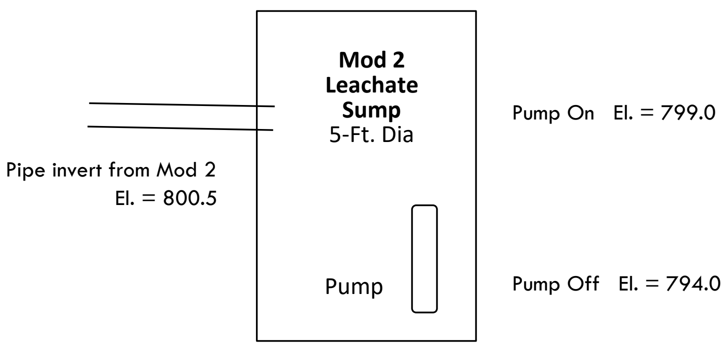
SCS ENGINEERS

		Calc. No.	
		Rev. No.	
Job No. 25222260.00	Job: Columbia Dry Ash Disposal Facility	By: MJT	Date: 8/31/23
Client: Wisconsin Power & Light	Subject: Sump Volume and Pump Capacity	Chk'd: KRG	Date: 9/1/23

Sump Volumes

Sump (For Module 2)



5 Ft. Diameter Sump Volume = π x r^2 x 7.48 gal/cf
= 3.14 x 2.5^2 x 7.48
= 147 gal/ft

Mod 2 Sump volume = 376 gal.ft x 5 ft
= 734 gal

Calculations:

	Available Volume in Mod 2 Sump (gals)	Leachate Generation Rate (gal/day)	Fill Time (hours)
Module 2 (Current Conditions)	734	1,711	10.3
Module 2 (Final Conditions)	734	293	60.2

Sump filling times provide adequate pump rest time during active conditions with open and closed conditions.

SCS ENGINEERS

Sheet No.	5 of 5
Calc. No.	
Rev. No.	

Job No. 25222260.00	Job: Columbia Dry Ash Disposal Facility	By: MJT	Date: 8/31/23
Client: Wisconsin Power & Light	Subject: Sump Volume and Pump Capacity	Chk'd: KRG	Date: 9/1/23

Calculations:

Determine preliminary pumping rates and times based on assumed sump filling rate

Filling rate (gpm) = Sump Volume (gal) / Sump Fill Time (hr) / 60 min/hr

Dewatering Time (hr) = Sump Volume (gal) / (Pumping Rate - Filling Rate (gpm)) / 60 min/hr

Pump Rest Time (hr) = Sump Fill Time (hr)

Mod 1 Sump - (assume pump will pump at 17 gpm with all pumps running, see pump sizing calculation)

	Available Sump Volume, gal	**Sump Fill Time, hrs**	**Filling Rate, gpm**	**Pumping Rate, gpm**	**Dewatering Time, hrs**	**Pump Rest Time, hrs**
Mod 1 (Current Conditions)	587	8.9	1.1	17.0	0.6	8.9
Mod 1 (Final Conditions)	587	22.9	0.4	17.0	0.6	22.9

Mod 2 Sump - (assume pump will pump at 17 gpm with all pumps running, see pump sizing calculation)

	Available Sump Volume, gal	**Sump Fill Time, hrs**	**Filling Rate, gpm**	**Pumping Rate, gpm**	**Dewatering Time, hrs**	**Pump Rest Time, hrs**
Mod 2 (Current Conditions)	587	10.3	1.0	17.0	0.6	10.3
Mod 2 (Final Conditions)	587	60.2	0.2	17.0	0.6	60.2

Conclusion:

The required pumping rates are readily achievable with available pumps, such as EPG Model 5 series.

SCS ENGINEERS

		Sheet No.	1
		Calc. No.	
		Rev. No.	
Job No. 25222260.00	Job: Columbia Dry Ash Disposal Facility	By: MJT	Date : 8/21/2023
Client: Wisconsin Power & Light	Subject: Leachate Storage Capacity	Chk'd KRG	Date: 8/24/23

Leachate Generated at the Site During Closed Conditions

Purpose:

To determine the amount of leachate storage required when the site is closed and final cover is installed.

Leachate will be collected and pumped to a storage tank.

Approach:

Determine the area of final cover, use 1 inch/year for leachate generation per NR 512.12(3)(b).

Determine the leachate generated per day and the tank volume needed to store 4 days of leachate.

Assumptions:

The site is fully constructed (Modules 1 - 6, and 10 - 13 are constructed)

There is final cover on all Modules with a leachate generation rate of 1 inch/year

Calculations:

Entire Area of Filling (Final Cover):

Mod 1	8.28	acres	Mod 5	4.12	acres	Mod 11	3.48	acres
Mod 2	4.05	acres	Mod 6	3.79	acres	Mod 12	4.65	acres
Mod 3	3.98	acres	Mod 10	3.42	acres	Mod 13	2.48	acres
Mod 4	4.05	acres						
			Total:	**42.30**	**acres**			

Final Cover (Volume per day)

$$42.30 \text{ acres} \times 1 \frac{\text{in}}{\text{yr}} \times \frac{1 \text{ ft}}{12 \text{ in}} \times 43{,}560 \frac{\text{ft}^2}{\text{acre}} \times \frac{1 \text{ yr}}{365 \text{ days}}$$

$$= 420.7 \frac{\text{ft}^3}{\text{day}} \times 7.48 \frac{\text{gal}}{\text{ft}^3} = 3{,}147 \frac{\text{gallons}}{\text{day}} \times 4 \text{ days}$$

$$\mathbf{= 12{,}587 \text{ gallons}}$$

Results: 4 days of leachate production when the site is 100% covered in final cover requires a 15,000 gallon storage tank.

SCS ENGINEERS

		Sheet No. 1 of 5	
		Calc. No.	
		Rev. No.	
Job No. 25222260.00	Job: Columbia Dry Ash Disposal Facility	By: MJT	Date: 8/22/23
Client: Wisconsin Power & Light	Subject: Leachate Loadout Facility Pump Design	Chk'd: KRG	Date: 8/24/23

Purpose:

To size the leachate loadout facility pump.

Approach:

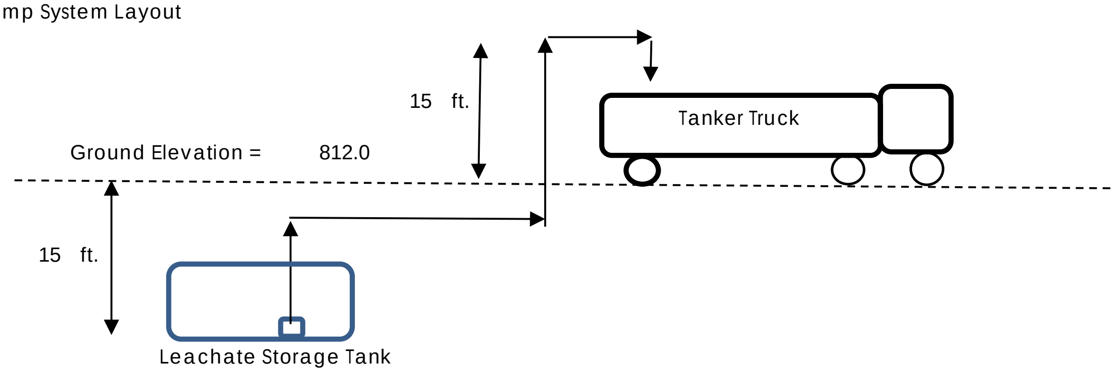
Determine the total dynamic head that the pump will operate against under various pumping rates.

The total dynamic head is a combination of the static head and friction losses from fittings and flow through the pipe.

Plot the resulting system curve on a representative pump curve to determine the suitability of a pump.

Calculations:

Pump System Layout



Assume 2.5 in. diameter pipe

Pipe Length = 75 ft.

Static Head

Tank Pump: Pump Off Elevation = 797.0 Assumes: 5 feet of cover over tank

10 feet tank diameter

Loadout Gantry Elev. = 827.0

Assumes: Gantry is 15 feet above the ground surface

Static Head = 827.0 - 797.0 = 30.0 feet

Results:

The Goulds Pump Model 2GFK3212G, 3.2 hp, 200V will pump at 138 gpm. (See Sheet 5)

SCS ENGINEERS

		Calc. No.	
		Rev. No.	
Job No. 25222260.00	Job: Columbia Dry Ash Disposal Facility	By: MJT	Date: 8/22/23
Client: Wisconsin Power & Light	Subject: Leachate Loadout Facility Pump Design	Chk'd: KRG	Date: 8/24/23

Calculations (cont.):

Fittings and Equivalent Length (see Sheet 4)

From Pump to Loadout	Eq. Length (ft)				Total Eq. Length (ft)
90° Elbows, 2.5"	3	X	10	=	30
Union Fitting, 2.5"	1	X	4	=	4
Check Valve, 2.5"	1	X	15	=	15
			Total:		49
Actual Length (2.5" Steel)					75
	Equivalent Length =				124

Flowrate (GPM)	Static Head (Ft)	Equivalent Length (Ft)	Head Loss Per 100 Ft.	Head Loss (Ft)	Total Dynamic Head (Ft)
2.5" Pipe (Pump to Loadout)					
75	30	124	3.88	4.81	34.8
100	30	124	6.61	8.20	38.2
125	30	124	10.01	12.41	42.4
150	30	124	14.01	17.37	47.4

Engineering & Design Data

SPEARS

FLOW VELOCITY & FRICTION LOSS

SDR 13.5

Flow Rate (Gallons/ Minute)	cubic ft/sec	Velocity (ft/s)	Friction Head Loss (ft water/ 100ft)	Friction Pressure (psi/ 100ft)	Velocity (ft/s)	Friction Head Loss (ft water/ 100ft)	Friction Pressure (psi/ 100ft)	Velocity (ft/s)	Friction Head Loss (ft water/ 100ft)	Friction Pressure (psi/ 100ft)	Velocity (ft/s)	Friction Head Loss (ft water/ 100ft)	Friction Pressure (psi/ 100ft)	Velocity (ft/s)	Friction Head Loss (ft water/ 100ft)	Friction Pressure (psi/ 100ft)	Velocity (ft/s)	Friction Head Loss (ft water/ 100ft)	Friction Pressure (psi/ 100ft)	Velocity (ft/s)	Friction Head Loss (ft water/ 100ft)	Friction Pressure (psi/ 100ft)	Velocity (ft/s)	Friction Head Loss (ft water/ 100ft)	Friction Pressure (psi/ 100ft)	Flow Rate (Gallons/ Minute)
GPM		1/2"			3/4"			1"			1-1/4"			1-1/2"			2"			2-1/2"			3"			GPM
1	0.002	0.85	1.03	0.45	0.64	0.34	0.15																			1
2	0.004	1.69	2.06	0.89	1.07	0.68	0.29	0.68	0.40	0.17	0.42	0.13	0.06	0.32	0.059	0.026	0.20	0.03	0.013							2
5	0.011	4.22	11.58	5.01	2.68	3.62	1.68	1.69	1.24	0.54	1.05	0.53	0.17	0.80	0.20	0.088	0.51	0.075	0.033	0.36	0.038	0.016	0.24	0.02	0.009	5
7	0.016	5.91	21.24	9.20	3.75	7.01	3.08	2.36	2.20	0.89	1.47	0.72	0.31	1.12	0.37	0.16	0.72	0.125	0.054	0.49	0.53	0.023	0.33	0.03	0.012	7
10	0.022	8.44	40.46	17.52	5.35	13.34	5.78	3.37	4.33	1.87	2.10	1.37	0.59	1.60	0.71	0.31	1.02	0.24	0.10	0.70	0.09	0.039	0.47	0.04	0.017	10
15	0.033	4"			8.03	28.27	12.24	5.06	9.18	3.97	3.15	2.91	1.26	2.40	1.50	0.65	1.53	0.50	0.22	1.04	0.20	0.087	0.70	0.08	0.036	15
20	0.045	0.57	0.04	0.017	10.70	48.17	20.86	6.74	15.64	6.77	4.21	4.96	2.31	3.20	2.55	1.10	2.04	0.85	0.37	1.39	0.34	0.15	0.94	0.13	0.056	20
25	0.056	0.71	0.06	0.026	5"			8.43	23.65	10.24	5.26	7.49	3.24	4.00	3.85	1.67	2.55	1.28	0.56	1.74	0.51	0.22	1.17	0.19 0.	082	25
30	0.067	0.85	0.09	0.035	0.56	0.03	0.013	10.11	33.16	14.35	6.31	10.50	4.55	4.80	5.40	2.34	3.05	1.80	0.78	2.09	0.71	0.31	1.41	0.27	0.12	30
35	0.078	0.99	0.11	0.046	0.65	0.04	0.017				7.36	13.97	6.05	5.60	7.19	3.11	3.57	2.40	1.04	2.44	0.95	0.41	1.64	0.36	0.16	35
40	0.089	1.14	0.14	0.060	0.74	0.05	0.022				8.41	17.90	7.75	6.40	9.20	3.98	4.08	3.07	1.33	2.78	1.21	0.53	1.88	0.46	0.20	40
45	0.100	1.28	0.17	0.074	0.84	0.06	0.026	6"			9.46	22.26	9.64	7.20	11.44	4.95	4.59	3.82	1.65	3.13	1.51	0.65	2.11	0.58	0.25	45
50	0.111	1.42	0.21	0.091	0.93	0.07	0.030	0.68	0.03	0.013	10.52	27.05	11.71	8.00	13.91	6.02	5.10	4.64	2.01	3.48	1.83	0.79	2.35	0.70	0.30	50
60	0.134	1.70	0.29	0.13	1.12	0.10	0.043	0.79	0.04	0.017				9.60	19.50	8.44	6.12	6.50	2.81	4.18	2.57	1.11	2.82	0.98	0.42	60
70	0.156	1.99	0.38	0.16	1.30	0.14	0.061	0.92	0.06	0.026							7.14	8.65	3.75	4.87	3.42	1.48	3.29	1.31	0.57	70
75	0.167	2.13	0.44	0.19	1.40	0.15	0.069	0.99	0.07	0.030							7.65	9.83	4.26	5.22	3.89	1.68	3.52	1.49	0.65	75
80	0.178	2.27	0.49	0.21	1.49	0.18	0.078	1.05	0.08	0.035							8.16	11.08	4.80	5.57	4.37	1.89	3.76	1.68	0.73	80
90	0.201	2.56	0.61	0.26	1.67	0.22	0.095	1.18	0.09	0.039							9.18	13.78	5.97	6.27	5.44	2.35	4.23	2.09	0.90	90
100	0.223	2.84	0.74	0.32	1.86	0.27	0.12	1.31	0.11	0.049							10.20	16.75	7.25	6.96	6.61	2.86	4.70	2.54	1.10	100
125	0.279	3.55	1.13	0.49	2.33	0.40	0.18	1.64	0.17	0.074										8.70	10.01	4.33	5.88	3.84	1.66	125
150	0.334	4.26	1.58	0.68	2.79	0.56	0.24	1.97	0.24	0.10										10.44	14.01	6.07	7.04	5.37	2.33	150
175	0.390	4.97	2.10	0.91	3.26	0.75	0.33	2.30	0.32	0.14													8.22	7.15	3.10	175
200	0.446	5.68	2.69	1.16	3.72	0.96	0.42	2.62	0.41	0.18													9.39	9.15	3.96	200
250	0.557	7.10	4.07	1.76	4.65	1.45	0.63	3.28	0.62	0.27													11.74	13.83	6.00	250
300	0.669	8.52	5.69	2.46	5.59	2.03	0.88	3.93	0.87	0.38																300
350	0.780	9.94	7.58	3.29	6.52	2.70	1.17	4.59	1.16	0.50																350
400	0.891	11.36	9.70	4.20	7.44	3.46	1.50	5.24	1.48	0.64																400
450	1.003				8.37	4.31	1.87	5.90	1.84	0.80																450
500	1.114				9.30	5.24	2.27	6.56	2.23	0.97																500
750								9.83	4.73	2.05																750
1000	2.228							13.11	8.06	3.49																1000

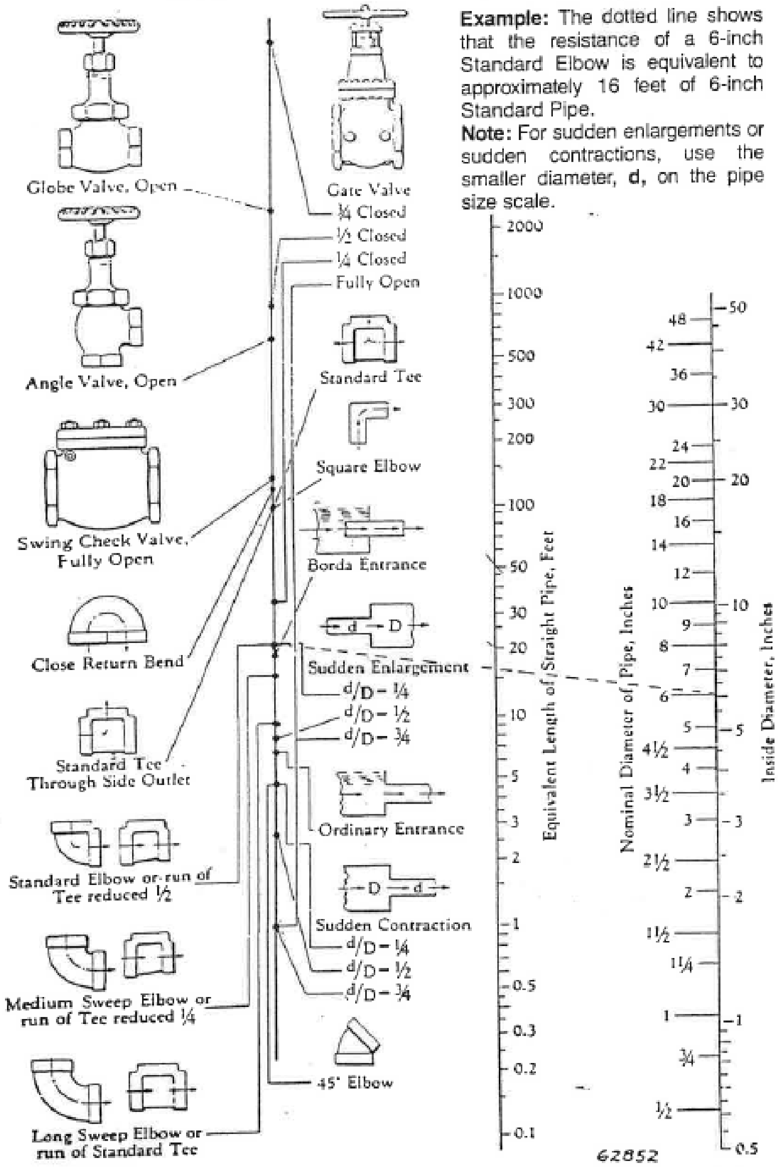
NOTE: Spears® recommends that Flow Velocities be maintained at or below 5 feet per second in large diameter piping systems (i.e. 6" diameter and larger) to minimize the potential for hydraulic shock. Refer to Spears® engineering section entitled "Hydraulic Shock" for additional information. Friction loss data based on utilizing mean wall dimensions to determine average ID; actual ID may vary.

FRICTION-WATER-PIPE FITTINGS

Friction of Water *(Continued)*
Resistance of Valves and Fittings to Flow of Fluids in Equivalent Length of Pipe

Example: The dotted line shows that the resistance of a 6-inch Standard Elbow is equivalent to approximately 16 feet of 6-inch Standard Pipe.

Note: For sudden enlargements or sudden contractions, use the smaller diameter, **d**, on the pipe size scale.



From Crane Co. Technical Paper No. 409. Data based on the above chart are satisfactory for most applications; for more detailed data and information refer to pages 3-110 to page 3-120 which are based on Crane Co. Technical Paper No. 410.

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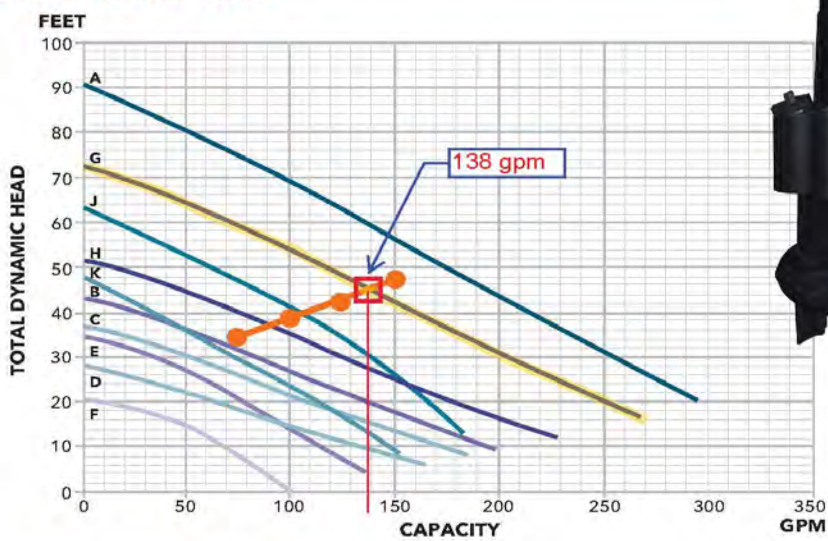
2" GFK & GFV

Goulds Water Technology GFK Series Submersible Sewage Pump

PERFORMANCE CURVE



PRODUCT SPECIFICATIONS

GWT Part No.	Impeller Type	Curve ID	Voltage	HP	Rated Current
2GFV1212F	Vortex	F	200	1.2	3.8
2GFV1213F	Vortex	F	230	1.2	4
2GFV1214F	Vortex	F	460	1.2	2
2GFV1712E	Vortex	E	200	1.7	5.1
2GFV1713E	Vortex	E	230	1.7	5
2GFV1714E	Vortex	E	460	1.7	2.5
2GFV3212K	Vortex	K	200	3.2	9.8
2GFV3213K	Vortex	K	230	3.2	8.8
2GFV3214K	Vortex	K	460	3.2	4.4
2GFK1212D	K	D	200	1.2	3.8
2GFK1213D	K	D	230	1.2	4
2GFK1214D	K	D	460	1.2	2
2GFV3812J	Vortex	J	200	3.8	12
2GFV3813J	Vortex	J	230	3.8	10.2
2GFV3814J	Vortex	J	460	3.8	5.1

GWT Part No.	Impeller Type	Curve ID	Voltage	HP	Rated Current
2GFK1712C	K	C	200	1.7	5.1
2GFK1713C	K	C	230	1.7	5
2GFK1714C	K	C	460	1.7	2.5
2GFK1712B	K	B	200	1.7	5.1
2GFK1713B	K	B	230	1.7	5
2GFK1714B	K	B	460	1.7	2.5
2GFK2412H	K	H	200	2.4	7.7
2GFK2413H	K	H	230	2.4	7.2
2GFK2414H	K	H	460	2.4	3.6
2GFK3212G	K	G	200	3.2	9.8
2GFK3213G	K	G	230	3.2	8.8
2GFK3214G	K	G	460	3.2	4.4
2GFK3812A	K	A	200	3.8	12
2GFK3813A	K	A	230	3.8	10.2
2GFK3814A	K	A	460	3.8	5.1

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SCS ENGINEERS

		Sheet No.	1
		Calc. No.	
		Rev. No.	
Job No. 25222260.00	Job: Columbia Dry Ash Disposal Facility	By: MJT	Date : 8/21/2023
Client: Wisconsin Power & Light	Subject: Leachate Generated over 4 Days	Chk'd: KRG	Date: 8/24/23

Leachate Generated at the Site During Open Conditions

Purpose:

To determine the volume of leachate generated over 4 days during open conditions and determine if the storage capacity of the Leachate Storage Pond is sufficient to contain the leachate.

Approach:

Estimate the leachate generated over 4 days assuming a leachate generation rate of 6 inches per year.

Determine the volume of storage available in the Leachate/Surface Water Pond based on the existing contours.

Assumptions:

The site is fully constructed (Modules 1 - 6, and 10 - 13 are constructed)

There is final cover on a portion of Module 1, which does not generate leachate.

There is final cover on the west side of Modules 2 through 4, which does not generate leachate.

The remainder of the site is considered open conditions, with a leachate generation rate of 6 inches/year.

The Leachate/Surface Water Pond can contain 194,617 cubic feet of water. (1,455,735 gallons)

The Leachate/Surface Water Pond has 0.5 feet of water in the pond prior to the start of storage and the top elevation of the pond storage area is at elevation 796.97 ft.

Calculations:

Areas of open conditions:

Mod 1	2.62	acres	Mod 5	4.12	acres	Mod 11	3.48	acres
Mod 2	2.38	acres	Mod 6	3.79	acres	Mod 12	4.65	acres
Mod 3	2.41	acres	Mod 10	3.42	acres	Mod 13	2.48	acres
Mod 4	2.65	acres						
			Total:	**32.00**	**acres**			

Leachate Generated in 4 days:

$$32.00 \text{ acres} \times 6\ \frac{\text{in}}{\text{yr}} \times \frac{1\ \text{ft}}{12\ \text{in}} \times 43{,}560\ \frac{\text{ft}^2}{\text{acre}} \times \frac{1\ \text{yr}}{365\ \text{days}}$$

$$= 1{,}909\ \frac{\text{ft}^3}{\text{day}} \times 7.48\ \frac{\text{gal}}{\text{ft}^3} = 14{,}283\ \frac{\text{gallons}}{\text{day}} \times 4 \text{ days}$$

$$= 57{,}132 \text{ gallons}$$

Results: The Leachate/Surface Water Pond has adequate volume to contain 4 days of leachate generation.

SCS ENGINEERS

		Sheet No.	1/1
		Calc. No.	
		Rev. No.	
Job No. 25220183.00	Job: Columbia Dry Ash Disposal Facility	By: KRG	Date: 2/17/22
Client: Wisconsin Power & Light	Subject: Hydraulic Capacity of LCS Pipe	Chk'd: MRS	Date: 4/8/22

Pipe Capacity Calculation

Purpose:

To confirm the leachate conveyance pipe is adequately sized for the flows expected.

Approach:

Estimate the amount of leachate that will be conveyed to the leachate collection pipe based on the leachate collection rate of 6 inches per year (NR 504.06(5)(j)1).

(Reference Leachate Sump Volume and Pump Capacity Calculations for this part of calculation.)

Use Manning's equation to estimate the maximum flow capacity of the pipe.

Assumptions:

Leachate flow from Modules 4, 5, and 6 flows through Module 11 to a collection sump.

From Leachate Sump Sizing and Pump Capacity Calculations, the estimated peak average leachate collection rate during active life **446.3** gal/acre/day.

The largest drainage basin area to a leachate collection pipe is approximately **16.39** acres

6" dia. leachate collection pipes are proposed

The inner diameter of 6" dia. HDPE SDR 11 pipe is **5.348** = 0.45 ft

Calculations:

Convert estimated peak average leachate flow to cfs:

446 gal/acre/day x 16.39 acres/[(1,440 min/day x 60 sec/min x 7.48 gal/cf] = 0.01 cfs

Using Mannings equation, calculate pipe flow capacity: $Q_{max} = (1.49/n) \times A \times R^{2/3} \times S^{1/2}$

where:

Q_{max} = Maximum flow rate

n = Mannings coefficient = 0.010 plastic pipe

A = Area of pipe = $(\pi) \times D^2/4$ 0.16 sf 6" dia. .pipe

R = Hydraulic radius = Area / Wetted perimeter = D/4 = 0.111

S = slope = **0.005** ft/ft (0.5%)

$Q_{max} = (1.49/.01) \times (A) \times (R^{0.667}) \times (S^{0.5})$

Q_{max} = 0.38 cfs

Results:

The flow capacity of the 6" dia. leachate collection pipe is 0.38 cfs. The worst-case flow rate is 0.01 cfs.

Therefore, the leachate collection pipe is adequately designed to accommodate the maximum flow rates expected to be generated at the site.

SCS ENGINEERS

Job No.	25222260.00	SHEET NO.		1	
Job:	Columbia Energy Center	CALC. NO.			
Client	WPL	REV. NO.		2	
Subject	Module 12/13 - Leachate/Surface Water Pond Evaluation	BY	SJL	DATE	8/28/23
		CHK'D.	RJG	DATE	8/30/23

Purpose:
The purpose of the leachate/surface water pond evaluation is to determine the following based on the as-built leachate/surface water pond top of liner elevation of 796.97 (see Background section below):

- The maximum amount of open area during each filling phase in order to maintain the peak water elevation resulting from the 25-year, 24-hour storm event at the maximum allowable 796.97.
- Based on the amount of allowable open area determined from the above, determine the maximum starting water elevations in the leachate/surface water pond to accommodate 1, 2, 5, and 10-year, 24-hour storm events without overtopping.

Background:

- During construction of Module 2, the top of the leachate/surface water pond liner was determined to be at elevation 796.97.
- Previous calculations submitted to the WDNR on January 30, 2018 and March 10, 2021, evaluated the leachate/surface water pond capacity based on the as-built pond liner elevation.
- A similar evaluation was performed for Module 3 and 4 construction and then Module 5 and 6 construction that produced a chart of maximum leachate/surface water pond starting elevations vs. rainfall storage capacity.
- Module 10 and 11 were constructed in 2002 and CCR placement began in 2023.
- Module 12 and 13 will be constructed if additional airspace is required before the plant is closed.
- The Filling Phases 0 - 4 were previously submitted and approved by WDNR in 2022 as part of the Plan Modification Request - Plan of Operations Update that covered modules up to Module 10-11.

Approach:

- Use the previously developed HydroCAD storm water model to model the below four filling scenarios.
    1. Filling Phase 5 – Assumes portions of Module 11 and 12 are contributing to the leachate/surface water pond while material is placed from the pond closure and the plant. See **Figure 1** for filling grades and contributing area.
    2. Filling Phase 6 – Assumes portions of Module 12 and 13 are contributing to the leachate/surface water pond while material is placed from the pond closure and the plant. See **Figure 2** for filling grades and contributing area.

Assumptions:

- CCR surfaces and intermediate cover areas were assumed to be impermeable (CN=98).
- The top of pond liner elevation is 796.97 (see Background section).
- Time of Concentration is 20 minutes for open areas.

Results:

1. Maximum allowable open area and contact water sump area during filling of Module 12 and 13 is 8.51 acres.

2. Filling Phase 5:
    - The contributing area of landfill to the leachate/surface water pond is 6.24 acres for the leachate/surface water pond to accommodate the runoff from a 25-year, 24-hour storm without overtopping. This acreage includes the open landfill area plus the contact water sump area.
    - The remainder of landfill would need to be closed/covered with final or intermediate cover and routed away from the pond.
    - **Figure 1** shows a proposed filling sequence, and **Figure 1a** shows the various operating levels of the leachate/surface water pond to accommodate the various storm events with the additional cover in place.

3. Filling Phase 6:
    - The contributing area of landfill to the leachate/surface water pond is 8.475 acres for the leachate/surface water pond to accommodate the runoff from a 25-year, 24-hour storm without overtopping. This acreage includes the open landfill area plus the contact water sump area.
    - The remainder of landfill would need to be closed/covered with final or intermediate cover and routed away from the pond.
    - **Figure 2** shows a proposed filling sequence, and **Figure 2a** shows the various operating levels of the leachate/surface water pond to accommodate the various storm events with the additional cover in place.

The HydroCAD reports for the maximum open contributing area, each scenario modeled are attached.

LEGEND

	DRY ASH DISPOSAL FACILITY LIMITS
	LIMITS OF WASTE
	FINAL COVER LIMITS
	PAVED ROAD
	UNPAVED ROAD
	VEGETATION
	FENCE
810	EXISTING GRADE (10' INTERVAL)
	EXISTING GRADE (2' INTERVAL)
	SWALE
	EDGE OF WATER
	WETLAND
800	PROPOSED GRADE (10' INTERVAL)
802	PROPOSED GRADE (2' INTERVAL)
	PROPOSED PERIMETER ROAD
	PROPOSED SWALE
	PROPOSED CULVERT
	EXISTING FINAL COVER
	ESTIMATED INTERMEDIATE COVER
	ACTIVE FILLING AREA
	UNFILLED MODULE 12 LINER AREA FOR CONTACT WATER PUMPING

NOTES:

1. PROPOSED GRADES ARE CONCEPTUAL. ACTUAL GRADES WILL BE BASED ON PLANT OPERATIONS.

100 0 100

SCALE: 1" = 100'

N

PROJECT NO.	25222260.01	DRAWN BY:	KP
DRAWN:	07/24/2023	CHECKED BY:	RR/MRH
REVISED:	08/15/2023	APPROVED BY:	MRH 08/30/2023

WISCONSIN POWER AND LIGHT
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WISCONSIN 53954

Wisconsin Power and Light Company

CLIENT

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
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ENGINEER

PLAN OF OPERATION UPDATE
COLUMBIA ENERGY CENTER
COLUMBIA DRY ASH DISPOSAL FACILITY
TOWN OF PACIFIC, WISCONSIN

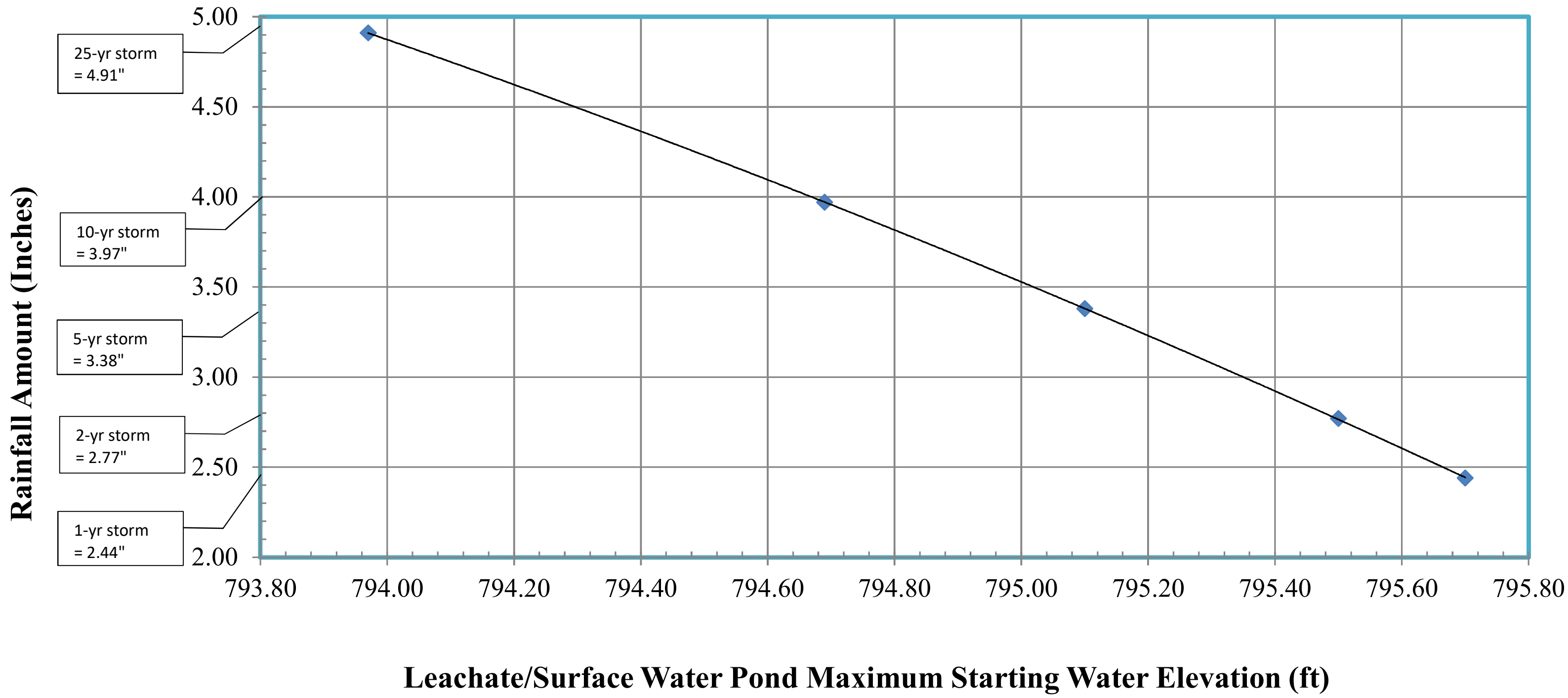
SITE

FILL SEQUENCE – MODULE 12

FIGURE

1

Figure 1A
Columbia Energy Center
Phase 5 Filling- Open Landfill Area
Leachate/Surface Water Pond Maximum Starting Water Elevation



Notes/Assumptions:

1. Maximum starting water elevations based on 2011 Mod 2 as-built survey which determined the top of pond liner elevation = 796.97.
2. Maximum starting water elevation assumes no freeboard.
3. Previously developed HydroCAD model utilized with curve number for intermediate cover areas and ash surfaces assumed at CN = 98.
4. HydroCAD model assumes drainage areas contributing to pond include (Figure 1):
   - Landfill open area plus contact water sump area = 6.24 acres.
   - Leachate/Surface Water Pond Area, 2.98 acres.
5. Maximum open area per HydroCAD model during filling is 8.51 acres.

I:\25220183.00\Data and Calculations\Leachate_Surface Water Pond Evaluation\Issued for Permitting_POO Update\

DRAWN BY:	KP
CHECKED BY:	RR/MRH
APPROVED BY:	MRH 08/30/2023
PROJECT NO.	25222260.01
DRAWN:	07/24/2023
REVISED:	08/15/2023

WISCONSIN POWER AND LIGHT
COLUMBIA ENERGY CENTER
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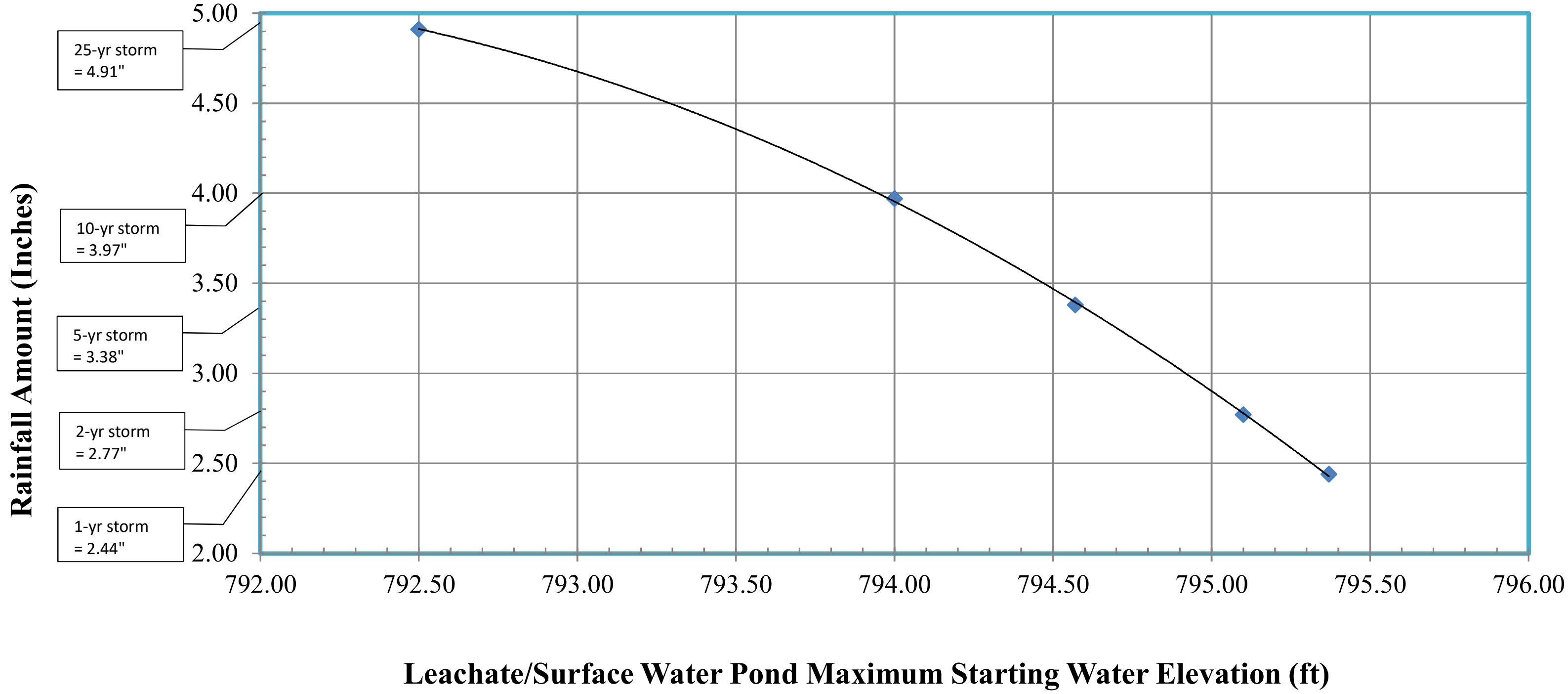
PLAN OF OPERATION UPDATE
COLUMBIA ENERGY CENTER
COLUMBIA DRY ASH DISPOSAL FACILITY
TOWN OF PACIFIC, WISCONSIN

SITE

FILL SEQUENCE – MODULE 12 AND 13

FIGURE
2

Figure 2A
Columbia Energy Center
Phase 6 Filling- Open Landfill Area
Leachate/Surface Water Pond Maximum Starting Water Elevation

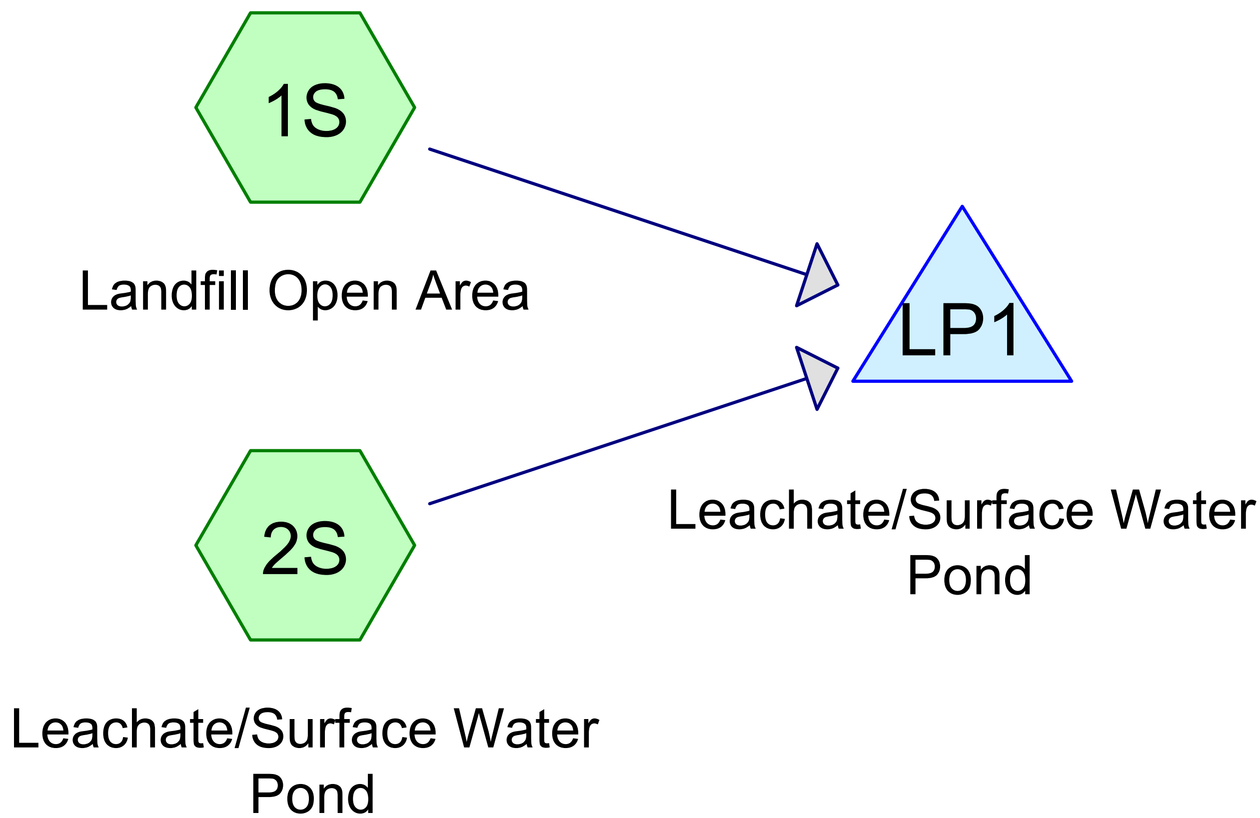


Notes/Assumptions:

1. Maximum starting water elevations based on 2011 Mod 2 as-built survey which determined the top of pond liner elevation = 796.97.
2. Maximum starting water elevation assumes no freeboard.
3. Previously developed HydroCAD model utilized with curve number for intermediate cover areas and ash surfaces assumed at CN = 98.
4. HydroCAD model assumes drainage areas contributing to pond include (Figure 2):
   - Landfill open area plus contact water sump area = 8.475 acres.
   - Leachate/Surface Water Pond Area, 2.98 acres.
5. Maximum open area per HydroCAD model during filling is 8.51 acres.

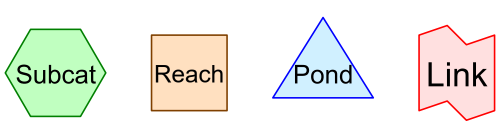
I:\25220183.00\Data and Calculations\Leachate_Surface Water Pond Evaluation\Issued for Permitting_POO Update\

Maximum Open Area



Phase 12 Filling

Phase 13 Filling



Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25-yr, 24-hr storm	MSE 24-hr	4	Default	24.00	1	4.91	2

Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Landfill Open Area Runoff Area=8.510 ac 100.00% Impervious Runoff Depth=4.67"
Tc=20.0 min CN=98 Runoff=34.73 cfs 3.314 af

Subcatchment2S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=4.67"
Tc=0.0 min CN=98 Runoff=21.19 cfs 1.161 af

Pond LP1: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,946 cf Inflow=39.03 cfs 4.475 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment 1S: Landfill Open Area

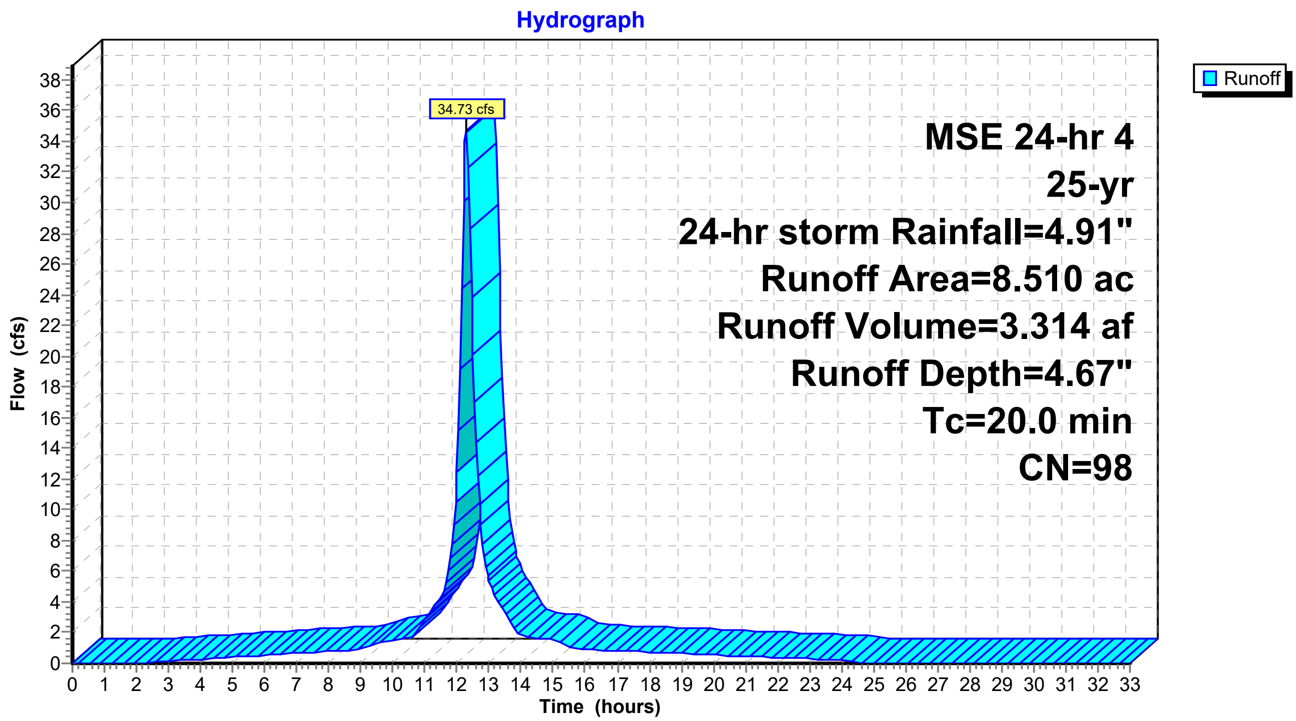
Runoff = 34.73 cfs @ 12.28 hrs, Volume= 3.314 af, Depth= 4.67"
Routed to Pond LP1 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr storm Rainfall=4.91"

	Area (ac)	CN	Description
*	8.510	98	Mod 2 - 11 Open Area
	8.510		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Subcatchment 1S: Landfill Open Area



Summary for Subcatchment 2S: Leachate/Surface Water Pond

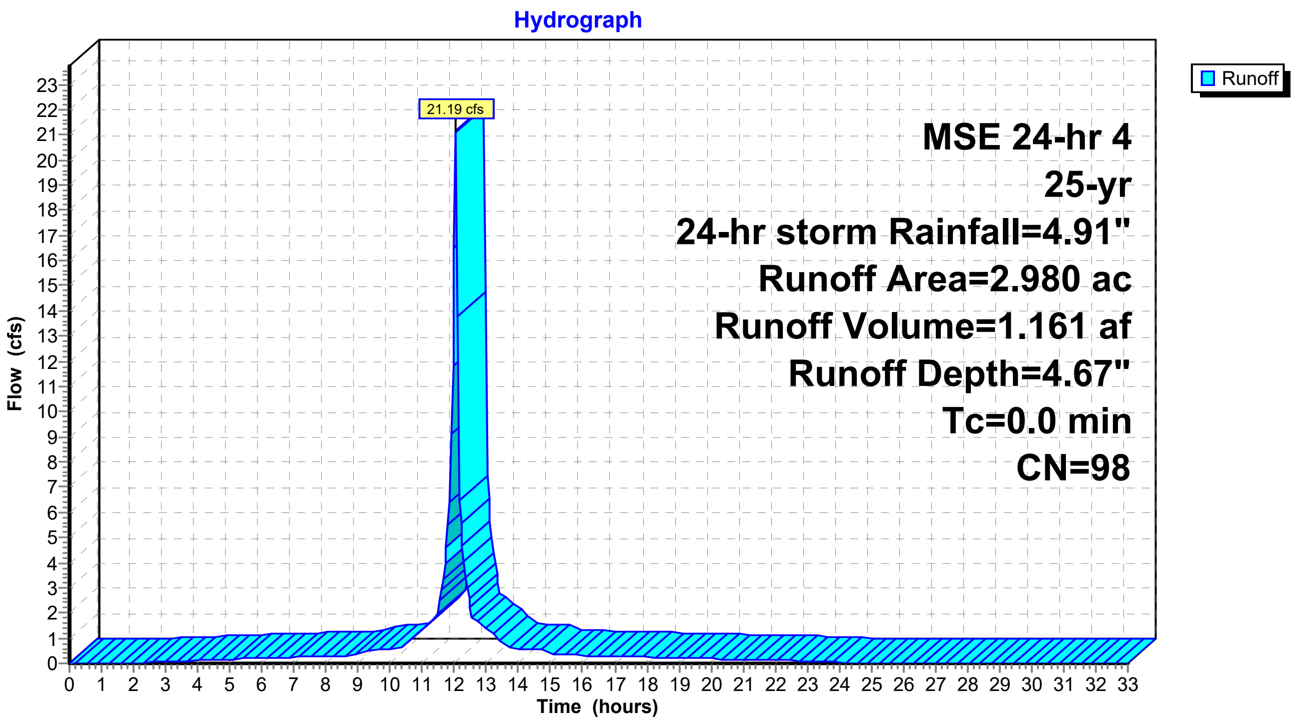
Runoff = 21.19 cfs @ 12.04 hrs, Volume= 1.161 af, Depth= 4.67"
Routed to Pond LP1 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr storm Rainfall=4.91"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Subcatchment 2S: Leachate/Surface Water Pond



Summary for Pond LP1: Leachate/Surface Water Pond

Inflow Area = 11.490 ac,100.00% Impervious, Inflow Depth = 4.67" for 25-yr, 24-hr storm event
Inflow = 39.03 cfs @ 12.27 hrs, Volume= 4.475 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

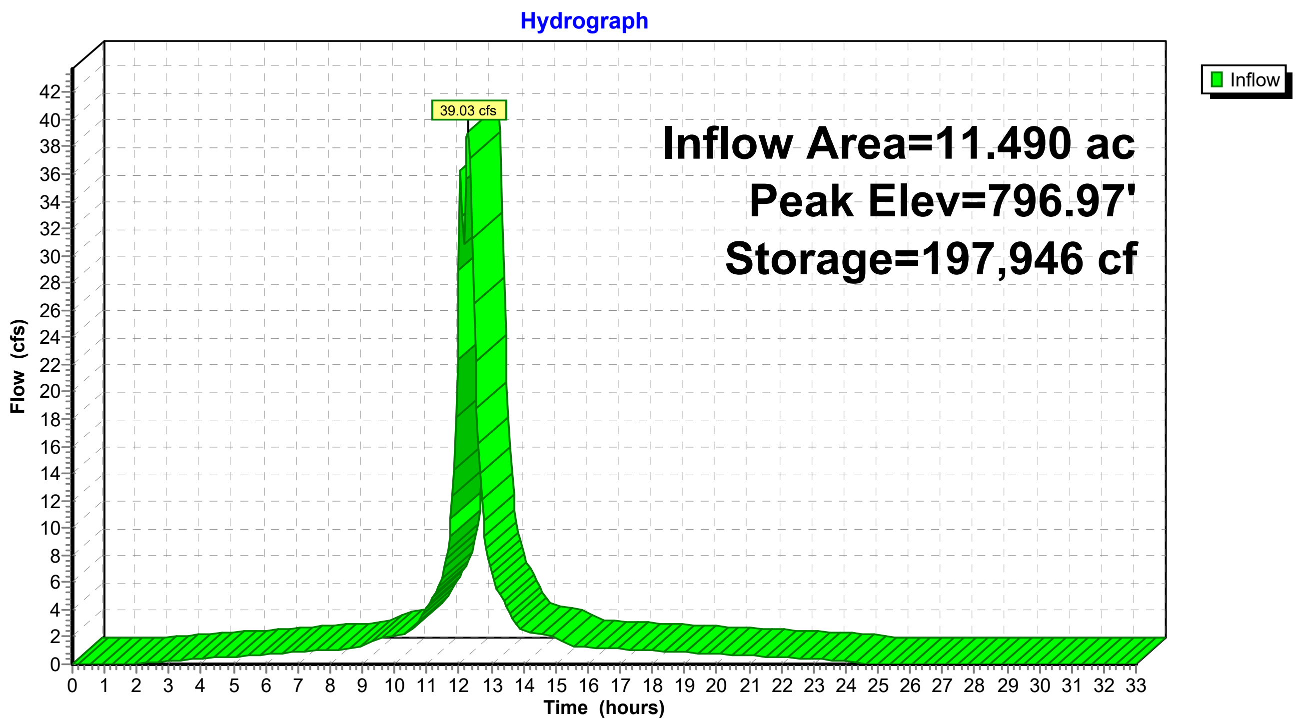
Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
Starting Elev= 792.50' Surf.Area= 11,070 sf Storage= 3,030 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,611 sf Storage= 197,946 cf (194,915 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (194,617 cf above start)

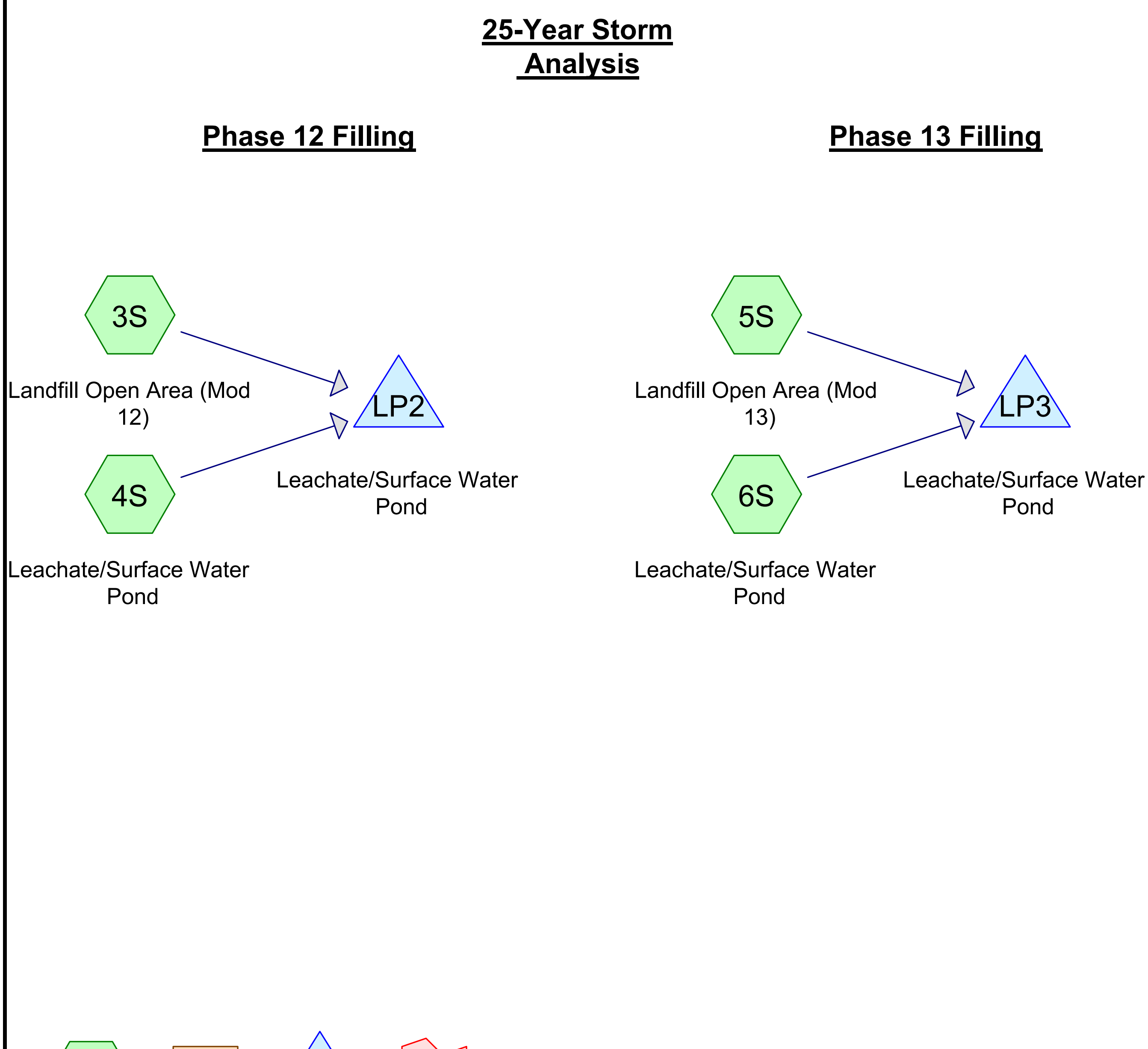
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

Pond LP1: Leachate/Surface Water Pond





Routing Diagram for 230817_WPL Columbia_Leachate Pond Evaluation
Prepared by SCS Engineers, Printed 8/18/2023
HydroCAD® 10.20-2d s/n 05804 © 2021 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25-yr, 24-hr storm	MSE 24-hr	4	Default	24.00	1	4.91	2

Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment3S: Landfill Open Area Runoff Area=6.240 ac 100.00% Impervious Runoff Depth=4.67"
Tc=20.0 min CN=98 Runoff=25.47 cfs 2.430 af

Subcatchment4S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=4.67"
Tc=0.0 min CN=98 Runoff=21.19 cfs 1.161 af

Subcatchment5S: Landfill Open Area Runoff Area=8.475 ac 100.00% Impervious Runoff Depth=4.67"
Tc=20.0 min CN=98 Runoff=34.59 cfs 3.301 af

Subcatchment6S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=4.67"
Tc=0.0 min CN=98 Runoff=21.19 cfs 1.161 af

Pond LP2: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,360 cf Inflow=32.30 cfs 3.591 af
Outflow=0.00 cfs 0.000 af

Pond LP3: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,353 cf Inflow=38.89 cfs 4.461 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment 3S: Landfill Open Area (Mod 12)

Runoff = 25.47 cfs @ 12.28 hrs, Volume= 2.430 af, Depth= 4.67"
Routed to Pond LP2 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr storm Rainfall=4.91"

	Area (ac)	CN	Description
*	6.240	98	Mod 12 Open Area
	6.240		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 4S: Leachate/Surface Water Pond

Runoff = 21.19 cfs @ 12.04 hrs, Volume= 1.161 af, Depth= 4.67"
Routed to Pond LP2 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr storm Rainfall=4.91"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Subcatchment 5S: Landfill Open Area (Mod 13)

Runoff = 34.59 cfs @ 12.28 hrs, Volume= 3.301 af, Depth= 4.67"
Routed to Pond LP3 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr storm Rainfall=4.91"

	Area (ac)	CN	Description
*	8.475	98	Mod 13 Open Area
	8.475		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 6S: Leachate/Surface Water Pond

Runoff = 21.19 cfs @ 12.04 hrs, Volume= 1.161 af, Depth= 4.67"
Routed to Pond LP3 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr storm Rainfall=4.91"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Pond LP2: Leachate/Surface Water Pond

Inflow Area = 9.220 ac,100.00% Impervious, Inflow Depth = 4.67" for 25-yr, 24-hr storm event
Inflow = 32.30 cfs @ 12.06 hrs, Volume= 3.591 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
Starting Elev= 793.97' Surf.Area= 40,525 sf Storage= 40,952 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,565 sf Storage= 197,360 cf (156,408 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (156,695 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

Summary for Pond LP3: Leachate/Surface Water Pond

Inflow Area = 11.455 ac,100.00% Impervious, Inflow Depth = 4.67" for 25-yr, 24-hr storm event
Inflow = 38.89 cfs @ 12.27 hrs, Volume= 4.461 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

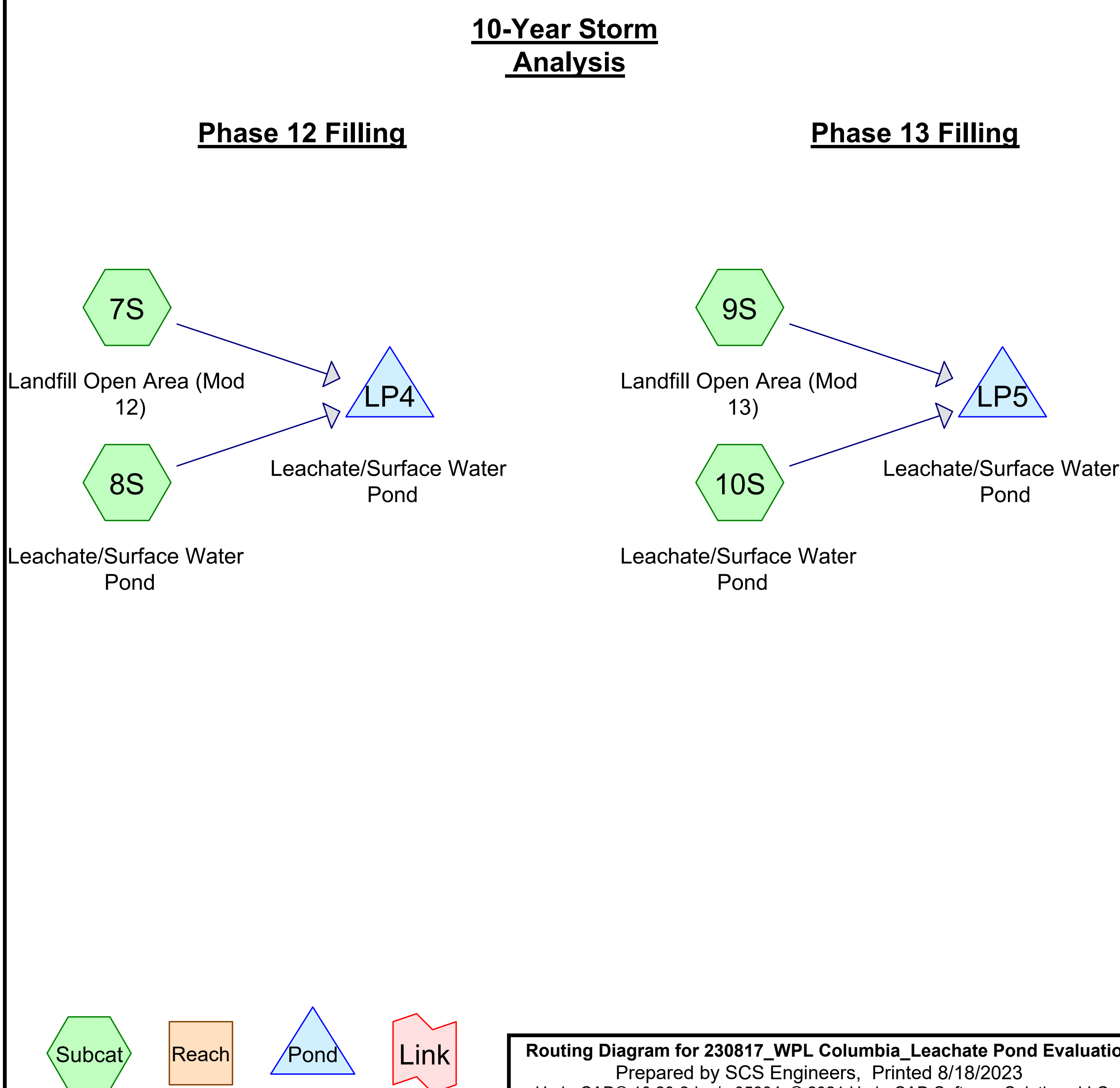
Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Starting Elev= 792.50' Surf.Area= 11,070 sf Storage= 3,030 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,564 sf Storage= 197,353 cf (194,323 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (194,617 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390


10-Year Storm Analysis
Phase 12 Filling
Phase 13 Filling
7S
Landfill Open Area (Mod 12)
8S
Leachate/Surface Water Pond
LP4
Leachate/Surface Water Pond
9S
Landfill Open Area (Mod 13)
10S
Leachate/Surface Water Pond
LP5
Leachate/Surface Water Pond
Subcat
Reach
Pond
Link

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	10-yr, 24-hr storm	MSE 24-hr	4	Default	24.00	1	3.97	2

Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment7S: Landfill Open Area Runoff Area=6.240 ac 100.00% Impervious Runoff Depth=3.74"
Tc=20.0 min CN=98 Runoff=20.53 cfs 1.942 af

Subcatchment8S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=3.74"
Tc=0.0 min CN=98 Runoff=17.09 cfs 0.928 af

Subcatchment9S: Landfill Open Area Runoff Area=8.475 ac 100.00% Impervious Runoff Depth=3.74"
Tc=20.0 min CN=98 Runoff=27.88 cfs 2.638 af

Subcatchment10S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=3.74"
Tc=0.0 min CN=98 Runoff=17.09 cfs 0.928 af

Pond LP4: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,440 cf Inflow=26.02 cfs 2.870 af
Outflow=0.00 cfs 0.000 af

Pond LP5: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,491 cf Inflow=31.34 cfs 3.566 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment 7S: Landfill Open Area (Mod 12)

Runoff = 20.53 cfs @ 12.29 hrs, Volume= 1.942 af, Depth= 3.74"
Routed to Pond LP4 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-yr, 24-hr storm Rainfall=3.97"

	Area (ac)	CN	Description
*	6.240	98	Mod 12 Open Area
	6.240		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 8S: Leachate/Surface Water Pond

Runoff = 17.09 cfs @ 12.04 hrs, Volume= 0.928 af, Depth= 3.74"
Routed to Pond LP4 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-yr, 24-hr storm Rainfall=3.97"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Subcatchment 9S: Landfill Open Area (Mod 13)

Runoff = 27.88 cfs @ 12.29 hrs, Volume= 2.638 af, Depth= 3.74"
Routed to Pond LP5 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-yr, 24-hr storm Rainfall=3.97"

	Area (ac)	CN	Description
*	8.475	98	Mod 13 Open Area
	8.475		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 10S: Leachate/Surface Water Pond

Runoff = 17.09 cfs @ 12.04 hrs, Volume= 0.928 af, Depth= 3.74"
Routed to Pond LP5 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-yr, 24-hr storm Rainfall=3.97"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Pond LP4: Leachate/Surface Water Pond

Inflow Area = 9.220 ac,100.00% Impervious, Inflow Depth = 3.74" for 10-yr, 24-hr storm event
Inflow = 26.02 cfs @ 12.06 hrs, Volume= 2.870 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
Starting Elev= 794.69' Surf.Area= 46,563 sf Storage= 72,430 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,571 sf Storage= 197,440 cf (125,010 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (125,218 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

Summary for Pond LP5: Leachate/Surface Water Pond

Inflow Area = 11.455 ac,100.00% Impervious, Inflow Depth = 3.74" for 10-yr, 24-hr storm event
Inflow = 31.34 cfs @ 12.27 hrs, Volume= 3.566 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Starting Elev= 794.00' Surf.Area= 41,126 sf Storage= 42,177 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,575 sf Storage= 197,491 cf (155,314 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (155,470 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

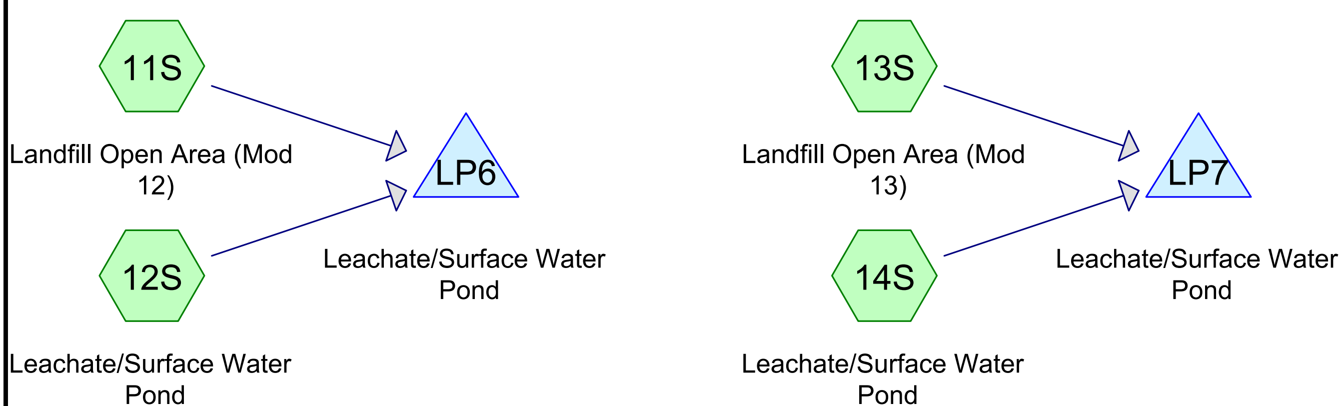
Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

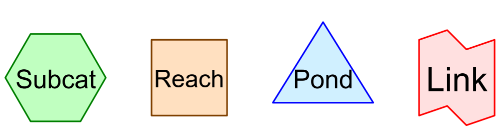
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

5-Year Storm Analysis

Phase 12 Filling

Phase 13 Filling





Routing Diagram for 230817_WPL Columbia_Leachate Pond Evaluation
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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	5-yr, 24-hr storm	MSE 24-hr	4	Default	24.00	1	3.38	2

Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 11S: Landfill Open Area Runoff Area=6.240 ac 100.00% Impervious Runoff Depth=3.15"
Tc=20.0 min CN=98 Runoff=17.42 cfs 1.636 af

Subcatchment 12S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=3.15"
Tc=0.0 min CN=98 Runoff=14.51 cfs 0.781 af

Subcatchment 13S: Landfill Open Area Runoff Area=8.475 ac 100.00% Impervious Runoff Depth=3.15"
Tc=20.0 min CN=98 Runoff=23.66 cfs 2.222 af

Subcatchment 14S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=3.15"
Tc=0.0 min CN=98 Runoff=14.51 cfs 0.781 af

Pond LP6: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,502 cf Inflow=22.07 cfs 2.418 af
Outflow=0.00 cfs 0.000 af

Pond LP7: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,748 cf Inflow=26.60 cfs 3.004 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment 11S: Landfill Open Area (Mod 12)

Runoff = 17.42 cfs @ 12.29 hrs, Volume= 1.636 af, Depth= 3.15"
Routed to Pond LP6 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-yr, 24-hr storm Rainfall=3.38"

	Area (ac)	CN	Description
*	6.240	98	Mod 12 Open Area
	6.240		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 12S: Leachate/Surface Water Pond

Runoff = 14.51 cfs @ 12.04 hrs, Volume= 0.781 af, Depth= 3.15"
Routed to Pond LP6 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-yr, 24-hr storm Rainfall=3.38"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Subcatchment 13S: Landfill Open Area (Mod 13)

Runoff = 23.66 cfs @ 12.29 hrs, Volume= 2.222 af, Depth= 3.15"
Routed to Pond LP7 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-yr, 24-hr storm Rainfall=3.38"

	Area (ac)	CN	Description
*	8.475	98	Mod 13 Open Area
	8.475		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 14S: Leachate/Surface Water Pond

Runoff = 14.51 cfs @ 12.04 hrs, Volume= 0.781 af, Depth= 3.15"
Routed to Pond LP7 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-yr, 24-hr storm Rainfall=3.38"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Pond LP6: Leachate/Surface Water Pond

Inflow Area = 9.220 ac,100.00% Impervious, Inflow Depth = 3.15" for 5-yr, 24-hr storm event
Inflow = 22.07 cfs @ 12.06 hrs, Volume= 2.418 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
Starting Elev= 795.10' Surf.Area= 49,793 sf Storage= 92,183 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,576 sf Storage= 197,502 cf (105,320 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (105,464 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

Summary for Pond LP7: Leachate/Surface Water Pond

Inflow Area = 11.455 ac,100.00% Impervious, Inflow Depth = 3.15" for 5-yr, 24-hr storm event
Inflow = 26.60 cfs @ 12.27 hrs, Volume= 3.004 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Starting Elev= 794.57' Surf.Area= 45,617 sf Storage= 66,899 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,596 sf Storage= 197,748 cf (130,850 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (130,748 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

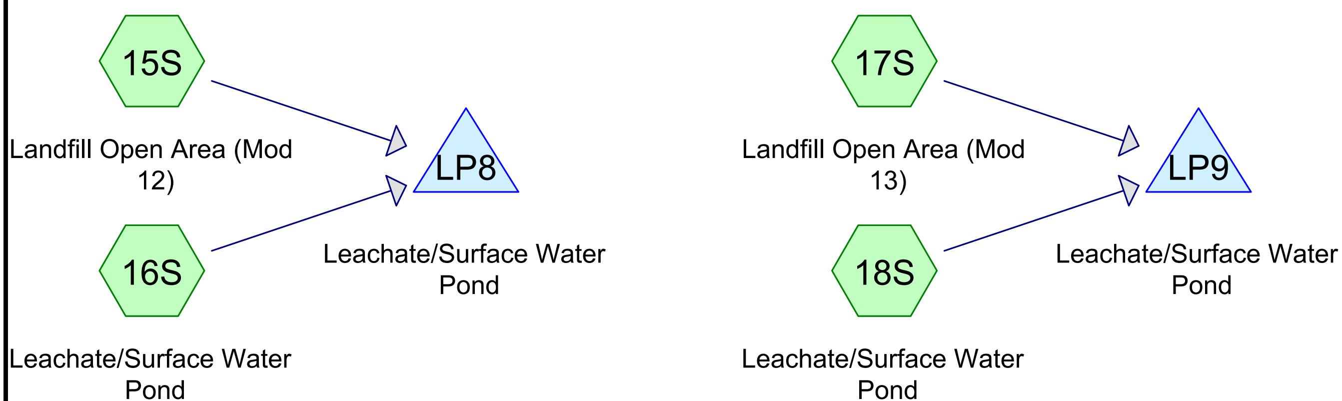
Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

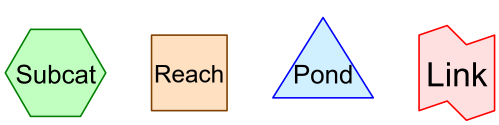
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

2-Year Storm Analysis

Phase 12 Filling

Phase 13 Filling





Routing Diagram for 230817_WPL Columbia_Leachate Pond Evaluation
Prepared by SCS Engineers, Printed 8/18/2023
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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr, 24-hr storm	MSE 24-hr	4	Default	24.00	1	2.77	2

Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 15S: Landfill Open Area Runoff Area=6.240 ac 100.00% Impervious Runoff Depth=2.54"
Tc=20.0 min CN=98 Runoff=14.19 cfs 1.320 af

Subcatchment 16S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=2.54"
Tc=0.0 min CN=98 Runoff=11.83 cfs 0.631 af

Subcatchment 17S: Landfill Open Area Runoff Area=8.475 ac 100.00% Impervious Runoff Depth=2.54"
Tc=20.0 min CN=98 Runoff=19.28 cfs 1.793 af

Subcatchment 18S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=2.54"
Tc=0.0 min CN=98 Runoff=11.83 cfs 0.631 af

Pond LP8: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,715 cf Inflow=17.97 cfs 1.951 af
Outflow=0.00 cfs 0.000 af

Pond LP9: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,769 cf Inflow=21.68 cfs 2.424 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment 15S: Landfill Open Area (Mod 12)

Runoff = 14.19 cfs @ 12.29 hrs, Volume= 1.320 af, Depth= 2.54"
Routed to Pond LP8 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-yr, 24-hr storm Rainfall=2.77"

	Area (ac)	CN	Description
*	6.240	98	Mod 12 Open Area
	6.240		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 16S: Leachate/Surface Water Pond

Runoff = 11.83 cfs @ 12.04 hrs, Volume= 0.631 af, Depth= 2.54"
Routed to Pond LP8 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-yr, 24-hr storm Rainfall=2.77"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Subcatchment 17S: Landfill Open Area (Mod 13)

Runoff = 19.28 cfs @ 12.29 hrs, Volume= 1.793 af, Depth= 2.54"
Routed to Pond LP9 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-yr, 24-hr storm Rainfall=2.77"

	Area (ac)	CN	Description
*	8.475	98	Mod 13 Open Area
	8.475		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 18S: Leachate/Surface Water Pond

Runoff = 11.83 cfs @ 12.04 hrs, Volume= 0.631 af, Depth= 2.54"
Routed to Pond LP9 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-yr, 24-hr storm Rainfall=2.77"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Pond LP8: Leachate/Surface Water Pond

Inflow Area = 9.220 ac,100.00% Impervious, Inflow Depth = 2.54" for 2-yr, 24-hr storm event
Inflow = 17.97 cfs @ 12.06 hrs, Volume= 1.951 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
Starting Elev= 795.50' Surf.Area= 52,945 sf Storage= 112,730 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,593 sf Storage= 197,715 cf (84,985 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (84,917 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

Summary for Pond LP9: Leachate/Surface Water Pond

Inflow Area = 11.455 ac,100.00% Impervious, Inflow Depth = 2.54" for 2-yr, 24-hr storm event
Inflow = 21.68 cfs @ 12.27 hrs, Volume= 2.424 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Starting Elev= 795.10' Surf.Area= 49,793 sf Storage= 92,183 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,597 sf Storage= 197,769 cf (105,586 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (105,464 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

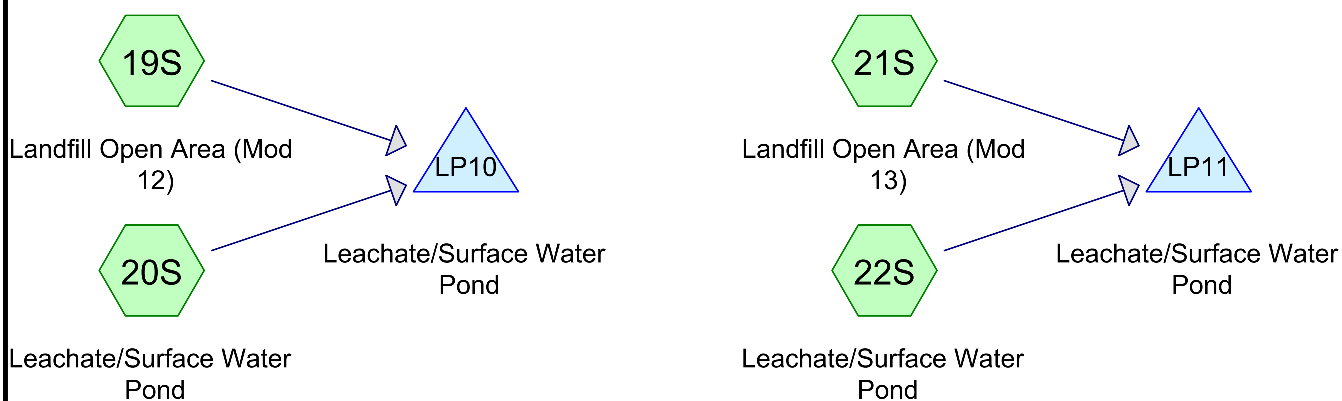
Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

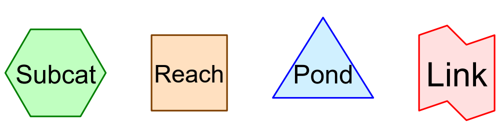
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

1-Year Storm Analysis

Phase 12 Filling

Phase 13 Filling





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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-yr, 24-hr storm	MSE 24-hr	4	Default	24.00	1	2.44	2

Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment19S: Landfill Open Area Runoff Area=6.240 ac 100.00% Impervious Runoff Depth=2.21"
Tc=20.0 min CN=98 Runoff=12.44 cfs 1.150 af

Subcatchment20S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=2.21"
Tc=0.0 min CN=98 Runoff=10.38 cfs 0.549 af

Subcatchment21S: Landfill Open Area Runoff Area=8.475 ac 100.00% Impervious Runoff Depth=2.21"
Tc=20.0 min CN=98 Runoff=16.90 cfs 1.562 af

Subcatchment22S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=2.21"
Tc=0.0 min CN=98 Runoff=10.38 cfs 0.549 af

Pond LP10: Leachate/SurfaceWater Peak Elev=796.97' Storage=197,478 cf Inflow=15.75 cfs 1.699 af
Outflow=0.00 cfs 0.000 af

Pond LP11: Leachate/SurfaceWater Peak Elev=796.97' Storage=197,853 cf Inflow=19.01 cfs 2.111 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment 19S: Landfill Open Area (Mod 12)

Runoff = 12.44 cfs @ 12.29 hrs, Volume= 1.150 af, Depth= 2.21"
Routed to Pond LP10 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-yr, 24-hr storm Rainfall=2.44"

	Area (ac)	CN	Description
*	6.240	98	Mod 12 Open Area
	6.240		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 20S: Leachate/Surface Water Pond

Runoff = 10.38 cfs @ 12.04 hrs, Volume= 0.549 af, Depth= 2.21"
Routed to Pond LP10 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-yr, 24-hr storm Rainfall=2.44"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Subcatchment 21S: Landfill Open Area (Mod 13)

Runoff = 16.90 cfs @ 12.29 hrs, Volume= 1.562 af, Depth= 2.21"
Routed to Pond LP11 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-yr, 24-hr storm Rainfall=2.44"

	Area (ac)	CN	Description
*	8.475	98	Mod 13 Open Area
	8.475		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 22S: Leachate/Surface Water Pond

Runoff = 10.38 cfs @ 12.04 hrs, Volume= 0.549 af, Depth= 2.21"
Routed to Pond LP11 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-yr, 24-hr storm Rainfall=2.44"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Pond LP10: Leachate/Surface Water Pond

Inflow Area = 9.220 ac,100.00% Impervious, Inflow Depth = 2.21" for 1-yr, 24-hr storm event
Inflow = 15.75 cfs @ 12.06 hrs, Volume= 1.699 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
Starting Elev= 795.70' Surf.Area= 54,521 sf Storage= 123,477 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,574 sf Storage= 197,478 cf (74,001 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (74,170 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

Summary for Pond LP11: Leachate/Surface Water Pond

Inflow Area = 11.455 ac,100.00% Impervious, Inflow Depth = 2.21" for 1-yr, 24-hr storm event
Inflow = 19.01 cfs @ 12.27 hrs, Volume= 2.111 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Starting Elev= 795.37' Surf.Area= 51,921 sf Storage= 105,914 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,604 sf Storage= 197,853 cf (91,939 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (91,733 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

E.5 Volume Calculations

SCS ENGINEERS

		Sheet No.	1 of 1
		Calc. No.	
		Rev. No.	
Job No. 25222260.00	Job: Columbia Energy Center	By: MJT	Date: 8/31/2023
Client: Wisconsin Power and Light Co	Subject: 2023 ADF Plan of Op Update Airspace Calcs	Chk'd: PEG	Date: 8/31/2023

Purpose: To determine the following airspace volumes

1. Airspace in Dry Ash Disposal Facility (ADF) with Module 1-6 and Modules 10 through 11 constructed
2. Airspace in Dry Ash Disposal Facility (ADF) with Module 1-6 and Modules 10 through 12 constructed
3. Airspace in Dry Ash Disposal Facility (ADF) with Module 1-6 and Modules 10 through 13 constructed

Approach: Use AutoCAD Civil 3D software to compare surfaces from the following data:

1. The total airspace in Phase 1 Modules 1 - 6 and Phase 2 Modules 10 through 11 was calculated using AutoCAD Civil 3D surfaces. As-built base grades (Figure 1) are based on construction documented grades Waste grades are based on the 2022 Plan of Operation Modification Request proposed waste grades (Figure 2).

2. The total airspace in Phase 1 Modules 1 - 6 and Phase 2 Modules 10 through 12 was calculated using AutoCAD Civil 3D surfaces. As-built base grades (Figure 3) are based on construction documented grades and proposed base grades for Module 12. Waste grades are based on the 2023 Plan of Operation Modification Request, Addendum No. 2 proposed waste grades (Figure 4).

3. The total airspace in Phase 1 Modules 1 - 6 and Phase 2 Modules 10 through 13 was calculated using AutoCAD Civil 3D surfaces. As-built base grades (Figure 5) are based on construction documented grades and proposed base grades for Modules 12-13. Waste grades are based on the 2023 Plan of Operation Modification Request, Addendum No. 2 proposed waste grades (Figure 6).

Results:

Total airspace in Modules 1-6 and Modules 10-11 = 2,596,262 cubic yards
(see attached AutoCAD Civil 3D report).

Total airspace in Modules 1-6 and Modules 10-12 = 3,207,520 cubic yards
(see attached AutoCAD Civil 3D report).

Total airspace in Modules 1-6 and Modules 10-13 = 3,630,075 cubic yards
(see attached AutoCAD Civil 3D report).

Surface Report
Project Name:
I:\25222260.00\Drawings\Civil\Airspace 2023\Total Airspace Vol.dwg
Report Date: 8/30/2023 1:28:26 PM

Client: Alliant

Project Description: Columbia Plan of Operation Update

Prepared by: KP

Linear Units: foot	**Area Units:** squareFoot	**Volume Units:** cubicYard

Surface: Vol - Total Airspace (Mod 10-11)
Description: total airspace volume surface from base grades to waste grades through Module 11. Subtract 1' drainage layer for final airspace.

Area 2D: 1568771.199	Area 3D: 1637412.816
Elevation Max: 98.458	Elevation Min: -12.273
Number of Points: 13204	Number of Triangles: 25588

Surface: Vol - Total Airspace (Mod 12)
Description: total airspace volume surface from base grades to waste grades through Module 12. Subtract 1' drainage layer for final airspace.

Area 2D: 1725844.456	Area 3D: 1798272.141
Elevation Max: 111.031	Elevation Min: -4.612
Number of Points: 25608	Number of Triangles: 50458

Surface: Vol - Total Airspace (Mod 13)
Description: total airspace volume surface from base grades to waste grades through Module 12. Subtract 1' drainage layer for final airspace.

Area 2D: 1833694.680	Area 3D: 1910725.684
Elevation Max: 128.895	Elevation Min: -4.655
Number of Points: 22476	Number of Triangles: 44223

Volume Surface: Vol - Total Airspace (Mod 10-11)
Description: total airspace volume surface from base grades to waste grades through Module 11. Subtract 1' drainage layer for final airspace.

Volume Cut: 740.176	Volume Fill: 2642283.786	Volume Total: 2641543.610

Compare Surface: Composite Final Waste Grades
Base Surface: Composite Base Grades (through Mod 11)

Drainage Layer = 45,282 cubic yards
CCR Volume = 2,641,544 cubic yards - 45,282 cubic yards = **2,596,262 cubic yards**

Volume Surface: Vol - Total Airspace (Mod 12)
Description: total airspace volume surface from base grades to waste grades through Module 12. Subtract 1' drainage layer for final airspace.

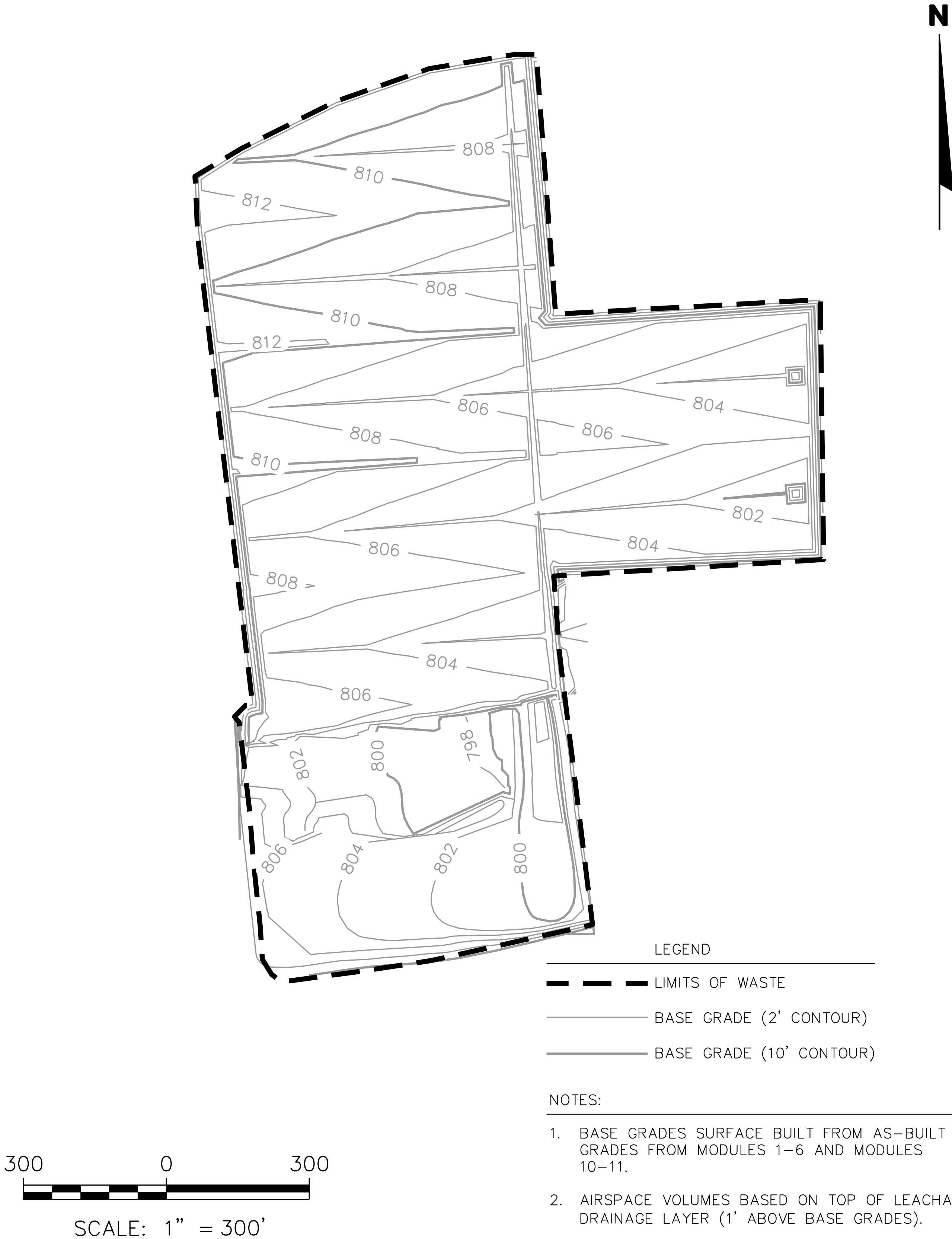
Volume Cut: 52.314
Volume Fill: 3259010.655
Volume Total: 3258958.342
Compare Surface: Pr-Waste Grades (Mod 2-12 Capped)
Base Surface: Composite Base Grades (through Mod 12)

Drainage Layer = 51,438 cubic yards
CCR Volume = 3,258,958 cubic yards - 51,438 cubic yards = **3,207,520 cubic yards**

Volume Surface: Vol - Total Airspace (Mod 13)
Description: total airspace volume surface from base grades to waste grades through Module 12. Subtract 1' drainage layer for final airspace.

Volume Cut: 52.908
Volume Fill: 3685558.884
Volume Total: 3685505.977
Compare Surface: Pr-Waste Grades (Mod 2-13 Capped)
Base Surface: Composite Base Grades (through Mod 13)

Drainage Layer = 55,431 cubic yards
CCR Volume = 3,685,506 cubic yards - 55,431 cubic yards = **3,630,075 cubic yards**



LEGEND

LIMITS OF WASTE

BASE GRADE (2' CONTOUR)

BASE GRADE (10' CONTOUR)

NOTES:

1. BASE GRADES SURFACE BUILT FROM AS-BUILT GRADES FROM MODULES 1-6 AND MODULES 10-11.

2. AIRSPACE VOLUMES BASED ON TOP OF LEACHATE DRAINAGE LAYER (1' ABOVE BASE GRADES).

CLIENT	SITE	
WISCONSIN POWER AND LIGHT COMPANY COLUMBIA ENERGY CENTER W8375 MURRAY ROAD PARDEEVILLE, WI 53954	PLAN OF OPERATION MODIFICATION REQUEST, ADDENDUM 2 DRY ASH DISPOSAL FACILITY COLUMBIA ENERGY CENTER TOWN OF PACIFIC, WISCONSIN	COMPOSITE BASE GRADES (MODULE 10-11)

				ENGINEER	
PROJECT NO. 25222260.00	DRAWN BY: KP/MJT			SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	FIGURE 1
DRAWN: 05/23/2022	CHECKED BY: PEG				
REVISED: 08/31/2023	APPROVED BY: PEG 09/01/2023				

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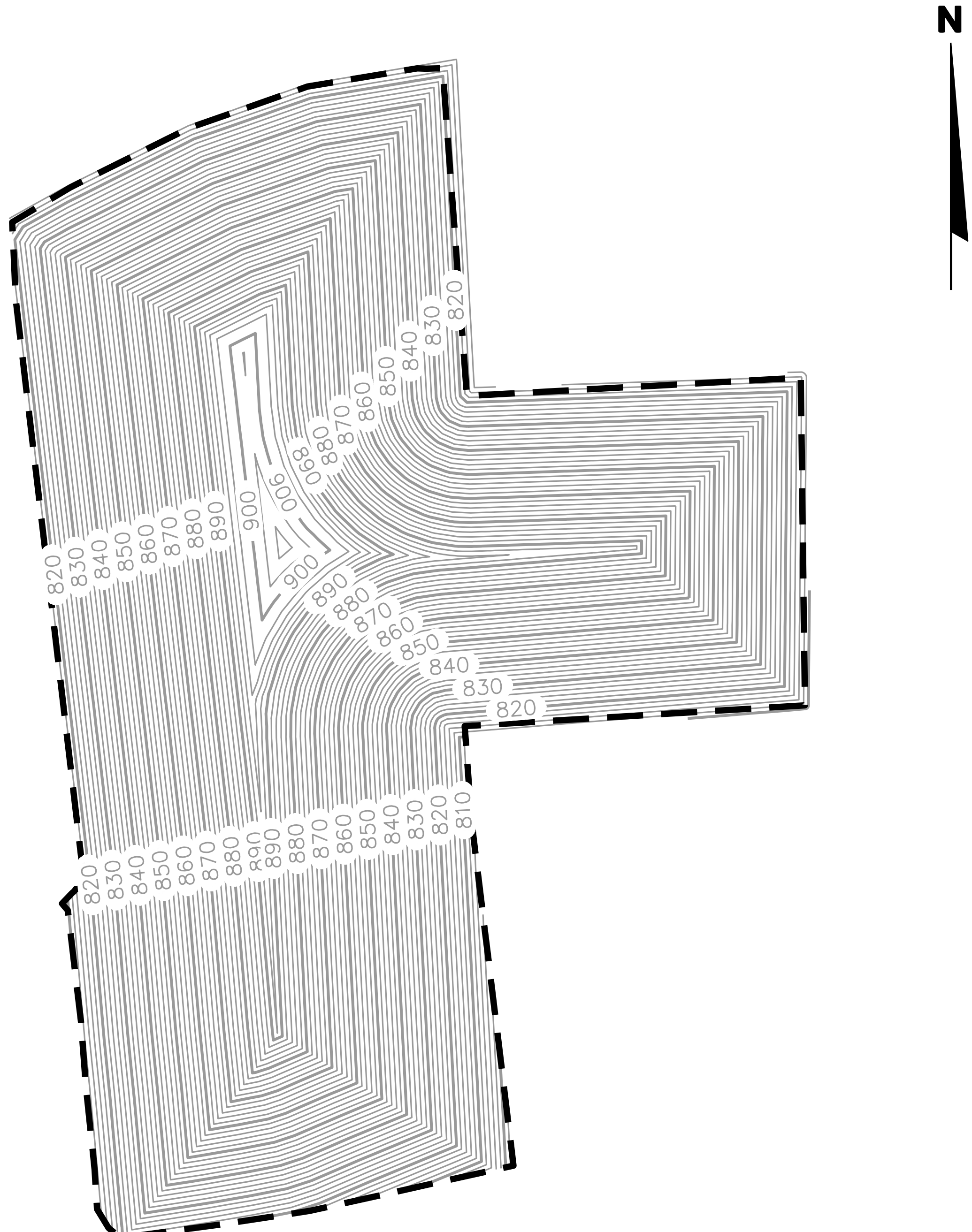


LEGEND

- LIMITS OF WASTE
- WASTE GRADE (2' CONTOUR)
- WASTE GRADE (10' CONTOUR)

NOTES:

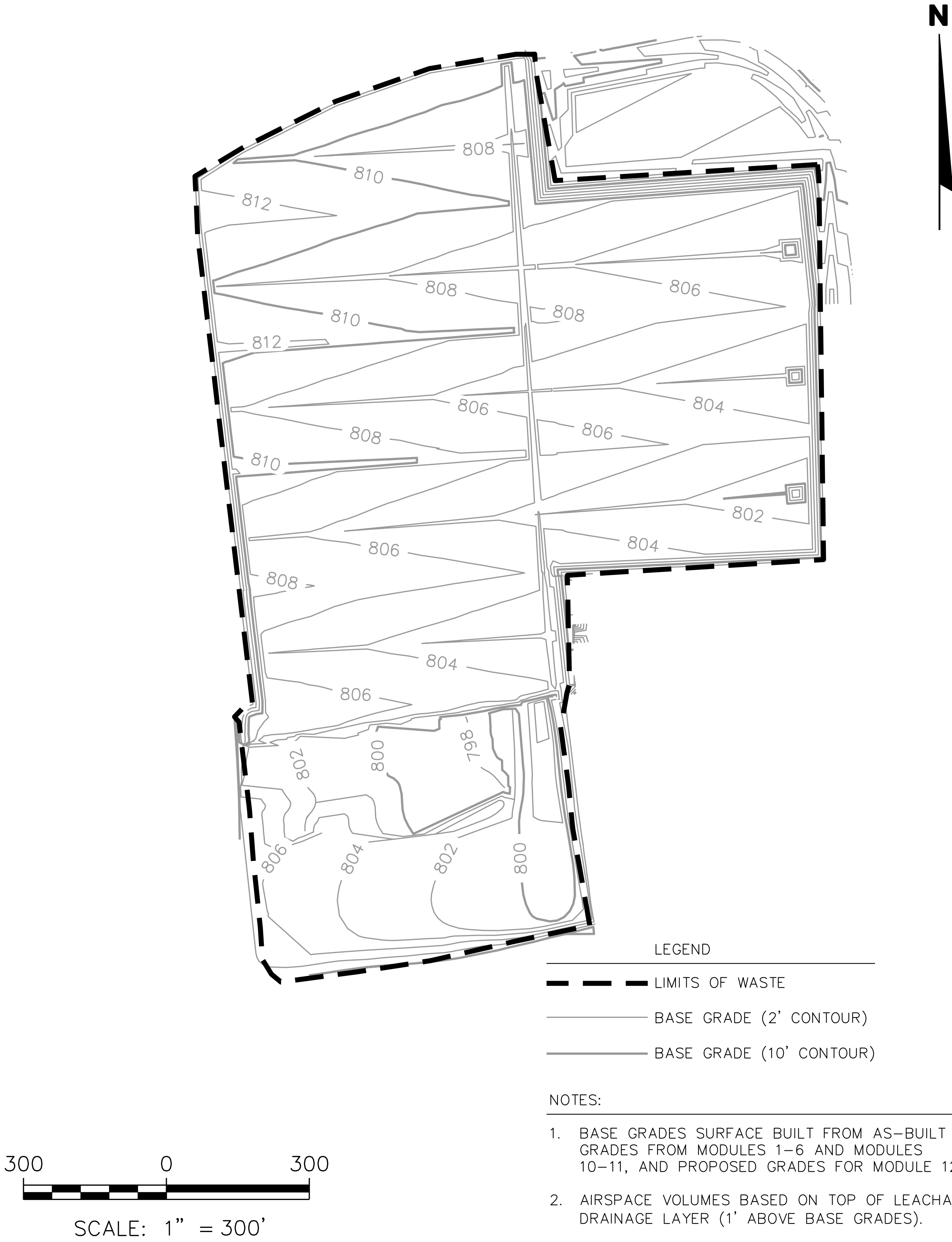
1. FINAL WASTE SURFACE BUILT FROM PROPOSED PHASE 1 TOP OF WASTE GRADES AND PROPOSED MODULES 10–11 TOP OF WASTE GRADES.

300 0 300

SCALE: 1" = 300'

CLIENT	SITE	
WISCONSIN POWER AND LIGHT COMPANY COLUMBIA ENERGY CENTER W8375 MURRAY ROAD PARDEEVILLE, WI 53954	PLAN OF OPERATION MODIFICATION REQUEST, ADDENDUM 2 DRY ASH DISPOSAL FACILITY COLUMBIA ENERGY CENTER TOWN OF PACIFIC, WISCONSIN	COMPOSITE FINAL WASTE GRADES (MODULE 10–11)

				ENGINEER	
PROJECT NO.	25222260.00	DRAWN BY:	KP/MJT	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	FIGURE
DRAWN:	05/23/2022	CHECKED BY:	PEG		2
REVISED:	08/31/2023	APPROVED BY:	PEG 09/01/2023		



LEGEND

LIMITS OF WASTE

BASE GRADE (2' CONTOUR)

BASE GRADE (10' CONTOUR)

NOTES:

1. BASE GRADES SURFACE BUILT FROM AS-BUILT GRADES FROM MODULES 1-6 AND MODULES 10-11, AND PROPOSED GRADES FOR MODULE 12.
2. AIRSPACE VOLUMES BASED ON TOP OF LEACHATE DRAINAGE LAYER (1' ABOVE BASE GRADES).

CLIENT	SITE	
WISCONSIN POWER AND LIGHT COMPANY COLUMBIA ENERGY CENTER W8375 MURRAY ROAD PARDEEVILLE, WI 53954	PLAN OF OPERATION MODIFICATION REQUEST, ADDENDUM 2 DRY ASH DISPOSAL FACILITY COLUMBIA ENERGY CENTER TOWN OF PACIFIC, WISCONSIN	COMPOSITE BASE GRADES (MODULE 12)

				ENGINEER	
PROJECT NO.	25222260.00	DRAWN BY:	KP/MJT	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	FIGURE
DRAWN:	05/23/2022	CHECKED BY:	PEG		3
REVISED:	08/31/2023	APPROVED BY:	PEG 09/01/2023		

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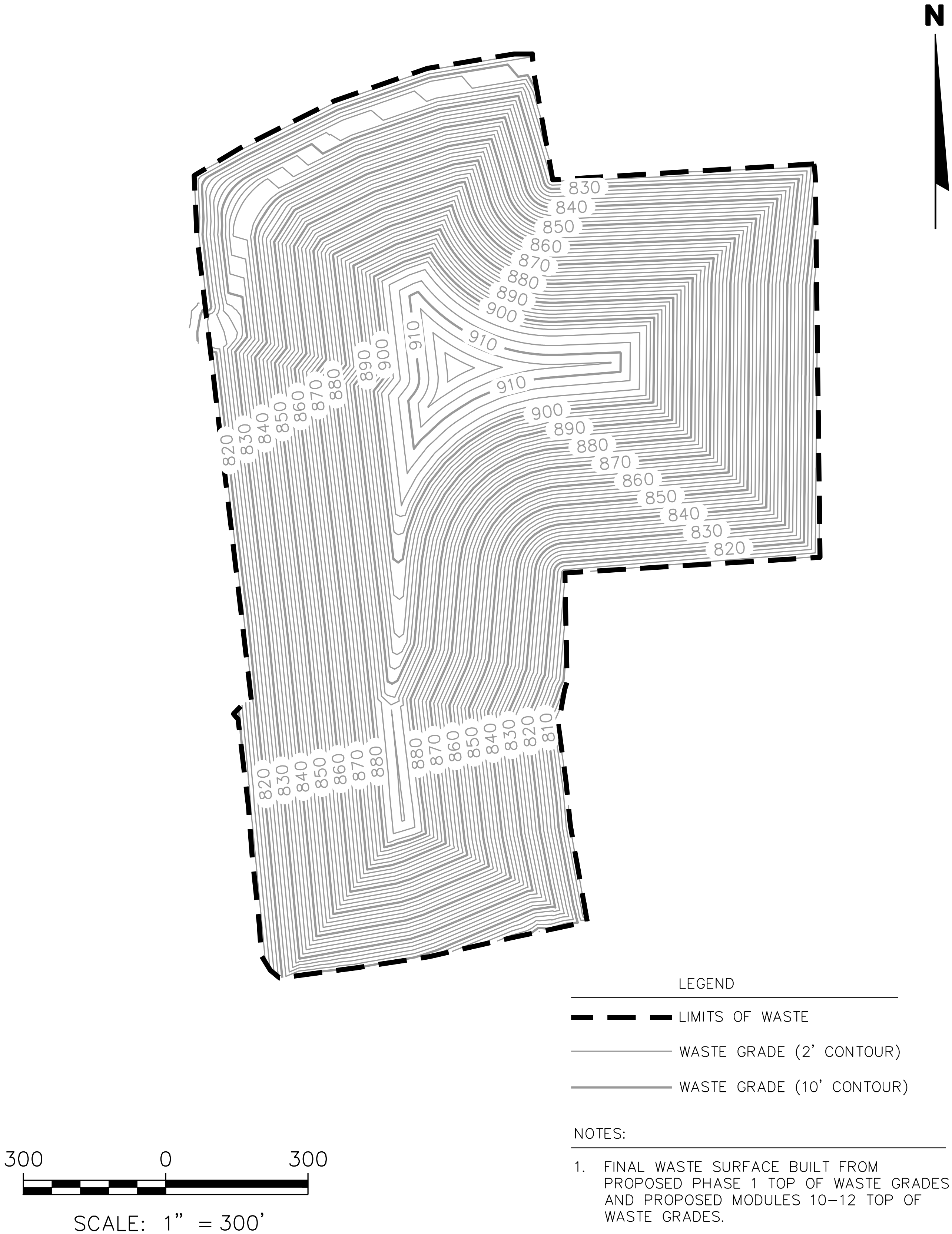

LEGEND

LIMITS OF WASTE

WASTE GRADE (2' CONTOUR)

WASTE GRADE (10' CONTOUR)

NOTES:

1. FINAL WASTE SURFACE BUILT FROM PROPOSED PHASE 1 TOP OF WASTE GRADES AND PROPOSED MODULES 10–12 TOP OF WASTE GRADES.

CLIENT	SITE	
WISCONSIN POWER AND LIGHT COMPANY COLUMBIA ENERGY CENTER W8375 MURRAY ROAD PARDEEVILLE, WI 53954	PLAN OF OPERATION MODIFICATION REQUEST, ADDENDUM 2 DRY ASH DISPOSAL FACILITY COLUMBIA ENERGY CENTER TOWN OF PACIFIC, WISCONSIN	COMPOSITE FINAL WASTE GRADES (MODULE 12)

				ENGINEER	
PROJECT NO.	25222260.00	DRAWN BY:	KP/MJT	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	FIGURE
DRAWN:	05/23/2022	CHECKED BY:	PEG		4
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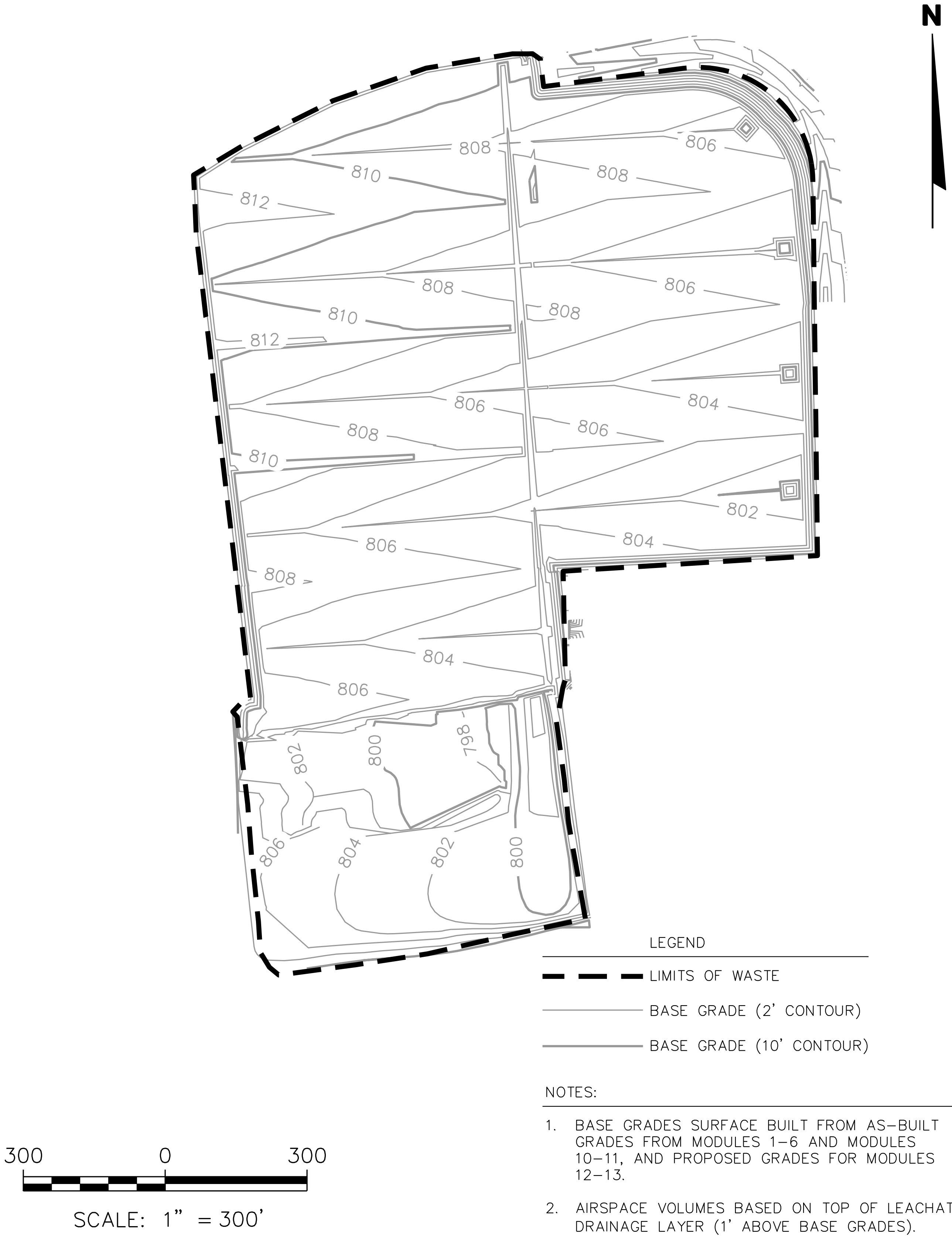

LEGEND

LIMITS OF WASTE

BASE GRADE (2' CONTOUR)

BASE GRADE (10' CONTOUR)

NOTES:

1. BASE GRADES SURFACE BUILT FROM AS-BUILT GRADES FROM MODULES 1-6 AND MODULES 10-11, AND PROPOSED GRADES FOR MODULES 12-13.

2. AIRSPACE VOLUMES BASED ON TOP OF LEACHATE DRAINAGE LAYER (1' ABOVE BASE GRADES).

CLIENT	SITE	
WISCONSIN POWER AND LIGHT COMPANY COLUMBIA ENERGY CENTER W8375 MURRAY ROAD PARDEEVILLE, WI 53954	PLAN OF OPERATION MODIFICATION REQUEST, ADDENDUM 2 DRY ASH DISPOSAL FACILITY COLUMBIA ENERGY CENTER TOWN OF PACIFIC, WISCONSIN	COMPOSITE BASE GRADES (MODULES 12 AND 13)

				ENGINEER	FIGURE
PROJECT NO.	25222260.00	DRAWN BY:	KP/MJT	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	5
DRAWN:	05/23/2022	CHECKED BY:	PEG		
REVISED:	08/31/2023	APPROVED BY:	PEG 09/01/2023		

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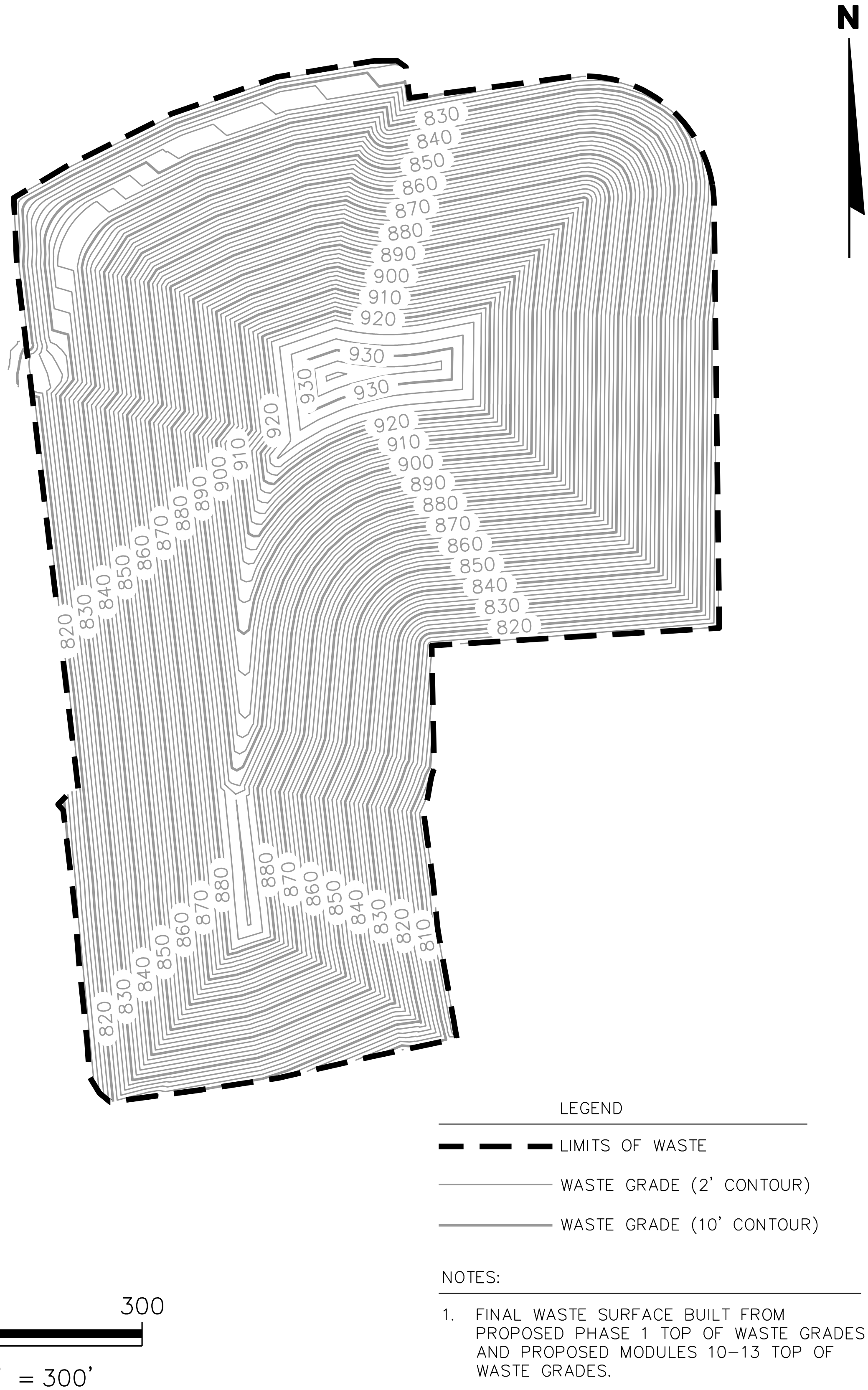

LEGEND

LIMITS OF WASTE

WASTE GRADE (2' CONTOUR)

WASTE GRADE (10' CONTOUR)

NOTES:

1. FINAL WASTE SURFACE BUILT FROM PROPOSED PHASE 1 TOP OF WASTE GRADES AND PROPOSED MODULES 10–13 TOP OF WASTE GRADES.

CLIENT	SITE	
WISCONSIN POWER AND LIGHT COMPANY COLUMBIA ENERGY CENTER W8375 MURRAY ROAD PARDEEVILLE, WI 53954	PLAN OF OPERATION MODIFICATION REQUEST, ADDENDUM 2 DRY ASH DISPOSAL FACILITY COLUMBIA ENERGY CENTER TOWN OF PACIFIC, WISCONSIN	COMPOSITE FINAL WASTE GRADES (MODULES 12 AND 13)

				ENGINEER	
PROJECT NO.	25222260.00	DRAWN BY:	KP/MJT	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	FIGURE
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E.6 Stormwater Calculations

E.6.1 Module 12 Stormwater Calculations

Storm Water Management Calculations

Purpose:
The purpose of the storm water runoff calculations is to demonstrate that the existing storm water sedimentation basin and proposed storm water management features included in the Module 12 Plan Modification Request can accommodate and safely convey the runoff from a 25-year, 24-hour storm event and 100-year, 24-hour storm event during post closure conditions.

Items addressed in these calculations:

- Swales
- Culverts
- Diversion Berms
- Downslope Flumes & Energy Dissipators
- Rock Chutes
- Discharge Aprons
- Sedimentation Basin
- North Infiltration Area

The proposed storm water management conditions are shown on **Figure 1**.
The calculations support the capacity check of the following existing storm water management feature:

Feature	Purpose	Design Method
Swales	Convey storm water runoff from adjacent areas to culverts and offsite during post construction conditions	HydroCAD runoff modeling and Swale Calculation
Culverts	Convey storm water from the final cover perimeter swales during post construction conditions	HydroCAD runoff modeling and HY-8 Culvert Model
Diversion Berms	Reduce storm water runoff from final cover slopes and to divert water to perimeter swales during post construction conditions	HydroCAD runoff modeling and Diversion Berm Calculations
Downslope Flumes & Energy Dissipators	Convey storm water from diversion berms down slope to swales and offsite drainage features during post construction conditions	HydroCAD runoff modeling and Downslope Flume Calculations
Rock Chutes	Erosion protection and convey storm water from energy dissipators to existing swale during post construction conditions	HydroCAD runoff modeling and Rock Chute Calculation
Discharge Aprons	Erosion protection from culvert discharge at culvert outlets	HydroCAD runoff modeling and Riprap Apron Calculation
Sedimentation Basin	To safely handle 25-year, 24-hour storm event without overtopping the 100-year, 24-hour spillway.	HydroCAD runoff modeling
North Infiltration Area	To safely handle 25-year, 24-hour and 100-year, 24-hour storm events without overtopping or backing up the inlet pipe.	HydroCAD runoff modeling

Approach:

Hydrograph Generation

HydroCAD was used to model the storm water management system and develop the hydrographs using TR-20 methodologies. The model is designed to simulate the surface runoff response of a watershed to a precipitation event. Input parameters for the model include precipitation depth for the design storm events from NOAA ATLAS 14, contributing drainage areas, runoff curve numbers, and time of concentration.

Swale Sizing

The proposed swales were sized for the 25-year, 24-hour storm event. A WisDOT HEC-15 spreadsheet based on Manning's equation was used to calculate the depth of flow and velocity in the swales using the swale geometry and peak flow in the swales (as determined by the Hydrograph Generation models).

Culvert Sizing

Culverts were sized for the 25-year, 24-hour storm event using the HY-8 computer model developed by the US Department of Transportation, Federal Highway Administration.

Diversion Berms

Diversion berms were sized for the 25-year, 24-hour storm event. A WisDOT HEC-15 spreadsheet based on Manning's Equation was used to calculate the depth of flow and velocity in the swale using the swale geometry and peak flow for the storm event (as determined by the Hydrograph Generation Calculations).

Downslope Flumes and Energy Dissipators Sizing

Flumes and energy dissipators were sized for the 25-year, 24-hour storm event. Manning's equation and the orifice equation were used to size the flumes. Energy dissipators were sized using tables from the reference book "Hydraulic Design of Energy Dissipators for Culverts and Channels" US Department of Transportation, Federal Highway Administration, July 2006.

Rock Chute Sizing

Rock chutes were sized for the 25-year, 24-hour storm event. Rock Chutes were sized based on the flow to each culvert location. The Iowa NRCS Rock Chute Design spreadsheet was used to size the chute and riprap.

Discharge Apron Sizing

Riprap aprons were sized for the 25-year, 24-hour storm event using equations in Section 5.2 – Riprap Blanket of WisDOT FDM 13-35-5. The riprap aprons were sized based on the flow to the culvert location. The riprap stone sizing was used to specify the thickness and geometry of the riprap discharge apron.

Sedimentation Basin Sizing

Route the proposed construction and existing drainage runoff through the sedimentation basin to confirm the basin can handle the 25-year, 24-hour storm event and to safely pass the 100-year, 24-hour storm event. HydroCAD was used to model the runoff flow through the basin outfall (as determined by the Hydrograph Generation model).

North Infiltration Area Verification

The depressional area located north of the Module 12 Plan Modification construction area acts as a infiltration area and accepts portions of the drainage runoff. Route the proposed construction and existing drainage runoff flowing to the North Infiltration Area to confirm the area can handle the 25-year, 24-hour and 100-year, 24-hour storm events without overtopping or backing up the inlet pipe. HydroCAD was used to model the runoff flow into this area (as determined by the Hydrograph Generation model).

Key Assumptions:

- Drainage areas and time of concentration flow paths are as shown on **Figure 1** for Post Construction Conditions.

- An MSE4 rainfall distribution was used based on NRCS Wisconsin rainfall distribution regions.

  The precipitation depth for the 25-year, 24-hour storm was assumed to be 4.91 inches, based on NOAA ATLAS 14 Point Precipitation Frequency Estimates (NOAA's National Weather Service Hydrometeorological Design Studies Center Precipitation Frequency Data Server).

  The precipitation depth for the 100-year, 24-hour storm was assumed to be 6.59 inches, based on NOAA ATLAS 14 Point Precipitation Frequency Estimates.

- Runoff curve numbers were based on tables presented in Urban Hydrology for Small Watersheds, and were assumed as follows and as listed in the modeling.

Cover Type	CN
Final Cover	69 – Pasture/grassland/range in good condition, hydrologic soil group (HSG) (B/C assumed mid value between each soil group)
Pasture, grassland or range	39 – Pasture/grassland/range, Good, HSG A
Gravel	96 – Gravel, HSG A
Water Surface	98 – Water Surface, HSG A

- Type A soil group for non-disturbed areas outside the landfill as soils are loamy sand.
- Other assumptions are included with the calculations attached to this appendix.

Results:

Hydrograph Generation

The hydrograph modeling results for the 25-year and 100-year, 24-hour storm events are included in the Post Construction Conditions Hydrograph Generation section.

Swale Sizing

The proposed swales will be constructed as shown on the Drawings. The swales have the capacity to safely convey the both the 25-year, 24-hour storm events and maintain a minimum 0.5 foot of freeboard. Refer to the Swale Sizing section.

Appropriate erosion control product was selected based on the velocities and shear stress in the swales. Refer to the Swale Sizing section below for the evaluation.

Culvert Sizing
Culverts will be as shown in the Drawings. The culverts have the capacity to safely convey the 25-year, 24-hour storm event. Refer to the Culvert Sizing Section for the detailed calculations.

Diversion Berm Sizing
The proposed final berms will be constructed as shown on the Drawings. The diversion berms will contain the runoff from the 25-year, 24-hour storm event. Refer to the Diversion Berm Design section.

Downslope Flume and Energy Dissipator Sizing
The downslope flumes and energy dissipaters will be constructed as shown on the Drawings. The downslope flumes are designed to contain the runoff from the 25-year, 24-hour storm event. Energy dissipators at the bottom of the downslope flumes have been designed to handle the peak velocities. Refer to the Downslope Flume and Energy Dissipator Sizing section below for detailed calculations.

Rock Chute Sizing
The proposed rock chutes will be constructed as shown in the Drawings. The rock chutes will accommodate the runoff from the 25-year, 24-hour storm event. Refer to the Rock Chute Sizing section.

Discharge Apron Sizing
The proposed riprap aprons will be constructed as shown in the Drawings. The aprons will accommodate the runoff from the 25-year, 24-hour storm event. Refer to Discharge Apron Sizing for design calculations.

Sedimentation Basin Sizing
The existing sedimentation basin has the capacity to safely contain the 25-year, 24-hour storm event and safely pass the 100-year, 24-hour storm event through the emergency spillway.

As shown in the HydroCAD model, the water elevation in both basin areas for each storm event is provided below:

Basin Area	Basin Crest Elevation (ft MSL)	Basin Spillway Elevation (ft MSL)	Peak Elevation 25-year storm (ft MSL)	Peak Elevation 100-year storm (ft MSL)
Existing Sedimentation Basin	794.00	793.00	792.18	793.23

North Infiltration Area Verification
The North Infiltration Area can safely contain the 25-year, 24-hour storm event and the 100-year, 24-hour storm event without overtopping or backing up the inlet pipe at Murray Road.

As shown in the HydroCAD model, the water elevation in both basin areas for each storm event is provided below:

Basin Area	Basin Crest Elevation (ft MSL)	Basin Inlet Pipe Elevation (ft MSL)	Peak Elevation 25-year storm (ft MSL)	Peak Elevation 100-year storm (ft MSL)
North Basin	810.00	806.81	803.89	805.24

LEGEND

	DRY ASH DISPOSAL FACILITY LIMITS	810	EXISTING GRADE (10' INTERVAL)		PROPOSED PERIMETER ROAD		PROPOSED DOWNSLOPE FLUME
	LIMITS OF WASTE		EXISTING GRADE (2' INTERVAL)		PROPOSED SWALE		PROPOSED ENERGY DISSIPATOR
	LINER PHASE/MODULE LIMIT		SWALE		PROPOSED CULVERT		PROPOSED RIPRAP
	FINAL COVER LIMITS		EDGE OF WATER		PROPOSED LEACHATE COLLECTION SYSTEM CLEANOUT		DRAINAGE AREA DIVIDES
	APPROXIMATE INTERMEDIATE COVER LIMITS/AREA		WETLAND		PROPOSED LEACHATE VAULT		FLOW PATH
	PAVED ROAD	840	PROPOSED PHASE 1 FINAL GRADE (10' INTERVAL)	FM	PROPOSED LEACHATE FORCEMAIN		
	UNPAVED ROAD		PROPOSED PHASE 1 FINAL GRADE (2' INTERVAL)	UE	PROPOSED UNDERGROUND ELECTRIC		
	VEGETATION	840	PROPOSED GRADE (10' INTERVAL)		PROPOSED DIVERSION BERM		
	FENCE		PROPOSED GRADE (2' INTERVAL)				

NOTES:

1. SEE SHEET 2 OF PLAN OF OPERATION UPDATE (2023) PLAN SET FOR BASE MAP LEGEND ITEMS AND NOTES.
2. PROPOSED GRADES REPRESENT TOP OF FINAL COVER (FINAL GRADE).

N

125 0 125

SCALE: 1" = 125'

DRAWN BY: SJL
CHECKED BY: MJT
APPROVED BY: MRH 08/31/2023

PROJECT NO. 25222260.01
DRAWN: 8/1/2023
REVISED: 08/31/2023

WISCONSIN POWER AND LIGHT
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WISCONSIN 53954

Wisconsin Power and Light Company

CLIENT

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

ENGINEER

PLAN OF OPERATION UPDATE
COLUMBIA ENERGY CENTER
COLUMBIA DRY ASH DISPOSAL FACILITY
TOWN OF PACIFIC, WISCONSIN

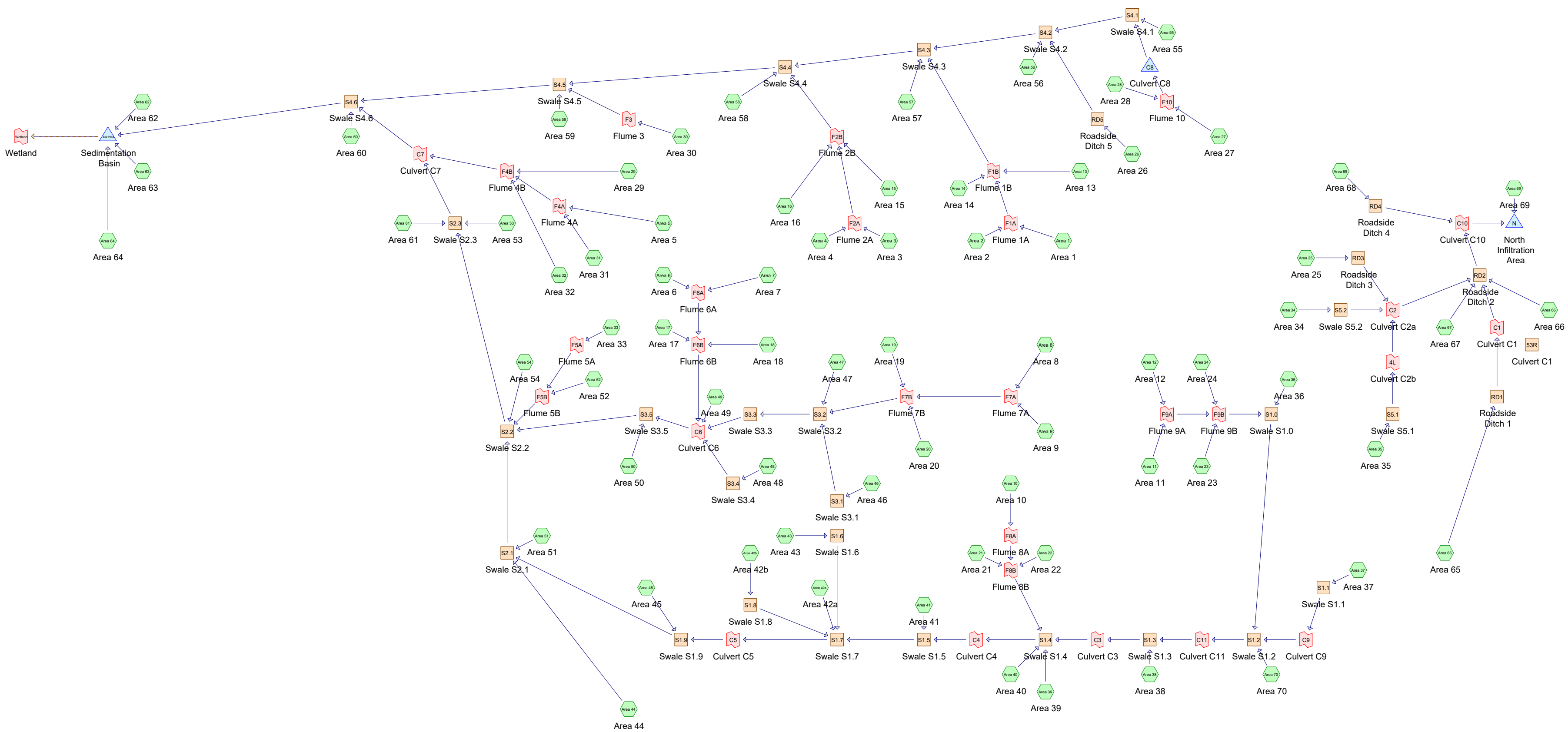
SITE

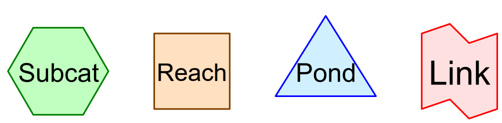
FINAL GRADES (MODULE 12)

SHEET
1 of 1

Post Construction Conditions Hydrograph Generation

- 25-year, 24-hour Storm Event
- 100-year, 24-hour Storm Event





Routing Diagram for 230828_COL_Mod12

Prepared by SCS Engineers, Printed 8/28/2023

HydroCAD® 10.20-2d s/n 05804 © 2021 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25-yr, 24-hr	MSE 24-hr	4	Default	24.00	1	4.91	2
2	100-yr, 24-hr	MSE 24-hr	4	Default	24.00	1	6.59	2

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentArea 1: Area 1 Runoff Area=1.141 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=500' Tc=6.5 min CN=69 Runoff=3.32 cfs 0.180 af

SubcatchmentArea 10: Area 10 Runoff Area=0.791 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=354' Tc=6.4 min CN=69 Runoff=2.31 cfs 0.125 af

SubcatchmentArea 11: Area 11 Runoff Area=0.885 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=288' Tc=6.4 min CN=69 Runoff=2.59 cfs 0.140 af

SubcatchmentArea 12: Area 12 Runoff Area=2.206 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=628' Tc=6.7 min CN=69 Runoff=6.39 cfs 0.348 af

SubcatchmentArea 13: Area 13 Runoff Area=1.610 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=712' Tc=5.3 min CN=69 Runoff=4.83 cfs 0.254 af

SubcatchmentArea 14: Area 14 Runoff Area=0.626 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=333' Tc=4.5 min CN=69 Runoff=1.94 cfs 0.099 af

SubcatchmentArea 15: Area 15 Runoff Area=0.620 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=331' Tc=4.4 min CN=69 Runoff=1.93 cfs 0.098 af

SubcatchmentArea 16: Area 16 Runoff Area=0.943 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=464' Tc=5.9 min CN=69 Runoff=2.80 cfs 0.149 af

SubcatchmentArea 17: Area 17 Runoff Area=0.571 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=315' Tc=4.4 min CN=69 Runoff=1.78 cfs 0.090 af

SubcatchmentArea 18: Area 18 Runoff Area=0.990 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=424' Tc=4.7 min CN=69 Runoff=3.04 cfs 0.156 af

SubcatchmentArea 19: Area 19 Runoff Area=1.179 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=385' Tc=4.7 min CN=69 Runoff=3.62 cfs 0.186 af

SubcatchmentArea 2: Area 2 Runoff Area=0.557 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=303' Tc=4.7 min CN=69 Runoff=1.71 cfs 0.088 af

SubcatchmentArea 20: Area 20 Runoff Area=1.057 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=419' Tc=4.7 min CN=69 Runoff=3.24 cfs 0.167 af

SubcatchmentArea 21: Area 21 Runoff Area=0.434 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=374' Tc=4.5 min CN=69 Runoff=1.35 cfs 0.068 af

SubcatchmentArea 22: Area 22 Runoff Area=1.442 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=489' Tc=4.8 min CN=69 Runoff=4.40 cfs 0.227 af

SubcatchmentArea 23: Area 23 Runoff Area=1.252 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=435' Tc=4.7 min CN=69 Runoff=3.84 cfs 0.197 af

SubcatchmentArea 24: Area 24 Runoff Area=1.846 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=701' Tc=5.4 min CN=69 Runoff=5.53 cfs 0.291 af

SubcatchmentArea 25: Area 25 Runoff Area=1.552 ac 0.00% Impervious Runoff Depth=2.64"
Flow Length=123' Slope=0.2500 '/' Tc=3.9 min CN=78 Runoff=6.95 cfs 0.341 af

SubcatchmentArea 26: Area 26 Runoff Area=0.616 ac 0.00% Impervious Runoff Depth=2.13"
Flow Length=109' Slope=0.2500 '/' Tc=3.8 min CN=72 Runoff=2.25 cfs 0.109 af

SubcatchmentArea 27: Area 27 Runoff Area=0.149 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=211' Tc=1.2 min CN=69 Runoff=0.52 cfs 0.023 af

SubcatchmentArea 28: Area 28 Runoff Area=0.126 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=59' Slope=0.2500 '/' Tc=2.5 min CN=69 Runoff=0.44 cfs 0.020 af

SubcatchmentArea 29: Area 29 Runoff Area=1.228 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=647' Tc=5.7 min CN=69 Runoff=3.66 cfs 0.194 af

SubcatchmentArea 3: Area 3 Runoff Area=0.348 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=298' Tc=4.8 min CN=69 Runoff=1.06 cfs 0.055 af

SubcatchmentArea 30: Area 30 Runoff Area=0.427 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=362' Tc=3.8 min CN=69 Runoff=1.38 cfs 0.067 af

SubcatchmentArea 31: Area 31 Runoff Area=0.223 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=296' Tc=3.7 min CN=69 Runoff=0.72 cfs 0.035 af

SubcatchmentArea 32: Area 32 Runoff Area=0.655 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=642' Tc=5.0 min CN=69 Runoff=1.98 cfs 0.103 af

SubcatchmentArea 33: Area 33 Runoff Area=0.237 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=348' Tc=4.0 min CN=69 Runoff=0.76 cfs 0.037 af

SubcatchmentArea 34: Area 34 Runoff Area=0.424 ac 0.00% Impervious Runoff Depth=2.29"
Flow Length=78' Slope=0.2500 '/' Tc=3.1 min CN=74 Runoff=1.73 cfs 0.081 af

SubcatchmentArea 35: Area 35 Runoff Area=0.993 ac 0.00% Impervious Runoff Depth=2.46"
Flow Length=126' Tc=4.4 min CN=76 Runoff=4.05 cfs 0.204 af

SubcatchmentArea 36: Area 36 Runoff Area=2.594 ac 0.00% Impervious Runoff Depth=3.19"
Flow Length=183' Tc=2.2 min CN=84 Runoff=14.85 cfs 0.689 af

SubcatchmentArea 37: Area 37 Runoff Area=0.306 ac 0.00% Impervious Runoff Depth=0.66"
Flow Length=133' Tc=4.5 min CN=50 Runoff=0.24 cfs 0.017 af

SubcatchmentArea 38: Area 38 Runoff Area=1.430 ac 0.00% Impervious Runoff Depth=1.52"
Flow Length=156' Slope=0.2500 '/' Tc=4.1 min CN=64 Runoff=3.58 cfs 0.181 af

SubcatchmentArea 39: Area 39 Runoff Area=0.742 ac 0.00% Impervious Runoff Depth=1.45"
Flow Length=145' Tc=4.3 min CN=63 Runoff=1.74 cfs 0.090 af

SubcatchmentArea 4: Area 4 Runoff Area=0.288 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=296' Tc=4.0 min CN=69 Runoff=0.92 cfs 0.045 af

SubcatchmentArea 40: Area 40 Runoff Area=0.620 ac 0.00% Impervious Runoff Depth=1.00"
Flow Length=168' Tc=9.6 min CN=56 Runoff=0.72 cfs 0.051 af

SubcatchmentArea 41: Area 41 Runoff Area=0.739 ac 0.00% Impervious Runoff Depth=1.00"
Flow Length=141' Tc=7.2 min CN=56 Runoff=0.98 cfs 0.061 af

SubcatchmentArea 42a: Area 42a Runoff Area=0.871 ac 0.00% Impervious Runoff Depth=1.59"
Flow Length=144' Slope=0.0500 '/' Tc=7.8 min CN=65 Runoff=2.00 cfs 0.116 af

SubcatchmentArea 42b: Area 42b Runoff Area=0.712 ac 0.00% Impervious Runoff Depth=2.05"
Flow Length=102' Slope=0.0500 '/' Tc=7.3 min CN=71 Runoff=2.19 cfs 0.122 af

SubcatchmentArea 43: Area 43 Runoff Area=0.769 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=139' Slope=0.0500 '/' Tc=7.7 min CN=69 Runoff=2.14 cfs 0.121 af

SubcatchmentArea 44: Area 44 Runoff Area=1.416 ac 0.00% Impervious Runoff Depth=0.18"
Flow Length=941' Slope=0.0260 '/' Tc=22.0 min CN=39 Runoff=0.06 cfs 0.022 af

SubcatchmentArea 45: Area 45 Runoff Area=2.792 ac 0.00% Impervious Runoff Depth=1.32"
Flow Length=419' Tc=14.7 min CN=61 Runoff=3.88 cfs 0.306 af

SubcatchmentArea 46: Area 46 Runoff Area=2.044 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=138' Tc=4.0 min CN=69 Runoff=6.52 cfs 0.322 af

SubcatchmentArea 47: Area 47 Runoff Area=0.457 ac 0.00% Impervious Runoff Depth=1.97"
Flow Length=122' Slope=0.2500 '/' Tc=3.9 min CN=70 Runoff=1.53 cfs 0.075 af

SubcatchmentArea 48: Area 48 Runoff Area=1.194 ac 0.00% Impervious Runoff Depth=2.21"
Flow Length=98' Slope=0.0500 '/' Tc=7.2 min CN=73 Runoff=3.99 cfs 0.220 af

SubcatchmentArea 49: Area 49 Runoff Area=0.079 ac 0.00% Impervious Runoff Depth=2.13"
Flow Length=143' Tc=5.1 min CN=72 Runoff=0.27 cfs 0.014 af

SubcatchmentArea 5: Area 5 Runoff Area=0.986 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=608' Tc=6.6 min CN=69 Runoff=2.87 cfs 0.155 af

SubcatchmentArea 50: Area 50 Runoff Area=3.726 ac 0.00% Impervious Runoff Depth=2.05"
Flow Length=391' Tc=11.1 min CN=71 Runoff=9.80 cfs 0.636 af

SubcatchmentArea 51: Area 51 Runoff Area=0.698 ac 0.00% Impervious Runoff Depth=0.18"
Flow Length=100' Slope=0.0600 '/' Tc=6.8 min CN=39 Runoff=0.03 cfs 0.011 af

SubcatchmentArea 52: Area 52 Runoff Area=0.475 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=425' Tc=4.5 min CN=69 Runoff=1.48 cfs 0.075 af

SubcatchmentArea 53: Area 53 Runoff Area=1.618 ac 0.00% Impervious Runoff Depth=1.18"
Flow Length=384' Tc=4.2 min CN=59 Runoff=2.98 cfs 0.160 af

SubcatchmentArea 54: Area 54 Runoff Area=0.826 ac 0.00% Impervious Runoff Depth=1.12"
Flow Length=126' Slope=0.2500 '/' Tc=3.9 min CN=58 Runoff=1.45 cfs 0.077 af

SubcatchmentArea 55: Area 55 Runoff Area=1.089 ac 0.00% Impervious Runoff Depth=1.12"
Flow Length=158' Tc=4.3 min CN=58 Runoff=1.86 cfs 0.102 af

SubcatchmentArea 56: Area 56 Runoff Area=1.194 ac 0.00% Impervious Runoff Depth=1.18"
Flow Length=221' Tc=4.4 min CN=59 Runoff=2.17 cfs 0.118 af

SubcatchmentArea 57: Area 57 Runoff Area=2.220 ac 0.00% Impervious Runoff Depth=0.88"
Flow Length=240' Tc=4.6 min CN=54 Runoff=2.69 cfs 0.162 af

SubcatchmentArea 58: Area 58 Runoff Area=2.476 ac 0.00% Impervious Runoff Depth=1.12"
Flow Length=263' Tc=4.7 min CN=58 Runoff=4.13 cfs 0.231 af

SubcatchmentArea 59: Area 59 Runoff Area=1.683 ac 0.00% Impervious Runoff Depth=0.82"
Flow Length=146' Slope=0.2345 '/' Tc=4.1 min CN=53 Runoff=1.90 cfs 0.115 af

SubcatchmentArea 6: Area 6 Runoff Area=0.504 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=258' Tc=3.4 min CN=69 Runoff=1.66 cfs 0.079 af

SubcatchmentArea 60: Area 60 Runoff Area=2.001 ac 0.00% Impervious Runoff Depth=0.33"
Flow Length=318' Tc=20.8 min CN=43 Runoff=0.24 cfs 0.055 af

SubcatchmentArea 61: Area 61 Runoff Area=2.177 ac 0.00% Impervious Runoff Depth=0.18"
Flow Length=149' Tc=8.2 min CN=39 Runoff=0.09 cfs 0.033 af

SubcatchmentArea 62: Area 62 Runoff Area=0.594 ac 0.00% Impervious Runoff Depth=0.66"
Flow Length=147' Slope=0.0544 '/' Tc=7.6 min CN=50 Runoff=0.39 cfs 0.032 af

SubcatchmentArea 63: Area 63 Runoff Area=1.509 ac 100.00% Impervious Runoff Depth=4.67"
Tc=0.0 min CN=98 Runoff=10.73 cfs 0.588 af

SubcatchmentArea 64: Area 64 Runoff Area=5.227 ac 0.00% Impervious Runoff Depth=0.18"
Flow Length=701' Tc=7.9 min CN=39 Runoff=0.22 cfs 0.079 af

SubcatchmentArea 65: Area 65 Runoff Area=3.035 ac 0.00% Impervious Runoff Depth=0.51"
Flow Length=886' Slope=0.0068 '/' Tc=38.9 min CN=47 Runoff=0.61 cfs 0.128 af

SubcatchmentArea 66: Area 66 Runoff Area=0.409 ac 0.00% Impervious Runoff Depth=1.18"
Flow Length=52' Slope=0.1154 '/' Tc=3.1 min CN=59 Runoff=0.81 cfs 0.040 af

SubcatchmentArea 67: Area 67 Runoff Area=0.755 ac 0.00% Impervious Runoff Depth=0.71"
Flow Length=86' Slope=0.2326 '/' Tc=3.5 min CN=51 Runoff=0.71 cfs 0.045 af

SubcatchmentArea 68: Area 68 Runoff Area=1.671 ac 0.00% Impervious Runoff Depth=0.71"
Flow Length=126' Tc=4.0 min CN=51 Runoff=1.52 cfs 0.099 af

SubcatchmentArea 69: Area 69 Runoff Area=9.875 ac 0.00% Impervious Runoff Depth=0.29"
Flow Length=1,337' Tc=16.6 min CN=42 Runoff=0.99 cfs 0.238 af

SubcatchmentArea 7: Area 7 Runoff Area=0.936 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=541' Tc=5.3 min CN=69 Runoff=2.81 cfs 0.148 af

SubcatchmentArea 70: Area 70 Runoff Area=0.694 ac 0.00% Impervious Runoff Depth=1.67"
Flow Length=127' Slope=0.2500 '/' Tc=3.9 min CN=66 Runoff=1.94 cfs 0.096 af

SubcatchmentArea 8: Area 8 Runoff Area=2.114 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=371' Tc=6.6 min CN=69 Runoff=6.16 cfs 0.333 af

SubcatchmentArea 9: Area 9 Runoff Area=0.810 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=292' Tc=6.3 min CN=69 Runoff=2.37 cfs 0.128 af

Reach 53R: Culvert C1 Avg. Flow Depth=0.00' Max Vel=0.00 fps
24.0" Round Pipe n=0.012 L=51.9' S=0.0222 '/' Capacity=36.48 cfs Outflow=0.00 cfs 0.000 af

Reach RD1: Roadside Ditch 1 Avg. Flow Depth=0.10' Max Vel=1.34 fps Inflow=0.61 cfs 0.128 af
n=0.030 L=440.6' S=0.0188 '/' Capacity=47.16 cfs Outflow=0.60 cfs 0.128 af

Reach RD2: Roadside Ditch 2 Avg. Flow Depth=0.40' Max Vel=2.70 fps Inflow=11.19 cfs 0.838 af
n=0.030 L=433.0' S=0.0162 '/' Capacity=72.77 cfs Outflow=10.57 cfs 0.838 af

Reach RD3: Roadside Ditch 3 Avg. Flow Depth=0.62' Max Vel=3.79 fps Inflow=6.95 cfs 0.341 af
n=0.030 L=821.0' S=0.0288 '/' Capacity=20.76 cfs Outflow=5.77 cfs 0.341 af

Reach RD4: Roadside Ditch 4 Avg. Flow Depth=0.12' Max Vel=1.05 fps Inflow=1.52 cfs 0.099 af
n=0.030 L=495.6' S=0.0090 '/' Capacity=54.26 cfs Outflow=0.92 cfs 0.099 af

Reach RD5: Roadside Ditch 5 Avg. Flow Depth=0.38' Max Vel=3.65 fps Inflow=2.25 cfs 0.109 af
n=0.030 L=288.0' S=0.0531 '/' Capacity=28.18 cfs Outflow=2.01 cfs 0.109 af

Reach S1.0: Swale S1.0 Avg. Flow Depth=0.93' Max Vel=2.44 fps Inflow=30.93 cfs 1.665 af
n=0.030 L=551.3' S=0.0039 '/' Capacity=118.85 cfs Outflow=26.03 cfs 1.665 af

Reach S1.1: Swale S1.1 Avg. Flow Depth=0.03' Max Vel=0.99 fps Inflow=0.24 cfs 0.017 af
n=0.030 L=98.0' S=0.0396 '/' Capacity=376.93 cfs Outflow=0.22 cfs 0.017 af

Reach S1.2: Swale S1.2 Avg. Flow Depth=0.57' Max Vel=4.60 fps Inflow=27.11 cfs 1.778 af
n=0.030 L=170.0' S=0.0242 '/' Capacity=294.55 cfs Outflow=26.46 cfs 1.778 af

Reach S1.3: Swale S1.3 Avg. Flow Depth=0.55' Max Vel=4.94 fps Inflow=27.98 cfs 1.960 af
n=0.030 L=212.6' S=0.0293 '/' Capacity=324.28 cfs Outflow=27.48 cfs 1.960 af

Reach S1.4: Swale S1.4 Avg. Flow Depth=0.73' Max Vel=4.09 fps Inflow=32.89 cfs 2.521 af
n=0.030 L=72.2' S=0.0144 '/' Capacity=227.36 cfs Outflow=32.85 cfs 2.521 af

Reach S1.5: Swale S1.5 Avg. Flow Depth=1.02' Max Vel=2.73 fps Inflow=33.64 cfs 2.583 af
n=0.030 L=148.0' S=0.0045 '/' Capacity=126.50 cfs Outflow=33.34 cfs 2.583 af

Reach S1.6: Swale S1.6 Avg. Flow Depth=0.20' Max Vel=1.12 fps Inflow=2.14 cfs 0.121 af
n=0.030 L=179.7' S=0.0050 '/' Capacity=134.06 cfs Outflow=1.95 cfs 0.121 af

Reach S1.7: Swale S1.7 Avg. Flow Depth=1.04' Max Vel=3.05 fps Inflow=38.89 cfs 2.941 af
n=0.030 L=252.0' S=0.0054 '/' Capacity=139.68 cfs Outflow=38.11 cfs 2.941 af

Reach S1.8: Swale S1.8 Avg. Flow Depth=0.31' Max Vel=1.88 fps Inflow=2.19 cfs 0.122 af
n=0.030 L=245.8' S=0.0099 '/' Capacity=90.14 cfs Outflow=1.99 cfs 0.122 af

Reach S1.9: Swale S1.9 Avg. Flow Depth=0.99' Max Vel=3.48 fps Inflow=41.96 cfs 3.247 af
n=0.030 L=422.0' S=0.0075 '/' Capacity=163.67 cfs Outflow=40.72 cfs 3.247 af

Reach S2.1: Swale S2.1 Avg. Flow Depth=1.34' Max Vel=3.22 fps Inflow=40.74 cfs 3.279 af
n=0.030 L=389.0' S=0.0054 '/' Capacity=97.05 cfs Outflow=39.80 cfs 3.279 af

Reach S2.2: Swale S2.2 Avg. Flow Depth=1.30' Max Vel=3.34 fps Inflow=66.42 cfs 6.023 af
n=0.030 L=411.0' S=0.0049 '/' Capacity=152.61 cfs Outflow=65.44 cfs 6.023 af

Reach S2.3: Swale S2.3 Avg. Flow Depth=1.00' Max Vel=4.74 fps Inflow=66.33 cfs 6.216 af
n=0.030 L=307.0' S=0.0130 '/' Capacity=249.72 cfs Outflow=65.84 cfs 6.216 af

Reach S3.1: Swale S3.1 Avg. Flow Depth=0.37' Max Vel=1.62 fps Inflow=6.52 cfs 0.322 af
n=0.030 L=357.0' S=0.0050 '/' Capacity=133.76 cfs Outflow=5.46 cfs 0.322 af

Reach S3.2: Swale S3.2 Avg. Flow Depth=0.76' Max Vel=2.46 fps Inflow=20.49 cfs 1.211 af
n=0.030 L=34.0' S=0.0050 '/' Capacity=133.95 cfs Outflow=20.35 cfs 1.211 af

Reach S3.3: Swale S3.3 Avg. Flow Depth=0.58' Max Vel=3.39 fps Inflow=20.35 cfs 1.211 af
n=0.030 L=200.0' S=0.0130 '/' Capacity=215.99 cfs Outflow=19.21 cfs 1.211 af

Reach S3.4: Swale S3.4 Avg. Flow Depth=0.47' Max Vel=1.99 fps Inflow=3.99 cfs 0.220 af
n=0.030 L=283.0' S=0.0071 '/' Capacity=76.21 cfs Outflow=3.61 cfs 0.220 af

Reach S3.5: Swale S3.5 Avg. Flow Depth=1.27' Max Vel=2.27 fps Inflow=39.25 cfs 2.554 af
n=0.030 L=318.5' S=0.0024 '/' Capacity=93.14 cfs Outflow=37.05 cfs 2.554 af

Reach S4.1: Swale S4.1 Avg. Flow Depth=0.14' Max Vel=1.62 fps Inflow=2.74 cfs 0.145 af
n=0.030 L=240.0' S=0.0153 '/' Capacity=70.22 cfs Outflow=2.38 cfs 0.145 af

Reach S4.2: Swale S4.2 Avg. Flow Depth=0.26' Max Vel=2.12 fps Inflow=6.29 cfs 0.372 af
n=0.030 L=259.3' S=0.0127 '/' Capacity=63.88 cfs Outflow=5.84 cfs 0.372 af

Reach S4.3: Swale S4.3 Avg. Flow Depth=0.73' Max Vel=1.82 fps Inflow=18.75 cfs 1.155 af
n=0.030 L=362.9' S=0.0027 '/' Capacity=108.12 cfs Outflow=16.68 cfs 1.155 af

Reach S4.4: Swale S4.4 Avg. Flow Depth=0.75' Max Vel=2.26 fps Inflow=22.06 cfs 1.732 af
n=0.030 L=495.6' S=0.0040 '/' Capacity=132.85 cfs Outflow=21.14 cfs 1.732 af

Reach S4.5: Swale S4.5 Avg. Flow Depth=0.59' Max Vel=3.07 fps Inflow=22.26 cfs 1.915 af
n=0.030 L=411.1' S=0.0097 '/' Capacity=465.89 cfs Outflow=21.79 cfs 1.915 af

Reach S4.6: Swale S4.6 Avg. Flow Depth=1.24' Max Vel=5.00 fps Inflow=89.57 cfs 8.673 af
n=0.030 L=537.0' S=0.0112 '/' Capacity=499.25 cfs Outflow=88.39 cfs 8.673 af

Reach S5.1: Swale S5.1 Avg. Flow Depth=0.20' Max Vel=2.00 fps Inflow=4.05 cfs 0.204 af
n=0.030 L=428.0' S=0.0154 '/' Capacity=235.24 cfs Outflow=3.50 cfs 0.204 af

Reach S5.2: Swale S5.2 Avg. Flow Depth=0.10' Max Vel=1.89 fps Inflow=1.73 cfs 0.081 af
n=0.030 L=183.6' S=0.0331 '/' Capacity=344.73 cfs Outflow=1.51 cfs 0.081 af

Pond C8: Culvert C8 Peak Elev=811.21' Storage=0.000 af Inflow=0.95 cfs 0.043 af
12.0" Round Culvert n=0.012 L=85.6' S=0.0245 '/' Outflow=0.96 cfs 0.043 af

Pond N: North Infiltration Area Peak Elev=803.89' Storage=20,733 cf Inflow=11.60 cfs 1.175 af
Outflow=1.40 cfs 1.175 af

Pond Sed Pond: Sedimentation Basin Peak Elev=792.17' Storage=175,109 cf Inflow=90.06 cfs 9.372 af
6.223 af Primary=10.22 cfs 3.149 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=15.75 cfs 9.372 af

Link 4L: Culvert C2b Inflow=3.50 cfs 0.204 af
Primary=3.50 cfs 0.204 af

Link C1: Culvert C1 Inflow=0.60 cfs 0.128 af
Primary=0.60 cfs 0.128 af

Link C10: Culvert C10 Inflow=11.21 cfs 0.937 af
Primary=11.21 cfs 0.937 af

Link C11: Culvert C11 Inflow=26.46 cfs 1.778 af
Primary=26.46 cfs 1.778 af

Link C2: Culvert C2a Inflow=10.41 cfs 0.626 af
Primary=10.41 cfs 0.626 af

Link C3: Culvert C3 Inflow=27.48 cfs 1.960 af
Primary=27.48 cfs 1.960 af

Link C4: Culvert C4 Inflow=32.85 cfs 2.521 af
Primary=32.85 cfs 2.521 af

Link C5: Culvert C5 Inflow=38.11 cfs 2.941 af
Primary=38.11 cfs 2.941 af

Link C6: Culvert C6 Inflow=30.03 cfs 1.918 af
Primary=30.03 cfs 1.918 af

Link C7: Culvert C7 Inflow=68.10 cfs 6.703 af
Primary=68.10 cfs 6.703 af

Link C9: Culvert C9 Inflow=0.22 cfs 0.017 af
Primary=0.22 cfs 0.017 af

Link F10: Flume 10 Inflow=0.95 cfs 0.043 af
Primary=0.95 cfs 0.043 af

Link F1A: Flume 1A	Inflow=4.96 cfs	0.268 af
	Primary=4.96 cfs	0.268 af
Link F1B: Flume 1B	Inflow=11.65 cfs	0.620 af
	Primary=11.65 cfs	0.620 af
Link F2A: Flume 2A	Inflow=1.98 cfs	0.100 af
	Primary=1.98 cfs	0.100 af
Link F2B: Flume 2B	Inflow=6.58 cfs	0.347 af
	Primary=6.58 cfs	0.347 af
Link F3: Flume 3	Inflow=1.38 cfs	0.067 af
	Primary=1.38 cfs	0.067 af
Link F4A: Flume 4A	Inflow=3.47 cfs	0.191 af
	Primary=3.47 cfs	0.191 af
Link F4B: Flume 4B	Inflow=9.10 cfs	0.488 af
	Primary=9.10 cfs	0.488 af
Link F5A: Flume 5A	Inflow=0.76 cfs	0.037 af
	Primary=0.76 cfs	0.037 af
Link F5B: Flume 5B	Inflow=2.23 cfs	0.112 af
	Primary=2.23 cfs	0.112 af
Link F6A: Flume 6A	Inflow=4.38 cfs	0.227 af
	Primary=4.38 cfs	0.227 af
Link F6B: Flume 6B	Inflow=9.20 cfs	0.473 af
	Primary=9.20 cfs	0.473 af
Link F7A: Flume 7A	Inflow=8.53 cfs	0.461 af
	Primary=8.53 cfs	0.461 af
Link F7B: Flume 7B	Inflow=15.13 cfs	0.814 af
	Primary=15.13 cfs	0.814 af
Link F8A: Flume 8A	Inflow=2.31 cfs	0.125 af
	Primary=2.31 cfs	0.125 af
Link F8B: Flume 8B	Inflow=7.92 cfs	0.421 af
	Primary=7.92 cfs	0.421 af
Link F9A: Flume 9A	Inflow=8.97 cfs	0.487 af
	Primary=8.97 cfs	0.487 af
Link F9B: Flume 9B	Inflow=18.15 cfs	0.976 af
	Primary=18.15 cfs	0.976 af

Link Wetland: Wetland

Inflow=10.22 cfs 3.149 af
Primary=10.22 cfs 3.149 af

Summary for Subcatchment Area 1: Area 1

Runoff = 3.32 cfs @ 12.14 hrs, Volume= 0.180 af, Depth= 1.89"
Routed to Link F1A : Flume 1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.141	69	Pasture/grassland/range, Fair, HSG B
1.141		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	60	0.1000	0.27		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.8	40	0.2500	0.36		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	16	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	384	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.5	500	Total			

Summary for Subcatchment Area 10: Area 10

Runoff = 2.31 cfs @ 12.14 hrs, Volume= 0.125 af, Depth= 1.89"
Routed to Link F8A : Flume 8A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.791	69	Pasture/grassland/range, Fair, HSG B
0.791		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	71	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.4	29	0.2500	0.34		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	88	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	166	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.4	354	Total			

Summary for Subcatchment Area 11: Area 11

Runoff = 2.59 cfs @ 12.14 hrs, Volume= 0.140 af, Depth= 1.89"
Routed to Link F9A : Flume 9A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.885	69	Pasture/grassland/range, Fair, HSG B
0.885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	71	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.4	29	0.2500	0.34		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	119	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	69	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.4	288	Total			

Summary for Subcatchment Area 12: Area 12

Runoff = 6.39 cfs @ 12.14 hrs, Volume= 0.348 af, Depth= 1.89"
Routed to Link F9A : Flume 9A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
2.206	69	Pasture/grassland/range, Fair, HSG B
2.206		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	40	0.1000	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.5	60	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	56	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.2	472	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.7	628	Total			

Summary for Subcatchment Area 13: Area 13

Runoff = 4.83 cfs @ 12.13 hrs, Volume= 0.254 af, Depth= 1.89"
Routed to Link F1B : Flume 1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.610	69	Pasture/grassland/range, Fair, HSG B
1.610		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	31	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	581	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.3	712	Total			

Summary for Subcatchment Area 14: Area 14

Runoff = 1.94 cfs @ 12.11 hrs, Volume= 0.099 af, Depth= 1.89"
Routed to Link F1B : Flume 1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.626	69	Pasture/grassland/range, Fair, HSG B
0.626		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	183	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	333	Total			

Summary for Subcatchment Area 15: Area 15

Runoff = 1.93 cfs @ 12.11 hrs, Volume= 0.098 af, Depth= 1.89"
Routed to Link F2B : Flume 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.620	69	Pasture/grassland/range, Fair, HSG B
0.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	181	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.4	331	Total			

Summary for Subcatchment Area 16: Area 16

Runoff = 2.80 cfs @ 12.14 hrs, Volume= 0.149 af, Depth= 1.89"
Routed to Link F2B : Flume 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.943	69	Pasture/grassland/range, Fair, HSG B
0.943		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1500	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	95	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	269	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.9	464	Total			

Summary for Subcatchment Area 17: Area 17

Runoff = 1.78 cfs @ 12.11 hrs, Volume= 0.090 af, Depth= 1.89"
Routed to Link F6B : Flume 6B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.571	69	Pasture/grassland/range, Fair, HSG B
0.571		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	44	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	171	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.4	315	Total			

Summary for Subcatchment Area 18: Area 18

Runoff = 3.04 cfs @ 12.12 hrs, Volume= 0.156 af, Depth= 1.89"
Routed to Link F6B : Flume 6B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.990	69	Pasture/grassland/range, Fair, HSG B
0.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	278	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	424	Total			

Summary for Subcatchment Area 19: Area 19

Runoff = 3.62 cfs @ 12.12 hrs, Volume= 0.186 af, Depth= 1.89"
Routed to Link F7B : Flume 7B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.179	69	Pasture/grassland/range, Fair, HSG B
1.179		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	60	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	225	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	385	Total			

Summary for Subcatchment Area 2: Area 2

Runoff = 1.71 cfs @ 12.12 hrs, Volume= 0.088 af, Depth= 1.89"
Routed to Link F1A : Flume 1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.557	69	Pasture/grassland/range, Fair, HSG B
0.557		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	100	0.1950	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	181	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	303	Total			

Summary for Subcatchment Area 20: Area 20

Runoff = 3.24 cfs @ 12.12 hrs, Volume= 0.167 af, Depth= 1.89"
Routed to Link F7B : Flume 7B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.057	69	Pasture/grassland/range, Fair, HSG B
1.057		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	57	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	262	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	419	Total			

Summary for Subcatchment Area 21: Area 21

Runoff = 1.35 cfs @ 12.11 hrs, Volume= 0.068 af, Depth= 1.89"
Routed to Link F8B : Flume 8B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.434	69	Pasture/grassland/range, Fair, HSG B
0.434		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	15	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	259	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	374	Total			

Summary for Subcatchment Area 22: Area 22

Runoff = 4.40 cfs @ 12.12 hrs, Volume= 0.227 af, Depth= 1.89"
Routed to Link F8B : Flume 8B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.442	69	Pasture/grassland/range, Fair, HSG B
1.442		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	49	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	340	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.8	489	Total			

Summary for Subcatchment Area 23: Area 23

Runoff = 3.84 cfs @ 12.12 hrs, Volume= 0.197 af, Depth= 1.89"
Routed to Link F9B : Flume 9B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.252	69	Pasture/grassland/range, Fair, HSG B
1.252		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	285	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	435	Total			

Summary for Subcatchment Area 24: Area 24

Runoff = 5.53 cfs @ 12.13 hrs, Volume= 0.291 af, Depth= 1.89"
Routed to Link F9B : Flume 9B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.846	69	Pasture/grassland/range, Fair, HSG B
1.846		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	43	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	558	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.4	701	Total			

Summary for Subcatchment Area 25: Area 25

Runoff = 6.95 cfs @ 12.10 hrs, Volume= 0.341 af, Depth= 2.64"
Routed to Reach RD3 : Roadside Ditch 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.024	69	Pasture/grassland/range, Fair, HSG B
0.528	96	Gravel surface, HSG A
1.552	78	Weighted Average
1.552		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	23	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	123	Total			

Summary for Subcatchment Area 26: Area 26

Runoff = 2.25 cfs @ 12.10 hrs, Volume= 0.109 af, Depth= 2.13"
Routed to Reach RD5 : Roadside Ditch 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.543	69	Pasture/grassland/range, Fair, HSG B
0.073	96	Gravel surface, HSG A
0.616	72	Weighted Average
0.616		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	9	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.8	109	Total			

Summary for Subcatchment Area 27: Area 27

Runoff = 0.52 cfs @ 12.08 hrs, Volume= 0.023 af, Depth= 1.89"
Routed to Link F10 : Flume 10

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.149	69	Pasture/grassland/range, Fair, HSG B
0.149		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	12	0.2500	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	199	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
1.2	211	Total			

Summary for Subcatchment Area 28: Area 28

Runoff = 0.44 cfs @ 12.09 hrs, Volume= 0.020 af, Depth= 1.89"
Routed to Link F10 : Flume 10

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.126	69	Pasture/grassland/range, Fair, HSG B
0.126		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	59	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 29: Area 29

Runoff = 3.66 cfs @ 12.13 hrs, Volume= 0.194 af, Depth= 1.89"
Routed to Link F4B : Flume 4B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.228	69	Pasture/grassland/range, Fair, HSG B
1.228		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	6	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	541	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
5.7	647	Total			

Summary for Subcatchment Area 3: Area 3

Runoff = 1.06 cfs @ 12.12 hrs, Volume= 0.055 af, Depth= 1.89"
Routed to Link F2A : Flume 2A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.348	69	Pasture/grassland/range, Fair, HSG B
0.348		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	100	0.1950	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	36	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	162	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.8	298	Total			

Summary for Subcatchment Area 30: Area 30

Runoff = 1.38 cfs @ 12.10 hrs, Volume= 0.067 af, Depth= 1.89"
Routed to Link F3 : Flume 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.427	69	Pasture/grassland/range, Fair, HSG B
0.427		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	70	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	227	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	65	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
3.8	362	Total			

Summary for Subcatchment Area 31: Area 31

Runoff = 0.72 cfs @ 12.10 hrs, Volume= 0.035 af, Depth= 1.89"
Routed to Link F4A : Flume 4A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.223	69	Pasture/grassland/range, Fair, HSG B
0.223		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	77	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	157	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	62	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
3.7	296	Total			

Summary for Subcatchment Area 32: Area 32

Runoff = 1.98 cfs @ 12.12 hrs, Volume= 0.103 af, Depth= 1.89"
Routed to Link F4B : Flume 4B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.655	69	Pasture/grassland/range, Fair, HSG B
0.655		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	11	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	314	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
0.3	217	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
5.0	642	Total			

Summary for Subcatchment Area 33: Area 33

Runoff = 0.76 cfs @ 12.11 hrs, Volume= 0.037 af, Depth= 1.89"
Routed to Link F5A : Flume 5A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.237	69	Pasture/grassland/range, Fair, HSG B
0.237		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	83	0.2500	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	138	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.2	127	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
4.0	348	Total			

Summary for Subcatchment Area 34: Area 34

Runoff = 1.73 cfs @ 12.10 hrs, Volume= 0.081 af, Depth= 2.29"
Routed to Reach S5.2 : Swale S5.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.346	69	Pasture/grassland/range, Fair, HSG B
0.078	96	Gravel surface, HSG A
0.424	74	Weighted Average
0.424		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	78	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 35: Area 35

Runoff = 4.05 cfs @ 12.11 hrs, Volume= 0.204 af, Depth= 2.46"
Routed to Reach S5.1 : Swale S5.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.745	69	Pasture/grassland/range, Fair, HSG B
0.248	96	Gravel surface, HSG A
0.993	76	Weighted Average
0.993		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	70	0.1736	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.9	30	0.0050	0.58		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.1	12	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	14	0.1766	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	126	Total			

Summary for Subcatchment Area 36: Area 36

Runoff = 14.85 cfs @ 12.08 hrs, Volume= 0.689 af, Depth= 3.19"
Routed to Reach S1.0 : Swale S1.0

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.120	69	Pasture/grassland/range, Fair, HSG B
1.474	96	Gravel surface, HSG A
2.594	84	Weighted Average
2.594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0140	1.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.2	32	0.0140	2.40		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	40	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.0	11	0.5000	4.95		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	183	Total			

Summary for Subcatchment Area 37: Area 37

Runoff = 0.24 cfs @ 12.14 hrs, Volume= 0.017 af, Depth= 0.66"
Routed to Reach S1.1 : Swale S1.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.249	39	Pasture/grassland/range, Good, HSG A
0.057	96	Gravel surface, HSG A
0.306	50	Weighted Average
0.306		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	72	0.1736	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	28	0.0050	0.57		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.2	19	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	14	0.1766	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	133	Total			

Summary for Subcatchment Area 38: Area 38

Runoff = 3.58 cfs @ 12.11 hrs, Volume= 0.181 af, Depth= 1.52"
Routed to Reach S1.3 : Swale S1.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.395	39	Pasture/grassland/range, Good, HSG A
0.886	69	Pasture/grassland/range, Fair, HSG B
0.149	96	Gravel surface, HSG A
1.430	64	Weighted Average
1.430		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	56	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	156	Total			

Summary for Subcatchment Area 39: Area 39

Runoff = 1.74 cfs @ 12.11 hrs, Volume= 0.090 af, Depth= 1.45"
Routed to Reach S1.4 : Swale S1.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.225	39	Pasture/grassland/range, Good, HSG A
0.436	69	Pasture/grassland/range, Fair, HSG B
0.081	96	Gravel surface, HSG A
0.742	63	Weighted Average
0.742		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	23	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	22	0.0833	2.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.3	145	Total			

Summary for Subcatchment Area 4: Area 4

Runoff = 0.92 cfs @ 12.11 hrs, Volume= 0.045 af, Depth= 1.89"
Routed to Link F2A : Flume 2A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.288	69	Pasture/grassland/range, Fair, HSG B
0.288		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	49	0.0820	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	247	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.0	296	Total			

Summary for Subcatchment Area 40: Area 40

Runoff = 0.72 cfs @ 12.19 hrs, Volume= 0.051 af, Depth= 1.00"
Routed to Reach S1.4 : Swale S1.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.317	39	Pasture/grassland/range, Good, HSG A
0.243	69	Pasture/grassland/range, Fair, HSG B
0.060	96	Gravel surface, HSG A
0.620	56	Weighted Average
0.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	81	0.0245	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.0	19	0.2500	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	29	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	20	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	19	0.1053	2.27		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	168	Total			

Summary for Subcatchment Area 41: Area 41

Runoff = 0.98 cfs @ 12.16 hrs, Volume= 0.061 af, Depth= 1.00"
Routed to Reach S1.5 : Swale S1.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.389	39	Pasture/grassland/range, Good, HSG A
0.270	69	Pasture/grassland/range, Fair, HSG B
0.080	96	Gravel surface, HSG A
0.739	56	Weighted Average
0.739		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	49	0.0408	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.1	47	0.2500	0.37		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	4	0.0050	0.39		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.2	19	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	22	0.1136	2.36		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.2	141	Total			

Summary for Subcatchment Area 42a: Area 42a

Runoff = 2.00 cfs @ 12.16 hrs, Volume= 0.116 af, Depth= 1.59"
Routed to Reach S1.7 : Swale S1.7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.249	39	Pasture/grassland/range, Good, HSG A
0.489	69	Pasture/grassland/range, Fair, HSG B
0.133	96	Gravel surface, HSG A
0.871	65	Weighted Average
0.871		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	44	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.8	144	Total			

Summary for Subcatchment Area 42b: Area 42b

Runoff = 2.19 cfs @ 12.15 hrs, Volume= 0.122 af, Depth= 2.05"
Routed to Reach S1.8 : Swale S1.8

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.655	69	Pasture/grassland/range, Fair, HSG B
0.057	96	Gravel surface, HSG A
0.712	71	Weighted Average
0.712		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	2	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.3	102	Total			

Summary for Subcatchment Area 43: Area 43

Runoff = 2.14 cfs @ 12.15 hrs, Volume= 0.121 af, Depth= 1.89"
Routed to Reach S1.6 : Swale S1.6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.769	69	Pasture/grassland/range, Fair, HSG B
0.769		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	39	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.7	139	Total			

Summary for Subcatchment Area 44: Area 44

Runoff = 0.06 cfs @ 13.20 hrs, Volume= 0.022 af, Depth= 0.18"
Routed to Reach S2.1 : Swale S2.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.416	39	Pasture/grassland/range, Good, HSG A
1.416		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0260	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.9	194	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	647	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.0	941	Total			

Summary for Subcatchment Area 45: Area 45

Runoff = 3.88 cfs @ 12.25 hrs, Volume= 0.306 af, Depth= 1.32"
Routed to Reach S1.9 : Swale S1.9

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.797	39	Pasture/grassland/range, Good, HSG A
1.938	69	Pasture/grassland/range, Fair, HSG B
0.057	96	Gravel surface, HSG A
2.792	61	Weighted Average
2.792		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.3	119	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	22	0.1905	3.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.0	178	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.7	419	Total			

Summary for Subcatchment Area 46: Area 46

Runoff = 6.52 cfs @ 12.11 hrs, Volume= 0.322 af, Depth= 1.89"
Routed to Reach S3.1 : Swale S3.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
2.044	69	Pasture/grassland/range, Fair, HSG B
2.044		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	38	0.2632	3.59		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.0	138	Total			

Summary for Subcatchment Area 47: Area 47

Runoff = 1.53 cfs @ 12.11 hrs, Volume= 0.075 af, Depth= 1.97"
Routed to Reach S3.2 : Swale S3.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.435	69	Pasture/grassland/range, Fair, HSG B
0.022	96	Gravel surface, HSG A
0.457	70	Weighted Average
0.457		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	122	Total			

Summary for Subcatchment Area 48: Area 48

Runoff = 3.99 cfs @ 12.15 hrs, Volume= 0.220 af, Depth= 2.21"
Routed to Reach S3.4 : Swale S3.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.031	69	Pasture/grassland/range, Fair, HSG B
0.163	96	Gravel surface, HSG A
1.194	73	Weighted Average
1.194		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	98	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 49: Area 49

Runoff = 0.27 cfs @ 12.12 hrs, Volume= 0.014 af, Depth= 2.13"
Routed to Link C6 : Culvert C6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.070	69	Pasture/grassland/range, Fair, HSG B
0.009	96	Gravel surface, HSG A
0.079	72	Weighted Average
0.079		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	90	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.2	10	0.0500	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	10	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	18	0.1390	2.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.1	143	Total			

Summary for Subcatchment Area 5: Area 5

Runoff = 2.87 cfs @ 12.14 hrs, Volume= 0.155 af, Depth= 1.89"
Routed to Link F4A : Flume 4A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.986	69	Pasture/grassland/range, Fair, HSG B
0.986		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	31	0.1000	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.8	69	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	9	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	419	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	80	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
6.6	608	Total			

Summary for Subcatchment Area 50: Area 50

Runoff = 9.80 cfs @ 12.20 hrs, Volume= 0.636 af, Depth= 2.05"
Routed to Reach S3.5 : Swale S3.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
3.470	69	Pasture/grassland/range, Fair, HSG B
0.256	96	Gravel surface, HSG A
3.726	71	Weighted Average
3.726		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.9	83	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.9	208	0.0289	1.19		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	391	Total			

Summary for Subcatchment Area 51: Area 51

Runoff = 0.03 cfs @ 12.51 hrs, Volume= 0.011 af, Depth= 0.18"
Routed to Reach S2.1 : Swale S2.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.698	39	Pasture/grassland/range, Good, HSG A
0.698		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0600	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 52: Area 52

Runoff = 1.48 cfs @ 12.11 hrs, Volume= 0.075 af, Depth= 1.89"
Routed to Link F5B : Flume 5B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.475	69	Pasture/grassland/range, Fair, HSG B
0.475		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	90	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	219	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.2	116	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
4.5	425	Total			

Summary for Subcatchment Area 53: Area 53

Runoff = 2.98 cfs @ 12.12 hrs, Volume= 0.160 af, Depth= 1.18"
Routed to Reach S2.3 : Swale S2.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.079	69	Pasture/grassland/range, Fair, HSG B
0.539	39	Pasture/grassland/range, Good, HSG A
1.618	59	Weighted Average
1.618		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	77	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	237	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.3	70	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.2	384	Total			

Summary for Subcatchment Area 54: Area 54

Runoff = 1.45 cfs @ 12.11 hrs, Volume= 0.077 af, Depth= 1.12"
Routed to Reach S2.2 : Swale S2.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.520	69	Pasture/grassland/range, Fair, HSG B
0.306	39	Pasture/grassland/range, Good, HSG A
0.826	58	Weighted Average
0.826		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	26	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	126	Total			

Summary for Subcatchment Area 55: Area 55

Runoff = 1.86 cfs @ 12.12 hrs, Volume= 0.102 af, Depth= 1.12"
Routed to Reach S4.1 : Swale S4.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.526	39	Pasture/grassland/range, Good, HSG A
0.405	69	Pasture/grassland/range, Fair, HSG B
0.158	96	Gravel surface, HSG A
1.089	58	Weighted Average
1.089		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	80	0.2000	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	20	0.0500	1.34		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.1	10	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	48	0.0625	1.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.3	158	Total			

Summary for Subcatchment Area 56: Area 56

Runoff = 2.17 cfs @ 12.12 hrs, Volume= 0.118 af, Depth= 1.18"
Routed to Reach S4.2 : Swale S4.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.580	39	Pasture/grassland/range, Good, HSG A
0.433	69	Pasture/grassland/range, Fair, HSG B
0.181	96	Gravel surface, HSG B
1.194	59	Weighted Average
1.194		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	121	0.2314	3.37		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	221	Total			

Summary for Subcatchment Area 57: Area 57

Runoff = 2.69 cfs @ 12.13 hrs, Volume= 0.162 af, Depth= 0.88"
Routed to Reach S4.3 : Swale S4.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.134	39	Pasture/grassland/range, Good, HSG A
1.086	69	Pasture/grassland/range, Fair, HSG B
2.220	54	Weighted Average
2.220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	140	0.1857	3.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.6	240	Total			

Summary for Subcatchment Area 58: Area 58

Runoff = 4.13 cfs @ 12.13 hrs, Volume= 0.231 af, Depth= 1.12"
Routed to Reach S4.4 : Swale S4.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.939	39	Pasture/grassland/range, Good, HSG A
1.537	69	Pasture/grassland/range, Fair, HSG B
2.476	58	Weighted Average
2.476		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.9	163	0.1718	2.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	263	Total			

Summary for Subcatchment Area 59: Area 59

Runoff = 1.90 cfs @ 12.12 hrs, Volume= 0.115 af, Depth= 0.82"
Routed to Reach S4.5 : Swale S4.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.898	39	Pasture/grassland/range, Good, HSG A
0.785	69	Pasture/grassland/range, Fair, HSG B
1.683	53	Weighted Average
1.683		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	100	0.2345	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2345	3.39		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	146	Total			

Summary for Subcatchment Area 6: Area 6

Runoff = 1.66 cfs @ 12.10 hrs, Volume= 0.079 af, Depth= 1.89"
Routed to Link F6A : Flume 6A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.504	69	Pasture/grassland/range, Fair, HSG B
0.504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	72	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	186	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
3.4	258	Total			

Summary for Subcatchment Area 60: Area 60

Runoff = 0.24 cfs @ 12.55 hrs, Volume= 0.055 af, Depth= 0.33"
Routed to Reach S4.6 : Swale S4.6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.871	39	Pasture/grassland/range, Good, HSG A
0.000	96	Gravel surface, HSG A
0.130	96	Gravel surface, HSG A
2.001	43	Weighted Average
2.001		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0074	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
4.7	169	0.0074	0.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	49	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.8	318	Total			

Summary for Subcatchment Area 61: Area 61

Runoff = 0.09 cfs @ 12.53 hrs, Volume= 0.033 af, Depth= 0.18"
Routed to Reach S2.3 : Swale S2.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
2.177	39	Pasture/grassland/range, Good, HSG A
2.177		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	66	0.0303	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.6	34	0.2500	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	49	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.2	149	Total			

Summary for Subcatchment Area 62: Area 62

Runoff = 0.39 cfs @ 12.18 hrs, Volume= 0.032 af, Depth= 0.66"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.479	39	Pasture/grassland/range, Good, HSG A
0.115	96	Gravel surface, HSG A
0.594	50	Weighted Average
0.594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0544	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	47	0.0544	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.6	147	Total			

Summary for Subcatchment Area 63: Area 63

Runoff = 10.73 cfs @ 12.04 hrs, Volume= 0.588 af, Depth= 4.67"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.509	98	Water Surface, HSG A
1.509		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Subcatchment Area 64: Area 64

Runoff = 0.22 cfs @ 12.53 hrs, Volume= 0.079 af, Depth= 0.18"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
5.227	39	Pasture/grassland/range, Good, HSG A
5.227		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	75	0.0933	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.3	25	0.2500	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	10	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	381	0.0265	7.85	109.92	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
0.8	162	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	48	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.9	701	Total			

Summary for Subcatchment Area 65: Area 65

Runoff = 0.61 cfs @ 12.73 hrs, Volume= 0.128 af, Depth= 0.51"
Routed to Reach RD1 : Roadside Ditch 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
2.616	39	Pasture/grassland/range, Good, HSG A
0.039	69	Pasture/grassland/range, Fair, HSG B
0.380	96	Gravel surface, HSG A
3.035	47	Weighted Average
3.035		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	100	0.0068	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
22.7	786	0.0068	0.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	886	Total			

Summary for Subcatchment Area 66: Area 66

Runoff = 0.81 cfs @ 12.10 hrs, Volume= 0.040 af, Depth= 1.18"
Routed to Reach RD2 : Roadside Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.213	39	Pasture/grassland/range, Good, HSG A
0.104	69	Pasture/grassland/range, Fair, HSG B
0.092	96	Gravel surface, HSG A
0.409	59	Weighted Average
0.409		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	52	0.1154	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 67: Area 67

Runoff = 0.71 cfs @ 12.12 hrs, Volume= 0.045 af, Depth= 0.71"
Routed to Reach RD2 : Roadside Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.524	39	Pasture/grassland/range, Good, HSG A
0.139	69	Pasture/grassland/range, Fair, HSG B
0.092	96	Gravel surface, HSG A
0.755	51	Weighted Average
0.755		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	86	0.2326	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 68: Area 68

Runoff = 1.52 cfs @ 12.12 hrs, Volume= 0.099 af, Depth= 0.71"
Routed to Reach RD4 : Roadside Ditch 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.016	39	Pasture/grassland/range, Good, HSG A
0.620	69	Pasture/grassland/range, Fair, HSG B
0.035	96	Gravel surface, HSG A
1.671	51	Weighted Average
1.671		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	26	0.1538	2.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.0	126	Total			

Summary for Subcatchment Area 69: Area 69

Runoff = 0.99 cfs @ 12.52 hrs, Volume= 0.238 af, Depth= 0.29"
Routed to Pond N : North Infiltration Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
9.360	39	Pasture/grassland/range, Good, HSG A
0.515	96	Gravel surface, HSG A
9.875	42	Weighted Average
9.875		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.7	100	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	1,137	0.0193	4.31	32.30	**Trap/Vee/Rect Channel Flow, Roadside Ditch** Bot.W=0.00' D=1.00' Z= 5.0 & 10.0 '/' Top.W=15.00' n= 0.030
16.6	1,337	Total			

Summary for Subcatchment Area 7: Area 7

Runoff = 2.81 cfs @ 12.13 hrs, Volume= 0.148 af, Depth= 1.89"
Routed to Link F6A : Flume 6A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.936	69	Pasture/grassland/range, Fair, HSG B
0.936		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	100	0.2070	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	395	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.3	541	Total			

Summary for Subcatchment Area 70: Area 70

Runoff = 1.94 cfs @ 12.11 hrs, Volume= 0.096 af, Depth= 1.67"
Routed to Reach S1.2 : Swale S1.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.153	39	Pasture/grassland/range, Good, HSG A
0.441	69	Pasture/grassland/range, Fair, HSG B
0.100	96	Gravel surface, HSG A
0.694	66	Weighted Average
0.694		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	27	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	127	Total			

Summary for Subcatchment Area 8: Area 8

Runoff = 6.16 cfs @ 12.14 hrs, Volume= 0.333 af, Depth= 1.89"
Routed to Link F7A : Flume 7A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
2.114	69	Pasture/grassland/range, Fair, HSG B
2.114		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	100	0.1000	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	26	0.1000	2.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	121	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	124	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.6	371	Total			

Summary for Subcatchment Area 9: Area 9

Runoff = 2.37 cfs @ 12.14 hrs, Volume= 0.128 af, Depth= 1.89"
Routed to Link F7A : Flume 7A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

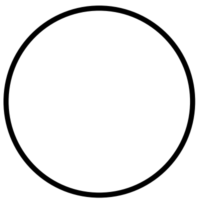
Area (ac)	CN	Description
0.810	69	Pasture/grassland/range, Fair, HSG B
0.810		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	71	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.4	29	0.2500	0.34		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	89	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	103	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.3	292	Total			

Summary for Reach 53R: Culvert C1

Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 36.48 cfs

24.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 51.9' Slope= 0.0222 '/'
Inlet Invert= 815.70', Outlet Invert= 814.55'



Summary for Reach RD1: Roadside Ditch 1

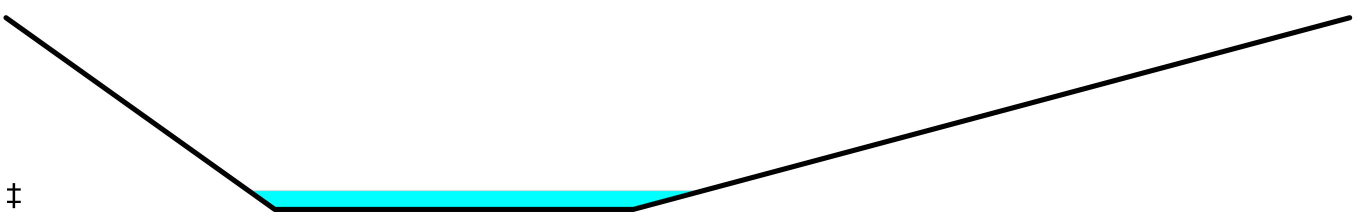
Inflow Area = 3.035 ac, 0.00% Impervious, Inflow Depth = 0.51" for 25-yr, 24-hr event
Inflow = 0.61 cfs @ 12.73 hrs, Volume= 0.128 af
Outflow = 0.60 cfs @ 12.89 hrs, Volume= 0.128 af, Atten= 2%, Lag= 9.5 min
Routed to Link C1 : Culvert C1

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.34 fps, Min. Travel Time= 5.5 min
Avg. Velocity = 0.62 fps, Avg. Travel Time= 11.8 min

Peak Storage= 197 cf @ 12.80 hrs
Average Depth at Peak Storage= 0.10' , Surface Width= 5.08'
Bank-Full Depth= 1.00' Flow Area= 9.5 sf, Capacity= 47.16 cfs

4.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 8.0 '/' Top Width= 15.00'
Length= 440.6' Slope= 0.0188 '/'
Inlet Invert= 824.00', Outlet Invert= 815.70'

‡



Summary for Reach RD2: Roadside Ditch 2

Inflow Area = 7.168 ac, 0.00% Impervious, Inflow Depth = 1.40" for 25-yr, 24-hr event
Inflow = 11.19 cfs @ 12.19 hrs, Volume= 0.838 af
Outflow = 10.57 cfs @ 12.26 hrs, Volume= 0.838 af, Atten= 6%, Lag= 4.5 min
Routed to Link C10 : Culvert C10

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.70 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.78 fps, Avg. Travel Time= 9.2 min

Peak Storage= 1,703 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.40' , Surface Width= 13.91'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 72.77 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 433.0' Slope= 0.0162 '/'
Inlet Invert= 814.55', Outlet Invert= 807.54'

‡

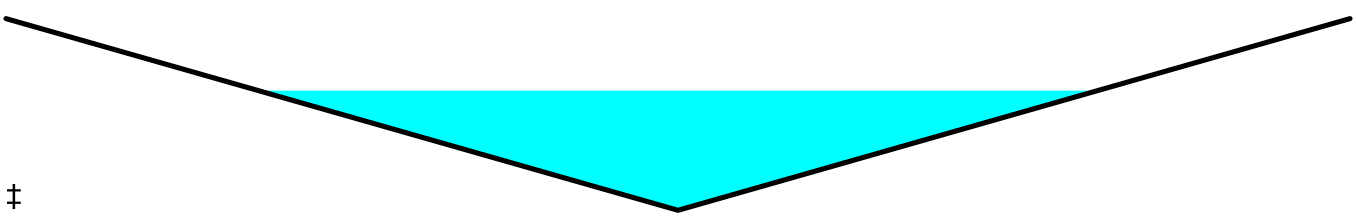
Summary for Reach RD3: Roadside Ditch 3

Inflow Area = 1.552 ac, 0.00% Impervious, Inflow Depth = 2.64" for 25-yr, 24-hr event
Inflow = 6.95 cfs @ 12.10 hrs, Volume= 0.341 af
Outflow = 5.77 cfs @ 12.20 hrs, Volume= 0.341 af, Atten= 17%, Lag= 5.9 min
Routed to Link C2 : Culvert C2a

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.79 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 1.26 fps, Avg. Travel Time= 10.8 min

Peak Storage= 1,282 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.62' , Surface Width= 5.00'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 20.76 cfs

0.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 821.0' Slope= 0.0288 '/'
Inlet Invert= 841.47', Outlet Invert= 817.83'



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Summary for Reach RD4: Roadside Ditch 4

Inflow Area = 1.671 ac, 0.00% Impervious, Inflow Depth = 0.71" for 25-yr, 24-hr event
Inflow = 1.52 cfs @ 12.12 hrs, Volume= 0.099 af
Outflow = 0.92 cfs @ 12.35 hrs, Volume= 0.099 af, Atten= 39%, Lag= 13.6 min
Routed to Link C10 : Culvert C10

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.05 fps, Min. Travel Time= 7.9 min
Avg. Velocity = 0.37 fps, Avg. Travel Time= 22.6 min

Peak Storage= 447 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.12' , Surface Width= 8.49'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 54.26 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 495.6' Slope= 0.0090 '/'
Inlet Invert= 812.00', Outlet Invert= 807.54'

‡

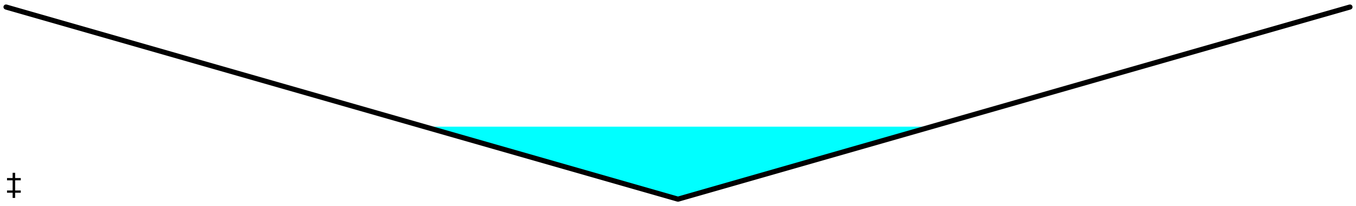
Summary for Reach RD5: Roadside Ditch 5

Inflow Area = 0.616 ac, 0.00% Impervious, Inflow Depth = 2.13" for 25-yr, 24-hr event
Inflow = 2.25 cfs @ 12.10 hrs, Volume= 0.109 af
Outflow = 2.01 cfs @ 12.14 hrs, Volume= 0.109 af, Atten= 11%, Lag= 2.5 min
Routed to Reach S4.2 : Swale S4.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.65 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 1.38 fps, Avg. Travel Time= 3.5 min

Peak Storage= 164 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.38' , Surface Width= 3.02'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 28.18 cfs

0.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 288.0' Slope= 0.0531 '/'
Inlet Invert= 841.47', Outlet Invert= 826.18'



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Summary for Reach S1.0: Swale S1.0

Inflow Area = 8.783 ac, 0.00% Impervious, Inflow Depth = 2.27" for 25-yr, 24-hr event
Inflow = 30.93 cfs @ 12.10 hrs, Volume= 1.665 af
Outflow = 26.03 cfs @ 12.21 hrs, Volume= 1.665 af, Atten= 16%, Lag= 6.2 min
Routed to Reach S1.2 : Swale S1.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.44 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.56 fps, Avg. Travel Time= 16.5 min

Peak Storage= 6,031 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.93' , Surface Width= 15.46'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 118.85 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 551.3' Slope= 0.0039 '/'
Inlet Invert= 823.92', Outlet Invert= 821.75'

‡

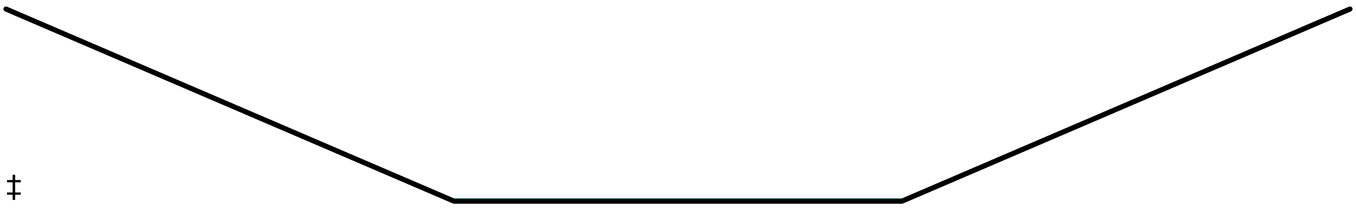
Summary for Reach S1.1: Swale S1.1

Inflow Area = 0.306 ac, 0.00% Impervious, Inflow Depth = 0.66" for 25-yr, 24-hr event
Inflow = 0.24 cfs @ 12.14 hrs, Volume= 0.017 af
Outflow = 0.22 cfs @ 12.20 hrs, Volume= 0.017 af, Atten= 10%, Lag= 3.5 min
Routed to Link C9 : Culvert C9

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.99 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.72 fps, Avg. Travel Time= 2.3 min

Peak Storage= 24 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.03' , Surface Width= 8.24'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 376.93 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 98.0' Slope= 0.0396 '/'
Inlet Invert= 825.88', Outlet Invert= 822.00'



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Summary for Reach S1.2: Swale S1.2

Inflow Area = 9.783 ac, 0.00% Impervious, Inflow Depth = 2.18" for 25-yr, 24-hr event
Inflow = 27.11 cfs @ 12.20 hrs, Volume= 1.778 af
Outflow = 26.46 cfs @ 12.22 hrs, Volume= 1.778 af, Atten= 2%, Lag= 1.0 min
Routed to Link C11 : Culvert C11

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.60 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.08 fps, Avg. Travel Time= 2.6 min

Peak Storage= 998 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.57' , Surface Width= 12.57'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 294.55 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 170.0' Slope= 0.0242 '/'
Inlet Invert= 821.79', Outlet Invert= 817.68'

‡

Summary for Reach S1.3: Swale S1.3

Inflow Area = 11.213 ac, 0.00% Impervious, Inflow Depth = 2.10" for 25-yr, 24-hr event
Inflow = 27.98 cfs @ 12.21 hrs, Volume= 1.960 af
Outflow = 27.48 cfs @ 12.24 hrs, Volume= 1.960 af, Atten= 2%, Lag= 1.3 min
Routed to Link C3 : Culvert C3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.94 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.19 fps, Avg. Travel Time= 3.0 min

Peak Storage= 1,194 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.55' , Surface Width= 12.40'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 324.28 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 212.6' Slope= 0.0293 '/'
Inlet Invert= 817.40', Outlet Invert= 811.17'

‡

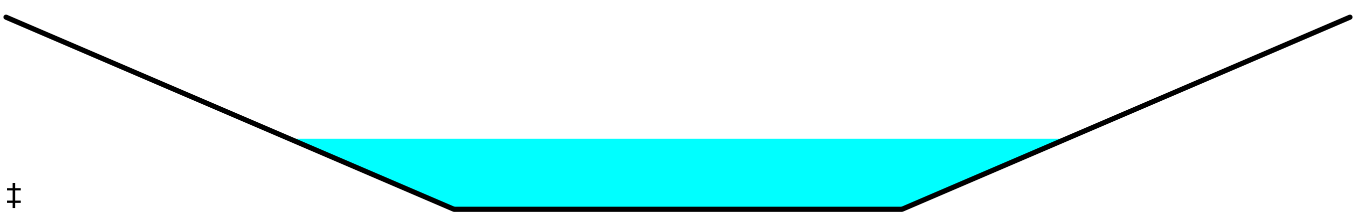
Summary for Reach S1.4: Swale S1.4

Inflow Area = 15.242 ac, 0.00% Impervious, Inflow Depth = 1.99" for 25-yr, 24-hr event
Inflow = 32.89 cfs @ 12.20 hrs, Volume= 2.521 af
Outflow = 32.85 cfs @ 12.21 hrs, Volume= 2.521 af, Atten= 0%, Lag= 0.6 min
Routed to Link C4 : Culvert C4

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.09 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 1.2 min

Peak Storage= 580 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.73' , Surface Width= 13.88'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 227.36 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 72.2' Slope= 0.0144 '/'
Inlet Invert= 810.90', Outlet Invert= 809.86'



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Summary for Reach S1.5: Swale S1.5

Inflow Area = 15.981 ac, 0.00% Impervious, Inflow Depth = 1.94" for 25-yr, 24-hr event
Inflow = 33.64 cfs @ 12.21 hrs, Volume= 2.583 af
Outflow = 33.34 cfs @ 12.23 hrs, Volume= 2.583 af, Atten= 1%, Lag= 1.5 min
Routed to Reach S1.7 : Swale S1.7

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.73 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 3.7 min

Peak Storage= 1,830 cf @ 12.22 hrs
Average Depth at Peak Storage= 1.02' , Surface Width= 16.18'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 126.50 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 148.0' Slope= 0.0045 '/'
Inlet Invert= 809.60', Outlet Invert= 808.94'

‡

Summary for Reach S1.6: Swale S1.6

Inflow Area = 0.769 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 2.14 cfs @ 12.15 hrs, Volume= 0.121 af
Outflow = 1.95 cfs @ 12.23 hrs, Volume= 0.121 af, Atten= 9%, Lag= 4.7 min
Routed to Reach S1.7 : Swale S1.7

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.12 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.32 fps, Avg. Travel Time= 9.2 min

Peak Storage= 316 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 9.60'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 134.06 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 179.7' Slope= 0.0050 '/'
Inlet Invert= 809.85', Outlet Invert= 808.95'

‡

Summary for Reach S1.7: Swale S1.7

Inflow Area = 18.333 ac, 0.00% Impervious, Inflow Depth = 1.93" for 25-yr, 24-hr event
Inflow = 38.89 cfs @ 12.22 hrs, Volume= 2.941 af
Outflow = 38.11 cfs @ 12.27 hrs, Volume= 2.941 af, Atten= 2%, Lag= 2.7 min
Routed to Link C5 : Culvert C5

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.05 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 5.7 min

Peak Storage= 3,186 cf @ 12.25 hrs
Average Depth at Peak Storage= 1.04' , Surface Width= 16.32'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 139.68 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 252.0' Slope= 0.0054 '/'
Inlet Invert= 808.94', Outlet Invert= 807.57'

‡

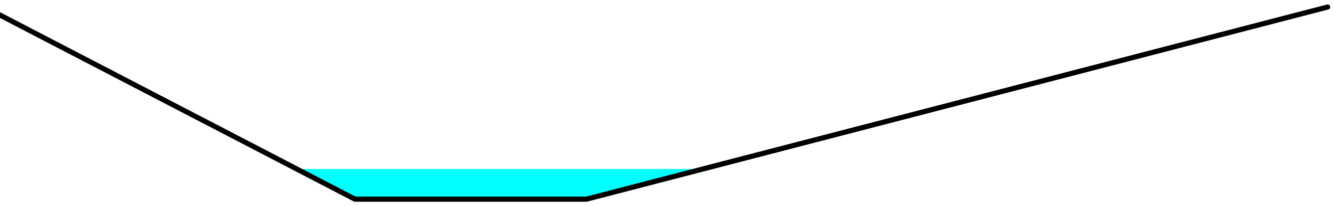
Summary for Reach S1.8: Swale S1.8

Inflow Area = 0.712 ac, 0.00% Impervious, Inflow Depth = 2.05" for 25-yr, 24-hr event
Inflow = 2.19 cfs @ 12.15 hrs, Volume= 0.122 af
Outflow = 1.99 cfs @ 12.21 hrs, Volume= 0.122 af, Atten= 9%, Lag= 3.8 min
Routed to Reach S1.7 : Swale S1.7

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.88 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.56 fps, Avg. Travel Time= 7.3 min

Peak Storage= 265 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.31' , Surface Width= 4.38'
Bank-Full Depth= 2.00' Flow Area= 17.0 sf, Capacity= 90.14 cfs

2.50' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 4.0 '/' Top Width= 14.50'
Length= 245.8' Slope= 0.0099 '/'
Inlet Invert= 810.00', Outlet Invert= 807.57'



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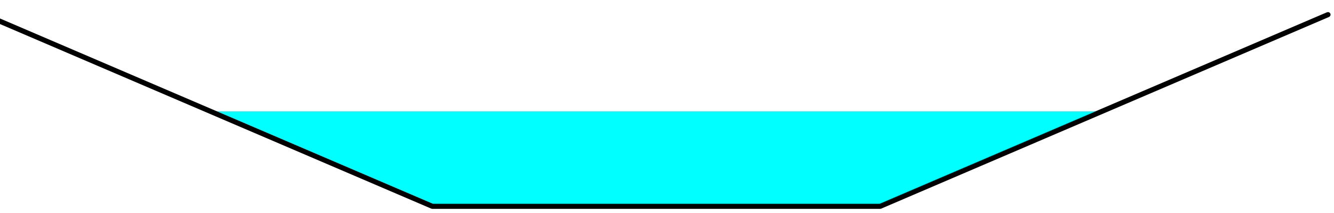
Summary for Reach S1.9: Swale S1.9

Inflow Area = 21.125 ac, 0.00% Impervious, Inflow Depth = 1.84" for 25-yr, 24-hr event
Inflow = 41.96 cfs @ 12.27 hrs, Volume= 3.247 af
Outflow = 40.72 cfs @ 12.33 hrs, Volume= 3.247 af, Atten= 3%, Lag= 3.8 min
Routed to Reach S2.1 : Swale S2.1

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.48 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.84 fps, Avg. Travel Time= 8.4 min

Peak Storage= 5,006 cf @ 12.30 hrs
Average Depth at Peak Storage= 0.99' , Surface Width= 15.93'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 163.67 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 422.0' Slope= 0.0075 '/'
Inlet Invert= 807.15', Outlet Invert= 804.00'



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Summary for Reach S2.1: Swale S2.1

Inflow Area = 23.239 ac, 0.00% Impervious, Inflow Depth = 1.69" for 25-yr, 24-hr event
Inflow = 40.74 cfs @ 12.33 hrs, Volume= 3.279 af
Outflow = 39.80 cfs @ 12.40 hrs, Volume= 3.279 af, Atten= 2%, Lag= 3.9 min
Routed to Reach S2.2 : Swale S2.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.22 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 7.5 min

Peak Storage= 4,870 cf @ 12.36 hrs
Average Depth at Peak Storage= 1.34' , Surface Width= 14.71'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 97.05 cfs

4.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 20.00'
Length= 389.0' Slope= 0.0054 '/'
Inlet Invert= 806.10', Outlet Invert= 804.00'

‡

Summary for Reach S2.2: Swale S2.2

Inflow Area = 40.438 ac, 0.00% Impervious, Inflow Depth = 1.79" for 25-yr, 24-hr event
Inflow = 66.42 cfs @ 12.32 hrs, Volume= 6.023 af
Outflow = 65.44 cfs @ 12.38 hrs, Volume= 6.023 af, Atten= 1%, Lag= 3.7 min
Routed to Reach S2.3 : Swale S2.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.34 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 8.5 min

Peak Storage= 8,100 cf @ 12.35 hrs
Average Depth at Peak Storage= 1.30' , Surface Width= 20.38'
Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 152.61 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 411.0' Slope= 0.0049 '/'
Inlet Invert= 804.00', Outlet Invert= 802.00'

‡

Summary for Reach S2.3: Swale S2.3

Inflow Area = 44.233 ac, 0.00% Impervious, Inflow Depth = 1.69" for 25-yr, 24-hr event
Inflow = 66.33 cfs @ 12.38 hrs, Volume= 6.216 af
Outflow = 65.84 cfs @ 12.41 hrs, Volume= 6.216 af, Atten= 1%, Lag= 2.0 min
Routed to Link C7 : Culvert C7

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.74 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.15 fps, Avg. Travel Time= 4.5 min

Peak Storage= 4,294 cf @ 12.40 hrs
Average Depth at Peak Storage= 1.00' , Surface Width= 17.99'
Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 249.72 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 307.0' Slope= 0.0130 '/'
Inlet Invert= 802.00', Outlet Invert= 798.00'

‡

Summary for Reach S3.1: Swale S3.1

Inflow Area = 2.044 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 6.52 cfs @ 12.11 hrs, Volume= 0.322 af
Outflow = 5.46 cfs @ 12.21 hrs, Volume= 0.322 af, Atten= 16%, Lag= 5.9 min
Routed to Reach S3.2 : Swale S3.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.62 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 14.2 min

Peak Storage= 1,242 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.37' , Surface Width= 10.94'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 133.76 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 357.0' Slope= 0.0050 '/'
Inlet Invert= 809.85', Outlet Invert= 808.07'

‡

Summary for Reach S3.2: Swale S3.2

Inflow Area = 7.661 ac, 0.00% Impervious, Inflow Depth = 1.90" for 25-yr, 24-hr event
Inflow = 20.49 cfs @ 12.14 hrs, Volume= 1.211 af
Outflow = 20.35 cfs @ 12.15 hrs, Volume= 1.211 af, Atten= 1%, Lag= 0.4 min
Routed to Reach S3.3 : Swale S3.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.46 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.65 fps, Avg. Travel Time= 0.9 min

Peak Storage= 285 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.76' , Surface Width= 14.07'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 133.95 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 34.0' Slope= 0.0050 '/'
Inlet Invert= 798.00', Outlet Invert= 797.83'

‡

Summary for Reach S3.3: Swale S3.3

Inflow Area = 7.661 ac, 0.00% Impervious, Inflow Depth = 1.90" for 25-yr, 24-hr event
Inflow = 20.35 cfs @ 12.15 hrs, Volume= 1.211 af
Outflow = 19.21 cfs @ 12.17 hrs, Volume= 1.211 af, Atten= 6%, Lag= 1.7 min
Routed to Link C6 : Culvert C6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.39 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.89 fps, Avg. Travel Time= 3.7 min

Peak Storage= 1,187 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.58' , Surface Width= 12.61'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 215.99 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 200.0' Slope= 0.0130 '/'
Inlet Invert= 808.00', Outlet Invert= 805.40'

‡

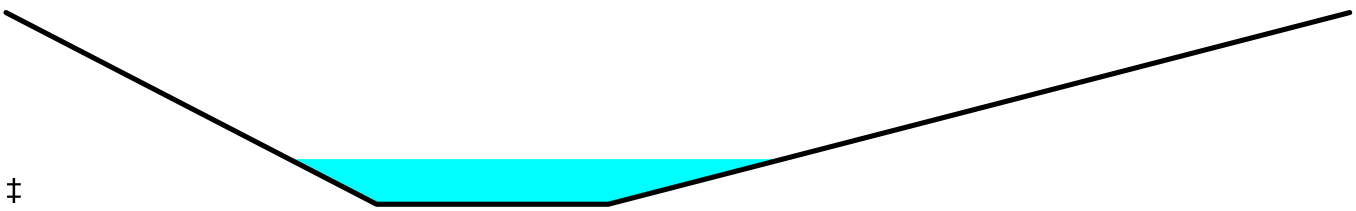
Summary for Reach S3.4: Swale S3.4

Inflow Area = 1.194 ac, 0.00% Impervious, Inflow Depth = 2.21" for 25-yr, 24-hr event
Inflow = 3.99 cfs @ 12.15 hrs, Volume= 0.220 af
Outflow = 3.61 cfs @ 12.22 hrs, Volume= 0.220 af, Atten= 9%, Lag= 4.1 min
Routed to Link C6 : Culvert C6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.99 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.59 fps, Avg. Travel Time= 8.0 min

Peak Storage= 520 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.47' , Surface Width= 5.32'
Bank-Full Depth= 2.00' Flow Area= 17.0 sf, Capacity= 76.21 cfs

2.50' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 4.0 '/' Top Width= 14.50'
Length= 283.0' Slope= 0.0071 '/'
Inlet Invert= 810.00', Outlet Invert= 808.00'



‡

Summary for Reach S3.5: Swale S3.5

Inflow Area = 15.661 ac, 0.00% Impervious, Inflow Depth = 1.96" for 25-yr, 24-hr event
Inflow = 39.25 cfs @ 12.17 hrs, Volume= 2.554 af
Outflow = 37.05 cfs @ 12.24 hrs, Volume= 2.554 af, Atten= 6%, Lag= 4.5 min
Routed to Reach S2.2 : Swale S2.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.27 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 8.9 min

Peak Storage= 5,295 cf @ 12.20 hrs
Average Depth at Peak Storage= 1.27' , Surface Width= 18.17'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 93.14 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 318.5' Slope= 0.0024 '/'
Inlet Invert= 804.76', Outlet Invert= 803.99'

‡

Summary for Reach S4.1: Swale S4.1

Inflow Area = 1.364 ac, 0.00% Impervious, Inflow Depth = 1.28" for 25-yr, 24-hr event
Inflow = 2.74 cfs @ 12.10 hrs, Volume= 0.145 af
Outflow = 2.38 cfs @ 12.18 hrs, Volume= 0.145 af, Atten= 13%, Lag= 4.4 min
Routed to Reach S4.2 : Swale S4.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.62 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.43 fps, Avg. Travel Time= 9.3 min

Peak Storage= 363 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 11.01'
Bank-Full Depth= 1.00' Flow Area= 13.5 sf, Capacity= 70.22 cfs

10.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 17.00'
Length= 240.0' Slope= 0.0153 '/'
Inlet Invert= 811.94', Outlet Invert= 808.26'

‡

Summary for Reach S4.2: Swale S4.2

Inflow Area = 3.174 ac, 0.00% Impervious, Inflow Depth = 1.41" for 25-yr, 24-hr event
Inflow = 6.29 cfs @ 12.15 hrs, Volume= 0.372 af
Outflow = 5.84 cfs @ 12.21 hrs, Volume= 0.372 af, Atten= 7%, Lag= 3.6 min
Routed to Reach S4.3 : Swale S4.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.12 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 8.1 min

Peak Storage= 732 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.26' , Surface Width= 11.81'
Bank-Full Depth= 1.00' Flow Area= 13.5 sf, Capacity= 63.88 cfs

10.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 17.00'
Length= 259.3' Slope= 0.0127 '/'
Inlet Invert= 808.26', Outlet Invert= 804.97'

‡

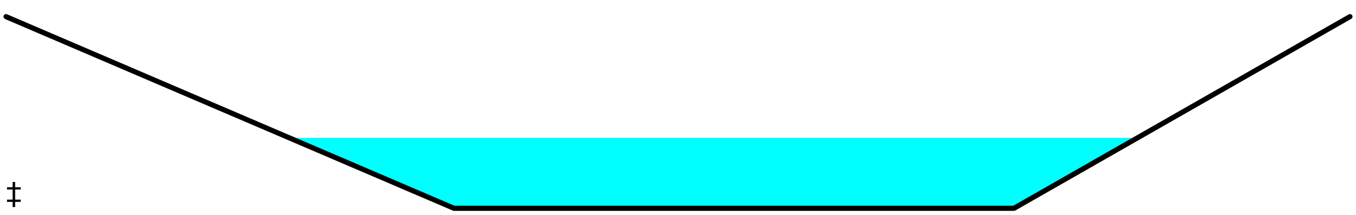
Summary for Reach S4.3: Swale S4.3

Inflow Area = 9.328 ac, 0.00% Impervious, Inflow Depth = 1.49" for 25-yr, 24-hr event
Inflow = 18.75 cfs @ 12.14 hrs, Volume= 1.155 af
Outflow = 16.68 cfs @ 12.24 hrs, Volume= 1.155 af, Atten= 11%, Lag= 5.7 min
Routed to Reach S4.4 : Swale S4.4

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.82 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 13.2 min

Peak Storage= 3,352 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.73' , Surface Width= 15.14'
Bank-Full Depth= 2.00' Flow Area= 34.0 sf, Capacity= 108.12 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 24.00'
Length= 362.9' Slope= 0.0027 '/'
Inlet Invert= 804.97', Outlet Invert= 804.00'



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Summary for Reach S4.4: Swale S4.4

Inflow Area = 14.003 ac, 0.00% Impervious, Inflow Depth = 1.48" for 25-yr, 24-hr event
Inflow = 22.06 cfs @ 12.20 hrs, Volume= 1.732 af
Outflow = 21.14 cfs @ 12.31 hrs, Volume= 1.732 af, Atten= 4%, Lag= 6.5 min
Routed to Reach S4.5 : Swale S4.5

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.26 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 0.58 fps, Avg. Travel Time= 14.2 min

Peak Storage= 4,669 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.75' , Surface Width= 15.23'
Bank-Full Depth= 2.00' Flow Area= 34.0 sf, Capacity= 132.85 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 24.00'
Length= 495.6' Slope= 0.0040 '/'
Inlet Invert= 804.00', Outlet Invert= 802.00'

‡

Summary for Reach S4.5: Swale S4.5

Inflow Area = 16.113 ac, 0.00% Impervious, Inflow Depth = 1.43" for 25-yr, 24-hr event
Inflow = 22.26 cfs @ 12.30 hrs, Volume= 1.915 af
Outflow = 21.79 cfs @ 12.37 hrs, Volume= 1.915 af, Atten= 2%, Lag= 3.9 min
Routed to Reach S4.6 : Swale S4.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.07 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 8.0 min

Peak Storage= 2,934 cf @ 12.33 hrs
Average Depth at Peak Storage= 0.59' , Surface Width= 14.14'
Bank-Full Depth= 3.00' Flow Area= 61.5 sf, Capacity= 465.89 cfs

10.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 31.00'
Length= 411.1' Slope= 0.0097 '/'
Inlet Invert= 802.00', Outlet Invert= 798.00'

‡

Summary for Reach S4.6: Swale S4.6

Inflow Area = 65.439 ac, 0.00% Impervious, Inflow Depth = 1.59" for 25-yr, 24-hr event
Inflow = 89.57 cfs @ 12.40 hrs, Volume= 8.673 af
Outflow = 88.39 cfs @ 12.45 hrs, Volume= 8.673 af, Atten= 1%, Lag= 3.3 min
Routed to Pond Sed Pond : Sedimentation Basin

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.00 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 1.27 fps, Avg. Travel Time= 7.1 min

Peak Storage= 9,563 cf @ 12.42 hrs
Average Depth at Peak Storage= 1.24' , Surface Width= 18.69'
Bank-Full Depth= 3.00' Flow Area= 61.5 sf, Capacity= 499.25 cfs

10.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 31.00'
Length= 537.0' Slope= 0.0112 '/'
Inlet Invert= 798.00', Outlet Invert= 792.00'

Summary for Reach S5.1: Swale S5.1

Inflow Area = 0.993 ac, 0.00% Impervious, Inflow Depth = 2.46" for 25-yr, 24-hr event
Inflow = 4.05 cfs @ 12.11 hrs, Volume= 0.204 af
Outflow = 3.50 cfs @ 12.20 hrs, Volume= 0.204 af, Atten= 14%, Lag= 5.7 min
Routed to Link 4L : Culvert C2b

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.00 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 13.0 min

Peak Storage= 769 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 9.63'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 235.24 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 428.0' Slope= 0.0154 '/'
Inlet Invert= 825.20', Outlet Invert= 818.60'

Summary for Reach S5.2: Swale S5.2

Inflow Area = 0.424 ac, 0.00% Impervious, Inflow Depth = 2.29" for 25-yr, 24-hr event
Inflow = 1.73 cfs @ 12.10 hrs, Volume= 0.081 af
Outflow = 1.51 cfs @ 12.14 hrs, Volume= 0.081 af, Atten= 13%, Lag= 2.8 min
Routed to Link C2 : Culvert C2a

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.89 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.70 fps, Avg. Travel Time= 4.4 min

Peak Storage= 156 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.10' , Surface Width= 8.81'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 344.73 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 183.6' Slope= 0.0331 '/'
Inlet Invert= 823.91', Outlet Invert= 817.83'

Summary for Pond C8: Culvert C8

Inflow Area = 0.275 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 0.95 cfs @ 12.08 hrs, Volume= 0.043 af
Outflow = 0.96 cfs @ 12.08 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.1 min
Primary = 0.96 cfs @ 12.08 hrs, Volume= 0.043 af
Routed to Reach S4.1 : Swale S4.1

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 811.21' @ 12.08 hrs Surf.Area= 0.000 ac Storage= 0.000 af
Flood Elev= 819.00' Surf.Area= 0.000 ac Storage= 0.001 af

Plug-Flow detention time= 0.2 min calculated for 0.043 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (830.2 - 830.0)

Volume	Invert	Avail.Storage	Storage Description
#1	810.70'	0.001 af	**3.00'D x 7.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	810.70'	**12.0" Round Culvert** L= 85.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 810.70' / 808.60' S= 0.0245 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.89 cfs @ 12.08 hrs HW=811.18' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.89 cfs @ 2.37 fps)

Summary for Pond N: North Infiltration Area

Inflow Area = 18.714 ac, 0.00% Impervious, Inflow Depth = 0.75" for 25-yr, 24-hr event
Inflow = 11.60 cfs @ 12.28 hrs, Volume= 1.175 af
Outflow = 1.40 cfs @ 13.94 hrs, Volume= 1.175 af, Atten= 88%, Lag= 99.8 min
Primary = 1.40 cfs @ 13.94 hrs, Volume= 1.175 af
Routed to nonexistent node 1L

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 803.89' @ 13.94 hrs Surf.Area= 16,766 sf Storage= 20,733 cf

Plug-Flow detention time= 178.4 min calculated for 1.174 af (100% of inflow)
Center-of-Mass det. time= 178.3 min (1,059.6 - 881.2)

Volume	Invert	Avail.Storage	Storage Description
#1	802.00'	256,569 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
802.00	5,140	0	0
804.00	17,424	22,564	22,564
806.00	32,191	49,615	72,179
808.00	46,130	78,321	150,500
810.00	59,939	106,069	256,569

Device	Routing	Invert	Outlet Devices
#1	Primary	802.00'	**3.600 in/hr Exfiltration over Surface area**

Primary OutFlow Max=1.40 cfs @ 13.94 hrs HW=803.89' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.40 cfs)

Summary for Pond Sed Pond: Sedimentation Basin

Inflow Area = 72.769 ac, 2.07% Impervious, Inflow Depth = 1.55" for 25-yr, 24-hr event
Inflow = 90.06 cfs @ 12.45 hrs, Volume= 9.372 af
Outflow = 15.75 cfs @ 13.56 hrs, Volume= 9.372 af, Atten= 83%, Lag= 66.6 min
Discarded = 5.53 cfs @ 13.56 hrs, Volume= 6.223 af
Primary = 10.22 cfs @ 13.56 hrs, Volume= 3.149 af
Routed to Link Wetland : Wetland
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link Wetland : Wetland
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link Wetland : Wetland

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Peak Elev= 792.17' @ 13.56 hrs Surf.Area= 66,370 sf Storage= 175,109 cf
Flood Elev= 794.00' Surf.Area= 75,797 sf Storage= 304,443 cf

Plug-Flow detention time= 186.0 min calculated for 9.366 af (100% of inflow)
Center-of-Mass det. time= 185.9 min (1,047.5 - 861.6)

Volume	Invert	Avail.Storage	Storage Description
#1	789.00'	304,443 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
789.00	27,325	0	0
790.00	55,972	41,649	41,649
791.00	61,532	58,752	100,401
792.00	65,703	63,618	164,018
793.00	69,675	67,689	231,707
794.00	75,797	72,736	304,443

Device	Routing	Invert	Outlet Devices
#1	Primary	787.70'	**15.0" Round Culvert** L= 40.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 787.70' / 787.50' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	791.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	790.50'	**0.8" Vert. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	790.00'	**0.8" Vert. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#5	Device 1	789.00'	**0.5" Vert. Orifice/Grate X 14.00 columns** X 6 rows with 6.0" cc spacing C= 0.600 Limited to weir flow at low heads
#6	Secondary	792.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#7	Tertiary	793.00'	**158.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#8	Discarded	789.00'	**3.600 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=5.53 cfs @ 13.56 hrs HW=792.17' (Free Discharge)
└─**8=Exfiltration** (Exfiltration Controls 5.53 cfs)

Primary OutFlow Max=10.22 cfs @ 13.56 hrs HW=792.17' (Free Discharge)
└─**1=Culvert** (Inlet Controls 10.22 cfs @ 8.33 fps)
  ├─**2=Orifice/Grate** (Passes < 25.54 cfs potential flow)
  ├─**3=Orifice/Grate** (Passes < 0.09 cfs potential flow)
  ├─**4=Orifice/Grate** (Passes < 0.10 cfs potential flow)
  └─**5=Orifice/Grate** (Passes < 0.74 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=789.00' (Free Discharge)
└─**6=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=789.00' (Free Discharge)
└─**7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link 4L: Culvert C2b

Inflow Area = 0.993 ac, 0.00% Impervious, Inflow Depth = 2.46" for 25-yr, 24-hr event
Inflow = 3.50 cfs @ 12.20 hrs, Volume= 0.204 af
Primary = 3.50 cfs @ 12.20 hrs, Volume= 0.204 af, Atten= 0%, Lag= 0.0 min
Routed to Link C2 : Culvert C2a

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C1: Culvert C1

Inflow Area = 3.035 ac, 0.00% Impervious, Inflow Depth = 0.51" for 25-yr, 24-hr event
Inflow = 0.60 cfs @ 12.89 hrs, Volume= 0.128 af
Primary = 0.60 cfs @ 12.89 hrs, Volume= 0.128 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C10: Culvert C10

Inflow Area = 8.839 ac, 0.00% Impervious, Inflow Depth = 1.27" for 25-yr, 24-hr event
Inflow = 11.21 cfs @ 12.27 hrs, Volume= 0.937 af
Primary = 11.21 cfs @ 12.27 hrs, Volume= 0.937 af, Atten= 0%, Lag= 0.0 min
Routed to Pond N : North Infiltration Area

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C11: Culvert C11

Inflow Area = 9.783 ac, 0.00% Impervious, Inflow Depth = 2.18" for 25-yr, 24-hr event
Inflow = 26.46 cfs @ 12.22 hrs, Volume= 1.778 af
Primary = 26.46 cfs @ 12.22 hrs, Volume= 1.778 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.3 : Swale S1.3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C2: Culvert C2a

Inflow Area = 2.969 ac, 0.00% Impervious, Inflow Depth = 2.53" for 25-yr, 24-hr event
Inflow = 10.41 cfs @ 12.20 hrs, Volume= 0.626 af
Primary = 10.41 cfs @ 12.20 hrs, Volume= 0.626 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C3: Culvert C3

Inflow Area = 11.213 ac, 0.00% Impervious, Inflow Depth = 2.10" for 25-yr, 24-hr event
Inflow = 27.48 cfs @ 12.24 hrs, Volume= 1.960 af
Primary = 27.48 cfs @ 12.24 hrs, Volume= 1.960 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.4 : Swale S1.4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C4: Culvert C4

Inflow Area = 15.242 ac, 0.00% Impervious, Inflow Depth = 1.99" for 25-yr, 24-hr event
Inflow = 32.85 cfs @ 12.21 hrs, Volume= 2.521 af
Primary = 32.85 cfs @ 12.21 hrs, Volume= 2.521 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.5 : Swale S1.5

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C5: Culvert C5

Inflow Area = 18.333 ac, 0.00% Impervious, Inflow Depth = 1.93" for 25-yr, 24-hr event
Inflow = 38.11 cfs @ 12.27 hrs, Volume= 2.941 af
Primary = 38.11 cfs @ 12.27 hrs, Volume= 2.941 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.9 : Swale S1.9

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C6: Culvert C6

Inflow Area = 11.935 ac, 0.00% Impervious, Inflow Depth = 1.93" for 25-yr, 24-hr event
Inflow = 30.03 cfs @ 12.16 hrs, Volume= 1.918 af
Primary = 30.03 cfs @ 12.16 hrs, Volume= 1.918 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S3.5 : Swale S3.5

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C7: Culvert C7

Inflow Area = 47.325 ac, 0.00% Impervious, Inflow Depth = 1.70" for 25-yr, 24-hr event
Inflow = 68.10 cfs @ 12.41 hrs, Volume= 6.703 af
Primary = 68.10 cfs @ 12.41 hrs, Volume= 6.703 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.6 : Swale S4.6

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C9: Culvert C9

Inflow Area = 0.306 ac, 0.00% Impervious, Inflow Depth = 0.66" for 25-yr, 24-hr event
Inflow = 0.22 cfs @ 12.20 hrs, Volume= 0.017 af
Primary = 0.22 cfs @ 12.20 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.2 : Swale S1.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F10: Flume 10

Inflow Area = 0.275 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 0.95 cfs @ 12.08 hrs, Volume= 0.043 af
Primary = 0.95 cfs @ 12.08 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min
Routed to Pond C8 : Culvert C8

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F1A: Flume 1A

Inflow Area = 1.698 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 4.96 cfs @ 12.13 hrs, Volume= 0.268 af
Primary = 4.96 cfs @ 12.13 hrs, Volume= 0.268 af, Atten= 0%, Lag= 0.0 min
Routed to Link F1B : Flume 1B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F1B: Flume 1B

Inflow Area = 3.934 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 11.65 cfs @ 12.13 hrs, Volume= 0.620 af
Primary = 11.65 cfs @ 12.13 hrs, Volume= 0.620 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.3 : Swale S4.3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F2A: Flume 2A

Inflow Area = 0.636 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 1.98 cfs @ 12.11 hrs, Volume= 0.100 af
Primary = 1.98 cfs @ 12.11 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.0 min
Routed to Link F2B : Flume 2B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F2B: Flume 2B

Inflow Area = 2.199 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 6.58 cfs @ 12.12 hrs, Volume= 0.347 af
Primary = 6.58 cfs @ 12.12 hrs, Volume= 0.347 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.4 : Swale S4.4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F3: Flume 3

Inflow Area = 0.427 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 1.38 cfs @ 12.10 hrs, Volume= 0.067 af
Primary = 1.38 cfs @ 12.10 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.5 : Swale S4.5

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F4A: Flume 4A

Inflow Area = 1.209 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 3.47 cfs @ 12.14 hrs, Volume= 0.191 af
Primary = 3.47 cfs @ 12.14 hrs, Volume= 0.191 af, Atten= 0%, Lag= 0.0 min
Routed to Link F4B : Flume 4B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F4B: Flume 4B

Inflow Area = 3.092 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 9.10 cfs @ 12.13 hrs, Volume= 0.488 af
Primary = 9.10 cfs @ 12.13 hrs, Volume= 0.488 af, Atten= 0%, Lag= 0.0 min
Routed to Link C7 : Culvert C7

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F5A: Flume 5A

Inflow Area = 0.237 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 0.76 cfs @ 12.11 hrs, Volume= 0.037 af
Primary = 0.76 cfs @ 12.11 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min
Routed to Link F5B : Flume 5B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F5B: Flume 5B

Inflow Area = 0.712 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 2.23 cfs @ 12.11 hrs, Volume= 0.112 af
Primary = 2.23 cfs @ 12.11 hrs, Volume= 0.112 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S2.2 : Swale S2.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F6A: Flume 6A

Inflow Area = 1.440 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 4.38 cfs @ 12.11 hrs, Volume= 0.227 af
Primary = 4.38 cfs @ 12.11 hrs, Volume= 0.227 af, Atten= 0%, Lag= 0.0 min
Routed to Link F6B : Flume 6B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F6B: Flume 6B

Inflow Area = 3.001 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 9.20 cfs @ 12.11 hrs, Volume= 0.473 af
Primary = 9.20 cfs @ 12.11 hrs, Volume= 0.473 af, Atten= 0%, Lag= 0.0 min
Routed to Link C6 : Culvert C6

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F7A: Flume 7A

Inflow Area = 2.924 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 8.53 cfs @ 12.14 hrs, Volume= 0.461 af
Primary = 8.53 cfs @ 12.14 hrs, Volume= 0.461 af, Atten= 0%, Lag= 0.0 min
Routed to Link F7B : Flume 7B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F7B: Flume 7B

Inflow Area = 5.160 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 15.13 cfs @ 12.13 hrs, Volume= 0.814 af
Primary = 15.13 cfs @ 12.13 hrs, Volume= 0.814 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S3.2 : Swale S3.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F8A: Flume 8A

Inflow Area = 0.791 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 2.31 cfs @ 12.14 hrs, Volume= 0.125 af
Primary = 2.31 cfs @ 12.14 hrs, Volume= 0.125 af, Atten= 0%, Lag= 0.0 min
Routed to Link F8B : Flume 8B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F8B: Flume 8B

Inflow Area = 2.667 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 7.92 cfs @ 12.12 hrs, Volume= 0.421 af
Primary = 7.92 cfs @ 12.12 hrs, Volume= 0.421 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.4 : Swale S1.4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F9A: Flume 9A

Inflow Area = 3.091 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 8.97 cfs @ 12.14 hrs, Volume= 0.487 af
Primary = 8.97 cfs @ 12.14 hrs, Volume= 0.487 af, Atten= 0%, Lag= 0.0 min
Routed to Link F9B : Flume 9B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F9B: Flume 9B

Inflow Area = 6.189 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 18.15 cfs @ 12.13 hrs, Volume= 0.976 af
Primary = 18.15 cfs @ 12.13 hrs, Volume= 0.976 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.0 : Swale S1.0

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link Wetland: Wetland

Inflow Area = 72.769 ac, 2.07% Impervious, Inflow Depth = 0.52" for 25-yr, 24-hr event
Inflow = 10.22 cfs @ 13.56 hrs, Volume= 3.149 af
Primary = 10.22 cfs @ 13.56 hrs, Volume= 3.149 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentArea 1: Area 1	Runoff Area=1.141 ac 0.00% Impervious Runoff Depth=3.18" Flow Length=500' Tc=6.5 min CN=69 Runoff=5.61 cfs 0.302 af
SubcatchmentArea 10: Area 10	Runoff Area=0.791 ac 0.00% Impervious Runoff Depth=3.18" Flow Length=354' Tc=6.4 min CN=69 Runoff=3.91 cfs 0.210 af
SubcatchmentArea 11: Area 11	Runoff Area=0.885 ac 0.00% Impervious Runoff Depth=3.18" Flow Length=288' Tc=6.4 min CN=69 Runoff=4.37 cfs 0.235 af
SubcatchmentArea 12: Area 12	Runoff Area=2.206 ac 0.00% Impervious Runoff Depth=3.18" Flow Length=628' Tc=6.7 min CN=69 Runoff=10.79 cfs 0.585 af
SubcatchmentArea 13: Area 13	Runoff Area=1.610 ac 0.00% Impervious Runoff Depth=3.18" Flow Length=712' Tc=5.3 min CN=69 Runoff=8.11 cfs 0.427 af
SubcatchmentArea 14: Area 14	Runoff Area=0.626 ac 0.00% Impervious Runoff Depth=3.18" Flow Length=333' Tc=4.5 min CN=69 Runoff=3.29 cfs 0.166 af
SubcatchmentArea 15: Area 15	Runoff Area=0.620 ac 0.00% Impervious Runoff Depth=3.18" Flow Length=331' Tc=4.4 min CN=69 Runoff=3.27 cfs 0.164 af
SubcatchmentArea 16: Area 16	Runoff Area=0.943 ac 0.00% Impervious Runoff Depth=3.18" Flow Length=464' Tc=5.9 min CN=69 Runoff=4.72 cfs 0.250 af
SubcatchmentArea 17: Area 17	Runoff Area=0.571 ac 0.00% Impervious Runoff Depth=3.18" Flow Length=315' Tc=4.4 min CN=69 Runoff=3.01 cfs 0.151 af
SubcatchmentArea 18: Area 18	Runoff Area=0.990 ac 0.00% Impervious Runoff Depth=3.18" Flow Length=424' Tc=4.7 min CN=69 Runoff=5.14 cfs 0.262 af
SubcatchmentArea 19: Area 19	Runoff Area=1.179 ac 0.00% Impervious Runoff Depth=3.18" Flow Length=385' Tc=4.7 min CN=69 Runoff=6.12 cfs 0.313 af
SubcatchmentArea 2: Area 2	Runoff Area=0.557 ac 0.00% Impervious Runoff Depth=3.18" Flow Length=303' Tc=4.7 min CN=69 Runoff=2.89 cfs 0.148 af
SubcatchmentArea 20: Area 20	Runoff Area=1.057 ac 0.00% Impervious Runoff Depth=3.18" Flow Length=419' Tc=4.7 min CN=69 Runoff=5.49 cfs 0.280 af
SubcatchmentArea 21: Area 21	Runoff Area=0.434 ac 0.00% Impervious Runoff Depth=3.18" Flow Length=374' Tc=4.5 min CN=69 Runoff=2.28 cfs 0.115 af
SubcatchmentArea 22: Area 22	Runoff Area=1.442 ac 0.00% Impervious Runoff Depth=3.18" Flow Length=489' Tc=4.8 min CN=69 Runoff=7.45 cfs 0.382 af
SubcatchmentArea 23: Area 23	Runoff Area=1.252 ac 0.00% Impervious Runoff Depth=3.18" Flow Length=435' Tc=4.7 min CN=69 Runoff=6.50 cfs 0.332 af

SubcatchmentArea 24: Area 24 Runoff Area=1.846 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=701' Tc=5.4 min CN=69 Runoff=9.33 cfs 0.489 af

SubcatchmentArea 25: Area 25 Runoff Area=1.552 ac 0.00% Impervious Runoff Depth=4.10"
Flow Length=123' Slope=0.2500 '/' Tc=3.9 min CN=78 Runoff=10.67 cfs 0.531 af

SubcatchmentArea 26: Area 26 Runoff Area=0.616 ac 0.00% Impervious Runoff Depth=3.48"
Flow Length=109' Slope=0.2500 '/' Tc=3.8 min CN=72 Runoff=3.67 cfs 0.179 af

SubcatchmentArea 27: Area 27 Runoff Area=0.149 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=211' Tc=1.2 min CN=69 Runoff=0.86 cfs 0.039 af

SubcatchmentArea 28: Area 28 Runoff Area=0.126 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=59' Slope=0.2500 '/' Tc=2.5 min CN=69 Runoff=0.74 cfs 0.033 af

SubcatchmentArea 29: Area 29 Runoff Area=1.228 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=647' Tc=5.7 min CN=69 Runoff=6.17 cfs 0.325 af

SubcatchmentArea 3: Area 3 Runoff Area=0.348 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=298' Tc=4.8 min CN=69 Runoff=1.80 cfs 0.092 af

SubcatchmentArea 30: Area 30 Runoff Area=0.427 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=362' Tc=3.8 min CN=69 Runoff=2.33 cfs 0.113 af

SubcatchmentArea 31: Area 31 Runoff Area=0.223 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=296' Tc=3.7 min CN=69 Runoff=1.22 cfs 0.059 af

SubcatchmentArea 32: Area 32 Runoff Area=0.655 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=642' Tc=5.0 min CN=69 Runoff=3.35 cfs 0.174 af

SubcatchmentArea 33: Area 33 Runoff Area=0.237 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=348' Tc=4.0 min CN=69 Runoff=1.28 cfs 0.063 af

SubcatchmentArea 34: Area 34 Runoff Area=0.424 ac 0.00% Impervious Runoff Depth=3.69"
Flow Length=78' Slope=0.2500 '/' Tc=3.1 min CN=74 Runoff=2.76 cfs 0.130 af

SubcatchmentArea 35: Area 35 Runoff Area=0.993 ac 0.00% Impervious Runoff Depth=3.89"
Flow Length=126' Tc=4.4 min CN=76 Runoff=6.35 cfs 0.322 af

SubcatchmentArea 36: Area 36 Runoff Area=2.594 ac 0.00% Impervious Runoff Depth=4.75"
Flow Length=183' Tc=2.2 min CN=84 Runoff=21.62 cfs 1.027 af

SubcatchmentArea 37: Area 37 Runoff Area=0.306 ac 0.00% Impervious Runoff Depth=1.44"
Flow Length=133' Tc=4.5 min CN=50 Runoff=0.66 cfs 0.037 af

SubcatchmentArea 38: Area 38 Runoff Area=1.430 ac 0.00% Impervious Runoff Depth=2.69"
Flow Length=156' Slope=0.2500 '/' Tc=4.1 min CN=64 Runoff=6.48 cfs 0.321 af

SubcatchmentArea 39: Area 39 Runoff Area=0.742 ac 0.00% Impervious Runoff Depth=2.60"
Flow Length=145' Tc=4.3 min CN=63 Runoff=3.20 cfs 0.161 af

SubcatchmentArea 4: Area 4 Runoff Area=0.288 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=296' Tc=4.0 min CN=69 Runoff=1.55 cfs 0.076 af

SubcatchmentArea 40: Area 40 Runoff Area=0.620 ac 0.00% Impervious Runoff Depth=1.96"
Flow Length=168' Tc=9.6 min CN=56 Runoff=1.57 cfs 0.101 af

SubcatchmentArea 41: Area 41 Runoff Area=0.739 ac 0.00% Impervious Runoff Depth=1.96"
Flow Length=141' Tc=7.2 min CN=56 Runoff=2.11 cfs 0.120 af

SubcatchmentArea 42a: Area 42a Runoff Area=0.871 ac 0.00% Impervious Runoff Depth=2.79"
Flow Length=144' Slope=0.0500 '/' Tc=7.8 min CN=65 Runoff=3.58 cfs 0.202 af

SubcatchmentArea 42b: Area 42b Runoff Area=0.712 ac 0.00% Impervious Runoff Depth=3.38"
Flow Length=102' Slope=0.0500 '/' Tc=7.3 min CN=71 Runoff=3.63 cfs 0.201 af

SubcatchmentArea 43: Area 43 Runoff Area=0.769 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=139' Slope=0.0500 '/' Tc=7.7 min CN=69 Runoff=3.63 cfs 0.204 af

SubcatchmentArea 44: Area 44 Runoff Area=1.416 ac 0.00% Impervious Runoff Depth=0.63"
Flow Length=941' Slope=0.0260 '/' Tc=22.0 min CN=39 Runoff=0.43 cfs 0.074 af

SubcatchmentArea 45: Area 45 Runoff Area=2.792 ac 0.00% Impervious Runoff Depth=2.41"
Flow Length=419' Tc=14.7 min CN=61 Runoff=7.53 cfs 0.561 af

SubcatchmentArea 46: Area 46 Runoff Area=2.044 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=138' Tc=4.0 min CN=69 Runoff=11.02 cfs 0.542 af

SubcatchmentArea 47: Area 47 Runoff Area=0.457 ac 0.00% Impervious Runoff Depth=3.28"
Flow Length=122' Slope=0.2500 '/' Tc=3.9 min CN=70 Runoff=2.55 cfs 0.125 af

SubcatchmentArea 48: Area 48 Runoff Area=1.194 ac 0.00% Impervious Runoff Depth=3.58"
Flow Length=98' Slope=0.0500 '/' Tc=7.2 min CN=73 Runoff=6.45 cfs 0.357 af

SubcatchmentArea 49: Area 49 Runoff Area=0.079 ac 0.00% Impervious Runoff Depth=3.48"
Flow Length=143' Tc=5.1 min CN=72 Runoff=0.44 cfs 0.023 af

SubcatchmentArea 5: Area 5 Runoff Area=0.986 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=608' Tc=6.6 min CN=69 Runoff=4.85 cfs 0.261 af

SubcatchmentArea 50: Area 50 Runoff Area=3.726 ac 0.00% Impervious Runoff Depth=3.38"
Flow Length=391' Tc=11.1 min CN=71 Runoff=16.26 cfs 1.050 af

SubcatchmentArea 51: Area 51 Runoff Area=0.698 ac 0.00% Impervious Runoff Depth=0.63"
Flow Length=100' Slope=0.0600 '/' Tc=6.8 min CN=39 Runoff=0.32 cfs 0.036 af

SubcatchmentArea 52: Area 52 Runoff Area=0.475 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=425' Tc=4.5 min CN=69 Runoff=2.50 cfs 0.126 af

SubcatchmentArea 53: Area 53 Runoff Area=1.618 ac 0.00% Impervious Runoff Depth=2.23"
Flow Length=384' Tc=4.2 min CN=59 Runoff=5.93 cfs 0.300 af

SubcatchmentArea 54: Area 54 Runoff Area=0.826 ac 0.00% Impervious Runoff Depth=2.13"
Flow Length=126' Slope=0.2500 '/' Tc=3.9 min CN=58 Runoff=2.95 cfs 0.147 af

SubcatchmentArea 55: Area 55 Runoff Area=1.089 ac 0.00% Impervious Runoff Depth=2.13"
Flow Length=158' Tc=4.3 min CN=58 Runoff=3.79 cfs 0.194 af

SubcatchmentArea 56: Area 56 Runoff Area=1.194 ac 0.00% Impervious Runoff Depth=2.23"
Flow Length=221' Tc=4.4 min CN=59 Runoff=4.33 cfs 0.221 af

SubcatchmentArea 57: Area 57 Runoff Area=2.220 ac 0.00% Impervious Runoff Depth=1.78"
Flow Length=240' Tc=4.6 min CN=54 Runoff=6.17 cfs 0.330 af

SubcatchmentArea 58: Area 58 Runoff Area=2.476 ac 0.00% Impervious Runoff Depth=2.13"
Flow Length=263' Tc=4.7 min CN=58 Runoff=8.43 cfs 0.441 af

SubcatchmentArea 59: Area 59 Runoff Area=1.683 ac 0.00% Impervious Runoff Depth=1.70"
Flow Length=146' Slope=0.2345 '/' Tc=4.1 min CN=53 Runoff=4.54 cfs 0.238 af

SubcatchmentArea 6: Area 6 Runoff Area=0.504 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=258' Tc=3.4 min CN=69 Runoff=2.81 cfs 0.134 af

SubcatchmentArea 60: Area 60 Runoff Area=2.001 ac 0.00% Impervious Runoff Depth=0.90"
Flow Length=318' Tc=20.8 min CN=43 Runoff=1.18 cfs 0.150 af

SubcatchmentArea 61: Area 61 Runoff Area=2.177 ac 0.00% Impervious Runoff Depth=0.63"
Flow Length=149' Tc=8.2 min CN=39 Runoff=0.97 cfs 0.114 af

SubcatchmentArea 62: Area 62 Runoff Area=0.594 ac 0.00% Impervious Runoff Depth=1.44"
Flow Length=147' Slope=0.0544 '/' Tc=7.6 min CN=50 Runoff=1.14 cfs 0.071 af

SubcatchmentArea 63: Area 63 Runoff Area=1.509 ac 100.00% Impervious Runoff Depth=6.35"
Tc=0.0 min CN=98 Runoff=14.43 cfs 0.799 af

SubcatchmentArea 64: Area 64 Runoff Area=5.227 ac 0.00% Impervious Runoff Depth=0.63"
Flow Length=701' Tc=7.9 min CN=39 Runoff=2.36 cfs 0.273 af

SubcatchmentArea 65: Area 65 Runoff Area=3.035 ac 0.00% Impervious Runoff Depth=1.20"
Flow Length=886' Slope=0.0068 '/' Tc=38.9 min CN=47 Runoff=1.99 cfs 0.304 af

SubcatchmentArea 66: Area 66 Runoff Area=0.409 ac 0.00% Impervious Runoff Depth=2.23"
Flow Length=52' Slope=0.1154 '/' Tc=3.1 min CN=59 Runoff=1.60 cfs 0.076 af

SubcatchmentArea 67: Area 67 Runoff Area=0.755 ac 0.00% Impervious Runoff Depth=1.53"
Flow Length=86' Slope=0.2326 '/' Tc=3.5 min CN=51 Runoff=1.86 cfs 0.096 af

SubcatchmentArea 68: Area 68 Runoff Area=1.671 ac 0.00% Impervious Runoff Depth=1.53"
Flow Length=126' Tc=4.0 min CN=51 Runoff=3.98 cfs 0.213 af

SubcatchmentArea 69: Area 69 Runoff Area=9.875 ac 0.00% Impervious Runoff Depth=0.83"
Flow Length=1,337' Tc=16.6 min CN=42 Runoff=5.65 cfs 0.684 af

SubcatchmentArea 7: Area 7 Runoff Area=0.936 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=541' Tc=5.3 min CN=69 Runoff=4.72 cfs 0.248 af

SubcatchmentArea 70: Area 70 Runoff Area=0.694 ac 0.00% Impervious Runoff Depth=2.89"
Flow Length=127' Slope=0.2500 '/' Tc=3.9 min CN=66 Runoff=3.41 cfs 0.167 af

SubcatchmentArea 8: Area 8 Runoff Area=2.114 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=371' Tc=6.6 min CN=69 Runoff=10.41 cfs 0.560 af

SubcatchmentArea 9: Area 9 Runoff Area=0.810 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=292' Tc=6.3 min CN=69 Runoff=4.01 cfs 0.215 af

Reach 53R: Culvert C1 Avg. Flow Depth=0.00' Max Vel=0.00 fps
24.0" Round Pipe n=0.012 L=51.9' S=0.0222 '/' Capacity=36.48 cfs Outflow=0.00 cfs 0.000 af

Reach RD1: Roadside Ditch 1 Avg. Flow Depth=0.19' Max Vel=2.00 fps Inflow=1.99 cfs 0.304 af
n=0.030 L=440.6' S=0.0188 '/' Capacity=47.16 cfs Outflow=1.96 cfs 0.304 af

Reach RD2: Roadside Ditch 2 Avg. Flow Depth=0.51' Max Vel=3.14 fps Inflow=18.53 cfs 1.460 af
n=0.030 L=433.0' S=0.0162 '/' Capacity=72.77 cfs Outflow=17.64 cfs 1.460 af

Reach RD3: Roadside Ditch 3 Avg. Flow Depth=0.74' Max Vel=4.23 fps Inflow=10.67 cfs 0.531 af
n=0.030 L=821.0' S=0.0288 '/' Capacity=20.76 cfs Outflow=9.18 cfs 0.531 af

Reach RD4: Roadside Ditch 4 Avg. Flow Depth=0.24' Max Vel=1.52 fps Inflow=3.98 cfs 0.213 af
n=0.030 L=495.6' S=0.0090 '/' Capacity=54.26 cfs Outflow=2.99 cfs 0.213 af

Reach RD5: Roadside Ditch 5 Avg. Flow Depth=0.46' Max Vel=4.14 fps Inflow=3.67 cfs 0.179 af
n=0.030 L=288.0' S=0.0531 '/' Capacity=28.18 cfs Outflow=3.30 cfs 0.179 af

Reach S1.0: Swale S1.0 Avg. Flow Depth=1.21' Max Vel=2.81 fps Inflow=49.33 cfs 2.668 af
n=0.030 L=551.3' S=0.0039 '/' Capacity=118.85 cfs Outflow=43.23 cfs 2.668 af

Reach S1.1: Swale S1.1 Avg. Flow Depth=0.06' Max Vel=1.42 fps Inflow=0.66 cfs 0.037 af
n=0.030 L=98.0' S=0.0396 '/' Capacity=376.93 cfs Outflow=0.61 cfs 0.037 af

Reach S1.2: Swale S1.2 Avg. Flow Depth=0.76' Max Vel=5.41 fps Inflow=45.42 cfs 2.871 af
n=0.030 L=170.0' S=0.0242 '/' Capacity=294.55 cfs Outflow=44.63 cfs 2.871 af

Reach S1.3: Swale S1.3 Avg. Flow Depth=0.74' Max Vel=5.86 fps Inflow=47.67 cfs 3.192 af
n=0.030 L=212.6' S=0.0293 '/' Capacity=324.28 cfs Outflow=46.84 cfs 3.192 af

Reach S1.4: Swale S1.4 Avg. Flow Depth=1.00' Max Vel=4.85 fps Inflow=58.99 cfs 4.161 af
n=0.030 L=72.2' S=0.0144 '/' Capacity=227.36 cfs Outflow=58.04 cfs 4.161 af

Reach S1.5: Swale S1.5 Avg. Flow Depth=1.38' Max Vel=3.22 fps Inflow=59.91 cfs 4.281 af
n=0.030 L=148.0' S=0.0045 '/' Capacity=126.50 cfs Outflow=59.49 cfs 4.281 af

Reach S1.6: Swale S1.6 Avg. Flow Depth=0.27' Max Vel=1.35 fps Inflow=3.63 cfs 0.204 af
n=0.030 L=179.7' S=0.0050 '/' Capacity=134.06 cfs Outflow=3.33 cfs 0.204 af

Reach S1.7: Swale S1.7 Avg. Flow Depth=1.41' Max Vel=3.58 fps Inflow=69.04 cfs 4.888 af
n=0.030 L=252.0' S=0.0054 '/' Capacity=139.68 cfs Outflow=67.28 cfs 4.888 af

Reach S1.8: Swale S1.8 Avg. Flow Depth=0.41' Max Vel=2.20 fps Inflow=3.63 cfs 0.201 af
n=0.030 L=245.8' S=0.0099 '/' Capacity=90.14 cfs Outflow=3.32 cfs 0.201 af

Reach S1.9: Swale S1.9 Avg. Flow Depth=1.35' Max Vel=4.11 fps Inflow=74.80 cfs 5.449 af
n=0.030 L=422.0' S=0.0075 '/' Capacity=163.67 cfs Outflow=72.74 cfs 5.449 af

Reach S2.1: Swale S2.1 Avg. Flow Depth=1.75' Max Vel=3.74 fps Inflow=73.27 cfs 5.559 af
n=0.030 L=389.0' S=0.0054 '/' Capacity=97.05 cfs Outflow=71.33 cfs 5.559 af

Reach S2.2: Swale S2.2 Avg. Flow Depth=1.78' Max Vel=3.97 fps Inflow=121.32 cfs 10.154 af
n=0.030 L=411.0' S=0.0049 '/' Capacity=152.61 cfs Outflow=119.32 cfs 10.154 af

Reach S2.3: Swale S2.3 Avg. Flow Depth=1.38' Max Vel=5.67 fps Inflow=121.74 cfs 10.568 af
n=0.030 L=307.0' S=0.0130 '/' Capacity=249.72 cfs Outflow=120.67 cfs 10.568 af

Reach S3.1: Swale S3.1 Avg. Flow Depth=0.50' Max Vel=1.94 fps Inflow=11.02 cfs 0.542 af
n=0.030 L=357.0' S=0.0050 '/' Capacity=133.76 cfs Outflow=9.75 cfs 0.542 af

Reach S3.2: Swale S3.2 Avg. Flow Depth=1.02' Max Vel=2.89 fps Inflow=35.67 cfs 2.034 af
n=0.030 L=34.0' S=0.0050 '/' Capacity=133.95 cfs Outflow=35.48 cfs 2.034 af

Reach S3.3: Swale S3.3 Avg. Flow Depth=0.78' Max Vel=4.03 fps Inflow=35.48 cfs 2.034 af
n=0.030 L=200.0' S=0.0130 '/' Capacity=215.99 cfs Outflow=33.84 cfs 2.034 af

Reach S3.4: Swale S3.4 Avg. Flow Depth=0.61' Max Vel=2.29 fps Inflow=6.45 cfs 0.357 af
n=0.030 L=283.0' S=0.0071 '/' Capacity=76.21 cfs Outflow=5.88 cfs 0.357 af

Reach S3.5: Swale S3.5 Avg. Flow Depth=1.68' Max Vel=2.64 fps Inflow=67.72 cfs 4.259 af
n=0.030 L=318.5' S=0.0024 '/' Capacity=93.14 cfs Outflow=63.93 cfs 4.259 af

Reach S4.1: Swale S4.1 Avg. Flow Depth=0.22' Max Vel=2.07 fps Inflow=5.28 cfs 0.267 af
n=0.030 L=240.0' S=0.0153 '/' Capacity=70.22 cfs Outflow=4.68 cfs 0.267 af

Reach S4.2: Swale S4.2 Avg. Flow Depth=0.38' Max Vel=2.70 fps Inflow=11.92 cfs 0.667 af
n=0.030 L=259.3' S=0.0127 '/' Capacity=63.88 cfs Outflow=11.06 cfs 0.667 af

Reach S4.3: Swale S4.3 Avg. Flow Depth=1.07' Max Vel=2.24 fps Inflow=35.42 cfs 2.039 af
n=0.030 L=362.9' S=0.0027 '/' Capacity=108.12 cfs Outflow=32.72 cfs 2.039 af

Reach S4.4: Swale S4.4 Avg. Flow Depth=1.10' Max Vel=2.81 fps Inflow=44.75 cfs 3.062 af
n=0.030 L=495.6' S=0.0040 '/' Capacity=132.85 cfs Outflow=42.89 cfs 3.062 af

Reach S4.5: Swale S4.5 Avg. Flow Depth=0.88' Max Vel=3.85 fps Inflow=45.33 cfs 3.413 af
n=0.030 L=411.1' S=0.0097 '/' Capacity=465.89 cfs Outflow=44.02 cfs 3.413 af

Reach S4.6: Swale S4.6 Avg. Flow Depth=1.73' Max Vel=6.01 fps Inflow=168.51 cfs 14.952 af
n=0.030 L=537.0' S=0.0112 '/' Capacity=499.25 cfs Outflow=165.78 cfs 14.952 af

Reach S5.1: Swale S5.1 Avg. Flow Depth=0.27' Max Vel=2.36 fps Inflow=6.35 cfs 0.322 af
n=0.030 L=428.0' S=0.0154 '/' Capacity=235.24 cfs Outflow=5.76 cfs 0.322 af

Reach S5.2: Swale S5.2 Avg. Flow Depth=0.13' Max Vel=2.27 fps Inflow=2.76 cfs 0.130 af
n=0.030 L=183.6' S=0.0331 '/' Capacity=344.73 cfs Outflow=2.42 cfs 0.130 af

Pond C8: Culvert C8 Peak Elev=811.38' Storage=0.000 af Inflow=1.60 cfs 0.073 af
12.0" Round Culvert n=0.012 L=85.6' S=0.0245 '/' Outflow=1.60 cfs 0.073 af

Pond N: North Infiltration Area Peak Elev=805.24' Storage=49,884 cf Inflow=25.48 cfs 2.356 af
Outflow=2.22 cfs 2.356 af

Pond Sed Pond: Sedimentation Basin Peak Elev=793.23' Storage=247,875 cf Inflow=169.90 cfs 16.095 af
2 af Primary=11.55 cfs 5.267 af Secondary=33.59 cfs 2.497 af Tertiary=43.71 cfs 1.010 af Outflow=94.78 cfs 16.095 af

Link 4L: Culvert C2b Inflow=5.76 cfs 0.322 af
Primary=5.76 cfs 0.322 af

Link C1: Culvert C1 Inflow=1.96 cfs 0.304 af
Primary=1.96 cfs 0.304 af

Link C10: Culvert C10 Inflow=20.55 cfs 1.672 af
Primary=20.55 cfs 1.672 af

Link C11: Culvert C11 Inflow=44.63 cfs 2.871 af
Primary=44.63 cfs 2.871 af

Link C2: Culvert C2a Inflow=16.75 cfs 0.983 af
Primary=16.75 cfs 0.983 af

Link C3: Culvert C3 Inflow=46.84 cfs 3.192 af
Primary=46.84 cfs 3.192 af

Link C4: Culvert C4 Inflow=58.04 cfs 4.161 af
Primary=58.04 cfs 4.161 af

Link C5: Culvert C5 Inflow=67.28 cfs 4.888 af
Primary=67.28 cfs 4.888 af

Link C6: Culvert C6 Inflow=52.51 cfs 3.209 af
Primary=52.51 cfs 3.209 af

Link C7: Culvert C7 Inflow=124.99 cfs 11.388 af
Primary=124.99 cfs 11.388 af

Link C9: Culvert C9 Inflow=0.61 cfs 0.037 af
Primary=0.61 cfs 0.037 af

Link F10: Flume 10 Inflow=1.60 cfs 0.073 af
Primary=1.60 cfs 0.073 af

Link F1A: Flume 1A	Inflow=8.37 cfs 0.450 af Primary=8.37 cfs 0.450 af
Link F1B: Flume 1B	Inflow=19.59 cfs 1.043 af Primary=19.59 cfs 1.043 af
Link F2A: Flume 2A	Inflow=3.34 cfs 0.169 af Primary=3.34 cfs 0.169 af
Link F2B: Flume 2B	Inflow=11.13 cfs 0.583 af Primary=11.13 cfs 0.583 af
Link F3: Flume 3	Inflow=2.33 cfs 0.113 af Primary=2.33 cfs 0.113 af
Link F4A: Flume 4A	Inflow=5.87 cfs 0.320 af Primary=5.87 cfs 0.320 af
Link F4B: Flume 4B	Inflow=15.35 cfs 0.820 af Primary=15.35 cfs 0.820 af
Link F5A: Flume 5A	Inflow=1.28 cfs 0.063 af Primary=1.28 cfs 0.063 af
Link F5B: Flume 5B	Inflow=3.77 cfs 0.189 af Primary=3.77 cfs 0.189 af
Link F6A: Flume 6A	Inflow=7.42 cfs 0.382 af Primary=7.42 cfs 0.382 af
Link F6B: Flume 6B	Inflow=15.57 cfs 0.795 af Primary=15.57 cfs 0.795 af
Link F7A: Flume 7A	Inflow=14.41 cfs 0.775 af Primary=14.41 cfs 0.775 af
Link F7B: Flume 7B	Inflow=25.54 cfs 1.368 af Primary=25.54 cfs 1.368 af
Link F8A: Flume 8A	Inflow=3.91 cfs 0.210 af Primary=3.91 cfs 0.210 af
Link F8B: Flume 8B	Inflow=13.41 cfs 0.707 af Primary=13.41 cfs 0.707 af
Link F9A: Flume 9A	Inflow=15.16 cfs 0.819 af Primary=15.16 cfs 0.819 af
Link F9B: Flume 9B	Inflow=30.63 cfs 1.640 af Primary=30.63 cfs 1.640 af

Link Wetland: Wetland

Inflow=88.85 cfs 8.773 af
Primary=88.85 cfs 8.773 af

Summary for Subcatchment Area 1: Area 1

Runoff = 5.61 cfs @ 12.14 hrs, Volume= 0.302 af, Depth= 3.18"
Routed to Link F1A : Flume 1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.141	69	Pasture/grassland/range, Fair, HSG B
1.141		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	60	0.1000	0.27		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.8	40	0.2500	0.36		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	16	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	384	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.5	500	Total			

Summary for Subcatchment Area 10: Area 10

Runoff = 3.91 cfs @ 12.14 hrs, Volume= 0.210 af, Depth= 3.18"
Routed to Link F8A : Flume 8A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.791	69	Pasture/grassland/range, Fair, HSG B
0.791		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	71	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.4	29	0.2500	0.34		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	88	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	166	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.4	354	Total			

Summary for Subcatchment Area 11: Area 11

Runoff = 4.37 cfs @ 12.14 hrs, Volume= 0.235 af, Depth= 3.18"
Routed to Link F9A : Flume 9A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.885	69	Pasture/grassland/range, Fair, HSG B
0.885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	71	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.4	29	0.2500	0.34		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	119	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	69	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.4	288	Total			

Summary for Subcatchment Area 12: Area 12

Runoff = 10.79 cfs @ 12.14 hrs, Volume= 0.585 af, Depth= 3.18"
Routed to Link F9A : Flume 9A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
2.206	69	Pasture/grassland/range, Fair, HSG B
2.206		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	40	0.1000	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.5	60	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	56	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.2	472	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.7	628	Total			

Summary for Subcatchment Area 13: Area 13

Runoff = 8.11 cfs @ 12.12 hrs, Volume= 0.427 af, Depth= 3.18"
Routed to Link F1B : Flume 1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.610	69	Pasture/grassland/range, Fair, HSG B
1.610		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	31	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	581	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.3	712	Total			

Summary for Subcatchment Area 14: Area 14

Runoff = 3.29 cfs @ 12.11 hrs, Volume= 0.166 af, Depth= 3.18"
Routed to Link F1B : Flume 1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.626	69	Pasture/grassland/range, Fair, HSG B
0.626		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	183	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	333	Total			

Summary for Subcatchment Area 15: Area 15

Runoff = 3.27 cfs @ 12.11 hrs, Volume= 0.164 af, Depth= 3.18"
Routed to Link F2B : Flume 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.620	69	Pasture/grassland/range, Fair, HSG B
0.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	181	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.4	331	Total			

Summary for Subcatchment Area 16: Area 16

Runoff = 4.72 cfs @ 12.13 hrs, Volume= 0.250 af, Depth= 3.18"
Routed to Link F2B : Flume 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.943	69	Pasture/grassland/range, Fair, HSG B
0.943		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1500	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	95	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	269	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.9	464	Total			

Summary for Subcatchment Area 17: Area 17

Runoff = 3.01 cfs @ 12.11 hrs, Volume= 0.151 af, Depth= 3.18"
Routed to Link F6B : Flume 6B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.571	69	Pasture/grassland/range, Fair, HSG B
0.571		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	44	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	171	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.4	315	Total			

Summary for Subcatchment Area 18: Area 18

Runoff = 5.14 cfs @ 12.11 hrs, Volume= 0.262 af, Depth= 3.18"
Routed to Link F6B : Flume 6B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.990	69	Pasture/grassland/range, Fair, HSG B
0.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	278	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	424	Total			

Summary for Subcatchment Area 19: Area 19

Runoff = 6.12 cfs @ 12.11 hrs, Volume= 0.313 af, Depth= 3.18"
Routed to Link F7B : Flume 7B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.179	69	Pasture/grassland/range, Fair, HSG B
1.179		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	60	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	225	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	385	Total			

Summary for Subcatchment Area 2: Area 2

Runoff = 2.89 cfs @ 12.11 hrs, Volume= 0.148 af, Depth= 3.18"
Routed to Link F1A : Flume 1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.557	69	Pasture/grassland/range, Fair, HSG B
0.557		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	100	0.1950	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	181	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	303	Total			

Summary for Subcatchment Area 20: Area 20

Runoff = 5.49 cfs @ 12.11 hrs, Volume= 0.280 af, Depth= 3.18"
Routed to Link F7B : Flume 7B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.057	69	Pasture/grassland/range, Fair, HSG B
1.057		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	57	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	262	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	419	Total			

Summary for Subcatchment Area 21: Area 21

Runoff = 2.28 cfs @ 12.11 hrs, Volume= 0.115 af, Depth= 3.18"
Routed to Link F8B : Flume 8B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.434	69	Pasture/grassland/range, Fair, HSG B
0.434		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	15	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	259	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	374	Total			

Summary for Subcatchment Area 22: Area 22

Runoff = 7.45 cfs @ 12.12 hrs, Volume= 0.382 af, Depth= 3.18"
Routed to Link F8B : Flume 8B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.442	69	Pasture/grassland/range, Fair, HSG B
1.442		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	49	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	340	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.8	489	Total			

Summary for Subcatchment Area 23: Area 23

Runoff = 6.50 cfs @ 12.11 hrs, Volume= 0.332 af, Depth= 3.18"
Routed to Link F9B : Flume 9B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.252	69	Pasture/grassland/range, Fair, HSG B
1.252		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	285	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	435	Total			

Summary for Subcatchment Area 24: Area 24

Runoff = 9.33 cfs @ 12.13 hrs, Volume= 0.489 af, Depth= 3.18"
Routed to Link F9B : Flume 9B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.846	69	Pasture/grassland/range, Fair, HSG B
1.846		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	43	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	558	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.4	701	Total			

Summary for Subcatchment Area 25: Area 25

Runoff = 10.67 cfs @ 12.10 hrs, Volume= 0.531 af, Depth= 4.10"
Routed to Reach RD3 : Roadside Ditch 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.024	69	Pasture/grassland/range, Fair, HSG B
0.528	96	Gravel surface, HSG A
1.552	78	Weighted Average
1.552		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	23	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	123	Total			

Summary for Subcatchment Area 26: Area 26

Runoff = 3.67 cfs @ 12.10 hrs, Volume= 0.179 af, Depth= 3.48"
Routed to Reach RD5 : Roadside Ditch 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.543	69	Pasture/grassland/range, Fair, HSG B
0.073	96	Gravel surface, HSG A
0.616	72	Weighted Average
0.616		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	9	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.8	109	Total			

Summary for Subcatchment Area 27: Area 27

Runoff = 0.86 cfs @ 12.07 hrs, Volume= 0.039 af, Depth= 3.18"
Routed to Link F10 : Flume 10

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.149	69	Pasture/grassland/range, Fair, HSG B
0.149		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	12	0.2500	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	199	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
1.2	211	Total			

Summary for Subcatchment Area 28: Area 28

Runoff = 0.74 cfs @ 12.09 hrs, Volume= 0.033 af, Depth= 3.18"
Routed to Link F10 : Flume 10

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.126	69	Pasture/grassland/range, Fair, HSG B
0.126		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	59	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 29: Area 29

Runoff = 6.17 cfs @ 12.13 hrs, Volume= 0.325 af, Depth= 3.18"
Routed to Link F4B : Flume 4B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.228	69	Pasture/grassland/range, Fair, HSG B
1.228		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	6	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	541	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
5.7	647	Total			

Summary for Subcatchment Area 3: Area 3

Runoff = 1.80 cfs @ 12.12 hrs, Volume= 0.092 af, Depth= 3.18"
Routed to Link F2A : Flume 2A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.348	69	Pasture/grassland/range, Fair, HSG B
0.348		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	100	0.1950	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	36	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	162	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.8	298	Total			

Summary for Subcatchment Area 30: Area 30

Runoff = 2.33 cfs @ 12.10 hrs, Volume= 0.113 af, Depth= 3.18"
Routed to Link F3 : Flume 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.427	69	Pasture/grassland/range, Fair, HSG B
0.427		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	70	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	227	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	65	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
3.8	362	Total			

Summary for Subcatchment Area 31: Area 31

Runoff = 1.22 cfs @ 12.10 hrs, Volume= 0.059 af, Depth= 3.18"
Routed to Link F4A : Flume 4A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.223	69	Pasture/grassland/range, Fair, HSG B
0.223		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	77	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	157	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	62	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
3.7	296	Total			

Summary for Subcatchment Area 32: Area 32

Runoff = 3.35 cfs @ 12.12 hrs, Volume= 0.174 af, Depth= 3.18"
Routed to Link F4B : Flume 4B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.655	69	Pasture/grassland/range, Fair, HSG B
0.655		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	11	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	314	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
0.3	217	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
5.0	642	Total			

Summary for Subcatchment Area 33: Area 33

Runoff = 1.28 cfs @ 12.10 hrs, Volume= 0.063 af, Depth= 3.18"
Routed to Link F5A : Flume 5A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.237	69	Pasture/grassland/range, Fair, HSG B
0.237		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	83	0.2500	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	138	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.2	127	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
4.0	348	Total			

Summary for Subcatchment Area 34: Area 34

Runoff = 2.76 cfs @ 12.09 hrs, Volume= 0.130 af, Depth= 3.69"
Routed to Reach S5.2 : Swale S5.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.346	69	Pasture/grassland/range, Fair, HSG B
0.078	96	Gravel surface, HSG A
0.424	74	Weighted Average
0.424		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	78	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 35: Area 35

Runoff = 6.35 cfs @ 12.11 hrs, Volume= 0.322 af, Depth= 3.89"
Routed to Reach S5.1 : Swale S5.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.745	69	Pasture/grassland/range, Fair, HSG B
0.248	96	Gravel surface, HSG A
0.993	76	Weighted Average
0.993		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	70	0.1736	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.9	30	0.0050	0.58		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.1	12	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	14	0.1766	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	126	Total			

Summary for Subcatchment Area 36: Area 36

Runoff = 21.62 cfs @ 12.08 hrs, Volume= 1.027 af, Depth= 4.75"
Routed to Reach S1.0 : Swale S1.0

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.120	69	Pasture/grassland/range, Fair, HSG B
1.474	96	Gravel surface, HSG A
2.594	84	Weighted Average
2.594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0140	1.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.2	32	0.0140	2.40		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	40	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.0	11	0.5000	4.95		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	183	Total			

Summary for Subcatchment Area 37: Area 37

Runoff = 0.66 cfs @ 12.12 hrs, Volume= 0.037 af, Depth= 1.44"
Routed to Reach S1.1 : Swale S1.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.249	39	Pasture/grassland/range, Good, HSG A
0.057	96	Gravel surface, HSG A
0.306	50	Weighted Average
0.306		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	72	0.1736	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	28	0.0050	0.57		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.2	19	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	14	0.1766	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	133	Total			

Summary for Subcatchment Area 38: Area 38

Runoff = 6.48 cfs @ 12.11 hrs, Volume= 0.321 af, Depth= 2.69"
Routed to Reach S1.3 : Swale S1.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.395	39	Pasture/grassland/range, Good, HSG A
0.886	69	Pasture/grassland/range, Fair, HSG B
0.149	96	Gravel surface, HSG A
1.430	64	Weighted Average
1.430		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	56	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	156	Total			

Summary for Subcatchment Area 39: Area 39

Runoff = 3.20 cfs @ 12.11 hrs, Volume= 0.161 af, Depth= 2.60"
Routed to Reach S1.4 : Swale S1.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.225	39	Pasture/grassland/range, Good, HSG A
0.436	69	Pasture/grassland/range, Fair, HSG B
0.081	96	Gravel surface, HSG A
0.742	63	Weighted Average
0.742		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	23	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	22	0.0833	2.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.3	145	Total			

Summary for Subcatchment Area 4: Area 4

Runoff = 1.55 cfs @ 12.10 hrs, Volume= 0.076 af, Depth= 3.18"
Routed to Link F2A : Flume 2A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.288	69	Pasture/grassland/range, Fair, HSG B
0.288		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	49	0.0820	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	247	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.0	296	Total			

Summary for Subcatchment Area 40: Area 40

Runoff = 1.57 cfs @ 12.18 hrs, Volume= 0.101 af, Depth= 1.96"
Routed to Reach S1.4 : Swale S1.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.317	39	Pasture/grassland/range, Good, HSG A
0.243	69	Pasture/grassland/range, Fair, HSG B
0.060	96	Gravel surface, HSG A
0.620	56	Weighted Average
0.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	81	0.0245	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.0	19	0.2500	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	29	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	20	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	19	0.1053	2.27		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	168	Total			

Summary for Subcatchment Area 41: Area 41

Runoff = 2.11 cfs @ 12.15 hrs, Volume= 0.120 af, Depth= 1.96"
Routed to Reach S1.5 : Swale S1.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.389	39	Pasture/grassland/range, Good, HSG A
0.270	69	Pasture/grassland/range, Fair, HSG B
0.080	96	Gravel surface, HSG A
0.739	56	Weighted Average
0.739		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	49	0.0408	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.1	47	0.2500	0.37		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	4	0.0050	0.39		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.2	19	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	22	0.1136	2.36		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.2	141	Total			

Summary for Subcatchment Area 42a: Area 42a

Runoff = 3.58 cfs @ 12.15 hrs, Volume= 0.202 af, Depth= 2.79"
Routed to Reach S1.7 : Swale S1.7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.249	39	Pasture/grassland/range, Good, HSG A
0.489	69	Pasture/grassland/range, Fair, HSG B
0.133	96	Gravel surface, HSG A
0.871	65	Weighted Average
0.871		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	44	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.8	144	Total			

Summary for Subcatchment Area 42b: Area 42b

Runoff = 3.63 cfs @ 12.15 hrs, Volume= 0.201 af, Depth= 3.38"
Routed to Reach S1.8 : Swale S1.8

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.655	69	Pasture/grassland/range, Fair, HSG B
0.057	96	Gravel surface, HSG A
0.712	71	Weighted Average
0.712		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	2	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.3	102	Total			

Summary for Subcatchment Area 43: Area 43

Runoff = 3.63 cfs @ 12.15 hrs, Volume= 0.204 af, Depth= 3.18"
Routed to Reach S1.6 : Swale S1.6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.769	69	Pasture/grassland/range, Fair, HSG B
0.769		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	39	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.7	139	Total			

Summary for Subcatchment Area 44: Area 44

Runoff = 0.43 cfs @ 12.47 hrs, Volume= 0.074 af, Depth= 0.63"
Routed to Reach S2.1 : Swale S2.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.416	39	Pasture/grassland/range, Good, HSG A
1.416		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0260	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.9	194	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	647	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.0	941	Total			

Summary for Subcatchment Area 45: Area 45

Runoff = 7.53 cfs @ 12.24 hrs, Volume= 0.561 af, Depth= 2.41"
Routed to Reach S1.9 : Swale S1.9

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.797	39	Pasture/grassland/range, Good, HSG A
1.938	69	Pasture/grassland/range, Fair, HSG B
0.057	96	Gravel surface, HSG A
2.792	61	Weighted Average
2.792		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.3	119	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	22	0.1905	3.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.0	178	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.7	419	Total			

Summary for Subcatchment Area 46: Area 46

Runoff = 11.02 cfs @ 12.10 hrs, Volume= 0.542 af, Depth= 3.18"
Routed to Reach S3.1 : Swale S3.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
2.044	69	Pasture/grassland/range, Fair, HSG B
2.044		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	38	0.2632	3.59		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.0	138	Total			

Summary for Subcatchment Area 47: Area 47

Runoff = 2.55 cfs @ 12.10 hrs, Volume= 0.125 af, Depth= 3.28"
Routed to Reach S3.2 : Swale S3.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.435	69	Pasture/grassland/range, Fair, HSG B
0.022	96	Gravel surface, HSG A
0.457	70	Weighted Average
0.457		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	122	Total			

Summary for Subcatchment Area 48: Area 48

Runoff = 6.45 cfs @ 12.15 hrs, Volume= 0.357 af, Depth= 3.58"
Routed to Reach S3.4 : Swale S3.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.031	69	Pasture/grassland/range, Fair, HSG B
0.163	96	Gravel surface, HSG A
1.194	73	Weighted Average
1.194		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	98	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 49: Area 49

Runoff = 0.44 cfs @ 12.12 hrs, Volume= 0.023 af, Depth= 3.48"
Routed to Link C6 : Culvert C6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.070	69	Pasture/grassland/range, Fair, HSG B
0.009	96	Gravel surface, HSG A
0.079	72	Weighted Average
0.079		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	90	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.2	10	0.0500	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	10	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	18	0.1390	2.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.1	143	Total			

Summary for Subcatchment Area 5: Area 5

Runoff = 4.85 cfs @ 12.14 hrs, Volume= 0.261 af, Depth= 3.18"
Routed to Link F4A : Flume 4A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.986	69	Pasture/grassland/range, Fair, HSG B
0.986		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	31	0.1000	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.8	69	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	9	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	419	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	80	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
6.6	608	Total			

Summary for Subcatchment Area 50: Area 50

Runoff = 16.26 cfs @ 12.19 hrs, Volume= 1.050 af, Depth= 3.38"
Routed to Reach S3.5 : Swale S3.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
3.470	69	Pasture/grassland/range, Fair, HSG B
0.256	96	Gravel surface, HSG A
3.726	71	Weighted Average
3.726		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.9	83	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.9	208	0.0289	1.19		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	391	Total			

Summary for Subcatchment Area 51: Area 51

Runoff = 0.32 cfs @ 12.19 hrs, Volume= 0.036 af, Depth= 0.63"
Routed to Reach S2.1 : Swale S2.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.698	39	Pasture/grassland/range, Good, HSG A
0.698		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0600	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 52: Area 52

Runoff = 2.50 cfs @ 12.11 hrs, Volume= 0.126 af, Depth= 3.18"
Routed to Link F5B : Flume 5B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.475	69	Pasture/grassland/range, Fair, HSG B
0.475		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	90	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	219	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.2	116	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
4.5	425	Total			

Summary for Subcatchment Area 53: Area 53

Runoff = 5.93 cfs @ 12.11 hrs, Volume= 0.300 af, Depth= 2.23"
Routed to Reach S2.3 : Swale S2.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.079	69	Pasture/grassland/range, Fair, HSG B
0.539	39	Pasture/grassland/range, Good, HSG A
1.618	59	Weighted Average
1.618		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	77	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	237	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.3	70	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.2	384	Total			

Summary for Subcatchment Area 54: Area 54

Runoff = 2.95 cfs @ 12.11 hrs, Volume= 0.147 af, Depth= 2.13"
Routed to Reach S2.2 : Swale S2.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.520	69	Pasture/grassland/range, Fair, HSG B
0.306	39	Pasture/grassland/range, Good, HSG A
0.826	58	Weighted Average
0.826		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	26	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	126	Total			

Summary for Subcatchment Area 55: Area 55

Runoff = 3.79 cfs @ 12.11 hrs, Volume= 0.194 af, Depth= 2.13"
Routed to Reach S4.1 : Swale S4.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.526	39	Pasture/grassland/range, Good, HSG A
0.405	69	Pasture/grassland/range, Fair, HSG B
0.158	96	Gravel surface, HSG A
1.089	58	Weighted Average
1.089		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	80	0.2000	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	20	0.0500	1.34		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.1	10	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	48	0.0625	1.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.3	158	Total			

Summary for Subcatchment Area 56: Area 56

Runoff = 4.33 cfs @ 12.11 hrs, Volume= 0.221 af, Depth= 2.23"
Routed to Reach S4.2 : Swale S4.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.580	39	Pasture/grassland/range, Good, HSG A
0.433	69	Pasture/grassland/range, Fair, HSG B
0.181	96	Gravel surface, HSG B
1.194	59	Weighted Average
1.194		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	121	0.2314	3.37		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	221	Total			

Summary for Subcatchment Area 57: Area 57

Runoff = 6.17 cfs @ 12.12 hrs, Volume= 0.330 af, Depth= 1.78"
Routed to Reach S4.3 : Swale S4.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.134	39	Pasture/grassland/range, Good, HSG A
1.086	69	Pasture/grassland/range, Fair, HSG B
2.220	54	Weighted Average
2.220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	140	0.1857	3.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.6	240	Total			

Summary for Subcatchment Area 58: Area 58

Runoff = 8.43 cfs @ 12.12 hrs, Volume= 0.441 af, Depth= 2.13"
Routed to Reach S4.4 : Swale S4.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.939	39	Pasture/grassland/range, Good, HSG A
1.537	69	Pasture/grassland/range, Fair, HSG B
2.476	58	Weighted Average
2.476		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.9	163	0.1718	2.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	263	Total			

Summary for Subcatchment Area 59: Area 59

Runoff = 4.54 cfs @ 12.11 hrs, Volume= 0.238 af, Depth= 1.70"
Routed to Reach S4.5 : Swale S4.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.898	39	Pasture/grassland/range, Good, HSG A
0.785	69	Pasture/grassland/range, Fair, HSG B
1.683	53	Weighted Average
1.683		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	100	0.2345	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2345	3.39		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	146	Total			

Summary for Subcatchment Area 6: Area 6

Runoff = 2.81 cfs @ 12.10 hrs, Volume= 0.134 af, Depth= 3.18"
Routed to Link F6A : Flume 6A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.504	69	Pasture/grassland/range, Fair, HSG B
0.504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	72	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	186	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
3.4	258	Total			

Summary for Subcatchment Area 60: Area 60

Runoff = 1.18 cfs @ 12.39 hrs, Volume= 0.150 af, Depth= 0.90"
Routed to Reach S4.6 : Swale S4.6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.871	39	Pasture/grassland/range, Good, HSG A
0.000	96	Gravel surface, HSG A
0.130	96	Gravel surface, HSG A
2.001	43	Weighted Average
2.001		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0074	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
4.7	169	0.0074	0.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	49	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.8	318	Total			

Summary for Subcatchment Area 61: Area 61

Runoff = 0.97 cfs @ 12.21 hrs, Volume= 0.114 af, Depth= 0.63"
Routed to Reach S2.3 : Swale S2.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
2.177	39	Pasture/grassland/range, Good, HSG A
2.177		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	66	0.0303	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.6	34	0.2500	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	49	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.2	149	Total			

Summary for Subcatchment Area 62: Area 62

Runoff = 1.14 cfs @ 12.16 hrs, Volume= 0.071 af, Depth= 1.44"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.479	39	Pasture/grassland/range, Good, HSG A
0.115	96	Gravel surface, HSG A
0.594	50	Weighted Average
0.594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0544	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	47	0.0544	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.6	147	Total			

Summary for Subcatchment Area 63: Area 63

Runoff = 14.43 cfs @ 12.04 hrs, Volume= 0.799 af, Depth= 6.35"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.509	98	Water Surface, HSG A
1.509		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Subcatchment Area 64: Area 64

Runoff = 2.36 cfs @ 12.21 hrs, Volume= 0.273 af, Depth= 0.63"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
5.227	39	Pasture/grassland/range, Good, HSG A
5.227		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	75	0.0933	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.3	25	0.2500	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	10	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	381	0.0265	7.85	109.92	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
0.8	162	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	48	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.9	701	Total			

Summary for Subcatchment Area 65: Area 65

Runoff = 1.99 cfs @ 12.64 hrs, Volume= 0.304 af, Depth= 1.20"
Routed to Reach RD1 : Roadside Ditch 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
2.616	39	Pasture/grassland/range, Good, HSG A
0.039	69	Pasture/grassland/range, Fair, HSG B
0.380	96	Gravel surface, HSG A
3.035	47	Weighted Average
3.035		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	100	0.0068	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
22.7	786	0.0068	0.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	886	Total			

Summary for Subcatchment Area 66: Area 66

Runoff = 1.60 cfs @ 12.10 hrs, Volume= 0.076 af, Depth= 2.23"
Routed to Reach RD2 : Roadside Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.213	39	Pasture/grassland/range, Good, HSG A
0.104	69	Pasture/grassland/range, Fair, HSG B
0.092	96	Gravel surface, HSG A
0.409	59	Weighted Average
0.409		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	52	0.1154	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 67: Area 67

Runoff = 1.86 cfs @ 12.11 hrs, Volume= 0.096 af, Depth= 1.53"
Routed to Reach RD2 : Roadside Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.524	39	Pasture/grassland/range, Good, HSG A
0.139	69	Pasture/grassland/range, Fair, HSG B
0.092	96	Gravel surface, HSG A
0.755	51	Weighted Average
0.755		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	86	0.2326	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 68: Area 68

Runoff = 3.98 cfs @ 12.11 hrs, Volume= 0.213 af, Depth= 1.53"
Routed to Reach RD4 : Roadside Ditch 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.016	39	Pasture/grassland/range, Good, HSG A
0.620	69	Pasture/grassland/range, Fair, HSG B
0.035	96	Gravel surface, HSG A
1.671	51	Weighted Average
1.671		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	26	0.1538	2.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.0	126	Total			

Summary for Subcatchment Area 69: Area 69

Runoff = 5.65 cfs @ 12.32 hrs, Volume= 0.684 af, Depth= 0.83"
Routed to Pond N : North Infiltration Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
9.360	39	Pasture/grassland/range, Good, HSG A
0.515	96	Gravel surface, HSG A
9.875	42	Weighted Average
9.875		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.7	100	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	1,137	0.0193	4.31	32.30	**Trap/Vee/Rect Channel Flow, Roadside Ditch** Bot.W=0.00' D=1.00' Z= 5.0 & 10.0 '/' Top.W=15.00' n= 0.030
16.6	1,337	Total			

Summary for Subcatchment Area 7: Area 7

Runoff = 4.72 cfs @ 12.12 hrs, Volume= 0.248 af, Depth= 3.18"
Routed to Link F6A : Flume 6A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.936	69	Pasture/grassland/range, Fair, HSG B
0.936		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	100	0.2070	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	395	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.3	541	Total			

Summary for Subcatchment Area 70: Area 70

Runoff = 3.41 cfs @ 12.10 hrs, Volume= 0.167 af, Depth= 2.89"
Routed to Reach S1.2 : Swale S1.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.153	39	Pasture/grassland/range, Good, HSG A
0.441	69	Pasture/grassland/range, Fair, HSG B
0.100	96	Gravel surface, HSG A
0.694	66	Weighted Average
0.694		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	27	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	127	Total			

Summary for Subcatchment Area 8: Area 8

Runoff = 10.41 cfs @ 12.14 hrs, Volume= 0.560 af, Depth= 3.18"
Routed to Link F7A : Flume 7A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
2.114	69	Pasture/grassland/range, Fair, HSG B
2.114		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	100	0.1000	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	26	0.1000	2.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	121	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	124	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.6	371	Total			

Summary for Subcatchment Area 9: Area 9

Runoff = 4.01 cfs @ 12.14 hrs, Volume= 0.215 af, Depth= 3.18"
Routed to Link F7A : Flume 7A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

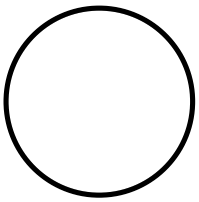
Area (ac)	CN	Description
0.810	69	Pasture/grassland/range, Fair, HSG B
0.810		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	71	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.4	29	0.2500	0.34		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	89	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	103	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.3	292	Total			

Summary for Reach 53R: Culvert C1

Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 36.48 cfs

24.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 51.9' Slope= 0.0222 '/'
Inlet Invert= 815.70', Outlet Invert= 814.55'



Summary for Reach RD1: Roadside Ditch 1

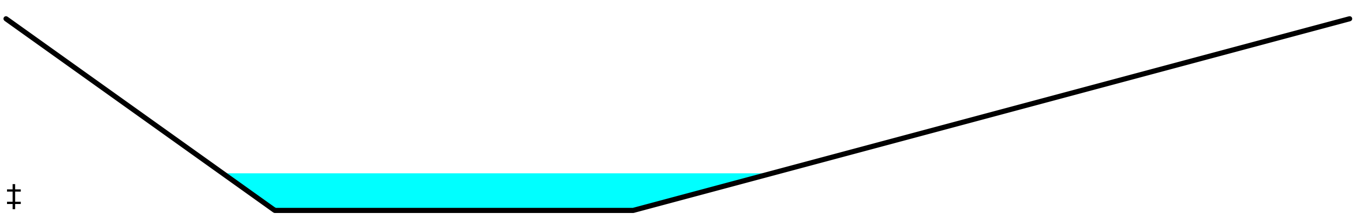
Inflow Area = 3.035 ac, 0.00% Impervious, Inflow Depth = 1.20" for 100-yr, 24-hr event
Inflow = 1.99 cfs @ 12.64 hrs, Volume= 0.304 af
Outflow = 1.96 cfs @ 12.74 hrs, Volume= 0.304 af, Atten= 1%, Lag= 6.5 min
Routed to Link C1 : Culvert C1

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.00 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 9.2 min

Peak Storage= 434 cf @ 12.68 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 6.14'
Bank-Full Depth= 1.00' Flow Area= 9.5 sf, Capacity= 47.16 cfs

4.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 8.0 '/' Top Width= 15.00'
Length= 440.6' Slope= 0.0188 '/'
Inlet Invert= 824.00', Outlet Invert= 815.70'

‡



Summary for Reach RD2: Roadside Ditch 2

Inflow Area = 7.168 ac, 0.00% Impervious, Inflow Depth = 2.44" for 100-yr, 24-hr event
Inflow = 18.53 cfs @ 12.17 hrs, Volume= 1.460 af
Outflow = 17.64 cfs @ 12.24 hrs, Volume= 1.460 af, Atten= 5%, Lag= 4.0 min
Routed to Link C10 : Culvert C10

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.14 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.90 fps, Avg. Travel Time= 8.1 min

Peak Storage= 2,485 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.51' , Surface Width= 16.30'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 72.77 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 433.0' Slope= 0.0162 '/'
Inlet Invert= 814.55', Outlet Invert= 807.54'

‡

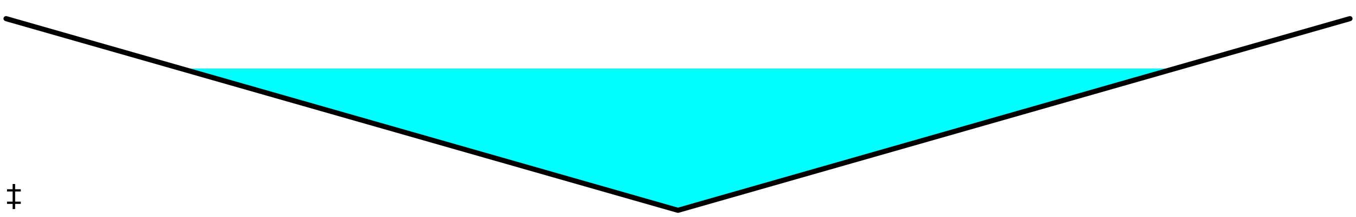
Summary for Reach RD3: Roadside Ditch 3

Inflow Area = 1.552 ac, 0.00% Impervious, Inflow Depth = 4.10" for 100-yr, 24-hr event
Inflow = 10.67 cfs @ 12.10 hrs, Volume= 0.531 af
Outflow = 9.18 cfs @ 12.19 hrs, Volume= 0.531 af, Atten= 14%, Lag= 5.4 min
Routed to Link C2 : Culvert C2a

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.23 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 1.37 fps, Avg. Travel Time= 10.0 min

Peak Storage= 1,795 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.74' , Surface Width= 5.92'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 20.76 cfs

0.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 821.0' Slope= 0.0288 '/'
Inlet Invert= 841.47', Outlet Invert= 817.83'



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Summary for Reach RD4: Roadside Ditch 4

Inflow Area = 1.671 ac, 0.00% Impervious, Inflow Depth = 1.53" for 100-yr, 24-hr event
Inflow = 3.98 cfs @ 12.11 hrs, Volume= 0.213 af
Outflow = 2.99 cfs @ 12.26 hrs, Volume= 0.213 af, Atten= 25%, Lag= 9.0 min
Routed to Link C10 : Culvert C10

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.52 fps, Min. Travel Time= 5.4 min
Avg. Velocity = 0.44 fps, Avg. Travel Time= 18.6 min

Peak Storage= 991 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 10.77'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 54.26 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 495.6' Slope= 0.0090 '/'
Inlet Invert= 812.00', Outlet Invert= 807.54'

‡

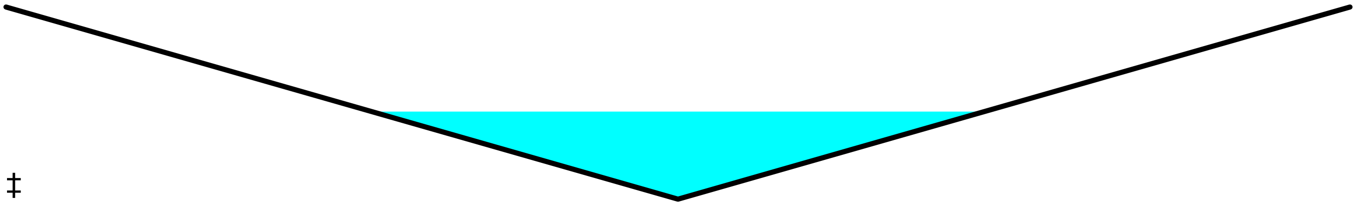
Summary for Reach RD5: Roadside Ditch 5

Inflow Area = 0.616 ac, 0.00% Impervious, Inflow Depth = 3.48" for 100-yr, 24-hr event
Inflow = 3.67 cfs @ 12.10 hrs, Volume= 0.179 af
Outflow = 3.30 cfs @ 12.14 hrs, Volume= 0.179 af, Atten= 10%, Lag= 2.2 min
Routed to Reach S4.2 : Swale S4.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.14 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.52 fps, Avg. Travel Time= 3.2 min

Peak Storage= 238 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.46' , Surface Width= 3.64'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 28.18 cfs

0.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 288.0' Slope= 0.0531 '/'
Inlet Invert= 841.47', Outlet Invert= 826.18'



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Summary for Reach S1.0: Swale S1.0

Inflow Area = 8.783 ac, 0.00% Impervious, Inflow Depth = 3.64" for 100-yr, 24-hr event
Inflow = 49.33 cfs @ 12.10 hrs, Volume= 2.668 af
Outflow = 43.23 cfs @ 12.19 hrs, Volume= 2.668 af, Atten= 12%, Lag= 5.6 min
Routed to Reach S1.2 : Swale S1.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.81 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 14.5 min

Peak Storage= 8,548 cf @ 12.14 hrs
Average Depth at Peak Storage= 1.21' , Surface Width= 17.67'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 118.85 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 551.3' Slope= 0.0039 '/'
Inlet Invert= 823.92', Outlet Invert= 821.75'

‡

Summary for Reach S1.1: Swale S1.1

Inflow Area = 0.306 ac, 0.00% Impervious, Inflow Depth = 1.44" for 100-yr, 24-hr event
Inflow = 0.66 cfs @ 12.12 hrs, Volume= 0.037 af
Outflow = 0.61 cfs @ 12.16 hrs, Volume= 0.037 af, Atten= 7%, Lag= 2.0 min
Routed to Link C9 : Culvert C9

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.42 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 2.2 min

Peak Storage= 45 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.06' , Surface Width= 8.45'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 376.93 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 98.0' Slope= 0.0396 '/'
Inlet Invert= 825.88', Outlet Invert= 822.00'

‡

Summary for Reach S1.2: Swale S1.2

Inflow Area = 9.783 ac, 0.00% Impervious, Inflow Depth = 3.52" for 100-yr, 24-hr event
Inflow = 45.42 cfs @ 12.19 hrs, Volume= 2.871 af
Outflow = 44.63 cfs @ 12.20 hrs, Volume= 2.871 af, Atten= 2%, Lag= 0.8 min
Routed to Link C11 : Culvert C11

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.41 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.22 fps, Avg. Travel Time= 2.3 min

Peak Storage= 1,428 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.76' , Surface Width= 14.09'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 294.55 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 170.0' Slope= 0.0242 '/'
Inlet Invert= 821.79', Outlet Invert= 817.68'

‡

Summary for Reach S1.3: Swale S1.3

Inflow Area = 11.213 ac, 0.00% Impervious, Inflow Depth = 3.42" for 100-yr, 24-hr event
Inflow = 47.67 cfs @ 12.20 hrs, Volume= 3.192 af
Outflow = 46.84 cfs @ 12.21 hrs, Volume= 3.192 af, Atten= 2%, Lag= 1.0 min
Routed to Link C3 : Culvert C3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.86 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.34 fps, Avg. Travel Time= 2.6 min

Peak Storage= 1,724 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.74' , Surface Width= 13.92'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 324.28 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 212.6' Slope= 0.0293 '/'
Inlet Invert= 817.40', Outlet Invert= 811.17'

‡

Summary for Reach S1.4: Swale S1.4

Inflow Area = 15.242 ac, 0.00% Impervious, Inflow Depth = 3.28" for 100-yr, 24-hr event
Inflow = 58.99 cfs @ 12.17 hrs, Volume= 4.161 af
Outflow = 58.04 cfs @ 12.18 hrs, Volume= 4.161 af, Atten= 2%, Lag= 0.6 min
Routed to Link C4 : Culvert C4

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.85 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.13 fps, Avg. Travel Time= 1.1 min

Peak Storage= 867 cf @ 12.18 hrs
Average Depth at Peak Storage= 1.00' , Surface Width= 16.00'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 227.36 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 72.2' Slope= 0.0144 '/'
Inlet Invert= 810.90', Outlet Invert= 809.86'

‡

Summary for Reach S1.5: Swale S1.5

Inflow Area = 15.981 ac, 0.00% Impervious, Inflow Depth = 3.21" for 100-yr, 24-hr event
Inflow = 59.91 cfs @ 12.18 hrs, Volume= 4.281 af
Outflow = 59.49 cfs @ 12.21 hrs, Volume= 4.281 af, Atten= 1%, Lag= 1.7 min
Routed to Reach S1.7 : Swale S1.7

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.22 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 0.76 fps, Avg. Travel Time= 3.3 min

Peak Storage= 2,761 cf @ 12.20 hrs
Average Depth at Peak Storage= 1.38' , Surface Width= 19.04'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 126.50 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 148.0' Slope= 0.0045 '/'
Inlet Invert= 809.60', Outlet Invert= 808.94'

‡

Summary for Reach S1.6: Swale S1.6

Inflow Area = 0.769 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 3.63 cfs @ 12.15 hrs, Volume= 0.204 af
Outflow = 3.33 cfs @ 12.21 hrs, Volume= 0.204 af, Atten= 8%, Lag= 3.8 min
Routed to Reach S1.7 : Swale S1.7

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.35 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.36 fps, Avg. Travel Time= 8.2 min

Peak Storage= 448 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.27' , Surface Width= 10.19'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 134.06 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 179.7' Slope= 0.0050 '/'
Inlet Invert= 809.85', Outlet Invert= 808.95'

‡

Summary for Reach S1.7: Swale S1.7

Inflow Area = 18.333 ac, 0.00% Impervious, Inflow Depth = 3.20" for 100-yr, 24-hr event
Inflow = 69.04 cfs @ 12.21 hrs, Volume= 4.888 af
Outflow = 67.28 cfs @ 12.24 hrs, Volume= 4.888 af, Atten= 3%, Lag= 2.3 min
Routed to Link C5 : Culvert C5

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.58 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.84 fps, Avg. Travel Time= 5.0 min

Peak Storage= 4,824 cf @ 12.22 hrs
Average Depth at Peak Storage= 1.41' , Surface Width= 19.25'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 139.68 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 252.0' Slope= 0.0054 '/'
Inlet Invert= 808.94', Outlet Invert= 807.57'

‡

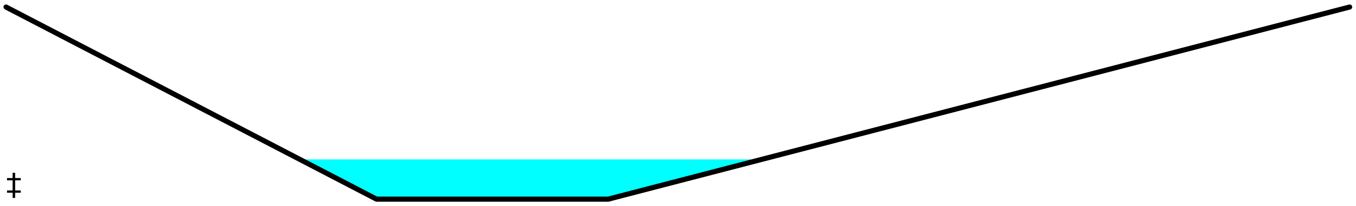
Summary for Reach S1.8: Swale S1.8

Inflow Area = 0.712 ac, 0.00% Impervious, Inflow Depth = 3.38" for 100-yr, 24-hr event
Inflow = 3.63 cfs @ 12.15 hrs, Volume= 0.201 af
Outflow = 3.32 cfs @ 12.20 hrs, Volume= 0.201 af, Atten= 9%, Lag= 3.3 min
Routed to Reach S1.7 : Swale S1.7

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.20 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 6.5 min

Peak Storage= 380 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.41' , Surface Width= 4.98'
Bank-Full Depth= 2.00' Flow Area= 17.0 sf, Capacity= 90.14 cfs

2.50' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 4.0 '/' Top Width= 14.50'
Length= 245.8' Slope= 0.0099 '/'
Inlet Invert= 810.00', Outlet Invert= 807.57'



‡

Summary for Reach S1.9: Swale S1.9

Inflow Area = 21.125 ac, 0.00% Impervious, Inflow Depth = 3.10" for 100-yr, 24-hr event
Inflow = 74.80 cfs @ 12.24 hrs, Volume= 5.449 af
Outflow = 72.74 cfs @ 12.30 hrs, Volume= 5.449 af, Atten= 3%, Lag= 3.2 min
Routed to Reach S2.1 : Swale S2.1

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.11 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.96 fps, Avg. Travel Time= 7.4 min

Peak Storage= 7,601 cf @ 12.26 hrs
Average Depth at Peak Storage= 1.35' , Surface Width= 18.77'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 163.67 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 422.0' Slope= 0.0075 '/'
Inlet Invert= 807.15', Outlet Invert= 804.00'

‡

Summary for Reach S2.1: Swale S2.1

Inflow Area = 23.239 ac, 0.00% Impervious, Inflow Depth = 2.87" for 100-yr, 24-hr event
Inflow = 73.27 cfs @ 12.30 hrs, Volume= 5.559 af
Outflow = 71.33 cfs @ 12.35 hrs, Volume= 5.559 af, Atten= 3%, Lag= 3.2 min
Routed to Reach S2.2 : Swale S2.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.74 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 6.6 min

Peak Storage= 7,518 cf @ 12.32 hrs
Average Depth at Peak Storage= 1.75' , Surface Width= 18.04'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 97.05 cfs

4.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 20.00'
Length= 389.0' Slope= 0.0054 '/'
Inlet Invert= 806.10', Outlet Invert= 804.00'

‡

Summary for Reach S2.2: Swale S2.2

Inflow Area = 40.438 ac, 0.00% Impervious, Inflow Depth = 3.01" for 100-yr, 24-hr event
Inflow = 121.32 cfs @ 12.28 hrs, Volume= 10.154 af
Outflow = 119.32 cfs @ 12.34 hrs, Volume= 10.154 af, Atten= 2%, Lag= 3.2 min
Routed to Reach S2.3 : Swale S2.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.97 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.92 fps, Avg. Travel Time= 7.5 min

Peak Storage= 12,489 cf @ 12.31 hrs
Average Depth at Peak Storage= 1.78' , Surface Width= 24.21'
Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 152.61 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 411.0' Slope= 0.0049 '/'
Inlet Invert= 804.00', Outlet Invert= 802.00'

‡

Summary for Reach S2.3: Swale S2.3

Inflow Area = 44.233 ac, 0.00% Impervious, Inflow Depth = 2.87" for 100-yr, 24-hr event
Inflow = 121.74 cfs @ 12.34 hrs, Volume= 10.568 af
Outflow = 120.67 cfs @ 12.36 hrs, Volume= 10.568 af, Atten= 1%, Lag= 1.6 min
Routed to Link C7 : Culvert C7

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.67 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.32 fps, Avg. Travel Time= 3.9 min

Peak Storage= 6,590 cf @ 12.35 hrs
Average Depth at Peak Storage= 1.38' , Surface Width= 21.06'
Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 249.72 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 307.0' Slope= 0.0130 '/'
Inlet Invert= 802.00', Outlet Invert= 798.00'

‡

Summary for Reach S3.1: Swale S3.1

Inflow Area = 2.044 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 11.02 cfs @ 12.10 hrs, Volume= 0.542 af
Outflow = 9.75 cfs @ 12.19 hrs, Volume= 0.542 af, Atten= 12%, Lag= 5.2 min
Routed to Reach S3.2 : Swale S3.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.94 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.48 fps, Avg. Travel Time= 12.5 min

Peak Storage= 1,797 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.50' , Surface Width= 12.02'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 133.76 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 357.0' Slope= 0.0050 '/'
Inlet Invert= 809.85', Outlet Invert= 808.07'

‡

Summary for Reach S3.2: Swale S3.2

Inflow Area = 7.661 ac, 0.00% Impervious, Inflow Depth = 3.19" for 100-yr, 24-hr event
Inflow = 35.67 cfs @ 12.14 hrs, Volume= 2.034 af
Outflow = 35.48 cfs @ 12.14 hrs, Volume= 2.034 af, Atten= 1%, Lag= 0.3 min
Routed to Reach S3.3 : Swale S3.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.89 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 0.8 min

Peak Storage= 420 cf @ 12.14 hrs
Average Depth at Peak Storage= 1.02' , Surface Width= 16.18'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 133.95 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 34.0' Slope= 0.0050 '/'
Inlet Invert= 798.00', Outlet Invert= 797.83'

‡

Summary for Reach S3.3: Swale S3.3

Inflow Area = 7.661 ac, 0.00% Impervious, Inflow Depth = 3.19" for 100-yr, 24-hr event
Inflow = 35.48 cfs @ 12.14 hrs, Volume= 2.034 af
Outflow = 33.84 cfs @ 12.17 hrs, Volume= 2.034 af, Atten= 5%, Lag= 1.3 min
Routed to Link C6 : Culvert C6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.03 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.02 fps, Avg. Travel Time= 3.3 min

Peak Storage= 1,746 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.78' , Surface Width= 14.27'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 215.99 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 200.0' Slope= 0.0130 '/'
Inlet Invert= 808.00', Outlet Invert= 805.40'

‡

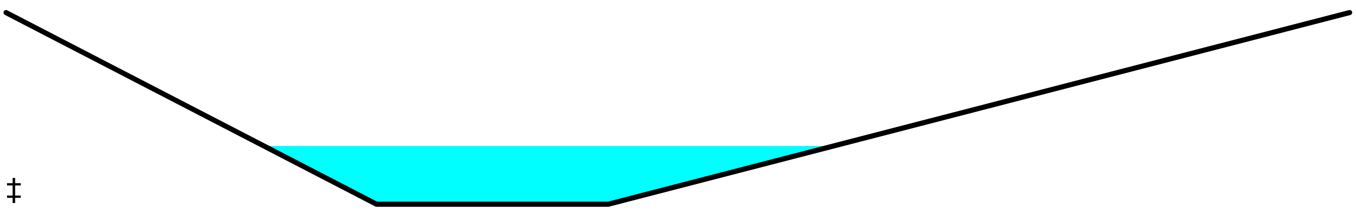
Summary for Reach S3.4: Swale S3.4

Inflow Area = 1.194 ac, 0.00% Impervious, Inflow Depth = 3.58" for 100-yr, 24-hr event
Inflow = 6.45 cfs @ 12.15 hrs, Volume= 0.357 af
Outflow = 5.88 cfs @ 12.20 hrs, Volume= 0.357 af, Atten= 9%, Lag= 3.6 min
Routed to Link C6 : Culvert C6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.29 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 7.1 min

Peak Storage= 743 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.61' , Surface Width= 6.15'
Bank-Full Depth= 2.00' Flow Area= 17.0 sf, Capacity= 76.21 cfs

2.50' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 4.0 '/' Top Width= 14.50'
Length= 283.0' Slope= 0.0071 '/'
Inlet Invert= 810.00', Outlet Invert= 808.00'



‡

Summary for Reach S3.5: Swale S3.5

Inflow Area = 15.661 ac, 0.00% Impervious, Inflow Depth = 3.26" for 100-yr, 24-hr event
Inflow = 67.72 cfs @ 12.16 hrs, Volume= 4.259 af
Outflow = 63.93 cfs @ 12.22 hrs, Volume= 4.259 af, Atten= 6%, Lag= 3.7 min
Routed to Reach S2.2 : Swale S2.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.64 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 7.8 min

Peak Storage= 7,862 cf @ 12.19 hrs
Average Depth at Peak Storage= 1.68' , Surface Width= 21.43'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 93.14 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 318.5' Slope= 0.0024 '/'
Inlet Invert= 804.76', Outlet Invert= 803.99'

‡

Summary for Reach S4.1: Swale S4.1

Inflow Area = 1.364 ac, 0.00% Impervious, Inflow Depth = 2.35" for 100-yr, 24-hr event
Inflow = 5.28 cfs @ 12.10 hrs, Volume= 0.267 af
Outflow = 4.68 cfs @ 12.16 hrs, Volume= 0.267 af, Atten= 11%, Lag= 3.3 min
Routed to Reach S4.2 : Swale S4.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.07 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.50 fps, Avg. Travel Time= 8.0 min

Peak Storage= 556 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.22' , Surface Width= 11.51'
Bank-Full Depth= 1.00' Flow Area= 13.5 sf, Capacity= 70.22 cfs

10.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 17.00'
Length= 240.0' Slope= 0.0153 '/'
Inlet Invert= 811.94', Outlet Invert= 808.26'

‡

Summary for Reach S4.2: Swale S4.2

Inflow Area = 3.174 ac, 0.00% Impervious, Inflow Depth = 2.52" for 100-yr, 24-hr event
Inflow = 11.92 cfs @ 12.14 hrs, Volume= 0.667 af
Outflow = 11.06 cfs @ 12.18 hrs, Volume= 0.667 af, Atten= 7%, Lag= 2.8 min
Routed to Reach S4.3 : Swale S4.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.70 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.62 fps, Avg. Travel Time= 7.0 min

Peak Storage= 1,118 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.38' , Surface Width= 12.66'
Bank-Full Depth= 1.00' Flow Area= 13.5 sf, Capacity= 63.88 cfs

10.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 17.00'
Length= 259.3' Slope= 0.0127 '/'
Inlet Invert= 808.26', Outlet Invert= 804.97'

Summary for Reach S4.3: Swale S4.3

Inflow Area = 9.328 ac, 0.00% Impervious, Inflow Depth = 2.62" for 100-yr, 24-hr event
Inflow = 35.42 cfs @ 12.14 hrs, Volume= 2.039 af
Outflow = 32.72 cfs @ 12.21 hrs, Volume= 2.039 af, Atten= 8%, Lag= 4.6 min
Routed to Reach S4.4 : Swale S4.4

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.24 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 11.4 min

Peak Storage= 5,330 cf @ 12.17 hrs
Average Depth at Peak Storage= 1.07' , Surface Width= 17.49'
Bank-Full Depth= 2.00' Flow Area= 34.0 sf, Capacity= 108.12 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 24.00'
Length= 362.9' Slope= 0.0027 '/'
Inlet Invert= 804.97', Outlet Invert= 804.00'

Summary for Reach S4.4: Swale S4.4

Inflow Area = 14.003 ac, 0.00% Impervious, Inflow Depth = 2.62" for 100-yr, 24-hr event
Inflow = 44.75 cfs @ 12.17 hrs, Volume= 3.062 af
Outflow = 42.89 cfs @ 12.26 hrs, Volume= 3.062 af, Atten= 4%, Lag= 5.4 min
Routed to Reach S4.5 : Swale S4.5

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.81 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 12.3 min

Peak Storage= 7,560 cf @ 12.21 hrs
Average Depth at Peak Storage= 1.10' , Surface Width= 17.71'
Bank-Full Depth= 2.00' Flow Area= 34.0 sf, Capacity= 132.85 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 24.00'
Length= 495.6' Slope= 0.0040 '/'
Inlet Invert= 804.00', Outlet Invert= 802.00'

‡

Summary for Reach S4.5: Swale S4.5

Inflow Area = 16.113 ac, 0.00% Impervious, Inflow Depth = 2.54" for 100-yr, 24-hr event
Inflow = 45.33 cfs @ 12.26 hrs, Volume= 3.413 af
Outflow = 44.02 cfs @ 12.31 hrs, Volume= 3.413 af, Atten= 3%, Lag= 3.2 min
Routed to Reach S4.6 : Swale S4.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.85 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 7.0 min

Peak Storage= 4,750 cf @ 12.28 hrs
Average Depth at Peak Storage= 0.88' , Surface Width= 16.18'
Bank-Full Depth= 3.00' Flow Area= 61.5 sf, Capacity= 465.89 cfs

10.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 31.00'
Length= 411.1' Slope= 0.0097 '/'
Inlet Invert= 802.00', Outlet Invert= 798.00'

‡

Summary for Reach S4.6: Swale S4.6

Inflow Area = 65.439 ac, 0.00% Impervious, Inflow Depth = 2.74" for 100-yr, 24-hr event
Inflow = 168.51 cfs @ 12.34 hrs, Volume= 14.952 af
Outflow = 165.78 cfs @ 12.39 hrs, Volume= 14.952 af, Atten= 2%, Lag= 2.7 min
Routed to Pond Sed Pond : Sedimentation Basin

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.01 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 1.44 fps, Avg. Travel Time= 6.2 min

Peak Storage= 14,973 cf @ 12.36 hrs
Average Depth at Peak Storage= 1.73' , Surface Width= 22.14'
Bank-Full Depth= 3.00' Flow Area= 61.5 sf, Capacity= 499.25 cfs

10.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 31.00'
Length= 537.0' Slope= 0.0112 '/'
Inlet Invert= 798.00', Outlet Invert= 792.00'

‡

Summary for Reach S5.1: Swale S5.1

Inflow Area = 0.993 ac, 0.00% Impervious, Inflow Depth = 3.89" for 100-yr, 24-hr event
Inflow = 6.35 cfs @ 12.11 hrs, Volume= 0.322 af
Outflow = 5.76 cfs @ 12.19 hrs, Volume= 0.322 af, Atten= 9%, Lag= 5.0 min
Routed to Link 4L : Culvert C2b

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.36 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 11.9 min

Peak Storage= 1,042 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.27' , Surface Width= 10.15'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 235.24 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 428.0' Slope= 0.0154 '/'
Inlet Invert= 825.20', Outlet Invert= 818.60'

‡

Summary for Reach S5.2: Swale S5.2

Inflow Area = 0.424 ac, 0.00% Impervious, Inflow Depth = 3.69" for 100-yr, 24-hr event
Inflow = 2.76 cfs @ 12.09 hrs, Volume= 0.130 af
Outflow = 2.42 cfs @ 12.13 hrs, Volume= 0.130 af, Atten= 12%, Lag= 2.2 min
Routed to Link C2 : Culvert C2a

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.27 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.72 fps, Avg. Travel Time= 4.2 min

Peak Storage= 211 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 9.08'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 344.73 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 183.6' Slope= 0.0331 '/'
Inlet Invert= 823.91', Outlet Invert= 817.83'

‡

Summary for Pond C8: Culvert C8

Inflow Area = 0.275 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 1.60 cfs @ 12.08 hrs, Volume= 0.073 af
Outflow = 1.60 cfs @ 12.08 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.1 min
Primary = 1.60 cfs @ 12.08 hrs, Volume= 0.073 af
Routed to Reach S4.1 : Swale S4.1

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 811.38' @ 12.08 hrs Surf.Area= 0.000 ac Storage= 0.000 af
Flood Elev= 819.00' Surf.Area= 0.000 ac Storage= 0.001 af

Plug-Flow detention time= 0.2 min calculated for 0.073 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (817.4 - 817.3)

Volume	Invert	Avail.Storage	Storage Description
#1	810.70'	0.001 af	**3.00'D x 7.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	810.70'	**12.0" Round Culvert** L= 85.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 810.70' / 808.60' S= 0.0245 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.49 cfs @ 12.08 hrs HW=811.35' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.49 cfs @ 2.75 fps)

Summary for Pond N: North Infiltration Area

Inflow Area = 18.714 ac, 0.00% Impervious, Inflow Depth = 1.51" for 100-yr, 24-hr event
Inflow = 25.48 cfs @ 12.26 hrs, Volume= 2.356 af
Outflow = 2.22 cfs @ 14.45 hrs, Volume= 2.356 af, Atten= 91%, Lag= 131.5 min
Primary = 2.22 cfs @ 14.45 hrs, Volume= 2.356 af
Routed to nonexistent node 1L

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 805.24' @ 14.45 hrs Surf.Area= 26,590 sf Storage= 49,884 cf

Plug-Flow detention time= 286.6 min calculated for 2.354 af (100% of inflow)
Center-of-Mass det. time= 286.6 min (1,151.8 - 865.2)

Volume	Invert	Avail.Storage	Storage Description
#1	802.00'	256,569 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
802.00	5,140	0	0
804.00	17,424	22,564	22,564
806.00	32,191	49,615	72,179
808.00	46,130	78,321	150,500
810.00	59,939	106,069	256,569

Device	Routing	Invert	Outlet Devices
#1	Primary	802.00'	**3.600 in/hr Exfiltration over Surface area**

Primary OutFlow Max=2.22 cfs @ 14.45 hrs HW=805.24' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 2.22 cfs)

Summary for Pond Sed Pond: Sedimentation Basin

Inflow Area = 72.769 ac, 2.07% Impervious, Inflow Depth = 2.65" for 100-yr, 24-hr event
Inflow = 169.90 cfs @ 12.39 hrs, Volume= 16.095 af
Outflow = 94.78 cfs @ 12.65 hrs, Volume= 16.095 af, Atten= 44%, Lag= 15.8 min
Discarded = 5.92 cfs @ 12.65 hrs, Volume= 7.322 af
Primary = 11.55 cfs @ 12.65 hrs, Volume= 5.267 af
Routed to Link Wetland : Wetland
Secondary = 33.59 cfs @ 12.65 hrs, Volume= 2.497 af
Routed to Link Wetland : Wetland
Tertiary = 43.71 cfs @ 12.65 hrs, Volume= 1.010 af
Routed to Link Wetland : Wetland

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Peak Elev= 793.23' @ 12.65 hrs Surf.Area= 71,081 sf Storage= 247,875 cf
Flood Elev= 794.00' Surf.Area= 75,797 sf Storage= 304,443 cf

Plug-Flow detention time= 154.9 min calculated for 16.084 af (100% of inflow)
Center-of-Mass det. time= 154.9 min (1,001.3 - 846.4)

Volume	Invert	Avail.Storage	Storage Description
#1	789.00'	304,443 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
789.00	27,325	0	0
790.00	55,972	41,649	41,649
791.00	61,532	58,752	100,401
792.00	65,703	63,618	164,018
793.00	69,675	67,689	231,707
794.00	75,797	72,736	304,443

Device	Routing	Invert	Outlet Devices
#1	Primary	787.70'	**15.0" Round Culvert** L= 40.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 787.70' / 787.50' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	791.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	790.50'	**0.8" Vert. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	790.00'	**0.8" Vert. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#5	Device 1	789.00'	**0.5" Vert. Orifice/Grate X 14.00 columns** X 6 rows with 6.0" cc spacing C= 0.600 Limited to weir flow at low heads
#6	Secondary	792.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#7	Tertiary	793.00'	**158.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#8	Discarded	789.00'	**3.600 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=5.92 cfs @ 12.65 hrs HW=793.23' (Free Discharge)
└─**8=Exfiltration** (Exfiltration Controls 5.92 cfs)

Primary OutFlow Max=11.55 cfs @ 12.65 hrs HW=793.23' (Free Discharge)
└─**1=Culvert** (Inlet Controls 11.55 cfs @ 9.41 fps)
  ├─**2=Orifice/Grate** (Passes < 35.29 cfs potential flow)
  ├─**3=Orifice/Grate** (Passes < 0.11 cfs potential flow)
  ├─**4=Orifice/Grate** (Passes < 0.12 cfs potential flow)
  └─**5=Orifice/Grate** (Passes < 0.94 cfs potential flow)

Secondary OutFlow Max=33.55 cfs @ 12.65 hrs HW=793.23' (Free Discharge)
└─**6=Broad-Crested Rectangular Weir** (Weir Controls 33.55 cfs @ 2.30 fps)

Tertiary OutFlow Max=43.39 cfs @ 12.65 hrs HW=793.23' (Free Discharge)
└─**7=Broad-Crested Rectangular Weir** (Weir Controls 43.39 cfs @ 1.20 fps)

Summary for Link 4L: Culvert C2b

Inflow Area = 0.993 ac, 0.00% Impervious, Inflow Depth = 3.89" for 100-yr, 24-hr event
Inflow = 5.76 cfs @ 12.19 hrs, Volume= 0.322 af
Primary = 5.76 cfs @ 12.19 hrs, Volume= 0.322 af, Atten= 0%, Lag= 0.0 min
Routed to Link C2 : Culvert C2a

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C1: Culvert C1

Inflow Area = 3.035 ac, 0.00% Impervious, Inflow Depth = 1.20" for 100-yr, 24-hr event
Inflow = 1.96 cfs @ 12.74 hrs, Volume= 0.304 af
Primary = 1.96 cfs @ 12.74 hrs, Volume= 0.304 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C10: Culvert C10

Inflow Area = 8.839 ac, 0.00% Impervious, Inflow Depth = 2.27" for 100-yr, 24-hr event
Inflow = 20.55 cfs @ 12.24 hrs, Volume= 1.672 af
Primary = 20.55 cfs @ 12.24 hrs, Volume= 1.672 af, Atten= 0%, Lag= 0.0 min
Routed to Pond N : North Infiltration Area

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C11: Culvert C11

Inflow Area = 9.783 ac, 0.00% Impervious, Inflow Depth = 3.52" for 100-yr, 24-hr event
Inflow = 44.63 cfs @ 12.20 hrs, Volume= 2.871 af
Primary = 44.63 cfs @ 12.20 hrs, Volume= 2.871 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.3 : Swale S1.3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C2: Culvert C2a

Inflow Area = 2.969 ac, 0.00% Impervious, Inflow Depth = 3.97" for 100-yr, 24-hr event
Inflow = 16.75 cfs @ 12.18 hrs, Volume= 0.983 af
Primary = 16.75 cfs @ 12.18 hrs, Volume= 0.983 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C3: Culvert C3

Inflow Area = 11.213 ac, 0.00% Impervious, Inflow Depth = 3.42" for 100-yr, 24-hr event
Inflow = 46.84 cfs @ 12.21 hrs, Volume= 3.192 af
Primary = 46.84 cfs @ 12.21 hrs, Volume= 3.192 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.4 : Swale S1.4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C4: Culvert C4

Inflow Area = 15.242 ac, 0.00% Impervious, Inflow Depth = 3.28" for 100-yr, 24-hr event
Inflow = 58.04 cfs @ 12.18 hrs, Volume= 4.161 af
Primary = 58.04 cfs @ 12.18 hrs, Volume= 4.161 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.5 : Swale S1.5

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C5: Culvert C5

Inflow Area = 18.333 ac, 0.00% Impervious, Inflow Depth = 3.20" for 100-yr, 24-hr event
Inflow = 67.28 cfs @ 12.24 hrs, Volume= 4.888 af
Primary = 67.28 cfs @ 12.24 hrs, Volume= 4.888 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.9 : Swale S1.9

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C6: Culvert C6

Inflow Area = 11.935 ac, 0.00% Impervious, Inflow Depth = 3.23" for 100-yr, 24-hr event
Inflow = 52.51 cfs @ 12.15 hrs, Volume= 3.209 af
Primary = 52.51 cfs @ 12.15 hrs, Volume= 3.209 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S3.5 : Swale S3.5

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C7: Culvert C7

Inflow Area = 47.325 ac, 0.00% Impervious, Inflow Depth = 2.89" for 100-yr, 24-hr event
Inflow = 124.99 cfs @ 12.36 hrs, Volume= 11.388 af
Primary = 124.99 cfs @ 12.36 hrs, Volume= 11.388 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.6 : Swale S4.6

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C9: Culvert C9

Inflow Area = 0.306 ac, 0.00% Impervious, Inflow Depth = 1.44" for 100-yr, 24-hr event
Inflow = 0.61 cfs @ 12.16 hrs, Volume= 0.037 af
Primary = 0.61 cfs @ 12.16 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.2 : Swale S1.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F10: Flume 10

Inflow Area = 0.275 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 1.60 cfs @ 12.08 hrs, Volume= 0.073 af
Primary = 1.60 cfs @ 12.08 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min
Routed to Pond C8 : Culvert C8

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F1A: Flume 1A

Inflow Area = 1.698 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 8.37 cfs @ 12.13 hrs, Volume= 0.450 af
Primary = 8.37 cfs @ 12.13 hrs, Volume= 0.450 af, Atten= 0%, Lag= 0.0 min
Routed to Link F1B : Flume 1B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F1B: Flume 1B

Inflow Area = 3.934 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 19.59 cfs @ 12.12 hrs, Volume= 1.043 af
Primary = 19.59 cfs @ 12.12 hrs, Volume= 1.043 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.3 : Swale S4.3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F2A: Flume 2A

Inflow Area = 0.636 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 3.34 cfs @ 12.11 hrs, Volume= 0.169 af
Primary = 3.34 cfs @ 12.11 hrs, Volume= 0.169 af, Atten= 0%, Lag= 0.0 min
Routed to Link F2B : Flume 2B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F2B: Flume 2B

Inflow Area = 2.199 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 11.13 cfs @ 12.12 hrs, Volume= 0.583 af
Primary = 11.13 cfs @ 12.12 hrs, Volume= 0.583 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.4 : Swale S4.4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F3: Flume 3

Inflow Area = 0.427 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 2.33 cfs @ 12.10 hrs, Volume= 0.113 af
Primary = 2.33 cfs @ 12.10 hrs, Volume= 0.113 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.5 : Swale S4.5

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F4A: Flume 4A

Inflow Area = 1.209 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 5.87 cfs @ 12.13 hrs, Volume= 0.320 af
Primary = 5.87 cfs @ 12.13 hrs, Volume= 0.320 af, Atten= 0%, Lag= 0.0 min
Routed to Link F4B : Flume 4B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F4B: Flume 4B

Inflow Area = 3.092 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 15.35 cfs @ 12.13 hrs, Volume= 0.820 af
Primary = 15.35 cfs @ 12.13 hrs, Volume= 0.820 af, Atten= 0%, Lag= 0.0 min
Routed to Link C7 : Culvert C7

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F5A: Flume 5A

Inflow Area = 0.237 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 1.28 cfs @ 12.10 hrs, Volume= 0.063 af
Primary = 1.28 cfs @ 12.10 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min
Routed to Link F5B : Flume 5B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F5B: Flume 5B

Inflow Area = 0.712 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 3.77 cfs @ 12.11 hrs, Volume= 0.189 af
Primary = 3.77 cfs @ 12.11 hrs, Volume= 0.189 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S2.2 : Swale S2.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F6A: Flume 6A

Inflow Area = 1.440 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 7.42 cfs @ 12.11 hrs, Volume= 0.382 af
Primary = 7.42 cfs @ 12.11 hrs, Volume= 0.382 af, Atten= 0%, Lag= 0.0 min
Routed to Link F6B : Flume 6B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F6B: Flume 6B

Inflow Area = 3.001 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 15.57 cfs @ 12.11 hrs, Volume= 0.795 af
Primary = 15.57 cfs @ 12.11 hrs, Volume= 0.795 af, Atten= 0%, Lag= 0.0 min
Routed to Link C6 : Culvert C6

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F7A: Flume 7A

Inflow Area = 2.924 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 14.41 cfs @ 12.14 hrs, Volume= 0.775 af
Primary = 14.41 cfs @ 12.14 hrs, Volume= 0.775 af, Atten= 0%, Lag= 0.0 min
Routed to Link F7B : Flume 7B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F7B: Flume 7B

Inflow Area = 5.160 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 25.54 cfs @ 12.13 hrs, Volume= 1.368 af
Primary = 25.54 cfs @ 12.13 hrs, Volume= 1.368 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S3.2 : Swale S3.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F8A: Flume 8A

Inflow Area = 0.791 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 3.91 cfs @ 12.14 hrs, Volume= 0.210 af
Primary = 3.91 cfs @ 12.14 hrs, Volume= 0.210 af, Atten= 0%, Lag= 0.0 min
Routed to Link F8B : Flume 8B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F8B: Flume 8B

Inflow Area = 2.667 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 13.41 cfs @ 12.12 hrs, Volume= 0.707 af
Primary = 13.41 cfs @ 12.12 hrs, Volume= 0.707 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.4 : Swale S1.4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F9A: Flume 9A

Inflow Area = 3.091 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 15.16 cfs @ 12.14 hrs, Volume= 0.819 af
Primary = 15.16 cfs @ 12.14 hrs, Volume= 0.819 af, Atten= 0%, Lag= 0.0 min
Routed to Link F9B : Flume 9B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F9B: Flume 9B

Inflow Area = 6.189 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 30.63 cfs @ 12.13 hrs, Volume= 1.640 af
Primary = 30.63 cfs @ 12.13 hrs, Volume= 1.640 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.0 : Swale S1.0

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link Wetland: Wetland

Inflow Area = 72.769 ac, 2.07% Impervious, Inflow Depth = 1.45" for 100-yr, 24-hr event
Inflow = 88.85 cfs @ 12.65 hrs, Volume= 8.773 af
Primary = 88.85 cfs @ 12.65 hrs, Volume= 8.773 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Swale Sizing

SCS ENGINEERS

		Sheet No: 1 of 3	
		Calc. No.	
		Rev. No. 2	
Job No. 25222260.00	Project: Columbia Energy Center MOD 12	By: SJL	Date: 8/28/23
Client: WPL	Subject: Swale Sizing	Chk'd: RJG	Date: 8/28/23

Purpose:

To size the proposed swales to accommodate the 25-year, 24-hour storm event and determine required erosion matting.

References:

1. WisDOT Facilities Development Manual Chapter 13, Section 30-15 - Grass Lined Channels.
2. Design of Roadside Channels with Flexible Linings, HEC-15, USDOT FHWA.
3. HydroCAD Report: COL_Mod12_HydroCAD Report
4. Wisconsin Department of Natural Resources Conservation Practice Standard 1053 - Channel Erosion Mat.

Approach:

Use the HydroCAD Model results to obtain the peak flow during a 25-year, 24-hour storm event.

Use Grass Lined Channel Design WisDOT Spreadsheet, FDM 13-30 Attachment 15.2 (from Reference #1) to size the swale for each design swale cross section. The WisDOT spreadsheet incorporates the design guidelines and equations described in "Design of Roadside Channels with Flexible Linings", HEC-15, USDOT FHWA (Reference #2).

Confirm the swale is stable and has enough capacity for the design flow rate.

Use Standard 1053 (see Reference #4) to select appropriate erosion control mat based on shear stress and application.

Assumptions:

1. Swales geometry shown on the drawing set.
2. Assume the following parameters per Section 15.2 - Grass Lining Properties from Reference #1:
   - Vegetation Retardance Class = C for Swales
   - Vegetation Condition = Good
   - Vegetation Growth Form = Turf
3. Assume cohesive soil type with ASTM Soil Class SC and a Plasticity Index (PI) of 16.

Calculations:

From the HydroCAD Report, the 25-year, 24-hour peak discharge rates in the swales are

Swales:	25-year		25-year		25-year
Swale S1.0 =	30.9 cfs	**Swale S2.1 =**	40.7 cfs	**Swale S4.1 =**	2.7 cfs
Swale S1.1 =	0.24 cfs	**Swale S2.2 =**	66.4 cfs	**Swale S4.2 =**	6.3 cfs
Swale S1.2 =	27.1 cfs	**Swale S2.3 =**	66.3 cfs	**Swale S4.3 =**	18.8 cfs
Swale S1.3 =	28.0 cfs	**Swale S3.1 =**	6.5 cfs	**Swale S4.4 =**	22.1 cfs
Swale S1.4 =	32.9 cfs	**Swale S3.2 =**	20.5 cfs	**Swale S4.5 =**	22.3 cfs
Swale S1.5 =	33.6 cfs	**Swale S3.3 =**	20.4 cfs	**Swale S4.6 =**	90.0 cfs
Swale S1.6 =	2.1 cfs	**Swale S3.4 =**	4.0 cfs	**Swale S5.1 =**	4.1 cfs
Swale S1.7 =	38.9 cfs	**Swale S3.5 =**	39.3 cfs	**Swale S5.2 =**	1.7 cfs
Swale S1.8 =	2.2 cfs				
Swale S1.9 =	42.0 cfs				
Roadside Ditch 1 =	0.6 cfs	**Roadside Ditch 2 =**	11.2 cfs	**Roadside Ditch 3 =**	7.0 cfs
Roadside Ditch 4 =	1.5 cfs	**Roadside Ditch 5 =**	2.3 cfs		

Use the WisDOT Grass Swale Design Spreadsheet (Page 2) to determine the flow depth, velocity and shear stress in the swales.

Results:

The swales are adequately designed to accommodate the flows from the 25-year, 24-hour storm event.

The swales are stable at the design flow rates.

Use Class I, Type B erosion mat for all swales except Roadside Ditch 3 and 5 should be Class II, Type B if regraded.

SCS ENGINEERS

Job No. 25222260.00
Client: WPL

Project: Columbia Energy Center MOD 12
Subject: Swale Sizing

Channel/Ditch Geometry	Swale S1.0 =	Swale S1.1 =	Swale S1.2 =	Swale S1.3 =	Swale S1.4 =	Swale S1.5 =	Swale S1.6 =	Swale S1.7 =	Swale S1.8 =	Swale S1.9 =	Swale S2.1 =	Swale S2.2 =	Swale S2.3 =	Swale S3.1 =	Swale S3.2 =	Swale S3.3 =
Channel Slope, S_o (ft/ft)	0.0039	0.0396	0.0242	0.0293	0.0144	0.0045	0.005	0.0054	0.0099	0.0075	0.0054	0.0049	0.0130	0.0050	0.0050	0.0130
Channel Bottom Width, B (ft)	8	8	8	8	8	8	8	8	2.5	8	4	10	10	8	8	8
Channel Side Slope, z_1	4	4	4	4	4	4	4	4	2	4	4	4	4	4	4	4
Channel Side Slope, z_2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Flow Depth, d (ft) Solve iteratively	1.72	0.065	0.78	0.73	1.05	1.69	0.46	1.67	0.58	1.52	2.00	2.03	1.38	0.78	1.30	0.88
Safety Factor, SF	1.0	1.0	1.0	1.0	1.0	3.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Vegetation/Soil Parameters																
Vegetation Retardance Class	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Vegetation Condition	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good
Vegetation Growth Form	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf
Soil Type	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive
D_{75} (in) (Set at 0.00 for cohesive soils)																
ASTM Soil Class	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC
Plasticity Index, PI	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Results Summary																
Design Q (ft^3/s)	30.9	0.2	27.1	28.0	32.9	33.6	2.1	38.9	2.2	42.0	40.0	66.4	66.3	6.5	20.5	20.4
1. Swales geometry shown on the drawing se	31.2	0.2	27.0	27.9	32.6	34.0	2.1	38.7	2.2	41.7	39.5	65.9	66.2	6.6	20.3	20.2
Difference Between Design & Calc. Flow (%)	0.9%	-2.0%	-0.4%	-0.3%	-0.9%	0.9%	-1.1%	-0.4%	1.1%	-0.5%	-1.3%	-0.8%	-0.1%	1.1%	-0.9%	-0.9%
Stable (Yes or No)	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Channel Parameters																
Vegetation Height, h (ft)	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Grass Roughness Coefficient, C_n	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238
Cover Factor, C_f	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Noncohesive Soil																
Soil Grain Roughness, n_s	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Permissible Soil Shear Stress, τ_p (lb/ft^2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cohesive Soil																
Porosity, e	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Soil Coefficient 1, c_1	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700
Soil Coefficient 2, c_2	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30
Soil Coefficient 3, c_3	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700
Soil Coefficient 4, c_4	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Soil Coefficient 5, c_5	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61
Soil Coefficient 6, c_6	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Permissible Soil Shear Stress, τ_p (lb/ft^2)	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
Total Permissible Shear Stress, τ_p (lb/ft^2)	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
Cross Sectional Area, A (ft^2)	25.594	0.537	8.674	7.972	12.810	24.944	4.526	24.516	2.459	21.402	24.000	36.784	21.418	8.674	17.160	10.138
Wetted Perimeter, P (ft)	22.18	8.54	14.43	14.02	16.66	21.94	11.79	21.77	6.19	20.53	20.49	26.74	21.38	14.43	18.72	15.26
Hydraulic Radius, R (ft)	1.154	0.063	0.601	0.569	0.769	1.137	0.384	1.126	0.397	1.042	1.171	1.376	1.002	0.601	0.917	0.664
Top Width, T (ft)	21.76	8.52	14.24	13.84	16.40	21.52	11.68	21.36	5.98	20.16	20.00	26.24	21.04	14.24	18.40	15.04
Hydraulic Depth, D (ft)	1.176	0.063	0.609	0.576	0.781	1.159	0.388	1.148	0.411	1.062	1.200	1.402	1.018	0.609	0.933	0.674
Froude Number (Q design)	0.198	0.308	0.703	0.813	0.507	0.223	0.132	0.260	0.247	0.334	0.264	0.267	0.540	0.171	0.216	0.427
Channel Shear Stress, τ_o (lb/ft^2)	0.28	0.16	0.91	1.04	0.69	0.32	0.12	0.38	0.25	0.49	0.39	0.42	0.81	0.19	0.29	0.54
Actual Sheer Stress, τ_d (lb/ft^2)	0.42	0.16	1.18	1.33	0.94	0.47	0.14	0.56	0.36	0.71	0.67	0.62	1.12	0.24	0.41	0.71
Mannings n	0.084	0.107	0.053	0.050	0.059	0.080	0.119	0.075	0.089	0.068	0.074	0.072	0.055	0.099	0.084	0.065
Average Velocity, V (ft/s)	1.21	0.45	3.13	3.51	2.57	1.35	0.47	1.59	0.89	1.96	1.67	1.81	3.10	0.75	1.19	2.01
Calculated Flow, Q (ft^3/s)	31.2	0.2	27.0	27.9	32.6	34.0	2.1	38.7	2.2	41.7	39.5	65.9	66.2	6.6	20.3	20.2
Difference Between Design & Calc. Flow (%)	0.9%	-2.0%	-0.4%	-0.3%	-0.9%	0.9%	-1.1%	-0.4%	1.1%	-0.5%	-1.3%	-0.8%	-0.1%	1.1%	-0.9%	-0.9%
Effective Shear on Soil Surface, τ_e (lb/ft^2)	0.002	0.000	0.011	0.014	0.007	0.002	0.000	0.003	0.001	0.004	0.003	0.003	0.009	0.001	0.001	0.004
Total Permissible Shear on Veg., $\tau_{p,veg}$ (lb/ft^2)	22.08	35.83	8.79	7.82	10.89	20.03	44.32	17.60	24.79	14.47	17.14	16.22	9.47	30.67	22.08	13.22
Stable (Y or N)	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Channel/Ditch Geometry	Swale S3.4 =	Swale S3.5 =	Swale S4.1 =	Swale S4.2 =	Swale S4.3 =	Swale S4.4 =	Swale S4.5 =	Swale S4.6 =	Swale S5.1 =	Swale S5.2 =	Roadside Ditch 1 =	Roadside Ditch 2 =	Roadside Ditch 3 =	Roadside Ditch 4 =	Roadside Ditch 5 =
Channel Slope, S_o (ft/ft)	0.0071	0.0024	0.0153	0.0127	0.0027	0.0040	0.0097	0.0112	0.0154	0.0331	0.0188	0.0162	0.0288	0.0090	0.0531
Channel Bottom Width, B (ft)	2.5	8	10	10	10	10	10	10	8	8	4	6	0	6	0
Channel Side Slope, z_1	2	4	4	4	4	4	4	4	4	4	3	10	4	10	4
Channel Side Slope, z_2	4	4	3	3	3	3	3	3	4	4	8	10	4	10	4
Flow Depth, d (ft) Solve iteratively	0.85	2.28	0.29	0.47	1.49	1.38	0.96	1.70	0.39	0.19	0.20	0.62	0.85	0.33	0.49
Safety Factor, SF	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Vegetation/Soil Parameters															
Vegetation Retardance Class	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Vegetation Condition	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good
Vegetation Growth Form	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf
Soil Type	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive
D_{75} (in) (Set at 0.00 for cohesive soils)															
ASTM Soil Class	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC
Plasticity Index, PI	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Results Summary															
Design Q (ft^3/s)	4.0	39.3	2.7	6.3	18.8	22.1	22.3	90.0	4.1	1.7	0.6	11.2	7.0	1.5	2.3
1. Swales geometry shown on the drawing se	4.0	39.4	2.8	6.3	18.6	22.2	22.6	90.0	4.0	1.7	0.6	11.0	7.0	1.5	2.3
Difference Between Design & Calc. Flow (%)	-0.1%	0.3%	0.4%	0.4%	-1.0%	0.7%	1.6%	0.0%	-0.2%	0.9%	-1.5%	-1.8%	0.6%	-1.7%	0.4%
Stable (Yes or No)	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Channel Parameters															
Vegetation Height, h (ft)	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Grass Roughness Coefficient, C_n	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238
Cover Factor, C_f	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Noncohesive Soil															
Soil Grain Roughness, n_s	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Permissible Soil Shear Stress, τ_p (lb/ft^2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cohesive Soil															
Porosity, e	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Soil Coefficient 1, c_1	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700
Soil Coefficient 2, c_2	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30
Soil Coefficient 3, c_3	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700
Soil Coefficient 4, c_4	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Soil Coefficient 5, c_5	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61
Soil Coefficient 6, c_6	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Permissible Soil Shear Stress, τ_p (lb/ft^2)	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
Total Permissible Shear Stress, τ_p (lb/ft^2)	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
Cross Sectional Area, A (ft^2)	4.293	39.034	3.194	5.473	22.670	20.465	12.826	27.115	3.673	1.617	0.989	7.564	2.856	3.069	0.960
Wetted Perimeter, P (ft)	7.91	26.80	12.11	13.42	20.86	20.05	16.99	22.39	11.17	9.53	6.19	18.46	6.97	12.63	4.04
Hydraulic Radius, R (ft)	0.543	1.456	0.264	0.408	1.087	1.021	0.755	1.211	0.329	0.170	0.160	0.410	0.410	0.243	0.238
Top Width, T (ft)	7.60	26.24	12.03	13.29	20.43	19.66	16.72	21.90	11.08	9.48	6.15	18.40	6.76	12.60	3.92
Hydraulic Depth, D (ft)	0.565	1.488	0.266	0.412	1.110	1.041	0.767	1.238	0.331	0.171	0.161	0.411	0.423	0.244	0.245
Froude Number (Q design)	0.218	0.146	0.295	0.317	0.137	0.187	0.355	0.526	0.337	0.461	0.267	0.399	0.664	0.174	0.838
Channel Shear Stress, τ_o (lb/ft^2)	0.24	0.22	0.25	0.32	0.18	0.25	0.46	0.85	0.32	0.35	0.19	0.41	0.74	0.14	0.79
Actual Sheer Stress, τ_d (lb/ft^2)	0.38	0.34	0.28	0.37	0.25	0.34	0.58	1.19	0.37	0.38	0.23	0.63	1.52	0.19	1.62
Mannings n	0.090	0.093	0.088	0.080	0.100	0.088	0.069	0.054	0.080	0.077	0.099	0.072	0.057	0.113	0.056
Average Velocity, V (ft/s)	0.93	1.01	0.86	1.15	0.83	1.08	1.74	3.32	1.10	1.07	0.62	1.48	2.43	0.50	2.34
Calculated Flow, Q (ft^3/s)	4.0	39.4	2.8	6.3	18.6	22.2	22.6	90.0	4.0	1.7	0.6	11.0	7.0	1.5	2.3
Difference Between Design & Calc. Flow (%)	-0.1%	0.3%	0.4%	0.4%	-1.0%	0.7%	1.6%	0.0%	-0.2%	0.9%	-1.5%	-1.8%	0.6%	-1.7%	0.4%
Effective Shear on Soil Surface, τ_e (lb/ft^2)	0.001	0.001	0.001	0.001	0.001	0.001	0.003	0.010	0.001	0.002	0.001	0.003	0.012	0.000	0.013
Total Permissible Shear on Veg., $\tau_{p,veg}$ (lb/ft^2)	25.35	27.07	24.24	20.03	31.30	24.24	14.90	9.13	20.03	18.56	30.67	16.22	10.17	39.96	9.81
Stable (Y or N)	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Source: Grass Lined Channel Design WisDOT Spreadsheet, FDM 13-30 Attachment 15.2

Channel Erosion Mat
(1053)

Wisconsin Department of Natural Resources
Conservation Practice Standard

To differentiate applications WisDOT organizes erosion mats into three classes of mats, which are further broken down into various Types.

A. **Class I**: A short-term duration (minimum of 6 months), light duty, organic ECRM with plastic or biodegradable netting.

1. **Type A** – Only suitable for slope applications, not channel applications.
2. **Type B** – Double netted product for use in channels where the calculated (design) shear stress is 1.5 lbs/ft^2 or less.

B. **Class II**: A long-term duration (three years or greater), organic ECRM.

1. **Type A** – Jute fiber only for use in channels to reinforce sod.
2. **Type B** – For use in channels where the calculated (design) shear stress is 2.0 lbs/ft^2 or less. Made with plastic or biodegradable mat.
3. **Type C** – A woven mat of 100% organic material for use in channels where the calculated (design) shear stress is 2.0 lbs/ft^2 or less. Applicable for use in environmentally sensitive areas where plastic netting is inappropriate.

C. **Class III**: A permanent 100% synthetic ECRM or TRM. Class I, Type B erosion mat or Class II, Type B or C erosion mat must be placed over a soil filled TRM.

1. **Type A** – An ECRM for use in channels where the calculated (design) shear stress of 2.0 lbs/ft^2 or less.
2. **Type B** – A TRM for use in channels where the calculated (design) shear stress of 2.0 lbs/ft^2 or less.
3. **Type C** – A TRM for use in channels where the calculated (design) shear stress of 3.5 lbs/ft^2 or less.
4. **Type D** – A TRM for use in channels where the calculated (design) shear stress of 5.0 lbs/ft^2 or less.

Culvert Sizing

SCS ENGINEERS

		Sheet No:	1/26
		Calc. No.	
		Rev. No.	3
Job No. 25222260.00	Job: Columbia Energy Center MOD 12	By: SJL	Date: 8/28/23
Client: WPL	Subject: Culvert Sizing	Chk'd: RJG	Date: 8/28/23

Purpose:

To size the post closure culverts to accommodate the 25-year, 24-hour storm event.

References:

1. HY-8 7.40 Computer Model
2. HydroCAD Report: COL_Mod12_HydroCAD Report
3. Figure 1 - Final Grades (Module 12)

Approach:

1. Create culvert crossing in HY-8 and input data from Reference #2 and #3.
2. Adjust diameter size and number of culverts in model until design flow does not over top berm/road crossing.

Assumptions:

1. Assume the tailwater channel data is a based on discharge swale or rock chute geometry (Reference #2).
2. Culverts are circular, PE Pipe with smooth interior, and with square edge with headwall.
3. Culvert elevatons,lengths, and slopes based on Figure 1 (Reference #3).
4. Roadway data for crossing based on Figure 1 (Reference #3).
5. Discharge flows from HydroCAD report (Refence #2).

Calculations:

See attached HY-8 Model output reports for C1 through C11

Results:

The culverts are adequately designed to accommodate the flows from the 25-year, 24-hour storm event.

Culvert	Dia. (ft)	# of Barrels	Upstream Invert (ft)	Downstream Invert (ft)	Slope (%)	Length (ft)
C1	2	1	815.70	814.55	2.22	52
C2a	1.5	2	817.60	814.00	4.83	75
C2b	1	2	818.00	817.60	1.00	40
C3	2.5	2	811.17	810.90	0.54	50
C4	2.5	2	809.86	809.60	0.52	50
C5	2.5	2	807.57	807.15	0.84	50
C6	2	2	805.40	804.76	0.61	105
C7	3.5	2	796.64	796.34	0.50	60
C8	1	1	810.70	808.60	2.45	86
C9	1	1	822.00	821.79	0.57	37
C10	2	1	807.54	806.81	0.73	100
C11	2.5	2	817.68	817.40	0.50	56

Culvert Data: Culvert C1

Site Data - Culvert C1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 815.70 ft

Outlet Station: 51.88 ft

Outlet Elevation: 814.55 ft

Number of Barrels: 1

Culvert Data Summary - Culvert C1

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 2 - Culvert Summary Table: Culvert C1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.60 cfs	0.60 cfs	816.05	0.35	0.287	1-S2n	0.18	0.27	0.18	0.29	4.28	1.23
0.74 cfs	0.74 cfs	816.09	0.39	0.310	1-S2n	0.20	0.29	0.20	0.31	4.64	1.29
0.87 cfs	0.87 cfs	816.13	0.43	0.331	1-JS1t	0.21	0.32	1.48	0.33	0.35	1.35
1.01 cfs	1.01 cfs	816.16	0.46	0.350	1-JS1t	0.23	0.35	1.50	0.35	0.40	1.40
1.14 cfs	1.14 cfs	816.19	0.49	0.368	1-S2n	0.24	0.37	0.24	0.36	5.29	1.44
1.28 cfs	1.28 cfs	816.22	0.52	0.385	1-JS1t	0.26	0.39	1.53	0.38	0.50	1.48
1.42 cfs	1.42 cfs	816.25	0.55	0.401	1-JS1t	0.27	0.41	1.54	0.39	0.54	1.52
1.55 cfs	1.55 cfs	816.28	0.58	0.416	1-JS1t	0.28	0.43	1.56	0.41	0.59	1.55
1.69 cfs	1.69 cfs	816.30	0.60	0.430	1-JS1t	0.29	0.45	1.57	0.42	0.64	1.59
1.82 cfs	1.82 cfs	816.33	0.63	0.444	1-JS1t	0.30	0.47	1.58	0.43	0.68	1.62
1.96 cfs	1.96 cfs	816.35	0.65	0.458	1-JS1t	0.31	0.49	1.60	0.45	0.73	1.65

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 815.70 ft,
  Outlet Elevation (invert): 814.55 ft

Culvert Length: 51.89 ft,
  Culvert Slope: 0.0222

Tailwater Data for Crossing: Culvert C1

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert C1)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.60	815.99	0.29	1.23	0.34	0.57
0.74	816.01	0.31	1.29	0.36	0.58
0.87	816.03	0.33	1.35	0.39	0.59

1.01	816.05	0.35	1.40	0.41	0.59
1.14	816.06	0.36	1.44	0.43	0.60
1.28	816.08	0.38	1.48	0.45	0.60
1.42	816.09	0.39	1.52	0.46	0.60
1.55	816.11	0.41	1.55	0.48	0.61
1.69	816.12	0.42	1.59	0.49	0.61
1.82	816.13	0.43	1.62	0.51	0.61
1.96	816.15	0.45	1.65	0.52	0.62

Tailwater Channel Data - Culvert C1

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 6.00 (_:1)

Channel Slope: 0.0188

Channel Manning's n: 0.0450

Channel Invert Elevation: 815.70 ft

Roadway Data for Crossing: Culvert C1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 50.00 ft

Crest Elevation: 819.06 ft

Roadway Surface: Gravel

Roadway Top Width: 30.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.60 cfs

Design Flow: 0.60 cfs

Maximum Flow: 1.96 cfs

Table 4 - Summary of Culvert Flows at Crossing: Culvert C1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert C1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
816.05	0.60	0.60	0.00	1
816.09	0.74	0.74	0.00	1
816.13	0.87	0.87	0.00	1
816.16	1.01	1.01	0.00	1
816.19	1.14	1.14	0.00	1
816.22	1.28	1.28	0.00	1
816.25	1.42	1.42	0.00	1
816.28	1.55	1.55	0.00	1
816.30	1.69	1.69	0.00	1
816.33	1.82	1.82	0.00	1
816.35	1.96	1.96	0.00	1
819.06	22.61	22.61	0.00	Overtopping

Culvert Data: C2a

Site Data - C2a

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 817.60 ft
Outlet Station: 74.54 ft
Outlet Elevation: 814.00 ft
Number of Barrels: 2

Culvert Data Summary - C2a

Barrel Shape: Circular
Barrel Diameter: 1.50 ft
Barrel Material: Smooth HDPE
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

Table 3 - Culvert Summary Table: C2a

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10.41 cfs	10.41 cfs	818.90	1.30	0.0*	1-S2n	0.46	0.88	0.46	0.52	11.19	1.99
11.12 cfs	11.12 cfs	818.96	1.36	0.0*	1-S2n	0.48	0.91	0.51	0.54	10.53	2.03
11.84 cfs	11.84 cfs	819.02	1.42	0.0*	1-S2n	0.50	0.94	0.52	0.56	10.95	2.07
12.55 cfs	12.55 cfs	819.08	1.48	0.0*	1-S2n	0.51	0.97	0.52	0.58	11.51	2.11
13.27 cfs	13.27 cfs	819.14	1.54	0.0*	5-S2n	0.53	1.00	0.53	0.60	11.98	2.14
13.98 cfs	13.98 cfs	819.20	1.60	0.0*	5-S2n	0.54	1.02	0.57	0.61	11.33	2.18
14.70 cfs	14.70 cfs	819.27	1.67	0.0*	5-S2n	0.56	1.05	0.58	0.63	11.54	2.21
15.41 cfs	15.41 cfs	819.33	1.73	0.0*	5-S2n	0.57	1.08	0.59	0.65	11.84	2.25
16.13 cfs	16.13 cfs	819.40	1.80	0.0*	5-S2n	0.59	1.10	0.60	0.66	12.17	2.28
16.84 cfs	16.77 cfs	819.47	1.87	0.0*	5-S2n	0.60	1.12	0.60	0.68	12.77	2.31
17.56 cfs	17.05 cfs	819.50	1.90	0.0*	5-S2n	0.60	1.13	0.60	0.70	12.83	2.34

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 817.60 ft,
Outlet Elevation (invert): 814.00 ft
Culvert Length: 74.63 ft,
Culvert Slope: 0.0483

Tailwater Data for Crossing: Culvert C2a

Table 5 - Downstream Channel Rating Curve (Crossing: Culvert C2a)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
10.41	814.52	0.52	1.99	0.16	0.53

11.12	814.54	0.54	2.03	0.17	0.54
11.84	814.56	0.56	2.07	0.17	0.54
12.55	814.58	0.58	2.11	0.18	0.54
13.27	814.60	0.60	2.14	0.19	0.54
13.98	814.61	0.61	2.18	0.19	0.55
14.70	814.63	0.63	2.21	0.20	0.55
15.41	814.65	0.65	2.25	0.20	0.55
16.13	814.66	0.66	2.28	0.21	0.55
16.84	814.68	0.68	2.31	0.21	0.55
17.56	814.70	0.70	2.34	0.22	0.55

Tailwater Channel Data - Culvert C2a

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0050

Channel Manning's n: 0.0300

Channel Invert Elevation: 814.00 ft

Roadway Data for Crossing: Culvert C2a

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 27.00 ft

Crest Elevation: 819.46 ft

Roadway Surface: Gravel

Roadway Top Width: 20.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 10.41 cfs

Design Flow: 10.41 cfs

Maximum Flow: 17.56 cfs

Table 6 - Summary of Culvert Flows at Crossing: Culvert C2a

Headwater Elevation (ft)	Total Discharge (cfs)	C2a Discharge (cfs)	Roadway Discharge (cfs)	Iterations
818.90	10.41	10.41	0.00	1
818.96	11.12	11.12	0.00	1
819.02	11.84	11.84	0.00	1
819.08	12.55	12.55	0.00	1
819.14	13.27	13.27	0.00	1
819.20	13.98	13.98	0.00	1
819.27	14.70	14.70	0.00	1
819.33	15.41	15.41	0.00	1
819.40	16.13	16.13	0.00	1
819.47	16.84	16.77	0.05	13
819.50	17.56	17.05	0.50	7
819.46	16.69	16.69	0.00	Overtopping

Culvert Data: C2b

Site Data - C2b

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 818.00 ft

Outlet Station: 40.00 ft

Outlet Elevation: 817.60 ft

Number of Barrels: 2

Culvert Data Summary - C2b

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Table 12 - Culvert Summary Table: C2b

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
3.50 cfs	3.50 cfs	819.00	0.84	1.002	1-S1f	0.47	0.56	1.00	0.20	2.23	1.98
3.73 cfs	3.73 cfs	819.04	0.88	1.035	1-S1f	0.49	0.58	1.00	0.21	2.37	2.03
3.95 cfs	3.95 cfs	819.07	0.91	1.070	1-S1f	0.51	0.60	1.00	0.22	2.52	2.07
4.18 cfs	4.18 cfs	819.11	0.95	1.106	1-S1f	0.52	0.62	1.00	0.22	2.66	2.11
4.40 cfs	4.40 cfs	819.14	0.98	1.143	1-S1f	0.54	0.63	1.00	0.23	2.80	2.15
4.63 cfs	4.63 cfs	819.18	1.01	1.183	1-S1f	0.56	0.65	1.00	0.24	2.95	2.19
4.86 cfs	4.86 cfs	819.22	1.05	1.223	4-FFf	0.57	0.67	1.00	0.24	3.09	2.23
5.08 cfs	5.08 cfs	819.27	1.09	1.266	4-FFf	0.59	0.68	1.00	0.25	3.24	2.26
5.31 cfs	5.31 cfs	819.31	1.13	1.310	4-FFf	0.61	0.70	1.00	0.26	3.38	2.30
5.53 cfs	5.53 cfs	819.36	1.16	1.356	4-FFf	0.63	0.71	1.00	0.26	3.52	2.33
5.76 cfs	5.76 cfs	819.40	1.20	1.403	4-FFf	0.64	0.73	1.00	0.27	3.67	2.36

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 818.00 ft,

Outlet Elevation (invert): 817.60 ft

Culvert Length: 40.00 ft,

Culvert Slope: 0.0100

Tailwater Data for Crossing: Culvert C2b

Table 23 - Downstream Channel Rating Curve (Crossing: Culvert C2b)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
3.50	818.80	0.20	1.98	0.19	0.81
3.73	818.81	0.21	2.03	0.20	0.82
3.95	818.82	0.22	2.07	0.21	0.82

4.18	818.82	0.22	2.11	0.21	0.83
4.40	818.83	0.23	2.15	0.22	0.83
4.63	818.84	0.24	2.19	0.23	0.83
4.86	818.84	0.24	2.23	0.23	0.84
5.08	818.85	0.25	2.26	0.24	0.84
5.31	818.86	0.26	2.30	0.25	0.84
5.53	818.86	0.26	2.33	0.25	0.85
5.76	818.87	0.27	2.36	0.26	0.85

Tailwater Channel Data - Culvert C2b

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0154

Channel Manning's n: 0.0300

Channel Invert Elevation: 818.60 ft

Roadway Data for Crossing: Culvert C2b

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 12.00 ft

Crest Elevation: 819.46 ft

Roadway Surface: Gravel

Roadway Top Width: 19.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 3.50 cfs

Design Flow: 3.50 cfs

Maximum Flow: 5.76 cfs

Table 24 - Summary of Culvert Flows at Crossing: Culvert C2b

Headwater Elevation (ft)	Total Discharge (cfs)	C2b Discharge (cfs)	Roadway Discharge (cfs)	Iterations
819.00	3.50	3.50	0.00	1
819.04	3.73	3.73	0.00	1
819.07	3.95	3.95	0.00	1
819.11	4.18	4.18	0.00	1
819.14	4.40	4.40	0.00	1
819.18	4.63	4.63	0.00	1
819.22	4.86	4.86	0.00	1
819.27	5.08	5.08	0.00	1
819.31	5.31	5.31	0.00	1
819.36	5.53	5.53	0.00	1
819.40	5.76	5.76	0.00	1
819.46	6.02	6.02	0.00	Overtopping

Culvert Data: C3

Site Data - C3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 811.17 ft

Outlet Station: 50.00 ft

Outlet Elevation: 810.90 ft

Number of Barrels: 2

Culvert Data Summary - C3

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 4 - Culvert Summary Table: C3

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
27.48 cfs	27.48 cfs	813.00	1.83	1.207	1-S2n	1.13	1.25	1.14	0.89	6.31	2.68
29.42 cfs	29.42 cfs	813.08	1.91	1.286	1-S2n	1.17	1.29	1.18	0.92	6.43	2.73
31.35 cfs	31.35 cfs	813.16	1.99	1.366	1-S2n	1.22	1.34	1.23	0.95	6.54	2.79
33.29 cfs	33.29 cfs	813.23	2.06	1.446	1-S2n	1.26	1.38	1.27	0.98	6.64	2.84
35.22 cfs	35.22 cfs	813.31	2.14	1.528	1-S2n	1.31	1.42	1.31	1.01	6.73	2.88
37.16 cfs	37.16 cfs	813.38	2.21	1.611	1-S2n	1.35	1.46	1.36	1.04	6.83	2.93
39.10 cfs	39.10 cfs	813.45	2.28	1.695	1-S2n	1.39	1.50	1.40	1.07	6.91	2.97
41.03 cfs	41.03 cfs	813.53	2.36	1.781	1-S2n	1.43	1.54	1.44	1.10	7.00	3.01
42.97 cfs	42.97 cfs	813.60	2.43	1.868	1-S2n	1.48	1.58	1.48	1.13	7.07	3.05
44.90 cfs	44.90 cfs	813.68	2.51	1.956	5-S2n	1.52	1.61	1.53	1.15	7.15	3.09
46.84 cfs	46.84 cfs	813.76	2.59	2.046	5-S2n	1.56	1.65	1.57	1.18	7.22	3.13

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 811.17 ft,

Outlet Elevation (invert): 810.90 ft

Culvert Length: 50.00 ft,

Culvert Slope: 0.0054

Tailwater Data for Crossing: Culvert C3

Table 7 - Downstream Channel Rating Curve (Crossing: Culvert C3)

Flow (cfs)	Water Surface	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number

	Elev (ft)				
27.48	812.06	0.89	2.68	0.28	0.57
29.42	812.10	0.92	2.73	0.29	0.58
31.35	812.13	0.95	2.79	0.30	0.58
33.29	812.16	0.98	2.84	0.31	0.58
35.22	812.19	1.01	2.88	0.32	0.58
37.16	812.22	1.04	2.93	0.33	0.59
39.10	812.25	1.07	2.97	0.33	0.59
41.03	812.27	1.10	3.01	0.34	0.59
42.97	812.30	1.13	3.05	0.35	0.59
44.90	812.33	1.15	3.09	0.36	0.59
46.84	812.35	1.18	3.13	0.37	0.60

Tailwater Channel Data - Culvert C3

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0050

Channel Manning's n: 0.0300

Channel Invert Elevation: 811.17 ft

Roadway Data for Crossing: Culvert C3

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 29.00 ft

Crest Elevation: 813.80 ft

Roadway Surface: Gravel

Roadway Top Width: 30.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 27.48 cfs

Design Flow: 27.48 cfs

Maximum Flow: 46.84 cfs

Table 8 - Summary of Culvert Flows at Crossing: Culvert C3

Headwater Elevation (ft)	Total Discharge	C3 Discharge (cfs)	Roadway Discharge	Iterations

	(cfs)		(cfs)	
813.00	27.48	27.48	0.00	1
813.08	29.42	29.42	0.00	1
813.16	31.35	31.35	0.00	1
813.23	33.29	33.29	0.00	1
813.31	35.22	35.22	0.00	1
813.38	37.16	37.16	0.00	1
813.45	39.10	39.10	0.00	1
813.53	41.03	41.03	0.00	1
813.60	42.97	42.97	0.00	1
813.68	44.90	44.90	0.00	1
813.76	46.84	46.84	0.00	1
813.80	47.92	47.92	0.00	Overtopping

Culvert Data: C4

Site Data - C4

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 809.86 ft

Outlet Station: 50.00 ft

Outlet Elevation: 809.60 ft

Number of Barrels: 2

Culvert Data Summary - C4

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Table 7 - Culvert Summary Table: C4

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
32.85 cfs	32.85 cfs	811.91	2.05	1.438	1-S2n	1.27	1.37	1.27	0.89	6.53	3.18
35.37 cfs	35.37 cfs	812.00	2.14	1.544	1-S2n	1.32	1.42	1.33	0.93	6.66	3.25
37.89 cfs	37.89 cfs	812.10	2.24	1.653	1-S2n	1.38	1.48	1.39	0.96	6.77	3.32
40.41 cfs	40.41 cfs	812.20	2.34	1.763	1-S2n	1.44	1.53	1.44	1.00	6.88	3.38
42.93 cfs	42.93 cfs	812.29	2.43	1.876	1-S2n	1.50	1.57	1.50	1.03	6.98	3.44
45.45 cfs	45.45 cfs	812.39	2.53	1.991	5-S2n	1.55	1.62	1.56	1.06	7.07	3.50
47.96 cfs	47.96 cfs	812.49	2.63	2.108	5-S2n	1.61	1.67	1.61	1.09	7.15	3.55
50.48 cfs	50.48 cfs	812.60	2.74	2.228	5-S2n	1.67	1.71	1.67	1.12	7.24	3.61
53.00 cfs	53.00 cfs	812.70	2.84	2.350	5-S2n	1.73	1.75	1.73	1.15	7.31	3.66
55.52 cfs	55.52 cfs	812.81	2.95	2.475	5-S2n	1.79	1.80	1.79	1.18	7.36	3.71
58.04 cfs	58.04 cfs	813.00	3.07	3.139	7-M2c	1.86	1.84	1.84	1.21	7.51	3.75

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 809.86 ft,

Outlet Elevation (invert): 809.60 ft

Culvert Length: 50.00 ft,

Culvert Slope: 0.0052

Tailwater Data for Crossing: Culvert C4

Table 13 - Downstream Channel Rating Curve (Crossing: Culvert C4)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
32.85	810.76	0.89	3.18	0.39	0.68
35.37	810.80	0.93	3.25	0.41	0.68
37.89	810.83	0.96	3.32	0.42	0.69

40.41	810.86	1.00	3.38	0.44	0.69
42.93	810.90	1.03	3.44	0.45	0.69
45.45	810.93	1.06	3.50	0.46	0.69
47.96	810.96	1.09	3.55	0.48	0.70
50.48	810.99	1.12	3.61	0.49	0.70
53.00	811.02	1.15	3.66	0.50	0.70
55.52	811.05	1.18	3.71	0.51	0.70
58.04	811.07	1.21	3.75	0.53	0.71

Tailwater Channel Data - Culvert C4

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0070

Channel Manning's n: 0.0300

Channel Invert Elevation: 809.87 ft

Roadway Data for Crossing: Culvert C4

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 29.00 ft

Crest Elevation: 813.14 ft

Roadway Surface: Gravel

Roadway Top Width: 30.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 32.85 cfs

Design Flow: 32.85 cfs

Maximum Flow: 58.04 cfs

Table 14 - Summary of Culvert Flows at Crossing: Culvert C4

Headwater Elevation (ft)	Total Discharge (cfs)	C4 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
811.91	32.85	32.85	0.00	1
812.00	35.37	35.37	0.00	1
812.10	37.89	37.89	0.00	1
812.20	40.41	40.41	0.00	1
812.29	42.93	42.93	0.00	1
812.39	45.45	45.45	0.00	1
812.49	47.96	47.96	0.00	1
812.60	50.48	50.48	0.00	1
812.70	53.00	53.00	0.00	1
812.81	55.52	55.52	0.00	1
813.00	58.04	58.04	0.00	1
813.14	62.27	62.27	0.00	Overtopping

Culvert Data: C5

Site Data - C5

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 807.57 ft

Outlet Station: 50.00 ft

Outlet Elevation: 807.15 ft

Number of Barrels: 2

Culvert Data Summary - C5

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Table 8 - Culvert Summary Table: C5

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
38.11 cfs	38.11 cfs	809.81	2.24	1.502	1-S2n	1.20	1.48	1.25	1.06	7.80	2.95
41.03 cfs	41.03 cfs	809.92	2.35	1.631	1-S2n	1.25	1.54	1.30	1.10	7.94	3.01
43.94 cfs	43.94 cfs	810.04	2.47	1.762	1-S2n	1.31	1.59	1.36	1.14	8.08	3.07
46.86 cfs	46.86 cfs	810.15	2.58	1.897	5-S2n	1.36	1.65	1.41	1.18	8.22	3.13
49.78 cfs	49.78 cfs	810.27	2.70	2.034	5-S2n	1.41	1.70	1.46	1.22	8.34	3.18
52.70 cfs	52.70 cfs	810.40	2.83	2.175	5-S2n	1.46	1.75	1.51	1.25	8.47	3.24
55.61 cfs	55.61 cfs	810.52	2.95	2.320	5-S2n	1.51	1.80	1.57	1.29	8.59	3.29
58.53 cfs	58.53 cfs	810.66	3.09	2.468	5-S2n	1.57	1.84	1.62	1.32	8.71	3.33
61.45 cfs	61.45 cfs	810.80	3.23	2.925	5-S2n	1.62	1.89	1.67	1.35	8.82	3.38
64.36 cfs	63.52 cfs	810.90	3.33	3.019	5-S2n	1.66	1.92	1.71	1.39	8.89	3.42
67.28 cfs	64.67 cfs	810.96	3.39	3.072	5-S2n	1.68	1.94	1.73	1.42	8.94	3.47

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 807.57 ft,
  Outlet Elevation (invert): 807.15 ft

Culvert Length: 50.00 ft,
  Culvert Slope: 0.0084

Tailwater Data for Crossing: Culvert C5

Table 15 - Downstream Channel Rating Curve (Crossing: Culvert C5)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
38.11	808.63	1.06	2.95	0.33	0.59
41.03	808.67	1.10	3.01	0.34	0.59
43.94	808.71	1.14	3.07	0.36	0.59

46.86	808.75	1.18	3.13	0.37	0.60
49.78	808.79	1.22	3.18	0.38	0.60
52.70	808.82	1.25	3.24	0.39	0.60
55.61	808.86	1.29	3.29	0.40	0.60
58.53	808.89	1.32	3.33	0.41	0.60
61.45	808.92	1.35	3.38	0.42	0.61
64.36	808.96	1.39	3.42	0.43	0.61
67.28	808.99	1.42	3.47	0.44	0.61

Tailwater Channel Data - Culvert C5

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0050

Channel Manning's n: 0.0300

Channel Invert Elevation: 807.57 ft

Roadway Data for Crossing: Culvert C5

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 28.00 ft

Crest Elevation: 810.85 ft

Roadway Surface: Gravel

Roadway Top Width: 20.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 38.11 cfs

Design Flow: 38.11 cfs

Maximum Flow: 67.28 cfs

Table 16 - Summary of Culvert Flows at Crossing: Culvert C5

Headwater Elevation (ft)	Total Discharge (cfs)	C5 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
809.81	38.11	38.11	0.00	1
809.92	41.03	41.03	0.00	1
810.04	43.94	43.94	0.00	1
810.15	46.86	46.86	0.00	1
810.27	49.78	49.78	0.00	1
810.40	52.70	52.70	0.00	1
810.52	55.61	55.61	0.00	1
810.66	58.53	58.53	0.00	1
810.80	61.45	61.45	0.00	1
810.90	64.36	63.52	0.81	10
810.96	67.28	64.67	2.58	7
810.85	62.52	62.52	0.00	Overtopping

Culvert Data: C6

Site Data - C6

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 805.40 ft

Outlet Station: 104.56 ft

Outlet Elevation: 804.76 ft

Number of Barrels: 2

Culvert Data Summary - C6

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Mitered to Conform to Slope

Inlet Depression: None

Table 1 - Culvert Summary Table: C6

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
30.03 cfs	30.03 cfs	807.77	2.37	1.750	5-S2n	1.33	1.40	1.33	0.80	6.77	3.22
32.28 cfs	32.28 cfs	807.95	2.55	1.956	5-S2n	1.40	1.45	1.41	0.84	6.84	3.30
34.53 cfs	34.53 cfs	808.15	2.75	2.170	5-S2n	1.48	1.50	1.48	0.87	6.92	3.38
36.77 cfs	36.77 cfs	808.36	2.96	2.848	7-M2c	1.57	1.54	1.54	0.90	7.07	3.45
39.02 cfs	38.66 cfs	808.54	3.14	2.934	7-M2c	1.65	1.58	1.58	0.93	7.26	3.52
41.27 cfs	39.50 cfs	808.63	3.23	2.974	7-M2c	1.70	1.60	1.60	0.97	7.35	3.58
43.52 cfs	40.15 cfs	808.69	3.29	3.007	7-M2c	1.74	1.61	1.61	1.00	7.41	3.65
45.77 cfs	40.72 cfs	808.75	3.35	3.037	7-M2c	1.78	1.62	1.62	1.02	7.47	3.71
48.01 cfs	41.23 cfs	808.81	3.41	3.066	7-M2c	2.00	1.63	1.63	1.05	7.53	3.77
50.26 cfs	41.69 cfs	808.86	3.46	3.094	7-M2c	2.00	1.64	1.64	1.08	7.58	3.82
52.51 cfs	42.13 cfs	808.91	3.51	3.122	7-M2c	2.00	1.64	1.64	1.11	7.62	3.88

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 805.40 ft,

Outlet Elevation (invert): 804.76 ft

Culvert Length: 104.56 ft,

Culvert Slope: 0.0061

Tailwater Data for Crossing: Culvert C6

Table 1 - Downstream Channel Rating Curve (Crossing: Culvert C6)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
30.03	805.36	0.80	3.22	0.35	0.68
32.28	805.40	0.84	3.30	0.37	0.68
34.53	805.43	0.87	3.38	0.38	0.68
36.77	805.46	0.90	3.45	0.39	0.69

39.02	805.49	0.93	3.52	0.41	0.69
41.27	805.53	0.97	3.58	0.42	0.69
43.52	805.56	1.00	3.65	0.43	0.70
45.77	805.58	1.02	3.71	0.45	0.70
48.01	805.61	1.05	3.77	0.46	0.70
50.26	805.64	1.08	3.82	0.47	0.70
52.51	805.67	1.11	3.88	0.48	0.71

Tailwater Channel Data - Culvert C6

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0070

Channel Manning's n: 0.0300

Channel Invert Elevation: 804.56 ft

Roadway Data for Crossing: Culvert C6

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 15.00 ft

Crest Elevation: 808.50 ft

Roadway Surface: Gravel

Roadway Top Width: 100.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 30.03 cfs

Design Flow: 30.03cfs

Maximum Flow: 52.51 cfs

Table 2 - Summary of Culvert Flows at Crossing: Culvert C6

Headwater Elevation (ft)	Total Discharge (cfs)	C6 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
807.77	30.03	30.03	0.00	1
807.95	32.28	32.28	0.00	1
808.15	34.53	34.53	0.00	1
808.36	36.77	36.77	0.00	1
808.54	39.02	38.66	0.34	12
808.63	41.27	39.50	1.75	8
808.69	43.52	40.15	3.35	7
808.75	45.77	40.72	5.03	6
808.81	48.01	41.23	6.78	6
808.86	50.26	41.69	8.56	5
808.91	52.51	42.13	10.37	5
808.50	38.24	38.24	0.00	Overtopping

Culvert Data: C7

Site Data - C7

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 796.64 ft

Outlet Station: 60.20 ft

Outlet Elevation: 796.34 ft

Number of Barrels: 2

Culvert Data Summary - C7

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 5 - Culvert Summary Table: C7

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
68.10 cfs	68.10 cfs	799.54	2.62	2.904	2-M2c	2.56	1.81	1.81	1.09	6.79	4.35
73.79 cfs	73.79 cfs	799.69	2.75	3.048	2-M2c	2.74	1.89	1.89	1.14	6.98	4.46
79.48 cfs	79.48 cfs	799.83	2.89	3.191	2-M2c	2.98	1.96	1.96	1.18	7.17	4.56
85.17 cfs	85.17 cfs	799.97	3.02	3.334	2-M2c	3.50	2.03	2.03	1.23	7.35	4.65
90.86 cfs	90.86 cfs	800.12	3.15	3.477	2-M2c	3.50	2.10	2.10	1.27	7.53	4.74
96.54 cfs	96.54 cfs	800.26	3.29	3.620	7-M2c	3.50	2.17	2.17	1.31	7.71	4.82
102.23 cfs	102.23 cfs	800.41	3.43	3.765	7-M2c	3.50	2.24	2.24	1.35	7.88	4.90
107.92 cfs	107.92 cfs	800.55	3.57	3.913	7-M2c	3.50	2.30	2.30	1.39	8.06	4.98
113.61 cfs	113.61 cfs	800.71	3.71	4.065	7-M2c	3.50	2.36	2.36	1.43	8.23	5.06
119.30 cfs	119.30 cfs	800.86	3.85	4.224	7-M2c	3.50	2.42	2.42	1.47	8.41	5.13
124.99 cfs	124.99 cfs	801.03	4.00	4.393	7-M2c	3.50	2.48	2.48	1.50	8.58	5.20

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 796.64 ft,

Outlet Elevation (invert): 796.34 ft

Culvert Length: 60.20 ft,

Culvert Slope: 0.0050

Tailwater Data for Crossing: Culvert C7

Table 9 - Downstream Channel Rating Curve (Crossing: Culvert C7)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
68.10	796.69	1.09	4.35	0.68	0.84

73.79	796.74	1.14	4.46	0.71	0.84
79.48	796.78	1.18	4.56	0.74	0.85
85.17	796.83	1.23	4.65	0.77	0.85
90.86	796.87	1.27	4.74	0.79	0.86
96.54	796.91	1.31	4.82	0.82	0.86
102.23	796.95	1.35	4.90	0.84	0.86
107.92	796.99	1.39	4.98	0.87	0.87
113.61	797.03	1.43	5.06	0.89	0.87
119.30	797.07	1.47	5.13	0.92	0.87
124.99	797.10	1.50	5.20	0.94	0.88

Tailwater Channel Data - Culvert C7

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0100

Channel Manning's n: 0.0300

Channel Invert Elevation: 795.60 ft

Roadway Data for Crossing: Culvert C7

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 50.00 ft

Crest Elevation: 802.50 ft

Roadway Surface: Gravel

Roadway Top Width: 60.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 68.10 cfs

Design Flow: 68.10 cfs

Maximum Flow: 124.99 cfs

Table 10 - Summary of Culvert Flows at Crossing: Culvert C7

Headwater Elevation (ft)	Total Discharge (cfs)	C7 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
799.54	68.10	68.10	0.00	1
799.69	73.79	73.79	0.00	1
799.83	79.48	79.48	0.00	1
799.97	85.17	85.17	0.00	1
800.12	90.86	90.86	0.00	1
800.26	96.54	96.54	0.00	1
800.41	102.23	102.23	0.00	1
800.55	107.92	107.92	0.00	1
800.71	113.61	113.61	0.00	1
800.86	119.30	119.30	0.00	1
801.03	124.99	124.99	0.00	1
802.50	162.83	162.83	0.00	Overtopping

Culvert Data: C8

Site Data - C8

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 810.70 ft

Outlet Station: 85.63 ft

Outlet Elevation: 808.60 ft

Number of Barrels: 1

Culvert Data Summary - C8

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 6 - Culvert Summary Table: C8

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.96 cfs	0.96 cfs	811.27	0.57	0.315	1-JS1f	0.27	0.41	1.00	0.23	1.22	1.44
1.02 cfs	1.02 cfs	811.30	0.60	0.335	1-JS1f	0.28	0.43	1.00	0.24	1.30	1.47
1.09 cfs	1.09 cfs	811.32	0.62	0.356	1-JS1f	0.29	0.44	1.00	0.24	1.39	1.49
1.15 cfs	1.15 cfs	811.34	0.64	0.377	1-JS1f	0.30	0.45	1.00	0.25	1.47	1.52
1.22 cfs	1.22 cfs	811.37	0.67	0.399	1-JS1f	0.30	0.47	1.00	0.26	1.55	1.55
1.28 cfs	1.28 cfs	811.39	0.69	0.421	1-JS1f	0.31	0.48	1.00	0.27	1.63	1.57
1.34 cfs	1.34 cfs	811.41	0.71	0.444	1-JS1f	0.32	0.49	1.00	0.27	1.71	1.59
1.41 cfs	1.41 cfs	811.43	0.73	0.467	1-JS1f	0.33	0.50	1.00	0.28	1.79	1.61
1.47 cfs	1.47 cfs	811.45	0.75	0.492	1-JS1f	0.34	0.51	1.00	0.29	1.87	1.63
1.54 cfs	1.54 cfs	811.47	0.77	0.516	1-JS1f	0.34	0.53	1.00	0.29	1.96	1.65
1.60 cfs	1.60 cfs	811.49	0.79	0.542	1-JS1f	0.35	0.54	1.00	0.30	2.04	1.67

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 810.70 ft,

Outlet Elevation (invert): 808.60 ft

Culvert Length: 85.63 ft,

Culvert Slope: 0.0245

Tailwater Data for Crossing: Culvert C8

Table 11 - Downstream Channel Rating Curve (Crossing: Culvert C8)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.96	810.93	0.23	1.44	0.29	0.61
1.02	810.94	0.24	1.47	0.30	0.61
1.09	810.94	0.24	1.49	0.31	0.61

1.15	810.95	0.25	1.52	0.31	0.62
1.22	810.96	0.26	1.55	0.32	0.62
1.28	810.97	0.27	1.57	0.33	0.62
1.34	810.97	0.27	1.59	0.34	0.62
1.41	810.98	0.28	1.61	0.35	0.63
1.47	810.99	0.29	1.63	0.36	0.63
1.54	810.99	0.29	1.65	0.37	0.63
1.60	811.00	0.30	1.67	0.37	0.63

Tailwater Channel Data - Culvert C8

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 2.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0450

Channel Invert Elevation: 810.70 ft

Roadway Data for Crossing: Culvert C8

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 50.00 ft

Crest Elevation: 824.00 ft

Roadway Surface: Paved

Roadway Top Width: 24.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.96 cfs

Design Flow: 0.96 cfs

Maximum Flow: 1.60 cfs

Table 12 - Summary of Culvert Flows at Crossing: Culvert C8

Headwater Elevation (ft)	Total Discharge (cfs)	C8 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
811.27	0.96	0.96	0.00	1
811.30	1.02	1.02	0.00	1
811.32	1.09	1.09	0.00	1
811.34	1.15	1.15	0.00	1
811.37	1.22	1.22	0.00	1
811.39	1.28	1.28	0.00	1
811.41	1.34	1.34	0.00	1
811.43	1.41	1.41	0.00	1
811.45	1.47	1.47	0.00	1
811.47	1.54	1.54	0.00	1
811.49	1.60	1.60	0.00	1
824.00	11.48	11.48	0.00	Overtopping

Culvert Data: C9

Site Data - C9

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 822.00 ft

Outlet Station: 36.70 ft

Outlet Elevation: 821.79 ft

Number of Barrels: 1

Culvert Data Summary - C9

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 9 - Culvert Summary Table: C9

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.22 cfs	0.22 cfs	822.26	0.26	0.072	1-JS1t	0.19	0.19	0.28	0.07	1.23	0.38
0.26 cfs	0.26 cfs	822.28	0.28	0.080	1-JS1t	0.20	0.21	0.29	0.08	1.39	0.41
0.30 cfs	0.30 cfs	822.31	0.31	0.088	1-JS1t	0.22	0.22	0.29	0.08	1.55	0.43
0.34 cfs	0.34 cfs	822.33	0.33	0.096	1-JS1t	0.23	0.24	0.30	0.09	1.71	0.45
0.38 cfs	0.38 cfs	822.35	0.35	0.104	1-S2n	0.24	0.25	0.24	0.10	2.56	0.47
0.42 cfs	0.42 cfs	822.36	0.36	0.112	1-JS1t	0.25	0.27	0.31	0.10	1.99	0.49
0.45 cfs	0.45 cfs	822.38	0.38	0.119	1-JS1t	0.27	0.28	0.32	0.11	2.13	0.51
0.49 cfs	0.49 cfs	822.40	0.40	0.127	1-JS1t	0.28	0.29	0.32	0.11	2.26	0.52
0.53 cfs	0.53 cfs	822.41	0.41	0.135	1-S2n	0.29	0.30	0.29	0.12	2.83	0.54
0.57 cfs	0.57 cfs	822.43	0.43	0.142	1-S2n	0.30	0.31	0.30	0.12	2.89	0.55
0.61 cfs	0.61 cfs	822.45	0.45	0.150	1-S2n	0.31	0.32	0.31	0.13	2.94	0.57

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 822.00 ft,

Outlet Elevation (invert): 821.79 ft

Culvert Length: 36.70 ft,

Culvert Slope: 0.0057

Tailwater Data for Crossing: Culvert C9

Table 17 - Downstream Channel Rating Curve (Crossing: Culvert C9)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.22	822.07	0.07	0.38	0.02	0.26
0.26	822.08	0.08	0.41	0.02	0.27
0.30	822.08	0.08	0.43	0.03	0.27

0.34	822.09	0.09	0.45	0.03	0.27
0.38	822.10	0.10	0.47	0.03	0.28
0.42	822.10	0.10	0.49	0.03	0.28
0.45	822.11	0.11	0.51	0.03	0.28
0.49	822.11	0.11	0.52	0.03	0.28
0.53	822.12	0.12	0.54	0.04	0.28
0.57	822.12	0.12	0.55	0.04	0.29
0.61	822.13	0.13	0.57	0.04	0.29

Tailwater Channel Data - Culvert C9

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0050

Channel Manning's n: 0.0450

Channel Invert Elevation: 822.00 ft

Roadway Data for Crossing: Culvert C9

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 50.00 ft

Crest Elevation: 824.00 ft

Roadway Surface: Paved

Roadway Top Width: 24.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.22 cfs

Design Flow: 0.22 cfs

Maximum Flow: 0.61 cfs

Table 18 - Summary of Culvert Flows at Crossing: Culvert C9

Headwater Elevation (ft)	Total Discharge (cfs)	C9 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
822.26	0.22	0.22	0.00	1
822.28	0.26	0.26	0.00	1
822.31	0.30	0.30	0.00	1
822.33	0.34	0.34	0.00	1
822.35	0.38	0.38	0.00	1
822.36	0.42	0.42	0.00	1
822.38	0.45	0.45	0.00	1
822.40	0.49	0.49	0.00	1
822.41	0.53	0.53	0.00	1
822.43	0.57	0.57	0.00	1
822.45	0.61	0.61	0.00	1
824.00	4.50	4.50	0.00	Overtopping

Culvert Data: C10

Site Data - C10

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 807.54 ft
Outlet Station: 99.86 ft
Outlet Elevation: 806.81 ft
Number of Barrels: 1

Culvert Data Summary - C10

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting
Inlet Depression: None

Table 10 - Culvert Summary Table: C10

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
11.21 cfs	11.21 cfs	809.68	1.98	2.141	7-M2c	2.00	1.20	1.20	0.27	5.69	2.88
12.14 cfs	12.14 cfs	809.83	2.11	2.288	7-M2c	2.00	1.25	1.25	0.28	5.87	2.96
13.08 cfs	13.08 cfs	810.00	2.24	2.465	7-M2c	2.00	1.30	1.30	0.29	6.04	3.03
14.01 cfs	14.01 cfs	810.29	2.38	2.747	7-M2c	2.00	1.35	1.35	0.30	6.22	3.10
14.95 cfs	14.95 cfs	810.59	2.52	3.054	7-M2c	2.00	1.39	1.39	0.31	6.40	3.17
15.88 cfs	15.88 cfs	810.91	2.67	3.374	7-M2c	2.00	1.44	1.44	0.32	6.57	3.23
16.81 cfs	16.81 cfs	811.25	2.83	3.710	7-M2c	2.00	1.48	1.48	0.33	6.75	3.29
17.75 cfs	17.75 cfs	811.57	3.00	4.030	7-M2c	2.00	1.52	1.52	0.34	6.94	3.35
18.68 cfs	18.68 cfs	811.93	3.18	4.386	7-M2c	2.00	1.56	1.56	0.35	7.13	3.40
19.62 cfs	19.62 cfs	812.30	3.36	4.762	7-M2c	2.00	1.59	1.59	0.36	7.32	3.46
20.55 cfs	20.55 cfs	812.69	3.56	5.146	7-M2c	2.00	1.63	1.63	0.37	7.51	3.51

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 807.54 ft,
Outlet Elevation (invert): 806.81 ft
Culvert Length: 99.86 ft,
Culvert Slope: 0.0073

Tailwater Data for Crossing: Culvert C10

Table 19 - Downstream Channel Rating Curve (Crossing: Culvert C10)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
11.21	807.81	0.27	2.88	0.93	1.07
12.14	807.82	0.28	2.96	0.97	1.08
13.08	807.83	0.29	3.03	1.01	1.09

14.01	807.84	0.30	3.10	1.05	1.09
14.95	807.85	0.31	3.17	1.09	1.10
15.88	807.86	0.32	3.23	1.13	1.10
16.81	807.87	0.33	3.29	1.16	1.11
17.75	807.88	0.34	3.35	1.20	1.11
18.68	807.89	0.35	3.40	1.24	1.12
19.62	807.90	0.36	3.46	1.27	1.12
20.55	807.91	0.37	3.51	1.30	1.13

Tailwater Channel Data - Culvert C10

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 12.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0560

Channel Manning's n: 0.0450

Channel Invert Elevation: 807.54 ft

Roadway Data for Crossing: Culvert C10

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 50.00 ft

Crest Elevation: 812.87 ft

Roadway Surface: Paved

Roadway Top Width: 24.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 11.21 cfs

Design Flow: 11.21 cfs

Maximum Flow: 20.55 cfs

Table 20 - Summary of Culvert Flows at Crossing: Culvert C10

Headwater Elevation (ft)	Total Discharge (cfs)	C10 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
809.68	11.21	11.21	0.00	1
809.83	12.14	12.14	0.00	1
810.00	13.08	13.08	0.00	1
810.29	14.01	14.01	0.00	1
810.59	14.95	14.95	0.00	1
810.91	15.88	15.88	0.00	1
811.25	16.81	16.81	0.00	1
811.57	17.75	17.75	0.00	1
811.93	18.68	18.68	0.00	1
812.30	19.62	19.62	0.00	1
812.69	20.55	20.55	0.00	1
812.87	21.01	21.01	0.00	Overtopping

Culvert Data: C11

Site Data - C11

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 817.68 ft

Outlet Station: 56.00 ft

Outlet Elevation: 817.40 ft

Number of Barrels: 2

Culvert Data Summary - C11

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 11 - Culvert Summary Table: C11

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
26.46 cfs	26.46 cfs	819.47	1.79	1.298	1-S2n	1.13	1.22	1.13	1.08	6.11	1.99
28.28 cfs	28.28 cfs	819.55	1.87	1.367	1-S2n	1.17	1.27	1.18	1.12	6.21	2.03
30.09 cfs	30.09 cfs	819.62	1.94	1.438	1-S2n	1.22	1.31	1.22	1.15	6.31	2.06
31.91 cfs	31.91 cfs	819.69	2.01	1.509	1-S2n	1.26	1.35	1.26	1.19	6.41	2.10
33.73 cfs	33.73 cfs	819.76	2.08	1.581	1-S2n	1.30	1.39	1.31	1.23	6.50	2.13
35.55 cfs	35.55 cfs	819.83	2.15	1.654	1-S2n	1.34	1.43	1.35	1.26	6.58	2.17
37.36 cfs	37.36 cfs	819.90	2.22	1.728	1-S2n	1.39	1.46	1.39	1.29	6.66	2.20
39.18 cfs	39.18 cfs	819.97	2.29	1.803	1-S2n	1.43	1.50	1.43	1.32	6.74	2.23
41.00 cfs	41.00 cfs	820.04	2.36	1.880	1-S2n	1.47	1.54	1.47	1.36	6.81	2.25
42.81 cfs	42.81 cfs	820.11	2.43	1.958	1-S2n	1.51	1.57	1.51	1.39	6.88	2.28
44.63 cfs	44.63 cfs	820.18	2.50	2.037	1-S2n	1.55	1.61	1.56	1.42	6.94	2.31

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 817.68 ft,
Outlet Elevation (invert): 817.40 ft

Culvert Length: 56.00 ft,
Culvert Slope: 0.0050

Tailwater Data for Crossing: Culvert C11

Table 21 - Downstream Channel Rating Curve (Crossing: Culvert C11)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
26.46	818.76	1.08	1.99	0.34	0.39
28.28	818.80	1.12	2.03	0.35	0.39
30.09	818.83	1.15	2.06	0.36	0.40

31.91	818.87	1.19	2.10	0.37	0.40
33.73	818.91	1.23	2.13	0.38	0.40
35.55	818.94	1.26	2.17	0.39	0.40
37.36	818.97	1.29	2.20	0.40	0.40
39.18	819.00	1.32	2.23	0.41	0.40
41.00	819.04	1.36	2.25	0.42	0.40
42.81	819.07	1.39	2.28	0.43	0.41
44.63	819.10	1.42	2.31	0.44	0.41

Tailwater Channel Data - Culvert C11

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0050

Channel Manning's n: 0.0450

Channel Invert Elevation: 817.68 ft

Roadway Data for Crossing: Culvert C11

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 50.00 ft

Crest Elevation: 821.40 ft

Roadway Surface: Paved

Roadway Top Width: 24.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 26.46 cfs

Design Flow: 26.46 cfs

Maximum Flow: 44.63 cfs

Table 22 - Summary of Culvert Flows at Crossing: Culvert C11

Headwater Elevation (ft)	Total Discharge (cfs)	C11 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
819.47	26.46	26.46	0.00	1
819.55	28.28	28.28	0.00	1
819.62	30.09	30.09	0.00	1
819.69	31.91	31.91	0.00	1
819.76	33.73	33.73	0.00	1
819.83	35.55	35.55	0.00	1
819.90	37.36	37.36	0.00	1
819.97	39.18	39.18	0.00	1
820.04	41.00	41.00	0.00	1
820.11	42.81	42.81	0.00	1
820.18	44.63	44.63	0.00	1
821.40	70.72	70.72	0.00	Overtopping

Diversion Berm Sizing

SCS ENGINEERS

		Sheet No:	1 of 3
		Calc. No.	
		Rev. No.	
Job No. 25222260.00	Project: Columbia Energy Center MOD 12	By: SJL	Date: 8/22/23
Client: WPL	Subject: Diversion Berm Sizing	Chk'd: RJG	Date: 8/24/23

Purpose:

To size the post closure diversion berms on the final cover to accommodate the 25-year, 24-hour storm event.

References:

1. WisDOT Facilities Development Manual Chapter 13, Section 30-15 - Grass Lined Channels.
2. Design of Roadside Channels with Flexible Linings, HEC-15, USDOT FHWA.
3. HydroCAD Report: COL_Mod12_HydroCAD Report
4. Wisconsin Department of Natural Resources Conservation Practice Standard 1053 - Channel Erosion Mat.

Approach:

Use the Post Closure HydroCAD Model results to obtain the peak flow during a 25-year, 24-hour storm event along the diversion berms.

Use Grass Lined Channel Design WisDOT Spreadsheet, FDM 13-30 Attachment 15.2 (from Reference #1) to size the swale for each design swale cross section. The WisDOT spreadsheet incorporates the design guidelines and equations described in "Design of Roadside Channels with Flexible Linings", HEC-15, USDOT FHWA (Reference #2).

Confirm the swale is stable and has enough capacity for the design flow rate.

Assumptions:

1. Assume the channel geometry is a v-notch swale with one sideslope at 4:1 and one sideslope at 2:1 and a depth of 2.0 ft.
2. Assume 2.0% slope along the flowpath of the diversion swale.
3. Assume the following parameters per Section 15.2 - Grass Lining Properties from Reference #1:
   Vegetation Retardance Class = C for Swales
   Vegetation Condition = Good
   Vegetation Growth Form = Turf
4. Assume cohesive soil type with ASTM Soil Class SC and a Plasticity Index (PI) of 16.

Calculations:

From the HydroCAD Report, the peak flow rate along the diversion berms are as follows:

Areas			Areas			Areas	
1	3.32	cfs	10	2.31	cfs	18	3.04 cfs
2	1.71	cfs	11	2.59	cfs	19	3.35 cfs
3	1.06	cfs	12	6.39	cfs	20	3.24 cfs
4	0.92	cfs	13	4.83	cfs	21	1.35 cfs
6	1.66	cfs	14	1.94	cfs	22	4.40 cfs
7	2.81	cfs	15	1.93	cfs	23	3.84 cfs
8	6.16	cfs	16	2.80	cfs	24	5.53 cfs
9	2.37	cfs	17	1.78	cfs		

Use highest flow to confirm diversion berm functions.

Use the Grass Swale Design Spreadsheet (Page 2) to determine the flow depth, velocity and shear stress in the swales.

Results:

The diversion berms are adequately designed to accommodate the flows from the 25-year, 24-hour storm event.

The diversion berms are stable at the design flow rates. The design flow depth of 2.0 feet maintains at least 0.5 ft of freeboard during the 25-year, 24-hour storm event. Based on shear stress, use erosion mat Class I, Type B along the flow path of the diversion berms.

Channel/Ditch Geometry	*Area 12*
Channel Slope, S_o (ft/ft)	**0.02**
Channel Bottom Width, B (ft)	**0**
Channel Side Slope, z_1	**4**
Channel Side Slope, z_2	**2**
Flow Depth, d (ft) Solve iteratively	**1.02**
Safety Factor, SF	**1.0**
Vegetation/Soil Parameters	
Vegetation Retardance Class	**C**
Vegetation Condition	**good**
Vegetation Growth Form	**turf**
Soil Type	**cohesive**
D_{75} (in) (Set at 0.00 for cohesive soils)	
ASTM Soil Class	**SC**
Plasticity Index, PI	**16**
Results Summary	
Design Q (ft^3/s)	**6.4**
Calculated Q (ft^3/s)	6.5
Difference Between Design & Calc. Flow (%)	1.9%
Stable (Yes or No)	**YES**
Channel Parameters	
Vegetation Height, h (ft)	0.67
Grass Roughness Coefficient, C_n	0.238
Cover Factor, C_f	0.90
Noncohesive Soil	
Soil Grain Roughness, n_s	0.016
Permissible Soil Shear Stress, τ_p (lb/ft^2)	N/A
Cohesive Soil	
Porosity, e	0.35
Soil Coefficient 1, c_1	1.0700
Soil Coefficient 2, c_2	14.30
Soil Coefficient 3, c_3	47.700
Soil Coefficient 4, c_4	1.42
Soil Coefficient 5, c_5	-0.61
Soil Coefficient 6, c_6	0.00010
Permissible Soil Shear Stress, τ_p (lb/ft^2)	0.080
Total Permissible Shear Stress, τ_p (lb/ft^2)	0.080
Cross Sectional Area, A (ft^2)	3.121
Wetted Perimeter, P (ft)	6.49
Hydraulic Radius, R (ft)	0.481
Top Width, T (ft)	6.12
Hydraulic Depth, D (ft)	0.510
Froude Number (Q design)	0.515
Channel Shear Stress, τ_o (lb/ft^2)	0.60
Actual Sheer Stress, τ_d (lb/ft^2)	1.27
Mannings n	0.062
Average Velocity, V (ft/s)	2.05
Calculated Flow, Q (ft^3/s)	6.5
Difference Between Design & Calc. Flow (%)	1.9%
Effective Shear on Soil Surface, τ_e (lb/ft^2)	0.008
Total Permissible Shear on Veg., $\tau_{p\ veg}$ (lb/ft^2)	12.03
Stable (Y or N)	YES

Source: Grass Lined Channel Design WisDOT Spreadsheet, FDM 13-30 Attachment 15.2

Channel Erosion Mat

(1053)

Wisconsin Department of Natural Resources
Conservation Practice Standard

To differentiate applications WisDOT organizes erosion mats into three classes of mats, which are further broken down into various Types.

A. **Class I**: A short-term duration (minimum of 6 months), light duty, organic ECRM with plastic or biodegradable netting.

   1. **Type A** – Only suitable for slope applications, not channel applications.

   2. **Type B** – Double netted product for use in channels where the calculated (design) shear stress is 1.5 lbs/ft^2 or less.

B. **Class II**: A long-term duration (three years or greater), organic ECRM.

   1. **Type A** – Jute fiber only for use in channels to reinforce sod.

   2. **Type B** – For use in channels where the calculated (design) shear stress is 2.0 lbs/ft^2 or less. Made with plastic or biodegradable mat.

   3. **Type C** – A woven mat of 100% organic material for use in channels where the calculated (design) shear stress is 2.0 lbs/ft^2 or less. Applicable for use in environmentally sensitive areas where plastic netting is inappropriate.

C. **Class III**: A permanent 100% synthetic ECRM or TRM. Class I, Type B erosion mat or Class II, Type B or C erosion mat must be placed over a soil filled TRM.

   1. **Type A** – An ECRM for use in channels where the calculated (design) shear stress of 2.0 lbs/ft^2 or less.

   2. **Type B** – A TRM for use in channels where the calculated (design) shear stress of 2.0 lbs/ft^2 or less.

   3. **Type C** – A TRM for use in channels where the calculated (design) shear stress of 3.5 lbs/ft^2 or less.

   4. **Type D** – A TRM for use in channels where the calculated (design) shear stress of 5.0 lbs/ft^2 or less.

SCS ENGINEERS

	Sheet No.	1 of 5
	Calc. No.	
	Rev. No.	
Job No. 25222260.00	Project: Columbia Energy Center MOD 12	By: SJL	Date: 8/14/23
Client: WPL	Subject: Diversion Berm Spacing Calculation	Chk'd: RJG	Date: 8/18/23

Purpose:

Determine the spacing between diversion berms on the landfill final cover, with the goal of maintaining ≤ 3 ton/acre of soil loss along the final cover.

References

1. "Predicting Rainfall Erosion Losses," USDA Agriculture Handbook Number 537, 1978.
   (Figure 1 on Sheet 2 and Tables 10 and 13 on Sheet 4).
2. Erosion and Sediment Control Handbook," Goldman, Jackson, & Bursztynsky, 1986.
   (Table 5.5 on Sheet 5).
3. Rainfed retention probabilities computed for different cropping tillage systems. Agricultural Water Management, A.W. Mills & G.W. Thomas, 1985. Table 5.10 on Sheet 3)
4. Columbia Energy Center POO Update Drawings

Approach:

Use the Universal Soil Loss Equation (USLE) to determine diversion berm spacing.

USLE Equation: $A = R * K * LS * C * P$

where: A = Average annual soil loss, tons/acre
R = Rainfall and runoff erosivity index
K = Soil erodibility factor, tons/acre
LS = Slope length and steepness factor
C = Cover management factor
P = Practice factor

or $$LS = \frac{A}{R \times K \times C \times P}$$

Assumptions:

A =	3	tons/acre
R =	145	see Figure 1 on Sheet 2 (Reference #1)
K =	0.38	see Table 5.10 on Sheet 3 for Loamy Very Fine Sand (Reference #3)
C =	0.0064	see Table 10 on Sheet 4, assuming 90% cover (Reference #1)
P =	1.0	assume no support practice used

Calculation:

$$LS = \frac{A}{R \times K \times C \times P} = \frac{3}{145 \times 0.38 \times 0.0064 \times 1.0} = 8.51$$

From the LS Values Table (Sheet 5), based on the 4:1 final cover slope, the LS value of 8.51 fallso between the slope distance of 200 and 250 feet. Use linear interpolation between the LS values for 200 and 250 feet to determine the slope length value for the 4:1 slope.

Slope Length @	200	ft	LS=	8.33
Slope Length @	250	ft	LS=	9.31

Slope length for the calculate LS factor = 209 ft

Results:

The maximum distance between diversion berms along the final cover to maintain less than 3 tons/acre soil loss is 209 ft.

SCS ENGINEERS

		Sheet No.	2 of 5
		Calc. No.	
		Rev. No.	
Job No. 25222260.00	Project: Columbia Energy Center MOD 12	By: SJL	Date: 8/14/23
Client: WPL	Subject: Diversion Berm Spacing Calculation	Chk'd: RJG	Date: 8/18/23

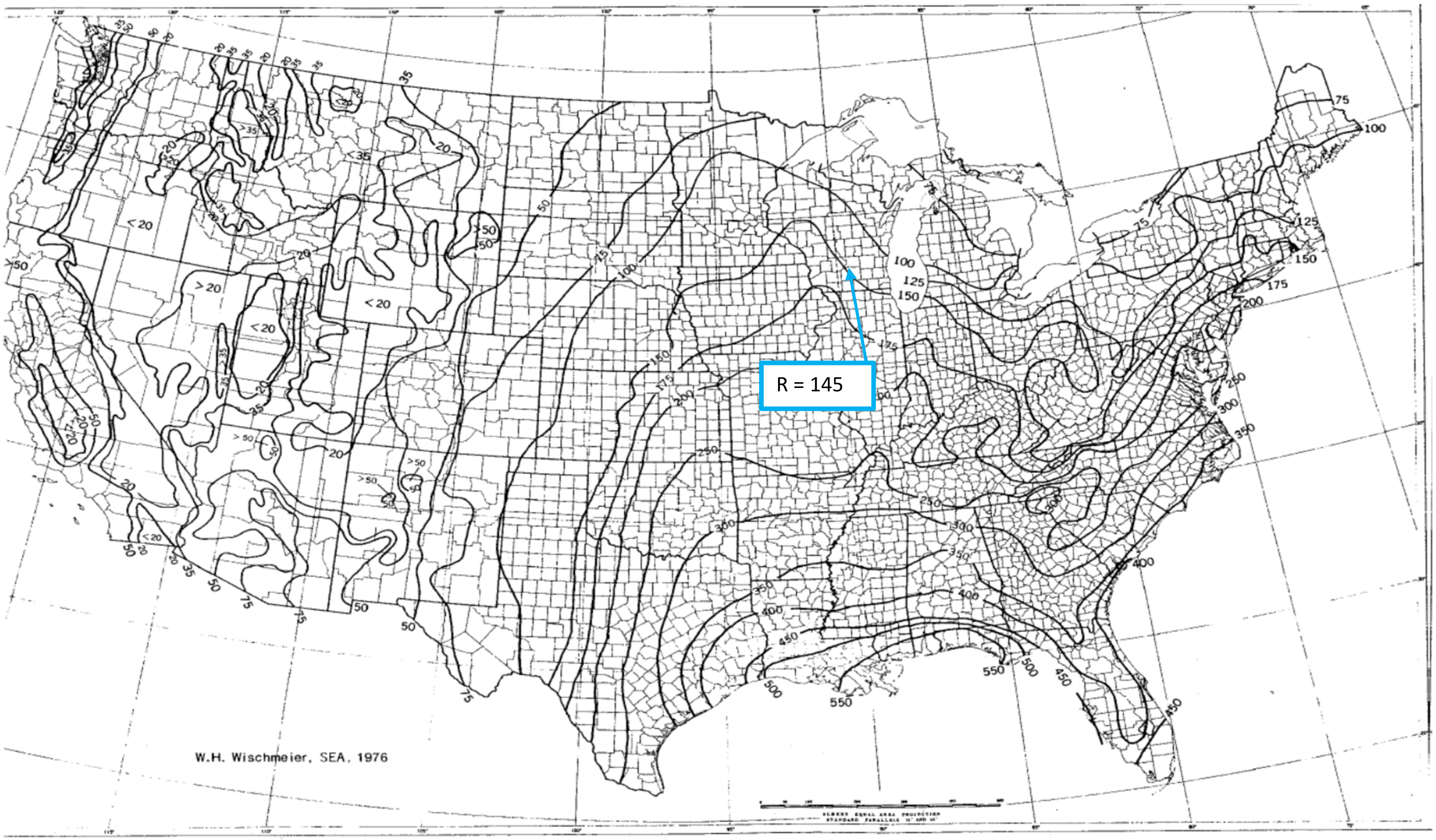


FIGURE 1.—Average annual values of the rainfall erosion index.

Source: "Predicting Rainfall Erosion Losses," USDA Agriculture Handbook Number 537, 1978.

Table 5.10. Soil Erodibility Factor K_{fact} (after Stewart et al. 1975)[a]

	P_{om}(%)		
Textural Class	<0.5	2	4
Sand	0.05	0.03	0.02
Fine sand	0.16	0.14	0.10
Very finesand	0.42	0.36	0.28
Loamy sand	0.12	0.10	0.08
Loamy finesand	0.24	0.20	0.16
Loamy veryfine sand	0.44	0.38	0.30
Sandy loam	0.27	0.24	0.19
Fine sandyloam	0.35	0.30	0.24
Very fine sandy loam	0.47	0.41	0.33
Loam	0.38	0.34	0.29
Silt loam	0.48	0.42	0.33
Silt	0.60	0.52	0.42
Sandy clayloam	0.27	0.25	0.21
Clay loam	0.28	0.25	0.21
Silty clayloam	0.37	0.32	0.26
Sandy clay	0.14	0.13	0.12
Silty clay	0.25	0.23	0.19
Clay		0.13-0.2	

(a) The values shown are estimated averages of broad ranges of specific soil values. When a texture is near the border line of two texture classes, use the average of the two K_{fact} values. In addition, the values shown are commensurate with the English units used in the cited reference (and as used in the source-term module input files). To obtain analagous values in the metric units used in this report, the above values should be multiplied by 1.292.

TABLE 10.—*Factor* **C** *for permanent pasture, range, and idle land*[1]

Vegetative canopy		Cover that contacts the soil surface						
			Percent ground cover					
Type and height[2]	Percent cover[3]	Type[4]	0	20	40	60	80	95+
No appreciable canopy		G	0.45	0.20	0.10	0.042	0.013	0.003
		W	.45	.24	.15	.091	.043	.011
Tall weeds or short brush with average drop fall height of 20 in	25	G	.36	.17	.09	.038	.013	.003
		W	.36	.20	.13	.083	.041	.011
	50	G	.26	.13	.07	.035	.012	.003
		W	.26	.16	.11	.076	.039	.011
	75	G	.17	.10	.06	.032	.011	.003
		W	.17	.12	.09	.068	.038	.011
Appreciable brush or bushes, with average drop fall height of 6½ ft	25	G	.40	.18	.09	.040	.013	.003
		W	.40	.22	.14	.087	.042	.011
	50	G	.34	.16	.08	.038	.012	.003
		W	.34	.19	.13	.082	.041	.011
	75	G	.28	.14	.08	.036	.012	.003
		W	.28	.17	.12	.078	.040	.011
Trees, but no appreciable low brush. Average drop fall height of 13 ft	25	G	.42	.19	.10	.041	.013	.003
		W	.42	.23	.14	.089	.042	.011
	50	G	.39	.18	.09	.040	.013	.003
		W	.39	.21	.14	.087	.042	.011
	75	G	.36	.17	.09	.039	.012	.003
		W	.36	.20	.13	.084	.041	.011

Interpolated value
C = 0.0064

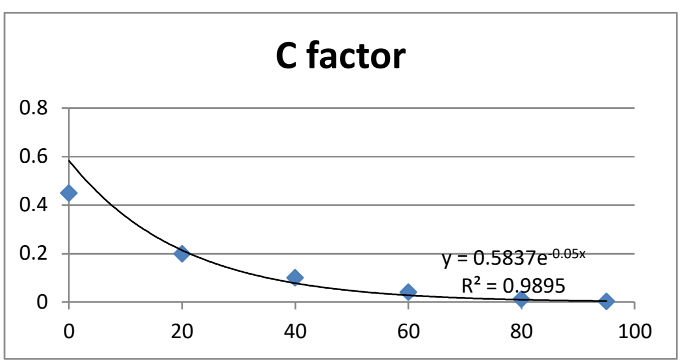
[1] The listed **C** values assume that the vegetation and mulch are randomly distributed over the entire area.

[2] Canopy height is measured as the average fall height of water drops falling from the canopy to the ground. Canopy effect is inversely proportional to drop fall height and is negligible if fall height exceeds 33 ft.

[3] Portion of total-area surface that would be hidden from view by canopy in a vertical projection (a bird's-eye view).

[4] G: cover at surface is grass, grasslike plants, decaying compacted duff, or litter at least 2 in deep.
W: cover at surface is mostly broadleaf herbaceous plants (as weeds with little lateral-root network near the surface) or undecayed residues or both.

Source: "Predicting Rainfall Erosion Losses," USDA Agriculture Handbook Number 537, 1978.



90 % cover
= 0.0065

TABLE 5.5 LS Values* (10)

Slope ratio	Slope gradient s, %	10 (3.0)	20 (6.1)	30 (9.1)	40 (12.2)	50 (15.2)	60 (18.3)	70 (21.3)	80 (24.4)	90 (27.4)	100 (30.5)
		LS values for following slope lengths l, ft (m)									
	0.5	0.06	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.09	0.10
100:1	1	0.08	0.09	0.10	0.10	0.11	0.11	0.12	0.12	0.12	0.12
	2	0.10	0.12	0.14	0.15	0.16	0.17	0.18	0.19	0.19	0.20
	3	0.14	0.18	0.20	0.22	0.23	0.25	0.26	0.27	0.28	0.29
	4	0.16	0.21	0.25	0.28	0.30	0.33	0.35	0.37	0.38	0.40
20:1	5	0.17	0.24	0.29	0.34	0.38	0.41	0.45	0.48	0.51	0.53
	6	0.21	0.30	0.37	0.43	0.48	0.52	0.56	0.60	0.64	0.67
	7	0.26	0.37	0.45	0.52	0.58	0.64	0.69	0.74	0.78	0.82
12½:1	8	0.31	0.44	0.54	0.63	0.70	0.77	0.83	0.89	0.94	0.99
	9	0.37	0.52	0.64	0.74	0.83	0.91	0.98	1.05	1.11	1.17
10:1	10	0.43	0.61	0.75	0.87	0.97	1.06	1.15	1.22	1.30	1.37
	11	0.50	0.71	0.86	1.00	1.12	1.22	1.32	1.41	1.50	1.58
8:1	12.5	0.61	0.86	1.05	1.22	1.36	1.49	1.61	1.72	1.82	1.92
	15	0.81	1.14	1.40	1.62	1.81	1.98	2.14	2.29	2.43	2.56
6:1	16.7	0.96	1.36	1.67	1.92	2.15	2.36	2.54	2.72	2.88	3.04
5:1	20	1.29	1.82	2.23	2.58	2.88	3.16	3.41	3.65	3.87	4.08
4½:1	22	1.51	2.13	2.61	3.02	3.37	3.69	3.99	4.27	4.53	4.77
4:1	25	1.86	2.63	3.23	3.73	4.16	4.56	4.93	5.27	5.59	5.89
	30	2.51	3.56	4.36	5.03	5.62	6.16	6.65	7.11	7.54	7.95
3:1	33.3	2.98	4.22	5.17	5.96	6.67	7.30	7.89	8.43	8.95	9.43
	35	3.23	4.57	5.60	6.46	7.23	7.92	8.55	9.14	9.70	10.22
2½:1	40	4.00	5.66	6.93	8.00	8.95	9.80	10.59	11.32	12.00	12.65
	45	4.81	6.80	8.33	9.61	10.75	11.77	12.72	13.60	14.42	15.20
2:1	50	5.64	7.97	9.76	11.27	12.60	13.81	14.91	15.94	16.91	17.82
	55	6.48	9.16	11.22	12.96	14.48	15.87	17.14	18.32	19.43	20.48
1¾:1	57	6.82	9.64	11.80	13.63	15.24	16.69	18.03	19.28	20.45	21.55
	60	7.32	10.35	12.68	14.64	16.37	17.93	19.37	20.71	21.96	23.15
1½:1	66.7	8.44	11.93	14.61	16.88	18.87	20.67	22.32	23.87	25.31	26.68
	70	8.98	12.70	15.55	17.96	20.08	21.99	23.75	25.39	26.93	28.39
	75	9.78	13.83	16.94	19.56	21.87	23.95	25.87	27.66	29.34	30.92
1¼:1	80	10.55	14.93	18.28	21.11	23.60	25.85	27.93	29.85	31.66	33.38
	85	11.30	15.98	19.58	22.61	25.27	27.69	29.90	31.97	33.91	35.74
	90	12.02	17.00	20.82	24.04	26.88	29.44	31.80	34.00	36.06	38.01
	95	12.71	17.97	22.01	25.41	28.41	31.12	33.62	35.94	38.12	40.18
1:1	100	13.36	18.89	23.14	26.72	29.87	32.72	35.34	37.78	40.08	42.24

Slope ratio	Slope gradient s, %	150 (46)	200 (61)	250 (76)	300 (91)	350 (107)	400 (122)	450 (137)	500 (152)	600 (183)	700 (213)	800 (244)	900 (274)	1000 (305)
		LS values for following slope lengths l, ft (m)												
	0.5	0.10	0.11	0.11	0.12	0.12	0.13	0.13	0.13	0.14	0.14	0.14	0.15	0.15
100:1	1	0.14	0.14	0.15	0.16	0.16	0.16	0.17	0.17	0.18	0.18	0.19	0.19	0.20
	2	0.23	0.25	0.26	0.28	0.29	0.30	0.32	0.33	0.34	0.36	0.37	0.39	0.40
	3	0.32	0.35	0.38	0.40	0.42	0.43	0.45	0.46	0.49	0.51	0.54	0.55	0.57
	4	0.47	0.53	0.58	0.62	0.66	0.70	0.73	0.76	0.82	0.87	0.92	0.96	1.00
20:1	5	0.66	0.76	0.85	0.93	1.00	1.07	1.13	1.20	1.31	1.42	1.51	1.60	1.69
	6	0.82	0.95	1.06	1.16	1.26	1.34	1.43	1.50	1.65	1.78	1.90	2.02	2.13
	7	1.01	1.17	1.30	1.43	1.54	1.65	1.75	1.84	2.02	2.18	2.33	2.47	2.61
12½:1	8	1.21	1.40	1.57	1.72	1.85	1.98	2.10	2.22	2.43	2.62	2.80	2.97	3.13
	9	1.44	1.66	1.85	2.03	2.19	2.35	2.49	2.62	2.87	3.10	3.32	3.52	3.71
10:1	10	1.68	1.94	2.16	2.37	2.56	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.87	4.11	4.33
	11	1.93	2.23	2.50	2.74	2.95	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.47	4.74	4.99
8:1	12.5	2.35	2.72	3.04	3.33	3.59	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.43	5.76	6.08
	15	3.13	3.62	4.05	4.43	4.79	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.24	7.68	8.09
6:1	16.7	3.72	4.30	4.81	5.27	5.69	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8.60	9.12	9.62
5:1	20	5.00	5.77	6.45	7.06	7.63	8.16	8.65	9.12	9.99	10.79	11.54	12.24	12.90
4½:1	22	5.84	6.75	7.54	8.26	8.92	9.54	10.12	10.67	11.68	12.62	13.49	14.31	15.08
4:1	25	7.21	8.33	9.31	10.20	11.02	11.78	12.49	13.17	14.43	15.58	16.66	17.67	18.63
	30	9.74	11.25	12.57	13.77	14.88	15.91	16.87	17.78	19.48	21.04	22.49	23.86	25.15
3:1	33.3	11.55	13.34	14.91	16.33	17.64	18.86	20.00	21.09	23.10	24.95	26.67	28.29	29.82
	35	12.52	14.46	16.16	17.70	19.12	20.44	21.68	22.86	25.04	27.04	28.91	30.67	32.32
2½:1	40	15.50	17.89	20.01	21.91	23.67	25.30	26.84	28.29	30.99	33.48	35.79	37.96	40.01
	45	18.62	21.50	24.03	26.33	28.44	30.40	32.24	33.99	37.23	40.22	42.99	45.60	48.07
2:1	50	21.83	25.21	28.18	30.87	33.34	35.65	37.81	39.85	43.66	47.16	50.41	53.47	56.36
	55	25.09	28.97	32.39	35.48	38.32	40.97	43.45	45.80	50.18	54.20	57.94	61.45	64.78
1¾:1	57	26.40	30.48	34.08	37.33	40.32	43.10	45.72	48.19	52.79	57.02	60.96	64.66	68.15
	60	28.35	32.74	36.60	40.10	43.31	46.30	49.11	51.77	56.71	61.25	65.48	69.45	73.21
1½:1	66.7	32.68	37.74	42.19	46.22	49.92	53.37	56.60	59.66	65.36	70.60	75.47	80.05	84.38
	70	34.77	40.15	44.89	49.17	53.11	56.78	60.23	63.48	69.54	75.12	80.30	85.17	89.78
	75	37.87	43.73	48.89	53.56	57.85	61.85	65.60	69.15	75.75	81.82	87.46	92.77	97.79
1¼:1	80	40.88	47.20	52.77	57.81	62.44	66.75	70.80	74.63	81.76	88.31	94.41	100.13	105.55
	85	43.78	50.55	56.51	61.91	66.87	71.48	75.82	79.92	87.55	94.57	101.09	107.23	113.03
	90	46.55	53.76	60.10	65.84	71.11	76.02	80.63	84.99	93.11	100.57	107.51	114.03	120.20
	95	49.21	56.82	63.53	69.59	75.17	80.36	85.23	89.84	98.42	106.30	113.64	120.54	127.06
1:1	100	51.74	59.74	66.79	73.17	79.03	84.49	89.61	94.46	103.48	111.77	119.48	126.73	133.59

Interpolate with

*Calculated from

$$LS = \left(\frac{65.41 \times s^2}{s^2 + 10{,}000} + \frac{4.56 \times s}{\sqrt{s^2 + 10{,}000}} + 0.065\right)\left(\frac{l}{72.5}\right)^m$$

LS = topographic factor
l = slope length, ft (m × 0.3048)
s = slope steepness,
m = exponent dependent upon slope steep (0.2 for slopes < 1%, 0.3 for slopes 1 | 0.4 for slopes 3.5 to 4.5%, and 0.5 for slopes > 5%)

FROM "EROSION & SEDIMENT CONTROL HANDBOOK", Goldman, Jackson, + Bursztynsky, 1986

Source: Erosion and Sediment Control Handbook," Goldman, Jackson, & Bursztynsky, 1986.

Downslope Flume & Energy Dissipator Sizing

SCS ENGINEERS

		Sheet No:	1 of 4
		Calc. No.	
		Rev. No.	2
Job No. 25222260.00	Project: Columbia Energy Center MOD 12	By: SJL	Date: 8/28/23
Client: WPL	Subject: Downslope Pipe and Inlet Sizing	Chk'd: RJG	Date: 8/28/23

Purpose:

To size the downslope pipe and inlet to accommodate the 25-year, 24-hour storm event.

References:

1. HydroCAD Report: COL_Mod12_HydroCAD Report

Approach:

Use the orifice equation to size the downslope pipe inlet. Size the inlet for the largest diversion berm flow rate and apply that inlet size to all downslope pipe inlets. Confirm the head (h) acting on the orifice will not overtop the diversion berm depth of 2.0 ft.

Use Manning's equation to size the downslope pipe based on the largest diversion berm flow rate.
Confirm the pipe has capacity for the design flow under open channel flow conditions.

Assumptions:

1. Orifice coefficient = 0.63
2. Assume the orifice head (h) acts on the centerline of the inlet pipe.
3. Manning's n = 0.012 (For smooth walled HDPE pipe: http://www.engineeringtoolbox.com/mannings-roughness-d_799.html)
4. Size flumes under the vegetated cover condition.

From the HydroCAD Report (Reference 1) , the peak discharge to each downslope flume resulting from a 25-year, 24-hour storm is as follows*:

Flume 1		Flume 2		Flume 3 Existing)		Flume 4 (Existing)		Flume 5 (Existing)	
Area 1	3.32	Area 3	1.06						
Area 2	1.71	Area 4	0.92						
Area 13	4.83	Area 15	1.93						
Area 14	1.94	Area 16	2.80						
Total =	11.80		6.71		0		0		0

Flume 6		Flume 7		Flume 8		Flume 9		Flume 10	
Area 6	1.66	Area 8	6.16	Area 10	2.31	Area 11	2.59	Area 27	0.52
Area 7	2.81	Area 9	2.37	Area 21	1.35	Area 12	6.39	Area 28	0.44
Area 17	1.78	Area 19	3.62	Area 22	4.40	Area 23	3.84		
Area 18	3.04	Area 20	3.24			Area 24	5.53		
Total =	9.29	Total =	15.39	Total =	8.06	Total =	18.35	Total =	0.96

** Please note that the total flow rate at each flume calculated above may not reflect the flow rate shown in the HydroCAD Model due to the inflow to the flume occuring at different times during the storm event. The calculation above reflects the peak flow rate.*

Results:

Based on the inlet sizing calculation, an 18" diameter inlet will convey the stormwater runoff from the largest flow rate to an inlet (Area 12).

Based on the Manning's calculation for flow within the pipe, the 12" diameter downslope pipe will accommodate the design flow for Flumes under open channel flow conditions. Although the flow for the downslope pipes can be handled by 12" dia. pipes, for ease of construction, all downslope pipes will be 18" dia with the exception of Flume 10.
Flume 10 will be constructed with a 12" dia pipe based on the drainage area and anticipated flow rate.

Calculations:

Size the downslope pipe inlet:

From the HydroCAD report (Reference #1), the maximum 25-year, 24-hour flow along a diversion berm is 6.39 cfs in HydroCAD model). Area 12 Inlet

Orifice Equation: $Q = C * A * (2 * g * h)^{0.5}$

where:
- Q = flow rate (cfs) = 6.39 (From above)
- C = orifice coefficient = 0.63 (See assumption #1)
- A = orifice area (sf) = 1.77 (area of 18" diameter pipe) Actual Pipe Diameter = 18 inches
- g = gravity (ft/sec^2)= 32
- h = orifice head acting on centerline (ft)
- $h = (Q/(C * A))^2/(2 * g)$ = 0.5 ft
- Given Assumption #2, depth of flow along diversion berm = h + D/2/12 = 1.26 ft = 15.1 inches

The diversion swale depth of 2 ft is sufficient to prevent overtopping at the downslope pipe inlet locations. The depth of the diversion berm increases at the entrance of the down slope pipes due to mounding of the soil over the pipe.

Size the downslope flume pipe:

Use Manning's equation to size the downslope pipe.

Manning's Equation: Q = (1.49/n) x A x R^(2/3) x S^(1/2)

where:
- Q = Flow Rate, cfs
- n = Manning's Roughness Coefficient
- A = Flow Area, sf
- R = Hydraulic Radius, ft (= A/P)
- S = Channel Slope, ft/ft

For flow rates < 20 cfs, assume a 12" diameter downslope flume:

Use 18.35 cfs to Flume 9 to check sizing (max flow to a flume that is < 20 cfs)

Design Criteria
- Pipe Diameter (in) = D = 12
- Pipe Slope (ft/ft) = S = 0.25
- Manning's Roughness Coefficient = n = 0.012

See Downslope Flume 7 pipe flow calculator on Sheet 3

SCS ENGINEERS

		Sheet No:	3 of 4
		Calc. No.	
		Rev. No.	
Job No. 25222260.00	Project: Columbia Energy Center MOD 12	By: SJL	Date: 8/28/23
Client: WPL	Subject: Downslope Pipe and Inlet Sizing	Chk'd: RJG	Date: 8/28/23

Calculations (Continued): **Flume 9** **18.35**

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Inputs:

Pipe Diameter, d_o	12	in
Manning Roughness, n	0.0120	
Pressure slope (possibly equal to pipe slope), S_0	0.2500	slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	0.7788	fraction

Results:

Flow, Q	18.3513	ft^3/s
Velocity, v	27.9622	ft/s
Velocity head, hv	12.1517	ft
Flow Area, A	0.6563	ft^2
Wetted Perimeter, P	2.1623	ft
Hydraulic Radius	0.3035	ft
Top Width, T	0.8301	ft
Froude Number, F	5.63	
Shear Stress (tractive force), τ	12.1539	psf

Version 2.0 (20 June 2017)

HawsEDC Calculators

SCS ENGINEERS

		Sheet No:	4 of 4
		Calc. No.	
		Rev. No.	
Job No. 25222260.00	Project: Columbia Energy Center MOD 12	By: SJL	Date: 8/28/23
Client: WPL	Subject: Downslope Pipe and Inlet Sizing	Chk'd: RJG	Date: 8/28/23

Calculations (Continued): **Flume 9** **18.35**

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Inputs:

Pipe Diameter, d_o	18	in
Manning Roughness, n	0.0120	
Pressure slope (possibly equal to pipe slope), S_0	0.2500	slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	0.3906	fraction

Results:

Flow, Q	18.3546	ft^3/s
Velocity, v	28.7059	ft/s
Velocity head, hv	12.8066	ft
Flow Area, A	0.6394	ft^2
Wetted Perimeter, P	2.0253	ft
Hydraulic Radius	0.3157	ft
Top Width, T	1.4637	ft
Froude Number, F	7.77	
Shear Stress (tractive force), τ	9.1435	psf

Version 2.0 (20 June 2017)

HawsEDC Calculators

Purpose:
To size an energy dissipator structure and riprap apron at the outlet of the downslope flume pipes.

References:
1. "Hydraulic Design of Energy Dissipators for Culverts and Channels," HEC-14, Third Edition, July 2006, USDOT FHWA.
2. Downslope Pipe and Inlet Sizing calculation (for pipe size, flow rate, and pipe velocity).
3. HydroCAD Report: COL_Mod12_HydroCAD Report
4. Facilities Development Manual Chapter 13, Section 13-30 - Rock Riprap Lined Chutes.
5. WisDOT FDM Table 25.1

Approach:
Use the downslope pipe outlet velocity to size an energy dissipator structure (USBR Type VI Impact Basin) following the design approach outlined in Section 9.4 of Reference #1.
Use Rock Chute Data Spreadsheet, FDM 13-30-30 Attachment 30.1 (from Reference #5) to design the rock chute.
For construction purposes use the maximum flow to size all dissipators and riprap apron.

Assumptions:
1. Riprap specific gravity = 2.65
2. From the HydroCAD Report, the 25-year, 24-hour peak discharge to each downslope flume is as follows*:

Flume 1		**Flume 2**		**Flume 3 Existing)**	**Flume 4 (Existing)**	**Flume 5 (Existing)**
Area 1	3.32	Area 3	1.06			
Area 2	1.71	Area 4	0.92			
Area 13	4.83	Area 15	1.93			
Area 14	1.94	Area 16	2.80			
Total =	11.80		6.71	0	0	0

Flume 6		**Flume 7**		**Flume 8**		**Flume 9**		**Flume 10**
Area 6	1.66	Area 8	6.16	Area 10	2.31	Area 11	2.59	This flume discharges directly into a concrete catch basin at the toe of slope, therefore, no energy dissipator is needed.
Area 7	2.81	Area 9	2.37	Area 21	1.35	Area 12	6.39	
Area 17	1.78	Area 19	3.62	Area 22	4.40	Area 23	3.84	
Area 18	3.04	Area 20	3.24			Area 24	5.53	
Total =	9.29	Total =	15.39	Total =	8.06	Total =	18.35	

** Please note that the total flow rate at each flume calculated above may not reflect the flow rate shown in the HydroCAD Model due to the inflow to the flume occuring at different times during the storm event. The calculation above reflects the peak flow rate.*

Using Figure 9.14 (See Sheet 4), enter the Froude Number and the Energy from Step 2 to determine the from the downslope flume pipe and inlet sizing calculation.

Results:
The energy dissipator structures for the 18" dia. downslope flume pipes will consist of dissipator structures with widths (W_B) of 6 feet, with the remaining dimensions from Table 9.2 on Sheets 5 and 6.
Riprap at the Flume energy dissipator outlets will consist of WisDOT Select Crush Material (D50= 2.2 inches) (See Page 3).
The riprap apron footprint will be based on the energy dissipator width, the outlet swale geometry, and as shown on the Plan Set.

Calculations:

For 18" dia. downslope flume pipes

From Reference #2:

Flow rate (Q) = 18.35 cfs

Pipe velocity (V) = 28.7 ft/s

Flow area (A) = Q/V = 0.64 sf

Design procedure from pg. 9-40 of Reference #1:

Step 1: Compute the Equivalent Depth of Flow Entering Dissipator:

$Y_e = (A/2)^{1/2}$ where: Ye = Equivalent depth

A = Area (from above)

$Y_e =$ 0.57 ft

Step 2: Compute the Froude Number and the energy at the end of the pipe:

$Fr = V/[(g*Y_e)^{1/2}]$ where: Fr = Froude Number

V = Velocity (from above)

g = Gravity constant (32.2 ft/sec^2)

Fr = 6.7 Y_e = Equivalent depth (from Step 1 above)

$H_o = Y_e+V^2/2g$ where: H_o = Energy at the end of the pipe

Y_e = Equivalent depth (from above)

V = Velocity (from above)

Ho = 13.4 ft g = Gravity constant (32.2 ft/sec^2)

Step 3: Determine H_o/W_B and calculate the required width of the energy dissipator:

Using Figure 9.14 (See Sheet 4), enter the Froude Number and the Energy from Step 2 to determine the width of the energy dissipator.

From Figure 9.14, H_o/W_B = 2.55

$W_B = H_o/(H_o/W_B)$ W_B = 5.2 ft.

Use W_B = 6.0 ft.

Step 4: Obtain the remaining energy dissipator dimensions from Table 9.2 from Reference #1 (see Sheets 5 and 6)

Step 5: Size the riprap at the structure outlet

From Reference #5, use Rock Chute Design spreadsheet (see Sheet 3)

SCS ENGINEERS

		Sheet No. 3 of 7
		Calc. No.
		Rev. No.
Job No. 25222260.00	Project: Columbia Energy Center MOD 12	By: SJL Date: 8/28/23
Client: WPL	Subject: Energy Dissipator Sizing	Chk'd: RJG Date: 8/28/23

Calculations:

Step 5: Determine the exit velocity from the energy dissiaptor structure and size the riprap apron at the structure outlet.

Use the relationship:

$H_B = Q/(W_B \times V_B) + V_B^2 / 2g = H_o \times (1-H_L/H_o)$

Where:

$Q =$ 18.4 cfs, flowrate

$W_B =$ 6.0 ft, width of energy dissipator

$g =$ 32.2 ft/s^2, gravity

H_O 13.4 Energy at end of pipe

H_L/H_O 75 %, Energy loss (From Figure 9.15 from Reference #1, see Sheet 3)

$V_B =$ Velocity at exit of dissipator (ft/s)

HB = Energy at exit of dissipator (ft)

Calculate HB using the second part of the equation:

$H_B = H_o \times (1-H_L/H_o)$

$H_B =$ 3.41 ft

Using trial and error, select values for V_B and use the first part of the equation to calculate H_B:

Try $V_B =$ 1.255 ft/s $H_B =$ 3.41 ft

Based on the energy dissipator structure exit velocity, calculate the riprap size at the dissipator outlet.

From Equation 10.6 from Reference #1:

$D_{50} = (0.692 / (S-1)) \times (V^2/2g)$

Where:

$S =$ 2.65 Specific gravity (See Assumption #1)

$V =$ 1.26 Velocity = V_B from above.

$D_{50} =$ riprap size

$D_{50\ Calc'd} =$ 0.010 feet

Round the calculated D_{50} up to the nearest IDOT standard riprap size:

$D_{50\ Design} =$ 0.18 feet Use = Select Crushed Material with geotextile Type R

Riprap Type	D_{50} (inches)	D_{50} (feet)	Riprap Thickness (in)	Geotextile Type
Select Crushed Material	2.2	0.18	5	Type R
Light Riprap	10	0.83	12	Type R
Medium Riprap	12.5	1.04	18	Type HR
Heavy Riprap	16	1.33	24	Type HR
Extra-Heavy Riprap	20	1.67	30	Type HR

from Reference 5

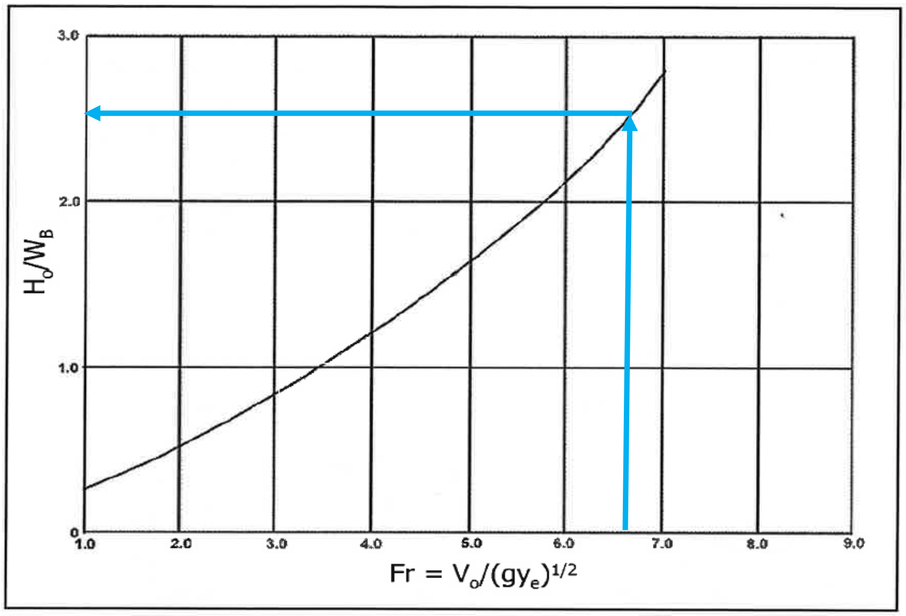


Figure 9.14. Design Curve for USBR Type VI Impact Basin

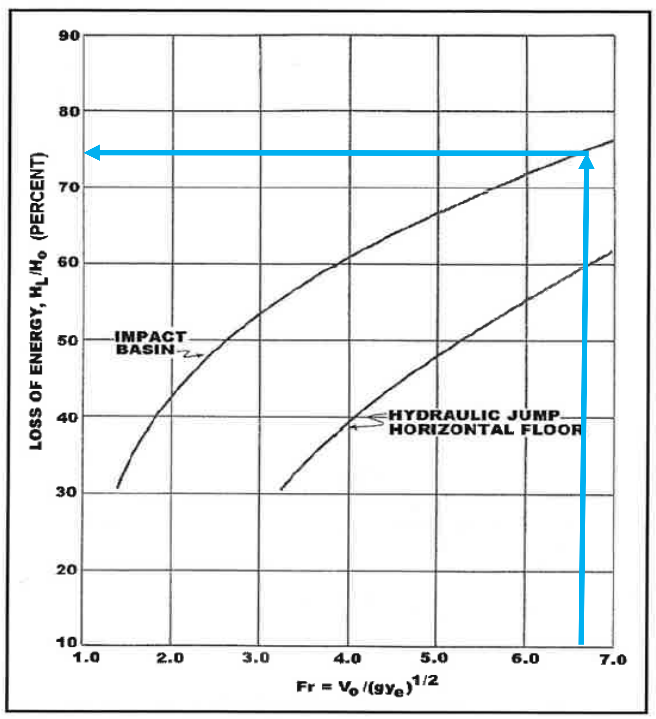


Figure 9.15. Energy Loss of USBR Type VI Impact Basin versus Hydraulic Jump

Table 9.2 (CU). USBR Type VI Impact Basin Dimensions (ft) (AASHTO, 2005)

W_E	h_1	h_2	h_3	h_4	L	L_1	L_2
4.	3.08	1.50	0.67	1.67	5.42	2.33	3.08
5.	3.83	1.92	0.83	2.08	6.67	2.92	3.83
6.	4.58	2.25	1.00	2.50	8.00	3.42	4.58
7.	5.42	2.58	1.17	2.92	9.42	4.00	5.42
8.	6.17	3.00	1.33	3.33	10.67	4.58	6.17
9.	6.92	3.42	1.50	3.75	12.00	5.17	6.92
10.	7.58	3.75	1.67	4.17	13.42	5.75	7.67
11.	8.42	4.17	1.83	4.58	14.58	6.33	8.42
12.	9.17	4.50	2.00	5.00	16.00	6.83	9.17
13.	10.17	4.92	2.17	5.42	17.33	7.42	10.00
14.	10.75	5.25	2.33	5.83	18.67	8.00	10.75
15.	11.50	5.58	2.50	6.25	20.00	8.50	11.50
16.	12.25	6.00	2.67	6.67	21.33	9.08	12.25
17.	13.00	6.33	2.83	7.08	21.50	9.67	13.00
18.	13.75	6.67	3.00	7.50	23.92	10.25	13.75
19.	14.58	7.08	3.17	7.92	25.33	10.83	14.58
20.	15.33	7.50	3.33	8.33	26.58	11.42	15.33

W_E	W_1	W_2	t_1	t_2	t_3	t_4	t_5
4.	0.33	1.08	0.50	0.50	0.50	0.50	0.25
5.	0.42	1.42	0.50	0.50	0.50	0.50	0.25
6.	0.50	1.67	0.50	0.50	0.50	0.50	0.25
7.	0.50	1.92	0.50	0.50	0.50	0.50	0.25
8.	0.58	2.17	0.50	0.58	0.58	0.50	0.25
9.	0.67	2.50	0.58	0.58	0.67	0.58	0.25
10.	0.75	2.75	0.67	0.67	0.75	0.67	0.25
11.	0.83	3.00	0.67	0.75	0.75	0.67	0.33
12.	0.92	3.00	0.67	0.83	0.83	0.75	0.33
13.	1.00	3.00	0.67	0.92	0.83	0.83	0.33
14.	1.08	3.00	0.67	1.00	0.92	0.92	0.42
15.	1.17	3.00	0.67	1.00	1.00	1.00	0.42
16.	1.25	3.00	0.75	1.00	1.00	1.00	0.50
17.	1.33	3.00	0.75	1.08	1.00	1.00	0.50
18.	1.33	3.00	0.75	1.08	1.08	1.08	0.58
19.	1.42	3.00	0.83	1.17	1.08	1.08	0.58
20.	1.50	3.00	0.83	1.17	1.17	1.17	0.67

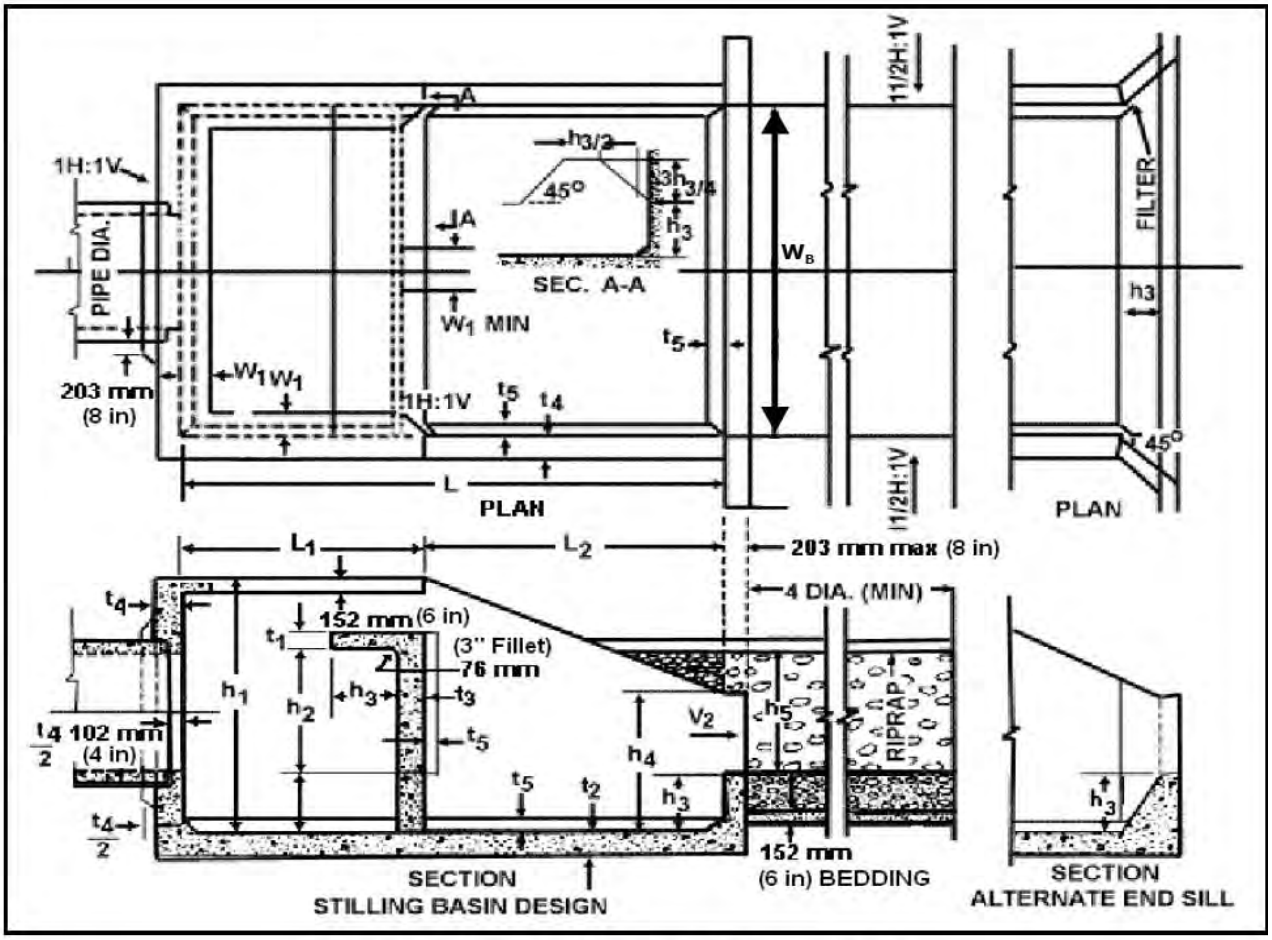


Figure 9.13. USBR Type VI Impact Basin

Calculations (Continued):

Downslope Flume 9 - Velocity Calculator (Q = 18.35 cfs)

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Inputs:

Pipe Diameter, d_o	18	in
Manning Roughness, n	0.0120	
Pressure slope (possibly equal to pipe slope), S_o	0.2500	slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	0.3906	fraction

Results:

Flow, Q	18.3546	ft^3/s
Velocity, v	28.7059	ft/s
Velocity head, hv	153.6794	in
Flow Area, A	0.6394	ft^2
Wetted Perimeter, P	2.0253	ft
Hydraulic Radius	0.3157	ft
Top Width, T	1.4637	ft
Froude Number, F	7.77	
Shear Stress (tractive force), τ	9.1435	psf

Version 2.0 (20 June 2017)

HawsEDC Calculators

Rock Chute Sizing

SCS ENGINEERS

Job No. 25222260.00	Job: Columbia Energy Center MOD12	By: SJL	Date: 8/28/23
Client: WPL	Subject: Rock Chute Sizing & Riprap Size	Chk'd: RJG	Date: 8/28/23

Purpose:

To size the rock chutes to accommodate the 25-year, 24-hour storm event.

References:

1. Rock Chute Design Data spreadsheet Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998.
2. HydroCAD Report: COL_Mod12_HydroCAD Report
3. Figure 1 - Final Grades (Module 12)
4. Stable 25.1 Typical Particle Sizes of Native Sands at 75 Percent Passing (D75) from WisDOT Facilities. Development Manual (FDM).

Approach:

1. Enter Inlet Channel data based on culvert apron or swale geometry Reference #2 and #3.
2. Enter Chute data based on slope from Reference #3, start the width, Bw equal to inlet channel Bw.
3. Enter Outlet Channel data based on Reference #3, start the width, Bw equal to inlet channel Bw.
4. Enter drainage area, apron elevations, flow (Q), and rainfall.
5. Adjust Bw for Chute and Outlet Channel until spreadsheet shows the rock chute "will" function adequately.
6. Determine rip rap classification based on D50 weight per Reference #4.

Assumptions:

1. Assume side slopes of chute and outlet channel are 2:1.
2. Assume Factor of Safey is 1.2.
3. n-value is based on proposed conditions at the channel.
4. Assume Outlet apron depth, d is 1.0 ft.
5. Freeboard is 1.0 ft.
6. Use 25-year, 24-hour storm event flow (Reference #2) for Q_{high} and Q_{low}.
7. Classification of riprap is based on weight (Reference #4).

Calculations:

See attached spreadsheet calcs for each rock chute.

Results:

The rock chutes are adequately designed to accommodate the flows from the 25-year, 24-hour storm event.

Rock Chute	Width (ft)	Thickness (in)	Apron Width (ft)	Apron Length (ft)	D_{50} (in)	WisDOT Rip Rap Classification
RC1	8	4	8	2	2	Select Crushed Material, Type R
RC2	6	12	6	7	5.9	Light Riprap Type R
RC3	6	8	6	5	3.8	Light Riprap Type R
RC4	6	9	6	6	3.8	Light Riprap, Type R

Rock Chute Design Data

(Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)
Revised for WisDOT 9/2010

Project: COL - Mod 12 RC1 **County:** Columbia
Designer: SJL **Checked by:** RJG
Date: August 28, 2023 **Date:** 08/28/23

Input Geometry:

Upstream Channel		Chute			Downstream Channel	
Bottom Width =	0.0 ft.	Bottom Width =	8.0 ft.		Bottom Width =	8.0 ft.
Side slopes =	4.0 (m:1)	Factor of safety =	1.20 (SF)	1.2 Min	Side slopes =	2.0 (m:1)
Mannings n value =	0.030	Side slopes =	2.0 (z:1)	2.0:1 max.	Mannings n value =	0.045
Bed slope =	0.0600 ft./ft.	Bed slope =	0.1769 ft./ft	3.0:1 max.	Bed slope =	0.0050 ft./ft.
		Freeboard =	1.0 ft.			
		Outlet apron depth, d =	1.0 ft.		Base flow =	0.0 cfs

Note: Use procedures 13-30-15 or 13-30-25 for upstream and downstream Mannings n

Flow and Elevation Data:

Apron elev. --- Inlet = 829.0 ft. -------- Outlet 806.0 ft. --- (H_{drop} = 22 ft.)

Degree of angularity = 1
1 --> 50% angular, 50% rounded
2 --> 100 % rounded

Q_{high} = Runoff from design storm
Q_5 = Runoff from a 5-year,24-hour storm

Q_{high} = 2.3 cfs — High flow storm through chute → Tw (ft.) = Program
Q_{low} = 2.3 cfs — Low flow storm through chute → Tw (ft.) = Program

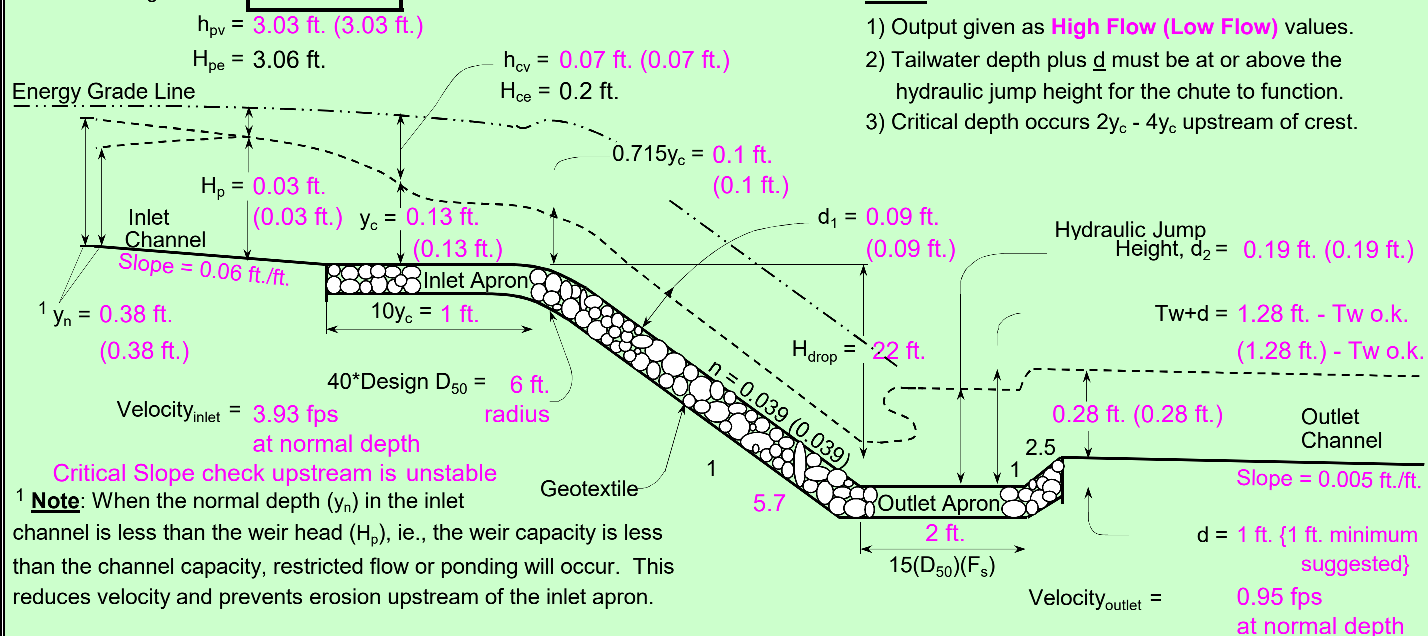
Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

Input tailwater (Tw): 0.18 1.20

Profile and Cross Section (Output):

Starting Station = 3+00.0

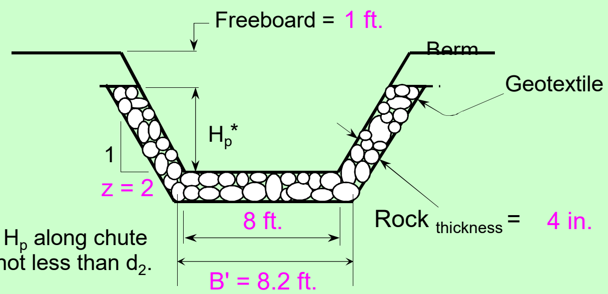
Notes:
1) Output given as **High Flow (Low Flow)** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.



[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than d_2.

	0.28 cfs/ft.	Equivalent unit discharge
SF =	1.20	Factor of safety (multiplier)
d_1 =	0.09 ft.	Normal depth in chute
n-value =	0.039	Manning's roughness coefficient
D_{50}(SF) =	2 in.	Minimum Design D_{50}*
$2(D_{50})$(SF) =	4 in.	Rock chute thickness
Tw + d =	1.28 ft.	Tailwater above outlet apron
d_2 =	0.19 ft.	Hydraulic jump height
*** The outlet	will	function adequately

High Flow Storm Information

Rock Chute Design Data

(Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)
Revised for WisDOT 9/2010

Project: COL - Mod 12 RC2 **County:** Columbia
Designer: SJL **Checked by:** RJG
Date: August 28, 2023 **Date:** 08/28/23

Input Geometry:

Upstream Channel		Chute			Downstream Channel	
Bottom Width =	6.0 ft.	Bottom Width =	6.0 ft.		Bottom Width =	6.0 ft.
Side slopes =	1.0 (m:1)	Factor of safety =	1.20 (SF)	1.2 Min	Side slopes =	2.0 (m:1)
Mannings n value =	0.012	Side slopes =	2.0 (z:1)	2.0:1 max.	Mannings n value =	0.045
Bed slope =	0.0001 ft./ft.	Bed slope =	0.2319 ft./ft	3.0:1 max.	Bed slope =	0.0050 ft./ft.
		Freeboard =	1.0 ft.			
		Outlet apron depth, d =	1.0 ft.		Base flow =	0.0 cfs

Note: Use procedures 13-30-15 or 13-30-25 for upstream and downstream Mannings n

Flow and Elevation Data:

Apron elev. --- Inlet = 820.0 ft. ------- Outlet 804.0 ft. --- (H_{drop} = 15 ft.)

Degree of angularity = 1
1 --> 50% angular, 50% rounded
2 --> 100 % rounded

Q_{high} = Runoff from design storm
Q_5 = Runoff from a 5-year,24-hour storm

Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

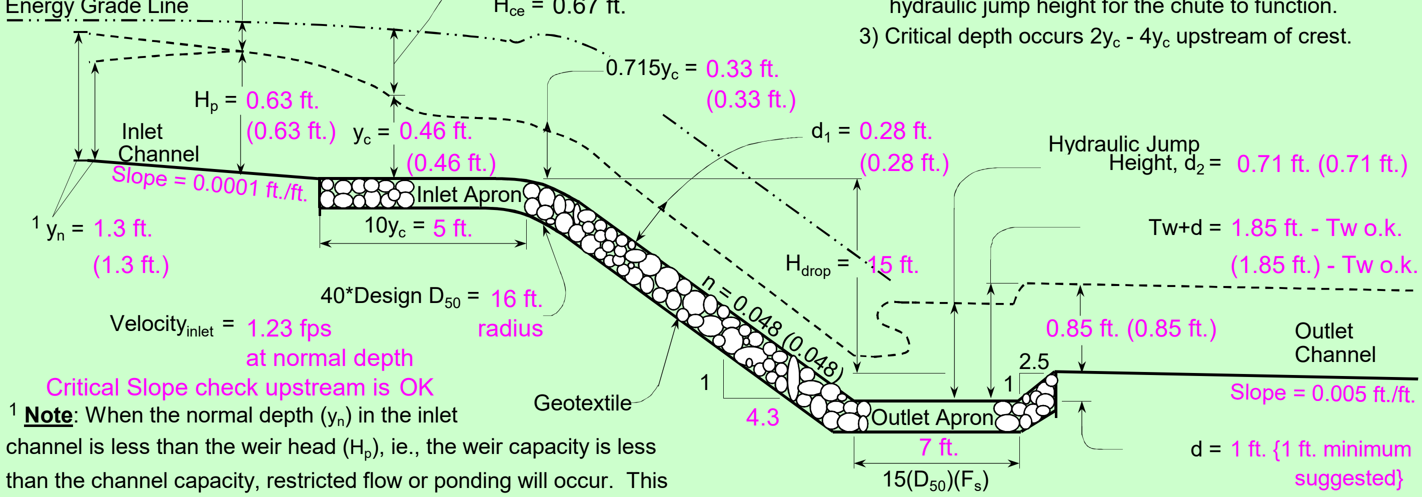
Input tailwater (Tw):

Q_{high} = 11.7 cfs High flow storm through chute → Tw (ft.) = **Program**
Q_{low} = 11.7 cfs Low flow storm through chute → Tw (ft.) = **Program**

Profile and Cross Section (Output):

Starting Station = 3+00.0

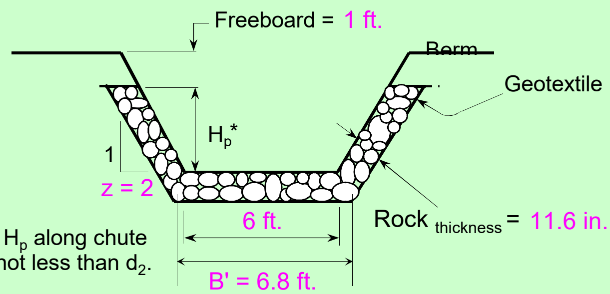
Notes:
1) Output given as **High Flow (Low Flow)** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.



[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than d_2.

	1.79 cfs/ft.	Equivalent unit discharge
SF =	1.20	Factor of safety (multiplier)
d_1 =	0.28 ft.	Normal depth in chute
n-value =	0.048	Manning's roughness coefficient
D_{50}(SF) =	5.8 in.	Minimum Design D_{50}*
$2(D_{50})$(SF) =	11.6 in.	Rock chute thickness
Tw + d =	1.85 ft.	Tailwater above outlet apron
d_2 =	0.71 ft.	Hydraulic jump height
***** The outlet**	**will**	**function adequately**

High Flow Storm Information

Rock Chute Design Data

(Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)
Revised for WisDOT 9/2010

Project:	COL - Mod 12 RC3	**County:**	Columbia
Designer:	SJL	**Checked by:**	RJG
Date:	August 28, 2023	**Date:**	08/28/23

Input Geometry:

Upstream Channel		Chute			Downstream Channel	
Bottom Width =	6.0 ft.	Bottom Width =	6.0 ft.		Bottom Width =	6.0 ft.
Side slopes =	1.0 (m:1)	Factor of safety =	1.20 (SF)	1.2 Min	Side slopes =	2.0 (m:1)
Mannings n value =	0.012	Side slopes =	2.0 (z:1)	2.0:1 max.	Mannings n value =	0.045
Bed slope =	0.0001 ft./ft.	Bed slope =	0.1545 ft./ft	3.0:1 max.	Bed slope =	0.0050 ft./ft.
		Freeboard =	1.0 ft.			
		Outlet apron depth, d =	1.0 ft.		Base flow =	0.0 cfs

Note: Use procedures 13-30-15 or 13-30-25 for upstream and downstream Mannings n

Flow and Elevation Data:

Apron elev. --- Inlet = 821.0 ft. -------- Outlet 804.0 ft. --- (H_{drop} = 16 ft.)

Degree of angularity = 1

Q_{high} = Runoff from design storm — 1 --> 50% angular, 50% rounded

Q_5 = Runoff from a 5-year,24-hour storm — 2 --> 100 % rounded

Q_{high}= 6.6 cfs — High flow storm through chute → Tw (ft.) = **Program**

Q_{low} = 6.6 cfs — Low flow storm through chute → Tw (ft.) = **Program**

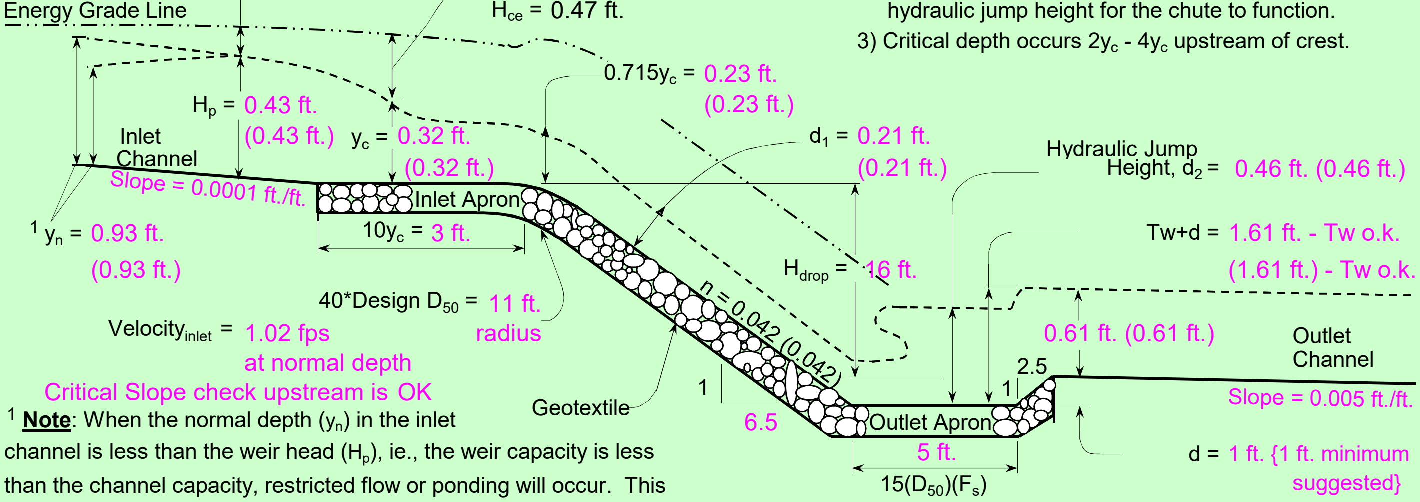
Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

Input tailwater (Tw):

Profile and Cross Section (Output):

Starting Station = 3+00.0

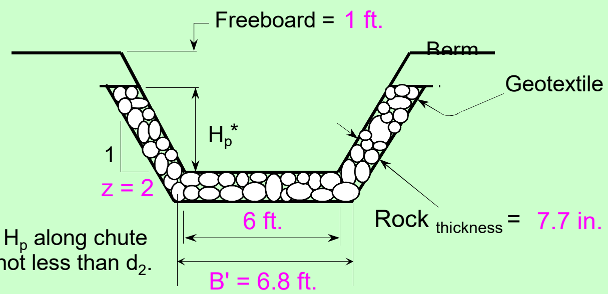
Notes:
1) Output given as **High Flow (Low Flow)** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.



[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than d_2.

	1.04 cfs/ft.	Equivalent unit discharge
SF =	1.20	Factor of safety (multiplier)
d_1 =	0.21 ft.	Normal depth in chute
n-value =	0.042	Manning's roughness coefficient
D_{50}(SF) =	3.8 in.	Minimum Design D_{50}*
$2(D_{50})$(SF) =	7.7 in.	Rock chute thickness
Tw + d =	1.61 ft.	Tailwater above outlet apron
d_2 =	0.46 ft.	Hydraulic jump height
***** The outlet**	**will**	**function adequately**

High Flow Storm Information

Rock Chute Design Data

(Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)
Revised for WisDOT 9/2010

Project: COL - Mod 12 RC4 **County:** Columbia
Designer: RJG **Checked by:** SJL
Date: August 28, 2023 **Date:** 08/28/23

Input Geometry:

Upstream Channel		Chute			Downstream Channel	
Bottom Width =	4.0 ft.	Bottom Width =	6.0 ft.		Bottom Width =	6.0 ft.
Side slopes =	4.0 (m:1)	Factor of safety =	1.20 (SF)	1.2 Min	Side slopes =	2.0 (m:1)
Mannings n value =	0.045	Side slopes =	2.0 (z:1)	2.0:1 max.	Mannings n value =	0.045
Bed slope =	0.0288 ft./ft.	Bed slope =	0.2212 ft./ft	3.0:1 max.	Bed slope =	0.0050 ft./ft.
		Freeboard =	1.0 ft.			
		Outlet apron depth, d =	1.0 ft.		Base flow =	0.0 cfs

Note: Use procedures 13-30-15 or 13-30-25 for upstream and downstream Mannings n

Flow and Elevation Data:

Apron elev. --- Inlet = 824.9 ft. -------- Outlet 817.6 ft. --- (H_{drop} = 6.3 ft.)

Degree of angularity = 1
1 --> 50% angular, 50% rounded
2 --> 100 % rounded

Q_{high} = Runoff from design storm
Q_5 = Runoff from a 5-year,24-hour storm

Q_{high}= 7.0 cfs High flow storm through chute → Tw (ft.) = **Program**
Q_{low} = 7.0 cfs Low flow storm through chute → Tw (ft.) = **Program**

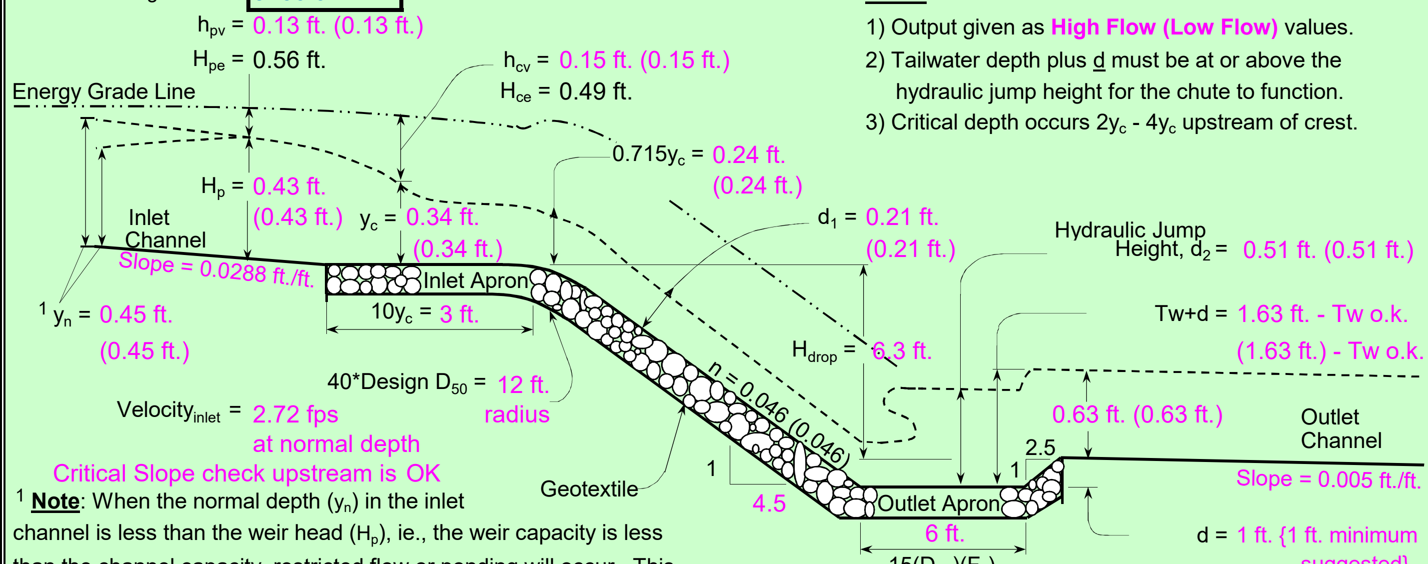
Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

Input tailwater (Tw): 0.22 1.20

Profile and Cross Section (Output):

Starting Station = 3+00.0

Notes:
1) Output given as **High Flow (Low Flow)** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.

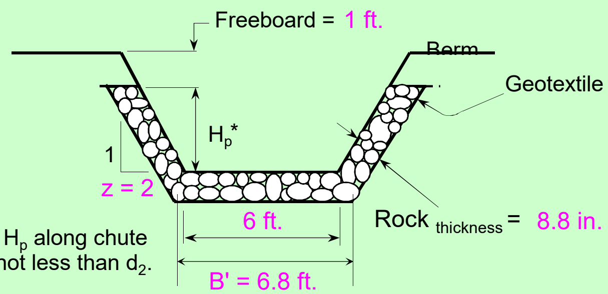


[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

$Velocity_{outlet}$ = 1.52 fps at normal depth

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than d_2.

	1.1 cfs/ft.	Equivalent unit discharge
SF =	1.20	Factor of safety (multiplier)
d_1 =	0.21 ft.	Normal depth in chute
n-value =	0.046	Manning's roughness coefficient
D_{50}(SF) =	4.4 in.	Minimum Design D_{50}*
$2(D_{50})$(SF) =	8.8 in.	Rock chute thickness
Tw + d =	1.63 ft.	Tailwater above outlet apron
d_2 =	0.51 ft.	Hydraulic jump height
*** The outlet	will	function adequately

High Flow Storm Information

Riprap Apron Sizing

SCS ENGINEERS

Sheet No.	1 of 2
Calc. No.	
Rev. No.	

Job No. 25222260.00	Job: Columbia Energy Center MOD 12	By: SJL Date: 8/28/23
Client: WPL	Subject: Riprap Sizing at Culvert Outlet	Chk'd: RJG Date: 8/28/23

Purpose:

To size the riprap apron dimensions at proposed culvert locations C2, C3, C4, C5, C6, C8, C9, and C11 based on a 25-year, 24 hour storm event:

References:

1. "Energy Dissipators," Wisconsin Department of Transportation (WisDOT), Facilities Development Manual (FDM) 13-35-5.
2. HydroCAD Report: COL_Mod12_HydroCAD Report
3. "Rock Riprap Lined Channels," WisDOT FDM 13-30-25.
4. Culvert Sizing Calculation.
5. WisDOT FDM Chapter 13, Section 30 - Rock Riprap Lined Chutes

Approach:

Use the equations in Section 5.2 - Riprap Blanket of WisDOT FDM 13-35-5 (Energy Dissipators) to determine the average size of stone (d_{50}) and riprap apron length. Round up the calculated d_{50} to the nearest WisDOT standard riprap size.

Use WisDOT FDM 13-35 Attachment 5.2 to determine the width of the riprap apron for discharges to a flat area. For discharges to channels, extend riprap across the channel bottom and up the sides.

Assumptions:

Assume riprap apron thickness (T) is 2 * d_{50} to protect against washout and undercutting of the riprap.

Assume tailwater depth, TW = 0.40 * D_o

Assume max TW conditions for the riprap apron width.

Assume that when there are multiple culverts, the total discharge to the culverts is distributed evenly through each barrel.

Calculation:

From WisDOT Section 5.2 - Riprap Blanket:

$$d_{50}/D_o = 0.020\ (D_o/TW)\ (Q/D_o^{5/2})^{4/3}$$

$$L_{sp}/D_o = 1.7\ (Q/D_o^{5/2}) + 8$$

Or:

$$d_{50} = 0.02 \times (D_o/TW) \times (Q/D_o^{5/2})^{4/3} \times D_o$$

$$L_{sp} = (1.7\ (Q/D_o^{5/2}) + 8) \times D_o$$

where: D_o = Diameter or width of culvert (ft)

Q = Flow rate (cfs) (discharge rate through culvert, from Worst Case Condition HydroCAD Model (Reference #2))

TW = Tail water depth (ft)

d_{50} = Average size of stone (ft)

L_{sp} = Length of stone protection (Apron Length) (ft)

Location	Total Flow (Q, cfs)	Number of Pipes	D_o (ft)	Q (cfs)	TW (ft)	$d_{50\ calculated}$	$d_{50\ Design}$	L_{sp}
Culvert C2a	10.41	2	1.5	5.2	0.60	0.18	0.18	17
Culvert C2b	3.50	2	1	1.8	0.40	0.11	0.18	11
Culvert C3	27.48	2	2.5	13.7	1.00	0.19	0.83	26
Culvert C4	32.85	2	2.5	16.4	1.00	0.25	0.83	27
Culvert C5	38.11	2	2.5	19.1	1.00	0.30	0.83	28
Culvert C6	30.03	2	2	15.0	0.80	0.37	0.83	25
Culvert C8	0.96	1	1	1.0	0.40	0.05	0.18	10
Culvert C9	0.22	1	1	0.2	0.40	0.01	0.18	8
Culvert C11	26.46	2	2.5	13.2	1.00	0.18	0.83	26

Results:

Below is a summary of the d_{50} , thickness (T), and configuration of the riprap apron. Also refer to WisDOT FDM Attachment 5.2 (Sheet 2) for details on apron layout. Use WisDOT Light Riprap at culvert discharge.

Location	d_{50} (in)	T (in)	L_{sp} (ft)	W_{sp} (ft)	WisDOT Riprap sizes
Culvert C2a	2.2	6	17	See Note 1	Select Crushed Material
Culvert C2b	2.2	6	11	See Note 1	Select Crushed Material
Culvert C3	10.0	20	26	See Note 1	Light Riprap
Culvert C4	10.0	20	27	See Note 1	Light Riprap
Culvert C5	10.0	20	28	See Note 1	Light Riprap
Culvert C6	10.0	20	25	See Note 1	Light Riprap
Culvert C8	2.2	6	10	See Note 1	Select Crushed Material
Culvert C9	2.2	6	8	See Note 1	Select Crushed Material
Culvert C11	10.0	20	26	See Note 1	Light Riprap

1. For discharges to channels, place riprap along channel bottom and up side of channel.

E.6.2 Modules 12 and 13 Stormwater Calculations

Storm Water Management Calculations

Purpose:
The purpose of the storm water runoff calculations is to demonstrate that the existing storm water sedimentation basin and proposed storm water management features included in the Module 12 and 13 Plan Modification Request can accommodate and safely convey the runoff from a 25-year, 24-hour storm event and 100-year, 24-hour storm event during post closure conditions.

Items addressed in these calculations:

- Swales
- Culverts
- Diversion Berms
- Downslope Flumes & Energy Dissipators
- Rock Chutes
- Discharge Aprons
- Sedimentation Basin
- North Infiltration Area

The proposed storm water management conditions are shown on **Figure 1**.
The calculations support the capacity check of the following existing storm water management feature:

Feature	Purpose	Design Method
Swales	Convey storm water runoff from adjacent areas to culverts and offsite during post construction conditions	HydroCAD runoff modeling and Swale Calculation
Culverts	Convey storm water from the final cover perimeter swales during post construction conditions	HydroCAD runoff modeling and HY-8 Culvert Model
Diversion Berms	Reduce storm water runoff from final cover slopes and to divert water to perimeter swales during post construction conditions	HydroCAD runoff modeling and Diversion Berm Calculations
Downslope Flumes & Energy Dissipators	Convey storm water from diversion berms down slope to swales and offsite drainage features during post construction conditions	HydroCAD runoff modeling and Downslope Flume Calculations
Rock Chutes	Erosion protection and convey storm water from energy dissipators to existing swale during post construction conditions	HydroCAD runoff modeling and Rock Chute Calculation
Discharge Aprons	Erosion protection from culvert discharge at culvert outlets	HydroCAD runoff modeling and Riprap Apron Calculation
Sedimentation Basin	To safely handle 25-year, 24-hour storm event without overtopping the 100-year, 24-hour spillway.	HydroCAD runoff modeling
North Infiltration Area	To safely handle 25-year, 24-hour and 100-year, 24-hour storm events without overtopping or backing up the inlet pipe.	HydroCAD runoff modeling

Approach:

Hydrograph Generation

HydroCAD was used to model the storm water management system and develop the hydrographs using TR-20 methodologies. The model is designed to simulate the surface runoff response of a watershed to a precipitation event. Input parameters for the model include precipitation depth for the design storm events from NOAA ATLAS 14, contributing drainage areas, runoff curve numbers, and time of concentration.

Swale Sizing

The proposed swales were sized for the 25-year, 24-hour storm event. A WisDOT HEC-15 spreadsheet based on Manning's equation was used to calculate the depth of flow and velocity in the swales using the swale geometry and peak flow in the swales (as determined by the Hydrograph Generation models).

Culvert Sizing

Culverts were sized for the 25-year, 24-hour storm event using the HY-8 computer model developed by the US Department of Transportation, Federal Highway Administration.

Diversion Berms

Diversion berms were sized for the 25-year, 24-hour storm event. A WisDOT HEC-15 spreadsheet based on Manning's Equation was used to calculate the depth of flow and velocity in the swale using the swale geometry and peak flow for the storm event (as determined by the Hydrograph Generation Calculations).

Downslope Flumes and Energy Dissipators Sizing

Flumes and energy dissipators were sized for the 25-year, 24-hour storm event. Manning's equation and the orifice equation were used to size the flumes. Energy dissipators were sized using tables from the reference book "Hydraulic Design of Energy Dissipators for Culverts and Channels" US Department of Transportation, Federal Highway Administration, July 2006.

Rock Chute Sizing

Rock chutes were sized for the 25-year, 24-hour storm event. Rock Chutes were sized based on the flow to each culvert location. The Iowa NRCS Rock Chute Design spreadsheet was used to size the chute and riprap.

Discharge Apron Sizing

Riprap aprons were sized for the 25-year, 24-hour storm event using equations in Section 5.2 – Riprap Blanket of WisDOT FDM 13-35-5. The riprap aprons were sized based on the flow to the culvert location. The riprap stone sizing was used to specify the thickness and geometry of the riprap discharge apron.

Sedimentation Basin Sizing

Route the proposed construction and existing drainage runoff through the sedimentation basin to confirm the basin can handle the 25-year, 24-hour storm event and to safely pass the 100-year, 24-hour storm event. HydroCAD was used to model the runoff flow through the basin outfall (as determined by the Hydrograph Generation model).

North Infiltration Area Verification

The depressional area located north of the Module 12 Plan Modification construction area acts as a infiltration area and accepts portions of the drainage runoff. Route the proposed construction and existing drainage runoff flowing to the North Infiltration Area to confirm the area can handle the 25-year, 24-hour and 100-year, 24-hour storm events without overtopping or backing up the inlet pipe. HydroCAD was used to model the runoff flow into this area (as determined by the Hydrograph Generation model).

Key Assumptions:

- Drainage areas and time of concentration flow paths are as shown on **Figure 1** for Post Construction Conditions.

- An MSE4 rainfall distribution was used based on NRCS Wisconsin rainfall distribution regions.

  The precipitation depth for the 25-year, 24-hour storm was assumed to be 4.91 inches, based on NOAA ATLAS 14 Point Precipitation Frequency Estimates (NOAA's National Weather Service Hydrometeorological Design Studies Center Precipitation Frequency Data Server).

  The precipitation depth for the 100-year, 24-hour storm was assumed to be 6.59 inches, based on NOAA ATLAS 14 Point Precipitation Frequency Estimates.

- Runoff curve numbers were based on tables presented in Urban Hydrology for Small Watersheds, and were assumed as follows and as listed in the modeling.

Cover Type	CN
Final Cover	69 – Pasture/grassland/range in good condition, hydrologic soil group (HSG) (B/C assumed mid value between each soil group)
Pasture, grassland or range	39 – Pasture/grassland/range, Good, HSG A
Gravel	96 – Gravel, HSG A
Water Surface	98 – Water Surface, HSG A

- Type A soil group for non-disturbed areas outside the landfill as soils are loamy sand.
- Other assumptions are included with the calculations attached to this appendix.

Results:

Hydrograph Generation

The hydrograph modeling results for the 25-year and 100-year, 24-hour storm events are included in the Post Construction Conditions Hydrograph Generation section.

Swale Sizing

The proposed swales will be constructed as shown on the Drawings. The swales have the capacity to safely convey the both the 25-year, 24-hour storm events and maintain a minimum 0.5 foot of freeboard. Refer to the Swale Sizing section.

Appropriate erosion control product was selected based on the velocities and shear stress in the swales. Refer to the Swale Sizing section below for the evaluation.

Culvert Sizing

Culverts will be as shown in the Drawings. The culverts have the capacity to safely convey the 25-year, 24-hour storm event. Refer to the Culvert Sizing Section for the detailed calculations.

Diversion Berm Sizing

The proposed final berms will be constructed as shown on the Drawings. The diversion berms will contain the runoff from the 25-year, 24-hour storm event. Refer to the Diversion Berm Design section.

Downslope Flume and Energy Dissipator Sizing

The downslope flumes and energy dissipaters will be constructed as shown on the Drawings. The downslope flumes are designed to contain the runoff from the 25-year, 24-hour storm event. Energy dissipators at the bottom of the downslope flumes have been designed to handle the peak velocities. Refer to the Downslope Flume and Energy Dissipator Sizing section below for detailed calculations.

Rock Chute Sizing

The proposed rock chutes will be constructed as shown in the Drawings. The rock chutes will accommodate the runoff from the 25-year, 24-hour storm event. Refer to the Rock Chute Sizing section.

Discharge Apron Sizing

The proposed riprap aprons will be constructed as shown in the Drawings. The aprons will accommodate the runoff from the 25-year, 24-hour storm event. Refer to Discharge Apron Sizing for design calculations.

Sedimentation Basin Sizing

The existing sedimentation basin has the capacity to safely contain the 25-year, 24-hour storm event and safely pass the 100-year, 24-hour storm event through the emergency spillway.

As shown in the HydroCAD model, the water elevation in both basin areas for each storm event is provided below:

Basin Area	Basin Crest Elevation (ft MSL)	Basin Spillway Elevation (ft MSL)	Peak Elevation 25-year storm (ft MSL)	Peak Elevation 100-year storm (ft MSL)
Existing Sedimentation Basin	794.00	793.00	792.00	793.20

North Infiltration Area Verification

The North Infiltration Area can safely contain the 25-year, 24-hour storm event and the 100-year, 24-hour storm event without overtopping or backing up the inlet pipe at Murray Road.

As shown in the HydroCAD model, the water elevation in both basin areas for each storm event is provided below:

Basin Area	Basin Crest Elevation (ft MSL)	Basin Inlet Pipe Elevation (ft MSL)	Peak Elevation 25-year storm (ft MSL)	Peak Elevation 100-year storm (ft MSL)
North Basin	810.00	806.81	803.86	805.23

LEGEND

DRY ASH DISPOSAL FACILITY LIMITS	EXISTING GRADE (10' INTERVAL)
LIMITS OF WASTE	EXISTING GRADE (2' INTERVAL)
LINER PHASE/MODULE LIMIT	SWALE
FINAL COVER LIMITS	EDGE OF WATER
APPROXIMATE INTERMEDIATE COVER LIMITS/AREA	WETLAND
PAVED ROAD	PROPOSED PHASE 1 FINAL GRADE (10' INTERVAL)
UNPAVED ROAD	PROPOSED PHASE 1 FINAL GRADE (2' INTERVAL)
VEGETATION	PROPOSED GRADE (10' INTERVAL)
FENCE	PROPOSED GRADE (2' INTERVAL)

PROPOSED PERIMETER ROAD	PROPOSED DOWNSLOPE FLUME
PROPOSED SWALE	PROPOSED ENERGY DISSIPATOR
PROPOSED CULVERT	PROPOSED RIPRAP
PROPOSED LEACHATE COLLECTION SYSTEM CLEANOUT	DRAINAGE AREA DIVIDES
PROPOSED LEACHATE VAULT	FLOW PATH
PROPOSED LEACHATE FORCEMAIN	
PROPOSED UNDERGROUND ELECTRIC	
PROPOSED DIVERSION BERM	

NOTES:

1. SEE SHEET 2 OF PLAN OF OPERATION UPDATE (2023) PLAN SET FOR BASE MAP LEGEND ITEMS AND NOTES.
2. PROPOSED GRADES REPRESENT TOP OF FINAL COVER (FINAL GRADE).

N

125 0 125

SCALE: 1" = 125'

PROJECT NO. 25222260.01	DRAWN BY: SJL		
DRAWN: 08/01/2023	CHECKED BY: MJT		
REVISED: 08/31/2023	APPROVED BY: MRH 08/31/2023		

CLIENT: Wisconsin Power and Light Company
WISCONSIN POWER AND LIGHT
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WISCONSIN 53954

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
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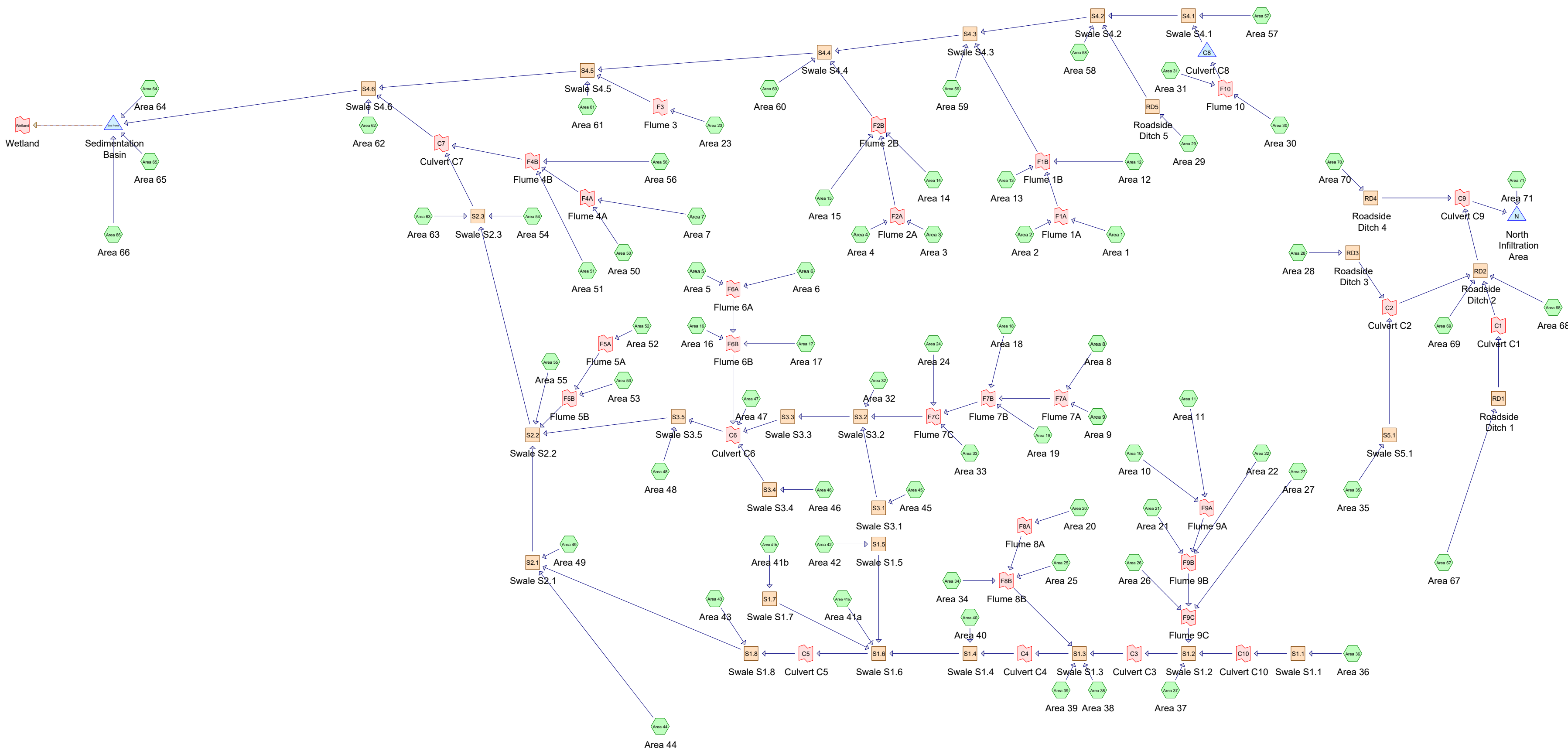
SITE: PLAN OF OPERATION UPDATE
COLUMBIA ENERGY CENTER
COLUMBIA DRY ASH DISPOSAL FACILITY
TOWN OF PACIFIC, WISCONSIN

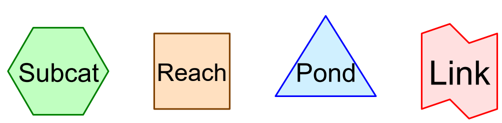
FINAL GRADES (MODULES 12 AND 13)

SHEET 1 OF 1

Post Construction Conditions Hydrograph Generation

- 25-year, 24-hour Storm Event
- 100-year, 24-hour Storm Event





Routing Diagram for 230828_COL_Mod12+13

Prepared by SCS Engineers, Printed 8/28/2023

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25-yr, 24-hr	MSE 24-hr	4	Default	24.00	1	4.91	2
2	100-yr, 24-hr	MSE 24-hr	4	Default	24.00	1	6.59	2

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentArea 1: Area 1 Runoff Area=1.296 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=364' Tc=6.7 min CN=69 Runoff=3.75 cfs 0.204 af

SubcatchmentArea 10: Area 10 Runoff Area=0.573 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=321' Tc=6.4 min CN=69 Runoff=1.68 cfs 0.090 af

SubcatchmentArea 11: Area 11 Runoff Area=1.872 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=796' Tc=7.6 min CN=69 Runoff=5.22 cfs 0.295 af

SubcatchmentArea 12: Area 12 Runoff Area=1.610 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=712' Tc=5.3 min CN=69 Runoff=4.83 cfs 0.254 af

SubcatchmentArea 13: Area 13 Runoff Area=0.626 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=333' Tc=4.5 min CN=69 Runoff=1.94 cfs 0.099 af

SubcatchmentArea 14: Area 14 Runoff Area=0.620 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=331' Tc=4.4 min CN=69 Runoff=1.93 cfs 0.098 af

SubcatchmentArea 15: Area 15 Runoff Area=0.943 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=464' Tc=5.9 min CN=69 Runoff=2.80 cfs 0.149 af

SubcatchmentArea 16: Area 16 Runoff Area=0.571 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=315' Tc=4.4 min CN=69 Runoff=1.78 cfs 0.090 af

SubcatchmentArea 17: Area 17 Runoff Area=0.990 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=424' Tc=4.7 min CN=69 Runoff=3.04 cfs 0.156 af

SubcatchmentArea 18: Area 18 Runoff Area=1.656 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=508' Tc=4.8 min CN=69 Runoff=5.06 cfs 0.261 af

SubcatchmentArea 19: Area 19 Runoff Area=0.689 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=286' Tc=4.3 min CN=69 Runoff=2.16 cfs 0.109 af

SubcatchmentArea 2: Area 2 Runoff Area=0.557 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=303' Tc=4.7 min CN=69 Runoff=1.71 cfs 0.088 af

SubcatchmentArea 20: Area 20 Runoff Area=0.381 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=306' Tc=4.3 min CN=69 Runoff=1.19 cfs 0.060 af

SubcatchmentArea 21: Area 21 Runoff Area=0.516 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=312' Tc=4.3 min CN=69 Runoff=1.62 cfs 0.081 af

SubcatchmentArea 22: Area 22 Runoff Area=2.579 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=1,146' Tc=6.4 min CN=69 Runoff=7.54 cfs 0.407 af

SubcatchmentArea 23: Area 23 Runoff Area=0.427 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=362' Tc=3.8 min CN=69 Runoff=1.38 cfs 0.067 af

SubcatchmentArea 24: Area 24 Runoff Area=1.177 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=385' Tc=4.7 min CN=69 Runoff=3.61 cfs 0.186 af

SubcatchmentArea 25: Area 25 Runoff Area=0.682 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=349' Tc=4.5 min CN=69 Runoff=2.12 cfs 0.108 af

SubcatchmentArea 26: Area 26 Runoff Area=0.677 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=341' Tc=4.5 min CN=69 Runoff=2.10 cfs 0.107 af

SubcatchmentArea 27: Area 27 Runoff Area=2.594 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=1,357' Tc=6.9 min CN=69 Runoff=7.46 cfs 0.409 af

SubcatchmentArea 28: Area 28 Runoff Area=2.159 ac 0.00% Impervious Runoff Depth=2.29"
Flow Length=125' Slope=0.2500 '/' Tc=3.9 min CN=74 Runoff=8.44 cfs 0.412 af

SubcatchmentArea 29: Area 29 Runoff Area=0.616 ac 0.00% Impervious Runoff Depth=2.13"
Flow Length=109' Slope=0.2500 '/' Tc=3.8 min CN=72 Runoff=2.25 cfs 0.109 af

SubcatchmentArea 3: Area 3 Runoff Area=0.348 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=298' Tc=4.8 min CN=69 Runoff=1.06 cfs 0.055 af

SubcatchmentArea 30: Area 30 Runoff Area=0.149 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=211' Tc=1.2 min CN=69 Runoff=0.52 cfs 0.023 af

SubcatchmentArea 31: Area 31 Runoff Area=0.126 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=59' Slope=0.2500 '/' Tc=2.5 min CN=69 Runoff=0.44 cfs 0.020 af

SubcatchmentArea 32: Area 32 Runoff Area=0.457 ac 0.00% Impervious Runoff Depth=1.97"
Flow Length=122' Slope=0.2500 '/' Tc=3.9 min CN=70 Runoff=1.53 cfs 0.075 af

SubcatchmentArea 33: Area 33 Runoff Area=1.056 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=419' Tc=4.7 min CN=69 Runoff=3.24 cfs 0.167 af

SubcatchmentArea 34: Area 34 Runoff Area=0.434 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=374' Tc=4.5 min CN=69 Runoff=1.35 cfs 0.068 af

SubcatchmentArea 35: Area 35 Runoff Area=1.218 ac 0.00% Impervious Runoff Depth=2.29"
Flow Length=104' Tc=4.6 min CN=74 Runoff=4.58 cfs 0.233 af

SubcatchmentArea 36: Area 36 Runoff Area=1.185 ac 0.00% Impervious Runoff Depth=1.59"
Flow Length=106' Tc=4.1 min CN=65 Runoff=3.12 cfs 0.157 af

SubcatchmentArea 37: Area 37 Runoff Area=1.291 ac 0.00% Impervious Runoff Depth=1.38"
Flow Length=120' Slope=0.2500 '/' Tc=3.9 min CN=62 Runoff=2.93 cfs 0.149 af

SubcatchmentArea 38: Area 38 Runoff Area=0.795 ac 0.00% Impervious Runoff Depth=1.45"
Flow Length=155' Tc=4.3 min CN=63 Runoff=1.86 cfs 0.096 af

SubcatchmentArea 39: Area 39 Runoff Area=0.620 ac 0.00% Impervious Runoff Depth=1.00"
Flow Length=168' Tc=9.6 min CN=56 Runoff=0.72 cfs 0.051 af

SubcatchmentArea 4: Area 4 Runoff Area=0.288 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=296' Tc=4.0 min CN=69 Runoff=0.92 cfs 0.045 af

SubcatchmentArea 40: Area 40 Runoff Area=0.739 ac 0.00% Impervious Runoff Depth=1.00"
Flow Length=141' Tc=7.2 min CN=56 Runoff=0.98 cfs 0.061 af

SubcatchmentArea 41a: Area 41a Runoff Area=0.871 ac 0.00% Impervious Runoff Depth=1.59"
Flow Length=144' Slope=0.0500 '/' Tc=7.8 min CN=65 Runoff=2.00 cfs 0.116 af

SubcatchmentArea 41b: Area 41b Runoff Area=0.712 ac 0.00% Impervious Runoff Depth=2.05"
Flow Length=102' Slope=0.0500 '/' Tc=7.3 min CN=71 Runoff=2.19 cfs 0.122 af

SubcatchmentArea 42: Area 42 Runoff Area=0.769 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=139' Slope=0.0500 '/' Tc=7.7 min CN=69 Runoff=2.14 cfs 0.121 af

SubcatchmentArea 43: Area 43 Runoff Area=2.792 ac 0.00% Impervious Runoff Depth=1.32"
Flow Length=419' Tc=14.7 min CN=61 Runoff=3.88 cfs 0.306 af

SubcatchmentArea 44: Area 44 Runoff Area=1.416 ac 0.00% Impervious Runoff Depth=0.18"
Flow Length=941' Slope=0.0260 '/' Tc=22.0 min CN=39 Runoff=0.06 cfs 0.022 af

SubcatchmentArea 45: Area 45 Runoff Area=2.044 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=138' Tc=4.0 min CN=69 Runoff=6.52 cfs 0.322 af

SubcatchmentArea 46: Area 46 Runoff Area=0.769 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=139' Slope=0.0500 '/' Tc=7.7 min CN=69 Runoff=2.14 cfs 0.121 af

SubcatchmentArea 47: Area 47 Runoff Area=0.079 ac 0.00% Impervious Runoff Depth=2.13"
Flow Length=143' Tc=5.1 min CN=72 Runoff=0.27 cfs 0.014 af

SubcatchmentArea 48: Area 48 Runoff Area=3.726 ac 0.00% Impervious Runoff Depth=2.05"
Flow Length=391' Tc=11.1 min CN=71 Runoff=9.80 cfs 0.636 af

SubcatchmentArea 49: Area 49 Runoff Area=0.698 ac 0.00% Impervious Runoff Depth=0.18"
Flow Length=100' Slope=0.0600 '/' Tc=6.8 min CN=39 Runoff=0.03 cfs 0.011 af

SubcatchmentArea 5: Area 5 Runoff Area=0.504 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=258' Tc=3.4 min CN=69 Runoff=1.66 cfs 0.079 af

SubcatchmentArea 50: Area 50 Runoff Area=0.223 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=296' Tc=3.7 min CN=69 Runoff=0.72 cfs 0.035 af

SubcatchmentArea 51: Area 51 Runoff Area=0.655 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=642' Tc=5.0 min CN=69 Runoff=1.98 cfs 0.103 af

SubcatchmentArea 52: Area 52 Runoff Area=0.237 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=348' Tc=4.0 min CN=69 Runoff=0.76 cfs 0.037 af

SubcatchmentArea 53: Area 53 Runoff Area=0.475 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=425' Tc=4.5 min CN=69 Runoff=1.48 cfs 0.075 af

SubcatchmentArea 54: Area 54 Runoff Area=1.618 ac 0.00% Impervious Runoff Depth=1.18"
Flow Length=384' Tc=4.2 min CN=59 Runoff=2.98 cfs 0.160 af

SubcatchmentArea 55: Area 55 Runoff Area=0.826 ac 0.00% Impervious Runoff Depth=1.12"
Flow Length=126' Slope=0.2500 '/' Tc=3.9 min CN=58 Runoff=1.45 cfs 0.077 af

SubcatchmentArea 56: Area 56 Runoff Area=1.228 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=647' Tc=5.7 min CN=69 Runoff=3.66 cfs 0.194 af

SubcatchmentArea 57: Area 57 Runoff Area=1.089 ac 0.00% Impervious Runoff Depth=1.12"
Flow Length=158' Tc=4.3 min CN=58 Runoff=1.86 cfs 0.102 af

SubcatchmentArea 58: Area 58 Runoff Area=1.194 ac 0.00% Impervious Runoff Depth=1.18"
Flow Length=221' Tc=4.4 min CN=59 Runoff=2.17 cfs 0.118 af

SubcatchmentArea 59: Area 59 Runoff Area=2.220 ac 0.00% Impervious Runoff Depth=0.88"
Flow Length=240' Tc=4.6 min CN=54 Runoff=2.69 cfs 0.162 af

SubcatchmentArea 6: Area 6 Runoff Area=0.936 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=541' Tc=5.3 min CN=69 Runoff=2.81 cfs 0.148 af

SubcatchmentArea 60: Area 60 Runoff Area=2.476 ac 0.00% Impervious Runoff Depth=1.12"
Flow Length=263' Tc=4.7 min CN=58 Runoff=4.13 cfs 0.231 af

SubcatchmentArea 61: Area 61 Runoff Area=1.683 ac 0.00% Impervious Runoff Depth=0.82"
Flow Length=146' Slope=0.2345 '/' Tc=4.1 min CN=53 Runoff=1.90 cfs 0.115 af

SubcatchmentArea 62: Area 62 Runoff Area=2.001 ac 0.00% Impervious Runoff Depth=0.33"
Flow Length=318' Tc=20.8 min CN=43 Runoff=0.24 cfs 0.055 af

SubcatchmentArea 63: Area 63 Runoff Area=2.177 ac 0.00% Impervious Runoff Depth=0.18"
Flow Length=149' Tc=8.2 min CN=39 Runoff=0.09 cfs 0.033 af

SubcatchmentArea 64: Area 64 Runoff Area=0.594 ac 0.00% Impervious Runoff Depth=0.66"
Flow Length=147' Slope=0.0544 '/' Tc=7.6 min CN=50 Runoff=0.39 cfs 0.032 af

SubcatchmentArea 65: Area 65 Runoff Area=1.509 ac 100.00% Impervious Runoff Depth=4.67"
Tc=0.0 min CN=98 Runoff=10.73 cfs 0.588 af

SubcatchmentArea 66: Area 66 Runoff Area=5.227 ac 0.00% Impervious Runoff Depth=0.18"
Flow Length=701' Tc=7.9 min CN=39 Runoff=0.22 cfs 0.079 af

SubcatchmentArea 67: Area 67 Runoff Area=3.035 ac 0.00% Impervious Runoff Depth=0.51"
Flow Length=886' Slope=0.0068 '/' Tc=38.9 min CN=47 Runoff=0.61 cfs 0.128 af

SubcatchmentArea 68: Area 68 Runoff Area=0.251 ac 0.00% Impervious Runoff Depth=0.29"
Flow Length=52' Slope=0.1154 '/' Tc=3.1 min CN=42 Runoff=0.03 cfs 0.006 af

SubcatchmentArea 69: Area 69 Runoff Area=0.913 ac 0.00% Impervious Runoff Depth=0.46"
Flow Length=86' Slope=0.2326 '/' Tc=3.5 min CN=46 Runoff=0.36 cfs 0.035 af

SubcatchmentArea 7: Area 7 Runoff Area=0.986 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=608' Tc=6.6 min CN=69 Runoff=2.87 cfs 0.155 af

SubcatchmentArea 70: Area 70 Runoff Area=1.671 ac 0.00% Impervious Runoff Depth=0.71"
Flow Length=126' Tc=4.0 min CN=51 Runoff=1.52 cfs 0.099 af

SubcatchmentArea 71: Area 71 Runoff Area=9.875 ac 0.00% Impervious Runoff Depth=0.29"
Flow Length=1,337' Tc=16.6 min CN=42 Runoff=0.99 cfs 0.238 af

SubcatchmentArea 8: Area 8 Runoff Area=35,545 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=348' Tc=3.6 min CN=69 Runoff=2.66 cfs 0.129 af

SubcatchmentArea 9: Area 9 Runoff Area=10,716 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=144' Tc=2.3 min CN=69 Runoff=0.86 cfs 0.039 af

Reach RD1: Roadside Ditch 1 Avg. Flow Depth=0.10' Max Vel=1.34 fps Inflow=0.61 cfs 0.128 af
n=0.030 L=440.6' S=0.0188 '/' Capacity=47.16 cfs Outflow=0.60 cfs 0.128 af

Reach RD2: Roadside Ditch 2 Avg. Flow Depth=0.39' Max Vel=2.69 fps Inflow=11.23 cfs 0.814 af
n=0.030 L=433.0' S=0.0162 '/' Capacity=72.77 cfs Outflow=10.38 cfs 0.814 af

Reach RD3: Roadside Ditch 3 Avg. Flow Depth=0.67' Max Vel=3.99 fps Inflow=8.44 cfs 0.412 af
n=0.030 L=821.0' S=0.0288 '/' Capacity=20.76 cfs Outflow=7.09 cfs 0.412 af

Reach RD4: Roadside Ditch 4 Avg. Flow Depth=0.12' Max Vel=1.05 fps Inflow=1.52 cfs 0.099 af
n=0.030 L=495.6' S=0.0090 '/' Capacity=54.26 cfs Outflow=0.92 cfs 0.099 af

Reach RD5: Roadside Ditch 5 Avg. Flow Depth=0.38' Max Vel=3.65 fps Inflow=2.25 cfs 0.109 af
n=0.030 L=288.0' S=0.0531 '/' Capacity=28.18 cfs Outflow=2.01 cfs 0.109 af

Reach S1.1: Swale S1.1 Avg. Flow Depth=0.14' Max Vel=2.32 fps Inflow=3.12 cfs 0.157 af
n=0.030 L=321.0' S=0.0319 '/' Capacity=338.34 cfs Outflow=2.76 cfs 0.157 af

Reach S1.2: Swale S1.2 Avg. Flow Depth=0.76' Max Vel=3.60 fps Inflow=30.31 cfs 1.696 af
n=0.030 L=202.8' S=0.0108 '/' Capacity=196.86 cfs Outflow=28.58 cfs 1.696 af

Reach S1.3: Swale S1.3 Avg. Flow Depth=0.76' Max Vel=4.15 fps Inflow=34.68 cfs 2.079 af
n=0.030 L=72.2' S=0.0144 '/' Capacity=227.36 cfs Outflow=34.14 cfs 2.079 af

Reach S1.4: Swale S1.4 Avg. Flow Depth=1.03' Max Vel=2.73 fps Inflow=35.12 cfs 2.141 af
n=0.030 L=148.0' S=0.0045 '/' Capacity=126.50 cfs Outflow=33.65 cfs 2.141 af

Reach S1.5: Swale S1.5 Avg. Flow Depth=0.20' Max Vel=1.12 fps Inflow=2.14 cfs 0.121 af
n=0.030 L=179.7' S=0.0050 '/' Capacity=134.06 cfs Outflow=1.95 cfs 0.121 af

Reach S1.6: Swale S1.6 Avg. Flow Depth=1.04' Max Vel=3.05 fps Inflow=39.20 cfs 2.499 af
n=0.030 L=252.0' S=0.0054 '/' Capacity=139.68 cfs Outflow=37.41 cfs 2.499 af

Reach S1.7: Swale S1.7 Avg. Flow Depth=0.31' Max Vel=1.88 fps Inflow=2.19 cfs 0.122 af
n=0.030 L=245.8' S=0.0099 '/' Capacity=90.14 cfs Outflow=1.99 cfs 0.122 af

Reach S1.8: Swale S1.8 Avg. Flow Depth=0.98' Max Vel=3.45 fps Inflow=41.27 cfs 2.805 af
n=0.030 L=422.0' S=0.0075 '/' Capacity=163.67 cfs Outflow=39.57 cfs 2.805 af

Reach S2.1: Swale S2.1 Avg. Flow Depth=1.31' Max Vel=3.17 fps Inflow=39.58 cfs 2.837 af
n=0.030 L=389.0' S=0.0054 '/' Capacity=97.05 cfs Outflow=38.03 cfs 2.837 af

Reach S2.2: Swale S2.2 Avg. Flow Depth=1.29' Max Vel=3.33 fps Inflow=65.64 cfs 5.558 af
n=0.030 L=411.0' S=0.0049 '/' Capacity=152.61 cfs Outflow=64.61 cfs 5.558 af

Reach S2.3: Swale S2.3 Avg. Flow Depth=0.99' Max Vel=4.71 fps Inflow=65.54 cfs 5.750 af
n=0.030 L=307.0' S=0.0130 '/' Capacity=249.72 cfs Outflow=64.79 cfs 5.750 af

Reach S3.1: Swale S3.1 Avg. Flow Depth=0.37' Max Vel=1.62 fps Inflow=6.52 cfs 0.322 af
n=0.030 L=357.0' S=0.0050 '/' Capacity=133.76 cfs Outflow=5.46 cfs 0.322 af

Reach S3.2: Swale S3.2 Avg. Flow Depth=0.79' Max Vel=2.48 fps Inflow=22.25 cfs 1.287 af
n=0.030 L=34.0' S=0.0050 '/' Capacity=133.95 cfs Outflow=21.76 cfs 1.287 af

Reach S3.3: Swale S3.3 Avg. Flow Depth=0.60' Max Vel=3.48 fps Inflow=21.76 cfs 1.287 af
n=0.030 L=200.0' S=0.0130 '/' Capacity=215.99 cfs Outflow=20.93 cfs 1.287 af

Reach S3.4: Swale S3.4 Avg. Flow Depth=0.33' Max Vel=1.67 fps Inflow=2.14 cfs 0.121 af
n=0.030 L=283.0' S=0.0071 '/' Capacity=76.21 cfs Outflow=1.94 cfs 0.121 af

Reach S3.5: Swale S3.5 Avg. Flow Depth=1.27' Max Vel=2.26 fps Inflow=39.57 cfs 2.531 af
n=0.030 L=318.5' S=0.0024 '/' Capacity=93.14 cfs Outflow=36.85 cfs 2.531 af

Reach S4.1: Swale S4.1 Avg. Flow Depth=0.14' Max Vel=1.62 fps Inflow=2.74 cfs 0.145 af
n=0.030 L=240.0' S=0.0153 '/' Capacity=70.22 cfs Outflow=2.38 cfs 0.145 af

Reach S4.2: Swale S4.2 Avg. Flow Depth=0.26' Max Vel=2.12 fps Inflow=6.29 cfs 0.372 af
n=0.030 L=259.3' S=0.0127 '/' Capacity=63.88 cfs Outflow=5.84 cfs 0.372 af

Reach S4.3: Swale S4.3 Avg. Flow Depth=0.74' Max Vel=1.83 fps Inflow=19.18 cfs 1.179 af
n=0.030 L=362.9' S=0.0027 '/' Capacity=108.12 cfs Outflow=17.09 cfs 1.179 af

Reach S4.4: Swale S4.4 Avg. Flow Depth=0.75' Max Vel=2.28 fps Inflow=22.46 cfs 1.757 af
n=0.030 L=495.6' S=0.0040 '/' Capacity=132.85 cfs Outflow=21.52 cfs 1.757 af

Reach S4.5: Swale S4.5 Avg. Flow Depth=0.60' Max Vel=3.08 fps Inflow=22.64 cfs 1.939 af
n=0.030 L=411.1' S=0.0097 '/' Capacity=465.89 cfs Outflow=22.15 cfs 1.939 af

Reach S4.6: Swale S4.6 Avg. Flow Depth=1.24' Max Vel=5.00 fps Inflow=89.26 cfs 8.232 af
n=0.030 L=537.0' S=0.0112 '/' Capacity=499.25 cfs Outflow=87.87 cfs 8.232 af

Reach S5.1: Swale S5.1 Avg. Flow Depth=0.22' Max Vel=2.09 fps Inflow=4.58 cfs 0.233 af
n=0.030 L=478.0' S=0.0154 '/' Capacity=235.22 cfs Outflow=3.89 cfs 0.233 af

Pond C8: Culvert C8 Peak Elev=811.21' Storage=0.000 af Inflow=0.95 cfs 0.043 af
12.0" Round Culvert n=0.012 L=85.6' S=0.0245 '/' Outflow=0.96 cfs 0.043 af

Pond N: North Infiltration Area Peak Elev=803.86' Storage=20,107 cf Inflow=11.66 cfs 1.151 af
Outflow=1.38 cfs 1.151 af

Pond Sed Pond: Sedimentation Basin Peak Elev=792.00' Storage=164,114 cf Inflow=89.59 cfs 8.931 af
6.100 af Primary=10.00 cfs 2.831 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=15.47 cfs 8.931 af

Link C1: Culvert C1 Inflow=0.60 cfs 0.128 af
Primary=0.60 cfs 0.128 af

Link C10: Culvert C10 Inflow=2.76 cfs 0.157 af
Primary=2.76 cfs 0.157 af

Link C2: Culvert C2 Inflow=10.95 cfs 0.645 af
Primary=10.95 cfs 0.645 af

Link C3: Culvert C3 Inflow=28.58 cfs 1.696 af
Primary=28.58 cfs 1.696 af

Link C4: Culvert C4 Inflow=34.14 cfs 2.079 af
Primary=34.14 cfs 2.079 af

Link C5: Culvert C5 Inflow=37.41 cfs 2.499 af
Primary=37.41 cfs 2.499 af

Link C6: Culvert C6 Inflow=30.67 cfs 1.895 af
Primary=30.67 cfs 1.895 af

Link C7: Culvert C7 Inflow=67.17 cfs 6.238 af
Primary=67.17 cfs 6.238 af

Link C9: Culvert C9 Inflow=11.16 cfs 0.913 af
Primary=11.16 cfs 0.913 af

Link F10: Flume 10 Inflow=0.95 cfs 0.043 af
Primary=0.95 cfs 0.043 af

Link F1A: Flume 1A Inflow=5.38 cfs 0.292 af
Primary=5.38 cfs 0.292 af

Link F1B: Flume 1B Inflow=12.06 cfs 0.645 af
Primary=12.06 cfs 0.645 af

Link F2A: Flume 2A Inflow=1.98 cfs 0.100 af
Primary=1.98 cfs 0.100 af

Link F2B: Flume 2B Inflow=6.58 cfs 0.347 af
Primary=6.58 cfs 0.347 af

Link F3: Flume 3 Inflow=1.38 cfs 0.067 af
Primary=1.38 cfs 0.067 af

Link F4A: Flume 4A	Inflow=3.47 cfs 0.191 af Primary=3.47 cfs 0.191 af
Link F4B: Flume 4B	Inflow=9.10 cfs 0.488 af Primary=9.10 cfs 0.488 af
Link F5A: Flume 5A	Inflow=0.76 cfs 0.037 af Primary=0.76 cfs 0.037 af
Link F5B: Flume 5B	Inflow=2.23 cfs 0.112 af Primary=2.23 cfs 0.112 af
Link F6A: Flume 6A	Inflow=4.38 cfs 0.227 af Primary=4.38 cfs 0.227 af
Link F6B: Flume 6B	Inflow=9.20 cfs 0.473 af Primary=9.20 cfs 0.473 af
Link F7A: Flume 7A	Inflow=3.51 cfs 0.167 af Primary=3.51 cfs 0.167 af
Link F7B: Flume 7B	Inflow=10.65 cfs 0.537 af Primary=10.65 cfs 0.537 af
Link F7C: Flume 7C	Inflow=17.47 cfs 0.889 af Primary=17.47 cfs 0.889 af
Link F8A: Flume 8A	Inflow=1.19 cfs 0.060 af Primary=1.19 cfs 0.060 af
Link F8B: Flume 8B	Inflow=4.66 cfs 0.236 af Primary=4.66 cfs 0.236 af
Link F9A: Flume 9A	Inflow=6.88 cfs 0.386 af Primary=6.88 cfs 0.386 af
Link F9B: Flume 9B	Inflow=15.84 cfs 0.874 af Primary=15.84 cfs 0.874 af
Link F9C: Flume 9C	Inflow=25.24 cfs 1.389 af Primary=25.24 cfs 1.389 af
Link Wetland: Wetland	Inflow=10.00 cfs 2.831 af Primary=10.00 cfs 2.831 af

Summary for Subcatchment Area 1: Area 1

Runoff = 3.75 cfs @ 12.14 hrs, Volume= 0.204 af, Depth= 1.89"
Routed to Link F1A : Flume 1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.296	69	Pasture/grassland/range, Fair, HSG B
1.296		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	93	0.1000	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	7	0.2500	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.7	151	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	113	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.7	364	Total			

Summary for Subcatchment Area 10: Area 10

Runoff = 1.68 cfs @ 12.14 hrs, Volume= 0.090 af, Depth= 1.89"
Routed to Link F9A : Flume 9A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.573	69	Pasture/grassland/range, Fair, HSG B
0.573		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	79	0.1000	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.1	21	0.2500	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	53	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	168	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.4	321	Total			

Summary for Subcatchment Area 11: Area 11

Runoff = 5.22 cfs @ 12.15 hrs, Volume= 0.295 af, Depth= 1.89"
Routed to Link F9A : Flume 9A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.872	69	Pasture/grassland/range, Fair, HSG B
1.872		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	96	0.1000	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	4	0.2500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	90	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	606	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
7.6	796	Total			

Summary for Subcatchment Area 12: Area 12

Runoff = 4.83 cfs @ 12.13 hrs, Volume= 0.254 af, Depth= 1.89"
Routed to Link F1B : Flume 1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.610	69	Pasture/grassland/range, Fair, HSG B
1.610		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	31	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	581	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.3	712	Total			

Summary for Subcatchment Area 13: Area 13

Runoff = 1.94 cfs @ 12.11 hrs, Volume= 0.099 af, Depth= 1.89"
Routed to Link F1B : Flume 1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.626	69	Pasture/grassland/range, Fair, HSG B
0.626		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	183	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	333	Total			

Summary for Subcatchment Area 14: Area 14

Runoff = 1.93 cfs @ 12.11 hrs, Volume= 0.098 af, Depth= 1.89"
Routed to Link F2B : Flume 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.620	69	Pasture/grassland/range, Fair, HSG B
0.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	181	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.4	331	Total			

Summary for Subcatchment Area 15: Area 15

Runoff = 2.80 cfs @ 12.14 hrs, Volume= 0.149 af, Depth= 1.89"
Routed to Link F2B : Flume 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.943	69	Pasture/grassland/range, Fair, HSG B
0.943		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1500	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	95	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	269	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.9	464	Total			

Summary for Subcatchment Area 16: Area 16

Runoff = 1.78 cfs @ 12.11 hrs, Volume= 0.090 af, Depth= 1.89"
Routed to Link F6B : Flume 6B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.571	69	Pasture/grassland/range, Fair, HSG B
0.571		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	44	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	171	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.4	315	Total			

Summary for Subcatchment Area 17: Area 17

Runoff = 3.04 cfs @ 12.12 hrs, Volume= 0.156 af, Depth= 1.89"
Routed to Link F6B : Flume 6B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.990	69	Pasture/grassland/range, Fair, HSG B
0.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	278	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	424	Total			

Summary for Subcatchment Area 18: Area 18

Runoff = 5.06 cfs @ 12.12 hrs, Volume= 0.261 af, Depth= 1.89"
Routed to Link F7B : Flume 7B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.656	69	Pasture/grassland/range, Fair, HSG B
1.656		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	88	0.2045	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.0	420	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.8	508	Total			

Summary for Subcatchment Area 19: Area 19

Runoff = 2.16 cfs @ 12.11 hrs, Volume= 0.109 af, Depth= 1.89"
Routed to Link F7B : Flume 7B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.689	69	Pasture/grassland/range, Fair, HSG B
0.689		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	136	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.3	286	Total			

Summary for Subcatchment Area 2: Area 2

Runoff = 1.71 cfs @ 12.12 hrs, Volume= 0.088 af, Depth= 1.89"
Routed to Link F1A : Flume 1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.557	69	Pasture/grassland/range, Fair, HSG B
0.557		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	100	0.1950	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	181	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	303	Total			

Summary for Subcatchment Area 20: Area 20

Runoff = 1.19 cfs @ 12.11 hrs, Volume= 0.060 af, Depth= 1.89"
Routed to Link F8A : Flume 8A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.381	69	Pasture/grassland/range, Fair, HSG B
0.381		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	7	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	199	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.3	306	Total			

Summary for Subcatchment Area 21: Area 21

Runoff = 1.62 cfs @ 12.11 hrs, Volume= 0.081 af, Depth= 1.89"
Routed to Link F9B : Flume 9B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.516	69	Pasture/grassland/range, Fair, HSG B
0.516		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	7	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	205	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.3	312	Total			

Summary for Subcatchment Area 22: Area 22

Runoff = 7.54 cfs @ 12.14 hrs, Volume= 0.407 af, Depth= 1.89"
Routed to Link F9B : Flume 9B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
2.579	69	Pasture/grassland/range, Fair, HSG B
2.579		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	21	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.5	1,025	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.4	1,146	Total			

Summary for Subcatchment Area 23: Area 23

Runoff = 1.38 cfs @ 12.10 hrs, Volume= 0.067 af, Depth= 1.89"
Routed to Link F3 : Flume 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.427	69	Pasture/grassland/range, Fair, HSG B
0.427		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	70	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	227	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	65	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
3.8	362	Total			

Summary for Subcatchment Area 24: Area 24

Runoff = 3.61 cfs @ 12.12 hrs, Volume= 0.186 af, Depth= 1.89"
Routed to Link F7C : Flume 7C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.177	69	Pasture/grassland/range, Fair, HSG B
1.177		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	60	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	225	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	385	Total			

Summary for Subcatchment Area 25: Area 25

Runoff = 2.12 cfs @ 12.11 hrs, Volume= 0.108 af, Depth= 1.89"
Routed to Link F8B : Flume 8B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.682	69	Pasture/grassland/range, Fair, HSG B
0.682		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	199	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	349	Total			

Summary for Subcatchment Area 26: Area 26

Runoff = 2.10 cfs @ 12.11 hrs, Volume= 0.107 af, Depth= 1.89"
Routed to Link F9C : Flume 9C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.677	69	Pasture/grassland/range, Fair, HSG B
0.677		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	191	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	341	Total			

Summary for Subcatchment Area 27: Area 27

Runoff = 7.46 cfs @ 12.15 hrs, Volume= 0.409 af, Depth= 1.89"
Routed to Link F9C : Flume 9C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
2.594	69	Pasture/grassland/range, Fair, HSG B
2.594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	99	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
3.1	1,258	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.9	1,357	Total			

Summary for Subcatchment Area 28: Area 28

Runoff = 8.44 cfs @ 12.10 hrs, Volume= 0.412 af, Depth= 2.29"
Routed to Reach RD3 : Roadside Ditch 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.735	69	Pasture/grassland/range, Fair, HSG B
0.424	96	Gravel surface, HSG A
2.159	74	Weighted Average
2.159		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	25	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	125	Total			

Summary for Subcatchment Area 29: Area 29

Runoff = 2.25 cfs @ 12.10 hrs, Volume= 0.109 af, Depth= 2.13"
Routed to Reach RD5 : Roadside Ditch 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.543	69	Pasture/grassland/range, Fair, HSG B
0.073	96	Gravel surface, HSG A
0.616	72	Weighted Average
0.616		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	9	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.8	109	Total			

Summary for Subcatchment Area 3: Area 3

Runoff = 1.06 cfs @ 12.12 hrs, Volume= 0.055 af, Depth= 1.89"
Routed to Link F2A : Flume 2A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.348	69	Pasture/grassland/range, Fair, HSG B
0.348		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	100	0.1950	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	36	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	162	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.8	298	Total			

Summary for Subcatchment Area 30: Area 30

Runoff = 0.52 cfs @ 12.08 hrs, Volume= 0.023 af, Depth= 1.89"
Routed to Link F10 : Flume 10

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.149	69	Pasture/grassland/range, Fair, HSG B
0.149		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	12	0.2500	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	199	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
1.2	211	Total			

Summary for Subcatchment Area 31: Area 31

Runoff = 0.44 cfs @ 12.09 hrs, Volume= 0.020 af, Depth= 1.89"
Routed to Link F10 : Flume 10

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.126	69	Pasture/grassland/range, Fair, HSG B
0.126		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	59	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 32: Area 32

Runoff = 1.53 cfs @ 12.11 hrs, Volume= 0.075 af, Depth= 1.97"
Routed to Reach S3.2 : Swale S3.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.435	69	Pasture/grassland/range, Fair, HSG B
0.022	96	Gravel surface, HSG A
0.457	70	Weighted Average
0.457		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	122	Total			

Summary for Subcatchment Area 33: Area 33

Runoff = 3.24 cfs @ 12.12 hrs, Volume= 0.167 af, Depth= 1.89"
Routed to Link F7C : Flume 7C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.056	69	Pasture/grassland/range, Fair, HSG B
1.056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	57	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	262	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	419	Total			

Summary for Subcatchment Area 34: Area 34

Runoff = 1.35 cfs @ 12.11 hrs, Volume= 0.068 af, Depth= 1.89"
Routed to Link F8B : Flume 8B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.434	69	Pasture/grassland/range, Fair, HSG B
0.434		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	15	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	259	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	374	Total			

Summary for Subcatchment Area 35: Area 35

Runoff = 4.58 cfs @ 12.11 hrs, Volume= 0.233 af, Depth= 2.29"
Routed to Reach S5.1 : Swale S5.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.986	69	Pasture/grassland/range, Fair, HSG B
0.232	96	Gravel surface, HSG A
1.218	74	Weighted Average
1.218		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	70	0.1736	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	20	0.0050	0.53		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.7	10	0.1766	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	4	0.1766	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.6	104	Total			

Summary for Subcatchment Area 36: Area 36

Runoff = 3.12 cfs @ 12.11 hrs, Volume= 0.157 af, Depth= 1.59"
Routed to Reach S1.1 : Swale S1.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.322	39	Pasture/grassland/range, Good, HSG A
0.696	69	Pasture/grassland/range, Fair, HSG B
0.167	96	Gravel surface, HSG A
1.185	65	Weighted Average
1.185		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	72	0.1736	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	20	0.0050	0.53		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.1	14	0.1766	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	106	Total			

Summary for Subcatchment Area 37: Area 37

Runoff = 2.93 cfs @ 12.11 hrs, Volume= 0.149 af, Depth= 1.38"
Routed to Reach S1.2 : Swale S1.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.415	39	Pasture/grassland/range, Good, HSG A
0.743	69	Pasture/grassland/range, Fair, HSG B
0.133	96	Gravel surface, HSG A
1.291	62	Weighted Average
1.291		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	20	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	120	Total			

Summary for Subcatchment Area 38: Area 38

Runoff = 1.86 cfs @ 12.11 hrs, Volume= 0.096 af, Depth= 1.45"
Routed to Reach S1.3 : Swale S1.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.263	39	Pasture/grassland/range, Good, HSG A
0.409	69	Pasture/grassland/range, Fair, HSG B
0.123	96	Gravel surface, HSG A
0.795	63	Weighted Average
0.795		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	14	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	17	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	24	0.0833	2.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.3	155	Total			

Summary for Subcatchment Area 39: Area 39

Runoff = 0.72 cfs @ 12.19 hrs, Volume= 0.051 af, Depth= 1.00"
Routed to Reach S1.3 : Swale S1.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.317	39	Pasture/grassland/range, Good, HSG A
0.243	69	Pasture/grassland/range, Fair, HSG B
0.060	96	Gravel surface, HSG A
0.620	56	Weighted Average
0.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	81	0.0245	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.0	19	0.2500	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	29	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	20	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	19	0.1053	2.27		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	168	Total			

Summary for Subcatchment Area 4: Area 4

Runoff = 0.92 cfs @ 12.11 hrs, Volume= 0.045 af, Depth= 1.89"
Routed to Link F2A : Flume 2A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.288	69	Pasture/grassland/range, Fair, HSG B
0.288		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	49	0.0820	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	247	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.0	296	Total			

Summary for Subcatchment Area 40: Area 40

Runoff = 0.98 cfs @ 12.16 hrs, Volume= 0.061 af, Depth= 1.00"
Routed to Reach S1.4 : Swale S1.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.389	39	Pasture/grassland/range, Good, HSG A
0.270	69	Pasture/grassland/range, Fair, HSG B
0.080	96	Gravel surface, HSG A
0.739	56	Weighted Average
0.739		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	49	0.0408	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.1	47	0.2500	0.37		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	4	0.0050	0.39		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.2	19	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	22	0.1136	2.36		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.2	141	Total			

Summary for Subcatchment Area 41a: Area 41a

Runoff = 2.00 cfs @ 12.16 hrs, Volume= 0.116 af, Depth= 1.59"
Routed to Reach S1.6 : Swale S1.6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.249	39	Pasture/grassland/range, Good, HSG A
0.489	69	Pasture/grassland/range, Fair, HSG B
0.133	96	Gravel surface, HSG A
0.871	65	Weighted Average
0.871		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	44	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.8	144	Total			

Summary for Subcatchment Area 41b: Area 41b

Runoff = 2.19 cfs @ 12.15 hrs, Volume= 0.122 af, Depth= 2.05"
Routed to Reach S1.7 : Swale S1.7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.655	69	Pasture/grassland/range, Fair, HSG B
0.057	96	Gravel surface, HSG A
0.712	71	Weighted Average
0.712		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	2	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.3	102	Total			

Summary for Subcatchment Area 42: Area 42

Runoff = 2.14 cfs @ 12.15 hrs, Volume= 0.121 af, Depth= 1.89"
Routed to Reach S1.5 : Swale S1.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.769	69	Pasture/grassland/range, Fair, HSG B
0.769		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	39	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.7	139	Total			

Summary for Subcatchment Area 43: Area 43

Runoff = 3.88 cfs @ 12.25 hrs, Volume= 0.306 af, Depth= 1.32"
Routed to Reach S1.8 : Swale S1.8

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.797	39	Pasture/grassland/range, Good, HSG A
1.938	69	Pasture/grassland/range, Fair, HSG B
0.057	96	Gravel surface, HSG A
2.792	61	Weighted Average
2.792		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.3	119	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	22	0.1905	3.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.0	178	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.7	419	Total			

Summary for Subcatchment Area 44: Area 44

Runoff = 0.06 cfs @ 13.20 hrs, Volume= 0.022 af, Depth= 0.18"
Routed to Reach S2.1 : Swale S2.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.416	39	Pasture/grassland/range, Good, HSG A
1.416		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0260	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.9	194	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	647	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.0	941	Total			

Summary for Subcatchment Area 45: Area 45

Runoff = 6.52 cfs @ 12.11 hrs, Volume= 0.322 af, Depth= 1.89"
Routed to Reach S3.1 : Swale S3.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
2.044	69	Pasture/grassland/range, Fair, HSG B
2.044		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	38	0.2632	3.59		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.0	138	Total			

Summary for Subcatchment Area 46: Area 46

Runoff = 2.14 cfs @ 12.15 hrs, Volume= 0.121 af, Depth= 1.89"
Routed to Reach S3.4 : Swale S3.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.769	69	Pasture/grassland/range, Fair, HSG B
0.769		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	39	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.7	139	Total			

Summary for Subcatchment Area 47: Area 47

Runoff = 0.27 cfs @ 12.12 hrs, Volume= 0.014 af, Depth= 2.13"
Routed to Link C6 : Culvert C6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.070	69	Pasture/grassland/range, Fair, HSG B
0.009	96	Gravel surface, HSG A
0.079	72	Weighted Average
0.079		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	90	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.2	10	0.0500	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	10	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	18	0.1390	2.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.1	143	Total			

Summary for Subcatchment Area 48: Area 48

Runoff = 9.80 cfs @ 12.20 hrs, Volume= 0.636 af, Depth= 2.05"
Routed to Reach S3.5 : Swale S3.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
3.470	69	Pasture/grassland/range, Fair, HSG B
0.256	96	Gravel surface, HSG A
3.726	71	Weighted Average
3.726		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.9	83	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.9	208	0.0289	1.19		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	391	Total			

Summary for Subcatchment Area 49: Area 49

Runoff = 0.03 cfs @ 12.51 hrs, Volume= 0.011 af, Depth= 0.18"
Routed to Reach S2.1 : Swale S2.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.698	39	Pasture/grassland/range, Good, HSG A
0.698		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0600	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 5: Area 5

Runoff = 1.66 cfs @ 12.10 hrs, Volume= 0.079 af, Depth= 1.89"
Routed to Link F6A : Flume 6A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.504	69	Pasture/grassland/range, Fair, HSG B
0.504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	72	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	186	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
3.4	258	Total			

Summary for Subcatchment Area 50: Area 50

Runoff = 0.72 cfs @ 12.10 hrs, Volume= 0.035 af, Depth= 1.89"
Routed to Link F4A : Flume 4A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.223	69	Pasture/grassland/range, Fair, HSG B
0.223		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	77	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	157	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	62	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
3.7	296	Total			

Summary for Subcatchment Area 51: Area 51

Runoff = 1.98 cfs @ 12.12 hrs, Volume= 0.103 af, Depth= 1.89"
Routed to Link F4B : Flume 4B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.655	69	Pasture/grassland/range, Fair, HSG B
0.655		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	11	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	314	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
0.3	217	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
5.0	642	Total			

Summary for Subcatchment Area 52: Area 52

Runoff = 0.76 cfs @ 12.11 hrs, Volume= 0.037 af, Depth= 1.89"
Routed to Link F5A : Flume 5A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.237	69	Pasture/grassland/range, Fair, HSG B
0.237		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	83	0.2500	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	138	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.2	127	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
4.0	348	Total			

Summary for Subcatchment Area 53: Area 53

Runoff = 1.48 cfs @ 12.11 hrs, Volume= 0.075 af, Depth= 1.89"
Routed to Link F5B : Flume 5B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.475	69	Pasture/grassland/range, Fair, HSG B
0.475		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	90	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	219	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.2	116	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
4.5	425	Total			

Summary for Subcatchment Area 54: Area 54

Runoff = 2.98 cfs @ 12.12 hrs, Volume= 0.160 af, Depth= 1.18"
Routed to Reach S2.3 : Swale S2.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.079	69	Pasture/grassland/range, Fair, HSG B
0.539	39	Pasture/grassland/range, Good, HSG A
1.618	59	Weighted Average
1.618		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	77	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	237	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.3	70	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.2	384	Total			

Summary for Subcatchment Area 55: Area 55

Runoff = 1.45 cfs @ 12.11 hrs, Volume= 0.077 af, Depth= 1.12"
Routed to Reach S2.2 : Swale S2.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.520	69	Pasture/grassland/range, Fair, HSG B
0.306	39	Pasture/grassland/range, Good, HSG A
0.826	58	Weighted Average
0.826		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	26	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	126	Total			

Summary for Subcatchment Area 56: Area 56

Runoff = 3.66 cfs @ 12.13 hrs, Volume= 0.194 af, Depth= 1.89"
Routed to Link F4B : Flume 4B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.228	69	Pasture/grassland/range, Fair, HSG B
1.228		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	6	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	541	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
5.7	647	Total			

Summary for Subcatchment Area 57: Area 57

Runoff = 1.86 cfs @ 12.12 hrs, Volume= 0.102 af, Depth= 1.12"
Routed to Reach S4.1 : Swale S4.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.526	39	Pasture/grassland/range, Good, HSG A
0.405	69	Pasture/grassland/range, Fair, HSG B
0.158	96	Gravel surface, HSG A
1.089	58	Weighted Average
1.089		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	80	0.2000	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	20	0.0500	1.34		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.1	10	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	48	0.0625	1.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.3	158	Total			

Summary for Subcatchment Area 58: Area 58

Runoff = 2.17 cfs @ 12.12 hrs, Volume= 0.118 af, Depth= 1.18"
Routed to Reach S4.2 : Swale S4.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.580	39	Pasture/grassland/range, Good, HSG A
0.433	69	Pasture/grassland/range, Fair, HSG B
0.181	96	Gravel surface, HSG B
1.194	59	Weighted Average
1.194		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	121	0.2314	3.37		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	221	Total			

Summary for Subcatchment Area 59: Area 59

Runoff = 2.69 cfs @ 12.13 hrs, Volume= 0.162 af, Depth= 0.88"
Routed to Reach S4.3 : Swale S4.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.134	39	Pasture/grassland/range, Good, HSG A
1.086	69	Pasture/grassland/range, Fair, HSG B
2.220	54	Weighted Average
2.220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	140	0.1857	3.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.6	240	Total			

Summary for Subcatchment Area 6: Area 6

Runoff = 2.81 cfs @ 12.13 hrs, Volume= 0.148 af, Depth= 1.89"
Routed to Link F6A : Flume 6A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.936	69	Pasture/grassland/range, Fair, HSG B
0.936		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	100	0.2070	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	395	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.3	541	Total			

Summary for Subcatchment Area 60: Area 60

Runoff = 4.13 cfs @ 12.13 hrs, Volume= 0.231 af, Depth= 1.12"
Routed to Reach S4.4 : Swale S4.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.939	39	Pasture/grassland/range, Good, HSG A
1.537	69	Pasture/grassland/range, Fair, HSG B
2.476	58	Weighted Average
2.476		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.9	163	0.1718	2.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	263	Total			

Summary for Subcatchment Area 61: Area 61

Runoff = 1.90 cfs @ 12.12 hrs, Volume= 0.115 af, Depth= 0.82"
Routed to Reach S4.5 : Swale S4.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.898	39	Pasture/grassland/range, Good, HSG A
0.785	69	Pasture/grassland/range, Fair, HSG B
1.683	53	Weighted Average
1.683		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	100	0.2345	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2345	3.39		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	146	Total			

Summary for Subcatchment Area 62: Area 62

Runoff = 0.24 cfs @ 12.55 hrs, Volume= 0.055 af, Depth= 0.33"
Routed to Reach S4.6 : Swale S4.6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.871	39	Pasture/grassland/range, Good, HSG A
0.000	96	Gravel surface, HSG A
0.130	96	Gravel surface, HSG A
2.001	43	Weighted Average
2.001		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0074	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
4.7	169	0.0074	0.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	49	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.8	318	Total			

Summary for Subcatchment Area 63: Area 63

Runoff = 0.09 cfs @ 12.53 hrs, Volume= 0.033 af, Depth= 0.18"
Routed to Reach S2.3 : Swale S2.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
2.177	39	Pasture/grassland/range, Good, HSG A
2.177		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	66	0.0303	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.6	34	0.2500	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	49	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.2	149	Total			

Summary for Subcatchment Area 64: Area 64

Runoff = 0.39 cfs @ 12.18 hrs, Volume= 0.032 af, Depth= 0.66"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.479	39	Pasture/grassland/range, Good, HSG A
0.115	96	Gravel surface, HSG A
0.594	50	Weighted Average
0.594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0544	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	47	0.0544	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.6	147	Total			

Summary for Subcatchment Area 65: Area 65

Runoff = 10.73 cfs @ 12.04 hrs, Volume= 0.588 af, Depth= 4.67"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.509	98	Water Surface, HSG A
1.509		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Subcatchment Area 66: Area 66

Runoff = 0.22 cfs @ 12.53 hrs, Volume= 0.079 af, Depth= 0.18"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
5.227	39	Pasture/grassland/range, Good, HSG A
5.227		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	75	0.0933	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.3	25	0.2500	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	10	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	381	0.0265	7.85	109.92	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
0.8	162	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	48	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.9	701	Total			

Summary for Subcatchment Area 67: Area 67

Runoff = 0.61 cfs @ 12.73 hrs, Volume= 0.128 af, Depth= 0.51"
Routed to Reach RD1 : Roadside Ditch 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
2.616	39	Pasture/grassland/range, Good, HSG A
0.039	69	Pasture/grassland/range, Fair, HSG B
0.380	96	Gravel surface, HSG A
3.035	47	Weighted Average
3.035		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	100	0.0068	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
22.7	786	0.0068	0.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	886	Total			

Summary for Subcatchment Area 68: Area 68

Runoff = 0.03 cfs @ 12.29 hrs, Volume= 0.006 af, Depth= 0.29"
Routed to Reach RD2 : Roadside Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.227	39	Pasture/grassland/range, Good, HSG A
0.024	69	Pasture/grassland/range, Fair, HSG B
0.251	42	Weighted Average
0.251		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	52	0.1154	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 69: Area 69

Runoff = 0.36 cfs @ 12.14 hrs, Volume= 0.035 af, Depth= 0.46"
Routed to Reach RD2 : Roadside Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.695	39	Pasture/grassland/range, Good, HSG A
0.218	69	Pasture/grassland/range, Fair, HSG B
0.913	46	Weighted Average
0.913		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	86	0.2326	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 7: Area 7

Runoff = 2.87 cfs @ 12.14 hrs, Volume= 0.155 af, Depth= 1.89"
Routed to Link F4A : Flume 4A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.986	69	Pasture/grassland/range, Fair, HSG B
0.986		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	31	0.1000	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.8	69	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	9	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	419	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	80	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
6.6	608	Total			

Summary for Subcatchment Area 70: Area 70

Runoff = 1.52 cfs @ 12.12 hrs, Volume= 0.099 af, Depth= 0.71"
Routed to Reach RD4 : Roadside Ditch 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.016	39	Pasture/grassland/range, Good, HSG A
0.620	69	Pasture/grassland/range, Fair, HSG B
0.035	96	Gravel surface, HSG A
1.671	51	Weighted Average
1.671		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	26	0.1538	2.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.0	126	Total			

Summary for Subcatchment Area 71: Area 71

Runoff = 0.99 cfs @ 12.52 hrs, Volume= 0.238 af, Depth= 0.29"
Routed to Pond N : North Infiltration Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
9.360	39	Pasture/grassland/range, Good, HSG A
0.515	96	Gravel surface, HSG A
9.875	42	Weighted Average
9.875		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.7	100	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	1,137	0.0193	4.31	32.30	**Trap/Vee/Rect Channel Flow, Roadside Ditch** Bot.W=0.00' D=1.00' Z= 5.0 & 10.0 '/' Top.W=15.00' n= 0.030
16.6	1,337	Total			

Summary for Subcatchment Area 8: Area 8

Runoff = 2.66 cfs @ 12.10 hrs, Volume= 0.129 af, Depth= 1.89"
Routed to Link F7A : Flume 7A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
35,545	69	Pasture/grassland/range, Fair, HSG B
35,545		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	59	0.1695	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.7	289	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
3.6	348	Total			

Summary for Subcatchment Area 9: Area 9

Runoff = 0.86 cfs @ 12.09 hrs, Volume= 0.039 af, Depth= 1.89"
Routed to Link F7A : Flume 7A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
10,716	69	Pasture/grassland/range, Fair, HSG B
10,716		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	48	0.2500	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	96	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
2.3	144	Total			

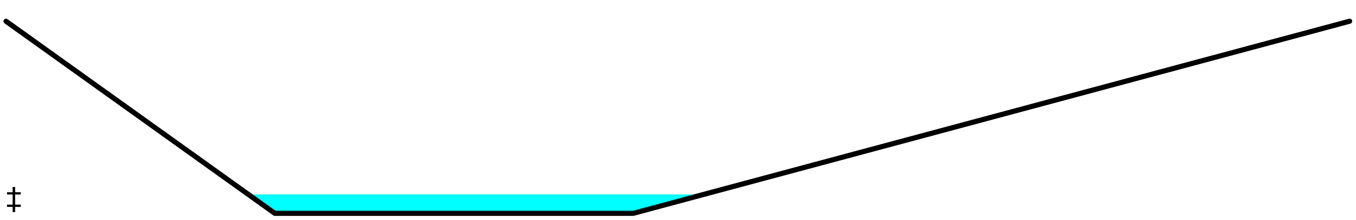
Summary for Reach RD1: Roadside Ditch 1

Inflow Area = 3.035 ac, 0.00% Impervious, Inflow Depth = 0.51" for 25-yr, 24-hr event
Inflow = 0.61 cfs @ 12.73 hrs, Volume= 0.128 af
Outflow = 0.60 cfs @ 12.89 hrs, Volume= 0.128 af, Atten= 2%, Lag= 9.5 min
Routed to Link C1 : Culvert C1

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.34 fps, Min. Travel Time= 5.5 min
Avg. Velocity = 0.62 fps, Avg. Travel Time= 11.8 min

Peak Storage= 197 cf @ 12.80 hrs
Average Depth at Peak Storage= 0.10' , Surface Width= 5.08'
Bank-Full Depth= 1.00' Flow Area= 9.5 sf, Capacity= 47.16 cfs

4.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 8.0 '/' Top Width= 15.00'
Length= 440.6' Slope= 0.0188 '/'
Inlet Invert= 824.00', Outlet Invert= 815.70'



Summary for Reach RD2: Roadside Ditch 2

Inflow Area = 7.576 ac, 0.00% Impervious, Inflow Depth = 1.29" for 25-yr, 24-hr event
Inflow = 11.23 cfs @ 12.20 hrs, Volume= 0.814 af
Outflow = 10.38 cfs @ 12.28 hrs, Volume= 0.814 af, Atten= 8%, Lag= 4.8 min
Routed to Link C9 : Culvert C9

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.69 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 9.1 min

Peak Storage= 1,686 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.39' , Surface Width= 13.85'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 72.77 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 433.0' Slope= 0.0162 '/'
Inlet Invert= 814.55', Outlet Invert= 807.54'

‡

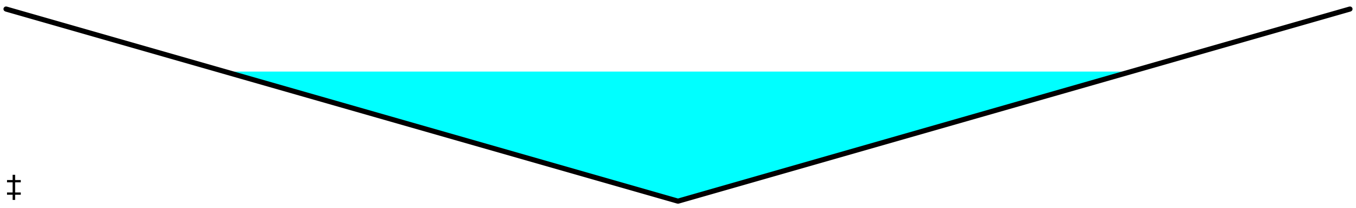
Summary for Reach RD3: Roadside Ditch 3

Inflow Area = 2.159 ac, 0.00% Impervious, Inflow Depth = 2.29" for 25-yr, 24-hr event
Inflow = 8.44 cfs @ 12.10 hrs, Volume= 0.412 af
Outflow = 7.09 cfs @ 12.20 hrs, Volume= 0.412 af, Atten= 16%, Lag= 5.7 min
Routed to Link C2 : Culvert C2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.99 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 1.34 fps, Avg. Travel Time= 10.2 min

Peak Storage= 1,491 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.67' , Surface Width= 5.39'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 20.76 cfs

0.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 821.0' Slope= 0.0288 '/'
Inlet Invert= 841.47', Outlet Invert= 817.83'



‡

Summary for Reach RD4: Roadside Ditch 4

Inflow Area = 1.671 ac, 0.00% Impervious, Inflow Depth = 0.71" for 25-yr, 24-hr event
Inflow = 1.52 cfs @ 12.12 hrs, Volume= 0.099 af
Outflow = 0.92 cfs @ 12.35 hrs, Volume= 0.099 af, Atten= 39%, Lag= 13.6 min
Routed to Link C9 : Culvert C9

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.05 fps, Min. Travel Time= 7.9 min
Avg. Velocity = 0.37 fps, Avg. Travel Time= 22.6 min

Peak Storage= 447 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.12' , Surface Width= 8.49'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 54.26 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 495.6' Slope= 0.0090 '/'
Inlet Invert= 812.00', Outlet Invert= 807.54'

‡

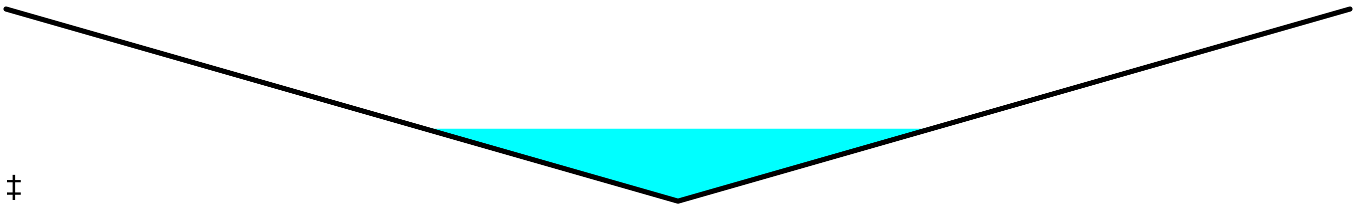
Summary for Reach RD5: Roadside Ditch 5

Inflow Area = 0.616 ac, 0.00% Impervious, Inflow Depth = 2.13" for 25-yr, 24-hr event
Inflow = 2.25 cfs @ 12.10 hrs, Volume= 0.109 af
Outflow = 2.01 cfs @ 12.14 hrs, Volume= 0.109 af, Atten= 11%, Lag= 2.5 min
Routed to Reach S4.2 : Swale S4.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.65 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 1.38 fps, Avg. Travel Time= 3.5 min

Peak Storage= 164 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.38' , Surface Width= 3.02'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 28.18 cfs

0.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 288.0' Slope= 0.0531 '/'
Inlet Invert= 841.47', Outlet Invert= 826.18'



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Summary for Reach S1.1: Swale S1.1

Inflow Area = 1.185 ac, 0.00% Impervious, Inflow Depth = 1.59" for 25-yr, 24-hr event
Inflow = 3.12 cfs @ 12.11 hrs, Volume= 0.157 af
Outflow = 2.76 cfs @ 12.18 hrs, Volume= 0.157 af, Atten= 12%, Lag= 4.2 min
Routed to Link C10 : Culvert C10

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.32 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 7.3 min

Peak Storage= 398 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 9.16'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 338.34 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 321.0' Slope= 0.0319 '/'
Inlet Invert= 825.20', Outlet Invert= 814.96'

‡

Summary for Reach S1.2: Swale S1.2

Inflow Area = 11.287 ac, 0.00% Impervious, Inflow Depth = 1.80" for 25-yr, 24-hr event
Inflow = 30.31 cfs @ 12.14 hrs, Volume= 1.696 af
Outflow = 28.58 cfs @ 12.17 hrs, Volume= 1.696 af, Atten= 6%, Lag= 1.5 min
Routed to Link C3 : Culvert C3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.60 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 3.4 min

Peak Storage= 1,690 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.76' , Surface Width= 14.05'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 196.86 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 202.8' Slope= 0.0108 '/'
Inlet Invert= 813.36', Outlet Invert= 811.17'

‡

Summary for Reach S1.3: Swale S1.3

Inflow Area = 14.199 ac, 0.00% Impervious, Inflow Depth = 1.76" for 25-yr, 24-hr event
Inflow = 34.68 cfs @ 12.16 hrs, Volume= 2.079 af
Outflow = 34.14 cfs @ 12.16 hrs, Volume= 2.079 af, Atten= 2%, Lag= 0.4 min
Routed to Link C4 : Culvert C4

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.15 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.18 fps, Avg. Travel Time= 1.0 min

Peak Storage= 602 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.76' , Surface Width= 14.05'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 227.36 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 72.2' Slope= 0.0144 '/'
Inlet Invert= 810.90', Outlet Invert= 809.86'

‡

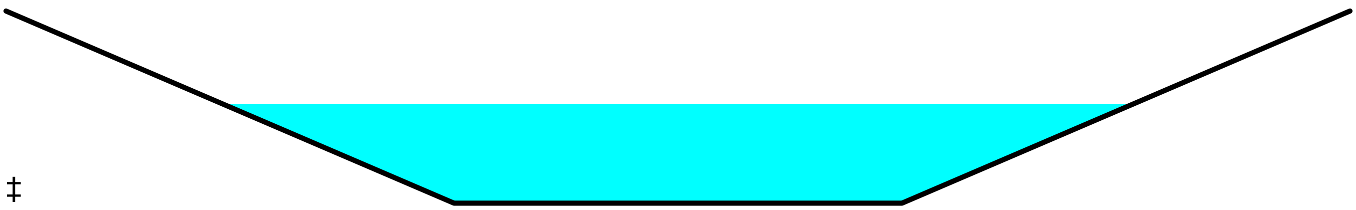
Summary for Reach S1.4: Swale S1.4

Inflow Area = 14.938 ac, 0.00% Impervious, Inflow Depth = 1.72" for 25-yr, 24-hr event
Inflow = 35.12 cfs @ 12.16 hrs, Volume= 2.141 af
Outflow = 33.65 cfs @ 12.19 hrs, Volume= 2.141 af, Atten= 4%, Lag= 1.8 min
Routed to Reach S1.6 : Swale S1.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.73 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 3.1 min

Peak Storage= 1,854 cf @ 12.18 hrs
Average Depth at Peak Storage= 1.03' , Surface Width= 16.27'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 126.50 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 148.0' Slope= 0.0045 '/'
Inlet Invert= 809.60', Outlet Invert= 808.94'



‡

Summary for Reach S1.5: Swale S1.5

Inflow Area = 0.769 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 2.14 cfs @ 12.15 hrs, Volume= 0.121 af
Outflow = 1.95 cfs @ 12.23 hrs, Volume= 0.121 af, Atten= 9%, Lag= 4.7 min
Routed to Reach S1.6 : Swale S1.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.12 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.32 fps, Avg. Travel Time= 9.2 min

Peak Storage= 316 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 9.60'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 134.06 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 179.7' Slope= 0.0050 '/'
Inlet Invert= 809.85', Outlet Invert= 808.95'

‡

Summary for Reach S1.6: Swale S1.6

Inflow Area = 17.290 ac, 0.00% Impervious, Inflow Depth = 1.73" for 25-yr, 24-hr event
Inflow = 39.20 cfs @ 12.19 hrs, Volume= 2.499 af
Outflow = 37.41 cfs @ 12.24 hrs, Volume= 2.499 af, Atten= 5%, Lag= 2.6 min
Routed to Link C5 : Culvert C5

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.05 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 4.9 min

Peak Storage= 3,198 cf @ 12.21 hrs
Average Depth at Peak Storage= 1.04' , Surface Width= 16.34'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 139.68 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 252.0' Slope= 0.0054 '/'
Inlet Invert= 808.94', Outlet Invert= 807.57'

‡

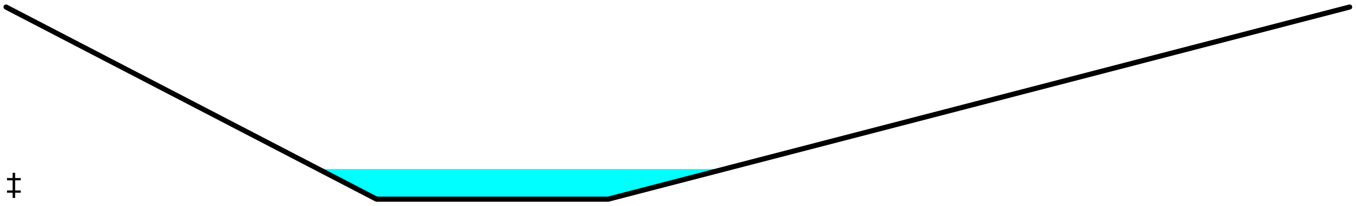
Summary for Reach S1.7: Swale S1.7

Inflow Area = 0.712 ac, 0.00% Impervious, Inflow Depth = 2.05" for 25-yr, 24-hr event
Inflow = 2.19 cfs @ 12.15 hrs, Volume= 0.122 af
Outflow = 1.99 cfs @ 12.21 hrs, Volume= 0.122 af, Atten= 9%, Lag= 3.8 min
Routed to Reach S1.6 : Swale S1.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.88 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.56 fps, Avg. Travel Time= 7.3 min

Peak Storage= 265 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.31' , Surface Width= 4.38'
Bank-Full Depth= 2.00' Flow Area= 17.0 sf, Capacity= 90.14 cfs

2.50' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 4.0 '/' Top Width= 14.50'
Length= 245.8' Slope= 0.0099 '/'
Inlet Invert= 810.00', Outlet Invert= 807.57'



‡

Summary for Reach S1.8: Swale S1.8

Inflow Area = 20.082 ac, 0.00% Impervious, Inflow Depth = 1.68" for 25-yr, 24-hr event
Inflow = 41.27 cfs @ 12.24 hrs, Volume= 2.805 af
Outflow = 39.57 cfs @ 12.30 hrs, Volume= 2.805 af, Atten= 4%, Lag= 3.7 min
Routed to Reach S2.1 : Swale S2.1

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.45 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.95 fps, Avg. Travel Time= 7.4 min

Peak Storage= 4,932 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.98' , Surface Width= 15.84'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 163.67 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 422.0' Slope= 0.0075 '/'
Inlet Invert= 807.15', Outlet Invert= 804.00'

‡

Summary for Reach S2.1: Swale S2.1

Inflow Area = 22.196 ac, 0.00% Impervious, Inflow Depth = 1.53" for 25-yr, 24-hr event
Inflow = 39.58 cfs @ 12.30 hrs, Volume= 2.837 af
Outflow = 38.03 cfs @ 12.36 hrs, Volume= 2.837 af, Atten= 4%, Lag= 3.7 min
Routed to Reach S2.2 : Swale S2.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.17 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 6.7 min

Peak Storage= 4,707 cf @ 12.33 hrs
Average Depth at Peak Storage= 1.31' , Surface Width= 14.48'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 97.05 cfs

4.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 20.00'
Length= 389.0' Slope= 0.0054 '/'
Inlet Invert= 806.10', Outlet Invert= 804.00'

‡

Summary for Reach S2.2: Swale S2.2

Inflow Area = 39.450 ac, 0.00% Impervious, Inflow Depth = 1.69" for 25-yr, 24-hr event
Inflow = 65.64 cfs @ 12.31 hrs, Volume= 5.558 af
Outflow = 64.61 cfs @ 12.37 hrs, Volume= 5.558 af, Atten= 2%, Lag= 3.6 min
Routed to Reach S2.3 : Swale S2.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.33 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.89 fps, Avg. Travel Time= 7.7 min

Peak Storage= 8,029 cf @ 12.33 hrs
Average Depth at Peak Storage= 1.29' , Surface Width= 20.31'
Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 152.61 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 411.0' Slope= 0.0049 '/'
Inlet Invert= 804.00', Outlet Invert= 802.00'

‡

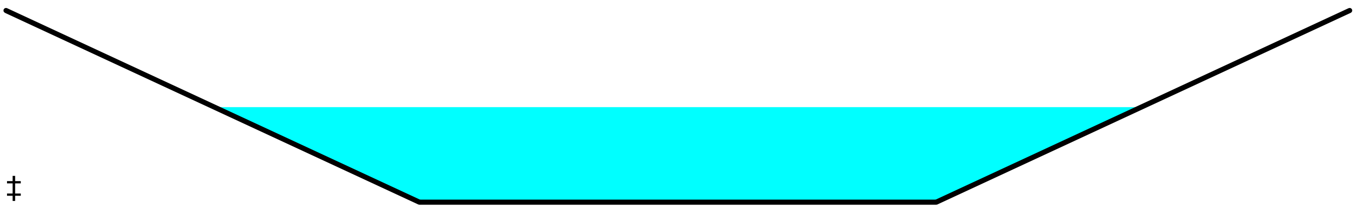
Summary for Reach S2.3: Swale S2.3

Inflow Area = 43.245 ac, 0.00% Impervious, Inflow Depth = 1.60" for 25-yr, 24-hr event
Inflow = 65.54 cfs @ 12.37 hrs, Volume= 5.750 af
Outflow = 64.79 cfs @ 12.40 hrs, Volume= 5.750 af, Atten= 1%, Lag= 1.9 min
Routed to Link C7 : Culvert C7

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.71 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.26 fps, Avg. Travel Time= 4.0 min

Peak Storage= 4,252 cf @ 12.38 hrs
Average Depth at Peak Storage= 0.99' , Surface Width= 17.93'
Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 249.72 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 307.0' Slope= 0.0130 '/'
Inlet Invert= 802.00', Outlet Invert= 798.00'



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Summary for Reach S3.1: Swale S3.1

Inflow Area =	2.044 ac,	0.00% Impervious, Inflow Depth = 1.89"	for 25-yr, 24-hr event	
Inflow =	6.52 cfs @	12.11 hrs, Volume=	0.322 af	
Outflow =	5.46 cfs @	12.21 hrs, Volume=	0.322 af,	Atten= 16%, Lag= 5.9 min

Routed to Reach S3.2 : Swale S3.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.62 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 14.2 min

Peak Storage= 1,242 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.37' , Surface Width= 10.94'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 133.76 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 357.0' Slope= 0.0050 '/'
Inlet Invert= 809.85', Outlet Invert= 808.07'

‡

Summary for Reach S3.2: Swale S3.2

Inflow Area =	8.141 ac,	0.00% Impervious, Inflow Depth = 1.90"	for 25-yr, 24-hr event	
Inflow =	22.25 cfs @	12.12 hrs, Volume=	1.287 af	
Outflow =	21.76 cfs @	12.13 hrs, Volume=	1.287 af,	Atten= 2%, Lag= 0.6 min

Routed to Reach S3.3 : Swale S3.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.48 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 0.9 min

Peak Storage= 299 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.79' , Surface Width= 14.30'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 133.95 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 34.0' Slope= 0.0050 '/'
Inlet Invert= 798.00', Outlet Invert= 797.83'

‡

Summary for Reach S3.3: Swale S3.3

Inflow Area = 8.141 ac, 0.00% Impervious, Inflow Depth = 1.90" for 25-yr, 24-hr event
Inflow = 21.76 cfs @ 12.13 hrs, Volume= 1.287 af
Outflow = 20.93 cfs @ 12.16 hrs, Volume= 1.287 af, Atten= 4%, Lag= 1.7 min
Routed to Link C6 : Culvert C6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.48 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.91 fps, Avg. Travel Time= 3.7 min

Peak Storage= 1,253 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.60' , Surface Width= 12.82'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 215.99 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 200.0' Slope= 0.0130 '/'
Inlet Invert= 808.00', Outlet Invert= 805.40'

‡

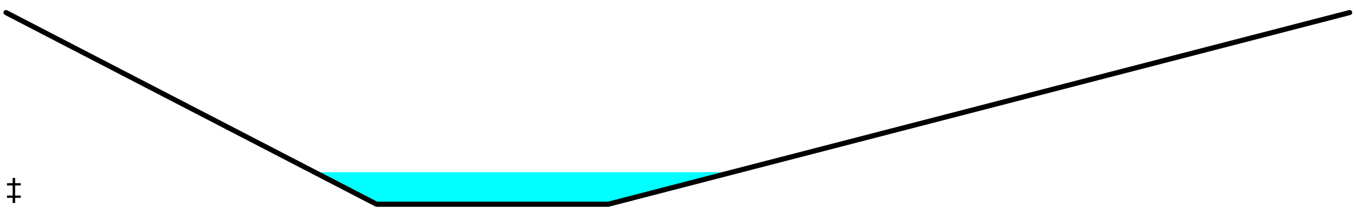
Summary for Reach S3.4: Swale S3.4

Inflow Area = 0.769 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 2.14 cfs @ 12.15 hrs, Volume= 0.121 af
Outflow = 1.94 cfs @ 12.24 hrs, Volume= 0.121 af, Atten= 9%, Lag= 5.0 min
Routed to Link C6 : Culvert C6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.67 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 0.50 fps, Avg. Travel Time= 9.5 min

Peak Storage= 332 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.33' , Surface Width= 4.51'
Bank-Full Depth= 2.00' Flow Area= 17.0 sf, Capacity= 76.21 cfs

2.50' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 4.0 '/' Top Width= 14.50'
Length= 283.0' Slope= 0.0071 '/'
Inlet Invert= 810.00', Outlet Invert= 808.00'



‡

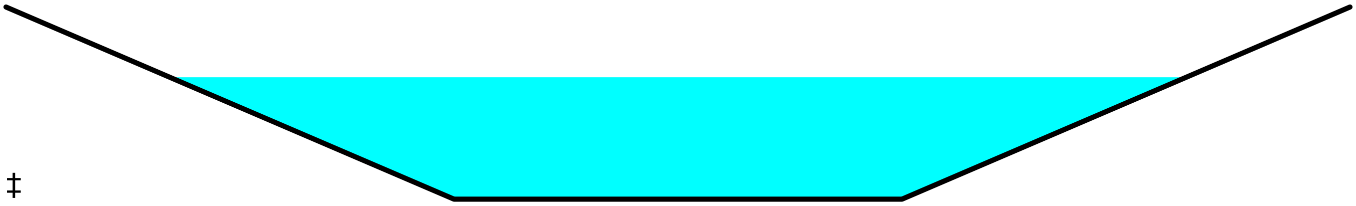
Summary for Reach S3.5: Swale S3.5

Inflow Area = 15.716 ac, 0.00% Impervious, Inflow Depth = 1.93" for 25-yr, 24-hr event
Inflow = 39.57 cfs @ 12.15 hrs, Volume= 2.531 af
Outflow = 36.85 cfs @ 12.23 hrs, Volume= 2.531 af, Atten= 7%, Lag= 4.3 min
Routed to Reach S2.2 : Swale S2.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.26 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 8.9 min

Peak Storage= 5,280 cf @ 12.19 hrs
Average Depth at Peak Storage= 1.27' , Surface Width= 18.15'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 93.14 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 318.5' Slope= 0.0024 '/'
Inlet Invert= 804.76', Outlet Invert= 803.99'



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Summary for Reach S4.1: Swale S4.1

Inflow Area = 1.364 ac, 0.00% Impervious, Inflow Depth = 1.28" for 25-yr, 24-hr event
Inflow = 2.74 cfs @ 12.10 hrs, Volume= 0.145 af
Outflow = 2.38 cfs @ 12.18 hrs, Volume= 0.145 af, Atten= 13%, Lag= 4.4 min
Routed to Reach S4.2 : Swale S4.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.62 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.43 fps, Avg. Travel Time= 9.3 min

Peak Storage= 363 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 11.01'
Bank-Full Depth= 1.00' Flow Area= 13.5 sf, Capacity= 70.22 cfs

10.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 17.00'
Length= 240.0' Slope= 0.0153 '/'
Inlet Invert= 811.94', Outlet Invert= 808.26'

‡

Summary for Reach S4.2: Swale S4.2

Inflow Area = 3.174 ac, 0.00% Impervious, Inflow Depth = 1.41" for 25-yr, 24-hr event
Inflow = 6.29 cfs @ 12.15 hrs, Volume= 0.372 af
Outflow = 5.84 cfs @ 12.21 hrs, Volume= 0.372 af, Atten= 7%, Lag= 3.6 min
Routed to Reach S4.3 : Swale S4.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.12 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 8.1 min

Peak Storage= 732 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.26' , Surface Width= 11.81'
Bank-Full Depth= 1.00' Flow Area= 13.5 sf, Capacity= 63.88 cfs

10.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 17.00'
Length= 259.3' Slope= 0.0127 '/'
Inlet Invert= 808.26', Outlet Invert= 804.97'

‡

Summary for Reach S4.3: Swale S4.3

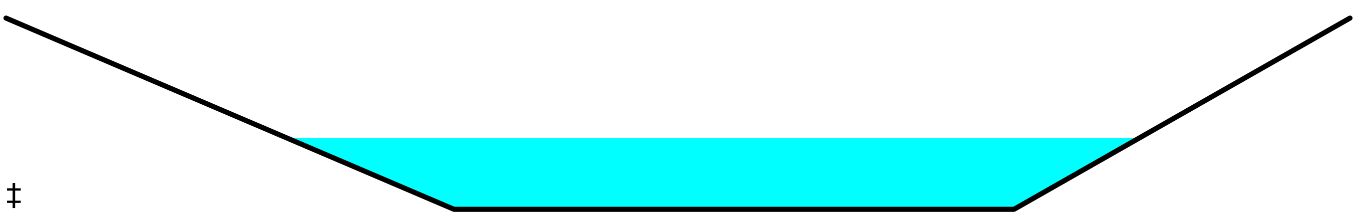
Inflow Area = 9.483 ac, 0.00% Impervious, Inflow Depth = 1.49" for 25-yr, 24-hr event
Inflow = 19.18 cfs @ 12.14 hrs, Volume= 1.179 af
Outflow = 17.09 cfs @ 12.24 hrs, Volume= 1.179 af, Atten= 11%, Lag= 5.7 min
Routed to Reach S4.4 : Swale S4.4

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.83 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 13.1 min

Peak Storage= 3,406 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.74' , Surface Width= 15.21'
Bank-Full Depth= 2.00' Flow Area= 34.0 sf, Capacity= 108.12 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 24.00'
Length= 362.9' Slope= 0.0027 '/'
Inlet Invert= 804.97', Outlet Invert= 804.00'

‡



Summary for Reach S4.4: Swale S4.4

Inflow Area = 14.158 ac, 0.00% Impervious, Inflow Depth = 1.49" for 25-yr, 24-hr event
Inflow = 22.46 cfs @ 12.20 hrs, Volume= 1.757 af
Outflow = 21.52 cfs @ 12.31 hrs, Volume= 1.757 af, Atten= 4%, Lag= 6.4 min
Routed to Reach S4.5 : Swale S4.5

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.28 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 0.58 fps, Avg. Travel Time= 14.2 min

Peak Storage= 4,726 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.75' , Surface Width= 15.28'
Bank-Full Depth= 2.00' Flow Area= 34.0 sf, Capacity= 132.85 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 24.00'
Length= 495.6' Slope= 0.0040 '/'
Inlet Invert= 804.00', Outlet Invert= 802.00'

‡

Summary for Reach S4.5: Swale S4.5

Inflow Area = 16.268 ac, 0.00% Impervious, Inflow Depth = 1.43" for 25-yr, 24-hr event
Inflow = 22.64 cfs @ 12.30 hrs, Volume= 1.939 af
Outflow = 22.15 cfs @ 12.37 hrs, Volume= 1.939 af, Atten= 2%, Lag= 3.9 min
Routed to Reach S4.6 : Swale S4.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.08 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 8.0 min

Peak Storage= 2,967 cf @ 12.33 hrs
Average Depth at Peak Storage= 0.60' , Surface Width= 14.18'
Bank-Full Depth= 3.00' Flow Area= 61.5 sf, Capacity= 465.89 cfs

10.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 31.00'
Length= 411.1' Slope= 0.0097 '/'
Inlet Invert= 802.00', Outlet Invert= 798.00'

‡

Summary for Reach S4.6: Swale S4.6

Inflow Area = 64.606 ac, 0.00% Impervious, Inflow Depth = 1.53" for 25-yr, 24-hr event
Inflow = 89.26 cfs @ 12.39 hrs, Volume= 8.232 af
Outflow = 87.87 cfs @ 12.44 hrs, Volume= 8.232 af, Atten= 2%, Lag= 3.2 min
Routed to Pond Sed Pond : Sedimentation Basin

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.00 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 1.37 fps, Avg. Travel Time= 6.5 min

Peak Storage= 9,534 cf @ 12.41 hrs
Average Depth at Peak Storage= 1.24' , Surface Width= 18.67'
Bank-Full Depth= 3.00' Flow Area= 61.5 sf, Capacity= 499.25 cfs

10.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 31.00'
Length= 537.0' Slope= 0.0112 '/'
Inlet Invert= 798.00', Outlet Invert= 792.00'

‡

Summary for Reach S5.1: Swale S5.1

Inflow Area = 1.218 ac, 0.00% Impervious, Inflow Depth = 2.29" for 25-yr, 24-hr event
Inflow = 4.58 cfs @ 12.11 hrs, Volume= 0.233 af
Outflow = 3.89 cfs @ 12.21 hrs, Volume= 0.233 af, Atten= 15%, Lag= 6.0 min
Routed to Link C2 : Culvert C2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.09 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 14.0 min

Peak Storage= 926 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.22' , Surface Width= 9.75'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 235.22 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 478.0' Slope= 0.0154 '/'
Inlet Invert= 825.20', Outlet Invert= 817.83'

‡

Summary for Pond C8: Culvert C8

Inflow Area = 0.275 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 0.95 cfs @ 12.08 hrs, Volume= 0.043 af
Outflow = 0.96 cfs @ 12.08 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.1 min
Primary = 0.96 cfs @ 12.08 hrs, Volume= 0.043 af
Routed to Reach S4.1 : Swale S4.1

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 811.21' @ 12.08 hrs Surf.Area= 0.000 ac Storage= 0.000 af
Flood Elev= 819.00' Surf.Area= 0.000 ac Storage= 0.001 af

Plug-Flow detention time= 0.2 min calculated for 0.043 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (830.2 - 830.0)

Volume	Invert	Avail.Storage	Storage Description
#1	810.70'	0.001 af	**3.00'D x 7.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	810.70'	**12.0" Round Culvert** L= 85.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 810.70' / 808.60' S= 0.0245 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.89 cfs @ 12.08 hrs HW=811.18' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.89 cfs @ 2.37 fps)

Summary for Pond N: North Infiltration Area

Inflow Area = 19.122 ac, 0.00% Impervious, Inflow Depth = 0.72" for 25-yr, 24-hr event
Inflow = 11.66 cfs @ 12.29 hrs, Volume= 1.151 af
Outflow = 1.38 cfs @ 13.97 hrs, Volume= 1.151 af, Atten= 88%, Lag= 100.5 min
Primary = 1.38 cfs @ 13.97 hrs, Volume= 1.151 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 803.86' @ 13.97 hrs Surf.Area= 16,535 sf Storage= 20,107 cf

Plug-Flow detention time= 176.3 min calculated for 1.150 af (100% of inflow)
Center-of-Mass det. time= 176.2 min (1,062.2 - 886.0)

Volume	Invert	Avail.Storage	Storage Description
#1	802.00'	256,569 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
802.00	5,140	0	0
804.00	17,424	22,564	22,564
806.00	32,191	49,615	72,179
808.00	46,130	78,321	150,500
810.00	59,939	106,069	256,569

Device	Routing	Invert	Outlet Devices
#1	Primary	802.00'	**3.600 in/hr Exfiltration over Surface area**

Primary OutFlow Max=1.38 cfs @ 13.97 hrs HW=803.86' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.38 cfs)

Summary for Pond Sed Pond: Sedimentation Basin

Inflow Area = 71.936 ac, 2.10% Impervious, Inflow Depth = 1.49" for 25-yr, 24-hr event
Inflow = 89.59 cfs @ 12.44 hrs, Volume= 8.931 af
Outflow = 15.47 cfs @ 13.52 hrs, Volume= 8.931 af, Atten= 83%, Lag= 64.8 min
Discarded = 5.48 cfs @ 13.52 hrs, Volume= 6.100 af
Primary = 10.00 cfs @ 13.52 hrs, Volume= 2.831 af
Routed to Link Wetland : Wetland
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link Wetland : Wetland
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link Wetland : Wetland

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 792.00' @ 13.52 hrs Surf.Area= 65,709 sf Storage= 164,114 cf
Flood Elev= 794.00' Surf.Area= 75,797 sf Storage= 304,443 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 185.0 min (1,047.1 - 862.1)

Volume	Invert	Avail.Storage	Storage Description
#1	789.00'	304,443 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
789.00	27,325	0	0
790.00	55,972	41,649	41,649
791.00	61,532	58,752	100,401
792.00	65,703	63,618	164,018
793.00	69,675	67,689	231,707
794.00	75,797	72,736	304,443

Device	Routing	Invert	Outlet Devices
#1	Primary	787.70'	**15.0" Round Culvert** L= 40.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 787.70' / 787.50' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	791.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	790.50'	**0.8" Vert. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	790.00'	**0.8" Vert. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#5	Device 1	789.00'	**0.5" Vert. Orifice/Grate X 14.00 columns** X 6 rows with 6.0" cc spacing C= 0.600

			Limited to weir flow at low heads
#6	Secondary	792.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#7	Tertiary	793.00'	**158.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#8	Discarded	789.00'	**3.600 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=5.48 cfs @ 13.52 hrs HW=792.00' (Free Discharge)
└─**8=Exfiltration** (Exfiltration Controls 5.48 cfs)

Primary OutFlow Max=10.00 cfs @ 13.52 hrs HW=792.00' (Free Discharge)
└─**1=Culvert** (Inlet Controls 10.00 cfs @ 8.15 fps)
  ├─**2=Orifice/Grate** (Passes < 23.65 cfs potential flow)
  ├─**3=Orifice/Grate** (Passes < 0.08 cfs potential flow)
  ├─**4=Orifice/Grate** (Passes < 0.09 cfs potential flow)
  └─**5=Orifice/Grate** (Passes < 0.70 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=789.00' (Free Discharge)
└─**6=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=789.00' (Free Discharge)
└─**7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link C1: Culvert C1

Inflow Area = 3.035 ac, 0.00% Impervious, Inflow Depth = 0.51" for 25-yr, 24-hr event
Inflow = 0.60 cfs @ 12.89 hrs, Volume= 0.128 af
Primary = 0.60 cfs @ 12.89 hrs, Volume= 0.128 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C10: Culvert C10

Inflow Area = 1.185 ac, 0.00% Impervious, Inflow Depth = 1.59" for 25-yr, 24-hr event
Inflow = 2.76 cfs @ 12.18 hrs, Volume= 0.157 af
Primary = 2.76 cfs @ 12.18 hrs, Volume= 0.157 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.2 : Swale S1.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C2: Culvert C2

Inflow Area = 3.377 ac, 0.00% Impervious, Inflow Depth = 2.29" for 25-yr, 24-hr event
Inflow = 10.95 cfs @ 12.20 hrs, Volume= 0.645 af
Primary = 10.95 cfs @ 12.20 hrs, Volume= 0.645 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C3: Culvert C3

Inflow Area = 11.287 ac, 0.00% Impervious, Inflow Depth = 1.80" for 25-yr, 24-hr event
Inflow = 28.58 cfs @ 12.17 hrs, Volume= 1.696 af
Primary = 28.58 cfs @ 12.17 hrs, Volume= 1.696 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.3 : Swale S1.3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C4: Culvert C4

Inflow Area = 14.199 ac, 0.00% Impervious, Inflow Depth = 1.76" for 25-yr, 24-hr event
Inflow = 34.14 cfs @ 12.16 hrs, Volume= 2.079 af
Primary = 34.14 cfs @ 12.16 hrs, Volume= 2.079 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.4 : Swale S1.4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C5: Culvert C5

Inflow Area = 17.290 ac, 0.00% Impervious, Inflow Depth = 1.73" for 25-yr, 24-hr event
Inflow = 37.41 cfs @ 12.24 hrs, Volume= 2.499 af
Primary = 37.41 cfs @ 12.24 hrs, Volume= 2.499 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.8 : Swale S1.8

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C6: Culvert C6

Inflow Area = 11.990 ac, 0.00% Impervious, Inflow Depth = 1.90" for 25-yr, 24-hr event
Inflow = 30.67 cfs @ 12.15 hrs, Volume= 1.895 af
Primary = 30.67 cfs @ 12.15 hrs, Volume= 1.895 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S3.5 : Swale S3.5

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C7: Culvert C7

Inflow Area = 46.337 ac, 0.00% Impervious, Inflow Depth = 1.62" for 25-yr, 24-hr event
Inflow = 67.17 cfs @ 12.39 hrs, Volume= 6.238 af
Primary = 67.17 cfs @ 12.39 hrs, Volume= 6.238 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.6 : Swale S4.6

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C9: Culvert C9

Inflow Area = 9.247 ac, 0.00% Impervious, Inflow Depth = 1.18" for 25-yr, 24-hr event
Inflow = 11.16 cfs @ 12.29 hrs, Volume= 0.913 af
Primary = 11.16 cfs @ 12.29 hrs, Volume= 0.913 af, Atten= 0%, Lag= 0.0 min
Routed to Pond N : North Infiltration Area

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F10: Flume 10

Inflow Area = 0.275 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 0.95 cfs @ 12.08 hrs, Volume= 0.043 af
Primary = 0.95 cfs @ 12.08 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min
Routed to Pond C8 : Culvert C8

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F1A: Flume 1A

Inflow Area = 1.853 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 5.38 cfs @ 12.14 hrs, Volume= 0.292 af
Primary = 5.38 cfs @ 12.14 hrs, Volume= 0.292 af, Atten= 0%, Lag= 0.0 min
Routed to Link F1B : Flume 1B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F1B: Flume 1B

Inflow Area = 4.089 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 12.06 cfs @ 12.13 hrs, Volume= 0.645 af
Primary = 12.06 cfs @ 12.13 hrs, Volume= 0.645 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.3 : Swale S4.3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F2A: Flume 2A

Inflow Area = 0.636 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 1.98 cfs @ 12.11 hrs, Volume= 0.100 af
Primary = 1.98 cfs @ 12.11 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.0 min
Routed to Link F2B : Flume 2B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F2B: Flume 2B

Inflow Area = 2.199 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 6.58 cfs @ 12.12 hrs, Volume= 0.347 af
Primary = 6.58 cfs @ 12.12 hrs, Volume= 0.347 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.4 : Swale S4.4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F3: Flume 3

Inflow Area = 0.427 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 1.38 cfs @ 12.10 hrs, Volume= 0.067 af
Primary = 1.38 cfs @ 12.10 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.5 : Swale S4.5

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F4A: Flume 4A

Inflow Area = 1.209 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 3.47 cfs @ 12.14 hrs, Volume= 0.191 af
Primary = 3.47 cfs @ 12.14 hrs, Volume= 0.191 af, Atten= 0%, Lag= 0.0 min
Routed to Link F4B : Flume 4B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F4B: Flume 4B

Inflow Area = 3.092 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 9.10 cfs @ 12.13 hrs, Volume= 0.488 af
Primary = 9.10 cfs @ 12.13 hrs, Volume= 0.488 af, Atten= 0%, Lag= 0.0 min
Routed to Link C7 : Culvert C7

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F5A: Flume 5A

Inflow Area = 0.237 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 0.76 cfs @ 12.11 hrs, Volume= 0.037 af
Primary = 0.76 cfs @ 12.11 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min
Routed to Link F5B : Flume 5B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F5B: Flume 5B

Inflow Area = 0.712 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 2.23 cfs @ 12.11 hrs, Volume= 0.112 af
Primary = 2.23 cfs @ 12.11 hrs, Volume= 0.112 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S2.2 : Swale S2.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F6A: Flume 6A

Inflow Area = 1.440 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 4.38 cfs @ 12.11 hrs, Volume= 0.227 af
Primary = 4.38 cfs @ 12.11 hrs, Volume= 0.227 af, Atten= 0%, Lag= 0.0 min
Routed to Link F6B : Flume 6B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F6B: Flume 6B

Inflow Area = 3.001 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 9.20 cfs @ 12.11 hrs, Volume= 0.473 af
Primary = 9.20 cfs @ 12.11 hrs, Volume= 0.473 af, Atten= 0%, Lag= 0.0 min
Routed to Link C6 : Culvert C6

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F7A: Flume 7A

Inflow Area = 1.062 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 3.51 cfs @ 12.10 hrs, Volume= 0.167 af
Primary = 3.51 cfs @ 12.10 hrs, Volume= 0.167 af, Atten= 0%, Lag= 0.0 min
Routed to Link F7B : Flume 7B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F7B: Flume 7B

Inflow Area = 3.407 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 10.65 cfs @ 12.11 hrs, Volume= 0.537 af
Primary = 10.65 cfs @ 12.11 hrs, Volume= 0.537 af, Atten= 0%, Lag= 0.0 min
Routed to Link F7C : Flume 7C

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F7C: Flume 7C

Inflow Area = 5.640 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 17.47 cfs @ 12.11 hrs, Volume= 0.889 af
Primary = 17.47 cfs @ 12.11 hrs, Volume= 0.889 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S3.2 : Swale S3.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F8A: Flume 8A

Inflow Area = 0.381 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 1.19 cfs @ 12.11 hrs, Volume= 0.060 af
Primary = 1.19 cfs @ 12.11 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min
Routed to Link F8B : Flume 8B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F8B: Flume 8B

Inflow Area = 1.497 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 4.66 cfs @ 12.11 hrs, Volume= 0.236 af
Primary = 4.66 cfs @ 12.11 hrs, Volume= 0.236 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.3 : Swale S1.3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F9A: Flume 9A

Inflow Area = 2.445 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 6.88 cfs @ 12.15 hrs, Volume= 0.386 af
Primary = 6.88 cfs @ 12.15 hrs, Volume= 0.386 af, Atten= 0%, Lag= 0.0 min
Routed to Link F9B : Flume 9B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F9B: Flume 9B

Inflow Area = 5.540 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 15.84 cfs @ 12.14 hrs, Volume= 0.874 af
Primary = 15.84 cfs @ 12.14 hrs, Volume= 0.874 af, Atten= 0%, Lag= 0.0 min
Routed to Link F9C : Flume 9C

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F9C: Flume 9C

Inflow Area = 8.811 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 25.24 cfs @ 12.14 hrs, Volume= 1.389 af
Primary = 25.24 cfs @ 12.14 hrs, Volume= 1.389 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.2 : Swale S1.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link Wetland: Wetland

Inflow Area = 71.936 ac, 2.10% Impervious, Inflow Depth = 0.47" for 25-yr, 24-hr event
Inflow = 10.00 cfs @ 13.52 hrs, Volume= 2.831 af
Primary = 10.00 cfs @ 13.52 hrs, Volume= 2.831 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentArea 1: Area 1 Runoff Area=1.296 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=364' Tc=6.7 min CN=69 Runoff=6.34 cfs 0.344 af

SubcatchmentArea 10: Area 10 Runoff Area=0.573 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=321' Tc=6.4 min CN=69 Runoff=2.83 cfs 0.152 af

SubcatchmentArea 11: Area 11 Runoff Area=1.872 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=796' Tc=7.6 min CN=69 Runoff=8.84 cfs 0.496 af

SubcatchmentArea 12: Area 12 Runoff Area=1.610 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=712' Tc=5.3 min CN=69 Runoff=8.11 cfs 0.427 af

SubcatchmentArea 13: Area 13 Runoff Area=0.626 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=333' Tc=4.5 min CN=69 Runoff=3.29 cfs 0.166 af

SubcatchmentArea 14: Area 14 Runoff Area=0.620 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=331' Tc=4.4 min CN=69 Runoff=3.27 cfs 0.164 af

SubcatchmentArea 15: Area 15 Runoff Area=0.943 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=464' Tc=5.9 min CN=69 Runoff=4.72 cfs 0.250 af

SubcatchmentArea 16: Area 16 Runoff Area=0.571 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=315' Tc=4.4 min CN=69 Runoff=3.01 cfs 0.151 af

SubcatchmentArea 17: Area 17 Runoff Area=0.990 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=424' Tc=4.7 min CN=69 Runoff=5.14 cfs 0.262 af

SubcatchmentArea 18: Area 18 Runoff Area=1.656 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=508' Tc=4.8 min CN=69 Runoff=8.56 cfs 0.439 af

SubcatchmentArea 19: Area 19 Runoff Area=0.689 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=286' Tc=4.3 min CN=69 Runoff=3.65 cfs 0.183 af

SubcatchmentArea 2: Area 2 Runoff Area=0.557 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=303' Tc=4.7 min CN=69 Runoff=2.89 cfs 0.148 af

SubcatchmentArea 20: Area 20 Runoff Area=0.381 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=306' Tc=4.3 min CN=69 Runoff=2.02 cfs 0.101 af

SubcatchmentArea 21: Area 21 Runoff Area=0.516 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=312' Tc=4.3 min CN=69 Runoff=2.74 cfs 0.137 af

SubcatchmentArea 22: Area 22 Runoff Area=2.579 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=1,146' Tc=6.4 min CN=69 Runoff=12.74 cfs 0.684 af

SubcatchmentArea 23: Area 23 Runoff Area=0.427 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=362' Tc=3.8 min CN=69 Runoff=2.33 cfs 0.113 af

SubcatchmentArea 24: Area 24 Runoff Area=1.177 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=385' Tc=4.7 min CN=69 Runoff=6.11 cfs 0.312 af

SubcatchmentArea 25: Area 25 Runoff Area=0.682 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=349' Tc=4.5 min CN=69 Runoff=3.58 cfs 0.181 af

SubcatchmentArea 26: Area 26 Runoff Area=0.677 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=341' Tc=4.5 min CN=69 Runoff=3.56 cfs 0.179 af

SubcatchmentArea 27: Area 27 Runoff Area=2.594 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=1,357' Tc=6.9 min CN=69 Runoff=12.62 cfs 0.688 af

SubcatchmentArea 28: Area 28 Runoff Area=2.159 ac 0.00% Impervious Runoff Depth=3.69"
Flow Length=125' Slope=0.2500 '/' Tc=3.9 min CN=74 Runoff=13.48 cfs 0.663 af

SubcatchmentArea 29: Area 29 Runoff Area=0.616 ac 0.00% Impervious Runoff Depth=3.48"
Flow Length=109' Slope=0.2500 '/' Tc=3.8 min CN=72 Runoff=3.67 cfs 0.179 af

SubcatchmentArea 3: Area 3 Runoff Area=0.348 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=298' Tc=4.8 min CN=69 Runoff=1.80 cfs 0.092 af

SubcatchmentArea 30: Area 30 Runoff Area=0.149 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=211' Tc=1.2 min CN=69 Runoff=0.86 cfs 0.039 af

SubcatchmentArea 31: Area 31 Runoff Area=0.126 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=59' Slope=0.2500 '/' Tc=2.5 min CN=69 Runoff=0.74 cfs 0.033 af

SubcatchmentArea 32: Area 32 Runoff Area=0.457 ac 0.00% Impervious Runoff Depth=3.28"
Flow Length=122' Slope=0.2500 '/' Tc=3.9 min CN=70 Runoff=2.55 cfs 0.125 af

SubcatchmentArea 33: Area 33 Runoff Area=1.056 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=419' Tc=4.7 min CN=69 Runoff=5.48 cfs 0.280 af

SubcatchmentArea 34: Area 34 Runoff Area=0.434 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=374' Tc=4.5 min CN=69 Runoff=2.28 cfs 0.115 af

SubcatchmentArea 35: Area 35 Runoff Area=1.218 ac 0.00% Impervious Runoff Depth=3.69"
Flow Length=104' Tc=4.6 min CN=74 Runoff=7.33 cfs 0.374 af

SubcatchmentArea 36: Area 36 Runoff Area=1.185 ac 0.00% Impervious Runoff Depth=2.79"
Flow Length=106' Tc=4.1 min CN=65 Runoff=5.57 cfs 0.275 af

SubcatchmentArea 37: Area 37 Runoff Area=1.291 ac 0.00% Impervious Runoff Depth=2.50"
Flow Length=120' Slope=0.2500 '/' Tc=3.9 min CN=62 Runoff=5.48 cfs 0.269 af

SubcatchmentArea 38: Area 38 Runoff Area=0.795 ac 0.00% Impervious Runoff Depth=2.60"
Flow Length=155' Tc=4.3 min CN=63 Runoff=3.43 cfs 0.172 af

SubcatchmentArea 39: Area 39 Runoff Area=0.620 ac 0.00% Impervious Runoff Depth=1.96"
Flow Length=168' Tc=9.6 min CN=56 Runoff=1.57 cfs 0.101 af

SubcatchmentArea 4: Area 4 Runoff Area=0.288 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=296' Tc=4.0 min CN=69 Runoff=1.55 cfs 0.076 af

SubcatchmentArea 40: Area 40 Runoff Area=0.739 ac 0.00% Impervious Runoff Depth=1.96"
Flow Length=141' Tc=7.2 min CN=56 Runoff=2.11 cfs 0.120 af

SubcatchmentArea 41a: Area 41a Runoff Area=0.871 ac 0.00% Impervious Runoff Depth=2.79"
Flow Length=144' Slope=0.0500 '/' Tc=7.8 min CN=65 Runoff=3.58 cfs 0.202 af

SubcatchmentArea 41b: Area 41b Runoff Area=0.712 ac 0.00% Impervious Runoff Depth=3.38"
Flow Length=102' Slope=0.0500 '/' Tc=7.3 min CN=71 Runoff=3.63 cfs 0.201 af

SubcatchmentArea 42: Area 42 Runoff Area=0.769 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=139' Slope=0.0500 '/' Tc=7.7 min CN=69 Runoff=3.63 cfs 0.204 af

SubcatchmentArea 43: Area 43 Runoff Area=2.792 ac 0.00% Impervious Runoff Depth=2.41"
Flow Length=419' Tc=14.7 min CN=61 Runoff=7.53 cfs 0.561 af

SubcatchmentArea 44: Area 44 Runoff Area=1.416 ac 0.00% Impervious Runoff Depth=0.63"
Flow Length=941' Slope=0.0260 '/' Tc=22.0 min CN=39 Runoff=0.43 cfs 0.074 af

SubcatchmentArea 45: Area 45 Runoff Area=2.044 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=138' Tc=4.0 min CN=69 Runoff=11.02 cfs 0.542 af

SubcatchmentArea 46: Area 46 Runoff Area=0.769 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=139' Slope=0.0500 '/' Tc=7.7 min CN=69 Runoff=3.63 cfs 0.204 af

SubcatchmentArea 47: Area 47 Runoff Area=0.079 ac 0.00% Impervious Runoff Depth=3.48"
Flow Length=143' Tc=5.1 min CN=72 Runoff=0.44 cfs 0.023 af

SubcatchmentArea 48: Area 48 Runoff Area=3.726 ac 0.00% Impervious Runoff Depth=3.38"
Flow Length=391' Tc=11.1 min CN=71 Runoff=16.26 cfs 1.050 af

SubcatchmentArea 49: Area 49 Runoff Area=0.698 ac 0.00% Impervious Runoff Depth=0.63"
Flow Length=100' Slope=0.0600 '/' Tc=6.8 min CN=39 Runoff=0.32 cfs 0.036 af

SubcatchmentArea 5: Area 5 Runoff Area=0.504 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=258' Tc=3.4 min CN=69 Runoff=2.81 cfs 0.134 af

SubcatchmentArea 50: Area 50 Runoff Area=0.223 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=296' Tc=3.7 min CN=69 Runoff=1.22 cfs 0.059 af

SubcatchmentArea 51: Area 51 Runoff Area=0.655 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=642' Tc=5.0 min CN=69 Runoff=3.35 cfs 0.174 af

SubcatchmentArea 52: Area 52 Runoff Area=0.237 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=348' Tc=4.0 min CN=69 Runoff=1.28 cfs 0.063 af

SubcatchmentArea 53: Area 53 Runoff Area=0.475 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=425' Tc=4.5 min CN=69 Runoff=2.50 cfs 0.126 af

SubcatchmentArea 54: Area 54 Runoff Area=1.618 ac 0.00% Impervious Runoff Depth=2.23"
Flow Length=384' Tc=4.2 min CN=59 Runoff=5.93 cfs 0.300 af

SubcatchmentArea 55: Area 55 Runoff Area=0.826 ac 0.00% Impervious Runoff Depth=2.13"
Flow Length=126' Slope=0.2500 '/' Tc=3.9 min CN=58 Runoff=2.95 cfs 0.147 af

SubcatchmentArea 56: Area 56 Runoff Area=1.228 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=647' Tc=5.7 min CN=69 Runoff=6.17 cfs 0.325 af

SubcatchmentArea 57: Area 57 Runoff Area=1.089 ac 0.00% Impervious Runoff Depth=2.13"
Flow Length=158' Tc=4.3 min CN=58 Runoff=3.79 cfs 0.194 af

SubcatchmentArea 58: Area 58 Runoff Area=1.194 ac 0.00% Impervious Runoff Depth=2.23"
Flow Length=221' Tc=4.4 min CN=59 Runoff=4.33 cfs 0.221 af

SubcatchmentArea 59: Area 59 Runoff Area=2.220 ac 0.00% Impervious Runoff Depth=1.78"
Flow Length=240' Tc=4.6 min CN=54 Runoff=6.17 cfs 0.330 af

SubcatchmentArea 6: Area 6 Runoff Area=0.936 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=541' Tc=5.3 min CN=69 Runoff=4.72 cfs 0.248 af

SubcatchmentArea 60: Area 60 Runoff Area=2.476 ac 0.00% Impervious Runoff Depth=2.13"
Flow Length=263' Tc=4.7 min CN=58 Runoff=8.43 cfs 0.441 af

SubcatchmentArea 61: Area 61 Runoff Area=1.683 ac 0.00% Impervious Runoff Depth=1.70"
Flow Length=146' Slope=0.2345 '/' Tc=4.1 min CN=53 Runoff=4.54 cfs 0.238 af

SubcatchmentArea 62: Area 62 Runoff Area=2.001 ac 0.00% Impervious Runoff Depth=0.90"
Flow Length=318' Tc=20.8 min CN=43 Runoff=1.18 cfs 0.150 af

SubcatchmentArea 63: Area 63 Runoff Area=2.177 ac 0.00% Impervious Runoff Depth=0.63"
Flow Length=149' Tc=8.2 min CN=39 Runoff=0.97 cfs 0.114 af

SubcatchmentArea 64: Area 64 Runoff Area=0.594 ac 0.00% Impervious Runoff Depth=1.44"
Flow Length=147' Slope=0.0544 '/' Tc=7.6 min CN=50 Runoff=1.14 cfs 0.071 af

SubcatchmentArea 65: Area 65 Runoff Area=1.509 ac 100.00% Impervious Runoff Depth=6.35"
Tc=0.0 min CN=98 Runoff=14.43 cfs 0.799 af

SubcatchmentArea 66: Area 66 Runoff Area=5.227 ac 0.00% Impervious Runoff Depth=0.63"
Flow Length=701' Tc=7.9 min CN=39 Runoff=2.36 cfs 0.273 af

SubcatchmentArea 67: Area 67 Runoff Area=3.035 ac 0.00% Impervious Runoff Depth=1.20"
Flow Length=886' Slope=0.0068 '/' Tc=38.9 min CN=47 Runoff=1.99 cfs 0.304 af

SubcatchmentArea 68: Area 68 Runoff Area=0.251 ac 0.00% Impervious Runoff Depth=0.83"
Flow Length=52' Slope=0.1154 '/' Tc=3.1 min CN=42 Runoff=0.26 cfs 0.017 af

SubcatchmentArea 69: Area 69 Runoff Area=0.913 ac 0.00% Impervious Runoff Depth=1.13"
Flow Length=86' Slope=0.2326 '/' Tc=3.5 min CN=46 Runoff=1.50 cfs 0.086 af

SubcatchmentArea 7: Area 7 Runoff Area=0.986 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=608' Tc=6.6 min CN=69 Runoff=4.85 cfs 0.261 af

SubcatchmentArea 70: Area 70 Runoff Area=1.671 ac 0.00% Impervious Runoff Depth=1.53"
Flow Length=126' Tc=4.0 min CN=51 Runoff=3.98 cfs 0.213 af

SubcatchmentArea 71: Area 71 Runoff Area=9.875 ac 0.00% Impervious Runoff Depth=0.83"
Flow Length=1,337' Tc=16.6 min CN=42 Runoff=5.65 cfs 0.684 af

SubcatchmentArea 8: Area 8 Runoff Area=35,545 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=348' Tc=3.6 min CN=69 Runoff=4.50 cfs 0.216 af

SubcatchmentArea 9: Area 9 Runoff Area=10,716 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=144' Tc=2.3 min CN=69 Runoff=1.44 cfs 0.065 af

Reach RD1: Roadside Ditch 1 Avg. Flow Depth=0.19' Max Vel=2.00 fps Inflow=1.99 cfs 0.304 af
n=0.030 L=440.6' S=0.0188 '/' Capacity=47.16 cfs Outflow=1.96 cfs 0.304 af

Reach RD2: Roadside Ditch 2 Avg. Flow Depth=0.52' Max Vel=3.14 fps Inflow=19.31 cfs 1.445 af
n=0.030 L=433.0' S=0.0162 '/' Capacity=72.77 cfs Outflow=17.96 cfs 1.445 af

Reach RD3: Roadside Ditch 3 Avg. Flow Depth=0.81' Max Vel=4.50 fps Inflow=13.48 cfs 0.663 af
n=0.030 L=821.0' S=0.0288 '/' Capacity=20.76 cfs Outflow=11.77 cfs 0.663 af

Reach RD4: Roadside Ditch 4 Avg. Flow Depth=0.24' Max Vel=1.52 fps Inflow=3.98 cfs 0.213 af
n=0.030 L=495.6' S=0.0090 '/' Capacity=54.26 cfs Outflow=2.99 cfs 0.213 af

Reach RD5: Roadside Ditch 5 Avg. Flow Depth=0.46' Max Vel=4.14 fps Inflow=3.67 cfs 0.179 af
n=0.030 L=288.0' S=0.0531 '/' Capacity=28.18 cfs Outflow=3.30 cfs 0.179 af

Reach S1.1: Swale S1.1 Avg. Flow Depth=0.21' Max Vel=2.87 fps Inflow=5.57 cfs 0.275 af
n=0.030 L=321.0' S=0.0319 '/' Capacity=338.34 cfs Outflow=4.95 cfs 0.275 af

Reach S1.2: Swale S1.2 Avg. Flow Depth=1.02' Max Vel=4.24 fps Inflow=52.19 cfs 2.880 af
n=0.030 L=202.8' S=0.0108 '/' Capacity=196.86 cfs Outflow=49.91 cfs 2.880 af

Reach S1.3: Swale S1.3 Avg. Flow Depth=1.03' Max Vel=4.92 fps Inflow=61.05 cfs 3.550 af
n=0.030 L=72.2' S=0.0144 '/' Capacity=227.36 cfs Outflow=60.33 cfs 3.550 af

Reach S1.4: Swale S1.4 Avg. Flow Depth=1.40' Max Vel=3.24 fps Inflow=62.44 cfs 3.671 af
n=0.030 L=148.0' S=0.0045 '/' Capacity=126.50 cfs Outflow=59.56 cfs 3.671 af

Reach S1.5: Swale S1.5 Avg. Flow Depth=0.27' Max Vel=1.35 fps Inflow=3.63 cfs 0.204 af
n=0.030 L=179.7' S=0.0050 '/' Capacity=134.06 cfs Outflow=3.33 cfs 0.204 af

Reach S1.6: Swale S1.6 Avg. Flow Depth=1.41' Max Vel=3.60 fps Inflow=69.21 cfs 4.277 af
n=0.030 L=252.0' S=0.0054 '/' Capacity=139.68 cfs Outflow=66.73 cfs 4.277 af

Reach S1.7: Swale S1.7 Avg. Flow Depth=0.41' Max Vel=2.20 fps Inflow=3.63 cfs 0.201 af
n=0.030 L=245.8' S=0.0099 '/' Capacity=90.14 cfs Outflow=3.32 cfs 0.201 af

Reach S1.8: Swale S1.8 Avg. Flow Depth=1.33' Max Vel=4.09 fps Inflow=74.10 cfs 4.838 af
n=0.030 L=422.0' S=0.0075 '/' Capacity=163.67 cfs Outflow=70.85 cfs 4.838 af

Reach S2.1: Swale S2.1 Avg. Flow Depth=1.73' Max Vel=3.72 fps Inflow=71.34 cfs 4.949 af
n=0.030 L=389.0' S=0.0054 '/' Capacity=97.05 cfs Outflow=68.62 cfs 4.949 af

Reach S2.2: Swale S2.2 Avg. Flow Depth=1.77' Max Vel=3.96 fps Inflow=120.78 cfs 9.518 af
n=0.030 L=411.0' S=0.0049 '/' Capacity=152.61 cfs Outflow=118.35 cfs 9.518 af

Reach S2.3: Swale S2.3 Avg. Flow Depth=1.38' Max Vel=5.64 fps Inflow=120.84 cfs 9.932 af
n=0.030 L=307.0' S=0.0130 '/' Capacity=249.72 cfs Outflow=119.37 cfs 9.932 af

Reach S3.1: Swale S3.1 Avg. Flow Depth=0.50' Max Vel=1.94 fps Inflow=11.02 cfs 0.542 af
n=0.030 L=357.0' S=0.0050 '/' Capacity=133.76 cfs Outflow=9.75 cfs 0.542 af

Reach S3.2: Swale S3.2 Avg. Flow Depth=1.06' Max Vel=2.93 fps Inflow=38.61 cfs 2.162 af
n=0.030 L=34.0' S=0.0050 '/' Capacity=133.95 cfs Outflow=37.80 cfs 2.162 af

Reach S3.3: Swale S3.3 Avg. Flow Depth=0.82' Max Vel=4.12 fps Inflow=37.80 cfs 2.162 af
n=0.030 L=200.0' S=0.0130 '/' Capacity=215.99 cfs Outflow=36.67 cfs 2.162 af

Reach S3.4: Swale S3.4 Avg. Flow Depth=0.45' Max Vel=1.95 fps Inflow=3.63 cfs 0.204 af
n=0.030 L=283.0' S=0.0071 '/' Capacity=76.21 cfs Outflow=3.29 cfs 0.204 af

Reach S3.5: Swale S3.5 Avg. Flow Depth=1.68' Max Vel=2.63 fps Inflow=68.29 cfs 4.234 af
n=0.030 L=318.5' S=0.0024 '/' Capacity=93.14 cfs Outflow=64.19 cfs 4.234 af

Reach S4.1: Swale S4.1 Avg. Flow Depth=0.22' Max Vel=2.07 fps Inflow=5.28 cfs 0.267 af
n=0.030 L=240.0' S=0.0153 '/' Capacity=70.22 cfs Outflow=4.68 cfs 0.267 af

Reach S4.2: Swale S4.2 Avg. Flow Depth=0.38' Max Vel=2.70 fps Inflow=11.92 cfs 0.667 af
n=0.030 L=259.3' S=0.0127 '/' Capacity=63.88 cfs Outflow=11.06 cfs 0.667 af

Reach S4.3: Swale S4.3 Avg. Flow Depth=1.08' Max Vel=2.26 fps Inflow=36.14 cfs 2.080 af
n=0.030 L=362.9' S=0.0027 '/' Capacity=108.12 cfs Outflow=33.37 cfs 2.080 af

Reach S4.4: Swale S4.4 Avg. Flow Depth=1.11' Max Vel=2.82 fps Inflow=45.34 cfs 3.104 af
n=0.030 L=495.6' S=0.0040 '/' Capacity=132.85 cfs Outflow=43.47 cfs 3.104 af

Reach S4.5: Swale S4.5 Avg. Flow Depth=0.89' Max Vel=3.87 fps Inflow=45.91 cfs 3.454 af
n=0.030 L=411.1' S=0.0097 '/' Capacity=465.89 cfs Outflow=44.58 cfs 3.454 af

Reach S4.6: Swale S4.6 Avg. Flow Depth=1.74' Max Vel=6.02 fps Inflow=168.73 cfs 14.356 af
n=0.030 L=537.0' S=0.0112 '/' Capacity=499.25 cfs Outflow=165.72 cfs 14.356 af

Reach S5.1: Swale S5.1 Avg. Flow Depth=0.29' Max Vel=2.49 fps Inflow=7.33 cfs 0.374 af
n=0.030 L=478.0' S=0.0154 '/' Capacity=235.22 cfs Outflow=6.57 cfs 0.374 af

Pond C8: Culvert C8 Peak Elev=811.38' Storage=0.000 af Inflow=1.60 cfs 0.073 af
12.0" Round Culvert n=0.012 L=85.6' S=0.0245 '/' Outflow=1.60 cfs 0.073 af

Pond N: North Infiltration Area Peak Elev=805.23' Storage=49,470 cf Inflow=26.07 cfs 2.341 af
Outflow=2.21 cfs 2.341 af

Pond Sed Pond: Sedimentation Basin Peak Elev=793.20' Storage=245,676 cf Inflow=169.96 cfs 15.500 af
3 af Primary=11.51 cfs 5.165 af Secondary=31.49 cfs 2.330 af Tertiary=34.88 cfs 0.772 af Outflow=83.78 cfs 15.500 af

Link C1: Culvert C1 Inflow=1.96 cfs 0.304 af
Primary=1.96 cfs 0.304 af

Link C10: Culvert C10 Inflow=4.95 cfs 0.275 af
Primary=4.95 cfs 0.275 af

Link C2: Culvert C2 Inflow=18.32 cfs 1.038 af
Primary=18.32 cfs 1.038 af

Link C3: Culvert C3 Inflow=49.91 cfs 2.880 af
Primary=49.91 cfs 2.880 af

Link C4: Culvert C4 Inflow=60.33 cfs 3.550 af
Primary=60.33 cfs 3.550 af

Link C5: Culvert C5 Inflow=66.73 cfs 4.277 af
Primary=66.73 cfs 4.277 af

Link C6: Culvert C6 Inflow=53.57 cfs 3.184 af
Primary=53.57 cfs 3.184 af

Link C7: Culvert C7 Inflow=123.92 cfs 10.752 af
Primary=123.92 cfs 10.752 af

Link C9: Culvert C9 Inflow=20.94 cfs 1.658 af
Primary=20.94 cfs 1.658 af

Link F10: Flume 10 Inflow=1.60 cfs 0.073 af
Primary=1.60 cfs 0.073 af

Link F1A: Flume 1A Inflow=9.08 cfs 0.491 af
Primary=9.08 cfs 0.491 af

Link F1B: Flume 1B Inflow=20.35 cfs 1.084 af
Primary=20.35 cfs 1.084 af

Link F2A: Flume 2A Inflow=3.34 cfs 0.169 af
Primary=3.34 cfs 0.169 af

Link F2B: Flume 2B Inflow=11.13 cfs 0.583 af
Primary=11.13 cfs 0.583 af

Link F3: Flume 3 Inflow=2.33 cfs 0.113 af
Primary=2.33 cfs 0.113 af

Link F4A: Flume 4A	Inflow=5.87 cfs 0.320 af Primary=5.87 cfs 0.320 af
Link F4B: Flume 4B	Inflow=15.35 cfs 0.820 af Primary=15.35 cfs 0.820 af
Link F5A: Flume 5A	Inflow=1.28 cfs 0.063 af Primary=1.28 cfs 0.063 af
Link F5B: Flume 5B	Inflow=3.77 cfs 0.189 af Primary=3.77 cfs 0.189 af
Link F6A: Flume 6A	Inflow=7.42 cfs 0.382 af Primary=7.42 cfs 0.382 af
Link F6B: Flume 6B	Inflow=15.57 cfs 0.795 af Primary=15.57 cfs 0.795 af
Link F7A: Flume 7A	Inflow=5.92 cfs 0.281 af Primary=5.92 cfs 0.281 af
Link F7B: Flume 7B	Inflow=18.00 cfs 0.903 af Primary=18.00 cfs 0.903 af
Link F7C: Flume 7C	Inflow=29.56 cfs 1.495 af Primary=29.56 cfs 1.495 af
Link F8A: Flume 8A	Inflow=2.02 cfs 0.101 af Primary=2.02 cfs 0.101 af
Link F8B: Flume 8B	Inflow=7.88 cfs 0.397 af Primary=7.88 cfs 0.397 af
Link F9A: Flume 9A	Inflow=11.65 cfs 0.648 af Primary=11.65 cfs 0.648 af
Link F9B: Flume 9B	Inflow=26.78 cfs 1.468 af Primary=26.78 cfs 1.468 af
Link F9C: Flume 9C	Inflow=42.66 cfs 2.335 af Primary=42.66 cfs 2.335 af
Link Wetland: Wetland	Inflow=77.88 cfs 8.267 af Primary=77.88 cfs 8.267 af

Summary for Subcatchment Area 1: Area 1

Runoff = 6.34 cfs @ 12.14 hrs, Volume= 0.344 af, Depth= 3.18"
Routed to Link F1A : Flume 1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.296	69	Pasture/grassland/range, Fair, HSG B
1.296		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	93	0.1000	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	7	0.2500	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.7	151	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	113	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.7	364	Total			

Summary for Subcatchment Area 10: Area 10

Runoff = 2.83 cfs @ 12.14 hrs, Volume= 0.152 af, Depth= 3.18"
Routed to Link F9A : Flume 9A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.573	69	Pasture/grassland/range, Fair, HSG B
0.573		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	79	0.1000	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.1	21	0.2500	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	53	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	168	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.4	321	Total			

Summary for Subcatchment Area 11: Area 11

Runoff = 8.84 cfs @ 12.15 hrs, Volume= 0.496 af, Depth= 3.18"
Routed to Link F9A : Flume 9A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.872	69	Pasture/grassland/range, Fair, HSG B
1.872		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	96	0.1000	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	4	0.2500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	90	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	606	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
7.6	796	Total			

Summary for Subcatchment Area 12: Area 12

Runoff = 8.11 cfs @ 12.12 hrs, Volume= 0.427 af, Depth= 3.18"
Routed to Link F1B : Flume 1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.610	69	Pasture/grassland/range, Fair, HSG B
1.610		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	31	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	581	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.3	712	Total			

Summary for Subcatchment Area 13: Area 13

Runoff = 3.29 cfs @ 12.11 hrs, Volume= 0.166 af, Depth= 3.18"
Routed to Link F1B : Flume 1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.626	69	Pasture/grassland/range, Fair, HSG B
0.626		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	183	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	333	Total			

Summary for Subcatchment Area 14: Area 14

Runoff = 3.27 cfs @ 12.11 hrs, Volume= 0.164 af, Depth= 3.18"
Routed to Link F2B : Flume 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.620	69	Pasture/grassland/range, Fair, HSG B
0.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	181	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.4	331	Total			

Summary for Subcatchment Area 15: Area 15

Runoff = 4.72 cfs @ 12.13 hrs, Volume= 0.250 af, Depth= 3.18"
Routed to Link F2B : Flume 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.943	69	Pasture/grassland/range, Fair, HSG B
0.943		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1500	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	95	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	269	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.9	464	Total			

Summary for Subcatchment Area 16: Area 16

Runoff = 3.01 cfs @ 12.11 hrs, Volume= 0.151 af, Depth= 3.18"
Routed to Link F6B : Flume 6B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.571	69	Pasture/grassland/range, Fair, HSG B
0.571		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	44	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	171	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.4	315	Total			

Summary for Subcatchment Area 17: Area 17

Runoff = 5.14 cfs @ 12.11 hrs, Volume= 0.262 af, Depth= 3.18"
Routed to Link F6B : Flume 6B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.990	69	Pasture/grassland/range, Fair, HSG B
0.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	278	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	424	Total			

Summary for Subcatchment Area 18: Area 18

Runoff = 8.56 cfs @ 12.12 hrs, Volume= 0.439 af, Depth= 3.18"
Routed to Link F7B : Flume 7B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.656	69	Pasture/grassland/range, Fair, HSG B
1.656		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	88	0.2045	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.0	420	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.8	508	Total			

Summary for Subcatchment Area 19: Area 19

Runoff = 3.65 cfs @ 12.11 hrs, Volume= 0.183 af, Depth= 3.18"
Routed to Link F7B : Flume 7B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.689	69	Pasture/grassland/range, Fair, HSG B
0.689		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	136	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.3	286	Total			

Summary for Subcatchment Area 2: Area 2

Runoff = 2.89 cfs @ 12.11 hrs, Volume= 0.148 af, Depth= 3.18"
Routed to Link F1A : Flume 1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.557	69	Pasture/grassland/range, Fair, HSG B
0.557		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	100	0.1950	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	181	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	303	Total			

Summary for Subcatchment Area 20: Area 20

Runoff = 2.02 cfs @ 12.11 hrs, Volume= 0.101 af, Depth= 3.18"
Routed to Link F8A : Flume 8A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.381	69	Pasture/grassland/range, Fair, HSG B
0.381		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	7	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	199	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.3	306	Total			

Summary for Subcatchment Area 21: Area 21

Runoff = 2.74 cfs @ 12.11 hrs, Volume= 0.137 af, Depth= 3.18"
Routed to Link F9B : Flume 9B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.516	69	Pasture/grassland/range, Fair, HSG B
0.516		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	7	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	205	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.3	312	Total			

Summary for Subcatchment Area 22: Area 22

Runoff = 12.74 cfs @ 12.14 hrs, Volume= 0.684 af, Depth= 3.18"
Routed to Link F9B : Flume 9B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
2.579	69	Pasture/grassland/range, Fair, HSG B
2.579		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	21	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.5	1,025	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.4	1,146	Total			

Summary for Subcatchment Area 23: Area 23

Runoff = 2.33 cfs @ 12.10 hrs, Volume= 0.113 af, Depth= 3.18"
Routed to Link F3 : Flume 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.427	69	Pasture/grassland/range, Fair, HSG B
0.427		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	70	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	227	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	65	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
3.8	362	Total			

Summary for Subcatchment Area 24: Area 24

Runoff = 6.11 cfs @ 12.11 hrs, Volume= 0.312 af, Depth= 3.18"
Routed to Link F7C : Flume 7C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.177	69	Pasture/grassland/range, Fair, HSG B
1.177		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	60	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	225	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	385	Total			

Summary for Subcatchment Area 25: Area 25

Runoff = 3.58 cfs @ 12.11 hrs, Volume= 0.181 af, Depth= 3.18"
Routed to Link F8B : Flume 8B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.682	69	Pasture/grassland/range, Fair, HSG B
0.682		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	199	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	349	Total			

Summary for Subcatchment Area 26: Area 26

Runoff = 3.56 cfs @ 12.11 hrs, Volume= 0.179 af, Depth= 3.18"
Routed to Link F9C : Flume 9C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.677	69	Pasture/grassland/range, Fair, HSG B
0.677		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	191	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	341	Total			

Summary for Subcatchment Area 27: Area 27

Runoff = 12.62 cfs @ 12.14 hrs, Volume= 0.688 af, Depth= 3.18"
Routed to Link F9C : Flume 9C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
2.594	69	Pasture/grassland/range, Fair, HSG B
2.594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	99	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
3.1	1,258	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.9	1,357	Total			

Summary for Subcatchment Area 28: Area 28

Runoff = 13.48 cfs @ 12.10 hrs, Volume= 0.663 af, Depth= 3.69"
Routed to Reach RD3 : Roadside Ditch 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.735	69	Pasture/grassland/range, Fair, HSG B
0.424	96	Gravel surface, HSG A
2.159	74	Weighted Average
2.159		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	25	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	125	Total			

Summary for Subcatchment Area 29: Area 29

Runoff = 3.67 cfs @ 12.10 hrs, Volume= 0.179 af, Depth= 3.48"
Routed to Reach RD5 : Roadside Ditch 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.543	69	Pasture/grassland/range, Fair, HSG B
0.073	96	Gravel surface, HSG A
0.616	72	Weighted Average
0.616		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	9	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.8	109	Total			

Summary for Subcatchment Area 3: Area 3

Runoff = 1.80 cfs @ 12.12 hrs, Volume= 0.092 af, Depth= 3.18"
Routed to Link F2A : Flume 2A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.348	69	Pasture/grassland/range, Fair, HSG B
0.348		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	100	0.1950	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	36	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	162	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.8	298	Total			

Summary for Subcatchment Area 30: Area 30

Runoff = 0.86 cfs @ 12.07 hrs, Volume= 0.039 af, Depth= 3.18"
Routed to Link F10 : Flume 10

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.149	69	Pasture/grassland/range, Fair, HSG B
0.149		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	12	0.2500	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	199	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
1.2	211	Total			

Summary for Subcatchment Area 31: Area 31

Runoff = 0.74 cfs @ 12.09 hrs, Volume= 0.033 af, Depth= 3.18"
Routed to Link F10 : Flume 10

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.126	69	Pasture/grassland/range, Fair, HSG B
0.126		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	59	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 32: Area 32

Runoff = 2.55 cfs @ 12.10 hrs, Volume= 0.125 af, Depth= 3.28"
Routed to Reach S3.2 : Swale S3.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.435	69	Pasture/grassland/range, Fair, HSG B
0.022	96	Gravel surface, HSG A
0.457	70	Weighted Average
0.457		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	122	Total			

Summary for Subcatchment Area 33: Area 33

Runoff = 5.48 cfs @ 12.11 hrs, Volume= 0.280 af, Depth= 3.18"
Routed to Link F7C : Flume 7C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.056	69	Pasture/grassland/range, Fair, HSG B
1.056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	57	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	262	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	419	Total			

Summary for Subcatchment Area 34: Area 34

Runoff = 2.28 cfs @ 12.11 hrs, Volume= 0.115 af, Depth= 3.18"
Routed to Link F8B : Flume 8B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.434	69	Pasture/grassland/range, Fair, HSG B
0.434		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	15	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	259	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	374	Total			

Summary for Subcatchment Area 35: Area 35

Runoff = 7.33 cfs @ 12.11 hrs, Volume= 0.374 af, Depth= 3.69"
Routed to Reach S5.1 : Swale S5.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.986	69	Pasture/grassland/range, Fair, HSG B
0.232	96	Gravel surface, HSG A
1.218	74	Weighted Average
1.218		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	70	0.1736	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	20	0.0050	0.53		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.7	10	0.1766	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	4	0.1766	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.6	104	Total			

Summary for Subcatchment Area 36: Area 36

Runoff = 5.57 cfs @ 12.11 hrs, Volume= 0.275 af, Depth= 2.79"
Routed to Reach S1.1 : Swale S1.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.322	39	Pasture/grassland/range, Good, HSG A
0.696	69	Pasture/grassland/range, Fair, HSG B
0.167	96	Gravel surface, HSG A
1.185	65	Weighted Average
1.185		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	72	0.1736	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	20	0.0050	0.53		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.1	14	0.1766	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	106	Total			

Summary for Subcatchment Area 37: Area 37

Runoff = 5.48 cfs @ 12.11 hrs, Volume= 0.269 af, Depth= 2.50"
Routed to Reach S1.2 : Swale S1.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.415	39	Pasture/grassland/range, Good, HSG A
0.743	69	Pasture/grassland/range, Fair, HSG B
0.133	96	Gravel surface, HSG A
1.291	62	Weighted Average
1.291		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	20	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	120	Total			

Summary for Subcatchment Area 38: Area 38

Runoff = 3.43 cfs @ 12.11 hrs, Volume= 0.172 af, Depth= 2.60"
Routed to Reach S1.3 : Swale S1.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.263	39	Pasture/grassland/range, Good, HSG A
0.409	69	Pasture/grassland/range, Fair, HSG B
0.123	96	Gravel surface, HSG A
0.795	63	Weighted Average
0.795		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	14	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	17	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	24	0.0833	2.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.3	155	Total			

Summary for Subcatchment Area 39: Area 39

Runoff = 1.57 cfs @ 12.18 hrs, Volume= 0.101 af, Depth= 1.96"
Routed to Reach S1.3 : Swale S1.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.317	39	Pasture/grassland/range, Good, HSG A
0.243	69	Pasture/grassland/range, Fair, HSG B
0.060	96	Gravel surface, HSG A
0.620	56	Weighted Average
0.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	81	0.0245	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.0	19	0.2500	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	29	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	20	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	19	0.1053	2.27		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	168	Total			

Summary for Subcatchment Area 4: Area 4

Runoff = 1.55 cfs @ 12.10 hrs, Volume= 0.076 af, Depth= 3.18"
Routed to Link F2A : Flume 2A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.288	69	Pasture/grassland/range, Fair, HSG B
0.288		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	49	0.0820	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	247	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.0	296	Total			

Summary for Subcatchment Area 40: Area 40

Runoff = 2.11 cfs @ 12.15 hrs, Volume= 0.120 af, Depth= 1.96"
Routed to Reach S1.4 : Swale S1.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.389	39	Pasture/grassland/range, Good, HSG A
0.270	69	Pasture/grassland/range, Fair, HSG B
0.080	96	Gravel surface, HSG A
0.739	56	Weighted Average
0.739		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	49	0.0408	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.1	47	0.2500	0.37		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	4	0.0050	0.39		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.2	19	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	22	0.1136	2.36		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.2	141	Total			

Summary for Subcatchment Area 41a: Area 41a

Runoff = 3.58 cfs @ 12.15 hrs, Volume= 0.202 af, Depth= 2.79"
Routed to Reach S1.6 : Swale S1.6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.249	39	Pasture/grassland/range, Good, HSG A
0.489	69	Pasture/grassland/range, Fair, HSG B
0.133	96	Gravel surface, HSG A
0.871	65	Weighted Average
0.871		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	44	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.8	144	Total			

Summary for Subcatchment Area 41b: Area 41b

Runoff = 3.63 cfs @ 12.15 hrs, Volume= 0.201 af, Depth= 3.38"
Routed to Reach S1.7 : Swale S1.7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.655	69	Pasture/grassland/range, Fair, HSG B
0.057	96	Gravel surface, HSG A
0.712	71	Weighted Average
0.712		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	2	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.3	102	Total			

Summary for Subcatchment Area 42: Area 42

Runoff = 3.63 cfs @ 12.15 hrs, Volume= 0.204 af, Depth= 3.18"
Routed to Reach S1.5 : Swale S1.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.769	69	Pasture/grassland/range, Fair, HSG B
0.769		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	39	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.7	139	Total			

Summary for Subcatchment Area 43: Area 43

Runoff = 7.53 cfs @ 12.24 hrs, Volume= 0.561 af, Depth= 2.41"
Routed to Reach S1.8 : Swale S1.8

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.797	39	Pasture/grassland/range, Good, HSG A
1.938	69	Pasture/grassland/range, Fair, HSG B
0.057	96	Gravel surface, HSG A
2.792	61	Weighted Average
2.792		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.3	119	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	22	0.1905	3.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.0	178	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.7	419	Total			

Summary for Subcatchment Area 44: Area 44

Runoff = 0.43 cfs @ 12.47 hrs, Volume= 0.074 af, Depth= 0.63"
Routed to Reach S2.1 : Swale S2.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.416	39	Pasture/grassland/range, Good, HSG A
1.416		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0260	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.9	194	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	647	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.0	941	Total			

Summary for Subcatchment Area 45: Area 45

Runoff = 11.02 cfs @ 12.10 hrs, Volume= 0.542 af, Depth= 3.18"
Routed to Reach S3.1 : Swale S3.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
2.044	69	Pasture/grassland/range, Fair, HSG B
2.044		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	38	0.2632	3.59		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.0	138	Total			

Summary for Subcatchment Area 46: Area 46

Runoff = 3.63 cfs @ 12.15 hrs, Volume= 0.204 af, Depth= 3.18"
Routed to Reach S3.4 : Swale S3.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.769	69	Pasture/grassland/range, Fair, HSG B
0.769		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	39	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.7	139	Total			

Summary for Subcatchment Area 47: Area 47

Runoff = 0.44 cfs @ 12.12 hrs, Volume= 0.023 af, Depth= 3.48"
Routed to Link C6 : Culvert C6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.070	69	Pasture/grassland/range, Fair, HSG B
0.009	96	Gravel surface, HSG A
0.079	72	Weighted Average
0.079		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	90	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.2	10	0.0500	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	10	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	18	0.1390	2.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.1	143	Total			

Summary for Subcatchment Area 48: Area 48

Runoff = 16.26 cfs @ 12.19 hrs, Volume= 1.050 af, Depth= 3.38"
Routed to Reach S3.5 : Swale S3.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
3.470	69	Pasture/grassland/range, Fair, HSG B
0.256	96	Gravel surface, HSG A
3.726	71	Weighted Average
3.726		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.9	83	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.9	208	0.0289	1.19		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	391	Total			

Summary for Subcatchment Area 49: Area 49

Runoff = 0.32 cfs @ 12.19 hrs, Volume= 0.036 af, Depth= 0.63"
Routed to Reach S2.1 : Swale S2.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.698	39	Pasture/grassland/range, Good, HSG A
0.698		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0600	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 5: Area 5

Runoff = 2.81 cfs @ 12.10 hrs, Volume= 0.134 af, Depth= 3.18"
Routed to Link F6A : Flume 6A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.504	69	Pasture/grassland/range, Fair, HSG B
0.504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	72	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	186	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
3.4	258	Total			

Summary for Subcatchment Area 50: Area 50

Runoff = 1.22 cfs @ 12.10 hrs, Volume= 0.059 af, Depth= 3.18"
Routed to Link F4A : Flume 4A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.223	69	Pasture/grassland/range, Fair, HSG B
0.223		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	77	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	157	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	62	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
3.7	296	Total			

Summary for Subcatchment Area 51: Area 51

Runoff = 3.35 cfs @ 12.12 hrs, Volume= 0.174 af, Depth= 3.18"
Routed to Link F4B : Flume 4B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.655	69	Pasture/grassland/range, Fair, HSG B
0.655		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	11	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	314	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
0.3	217	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
5.0	642	Total			

Summary for Subcatchment Area 52: Area 52

Runoff = 1.28 cfs @ 12.10 hrs, Volume= 0.063 af, Depth= 3.18"
Routed to Link F5A : Flume 5A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.237	69	Pasture/grassland/range, Fair, HSG B
0.237		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	83	0.2500	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	138	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.2	127	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
4.0	348	Total			

Summary for Subcatchment Area 53: Area 53

Runoff = 2.50 cfs @ 12.11 hrs, Volume= 0.126 af, Depth= 3.18"
Routed to Link F5B : Flume 5B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.475	69	Pasture/grassland/range, Fair, HSG B
0.475		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	90	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	219	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.2	116	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
4.5	425	Total			

Summary for Subcatchment Area 54: Area 54

Runoff = 5.93 cfs @ 12.11 hrs, Volume= 0.300 af, Depth= 2.23"
Routed to Reach S2.3 : Swale S2.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.079	69	Pasture/grassland/range, Fair, HSG B
0.539	39	Pasture/grassland/range, Good, HSG A
1.618	59	Weighted Average
1.618		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	77	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	237	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.3	70	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.2	384	Total			

Summary for Subcatchment Area 55: Area 55

Runoff = 2.95 cfs @ 12.11 hrs, Volume= 0.147 af, Depth= 2.13"
Routed to Reach S2.2 : Swale S2.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.520	69	Pasture/grassland/range, Fair, HSG B
0.306	39	Pasture/grassland/range, Good, HSG A
0.826	58	Weighted Average
0.826		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	26	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	126	Total			

Summary for Subcatchment Area 56: Area 56

Runoff = 6.17 cfs @ 12.13 hrs, Volume= 0.325 af, Depth= 3.18"
Routed to Link F4B : Flume 4B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.228	69	Pasture/grassland/range, Fair, HSG B
1.228		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	6	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	541	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
5.7	647	Total			

Summary for Subcatchment Area 57: Area 57

Runoff = 3.79 cfs @ 12.11 hrs, Volume= 0.194 af, Depth= 2.13"
Routed to Reach S4.1 : Swale S4.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.526	39	Pasture/grassland/range, Good, HSG A
0.405	69	Pasture/grassland/range, Fair, HSG B
0.158	96	Gravel surface, HSG A
1.089	58	Weighted Average
1.089		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	80	0.2000	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	20	0.0500	1.34		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.1	10	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	48	0.0625	1.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.3	158	Total			

Summary for Subcatchment Area 58: Area 58

Runoff = 4.33 cfs @ 12.11 hrs, Volume= 0.221 af, Depth= 2.23"
Routed to Reach S4.2 : Swale S4.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.580	39	Pasture/grassland/range, Good, HSG A
0.433	69	Pasture/grassland/range, Fair, HSG B
0.181	96	Gravel surface, HSG B
1.194	59	Weighted Average
1.194		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	121	0.2314	3.37		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	221	Total			

Summary for Subcatchment Area 59: Area 59

Runoff = 6.17 cfs @ 12.12 hrs, Volume= 0.330 af, Depth= 1.78"
Routed to Reach S4.3 : Swale S4.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.134	39	Pasture/grassland/range, Good, HSG A
1.086	69	Pasture/grassland/range, Fair, HSG B
2.220	54	Weighted Average
2.220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	140	0.1857	3.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.6	240	Total			

Summary for Subcatchment Area 6: Area 6

Runoff = 4.72 cfs @ 12.12 hrs, Volume= 0.248 af, Depth= 3.18"
Routed to Link F6A : Flume 6A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.936	69	Pasture/grassland/range, Fair, HSG B
0.936		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	100	0.2070	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	395	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.3	541	Total			

Summary for Subcatchment Area 60: Area 60

Runoff = 8.43 cfs @ 12.12 hrs, Volume= 0.441 af, Depth= 2.13"
Routed to Reach S4.4 : Swale S4.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.939	39	Pasture/grassland/range, Good, HSG A
1.537	69	Pasture/grassland/range, Fair, HSG B
2.476	58	Weighted Average
2.476		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.9	163	0.1718	2.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	263	Total			

Summary for Subcatchment Area 61: Area 61

Runoff = 4.54 cfs @ 12.11 hrs, Volume= 0.238 af, Depth= 1.70"
Routed to Reach S4.5 : Swale S4.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.898	39	Pasture/grassland/range, Good, HSG A
0.785	69	Pasture/grassland/range, Fair, HSG B
1.683	53	Weighted Average
1.683		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	100	0.2345	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2345	3.39		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	146	Total			

Summary for Subcatchment Area 62: Area 62

Runoff = 1.18 cfs @ 12.39 hrs, Volume= 0.150 af, Depth= 0.90"
Routed to Reach S4.6 : Swale S4.6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.871	39	Pasture/grassland/range, Good, HSG A
0.000	96	Gravel surface, HSG A
0.130	96	Gravel surface, HSG A
2.001	43	Weighted Average
2.001		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0074	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
4.7	169	0.0074	0.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	49	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.8	318	Total			

Summary for Subcatchment Area 63: Area 63

Runoff = 0.97 cfs @ 12.21 hrs, Volume= 0.114 af, Depth= 0.63"
Routed to Reach S2.3 : Swale S2.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
2.177	39	Pasture/grassland/range, Good, HSG A
2.177		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	66	0.0303	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.6	34	0.2500	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	49	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.2	149	Total			

Summary for Subcatchment Area 64: Area 64

Runoff = 1.14 cfs @ 12.16 hrs, Volume= 0.071 af, Depth= 1.44"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.479	39	Pasture/grassland/range, Good, HSG A
0.115	96	Gravel surface, HSG A
0.594	50	Weighted Average
0.594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0544	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	47	0.0544	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.6	147	Total			

Summary for Subcatchment Area 65: Area 65

Runoff = 14.43 cfs @ 12.04 hrs, Volume= 0.799 af, Depth= 6.35"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.509	98	Water Surface, HSG A
1.509		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Subcatchment Area 66: Area 66

Runoff = 2.36 cfs @ 12.21 hrs, Volume= 0.273 af, Depth= 0.63"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
5.227	39	Pasture/grassland/range, Good, HSG A
5.227		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	75	0.0933	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.3	25	0.2500	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	10	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	381	0.0265	7.85	109.92	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
0.8	162	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	48	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.9	701	Total			

Summary for Subcatchment Area 67: Area 67

Runoff = 1.99 cfs @ 12.64 hrs, Volume= 0.304 af, Depth= 1.20"
Routed to Reach RD1 : Roadside Ditch 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
2.616	39	Pasture/grassland/range, Good, HSG A
0.039	69	Pasture/grassland/range, Fair, HSG B
0.380	96	Gravel surface, HSG A
3.035	47	Weighted Average
3.035		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	100	0.0068	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
22.7	786	0.0068	0.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	886	Total			

Summary for Subcatchment Area 68: Area 68

Runoff = 0.26 cfs @ 12.11 hrs, Volume= 0.017 af, Depth= 0.83"
Routed to Reach RD2 : Roadside Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.227	39	Pasture/grassland/range, Good, HSG A
0.024	69	Pasture/grassland/range, Fair, HSG B
0.251	42	Weighted Average
0.251		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	52	0.1154	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 69: Area 69

Runoff = 1.50 cfs @ 12.11 hrs, Volume= 0.086 af, Depth= 1.13"
Routed to Reach RD2 : Roadside Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.695	39	Pasture/grassland/range, Good, HSG A
0.218	69	Pasture/grassland/range, Fair, HSG B
0.913	46	Weighted Average
0.913		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	86	0.2326	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 7: Area 7

Runoff = 4.85 cfs @ 12.14 hrs, Volume= 0.261 af, Depth= 3.18"
Routed to Link F4A : Flume 4A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.986	69	Pasture/grassland/range, Fair, HSG B
0.986		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	31	0.1000	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.8	69	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	9	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	419	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	80	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
6.6	608	Total			

Summary for Subcatchment Area 70: Area 70

Runoff = 3.98 cfs @ 12.11 hrs, Volume= 0.213 af, Depth= 1.53"
Routed to Reach RD4 : Roadside Ditch 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.016	39	Pasture/grassland/range, Good, HSG A
0.620	69	Pasture/grassland/range, Fair, HSG B
0.035	96	Gravel surface, HSG A
1.671	51	Weighted Average
1.671		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	26	0.1538	2.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.0	126	Total			

Summary for Subcatchment Area 71: Area 71

Runoff = 5.65 cfs @ 12.32 hrs, Volume= 0.684 af, Depth= 0.83"
Routed to Pond N : North Infiltration Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
9.360	39	Pasture/grassland/range, Good, HSG A
0.515	96	Gravel surface, HSG A
9.875	42	Weighted Average
9.875		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.7	100	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	1,137	0.0193	4.31	32.30	**Trap/Vee/Rect Channel Flow, Roadside Ditch** Bot.W=0.00' D=1.00' Z= 5.0 & 10.0 '/' Top.W=15.00' n= 0.030
16.6	1,337	Total			

Summary for Subcatchment Area 8: Area 8

Runoff = 4.50 cfs @ 12.10 hrs, Volume= 0.216 af, Depth= 3.18"
Routed to Link F7A : Flume 7A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
35,545	69	Pasture/grassland/range, Fair, HSG B
35,545		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	59	0.1695	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.7	289	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
3.6	348	Total			

Summary for Subcatchment Area 9: Area 9

Runoff = 1.44 cfs @ 12.09 hrs, Volume= 0.065 af, Depth= 3.18"
Routed to Link F7A : Flume 7A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
10,716	69	Pasture/grassland/range, Fair, HSG B
10,716		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	48	0.2500	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	96	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
2.3	144	Total			

Summary for Reach RD1: Roadside Ditch 1

Inflow Area = 3.035 ac, 0.00% Impervious, Inflow Depth = 1.20" for 100-yr, 24-hr event
Inflow = 1.99 cfs @ 12.64 hrs, Volume= 0.304 af
Outflow = 1.96 cfs @ 12.74 hrs, Volume= 0.304 af, Atten= 1%, Lag= 6.5 min
Routed to Link C1 : Culvert C1

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.00 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 9.2 min

Peak Storage= 434 cf @ 12.68 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 6.14'
Bank-Full Depth= 1.00' Flow Area= 9.5 sf, Capacity= 47.16 cfs

4.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 8.0 '/' Top Width= 15.00'
Length= 440.6' Slope= 0.0188 '/'
Inlet Invert= 824.00', Outlet Invert= 815.70'

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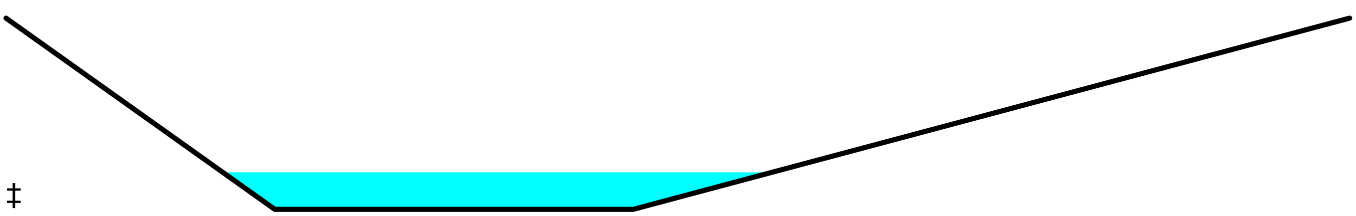


Summary for Reach RD2: Roadside Ditch 2

Inflow Area = 7.576 ac, 0.00% Impervious, Inflow Depth = 2.29" for 100-yr, 24-hr event
Inflow = 19.31 cfs @ 12.19 hrs, Volume= 1.445 af
Outflow = 17.96 cfs @ 12.25 hrs, Volume= 1.445 af, Atten= 7%, Lag= 3.9 min
Routed to Link C9 : Culvert C9

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.14 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.92 fps, Avg. Travel Time= 7.9 min

Peak Storage= 2,519 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.52' , Surface Width= 16.40'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 72.77 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 433.0' Slope= 0.0162 '/'
Inlet Invert= 814.55', Outlet Invert= 807.54'

‡

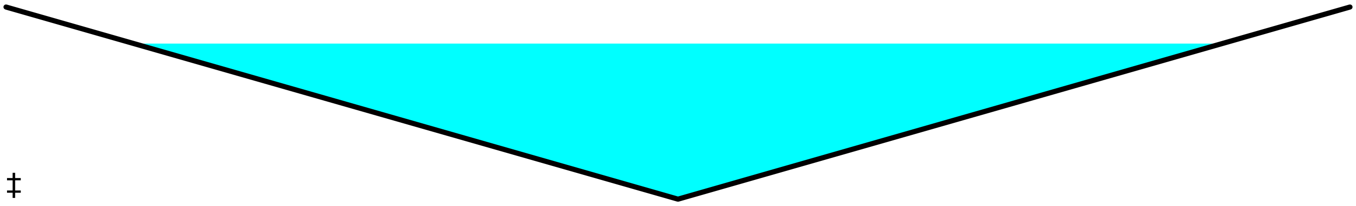
Summary for Reach RD3: Roadside Ditch 3

Inflow Area = 2.159 ac, 0.00% Impervious, Inflow Depth = 3.69" for 100-yr, 24-hr event
Inflow = 13.48 cfs @ 12.10 hrs, Volume= 0.663 af
Outflow = 11.77 cfs @ 12.19 hrs, Volume= 0.663 af, Atten= 13%, Lag= 5.2 min
Routed to Link C2 : Culvert C2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.50 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 1.47 fps, Avg. Travel Time= 9.3 min

Peak Storage= 2,151 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.81' , Surface Width= 6.48'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 20.76 cfs

0.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 821.0' Slope= 0.0288 '/'
Inlet Invert= 841.47', Outlet Invert= 817.83'



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Summary for Reach RD4: Roadside Ditch 4

Inflow Area = 1.671 ac, 0.00% Impervious, Inflow Depth = 1.53" for 100-yr, 24-hr event
Inflow = 3.98 cfs @ 12.11 hrs, Volume= 0.213 af
Outflow = 2.99 cfs @ 12.26 hrs, Volume= 0.213 af, Atten= 25%, Lag= 9.0 min
Routed to Link C9 : Culvert C9

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.52 fps, Min. Travel Time= 5.4 min
Avg. Velocity = 0.44 fps, Avg. Travel Time= 18.6 min

Peak Storage= 991 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 10.77'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 54.26 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 495.6' Slope= 0.0090 '/'
Inlet Invert= 812.00', Outlet Invert= 807.54'

‡

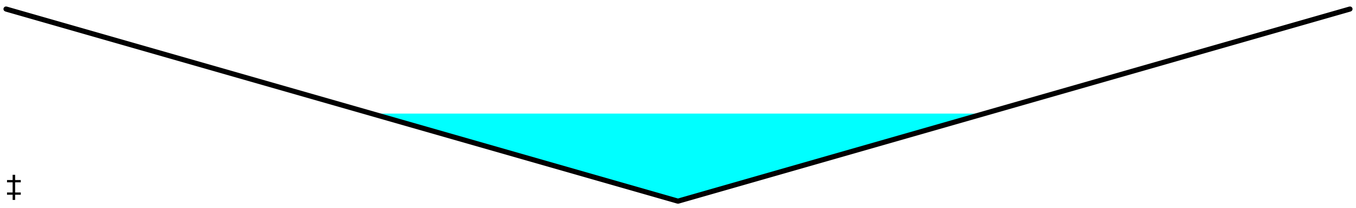
Summary for Reach RD5: Roadside Ditch 5

Inflow Area = 0.616 ac, 0.00% Impervious, Inflow Depth = 3.48" for 100-yr, 24-hr event
Inflow = 3.67 cfs @ 12.10 hrs, Volume= 0.179 af
Outflow = 3.30 cfs @ 12.14 hrs, Volume= 0.179 af, Atten= 10%, Lag= 2.2 min
Routed to Reach S4.2 : Swale S4.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.14 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.52 fps, Avg. Travel Time= 3.2 min

Peak Storage= 238 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.46' , Surface Width= 3.64'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 28.18 cfs

0.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 288.0' Slope= 0.0531 '/'
Inlet Invert= 841.47', Outlet Invert= 826.18'



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Summary for Reach S1.1: Swale S1.1

Inflow Area = 1.185 ac, 0.00% Impervious, Inflow Depth = 2.79" for 100-yr, 24-hr event
Inflow = 5.57 cfs @ 12.11 hrs, Volume= 0.275 af
Outflow = 4.95 cfs @ 12.16 hrs, Volume= 0.275 af, Atten= 11%, Lag= 3.2 min
Routed to Link C10 : Culvert C10

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.87 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 6.7 min

Peak Storage= 581 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 9.64'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 338.34 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 321.0' Slope= 0.0319 '/'
Inlet Invert= 825.20', Outlet Invert= 814.96'

‡

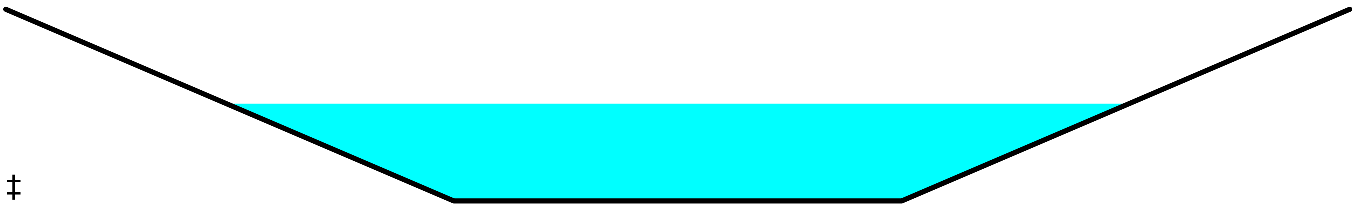
Summary for Reach S1.2: Swale S1.2

Inflow Area = 11.287 ac, 0.00% Impervious, Inflow Depth = 3.06" for 100-yr, 24-hr event
Inflow = 52.19 cfs @ 12.14 hrs, Volume= 2.880 af
Outflow = 49.91 cfs @ 12.16 hrs, Volume= 2.880 af, Atten= 4%, Lag= 1.2 min
Routed to Link C3 : Culvert C3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.24 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.15 fps, Avg. Travel Time= 2.9 min

Peak Storage= 2,484 cf @ 12.15 hrs
Average Depth at Peak Storage= 1.02' , Surface Width= 16.13'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 196.86 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 202.8' Slope= 0.0108 '/'
Inlet Invert= 813.36', Outlet Invert= 811.17'



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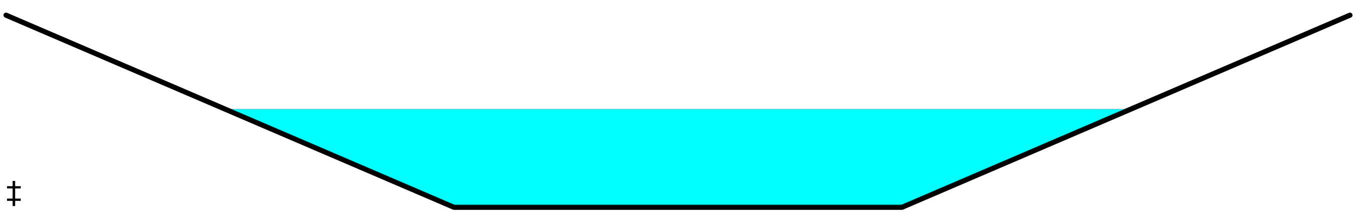
Summary for Reach S1.3: Swale S1.3

Inflow Area = 14.199 ac, 0.00% Impervious, Inflow Depth = 3.00" for 100-yr, 24-hr event
Inflow = 61.05 cfs @ 12.15 hrs, Volume= 3.550 af
Outflow = 60.33 cfs @ 12.15 hrs, Volume= 3.550 af, Atten= 1%, Lag= 0.4 min
Routed to Link C4 : Culvert C4

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.92 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.36 fps, Avg. Travel Time= 0.9 min

Peak Storage= 895 cf @ 12.15 hrs
Average Depth at Peak Storage= 1.03' , Surface Width= 16.20'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 227.36 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 72.2' Slope= 0.0144 '/'
Inlet Invert= 810.90', Outlet Invert= 809.86'



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Summary for Reach S1.4: Swale S1.4

Inflow Area = 14.938 ac, 0.00% Impervious, Inflow Depth = 2.95" for 100-yr, 24-hr event
Inflow = 62.44 cfs @ 12.15 hrs, Volume= 3.671 af
Outflow = 59.56 cfs @ 12.18 hrs, Volume= 3.671 af, Atten= 5%, Lag= 1.4 min
Routed to Reach S1.6 : Swale S1.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.24 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 0.92 fps, Avg. Travel Time= 2.7 min

Peak Storage= 2,814 cf @ 12.16 hrs
Average Depth at Peak Storage= 1.40' , Surface Width= 19.19'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 126.50 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 148.0' Slope= 0.0045 '/'
Inlet Invert= 809.60', Outlet Invert= 808.94'

‡

Summary for Reach S1.5: Swale S1.5

Inflow Area = 0.769 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 3.63 cfs @ 12.15 hrs, Volume= 0.204 af
Outflow = 3.33 cfs @ 12.21 hrs, Volume= 0.204 af, Atten= 8%, Lag= 3.8 min
Routed to Reach S1.6 : Swale S1.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.35 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.36 fps, Avg. Travel Time= 8.2 min

Peak Storage= 448 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.27' , Surface Width= 10.19'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 134.06 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 179.7' Slope= 0.0050 '/'
Inlet Invert= 809.85', Outlet Invert= 808.95'

‡

Summary for Reach S1.6: Swale S1.6

Inflow Area = 17.290 ac, 0.00% Impervious, Inflow Depth = 2.97" for 100-yr, 24-hr event
Inflow = 69.21 cfs @ 12.18 hrs, Volume= 4.277 af
Outflow = 66.73 cfs @ 12.21 hrs, Volume= 4.277 af, Atten= 4%, Lag= 2.1 min
Routed to Link C5 : Culvert C5

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.60 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 4.3 min

Peak Storage= 4,825 cf @ 12.20 hrs
Average Depth at Peak Storage= 1.41' , Surface Width= 19.25'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 139.68 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 252.0' Slope= 0.0054 '/'
Inlet Invert= 808.94', Outlet Invert= 807.57'

‡

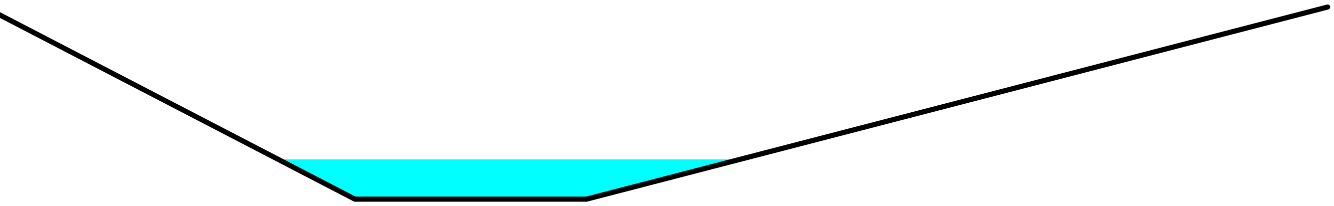
Summary for Reach S1.7: Swale S1.7

Inflow Area = 0.712 ac, 0.00% Impervious, Inflow Depth = 3.38" for 100-yr, 24-hr event
Inflow = 3.63 cfs @ 12.15 hrs, Volume= 0.201 af
Outflow = 3.32 cfs @ 12.20 hrs, Volume= 0.201 af, Atten= 9%, Lag= 3.3 min
Routed to Reach S1.6 : Swale S1.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.20 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 6.5 min

Peak Storage= 380 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.41' , Surface Width= 4.98'
Bank-Full Depth= 2.00' Flow Area= 17.0 sf, Capacity= 90.14 cfs

2.50' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 4.0 '/' Top Width= 14.50'
Length= 245.8' Slope= 0.0099 '/'
Inlet Invert= 810.00', Outlet Invert= 807.57'



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Summary for Reach S1.8: Swale S1.8

Inflow Area = 20.082 ac, 0.00% Impervious, Inflow Depth = 2.89" for 100-yr, 24-hr event
Inflow = 74.10 cfs @ 12.22 hrs, Volume= 4.838 af
Outflow = 70.85 cfs @ 12.27 hrs, Volume= 4.838 af, Atten= 4%, Lag= 3.2 min
Routed to Reach S2.1 : Swale S2.1

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.09 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.09 fps, Avg. Travel Time= 6.5 min

Peak Storage= 7,485 cf @ 12.24 hrs
Average Depth at Peak Storage= 1.33' , Surface Width= 18.65'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 163.67 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 422.0' Slope= 0.0075 '/'
Inlet Invert= 807.15', Outlet Invert= 804.00'

‡

Summary for Reach S2.1: Swale S2.1

Inflow Area = 22.196 ac, 0.00% Impervious, Inflow Depth = 2.68" for 100-yr, 24-hr event
Inflow = 71.34 cfs @ 12.27 hrs, Volume= 4.949 af
Outflow = 68.62 cfs @ 12.32 hrs, Volume= 4.949 af, Atten= 4%, Lag= 3.2 min
Routed to Reach S2.2 : Swale S2.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.72 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.10 fps, Avg. Travel Time= 5.9 min

Peak Storage= 7,331 cf @ 12.29 hrs
Average Depth at Peak Storage= 1.73' , Surface Width= 17.82'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 97.05 cfs

4.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 20.00'
Length= 389.0' Slope= 0.0054 '/'
Inlet Invert= 806.10', Outlet Invert= 804.00'

‡

Summary for Reach S2.2: Swale S2.2

Inflow Area = 39.450 ac, 0.00% Impervious, Inflow Depth = 2.90" for 100-yr, 24-hr event
Inflow = 120.78 cfs @ 12.27 hrs, Volume= 9.518 af
Outflow = 118.35 cfs @ 12.32 hrs, Volume= 9.518 af, Atten= 2%, Lag= 3.1 min
Routed to Reach S2.3 : Swale S2.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.96 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 6.7 min

Peak Storage= 12,407 cf @ 12.29 hrs
Average Depth at Peak Storage= 1.77' , Surface Width= 24.15'
Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 152.61 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 411.0' Slope= 0.0049 '/'
Inlet Invert= 804.00', Outlet Invert= 802.00'

‡

Summary for Reach S2.3: Swale S2.3

Inflow Area = 43.245 ac, 0.00% Impervious, Inflow Depth = 2.76" for 100-yr, 24-hr event
Inflow = 120.84 cfs @ 12.32 hrs, Volume= 9.932 af
Outflow = 119.37 cfs @ 12.35 hrs, Volume= 9.932 af, Atten= 1%, Lag= 1.7 min
Routed to Link C7 : Culvert C7

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.64 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.45 fps, Avg. Travel Time= 3.5 min

Peak Storage= 6,544 cf @ 12.33 hrs
Average Depth at Peak Storage= 1.38' , Surface Width= 21.00'
Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 249.72 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 307.0' Slope= 0.0130 '/'
Inlet Invert= 802.00', Outlet Invert= 798.00'

‡

Summary for Reach S3.1: Swale S3.1

Inflow Area = 2.044 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 11.02 cfs @ 12.10 hrs, Volume= 0.542 af
Outflow = 9.75 cfs @ 12.19 hrs, Volume= 0.542 af, Atten= 12%, Lag= 5.2 min
Routed to Reach S3.2 : Swale S3.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.94 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.48 fps, Avg. Travel Time= 12.5 min

Peak Storage= 1,797 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.50' , Surface Width= 12.02'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 133.76 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 357.0' Slope= 0.0050 '/'
Inlet Invert= 809.85', Outlet Invert= 808.07'

‡

Summary for Reach S3.2: Swale S3.2

Inflow Area = 8.141 ac, 0.00% Impervious, Inflow Depth = 3.19" for 100-yr, 24-hr event
Inflow = 38.61 cfs @ 12.12 hrs, Volume= 2.162 af
Outflow = 37.80 cfs @ 12.13 hrs, Volume= 2.162 af, Atten= 2%, Lag= 0.5 min
Routed to Reach S3.3 : Swale S3.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.93 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.75 fps, Avg. Travel Time= 0.8 min

Peak Storage= 442 cf @ 12.12 hrs
Average Depth at Peak Storage= 1.06' , Surface Width= 16.50'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 133.95 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 34.0' Slope= 0.0050 '/'
Inlet Invert= 798.00', Outlet Invert= 797.83'

‡

Summary for Reach S3.3: Swale S3.3

Inflow Area = 8.141 ac, 0.00% Impervious, Inflow Depth = 3.19" for 100-yr, 24-hr event
Inflow = 37.80 cfs @ 12.13 hrs, Volume= 2.162 af
Outflow = 36.67 cfs @ 12.15 hrs, Volume= 2.162 af, Atten= 3%, Lag= 1.5 min
Routed to Link C6 : Culvert C6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.12 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.04 fps, Avg. Travel Time= 3.2 min

Peak Storage= 1,839 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.82' , Surface Width= 14.53'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 215.99 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 200.0' Slope= 0.0130 '/'
Inlet Invert= 808.00', Outlet Invert= 805.40'

‡

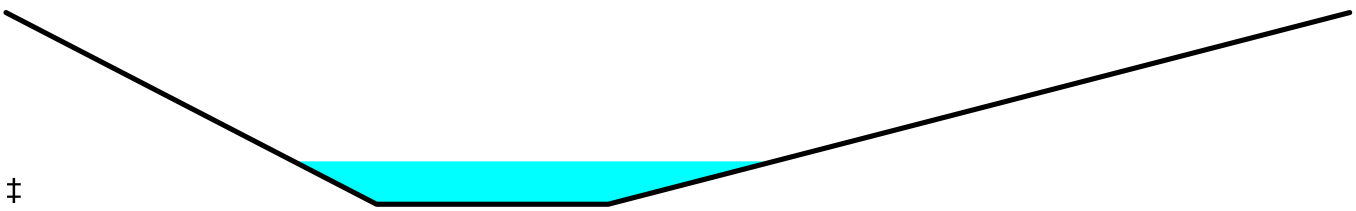
Summary for Reach S3.4: Swale S3.4

Inflow Area = 0.769 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 3.63 cfs @ 12.15 hrs, Volume= 0.204 af
Outflow = 3.29 cfs @ 12.22 hrs, Volume= 0.204 af, Atten= 9%, Lag= 4.3 min
Routed to Link C6 : Culvert C6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.95 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 8.3 min

Peak Storage= 487 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.45' , Surface Width= 5.19'
Bank-Full Depth= 2.00' Flow Area= 17.0 sf, Capacity= 76.21 cfs

2.50' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 4.0 '/' Top Width= 14.50'
Length= 283.0' Slope= 0.0071 '/'
Inlet Invert= 810.00', Outlet Invert= 808.00'



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Summary for Reach S3.5: Swale S3.5

Inflow Area = 15.716 ac, 0.00% Impervious, Inflow Depth = 3.23" for 100-yr, 24-hr event
Inflow = 68.29 cfs @ 12.15 hrs, Volume= 4.234 af
Outflow = 64.19 cfs @ 12.21 hrs, Volume= 4.234 af, Atten= 6%, Lag= 3.7 min
Routed to Reach S2.2 : Swale S2.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.63 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 7.8 min

Peak Storage= 7,904 cf @ 12.17 hrs
Average Depth at Peak Storage= 1.68' , Surface Width= 21.48'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 93.14 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 318.5' Slope= 0.0024 '/'
Inlet Invert= 804.76', Outlet Invert= 803.99'

‡

Summary for Reach S4.1: Swale S4.1

Inflow Area = 1.364 ac, 0.00% Impervious, Inflow Depth = 2.35" for 100-yr, 24-hr event
Inflow = 5.28 cfs @ 12.10 hrs, Volume= 0.267 af
Outflow = 4.68 cfs @ 12.16 hrs, Volume= 0.267 af, Atten= 11%, Lag= 3.3 min
Routed to Reach S4.2 : Swale S4.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.07 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.50 fps, Avg. Travel Time= 8.0 min

Peak Storage= 556 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.22' , Surface Width= 11.51'
Bank-Full Depth= 1.00' Flow Area= 13.5 sf, Capacity= 70.22 cfs

10.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 17.00'
Length= 240.0' Slope= 0.0153 '/'
Inlet Invert= 811.94', Outlet Invert= 808.26'

‡

Summary for Reach S4.2: Swale S4.2

Inflow Area = 3.174 ac, 0.00% Impervious, Inflow Depth = 2.52" for 100-yr, 24-hr event
Inflow = 11.92 cfs @ 12.14 hrs, Volume= 0.667 af
Outflow = 11.06 cfs @ 12.18 hrs, Volume= 0.667 af, Atten= 7%, Lag= 2.8 min
Routed to Reach S4.3 : Swale S4.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.70 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.62 fps, Avg. Travel Time= 7.0 min

Peak Storage= 1,118 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.38' , Surface Width= 12.66'
Bank-Full Depth= 1.00' Flow Area= 13.5 sf, Capacity= 63.88 cfs

10.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 17.00'
Length= 259.3' Slope= 0.0127 '/'
Inlet Invert= 808.26', Outlet Invert= 804.97'

Summary for Reach S4.3: Swale S4.3

Inflow Area = 9.483 ac, 0.00% Impervious, Inflow Depth = 2.63" for 100-yr, 24-hr event
Inflow = 36.14 cfs @ 12.14 hrs, Volume= 2.080 af
Outflow = 33.37 cfs @ 12.21 hrs, Volume= 2.080 af, Atten= 8%, Lag= 4.5 min
Routed to Reach S4.4 : Swale S4.4

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.26 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.54 fps, Avg. Travel Time= 11.3 min

Peak Storage= 5,406 cf @ 12.17 hrs
Average Depth at Peak Storage= 1.08' , Surface Width= 17.57'
Bank-Full Depth= 2.00' Flow Area= 34.0 sf, Capacity= 108.12 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 24.00'
Length= 362.9' Slope= 0.0027 '/'
Inlet Invert= 804.97', Outlet Invert= 804.00'

Summary for Reach S4.4: Swale S4.4

Inflow Area = 14.158 ac, 0.00% Impervious, Inflow Depth = 2.63" for 100-yr, 24-hr event
Inflow = 45.34 cfs @ 12.17 hrs, Volume= 3.104 af
Outflow = 43.47 cfs @ 12.26 hrs, Volume= 3.104 af, Atten= 4%, Lag= 5.4 min
Routed to Reach S4.5 : Swale S4.5

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.82 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 12.3 min

Peak Storage= 7,633 cf @ 12.21 hrs
Average Depth at Peak Storage= 1.11' , Surface Width= 17.77'
Bank-Full Depth= 2.00' Flow Area= 34.0 sf, Capacity= 132.85 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 24.00'
Length= 495.6' Slope= 0.0040 '/'
Inlet Invert= 804.00', Outlet Invert= 802.00'

‡

Summary for Reach S4.5: Swale S4.5

Inflow Area = 16.268 ac, 0.00% Impervious, Inflow Depth = 2.55" for 100-yr, 24-hr event
Inflow = 45.91 cfs @ 12.26 hrs, Volume= 3.454 af
Outflow = 44.58 cfs @ 12.31 hrs, Volume= 3.454 af, Atten= 3%, Lag= 3.1 min
Routed to Reach S4.6 : Swale S4.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.87 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 7.0 min

Peak Storage= 4,792 cf @ 12.28 hrs
Average Depth at Peak Storage= 0.89' , Surface Width= 16.22'
Bank-Full Depth= 3.00' Flow Area= 61.5 sf, Capacity= 465.89 cfs

10.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 31.00'
Length= 411.1' Slope= 0.0097 '/'
Inlet Invert= 802.00', Outlet Invert= 798.00'

‡

Summary for Reach S4.6: Swale S4.6

Inflow Area = 64.606 ac, 0.00% Impervious, Inflow Depth = 2.67" for 100-yr, 24-hr event
Inflow = 168.73 cfs @ 12.33 hrs, Volume= 14.356 af
Outflow = 165.72 cfs @ 12.38 hrs, Volume= 14.356 af, Atten= 2%, Lag= 2.6 min
Routed to Pond Sed Pond : Sedimentation Basin

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.02 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 1.58 fps, Avg. Travel Time= 5.7 min

Peak Storage= 14,984 cf @ 12.35 hrs
Average Depth at Peak Storage= 1.74' , Surface Width= 22.15'
Bank-Full Depth= 3.00' Flow Area= 61.5 sf, Capacity= 499.25 cfs

10.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 31.00'
Length= 537.0' Slope= 0.0112 '/'
Inlet Invert= 798.00', Outlet Invert= 792.00'

‡

Summary for Reach S5.1: Swale S5.1

Inflow Area = 1.218 ac, 0.00% Impervious, Inflow Depth = 3.69" for 100-yr, 24-hr event
Inflow = 7.33 cfs @ 12.11 hrs, Volume= 0.374 af
Outflow = 6.57 cfs @ 12.20 hrs, Volume= 0.374 af, Atten= 10%, Lag= 5.2 min
Routed to Link C2 : Culvert C2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.49 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 12.7 min

Peak Storage= 1,277 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.29' , Surface Width= 10.33'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 235.22 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 478.0' Slope= 0.0154 '/'
Inlet Invert= 825.20', Outlet Invert= 817.83'

‡

Summary for Pond C8: Culvert C8

Inflow Area = 0.275 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 1.60 cfs @ 12.08 hrs, Volume= 0.073 af
Outflow = 1.60 cfs @ 12.08 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.1 min
Primary = 1.60 cfs @ 12.08 hrs, Volume= 0.073 af
Routed to Reach S4.1 : Swale S4.1

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 811.38' @ 12.08 hrs Surf.Area= 0.000 ac Storage= 0.000 af
Flood Elev= 819.00' Surf.Area= 0.000 ac Storage= 0.001 af

Plug-Flow detention time= 0.2 min calculated for 0.073 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (817.4 - 817.3)

Volume	Invert	Avail.Storage	Storage Description
#1	810.70'	0.001 af	**3.00'D x 7.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	810.70'	**12.0" Round Culvert** L= 85.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 810.70' / 808.60' S= 0.0245 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.49 cfs @ 12.08 hrs HW=811.35' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.49 cfs @ 2.75 fps)

Summary for Pond N: North Infiltration Area

Inflow Area = 19.122 ac, 0.00% Impervious, Inflow Depth = 1.47" for 100-yr, 24-hr event
Inflow = 26.07 cfs @ 12.26 hrs, Volume= 2.341 af
Outflow = 2.21 cfs @ 14.51 hrs, Volume= 2.341 af, Atten= 92%, Lag= 134.8 min
Primary = 2.21 cfs @ 14.51 hrs, Volume= 2.341 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 805.23' @ 14.51 hrs Surf.Area= 26,475 sf Storage= 49,470 cf

Plug-Flow detention time= 286.7 min calculated for 2.340 af (100% of inflow)
Center-of-Mass det. time= 286.7 min (1,155.0 - 868.3)

Volume	Invert	Avail.Storage	Storage Description
#1	802.00'	256,569 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
802.00	5,140	0	0
804.00	17,424	22,564	22,564
806.00	32,191	49,615	72,179
808.00	46,130	78,321	150,500
810.00	59,939	106,069	256,569

Device	Routing	Invert	Outlet Devices
#1	Primary	802.00'	**3.600 in/hr Exfiltration over Surface area**

Primary OutFlow Max=2.21 cfs @ 14.51 hrs HW=805.23' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 2.21 cfs)

Summary for Pond Sed Pond: Sedimentation Basin

Inflow Area = 71.936 ac, 2.10% Impervious, Inflow Depth = 2.59" for 100-yr, 24-hr event
Inflow = 169.96 cfs @ 12.38 hrs, Volume= 15.500 af
Outflow = 83.78 cfs @ 12.65 hrs, Volume= 15.500 af, Atten= 51%, Lag= 16.6 min
Discarded = 5.91 cfs @ 12.65 hrs, Volume= 7.233 af
Primary = 11.51 cfs @ 12.65 hrs, Volume= 5.165 af
Routed to Link Wetland : Wetland
Secondary = 31.49 cfs @ 12.65 hrs, Volume= 2.330 af
Routed to Link Wetland : Wetland
Tertiary = 34.88 cfs @ 12.65 hrs, Volume= 0.772 af
Routed to Link Wetland : Wetland

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 793.20' @ 12.65 hrs Surf.Area= 70,892 sf Storage= 245,676 cf
Flood Elev= 794.00' Surf.Area= 75,797 sf Storage= 304,443 cf

Plug-Flow detention time= 158.5 min calculated for 15.489 af (100% of inflow)
Center-of-Mass det. time= 158.5 min (1,005.3 - 846.8)

Volume	Invert	Avail.Storage	Storage Description
#1	789.00'	304,443 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
789.00	27,325	0	0
790.00	55,972	41,649	41,649
791.00	61,532	58,752	100,401
792.00	65,703	63,618	164,018
793.00	69,675	67,689	231,707
794.00	75,797	72,736	304,443

Device	Routing	Invert	Outlet Devices
#1	Primary	787.70'	**15.0" Round Culvert** L= 40.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 787.70' / 787.50' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	791.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	790.50'	**0.8" Vert. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	790.00'	**0.8" Vert. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#5	Device 1	789.00'	**0.5" Vert. Orifice/Grate X 14.00 columns** X 6 rows with 6.0" cc spacing C= 0.600

			Limited to weir flow at low heads
#6	Secondary	792.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#7	Tertiary	793.00'	**158.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#8	Discarded	789.00'	**3.600 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=5.91 cfs @ 12.65 hrs HW=793.20' (Free Discharge)
└─**8=Exfiltration** (Exfiltration Controls 5.91 cfs)

Primary OutFlow Max=11.51 cfs @ 12.65 hrs HW=793.20' (Free Discharge)
└─**1=Culvert** (Inlet Controls 11.51 cfs @ 9.38 fps)
  ├─**2=Orifice/Grate** (Passes < 35.04 cfs potential flow)
  ├─**3=Orifice/Grate** (Passes < 0.11 cfs potential flow)
  ├─**4=Orifice/Grate** (Passes < 0.12 cfs potential flow)
  └─**5=Orifice/Grate** (Passes < 0.93 cfs potential flow)

Secondary OutFlow Max=31.42 cfs @ 12.65 hrs HW=793.20' (Free Discharge)
└─**6=Broad-Crested Rectangular Weir** (Weir Controls 31.42 cfs @ 2.25 fps)

Tertiary OutFlow Max=34.62 cfs @ 12.65 hrs HW=793.20' (Free Discharge)
└─**7=Broad-Crested Rectangular Weir** (Weir Controls 34.62 cfs @ 1.11 fps)

Summary for Link C1: Culvert C1

Inflow Area = 3.035 ac, 0.00% Impervious, Inflow Depth = 1.20" for 100-yr, 24-hr event
Inflow = 1.96 cfs @ 12.74 hrs, Volume= 0.304 af
Primary = 1.96 cfs @ 12.74 hrs, Volume= 0.304 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C10: Culvert C10

Inflow Area = 1.185 ac, 0.00% Impervious, Inflow Depth = 2.79" for 100-yr, 24-hr event
Inflow = 4.95 cfs @ 12.16 hrs, Volume= 0.275 af
Primary = 4.95 cfs @ 12.16 hrs, Volume= 0.275 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.2 : Swale S1.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C2: Culvert C2

Inflow Area = 3.377 ac, 0.00% Impervious, Inflow Depth = 3.69" for 100-yr, 24-hr event
Inflow = 18.32 cfs @ 12.19 hrs, Volume= 1.038 af
Primary = 18.32 cfs @ 12.19 hrs, Volume= 1.038 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C3: Culvert C3

Inflow Area = 11.287 ac, 0.00% Impervious, Inflow Depth = 3.06" for 100-yr, 24-hr event
Inflow = 49.91 cfs @ 12.16 hrs, Volume= 2.880 af
Primary = 49.91 cfs @ 12.16 hrs, Volume= 2.880 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.3 : Swale S1.3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C4: Culvert C4

Inflow Area = 14.199 ac, 0.00% Impervious, Inflow Depth = 3.00" for 100-yr, 24-hr event
Inflow = 60.33 cfs @ 12.15 hrs, Volume= 3.550 af
Primary = 60.33 cfs @ 12.15 hrs, Volume= 3.550 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.4 : Swale S1.4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C5: Culvert C5

Inflow Area = 17.290 ac, 0.00% Impervious, Inflow Depth = 2.97" for 100-yr, 24-hr event
Inflow = 66.73 cfs @ 12.21 hrs, Volume= 4.277 af
Primary = 66.73 cfs @ 12.21 hrs, Volume= 4.277 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.8 : Swale S1.8

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C6: Culvert C6

Inflow Area = 11.990 ac, 0.00% Impervious, Inflow Depth = 3.19" for 100-yr, 24-hr event
Inflow = 53.57 cfs @ 12.14 hrs, Volume= 3.184 af
Primary = 53.57 cfs @ 12.14 hrs, Volume= 3.184 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S3.5 : Swale S3.5

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C7: Culvert C7

Inflow Area = 46.337 ac, 0.00% Impervious, Inflow Depth = 2.78" for 100-yr, 24-hr event
Inflow = 123.92 cfs @ 12.34 hrs, Volume= 10.752 af
Primary = 123.92 cfs @ 12.34 hrs, Volume= 10.752 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.6 : Swale S4.6

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C9: Culvert C9

Inflow Area = 9.247 ac, 0.00% Impervious, Inflow Depth = 2.15" for 100-yr, 24-hr event
Inflow = 20.94 cfs @ 12.26 hrs, Volume= 1.658 af
Primary = 20.94 cfs @ 12.26 hrs, Volume= 1.658 af, Atten= 0%, Lag= 0.0 min
Routed to Pond N : North Infiltration Area

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F10: Flume 10

Inflow Area = 0.275 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 1.60 cfs @ 12.08 hrs, Volume= 0.073 af
Primary = 1.60 cfs @ 12.08 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min
Routed to Pond C8 : Culvert C8

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F1A: Flume 1A

Inflow Area = 1.853 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 9.08 cfs @ 12.13 hrs, Volume= 0.491 af
Primary = 9.08 cfs @ 12.13 hrs, Volume= 0.491 af, Atten= 0%, Lag= 0.0 min
Routed to Link F1B : Flume 1B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F1B: Flume 1B

Inflow Area = 4.089 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 20.35 cfs @ 12.13 hrs, Volume= 1.084 af
Primary = 20.35 cfs @ 12.13 hrs, Volume= 1.084 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.3 : Swale S4.3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F2A: Flume 2A

Inflow Area = 0.636 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 3.34 cfs @ 12.11 hrs, Volume= 0.169 af
Primary = 3.34 cfs @ 12.11 hrs, Volume= 0.169 af, Atten= 0%, Lag= 0.0 min
Routed to Link F2B : Flume 2B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F2B: Flume 2B

Inflow Area = 2.199 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 11.13 cfs @ 12.12 hrs, Volume= 0.583 af
Primary = 11.13 cfs @ 12.12 hrs, Volume= 0.583 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.4 : Swale S4.4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F3: Flume 3

Inflow Area = 0.427 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 2.33 cfs @ 12.10 hrs, Volume= 0.113 af
Primary = 2.33 cfs @ 12.10 hrs, Volume= 0.113 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.5 : Swale S4.5

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F4A: Flume 4A

Inflow Area = 1.209 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 5.87 cfs @ 12.13 hrs, Volume= 0.320 af
Primary = 5.87 cfs @ 12.13 hrs, Volume= 0.320 af, Atten= 0%, Lag= 0.0 min
Routed to Link F4B : Flume 4B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F4B: Flume 4B

Inflow Area = 3.092 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 15.35 cfs @ 12.13 hrs, Volume= 0.820 af
Primary = 15.35 cfs @ 12.13 hrs, Volume= 0.820 af, Atten= 0%, Lag= 0.0 min
Routed to Link C7 : Culvert C7

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F5A: Flume 5A

Inflow Area = 0.237 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 1.28 cfs @ 12.10 hrs, Volume= 0.063 af
Primary = 1.28 cfs @ 12.10 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min
Routed to Link F5B : Flume 5B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F5B: Flume 5B

Inflow Area = 0.712 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 3.77 cfs @ 12.11 hrs, Volume= 0.189 af
Primary = 3.77 cfs @ 12.11 hrs, Volume= 0.189 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S2.2 : Swale S2.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F6A: Flume 6A

Inflow Area = 1.440 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 7.42 cfs @ 12.11 hrs, Volume= 0.382 af
Primary = 7.42 cfs @ 12.11 hrs, Volume= 0.382 af, Atten= 0%, Lag= 0.0 min
Routed to Link F6B : Flume 6B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F6B: Flume 6B

Inflow Area = 3.001 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 15.57 cfs @ 12.11 hrs, Volume= 0.795 af
Primary = 15.57 cfs @ 12.11 hrs, Volume= 0.795 af, Atten= 0%, Lag= 0.0 min
Routed to Link C6 : Culvert C6

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F7A: Flume 7A

Inflow Area = 1.062 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 5.92 cfs @ 12.10 hrs, Volume= 0.281 af
Primary = 5.92 cfs @ 12.10 hrs, Volume= 0.281 af, Atten= 0%, Lag= 0.0 min
Routed to Link F7B : Flume 7B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F7B: Flume 7B

Inflow Area = 3.407 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 18.00 cfs @ 12.11 hrs, Volume= 0.903 af
Primary = 18.00 cfs @ 12.11 hrs, Volume= 0.903 af, Atten= 0%, Lag= 0.0 min
Routed to Link F7C : Flume 7C

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F7C: Flume 7C

Inflow Area = 5.640 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 29.56 cfs @ 12.11 hrs, Volume= 1.495 af
Primary = 29.56 cfs @ 12.11 hrs, Volume= 1.495 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S3.2 : Swale S3.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F8A: Flume 8A

Inflow Area = 0.381 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 2.02 cfs @ 12.11 hrs, Volume= 0.101 af
Primary = 2.02 cfs @ 12.11 hrs, Volume= 0.101 af, Atten= 0%, Lag= 0.0 min
Routed to Link F8B : Flume 8B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F8B: Flume 8B

Inflow Area = 1.497 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 7.88 cfs @ 12.11 hrs, Volume= 0.397 af
Primary = 7.88 cfs @ 12.11 hrs, Volume= 0.397 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.3 : Swale S1.3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F9A: Flume 9A

Inflow Area = 2.445 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 11.65 cfs @ 12.15 hrs, Volume= 0.648 af
Primary = 11.65 cfs @ 12.15 hrs, Volume= 0.648 af, Atten= 0%, Lag= 0.0 min
Routed to Link F9B : Flume 9B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F9B: Flume 9B

Inflow Area = 5.540 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 26.78 cfs @ 12.14 hrs, Volume= 1.468 af
Primary = 26.78 cfs @ 12.14 hrs, Volume= 1.468 af, Atten= 0%, Lag= 0.0 min
Routed to Link F9C : Flume 9C

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F9C: Flume 9C

Inflow Area = 8.811 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 42.66 cfs @ 12.14 hrs, Volume= 2.335 af
Primary = 42.66 cfs @ 12.14 hrs, Volume= 2.335 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.2 : Swale S1.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link Wetland: Wetland

Inflow Area = 71.936 ac, 2.10% Impervious, Inflow Depth = 1.38" for 100-yr, 24-hr event
Inflow = 77.88 cfs @ 12.65 hrs, Volume= 8.267 af
Primary = 77.88 cfs @ 12.65 hrs, Volume= 8.267 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Swale Sizing

		Sheet No: 1 of 3	
		Calc. No.	
		Rev. No. 2	
Job No. 25222260.00	Project: Columbia Energy Center MOD 12-13	By: SJL	Date: 8/28/23
Client: WPL	Subject: Swale Sizing	Chk'd: RJG	Date: 8/28/23

Purpose:

To size the proposed swales f to accommodate the 25-year, 24-hour storm event and determine required erosion matting.

References:

1. WisDOT Facilities Development Manual Chapter 13, Section 30-15 - Grass Lined Channels.
2. Design of Roadside Channels with Flexible Linings, HEC-15, USDOT FHWA.
3. HydroCAD Report: COL_Mod12-13_HydroCAD Report
4. Wisconsin Department of Natural Resources Conservation Practice Standard 1053 - Channel Erosion Mat.

Approach:

Use the HydroCAD Model results to obtain the peak flow during a 25-year, 24-hour storm event.

Use Grass Lined Channel Design WisDOT Spreadsheet, FDM 13-30 Attachment 15.2 (from Reference #1) to size the swale for each design swale cross section. The WisDOT spreadsheet incorporates the design guidelines and equations described in "Design of Roadside Channels with Flexible Linings", HEC-15, USDOT FHWA (Reference #2).

Confirm the swale is stable and has enough capacity for the design flow rate.

Use Standard 1053 (see Reference #4) to select appropriate erosion control mat based on shear stress and application.

Assumptions:

1. Swales geometry shown on the drawing set.
2. Assume the following parameters per Section 15.2 - Grass Lining Properties from Reference #1:
   Vegetation Retardance Class = C for Swales
   Vegetation Condition = Good
   Vegetation Growth Form = Turf
3. Assume cohesive soil type with ASTM Soil Class SC and a Plasticity Index (PI) of 16.

Calculations:

From the HydroCAD Report, the 25-year, 24-hour peak discharge rates in the swales are

Swales:	25-year		25-year		25-year
Swale S1.1 =	3.1 cfs	**Swale S2.1 =**	39.6 cfs	**Swale S3.5 =**	39.6 cfs
Swale S1.2 =	30.3 cfs	**Swale S2.2 =**	65.6 cfs	**Swale S4.1 =**	2.7 cfs
Swale S1.3 =	34.7 cfs	**Swale S2.3 =**	65.5 cfs	**Swale S4.2 =**	6.3 cfs
Swale S1.4 =	35.1 cfs	**Swale S3.1 =**	6.5 cfs	**Swale S4.3 =**	19.2 cfs
Swale S1.5 =	2.1 cfs	**Swale S3.2 =**	22.3 cfs	**Swale S4.4 =**	22.5 cfs
Swale S1.6 =	39.2 cfs	**Swale S3.3 =**	21.8 cfs	**Swale S4.5 =**	22.6 cfs
Swale S1.7 =	2.2 cfs	**Swale S3.4 =**	2.1 cfs	**Swale S4.6 =**	89.3 cfs
Swale S1.8 =	41.3 cfs			**Swale S5.1 =**	4.6 cfs
Roadside Ditch 1 =	0.6 cfs	**Roadside Ditch 2 =**	11.2 cfs	**Roadside Ditch 3 =**	8.4 cfs
Roadside Ditch 4 =	1.5 cfs	**Roadside Ditch 5 =**	2.3 cfs		

Use the WisDOT Grass Swale Design Spreadsheet (Page 2) to determine the flow depth, velocity and shear stress in the swales.

Results:

The swales are adequately designed to accommodate the flows from the 25-year, 24-hour storm event.

The swales are stable at the design flow rates.

Use Class I, Type B erosion mat for all swales except Roadside Ditch 3 and 5 should be Class II, Type B if regraded.

Channel/Ditch Geometry	Swale S1.1 =	Swale S1.2 =	Swale S1.3 =	Swale S1.4 =	Swale S1.5 =	Swale S1.6 =	Swale S1.7 =	Swale S1.8 =	Swale S2.1 =	Swale S2.2 =	Swale S2.3 =	Swale S3.1 =	Swale S3.2 =	Swale S3.3 =
Channel Slope, S_o (ft/ft)	**0.0319**	**0.0108**	**0.0144**	**0.0045**	**0.0054**	**0.005**	**0.005**	**0.005**	**0.0054**	**0.0049**	**0.0130**	**0.0050**	**0.0050**	**0.0130**
Channel Bottom Width, B (ft)	**8**	**8**	**8**	**8**	**8**	**8**	**2.5**	**8**	**4**	**10**	**10**	**8**	**8**	**8**
Channel Side Slope, z_1	**4**	**4**	**4**	**4**	**4**	**4**	**2**	**4**	**4**	**4**	**4**	**4**	**4**	**4**
Channel Side Slope, z_2	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**
Flow Depth, d (ft) Solve iteratively	**0.25**	**1.14**	**1.08**	**1.73**	**0.45**	**1.73**	**0.75**	**1.77**	**2.00**	**2.02**	**1.37**	**0.78**	**1.36**	**0.91**
Safety Factor, SF	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
Vegetation/Soil Parameters														
Vegetation Retardance Class	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**
Vegetation Condition	**good**	**good**	**good**	**good**	**good**	**good**	**good**	**good**	**good**	**good**	**good**	**good**	**good**	**good**
Vegetation Growth Form	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**
Soil Type	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**
D_{75} (in) (Set at 0.00 for cohesive soils)														
ASTM Soil Class	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**
Plasticity Index, PI	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**
Results Summary														
Design Q (ft^3/s)	**3.1**	**30.3**	**34.7**	**35.1**	**2.1**	**39.2**	**2.2**	**41.3**	**39.6**	**65.6**	**65.5**	**6.5**	**22.3**	**21.8**
1. Swales geometry shown on the drawing se	3.2	30.4	35.0	35.6	2.2	39.5	2.2	41.3	39.5	65.3	65.3	6.6	22.4	21.8
Difference Between Design & Calc. Flow (%)	1.0%	0.4%	0.8%	1.3%	1.4%	0.7%	-1.4%	0.2%	-0.3%	-0.6%	-0.3%	0.8%	0.9%	0.2%
Stable (Yes or No)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Channel Parameters														
Vegetation Height, h (ft)	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Grass Roughness Coefficient, C_n	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238
Cover Factor, C_f	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Noncohesive Soil														
Soil Grain Roughness, n_s	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Permissible Soil Shear Stress, τ_p (lb/ft^2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cohesive Soil														
Porosity, e	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Soil Coefficient 1, c_1	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700
Soil Coefficient 2, c_2	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30
Soil Coefficient 3, c_3	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700
Soil Coefficient 4, c_4	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Soil Coefficient 5, c_5	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61
Soil Coefficient 6, c_6	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Permissible Soil Shear Stress, τ_p (lb/ft^2)	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
Total Permissible Shear Stress, τ_p (lb/ft^2)	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
Cross Sectional Area, A (ft^2)	2.250	14.318	13.306	25.812	4.410	25.812	3.563	26.692	24.000	36.522	21.208	8.674	18.278	10.592
Wetted Perimeter, P (ft)	10.06	17.40	16.91	22.27	11.71	22.27	7.27	22.60	20.49	26.66	21.30	14.43	19.21	15.50
Hydraulic Radius, R (ft)	0.224	0.823	0.787	1.159	0.377	1.159	0.490	1.181	1.171	1.370	0.996	0.601	0.951	0.683
Top Width, T (ft)	10.00	17.12	16.64	21.84	11.60	21.84	7.00	22.16	20.00	26.16	20.96	14.24	18.88	15.28
Hydraulic Depth, D (ft)	0.225	0.836	0.800	1.182	0.380	1.182	0.509	1.204	1.200	1.396	1.012	0.609	0.968	0.693
Froude Number (Q design)	0.520	0.409	0.518	0.224	0.141	0.248	0.150	0.249	0.264	0.267	0.540	0.171	0.220	0.436
Channel Shear Stress, τ_o (lb/ft^2)	0.45	0.55	0.71	0.33	0.13	0.36	0.15	0.37	0.39	0.42	0.81	0.19	0.30	0.55
Actual Sheer Stress, τ_d (lb/ft^2)	0.50	0.77	0.97	0.49	0.15	0.54	0.23	0.55	0.67	0.62	1.11	0.24	0.42	0.74
Mannings n	0.070	0.064	0.058	0.080	0.116	0.076	0.108	0.076	0.074	0.072	0.055	0.099	0.083	0.064
Average Velocity, V (ft/s)	1.39	2.12	2.61	1.36	0.49	1.52	0.61	1.55	1.65	1.80	3.09	0.75	1.22	2.05
Calculated Flow, Q (ft^3/s)	3.2	30.4	35.0	35.6	2.2	39.5	2.2	41.3	39.5	65.3	65.3	6.6	22.4	21.8
Difference Between Design & Calc. Flow (%)	1.0%	0.4%	0.8%	1.3%	1.4%	0.7%	-1.4%	0.2%	-0.3%	-0.6%	-0.3%	0.8%	0.9%	0.2%
Effective Shear on Soil Surface, τ_e (lb/ft^2)	0.003	0.005	0.007	0.002	0.000	0.002	0.001	0.002	0.003	0.003	0.009	0.001	0.002	0.005
Total Permissible Shear on Veg., $\tau_{p,veg}$ (lb/ft^2)	15.34	12.82	10.53	20.03	42.11	18.08	36.51	18.08	17.14	16.22	9.47	30.67	21.56	12.82
Stable (Y or N)	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Channel/Ditch Geometry	Swale S3.4 =	Swale S3.5 =	Swale S4.1 =	Swale S4.2 =	Swale S4.3 =	Swale S4.4 =	Swale S4.5 =	Swale S4.6 =	Swale S5.1 =	Roadside Ditch 1 =	Roadside Ditch 2 =	Roadside Ditch 3 =	Roadside Ditch 4 =	Roadside Ditch 5 =
Channel Slope, S_o (ft/ft)	**0.0071**	**0.0090**	**0.0153**	**0.0127**	**0.0027**	**0.0040**	**0.0097**	**0.0112**	**0.0154**	**0.0188**	**0.0162**	**0.0288**	**0.0090**	**0.0531**
Channel Bottom Width, B (ft)	**2.5**	**8**	**10**	**10**	**10**	**10**	**10**	**10**	**8**	**4**	**6**	**0**	**6**	**0**
Channel Side Slope, z_1	**2**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**3**	**10**	**4**	**10**	**4**
Channel Side Slope, z_2	**4**	**4**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**8**	**10**	**4**	**10**	**4**
Flow Depth, d (ft) Solve iteratively	**0.65**	**1.38**	**0.29**	**0.47**	**1.52**	**1.38**	**0.97**	**1.70**	**0.41**	**0.20**	**0.63**	**0.90**	**0.33**	**0.49**
Safety Factor, SF	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
Vegetation/Soil Parameters														
Vegetation Retardance Class	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**
Vegetation Condition	**good**	**good**	**good**	**good**	**good**	**good**	**good**	**good**	**good**	**good**	**good**	**good**	**good**	**good**
Vegetation Growth Form	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**	**turf**
Soil Type	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**	**cohesive**
D_{75} (in) (Set at 0.00 for cohesive soils)														
ASTM Soil Class	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**	**SC**
Plasticity Index, PI	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**
Results Summary														
Design Q (ft^3/s)	**2.1**	**39.6**	**2.7**	**6.3**	**19.2**	**22.5**	**22.6**	**89.3**	**4.6**	**0.6**	**11.2**	**8.4**	**1.5**	**2.3**
1. Swales geometry shown on the drawing se	2.1	39.6	2.8	6.3	19.5	22.2	23.0	90.0	4.6	0.6	11.4	8.4	1.5	2.3
Difference Between Design & Calc. Flow (%)	-0.4%	0.0%	0.4%	0.4%	1.5%	-1.1%	1.8%	0.8%	-0.2%	-1.5%	1.2%	-0.2%	-1.7%	0.4%
Stable (Yes or No)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Channel Parameters														
Vegetation Height, h (ft)	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Grass Roughness Coefficient, C_n	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238
Cover Factor, C_f	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Noncohesive Soil														
Soil Grain Roughness, n_s	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Permissible Soil Shear Stress, τ_p (lb/ft^2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cohesive Soil														
Porosity, e	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Soil Coefficient 1, c_1	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700
Soil Coefficient 2, c_2	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30
Soil Coefficient 3, c_3	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700
Soil Coefficient 4, c_4	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Soil Coefficient 5, c_5	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61
Soil Coefficient 6, c_6	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Permissible Soil Shear Stress, τ_p (lb/ft^2)	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
Total Permissible Shear Stress, τ_p (lb/ft^2)	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
Cross Sectional Area, A (ft^2)	2.893	18.658	3.194	5.473	23.286	20.465	12.993	27.115	3.952	0.989	7.749	3.240	3.069	0.960
Wetted Perimeter, P (ft)	6.63	19.38	12.11	13.42	21.07	20.05	17.07	22.39	11.38	6.19	18.66	7.42	12.63	4.04
Hydraulic Radius, R (ft)	0.436	0.963	0.264	0.408	1.105	1.021	0.761	1.211	0.347	0.160	0.415	0.437	0.243	0.238
Top Width, T (ft)	6.40	19.04	12.03	13.29	20.64	19.66	16.79	21.90	11.28	6.15	18.60	7.20	12.60	3.92
Hydraulic Depth, D (ft)	0.452	0.980	0.266	0.412	1.128	1.041	0.774	1.238	0.350	0.161	0.417	0.450	0.244	0.245
Froude Number (Q design)	0.193	0.377	0.295	0.317	0.139	0.187	0.355	0.526	0.344	0.267	0.400	0.683	0.174	0.838
Channel Shear Stress, τ_o (lb/ft^2)	0.19	0.54	0.25	0.32	0.19	0.25	0.46	0.85	0.33	0.19	0.42	0.78	0.14	0.79
Actual Sheer Stress, τ_d (lb/ft^2)	0.29	0.78	0.28	0.37	0.26	0.34	0.59	1.19	0.39	0.23	0.64	1.62	0.19	1.62
Mannings n	0.098	0.065	0.088	0.080	0.099	0.088	0.069	0.054	0.079	0.099	0.072	0.056	0.113	0.056
Average Velocity, V (ft/s)	0.74	2.12	0.86	1.15	0.82	1.10	1.74	3.29	1.16	0.62	1.45	2.60	0.50	2.34
Calculated Flow, Q (ft^3/s)	2.1	39.6	2.8	6.3	19.5	22.2	23.0	90.0	4.6	0.6	11.4	8.4	1.5	2.3
Difference Between Design & Calc. Flow (%)	-0.4%	0.0%	0.4%	0.4%	1.5%	-1.1%	1.8%	0.8%	-0.2%	-1.5%	1.2%	-0.2%	-1.7%	0.4%
Effective Shear on Soil Surface, τ_e (lb/ft^2)	0.001	0.005	0.001	0.001	0.001	0.001	0.003	0.010	0.002	0.001	0.003	0.013	0.000	0.013
Total Permissible Shear on Veg., $\tau_{p,veg}$ (lb/ft^2)	30.06	13.22	24.24	20.03	30.67	24.24	14.90	9.13	19.53	30.67	16.22	9.81	39.96	9.81
Stable (Y or N)	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Source: Grass Lined Channel Design WisDOT Spreadsheet, FDM 13-30 Attachment 15.2

Channel Erosion Mat

(1053)

Wisconsin Department of Natural Resources
Conservation Practice Standard

To differentiate applications WisDOT organizes erosion mats into three classes of mats, which are further broken down into various Types.

A. **Class I**: A short-term duration (minimum of 6 months), light duty, organic ECRM with plastic or biodegradable netting.

1. **Type A** – Only suitable for slope applications, not channel applications.

2. **Type B** – Double netted product for use in channels where the calculated (design) shear stress is 1.5 lbs/ft^2 or less.

B. **Class II**: A long-term duration (three years or greater), organic ECRM.

1. **Type A** – Jute fiber only for use in channels to reinforce sod.

2. **Type B** – For use in channels where the calculated (design) shear stress is 2.0 lbs/ft^2 or less. Made with plastic or biodegradable mat.

3. **Type C** – A woven mat of 100% organic material for use in channels where the calculated (design) shear stress is 2.0 lbs/ft^2 or less. Applicable for use in environmentally sensitive areas where plastic netting is inappropriate.

C. **Class III**: A permanent 100% synthetic ECRM or TRM. Class I, Type B erosion mat or Class II, Type B or C erosion mat must be placed over a soil filled TRM.

1. **Type A** – An ECRM for use in channels where the calculated (design) shear stress of 2.0 lbs/ft^2 or less.

2. **Type B** – A TRM for use in channels where the calculated (design) shear stress of 2.0 lbs/ft^2 or less.

3. **Type C** – A TRM for use in channels where the calculated (design) shear stress of 3.5 lbs/ft^2 or less.

4. **Type D** – A TRM for use in channels where the calculated (design) shear stress of 5.0 lbs/ft^2 or less.

Culvert Sizing

SCS ENGINEERS

		Sheet No:	1 of 21
		Calc. No.	
		Rev. No.	1
Job No. 25222260.00	Job: Columbia Energy Center MOD 12-13	By: SJL	Date: 8/28/23
Client: WPL	Subject: Culvert Sizing	Chk'd: RJG	Date: 8/28/23

Purpose:

To size the post closure culverts to accommodate the 25-year, 24-hour storm event.

References:

1. HY-8 7.40 Computer Model
2. HydroCAD Report: COL_Mod12-13_HydroCAD Report
3. Figure 1 - Final Grades (Module 13)

Approach:

1. Create culvert crossing in HY-8 and input data from Reference #2 and #3.
2. Adjust diameter size and number of culverts in model until design flow does not over top berm/road crossing.

Assumptions:

1. Assume the tailwater channel data is a based on discharge swale or rock chute geometry (Reference #2).
2. Culverts are circular, PE Pipe with smooth interior, and with square edge with headwall.
3. Culvert elevatons,lengths, and slopes based on Figure 1 (Reference #3).
4. Roadway data for crossing based on Figure 1 (Reference #3).
5. Discharge flows from HydroCAD report (Refence #2).

Calculations:

See attached HY-8 Model output reports for C1 through C10.

Results:

The culverts are adequately designed to accommodate the flows from the 25-year, 24-hour storm event.

Culvert	Dia. (ft)	# of Barrels	Upstream Invert (ft)	Downstream Invert (ft)	Slope (%)	Length (ft)
C1	2	1	815.70	814.55	2.22	52
C2	2	2	817.83	814.00	5.14	75
C3	2.5	2	811.17	810.90	0.54	50
C4	2.5	2	809.86	809.60	0.52	50
C5	2.5	2	807.57	807.15	0.87	49
C6	2	2	805.40	804.76	0.61	105
C7	3.5	2	796.64	796.34	0.50	60
C8	1	1	810.70	808.60	2.45	86
C9	2	1	807.54	806.81	0.73	100
C10	2	2	814.96	813.36	3.20	50

Culvert Data: Culvert C1

Site Data - Culvert C1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 815.70 ft

Outlet Station: 51.88 ft

Outlet Elevation: 814.55 ft

Number of Barrels: 1

Culvert Data Summary - Culvert C1

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 2 - Culvert Summary Table: Culvert C1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.60 cfs	0.60 cfs	816.05	0.35	0.0*	1-JS1t	0.18	0.27	1.06	0.29	0.36	1.23
0.74 cfs	0.74 cfs	816.09	0.39	0.0*	1-S2n	0.20	0.29	0.20	0.31	4.64	1.29
0.87 cfs	0.87 cfs	816.13	0.43	0.0*	1-JS1t	0.21	0.32	1.10	0.33	0.49	1.35
1.01 cfs	1.01 cfs	816.16	0.46	0.0*	1-JS1t	0.23	0.35	1.12	0.35	0.56	1.40
1.14 cfs	1.14 cfs	816.19	0.49	0.0*	1-JS1t	0.24	0.37	1.13	0.36	0.62	1.44
1.28 cfs	1.28 cfs	816.22	0.52	0.005	1-JS1t	0.26	0.39	1.15	0.38	0.69	1.48
1.42 cfs	1.42 cfs	816.25	0.55	0.021	1-JS1t	0.27	0.41	1.16	0.39	0.75	1.52
1.55 cfs	1.55 cfs	816.28	0.58	0.036	1-JS1t	0.28	0.43	1.18	0.41	0.81	1.55
1.69 cfs	1.69 cfs	816.30	0.60	0.050	1-JS1t	0.29	0.45	1.19	0.42	0.87	1.59
1.82 cfs	1.82 cfs	816.33	0.63	0.064	1-JS1t	0.30	0.47	1.20	0.43	0.92	1.62
1.96 cfs	1.96 cfs	816.35	0.65	0.078	1-JS1t	0.31	0.49	1.22	0.45	0.98	1.65

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 815.70 ft,

Outlet Elevation (invert): 814.55 ft

Culvert Length: 51.89 ft,

Culvert Slope: 0.0222

Tailwater Data for Crossing: Culvert C1

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert C1)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.60	815.61	0.29	1.23	0.34	0.57
0.74	815.63	0.31	1.29	0.36	0.58
0.87	815.65	0.33	1.35	0.39	0.59

1.01	815.67	0.35	1.40	0.41	0.59
1.14	815.68	0.36	1.44	0.43	0.60
1.28	815.70	0.38	1.48	0.45	0.60
1.42	815.71	0.39	1.52	0.46	0.60
1.55	815.73	0.41	1.55	0.48	0.61
1.69	815.74	0.42	1.59	0.49	0.61
1.82	815.75	0.43	1.62	0.51	0.61
1.96	815.77	0.45	1.65	0.52	0.62

Tailwater Channel Data - Culvert C1

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 6.00 (_:1)

Channel Slope: 0.0188

Channel Manning's n: 0.0450

Channel Invert Elevation: 815.32 ft

Roadway Data for Crossing: Culvert C1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 50.00 ft

Crest Elevation: 819.06 ft

Roadway Surface: Gravel

Roadway Top Width: 30.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.60 cfs

Design Flow: 0.60 cfs

Maximum Flow: 1.96 cfs

Table 4 - Summary of Culvert Flows at Crossing: Culvert C1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert C1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
816.05	0.60	0.60	0.00	1
816.09	0.74	0.74	0.00	1
816.13	0.87	0.87	0.00	1
816.16	1.01	1.01	0.00	1
816.19	1.14	1.14	0.00	1
816.22	1.28	1.28	0.00	1
816.25	1.42	1.42	0.00	1
816.28	1.55	1.55	0.00	1
816.30	1.69	1.69	0.00	1
816.33	1.82	1.82	0.00	1
816.35	1.96	1.96	0.00	1
819.06	22.61	22.61	0.00	Overtopping

Culvert Data: C2

Site Data - C2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 817.83 ft

Outlet Station: 74.54 ft

Outlet Elevation: 814.00 ft

Number of Barrels: 2

Culvert Data Summary - C2

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Culvert Summary Table: C2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10.95 cfs	10.95 cfs	818.96	1.13	0.593	1-JS1f	0.42	0.83	2.00	0.49	1.74	2.24
11.69 cfs	11.62 cfs	819.00	1.17	0.625	1-JS1f	0.44	0.85	2.00	0.51	1.85	2.29
12.42 cfs	11.95 cfs	819.02	1.19	0.649	1-JS1f	0.44	0.86	2.00	0.53	1.90	2.34
13.16 cfs	12.19 cfs	819.04	1.21	0.672	1-JS1f	0.45	0.87	2.00	0.54	1.94	2.38
13.90 cfs	12.40 cfs	819.05	1.22	0.693	1-JS1f	0.45	0.88	2.00	0.56	1.97	2.42
14.63 cfs	12.59 cfs	819.06	1.23	0.714	1-JS1f	0.45	0.89	2.00	0.58	2.00	2.46
15.37 cfs	12.77 cfs	819.07	1.24	0.734	1-JS1f	0.46	0.89	2.00	0.59	2.03	2.50
16.11 cfs	12.94 cfs	819.09	1.26	0.754	1-JS1f	0.46	0.90	2.00	0.61	2.06	2.54
16.85 cfs	13.10 cfs	819.10	1.27	0.773	1-JS1f	0.46	0.91	2.00	0.62	2.09	2.57
17.58 cfs	13.26 cfs	819.10	1.27	0.791	1-JS1f	0.47	0.91	2.00	0.64	2.11	2.61
18.32 cfs	13.41 cfs	819.11	1.28	0.810	1-JS1f	0.47	0.92	2.00	0.65	2.13	2.64

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 817.83 ft,

Outlet Elevation (invert): 814.00 ft

Culvert Length: 74.64 ft,

Culvert Slope: 0.0514

Tailwater Data for Crossing: Culvert C2

Table 5 - Downstream Channel Rating Curve (Crossing: Culvert C2)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
10.95	818.32	0.49	2.24	0.47	0.62
11.69	818.34	0.51	2.29	0.49	0.62
12.42	818.36	0.53	2.34	0.51	0.62

13.16	818.37	0.54	2.38	0.52	0.63
13.90	818.39	0.56	2.42	0.54	0.63
14.63	818.41	0.58	2.46	0.55	0.63
15.37	818.42	0.59	2.50	0.57	0.63
16.11	818.44	0.61	2.54	0.58	0.64
16.85	818.45	0.62	2.57	0.60	0.64
17.58	818.47	0.64	2.61	0.61	0.64
18.32	818.48	0.65	2.64	0.63	0.64

Tailwater Channel Data - Culvert C2

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0154

Channel Manning's n: 0.0450

Channel Invert Elevation: 817.83 ft

Roadway Data for Crossing: Culvert C2

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 50.00 ft

Crest Elevation: 819.00 ft

Roadway Surface: Gravel

Roadway Top Width: 20.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 10.95 cfs

Design Flow: 10.95 cfs

Maximum Flow: 18.32 cfs

Table 6 - Summary of Culvert Flows at Crossing: Culvert C2

Headwater Elevation (ft)	Total Discharge (cfs)	C2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
818.96	10.95	10.95	0.00	1
819.00	11.69	11.62	0.01	13
819.02	12.42	11.95	0.43	6
819.04	13.16	12.19	0.93	5
819.05	13.90	12.40	1.48	5
819.06	14.63	12.59	2.01	4
819.07	15.37	12.77	2.58	4
819.09	16.11	12.94	3.15	4
819.10	16.85	13.10	3.73	4
819.10	17.58	13.26	4.32	4
819.11	18.32	13.41	4.91	4
819.00	11.61	11.61	0.00	Overtopping

Culvert Data: C3

Site Data - C3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 811.17 ft

Outlet Station: 50.00 ft

Outlet Elevation: 810.90 ft

Number of Barrels: 2

Culvert Data Summary - C3

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 4 - Culvert Summary Table: C3

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
28.58 cfs	28.58 cfs	813.05	1.88	1.252	1-S2n	1.16	1.27	1.16	0.91	6.38	2.71
30.71 cfs	30.71 cfs	813.13	1.96	1.339	1-S2n	1.20	1.32	1.21	0.94	6.50	2.77
32.85 cfs	32.85 cfs	813.22	2.05	1.428	1-S2n	1.25	1.37	1.26	0.98	6.61	2.82
34.98 cfs	34.98 cfs	813.30	2.13	1.518	1-S2n	1.30	1.42	1.31	1.01	6.72	2.88
37.11 cfs	37.11 cfs	813.38	2.21	1.609	1-S2n	1.35	1.46	1.36	1.04	6.82	2.93
39.24 cfs	39.24 cfs	813.46	2.29	1.702	1-S2n	1.40	1.50	1.40	1.07	6.92	2.98
41.38 cfs	41.38 cfs	813.54	2.37	1.796	1-S2n	1.44	1.54	1.45	1.10	7.01	3.02
43.51 cfs	43.51 cfs	813.62	2.45	1.892	1-S2n	1.49	1.59	1.50	1.13	7.10	3.07
45.64 cfs	45.64 cfs	813.71	2.54	1.990	5-S2n	1.54	1.63	1.54	1.16	7.17	3.11
47.78 cfs	47.78 cfs	813.79	2.62	2.089	5-S2n	1.59	1.66	1.59	1.19	7.25	3.15
49.91 cfs	49.09 cfs	813.85	2.68	2.152	5-S2n	1.62	1.69	1.62	1.22	7.29	3.19

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 811.17 ft,

Outlet Elevation (invert): 810.90 ft

Culvert Length: 50.00 ft,

Culvert Slope: 0.0054

Tailwater Data for Crossing: Culvert C3

Table 7 - Downstream Channel Rating Curve (Crossing: Culvert C3)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
28.58	812.08	0.91	2.71	0.28	0.57
30.71	812.12	0.94	2.77	0.29	0.58
32.85	812.15	0.98	2.82	0.30	0.58

34.98	812.18	1.01	2.88	0.32	0.58
37.11	812.22	1.04	2.93	0.33	0.59
39.24	812.25	1.07	2.98	0.33	0.59
41.38	812.28	1.10	3.02	0.34	0.59
43.51	812.31	1.13	3.07	0.35	0.59
45.64	812.34	1.16	3.11	0.36	0.59
47.78	812.36	1.19	3.15	0.37	0.60
49.91	812.39	1.22	3.19	0.38	0.60

Tailwater Channel Data - Culvert C3

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0050

Channel Manning's n: 0.0300

Channel Invert Elevation: 811.17 ft

Roadway Data for Crossing: Culvert C3

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 29.00 ft

Crest Elevation: 813.80 ft

Roadway Surface: Gravel

Roadway Top Width: 30.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 28.58 cfs

Design Flow: 28.58 cfs

Maximum Flow: 49.91 cfs

Table 8 - Summary of Culvert Flows at Crossing: Culvert C3

Headwater Elevation (ft)	Total Discharge (cfs)	C3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
813.05	28.58	28.58	0.00	1
813.13	30.71	30.71	0.00	1
813.22	32.85	32.85	0.00	1
813.30	34.98	34.98	0.00	1
813.38	37.11	37.11	0.00	1
813.46	39.24	39.24	0.00	1
813.54	41.38	41.38	0.00	1
813.62	43.51	43.51	0.00	1
813.71	45.64	45.64	0.00	1
813.79	47.78	47.78	0.00	1
813.85	49.91	49.09	0.77	7
813.80	47.90	47.90	0.00	Overtopping

Culvert Data: C4

Site Data - C4

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 809.86 ft
Outlet Station: 50.00 ft
Outlet Elevation: 809.60 ft
Number of Barrels: 2

Culvert Data Summary - C4

Barrel Shape: Circular
Barrel Diameter: 2.50 ft
Barrel Material: Smooth HDPE
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

Table 7 - Culvert Summary Table: C4

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
34.14 cfs	34.14 cfs	811.96	2.10	1.492	1-S2n	1.30	1.40	1.30	0.91	6.60	3.22
36.76 cfs	36.76 cfs	812.06	2.20	1.604	1-S2n	1.36	1.45	1.36	0.95	6.72	3.29
39.38 cfs	39.38 cfs	812.16	2.30	1.718	1-S2n	1.41	1.51	1.42	0.98	6.84	3.36
42.00 cfs	42.00 cfs	812.26	2.40	1.834	1-S2n	1.47	1.56	1.48	1.02	6.94	3.42
44.62 cfs	44.62 cfs	812.36	2.50	1.953	1-S2n	1.53	1.61	1.54	1.05	7.04	3.48
47.23 cfs	47.23 cfs	812.46	2.60	2.074	5-S2n	1.59	1.65	1.60	1.08	7.13	3.54
49.85 cfs	49.85 cfs	812.57	2.71	2.198	5-S2n	1.66	1.70	1.66	1.11	7.23	3.59
52.47 cfs	52.47 cfs	812.68	2.82	2.325	5-S2n	1.72	1.75	1.72	1.14	7.28	3.65
55.09 cfs	55.09 cfs	812.79	2.93	2.454	5-S2n	1.78	1.79	1.78	1.17	7.35	3.70
57.71 cfs	57.71 cfs	812.99	3.05	3.129	7-M2c	1.85	1.83	1.83	1.20	7.49	3.75
60.33 cfs	60.33 cfs	813.07	3.18	3.214	7-M2c	1.93	1.87	1.87	1.23	7.65	3.79

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 809.86 ft,
Outlet Elevation (invert): 809.60 ft
Culvert Length: 50.00 ft,
Culvert Slope: 0.0052

Tailwater Data for Crossing: Culvert C4

Table 13 - Downstream Channel Rating Curve (Crossing: Culvert C4)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
34.14	810.78	0.91	3.22	0.40	0.68
36.76	810.82	0.95	3.29	0.41	0.68
39.38	810.85	0.98	3.36	0.43	0.69

42.00	810.88	1.02	3.42	0.44	0.69
44.62	810.92	1.05	3.48	0.46	0.69
47.23	810.95	1.08	3.54	0.47	0.70
49.85	810.98	1.11	3.59	0.49	0.70
52.47	811.01	1.14	3.65	0.50	0.70
55.09	811.04	1.17	3.70	0.51	0.70
57.71	811.07	1.20	3.75	0.53	0.71
60.33	811.10	1.23	3.79	0.54	0.71

Tailwater Channel Data - Culvert C4

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0070

Channel Manning's n: 0.0300

Channel Invert Elevation: 809.87 ft

Roadway Data for Crossing: Culvert C4

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 29.00 ft

Crest Elevation: 813.14 ft

Roadway Surface: Gravel

Roadway Top Width: 30.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 34.14 cfs

Design Flow: 34.14 cfs

Maximum Flow: 60.33 cfs

Table 14 - Summary of Culvert Flows at Crossing: Culvert C4

Headwater Elevation (ft)	Total Discharge (cfs)	C4 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
811.96	34.14	34.14	0.00	1
812.06	36.76	36.76	0.00	1
812.16	39.38	39.38	0.00	1
812.26	42.00	42.00	0.00	1
812.36	44.62	44.62	0.00	1
812.46	47.23	47.23	0.00	1
812.57	49.85	49.85	0.00	1
812.68	52.47	52.47	0.00	1
812.79	55.09	55.09	0.00	1
812.99	57.71	57.71	0.00	1
813.07	60.33	60.33	0.00	1
813.14	62.28	62.28	0.00	Overtopping

Culvert Data: C5

Site Data - C5

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 807.57 ft

Outlet Station: 48.50 ft

Outlet Elevation: 807.15 ft

Number of Barrels: 2

Culvert Data Summary - C5

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 8 - Culvert Summary Table: C5

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
37.41 cfs	37.41 cfs	809.79	2.22	1.490	1-S2n	1.18	1.47	1.23	1.05	7.81	2.93
40.34 cfs	40.34 cfs	809.90	2.33	1.601	1-S2n	1.23	1.52	1.28	1.09	7.96	3.00
43.27 cfs	43.27 cfs	810.01	2.44	1.728	1-S2n	1.28	1.58	1.34	1.13	8.10	3.06
46.21 cfs	46.21 cfs	810.13	2.56	1.862	5-S2n	1.33	1.64	1.39	1.17	8.24	3.12
49.14 cfs	49.14 cfs	810.25	2.68	1.999	5-S2n	1.39	1.69	1.44	1.21	8.37	3.17
52.07 cfs	52.07 cfs	810.37	2.80	2.140	5-S2n	1.44	1.74	1.50	1.24	8.50	3.23
55.00 cfs	55.00 cfs	810.50	2.93	2.284	5-S2n	1.49	1.79	1.55	1.28	8.62	3.28
57.93 cfs	57.93 cfs	810.63	3.06	2.431	5-S2n	1.54	1.83	1.60	1.31	8.74	3.32
60.87 cfs	60.87 cfs	810.77	3.20	2.892	5-S2n	1.59	1.88	1.65	1.35	8.86	3.37
63.80 cfs	63.26 cfs	810.89	3.32	2.999	5-S2n	1.64	1.92	1.69	1.38	8.95	3.42
66.73 cfs	64.47 cfs	810.95	3.38	3.055	5-S2n	1.66	1.93	1.71	1.41	8.99	3.46

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 807.57 ft,

Outlet Elevation (invert): 807.15 ft

Culvert Length: 48.50 ft,

Culvert Slope: 0.0087

Tailwater Data for Crossing: Culvert C5

Table 15 - Downstream Channel Rating Curve (Crossing: Culvert C5)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
37.41	808.64	1.05	2.93	0.33	0.59
40.34	808.68	1.09	3.00	0.34	0.59
43.27	808.72	1.13	3.06	0.35	0.59

46.21	808.76	1.17	3.12	0.36	0.59
49.14	808.80	1.21	3.17	0.38	0.60
52.07	808.83	1.24	3.23	0.39	0.60
55.00	808.87	1.28	3.28	0.40	0.60
57.93	808.90	1.31	3.32	0.41	0.60
60.87	808.94	1.35	3.37	0.42	0.61
63.80	808.97	1.38	3.42	0.43	0.61
66.73	809.00	1.41	3.46	0.44	0.61

Tailwater Channel Data - Culvert C5

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0050

Channel Manning's n: 0.0300

Channel Invert Elevation: 807.59 ft

Roadway Data for Crossing: Culvert C5

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 28.00 ft

Crest Elevation: 810.85 ft

Roadway Surface: Gravel

Roadway Top Width: 20.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 37.41 cfs

Design Flow: 37.41 cfs

Maximum Flow: 66.73 cfs

Table 16 - Summary of Culvert Flows at Crossing: Culvert C5

Headwater Elevation (ft)	Total Discharge (cfs)	C5 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
809.79	37.41	37.41	0.00	1
809.90	40.34	40.34	0.00	1
810.01	43.27	43.27	0.00	1
810.13	46.21	46.21	0.00	1
810.25	49.14	49.14	0.00	1
810.37	52.07	52.07	0.00	1
810.50	55.00	55.00	0.00	1
810.63	57.93	57.93	0.00	1
810.77	60.87	60.87	0.00	1
810.89	63.80	63.26	0.50	11
810.95	66.73	64.47	2.22	7
810.85	62.53	62.53	0.00	Overtopping

Culvert Data: C6

Site Data - C6

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 805.40 ft
Outlet Station: 104.56 ft
Outlet Elevation: 804.76 ft
Number of Barrels: 2

Culvert Data Summary - C6

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Smooth HDPE
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Mitered to Conform to Slope
Inlet Depression: None

Table 1 - Culvert Summary Table: C6

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
30.67 cfs	30.67 cfs	807.82	2.42	1.808	5-S2n	1.35	1.41	1.35	0.81	6.79	3.25
32.96 cfs	32.96 cfs	808.01	2.61	2.020	5-S2n	1.43	1.46	1.43	0.85	6.87	3.33
35.25 cfs	35.25 cfs	808.21	2.81	2.485	5-S2n	1.51	1.51	1.51	0.88	6.94	3.40
37.54 cfs	37.54 cfs	808.43	3.03	2.882	7-M2c	1.60	1.56	1.56	0.91	7.14	3.47
39.83 cfs	39.00 cfs	808.58	3.18	2.950	7-M2c	1.67	1.59	1.59	0.95	7.29	3.54
42.12 cfs	39.76 cfs	808.65	3.25	2.987	7-M2c	1.71	1.60	1.60	0.98	7.37	3.61
44.41 cfs	40.38 cfs	808.72	3.32	3.019	7-M2c	1.75	1.61	1.61	1.01	7.44	3.67
46.70 cfs	40.94 cfs	808.78	3.38	3.049	7-M2c	2.00	1.62	1.62	1.04	7.50	3.73
48.99 cfs	41.44 cfs	808.83	3.43	3.079	7-M2c	2.00	1.63	1.63	1.07	7.55	3.79
51.28 cfs	41.89 cfs	808.88	3.48	3.107	7-M2c	2.00	1.64	1.64	1.09	7.60	3.85
53.57 cfs	42.33 cfs	808.93	3.53	3.135	7-M2c	2.00	1.65	1.65	1.12	7.65	3.90

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 805.40 ft,
Outlet Elevation (invert): 804.76 ft
Culvert Length: 104.56 ft,
Culvert Slope: 0.0061

Tailwater Data for Crossing: Culvert C6

Table 1 - Downstream Channel Rating Curve (Crossing: Culvert C6)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
30.67	805.37	0.81	3.25	0.36	0.68
32.96	805.41	0.85	3.33	0.37	0.68
35.25	805.44	0.88	3.40	0.38	0.68

37.54	805.47	0.91	3.47	0.40	0.69
39.83	805.51	0.95	3.54	0.41	0.69
42.12	805.54	0.98	3.61	0.43	0.69
44.41	805.57	1.01	3.67	0.44	0.70
46.70	805.60	1.04	3.73	0.45	0.70
48.99	805.63	1.07	3.79	0.47	0.70
51.28	805.65	1.09	3.85	0.48	0.70
53.57	805.68	1.12	3.90	0.49	0.71

Tailwater Channel Data - Culvert C6

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0070

Channel Manning's n: 0.0300

Channel Invert Elevation: 804.56 ft

Roadway Data for Crossing: Culvert C6

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 15.00 ft

Crest Elevation: 808.50 ft

Roadway Surface: Gravel

Roadway Top Width: 100.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 30.67 cfs

Design Flow: 30.67 cfs

Maximum Flow: 53.57 cfs

Table 2 - Summary of Culvert Flows at Crossing: Culvert C6

Headwater Elevation (ft)	Total Discharge (cfs)	C6 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
807.82	30.67	30.67	0.00	1
808.01	32.96	32.96	0.00	1
808.21	35.25	35.25	0.00	1
808.43	37.54	37.54	0.00	1
808.58	39.83	39.00	0.81	10
808.65	42.12	39.76	2.34	7
808.72	44.41	40.38	4.01	6
808.78	46.70	40.94	5.75	6
808.83	48.99	41.44	7.55	6
808.88	51.28	41.89	9.37	5
808.93	53.57	42.33	11.23	5
808.50	38.24	38.24	0.00	Overtopping

Culvert Data: C7

Site Data - C7

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 796.64 ft

Outlet Station: 60.20 ft

Outlet Elevation: 796.34 ft

Number of Barrels: 2

Culvert Data Summary - C7

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 5 - Culvert Summary Table: C7

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
67.17 cfs	67.17 cfs	799.52	2.60	2.880	2-M2c	2.53	1.79	1.79	1.08	6.76	4.34
72.84 cfs	72.84 cfs	799.66	2.73	3.024	2-M2c	2.71	1.87	1.87	1.13	6.95	4.44
78.52 cfs	78.52 cfs	799.81	2.86	3.167	2-M2c	2.93	1.95	1.95	1.18	7.14	4.54
84.19 cfs	84.19 cfs	799.95	3.00	3.310	2-M2c	3.50	2.02	2.02	1.22	7.32	4.64
89.87 cfs	89.87 cfs	800.09	3.13	3.452	2-M2c	3.50	2.09	2.09	1.26	7.50	4.72
95.55 cfs	95.55 cfs	800.23	3.26	3.595	7-M2c	3.50	2.16	2.16	1.31	7.67	4.81
101.22 cfs	101.22 cfs	800.38	3.40	3.739	7-M2c	3.50	2.22	2.22	1.35	7.85	4.89
106.90 cfs	106.90 cfs	800.53	3.54	3.886	7-M2c	3.50	2.29	2.29	1.38	8.02	4.97
112.57 cfs	112.57 cfs	800.68	3.68	4.037	7-M2c	3.50	2.35	2.35	1.42	8.20	5.04
118.25 cfs	118.25 cfs	800.83	3.83	4.194	7-M2c	3.50	2.41	2.41	1.46	8.37	5.11
123.92 cfs	123.92 cfs	801.00	3.98	4.360	7-M2c	3.50	2.47	2.47	1.50	8.55	5.18

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 796.64 ft,

Outlet Elevation (invert): 796.34 ft

Culvert Length: 60.20 ft,

Culvert Slope: 0.0050

Tailwater Data for Crossing: Culvert C7

Table 9 - Downstream Channel Rating Curve (Crossing: Culvert C7)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
67.17	796.68	1.08	4.34	0.67	0.84

72.84	796.73	1.13	4.44	0.70	0.84
78.52	796.78	1.18	4.54	0.73	0.85
84.19	796.82	1.22	4.64	0.76	0.85
89.87	796.86	1.26	4.72	0.79	0.86
95.55	796.91	1.31	4.81	0.81	0.86
101.22	796.95	1.35	4.89	0.84	0.86
106.90	796.98	1.38	4.97	0.86	0.87
112.57	797.02	1.42	5.04	0.89	0.87
118.25	797.06	1.46	5.11	0.91	0.87
123.92	797.10	1.50	5.18	0.93	0.88

Tailwater Channel Data - Culvert C7

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0100

Channel Manning's n: 0.0300

Channel Invert Elevation: 795.60 ft

Roadway Data for Crossing: Culvert C7

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 50.00 ft

Crest Elevation: 802.50 ft

Roadway Surface: Gravel

Roadway Top Width: 60.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 67.17 cfs

Design Flow: 67.17 cfs

Maximum Flow: 123.92 cfs

Table 10 - Summary of Culvert Flows at Crossing: Culvert C7

Headwater Elevation (ft)	Total Discharge (cfs)	C7 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
799.52	67.17	67.17	0.00	1
799.66	72.84	72.84	0.00	1
799.81	78.52	78.52	0.00	1
799.95	84.19	84.19	0.00	1
800.09	89.87	89.87	0.00	1
800.23	95.55	95.55	0.00	1
800.38	101.22	101.22	0.00	1
800.53	106.90	106.90	0.00	1
800.68	112.57	112.57	0.00	1
800.83	118.25	118.25	0.00	1
801.00	123.92	123.92	0.00	1
802.50	162.83	162.83	0.00	Overtopping

Culvert Data: C8

Site Data - C8

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 810.70 ft

Outlet Station: 85.60 ft

Outlet Elevation: 808.60 ft

Number of Barrels: 1

Culvert Data Summary - C8

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 9 - Culvert Summary Table: C8

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.96 cfs	0.96 cfs	811.27	0.57	0.534	1-JS1f	0.27	0.41	1.00	0.45	1.22	2.40
1.02 cfs	1.02 cfs	811.30	0.60	0.557	1-S2n	0.28	0.43	0.28	0.46	5.74	2.44
1.09 cfs	1.09 cfs	811.32	0.62	0.581	1-JS1f	0.29	0.44	1.00	0.47	1.39	2.47
1.15 cfs	1.15 cfs	811.34	0.64	0.605	1-JS1f	0.30	0.45	1.00	0.48	1.47	2.51
1.22 cfs	1.22 cfs	811.37	0.67	0.629	1-JS1f	0.30	0.47	1.00	0.49	1.55	2.54
1.28 cfs	1.28 cfs	811.39	0.69	0.653	1-JS1f	0.31	0.48	1.00	0.50	1.63	2.58
1.34 cfs	1.34 cfs	811.41	0.71	0.679	1-JS1f	0.32	0.49	1.00	0.51	1.71	2.61
1.41 cfs	1.41 cfs	811.43	0.73	0.704	1-JS1f	0.33	0.50	1.00	0.52	1.79	2.64
1.47 cfs	1.47 cfs	811.45	0.75	0.730	1-JS1f	0.34	0.51	1.00	0.53	1.87	2.67
1.54 cfs	1.54 cfs	811.54	0.77	0.840	1-S1f	0.34	0.53	1.00	0.53	1.96	2.70
1.60 cfs	1.60 cfs	811.55	0.79	0.849	1-S1f	0.35	0.54	1.00	0.54	2.04	2.72

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 810.70 ft,
Outlet Elevation (invert): 808.60 ft

Culvert Length: 85.63 ft,
Culvert Slope: 0.0245

Tailwater Data for Crossing: Culvert C8

Table 17 - Downstream Channel Rating Curve (Crossing: Culvert C8)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.96	811.15	0.45	2.40	0.56	0.89
1.02	811.16	0.46	2.44	0.57	0.90

1.09	811.17	0.47	2.47	0.59	0.90
1.15	811.18	0.48	2.51	0.60	0.90
1.22	811.19	0.49	2.54	0.61	0.91
1.28	811.20	0.50	2.58	0.62	0.91
1.34	811.21	0.51	2.61	0.63	0.91
1.41	811.22	0.52	2.64	0.64	0.91
1.47	811.23	0.53	2.67	0.66	0.92
1.54	811.23	0.53	2.70	0.67	0.92
1.60	811.24	0.54	2.72	0.68	0.92

Tailwater Channel Data - Culvert C8

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0300

Channel Invert Elevation: 822.00 ft

Roadway Data for Crossing: Culvert C8

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 ft

Crest Elevation: 822.00 ft

Roadway Surface: Gravel

Roadway Top Width: 25.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.96 cfs

Design Flow: 0.96 cfs

Maximum Flow: 1.60 cfs

Table 18 - Summary of Culvert Flows at Crossing: Culvert C8b

Headwater Elevation (ft)	Total Discharge (cfs)	C8 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
811.27	0.96	0.96	0.00	1
811.30	1.02	1.02	0.00	1
811.32	1.09	1.09	0.00	1
811.34	1.15	1.15	0.00	1
811.37	1.22	1.22	0.00	1
811.39	1.28	1.28	0.00	1
811.41	1.34	1.34	0.00	1
811.43	1.41	1.41	0.00	1
811.45	1.47	1.47	0.00	1
811.54	1.54	1.54	0.00	1
811.55	1.60	1.60	0.00	1
822.00	10.37	10.37	0.00	Overtopping

Culvert Data: C9

Site Data - C9

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 807.54 ft
Outlet Station: 99.86 ft
Outlet Elevation: 806.81 ft
Number of Barrels: 1

Culvert Data Summary - C9

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting
Inlet Depression: None

Table 6 - Culvert Summary Table: C9

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
11.16 cfs	11.16 cfs	809.67	1.98	2.134	7-M2c	1.79	1.20	1.20	0.27	5.68	3.11
12.14 cfs	12.14 cfs	809.83	2.11	2.287	7-M2c	2.00	1.25	1.25	0.29	5.87	3.21
13.12 cfs	13.12 cfs	810.01	2.24	2.473	7-M2c	2.00	1.30	1.30	0.30	6.05	3.30
14.09 cfs	14.09 cfs	810.31	2.39	2.772	7-M2c	2.00	1.35	1.35	0.31	6.24	3.39
15.07 cfs	15.07 cfs	810.63	2.54	3.090	7-M2c	2.00	1.40	1.40	0.33	6.42	3.47
16.05 cfs	16.05 cfs	810.97	2.70	3.425	7-M2c	2.00	1.44	1.44	0.34	6.61	3.55
17.03 cfs	17.03 cfs	811.32	2.87	3.777	7-M2c	2.00	1.49	1.49	0.35	6.80	3.62
18.01 cfs	18.01 cfs	811.69	3.05	4.147	7-M2c	2.00	1.53	1.53	0.36	6.99	3.69
18.98 cfs	18.98 cfs	812.04	3.24	4.503	7-M2c	2.00	1.57	1.57	0.37	7.19	3.76
19.96 cfs	19.96 cfs	812.44	3.44	4.896	7-M2c	2.00	1.60	1.60	0.38	7.39	3.83
20.94 cfs	20.94 cfs	812.85	3.65	5.310	7-M2c	2.00	1.64	1.64	0.40	7.60	3.90

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 807.54 ft,
Outlet Elevation (invert): 806.81 ft
Culvert Length: 99.86 ft,
Culvert Slope: 0.0073

Tailwater Data for Crossing: Culvert C9

Table 11 - Downstream Channel Rating Curve (Crossing: Culvert C9)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
11.16	807.71	0.27	3.11	0.96	1.09
12.14	807.73	0.29	3.21	1.01	1.10
13.12	807.74	0.30	3.30	1.05	1.11
14.09	807.75	0.31	3.39	1.10	1.11

15.07	807.77	0.33	3.47	1.14	1.12
16.05	807.78	0.34	3.55	1.18	1.13
17.03	807.79	0.35	3.62	1.23	1.13
18.01	807.80	0.36	3.69	1.27	1.14
18.98	807.81	0.37	3.76	1.31	1.14
19.96	807.82	0.38	3.83	1.34	1.15
20.94	807.84	0.40	3.90	1.38	1.15

Tailwater Channel Data - Culvert C9

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 12.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0560

Channel Manning's n: 0.0450

Channel Invert Elevation: 807.44 ft

Roadway Data for Crossing: Culvert C9

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 50.00 ft

Crest Elevation: 812.87 ft

Roadway Surface: Paved

Roadway Top Width: 24.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 11.16 cfs

Design Flow: 11.16 cfs

Maximum Flow: 20.94 cfs

Table 12 - Summary of Culvert Flows at Crossing: Culvert C9

Headwater Elevation (ft)	Total Discharge (cfs)	C9 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
809.67	11.16	11.16	0.00	1
809.83	12.14	12.14	0.00	1
810.01	13.12	13.12	0.00	1
810.31	14.09	14.09	0.00	1
810.63	15.07	15.07	0.00	1
810.97	16.05	16.05	0.00	1
811.32	17.03	17.03	0.00	1
811.69	18.01	18.01	0.00	1
812.04	18.98	18.98	0.00	1
812.44	19.96	19.96	0.00	1
812.85	20.94	20.94	0.00	1
812.87	21.00	21.00	0.00	Overtopping

Culvert Data: C10

Site Data - C10

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 814.96 ft

Outlet Station: 50.00 ft

Outlet Elevation: 813.36 ft

Number of Barrels: 2

Culvert Data Summary - C10

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 10 - Culvert Summary Table: C10

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2.76 cfs	2.76 cfs	815.50	0.54	0.147	1-JS1t	0.24	0.41	1.74	0.14	0.48	2.29
2.98 cfs	2.98 cfs	815.52	0.56	0.154	1-JS1t	0.25	0.42	1.75	0.15	0.51	2.36
3.20 cfs	3.20 cfs	815.54	0.58	0.162	1-JS1t	0.26	0.44	1.75	0.15	0.55	2.42
3.42 cfs	3.42 cfs	815.56	0.60	0.169	1-JS1t	0.27	0.45	1.76	0.16	0.58	2.48
3.64 cfs	3.64 cfs	815.58	0.62	0.176	1-JS1t	0.28	0.47	1.77	0.17	0.62	2.54
3.85 cfs	3.85 cfs	815.60	0.64	0.183	1-JS1t	0.28	0.48	1.77	0.17	0.66	2.59
4.07 cfs	4.07 cfs	815.62	0.66	0.190	1-JS1t	0.29	0.50	1.78	0.18	0.69	2.64
4.29 cfs	4.29 cfs	815.64	0.68	0.197	1-JS1t	0.30	0.51	1.78	0.18	0.73	2.69
4.51 cfs	4.51 cfs	815.66	0.70	0.204	1-JS1t	0.31	0.52	1.79	0.19	0.76	2.74
4.73 cfs	4.73 cfs	815.68	0.72	0.211	1-JS1t	0.31	0.53	1.79	0.19	0.80	2.79
4.95 cfs	4.95 cfs	815.69	0.73	0.218	1-JS1t	0.32	0.55	1.80	0.20	0.83	2.84

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 814.96 ft,

Outlet Elevation (invert): 813.36 ft

Culvert Length: 50.03 ft,

Culvert Slope: 0.0320

Tailwater Data for Crossing: Culvert C10

Table 19 - Downstream Channel Rating Curve (Crossing: Culvert C10)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
2.76	815.10	0.14	2.29	0.28	1.11
2.98	815.11	0.15	2.36	0.29	1.12
3.20	815.11	0.15	2.42	0.31	1.13

3.42	815.12	0.16	2.48	0.32	1.13
3.64	815.13	0.17	2.54	0.33	1.14
3.85	815.13	0.17	2.59	0.34	1.15
4.07	815.14	0.18	2.64	0.35	1.15
4.29	815.14	0.18	2.69	0.36	1.16
4.51	815.15	0.19	2.74	0.38	1.16
4.73	815.15	0.19	2.79	0.39	1.17
4.95	815.16	0.20	2.84	0.40	1.17

Tailwater Channel Data - Culvert C10

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0320

Channel Manning's n: 0.0300

Channel Invert Elevation: 814.96 ft

Roadway Data for Crossing: Culvert C10

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 ft

Crest Elevation: 818.00 ft

Roadway Surface: Gravel

Roadway Top Width: 25.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 2.76 cfs

Design Flow: 2.76 cfs

Maximum Flow: 4.95 cfs

Table 20 - Summary of Culvert Flows at Crossing: Culvert C10

Headwater Elevation (ft)	Total Discharge (cfs)	C10 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
815.50	2.76	2.76	0.00	1
815.52	2.98	2.98	0.00	1
815.54	3.20	3.20	0.00	1
815.56	3.42	3.42	0.00	1
815.58	3.64	3.64	0.00	1
815.60	3.85	3.85	0.00	1
815.62	4.07	4.07	0.00	1
815.64	4.29	4.29	0.00	1
815.66	4.51	4.51	0.00	1
815.68	4.73	4.73	0.00	1
815.69	4.95	4.95	0.00	1
818.00	41.60	41.60	0.00	Overtopping

Diversion Berm Sizing

SCS ENGINEERS

		Sheet No:	1 of 3
		Calc. No.	
		Rev. No.	1
Job No. 25222260.00	Project: Columbia Energy Center MOD 12-13	By: RJG	Date: 8/11/23
Client: WPL	Subject: Diversion Berm Sizing	Chk'd: SJL	Date: 8/24/23

Purpose:

To size the post closure diversion berms on the final cover to accommodate the 25-year, 24-hour storm event.

References:

1. WisDOT Facilities Development Manual Chapter 13, Section 30-15 - Grass Lined Channels.
2. Design of Roadside Channels with Flexible Linings, HEC-15, USDOT FHWA.
3. HydroCAD Report: COL_Mod12-13_HydroCAD Report
4. Wisconsin Department of Natural Resources Conservation Practice Standard 1053 - Channel Erosion Mat.

Approach:

Use the Post Closure HydroCAD Model results to obtain the peak flow during a 25-year, 24-hour storm event along the diversion berms.

Use Grass Lined Channel Design WisDOT Spreadsheet, FDM 13-30 Attachment 15.2 (from Reference #1) to size the swale for each design swale cross section. The WisDOT spreadsheet incorporates the design guidelines and equations described in "Design of Roadside Channels with Flexible Linings", HEC-15, USDOT FHWA (Reference #2).

Confirm the swale is stable and has enough capacity for the design flow rate.

Assumptions:

1. Assume the channel geometry is a v-notch swale with one sideslope at 4:1 and one sideslope at 2:1 and a depth of 2.0 ft.
2. Assume 2.0% slope along the flowpath of the diversion swale.
3. Assume the following parameters per Section 15.2 - Grass Lining Properties from Reference #1:
   Vegetation Retardance Class = C for Swales
   Vegetation Condition = Good
   Vegetation Growth Form = Turf
4. Assume cohesive soil type with ASTM Soil Class SC and a Plasticity Index (PI) of 16.

Calculations:

From the HydroCAD Report, the peak flow rate along the diversion berms are as follows:

Areas			Areas			Areas			Areas		
1	3.75	cfs	10	1.68	cfs	18	5.06	cfs	26	2.10	cfs
2	1.71	cfs	11	5.22	cfs	19	2.16	cfs	27	7.46	cfs
3	1.06	cfs	12	4.83	cfs	20	1.19	cfs	30	1.34	cfs
4	0.92	cfs	13	1.94	cfs	21	1.62	cfs	33	3.24	cfs
5	1.66	cfs	14	1.93	cfs	22	7.54	cfs	34	1.35	cfs
6	2.81	cfs	15	2.80	cfs	23	1.38	cfs			
8	2.66	cfs	16	1.78	cfs	24	3.61	cfs			
9	0.86	cfs	17	3.04	cfs	25	2.12	cfs			

Use highest flow to confirm diversion berm functions.

Use the Grass Swale Design Spreadsheet (Page 2) to determine the flow depth, velocity and shear stress in the swales.

Results:

The diversion berms are adequately designed to accommodate the flows from the 25-year, 24-hour storm event.

The diversion berms are stable at the design flow rates. The design flow depth of 2.0 feet maintains at least 0.5 ft of freeboard during the 25-year, 24-hour storm event. Based on shear stress, use erosion mat Class I, Type B along the flow path of the diversion berms.

Channel/Ditch Geometry	*Area 22*
Channel Slope, S_o (ft/ft)	**0.02**
Channel Bottom Width, B (ft)	**0**
Channel Side Slope, z_1	**4**
Channel Side Slope, z_2	**2**
Flow Depth, d (ft) Solve iteratively	**1.07**
Safety Factor, SF	**1.0**
Vegetation/Soil Parameters	
Vegetation Retardance Class	**C**
Vegetation Condition	**good**
Vegetation Growth Form	**turf**
Soil Type	**cohesive**
D_{75} (in) (Set at 0.00 for cohesive soils)	
ASTM Soil Class	**SC**
Plasticity Index, PI	**16**
Results Summary	
Design Q (ft^3/s)	**7.5**
Calculated Q (ft^3/s)	7.5
Difference Between Design & Calc. Flow (%)	-0.2%
Stable (Yes or No)	**YES**
Channel Parameters	
Vegetation Height, h (ft)	0.67
Grass Roughness Coefficient, C_n	0.238
Cover Factor, C_f	0.90
Noncohesive Soil	
Soil Grain Roughness, n_s	0.016
Permissible Soil Shear Stress, τ_p (lb/ft^2)	N/A
Cohesive Soil	
Porosity, e	0.35
Soil Coefficient 1, c_1	1.0700
Soil Coefficient 2, c_2	14.30
Soil Coefficient 3, c_3	47.700
Soil Coefficient 4, c_4	1.42
Soil Coefficient 5, c_5	-0.61
Soil Coefficient 6, c_6	0.00010
Permissible Soil Shear Stress, τ_p (lb/ft^2)	0.080
Total Permissible Shear Stress, τ_p (lb/ft^2)	0.080
Cross Sectional Area, A (ft^2)	3.435
Wetted Perimeter, P (ft)	6.80
Hydraulic Radius, R (ft)	0.505
Top Width, T (ft)	6.42
Hydraulic Depth, D (ft)	0.535
Froude Number (Q design)	0.528
Channel Shear Stress, τ_o (lb/ft^2)	0.63
Actual Sheer Stress, τ_d (lb/ft^2)	1.34
Mannings n	0.061
Average Velocity, V (ft/s)	2.20
Calculated Flow, Q (ft^3/s)	7.5
Difference Between Design & Calc. Flow (%)	-0.2%
Effective Shear on Soil Surface, τ_e (lb/ft^2)	0.009
Total Permissible Shear on Veg., $\tau_{p\ veg}$ (lb/ft^2)	11.65
Stable (Y or N)	YES

Source: Grass Lined Channel Design WisDOT Spreadsheet, FDM 13-30 Attachment 15.2

Channel Erosion Mat
(1053)

Wisconsin Department of Natural Resources
Conservation Practice Standard

To differentiate applications WisDOT organizes erosion mats into three classes of mats, which are further broken down into various Types.

A. **Class I**: A short-term duration (minimum of 6 months), light duty, organic ECRM with plastic or biodegradable netting.

1. **Type A** – Only suitable for slope applications, not channel applications.
2. **Type B** – Double netted product for use in channels where the calculated (design) shear stress is 1.5 lbs/ft^2 or less.

B. **Class II**: A long-term duration (three years or greater), organic ECRM.

1. **Type A** – Jute fiber only for use in channels to reinforce sod.
2. **Type B** – For use in channels where the calculated (design) shear stress is 2.0 lbs/ft^2 or less. Made with plastic or biodegradable mat.
3. **Type C** – A woven mat of 100% organic material for use in channels where the calculated (design) shear stress is 2.0 lbs/ft^2 or less. Applicable for use in environmentally sensitive areas where plastic netting is inappropriate.

C. **Class III**: A permanent 100% synthetic ECRM or TRM. Class I, Type B erosion mat or Class II, Type B or C erosion mat must be placed over a soil filled TRM.

1. **Type A** – An ECRM for use in channels where the calculated (design) shear stress of 2.0 lbs/ft^2 or less.
2. **Type B** – A TRM for use in channels where the calculated (design) shear stress of 2.0 lbs/ft^2 or less.
3. **Type C** – A TRM for use in channels where the calculated (design) shear stress of 3.5 lbs/ft^2 or less.
4. **Type D** – A TRM for use in channels where the calculated (design) shear stress of 5.0 lbs/ft^2 or less.

Purpose:

Determine the spacing between diversion berms on the landfill final cover, with the goal of maintaining ≤ 3 ton/acre of soil loss along the final cover.

References

1. "Predicting Rainfall Erosion Losses," USDA Agriculture Handbook Number 537, 1978.
   (Figure 1 on Sheet 2 and Tables 10 and 13 on Sheet 4).
2. Erosion and Sediment Control Handbook," Goldman, Jackson, & Bursztynsky, 1986.
   (Table 5.5 on Sheet 5).
3. Rainfed retention probabilities computed for different cropping tillage systems. Agricultural Water Management, A.W. Mills & G.W. Thomas, 1985. Table 5.10 on Sheet 3)
4. Colombia Energy Center POO Update Drawings

Approach:

Use the Universal Soil Loss Equation (USLE) to determine diversion berm spacing. Longest flow length is 555 feet.

USLE Equation: $A = R * K * LS * C * P$

where: A = Average annual soil loss, tons/acre
R = Rainfall and runoff erosivity index
K = Soil erodibility factor, tons/acre
LS = Slope length and steepness factor
C = Cover management factor
P = Practice factor

or $LS = \dfrac{A}{R \times K \times C \times P}$

Assumptions:

A =	3	tons/acre
R =	145	see Figure 1 on Sheet 2 (Reference #1)
K =	0.38	see Table 5.10 on Sheet 3 for Loamy Very Fine Sand (Reference #3)
C =	0.0064	see Table 10 on Sheet 4, assuming 90% cover (Reference #1)
P =	1.0	assume no support practice used

Calculation:

$$LS = \frac{A}{R \times K \times C \times P} = \frac{3}{145 \times 0.38 \times 0.0064 \times 1.0} = 8.51$$

From the LS Values Table (Sheet 5), based on the 4:1 final cover slope, the slope distance is between 200 and 250 feet.
Use linear interpolation between the LS values for 200 and 250 feet to determine the slope length value for the 4:1 slope.

Slope Length @	200	ft	LS=	8.33
Slope Length @	250	ft	LS=	9.31

Slope length for the calculate LS factor = 209 ft

Results:

The maximum distance between diversion berms along the final cover to maintain less than 3 tons/acre soil loss is 209 ft.

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		Sheet No.	2 of 5
		Calc. No.	
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Job No. 25222260.00	Project: Columbia Energy Center MOD 12-13	By: RJG	Date: 8/11/23
Client: WPL	Subject: Diversion Berm Spacing Calculation	Chk'd: SJL	Date: 8/18/23

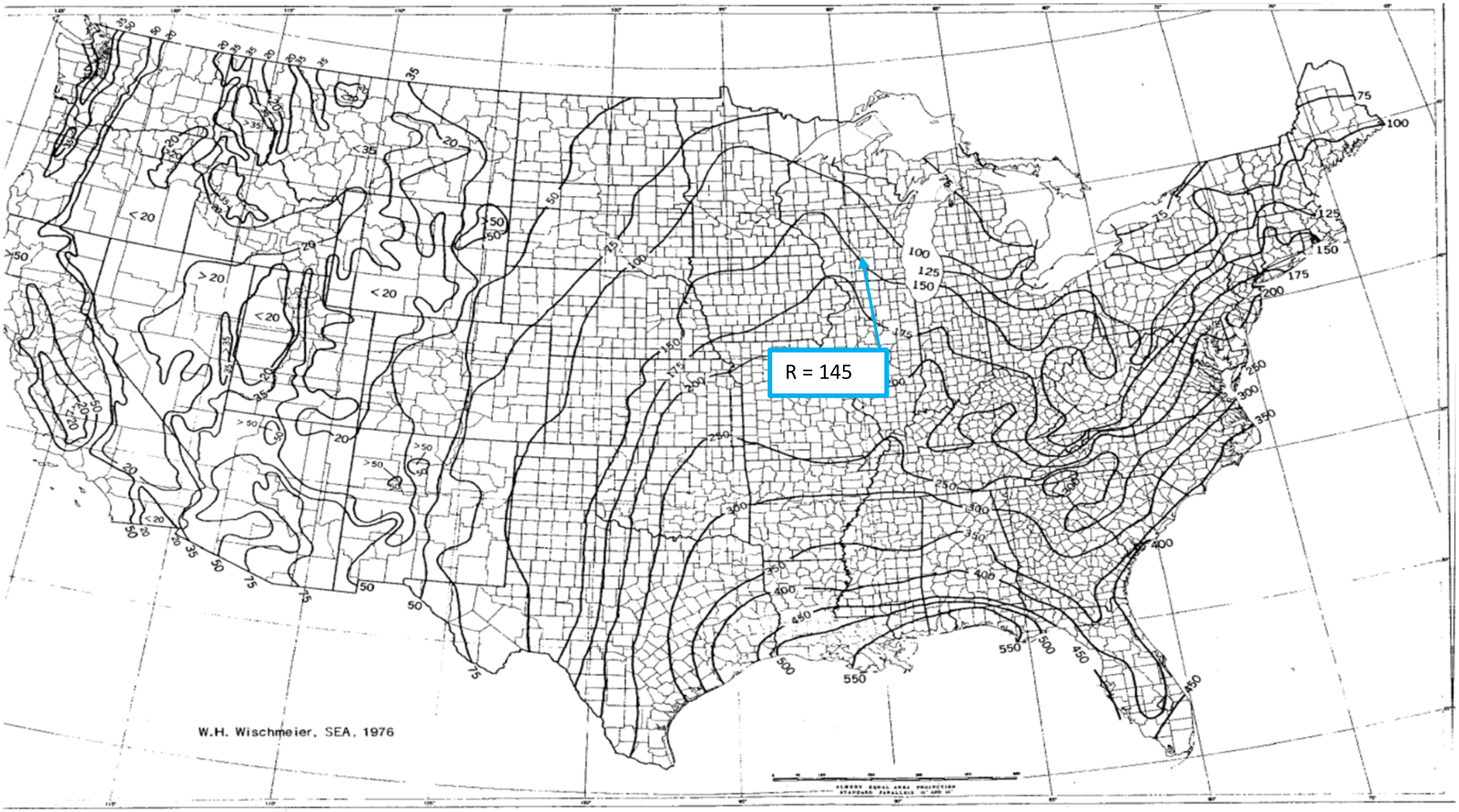

FIGURE 1.—Average annual values of the rainfall erosion index.

Source: "Predicting Rainfall Erosion Losses," USDA Agriculture Handbook Number 537, 1978.

Table 5.10. Soil Erodibility Factor K_{fact} (after Stewart et al. 1975)[a]

	P_{om}(%)		
Textural Class	<0.5	2	4
Sand	0.05	0.03	0.02
Fine sand	0.16	0.14	0.10
Very finesand	0.42	0.36	0.28
Loamy sand	0.12	0.10	0.08
Loamy finesand	0.24	0.20	0.16
Loamy veryfine sand	0.44	0.38	0.30
Sandy loam	0.27	0.24	0.19
Fine sandyloam	0.35	0.30	0.24
Very fine sandy loam	0.47	0.41	0.33
Loam	0.38	0.34	0.29
Silt loam	0.48	0.42	0.33
Silt	0.60	0.52	0.42
Sandy clayloam	0.27	0.25	0.21
Clay loam	0.28	0.25	0.21
Silty clayloam	0.37	0.32	0.26
Sandy clay	0.14	0.13	0.12
Silty clay	0.25	0.23	0.19
Clay		0.13-0.2	

(a) The values shown are estimated averages of broad ranges of specific soil values. When a texture is near the border line of two texture classes, use the average of the two K_{fact} values. In addition, the values shown are commensurate with the English units used in the cited reference (and as used in the source-term module input files). To obtain analagous values in the metric units used in this report, the above values should be multiplied by 1.292.

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		Sheet No.	4 of 5
		Calc. No.	
		Rev. No.	
Job No. 25222260.00	Project: Columbia Energy Center MOD 12-13	By: RJG	Date: 8/11/23
Client: WPL	Subject: Diversion Berm Spacing Calculation	Chk'd: SJL	Date: 8/18/23

TABLE 10.—*Factor* **C** *for permanent pasture, range, and idle land*[1]

Vegetative canopy		Cover that contacts the soil surface						
			Percent ground cover					
Type and height[2]	Percent cover[3]	Type[4]	0	20	40	60	80	95+
No appreciable canopy		G	0.45	0.20	0.10	0.042	0.013	0.003
		W	.45	.24	.15	.091	.043	.011
Tall weeds or short brush with average drop fall height of 20 in	25	G	.36	.17	.09	.038	.013	.003
		W	.36	.20	.13	.083	.041	.011
	50	G	.26	.13	.07	.035	.012	.003
		W	.26	.16	.11	.076	.039	.011
	75	G	.17	.10	.06	.032	.011	.003
		W	.17	.12	.09	.068	.038	.011
Appreciable brush or bushes, with average drop fall height of 6½ ft	25	G	.40	.18	.09	.040	.013	.003
		W	.40	.22	.14	.087	.042	.011
	50	G	.34	.16	.08	.038	.012	.003
		W	.34	.19	.13	.082	.041	.011
	75	G	.28	.14	.08	.036	.012	.003
		W	.28	.17	.12	.078	.040	.011
Trees, but no appreciable low brush. Average drop fall height of 13 ft	25	G	.42	.19	.10	.041	.013	.003
		W	.42	.23	.14	.089	.042	.011
	50	G	.39	.18	.09	.040	.013	.003
		W	.39	.21	.14	.087	.042	.011
	75	G	.36	.17	.09	.039	.012	.003
		W	.36	.20	.13	.084	.041	.011

Interpolated value
C = 0.0064

[1] The listed C values assume that the vegetation and mulch are randomly distributed over the entire area.

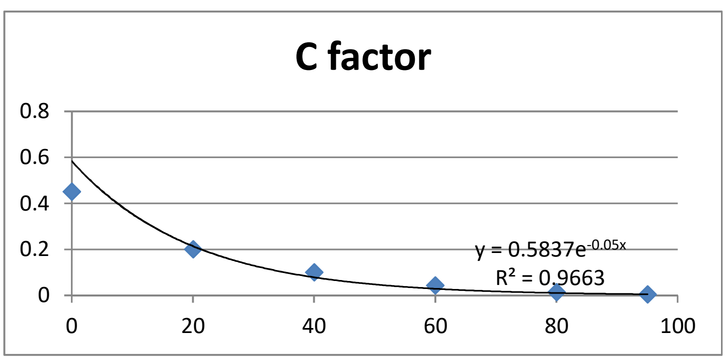
[2] Canopy height is measured as the average fall height of water drops falling from the canopy to the ground. Canopy effect is inversely proportional to drop fall height and is negligible if fall height exceeds 33 ft.

[3] Portion of total-area surface that would be hidden from view by canopy in a vertical projection (a bird's-eye view).

[4] G: cover at surface is grass, grasslike plants, decaying compacted duff, or litter at least 2 in deep.

W: cover at surface is mostly broadleaf herbaceous plants (as weeds with little lateral-root network near the surface) or undecayed residues or both.

Source: "Predicting Rainfall Erosion Losses," USDA Agriculture Handbook Number 537, 1978.



90 % cover

= 0.0064

TABLE 5.5 LS Values* (10)

Slope ratio	Slope gradient s, %	LS values for following slope lengths l, ft (m) 10 (3.0)	20 (6.1)	30 (9.1)	40 (12.2)	50 (15.2)	60 (18.3)	70 (21.3)	80 (24.4)	90 (27.4)	100 (30.5)	LS values for following slope lengths l, ft (m) 150 (46)	200 (61)	250 (76)	300 (91)	350 (107)	400 (122)	450 (137)	500 (152)	600 (183)	700 (213)	800 (244)	900 (274)	1000 (305)
	0.5	0.06	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.09	0.10	0.10	0.11	0.11	0.12	0.12	0.13	0.13	0.13	0.14	0.14	0.14	0.15	0.15
100:1	1	0.08	0.09	0.10	0.10	0.11	0.11	0.12	0.12	0.12	0.12	0.14	0.14	0.15	0.16	0.16	0.16	0.17	0.17	0.18	0.18	0.19	0.19	0.20
	2	0.10	0.12	0.14	0.15	0.16	0.17	0.18	0.19	0.19	0.20	0.23	0.25	0.26	0.28	0.29	0.30	0.32	0.33	0.34	0.36	0.37	0.39	0.40
	3	0.14	0.18	0.20	0.22	0.23	0.25	0.26	0.27	0.28	0.29	0.32	0.35	0.38	0.40	0.42	0.43	0.45	0.46	0.49	0.51	0.54	0.55	0.57
	4	0.16	0.21	0.25	0.28	0.30	0.33	0.35	0.37	0.38	0.40	0.47	0.53	0.58	0.62	0.66	0.70	0.73	0.76	0.82	0.87	0.92	0.96	1.00
20:1	5	0.17	0.24	0.29	0.34	0.38	0.41	0.45	0.48	0.51	0.53	0.66	0.76	0.85	0.93	1.00	1.07	1.13	1.20	1.31	1.42	1.51	1.60	1.69
	6	0.21	0.30	0.37	0.43	0.48	0.52	0.56	0.60	0.64	0.67	0.82	0.95	1.06	1.16	1.26	1.34	1.43	1.50	1.65	1.78	1.90	2.02	2.13
	7	0.26	0.37	0.45	0.52	0.58	0.64	0.69	0.74	0.78	0.82	1.01	1.17	1.30	1.43	1.54	1.65	1.75	1.84	2.02	2.18	2.33	2.47	2.61
12½:1	8	0.31	0.44	0.54	0.63	0.70	0.77	0.83	0.89	0.94	0.99	1.21	1.40	1.57	1.72	1.85	1.98	2.10	2.22	2.43	2.62	2.80	2.97	3.13
	9	0.37	0.52	0.64	0.74	0.83	0.91	0.98	1.05	1.11	1.17	1.44	1.66	1.85	2.03	2.19	2.35	2.49	2.62	2.87	3.10	3.32	3.52	3.71
10:1	10	0.43	0.61	0.75	0.87	0.97	1.06	1.15	1.22	1.30	1.37	1.68	1.94	2.16	2.37	2.56	2.74	2.90	3.06	3.35	3.62	3.87	4.11	4.33
	11	0.50	0.71	0.86	1.00	1.12	1.22	1.32	1.41	1.50	1.58	1.93	2.23	2.50	2.74	2.95	3.16	3.35	3.53	3.87	4.18	4.47	4.74	4.99
8:1	12.5	0.61	0.86	1.05	1.22	1.36	1.49	1.61	1.72	1.82	1.92	2.35	2.72	3.04	3.33	3.59	3.84	4.08	4.30	4.71	5.08	5.43	5.76	6.08
	15	0.81	1.14	1.40	1.62	1.81	1.98	2.14	2.29	2.43	2.56	3.13	3.62	4.05	4.43	4.79	5.12	5.43	5.72	6.27	6.77	7.24	7.68	8.09
6:1	16.7	0.96	1.36	1.67	1.92	2.15	2.36	2.54	2.72	2.88	3.04	3.72	4.30	4.81	5.27	5.69	6.08	6.45	6.80	7.45	8.04	8.60	9.12	9.62
5:1	20	1.29	1.82	2.23	2.58	2.88	3.16	3.41	3.65	3.87	4.08	5.00	5.77	6.45	7.06	7.63	8.16	8.65	9.12	9.99	10.79	11.54	12.24	12.90
4½:1	22	1.51	2.13	2.61	3.02	3.37	3.69	3.99	4.27	4.53	4.77	5.84	6.75	7.54	8.26	8.92	9.54	10.12	10.67	11.68	12.62	13.49	14.31	15.08
4:1	25	1.86	2.63	3.23	3.73	4.16	4.56	4.93	5.27	5.59	5.89	7.21	8.33	9.31	10.20	11.02	11.78	12.49	13.17	14.43	15.58	16.66	17.67	18.63
	30	2.51	3.56	4.36	5.03	5.62	6.16	6.65	7.11	7.54	7.95	9.74	11.25	12.57	13.77	14.88	15.91	16.87	17.78	19.48	21.04	22.49	23.86	25.15
3:1	33.3	2.98	4.22	5.17	5.96	6.67	7.30	7.89	8.43	8.95	9.43	11.55	13.34	14.91	16.33	17.64	18.86	20.00	21.09	23.10	24.95	26.67	28.29	29.82
	35	3.23	4.57	5.60	6.46	7.23	7.92	8.55	9.14	9.70	10.22	12.52	14.46	16.16	17.70	19.12	20.44	21.68	22.86	25.04	27.04	28.91	30.67	32.32
2½:1	40	4.00	5.66	6.93	8.00	8.95	9.80	10.59	11.32	12.00	12.65	15.50	17.89	20.01	21.91	23.67	25.30	26.84	28.29	30.99	33.48	35.79	37.96	40.01
	45	4.81	6.80	8.33	9.61	10.75	11.77	12.72	13.60	14.42	15.20	18.62	21.50	24.03	26.33	28.44	30.40	32.24	33.99	37.23	40.22	42.99	45.60	48.07
2:1	50	5.64	7.97	9.76	11.27	12.60	13.81	14.91	15.94	16.91	17.82	21.83	25.21	28.18	30.87	33.34	35.65	37.81	39.85	43.66	47.16	50.41	53.47	56.36
	55	6.48	9.16	11.22	12.96	14.48	15.87	17.14	18.32	19.43	20.48	25.09	28.97	32.39	35.48	38.32	40.97	43.45	45.80	50.18	54.20	57.94	61.45	64.78
1¾:1	57	6.82	9.64	11.80	13.63	15.24	16.69	18.03	19.28	20.45	21.55	26.40	30.48	34.08	37.33	40.32	43.10	45.72	48.19	52.79	57.02	60.96	64.66	68.15
	60	7.32	10.35	12.68	14.64	16.37	17.93	19.37	20.71	21.96	23.15	28.35	32.74	36.60	40.10	43.31	46.30	49.11	51.77	56.71	61.25	65.48	69.45	73.21
1½:1	66.7	8.44	11.93	14.61	16.88	18.87	20.67	22.32	23.87	25.31	26.68	32.68	37.74	42.19	46.22	49.92	53.37	56.60	59.66	65.36	70.60	75.47	80.05	84.38
	70	8.98	12.70	15.55	17.96	20.08	21.99	23.75	25.39	26.93	28.39	34.77	40.15	44.89	49.17	53.11	56.78	60.23	63.48	69.54	75.12	80.30	85.17	89.78
	75	9.78	13.83	16.94	19.56	21.87	23.95	25.87	27.66	29.34	30.92	37.87	43.73	48.89	53.56	57.85	61.85	65.60	69.15	75.75	81.82	87.46	92.77	97.79
1¼:1	80	10.55	14.93	18.28	21.11	23.60	25.85	27.93	29.85	31.66	33.38	40.88	47.20	52.77	57.81	62.44	66.75	70.80	74.63	81.76	88.31	94.41	100.13	105.55
	85	11.30	15.98	19.58	22.61	25.27	27.69	29.90	31.97	33.91	35.74	43.78	50.55	56.51	61.91	66.87	71.48	75.82	79.92	87.55	94.57	101.09	107.23	113.03
	90	12.02	17.00	20.82	24.04	26.88	29.44	31.80	34.00	36.06	38.01	46.55	53.76	60.10	65.84	71.11	76.02	80.63	84.99	93.11	100.57	107.51	114.03	120.20
	95	12.71	17.97	22.01	25.41	28.41	31.12	33.62	35.94	38.12	40.18	49.21	56.82	63.53	69.59	75.17	80.36	85.23	89.84	98.42	106.30	113.64	120.54	127.06
1:1	100	13.36	18.89	23.14	26.72	29.87	32.72	35.34	37.78	40.08	42.24	51.74	59.74	66.79	73.17	79.03	84.49	89.61	94.46	103.48	111.77	119.48	126.73	133.59

*Calculated from

$$LS = \left(\frac{65.41 \times s^2}{s^2 + 10{,}000} + \frac{4.56 \times s}{\sqrt{s^2 + 10{,}000}} + 0.065\right)\left(\frac{l}{72.5}\right)^m$$

LS = topographic factor
l = slope length, ft (m × 0.3048)
s = slope steepness,
m = exponent dependent upon slope steep
(0.2 for slopes < 1%, 0.3 for slopes 1
0.4 for slopes 3.5 to 4.5%, and
0.5 for slopes > 5%)

FROM "EROSION & SEDMENT CONTROL HANDBOOK", Goldman, Jackson, + Bursztynsky, 1986

Source: Erosion and Sediment Control Handbook," Goldman, Jackson, & Bursztynsky, 1986.

Downslope Flume & Energy Dissipator Sizing

SCS ENGINEERS

		Sheet No:	1 of 4
		Calc. No.	
		Rev. No.	
Job No. 25222260.00	Project: Columbia Energy Center MOD 12-13	By: SJL	Date: 8/28/23
Client: WPL	Subject: Downslope Pipe and Inlet Sizing	Chk'd: RJG	Date: 8/28/23

Purpose:

To size the downslope pipe and inlet to accommodate the 25-year, 24-hour storm event.

References:

1. HydroCAD Report: COL_Mod12-13_HydroCAD Report

Approach:

Use the orifice equation to size the downslope pipe inlet. Size the inlet for the largest diversion berm flow rate and apply that inlet size to all downslope pipe inlets. Confirm the head (h) acting on the orifice will not overtop the diversion berm depth of 2.0 ft.

Use Manning's equation to size the downslope pipe based on the largest diversion berm flow rate. Confirm the pipe has capacity for the design flow under open channel flow conditions.

Assumptions:

1. Orifice coefficient = 0.63
2. Assume the orifice head (h) acts on the centerline of the inlet pipe.
3. Manning's n = 0.012 (For smooth walled HDPE pipe: http://www.engineeringtoolbox.com/mannings-roughness-d_799.html)
4. Size flumes under the vegetated cover condition.

From the HydroCAD Report (Reference 1) , the peak discharge to each downslope flume resulting from a 25-year, 24-hour storm is as follows*:

Flume 1		Flume 2		Flume 3 Existing)	Flume 4 (Existing)	Flume 5 (Existing)
Area 1	3.75	Area 3	1.06			
Area 2	1.71	Area 4	0.92			
Area 12	4.83	Area 14	1.93			
Area 13	1.94	Area 15	2.80			
Total =	12.23		6.71	0	0	0

Flume 6		Flume 7		Flume 8		Flume 9		Flume 10	
Area 5	1.66	Area 8	2.66	Area 20	1.19	Area 10	1.68	Area 27	0.52
Area 6	2.81	Area 9	0.86	Area 25	2.12	Area 11	5.22	Area 28	0.44
Area 16	1.78	Area 18	5.06	Area 34	1.35	Area 21	1.62		
Area 17	3.04	Area 19	2.16			Area 22	7.54		
		Area 24	3.61			Area 26	2.10		
		Area 33	3.24			Area 27	7.46		
Total =	9.29	Total =	17.59	Total =	4.66	Total =	25.62	Total =	0.96

** Please note that the total flow rate at each flume calculated above may not reflect the flow rate shown in the HydroCAD Model due to the inflow to the flume occuring at different times during the storm event. The calculation above reflects the peak flow rate.*

Results:

Based on the inlet sizing calculation, an 18" diameter inlet will convey the stormwater runoff from the largest flow rate to a inlet (Area 22).

Based on the Manning's calculation for flow within the pipe, the 12" diameter downslope pipe will accommodate the design flow for Flumes 1 through 8 and Flume 10 under open channel flow conditions. Although the flow for the downslope pipes can be handled by 12" dia. pipes, for ease of construction, all downslope pipes will be 18" dia with the exception of Flume 10. Flume 10 will be constructed with a 12" dia pipe based on the drainage area and anticipated flow rate.

Calculations:

Size the downslope pipe inlet:

From the HydroCAD report (Reference #1), the maximum 25-year, 24-hour flow along a diversion berm is 7.54 cfs in HydroCAD model). Area 27 Inlet

Orifice Equation: $Q = C * A * (2 * g * h)^{0.5}$

where: Q = flow rate (cfs) = 7.5 (From above)

C = orifice coefficient = 0.63 (See assumption #1)

A = orifice area (sf) = 1.77 (area of 18" diameter pipe) Actual Pipe Diameter = 18 inches

g = gravity (ft/sec^2)= 32

h = orifice head acting on centerline (ft)

$h = (Q/(C * A))^2/(2 * g) =$ 0.7 ft

Given Assumption #2, depth of flow along diversion berm = h + D/2/12 = 1.46 ft

The diversion swale depth of 2 ft is sufficient to prevent overtopping at the downslope pipe inlet locations.
The depth of the diversion berm increases at the entrance of the down slope pipes due to mounding of the soil over the pipe.

Size the downslope flume pipe:

Use Manning's equation to size the downslope pipe.

Manning's Equation: Q = (1.49/n) x A x R^(2/3) x S^(1/2)

where: Q = Flow Rate, cfs

n = Manning's Roughness Coefficient

A = Flow Area, sf

R = Hydraulic Radius, ft (= A/P)

S = Channel Slope, ft/ft

For flow rates < 20 cfs, assume a 12" diameter downslope flume:

Use 17.59 cfs to Flume 7 to check sizing (max flow to a flume that is < 20 cfs)

Design Criteria

Pipe Diameter (in) = D = 12

Pipe Slope (ft/ft) = S = 0.25

Manning's Roughness Coefficient = n = 0.012

See Downslope Flume 7 pipe flow calculator on Sheet 3

For flow rates >20 cfs, try 18" diameter downslope flume:

Use 25.62 cfs to Flume 9 to check sizing (max flow to a flume that is < 20 cfs)

Design Criteria

Pipe Diameter (in) = D = 18

Pipe Slope (ft/ft) = S = 0.25

Manning's Roughness Coefficient = n = 0.012

See Downslope Flume 9 pipe flow calculator on Sheet 3

SCS ENGINEERS

		Calc. No.
		Rev. No.
Job No. 25222260.00	Project: Columbia Energy Center MOD 12-13	By: SJL Date: 8/28/23
Client: WPL	Subject: Downslope Pipe and Inlet Sizing	Chk'd: RJG Date: 8/28/23

Calculations (Continued): **Flume 7** **17.59** 0

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Inputs:

Pipe Diameter, d_o	12.00	in
Manning Roughness, n	0.0120	
Pressure slope (possibly equal to pipe slope), S_0	0.2500	slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	0.7500	fraction

Results:

Flow, Q	17.5969	ft^3/s
Velocity, v	27.8498	ft/s
Velocity head, hv	12.0541	ft
Flow Area, A	0.6319	ft^2
Wetted Perimeter, P	2.0944	ft
Hydraulic Radius	0.3017	ft
Top Width, T	0.8660	ft
Froude Number, F	5.84	
Shear Stress (tractive force), τ	11.7045	psf

Version 2.0 (20 June 2017)

HawsEDC Calculators

SCS ENGINEERS

Sheet No:	4 of 4
Calc. No.	
Rev. No.	

Job No. 25222260.00	Project: Columbia Energy Center MOD 12-13	By: SJL	Date: 8/28/23
Client: WPL	Subject: Downslope Pipe and Inlet Sizing	Chk'd: RJG	Date: 8/28/23

Calculations (Continued): **Flume 9** **25.62**

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Inputs:

Pipe Diameter, d_o	18.00	in
Manning Roughness, n	0.0120	
Pressure slope (possibly equal to pipe slope), S_0	0.2500	slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	0.4705	fraction

Results:

Flow, Q	25.6240	ft^3/s
Velocity, v	31.3544	ft/s
Velocity head, hv	15.2789	ft
Flow Area, A	0.8172	ft^2
Wetted Perimeter, P	2.2676	ft
Hydraulic Radius	0.3604	ft
Top Width, T	1.4974	ft
Froude Number, F	7.60	
Shear Stress (tractive force), τ	11.0139	psf

Version 2.0 (20 June 2017)

HawsEDC Calculators

SCS ENGINEERS

		Sheet No. 1	of 7
		Calc. No.	
		Rev. No.	
Job No. 25222260.00	Project: Columbia Energy Center MOD 12-13	By: SJL	Date: 8/28/23
Client: WPL	Subject: Energy Dissipator Sizing	Chk'd: RJG	Date: 8/30/23

Purpose:
To size an energy dissipator structure and riprap apron at the outlet of the downslope flume pipes.

References:
1. "Hydraulic Design of Energy Dissipators for Culverts and Channels," HEC-14, Third Edition, July 2006, USDOT FHWA.
2. Downslope Pipe and Inlet Sizing calculation (for pipe size, flow rate, and pipe velocity).
3. HydroCAD Report: COL_Mod12-13_HydroCAD Report
4. Facilities Development Manual Chapter 13, Section 13-30 - Rock Riprap Lined Chutes.
5. WisDOT FDM Table 25.1

Approach:
Use the downslope pipe outlet velocity to size an energy dissipator structure (USBR Type VI Impact Basin) following the design approach outlined in Section 9.4 of Reference #1.
Use Rock Chute Data Spreadsheet, FDM 13-30-30 Attachment 30.1 (from Reference #5) to design the rock chute.
For construction purposes use the maximum flow to size all dissipators and riprap apron.

Assumptions:
1. Riprap specific gravity = 2.65
2. From the HydroCAD Report, the 25-year, 24-hour peak discharge to each downslope flume is as follows*:

Flume 1		**Flume 2**		**Flume 3 Existing)**	**Flume 4 (Existing)**	**Flume 5 (Existing)**
Area 1	3.75	Area 3	1.06			
Area 2	1.71	Area 4	0.92			
Area 12	4.83	Area 14	1.93			
Area 13	1.94	Area 15	2.80			
Total =	12.23		6.71	0	0	0

Flume 6		**Flume 7**		**Flume 8**		**Flume 9**		**Flume 10**
Area 5	1.66	Area 8	2.66	Area 20	1.19	Area 10	1.68	This flume discharges directly into a concrete catch basin at the toe of slope, therefore, no energy dissipator is needed.
Area 6	2.81	Area 9	0.86	Area 25	2.12	Area 11	5.22	
Area 16	1.78	Area 18	5.06	Area 34	1.35	Area 21	1.62	
Area 17	3.04	Area 19	2.16			Area 22	7.54	
		Area 24	3.61			Area 26	2.10	
		Area 33	3.24			Area 27	7.46	
Total =	9.29	Total =	17.59	Total =	4.66	Total =	25.62	

** Please note that the total flow rate at each flume calculated above may not reflect the flow rate shown in the HydroCAD Model due to the inflow to the flume occuring at different times during the storm event. The calculation above reflects the peak flow rate.*

Using Figure 9.14 (See Sheet 4), enter the Froude Number and the Energy from Step 2 to determine the
from the downslope flume pipe and inlet sizing calculation.

Results:
The energy dissipator structures for the 18" dia. downslope flume pipes will consist of dissipator structures with widths (W_B) of 6 feet, with the remaining dimensions from Table 9.2 on Sheets 5 and 6.
Riprap at the Flume energy dissipator outlets will consist of WisDOT Select Crush Material (D50= 2.2 inches) (See Page 3).
The riprap apron footprint will be based on the energy dissipator width, the rock chute, and/or the outlet swale geometry (See Plan Set).

Calculations:

For 18" dia. downslope flume pipes

From Reference #2:

Flow rate (Q) = 25.6 cfs

Pipe velocity (V) = 31.4 ft/s

Flow area (A) = Q/V = 0.82 sf

Design procedure from pg. 9-40 of Reference #1:

Step 1: Compute the Equivalent Depth of Flow Entering Dissipator:

$Y_e = (A/2)^{1/2}$ where: Ye = Equivalent depth

A = Area (from above)

$Y_e =$ 0.64 ft

Step 2: Compute the Froude Number and the energy at the end of the pipe:

$Fr = V/[(g*Y_e)^{1/2}]$ where: Fr = Froude Number

V = Velocity (from above)

g = Gravity constant (32.2 ft/sec^2)

Fr = 6.9 Y_e = Equivalent depth (from Step 1 above)

$H_o = Y_e+V^2/2g$ where: H_o = Energy at the end of the pipe

Y_e = Equivalent depth (from above)

V = Velocity (from above)

Ho = 15.9 ft g = Gravity constant (32.2 ft/sec^2)

Step 3: Determine H_o/W_B and calculate the required width of the energy dissipator:

Using Figure 9.14 (See Sheet 4), enter the Froude Number and the Energy from Step 2 to determine the width of the energy dissipator.

From Figure 9.14, H_o/W_B = 2.70

$W_B = H_o/(H_o/W_B)$ W_B = 5.9 ft.

Use W_B = 6.0 ft.

Step 4: Obtain the remaining energy dissipator dimensions from Table 9.2 from Reference #1 (see Sheets 5 and 6)

Calculations:

Step 5: Determine the exit velocity from the energy dissiaptor structure and size the riprap apron at the structure outlet.

Use the relationship:

$H_B = Q/(W_B \times V_B) + V_B^2 / 2g = H_o \times (1-H_L/H_o)$

Where:

$Q =$	25.6	cfs, flowrate
$W_B =$	6.0	ft, width of energy dissipator
$g =$	32.2	ft/s^2, gravity
H_O	15.9	Energy at end of pipe
H_L/H_O	76	%, Energy loss (From Figure 9.15 from Reference #1, see Sheet 3)
$V_B =$		Velocity at exit of dissipator (ft/s)
HB =		Energy at exit of dissipator (ft)

Calculate HB using the second part of the equation:

$H_B = H_o \times (1-H_L/H_o)$

$H_B =$ 3.82 ft

Using trial and error, select values for V_B and use the first part of the equation to calculate H_B:

Try $V_B =$ 1.105 ft/s $H_B =$ 3.87 ft

Based on the energy dissipator structure exit velocity, calculate the riprap size at the dissipator outlet.

From Equation 10.6 from Reference #1:

$D_{50} = (0.692 / (S-1)) \times (V^2/2g)$

Where:

$S =$	2.65	Specific gravity (See Assumption #1)
$V =$	1.11	Velocity = V_B from above.
$D_{50} =$		riprap size

$D_{50\ Calc'd} =$ 0.008 feet

Round the calculated D_{50} up to the nearest IDOT standard riprap size:

$D_{50\ Design} =$ 0.18 feet Use = Select Crushed Material with geotextile Type R

Riprap Type	D_{50} (inches)	D_{50} (feet)	Riprap Thickness (in)	Geotextile Type
Select Crushed Material	2.2	0.18	5	Type R
Light Riprap	10	0.83	12	Type R
Medium Riprap	12.5	1.04	18	Type HR
Heavy Riprap	16	1.33	24	Type HR
Extra-Heavy Riprap	20	1.67	30	Type HR

from Reference 5

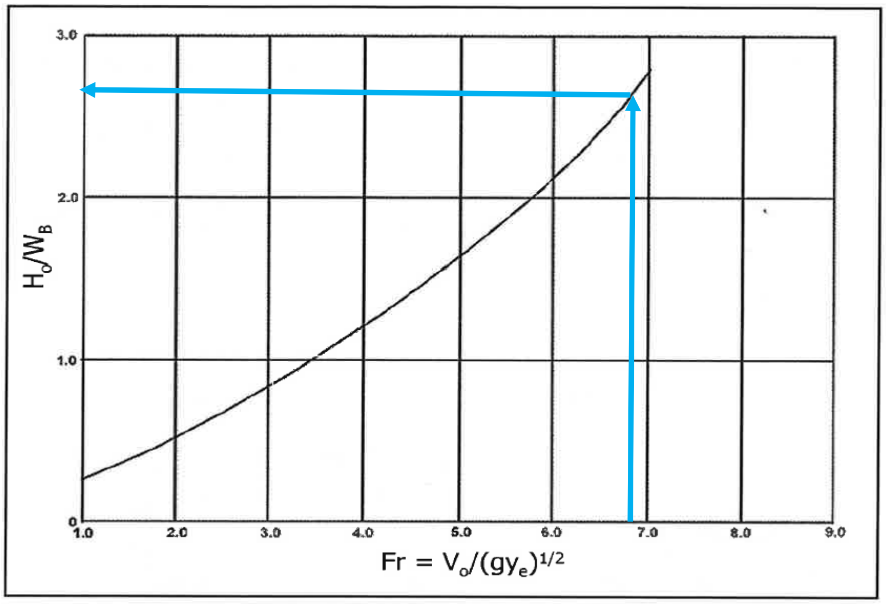


Figure 9.14. Design Curve for USBR Type VI Impact Basin

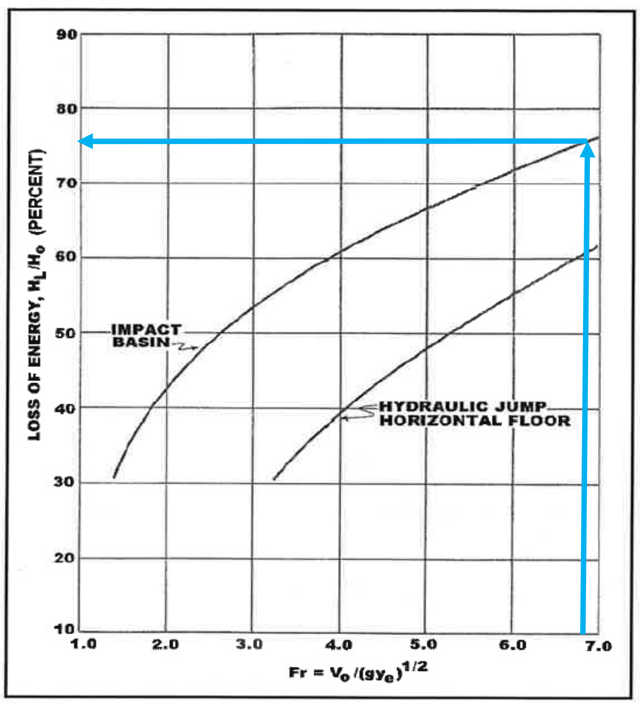


Figure 9.15. Energy Loss of USBR Type VI Impact Basin versus Hydraulic Jump

Table 9.2 (CU). USBR Type VI Impact Basin Dimensions (ft) (AASHTO, 2005)

W_B	h_1	h_2	h_3	h_4	L	L_1	L_2
4.	3.08	1.50	0.67	1.67	5.42	2.33	3.08
5.	3.83	1.92	0.83	2.08	6.67	2.92	3.83
6.	4.58	2.25	1.00	2.50	8.00	3.42	4.58
7.	5.42	2.58	1.17	2.92	9.42	4.00	5.42
8.	6.17	3.00	1.33	3.33	10.67	4.58	6.17
9.	6.92	3.42	1.50	3.75	12.00	5.17	6.92
10.	7.58	3.75	1.67	4.17	13.42	5.75	7.67
11.	8.42	4.17	1.83	4.58	14.58	6.33	8.42
12.	9.17	4.50	2.00	5.00	16.00	6.83	9.17
13.	10.17	4.92	2.17	5.42	17.33	7.42	10.00
14.	10.75	5.25	2.33	5.83	18.67	8.00	10.75
15.	11.50	5.58	2.50	6.25	20.00	8.50	11.50
16.	12.25	6.00	2.67	6.67	21.33	9.08	12.25
17.	13.00	6.33	2.83	7.08	21.50	9.67	13.00
18.	13.75	6.67	3.00	7.50	23.92	10.25	13.75
19.	14.58	7.08	3.17	7.92	25.33	10.83	14.58
20.	15.33	7.50	3.33	8.33	26.58	11.42	15.33

W_B	W_1	W_2	t_1	t_2	t_3	t_4	t_5
4.	0.33	1.08	0.50	0.50	0.50	0.50	0.25
5.	0.42	1.42	0.50	0.50	0.50	0.50	0.25
6.	0.50	1.67	0.50	0.50	0.50	0.50	0.25
7.	0.50	1.92	0.50	0.50	0.50	0.50	0.25
8.	0.58	2.17	0.50	0.58	0.58	0.50	0.25
9.	0.67	2.50	0.58	0.58	0.67	0.58	0.25
10.	0.75	2.75	0.67	0.67	0.75	0.67	0.25
11.	0.83	3.00	0.67	0.75	0.75	0.67	0.33
12.	0.92	3.00	0.67	0.83	0.83	0.75	0.33
13.	1.00	3.00	0.67	0.92	0.83	0.83	0.33
14.	1.08	3.00	0.67	1.00	0.92	0.92	0.42
15.	1.17	3.00	0.67	1.00	1.00	1.00	0.42
16.	1.25	3.00	0.75	1.00	1.00	1.00	0.50
17.	1.33	3.00	0.75	1.08	1.00	1.00	0.50
18.	1.33	3.00	0.75	1.08	1.08	1.08	0.58
19.	1.42	3.00	0.83	1.17	1.08	1.08	0.58
20.	1.50	3.00	0.83	1.17	1.17	1.17	0.67

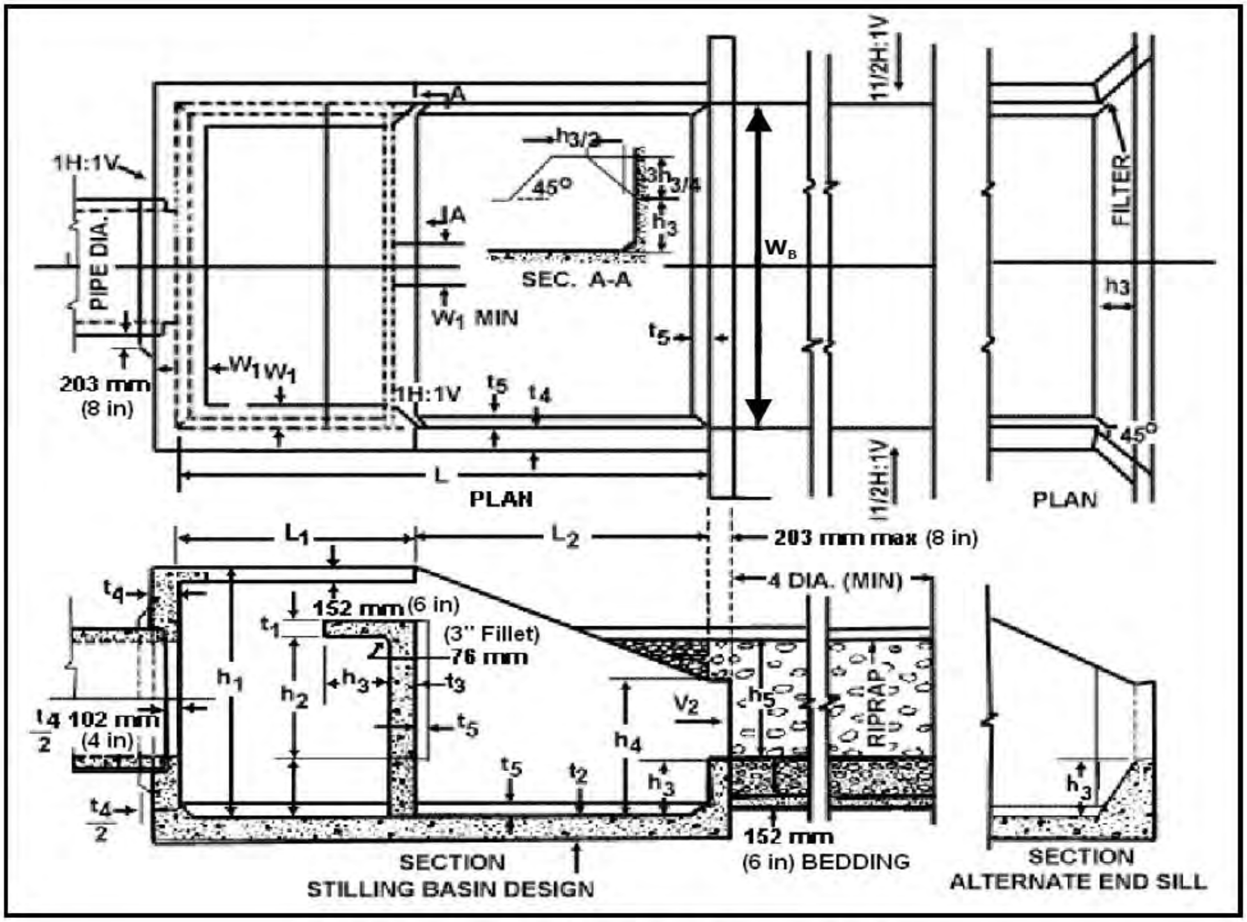


Figure 9.13. USBR Type VI Impact Basin

Calculations (Continued):

Downslope Flume 9 - Velocity Calculator (Q = 25.62 cfs)

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Inputs:

Pipe Diameter, d_o	18	in
Manning Roughness, n	0.0120	
Pressure slope	0.2500	slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	0.4705	fraction

Results:

Flow, Q	25.6240	ft^3/s
Velocity, v	31.3544	ft/s
Velocity head, hv	183.3465	in
Flow Area, A	0.8172	ft^2
Wetted Perimeter, P	2.2676	ft
Hydraulic Radius	0.3604	ft
Top Width, T	1.4974	ft
Froude Number, F	7.60	
Shear Stress (tractive force), τ	11.0139	psf

Version 2.0 (20 June 2017)

HawsEDC Calculators

Rock Chute Sizing

SCS ENGINEERS

		Sheet No:	1 of 5
		Calc. No.	
		Rev. No.	
Job No. 25222260.00	Job: Columbia Energy Center MOD 12-13	By: SJL	Date: 8/28/23
Client: WPL	Subject: Rock Chute Sizing & Riprap Size	Chk'd: RJG	Date: 8/28/23

Purpose:

To size the rock chutes to accommodate the 25-year, 24-hour storm event.

References:

1. Rock Chute Design Data spreadsheet Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998.
2. HydroCAD Report: COL_Mod12-13_HydroCAD Report
3. Figure 1 - Final Grades (Module 13)
4. Stable 25.1 Typical Particle Sizes of Native Sands at 75 Percent Passing (D75) from WisDOT Facilities. Development Manual (FDM).

Approach:

1. Enter Inlet Channel data based on culvert apron or swale geometry Reference #2 and #3.
2. Enter Chute data based on slope from Reference #3, start the width, Bw equal to inlet channel Bw.
3. Enter Outlet Channel data based on Reference #3, start the width, Bw equal to inlet channel Bw.
4. Enter drainage area, apron elevations, flow (Q), and rainfall.
5. Adjust Bw for Chute and Outlet Channel until spreadsheet shows the rock chute "will" function adequately.
6. Determine rip rap classification based on D50 weight per Reference #4.

Assumptions:

1. Assume side slopes of chute and outlet channel are 2:1.
2. Assume Factor of Safey is 1.2.
3. n-value is based on proposed conditions at the channel.
4. Assume Outlet apron depth, d is 1.0 ft.
5. Freeboard is 1.0 ft.
6. Use 25-year, 24-hour storm event flow (Reference #2) for Q_{high} and Q_{low}.
7. Classification of riprap is based on weight (Reference #4).

Calculations:

See attached spreadsheet calcs for each rock chute.

Results:

The rock chutes are adequately designed to accommodate the flows from the 25-year, 24-hour storm event.

Rock Chute	Width (ft)	Thickness (in)	Apron Width (ft)	Apron Length (ft)	D_{50} (in)	WisDOT Rip Rap Classification
RC1	8	4	8	2	2	Select Crushed Material, Type R
RC2	6	12	6	7	5.9	Light Riprap Type R
RC3	6	8	6	5	3.8	Light Riprap Type R
RC4	6	9	6	6	3.8	Light Riprap, Type R

Rock Chute Design Data

(Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)
Revised for WisDOT 9/2010

Project:	COL - Mod 12-13 RC1	**County:**	Columbia
Designer:	SJL	**Checked by:**	RJG
Date:	August 28, 2023	**Date:**	08/28/23

Input Geometry:

Upstream Channel		Chute			Downstream Channel	
Bottom Width =	0.0 ft.	Bottom Width =	8.0 ft.		Bottom Width =	8.0 ft.
Side slopes =	4.0 (m:1)	Factor of safety =	1.20 (SF)	1.2 Min	Side slopes =	2.0 (m:1)
Mannings n value =	0.030	Side slopes =	2.0 (z:1)	2.0:1 max.	Mannings n value =	0.045
Bed slope =	0.0600 ft./ft.	Bed slope =	0.1769 ft./ft	3.0:1 max.	Bed slope =	0.0050 ft./ft.
		Freeboard =	1.0 ft.			
		Outlet apron depth, d =	1.0 ft.		Base flow =	0.0 cfs

Note: Use procedures 13-30-15 or 13-30-25 for upstream and downstream Mannings n

Flow and Elevation Data:

Apron elev. --- Inlet = 829.0 ft. -------- Outlet 806.0 ft. --- (H_{drop} = 22 ft.)

Degree of angularity = 1

1 --> 50% angular, 50% rounded
2 --> 100 % rounded

Q_{high} = Runoff from design storm
Q_5 = Runoff from a 5-year,24-hour storm

Q_{high} = 2.3 cfs — High flow storm through chute → Tw (ft.) = Program
Q_{low} = 2.3 cfs — Low flow storm through chute → Tw (ft.) = Program

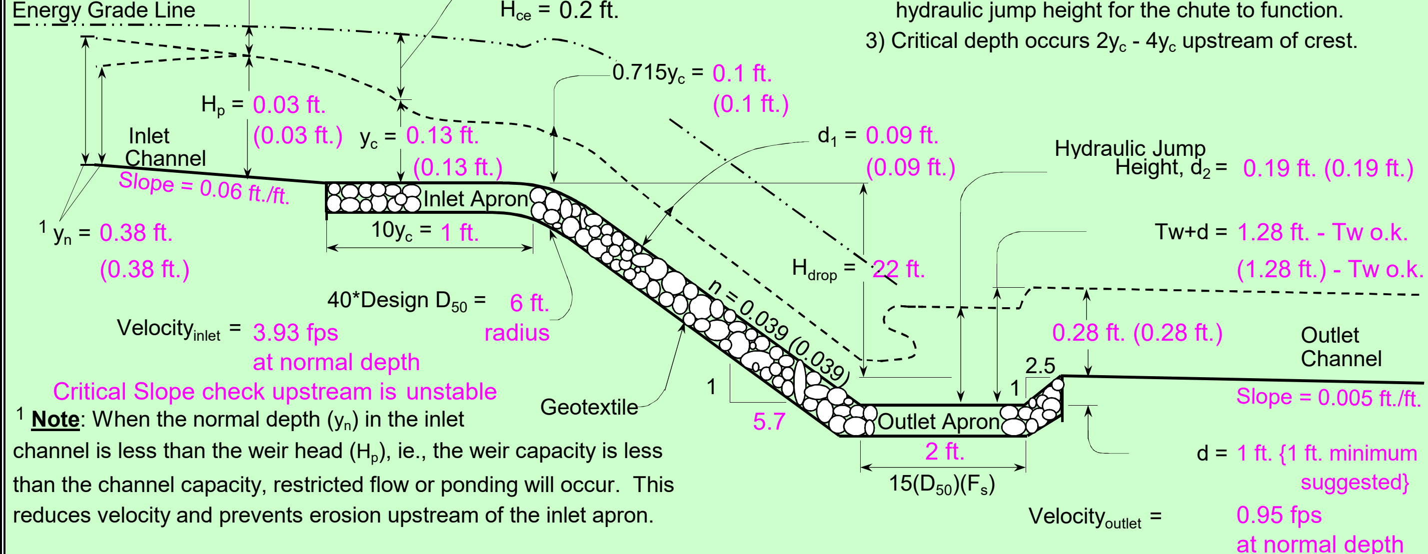
Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

Input tailwater (Tw):

Profile and Cross Section (Output):

Starting Station = 3+00.0

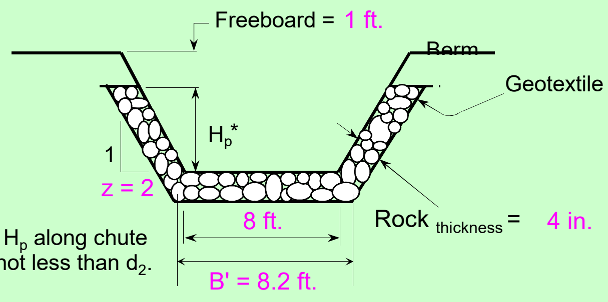
Notes:
1) Output given as **High Flow (Low Flow)** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.



[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than d_2.

	0.28 cfs/ft.	Equivalent unit discharge
SF =	1.20	Factor of safety (multiplier)
d_1 =	0.09 ft.	Normal depth in chute
n-value =	0.039	Manning's roughness coefficient
D_{50}(SF) =	2 in.	Minimum Design D_{50}*
$2(D_{50})$(SF) =	4 in.	Rock chute thickness
Tw + d =	1.28 ft.	Tailwater above outlet apron
d_2 =	0.19 ft.	Hydraulic jump height
*** **The outlet**	**will**	**function adequately**

High Flow Storm Information

Rock Chute Design Data

(Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)
Revised for WisDOT 9/2010

Project: COL - Mod 12-13 RC2 **County:** Columbia
Designer: SJL **Checked by:** RJG
Date: August 28, 2023 **Date:** 08/28/23

Input Geometry:

Upstream Channel		Chute			Downstream Channel	
Bottom Width =	6.0 ft.	Bottom Width =	6.0 ft.		Bottom Width =	6.0 ft.
Side slopes =	1.0 (m:1)	Factor of safety =	1.20 (SF)	1.2 Min	Side slopes =	2.0 (m:1)
Mannings n value =	0.012	Side slopes =	2.0 (z:1)	2.0:1 max.	Mannings n value =	0.045
Bed slope =	0.0001 ft./ft.	Bed slope =	0.2319 ft./ft	3.0:1 max.	Bed slope =	0.0050 ft./ft.
		Freeboard =	1.0 ft.			
		Outlet apron depth, d =	1.0 ft.		Base flow =	0.0 cfs

Note: Use procedures 13-30-15 or 13-30-25 for upstream and downstream Mannings n

Flow and Elevation Data:

Apron elev. --- Inlet = 820.0 ft. ------- Outlet 804.0 ft. --- (H_{drop} = 15 ft.)

Degree of angularity = 1
1 --> 50% angular, 50% rounded
2 --> 100 % rounded

Q_{high} = Runoff from design storm
Q_5 = Runoff from a 5-year,24-hour storm

Q_{high} = 12.1 cfs — High flow storm through chute → Tw (ft.) = Program
Q_{low} = 12.1 cfs — Low flow storm through chute → Tw (ft.) = Program

Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

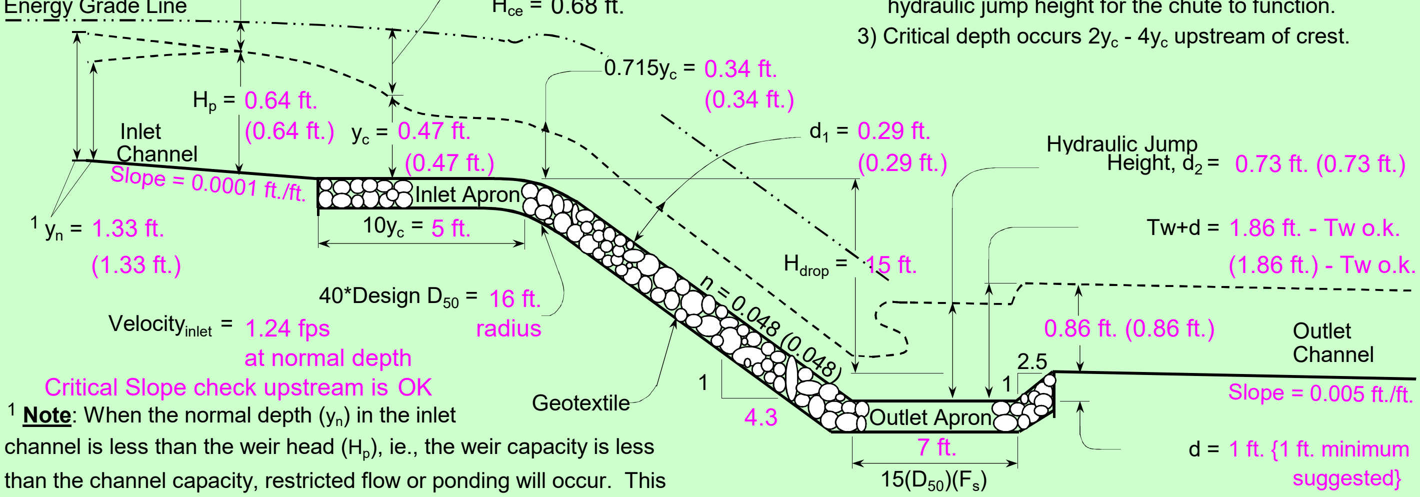
Input tailwater (Tw):

Profile and Cross Section (Output):

Starting Station = 3+00.0

h_{pv} = 0.12 ft. (0.12 ft.)
H_{pe} = 0.77 ft.
h_{cv} = 0.21 ft. (0.21 ft.)
H_{ce} = 0.68 ft.

Notes:
1) Output given as **High Flow (Low Flow)** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.



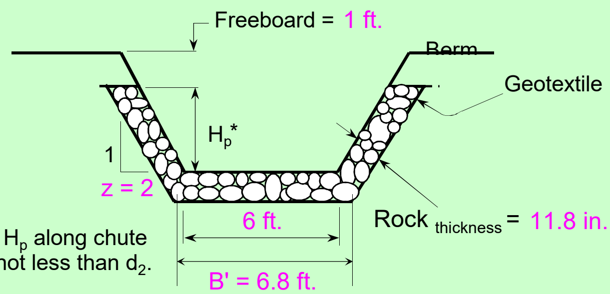
Critical Slope check upstream is OK

[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Velocity$_{outlet}$ = 1.81 fps at normal depth

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than d_2.

	1.85 cfs/ft.	Equivalent unit discharge
SF =	1.20	Factor of safety (multiplier)
d_1 =	0.29 ft.	Normal depth in chute
n-value =	0.048	Manning's roughness coefficient
D_{50}(SF) =	5.9 in.	Minimum Design D_{50}*
$2(D_{50})$(SF) =	11.8 in.	Rock chute thickness
Tw + d =	1.86 ft.	Tailwater above outlet apron
d_2 =	0.73 ft.	Hydraulic jump height
***** The outlet**	**will**	**function adequately**

High Flow Storm Information

Rock Chute Design Data

(Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)
Revised for WisDOT 9/2010

Project: COL - Mod 12-13 RC3 **County:** Columbia
Designer: SJL **Checked by:** RJG
Date: August 28, 2023 **Date:** 08/28/23

Input Geometry:

Upstream Channel		Chute			Downstream Channel	
Bottom Width =	6.0 ft.	Bottom Width =	6.0 ft.		Bottom Width =	6.0 ft.
Side slopes =	1.0 (m:1)	Factor of safety =	1.20 (SF)	1.2 Min	Side slopes =	2.0 (m:1)
Mannings n value =	0.012	Side slopes =	2.0 (z:1)	2.0:1 max.	Mannings n value =	0.045
Bed slope =	0.0001 ft./ft.	Bed slope =	0.1545 ft./ft	3.0:1 max.	Bed slope =	0.0050 ft./ft.
Note: Use procedures 13-30-15 or 13-30-25 for		Freeboard =	1.0 ft.			
upstream and downstream Mannings n		Outlet apron depth, d =	1.0 ft.		Base flow =	0.0 cfs

Flow and Elevation Data:

Apron elev. --- Inlet = 821.0 ft. ------- Outlet 804.0 ft. --- (H_{drop} = 16 ft.)

Degree of angularity = 1

Q_{high} = Runoff from design storm — 1 --> 50% angular, 50% rounded

Q_5 = Runoff from a 5-year,24-hour storm — 2 --> 100 % rounded

Q_{high}= 6.6 cfs — High flow storm through chute → Tw (ft.) = **Program**

Q_{low} = 6.6 cfs — Low flow storm through chute → Tw (ft.) = **Program**

Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

Input tailwater (Tw):

Profile and Cross Section (Output):

Starting Station = 3+00.0

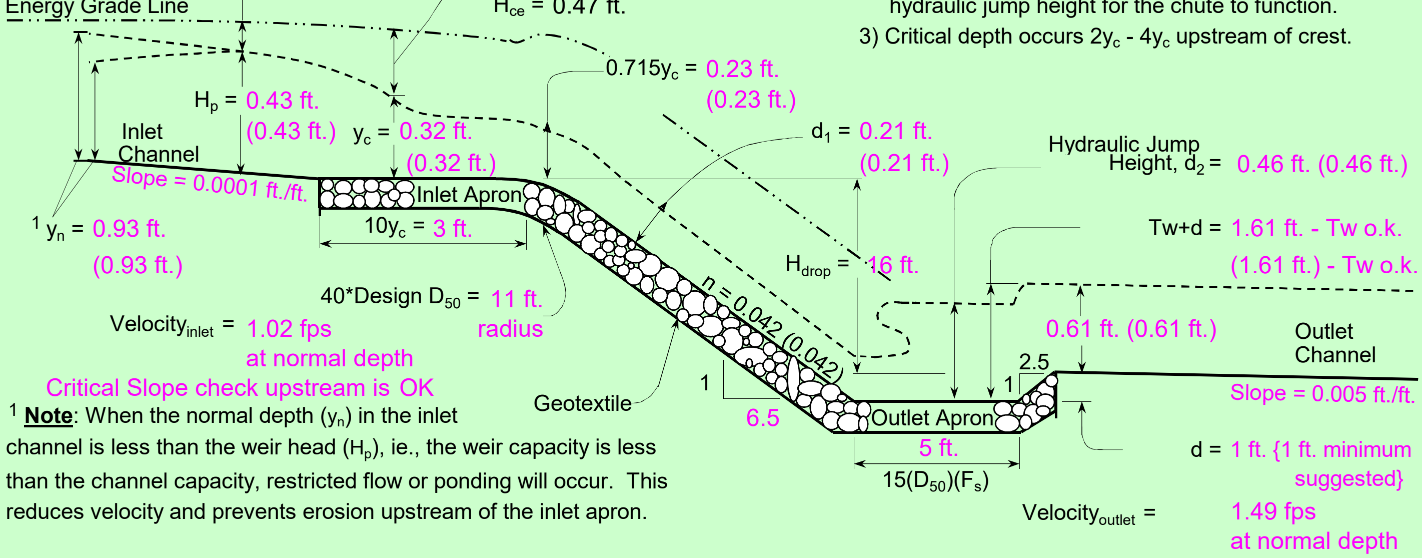
Notes:
1) Output given as **High Flow (Low Flow)** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.

h_{pv} = 0.09 ft. (0.09 ft.)

H_{pe} = 0.52 ft.

h_{cv} = 0.15 ft. (0.15 ft.)

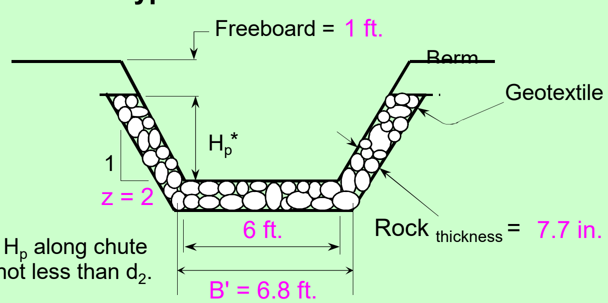
H_{ce} = 0.47 ft.



[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than d_2.

	1.04 cfs/ft.	Equivalent unit discharge
SF =	1.20	Factor of safety (multiplier)
d_1 =	0.21 ft.	Normal depth in chute
n-value =	0.042	Manning's roughness coefficient
D_{50}(SF) =	3.8 in.	Minimum Design D_{50}*
$2(D_{50})$(SF) =	7.7 in.	Rock chute thickness
Tw + d =	1.61 ft.	Tailwater above outlet apron
d_2 =	0.46 ft.	Hydraulic jump height
*** **The outlet**	**will**	**function adequately**

High Flow Storm Information

Rock Chute Design Data

(Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)
Revised for WisDOT 9/2010

Project: COL - Mod 12-13 RC4 **County:** Columbia
Designer: RJG **Checked by:** SJL
Date: August 28, 2023 **Date:** 08/28/23

Input Geometry:

Upstream Channel		Chute			Downstream Channel	
Bottom Width =	4.0 ft.	Bottom Width =	6.0 ft.		Bottom Width =	6.0 ft.
Side slopes =	4.0 (m:1)	Factor of safety =	1.20 (SF)	1.2 Min	Side slopes =	2.0 (m:1)
Mannings n value =	0.045	Side slopes =	2.0 (z:1)	2.0:1 max.	Mannings n value =	0.045
Bed slope =	0.0288 ft./ft.	Bed slope =	0.2212 ft./ft	3.0:1 max.	Bed slope =	0.0050 ft./ft.
		Freeboard =	1.0 ft.			
		Outlet apron depth, d =	1.0 ft.		Base flow =	0.0 cfs

Note: Use procedures 13-30-15 or 13-30-25 for upstream and downstream Mannings n

Flow and Elevation Data:

Apron elev. --- Inlet = 824.9 ft. ------- Outlet 817.6 ft. --- (H_{drop} = 6.3 ft.)

Degree of angularity = 1
1 --> 50% angular, 50% rounded
2 --> 100 % rounded

Q_{high} = Runoff from design storm
Q_5 = Runoff from a 5-year,24-hour storm

Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

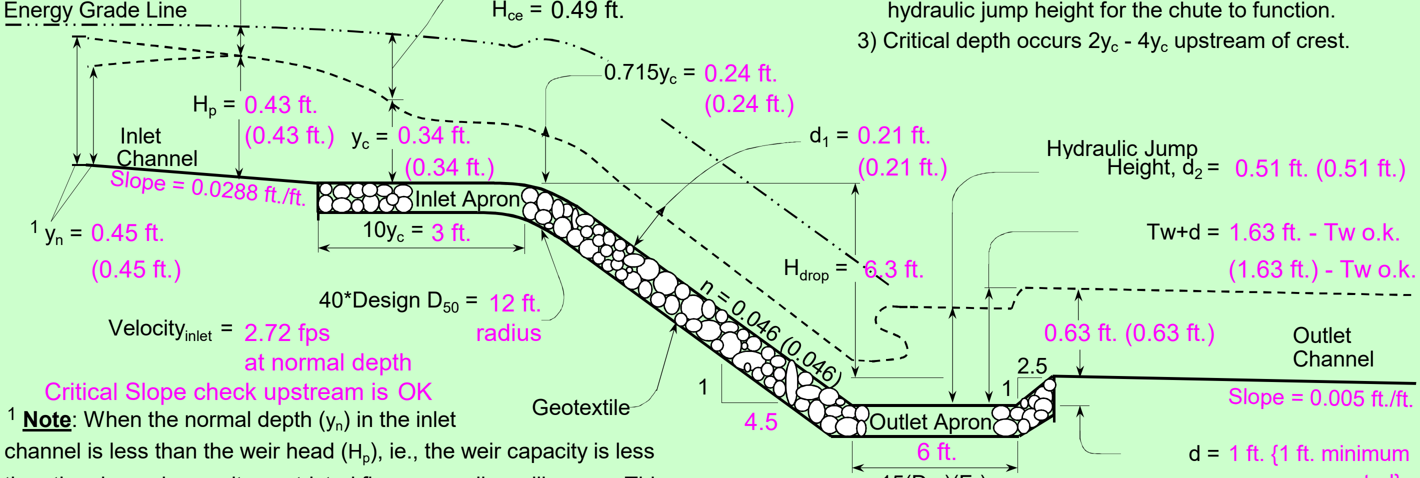
Input tailwater (Tw):

Q_{high} =	7.0 cfs	High flow storm through chute	Tw (ft.) = Program
Q_{low} =	7.0 cfs	Low flow storm through chute	Tw (ft.) = Program

Profile and Cross Section (Output):

Starting Station = 3+00.0

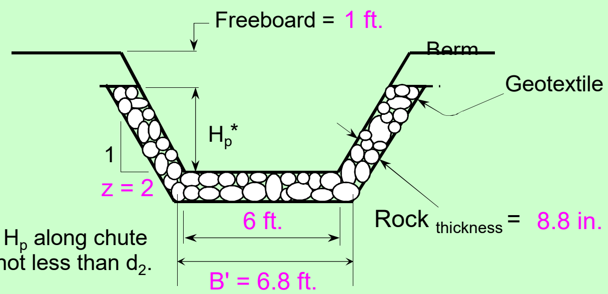
Notes:
1) Output given as **High Flow (Low Flow)** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.



[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than d_2.

	1.1 cfs/ft.	Equivalent unit discharge
SF =	1.20	Factor of safety (multiplier)
d_1 =	0.21 ft.	Normal depth in chute
n-value =	0.046	Manning's roughness coefficient
D_{50}(SF) =	4.4 in.	Minimum Design D_{50}*
$2(D_{50})$(SF) =	8.8 in.	Rock chute thickness
Tw + d =	1.63 ft.	Tailwater above outlet apron
d_2 =	0.51 ft.	Hydraulic jump height
*** The outlet	will	function adequately

High Flow Storm Information

Riprap Apron Sizing

SCS ENGINEERS

Purpose:

To size the riprap apron dimensions at culvert C2, C3, C4, C5, C8, and C10 based on a 25-year, 24 hour storm event:

References:

1. "Energy Dissipators," Wisconsin Department of Transportation (WisDOT), Facilities Development Manual (FDM) 13-35-5.
2. HydroCAD Report: COL_Mod12-13_HydroCAD Report
3. "Rock Riprap Lined Channels," WisDOT FDM 13-30-25.
4. Culvert Sizing Calculation.
5. WisDOT FDM Chapter 13, Section 30 - Rock Riprap Lined Chutes

Approach:

Use the equations in Section 5.2 - Riprap Blanket of WisDOT FDM 13-35-5 (Energy Dissipators) to determine the average size of stone (d_{50}) and riprap apron length. Round up the calculated d_{50} to the nearest WisDOT standard riprap size.

Use WisDOT FDM 13-35 Attachment 5.2 to determine the width of the riprap apron for discharges to a flat area. For discharges to channels, extend riprap across the channel bottom and up the sides.

Assumptions:

Assume riprap apron thickness (T) is 2 * d_{50} to protect against washout and undercutting of the riprap.

Assume tailwater depth, TW = 0.40 * D_o

Assume max TW conditions for the riprap apron width.

Assume that when there are multiple culverts, the total discharge to the culverts is distributed evenly through each barrel.

Calculation:

From WisDOT Section 5.2 - Riprap Blanket:

$$d_{50}/D_o = 0.020\ (D_o/TW)\ (Q/D_o^{5/2})^{4/3}$$

$$L_{sp}/D_o = 1.7\ (Q/D_o^{5/2}) + 8$$

Or:

$$d_{50} = 0.02 \times (D_o/TW) \times (Q/D_o^{5/2})^{4/3} \times D_o$$

$$L_{sp} = (1.7\ (Q/D_o^{5/2}) + 8) \times D_o$$

where: D_o = Diameter or width of culvert (ft)

Q = Flow rate (cfs) (discharge rate through culvert, from Worst Case Condition HydroCAD Model (Reference #2))

TW = Tail water depth (ft)

d_{50} = Average size of stone (ft)

L_{sp} = Length of stone protection (Apron Length) (ft)

Location	Total Flow (Q, cfs)	Number of Pipes	D_o (ft)	Q (cfs)	TW (ft)	$d_{50\ calculated}$	$d_{50\ Design}$	L_{sp}
Culvert C2	10.95	2	2	5.5	0.80	0.10	0.18	19
Culvert C3	28.58	2	2.5	14.3	1.00	0.20	0.83	26
Culvert C4	34.14	2	2.5	17.1	1.00	0.26	0.83	27
Culvert C5	37.41	2	2.5	18.7	1.00	0.29	0.83	28
Culvert C8	0.96	1	1	1.0	0.40	0.05	0.18	10
Culvert 10	2.76	1	2	2.8	0.80	0.04	0.18	18

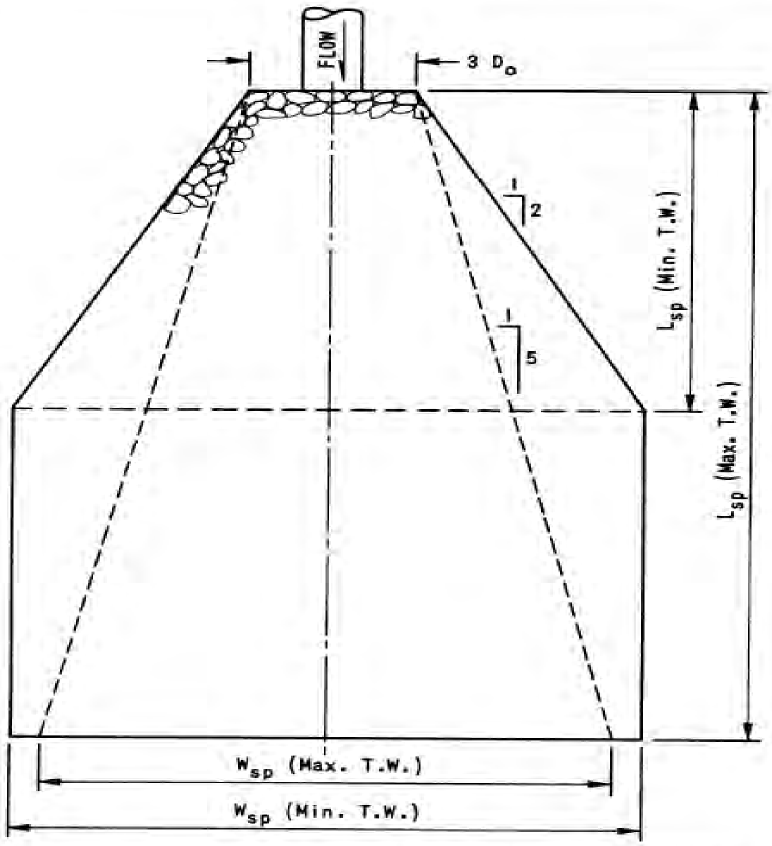
Results:

Below is a summary of the d_{50} , thickness (T), and configuration of the riprap apron. Also refer to WisDOT FDM Attachment 5.2 (Sheet 2) for details on apron layout. Use WisDOT Light Riprap at culvert discharge.

Location	d_{50} (in)*	T (in)	L_{sp} (ft)	W_{sp} (ft)	WisDOT Riprap sizes
Culvert C2	2.2	6	19	See Note 1	Select Crushed Material
Culvert C3	10.0	20	26	See Note 1	Light Riprap
Culvert C4	10.0	20	27	See Note 1	Light Riprap
Culvert C5	10.0	20	28	See Note 1	Light Riprap
Culvert C8	2.2	6	10	See Note 1	Select Crushed Material
Culvert 10	2.2	6	18	See Note 1	Select Crushed Material

1. For discharges to channels, place riprap along channel bottom and up side of channel.

FDM 13-35 Attachment 5.2 Recommended Configuration of Riprap Blanket Subject to Maximum and Minimum Tail Waters



RECOMMENDED CONFIGURATION OF RIPRAP BLANKET SUBJECT TO MAXIMUM AND MINIMUM TAILWATERS

Source: Miscellaneous paper H-72-5, "Practical Guidance for Estimating and Controlling Erosion at Culvert Outlets", U.S. Army Engineer Waterways Experiment Station, May, 1972.

***Table 25.1** Typical Particle Sizes of Native Sands at 75 Percent Passing (D_{75})*

Riprap Type	D50 (inches)	D50 (feet)	Riprap Thickness (in)	Geotextile Type
Select Crushed Material	2.2	0.18	5	Type R
Light Riprap	10	0.83	12	Type R
Medium Riprap	12.5	1.04	18	Type HR
Heavy Riprap	16	1.33	24	Type HR
Extra-Heavy Riprap	20	1.67	30	Type HR

Source: Table 25.1 from WisDOT FDM.

Appendix F

Closure Plan

Closure Plan

Columbia Dry Ash Disposal Facility

Phase 1 Module 1
Phase 1 Module 2
Phase 1 Module 3
Phase 1 Module 4
Phase 1 Module 5
Phase 1 Module 6
Phase 2 Module 10
Phase 2 Module 11
Phase 2 Module 12
Phase 2 Module 13

Prepared for:

Wisconsin Power and Light Company
Columbia Energy Center
W8375 Murray Road
Pardeeville, Wisconsin 53954

SCS ENGINEERS

25222260.00 | September 1, 2023

2830 Dairy Drive
Madison, WI 53718-6751
608-224-2830

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Figures

Appendices

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PE CERTIFICATION

I, Phillip Gearing, hereby certify that I am a licensed professional engineer in the State of Wisconsin in accordance with the requirements of ch. A–E 4, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A–E 8, Wis. Adm. Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 500 to 538, Wis. Adm. Code.

Specifically,

- This Closure Plan was prepared by me or under my direct supervision and meets the requirements of 40 CFR 257.102(b) and NR 514.07(10)(c)

	September 1, 2023
(signature)	(date)

Phillip E. Gearing
(printed or typed name)

License number ____E-45115______________

My license renewal date is ___July 31, 2024_________.

Pages or sheets covered by this seal:

ALL

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1.0 INTRODUCTION AND PROJECT SUMMARY

On behalf of Wisconsin Power and Light Company (WPL), SCS Engineers (SCS) has prepared this Closure Plan for the Columbia (COL) Dry Ash Disposal Facility Phase 1, Modules 1 through 6 and Phase 2, Modules 10 through 13 as required by 40 Code of Federal Regulations (CFR) 257.102(b) and Wisconsin Administrative Code NR 514.07(10)(c), as stated below.

40 CFR 257.102(b) *"Written closure plan – (1) Content of the plan. The owner or operator of a CCR unit must prepare a written closure plan that describes the steps necessary to close the CCR unit at any point during the active life of the CCR unit consistent with recognized and generally accepted good engineering practices. The written closure plan must include, at a minimum, the information specified in paragraphs (b)(1)(i) through (vi) of this section."*

NR 517.07(10)(c) *"A written closure plan in accordance with the requirements under s. NR 514.06 (10) and all of the following: (1) A narrative description of how the CCR landfill will be closed, including a description of the steps necessary to close the CCR unit at any point during the active life of the CCR unit, consistent with recognized and generally accepted good engineering practices."*

The COL facility includes an active coal combustion residual (CCR) landfill, which currently consists of the following modules, located in Phase 1 and Phase 2 of the facility.

- **Phase 1, Module 1** – This module has received final cover over outer sideslope areas that will no longer receive additional CCR; intermediate cover has been placed over remaining areas. The final cover placed complies with the CCR Rule.
- **Phase 1, Module 2** – This module has received intermediate cover over a majority of the in-place CCR.
- **Phase 1, Module 3** – This module has received intermediate cover over a majority of the in-place CCR.
- **Phase 1, Module 4** – This module is currently being filled and also has received intermediate cover over areas of the in-place CCR.
- **Phase 1, Module 5** – This module is currently being filled and has received intermediate cover over areas of the in-place CCR.
- **Phase 1, Module 6** – This module is currently being filled and has received intermediate cover over areas of the in-place CCR.
- **Phase 2, Module 10** – This module is currently being filled.
- **Phase 2, Module 11** – This module is currently being filled.
- **Phase 2, Module 12** – This module is currently proposed for approval. The module will be constructed and filled following approval.
- **Phase 2, Module 13** – This module is currently proposed for approval. The module will be constructed and filled following approval.

Phase 1, Modules 1 through 3 were previously described as separate existing CCR landfills although they are contiguous and are managed as a single landfill by the facility and by the Wisconsin Department of Natural Resources (WDNR, or "Department"). WPL has clarified in the operating record for the Columbia facility that Modules 1 Through 3 are one existing CCR landfill as defined in 40 CFR 257.53 of the federal CCR Rule. Phase 1, Modules 4 through 6 and Modules 10 and 11 are considered to be a new CCR landfill that initiated construction after October 19, 2015, and is therefore managed as a separate CCR unit under the CCR Rule even though they are contiguous to the existing CCR landfill (Modules 1 through 3). Phase 2, Modules 12 and 13 will be included in the new CCR landfill, if approved and constructed. Construction of additional modules beyond Modules 12 and 13 is not currently planned prior to retirement of the Columbia Energy Center, which is currently scheduled to occur no later than June 1, 2026.

Figure 1 shows the site location. **Figure 2** shows the closure areas. A detail of the final cover system is shown on **Figure 3**.

2.0 PROPOSED CLOSURE PLAN NARRATIVE

40 CFR 257.102(b)(1)(i) *"A narrative description of how the CCR unit will be closed in accordance with this section."*

NR 517.07(10)(c)(1) *"A narrative description of how the CCR landfill will be closed, including a description of the steps necessary to close the CCR unit at any point during the active life of the CCR unit, consistent with recognized and generally accepted good engineering practices."*

When CCR placement is completed in the CCR unit, or if early closure is required, the unit will be closed by covering the CCR with the final cover system described in **Section 3.0**. Prior to final cover system construction, the CCR surfaces will be graded and compacted to establish a firm subgrade for final cover construction. In addition, all required notifications will be submitted to the WDNR, and WPL will obtain all additional necessary permits (for example, general permit coverage for construction storm water management). WPL may also engage in procurement activities to secure services for installing the final cover system.

The timing for completion of CCR placement in the units that are addressed with this closure plan will depend on CCR generation and disposal rates. Future CCR unit development will also impact the timing of closure. Each of the existing CCR units is designed to receive additional CCR once adjacent units are constructed and overlay airspace is available for filling. Based on the current CCR units alone, if early closure of all units is required, final cover will be placed in the active landfill areas shown on **Figure 2.** A closure schedule is discussed in **Section 6.0** and presented in **Appendix B.**

The initiation of closure activities will commence no later than 30 days after the known final receipt of CCR as required by 40 CFR 257.102(e)(1) and NR 506.083(2)(a), or in accordance with 40 CFR 257.102(e)(2) and NR 506.083(2)(b).

3.0 FINAL COVER SYSTEM AND PERFORMANCE

40 CFR 257.102(b)(1)(iii) *"If closure of the CCR unit will be accomplished by leaving CCR in place, a description of the final cover system, designed in accordance with paragraph (d) of this section, and the methods and procedures to be used to install the final cover. The closure plan must also discuss how the final cover system will achieve the performance standards specified in paragraph (d) of this section."*

40 CFR 257.102(d) *"Closure performance standard when leaving CCR in place."*

40 CFR 257.102(d)(1) *"The owner or operator of a CCR unit must ensure that, at a minimum, the CCR unit is closed in a manner that will:"*

> 40 CFR 257.102(d)(1)(i) *"Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere;"*

NR 514.07(10)(c)(3) *"A demonstration, including a narrative discussion, of how final closure will meet the performance standards under s. NR 506.083(6)."*

NR 506.083(6) *"Closure performance standards when leaving CCR in place. An owner or operator of a CCR landfill shall ensure that, at a minimum the CCR landfill is closed in a manner that will achieve all of the following performance standards:"*

> NR 506.083(6)(a) *"Control, minimization or elimination, to the maximum extent feasible, of post-closure infiltration of liquids into the waste and of releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere."*

The final cover system design will minimize or eliminate infiltration, as further described below.

> 40 CFR 257.102(d)(1)(ii) *"Preclude the probability of future impoundment of water, sediment, or slurry;"*
>
> NR 506.083(6)(b) *"Prevention of the impoundment of water, sediment or slurry."*

The final cover system will meet these criteria, as further described below.

> 40 CFR 257.102(d)(1)(iii) *"Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period;"*
>
> NR 506.083(6)(c) *"Slope stability to prevent the sloughing or movement of the final cover system during the closure and long-term care period.*

The final cover system is designed to provide slope stability and to prevent sloughing or movement during the closure and post-closure care period. Stability of the final cover system was assessed as part of the WDNR landfill permitting process and is further addressed below.

> 40 CFR 257.102(d)(1)(iv) *"Minimize the need for further maintenance of the CCR unit; and"*
>
> NR 506.083(6)(d) *"Minimization of the need for long-term maintenance of the CCR landfill."*

Maintenance of the final cover will be minimized by the establishment of vegetative cover and the erosion control systems, which are further described below.

> 40 CFR 257.102(d)(1)(v) *"Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices."*
>
> NR 506.083(6)(e) *"Complete closure in the shortest amount of time consistent with recognized and generally accepted good engineering practices."*

All closure activities for the CCR units will be completed within 6 months, as stated in **Section 7.0** below.

40 CFR 257.102(d)(2) *"Drainage and stabilization of CCR surface impoundments."*

This does not apply to the COL CCR landfill units.

40 CFR 257.102(d)(3) *"Final cover system"*

NR 517.07(10)(c)(2) *"A description of the final cover system, designed in accordance with s. NR 504.07, and the methods and procedures to be used to install the final cover."*

The existing final cover system (see **Figure 3** for details) in place on part of Module 1 is as follows from the bottom up:

- 3-inch grading layer
- Geosynthetic clay liner (GCL)
- 40-millimeters (mil) linear low-density polyethylene (LLDPE) geomembrane
- 12 inches of drainage material
- 12 inches of rooting zone
- 6 inches of topsoil

Final cover designs have been developed to meet the requirements of NR 504.07 and are discussed in detail below.

The final cover system below will be extended to cover the remaining portion of Module 1 (see **Figure 3** for details). The future Module 1 final cover system consists of the following from the bottom up:

- 3-inch-thick grading layer
- 12-inch-thick capillary break/barrier soil
- 12-inch-thick clay barrier soil
- GCL
- 40-mil polyethylene geomembrane
- 12-inch-thick drainage layer (sand)
- 18-inch-thick rooting zone layer
- 6-inch-thick topsoil layer

These final cover systems meet and exceed the minimum requirements of 40 CFR 257.102(d)(3)(i)(A) through (D) and NR 504.12(4)(b)(1) through (4) as follows:

- Per 257.102(d)(3)(i)(A) and NR 504.12(4)(b)(1), the permeability of the final cover system is less than or equal to the permeability of the bottom liner system and is less than $1x10^{-5}$ centimeters per second (cm/sec) required by the rule. The COL cover system contains a GCL with a permeability of $5x10^{-9}$ cm/sec. The geomembrane above the GCL makes the cover system even less permeable.

The bottom liner system for the existing CCR landfill in Module 1 is as follows:

- Phase 1, Module 1 South:
  - GCL.
  - 40-mil high density polyethylene (HDPE) geomembrane.
  - The layers of the liner system are less than the cover system layers; therefore, infiltration will be more than the cover system.

- Phase 1, Module 1 North:
  - 3 feet of compacted ash.
  - The liner here does not include a geomembrane, and therefore the infiltration through the cover system will be less than this base liner.

A final cover system will be installed in future remaining areas of final cover north of Module 1 (Phase 1, Modules 2, 3, 4, 5, and 6 and Phase 2, Modules 10, 11, 12, and 13) and consists of the following components, from bottom to top:

- 3-inch-thick grading layer
- 12-inch-thick capillary break/barrier soil
- 12-inch-thick clay barrier soil
- GCL
- 40-mil polyethylene geomembrane
- Geocomposite drainage layer
- 30-inch-thick rooting zone layer
- 6-inch-thick topsoil layer

This final cover meets and exceeds the minimum requirements of 40 CFR 257.102(d)(3)(i)(A) through (D) and NR 504.12(4)(b)(1) through (4) as follows:

- Per 257.102(d)(3)(ii)(A), 257.102(d)(3)(i)(A), and NR 504.12(4)(b)(1), the permeability of the final cover system is less than or equal to the permeability of the bottom liner system and is less than $1x10^{-5}$ centimeters per second (cm/sec) required by the rule. The COL cover system contains a GCL with a permeability of $5x10^{-9}$ cm/sec. The geomembrane above the GCL makes the cover system even less permeable.

The bottom liner system for the existing CCR landfill is as follows:

- Phase 1, Modules 2 and 3:
  - 2 feet of compacted clay
  - GCL
  - 60-mil HDPE geomembrane

The bottom liner system for the new CCR landfill is as follows:

- Phase 1, Modules 4, 5, and 6 and Phase 2, Modules 10, 11, 12, and 13:
  - 2 feet of compacted clay
  - GCL
  - 60-mil HDPE geomembrane

Based on a comparison of the design slopes and drainage system components in the liner system and final cover system (described in greater detail below), the final cover system is at least equivalent in permeability when compared to the liner system in Phase 1, Modules 1, 2, 3, 4, 5, and 6 and Phase 2, Modules 10, 11, 12, and 13.

- Per 257.102(d)(3)(i)(B), the existing final cover system includes 2.5 feet of soil, which is greater than the 18 inches of earthen material required to minimize infiltration.

- Per 257.102(d)(3)(i)(B), the future Module 1 final cover system includes 5.0 feet of soil, which is greater than the 18 inches of earthen material required to minimize infiltration.

- Per 257.102(d)(3)(ii)(A) and 257.102(d)(3)(i)(B), the future final cover system north of Module 1 includes 5.0 feet of soil, which is greater than the 18 inches of earthen material required to minimize infiltration.

- Per NR 504.12(4)(b)(2), the proposed final cover contains a GCL infiltration layer. Water infiltrating the final cover will be contained in the drainage layers (sand and geocomposite), which will limit infiltration further through the final cover system. A soil barrier layer has been added below the final cover GCL.

- Per 257.102(d)(3)(i)(C) and NR 504.12(4)(b)(3), erosion of the existing final cover system is minimized with a vegetative support layer consisting of 12 inches of uncompacted rooting zone material and 6 inches of topsoil. This provides more than the required 6-inch thickness for plant growth.

- Per 257.102(d)(3)(i)(C) and NR 504.12(4)(b)(3), erosion of the future Module 1 final cover system is minimized with a vegetative support layer consisting of 18 inches of uncompacted rooting zone material and 6 inches of topsoil. This provides more than the required 6-inch thickness for plant growth.

- Per 257.102(d)(3)(ii)(B), 257.102(d)(3)(i)(C), and NR 504.12(4)(b)(3), erosion of the final cover system (north of Module 1) is minimized with a vegetative support layer consisting of 30 inches of uncompacted rooting zone material and 6 inches of topsoil. This provides more than the required 6-inch thickness for plant growth.

Also, the existing final cover system, the future Module 1 final cover system, and the final cover system north of Module 1 limits infiltration while promoting surface water run-off in a controlled manner to minimize erosion and promote stability. The surface layer of 18 inches (existing), 24 inches (future Module 1), or 36 inches (north of Module 1) of soil supports vegetation that assists with erosion control. Water that infiltrates will be collected by the 12-inch drainage layer (existing and future Module 1) or geocomposite drainage layer (north of Module 1) and will be routed to the perimeter drainage system.

In addition, the surface has intermediate drainage swales to reduce the flow lengths down the final cover slope, also aiding in erosion control. Where needed, the intermediate drainage swales are connected to downslope channels to control storm water runoff and prevent erosion of the final cover.

- Per 257.102(d)(3)(i)(D) and NR 504.12(4)(b)(4), the design of the existing final cover system minimizes disruptions to the final cover system. Stability of the final cover system was assessed as part of the WDNR landfill permitting process. The stability calculations are included in **Appendix A1**.

- Per 257.102(d)(3)(i)(D) and NR 504.12(4)(b)(4), the design of the future Module 1 final cover system minimizes disruptions to the final cover system. Stability of the final cover system was assessed as part of the WDNR landfill permitting process. The stability calculations are included in **Appendix A2**.

- Per 257.102(d)(3)(ii)(C) and NR 504.12(4)(b)(4), the design of the final cover system north of Module 1 minimizes disruptions to the final cover system. Stability of the final cover system was assessed as part of the WDNR landfill permitting process. The stability calculations are included in **Appendix A3**.

The design of the final cover system accommodates settling and subsidence of the CCR fill below the cover. The CCR at COL is placed dry and is compacted in place. CCR continues to consolidate and gain strength as filling progresses prior to final cover placement. The final cover system is designed with a maximum slope of 25 percent (4 horizontal to 1 vertical). Because the final cover has a relatively large positive slope and the CCR has been gaining strength over time, the final cover is expected to easily accommodate the remaining relatively minor settlement potential of the CCR fill when fill placement ends and the landfill is closed.

Construction of each of the final cover systems will be performed per methods and procedures described in NR 504, NR 516, and the site-specific Construction Quality Assurance / Quality Control Plan. All final cover materials will be tested to confirm they meet the code requirements and project documents. Barrier soil, rooting zone, and topsoil layers will be checked for thickness. All areas will be restored after final cover is placed. Vegetation will be monitored and maintained. Construction activities will be documented by a licensed engineer.

4.0 MAXIMUM INVENTORY OF CCR

40 CFR 257.102(b)(1)(iv) *"An estimate of the maximum inventory of CCR ever on-site over the active life of the CCR unit."*

NR 514.07(10)(c)(4) *"An estimate of the maximum volume in cubic yards of CCR that will be disposed on–site over the active life of the CCR landfill."*

The following table reflects the estimated maximum volume of CCR disposed on-site at the COL facility.

Area	Maximum Capacity (cy)
Phase 1, Modules 1-6, Phase 2, Modules 10-13	3,630,075

The estimated maximum inventory of CCR ever on-site over the active life of the CCR landfill units is based on the design capacity of the landfill. The maximum design capacity was submitted in the WDNR 2023 Plan of Operation Update, Addendum 2.

5.0 LARGEST AREA OF CCR UNIT REQUIRING FINAL COVER

40 CFR 257.102(b)(1)(v) *"An estimate of the largest area of the CCR unit ever requiring a final cover as required by paragraph (d) of this section at any time during the CCR unit's active life."*

NR 514.07(10)(c)(5) *"An estimate of the largest area of the CCR landfill that will require a final cover at any time during the CCR landfill's active life."*

The largest area of each CCR unit requiring final cover is the open area shown on **Figure 2**, with areas as follows:

Areas Requiring Final Cover (acres)	
Phase 1, Modules 1- 3	10.5
Phase 1, Modules 4-6	12.0
Phase 2, Modules 10-11	6.9
Phase 2, Modules 12-13	7.1
Total	**36.5**

6.0 SCHEDULE OF SEQUENTIAL CLOSURE ACTIVITIES

40 CFR 257.102(b)(1)(vi) *"A schedule for completing all activities necessary to satisfy the closure criteria in this section, including an estimate of the year in which all closure activities for the CCR unit will be completed."*

NR 514.07(10)(c)(6) *"A schedule for completion of all closure activities, including an estimate of the year in which all closure activities for the CCR landfill will be completed."*

CCR placement is anticipated to permanently end at this facility following retirement of the Columbia Generating Station by June 2026, as announced by WPL. Some CCR disposal activity may be necessary following retirement of Columbia as part of decommissioning efforts (for example, cleaning of ducts and other equipment that may contain CCR following retirement). Closure activities are expected to be complete by the end of 2027. The potential schedule for closure of the existing CCR modules was divided into two phases and is provided in **Appendix B.**

7.0 COMPLETION OF CLOSURE ACTIVITIES

40 CFR 257.102(f)(1) *"Except as provided for in paragraph (f)(2) of this section, the owner or operator must complete closure of the CCR unit:*

(i) For existing and new CCR landfills and any lateral expansion of a CCR landfill, within six months of commencing closure activities."

NR 506.083(3)(a) *"The owner or operator shall complete closure of the CCR landfill within 6 months of commencing closure activities."*

As shown on the enclosed schedule, closure of each CCR unit will be completed within 6 months of commencing closure activities.

40 CFR 257.102(f)(3) *"Upon completion, the owner or operator of the CCR unit must obtain a certification from a qualified professional engineer verifying that closure has been completed in accordance with the closure plan specified in paragraph (b) of this section and the requirements of this section."*

NR 506.083(1)(b) *"Within 30 days following completion of closure of a CCR landfill under sub. (3), the owner or operator shall prepare and submit a notification of closure to the department and place a copy in the facility's operating record. The notification shall include the certification required under s. NR 516.04(3)(d)."*

A qualified licensed engineer will oversee the final cover construction. The engineer will verify final cover materials and methods and oversee material testing. At the end of construction, the engineer will provide a report summarizing and documenting construction and will certify compliance with the requirements.

8.0 CERTIFICATION

40 CFR 257.102(b)(4) *"The owner or operator of the CCR unit must obtain a written certification from a qualified professional engineer that the initial and any amendment of the written closure plan meets the requirement of this section."*

NR 500.05 *"Unless otherwise specified, all submittals for review and approval of any initial site report, feasibility report, plan of operation site investigation report, remedial action options report, construction documentation report, or closure plan, or any modifications to those plans, shall include all of the following:*

(4) CERTIFICATION. (a) The reports and plan sheets shall be under the seal of a licensed professional engineer."

Phillip Gearing, PE, a licensed professional engineer in the State of Wisconsin has overseen the preparation of this Closure Plan. A certification statement is provided on **page iii** of this plan.

40 CFR 257.102(d)(2)(iii) *"The owner or operator of the CCR unit must obtain a written certification from a qualified professional engineer that the design of the final cover system meets the requirement of this section."*

Phillip Gearing, PE, a licensed professional engineer in the State of Wisconsin has overseen the design of the final cover system and certifies that the design meets the requirements of 40 CFR 257.102(d). The certification statement is provided on **page iii** of this plan.

9.0 RECORDKEEPING AND REPORTING

40 CFR 257.102(b)(vi)(2)(iii) *"The owner or operator has completed the written closure plan when the plan including the certification required by paragraph (b)(4) of this section, has been placed in the facility's operating record as required by Section 257.105(i)(4)."*

NR 506.17(2)(e) *"The written operating record shall contain the plan of operation, plan modifications, construction documentation, department approvals, annual reports, inspection* *records, monitoring and corrective action records, notifications to the department, and records of public comments received during any public comment period."*

The Closure Plan will be placed in the facility's operating record and on Alliant Energy's CCR Rule Compliance Data and Information website.

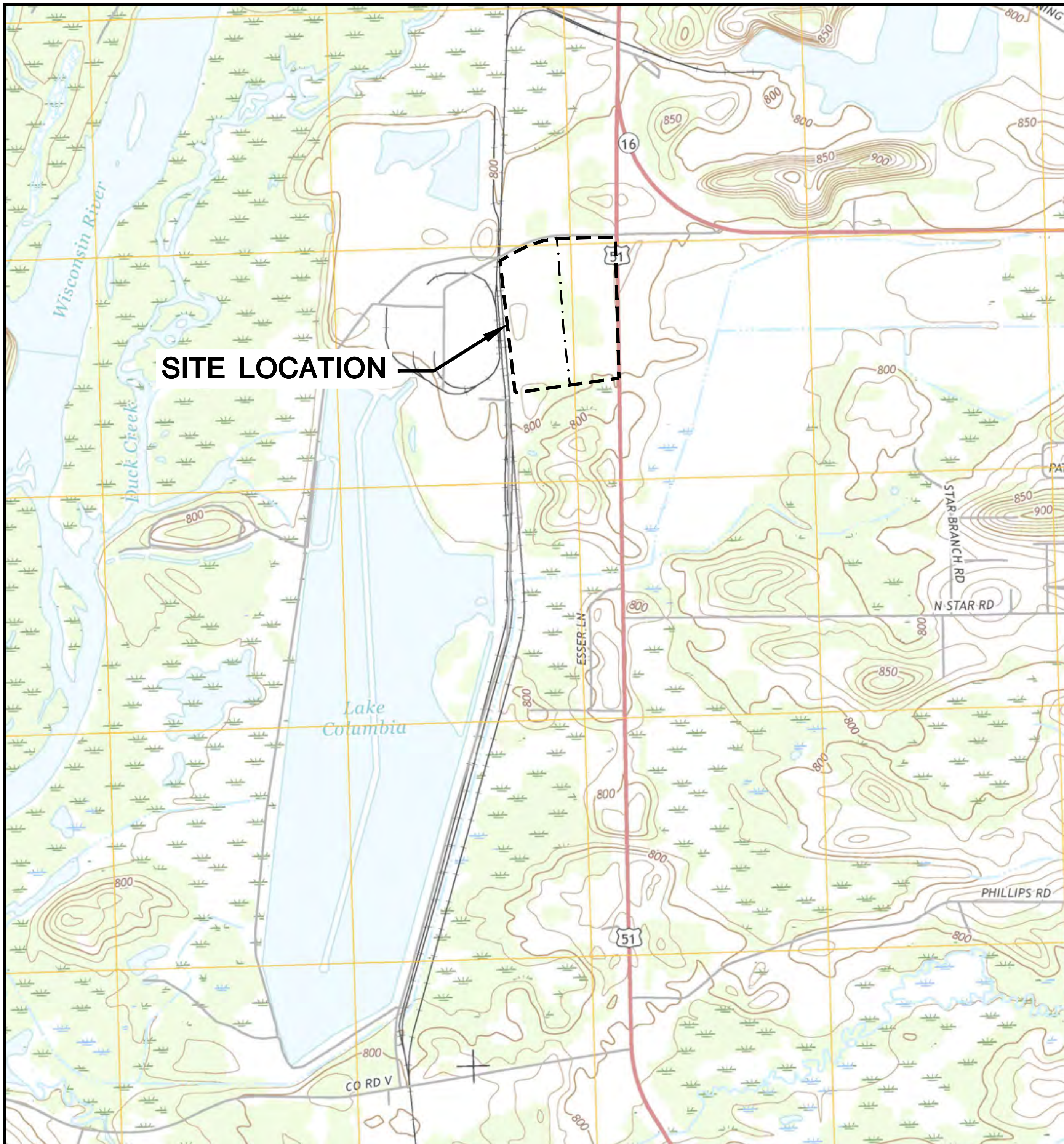
Amendments to the written Closure Plan will be done when a new module is constructed, when there is a change in the operation of the CCR unit that affects the plan, or when unanticipated events warrant revision to the written Closure Plan as required by 40 CFR 257.102(b)(3) and NR 514.07(10)(c)(7).

WPL will provide notification as follows:

- Intent to initiate closure
- Closure completion
- Availability of the written Closure Plan and any amendments

All notifications will be placed in the facility's operating record and on the website per 40 CFR 257.105(i), 257.106(i), 257.107(i), and NR 506.17(2).

Figures



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POYNETTE QUADRANGLE
WISCONSIN–COLUMBIA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
2016
SCALE: 1" = 2,000'

CLIENT	WISCONSIN POWER AND LIGHT COLUMBIA ENERGY CENTER W8375 MURRAY ROAD PARDEEVILLE, WISCONSIN 53954	SITE	CLOSURE PLAN COLUMBIA DRY ASH DISPOSAL FACILITY TOWN OF PACIFIC, WISCONSIN
	SITE LOCATION MAP		

PROJECT NO.	25222260.00	DRAWN BY:	AHB	ENGINEER	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	FIGURE
DRAWN:	08/09/2016	CHECKED BY:	RJG			1
REVISED:	12/28/2022	APPROVED BY:	PEG 01/31/23			

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LEGEND

- ASH DISPOSAL FACILITY LIMITS
- APPROVED LIMITS OF ASH FILL
- PHASE/MODULE LIMIT
- 810 EXISTING GRADE (5' CONTOUR)
- EXISTING GRADE (1' CONTOUR)
- PAVED ROAD
- UNPAVED ROAD
- RAILROAD TRACKS
- VEGETATION
- FENCE
- SWALE
- EDGE OF WATER
- APPROXIMATE LIMITS OF EXISTING LEACHATE/SURFACE WATER POND LINER
- CULVERT
- TRANSMISSION TOWER
- WATER SUPPLY WELL
- STAFF GAUGE
- WATER TABLE WELL
- PIEZOMETER
- SURFACE WATER SAMPLE LOCATION
- LYSIMETER
- ABANDONED WATER TABLE WELL
- ABANDONED PIEZOMETER
- BENCHMARK
- PROPOSED FINAL GRADE (2' CONTOUR)
- 820 PROPOSED FINAL GRADE (10' CONTOUR)
- ACTIVE LANDFILL AREA
- PROPOSED DIVERSION BERM
- PROPOSED DOWNSLOPE FLUME
- CLOSED AREA
- AREA TO BE CLOSED WITH FINAL COVER (SAND DRAINAGE LAYER)
- AREA TO BE CLOSED WITH FINAL COVER (GEOCOMPOSITE DRAINAGE LAYER)
- AREA OF LEACHATE/SURFACE WATER POND TO BE ABANDONED

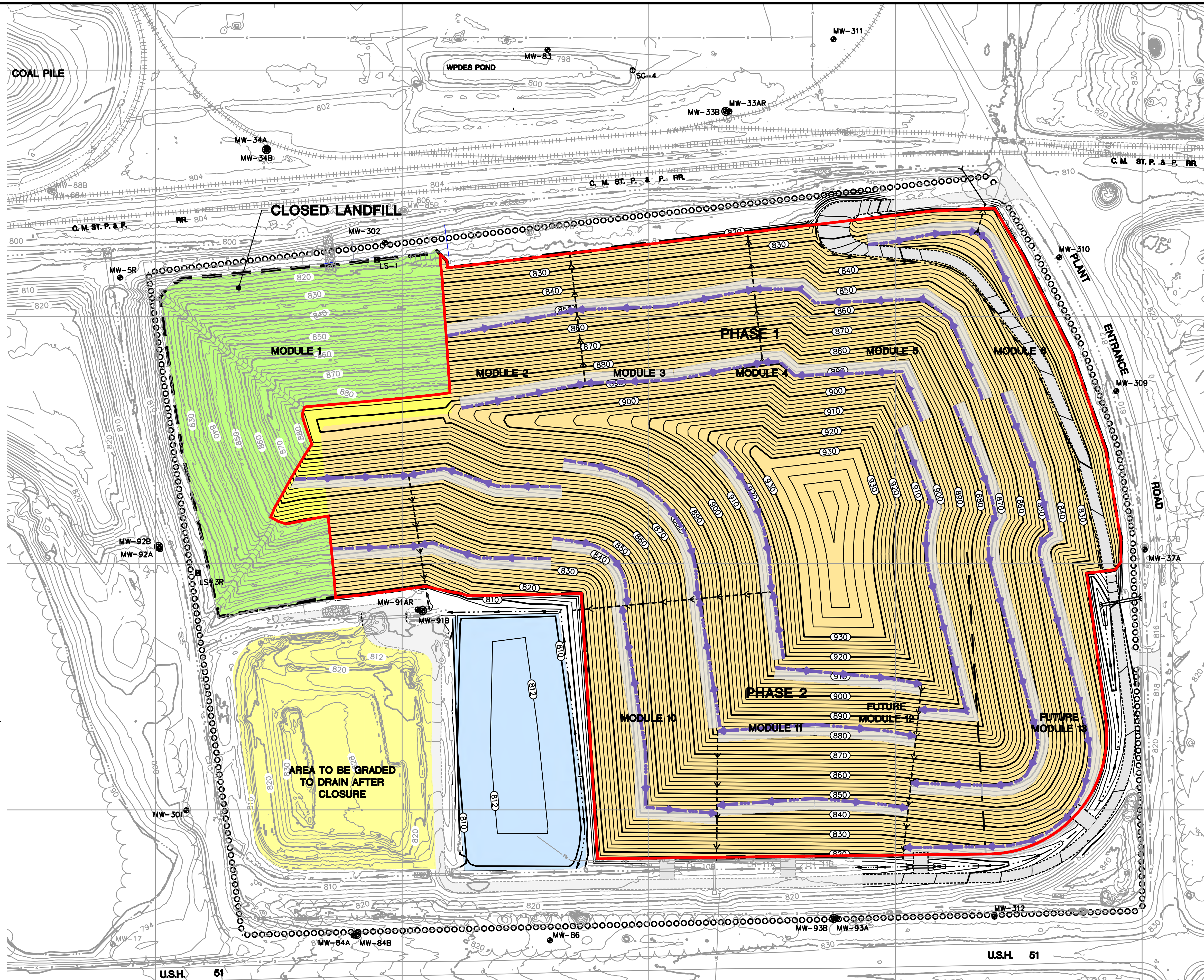
NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEYS BY SCS ENGINEERS IN MAY 2019, DECEMBER 2020, NOVEMBER 2021, AND DECEMBER 2021, AND BY DRONE SURVEYS BY AMES IN NOVEMBER 2022, JANUARY 2023, AND JUNE 2023.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AUGUST 2012, AND JANUARY 2016, AND BY SCS ENGINEERS IN MAY 2019.

N

200 0 200

SCALE: 1" = 200'



CLOSURE PLAN

CLOSURE PLAN
COLUMBIA DRY ASH DISPOSAL FACILITY
TOWN OF PACIFIC, WISCONSIN

SITE

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

ENGINEER

FIGURE 2

WISCONSIN POWER AND LIGHT
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WISCONSIN 53954

CLIENT

PROJECT NO.	25222260.00	DRAWN BY:	KP/MJT
DRAWN:	11/30/2021	CHECKED BY:	PEG
REVISED:	09/01/2023	APPROVED BY:	PEG 09/01/23

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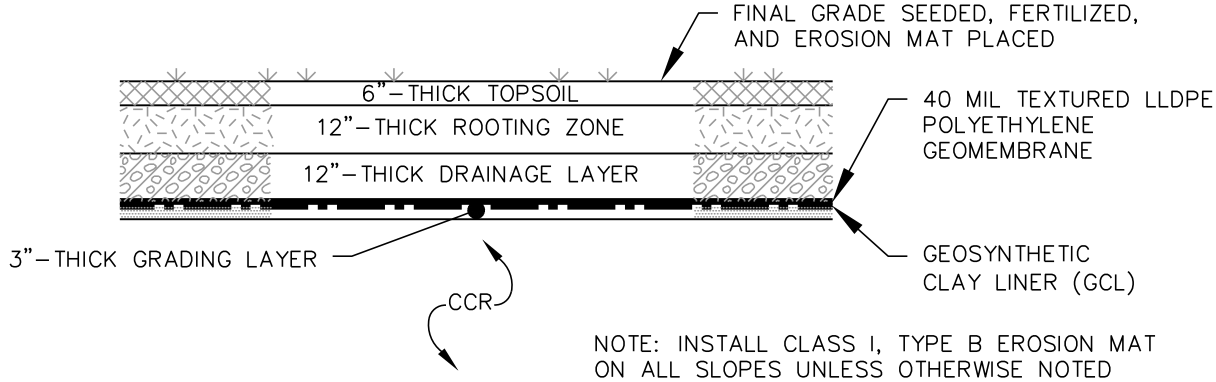
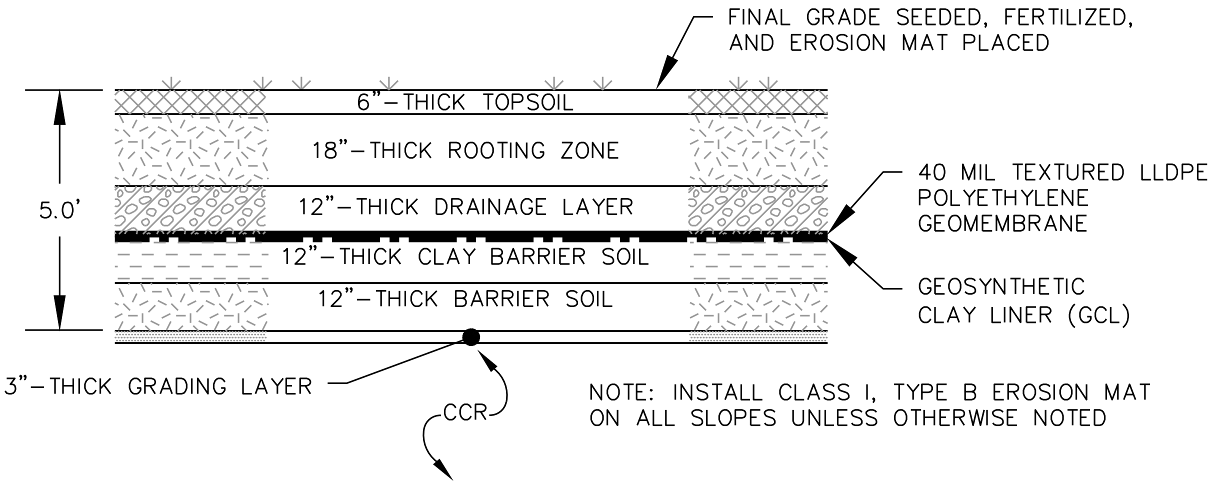


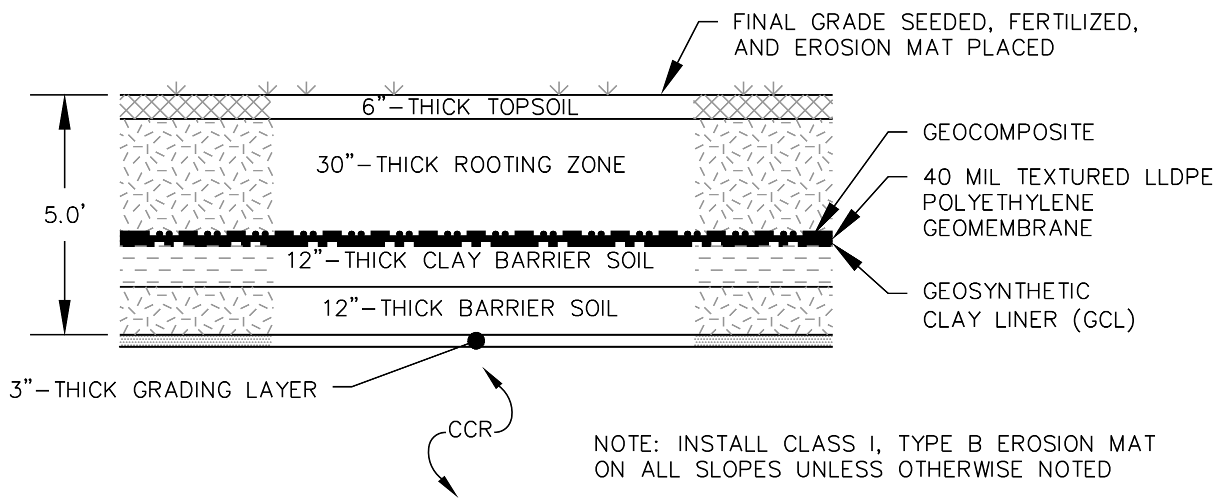
EXISTING FINAL COVER SYSTEM

SCALE: 1" = 4'



FINAL COVER SYSTEM (SAND DRAINAGE LAYER)

SCALE: 1" = 4'



FINAL COVER SYSTEM (GEOCOMPOSITE DRAINAGE LAYER)

SCALE: 1" = 4'

CLIENT	SITE	
WISCONSIN POWER AND LIGHT COLUMBIA ENERGY CENTER W8375 MURRAY ROAD PARDEEVILLE, WISCONSIN 53954	CLOSURE PLAN COLUMBIA DRY ASH DISPOSAL FACILITY TOWN OF PACIFIC, WISCONSIN	FINAL COVER SYSTEM

				ENGINEER	FIGURE
PROJECT NO.	25222260.00	DRAWN BY:	KP/MJT	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	3
DRAWN:	08/17/2016	CHECKED BY:	PEG		
REVISED:	08/18/2023	APPROVED BY:	PEG 09/01/2023		

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Appendix A

Stability Calculations

Appendix A1

Existing Final Cover Stability Calculations

BT SQUARED
CIVIL & ENVIRONMENTAL ENGINEERING

		Sheet No. 1	
		Calc. No.	
		Rev. No.	
Job No. 4071	Job: Columbia Ash Generation Landfill	By: PEG	Date 9/23/10
Client: Alliant	Subject: Liner Side Slope Drainage Layer Stability	Chk'd: DLN	Date 9/24/10

EVALUATION:

Evaluate the Phase 1 landfill liner side slope drainage layer for static veneer slope stability.

The side slope on the modules base runs at a 3:1 slope for an approximate maximum of 80 feet.

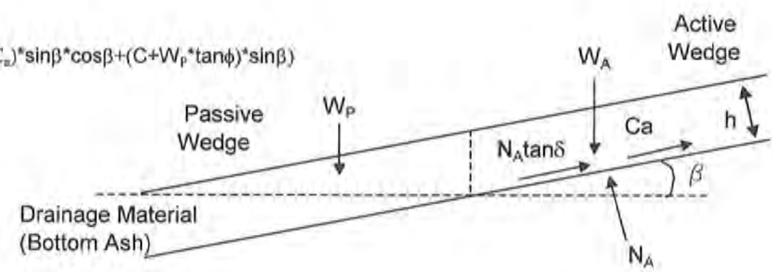
The following calculations evaluate the static veneer slope stability of the 3:1 slope.

REFERENCES:

1.) Koerner, Robert M. & Te-Yang Soong, Analysis and Design of Veneer Cover Soils, Geosynthetic Research Institute.
2.) U.S. Department of Transportation - Federal Highway Administration Recycled Materials, Coal Bottom Ash User's Guide

EQUATIONS:

$FS = (-b+(b^2-4*a*c)^{1/2})/(2*a)$
$a = (W_A-N_A*\cos\beta)*\cos\beta$
$b = -((W_A-N_A*\cos\beta)*\sin\beta*\tan\phi+(N_A*\tan\delta+C_a)*\sin\beta*\cos\beta+(C+W_P*\tan\phi)*\sin\beta)$
$c = (N_A*\tan\delta+C_a)*(\sin\beta)^2*\tan\phi$
$N_A = W_A*\cos\beta$
$W_A = \gamma*h^2*(L/h-1/\sin\beta-\tan\beta/2)$
$W_P = (\gamma*h^2)/\sin 2\beta$
$C_a = c_a(L-h/\sin\beta)$

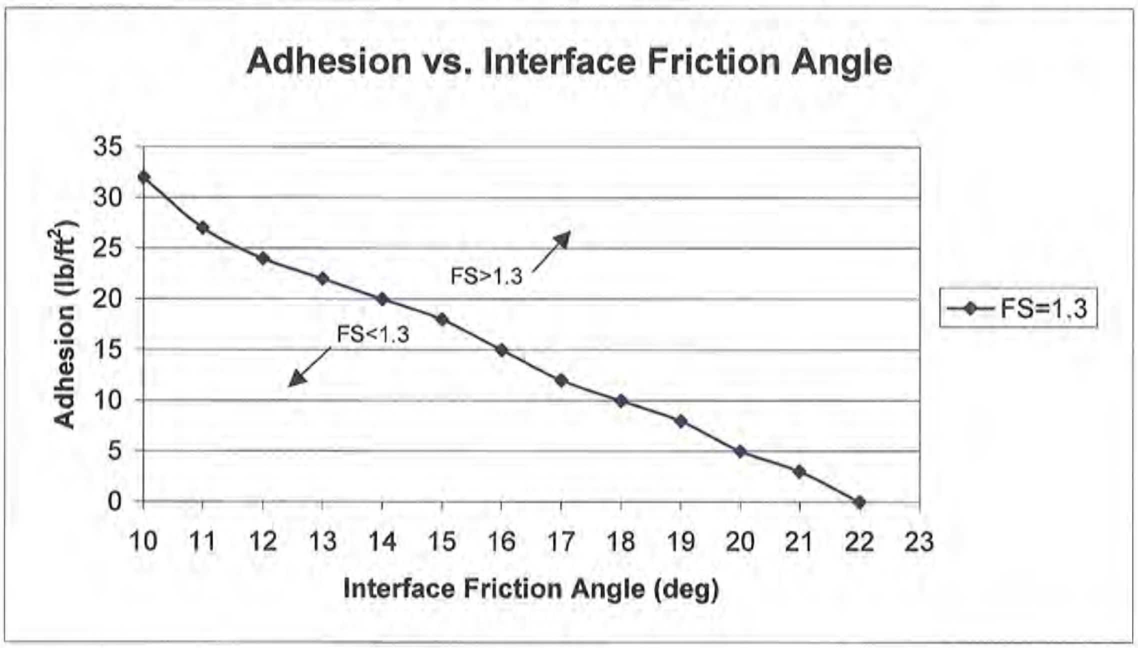


DEFINITIONS OF VARIABLES:

FS = Factor of Safety
a, b, & c = intermediate variables (= calculated variable)
N_A = Effective force normal to the failure plane of the active wedge (= calculated variable)
W_A = Total weight of active wedge (= calculated variable)
W_P = Total weight of passive wedge (= calculated variable)
β = Soil slope angle beneath the geomembrane (= 18.42 degrees or 0.322 radians based on liner slope of 3 to 1)
ϕ = Friction angle of the drainage layer material (= 35 degrees 0.611 radians based on Ref #2)
δ = Interface friction angle for liner system geosynthetics (to be determined)
c_a = Adhesion for liner system geosynthetics at active wedge (to be determined) , Variable
γ = Unit weight of the drainage layer material (= 135 pcf based on conservative wet density of bottom ash).
C = Cohesive force along the failure plane of the passive wedge (assumed 0 for drainage layer material)
C_a = Adhesive force of the active wedge for the liner system geosynthetics
h = Thickness of the drainage layer material(= 1.0 foot based on base design)
L = Length of slope measured along the geomembrane (= 80 feet based on base design)

CALCULATIONS:

δ		c_a	W_A	W_P	N_A	C_a	a	b	c	FS
(deg)	(rad)	(lb/ft^2)	(lb/ft)	(lb/ft)	(lb/ft)	(lb/ft)	(lb/ft)	(lb/ft)	(lb/ft)	
10	0.175	32	10,350	225	9,820	2,459	981	-1,535	293	**1.3**
11	0.192	27	10,350	225	9,820	2,075	981	-1,473	279	**1.3**
12	0.209	24	10,350	225	9,820	1,844	981	-1,457	275	**1.3**
13	0.227	22	10,350	225	9,820	1,690	981	-1,465	277	**1.3**
14	0.244	20	10,350	225	9,820	1,537	981	-1,473	279	**1.3**
15	0.262	18	10,350	225	9,820	1,383	981	-1,482	281	**1.3**
16	0.279	15	10,350	225	9,820	1,153	981	-1,468	277	**1.3**
17	0.297	12	10,350	225	9,820	922	981	-1,455	274	**1.3**
18	0.314	10	10,350	225	9,820	768	981	-1,465	277	**1.3**
19	0.332	8	10,350	225	9,820	615	981	-1,477	279	**1.3**
20	0.349	5	10,350	225	9,820	384	981	-1,465	277	**1.3**
21	0.367	3	10,350	225	9,820	231	981	-1,478	280	**1.3**
22	0.384	0	10,350	225	9,820	0	981	-1,468	277	**1.3**



CONCLUSION:

The landfill liner side slope drainage layer was evaluated for static veneer slope stability along its longest slope. Calculations were performed to determine the minimum adhesion necessary for a range of interface friction angles to reach a FS of 1.3 or greater. Each interface friction angle and the coinciding adhesion was graphed in order to easily determine if a material interface is acceptable along the side slope.

BT SQUARED

		Sheet No.	1 of 1
		Calc. No.	
		Rev. No.	
Job No. 4071	Job: Columbia Ash Generation Landfill	By PEG	Date 9/27/10
Client: Alliant	Subject: GCL Internal Shear for Liner System	Chk'd DLN	Date 9/29/10

Purpose: Determine the maximum shear stress acting on a Geosynthetic Clay Liner (GCL) and the GCL internal shear strength required to provide a minimum slope stability safety factor (FS) of 1.5 for the liner system.

Approach: Use maximum shear stress formula and assumed values.

References: **Design of GCL Barrier for Final Cover Side Slope Applications**
Gregory N. Richardson, Ph.D., P.E. Geosynthetics '97 - 541

Calculation: The maximum shear stress acting on the GCL can be calculated as follows:

$$\tau_{act} = W_T \sin \beta$$

$$\beta = 18.4°$$
$$W_T = \gamma * h$$

Where,

γ = Ash Unit Weight = 135 pcf

h = drainage layer thickness = 1 ft

$$W_T = 135 \text{ psf}$$

$$\tau_{act} = 42.6 \text{ psf}$$

$$FS = \frac{\tau_{resist}}{\tau_{act}} = 1.5$$

$$\tau_{resist} = FS * \tau_{act} = 1.5 * 42.6 = 64 \text{ psf}$$

Assumptions: 1. Slope angle, β=18.4° (3:1 horizontal/vertical liner side slope).

2. Ash unit weight, γ = 135 pcf

Conclusions: For a total weight of the leachate drainage layer of 135 psf and a slope angle of 3:1, the maximum shear stress will be 42.6 psf. A minimum GCL internal shear strength of 64 psf is required to provide a slope stability safety factor of 1.5.