Coal Combustion Residuals Landfill
Run-on and Run-off Control System Plan – Revision 2

Laramie River Station Landfill

Prepared for
Basin Electric Power Cooperative

Prepared by
Barr Engineering Co.

January 2026

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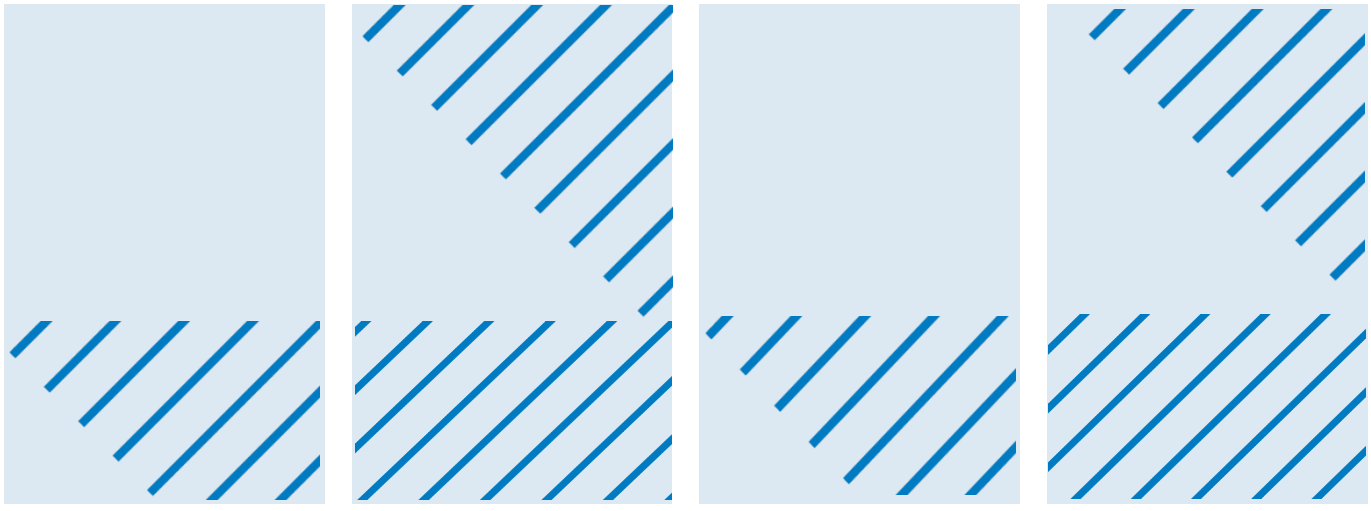
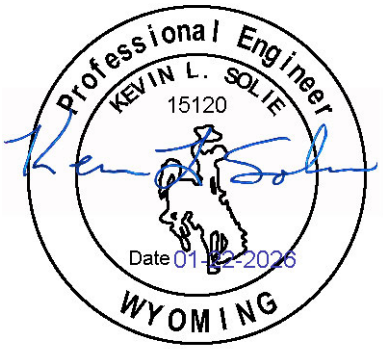


Certification

I hereby certify that I have or my agent has examined the facility and, being familiar with the provisions of 40 CFR 257 Subpart D, attest that this Coal Combustion Residuals landfill run-on and run-off control system plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards and the requirements of 40 CFR § 257.81. I certify that the plan is adequate for this facility and that procedures for recordkeeping and reporting have been established.

Kevin L. Solie
Wyoming PE #: 15120

January 22, 2026
Date



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January 2026

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1 Introduction

Larmie River Station (LRS) is a coal-fired power plant consisting of three units. The power plant, owned by the Missouri Basin Power Pool (MBPP) and operated by Basin Electric Power Cooperative (BEPC), is located northeast of Wheatland in Platte County, Wyoming. Fly ash generated at LRS is disposed at the onsite landfill, regulated as a coal combustion residuals (CCR) landfill under Permit No. 20.066 issued by the Wyoming Department of Environmental Quality (WDEQ). CCR management is subject to Federal Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments per 40 CFR 257 Subpart D. This CCR run-on and run-off control system plan has been developed to satisfy the requirements described in 40 CFR § 257.81, run-on and run-off controls for CCR landfills, as they apply to LRS's Landfill.

Construction of the facility has been phased with the construction of 9 existing cells. Partial sequential closure has been conducted on areas of the landfill that had been filled to the current permitted final waste grade, with the most recent phase of sequential closure being completed in 2023 resulting in the partial closure of Cell's 7 and 6. Cells 1-7 have now been closed or partially closed with an engineered earthen cover previously approved by the WDEQ. Cells 1-9 comprise an area of approximately 164 acres. Approximately 102 acres have been sequentially closed, leaving approximately 62 acres open and actively receiving ash.

Construction of a lateral expansion is scheduled for 2027. The lateral expansion will include a composite liner constructed with a geosynthetic clay liner overlain by a 60-mil high density polyethylene (HDPE) geomembrane liner. The lateral expansion will consist of one additional landfill cell, Cell 10, totaling approximately 20 acres. The existing landfill and lateral expansion are considered to be one CCR unit (Cells 1-10). This run-on and run-off control system plan has been developed to satisfy the requirements described in 40 CFR § 257.81, run-on and run-off controls for CCR landfills.

2 Objectives

Per 40 CFR § 257.81, the owner of an existing or new CCR landfill or any lateral expansion of a CCR landfill is required to design, construct, operate, and maintain a run-on and run-off control system.

In order to fulfill these objectives, the run-on and run-off control system plan must:

- provide documentation that the run-on control system adequately manages flow onto the active portion of the CCR unit during and following the peak discharge from a 25-year, 24-hour storm;
- provide documentation that the run-off control system adequately collects and controls at least the water volume from a 25-year, 24-hour storm;
- define recordkeeping requirements;
- define reporting requirements; and
- include a certification from a qualified professional engineer.

3 Run-on Control System

The purpose of a run-on control system is to prevent surface water from outside the lined CCR storage area from flowing onto the active landfill area. Site grading and existing topography near the landfill prevents surface drainage run-on onto the active portion of the CCR unit for events up to and exceeding a 25-year, 24-hour storm. Figure 1 shows that the areas around the proposed landfill perimeter are elevated above the surrounding topography and that the surrounding area drains away from the landfill, with arrows added to illustrate surface drainage outside of the landfill.

The closed portions of the landfill are graded to direct surface run-off to the nearest edge of the landfill, and then offsite to surrounding existing drainage systems.

4 Run-off Control System

As part of this plan, the Site hydrology and hydraulics were modeled using HydroCAD Version 10.00-16 and Soil Conservation Service (SCS) methods. The design storm for the run-off control system is the 25-year, 24-hour storm event, which has a rainfall depth of 3.26 inches (reference: NOAA Atlas 14). Hydrology calculations are included in Appendix A.

Precipitation events typically produce minimal observed surface run-off from the approximately 62 acres of active landfill in Cells 1-9. Instead, water rapidly infiltrates and is stored in the dry ash until it evaporates or is bound to the ash mass through chemical reaction. For larger precipitation events, like the 25-year, 24-hour design storm, some surface run-off within the active landfill may occur. Ash placed in the existing open, active area of Cells 1-9 is graded to drain towards Cell 10 and will be contained within the lined areas of Cell 10.

The lateral expansion of Cell 10 will increase the open area by approximately 20 acres. The existing sump will be removed, and a drainage collection system will promote runoff to a new lined sump in Cell 10. Run-off from the active portion of Cell 10 will generally flow to the north and west perimeters. An interior perimeter ditch within the landfill and around the edge of the active face will be maintained to intercept ash-contact water and keep it from draining outside the lined limits of the landfill. The perimeter ditches will generally be graded toward the sump within Cell 10, however, water that reaches the perimeter ditches will infiltrate into the drainage layer. The interior perimeter ditch length has an estimated length of 1,700 feet, which includes the total length of the west and north sides of the Cell 10.

The 25-year, 24-hour storm event was conservatively modeled with Cell 10 in the worst-case “full” condition with waste placed to approximately elevation 4725 feet and the perimeter ditches at the toe of waste at an elevation of approximately 4530 feet, and did not consider exfiltration of runoff into the drainage layer. In this scenario the storm event is expected to produce approximately 2.7 acre-feet of runoff, requiring a minimum ditch cross sectional area of approximately 69 square feet to a minimum ditch depth of 5 feet with 3 horizontal to 1 vertical (3H:1V) side slopes has been calculated to provide the required cross sectional area.

While not surface water, the liquid in the leachate collection system drainage layer will be managed so as not to contribute to the runoff. Leachate will flow to and be collected in leachate pipes that, in turn, drain

to the leachate sump. The leachate collected in the sump is then pumped to the Bottom Ash Ponds on the south side of the landfill.

5 Recordkeeping & Reporting

According to 40 CFR § 257.81(c)(2), BEPC will amend the written run-on and run-off control system plan whenever there is a change in conditions that would substantially affect the written plan. Additionally, BEPC will prepare periodic updates to the plan every five years (minimum).

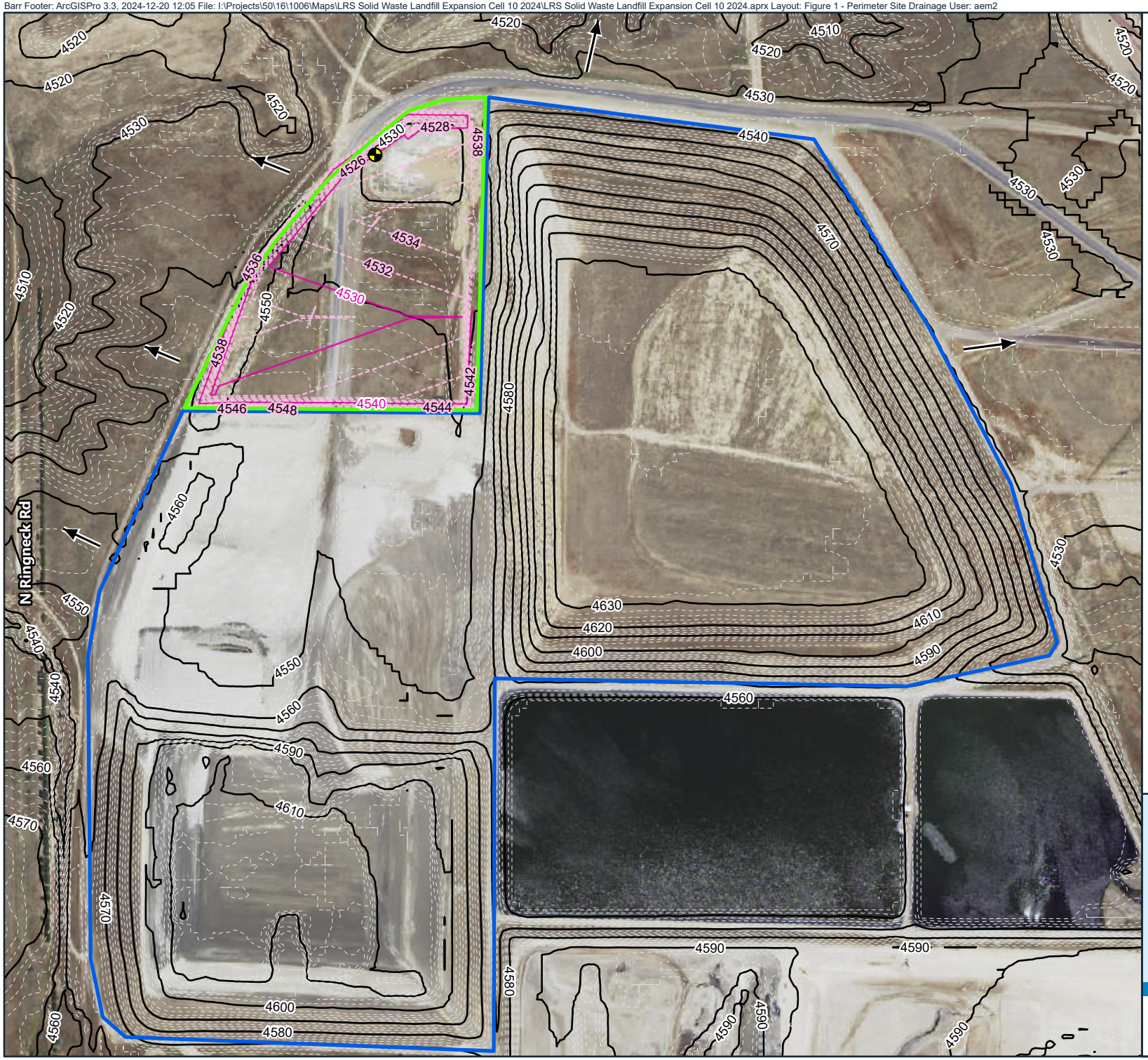
BEPC will maintain a copy of the most recent version of the run-on and run-off control system plan in the facility's operating record in accordance with 40 CFR § 257.105, Recordkeeping Requirements, and the plan will be made publicly available on the Basin Electric CCR web site in compliance with 40 CFR § 257.107, Publicly Accessible Internet Site Requirements. Notification will be sent to WDEQ State Director in compliance with 40 CFR § 257.106, Notification Requirements.

6 References

Barr, 2024. Engineering Report, Landfill Laramie River Station, January 2025

NOAA Atlas 14 Point Precipitation Frequency Estimates: North Dakota. National Weather Service. https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=nd. Accessed December 18, 2024

Figures



Proposed Landfill Expansion
Existing Landfill Limits
Proposed 10ft Contour
Proposed 2ft Contour
Existing 10ft Contour
Existing 2ft Contour

N

0 250 500
Feet

Imagery: FSA, 2022

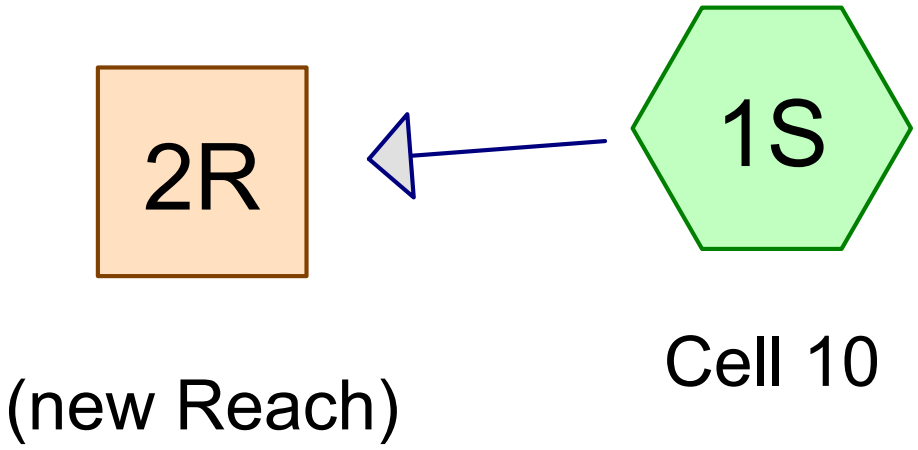
Perimeter Site Drainage
Basin Electric Power Cooperative
Laramie River Station Landfill
Platte County, Wyoming

FIGURE 1

BARR

Appendix A

HydroCad Report



Subcat Reach Pond Link

Routing Diagram for LRS_hydro_cad_v1
Prepared by Barr Engineering, Printed 12/18/2024

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr, 24-hr	Type III 24-hr		Default	24.00	1	3.26	2
2	25-yr, 24-hr	Type III 24-hr		Default	24.00	1	3.26	2
3	100-yr, 24-hr	Type III 24-hr		Default	24.00	1	4.18	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
20.400	82	Ash (1S)
20.400	**82**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
20.400	Other	1S
20.400		**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	20.400	20.400	Ash	1S
0.000	**0.000**	**0.000**	**0.000**	**20.400**	**20.400**	**TOTAL AREA**	

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

Subcatchment1S: Cell 10 Runoff Area=20.400 ac 0.00% Impervious Runoff Depth=1.59"
Flow Length=975' Slope=0.2000 '/' Tc=4.5 min CN=82 Runoff=38.83 cfs 2.697 af

Reach 2R: (new Reach) Avg. Flow Depth=1.58' Max Vel=3.94 fps Inflow=38.83 cfs 2.697 af
n=0.022 L=1,700.0' S=0.0050 '/' Capacity=163.15 cfs Outflow=29.14 cfs 2.697 af

Total Runoff Area = 20.400 ac Runoff Volume = 2.697 af Average Runoff Depth = 1.59"
100.00% Pervious = 20.400 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Cell 10

[49] Hint: Tc<2dt may require smaller dt

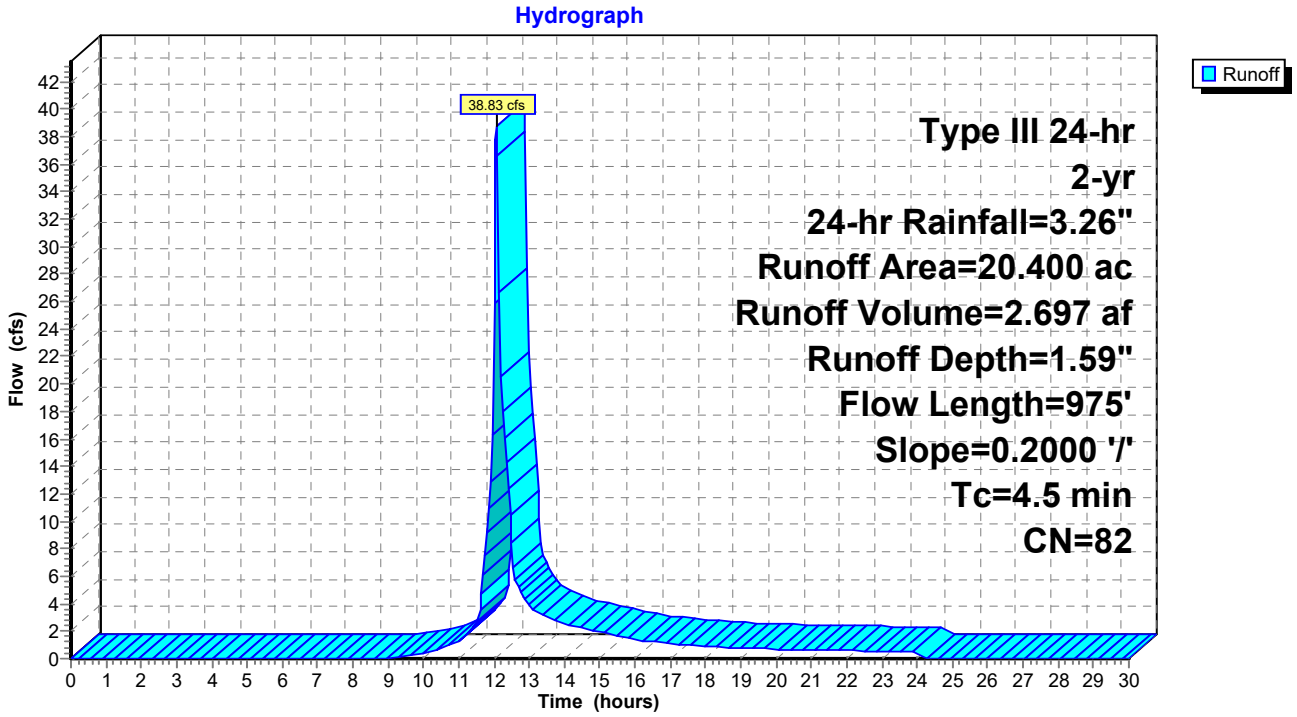
Runoff = 38.83 cfs @ 12.07 hrs, Volume= 2.697 af, Depth= 1.59"
Routed to Reach 2R : (new Reach)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr, 24-hr Rainfall=3.26"

	Area (ac)	CN	Description
*	20.400	82	Ash
	20.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	15	0.2000	0.26		**Sheet Flow, sheet** Smooth surfaces n= 0.011 P2= 0.04"
3.6	960	0.2000	4.47		**Shallow Concentrated Flow, shallow concentrated** Nearly Bare & Untilled Kv= 10.0 fps
4.5	975	Total			

Subcatchment 1S: Cell 10



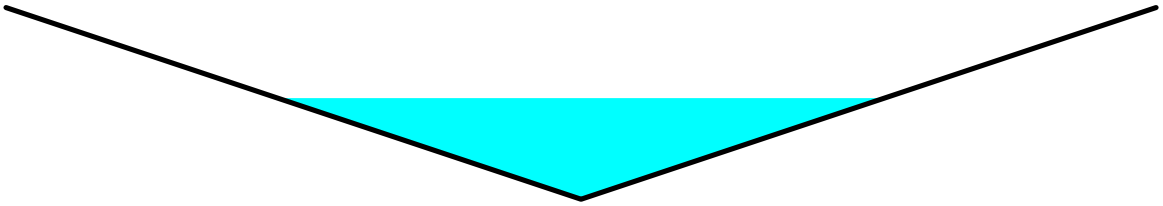
Summary for Reach 2R: (new Reach)

Inflow Area = 20.400 ac, 0.00% Impervious, Inflow Depth = 1.59" for 2-yr, 24-hr event
Inflow = 38.83 cfs @ 12.07 hrs, Volume= 2.697 af
Outflow = 29.14 cfs @ 12.26 hrs, Volume= 2.697 af, Atten= 25%, Lag= 11.6 min

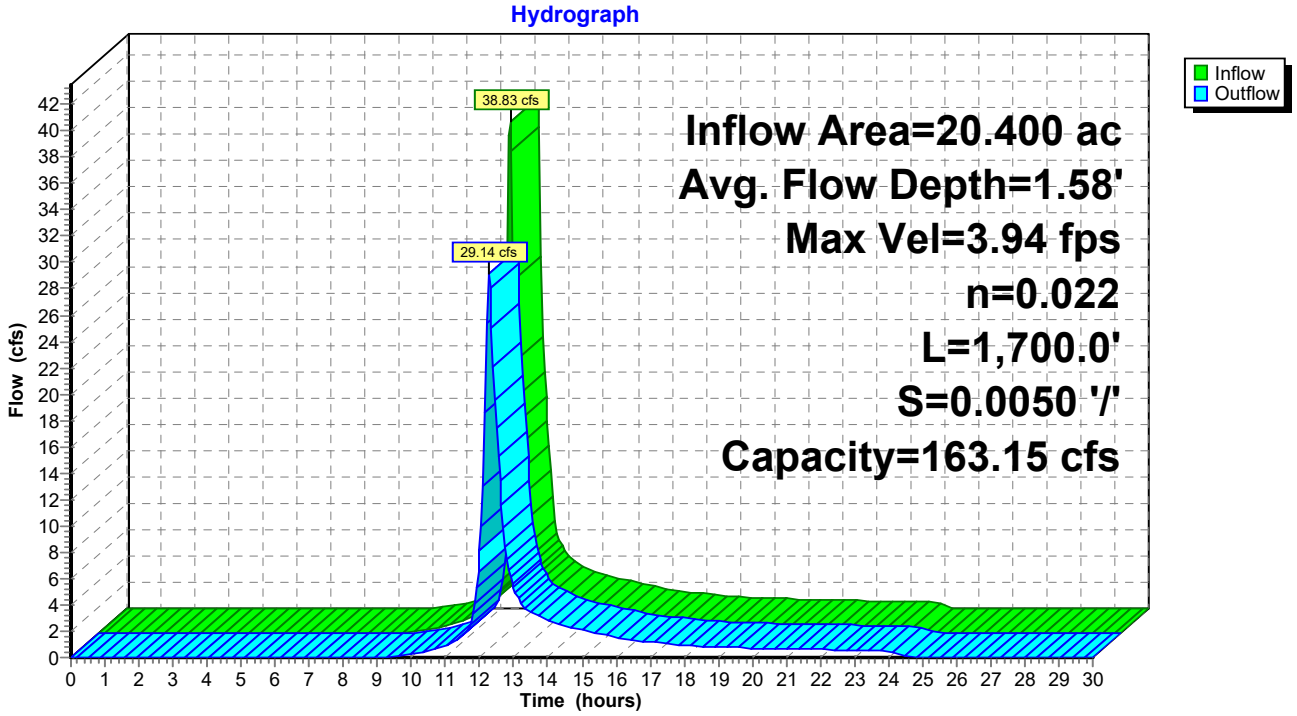
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.94 fps, Min. Travel Time= 7.2 min
Avg. Velocity = 1.40 fps, Avg. Travel Time= 20.2 min

Peak Storage= 12,761 cf @ 12.14 hrs
Average Depth at Peak Storage= 1.58' , Surface Width= 9.49'
Bank-Full Depth= 3.00' Flow Area= 27.0 sf, Capacity= 163.15 cfs

0.00' x 3.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 '/' Top Width= 18.00'
Length= 1,700.0' Slope= 0.0050 '/'
Inlet Invert= 4,548.00', Outlet Invert= 4,539.50'



Reach 2R: (new Reach)



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

Subcatchment1S: Cell 10 Runoff Area=20.400 ac 0.00% Impervious Runoff Depth=1.59"
Flow Length=975' Slope=0.2000 '/' Tc=4.5 min CN=82 Runoff=38.83 cfs 2.697 af

Reach 2R: (new Reach) Avg. Flow Depth=1.58' Max Vel=3.94 fps Inflow=38.83 cfs 2.697 af
n=0.022 L=1,700.0' S=0.0050 '/' Capacity=163.15 cfs Outflow=29.14 cfs 2.697 af

Total Runoff Area = 20.400 ac Runoff Volume = 2.697 af Average Runoff Depth = 1.59"
100.00% Pervious = 20.400 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Cell 10

[49] Hint: Tc<2dt may require smaller dt

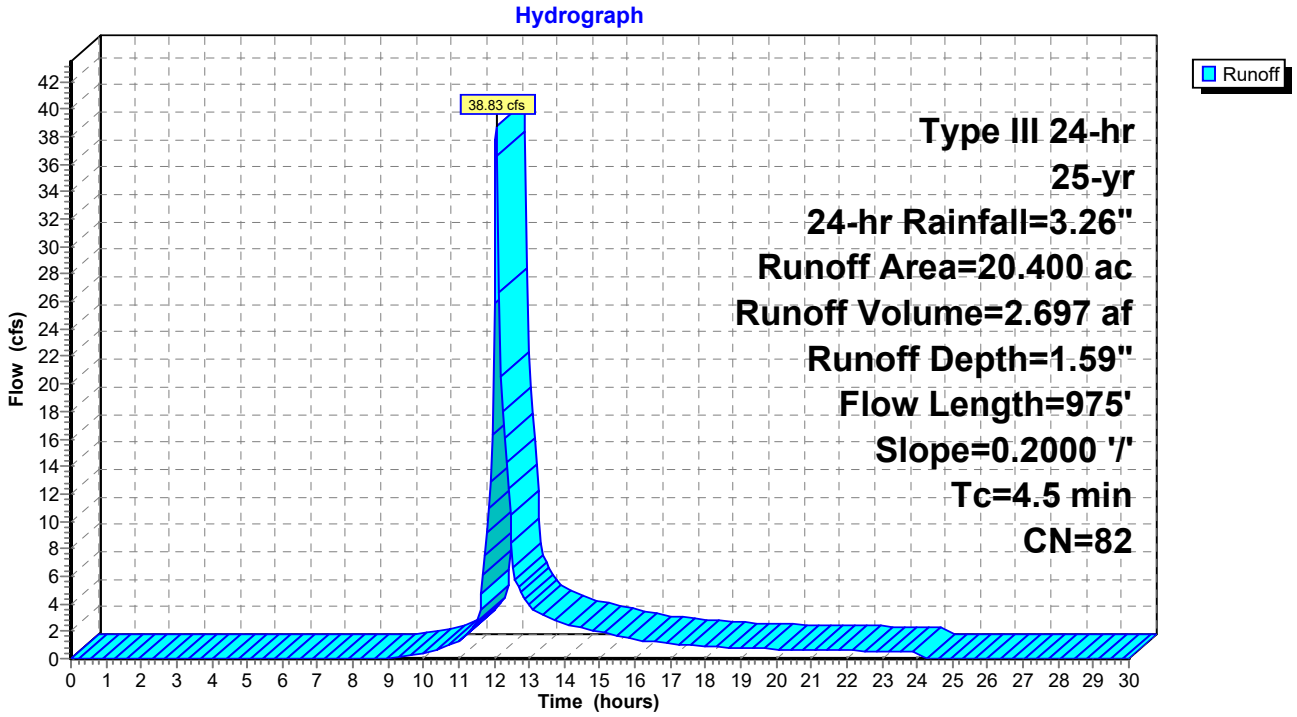
Runoff = 38.83 cfs @ 12.07 hrs, Volume= 2.697 af, Depth= 1.59"
Routed to Reach 2R : (new Reach)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr, 24-hr Rainfall=3.26"

	Area (ac)	CN	Description
*	20.400	82	Ash
	20.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	15	0.2000	0.26		**Sheet Flow, sheet** Smooth surfaces n= 0.011 P2= 0.04"
3.6	960	0.2000	4.47		**Shallow Concentrated Flow, shallow concentrated** Nearly Bare & Untilled Kv= 10.0 fps
4.5	975	Total			

Subcatchment 1S: Cell 10



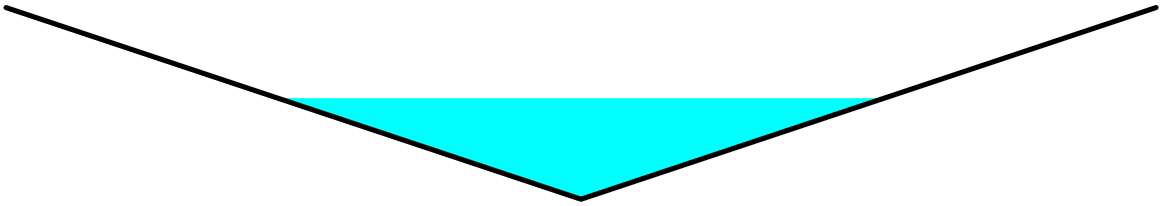
Summary for Reach 2R: (new Reach)

Inflow Area = 20.400 ac, 0.00% Impervious, Inflow Depth = 1.59" for 25-yr, 24-hr event
Inflow = 38.83 cfs @ 12.07 hrs, Volume= 2.697 af
Outflow = 29.14 cfs @ 12.26 hrs, Volume= 2.697 af, Atten= 25%, Lag= 11.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.94 fps, Min. Travel Time= 7.2 min
Avg. Velocity = 1.40 fps, Avg. Travel Time= 20.2 min

Peak Storage= 12,761 cf @ 12.14 hrs
Average Depth at Peak Storage= 1.58' , Surface Width= 9.49'
Bank-Full Depth= 3.00' Flow Area= 27.0 sf, Capacity= 163.15 cfs

0.00' x 3.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 '/' Top Width= 18.00'
Length= 1,700.0' Slope= 0.0050 '/'
Inlet Invert= 4,548.00', Outlet Invert= 4,539.50'



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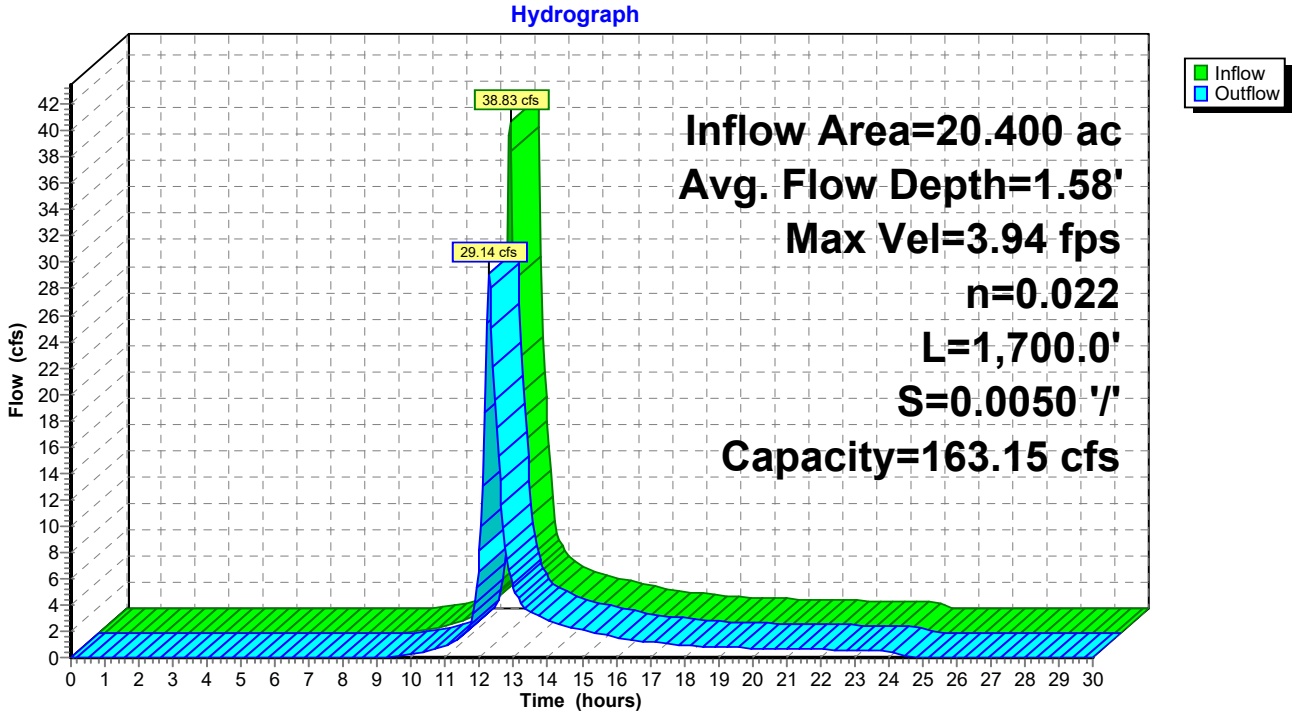


Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Cell 10 Runoff Area=20.400 ac 0.00% Impervious Runoff Depth=2.36"
Flow Length=975' Slope=0.2000 '/' Tc=4.5 min CN=82 Runoff=57.92 cfs 4.008 af

Reach 2R: (new Reach) Avg. Flow Depth=1.86' Max Vel=4.38 fps Inflow=57.92 cfs 4.008 af
n=0.022 L=1,700.0' S=0.0050 '/' Capacity=163.15 cfs Outflow=45.02 cfs 4.008 af

Total Runoff Area = 20.400 ac Runoff Volume = 4.008 af Average Runoff Depth = 2.36"
100.00% Pervious = 20.400 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Cell 10

[49] Hint: Tc<2dt may require smaller dt

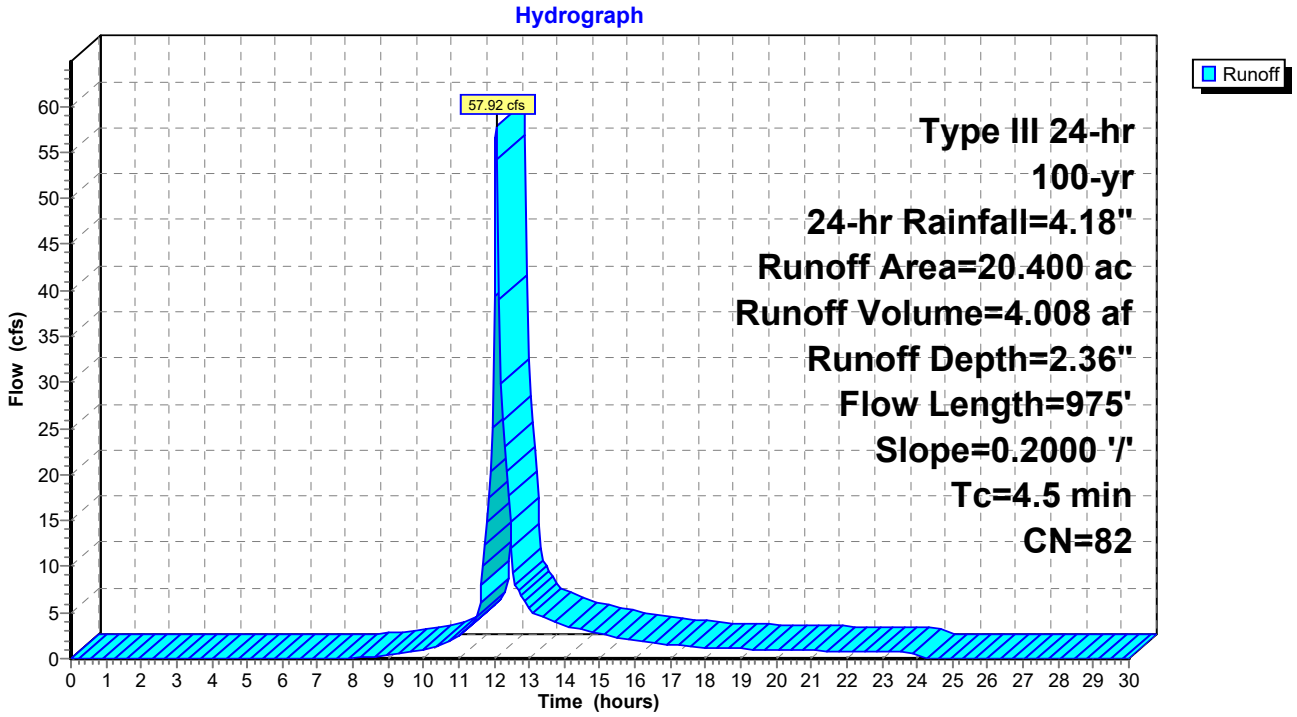
Runoff = 57.92 cfs @ 12.07 hrs, Volume= 4.008 af, Depth= 2.36"
Routed to Reach 2R : (new Reach)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr, 24-hr Rainfall=4.18"

	Area (ac)	CN	Description
*	20.400	82	Ash
	20.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	15	0.2000	0.26		**Sheet Flow, sheet** Smooth surfaces n= 0.011 P2= 0.04"
3.6	960	0.2000	4.47		**Shallow Concentrated Flow, shallow concentrated** Nearly Bare & Untilled Kv= 10.0 fps
4.5	975	Total			

Subcatchment 1S: Cell 10



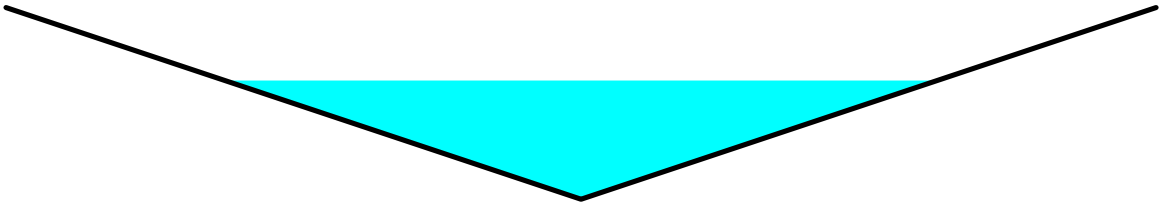
Summary for Reach 2R: (new Reach)

Inflow Area = 20.400 ac, 0.00% Impervious, Inflow Depth = 2.36" for 100-yr, 24-hr event
Inflow = 57.92 cfs @ 12.07 hrs, Volume= 4.008 af
Outflow = 45.02 cfs @ 12.24 hrs, Volume= 4.008 af, Atten= 22%, Lag= 10.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.38 fps, Min. Travel Time= 6.5 min
Avg. Velocity = 1.52 fps, Avg. Travel Time= 18.6 min

Peak Storage= 17,604 cf @ 12.14 hrs
Average Depth at Peak Storage= 1.86' , Surface Width= 11.15'
Bank-Full Depth= 3.00' Flow Area= 27.0 sf, Capacity= 163.15 cfs

0.00' x 3.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 '/' Top Width= 18.00'
Length= 1,700.0' Slope= 0.0050 '/'
Inlet Invert= 4,548.00', Outlet Invert= 4,539.50'



Reach 2R: (new Reach)