Appendix B – Hydraulic Calculations

- Normal Depth Calculations – Onsite
- Drop Inlet Calculations
- Emergency Overflow Calculations
- Standard Form 6 Models

Worksheet for ON1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.000 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+24.50	0.62
0+24.50	1.12
0+25.00	1.12

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+25.00, 1.12)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.23 ft
Roughness Coefficient	0.016
Elevation	0.23 ft
Elevation Range	0.00 to 1.12 ft
Flow Area	0.3 ft²
Wetted Perimeter	4.55 ft
Hydraulic Radius	0.07 ft
Top Width	4.28 ft
Normal Depth	0.23 ft
Critical Depth	0.28 ft
Critical Slope	0.893 %
Velocity	3.14 ft/s
Velocity Head	0.15 ft

Worksheet for ON1

Results	
Specific Energy	0.38 ft
Froude Number	2.031
Flow Type	Supercritical

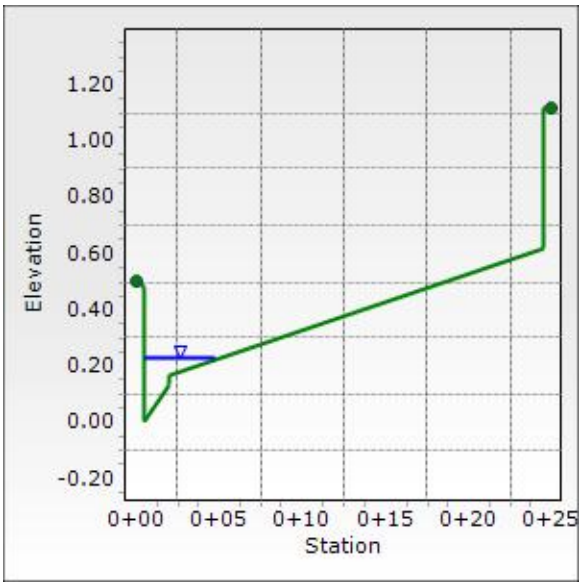
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.23 ft
Critical Depth	0.28 ft
Channel Slope	4.000 %
Critical Slope	0.893 %

XS for ON1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	4.000 %
Normal Depth	0.23 ft
Discharge	1.00 cfs



Worksheet for ON2.2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.870	%
Discharge	5.00	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.90
0+00.50	0.90
0+00.50	0.40
0+23.00	0.17
0+23.00	0.13
0+24.50	0.00
0+24.50	0.48
0+25.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.90)	(0+25.00, 0.50)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.37	ft
Roughness Coefficient	0.016	
Elevation	0.37	ft
Elevation Range	0.00 to 0.90	ft
Flow Area	2.5	ft²
Wetted Perimeter	21.71	ft
Hydraulic Radius	0.11	ft
Top Width	21.29	ft
Normal Depth	0.37	ft
Critical Depth	0.38	ft
Critical Slope	0.780	%
Velocity	2.03	ft/s
Velocity Head	0.06	ft

Worksheet for ON2.2

Results	
Specific Energy	0.44 ft
Froude Number	1.052
Flow Type	Supercritical

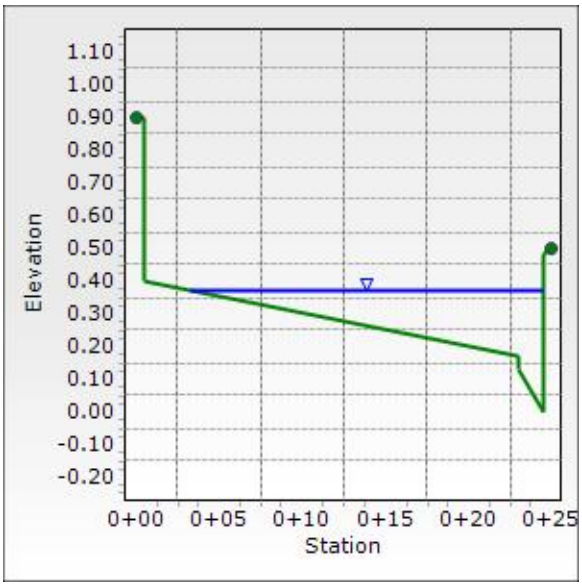
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.37 ft
Critical Depth	0.38 ft
Channel Slope	0.870 %
Critical Slope	0.780 %

XS for ON2.2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.870 %
Normal Depth	0.37 ft
Discharge	5.00 cfs



Worksheet for ON3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.250	%
Discharge	1.00	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+24.50	0.62
0+24.50	1.12
0+25.00	1.12

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+25.00, 1.12)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.23	ft
Roughness Coefficient	0.016	
Elevation	0.23	ft
Elevation Range	0.00 to 1.12	ft
Flow Area	0.3	ft²
Wetted Perimeter	4.89	ft
Hydraulic Radius	0.07	ft
Top Width	4.62	ft
Normal Depth	0.23	ft
Critical Depth	0.28	ft
Critical Slope	0.893	%
Velocity	2.87	ft/s
Velocity Head	0.13	ft

Worksheet for ON3

Results	
Specific Energy	0.36 ft
Froude Number	1.844
Flow Type	Supercritical

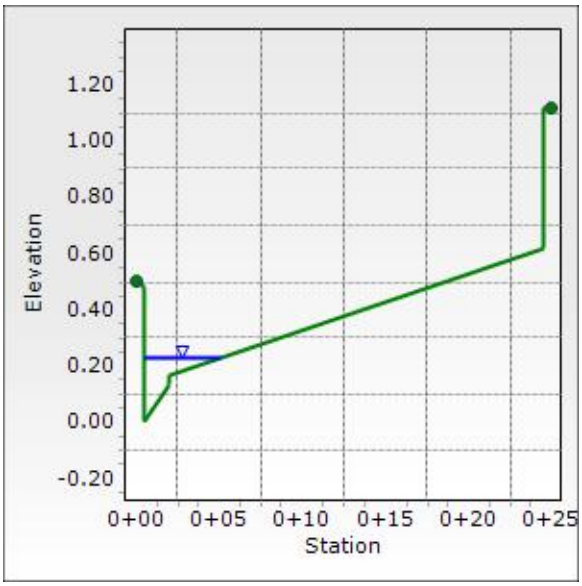
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.23 ft
Critical Depth	0.28 ft
Channel Slope	3.250 %
Critical Slope	0.893 %

XS for ON3

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.250 %
Normal Depth	0.23 ft
Discharge	1.00 cfs



Worksheet for ON4.1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.470 %
Discharge	3.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.12
0+00.50	1.12
0+00.50	0.62
0+23.00	0.17
0+23.00	0.13
0+24.50	0.00
0+24.50	0.48
0+25.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.12)	(0+25.00, 0.50)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.32 ft
Roughness Coefficient	0.016
Elevation	0.32 ft
Elevation Range	0.00 to 1.12 ft
Flow Area	0.9 ft²
Wetted Perimeter	9.38 ft
Hydraulic Radius	0.10 ft
Top Width	9.02 ft
Normal Depth	0.32 ft
Critical Depth	0.37 ft
Critical Slope	0.777 %
Velocity	3.17 ft/s
Velocity Head	0.16 ft

Worksheet for ON4.1

Results	
Specific Energy	0.48 ft
Froude Number	1.721
Flow Type	Supercritical

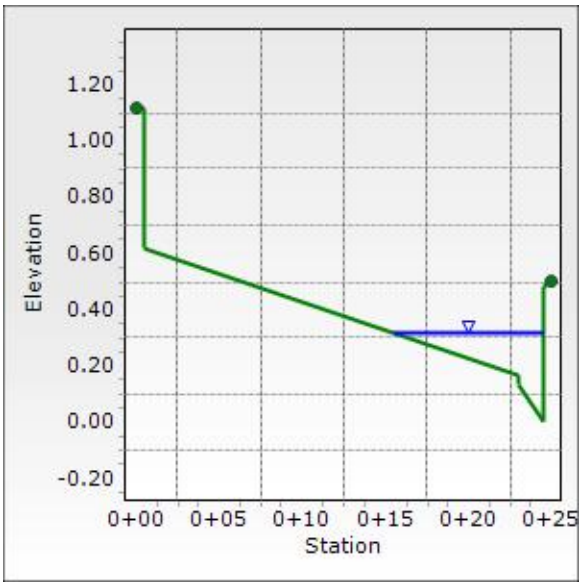
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.32 ft
Critical Depth	0.37 ft
Channel Slope	2.470 %
Critical Slope	0.777 %

XS for ON4.1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.470 %
Normal Depth	0.32 ft
Discharge	3.00 cfs



Worksheet for ON4.2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.640 %
Discharge	3.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.12
0+00.50	1.12
0+00.50	0.62
0+23.00	0.17
0+23.00	0.13
0+24.50	0.00
0+24.50	0.48
0+25.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.12)	(0+25.00, 0.50)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.32 ft
Roughness Coefficient	0.016
Elevation	0.32 ft
Elevation Range	0.00 to 1.12 ft
Flow Area	0.9 ft²
Wetted Perimeter	9.24 ft
Hydraulic Radius	0.10 ft
Top Width	8.88 ft
Normal Depth	0.32 ft
Critical Depth	0.37 ft
Critical Slope	0.777 %
Velocity	3.25 ft/s
Velocity Head	0.16 ft

Worksheet for ON4.2

Results	
Specific Energy	0.48 ft
Froude Number	1.776
Flow Type	Supercritical

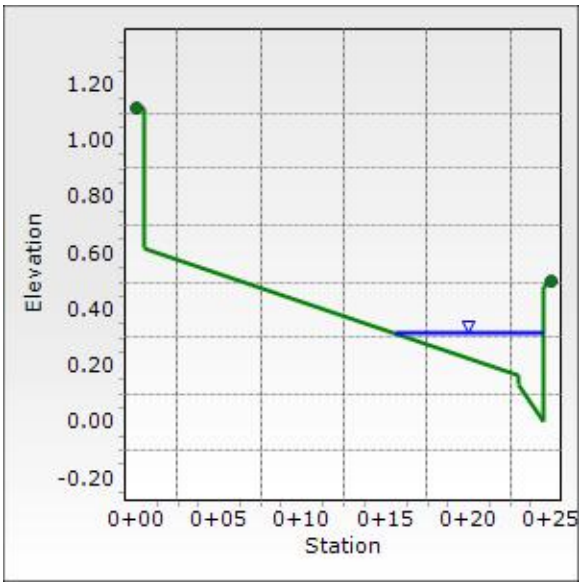
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.32 ft
Critical Depth	0.37 ft
Channel Slope	2.640 %
Critical Slope	0.777 %

XS for ON4.2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.640 %
Normal Depth	0.32 ft
Discharge	3.00 cfs



Worksheet for ON6.1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.000 %
Discharge	4.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.12
0+00.50	1.12
0+00.50	0.62
0+23.00	0.17
0+23.00	0.13
0+24.50	0.00
0+24.50	0.48
0+25.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.12)	(0+25.00, 0.50)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.37 ft
Roughness Coefficient	0.016
Elevation	0.37 ft
Elevation Range	0.00 to 1.12 ft
Flow Area	1.4 ft²
Wetted Perimeter	11.68 ft
Hydraulic Radius	0.12 ft
Top Width	11.27 ft
Normal Depth	0.37 ft
Critical Depth	0.42 ft
Critical Slope	0.736 %
Velocity	3.20 ft/s
Velocity Head	0.16 ft

Worksheet for ON6.1

Results	
Specific Energy	0.52 ft
Froude Number	1.600
Flow Type	Supercritical

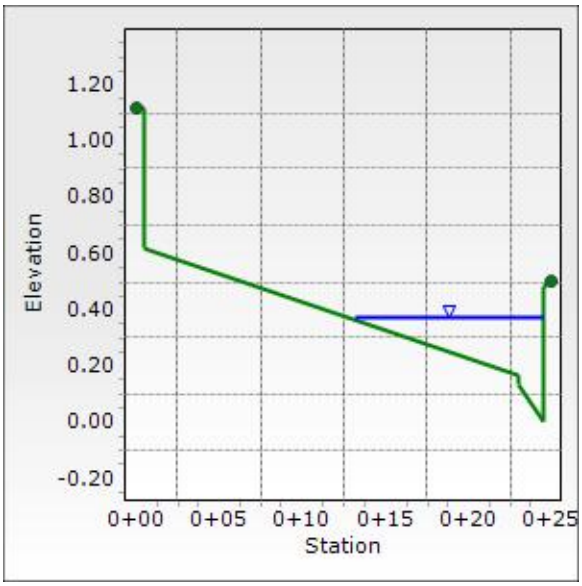
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.37 ft
Critical Depth	0.42 ft
Channel Slope	2.000 %
Critical Slope	0.736 %

XS for ON6.1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.000 %
Normal Depth	0.37 ft
Discharge	4.50 cfs



Worksheet for ON6.2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.000 %
Discharge	4.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.45
0+00.50	1.43
0+00.50	0.95
0+19.00	0.57
0+42.00	0.06
0+43.50	0.00
0+45.00	0.06
0+61.50	0.33
0+61.50	0.81
0+62.00	0.83

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.45)	(0+62.00, 0.83)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.21 ft
Roughness Coefficient	0.016
Elevation	0.21 ft
Elevation Range	0.00 to 1.45 ft
Flow Area	1.7 ft²
Wetted Perimeter	18.72 ft
Hydraulic Radius	0.09 ft
Top Width	18.72 ft
Normal Depth	0.21 ft
Critical Depth	0.24 ft
Critical Slope	0.784 %

Worksheet for ON6.2

Results	
Velocity	2.65 ft/s
Velocity Head	0.11 ft
Specific Energy	0.32 ft
Froude Number	1.553
Flow Type	Supercritical

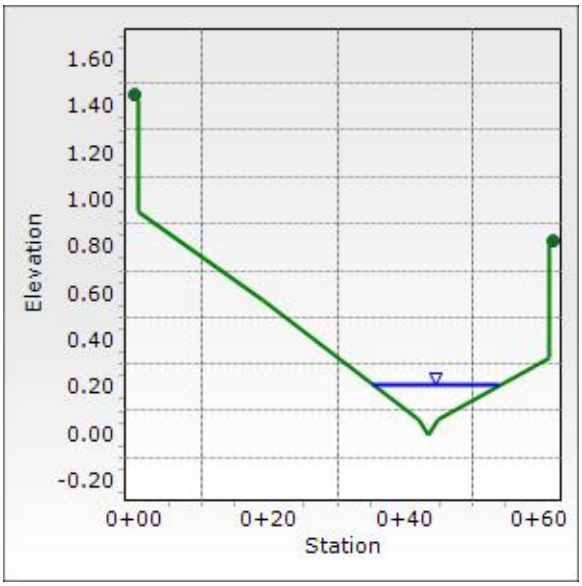
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.21 ft
Critical Depth	0.24 ft
Channel Slope	2.000 %
Critical Slope	0.784 %

XS for ON6.2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.000 %
Normal Depth	0.21 ft
Discharge	4.50 cfs



Worksheet for ON7

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.800 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.12
0+00.50	1.12
0+00.50	0.62
0+23.00	0.17
0+23.00	0.13
0+24.50	0.00
0+24.50	0.48
0+25.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.12)	(0+25.00, 0.50)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.23 ft
Roughness Coefficient	0.016
Elevation	0.23 ft
Elevation Range	0.00 to 1.12 ft
Flow Area	0.3 ft²
Wetted Perimeter	4.63 ft
Hydraulic Radius	0.07 ft
Top Width	4.36 ft
Normal Depth	0.23 ft
Critical Depth	0.28 ft
Critical Slope	0.893 %
Velocity	3.08 ft/s
Velocity Head	0.15 ft

Worksheet for ON7

Results	
Specific Energy	0.37 ft
Froude Number	1.988
Flow Type	Supercritical

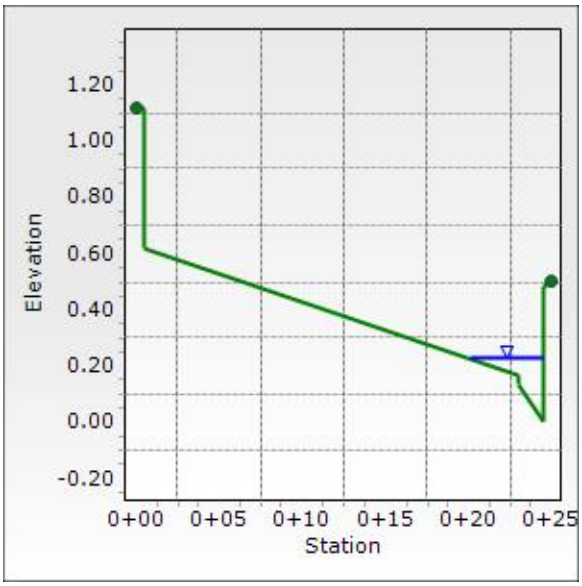
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.23 ft
Critical Depth	0.28 ft
Channel Slope	3.800 %
Critical Slope	0.893 %

XS for ON7

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.800 %
Normal Depth	0.23 ft
Discharge	1.00 cfs



Worksheet for ON8

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.380 %
Discharge	3.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.12
0+00.50	1.12
0+00.50	0.62
0+23.00	0.17
0+23.00	0.13
0+24.50	0.00
0+24.50	0.48
0+25.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.12)	(0+25.00, 0.50)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.35 ft
Roughness Coefficient	0.016
Elevation	0.35 ft
Elevation Range	0.00 to 1.12 ft
Flow Area	1.2 ft²
Wetted Perimeter	10.65 ft
Hydraulic Radius	0.11 ft
Top Width	10.26 ft
Normal Depth	0.35 ft
Critical Depth	0.37 ft
Critical Slope	0.777 %
Velocity	2.53 ft/s
Velocity Head	0.10 ft

Worksheet for ON8

Results	
Specific Energy	0.44 ft
Froude Number	1.309
Flow Type	Supercritical

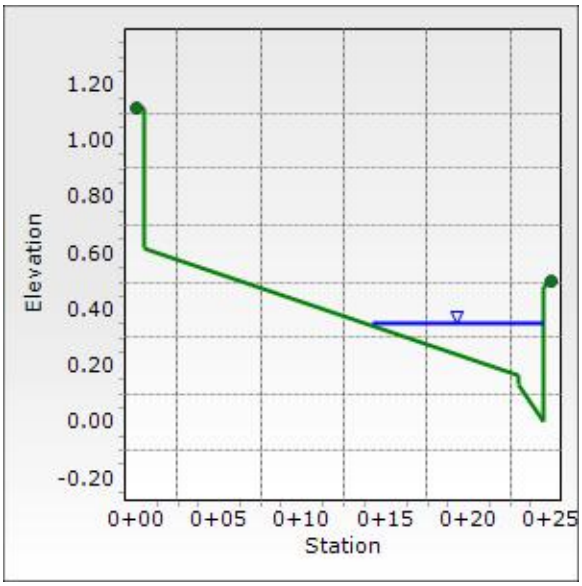
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.35 ft
Critical Depth	0.37 ft
Channel Slope	1.380 %
Critical Slope	0.777 %

XS for ON8

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.380 %
Normal Depth	0.35 ft
Discharge	3.00 cfs



Worksheet for ON9

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.000 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.28
0+00.50	1.28
0+00.50	0.78
0+23.00	0.17
0+23.00	0.13
0+24.50	0.00
0+24.50	0.48
0+25.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.28)	(0+25.00, 0.50)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.28 ft
Roughness Coefficient	0.016
Elevation	0.28 ft
Elevation Range	0.00 to 1.28 ft
Flow Area	0.5 ft²
Wetted Perimeter	5.77 ft
Hydraulic Radius	0.09 ft
Top Width	5.45 ft
Normal Depth	0.28 ft
Critical Depth	0.28 ft
Critical Slope	0.870 %
Velocity	1.89 ft/s
Velocity Head	0.06 ft

Worksheet for ON9

Results	
Specific Energy	0.33 ft
Froude Number	1.069
Flow Type	Supercritical

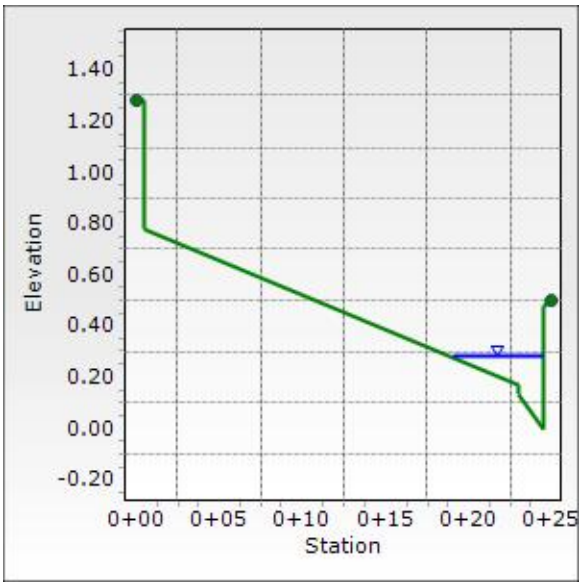
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.28 ft
Critical Depth	0.28 ft
Channel Slope	1.000 %
Critical Slope	0.870 %

XS for ON9

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.28 ft
Discharge	1.00 cfs



Worksheet for ON10.1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.000 %
Discharge	3.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+24.50	0.59
0+24.50	1.09
0+25.00	1.09

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+25.00, 1.09)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.33 ft
Roughness Coefficient	0.016
Elevation	0.33 ft
Elevation Range	0.00 to 1.09 ft
Flow Area	1.0 ft²
Wetted Perimeter	10.24 ft
Hydraulic Radius	0.10 ft
Top Width	9.86 ft
Normal Depth	0.33 ft
Critical Depth	0.37 ft
Critical Slope	0.782 %
Velocity	2.87 ft/s
Velocity Head	0.13 ft

Worksheet for ON10.1

Results	
Specific Energy	0.45 ft
Froude Number	1.555
Flow Type	Supercritical

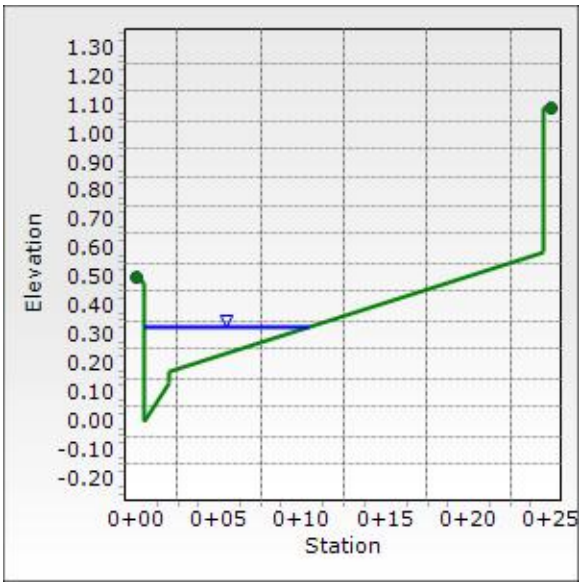
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.33 ft
Critical Depth	0.37 ft
Channel Slope	2.000 %
Critical Slope	0.782 %

XS for ON10.1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.000 %
Normal Depth	0.33 ft
Discharge	3.00 cfs



Worksheet for ON10.2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.310 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.12
0+00.50	1.12
0+00.50	0.62
0+23.00	0.17
0+23.00	0.13
0+24.50	0.00
0+24.50	0.48
0+25.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.12)	(0+25.00, 0.50)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.24 ft
Roughness Coefficient	0.016
Elevation	0.24 ft
Elevation Range	0.00 to 1.12 ft
Flow Area	0.4 ft²
Wetted Perimeter	5.46 ft
Hydraulic Radius	0.07 ft
Top Width	5.17 ft
Normal Depth	0.24 ft
Critical Depth	0.28 ft
Critical Slope	0.893 %
Velocity	2.48 ft/s
Velocity Head	0.10 ft

Worksheet for ON10.2

Results	
Specific Energy	0.34 ft
Froude Number	1.570
Flow Type	Supercritical

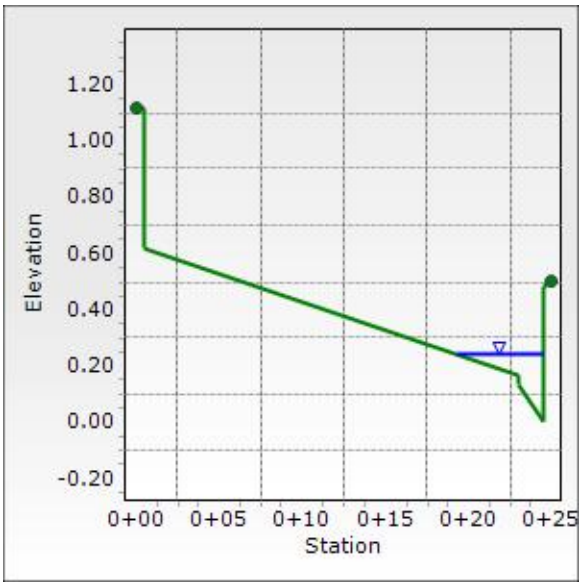
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.24 ft
Critical Depth	0.28 ft
Channel Slope	2.310 %
Critical Slope	0.893 %

XS for ON10.2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.310 %
Normal Depth	0.24 ft
Discharge	1.00 cfs



Worksheet for ON11

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.000 %
Discharge	4.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+24.50	0.59
0+24.50	1.09
0+25.00	1.09

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+25.00, 1.09)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.35 ft
Roughness Coefficient	0.016
Elevation	0.35 ft
Elevation Range	0.00 to 1.09 ft
Flow Area	1.3 ft²
Wetted Perimeter	11.60 ft
Hydraulic Radius	0.11 ft
Top Width	11.20 ft
Normal Depth	0.35 ft
Critical Depth	0.40 ft
Critical Slope	0.753 %
Velocity	3.06 ft/s
Velocity Head	0.15 ft

Worksheet for ON11

Results	
Specific Energy	0.50 ft
Froude Number	1.578
Flow Type	Supercritical

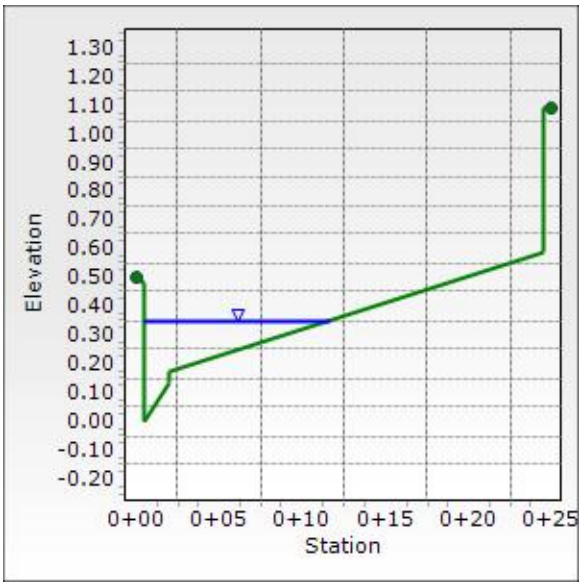
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.35 ft
Critical Depth	0.40 ft
Channel Slope	2.000 %
Critical Slope	0.753 %

XS for ON11

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.000 %
Normal Depth	0.35 ft
Discharge	4.00 cfs



Type CM Drop Inlet Sizing on a C. G.

DI1 - ON1

Known:

Q_s=	Half Street Flow	1	cfs
S_o=	Longitudinal Slope	0.04	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	3.14	fps
D=	Flow Depth	0.23	ft
S_x=	Street Transverse Slope	0.02	ft/ft
W=	Gutter Width	2	ft
a=	Gutter Depression	5.0	in
L_g=	Length of Grate	2.5	ft
L_c=	Length of Curb Opening	4.5	ft
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R_f=	Frontal flow factor = $1-0.09*(V_s-V_o)$ if $V_s>V_o$; else $R_f=1$	1.00	
	V_o= Splash over velocity=$p+q*(L_g*(1-(C_{fg}/100)))-r*(L_g*(1-(C_{fg}/100)))^2+s*(L_g*(1-(C_{fg}/100)))^3$†	5.02	fps
E_o=	Grate flow ratio = Q_w/Q_s	1.18	
	Q_w= Frontal flow=A_w*V_s	1.18	cfs
	Q_x= Side flow = Q_s-Q_w	-0.18	cfs
R_s=	Side flow factor = $1/(1+(0.15*V_s^{1.8})/(S_x*(L_g*(1-C_{fg}/100))^{2.3}))$	0.03	
Q_{ig}=	Flow intercepted = $[R_f*E_o+R_s*(1-E_o)]*Q_s$	1.0	cfs
	†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)		

Curb Opening Capacity Calculations

S_e=	Equivalent cross slope = Sx+Sw*Eo	0.273	ft/ft
S_w=	Gutter cross slope = (0.137+afeet)/W	0.214	ft/ft
L_t=	Total interception L = $0.60*Q_s^{0.42}*So^{0.30}*(1/n*S_e)^{0.6}$	5.95	ft
Q_{ic}=	Flow intercepted = $(1-(1-(L_c*(1-C_{fc}/100))/L_t)^{1.8})*Q_s$	0.6	cfs

Total Inlet Calculations

Q_{ti}=	Total flow intercepted = $Q_{ig}+Q_{ic}$	1.0	cfs
Q_{tq}=	Flow bypass = Q_s-Q_{ti}	0.0	cfs
q=	Interception per unit ratio = Q_{ti}/L_g	0.22	cfs/ft
E_q=	Efficiency = (Qti/Qs)*100	100	%

Type CM Drop Inlet Sizing on a C. G.

DI2 - ON2

Known:

Q_s=	Half Street Flow	5	cfs
S_o=	Longitudinal Slope	0.0286	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	3.20	fps
D=	Flow Depth	0.32	ft
S_x=	Street Transverse Slope	0.01	ft/ft
W=	Gutter Width	2	ft
a=	Gutter Depression	5.0	in
L_g=	Length of Grate	12.5	ft
L_c=	Length of Curb Opening	14.5	ft
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R_f=	Frontal flow factor = $1-0.09*(V_s-V_o)$ if $V_s>V_o$; else $R_f=1$	1.00	
	V_o= Splash over velocity=$p+q*(L_g*(1-(C_{fg}/100)))-r*(L_g*(1-(C_{fg}/100)))^2+s*(L_g*(1-(C_{fg}/100)))^3$†	11.01	fps
E_o=	Grate flow ratio = Q_w/Q_s	0.36	
	Q_w= Frontal flow=A_w*V_s	1.78	cfs
	Q_x= Side flow = Q_s-Q_w	3.22	cfs
R_s=	Side flow factor = $1/(1+(0.15*V_s^{1.8})/(S_x*(L_g*(1-C_{fg}/100))^{2.3}))$	0.36	
Q_{ig}=	Flow intercepted = $[R_f*E_o+R_s*(1-E_o)]*Q_s$	2.9	cfs
	†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)		

Curb Opening Capacity Calculations

S_e=	Equivalent cross slope = Sx+Sw*Eo	0.086	ft/ft
S_w=	Gutter cross slope = (0.137+afeet)/W	0.214	ft/ft
L_t=	Total interception L = $0.60*Q_s^{0.42}*So^{0.30}*(1/n*S_e)^{0.6}$	21.12	ft
Q_{ic}=	Flow intercepted = $(1-(1-(L_c*(1-C_{fc}/100))/L_t)^{1.8})*Q_s$	2.7	cfs

Total Inlet Calculations

Q_{ti}=	Total flow intercepted = $Q_{ig}+Q_{ic}$	5.0	cfs
Q_{tq}=	Flow bypass = Q_s-Q_{ti}	0.0	cfs
q=	Interception per unit ratio = Q_{ti}/L_g	0.34	cfs/ft
E_q=	Efficiency = (Qti/Qs)*100	100	%

Type CM Drop Inlet Sizing on a C. G.

DI3 - ON3

Known:

Q_s=	Half Street Flow	1	cfs
S_o=	Longitudinal Slope	0.0325	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	2.87	fps
D=	Flow Depth	0.23	ft
S_x=	Street Transverse Slope	0.02	ft/ft
W=	Gutter Width	2	ft
a=	Gutter Depression	5.0	in
L_g=	Length of Grate	2.5	ft
L_c=	Length of Curb Opening	4.5	ft
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R_f=	Frontal flow factor = $1-0.09*(V_s-V_o)$ if $V_s>V_o$; else $R_f=1$	1.00	
	V_o= Splash over velocity=$p+q*(L_g*(1-(C_{fg}/100)))-r*(L_g*(1-(C_{fg}/100)))^2+s*(L_g*(1-(C_{fg}/100)))^3$†	5.02	fps
E_o=	Grate flow ratio = Q_w/Q_s	1.08	
	Q_w= Frontal flow=A_w*V_s	1.08	cfs
	Q_x= Side flow = Q_s-Q_w	-0.08	cfs
R_s=	Side flow factor = $1/(1+(0.15*V_s^{1.8})/(S_x*(L_g*(1-C_{fg}/100))^{2.3}))$	0.03	
Q_{ig}=	Flow intercepted = $[R_f*E_o+R_s*(1-E_o)]*Q_s$	1.0	cfs
	†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)		

Curb Opening Capacity Calculations

S_e=	Equivalent cross slope = Sx+Sw*Eo	0.251	ft/ft
S_w=	Gutter cross slope = (0.137+afeet)/W	0.214	ft/ft
L_t=	Total interception L = $0.60*Q_s^{0.42}*So^{0.30}*(1/n*S_e)^{0.6}$	5.88	ft
Q_{ic}=	Flow intercepted = $(1-(1-(L_c*(1-C_{fc}/100))/L_t)^{1.8})*Q_s$	0.6	cfs

Total Inlet Calculations

Q_{ti}=	Total flow intercepted = $Q_{ig}+Q_{ic}$	1.0	cfs
Q_{tq}=	Flow bypass = Q_s-Q_{ti}	0.0	cfs
q=	Interception per unit ratio = Q_{ti}/L_g	0.22	cfs/ft
E_q=	Efficiency = (Qti/Qs)*100	100	%

Type CM Drop Inlet Sizing on a C. G.

DI4 - ON4

Known:

Q_s=	Half Street Flow	3	cfs
S_o=	Longitudinal Slope	0.0247	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	3.17	fps
D=	Flow Depth	0.32	ft
S_x=	Street Transverse Slope	0.02	ft/ft
W=	Gutter Width	2	ft
a=	Gutter Depression	5.0	in
L_g=	Length of Grate	5.0	ft
L_c=	Length of Curb Opening	7.0	ft
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R_f=	Frontal flow factor = $1-0.09*(V_s-V_o)$ if $V_s>V_o$; else $R_f=1$	1.00	
	V_o= Splash over velocity=$p+q*(L_g*(1-(C_{fg}/100)))-r*(L_g*(1-(C_{fg}/100)))^2+s*(L_g*(1-(C_{fg}/100)))^3$†	7.22	fps
E_o=	Grate flow ratio = Q_w/Q_s	0.59	
	Q_w= Frontal flow=A_w*V_s	1.76	cfs
	Q_x= Side flow = Q_s-Q_w	1.24	cfs
R_s=	Side flow factor = $1/(1+(0.15*V_s^{1.8})/(S_x*(L_g*(1-C_{fg}/100))^{2.3}))$	0.12	
Q_{ig}=	Flow intercepted = $[R_f*E_o+R_s*(1-E_o)]*Q_s$	1.9	cfs
	†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)		

Curb Opening Capacity Calculations

S_e=	Equivalent cross slope = Sx+Sw*Eo	0.146	ft/ft
S_w=	Gutter cross slope = (0.137+afeet)/W	0.214	ft/ft
L_t=	Total interception L = $0.60*Q_s^{0.42}*So^{0.30}*(1/n*S_e)^{0.6}$	11.90	ft
Q_{ic}=	Flow intercepted = $(1-(1-(L_c*(1-C_{fc}/100))/L_t)^{1.8})*Q_s$	1.4	cfs

Total Inlet Calculations

Q_{ti}=	Total flow intercepted = $Q_{ig}+Q_{ic}$	3.0	cfs
Q_{tq}=	Flow bypass = Q_s-Q_{ti}	0.0	cfs
q=	Interception per unit ratio = Q_{ti}/L_g	0.43	cfs/ft
E_q=	Efficiency = (Qti/Qs)*100	100	%

Grate Inlet Headwater Depth Calculation

4-ft by 4-ft Jensen Grate at ON11 Low Point DI #5

Known:

Q=	Flow (cfs)	4.0
W=	Width of Grate (ft)	4.0
L=	Length of Grate (ft)	4.0
D=	Diameter of Circle (in)	
Cf=	Clogging Factor (%)	50

Weir Conditions:

$Hw=(Q/(Cw*P))^{2/3}$

Cw=	Weir Coefficient	2.7
P=	Perimeter of grate (ft)	16.0
Pc=	Perimeter (w/clogging) (ft)	8.0
Hw=	Headwater depth (ft)	0.32

Orifice Conditions:

$Hw=(Q/(Co*Ac))^{2}/2*g$

Co=	Orifice Coefficient	0.67
Ag=	Grate Area (ft^2)	16.0
Gf=	Grate Opening Factor	0.64
Ac=	Grate Open Area (w/ clogging) (ft^2)	5.1
Hw=	Headwater depth (ft)	0.02

Worst Case Scenario Occurs Under Weir Conditions

Headwater Depth (ft) = 0.32

Type CM Drop Inlet Sizing on a C. G.

DI6 - ON6

Known:

Q_s=	Half Street Flow	4.5	cfs
S_o=	Longitudinal Slope	0.02	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	3.20	fps
D=	Flow Depth	0.37	ft
S_x=	Street Transverse Slope	0.02	ft/ft
W=	Gutter Width	2	ft
a=	Gutter Depression	5.0	in
L_g=	Length of Grate	7.5	ft
L_c=	Length of Curb Opening	9.5	ft
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R_f=	Frontal flow factor = $1-0.09*(V_s-V_o)$ if $V_s>V_o$; else $R_f=1$	1.00	
	V_o= Splash over velocity=$p+q*(L_g*(1-(C_{fg}/100)))-r*(L_g*(1-(C_{fg}/100)))^2+s*(L_g*(1-(C_{fg}/100)))^3$†	8.71	fps
E_o=	Grate flow ratio = Q_w/Q_s	0.47	
	Q_w= Frontal flow=A_w*V_s	2.10	cfs
	Q_x= Side flow = Q_s-Q_w	2.40	cfs
R_s=	Side flow factor = $1/(1+(0.15*V_s^{1.8})/(S_x*(L_g*(1-C_{fg}/100))^{2.3}))$	0.26	
Q_{ig}=	Flow intercepted = $[R_f*E_o+R_s*(1-E_o)]*Q_s$	2.7	cfs
	†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)		

Curb Opening Capacity Calculations

S_e=	Equivalent cross slope = Sx+Sw*Eo	0.120	ft/ft
S_w=	Gutter cross slope = (0.137+afeet)/W	0.214	ft/ft
L_t=	Total interception L = $0.60*Q_s^{0.42}*So^{0.30}*(1/n*S_e)^{0.6}$	14.89	ft
Q_{ic}=	Flow intercepted = $(1-(1-(L_c*(1-C_{fc}/100))/L_t)^{1.8})*Q_s$	2.2	cfs

Total Inlet Calculations

Q_{ti}=	Total flow intercepted = $Q_{ig}+Q_{ic}$	4.5	cfs
Q_{tq}=	Flow bypass = Q_s-Q_{ti}	0.0	cfs
q=	Interception per unit ratio = Q_{ti}/L_g	0.47	cfs/ft
E_q=	Efficiency = (Qti/Qs)*100	100	%

Type CM Drop Inlet Sizing on a C. G.

DI7 - ON7

Known:

Q_s=	Half Street Flow	1	cfs
S_o=	Longitudinal Slope	0.038	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	3.08	fps
D=	Flow Depth	0.23	ft
S_x=	Street Transverse Slope	0.02	ft/ft
W=	Gutter Width	2	ft
a=	Gutter Depression	5.0	in
L_g=	Length of Grate	2.5	ft
L_c=	Length of Curb Opening	4.5	ft
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R_f=	Frontal flow factor = $1-0.09*(V_s-V_o)$ if $V_s>V_o$; else $R_f=1$	1.00	
	V_o= Splash over velocity=$p+q*(L_g*(1-(C_{fg}/100)))-r*(L_g*(1-(C_{fg}/100)))^2+s*(L_g*(1-(C_{fg}/100)))^3$†	5.02	fps
E_o=	Grate flow ratio = Q_w/Q_s	1.16	
	Q_w= Frontal flow=A_w*V_s	1.16	cfs
	Q_x= Side flow = Q_s-Q_w	-0.16	cfs
R_s=	Side flow factor = $1/(1+(0.15*V_s^{1.8})/(S_x*(L_g*(1-C_{fg}/100))^{2.3}))$	0.03	
Q_{ig}=	Flow intercepted = $[R_f*E_o+R_s*(1-E_o)]*Q_s$	1.0	cfs
	†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)		

Curb Opening Capacity Calculations

S_e=	Equivalent cross slope = Sx+Sw*Eo	0.268	ft/ft
S_w=	Gutter cross slope = (0.137+afeet)/W	0.214	ft/ft
L_t=	Total interception L = $0.60*Q_s^{0.42}*So^{0.30}*(1/n*S_e)^{0.6}$	5.92	ft
Q_{ic}=	Flow intercepted = $(1-(1-(L_c*(1-C_{fc}/100))/L_t)^{1.8})*Q_s$	0.6	cfs

Total Inlet Calculations

Q_{ti}=	Total flow intercepted = $Q_{ig}+Q_{ic}$	1.0	cfs
Q_{tq}=	Flow bypass = Q_s-Q_{ti}	0.0	cfs
q=	Interception per unit ratio = Q_{ti}/L_g	0.22	cfs/ft
E_q=	Efficiency = (Qti/Qs)*100	100	%

Type B Drop Inlet Sizing on a C. G.

DI8 - ON8

Known:

Q_s=	Half Street Flow	3	cfs
S_o=	Longitudinal Slope	0.0138	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	2.53	fps
D=	Flow Depth	0.35	ft
S_x=	Street Transverse Slope	0.02	ft/ft
W=	Gutter Width	2	ft
a=	Gutter Depression	5.0	in
L_g=	Length of Grate	2.5	ft
L_c=	Length of Curb Opening	2.5	ft
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R_f=	Frontal flow factor = $1-0.09*(V_s-V_o)$ if $V_s>V_o$; else $R_f=1$	1.00	
	V_o= Splash over velocity=$p+q*(L_g*(1-(C_{fg}/100)))-r*(L_g*(1-(C_{fg}/100)))^2+s*(L_g*(1-(C_{fg}/100)))^3$†	5.02	fps
E_o=	Grate flow ratio = Q_w/Q_s	0.52	
	Q_w= Frontal flow=A_w*V_s	1.56	cfs
	Q_x= Side flow = Q_s-Q_w	1.44	cfs
R_s=	Side flow factor = $1/(1+(0.15*V_s^{1.8})/(S_x*(L_g*(1-C_{fg}/100))^{2.3}))$	0.04	
Q_{ig}=	Flow intercepted = $[R_f*E_o+R_s*(1-E_o)]*Q_s$	1.6	cfs
	†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)		

Curb Opening Capacity Calculations

S_e=	Equivalent cross slope = Sx+Sw*Eo	0.131	ft/ft
S_w=	Gutter cross slope = (0.137+afeet)/W	0.214	ft/ft
L_t=	Total interception L = $0.60*Q_s^{0.42}*So^{0.30}*(1/n*S_e)^{0.6}$	10.64	ft
Q_{ic}=	Flow intercepted = $(1-(1-(L_c*(1-C_{fc}/100))/L_t)^{1.8})*Q_s$	0.6	cfs

Total Inlet Calculations

Q_{ti}=	Total flow intercepted = $Q_{ig}+Q_{ic}$	2.2	cfs
Q_{tq}=	Flow bypass = Q_s-Q_{ti}	0.8	cfs
q=	Interception per unit ratio = Q_{ti}/L_g	0.89	cfs/ft
E_q=	Efficiency = (Qti/Qs)*100	74	%

Type CM Drop Inlet Sizing on a C. G.

DI9 - ON9

Known:

Q_s=	Half Street Flow	1	cfs
S_o=	Longitudinal Slope	0.01	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	1.89	fps
D=	Flow Depth	0.28	ft
S_x=	Street Transverse Slope	0.027	ft/ft
W=	Gutter Width	2	ft
a=	Gutter Depression	5.0	in
L_g=	Length of Grate	2.5	ft
L_c=	Length of Curb Opening	4.5	ft
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R_f=	Frontal flow factor = $1-0.09*(V_s-V_o)$ if $V_s>V_o$; else $R_f=1$	1.00	
	V_o= Splash over velocity=$p+q*(L_g*(1-(C_{fg}/100)))-r*(L_g*(1-(C_{fg}/100)))^2+s*(L_g*(1-(C_{fg}/100)))^3$†	5.02	fps
E_o=	Grate flow ratio = Q_w/Q_s	0.90	
	Q_w= Frontal flow=A_w*V_s	0.90	cfs
	Q_x= Side flow = Q_s-Q_w	0.10	cfs
R_s=	Side flow factor = $1/(1+(0.15*V_s^{1.8})/(S_x*(L_g*(1-C_{fg}/100))^{2.3}))$	0.09	
Q_{ig}=	Flow intercepted = $[R_f*E_o+R_s*(1-E_o)]*Q_s$	0.9	cfs
	†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)		

Curb Opening Capacity Calculations

S_e=	Equivalent cross slope = Sx+Sw*Eo	0.220	ft/ft
S_w=	Gutter cross slope = (0.137+afeet)/W	0.214	ft/ft
L_t=	Total interception L = $0.60*Q_s^{0.42}*So^{0.30}*(1/n*S_e)^{0.6}$	4.47	ft
Q_{ic}=	Flow intercepted = $(1-(1-(L_c*(1-C_{fc}/100))/L_t)^{1.8})*Q_s$	0.7	cfs

Total Inlet Calculations

Q_{ti}=	Total flow intercepted = $Q_{ig}+Q_{ic}$	1.0	cfs
Q_{tq}=	Flow bypass = Q_s-Q_{ti}	0.0	cfs
q=	Interception per unit ratio = Q_{ti}/L_g	0.22	cfs/ft
E_q=	Efficiency = (Qti/Qs)*100	100	%

Type CM Drop Inlet Sizing on a C. G.

DI10 - ON10

Known:

Q_s=	Half Street Flow	3	cfs
S_o=	Longitudinal Slope	0.02	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	2.87	fps
D=	Flow Depth	0.33	ft
S_x=	Street Transverse Slope	0.02	ft/ft
W=	Gutter Width	2	ft
a=	Gutter Depression	5.0	in
L_g=	Length of Grate	2.5	ft
L_c=	Length of Curb Opening	4.5	ft
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R_f=	Frontal flow factor = $1-0.09*(V_s-V_o)$ if $V_s>V_o$; else $R_f=1$	1.00	
	V_o= Splash over velocity=$p+q*(L_g*(1-(C_{fg}/100)))-r*(L_g*(1-(C_{fg}/100)))^2+s*(L_g*(1-(C_{fg}/100)))^3$†	5.02	fps
E_o=	Grate flow ratio = Q_w/Q_s	0.55	
	Q_w= Frontal flow=A_w*V_s	1.66	cfs
	Q_x= Side flow = Q_s-Q_w	1.34	cfs
R_s=	Side flow factor = $1/(1+(0.15*V_s^{1.8})/(S_x*(L_g*(1-C_{fg}/100))^{2.3}))$	0.03	
Q_{ig}=	Flow intercepted = $[R_f*E_o+R_s*(1-E_o)]*Q_s$	1.7	cfs
	†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)		

Curb Opening Capacity Calculations

S_e=	Equivalent cross slope = Sx+Sw*Eo	0.138	ft/ft
S_w=	Gutter cross slope = (0.137+afeet)/W	0.214	ft/ft
L_t=	Total interception L = $0.60*Q_s^{0.42}*So^{0.30}*(1/n*S_e)^{0.6}$	11.54	ft
Q_{ic}=	Flow intercepted = $(1-(1-(L_c*(1-C_{fc}/100))/L_t)^{1.8})*Q_s$	1.0	cfs

Total Inlet Calculations

Q_{ti}=	Total flow intercepted = $Q_{ig}+Q_{ic}$	2.7	cfs
Q_{tq}=	Flow bypass = Q_s-Q_{ti}	0.3	cfs
q=	Interception per unit ratio = Q_{ti}/L_g	0.59	cfs/ft
E_q=	Efficiency = (Qti/Qs)*100	89	%

Worksheet for Emergency Overflow ON8 (ON6 + ON7 + ON8)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.380	%
Discharge	8.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.12
0+00.50	1.12
0+00.50	0.62
0+23.00	0.17
0+23.00	0.13
0+24.50	0.00
0+24.50	0.48
0+25.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.12)	(0+25.00, 0.50)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.46	ft
Roughness Coefficient	0.016	
Elevation	0.46	ft
Elevation Range	0.00 to 1.12	ft
Flow Area	2.6	ft²
Wetted Perimeter	16.30	ft
Hydraulic Radius	0.16	ft
Top Width	15.80	ft
Normal Depth	0.46	ft
Critical Depth	0.51	ft
Critical Slope	0.679	%
Velocity	3.23	ft/s
Velocity Head	0.16	ft

Worksheet for Emergency Overflow ON8 (ON6 + ON7 + ON8)

Results	
Specific Energy	0.62 ft
Froude Number	1.396
Flow Type	Supercritical

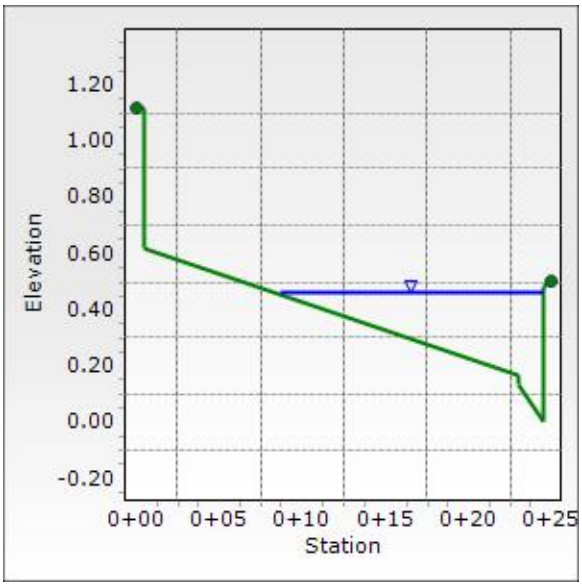
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.46 ft
Critical Depth	0.51 ft
Channel Slope	1.380 %
Critical Slope	0.679 %

XS for Emergency Overflow ON8 (ON6 + ON7 + ON8)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.380 %
Normal Depth	0.46 ft
Discharge	8.50 cfs



Worksheet for Emergency Overflow ON9 (ON6 + ON7 + ON9)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.000	%
Discharge	6.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.28
0+00.50	1.28
0+00.50	0.78
0+23.00	0.17
0+23.00	0.13
0+24.50	0.00
0+24.50	0.48
0+25.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.28)	(0+25.00, 0.50)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.47	ft
Roughness Coefficient	0.016	
Elevation	0.47	ft
Elevation Range	0.00 to 1.28	ft
Flow Area	2.3	ft²
Wetted Perimeter	13.05	ft
Hydraulic Radius	0.17	ft
Top Width	12.53	ft
Normal Depth	0.47	ft
Critical Depth	0.50	ft
Critical Slope	0.684	%
Velocity	2.88	ft/s
Velocity Head	0.13	ft

Worksheet for Emergency Overflow ON9 (ON6 + ON7 + ON9)

Results	
Specific Energy	0.60 ft
Froude Number	1.198
Flow Type	Supercritical

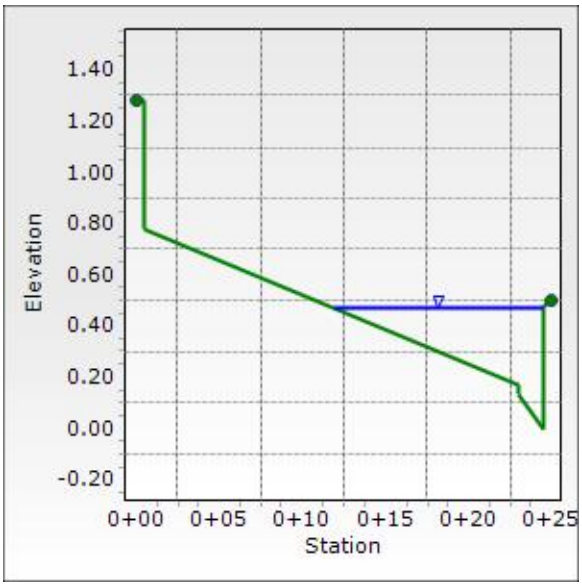
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.47 ft
Critical Depth	0.50 ft
Channel Slope	1.000 %
Critical Slope	0.684 %

XS for Emergency Overflow ON9 (ON6 + ON7 + ON9)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.47 ft
Discharge	6.50 cfs



Worksheet for Emergency Overflow ON11 (ON4 + ON9 + ON10 + ON11)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.000 %
Discharge	10.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+24.50	0.62
0+24.50	1.12
0+25.00	1.12

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+25.00, 1.12)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.46 ft
Roughness Coefficient	0.016
Elevation	0.46 ft
Elevation Range	0.00 to 1.12 ft
Flow Area	2.7 ft²
Wetted Perimeter	16.47 ft
Hydraulic Radius	0.16 ft
Top Width	15.96 ft
Normal Depth	0.46 ft
Critical Depth	0.54 ft
Critical Slope	0.660 %
Velocity	3.92 ft/s
Velocity Head	0.24 ft

Worksheet for Emergency Overflow ON11 (ON4 + ON9 + ON10 + ON11)

Results	
Specific Energy	0.70 ft
Froude Number	1.684
Flow Type	Supercritical

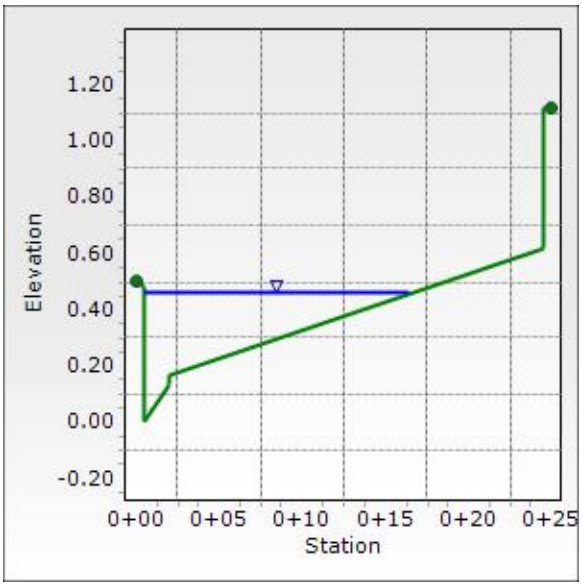
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.46 ft
Critical Depth	0.54 ft
Channel Slope	2.000 %
Critical Slope	0.660 %

XS for Emergency Overflow ON11 (ON4 + ON9 + ON10 + ON11)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.000 %
Normal Depth	0.46 ft
Discharge	10.50 cfs



Storm Drain Hydraulics Calculations

Kimley»Horn

MAIN

DATE: 08/15/24 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA								FLOW DATA								ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																	PIPE	TRANSITION																											
	STATION			PIPE	BOX		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend			Misc			CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_i	H_i	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		30					2533.84																			Outlet K_o=		1.0										2536.32	2535.89			Outlet
2	1000.00	1074.57	R	30			1	2533.84	2534.14	74.6	0.40%	4.91	0.0049	26.0	5.30	0.44	0.0040	0.0040	0.30																					0.00	2537.07	2536.64			FULL	D/S	
3	1074.57	1079.57	T	24			1	2534.14	2534.16	5.0	0.40%	3.14	0.0049	26.0	8.28	1.06	0.0132	0.0132		0.07	0	0.02	0.01															0.07			2537.22	2536.16	FULL	D/S	SDMH15
4	1079.57	1087.07	R	24			1	2534.16	2534.19	7.5	0.40%	3.14	0.0049	26.0	8.28	1.06	0.0132	0.0132	0.10																					0.00	2537.32	2536.26			FULL	U/S	
5	1087.07	1091.07	T	24			1	2534.19	2534.20	4.0	0.40%	3.14	0.0049	22.0	7.00	0.76	0.0094	0.0094		0.04	8	0.05	0.05	45	0.50	0.68													0.77			2538.09	2537.33	FULL	U/S	DI5
6	1091.07	1112.34	R	24			1	2534.20	2534.29	21.3	0.40%	3.14	0.0049	22.0	7.00	0.76	0.0094	0.0094	0.20																					0.00	2538.29	2537.53			FULL	U/S	
7	1112.34	1117.34	T	24			1	2534.29	2534.31	5.0	0.40%	3.14	0.0049	22.0	7.00	0.76	0.0094	0.0094		0.05	15	0.11	0.08															0.13			2538.42	2537.66	FULL	U/S	SDMH8
8	1117.34	1309.80	R	24			1	2534.31	2535.08	192.5	0.40%	3.14	0.0049	22.0	7.00	0.76	0.0094	0.0094	1.81																					0.00	2540.24	2539.48			FULL	U/S	
9	1309.80	1314.80	T	18			1	2535.08	2535.15	5.0	1.45%	1.77	0.0049	13.0	7.36	0.84	0.0153	0.0123		0.06	0	0.02	0.02	90	0.25	0.55													0.63			2540.87	2540.03	FULL	U/S	SDMH7
10	1314.80	1411.96	R	18			1	2535.15	2537.58	97.2	2.50%	1.77	0.0049	13.0	7.36	0.84	0.0153	0.0153	1.48																					0.00	2542.35	2541.51			FULL	U/S	
11	1411.96	1416.96	T	18			1	2537.58	2537.70	5.0	2.50%	1.77	0.0049	10.5	5.94	0.55	0.0100	0.0126		0.06	6	0.05	0.04	90	0.25	0.70													0.81			2543.16	2542.61	FULL	U/S	SDMH6
12	1416.96	1491.22	R	18			1	2537.70	2539.49	74.3	2.40%	1.77	0.0049	10.5	5.94	0.55	0.0100	0.0100	0.74																					0.00	2543.90	2543.35			FULL	U/S	
13	1491.22	1495.85	T	18			1	2539.49	2539.49	4.6	0.00%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0075		0.03	25	0.22	0.12	45	0.50	0.41													0.56			2544.46	2544.18	FULL	U/S	DI4
14	1495.85	1513.96	R	18			1	2539.49	2539.94	18.1	2.50%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0051	0.09																					0.00	2544.55	2544.27			FULL	U/S	
15	1513.96	1518.96	T	18			1	2539.94	2540.06	5.0	2.50%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0051		0.03	31	0.22	0.06															0.09			2544.64	2544.36	FULL	U/S	SDMH5
16	1518.96	1814.98	R	18			1	2540.06	2547.46	296.0	2.50%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0051	1.50																					0.00	2549.24	2548.96			PART	D/S	
17	1814.98	1815.64	T	18			1	2547.46	2547.48	0.7	2.50%	1.77	0.0049	7.0	3.96	0.24	0.0044	0.0048		0.00	0	0.02	0.01															0.01			2549.25	2549.01	FULL	U/S	Roof Drain
18	1815.64	1917.60	R	18			1	2547.48	2550.03	102.0	2.50%	1.77	0.0049	7.0	3.96	0.24	0.0044	0.0044	0.45																					0.00	2551.77	2551.53			PART	D/S	
19	1917.60	1922.60	T	18			1	2550.03	2550.15	5.0	2.50%	1.77	0.0049	7.0	3.96	0.24	0.0044	0.0044		0.02	12	0.05	0.01															0.03			2551.90	2551.65	FULL	D/S	SDMH4
20	1922.60	1972.91	R	18			1	2550.15	2551.41	50.3	2.50%	1.77	0.0049	7.0	3.96	0.24	0.0044	0.0044	0.22																					0.00	2553.16	2552.91			PART	D/S	
21	1972.91	1977.91	T	18			1	2551.41	2551.54	5.0	2.50%	1.77	0.0049	6.0	3.40	0.18	0.0032	0.0038		0.02	78	1.06	0.26	11	0.85	0.09													0.37			2553.53	2553.35	FULL	U/S	SDMH3
22	1977.91	2036.24	R	18			1	2551.54	2553.00	58.3	2.50%	1.77	0.0049	6.0	3.40	0.18	0.0032	0.0032	0.19																					0.00	2554.67	2554.50			PART	D/S	
23	2036.24	2041.24	T	18			1	2553.00	2553.12	5.0	2.50%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0017		0.01	0	0.02	0.00	90	0.25	0.18													0.19			2554.86	2554.86	FULL	U/S	SDMH2
24	2041.24	2309.56	R	18			1	2553.12	2559.83	268.3	2.50%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.02																					0.00	2561.33	2561.33			PART	D/S	
25	2309.56	2314.56	T	18			1	2559.83	2559.95	5.0	2.50%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001		0.00	90	1.33	0.01															0.01			2561.46	2561.45	FULL	D/S	SDMH1
26	2314.56	2337.05	R	18			1	2559.95	2560.52	22.5	2.50%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.00																					0.00	2562.02	2562.02			PART	D/S	
27	2337.05	2337.05	R	18			1	2560.52	2560.52	0.0		1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.00					45	0.50	0.00	Ki=	0.4	0.00									0.00			2562.03	2562.03	FULL	U/S	DI1

MAIN - Summary of Results

					(Optional)		HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	to FG	Required?
1000.00	2533.84	2536.34	2536.32	2535.89	2535.00	Outlet	HGL<1ft below FG	NO
1074.57	2534.14	2536.64	2537.07	2536.64	2539.71	SDMH15	OK	NO
1079.57	2534.16	2536.16	2537.22	2536.16	2539.71	SDMH15	OK	NO
1087.07	2534.19	2536.19	2537.32	2536.26	2539.87	DI5	OK	NO
1091.07	2534.20	2536.20	2538.09	2537.33	2539.87	DI5	OK	NO
1112.34	2534.29	2536.29	2538.29	2537.53	2540.61	SDMH8	OK	NO
1117.34	2534.31	2536.31	2538.42	2537.66	2540.61	SDMH8	OK	NO
1309.80	2535.08	2537.08	2540.24	2539.48	2544.61	SDMH7	OK	NO
1314.80	2535.15	2536.65	2540.87	2540.03	2544.61	SDMH7	OK	NO
1411.96	2537.58	2539.08	2542.35	2541.51	2546.67	SDMH6	OK	NO
1416.96	2537.70	2539.20	2543.16	2542.61	2546.67	SDMH6	OK	NO
1491.22	2539.49	2540.99	2543.90	2543.35	2548.16	DI4	OK	NO
1495.85	2539.49	2540.99	2544.46	2544.18	2548.16	DI4	OK	NO
1513.96	2539.94	2541.44	2544.55	2544.27	2548.91	SDMH5	OK	NO
1518.96	2540.06	2541.56	2544.64	2544.36	2548.91	SDMH5	OK	NO
1814.98	2547.46	2548.96	2549.24	2548.96	2556.47	Roof Drain	OK	NO
1815.64	2547.48	2548.98	2549.25	2549.01	2556.47	Roof Drain	OK	NO
1917.60	2550.03	2551.53	2551.77	2551.53	2559.66	SDMH4	OK	NO
1922.60	2550.15	2551.65	2551.90	2551.65	2559.66	SDMH4	OK	NO
1972.91	2551.41	2552.91	2553.16	2552.91	2559.95	SDMH3	OK	NO
1977.91	2551.54	2553.04	2553.53	2553.35	2559.95	SDMH3	OK	NO
2036.24	2553.00	2554.50	2554.67	2554.50	2561.33	SDMH2	OK	NO
2041.24	2553.12	2554.62	2554.86	2554.86	2561.33	SDMH2	OK	NO
2309.56	2559.83	2561.33	2561.33	2561.33	2566.81	SDMH1	OK	NO
2314.56	2559.95	2561.45	2561.46	2561.45	2566.81	SDMH1	OK	NO
2337.05	2560.52	2562.02	2562.02	2562.02	2566.27	DI1	OK	NO
2337.05	2560.52	2562.02	2562.03	2562.03	2566.27	DI1	OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

MAIN_SDMH2

DATE: 08/12/24 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA									FLOW DATA									ENERGY LOSS DATA																				EGL & HGL				COMMENTS		
																			PIPE	TRANSITION																									
	STATION			PIPE	BOX		#	INVERT ELEV		L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/		
	FROM	TO	T/R	D	SPAN	RISE		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_i	H_j	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL	
	(ft)	(ft)		(in)	(ft)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW		
1		1000.00		18					2553.21																					Outlet K_o=	1.0										2554.98	2554.86			SDMH2
2	1000.00	1019.98	R	18			1	2553.21	2554.21	20.0	5.00%	1.77	0.0049	5.0	2.83	0.12	0.0023	0.0023	0.05																			0.00	2555.83	2555.71			PART	D/S	
3	1019.98	1019.98	R	18			1	2554.21	2554.21	0.0		1.77	0.0049	5.0	2.83	0.12	0.0023	0.0023	0.00					45	0.50	0.06	Ki=	0.4	0.05									0.11			2555.95	2555.95	FULL	U/S	DI2

MAIN_SDMH2 - Summary of Results

					(Optional)		HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	to FG	Required?
1000.00	2553.21	2554.71	2554.98	2554.86	2561.33	SDMH2	OK	NO
1019.98	2554.21	2555.71	2555.83	2555.71	2561.39	DI2	OK	NO
1019.98	2554.21	2555.71	2555.95	2555.95	2561.39	DI2	OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

MAIN_SDMH3

DATE: 08/12/24 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA									FLOW DATA									ENERGY LOSS DATA																				EGL & HGL				COMMENTS		
																			PIPE	TRANSITION																									
	STATION			PIPE	BOX		#	INVERT ELEV		L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/		
	FROM	TO	T/R	D	SPAN	RISE		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_i	H_j	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL	
	(ft)	(ft)		(in)	(ft)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW		
1		1000.00		18					2551.48																					Outlet K_o=	1.0										2553.35	2553.35			SDMH3
2	1000.00	1030.32	R	18			1	2551.48	2552.23	30.3	2.50%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.00																			0.00	2553.74	2553.73			PART	D/S	
3	1030.32	1030.32	R	18			1	2552.23	2552.23	0.0		1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.00					45	0.50	0.00	Ki=	0.4	0.00									0.00			2553.74	2553.74	FULL	U/S	DI1

MAIN_SDMH3 - Summary of Results

					(Optional)		HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	to FG	Required?
1000.00	2551.48	2552.98	2553.35	2553.35	2559.95	SDMH3	OK	NO
1030.32	2552.23	2553.73	2553.74	2553.73	2559.19	DI1	OK	NO
1030.32	2552.23	2553.73	2553.74	2553.74	2559.19	DI1	OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

MAIN_SDMH6 DATE: 08/15/24 FILE: SF6.xls

DMH2 - Summary of Results | Storm Drain Manning's n (typ=0.013)= 0.013 | Inlet Structure Type or K_i= D | Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA								FLOW DATA									ENERGY LOSS DATA																												EGL & HGL				COMMENTS	
																		PIPE	TRANSITION																																			
	STATION			PIPE	BOX		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc				CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_i	H_i	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW		
1		1000.00		18					2537.64																		Outlet K_o=		1.0													2542.64	2542.61			SDMH6
2	1000.00	1008.25	R	18			1	2537.64	2538.05	8.3	5.00%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006	0.00																					0.00	2542.65	2542.61			FULL	U/S
3	1008.25	1008.25	R	18			1	2538.05	2538.05	0.0		1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006	0.00				45	0.50	0.02	Ki=	0.4	0.01									0.03			2542.67	2542.67	FULL	U/S	DI10

MAIN_SDMH6 - Summary of Results

					(Optional)		HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	to FG	Required?
1000.00	2537.64	2539.14	2542.64	2542.61	2546.67	SDMH6	OK	NO
1008.25	2538.05	2539.55	2542.65	2542.61	2546.40	DI10	OK	NO
1008.25	2538.05	2539.55	2542.67	2542.67	2546.40	DI10	OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

MAIN_SDMH7

DATE: 08/15/24 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA								FLOW DATA							ENERGY LOSS DATA																								EGL & HGL				COMMENTS	
																PIPE	TRANSITION																													
	STATION			PIPE	BOX		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc			CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_i	H_i	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)			(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18					2535.09																					Outlet K_o=	1.0									2540.43	2540.03			SDMH7
2	1000.00	1176.72	R	18			1	2535.09	2538.62	176.7	2.00%	1.77	0.0049	9.0	5.09	0.40	0.0073	0.0037	0.65																					0.00	2541.08	2540.68			FULL	U/S	
3	1176.72	1182.73	T	18			1	2538.62	2538.62	6.0	0.00%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0065		0.04	0	0.02	0.01	45	0.50	0.24													0.29			2541.37	2541.05	FULL	U/S	DI9
4	1182.73	1346.72	R	18			1	2538.62	2541.90	164.0	2.00%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0058	0.95																					0.00	2543.72	2543.40			PART	D/S	
5	1346.72	1351.72	T	18			1	2541.90	2542.00	5.0	2.00%	1.77	0.0049	6.0	3.40	0.18	0.0032	0.0045		0.02	88	1.33	0.42	90	0.25	0.27													0.72			2544.44	2544.26	FULL	U/S	SDMH12
6	1351.72	1381.74	R	18			1	2542.00	2542.60	30.0	2.00%	1.77	0.0049	6.0	3.40	0.18	0.0032	0.0032	0.10																					0.00	2544.54	2544.36			FULL	U/S	
7	1381.74	1387.74	T	18			1	2542.60	2542.60	6.0	0.00%	1.77	0.0049	5.0	2.83	0.12	0.0023	0.0028		0.02	2	0.02	0.00	45	0.50	0.12													0.14			2544.67	2544.55	FULL	U/S	DI7
8	1387.74	1501.24	R	18			1	2542.60	2544.87	113.5	2.00%	1.77	0.0049	5.0	2.83	0.12	0.0023	0.0023	0.26																					0.00	2546.50	2546.37			PART	D/S	
9	1501.24	1506.24	T	18			1	2544.87	2545.01	5.0	2.75%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0020		0.01	90	1.33	0.17	90	0.25	0.10													0.27			2546.77	2546.67	FULL	U/S	SDMH11
10	1506.24	1617.27	R	18			1	2545.01	2548.90	111.0	3.50%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018	0.20																					0.00	2550.50	2550.40			PART	D/S	
11	1617.27	1622.27	T	18			1	2548.90	2549.07	5.0	3.50%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018		0.01	90	1.33	0.13																	0.14			2550.67	2550.57	FULL	D/S	SDMH10
12	1622.27	1680.70	R	18			1	2549.07	2551.12	58.4	3.50%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018	0.11																					0.00	2552.72	2552.62			PART	D/S	
13	1680.70	1685.70	T	18			1	2551.12	2551.29	5.0	3.50%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018		0.01	90	1.33	0.13																	0.14			2552.89	2552.79	FULL	D/S	SDMH16
14	1685.70	1692.34	R	18			1	2551.29	2551.52	6.6	3.50%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018	0.01																					0.00	2553.12	2553.02			FULL	D/S	
15	1692.34	1692.34	R	18			1	2551.52	2551.52	0.0		1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018	0.00					45	0.50	0.05	Ki=	0.4	0.04									0.09			2553.22	2553.22	FULL	U/S	DI6

MAIN_SDMH7 - Summary of Results

					(Optional)		HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	to FG	Required?
1000.00	2535.09	2536.59	2540.43	2540.03	2544.61	SDMH7	OK	NO
1176.72	2538.62	2540.12	2541.08	2540.68	2547.84	DI9	OK	NO
1182.73	2538.62	2540.12	2541.37	2541.05	2547.84	DI9	OK	NO
1346.72	2541.90	2543.40	2543.72	2543.40	2550.18	SDMH12	OK	NO
1351.72	2542.00	2543.50	2544.44	2544.26	2550.18	SDMH12	OK	NO
1381.74	2542.60	2544.10	2544.54	2544.36	2551.11	DI7	OK	NO
1387.74	2542.60	2544.10	2544.67	2544.55	2551.11	DI7	OK	NO
1501.24	2544.87	2546.37	2546.50	2546.37	2556.40	SDMH11	OK	NO
1506.24	2545.01	2546.51	2546.77	2546.67	2556.40	SDMH11	OK	NO
1617.27	2548.90	2550.40	2550.50	2550.40	2558.34	SDMH10	OK	NO
1622.27	2549.07	2550.57	2550.67	2550.57	2558.34	SDMH10	OK	NO
1680.70	2551.12	2552.62	2552.72	2552.62	2560.74	SDMH16	OK	NO
1685.70	2551.29	2552.79	2552.89	2552.79	2560.74	SDMH16	OK	NO
1692.34	2551.52	2553.02	2553.12	2553.02	2560.12	DI6	OK	NO
1692.34	2551.52	2553.02	2553.22	2553.22	2560.12	DI6	OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

MAIN_SDMH7_SDMH12

DATE: 08/12/24 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA									FLOW DATA									ENERGY LOSS DATA																				EGL & HGL				COMMENTS		
																			PIPE	TRANSITION																									
	STATION			PIPE	BOX		#	INVERT ELEV		L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/		
	FROM	TO	T/R	D	SPAN	RISE		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_i	H_i	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL	
	(ft)	(ft)		(in)	(ft)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW		
1		1000.00		18					2541.95																				Outlet K_o=		1.0										2544.28	2544.26			SDMH 12
2	1000.00	1179.57	R	18			1	2541.95	2542.67	179.6	0.40%	1.77	0.0049	2.0	1.13	0.02	0.0004	0.0004	0.06																			0.00	2544.34	2544.32			FULL	U/S	
3	1179.57	1179.57	R	18			1	2542.67	2542.67	0.0		1.77	0.0049	2.0	1.13	0.02	0.0004	0.0004	0.00					45	0.50	0.01	Ki=	0.4	0.01									0.02			2544.36	2544.36	FULL	U/S	DI8

MAIN_SDMH7_SDMH12 - Summary of Results

					(Optional)		HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	to FG	Required?
1000.00	2541.95	2543.45	2544.28	2544.26	2550.18	SDMH 12	OK	NO
1179.57	2542.67	2544.17	2544.34	2544.32	2546.91	DI8	OK	NO
1179.57	2542.67	2544.17	2544.36	2544.36	2546.91	DI8	OK	NO