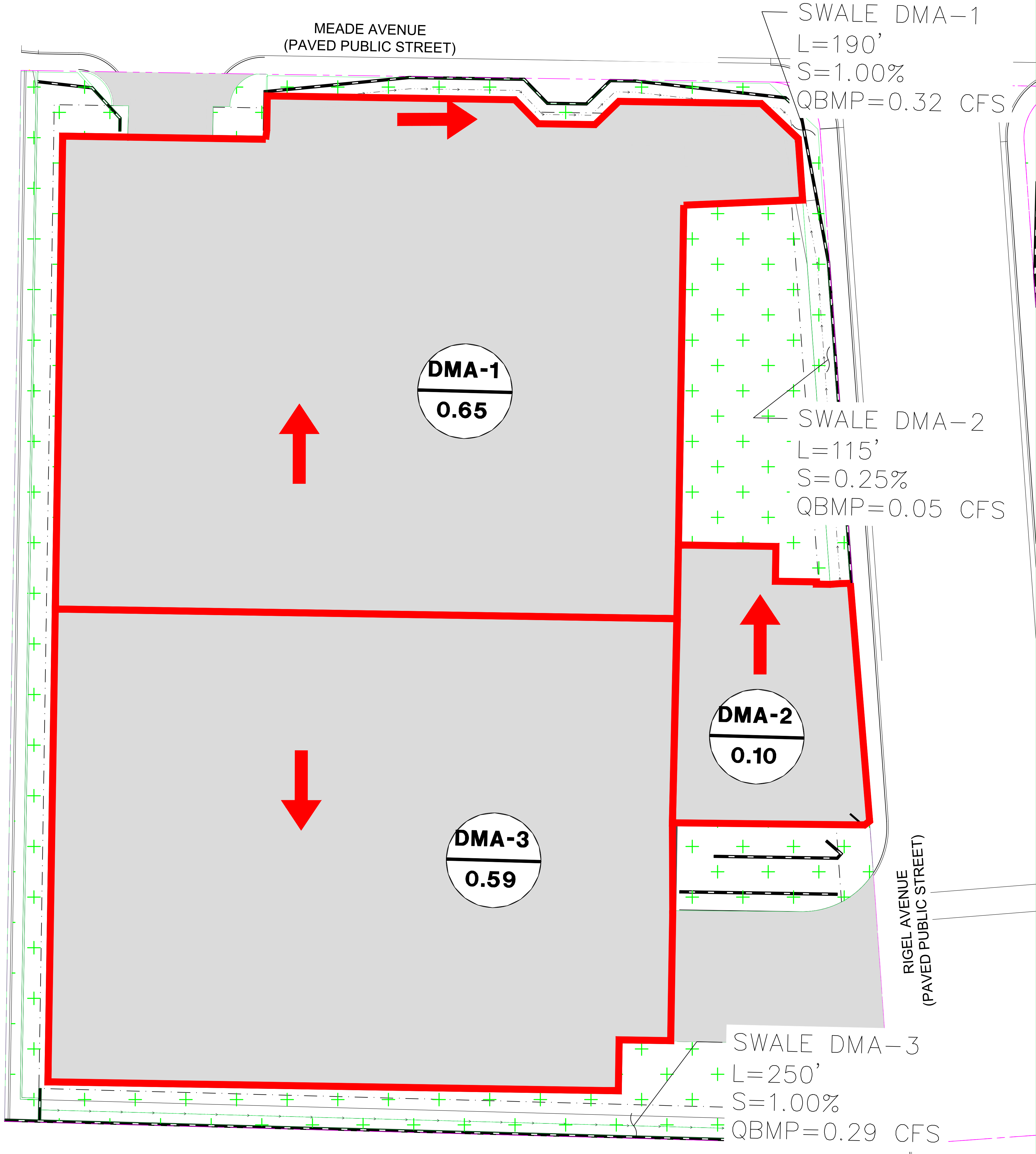


Appendix C – Parking Lot LID Calculations

- LID Parking Lot LID Map & Calculations
- Table 505 2-Year 6-Hour Rainfall Depth-Duration-Frequency (McCarran)
- Normal Depth Sections – BMP Swales

Plotted By: Logan, Christian - Sheet Set: KHA - Layout: KHA - November 15, 2022 - 11:42:44am - K:\AV-Civil\092965012 - Area 15 District 2 (Finley Brothers)\Reports\DRAINAGE\01-TDS\Figures\CAD\LID.dwg
This document, together with the concepts and designs presented herein, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.



PARKING LOT DATA CALCULATIONS			
Note: Stormwater Quality Design Volume calculated using steps from Section 1500 Figures 1501-1503 of the CCRFCD HCDDM, Revised 2013			
GIVEN:			
Project Description:	Area 15 District 2		
Parking Lot Data			Acreage
Property Size (PS)	=	1.79	
Building Area (BA)	=	0.00	
Total Hardscape/ Landscape Area (TPA)	=	0.37	
Parking Lot Area (PLA) = (PLA = PS-BA-TPA)	=	1.42	
Minimum PLA to be treated = (PLA * 0.75)	=	1.07	acres
Area to be treated by the proposed LID BMPs			
Drainage Area DMA-1	=	0.65	
Drainage Area DMA-2	=	0.10	
Drainage Area DMA-3	=	0.59	
Total	=	1.34	acres
Since 1.34 ac >= 1.07 ac then site satisfies Parking Lot LID criteria			

LID

AREA 15
DISTRICT 2
PREPARED FOR
NEW VEGAS HOLDING COMPANY, LLC
CITY OF LAS VEGAS
NEVADA

LID BASIN MAP

KHA PROJECT
092965011

DATE
10/25/2022

SCALE
AS SHOWN

DESIGNED BY
TEA

DRAWN BY
SS

CHECKED BY
RD

10/25/2022

10/25/2022

10/25/2022

10/25/2022

Kimley»Horn

© 2022 KIMLEY-HORN AND ASSOCIATES, INC.
6671 LAS VEGAS BOULEVARD S. SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

REVISIONS

No.

DATE

BY

PROJECT NAME: **Area 15 District 2**
 CALC'D BY: **SS** CHECKED BY: **RRD**
 DATE: **11/15/22** KH No. **91965012**

PARKING LOT DATA CALCULATIONS

Note: Stormwater Quality Design Volume calculated using steps from Section 1500 Figures 1501-1503 of the CCRFCD HCDDM, Revised 2013

GIVEN:

Project Description:	Area 15 District 2		
Parking Lot Data			Acreage
Property Size (PS)	=	1.79	
Building Area (BA)	=	0.00	
Total Hardscape/ Landscape Area (TPA)	=	0.37	
Parking Lot Area (PLA) = (PS-BA-TPA)	=	1.42	
Minimum PLA to be treated = (PLA * 0.75)	=	1.07	acres
Area to be treated by the proposed LID BMPs			
Drainage Area DMA-1	=	0.65	
Drainage Area DMA-2	=	0.10	
Drainage Area DMA-3	=	0.59	
Total	=	1.34	acres

Since 1.34 ac >= 1.07 ac then site satisfies Parking Lot LID criteria

PROJECT NAME: Area 15 District 2
 CALC'D BY: SS CHECKED BY: RRD
 DATE: 11/15/22 KH No. 91965012

PARKING LOT LID CALCULATIONS - Peak QBMP FOR DRAINAGE AREA "1"

Note: Stormwater Quality Design Volume calculated using steps from Section 1502.3 of the CCRFCD HCDDM, Revised 2013

GIVEN:

Project Description: Area Event Parking Lot
 Drainage Area = 0.65 acres
 Avg % Impervious = 98 %
 0.7794

Determine BMP Design Precipitation - 85th Percentile Rainfall Depth 1.11485537

Is site located within McCarran Airport Rainfall Area? (Yes/No?) YES

If yes, use Table 505 to obtain 2-year 6-hour rainfall depth; this is your D2

If no, use Figure 501 to obtain 2-year 6-hour rainfall depth; this is your D2

D2 = 0.72

Compute ratio of D2 of site to D2 for the McCarran Area

$D2_{site}/D2_{McCarran} = 1.00$

Compute 85th Percentile Rainfall depth D_{85} using following equation

0.32

Calculate BMP Design Peak Discharge, QBMP

Page 1 of 2 Use the following regression equation to calculate the unit discharge (Qp/A) for the 90 percent average percent impervious area condition based on D_{85} value

$$Y = 1.5042X - 0.0066$$

where, Y = Average Qp/A in cfs/ac

X = D_{85} in inches

$Qp/A = 0.47$ cfs/ac

Adjust the Qp/A for site based on actual percent impervious using the following regression equation

$$Y = 0.0059X + 0.4688$$

where, Y = Ratio Qp/A to 90% Impervious Value (unitless)

X = Percent Impervious

Y = 1.05

Qp/A (adjusted) = 0.50 cfs/ac

QBMP = Qp/A (adjusted) * Area

= 0.32 cfs

PROJECT NAME: **Area 15 District 2**
 CALC'D BY: **SS** CHECKED BY: **RRD**
 DATE: **11/15/22** KH No. **91965012**

PARKING LOT LID CALCULATIONS - Peak QBMP FOR DRAINAGE AREA "2"

Note: Stormwater Quality Design Volume calculated using steps from Section 1502.3 of the CCRFCD HCDDM, Revised 2013

GIVEN:

Project Description: **Area Event Parking Lot**
 Drainage Area = **0.10** acres
 Avg % Impervious = **98** %
 0.7794

Determine BMP Design Precipitation - 85th Percentile Rainfall Depth **1.11485537**

Is site located within McCarran Airport Rainfall Area? (Yes/No?) **YES**

If yes, use Table 505 to obtain 2-year 6-hour rainfall depth; this is your **D2**

If no, use Figure 501 to obtain 2-year 6-hour rainfall depth; this is your **D2**

D2 = **0.72**

Compute ratio of D2 of site to D2 for the McCarran Area

D2_{site}/D2_{McCarran} = **1.00**

Compute 85th Percentile Rainfall depth **D₈₅** using following equation

0.32

Calculate BMP Design Peak Discharge, **QBMP**

Page 1 of 2 Use the following regression equation to calculate the unit discharge (**Qp/A**) for the 90 percent average percent impervious area condition based on **D₈₅** value

$$Y = 1.5042X - 0.0066$$

where, **Y** = Average **Qp/A** in cfs/ac

X = **D₈₅** in inches

Qp/A = **0.47** cfs/ac

Adjust the **Qp/A** for site based on actual percent impervious using the following regression equation

$$Y = 0.0059X + 0.4688$$

where, **Y** = Ratio **Qp/A** to 90% Impervious Value (unitless)

X = Percent Impervious

Y = **1.05**

Qp/A (adjusted) = **0.50** cfs/ac

QBMP = **Qp/A (adjusted) * Area**

= **0.05** cfs

PROJECT NAME: **Area 15 District 2**
 CALC'D BY: **SS** CHECKED BY: **RRD**
 DATE: **11/15/22** KH No. **91965012**

PARKING LOT LID CALCULATIONS - Peak QBMP FOR DRAINAGE AREA "3"

Note: Stormwater Quality Design Volume calculated using steps from Section 1502.3 of the CCRFCD HCDDM, Revised 2013

GIVEN:

Project Description: **Area Event Parking Lot**
 Drainage Area = **0.59** acres
 Avg % Impervious = **98** %
 0.7794

Determine BMP Design Precipitation - 85th Percentile Rainfall Depth **1.11485537**

Is site located within McCarran Airport Rainfall Area? (Yes/No?) **YES**

If yes, use Table 505 to obtain 2-year 6-hour rainfall depth; this is your **D2**

If no, use Figure 501 to obtain 2-year 6-hour rainfall depth; this is your **D2**

D2 = **0.72**

Compute ratio of D2 of site to D2 for the McCarran Area

D2_{site}/D2_{McCarran} = **1.00**

Compute 85th Percentile Rainfall depth **D₈₅** using following equation

0.32

Calculate BMP Design Peak Discharge, **QBMP**

Page 1 of 2 Use the following regression equation to calculate the unit discharge (**Qp/A**) for the 90 percent average percent impervious area condition based on **D₈₅** value

$$Y = 1.5042X - 0.0066$$

where, **Y** = Average **Qp/A** in cfs/ac

X = **D₈₅** in inches

Qp/A = **0.47** cfs/ac

Adjust the **Qp/A** for site based on actual percent impervious using the following regression equation

$$Y = 0.0059X + 0.4688$$

where, **Y** = Ratio **Qp/A** to 90% Impervious Value (unitless)

X = Percent Impervious

Y = **1.05**

Qp/A (adjusted) = **0.50** cfs/ac

QBMP = **Qp/A (adjusted) * Area**

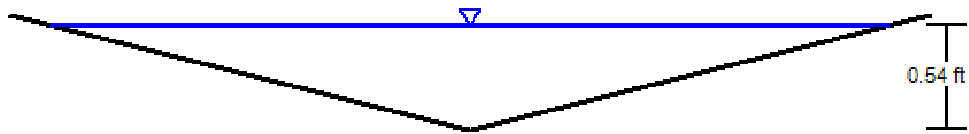
= **0.29** cfs

Worksheet for SW1

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	1.00 %
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	2.00 cfs
Results	
Normal Depth	0.54 ft
Flow Area	1.2 ft ²
Wetted Perimeter	4.43 ft
Hydraulic Radius	0.26 ft
Top Width	4.30 ft
Critical Depth	0.43 ft
Critical Slope	3.09 %
Velocity	1.73 ft/s
Velocity Head	0.05 ft
Specific Energy	0.58 ft
Froude Number	0.589
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	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.54 ft
Critical Depth	0.43 ft
Channel Slope	1.00 %
Critical Slope	3.09 %

Cross Section for SW1

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	1.00 %
Normal Depth	0.54 ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	2.00 cfs



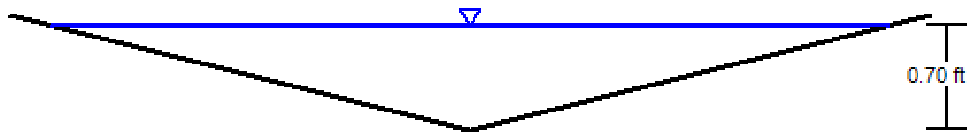
V: 1 
H: 1

Worksheet for SW2

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	0.25 %
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	2.00 cfs
Results	
Normal Depth	0.70 ft
Flow Area	1.9 ft ²
Wetted Perimeter	5.74 ft
Hydraulic Radius	0.34 ft
Top Width	5.57 ft
Critical Depth	0.43 ft
Critical Slope	3.09 %
Velocity	1.03 ft/s
Velocity Head	0.02 ft
Specific Energy	0.71 ft
Froude Number	0.308
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	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.70 ft
Critical Depth	0.43 ft
Channel Slope	0.25 %
Critical Slope	3.09 %

Cross Section for SW2

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	0.25 %
Normal Depth	0.70 ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	2.00 cfs



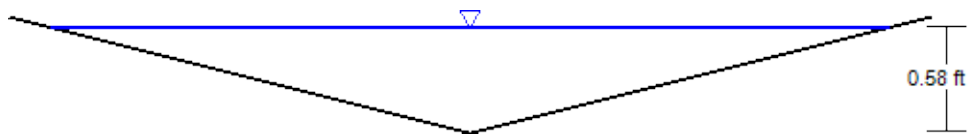
V: 1 
H: 1

Worksheet for SW3

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	1.00 %
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	2.50 cfs
Results	
Normal Depth	0.58 ft
Flow Area	1.4 ft ²
Wetted Perimeter	4.82 ft
Hydraulic Radius	0.28 ft
Top Width	4.67 ft
Critical Depth	0.48 ft
Critical Slope	3.00 %
Velocity	1.83 ft/s
Velocity Head	0.05 ft
Specific Energy	0.64 ft
Froude Number	0.598
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	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.58 ft
Critical Depth	0.48 ft
Channel Slope	1.00 %
Critical Slope	3.00 %

Cross Section for SW3

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	1.00 %
Normal Depth	0.58 ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	2.50 cfs



V: 1
H: 1