

TABLES

Table 5.1.1 MONTHLY RAINY DAYS AT SEMARANG METEOROLOGICAL STATION (BMG)

UNIT: day

Year	Rainfall	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1987	0 < R < 5 mm	0	0	0	0	1	0	0	0	0	0	0	3	4
	5 < R < 10 mm	0	0	1	0	3	2	0	0	0	1	1	6	14
	10 < R < 15 mm	3	1	2	1	2	0	0	0	0	0	0	1	10
	15 < R < 30 mm	3	5	2	2	0	1	1	0	0	0	3	4	21
	30 < R mm	9	6	4	0	1	0	1	0	0	0	4	9	34
1988	0 < R < 5 mm	4	1	2	0	1	0	0	2	2	2	2	3	19
	5 < R < 10 mm	4	2	3	0	1	1	1	0	1	1	3	1	18
	10 < R < 15 mm	3	4	2	0	1	0	0	1	1	1	2	3	18
	15 < R < 30 mm	2	6	3	3	4	1	1	0	0	4	2	4	30
	30 < R mm	7	5	6	5	2	0	0	0	0	2	2	11	40
1989	0 < R < 5 mm	3	2	2	2	3	4	3	1	2	4	2	3	31
	5 < R < 10 mm	2	2	2	3	2	0	1	1	0	2	1	3	19
	10 < R < 15 mm	2	5	1	3	1	2	2	0	0	1	4	0	21
	15 < R < 30 mm	4	2	4	3	1	3	0	0	0	3	6	3	29
	30 < R mm	4	10	8	4	4	2	1	0	1	1	3	5	43
1990	0 < R < 5 mm	6	2	5	1	3	1	1	1	2	1	4	3	30
	5 < R < 10 mm	2	2	3	2	1	0	1	2	1	2	1	6	23
	10 < R < 15 mm	1	4	2	1	0	3	0	1	1	2	2	2	19
	15 < R < 30 mm	3	6	4	4	0	3	0	2	1	0	2	4	29
	30 < R mm	8	1	2	1	2	1	1	0	0	0	2	7	25
1991	0 < R < 5 mm	5	6	2	3	0	2	0	0	0	2	4	5	29
	5 < R < 10 mm	2	2	5	2	0	0	0	0	0	1	1	5	18
	10 < R < 15 mm	2	1	0	6	1	0	1	0	0	0	5	0	16
	15 < R < 30 mm	6	6	1	2	0	0	0	0	0	0	4	6	25
	30 < R mm	10	4	2	4	2	0	0	0	0	0	3	2	27
1992	0 < R < 5 mm	3	2	1	4	5	4	0	6	2	5	6	2	40
	5 < R < 10 mm	2	2	3	4	0	1	1	0	1	3	4	0	21
	10 < R < 15 mm	1	3	5	3	3	0	0	0	2	4	0	1	22
	15 < R < 30 mm	3	4	6	2	2	2	0	1	2	4	1	2	29
	30 < R mm	4	3	3	3	2	1	0	3	2	1	1	7	30
1993	0 < R < 5 mm	6	1	6	2	2	3	1	1	1	0	1	3	27
	5 < R < 10 mm	1	4	5	4	0	1	1	2	2	1	2	1	24
	10 < R < 15 mm	2	3	2	3	1	1	1	1	1	0	2	3	20
	15 < R < 30 mm	5	3	1	2	0	3	1	0	0	1	1	2	19
	30 < R mm	6	4	3	4	1	1	0	0	1	0	2	3	25
1994	0 < R < 5 mm	2	0	5	5	0	1	1	2	0	0	6	2	24
	5 < R < 10 mm	2	5	1	2	0	0	0	1	0	0	2	3	16
	10 < R < 15 mm	4	3	0	1	1	0	0	0	0	2	2	1	14
	15 < R < 30 mm	6	5	9	3	2	0	0	0	0	1	1	4	31
	30 < R mm	9	2	8	2	0	0	0	0	0	1	5	6	33
1995	0 < R < 5 mm	9	6	1	2	3	10	0	0	0	1	6	3	41
	5 < R < 10 mm	2	1	5	5	2	2	0	0	0	3	0	4	24
	10 < R < 15 mm	1	2	3	1	1	2	0	0	0	1	4	2	17
	15 < R < 30 mm	2	5	5	1	1	3	0	0	1	2	6	6	32
	30 < R mm	6	4	6	0	3	2	0	0	1	0	4	8	34
1996	0 < R < 5 mm	7	3	4	4	3	1	3	2	2	9	4	4	46
	5 < R < 10 mm	4	0	3	2	1	2	1	2	1	4	5	6	31
	10 < R < 15 mm	1	2	4	2	1	1	1	1	0	1	1	5	20
	15 < R < 30 mm	8	11	4	1	1	0	0	1	1	4	4	3	38
	30 < R mm	2	9	4	0	1	0	0	1	1	1	2	5	26
AVERAGE	0 < R < 5 mm	4.5	2.3	2.8	2.3	2.1	2.6	0.9	1.5	1.1	2.4	3.5	3.1	29.1
	5 < R < 10 mm	2.1	2	3.1	2.4	1	0.9	0.6	0.8	0.6	1.8	2	3.5	20.8
	10 < R < 15 mm	2	2.8	2.1	2.1	1.2	0.9	0.5	0.4	0.5	1.2	2.2	1.8	17.7
	15 < R < 30 mm	4.2	5.3	3.9	2.3	1.1	1.6	0.3	0.4	0.5	1.9	3	3.8	28.3
	30 < R mm	6.5	4.8	4.6	2.3	1.8	0.7	0.3	0.4	0.6	0.6	2.8	6.3	31.7

**Table 5.1.2 MONTHLY WORKABLE DAYS FOR CONSTRUCTION WORKS
[EARTH WORKS & FOUNDATION WORKS]**

UNIT: day

Item	Month												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(1) Rainy Day & Suspended Day													
Calendar	31	28	31	30	31	30	31	31	30	31	30	31	365
5<R<10 mm : Rainy Day	2.1	2	3.1	2.4	1	0.9	0.6	0.8	0.6	1.8	2	3.5	20.8
: Suspended Day (Rainy Day x 0.0)	0	0	0	0	0	0	0	0	0	0	0	0	0.0
10<R<15 mm : Rainy Day	2	2.8	2.1	2.1	1.2	0.9	0.5	0.4	0.5	1.2	2.2	1.8	17.7
: Suspended Day (Rainy Day x 0.0)	0	0	0	0	0	0	0	0	0	0	0	0	0.0
15<R<30 mm : Rainy Day	4.2	5.3	3.9	2.3	1.1	1.6	0.3	0.4	0.5	1.9	3	3.8	28.3
: Suspended Day (Rainy Day x 1.0)	4.2	5.3	3.9	2.3	1.1	1.6	0.3	0.4	0.5	1.9	3	3.8	28.3
30 mm < : Rainy Day	6.5	4.8	4.6	2.3	1.8	0.7	0.3	0.4	0.6	0.6	2.8	6.3	31.7
: Suspended Day (Rainy Day x 2.0)	13	9.6	9.2	4.6	3.6	1.4	0.6	0.8	1.2	1.2	5.6	12.6	63.4
(2) Total of Rainy Day	14.8	14.9	13.7	9.1	5.1	4.1	1.7	2	2.2	5.5	10	15.4	98.5
(3) Total of Suspended Day	17.2	14.9	13.1	6.9	4.7	3	0.9	1.2	1.7	3.1	8.6	16.4	91.7
(4) Suspended Rate : (3)/(1)%	55.5	53.2	42.3	23.0	15.2	10.0	2.9	3.9	5.7	10.0	28.7	52.9	25.1
(5) Sunday & National Holiday	7	4	5	7	7	4	5	6	4	4	6	5	64.0
(6) Rainy Day in Sunday & National Holiday (5) x (4)	3.9	2.1	2.1	1.6	1.1	0.4	0.1	0.2	0.2	0.4	1.7	2.6	16.6
(7) Non Workable Day : (3)+(5)-(6)	20.3	16.8	16.0	12.3	10.6	6.6	5.8	7.0	5.5	6.7	12.9	18.8	139.1
(8) Workable Day : (1)-(7)	10.7	11.2	15.0	17.7	20.4	23.4	25.2	24.0	24.5	24.3	17.1	12.2	225.9
(9) Workable Rate : (8)/(1)%	34.5	40.1	48.4	59.0	65.7	78.0	81.4	77.5	81.8	78.4	57.1	39.5	61.9
(10) Applied Workable Day	11	11	15	18	20	23	25	24	25	24	17	12	225

Note: Data of average rainy day is given from 1987 to 1996 at Semarang Meteorological Station (BMG)

Table 5.1.3 MONTHLY WORKABLE DAYS FOR CONSTRUCTION WORKS
[CONCRETE WORKS & GATE INSTALLATION]

Item	Month												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(1) Rainy Day & Suspended Day													
Calendar	31	28	31	30	31	30	31	31	30	31	30	31	365
5<R<10 mm : Rainy Day	2.1	2.0	3.1	2.4	1.0	0.9	0.6	0.8	0.6	1.8	2.0	3.5	20.8
: Suspended Day (Rainy Day x 0.0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10<R<15 mm : Rainy Day	2.0	2.8	2.1	2.1	1.2	0.9	0.5	0.4	0.5	1.2	2.2	1.8	17.7
: Suspended Day (Rainy Day x 0.0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15<R<30 mm : Rainy Day	4.2	5.3	3.9	2.3	1.1	1.6	0.3	0.4	0.5	1.9	3.0	3.8	28.3
: Suspended Day (Rainy Day x 1.0)	4.2	5.3	3.9	2.3	1.1	1.6	0.3	0.4	0.5	1.9	3.0	3.8	28.3
30 mm < : Rainy Day	6.5	4.8	4.6	2.3	1.8	0.7	0.3	0.4	0.6	0.6	2.8	6.3	31.7
: Suspended Day (Rainy Day x 2.0)	6.5	4.8	4.6	2.3	1.8	0.7	0.3	0.4	0.6	0.6	2.8	6.3	31.7
(2) Total of Rainy Day	14.8	14.9	13.7	9.1	5.1	4.1	1.7	2.0	2.2	5.5	10.0	15.4	98.5
(3) Total of Suspended Day	10.7	10.1	8.5	4.6	2.9	2.3	0.6	0.8	1.1	2.5	5.8	10.1	60.0
(4) Suspended Rate : (3)/(1)%	34.5	36.1	27.4	15.3	9.4	7.7	1.9	2.6	3.7	8.1	19.3	32.6	16.4
(5) Sunday & National Holiday	7.0	4.0	5.0	7.0	7.0	4.0	5.0	6.0	4.0	4.0	6.0	5.0	64.0
(6) Rainy Day in Sunday & National Holiday (5) x (4)	2.4	1.4	1.4	1.1	0.7	0.3	0.0	0.2	0.1	0.3	1.2	1.6	10.7
(7) Non Workable Day : (3)+(5)-(6)	15.3	12.7	12.1	10.5	9.2	6.0	5.6	6.6	5.0	6.2	10.6	13.5	113.3
(8) Workable Day : (1)-(7)	15.7	15.3	18.9	19.5	21.8	24.0	25.4	24.4	25.0	24.8	19.4	17.5	251.7
(9) Workable Rate : (8)/(1)%	50.7	54.8	60.9	64.9	70.2	80.0	81.9	78.6	83.5	80.1	64.5	56.5	69.0
(10) Applied Workable Day	16	15	19	20	22	24	25	24	25	25	19	18	252

Note: Data of average rainy day is given from 1987 to 1996 at Semarang Meteorological Station (BMG)

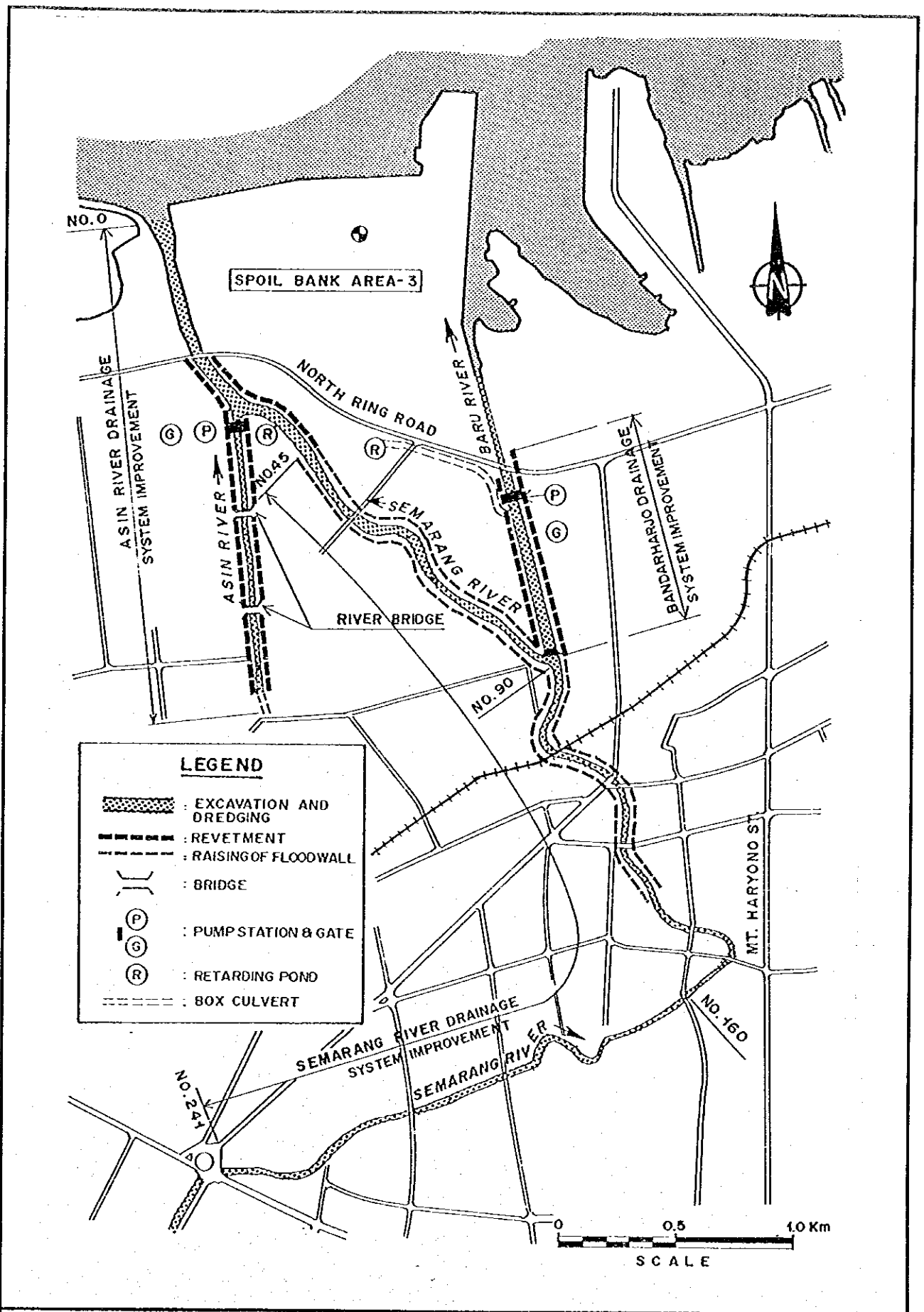
Table S.1.4 WORKABLE DAYS

Work Items	Precipitation	Suspension	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Earth Works	R ≥ 15 mm/day	one(1) day suspension	11	11	15	18	20	23	25	24	25	24	17	12	225
Foundation Works	R ≥ 30 mm/day	two(2) day suspension													
Concrete Works	R ≥ 15 mm/day	one(1) day suspension	16	15	19	20	22	24	25	24	25	25	19	18	252
Gate Installation															

Table S.1.5 SEASONAL WORKABLE DAYS

Work Items	Dry Season (Apr. ~ Nov.)	Rainy Season (Dec. ~ Mar.)	Through a year
Earth Works	176 days / 8 ^{mo} = 22 days / mo	49 days / 4 ^{mo} = 12 days / mo	225 days / year = 18 days / mo
Foundation Works			
Concrete Works	184 days / 8 ^{mo} = 23 days / mo	68 days / 4 ^{mo} = 17 days / mo	252 days / 4 ^{year} = 21 days / mo
Gate Installation			

FIGURES

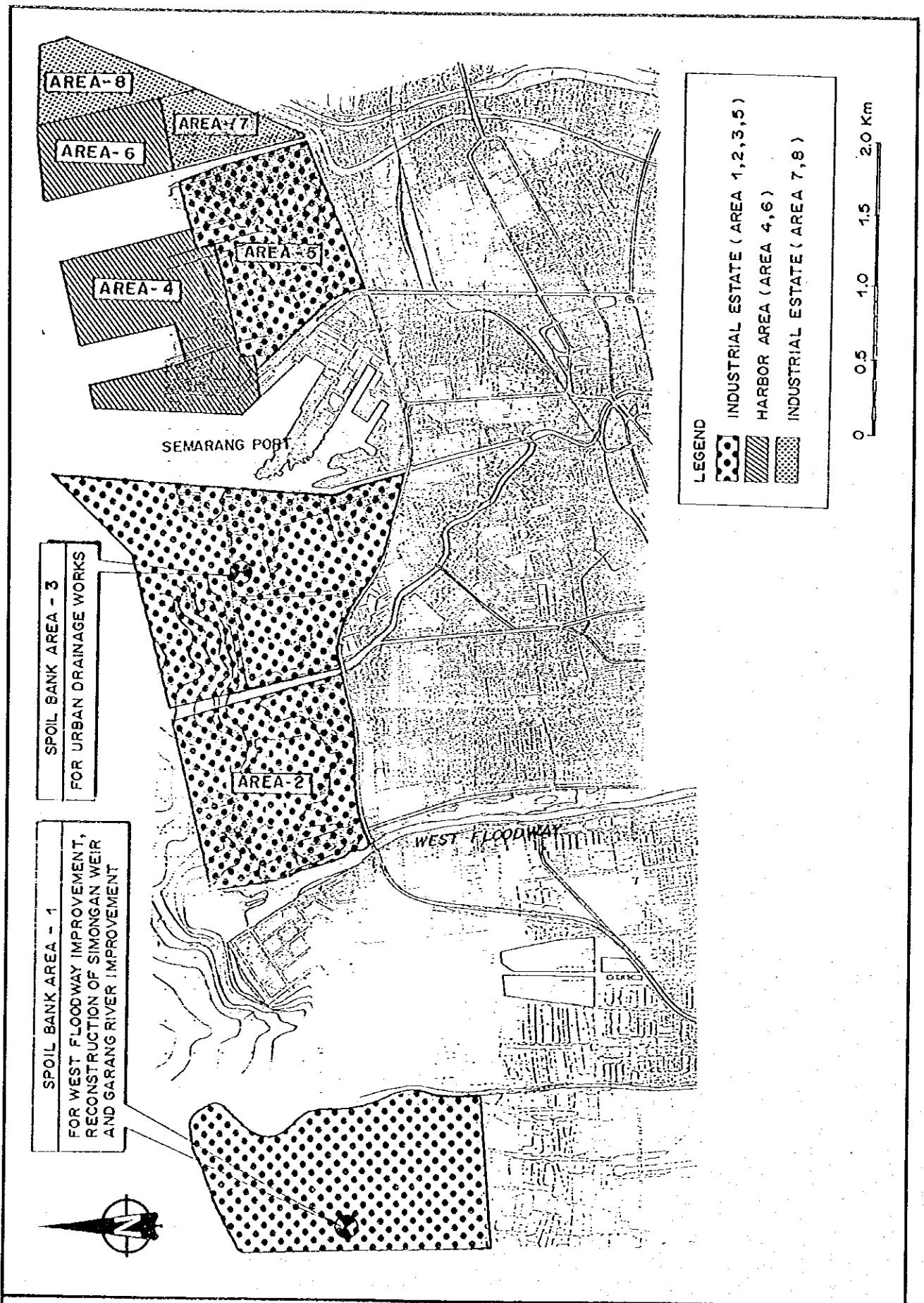


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

Fig. 1.2.1

LOCATION OF CONSTRUCTION AREA

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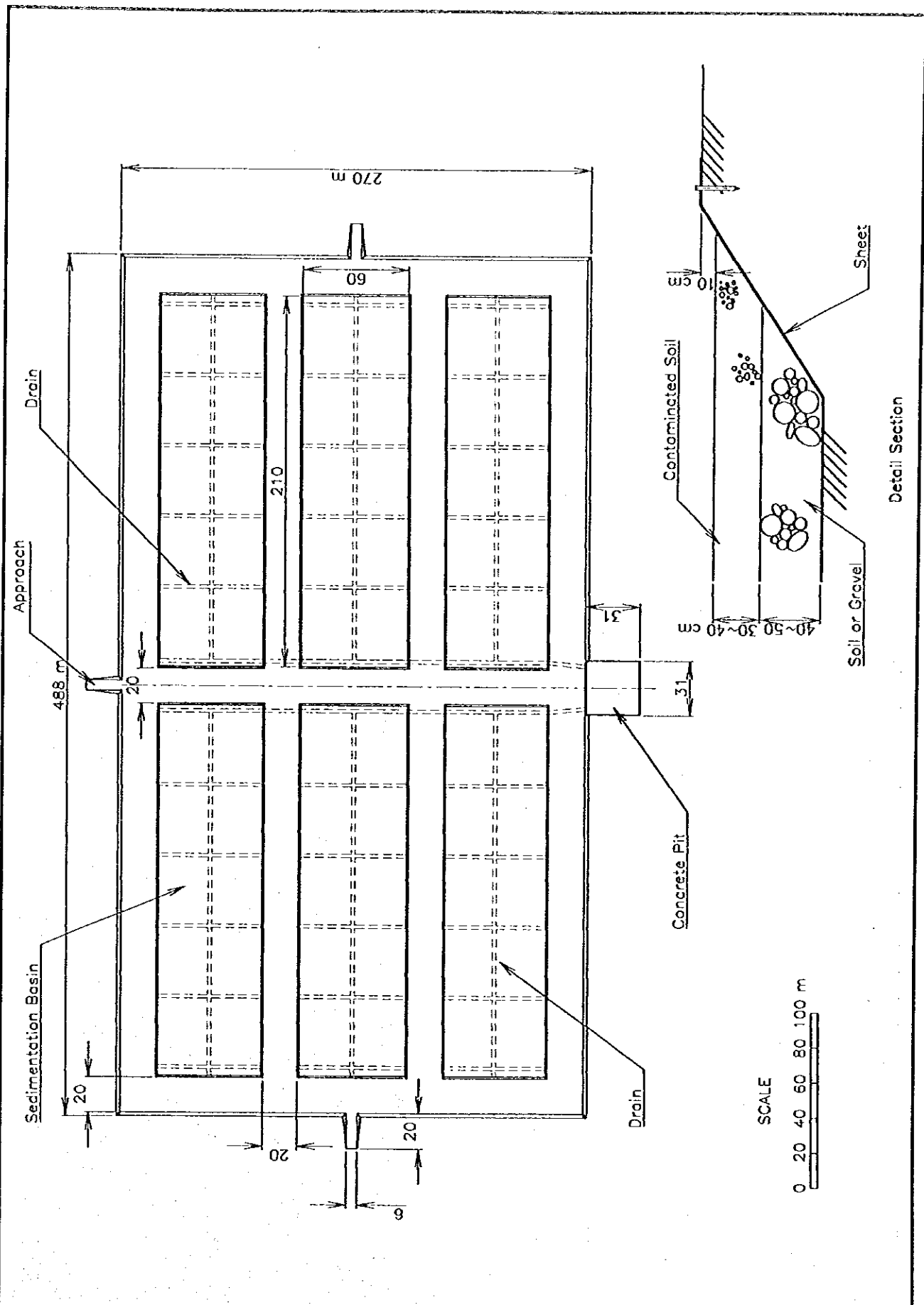


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Fig. 1.22

POSSIBLE SPOIL BANK AREAS



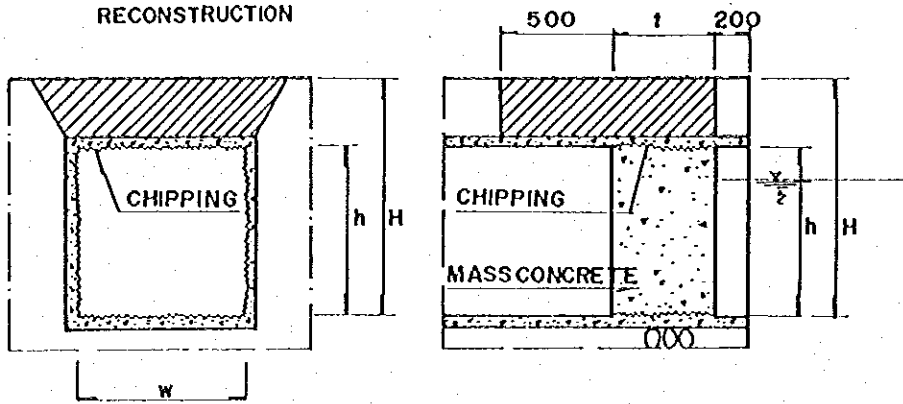
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Fig. 1.3.1

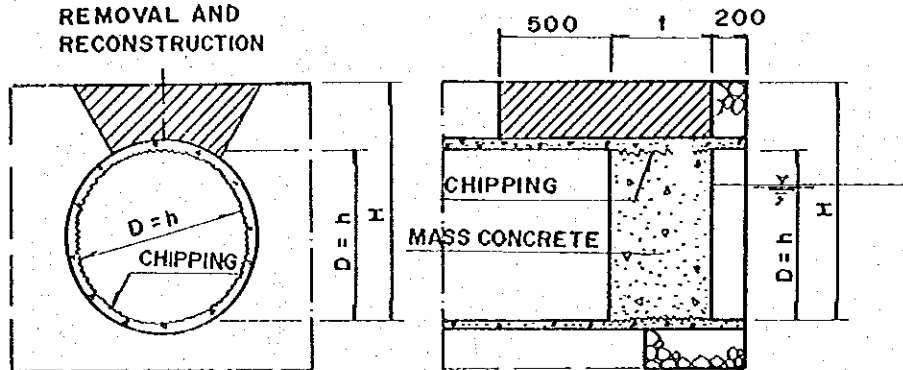
TREATMENT FACILITIES

REMOVAL AND RECONSTRUCTION

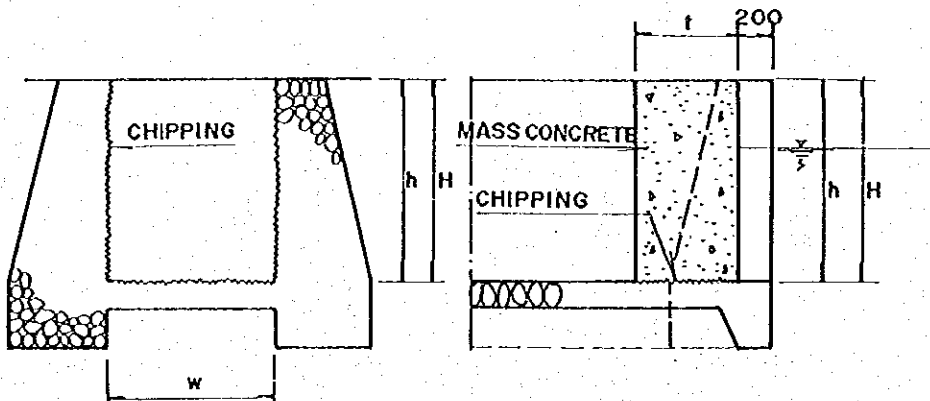


TYPE I

REMOVAL AND RECONSTRUCTION



TYPE II



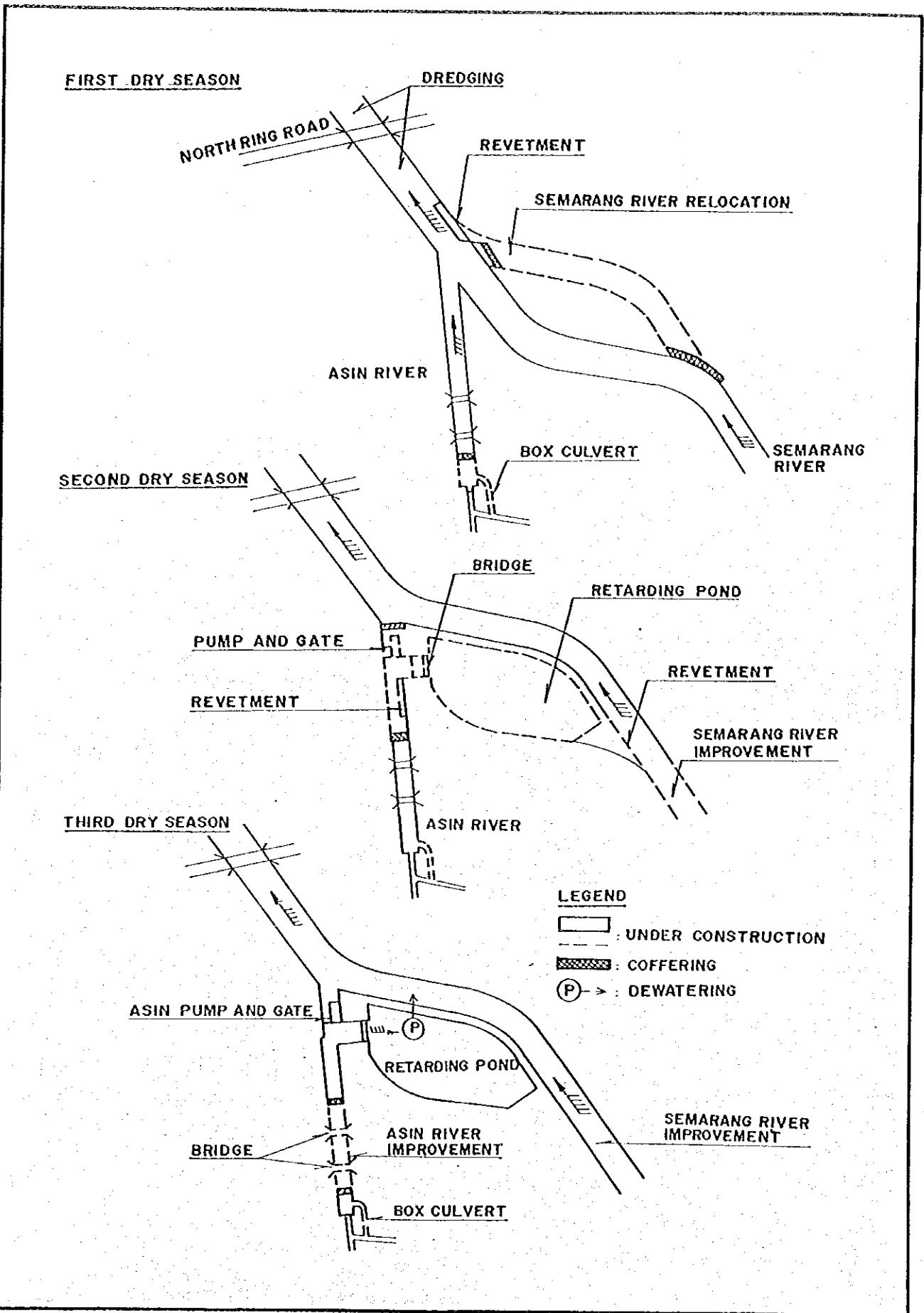
TYPE III

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Fig. 2.3.1

DRAINAGE OUTLETS TO SEMARANG RIVER

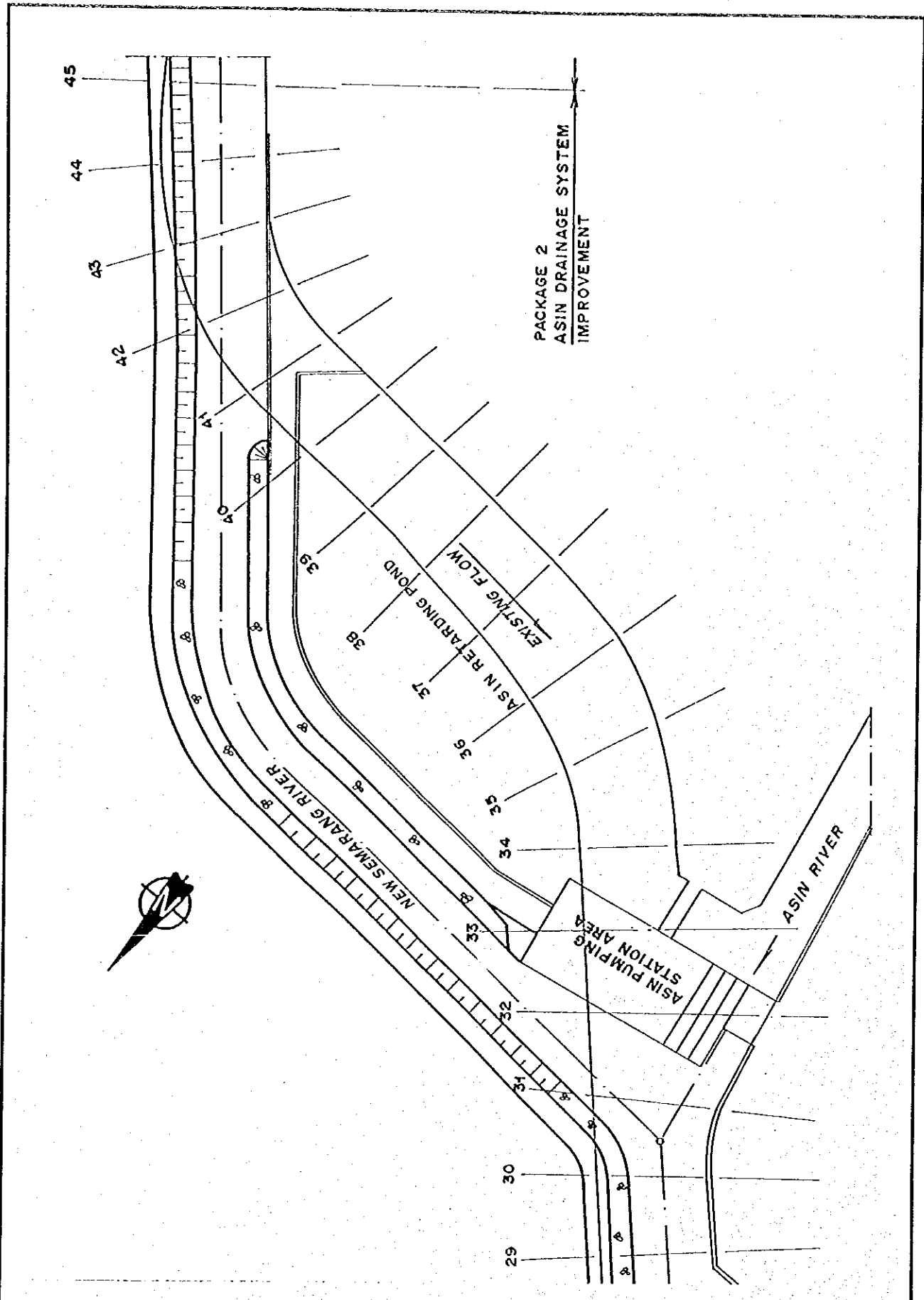


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

Fig. 3.1.1

CONSTRUCTION PROCEDURE OF ASIN RIVER DRAINAGE SYSTEM

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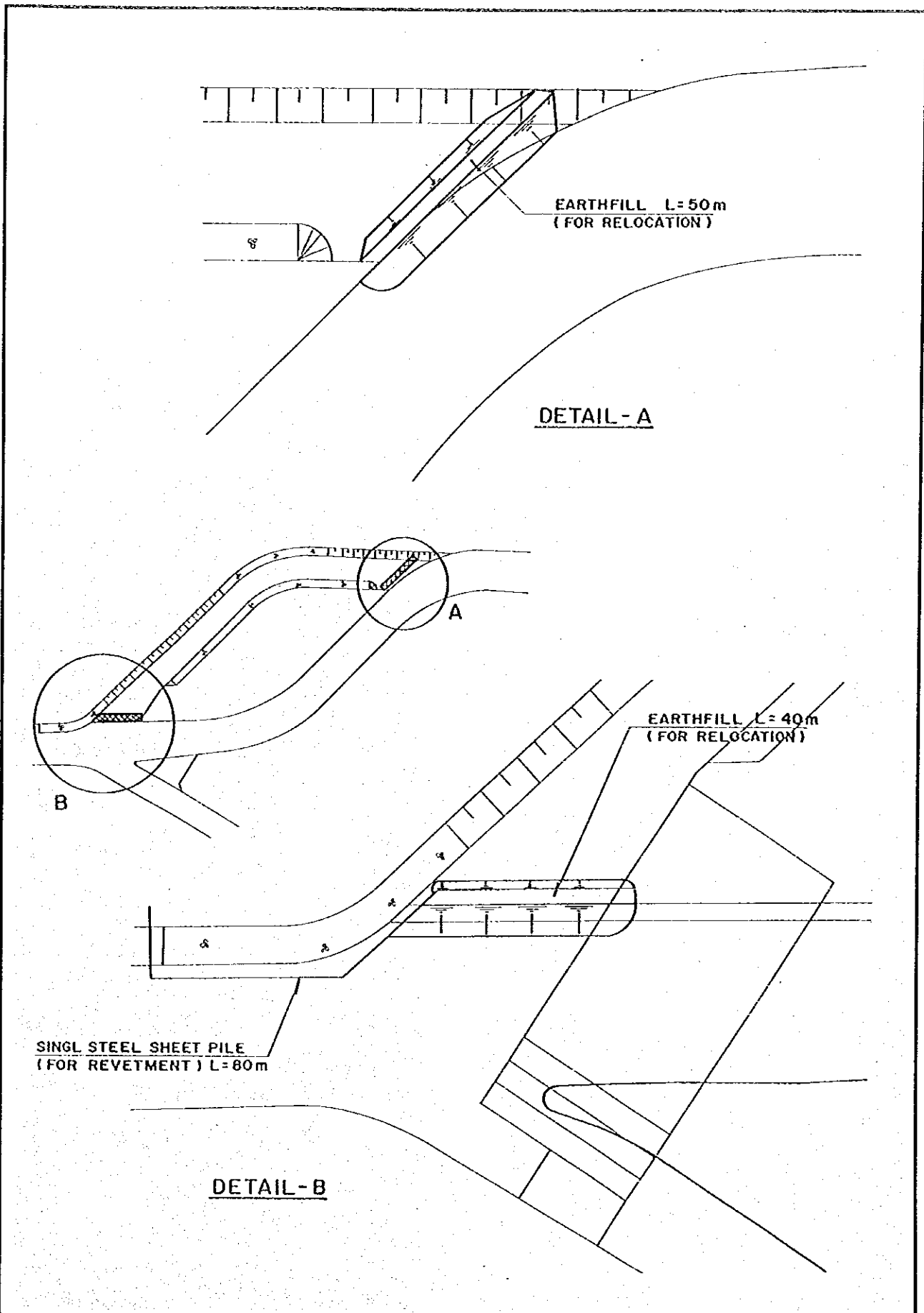


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

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Fig. 3.2.1

RELOCATION OF SEMARANG RIVER

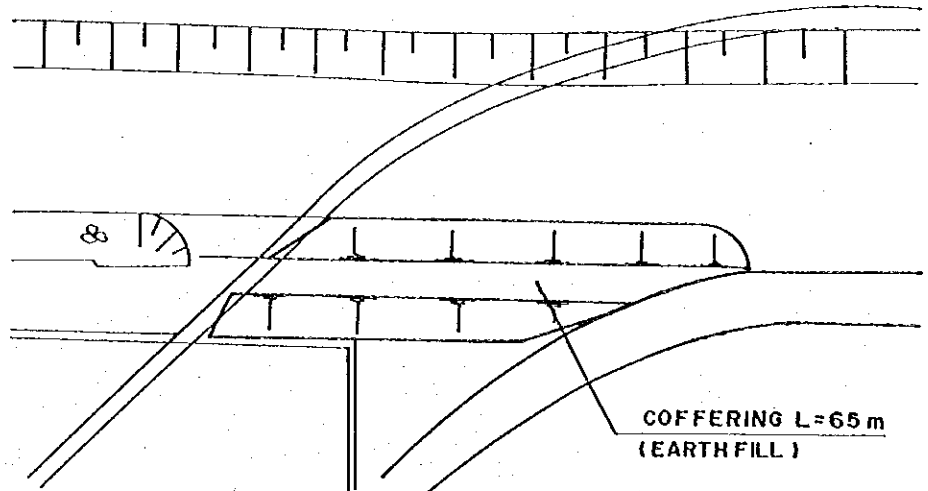


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

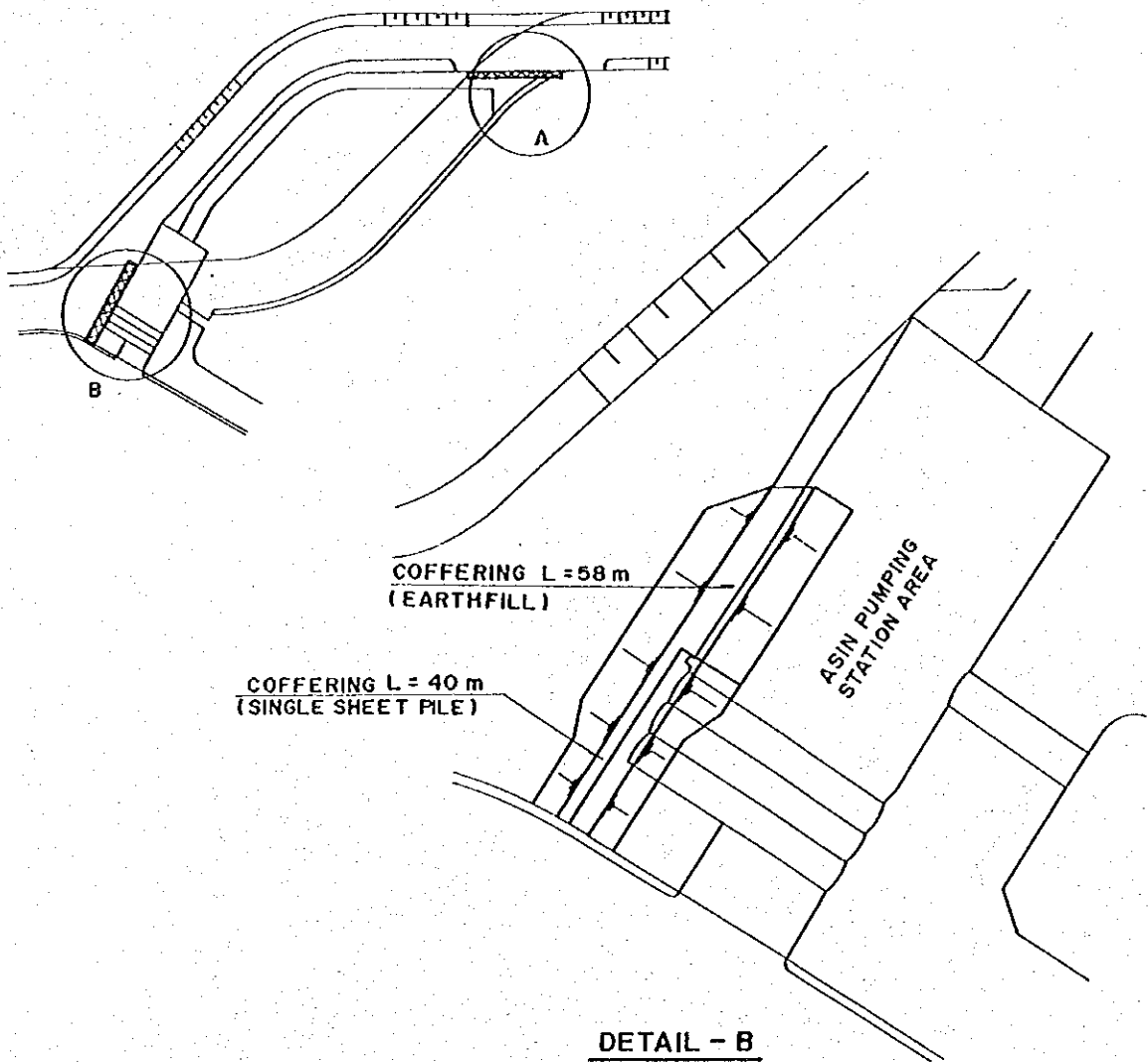
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Fig. 3.2.2

COFFERING FOR RELOCATION OF SEMARANG RIVER



DETAIL - A



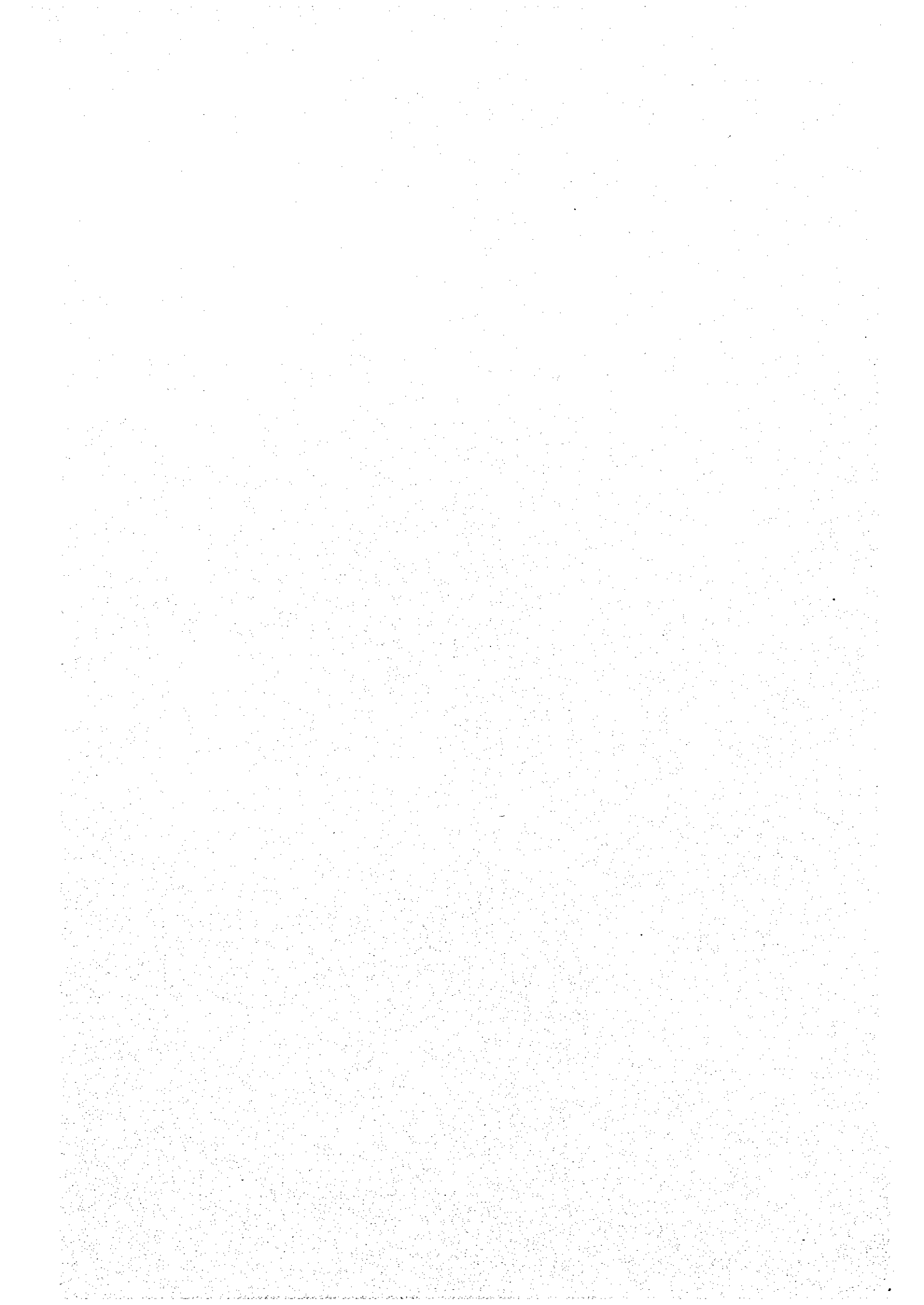
DETAIL - B

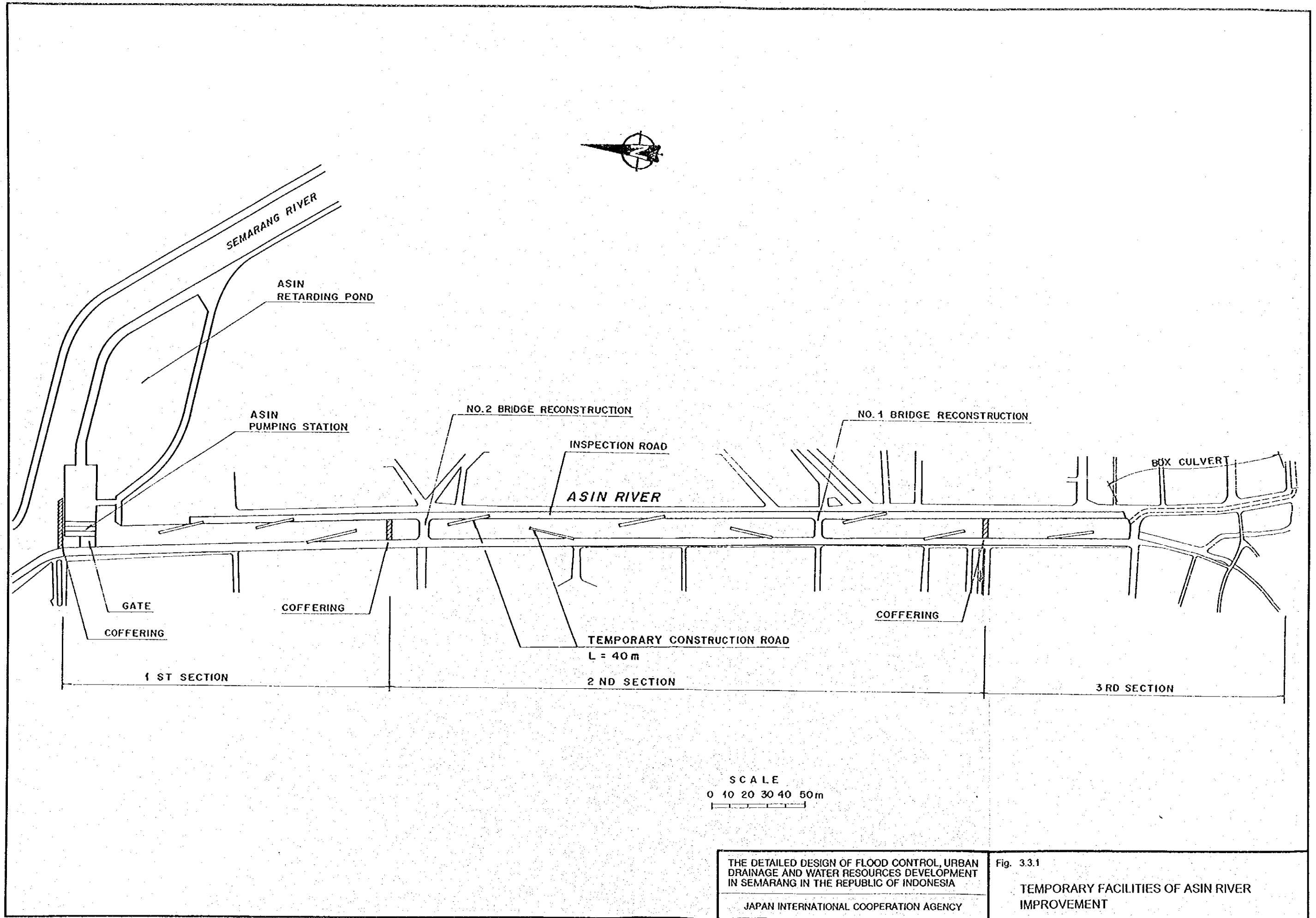
THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

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Fig. 3.23

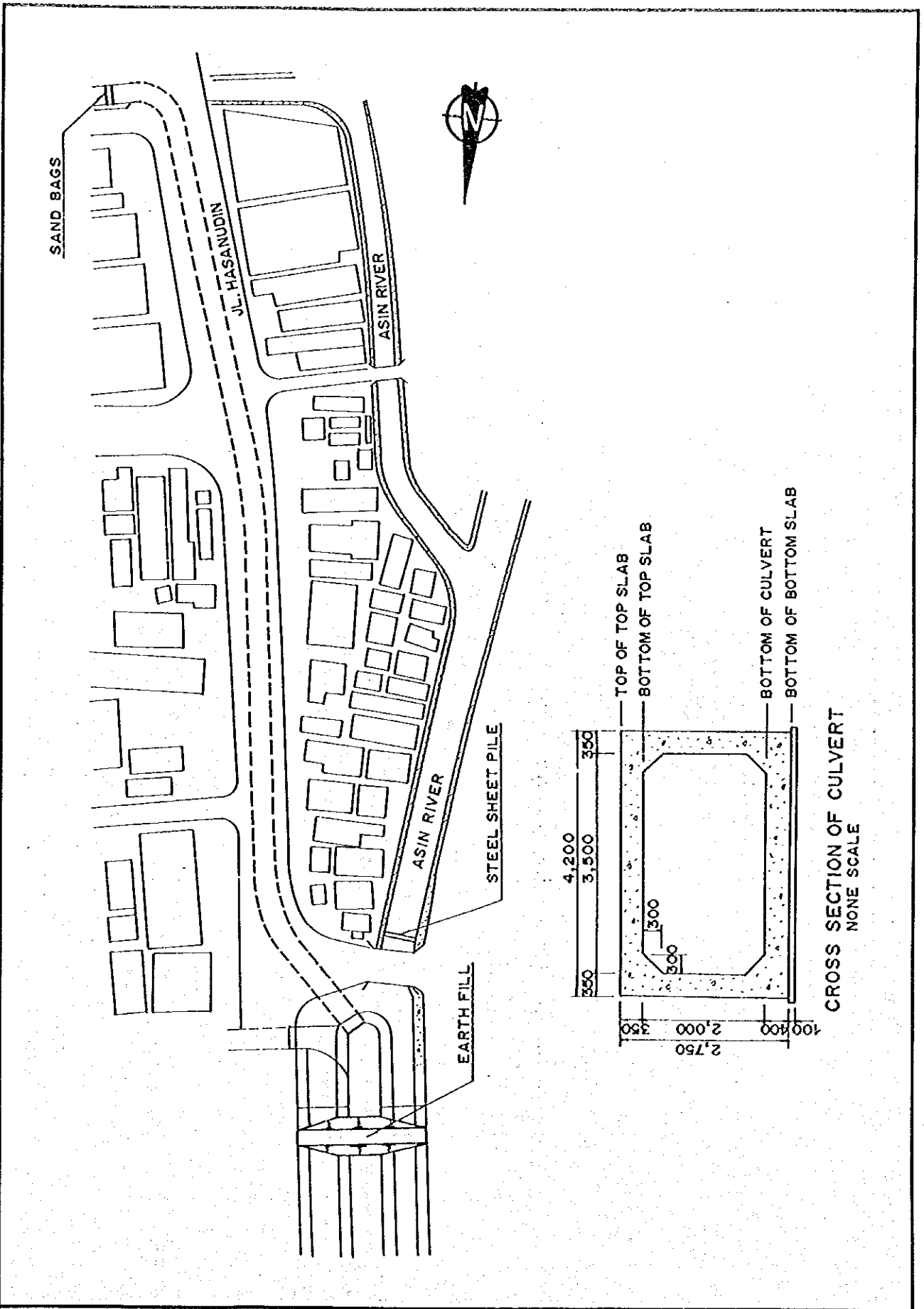
COFFERING FOR RIVER DIVERSION





THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA
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Fig. 3.3.1
 TEMPORARY FACILITIES OF ASIN RIVER IMPROVEMENT



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

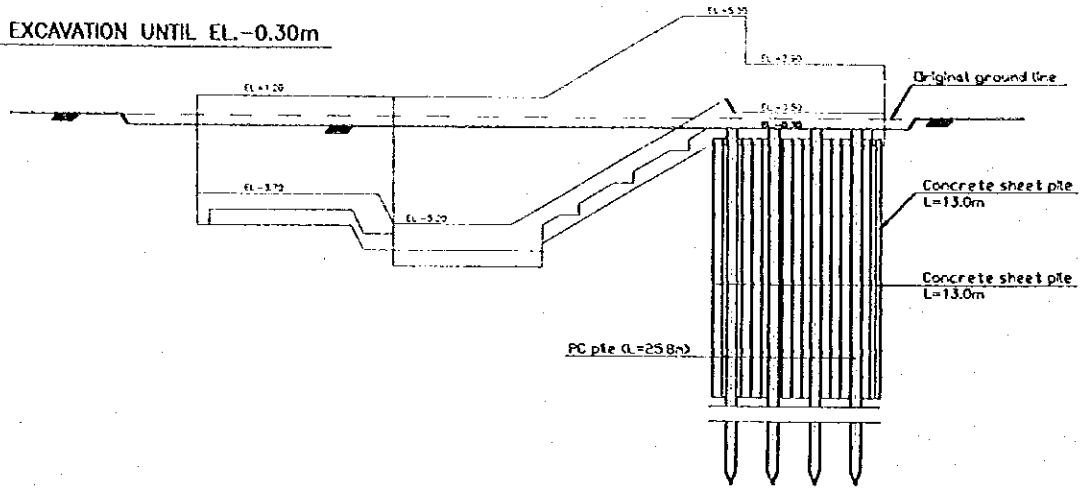
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Fig. 3.3.3

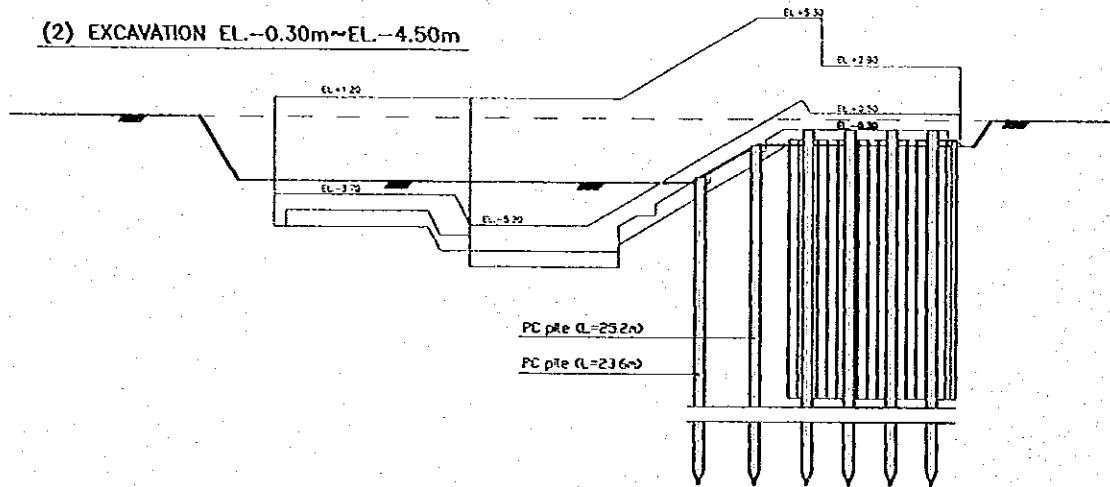
ASIN RIVER BOX CULVERT

CROSS SECTION OF CULVERT
NONE SCALE

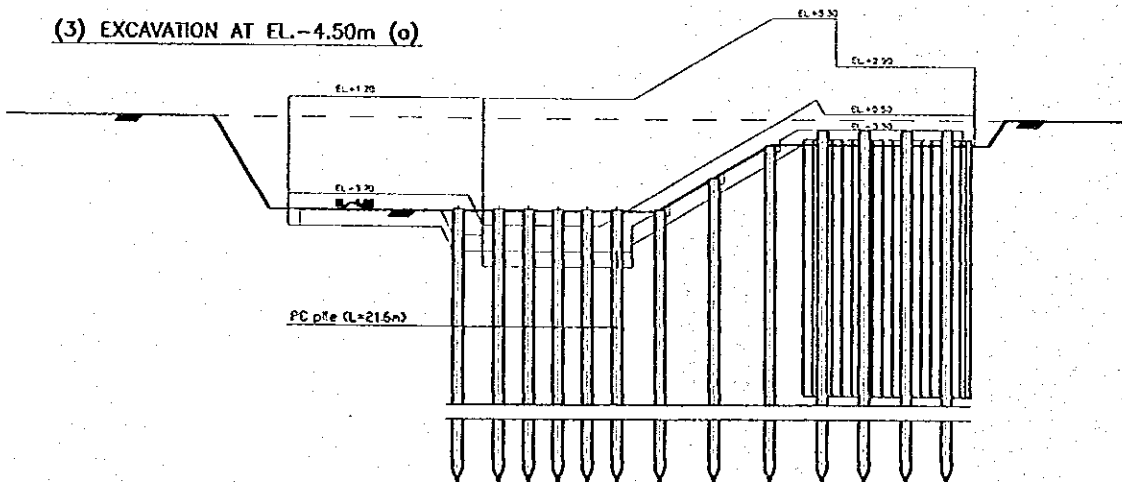
(1) EXCAVATION UNTIL EL. -0.30m



(2) EXCAVATION EL. -0.30m~EL. -4.50m



(3) EXCAVATION AT EL. -4.50m (o)



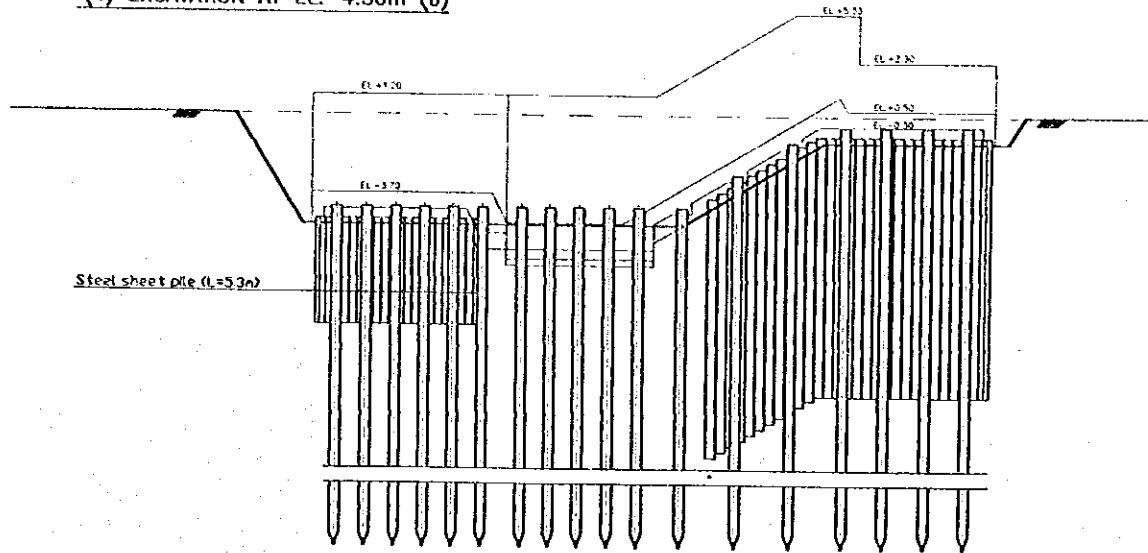
THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

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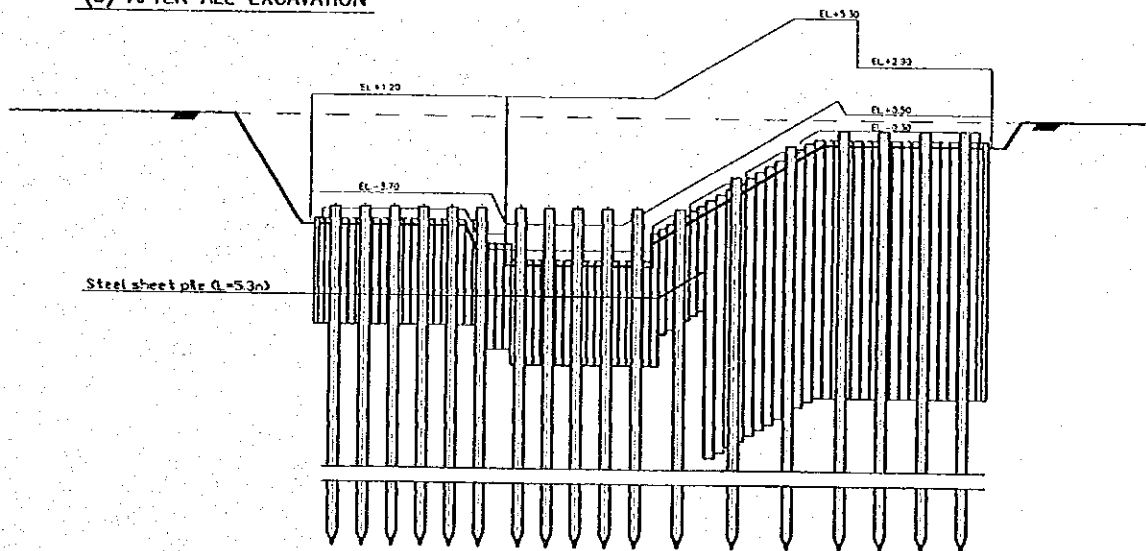
Fig. 3.4.1

EXCAVATION AND PILE DRIVING PROCEDURE (1/2)

(4) EXCAVATION AT EL. -4.50m (b)



(5) AFTER ALL EXCAVATION

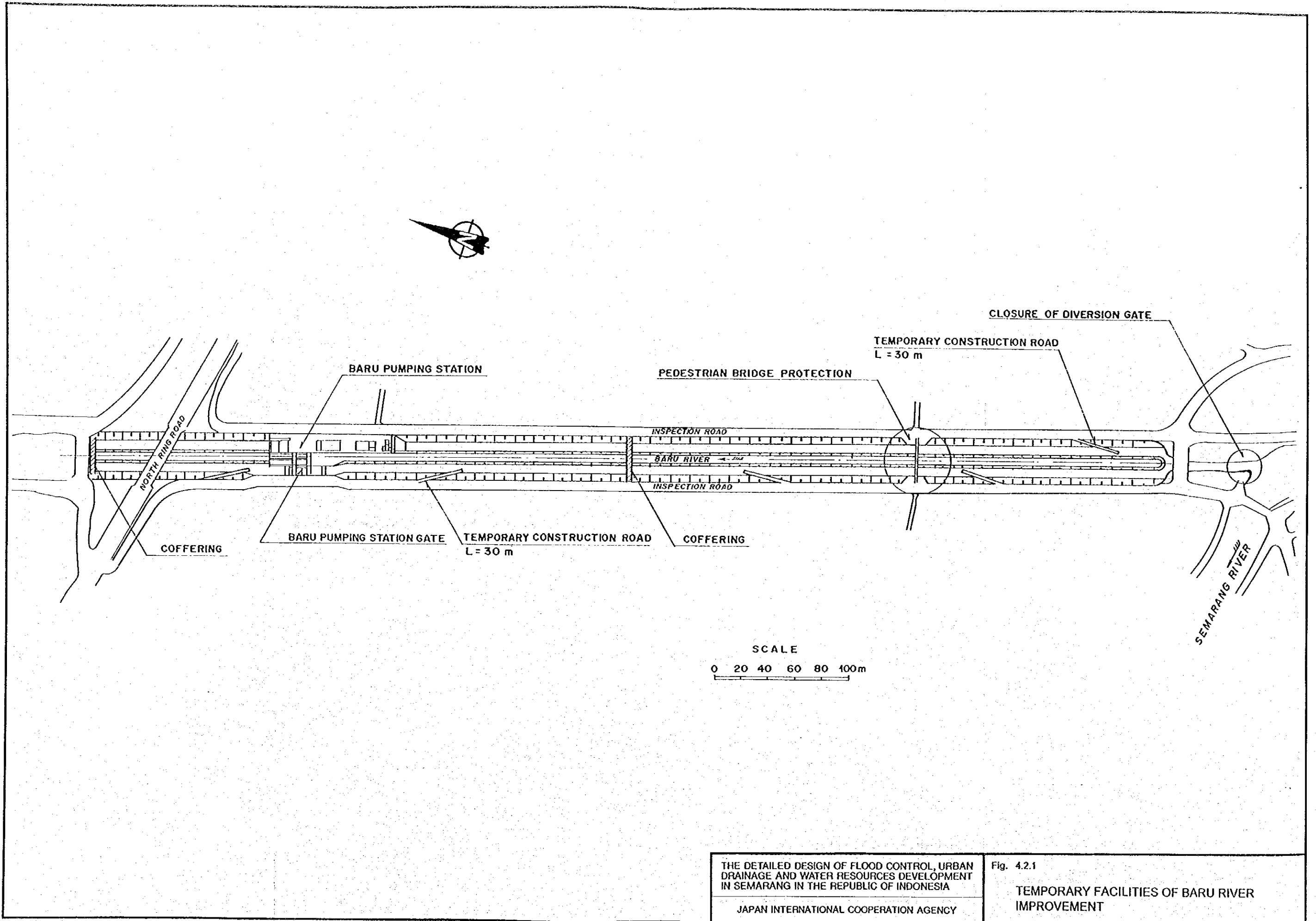


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

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Fig. 3.4.1

EXCAVATION AND PILE DRIVING PROCEDURE (2/2)

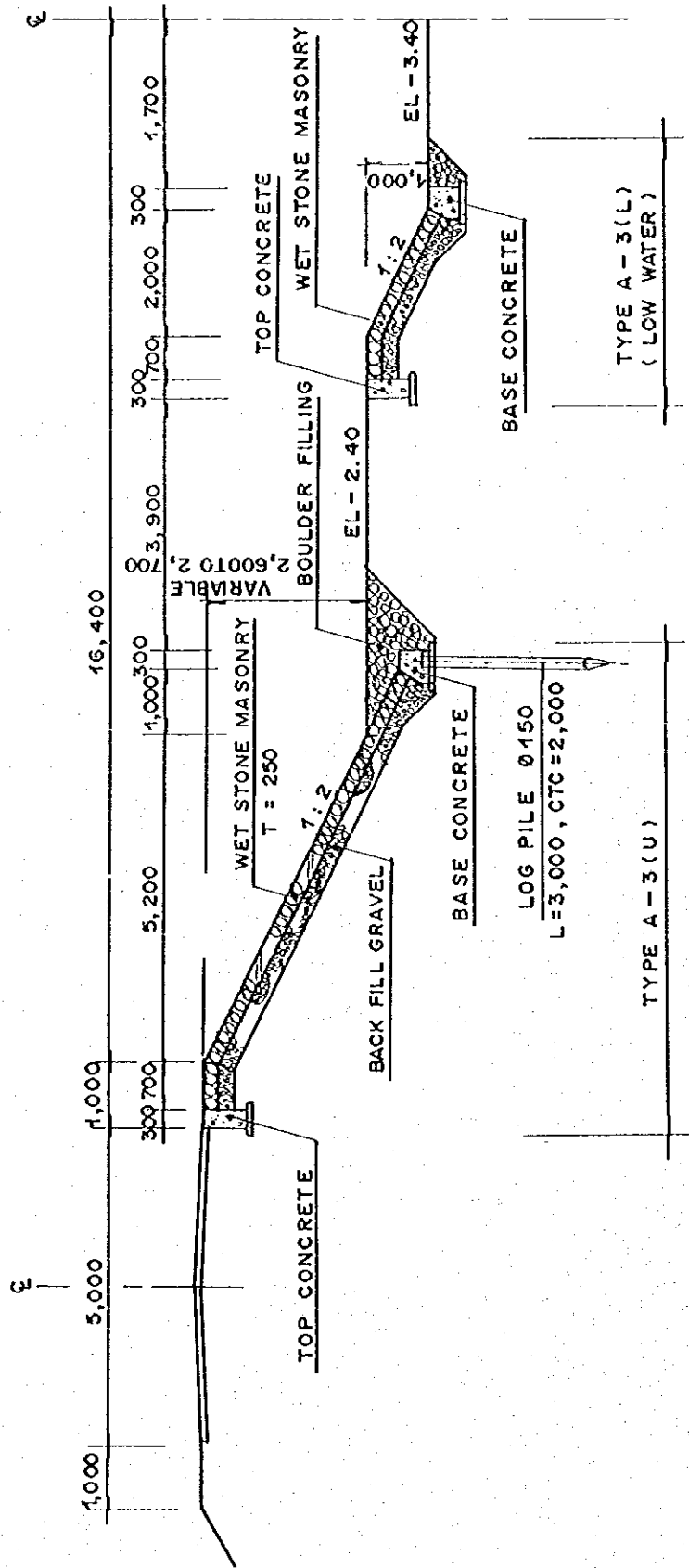


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

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Fig. 4.2.1

TEMPORARY FACILITIES OF BARU RIVER IMPROVEMENT

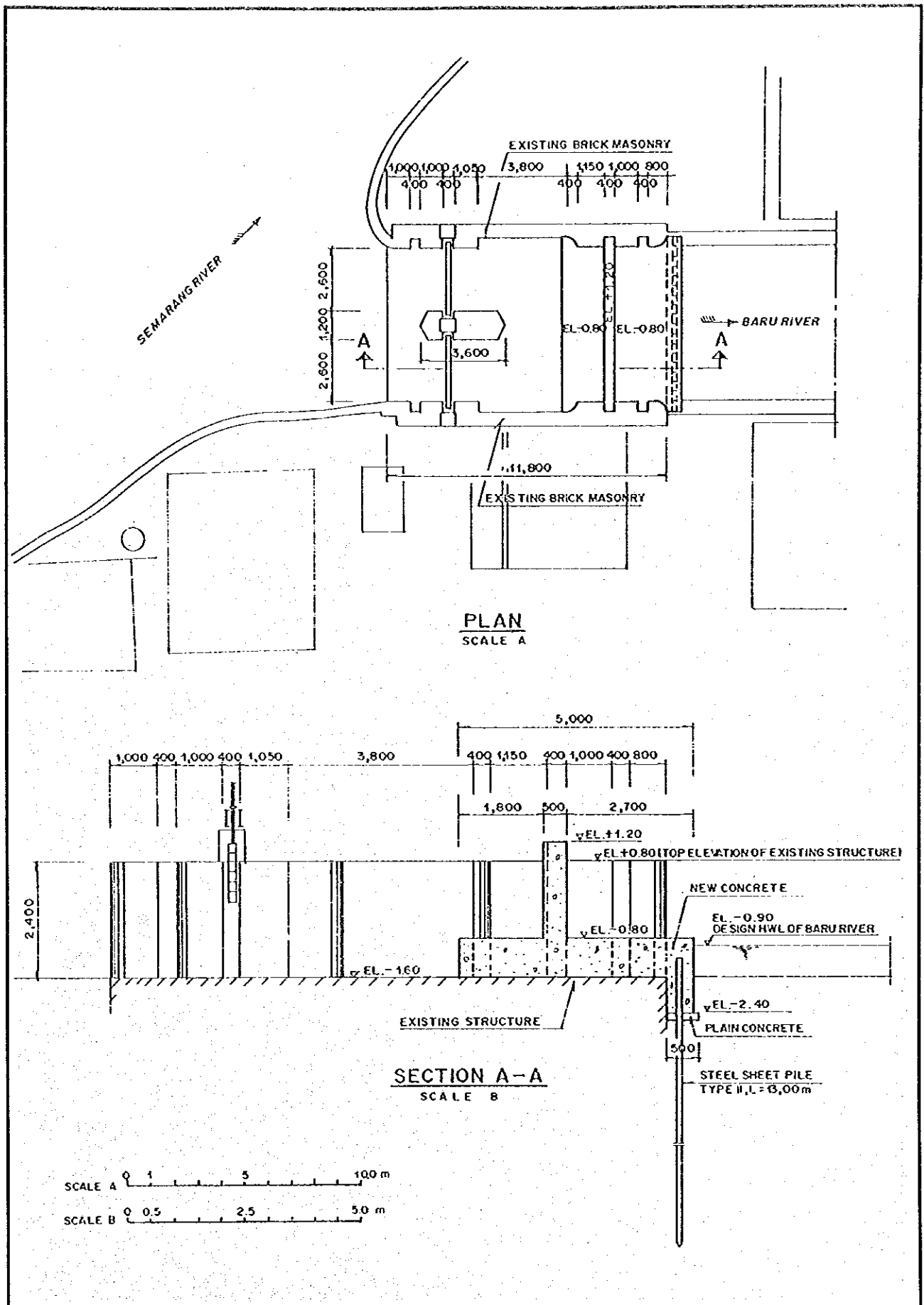


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

Fig. 4.2.2

REVTMENT OF BARU RIVER

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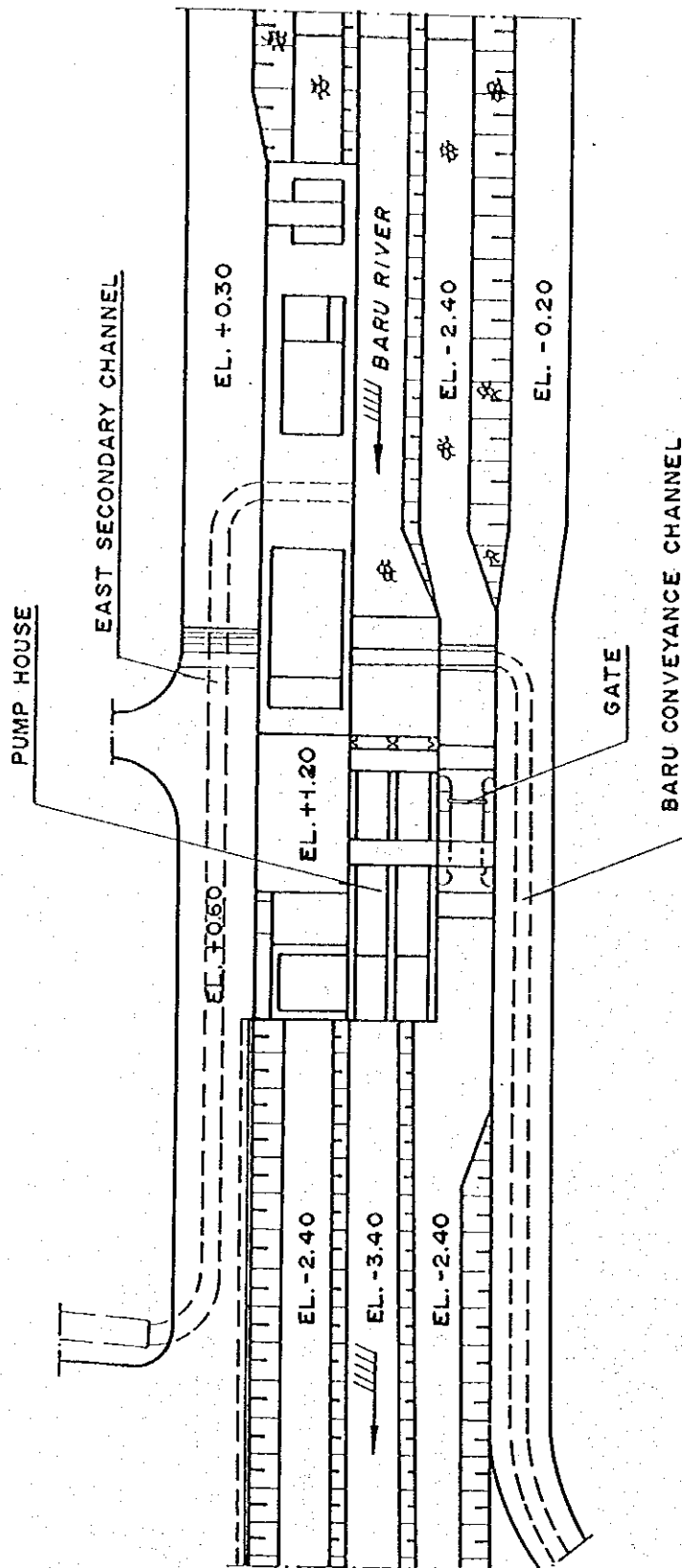


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

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Fig. 4.23

DIVERSION GATE TO BARU RIVER



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 4.3.1

GENERAL LAYOUT OF PUMPING STATION

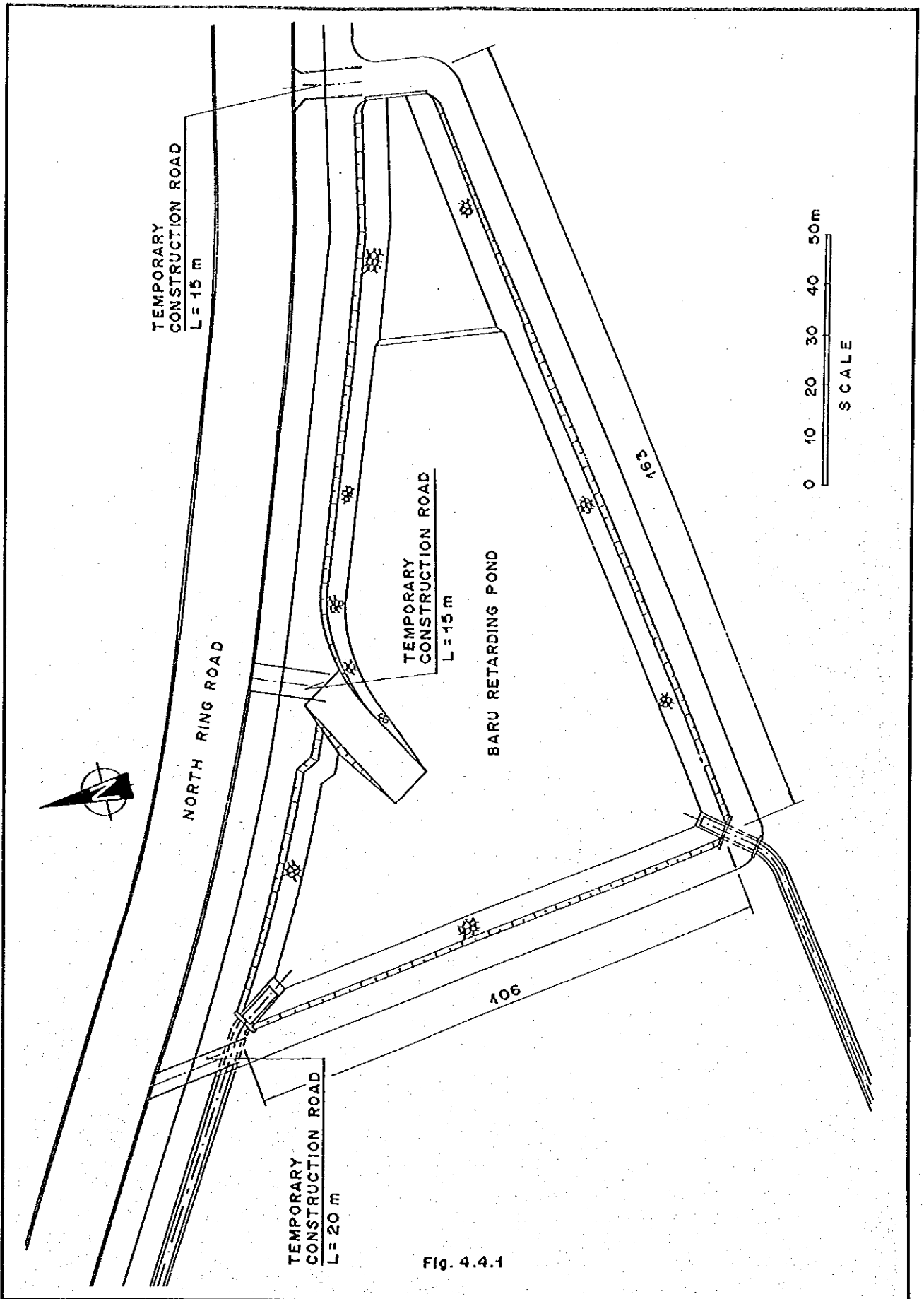


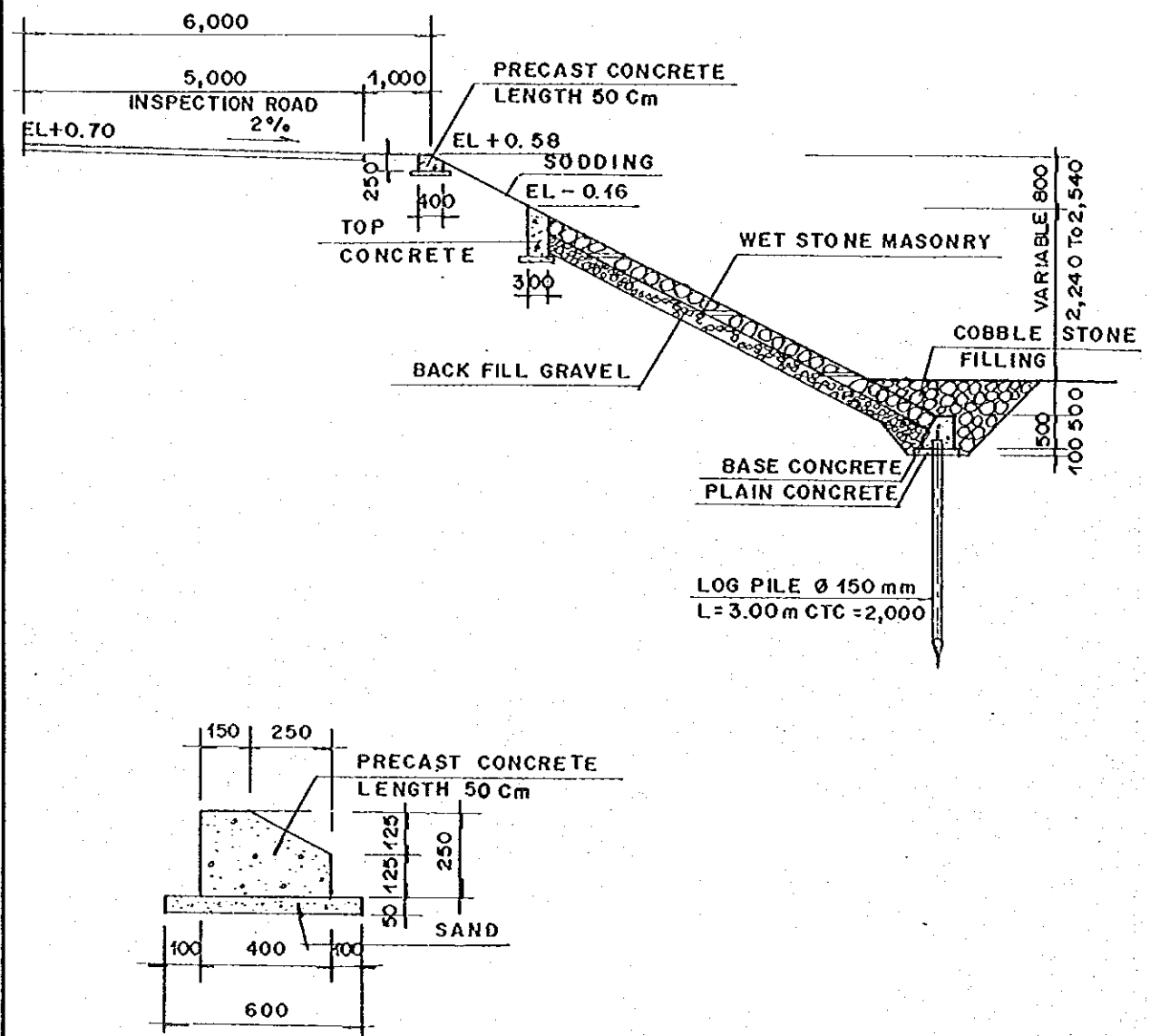
Fig. 4.4.1

THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

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Fig. 4.4.1

BARU RETARDING POND

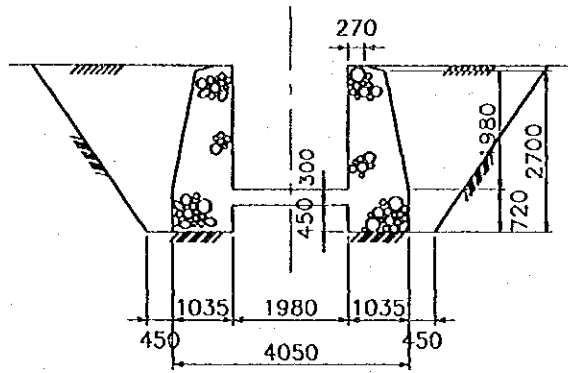


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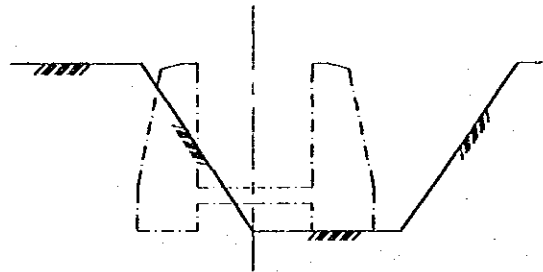
Fig. 4.4.2

REVTMENT OF BARU RETARDING POND

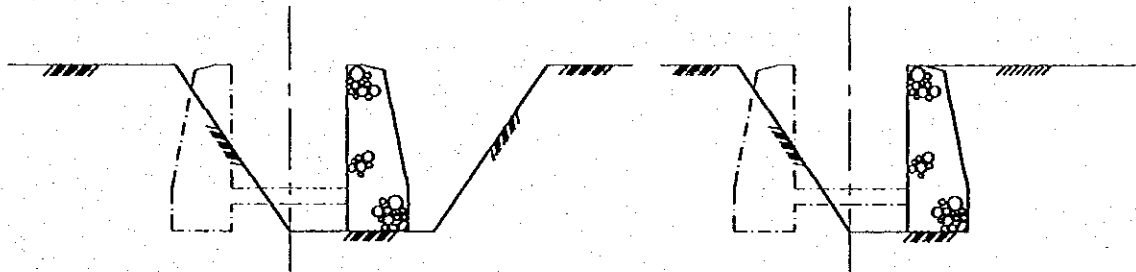


STANDARD CROSS SECTION

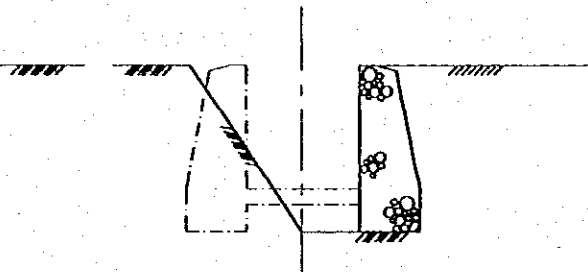
1: EXCAVATION (1)



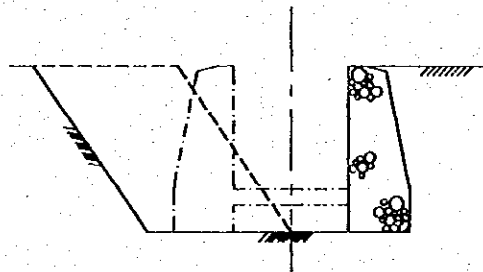
2: MASONRY (1)



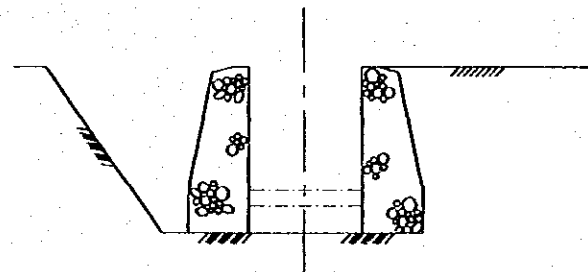
3: BACKFILL (1)



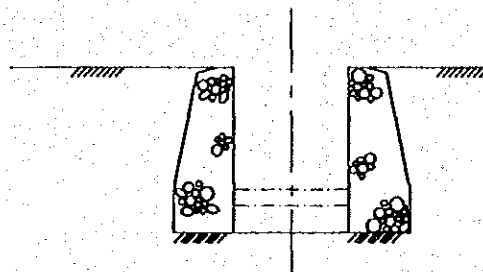
4: EXCAVATION (2)



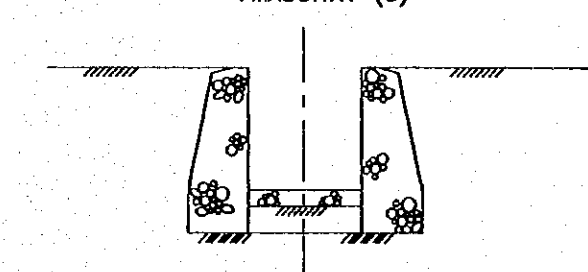
5: MASONRY (2)



6: BACKFILL (2)



7: BACKFILL (3)
+MASONRY (3)

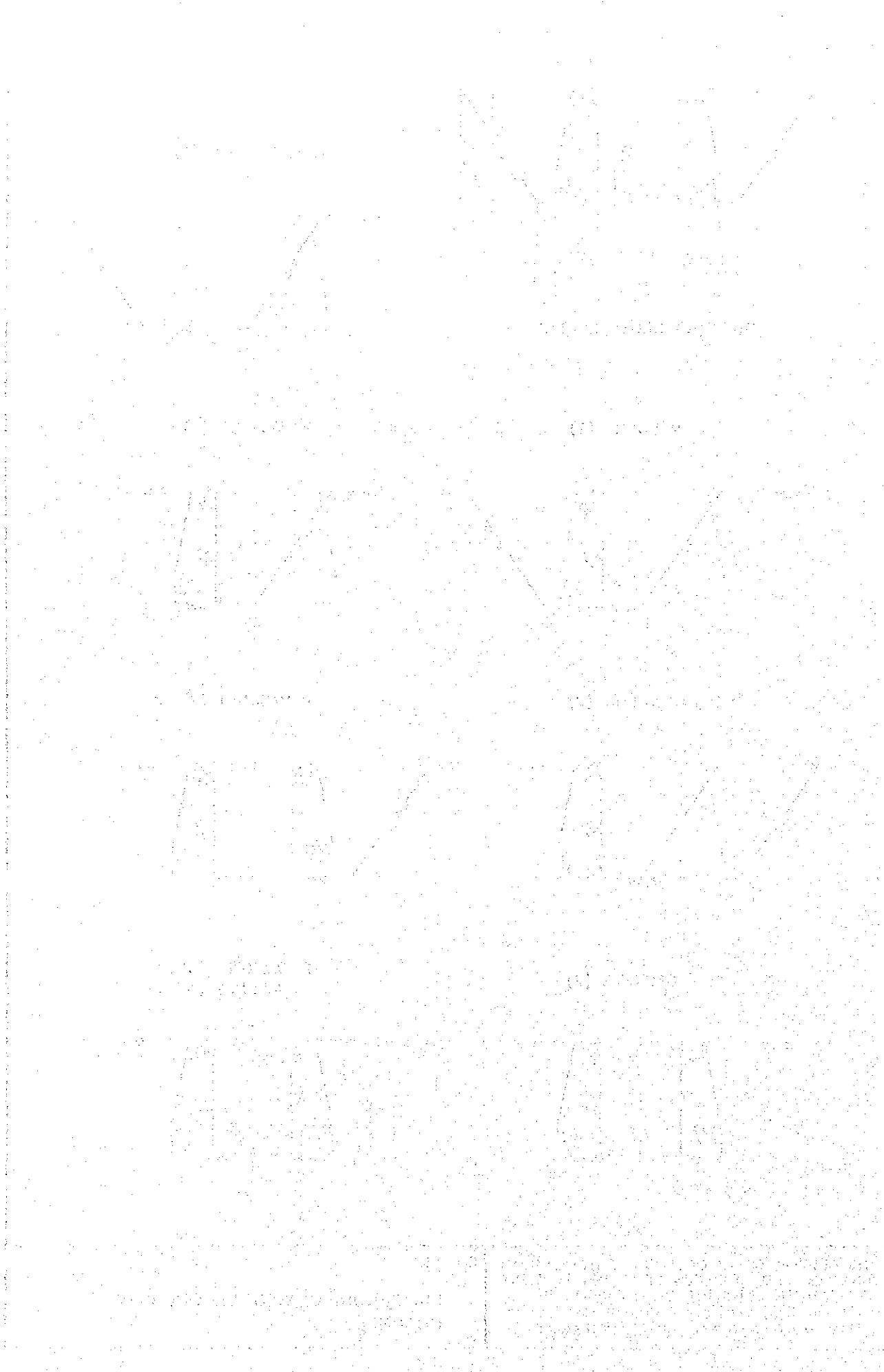


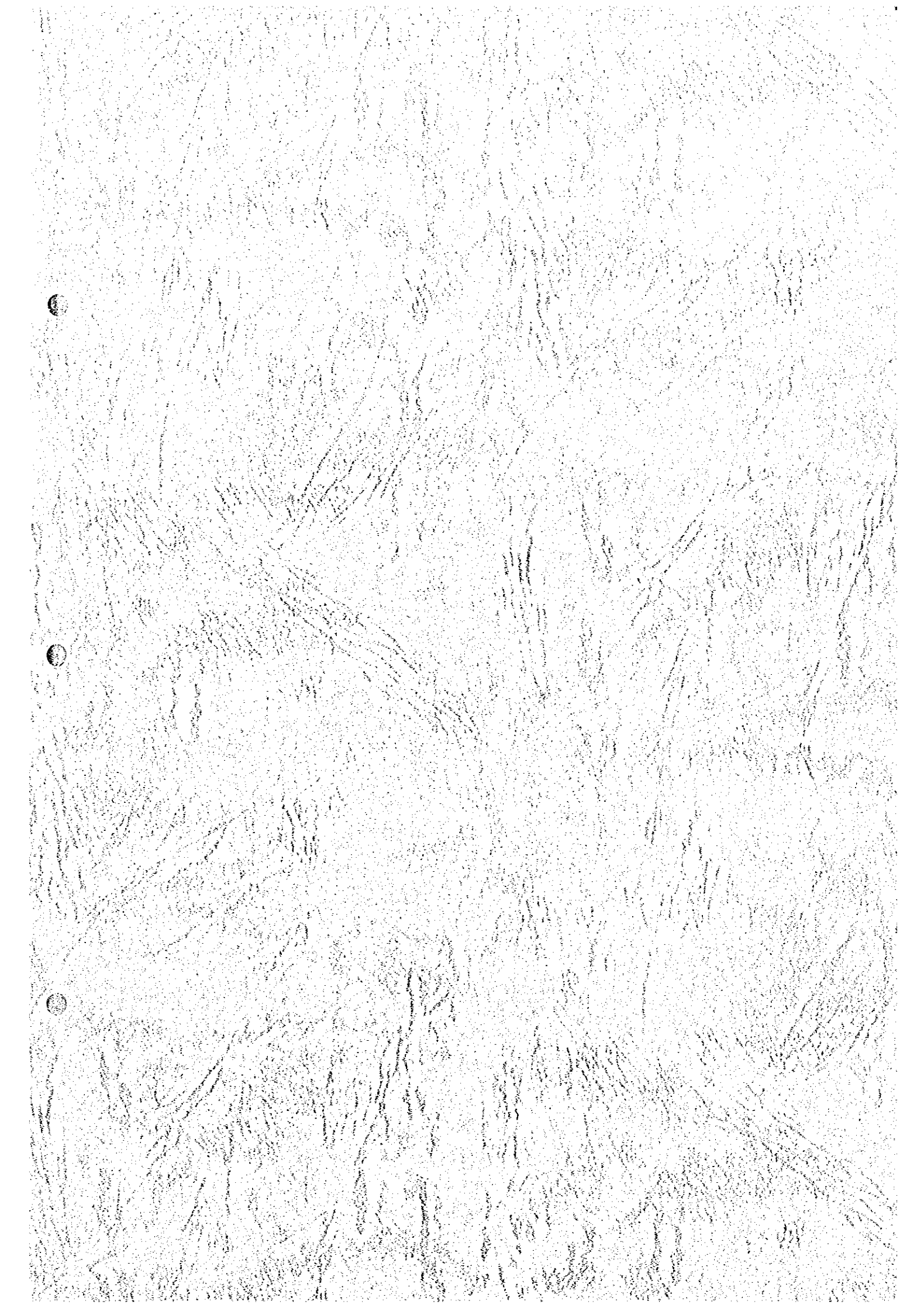
THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

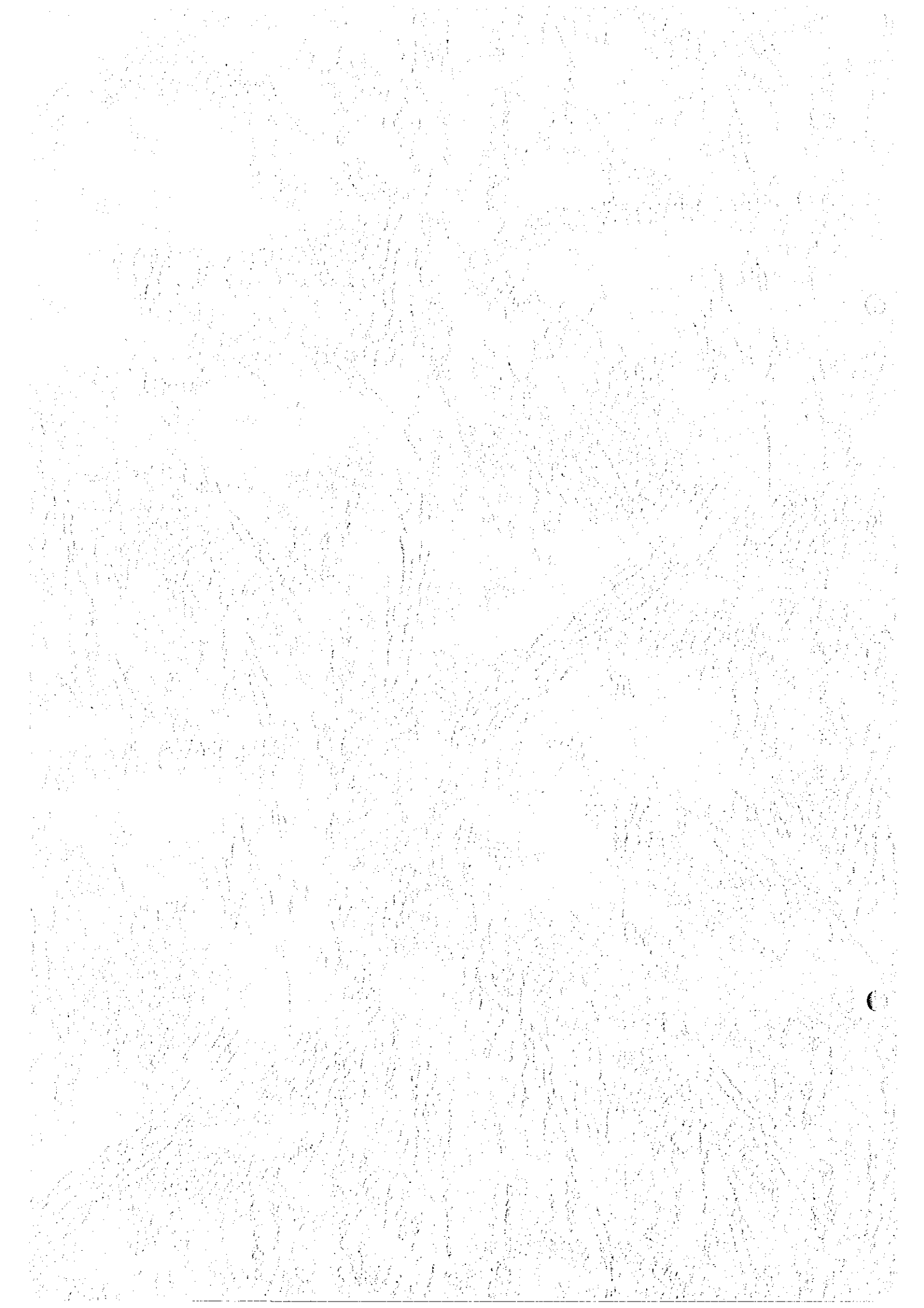
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Fig. 4.6.1

PROCEDURE OF WEST SECONDARY CHANNEL







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