STORM DRAINAGE ANALYSIS - 100 YEAR EVENT

Stagecoach Subdivision

Detention Area #1

Weber County, Utah

29 December 2021

1. Drainage Areas:

Drainage Area #1 -	1.5000 acres	Paving & Impervious Areas
Drainage Area #2 -	0.0000 acres	Building - Roof Areas
Drainage Area #3 -	10.5700 acres	Landscaping Areas
Total Area =	**12.070 acres**	**Drainage Area - Site Detention Area**

Drainage Area Slope = 0.5 % (Per the Developer's Contour Map)

Study Area Overview:

The Study Area is to be developed as a Residential Subdivision

2. Coefficient of Run-off:

The composite coefficient of runoff "C" was developed using design by "Seelye 18-01" and Mark J. Hammer "Water and Waste Water Technology" is as follows:

Drainage Area #1 - Paving & Impervious Areas	**C = 0.90**
Drainage Area #2 - Building - Roof Areas	**C = 0.95**
Drainage Area #3 - Landscaping Areas	**C = 0.15**
Composite "C" =	**C = 0.24**

3. Time of Concentration:

Using Storm Water Run-Off - "Overland Flow Time", design by "Seelye 18-01"

Tc from Area (total) = **45.00 minutes** **(from attached "Seelye" chart)**

4. Rainfall Intensities:

Rainfall Intensities are calculated using the rainfall frequency duration curves for Davis County, Utah. Using the National Weather Bureau "technical paper No. 28" for a 2, 10 and 100 year "Return Period".

Time of Concentration (minutes) Tc	Rainfall Intensity* (in/hour) I
5	6.50
10	4.95
15	4.10
30	2.60
45	1.95
60	1.65
90	1.35
120	0.93

*Rainfall intensity for a 100 year return period

Tc=time of concentration
I=rainfall intensity

Drainage Area (total) 12.070 acres Paving, Impervious and Landscaping Area

Tc = 45.00 minutes

Rainfall Intensity 1.95 (I in/hr) **(Technical Paper)**

Calculation Parameters:

Maximum flow paths used for routing and calculating time of concentration.

Maximum Intensity on technical paper chart used for time of concentration under 5 minutes.

5. Peak Run-off:

Using the "Rational Formula" to calculate the Peak run-off (Q=CIA) - maximum pipe flow

Q= Quantity of run-off, in cubic feet per second (cfs)
C= Coefficient of run-off (based upon surface materials)
I= Intensity of the average storm, in inches per hour (in/hr)
A= Area of drainage area, in acres

Total Drainage Area		Coeff. of Run-off "C"	Time of Concentration "Tc"	Rainfall Intensity "I"	Rate of Run-off "Q" (cfs)
Total Drainage Area					
12.070 acres	Impervious & Landscaping Area	0.24	45.00	1.95	5.72
				Total Flow	**5.72**

All Areas **Q =** **5.72** **cfs**

Pipe sizing - Use 15" diameter at a Slope of 0.5% which will handle the 100-year storm volume.

6. Allowable Discharge:

Allowable discharge of storm water volume (pre-development) is 0.1 cfs per acre.
Allowable discharge = 0.10 cfs/acre 12.070 acres = 1.21 cfs

Allowable discharge = 1.21 cfs

This flow rate is to be used as the allowable discharge from the detention basins.

7. Volume of Run-off: 100 year storm period

Time	**Intensity**	**Allowable Discharge**	**Volume Generated**	**Detention Volume Required**
Tc minutes	I in/hour	Undeveloped not detained c.f.	Inflow c.f.	Detention c.f.
5	6.50	362.10	5,724.23	5,362.13
10	4.95	724.20	8,718.44	7,994.24
15	4.10	1,086.30	10,832.00	9,745.70
30	2.60	2,172.60	13,738.14	11,565.54
45	1.95	3,258.90	15,455.41	12,196.51
60	1.65	4,345.20	17,436.87	13,091.67
90	1.35	6,517.80	21,399.80	**14,882.00**
120	0.93	8,690.40	19,656.11	10,965.71

Total Detention Required: **14,882.00** **Cubic feet of Detention / or**
0.34 **Acre feet of Detention**

8. Orifice Sizing: **100 year storm period**

Given:

Q= 1.21 cubic feet/second

2g= 64.4 ft/sec^2 (acceleration due to gravity)

H= ***(4.0 feet in basin from overflow to flowline outlet pipe)***

Cd= 0.62 for square-edged openings

Ao= Area of orifice opening

Formula:

$Q = Cd \times Ao\ (2gH)^{1/2}$ Solving for Ao

$Ao = Q/Cd \times (2gH)^{1/2}$

Ao= 0.12 square feet (orifice size)

Ao= 17.47 square inches (orifice size)

Ao= 4.72 inches in diameter (orifice size)

Summary:	**100 year storm period**		
	Use a 4.72" diameter orifice and the outlet control rate is =	**1.21**	**cubic feet per second**

APPENDIX DOCUMENTS