

APPENDIX C

STORMWATER DRAINAGE

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1. RAINFALL INTENSITY FREQUENCY DURATION CHART – rainfall intensities

DURATION	1 YR	2 YR	5 YR	10 YR	20 YR	50 YR	100 YR	200 YR	500 YR
5 min	76.07	98.03	128.09	146.13	169.82	201.35	225.75	250.79	285.09
6 min	71.24	91.79	119.92	136.79	158.94	188.44	211.26	234.68	266.75
10 min	58.16	74.92	97.81	111.53	129.56	153.55	172.10	191.14	217.21
12 min	53.73	69.20	90.32	102.98	119.61	141.74	158.84	176.40	200.44
15 min	48.52	62.49	81.53	92.30	107.92	127.87	143.29	159.11	180.76
18 min	44.47	57.26	74.69	85.12	98.84	117.09	131.20	145.67	165.48
20 min	42.22	54.36	70.89	80.79	93.80	111.11	124.49	138.21	157.00
24 min	38.49	49.56	64.61	73.62	85.46	101.22	113.39	125.88	142.97
30 min	34.24	44.07	57.43	65.43	75.94	89.92	100.73	111.80	126.97
45 min	27.39	35.25	45.90	52.27	60.65	71.78	80.38	89.21	101.27
1.0 hr	23.22	29.88	38.89	44.27	51.35	60.77	68.03	75.49	85.68
1.5 hr	18.21	23.43	30.50	34.72	40.27	47.65	53.35	59.20	67.19
2.0 hr	15.27	19.65	25.57	29.11	33.77	39.96	44.74	49.65	56.35
3.0 hr	11.88	15.29	19.90	22.65	26.28	31.10	34.82	38.63	43.85
4.5 hr	9.24	11.88	15.47	17.61	20.42	24.17	27.06	30.02	34.08
6.0 hr	7.73	9.94	12.94	14.73	17.08	20.21	22.63	25.11	28.50
9.0 hr	6.01	7.73	10.06	11.46	13.29	15.73	17.61	19.54	22.18
12.0 hr	5.03	6.47	8.43	9.59	11.13	13.17	14.74	16.36	18.56
18.0 hr	4.01	5.14	6.64	7.52	8.69	10.24	11.44	12.66	14.32
24.0 hr	3.41	4.36	5.59	6.32	7.28	8.55	9.53	10.53	11.89
30.0 hr	2.99	3.82	4.88	5.50	6.33	7.42	8.25	9.10	10.26
36.0 hr	2.69	3.43	4.36	4.90	5.63	6.59	7.32	8.06	9.07
48.0 hr	2.25	2.87	3.63	4.06	4.65	5.42	6.01	6.61	7.42
72.0 hr	1.73	2.19	2.74	3.06	3.49	4.05	4.47	4.90	5.48

STORMWATER DRAINAGE

2. OVERLAND FLOW TRAVEL TIME AID

Table of 'k' values being $t \cdot I^{0.4}$ where: t = time in min and I = intensity in mm/h

DURATION	1 YR	2 YR	5 YR	10 YR	20 YR	50 YR	100 YR	200 YR	500 YR
5 min	28.27	31.29	34.83	36.71	38.99	41.74	43.70	45.58	47.97
6 min	33.06	36.59	40.72	42.91	45.57	48.78	51.06	53.25	56.04
7 min	37.69	41.71	46.41	48.91	51.93	55.58	58.18	60.67	63.86
8 min	42.18	46.67	51.92	54.72	58.10	62.19	65.09	67.88	71.45
9 min	46.54	51.50	57.30	60.39	64.11	68.62	71.83	74.90	78.83
10 min	50.80	56.21	62.54	65.91	69.98	74.90	78.40	81.76	86.04
12 min	59.04	65.34	72.69	76.60	81.33	87.05	91.11	95.01	100.00
14 min	66.98	74.12	82.45	86.89	92.25	98.73	103.34	107.77	113.42
16 min	74.65	82.60	91.89	96.83	102.81	110.03	115.16	120.08	126.38
18 min	82.10	90.84	101.04	106.48	113.04	120.98	126.61	132.03	138.95
20 min	89.35	98.86	109.96	115.86	123.00	131.63	137.76	143.65	151.17
22 min	96.43	106.69	118.65	125.02	132.72	142.02	148.63	154.98	163.09
24 min	103.35	114.34	127.15	133.97	142.21	152.17	159.25	166.05	174.73
26 min	110.12	121.84	135.47	142.73	151.51	162.11	169.65	176.89	186.13
28 min	116.77	129.18	143.63	151.32	160.62	171.86	179.84	187.51	197.30
30 min	123.29	136.40	151.64	159.75	169.57	181.43	189.85	197.94	208.27
40 min	154.42	170.81	189.84	199.96	212.21	227.02	237.53	247.63	260.53

THE KINEMATIC WAVE EQUATION

$$t = 6.94(L \times n^*)^{0.6} / I^{0.4} \times S^{0.3} \quad \text{and} \quad K = 6.94(L \times n^*)^{0.6} / S^{0.3} = t \times I^{0.4}$$

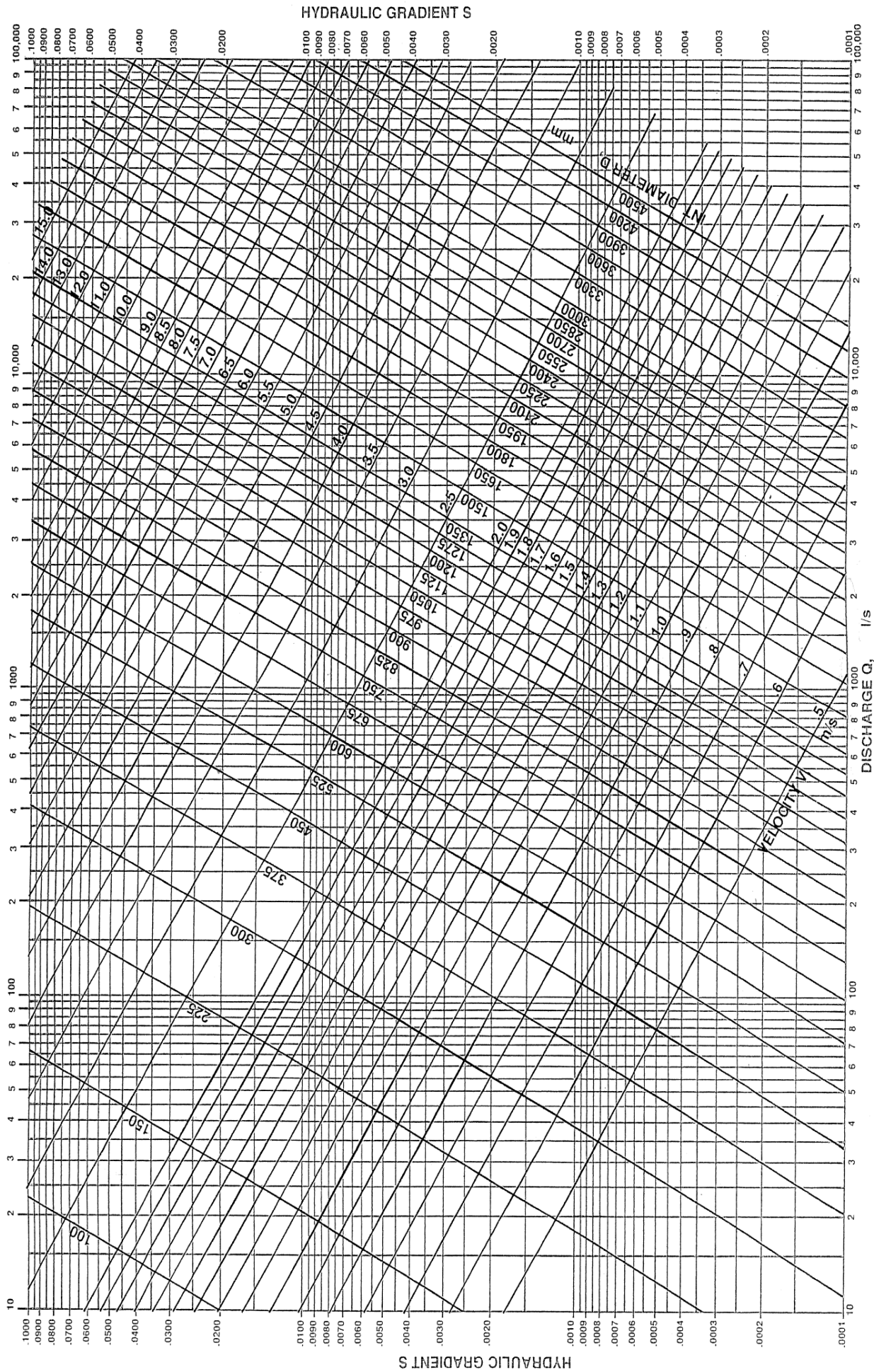
Where t is overland flow time (minutes)
 L is flow path length (m)
 n* is a surface roughness or retardance coefficient
 I is rainfall intensity (mm/hr)
 S is slope (m/m)

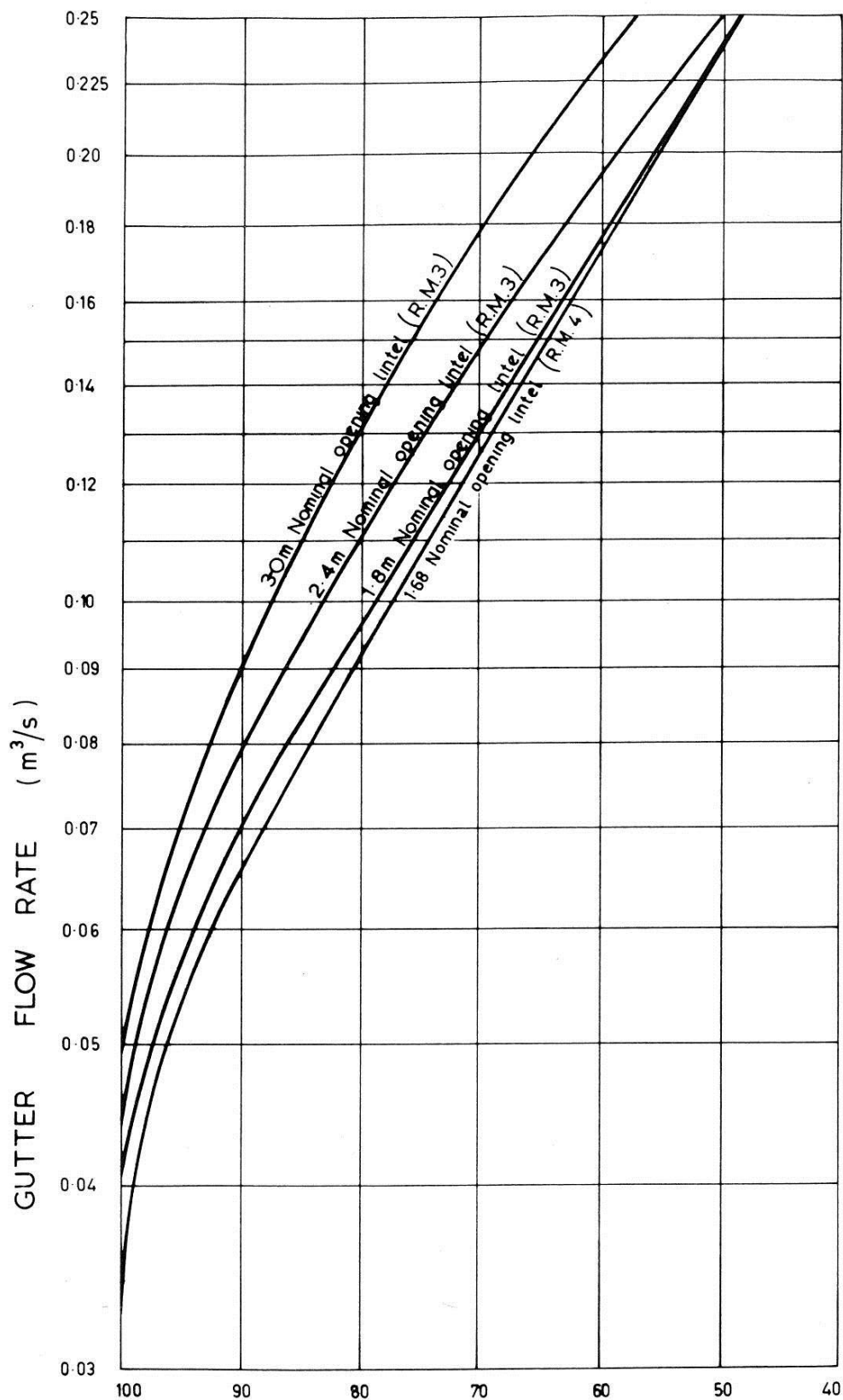
3. SURFACE ROUGHNESS OR RETARDANCE FACTORS

SURFACE TYPE	ROUGHNESS COEFFICIENT
Concrete or Asphalt	0.010 – 0.013
Bare Sand	0.010 – 0.016
Gravelled Surface	0.012 – 0.030
Bare Clay-Loam Soil (eroded)	0.012 – 0.033
Sparse Vegetation	0.053 – 0.130
Shod Grass Prairie	0.100 – 0.200
Lawns	0.170 – 0.480

Eg: For a sub-catchment length of 60m, a slope of 2 percent and a roughness of 0.05.

K = 43.38 For a 10 year ARI and the Overland Land Travel Time is 6 minutes.





$$INLET\ EFFICIENCY\ (I_{eff}) = \frac{FLOW\ INTO\ PIT}{APPROACH\ FLOW} \quad (\%)$$

SOURCE P.W.D. HYDRAULICS LABORATORY (MANLY)

APPROVED

[Signature]

RM.10 PIT INTAKE CURVE
ROADS

DEPARTMENT
OF
HOUSING

FIGURE

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