

PROJECT:

RAIN FOREST CARWASH

STORMWATER RUN-OFF CALCULATIONS

Formulas used:

[1] RATIONAL METHOD: $Q=Aci$

where: Q= Peak discharge of watershed in cubic feet per second (cfs) due to maximum storm assumed.
 A= Area of watershed in acres.
 c= Coefficient of run-off [2].
 i= Intensity of rainfall in inches per hour based on concentration time. [3]

$$[4] TC = \frac{(L^{0.8} (\frac{1000}{c} - 9)^{0.7})}{(1140(s^{0.5}))}$$

where: TC= Time of concentration= time required for rain falling at most remote point to reach discharge point.
 c= Site run-off coefficient based on conditions shown.
 s= Percent slope of overland flow.

AREA OF WORK – PRIOR DEVELOPMENT

25 Year Frequency

 $Q_1 = Aci$

Watertight Surfaces		0	sqft =	0.000	Acres
c(1) =	0.9				
Gravel Surface		0	sqft =	0.000	Acres
c(2) =	0.25				
Green Space		37154	sqft =	0.853	Acres
c(3) =	0.1				
Summary		37154	sqft =	0.853	Acres
c =	0.10				

Duration (D) = Time of concentration (TC)

where L = 263 run-off length ft Elev diff = 1.9
 c = 0.10 run-off coef
 S = 0.7224 percent slope
 therefore TC = D = 40.57 minutes
 Expected Rainfall Intensity i = 3.50 in/hr

 $Q_1 = 0.299 \text{ cfs}$

10% retention= 0.030 cfs

AREA OF WORK - POST DEVELOPMENT

25 Year Frequency

 $Q_2 = Aci$

Watertight Surfaces		26549	sqft =	0.609	Acres
c(1) =	0.9				
Gravel Surface		0	sqft =	0.000	Acres
c(2) =	0.25				
Green Space		10605	sqft =	0.243	
c(3) =	0.1				
Summary		37154	sqft =	0.853	Acres
c =	0.67				

D = Time of concentration (TC)

where L = 200 Runoff length ft Elev diff = 5
 c = 0.67 Runoff coef
 S = 2.5000 Percent Slope
 therefore TC = D = 15.92 minutes
 Expected Rainfall Intensity i = 3.50 in/hr

 $Q_2 = 2.005 \text{ cfs}$

Total Retention Required

 $Q_2 - Q_1 + 10\% = 1.736 \text{ cfs}$ **RESULTS**

DETENTION REQUIRED	1.736	cfs
ONE HOUR DETENTION	6251.0	cuft
DETENTION DIMENSIONS		
WIDTH	100	feet
LENGTH	163	feet
DEPTH	0.38	feet

DISCHARGE END AREA REQUIREMENTS

25 Year Frequency

Area requirements for pipe servicing On-Site Retention Pond

$$[5] A = \frac{Q}{(c\sqrt{2gh})}$$

where: A= Discharge Area required
 g= Acceleration of gravity
 c= Discharge coefficient
 h= Hydraulic head
 Q= Flow volume from run-off

Pipe Servicing Offsite Drainage

Q = 1.736 cfs H = 1.00 feet
 c = 0.62 coefficient A = 0.35 sqft
 g = 32.16 ft/ft/sec

REQUIRED CONDUIT =

8.00 inch diameter

Use 6" Orifice

References:

- Chen, W.F. The Civil Engineering Handbook. 1995. Eq.# 31.1, pg. 1036
- Seelye, Elwyn E. Data Book for Civil Engineers. Vol.1 1960. Tbl. B, pg. 18-02
- Seelye, Elwyn E. Data Book for Civil Engineers. Vol.1 1960. Fig.B, pg. 18-01
- Chen, W.F. The Civil Engineering Handbook. 1995. Tbl. 31.2 Regan Equation ($n=0.013$)
- Chen, W.F. The Civil Engineering Handbook. 1995. Eq.# 28.32, pg. 969