

## **Appendix B – Hydraulic Calculations**

- Hydraulic Sections – Streets
- Hydraulic Sections – Onsite
- Hydraulic Sections – Easement
- Finished Floor Calculations
- Riprap Calculations

## Worksheet for ES-1 (10-yr)

---

### Project Description

---

Friction Method	Manning Formula
Solve For	Normal Depth

---

### Input Data

---

Channel Slope	0.610 %
Discharge	2.00 cfs

---

### Section Definitions

	Station (ft)	Elevation (ft)	
	0+00.00		0.60
	0+05.00		0.50
	0+05.50		0.48
	0+05.50		0.00
	0+07.00		0.13
	0+07.00		0.17
	0+30.00		0.63

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.60)	(0+30.00, 0.63)	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 0.63 ft
Flow Area	1.2 ft <sup>2</sup>
Wetted Perimeter	10.67 ft
Hydraulic Radius	0.11 ft
Top Width	10.28 ft
Normal Depth	0.35 ft
Critical Depth	0.33 ft
Critical Slope	0.819 %
Velocity	1.68 ft/s
Velocity Head	0.04 ft
Specific Energy	0.39 ft

## Worksheet for ES-1 (10-yr)

---

### Results

---

Froude Number	0.870
Flow Type	Subcritical

---

### 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	0.33 ft
Channel Slope	0.610 %
Critical Slope	0.819 %

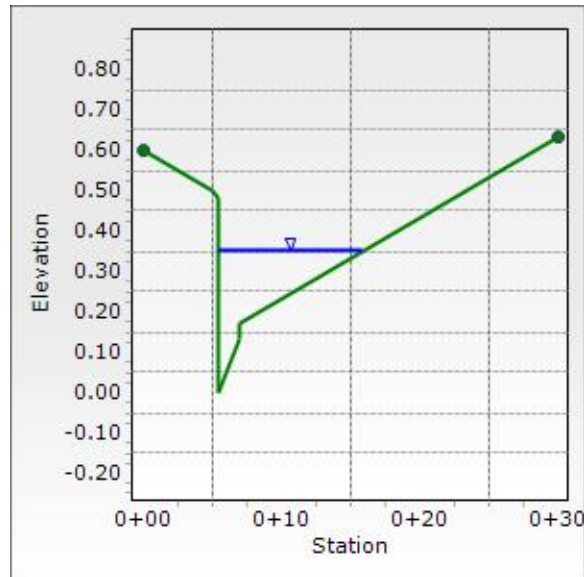
---

## Cross Section for ES-1 (10-yr)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.610 %
Normal Depth	0.35 ft
Discharge	2.00 cfs



## Worksheet for ES-1 (100-yr)

---

### Project Description

---

Friction Method	Manning Formula
Solve For	Normal Depth

---

### Input Data

---

Channel Slope	0.610 %
Discharge	5.00 cfs

---

### Section Definitions

	Station (ft)	Elevation (ft)	
	0+00.00		0.60
	0+05.00		0.50
	0+05.50		0.48
	0+05.50		0.00
	0+07.00		0.13
	0+07.00		0.17
	0+30.00		0.63

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient	
(0+00.00, 0.60)	(0+30.00, 0.63)		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	0.44 ft
Roughness Coefficient	0.016
Elevation	0.44 ft
Elevation Range	0.00 to 0.63 ft
Flow Area	2.4 ft <sup>2</sup>
Wetted Perimeter	15.51 ft
Hydraulic Radius	0.15 ft
Top Width	15.03 ft
Normal Depth	0.44 ft
Critical Depth	0.43 ft
Critical Slope	0.726 %
Velocity	2.09 ft/s
Velocity Head	0.07 ft
Specific Energy	0.51 ft

## Worksheet for ES-1 (100-yr)

---

### Results

---

Froude Number	0.923
Flow Type	Subcritical

---

### GVF Input Data

---

Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

---

### GVF Output Data

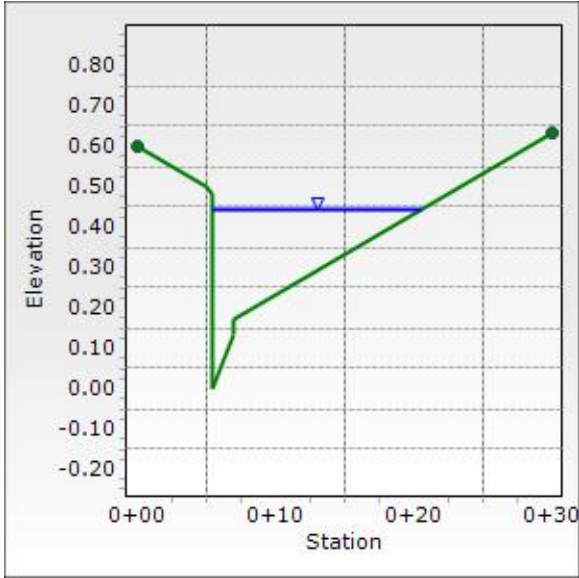
---

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	0.44 ft
Critical Depth	0.43 ft
Channel Slope	0.610 %
Critical Slope	0.726 %

---

# Cross Section for ES-1 (100-yr)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.610 %
Normal Depth	0.44 ft
Discharge	5.00 cfs



## Worksheet for ON1-A2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	0.610 %
Discharge	8.00 cfs

### Section Definitions

	Station (ft)	Elevation (ft)
	0+00.00	0.60
	0+05.00	0.50
	0+05.50	0.48
	0+05.50	0.00
	0+07.00	0.13
	0+07.00	0.17
	0+24.50	0.52
	0+42.00	0.17
	0+42.00	0.13
	0+43.50	0.00
	0+43.50	0.48
	0+44.00	0.50
	0+49.00	0.60

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.60)	(0+49.00, 0.60)	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	0.41 ft
Roughness Coefficient	0.016
Elevation	0.41 ft
Elevation Range	0.00 to 0.60 ft
Flow Area	4.1 ft <sup>2</sup>
Wetted Perimeter	28.42 ft
Hydraulic Radius	0.14 ft
Top Width	27.50 ft

## Worksheet for ON1-A2

---

### Results

---

Normal Depth	0.41 ft
Critical Depth	0.40 ft
Critical Slope	0.748 %
Velocity	1.98 ft/s
Velocity Head	0.06 ft
Specific Energy	0.48 ft
Froude Number	0.907
Flow Type	Subcritical

---

---

### 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	0.41 ft
Critical Depth	0.40 ft
Channel Slope	0.610 %
Critical Slope	0.748 %

---

## Worksheet for ON1-A2

Messages:

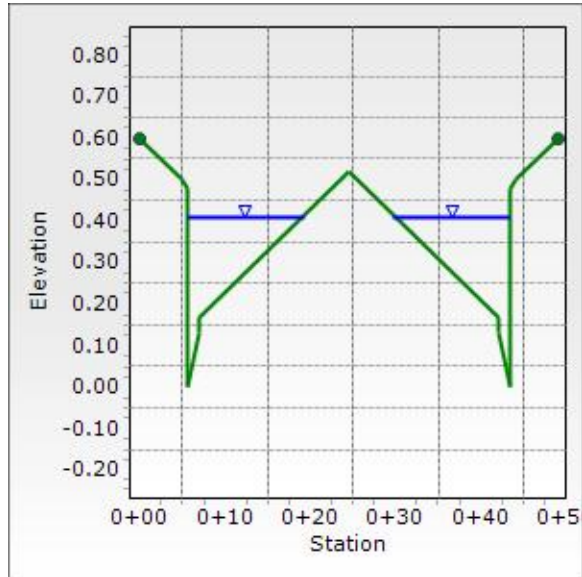
Flow is divided.

## Cross Section for ON1-A2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.610 %
Normal Depth	0.41 ft
Discharge	8.00 cfs



## Worksheet for ON1-B2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

---

Input Data	
Channel Slope	3.940 %
Discharge	3.00 cfs

### Section Definitions

	Station (ft)	Elevation (ft)
	0+00.00	0.60
	0+05.00	0.50
	0+05.50	0.48
	0+05.50	0.00
	0+07.00	0.13
	0+07.00	0.17
	0+23.50	0.50
	0+40.00	0.17
	0+40.00	0.13
	0+41.50	0.00
	0+41.50	0.48
	0+42.00	0.50
	0+47.00	0.60

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.60)	(0+47.00, 0.60)	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	0.25 ft
Roughness Coefficient	0.016
Elevation	0.25 ft
Elevation Range	0.00 to 0.60 ft
Flow Area	0.9 ft <sup>2</sup>
Wetted Perimeter	11.85 ft
Hydraulic Radius	0.08 ft
Top Width	11.25 ft

## Worksheet for ON1-B2

---

### Results

---

Normal Depth	0.25 ft
Critical Depth	0.31 ft
Critical Slope	0.850 %
Velocity	3.32 ft/s
Velocity Head	0.17 ft
Specific Energy	0.42 ft
Froude Number	2.068
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	0.25 ft
Critical Depth	0.31 ft
Channel Slope	3.940 %
Critical Slope	0.850 %

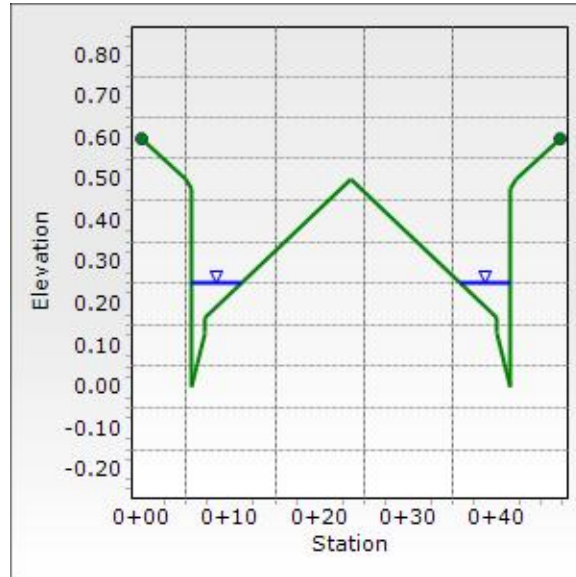
---

## Cross Section for ON1-B2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.940 %
Normal Depth	0.25 ft
Discharge	3.00 cfs



## Worksheet for ESMT-1

---

### Project Description

---

Friction Method	Manning Formula
Solve For	Normal Depth

---

### Input Data

---

Channel Slope	1.450 %
Discharge	8.00 cfs

---

### Section Definitions

	Station (ft)	Elevation (ft)	
	0+00.00		2.40
	0+00.00		0.40
	0+05.00		0.30
	0+20.00		0.00
	0+35.00		0.30
	0+35.00		1.80

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2.40)	(0+35.00, 1.80)	0.013

---

### 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	0.22 ft
Roughness Coefficient	0.013
Elevation	0.22 ft
Elevation Range	0.00 to 2.40 ft
Flow Area	2.5 ft <sup>2</sup>
Wetted Perimeter	22.36 ft
Hydraulic Radius	0.11 ft
Top Width	22.36 ft
Normal Depth	0.22 ft
Critical Depth	0.28 ft
Critical Slope	0.477 %
Velocity	3.20 ft/s
Velocity Head	0.16 ft
Specific Energy	0.38 ft
Froude Number	1.687

## Worksheet for ESMT-1

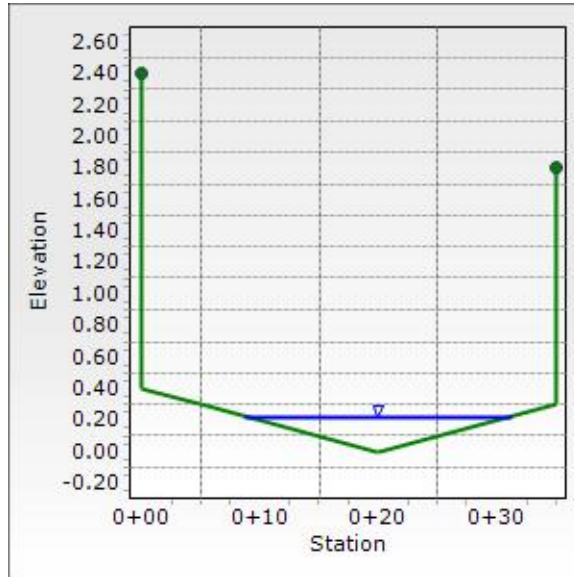
Results	
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.22 ft
Critical Depth	0.28 ft
Channel Slope	1.450 %
Critical Slope	0.477 %

# Cross Section for ESMT-1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.450 %
Normal Depth	0.22 ft
Discharge	8.00 cfs



Finished Floor Elevations Check						
LOT #	FF	High TC/FL	Criteria	Freeboard	Section #	Remarks
1	2803.90	2801.41	0.82	2.05	ON1-A2	Denton Ct
1	2803.90	2803.70	1.52	-0.82	DSW-1	Deer Springs Way - 2 Courses Solid Grout
2	2804.30	2801.67	0.82	2.19	ON1-A2	Denton Ct
3	2804.70	2802.11	0.82	2.15	ON1-A2	Denton Ct
4	2805.00	2802.56	0.82	2.00	ON1-A2	Denton Ct
5	2805.40	2803.01	0.82	1.95	ON1-A2	Denton Ct
6	2805.50	2803.46	0.74	1.68	ON1-A1	Denton Ct
7	2806.30	2804.20	0.74	1.74	ON1-A1	Denton Ct
8	2807.10	2804.98	0.74	1.76	ON1-A1	Denton Ct
9	2807.90	2805.77	0.74	1.77	ON1-A1	Denton Ct
10	2808.60	2806.54	0.74	1.70	ON1-A1	Denton Ct
11	2809.20	2807.27	0.74	1.57	ON1-A1	Denton Ct
12	2810.00	2808.03	0.74	1.61	ON1-A1	Denton Ct
13	2810.00	2808.03	0.68	1.67	ON1-B1	Denton Ct
13	2810.00	2804.49	0.88	5.13	ES-1	Eula Street
14	2809.20	2807.25	0.68	1.65	ON1-B1	Denton Ct
14	2809.20	2803.73	0.88	5.09	ES-1	Eula Street
15	2808.70	2806.53	0.68	1.87	ON1-B1	Denton Ct
15	2808.70	2802.62	0.88	5.70	ES-1	Eula Street
16	2807.90	2805.75	0.68	1.85	ON1-B1	Denton Ct
16	2807.90	2801.51	0.88	6.01	ES-1	Eula Street
17	2807.10	2804.96	0.68	1.84	ON1-B1	Denton Ct
17	2807.10	2800.31	0.88	6.41	ES-1	Eula Street
18	2806.30	2804.17	0.68	1.83	ON1-B1	Denton Ct
18	2806.30	2802.03	0.50	4.15	ON1-B2	McKenny Ave
18	2806.30	2799.21	0.88	6.71	ES-1	Eula Street
19	2805.30	2802.83	0.50	2.35	ON1-B2	McKenny Ave
19	2805.30	2802.03	0.82	2.83	ON1-A2	Denton Ct
19	2805.30	2797.69	0.88	7.23	ES-1	Eula Street
20	2805.00	2802.47	0.82	2.09	ON1-A2	Denton Ct
20	2805.00	2797.31	0.88	7.31	ES-1	Eula Street
21	2804.60	2802.02	0.82	2.14	ON1-A2	Denton Ct
21	2804.60	2796.88	0.88	7.34	ES-1	Eula Street
22	2804.20	2801.58	0.82	2.18	ON1-A2	Denton Ct
22	2804.20	2796.43	0.88	7.39	ES-1	Eula Street
23	2803.50	2801.37	0.82	1.69	ON1-A2	Denton Ct
23	2803.50	2799.91	1.52	2.57	DSW-1	Deer Springs Way
23	2803.50	2796.12	0.88	7.00	ES-1	Eula Street

Date 08/31/22 Project 92935017

By DH

### **Riprap Lining Calculation Deer Springs Eula**

$$d_{50} = (3V^* (S^{0.17}/S_s-1))^2$$

V = 6.24 ft/s

S = 0.027 ft/ft

S<sub>s</sub> = 2.65 Specific Gravity

d<sub>50</sub> = 0.4654 = 0.4654 x 12in/ft = 5.58-inches → Use d<sub>50</sub> = 6-inches