Internal Catchments

- High Bay & Circulation Road

Catchment = 2.105 ha
tc = 9.5 mins

ARI	INTENSITY (mm/h)	C_I MULTIPLIER	Q_{tc} (m^3/s)
10	124.0 (AR&R)	1.00	0.725
5	112.5 (AR&R)	0.95	0.625
2	88.6 (AR&R)	0.85	0.440
1	69.4 (AR&R)	0.8	0.325
0.5 (6 month)	53.2 (extrapolated)	0.74 (extrapolated)	0.230
0.25 (3 month)	35.2 (extraplolated)	0.68 (extrapolated)	0.140

1 year flow is 0.325 m^3/s thus use ECOSOL unit RSF 4600

- Truck Loading Dock

Catchment = 0.4809 ha
Use t_c = 6 mins

ARI	INTENSITY (mm/h)	C_I MULTIPLIER	Q_{tc} (m^3/s)
10	147.1 (AR&R)	1.00	0.197
5	132.0 (AR&R)	0.95	0.168
2	105.2 (AR&R)	0.85	0.119
1	82.5 (AR&R)	0.8	0.088
0.5 (6 month)	62.5 (extrapolated)	0.74 (extrapolated)	0.062
0.25 (3 month)	41.5 (extraplolated)	0.68 (extrapolated)	0.038

1 year flow is 0.088 m^3/s thus use ECOSOL unit RSF 4300

- Car park Area

Catchment = 1.096 ha
Use t_c = 6 mins

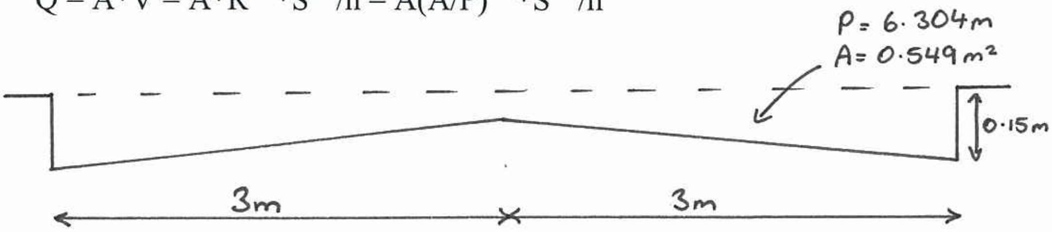
ARI	INTENSITY (mm/h)	C_I MULTIPLIER	Q_{tc} (m^3/s)
10	147.1 (AR&R)	1.00	0.448
5	132.0 (AR&R)	0.95	0.382
2	105.2 (AR&R)	0.85	0.272
1	82.5 (AR&R)	0.8	0.201
0.5 (6 month)	62.5 (extrapolated)	0.74 (extrapolated)	0.141
0.25 (3 month)	41.5 (extraplolated)	0.68 (extrapolated)	0.086

1 year flow is 0.201 m^3/s thus use ECOSOL unit RSF 4600

Determing t_c

Gutter Flow

$Q = A*V = A*R^{2/3}*S^{1/2}/n = A(A/P)^{2/3}*S^{1/2}/n$



a. L = 102 metres

Q = $0.549\ (0.549 / 6.304)^{2/3} * 0.026^{1/2} / 0.013$
= 1.338 m3/s

Q = A * V

V = Q / A
= 1.338 / 0.549
= 2.437 m/s

t = 102 / 2.437
= 41.855 secs (0.698 mins)

b. L = 90 metres

Q = $0.549\ (0.549 / 6.304)^{2/3} * 0.022^{1/2} / 0.013$
= 1.231 m3/s

V = 1.231 / 0.549
= 2.242 m/s

t = 90 / 2.242
= 40.143 secs (0.669 mins)

c. L = 80 metres

Q = $0.549\ (0.549 / 6.304)^{2/3} * 0.039^{1/2} / 0.013$
= 1.639 m3/s

V = 1.639 / 0.549
= 2.985 m/s

t = 90 / 2.985
= 26.801 secs (0.447 mins)

d. L = 120 metres

Q = $0.125 (0.125 / 1.824)^{2/3} * 0.025^{1/2} / 0.013$
= 0.255 m3/s

V = 0.255 / 0.125
= 2.04 m/s

t = 120 / 2.04
= 58.824 secs (0.980 mins)

e. L = 190 metres

Q = $0.125 (0.125 / 1.824)^{2/3} * 0.034^{1/2} / 0.013$
= 0.298 m3/s

V = 0.298 / 0.125
= 2.384 m/s

t = 190 / 2.384
= 79.698 secs (1.328 mins)

f. L = 80 metres

Q = $0.125 (0.125 / 1.824)^{2/3} * 0.008^{1/2} / 0.013$
= 0.144 m3/s

V = 0.144 / 0.125
= 1.152 m/s

t = 80 / 1.152
= 69.444 secs (1.157 mins)

g. L = 25 metres

$$Q = 0.09\ (0.09 / 6)^{2/3} * 0.03^{1/2} / 0.013$$
$$= 0.073 \text{ m3/s}$$

$$V = 0.073 / 0.09$$
$$= 0.811 \text{ m/s}$$

$$t = 25 / 0.811$$
$$= 30.826 \text{ secs} \quad (0.514 \text{ mins})$$

h. L = 40 metres

$$Q = 0.125\ (0.125 / 1.824)^{2/3} * 0.02^{1/2} / 0.013$$
$$= 0.228 \text{ m3/s}$$

$$V = 0.228 / 0.125$$
$$= 1.824 \text{ m/s}$$

$$t = 40 / 1.824$$
$$= 21.93 \text{ secs} \quad (0.365 \text{ mins})$$

Top housing lot t = 10 mins

$$\therefore t_{total} = 0.698 + 0.669 + 0.447 + 0.98 + 1.328 + 1.157 + 0.514 + 0.365 + 10$$
$$= 16.158 \text{ mins} \quad \text{(use 16.2 minutes)}$$

Storms & Flows for external Catchments

A	=	14.5 ha	(0.145 km^2)
t_c	=	16.158 mins	

$Q = 0.278 * CIA$

${}^{Y}I_D = {}^{Y}P$ [$\text{antilog}_{10} (X_D + {}^{Y}K * S_D)$]

- **2 yr ARI**

$${}^{2}I_{6m} = 105.215$$
$${}^{2}I_{1} = 35.001$$

$${}^{2}I_{10m} = {}^{2}I_{6m} ({}^{2}I_{1} / {}^{2}I_{6m})^{0.181}$$
$$= 105.215 (35.001 / 105.215)^{0.181}$$
$$= 86.211 \text{ mm/h}$$

$${}^{2}I_{20m} = {}^{2}I_{6m} ({}^{2}I_{1} / {}^{2}I_{6m})^{0.467}$$
$$= 105.215 (35.001 / 105.215)^{0.467}$$
$$= 62.929 \text{ mm/h}$$

For ${}^{2}I_{16.158}$ use linear interpolation

$${}^{2}I_{tc} = 71.874 \text{ mm/h}$$

- **5 yr ARI**

$${}^{5}I_{6m} = 132.019$$
$${}^{5}I_{1} = 47.477$$

$${}^{5}I_{10m} = {}^{5}I_{6m} ({}^{5}I_{1} / {}^{5}I_{6m})^{0.181}$$
$$= 132.019 (47.477 / 132.019)^{0.181}$$
$$= 109.697 \text{ mm/h}$$

$${}^{5}I_{20m} = {}^{5}I_{6m} ({}^{5}I_{1} / {}^{5}I_{6m})^{0.467}$$
$$= 132.019 (47.447 / 132.019)^{0.467}$$
$$= 81.863 \text{ mm/h}$$

For ${}^{5}I_{16.158}$ use linear interpolation

$${}^{5}I_{tc} = 92.557 \text{ mm/h}$$

- **10 yr ARI**

$${}^{10}I_{6m} = 147.112$$
$${}^{10}I_{1} = 49.228$$

$${}^{10}I_{10m} = {}^{10}I_{6m} ({}^{10}I_{1} / {}^{10}I_{6m})^{0.181}$$
$$= 147.112 (49.228 / 147.112)^{0.181}$$
$$= 120.669 \text{ mm/h}$$

$^{10}I_{20m}$ = $^{10}I_{6m}$ ($^{10}I_1$ / $^{10}I_{6m}$)$^{0.467}$
= 147.112 (49.228 / 147.112)$^{0.467}$
= 88.231 mm/h

For $^{10}I_{16.158}$ use linear interpolation
$^{10}I_{tc}$ = 100.694 mm/h

- **20 yr ARI**

$^{20}I_{6m}$ = 167.479
$^{20}I_1$ = 56.137

$^{20}I_{10m}$ = $^{20}I_{6m}$ ($^{20}I_1$ / $^{20}I_{6m}$)$^{0.181}$
= 167.479 (56.137 / 167.479)$^{0.181}$
= 137.416 mm/h

$^{20}I_{20m}$ = $^{20}I_{6m}$ ($^{20}I_1$ / $^{20}I_{6m}$)$^{0.467}$
= 167.479 (56.137 / 167.479)$^{0.467}$
= 100.524 mm/h

For $^{20}I_{16.158}$ use linear interpolation
$^{20}I_{tc}$ = 114.698 mm/h

- **50 yr ARI**

$^{50}I_{6m}$ = 193.786
$^{50}I_1$ = 65.078

$^{50}I_{10m}$ = $^{50}I_{6m}$ ($^{50}I_1$ / $^{50}I_{6m}$)$^{0.181}$
= 193.786 (65.078 / 193.786)$^{0.181}$
= 159.055 mm/h

$^{50}I_{20m}$ = $^{50}I_{6m}$ ($^{50}I_1$ / $^{50}I_{6m}$)$^{0.467}$
= 193.786 (65.078 / 193.786)$^{0.467}$
= 116.417 mm/h

For $^{50}I_{16.158}$ use linear interpolation
$^{50}I_{tc}$ = 132.799 mm/h

- **100 yr ARI**

$^{100}I_{6m}$ = 213.588
$^{100}I_1$ = 71.817

$^{100}I_{10m}$ = $^{100}I_{6m}$ ($^{100}I_1$ / $^{100}I_{6m}$)$^{0.181}$
= 213.588 (71.817 / 213.588)$^{0.181}$
= 175.348 mm/h

$^{100}I_{20m}$ = $^{100}I_{6m}$ ($^{100}I_1$ / $^{100}I_{6m}$)$^{0.467}$
= 213.588 (71.817 / 213.588)$^{0.467}$

= 128.387 mm/h

For ${}^{100}I_{16.158}$ use linear interpolation

${}^{100}I_{tc}$ = 146.429 mm/h

AR1 (yrs)	I_{tc} (mm/h)
2	71.9
5	92.6
10	100.7
20	114.7
50	132.8
100	146.4

$Q = 0.278 * CIA$

$C_{10} = (0.9 * f) + C'_{10} (1 - F)$

f = 0.678 (from detailed catchment study)

$C'_{10} = 0.1 + 0.0133 ({}^{10}I_1 - 25)$
$= 0.1 + 0.0133 (49.228 - 25)$
$= 0.422$

$C_{10} = (0.9 * 0.678) + 0.422 (1 - 0.678)$
$= 0.746$

For ${}^{1}I_{tc}$

$FF_1 = 0.62$

$\therefore C_1 = 0.62 * 0.746$
$= 0.463$

$\therefore Q_1 = 0.278 * 0.463 * 56.323 * 0.145$
$= 1.051\ m^3/s$

For ${}^{2}I_{tc}$

$FF_2 = 0.74$

$\therefore C_2 = 0.74 * 0.746$
$= 0.552$

$\therefore Q_2 = 0.278 * 0.552 * 71.874 * 0.145$
$= 1.599\ m^3/s$

For ${}^{5}I_{tc}$

$FF_5 = 0.88$

$\therefore C_5 = 0.88 * 0.746$
$= 0.656$

$\therefore Q_5$ = $0.278 * 0.656 * 92.557 * 0.145$
= $2.448 \ m^3/s$

For $^{10}I_{tc}$
FF_{10} = 1.00

$\therefore C_{10}$ = $1.00 * 0.746$
= 0.746

$\therefore Q_{10}$ = $0.278 * 0.746 * 100.694 * 0.145$
= $3.028 \ m^3/s$

For $^{20}I_{tc}$
FF_{20} = 1.12

$\therefore C_{20}$ = $1.12 * 0.746$
= 0.836

$\therefore Q_{20}$ = $0.278 * 0.836 * 114.698 * 0.145$
= $3.865 \ m^3/s$

For $^{50}I_{tc}$
FF_{50} = $1.99 - (0.366 * 15.995) / 7.5$
= 1.209

$\therefore C_{50}$ = $1.209 * 0.746$
= 0.902

$\therefore Q_{50}$ = $0.278 * 0.902 * 132.799 * 0.145$
= $4.829 \ m^3/s$

For $^{100}I_{tc}$
FF_{100} = $2.57 - (0.588 * 15.995) / 7.5$
= 1.316

$\therefore C_{100}$ = $1.316 * 0.746$
= 0.982

$\therefore Q_{100}$ = $0.278 * 0.982 * 146.429 * 0.145$
= $5.796 \ m^3/s$

ARI (yrs)	**I_{tc} (mm/h)**	**Q_{tc} (m^3/s)**
1	56.3	1.05
2	71.9	1.60
5	92.6	2.45
10	100.7	3.03
20	114.7	3.87
50	132.8	4.83
100	146.5	5.80

I Standard Worksheets

I1 Site Data Sheet

Site Name: Coca Cola Amatil, Northmead

Site Number: ______

Site Location: Briens Road

Precinct: Eastern Area

Description of Site: ______

Catchment Area (ha): 2·96 Disturbed Area (ha): 2·96

Topographic Position: ______

Soil Loss Class: ______ (Appendix C)

Soil Hydrologic Group: ______ (Appendix F)

Soil Texture Group: ______ (Section 6.3.1)

Percent of whole subsoil dispersible: ______ (Section 6.3.1)

5 Day 75th percentile Rainfall Event: 20·6 mm (Section 6.3.3)

Peak Flow Runoff Coefficient (C_{10}): ______ (AR&R)

Volumetric Runoff Coefficient (C_v): 0·6 (Appendix F)

Rainfall Erosivity (*R*-factor): 2500 (Appendix A)

Table I1 RUSLE Values

Site/soil/water characteristic	Value	Comments
rainfall erosivity (*R*-factor)	2500	
soil erodibility (*K*-factor)	0·038	
length/gradient (*LS*-factor)	2	Slope length = metres; slope gradient = %
erosion control practice (*P*-factor)	1·3	
ground cover (*C*-factor)	1	

A10

I4 Sediment Basin Volume - *Type F & D* Soils

Basin Volume = Settling Zone Volume + Sediment Storage Zone Volume

The settling zone volume for Type F & D Soils is calculated to provide capacity to contain all runoff expected from up to the 75th percentile rainfall event. The settling zone volume (*V*) can be determined by the following equation:

$$V = 10 \;.\; C_V \;.\; A \;.\; R_{75th\ ile,\ 5\ day}\ (m^3)$$

where:

		Description	Value
10	=	a unit conversion factor	10
C_V	=	the volumetric runoff coefficient, defined as that portion of rainfall that runs off as stormwater over the 5-day period	0.6
R	=	is the 5-day total rainfall depth (mm) which is not exceeded in 75 percent of rainfall events. (See table in Section 6.3.3)	20.6
A	=	area of catchment in hectares (ha)	2.96

$V = 10 \times C_V \times A \times R_{75th\ ile,\ 5\ day}$

$V = 10 \times 0.6 \times 20.6 \times 2.96$

$V = 365.9\ m^3$

Therefore the settling zone volume for Type F & D Soils is V = 366 m^3

Total Basin Volume = Settling Zone Volume + Sediment Storage Zone Volume

The Sediment Storage Zone Volume for Type F & D Soils has been stipulated as 50 per cent of the Settling Zone Volume (Section 6.3.3) for soils that are not highly erodible. For highly erodible soils the sediment storage zone volume should be determined more precisely using the RUSLE outlined in Worksheet I5. Therefore;

= V + 50%V

= 366 + 183

= 549 m^3

A11