STORM DRAINAGE ANALYSIS - 100 YEAR EVENT

Kent Subdivision #2

Weber County, Utah

January 19, 2021

1. Drainage Areas:

Drainage Area #1 -	0.6000 acres	Paving & Impervious Areas
Drainage Area #2 -	5.9600 acres	Landscaping Areas
Total Area =	**6.560 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 = 0.85**
Drainage Area #2 - Landscaping Areas	**C = 0.15**
Composite "C" =	**C = 0.21**

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) 6.560 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						
6.560 acres		Impervious & Landscaping Area	0.21	45.00	1.95	2.74
					Total Flow	**2.74**

All Areas **Q =** **2.74** **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 6.560 acres = 1.31 cfs

Allowable discharge = 1.31 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	196.80	2,737.80	2,541.00
10	4.95	393.60	4,169.88	3,776.28
15	4.10	590.40	5,180.76	4,590.36
30	2.60	1,180.80	6,570.72	5,389.92
45	1.95	1,771.20	7,392.06	5,620.86
60	1.65	2,361.60	8,339.76	5,978.16
90	1.35	3,542.40	10,235.16	6,692.76
120	0.93	4,723.20	9,401.18	4,677.98

Total Detention Required: 6,692.76 Cubic feet of Detention / or
0.15 Acre feet of Detention

8. Orifice Sizing: 100 year storm period

Given:

Q= 1.31 cubic feet/second

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

H= *(2.0 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

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

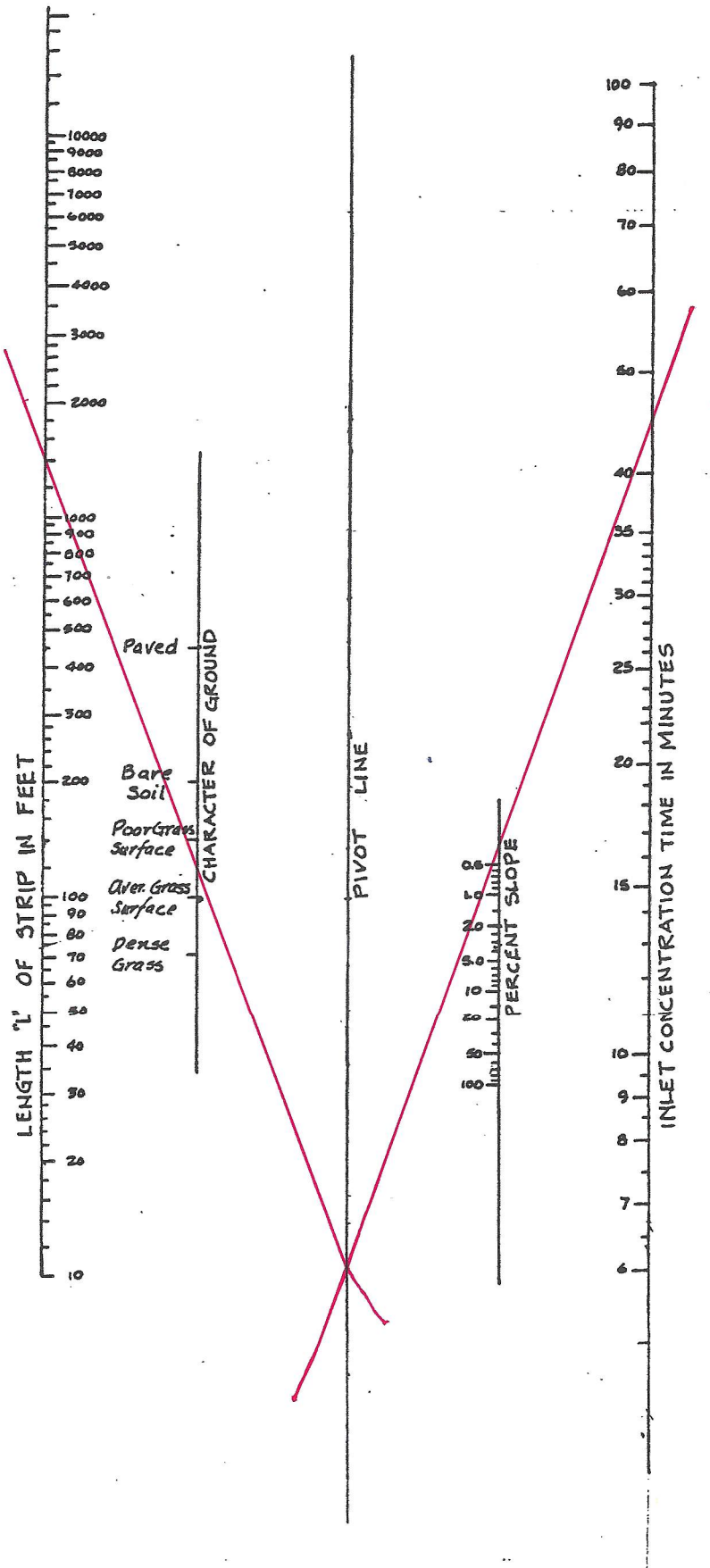
Ao= 0.19 square feet (orifice size)

Ao= 26.85 square inches (orifice size)

Ao= 4.13 inches in diameter (orifice size)

Summary:	**100 year storm period**		
	Use a 4.13" diameter orifice and the outlet control rate is =	**1.31**	**cubic feet per second**

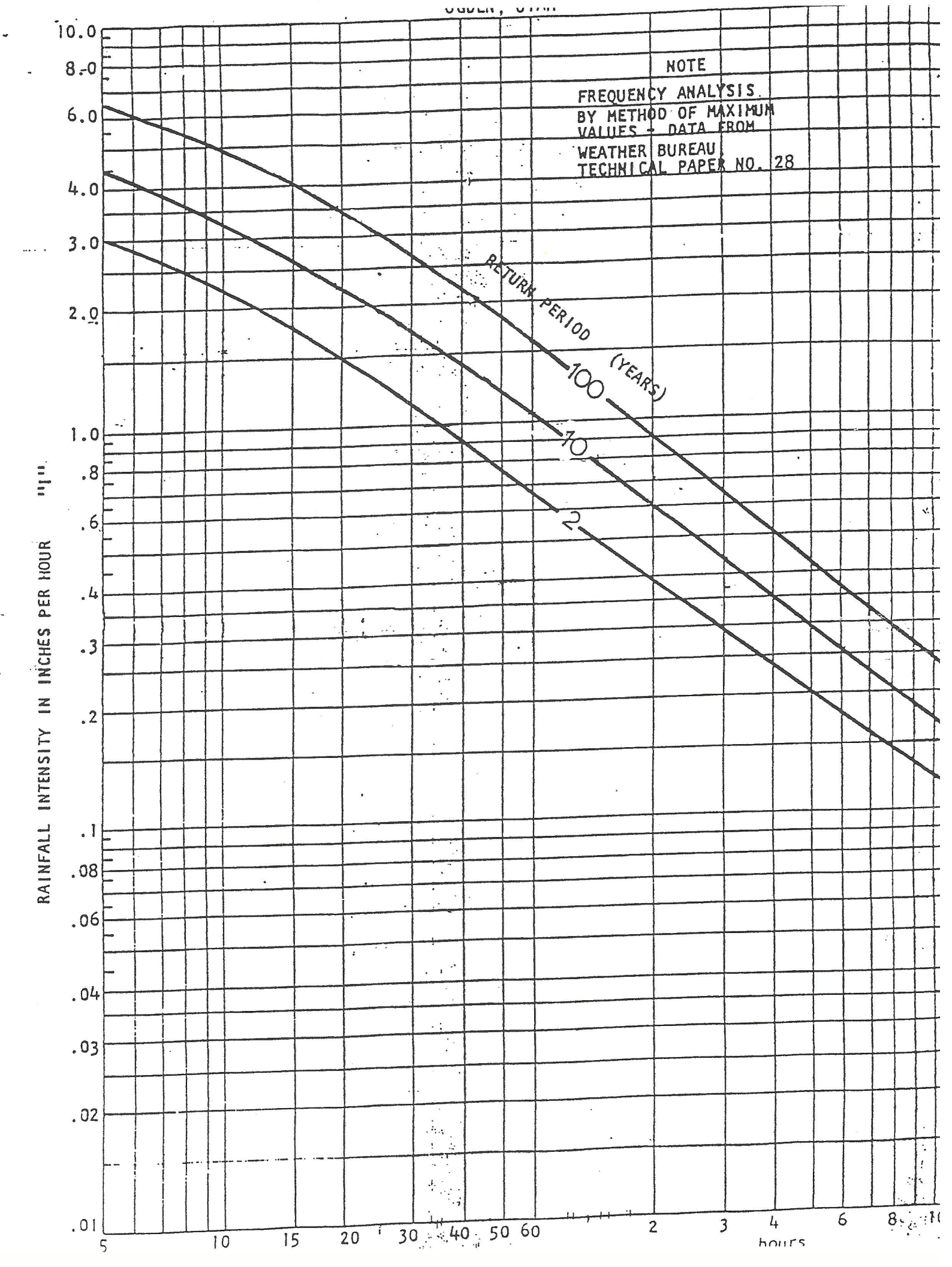
APPENDIX DOCUMENTS



45 minutes

OVERLAND FLOW TIME

"Design" by Seelye Pg 18-01


NOTE
FREQUENCY ANALYSIS BY METHOD OF MAXIMUM VALUES - DATA FROM WEATHER BUREAU TECHNICAL PAPER NO. 28
RETURN PERIOD (YEARS)
100
10
2
RAINFALL INTENSITY IN INCHES PER HOUR "I"
10.0
8.0
6.0
4.0
3.0
2.0
1.0
.8
.6
.4
.3
.2
.1
.08
.06
.04
.03
.02
.01
5
10
15
20
30
40
50
60
2
3
4
6
8
hours