

Handbook for Drainage Design Criteria

Information contained in this Handbook

This handbook is to be read in conjunction with Liverpool City Councils Stormwater Drainage Design specification D5 (as amended). The following information is contained in this handbook.

- 1) Design IFD Tables for two specific locations. (Appendix A)
- 2) Percentage impervious and runoff coefficients for specific locations and individual zonings. (Appendix B)
- 3) Sample Summary sheets for hydrological and hydraulic calculations. (Appendix C)
- 4) Pit Loss References. (Appendix D)
- 5) Interallotment Drainage Easement Widths. (Appendix E)
- 6) On Site Detention Policy. (Appendix F)
- 7) Standard drawings relevant to drainage works. (Appendix G)
- 8) Hazard/Safety Signage for spillway/basin works. (Appendix H)

APPENDIX A – DESIGN IFD RAINFALLS

INTENSITY - FREQUENCY - DURATION ANAL' AR&R (1987)

Site Location : Liverpool - Georges River

IFD Polynomial Coefficients *issued 18th December 2000 (Bureau of Meteorology)*

ARI	a	b	c	d	e	f	g
1	3.286	-0.5919	-0.0394	0.00708	0.001498	-0.0001236	-0.0000567
2	3.5354	-0.5901	-0.0395	0.00695	0.001584	-0.0001092	-0.0000617
5	3.7771	-0.5852	-0.0388	0.00681	0.001599	-0.0000906	-0.0000632
10	3.8936	-0.5821	-0.0390	0.00621	0.001778	-0.0000123	-0.0000820
20	4.0296	-0.5805	-0.0388	0.00639	0.001775	-0.0000305	-0.0000782
50	4.1830	-0.5779	-0.0386	0.00606	0.001848	0.0000115	-0.0000868
100	4.2850	-0.5762	-0.0384	0.00598	0.001863	0.0000222	-0.0000885

Rainfall Intensity (mm/h)

Duration Minutes	Return Period (Years)						Duration Minutes	
	1	2	5	10	20	50		100
5	86.52	110.77	140.03	156.59	178.86	207.81	229.53	5
6	81.06	103.78	131.25	146.92	167.79	195.06	215.49	6
7	76.52	97.97	123.93	138.79	158.51	184.31	203.64	7
8	72.66	93.02	117.70	131.84	150.58	175.11	193.49	8
9	69.31	88.73	112.30	125.80	143.70	167.11	184.67	9
10	66.37	84.96	107.55	120.48	137.64	160.07	176.90	10
11	63.75	81.62	103.33	115.76	132.26	153.82	170.00	11
12	61.40	78.62	99.55	111.52	127.44	148.21	163.81	12
13	59.28	75.90	96.13	107.68	123.07	143.13	158.21	13
14	57.35	73.43	93.01	104.19	119.10	138.51	153.11	14
15	55.57	71.16	90.16	101.00	115.46	134.28	148.44	15
16	53.94	69.08	87.53	98.06	112.11	130.39	144.15	16
17	52.43	67.15	85.10	95.34	109.01	126.79	140.17	17
18	51.03	65.36	82.84	92.81	106.13	123.45	136.49	18
19	49.72	63.69	80.74	90.46	103.45	120.34	133.05	19
20	48.50	62.13	78.77	88.26	100.94	117.42	129.84	20
21	47.36	60.66	76.92	86.19	98.59	114.69	126.82	21
22	46.28	59.28	75.18	84.25	96.38	112.12	123.99	22
23	45.26	57.98	73.55	82.42	94.29	109.70	121.32	23
24	44.30	56.75	72.00	80.69	92.32	107.41	118.79	24
25	43.39	55.59	70.53	79.06	90.45	105.25	116.40	25
26	42.52	54.49	69.14	77.50	88.68	103.19	114.13	26
27	41.70	53.44	67.82	76.03	87.00	101.24	111.98	27
28	40.92	52.44	66.56	74.62	85.39	99.38	109.93	28
29	40.17	51.49	65.36	73.28	83.86	97.61	107.97	29
30	39.46	50.58	64.21	72.00	82.40	95.91	106.10	30
31	38.78	49.71	63.12	70.78	81.01	94.29	104.31	31
32	38.13	48.87	62.07	69.60	79.67	92.74	102.60	32
33	37.50	48.08	61.06	68.48	78.39	91.25	100.96	33
34	36.90	47.31	60.09	67.40	77.15	89.83	99.38	34
35	36.33	46.57	59.16	66.37	75.97	88.45	97.87	35
36	35.77	45.87	58.27	65.37	74.83	87.13	96.41	36
37	35.24	45.18	57.41	64.41	73.74	85.86	95.01	37
38	34.73	44.53	56.58	63.49	72.68	84.64	93.66	38
39	34.23	43.89	55.79	62.60	71.67	83.46	92.36	39
40	33.75	43.28	55.01	61.73	70.68	82.32	91.10	40
41	33.29	42.69	54.27	60.90	69.73	81.22	89.89	41
42	32.85	42.12	53.55	60.10	68.82	80.16	88.71	42
43	32.41	41.57	52.85	59.32	67.93	79.13	87.58	43
44	32.00	41.04	52.18	58.57	67.07	78.13	86.48	44
45	31.59	40.52	51.53	57.84	66.24	77.16	85.41	45
46	31.20	40.02	50.89	57.13	65.43	76.23	84.38	46
47	30.82	39.53	50.28	56.45	64.65	75.32	83.37	47
48	30.45	39.06	49.68	55.78	63.89	74.44	82.40	48
49	30.09	38.60	49.11	55.14	63.15	73.58	81.46	49
50	29.74	38.15	48.54	54.51	62.43	72.75	80.54	50
51	29.40	37.72	48.00	53.90	61.74	71.94	79.65	51
52	29.07	37.30	47.47	53.31	61.06	71.16	78.78	52
53	28.75	36.89	46.95	52.73	60.40	70.39	77.94	53
54	28.44	36.49	46.45	52.17	59.76	69.65	77.11	54
55	28.14	36.11	45.96	51.62	59.13	68.92	76.31	55
56	27.84	35.73	45.48	51.09	58.53	68.22	75.53	56
57	27.56	35.36	45.02	50.57	57.93	67.53	74.77	57
58	27.28	35.00	44.56	50.06	57.35	66.86	74.03	58
59	27.00	34.65	44.12	49.57	56.79	66.20	73.31	59
60	26.74	34.31	43.69	49.09	56.24	65.56	72.60	60

INTENSITY - FREQUENCY - DURATION ANALYSIS AR&R (1987)

Site Location : Liverpool - Western South Creek

IFD Polynomial Coefficients *issued 18th December 2000 (Bureau of Meteorology)*

ARI	a	b	c	d	e	f	g
1	3.1237	-0.5748	-0.0174	0.00938	-0.00149	-0.0004671	0.0000782
2	3.3831	-0.5743	-0.0175	0.00914	-0.00136	-0.0004307	0.0000696
5	3.6526	-0.5732	-0.0187	0.00853	-0.00098	-0.0003327	0.0000444
10	3.7844	-0.5723	-0.0195	0.00785	-0.00068	-0.0002402	0.0000211
20	3.9335	-0.5718	-0.0197	0.00754	-0.00054	-0.0001912	0.0000097
50	4.1017	-0.5713	-0.0202	0.00712	-0.00034	-0.0001199	-0.0000074
100	4.2144	-0.5708	-0.0207	0.00679	-0.00017	-0.0000747	-0.0000191

Rainfall Intensity (mm/h)

Duration Minutes	Return Period (Years)						Duration Minutes	
	1	2	5	10	20	50		100
5	74.19	96.26	125.88	143.66	166.80	197.19	220.71	5
6	69.44	90.11	117.90	134.63	156.37	185.00	207.11	6
7	65.54	85.03	111.27	127.06	147.59	174.66	195.54	7
8	62.22	80.71	105.61	120.58	140.06	165.76	185.55	8
9	59.34	76.97	100.69	114.94	133.49	157.98	176.82	9
10	56.81	73.67	96.36	109.97	127.70	151.11	169.12	10
11	54.55	70.72	92.50	105.54	122.54	145.00	162.26	11
12	52.51	68.08	89.03	101.56	117.91	139.50	156.10	12
13	50.67	65.68	85.88	97.96	113.72	134.53	150.52	13
14	48.99	63.50	83.02	94.68	109.90	130.01	145.45	14
15	47.44	61.49	80.40	91.68	106.41	125.87	140.81	15
16	46.02	59.65	77.98	88.91	103.20	122.06	136.55	16
17	44.71	57.94	75.75	86.36	100.23	118.54	132.61	17
18	43.49	56.35	73.67	83.99	97.47	115.28	128.97	18
19	42.35	54.88	71.74	81.79	94.91	112.25	125.57	19
20	41.28	53.50	69.94	79.73	92.52	109.42	122.41	20
21	40.29	52.20	68.25	77.80	90.28	106.77	119.44	21
22	39.35	50.99	66.66	75.99	88.18	104.29	116.66	22
23	38.47	49.84	65.17	74.29	86.20	101.95	114.05	23
24	37.63	48.76	63.76	72.68	84.34	99.74	111.58	24
25	36.84	47.74	62.43	71.16	82.58	97.66	109.25	25
26	36.10	46.77	61.16	69.72	80.91	95.68	107.04	26
27	35.39	45.85	59.96	68.36	79.32	93.81	104.95	27
28	34.71	44.98	58.83	67.06	77.82	92.03	102.96	28
29	34.07	44.15	57.74	65.83	76.39	90.34	101.07	29
30	33.46	43.36	56.71	64.65	75.02	88.73	99.27	30
31	32.88	42.60	55.72	63.53	73.72	87.19	97.55	31
32	32.32	41.88	54.78	62.45	72.47	85.72	95.90	32
33	31.78	41.19	53.88	61.43	71.28	84.31	94.33	33
34	31.27	40.52	53.01	60.44	70.14	82.96	92.82	34
35	30.78	39.89	52.18	59.50	69.04	81.66	91.37	35
36	30.31	39.28	51.38	58.59	67.99	80.42	89.99	36
37	29.86	38.69	50.62	57.72	66.98	79.23	88.65	37
38	29.42	38.12	49.88	56.88	66.01	78.08	87.37	38
39	29.00	37.58	49.17	56.07	65.08	76.97	86.13	39
40	28.60	37.06	48.49	55.30	64.17	75.91	84.94	40
41	28.21	36.55	47.83	54.55	63.30	74.88	83.79	41
42	27.83	36.06	47.19	53.82	62.46	73.89	82.69	42
43	27.46	35.59	46.58	53.12	61.65	72.93	81.61	43
44	27.11	35.14	45.99	52.45	60.87	72.00	80.58	44
45	26.77	34.70	45.41	51.79	60.11	71.11	79.58	45
46	26.44	34.27	44.85	51.16	59.38	70.24	78.61	46
47	26.12	33.86	44.32	50.55	58.67	69.40	77.67	47
48	25.82	33.46	43.79	49.95	57.98	68.59	76.76	48
49	25.52	33.07	43.29	49.37	57.31	67.80	75.88	49
50	25.23	32.69	42.80	48.82	56.66	67.03	75.02	50
51	24.94	32.33	42.32	48.27	56.03	66.29	74.19	51
52	24.67	31.97	41.86	47.74	55.42	65.56	73.38	52
53	24.40	31.63	41.41	47.23	54.82	64.86	72.59	53
54	24.14	31.29	40.97	46.73	54.25	64.18	71.83	54
55	23.89	30.97	40.54	46.25	53.68	63.51	71.09	55
56	23.65	30.65	40.13	45.78	53.14	62.87	70.36	56
57	23.41	30.34	39.72	45.32	52.60	62.24	69.66	57
58	23.18	30.04	39.33	44.87	52.08	61.62	68.97	58
59	22.95	29.75	38.95	44.43	51.58	61.03	68.31	59
60	22.73	29.46	38.57	44.01	51.09	60.44	67.65	60

APPENDIX B – PERCENTAGE IMPERVIOUS AND RUNOFF COEFFICIENTS

FRACTION IMPERVIOUS VALUES

Land Use	Fraction Impervious (f)
Residential - torrens title subdivisions	0.75
Residential - medium density townhouses,villas etc	0.90
Buisness/Commercial area	1.00
Industrial areas	0.90
Road reserves	0.95
Public Recreation areas - reserves, bushland	0.50
Rural areas	site measure

**FREQUENCY FACTORS RATIONAL METHOD
RUNOFF COEFFICIENTS**

Average Recurrence Interval (ARI) - years	Frequency Factor (Fy)
1	0.80
2	0.85
5	0.95
10	1.00
20	1.05
50	1.15
100	1.20

RUNOFF COEFFICIENTS (C) FOR LIVERPOOL CITY COUNCIL

C'10= 0.420360864
C'10= 0.352823119

Georges River Catchment
Western South Creek Catchment

Georges River Catchment

Land Use	C - 5year	C - 10year	C - 20year	C - 50year	C - 100year
Residential - torrens title subdivisions	0.74	0.78	0.82	0.90	0.94
Residential - medium density townhouses,villas etc	0.81	0.85	0.89	0.98	1.00
Buisness/Commercial area	0.86	0.90	0.95	1.00	1.00
Industrial areas	0.81	0.85	0.89	0.98	1.00
Road reserves	0.83	0.88	0.92	1.00	1.00
Public Recreation areas - reserves, bushland	0.63	0.66	0.69	0.76	0.79
Rural areas	site measure	site measure	site measure	site measure	site measure

Western South Creek Catcment

Land Use	C - 5year	C - 10year	C - 20year	C - 50year	C - 100year
Residential - torrens title subdivisions	0.73	0.76	0.80	0.88	0.92
Residential - medium density townhouses,villas etc	0.80	0.85	0.89	0.97	1.00
Buisness/Commercial area	0.86	0.90	0.95	1.00	1.00
Industrial areas	0.80	0.85	0.89	0.97	1.00
Road reserves	0.83	0.87	0.92	1.00	1.00
Public Recreation areas - reserves, bushland	0.60	0.63	0.66	0.72	0.75
Rural areas	site measure	site measure	site measure	site measure	site measure

APPENDIX C – HYDROLOGICAL AND HYDRAULIC SAMPLE CALCULATION SHEETS

APPENDIX D – PIT LOSS COEFFICIENTS

Note: Council advises that all pit loss coefficients assumed are to be in accordance with the Missouri (ref 1) and Hare (ref 2) charts.

Reference 1 DEPARTMENT OF MAIN ROADS NSW (1979) "Model Analysis to determine hydraulic capacities of kerb inlets and Gully Pit Gratings"

Reference 2 HARE C "Magnitude of hydraulic losses at junctions in piped drainage systems" Conference on hydraulics in Civil Engineering, 1981. I.E.A. 12-13 Oct, 1981 Pub. 81/12

APPENDIX E – INTERALLOTMENT DRAINAGE EASEMENT WIDTHS

Interallotment Drainage Widths

In order to clarify Councils requirements in regard to Interallotment drainage Easement Widths, the following table has been prepared and will be applied in determining the appropriate easement widths:-

Maximum Pipe Cover (metres)	Easement Width (metres)	
	150mm & 225mm diameter	300mm diameter
0.6	1.2	1.5
0.75	1.5	2.0
1.0	2.0	2.5
1.25	2.5	3.0
1.5	3.0	3.5

The proposed invert levels of all pits, slope junctions and grade changes will be required to be shown on the engineering plans, either on the plan sheet or on a longitudinal section of the pipeline. Pipe lines 225mm diameter and greater will require a longitudinal section.

Depths of cover greater than 1.5m are not considered desirable within interallotment easements, and should be avoided by provision of intermediate pits where necessary. Where this is impractical, easement widths for depths of cover greater than 1.5m will be determined on an individual basis.

Council also considers that interallotment drainage is only to be provided as a means of collecting minor lot drainage to the nearest available drainage under council's control. The number of lots connected to any one interallotment line should therefore be kept to a minimum and the road drainage layout should take into account the need to intercept the lot drainage and minimise volume of flows in interallotment pipelines.

APPENDIX F – ON SITE DETENTION POLICY

[..\Guidelines and policies\onsite stormwater detention policy.doc](#)

APPENDIX G – STANDARD DRAWINGS

Relevant Standard Drawings

[..\Standard Drawings\d17_20040630172107.pdf](#)
[..\Standard Drawings\d8_20040630172023.pdf](#)
[..\Standard Drawings\d9_20040630172044.pdf](#)
[..\Standard Drawings\d20_20040630172128.pdf](#)
[..\Standard Drawings\d22_20040630172154.pdf](#)
[..\Standard Drawings\r21_20040630172240.pdf](#)
[..\Standard Drawings\r22_20040630172304.pdf](#)

APPENDIX H – HAZARD/SAFETY SIGNAGE FOR SPILLWAY/BASIN WORKS

← 450 mm →



↑ 680 mm ↓

← 450 mm →



↑
600 mm
↓