REF : B9572-402515-calcs.xls

# STORMWATER DESIGN CALCULATIONS

## AT 57 Mona Vale Road

## Mona Vale

### FOR M & N Foster

P.O. Box 400 Cherrybrook NSW 2126

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**Files On Disk**

B9572-402515-calcs.xls -DRAINS.DRN

## 1.0 Detention System Requirements

## 1.1 Storage-Area calcs.

**DATA:**

Site Area Assessed due to easements

Site Area = **0.0700** ha 700.2 sq.m

Impervious Area Pre Development = 0 sqm

Percentage Impervious Pre Development = 0%

Impervious Area POST Development = 324.68 sqm

Percentage Impervious POST Development = 46%

Catchment directed through OSD = 243.38 sqm 75.0 %

OSD Bypass Areas : Impervious 81.3 sqm 17.8 %

Pervious 375.52 sqm 82.2 %

Total 456.82 sqm

Slope of Site = 13.2 %

Effective Flow Length = 40.05 m

Hortons n= 0.1

Time of Concentration tc =

1 min. 1:5

1 min. 1:100

FFL of house = 40.81 m

Roof Gutter Level = 43.25 m

Invert of Boundary Pit= 36.9 m

Invert of Outlet= 34.9 m

**Detention A**

Volume Required 3.97 cu.m

Total Area 4.15 sq.m

Stage Storage-Discharge Relationship

| Stage | Storage Area | Avg. Depth | Storage |
|---|---|---|---|
| (m) | (sq.m) | (m) | (cu.m) |
| 41.44 | 0 | 0 | 0.000 |
| 41.92 | 4.2 | 0.479 | 1.990 |
| 42.40 | 4.2 | 0.96 | 3.970 |

Invert of pit = 41.44 m Q=d^2*sqrt(h)/0.48

Orifice Dia. = 68 mm d=sqrt((0.48*Q)/sqrt(h))

Max. Water Level achieved = 42.390 m

Storage achieved 3.93 cu.m

**Basix Allowance**

Raintank Basix = 3000 L

Raintank Provided = 3290 L

Raintank Pad Level = 40.65 m

Water Level in Tank RL for Basix = 41.44 m = orifice IL. Depth=0.79m

Total Effective Tank Required = 7222 L OK Max. WL.=42.39m

OSD Volume Available = 3970 L

Nominal tank Volume used = 7720 L

Total Tank Height = 1.860 m TOP OF TANK.=42.51m

## 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 | id | Part Full Shock Loss |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pre | Node | | | | | 10 | | 0 | | 256 | -139 | | 2 | |
| Ground | Node | | | | | 40.61 | | 0 | | 444 | -153 | | 8 | |
| N1 | Node | | | | | 37.2 | | 0 | | 571 | -185 | | 12 | |
| Outlet | Node | | | | | 35.05 | | 0 | | 617.232 | -211.091 | | 45 | |
| Roof | Node | | | | | 43.25 | | 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 L id |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OSD Basin | 41.44 | 4.1505 | 0 | Orifice | | 68 | 41.4766684 | | | 558 | -103 | No | | 5 |
| | 41.92 | 4.1505 | | | | | | | | | | | | |
| | 42.40 | 4.1505 | | | | | | | | | | | | |

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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pre Site | Pre | 0.0700 | 0 | 100 | 0 | 0 | 0 | 0 | 40.05 | 40.05 | 0 | 13.2 | 13.2 | 0 | 0.01 | 0.2 | 0 | 0 | | | |
| Bypass | Ground | 0.0457 | 17.8 | 82.2 | 0 | 0 | 0 | 0 | 40.05 | 40.05 | 0 | 13.2 | 13.2 | 0 | 0.01 | 0.2 | 0 | 0 | | | |
| Roof Area | Roof | 0.0243 | 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 (m) | Chg (m) | Rl (m) | Chg (m) | RL (m) | etc (m) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe1 | Roof | OSD Basin | 20 | 41.64 | 41.44 | 3.6 | uPVC, not un | 150 | 154 | 0.03 | NewFixed | 1 | Roof | 0 | | | | | |
| Pipe2 | Ground | N1 | 40.05 | 40.36 | 36.9 | 8 | uPVC, not un | 150 | 154 | 0.03 | New | 1 | Ground | 0 | | | | | |
| Pipe3 | OSD Basin | N1 | 10 | 41.44 | 36.9 | 66 | uPVC, not un | 150 | 154 | 0.03 | NewFixed | 1 | OSD Basi | 0 | | | | | |
| Pipe4 | N1 | Outlet | 5 | 36.9 | 34.9 | 1 | uPVC, not un | 150 | 154 | 0.03 | New | 1 | N1 | 0 | | | | | |

DETAILS of SERVICES CROSSING PIPES

| Pipe | Chg (m) | Bottom Elev (m) | Height of Ser (m) | Chg (m) | Bottom Elev (m) | Height of S (m) | Chg (m) | Bottom Elev (m) | Height of S (m) | etc |
|---|---|---|---|---|---|---|---|---|---|---|

CHANNEL DETAILS

| Name | From | To | Type | Length (m) | U/S IL (m) | D/S IL (m) | Slope (%) | Base Width (m) | L.B. Slope (1:?) | R.B. Slope (1:?) | Manning n | Depth (m) | Roofed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

## 1.3 DRAINS Summary of Pre & Post Developed Discharges

### 5 YEAR

DRAINS results prepared from Version 2020.033

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 |
|---|---|---|---|---|---|---|---|
| Ground | 40.41 | | 0.015 | | | | |
| N1 | 36.94 | | 0 | | | | |
| Outlet | 34.94 | | 0 | | | | |
| Roof | 41.96 | | 0.011 | | | | |

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 | 0.021 | 0 | 0.021 | 1.31 | 7.89 | 0 | AR&R 5 year, 30 minutes storm, average 75 mm/h, Zone 1 |
| Bypass | 0.015 | 0.003 | 0.011 | 1.31 | 7.89 | 0 | AR&R 5 year, 30 minutes storm, average 75 mm/h, Zone 1 |
| Roof Area | 0.011 | 0.011 | 0 | 0.73 | 0 | 0 | AR&R 5 year, 20 minutes storm, average 91 mm/h, Zone 1 |

Outflow Volumes for Total Catchment (0.03 impervious + 0.11 pervious = 0.14 total ha)

| Storm | Total Rainfal cu.m | Total Runoff cu.m (Runoff % | Impervious Ru cu.m (Runoff % | Pervious Runoff cu.m (Runoff %) |
|---|---|---|---|---|
| AR&R 5 year, 10 min | 28.7 | 16.59 (57.8%) | 6.32 (95.1%) | 10.27 (46.6%) |
| AR&R 5 year, 20 min | 42.47 | 26.97 (63.5%) | 9.51 (96.7%) | 17.46 (53.5%) |
| AR&R 5 year, 30 min | 52.5 | 33.70 (64.2%) | 11.84 (97.3%) | 21.86 (54.2%) |
| AR&R 5 year, 1 hour | 72.8 | 47.82 (65.7%) | 16.54 (98.1%) | 31.27 (55.9%) |
| AR&R 5 year, 2 hours | 97.16 | 63.89 (65.8%) | 22.19 (98.6%) | 41.71 (55.9%) |
| AR&R 5 year, 3 hours | 114.66 | 75.65 (66.0%) | 26.24 (98.8%) | 49.41 (56.1%) |
| AR&R 5 year, 6 hours | 151.2 | 96.43 (63.8%) | 34.71 (99.1%) | 61.72 (53.1%) |

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 | 0.015 | 3.27 | 40.408 | 36.945 | AR&R 5 year, 30 minutes storm, average 75 mm/h, Zone 1 |
| Pipe4 | 0.021 | 6.24 | 36.937 | 34.937 | AR&R 5 year, 30 minutes storm, average 75 mm/h, Zone 1 |
| Pipe1 | 0.011 | 0.58 | 41.963 | 41.915 | AR&R 5 year, 20 minutes storm, average 91 mm/h, Zone 1 |
| Pipe3 | 0.007 | 4.63 | 41.46 | 36.937 | AR&R 5 year, 30 minutes storm, average 75 mm/h, Zone 1 |

CHANNEL DETAILS

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

DETENTION BASIN DETAILS

| Name | Max WL | MaxVol | Max Q Total | Max Q Low Level | Max Q High Level |
|---|---|---|---|---|---|
| OSD Basin | 41.91 | 2 | 0.007 | 0.007 | 0 |

CONTINUITY CHECK for AR&R 5 year, 30 minutes storm, average 75 mm/h, Zone 1

| Node | Inflow (cu.m) | Outflow (cu.m) | Storage Chang (cu.m) | Difference % |
|---|---|---|---|---|
| Pre | 14.23 | 14.23 | 0 | 0 |
| Ground | 10.6 | 10.6 | 0 | 0 |
| N1 | 19.39 | 19.38 | 0 | 0.1 |
| Outlet | 19.38 | 19.38 | 0 | 0 |
| Roof | 8.87 | 8.87 | 0 | -0.1 |
| OSD Basin | 8.87 | 8.78 | 0.05 | 0.5 |

## 100 YEAR

DRAINS results prepared from Version 2020.033

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 |
|---|---|---|---|---|---|---|---|
| Ground | 40.42 | | 0.026 | | | | |
| N1 | 36.95 | | 0 | | | | |
| Outlet | 34.95 | | 0 | | | | |
| Roof | 42.47 | | 0.016 | | | | |

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 | 0.04 | 0 | 0.04 | 0.99 | 5.95 | 0 | AR&R 100 year, 20 minutes storm, average 152 mm/h, Zone 1 |
| Bypass | 0.026 | 0.005 | 0.021 | 0.99 | 5.95 | 0 | AR&R 100 year, 20 minutes storm, average 152 mm/h, Zone 1 |
| Roof Area | 0.016 | 0.016 | 0 | 0.59 | 0 | 0 | AR&R 100 year, 20 minutes storm, average 152 mm/h, Zone 1 |

Outflow Volumes for Total Catchment (0.03 impervious + 0.11 pervious = 0.14 total ha)

| Storm | Total Rainfal cu.m | Total Runoff cu.m (Runoff % | Impervious Ru cu.m (Runoff % | Pervious Runoff cu.m (Runoff %) |
|---|---|---|---|---|
| AR&R 100 year, 10 m | 47.13 | 35.08 (74.4%) | 10.60 (97.0%) | 24.49 (67.6%) |
| AR&R 100 year, 20 m | 70.93 | 55.11 (77.7%) | 16.11 (98.0%) | 39.00 (71.6%) |
| AR&R 100 year, 30 m | 88.2 | 69.17 (78.4%) | 20.11 (98.4%) | 49.06 (72.4%) |
| AR&R 100 year, 1 ho | 124.6 | 99.16 (79.6%) | 28.54 (98.9%) | 70.62 (73.8%) |
| AR&R 100 year, 2 ho | 165.2 | 131.60 (79.7%) | 37.95 (99.2%) | 93.66 (73.8%) |
| AR&R 100 year, 3 ho | 191.52 | 151.36 (79.0%) | 44.05 (99.3%) | 107.32 (72.9%) |
| AR&R 100 year, 6 ho | 248.64 | 190.74 (76.7%) | 57.28 (99.4%) | 133.46 (69.9%) |

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 | 0.026 | 3.7 | 40.425 | 36.962 | AR&R 100 year, 20 minutes storm, average 152 mm/h, Zone 1 |
| Pipe4 | 0.034 | 7.14 | 36.947 | 34.947 | AR&R 100 year, 30 minutes storm, average 126 mm/h, Zone 1 |
| Pipe1 | 0.017 | 0.89 | 42.47 | 42.389 | AR&R 100 year, 20 minutes storm, average 152 mm/h, Zone 1 |
| Pipe3 | 0.009 | 5.14 | 41.464 | 36.947 | AR&R 100 year, 1 hour storm, average 89 mm/h, Zone 1 |

CHANNEL DETAILS

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

DETENTION BASIN DETAILS

| Name | Max WL | MaxVol | Max Q Total | Max Q Low Level | Max Q High Level |
|---|---|---|---|---|---|
| OSD Basin | 42.39 | 3.9 | 0.009 | 0.009 | 0 |

CONTINUITY CHECK for AR&R 100 year, 20 minutes storm, average 152 mm/h, Zone 1

| Node | Inflow (cu.m) | Outflow (cu.m) | Storage Chang (cu.m) | Difference % |
|---|---|---|---|---|
| Pre | 25.38 | 25.38 | 0 | 0 |
| Ground | 17.66 | 17.66 | 0 | 0 |
| N1 | 29.48 | 29.45 | 0 | 0.1 |
| Outlet | 29.45 | 29.45 | 0 | 0 |
| Roof | 12.07 | 12.06 | 0 | 0.1 |
| OSD Basin | 12.06 | 11.82 | 0.04 | 1.6 |