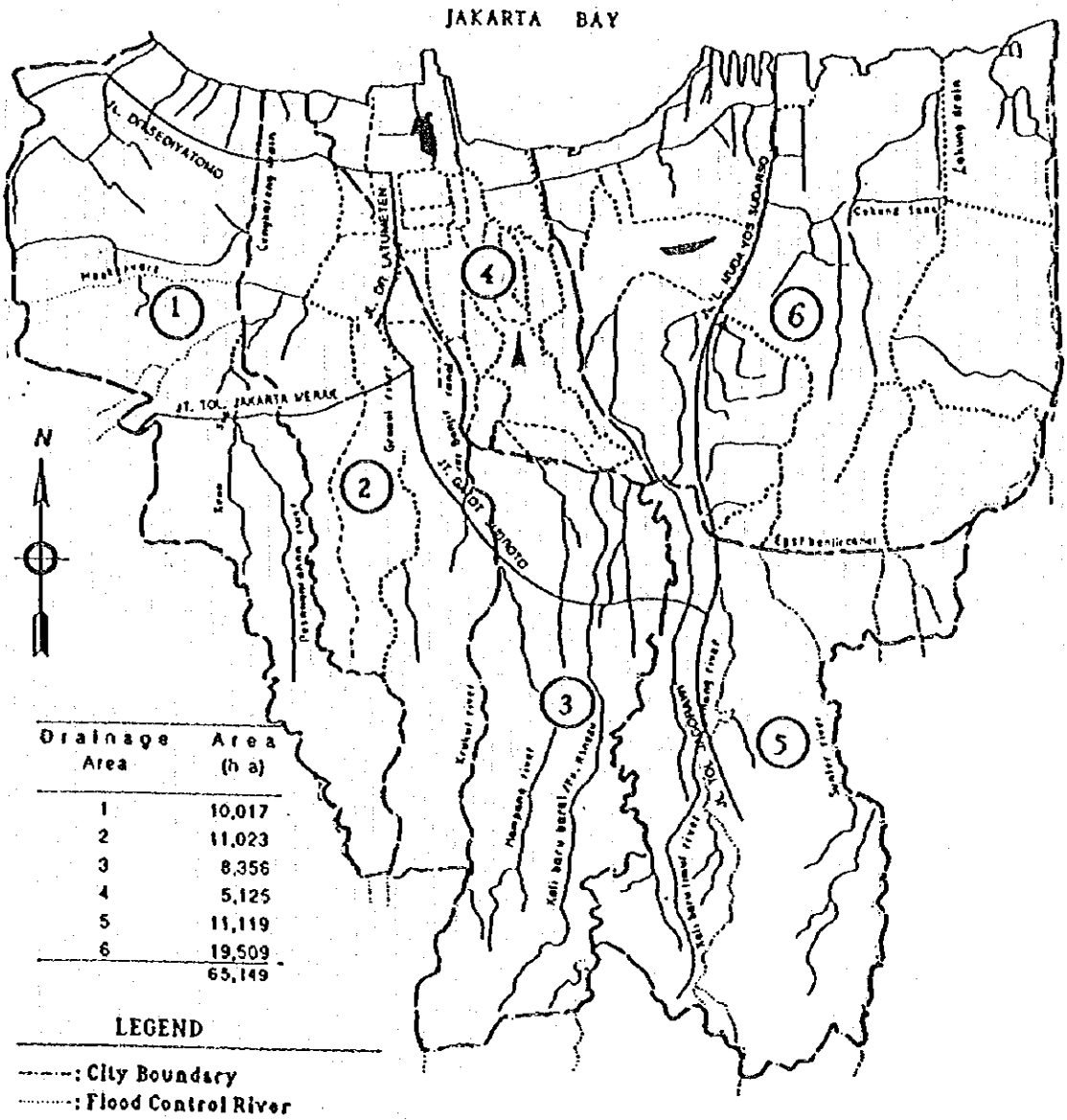
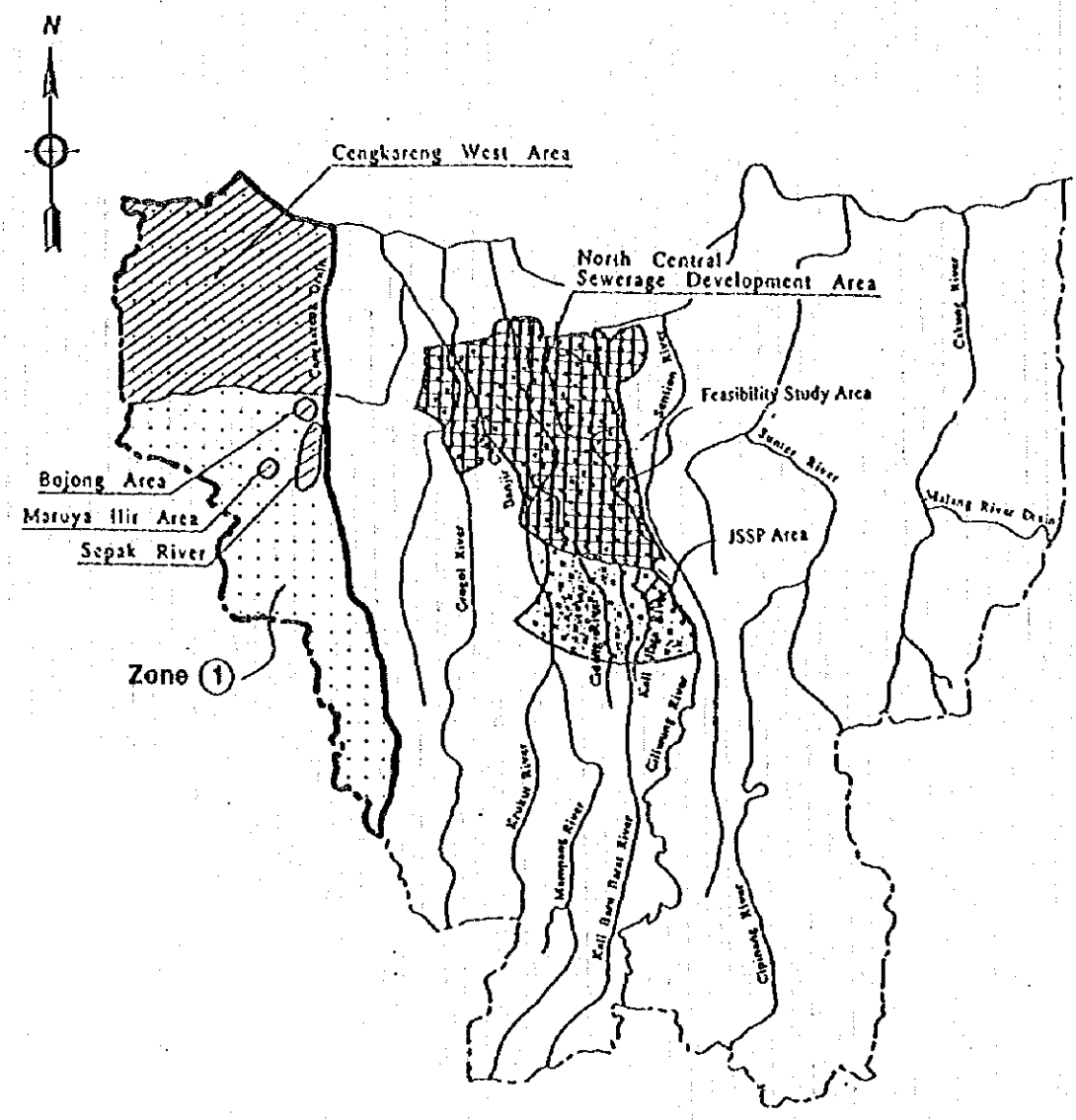


Source : The Study on Urban Drainage and Waste Water Disposal Project in the City of Jakarta JICA, March 1991

Figure 7 DIVIDED DRAINAGE ZONE IN DKI JAKARTA(PREVIOUS JICA STUDY)



LEGEND

: Priority Area of Drainage Development (Drainage Zone No.1)

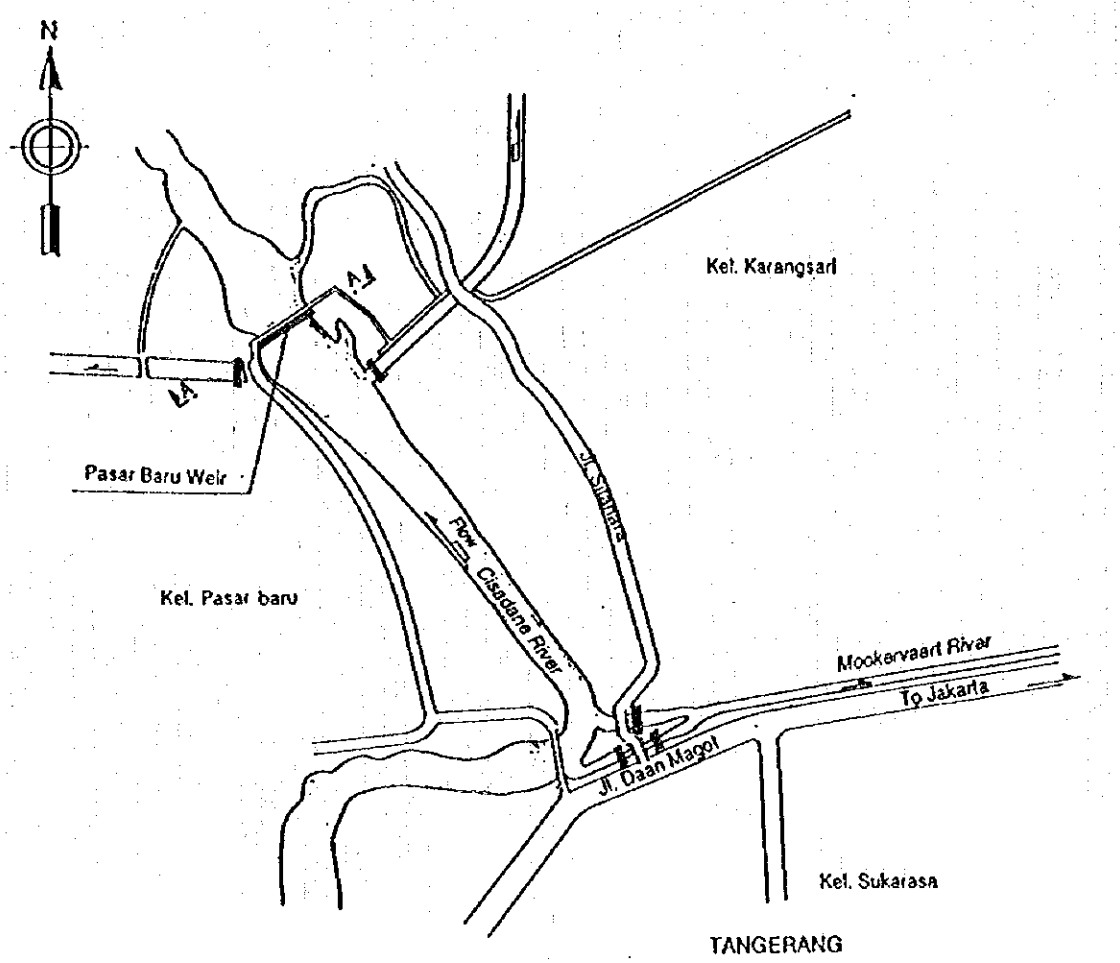
: Project Area of Drainage Development

: Priority Area of Sewerage Development (Central Sewerage Zone)

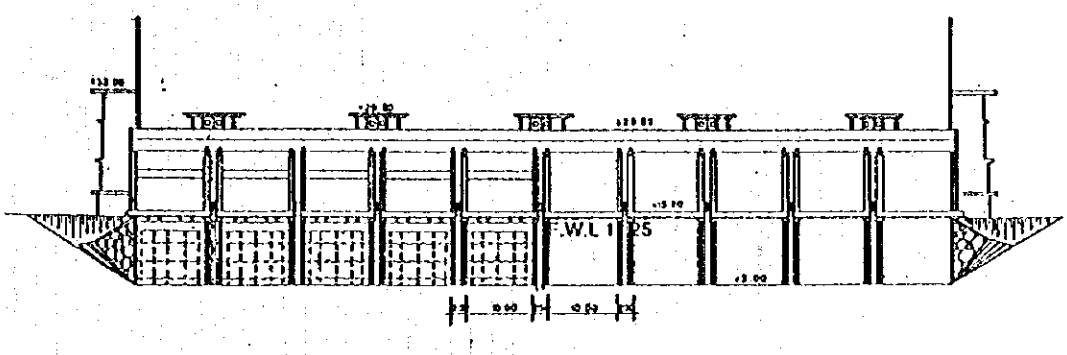
: Project Area of Sewerage Development

Source : The Study on Urban Drainage and Waste Water Disposal Project in the City of Jakarta JICA, March 1991

Figure 8 PROPOSED URBAN DRAINAGE AND SEWERAGE DEVELOPMENT PLAN IN PREVIOUS JICA STUDY

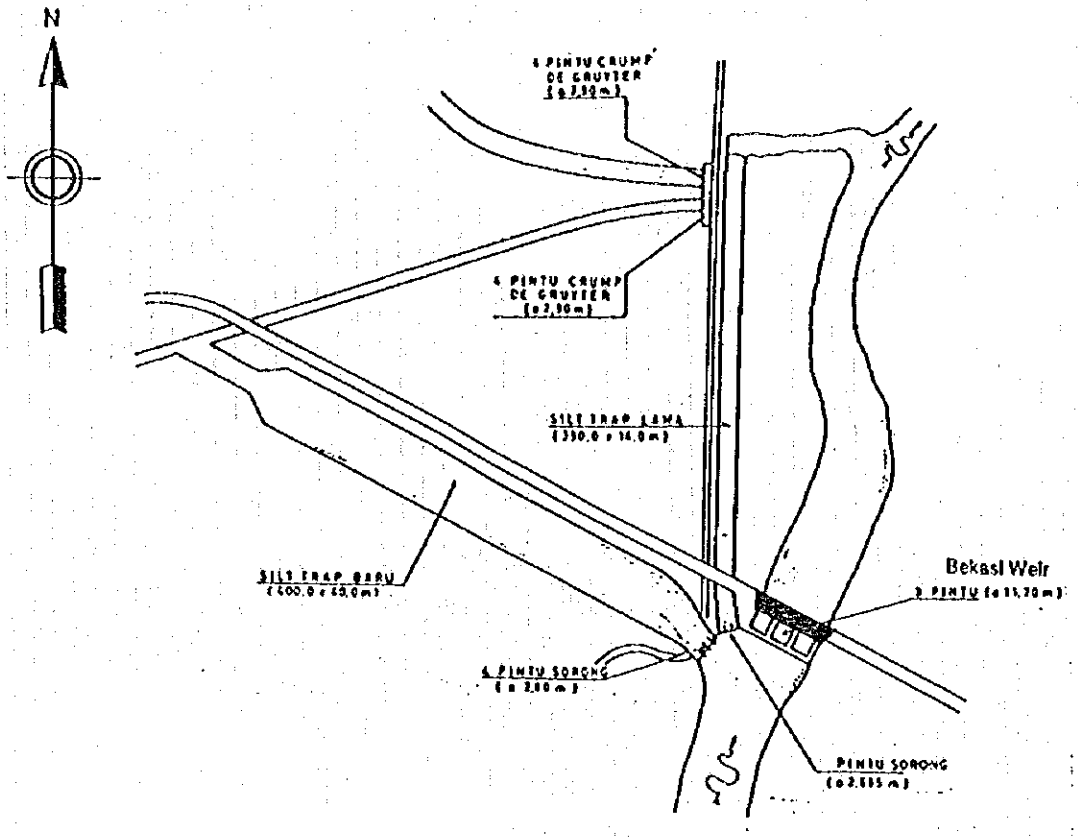


Plan

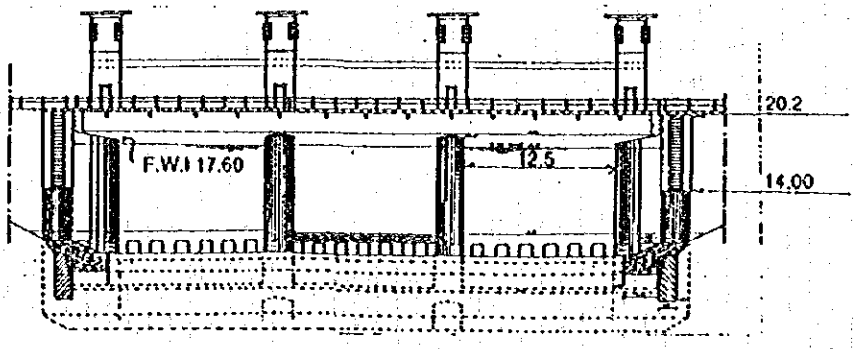


Elevation

Figure 9 PASAR BARU BARRAGE

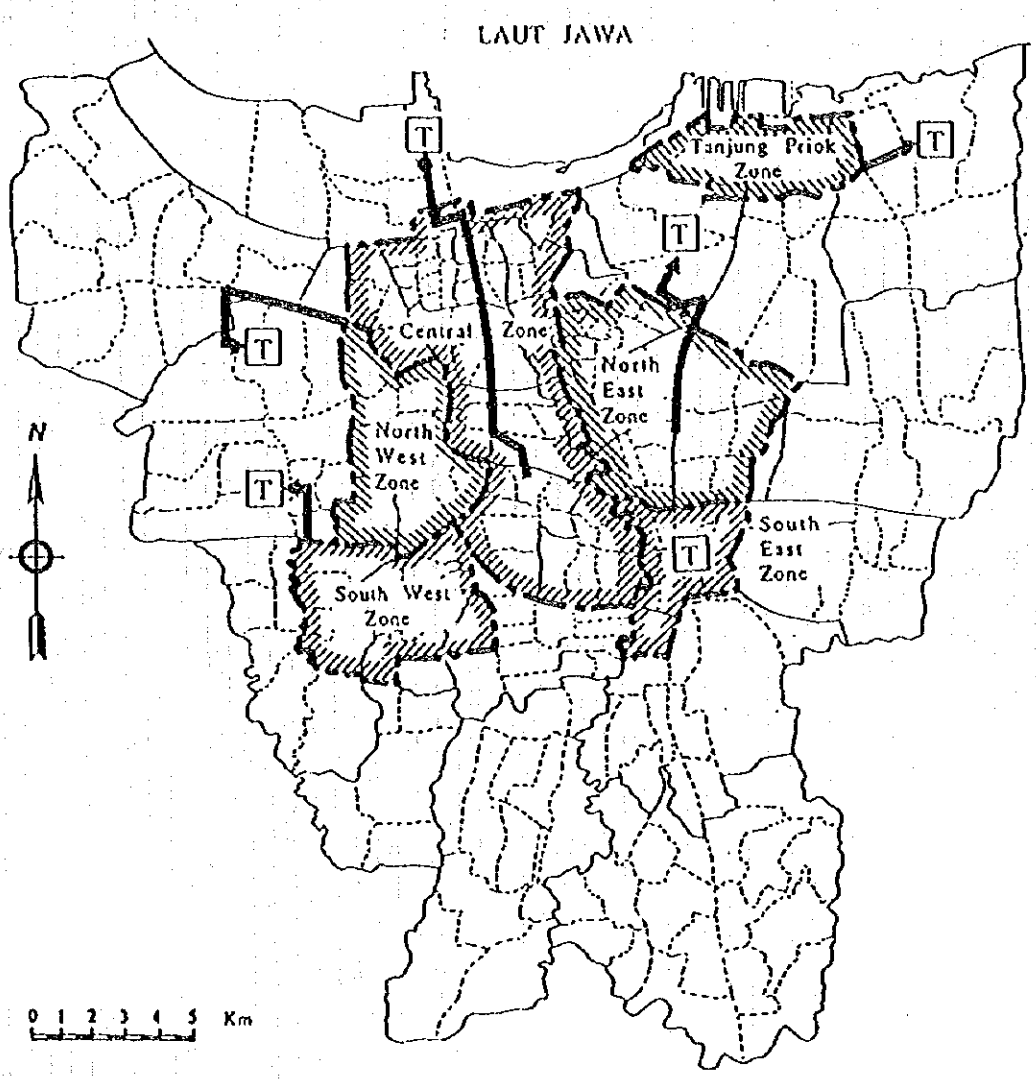


Plan



Elevation

Figure 10 . BEKASI GATED WEIR

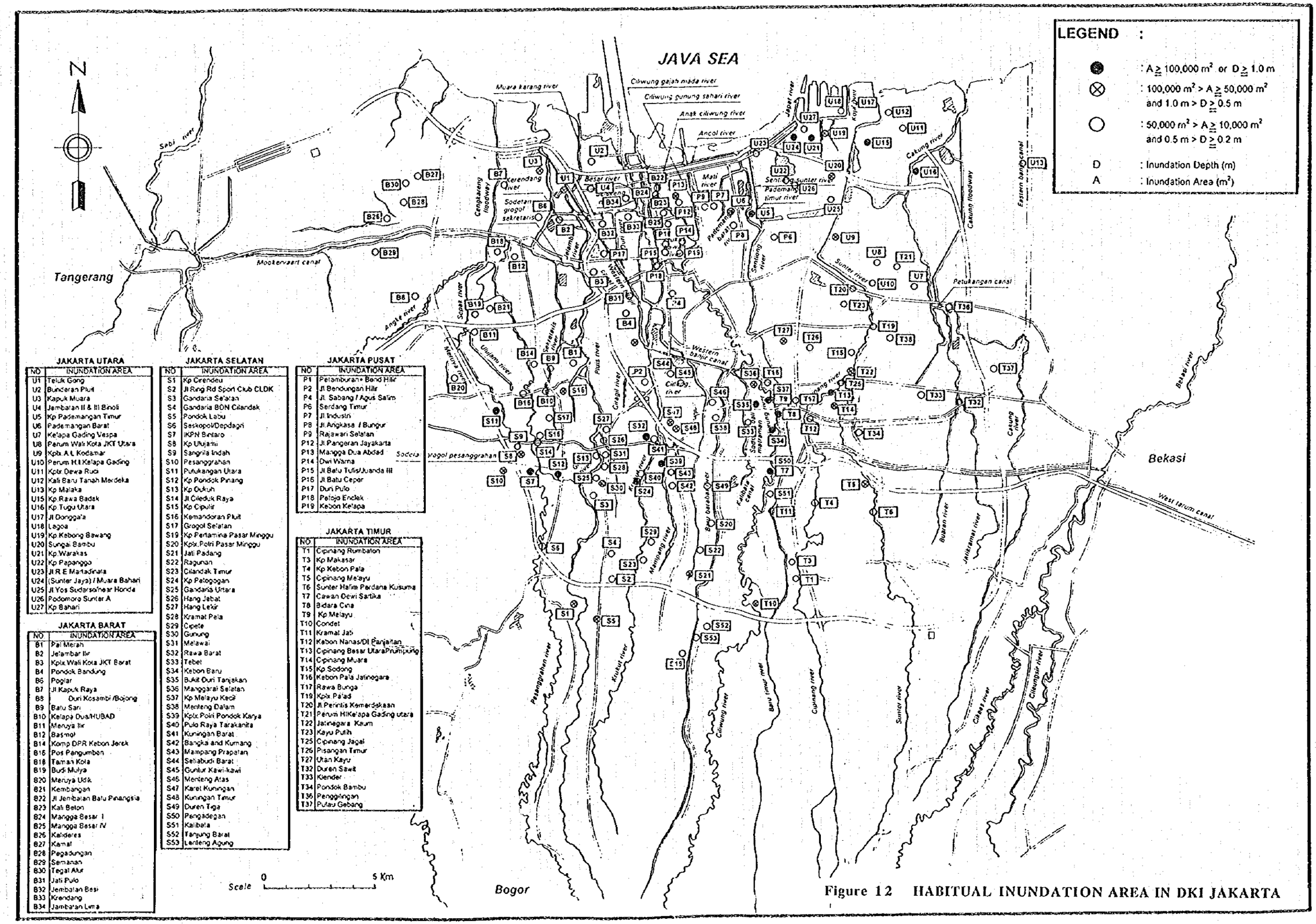


Source : The Study on Urban Drainage and Waste Water Disposal Project in the City of Jakarta JICA, March 1991

LEGEND

——— : Wilayah Boundary
—·—·— : Kecamatan Boundary
- - - - - - : Kelurahan Boundary
—— ● —— : Boundary of Sewerage Development Zone
➡ : Conveyance Sewer Line
[T] : Sewerage Treatment Plant

Figure 11 SEWERAGE DEVELOPMENT SYSTEM PROPOSED IN PREVIOUS JICA MASTER PLAN



JAKARTA UTARA

NO	INUNDATION AREA
U1	Teluk Gong
U2	Bunderan Pluit
U3	Kapuk Muara
U4	Jembatan II & III Bandi
U5	Kp Pademangan Timur
U6	Pademangan Barat
U7	Kelapa Gading Vespa
U8	Perum Wali Kota JKT Utara
U9	Kpbr A.L Kodamar
U10	Perum H.I Kelapa Gading
U11	Kpbr Dewa Ruci
U12	Kali Baru Tanah Merdeka
U13	Kp Malaka
U15	Kp Rawa Badak
U16	Kp Tugu Utara
U17	Jl Dongga'a
U18	Lagoa
U19	Kp Kebong Bawang
U20	Sungai Bambu
U21	Kp Warakas
U22	Kp Papanggo
U23	Jl R E Martadinata
U24	(Sunter Jaya) / Muara Bahari
U25	Jl Yos Sudarso/near Honda
U26	Podomoro Sunter A
U27	Kp Bahari

JAKARTA BARAT

NO	INUNDATION AREA
B1	Pal Merah
B2	Jelambar Ilir
B3	Kpbr.Wali Kota JKT Barat
B4	Pondok Bandung
B6	Poglar
B7	Jl Kapuk Raya
B8	Duri Kosambi /Bojong
B9	Batu Sari
B10	Kelapa Dua/HUBAD
B11	Meruya Ilir
B12	Basmol
B14	Komp DPR Kebon Jerok
B16	Pos Pengumbon
B18	Taman Kota
B19	Budi Mulya
B20	Meruya Udik
B21	Kembangan
B22	Jl Jembatan Batu Penangsia
B23	Kali Beton
B24	Mangga Besar I
B25	Mangga Besar IV
B26	Kalideres
B27	Kamal
B28	Pegadungan
B29	Semanan
B30	Tegal Alur
B31	Jati Pulo
B32	Jembatan Besi
B33	Krendang
B34	Jambatan Lima

JAKARTA SELATAN

NO	INUNDATION AREA
S1	Kp Cirendeu
S2	Jl.Ring Rd Sport Club CLDK
S3	Gandaria Selatan
S4	Gandaria BDN Cilandak
S5	Pondok Labu
S6	Seskopol/Depdagri
S7	IKPN Bintaro
S8	Kp Ulujami
S9	Sangrila Indah
S10	Pesanggrahan
S11	Pulukangan Utara
S12	Kp Pondok Pinang
S13	Kp Gukuh
S14	Jl Cileduk Raya
S15	Kp Cipulir
S16	Kemandoran Pluit
S17	Grogol Selatan
S19	Kp Pertamina Pasar Minggu
S20	Kpbr.Polri Pasar Minggu
S21	Jati Padang
S22	Ragunan
S23	Cilandak Timur
S24	Kp Petogogan
S25	Gandaria Utara
S26	Hang Jebat
S27	Hang Lekir
S28	Kramat Pela
S29	Cipete
S30	Gunung
S31	Melawai
S32	Rawa Barat
S33	Tebet
S34	Kebon Baru
S35	Bukit Duri Tanjakan
S36	Manggarai Selatan
S37	Kp Melayu Kecil
S38	Menteng Dalam
S39	Kpbr Polri Pondok Karya
S40	Pulo Raya Tarakanita
S41	Kuningan Barat
S42	Bangka and Kumang
S43	Mampang Prapatan
S44	Setiabudi Barat
S45	Guntur Kawi-kawi
S46	Menteng Atas
S47	Karet Kuningan
S48	Kuningan Timur
S49	Duren Tiga
S50	Pengadegan
S51	Kalibata
S52	Tanjung Barat
S53	Lenteng Agung

JAKARTA PUSAT

NO	INUNDATION AREA
P1	Petamburan+ Bend Hilir
P2	Jl Bendungan Hilir
P4	Jl. Sabang / Agus Salim
P6	Serdang Timur
P7	Jl Industri
P8	Jl Angkasa / Bungur
P9	Rajawari Selatan
P12	Jl Pangeran Jayakarta
P13	Mangga Dua Abdad
P14	Dwi Warna
P15	Jl Batu Tulis/Juanda III
P16	Jl Batu Ceper
P17	Duri Pulo
P18	Petojo Enclek
P19	Kebon Kelapa

JAKARTA TIMUR

NO	INUNDATION AREA
T1	Cipinang Rumbaton
T3	Kp Makassar
T4	Kp Kebon Pala
T5	Cipinang Melayu
T6	Sunter Halim Perdana Kusuma
T7	Cawan Dewi Sartika
T8	Bidara Cina
T9	Kp Melayu
T10	Condet
T11	Kramat Jati
T12	Kebon Nanas/Dl Panjaitan
T13	Cipinang Besar Utara/Prumpung
T14	Cipinang Muara
T15	Kp Sodong
T16	Kebon Pala Jatinegara
T17	Rawa Bunga
T19	Kpbr Palad
T20	Jl Perintis Kemerdekaan
T21	Perum HIKelapa Gading utara
T22	Jatinegara Kaum
T23	Kayu Putih
T25	Cipinang Jagal
T26	Pisangan Timur
T27	Utan Kayu
T32	Duren Sawit
T33	Klender
T34	Pondok Bambu
T36	Penggilingan
T37	Pulau Gebang

Figure 12 HABITUAL INUNDATION AREA IN DKI JAKARTA

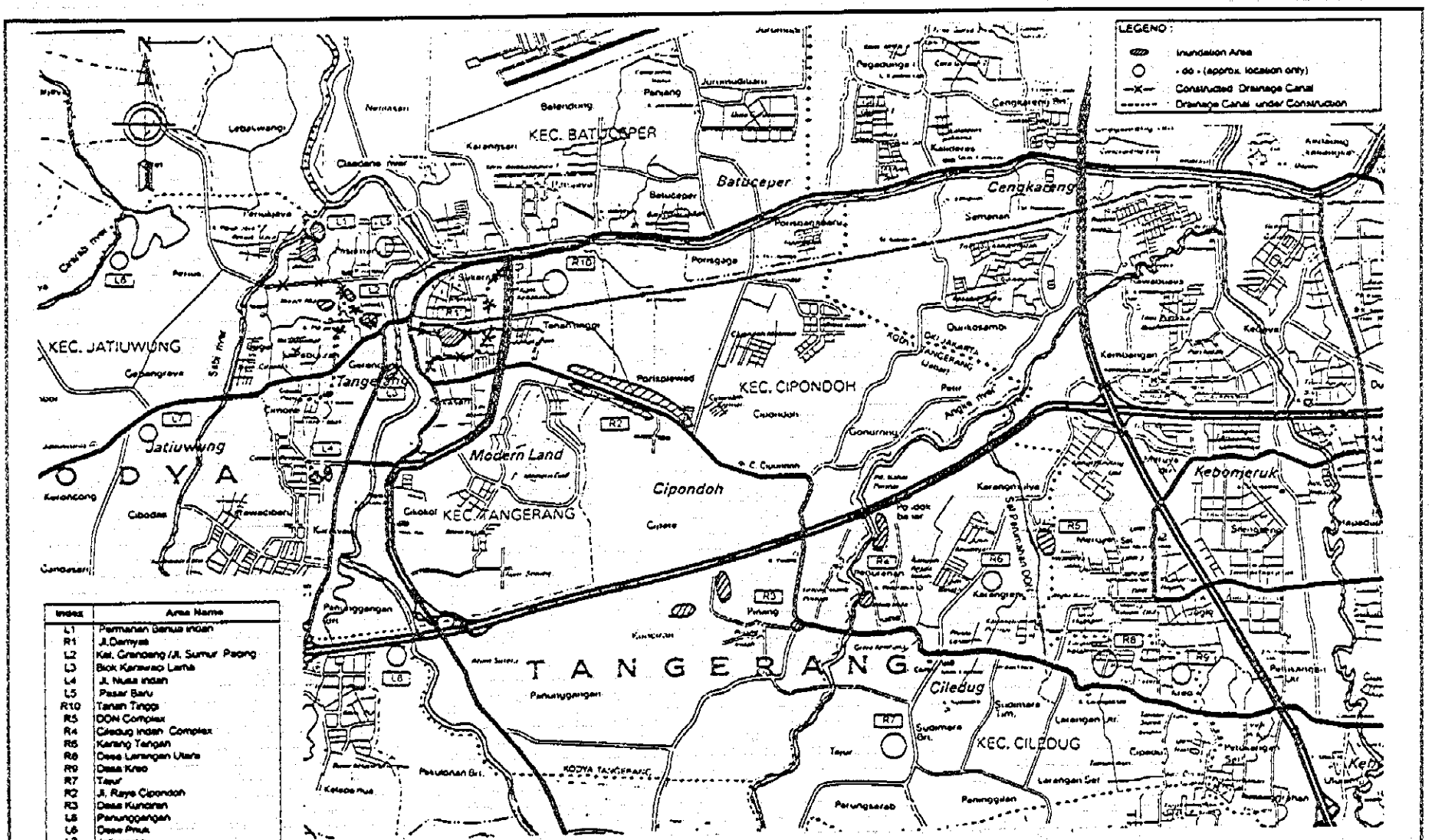
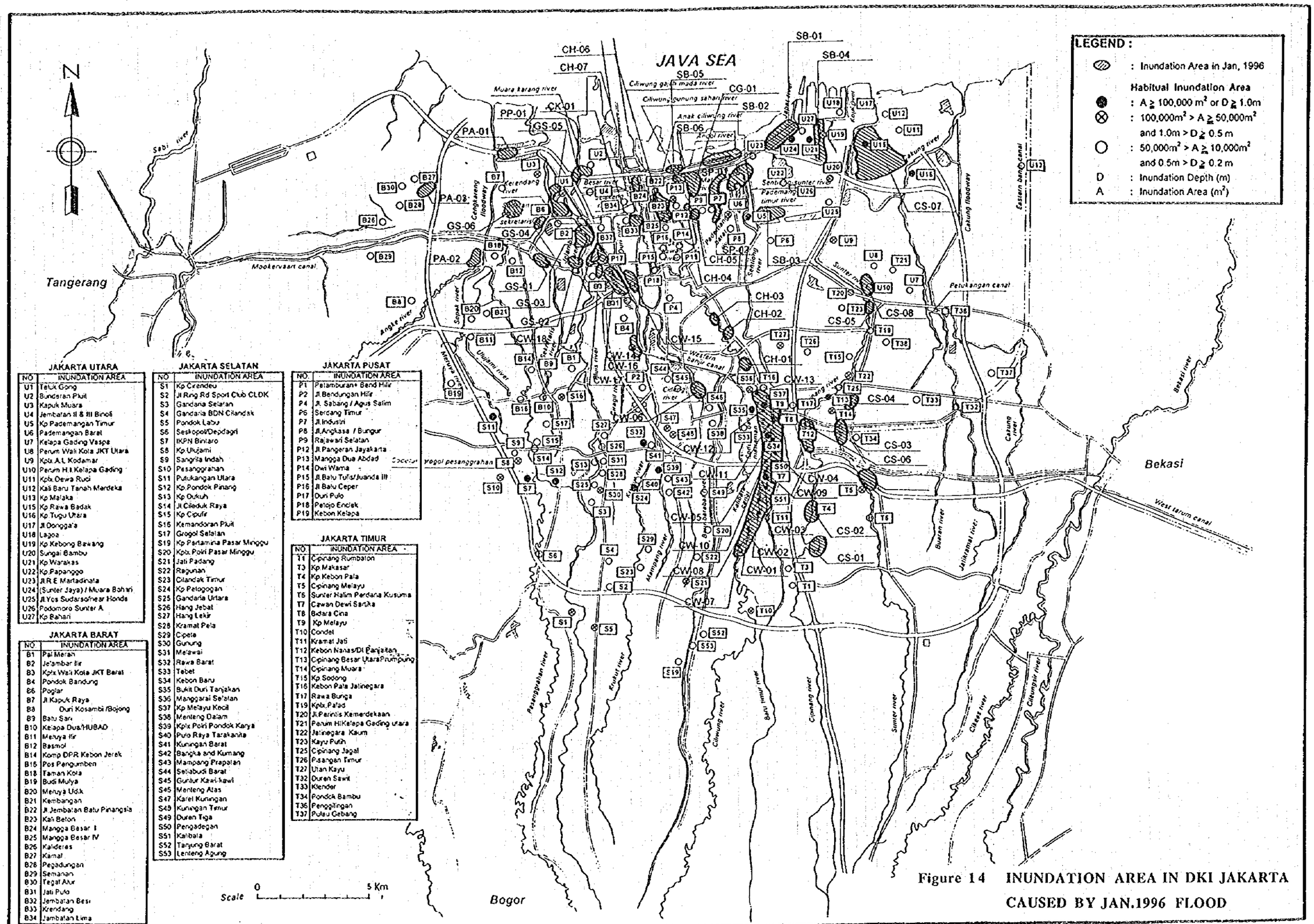


Figure 13 HABITUAL INUNDATION AREA IN TANGERANG CITY



JAKARTA UTARA

NO	INUNDATION AREA
U1	Teluk Gong
U2	Bunderan Pluit
U3	Kapuk Muara
U4	Jembatan II & III Binos
U5	Kp Pademangan Timur
U6	Pademangan Barat
U7	Kelapa Gading Vaspa
U8	Perum Wali Kota JKT Utara
U9	Kpk.A.L Kodamar
U10	Perum H.I.Kelapa Gading
U11	Kpk.Dewa Ruci
U12	Kali Baru Tanah Merdeka
U13	Kp Malaka
U15	Kp Rawa Badak
U16	Kp Tugu Utara
U17	Jl Dongga'a
U18	Lagoa
U19	Kp Kebong Bawang
U20	Sungai Bambu
U21	Kp Warakas
U22	Kp Papanggo
U23	Jl.R.E Martadinata
U24	(Sunter Jaya) / Muara Bahari
U25	Jl.Yos Sudarso/near Honda
U26	Podomoro Sunter A
U27	Kp Bahari

JAKARTA BARAT

NO	INUNDATION AREA
B1	Pal Merah
B2	Jembatan tiir
B3	Kpk.Wali Kota JKT Barat
B4	Pondok Bandung
B6	Poglar
B7	Jl.Kapuk Raya
B8	Duri Kosambi /Bojong
B9	Batu Sari
B10	Kelapa Dua/HUBAD
B11	Meruya tiir
B12	Basmol
B14	Komp DPR Kebon Jerek
B15	Pos Pengumben
B18	Taman Kota
B19	Budi Mulya
B20	Meruya Udik
B21	Kembangan
B22	Jl.Jembatan Batu Pinangsia
B23	Kali Beton
B24	Mangga Besar I
B25	Mangga Besar IV
B26	Kalideres
B27	Kamal
B28	Pegadungan
B29	Semanan
B30	Tegal Alur
B31	Jati Pulo
B32	Jembatan Besi
B33	Krendang
B34	Jambatan Lima

JAKARTA SELATAN

NO	INUNDATION AREA
S1	Kp Crendeu
S2	Jl.Ring Rd Sport Club CLDK
S3	Gandaria Selatan
S4	Gandaria BDN Chandak
S5	Pondok Labu
S6	Seskopol/Depdagri
S7	IKPN Bintaro
S8	Kp.Ulujami
S9	Sangrila Indah
S10	Pesanggrahan
S11	Pulukangan Utara
S12	Kp.Pondok Pinang
S13	Kp Outkuh
S14	Jl.Cileduk Raya
S15	Kp Cipulir
S16	Kemandoran Pluit
S17	Grogol Selatan
S19	Kp Pertamina Pasar Minggu
S20	Kpk.Polri Pasar Minggu
S21	Jati Padang
S22	Ragunan
S23	Cilandak Timur
S24	Kp Petogogan
S25	Gandaria Urtara
S26	Hang Jebat
S27	Hang Lekir
S28	Kramat Pela
S29	Cipete
S30	Gunung
S31	Melawai
S32	Rawa Barat
S33	Tebet
S34	Kebon Baru
S35	Bukit Duri Tanjakan
S36	Manggarai Selatan
S37	Kp Melayu Kecil
S38	Menteng Dalam
S39	Kpk Polri Pondok Karya
S40	Pulo Raya Tarakanita
S41	Kuningan Barat
S42	Bangka and Kumang
S43	Mampang Prapatan
S44	Setiabudi Barat
S45	Guntur Kawi-kawi
S46	Menteng Atas
S47	Karet Kuningan
S49	Kuningan Timur
S49	Duren Tiga
S50	Pengadegan
S51	Kalibata
S52	Tanjung Barat
S53	Lenteng Agung

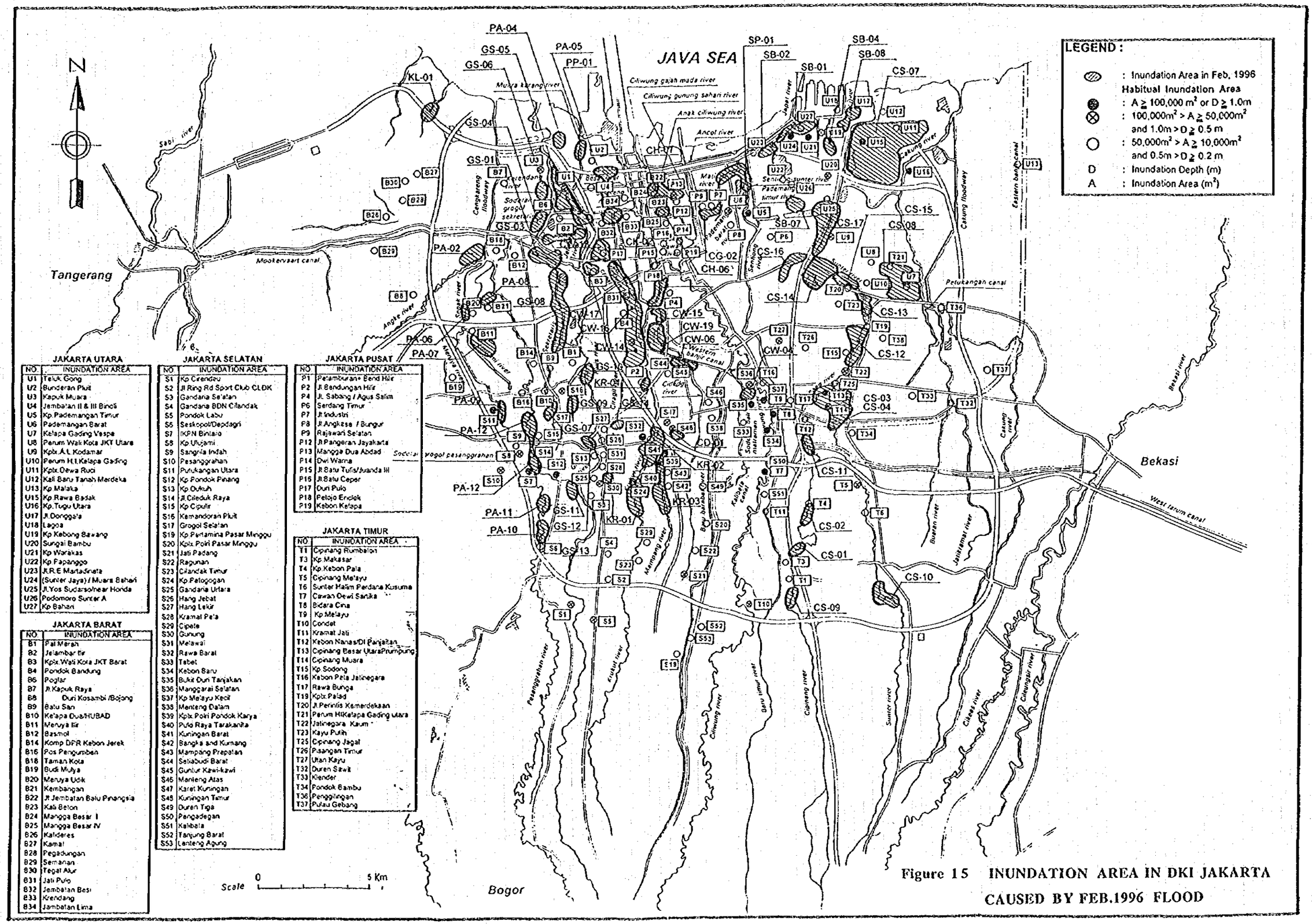
JAKARTA PUSAT

NO.	INUNDATION AREA
P1	Pelamburan+ Bend Hilir
P2	Jl.Bendungan Hilir
P4	Jl. Sabang / Agus Salim
P5	Sercang Timur
P7	Jl.Industri
P8	Jl.Angkasa / Bungur
P9	Rajawari Selatan
P12	Jl.Pangeran Jayakarta
P13	Mangga Dua Abdad
P14	Dwi Warna
P15	Jl.Balu Tufis/Juanda III
P16	Jl.Balu Ceper
P17	Duri Pulo
P18	Petojo Enclek
P19	Kebon Kelapa

JAKARTA TIMUR

NO	INUNDATION AREA
T1	Cipinang Rumbalon
T3	Kp.Makasar
T4	Kp.Kebon Pala
T5	Cipinang Melayu
T6	Sunter Kalim Perdana Kusuma
T7	Cawan Dewi Sartika
T8	Bidara Cina
T9	Kp Melayu
T10	Condet
T11	Kramat Jati
T12	Kebon Nanas/Dt Panjaitan
T13	Cipinang Besar Utara/Prumpung
T14	Cipinang Muara
T15	Kp Sodong
T16	Kebon Pala Jatinegara
T17	Rawa Bunga
T19	Kpk.Palad
T20	Jl.Perintis Kemerdekaan
T21	Perum HIKelapa Gading utara
T22	Jatinegara Kaum
T23	Kayu Putih
T25	Cipinang Jagal
T26	Pisangan Timur
T27	Utan Kayu
T32	Duren Sawit
T33	Klender
T34	Pondok Bambu
T36	Penggilingan
T37	Pulau Gebang

Figure 14 INUNDATION AREA IN DKI JAKARTA CAUSED BY JAN.1996 FLOOD



JAKARTA UTARA

NO	INUNDATION AREA
U1	Teluk Gong
U2	Bunderan Pluit
U3	Kapuk Muara
U4	Jembatan II & III Binoli
U5	Kp.Pademangan Timur
U6	Pademangan Barat
U7	Kelapa Gading Vespa
U8	Perum Wali Kota JKT Utara
U9	Kpb.A.L Kodamar
U10	Perum H.I.Kelapa Gading
U11	Kpb.Dewa Ruci
U12	Kali Baru Tanah Merdeka
U13	Kp.Malaka
U15	Kp.Rawa Badak
U16	Kp.Tugu Utara
U17	Jl.Dongga'a
U18	Lagoa
U19	Kp.Kebong Bawang
U20	Sungai Bambu
U21	Kp.Warakas
U22	Kp.Papanggo
U23	Jl.R.E Martadinata
U24	(Sunter Jaya) / Muara Bahari
U25	Jl.Yos Sudarso/near Honda
U26	Podomoro Sunter A
U27	Kp.Bahari

JAKARTA SELATAN

NO	INUNDATION AREA
S1	Ko Cirendeu
S2	Jl Ring Rd Sport Club CLDK
S3	Gandaria Selatan
S4	Gandaria BDN Cilandak
S5	Pondok Labu
S6	Seskopol/Depdagri
S7	IKPN Bintaro
S8	Kp.Ulujami
S9	Sangria Indah
S10	Pesanggrahan
S11	Putukangan Utara
S12	Kp.Pondok Pinang
S13	Kp.Oukuh
S14	Jl.Cileduk Raya
S15	Kp.Cipulir
S16	Kemandoran Pkit
S17	Grogol Selatan
S19	Kp.Pertamina Pasar Minggu
S20	Kpb.Polri Pasar Minggu
S21	Jati Padang
S22	Ragunan
S23	Cilandak Timur
S24	Kp.Petogogan
S25	Gandaria Utara
S26	Hang Jebat
S27	Hang Lekir
S28	Kramat Pela
S29	Cipete
S30	Gunung
S31	Melawai
S32	Rawa Barat
S33	Tebet
S34	Kebon Baru
S35	Bukit Duri Tanjakan
S36	Manggarai Selatan
S37	Kp.Melayu Kecil
S38	Menteng Dalam
S39	Kpb.Polri Pondok Karya
S40	Pulo Raya Tarakanita
S41	Kuningan Barat
S42	Bangka and Kumang
S43	Mampang Prepatan
S44	Setiabudi Barat
S45	Guntur Kawi-kawi
S46	Menteng Atas
S47	Karet Kuningan
S48	Kuningan Timur
S49	Duren Tiga
S50	Pengadegan
S51	Kalibata
S52	Tanjung Barat
S53	Lenteng Agung

JAKARTA PUSAT

NO	INUNDATION AREA
P1	Petamburan+ Bend Hilir
P2	Jl.Bendungan Hilir
P4	Jl. Sabang / Agus Salim
P6	Serdang Timur
P7	Jl.Industri
P8	Jl.Angkasa / Bungur
P9	Rajawari Selatan
P12	Jl.Pangeran Jayakarta
P13	Mangga Dua Abdad
P14	Dwi Warna
P15	Jl.Batu Tulis/Juanda III
P16	Jl.Batu Ceper
P17	Duri Pulo
P18	Pelojo Enclok
P19	Kebon Kelapa

JAKARTA BARAT

NO	INUNDATION AREA
B1	Pal Merah
B2	Jelambar Ilir
B3	Kpb.Wali Kota JKT Barat
B4	Pondok Bandung
B6	Poglar
B7	Jl.Kapuk Raya
B8	Duri Kosambi /Bojong
B9	Batu Sari
B10	Kelapa Dua/HUBAD
B11	Meruya Ilir
B12	Basmol
B14	Komp DPR Kebon Jerek
B15	Pos Pengumben
B18	Taman Kota
B19	Budi Mulya
B20	Meruya Udik
B21	Kembangan
B22	Jl Jembatan Batu Pinangsia
B23	Kali Belon
B24	Mangga Besar I
B25	Mangga Besar IV
B26	Kalideres
B27	Kamal
B28	Pegadungan
B29	Semanan
B30	Tegal Alur
B31	Jati Pulo
B32	Jembatan Besi
B33	Krendang
B34	Jambatan Lima

JAKARTA TIMUR

NO	INUNDATION AREA
T1	Cipinang Rumbalon
T3	Kp.Makassar
T4	Kp.Kebon Pala
T5	Cipinang Melayu
T6	Sunter Hailim Perdana Kusuma
T7	Cawan Dewi Sartika
T8	Bidara Cina
T9	Kp.Melayu
T10	Condet
T11	Kramat Jati
T12	Kebon Nanas/DI Panjaitan
T13	Cipinang Besar Utara/Prumpung
T14	Cipinang Muara
T15	Kp.Sodong
T16	Kebon Pala Jatinegara
T17	Rawa Bunga
T19	Kpb.Palad
T20	Jl.Perintis Kemerdekaan
T21	Perum Hlkelapa Gading utara
T22	Jatinegara Kaum
T23	Kayu Putih
T25	Cipinang Jagal
T26	Pisangan Timur
T27	Utan Kayu
T32	Duren Sawit
T33	Klender
T34	Pondok Bambu
T36	Penggilingan
T37	Pulau Gebang

Figure 15 INUNDATION AREA IN DKI JAKARTA CAUSED BY FEB.1996 FLOOD

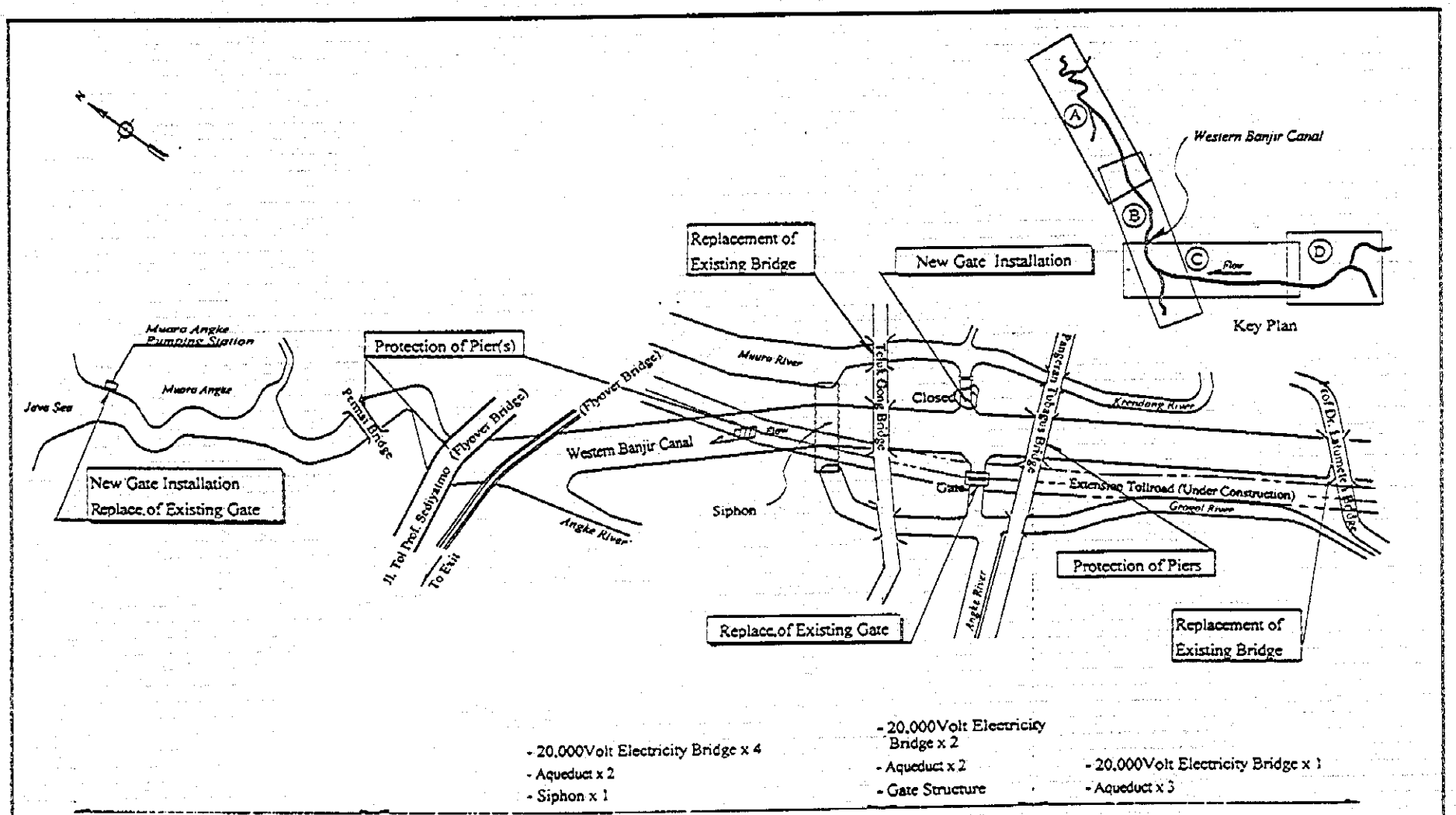


Figure 16 RELATED STRUCTURES IN THE WESTERN BANJIR CANAL (1/4) (1/4 : SHEET Ⓐ)

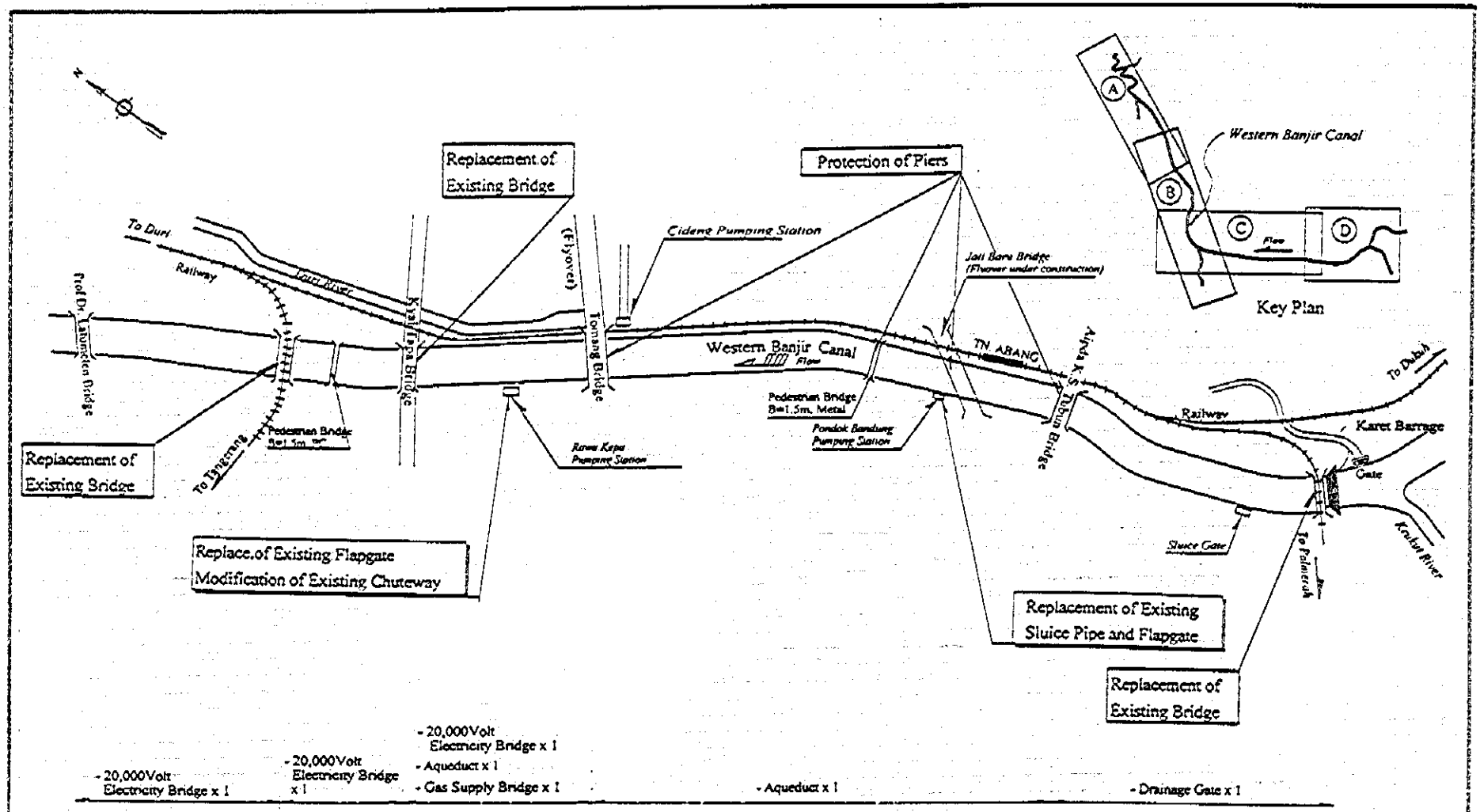


Figure 16 RELATED STRUCTURES IN THE WESTERN BANJIR CANAL (2/4) (2/4 : SHEET Ⓑ)

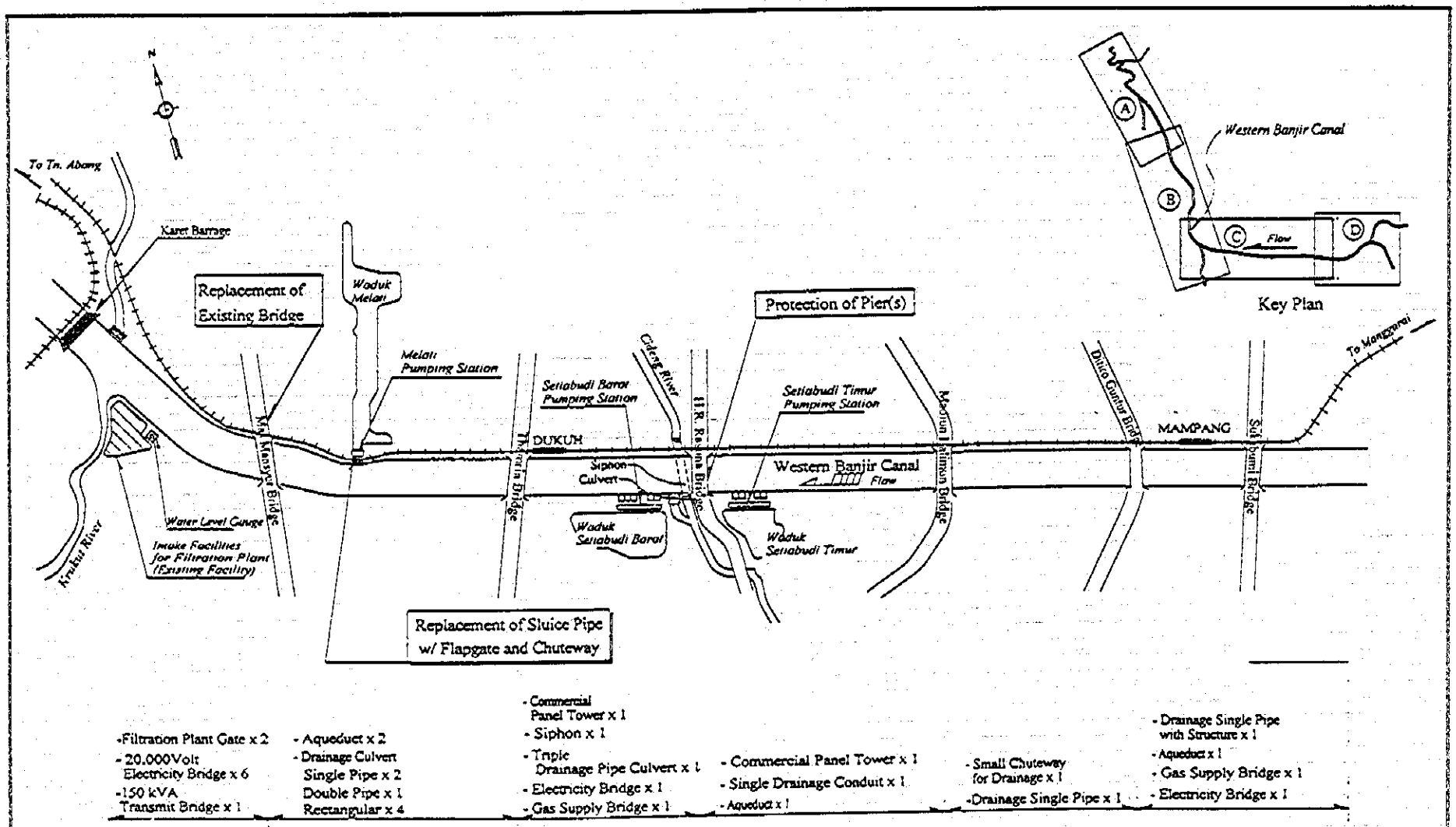


Figure 16 RELATED STRUCTURES IN THE WESTERN BANJIR CANAL (3/4) (3/4 : SHEET©)

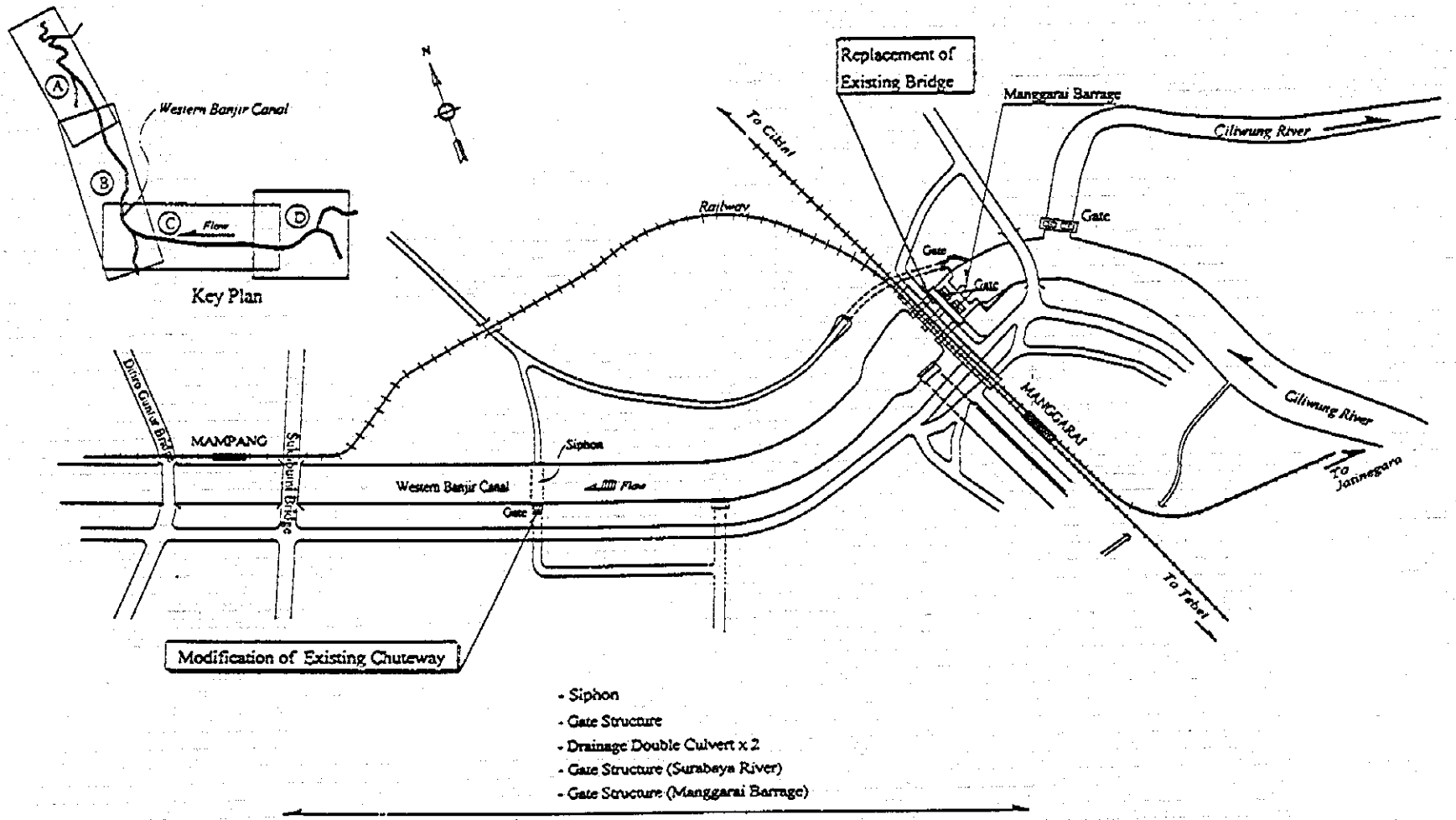


Figure 16 RELATED STRUCTURES IN THE WESTERN BANJIR CANAL (4/4) (4/4 : SHEET Ⓓ)

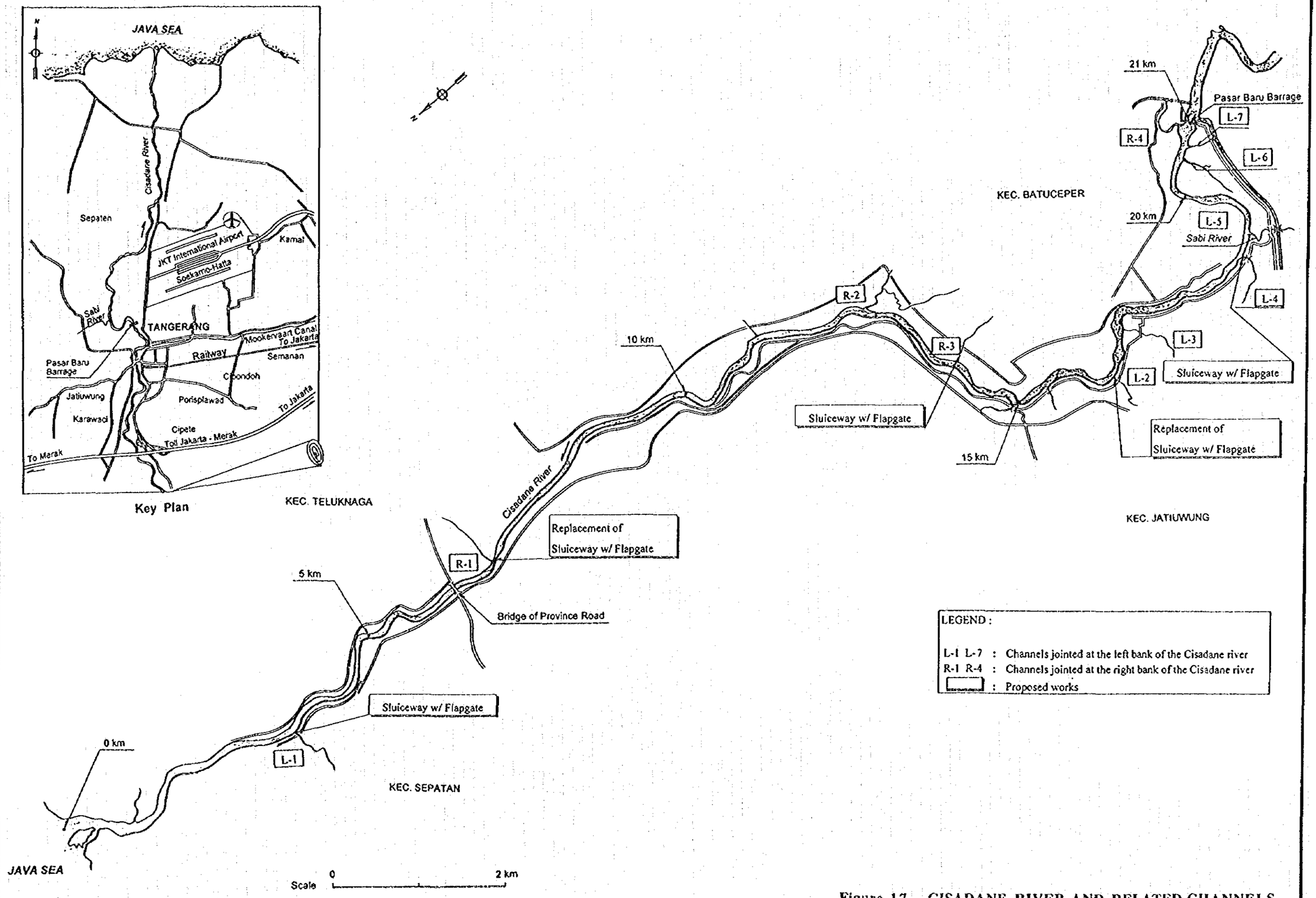


Figure 17 CISADANE RIVER AND RELATED CHANNELS

ANNEX 8

DESIGN AND COST ESTIMATE

THE STUDY
ON
COMPREHENSIVE RIVER WATER MANAGEMENT PLAN
IN
JABOTABEK

Annex 8
Design and Cost Estimate

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1. MASTER PLAN STUDY

1.1 Design

1.1.1 General

For the formulation of the flood control master plan, various facilities and structures have been preliminarily designed in the Study. Some existing structures which will be replaced or modified due to flood control improvement works were not specifically designed but be considered as cost items. The major works incorporated in the preliminary design and cost estimatefor the master plan study are as follows:

(1) Dike

(2) River improvement

(3) Floodway (Eastern Banjir Canal ; open channel, culvert)

(4) Floodways including inlet weirs and inlet/outlet structures

(Angke riv. to Cisadane riv. and Ciliwung riv. to Cisadane riv. ;

open channel, culvert, tunnel, gated/non-gated weir)

(5) Flood control dam

(Limo Dam ; earthfill type with spillway and diversion tunnel)

(6) Rehabilitation of existing gates (Pasar Baru Barrage)

(7) Replacement or modification of the existing river structures (road bridges, sluices, gates)

(8) Construction access road

1.1.2 Design of Major Structures

(1) Floodway

The floodway diverting Angke river flood to the Cisadane river is designed as illustrated in Figure 1, which outline is described in Table 1. The floodway will comprise open channels, tunnel and box culvert, which length will be approximately 4,200 m in total as shown in Figure 2. The floodway capacity is designed to divert a maximum discharge of 135 m^3/s. A gated weir will be constructed to regulate the Angke flow together with a inlet structure in the floodway which is designed for a purpose of floodway discharge control.

The floodway diverting Ciliwung river flood to the Cisadane river is designed as illustrated in Figure 3, which outline is described in Table 1. The floodway will comprise open channels and tunnel, which length will be approximately 1,100 m in total as shown in Figure 4. The floodway capacity is designed to divert a maximum discharge of 600 m^3/s. A non-gated weir

will be constructed to regulate the Ciliwung flow together with a inlet structure in the floodway which is designed for a purpose of floodway discharge control.

(2) Limo Dam

The Limo dam is designed for a single purpose of flood control on the Pesanggrahan river. Judging from the field geological investigation result, an earth fill type dam is designed with a height of 54 m and a gross storage volume is approximately 5.2 million m^3 at a high waterlevel of El. 60.0 m. Outline and a typical cross section of the dam are shown in Table 2 and Figure 5, respectively.

1.2 Construction Cost

1.2.1 General

The construction cost is estimated in terms of the foreign currency(Japanese Yen) and the local currency(Indonesia Rupiah) at October 1995 price. Applied foreign exchange rate are US$.1=Rp.2,281 and Yen 1=Rp.22.70.

Estimate of the direct construction cost and the land acquisition /house conpensation costs are based on the respective work quantities obtained from the preliminary design, while the following related cost are worked out as a certain rate of the direct construction cost and land acuisition/house compensation costs:

(a) - Administration cost
- Engineering services cost
- Physical contingency

(b) Operation and maintenance cost

(c) Replacement cost

1.2.2 Direct Construction Cost

The items of work quantity and unit price considered in the estimate are as follows:

(1) Civil Works

(a) Clearing and stripping (ha)
(b) Excavation(m^3) : Open, Tunnel
(c) Embankment (m^3)
(d) Backfilling (m^3)
(e) Bank protection (m^2)
(f) Concrete works(m^3) : Open-air, Tunnel, Box culvert
(g) Bridge (no.)

(h) PC Pile (m)

(i) PC sheet pile (m)

(j) Consolidation grouting(ton)

(k) Preparatory works

(l) Others

(2) Mechanical Works

(a) Gate type A (no., 1.0 m x 1.0 m)

(b) Gate type B (no., 1.5 m x 1.5 m)

(c) Gate type C (no., 4.5 m x 4.5 m)

(d) Gate type D (no.,10.0 m x 10.0 m ; Pasar Baru Barrage)

(e) Others

(3) Miscellaneous Works

(a) Access road (m)

(b) Others

The major quantities and the total cost of each principal items are summarized in Tables 3 thru 10.

1.2.3 Land Acquisition

The cost estimate of land acquisition and house compensation are based on the design results and available maps. The quantities and total cost are summarized in Tables 3 thru 10.

2. FEASIBILITY STUDY

2.1 Design of Ciliwung Floodway

2.1.1 Present Situation of the Objective Area

(1) Location

The proposed site of the Ciliwung Floodway is located in the hilly area with gentle slope in Kecamatan Bogor Selatan between the Ciliwung river and the Cisadane river as shown in Figure 6.

The floodway inlet site is proposed on the left bank of the Ciliwung river between 300 m and 350 m downstream of the bridge of Jl.Pajajaran going to Bandung. The left bank side is of crowded residential area which is very close to the river course. Residential complex of middle scale has been extended on the right bank of the Ciliwung river. A regulating weir will be at the downstream end of the inlet portion.

The outlet facilities will be located on the right bank of the Cisadane river at about 120 m upstream of the existing suspension bridge. Rather crowded residential area have been extended on the slope of hilly area on the right bank, but not very close to the river course. The present river bed elevation of the Cisadane river near the outlet is approximately 256 m. On the right bank of the Cisadane river, the railway is running along the river course.

The floodway route is in the hilly area of the elevation of 275 m to 300 m, mostly under the crowded residential and commercial area. In the midway of the route, a creek and a canal form some shallow gorges flowing from south to north.

(2) River Condition

The catchment areas of the Ciliwung river at the proposed inlet site and the Cisadane river at the proposed outlet site are 152 km^2 and 205 km^2, respectively. The distance between the both rivers becomes shortest of approximately 1,000 m, near the project site. Towards the upstream and downstream, the distance between the both rivers increases.

The average gradient of the rivers is roughly from 1/50 to 1/75. At many portions along the rivers, bedrock is exposed on the river bed; many nick points have been formed reflecting the difference of geological condition along the river course. The bed material consists of cobbles and boulders; some boulders are estimated to be washed out from river bank nearby, which originated in past pyroclastic flows.

The both rivers have formed extremely deeply dissected valley and the city area of Bogor is located on high terrace. The Cisadane river forms bigger and deeper valley than that of the Ciliwung river everywhere around the project site.

(3) Existing Structures in the Area

(a) Bridges

The road bridge across the Ciliwung river exists at about 300 mupstream of the proposed inlet site of the floodway in Kecamatan Bogor Selatan. This bridge is located on the national road (Jl. Pajajaran) going to Bandung via. Ciawi and Puncak.

A suspension bridge for only pedestrian is located at about 120 m downstream of the proposed outlet site of the floodway. The area beside the bridge and connecting path is a crowded residential quarter on the right bank, while the left bank side is a rather thinly settled area.

(b) Railway

The railway for Sukabumi running on the slope of hilly area along the Cisadane river passes by the floodway outlet site about 50 m far from the river course. This railway is of single track and its elevation is some 20 m higher than the riverbed. According to the investigation of the Study Team, a train passes by 6 times a day.

(c) Residential Complex

Residential complex of middle scale has been extended on the right bank of the Ciliwung river in downstream of the aforementioned bridge. Southern portion of the complex is facing to the river course and a proposed inlet facility site of the floodway. The present river bed elevation of the Cisadane river is approximately 6 to 7 m lower than that of the complex.

2.1.2 Design Requirement

(1) Objective Facilities

The floodway facilities will be composed of inlet facilities, tunnel(s) and outlet facilities. The objective facilities include a suspension bridge for replacement. Those facilities are further broken down into the following structures:

(a) Inlet Facilities :
- (i) Regulating fixed weir in the river channel
- (ii) Inlet structures of the floodway(tunnel)
  - regulating fixed weir
  - open channel(forebay)
  - guide wall
- (iii) Revetment

(b) Tunnel

(c) Outlet Facilities :
- (i) Open channel
- (ii) Stilling basin

(iii) Dike on the left bank of the Cisadane river and riverbed protection.

Other than the avove facilities, the existing suspension bridge across the Cisadane river is designed for replacement.

(2) Design Concept

The following basic requirement have been incorporated as much as possible in the preliminary design :

(a) Flow Regulation

(i) Design maximum discharge of the floodway is $600m^3/s$ or $300m^3/s$ per (1) tunnel channel.

(ii) Discharge of $300m^3/s$ is designed to be diverted to the floodway(1 tunnel channel will be closed) and remaining $490m^3/s$ will be discharged to the Ciliwung river when an inflow of $790m^3/s$ (design flood) is expected.

(iii) River flow shall be controlled by the non-gated fixed weirs.

(b) Tunnel

(i) Number of tunnel shall be two.

(ii) Flow inside a tunnel shall be of non-pressure flow .

(iii) Specific consideration shall be incorporated in the design that the project area has been densely populated and use of ground water have been developed.

(iv) Feature of the tunnel including profile, alignment and shape shall be determined referring to both the geological and topographical conditions as well as tunnel construction method.

(v) Required minimum overburden of the tunnel is 1.0 x D(outside diameter of the tunnel) in case of shield tunneling work, while 1.5 - 2.0 x D for mountain tunneling work.

(c) Inlet/Outlet Structures

(i) Desilting basin to minimize sediment flowing into the tunnel and trashrack or equivalent structure shall be provided in the inlet facilities.

(ii) Stilling basin and/or energy dissipater shall be provided in the outlet facilities.

(iii) Diking shall be studied in left bank of the Cisadane river not to cause inundation by discharge from the floodway.

2.1.3 Preliminary Design

(1) Floodway Route Alternative

In consideration of the topographic condition as well as profiles of the Ciliwung river and the Cisadane river, a location of the floodway inlet and outlet facilities have been determined as shown in Figure 7.

Basic alignment of the floodway tunnel is of a direct way from the inlet to the outlet as Alternative No.2 in Figure 7. Advantages of the No.2 route is the shortest length of the tunnel and no complicated hydraulic flow is expected in the tunnel channel. However, No.2 route will pass under the creek and irrigation canal where an overburden is expected rather small due to the existing ground sills near the route. In case that the mountain tunneling is applied for this floodway construction, the required sufficient overburden could not be secured under the said creek.

The alternative No.1 has been studied to keep a sufficient overburden throughout a whole route of the tunnel. The alignment of the No.1 takes a roundabout route which pass under the creek at just upstream of the ground sill. The distance between those two alternative routes is about 120 m at the creek crossing portion as shown in Figure 7. This alternative is disadvantageous to have a bend alignment in the steep gradient channel and to increase a length of the tunnel.

The tunnel route will be under rather crowded residential and commercial areas and use of groundwater have been developed. Tunnel construction by the mountain tunneling would cause much spring out of the groundwater and drawdown of groundwater table as well as some subsidence of the ground surface. In order to avoid such problems, the shield works of closed and earth pressure type is proposed for the tunnel construction. Since that the said shield works requires less overburden than that for the traditional tunneling method, the route alternative No.2 is acceptable in technical view point.

Through the aforesaid alternative studies, the alternative No.2 is proposed in the preliminary design stage as shown in Figure 8. The proposed floodway alignment has 1,060 m in length including 1,000 m of tunnel portion and channel inlet and outlet structures.

(2) Tunnel

Two tunnel channels of circle shaped with an inner diameter of 8.0 m is preliminarily designed in accordance with the Manual for River Works in Japan and under the following condition:

Discharge capacity	:	300 m^3/s per (1) channel
Gradient of channel	:	1 / 125
Roughness coefficient	:	0.023 (for design of cross section of the channel)

Typical cross section of the channel is presented in Figure 9.

(3) Inlet Facilities

The inlet facilities of the floodway are preliminarily designed as shown in Figure 10 and general feature of main structures are described as follows:

(a) Control Weir in the Ciliwung river

Weir height	:	Crest elevation	;	El.276 m
		6 m from original riverbed elevation		
Weir width	:	Crest length	;	60 m
		Overflow section	;	5.0 to 25.0 m
Flow capacity	:	0 to 490m^3/s(at total head of El. 275.1 m) as shown in Figure 9		

(b) Inlet Weir of the Floodway

Weir height	:	2.2 m
Weir width	:	40 m for (1) channel x 2
Flow capacity	:	0 to 300 m^3/s(per (1) channel, at total head of El. 275.1 m)

(c) Desilting basin : No space to be provided. River bed is designed to be lowered by 1.0 m from the forebay sill of the floodway and the inlet weir(2.2 m higher than the forebay sill) will be expected to prevent bed load and sediment from flowing into the floodway channel.

(d) Trashrack(boom): Such as piles arrangement in the forebay.

(4) Outlet Facilities

The outlet facilities such as a stilling basin and an energy dissipator of the floodway as well as river bank protections are preliminarily designed as shown in Figure 9. Other than the bank protection works against outflow of the floodway, dike on the left bank of the Ciliwung river is designed to protect the left bank area partially.

2.2 Design of Related Structures

2.2.1 Manggarai Barrage

(1) Existing Barrage

The existing Manggarai Barrage is located under a railway bridge and a road bridge near Manggarai station yard where there are several tracks and trains pass frequently. The gated structure is not under but just beside these bridges, while most part of sluiceways are under the bridge structures as shown in Figure 11.

The existing barrage consists of two sluiceways with gates. One sluiceway is about 5.5 m wide and 50 m in length with a gate of about 8.5m in height. The widths of railway bridge and road bridge are 40 m and 5 m, respectively.

Beside the existing gate structures of the barrage on the right bank, there is a small gate structure which is an inlet of a channel connecting to Surabaya river. This channel is to provide flushing water for the Surabaya river.

(2) Design Requirement

(a) Objective Structures

(i) Additional sluiceway with a gate structure.

(ii) Replacement of the sluiceway with a gate structure connecting to the Surabaya river.

(b) Design Concept

(i) Additional sluiceway is preferable to be constructed on the right side of the existing barrage in smooth river flow aspect with less deposit in river course.

(ii) Required capacity of the additional sluiceway shall be mostly same as that of the existing one.

(iii) Affected area and modification of the existing structures shall be minimized by the construction.

(iv) Existing structure of the barrage and present flushing function shall be retained.

(3) Preliminary Design

The objective facilities are preliminarily designed in accordance with the design concept mentioned above. A new sluiceway with a gate structure will be constructed on the right side of the existing barrage being parallel with the existing structure. Width and length of the designed sluiceway are same as those of the present one as well as the gate height. The plan and profile of the proposed Manggarai Barrage is presented in Figures 11 and 12, respectively.

The small sluiceway going to the Surabaya river is also designed not to change a function of the structure. The existing gate will be totally demolished and to be newly constructed on the right side of the new gate of the barrage. A new pipe culvert will be connected to the existing one under the railway bridge. No modification is expected for outlet of the sluiceway.

2.2.2 Drainage Facilities in the Western Banjir Canal

(1) Existing Drainage Facilities

Along the Western Banjir Canal(WBC) between the river mouth and the Manggarai Barrage, there are various drainage facilities such as drainage pumping stations, inlet or outlet of the

drainage rivers with or without gate structures, siphons and many sluice pipe outlets. Most of those are shown in Figure 13 and feature of main facilities are detailed in Tables 11 thru 14.

(2) Design Requirement

(a) Objective Structures

(i) Sluice gate and/or outlet structures of the drainage pumping stations.

(ii) Sluice gate structures at the outlet of the drainage rivers.

(iii) Sluice structure of the drainage channel.

(b) Design Concept

(i) Construction of new structures or replacement of the existing ones shall be made in case that river improvement works require such provision.

(ii) Construction of new structures or replacement of the existing ones shall be made to avoid river water intrusion at the proposed design water level

(iii) Structures in the river course which might be an obstruction of river flow shall be replaced.

(iv) No construction nor improvement of drainage pumping facility itself is provided.

(3) Preliminary Design

Taking account of the proposed river improvement works and design water level, proposed works in the drainage facilities are studied and required preliminary design has been undertaken for the following facilities:

(a) Improvement of Muara Angke Pumping Station

(i) New sluice gates for the existing channel between the existing pumping equipment and the WBC.

(ii) Replacement of the existing gate in the existing channel connecting the reservoir and the WBC.

(b) Replacement of the Existing Gated Structure

(i) Outlet of K.Angke to the WBC

(c) Construction of New Gated Structure

(i) Outlet of K.Krendang to the WBC

(d) Replacement/Improvement of the Existing Outlet Facilities in the Pumping Stations

(i) Rawa Kepa Pumping Station

(ii) Ponduk Bandung Pumping Station

(iii) Melati Pumping Station

(e) Improvement of the Existing Sluice Outlet Structure

(f) Installation of miscellaneous sluiceways for local drainage.

The details are presented in Table 11 including the feature of the required works in the respective facilities as well as plan and profiles of the proposed structures in the Muara Angke Pumping Stationas shown in Figure 14.

2.2.3 Drainage Facilities of the Cisadane River

(1) Existing Drainage Facilities

Along the Cisadane river between the river mouth and the Pasar Baru Barrage(Cisadane river), there are several channels used for drainage purpose such as the Sabi river, drainage channels from the irrigation canal and small creeks. The major ones are shown in Table 15 and Figure 15 in which those locations are indicated. There are no existing drainage structures except ones which are small sluice pipes.

(2) Design Requirement

(a) Objective Structures

(i) Sluiceway with Flapgate

(b) Design Concept

(i) Construction of new structures or replacement of the existing ones shall be made in case that river improvement works require such provision.

(ii) Construction of new structures or replacement of the existing ones shall be made to avoid river water intrusion at the proposed design water level.

(3) Preliminary Design

Design of sluiceways with flapgate for construction or improvement at the existing channels are preliminarily carried out for 5 locations as shown in Table 15 and Figure 15. Miscellaneous sluiceways for small scale local drainage are incorporated on lump sum basis.

The followings are recommendable works to be realized as future improvement of drainage system in the Cisadane river basin:

(a) Construction of a drainage pumping station and gated structures for improvement of urban drainage situation condition in the Sabi river basin where backwater of the Cisadane river affects the condition of urban drainage;

(b) Construction of parapet walls along the drainage channels from the irrigation canal to prevent local inundation in case of high water level of the Cisadane river.

2.2.4 Bridges and Others

Some of the existing road and railway bridges in the WBC require its replacement due to too low elevations of the existing bridge girder comparing to the design water level. Furthermore, several bridges require a certain protection works of those piers due to the river improvement works such as dredging of the river course and excavation of the low water channel. Table 16 and Figure 13 shows those bridges and respective required works which is summarized as follows:

(a) Replacement of the existing bridges : 7 bridges

(b) Protection works of the pier(s) : 9 bridges

The required work cost have been estimated based on the Bina Marga Standard without a design for the respective bridges specifically.

2.3 Cost Estimate

2.3.1 General

Project cost is estimated for the following cost items:

(a) Direct construction cost

(b) Land acquisition and house compensation costs

(c) Government administration cost

(d) Engineering service cost

(e) Contingencies

(f) O & M cost

The direct construction cost is further subdivided into preparatory works, main civil works including hydromechanical works and miscellaneous works.

2.3.2 Condition for Cost Estimate

(1) General Condition

The basic assumptions and conditions employed for the cost estimate are set forth as follows;

(a) The costs presented are the financial costs at the price level of October, 1995.

(b) The following exchange rates of domestic to foreign currencies are applied;
US$ 1.0 = Rp. 2,281 = JPY. 100.48

JPY. 1.0 = Rp. 22.70

(c) The cost required for main civil works is estimated by multiplying work quantity by unit price.

(d) The unit prices applied include costs for materials, plant and equipment including spare parts, operators, technicians, labours and contractor's overhead, profit and local taxes.

(e) The costs for preparatory and miscellaneous works are estimated at 8% and 10%, respectively, of the main civil works including hydromechanical works, except for preparatory works of the shield tunneling work, that is 15 %.

(f) The project cost is divided into foreign and local currency portions in accordance with the following classification;

(i) Foreign Currency Portion (F.C.)

- Depreciation cost of construction equipment including cost for spare parts and maintenance cost.
- Metal works, if any.
- Procurement costs for imported materials and special construction equipment, if any, and foreign portion of local material.
- Cost for foreign technician for execution of works.
- Engineering service cost for foreign consultants.

(ii) Local Currency Portion (L.C.)

- Land acquisition and house compensation costs.
- Labour wages.
- Government administration cost.
- Engineering service cost for local consultants.
- Locally obtained materials such as sand, gravel, timber board, concrete products, steel pipes, small gates, etc.
- Inland transportation cost.

(g) Government administration cost is estimated in local currency portion at 5.0 % of the sum of the direct construction cost(foreign and local currency portions) and land acquisition and house compensation costs.

(h) The engineering service costs during the detailed design stage and construction supervision stage are estimated at 5 % and 10 % of the direct construction cost, respectively.

(i) The physical contingency is estimated at 10 % of the sum of the total cost.

(j) The price contingency applied is 3% for foreign currency portion and 8% for local currency portion.

(k) The foreign currency portion is expressed by Japanese Yen and the local currency portion is expressed by Indonesian Rupiah.

(l) All the construction works are executed on a contract basis through international bidding.

(m) All equipment and their spare parts required for the works are to be provided by contractor.

(n) For estimating the unit construction cost, unit prices of labour wages, materials and equipment expenses were surveyed on the practical unit prices which are currently applied to the similar projects in Indonesia, such as;

(i) East Jakarta Flood Control Project

(ii) Cisadane River Basin Development Project

(iii) Lower Solo River Improvement Project

(o) The annual operation and maintenance cost of each scheme is approximated as follows;

- 1 % of the total construction cost for main civil works.
- 2 % of the total installation cost for hydro-mechanical equipment.

(2) Preparatory Works and Miscellaneous Works

Cost of preparatory works is estimated by lump sum basis to cover temporary construction roads; temporary buildings such as offices, quarters, etc.; electric power supply system; water supply system; and other facilities for construction use.

Besides, costs of miscellaneous works; such as slope protection, forms, reinforcement bars, waterstops, dowel bars, etc., which are not estimated by unit price basis; are also estimated by lump sum basis.

These costs are estimated at 8 % for preparatory works and at 10 % for miscellaneous works, respectively, of the main civil works including hydromechanical works, except for preparatory works of the shield tunneling work, that is 15 %.

(3) Main Civil Works

Direct construction cost of the main civil works is estimated principally by adopting the unit price basis that is multiplied by the corresponding work quantity. According to the preliminary design, quantities for the major work items are calculated.

Unit prices of fuel and materials are estimated dividing into foreign and local currency portions.

Operation costs of the major construction equipment are estimated based on the costs for depreciation, repair and maintenance, fuel, labour and operator.

(4) Hydro-mechanical Works

Cost of the hydro-mechanical works is estimated based on the past tendered records of the similar projects and considering the local conditions. The estimated cost includes the cost of engineering, design, material, manufacturing, painting, testing, packing, delivery to the site and installation.

(5) Land Acquisition and House Compensation Cost

The cost of right of way and compensation is estimated for the lands, buildings and other private properties by using prevailing unit cost obtained at the field.

(6) Administration Cost

The government administration cost for the Project is estimated by lump sum basis at 5.0 % of the sum of the direct construction cost(foreign and local currency portions) and land acquisition and house compensation costs. It is expressed in local currency portion.

(7) Engineering Service Cost

The engineering service costs during the detailed design stage and construction supervision stage are estimated at 5 % and 10 % of the direct construction cost, respectively.

(8) Contingency

The contingency is provided to cope with the unforeseen physical condition and the price escalation due to inflation. The physical contingency is assumed to be 10 % of the sum of direct construction cost, land acquisition and house compensation costs, government administration cost and engineering service cost for both foreign and local currency portions.

The price contingency is estimated by applying annual inflation rates of 3 % for foreign currency portion and 8 % for local currency portio

2.3.3 Financial Cost

The total construction cost is estimated at about 500 billion Rupiah, consisting of about 15.0 billion Japanese Yen and about 159 billion Rupiah, as shown in Table 17.

The 1st phase project cost is estimated at about 863.3 billion Rupiah, consisting of about 19.4 billion Japanese Yen of foreign currency portion and about 423.2 billion Rupiah of local currency portion as shown in Table 18. The 2nd phase project cost is estimated at about 247.3 billion Rupiah, consisting of about 4.3 billion Japanese Yen of foreign currency portion and about 150.8 billion Rupiah of local currency portion as shown in Table 19.

The total project cost, except price contingency, is estimated at about 1,110.6 billion Rupiah, consisting of about 23.6 billion Japanese Yen of foreign currency portion and about 573.7billion Rupiah of local currency portion as shown in Table 20.

2.3.4 Annual Disbursement Schedule

Based on the implementation schedule shown in Figure 16, the annual disbursement schedule has been prepared as shown in Table 21.

Funds required for the implementation of the project including the price escalation are summarized below:

Foreign currency	:	Japanese Yen	23,532 million
Local currency	:	Indonesia Rupiah	560,966 million
Total equivalent to Rupiah	:		Rp. 1,095,144 million.

Table 1 DESIGNED FEATURE OF FLOODWAY (MASTER PLAN STUDY)

DESCRIPTION		ANGKE FLOODWAY	CILIWUN FLOODWAY
(1) River System		Angke river to Cisadane river	Ciliwun river to Cisadane river
(2) Location		From an inlet site at Section KA-12 of Angke river to an outlet site at Section CSD-38 of Cisadane river	From an inlet site between Sections CUT-4 and CUT-5 of Ciliwun river to an outlet site at Section CSD-95 of Cisadane river
(3) Floodway			
(a) Total Length (m)		4,220	1,110
i) Open Channel	- Length(m)	1,800	480
	- Width(m)	35	150
ii) Culvert	- Length(m)	1,700	-
	- Lane	2	-
	- Shape	Box	-
	- Width(m)	6.5	-
	- Height(m)	6.5	-
iii) Tunnel	- Length(m)	720	630
	- Lane	1	2
	- Shape	8.4m-R Standard Horse Shoe	7.0m-R Standard Horse Shoe
(b) Max. Flow Capacity (m^3/s)		135.0	600
(4) Operation		Gated weir is designed on the Angke river, all of which will be closed during flooding to divert whole runoff of 135 m^3/s, while gates will be partially opened in a rainy season to allow the Angke river water to flow down when flood is not expected. All gates will be opened in a dry season.	A non-gatd concrete weir is designed at a downstream of the inlet site to divert a flood discharge of 600 m^3/s to the floodway at a regulated waterlevel of El.272.5 m when a 190 m^3/s will be spilled out from the weir.
(5) Others			Desined open channel portion will be crossed with the existing railway

Remarks : Feature of the Ciliwung Floodway in this table is the design in the Master Plan Study.

Table 2 DESIGNED FEATURE OF THE LIMO DAM

DESCRIPTION		FEATURE AND SCALE
(1) River System		Pesanggrahan river
(2) Location		Desa Limo
(3) Dam	Type	Earthfill
	Height	54 m
	Crest Length	560 m
	Dam Volume	1,832,000 m^3
(4) Spillway		Non-gate type with drain conduit
(5) Highest Waterlevel		EL.60.0 m (storage volume ; 5,181,000 m^3)
(6) Designed Sediment Deposit Level		EL.52.4 m (storage volume ; 3,816,000 m^3)
(7) Others		Diversion tunnel will be used for a temporary drain conduit until sediment level will reach to the tunnel invert level.

Table 3 SUMMARY OF CONSTRUCTION COST (CIDURIAN RIVER)

	Work Item	CIDURIAN RIVER (CDR - 1) Major Work Quantity		Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I	Land Acquisition /Compensation			-	87,109,000	87,109,000
	Land acquisition	86.5	ha			
	House	87	nos			
II	Construction			2,788,853	30,676,810	93,968,230
2.1	Civil Works			2,777,734	30,496,310	93,535,329
	Open Excavation	4,918,200	m3			
	Tunnel Excavation	-	m3			
	Embankment	636,000	m3			
	Bank Protection	48,500	m2			
	RF Concrete(Open-air)	1,370	m3			
	RF Concrete(Tunnel)	-	m3			
	PC Pile (500mm dia.)	500	m			
2.2	Mechanical Works			10,846	159,500	405,704
	Gate type-A	20	nos			
	Gate type-B	6	nos			
	Gate type-C	-	nos			
2.3	Miscellaneous Works			273	21,000	27,197
	Road	100	m			

Table 4 SUMMARY OF CONSTRUCTION COST (CIMANCEURI RIVER)

	Work Item	CIMANCEURI RIVER (CMC - 1) Major Work Quantity		Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I	Land Acquisition /Compensation			-	58,706,000	58,706,000
	Land acquisition	58.3	ha			
	House	58	nos			
II	Construction			706,381	13,663,986	29,696,160
2.1	Civil Works			695,636	13,488,986	29,277,249
	Open Excavation	992,200	m3			
	Tunnel Excavation	0	m3			
	Embankment	254,000	m3			
	Bank Protection	28,800	m2			
	RF Concrete(Open-air)	1,350	m3			
	RF Concrete(Tunnel)	0	m3			
	PC Pile (500mm dia.)	800	m			
2.2	Mechanical Works			10,472	154,000	391,714
	Gate type-A	16	nos			
	Gate type-B	8	nos			
	Gate type-C	-	nos			
2.3	Miscellaneous Works			273	21,000	27,197
	Road	100	m			

Table 5 SUMMARY OF CONSTRUCTION COST
(CIRARAB RIVER)

	Work Item	CIRARAB RIVER (CMC- 1) Major Work Quantity		Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I	Land Acquisition /Compensation			-	11,684,000	11,684,000
	Land acquisition	11.6	ha			
	House	12	nos			
II	Construction			194,946	5,440,856	9,866,297
2.1	Civil Works			186,849	5,236,856	9,478,495
	Open Excavation	117,750	m3			
	Tunnel Excavation	-	m3			
	Embankment	165,000	m3			
	Bank Protection	11,300	m2			
	RF Concrete(Open-air)	880	m3			
	RF Concrete(Tunnel)	-	m3			
	PC Pile (500mm dia.)	500	m			
2.2	Mechanical Works			6,732	99,000	251,816
	Gate type-A	12	nos			
	Gate type-B	4	nos			
	Gate type-C	-	nos			
2.3	Miscellaneous Works			1,365	105,000	135,986
	Road	500	m			

Table 6 SUMMARY OF CONSTRUCTION COST
(CISADANE RIVER)

	Work Item	CISADANE RIVER (CSD) Major Work Quantity		Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I	Land Acquisition /Compensation			-	112,984,000	112,984,000
	Land acquisition	112.2	ha			
	House	112	nos			
II	Construction			3,416,111	34,711,926	112,266,166
2.1	Civil Works			3,128,496	31,891,426	102,916,806
	Open Excavation	1,881,500	m3			
	Tunnel Excavation	-	m3			
	Embankment	4,228,000	m3			
	Bank Protection	44,800	m2			
	RF Concrete(Open-air)	1,540	m3			
	RF Concrete(Tunnel)	-	m3			
	PC Pile (500mm dia.)	1,000	m			
2.2	Mechanical Works			287,342	2,799,500	9,322,163
	Gate type-A	12	nos			
	Gate type-B	14	nos			
	Gate type-C	-	nos			
	Gate type-D	5	nos			
2.3	Miscellaneous Works			273	21,000	27,197
	Road	100	m			

Table 7 SUMMARY OF CONSTRUCTION COST(1/4)
(CENGKARENG SYSTEM : CKR - 1)

Work Item	CENGKARENG SYSTEM TOTAL (CKR - 1)				CHENGKARENG FLOODWAY				MOOKERVAART CANAL			
	Major Work Quantity		Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Major Work Quantity		Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Major Work Quantity		Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)
I Land Acquisition /Compensation			-	388,050,000			-	167,100,000			-	2,500,000
Land Acquisition	65.5	ha			26.6	ha			0.4	ha		
House	531	nos			300	nos			4	nos		
II Construction			13,130,366	144,091,299			725,166	8,600,231			97,945	2,734,555
2.1 Civil Works			13,107,339	143,599,799			715,371	8,405,231			90,667	2,593,555
Open Excavation	2,494,800	m3			1,084,200	m3			126,900	m3		
Tunnel Excavation	-	m3			-	m3			-	m3		
Embankment	655,000	m3			213,000	m3			-	m3		
Bank Protection	49,400	m2			-	m2			2,700	m2		
RF Concrete(Open-air)	1,610	m3			200	m3			790	m3		
RF Concrete(Tunnel)	-	m3			-	m3			-	m3		
PC Pile (500mm dia.)	1,800	m			800	m			600	m		
2.2 Mechanical Works			20,570	302,500			8,976	132,000			6,732	99,000
Gate type-A	4	nos			-	nos			-	nos		
Gate type-B	34	nos			16	nos			12	nos		
Gate type-C	-	nos			-	nos			-	nos		
2.3 Miscellaneous Works			2,457	189,000			819	63,000			546	42,000
Road	900	m			300	m			200	m		

Work Item	ANGKE RIVER				PESANGGRAHAN RIVER			
	Major Work Quantity		Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Major Work Quantity		Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)
I Land Acquisition /Compensation			-	149,975,000			-	68,475,000
Land Acquisition	24.7	ha			13.8	ha		
House	71	nos			156	nos		
II Construction			840,709	15,760,028			11,466,546	116,996,485
2.1 Civil Works			838,667	15,696,028			11,462,634	116,904,985
Open Excavation	954,200	m3			329,500	m3		
Tunnel Excavation	-	m3			-	m3		
Embankment	347,000	m3			95,000	m3		
Bank Protection	40,700	m2			6,000	m2		
RF Concrete(Open-air)	190	m3			430	m3		
RF Concrete(Tunnel)	-	m3			-	m3		
PC Pile (500mm dia.)	100	m			300	m		
2.2 Mechanical Works			1,496	22,000			3,366	49,500
Gate type-A	4	nos			-	nos		
Gate type-B	-	nos			6	nos		
Gate type-C	-	nos			-	nos		
2.3 Miscellaneous Works			546	42,000			546	42,000
Road	200	m			200	m		

Table 7 SUMMARY OF CONSTRUCTION COST(2/4)
(CENGKARENG SYSTEM : CKR - 2)

Work Item	CENGKARENG SYSTEM TOTAL (CKR - 2) Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)	CHENGKARENG FLOODWAY Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)	MOOKERVAART CANAL Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I Land Acquisition /Compensation		-	621,300,000	621,300,000		-	70,350,000	70,350,000		-	2,500,000	2,500,000
Land Acquisition	102.2 ha				11.2 ha				0.4 ha			
House	324 nos				126 nos				4 nos			
II Construction		12,917,850	141,429,305	434,653,292		463,238	4,794,237	15,307,527		97,945	2,734,555	4,957,434
2.1 Civil Works		12,845,411	139,793,805	431,373,428		453,443	4,599,237	14,890,181		90,667	2,593,555	4,651,224
Open Excavation	3,078,500 m3				607,200 m3				126,900 m3			
Tunnel Excavation	80,300 m3				- m3				- m3			
Embankment	2,431,150 m3				157,000 m3				- m3			
Bank Protection	72,500 m2				- m2				2,700 m2			
RF Concrete(Open-air)	137,680 m3				1,050 m3				790 m3			
RF Concrete(Tunnel)	25,140 m3				- m3				- m3			
PC Pile (500mm dia.)	344,700 m				800 m				600 m			
2.2 Mechanical Works		57,970	522,500	1,838,418		8,976	132,000	335,755		6,732	99,000	251,816
Gate type-A	4 nos				- nos				- nos			
Gate type-B	34 nos				16 nos				12 nos			
Gate type-C	4 nos				- nos				- nos			
2.3 Miscellaneous Works		14,469	1,113,000	1,441,446		819	63,000	81,591		546	42,000	54,394
Road	5,300 m				300 m				200 m			

Work Item	ANGKE RIVER Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)	PESANGGRAHAN RIVER Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I Land Acquisition /Compensation		-	149,975,000	149,975,000		-	398,475,000	398,475,000
Land Acquisition	24.7 ha				65.9 ha			
House	71 nos				123 nos			
II Construction		840,709	15,760,028	34,840,652		11,515,958	118,140,485	379,547,679
2.1 Civil Works		838,667	15,696,028	34,730,299		11,462,634	116,904,985	377,101,724
Open Excavation	954,200 m3				1,390,200 m3			
Tunnel Excavation	- m3				80,300 m3			
Embankment	347,000 m3				1,927,150 m3			
Bank Protection	40,700 m2				29,100 m2			
RF Concrete(Open-air)	190 m3				135,650 m3			
RF Concrete(Tunnel)	- m3				25,140 m3			
PC Pile (500mm dia.)	100 m				343,200 m			
2.2 Mechanical Works		1,496	22,000	55,959		40,766	269,500	1,194,888
Gate type-A	4 nos				- nos			
Gate type-B	- nos				6 nos			
Gate type-C	- nos				4 nos			
2.3 Miscellaneous Works		546	42,000	54,394		12,558	966,000	1,251,067
Road	200 m				4,600 m			

Table 7 SUMMARY OF CONSTRUCTION COST(3/4)
(CENGKARENG SYSTEM : CKR - 3)

Work Item	CENGKARENG SYSTEM TOTAL (CKR - 3) Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)	CHENGKARENG FLOODWAY Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)	MOOKERVAART CANAL Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I Land Acquisition /Compensation		-	294,700,000	294,700,000		-	83,500,000	83,500,000		-	2,500,000	2,500,000
Land Acquisition	54.3 ha				13.3 ha				0.4 ha			
House	358 nos				150 nos				4 nos			
II Construction		11,265,683	118,066,260	373,777,244		530,761	5,125,831	17,171,548		97,945	2,734,555	4,957,434
2.1 Civil Works		11,203,891	117,249,760	371,558,067		521,239	4,951,831	16,781,399		90,667	2,593,555	4,651,224
Open Excavation	5,131,900 m3				329,500 m3				126,900 m3			
Tunnel Excavation	90,200 m3				- m3				- m3			
Embankment	564,900 m3				95,000 m3				- m3			
Bank Protection	20,100 m2				6,000 m2				2,700 m2			
RF Concrete(Open-air)	128,160 m3				430 m3				790 m3			
RF Concrete(Tunnel)	36,320 m3				- m3				- m3			
PC Pile (500mm dia.)	273,990 m				300 m				600 m			
2.2 Mechanical Works		57,970	522,500	1,838,418		8,976	132,000	335,755		6,732	99,000	251,816
Gate type-A	4 nos				- nos				- nos			
Gate type-B	34 nos				16 nos				12 nos			
Gate type-C	4 nos				- nos				- nos			
2.3 Miscellaneous Works		3,822	294,000	380,759		546	42,000	54,394		546	42,000	54,394
Road	1,400 m				200 m				200 m			

Work Item	ANGKE RIVER Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)	PESANGGRAHAN RIVER Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I Land Acquisition /Compensation		-	122,000,000	122,000,000		-	86,700,000	86,700,000
Land Acquisition	26.8 ha				13.8 ha			
House	48 nos				156 nos			
II Construction		10,370,929	106,452,101	341,856,405		266,048	3,753,773	9,791,857
2.1 Civil Works		10,329,849	106,042,101	340,513,889		262,136	3,662,273	9,611,555
Open Excavation	4,346,000 m3				329,500 m3			
Tunnel Excavation	90,200 m3				- m3			
Embankment	374,900 m3				95,000 m3			
Bank Protection	5,400 m2				6,000 m2			
RF Concrete(Open-air)	126,510 m3				430 m3			
RF Concrete(Tunnel)	36,320 m3				- m3			
PC Pile (500mm dia.)	272,790 m				300 m			
2.2 Mechanical Works		38,896	242,000	1,124,939		3,366	49,500	125,908
Gate type-A	4 nos				- nos			
Gate type-B	- nos				6 nos			
Gate type-C	4 nos				- nos			
2.3 Miscellaneous Works		2,184	168,000	217,577		546	42,000	54,394
Road	800 m				200 m			

Table 7 SUMMARY OF CONSTRUCTION COST(4/4)
(CENGKARENG SYSTEM : CKR - 4)

Work Item	CENGKARENG SYSTEM TOTAL (CKR -4) Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)	CHENGKARENG FLOODWAY Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)	MOOKERVAART CANAL Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I Land Acquisition /Compensation		-	570,725,000	570,725,000		-	47,750,000	47,750,000		-	2,500,000	2,500,000
Land Acquisition	101.1 ha				8.0 ha				0.4 ha			
House	261 nos				86 nos				4 nos			
II Construction		22,282,280	229,550,666	735,335,981		298,810	2,849,700	9,631,539		97,945	2,734,555	4,957,434
2.1 Civil Works		22,171,076	227,590,166	730,851,151		289,288	2,675,700	9,241,390		90,667	2,593,555	4,651,224
Open Excavation	6,179,300 m3				316,200 m3				126,900 m3			
Tunnel Excavation	170,500 m3				- m3				- m3			
Embankment	2,430,050 m3				128,000 m3				- m3			
Bank Protection	37,200 m2				- m2				2,700 m2			
RF Concrete(Open-air)	264,000 m3				1,050 m3				790 m3			
RF Concrete(Tunnel)	61,460 m3				- m3				- m3			
PC Pile (500mm dia.)	617,390 m				800 m				600 m			
2.2 Mechanical Works		95,370	742,500	2,907,398		8,976	132,000	335,755		6,732	99,000	251,816
Gate type-A	4 nos				- nos				- nos			
Gate type-B	34 nos				16 nos				12 nos			
Gate type-C	8 nos				- nos				- nos			
2.3 Miscellaneous Works		15,834	1,218,000	1,577,432		546	42,000	54,394		546	42,000	54,394
Road	5,800 m				200 m				200 m			

Work Item	ANGKE RIVER Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)	PESANGGRAHAN RIVER Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I Land Acquisition /Compensation		-	122,000,000	122,000,000		-	398,475,000	398,475,000
Land Acquisition	26.8 ha				65.9 ha			
House	48 nos				123 nos			
II Construction		10,370,929	106,452,101	341,856,405		11,514,596	117,514,310	378,890,603
2.1 Civil Works		10,329,849	106,042,101	340,513,889		11,461,272	116,278,810	376,444,648
Open Excavation	4,346,000 m3				1,390,200 m3			
Tunnel Excavation	90,200 m3				80,300 m3			
Embankment	374,900 m3				1,927,150 m3			
Bank Protection	5,400 m2				29,100 m2			
RF Concrete(Open-air)	126,510 m3				135,650 m3			
RF Concrete(Tunnel)	36,320 m3				25,140 m3			
PC Pile (500mm dia.)	272,790 m				343,200 m			
2.2 Mechanical Works		38,896	242,000	1,124,939		40,766	269,500	1,194,888
Gate type-A	4 nos				- nos			
Gate type-B	- nos				6 nos			
Gate type-C	4 nos				4 nos			
2.3 Miscellaneous Works		2,184	168,000	217,577		12,558	966,000	1,251,067
Road	800 m				4,600 m			

Table 8 SUMMARY OF CONSTRUCTION COST
(WESTERN BANJIR CANAL SYSTEM)

	Work Item	WESTERN BANJIR CANAL (WBC- 1)				WBC - 3 (WBC + Ciliwun Tunnel + Cisadane)			
		Major Work Quantity		Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)	Major Work Quantity		Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I	Land Acquisition /Compensation			-	353,160,000	353,160,000			-	217,080,000	217,080,000
	Land Acquisition	54.0	ha				33.3	ha			
	House	1,080	nos				640	nos			
II	Construction			1,454,331	17,309,158	50,315,435			9,761,803	87,084,352	308,669,630
2.1	Civil Works			1,450,419	17,217,658	50,135,133			9,757,345	86,950,852	308,434,934
	Open Excavation	2,420,500	m3				2,470,300	m3			
	Tunnel Excavation	-	m3				90,400	m3			
	Embankment	485,000	m3				694,200	m3			
	Bank Protection	22,700	m2				22,700	m2			
	RF concrete(Open-air)	430	m3				14,190	m3			
	RF concrete(Tunnel)	-	m3				32,940	m3			
	PC Pile (500mm dia.)	300	m				147,780	m			
2.2	Mechanical Works			3,366	49,500	125,908			3,366	49,500	125,908
	Gate type-A	-	nos				-	nos			
	Gate type-B	6	nos				6	nos			
	Gate type-C	-	nos				-	nos			
2.3	Miscellaneous Works			546	42,000	54,394			1,092	84,000	108,788
	Road	200	m				400	m			

Table 9 SUMMARY OF CONSTRUCTION COST (1/2)
(EASTERN BANJIR CANAL SYSTEM : EBC - 1)

Work Item	EBC 1-1 : BOX CULVERT+OPEN CHAN'L Type				EBC 1-2 : PC-SHEET PILE REVETMENT Type				EBC 1-3 : OPEN CHANNEL Type			
	Major Work Quantity	Estimated Cost (x1,000)			Major Work Quantity	Estimated Cost (x1,000)			Major Work Quantity	Estimated Cost (x1,000)		
		Foreign (Yen)	Local (Rupiah)	Total(Rupiah)		Foreign (Yen)	Local (Rupiah)	Total(Rupiah)		Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I Land Acquisition /Compensation		-	378,532,000	378,532,000		-	443,436,000	443,436,000		-	588,722,000	588,722,000
Land Acquisition	147.6 ha				142.8 ha				182.1 ha			
House	708 nos				684 nos				818 nos			
II Construction		48,414,279	529,387,114	1,628,361,562		14,579,936	135,057,062	465,996,023		4,354,300	44,040,052	142,856,969
2.1 Civil Works		48,412,914	529,282,114	1,628,225,576		14,578,571	134,952,062	465,860,037		4,352,935	43,935,052	142,720,983
Open Excavation	8,232,800 m3				7,070,900 m3				7,101,900 m3			
Tunnel Excavation	- m3				- m3				- m3			
Embankment	56,550 m3				20,500 m3				23,600 m3			
Bank Protection	- m2				6,500 m2				6,500 m2			
RF Concrete(Open-air)	36,000 m3				36,000 m3				36,000 m3			
RF Concrete(Box Clvrt	1,568,300 m3				- m3				- m3			
PC Pile (500mm dia.)	1,200,500 m				- m				- m			
PC Sheet Pile	- m				2,080,000 m				- m			
2.2 Mechanical Works		-	-	-		-	-	-		-	-	-
Gate type-A	- nos				- nos				- nos			
Gate type-B	- nos				- nos				- nos			
Gate type-C	- nos				- nos				- nos			
2.3 Miscellaneous Works		1,365	105,000	135,986		1,365	105,000	135,986		1,365	105,000	135,986
Road	500 m				500 m				500 m			

Table 9 SUMMARY OF CONSTRUCTION COST (2/2)
(EASTERN BANJIR CANAL SYSTEM : EBC - 3)

Work Item	EASTERN BANJIR CANAL SYSTEM TOTAL				CIPINANG RIVER			SUNTER RIVER			BUARAN RIVER		
	Major Work Quantity	Estimated Cost (x1,000)			Major Work Quantity	Estimated Cost (x1,000)		Major Work Quantity	Estimated Cost (x1,000)		Major Work Quantity	Estimated Cost (x1,000)	
		Foreign (Yen)	Local (Rupiah)	Total(Rupiah)		Foreign (Yen)	Local (Rupiah)	Total(Rupiah)		Foreign (Yen)	Local (Rupiah)	Total(Rupiah)		Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I Land Acquisition /Compensation		-	499,465,000	499,465,000		-	106,293,000	106,293,000		-	90,293,000	90,293,000		-	46,293,000	46,293,000
Land Acquisition	67.0 ha				25.0 ha				21.0 ha				10.0 ha			
House	868 nos				217 nos				217 nos				217 nos			
II Construction		1,846,240	167,055,930	210,187,604		582,843	40,811,453	55,264,173		568,808	82,188,680	95,100,142		185,801	12,520,684	16,738,524
2.1 Civil Works		1,815,995	165,991,430	207,214,010		575,868	40,326,953	53,398,809		563,228	82,038,680	94,823,476		182,637	12,440,184	16,586,201
Open Excavation	851,000 m3				283,200 m3				328,500 m3				52,300 m3			
Tunnel Excavation	0 m3				- m3				- m3				- m3			
Embankment	706,400 m3				187,400 m3				194,000 m3				92,900 m3			
Bank Protection	339,100 m2				134,400 m2				63,000 m2				41,500 m2			
RF Concrete(Open-air)	3,740 m3				1,020 m3				600 m3				380 m3			
RF Concrete(Tunnel)	0 m3				- m3				- m3				- m3			
PC Pile (500mm dia.)	1,200 m				400 m				- m				100 m			
2.2 Mechanical Works		25,058	665,500	2,456,849		5,610	379,500	1,729,378		4,488	66,000	167,878		2,618	38,500	97,929
Gate type-A	34 nos				6 nos				6 nos				4 nos			
Gate type-B	22 nos				6 nos				4 nos				2 nos			
Gate type-C	0 nos				- nos				- nos				- nos			
2.3 Miscellaneous Works		5,187	399,000	516,745		1,365	105,000	135,986		1,092	84,000	108,788		546	42,000	54,394
Road	1,900 m				500 m				400 m				200 m			

Work Item	JATIKRAMAT RIVER				CAKUNG RIVER			
	Major Work Quantity	Estimated Cost (x1,000)			Major Work Quantity	Estimated Cost (x1,000)		
		Foreign (Yen)	Local (Rupiah)	Total(Rupiah)		Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I Land Acquisition /Compensation		-	50,293,000	50,293,000		-	206,293,000	206,293,000
Land Acquisition	11.0 ha				50.0 ha			
House	217 nos				217 nos			
II Construction		151,633	8,262,525	11,704,461		357,155	23,272,588	31,380,304
2.1 Civil Works		148,469	8,182,025	11,552,138		345,793	23,003,588	30,853,386
Open Excavation	95,700 m3				91,300 m3			
Tunnel Excavation	- m3				- m3			
Embankment	56,500 m3				175,600 m3			
Bank Protection	26,400 m2				73,800 m2			
RF Concrete(Open-air)	280 m3				1,460 m3			
RF Concrete(Tunnel)	- m3				- m3			
PC Pile (500mm dia.)	100 m				600 m			
2.2 Mechanical Works		2,618	38,500	97,929		9,724	143,000	363,735
Gate type-A	4 nos				14 nos			
Gate type-B	2 nos				8 nos			
Gate type-C	- nos				- nos			
2.3 Miscellaneous Works		546	42,000	54,394		1,638	126,000	163,183
Road	200 m				600 m			

Table 10 SUMMARY OF CONSTRUCTION COST (CBL FLOODWAY SYSTEM)

Work Item	CBL FLOODWAY SYSTEM TOTAL (CBL- 1) Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I Land Acquisition /Compensation		-	87,706,000	87,706,000
Land Acquisition	85.9 ha			
House	86 nos			
II Construction		2,586,325	30,115,454	88,810,843
2.1 Civil Works		2,565,987	29,714,454	87,948,171
Open Excavation	4,482,050 m3			
Tunnel Excavation	- m3			
Embankment	573,000 m3			
Bank Protection	45,600 m2			
RF Concrete(Open-air)	2,410 m3			
RF Concrete(Tunnel)	- m3			
PC Pile (500mm dia.)	1,300 m			
2.2 Mechanical Works		18,700	275,000	699,490
Gate type-A	44 nos			
Gate type-B	4 nos			
Gate type-C	- nos			
2.3 Miscellaneous Works		1,638	126,000	163,182
Road	600 m			

Work Item	CBL FLOODWAY Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I Land Acquisition /Compensation		-	34,814,000	34,814,000
Land Acquisition	34.1 ha			
House	34 nos			
II Construction		2,004,994	16,270,326	61,769,421
2.1 Civil Works		1,996,220	16,107,326	61,407,251
Open Excavation	4,017,900 m3			
Tunnel Excavation	- m3			
Embankment	84,000 m3			
Bank Protection	12,900 m2			
RF Concrete(Open-air)	1,080 m3			
RF Concrete(Tunnel)	- m3			
PC Pile (500mm dia.)	600 m			
2.2 Mechanical Works		8,228	121,000	307,776
Gate type-A	16 nos			
Gate type-B	4 nos			
Gate type-C	- nos			
2.3 Miscellaneous Works		546	42,000	54,394
Road	200 m			

Work Item	BEKASI RIVER Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I Land Acquisition /Compensation		-	29,609,000	29,609,000
Land Acquisition	29.0 ha			
House	29 nos			
II Construction		400,466	10,957,859	20,049,153
2.1 Civil Works		390,944	10,783,859	19,659,004
Open Excavation	209,000 m3			
Tunnel Excavation	- m3			
Embankment	408,000 m3			
Bank Protection	26,800 m2			
RF Concrete(Open-air)	1,140 m3			
RF Concrete(Tunnel)	- m3			
PC Pile (500mm dia.)	600 m			
2.2 Mechanical Works		8,976	132,000	335,755
Gate type-A	24 nos			
Gate type-B	- nos			
Gate type-C	- nos			
2.3 Miscellaneous Works		546	42,000	54,394
Road	200 m			

Work Item	CISADANG RIVER Major Work Quantity	Estimated Cost (x1,000) Foreign (Yen)	Local (Rupiah)	Total(Rupiah)
I Land Acquisition /Compensation		-	23,283,000	23,283,000
Land Acquisition	22.8 ha			
House	23 nos			
II Construction		180,865	2,887,269	6,992,269
2.1 Civil Works		178,823	2,823,269	6,881,916
Open Excavation	255,150 m3			
Tunnel Excavation	- m3			
Embankment	81,000 m3			
Bank Protection	5,900 m2			
RF Concrete(Open-air)	190 m3			
RF Concrete(Tunnel)	- m3			
PC Pile (500mm dia.)	100 m			
2.2 Mechanical Works		1,496	22,000	55,959
Gate type-A	4 nos			
Gate type-B	- nos			
Gate type-C	- nos			
2.3 Miscellaneous Works		546	42,000	54,394
Road	200 m			

Table 11 DRAINAGE FACILITIES IN WESTERN BANJIR CANAR (1/2)

Site	Location		Present Condition		River Improvement		Proposed Works
	(Section No.)	Bank	Channel	Structure	Design W.L(m)	Works	
Muara Angke Pumping Sta.	(0.5K)	Right	Reservoir	Channels Gated Structure	0.99	Diking Levee Raising	Existing Gated Structure to be Replaced New Gate for Pumping Station
Siphon(Teluk Gong)	mid(4.6K/4.8K)	L to R	K.Angke	Siphon	2.30	Levee Raising	None
Drainage Gated Structure in K.Angke	(5.6K)	Left	K.Angke	Gated Structure	2.63	- do -	Existing Gated Structure to be Replaced
K.Krendang Outlet	(5.6K)	Right	K.Krendang	-	2.63	- do -	New Gated Structure at Outlet
Rawa Kepa Pumping Sta.	(9.2K)	Left	-	Sluiceway w/Flapgate Chuteway	3.89	- do -	Replacement of Flapgate Modification of Chuteway
Cideng Pumping Sta.	(9.4K)+	Right	-	Sluiceway	4.00	- do -	None
Ponduk Bandung Pumping Sta.	(10.8K)	Left	-	Sluice Pipe w/ Flapgate	4.48	- do -	Existing Sluice Pipe and Flapgate to be Replaced
Drainage Gated Structure in Petamburan	(12.1K)	Left	Local drain	Gated Structure	4.94	- do -	None
Drainage Gated Structure in K.Krukut Outlet (beside Karet Barrage)	(12.42K)	Right	K.Krukut	Gated Structure	5.06	- do -	None
Gated Structure in Filtration Plant	mid (12.6K/12.9K)	Left	-	Gated Structure	5.15	- do -	None

Table 11 DRAINAGE FACILITIES IN WESTERN BANJIR CANAR (2/2)

Site	Location (Section No.)	Bank	Present Condition Channel	Structure	River Improvement Design W.L (m)	Works	Proposed Works
Melati Pumping Sta.	(13.4K)-	Right	-	Sluiceway w/Flapgate	5.40	Widening of Low Water Channel	Replacement of Sluice Pipe w/ Flapgate Modification of Chuteway
Setiabudi(Barat) Pumping Station	(14.40K)	Left	-	Outlet Culvert	6.05	- do -	None
Siphon in K.Cideng	(14.40K)+	L to R	K.Cideng	Siphon	6.10	- do -	None
Setiabudi(Timur) Pumping Station	mid (14.4K/14.8K)	Left	-	Outlet Culvert	6.15	- do -	None
Drain Outlet near Mampang Sta.	(15.7K)+	Right	Local drain	Sluiceway	6.90	- do -	None
Gate at Drainage Outlet in Pasar Manggis	(16.3K)	Left	Local drain	Gated Structure	7.20	- do -	Modification of existing Chuteway
Siphon in Menteng	(16.3K)	L to R	Local drain	Siphon	7.20	- do -	None
Drain. Channel in Menteng	(16.6K)	Right	Local drain	Sluiceway	7.37	- do -	None
Outlet of S.Bali Matraman	(16.9K)	Left	S.B.Matraman	Sluiceway	7.55	- do -	None
Gate at Flushing Channel to Surabaya River	-	Left	K.Surabaya	Gated Structure	-	-	To be Replaced beside New Channel of Manggarai Barrage

Table 12 IMPROVEMENT WORKS IN THE EXISTING MAJOR DRAINAGE FACILITIES IN WBC AREA (1/2)

Drainage Facility	Facility Name	Situation on WBC	Structure to be Affected by River Improvement	Scale: Structure	D (m)	W (m)	H (m)	L (m)	No.	Conceivable Construction /Modification of Structures
Pumping Station	Muara Angke P.S.	Outlet	- Outlet Structure of Pump Sta.	Outlet	-	3.7	-	3.0	1	New Sluice with Flapgate
			- Gated Structure in Channel fromReservoir	Gate	-	1.8	2.5	-	1	New Sluice Gate
				Channel	-	3.0	-	-	1	Reconstruction
	Rawa Kepa P.S.	Outlet	- Sluice with Flapgate	Sluice Pipe	0.8	-	-	-	4	Replacement of Flapgate
			- Outlet Structure	Outlet	-	2.7	2.6	-	4	Reconstruction
	Cideng P.S.	Outlet	- Outlet Structure	-	-	-	-	-	-	None
	Pondok Bandung	Outlet	- Sluice with Flapgate(from Pump)	Sluice Pipe	0.8	-	-	-	2	Replacement of Flapgate
			- Sluice with Flapgate(from Drain)	Sluice Pipe	0.8	-	-	-	2	Replacement of Sluice Pipe with Flapgate
	Melati P.S.	Outlet	- Sluice with Flapgate	Sluice Pipe	0.7	-	-	-	4	Replacement of Flapgate
			- Outlet Structure	Outlet	4.0	-	2.3	5.5	1	Replacement of Outlet Structure
	Setiabudi Barat P.S.	Outlet	- Outlet Structure	Outlet(A)	-	5.0	-	-	1	None
				Outlet(B)	-	4.0	-	-	1	None
	Setiabudi Timur P.S.	Outlet	- Outlet Structure	Outlet	-	3.0	-	-	1	None

Note : Construction/Modification works will be subject to the scale of river improvement works.

Table 12 IMPROVEMENT WORKS IN THE EXISTING MAJOR DRAINAGE FACILITIES IN WBC AREA (2/2)

Drainage Facility	Facility Name	Situation on WBC	Structure to be Affected by River Improvement	Scale					Conceivable Construction /Modification of Structures
				Structure	D (m)	W (m)	H (m)	L (m)	No.	
Drainage River (Channel)	Grogol River (Teluk Gong Siphon)	Crossing	- Siphon	Inlet of Siphon	-	2.0	-	-	4	Not specified yet
	Angke River	Outlet	- Gate Structure on Outlet Channel	Gate	-	1.5	-	-	2	New Sluice Gate
				Sluiceway	-	7.0	-	-	1	Improvement
	K.Krendang	Outlet	- Closed Channel w/ Soil Embank.	Channel	-	3.0	-	-	1	New Sluice Gate
	Local Drain Channel (Kel.Petamburan)	Outlet	- Sluice Gate	Gate	-	0.9	-	-	3	None
			- Sluiceway	Sluiceway	-	30	-	-	1	Replacement of Channel and Masonry Wall
	Krukut River	Inlet	- Gated Structure	Gate	-	1.5	-	-	2	None
	K. Cideng	Crossing	- Siphon	-	-		-	-		Not specified yet
		Outlet	- Outlet Structure	Channel	-	12	-	-	1	None
	K.Baru Barat	Outlet	- Sluice Gate	Gate	-	2.5	-	-	1	None
			- Outlet Structure	Outlet	-	2.0	3.0	-	1	Partial Replacement
		Crossing	- Siphon (connected to local drain in Menteng Tenggulun)	Inlet Pipe of local drain	0.8	-	-	-	1	Not specified yet
	New Drain branched from K.Baru Barat	Outlet	- Sluice	Box Culvert	(2.5+3.0)		2.5	-	1	None
	S.Bali Matraman	Outlet	- Sluice	Box Culvert	(5.0+5.0)		2.0	-	1	None
	K.Surabaya	Inlet	- Gated Structure	Gate	-	1.5	-	-	1	Gate to be replaced; Channel under railway to be replaced.
	Old Ciliwun River	Inlet	- Gated Structure	-	-	-	-	-	-	None

Note : Construction/Modification works will be subject to the scale of river improvement works.

Table 13 EXISTING PUMPING STATIONS ALONG WBC

Station	Drainage Area (ha)	Reservoir Area (ha)	Pump Capacity			Start Year	Objective Drainage Area/River	
			Unit Capacity (m^3/s)	Unit (nos.)	Total (m^3/s)		River	Area
Muara Angke	53	0.5	0.5	2	1.0	1980	-	Muara Angke
Rawa Kepa	223	0.5	2.0	4	8.0	1984	-	Jati Petamburan, Tomang Timur
Cideng	750	-	6.7	6	40.0	1989	-	Thamrin, Medan Merdeka, Sabang, Kebon Sirih, Wahid Hasyim
Pondok Bandung	90	-	0.5	2	2.6	1979	-	Kel. Kota Bambu
Melati	185	3.5	1.1	4	4.4	1965	K.Cideng	
Setiabudi Barat	750	5.0	1.1	5	5.5	1969/75	K.Cideng	
Setiabudi Timur	90	2.0	1.1	3	3.3	1973	K.Cideng	Jl. Rasuna Said, Kel. Menteng Atas, Kel.Menteng Dalam (as retension pond for K.Cideng Bawah)

Source : Pengendalian Banjir dan Drainase di DKI Jakarta, DPU

Table 14 EXISTING STRUCTURES OF LOCAL DRAINAGE SYSTEM CONNECTED TO WBC

Facility Name	Section of WBC	Structure Located in River Channel	Scale
Drainage Outlet	Between Jl.Mas Mansyur - Jl.Thamrin	Sluice	Single Pipe x 2 Double Pipe x 1 Rectangular t x 4
	Between Jl.Thamrin - Jl.H.R.Rasuna	Sluice	Triple Pipe x 1
	Between Jl.H.R.Rasuna - Jl.Madiun	Sluice	Single Conduit x 1
	Between Jl.Madiun - Jl.Gunter	Sluice	(Conduit&Chuteway)x 1 Single Pipe x 1
	Between Jl.Gunter - Jl.Sukabumi	Sluice / Outlet Structure	Single Pipe x 1

Table 15 DRAINAGE FACILITIES IN CISADANE RIVER

No.	Location (Section No.)	Bank	Present Condition: Channel	Channel Width at Outlet(m)	Structure	River Improvement: Design W.L.(m)	Work	Elevation(El.,m): New(Raised) Levee	Present Levee	Present Ground	Proposed Works
L-1	(3.5 K)- 100 m	Left	Local drain channel	3	-	+5.06	New Levee	+6.06	+4.90	+2.10	New Sluiceway w/ Flapgate
R-1	mid(6.8K/7.1K)	Right	Local drain channel	5	Sluiceway w/ Flapgate	+6.18	Levee Raising B.D. of Levee	+7.18	+6.30	+3.00	Replacement of existing Sluiceway w/ Flapgate
R-2	mid(12.7K/13.1K)	Right	Creek	5	-	+8.60	Levee Raising B.D. of Levee	+9.60	+9.20	+8.70	None
R-3	(14.4K)-120 m	Right	Local drain channel	2	-	+9.50	Levee Raising (Left bank only)	+10.50	-	-	New Sluiceway w/ Flapgate
L-2	(16.8K) - 300 m	Left	Irri. drain channel	3	Drop	+11.00	Levee Raising B.D. of Levee	+12.00	+11.90	+10.20	Existing Sluiceway under road to be Replaced with New Sluiceway w/ Flapgate
L-3	(17.4K)- 300 m	Left	Local drain channel	5	-	-	No Improv.	-	-	-	None
L-4	(19.1K) - 40 m	Left	Local drain channel	5	Drop	-	No Improv.	-	-	-	New Sluiceway w/ Flapgate udr. road
L-5	(19.5K) - 200 m	Left	Sabi River	5 - 7	-	-	No Improv.	-	-	-	None (Drainage Facility for Sabi River incl. Gated Structure and Pumping Station to be Provided in future improvement)
L-6	(20.7K) + 140 m	Left	Local drain channel	5 - 6	Sluiceway w/ Chute	-	No Improv.	-	-	-	None
L-7	(20.7K) + 300 m	Left	Drain from irri. canal	6 - 7	-	-	No Improv.	-	-	-	None (Parapet Wall to be Provided for Left Bank of Canal in future improvement)
R-4	(21.3K) - 80 m	Right	Drain from irri. canal	20 - 25	-	-	No Improv.	-	-	-	None (Parapet Wall to be Provided for Right Bank of Canal in future improvement)

Note : B.D.of Levee ; Backward Displacement of Levee

Table 16 EXISTING BRIDGES IN THE PROJECT AREA (1/2)

Name	Location	Classification	Structure	Scale			Present Condition	Works to be Executed
				Length (m)	Width (m)	Lane Nos.		
(Western Banjir Canal)								
Permai	+1.9K	Road Br.	PSC	75.0	7.5 x 2	2 x 2	separate two bridges	protection works of exposed pier(s)
Jl.Tol Prof.Sediyatmo	+2.7K	Elevated Road	PSC	-	-	-	under const.; piers in river channel	protection works of exposed pier(s)
Jl.Tol Northern Extension	+4.7K	Elevated Road	PSC	-	-	-	piers in river channel	protection works of exposed pier(s)
Teluk Gong	+4.9K	Road Br.	Steel Truss	50.0	7.0	2	-	None
Pangeran Tubagus	+5.6K	Road Br.	RFC	50.0	7.0x 2	2 x 2	separate two bridges	protection works of exposed pier(s)
Dr. Latumeten	+6.9K	Road Br.	PSC	60.0	28.0	8	poor clearance above waterlevel	whole bridge to be replaced(raised)
Dr. Semeru	+7.9K	Railway Br.	Steel Truss	42.0	42.0	-	under replacement with new concrete bridge	None
Grogol - Duri Pulo	+8.1K	Pedestrian Br.	PSC	-	1.5	-	-	None
Kyai Tapa	+8.4K	Road Br.	PSC	50.0	23.0	8	poor clearance above waterlevel	whole bridge to be replaced(raised)
Tomang	+9.4K	Road Flyover	PSC	-	-	-	under construction	protection works of exposed pier(s)
Jati Pulo - Cideng	+10.7K	Pedestrian Br.	Steel	-	1.5	-	available for motorcycle	protection works of exposed pier(s)
Jatibaru	+10.9K	Road Flyover	PSC	-	-	-	-	protection works of exposed pier(s)
Aipda K.S. Tubun	+11.3K	Road Br.	PSC	-	-	-	separate two bridges	protection works of exposed pier(s)
Karet Barrage	-	Railway Br.	RFC	-	-	-	on the piers of weir	None
KH. Mas Mansyur	+13.1K	Road Br.	PSC	37.0	6.0 x 2	2 x 2	poor clearance above waterlevel	None
							separate two bridges	None
							another flyovers under construction	None

Note Br : Bridge PSC : Prestressed Concrete T : Truss
RFC : Reinforced Concrete

Table 16 EXISTING BRIDGES IN THE PROJECT AREA (2/2)

Name	Location	Classification	Structure	Scale			Present Condition	Works to be Executed
				Length (m)	Width (m)	Lane Nos.		
(Western Banjir Canal)								
M.H.Thamrin	+13.9K	Road Br.	PSC	-	-	8	abutement in river channel	None
H.R.Rasuna Said	+14.4K	Road Flyover	PSC	-	-	-	-	protection works of exposed pier(s)
Madiun Halimun	+15.2K	Road Br.	PSC	36.0	14.0	4	-	None
Guntur	+15.7K	Road Br.	Concrete T	30.0	7.0	2	-	None
Sukabumi	+16.0K	Road Br.	Steel Truss	36.0	8.0	2	-	None
(Cisadane River)								
Kali Baru	-	Road Br.	Steel Truss	60.0	6.0	2	-	None
Suspension Bridge	-	Pedestrian Br.	Suspension	23.0	1.3	-	downstream of the proposed floodway outlet	None
(Ciliwung River)								
Jl.Pajajaran(to Puncak)	-	Road Br.	RFC	50.0	13.0	4	upstream of the proposed floodway inlet	None

Note Br : Bridge PSC : Prestressed Concrete T : Truss
RFC : Reinforced Concrete

Table 17 SUMMARY OF CONSTRUCTION COST

(Unit : Thousand)

	Description	Foreign Currency (Japanese Yen)	Local Currency (Rupiah)	Total Equivalent (Rupiah)
A.	1ST PHASE			
I.	CISADANE RIVER			
1.1	River Channel Improvement	1,108,152	13,578,926	38,733,980
1.2	Related Structures	10,879	346,023	592,970
	Sub-total of A-I	1,119,031	13,924,950	39,326,950
II.	CILIWUNG FLOODWAY	11,437,817	109,653,701	369,292,149
	Sub-total of A-II	11,437,817	109,653,701	369,292,149
	TOTAL OF 1st PHASE	12,556,848	123,578,650	408,619,099
B.	2ND PHASE			
I.	WESTERN BANJIR CANAL			
1.1	River Channel Improvement	2,306,606	32,049,715	84,409,663
1.2	Manggarai Barrage	139,053	3,174,025	6,330,520
1.3	Related Structures	7,821	307,568	485,103
	TOTAL OF 2nd PHASE	2,453,479	35,531,309	91,225,286
	GRAND TOTAL	15,010,327	159,109,959	499,844,385

Note : Exchange rate : US$ 1.0 = Rp. 2,281 = JPY. 100.48
JPY. 1.0 = Rp. 22.70

Table 18 PROJECT COST FOR 1ST PHASE

(Unit : Million)

	Description	Foreign Currency (Japanese Yen)	Local Currency (Rupiah)	Total Equivalent (Rupiah)
1	Direct Construction Cost	12,557	123,579	408,619
2	Land Acquisition and House Compensation Cost	0	61,455	61,455
3	Sub-total of (1+2)	12,557	185,034	470,074
4	Engineering Services Cost (15 % of 1.)	1,884	18,537	61,293
5	Government Administration Cost (5 % of 3.(F+L))	0	23,504	23,504
6	Sub-total of (3+4+5)	14,440	227,074	554,871
7	Physical Contingency (10 % of 6.)	1,444	22,707	55,487
8	Sub-total of (6+7)	15,884	249,782	610,358
9	Price Contingency	3,292	152,140	226,868
	TOTAL (8+9)	19,176	401,922	837,226

Note : Exchange rate : US$ 1.0 = Rp. 2,281 = JPY. 100.48

JPY. 1.0 = Rp. 22.70

Table 19 PROJECT COST FOR 2ND PHASE

(Unit : Million)

	Description	Foreign Currency (Japanese Yen)	Local Currency (Rupiah)	Total Equivalent (Rupiah)
1	Direct Construction Cost	2,453	35,531	91,214
2	Land Acquisition and House Compensation Cost	0	20,247	20,247
3	Sub-total of (1+2)	2,453	55,778	111,461
4	Engineering Services Cost (15 % of 1.)	368	5,330	13,684
5	Government Administration Cost (5 % of 3.(F+L))	0	5,573	5,573
6	Sub-total of (3+4+5)	2,821	66,681	130,718
7	Physical Contingency (10 % of 6.)	282	6,668	13,072
8	Sub-total of (6+7)	3,103	73,349	143,790
9	Price Contingency	1,152	85,694	111,844
	TOTAL (8+9)	4,255	159,043	255,634

Note : Exchange rate : US$ 1.0 = Rp. 2,281 = JPY. 100.48

JPY. 1.0 = Rp. 22.70

Table 20 TOTAL PROJECT COST

(Unit : Million)

	Description	Foreign Currency (Japanese Yen)	Local Currency (Rupiah)	Total Equivalent (Rupiah)
1	Direct Construction Cost	15,010	159,110	499,844
2	Land Acquisition and House Compensation Cost	0	81,702	81,702
3	Sub-total of (1+2)	15,010	240,812	581,546
4	Engineering Services Cost (15 % of 1.)	2,252	23,867	74,977
5	Government Administration Cost (5 % of 3.(F+L))	0	29,077	29,077
6	Sub-total of (3+4+5)	17,262	293,756	685,601
7	Physical Contingency (10 % of 6.)	1,726	29,376	68,560
8	Sub-total of (6+7)	18,988	323,132	754,161
9	Price Contingency	4,544	237,834	340,983
	TOTAL (8+9)	23,532	560,966	1,095,144

Note : Exchange rate : US$ 1.0 = Rp. 2,281 = JPY. 100.48
JPY. 1.0 = Rp. 22.70

Table 21 DISBURSEMENT SCHEDULE OF PROJECT COST

(Unit : Million)

Description	1997/98		1998/99		1999/2000		2000/01		2001/02		2002/03		2003/04		2004/05		2005/06		2006/07		2007/08		2008/09		Total	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
1. Direct Construction Cost							1,882	18,485	3,708	36,291	3,712	36,395	2,572	25,568	805	8,602	632	9,282	633	9,297	603	8,719	463	6,471	15,010	159,110
(1st Phase)							1,882	18,485	3,708	36,291	3,712	36,395	2,572	25,568	683	6,840									12,557	123,579
(2nd Phase)															122	1,762	632	9,282	633	9,297	603	8,719	463	6,471	2,453	35,531
2. Land Acquisition and House Compensation Cost						20,000		20,000		21,455				10,000		10,247										81,702
(1st Phase)						20,000		20,000		21,455																61,455
(2nd Phase)														10,000		10,247										20,247
3. Sub-total of (1+2)						20,000	1,882	38,485	3,708	57,746	3,712	36,395	2,572	35,568	805	18,849	632	9,282	633	9,297	603	8,719	463	6,471	15,010	240,812
(1st Phase)						20,000	1,882	38,485	3,708	57,746	3,712	36,395	2,572	25,568	683	6,840									12,557	185,034
(2nd Phase)														10,000	122	12,009	632	9,282	633	9,297	603	8,719	463	6,471	2,453	55,778
4. Government Administration Cost		588		588		3,721		3,721		3,721		3,861		3,861		4,780		1,059		1,059		1,059		1,059		29,077
5. Engineering Service Cost	314	3,089	314	3,089	209	2,660	209	2,060	209	2,060	271	2,948	271	2,948	258	2,770	49	711	49	711	49	711	49	711	2,252	23,867
6. Sub-total of (3+4+5)	314	3,677	314	3,677	209	25,781	2,091	44,266	3,917	63,527	3,983	43,204	2,843	42,377	1,063	26,400	681	11,052	682	11,067	652	10,489	512	8,241	17,262	293,755
7. Physical Contingency	31	368	31	368	21	2,578	209	4,427	392	6,353	398	4,320	284	4,238	106	2,640	68	1,105	68	1,107	65	1,049	51	824	1,726	29,376
8. Total of (6+7)	345	4,045	345	4,045	230	28,359	2,300	48,693	4,309	69,880	4,381	47,524	3,127	46,614	1,170	29,040	749	12,157	750	12,173	717	11,537	563	9,065	18,988	323,131
9. Price Contingency	21	673	32	1,050	29	10,223	366	22,853	836	41,011	1,007	33,924	834	39,666	356	29,011	258	14,089	288	16,210	276	15,364	240	13,762	4,544	237,834
10. Grand Total of (8+9)	366	4,718	377	5,095	259	38,582	2,667	71,546	5,145	110,890	5,388	81,448	3,961	86,280	1,526	58,050	1,007	26,245	1,039	28,383	993	26,901	803	22,826	23,531	560,965

Notes ; F.C. = Foreign Currency in Japanese Yen
L.C. = Local Currency in Indonesian Rupiah

US$ 1.0 = Rp. 2,281 = JPY. 100.48
JPY. 1.0 = Rp. 22.70

Price Contingency : 3 % per annum
8 % per annum

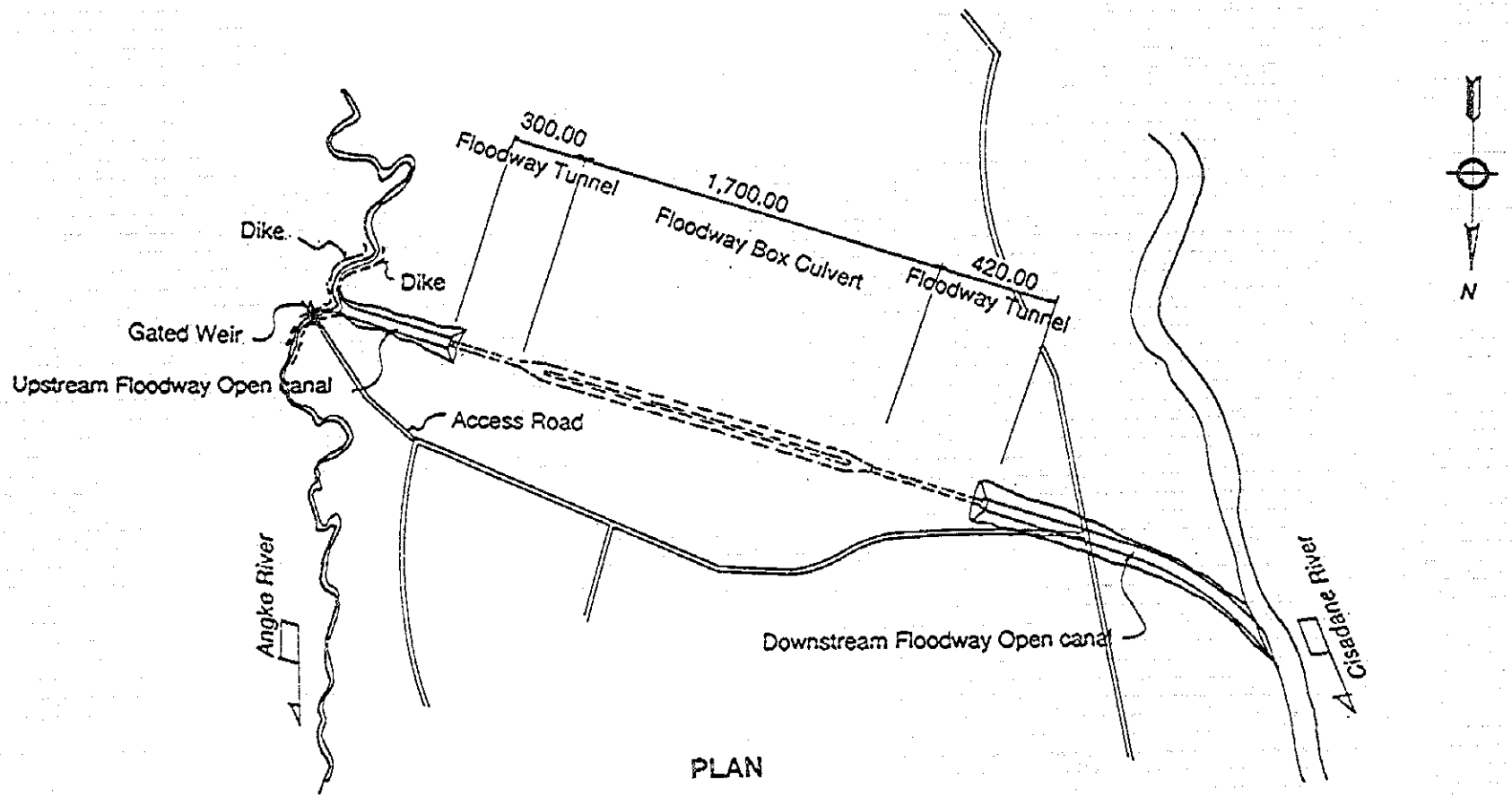
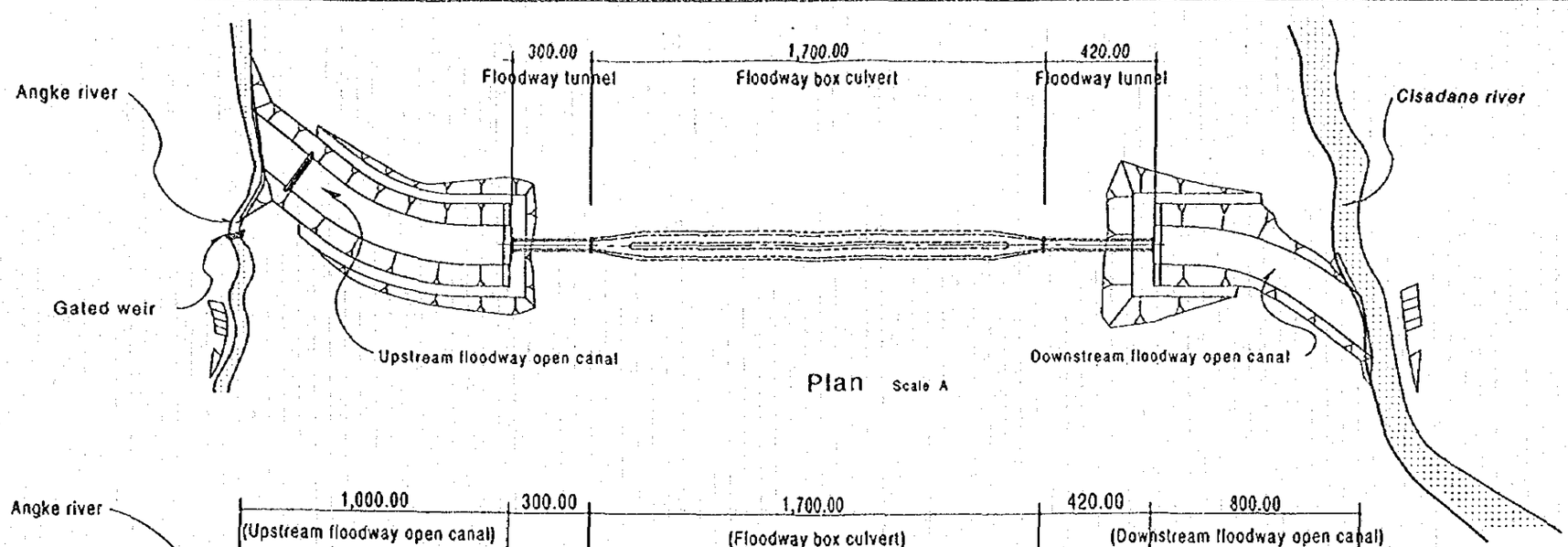
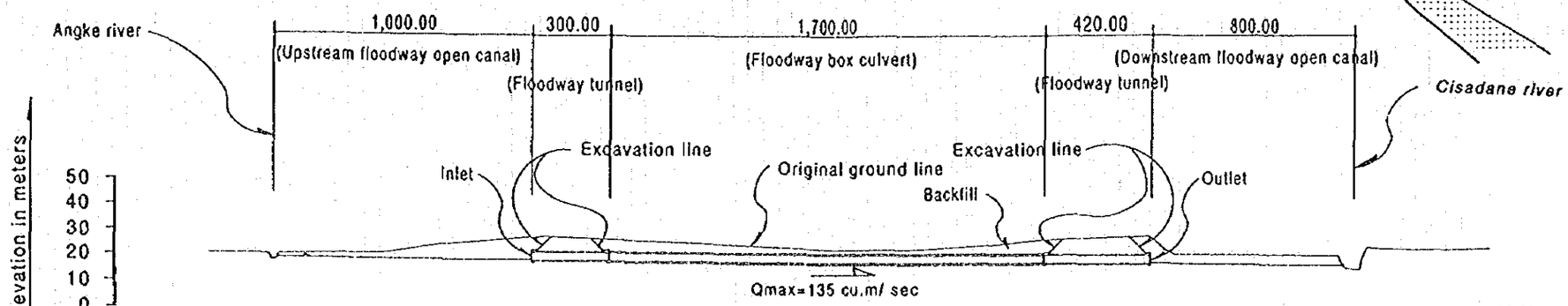


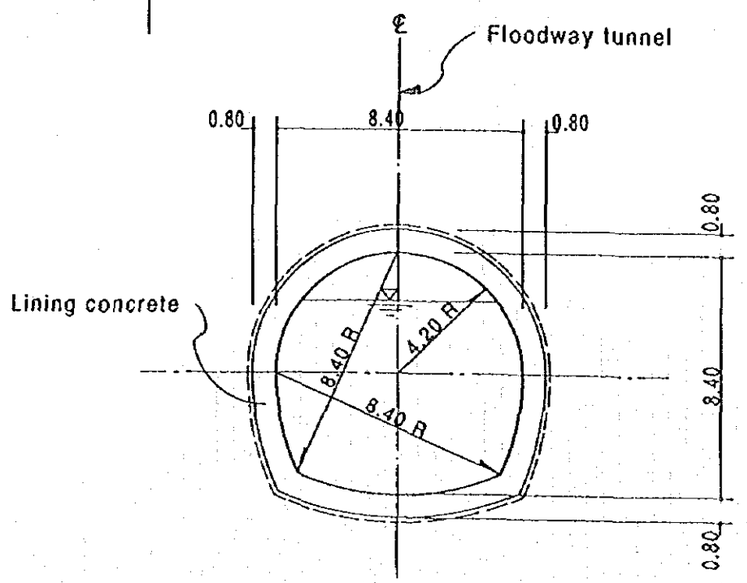
Figure 1 ANGKE RIVER, FLOODWAY; GENERAL PLAN



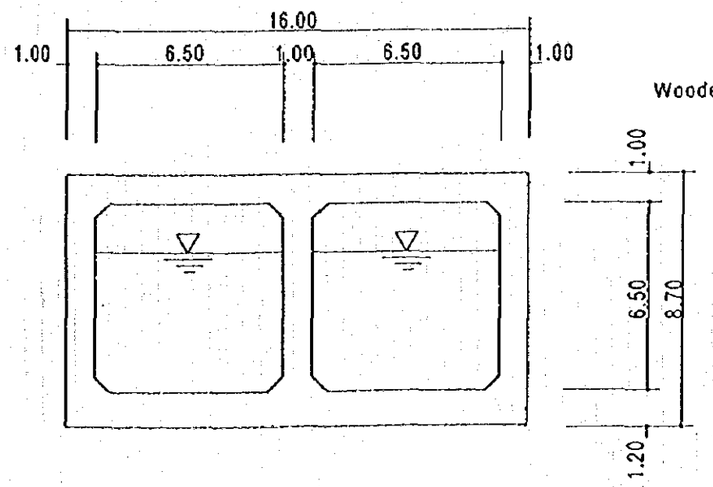
Plan Scale A



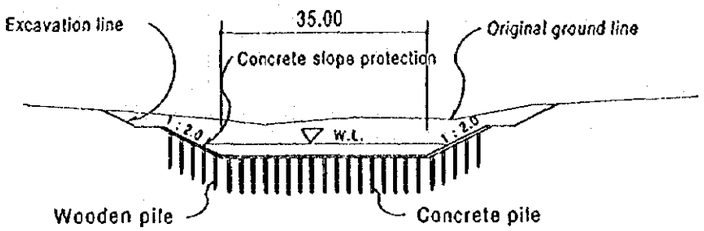
Profile H = Scale A
V = Scale B



Typical Cross Section Scale D



Cross Section of Box Culvert Scale D



Cross Section of Open Canal Scale C

Scale A 0 1,000m
Scale B 0 100m
Scale C 0 50m
Scale D 0 10m

Figure 2 ANGKE RIVER, FLOODWAY ; PLAN, PROFILE AND TYPICAL SECTIONS

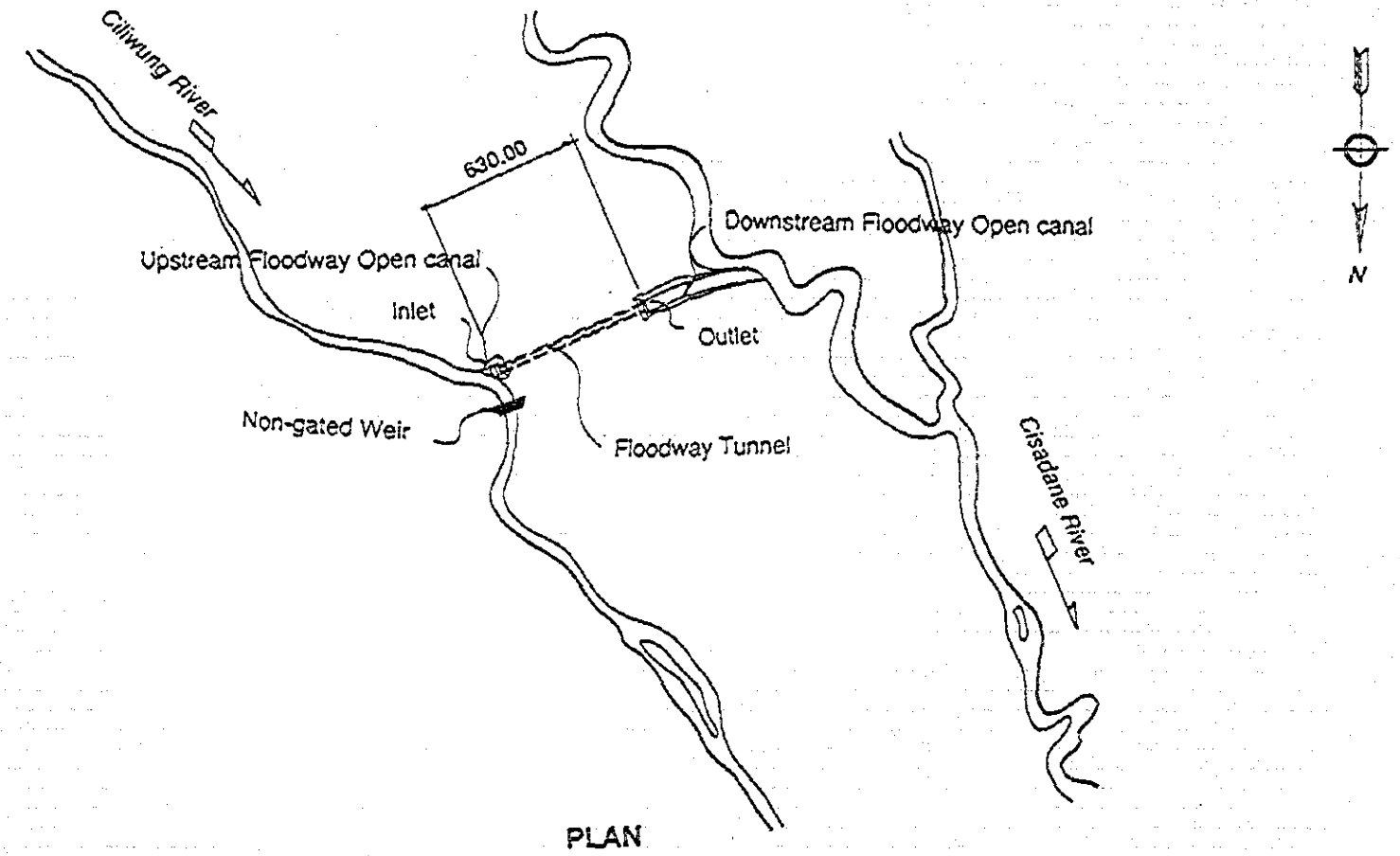
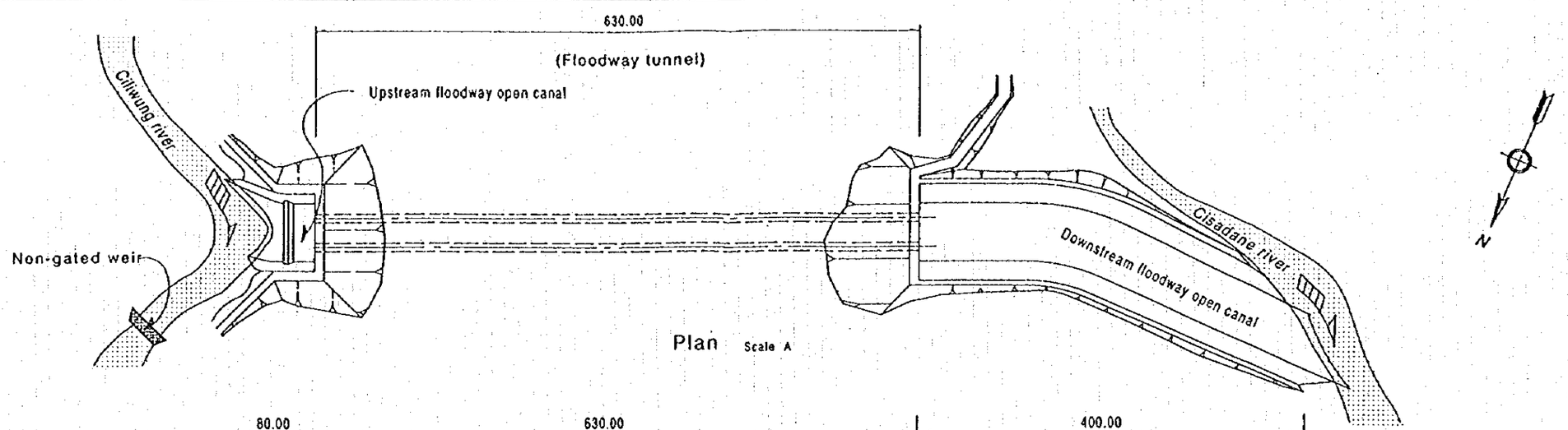
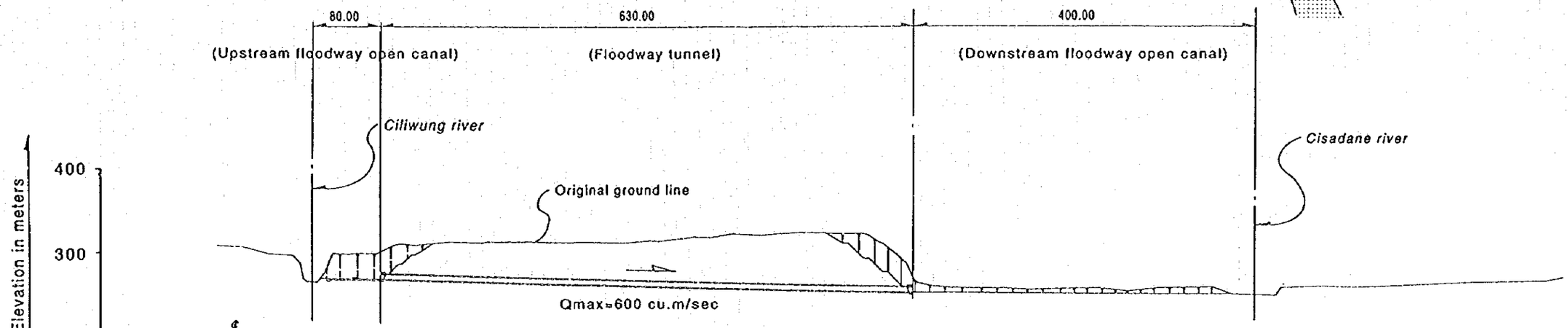


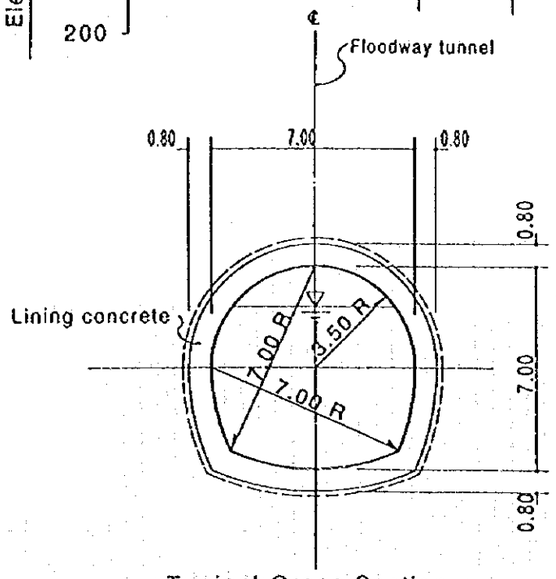
Figure 3 CILIWUN RIVER, FLOODWAY ; GENERAL PLAN (MASTER PLAN STUDY)



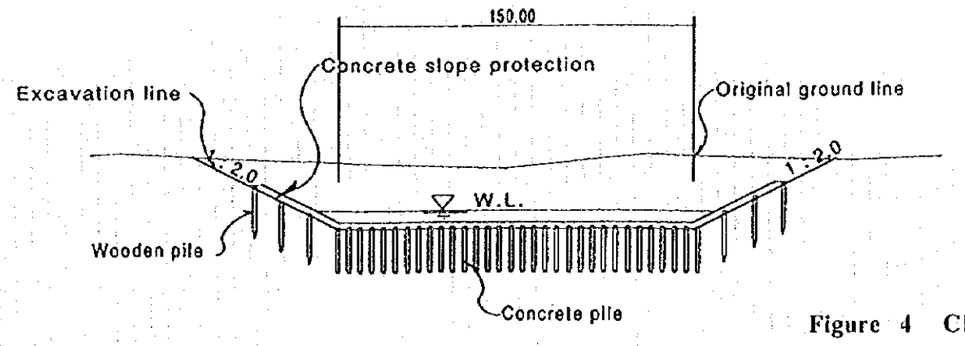
Plan Scale A



Profile Scale A



Typical Cross Section Scale C



Cross Section of Open Canal Scale B

Scale A 0 250 m
Scale B 0 100 m
Scale C 0 10 m

Figure 4 CILIWUN RIVER, FLOODWAY TUNNEL ; PLAN, PROFILE AND TYPICAL SECTIONS (MASTER PLAN STUDY)

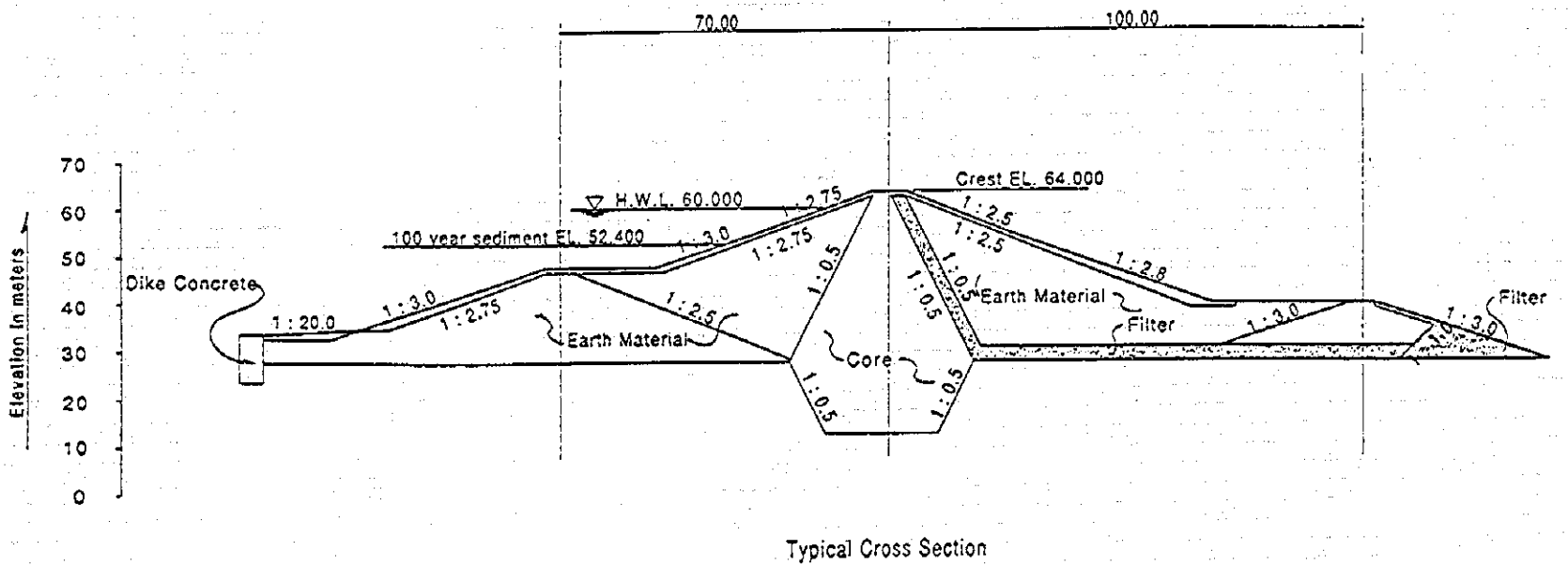


Figure 5 LIMO DAM ; TYPICAL CROSS SECTION

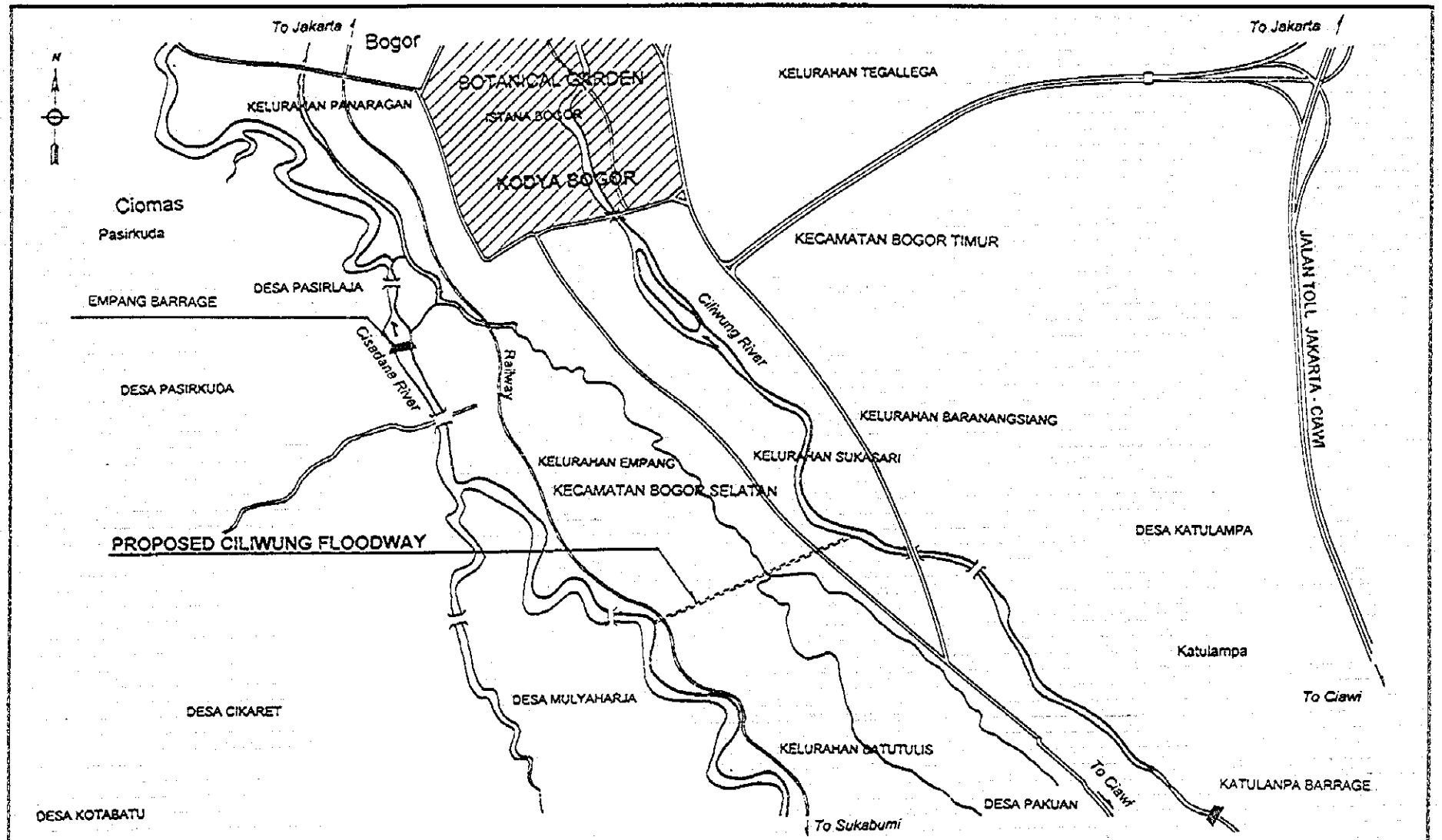


Figure 6 LOCATION MAP OF THE CILIWUNG FLOODWAY (FEASIBILITY STUDY)

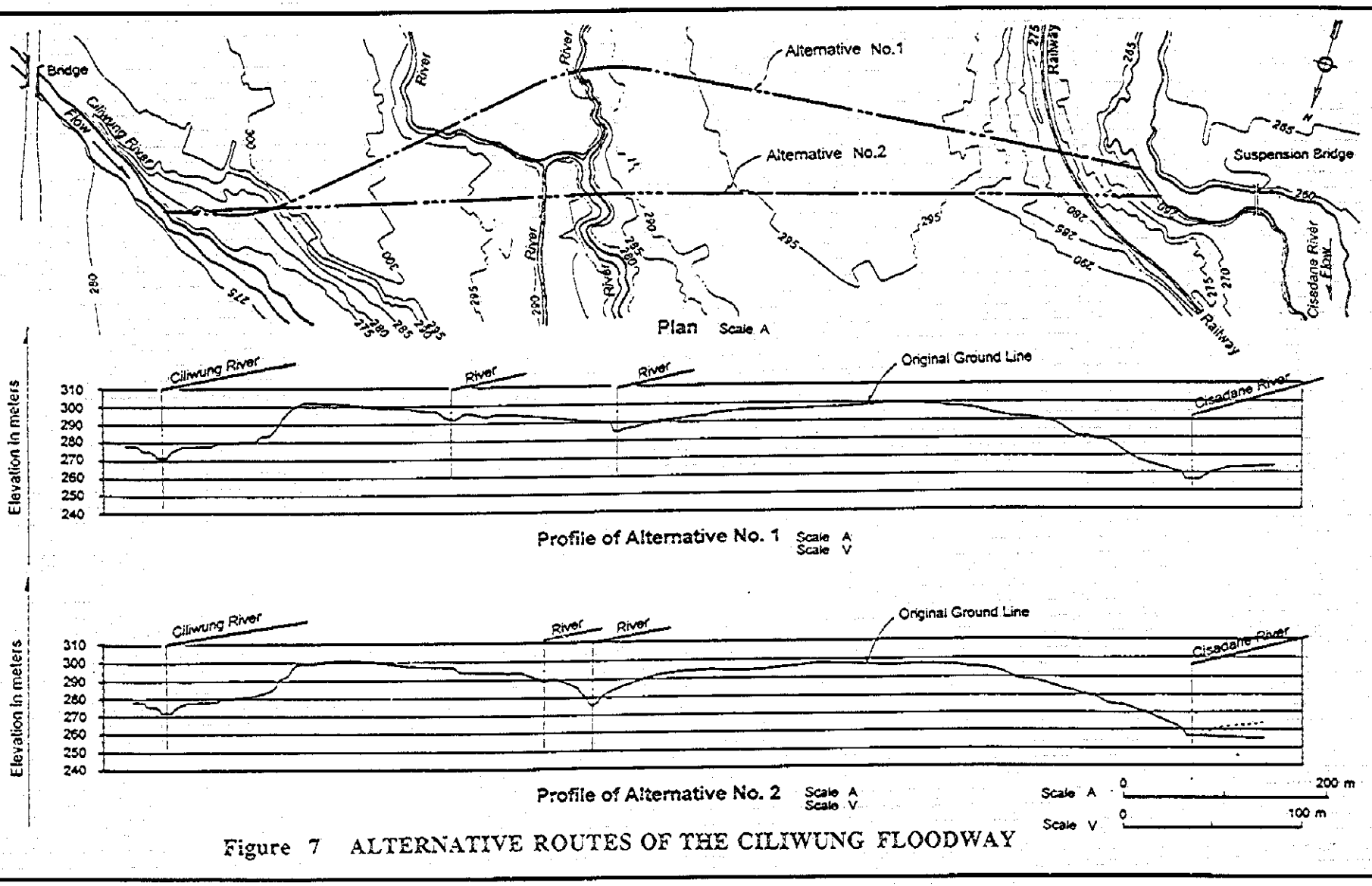
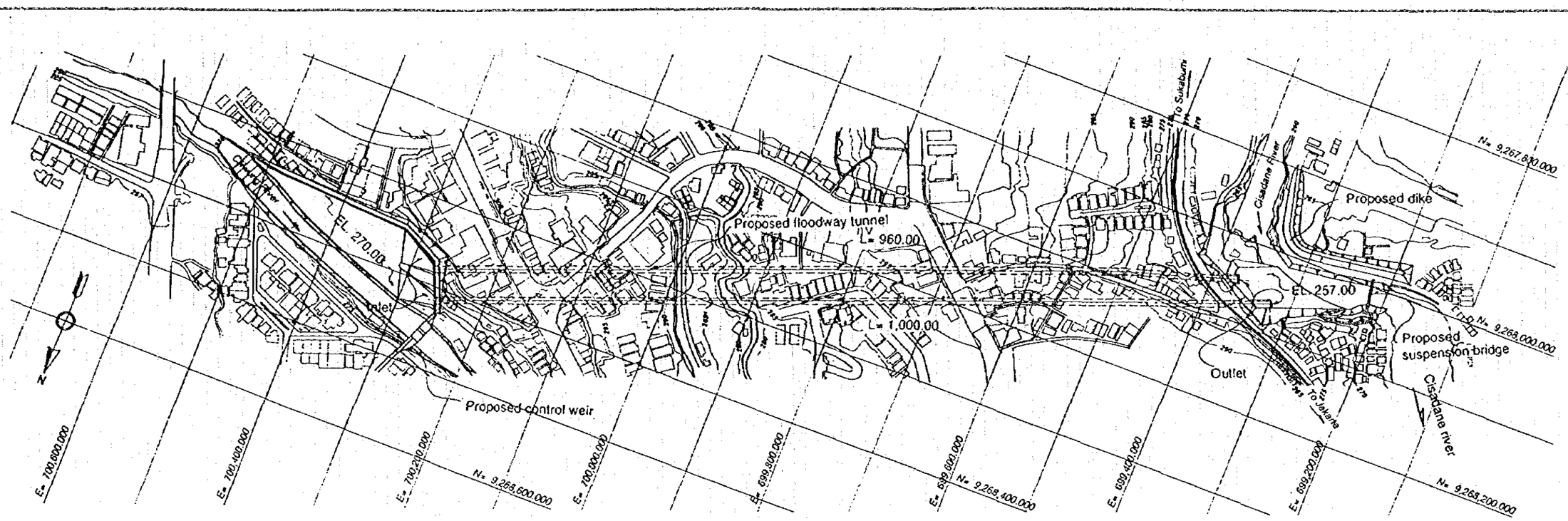
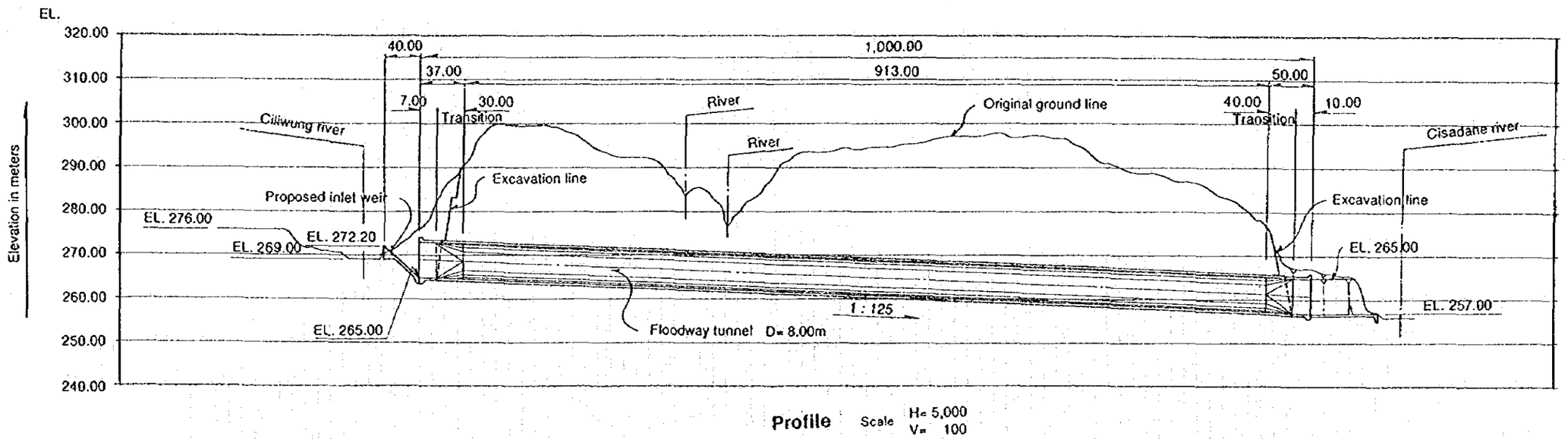


Figure 7 ALTERNATIVE ROUTES OF THE CILIWUNG FLOODWAY



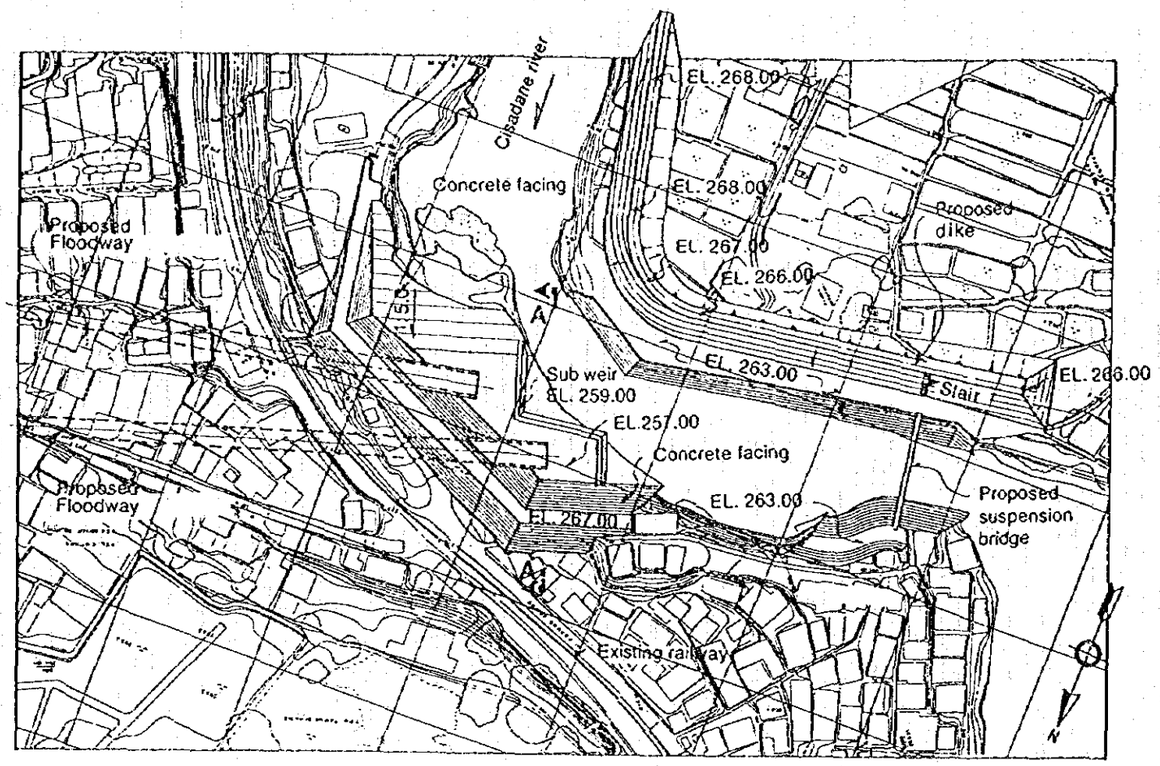
Plan



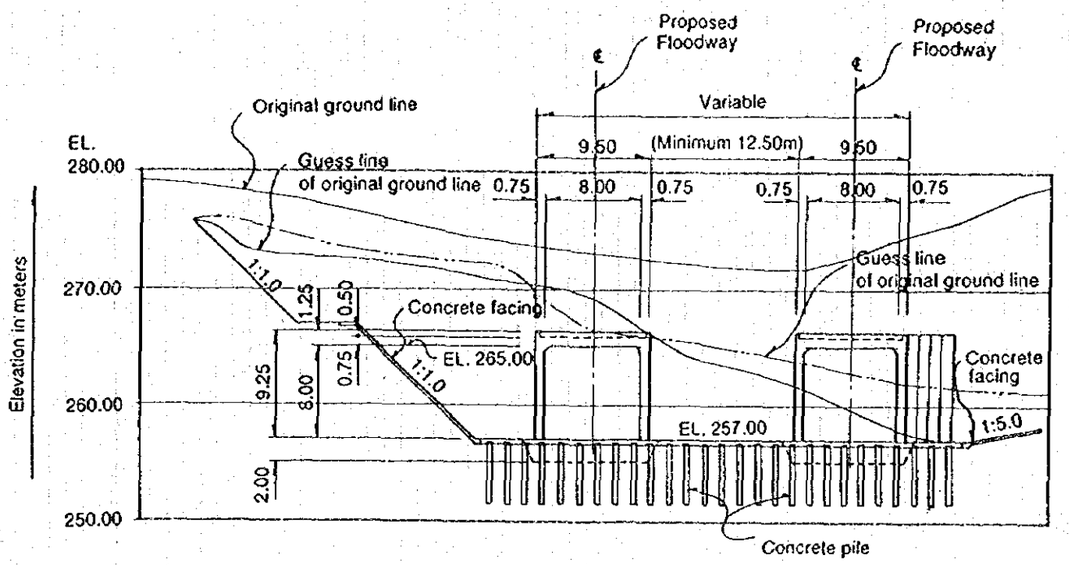
Profile Scale H= 5,000
V= 100

Scale 0 200 m

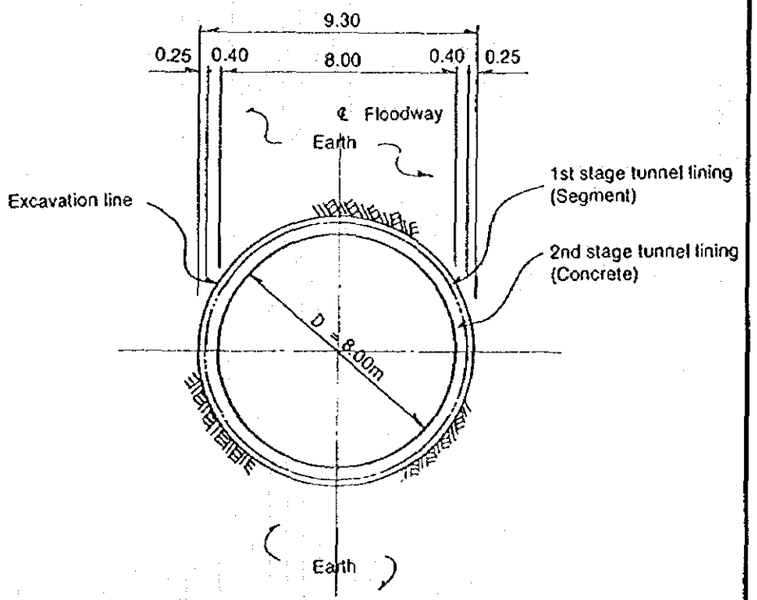
Figure 8 PLAN AND PROFILE OF THE CILIWUNG FLOODWAY



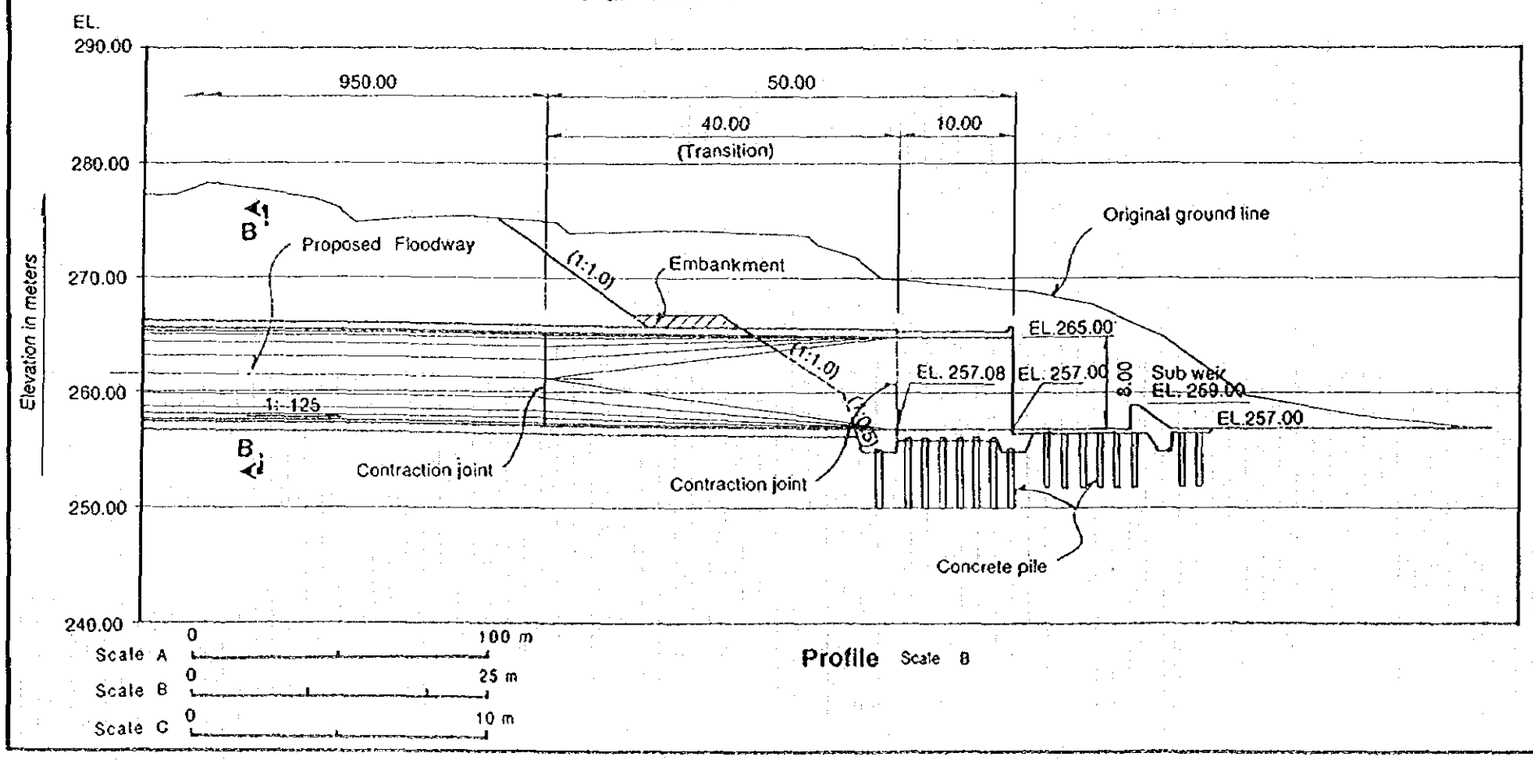
Plan Scale A



Section A - A Scale B

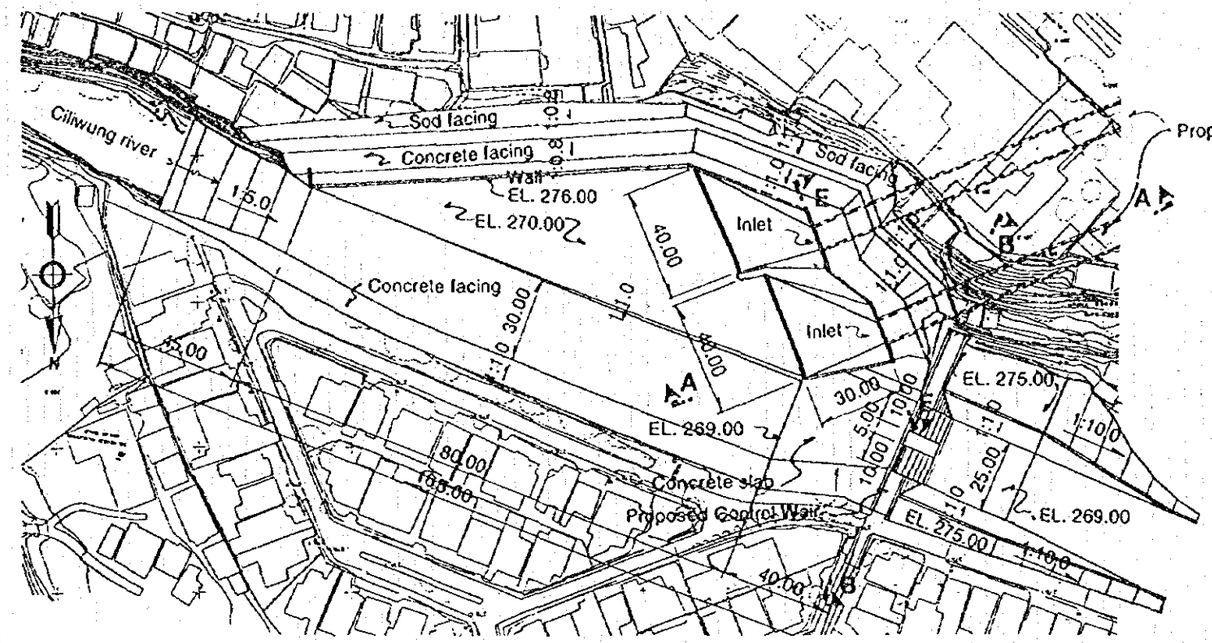


Typical Cross Section of Floodway (Section B - B) Scale C

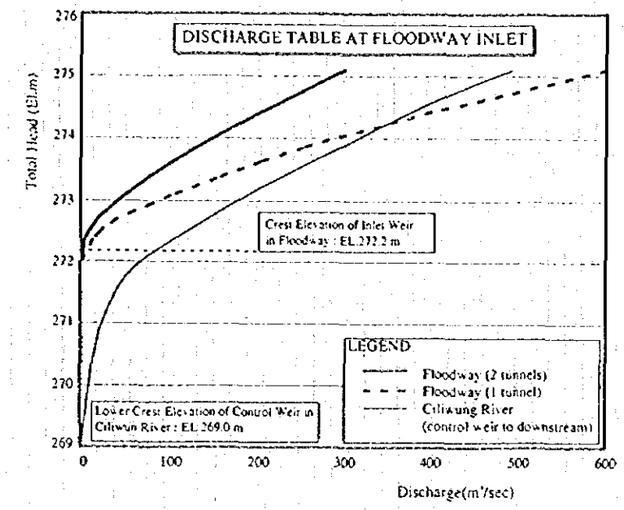


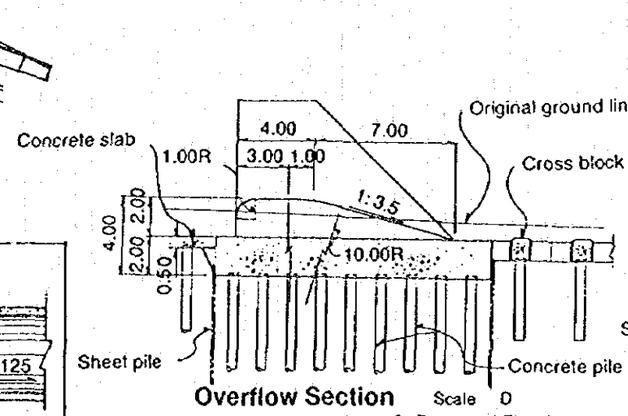
Profile Scale B

Figure 9 **OUTLET OF THE CILIWUNG FLOODWAY**

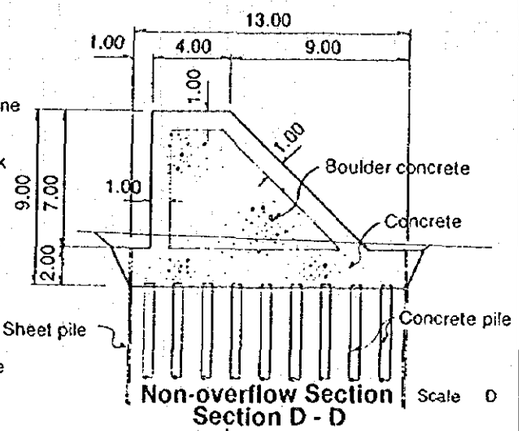


Plan Scale A

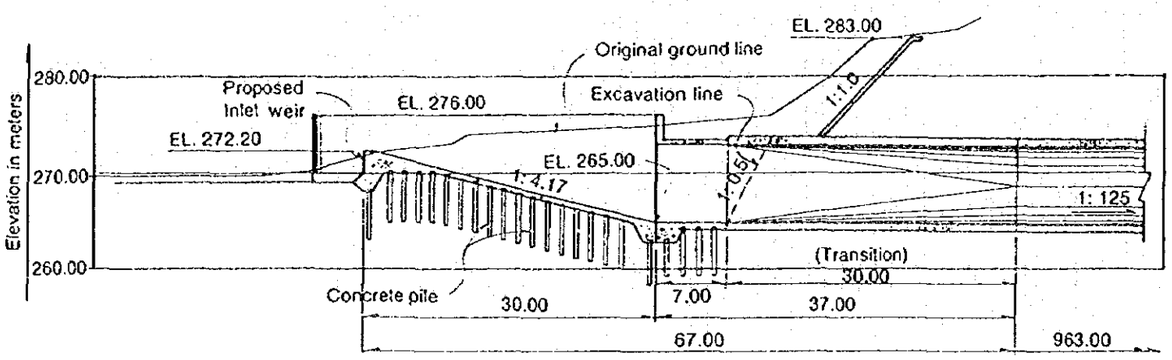




Overflow Section Scale D

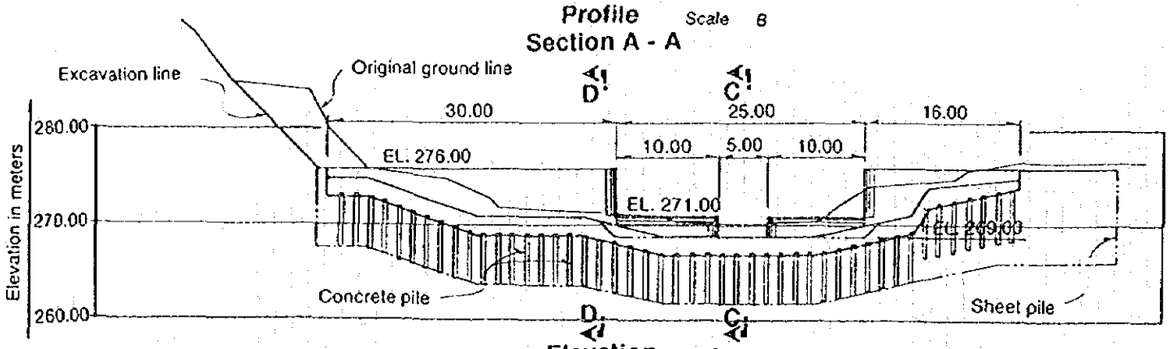


Non-overflow Section Scale D



Profile Scale B

Section A - A



Elevation Scale B

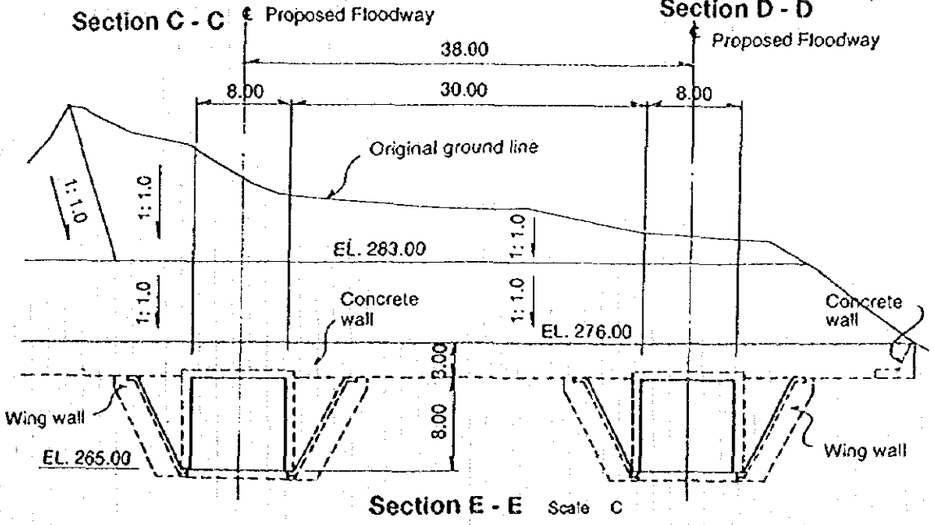
Section B - B

Scale A 0 100 m

Scale B 0 30 m

Scale C 0 25 m

Scale D 0 15 m



Section C - C

Section E - E Scale C

Figure 10 INLET OF THE CILIWUNG FLOODWAY

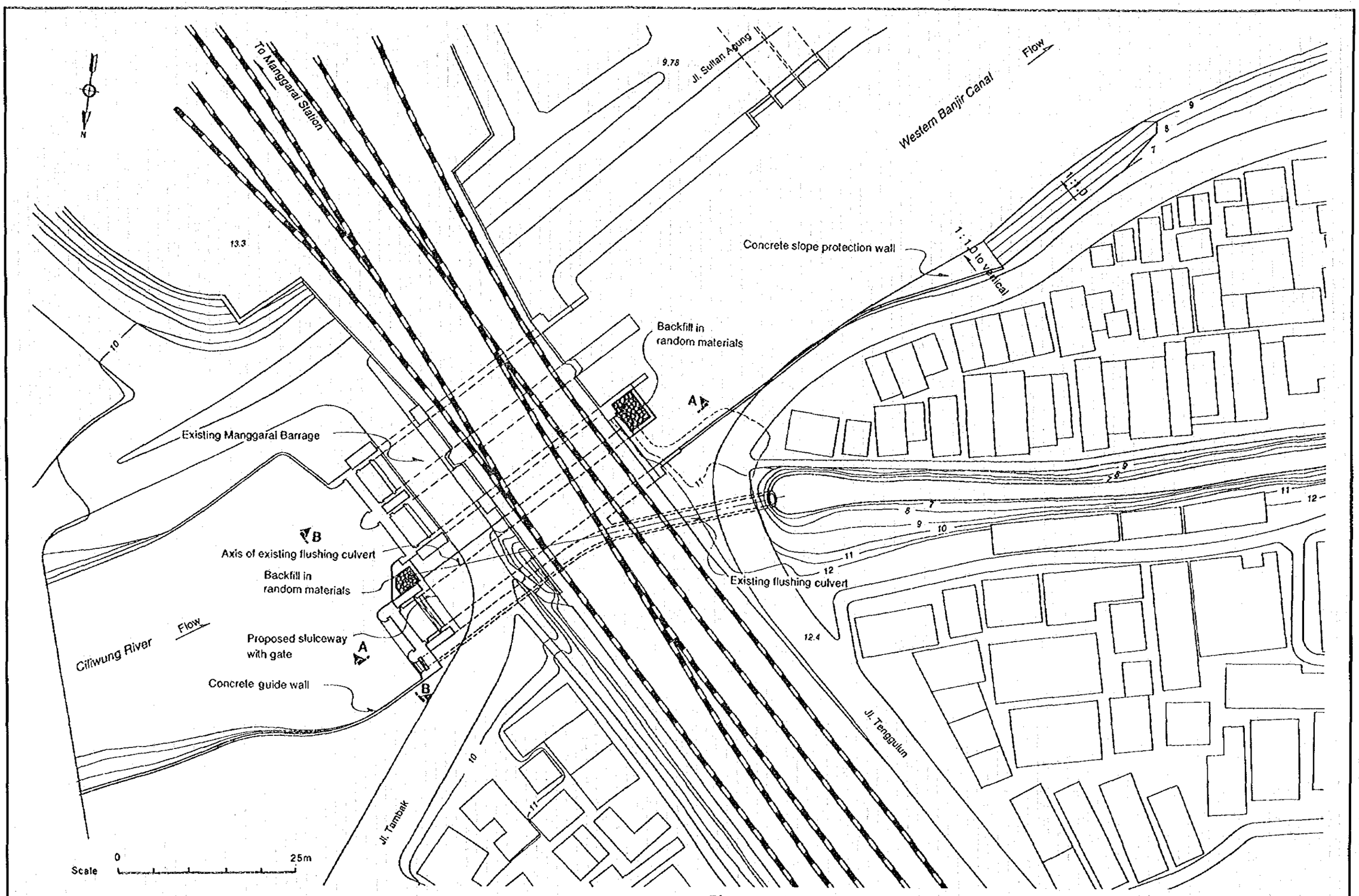
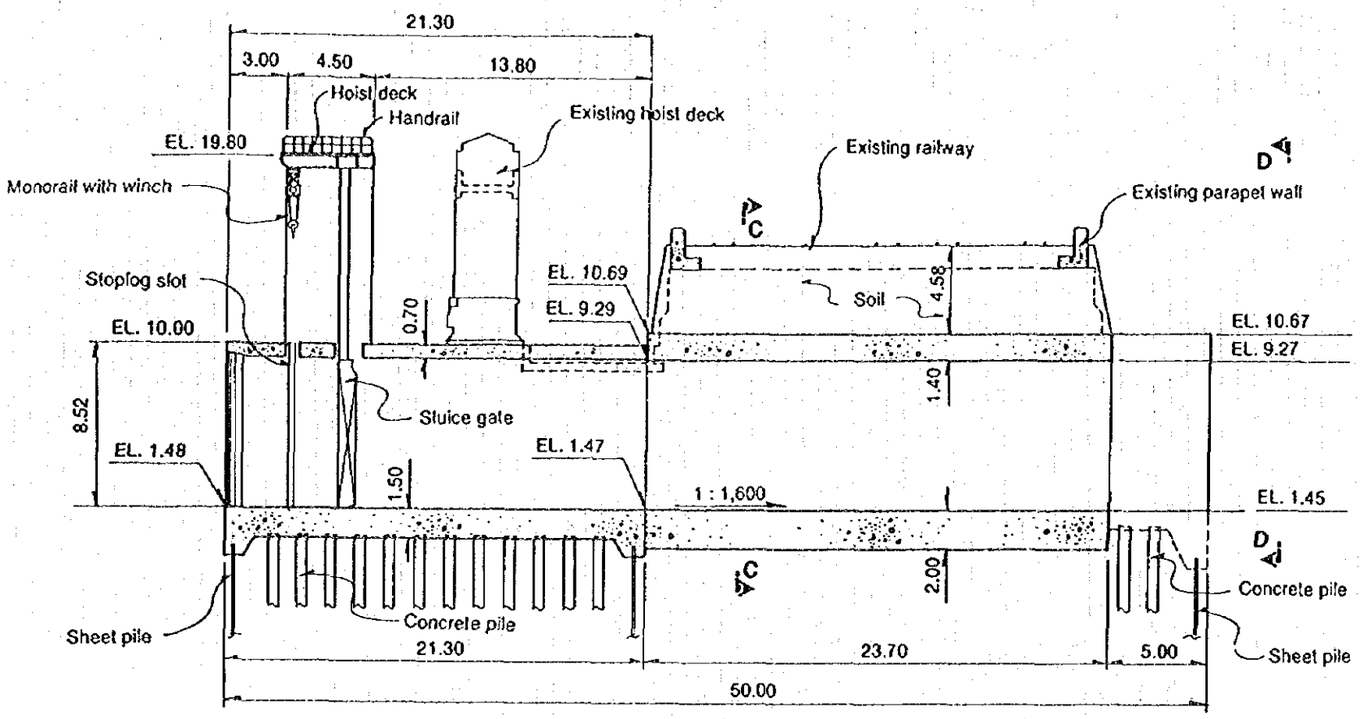
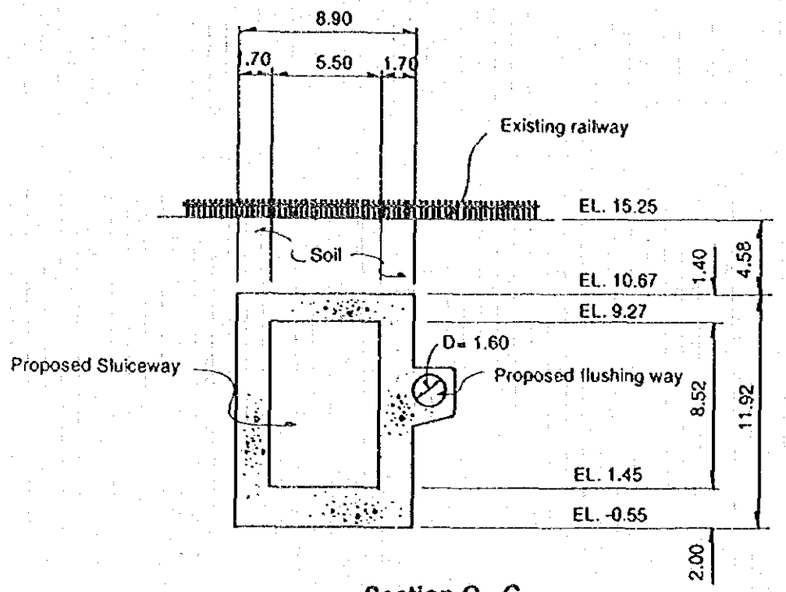


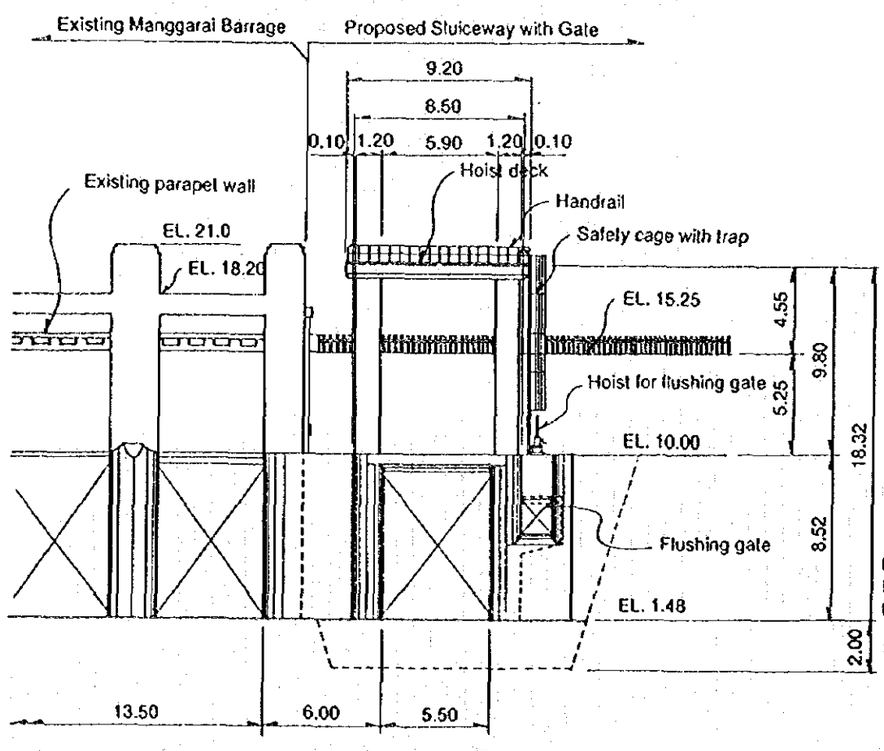
Figure 11 EXISTING MANGGARAI BARRAGE AND PROPOSED SLUICEWAY



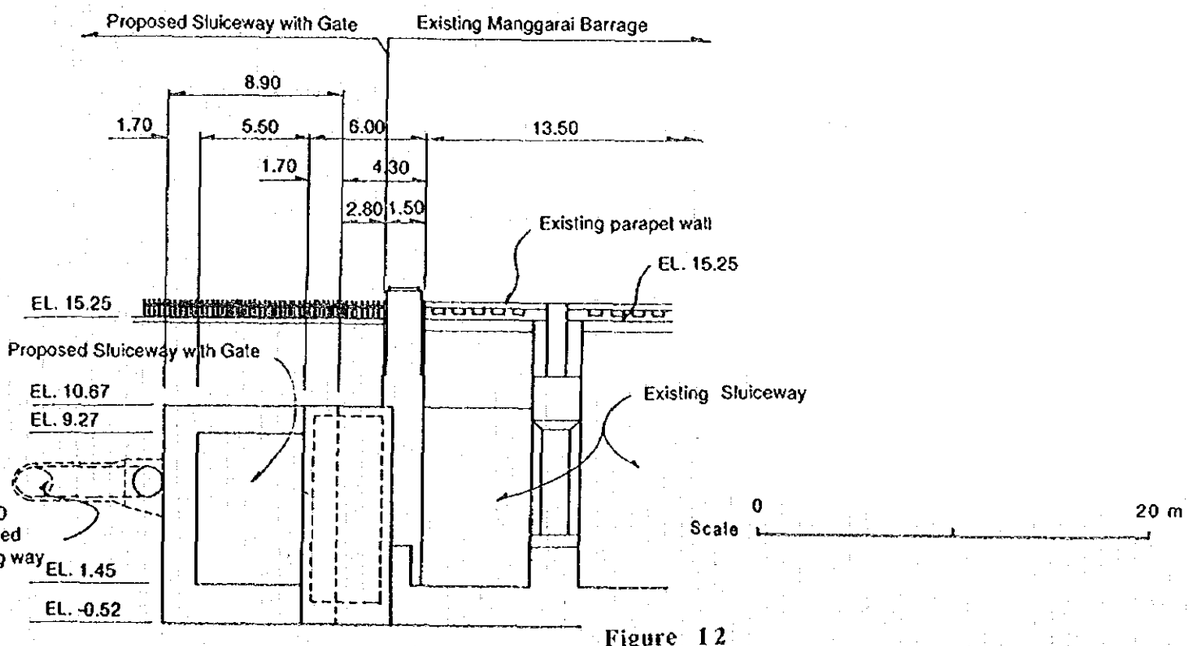
Section A - A



Section C - C



Section B - B



Section D - D

Figure 12

PLAN AND PROFILE OF THE PROPOSED SLUICEWAY IN THE MANGGARAI BARRAGE