2.3.2 Results of social survey

(1) General conditions

Table 2.3 shows the general conditions in four model areas. The landuse of five Kelurahans are determined based on the observation in the field survey (ref. *Fig. 2.21* to *Fig. 2.25).*

1) Losari (RW IV and a part of III): Income level of household is high or middle in this area. Education level of the respondents is the highest of four model areas. Regarding to the occupation of the respondents, the share of government employee and the retired are high which are 38 % and 26 % respectively.

   In this area, most of respondents own their permanent houses (72 %) with good condition. The average yard area of house is 48 sq. meter per household and 16 sq. meter is available for the household infiltration trench that could be installed among their yards in average (ref. *Fig. 2.21*).

2) Parang (RW IV): This area is a mixed residential area of high, middle and low income. It was also a model area of TAS survey for solid waste management conducted in July 1995. There exists a vacant area, that is used as a temporal disposal site (TPS) (ref *Fig. 2.22).*

   The average yard area is 47 sq. meter that is almost same as that in Losari. The available yard for the household infiltration trench is only 6 sq. meter.

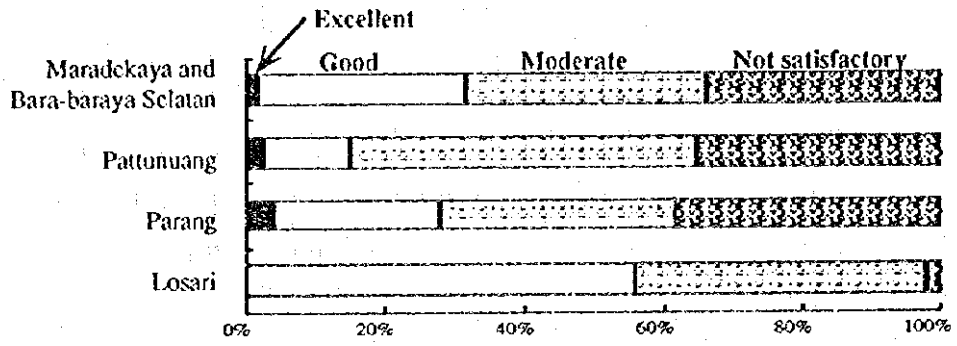
3) Pattunuang (RW IV): This is a commercial area along the Losari beach, Pantai Losari (ref *Fig. 2.23).* The share of self-employment almost amounts to 60 % of the respondents and the Chinese descent is dominant. The income level is highest among the four areas. The average number of family member is very small (2 persons) and average household income is very high (Rp. 792,000 per month).

   The condition of house of the respondents is almost permanent and self-owned. Width of the respondent houses ranged among 60 -160 sq. meter (or 84 sq. meter in average) whereas the yard to install household infiltration trench scarcely exists. 90 % of the respondents have no yard.

4) Maradekaya Selatan (RW II) and Bara-baraya Selatan (RW III): RW II of Maradekaya Selatan is the residential area of high, middle and low incomes. Kelurahan Bara-baraya Selatan lies along the Panampu-Jongaya canal and in RW III of Bara-baraya Selatan there hardly exists housing of high income households (ref. *Fig. 2.24* and *Fig. 2.25*). Most households belong to low income and their living environment is relatively worse. Slum area exists in this area. The average household income of the respondents is Rp. 311,000 and the lowest is Rp. 50,000 per month. The education level is low compared to other areas.

(2) Problems in wastewater management

Based on the results of survey, approximately one third of the respondents are not satisfied with the wastewater management in every model area except Losari as shown in the following figure (ref. *Table 2.4*).



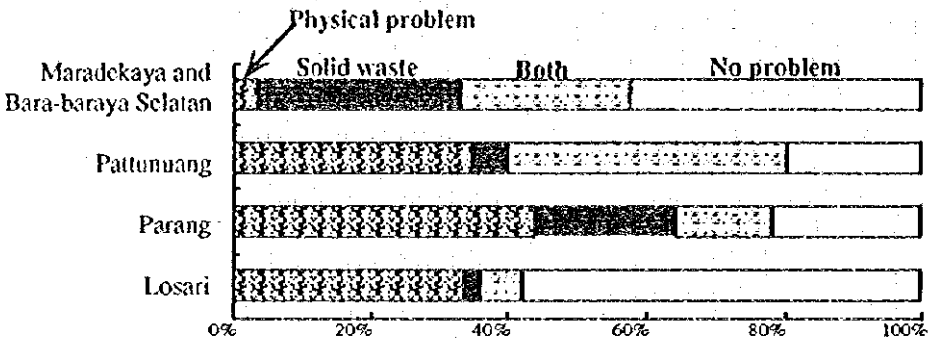
The causes of the problems in wastewater management in Ujung Pandang have been identified throughout the interview survey as follows:

- The physical condition of the ditches and drains are not desirable.
- The cleaning service of the ditches and drains are not satisfactory.
- Some residents in the area do not discharge the solid waste in the proper place.
- There is not sufficient campaign and guidance by the government.

Among the causes of insufficient wastewater management, the inferior condition of ditches and drains have been emphasized by the respondents of the community.

Condition of ditches and drains

The respondents indicated the followings as the reasons of malfunction of ditches and drains:



The main causes of the malfunction of ditches are the insufficient physical condition of ditches in Losari and both of physical condition and discharged solid waste in Pattunuang and Parang. In Maradekaya and Bara-baraya Selatan, the physical condition of ditches is relatively good and the main problem is the solid waste discharged in the ditches.

(3) Role of family member and community in sanitary management

In the sanitary management, father and children seem to play important roles based on the results of survey. Children more frequently dispose solid waste in the collection sites outside and the fathers and children usually clean the ditches both in their own yard and in the area. Pattunuang is an exception where the servants or employees mainly dispose solid waste and clean the ditches in the yards.

In the interview survey, women's responses were compared with men's regarding the awareness of environment, the evaluation of cleanliness condition in the area and the behavior in sanitary programs. Consequently, significant differences have not been recognized between men and women.

In Parang, Maradekaya Selatan and Bara-baraya Selatan, the activities of ditch cleansing in the area are considerably supported by community, while in Pattunuang Dinas Kebersihan provides the services. Still, the activities and/or services of the ditch cleansing are not so frequent as the people are satisfied. The respondents also indicated complaints about the uncertain time of ditch cleansing.

(4) Willingness to participate in wastewater management

The community's willingness to participate in the following sanitary programs has been confirmed in the interview survey (ref. *Table 2.4)*:

- Willingness to help to create a clean city
- Willingness to help the government to build ditches and canals for the wastewater
- Willingness to support improving water quality in Pantai Losari area
- Willingness to support creating clean canal in the city

The respondents in every area stated that community agreed on the government's effort to improve wastewater management and are willing to participate in the program, principally.

The community participation will be in the form of retribution, manpower as well as mutual help and/or material input. The form of participation differs among the areas. In Bara-baraya and Maradekaya Selatan, the community is more positive to participate in the form of manpower and mutual help in ditch cleansing. Whereas in Losari and Pattunuang, the participation in the form of retribution is more preferred.

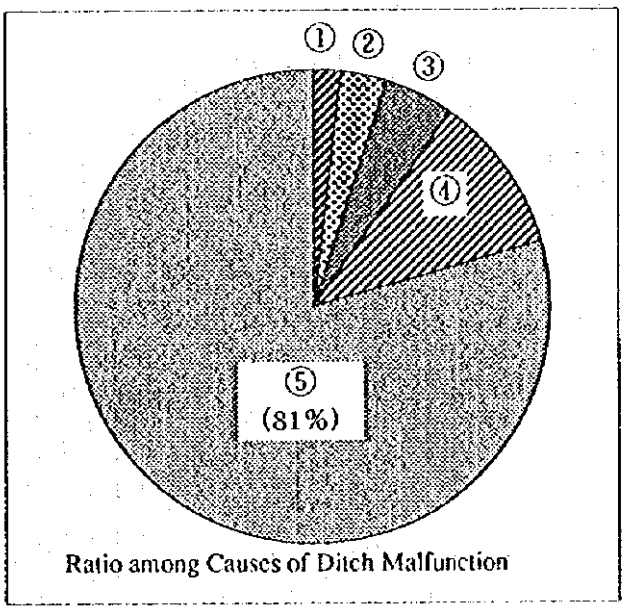
CIPTA KARYA classifies the activities and fund of input resources in the sanitary programs in the CBD (community based development) approach (ref. Section 1.2.2) . CIPTA KARYA requires the community to input the resources for the simple work in construction and operation and maintenance, local materials and available land from the community in the CBD approach as follows:

Activities		Source of Fund
Community building	- Social marketing	Government
	- Training	Government
	- Providing instructions, manuals, etc.	Government
Land		Government/Community
Materials	- Local materials	Community
	- Non-local materials	Government
Construction work	- Simple work	Community
	- Technical work	Government

Table 2.1 Locations of Malfunctioned Ditches and Drains

No.	Location of Kecamatan	No. of corresponding causess for damaged/malfunctioned ditches/drains*						Remarks
		1	2	3	4	5	Total	
1	Ujung Tanah	9	9	3	20	133	174	
2	Wajo	2	0	31	46	164	243	
3	Bontoala	1	0	10	27	187	225	
4	Tallo	7	10	8	19	148	192	
5	Ujung Pandang	4	0	7	23	111	145	
6	Makassar	5	5	25	27	356	418	
7	Mamajang	1	11	0	15	233	260	
8	Mariso	0	5	3	15	163	186	
9	Tamalate	0	11	0	7	31	49	
10	Panakkukang	0	0	0	3	1	4	
11	Biringkanaya	-	-	-	-	-	-	Not surveyed
Total		29	51	87	202	1,527	1,896	
Ratio (%)		2	3	5	11	81	100	

Source : JICA survey 1995



Ratio among Causes of Ditch Malfunction

*Note

1 = Because of low lying area
2 = Because of lack of drainage for storm water
3 = Because of low capacity of the ditch / drain
4 = Because of damaged ditch / drain partially
5 = Because of deposited solid waste

Table 2.2 Alternatives of Interceptor Sewer System for Living Environment Improvement

Case		without project	Alternative -1 Sunken facilities (Treatment plant, pump station and conveyance sewer)	Alternative -2 Interceptor with main & conveyance sewer (more than 350mm)	Alternative -3 Interceptor of Alternative-2 & selected sewer
Service area		435 ha			
Served Population (existing)		107,000 persons			
Flow distance of exposed wastewater (No. of mesh)	more than 2.5 km	37	37	0	0
	2.0 - 2.5 km	127	127	0	0
	1.5 - 2.0 km	62	62	0	0
	1.0 - 1.5 km	151	151	23	0
	0.5 - 1.0 km	654	654	412	75
	50 m - 500 m	641	641	1047	1273
	less than 50 m	46	46	236	370
	total	1718	1718	1718	1718
	(Average distance)	0.8 km	0.8 km	0.3 km	0.2 km
	(Maximum distance)	2.9 km	2.9 km	1.2 km	0.6 km
Pipe length of sewer (km)		0.0 km	2.5 km	11.9 km	19.0 km
Collected wastewater		non	Graywater	Graywater	Graywater
Direct construction costs (million Rp.)	Total	-	5,447	11,475	13,270
	House connection	-	-	-	-
	Tertiary /secondary sewer	-	-	0	1,795
	Main/conveyance	-	2,372	6,295	6,295
	Pump station	-	1,454	1,939	1,939
	Treatment plant	-	1,621	3,241	3,241
Land Acquisition cost		-	3,140	3,140	3,140
Administration Cost		-	109	230	265
Engineering Cost		-	654	1,377	1,592
Total		-	9,350	16,222	18,267
Share of cost in sewerage development project cost		0%	19%	33%	37%
Operation/Maintenance Cost (million Rp./year)		-	-	230	265

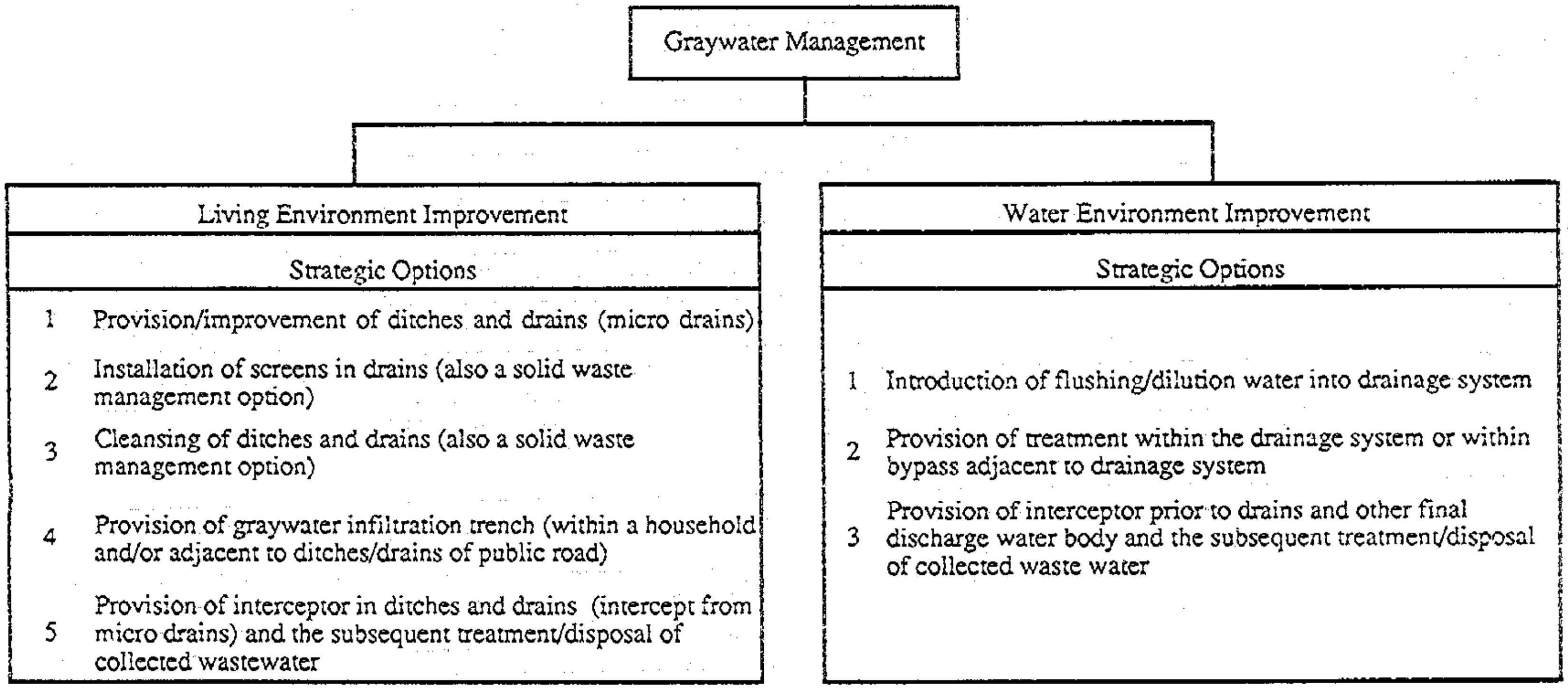
note : Share of cost in sewerage development project cost is calculated as follows;
Share of cost(%) = ((Project Cost of alternative) / (Conventional sewerage development project cost)) x 100

Table 2.3 Results of Household Interview Survey (General)

Model area	Losari (RW IV and part of RW III)	Parang (RW IV)	Pattunuang (RW IV)	Maradekaya selatan (RW II) & Bar-baraya selatan (RW III)
Respondant (households)	50	50	40	60
1. Socio-economic condition				
Population (persons)	2,691	1,411	848	2,905
Education level (higher than senior high school)	78%	68%	68%	43%
Number of family member (persons)	4.0	5.0	2.0	5.0
Average income per month (Rp.1,000)	433	388	792	311
Average expenditure per month (Rp.1,000)	290	205	515	122
Occupation				
Government employee	38%	28%	8%	18%
Private company employee	16%	18%	13%	17%
Self-emlpoyment (incl. merchant)	16%	16%	65%	25%
Pension	26%	22%	0%	15%
Others	4%	16%	15%	25%
2. House condition				
Average house size (m2)	162	94	84	84
Yard in average (m2)	48	47	4	14
Yard available for infiltration (m2)	16	6	0	8

Table 2.4 Results of Social Survey (Sanitary Condition)

Model area		Losari		Parang		Pattunuang		Maradekaya selatan & Bara-baraya selatan	
		Household survey	Key informant interview	Household survey	Key informant interview	Household survey	Key informant interview	Household survey	Key informant interview
1) Housing condition in the area	excellent	2%	0%	6%	20%	0%	0%	2%	0%
	good	78%	90%	32%	20%	18%	25%	27%	25%
	moderate	20%	10%	38%	40%	68%	63%	47%	67%
	not satisfactory	0%	0%	24%	20%	10%	13%	25%	8%
2) General cleanliness around housing	Dry season								
	good	86%	100%	38%	50%	43%	25%	57%	50%
	moderate	14%	0%	50%	50%	40%	50%	38%	50%
	poor	0%	0%	12%	0%	10%	13%	5%	0%
	Rainy season								
	good	60%	80%	28%	40%	10%	25%	23%	42%
	moderate	22%	20%	36%	30%	35%	25%	42%	50%
	poor	18%	0%	36%	30%	55%	50%	18%	8%
3) General condition of wastewater management	excellent	0%	10%	4%	0%	3%	0%	2%	8%
	good	56%	80%	24%	40%	13%	13%	30%	58%
	moderate	42%	10%	34%	20%	50%	63%	35%	8%
	not satisfactory	2%	0%	38%	40%	35%	13%	33%	25%
4) Cleanliness problems of ditch	Physical problem	34%	30%	44%	30%	35%	38%	13%	8%
	Waste problem	2%	0%	20%	20%	5%	0%	27%	17%
	Both above	6%	0%	14%	20%	40%	38%	22%	50%
	No problem	58%	70%	22%	30%	20%	25%	38%	25%
5) Physical condition of ditch	sufficiently good	76%	100%	42%	40%	10%	13%	58%	50%
	some broken	4%	0%	48%	40%	40%	38%	23%	25%
	all broken	4%	0%	6%	10%	43%	50%	3%	17%
	others	16%	0%	4%	10%	1%	0%	15%	8%
6) Agree the idea to build wastewater ditch/canal	agree	100%	100%	98%	100%	98%	100%	100%	83%
	not agree	0%	0%	0%	0%	3%	0%	0%	0%
	do not know	0%	0%	2%	0%	0%	0%	0%	17%
7) Willing to help the government to built ditch/canal	will help	98%	100%	98%	100%	95%	100%	100%	92%
	will not help	0%	0%	0%	0%	0%	0%	0%	0%
	do not know	2%	0%	2%	0%	5%	0%	0%	8%
8) Willingness to help cleaning Pantai Losari	will	98%	100%	98%	100%	78%	88%	65%	67%
	will not	0%	0%	0%	0%	3%	0%	33%	25%
	no answer	2%	0%	2%	0%	20%	13%	2%	8%
9) Willingness to help cleaning City Canal	will	90%	100%	98%	100%	78%	100%	90%	92%
	will not	2%	0%	0%	0%	3%	0%	8%	8%
	no answer	8%	0%	2%	0%	20%	0%	2%	0%



Note : Living Environment Improvement : Targets graywater management near the source
Water Environment Improvement : Targets graywater management at major drains, canals and other water bodies (coastal waters)

FIG.2.1 **Concept of Graywater Management**

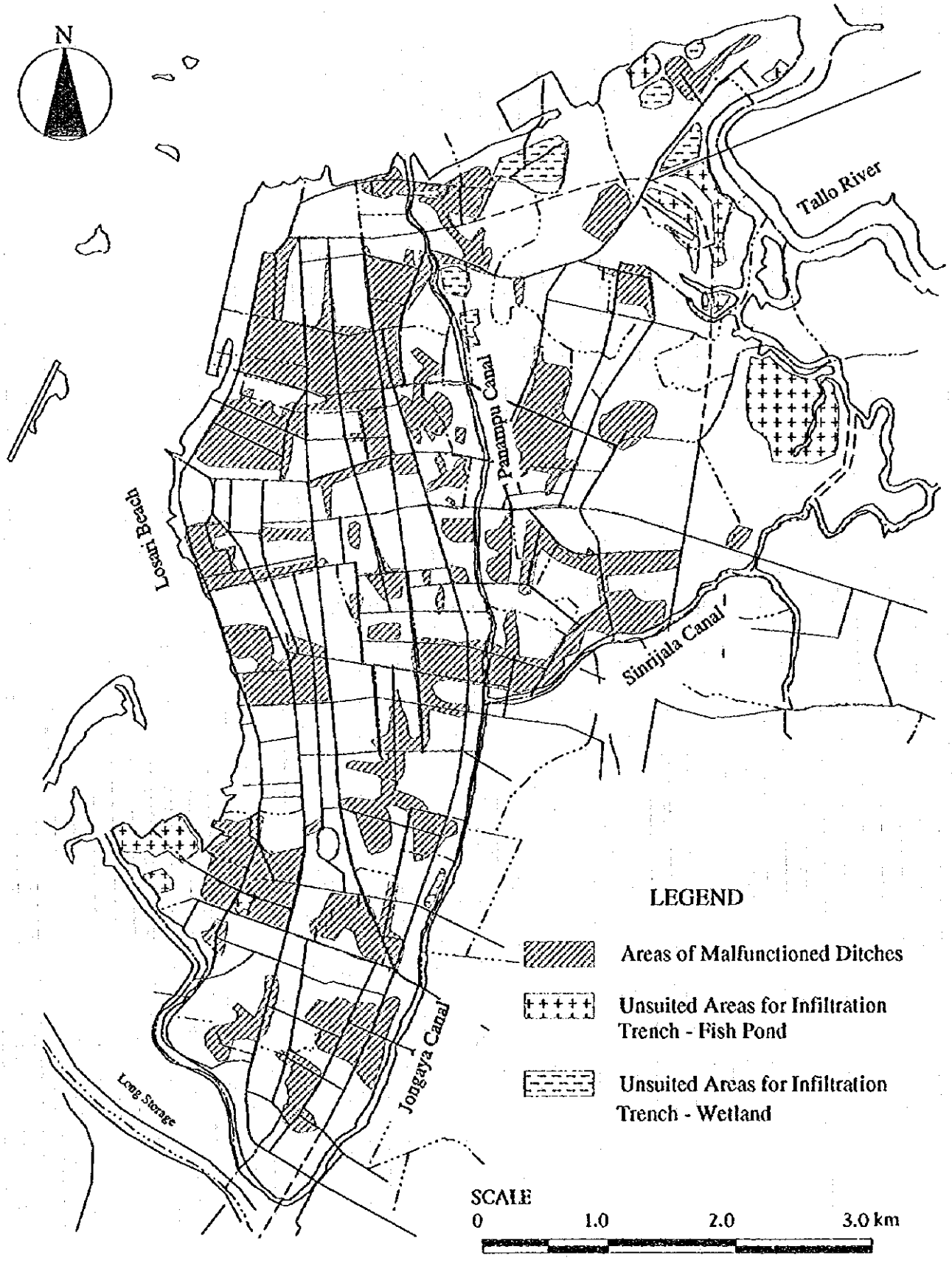


FIG. 2.2 Malfunctioned Ditches and Unsuited Areas for Infiltration Trench

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

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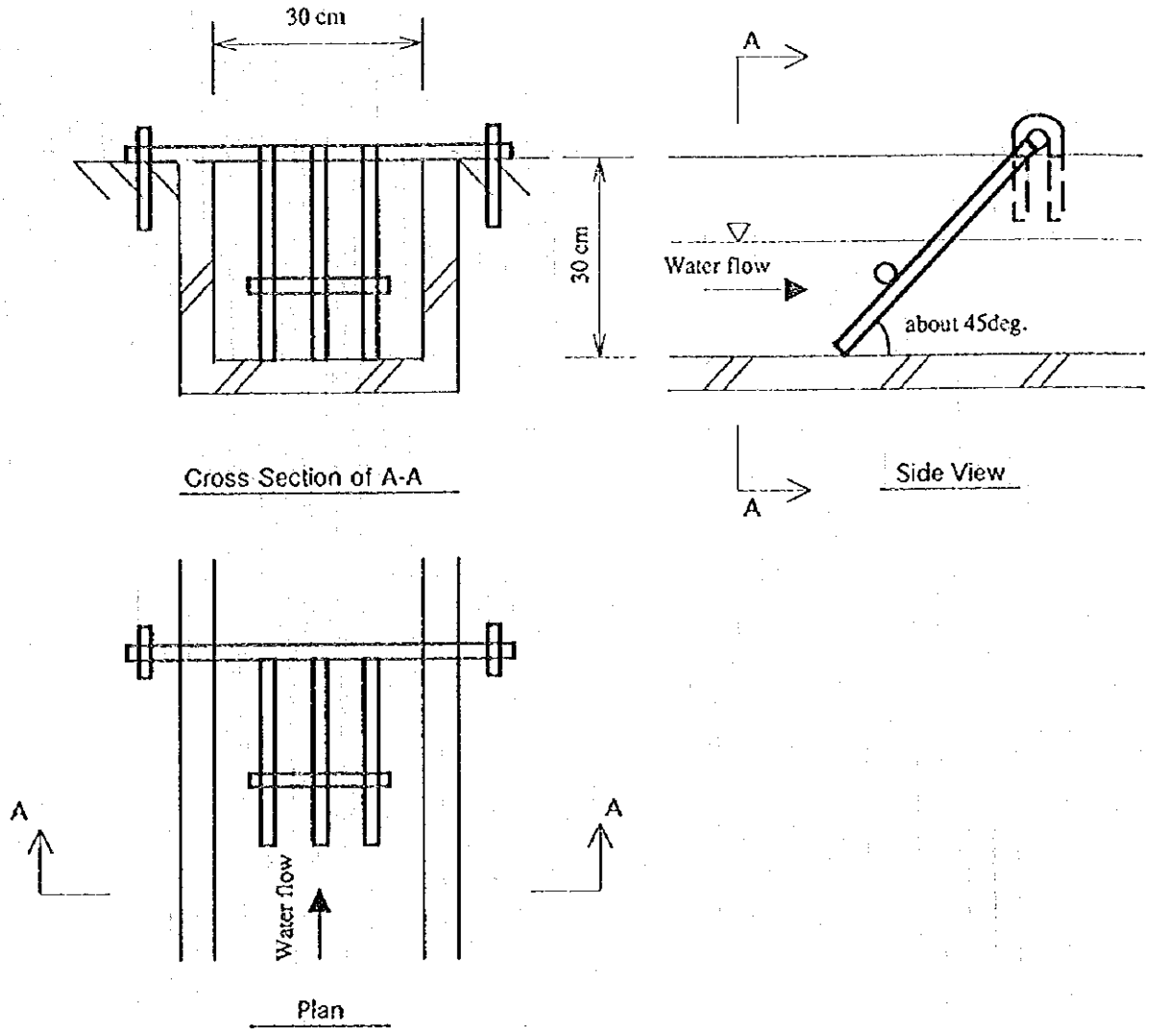

FIG. 2.3	Typical Structure of Screen

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

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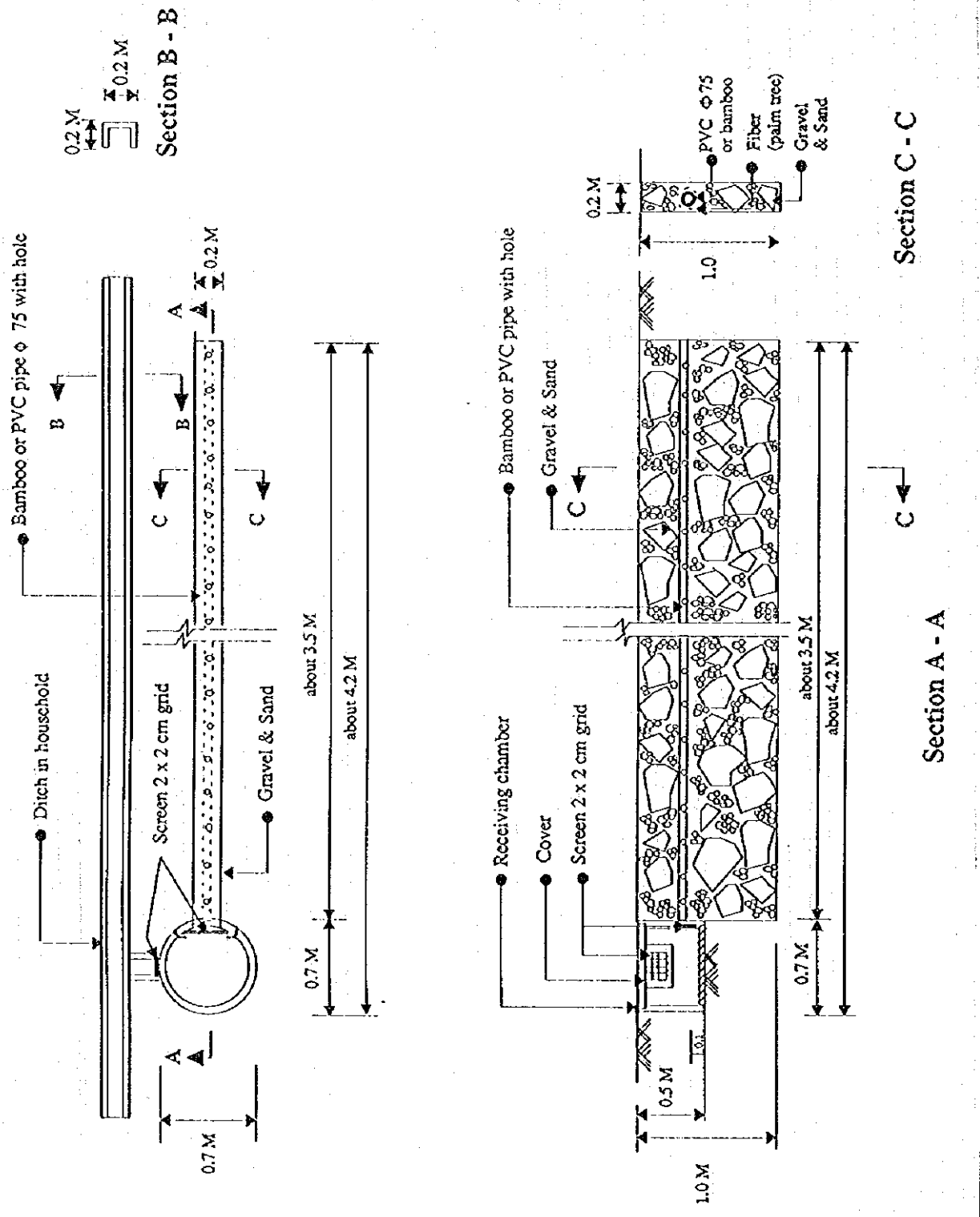

FIG. 2.4 Typical Infiltration Trench for Household

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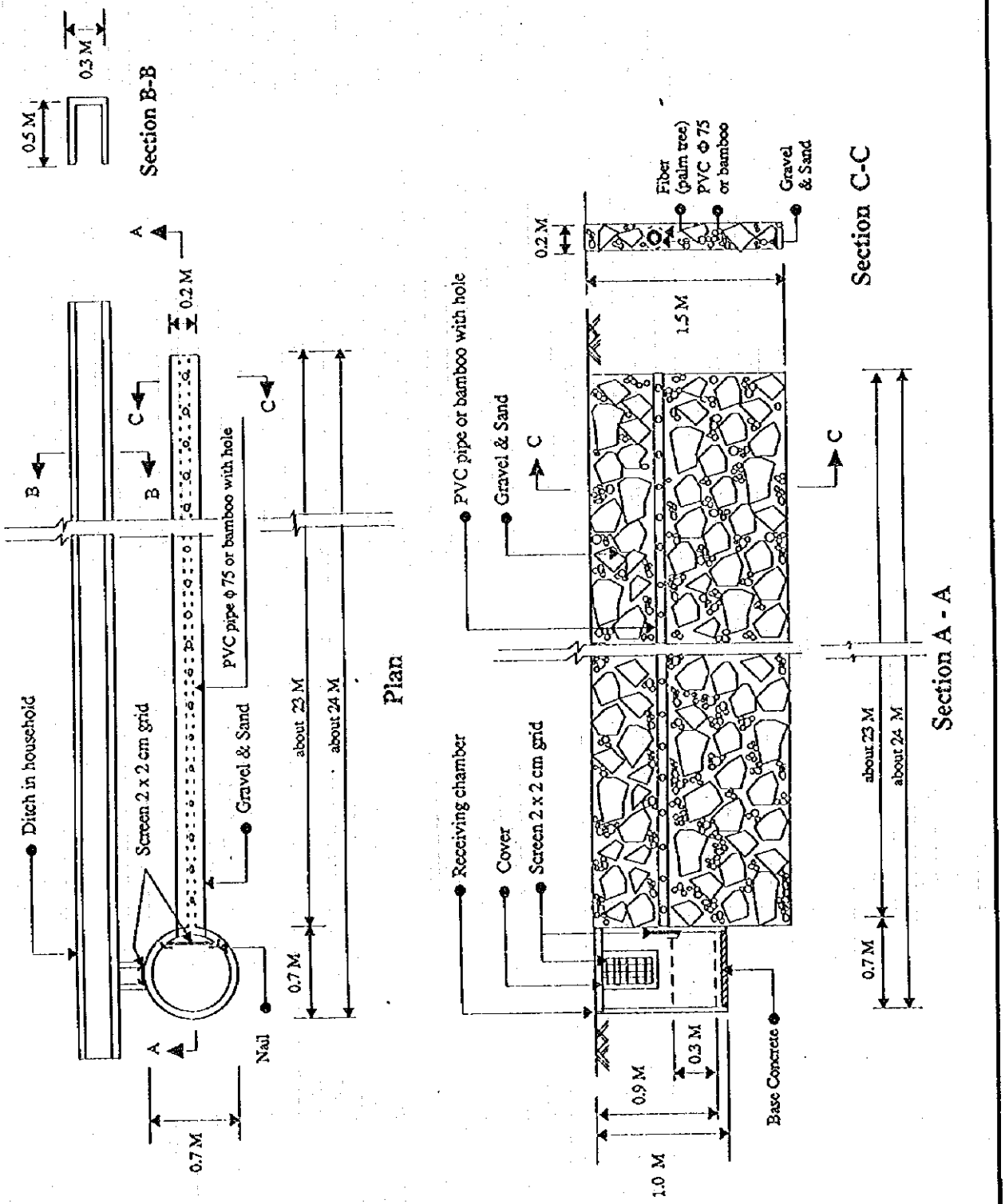

FIG. 2.5	Typical Infiltration Trench for Drain

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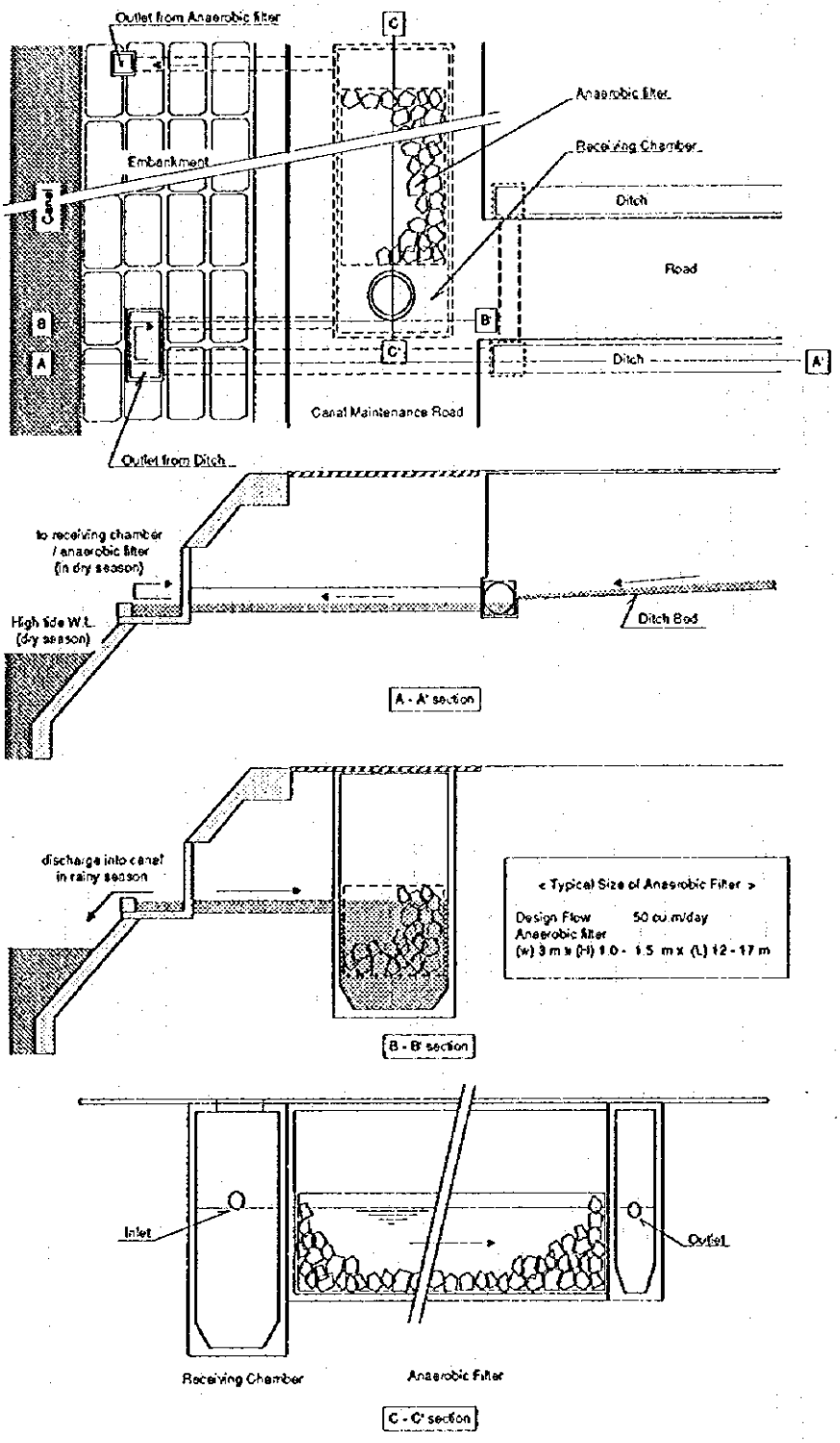

FIG. 2.6	Anaerobic Filter System for Graywater Treatment

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

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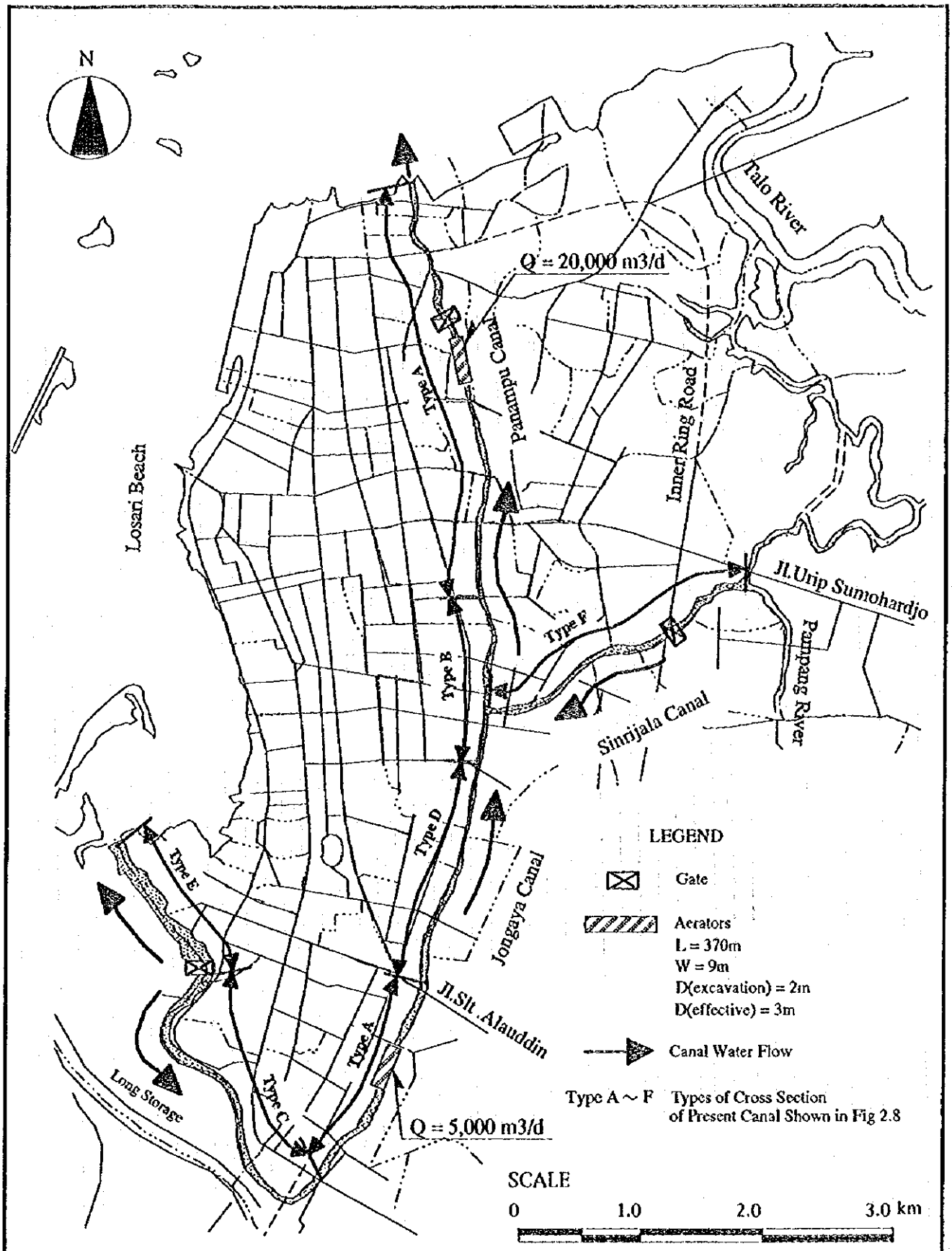

FIG. 2.7 Canal Water Aeration System

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

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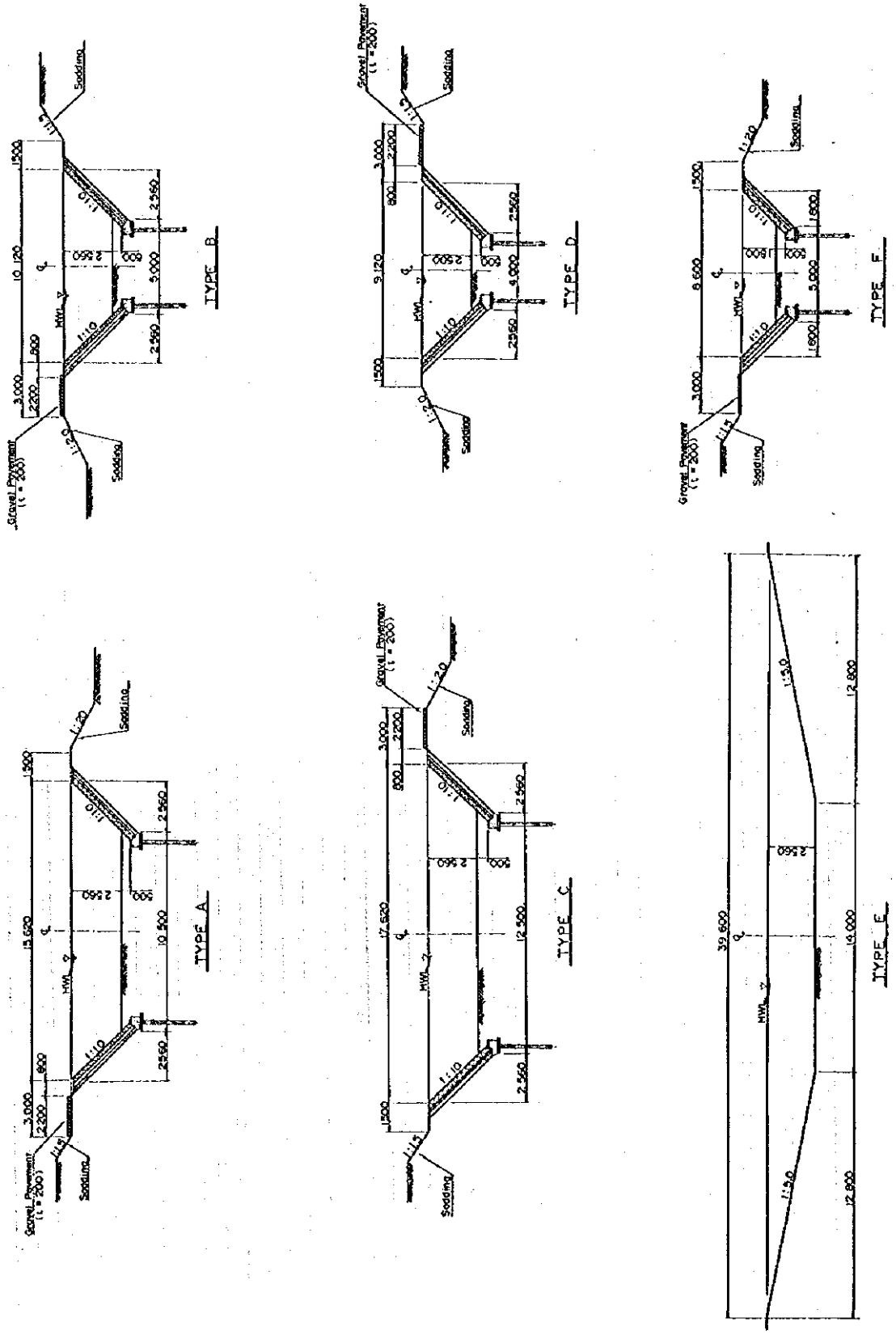

FIG. 2.8 Types of Panampu - Jongaya Canal

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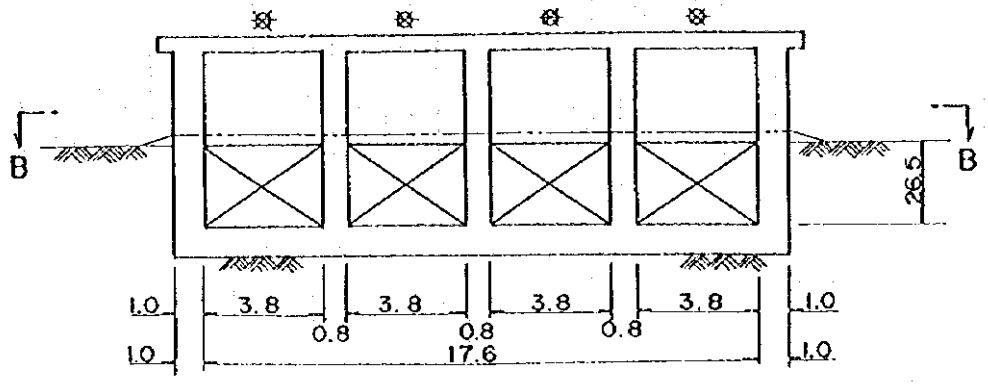
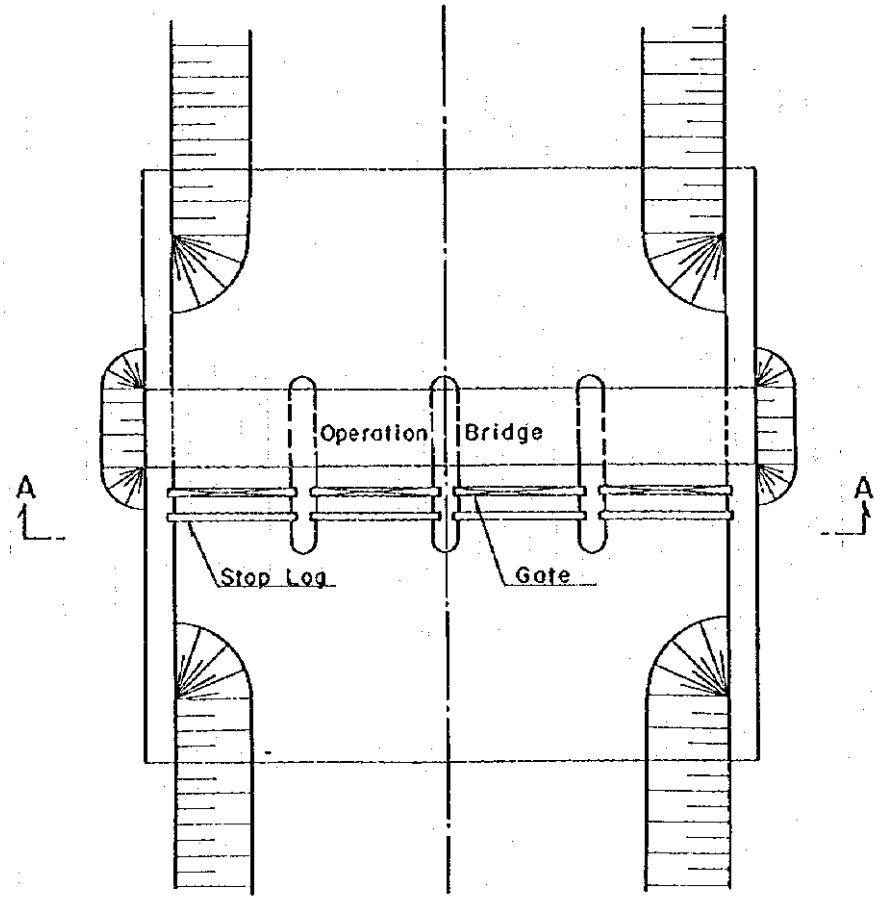


SECTION A-A



PLAN
(SECTION B-B)

FIG. 2.9	Typical Structure of Gate for Canal Type C

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

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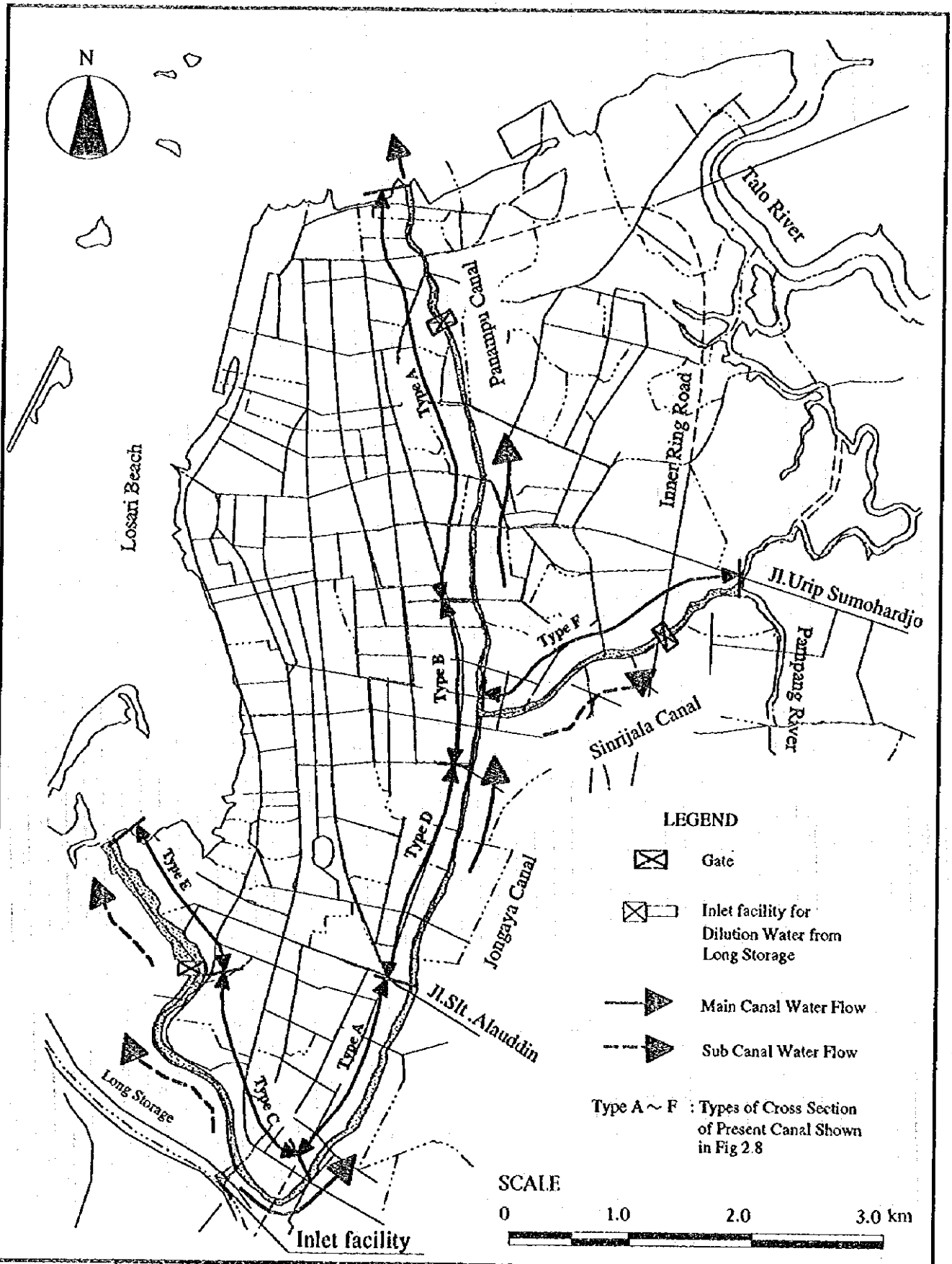

FIG. 2.10 Dilution Water Introduction into Canal

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

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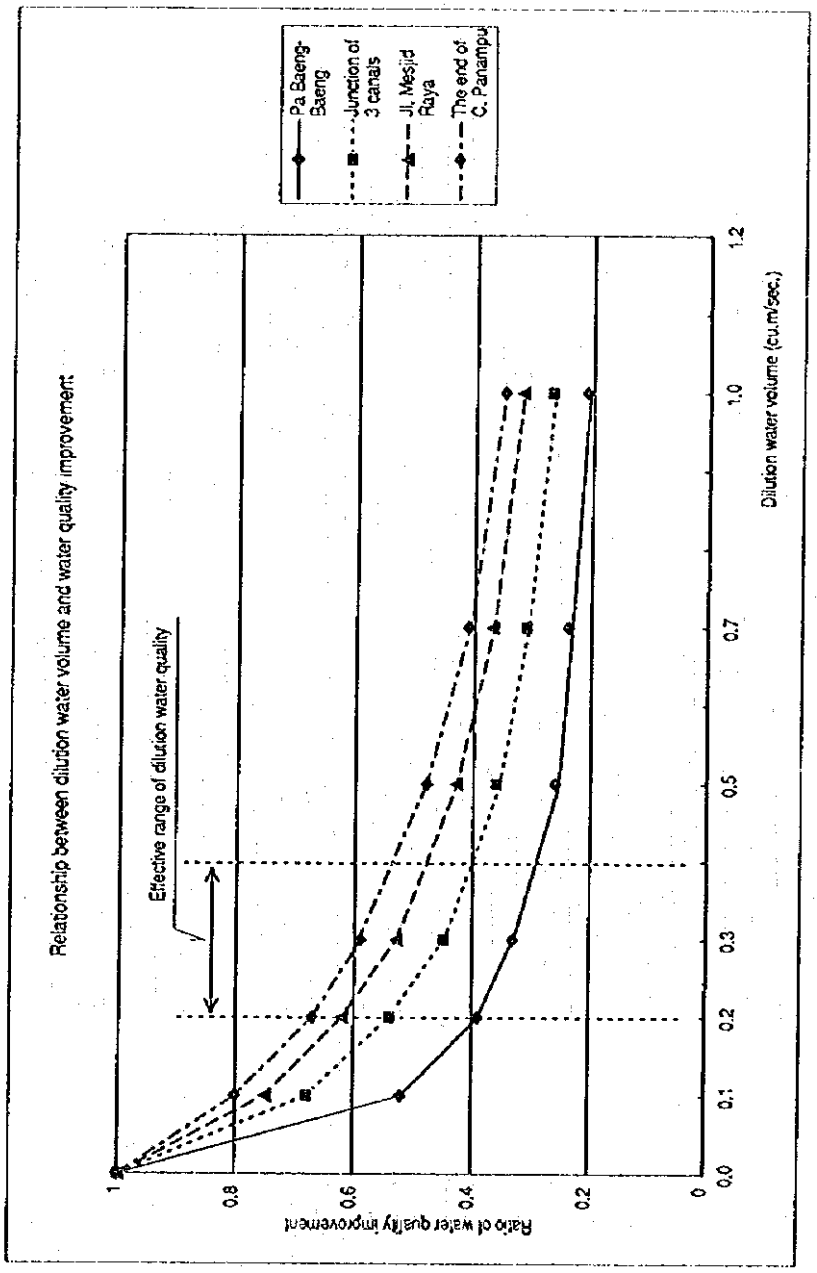

note: Ratio of water quality improvement (RWQI)
RWQI = (wastewater generation) / (wastewater generation +dilution water volume)
assuming that water quality is below.
Dilution water from Jeneberang river : 15 mg/l (BOD)
Wastewater : 100 mg/l (BOD)

FIG. 2.11	Relationship between Dilution Water Volume and Water Quality Improvement

MASTER PLAN AND FEASIBILITY STUDY ON WASTEWATER AND SOLID WASTE MANAGEMENT FOR THE CITY OF UJUNG PANDANG IN THE REPUBLIC OF INDONESIA

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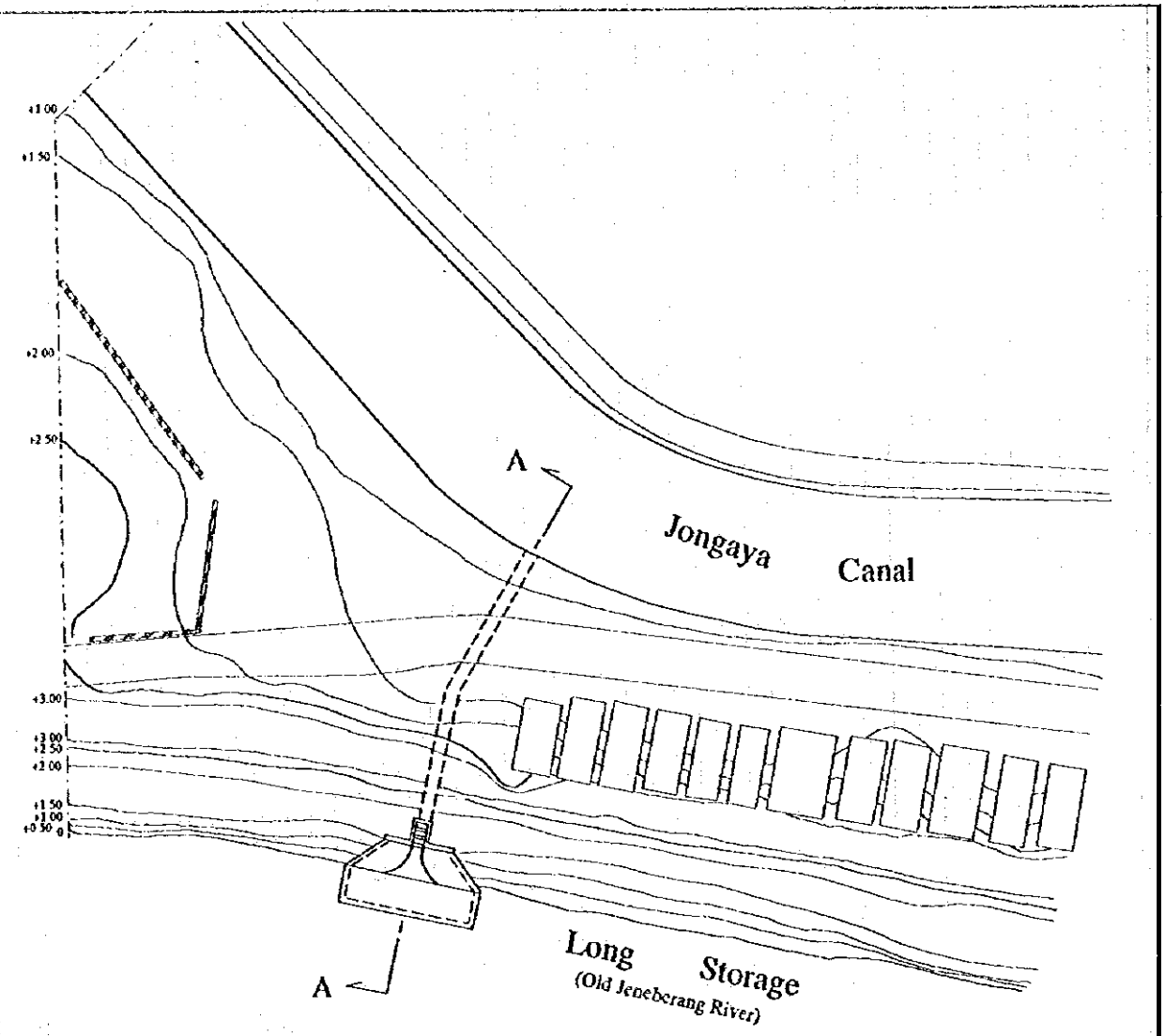
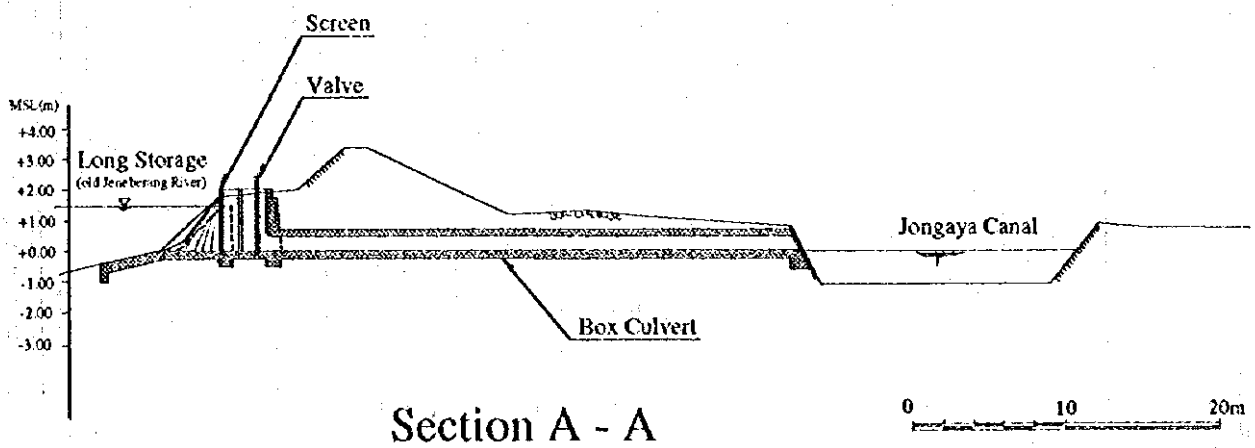


Plan



Section A - A

FIG. 2.12	Inlet Facility for Dilution Water Introduction

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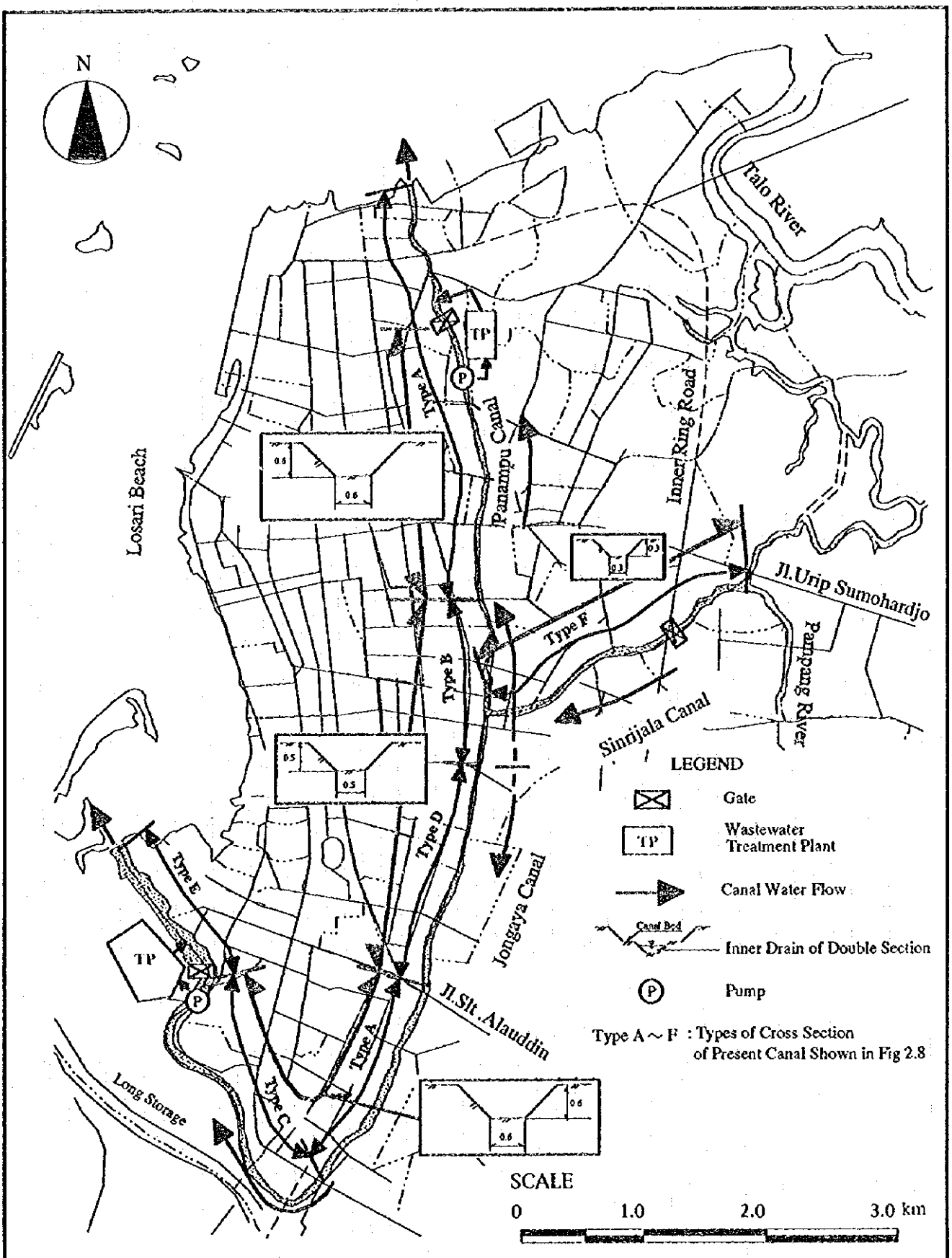

FIG. 2.13 Canal Water Conveyance and Treatment System

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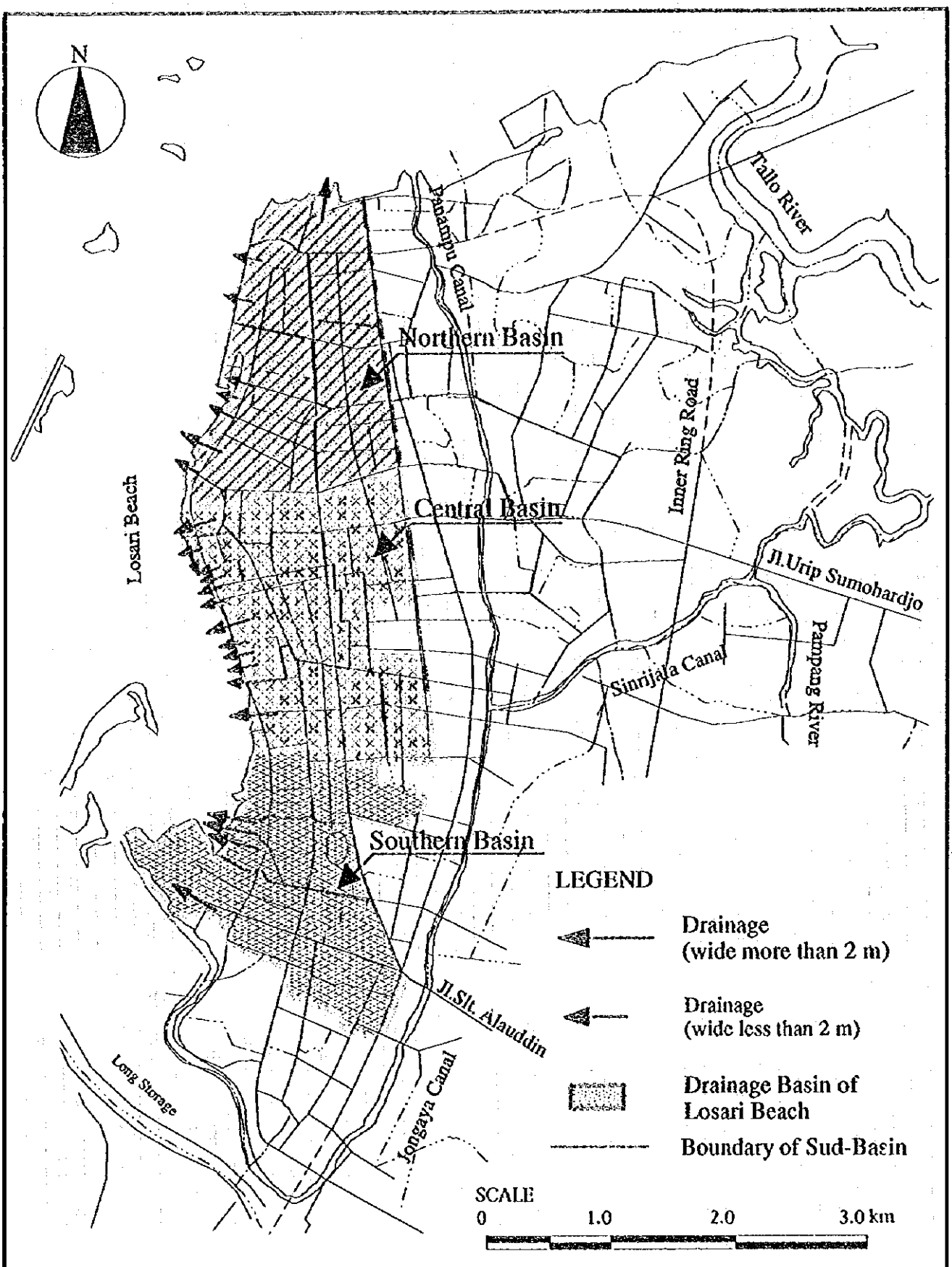

FIG. 2 .14 Drainage Basin of Costal Area

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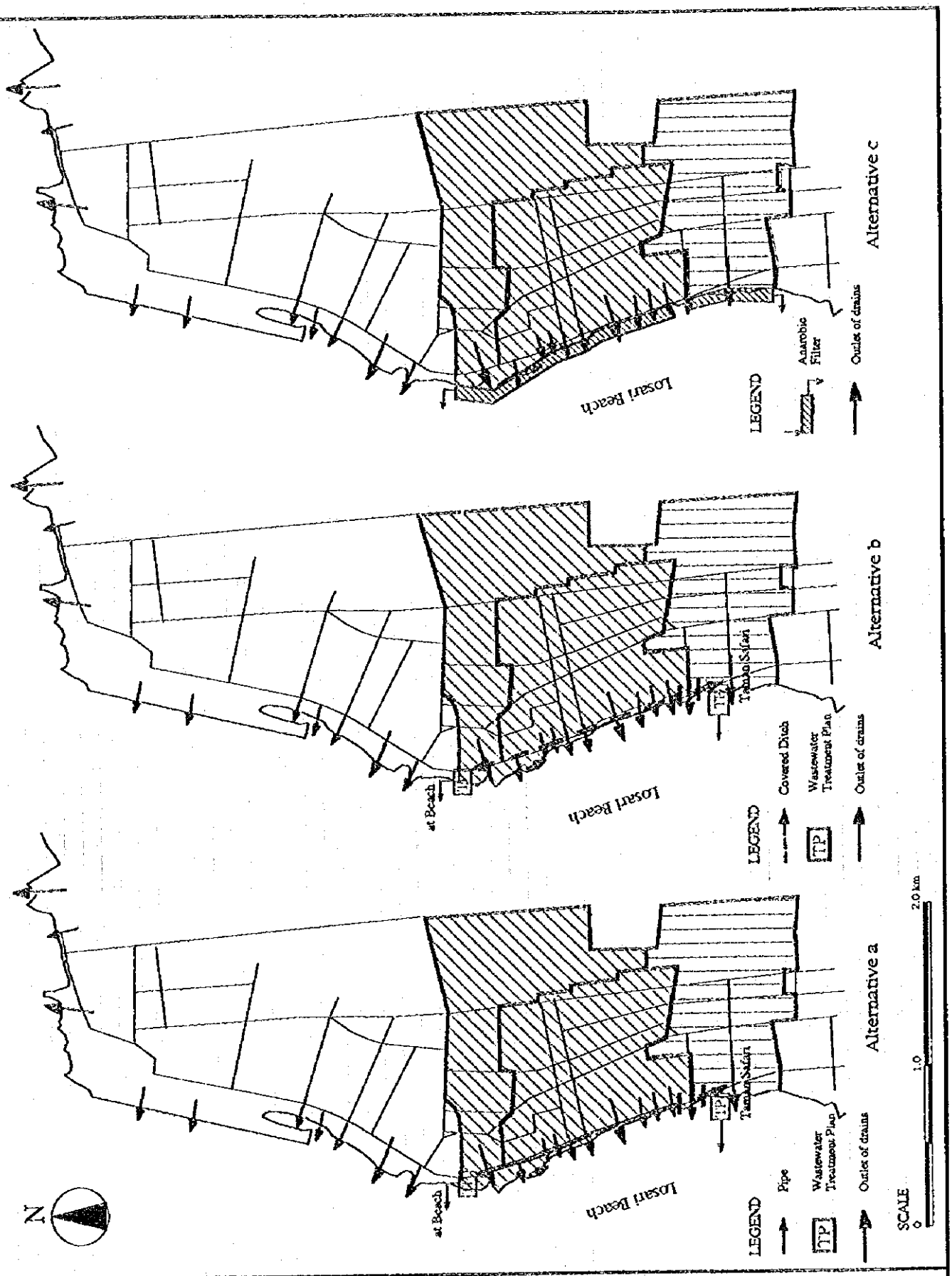

FIG. 2.15 Alternatives of Losari Beach Interceptor

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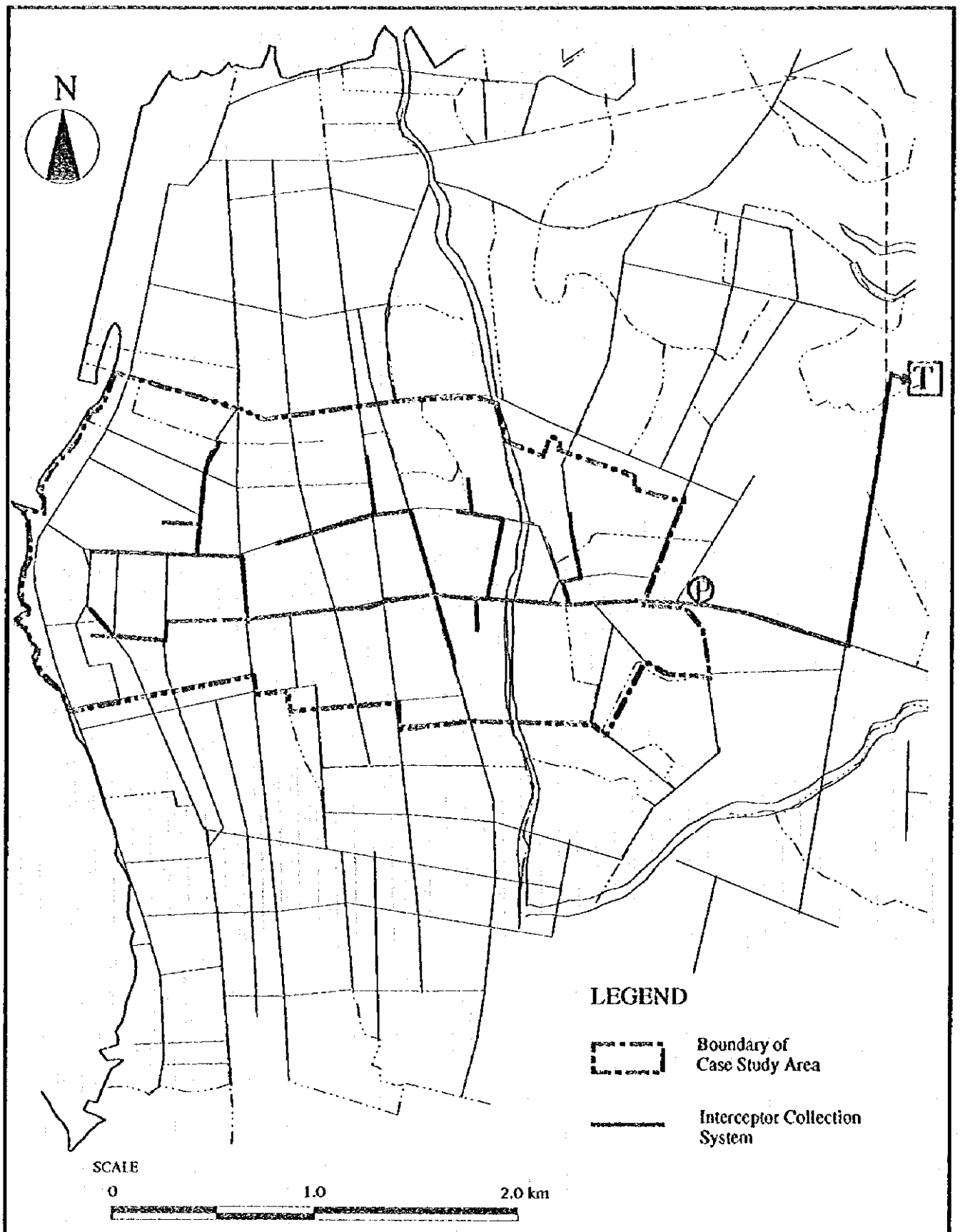

FIG. 2.16 Interceptor Sewer System (Alternative - 2)

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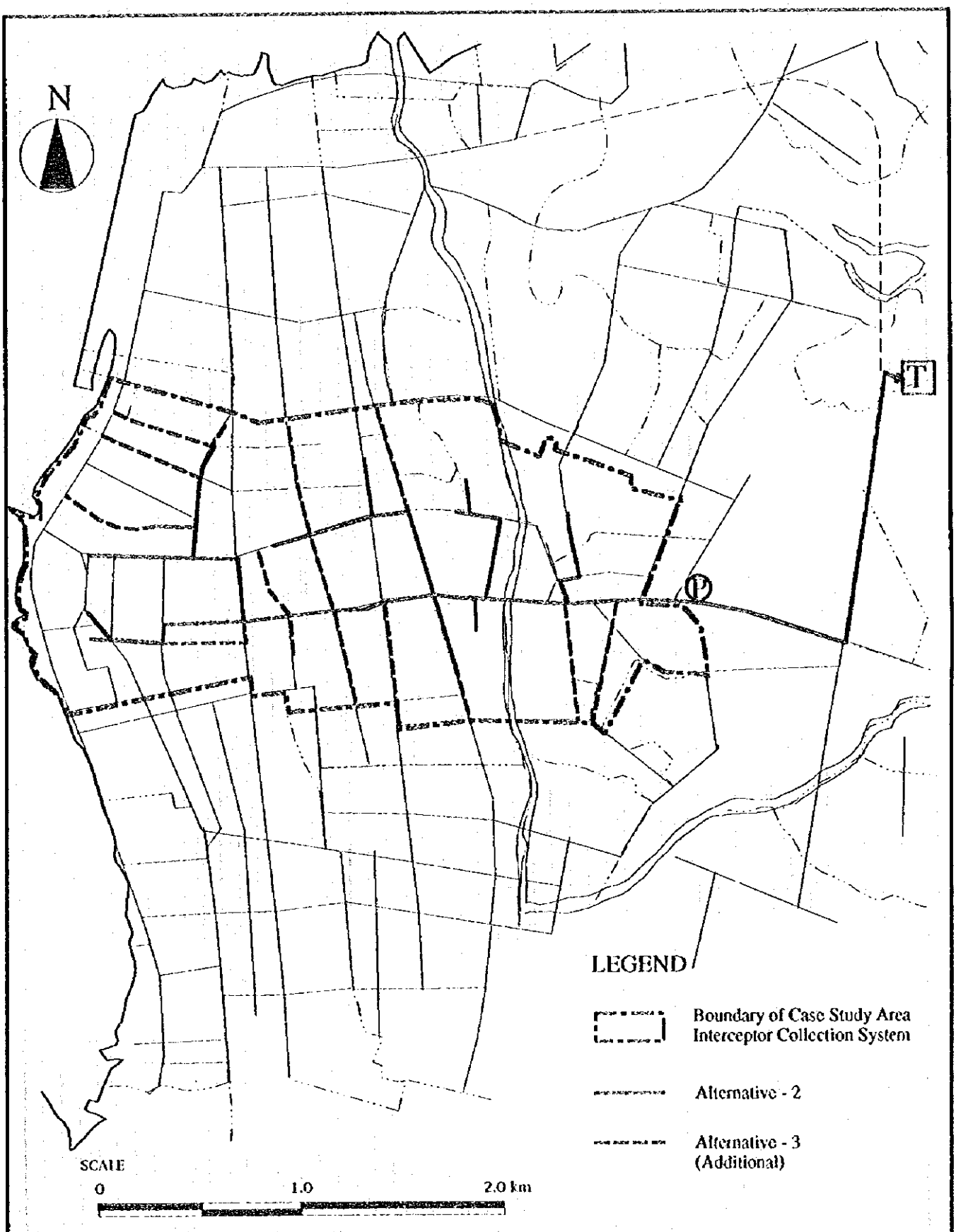

FIG. 2.17 Interceptor Sewer System (Alternative - 3)

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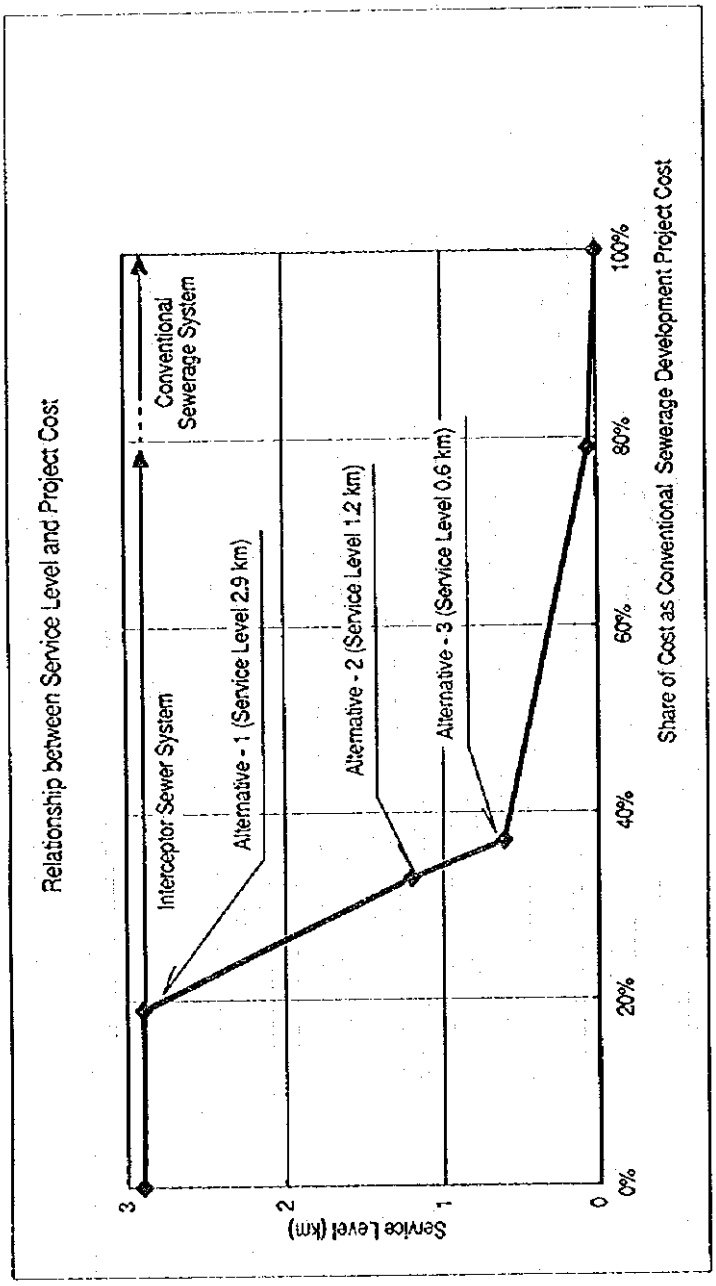

FIG. 2.18	Relationship between Service Level and Project Cost

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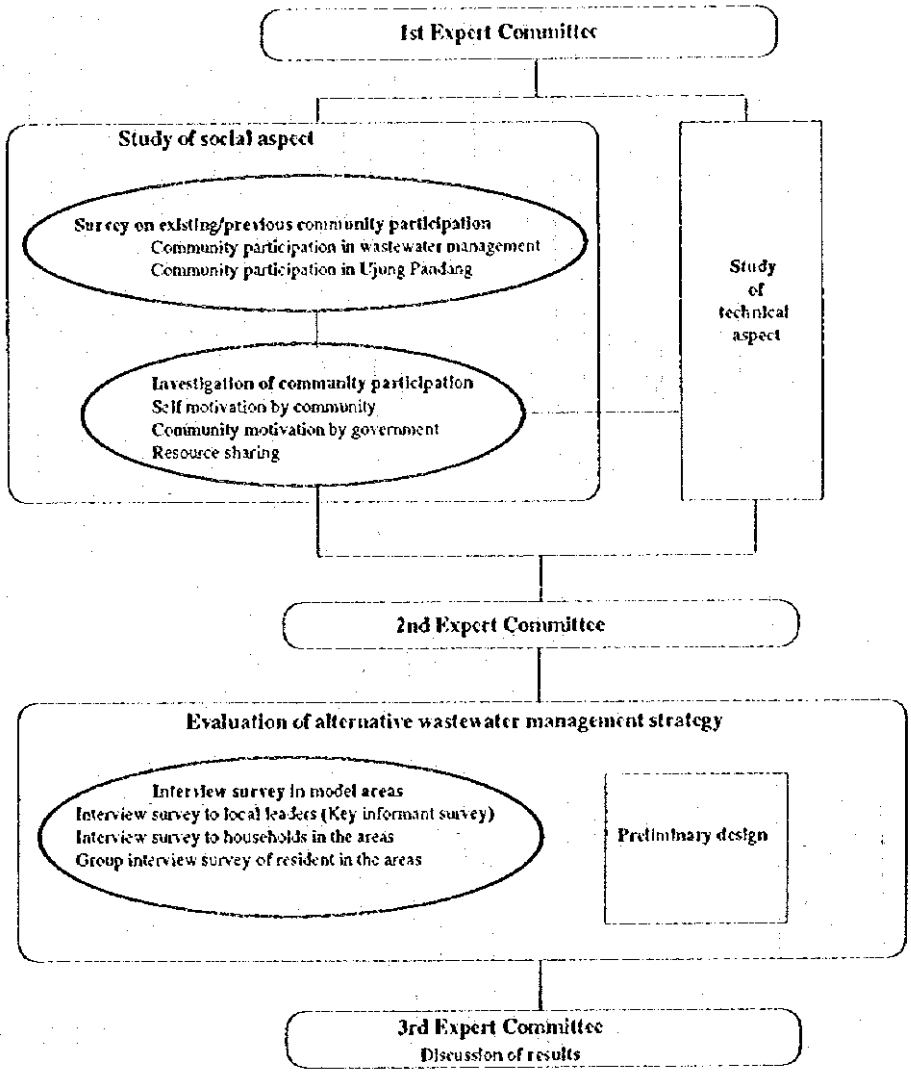

FIG. 2.19 Flow Chart of Social Survey

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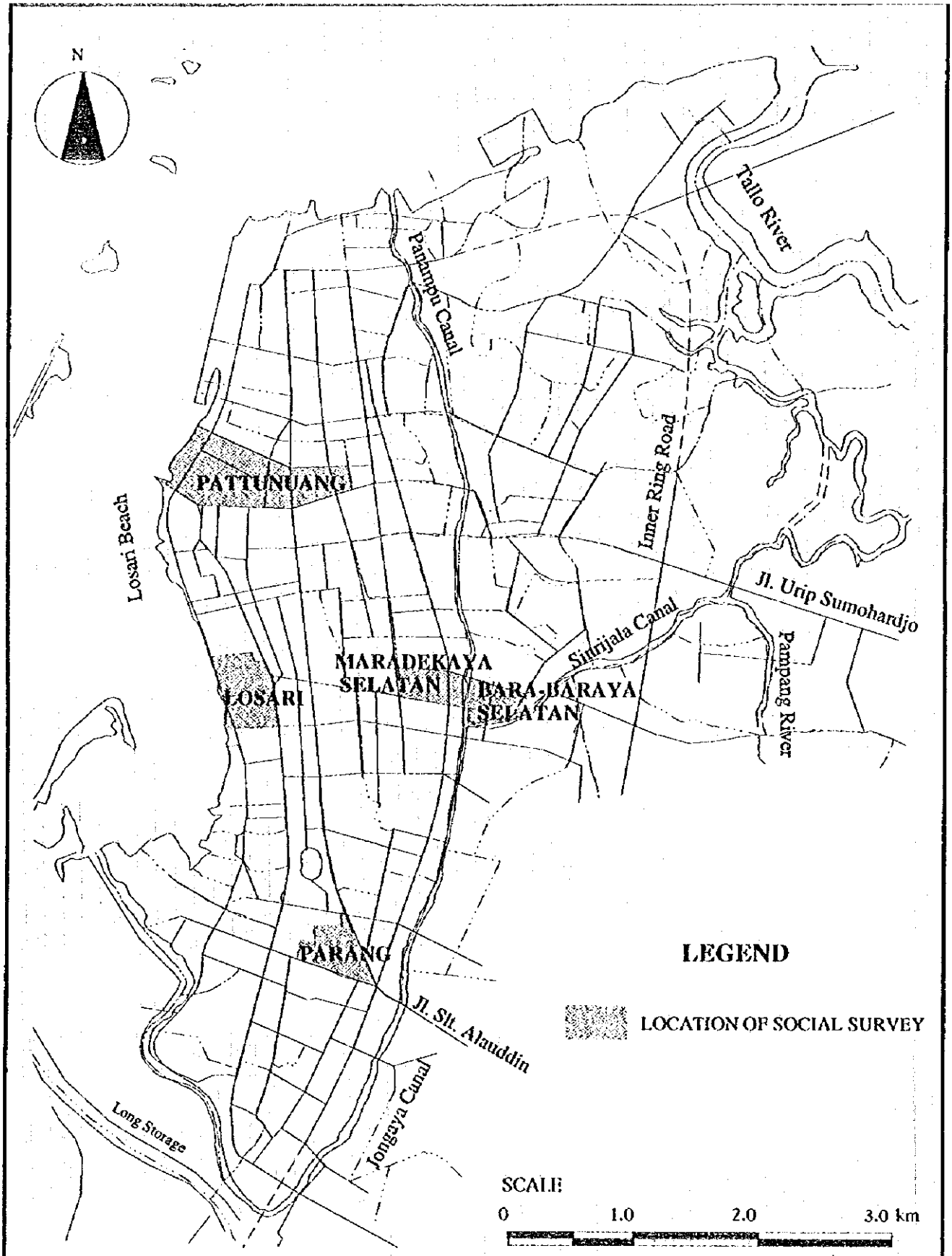

FIG. 2. 20 Location of Social Survey

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LEGEND

- School
- Religious
- Medical
- Commercial
- Open space (sport, park)
- Ⓛ Lurah Office
- Ⓒ PKK, Pos Yandu
- Ⓡ Pos Ronda
- Ⓦ Warung
- RW Boundary

Scale

0 25 50m

FIG. 2.21 **Land Use of Kelurahan Losari**

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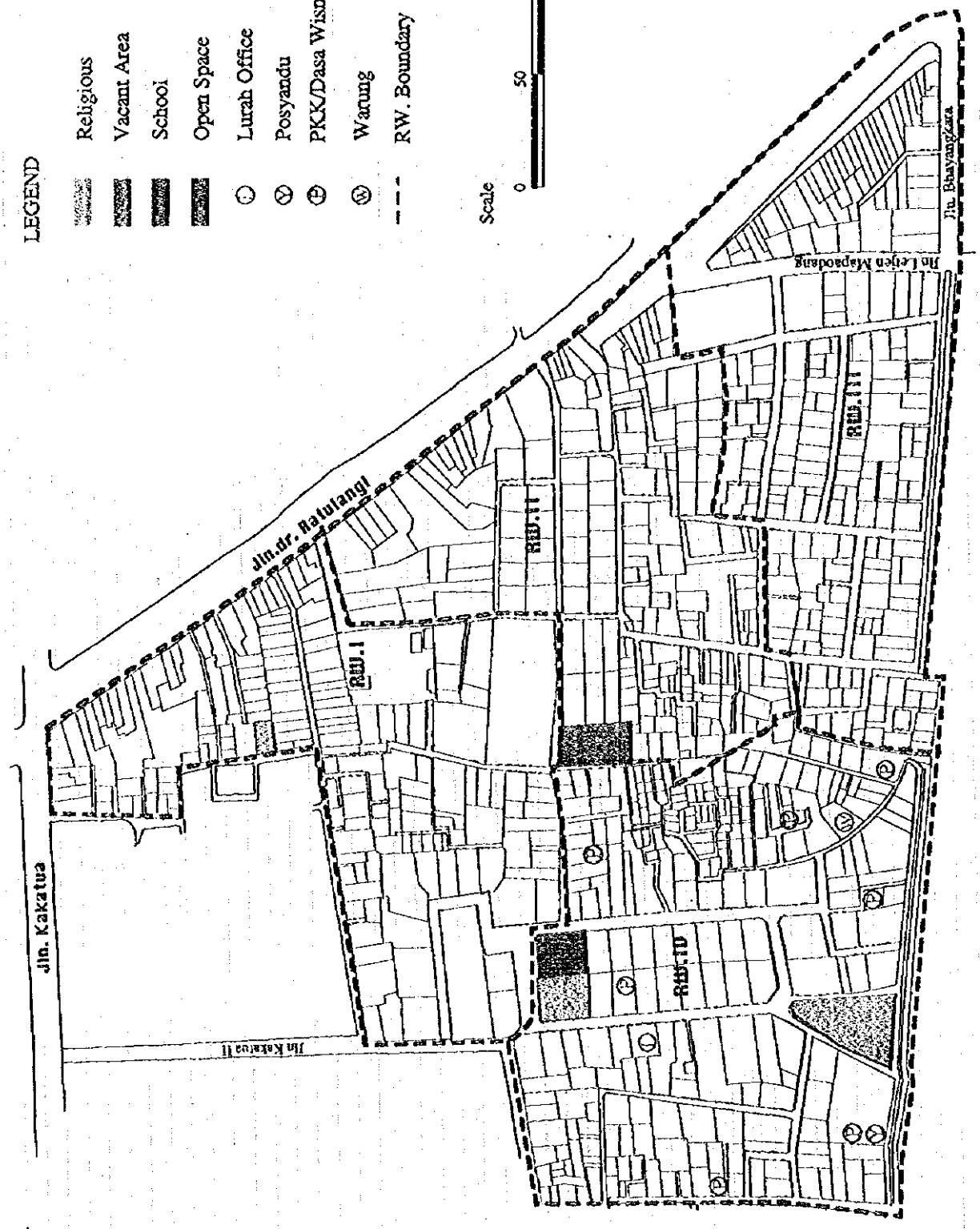

FIG. 2.22 **Land Use of Kelurahan Parang**

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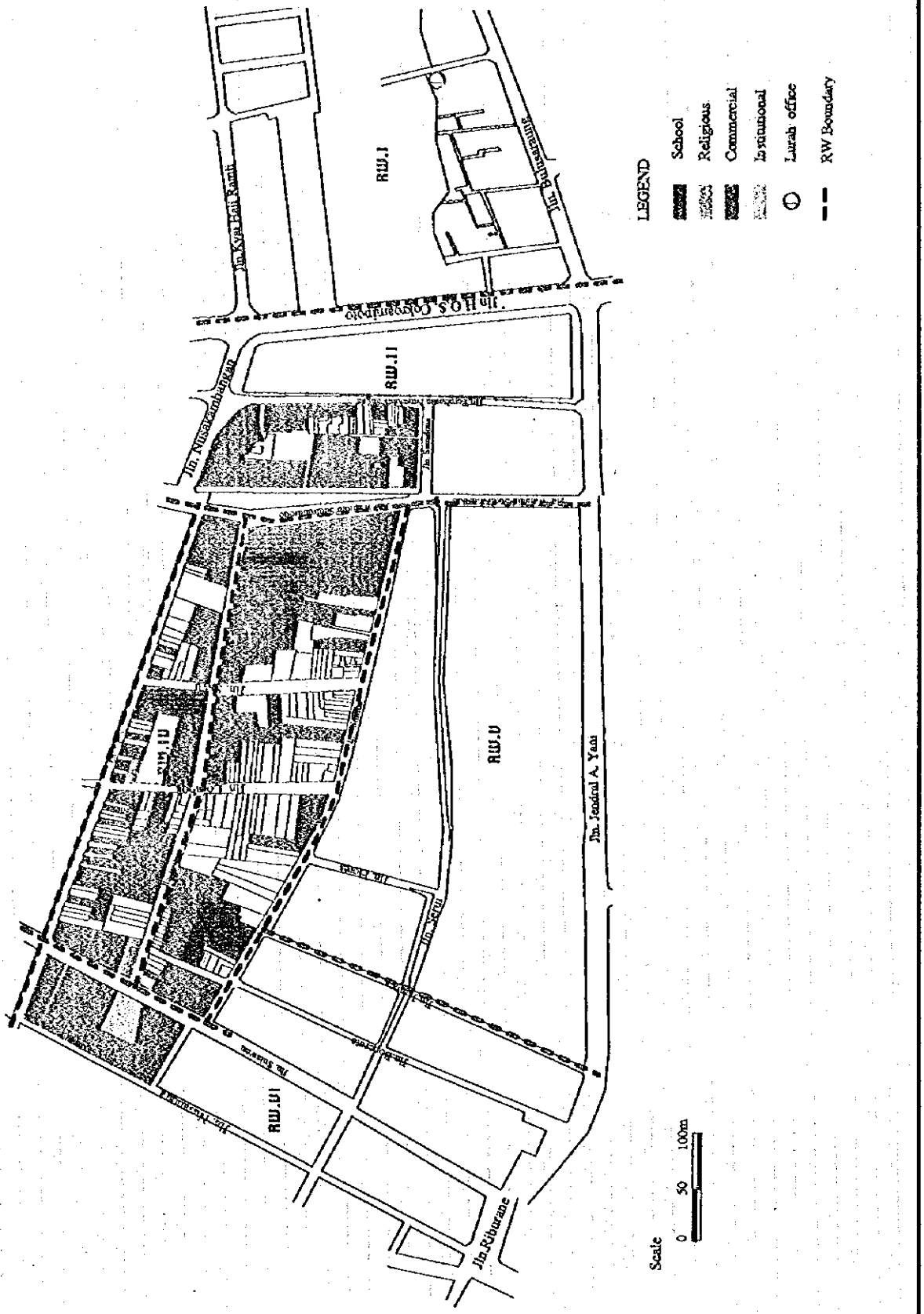

FIG. 2.23 | **Land Use of Kelurahan Pattunuang**

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FIG. 2.24 | **Land Use of Kelurahan Maradekaya Selatan**

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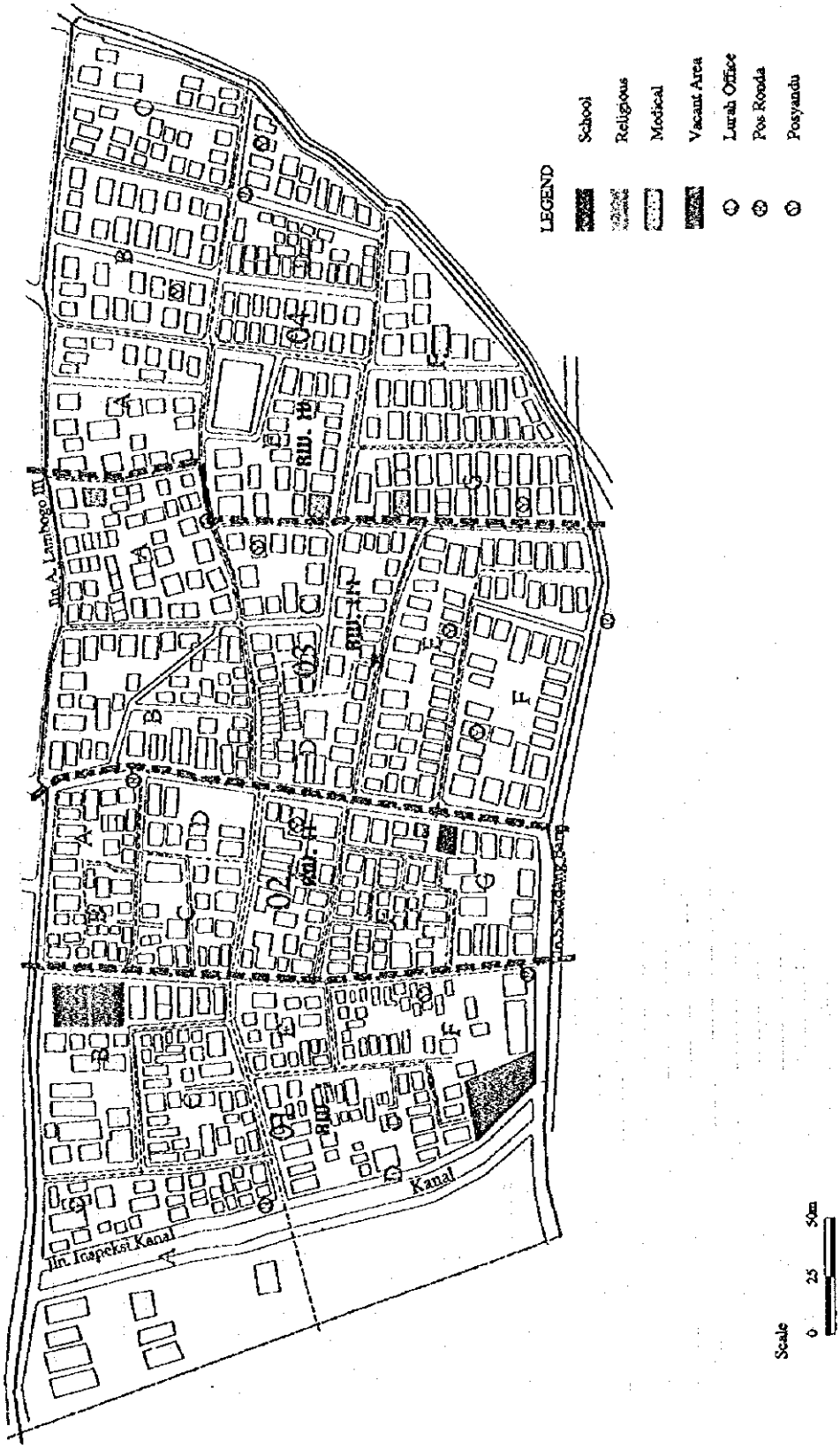

FIG. 2.25	Land Use of Kelurahan Bara - baraya Selatan

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CHAPTER 3

EVALUATION OF ALTERNATIVE STRATEGIES

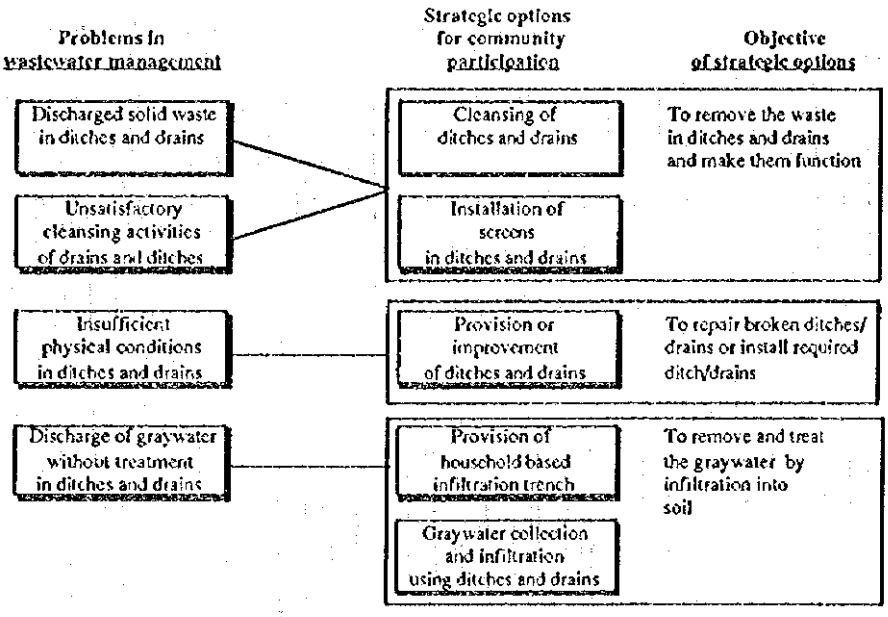
CHAPTER 3 EVALUATION OF ALTERNATIVE STRATEGIES

3.1 Community Oriented Options

Ten (10) conceivable strategic options of wastewater (graywater) management for the objective area are illustrated in the foregone chapter. From the view point of the community participation, ten (10) options were preliminary reviewed and the applicabilities of community participation have been evaluated for each phase of program implementation as shown in *Table 3.1*. Of the ten (10) options, the initial (5) options (ref. Section 2.2.1 to Section 2.2.5) have preliminary been selected to realize community participation. Those options are evaluated in this section based on the social survey conducted in the selected four (4) model areas of Losari, Parang, Pattunuang and Maradekaya Selatan / Bara-baraya Selatan.

3.1.1 Alternative strategic options

The following figure clarifies the causes of problems concerned to wasterwater management indicated by the community in the social survey and their relation to the objectives of options oriented toward community participation.



3.1.2 Community's willingness to participate in strategic options

As described in section 2.3.2, the community's willingness to participate in the sanitary program is very high in general.

The most of respondents of the survey stated their full agreement on the implementation of wastewater treatment programs such as the programs to create clean canals and to improve the water environment in the Losari Beach (Pantai Losari).

Possible contribution to the wastewater management programs by the community, as obtained from the result of interview survey in each model area, is as follows:

Model area		Losari		Parang		Pattunuang		Maradekaya selatan / Para-baraya selatan	
		Household survey	Key informant interview	Household survey	Key informant interview	Household survey	Key informant interview	Household survey	Key informant interview
Available contribution to wastewater management	money	64%	80%	44%	50%	60%	63%	38%	50%
	labor	34%	20%	46%	50%	33%	38%	53%	50%
	materials	0%	0%	0%	0%	0%	0%	1%	0%
	others*	2%	0%	10%	0%	8%	0%	8%	0%

note : others do not know or no answer

Though the possible form of community participation varied based on the socio-economic conditions of the community members, the respondents stated that they would be ready to pay or partly pay for the wastewater management program if so required by the government.

The following table shows the result of interview survey for the willingness to pay in each model area:

Model area		Losari		Parang		Pattunuang		Maradekaya selatan / Bara-baraya selatan	
		Household survey	Key informant interview	Household survey	Key informant interview	Household survey	Key informant interview	Household survey	Key informant interview
Willing to pay for wastewater program to government	will pay	56%	60%	38%	60%	38%	50%	45%	50%
	will pay partly	34%	40%	34%	20%	43%	50%	18%	25%
	will not pay	2%	0%	0%	0%	8%	0%	8%	8%
	others*	8%	0%	28%	20%	0%	0%	28%	17%

note : others do not know or no answer

Regarding the five (5) specified strategic options, the respondents in each model area showed their preferences as shown below:

Model area	Losari		Parang		Pattunuang		Maradekaya selatan / Bara-baraya selatan	
	Household survey	Key informant interview	Household survey	Key informant interview	Household survey	Key informant interview	Household survey	Key informant interview
Preferable option for community participation								
Cleansing of ditches/drains	50%	80%	34%	40%	50%	100%	57%	58%
Improvement of ditches/drains	20%	0%	22%	20%	10%	0%	25%	33%
Installation of screens	2%	10%	6%	10%	3%	0%	0%	8%
Infiltration trench (individual)	16%	0%	0%	0%	3%	0%	12%	0%
Infiltration trench (communal)	2%	10%	38%	0%	25%	0%	7%	0%
Others	10%	0%	0%	30%	10%	0%	0%	0%

note : others means other than above or no answer

The option of cleansing of ditches and drains (ref. Section 2.2.1) are mostly supported by the community in every model area.

On the other hand the preference for the installation of screens (ref. Section 2.2.2) is low. The purpose of screens is considered as to prevent animals such as rats from entering into the house and then they sometimes clog thereby interfering with the smooth flow in the ditches and drains.

The provision of household infiltration trenches would hardly be applicable in every model area except in Losari because of the lack of land availability and community's low preference. According to the survey, the available potential yard for household installation is about 16 m^2, 6 m^2 and 8 m^2 per household in average in Losari, Parang and Maradekaya / Bara-baraya Selatan, respectively. The yard of about 1m x 4m or more is required for the provision of household infiltration trench.

On the other hand the provision of communal infiltration trench is supported in the model area of Parang and Pattunuang by the community.

Typical potential sites for the communal infiltration trench in each model areas are shown in *Fig. 3.1* to *Fig. 3.5*.

At the same time, during the group meetings, the participants suggested the following actions should be undertaken by the local government to give motivation to the community, and hence to encourage their participation in wastewater management programs:

- To provide active and continuous guidance on the wastewater management programs to the community

- To properly improve the major drains and provide technical guidance for the alignment and elevation of micro drains so that the community could carry out the provision and improvement of ditches and drains
- To improve the solid waste collection system
- To impose punishment to those community members who do not observe the regulation of the wastewater management
- To conduct the campaign in order to make the people understand the importance of sanitary environment

3.1.3 Implementation

(1) Cleansing of ditches and drains

This option was mostly preferred by the community in the interview survey and the community participation is essential to realize the work.

The ditch cleansing should be organized and conducted on a regular basis, for example once in two weeks on the Clean Friday Movement, by the community. Shovels, buckets hoes and hand carts are necessary for the work.

(2) Provision or improvement of ditches and drains

The option could be carried out on a community basis with proper technical guidance.

Investment cost

Average construction cost of the ditches and drains (30cm wide x 30cm deep x 1m long) would cost about Rp 50,000 per meter:

Materials (gravel, sand and cement)	Rp 16,500
Installation	33,500
Unit construction cost per meter	Rp 50,000

The materials, such as gravel, sand and cement, can be obtained easily in the local market. Shovels, buckets, hoes and mortarboards will be necessary for construction work.

Operation and maintenance work

The operation and maintenance work is same as mentioned in the strategic option of cleansing of ditches and drains.

(3) Installation of screens in ditches and drains

The preference of the respondents was low in the social survey but this option is simple and effective referring to the causes of malfunction of ditches and drains observed in Ujung Pandang. The consensus of the community is essential and therefore should be confirmed before the installation of the screens. The system will hardly work, unless the management or organization of community is well organized.

Investment cost

The cost for the installation of a screen is about Rp 10,000 for the ditches/drains (30 cm wide x 30 cm deep) including the process works.

Materials (iron bar)	Rp 3,000
Processing work	7,000
Unit construction cost	Rp 10,000

The proper technical guidance will be required for the following processing works:

- Cutting iron bar
- Welding the iron bars; which would be done at workshop
- Bending the iron bars
- Installation

Operation and maintenance work

The operation and maintenance work for screen is very important and should be managed by community. The work is same as described for ditch cleansing.

(4) Provision of household based infiltration trench

For the provision of household infiltration trench, the availability of land for installation in household yard is the basic assumption. From the economic

point of view of the community, the provision of this option is preferable in the high and middle income residential areas.

Investment cost

The infiltration trench consists of receiving chamber (approximate size : 70 cm in diameter x 100 cm deep) and infiltration trench (approximate size : 20 cm wide x 100 cm deep x 3.5m long including pipe(approximate size : 75 mm in diameter of polyvinyl chloride (PVC) or bamboo)).

The system is designed under the following conditions,

Graywater discharge : 100 liter / person / day
Infiltration rate : 20 liter / m^2 / day
Treated wastewater : 25% of generated graywater from household

The total cost of one infiltration trench will be about Rp 200,000 ~ 250,000 including the installation work.

a. Receiving chamber

Materials (1pc of concrete pipe (70 cm in dia. x 50 cm in deep), cover plate and base concrete)	Rp 30,000
(unit price of pipe, cover plate and base concrete is about Rp 10,000)	
Digging and installation work	Rp 10,000
Installation cost of receiving chamber	Rp 40,000

b. Infiltration trench (width : 20 cm, depth : 1m)

bamboo (7m) pipe or PVC pipe(3.5m long x 75 mm in dia. with hole)	Rp 3,000 ~ 52,500
Sand, gravel and fiber	Rp 14,000
Processing and installation work	Rp 143,000
Installation cost of infiltration trench	Rp 160,000 ~ 210,000

The following process works are required:

- Digging (70 cm in diameter x 100 cm deep for receiving chamber and 20 cm wide x 3.5m long x 100 cm deep for infiltration trench)
- Installation of receiving chamber (including screen, concrete and cover)
- Installation of sand and gravel and
- Installation of Pipe (polyvinyl chloride or bamboo) with fiber

The shovel, bucket, hoe and mortarboard are necessary for installation work.
All the materials are locally available.

Operation and maintenance work

The operation and maintenance work for infiltration trench consists of two items. One is ditch and screen cleansing and another is desludging from receiving chamber once a month. The desludging shall be cooperated with the relevant municipal agency such as Dinas Kebersihan.

The shovels, buckets and hoes are also necessary for the operation and maintenance work.

(5) Graywater collection and infiltration using ditches and drains

This system depends on the same concept as the household infiltration trench but the size is different. One system will be adopted for about five (5) households.

The system is designed under the following conditions,

Graywater discharge	: liter / person / day
Infiltration rate	: 20 liter / m^2 / day
Treated wastewater	: 50% of generated graywater from household

Investment cost

The infiltration trench consists of receiving chamber approximate size : (70 cm in diameter x 100 cm deep) and infiltration trench (approximate size : 20 cm wide x 100 cm deep x 23m long with pipe (approximate size : 75 mm in diameter polyvinyl chloride or bamboo)). Cost of provision of infiltration trench for five households is about Rp 1,000,000 ~ 1,350,000, corresponding Rp 200,000 - 300,000 per one household.

a. Receiving chamber

Materials (2pcs of concrete pipe(70 cm in dia. x 100 cm in deep), cover plate and base concrete)	Rp 40,000
(unit price of pipe, cover plate and base concrete is about Rp 10,000)	
Digging and installation work	Rp 15,000
Installation cost of receiving chamber	Rp 55,000

b. Infiltration trench (width : 20 cm, depth : 1m)

bamboo (23 m) pipe or PVC pipe(23 m long x 75 mm in dia. with hole)	Rp 10,000 ~ 345,000
Sand, gravel and fiber	Rp 92,000
Processing and installation work	Rp 848,000
Installation cost of infiltration trench	Rp 950,000 ~ 1,300,000

The process work is same as described in the household infiltration trench.

Operation and maintenance work

The O/M work is same as the individual trench, but desludging from the receiving chamber shall be done twice a year. The active community participation is also required for operation and maintenance. The desludging shall be cooperated with the relevant municipal agency such as Dinas Kebersihan.

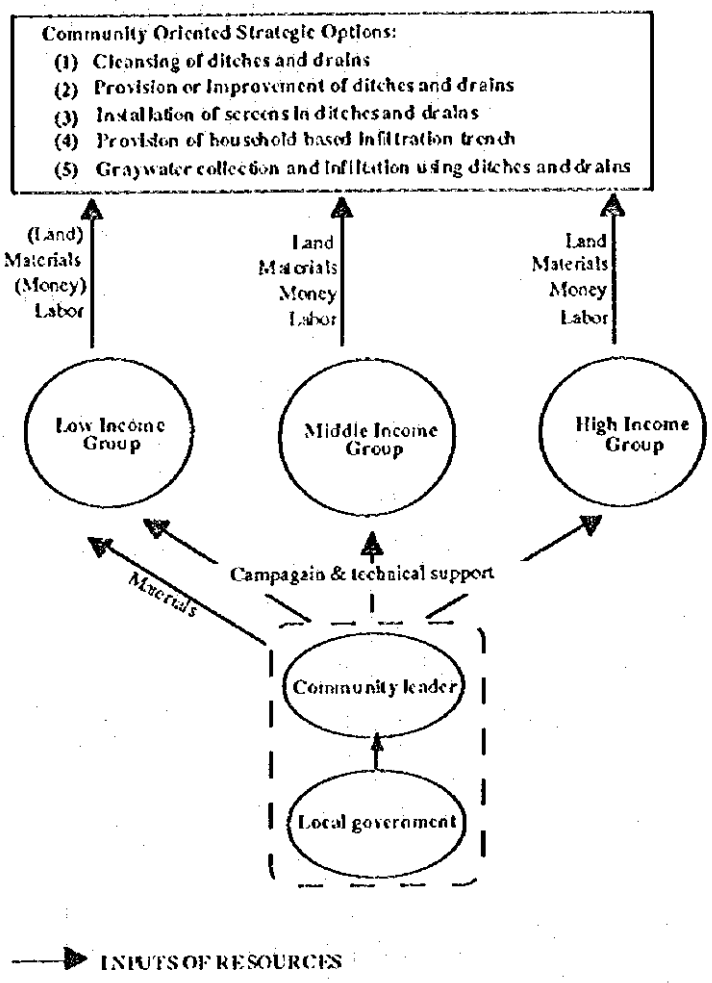
The cost which must be shared by a household is almost same as the household infiltration trench. For the installation of communal trench, the community participation is extremely required throughout the stage of planning, construction and operation and maintenance. At the same time coordination between the local government and the community is indispensable.

It could be considered that the local government will prepare the polyvinyl chloride pipes and provide them to the households who intend to install the infiltration trench as an incentive. It will encourage the community to implement the program.

3.1.4 Organization approach

(1) organization

In the CBD (community based development) approach, the resource inputs for manpower of simple work, fund for local materials and appropriate land in sanitary programs are required from the community. In the each model area, the community agreed to participate in the program in accordance with their capacity in each model area. Taking into account of the concept of the CBD approach and the results of social survey, the resource inputs for the five (5) community oriented options could be illustrated as the following flow diagram :



(2) Community building

(a) Campaign and guidance

Prior to the implementation of the strategic options, it is required to provide the proper guidance in order to encourage the community participation. Those guidance will be provided by the local government of KMUP through Kelurahan, directing the community leaders, Chief of LKMD and RW, and the NGOs .

At the same time, for enhancing the awareness of the people, the following information will periodically be transmitted to the community through printed media as well as electronic media such as radio and TV :

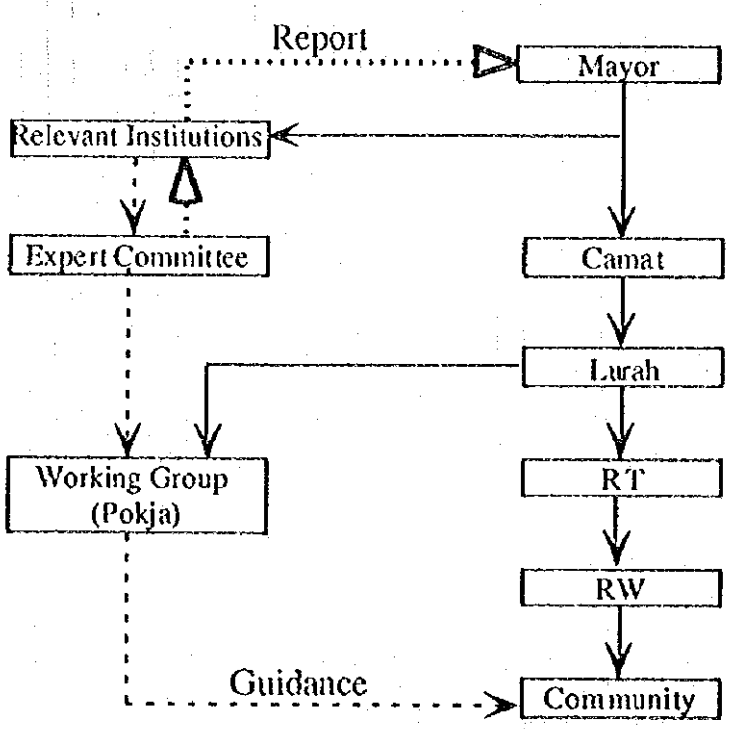
- The importance of the living environment
- The deterioration of the water environment by discharging the graywater into ditches without treatment

- Technical options for the wastewater treatment from a simple method such as the individual infiltration trench to the sophisticated piped system

(b) Social marketing

Social marketing will be provided in the selected area for the purpose of implementation of the community oriented strategic options as follows:

- Explanation on the community based program for the improvement of living environment in Ujung Pandang by the local government
- Meeting with community to explain the strategic options in detail and to confirm the commitment of the community's willingness to participate in the community oriented strategic options
- Formulation of the Working Group (Pokja) for the planning of the strategic options by the community
- Explanation and training for the effective community participation by the Working Group
- Providing technical guidance to community during the implementation stage by the local government



(3) Incentive system

In order to motivate the community participation, incentive and disincentive should also be considered.

- To provide a portion of materials especially the sophisticated ones, for the implementation of the strategic options
- To give appreciation or award to the Kelurahans that successfully manage its sanitary management
- To impose punishment to those who do not conform to the regulation on the sanitation

(4) Manuals

Among the strategic options, simplified manuals for the installation of screens and the provision of household and communal infiltration trench have been prepared and attached in the Annex.

3.2 Canal Water Improvement Program

In the foregone Chapter 2, three (3) alternative strategies, namely, provision of treatment system within canal (ref. Section 2.2.7), introduction of dilution water from Jeneberang river (ref. Section 2.2.8) and graywater conveyance and treatment system using canal (ref. Section 2.2.9) are elaborated as the conceivable means of water quality improvement for the Panampu ~ Jongaya canal, the primary canal system in the objective area.

A comparative evaluation of these three (3) alternative strategies is summarized in *Table 3.2*. This evaluation is to investigate the possibility and the relevant constraints of identifying the most suited (optimum) option among these three (3) options for canal water improvement.

The comparative evaluation is delineated below.

The most significant common feature among all these options, as could be visualized from *Fig. 2.7*, *Fig. 2.10* and *Fig. 2.13*, is the provision of three (3) gates, one each at Jongaya, Sinrijala and Panampu canals.

Intended significant usages of the gates irrespective of the option used for canal water improvement are as follows :

(1) Mitigation of salinity intrusion into the canal due to tidal effect of coastal waters, thereby contributing to the mitigation of saline water pollution of inland waters.

(2) Separation of wastewater (graywater) from being diluted with saline water, thereby contributing to the effectiveness of an applied water quality improvement method in the canals.

The above two (2) uses are in fact interrelated.

The direct construction and installation cost of each options, with the cost of the three (3) gates being added to each option, are as follows (ref. also *Table 3.2*) :

Unit : Rp. million

Option	Total direct construction cost
Provision of aerators within canal (ref. *Fig. 2.7* and Section 2.2.7)	5046
Dilution water introduction (ref. *Fig. 2.10* and Section 2.2.8)	515
Canal water conveyance and treatment (ref. *Fig. 2.13* and Section 2.2.9)	4335

It is evident from the above cost comparison, that the introduction of dilution water is the most economical one. However, it could only be a short term option, due to the constraint of the availability of water for dilution from the long storage of Jeneberang river.

Since the water supply development project of PDAM is behind schedule, on a short term basis, water may be extracted from the long storage. Accordingly, this option is useful, if the necessary facilities as shown in *Fig. 2.10* and *Fig. 2.12* are provided immediately. As pointed out in Section 2.2.8 of foregone chapter, once the water supply project of PDAM is completed there would be no water available for any other use (except water supply).

Still, the three (3) gates are useful for mitigation of salinity intrusion, a long term use, even in the absence of dilution water introduction. Accordingly, the direct cost of this option is that of the inlet facility shown in *Fig. 2.12*.

The direct construction and installation cost of inlet facility is only 85 million Rp.

Accordingly, provided it could be implemented immediately, the introduction of dilution water from Jeneberang river, could be the short term solution as the "Canal Water Improvement Program".

On the other hand, the remaining two (2) options basically involve the treatment of wastewater either within the canal (with the provision of aerators) or adjacent to the canal (stabilization pond treatment plants at Lembo and Maccini Sombala). So they could be compared more on an equity basis.

In this regard, it is evident simply from the comparison of direct construction cost as shown above (also ref. *Table 3.2*), the graywater conveyance and treatment system is more economical than the provision of treatment system (aerators) within the Panampu-Jongaya canal.

Moreover the two (2) treatment plants proposed at Lembo and Maccini Sombala are in conformity with that proposed in the Feasibility Study. Accordingly, the investment made for treatment plants is of long term.

The problems associated with the provision of aerators within the canal are many (ref. Section 2.2.7). They include, among others, potential interference with the flood run-off during the rainy season and other adverse environmental effects of aerator operation, like the potential noise and foams in the public water environment of canal (ref. *Table 3.2*).

It is worth to mention that excluding the costs of the three (3) gates and treatment plants, which could be considered as a long term investment, the total direct construction cost of the pump facilities and double canal section is about 3.0 billion Rp. The corresponding cost for aerators in Panampu-Jongaya canal, excluding the cost of three (3) gates, is about 4.6 billion Rp.

Based on the above considerations, it is concluded that on a medium term, in the absence of dilution water, the graywater conveyance and treatment system as dealt with in Section 2.2.9 (ref. *Fig. 2.13*) is absolutely the preferred one, and hence recommended as the "Canal Water Improvement Program".

3.3 Losari Beach Protection Program

The interceptor system proposed for the coastal water protection of Makassar Strait (western coastal reaches of the objective area) is illustrated in Section 2.2.10 (1) of foregone Chapter 2 (ref. *Fig. 2.14*).

Accordingly, the Central Basin that discharges directly into Losari Beach area, the tourism area, is targeted for alternative means of interceptor collection and treatment systems for which three (3) alternatives are proposed as given below (ref. *Fig. 2.15*).

Alternative a : Pipe interceptor with influent pump facilities and treatment plants (anaerobic filters) near Ferry Terminal to Kayangan and at Taman Safari Park.

Alternative b : Box type (ditch with cover) interceptor with similar pump and treatment facilities as the above Alternative a.

Alternative c : Box type interceptor in combination with anaerobic filter (No separate pump and treatment facilities)

A comparative evaluation of the three (3) alternatives, which are structural alternatives for collection and treatment of graywater, is summarized in *Table 3.3*.

The direct construction cost of each alternatives is as follows :

Unit : million Rp.

Alternative a	4,250
Alternative b	4,150
Alternative c	1,700

It is evident from the above cost comparison that the Alternative c costs less than 50% of either Alternative a or Alternative b.

Accordingly, simply from the view point of water quality improvement of Losari beach (the basic Losari beach protection program), the Alternative c could be recommended.

The above system (Alternative c) is essentially for the single purpose of Losari beach coastal water improvement. Nevertheless, a similar system, when provided with necessary modifications along the coast line of Losari beach, instead of being at inland (beneath the parapet of existing embankment for coastal protection) as per

Alternative c, then the system would become a multipurpose system for the overall protection of Losari beach.

Such significant multipurpose uses, other than the collection and treatment of graywater, of the interceptor system provided along the coast line of Losari beach would include the following :

(1) Development of promenade, above the interceptor system, as the beach front recreational and relaxation area for the residents as well as for the enhancement of commercial activities and tourism.

(2) Protection of Losari beach area from coastal erosion by utilizing the exterior wall, facing the coastal waters, of the interceptor as the base to support the necessary means to mitigate coastal erosion (armour stones and other rubble stones).

Concerned to the erosion of Losari beach, it is noted that the existing means of erosion mitigation is very unsatisfactory. Frequent caving of the existing embankment along the beach, due to coastal erosion, is very common. Such caving of embankment leads to collapsing of the parapet wall as well.

A visual image of the multipurpose interceptor system as compared with that of the single purpose one for coastal water quality improvement is shown in *Fig. 3.6*.

The direct construction cost of the multipurpose interceptor for the overall protection of Losari beach is estimated at 7.365 billion Rp. This compares with the single propose interceptor cost of 1.70 billion Rp. (Alternative c of *Table 3.3*).

Accordingly, the required additional investment for multipurpose system becomes 5.665 billion Rp. This additional investment cost may be considered as the cost for both the development of promenade and that of coastal erosion mitigation.

3.4 Interceptor Sewerage System

An alternative study (Case Study) concerning the development of interceptor sewerage system for living environment improvement, as the initial step of conventional sewerage development for the central area of the objective area, is illustrated in Section 2.2.10(2) of foregone Chapter 2 (ref. *Table 2.2*, *Fig. 2.16* to *Fig. 2.18*).

As per this case study the Alternative 3, shown in *Fig. 2.17* , was identified as the optimum one. A financial evaluation of both the Alternative 2 (ref. *Fig. 2.16*) and Alternative 3 is illustrated in this Section.

The total project cost (excluding price and physical contingencies) of Alternative 2 and Alternative 3 are, respectively, 16.222 billion Rp. and 18.267 billion Rp. (ref. *Table 2.2*).

3.4.1 Financial evaluation

Initially, as the basis of financial evaluation, marginal cost pricing and cost recovery analyses will be presented in a bid to address the concerned issue of the urgent urban sanitation measures, particularly with a bearing on affordability in the city of Ujung Pandang. The first part discusses the model framework to outline the methodology with which the analysis sequentially developed. The subsequent part presents the numerical assumptions and parameters used in analysis. The deriverable outcomes thereof are presented in the subsequent section. Also, some points of policy implication emanating from a series of analysis are summarized while focusing on the plausible measures to manage the project on a financially sound basis.

(1) Model configuration (Framework)

In general, the model configuration and the assumptive parameters applied in this section has followed what had been used in the Feasibility Study previously submitted and as such, could make it possible to directly compare the outcomes with those associated with the full-scale project scope therein.

1) Marginal costs

Marginal costs of supplying additional one unit of the sewerage services, inter alia, wastewater and septage, associated with each of the technical Alternatives are estimated applying the capital recovery factor to the financial costs which pertain to construction, recurrent costs as well as capital cost representing social discount rate. With this, cash inflows to be recovered over the projected economic life of the physical components have been allocated to each of the direct beneficiaries, vis-à-vis, households, commercial/industrial entities and public institutions with cohorts of three (low, middle, and high income groups), two (small and medium, and large business undertakings) and one in that order. (*Table 3.4*)

2) Cross subsidy

In so doing, cross subsidizing have been duly taken into consideration from the equity view point, such that proportionately higher financial burden be borne by (i) business entities for households, (ii) higher income group (referred to as R-3 in the tables attached) in lieu of lower income group (R-1), and (iii) large business undertakings (BE-2) in place of small and medium scale business entities (BE-1). The middle income group and public entities are to appropriate the financial burden in proportion to each of benefit shares. For the details, see the Feasibility Study Report (Chapter 5 of Part II, Main Report) and *Table 3.5* , *Table 3.6*.

3) Affordability (Willingness to pay)

Given that services be provided to each category of the direct beneficiaries regardless of their actual disposition of wastes, the "indicative tariff" or *Harga Popok* will simply indicates a cost-related benchmark while being defined as total cash-inflow requirement (or "*revenue*") divided by the unit of beneficiaries. With this and "willingness to pay", or people's perceptive "bid prices" at the highest level for interceptor and septage services, as a mark-up expenditure level for direct beneficiaries, normative value judgment will be made as to whether the proposed technical scheme shift people's welfare level upwards under the binding financial constraint.

(2) Numerical assumptions and parameters applied

1) Marginal costs

For the financial costs of $8.8 million (Rp.19.8 billion equivalent as per 1995 price and quotation) and $9.8 million (Rp.22.05 billion), the marginal costs (levelized annuity costs of construction and maintenance) of an incremental unit of sanitation services, inter alia, interceptor and septage, are estimated at $1.1 million (Rp.2.45 billion) and $1.2 million (Rp2.70 billion)for technical Alternative 2 and 3, respectively. Capital Recovery factor to annuitize the capital investment costs is 0.1175 with the social discount rate of 10 percent and 20 years of economic life. (*Table 3.4*)

2) Cost recovery

Of the direct beneficiaries comprising households, business entities and public entities, each of the sample cohorts in the project area are classified by the number of households and floor areas with the total population of 131,000, and 367,126 and 58,115 square kilometers, in that order. The conversion parameter for population to household is 1 (one) over 5.5. Disaggregating these first-order categories of beneficiaries, income groups of lower, middle, and higher account for 45 percent, 35 percent and 20 percent for households.[1] Small/medium and large scale business entities account for 50 percent, 9 percent, respectively, while public entities being added with the residual 41 percent. (*Table 3.5*)

Provided that financial burden is allocated among the beneficiary groups, cost shares attached to those first-order cohorts are 50 percent, 30 percent and 20 percent for households, business entities and public entities, respectively. In line with this, each of the second-order clusters will bear the burden with 10 percent (R-1), 18 percent (R-2), 22 percent (R-3), 18 percent (BE-1), 12 percent (BE-2) and 20 percent (PE) in the ascending order of income level and business size. (*Table 3.6*)

Marginal costs with a bearing on full cost recovery by each of the second-order clusters, to the highest extent, are about Rp.2,400 (R-1), Rp.5,400 (R-2), and Rp.12,000 (R-3) per month for households cohorts, Rp.150 (BE-1), Rp.570 (BE-2), and Rp.210 (PE) per square per month for institutions. (*Table 3.7*)

3) Household income and revenue

The weighed average annual income for household and business entities in the city of Ujung Pandang are estimated at Rp.3.03 million (about $1,300), or Rp.252,500 per month, and Rp.118.67 million (rounded at $52,700), or Rp.9,890,000 per month, respectively. The average monthly incomes for each of the second-order household cohorts are presumably set at Rp.180,000, 380,000 and Rp.800,000 for the lower, middle and higher income groups, respectively.

[1]The income distribution of the city residents highly deviated with the positive skewness of 1.8.

Perception of residents and managers/business owners regarding their income/revenue turned out to be remarkably higher in the area projected in this alternative study. Nonetheless, those higher estimates of income/revenue have not been incorporated in the current analysis. (*Table 3.8*)

4) Willingness to pay (WTP)

As noted in the Mater Plan Report (Chapter 3 of Part I, Main Report), the maximum amount of willingness to pay (WTP) for the prospective urban sanitation services is again revealed in terms of the percentage of beneficiary's income/revenue. Currently, 1.0 percent, 0.75 percent totaling to a number of 1.75 percent of their cash/asset inflow are assumed to be the benchmark parameters for WTP associated with interceptor and septage management services.[2] Specifically, Rp.2,520, Rp.5,320 and Rp.11,200 per month have been figured out for lower, middle and higher income groups of households. (*Table 3.9, Table 3.10*)

3.4.2 Results of evaluation

(1) General

As compared with a mark-up price level to pay for the services (beneficiary's willingness to pay, WTP), both technical Alternatives sequentially reveal people's affordability as well as financial sustainability with all the cost shares ("indicative tariffs") rest below (Alternative 2) and/or near the neighborhood (Alternative 3) of WTP. While the tariffs charged against the middle and higher income groups slightly outnumber the figured-out-WTP in the case of Alternative 3, this will do when the relatively higher average income presumed for residents in the central city area being considered.

For the business entities in the target area, the monthly average "tariff" weighed by floor area is Rp.189.5 and Rp.211.0 per square meter for Alternative 2 and 3, respectively. With this and the weighed average WTP for consolidated sanitation services amounting at Rp.97,600 per month, the maximum average floor area for business entity to willingly pay for is 515 and 462 sq. meters reflecting the technical Alternatives of 2 and 3,

[2]The past experiences of the international lending institutions in the urban sanitation sector investment in Indonesia revealed that about 1-3 percent of household income be acceptable for lower income groups(20th-40th percentile income groups). Also see *BAPPENAS* and *UNDP* referred to in *Master Plan* p.3-15.

respectively. Provided that the actual average floor area of business entities in the projected area be less than those, it would most likely be possible to accept the proposed schemes as financially affordable. (*Table 3.7, Table 3.8 Table 3.9 Table 3.10*)

As for the city government, there will be schematically four Alternatives to finance the project, inter alia, (i)city budget, (ii) external borrowing, (iii) full cost recovery by direct beneficiaries, and (iv) private sector participation. Intuitive reasonings and favorable rationales for the city government to implement the urgent sanitation measures with bearing on each of the Alternatives above would be given in that order as follows.

1) Given that the annual disbursement of investment outlays in the first three years be $1.0 million (Rp.2,250 million), $2.8 million (Rp.6,322 million) and $1.68 million (Rp.3,780 million) in real term, these expenditures account for 2.7 percent, 7.8 percent, and 2.1 percent of the city revenue as per 1995 level, thereby making it possible for the city to finance from part of their forthcoming development budgets;

2) Debt service ratio (DSR) is a proxy index commonly used for sound environment of public finance, with a 25 percent level as a critical cut-off point. While the current DSR in the city stands at around 6.0 percent in 1995, a total commitment by the city to entirely finance on external borrowing would raise DSR by 0.2 percent to a little bit less than 1 percent, depending on what variable (APBD II or PAD) be taken as a denominator;

3) As noted in the preceding two paragraphs, economic agents directly involved in the project scope, namely households, business and public entities in the area could afford the project with their current income/revenues, while expenditures be commenced in tandem with the first investment outflows and take place for 20 years;

4) On the managerial and commercial front the private sector would be interested in undertaking the projected sanitation services as business, given that the real return on capital attributable to the project outnumbers, to a certain extent, the presumably estimated 8-10 percent return. By estimate of the study team, real return remarkably worked out to 15.1 percent and 15.0 percent for the Alternative 2 and 3 respectively, should the city government grant subsidiary fund to the

business entity involved as part of cost recovery during the initial three years (construction period). As seen in *Table 3.4*, the annual cost recovery (marginal cost per annum) amounts $ 1.1 million (around Rp. 2.5 billion) and $ 1.2 million (about Rp. 2.8 billion) respectively for Alternative 2 and 3, while those accounting for about 1.4 percent of the aggregate revenue of the city as per 1995 level. Further, it would be favorably commendable for the city government to accord certain level of policy measures in a bid to encourage private sector investments, thereby fostering the environment conductive to financial soundness of entities involved (*Table 3.11, Table 3.12*).

Meanwhile, disagregating the consolidated WTP for the interceptor and septage services reveals that a proportionately larger chunk of that WTP emanates from the septage sub-component with 43 percent as against the actual 7.5 percentage cost share. (*Table 3.4, Table 3.9*)

(2) Policy implication

1) Integrated urban sanitation services

As noted above, the share of cost recovery associated with septage service unproportionately responds to the share of actual costs accrued, thereby implying heavy cross-subsidizing from septage to the interceptor segment. With this in view, combined with managerial efficiency in tariff collection at each of the end-beneficiaries level, the sanitation services concerned should be integrated and offered together by one unit of business undertaking so that the financial sustainability of the project be ensured.

2) Collection system

It would be noted the urban sanitation service undertaking concerned would have to make a concerted efforts in improving the tariff collection system on the lines implied by efficiency and equity, unless otherwise no tangible success in managing the institution on financially sound basis could be realized, irrespective of how meticulously and constructively the tariff structure and level have been prepared.