proposed in the Urgent Plan. The improvement of other secondary and tertiary drains causing localized and confined inundation is not included.

5.2 Urgent Flood Control Plan

River Improvement

Delineating the area of the Urgent Plan, river improvement works are proposed as follows:

(1) Jaro River

The Urgent Plan of Jaro river improvement works is limited to the construction of Jaro Floodway, the partial improvement of Jaro River and the improvement works of Tigum and Aganan rivers in the upstream of the diversion works. The related river structures included in the works are as follows:

River Structure	Dimension/Site	Remarks
Earth Dike	14,440 m	
Revetment	3,250 m	
Diversion Works	66 m	
	12 m	
Groundsill	50 m	Outlet of Jaro Floodway
Sluice	7 sites	
Invert Siphon	3 sites	Along Jaro Floodway
Bridge	2 sites	Along Jaro Floodway

(2) Iloilo River

The Urgent Plan of Iloilo river improvement works is mainly composed of heightening of the river banks for the whole stretch from the river mouth to Molo Bridge. The related structures included in the works are as follows:

River Structure	Dimension/Site	Remarks
Earth Dike	12,830 m	
Concrete Dike	4,780 m	
Revetment	2,050 m	
Sluice	9 sites	
Bridge	4 sites	3 to be reconstructed

(3) Anilao River

In the Urgent Plan, the whole stretches mentioned in the Master Plan is improved, and the construction of two (2) slit dams are carried out to stop drift logs and boulders. The other river structures included in the improvement works are as follows:

River Structure	Dimension/Site	Remarks
Earth Dike	1,800 m	
Revetment	3,600 m	
Sluice	3 sites	
Drop	3 sites	
Bridge	3 sites	One is under construction

(4) Malbasag River

As in the Anilao river improvement works, the works in the Urgent Plan include the river improvement for the whole stretch mentioned in the Master Plan and construction of slit dam on the upstream reaches. The other river structures included are as follows:

River Structure	Dimension/Site	Remarks
Earth Dike	1,250 m	
Retaining Wall	1,095 m	
Revetment	2,505 m	
Sluice	4 sites	
Drop	4 sites	
Bridge	2 sites	Reconstruction

Drainage Improvement

(1) Iloilo

The study on alternatives (refer to Supporting Report on Urban Drainage Plan, Section 5.3), a diversion channel to cutoff the stormwater runoff is employed for both Ingore and Bo. Obrero creeks in Iloilo City.

The drainage improvement of Ingore Creek is composed of the channel improvement for 4,870 m and the construction of diversion channel of 580 m. The alignment, profile and cross-section are shown in Figs. 5.8 and 5.9.

The improvement of Bo. Obrero Creek is composed of the channel improvement of 4,220 m and the construction of diversion channel of 200 m. The alignment, profile and cross-section are shown in Figs. 5.10 and 5.11.

Only widening and deepening of channel are employed for the improvement of Rizal Creek. The alignment, profile and cross-section are shown in Figs. 5.12 and 5.13.

The related structures included in the improvement works are summarized as follows:

Structures	Ingore Creek	Bo. Obrero Creek	Rizal Creek
Slope Lining (m)	1,320	750	180
Full Lining (m)	-	1,450	-
Box Culvert (m)	-	55	437
Bridge (No.)	10	8	1

(2) Ormoc

The improvement for Lotao Creek is only the widening and deepening of 1,200 m of the existing channel. The alignment, profile and cross-sections are shown in Figs. 5.14 and 5.15. The related structures are summarized as follows:

Structure	Dimension (m)
Slope Lining	600
Box Culvert	75

Design with Environmental Consideration

Inasmuch as a river contributes to the preservation of the environment, provides water and functions for flood mitigation as well, many people, particularly those in urban areas, have come to realize the importance of caring for and preserving rivers. Therefore, environmental concerns are taken into consideration in the preliminary design. The environmental requirements may be classified into two categories as below:

(1) Maintenance of River Channel and Water Quality

To provide the amenity of river space, the following items shall be included in this category:

- Water quality control
- Safe utility of river
- Enjoyment of river scenery

(2) Social Activity at River

To accelerate local/regional activity, the following items shall be considered:

- Water usage at riverside

- Usage of river flow
- Utility of river space

In the planning and designing of river control works, the following designs and structures are employed in this Plan:

(a) Drops

Aside from the functions as hydraulic requirement, drops, which are to be provided along Anilao and Malbasag rivers, should also have the following functions related to the environmental aspect:

- Effect of aeration to preserve water quality;
- Provide a variety of water flow; and
- Improvement of river scenery.

Natural stones will be used for the main structure of the drops. A drop is divided into three steps to accelerate aeration and to give variety to the river flow.

(b) Low Water Channel for Maintenance Flow

A low water channel for maintenance flow is proposed for river water use such as washing and bathing. The depth of channel is set from 0.5 m to 1.0 m and the capacity of the channel corresponds to the specific discharge of 0.01 $m^3/s/km^2$ for Jaro River and 0.1 $m^3/s/km^2$ for rivers in Ormoc City. Meandering like a natural stream is given to the improvement alignment. Riverbanks of the low water channel with a gentle slope are fixed with log piles or boulders. The flood water channel is sodded with grass or covered with boulders.

(c) Maintenance Road along River

Maintenance roads are provided along both banks or on the earth dike, which may be used for strolling along rivers. If there is a space behind the road, tree planting is recommended for improvement of the scenery. Riverside trees clearly show the boundary of the river and private properties.

(d) Approach Steps to Waterfront

The river water is used by inhabitants near the river for domestic purposes. Therefore, approach steps to the waterfront are provided on the earth

dike/retaining wall to ease access to the river water. Additionally, these steps will also help people become intimate with rivers.

(e) Materials for Structural Design

Natural construction materials such as wood or stone/boulder are used for the structures as much as possible. The use of natural materials for the river structures will provide a refreshing view to the onlooker.

The image perspectives of the environmental design for Anilao River in Ormoc City and Jaro River in Iloilo City are shown in Fig. 5.16.

(f) Drainage Channel

The drainage channel in the project area performs the combined functions of sewage mainly in the dry season and stormwater collection in the rainy season. Stagnant wastewater in the uneven bed of an open channel spreads a nasty smell in the vicinity. To minimize these unhealthy and unfavorable environmental situations, the construction of a maintenance water ditch is proposed in the middle of the channel bed as shown in Fig. 5.17. The ditch will be located in the upstream stretch of Bo. Obrero Creek where the channel bed is lined with concrete and will be dried up in the dry season since it is not affected by the tidal compartment.

5.3 Project Cost and Evaluation

Project Cost

The conditions of cost estimates are the same as those employed in the Master Plan. The project costs of the Urgent Plan for Iloilo and Ormoc cities are as follows:

(Unit: Million Peso)

City/River	Main Construction*	Compensation	Total
Iloilo City	1,175.4	289.6	1,465.0
Jaro	614.1	128.7	742.8
Iloilo	421.9	134.7	556.6
Drainage	139.5	26.2	165.7
Ormoc City	321.3	51.9	373.2
Anilao	182.2	33.5	215.7
Malbasag	129.8	17.6	147.4
Drainage	9.3	0.8	10.1
Grand Total	1,496.7	341.5	1,838.2

* This consists of Main Construction Cost, Administration Cost, Physical Contingency and Engineering Services Cost.

Economic Evaluation

The conditions for economic evaluation are almost the same as the Master Plan. Only the disbursement schedule is different. The implementation period of the projects is assumed as follows: (a) one year for detailed engineering service; (b) two years for expropriation of project sites and preparation of construction; and (c) three years for construction works in Iloilo City and two years in Ormoc City. Accordingly, six years are needed for Iloilo City and five years for Ormoc City.

The economic indices of EIRR for the respective projects are summarized in the following table. (Cash flows are presented in the Supporting Report : SOCIO-ECONOMY.)

Year	Iloilo City			Ormoc City		
	River Project	Drainage	Total	River Project	Drainage	Total
Under Present Conditions						
EIRR (%)	28.0%	5.9%	26.4%	24.1%	16.5%	24.0%
NPV* (Million Pesos)	4,399	14	4,414	755	10	765
B/C*	6.2	1.1	5.7	4.1	2.6	4.1
Under Future Conditions						
EIRR (%)	38.8%	13.9%	37.1%	33.4%	26.2%	33.3%
NPV* (Million Pesos)	10,454	184	10,647	1,577	27.3%	1,604
B/C*	13.5	2.8	12.3	7.5	5.2	7.4

* Discount rate is 10% for computation of NPV and B/C.

EIRR of the whole integrated projects in Iloilo City shows that the projects are viable at 26.4% even under present conditions. The projects in Ormoc City are also viable because EIRR is 24.0%.

The sensitivity test was carried out for only the variation in total discounted costs and benefits. The test was made for a variation of 10% of the cost and benefit with the

respective EIRRs of the proposed schemes in the cities for the urgent projects under present conditions. The test results are given in the following table.

	Iloilo City		Ormoc City	
	Benefit		Benefit	
Cost	Base Case	10% Down	Base Case	10% Down
Base Case	26.3%	24.4%	23.2%	21.2%
10% Up	24.6%	22.8%	21.4%	19.6%

Even in the worst case such as 10% decrease in benefit and 10% increase in cost, EIRR still holds a higher rate than the opportunity cost of capital of 15%, and this is identified to be economically viable.

Environmental Impact Assessment

The environmental impacts to arise through the implementation of the Urgent Plan is, in general, predicted for Iloilo and Ormoc cities as follows:

(1) Physico-chemical Aspects

(a) Surface Water

Garbage dumped in the river/drainage channels will be removed by the initial site clearing during the pre-construction stage

Excavation and dredging will increase the turbidity of channels during the construction stage. Therefore, a necessary management of the works will be adopted referring to the monitoring results to avoid water pollution during the construction stage.

(b) Ground Water

For Iloilo City, seawater will intrude to almost the same distance above the mouth of Jaro River as the present, because channel deepening proposed in the Urgent Plan is rather limited. As for La Paz Floodway, the area along the proposed course is utilized for fishponds. Saline water is used for fishponds and the groundwater around the fishponds also has high salinity.

As for Iloilo River and Mandurriao River, seawater is already intruding deeply into the middle reach.

To summarize, therefore, the Plan will not affect the ground water quality in these areas.

(c) Topography

For Iloilo City, Jaro Floodway will also carry the sediment into the strait. The waterway excavated on the seabed from the outlet of the floodway to 2 km offshore will take the sediment to the center of the strait where there exists a strong tidal current. Most of the discharged sediment will be dispersed by the current

As for the La Paz Floodway, the conditions are the same as the Jaro Floodway. The proposed discharge of Jaro River is the same as the present one. Therefore, the coastal topography will not change.

(d) Air, Noise and Offensive Odor

Air quality will be affected in the construction stage because of the emission of exhaust gas from various construction equipment and facilities and the production of dust from the spoils. Unwanted noise and vibration caused by the construction equipment will be experienced.

The optimum construction work schedule will be considered not to concentrate the equipment on a certain point close to the houses.

(2) Ecological Aspects

(a) Terrestrial Species

Corn, coconuts, bamboo, bananas, and fruit trees along the river bank will be displaced by the dikes on a limited scale. However, the soil stabilizing effect of the flood control structures will be favorable for future cultivation of such species after the Plan is implemented. In Ormoc City, Ipomoea sp. (kangkong) will be disrupted but it will regain its habitat within a short time after the construction.

(b) Aquatic Species

For Iloilo City, it was noted previously that the deposition process supplies the substrate for the developing mangrove community of the river mouth. Judging from the fact that the newly formed delta is now being colonized by mangrove species at the mouth of Jaro River, mangrove will rather grow than diminish. A similar situation is likewise expected at the outlet of La Paz Floodway.

(3) Aesthetic Aspects

No significant degree of negative impact is anticipated on the aesthetic character of the affected terrestrial and aquatic ecosystem. Rather, it is likely that river bank stabilization, as a result of river improvement works, will facilitate the adoption of practical beautification measures such as approach steps to the waterfront, low water channel and tree planting along the river banks.

(4) Socio-economic Aspects

According to the socio-economic questionnaire survey in Iloilo City among a population of 128 households, around 54% of the inhabitants stated that the Plan will improve the quality of life in the community, while 44% anticipate that conditions will be more peaceful, safe and convenient as a result of the implementation of the Plan. Only 3% indicated that the Plan will have no effect. As for the question about the negative impacts, a slight majority of the respondents stated that there are no negative effects, with 29% still uncertain about the effects of the Plan.

The relocation of squatters still constitutes a significant socio-economic impact as evidenced by these perceptions. This is also aggravated by the fact that more than 50% of the respondents to the questionnaire survey have been staying in their present location for more than 15 years. This lends a relatively permanent character to these communities which is further reflected in established social relationships and lifestyles. However, 65% of the respondents recognize that the riverbank is a dangerous area, and 72% expressed willingness to relocate provided that the relocation site is within the immediate vicinity or in other accessible parts of the city.

Socio-economic effects associated with the Plan include generation of short-term employment opportunities to unemployed semi-skilled and unskilled laborers in the city, increase of economic activities as a result of increased demand for goods and services among these temporary workers.

A socio-economic study was conducted as well in Ormoc City among a population of 47 households in the same manner as the study in Iloilo City.

Around 63% of the inhabitants interviewed said that the Plan will promote safety and protection for the community while 20% expect that the Plan will improve their living conditions. Based on the answers to the perception questionnaire survey, the

positive and beneficial effects of the Plan outweigh its negative impacts. Majority (74 %) of the respondents stated that there will be no negative effects.

5.4 Implementation of Urgent Plan

Implementation Schedule

The implementation schedule of the Urgent Plan is prepared taking two considerations into account, as follows:

(1) The construction period is three (3) years for river improvement works and two (2) years for drainage improvement in Iloilo, while it is two (2) years for river improvement works and one (1) year for drainage improvement in Ormoc; and,

(2) Some investments from foreign sources are expected for the execution of detailed design and construction of the works.

The required period for the detailed design work is estimated to be about one (1) year and compensation work is assumed to take two (2) years following the standard procedure. Based on these considerations, the Urgent Plan for Iloilo City is proposed to be completed in 2001 while that in Ormoc City, in 2000, as illustrated in Fig. 5.18. The disbursement schedule of project cost is prepared in accordance with the proposed implementation schedule, as given in Table 5.1.

Recommendation

The feasibility study on the Urgent Plan was completed in February 1995. Since disastrous floods have devastated Ormoc City in November 1991 and Iloilo City in July 1994, the proposed projects under the Urgent Plan should be implemented without delay. Besides, the flood in Ormoc caused by Typhoon Uring in November 5 has brought tremendous damage accounting for approximately 8,000 casualties; therefore, the implementation of flood control works in Ormoc City is considered more urgent than the implementation in Iloilo City.

(1) Iloilo City

Aiming at the early realization of the Urgent Plan of flood control works in Iloilo City, the preparation of funds and execution body for the compensation works shall have to be started soon after completion of this Study, since the compensation work

is the most critical factor that will obstruct the smooth implementation of the Urgent Project,

(2) Ormoc City

The urgency of flood control works in Ormoc City requires expeditious implementation. The required cost is small and compensation work is also easier compared to Iloilo City because a city zoning ordinance on flood-prone areas along rivers was enacted after the flood in November 1991. Therefore, the flood control works in Ormoc City can be implemented earlier than the proposed schedule with the allocation of special funds and manpower.

It is recommended that a comprehensive study shall be made in the detail design stage to evaluate if the river improvement works in Ormoc City can be undertaken with the full scale of a 50-year return period adopted in the Urgent Plan stage, on account of the following:

- The difference of 16% (62 million pesos) in the project costs between the scale of 50-year and 20-year is very small.
- In the full-scale project of a 50-year return period, the environmental design in the river improvement works can be fully employed and project benefits will be enjoyed earlier by people in Ormoc City.

TABLES

Table 2.1 Mean Monthly Rainfall and Maximum Daily Rainfall in the Study Area

No.	City	Station	Mean monthly rainfall distribution												Annual	Max. Daily
			Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Rainfall	Rainfall
1	Laoag	Laoag	4.4	2.2	2.0	19.6	137.9	355.4	392.3	516.3	357.0	115.2	37.9	9.3	1,949.5	510.3
2	Ilagan	Tuguegarao	26.5	14.2	26.3	47.2	132.6	177.4	218.4	281.1	194.2	286.3	321.7	98.0	1,823.9	746.0
3	Olongapo	Iba	2.3	4.0	13.0	26.2	330.9	636.1	848.8	1,089.8	556.6	258.4	92.7	33.9	3,892.7	471.8
4	Batangas	Ambulong	20.5	7.3	20.9	40.2	152.4	299.3	339.8	344.9	314.5	263.5	221.0	93.3	2,117.6	765.8
5	Lucena	Tayabas	155.1	72.3	72.3	103.2	227.5	257.9	260.6	172.6	316.1	512.7	519.9	413.7	3,083.9	557.7
6	P.Princesa	P.Princesa	29.1	15.4	28.6	42.8	153.4	203.7	191.6	189.9	221.5	215.2	221.5	132.2	1,644.9	269.3
7	Legaspi	Legaspi	293.2	188.6	157.9	153.4	167.9	255.0	266.0	280.9	271.2	340.5	479.9	475.0	3,329.5	484.6
8	Iloilo	Iloilo	39.9	19.1	27.1	47.7	117.9	255.2	313.2	363.7	266.8	264.1	174.8	64.2	1,953.7	303.0
9	Cebu	Mactan	78.1	62.3	41.5	29.1	54.8	149.9	157.0	136.5	167.3	148.3	131.4	103.8	1,260.0	374.0
10	Tacloban	Tacloban	281.7	204.1	139.6	118.9	142.4	160.8	167.0	135.5	161.5	197.2	279.0	305.3	2,293.0	204.0
11	Ormoc	Merida	143.0	81.9	84.0	75.9	133.7	155.9	253.2	235.2	241.5	303.0	233.3	173.2	2,113.8	259.1
12	Zamboanga	Zamboanga	43.9	44.2	37.7	51.0	94.8	142.3	135.1	128.5	145.1	192.4	108.7	88.1	1,211.8	193.2
13	Davao	Davao City	104.5	97.1	86.7	146.7	183.7	189.6	148.3	174.7	170.5	170.1	129.1	86.3	1,687.3	174.3

Source: PAGASA

Table 2.2(1/2) Population and Density by Urban/Rural Area in 13 Selected Cities: 1990 Census

	City Urban/Rural Area	Land Area (ha)	1990 Census Population Urban (persons)	Rural (persons)	Total (persons)	Density (p./ha)	Number of Households (Families)
1.	Laoag City	10,750	38,875	44,881	83,756	7.8	16,866
	1 Poblacion (City Proper)	520	37,624	-	37,624	72.4	7,610
	2 Other Urban Area	148	1,251	-	1,251	8.5	246
	3 Rural Area	10,083	-	44,881	44,881	4.5	9,010
2.	Ilagan	139,360	22,261	76,859	99,120	0.7	18,891
	1 Poblacion (City Proper)	518	12,419	-	12,419	24.0	2,269
	2 Other Urban Area	1,512	9,842	-	9,842	6.5	1,822
	3 Rural Area	137,330	-	76,859	76,859	0.6	14,800
3.	Olongapo City	10,330	193,327	-	193,327	18.7	42,623
	1 Poblacion (City Proper)	10,330	193,327	-	193,327	18.7	42,623
	2 Other Urban Area	0	-	-	-	-	-
	3 Rural Area	0	-	-	-	-	-
4.	Batangas City	28,300	90,748	94,222	184,970	6.5	35,048
	1 Poblacion (City Proper)	195	19,401	-	19,401	99.5	3,836
	2 Other Urban Area	2,871	71,347	-	71,347	24.9	13,423
	3 Rural Area	25,234	-	94,222	94,222	3.7	17,789
5.	Lucena City	6,850	150,624	-	150,624	22.0	29,240
	1 Poblacion (City Proper)	6,850	150,624	-	150,624	22.0	29,240
	2 Other Urban Area	-	-	-	-	-	-
	3 Rural Area	-	-	-	-	-	-
6.	Puerto Princesa City	210,670	47,917	44,230	92,147	0.4	17,616
	1 Poblacion (City Proper)	1,470	32,040	-	32,040	21.8	5,903
	2 Other Urban Area	1,098	15,877	-	15,877	14.5	3,132
	3 Rural Area	208,102	-	44,230	44,230	0.2	8,581
7.	Legaspi City	15,370	83,226	37,890	121,116	7.9	22,222
	1 Poblacion (City Proper)	3,627	83,226	-	83,226	22.9	15,340
	2 Other Urban Area	-	-	-	-	-	-
	3 Rural Area	11,743	-	37,890	37,890	3.2	6,882
8.	Iloilo City	5,600	309,505	-	309,505	55.3	56,617
	1 Poblacion (City Proper)	5,600	309,505	-	309,505	55.3	56,617
	2 Other Urban Area	-	-	-	-	-	-
	3 Rural Area	-	-	-	-	-	-
9.	Cebu City	28,090	610,417	-	610,417	21.7	114,708
	1 Poblacion (City Proper)	28,090	610,417	-	610,417	21.7	114,708
	2 Other Urban Area	-	-	-	-	-	-
	3 Rural Area	-	-	-	-	-	-

Table 2.2(2/2) Population and Density by Urban/Rural Area in 13 Selected Cities: 1990 Census

City / Urban/Rural Area	Land Area (ha)	1990 Census Population				Number of Households (Families)
		Urban (persons)	Rural (persons)	Total (persons)	Density (p./ha)	
10. Tacloban City	10,090	136,891	-	136,891	13.6	24,897
1 Poblacion (City Proper)	10,090	136,891	-	136,891	13.6	24,897
2 Other Urban Area	-	-	-	-	-	-
3 Rural Area	-	-	-	-	-	-
11. Ormoc City	46,430	58,393	71,063	129,456	2.8	24,895
1 Poblacion (City Proper)	67	14,833	-	14,833	221.4	2,850
2 Other Urban Area	6,842	43,560	-	43,560	6.4	8,235
3 Rural Area	39,521	-	71,063	71,063	1.8	13,810
12. Zamboanga City	141,470	354,814	87,531	442,345	3.1	81,321
1 Poblacion (City Proper)	36,414	354,814	-	354,814	9.7	64,834
2 Other Urban Area	-	-	-	-	-	-
3 Rural Area	105,056	-	87,531	87,531	0.8	16,487
13. Davao City	221,130	624,757	225,190	849,947	3.8	159,976
1 Poblacion (City Proper)	3,690	254,536	-	254,536	69.0	48,358
2 Other Urban Area	12,941	370,221	-	370,221	28.6	69,536
3 Rural Area	204,499	-	225,190	225,190	1.1	42,082

Source : 1) 1990 Census of Population and Housing, Report 2-39A, Ilocos Norte, NSO
2) 1990 Census of Population and Housing, Report 2-43B, Isabela, NSO
3) 1990 Census of Population and Housing, Report 2-99C, Zambales, NSO
4) 1990 Census of Population and Housing, Report 2-71C, Olongapo City, NSO
5) 1990 Census of Population and Housing, Report 2-13D, Batangas, NSO
6) 1990 Census of Population and Housing, Report 2-73D, Palawan, NSO
7) 1990 Census of Population and Housing, Report 2-80D, Quezon, NSO
8) 1990 Census of Population and Housing, Report 2-5E, Albay, NSO
9) 1990 Census of Population and Housing, Report 2-41F, Iloilo, NSO
10) 1990 Census of Population and Housing, Report 2-42F, Iloilo City, NSO
11) 1990 Census of Population and Housing, Report 2-28G, Cebu, NSO
12) 1990 Census of Population and Housing, Report 2-29G, Cebu City, NSO
13) 1990 Census of Population and Housing, Report 2-51H, Leyte, NSO
14) 1990 Census of Population and Housing, Report 2-102I, Zamboanga del Sur, NSO
15) 1990 Census of Population and Housing, Report 2-100I, Zamboanga City, NSO
16) 1990 Census of Population and Housing, Report 2-32K, Davao del Sur, NSO
17) 1990 Census of Population and Housing, Report 2-33K, Davao City, NSO
18) 1990 Census Maps, NSO

Table 2.3 (1/2) Gross Regional Domestic Product at Current Prices by Region Concerned: 1985 to 1990

No.	Region	Gross Regional Domestic Product (in Billion Pesos) 1985	1986	1987	1988	1989	1990	GRDP per Capita(Pesos) 1985	1990*1
	Philippines	571.9	608.9	685.1	802.5	922.6	1,066.2	10,461	17,565
NCR.	Metro Manila	169.2	185.4	213.9	256.1	302.6	345.9	24,372	43,524
I.	Ilocos	25.3	29.5	31.7	34.7	39.3	43.8	6,478	10,094
II.	Cagayan Valley	14.8	15.0	16.9	19.2	22.2	25.5	5,864	9,437
III.	Central Luzon	53.2	54.6	59.8	70.1	77.2	94.2	9,743	15,192
IV.	Southern Tagalog	79.6	83.8	93.4	109.9	125.3	147.6	11,222	17,863
V.	Bicol	18.3	18.7	19.8	22.8	26.7	30.9	4,663	7,896
VI.	Western Visayas	42.6	44.5	49.2	57.6	65.0	75.4	8,375	13,978
VII.	Central Visayas	35.7	38.3	43.4	51.8	60.5	70.3	8,500	15,309
VIII.	Eastern Visayas	16.2	16.3	18.2	21.7	25.3	28.5	5,280	9,323
IX.	Western Mindanao	18.7	19.7	21.1	23.9	27.2	31.6	6,539	10,013
XI.	Southern Midanao	44.1	45.9	54.4	62.5	68.6	78.3	11,497	17,550

		Percentage Distribution by Region (%)						Ratio of Region to Country of GRDP/capit	
	Philippines	100.0	100.0	100.0	100.0	100.0	100.0	1.00	1.00
NCR.	Metro Manila	29.6	30.4	31.2	31.9	32.8	32.4	2.33	2.48
I.	Ilocos	4.4	4.9	4.6	4.3	4.3	4.1	0.62	0.57
II.	Cagayan Valley	2.6	2.5	2.5	2.4	2.4	2.4	0.56	0.54
III.	Central Luzon	9.3	9.0	8.7	8.7	8.4	8.8	0.93	0.86
IV.	Southern Tagalog	13.9	13.8	13.6	13.7	13.6	13.8	1.07	1.02
V.	Bicol	3.2	3.1	2.9	2.8	2.9	2.9	0.45	0.45
VI.	Western Visayas	7.5	7.3	7.2	7.2	7.0	7.1	0.80	0.80
VII.	Central Visayas	6.2	6.3	6.3	6.5	6.6	6.6	0.81	0.87
VIII.	Eastern Visayas	2.8	2.7	2.7	2.7	2.7	2.7	0.50	0.53
IX.	Western Mindanao	3.3	3.2	3.1	3.0	2.9	3.0	0.63	0.57
XI.	Southern Midanao	7.7	7.5	7.9	7.8	7.4	7.3	1.10	1.00

Source: 1992 Philippine Statistical Yearbook, October 1992, NSCB
Revised esimates as of October 1991
Note: *1 Applied the 1990 census population

Table 2.3(2/2) Gross Regional Domestic Product at Current Prices by Region Concerned: 1985 to 1990(2/2)

No.	Region	Gross Regional Domestic Product (in Billion Pesos)						GRDP per Capita(Pesos)	
		1985	1986	1987	1988	1989	1990	1985	1990*1
	Philippines	571.9	591.4	619.7	658.5	697.8	712.7	10,461	11,740
NCR.	Metro Manila	169.2	175.2	187.2	204.3	222.9	225.4	24,372	28,364
I.	Ilocos	25.3	27.2	27.1	28.1	30.0	30.2	6,478	6,956
II.	Cagayan Valley	14.8	15.1	15.5	16.1	16.5	16.7	5,864	6,175
III.	Central Luzon	53.2	54.2	57.2	61.5	63.9	68.4	9,743	11,033
IV.	Southern Tagalog	79.6	82.9	87.9	92.6	99.2	101.3	11,222	12,265
V.	Bicol	18.3	18.4	18.1	19.1	20.3	20.5	4,663	5,247
VI.	Western Visayas	42.6	43.8	45.3	47.1	49.2	50.1	8,375	9,284
VII.	Central Visayas	35.7	37.5	39.7	43.0	44.9	46.6	8,500	10,149
VIII.	Eastern Visayas	16.2	16.0	16.2	17.3	17.8	18.1	5,280	5,910
IX.	Western Mindanao	18.7	19.4	19.4	19.8	20.5	21.2	6,539	6,711
XI.	Southern Midanao	44.1	45.7	48.7	49.6	50.8	50.8	11,497	11,401

		Annual Growth Rate (%)						Average Growth Rate of GRDP per Capita: 1990/1985 (%/annum)
	Philippines	-7.3	3.4	4.8	6.3	6.0	2.1	2.3
NCR.	Metro Manila	-9.1	3.5	6.9	9.1	9.1	1.2	3.1
I.	Ilocos	0.3	7.7	-0.4	3.8	6.5	0.7	1.4
II.	Cagayan Valley	-10.4	2.1	2.8	3.9	2.6	0.8	1.0
III.	Central Luzon	-5.7	2.0	5.6	7.4	3.8	7.1	2.5
IV.	Southern Tagalog	-8.4	4.2	6.0	5.3	7.1	2.2	1.8
V.	Bicol	-5.1	0.4	-1.6	6.0	6.0	1.1	2.4
VI.	Western Visayas	-8.2	2.8	3.3	4.0	4.3	1.9	2.1
VII.	Central Visayas	-10.3	5.2	5.9	8.3	4.3	3.9	3.6
VIII.	Eastern Visayas	-7.4	-1.1	1.1	6.6	2.9	1.5	2.3
IX.	Western Mindanao	-7.1	3.4	0.0	2.1	3.9	3.2	0.5
XI.	Southern Midanao	-4.5	3.6	6.6	1.9	2.4	0.1	-0.2

Source: 1992 Philippine Statistical Yearbook, October 1992, NSCB
Revised esimates as of October 1991
Note: *1 Applied the 1990 census population

Table 2.4 Summary of Flood Conditions

(1982 - 1992)

	URBAN CENTER	MAJOR CAUSES OF FLOOD	MAXIMUM DAILY RAINFAI DATE	DEPTH (mm.)	FLOOD CONDITIONS AREA (ha.)	DEPTH (cm.)	DURATION (hr.)	REMARKS
1.	Laoag	- overbank flow of river - inadequate drainage system	09/09/89	437	210	200	12	
2.	Ilagan	- overbank flow of river	01/08/86	345	46	60-250	5-48	
3.	Olongapo	- overbank flow of river due to volcanic ash siltation - inadequate drainage system	20/06/85	422	26	30-125	2-8	
4.	Batangas	- overbank flow of river - inadequate drainage system	24/08/90	284	118	100-120	12	
5.	Lucena	- overbank flow of river - inadequate drainage system	14/07/83	254	11	30-120	0.3-24	
6.	Puerto Princesa	- inadequate drainage system	30/09/83	226	19	15-30	1-3	
7.	Legaspi	- overbank flow of river due to volcanic ash siltation - inadequate drainage system	14/02/89	254	316	30-100	8-24	
8.	Iloilo	- overbank flow of river - inadequate drainage system	05/11/84	256	1,004	30-200	1-24	
9.	Cebu	- overbank flow of river inadequate drainage system	19/12/91	374	187	30-50	1-3	
10.	Tacloban	- overbank flow of river - inadequate drainage system	12/03/91	204	79	10-100	6-48	
11.	Ormoc	- overbank flow of river - inadequate drainage system	Not Avail.		200	50-300	0.5-1	
12.	Zamboanga	- overbank flow of river - inadequate drainage system	29/09/90	193	112	10-210	0.3-24	
13.	Davao	- overbank flow of river - inadequate drainage system	08/10/85	150	57	20-150	1-24	

Note:

(1) Source: DPWH District Office/City Engineer's Office (by interview)

(2) Flood Conditions indicated only within the city proper

Table 2.5 Summary of Flood Damage

(1982 - 1992)

	Chartered City	Casualty			Population Affected		Homeless		Houses Destroyed		Infra-Structure (Mill. Pesos)	Crops Livestocks Fisheries (Mill. Pesos)	Private Properties (Mill. Pesos)
		Dead	Injured	Missing	Families	Persons	Families	Persons	Totally	Partially			
1	Laoag City	4	5	-	22,080	98,497	230	1,380	230	4,009	83.282	13.166	7.407
2	Ilagan, Isabela												
3	Olongapo City	12	6	-	10,468	55,508	188	1,128	188	564	11.384	-	-
4	Batangas City	18	1	3	3,549	19,126	1,387	8,322	1,387	562	42.830	3.700	2.200
5	Lucena City	2	-	-	2,429	11,432	1	6	1	-	12.280	-	-
6	P. Princesa City	4	4	6	2,877	13,938	1,117	6,702	1,117	1,508	-	-	-
7	Legaspi City	37	51	5	44,647	251,442	15,623	93.738	15,623	13,461	15.081	17.106	1.861
8	Iloilo City	2	10	-	22,011	130,321	4,022	24,132	4,022	17,857	151.198	129.175	16.218
9	Cebu City	49	66	7	123,026	638,209	30,091	180,546	30,091	81,078	104.224	0.728	172.881
10	Tacloban City	23	35	-	32,318	188,557	7,951	47,706	7,951	32,318	29.589	309.500	64.300
11	Ormoc City	4,561	84	1,205	39,691	238,309	3,193	19,158	3,193	12,470	411.959	40.100	108.010
12	Zamboanga City	3	50	-	1,488	8,083	160	960	160	377	57.710	7.656	27.300
13	Davao City	10	4	-	5,257	13,875	139	834	139	1,551	6.524	-	5.244

Source: Office of Civil Defence (OCD), DND

Table 2.6 Existing Flood Control Structures/Works

Name of City	Name of River	Flood Control Facilities						
		Dike		Revetment/Wall		Dredging	Super Dike	Others
		Type	Length (m)	Type	Length (m)	Length (m)	(units)	
Laoag	Laoag	--	--	Rb. Conc.	2,754	381	4	closing dike 1,370m
								cut-off 3,340m
Ilagan	Ilagan	--	--	Rb. Conc.	100	--	1	
Olongapo	Sta. Rita	--	--	Rb. Conc.	1,284	--	--	
Batangas	Kalumpang	--	--	Rb. Conc.	765	--	--	
Lucena	Tayabas-Iyam	--	--	Rb. Conc.	145	--	--	
	Tayabas-Dumaga			Rb. Conc.	868			
Puerto Princesa		--	--	--	--	--	--	
Legaspi	Yawa	--	--	Rb. Conc.	2,925	--	--	
	Macabalo	--	--	Rb. Conc.	N/A	--	--	
Iloilo	Jaro	--	--	Rb. Conc.	2,585	--	--	
Cebu	Subangdaku	--	--	Rb. Conc.	N/A	1,900	--	
	Lahug	Earth	935	Rb. Conc.	N/A	3,250	--	
	Guadalupe	Boulder	50	Rb. Conc.	N/A	1,500	--	
	Kinalanisan	--	--	Rb. Conc.	N/A	--	--	
	Binaliw	--	--	Rb. Conc.	N/A	--	--	
Tacloban	Mangonbangon	--	--	Rb. Conc.	2,170	1,482	--	
	Abucay	--	--	Rb. Conc.	N/A	--	--	
Ormoc	Anilao	Earth	350	Rb. Conc.	1,073	500	--	
				Gabion	350			
	Malbasag	--	--	Rb. Conc.	767	--	--	
Zamboanga	Tumaga	--	--	Rb. Conc.	460	--	--	
Davao	Davao	--	--	Rb. Conc.	2,316	--	--	

Table 2.7 Existing Drainage Facilities

Name of City	City Proper Area (ha)	Drainage Area (ha)	Covering Ratio (%)	Drainage Facilities (Pipe/channel) Channel (m)	Main (m)	Secondary (m)	Tertiary (m)	Total (m)	Others
Laoag	520	165	31.7	2,030	2,778	10,340	7,590	22,738	
Ilagan	518	51	9.8		920	100	13,090	14,110	
Olongapo	10,330	30	0.3	3,352	674	3,196		7,222	
Batangas	195	64	32.8		2,270	3,169		5,439	
Lucena	6,850	37	0.5		5,560	1,600		7,160	
Puerto Princesa	1,470	165	11.2		1,930	1,950		3,880	
Legaspi	3,627	73	2.0		4,080	2,925		7,005	
Iloilo	5,600	454	8.1		3,800	24,150		27,950	
Cebu	28,090	319	1.1	2,200	11,200	3,260	39,190	55,850	Diversion L=900m
Tacloban	10,090	164	1.6	2,600	5,400	3,900	1,700	13,600	
Ormoc	67	44	65.7	580	1,100	1,810		3,490	
Zanboanga	36,414	119	0.3	7,250	1,700	9,540		18,490	
Davao	3,690	876	23.7	15,019	2,790	1,080		18,889	

Covering Ratio = Drainage Survice area / City Proper Area x 100 (%)

Table 2.8 Prioritization of Flood Control and Drainage Project

Priority Factor	Urban Center	(1) Laoag	(2) Ilagan	(3) Olongapo	(4) Batangas	(5) Lucena	(6) Puerto Princesa	(7) Legaspi	(8) Iloilo	(9) Cebu	(10) Tacloban	(11) Ormoc	(12) Zamboanga	(13) Davao
1. NECESSITY		3	2	2	2	2	1	3	3	2	2	3	2	2
(1) Flood Area		3	1	1	2	1	1	3	3	2	1	3	2	1
(2) Flood Depth		3	3	2	3	2	1	2	3	1	2	3	3	2
(3) Flood Duration		2	3	2	2	3	2	3	3	2	3	1	3	3
(4) Population Affection		2	1	2	1	1	1	3	3	3	3	3	1	1
2. URGENCY		3	3	3	2	3	2	3	2	3	3	3	3	3
(1) River Capacity		3	3	3	3	3	1	3	2	2	3	3	3	3
(2) Drainage Development		3	3	3	2	3	3	3	3	3	3	1	3	3
(3) Casualties		1	1	1	1	1	1	2	1	2	2	3	2	1
3. BENEFIT		1	1	1	1	1	1	1	2	2	3	3	1	1
(1) Total Amount		2	1	1	1	1	1	1	3	3	3	3	2	1
(2) Amount per Capita		1	1	1	1	1	1	1	1	1	1	3	1	1
4. REGIONAL EQUALITY		3	2	3	3	3	2	3	3	3	3	3	3	3
(1) River Project		3	3	3	3	3	1	3	3	3	3	3	3	3
(2) Drainage Project		3	1	3	3	3	2	3	2	2	2	3	3	2
Integrated Evaluation		10	8	9	8	9	6	10	10	10	11	12	9	9

Table 4.1 River Improvement Project Cost of Master Plan in Iloilo City

Work Items		Unit	Unit Cost (Pesos)	Jaro River		Iloilo River		Manduriao River		Total	
				Quantity	Amount (1000 P)	Quantity	Amount (1000 P)	Quantity	Amount (1000 P)	Quantity	Amount (1000 P)
I. Main Construction Cost					900,521		268,786		147,888		1,317,196
1. Preparatory Works					74,423		22,214		12,222		108,859
2. Main Work					744,233		222,138		122,222		1,088,592
(1) Excavation		m3	83	3,069,000	254,727	0	0	75,000	6,225	3,144,000	260,952
(2) Embankment	Excavated Material	m3	79	463,000	36,577	0	0	0	0	463,000	36,577
	Barrow Pit	m3	132	0	0	63,000	8,316	72,000	9,504	135,000	17,820
(3) Backfill		m3	73	0	0	23,000	1,679	20,000	1,460	43,000	3,139
(4) Dredging	Spoil in Land	m3	71	0	0	563,000	39,973	250,000	17,750	813,000	57,723
	Spoil in Sea	m3	55	32,000	1,760	420,000	23,100	0	0	452,000	24,860
(5) Revetment	Type 1(H=3m)	m	11,900	0	0	0	0	1,100	13,090	1,100	13,090
	Type 1(H=6m)	m	17,500	10,900	190,750	0	0	0	0	10,900	190,750
	Type 1(H=7.2m)	m	19,400	1,000	19,400	0	0	0	0	1,000	19,400
	Type 2(H=2m)	m	27,800	1,600	44,480	0	0	1,800	50,040	3,400	94,520
	Type 2(H=3m)	m	29,400	0	0	300	8,820	0	0	300	8,820
(6) MFC Protection		m2	150	275,000	41,250	0	0	0	0	275,000	41,250
(7) Sodding		m2	19	252,000	4,788	20,000	380	2,900	55	274,900	5,223
(8) Gravel Pavement		m2	105	152,000	15,960	26,000	2,730	5,400	567	183,400	19,257
(9) Concrete Dike		m	20,000	0	0	4,780	95,600	0	0	4,780	95,600
(10) Diversion Works											
a. Lapaz Floodway	Conc. Weir H=0.7m (River	m	106,800	52	5,554	0	0	0	0	52	5,554
b. Jaro Floodway	Conc. Weir H=4m (River)	m	221,000	44	9,724	0	0	0	0	44	9,724
	Conc. Weir H=4m (FW)	m	221,000	68	15,028	0	0	0	0	68	15,028
c. Groundsill		m	27,100	80	2,168	0	0	0	0	80	2,168
(11) Sluice	Type A1	no.	772,900	2	1,546	0	0	0	0	2	1,546
	Type A2	no.	1,364,200	0	0	1	1,364	1	1,364	2	2,728
	Type A3	no.	2,085,500	0	0	1	2,086	1	2,086	2	4,171
	Type B0.6	no.	148,700	0	0	2	297	0	0	2	297
	Type B1.0x1	no.	192,500	6	1,155	1	193	0	0	7	1,348
	Type B1.0x2	no.	385,000	3	1,155	0	0	2	770	5	1,925
	Type B1.0x3	no.	577,500	1	578	0	0	0	0	1	578
(12) Jetty		m3	500	5,900	2,950	0	0	0	0	5,900	2,950
(13) Invert Siphon	D=0.7m	no.	829,900	1	830	0	0	0	0	1	830
	D=1.0m	no.	948,900	2	1,898	0	0	0	0	2	1,898
(14) Bridge		m2	22,989	4,000	91,956	1,100	25,288	840	19,311	5,940	136,555
(15) Bridge Protection		m2	5,130	0	0	2,400	12,312	0	0	2,400	12,312
3. Miscellaneous Works					81,866		24,435		13,444		119,745
II. Compensation Cost					457,553		51,909		68,197		577,659
(1) Land Acquisition	Residential A	m2	1,052	370,000	389,240	38,000	39,976	36,000	37,872	444,000	467,088
	Farm Land	m2	40	562,000	22,480	0	0	0	0	562,000	22,480
	Fish Pond	m2	50	94,000	4,700	82,000	4,100	0	0	176,000	8,800
	Other	m2	5	125,000	625	0	0	0	0	125,000	625
(2) House Compensation		no.	111,900	362	40,508	70	7,833	271	30,325	703	78,666
III. Administration Cost (5% of I+II)					67,904		16,035		10,804		94,743
IV. Physical Contingency (15% of I+II+III)					213,897		50,510		34,033		298,440
Total of I to IV					1,639,875		387,240		260,923		2,288,037
V. Engineering Services (16% of I. to IV)					144,083		43,006		23,662		210,751
Grand Total					1,783,958		430,245		284,585		2,498,788

Table 4.2 River Improvement Project Cost of Master Plan in Cebu City

Work Items		Unit	Unit Cost (Pesos)	Bulacao		Kinalumsan		Guadalupe		Labug		Subang Daku		Total	
				Quantity	Amount (1000 P)	Quantity	Amount (1000 P)	Quantity	Amount (1000 P)	Quantity	Amount (1000 P)	Quantity	Amount (1000 P)	Quantity	Amount (1000 P)
I. Main Construction Cost					89,617		166,504		169,813		217,487		245,115		888,536
1. Preparatory Works					7,406		13,761		14,034		17,974		20,257		73,433
2. Main Work					74,064		137,606		140,342		179,742		202,574		734,328
(1) Excavation		m3	83	297,000	24,651	143,000	11,869	330,000	27,390	149,600	12,417	374,000	31,042	1,293,600	107,369
(2) Embankment		m3	132	36,000	4,752	0	0	0	0	0	0	0	0	36,000	4,752
(3) Revetment		m	9,600	1,340	12,864	0	0	0	0	0	0	0	0	1,340	12,864
(4) Retaining Wall	H=2.8m	m	7,100	0	0	3,000	21,300	2,970	21,087	4,180	29,678	2,950	20,945	13,100	93,010
	H=3.1m	m	7,300	0	0	0	0	0	0	8,000	58,400	0	0	8,000	58,400
	H=3.6m	m	7,700	0	0	4,600	35,420	0	0	0	0	5,000	38,500	9,600	73,920
	H=3.8m	m	7,900	0	0	2,800	22,120	0	0	0	0	3,420	27,018	6,220	49,138
	H=4.3m	m	8,300	0	0	0	0	6,400	53,120	0	0	0	0	6,400	53,120
(5) Backfill Conc.		m3	2,658	0	0	2,520	6,698	600	1,595	2,400	6,379	5,040	13,396	10,560	28,068
(5) Sodding		m2	19	39,200	745	0	0	0	0	0	0	0	0	39,200	745
(6) Gravel Pavement		m2	105	15,900	1,670	0	0	0	0	0	0	0	0	15,900	1,670
(7) Drops	H=0.85m	m	49,900	0	0	12	599	0	0	0	0	12	599	24	1,198
	H=1.0m	m	50,700	244	12,371	0	0	0	0	0	0	232	11,762	476	24,133
	H=1.4m	m	52,700	0	0	0	0	0	0	11	580	0	0	11	580
	H=1.5m	m	53,300	0	0	96	5,117	36	1,919	55	2,932	0	0	187	9,967
	H=1.7m	m	54,300	0	0	0	0	18	977	0	0	0	0	18	977
(8) Bridge		m2	22,989	740	17,012	1,500	34,484	1,490	34,254	2,140	49,196	2,580	59,312	8,450	194,257
(9) Bridge for Labug River Mouth		no.	20,160,000	0	0	0	0	0	0	1	20,160	0	0	1	20,160
3. Miscellaneous Works					8,147		15,137		15,438		19,772		22,283		80,776
II. Compensation Cost					110,614		279,213		367,239		424,694		547,718		1,729,477
(1) Land Acquisition	Residential A	m2	5,150	18,000	92,700	52,000	267,800	5,300	27,295	19,870	102,331	102,000	525,300	197,170	1,015,426
	B	m2	8,000		0		0	5,000	40,000	38,130	305,040	0	0	43,130	345,040
	C	m2	11,100		0		0	25,700	285,270	0	0	0	0	25,700	285,270
	Farm Land	m2	170	82,000	13,940	0	0	0	0	0	0	0	0	82,000	13,940
(2) House Compensation		no.	101,900	39	3,974	112	11,413	144	14,674	170	17,323	220	22,418	685	69,802
III. Administration Cost (5% of I+II)					10,012		22,286		26,853		32,109		39,642		130,901
IV. Physical Contingency (15% of I+II+III)					31,536		70,200		84,586		101,143		124,871		412,337
Total of I to IV					241,780		538,203		648,490		775,433		957,345		3,161,251
V. Engineering Services (16% of I. to IV)					14,339		26,641		27,170		34,798		39,218		142,166
Grand Total					256,118		564,843		675,660		810,231		996,564		3,303,417

Table 4.3 River Improvement Project Cost of Master Plan in Ormoc City

Work Items		Unit	Unit Cost	Anilao river		Malbasag River		Total	
			(Pesos)	Quantity	Amount (1000 P)	Quantity	Amount (1000 P)	Quantity	Amount (1000 P)
I. Main Construction Cost					154,474		104,221		258,695
1. Preparatory Works					12,766		8,613		21,380
2. Main Work					127,664		86,133		213,797
(1) Excavation		m3	81	166,000	13,446	225,000	18,225	391,000	31,671
(2) Embankment		m3	108	38,000	4,104	6,500	702	44,500	4,806
(3) Backfill		m3	71	60,000	4,260	45,000	3,195	105,000	7,455
(4) Revetment	(H=4m, LWC)	m	8,100	3,600	29,160	0	0	3,600	29,160
	(H=4m, HWC)	m	4,300	3,600	15,480	0	0	3,600	15,480
	(H=3m, LWC)	m	7,400	0	0	1,410	10,434	1,410	10,434
	(H=3m, HWC)	m	3,600	0	0	1,410	5,076	1,410	5,076
(5) Retaining Wall	H=3.8m	m	7,200	0	0	2,190	15,768	2,190	15,768
(6) MFC Protection		m2	148	21,000	3,108	10,225	1,513	31,225	4,621
(7) Sodding		m2	16	16,000	256	6,300	101	22,300	357
(8) Gravel Pavement		m2	66	11,000	726	10,800	713	21,800	1,439
(9) Drops	H=1.0m	m	48,300	0	0	35	1,691	35	1,691
	H=1.5m	m	50,700	40	2,028	64	3,245	104	5,273
	H=1.75m	m	52,000	80	4,160	0	0	80	4,160
(10) Sluice	Type A2	no.	1,352,600	2	2,705	0	0	2	2,705
	Type B0.6	no.	130,700	1	131	4	523	5	654
(11) Slit Dam	Anilao 1	no.	7,530,000	1	7,530	0	0	1	7,530
	Anilao 2	no.	5,670,000	1	5,670	0	0	1	5,670
	Malbasag	no.	9,070,000	0	0	1	9,070	1	9,070
(12) Maintenance Road for Slit Dams		m	1,500	800	1,200	600	900	1,400	2,100
(13) Bridge		m2	23,403	1,440	33,700	640	14,978	2,080	48,678
3. Miscellaneous Works					14,043		9,475		23,518
II. Compensation Cost					29,148		25,301		54,450
(1) Land Acquisition	Residential A	m2	0	0	0	0	0	0	0
	B	m2	280	34,800	9,744	39,700	11,116	74,500	20,860
	C	m2	1,000	0	0	0	0	0	0
	Farm Land	m2	5	0	0	0	0	0	0
	Forest, Wasteland	m2	1	13,400	13	32,700	33	46,100	46
(2) House Compensation		no.	91,900	211	19,391	154	14,153	365	33,544
III. Administration Cost (5% of I+II)					9,181		6,476		15,657
IV. Physical Contingency (15% of I+II+III)					28,920		20,400		49,320
Total of I to IV					221,724		156,398		378,122
V. Engineering Services (16% of I. to IV)					24,716		16,675		41,391
Grand Total					246,439		173,073		419,513

Table 4.4 Drainage Improvement Project Cost of Master Plan in Iloilo City

ILOILO CITY (1/5,1/3)

Work Items	Unit	Unit Cost (Peso)	Ingore Creek (5000 m)		Bo.Obrero Creek (4400 m)		Rizal Creek (620 m)		Total	
			Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)
I Main Construction										
1. Preparatory Works				4,263		3,631		675		8,569
2. Main Works										
(1) Excavation	m3	83	103,000	8,568	73,000	6,072	2,200	183	178,200	14,823
(2) Revetment	m2	1,400	10,200	14,280	10,400	14,560	700	980	21,300	29,820
(3) Concrete	m3	12,700	0	0	800	10,160	440	5,588	1,240	15,748
(4) Bridge	m2	23,000	860	19,780	240	5,520	0	0	1,100	25,300
Total Amount of Works				42,628		36,312		6,751		85,691
3. Miscellaneous Works (10% of 1+2)				4,689		3,994		743		9,426
Total of I				51,579		43,938		8,169		103,686
II Compensation				10,302		13,203		4,588		28,094
(1) Land	m2		46,000	8,400	8,500	6,825	0	0	54,500	15,225
(2) House	no.	111,900	17	1,902	57	6,378	41	4,588	115	12,869
III Administration (5% of I+II)				3,094		2,857		638		6,589
IV Physical Contingency (15% of I+II+III)				9,746		9,000		2,009		20,755
Total of I,II,III, and IV				74,722		68,998		15,404		159,123
V Engineering Services (16% of I)				8,253		7,030		1,307		16,590
Grand Total				82,975		76,028		16,711		175,713

Table 4.5(1/2) Drainage Improvement Project Cost of Master Plan in Cebu City

CEBU CITY (1/5.1/3)

Work Items	Unit	Unit Cost (Peso)	Mabolo Creek (1930 m) Quantity	Mabolo Creek (1930 m) Amount (1000 P.)	Lahug Tributary (1680 m) Quantity	Lahug Tributary (1680 m) Amount (1000 P.)	Tinago Creek (1220 m) Quantity	Tinago Creek (1220 m) Amount (1000 P.)	Pahina Central M.D. (1100 m) Quantity	Pahina Central M.D. (1100 m) Amount (1000 P.)	Calamba Drainage Area M.D. (830 m) Quantity	Calamba Drainage Area M.D. (830 m) Amount (1000 P.)
I Main Construction												
1. Preparatory Works				1,711		1,385		2,813		3,886		2,191
2. Main Works												
(1) Excavation	m3	83	19,968	1,661	4,121	343	10,846	902	3,465	288	2,490	207
(2) Revetment	m2	1,400	10,375	14,525	8,910	12,474	10,699	14,979	0	0	0	0
(3) Concrete	m3	12,700	0	0	0	0	820	10,414	3,037	38,574	1,709	21,706
(4) Bridge	m2	23,000	40	920	45	1,035	80	1,840	0	0	0	0
Total Amount of Works				17,106		13,852		28,135		38,862		21,913
3. Miscellaneous Works (10% of 1+2)				1,882		1,524		3,095		4,275		2,410
Total of I				20,699		16,760		34,043		47,023		26,514
II Compensation												
(1) Land	m2		24,170	124,476	6,428	47,064	5,950	30,643	0	0	0	0
(2) House	no.	101,900	9	966	10	1,040	2	238	0	0	0	0
III Administration (5% of I+II)				7,307		3,243		3,246		2,351		1,326
IV Physical Contingency (15% of I+II+III)				23,017		10,216		10,225		7,406		4,176
Total of I,II,III, and IV				176,464		78,323		78,395		56,780		32,016
V Engineering Services (16% of I)				3,312		2,682		5,447		7,524		4,242
Grand Total				179,776		81,004		83,842		64,304		36,258

Table 4.5(2/2) Drainage Improvement Project Cost of Master Plan in Cebu City

CEBU CITY (1/5.1/3)

Work Items	Unit	Unit Cost (Peso)	Sta. Teresita (530 m) Quantity	Sta. Teresita (530 m) Amount (1000 P.)	Basak-san Nicolas (860 m) Quantity	Basak-san Nicolas (860 m) Amount (1000 P.)	Sto. Niho Creek (1200 m) Quantity	Sto. Niho Creek (1200 m) Amount (1000 P.)	Barangsy Inayawan (1500 m) Quantity	Barangsy Inayawan (1500 m) Amount (1000 P.)	Total Quantity	Total Amount (1000 P.)
I Main Construction												
1. Preparatory Works				3,075		2,184		804		1,254		19,304
2. Main Works												
(1) Excavation	m3	83	2,625	218	4,485	373	23,441	1,950	13,221	1,100	84,662	7,042
(2) Revetment	m2	1,400	0	0	0	0	3,691	5,168	6,861	9,605	40,536	56,750
(3) Concrete	m3	12,700	2,404	30,532	1,690	21,468	0	0	0	0	9,661	122,693
(4) Bridge	m2	23,000	0	0	0	0	40	920	80	1,840	285	6,555
Total Amount of Works				30,750		21,841		8,037		12,544		193,041
3. Miscellaneous Works (10% of 1+2)				3,383		2,403		884		1,380		21,234
Total of I				37,208		26,428		9,725		15,179		233,579
II Compensation												371,542
(1) Land	m2		0	0	0	0	13,200	67,980	19,000	97,850	68,748	368,012
(2) House	no.	101,900	0	0	0	0	5	527	7	759	35	3,530
III Administration (5% of I+II)				1,860		1,321		3,912		5,689		30,256
IV Physical Contingency (15% of I+II+III)				5,860		4,162		12,322		17,922		95,307
Total of I,II,III, and IV				44,929		31,912		94,466		137,399		730,683
V Engineering Services (16% of I)				5,953		4,228		1,556		2,429		37,373
Grand Total				50,882		36,140		96,022		139,828		768,056

Table 4.6 Drainage Improvement Project Cost of Master Plan in Ormoc City

OROMOC CITY (1/5,1/3)

Work Items	Unit	Unit Cost (Peso)	Lotao Creek (1200 m) Quantity	Lotao Creek (1200 m) Amount (1000 P.)	City Proper Creek (630 m) Quantity	City Proper Creek (630 m) Amount (1000 P.)	Total Quantity	Total Amount (1000 P.)
I Main Construction								
1. Preparatory Works				589		665		1,254
2. Main Works								
(1) Excavation	m3	77	5,700	437	646	49	6,346	486
(2) Revetment	m2	1,400	2,300	3,220	2,043	2,860	4,343	6,080
(3) Concrete	m3	12,700	150	1,905	0	0	150	1,905
(4) Bridge	m2	23,400	14	328	160	3,744	174	4,072
Total Amount of Works				5,889		6,653		12,542
3. Miscellaneous Works (10% of 1+2)				648		732		1,380
Total of I				7,126		8,050		15,176
II Compensation								2,565
(1) Land	m2		4,000	4	2,583	723	6,583	727
(2) House	no.	91,900	13	1,195	7	643	20	1,838
III Administration (5% of I+II)				416		471		887
IV Physical Contingency (15% of I+II+III)				1,311		1,483		2,794
Total of I,II,III, and IV				10,052		11,371		21,423
V Engineering Services (16% of I)				1,140		1,288		2,428
Grand Total				11,192		12,659		23,851

Table 4.7(1/2) Drainage Improvement Project Cost of Master Plan in Tacloban City

TACLOBAN CITY (1/5,1/3)

Work Items	Unit	Unit Cost (Peso)	Abucay River (1700 m)		Naga-naga Creek (1000 m)		Mangonbangon River (4000 m)		Langhas Lirang Creek (3750 m)		Sagkahan Creek (380 m)	
			Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)
I Main Construction												
1. Preparatory Works				184		118		3,295		4,471		268
2. Main Works												
(1) Excavation	m3	77	5,712	438	3,240	248	40,670	3,116	74,450	5,704	474	36
(2) Revetment	m2	1,368	0	0	0	0	20,102	27,495	26,464	36,196	1,247	1,705
(3) Concrete	m3	12,700	0	0	0	0	0	0	0	0	0	0
(4) Bridge	m2	23,403	60	1,404	40	936	100	2,340	120	2,808	40	936
Total Amount of Works				1,842		1,184		32,951		44,709		2,678
3. Miscellaneous Works (10% of 1+2)				203		130		3,625		4,918		295
Total of I				2,229		1,433		39,871		54,097		3,240
II Compensation												
(1) Land	m2		19,720	1,919	1,800	192	40,570	31,782	52,000	16,201	1,330	1,397
(2) House	no.	91,900	4	400	0	40	66	6,095	35	3,252	3	266
III Administration (5% of I+II)				227		83		3,887		3,678		245
IV Physical Contingency (15% of I+II+III)				716		262		12,245		11,584		772
Total of I,II,III, and IV				5,491		2,010		93,881		88,813		5,919
V Engineering Services (16% of I)				357		229		6,379		8,656		518
Grand Total				5,848		2,239		100,260		97,468		6,438

Table 4.7(2/2) Drainage Improvement Project Cost of Master Plan in Tacloban City

TACLOBAN CITY (1/5,1/3)

Work Items	Unit	Unit Cost (Peso)	Pleasan Creek (1600 m) Quantity	Pleasan Creek (1600 m) Amount (1000 P.)	Burayan River (3500 m) Quantity	Burayan River (3500 m) Amount (1000 P.)	Total Quantity	Total Amount (1000 P.)
I Main Construction								
1. Preparatory Works				1,933		4,383		14,652
2. Main Works								
(1) Excavation	m3	77	11,268	863	47,300	3,624	183,114	14,029
(2) Revetment	m2	1,368	12,132	16,594	28,709	39,267	88,654	121,257
(3) Concrete	m3	12,700	0	0	0	0	0	0
(4) Bridge	m2	23,403	80	1,872	40	936	480	11,233
Total Amount of Works				19,329		43,827		146,519
3. Miscellaneous Works (10% of 1+2)				2,126		4,821		16,117
Total of I				23,388		53,030		177,288
II Compensation								85,441
(1) Land	m2		16,220	9,603	53,220	10,112	184,860	71,206
(2) House	no.	91,900	22	2,056	23	2,126	155	14,235
III Administration (5% of I+II)				1,752		3,263		13,136
IV Physical Contingency (15% of I+II+III)				5,520		10,280		41,380
Total of I,II,III, and IV				42,320		78,812		317,246
V Engineering Services (16% of I)				3,742		8,485		28,366
Grand Total				46,062		87,297		345,612

Table 4.8 Comparison of Economic Internal Rate of Return

(Unit: %)

Item	Flood Control Work		Drainage Improvement	Entire City Project
	Entire River	River Basin		
I. Under Future Conditions				
1. Iloilo City	22.0	-	12.7	21.4
Jaro River		21.3	-	-
Iloilo & Mandurriao River		23.9	-	-
2. Cebu City	19.9	-	26.5	21.2
Bulacao River		26.1	-	-
Kinalumsan River		22.6	-	-
Guadalupe River		22.8	-	-
Lahug River		19.8	-	-
Sabang Daku River		14.2	-	-
3. Ormoc City	29.1	-	11.9	28.3
Anilao & Malbasag River		29.1	-	-
4. Tacloban City	-	-	27.8	27.8
II. Under Present Conditions				
1. Iloilo City	14.0	-	5.6	13.5
Jaro River		13.7	-	-
Iloilo & Mandurriao River		14.9	-	-
2. Cebu City	10.5	-	14.8	11.3
Bulacao River		14.7	-	-
Kinalumsan River		12.5	-	-
Guadalupe River		12.9	-	-
Lahug River		10.5	-	-
Sabang Daku River		5.9	-	-
3. Ormoc City	21.5	-	5.9	21.3
Anilao & Malbasag River		21.5	-	-
4. Tacloban City	-	-	20.2	20.2

Table 4.9 Environmental Interaction Matrix of Flood Control Plan in Iloilo

MAJOR ACTIVITIES (which may cause IMPACTS)		ENVIRONMENTAL FACTORS														
		Physico-Chemical				Ecological			Socio-Economic							
Project Stage	Activities	Surface Water	Ground Water	Topography	Air, Noise & Offensive Odor	Terrestrial Species	Aquatic Species	Aesthetic Aspects	Economic Activities	Land Use	Demography & Manpower	Transportation	Housing & Community Infrastructure	Health & Social Services	Life Style & Community
Pre-Construction	Right-of-Way Acquisition								-	--			---		---
	Initial Site Clearing					-		-							
Construction	Labor Mobilization								+		-		-	-	-
	Channel Improvement	--			---	-	--	--	+ -	-	+	-	-	--	
	Floodways		-		-	-	-	--	+ -	--	+	-	-	--	
	Replacement (Bridge, etc.)	--			--		--	--	+ --		+	--	-		--
	Drainage Channel Improvement	-			---		-	--	+ --	-	+	-	-	-	
	Drainage Diversion		-		---	-		--	+ --	--	+	--	-		
Operation	River Channel	+++		+ -	++	+	+	+++	+++	+++ -		++	+++	+++	++
	Floodway	+++	-	-		-	-	--	+++	+++ ---		++ -	+++	+++	++ --
	Drainage	+++	-	-	+++		+	+++	+++	+++ --		++	+++	+++	++

Note: + : Positive (Beneficial) Impact - : Negative (Adverse) Impact

Impact Categories:
+ or - : Possible but Minor Impact
++ or -- : Minor to Moderate Impact
+++ or --- : Moderate to Major Impact

Table 4.10 Environmental Interaction Matrix of Flood Control Plan in Cebu

MAJOR ACTIVITIES (which may cause IMPACTS)		ENVIRONMENTAL FACTORS													
		Physico-Chemical				Ecological			Socio-Economic						
Project Stage	Activities	Surface Water	Ground Water	Topography	Air, Noise & Offensive Odor	Terrestrial Species	Aquatic Species	Aesthetic Aspects	Economic Activities	Land Use	Demography & Manpower	Transportation	Housing & Community Infrastructure	Health & Social Services	Life Style & Community
Pre-Construction	Right-of-Way Acquisition								--	---			---		---
	Initial Site Clearing					-									
Construction	Labor Mobilization								+		-		-	-	-
	Channel Improvement	-			---	-	-	-	+ -	-	+	--	--	--	
	Replacement (Bridge, etc.)	-			---		-	-	+ --		+	--	-		-
	Drainage Channel Improvement	-			---			-	+ --	-	+	--	--	--	
Operation	River Channel	+++		+ -	+++	+	+	+++	+++	+++ -		++	+++	+++	++
	Drainage	+++	--		+++			+++	+++	+++ --		+++	+++	+++	+++

Note: + : Positive (Beneficial) Impact - : Negative (Adverse) Impact

Impact Categories:
+ or - : Possible but Minor Impact
++ or -- : Minor to Moderate Impact
+++ or --- : Moderate to Major Impact

Table 4.11 Environmental Interaction Matrix of Flood Control Plan in Ormoc

MAJOR ACTIVITIES (which may cause IMPACTS)		ENVIRONMENTAL FACTORS													
		Physico-Chemical				Ecological			Socio-Economic						
Project Stage	Activities	Surface Water	Ground Water	Topography	Air, Noise & Offensive Odor	Terrestrial Species	Aquatic Species	Aesthetic Aspects	Economic Activities	Land Use	Demography & Manpower	Transportation	Housing & Community Infrastructure	Health & Social Services	Life Style & Community
Pre-Construction	Right-of-Way Acquisition								-	--			---		--
	Initial Site Clearing					-		-							
Construction	Labor Mobilization								+		--		-	-	--
	Channel Improvement	--			--	--	-	--	+ -	-	+	-	-	-	
	Slit Dam					--	-	--	+	-	+				
	Replacement (Bridge, etc.)	--			--		-	--	+ --		+	--	-		--
	Drainage Channel Improvement				--		-	-	+ -	-	+	-	-	-	
Operation	River Channel	+++		++ -		++	+	+++	+++	+++ -		+	+++	++	++
	Drainage	+++	-	-	++		+	++	+++	+++ --		++	+++	+++	++

Note: + : Positive (Beneficial) Impact - : Negative (Adverse) Impact

Impact Categories:
+ or - : Possible but Minor Impact
++ or -- : Minor to Moderate Impact
+++ or --- : Moderate to Major Impact

Table 4.12 Environmental Interaction Matrix of Flood Control Plan in Tacloban

MAJOR ACTIVITIES (which may cause IMPACTS)		ENVIRONMENTAL FACTORS													
		Physico-Chemical				Ecological			Socio-Economic						
Project Stage	Activities	Surface Water	Ground Water	Topography	Air, Noise & Offensive Odor	Terrestrial Species	Aquatic Species	Aesthetic Aspects	Economic Activities	Land Use	Demography & Manpower	Transportation	Housing & Community Infrastructure	Health & Social Services	Life Style & Community
Pre-Construction	Right-of-Way Acquisition								-	--			---		---
	Initial Site Clearing					-									
Construction	Labor Mobilization								+		--		-	-	--
	Replacement (Bridge, etc.)	-			--		-	--	+ --		+	--	-		--
	Drainage Channel Improvement	--			--		-	--	+ --	-	+	--	--	-	
Operation	Drainage	+++	-	-	++		+	+++	+++	+++ --		++	+++	+++	++

Note: + : Positive (Beneficial) Impact - : Negative (Adverse) Impact

Impact Categories:
+ or - : Possible but Minor Impact
++ or -- : Minor to Moderate Impact
+++ or --- : Moderate to Major Impact

Table 5.1 Disbursement Schedule of Urgent Plan

Unit: million peso

	Iloilo			Ormoc		
	River	Drainage	Total	River	Drainage	Total
I. Main Construction Cost	747.9	101.0	848.9	226.3	6.7	233.0
II Compensation Cost	232.0	22.8	254.8	44.4	0.7	45.1
III Administration Cost	49.0	6.2	55.2	13.5	0.4	13.9
IV Contingency						
for Main con. & Admi.	119.5	16.1	135.6	36.0	1.1	37.1
for Compen.	34.8	3.4	38.2	6.7	0.1	6.8
V Engineering Services						
for Detail Design	74.8	10.1	84.9	22.6	0.7	23.3
for Construction	44.9	6.1	51.0	13.6	0.4	14.0
Total	1,302.9	165.7	1,468.6	363.1	10.1	373.2

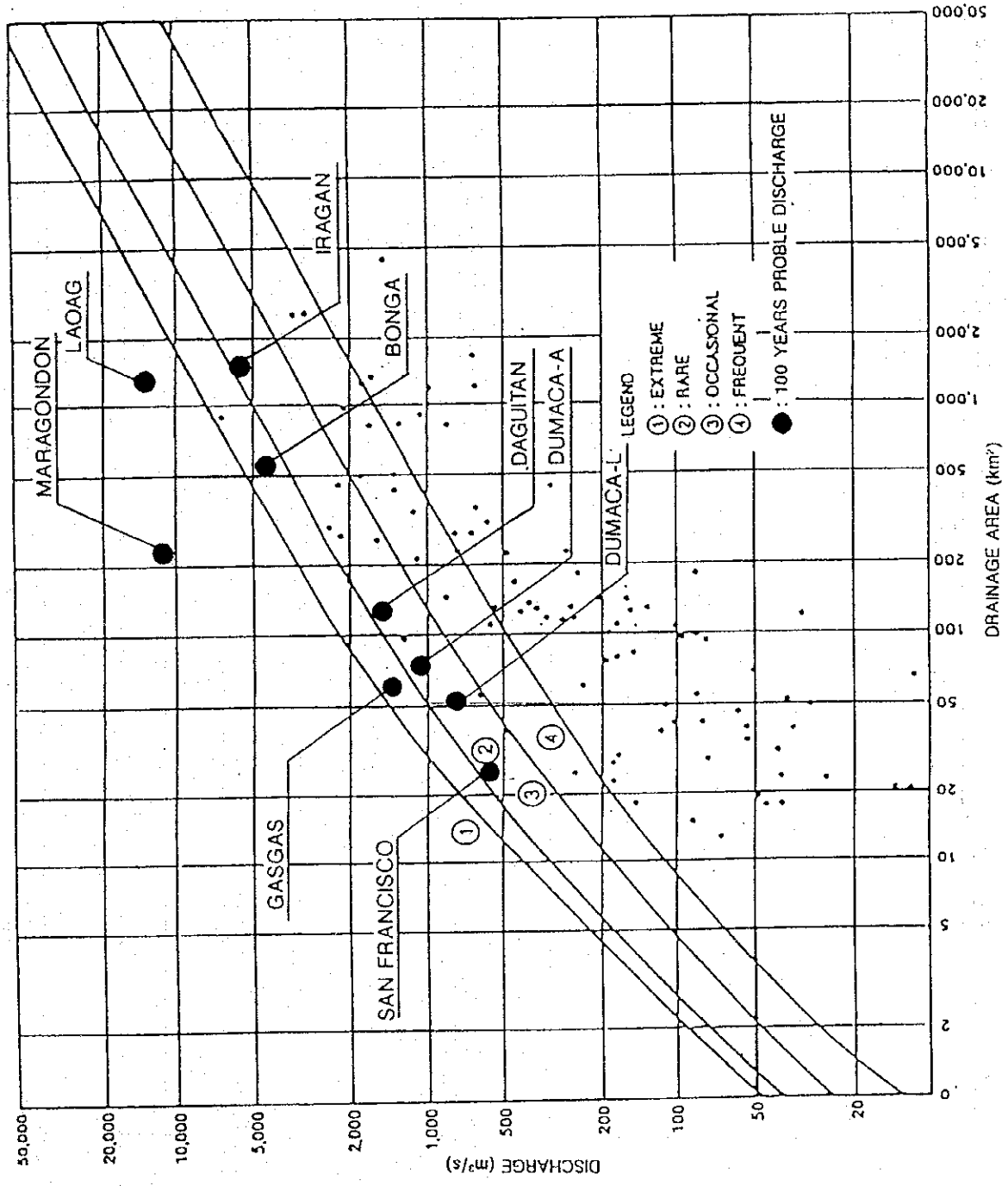
Iloilo City	1st year	2nd year	3rd year	4th year	5th year	6th year	Total
	D/D	Compensation		Construction			
I. Main Construction Cost				249.3	299.8	299.8	848.9
II Compensation Cost		127.4	127.4	0.0	0.0	0.0	254.8
III Administration Cost				16.3	19.4	19.4	55.1
IV Contingency		19.1	19.1	39.8	47.9	47.9	173.8
V Engineering Services	85.0			15.0	18.0	18.0	136.0
Total	85.0	146.5	146.5	320.4	385.1	385.1	1,468.6

note: Construction work for river is 3 years and for drainage is last 2 years.

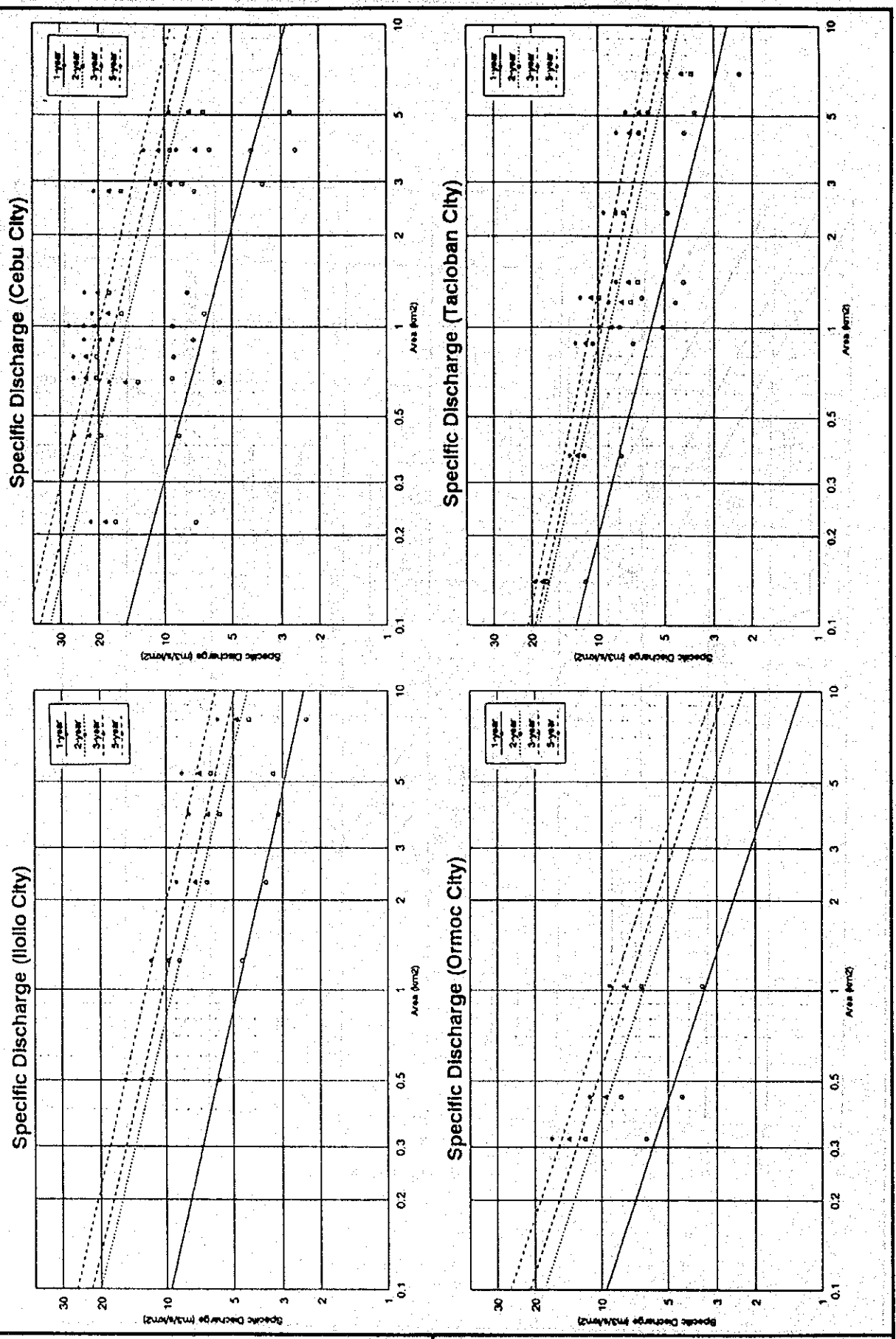
Ormoc City	1st year	2nd year	3rd year	4th year	5th year	Total
	D/D	Compensation		Construction		
I. Main Construction Cost				113.2	120.0	233.2
II Compensation Cost		22.6	22.6	0.0	0.0	45.2
III Administration Cost				7.0	7.0	14.0
IV Contingency		3.4	3.4	18.0	19.0	43.8
V Engineering Services	23.0			7.0	7.0	37.0
Total	23.0	26.0	26.0	145.2	153.0	373.2

note: Construction work for river is 2 years and for drainage is last year.

FIGURES

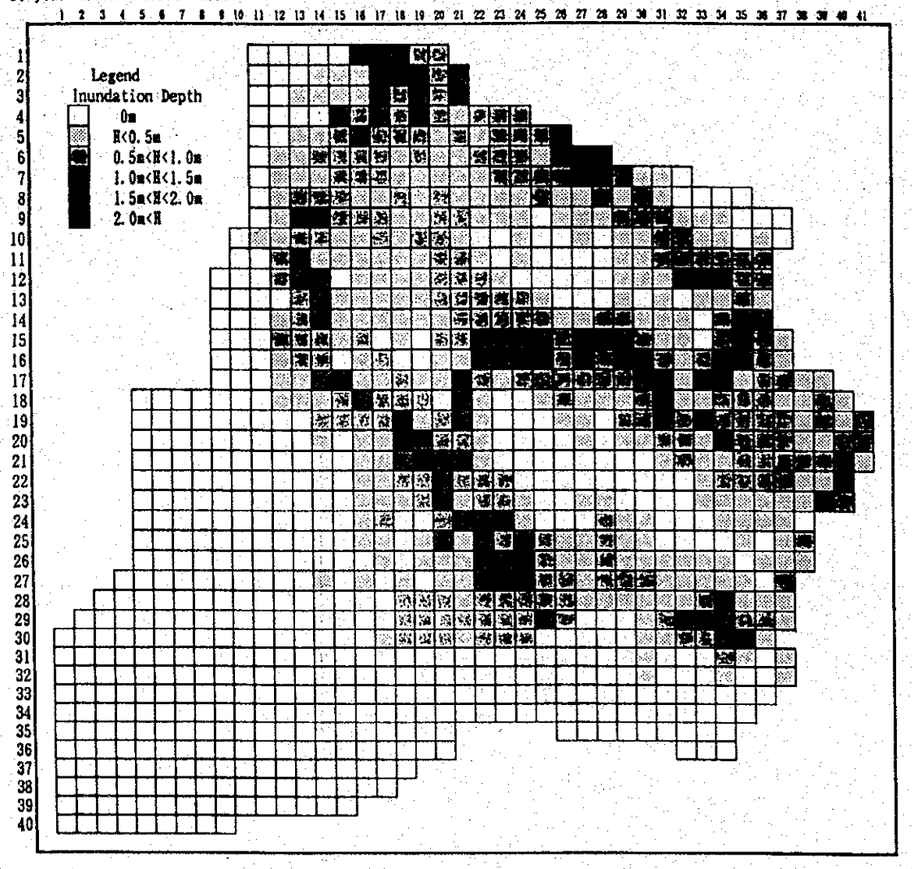


THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 2.1 Relation of Runoff to Size of Drainage Area in the Philippines



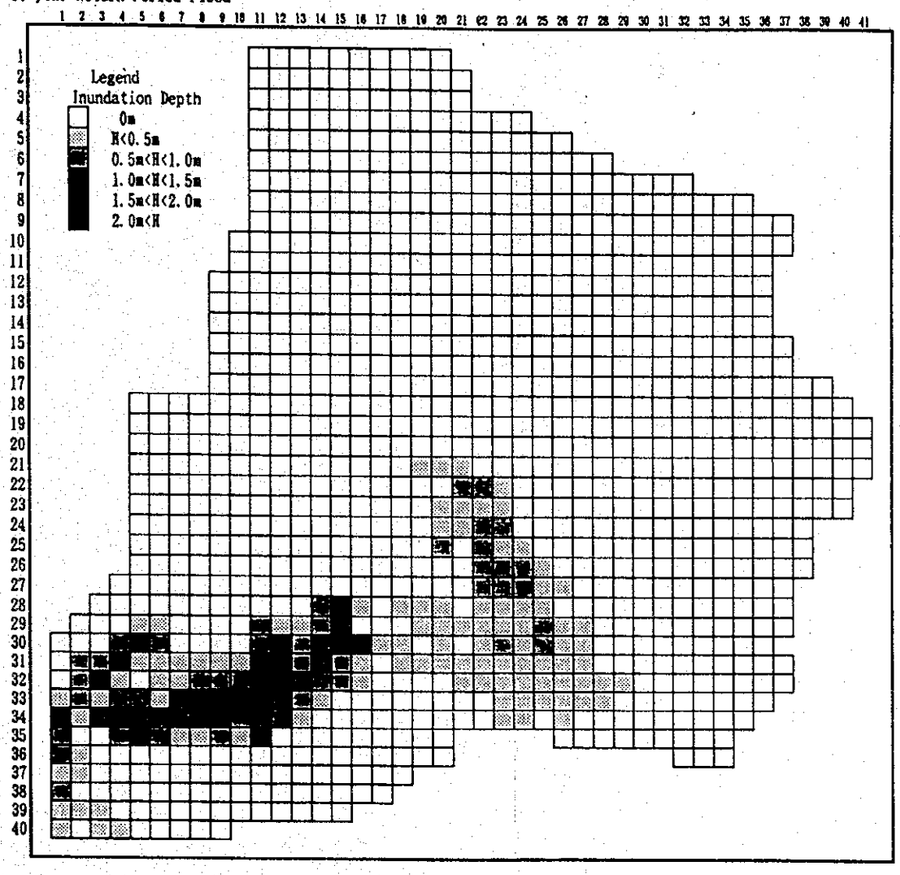
THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS	Fig. 3.1
JAPAN INTERNATIONAL COOPERATION AGENCY	Specific Discharge of Drainage Areas

Iloilo City (Jaro River)
50-year Return Period Flood



Note
□: Mesh unit (250m x 250m)

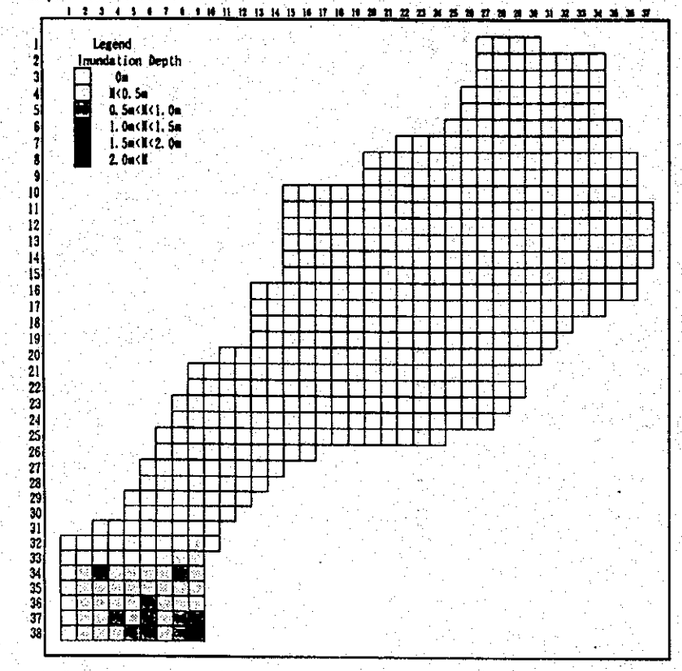
Iloilo City (Iloilo River)
50-year Return Period Flood



Note
□: Mesh unit (250m x 250m)

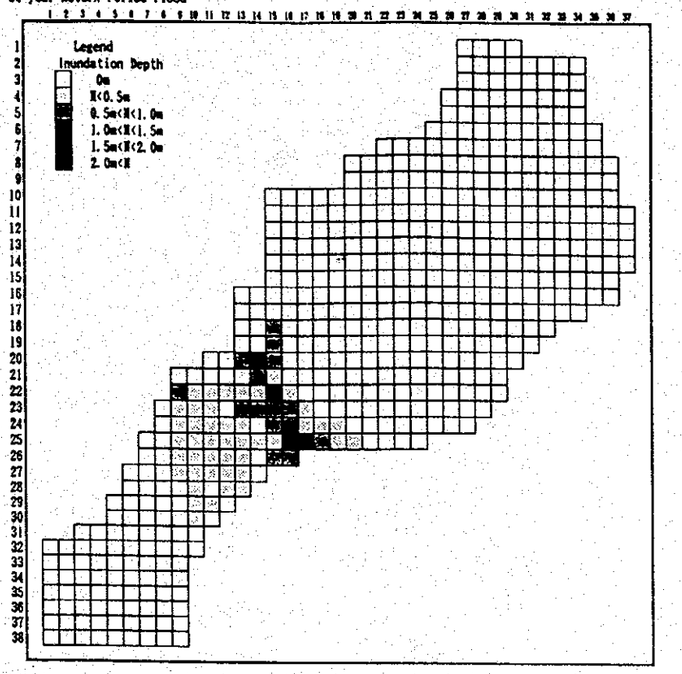
THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 3.2(1/3) Result of Inundation Analysis of a 50-Year Return Period Flood, Iloilo City

Cebu City (Bulacao River)
50-year Return Period Flood



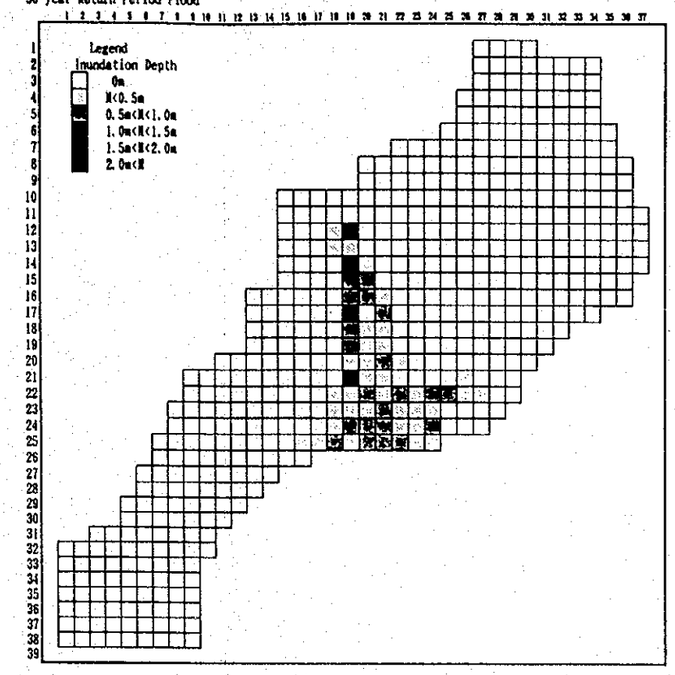
Note
□: Mesh unit (250m x 250m)

Cebu City (Kinalumsan River)
50-year Return Period Flood



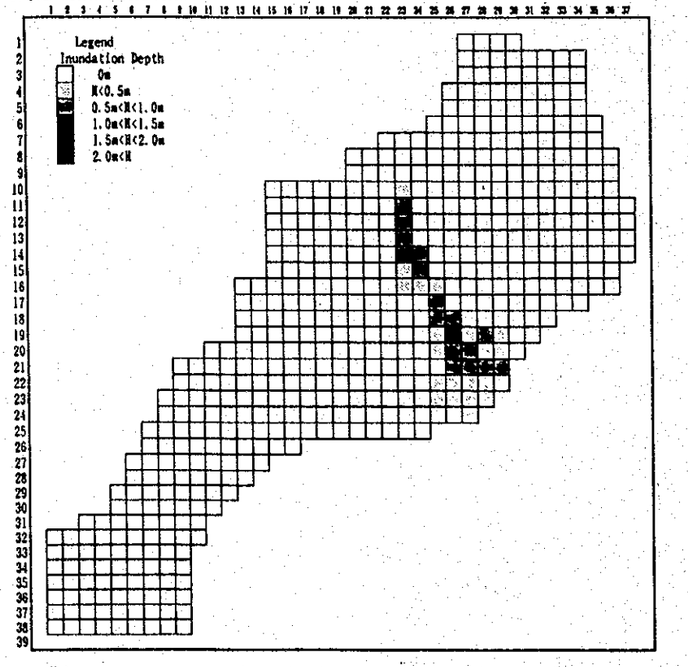
Note
□: Mesh unit (250m x 250m)

Cebu City (Guadalupe River)
50-year Return Period Flood



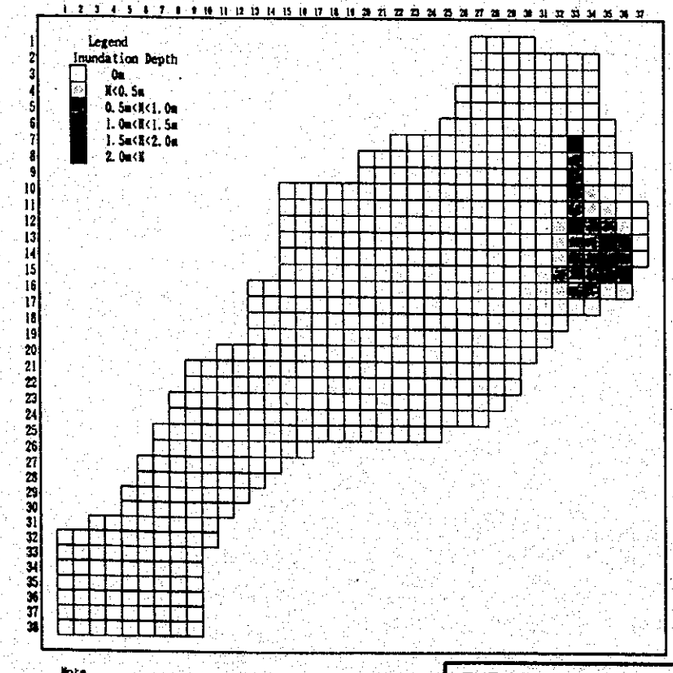
Note
□: Mesh unit (250m x 250m)

Cebu City (Lahug River)
50-year Return Period Flood



Note
□: Mesh unit (250m x 250m)

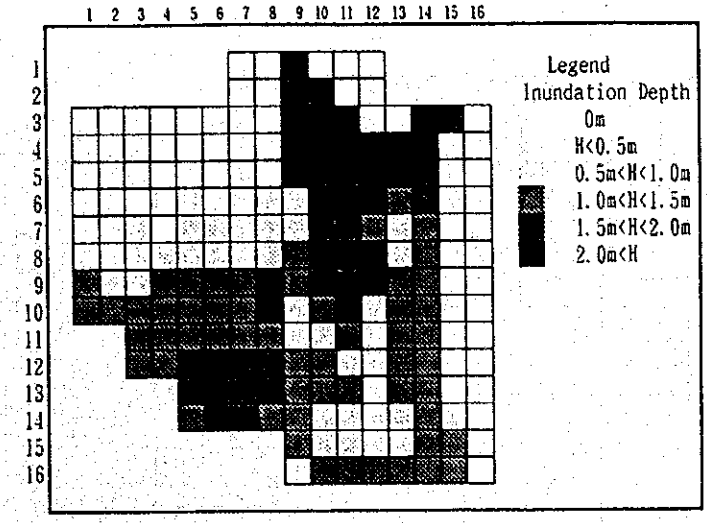
Cebu City (Subang Daku River)
50-year Return Period Flood



Note
□: Mesh unit (250m x 250m)

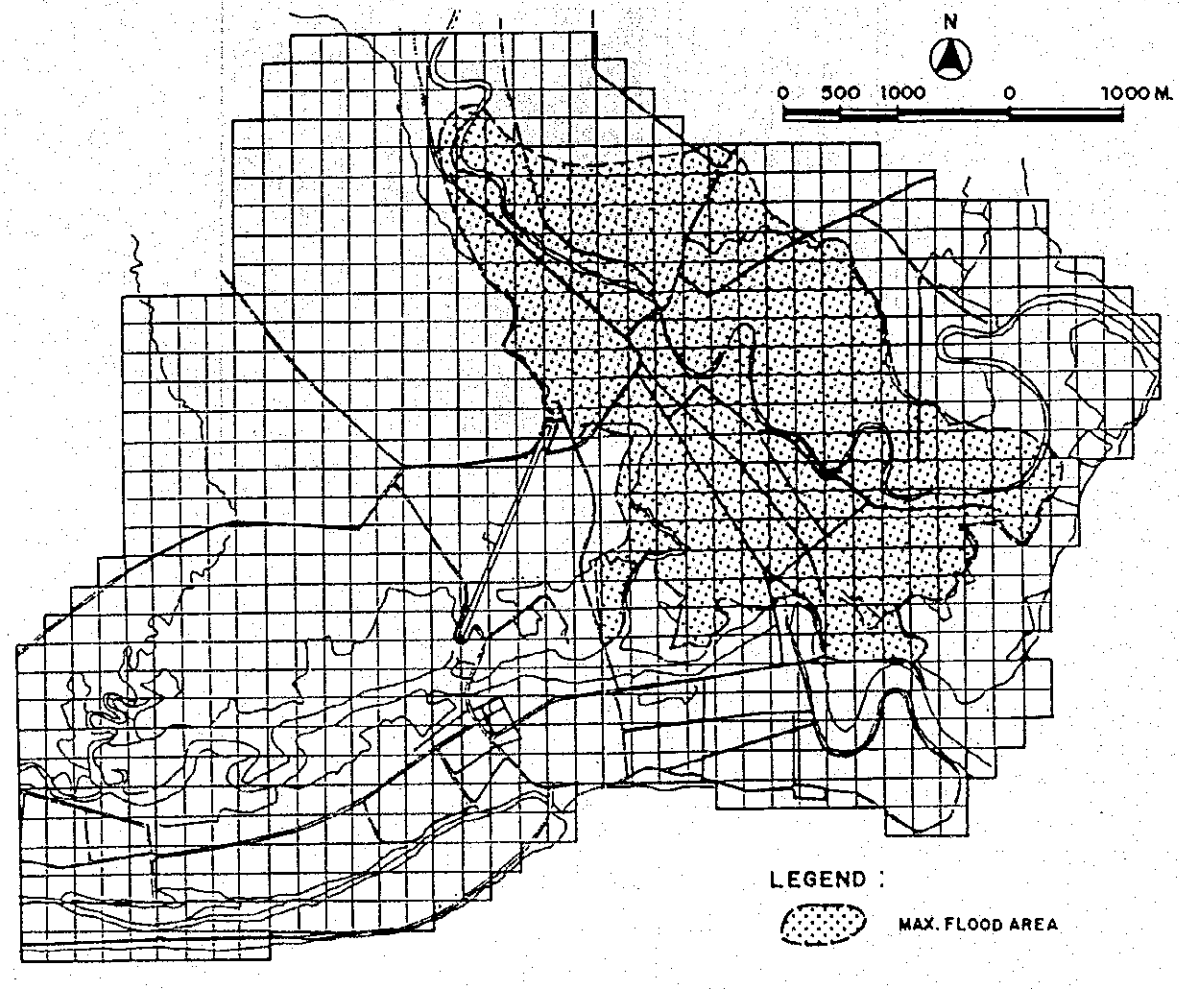
THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS	Fig. 3.2(2/3) Result of Inundation Analysis of a 50-Year Return Period Flood, Cebu City
JAPAN INTERNATIONAL COOPERATION AGENCY	

Ormoc City (Anilao and Maibasag Rivers)
50-year Return Period Flood



Note
□: Mesh unit (125m x 125m)

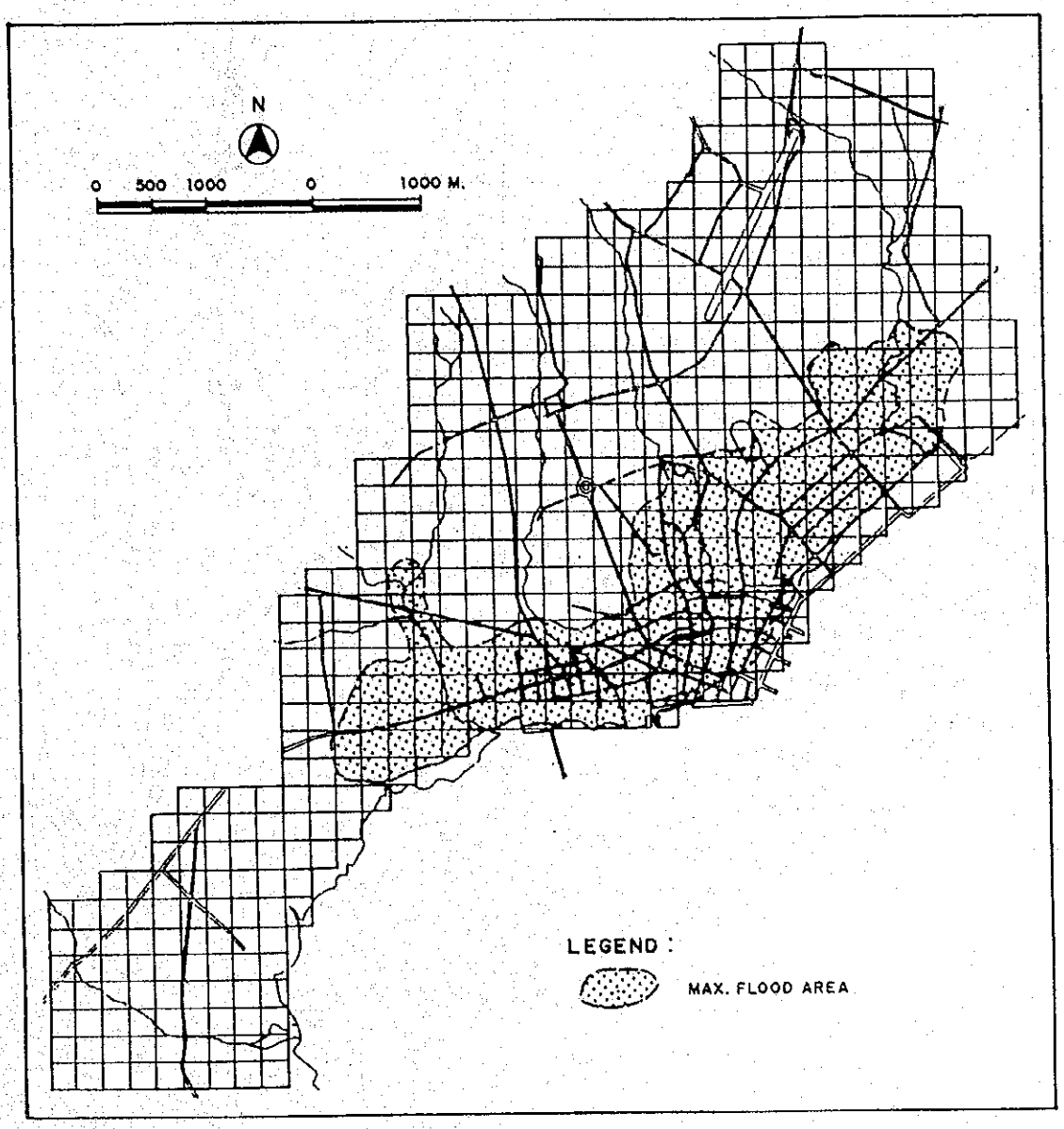
THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS	Fig. 3.2(3/3) Result of Inundation Analysis of a 50-Year Return Period Flood, Ormoc City
JAPAN INTERNATIONAL COOPERATION AGENCY	



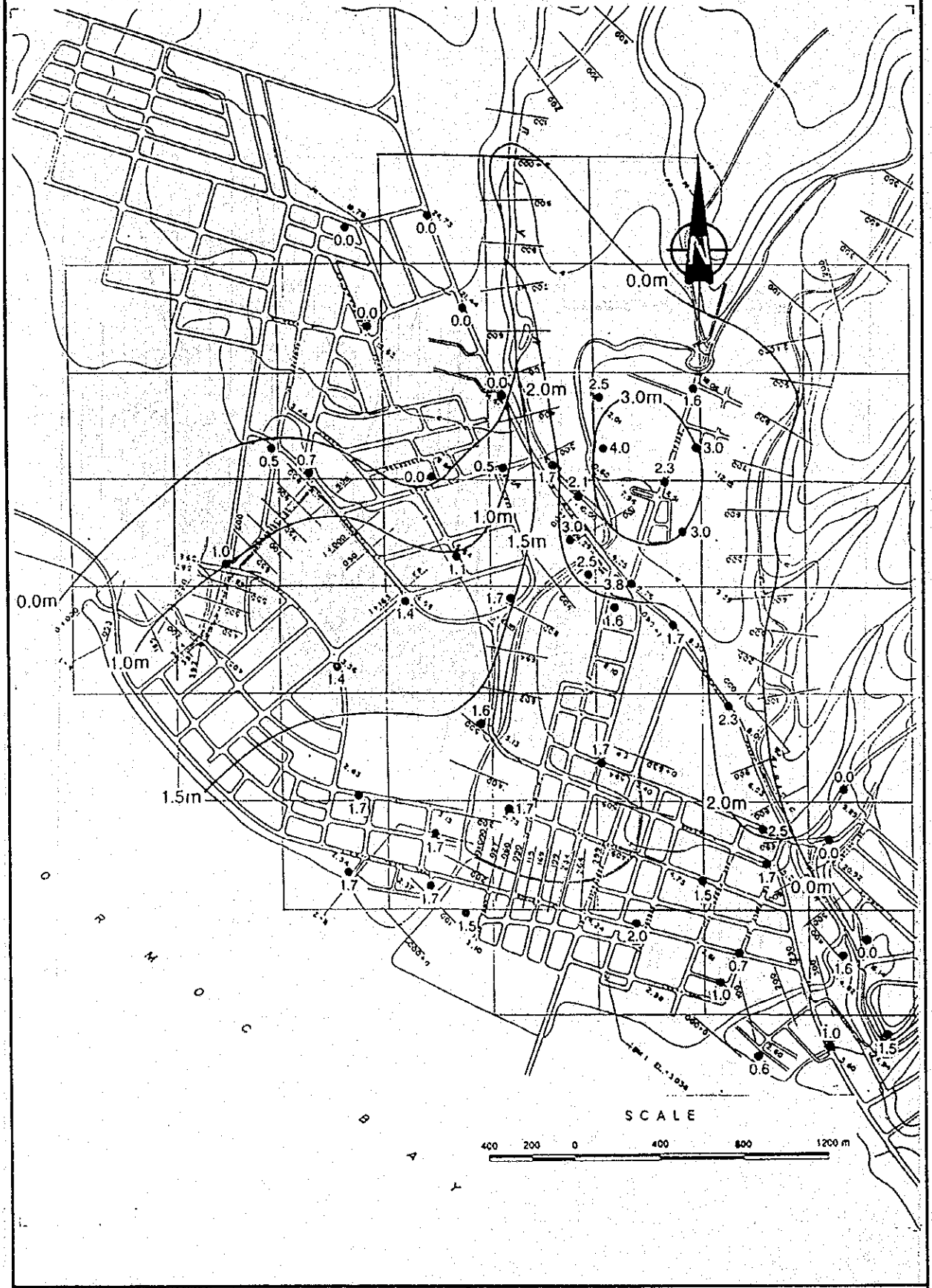
THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 3.3
Maximum Record Flood Area, Iloilo



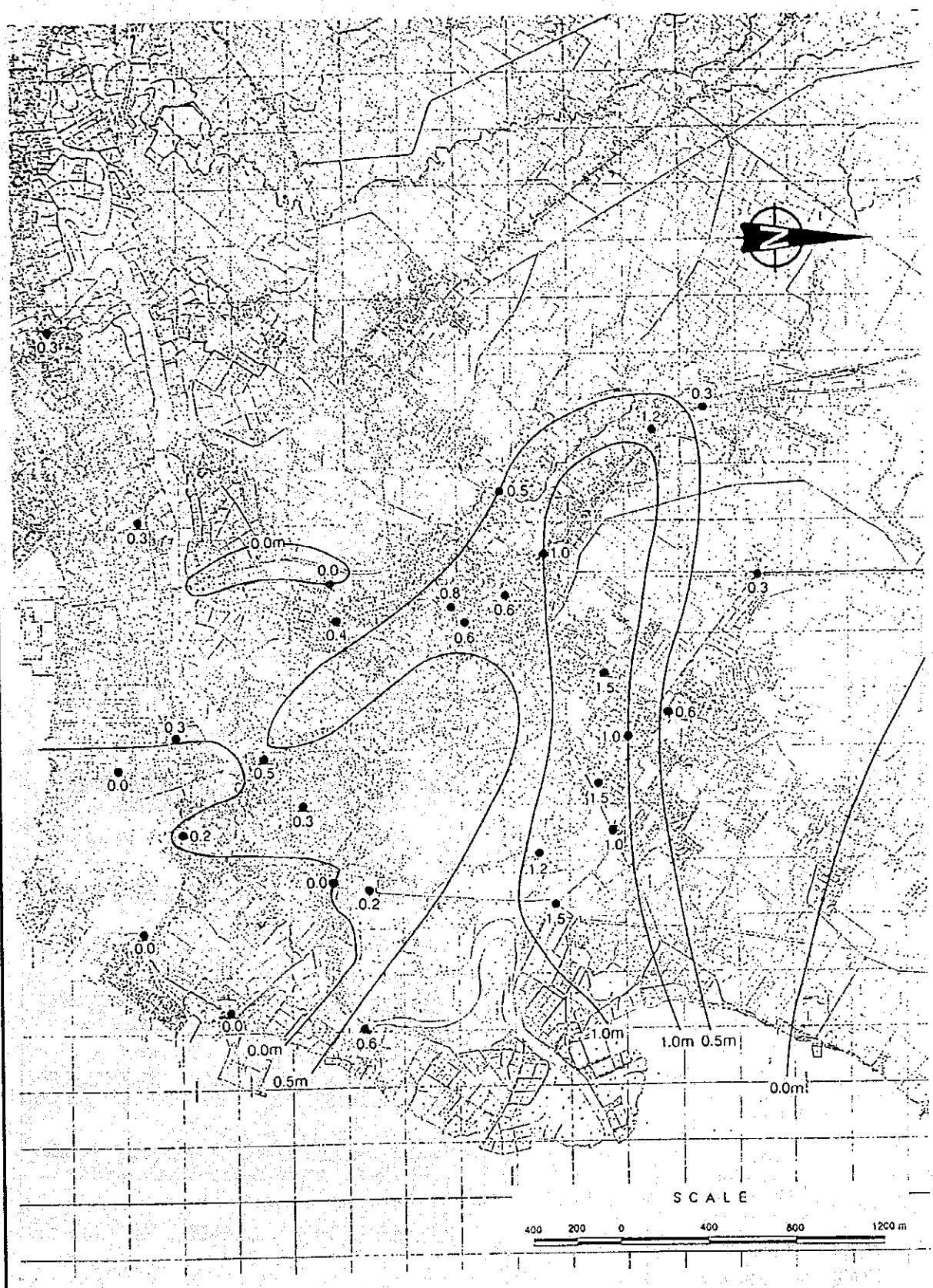
THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 3.4 Maximum Record Flood Area, Cebu



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS

JAPAN INTERNATIONAL COOPERATION AGENCY

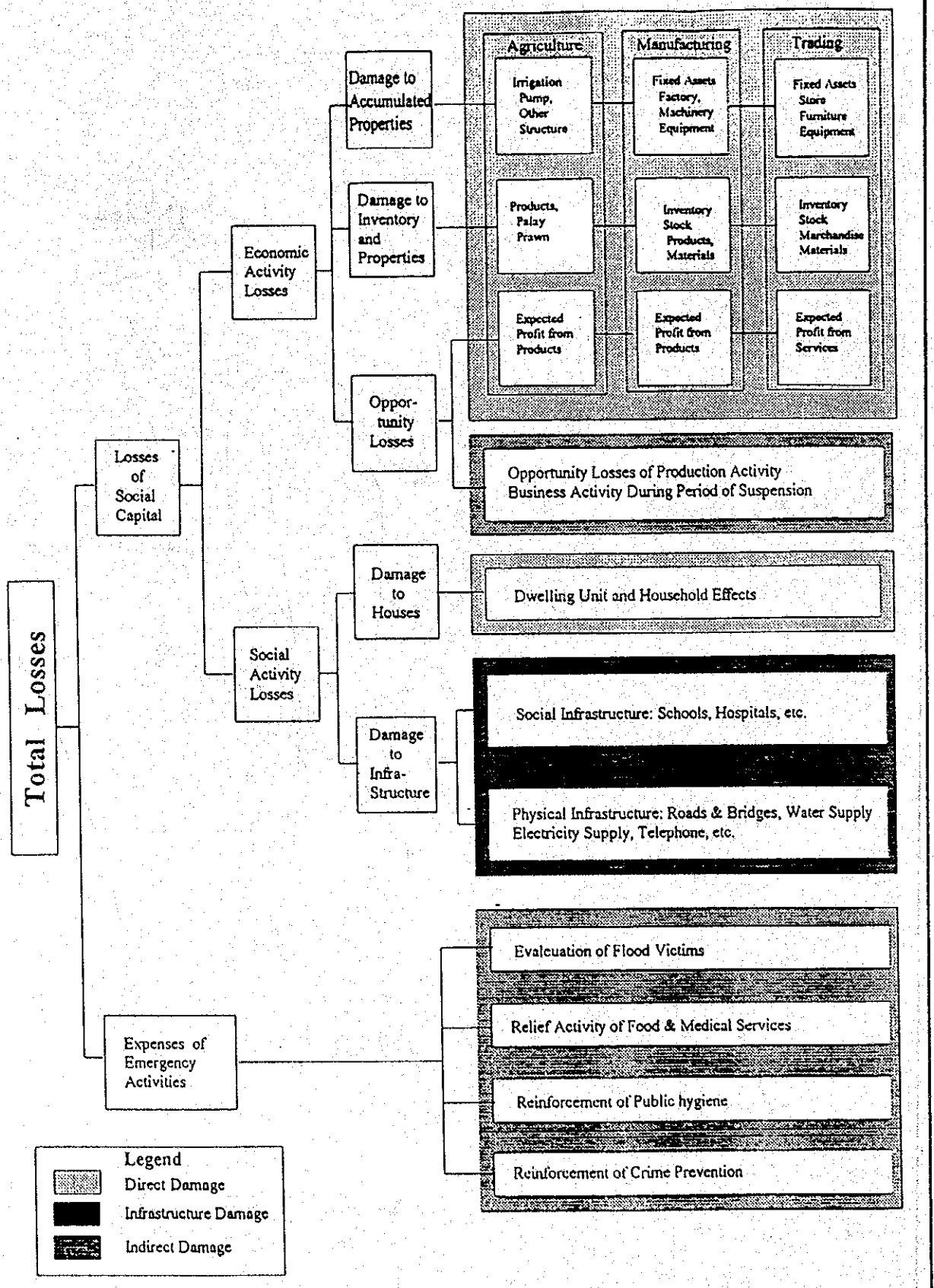
Fig. 3.5
Maximum Record Flood Area, Ormoc



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS

JAPAN INTERNATIONAL COOPERATION AGENCY

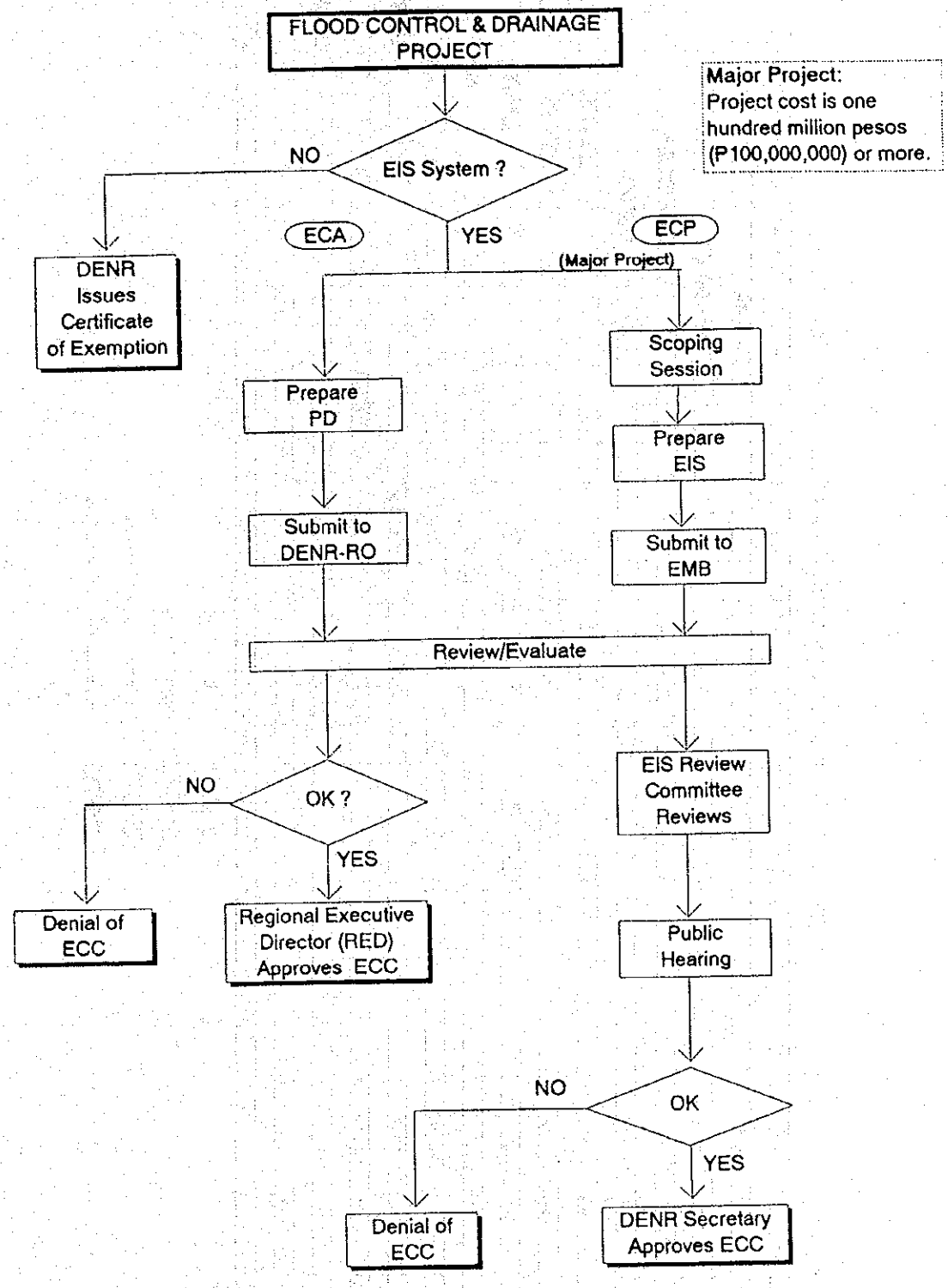
Fig. 3.6
Area of Flood on July 29, 1994, Iloilo



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 3.7
Structure of Damage



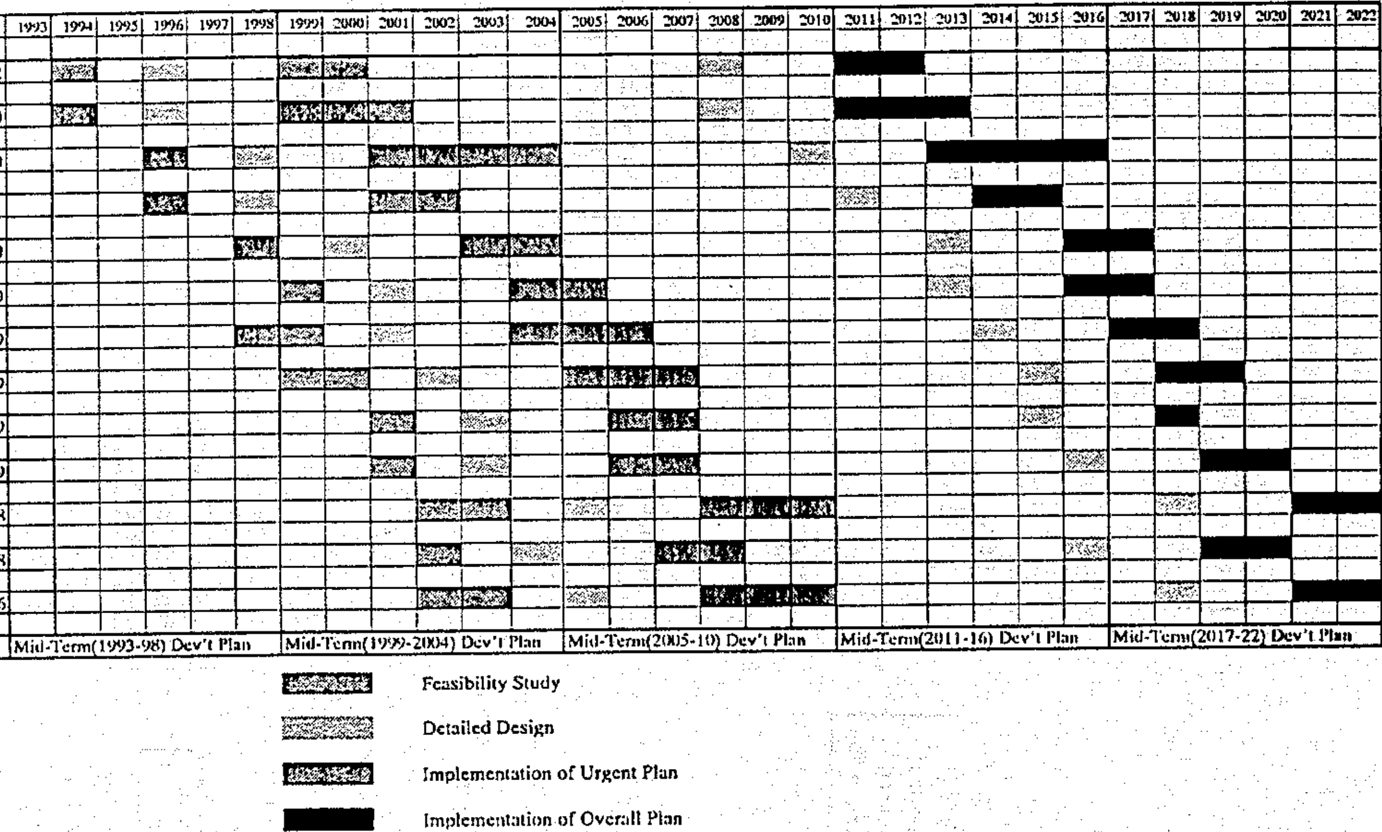
THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 3.8
Conceptual Flow Chart of EIS System

OVERALL PROJECT IMPLEMENTATION PLAN FOR 13 URBAN CENTERS

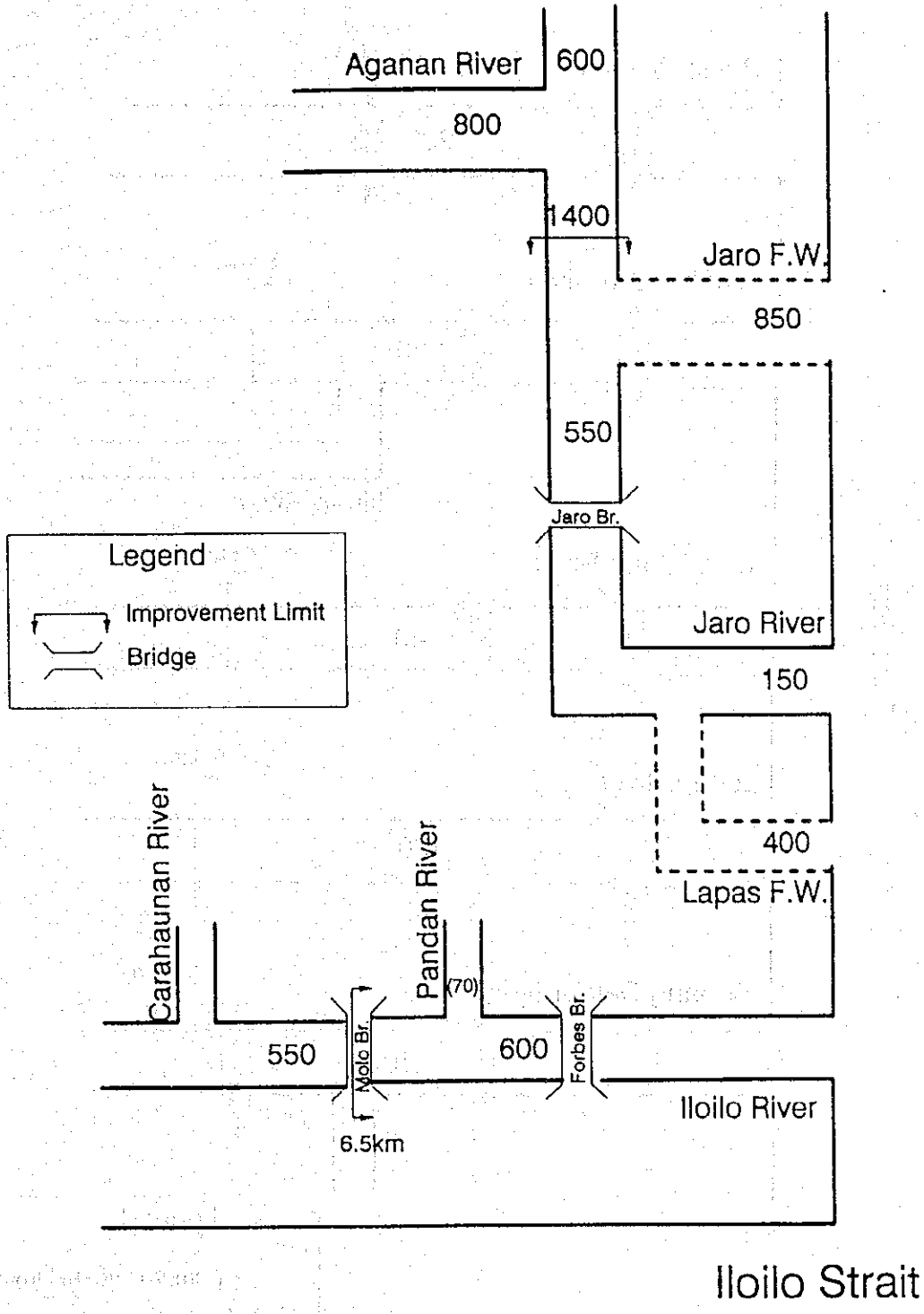
	City/Munic'ty	Area(km2)	Population	Rank
1	Ormoc	101	129,456	12
2	Iloilo	56	309,505	10
3	Cebu	281	610,417	10
4	Tacloban	464	136,891	11
5	Laoag	108	83,756	10
6	Legaspi	154	121,116	10
7	Davao	2,211	849,947	9
8	Zamboanga	1,415	442,345	9
9	Lucena	69	150,624	9
10	Olongapo	103	193,327	9
11	Iligan	1,394	99,120	8
12	Batangas	283	184,970	8
13	P.Princesa	2,107	92,147	6



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 4.1
Overall Project Implementation Plan for 13 Urban Centers

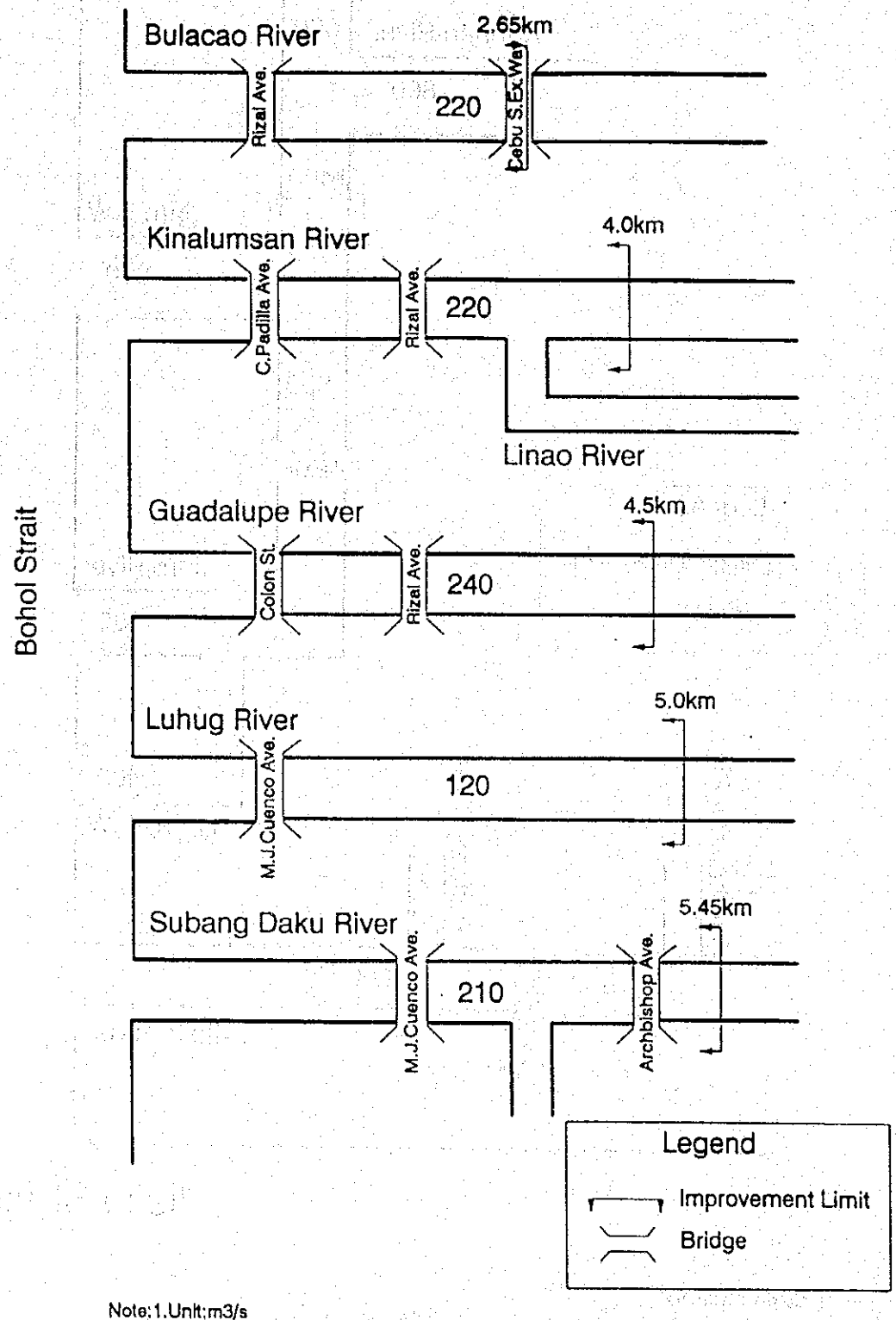


Note:1.Unit:m3/s

2.The Figures show probable Flood Discharge of 50-Year Return Period

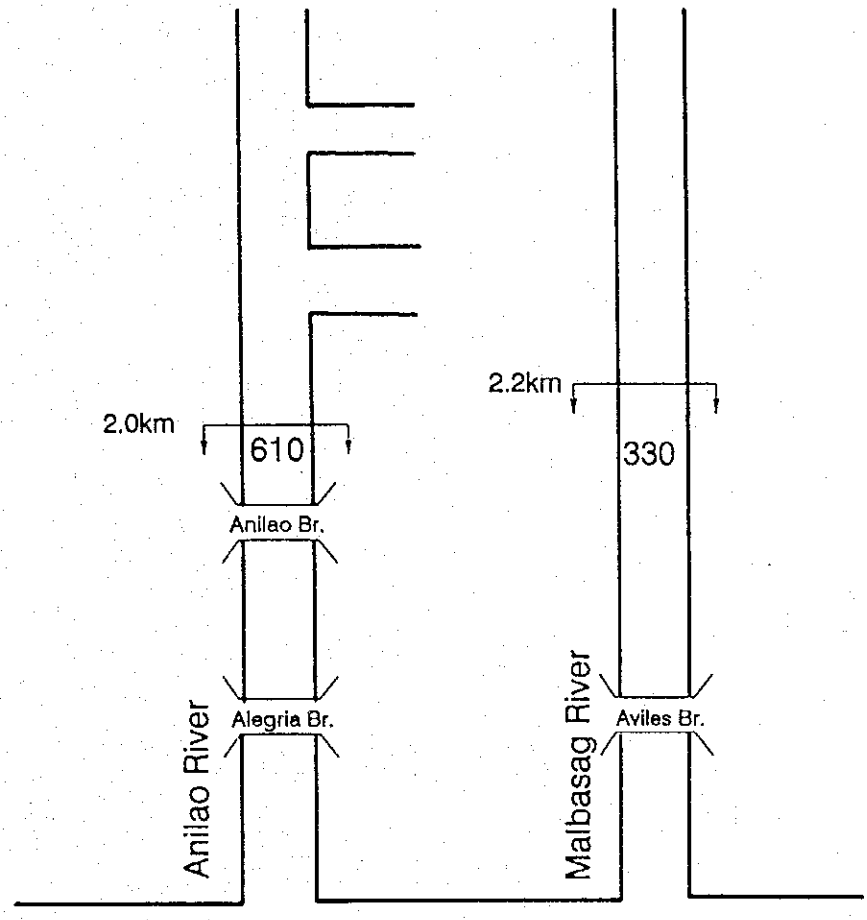
3.( ) shows probable Flood Discharge of 20-Year Return Period

THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 4.2 Distribution of Design Discharge (Iloilo City)



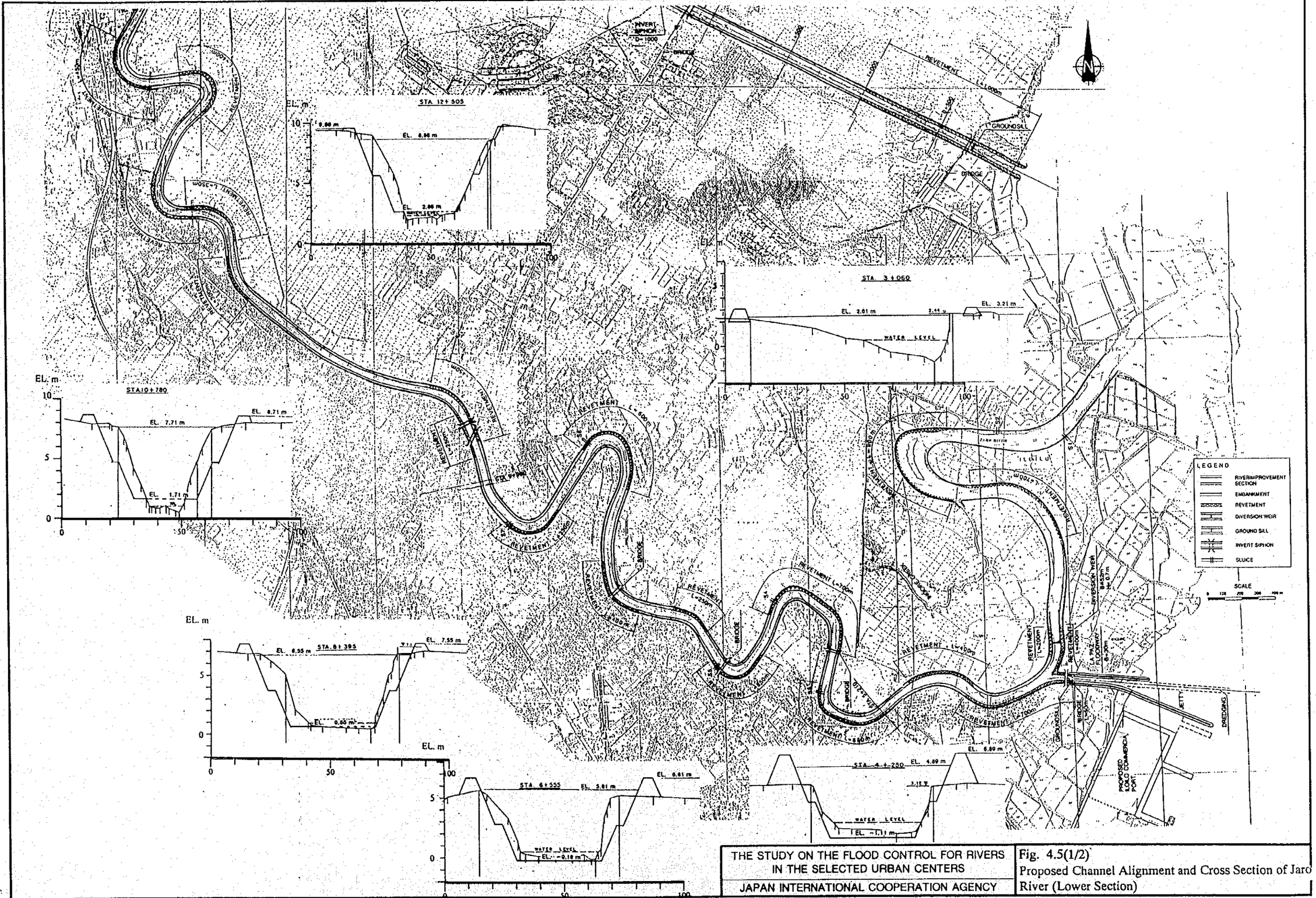
Note;1.Unit;m3/s
2.The Figures show probable Flood Discharge of 50-Year Return Period

THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 4.3 Distribution of Design Discharge (Cebu City)



Note:1.Unit:m3/s
2.The Figures show probable Flood Discharge of 50-Year Return Period

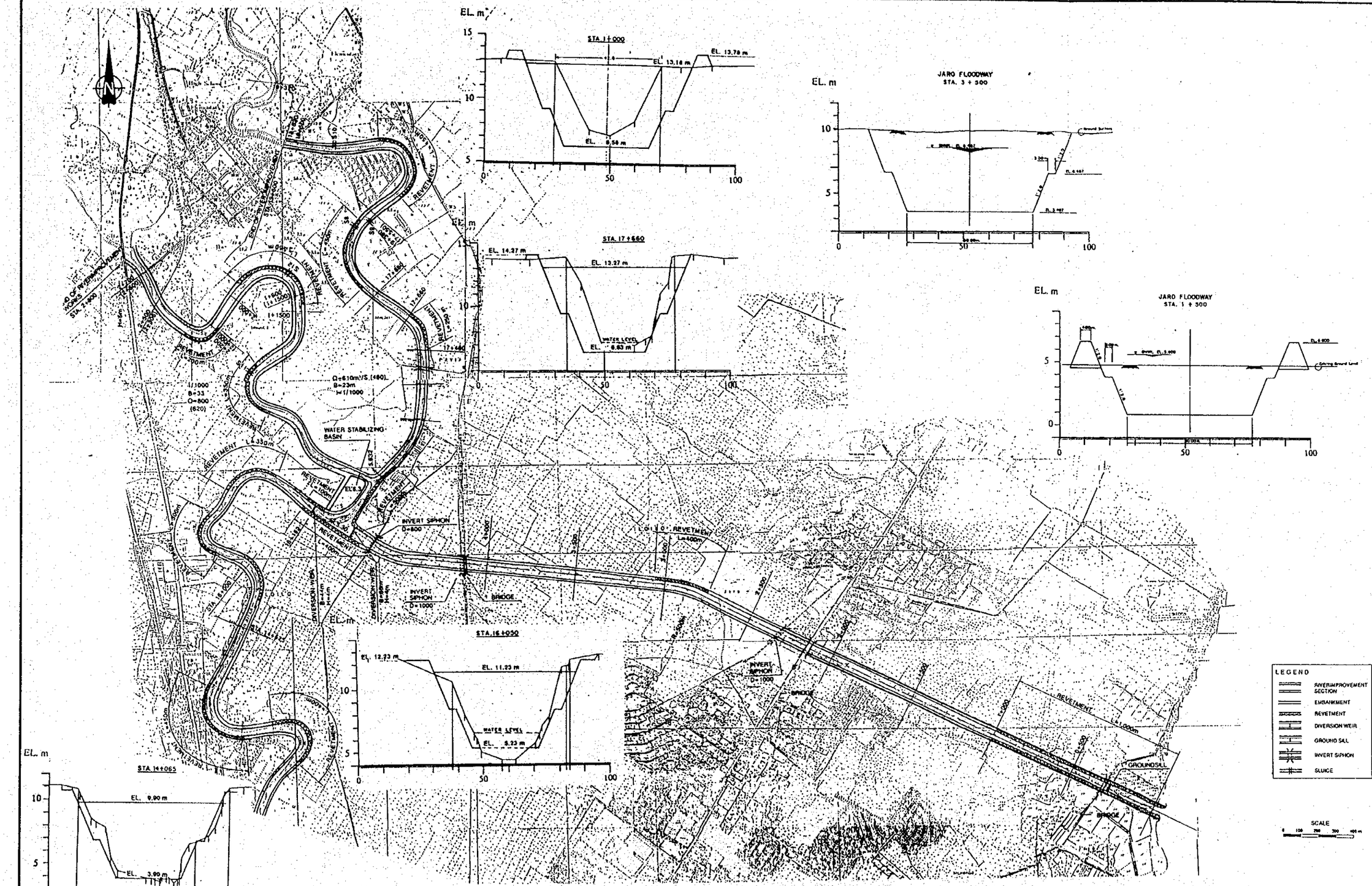
THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 4.4 Distribution of Design Discharge (Ormoc City)



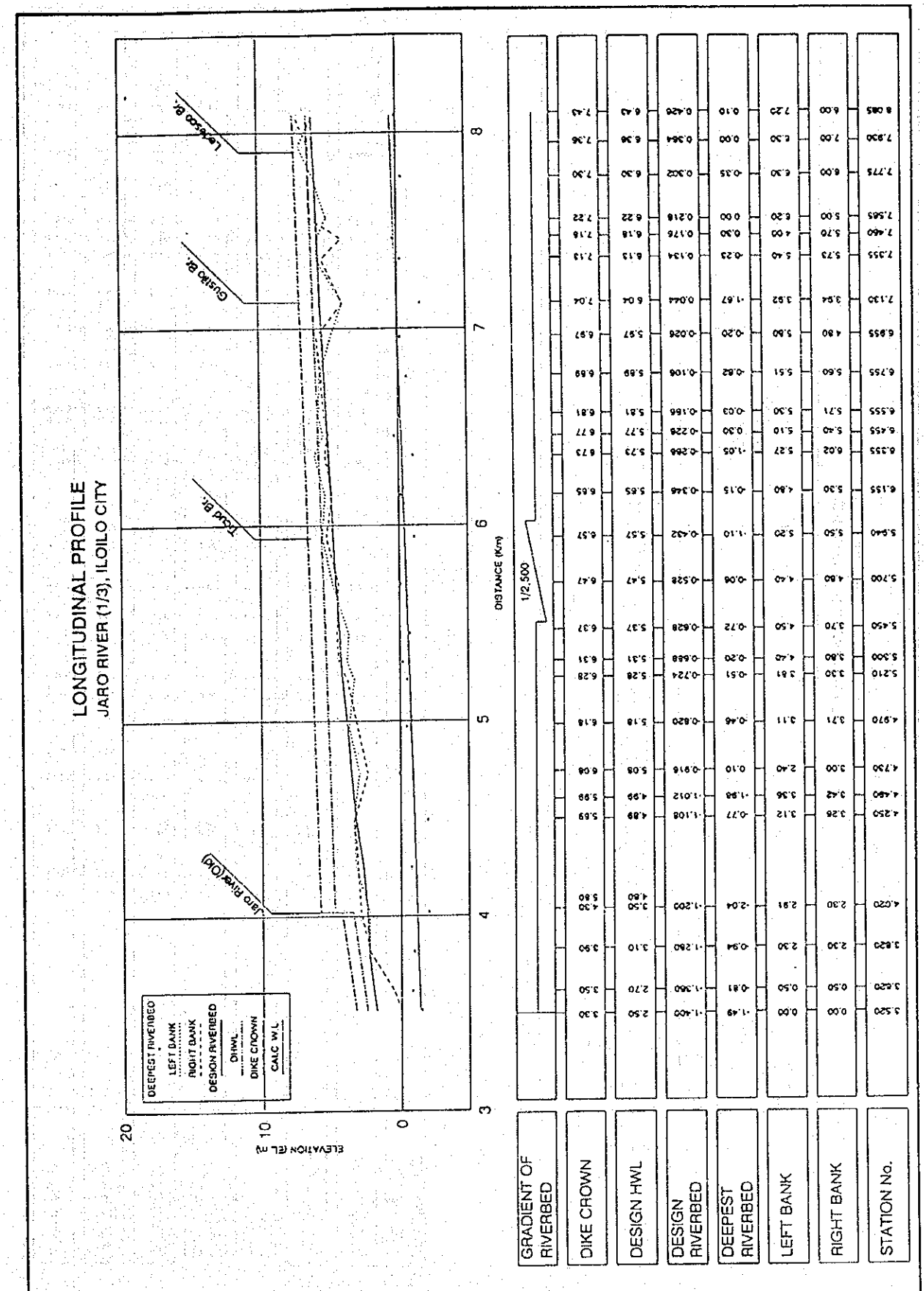
THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS

JAPAN INTERNATIONAL COOPERATION AGENCY

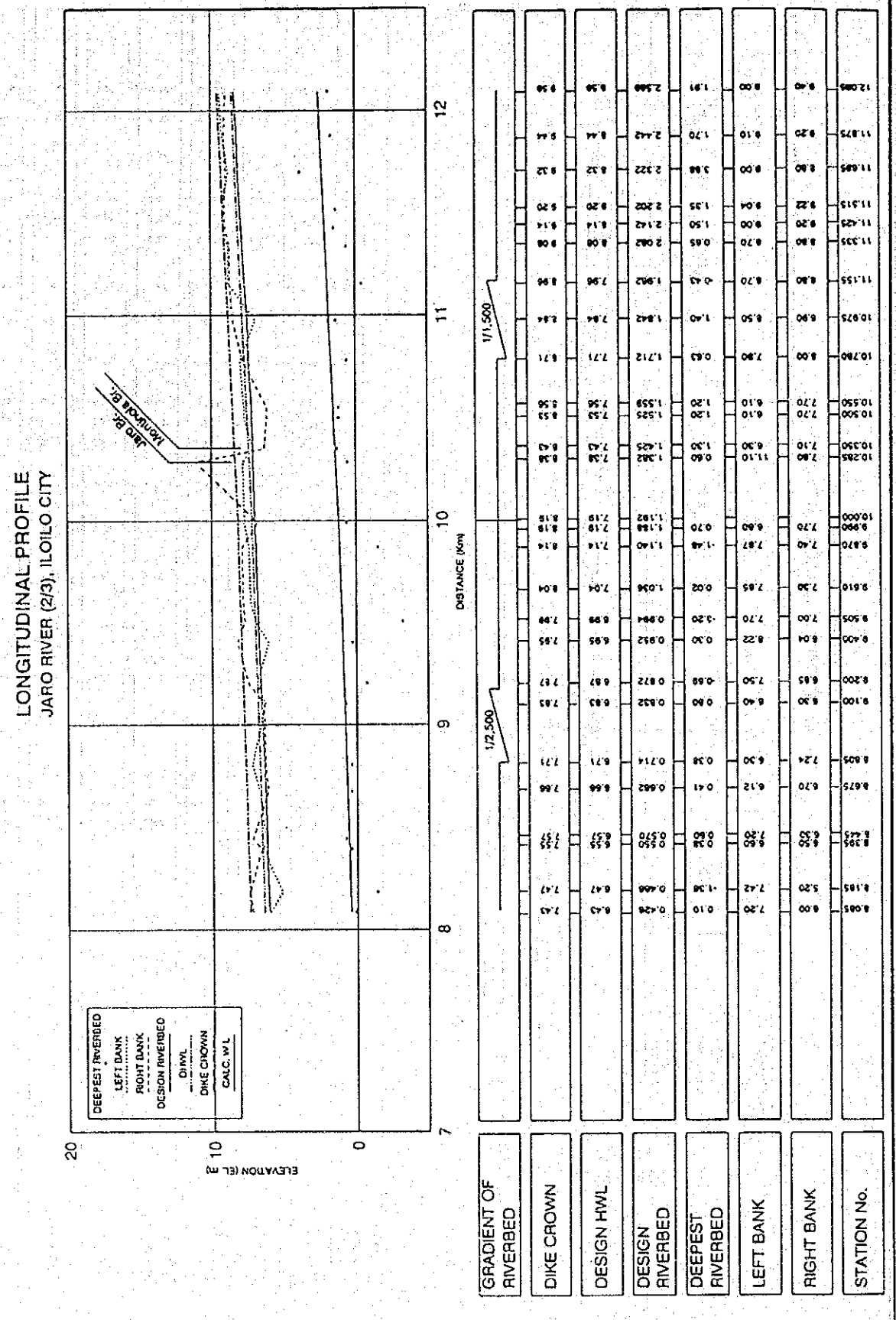
Fig. 4.5(1/2)
Proposed Channel Alignment and Cross Section of Jaro River (Lower Section)



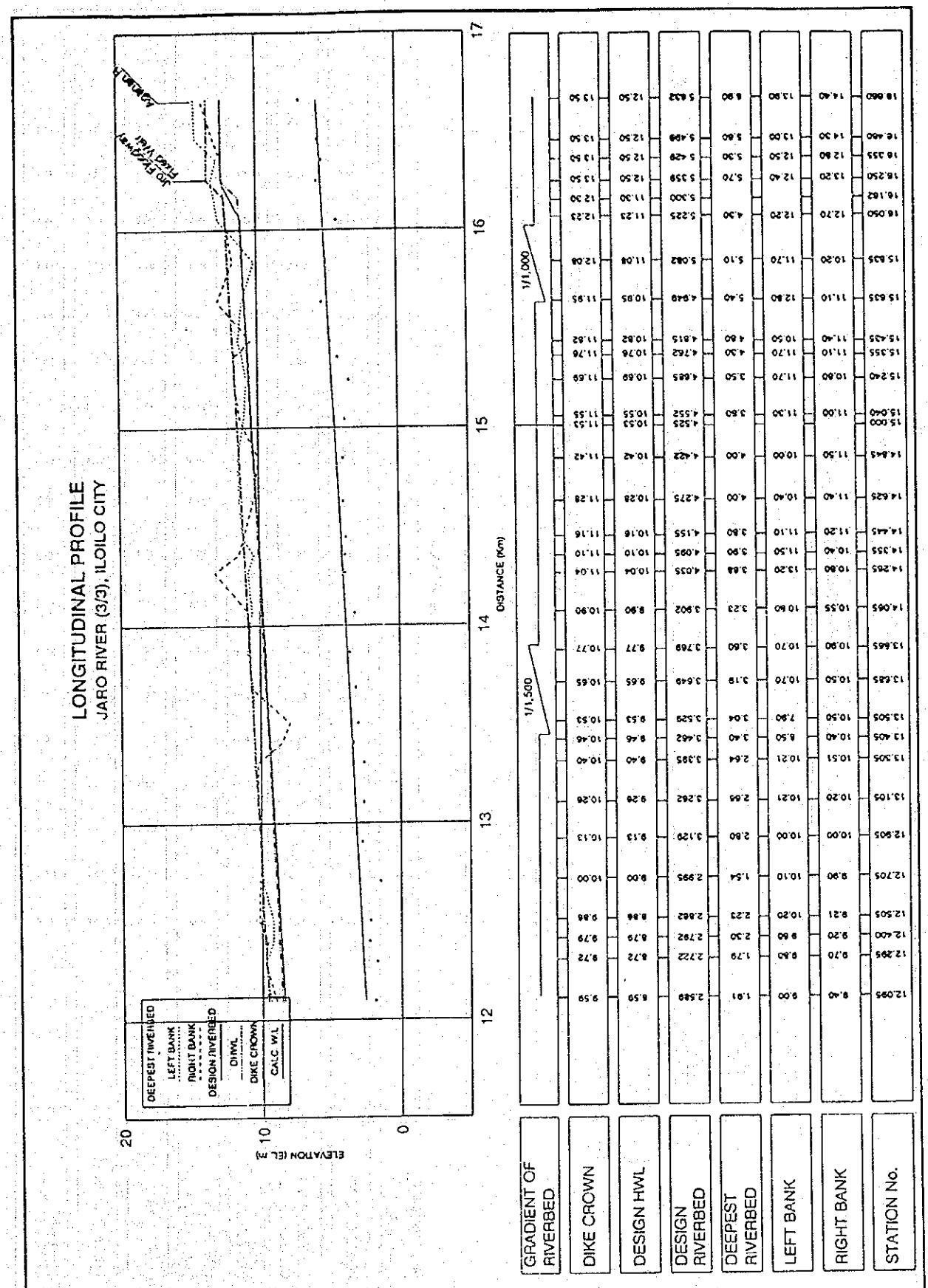
THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS	Fig. 4.5(2/2) Proposed Channel Alignment and Cross Section of Jaro River (Upper Section and Jaro Floodway)
JAPAN INTERNATIONAL COOPERATION AGENCY	



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS	Fig. 4.6(1/7) Longitudinal Profile of Jaro River (La Paz Floodway - Jaro River STA. 8.085)
JAPAN INTERNATIONAL COOPERATION AGENCY	



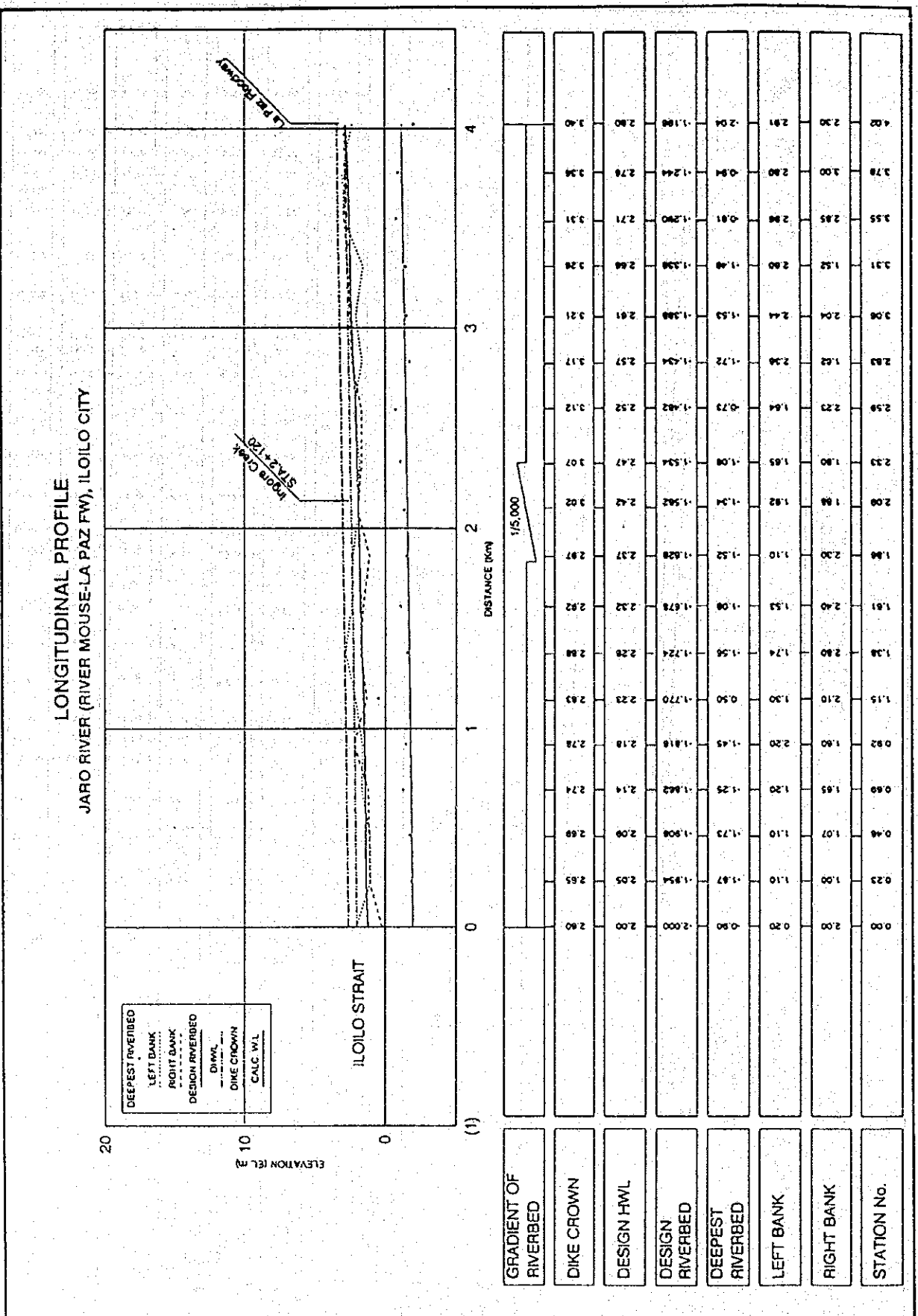
THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS	Fig. 4.6(2/7) Longitudinal Profile of Jaro River (Jaro River : STA. 8.085 - STA. 12.095)
JAPAN INTERNATIONAL COOPERATION AGENCY	



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 4.6(3/7)
Longitudinal Profile of Jaro River
(Jaro River : STA. 12.095 - STA. 16.660)



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS	Fig. 4.6(4/7) Longitudinal Profile of Jaro River (Jaro River : STA. 0.000 - STA. 4.020)
JAPAN INTERNATIONAL COOPERATION AGENCY	