



Ibrahim Stormwater Consultants



REF : M6194-662327

STORMWATER DESIGN CALCULATIONS

AT 32 (Unit A & B) Dudley Street

BALGOWLAH

Contents

- 1.0 Detention System Requirements**
 - 1.1 Storage-Area calcs.
 - 1.2 Data Files for Pre & Post Developed Conditions
 - 1.3 Summary of Pre & Post Developed Discharges

1.0 Detention System Requirements

1.1 Storage-Area calcs.**UNIT B****DATA:**

Site Area Assessed due to easements

Site Area = **0.0350** ha **349.55** sq.mImpervious Area Pre Development = **248.5** sqmPercentage Impervious Pre Development = **35%**Impervious Area POST Development = **161.482** sqmPercentage Impervious POST Development = **46%**Catchment directed through OSD = **130.21** sqm **121.0 %**OSD 1 Bypass Areas : Impervious **4.0** sqm **2.4 %**Pervious **161.4** sqm **97.6 %**Total **165.34** sqmArea bypassing OSD B = **54** sqmSlope of Site = **3.0 %** Time of Concentration t_c =Effective Flow Length = **45.7** m **2 min. 1:5**Hortons n = **0.1** **1 min. 1:100**FFL of house = **55.81** mRoof Gutter Level = **58.46** mInvert of Outlet = **54.68** mRaintank Pad Level = **55.65** mRaintank Height = **1.86** mFreeboard = **0.955** m**Detention 1**Volume Required **2.57** cu.mTotal Area **2.72** sq.m

Stage Storage-Discharge Relationship

Stage	Storage Area	Avg. Depth	Storage
(m)	(sq.m)	(m)	(cu.m)
56.44	0	0	0.000
56.94	2.7	0.500	1.360
57.39	2.7	0.94	2.569

Invert of pit = **56.44** mOrifice Dia. = **39** mmMax. Water Level achieved = **57.360** mStorage achieved **2.50** cu.m**Basix Allowance**Raintank Basix = **2000** LRaintank Provided = **2165** LWater Level in Tank RL for Basix = **56.44** m = orifice IL. **Depth=0.796m**Nominal tank Volume used = **5060** LTotal Tank Height = **1.860** m **TOP OF TANK.=57.51m****Overflow to ---> Kerb & Gutter**Trench Length = **3** m x **1** rows x **0.2** m wide**Detention 2**Volume Required **3.85** cu.mTotal Area **14.00** sq.m

Stage Storage-Discharge Relationship

Stage	Storage Area	Avg. Depth	Storage
(m)	(sq.m)	(m)	(cu.m)
54.75	0	0	0.000
55.20	0.4	0.000	0.000
55.25	14.0	0.017	0.240
55.50	14.0	0.28	3.850

Invert of pit = **54.75** mOrifice Dia. = **53** mmMax. Water Level achieved = **55.440** mStorage achieved **2.98** cu.m

1.2 DRAINS Data File for Pre & Post Developed Conditions

PIT / NODE DETAILS			Version 9																		
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	Part Full Shock Loss								
Pre	Node					10			0		256	-139	2								
Ground	Node					55.645			0		444	-153	8								
Level Spreader	OnGrade	Sutherland grate	Grated pit with 0.9 m x 0.9 m		1.5	55.05			0	0	618.441	-210.487	No 566686 1 x Ku								
Dummy Node	Node					54.75			0		664.978	-235.87	45								
Roof	Node					58.46			0		440	-74	9								
DETENTION BASIN DETAILS																					
Name	Elev	Surf. Area	Init Vol. (cu. m)	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Length	id						
OSD -2	54.75		0.00	0.3 Orifice		53	54.7765				571.865	-185.735	No		36990						
	55.20		0.36																		
	55.25		14.00																		
	55.50		14.00																		
OSD -1	56.44	2.7		0 Orifice		39	56.46033				558	-103	No		5						
	56.94	2.7																			
	57.39	2.7																			
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 Flow Factor
Pre Site	Pre	0.0350		35	65	0	0	0	0	45.7	45.7	0	3.0	3.0	0	0.01	0.17	0	0		
Ground -2	Ground	0.016534		2.4	97.6	0	0	0	0	25	25	0	3.0	3.0	0	0.01	0.17	0	0		
bypass-2	Level Spreader	0.0054		7.4	92.6	0	0	0	0	45.7	45.7	0	3.0	3.0	0	0.01	0.17	0	0		
Roof Area	Roof	0.013021		100	0	0	0	0	0	21	0	0	20	0	0	0.01	0	0	0		
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)	RI (m)	Chg (m)	RL (m)	etc (m)		
Pipe2	Ground	OSD -2	45	55.05	54.75	1.44	uPVC, not un	150	154	0.03	NewFixed	1	Ground		0						
Pipe4	OSD -2	Level Spreader	7	54.75	54.65	2	uPVC, not un	150	154	0.03	NewFixed	1	OSD -2		0						
Pipe5	Level Spreader	Dummy Node	5	54.65	54.55	2	uPVC, not un	225	230	0.03	New	1	Level Spreader		0						
Pipe1	Roof	OSD -1	20	56.74	56.54	1	uPVC, not un	150	154	0.03	NewFixed	1	Roof		0						
Pipe3	OSD -1	OSD -2	10	56.44	54.85	9.8	uPVC, not un	150	154	0.03	NewFixed	1	OSD -1		0						
DETAILS of SERVICES CROSSING PIPES																					
Pipe	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of : Chg (m)	Bottom Elev (m)	Height of S etc (m)													
CHANNEL DETAILS																					
Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (m)	R.B. Slope (m)	Manning	Depth (m)	Roofed								
OVERFLOW ROUTE DETAILS																					
Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Storm (m)	SafeDepth Minor Storm (m)	Safe Depth Storm (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id								
OSD Overflow	OSD -2	Level Spreader	1	55.5	3	1.7	Pathway 6 m	0.1	0.05	0.4	1	0	37044								

1.3 DRAINS Summary of Pre & Post Developed Discharges

5 YEAR

DRAINS results prepared from Version 2020.033

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Version 8		Min Freeboard (m)	Overflow (cu.m/s)	Constraint
			Max Surface	Max Pond			
			Flow Arriving Volume (cu.m/s)	Flow Arriving Volume (cu.m)			
Ground	55.25		0.003				
Level Spreader	54.71		0.001		0.34		None
Dummy Node	54.58		0				
Roof	56.87		0.005				

SUB-CATCHMENT DETAILS

Name	Max	Paved	Grassed	Paved	Grassed	Supp.	Due to Storm
	Flow Q	Max Q	Max Q	Tc	Tc	Tc	
	(cu.m/s)	(cu.m/s)	(cu.m/s)	(min)	(min)	(min)	
Pre Site	0.007		0.004	0.002	2.31	12.65	0 AR&R 5 year, 25 minutes storm, average 67 mm/h, Zone 1
Ground -2	0.003		0	0.002	1.61	8.81	0 AR&R 5 year, 25 minutes storm, average 67 mm/h, Zone 1
bypass-2	0.001		0	0.001	2.31	12.65	0 AR&R 5 year, 25 minutes storm, average 67 mm/h, Zone 1
Roof Area	0.005		0.005	0	0.62	0	0 AR&R 5 year, 5 minutes storm, average 135 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.03 impervious + 0.04 pervious = 0.07 total ha)

Storm	Total Rainfall		Total Runoff		Impervious R		Pervious Runoff	
	cu.m		cu.m (Runoff %)		cu.m (Runoff %)		cu.m (Runoff %)	
AR&R 5 year, 5 min	7.87	2.97 (37.8%)	2.67 (91.1%)	0.30 (6.1%)				
AR&R 5 year, 10 min	12.01	5.60 (46.7%)	4.21 (94.2%)	1.39 (18.4%)				
AR&R 5 year, 15 min	15.04	7.65 (50.9%)	5.34 (95.3%)	2.31 (24.5%)				
AR&R 5 year, 25 min	19.53	10.42 (53.4%)	7.02 (96.4%)	3.40 (27.8%)				
AR&R 5 year, 45 min	25.71	13.67 (53.2%)	9.32 (97.3%)	4.35 (27.0%)				
AR&R 5 year, 1 hour	29.1	15.70 (53.9%)	10.58 (97.6%)	5.11 (28.0%)				
AR&R 5 year, 1.5 hour	34.73	18.44 (53.1%)	12.68 (98.0%)	5.76 (26.4%)				
AR&R 5 year, 2 hour	39.17	20.83 (53.2%)	14.34 (98.2%)	6.49 (26.4%)				

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
Pipe2	0.003		0.15	55.253	55.226 AR&R 5 year, 2 hours storm, average 28 mm/h, Zone 1
Pipe4	0.004		0.99	54.791	54.706 AR&R 5 year, 1.5 hours storm, average 33.1 mm/h, Zone 1
Pipe5	0.005		1.23	54.682	54.583 AR&R 5 year, 1.5 hours storm, average 33.1 mm/h, Zone 1
Pipe1	0.005		0.3	56.867	56.869 AR&R 5 year, 5 minutes storm, average 135 mm/h, Zone 1
Pipe3	0.002		2.24	56.455	55.226 AR&R 5 year, 1.5 hours storm, average 33.1 mm/h, Zone 1

CHANNEL DETAILS

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

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
OSD Overflow	0	0.001	0.565	0.012	0	0.48		0.23 AR&R 5 year, 25 minutes storm, average 67 mm/h, Zone 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD -2	55.23		0.1	0.004	0.004
OSD -1	56.87		1.2	0.002	0.002

CONTINUITY CHECK for AR&R 5 year, 25 minutes storm, average 67 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage (cu.m)	Chai Difference %
Pre	5.05	5.05	0	0
Ground	1.38	1.37	0	0.7
OSD -2	4.83	5.52	0	-14.3
Level Spreader	6.01	5.91	0	1.7
Dummy Node	5.91	5.91	0	0
Roof	3.5	3.46	0	1.3
OSD -1	3.46	3.46	0.03	-0.7

Run Log for M9610 run at 13:48:32 on 26/5/2020 using version 2020.033

No water upwelling from any pit. Freeboard was adequate at all pits.

Flows were safe in all overflow routes.

100 YEAR

DRAINS results prepared from Version 2020.033

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow (cu.m/s)	Max Pond Arrival Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Ground	55.44			0.007			
Level Spreader	54.72			0.002	0.33		None
Dummy Node	54.59			0			
Roof	57.37			0.008			

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
Pre Site	0.015	0.007	0.008	1.87	10.26		0 AR&R 100 year, 25 minutes storm, average 113 mm/h, Zone 1
Ground -2	0.007	0	0.007	1.18	6.47		0 AR&R 100 year, 15 minutes storm, average 145 mm/h, Zone 1
bypass-2	0.002	0	0.002	1.87	10.26		0 AR&R 100 year, 25 minutes storm, average 113 mm/h, Zone 1
Roof Area	0.008	0.008	0	0.5	0		0 AR&R 100 year, 5 minutes storm, average 226 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.03 impervious + 0.04 pervious = 0.07 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 min	13.17	8.14 (61.8%)	4.65 (94.7%)	3.49 (42.3%)
AR&R 100 year, 10 min	20.29	13.81 (68.1%)	7.30 (96.6%)	6.51 (51.2%)
AR&R 100 year, 15 min	25.36	17.75 (70.0%)	9.19 (97.2%)	8.56 (53.8%)
AR&R 100 year, 20 min	32.94	23.25 (70.6%)	12.01 (97.9%)	11.24 (54.4%)
AR&R 100 year, 30 min	36.03	25.44 (70.6%)	13.16 (98.1%)	12.27 (54.3%)
AR&R 100 year, 1 hour	48.97	34.63 (70.7%)	17.99 (98.6%)	16.65 (54.2%)
AR&R 100 year, 1.5 hours	58.76	41.58 (70.8%)	21.64 (98.8%)	19.95 (54.1%)
AR&R 100 year, 2 hours	67.3	47.75 (71.0%)	24.82 (99.0%)	22.94 (54.3%)

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
Pipe2	0.007		0.38	55.44	55.437 AR&R 100 year, 15 minutes storm, average 145 mm/h, Zone 1
Pipe4	0.005		1.17	54.792	54.717 AR&R 100 year, 2 hours storm, average 48.1 mm/h, Zone 1
Pipe5	0.006		1.36	54.688	54.588 AR&R 100 year, 2 hours storm, average 48.1 mm/h, Zone 1
Pipe1	0.009		0.46	57.373	57.361 AR&R 100 year, 5 minutes storm, average 226 mm/h, Zone 1
Pipe3	0.003		2.52	56.458	55.437 AR&R 100 year, 2 hours storm, average 48.1 mm/h, Zone 1

CHANNEL DETAILS

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

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
OSD Overflow	0	0.002	-33046336	0.019	0.01	0.74	0.29	AR&R 100 year, 25 minutes storm, average 113 mm/h, Zone 1

DETENTION BASIN DETAILS

Name	Max WL	Max Vol	Max Q Total	Max Q Low Level	Max Q High Level
OSD -2	55.44		3	0.005	0.005
OSD -1	57.36		2.5	0.003	0.003

CONTINUITY CHECK for AR&R 100 year, 25 minutes storm, average 113 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Ch. (cu.m)	Difference %
Pre	11.44	11.44	0	0
Ground	4.35	4.34	0	0.3
OSD -2	10.18	10.5	0	-3.2
Level Spreader	11.96	11.87	0	0.7
Dummy Node	11.87	11.87	0	0
Roof	6	5.94	0	1
OSD -1	5.94	5.85	0.16	-1.1

Run Log for M9610 run at 13:46:53 on 26/5/2020 using version 2020.033

No water upwelling from any pit. Freeboard was adequate at all pits.

Flows were safe in all overflow routes.

The maximum water level in these storages exceeds the maximum elevation you specified: OSD -1.

DRAINS has extrapolated the Elevation vs Storage table to a higher Elevation. Please provide accurate values for higher elevations.

No water upwelling from any pit. Freeboard was adequate at all pits.

Flows were safe in all overflow routes.

Contents

- 1.0 Detention System Requirements**
 - 1.1 Storage-Area calcs.
 - 1.2 Data Files for Pre & Post Developed Conditions
 - 1.3 Summary of Pre & Post Developed Discharges

1.0 Detention System Requirements

1.1 Storage-Area calcs.**UNIT B****DATA:**

Site Area Assessed due to easements

Site Area = **0.0350** ha **349.55** sq.mImpervious Area Pre Development = **248.5** sqm

Percentage Impervious Pre Development = 35%

Impervious Area POST Development = **161.482** sqm

Percentage Impervious POST Development = 46%

Catchment directed through OSD = **130.21** sqm 121.0 %OSD 1 Bypass Areas : Impervious **4.0** sqm 2.4 %Pervious **161.4** sqm 97.6 %Total **165.34** sqmArea bypassing OSD B = **54** sqmSlope of Site = **3.0** % Time of Concentration t_c =Effective Flow Length = **45.7** m 2 min. 1:5Hortons n = **0.1** 1 min. 1:100FFL of house = **55.81** mRoof Gutter Level = **58.46** mInvert of Outlet = **54.68** mRaintank Pad Level = **55.65** mRaintank Height = **1.86** mFreeboard = **0.955** m**Detention 1**

Volume Required 2.57 cu.m

Total Area 2.72 sq.m

Stage Storage-Discharge Relationship

Stage	Storage Area	Avg. Depth	Storage
(m)	(sq.m)	(m)	(cu.m)
56.44	0	0	0.000
56.94	2.7	0.500	1.360
57.39	2.7	0.94	2.569

Invert of pit = 56.44 m

Orifice Dia. = **39** mm

Max. Water Level achieved = 57.360 m

Storage achieved 2.50 cu.m

Basix AllowanceRaintank Basix = **2000** LRaintank Provided = **2165** L

Water Level in Tank RL for Basix = 56.44 m = orifice IL. Depth=0.796m

Nominal tank Volume used = **5060** LTotal Tank Height = **1.860** m**Detention 2**

Volume Required 3.85 cu.m

Total Area 14.00 sq.m

Stage Storage-Discharge Relationship

Stage	Storage Area	Avg. Depth	Storage
(m)	(sq.m)	(m)	(cu.m)
54.75	0	0	0.000
55.20	0.4	0.000	0.000
55.25	14.0	0.017	0.240
55.50	14.0	0.28	3.850

Invert of pit = 54.75 m

Orifice Dia. = **53** mm

Max. Water Level achieved = 55.440 m

Storage achieved 2.98 cu.m

TOP OF TANK.=57.51m

Overflow to ---> Kerb & Gutter

Trench Length = 3 m x 1 rows x 0.2 m wide

1.2 DRAINS Data File for Pre & Post Developed Conditions

PIT / NODE DETAILS			Version 9																		
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	Part Full Shock Loss								
Pre	Node					10		0			256	-139	2								
Ground	Node					55.645		0			444	-153	8								
Level Spreader	OnGrade	Sutherland grate	Grated pit with 0.9 m x 0.9 m		1.5	55.05		0	0		618.441	-210.487	No 566686 1 x Ku								
Dummy Node	Node					54.75		0			664.978	-235.87	45								
Roof	Node					58.46		0			440	-74	9								
DETENTION BASIN DETAILS																					
Name	Elev	Surf. Area	Init Vol. (cu. m)	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Length	id						
OSD -2	54.75		0.00	0.3 Orifice		53	54.7765				571.865	-185.735	No		36990						
	55.20		0.36																		
	55.25		14.00																		
	55.50		14.00																		
OSD -1	56.44	2.7		0 Orifice		39	56.46033				558	-103	No		5						
	56.94	2.7																			
	57.39	2.7																			
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 Flow Factor
Pre Site	Pre	0.0350		35	65	0	0	0	0	45.7	45.7	0	3.0	3.0	0	0.01	0.17	0	0		
Ground -2	Ground	0.016534		2.4	97.6	0	0	0	0	25	25	0	3.0	3.0	0	0.01	0.17	0	0		
bypass-2	Level Spreader	0.0054		7.4	92.6	0	0	0	0	45.7	45.7	0	3.0	3.0	0	0.01	0.17	0	0		
Roof Area	Roof	0.013021		100	0	0	0	0	0	21	0	0	20	0	0	0.01	0	0	0		
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)	RI (m)	Chg (m)	RL (m)	etc (m)		
Pipe2	Ground	OSD -2	45	55.05	54.75	1.44	uPVC, not un	150	154	0.03	NewFixed	1	Ground		0						
Pipe4	OSD -2	Level Spreader	7	54.75	54.65	2	uPVC, not un	150	154	0.03	NewFixed	1	OSD -2		0						
Pipe5	Level Spreader	Dummy Node	5	54.65	54.55	2	uPVC, not un	225	230	0.03	New	1	Level Spreader		0						
Pipe1	Roof	OSD -1	20	56.74	56.54	1	uPVC, not un	150	154	0.03	NewFixed	1	Roof		0						
Pipe3	OSD -1	OSD -2	10	56.44	54.85	9.8	uPVC, not un	150	154	0.03	NewFixed	1	OSD -1		0						
DETAILS of SERVICES CROSSING PIPES																					
Pipe	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of : (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)
CHANNEL DETAILS																					
Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope	R.B. Slope	Manning	Depth (m)	Roofed								
OVERFLOW ROUTE DETAILS																					
Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth (m)	SafeDepth Major Storm	SafeDepth Minor Storm	SafeDepth Safe	Bed Slope (%)	D/S Area Contributing %	id							
OSD Overflow	OSD -2	Level Spreader	1	55.5	3	1.7	Pathway 6 m	0.1	0.05	0.4	1	0	37044								

1.3 DRAINS Summary of Pre & Post Developed Discharges

5 YEAR

DRAINS results prepared from Version 2020.033

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Version 8		Min Freeboard (m)	Overflow (cu.m/s)	Constraint
			Max Surface	Max Pond			
			Flow Arriving Volume (cu.m/s)	Flow Arriving Volume (cu.m)			
Ground	55.25		0.003				
Level Spreader	54.71		0.001		0.34		None
Dummy Node	54.58		0				
Roof	56.87		0.005				

SUB-CATCHMENT DETAILS

Name	Max	Paved	Grassed	Paved	Grassed	Supp.	Due to Storm
	Flow Q	Max Q	Max Q	Tc	Tc	Tc	
	(cu.m/s)	(cu.m/s)	(cu.m/s)	(min)	(min)	(min)	
Pre Site	0.007		0.004	0.002	2.31	12.65	0 AR&R 5 year, 25 minutes storm, average 67 mm/h, Zone 1
Ground -2	0.003		0	0.002	1.61	8.81	0 AR&R 5 year, 25 minutes storm, average 67 mm/h, Zone 1
bypass-2	0.001		0	0.001	2.31	12.65	0 AR&R 5 year, 25 minutes storm, average 67 mm/h, Zone 1
Roof Area	0.005		0.005	0	0.62	0	0 AR&R 5 year, 5 minutes storm, average 135 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.03 impervious + 0.04 pervious = 0.07 total ha)

Storm	Total Rainfa		Total Runoff		Impervious R		Pervious Runoff	
	cu.m		cu.m (Runoff %)		cu.m (Runoff		cu.m (Runoff %)	
AR&R 5 year, 5 minu	7.87	2.97 (37.8%)	2.67 (91.1%)	0.30 (6.1%)				
AR&R 5 year, 10 min	12.01	5.60 (46.7%)	4.21 (94.2%)	1.39 (18.4%)				
AR&R 5 year, 15 min	15.04	7.65 (50.9%)	5.34 (95.3%)	2.31 (24.5%)				
AR&R 5 year, 25 min	19.53	10.42 (53.4%)	7.02 (96.4%)	3.40 (27.8%)				
AR&R 5 year, 45 min	25.71	13.67 (53.2%)	9.32 (97.3%)	4.35 (27.0%)				
AR&R 5 year, 1 hour	29.1	15.70 (53.9%)	10.58 (97.6%)	5.11 (28.0%)				
AR&R 5 year, 1.5 hoi	34.73	18.44 (53.1%)	12.68 (98.0%)	5.76 (26.4%)				
AR&R 5 year, 2 hour:	39.17	20.83 (53.2%)	14.34 (98.2%)	6.49 (26.4%)				

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
Pipe2	0.003		0.15	55.253	55.226 AR&R 5 year, 2 hours storm, average 28 mm/h, Zone 1
Pipe4	0.004		0.99	54.791	54.706 AR&R 5 year, 1.5 hours storm, average 33.1 mm/h, Zone 1
Pipe5	0.005		1.23	54.682	54.583 AR&R 5 year, 1.5 hours storm, average 33.1 mm/h, Zone 1
Pipe1	0.005		0.3	56.867	56.869 AR&R 5 year, 5 minutes storm, average 135 mm/h, Zone 1
Pipe3	0.002		2.24	56.455	55.226 AR&R 5 year, 1.5 hours storm, average 33.1 mm/h, Zone 1

CHANNEL DETAILS

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

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
OSD Overflow	0	0.001	0.565	0.012	0	0.48		0.23 AR&R 5 year, 25 minutes storm, average 67 mm/h, Zone 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD -2	55.23		0.1	0.004	0.004
OSD -1	56.87		1.2	0.002	0.002

CONTINUITY CHECK for AR&R 5 year, 25 minutes storm, average 67 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage (cu.m)	Chai Difference %
Pre	5.05	5.05	0	0
Ground	1.38	1.37	0	0.7
OSD -2	4.83	5.52	0	-14.3
Level Spreader	6.01	5.91	0	1.7
Dummy Node	5.91	5.91	0	0
Roof	3.5	3.46	0	1.3
OSD -1	3.46	3.46	0.03	-0.7

Run Log for M9610 run at 13:48:32 on 26/5/2020 using version 2020.033

No water upwelling from any pit. Freeboard was adequate at all pits.

Flows were safe in all overflow routes.

100 YEAR

DRAINS results prepared from Version 2020.033

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow (cu.m/s)	Max Pond Arrival Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Ground	55.44			0.007			
Level Spreader	54.72			0.002	0.33		None
Dummy Node	54.59			0			
Roof	57.37			0.008			

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
Pre Site	0.015	0.007	0.008	1.87	10.26		0 AR&R 100 year, 25 minutes storm, average 113 mm/h, Zone 1
Ground -2	0.007	0	0.007	1.18	6.47		0 AR&R 100 year, 15 minutes storm, average 145 mm/h, Zone 1
bypass-2	0.002	0	0.002	1.87	10.26		0 AR&R 100 year, 25 minutes storm, average 113 mm/h, Zone 1
Roof Area	0.008	0.008	0	0.5	0		0 AR&R 100 year, 5 minutes storm, average 226 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.03 impervious + 0.04 pervious = 0.07 total ha)

Storm	Total Rainf. cu.m	Total Runoff cu.m (Runoff %)	Impervious cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 year, 5 min	13.17	8.14 (61.8%)	4.65 (94.7%)	3.49 (42.3%)
AR&R 100 year, 10 min	20.29	13.81 (68.1%)	7.30 (96.6%)	6.51 (51.2%)
AR&R 100 year, 15 min	25.36	17.75 (70.0%)	9.19 (97.2%)	8.56 (53.8%)
AR&R 100 year, 25 min	32.94	23.25 (70.6%)	12.01 (97.9%)	11.24 (54.4%)
AR&R 100 year, 30 min	36.03	25.44 (70.6%)	13.16 (98.1%)	12.27 (54.3%)
AR&R 100 year, 1 hr	48.97	34.63 (70.7%)	17.99 (98.6%)	16.65 (54.2%)
AR&R 100 year, 1.5 hr	58.76	41.58 (70.8%)	21.64 (98.8%)	19.95 (54.1%)
AR&R 100 year, 2 hr	67.3	47.75 (71.0%)	24.82 (99.0%)	22.94 (54.3%)

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
Pipe2	0.007		0.38	55.44	55.437 AR&R 100 year, 15 minutes storm, average 145 mm/h, Zone 1
Pipe4	0.005		1.17	54.792	54.717 AR&R 100 year, 2 hours storm, average 48.1 mm/h, Zone 1
Pipe5	0.006		1.36	54.688	54.588 AR&R 100 year, 2 hours storm, average 48.1 mm/h, Zone 1
Pipe1	0.009		0.46	57.373	57.361 AR&R 100 year, 5 minutes storm, average 226 mm/h, Zone 1
Pipe3	0.003		2.52	56.458	55.437 AR&R 100 year, 2 hours storm, average 48.1 mm/h, Zone 1

CHANNEL DETAILS

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

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
OSD Overflow	0	0.002	-33046336	0.019	0.01	0.74	0.29	AR&R 100 year, 25 minutes storm, average 113 mm/h, Zone 1

DETENTION BASIN DETAILS

Name	Max WL	Max Vol	Max Q Total	Max Q Low Level	Max Q High Level
OSD -2	55.44		3	0.005	0.005
OSD -1	57.36		2.5	0.003	0.003

CONTINUITY CHECK for AR&R 100 year, 25 minutes storm, average 113 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Ch: Difference (cu.m)	%
Pre	11.44	11.44	0	0
Ground	4.35	4.34	0	0.3
OSD -2	10.18	10.5	0	-3.2
Level Spreader	11.96	11.87	0	0.7
Dummy Node	11.87	11.87	0	0
Roof	6	5.94	0	1
OSD -1	5.94	5.85	0.16	-1.1

Run Log for M9610 run at 13:46:53 on 26/5/2020 using version 2020.033

No water upwelling from any pit. Freeboard was adequate at all pits.

Flows were safe in all overflow routes.

The maximum water level in these storages exceeds the maximum elevation you specified: OSD -1.

DRAINS has extrapolated the Elevation vs Storage table to a higher Elevation. Please provide accurate values for higher elevations.

No water upwelling from any pit. Freeboard was adequate at all pits.

Flows were safe in all overflow routes.