FORM I
SOIL EROSION AND SEDIMENTATION CONTROLS

Prepared 6/2003; Revised 9/2010, 8/2013, 11/2017, 05/2018**, 10/2025**

This Minor Permit Modification presents the installation of a temporary geomembrane tarp and calculations for associated stormwater and E&S controls.

Form I - Table of Contents

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised
Prepared 06/2003; Revised 09/2010, 08/2013, 11/2017, 05/2018, 10/2025
DEP USE ONLY
Date Received

FORM I
SOIL EROSION AND SEDIMENTATION CONTROLS

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form I, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: 273.151, 275.205, 277.151, 279.232, 281.132, 283.106, 288.151, 289.252, 291.205, 293.232, 295.132, 297.106

SECTION A. SITE IDENTIFIER

Applicant/permittee: *Westmoreland Sanitary Landfill, LLC*

Site Name: *Sanitary Landfill*

Facility ID (as issued by DEP): *100277*

SECTION B. EROSION AND SEDIMENT CONTROL

Provide a plan for the control of erosion and sedimentation on land within the permit area, all borrow areas and adjacent areas to be disturbed by construction activities. Include a narrative describing the implementation of the plan, its relationship to the overall staging of earth moving activities, and detailed design and construction plans and specifications for each structure or facility used in the plan. The plan must be site specific for each phase of construction. Include design assumptions, runoff calculations, channel profiles, cross sections, channel linings, and applicable details on attached Data Sheet for all collection and interceptor ditches. Provide documentation on the capacity of existing drainage system and the effect that storage or disposal activities will have on the drainage. Show discharge points to natural drainageways and all culverts that carry drainage away from the site. Plans and maps shall contain all details necessary for construction of the structures. ***Refer to Form I , Attachment I-1 through Attachment I-3.***

SECTION C. DIVERSION CONTROLS

Provide a plan for the collection and conveyance to a natural drainageway of the runoff from up slope undisturbed areas. Include design calculations, profiles, cross sections, and applicable details for each structure, ditch, or channel used for diverting runoff. The diversion control and erosion and sedimentation control plan shall be based on the requirements of Chapter 102 (Erosion and Sedimentation Control) of the Department's regulations. Calculations indicating water quantities shall be based on a 24-hour precipitation event with a frequency of once in 25 years. More stringent criteria may be required by the Department based on the most recent edition of the USDA-SCS, *Engineering Field Manual for conservation Practices,* or as otherwise determined necessary by the Department. ***Refer to Form I , Attachment I-1 through Attachment I-3.***

SECTION D. ACCESS ROADS (Residual Waste Facilities Must Submit Form 23R)

Access roads shall have drainage system that is compatible with the natural contours, structurally stable, and capable of passing safely the peak flow from a 25-year, 24-hour precipitation event.

Provide the following information for each haul road to be used in the operation.

a) Show the location on the application's topographic maps;

b) Description and typical cross sections showing the construction of each access road including existing and proposed contours, grades, slopes, culvert locations, outlet protection, and other drainage control;

c) Measures to control and prevent erosion and sedimentation; include proposed spacing of sediment traps, turnouts, cross drains, culverts, check dams, stabilized ditches, erosion resistant surfacing, etc.;

d) Plan for reclamation after the operation is completed;

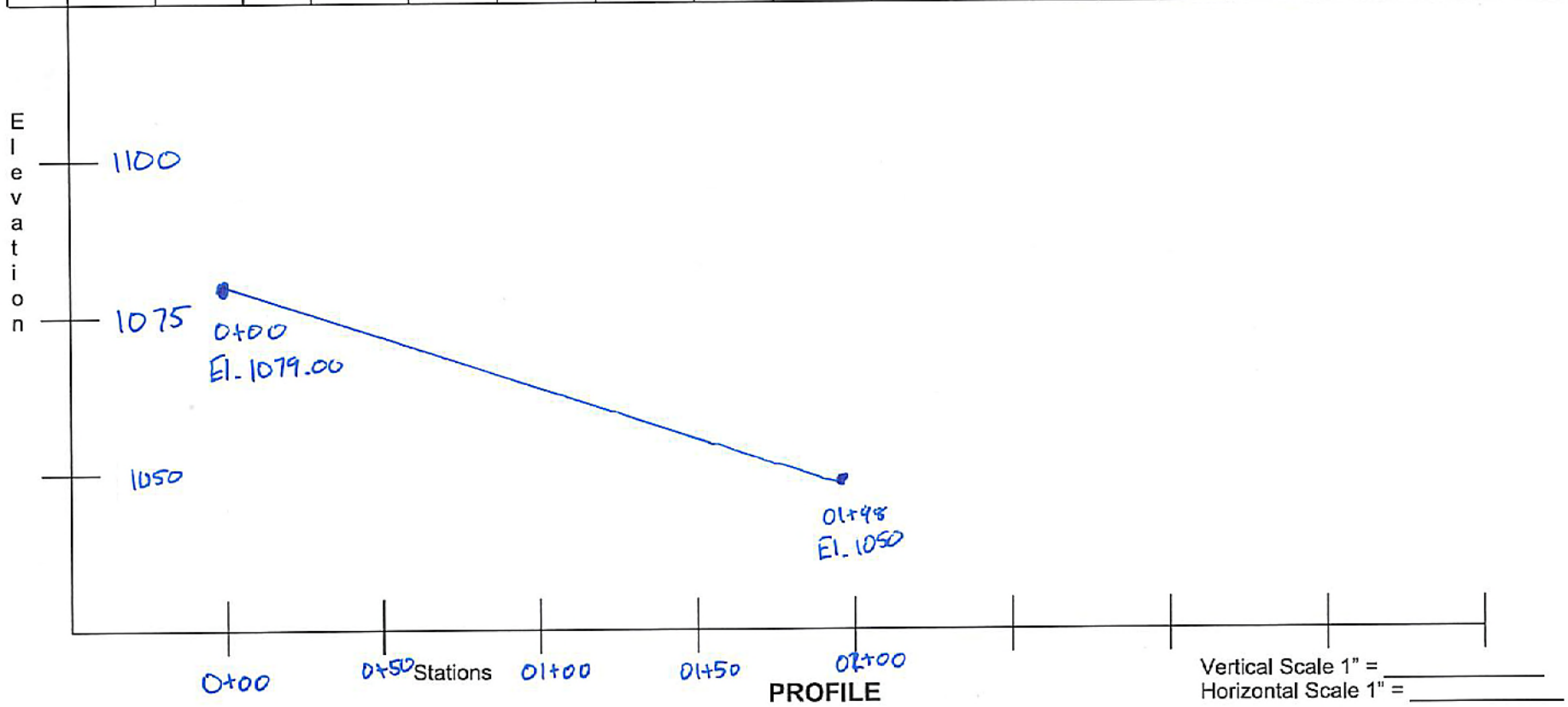
Refer to Form I , Attachment I-1 through Attachment I-3.

FORM I
DIVERSION/COLLECTION DITCH DATA SHEET

Title: *Leachate Pre-treatment Mod.*	Site: *Sanitary Landfill*		
Prepared by: *Civil Design Solutions*	Telephone Number: *412-299-2700*	Date: *10/2025*	Sheet *1* of *1*

Estimated Peak Storm Intensity: *3.93* (in./hr.) ***Design Calculations:*** *Channel A1*

Station																With Freeboard		
Start End	Elevation	Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope %	Peak Discharge Q (cfs)	Channel Bed Slope (%)	Freeboard (ft.)	Channel Lining	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes (%)	Flow Area (sq. ft.)	Flow Depth (ft.)	Top Flow Width (ft.)	Flow Velocity (ft./sec.)	Q Available (cfs)	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available (cfs)
0+00	1079.0																		
1+98	1050.0	0.42	25	22	56.86	14.65	1.31	Riprap	0.030	1.0	1H:1V	0.23	0.19	4.4	1.48	56.86	1.5	4.0	56.86

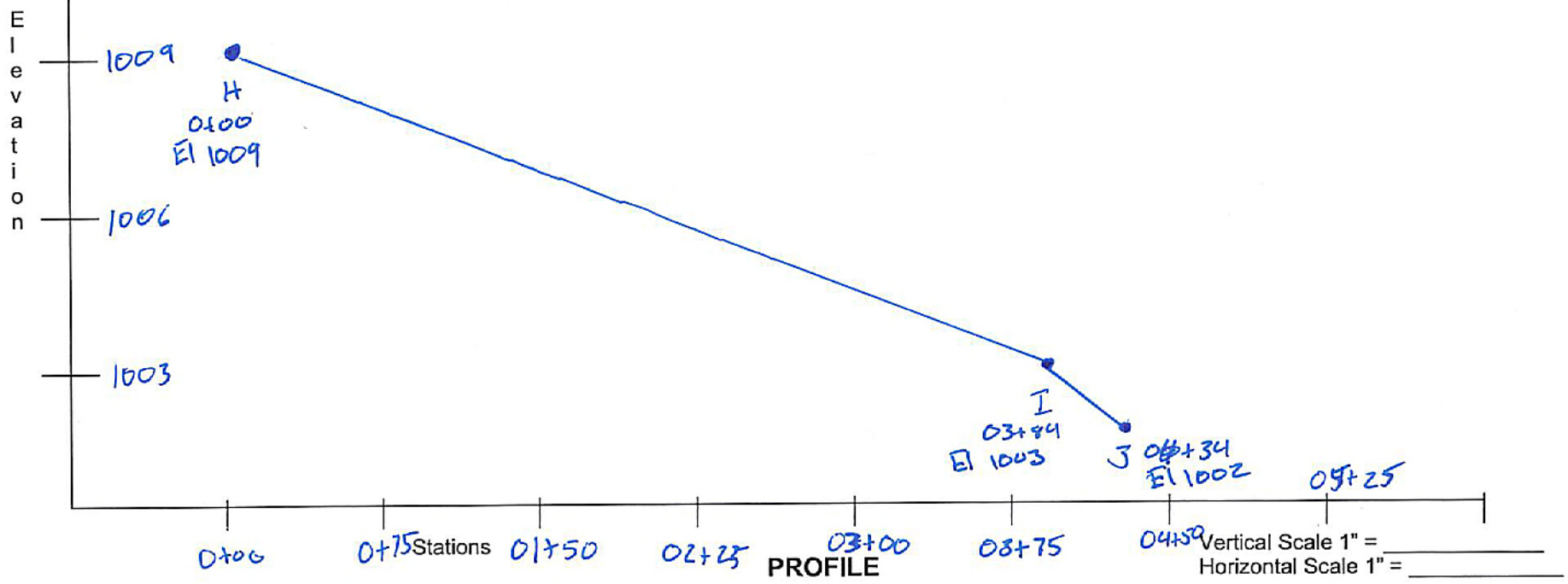


FORM I
DIVERSION/COLLECTION DITCH DATA SHEET

Title: ***Leachate Pre-treatment Mod.***	Site: ***Sanitary Landfill***		
Prepared by: ***Civil Design Solutions***	Telephone Number: ***412-299-2700***	Date: ***10/2025***	Sheet *1* of *1*

Estimated Peak Storm Intensity: *3.93* (in./hr.) ***Design Calculations:*** ***Channel B***

Station		Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope %	Peak Discharge Q (cfs)	Channel Bed Slope (%)	Freeboard (ft.)	Channel Lining	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes (%)	Flow Area (sq. ft.)	Flow Depth (ft.)	Top Flow Width (ft.)	Flow Velocity (ft./sec.)	Q Available (cfs)	With Freeboard		
Start End	Elevation																Channel Depth (ft.)	Top Channel Width (ft.)	Q Available (cfs)
H-I	1009.0 1003.0		25	2.45															
I-J	1003.0 1002.0	7.1	25	2.45	7.88	1.53	0.99	Riprap	0.030	4.0	2H:1V	2.56	0.51	5.3	3.12	59.09	1.5	10.0	59.09



SECTION E. SEDIMENTATION PONDS

Sedimentation ponds and other impoundments must be constructed in accordance with the requirements of Chapter 102 and this permit before any earthmoving activities start in the drainage area. Each impoundment must be inspected during construction by or under the supervision of a registered professional engineer, licensed in Pennsylvania, and certified by the Department upon completion of construction.

Any enlargement, reduction in size, reconstruction, or other modification that may affect the stability or operation must be approved by the Department. Ponds must be certified and approved by the Department prior to the start of storage or disposal activities.

Identification ***Sedimentation Pond C***
U.S.G.S. Quadrangle _____ Location: Latitude ***40⁰ 08' 45"*** ; Longitude ***79⁰ 51' 20"***
Or Location from Bottom Right corner of U.S.G.S. Quadrangle; inches North: _____ inches West: _____
HYDROLOGY: Drainage area ***34-ac*** acres; Design Storm ***25-yr, 24-hr*** Average Watershed Slope ***Varies***
Land Use ***Landfill*** Soil Type ***Varies*** Curve Number ***82*** Peak Discharge ***Q=5.07-cfs***

Embankment	Top Width (Minimum)	*12-ft*
	Outside Slope (Maximum)	*Max. 2H:1V*
	Inside Slope (Maximum)	*2.5H:1V*
	Top Elevation	*El. 967*
	Upstream Toe Elevation	*Varies*
	Liner Material (earthen, synthetic, etc.)	*Existing Soil and Rock*
Impoundment Dimensions and Capacities	Length at Bottom	*200-ft (Average)*
	Width at Bottom	*80-ft (Average)*
	Length at Crest of Principal Spillway	*260-ft (Average)*
	Width at Crest of Principal Spillway	*160-ft (Average)*
	Depth from Crest of Principal Spillway	*15-ft*
	Length at Crest of Emergency Spillway	*280-ft (Average)*
	Width at Crest of Emergency Spillway	*175-ft (Average)*
	Volume at Crest of Principle Spillway	*303,375-cf*
Principal Spillway	Time of Detention	
	Maximum Sediment Storage Volume	*138,605-cf*
	Shape (Circular, semi-circular, trapezoid, etc.)	*Circular*
	Dimensions (W x H x L)	*48-in Riser / 36-in Barrel*
	Inlet Elevation	*Invert El. 956.92*
	Slope and Length	*87-ft @ 0.087%*
	Discharge Elevation	*El. ~956.16*
	Spillway Capacity	*76.76-cfs @ El. 1061.6*
	Construction Material	*CMP*
Dewatering Device	Type/Size	*Perforations in Riser*
	Inlet Elevation	*El. 958.33, Lowest Row*
	Discharge Controls (i.e. self draining or valved)	*Self Draining*
	Discharge Capacity (maximum)	*4.38-cfs @ El. 963.60*
	Time to Dewater Full Pond	*2.6-days*
Emergency Spillway	Shape	*Trapezoidal Channel, 6:1 Side Slopes*
	Dimensions (W x H x L)	*12-ft W x 1-ft H x 20-ft L*
	Slope	*N/A*
	Discharge Elevation	*El. 966 (Invert)*
	Type of Lining/Protection	*R-4 Rip-Rap*
	Spillway Capacity (provide design calculations)	*Q25=9.04-cfs*

FORM I – SOIL EROSION AND SEDIMENTATION CONTROLS

ATTACHMENT I-2
EXHIBIT I-2.6.3

EXISTING SEDIMENTATION BASIN C

The Channel Design Drawings presented with the November 2025 Response to PADEP Comments identifies that an additional watershed area of 3.21-ac will drain to Existing Sedimentation Basin C as part of the grading for the Leachate Pre-Treatment Area grading and channels. This additional watershed area of 3.21-ac in addition to the previous design watershed area of 29.8-ac results in a total watershed area of 33.01-ac.

The approved calculations for Existing Sedimentation Basin C utilized a design watershed area of 34-ac. Therefore, the Existing Sedimentation Basin C is adequately sized to handle the additional watershed area due to the Leachate Pre-Treatment Area grading and channels proposed as part of this Minor Permit Modification.

FORM I – SOIL EROSION AND SEDIMENTATION CONTROLS

ATTACHMENT I-2
EXHIBIT I-2.10

GAS PROCESSING PLANT AREA

The calculations attached to Attachment I-2, Exhibit I-2.11, provide channel and culvert calculation checks for the existing gas processing plant. These calculations show that the existing design is adequate to handle flow from Channel B1 and Channel B2.

FORM I – SOIL EROSION AND SEDIMENTATION CONTROLS

ATTACHMENT I-2
EXHIBIT I-2.11

LEACHATE PRE-TREATMENT PLANT
CHANNEL CALCULATIONS

Civil Design Solutions, Inc.

PROJECT	**WESTMORELAND SANITARY LANDFILL**	PROJECT NO.	**2024-098**
LEACHATE PRE-TREATMENT PLANT		PAGE	OF

MADE BY	**KAF**	DATE	**10/2025**	CHECKED BY	**DWM**	DATE	**10/2025**

INTRODUCTION This calculation involves the estimation of peak flows and design of the surface water channels for the Evergreen Landfill closure. Peak flows utilized for channel sizing have been estimated by use of the SCS TR-55 (Soil Conservation Services Technical Release - 55) graphical peak method. All channels have been designed for the 25-year 24-hour storm event, as the requirements of the 25 Pa. Code § 273.

This design includes newly designed channel for the proposed Leachate Pre-Treatment Plant (B1) and a confirmation that the existing Gas Plant Area Channel and Culvert will perform adequetly with the revised watershed areas as part of the Leachate Pre-Treatment Plant for this site. This design also includes a diversion channel A1 which will collect stormwater from existing sections of the landfill.

HYDROLOGY The peak flow to the channel have been estimated using the computer program HydroCAD, which will use the SCS TR-55 Method to calculate the time of concentration of the channel reach, the composite runoff curve number describing the reach's watershed. estimate the flow.

Using the curve number tool in HydroCAD, the following runoff coefficients will be utilized.

CN DATA	
Description	**CN**
Impervious	98
Newly Graded	91
Meadow, non-grazed*	78
Woods, Fair*	79

(*) Used to check confirm the design of Channel for Gas Plant Design is adequate.

As per the TR-55 methods, times of concentration will be estimated as the sum of sheet flow, shallow flow and channel flow. Similar to the calculation of a composite CN above. Maximum sheet flow length will be 200-ft consistent with TR-55. Sheet flow time will be estimated by use of the SCS Kinematic Wave Equation, identified below. Channels where the calculation of a Sheet Flow time of concentration was not performed, a time of 0.1-hrs was assigned.

$$\text{Sheet Flow } T_C = \left[\frac{0.007\,(nL)^{0.8}}{\sqrt{P_2}\,(S^{0.4})} \right]$$

Where:

$\text{Sheet Flow } T_C = \text{Travel Time, hr}$

$L = \text{Length of flow path, ft}$

$n = \text{Roughness Coefficient}$

$S = \text{Surface Slope, ft/ft}$

$P_2 = \text{Rainfall Depth } 2-\text{yr}, 24-\text{hr storm, inch}$

Shallow flow times of concentration will be estimated depending on paved/unpaved condition of the flow path, identified below.

$$\text{Shallow Flow } T_C = \left[\frac{1}{\text{Factor}\left(\sqrt{S}\right)3600} \right]$$

Where:

Shallow Flow T_C = Unit Travel Time, hr/ft

Factor = 16.1345 for Unpaved, 20.3282 for Paved

S = Surface Slope, ft/ft

Channel flow times of concentration will be estimated as part of the channel cross section design, utilizing actual flow depth and velocity information.

All channels have been designed utilizing the 25-year 24-hour storm event. Flows in the channels have been estimated for other storm frequencies also. The rainfall values for this site listed below, have been taken from the NOAA Atlas 14 on-line database (report included here). This site is located within areas applicable to SCS rainfall distribution II.

RAINFALL DATA		
Frequency	**Duration**	**Depth (in)**
2 yr	24 hr	2.37
10 yr	24 hr	3.32
25 yr	24 hr	3.93
50 yr	24 hr	4.43
100 yr	24 hr	4.93

CHANNELS

With the peak discharge for each channel, the channel cross section is sized and a channel lining material is selected (from the channel lining design options, included below). Flow properties within the channels are estimates from Manning's Equation:

$$V = \frac{Q}{A} = 1.49\frac{R^{2/3}\sqrt{S_f}}{n} = 1.49\frac{\left[\frac{A}{WP}\right]^{2/3}\sqrt{S_f}}{n}$$

Where:

V = Velocity, fps

Q = Flowrate, cfs

A = Cross – Sectional area of flow, sf

R = Hydraulic Radius, ft

WP = Wetted Perimeter, ft

S_f = Slope of channel, ft / ft

n = Manning's roughness coefficient

All channels have been designed trapezoidal in cross sectional shape. Sizing of channels have been selected for constructability and maintenance. In addition to the selection of a size for each channel, the lining material has been selected from the following information. Maximum velocity checks for the channels are performed as part of the computer design, an additional check is done to verify Shear Stress applied to the lining.

The check of Shear Stress is presented in a spreadsheet summary included with the channel designs. Shear Stress is checked using the following equation

$$\tau_D = 62.4(d)S$$

Where :

τ_D = Shear Stress, lb/sf

S = Channel Slope, ft/ft

d = Flow Depth, ft

CHANNEL LININGS			
Material	n	Vmax (fps)	τ_s max (lb/sf)
Grass	0.035 (6)	4.0 (7)	1.00 (3)
Matting (1)	0.030 (5)	12.0	6.00 (2)
Gabion	0.027 (4)	22.0 (4)	8.35 (4)
Grouted RipRap	0.030 (8)	20.0 (8)	13.0 (8)
Chute	0.030 (9)	20.0 (9)	13.0 (9)
HDPE (10)	0.013 (10)	22.0 (10)	10.00 (10)
Grout	0.027	20.0	13.0

1. The term Matting is used to reference synthetic (non-degradable) matting which reinforces the base of vegetation within the channel.
2. Taken as average of manufacturer reported maximum shear stress of 3 lb/sf for long term unvegetated and 10 lb/sf for short term vegetated.
3. Vegetative Liners Class C. Taken from Table 6, Page 21, Reference 5.
4. Taken from Table 13, Page 31, Reference 5.
5. See Reference 5 for maximum velocities and allowable shear stress based on riprap size.
6. Taken from Table 12, Page 26, Reference 5.
7. Taken from Table 7a, Page 23, Reference 5.
8. The Manning's n has been taken to be 0.030 which is reported as a typical value for grouted riprap as shown in Table 2.1 of the Federal Highway Administration Hydraulic Engineering Circular 15. This channel lining has been taken to have a maximum shear stress of 13.0-lb/sf and a maximum allowable velocity of 20-fps matching that shown for Grout in this same table.
9. Chute lining shall include Grouted Rirap to be used as part of all downchute channel construction. The design Manning's n, maximum velocity and maximum shear stress have been specified to match the Grouted Riprap specifications also presented on this table.
10. HDPE lining shall consist of geomembrane channels lined with a HDPE piping. While this material is expected to have superior resistance to maximum velocities and shear stresses, values have been provided here for calculation purposes.

Following the selection of the channel cross section and lining, the freeboard is also checked. The procedure for checking freeboard is clearly presented on the spreadsheet titled "Surface Water Channel Design Freeboard Verifications"

REFERENCES

1. Soil Conservation Service, URBAN HYDROLOGY FOR SMALL WATERSHEDS, Technical Release 55, June 1986.

2. Soil Conservation Service, ENGINEERING FIELD MANUAL FOR CONSERVATION PRACTICES, November 1986.

3. Ven Te Chow, OPEN CHANNEL HYDRAULICS, Mc-Graw Hill Book Company, 1959.

4. Goldman, Jackson and Bursztynsky, EROSION AND SEDIMENT CONTROL HANDBOOK, Mc-Graw Hill Book Company, 1986.

5. Commonwealth of Pennsylvania, Department of Environmental Protection, Bureau of Water Quality Protection, EROSION AND SEDIMENT POLLUTION CONTROL PROGRAM MANUAL, March 2000.

6. Pennsylvania State University, COMPUTATIONAL METHODS IN STORMWATER MANAGEMENT, short course reference document.

7. Hydrometerlogical Design Studies Center, DOC/NOAA/National Weather Service, Point Precipitation Frequency Estimates from NOAA Atlas 14.

ELEVATIONS

Point	Elevation
H	1009.0
I	1003.0
J	1002.0
K	1000.0
L	1004.0
M	1082.0
N	1072.0
O	1008.0
P	1079.0
Q	1050.0
R	1095.0

LENGTHS

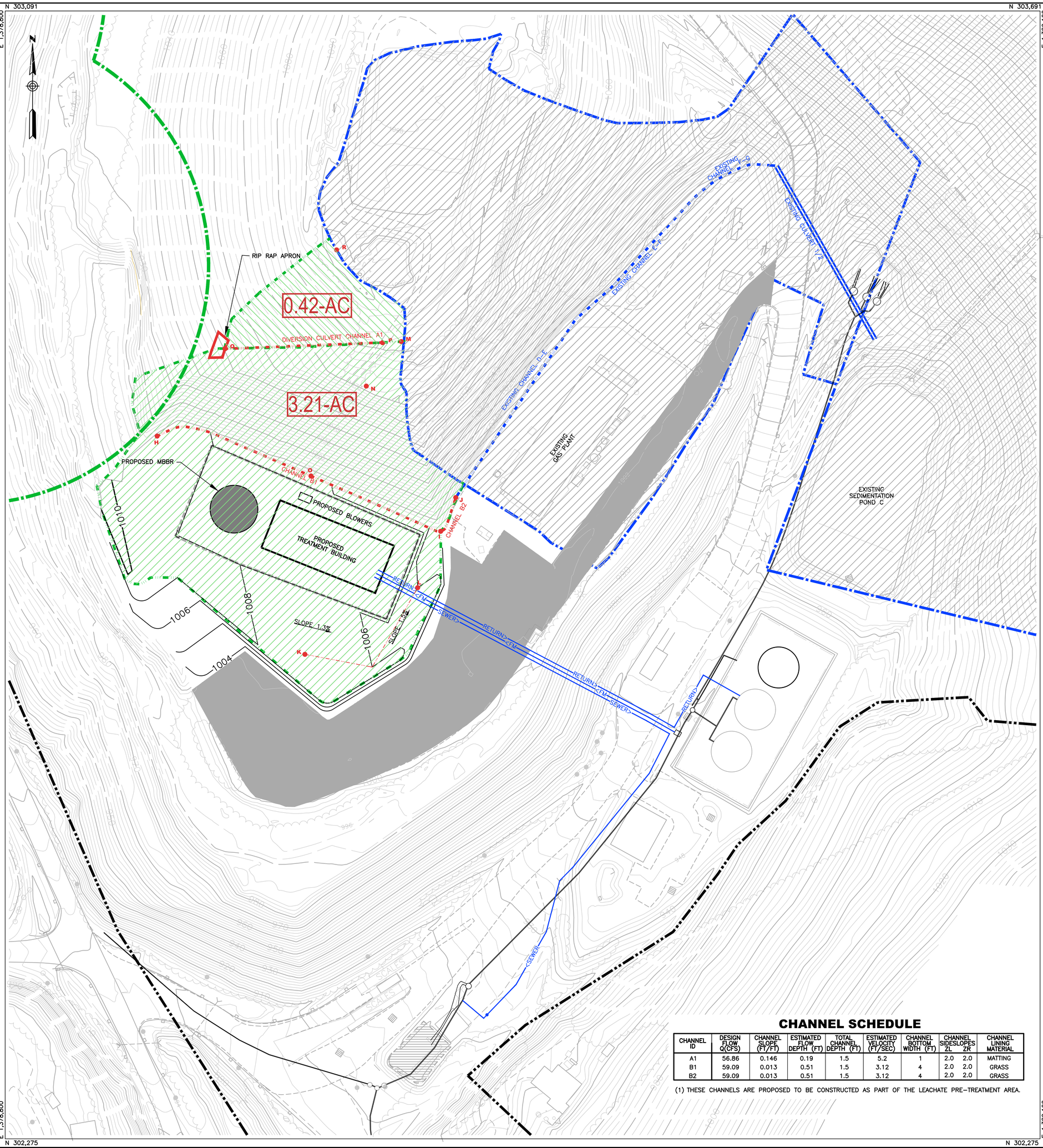
From	To	Length
H	I	484.00
I	J	50.00
K	L	200.00
M	N	72.00
N	O	133.00
P	Q	198.00
R	Q	189.00

N 303,091

N 303,691

E 1,378,800

E 1,380,100



N 302,275

N 302,275

E 1,378,800

E 1,380,100

SCALE IN FEET
0 50 100

CIVIL DESIGN SOLUTIONS, INC.
1331 State Avenue • Coraopolis, PA 15108
(412) 299-2700 • (412) 299-2922

LEGEND

- 1050 — 12/24/2024 AERIAL MAPPING CONTOUR (SEE NOTE 1)
- PROPERTY LINE / FACILITY LIMIT (WHERE SAME AS PROPERTY LINE)
- PADEP FACILITY LIMIT (WHERE SEPARATE FROM PROPERTY LINE)
- EXISTING PIPING
- PROPOSED PIPING
- EXISTING SURFACE WATER CHANNEL
- PROPOSED SURFACE WATER CHANNEL
- EXISTING CULVERT
- EXISTING ASPHALT PARKING LOT
- WATERSHED AREA FROM PREVIOUS CALCULATION
- LEACHATE PRE-TREATMENT PLANT ADDITIONAL WATERSHED AREA
- DIVERSION CHANNEL WATERSHED AREA
- R — DESIGN POINT

NOTES

1. DECEMBER 24, 2024 AERIAL MAPPING PERFORMED BY SOUTHERN RESOURCE MAPPING.
2. THIS DRAWING HAS BEEN PREPARED TO SHOW THE EXISTING LEACHATE CONVEYANCE AND STORAGE SYSTEMS AND THE MODIFICATIONS FOR CONNECTION TO THE ON-SITE TREATMENT AREA.

CHANNEL SCHEDULE

CHANNEL ID	DESIGN FLOW Q(CFS)	CHANNEL SLOPE (FT/FT)	ESTIMATED FLOW DEPTH (FT)	TOTAL CHANNEL DEPTH (FT)	ESTIMATED VELOCITY (FT/SEC)	CHANNEL BOTTOM WIDTH (FT)	CHANNEL SIDESLOPES ZL	ZR	CHANNEL LINING MATERIAL
A1	56.86	0.146	0.19	1.5	5.2	1	2.0	2.0	MATTING
B1	59.09	0.013	0.51	1.5	3.12	4	2.0	2.0	GRASS
B2	59.09	0.013	0.51	1.5	3.12	4	2.0	2.0	GRASS

(1) THESE CHANNELS ARE PROPOSED TO BE CONSTRUCTED AS PART OF THE LEACHATE PRE-TREATMENT AREA.

REV	DATE		DESCRIPTION	BY	CHK
DES	KAF	10/31/25	PROJECT: SANITARY LANDFILL ROSTRAVER TWP., WESTMORELAND COUNTY, PA		
CHECK	DWM	10/31/25			
APPROVED	DWM	10/31/25	SHEET TITLE: **EROSIONS AND SEDIMENTATION PLAN**		
SCALE	1" = 50'				
ISSUED	10/2025				
REVISION	0				

WESTMORELAND SANITARY LANDFILL

FIGURE: 1

Sanitary Landfill - Surface Water Channel Design Freeboard Verifications

Channel	Channel Slope (So) (ft/ft)	Flow Depth (Dm) (ft)	Channel Depth (ft)	Channel Sideslope (_H:1V)	Channel Width (ft)	Selected Lining	Manning's n	Hydraulic Radius (R) (ft)	Flow Velocity (V) (fps)	Critical Slope (Sc) (ft/ft)	Flow Regime	Unstable Freeboard (ft)	Stable Freeboard (ft)	Actual Freeboard (ft)	Design Check
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
A1	0.146	0.19	1.5	1.0	1.0	Matting	0.03	1.24	5.2	0.002	Stable	-	0.50	1.31	OK
B1	0.013	0.51	1.5	2.0	4.0	Grass	0.030	0.98	3.12	0.006	Stable	-	0.50	0.99	OK
B2	0.013	0.51	1.5	2.0	4.0	Grass	0.030	0.98	3.12	0.006	Stable	-	0.50	0.99	OK
D-E	0.010	0.94	1.5	2.0	4.0	Riprap	0.030	1.24	4.74	0.007	Stable	-	0.50	0.56	OK
E-F	0.010	0.94	1.5	2.0	4.0	Riprap	0.030	1.24	4.74	0.007	Stable	-	0.50	0.56	OK
F-G	0.010	0.94	1.5	2.0	4.0	Riprap	0.030	1.24	4.74	0.007	Stable	-	0.50	0.56	OK

(1)-(9) Information taken from channel designs included with Permit Application.

(10) Calculated using equation below.

$$S_c = \frac{14.56(n^2)(\text{Area} / \text{Top Width})}{(\text{Hydraulic Radius})^{2/3}}$$

(11) Flow is Unstable if 0.7(Sc) < So < 1.3(Sc)

(12) Unstable F = 0.075(V)(Dm)

(13) Stable F = MIN(0.5-ft or 0.25(Dm))

(14) Actual Freeboard (12) = (3) - (2)

(15) Design check is "OK" if Actual Freeboard is larger than the required Freeboard

Sanitary Landfill
Surface Water Channel Lining Shear Stress Verifications

Channel	Channel Slope (So) (ft/ft)	Flow Depth (Dm) (ft)	Channel Bottom (ft)	Selected Lining	Estimated Shear (lb/sf)	Allowable Shear (lb/sf)	Lining Acceptable	Bottom Width to d Ratio	B to d Acceptable
	(1)	(2)		(3)	(4)	(5)		(6)	(7)
A1	0.146	0.19	1.00	Matting	1.73	6.00	OK	5.26	OK
B1	0.013	0.51	4.00	Grass	0.42	1.00	OK	7.84	OK
B2	0.013	0.51	4.00	Grass	0.42	1.00	OK	7.84	OK
D-E	0.010	0.94	4.00	Riprap	0.59	8.00	OK	4.26	OK
E-F	0.010	0.94	4.00	Riprap	0.59	8.00	OK	4.26	OK
F-G	0.010	0.94	4.00	Riprap	0.59	8.00	OK	4.26	OK

(1)-(3) Information taken from channel designs included with Permit Application.

(4) Calculated using shear stress equation below.

$$\tau = 62.4 * FlowDepth * ChannelSlope$$

(5) Taken from Channel Design Narrative for different materials.

(6) Calculated as [Channel Bottom Width] / [Flow Depth]

(7) Ratio is taken to be acceptable if it is less than 12.

NOAA Atlas 14, Volume 2, Version 3
Location name: Belle Vernon, Pennsylvania, USA*
Latitude: 40.1458°, Longitude: -79.8573°
Elevation: 1004 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.310** (0.281-0.342)	**0.370** (0.336-0.408)	**0.448** (0.406-0.494)	**0.507** (0.459-0.558)	**0.584** (0.526-0.641)	**0.642** (0.576-0.704)	**0.697** (0.623-0.763)	**0.754** (0.670-0.824)	**0.829** (0.735-0.904)	**0.885** (0.780-0.964)
10-min	**0.482** (0.437-0.531)	**0.577** (0.525-0.637)	**0.697** (0.630-0.768)	**0.783** (0.708-0.861)	**0.893** (0.804-0.981)	**0.973** (0.874-1.07)	**1.05** (0.938-1.15)	**1.12** (1.00-1.23)	**1.22** (1.08-1.33)	**1.29** (1.14-1.40)
15-min	**0.591** (0.535-0.651)	**0.706** (0.642-0.780)	**0.856** (0.774-0.943)	**0.964** (0.872-1.06)	**1.10** (0.993-1.21)	**1.20** (1.08-1.32)	**1.30** (1.16-1.43)	**1.40** (1.24-1.53)	**1.52** (1.35-1.66)	**1.61** (1.42-1.75)
30-min	**0.782** (0.708-0.861)	**0.945** (0.859-1.04)	**1.17** (1.06-1.29)	**1.34** (1.21-1.47)	**1.56** (1.40-1.71)	**1.72** (1.55-1.89)	**1.88** (1.68-2.06)	**2.04** (1.82-2.23)	**2.25** (2.00-2.46)	**2.41** (2.13-2.63)
60-min	**0.955** (0.865-1.05)	**1.16** (1.05-1.28)	**1.47** (1.33-1.62)	**1.70** (1.54-1.87)	**2.02** (1.82-2.22)	**2.27** (2.04-2.49)	**2.52** (2.25-2.75)	**2.77** (2.46-3.03)	**3.12** (2.76-3.40)	**3.39** (2.99-3.69)
2-hr	**1.10** (1.01-1.20)	**1.34** (1.23-1.46)	**1.69** (1.54-1.84)	**1.96** (1.78-2.13)	**2.33** (2.12-2.52)	**2.63** (2.38-2.84)	**2.93** (2.64-3.16)	**3.24** (2.91-3.49)	**3.67** (3.26-3.94)	**4.00** (3.54-4.29)
3-hr	**1.17** (1.08-1.28)	**1.42** (1.30-1.54)	**1.78** (1.64-1.94)	**2.07** (1.90-2.25)	**2.46** (2.25-2.67)	**2.78** (2.53-3.02)	**3.12** (2.82-3.36)	**3.46** (3.11-3.72)	**3.94** (3.51-4.22)	**4.31** (3.81-4.62)
6-hr	**1.40** (1.29-1.53)	**1.68** (1.55-1.84)	**2.10** (1.93-2.29)	**2.43** (2.23-2.65)	**2.90** (2.65-3.15)	**3.29** (2.99-3.55)	**3.69** (3.34-3.98)	**4.11** (3.70-4.42)	**4.70** (4.19-5.04)	**5.17** (4.58-5.53)
12-hr	**1.66** (1.53-1.82)	**1.98** (1.82-2.17)	**2.44** (2.24-2.67)	**2.82** (2.58-3.07)	**3.37** (3.06-3.66)	**3.82** (3.46-4.13)	**4.29** (3.86-4.62)	**4.79** (4.28-5.15)	**5.50** (4.87-5.89)	**6.07** (5.34-6.48)
24-hr	**1.99** (1.86-2.13)	**2.37** (2.22-2.55)	**2.90** (2.70-3.11)	**3.32** (3.10-3.57)	**3.93** (3.65-4.21)	**4.43** (4.10-4.73)	**4.95** (4.57-5.27)	**5.49** (5.05-5.84)	**6.26** (5.72-6.64)	**6.87** (6.24-7.28)
2-day	**2.32** (2.18-2.49)	**2.76** (2.60-2.96)	**3.34** (3.14-3.58)	**3.81** (3.57-4.08)	**4.47** (4.18-4.77)	**5.00** (4.66-5.33)	**5.55** (5.15-5.90)	**6.11** (5.66-6.49)	**6.88** (6.34-7.31)	**7.50** (6.87-7.96)
3-day	**2.50** (2.34-2.67)	**2.96** (2.78-3.17)	**3.56** (3.34-3.81)	**4.04** (3.79-4.32)	**4.72** (4.41-5.03)	**5.26** (4.90-5.60)	**5.82** (5.41-6.19)	**6.38** (5.92-6.78)	**7.17** (6.61-7.61)	**7.78** (7.14-8.26)
4-day	**2.67** (2.51-2.85)	**3.16** (2.96-3.38)	**3.78** (3.54-4.03)	**4.28** (4.00-4.56)	**4.97** (4.64-5.29)	**5.52** (5.15-5.87)	**6.09** (5.66-6.47)	**6.66** (6.18-7.08)	**7.45** (6.88-7.91)	**8.07** (7.41-8.56)
7-day	**3.19** (3.01-3.38)	**3.76** (3.55-3.99)	**4.44** (4.18-4.71)	**4.98** (4.69-5.27)	**5.71** (5.37-6.04)	**6.28** (5.89-6.64)	**6.86** (6.42-7.24)	**7.44** (6.94-7.85)	**8.21** (7.62-8.66)	**8.80** (8.14-9.28)
10-day	**3.67** (3.48-3.88)	**4.32** (4.10-4.57)	**5.04** (4.79-5.33)	**5.62** (5.33-5.94)	**6.40** (6.05-6.75)	**7.00** (6.60-7.38)	**7.59** (7.15-8.00)	**8.19** (7.69-8.63)	**8.96** (8.39-9.44)	**9.54** (8.91-10.1)
20-day	**5.14** (4.91-5.40)	**6.02** (5.75-6.33)	**6.94** (6.62-7.30)	**7.67** (7.31-8.05)	**8.62** (8.20-9.05)	**9.35** (8.88-9.80)	**10.1** (9.53-10.5)	**10.7** (10.2-11.3)	**11.6** (11.0-12.2)	**12.3** (11.5-12.9)
30-day	**6.46** (6.16-6.77)	**7.54** (7.19-7.92)	**8.62** (8.21-9.04)	**9.46** (9.01-9.92)	**10.6** (10.0-11.1)	**11.4** (10.8-11.9)	**12.2** (11.5-12.8)	**12.9** (12.3-13.6)	**13.9** (13.2-14.6)	**14.6** (13.8-15.4)
45-day	**8.26** (7.91-8.61)	**9.62** (9.22-10.0)	**10.9** (10.4-11.3)	**11.8** (11.3-12.3)	**13.0** (12.5-13.6)	**13.9** (13.3-14.5)	**14.8** (14.1-15.4)	**15.5** (14.8-16.2)	**16.5** (15.7-17.3)	**17.2** (16.3-18.0)
60-day	**9.94** (9.55-10.4)	**11.5** (11.1-12.1)	**12.9** (12.4-13.5)	**14.0** (13.4-14.6)	**15.3** (14.7-16.0)	**16.3** (15.6-17.0)	**17.2** (16.4-17.9)	**18.0** (17.2-18.7)	**19.0** (18.1-19.8)	**19.6** (18.8-20.5)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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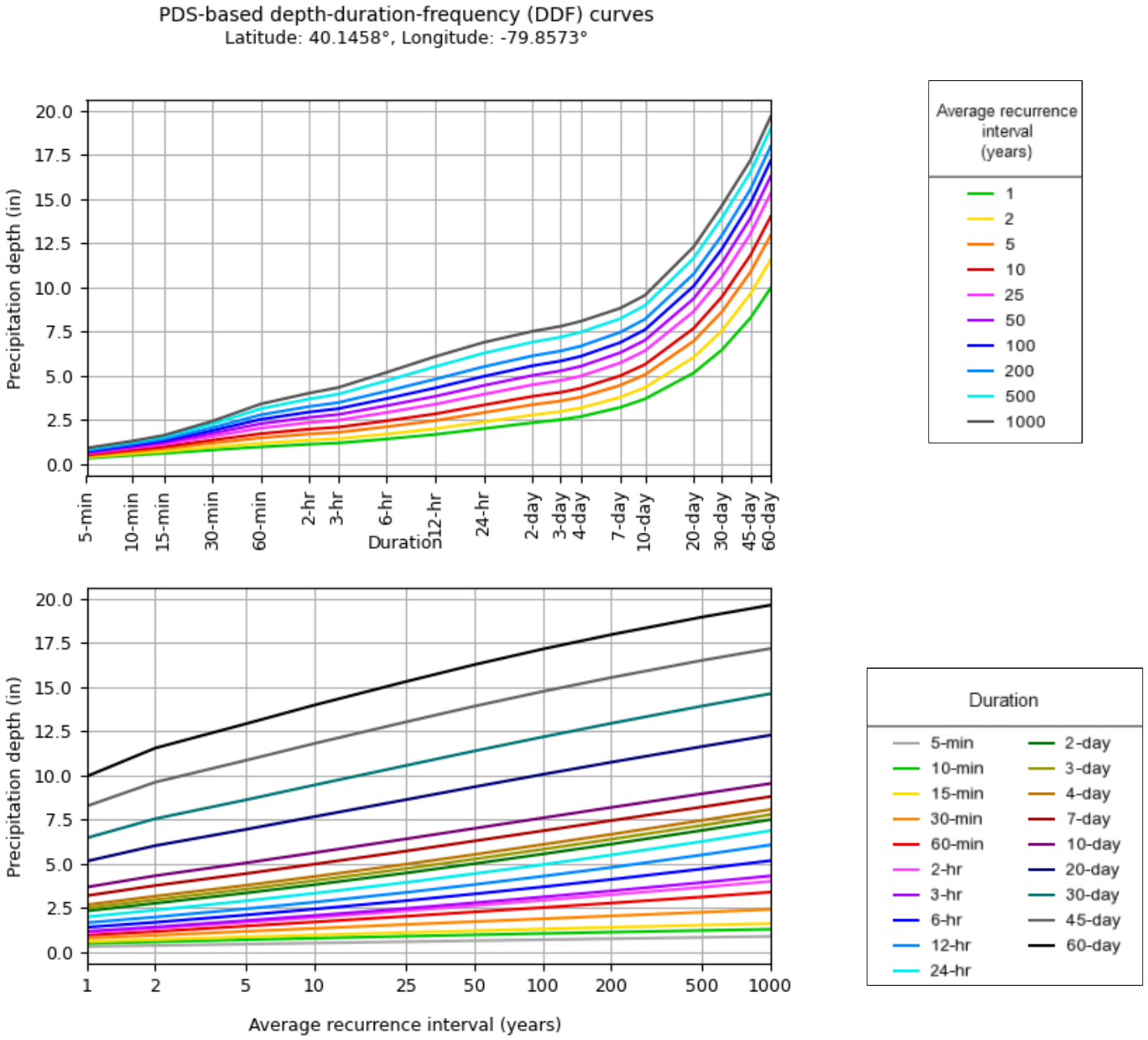
PF graphical



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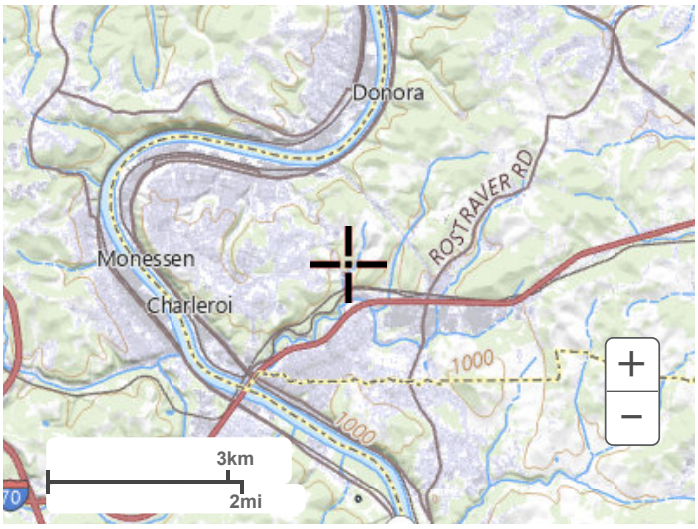
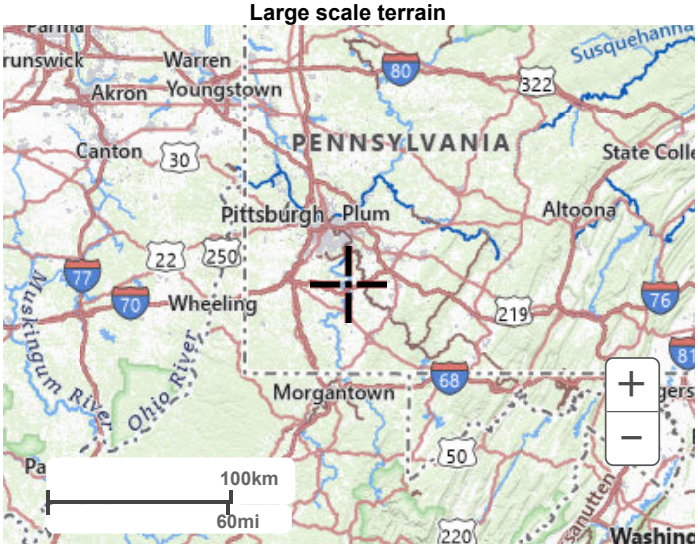
Maps & aerials

Small scale terrain



Large scale terrain



Large scale map

Large scale aerial

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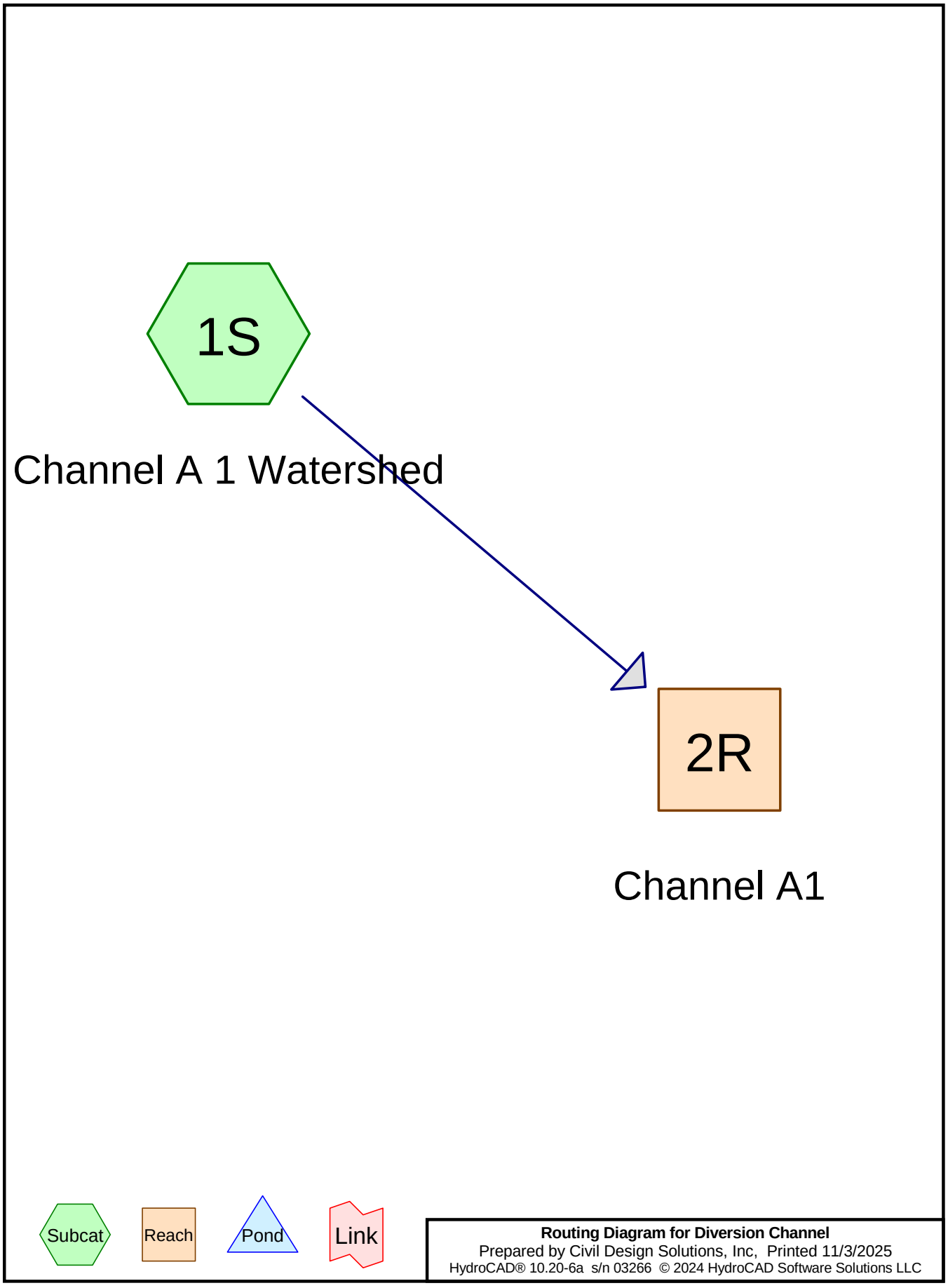


Routing Diagram for Diversion Channel
Prepared by Civil Design Solutions, Inc, Printed 11/3/2025

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.420	78	Meadow, non-grazed, HSG D (1S)
0.420	**78**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.420	HSG D	1S
0.000	Other	
0.420		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.420	0.000	0.420	Meadow, non-grazed	1S
0.000	**0.000**	**0.000**	**0.420**	**0.000**	**0.420**	**TOTAL AREA**	

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 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 1S: Channel A 1 Watershed Runoff Area=0.420 ac 0.00% Impervious Runoff Depth=1.83"
Flow Length=387' Tc=9.8 min CN=78 Runoff=1.17 cfs 0.064 af

Reach 2R: Channel A1 Avg. Flow Depth=0.19' Max Vel=5.20 fps Inflow=1.17 cfs 0.064 af
n=0.030 L=198.0' S=0.1465 '/' Capacity=56.86 cfs Outflow=1.15 cfs 0.064 af

Total Runoff Area = 0.420 ac Runoff Volume = 0.064 af Average Runoff Depth = 1.83"
100.00% Pervious = 0.420 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Channel A 1 Watershed

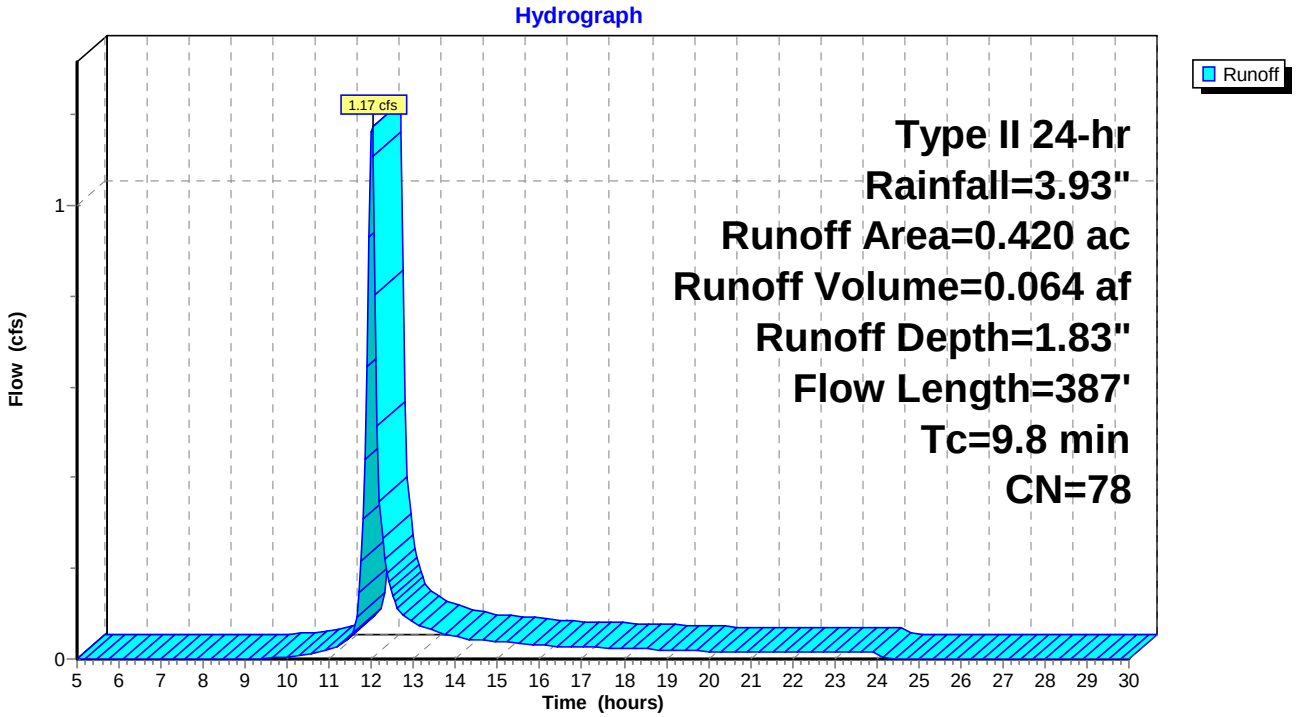
Runoff = 1.17 cfs @ 12.02 hrs, Volume= 0.064 af, Depth= 1.83"
Routed to Reach 2R : Channel A1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=3.93"

Area (ac)	CN	Description
0.420	78	Meadow, non-grazed, HSG D
0.420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	198	0.1460	21.83	305.66	**Channel Flow, Channel Flow P-Q** Area= 14.0 sf Perim= 11.3' r= 1.24' n= 0.030
9.6	189	0.0022	0.33		**Shallow Concentrated Flow, Point R-Q** Short Grass Pasture Kv= 7.0 fps
9.8	387	Total			

Subcatchment 1S: Channel A 1 Watershed



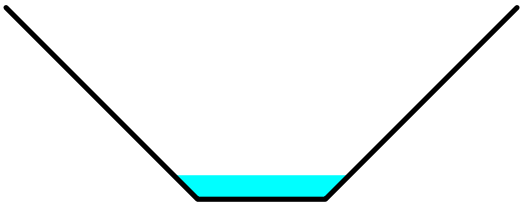
Summary for Reach 2R: Channel A1

Inflow Area = 0.420 ac, 0.00% Impervious, Inflow Depth = 1.83"
Inflow = 1.17 cfs @ 12.02 hrs, Volume= 0.064 af
Outflow = 1.15 cfs @ 12.04 hrs, Volume= 0.064 af, Atten= 2%, Lag= 1.2 min

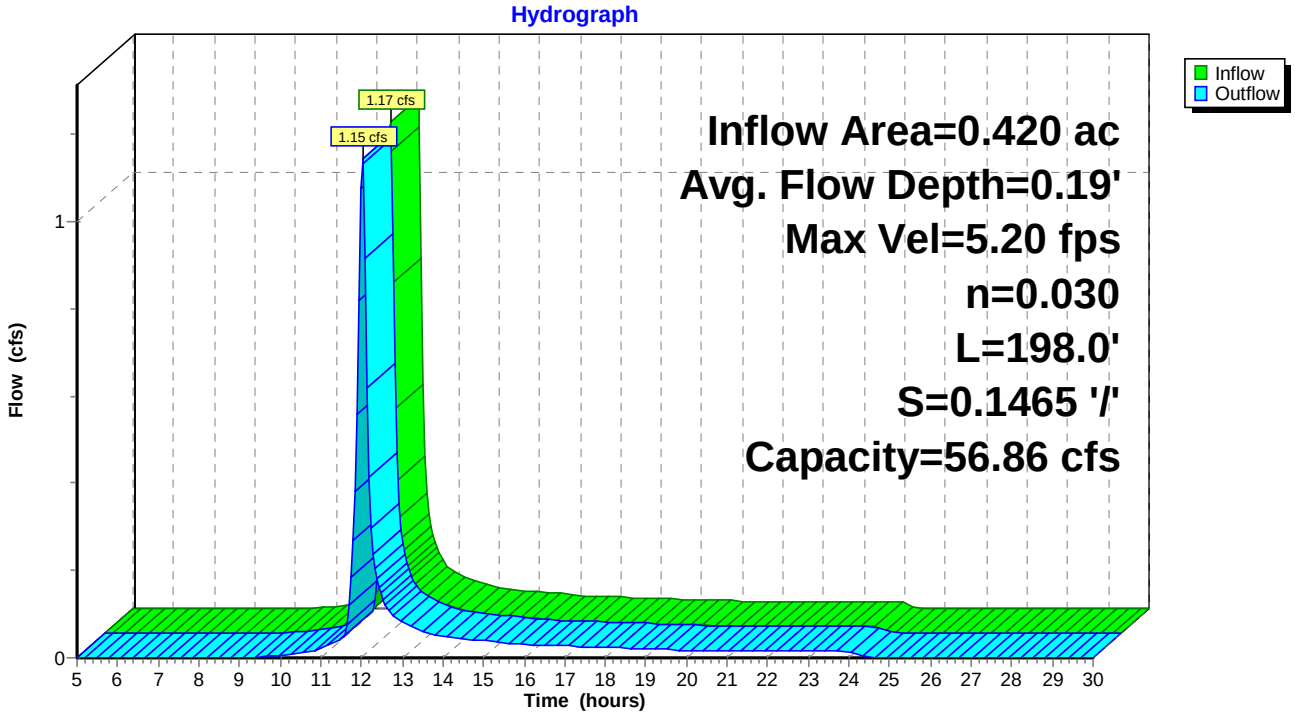
Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.20 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.48 fps, Avg. Travel Time= 2.2 min

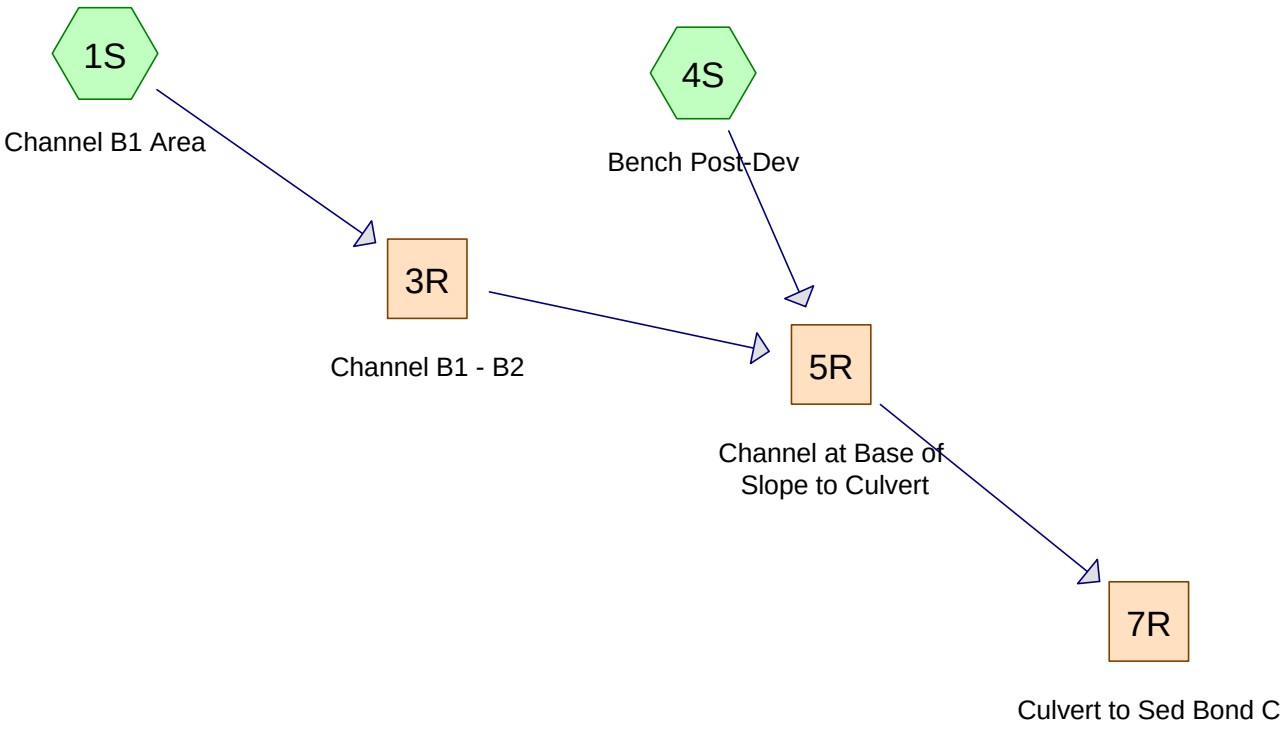
Peak Storage= 44 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 1.38'
Bank-Full Depth= 1.50' Flow Area= 3.8 sf, Capacity= 56.86 cfs

1.00' x 1.50' deep channel, n= 0.030
Side Slope Z-value= 1.0 '/' Top Width= 4.00'
Length= 198.0' Slope= 0.1465 '/'
Inlet Invert= 1,079.00', Outlet Invert= 1,050.00'



Reach 2R: Channel A1





Subcat Reach Pond Link

Routing Diagram for Channel Calcs
Prepared by Civil Design Solutions, Inc, Printed 11/3/2025

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.140	91	Graded (1S)
5.080	98	Impervious (1S, 4S)
0.500	78	Meadow, non-grazed, HSG D (4S)
2.560	79	Woods, Fair, HSG D (4S)
9.280	**91**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
3.060	HSG D	4S
6.220	Other	1S, 4S
9.280		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	1.140	1.140	Graded	1S
0.000	0.000	0.000	0.000	5.080	5.080	Impervious	1S, 4S
0.000	0.000	0.000	0.500	0.000	0.500	Meadow, non-grazed	4S
0.000	0.000	0.000	2.560	0.000	2.560	Woods, Fair	4S
0.000	**0.000**	**0.000**	**3.060**	**6.220**	**9.280**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	7R	994.00	978.00	250.0	0.0640	0.030	0.0	60.0	0.0	

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 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 1S: Channel B1 Area Runoff Area=3.160 ac 63.92% Impervious Runoff Depth=3.36"
Flow Length=767' Tc=34.8 min CN=95 Runoff=7.95 cfs 0.885 af

Subcatchment 4S: Bench Post-Dev Runoff Area=6.120 ac 50.00% Impervious Runoff Depth=2.66"
Flow Length=1,025' Tc=14.8 min CN=88 Runoff=20.77 cfs 1.359 af

Reach 3R: Channel B1 - B2 Avg. Flow Depth=0.51' Max Vel=3.12 fps Inflow=7.95 cfs 0.885 af
n=0.030 L=434.0' S=0.0132 '/' Capacity=59.09 cfs Outflow=7.88 cfs 0.885 af

Reach 5R: Channel at Base of Slope to Avg. Flow Depth=0.94' Max Vel=4.74 fps Inflow=24.26 cfs 2.244 af
n=0.030 L=403.0' S=0.0151 '/' Capacity=98.41 cfs Outflow=23.76 cfs 2.244 af

Reach 7R: Culvert to Sed Bond C Avg. Flow Depth=0.97' Max Vel=8.78 fps Inflow=23.76 cfs 2.244 af
60.0" Round Pipe n=0.030 L=250.0' S=0.0640 '/' Capacity=285.51 cfs Outflow=23.50 cfs 2.244 af

Total Runoff Area = 9.280 ac Runoff Volume = 2.244 af Average Runoff Depth = 2.90"
45.26% Pervious = 4.200 ac 54.74% Impervious = 5.080 ac

Summary for Subcatchment 1S: Channel B1 Area

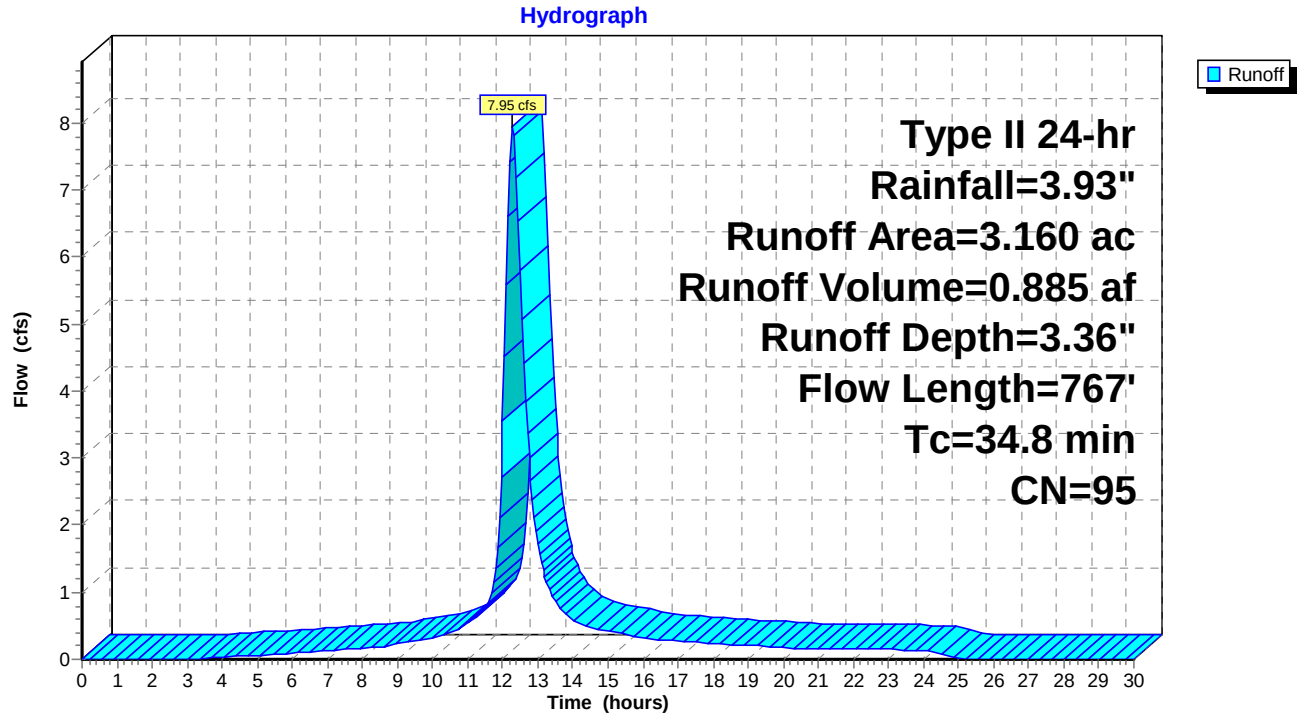
Runoff = 7.95 cfs @ 12.28 hrs, Volume= 0.885 af, Depth= 3.36"
Routed to Reach 3R : Channel B1 - B2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=3.93"

	Area (ac)	CN	Description
*	1.140	91	Graded
*	2.020	98	Impervious
	3.160	95	Weighted Average
	1.140		36.08% Pervious Area
	2.020		63.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.4	200	0.0150	0.10		**Sheet Flow, Sheet Flow** n= 0.240 P2= 2.37"
0.9	384	0.0153	7.07	98.95	**Channel Flow, Channel H-I** Area= 14.0 sf Perim= 11.3' r= 1.24' n= 0.030
0.1	50	0.0200	8.08	113.13	**Channel Flow, Channel I-J** Area= 14.0 sf Perim= 11.3' r= 1.24' n= 0.030
1.4	133	0.0480	1.53		**Shallow Concentrated Flow, N-O Shallow** Short Grass Pasture Kv= 7.0 fps
34.8	767	Total			

Subcatchment 1S: Channel B1 Area



Summary for Subcatchment 4S: Bench Post-Dev

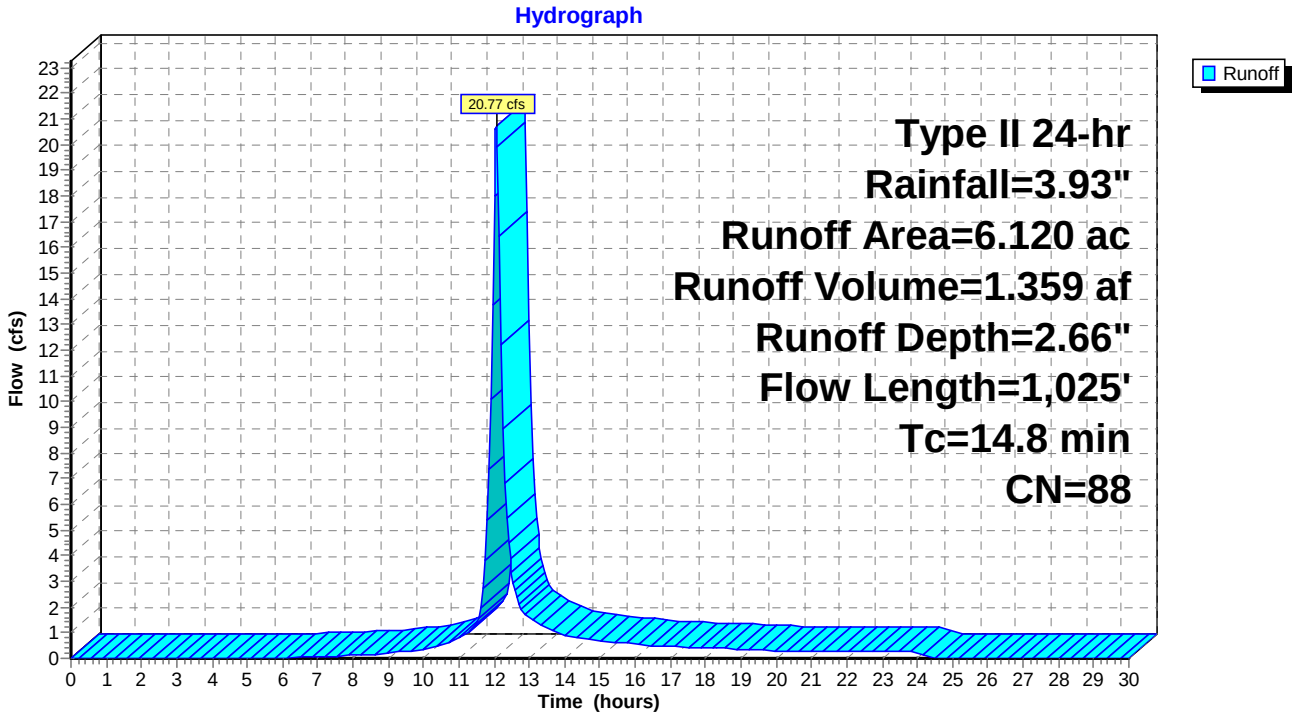
Runoff = 20.77 cfs @ 12.06 hrs, Volume= 1.359 af, Depth= 2.66"
Routed to Reach 5R : Channel at Base of Slope to Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=3.93"

	Area (ac)	CN	Description
*	3.060	98	Impervious
*	0.500	78	Meadow, non-grazed, HSG D
*	2.560	79	Woods, Fair, HSG D
	6.120	88	Weighted Average
	3.060		50.00% Pervious Area
	3.060		50.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.5	150	0.0330	0.22		**Sheet Flow, Sheet Flow, A-B** Range n= 0.130 P2= 2.37"
1.3	150	0.0730	1.89		**Shallow Concentrated Flow, B-C Shallow Conc** Short Grass Pasture Kv= 7.0 fps
0.2	115	0.6700	8.19		**Shallow Concentrated Flow, C-D Shallow Conc** Nearly Bare & Untilled Kv= 10.0 fps
0.7	250	0.0100	5.71	79.99	**Channel Flow, D-E Channel Flow** Area= 14.0 sf Perim= 11.3' r= 1.24' n= 0.030
0.4	130	0.0100	5.71	79.99	**Channel Flow, E-F Channel** Area= 14.0 sf Perim= 11.3' r= 1.24' n= 0.030
0.7	230	0.0100	5.71	79.99	**Channel Flow, F-G Channel** Area= 14.0 sf Perim= 11.3' r= 1.24' n= 0.030
14.8	1,025	Total			

Subcatchment 4S: Bench Post-Dev



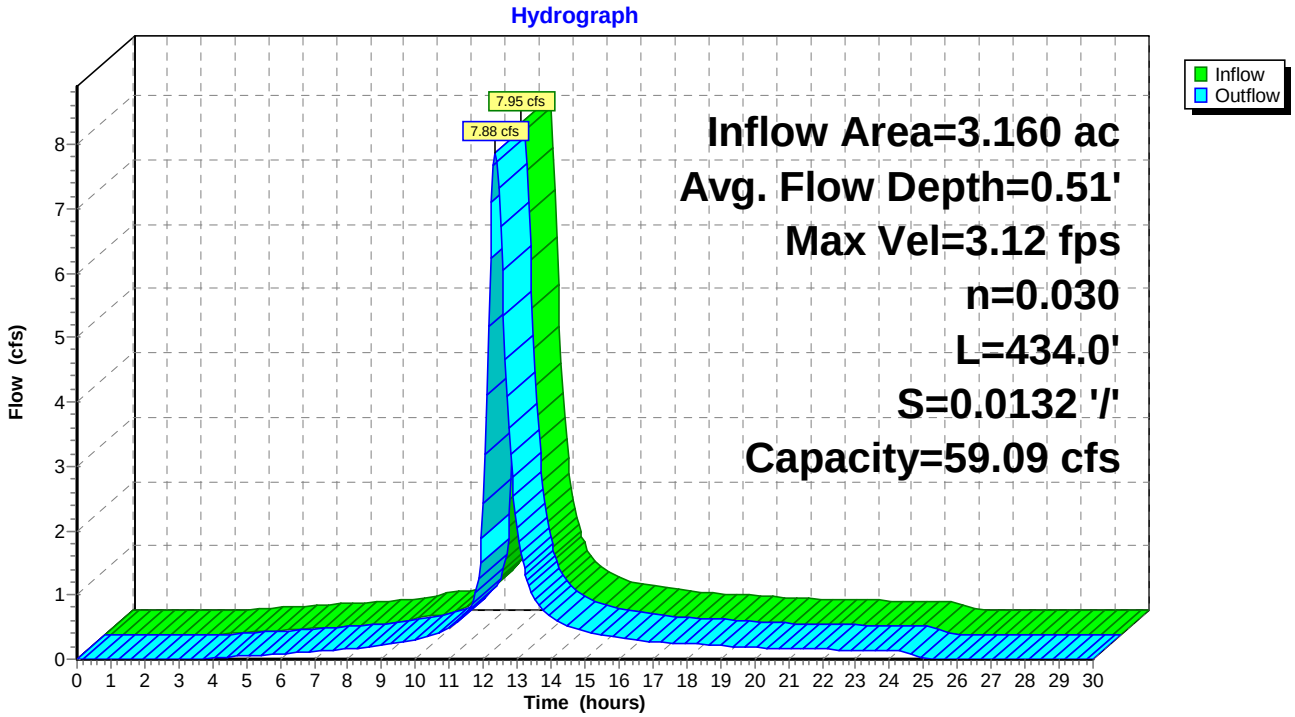
Summary for Reach 3R: Channel B1 - B2

Inflow Area = 3.160 ac, 63.92% Impervious, Inflow Depth = 3.36"
Inflow = 7.95 cfs @ 12.28 hrs, Volume= 0.885 af
Outflow = 7.88 cfs @ 12.35 hrs, Volume= 0.885 af, Atten= 1%, Lag= 4.1 min
Routed to Reach 5R : Channel at Base of Slope to Culvert

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.12 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 8.3 min

Peak Storage= 1,100 cf @ 12.31 hrs
Average Depth at Peak Storage= 0.51' , Surface Width= 6.02'
Bank-Full Depth= 1.50' Flow Area= 10.5 sf, Capacity= 59.09 cfs

4.00' x 1.50' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 434.0' Slope= 0.0132 '/'
Inlet Invert= 1,009.00', Outlet Invert= 1,003.25'



Summary for Reach 5R: Channel at Base of Slope to Culvert

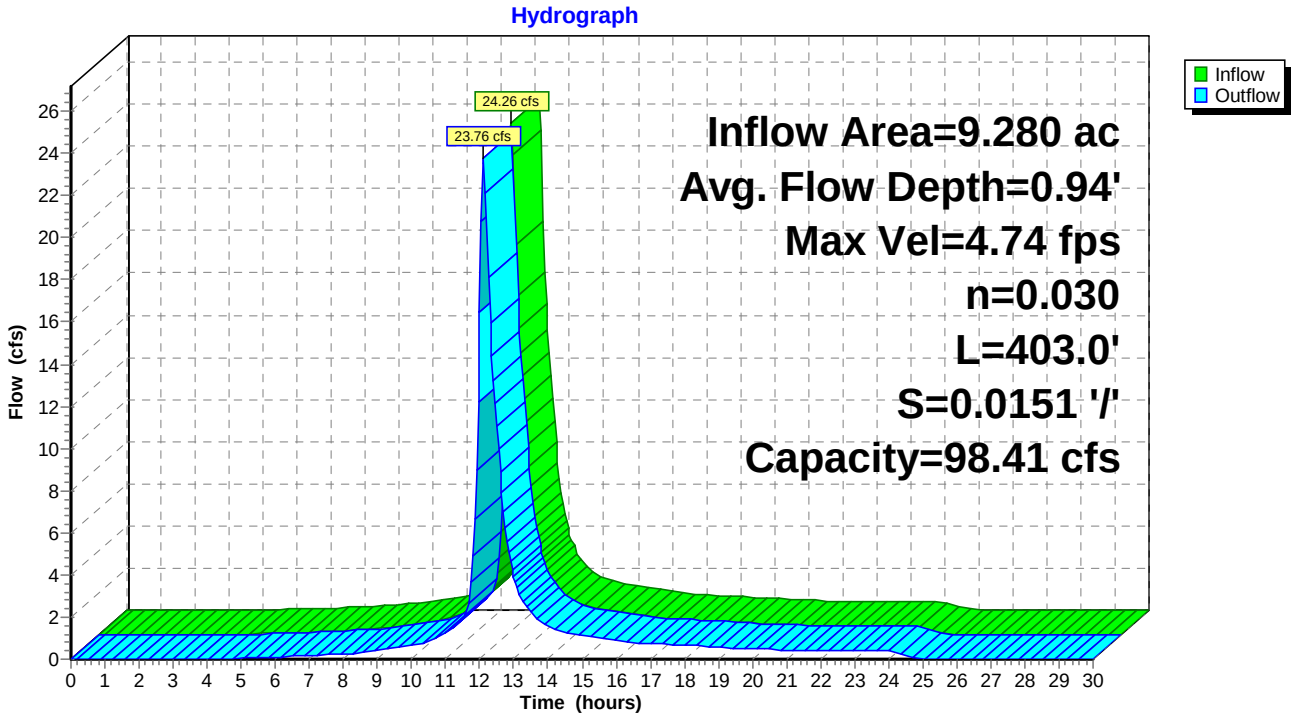
Inflow Area = 9.280 ac, 54.74% Impervious, Inflow Depth = 2.90"
Inflow = 24.26 cfs @ 12.08 hrs, Volume= 2.244 af
Outflow = 23.76 cfs @ 12.12 hrs, Volume= 2.244 af, Atten= 2%, Lag= 2.6 min
Routed to Reach 7R : Culvert to Sed Bond C

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.74 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 1.25 fps, Avg. Travel Time= 5.4 min

Peak Storage= 2,055 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.94' , Surface Width= 6.83'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 98.41 cfs

4.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 1.0 2.0 '/' Top Width= 10.00'
Length= 403.0' Slope= 0.0151 '/'
Inlet Invert= 1,002.00', Outlet Invert= 995.90'

Reach 5R: Channel at Base of Slope to Culvert



Summary for Reach 7R: Culvert to Sed Bond C

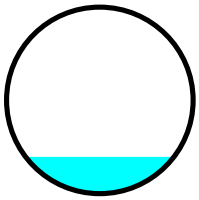
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 9.280 ac, 54.74% Impervious, Inflow Depth = 2.90"
Inflow = 23.76 cfs @ 12.12 hrs, Volume= 2.244 af
Outflow = 23.50 cfs @ 12.14 hrs, Volume= 2.244 af, Atten= 1%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.78 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 2.76 fps, Avg. Travel Time= 1.5 min

Peak Storage= 672 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.97' , Surface Width= 3.96'
Bank-Full Depth= 5.00' Flow Area= 19.6 sf, Capacity= 285.51 cfs

60.0" Round Pipe
n= 0.030
Length= 250.0' Slope= 0.0640 '/'
Inlet Invert= 994.00', Outlet Invert= 978.00'



Reach 7R: Culvert to Sed Bond C