APPENDIX I

IMPLEMENTATION PRIORITY OF INDIVIDUAL FACILITIES

APPENDIX I. IMPLEMENTATION PRIORITY OF INDIVIDUAL FACILITIES

Implementation priority of individual works, which was requested by the Malaysian Government, is presented as follows:

I.1. Division of Drainage Facilities

Division of trunk drains is the same as that of the trunk drains proposed by the Study Team, based on consideration of such factors as topographical condition and existing capacity of trunk drains, the division of each trunk drain ranges from one to 13 parts. (Ref.: Fig. 5.8 to 5.10 of Volume VI)

I.2. Method for Determining Implementation Order of Individual Works

In order to determine the implementation order of individual works, it is necessary to assess its effect, on flood mitigation.

The following index is adopted for determining implementation priority.

Index of effect to cost

$$= \frac{P \times D}{C}$$

where

P: Flood-Prone Area Population in 1980

D: Decrease of Flood Duration

= (Flood Duration according to land use in 1980 and 5-year return period) - (Flood Duration according to land use in 1980 and 5-year return period after improvement of a certain part of trunk drain)

C: Involved Cost for improving a certain part of trunk drain to accommodate stormwater according to land use in 2000 and

5-year return period, excluding engineering fee and contingency cost.

However, careful attention should be paid to the fact that this index is devised only from available data. Therefore, consideration of such basic factors as damage decrease, reduced flood area, reduced flood depth, etc. will be necessary.

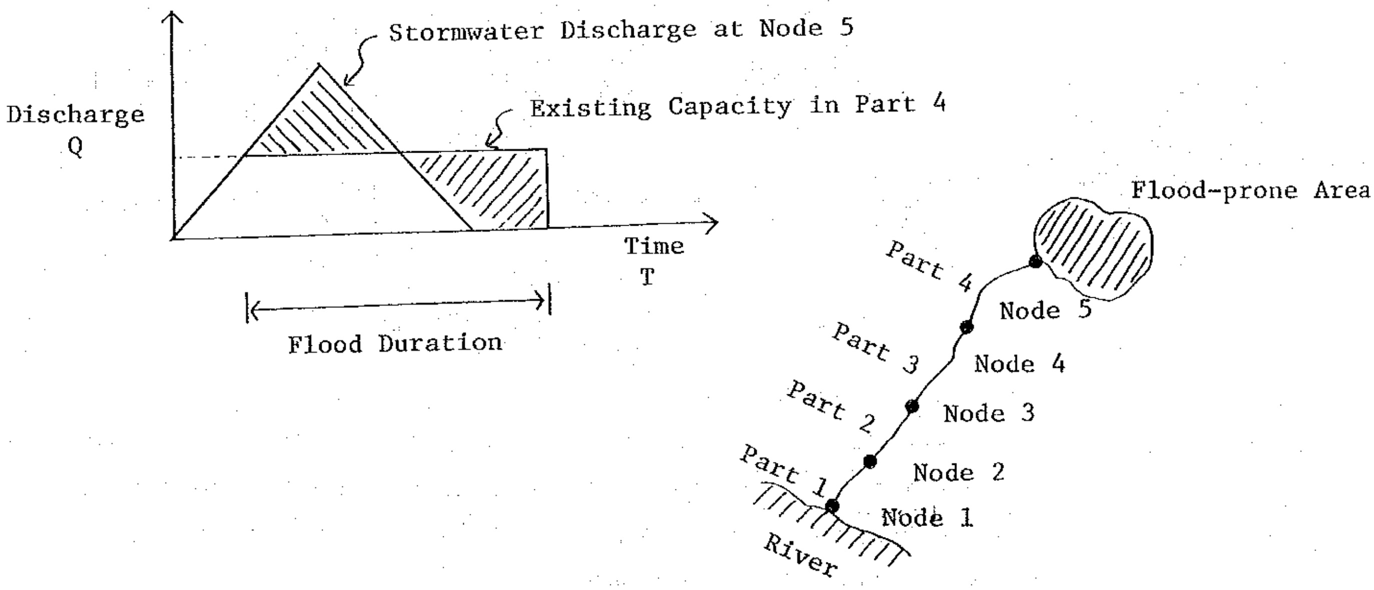
I.3. Method of Calculation

a) Calculation of Flood Duration

i) Part 4

(1) Calculate existing Stormwater discharge at Node 5
(2) Calculate existing capacity in Part 4
(3) Calculate flood duration (T_4)

Fig. I.1. Priority for Trunk Drain Parts Requiring Improvement



ii) Part 3

(1) Calculate existing stormwater discharge at Node 4
(2) Calculate existing capacity in Part 3
(3) Calculate flood duration (T_3)

iii) Flood duration T_2 and T_1 are calculated similarly.

The longer the flood duration, the greater its effect on the concerned part of the trunk drain. For example, assuming flood duration (T) to be as follows:

T_1 = 250 minutes
T_2 = 0 "
T_3 = 350 "
T_4 = 400 "

The longest flood duration is 400 minutes, depending on the existing capacity of Part 4. Therefore, Part 4 would be improved first. Succeeding improvements for Part 3 and Part 1 would be made in the order of next longest flood duration. Part 2, having adequate capacity, would not require improvement work.

b) Decrease of Flood Duration

Improvement of Part 4 would shorten flood duration caused by its inadequate capacity. However, as a result, flooding would occur from Part 3, lasting 350 minutes; that is, flood duration would be shortened 50 minutes, (from 400 to 350 minutes,) by improving Part 4. Decrease in flood duration in other parts of the trunk drain by improvement or reconstruction is assumed as follows:

Improved Part	Decrease
Part 4	50 min.
" 4 and 3	150 min. (400 - 250)
" 4, 3 and 1	400 min. (400 - 0)
" 4, 3, 1 and 2	400 min.

Calculation of (population in flood-prone area) x (decreased flood duration)/(involved cost)

I.4. Result

Implementation priority of individual works is tabulated in Table I.1 according to the above-mentioned index, which is presented in Table I.3.

Additionally, the index values of parts of the trunk drains presented in Table I.2 are nil.

Based on consideration of the cause of flooding involved cost, etc., implementation priority of gates, bunds and retention ponds is judged to be higher than that of parts of trunk drains.

Table I.1. Implementation Priority of Parts of Trunk Drain

Implementation Priority	Parts of Trunk Drain	Catchment Code No.	Implementation Priority	Parts of Trunk Drain	Catchment Code No.
1.	8	(S-8)	25.	5,7	(N-9)
2.	8,9	(N-6)	26.	3,5	(S-5)
3.	5	(S-8)	27.	1	(S-4)
4.	8,11	(A-1)	28.	8	(N-9)
5.	9	(S-8)	29.	2	(N-9)
6.	2	(A-5)	30.	4,5	(N-4)
7.	2,4	(A-2)	31.	3,5	(S-10)
8.	12,13	(N-6)	32.	5,7,8,9	(N-7)
9.	11	(N-6)	33.	5	(N-8)
10.	7	(A-3)	34.	2,5,7	(N-2)
11.	10	(N-6)	35.	1,2	(S-5)
12.	3,6	(N-8)	36.	4	(S-5)
13.	1,3	(A-5)	37.	1	(S-7)
14.	3	(A-3)	38.	3,4,5	(N-5)
15.	7	(S-8)	39.	1,3,5	(S-9)
16.	3	(S-2)	40.	1,3	(N-4)
17.	1	(N-8)	41.	2,3,4	(N-6)
18.	5,9,10	(A-4)	42.	2	(S-5)
19.	6	(A-3)	43.	4	(S-9)
20.	2	(S-10)	44.	2,3	(N-3)
21.	2,3	(S-7)	45.	1	(S-10)
22.	4	(A-3)	46.	1	(S-3)
23.	4,6,7	(A-4)	47.	2	(N-5)
24.	1,2,3	(S-6)			

Note: Parts of trunk drain are the same as line numbers of trunk drain which are shown in Figs.5.8 to 5.10 of Volume VI.

Table I.2. Implementation Priority of Parts of Trunk Drain
(The index value is nil.)

Catchment Code No.	Parts of Trunk Drain
N-1	1-9
2	1,3,4,6
3	1
4	2
5	1,6,7
6	1,5-7
7	1-4,6
8	2,4
9	1,3,4,6
S-1	1-3
2	1,2,4
8	1-4,6
9	2
10	4
A-1	1-7,9,10
2	1,3
3	1,2,5
4	1-3,8
5	4
O-1	1-7
2	1-5
3	1-8
4	1-5
5	1-8
6	1-19

Note: Parts of trunk drain are the same as line numbers of trunk drain which are shown in Figs.5.8 to 5.10 of Volume VI.

Table I.3.(1) Index of Effect to Cost

(Flood-Prone Are Population) x (Decrease of Flood Duration) / (Involved Cost)

Flood-Prome Area No.	Catchment Code No.	Proposed Line No.	Time of Concen-tration tc(min)	Runoff Coefficient C	Served Area A (ha)	Existing Capacity (m^3/sec)	Flood-Prone Area Population (a)	Flood Duration (min) 3	Decrease of Flood Duration (min)(b)	Construction Cost & Accumu-latεd Con-struction Cost (C) (M$)	Index (a)x(b) / (c)	Implementation Priority
1	N-2	5,7	42.1	0.45	165.8	1.71	400	700	330	979,000	(135)	-
		(5,7),2	37.0	0.45	105.8	1.90		370	700	1,018,000 1,997,000	140	34
2		7	43.9	0.45	210.1	1.71	0	910	910	351,000	0	-
3		7	43.9	0.45	210.1	1.71	0	910	910	351,000	0	-
4	N-3	3,1	28.9	0.45	14.3	0.50	0	170	170	385,000	0	-
5		3,2	22.1	0.45	11.2	0.50	100	130	130	396,000	33	44
6	N-4	1	21.5	0.55	47.2	2.28	1000	150	30	724,000	(41)	-
		(1),5,3	39.2	0.55	120.4	7.42		120	150	2,069,000 2,793,000	54	40
7		5,3	39.2	0.55	120.4	7.42	200	120	120	2,069,000	(12)	-
8		5,4	31.3	0.55	38.6	0.30	400	1180	1180	1,664,000	284	30
9		5,4	31.3	0.55	38.6	0.30	200	1180	1180	1,664,000	(141)	-
10		5,3	39.2	0.55	120.4	7.42	0	120	120	2,069,000	0	-
11	N-5	5	31.7	0.65	51.5	3.57	500	120	30	337,000	(45)	-
		(5),4	30.0	0.65	41.2	3.57		90	30	126,000 463,000	(32)	-
		(5,4),2	25.0	0.65	22.6	1.93		90	30	495,000 958,000	16	47
		(5,4,2),3	29.2	0.65	39.3	3.57		90	120	622,000 1,580,000	(38)	-
12		5	31.7	0.65	51.5	3.57	800	120	30	337,000	(71)	-
		(5),4	30.0	0.65	41.2	3.57		90	30	126,000 463,000	(52)	-
		(5,4),3	29.2	0.65	39.3	3.57		90	120	622,000 1,085,000	88	38

Table I.3. (2)

Flood-Prome Area No.	Catchment Code No.	Proposed Line No.	Time of Concentration tc(min)	Runoff Coefficient C	Served Area A (ha)	Existing Capacity (m^3/sec)	Flood-Prone Area Population (a)	Flood Duration (min) 3	Decrease of Flood Duration (min)(b)	Construction Cost & Accumulated Construction Cost (C) (M$)	Index (a)x(b)/(c)	Implementation Priority
15	N-6	13,12	40.2	0.75	53.8	1.47	300	420	20	918,000	(7)	-
		(13,12),21	37.5	0.75	51.6	1.47		400	30	82,000 1,000,000	(9)	-
		(13-11),10	37.2	0.75	50.6	1.47		390	100	244,000 1,244,000	(24)	-
		(13-10),4	36.1	0.75	20.2	0.70		320	270	394,000 1,638,000	(49)	-
		(13-10,4),3	32.1	0.75	16.5	1.07		150	340	632,000 2,270,000	(45)	-
		(13-10,4,3)2	24.4	0.75	10.2	1.15		80	420	128,000 2,398,000	53	41
16		8,9	31.3	0.75	25.7	0.10	(1000)	3420	3000	472,000	5245	2
		(8,9),13,12	40.2	0.75	53.8	1.47		420	3020	918,000 1,490,000	2027	8
		(8,9,13 12),11	37.5	0.75	51.6	1.47		400	3030	82,000 1,572,000	1927	9
		(8,9,13,12,11),10	37.2	0.75	50.6	1.47		390	3420	244,000 1,816,000	1883	11
19	N-7	7,8,9,5	24.1	0.65	25.5	2.08	1700	100	100	1,102,000	154	32
20	N-8	6	51.5	0.40	255.0	1.07	1000	1630	750	662,000	(1133)	-
		(6),3	48.7	0.40	141.8	1.05		880	1170	267,000 929,000	1259	12
		(6,3),1	42.0	0.40	78.4	1.05		460	1630	1,366,000 2,295,000	710	17
21		6	51.5	0.40	255.0	1.07	200	1630	950	662,000	(287)	-
		(6),5	28.2	0.40	32.2	0.30		680	1630	1,656,000 2,318,000	141	33
22		6	51.5	0.40	255.0	1.07	0	1630	1630	662,000	0	-
23		6	51.5	0.40	255.0	1.07	300	1630	750	662,000	(340)	-
		(6),3	48.7	0.40	141.8	1.05		880	1170	267,000 929,000	(378)	-
		(6,3),1	42.0	0.40	78.4	1.05		460	1630	1,366,000 2,295,000	(213)	-

Table I.3. (3)

Flood-Prome Area No.	Catchment Code No.	Proposed Line No.	Time of Concen-tration tc(min)	Runoff Coefficient C	Served Area A (ha)	Existing Capacity (m^3/sec)	Flood-Prone Area Population (a)	Flood Duration (min) 3	Decrease of Flood Duration (min) (b)	Construction Cost & Accumu-lated Con-struction Cost (C) (M$)	Index $\frac{(a)x(b)}{(c)}$	Implementation Priority
24	N-9	7	62.1	0.40	337.8	1.75	1100	1300	10	378,000	(36)	-
		(7),5	59.0	0.40	280.7	1.47		1290	680	1,721,000 2,029,000	369	25
		(7,5),8	69.8	0.40	366.3	3.77		620	1060	1,496,000 3,525,000	331	28
		(7,5,8),2	39.3	0.40	95.1	2.25		240	1300	1,259,000 4,782,000	299	29
25	S-2	1	23.3	0.40	108.9	0.79	0	900	450	932,000	0	-
		(1),2	29.7	0.40	127.5	1.72		450	900	708,000 1,640,000	0	-
26		3	18.2	0.40	30.5	0.30	400	640	640	319,000	803	16
27	S-3	1	13.7	0.75	11.8	1.78	300	50	50	517,000	29	46
28		1	13.7	0.75	11.8	1.78	100	50	50	517,000	(10)	-
29	S-4	1	16.3	0.55	53.9	1.69	1500	240	240	1,078,000	334	27
30	S-5	$\frac{S-6}{3}$, $\frac{S-6}{2}$, 5	47.1	0.50	147.1	1.11	1300	1100	400	7,010,000	(74)	-
		(5),3	35.1	0.50	97.4	1.11		700	890	2,329,000 9,339,000	(124)	-
		(5,3),1	17.9	0.50	16.0	0.51		210	990	395,000 9,734,000	(132)	-
		(5,3,1),2	24.2	0.50	45.0	2.60		110	1100	768,000 10,502,000	136	35
31		$\frac{S-6}{3}$, $\frac{S-6}{2}$, 5	47.1	0.50	147.1	1.11	400	1100	400	7,010,000	(23)	-
		(5),3	35.1	0.50	97.4	1.11		700	990	2,329,000 9,339,000	(42)	-
		(5,3),2	24.2	0.50	45.0	2.60		110	1100	768,000 10,107,000	44	42
32		$\frac{S-6}{3}$, $\frac{S-6}{2}$, 5	47.1	0.50	147.1	1.11	3100	1100	400	7,010,000	(177)	-
		(5),3	35.1	0.50	97.4	1.11		700	1100	2,329,000 9,339,000	365	26

Table I.3. (4)

Flood-Prome Area No.	Catchment Code No.	Proposed Line No.	Time of Concentration tc(min)	Runoff Coefficient C	Served Area A (ha)	Existing Capacity (m^3/sec)	Flood-Prone Area Population (a)	Flood Duration (min) 3	Decrease of Flood Duration (min)(b)	Construction Cost & Accumulated Construction Cost (C) (M$)	Index $\frac{(a)x(b)}{(c)}$	Implementation Priority
34	S-5	$\frac{S-6}{3},\frac{S-6}{2}$, 5	47.1	0.50	147.1	1.11	1200	1100	640	7,010,000	(110)	-
		(5),4	36.1	0.50	49.7	0.83		460	1100	2,752,000 9,762,000	135	36
35	S-6	3,2,1	25.8	0.40	59.5	0.51	3600	750	750	6,661,000	405	24
36	S-7	1	27.6	0.45	27.0	0.15	500	1360	30	784,000	(19)	-
		(1),$\frac{S-6}{3}$,3	48.8	0.45	110.8	0.63		1330	240	5,752,000 6,536,000	(18)	-
		(1,3),2	38.2	0.45	94.3	0.63		1120	1360	732,000 7,268,000	94	37
37		$\frac{S-6}{3}$,3	48.8	0.45	110.8	0.63	2500	1330	210	5,752,000	(91)	-
		(3),2	38.2	0.45	94.3	0.63		1120	1330	732,000 6,484,000	513	21
33	S-8	8	83.6	0.45	539.2	0.71	1400	5570	3320	545,000	8528	1
		(8),9	87.8	0.45	539.2	1.88		2250	3940	1,474,000 2,019,000	2782	5
		(8,9),7	52.1	0.45	106.4	0.50		1630	5570	6,895,000 8,914,000	875	15
38		5	77.3	0.45	387.4	0.40	1000	5610	40	344,000	(116)	-
		(5),8	83.6	0.45	539.2	0.71		5570	3320	545,000 889,000	3735	3
		(5,8),9	87.8	0.45	539.2	1.88		2250	5610	1,474,000 2,363,000	(2374)	-
39		8	83.6	0.45	539.2	0.71	600	5570	3320	545,000	(3655)	-
		(8),9	87.8	0.45	539.2	1.88		2250	3940	1,474,000 2,019,000	(1171)	-
		(8,9),7	52.1	0.45	106.4	0.50		1630	5570	6,895,000 8,914,000	(375)	-
40		8	83.6	0.45	539.2	0.71	300	5570	3320	545,000	(676)	-
		(8),9	87.8	0.45	539.2	1.88		2250	5570	1,474,000 2,019,000	(828)	-

Table I.3. (5)

Flood-Prome Area No.	Catchment Code No.	Proposed Line No.	Time of Concen-tration tc(min)	Runoff Coefficient C	Served Area A (ha)	Existing Capacity (m^3/sec)	Flood-Prone Area Population (a)	Flood Duration (min) 3	Decrease of Flood Duration (min)(b)	Construction Cost & Accumu-lated Con-struction Cost (C) (M$)	Index (a)x(b)/(c)	Implementation Priority
41	S-9	(5),3	26.9	0.55	87.2	1.83	1000	390	200	4,781,000	(42)	-
		(5,3),1	23.4	0.55	23.2	0.89		190	390	1,293,000 6,074,000	64	39
42		5,4	22.7	0.55	32.7	1.51	1100	160	160	4,781,000	37	43
43	S-10	5,3	32.9	0.55	105.0	2.47	600	350	110	4,086,000	(16)	-
		(5,3),1	28.5	0.55	48.4	1.54		240	350	2,195,000 6,281,000	33	45
44		2	27.2	0.55	26.5	0.24	700	1450	1100	1,445,000	533	20
		(2),5,3	32.9	0.55	105.0	2.47		350	1450	4,086,000 5,531,000	(184)	31
45		5,4	22.6	0.55	39.6	0.10	0	3890	3890	4,266,000	0	-
46	A-1	11	255.3	0.40	1623.0	0.38	0	6390	300	552,000	0	-
		(11),8	168.3	0.40	1178.2	0.38		6090	6390	2,316,000 2,868,000	0	-
47		11	255.3	0.40	1623.0	0.38	1400	6390	300	552,000	(761)	-
		(11),8	168.3	0.40	1178.2	0.38		6090	6390	2,316,000 2,868,000	3119	4
48	A-2	2,4	52.3	0.50	133.6	0.58	3300	1990	1990	3,254,000	2018	7
49	A-3	7	53.6	0.55	106.9	0.83	900	1180	570	269,000	1907	10
		(7),6	46.6	0.55	63.6	0.91		610	1030	1,092,000 1,361,000	681	19
		(7,6),4	35.7	0.55	12.2	0.58		150	1180	900,000 2,261,000	470	22
50		3,7	53.6	0.55	106.9	0.83	1600	1180	1180	1,523,000	1240	14
51	A-4	10,9,5	31.5	0.65	52.5	1.14	600	460	290	254,000	685	18
		(10,9,5) 6,7,4	26.4	0.65	21.8	1.14		170	460	724,000	465	23
52	A-5	2	30.9	0.85	36.9	0.30	3100	1790	1020	1,385,000	2283	6
		(2),3	34.0	0.85	56.1	1.00		770	1030	2,156,000 3,541,000	(902)	-
		(2,3),1	20.1	0.85	16.8	0.30		760	1790	921,000 4,462,000	1244	13

APPENDIX J

EXISTING CAPACITY OF DRAIN

(Ref.: Section 2.4.3, Vol. VI)

Table J.1. Existing Capacity of Drain

Catchment Code No.	Proposed Line No.	Point	Existing Drain: Width(m)× Height(m)	Existing Drain: Capacity (m^3/sec)	Proposed Design Storm Discharge (m^3/sec)
N-1	9	1	E TA 27.6 × 1.7	15.94	98.14 (10.6)
		2	E TA 21.1 × 1.8	13.00	
		3	E TA 16.6 × 1.7	∘ 9.29	
		4	E TA 7.7 × 1.3	2.72	
	8	5	E TZ $\genfrac{}{}{0pt}{}{12.1}{4.6}$ × 1.3	7.32	102.55 (34.9)
		6	E TA 6.8 × 1.5	∘ 2.94	
	3	7	E TA 7.1 × 1.6	3.46	88.88 (25.7)
	1	8	E TA 8.0 × 1.3	2.82	87.28 (28.9)
		9	E TA 9.5 × 2.2	6.16	
		10	E TA 7.9 × 1.4	3.12	
		11	TZ $\genfrac{}{}{0pt}{}{9.5}{0.9}$ × 1.7	∘ 3.02	
N-2	5	1	E TA 5.6 × 1.3	∘ 1.71	17.84 (10.4)
		2	E TA 5.6 × 1.3	1.71	
		3	E TZ $\genfrac{}{}{0pt}{}{4.4}{2.0}$ × 1.0	3.63	
	2	4	C TZ $\genfrac{}{}{0pt}{}{6.3}{3.9}$ × 1.7	7.34	12.40 (6.5)
		5	C TZ $\genfrac{}{}{0pt}{}{5.8}{0.4}$ × 1.8	1.22	
		6	E TZ $\genfrac{}{}{0pt}{}{3.6}{1.6}$ × 0.9	∘ 1.90	
	1	7	E TZ $\genfrac{}{}{0pt}{}{3.8}{0.6}$ × 1.2	2.18	11.11 (2.5)
		8	C TZ $\genfrac{}{}{0pt}{}{3.9}{2.4}$ × 1.4	9.59	
		9	C TZ $\genfrac{}{}{0pt}{}{4.0}{1.9}$ × 1.3	4.62	

Note 1; E : Earth TZ : Trapezoidal C : Concrete
TA : Triangle CB : Concrete Block
2; Figures in parentheses is a ratio of proposed design storm discharge to existing drain capacity
3; Point is shown in Fig.2.10, Proposed line No. is shown in Figs.5.8 to 5.10 of Vol.VI.

Catch-ment Code No.	Proposed Line No.	Point	Existing Drain Width(m)×Height(m)	Existing Drain Capacity (m^3/sec)	Proposed Design Storm Discharge (m^3/sec)
N-2	1	10	C TZ $\genfrac{}{}{0pt}{}{3.5}{1.7} \times 1.0$	∘ 4.40	
		11	C TA 3.8 × 0.6	1.23	
N-4	3	1	C TZ $\genfrac{}{}{0pt}{}{7.0}{2.9} \times 2.7$	17.57	14.98 (2.1)
		2	C TZ $\genfrac{}{}{0pt}{}{8.0}{2.1} \times 1.6$	9.19	
		3	C TZ $\genfrac{}{}{0pt}{}{6.4}{3.2} \times 2.1$	9.24	
		4	C TZ $\genfrac{}{}{0pt}{}{6.9}{3.7} \times 1.4$	∘ 7.42	
	2	5	C TZ $\genfrac{}{}{0pt}{}{7.5}{2.0} \times 2.0$	21.21	10.71 (1.4)
		6	C TZ $\genfrac{}{}{0pt}{}{6.7}{2.1} \times 1.6$	14.14	
		7	C TZ $\genfrac{}{}{0pt}{}{5.6}{0.8} \times 1.3$	∘ 7.48	
	1	8	C TZ $\genfrac{}{}{0pt}{}{4.5}{2.1} \times 1.1$	7.71	8.60 (3.8)
		9	C TZ $\genfrac{}{}{0pt}{}{1.8}{0.9} \times 0.6$	2.28	
		10	C TZ $\genfrac{}{}{0pt}{}{2.9}{0.5} \times 1.2$	7.52	
N-5	6	1	C TZ $\genfrac{}{}{0pt}{}{7.9}{4.5} \times 3.0$	49.56	13.43 (0.8)
		2	C TZ $\genfrac{}{}{0pt}{}{6.0}{3.3} \times 1.9$	∘ 17.22	
	3	3	C TA 3.8 × 1.4	3.57	7.08 (2.0)
		4	C TZ $\genfrac{}{}{0pt}{}{4.0}{0.6} \times 1.4$	4.78	
	2	5	C TA 3.0 × 1.1	1.98	4.52 (2.3)
		6	C TA 2.2 × 1.0	∘ 1.93	
	1	7	C TZ $\genfrac{}{}{0pt}{}{3.0}{0.8} \times 1.1$	8.14	2.35 (0.3)

Catch-ment Code No.	Proposed Line No.	Point	Existing Drain Width(m)×Height(m)	Existing Drain Capacity (m^3/sec)	Proposed Design Storm Discharge (m^3/sec)
N-6	11,12,13	1	(i=1.9°/₀₀) ϕ 1,200	1.47	10.85 (7.4)
	4	2	C TA 1.3 × 1.2	0.70	3.63 (5.2)
	3	3	C TZ 1.6/0.4 × 1.0	◦ 1.07	3.12 (2.9)
		4	C TA 1.8 × 1.2	1.15	
		5	C TA 1.2 × 0.7	0.32	
	2	6	C TA 2.0 × 1.1	1.15	2.18 (1.9)
	1	7	C TA 2.9 × 0.9	1.42	2.11 (1.5)
N-7	5	1	E TZ 4.3/2.9 × 0.9	2.22	5.04 (2.4)
		2	CBTZ 2.5/2.2 × 0.9	◦ 2.08	
	3	3	CBTZ 1.5/1.2 × 0.8	0.56	2.87 (5.1)
N-8	6	1	E TZ 12.5/1.6 × 2.1	7.48	26.36 (24.6)
		2	E TZ 10.6/4.1 × 1.4	4.56	
		3	E TZ 4.6/2.8 × 0.9	1.14	
		4	E TZ 4.4/1.9 × 1.0	◦ 1.07	
	1	5	E TZ 4.9/0.8 × 0.9	◦ 1.05	9.22 (8.8)
		6	E TZ 4.2/1.3 × 1.5	2.29	
		7	E TZ 4.6/1.1 × 1.1	1.47	
		8	E TZ 2.3/1.2 × 0.7	0.46	
		9	E TZ 3.4/1.3 × 0.8	0.75	

Catch-ment Code No.	Proposed Line No.	Point	Existing Drain		Proposed Design Storm Discharge (m^3/sec)
			Width(m)×Height(m)	Capacity (m^3/sec)	
		10	E TZ $\frac{3.2}{1.8}$ × 0.7	0.70	
		11	E TZ $\frac{1.8}{0.5}$ × 0.6	0.21	
	2	12	C TZ $\frac{2.9}{1.6}$ × 1.3	3.59	7.10 (6.2)
		13	E TZ $\frac{4.8}{1.9}$ × 1.3	0.94	
		14	E TZ $\frac{4.3}{1.8}$ × 1.1	2.08	
		15	E TZ $\frac{3.8}{1.1}$ × 0.9	∘ 1.14	
		16	E TZ $\frac{2.3}{1.0}$ × 1.2	1.05	
		17	E TZ $\frac{4.7}{0.9}$ × 1.3	2.18	
		18	C TA 1.5 × 1.0	0.54	
		19	C TZ $\frac{2.9}{0.8}$ × 0.7	1.11	
N-9	8	1	E TZ $\frac{6.6}{1.1}$ × 1.7	∘ 3.77	25.59 (6.7)
		2	E TA 9.5 × 1.7	4.60	
	7	3	E TZ $\frac{3.5}{2.2}$ × 1.2	1.75	25.29 (14.5)
	5	4	E TZ $\frac{5.8}{1.3}$ × 2.4	6.09	21.89 (14.9)
		5	E TZ $\frac{4.6}{1.6}$ × 1.2	1.96	
		6	E TZ $\frac{4.0}{1.5}$ × 1.1	∘ 1.47	
		7	E TA 2.8 × 1.5	0.92	
		8	E TZ $\frac{4.1}{1.3}$ × 1.3	1.77	
		9	E TZ $\frac{3.2}{1.1}$ × 0.8	0.67	
		10	E TZ $\frac{2.9}{0.7}$ × 1.0	0.75	

Catch-ment Code No.	Proposed Line No.	Point	Existing Drain Width(m)×Height(m)	Existing Drain Capacity (m^3/sec)	Proposed Design Storm Discharge (m^3/sec)
N-9	4	11	E TZ $\frac{4.4}{0.9}$ × 1.0	1.17	13.22 (38.9)
		12	E TZ $\frac{2.5}{1.7}$ × 0.5	◦ 0.34	
	2	13	E TZ $\frac{4.5}{0.3}$ × 1.5	◦ 2.25	9.86 (4.4)
		14	E TZ $\frac{4.9}{1.1}$ × 1.5	3.06	
		15	E TZ $\frac{3.5}{0.6}$ × 1.0	1.05	
		16	E TZ $\frac{4.4}{1.2}$ × 1.3	2.32	
		17	C TA 2.6 × 0.9	0.95	
S-1	3	1	E TZ $\frac{5.8}{1.1}$ × 1.3	2.36	8.17 (3.5)
	2	2	E TZ $\frac{5.7}{1.7}$ × 1.7	3.12	7.45 (3.0)
		3	E TZ $\frac{4.5}{1.3}$ × 1.3	1.96	
		4	E TZ $\frac{5.0}{1.0}$ × 1.5	◦ 2.48	
	1	5	E TZ $\frac{3.2}{1.3}$ × 0.8	1.60	6.21 (4.8)
		6	E TZ $\frac{3.8}{0.5}$ × 1.3	2.97	
		7	E TA 3.1 × 0.9	1.09	
		8	E TA 2.8 × 1.1	◦ 1.29	
S-2	4	1	E TZ $\frac{12.5}{3.1}$ × 1.6	13.23	17.39 (1.3)
	2	2	CBTA 2.9 × 1.2	◦ 1.72	12.56 (7.3)
		3	CBTZ $\frac{2.4}{1.2}$ × 1.0	1.88	
		4	CBTZ $\frac{2.2}{0.4}$ × 1.2	1.30	
		5	CBTZ $\frac{3.4}{0.3}$ × 1.6	3.00	

Catch-ment Code No.	Proposed Line No.	Point	Existing Drain		Proposed Design Storm Discharge (m^3/sec)
			Width(m)xHeight(m)	Capacity (m^3/sec)	
S-2	1	6	E TZ $\frac{3.8}{0.9}$ × 0.9	0.63	12.56 (15.9)
		7	E TZ $\frac{2.9}{2.2}$ × 0.6	∘ 0.79	
		8	E TZ $\frac{3.2}{2.6}$ × 0.7	1.38	
S-3	1	1	CBTZ $\frac{1.6}{0.8}$ × 1.7	4.91	3.45 (1.9)
		2	CBTZ $\frac{1.5}{1.2}$ × 1.4	2.14	
		3	CBTZ $\frac{1.5}{1.2}$ × 1.2	∘ 1.78	
S-4	1	1	CBTZ $\frac{1.6}{0.6}$ × 3.0	∘ 1.69	10.67 (6.3)
		2	CBTZ $\frac{2.7}{1.4}$ × 1.4	2.57	
		3	CBTZ $\frac{2.8}{0.9}$ × 1.0	2.57	
		4	CBTZ $\frac{1.5}{0.3}$ × 1.4	0.57	
S-5	3	1	CBTZ $\frac{2.8}{0.7}$ × 0.6	0.36	11.98 (10.8)
		2	CBTZ $\frac{2.7}{1.1}$ × 1.2	∘ 1.11	
		3	E TZ $\frac{4.1}{1.3}$ × 1.5	1.59	
		4	E TZ $\frac{3.2}{1.7}$ × 0.8	0.57	
	2	5	E TZ $\frac{4.3}{1.8}$ × 1.0	∘ 2.60	6.84 (2.6)
		6	E TZ $\frac{2.6}{0.9}$ × 1.2	1.40	
		7	E TZ $\frac{3.0}{1.0}$ × 1.1	2.65	
	1	8	E TZ $\frac{1.0}{0.5}$ × 0.8	∘ 0.51	2.93 (5.7)
		9	E TZ $\frac{3.5}{0.7}$ × 1.3	6.21	
	4	10	E TZ $\frac{10.7}{1.1}$ × 1.2	1.75	

Catch-ment Code No.	Proposed Line No.	Point	Existing Drain Width(m)×Height(m)	Existing Drain Capacity (m^3/sec)	Proposed Design Storm Discharge (m^3/sec)
S-5	4	11	E TA 9.4 × 1.1	1.15	5.96 (7.2)
		12	E TZ 3.6 / 0.8 × 0.8	0.33	
		13	E TZ 4.8 / 1.7 × 0.8	0.55	
		14	E TZ 4.0 / 1.5 × 1.2	◦ 0.83	
		15	E TZ 4.4 / 3.0 × 1.2	1.03	
		16	E TZ 3.8 / 1.5 × 1.2	0.56	
		17	E TZ 4.1 / 1.7 × 1.0	0.56	
		18	E TZ 4.5 / 1.6 × 1.1	3.23	
	7 (New S-8)	19	E TZ 4.0 / 1.0 × 1.5	1.44	15.80 (7.8)
		20	E TZ 3.2 / 0.7 × 0.8	1.01	
		21	E TZ 4.7 / 1.0 × 1.5	◦ 2.03	
		22	E TZ 5.2 / 0.3 × 1.7	2.85	
S-6	1	1	E TZ 3.4 / 0.8 × 1.6	3.06	7.38 (14.5)
		2	E TA 2.9 × 0.8	◦ 0.51	
		3	E TA 2.9 × 0.7	0.38	
		4	E TA 2.5 × 0.3	0.09	
		5	E TA 3.9 × 0.5	0.33	
		6	E TZ 6.5 / 1.9 × 0.9	2.24	
S-7	2	1	E TZ 7.0 / 0.7 × 1.3	1.81	9.98 (15.8)
		2	E TZ 3.7 / 0.4 × 0.4	0.14	
		3	E TZ 2.9 / 0.2 × 0.9	◦ 0.63	
		4	E TA 2.2 × 0.6	0	

Catch-ment Code No.	Proposed Line No.	Point	Existing Drain		Proposed Design Storm Discharge (m^3/sec)
			Width(m)×Height(m)	Capacity (m^3/sec)	
S-7	1	5	E TZ 3.2/1.2 × 0.7	0.23	3.47 (23.1)
		6	E TA 2.7 × 0.6	0.04	
		7	E TA 2.2 × 0.5	0.04	
		8	E TA 2.7 × 0.4	◦ 0.15	
S-8	9	1	E TZ 10.7/6.4 × 1.1	3.91	40.91 (21.8)
		2	E TA 7.5 × 1.4	◦ 1.88	
	8	3	E TA 5.8 × 0.9	◦ 0.71	42.61 (60.0)
		4	E TA 5.5 × 1.5	1.46	
	5	5	E TA 4.1 × 0.8	0.40	32.19 (80.5)
	3	6	E TZ 5.3/2.3 × 1.0	1.63	28.29 (23.8)
		7	E TA 5.1 × 1.2	◦ 1.19	
	2	8	E TZ 5.6/1.8 × 0.9	1.29	29.55 (13.4)
		9	E TZ 3.8/1.1 × 1.9	2.36	
		10	E TZ 6.2/1.6 × 2.1	3.11	
		11	E TZ 5.1/1.0 × 2.1	◦ 2.21	
		12	E TZ 7.8/4.7 × 2.0	5.14	
		13	E TZ 5.2/1.2 × 1.8	1.40	
		14	E TZ 6.8/1.1 × 2.0	2.40	
	1	15	E TA 4.8 × 1.7	1.36	
		16	E TA 5.4 × 1.8	2.32	

Catch-ment Code No.	Proposed Line No.	Point	Existing Drain Width(m)×Height(m)	Existing Drain Capacity (m^3/sec)	Proposed Design Storm Discharge (m^3/sec)
S-8	1	17	E TZ 3.8/0.8 × 1.2	1.12	30.84 (20.8)
		18	E TZ 4.6/0.9 × 1.5	1.92	
		19	E TZ 3.6/0.8 × 1.6	1.59	
		20	C TA 5.2 × 1.2	∘ 1.48	
S-9	3	1	E TA 4.7 × 2.0	1.83	15.09 (8.2)
	1	2	E TA 10.5 × 1.5	2.98	4.40 (4.9)
		3	E TZ 3.4/0.4 × 0.8	0.98	
		4	E TZ 2.2/1.0 × 0.8	∘ 0.89	
		5	E TZ 2.5/1.1 × 0.6	0.66	
	2	6	E TZ 5.7/1.6 × 1.1	∘ 3.02	5.59 (1.9)
		7	E TA 9.8 × 1.5	5.85	
		8	E TA 8.9 × 1.7	6.52	
		9	E TA 1.0 × 0.8	0.15	
	4	10	E TZ 8.2/2.1 × 1.4	5.48	6.18 (4.1)
		11	E TZ 5.5/1.5 × 0.8	∘ 1.51	
		12	E TA 5.2 × 0.5	0.45	
		13	E TZ 5.3/2.0 × 0.8	1.67	
S-10	3	1	E TZ 6.9/2.6 × 1.6	2.47	17.04 (6.9)
	1	2	E TZ 3.2/1.5 × 2.3	1.64	
		3	E TZ 3.5/0.5 × 1.1	0.47	

Catch-ment Code No.	Proposed Line No.	Point	Existing Drain			Proposed Design Storm Discharge (m^3/sec)
			Width(m)×Height(m)		Capacity (m^3/sec)	
S-10	1	4	E TZ	5.8/1.8 × 1.4	◦ 1.54	8.53 (5.5)
		5	CBTZ	4.1/1.0 × 1.2	1.11	
		6	CBTZ	3.4/1.1 × 1.1	0.87	
		7	CBTA	3.5 × 1.0	0.50	
		8	CBTZ	2.0/1.0 × 0.7	0.24	
	2	9	E TZ	1.4/0.6 × 0.5	0.23	4.80 (9.1)
		10	E TZ	1.7/0.6 × 0.6	0.17	
		11	E TZ	3.1/0.5 × 1.4	1.53	
		12	E TZ	2.0/0.8 × 0.6	0.24	
		13	C TZ	3.4 × 1.1	3.30	
		14	C TZ	1.5/0.3 × 0.8	◦ 0.53	
A-1	8	1	E TA	2.8 × 0.9	0.22	31.85 (83.8)
		2	E TZ	3.6/0.9 × 0.7	◦ 0.38	
		3	E TZ	2.9/1.3 × 0.9	0.41	
		4	E TZ	2.7/2.2 × 0.7	0.75	
	6	5	E TZ	2.6/2.0 × 1.1	1.31	33.83 (29.7)
		6	E TZ	2.8/1.7 × 1.1	1.33	
		7	E TA	1.8 × 0.8	0.27	
		8	E TZ	2.8/1.7 × 1.0	◦ 1.14	
		9	E TZ	3.0/1.6 × 1.3	1.67	
		10	E TZ	2.7/1.4 × 1.5	1.76	
		11	E TZ	2.0/0.5 × 0.9	0.44	

Catchment Code No.	Proposed Line No.	Point	Existing Drain Width(m)×Height(m)	Existing Drain Capacity (m3/sec)	Proposed Design Storm Discharge (m3/sec)
A-1	6	12	E TZ 2.7/0.8 × 1.0	0.79	
	5	13	E TZ 4.7/1.6 × 1.2	2.20	28.27 (12.9)
	3	14	E TZ 3.2/1.8 × 1.3	∘ 1.95	25.72 (13.2)
		15	E TZ 4.6/1.8 × 1.4	2.76	
	1	16	E TZ 3.3/0.8 × 0.7	0.58	17.67 (30.5)
	7	17	E TA 8.8 × 1.9	5.68	7.18 (1.6)
		18	E TZ 9.5/1.2 × 1.7	6.28	
		19	E TZ 7.0/1.0 × 1.5	3.79	
		20	E TZ 7.0/3.9 × 1.4	5.42	
		21	E TZ 6.1/2.2 × 1.4	3.82	
		22	E TZ 8.0/3.5 × 1.2	∘ 4.40	
		23	E TZ 6.1/2.0 × 1.5	4.03	
		24	E TZ 6.4/3.4 × 1.2	3.81	
		25	E TZ 5.7/3.4 × 0.9	2.27	
	9	26	C TA 4.6 × 0.7	1.05	3.92 (1.3)
		27	C TZ 6.1/1.0 × 2.3	5.57	
		28	C TZ 2.8/1.6 × 1.8	3.18	
		29	C TZ 3.4/1.0 × 1.8	∘ 2.97	
		30	C TZ 4.1/1.9 × 1.8	3.69	
		31	E TZ 4.2/1.2 × 1.3	1.27	
		32	E TZ 3.2/1.8 x 0.9	1.01	
		33	E TZ 2.7/1.1 x 0.8	0.60	

Catch-ment Code No.	Proposed Line No.	Point	Existing Drain		Proposed Design Storm Discharge (m^3/sec)
			Width(m)×Height(m)	Capacity (m^3/sec)	
A-2	4	1	E TA 5.1 × 1.1	1.04	15.53 (26.8)
		2	E TA 5.0 × 1.4	∘ 0.58	
	2	3	E TA 5.7 × 1.4	∘ 1.69	5.36 (3.2)
		4	E TZ 4.4/1.7 × 1.1	0.78	
		5	E TZ 4.5/1.1 × 1.3	1.61	
		6	E TZ 5.6/1.8 × 1.4	1.94	
		7	E TZ 3.9/0.8 × 1.4	1.44	
		8	E TA 5.7 × 1.5	1.87	
		9	E TZ 5.1/1.7 × 0.9	1.19	
	1	10	E TA 8.0 × 1.6	5.57	9.41 (3.8)
		11	E TA 7.4 × 2.0	2.26	
		12	E TA 4.7 × 1.5	1.78	
		13	E TZ 5.4/1.2 × 1.1	2.78	
		14	E TA 5.2 × 1.4	2.79	
		15	E TA 5.7 × 1.2	∘ 2.45	
		16	E TA 1.4 × 1.3	0.54	
A-3	7	1	E TZ 8.7/6.9 × 0.6	1.19	13.70 (16.5)
		2	E TZ 5.9/1.9 × 0.6	∘ 0.83	
		3	E TZ 9.7/1.3 × 2.0	7.62	10.03 (11.3)
		4	E TZ 4.0/1.5 x 0.8	∘ 0.91	
		5	E TZ 4.4/1.0 x 0.8	0.86	

Catch-ment Code. No.	Proposed Line No.	Point	Existing Drain		Proposed Design Storm Discharge (m^3/sec)
			Width(m)×Height(m)	Capacity (m^3/sec)	
A-3	4	6	E TZ 3.4/1.0 × 0.8	0.70	2.15 (3.7)
		7	E TA 3.1 × 1.0	0.57	
		8	E TZ 2.8/0.9 × 0.8	0.57	
		9	E TZ 3.5/1.1 × 0.9	0.87	
		10	E TA 3.1 × 1.0	° 0.58	
	3	11	E TZ 10.3/2.4 × 1.1	3.50	5.76 (3.0)
		12	E TZ 8.5/2.8 × 0.8	° 1.92	
		13	E TZ 9.0/2.5 × 1.5	5.36	
		14	E TZ 8.9/4.4 × 1.3	5.38	
		15	E TA 5.8 × 1.2	1.56	
	2	16	E TA 7.6 × 2.1	5.03	4.11 (4.8)
		17	E TA 3.8 × 1.1	° 0.85	
		18	E TA 5.1 × 1.4	1.62	
		19	C TA 1.4 × 0.9	0.11	
		20	C TA 0.8 × 0.4	0.05	
A-4	9	1	E TA 7.2 × 0.5	0.58	7.99 (13.8)
	4	2	CBTA 3.7 × 1.2	1.71	4.78 (4.2)
		3	CBTZ 2.7/1.9 × 0.7	° 1.14	
	3	4	CBTZ 0.6/0.4 x 0.5	0.09	3.87 (43.0)
A-5	4	1	E TZ 7.0/3.8 x 1.8	°10.98	13.91 (1.3)
	-	2	ϕ 1.2 (i=0.2°/∘∘)	0.48	

APPENDIX K

PLANNING OF FACILITIES
FOR
THE FEASIBILITY STUDY

(Ref.: Section 4.2., Vol. VII)

Table K.1 Hydraulic Computation for N-5 Catchment

Name of Catchment	Line No.	Inflow No.	in Year 2000: Area Each (ha)	Area Total (ha)	Length Each (m)	Length Total (m)	Time of Flow in the Drain Each (min)	Time of Flow in the Drain Total (min)	Time of Concentration (min)	Runoff Coefficient	Storage Coefficient	Design Runoff Per ha (m³/s)	Design Runoff Total Runoff (m³/s)	Runoff Major Storm (m³/s)	Proposed Drain Size (m)	Proposed Drain Slope (‰)	Proposed Drain Velocity (m/s)	Proposed Drain Capacity (m³/s)	Existing Condition Runoff (m³/s)	Existing Drain Size (m)	Existing Drain Capacity (m³/s)	Remarks
N-5	1		3.29		370		6.2	6.2	16.2	0.75	0.84	0.271	0.89	1.22	⊔ 1.1×1.1	1.0	1.05	1.15				R1 = 3.29 ha
	2		2.24	5.53	195	565	2.5	8.7	18.7	0.75	0.81	0.248	1.37	1.89	⊔ 1.2×1.2	1.5	1.37	1.77				R1 = 2.24
		1																				
	3		2.93		260		3.0	3.0	13.0	0.75	0.90	0.312	0.91	1.24	⊔ 0.9×0.9	2.7	1.52	1.10				R1 = 2.93
	1	2	2.07	10.53	155	720	1.8	10.5	20.5	0.71	0.80	0.223	2.35	3.24	⊔ 1.4×1.4	1.5	1.52	2.67		$\omega^{3.0}_{0.8}\times 1.1$	2.13	R1 = 7.73 O = 0.94
		2																				
	4		3.96		420		5.5	5.5	15.5	0.70	0.85	0.260	1.03	1.41	⊔ 1.0×1.0	1.8	1.33	1.19				R1 = 3.76 S = 0.80
	2	1	8.11	22.60	400	1120	4.5	15.0	25.0	0.72	0.77	0.200	4.52	6.26	⊔ 2.0×2.0	1.0	1.57	5.65		$\omega^{2.2}_{0.7}\times 1.0$	1.19	R1 = 7.43 R2 = 0.46 O = 0.22
		3																				
	5		7.82		540		6.4	6.4	16.4	0.78	0.84	0.281	2.20	3.02	⊔ 1.4×1.4	1.4	1.46	2.58				R1 = 1.02 R2 = 2.32 C = 4.48
		7																				
	6		1.39		240		5.4	5.4	15.4	0.79	0.85	0.294	0.41	0.56	⊔ 0.9×0.9	0.8	0.82	0.60				R2 = 0.43 C = 0.96
	7	5	0.35	9.56	115	655	1.4	7.8	17.8	0.85	0.82	0.290	2.77	3.81	⊔ 1.6×1.6	1.2	1.48	3.42				R2 = 0.35
	3	2	7.18	39.34	400	1520	4.2	19.2	29.2	0.72	0.75	0.180	7.08	9.85	⊔ 2.3×2.3	0.9	1.64	7.79		$\omega^{3.8}_{0.1}\times 1.4$	3.54	R2 = 7.09 O = 0.09
		4																				
	8		1.20		220		4.6	4.6	14.6	0.80	0.86	0.307	0.37	0.51	⊔ 0.8×0.8	1.0	0.85	0.49				R2 = 0.35 C = 0.85
	4	3	0.74	41.28	75	1595	0.8	20.0	30.0	0.71	0.75	0.175	7.22	10.05	⊔ 2.4×2.4	0.9	1.68	8.72				O = 0.74
		5																				
	9		3.06		535		10.4	10.4	20.4	0.90	0.80	0.283	0.87	1.20	⊔ 1.1×1.1	0.7	0.88	0.96				C = 3.06
		11																				
	10		4.47		310		3.9	3.9	13.9	0.90	0.88	0.359	1.60	2.19	⊔ 1.2×1.2	1.5	1.37	1.77				C = 4.47
	11	9	0.09	7.62	40	575	0.5	10.9	20.9	0.89	0.79	0.274	2.09	2.88	⊔ 1.4×1.4	1.3	1.41	2.49				O = 0.09
		13																				
	12		1.78		340		7.5	7.5	17.5	0.53	0.82	0.182	0.32	0.44	⊔ 0.8×0.8	1.0	0.85	0.49				R2 = 1.61 O = 0.17
	13	11	0.06	9.46	25	600	0.3	11.2	21.2	0.82	0.79	0.251	2.37	3.27	⊔ 1.5×1.5	1.3	1.48	2.99				O = 0.06
	5	4	0.77	51.51	170	1765	1.7	21.7	31.7	0.73	0.75	0.175	9.02	12.57	⊔ 2.6×2.6	0.8	1.68	10.18				O = 0.77
		6																				

Legend: { C: Commercial Area; R1: Residential Area (High Density) } R2: Residential Area (Midium Density); S: Institutional Area; I: Industrial Area; O: Open Space

Name of Catchment	Line No.	Inflow No.	in Year 2000																Existing Condition			Remarks
			Area		Length		Time of Flow in the Drain		Time of Concentration	Runoff Coefficient	Storage Coefficient	Design Runoff		Runoff	Proposed Drain				Runoff	Existing Drain		
			Each (ha)	Total (ha)	Each (m)	Total (m)	Each (min)	Total (min)	(min)			Per ha (m^3/s)	Total Runoff (m^3/s)	Major Storm (m^3/s)	Size (m)	Slope (‰)	Velocity (m/s)	Capacity (m^3/s)	(m^3/s)	Size (m)	Capacity (m^3/s)	
N-5	(14)		2.25		285		5.1	5.1	15.1	0.85	0.86	0.322	0.72	0.99	⊔ 1.0×1.0	1.0	0.99	0.89				C = 2.05 ha Q = 0.20
	(6)	(5)	4.17	57.93	165	1930	1.7	23.4	33.4	0.72	0.74	0.166	9.62	13.43	⊔ 2.7×2.7	0.8	1.72	11.26		⊔ 6.0/3.0×1.3	13.17	R2 = 2.31 C=0.84 Q = 0.22 S=0.80
		(7)																				
	(15)		8.37		635		11.5	11.5	21.5	0.56	0.79	0.170	1.42	1.96	⊔ 1.4×1.4	0.6	0.96	1.69				R2 = 8.08 C = 0.29
	(7)	(6)	3.20	69.50	60	1990	0.6	24.0	34.0	0.71	0.74	0.162	11.26	15.72	⊔ 2.8×2.8	0.9	1.86	13.16		⊔ 7.8/4.1×2.7	57.05	C = 3.20

Table K..2 Hydraulic Computation for N-6 Catchment

Name of Catchment	Line No.	Inflow No.	in Year 2000: Area Each (ha)	Area Total (ha)	Length Each (m)	Length Total (m)	Tim of Flow in the Drain Each (min)	Tim of Flow in the Drain Total (min)	Time of Concentration (min)	Runoff Coefficient	Storage Coefficient	Design Runoff Per ha (m³/s)	Design Runoff Total Runoff (m³/s)	Runoff Major Storm (m³/s)	Proposed Drain Size (m)	Proposed Drain Slope (‰)	Proposed Drain Velocity (m/s)	Proposed Drain Capacity (m³/s)	Existing Condition: Runoff (m³/s)	Existing Drain Size (m)	Existing Drain Capacity (m³/s)	Remarks
N-6	(1)		5.88		755		10.8	10.8	20.8	0.74	0.79	0.228	1.34	1.85	⊔ 1.2×1.2	1.2	1.22	1.59				R1 = 4.17 C = 1.77 Q = 0.54 ha
		(1)																				
	(2)		1.63		280		4.3	4.3	14.3	0.75	0.87	0.293	0.48	0.66	⊔ 0.8×0.8	2.0	1.21	0.69				R1 = 1.63
	(3)		1.79	3.42	75	355	1.1	5.4	15.4	0.75	0.85	0.279	0.95	1.30	⊔ 1.0×1.0	1.5	1.21	1.09				R1 = 1.79
	(1)	(1)	0.26	9.56	120	875	1.6	12.4	22.4	0.75	0.78	0.221	2.11	2.92	⊔ 1.5×1.5	1.0	1.30	2.62		⊔ 2.9/0.1 × 0.9	1.53	C = 0.26
	(2)		0.66	10.22	160	1035	2.0	14.4	24.4	0.76	0.77	0.213	2.18	3.02	⊔ 1.5×1.5	1.2	1.42	2.88		⊔ 2.0/0.1 × 1.1	0.49	C = 0.66
		(3)																				
	(4)		1.20		120		1.6	1.6	11.6	0.86	0.94	0.387	0.46	0.63	⊔ 0.7×0.7	3.0	1.35	0.60				R1 = 0.30 C = 0.90
	(3)	(2)	5.13	16.55	625	1660	7.7	22.1	32.1	0.80	0.74	0.188	3.12	4.35	⊔ 1.7×1.7	1.0	1.42	3.67		⊔ 1.6/0.4 × 1.0	0.35	R2 = 0.29 C = 4.84
	(4)		3.72	20.27	340	2000	4.0	26.1	36.1	0.82	0.73	0.179	3.63	5.08	⊔ 1.8×1.8	1.0	1.46	4.27		⊔ 1.3/0.1 × 1.2	0.62	C = 3.72
		(10)																				
	(5)		2.82		320		5.3	5.3	15.3	0.72	0.85	0.269	0.76	1.04	⊔ 1.0×1.0	1.2	1.08	0.98				R1 = 2.54 C = 0.08 Q = 0.20
	(5)		2.92	5.74	270	590	4.1	9.4	19.4	0.76	0.80	0.244	1.40	1.93	⊔ 1.3×1.3	1.0	1.18	1.79				R1 = 1.92 C = 1.00
	(6)		0.95	6.69	175	765	2.6	12.0	22.0	0.72	0.79	0.217	1.45	2.00	⊔ 1.3×1.3	1.0	1.18	1.79				S = 0.95
		(7)																				
	(6)		2.60		395		6.2	6.2	16.2	0.69	0.84	0.249	0.65	0.89	⊔ 0.9×0.9	1.5	1.13	0.82				R1 = 2.25 Q = 0.35
	(7)		3.76	6.36	285	680	4.3	10.5	20.5	0.60	0.80	0.189	1.20	1.66	⊔ 1.2×1.2	1.1	1.17	1.52				R2 = 2.81 Q = 0.22 S = 0.73
	(7)	(6)	0.88	13.93	205	970	2.9	14.9	24.9	0.64	0.77	0.178	2.48	3.44	⊔ 1.6×1.6	0.8	1.21	2.79				Q = 0.88
		(8)																				
	(8)		3.94		315		6.2	6.2	16.2	0.30	0.84	0.108	0.43	0.59	⊔ 0.8×0.8	1.1	0.89	0.51				Q = 3.94
	(8)	(7)	6.06	23.93	230	1200	2.7	17.6	27.6	0.55	0.76	0.144	3.45	4.79	⊔ 1.7×1.7	1.1	1.48	3.84				S = 6.06
	(9)		1.79	25.72	320	1520	3.7	21.3	31.3	0.57	0.75	0.138	3.55	4.95	⊔ 1.8×1.8	1.1	1.54	4.48				C = 1.40 S = 0.39
		(10)																				
	(9)		4.18		425		5.0	5.0	15.0	0.86	0.86	0.327	1.37	1.88	1.1×1.1	2.0	1.49	1.62				C = 3.82 Q = 0.09 S = 9.27
	(10)	(4) (9)	0.45	50.62	125	2125	1.1	27.2	37.2	0.69	0.72	0.148	7.49	10.48	⊡ 2.1×2.1	1.9	1.89	8.33				C = 0.07 Q = 0.38
	(11)		1.07	51.69	35	2160	0.3	27.5	37.5	0.69	0.73	0.147	7.60	10.64	⊡ 2.1×2.1	1.9	1.89	8.33				C = 0.45 Q = 0.61
		(12)																				

Name of Catchment	Line No.	Inflow No.	in Year 2000 Area Each (ha)	Area Total (ha)	Length Each (m)	Length Total (m)	Time of Flow in the Drain Each (min)	Time of Flow in the Drain Total (min)	Time of Concentration (min)	Runoff Coefficient	Storage Coefficient	Design Runoff Per ha (m^3/s)	Design Runoff Total Runoff (m^3/s)	Runoff Major Storm (m^3/s)	Proposed Drain Size (m)	Proposed Drain Slope (‰)	Proposed Drain Velocity (m/s)	Proposed Drain Capacity (m^3/s)	Existing Condition Runoff (m^3/s)	Existing Drain Size (m)	Existing Drain Capacity (m^3/s)	Remarks
N-6	(10)		1.29		190		2.6	2.6	12.6	0.82	0.91	0.349	0.45	6.14	⊔ 0.7×0.7	2.8	1.30	0.58				C = 1.12 ha Q = 0.17
	(12)	(11)	0.89	53.87	295	2455	2.7	30.2	40.2	0.69	0.73	0.142	7.65	10.73	⊡ 2.1×2.1	1.9	1.89	8.33				C = 0.33 Q = 0.56
		(13)																				
	(11)		2.23		280		4.9	4.9	14.9	0.90	0.86	0.343	0.76	1.04	⊔ 1.0×1.0	1.0	0.99	0.89				C = 2.23
		(13)																				
	(12)		1.81		280		5.2	5.2	15.2	0.90	0.85	0.337	0.61	0.84	⊔ 0.9×0.9	1.0	0.92	0.67				C = 1.81
	(13)	(11)	0.61	4.65	120	400	1.9	7.1	17.1	0.90	0.83	0.315	1.47	2.02	⊔ 1.4×1.4	0.8	1.11	1.95				C = 0.61
		(15)																				
	(14)		1.88		210		3.8	3.8	13.8	0.90	0.88	0.360	0.68	0.93	⊔ 1.0×1.0	1.0	0.99	0.89				C = 1.88
	(15)	(13)	2.56	9.09	200	600	2.4	9.5	19.5	0.86	0.80	0.276	2.51	3.46	⊔ 1.5×1.5	1.3	1.48	2.99				C = 2.00 Q = 0.56
		(13)																				
	(16)		3.56		260		3.7	3.7	13.7	0.90	0.88	0.361	1.29	1.76	⊔ 1.2×1.2	1.2	1.22	1.59				C = 3.56
	(17)		2.92	6.48	250	510	3.4	7.1	17.1	0.90	0.83	0.315	2.04	2.80	⊔ 1.5×1.5	1.0	1.30	2.62				C = 2.92
	(13)	(12) (15)	2.86	72.30	85	2540	0.7	30.9	40.9	0.74	0.73	0.150	10.85	15.22	⊡ 2.4×2.4	1.9	2.07	11.92				C = 2.86

Table K.3 Hydraulic Computation for N-7 Catchment

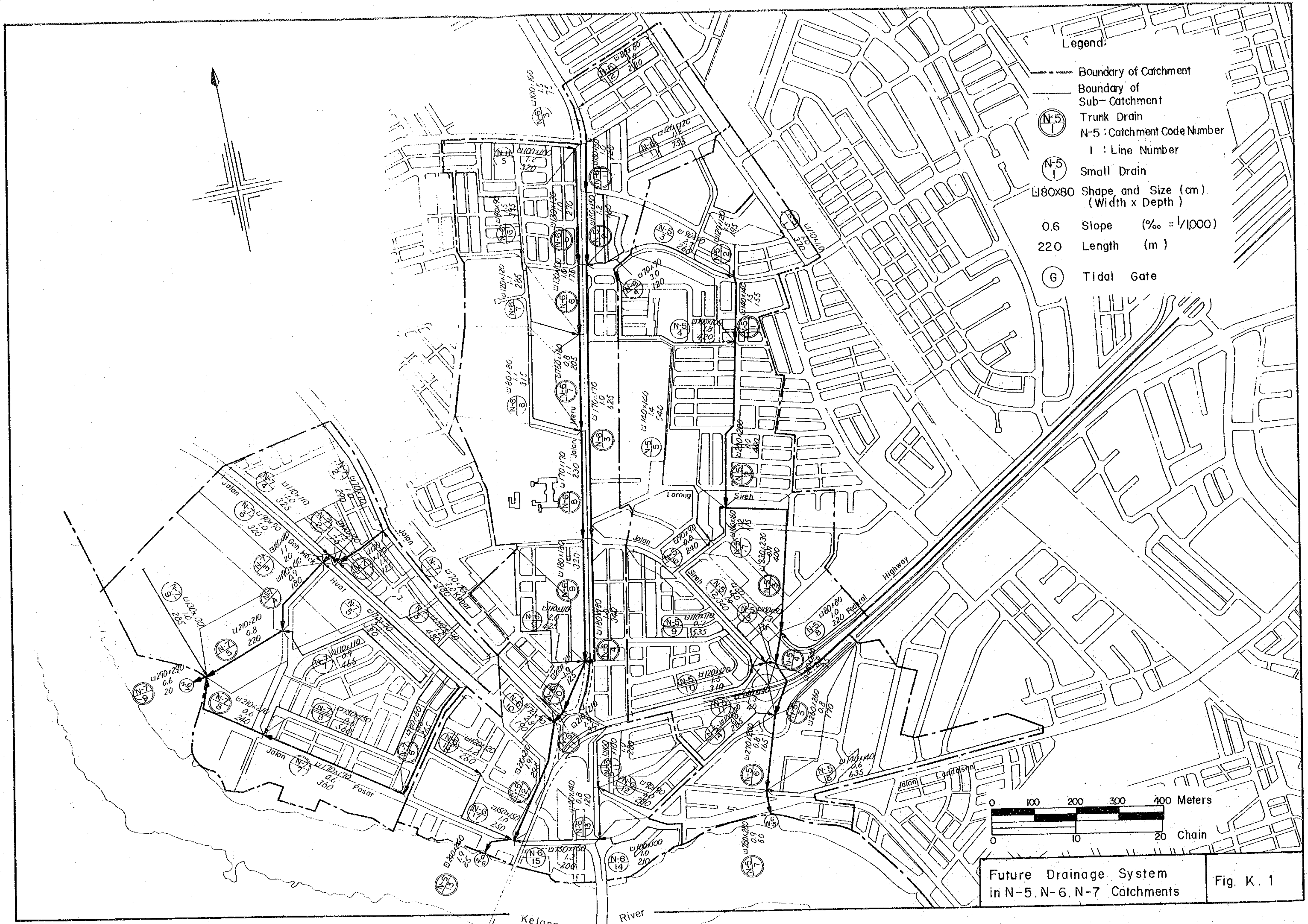
Name of Catchment	Line No.	Inflow No.	in Year 2000																Existing Condition			Remarks
			Area		Length		Time of Flow in the Drain		Time of Concentration	Runoff Coefficient	Storage Coefficient	Design Runoff		Runoff Major Storm	Proposed Drain				Runoff	Existing Drain		
			Each (ha)	Total (ha)	Each (m)	Total (m)	Each (min)	Total (min)	(min)			Per ha (m^3/s)	Total Runoff (m^3/s)	(m^3/s)	Size (m)	Slope (‰)	Velocity (m/s)	Capacity (m^3/s)	(m^3/s)	Size (m)	Capacity (m^3/s)	
N-7	①		1.28		380		6.0	6.0	16.0	0.90	0.84	0.327	0.42	0.58	⊔0.7×0.7	2.0	1.10	0.49				C = 1.28 ha
		①																				
	②		1.24		290		6.8	6.8	16.8	0.57	0.83	0.201	0.25	0.34	⊔0.7×0.7	1.0	0.78	0.34				R1 = 0.16 C = 0.43 Q = 0.65
	⓵	①	1.70	4.22	125	505	2.0	8.8	18.8	0.79	0.81	0.260	1.10	1.51	⊔1.2×1.2	1.0	1.12	1.45				R1 = 0.32 C = 1.38
		②																				
	③		3.38		480		7.3	7.3	17.3	0.87	0.83	0.303	1.02	1.40	⊔1.1×1.1	1.2	1.15	1.26				R1 = 0.72 C = 2.66
	⓶	①	0.09	7.69	25	530	0.3	9.1	19.1	0.83	0.81	0.272	2.09	2.88	⊔1.4×1.4	1.2	1.36	2.39				R1 = 0.09
		③																				
	④		4.61		325		5.5	5.5	15.5	0.52	0.85	0.193	0.89	1.22	⊔1.1×1.1	1.0	1.05	1.15				R1 = 2.26 Q = 2.35
	⓷	②	0.05	12.35	20	550	0.2	9.3	19.3	0.71	0.81	0.232	2.87	3.95	⊔1.6×1.6	1.1	1.42	3.27				R1 = 0.05
		④																				
	⑤		1.97		420		6.1	6.1	16.1	0.65	0.84	0.235	0.46	0.63	⊔0.7×0.7	2.3	1.18	0.52				C = 0.74 S = 1.23
		④																				
	⑥		2.35		320		6.1	6.1	16.1	0.65	0.84	0.235	0.55	0.75	⊔0.9×0.9	1.0	0.92	0.67				I = 2.35
	⓸	③⑤	2.73	19.40	180	730	2.2	11.5	21.5	0.69	0.79	0.210	4.07	5.62	⊔1.9×1.9	0.9	1.44	4.68				I = 2.73
		⑤																				
	⑦		3.49		465		8.0	8.0	18.0	0.81	0.82	0.275	0.96	1.32	⊔1.1×1.1	0.9	1.00	1.09				C = 2.72 S = 0.77 I = 2.67
	⓹	④	2.67	25.56	220	950	2.6	14.1	24.1	0.70	0.77	0.197	5.04	6.98	⊔2.1×2.1	0.8	1.45	5.76		⊔ 2.5/2.2 ×0.9	3.07	
		⑨																				
	⓺		1.25		265		4.5	4.5	14.5	0.90	0.87	0.350	0.44	0.60	⊔0.8×0.8	1.6	1.08	0.62				C = 1.25
	⓻		6.44	7.69	360	625	5.9	10.4	20.4	0.90	0.80	0.283	2.18	3.01	⊔1.7×1.7	0.6	1.09	2.84				C = 6.44
		⑧																				
	⑧		5.70		560		9.7	9.7	19.7	0.90	0.80	0.287	1.71	2.36	⊔1.5×1.5	0.6	1.00	2.03				C = 5.70
	⓼	⑦	3.15	16.54	240	865	3.4	13.8	23.8	0.85	0.78	0.244	4.04	5.57	⊔2.1×2.1	0.6	1.26	4.99				I = 3.15
		⑨																				
	⑨		6.10		285		4.2	4.2	14.2	0.65	0.87	0.255	1.55	2.12	⊔1.3×1.3	1.0	1.18	1.79				I = 6.10
	⓽	⑤⑧	—	48.20	20	970	0.2	14.3	24.3	0.75	0.77	0.211	10.17	14.08	⊔2.9×2.9	0.6	1.56	11.79				

Legend:
- C : Commercial Area
- R1 : Residential 〃 (High Density)
- R2: 〃 〃 (Midium Density)
- S : Institutional 〃
- I : Industrial 〃
- O : Open Space

Table K.4 Hydraulic Computation for A-4 Catchment

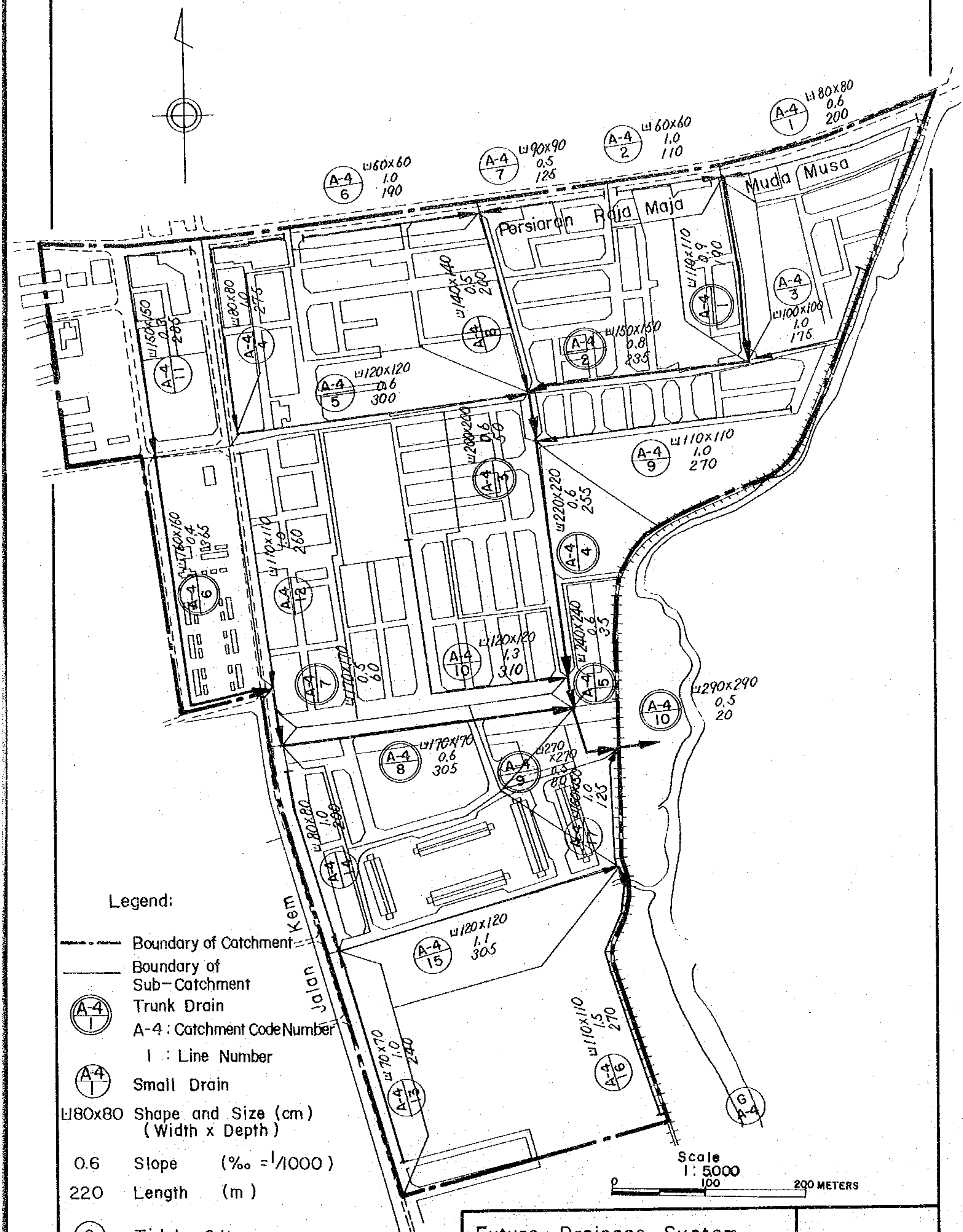
Name of Catchment	Line No.	Inflow No.	in Year 2000: Area Each (ha)	Area Total (ha)	Length Each (m)	Length Total (m)	Time of Flow in the Drain Each (min)	Time of Flow in the Drain Total (min)	Time of Concentration (min)	Runoff Coefficient	Storage Coefficient	Design Runoff Per ha (m³/s)	Design Runoff Total Runoff (m³/s)	Runoff Major Storm (m³/s)	Proposed Drain Size (m)	Proposed Drain Slope (‰)	Proposed Drain Velocity (m/s)	Proposed Drain Capacity (m³/s)	Existing Condition Runoff (m³/s)	Existing Drain Size (m)	Existing Drain Capacity (m³/s)	Remarks
A-4	(1)		0.98		200		5.3	5.3	15.3	0.90	0.85	0.336	0.33	0.45	⊔0.8×0.8	0.6	0.66	0.38				C = 0.98 ha
		(1)																				
	(2)		0.52		110		2.7	2.7	12.7	0.90	0.90	0.378	0.20	0.27	⊔0.6×0.6	1.0	0.70	0.23				C = 0.52
	((1))	(1)	1.26	2.76	190	390	3.4	8.7	18.7	0.90	0.81	0.297	0.82	1.13	⊔1.1×1.1	0.9	1.00	1.09				C = 1.26
		(2)																				
	(3)		1.95		175		3.1	3.1	13.1	0.90	0.89	0.370	0.72	0.98	⊔1.0×1.0	1.0	0.99	0.89				C = 1.95
	((2))	((1))	2.51	7.22	235	625	3.6	12.3	22.3	0.90	0.78	0.266	1.92	2.65	⊔1.5×1.5	0.8	1.16	2.35				C = 2.51
		(3)																				
	(4)		1.00		275		6.0	6.0	16.0	0.90	0.84	0.327	0.32	0.44	⊔0.8×0.8	1.0	0.85	0.49				C = 1.00
	(5)		2.18	3.18	300	575	6.3	12.3	22.3	0.90	0.78	0.266	0.84	1.16	⊔1.2×1.2	0.6	0.87	1.12				C = 2.18
		(3)																				
	(6)		0.52		190		4.9	4.9	14.9	0.90	0.86	0.343	0.18	0.25	⊔0.6×0.6	1.0	0.70	0.23				C = 0.52
		(8)																				
	(7)		1.02		125		3.4	3.4	13.4	0.90	0.89	0.367	0.37	0.51	⊔0.9×0.9	0.5	0.65	0.48				C = 1.02
	(8)	(6)	2.77	4.31	200	390	4.0	8.9	18.9	0.90	0.81	0.296	1.28	1.76	⊔1.4×1.4	0.5	0.88	1.54				C = 2.77
	((3))	((2)) (5)	0.08	14.79	50	675	0.7	13.0	23.0	0.90	0.78	0.262	3.87	5.35	⊔2.0×2.0	0.6	1.22	4.38		⊔ 2.7/1.9 ×0.7	2.26	R1 = 0.08
		(4)																				
	(9)		3.61		270		4.6	4.6	14.6	0.62	0.86	0.238	0.86	1.18	⊔1.1×1.1	1.0	1.05	1.15				R1 = 1.75 S = 1.86
	((4))	((3))	3.44	21.84	255	930	3.4	16.4	26.4	0.82	0.76	0.219	4.78	6.63	⊔2.2×2.2	0.6	1.30	5.65		⊔ 3.7/2.1 ×1.2	3.47	R1 = 2.30 S = 1.14
		(5)																				
	(10)		5.00		310		4.2	4.2	14.2	0.75	0.87	0.294	1.47	2.01	⊔1.2×1.2	1.3	1.27	1.65				R1 = 5.00
	((5))	((4))	0.75	27.59	35	965	0.4	16.8	26.8	0.81	0.76	0.215	5.93	8.23	⊔2.4×2.4	0.6	1.36	7.12				R1 = 0.75
		(9)																				
	(11)		4.29		285		7.0	7.0	17.0	0.80	0.83	0.281	1.21	1.66	⊔1.5×1.5	0.3	0.71	1.44				R2 = 1.24 C = 3.05
	((6))		2.41	6.70	365	650	7.5	14.5	24.5	0.84	0.77	0.235	1.57	2.17	⊔1.6×1.6	0.4	0.86	1.97				C = 2.41
		(7)																				
	(12)		2.61		260		4.0	4.0	14.0	0.90	0.88	0.358	0.93	1.27	⊔1.1×1.1	1.0	1.05	1.15				C = 2.61

Name of Catchment	Line No.	Inflow No.	in Year 2000																Existing Condition			Remarks
			Area		Length		Time of Flow in the Drain		Time of Concentration	Runoff Coefficient	Storage Coefficient	Design Runoff		Runoff Major Storm	Proposed Drain				Runoff	Existing Drain		
			Each (ha)	Total (ha)	Each (m)	Total (m)	Each (min)	Total (min)	(min)			Per ha (m^3/s)	Total Runoff (m^3/s)	(m^3/s)	Size (m)	Slope (‰)	Velocity (m/s)	Capacity (m^3/s)	(m^3/s)	Size (m)	Capacity (m^3/s)	
A-4	⑦	⑥	0.13	9.44	60	710	1.0	15.5	25.5	0.85	0.77	0.234	2.21	3.06	⊔ 1.7×1.7	0.5	1.00	2.59				C = 0.13 ha
	⑧		2.68	12.12	305	1015	4.8	20.3	30.3	0.86	0.75	0.211	2.56	3.56	⊔ 1.7×1.7	0.6	1.09	2.84				RI = 0.62 C = 2.06
	⑨	⑤	0.65	40.36	80	1095	1.0	21.3	31.3	0.82	0.75	0.198	7.99	11.13	⊔ 2.7×2.7	0.5	1.36	8.90				RI = 0.65
		⑩																				
	⑬		1.17		240		5.7	5.7	15.7	0.55	0.85	0.203	0.24	0.33	⊔ 0.7×0.7	1.0	0.78	0.34				I = 0.83 O = 0.34
		⑮																				
	⑭		1.03		200		4.3	4.3	14.3	0.9	0.87	0.352	0.36	0.49	⊔ 0.8×0.8	1.0	0.85	0.49				C = 1.03
	⑮	⑬	4.04	6.24	305	545	4.6	10.3	20.3	0.61	0.80	0.192	1.20	1.65	⊔ 1.2×1.2	1.1	1.17	1.52				RI = 2.28 O = 1.76
		⑰																				
	⑯		5.07		270		3.6	3.6	13.6	0.62	0.88	0.249	1.26	3.10	⊔ 1.1×1.1	1.5	1.29	1.41				I = 4.67 O = 0.40
	⑰	⑮	0.83	12.14	125	670	1.7	12.0	22.0	0.62	0.79	0.187	2.27	3.14	⊔ 1.5×1.5	1.0	1.30	2.62				RI = 0.83
	⑩	⑨	—	52.50	20	1115	0.2	21.5	31.5	0.77	0.75	0.186	9.77	13.62	⊔ 2.9×2.9	0.5	1.42	10.77				



Future Drainage System in N-5. N-6. N-7 Catchments

Fig. K. 1

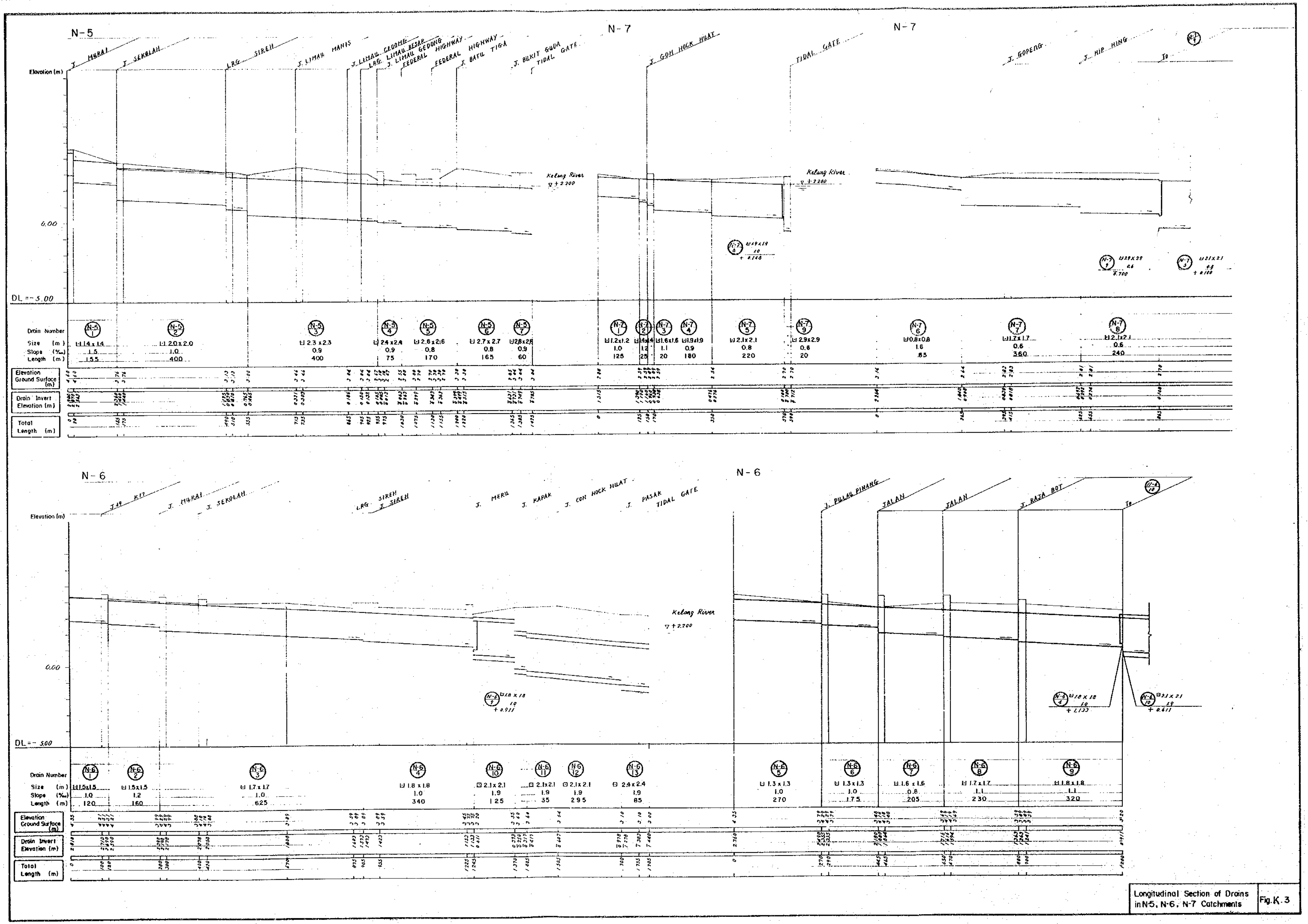


Legend:

- Boundary of Catchment
- Boundary of Sub-Catchment
- (A-4 / 1) Trunk Drain
  - A-4 : Catchment Code Number
  - 1 : Line Number
- (A-4 / 1) Small Drain
- ⊔80x80 Shape and Size (cm) (Width x Depth)
- 0.6 Slope (‰ = 1/1000)
- 220 Length (m)
- (G) Tidal Gate

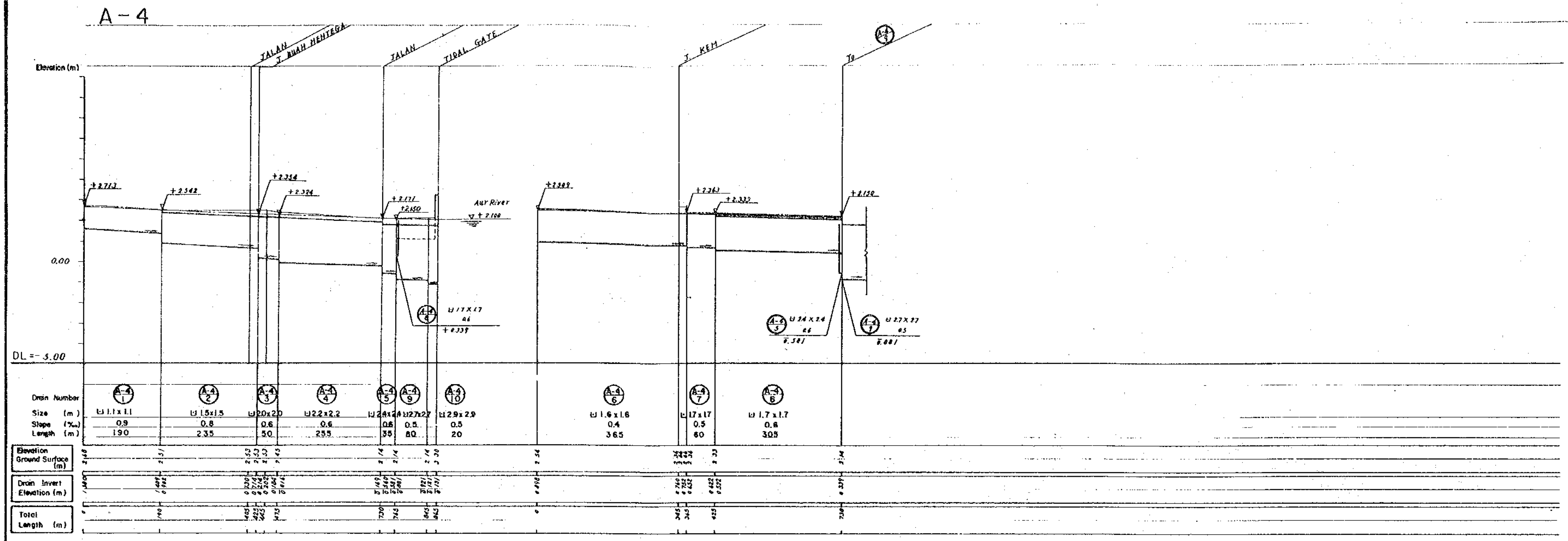
Future Drainage System in Port Kelang (A-4)

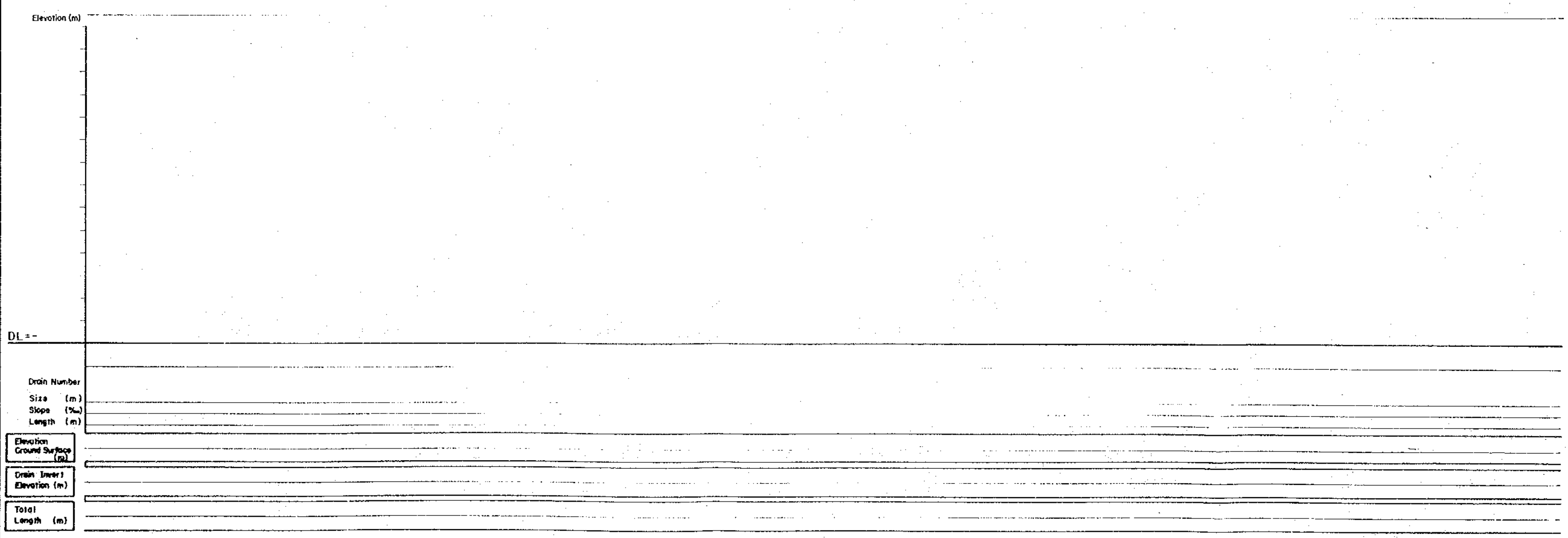
Fig. K. 2



Longitudinal Section of Drains in N-5, N-6, N-7 Catchments

Fig. K.3





Longitudinal Section of Drains in A-4 Catchment

Fig.K-4