Appendix F: DRAINS Data

PIT / NODE DETAILS — Version 12

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Loss	Inflow Hydrograph	Pit is
DP A1	OnGrade	Downpipe	Downpipe		1.5	36.125		0	0	1010394.18	479691.777	No	10	1 x Ku	No	New
DP A2	OnGrade	Downpipe	Downpipe		1.5	35.641		0	0	1017316.97	487885.18	No	1	1 x Ku	No	New
Out A4	Node					28.6		0		1061340.9	459048.461		21			
Out A1	Node					28.71		0		1057247.59	440639.783		73			
Pre Dev	Node					28		0		1122707.77	468071.819		89			
Post Dev	Node					28		0		1028861.36	372477.795		93			

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Not Used	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Length(m)	id
Basin A3	32.859	0		Culvert	0.5					1019833.36	484043.349	No			53565
	33.314	2.5													
	35.314	2.5													

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%) %	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %	Gutter FlowFactor	Rainfall Multiplier
Cat A1	DP A1	0.0221	100	0	0	0	0	0	30	0	0	3	0	0	0.012	0	0	0				1
Cat A2	DP A2	0.0355	100	0	0	0	0	0	52.677	0	0	2	0	0	0.012	0	0	0				1
Cat A4	Out A4	0.6042	3	97	0	0	0	0	41	147	0	10	10	0	0.015	0.06	0	0				1
Cat Pre Dev	Pre Dev	2.108	0	100	0	0	0	0	0	184	0	0	10	0	0	0.06	0	0				1
Cat Post Dev	Post Dev	1.4472	0	100	0	0	0	0	0	184	0	0	10	0	0	0.06	0	0				1

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	Rl (m)	Chg (m)	RL (m)	etc (m)
Pipe A1	DP A1	DP A2	10.7	33.17	32.945	2.1	uPVC, not under roads, 1% minimum slope	100	105	0.03	NewFixed	1	DP A1	0	0	33.625	10.7	33.4	
Pipe A2	DP A2	Basin A3	4.6	32.945	32.859	1.87	uPVC, not under roads, 1% minimum slope	100	105	0.03	NewFixed	1	DP A2	0	0	33.4	4.6	33.314	
Pipe A3	Basin A3	Out A4	48.3	32.859	28.14	9.77	uPVC, not under roads, 1% minimum slope	100	105	0.03	NewFixed	1	Basin A3	0	0	33.314			

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg	Bottom	Height of Service	Chg	Bottom	Height of Service	Chg	Bottom	Height of Service	etc

	(m)	Elev (m)	(m)	(m)	Elev (m)	(m)	(m)	Elev (m)	(m)	etc												
CHANNEL DETAILS																						
Name	From	To	Type	Length	U/S IL	D/S IL	Slope	Base Width	L.B. Slope	R.B. Slope	Manning	Depth	Roofed									
				(m)	(m)	(m)	(%)	(m)	(1:?)	(1:?)	n	(m)										
OVERFLOW ROUTE DETAILS																						
Name	From	To	Travel	Spill	Crest	Weir	Cross	Safe Depth	SafeDepth	Safe	Bed	D/S Area		id								
			Time	Level	Length	Coeff. C	Section	Major Storms	Minor Storms	DxV	Slope	Contributing										
			(min)	(m)	(m)			(m)	(m)	(sq.m/sec)	(%)	%										
OF A1	DP A1	Out A1	1				Swale with 1:6 sideslopes	0.15	0.1	1	12.1	0		74								
OFA2	DP A2	Out A4	0.4				4 m wide pathway	0.3	0.15	0.4	13.3	0		53611								
OF A3	Basin A3	Out A4	0.33	33.314	10	1.5	4 m wide pathway	0.3	0.15	0.4	14	0		20								

Appendix F: DRAINS Major Storm Results

DRAINS results prepared 19 December, 2014 from Version 2014.12

PIT / NODE DETAILS				Version 8			
Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
DP A1	35.59		0.014		0.54	0	None
DP A2	35.19		0.022		0.45	0	None
Out A4	28.19		0.155				

SUB-CATCHMENT DETAILS							
Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat A1	0.014	0.014	0	1.24	0	0	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Cat A2	0.022	0.022	0	1.97	0	0	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Cat A4	0.147	0.01	0.139	1.51	7.48	0	AR&R 100 year, 20 minutes storm, average 122 mm/h, Zone 1
Cat Pre Dev	0.437	0	0.437	0	8.56	0	AR&R 100 year, 20 minutes storm, average 122 mm/h, Zone 1
Cat Post Dev	0.3	0	0.3	0	8.56	0	AR&R 100 year, 20 minutes storm, average 122 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.08 impervious + 4.14 pervious = 4.22 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 year, 5 minutes sto	774.56	115.00 (14.8%)	13.15 (94.6%)	101.85 (13.4%)
AR&R 100 year, 10 minutes st	1186.56	261.76 (22.1%)	20.54 (96.4%)	241.21 (20.7%)
AR&R 100 year, 15 minutes st	1480.13	367.36 (24.8%)	25.81 (97.2%)	341.55 (23.5%)
AR&R 100 year, 20 minutes st	1714.63	431.57 (25.2%)	30.02 (97.5%)	401.55 (23.8%)
AR&R 100 year, 25 minutes st	1912.52	435.88 (22.8%)	33.57 (97.8%)	402.30 (21.4%)
AR&R 100 year, 30 minutes st	2085.2	439.20 (21.1%)	36.67 (98.0%)	402.53 (19.7%)
AR&R 100 year, 45 minutes st	2506.8	562.60 (22.4%)	44.24 (98.3%)	518.37 (21.1%)
AR&R 100 year, 1 hour storm	2840.18	676.44 (23.8%)	50.22 (98.5%)	626.22 (22.5%)
AR&R 100 year, 1.5 hours sto	3365.03	775.26 (23.0%)	59.64 (98.7%)	715.62 (21.7%)
AR&R 100 year, 2 hours storm, average 44.9 mm/h, Zone 1	3782.61	958.68 (25.3%)	67.14 (98.9%)	891.54 (24.0%)
AR&R 100 year, 3 hours storm, average 35.2 mm/h, Zone 1	4449.57	1210.11 (27.2%)	79.11 (99.1%)	1131.00 (25.9%)
AR&R 100 year, 4.5 hours storm, average 27.6 mm/h, Zone 1	5231.29	1556.48 (29.8%)	93.14 (99.2%)	1463.33 (28.5%)

PIPE DETAILS					
Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Pipe A1	0.014	1.56	35.402	35.191	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Pipe A2	0.035	4.07	33.923	33.326	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Pipe A3	0.015	3.45	32.911	28.192	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q	Max V			Due to Storm
	(cu.m/s)	(m/s)			

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF A1	0	0	0	0	0	0	0	
OFA2	0	0	0	0	0	0	0	
OF A3	0.02	0.02	0	0.019	0.02	1.92	1.1	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
Basin A3	33.33	0.4	0.035	0.015	0.02

CONTINUITY CHECK for AR&R 100 year, 20 minutes storm, average 122 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
DP A1	8.75	8.75	0	0.1
DP A2	22.83	22.84	0	0
Basin A3	22.84	22.87	0	-0.2
Out A4	87.85	87.85	0	0
Out A1	0	0	0	0
Pre Dev	203.82	203.82	0	0
Post Dev	139.93	139.93	0	0

Run Log for REF run at 19:15:36 on 19/12/2014

No water upwelling from any pit. Freeboard was adequate at all pits.
Flows were safe in all overflow routes.

The following detention basins have little effect (less than 2%) in reducing peak discharge: Basin A3 You might consider upsizing these, or removing them from the model.

Appendix F: DRAINS Minor Storm Results

DRAINS results prepared 19 December, 2014 from Version 2014.12

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
DP A1	34.32		0.009		1.81	0	None
DP A2	34.14		0.014		1.5	0	None
Out A4	28.19		0.028				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat A1	0.009	0.009	0	1.47	0	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat A2	0.014	0.014	0	2.33	0	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat A4	0.022	0.006	0.018	2.67	13.22	0	AR&R 10 year, 2 hours storm, average 29.4 mm/h, Zone 1
Cat Pre Dev	0.055	0	0.055	0	15.13	0	AR&R 10 year, 2 hours storm, average 29.4 mm/h, Zone 1
Cat Post Dev	0.038	0	0.038	0	15.13	0	AR&R 10 year, 2 hours storm, average 29.4 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.08 impervious + 4.14 pervious = 4.22 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 10 year, 5 minutes stor	507.73	8.36 (1.6%)	8.36 (91.7%)	0.00 (0.0%)
AR&R 10 year, 10 minutes sto	777.12	13.19 (1.7%)	13.19 (94.6%)	0.00 (0.0%)
AR&R 10 year, 15 minutes sto	971.46	16.68 (1.7%)	16.68 (95.7%)	0.00 (0.0%)
AR&R 10 year, 20 minutes sto	1126.4	24.74 (2.2%)	19.46 (96.3%)	5.27 (0.5%)
AR&R 10 year, 25 minutes sto	1256.63	29.86 (2.4%)	21.80 (96.6%)	8.06 (0.7%)
AR&R 10 year, 30 minutes sto	1369.89	24.02 (1.8%)	23.83 (96.9%)	0.18 (0.0%)
AR&R 10 year, 45 minutes sto	1645.51	28.78 (1.7%)	28.78 (97.4%)	0.00 (0.0%)
AR&R 10 year, 1 hour storm,	1863.07	32.68 (1.8%)	32.68 (97.7%)	0.00 (0.0%)
AR&R 10 year, 1.5 hours storr	2206.16	46.56 (2.1%)	38.84 (98.1%)	7.71 (0.4%)
AR&R 10 year, 2 hours storm, average 29.4 mm/h, Zone 1	2480.26	92.53 (3.7%)	43.76 (98.3%)	48.77 (2.0%)
AR&R 10 year, 3 hours storm, average 23.1 mm/h, Zone 1	2919.32	51.64 (1.8%)	51.64 (98.6%)	0.00 (0.0%)
AR&R 10 year, 4.5 hours storm, average 18.1 mm/h, Zone 1	3434.01	60.88 (1.8%)	60.88 (98.8%)	0.00 (0.0%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Pipe A1	0.009	1.02	34.237	34.141	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Pipe A2	0.023	2.67	33.596	33.321	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Pipe A3	0.015	3.44	32.911	28.192	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1

CHANNEL DETAILS								
Name	Max Q	Max V			Due to Storm			
	(cu.m/s)	(m/s)						
OVERFLOW ROUTE DETAILS								
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF A1	0	0	0	0	0	0	0	
OFA2	0	0	0	0	0	0	0	
OF A3	0.008	0.008	0	0.013	0.01	1.33	0.95	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
DETENTION BASIN DETAILS								
Name	Max WL	MaxVol	Max Q	Max Q	Max Q			
			Total	Low Level	High Level			
Basin A3	33.32	0.4	0.023	0.015	0.008			
CONTINUITY CHECK for AR&R 10 year, 2 hours storm, average 29.4 mm/h, Zone 1								
Node	Inflow	Outflow	Storage Change	Difference				
	(cu.m)	(cu.m)	(cu.m)	%				
DP A1	12.76	12.76	0	0				
DP A2	33.28	33.28	0	0				
Basin A3	33.28	33.35	0	-0.2				
Out A4	51.55	51.55	0	0				
Out A1	0	0	0	0				
Pre Dev	24.33	24.33	0	0				
Post Dev	16.71	16.71	0	0				
Run Log for REF run at 19:19:46 on 19/12/2014								
No water upwelling from any pit. Freeboard was adequate at all pits.								
Flows were safe in all overflow routes.								
The following detention basins have little effect (less than 2%) in reducing peak discharge: Basin A3 You might consider upsizing these, or removing them from the model.								

Appendix F: DRAINS Major Storm Check HGL

Results of a simplified bottom up HGL analysis.

This provides a simple analysis that can be checked manually. It is useful where Council insists on a manual check on HGLs.

The HGLs shown here may be different to the more accurate values normally calculated by Drains.

the maximum flows and HGLs throughout the system occur at the same time. In fact, in different parts of the system, they may occur during different storms, or even at different times within the one storm, and that flow is steady.

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat A1	0.014	0.014	0	1.24	0	0	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Cat A2	0.022	0.022	0	1.97	0	0	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Cat A4	0.147	0.01	0.139	1.51	7.48	0	AR&R 100 year, 20 minutes storm, average 122 mm/h, Zone 1
Cat Pre Dev	0.437	0	0.437	0	8.56	0	AR&R 100 year, 20 minutes storm, average 122 mm/h, Zone 1
Cat Post Dev	0.3	0	0.3	0	8.56	0	AR&R 100 year, 20 minutes storm, average 122 mm/h, Zone 1

PIPE DETAILS / PIT & NODE DETAILS

Pipe	Flow (cu.m/s)	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Int. Dia (mm)	Rough (mm)	Nom.Capacity (cu.m/s)	V (m/sec)	D/S HGL (m)	Friction Loss (m)	U/S HGL (m)	Node	Headloss Coeff (Ku)	Shock Loss (m)	HGL (m)	Free-board	Overflow (cu.m/s)
													Out A4			28.192		
													Basin A3			32.911		
Pipe A2	0.035	4.6	32.945	32.859	1.87	105	0.03	0.012	4.1	32.964	0.086	33.05	DP A2	1.5	1.268	34.318	1.32	0
Pipe A1	0.014	10.7	33.17	32.945	2.1	105	0.03	0.013	1.6	34.318	0.235	34.553	DP A1	1.5	0.186	34.739	1.39	0

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF A1	0	0	0	0	0	0	0	
OFA2	0	0	0	0	0	0	0	
OF A3	0.02	0.02	0	0.019	0.02	1.92	1.1	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1

Appendix F: DRAINS Minor Storm Check HGL

Results of a simplified bottom up HGL analysis.

This provides a simple analysis that can be checked manually. It is useful where Council insists on a manual check on HGLs.

The HGLs shown here may be different to the more accurate values normally calculated by Drains.

the maximum flows and HGLs throughout the system occur at the same time. In fact, in different parts of the system, they may occur during different storms, or even at different times within the one storm, and that flow is steady.

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat A1	0.009	0.009	0	1.47	0	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat A2	0.014	0.014	0	2.33	0	0	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1
Cat A4	0.022	0.006	0.018	2.67	13.22	0	AR&R 10 year, 2 hours storm, average 29.4 mm/h, Zone 1
Cat Pre Dev	0.055	0	0.055	0	15.13	0	AR&R 10 year, 2 hours storm, average 29.4 mm/h, Zone 1
Cat Post Dev	0.038	0	0.038	0	15.13	0	AR&R 10 year, 2 hours storm, average 29.4 mm/h, Zone 1

PIPE DETAILS / PIT & NODE DETAILS

Pipe	Flow (cu.m/s)	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Int. Dia (mm)	Rough (mm)	Nom.Capacity (cu.m/s)	V (m/sec)	D/S HGL (m)	Friction Loss (m)	U/S HGL (m)	Node	Headloss Coeff (Ku)	Shock Loss (m)	HGL (m)	Free-board	Overflow (cu.m/s)
													Out A4			28.192		
													Basin A3			32.911		
Pipe A2	0.023	4.6	32.945	32.859	1.87	105	0.03	0.012	2.7	32.964	0.086	33.05	DP A2	1.5	0.545	33.595	2.05	0
Pipe A1	0.009	10.7	33.17	32.945	2.1	105	0.03	0.013	1	33.595	0.107	33.702	DP A1	1.5	0.08	33.782	2.34	0

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF A1	0	0	0	0	0	0	0	
OFA2	0	0	0	0	0	0	0	
OF A3	0.008	0.008	0	0.013	0.01	1.33	0.95	AR&R 10 year, 5 minutes storm, average 144 mm/h, Zone 1