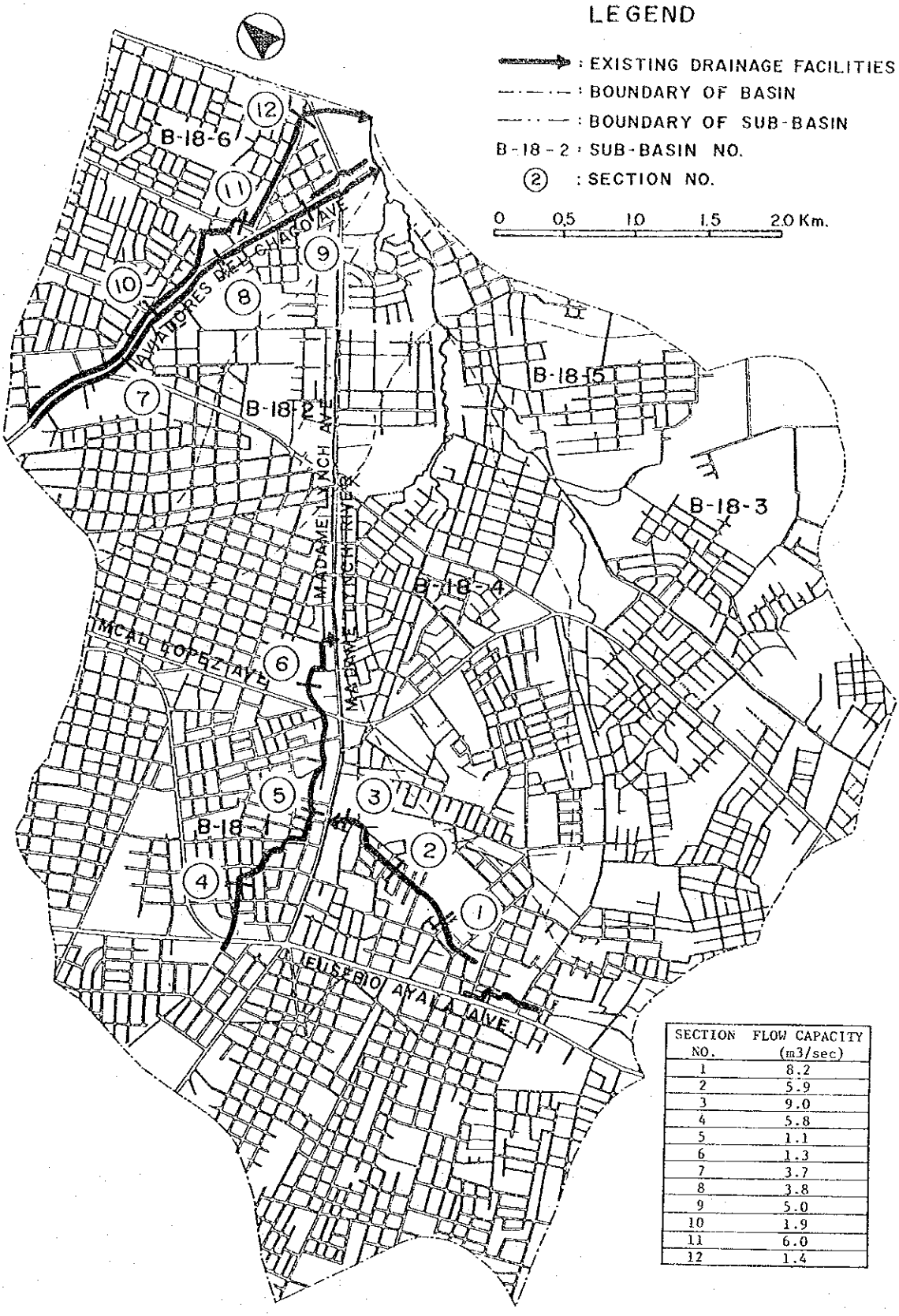


SECTION NO.	FLOW CAPACITY (m3/sec)
1	0.8
2	5.4
3	6.8
4	0.5
5	2.2
6	2.3
7	12.4
8	0.4
9	5.0
10	3.5

Fig. 5-37(1/2). LOCATION AND FLOW CAPACITY OF EXISTING DRAINAGE FACILITIES (MBURICAO RIVER BASIN)

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY



SECTION NO.	FLOW CAPACITY (m3/sec)
1	8.2
2	5.9
3	9.0
4	5.8
5	1.1
6	1.3
7	3.7
8	3.8
9	5.0
10	1.9
11	6.0
12	1.4

Fig. 5-37(2/2). LOCATION AND FLOW CAPACITY OF EXISTING DRAINAGE FACILITIES (ITAY RIVER BASIN)

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

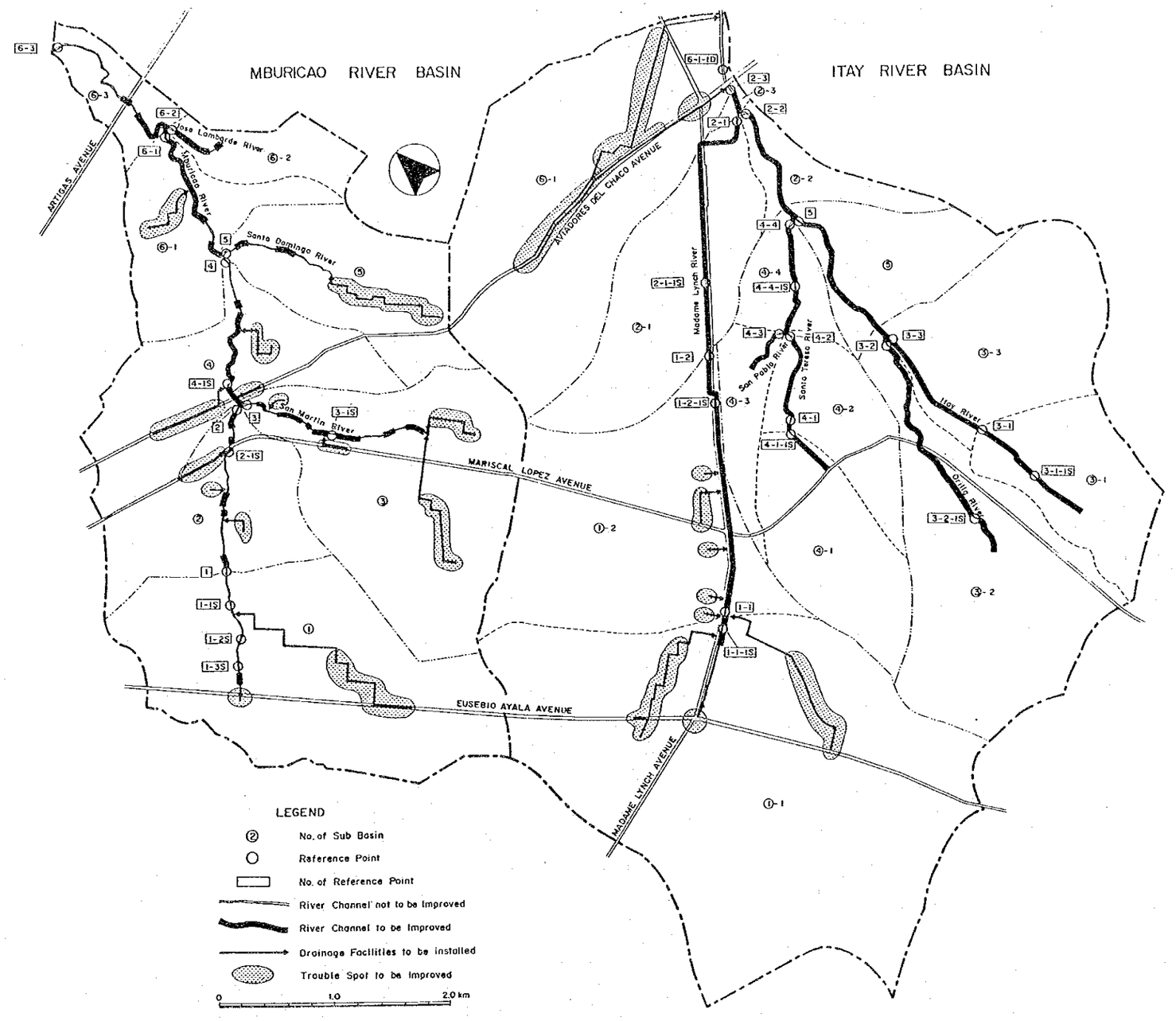


Fig. 5-38. TROUBLE SPOT IN MBURICAO AND ITAY RIVER BASINS

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

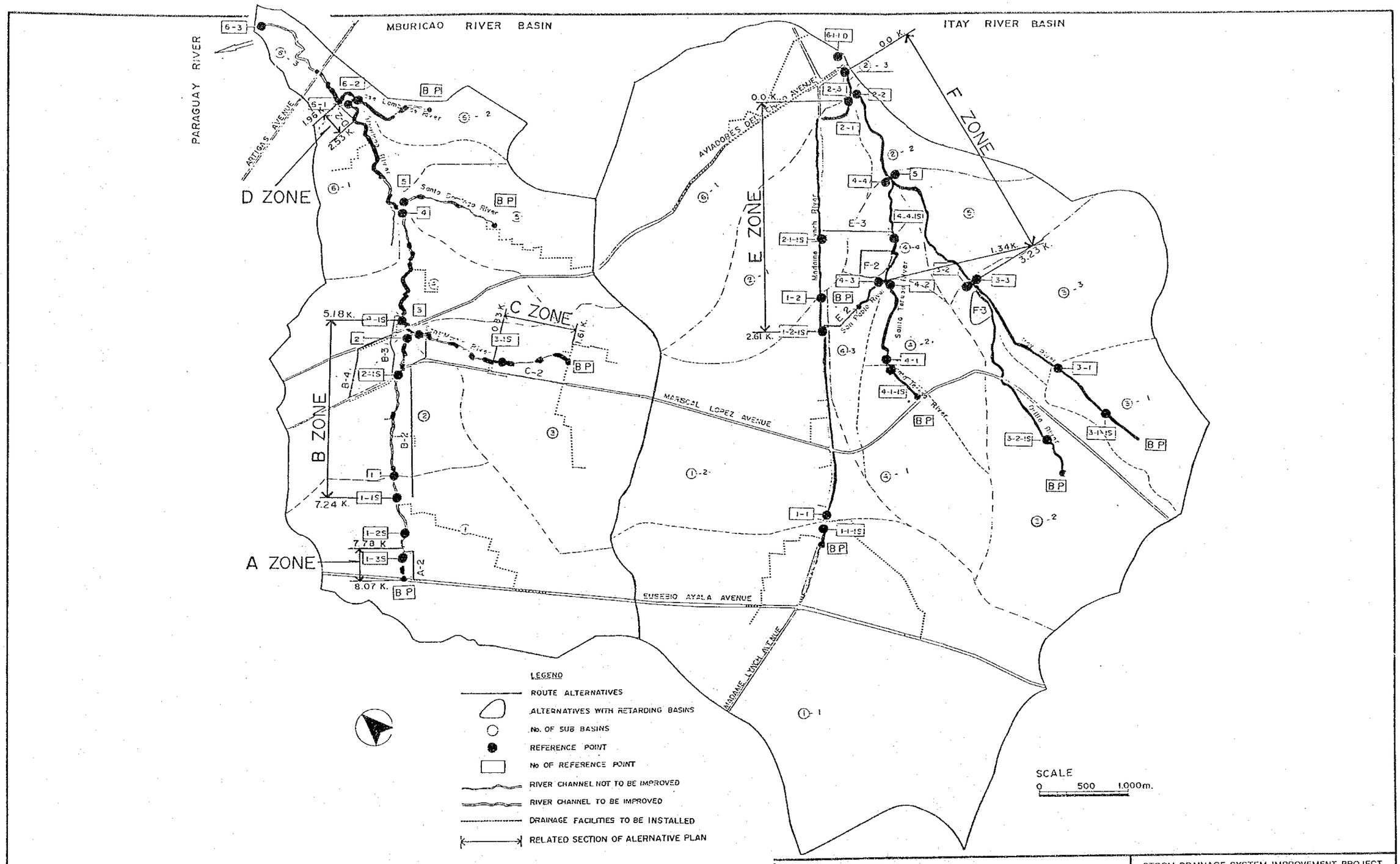
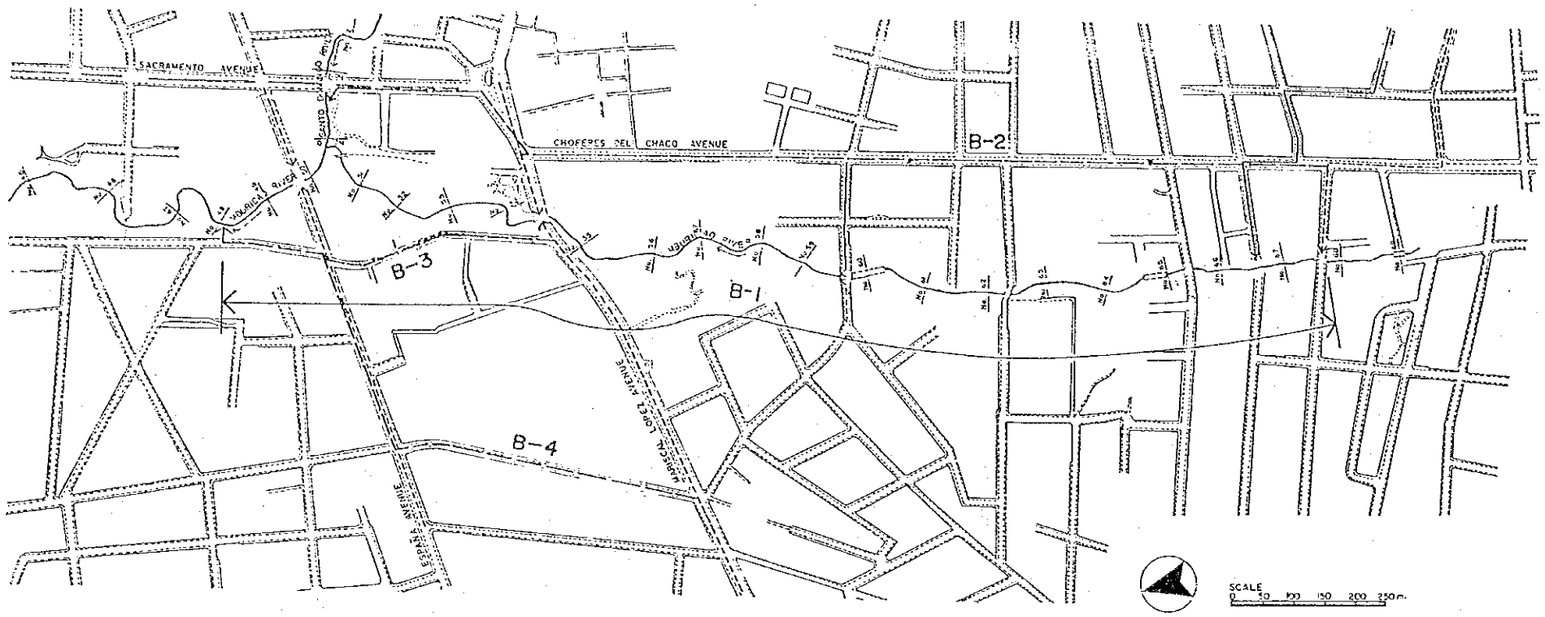


Fig. 5-39. LOCATION OF ALTERNATIVE PLANS FOR FIRST STAGE PROJECT

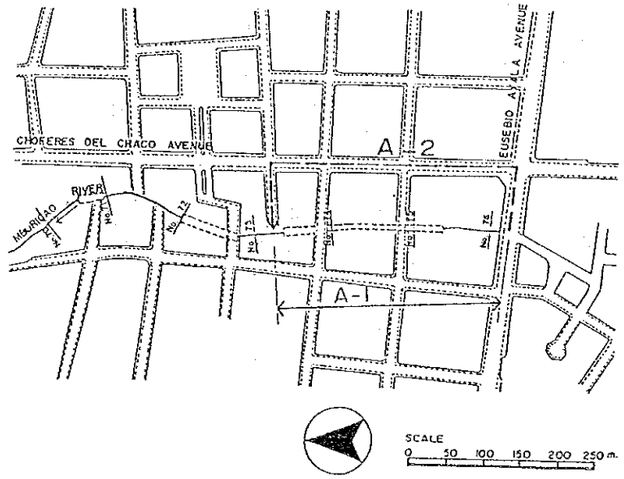
STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

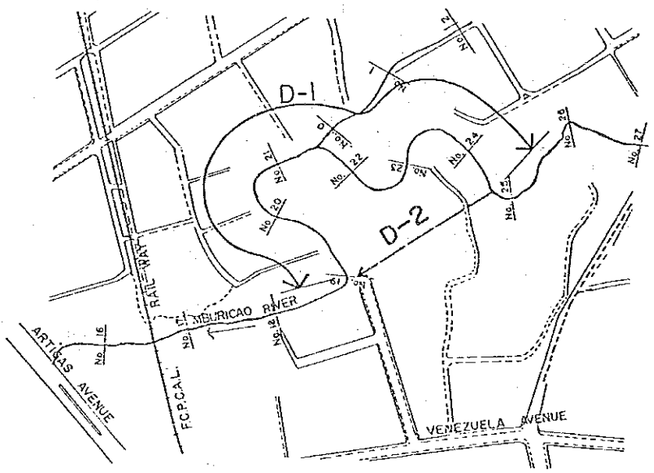
MBURICAO RIVER BASIN (ZONE B)



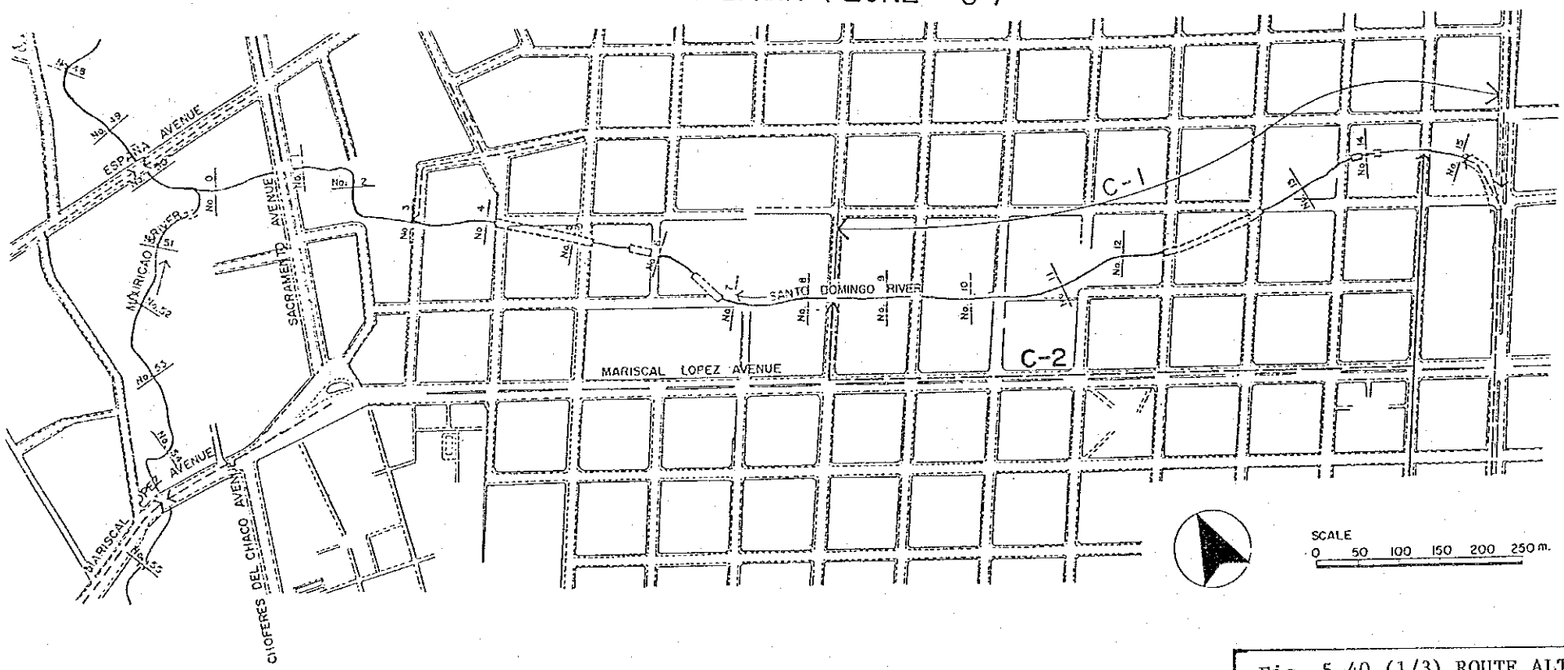
MBURICAO RIVER BASIN (ZONE A)



MBURICAO RIVER BASIN (ZONE D)



MBURICAO RIVER BASIN (ZONE C)



LEGEND

— — — : ROUTE ALTERNATIVES

- - - - - - : PLANNED DRAINAGE FACILITIES

——— : EXISTING DRAINAGE FACILITIES

[- - -] : UNDERGROUND CONDUIT

Fig. 5-40.(1/3) ROUTE ALTERNATIVES OF EACH ZONE FOR FIRST STAGE PROJECT (MBURICAO RIVER BASIN)

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

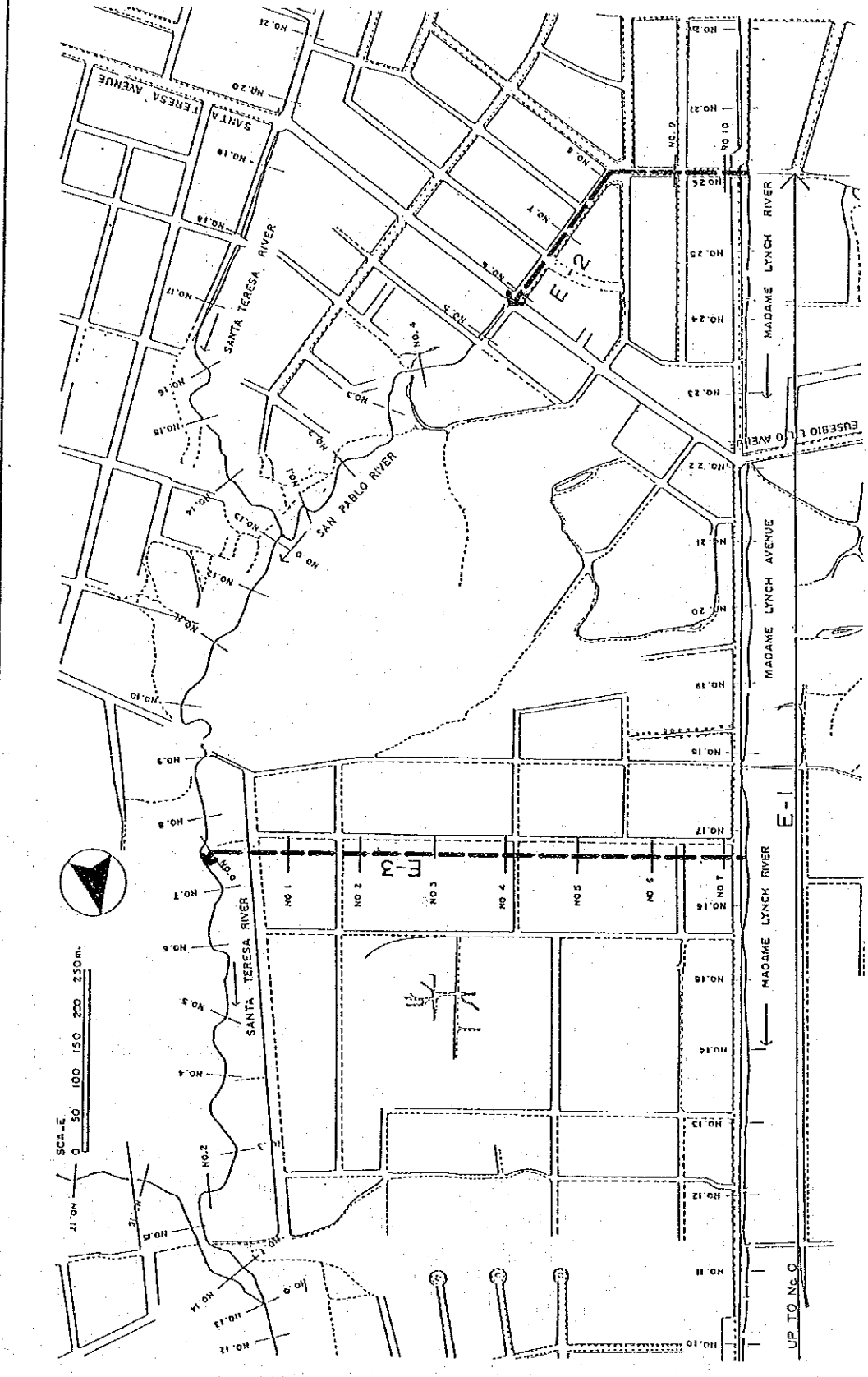


Fig. 5-40(2/3). ROUTE ALTERNATIVES OF EACH ZONE FOR FIRST STAGE PROJECT (ITAY RIVER BASIN)

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

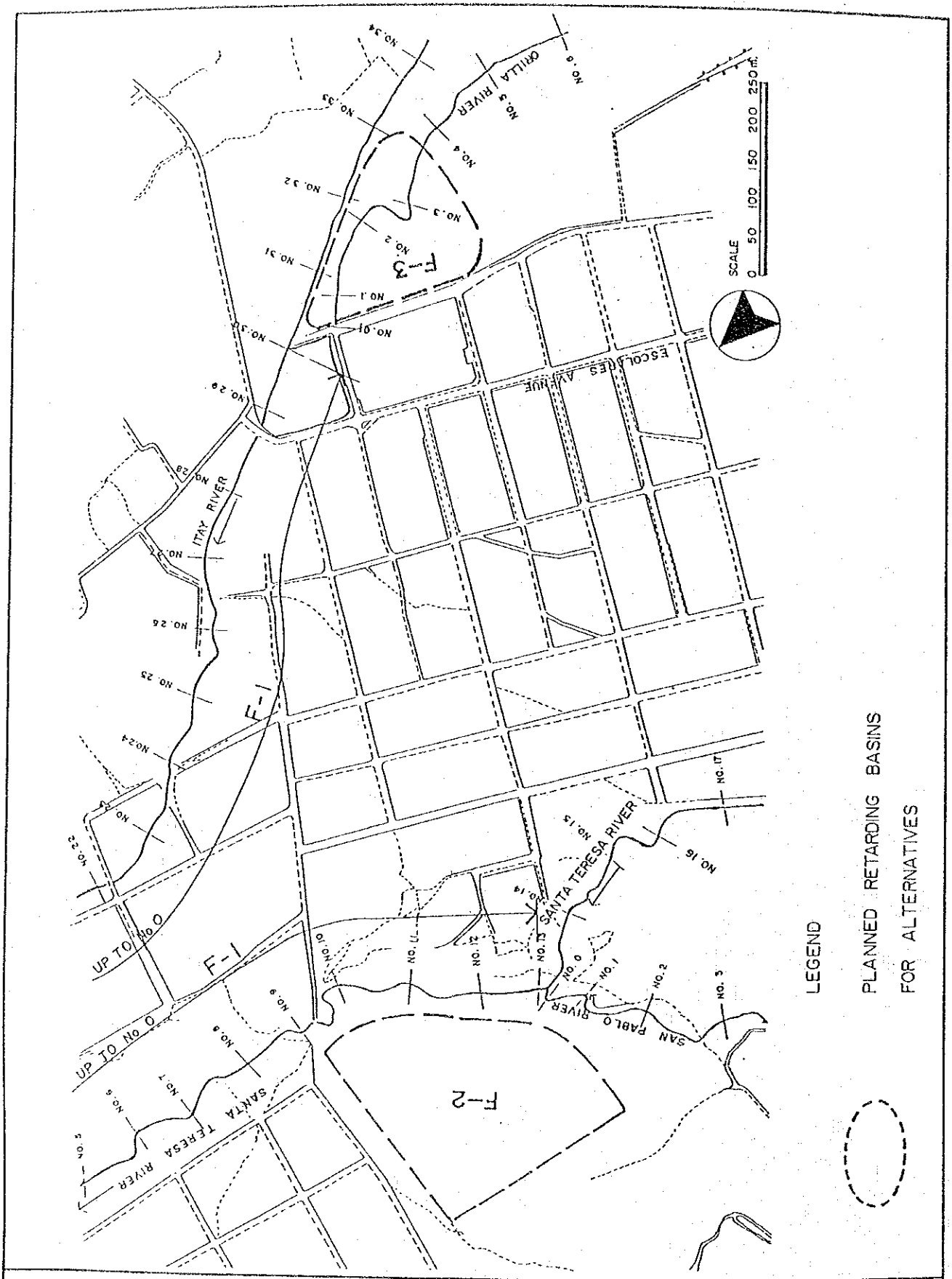


Fig. 5-40(3/3). ROUTE ALTERNATIVES OF EACH ZONE FOR FIRST STAGE PROJECT (ITAY RIVER BASIN)

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

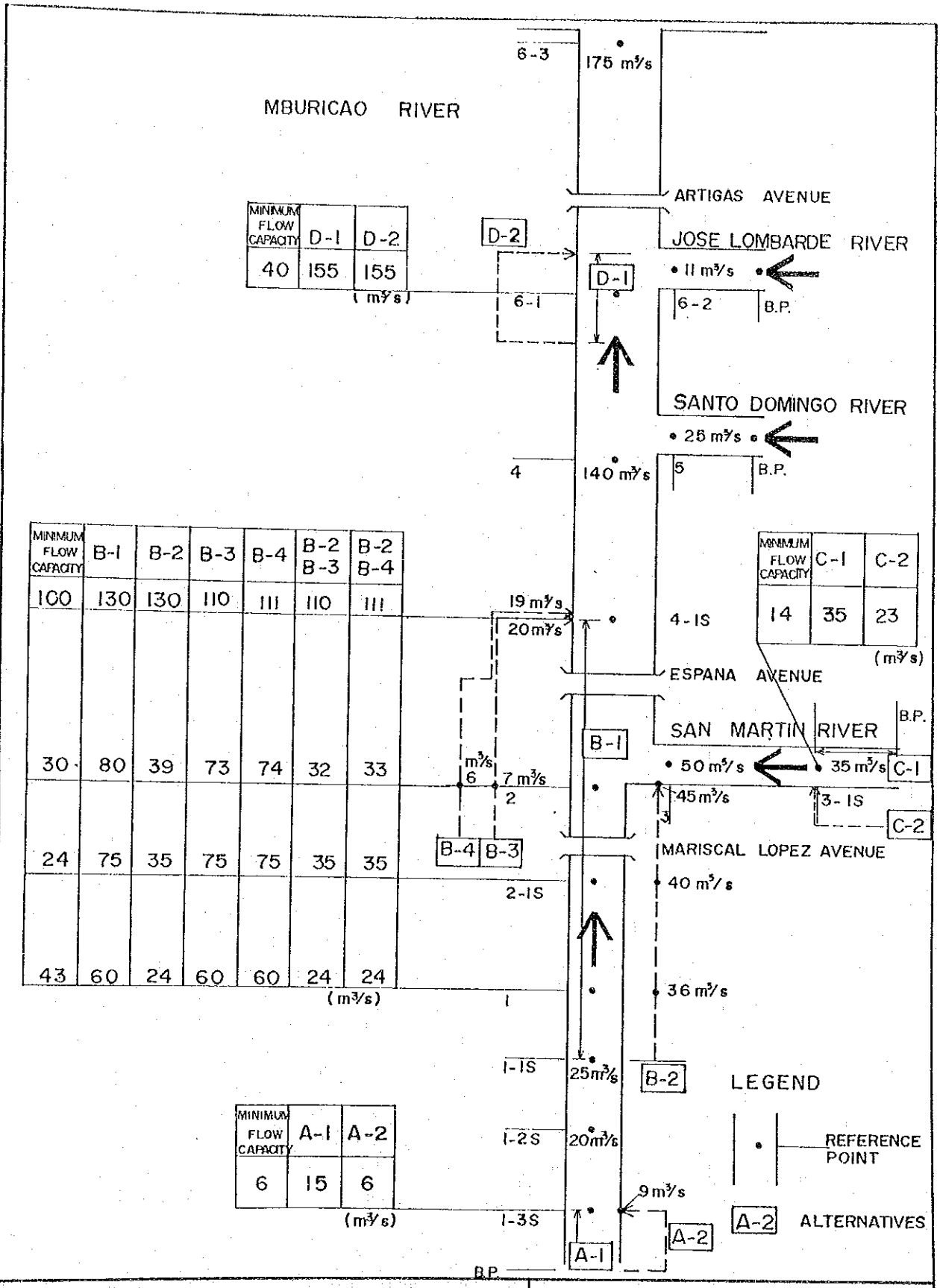


Fig. 5-41(1/3). DESIGN DISCHARGE DISTRIBUTION OF ALTERNATIVES FOR FIRST STAGE PROJECT (MBURICAO RIVER BASIN)

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

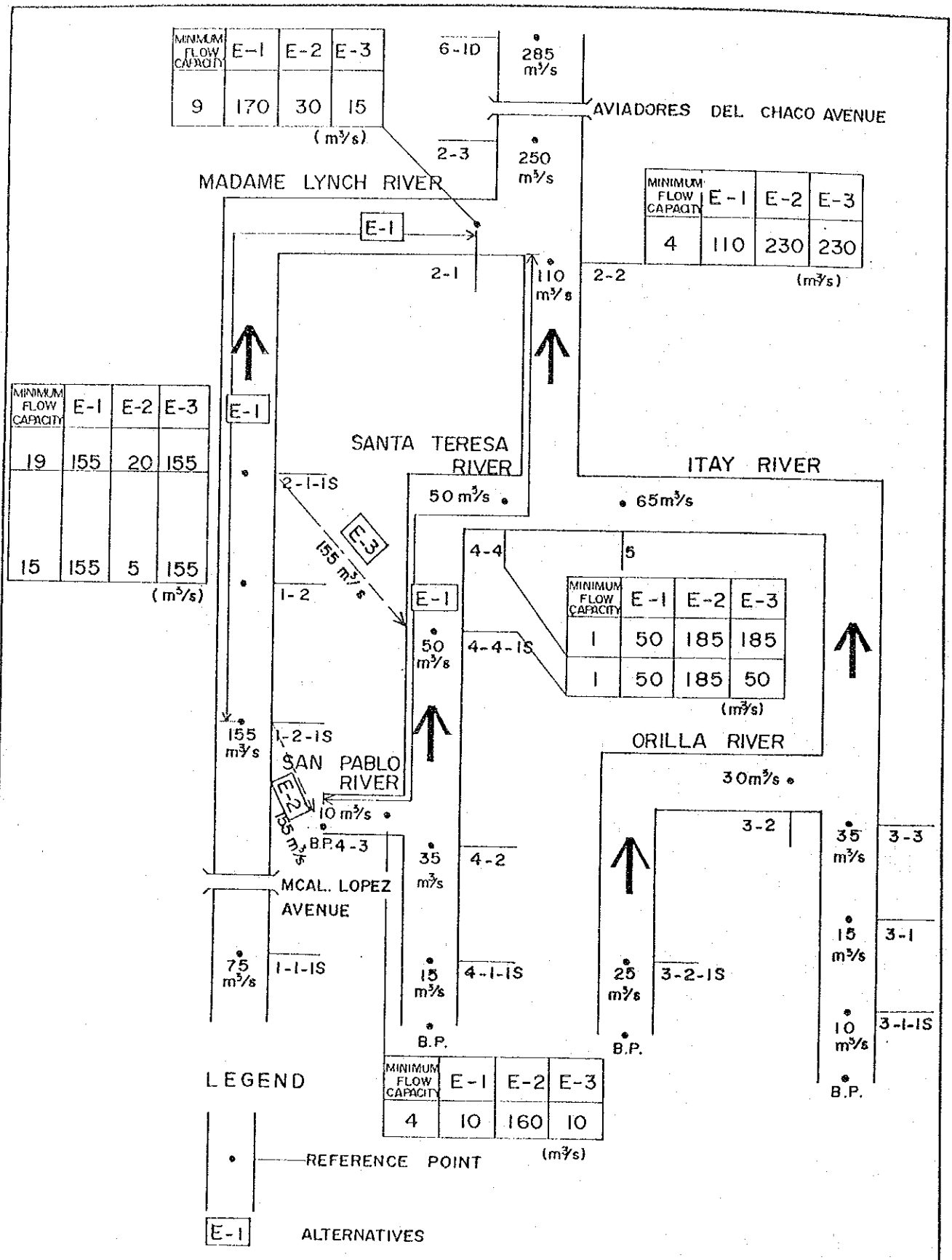


Fig. 5-41(2/3). DESIGN DISCHARGE DISTRIBUTION OF ALTERNATIVES FOR FIRST STAGE PROJECT (ITAY RIVER BASIN-1)

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

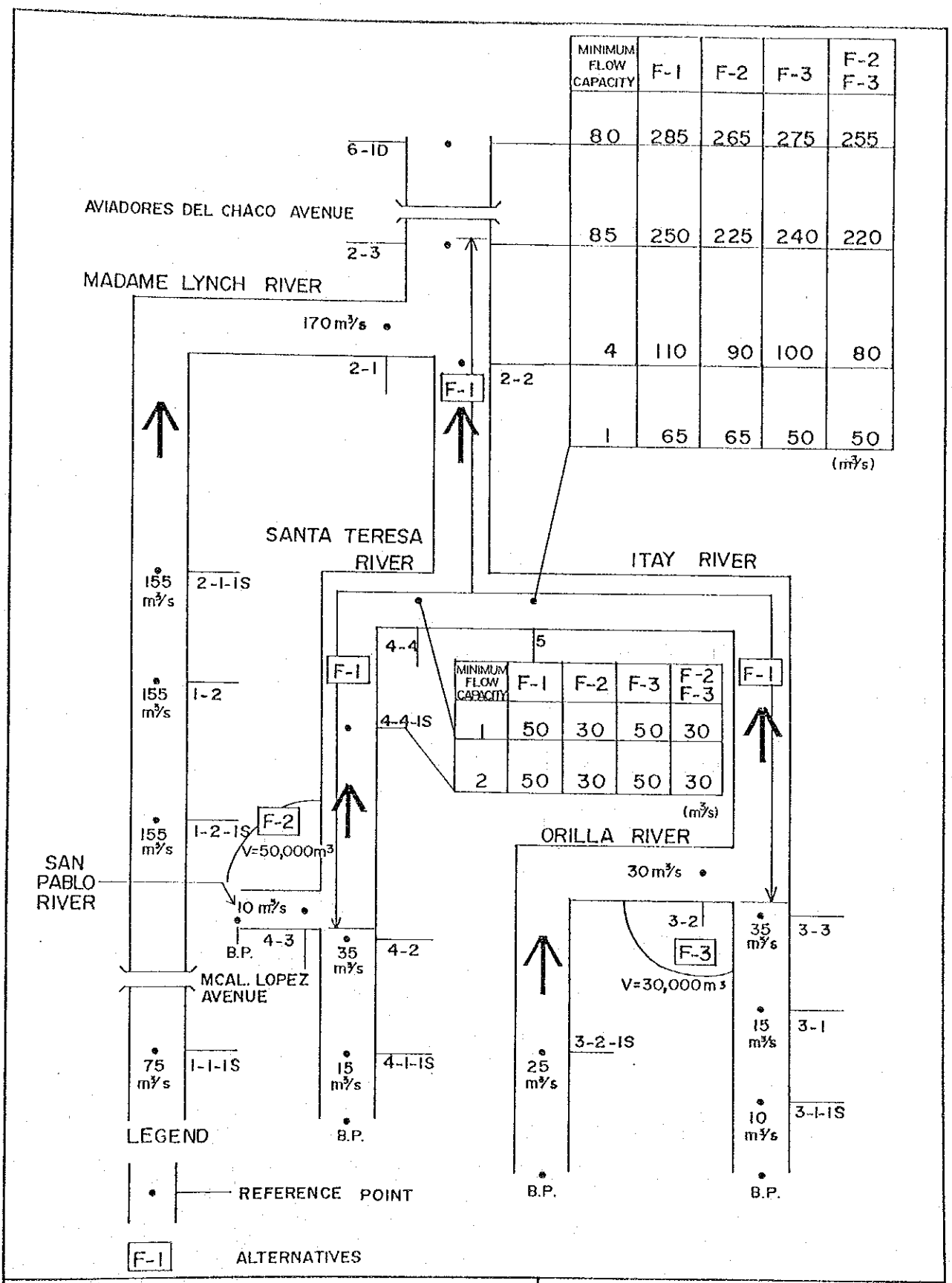


Fig. 5-41(3/3). DESIGN DISCHARGE DISTRIBUTION OF ALTERNATIVES FOR FIRST STAGE PROJECT (ITAY RIVER BASIN-2)

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

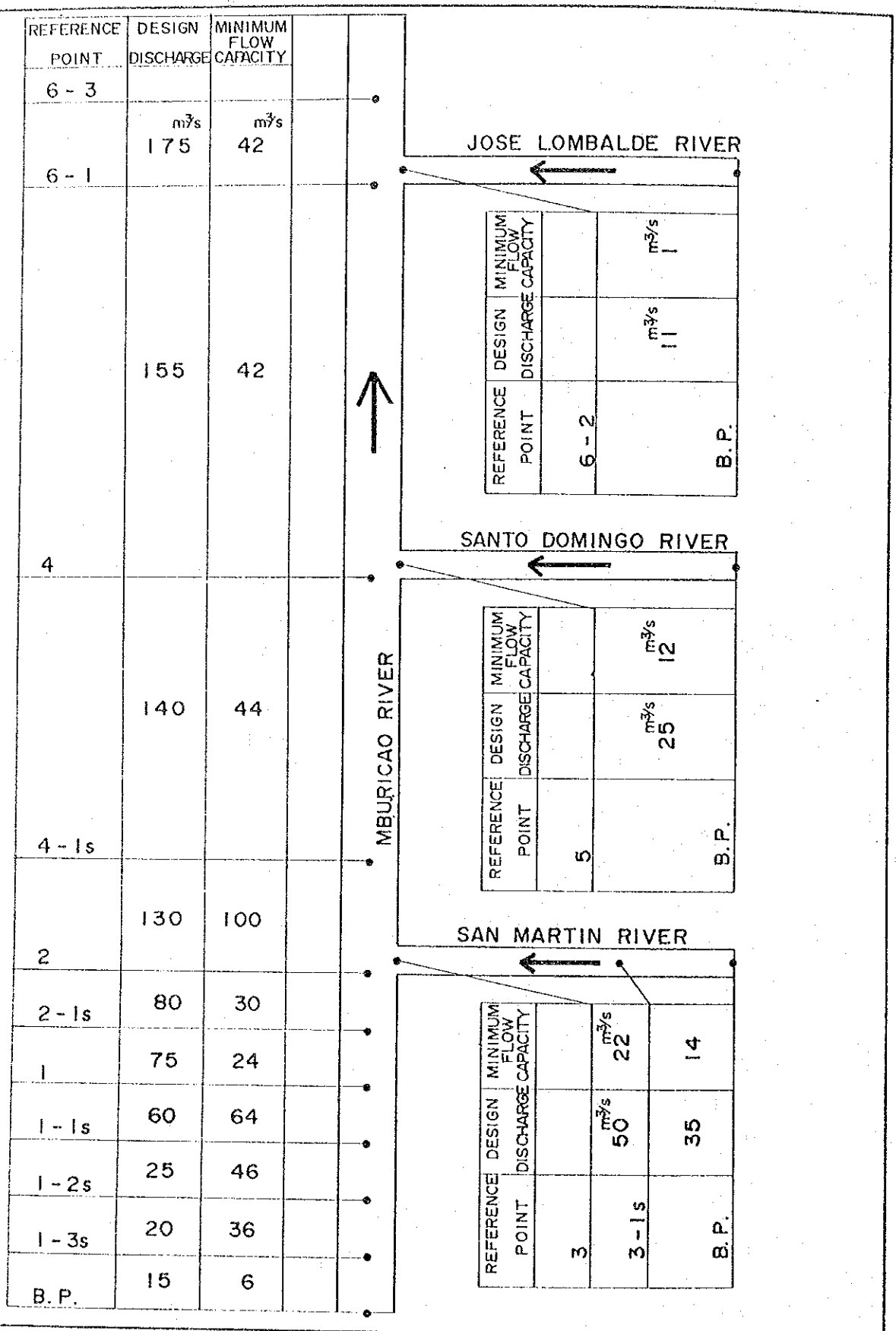


Fig. 5-42(1/2). DESIGN DISCHARGE DISTRIBUTION FOR OPTIMUM PLAN FOR FIRST STAGE PROJFCT (MBURICAO RIVER BASIN)

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

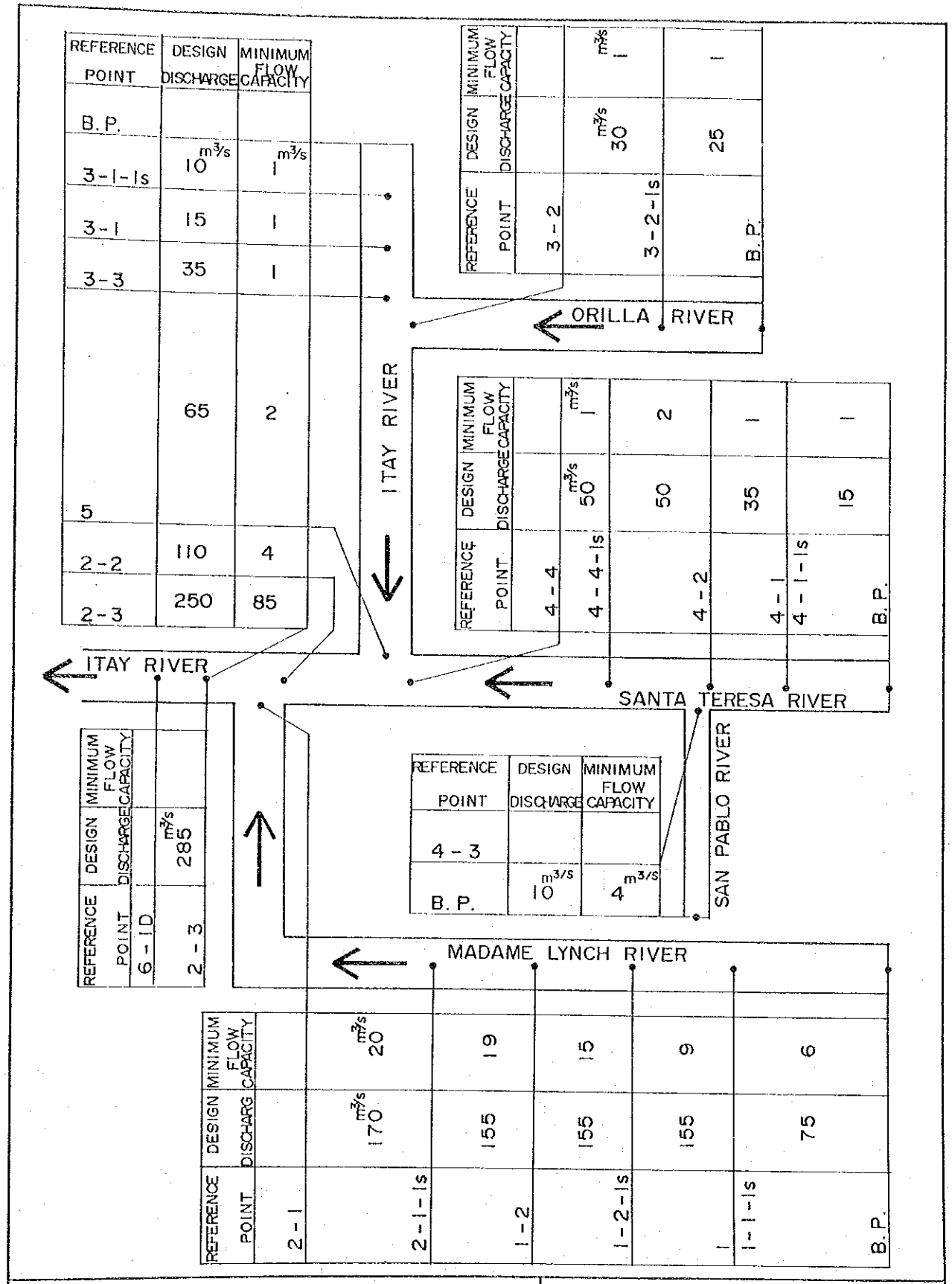
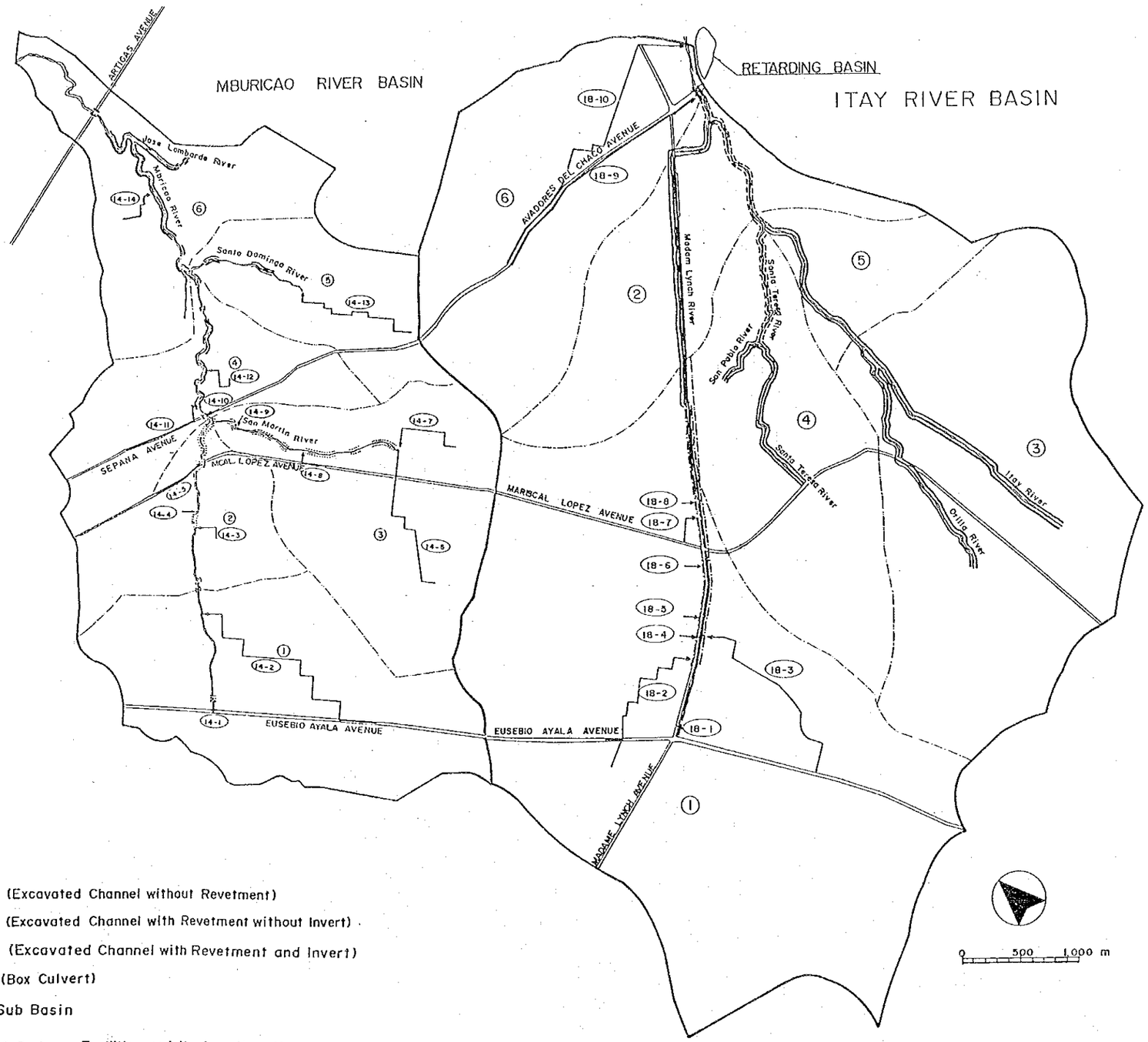


Fig. 5-42(2/2). DESIGN DISCHARGE DISTRIBUTION FOR OPTIMUM PLAN FOR FIRST STAGE PROJFCT

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY



LEGEND

- ------: Type A (Excavated Channel without Revetment)
- ———: Type B (Excavated Channel with Revetment without Invert)
- ·····: Type C (Excavated Channel with Revetment and Invert)
- —·—·—: Type D (Box Culvert)
- (3) : No. of Sub Basin
- (14-4) ——→: Route of Drainage Facilities and its Location No.

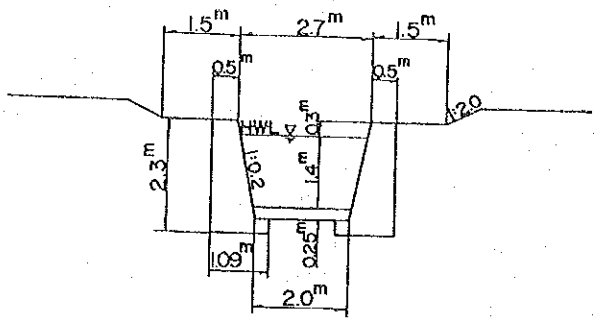
Fig. 5-43. PROPOSED RIVER IMPROVEMENT STRETCH FOR FIRST STAGE PROJECT

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

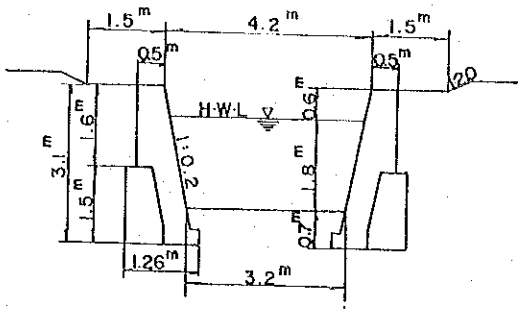
JAPAN INTERNATIONAL COOPERATION AGENCY

MBURICAO RIVER

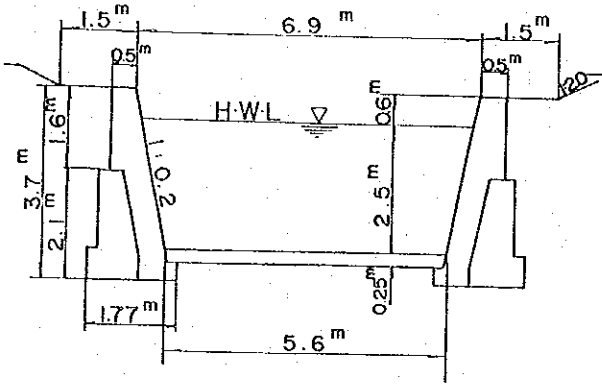
BP ~ 1-3S



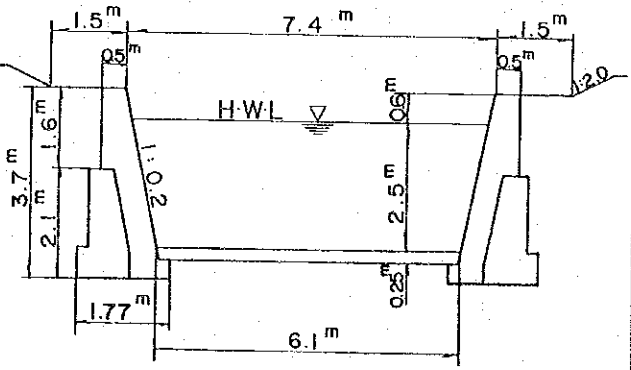
1-2S ~ 1-1S



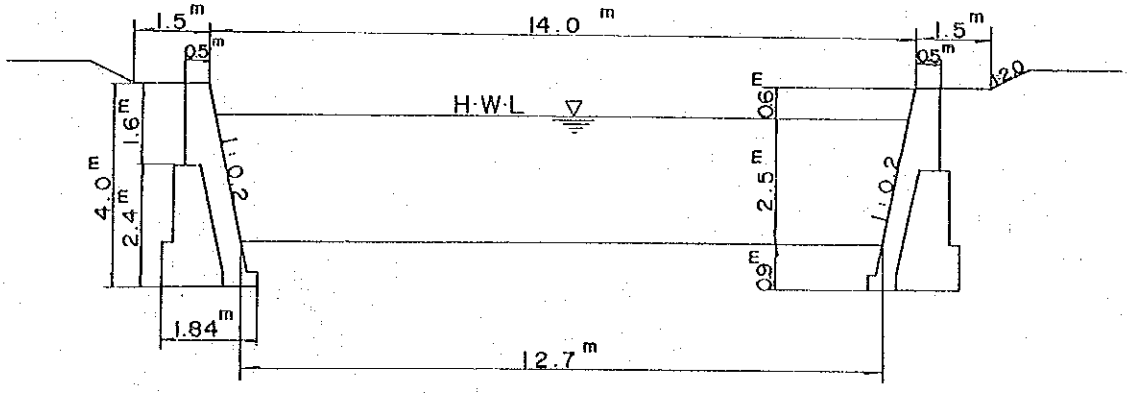
1 ~ 2-1S



2-1S ~ 2



2 ~ 4-1S



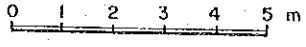


Fig. 5-44(1/7). TYPICAL CROSS SECTION OF RIVER CHANNEL FOR FIRST STAGE PROJECT

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

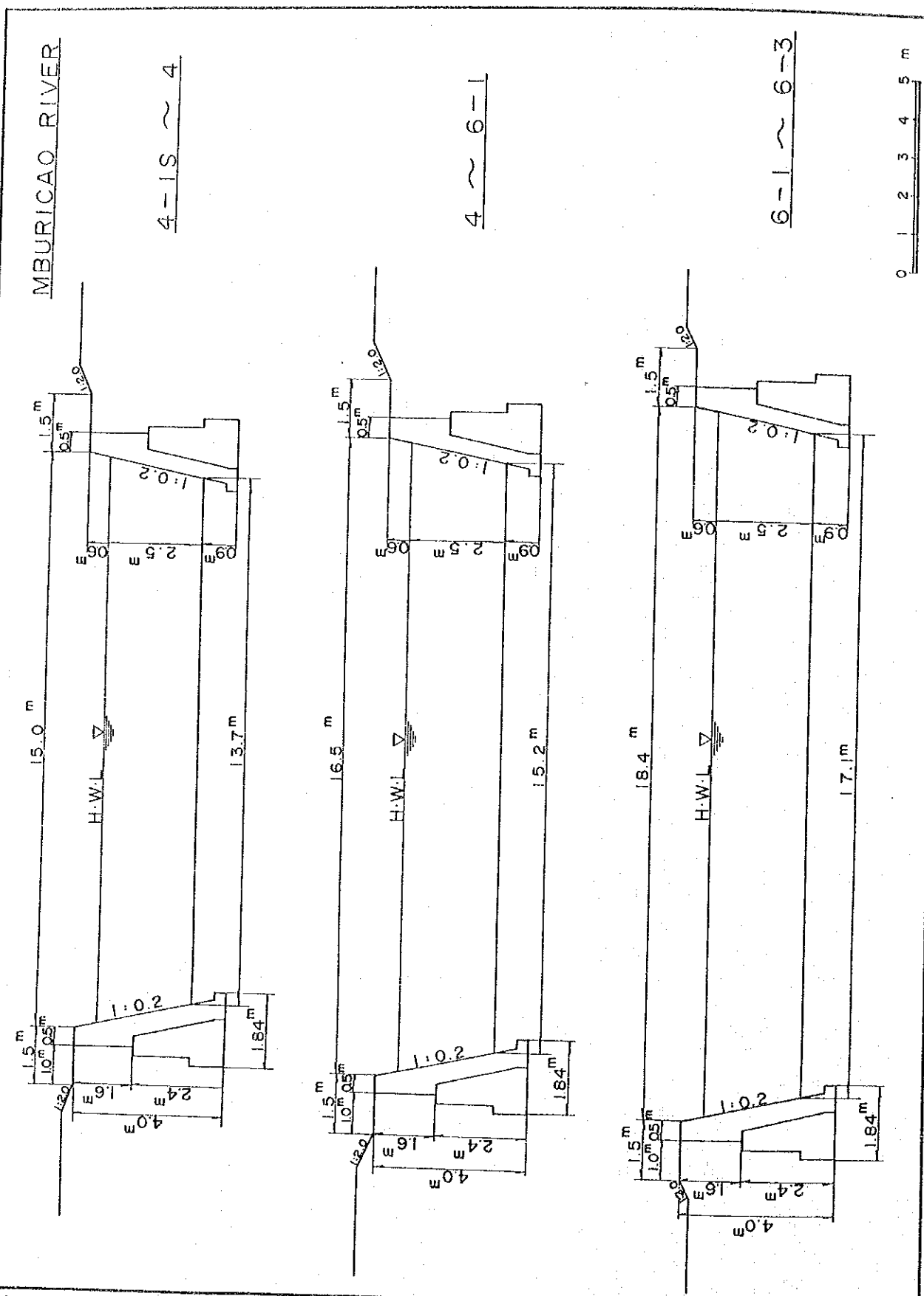


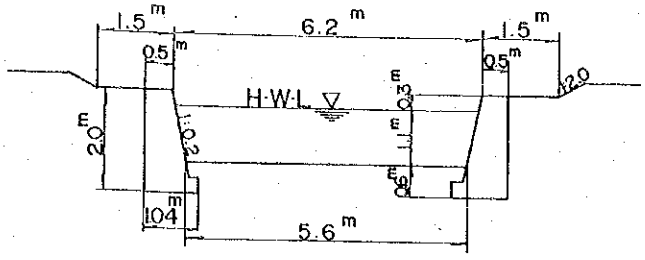
Fig. 5-44(2/7). TYPICAL CROSS SECTION OF RIVER CHANNEL FOR FIRST STAGE PROJECT

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

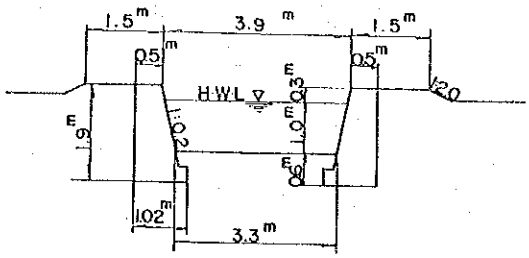
SANTO DOMINGO RIVER

B. P. ~ 5



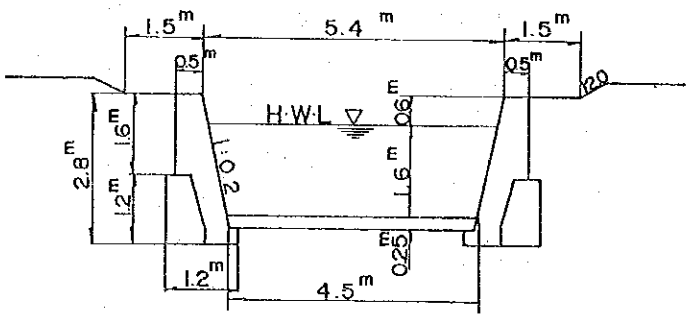
JOSE LOMBARDE RIVER

B. P. ~ 6-2

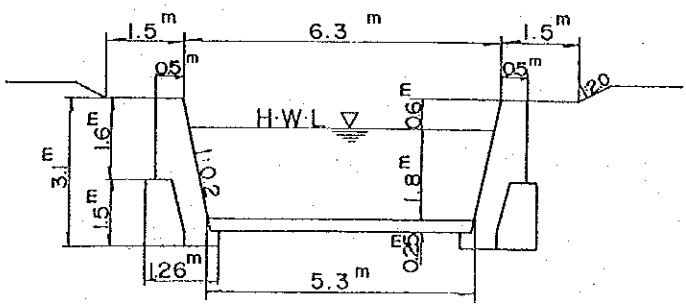


SAN MARTIN RIVER

B. P. ~ 3-IS



3-IS ~ 3



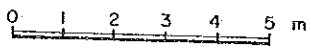


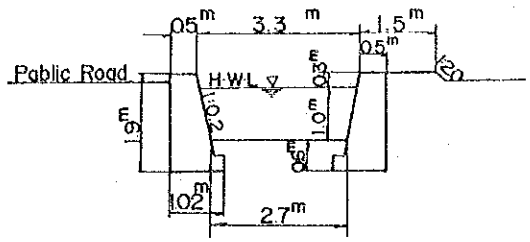
Fig. 5-44(3/7). TYPICAL CROSS SECTION OF RIVER CHANNEL FOR FIRST STAGE PROJECT

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

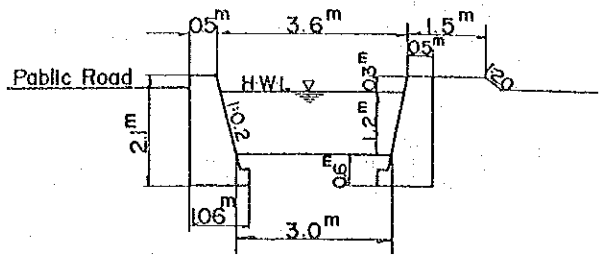
JAPAN INTERNATIONAL COOPERATION AGENCY

ITAY RIVER

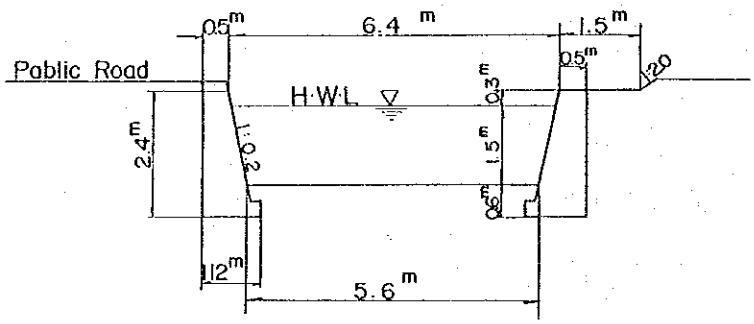
B.P. ~ 3-1-IS



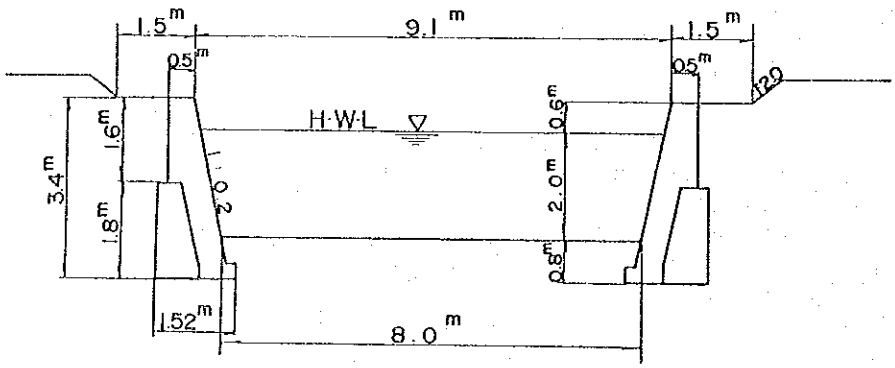
3-1-IS ~ 3-1



3-1 ~ 3-3



3-3 ~ 5



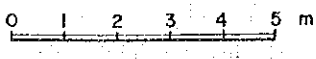


Fig. 5-44(4/7). TYPICAL CROSS SECTION OF RIVER CHANNEL FOR FIRST STAGE PROJECT

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

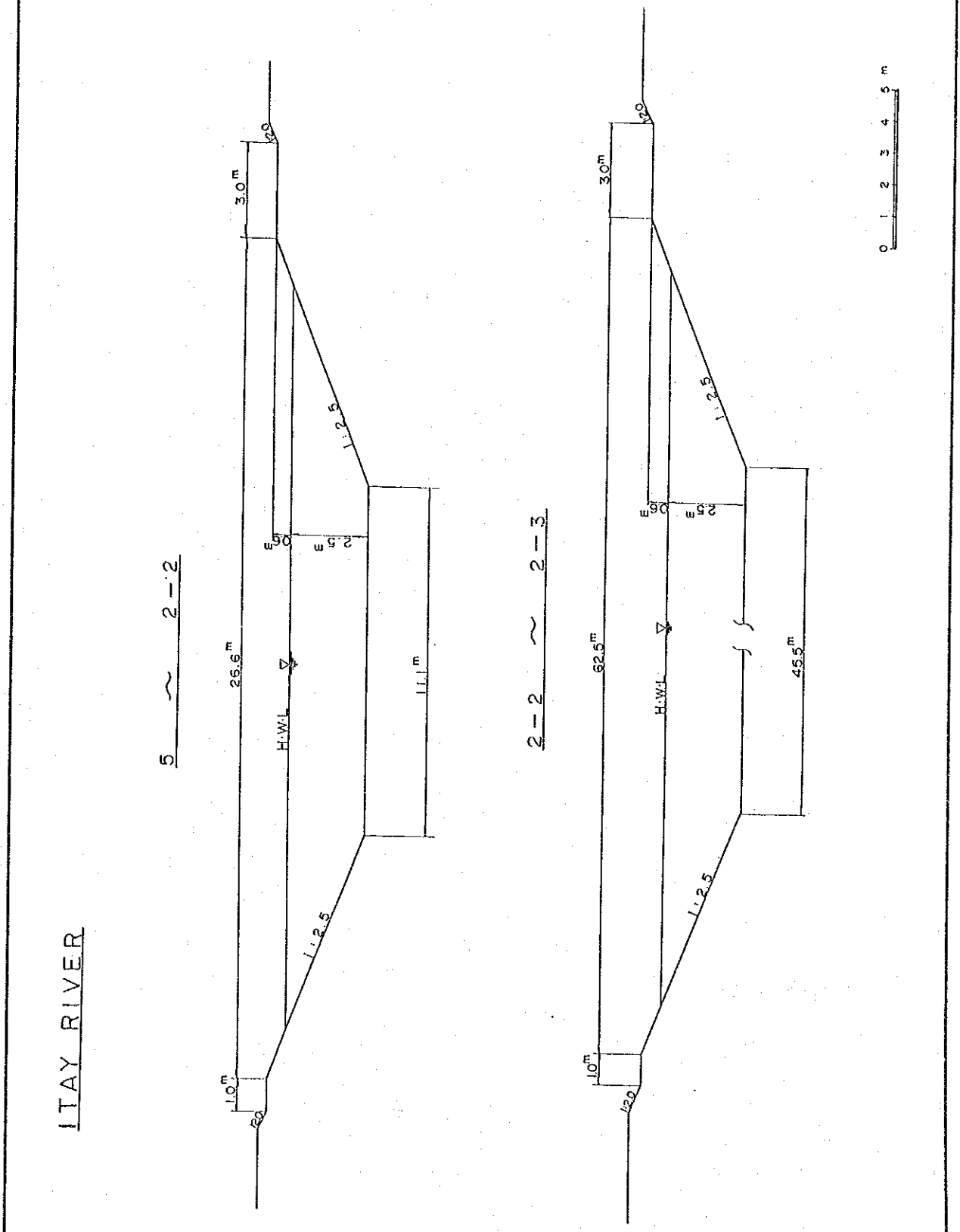


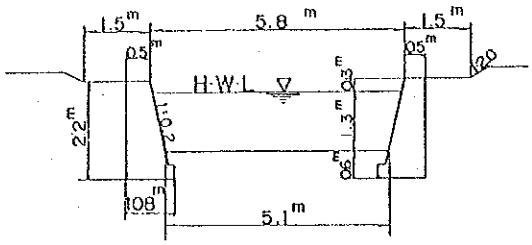
Fig. 5-44(5/7). TYPICAL CROSS SECTION OF RIVER CHANNEL FOR FIRST STAGE PROJECT

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

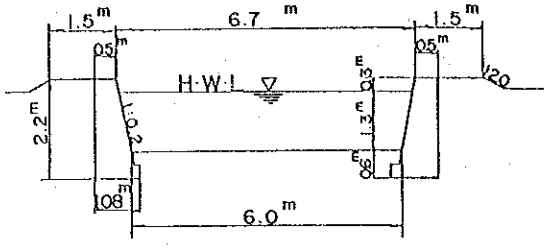
JAPAN INTERNATIONAL COOPERATION AGENCY

ORILLA RIVER

B.P. ~ 3-2-1S

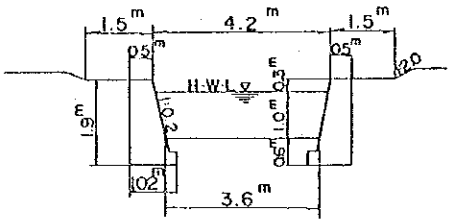


3-2-1S ~ 3-2

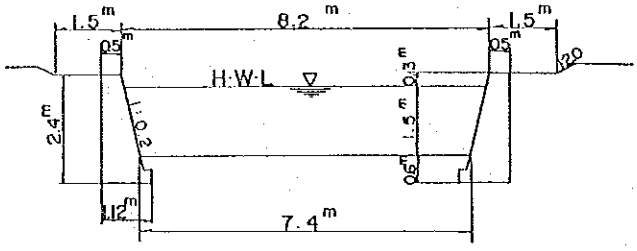


SANTA TERESA RIVER

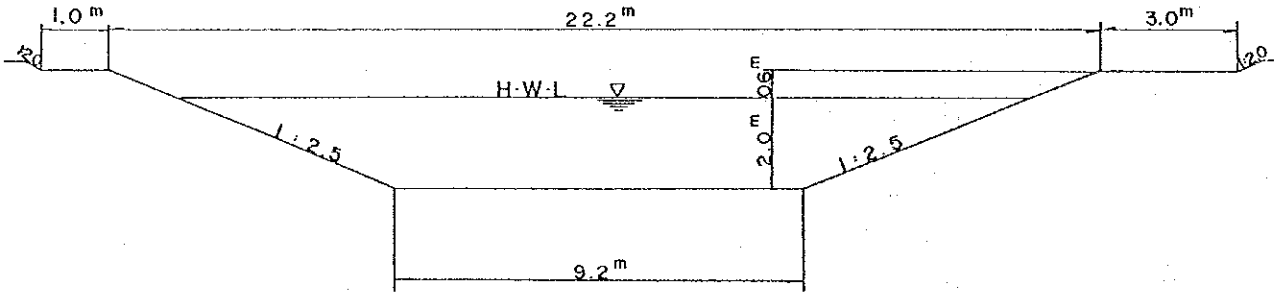
B.P. ~ 4-1



4-1 ~ 4-2

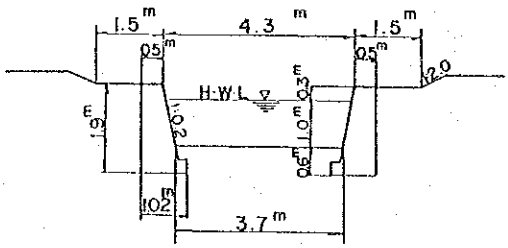


4-2 ~ 4-4



SAN PABLO RIVER

B.P. ~ 4-3



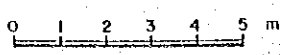


Fig. 5-44(6/7). TYPICAL CROSS SECTION OF RIVER CHANNEL FOR FIRST STAGE PROJECT

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

MADAME LYNCH RIVER

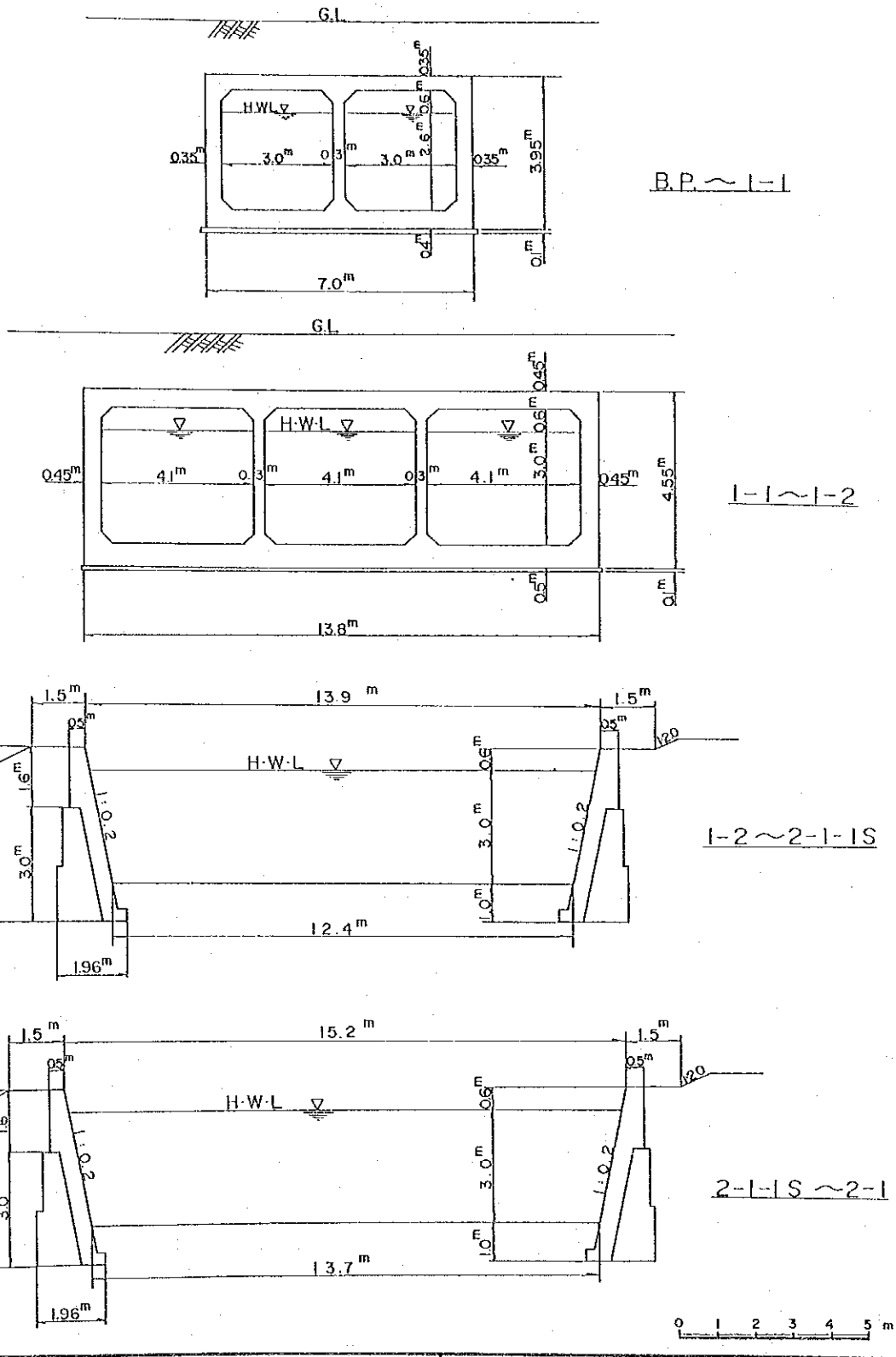


Fig. 5-44(7/7). TYPICAL CROSS SECTION OF RIVER CHANNEL FOR FIRST STAGE PROJECT

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

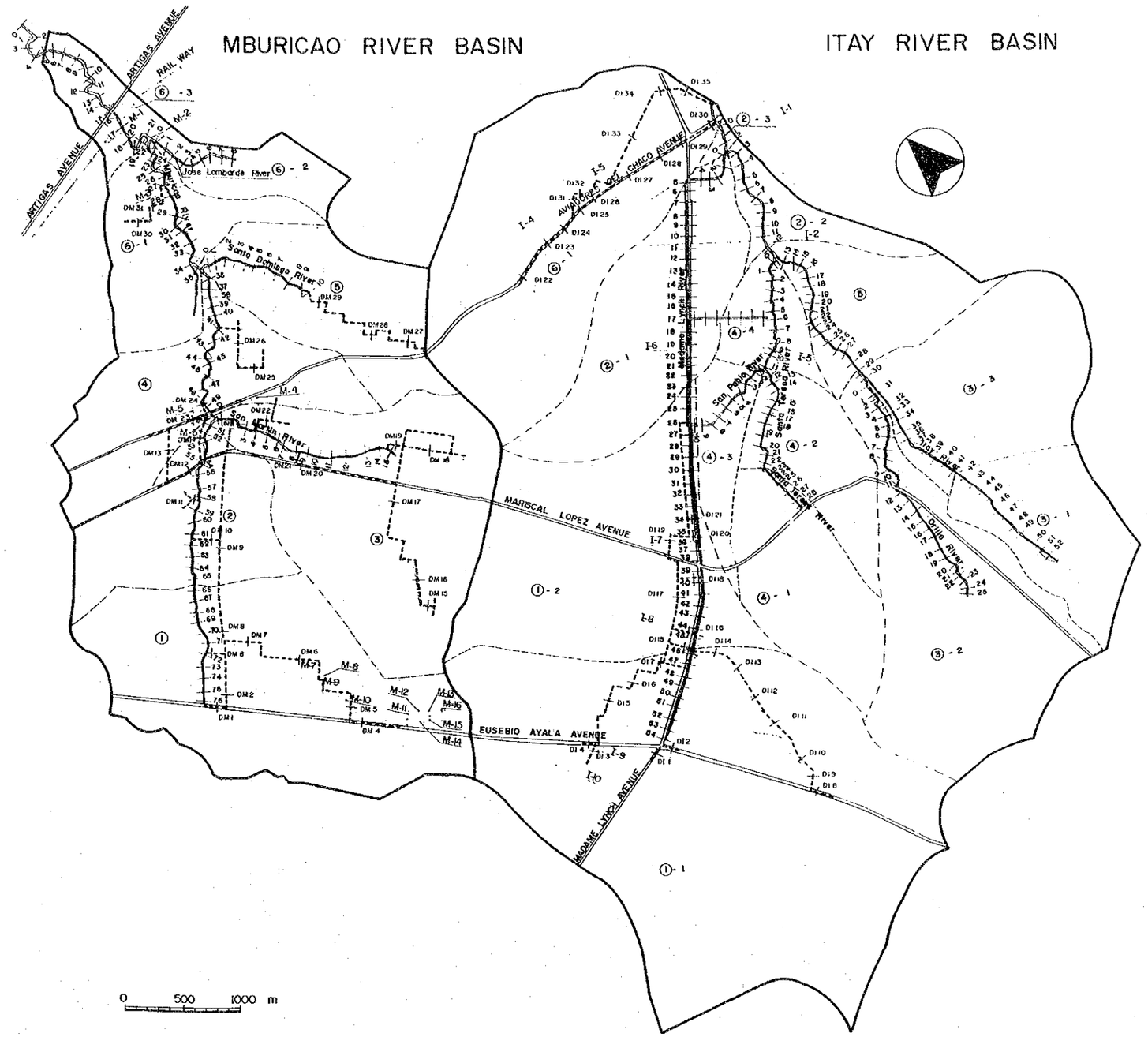


Fig. 5-45. LOCATION OF CROSS SECTION SURVEY FOR FIRST STAGE PROJECT

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

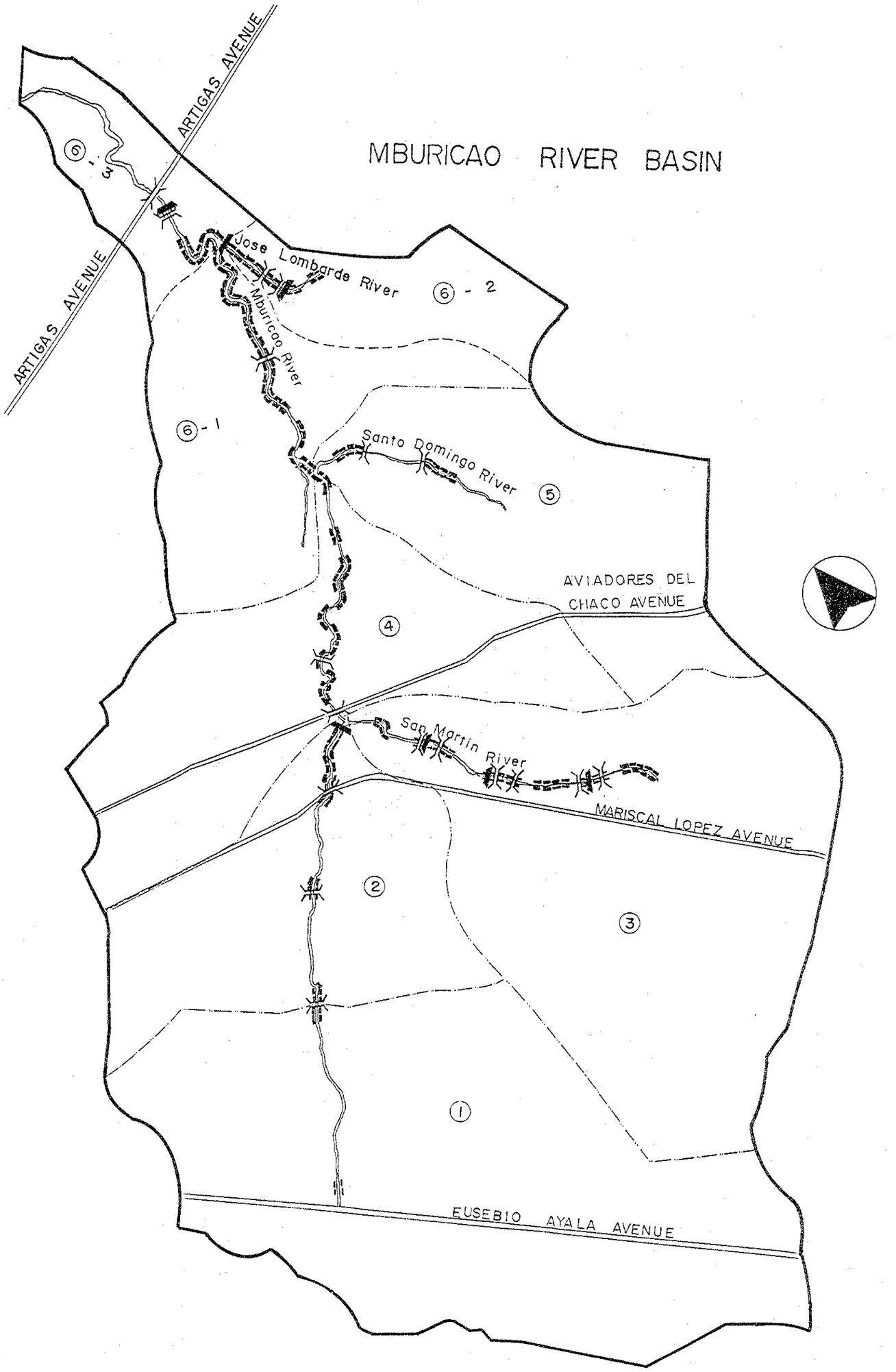


Fig. 5-46(1/2). LAYOUT OF PROPOSED RIPARIAN STRUCTURES FOR FIRST STAGE PROJECT

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

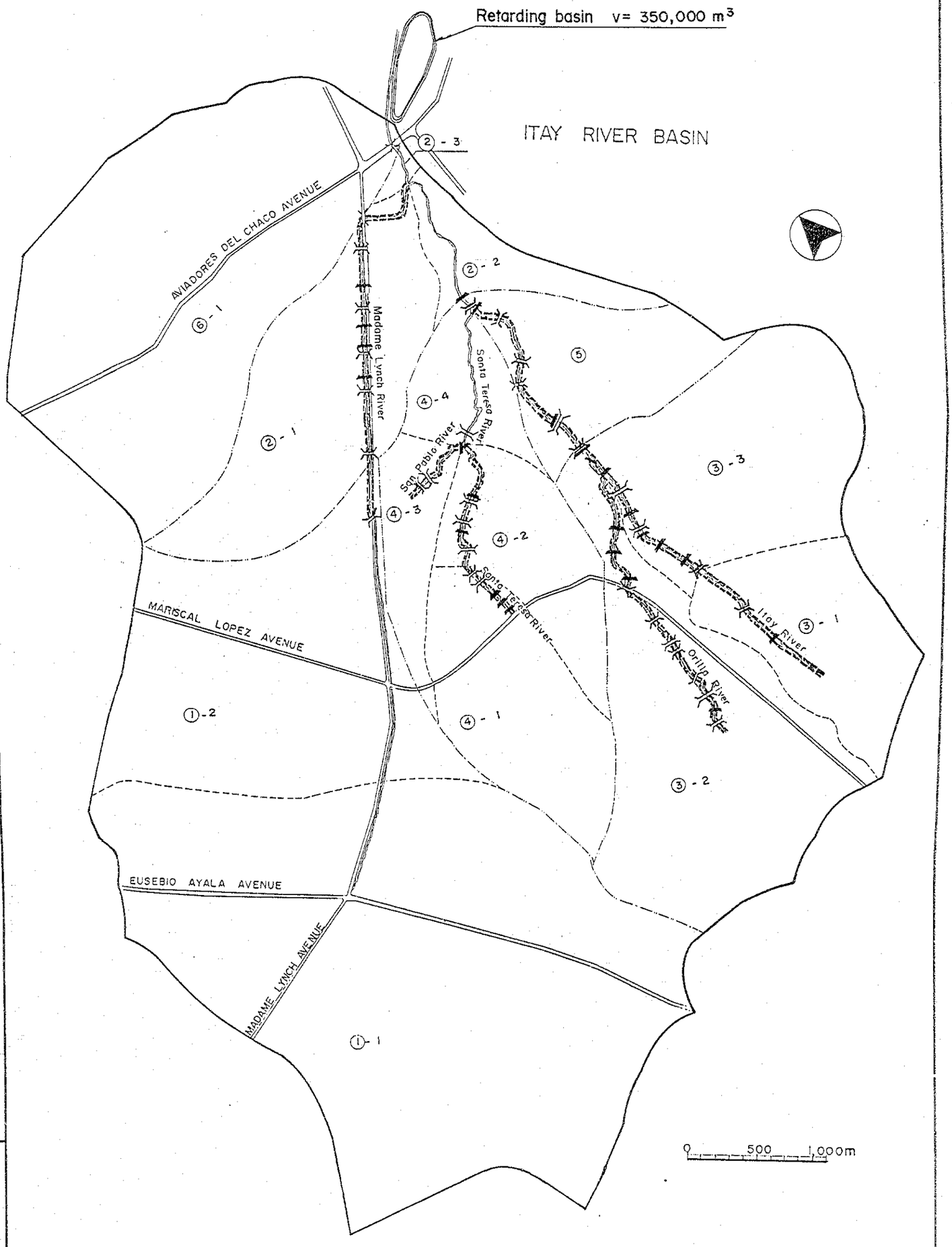


Fig. 5-46(2/2). LAYOUT OF PROPOSED RIPARIAN STRUCTURES FOR FIRST STAGE PROJECT

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY

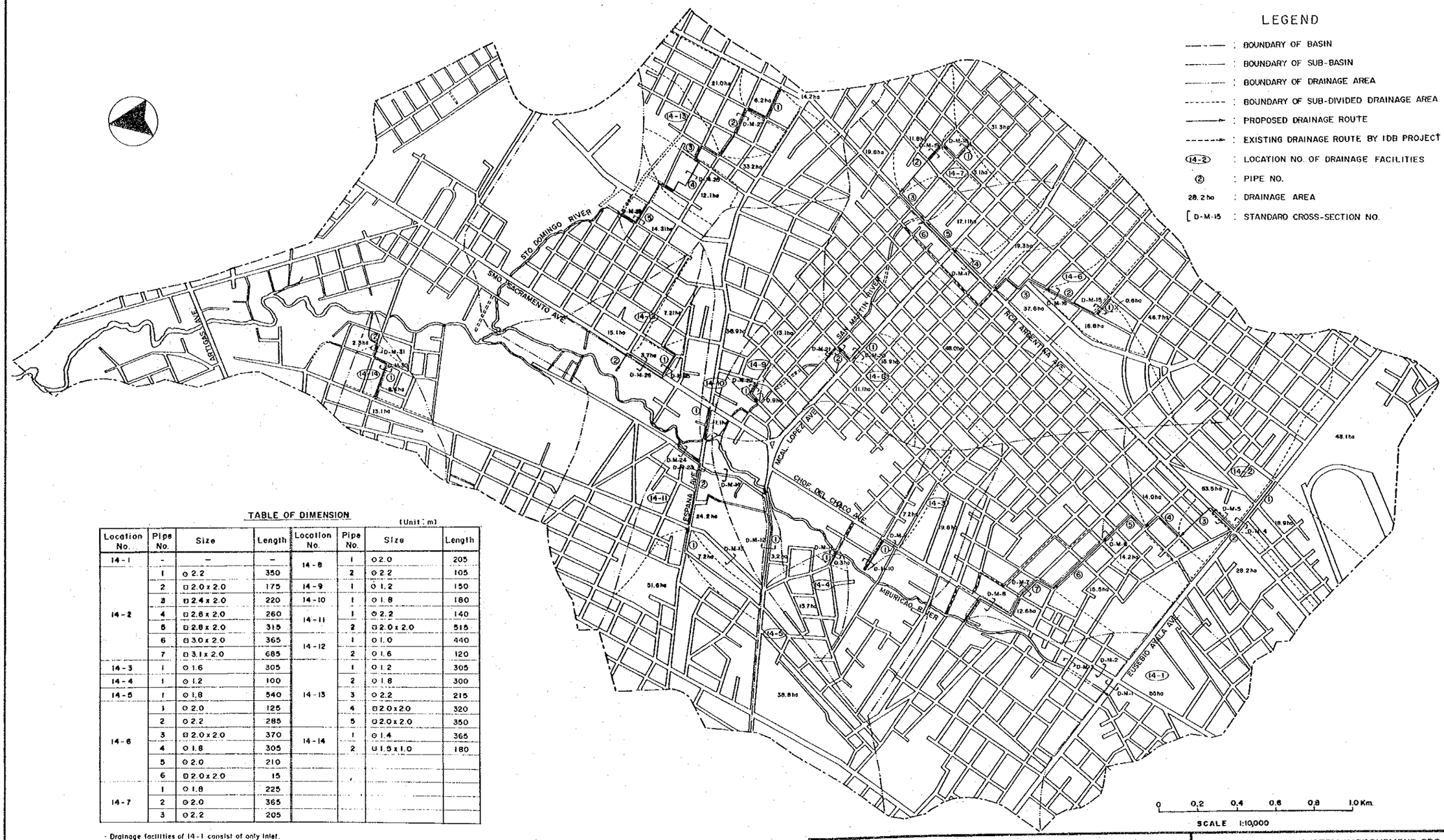


TABLE OF DIMENSION (Unit : m)

Location No.	Pipe No.	Size	Length	Location No.	Pipe No.	Size	Length
14-1	-	-	-	14-8	1	⊙2.0	205
14-2	1	⊙2.2	350		2	⊙2.2	105
	2	□2.0x2.0	175	14-9	1	⊙1.2	150
	3	□2.4x2.0	220	14-10	1	⊙1.8	180
	4	□2.6x2.0	260	14-11	1	⊙2.2	140
	5	□2.8x2.0	315		2	□2.0x2.0	515
	6	□3.0x2.0	365	14-12	1	⊙1.0	440
	7	□3.1x2.0	685		2	⊙1.6	120
14-3	1	⊙1.6	305	14-13	1	⊙1.2	305
14-4	1	⊙1.2	100		2	⊙1.8	300
14-5	1	⊙1.8	540		3	⊙2.2	215
14-6	1	⊙2.0	125		4	□2.0x2.0	320
	2	⊙2.2	285		5	□2.0x2.0	350
	3	□2.0x2.0	370	14-14	1	⊙1.4	365
	4	⊙1.8	305		2	⊔1.5x1.0	180
	5	⊙2.0	210				
	6	□2.0x2.0	15				
14-7	1	⊙1.8	225				
	2	⊙2.0	365				
	3	⊙2.2	205				

- Drainage facilities of 14-1 consist of only inlet.
- ⊙, □, ▭, ⊔ represent Pipe Culvert, one Box Culvert, two Boxes Culvert and Open Channel, respectively. The first and second figures of Box Culvert and Open Channel types give the bottom width and the height, respectively.

Fig. 5-47(1/2). LAYOUT OF PROPOSED DRAINAGE FACILITIES FOR FIRST STAGE PROJECT (MBURICAO RIVER BASIN)

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

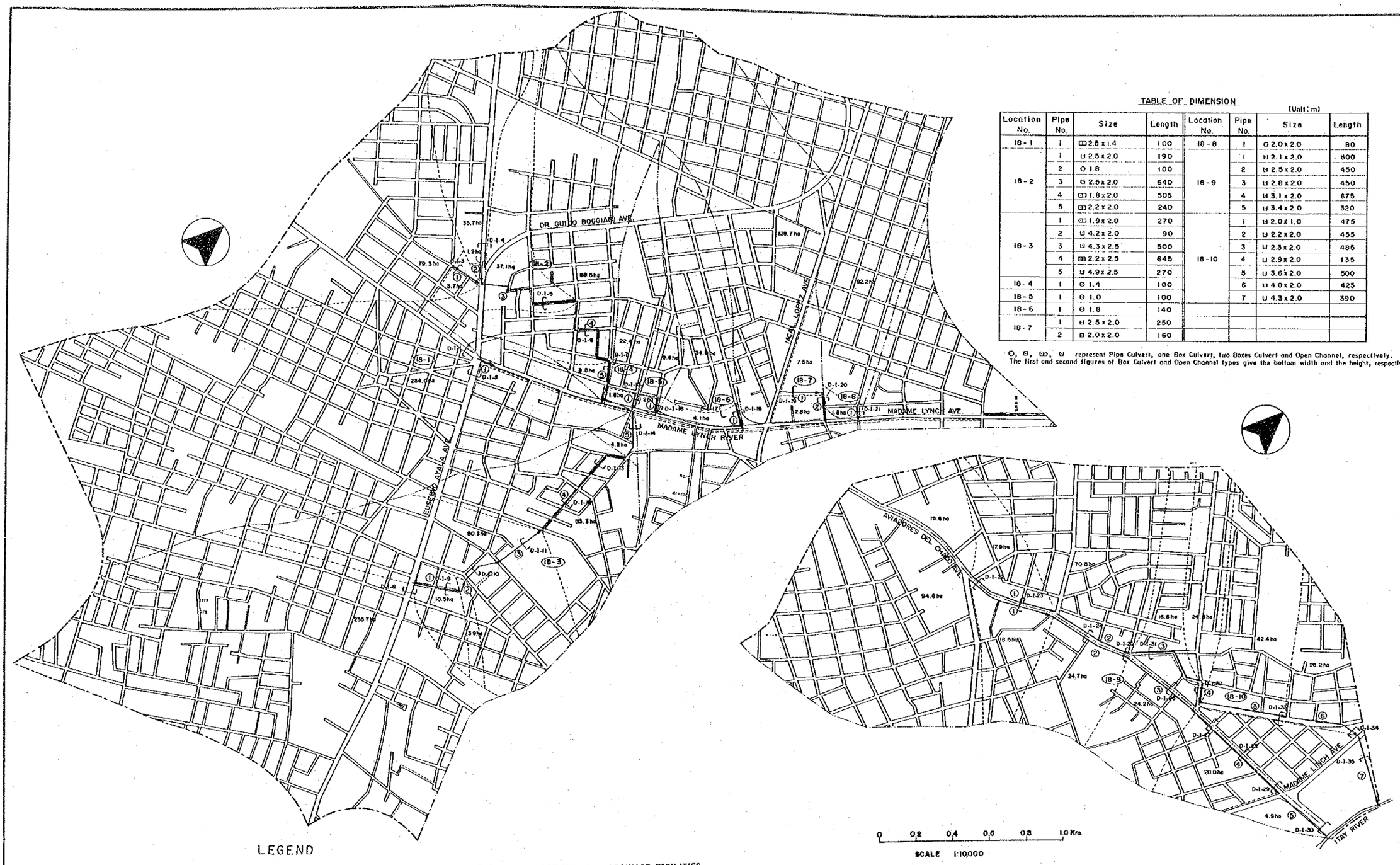
JAPAN INTERNATIONAL COOPERATION AGENCY

TABLE OF DIMENSION

(Unit: m)

Location No.	Pipe No.	Size	Length	Location No.	Pipe No.	Size	Length
18-1	1	□2.5 x 1.4	100	18-8	1	⊙2.0x2.0	80
18-2	1	∪2.5x2.0	190	18-9	1	∪2.1x2.0	300
	2	⊙1.8	100		2	∪2.5x2.0	450
	3	⊟2.5x2.0	640		3	∪2.8x2.0	450
	4	□1.8x2.0	505		4	∪3.1x2.0	675
	5	□2.2x2.0	240		5	∪3.4x2.0	320
18-3	1	□1.9x2.0	270	18-10	1	∪2.0x1.0	475
	2	∪4.2x2.0	90		2	∪2.2x2.0	455
	3	∪4.3x2.5	500		3	∪2.3x2.0	485
	4	□2.2x2.5	645		4	∪2.9x2.0	135
	5	∪4.9x2.5	270		5	∪3.6x2.0	500
18-4	1	⊙1.4	100		6	∪4.0x2.0	425
18-5	1	⊙1.0	100		7	∪4.3x2.0	390
18-6	1	⊙1.8	140				
18-7	1	∪2.5x2.0	250				
	2	⊓2.0x2.0	160				

·⊙, ⊟, □, ∪ represent Pipe Culvert, one Box Culvert, two Boxes Culvert and Open Channel, respectively.
The first and second figures of Box Culvert and Open Channel types give the bottom width and the height, respectively.



LEGEND

———	: BOUNDARY OF BASIN	(18-2)	: LOCATION NO. OF DRAINAGE FACILITIES
—·—·—	: BOUNDARY OF SUB-BASIN	③	: PIPE NO.
———	: BOUNDARY OF DRAINAGE AREA	37.1 ha	: DRAINAGE AREA
- - - -	: BOUNDARY OF SUB-DIVIDED DRAINAGE AREA	[D-1-12	: STANDARD CROSS-SECTION NO.
——→	: PROPOSED DRAINAGE ROUTE		

Fig. 5-47(2/2). LAYOUT OF PROPOSED DRAINAGE FACILITIES FOR FIRST STAGE PROJECT (ITAY RIVER BASIN)

STORM DRAINAGE SYSTEM IMPROVEMENT PROJECT IN ASUNCION CITY, PARAGUAY

JAPAN INTERNATIONAL COOPERATION AGENCY