

**GREATER TAREE CITY COUNCIL  
HANDBOOK OF DRAINAGE CRITERIA**

# 1 IFD Data

Site name: Taree

Site latitude = 31.57 degrees S  
 Longitude = 152.24 degrees E  
 skewness = .05

2-year ARI, 1 hour intensity = 36.00 mm/hr  
 12 hour intensity = 8.50 mm/hr  
 72 hour intensity = 2.50 mm/hr

50-year ARI, 1 hour intensity = 67.00 mm/hr  
 12 hour intensity = 16.30 mm/hr  
 72 hour intensity = 6.00 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	91.36	116.20	146.15	163.34	186.57	216.89	239.94	263.27	294.77
6 min	85.60	108.88	136.98	153.11	174.91	203.36	224.98	246.88	276.43
10 min	70.01	89.08	112.14	125.39	143.28	166.64	184.40	202.39	226.68
12 min	64.72	82.35	103.70	115.97	132.53	154.16	170.60	187.26	209.75
15 min	58.50	74.44	93.77	104.89	119.88	139.47	154.36	169.46	189.83
18 min	53.66	68.29	86.04	96.25	110.03	128.03	141.71	155.58	174.31
20 min	50.96	64.86	81.75	91.46	104.55	121.66	134.68	147.86	165.67
24 min	46.50	59.20	74.62	83.50	95.47	111.11	123.01	135.07	151.35
30 min	41.40	52.71	66.48	74.40	85.08	99.04	109.65	120.42	134.96
35 min	33.19	42.26	53.34	59.72	68.31	79.55	88.10	96.77	108.48
1.0 hr	28.18	35.89	45.32	50.76	58.08	67.65	74.93	82.32	92.31
1.5 hr	22.39	28.53	36.10	40.47	46.35	54.04	59.90	65.85	73.89
2.0 hr	18.95	24.17	30.62	34.35	39.37	45.93	50.93	56.01	62.89
3.0 hr	14.94	19.07	24.21	27.19	31.19	36.43	40.42	44.48	49.98
4.5 hr	11.77	15.03	19.12	21.50	24.68	28.86	32.05	35.29	39.67
6.0 hr	9.94	12.70	16.18	18.21	20.91	24.47	27.18	29.94	33.69
9.0 hr	7.84	10.02	12.79	14.41	16.57	19.40	21.57	23.78	26.77
12.0 hr	6.62	8.47	10.83	12.21	14.05	16.46	18.31	20.19	22.75
18.0 hr	5.07	6.53	8.52	9.70	11.26	13.32	14.91	16.55	18.78
24.0 hr	4.18	5.42	7.16	8.22	9.60	11.44	12.87	14.34	16.36
30.0 hr	3.59	4.67	6.25	7.21	8.46	10.14	11.45	12.80	14.67
36.0 hr	3.17	4.13	5.57	6.47	7.62	9.17	10.39	11.65	13.39
48.0 hr	2.57	3.38	4.63	5.41	6.42	7.79	8.86	9.99	11.54
72.0 hr	1.88	2.49	3.49	4.13	4.95	6.08	6.97	7.91	9.22

IFD Polynomial:  $\ln I = a + b \ln(D) + c \ln(D)^2 + d \ln(D)^3 + e \ln(D)^4 + f \ln(D)^5 + g \ln(D)^6$   
 where duration D is in hrs and average intensity I is in mm/hr

ARI	a	b	c	d	e	f	g	Max % error
1	3.3392716	-.5690387	-.0156277	.0094575	-.0016828	-.0004936	.0000887	.67
2	3.5818343	-.5673231	-.0162522	.0089708	-.0014243	-.0004186	.0000700	.50
5	3.8169089	-.5626104	-.0180176	.0076127	-.0007006	-.0002090	.0000176	.31
10	3.9311286	-.5601202	-.0189504	.0068951	-.0003182	-.0000983	-.0000101	.40
20	4.0666174	-.5580505	-.0197257	.0062987	-.0000004	-.0000063	-.0000331	.48
50	4.2200459	-.5557067	-.0206037	.0056233	.0003595	.0000979	-.0000592	.61
100	4.3229294	-.5541351	-.0211924	.0051704	.0006008	.0001678	-.0000767	.76
200	4.4174974	-.5526904	-.0217336	.0047541	.0008226	.0002320	-.0000927	.89
500	4.5326334	-.5509316	-.0223924	.0042473	.0010927	.0003102	-.0001123	1.06

Overland Flow Travel Time Aid

Table of  $t * I^{0.4}$  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	30.43	33.50	36.71	38.38	40.47	42.97	44.74	46.43	48.57
6 min	35.57	39.16	42.94	44.91	47.37	50.32	52.40	54.39	56.92
7 min	40.55	44.65	48.97	51.22	54.03	57.40	59.78	62.05	64.94
8 min	45.39	49.98	54.82	57.34	60.49	64.26	66.92	69.47	72.70
9 min	50.11	55.18	60.52	63.29	66.77	70.93	73.87	76.68	80.24
10 min	54.72	60.25	66.08	69.10	72.89	77.44	80.64	83.71	87.59
12 min	63.64	70.07	76.83	80.34	84.75	90.02	93.75	97.30	101.82
14 min	72.22	79.52	87.18	91.16	96.16	102.14	106.36	110.39	115.51
16 min	80.51	88.65	97.19	101.63	107.19	113.86	118.56	123.06	128.76
18 min	88.56	97.51	106.91	111.79	117.91	125.24	130.42	135.36	141.64
20 min	96.38	106.13	116.37	121.68	128.35	136.34	141.97	147.36	154.19
22 min	104.02	114.54	125.60	131.34	138.54	147.17	153.26	159.08	166.46
24 min	111.48	122.76	134.62	140.79	148.51	157.77	164.31	170.55	178.47
26 min	118.79	130.81	143.47	150.05	158.29	168.17	175.14	181.80	190.25
28 min	125.95	138.71	152.15	159.14	167.88	178.37	185.77	192.84	201.82
30 min	132.99	146.47	160.68	168.07	177.32	188.41	196.23	203.71	213.20
40 min	166.60	183.52	201.44	210.76	222.42	236.40	246.26	255.69	267.66

Site name: OLD BAR VILLAGE AREA

Site latitude = 31.59 degrees S  
 Longitude = 152.35 degrees E  
 skewness = .03

2-year ARI, 1 hour intensity = 38.00 mm/hr  
 12 hour intensity = 8.40 mm/hr  
 72 hour intensity = 2.60 mm/hr

50-year ARI, 1 hour intensity = 70.00 mm/hr  
 12 hour intensity = 17.00 mm/hr  
 72 hour intensity = 5.60 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	96.23	122.12	152.07	168.96	191.97	221.77	244.24	266.86	297.19
6 min	90.18	114.47	142.62	158.49	180.13	208.13	229.26	250.53	279.05
10 min	73.81	93.74	116.96	130.09	147.94	171.07	188.53	206.11	229.71
12 min	68.25	86.69	108.24	120.42	136.98	158.44	174.64	190.97	212.88
15 min	61.70	78.40	97.96	109.03	124.07	143.56	158.28	173.12	193.03
18 min	56.61	71.95	89.96	100.16	114.00	131.95	145.52	159.19	177.54
20 min	53.78	68.36	85.50	95.22	108.40	125.49	138.41	151.43	168.91
24 min	49.09	62.41	78.12	87.02	99.10	114.77	126.61	138.55	154.58
30 min	43.72	55.61	69.66	77.64	88.44	102.47	113.08	123.77	138.14
45 min	35.07	44.63	56.00	62.47	71.22	82.58	91.18	99.85	111.51
1.0 hr	29.79	37.93	47.66	53.20	60.68	70.40	77.76	85.19	95.18
1.5 hr	23.38	29.84	37.72	42.24	48.31	56.23	62.23	68.30	76.49
2.0 hr	19.62	25.08	31.85	35.75	40.97	47.78	52.96	58.21	65.29
3.0 hr	15.28	19.58	25.02	28.18	32.38	37.88	42.08	46.34	52.10
4.5 hr	11.89	15.27	19.63	22.19	25.57	30.01	33.40	36.85	41.53
6.0 hr	9.95	12.80	16.54	18.73	21.62	25.44	28.35	31.33	35.36
9.0 hr	7.75	9.99	12.99	14.76	17.09	20.17	22.53	24.94	28.21
12.0 hr	6.49	8.38	10.95	12.47	14.47	17.11	19.14	21.22	24.05
18.0 hr	5.05	6.53	8.58	9.80	11.40	13.51	15.15	16.82	19.10
24.0 hr	4.21	5.46	7.20	8.24	9.60	11.41	12.80	14.23	16.18
30.0 hr	3.65	4.74	6.27	7.19	8.38	9.98	11.21	12.47	14.19
36.0 hr	3.24	4.21	5.58	6.41	7.49	8.92	10.03	11.17	12.72
48.0 hr	2.67	3.47	4.62	5.32	6.22	7.43	8.37	9.33	10.64
72.0 hr	1.99	2.59	3.48	4.01	4.71	5.64	6.36	7.11	8.13

IFD Polynomial:  $\ln I = a + b \ln(D) + c \ln(D)^2 + d \ln(D)^3 + e \ln(D)^4 + f \ln(D)^5 + g \ln(D)^6$   
 where duration D is in hrs and average intensity I is in mm/hr

ARI	a	b	c	d	e	f	g	Max % error
1	3.3920918	-.5819509	-.0296802	.0080257	.0002441	-.0002721	.0000012	.22
2	3.6342479	-.5782523	-.0283326	.0079484	.0001452	-.0002628	.0000026	.16
5	3.8641196	-.5682599	-.0246868	.0077344	-.0001203	-.0002368	.0000062	.05
10	3.9749138	-.5630022	-.0227685	.0076217	-.0002599	-.0002231	.0000080	.09
20	4.1072067	-.5586438	-.0211783	.0075284	-.0003757	-.0002117	.0000096	.16
50	4.2566392	-.5537206	-.0193820	.0074229	-.0005065	-.0001989	.0000113	.24
100	4.3566218	-.5504265	-.0181801	.0073524	-.0005940	-.0001903	.0000125	.30
200	4.4483684	-.5474039	-.0170773	.0072876	-.0006743	-.0001824	.0000136	.35
500	4.5598710	-.5437303	-.0157370	.0072089	-.0007719	-.0001729	.0000149	.41

Overland Flow Travel Time Aid

Table of  $t * I^{0.4}$  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	31.07	34.18	37.31	38.91	40.95	43.38	45.08	46.71	48.76
6 min	36.32	39.95	43.63	45.52	47.91	50.76	52.77	54.68	57.09
7 min	41.40	45.55	49.76	51.92	54.65	57.91	60.21	62.39	65.15
8 min	46.34	50.99	55.71	58.13	61.20	64.86	67.43	69.88	72.97
9 min	51.16	56.30	61.51	64.19	67.58	71.62	74.47	77.17	80.59
10 min	55.87	61.47	67.18	70.10	73.81	78.23	81.34	84.29	88.03
12 min	64.98	71.51	78.15	81.56	85.88	91.03	94.64	98.09	102.45
14 min	73.76	81.17	88.72	92.59	97.50	103.35	107.46	111.38	116.33
16 min	82.24	90.51	98.94	103.27	108.74	115.28	119.86	124.24	129.76
18 min	90.48	99.58	108.87	113.63	119.66	126.86	131.91	136.73	142.82
20 min	98.50	108.41	118.53	123.73	130.30	138.14	143.65	148.90	155.53
22 min	106.32	117.02	127.96	133.58	140.68	149.16	155.11	160.78	167.96
24 min	113.96	125.44	137.19	143.22	150.84	159.94	166.33	172.42	180.12
26 min	121.45	133.69	146.22	152.66	160.79	170.50	177.32	183.82	192.04
28 min	128.79	141.78	155.09	161.93	170.56	180.87	188.12	195.02	203.75
30 min	136.00	149.72	163.80	171.03	180.17	191.07	198.73	206.03	215.26
40 min	170.36	187.60	205.38	214.53	226.05	239.81	249.49	258.70	270.37

Site name: NABIAC

Site latitude = 32.10 degrees S  
 longitude = 152.38 degrees E  
 skewness = .04

2-year ARI, 1 hour intensity = 37.00 mm/hr  
 12 hour intensity = 8.12 mm/hr  
 72 hour intensity = 2.54 mm/hr

50-year ARI, 1 hour intensity = 67.00 mm/hr  
 12 hour intensity = 15.90 mm/hr  
 72 hour intensity = 5.30 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	93.76	118.87	147.95	164.38	186.82	215.89	237.86	260.00	289.73
6 min	87.88	111.43	138.71	154.12	175.17	202.45	223.06	243.83	271.72
10 min	71.95	91.24	113.63	126.29	143.56	165.96	182.89	199.95	222.86
12 min	66.53	84.38	105.11	116.83	132.82	153.55	169.22	185.02	206.24
15 min	60.17	76.31	95.08	105.70	120.18	138.95	153.15	167.45	186.67
18 min	55.21	70.03	87.27	97.02	110.32	127.57	140.61	153.76	171.42
20 min	52.45	66.53	82.92	92.20	104.84	121.25	133.64	146.14	162.94
24 min	47.88	60.74	75.72	84.20	95.76	110.75	122.09	133.51	148.87
30 min	42.66	54.12	67.48	75.05	85.36	98.74	108.85	119.05	132.76
45 min	34.23	43.43	54.19	60.28	68.58	79.35	87.49	95.70	106.74
1.0 hr	29.09	36.91	46.07	51.26	58.33	67.50	74.44	81.43	90.84
1.5 hr	22.81	29.01	36.39	40.60	46.30	53.71	59.33	65.01	72.66
2.0 hr	19.13	24.36	30.67	34.29	39.17	45.52	50.35	55.23	61.81
3.0 hr	14.89	18.99	24.04	26.95	30.86	35.96	39.84	43.77	49.08
4.5 hr	11.57	14.79	18.82	21.16	24.28	28.37	31.49	34.66	38.94
6.0 hr	9.68	12.39	15.83	17.83	20.49	23.99	26.66	29.37	33.04
9.0 hr	7.53	9.66	12.41	14.01	16.14	18.95	21.09	23.28	26.24
12.0 hr	6.31	8.10	10.44	11.81	13.63	16.03	17.87	19.74	22.29
18.0 hr	4.92	6.33	8.20	9.31	10.77	12.69	14.18	15.69	17.75
24.0 hr	4.11	5.30	6.89	7.84	9.09	10.73	12.00	13.30	15.07
30.0 hr	3.57	4.60	6.01	6.85	7.95	9.40	10.52	11.67	13.24
36.0 hr	3.17	4.09	5.36	6.11	7.10	8.42	9.43	10.47	11.88
48.0 hr	2.61	3.38	4.44	5.08	5.92	7.02	7.88	8.76	9.96
72.0 hr	1.95	2.53	3.35	3.85	4.49	5.35	6.01	6.70	7.63

IFD Polynomial:  $\ln I = a + b \ln(D) + c \ln(D)^2 + d \ln(D)^3 + e \ln(D)^4 + f \ln(D)^5 + g \ln(D)^6$   
 where duration D is in hrs and average intensity I is in mm/hr

ARI	a	b	c	d	e	f	g	Max % error
1	3.3678643	-.5822992	-.0309841	.0078567	.0004367	-.0002473	-.0000079	.24
2	3.6068720	-.5795886	-.0296988	.0077590	.0003536	-.0002328	-.0000078	.17
5	3.8302612	-.5722351	-.0262192	.0074893	.0001305	-.0001930	-.0000078	.06
10	3.9379757	-.5683578	-.0243845	.0073470	.0000129	-.0001720	-.0000077	.10
20	4.0678867	-.5651393	-.0228615	.0072290	-.0000848	-.0001545	-.0000077	.18
50	4.2148142	-.5614993	-.0211391	.0070955	-.0001952	-.0001348	-.0000077	.27
100	4.3132297	-.5590610	-.0199854	.0070061	-.0002692	-.0001215	-.0000077	.33
200	4.4036151	-.5568218	-.0189258	.0069239	-.0003371	-.0001094	-.0000076	.38
500	4.5135612	-.5540979	-.0176369	.0068240	-.0004197	-.0000946	-.0000076	.45

Overland Flow Travel Time Aid

Table of  $t * I^{0.4}$  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	30.75	33.81	36.90	38.48	40.50	42.91	44.60	46.22	48.26
6 min	35.94	39.53	43.15	45.01	47.38	50.21	52.20	54.09	56.49
7 min	40.98	45.06	49.21	51.33	54.04	57.27	59.54	61.70	64.44
8 min	45.87	50.45	55.09	57.47	60.50	64.11	66.66	69.08	72.15
9 min	50.64	55.69	60.81	63.44	66.79	70.78	73.59	76.27	79.66
10 min	55.30	60.81	66.40	69.28	72.93	77.29	80.36	83.28	86.98
12 min	64.32	70.74	77.24	80.58	84.82	89.89	93.45	96.85	101.15
14 min	73.01	80.29	87.67	91.45	96.27	102.02	106.06	109.92	114.79
16 min	81.42	89.54	97.75	101.97	107.34	113.75	118.26	122.55	127.99
18 min	89.58	98.51	107.55	112.19	118.09	125.14	130.10	134.83	140.81
20 min	97.52	107.24	117.08	122.14	128.56	136.24	141.63	146.78	153.29
22 min	105.27	115.76	126.39	131.84	138.78	147.07	152.90	158.45	165.48
24 min	112.84	124.09	135.49	141.34	148.78	157.67	163.91	169.87	177.41
26 min	120.26	132.25	144.40	150.64	158.57	168.05	174.71	181.06	189.10
28 min	127.53	140.25	153.14	159.77	168.18	178.24	185.31	192.05	200.58
30 min	134.67	148.11	161.73	168.73	177.63	188.25	195.72	202.85	211.86
40 min	168.72	185.58	202.73	211.55	222.74	236.11	245.51	254.47	265.82

Site name: Wingham

Site latitude = 31.42 degrees S  
 longitude = 152.22 degrees E  
 skewness = .06

2-year ARI, 1 hour intensity = 34.00 mm/hr  
 12 hour intensity = 8.00 mm/hr  
 72 hour intensity = 2.40 mm/hr

50-year ARI, 1 hour intensity = 65.00 mm/hr  
 12 hour intensity = 16.00 mm/hr  
 72 hour intensity = 5.80 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	86.40	110.39	140.87	158.71	182.52	213.88	237.89	262.36	295.61
6 min	80.93	103.40	131.97	148.68	170.99	200.37	222.88	245.81	276.96
10 min	66.13	84.50	107.86	121.53	139.78	163.81	182.21	200.97	226.45
12 min	61.11	78.08	99.67	112.31	129.18	151.39	168.41	185.75	209.30
15 min	55.21	70.55	90.06	101.48	116.73	136.80	152.19	167.86	189.15
18 min	50.62	64.68	82.58	93.05	107.04	125.45	139.56	153.93	173.46
20 min	48.07	61.42	78.42	88.37	101.65	119.14	132.54	146.20	164.75
24 min	43.84	56.02	71.53	80.61	92.73	108.69	120.92	133.38	150.31
30 min	39.01	49.85	63.66	71.75	82.54	96.75	107.63	118.73	133.80
45 min	31.24	39.92	50.99	57.47	66.12	77.50	86.23	95.12	107.21
1.0 hr	26.50	33.87	43.27	48.77	56.11	65.78	73.19	80.75	91.01
1.5 hr	21.04	26.91	34.48	38.93	44.85	52.65	58.64	64.75	73.06
2.0 hr	17.79	22.78	29.25	33.06	38.13	44.81	49.94	55.18	62.32
3.0 hr	14.02	17.97	23.14	26.20	30.25	35.61	39.73	43.94	49.68
4.5 hr	11.03	14.16	18.29	20.74	23.98	28.27	31.57	34.95	39.56
6.0 hr	9.31	11.95	15.48	17.57	20.33	24.00	26.82	29.71	33.66
9.0 hr	7.33	9.43	12.24	13.92	16.13	19.07	21.34	23.66	26.83
12.0 hr	6.19	7.97	10.37	11.80	13.69	16.20	18.14	20.13	22.85
18.0 hr	4.77	6.17	8.16	9.37	10.95	13.07	14.71	16.41	18.74
24.0 hr	3.95	5.13	6.87	7.94	9.33	11.20	12.66	14.17	16.25
30.0 hr	3.40	4.44	6.00	6.97	8.22	9.91	11.24	12.61	14.52
36.0 hr	3.00	3.93	5.35	6.24	7.39	8.95	10.17	11.45	13.22
48.0 hr	2.45	3.22	4.45	5.22	6.22	7.58	8.65	9.77	11.34
72.0 hr	1.81	2.39	3.36	3.99	4.79	5.89	6.77	7.70	9.00

IFD Polynomial:  $\ln I = a + b \ln(D) + c \ln(D)^2 + d \ln(D)^3 + e \ln(D)^4 + f \ln(D)^5 + g \ln(D)^6$   
 where duration D is in hrs and average intensity I is in mm/hr

ARI	a	b	c	d	e	f	g	Max % error
1	3.2784987	-.5710389	-.0165812	.0090281	-.0014122	-.0004217	.0000699	.51
2	3.5246018	-.5692175	-.0165572	.0086294	-.0012510	-.0003595	.0000558	.38
5	3.7714986	-.5641582	-.0165377	.0075046	-.0007917	-.0001840	.0000159	.41
10	3.8923220	-.5614792	-.0165273	.0069090	-.0005485	-.0000911	-.0000052	.52
20	4.0334842	-.5592497	-.0165187	.0064133	-.0003461	-.0000138	-.0000228	.61
50	4.1935369	-.5567217	-.0165089	.0058512	-.0001166	.0000739	-.0000427	.71
100	4.3009800	-.5550248	-.0165023	.0054740	.0000375	.0001327	-.0000561	.78
200	4.3998216	-.5534636	-.0164963	.0051269	.0001792	.0001868	-.0000684	.85
500	4.5202663	-.5515613	-.0164889	.0047039	.0003520	.0002528	-.0000834	.93

Overland Flow Travel Time Aid

Table of  $t * I^{0.4}$  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	29.76	32.82	36.17	37.93	40.11	42.73	44.59	46.36	48.62
6 min	34.78	38.37	42.31	44.39	46.95	50.03	52.21	54.30	56.96
7 min	39.65	43.74	48.24	50.61	53.54	57.06	59.55	61.94	64.97
8 min	44.38	48.96	54.00	56.65	59.92	63.86	66.65	69.32	72.72
9 min	48.99	54.04	59.60	62.52	66.13	70.47	73.55	76.49	80.24
10 min	53.49	59.00	65.06	68.25	72.18	76.92	80.27	83.48	87.57
12 min	62.19	68.60	75.63	79.32	83.89	89.38	93.27	97.00	101.74
14 min	70.56	77.83	85.79	89.98	95.15	101.37	105.78	110.00	115.37
16 min	78.66	86.75	95.62	100.27	106.03	112.96	117.87	122.57	128.55
18 min	86.50	95.40	105.15	110.27	116.60	124.22	129.61	134.77	141.34
20 min	94.14	103.82	114.43	120.00	126.89	135.18	141.04	146.66	153.81
22 min	101.59	112.04	123.49	129.50	136.93	145.88	152.21	158.28	166.00
24 min	108.87	120.07	132.34	138.79	146.76	156.35	163.14	169.64	177.92
26 min	116.00	127.93	141.02	147.90	156.39	166.62	173.86	180.79	189.62
28 min	122.99	135.65	149.54	156.83	165.85	176.70	184.38	191.74	201.10
30 min	129.86	143.23	157.90	165.61	175.14	186.61	194.72	202.50	212.39
40 min	162.64	179.42	197.88	207.60	219.58	234.01	244.22	254.00	266.46

Site name: Lansdowne

Site latitude = 31.48 degrees S  
 longitude = 152.31 degrees E  
 skewness = .60

2-year ARI, 1 hour intensity = 36.00 mm/hr  
 12 hour intensity = 9.00 mm/hr  
 72 hour intensity = 3.20 mm/hr

50-year ARI, 1 hour intensity = 68.00 mm/hr  
 12 hour intensity = 17.80 mm/hr  
 72 hour intensity = 6.00 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	91.27	112.50	144.63	166.79	197.66	242.45	280.07	321.43	382.72
6 min	85.52	105.41	135.57	156.38	185.35	227.41	262.73	301.58	359.15
10 min	69.93	86.22	111.01	128.13	151.96	186.57	215.65	247.66	295.11
12 min	64.63	79.70	102.66	118.53	140.60	172.67	199.63	229.30	273.30
15 min	58.41	72.04	92.84	107.23	127.24	156.31	180.76	207.68	247.60
18 min	53.57	66.08	85.20	98.43	116.82	143.56	166.05	190.81	227.55
20 min	50.88	62.76	80.95	93.53	111.03	136.47	157.86	181.43	216.39
24 min	46.42	57.27	73.90	85.42	101.42	124.70	144.28	165.86	197.88
30 min	41.33	50.99	65.84	76.13	90.42	111.22	128.73	148.01	176.65
35 min	33.12	40.87	52.84	61.14	72.67	89.45	103.59	119.17	142.32
1.0 hr	28.11	34.71	44.91	51.99	61.82	76.14	88.21	101.52	121.30
1.5 hr	22.53	27.84	36.13	41.91	49.92	61.60	71.47	82.36	98.58
2.0 hr	19.19	23.72	30.87	35.85	42.75	52.84	61.36	70.79	84.83
3.0 hr	15.27	18.89	24.66	28.70	34.28	42.46	49.38	57.04	68.48
4.5 hr	12.14	15.03	19.68	22.95	27.46	34.08	39.69	45.92	55.22
6.0 hr	10.31	12.78	16.77	19.59	23.47	29.17	34.01	39.38	47.41
9.0 hr	8.21	10.17	13.40	15.68	18.81	23.43	27.36	31.73	38.27
12.0 hr	6.98	8.66	11.43	13.39	16.09	20.07	23.46	27.23	32.89
18.0 hr	5.61	6.95	9.13	10.67	12.79	15.90	18.54	21.48	25.87
24.0 hr	4.80	5.94	7.77	9.06	10.84	13.45	15.66	18.11	21.78
30.0 hr	4.24	5.24	6.84	7.97	9.51	11.78	13.70	15.83	19.00
36.0 hr	3.82	4.73	6.15	7.15	8.53	10.55	12.26	14.15	16.96
48.0 hr	3.23	3.99	5.17	6.00	7.14	8.81	10.22	11.77	14.09
72.0 hr	2.50	3.09	3.98	4.60	5.46	6.71	7.76	8.92	10.64

IFD Polynomial:  $\ln I = a + b \ln(D) + c \ln(D)^2 + d \ln(D)^3 + e \ln(D)^4 + f \ln(D)^5 + g \ln(D)^6$   
 where duration D is in hrs and average intensity I is in mm/hr

ARI	a	b	c	d	e	f	g	Max % error
1	3.3434920	-.5550865	-.0151166	.0061009	-.0003528	.0000335	-.0000299	.72
2	3.5542076	-.5538524	-.0144245	.0062123	-.0004656	.0000147	-.0000238	.72
5	3.8120240	-.5487918	-.0115758	.0066694	-.0009291	-.0000625	.0000012	.73
10	3.9585031	-.5458085	-.0098966	.0069389	-.0012023	-.0001080	.0000159	.74
20	4.1317567	-.5431616	-.0084066	.0071780	-.0014447	-.0001483	.0000290	.74
50	4.3401836	-.5399773	-.0066142	.0074656	-.0017363	-.0001969	.0000447	.75
100	4.4873374	-.5377292	-.0053487	.0076687	-.0019422	-.0002311	.0000558	.76
200	4.6278994	-.5355817	-.0041398	.0078627	-.0021389	-.0002639	.0000664	.76
500	4.8059641	-.5328613	-.0026086	.0081084	-.0023881	-.0003053	.0000798	.77

Overland Flow Travel Time Aid

Table of  $t \cdot I^{0.4}$  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	30.40	33.05	36.54	38.69	41.41	44.94	47.61	50.30	53.94
6 min	35.59	38.69	42.78	45.30	48.48	52.61	55.74	58.90	63.16
7 min	40.59	44.13	48.80	51.67	55.31	60.03	63.60	67.20	72.07
8 min	45.43	49.40	54.63	57.85	61.93	67.22	71.22	75.26	80.72
9 min	50.13	54.51	60.31	63.86	68.37	74.21	78.64	83.11	89.14
10 min	54.72	59.50	65.84	69.72	74.65	81.03	85.87	90.76	97.35
12 min	63.59	69.16	76.53	81.06	86.80	94.24	99.87	105.56	113.25
14 min	72.13	78.44	86.82	91.97	98.48	106.94	113.34	119.81	128.54
16 min	80.38	87.41	96.76	102.51	109.78	119.21	126.36	133.58	143.33
18 min	88.38	96.12	106.42	112.75	120.75	131.14	139.00	146.95	157.69
20 min	96.19	104.61	115.82	122.72	131.44	142.75	151.32	159.98	171.67
22 min	103.80	112.90	125.01	132.46	141.87	154.09	163.34	172.70	185.33
24 min	111.26	121.01	134.00	141.99	152.09	165.19	175.12	185.15	198.70
26 min	118.56	128.95	142.81	151.33	162.10	176.07	186.66	197.36	211.81
28 min	125.74	136.76	151.46	160.50	171.93	186.76	197.99	209.35	224.69
30 min	132.79	144.43	159.97	169.52	181.60	197.27	209.14	221.15	237.35
40 min	166.52	181.14	200.69	212.72	227.90	247.62	262.55	277.66	298.05

Site name: Krumbach

Site latitude = 32.03 degrees S  
 longitude = 152.16 degrees E  
 skewness = .05

2-year ARI, 1 hour intensity = 35.50 mm/hr  
 12 hour intensity = 8.00 mm/hr  
 72 hour intensity = 2.40 mm/hr

50-year ARI, 1 hour intensity = 65.00 mm/hr  
 12 hour intensity = 16.10 mm/hr  
 72 hour intensity = 5.40 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	90.12	114.50	143.60	160.25	182.81	212.22	234.55	257.14	287.59
6 min	84.45	107.30	134.58	150.18	171.32	198.88	219.80	240.97	269.51
10 min	69.10	87.79	110.11	122.88	140.18	162.73	179.85	197.17	220.52
12 min	63.88	81.17	101.80	113.61	129.60	150.45	166.28	182.29	203.88
15 min	57.75	73.38	92.03	102.70	117.17	136.01	150.32	164.80	184.32
18 min	52.98	67.31	84.43	94.22	107.48	124.77	137.90	151.18	169.09
20 min	50.33	63.94	80.20	89.50	102.10	118.53	131.00	143.61	160.62
24 min	45.93	58.36	73.19	81.68	93.18	108.17	119.56	131.07	146.60
30 min	40.90	51.97	65.18	72.74	82.98	96.33	106.47	116.72	130.55
32.80 min	32.80	41.67	52.27	58.33	66.54	77.25	85.38	93.60	104.69
1.0 hr	27.86	35.40	44.40	49.54	56.52	65.62	72.52	79.50	88.92
1.5 hr	21.93	27.93	35.25	39.47	45.15	52.57	58.23	63.96	71.70
2.0 hr	18.45	23.53	29.83	33.47	38.37	44.78	49.67	54.63	61.35
3.0 hr	14.41	18.42	23.51	26.47	30.43	35.62	39.60	43.64	49.12
4.5 hr	11.25	14.41	18.51	20.91	24.10	28.31	31.53	34.82	39.29
6.0 hr	9.43	12.11	15.62	17.69	20.43	24.05	26.84	29.67	33.54
9.0 hr	7.37	9.48	12.31	13.99	16.20	19.13	21.39	23.70	26.85
12.0 hr	6.19	7.97	10.40	11.85	13.75	16.27	18.22	20.22	22.94
18.0 hr	4.77	6.17	8.13	9.31	10.85	12.90	14.50	16.13	18.37
24.0 hr	3.96	5.13	6.81	7.83	9.15	10.92	12.30	13.72	15.66
30.0 hr	3.42	4.44	5.92	6.83	8.00	9.57	10.80	12.07	13.81
36.0 hr	3.02	3.93	5.27	6.09	7.15	8.58	9.69	10.84	12.43
48.0 hr	2.47	3.23	4.35	5.05	5.95	7.17	8.12	9.10	10.47
72.0 hr	1.82	2.39	3.27	3.81	4.51	5.47	6.21	6.99	8.07

IFD Polynomial:  $\ln I = a + b \ln(D) + c \ln(D)^2 + d \ln(D)^3 + e \ln(D)^4 + f \ln(D)^5 + g \ln(D)^6$   
 where duration D is in hrs and average intensity I is in mm/hr

ARI	a	b	c	d	e	f	g	Max % error
1	3.3254345	-.5791118	-.0254017	.0086860	-.0004344	-.0003744	.0000358	.32
2	3.5658514	-.5760585	-.0238711	.0084863	-.0004986	-.0003432	.0000327	.27
5	3.7950754	-.5676832	-.0197026	.0079280	-.0006673	-.0002558	.0000238	.19
10	3.9062036	-.5632577	-.0175000	.0076329	-.0007565	-.0002096	.0000191	.33
20	4.0391230	-.5595794	-.0156692	.0073877	-.0008306	-.0001713	.0000152	.45
50	4.1896416	-.5554140	-.0135961	.0071100	-.0009145	-.0001278	.0000108	.58
100	4.2905740	-.5526210	-.0122059	.0069238	-.0009707	-.0000987	.0000078	.67
200	4.3833486	-.5500536	-.0109281	.0067527	-.0010225	-.0000719	.0000051	.75
500	4.4963010	-.5469278	-.0093724	.0065443	-.0010854	-.0000393	.0000018	.85

Overland Flow Travel Time Aid

Table of  $t * I^{0.4}$  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	30.27	33.31	36.46	38.09	40.15	42.61	44.34	46.00	48.10
6 min	35.37	38.93	42.64	44.55	46.97	49.86	51.90	53.85	56.32
7 min	40.32	44.38	48.61	50.81	53.56	56.87	59.20	61.42	64.25
8 min	45.14	49.68	54.42	56.87	59.96	63.66	66.27	68.76	71.92
9 min	49.83	54.85	60.07	62.78	66.18	70.27	73.14	75.89	79.38
10 min	54.42	59.89	65.59	68.54	72.26	76.71	79.85	82.84	86.65
12 min	63.29	69.66	76.27	79.69	84.00	89.17	92.81	96.29	100.70
14 min	71.84	79.06	86.54	90.42	95.30	101.16	105.28	109.22	114.22
16 min	80.10	88.15	96.48	100.79	106.23	112.75	117.34	121.72	127.28
18 min	88.12	96.96	106.12	110.86	116.83	123.99	129.04	133.86	139.97
20 min	95.92	105.55	115.50	120.66	127.16	134.95	140.44	145.68	152.32
22 min	103.53	113.92	124.66	130.22	137.24	145.64	151.56	157.22	164.39
24 min	110.97	122.10	133.62	139.57	147.09	156.10	162.45	168.51	176.19
26 min	118.25	130.12	142.39	148.74	156.75	166.35	173.12	179.58	187.77
28 min	125.39	137.98	151.00	157.73	166.24	176.42	183.59	190.45	199.13
30 min	132.41	145.69	159.45	166.57	175.55	186.31	193.89	201.13	210.31
40 min	165.85	182.52	199.83	208.79	220.09	233.63	243.16	252.28	263.83



Site name: Hannamvale

Site latitude = 31.45 degrees S  
 Longitude = 152.35 degrees E  
 skewness = .05

2-year ARI, 1 hour intensity = 37.50 mm/hr  
 12 hour intensity = 9.90 mm/hr  
 72 hour intensity = 3.40 mm/hr

50-year ARI, 1 hour intensity = 75.00 mm/hr  
 12 hour intensity = 19.20 mm/hr  
 72 hour intensity = 7.00 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	94.38	120.59	153.56	172.75	198.39	232.05	257.77	283.91	319.34
6 min	88.42	113.02	144.10	162.20	186.37	218.12	242.39	267.07	300.54
10 min	72.29	92.52	118.38	133.51	153.65	180.16	200.44	221.10	249.14
12 min	66.81	85.55	109.62	123.73	142.48	167.18	186.09	205.35	231.52
15 min	60.37	77.36	99.31	112.19	129.30	151.85	169.13	186.75	210.69
18 min	55.36	70.98	91.26	103.18	119.00	139.86	155.86	172.18	194.37
20 min	52.58	67.43	86.78	98.17	113.27	133.18	148.46	164.05	185.25
24 min	47.96	61.55	79.35	89.84	103.73	122.07	136.15	150.52	170.08
30 min	42.69	54.83	70.83	80.28	92.78	109.30	121.99	134.96	152.62
45 min	34.20	43.99	57.05	64.80	75.03	88.56	98.98	109.63	124.16
1.0 hr	29.03	37.38	48.62	55.31	64.12	75.80	84.80	94.01	106.58
1.5 hr	23.51	30.25	39.27	44.62	51.68	61.04	68.24	75.60	85.65
2.0 hr	20.18	25.95	33.64	38.20	44.21	52.17	58.30	64.57	73.11
3.0 hr	16.23	20.86	26.98	30.60	35.39	41.72	46.59	51.56	58.34
4.5 hr	13.04	16.75	21.62	24.49	28.30	33.33	37.19	41.13	46.50
6.0 hr	11.17	14.33	18.48	20.92	24.15	28.42	31.70	35.04	39.60
9.0 hr	8.98	11.52	14.82	16.76	19.33	22.73	25.33	27.98	31.59
12.0 hr	7.70	9.87	12.68	14.32	16.51	19.40	21.61	23.86	26.93
18.0 hr	6.12	7.86	10.15	11.50	13.29	15.65	17.47	19.32	21.85
24.0 hr	5.19	6.68	8.65	9.83	11.37	13.42	14.99	16.60	18.80
30.0 hr	4.56	5.87	7.63	8.68	10.05	11.88	13.29	14.73	16.70
36.0 hr	4.09	5.27	6.87	7.82	9.07	10.73	12.01	13.33	15.12
48.0 hr	3.43	4.42	5.78	6.60	7.67	9.09	10.19	11.32	12.86
72.0 hr	2.62	3.39	4.46	5.11	5.95	7.08	7.95	8.84	10.07

IFD Polynomial:  $\ln I = a + b \ln(D) + c \ln(D)^2 + d \ln(D)^3 + e \ln(D)^4 + f \ln(D)^5 + g \ln(D)^6$   
 where duration D is in hrs and average intensity I is in mm/hr

ARI	a	b	c	d	e	f	g	Max % error
1	3.3780666	-.5431812	-.0035120	.0071444	-.0018880	-.0001290	.0000378	.97
2	3.6301253	-.5422055	-.0054972	.0070186	-.0016515	-.0001158	.0000294	.91
5	3.8912064	-.5395277	-.0109555	.0066718	-.0010009	-.0000792	.0000063	.72
10	4.0191678	-.5381128	-.0138396	.0064885	-.0006571	-.0000598	-.0000058	.62
20	4.1660783	-.5369368	-.0162369	.0063362	-.0003714	-.0000438	-.0000160	.53
50	4.3324406	-.5356051	-.0189515	.0061637	-.0000478	-.0000256	-.0000274	.44
100	4.4439972	-.5347121	-.0207718	.0060480	.0001691	-.0000134	-.0000351	.37
200	4.5465372	-.5338912	-.0224450	.0059417	.0003686	-.0000021	-.0000422	.41
500	4.6713791	-.5328918	-.0244821	.0058122	.0006114	.0000115	-.0000508	.46

Overland Flow Travel Time Aid

Table of  $t * I^{0.4}$  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	30.81	33.98	37.43	39.24	41.47	44.16	46.06	47.87	50.18
6 min	36.06	39.78	43.84	45.96	48.59	51.74	53.97	56.10	58.81
7 min	41.14	45.38	50.03	52.46	55.46	59.07	61.62	64.06	67.17
8 min	46.05	50.81	56.02	58.76	62.13	66.18	69.05	71.79	75.28
9 min	50.82	56.08	61.86	64.89	68.62	73.11	76.29	79.33	83.19
10 min	55.47	61.22	67.55	70.87	74.96	79.88	83.36	86.69	90.92
12 min	64.46	71.16	78.57	82.46	87.24	93.00	97.07	100.96	105.92
14 min	73.10	80.71	89.17	93.62	99.07	105.64	110.29	114.74	120.40
16 min	81.44	89.95	99.43	104.42	110.53	117.89	123.09	128.08	134.43
18 min	89.55	98.91	109.39	114.91	121.66	129.79	135.55	141.06	148.08
20 min	97.43	107.64	119.10	125.14	132.52	141.41	147.70	153.72	161.40
22 min	105.14	116.17	128.58	135.13	143.13	152.75	159.57	166.10	174.42
24 min	112.67	124.51	137.87	144.91	153.51	163.87	171.20	178.23	187.18
26 min	120.06	132.69	146.97	154.51	163.70	174.77	182.61	190.13	199.70
28 min	127.32	140.73	155.92	163.94	173.71	185.48	193.82	201.82	212.00
30 min	134.46	148.63	164.71	173.21	183.55	196.02	204.85	213.31	224.10
40 min	168.64	186.48	206.84	217.62	230.71	246.49	257.67	268.39	282.05

Site name: HALLIDAYS PT- DIAMOND BEACH AREA

Site latitude = 32.03 degrees S  
 Longitude = 152.33 degrees E  
 skewness = .02

2-year ARI, 1 hour intensity = 38.00 mm/hr  
 12 hour intensity = 8.10 mm/hr  
 72 hour intensity = 2.60 mm/hr

50-year ARI, 1 hour intensity = 71.00 mm/hr  
 12 hour intensity = 16.30 mm/hr  
 72 hour intensity = 5.60 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	95.92	121.92	152.20	169.26	192.43	222.41	245.01	267.74	298.19
6 min	89.90	114.30	142.78	158.83	180.64	208.84	230.11	251.51	280.18
10 min	73.59	93.63	117.20	130.52	148.56	171.93	189.57	207.32	231.12
12 min	68.04	86.61	108.49	120.87	137.63	159.34	175.73	192.23	214.36
15 min	61.53	78.34	98.24	109.51	124.74	144.49	159.41	174.43	194.59
18 min	56.45	71.90	90.24	100.64	114.69	132.90	146.66	160.53	179.13
20 min	53.63	68.32	85.79	95.70	109.09	126.45	139.56	152.78	170.52
24 min	48.96	62.39	78.41	87.51	99.79	115.72	127.77	139.90	156.20
30 min	43.61	55.60	69.96	78.13	89.13	103.42	114.23	125.12	139.76
45 min	34.99	44.64	56.30	62.94	71.88	83.50	92.29	101.16	113.08
1.0 hr	29.73	37.95	47.94	53.65	61.31	71.27	78.82	86.44	96.69
1.5 hr	23.21	29.69	37.68	42.27	48.41	56.42	62.49	68.63	76.90
2.0 hr	19.40	24.85	31.65	35.57	40.80	47.63	52.82	58.07	65.15
3.0 hr	15.03	19.28	24.69	27.82	31.98	37.42	41.56	45.76	51.43
4.5 hr	11.63	14.95	19.23	21.73	25.03	29.36	32.66	36.02	40.56
6.0 hr	9.69	12.48	16.11	18.24	21.04	24.72	27.54	30.40	34.28
9.0 hr	7.51	9.68	12.56	14.26	16.49	19.42	21.67	23.96	27.06
12.0 hr	6.26	8.09	10.53	11.98	13.87	16.37	18.28	20.24	22.89
18.0 hr	4.91	6.35	8.32	9.49	11.02	13.04	14.60	16.19	18.35
24.0 hr	4.12	5.34	7.03	8.03	9.34	11.08	12.42	13.79	15.65
30.0 hr	3.59	4.66	6.15	7.04	8.20	9.74	10.93	12.14	13.80
36.0 hr	3.20	4.15	5.50	6.30	7.35	8.75	9.82	10.92	12.43
48.0 hr	2.65	3.44	4.58	5.27	6.15	7.34	8.25	9.19	10.47
72.0 hr	1.99	2.60	3.48	4.01	4.70	5.63	6.34	7.08	8.09

IFD Polynomial:  $\ln I = a + b \ln(D) + c \ln(D)^2 + d \ln(D)^3 + e \ln(D)^4 + f \ln(D)^5 + g \ln(D)^6$   
 where duration D is in hrs and average intensity I is in mm/hr

ARI	a	b	c	d	e	f	g	Max % error
1	3.3887211	-.5877242	-.0358470	.0073599	.0011055	-.0001685	-.0000387	.33
2	3.6334328	-.5843393	-.0351120	.0072616	.0010729	-.0001569	-.0000394	.29
5	3.8681138	-.5752536	-.0331331	.0069924	.0009874	-.0001247	-.0000417	.27
10	3.9810949	-.5704832	-.0320942	.0068511	.0009426	-.0001078	-.0000429	.29
20	4.1150231	-.5665338	-.0312341	.0067341	.0009054	-.0000938	-.0000439	.31
50	4.2661108	-.5620785	-.0302637	.0066021	.0008635	-.0000780	-.0000450	.33
100	4.3670881	-.5591008	-.0296152	.0065139	.0008354	-.0000674	-.0000458	.35
200	4.4596684	-.5563708	-.0290206	.0064330	.0008097	-.0000578	-.0000465	.36
500	4.5720828	-.5530558	-.0282986	.0063348	.0007785	-.0000460	-.0000473	.38

Overland Flow Travel Time Aid

Table of  $t * I^{0.4}$  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	31.03	34.16	37.32	38.94	40.99	43.43	45.14	46.77	48.83
6 min	36.27	39.93	43.65	45.56	47.96	50.83	52.84	54.76	57.18
7 min	41.35	45.53	49.78	51.96	54.71	57.99	60.30	62.49	65.25
8 min	46.28	50.96	55.74	58.19	61.27	64.95	67.54	69.99	73.10
9 min	51.09	56.26	61.54	64.25	67.67	71.74	74.59	77.31	80.75
10 min	55.79	61.44	67.22	70.18	73.91	78.36	81.49	84.46	88.22
12 min	64.89	71.47	78.21	81.67	86.02	91.21	94.85	98.32	102.70
14 min	73.66	81.13	88.80	92.74	97.69	103.60	107.74	111.69	116.67
16 min	82.15	90.48	99.06	103.45	108.99	115.59	120.22	124.63	130.21
18 min	90.38	99.56	109.01	113.86	119.97	127.24	132.35	137.21	143.36
20 min	98.40	108.40	118.71	124.01	130.66	138.60	144.17	149.48	156.18
22 min	106.22	117.02	128.18	133.91	141.10	149.69	155.72	161.46	168.71
24 min	113.86	125.45	137.44	143.59	151.32	160.54	167.02	173.18	180.97
26 min	121.35	133.71	146.51	153.08	161.34	171.18	178.09	184.68	193.00
28 min	128.69	141.80	155.40	162.39	171.16	181.62	188.97	195.96	204.80
30 min	135.89	149.75	164.14	171.54	180.81	191.88	199.65	207.05	216.41
40 min	170.23	187.64	205.83	215.20	226.91	240.89	250.71	260.06	271.89

Site name: Coopernock

Site latitude = 31.50 degrees S  
 Longitude = 152.37 degrees E  
 skewness = .05

2-year ARI, 1 hour intensity = 38.00 mm/hr  
 12 hour intensity = 8.90 mm/hr  
 72 hour intensity = 2.90 mm/hr

50-year ARI, 1 hour intensity = 70.00 mm/hr  
 12 hour intensity = 17.50 mm/hr  
 72 hour intensity = 5.70 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	96.26	122.03	152.12	169.21	192.51	222.80	245.74	268.90	300.07
6 min	90.22	114.38	142.66	158.72	180.62	209.09	230.65	252.43	281.74
10 min	73.83	93.66	116.98	130.26	148.33	171.83	189.65	207.64	231.88
12 min	68.26	86.62	108.25	120.57	137.33	159.14	175.67	192.38	214.87
15 min	61.72	78.33	97.97	109.16	124.38	144.18	159.20	174.38	194.83
18 min	56.62	71.88	89.96	100.27	114.28	132.52	146.35	160.34	179.18
20 min	53.79	68.29	85.50	95.32	108.66	126.02	139.20	152.52	170.47
24 min	49.09	62.35	78.11	87.11	99.33	115.24	127.32	139.53	155.99
30 min	43.73	55.55	69.65	77.71	88.64	102.89	113.70	124.64	139.39
35 min	35.07	44.58	55.99	62.52	71.37	82.91	91.67	100.54	112.50
1.0 hr	29.79	37.89	47.64	53.23	60.80	70.67	78.17	85.76	96.01
1.5 hr	23.62	30.08	37.99	42.54	48.68	56.70	62.81	69.00	77.37
2.0 hr	19.96	25.45	32.24	36.17	41.44	48.35	53.61	58.95	66.18
3.0 hr	15.70	20.06	25.52	28.70	32.94	38.52	42.77	47.10	52.96
4.5 hr	12.34	15.79	20.18	22.74	26.16	30.65	34.09	37.59	42.34
6.0 hr	10.41	13.33	17.09	19.29	22.22	26.07	29.03	32.04	36.13
9.0 hr	8.19	10.50	13.52	15.30	17.66	20.77	23.16	25.59	28.91
12.0 hr	6.91	8.87	11.46	12.99	15.01	17.68	19.74	21.83	24.69
18.0 hr	5.44	6.99	9.03	10.23	11.83	13.93	15.55	17.20	19.45
24.0 hr	4.59	5.89	7.61	8.62	9.96	11.74	13.10	14.49	16.39
30.0 hr	4.01	5.14	6.64	7.53	8.70	10.25	11.44	12.65	14.31
36.0 hr	3.58	4.59	5.93	6.72	7.77	9.15	10.22	11.30	12.78
48.0 hr	2.97	3.82	4.93	5.62	6.46	7.61	8.49	9.40	10.63
72.0 hr	2.25	2.89	3.73	4.23	4.89	5.76	6.43	7.11	8.04

IFD Polynomial:  $\ln I = a + b \ln(D) + c \ln(D)^2 + d \ln(D)^3 + e \ln(D)^4 + f \ln(D)^5 + g \ln(D)^6$   
 where duration D is in hrs and average intensity I is in mm/hr

ARI	a	b	c	d	e	f	g	Max % error
1	3.3961783	-.5688753	-.0225530	.0073246	-.0001482	-.0001621	-.0000050	.19
2	3.6367818	-.5662227	-.0215327	.0073745	-.0002680	-.0001726	.0000000	.22
5	3.8664912	-.5589792	-.0187340	.0075106	-.0005962	-.0002013	.0000138	.28
10	3.9778760	-.5551519	-.0172551	.0075826	-.0007697	-.0002164	.0000211	.32
20	4.1110086	-.5519706	-.0160259	.0076423	-.0009138	-.0002290	.0000271	.34
50	4.2617687	-.5483682	-.0146340	.0077100	-.0010771	-.0002433	.0000340	.38
100	4.3628630	-.5459526	-.0137006	.0077554	-.0011866	-.0002528	.0000386	.40
200	4.4557864	-.5437321	-.0128427	.0077972	-.0012872	-.0002616	.0000428	.42
500	4.5689200	-.5410288	-.0117981	.0078480	-.0014097	-.0002723	.0000479	.44

Overland Flow Travel Time Aid

Table of  $t * I^{0.4}$  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	31.07	34.16	37.30	38.93	40.99	43.46	45.19	46.85	48.95
6 min	36.34	39.96	43.65	45.55	47.97	50.86	52.90	54.84	57.30
7 min	41.43	45.56	49.78	51.96	54.72	58.03	60.35	62.57	65.39
8 min	46.38	51.01	55.74	58.18	61.28	64.99	67.60	70.09	73.25
9 min	51.20	56.30	61.54	64.24	67.66	71.76	74.65	77.41	80.90
10 min	55.90	61.48	67.20	70.16	73.90	78.38	81.54	84.55	88.37
12 min	64.99	71.49	78.16	81.61	85.97	91.20	94.88	98.39	102.84
14 min	73.75	81.13	88.71	92.64	97.60	103.53	107.72	111.71	116.78
16 min	82.22	90.45	98.92	103.30	108.84	115.47	120.14	124.60	130.26
18 min	90.44	99.49	108.83	113.66	119.76	127.06	132.21	137.12	143.35
20 min	98.44	108.30	118.48	123.74	130.39	138.35	143.96	149.32	156.11
22 min	106.25	116.90	127.90	133.59	140.77	149.38	155.44	161.23	168.57
24 min	113.89	125.31	137.11	143.22	150.93	160.17	166.68	172.89	180.77
26 min	121.37	133.54	146.14	152.66	160.89	170.74	177.69	184.32	192.73
28 min	128.71	141.63	155.01	161.93	170.67	181.13	188.50	195.54	204.47
30 min	135.92	149.57	163.72	171.04	180.27	191.33	199.13	206.57	216.01
40 min	170.36	187.51	205.35	214.59	226.23	240.17	250.00	259.39	271.29

Site name: Harrington Village

Site latitude = 31.53 degrees S  
 Longitude = 152.41 degrees E  
 skewness = .02

2-year ARI, 1 hour intensity = 40.00 mm/hr  
 12 hour intensity = 8.60 mm/hr  
 72 hour intensity = 2.70 mm/hr

50-year ARI, 1 hour intensity = 74.00 mm/hr  
 12 hour intensity = 17.00 mm/hr  
 72 hour intensity = 5.50 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	100.99	127.97	158.45	175.45	198.76	228.80	251.37	274.02	304.27
6 min	94.66	119.99	148.70	164.73	186.69	215.00	236.28	257.63	286.16
10 min	77.50	98.34	122.20	135.57	153.83	177.39	195.12	212.93	236.75
12 min	71.67	90.98	113.18	125.63	142.61	164.54	181.05	197.64	219.83
15 min	64.81	82.32	102.54	113.91	129.38	149.38	164.44	179.58	199.85
18 min	59.47	75.57	94.25	104.75	119.05	137.53	151.45	165.45	184.21
20 min	56.51	71.82	89.63	99.66	113.29	130.92	144.21	157.57	175.48
24 min	51.59	65.59	81.96	91.20	103.73	119.94	132.17	144.47	160.96
30 min	45.96	58.47	73.18	81.49	92.75	107.33	118.33	129.41	144.26
45 min	36.88	46.97	58.97	65.76	74.95	86.86	95.86	104.93	117.10
1.0 hr	31.34	39.95	50.26	56.12	64.03	74.28	82.04	89.86	100.36
1.5 hr	24.51	31.29	39.54	44.25	50.58	58.80	65.03	71.33	79.79
2.0 hr	20.51	26.22	33.23	37.25	42.64	49.65	54.96	60.34	67.58
3.0 hr	15.91	20.37	25.94	29.15	33.42	39.01	43.25	47.54	53.33
4.5 hr	12.33	15.81	20.23	22.78	26.17	30.61	33.99	37.41	42.04
6.0 hr	10.29	13.22	16.95	19.13	22.01	25.78	28.65	31.57	35.51
9.0 hr	7.98	10.27	13.23	14.96	17.25	20.25	22.54	24.87	28.02
12.0 hr	6.67	8.59	11.10	12.58	14.52	17.07	19.02	21.01	23.70
18.0 hr	5.21	6.71	8.70	9.87	11.41	13.43	14.98	16.55	18.69
24.0 hr	4.36	5.62	7.30	8.29	9.59	11.30	12.61	13.95	15.76
30.0 hr	3.79	4.89	6.36	7.23	8.36	9.86	11.01	12.18	13.77
36.0 hr	3.37	4.35	5.67	6.44	7.46	8.80	9.83	10.88	12.31
48.0 hr	2.78	3.60	4.69	5.34	6.19	7.31	8.17	9.05	10.24
72.0 hr	2.08	2.70	3.53	4.02	4.67	5.52	6.18	6.85	7.76

IFD Polynomial:  $\ln I = a + b \ln(D) + c \ln(D)^2 + d \ln(D)^3 + e \ln(D)^4 + f \ln(D)^5 + g \ln(D)^6$   
 where duration D is in hrs and average intensity I is in mm/hr

ARI	a	b	c	d	e	f	g	Max % error
1	3.4416773	-.5857517	-.0340441	.0076529	.0008123	-.0002156	-.0000232	.32
2	3.6845917	-.5823337	-.0335006	.0076435	.0007607	-.0002192	-.0000211	.31
5	3.9144652	-.5731903	-.0320281	.0076162	.0006217	-.0002283	-.0000153	.28
10	4.0249220	-.5683896	-.0312549	.0076018	.0005487	-.0002331	-.0000123	.27
20	4.1567605	-.5644152	-.0306148	.0075900	.0004883	-.0002371	-.0000098	.25
50	4.3054906	-.5599316	-.0298927	.0075766	.0004202	-.0002416	-.0000070	.24
100	4.4048924	-.5569350	-.0294102	.0075676	.0003746	-.0002446	-.0000051	.23
200	4.4960280	-.5541876	-.0289677	.0075594	.0003329	-.0002474	-.0000034	.22
500	4.6066884	-.5508516	-.0284304	.0075495	.0002822	-.0002507	-.0000013	.21

Overland Flow Travel Time Aid

Table of  $t * I^{0.4}$  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	31.68	34.83	37.93	39.51	41.53	43.94	45.62	47.22	49.24
6 min	37.03	40.71	44.36	46.21	48.59	51.41	53.39	55.27	57.64
7 min	42.21	46.42	50.59	52.72	55.43	58.66	60.92	63.08	65.79
8 min	47.25	51.96	56.66	59.04	62.09	65.72	68.26	70.68	73.73
9 min	52.16	57.37	62.57	65.21	68.59	72.60	75.42	78.09	81.47
10 min	56.96	62.66	68.35	71.24	74.94	79.34	82.42	85.35	89.05
12 min	66.26	72.90	79.55	82.94	87.26	92.40	96.00	99.43	103.75
14 min	75.22	82.76	90.35	94.22	99.13	104.99	109.10	113.01	117.94
16 min	83.88	92.30	100.80	105.13	110.64	117.19	121.79	126.16	131.68
18 min	92.29	101.57	110.95	115.74	121.81	129.05	134.12	138.95	145.05
20 min	100.48	110.59	120.83	126.07	132.70	140.60	146.14	151.42	158.08
22 min	108.46	119.39	130.48	136.15	143.33	151.88	157.88	163.59	170.80
24 min	116.27	127.99	139.92	146.02	153.73	162.92	169.37	175.51	183.26
26 min	123.91	136.42	149.16	155.68	163.92	173.74	180.63	187.19	195.47
28 min	131.41	144.68	158.23	165.16	173.92	184.36	191.68	198.65	207.46
30 min	138.77	152.80	167.14	174.48	183.75	194.79	202.54	209.92	219.24
40 min	173.84	191.48	209.63	218.94	230.65	244.63	254.43	263.77	275.57

Site name: Ti nonee

Site latitude = 31.90 degrees S  
 longitude = 152.40 degrees E  
 skewness = .05

2-year ARI, 1 hour intensity = 35.50 mm/hr  
 12 hour intensity = 8.10 mm/hr  
 72 hour intensity = 2.50 mm/hr

50-year ARI, 1 hour intensity = 66.50 mm/hr  
 12 hour intensity = 16.00 mm/hr  
 72 hour intensity = 6.00 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	89.98	114.60	144.65	161.97	185.29	215.79	239.00	262.53	294.33
6 min	84.32	107.39	135.57	151.82	173.69	202.30	224.07	246.14	275.97
10 min	68.96	87.85	110.97	124.30	142.24	165.71	183.57	201.69	226.18
12 min	63.75	81.21	102.61	114.95	131.55	153.27	169.80	186.57	209.24
15 min	57.62	73.41	92.78	103.95	118.98	138.64	153.61	168.79	189.32
18 min	52.85	67.34	85.12	95.38	109.18	127.24	140.99	154.94	173.80
20 min	50.20	63.97	80.87	90.62	103.74	120.90	133.98	147.24	165.16
24 min	45.81	58.38	73.82	82.73	94.72	110.40	122.35	134.46	150.85
30 min	40.79	51.98	65.75	73.70	84.39	98.38	109.04	119.85	134.47
45 min	32.69	41.67	52.74	59.14	67.74	78.99	87.56	96.26	108.02
1.0 hr	27.76	35.39	44.81	50.26	57.57	67.15	74.45	81.85	91.87
1.5 hr	21.92	27.98	35.55	39.95	45.83	53.55	59.44	65.42	73.53
2.0 hr	18.48	23.61	30.07	33.83	38.86	45.46	50.50	55.62	62.57
3.0 hr	14.48	18.52	23.68	26.69	30.71	35.99	40.03	44.14	49.72
4.5 hr	11.33	14.52	18.63	21.04	24.24	28.46	31.69	34.99	39.46
6.0 hr	9.53	12.22	15.72	17.77	20.50	24.10	26.86	29.67	33.50
9.0 hr	7.47	9.59	12.38	14.02	16.20	19.08	21.29	23.54	26.62
12.0 hr	6.28	8.07	10.45	11.85	13.71	16.17	18.06	19.99	22.62
18.0 hr	4.86	6.29	8.28	9.48	11.04	13.13	14.75	16.41	18.69
24.0 hr	4.04	5.25	7.00	8.07	9.45	11.31	12.75	14.24	16.30
30.0 hr	3.50	4.56	6.13	7.10	8.36	10.05	11.37	12.74	14.62
36.0 hr	3.10	4.05	5.49	6.39	7.54	9.11	10.33	11.60	13.36
48.0 hr	2.54	3.34	4.59	5.37	6.38	7.75	8.83	9.96	11.53
72.0 hr	1.88	2.49	3.49	4.13	4.95	6.08	6.97	7.91	9.22

IFD Polynomial:  $\ln I = a + b \ln(D) + c \ln(D)^2 + d \ln(D)^3 + e \ln(D)^4 + f \ln(D)^5 + g \ln(D)^6$   
 where duration D is in hrs and average intensity I is in mm/hr

ARI	a	b	c	d	e	f	g	Max % error
1	3.3232336	-.5756315	-.0229045	.0085066	-.0005980	-.0003446	.0000356	.28
2	3.5669053	-.5733736	-.0228336	.0081001	-.0004385	-.0002819	.0000215	.15
5	3.8050064	-.5671663	-.0226882	.0069621	-.0000129	-.0001061	-.0000181	.25
10	3.9208253	-.5638864	-.0226114	.0063609	.0002515	-.0000133	-.0000391	.40
20	4.0576434	-.5611602	-.0225476	.0058611	.0004497	.0000639	-.0000565	.56
50	4.2125770	-.5580731	-.0224753	.0052952	.0006742	.0001513	-.0000762	.74
100	4.3164699	-.5560030	-.0224268	.0049157	.0008248	.0002099	-.0000895	.86
200	4.4119657	-.5541003	-.0223823	.0045669	.0009632	.0002638	-.0001016	.97
500	4.5282311	-.5517836	-.0223280	.0041422	.0011316	.0003294	-.0001164	1.10

Overland Flow Travel Time Aid

Table of  $t \cdot I^{0.4}$  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	30.25	33.32	36.56	38.25	40.36	42.89	44.67	46.38	48.54
6 min	35.35	38.95	42.77	44.76	47.24	50.22	52.32	54.33	56.88
7 min	40.30	44.41	48.77	51.04	53.88	57.28	59.68	61.98	64.89
8 min	45.12	49.71	54.60	57.14	60.32	64.12	66.81	69.38	72.65
9 min	49.80	54.87	60.26	63.07	66.57	70.78	73.74	76.58	80.18
10 min	54.38	59.91	65.79	68.85	72.68	77.26	80.50	83.59	87.52
12 min	63.24	69.67	76.50	80.05	84.49	89.81	93.57	97.16	101.72
14 min	71.77	79.07	86.80	90.83	95.86	101.89	106.15	110.22	115.38
16 min	80.02	88.15	96.77	101.25	106.86	113.58	118.32	122.85	128.61
18 min	88.02	96.96	106.44	111.37	117.54	124.93	130.15	135.13	141.46
20 min	95.80	105.54	115.86	121.23	127.94	135.99	141.67	147.10	153.99
22 min	103.40	113.91	125.06	130.85	138.10	146.79	152.93	158.79	166.23
24 min	110.82	122.09	134.05	140.27	148.04	157.37	163.95	170.24	178.22
26 min	118.09	130.10	142.86	149.50	157.79	167.73	174.75	181.46	189.98
28 min	125.23	137.96	151.50	158.55	167.35	177.91	185.36	192.48	201.52
30 min	132.23	145.68	160.00	167.45	176.75	187.91	195.79	203.32	212.88
40 min	165.64	182.53	200.58	209.98	221.70	235.76	245.68	255.17	267.23

**SAMPLE SUMMARY SHEET FOR  
HYDRAULIC/HYDROLOGICAL CALCULATIONS**

STORMWATER DRAINAGE CALCULATIONS

1	2	3	4	5	6	7	8	9	10	11	12	13						14						15						16						17														
												SUB-AREA TIME OF CONCENTRATION			EQUIVALENT IMPERVIOUS AREA			INLET DESIGN			DRAIN DESIGN			H.G.L. DESIGN			COMMENTS																							
CATCHMENT REFERENCE COLOUR & No.	LENGTH OF SECTION	L/s	Plan	Slope	Length	Type	Slope	Type	Length	Type	Max. Flow	Average Recurrence Interval	Rainfall Intensity	Sub-Catch Area	Impervious Area (%)	Runoff Coeff. C <sub>p</sub>	Sub-Area C <sub>p</sub> x A	Frequency Factor	Runoff Coeff.	Sub-Area EIA	Sub-Area	EIA	Sub-Area	C <sub>p</sub> x A	Total EIA	Discharge		Size of Culvert	Velocity in Culvert	Inlet / Bend No.	K - Head Change Coefficient	Hp	Head Pressure	Minimum Friction	Grade															
																											Length									Slope	Time	Length	Slope	Time	Length	Slope	Time	Length	Slope	Time	Length	Slope	Time	Length
Plan	L/s	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan	Plan

**3**

**GUTTER FLOW WIDTHS**



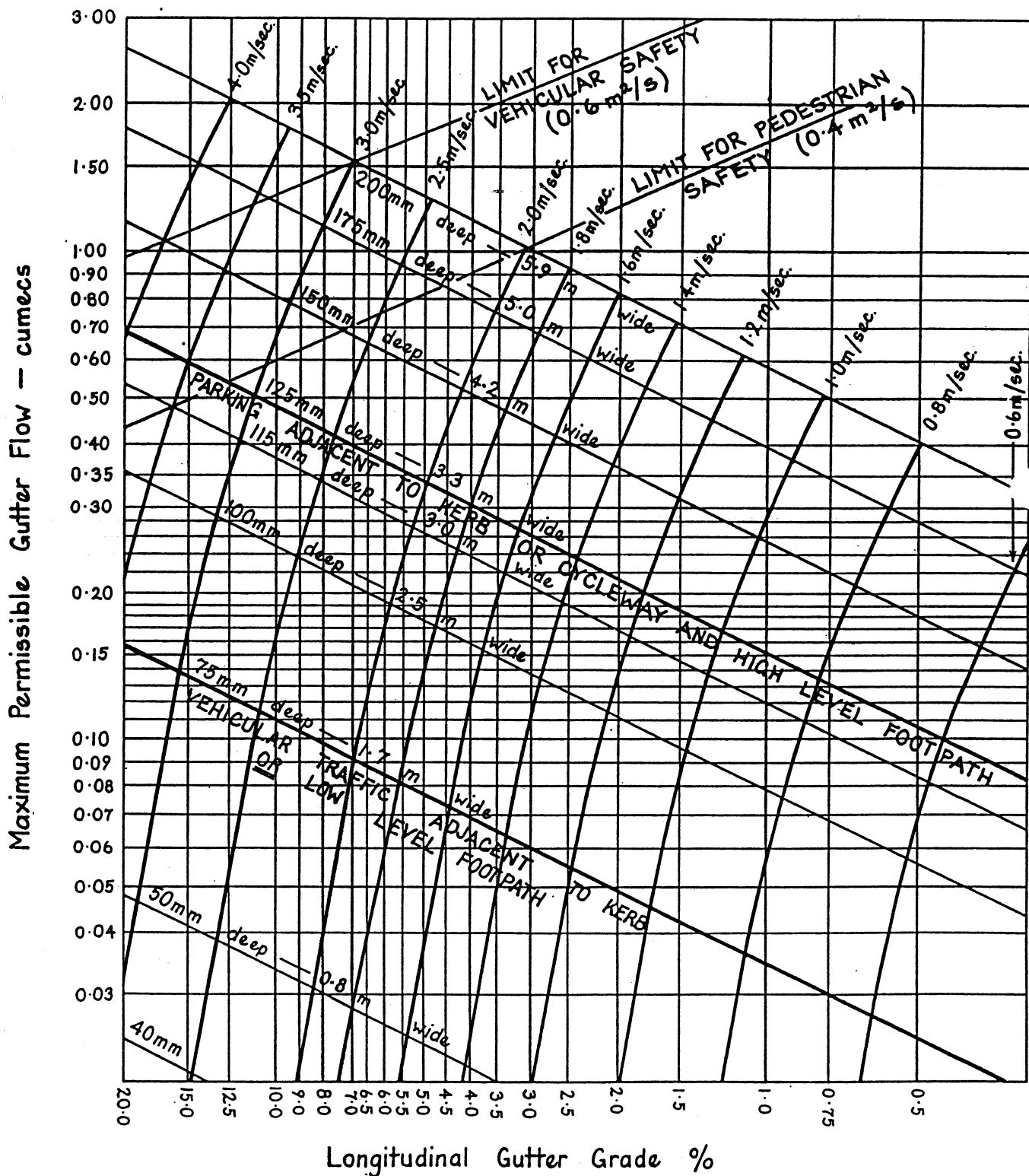


FIGURE F1

MAXIMUM PERMISSIBLE GUTTER FLOW

**4**  
**PIT CAPACITIES**

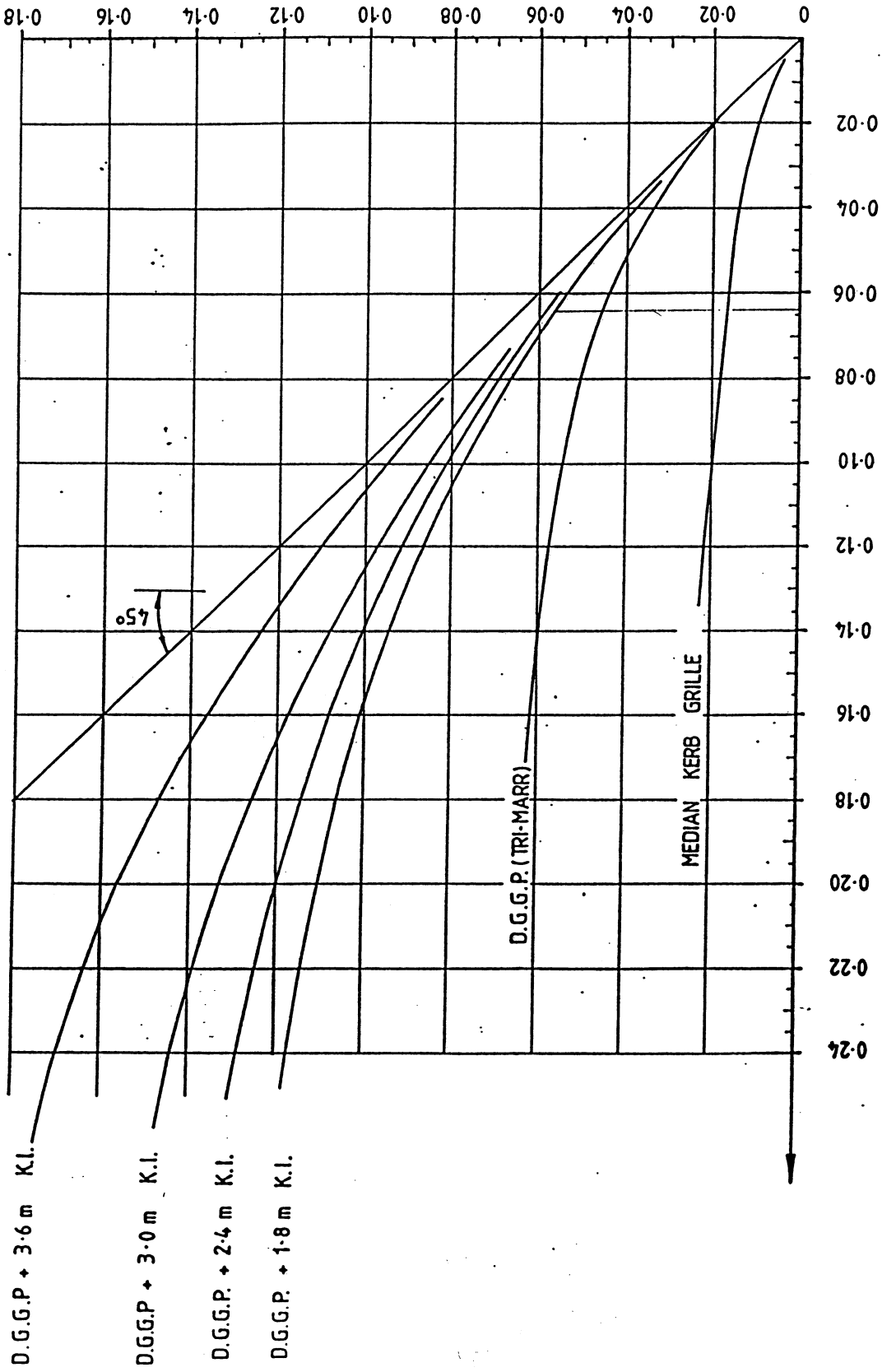
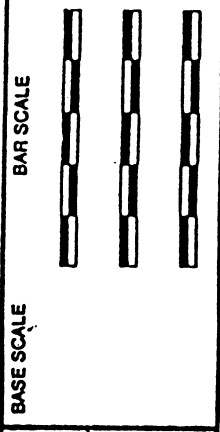


FIGURE G1  
( CUMECs )  
INLET CAPACITY

GREATER TAREE CITY COUNCIL

STRAIGHT KERB INLET CAPACITIES  
FOR ROAD CROSSFALLS BETWEEN 2% AND 6%  
LONGITUDINAL GRADES UP TO 10%



SURVEYED	
DRAWN	
CHECKED	
DESIGN ENG.	

No.

DRAWING No.

292 / 36

A3

**5**

**PRESSURE HEAD CHANGE CO-EFFICIENTS  
"Ke" CHARTS**

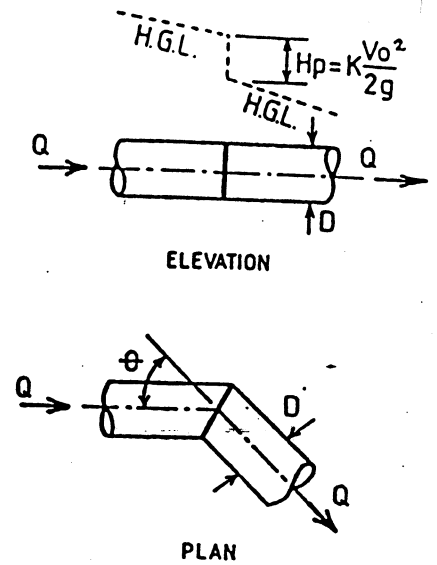
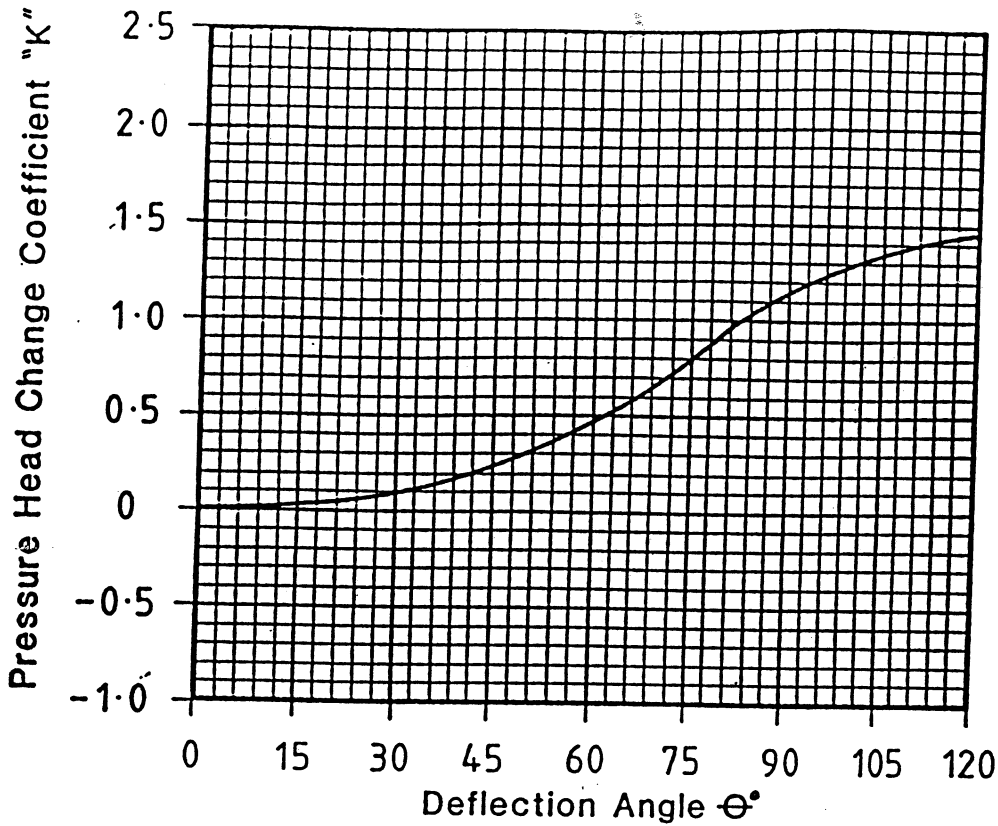


FIGURE H1 PRESSURE HEAD CHANGE COEFFICIENTS FOR MITRE BENDS

INTERPOLATE BETWEEN FIGURES H1 & H2 FOR LESS THAN 90° DEFLECTION

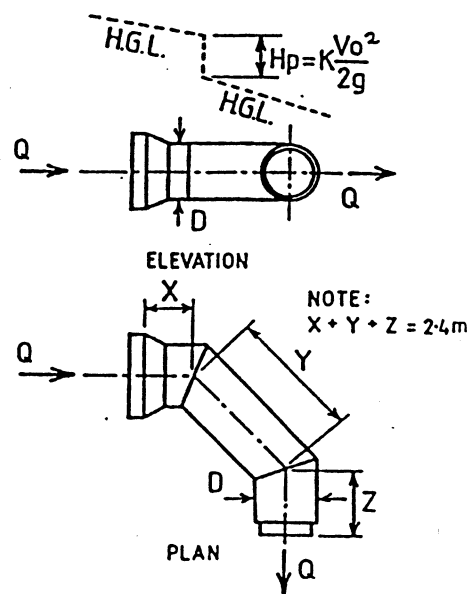
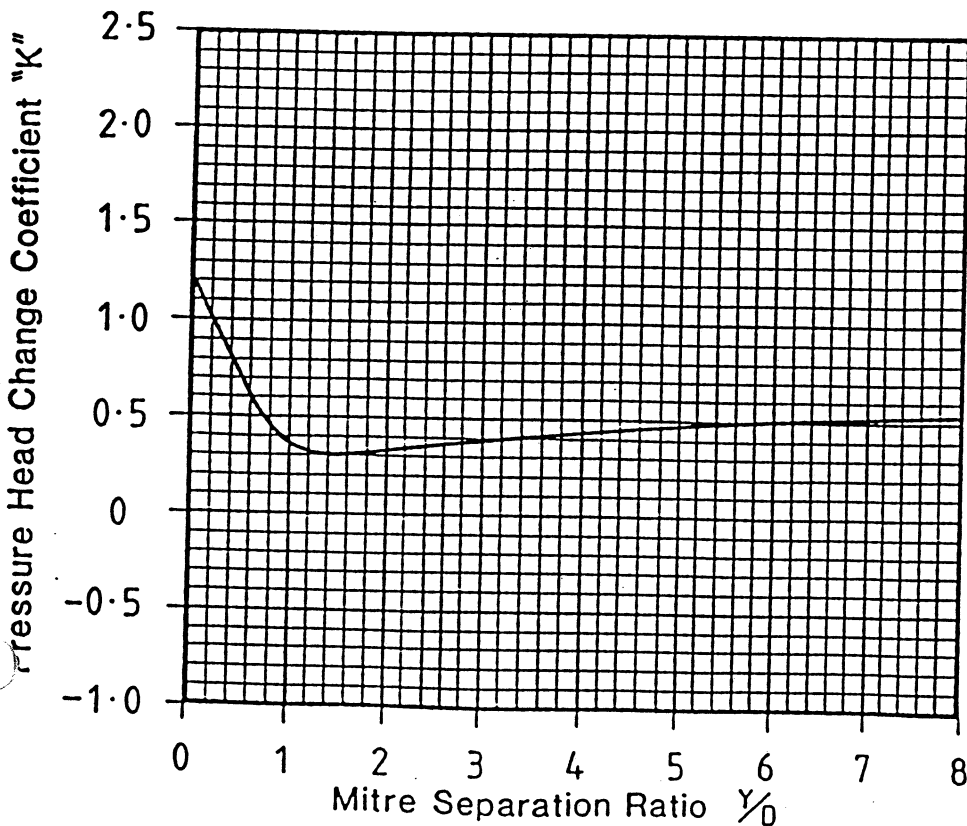


FIGURE H2 PRESSURE HEAD CHANGE COEFFICIENTS FOR 90° COMPOUND BENDS (LOBSTERBACK)

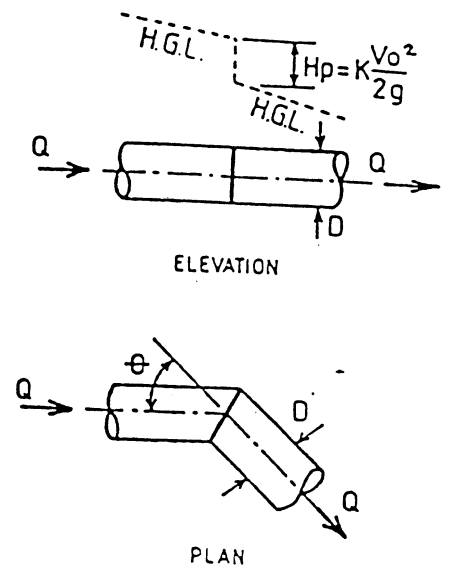
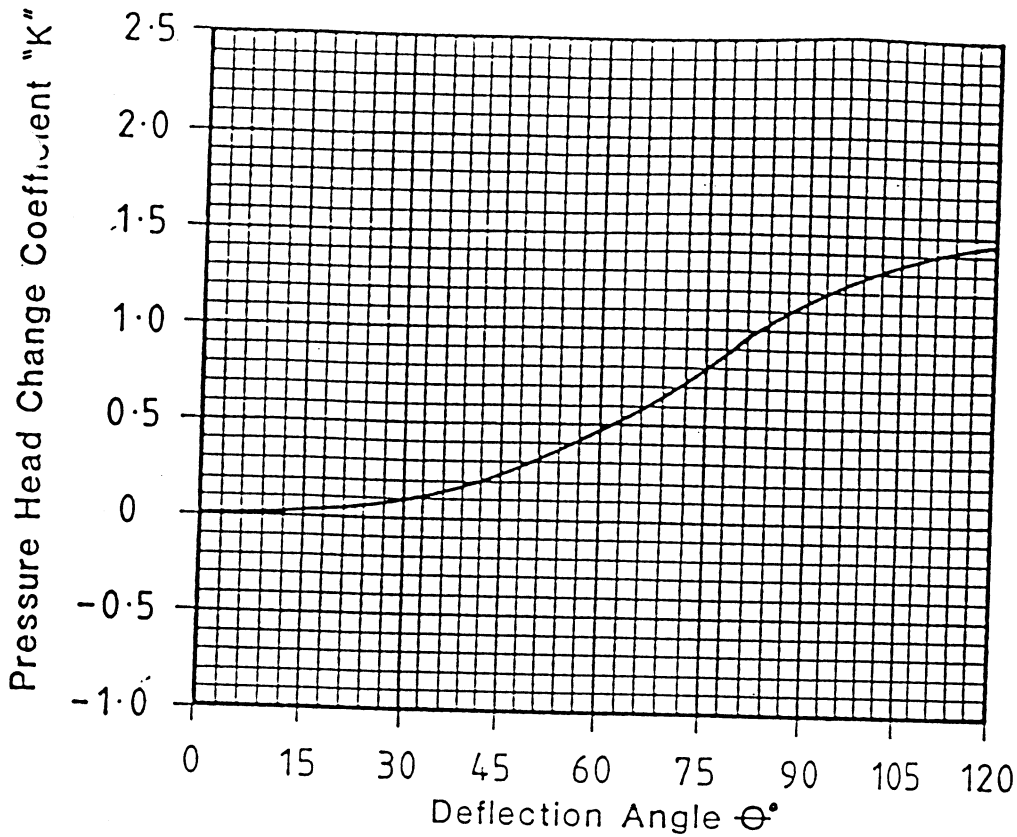


FIGURE H1 PRESSURE HEAD CHANGE COEFFICIENTS FOR MITRE BENDS

INTERPOLATE BETWEEN FIGURES H1 & H2 FOR LESS THAN 90° DEFLECTION

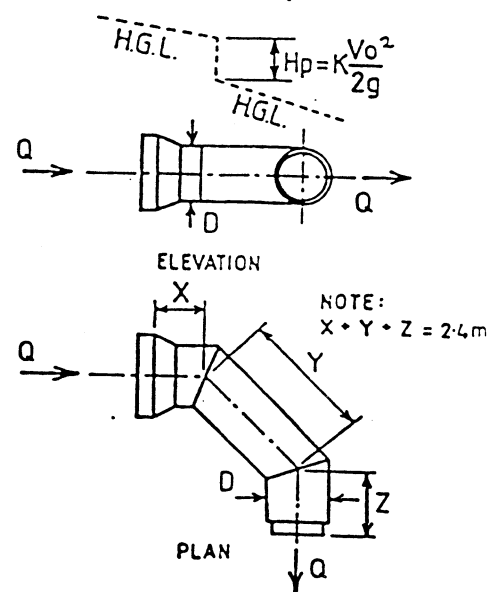
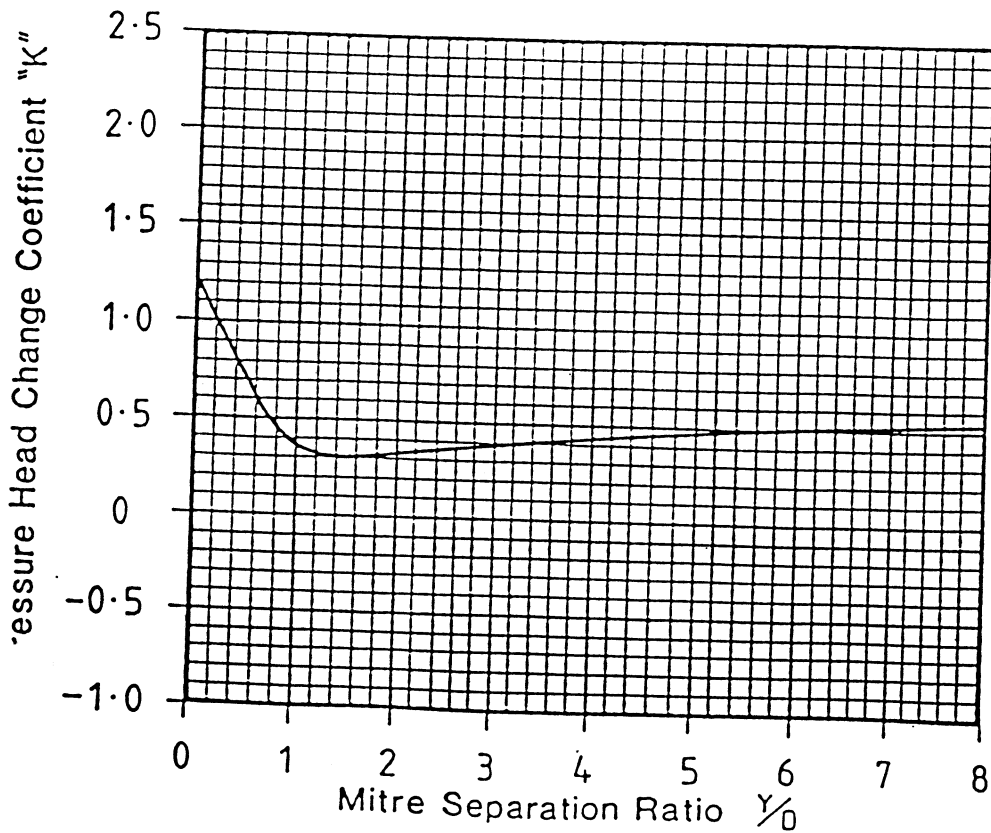


FIGURE H2 PRESSURE HEAD CHANGE COEFFICIENTS FOR 90° COMPOUND BENDS (LOBSTERBACK)

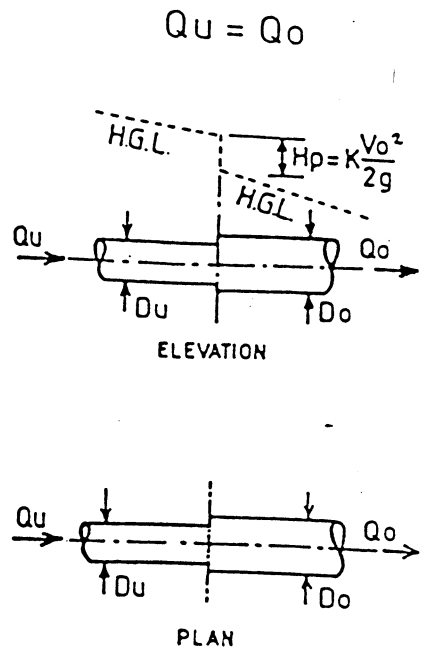
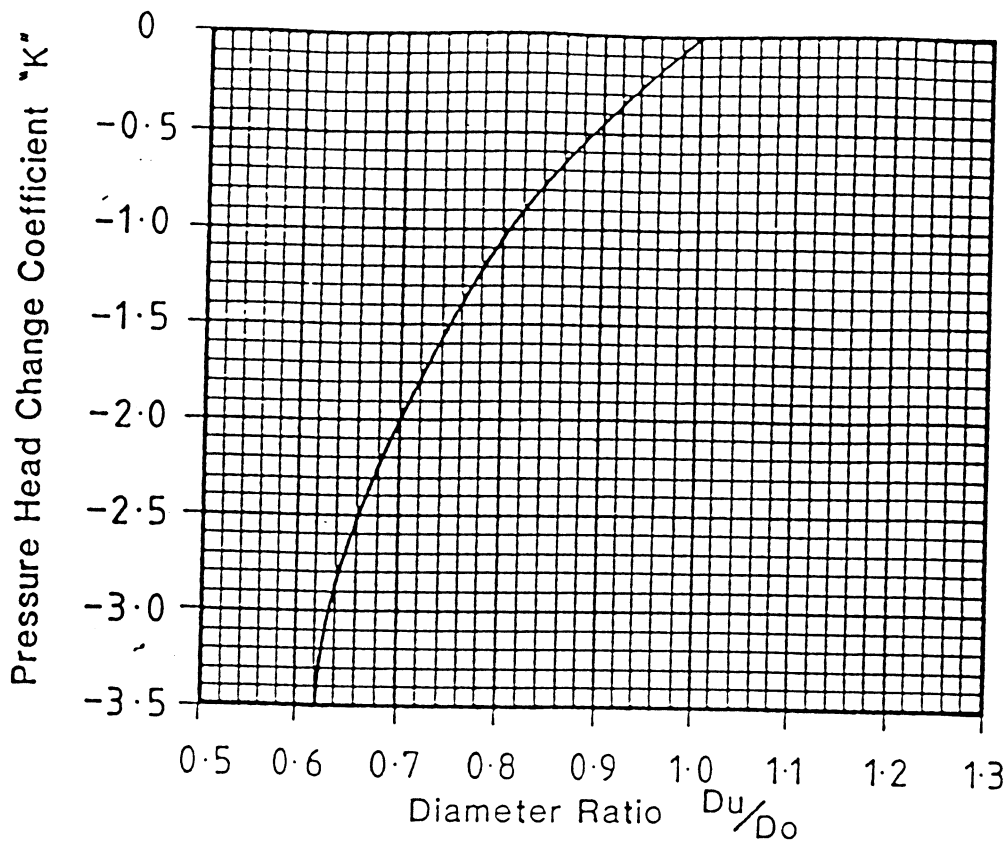


FIGURE H3 : PRESSURE HEAD CHANGE COEFFICIENTS FOR SUDDEN EXPANSIONS

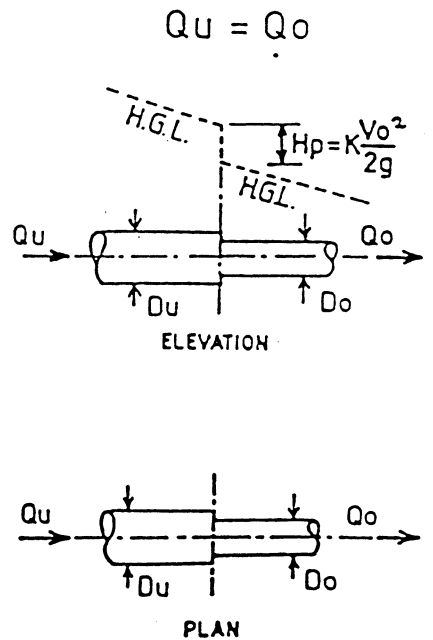
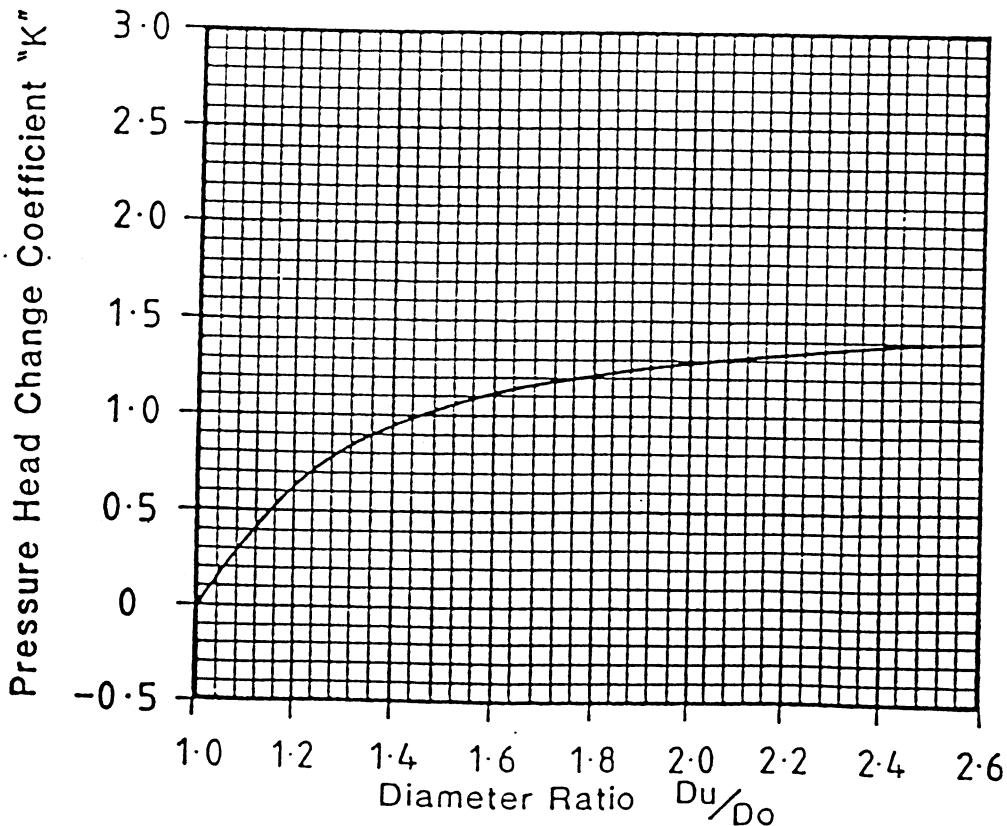


FIGURE H4 : PRESSURE HEAD CHANGE COEFFICIENTS FOR SUDDEN CONTRACTIONS OR REDUCERS

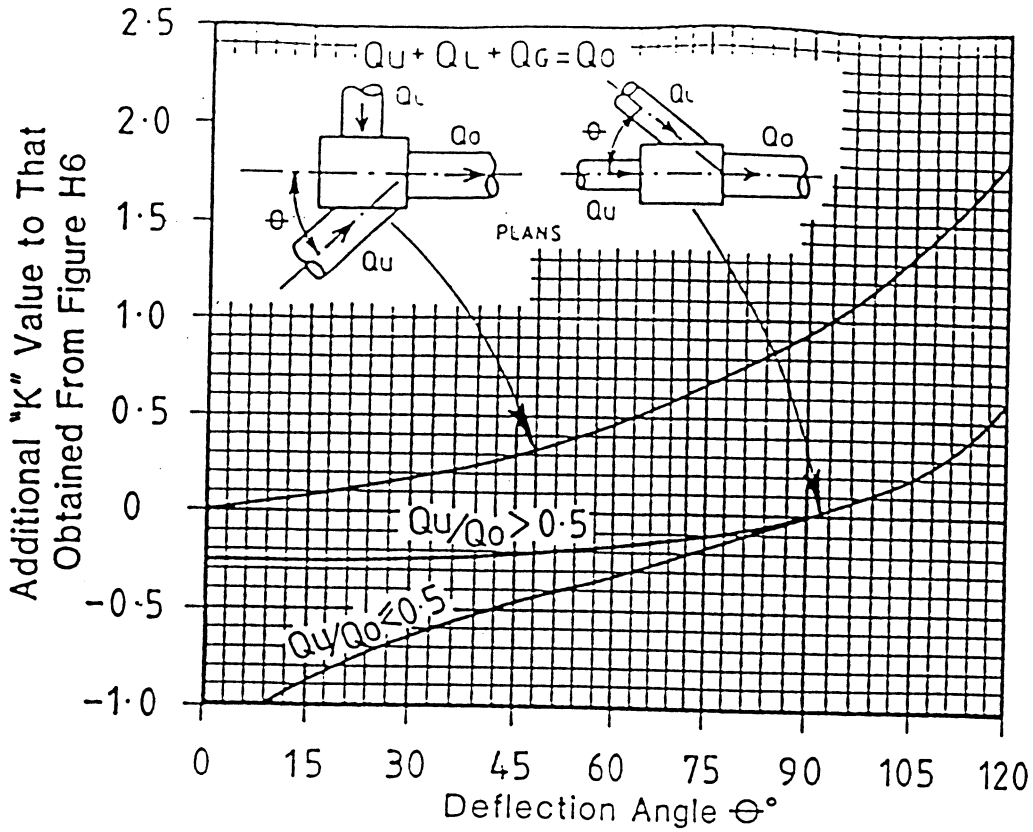


FIGURE H5: MODIFICATION OF PRESSURE HEAD CHANGE COEFFICIENTS FOR THE ANGLED JUNCTION OF THREE PIPELINES AT PITS

(FIGURES H5 & H6 EQUAL TO CHART 5 IN CIVILCAD VER.4.4, PIPE NETWORK INFORMATION DATA SCREEN)

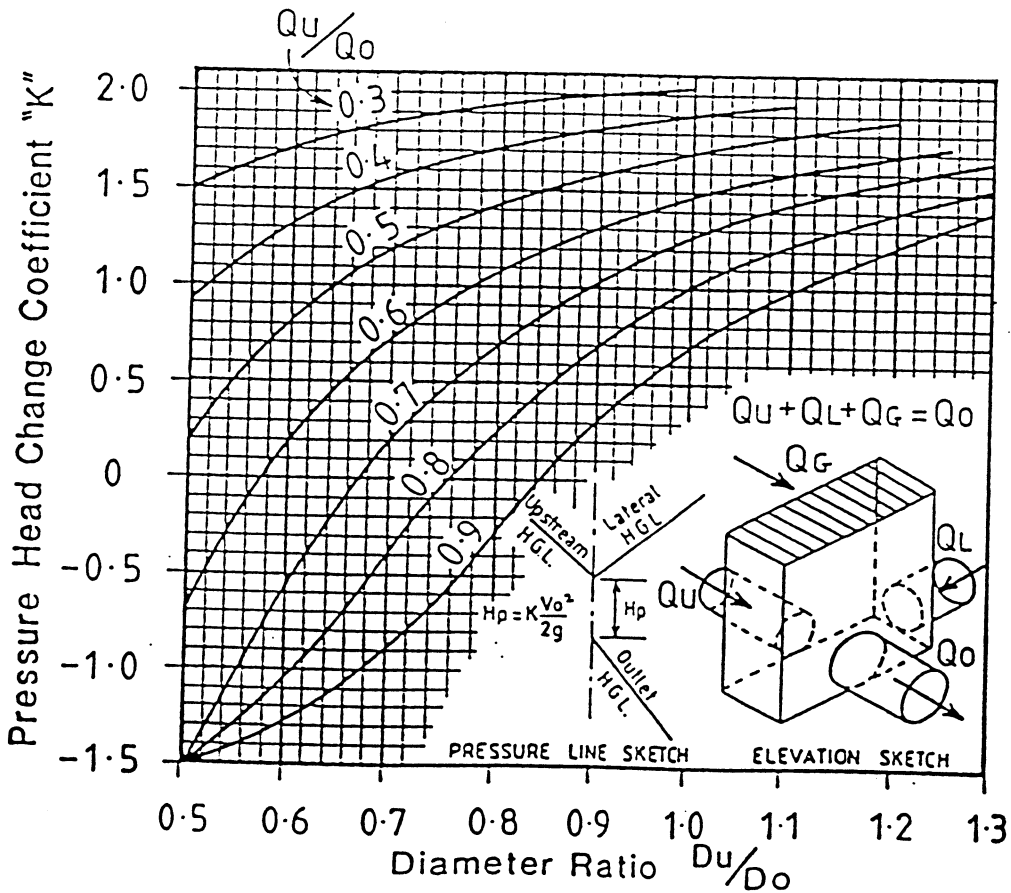


FIGURE H6: PRESSURE HEAD CHANGE COEFFICIENTS FOR THROUGH PIPELINE JUNCTION PIT WITH PERPENDICULAR LATERAL



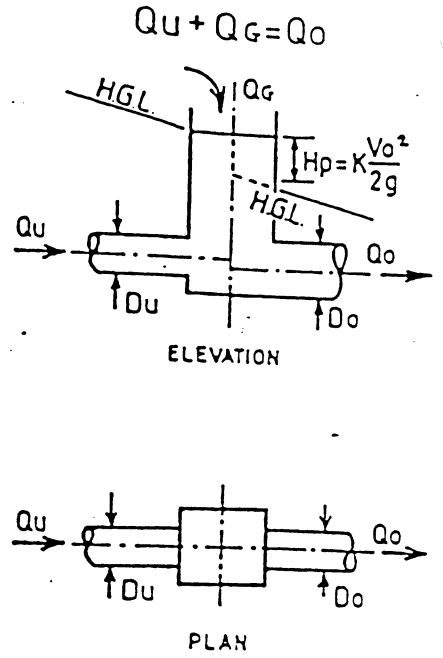
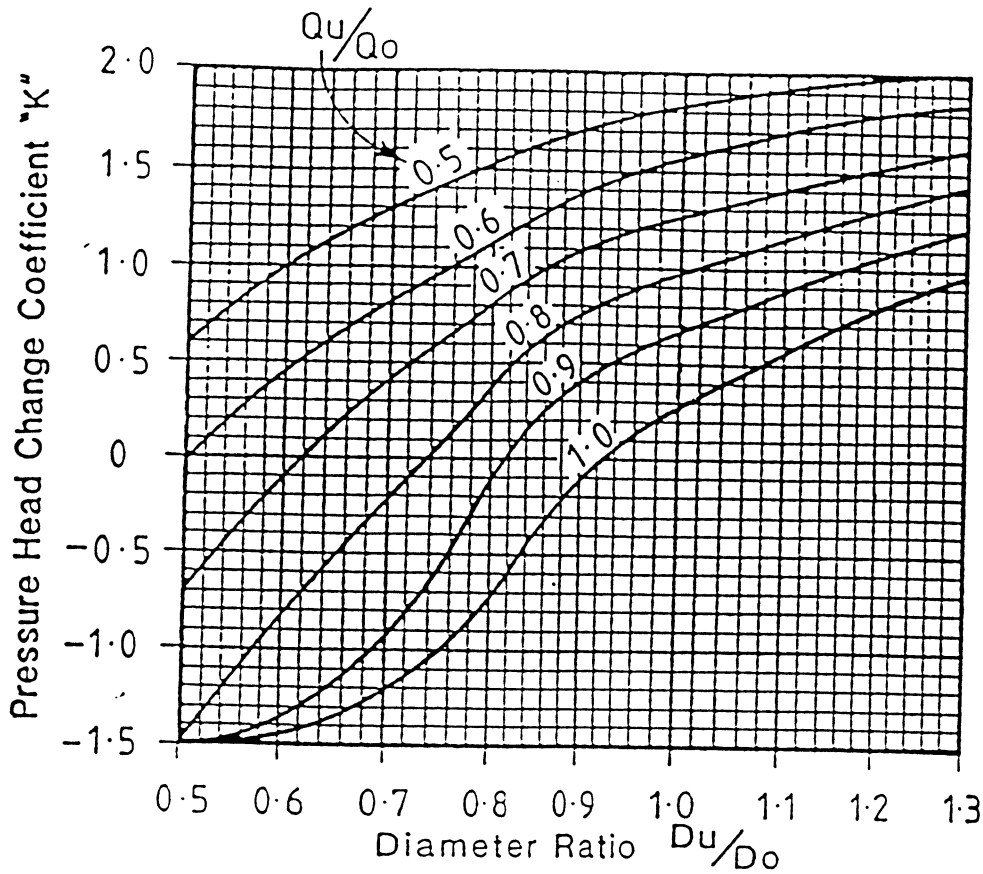


FIGURE H7 : PRESSURE HEAD CHANGE COEFFICIENTS FOR STRAIGHT THROUGH PIPELINES AT PITS

(FIGURES H7 & H8 EQUAL TO CHART 4 IN CIVILCAD VER 4.4, PIPE NETWORK INFORMATION DATA SCREEN)

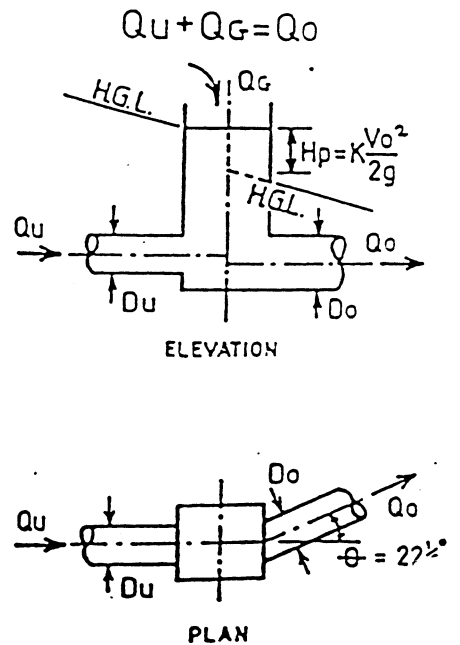
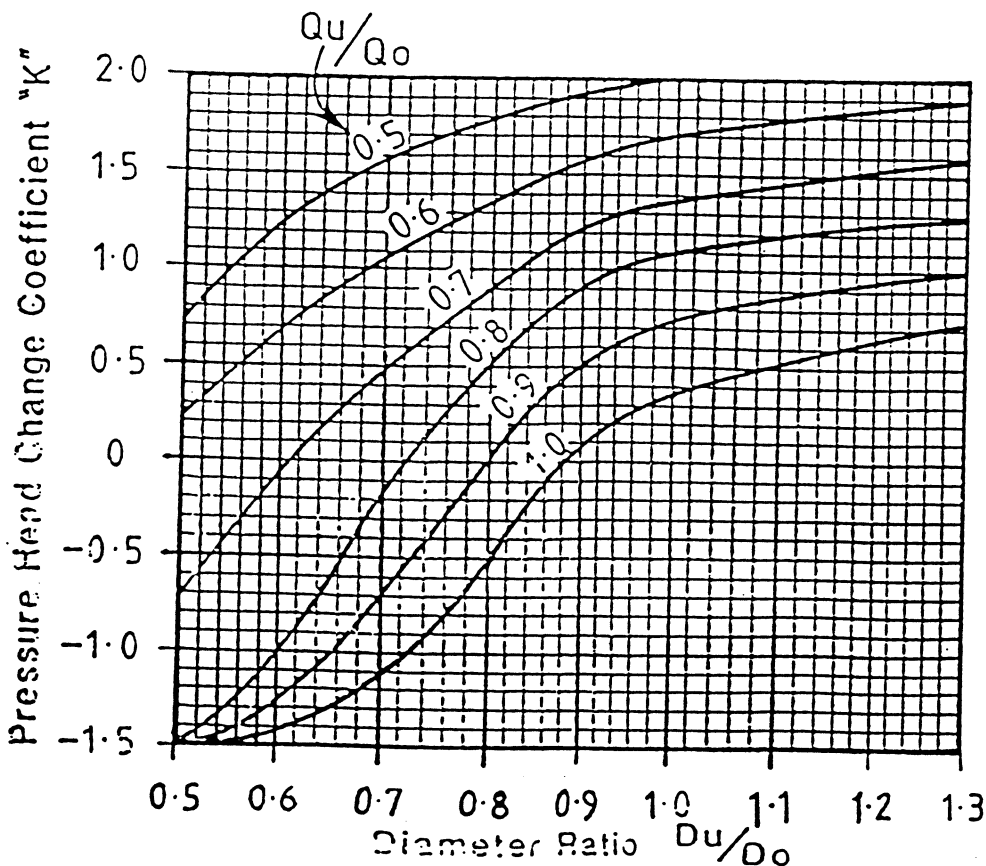


FIGURE H8 : PRESSURE HEAD CHANGE COEFFICIENTS FOR  $22\frac{1}{2}$  BENDS AT PITS

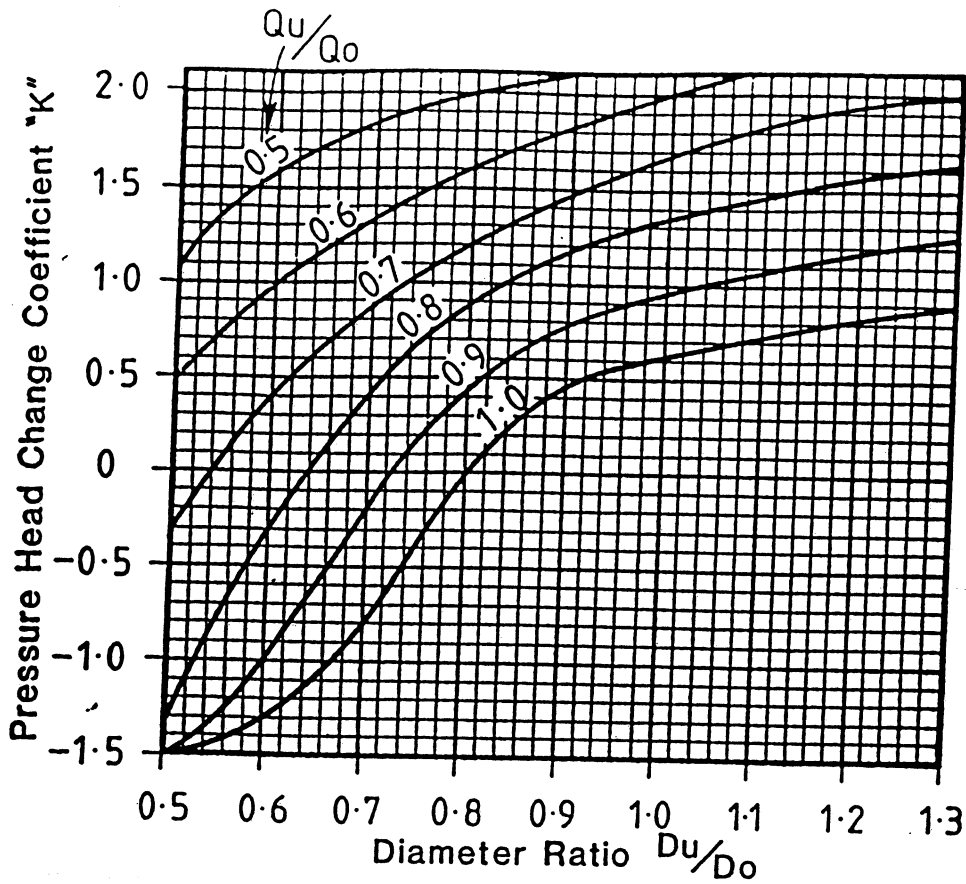


FIGURE H9 : PRESSURE HEAD CHANGE COEFFICIENTS FOR 45° BENDS AT PITS

(FIGURES H9 & H10 EQUAL TO CHART 4 IN CIVILCAD VER 4.4, PIPE NETWORK INFORMATION DATA SCREEN)

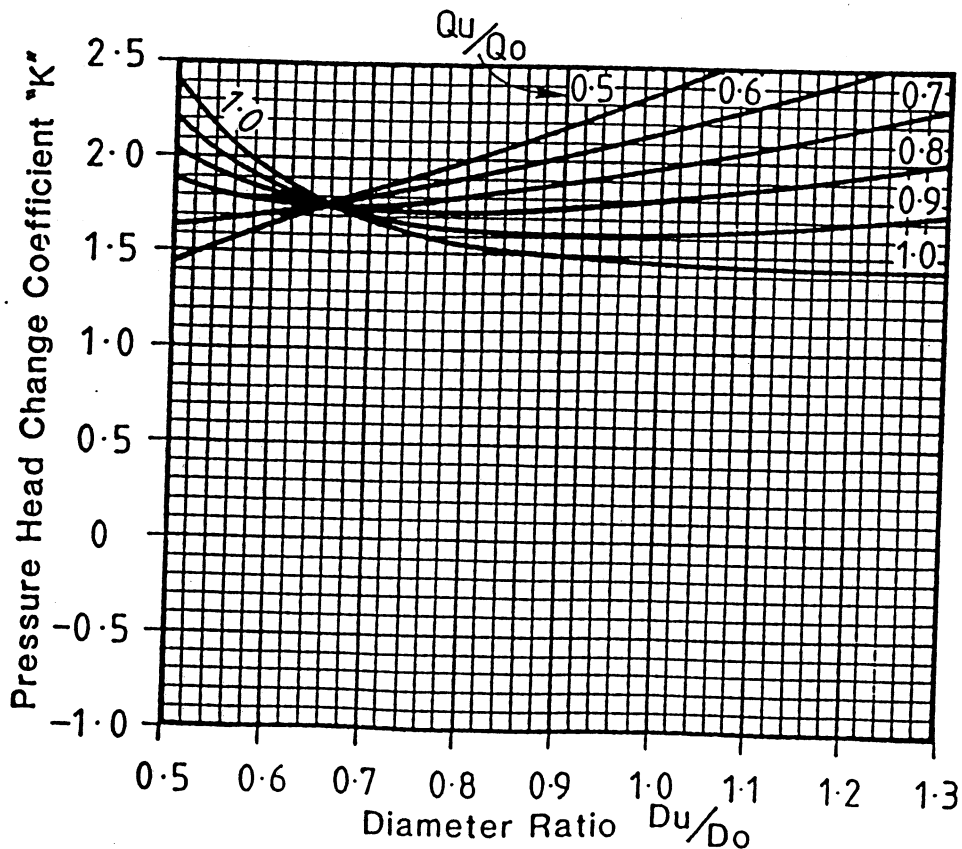


FIGURE H10 PRESSURE HEAD CHANGE COEFFICIENTS FOR 67½° BENDS AT PITS

**6**

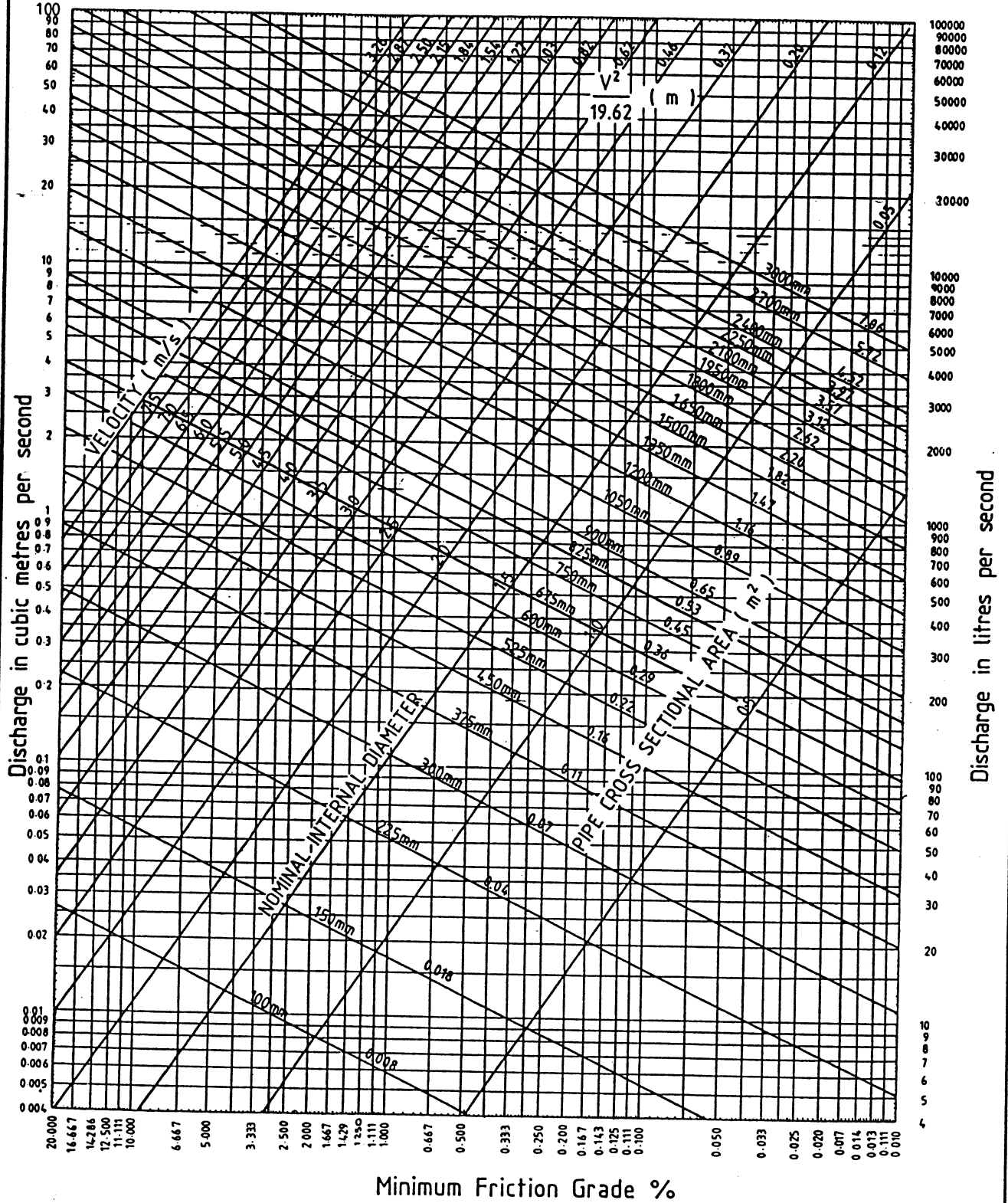
**VELOCITY/DISCHARGE DIAGRAM**

### Velocity and discharge diagram

Manning  $n = 0.012$

For circular pipes running full but not under head

Computed by  $Q = \frac{1.49}{n} AR^{2/3} S^{1/2}$



**1**  
**REQUIREMENTS FOR  
STORMWATER DETENTION DESIGN**

## PEAK DISCHARGE CONTROL – DETENTION BASIN GUIDELINES

- In circumstances where the downstream stormwater pipelines are inadequate and the costs of upgrading are excessive, the Director Engineering may determine the use of a detention basin as being applicable subject to the following design criteria. **General**
- The basin is to be designed to just overtop for the 1 in 100 year Average Recurrence Interval flow. The effect of lesser ARI events (ie 1 year, 2 year, 5 year, 10 year, 20 year, 50 year) on the basin shall also be analysed and the design adjusted accordingly to ensure there is no increase in peak discharge for those storms. **Average Recurrence Interval**
- Basins shall be analysed by a suitable computer model. A check shall be made to ensure that the basin outflows do not superimpose on downstream flood hydrographs resulting in higher flood peaks than what has been experienced prior to the construction of the basin. **Hydrology Analysis**
- The emergency spillway shall be designed to pass the 1 in 100 year Average Recurrence Interval flow and shall be capable of resisting erosion from higher velocities. The effect of the Probable Maximum Flood shall also be considered to ensure there is no likelihood of catastrophic failure which may result in the loss of life or major property damage. Basins and basin spillways shall not be upstream of residential and/or commercial and/or industrial areas without approval of the Dam Safety Committee. **Spillway**
- Low flows through the detention basin shall be by means of a low flow system. The actual form of the low flow system will be by pipeline, or concrete dish and shall be approved by the Director Engineering and shall be site specific. **Low Flow**
- The freeboard above the emergency spillway shall not be less than 0.5 metres. **Freeboard**
- Grassed internal batters shall be no steeper than 1 in 6. The minimum slope of the basin floor shall be 1%. **Batter**
- Due consideration shall be given to geotechnical aspects of the basin. Subsurface geotechnical exploration by a geotechnical engineer shall be undertaken. **Geotechnical**
- The maximum depth of a detention basin for the 1 in 100 year Average Recurrence Interval flow should be 1.2 metres. For depths greater than 1.2 metres or ponding times in excess of 2 hours the detention basin will be required to incorporate a child proof fence and other safety measures as required by GTCC Aus-Spec Design Specification. **Maximum Depth**
- Outlets must have debris and scour control along with safety fences where applicable. **Outlets**
- A typical section through the embankment wall is to be shown on engineering plans, indicating a clay core or cut off wall. **Embankments**
- Filling is to be carried out in accordance with “Australian Standard 3798 – Guidelines on Earthworks for Commercial and Residential Development”.
- A plan showing contours and all drainage structures is required, covering the entire basin site. A table showing the stage, storage discharge relationship is required. **Plans & Tables**
- This method of addressing the increase in peak discharge is similar to that for detention basin design. The method is described in Greater Taree City Council's On-Site Detention Guidelines. **Microponding/ On-site Detention**