Plan

Periodic (5 Year) Revision, Run-On and Runoff Control System Plan, CCR Landfill, Reid Gardner Station

PREPARED FOR:	File
PREPARED BY:	NV Energy, Jacobs
DATE:	October 14, 2026

1.0 INTRODUCTION

This plan represents the periodic (five-year) revision of the previous Run-on and Runoff Control System Plan (Jacobs 2021a) for the coal combustion residuals (CCR) landfill at NV Energy's Reid Gardner Station (RGS). This plan documents how the existing run-on and runoff control system has been designed and constructed to meet the applicable requirements of §257.81(c) of the CCR Rule (U.S. Environmental Protection Agency Hazardous and Solid Waste Management System; Disposal of CCR from Electric Utilities; Code of Federal Regulations Title 40, Part 257 [40 CFR 257]).

The landfill is situated on a mesa and is a partially lined monofill landfill that is permitted for 136 acres, extends up to approximately 110 feet above the adjacent ground surface, and generally has fill side slopes ranging from 4:1 (horizontal to vertical) to 12:1 (horizontal to vertical). The landfill is generally higher than the surrounding ground surface and graded to drain stormwater runoff to retention basins located along the landfill perimeter. Run-on potential is limited to a portion of the southern boundary which is managed by a roadside ditch (CH2M 2016; Jacobs 2021a).

1.1 APPLICABILITY, PURPOSE, AND REGULATORY OVERVIEW

Published on April 17, 2015, and effective on October 19, 2015, the CCR Rule regulates the disposal of CCR as solid waste in landfills under Subtitle D of the Resource Conservation and Recovery Act. Section §257.81 of the CCR Rule sets forth minimum requirements for run-on and runoff controls for CCR landfills.

The RGS landfill is regulated under the CCR Rule as an existing CCR landfill and is therefore subject to the CCR Rule's run-on and runoff control requirements. An existing CCR landfill is defined as "a CCR landfill that receives CCR both before and after October 19, 2015, or for which construction commenced prior to October 19, 2015, and receives CCR on or after October 19, 2015." (§257.53). The landfill started receiving waste by the 1980s (before 2015) and therefore meets this definition.

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1.2 REGULATORY REQUIREMENTS

This plan was prepared to meet the requirements of §257.81(c) of the CCR Rule. The purposes of this plan are to:

- Document how "the run-on and runoff control systems have been designed and constructed to meet the applicable requirements of this section [§257.81]" and that it is "supported by appropriate engineering calculations" (§257.81(c)(1)).
- Document that the run-on control system is designed, constructed, operated, and maintained "to prevent flow onto the active portion of the CCR unit during the peak discharge from a 24–hour, 25-year storm" (§257.81(a)(1)). The active portion is defined as "that part of the CCR unit that has received or is receiving CCR or non-CCR waste and that has not completed closure in accordance with §257.102." (§257.53).
- Document that the landfill has a "run-off control system from the active portion of the CCR unit to collect and control at least the water volume resulting from a 24-hour, 25-year storm" (§257.81(a)(2)) where the active portion is defined as described above.
- Document that "run-off from the active portion of the CCR unit [is] handled in accordance with the surface water requirements under §257.3-3" (§257.81(b)). Generally, this means that the following actions are prohibited: 1) discharge of fill or dredge material to waters of the United States, 2) discharge of pollutants that violate the requirements of the National Pollutant Discharge Elimination System, and 3) causing non-point source pollution to waters of the United States.
- Be placed in the operating record by October 15, 2026, which is five years after October 15, 2021, when the previous plan was placed in the operating record (§257.81(c)(4) and §257.107(g)(3)). This plan must also be placed on NV Energy's publicly accessible CCR website[1] 30 days after placement in the operating record (§257.81(d) and §257.107(g)(3)), and the State Director must also be notified 30 days after placement (§257.81(d) and §257.106(g)(3)).
- Be certified by a Qualified Professional Engineer (QPE) (§257.81(c)(5)).

It is important to note that the landfill is also regulated by the Nevada Division of Environmental Protection's (NDEP) Bureau of Sustainable Materials Management under Class III Landfill Permit SW138REV00. The activities and requirements associated with the NDEP permit and applicable state regulations are not described in this plan.

2.0 DATA REVIEW

Both information in and out of the operating record was reviewed to inform this plan, including the following items:

- *Run-on and Run-off Control System Plan Coal Combustion Residual Landfill Reid Gardner Generation Station* (CH2M 2016)
- *Periodic (5 Year) Review and Revision, Run-on and Runoff Control System Plan, CCR Landfill, Reid Gardner Station* (Jacobs 2021a)

[1] NV Energy. 2026. *CCR Rule Compliance Data and Information web page*. https://www.nvenergy.com/cleanenergy/ccr-rule-compliance-data/reid-gardner-generating-station-data.

- Annual landfill inspection reports for 2021 through 2025 (Jacobs 2021b; 2022; 2023; 2024; 2025)
- Landfill topography (Baughman & Turner 2025; Stovall Land Surveying 2017; Aero-Graphics 2017; NV Energy 2026) (Figure 1)

3.0 SITE CONDITIONS

The topographic surface used for this analysis (Figure 1) incorporates data from four different surveys (Baughman & Turner 2025; Stovall Land Surveying 2017; Aero-Graphics 2017; NV Energy 2026). Based on a review of the survey data and operator knowledge, the most significant change since the previous plan (Jacobs 2021a) is the placement of ash/soil fill and pond solids within the landfill. This change primarily occurred near the north-central portion of the landfill. Additionally, since the previous plan (Jacobs 2021a), stormwater berms were constructed on the side slopes of the South Lateral Landfill Expansion (SLLE) to direct surface water runoff, potentially reduce runoff velocity, and prevent erosion.

Although the interior landfill topography has been modified by ongoing waste placement activities, the overall drainage characteristics and runoff flow patterns of the site remain generally consistent with those identified in previous plans (Jacobs 2016; 2021a). With the recent topography incorporated into the hydrologic model, surface runoff continues to follow similar drainage patterns, and the primary watershed boundaries and flow directions have not changed substantially.

4.0 RUNOFF EVALUATION

As required by the CCR Rule, the design storm event for the run-on and runoff control plan is the 25-year, 24-hour storm. The hydrologic analysis was performed using the Soil Conservation Service (SCS) unit hydrograph method to estimate peak surface water runoff flowrates and volumes. Within the SCS Unit Hydrograph methodology, precipitation surface runoff is estimated using the SCS CN method. The SCS Unit Hydrograph is a common unit hydrograph methodology approach for developing synthetic runoff hydrographs in a hydrologic model. These methods and software are recognized as industry-standard tools for stormwater runoff analyses to evaluate response to rainfall events.

4.1 RUNOFF METHOD OF ANALYSIS

Hydrologic characteristics such as drainage basins, flow paths, soil properties, and time of concentration were evaluated for use in a hydrologic model representing a hydrologic analysis for determination of surface water runoff flowrates and volumes.

Drainage basin boundaries (subbasins) (Figure 2) and hydrologic longest flow paths were delineated using the landfill topography and assigned a SCS Curve Number (CN). The CN is based on a specific type of land and surface cover, which contributes to the surface runoff.

The time of concentration calculation was prepared based on the Standard Form 4 of the Clark County Regional Flood District Hydrologic Criteria and Drainage Design Manual (Clark County 1999). The Standard Form 4 is based on an overland or initial flow plus the travel time in a combined form such as a channel, ditch, or swale (Clark County 1999), which was delineated using the landfill topography. The time of concentration represents the longest hydraulic path rainfall surface runoff would need to take before it was discharged from the drainage basin. The lag time, which is the delay in time before the runoff reaches its peak, was estimated by multiplying the time of concentration by 0.6 in accordance with the Standard Form 4. The Standard Form 4 calculations are provided in Attachment 1.

A hydrologic model was then created to calculate the peak runoff flows and volumes generated from a 25-year, 24-hour storm event (per §257.81.). This model was developed utilizing the SCS CN method and the SCS Unit Hydrograph method within the U.S. Army Corps of Engineers Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS) Version 4.13 software (USACE, 2025).

4.2 PARAMETER ASSUMPTIONS AND INPUTS

- A 25-year, 24-hr storm event of 2.03 inches was used for analysis, which was obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 (NOAA 2026) (Attachment 1).
- The SCS Type II rainfall distribution for a 24-hour storm event was utilized for the hydrologic model in HEC-HMS, which is generally used for most of the United States (USACE 2026).
- The topographic surface used for analysis (Figure 1) was used to estimate the geometry, dimensions, and slope of the following:
    - Longest flow path,
    - Drainage basins,
    - Ditches,
    - Berms,
    - Low water crossing, and
    - Riprap down drains.
- Retention basin storage capacities were estimated using the topographic surface with adjustments based on field observations.
- The CWPS is the only retention basin that was constructed with a spillway. The other retention basins do not contain a spillway or outfall feature.
- Culvert size, material, inlet elevations, and outlet elevations are assumed to be the same as the 2021 plan as culvert conditions remain unchanged (Jacobs 2021a).
- The maximum headwater for culverts with a diameter of 36-inches or less is 5 feet (Clark County 1999).
- For purposes of this analysis, it is assumed that the run-on and runoff control facilities have been maintained and are in proper working order, which is consistent with routine inspections.
- Drainage diversion flow capacities were calculated using normal-depth flow conditions by assuming the flow depth within each diversion was equal to the normal depth.
- Consistent with the 2021 plan (Jacobs 2021a), this plan continues to use a CN value of 83 since it is understood that the landfill surface material is poorly-graded-sand and remains unchanged. This corresponds to landfill surface conditions of newly graded, unvegetated areas that tend to have higher hydrologic infiltration parameters than Hydrologic Soil Group A.
- The Standard Form 4 does not specify a minimum time of concentration.
- Manning’s roughness coefficients (n):
    - A Manning’s n of 0.025 was used for the channel/v-ditch, representing conditions between a smooth earthen channel and a gravel-lined channel.

- The analysis assumed a Manning's n of 0.040 for the riprap lined downdrain, which is characteristic of a riprap armored surface.
- The culverts were modeled using a Manning's n of 0.013, which is representative of concrete pipe.

4.3 RUNOFF VOLUME AND FLOW CALCULATIONS

A hydrologic analysis was performed in HEC-HMS to estimate peak flow rates and runoff volumes for the 25-year, 24-hour storm. Table 4.1 summarizes the runoff calculations by subbasin, which are shown on Figure 2. The landfill run-on and runoff hydrology calculations are presented in Attachment 1.

Table 4.1. RGS 2026 HEC-HMS Subbasin Results

ID	Area (ac)	Lag Time (mins)	Peak Discharge Flow Rate (cfs)	Peak Discharge Volume (ac-ft)
SUB1	19.7	6.23	20.4	1.2
SUB2	7.0	6.11	7.3	0.4
SUB2A	14.3	7.79	13.5	0.8
SUB2B	3.3	3.91	3.8	0.2
SUB2C	4.1	4.13	4.6	0.2
SUB3	8.7	11.63	7.0	0.5
SUB3A	2.7	3.47	3.1	0.2
SUB4	14.7	7.20	14.4	0.9
SUB5	2.8	4.90	3.0	0.2
SUB5A	1.6	3.48	1.9	0.1
SUB6	14.8	3.65	17.0	0.9
SUB7	5.6	5.29	6.0	0.3
SUB8	2.1	3.78	2.4	0.1
SUB9	4.6	4.72	5.0	0.3
SUB10	3.2	3.47	3.8	0.2
SUB11	11.9	6.84	12.0	0.7
SUB12	1.8	5.11	1.9	0.1
SUB12A	3.2	4.93	3.6	0.2
SLLE-1	6.4	7.92	6.2	0.4
SLLE-2	12.8	7.16	12.7	0.8

Notes:
ac = acres
cfs = cubic feet per second
ft = feet

ID = identifier
mins = minutes

4.4 RUNOFF CONTROL SYSTEM

The runoff control system consists of a series of drainage diversions (i.e., berms, ditches, a down drain, and a Low Water Crossing [sagged roadway]), retention basins (i.e., contact water pond system [CWPS] and stormwater basins [SWBs]), and culverts/pipes. These features are designed to collect and route discharge from the landfill in accordance with §257.81.

Peak flow rates from the hydrologic analysis were then compared to the hydraulic capacity of the runoff controls. Hydraulic capacities were analyzed using the Manning's equation and standard culvert headwater and tailwater analysis in approved software such as Bentley FlowMaster and the Federal Highway Administration (FHWA) HY-8 program.

Table 4.2 compares the calculated peak inflow rate from HEC-HMS to the flow rate capacity of the drainage diversions. The Bentley FlowMaster calculations are provided in Attachment 2.

Table 4.2. RGS 2026 Drainage Diversions

Diversion ID	Diversion Description	Peak Inflow Rate (cfs)	Flow Rate Capacity (cfs)
V-Ditch 1	Runoff from SUB9	5.0	57.8
V-Ditch 2 (min)	Runoff from SUB7 and SUB6	22.9	26.6
V-Ditch 2 (max)	Runoff from SUB7	6.0	59.5
V-Ditch 3	Runoff from SUB10	3.8	92.5
CWPS Ditch	Runoff from SUB1, SUB2, SLLE-1, and SLLE-2 (CWPS1)	46.4	51.7
Riprap Lined Down Drain	Runoff from SUB2A	13.5	61.9
Low Water Crossing	Runoff from SUB4 and SUB5 (Junction-2)	16.1	101.9
Berm 1	Runoff from SUB2A	13.5	33.5
Berm 2	Runoff from SUB2A	13.5	47.3
Berm 4	Runoff from SUB4	14.4	18.2
Berm 5	Runoff from RUB5	3.0	21.8
SLLE Runoff Ditch	Runoff from SLLE-1 and SLLE-2	18.9	36.9

Table 4.3 compares the calculated peak inflow volume from HEC-HMS to the calculated storage capacity of each retention basin. The retention basin storage capacities are summarized below and provided in Attachment 2.

Table 4.3. RGS 2026 Retention Basins

Retention Basin ID	Retention Basin Description	Peak Inflow Volume (ac-ft)	Storage Capacity (ac-ft)
CWPS	Runoff from CWPS1	2.8	4.2
SWB1 and SWB2	Runoff from SUB2A, SUB2B, SUB2C, and SUB3	1.8	3.1
SWB3	Runoff from SUB3A	0.2	0.3
SWB4	Runoff from SUB5, SUB5A, and SUB4	1.1	1.6
SWB5	Runoff from SUB6 and SUB7	1.2	1.4
SWB6	Runoff from SUB12	0.1	0.2
SWB7	Runoff from SUB12A	0.2	0.2
SWB8	Runoff from SUB6 and SUB7 (Junction-1)	0.6	0.9
Stormwater Retention Basins	Runoff from SUB11	0.7	10.6

Notes:
SWB = stormwater basin

Table 4.4 shows the peak inflow rate for each culvert and compares the calculated maximum headwater to the maximum allowable headwater from FWHA HY-8. Refer to Figures 1 or 2 for culvert locations.

Table 4.4. RGS 2026 Culverts

Culvert ID	Culvert Description	Peak Inflow Rate (cfs)	Calculated Maximum Headwater (ft)	Maximum Allowable Headwater (ft)
SWB5 Culvert	Runoff from Junction-3	22.9	3.4	4.8
SWB8 Culvert	Runoff from Junction-1	11.1	2.3	2.8

The results from the FHWA HY-8 analysis are provided in Attachment 2.

4.5 OPERATION AND MAINTENANCE

Landfill inspections are performed regularly and include the run-on and runoff control systems. The inspections are performed every seven days and annually in accordance with §257.84(a)(1) and §257.84(b)(1), respectively. The run-on and runoff control systems are typically inspected for signs of erosion, sediment accumulation, channel degradation, damage to drainage control features, and other items which could prevent the systems from performing as designed.

Maintenance activities are performed on as needed basis, based on inspection findings, and in accordance with operational requirements. The maintenance activities are intended to preserve the integrity of the run-on and runoff control systems and could include the following:

- Erosion repair
- Berm restoration
- Basin cleanout
- Ditch/channel cleanout
- Cleanout of culvert inlets and outlets

The inspection and maintenance activities are also intended to provide assurance that "run-off from the active portion of the CCR unit [is] handled in accordance with the surface water requirements under §257.3-3." (§257.81(b)). The maintenance activities do not include, and do not cause the following: (1) the discharge of fill or dredged material into waters of the United States, (2) the discharge of pollutants in violation of NPDES permit requirements, or (3) the creation of nonpoint source pollution that adversely affects waters of the United States.

5.0 RUN-ON EVALUATION

As required by CCR Rule, the design storm event for the run-on and runoff control plan is the 25-year, 24-hour storm. Consistent with the methodology described in Sections 4.0 and 4.1, the run-on evaluation used for this plan was based on the delineated drainage basin using the landfill topography (Figure 2). The hydrologic calculations are included in Attachment 1.

The landfill is higher than the adjacent ground surface around most of its perimeter and therefore, run-on potential is largely prevented from reaching the active portion of the landfill. However, part of the perimeter road at the landfill's southern boundary, near the South Lateral Landfill Expansion (SLLE), is lower than the adjacent ground surface (Figure 2; SLLE-3). The tributary area in this location is largely limited to the cut slope itself, and potential run-on is diverted away from the landfill by the roadside ditch in accordance with §257.81(a)(1) and §257.81(b) (CH2M 2016; Jacobs 2021a). Table 5.1 summarizes the run-on calculations by subbasin as shown on Figure 2.

Table 5.1. RGS 2026 HEC-HMS Subbasin Results

ID	Area (ac)	Lag Time (mins)	Peak Discharge (cfs)	Peak Discharge Volume (ac-ft)
SLLE-3	0.4	4.3	0.4	0.02

The SLLE Run-on Ditch geometry was estimated utilizing the landfill topography, and the hydraulic capacity was analyzed using Manning's equation in approved software such as Bentley FlowMaster. The results demonstrate that the ditch can convey a flow of 2.58 cfs (Attachment 2). As noted in the previous plans (Jacobs 2016, Jacobs 2021a), the SLLE Run-On Ditch was designed to contain the 100-year, 24-hour storm event (CH2M 2013). Additionally, the SLLE Runoff Ditch located on the north side of the haul road and would also intercept and convey any potential run-on flow before reaching the active portion of the landfill.

6.0 CONCLUSION AND RECOMMENDATIONS

NV Energy prepared this plan to meet the requirements of §257.81(c)(4) of the CCR Rule.

The following conclusions are made based on this plan:

- As required by §257.81(c)(1), the run-on and runoff control systems were designed and constructed in accordance with §257.81 (Sections 3 and 4), which is supported by appropriate engineering calculations (Attachments 1 and 2).
- The landfill meets the run-on requirements of §257.81(a)(1) because the run-on control system was designed and constructed to prevent flow onto the active portion of the landfill during the peak flow from the 100-year, 24-hour event, which exceeds the requirement of 25-year, 24-hour storm specified in §257.81(a)(1) (Section 4). This condition is monitored by operations and maintenance activities.
- The runoff control system was designed and constructed to meet the runoff requirements of §257.81(a)(2) (Section 3). This system is monitored by operations and maintenance activities.
- Runoff is handled in accordance with the surface water requirements under §257.3-3 (reference statement location), as required by §257.81(b) (Section 3.6), since it is contained by the runoff control system.
- This plan was certified by a QPE per as required by §257.81(c)(5) (Section 6).

The following recommendations are made based on this plan.

- Place this plan in the operating record by October 15, 2026, to comply with §257.81(c)(4) and §257.107(g)(3). Post this plan to NV Energy's publicly accessible CCR website 30 days after placement in the operating record (§257.81(d) and §257.107(g)(3)), and notify the State Director 30 days after placement (§257.81(d) and §257.106(g)(3)).
- Continue inspections and maintenance of the landfill, including the existing stormwater control features, to maintain compliance with run-on and runoff control requirements.
- Continue sediment cleanout from retention basins as needed to maintain storage capacity.
- Survey the entire landfill as well as culvert inlet and outlet elevations before the next periodic revision.

7.0 CERTIFICATION

This of the run-on and runoff control plan was conducted in accordance with the requirements of §257.81 of the CCR Rule.



Digitally signed
by Nathan Betts
Date: 10/14/26
04:19 PM

Jacobs
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Document History and Status			
Revision Date	**QPE**	**Revision**	**Description of Change**
October 14, 2016	Michael E. Schwab, P.E./CH2M (now Jacobs)	0	Initial Plan
October 15, 2021	Stephen M Jones, P.E./Jacobs	1	First Revised Plan - Updated plan and calculations to account for changes in site and reference documents over preceding 5 years
October 14, 2026	Nathan Betts, P.E./Jacobs	2	Second Revised Plan - Updated plan and calculations to account for changes in site conditions, regulations, and reference documents over preceding 5 years

8.0 REFERENCES

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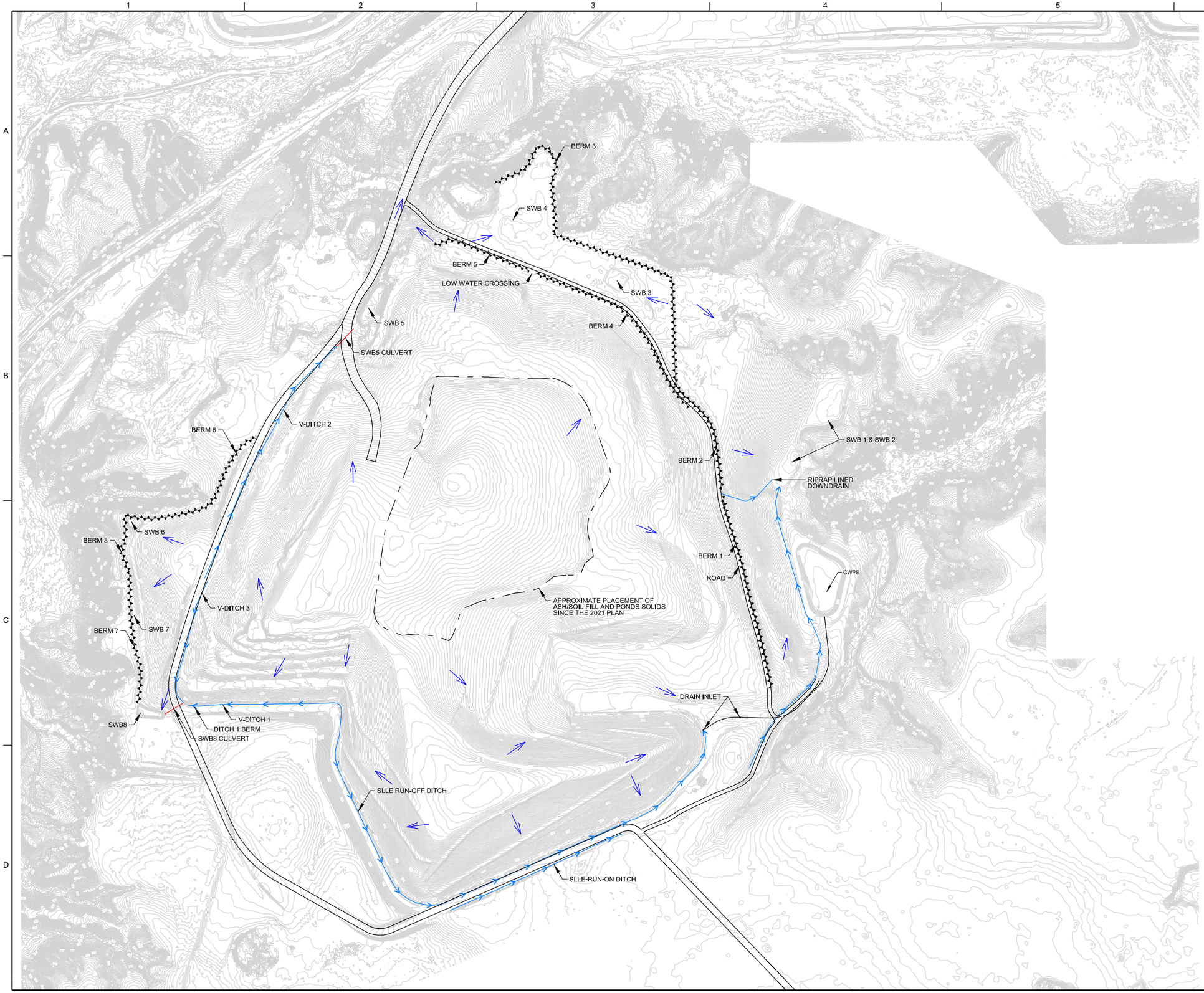
9.0 ATTACHMENT LIST

Figures

Attachment 1 Hydrologic Calculations

Attachment 2 Hydraulic Calculations

FIGURES



N

200 0 200

Scale In Feet

NOTES:

1. SOURCE OF LANDFILL TOPOGRAPHY IS BASED PRIMARILY ON AS-BUILT SURVEYS PEFORMED AND PROVIDED BY STOVALL LAND SURVEYING (2017), BAUGHMAN & TURNER (2025), AND NV ENERGY (2026). UNLESS NOTED OTHERWISE, THE SOURCE OF TOPOGRAPHY ELSEWHERE IN THE LANDFILL IS BASED ON AERIAL LIDAR SURVEY PERFORMED AND PROVIDED BY AERO-GRAPHICS (2017).
2. HORIZONTAL DATUM: NAD83 NEVADA SP EAST
3. VERTICAL DATUM: NAVD88

LEGEND

- EXISTING GRADE (1 FOOT CONTOURS, NOTE 1)
- BERMS
- DRAINAGE DITCH/CHANNEL
- CULVERT
- SURFACE FLOW LINES
- SWB STORMWATER (RETENTION) BASIN
- SLLE SOUTH LATERAL LANDFILL EXPANSION
- CWPS CONTACT WATER POND SYSTEM

PRELIMINARY NOT FOR CONSTRUCTION

NO.	DATE	REVISION	DR	CHK	APVD
0	10/12/26	2026 RUN-ON AND RUNOFF CONTROL PLAN UPDATE	S. BOURQUE	I. MATAGI	N. BETTS
DSGN M. BRADEN			MB	BY	APVD NB

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REID GARDNER STATION
Moapa, Nevada

NVEnergy

LANDFILL RUN-ON AND RUNOFF CONTROL PLAN

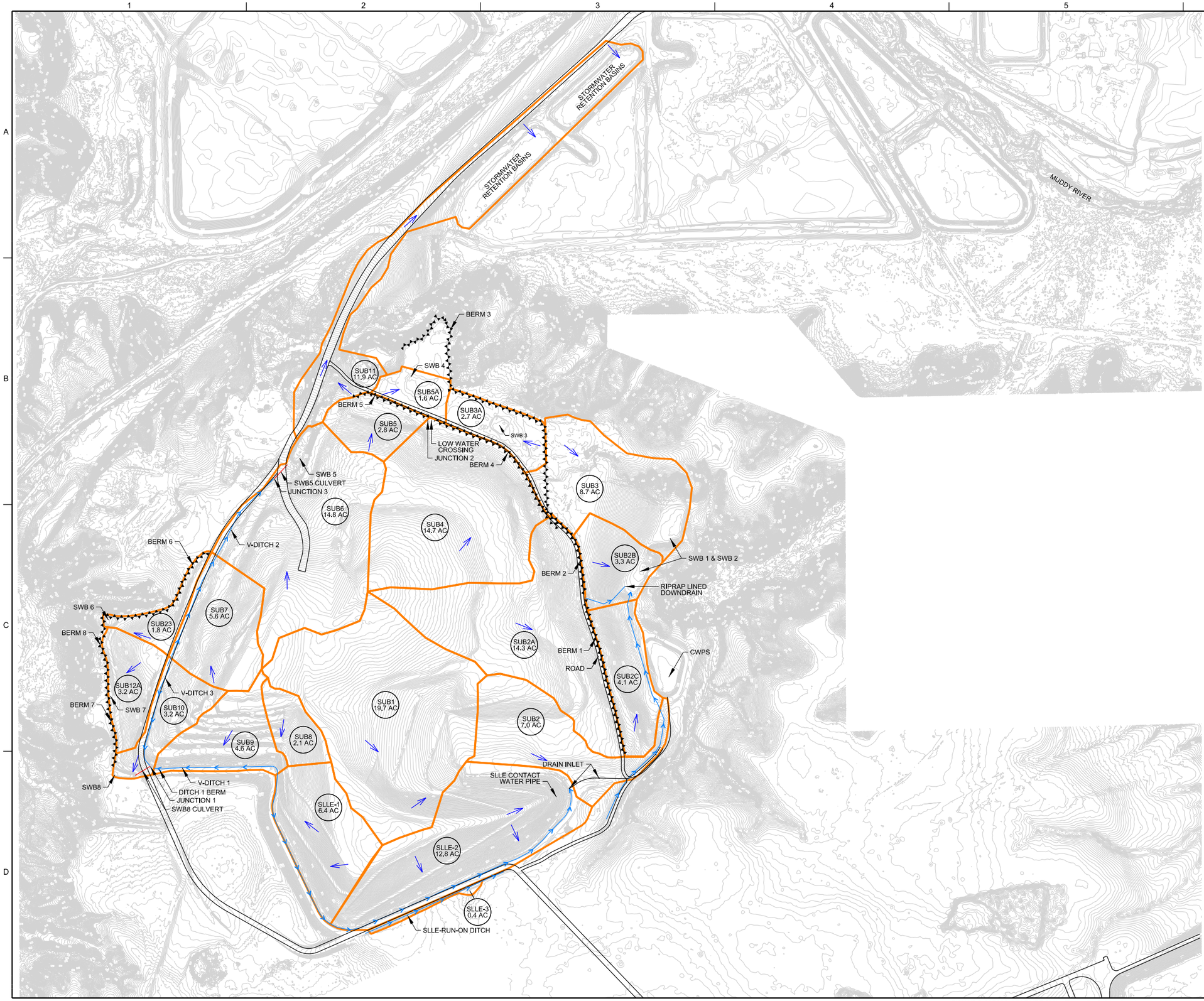
CURRENT TOPOGRAPHY MAP

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	OCTOBER 2026
PROJ	02111
DWG	1
SHEET	FIGURE 1

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Scale In Feet

NOTES:

1. SOURCE OF LANDFILL TOPOGRAPHY IS BASED PRIMARILY ON AS-BUILT SURVEYS PEFORMED AND PROVIDED BY STOVALL LAND SURVEYING (2017). BAUGHMAN & TURNER (2025), AND NV ENERGY (2026). UNLESS NOTED OTHERWISE, THE SOURCE OF TOPOGRAPHY ELSEWHERE IN THE LANDFILL IS BASED ON AERIAL LIDAR SURVEY PERFORMED AND PROVIDED BY AERO-GRAPHICS (2017).
2. HORIZONTAL DATUM: NAD83 NEVADA SP EAST
3. VERTICAL DATUM: NAVD88

LEGEND

	EXISTING GRADE (1 FOOT CONTOURS, NOTE 1)
	BERMS
	DRAINAGE DITCH/CHANNEL
	CULVERT
	SUBBASIN
	SURFACE FLOW LINES
AC	ACRES
SWB	STORMWATER (RETENTION) BASIN
SLLE	SOUTH LATERAL LANDFILL EXPANSION
CWPS	CONTACT WATER POND SYSTEM

PRELIMINARY NOT FOR CONSTRUCTION

NO.	DATE	DSGN	DR	CHK	APVD
0	10/12/26	M. BRADEN	S. BOURQUE	I. MATAGI	N. BETTS

2026 RUN-ON AND RUNOFF CONTROL PLAN UPDATE

REVISION	BY	APVD
	MB	NB

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LANDFILL RUN-ON AND RUNOFF CONTROL PLAN

SUBBASIN MAP

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VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	OCTOBER 2026
PROJ	02111
DWG	1
SHEET	FIGURE 2

ATTACHMENT 1
HYDROLOGIC CALCULATIONS

NOAA Atlas 14 Precipitation Data

NOAA Atlas 14, Volume 1, Version 5
Location name: Moapa, Nevada, USA*
Latitude: 36.6585°, Longitude: -114.6361°
Elevation: 1594 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

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	0.118 (0.096-0.141)	0.154 (0.127-0.187)	0.218 (0.179-0.266)	0.271 (0.222-0.330)	0.349 (0.283-0.427)	0.414 (0.333-0.508)	0.487 (0.385-0.602)	0.566 (0.439-0.708)	0.686 (0.521-0.873)	0.787 (0.587-1.02)
10-min	0.179 (0.147-0.215)	0.234 (0.194-0.285)	0.332 (0.272-0.404)	0.413 (0.338-0.502)	0.531 (0.431-0.649)	0.630 (0.507-0.773)	0.741 (0.586-0.916)	0.862 (0.668-1.08)	1.04 (0.793-1.33)	1.20 (0.893-1.55)
15-min	0.222 (0.182-0.266)	0.290 (0.240-0.353)	0.411 (0.338-0.500)	0.512 (0.419-0.623)	0.658 (0.534-0.805)	0.780 (0.628-0.959)	0.918 (0.726-1.14)	1.07 (0.828-1.34)	1.30 (0.983-1.65)	1.48 (1.11-1.92)
30-min	0.299 (0.245-0.358)	0.391 (0.323-0.475)	0.553 (0.454-0.674)	0.689 (0.564-0.839)	0.886 (0.719-1.08)	1.05 (0.845-1.29)	1.24 (0.978-1.53)	1.44 (1.12-1.80)	1.74 (1.32-2.22)	2.00 (1.49-2.59)
60-min	0.370 (0.303-0.443)	0.484 (0.400-0.588)	0.685 (0.562-0.834)	0.852 (0.698-1.04)	1.10 (0.890-1.34)	1.30 (1.05-1.60)	1.53 (1.21-1.89)	1.78 (1.38-2.23)	2.16 (1.64-2.75)	2.48 (1.84-3.20)
2-hr	0.444 (0.371-0.534)	0.571 (0.481-0.693)	0.785 (0.654-0.953)	0.965 (0.797-1.17)	1.23 (1.00-1.49)	1.45 (1.16-1.75)	1.70 (1.34-2.06)	1.97 (1.52-2.40)	2.37 (1.79-2.92)	2.72 (2.00-3.38)
3-hr	0.506 (0.427-0.605)	0.648 (0.546-0.780)	0.880 (0.736-1.06)	1.07 (0.890-1.28)	1.33 (1.09-1.59)	1.54 (1.26-1.86)	1.78 (1.43-2.16)	2.04 (1.61-2.49)	2.43 (1.87-2.99)	2.78 (2.09-3.44)
6-hr	0.620 (0.527-0.740)	0.794 (0.682-0.951)	1.07 (0.914-1.28)	1.29 (1.09-1.53)	1.59 (1.34-1.90)	1.83 (1.52-2.18)	2.08 (1.71-2.50)	2.36 (1.90-2.85)	2.77 (2.18-3.38)	3.11 (2.40-3.84)
12-hr	0.726 (0.629-0.840)	0.938 (0.813-1.09)	1.26 (1.09-1.46)	1.50 (1.29-1.73)	1.81 (1.55-2.10)	2.05 (1.74-2.38)	2.31 (1.93-2.69)	2.56 (2.12-3.01)	2.92 (2.36-3.46)	3.22 (2.56-3.86)
24-hr	0.813 (0.711-0.927)	1.06 (0.931-1.21)	1.42 (1.25-1.62)	1.68 (1.47-1.91)	2.03 (1.76-2.31)	2.29 (1.97-2.61)	2.55 (2.18-2.92)	2.80 (2.38-3.24)	3.15 (2.64-3.66)	3.41 (2.83-3.99)
2-day	0.860 (0.754-0.979)	1.12 (0.983-1.28)	1.51 (1.32-1.71)	1.78 (1.56-2.02)	2.14 (1.86-2.42)	2.40 (2.07-2.73)	2.66 (2.28-3.04)	2.92 (2.47-3.36)	3.26 (2.73-3.79)	3.51 (2.91-4.11)
3-day	0.895 (0.788-1.02)	1.17 (1.03-1.33)	1.58 (1.39-1.78)	1.86 (1.63-2.10)	2.23 (1.95-2.52)	2.50 (2.17-2.84)	2.77 (2.38-3.16)	3.04 (2.59-3.49)	3.39 (2.85-3.93)	3.65 (3.04-4.27)
4-day	0.931 (0.822-1.05)	1.22 (1.08-1.38)	1.64 (1.45-1.86)	1.94 (1.71-2.19)	2.32 (2.04-2.63)	2.60 (2.27-2.95)	2.88 (2.49-3.28)	3.15 (2.70-3.61)	3.52 (2.97-4.08)	3.79 (3.17-4.43)
7-day	1.04 (0.918-1.17)	1.36 (1.21-1.54)	1.83 (1.62-2.06)	2.16 (1.90-2.43)	2.56 (2.25-2.89)	2.85 (2.49-3.22)	3.13 (2.72-3.56)	3.41 (2.93-3.89)	3.76 (3.21-4.33)	4.02 (3.39-4.67)
10-day	1.11 (0.982-1.25)	1.46 (1.29-1.63)	1.96 (1.74-2.20)	2.30 (2.04-2.58)	2.72 (2.40-3.06)	3.02 (2.65-3.40)	3.31 (2.88-3.74)	3.57 (3.09-4.06)	3.93 (3.37-4.51)	4.19 (3.56-4.83)
20-day	1.27 (1.12-1.43)	1.68 (1.48-1.89)	2.29 (2.02-2.56)	2.70 (2.38-3.02)	3.21 (2.82-3.59)	3.58 (3.12-4.01)	3.92 (3.40-4.41)	4.25 (3.66-4.81)	4.67 (3.98-5.34)	4.96 (4.21-5.71)
30-day	1.46 (1.28-1.67)	1.95 (1.70-2.22)	2.71 (2.37-3.07)	3.23 (2.82-3.66)	3.88 (3.38-4.40)	4.36 (3.77-4.96)	4.82 (4.14-5.51)	5.26 (4.48-6.05)	5.82 (4.91-6.76)	6.23 (5.21-7.28)
45-day	1.64 (1.42-1.87)	2.19 (1.91-2.49)	3.08 (2.68-3.50)	3.71 (3.22-4.20)	4.51 (3.88-5.12)	5.10 (4.38-5.81)	5.68 (4.83-6.50)	6.25 (5.27-7.20)	6.98 (5.80-8.10)	7.51 (6.19-8.78)
60-day	1.77 (1.53-2.03)	2.39 (2.06-2.72)	3.40 (2.94-3.88)	4.12 (3.56-4.70)	5.06 (4.33-5.79)	5.77 (4.91-6.61)	6.48 (5.46-7.46)	7.18 (5.99-8.31)	8.09 (6.66-9.46)	8.78 (7.14-10.3)

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

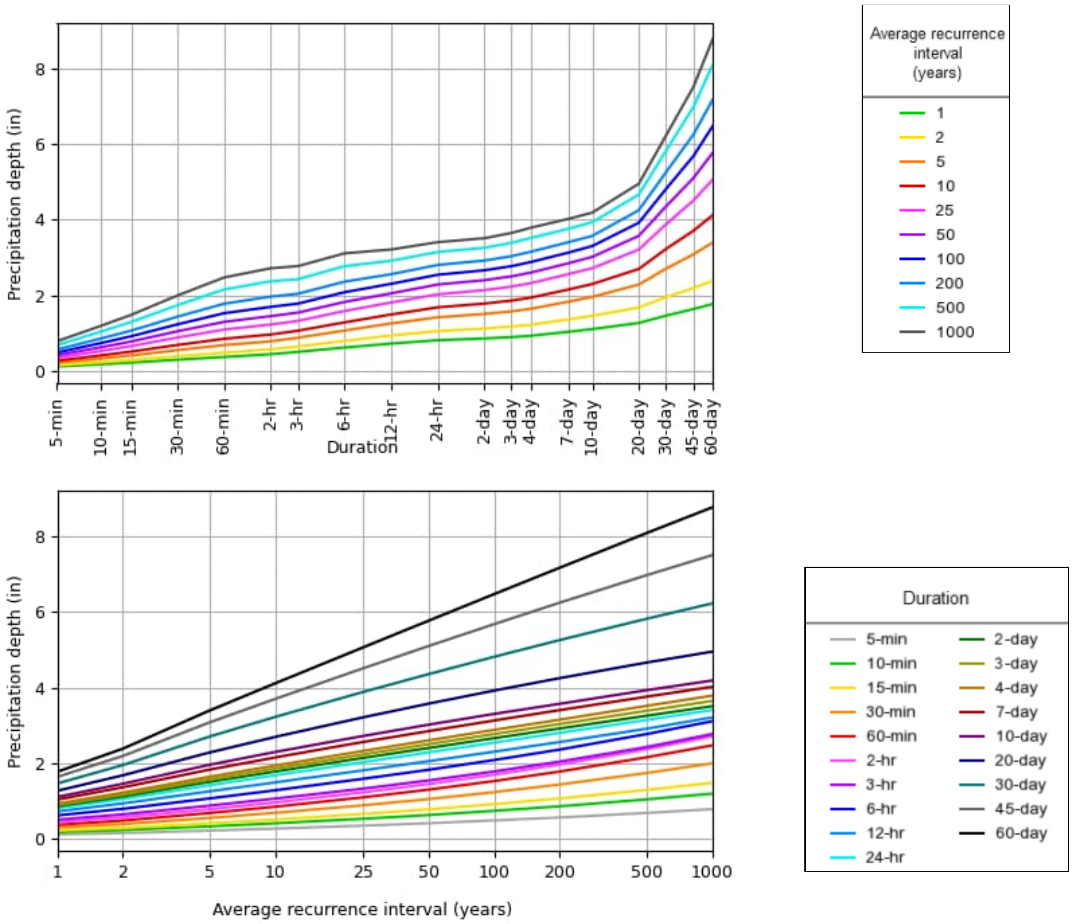
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper 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.

Back to Top

PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 36.6585°, Longitude: -114.6361°



NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Thu Sep 3 20:09:59 2026

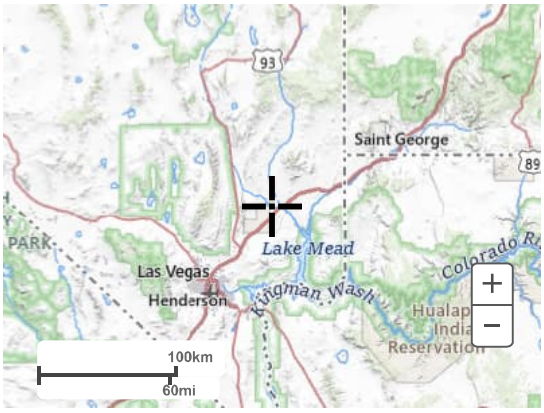
Back to Top

Maps & aerials

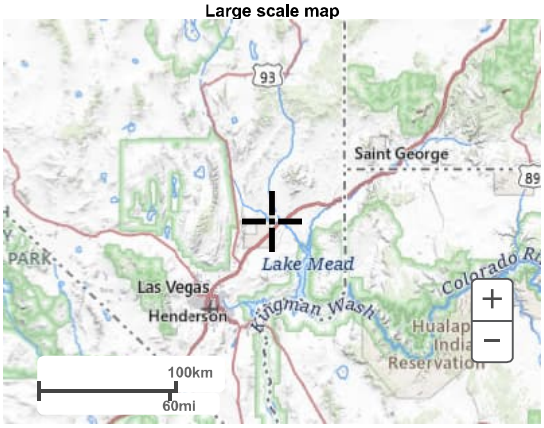
Small scale terrain



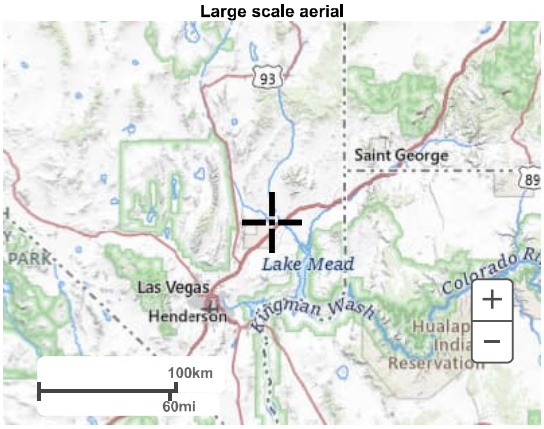
Large scale terrain



Large scale map



Large scale aerial

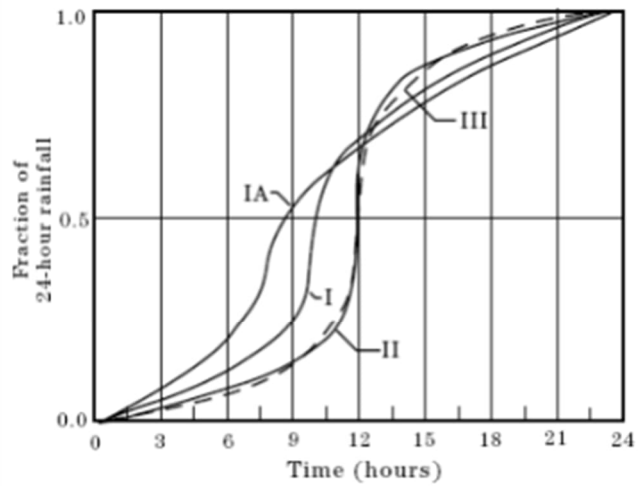


Back to Top

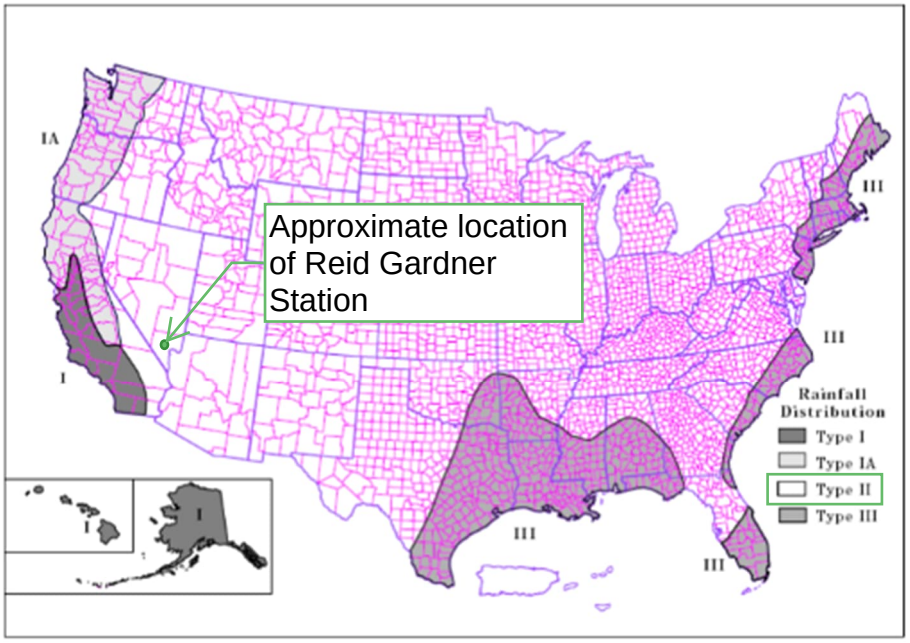
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

SCS Patterns[1]



SCS 24-hour rainfall distributions. Reproduction of Figure B-1 in TR-55.



Approximate geographic boundaries for SCS storm distributions. Reproduction of Figure B-2 in TR-55.

[1] Source: U.S. Army Corps of Engineers (USACE). 2026. *HEC-HMS Technical Reference Manual*. https://www.hec.usace.army.mil/confluence/hmsdocs/hmstrm/meteorology/precipitation/hypothetical-storm#HypotheticalStorm-worddav5c9b79139bc7809106216b0fd449781b.png506ApproximategeographicboundariesforSCSstormdistributions.ReproductionofFigureB-2inTR-55

SF4 Calculation

TIME OF CONCENTRATION / LAG TIME DETERMINATION - less than 1 mi2

Jacobs

CCR LANDFILL STORMWATER CONTROLS

RUN-OFF SUBBASIN HYDROLOGIC PARAMETERS

Project No: NVE02429
Date: 9/17/2026
Calculated by: MEB

SUB-BASIN DATA					INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)							T_{lag}	REMARKS
Basin ID	DEV./UNDEV. (D or U)	CN	K	AREA Mi^2	INITIAL LENGTH Feet	SLOPE %	Ti Min	TRAVEL LENGTH Feet	SLOPE %	V_1 VELOCITY FPS	V_2 VELOCITY FPS	Tt Min	Tc Min	Tc Check Min	T_{lag} 0.6Tc/60 Hours	RAINFALL INCHES
(1)	(2)	(3)	(4)	(5b)	(6)	(7)	(8)	(9)	(10)	(10a)	(10b)	(11)	(12)	(13)	(14)	(15)
SUB1	U	83	0.7056	0.0308	294	4.1	7.6	822	7.2	4.0	7.9	2.8	10.4	N/A	**0.104**	2.03
SUB2	U	83	0.7056	0.0110	144	4.9	5.0	1539	5.0	3.3	6.6	5.2	10.2	N/A	**0.102**	2.03
SUB2A	U	83	0.7056	0.0223	288	4.2	7.5	1486	4.2	3.0	6.0	5.5	13.0	N/A	**0.130**	2.03
SUB2B	U	83	0.7056	0.0052	123	3.3	5.3	392	13.5	5.4	10.8	1.2	6.5	N/A	**0.065**	2.03
SUB2C	U	83	0.7056	0.0064	132	10.6	3.7	785	5.2	3.4	6.7	3.2	6.9	N/A	**0.069**	2.03
SUB3	U	83	0.7056	0.0135	300	0.3	17.7	517	12.0	5.1	10.2	1.7	19.4	N/A	**0.194**	2.03
SUB3A	U	83	0.7056	0.0042	86	3.5	4.3	202	2.5	2.3	4.6	1.4	5.8	N/A	**0.058**	2.03
SUB4	U	83	0.7056	0.0229	288	4.2	7.5	1317	5.2	3.4	6.7	4.5	12.0	N/A	**0.120**	2.03
SUB5	U	83	0.7056	0.0043	93	3.2	4.6	542	2.8	2.5	4.9	3.5	8.2	N/A	**0.082**	2.03
SUB5A	U	83	0.7056	0.0026	43	2.3	3.5	255	1.6	1.9	3.7	2.3	5.8	N/A	**0.058**	2.03
SUB6	U	83	0.7056	0.0231	99	7.1	3.7	794	9.2	4.5	8.9	2.4	6.1	N/A	**0.061**	2.03
SUB7	U	83	0.7056	0.0088	122	2.5	5.8	865	6.6	3.8	7.5	3.0	8.8	N/A	**0.088**	2.03
SUB8	U	83	0.7056	0.0033	212	6.6	5.5	257	13.6	5.5	10.8	0.8	6.3	N/A	**0.063**	2.03
SUB9	U	83	0.7056	0.0071	155	5.2	5.1	885	8.0	4.2	8.3	2.8	7.9	N/A	**0.079**	2.03
SUB10	U	83	0.7056	0.0051	78	19.2	2.3	1004	6.1	3.6	7.2	3.4	5.8	N/A	**0.058**	2.03
SUB11	U	83	0.7056	0.0187	67	4.5	3.5	2672	5.2	3.4	6.7	7.9	11.4	N/A	**0.114**	2.03
SUB12	U	83	0.7056	0.0028	111	2.7	5.4	557	3.6	2.8	5.6	3.1	8.5	N/A	**0.085**	2.03
SUB12A	U	83	0.7056	0.0051	131	1.5	7.1	342	11.1	4.9	9.8	1.2	8.2	N/A	**0.082**	2.03
SLLE-1	U	83	0.7056	0.0101	220	2.7	7.5	1502	3.9	2.9	5.8	5.7	13.2	N/A	**0.132**	2.03
SLLE-2	U	83	0.7056	0.0201	108	5.6	4.2	1912	3.1	2.6	5.2	7.8	11.9	N/A	**0.119**	2.03
SLLE-3	U	83	0.7056	0.0006	15	26.7	0.9	650	1.1	1.5	3.1	6.2	7.2	N/A	**0.072**	2.03

NOTE:

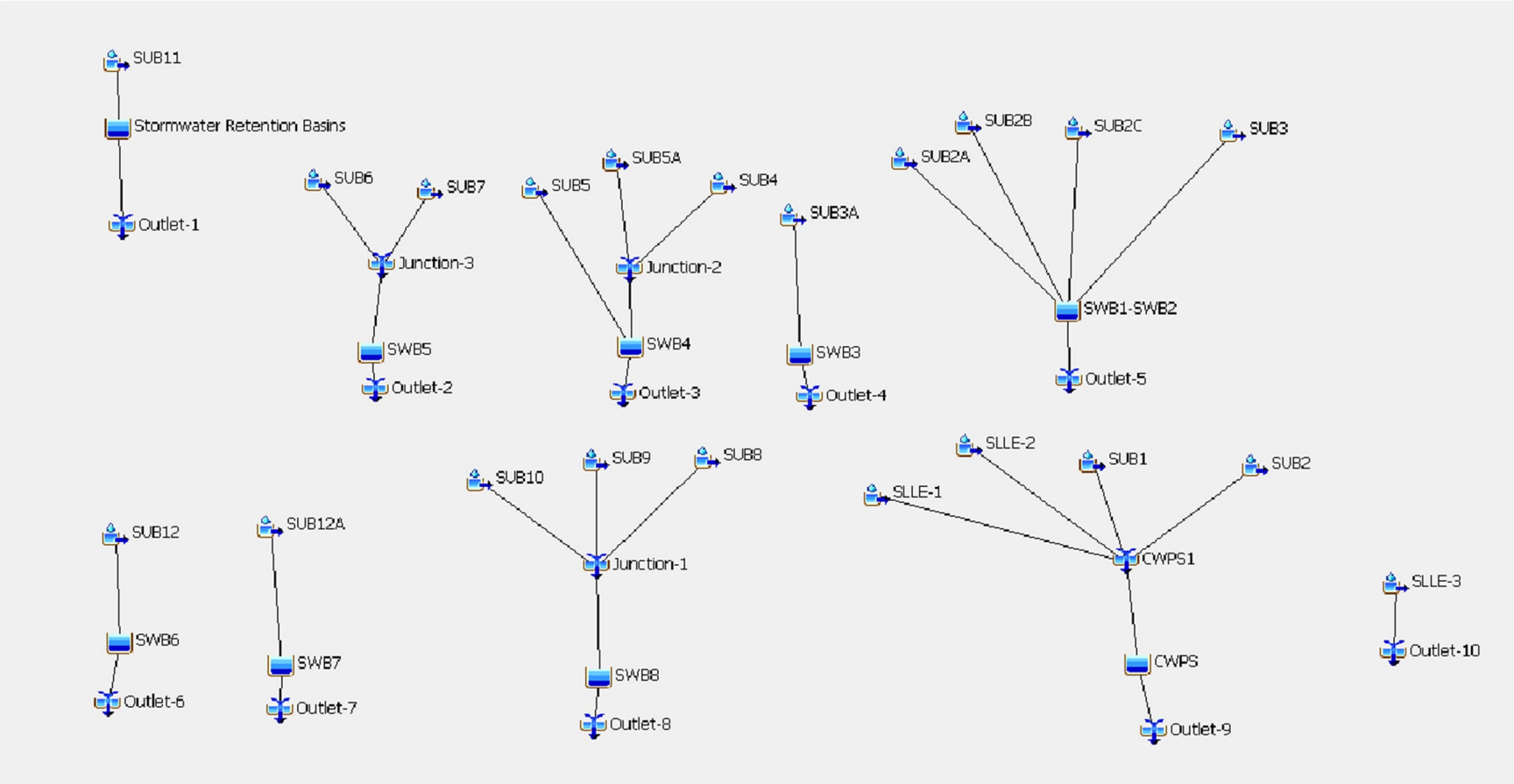
(1) Subbasin Name
(2) Developed or Undeveloped Subbasin
(3) Curve Number (See Subbasin CN Calculations)
(4) K = 0.0132 (CN) - 0.39
(5a) & (5b) Area
(6) Initial Length
(7) Initial Slope
(8) Ti = 1.8 (1.1 - K) L^1/2 / S^1/3
(9) Travel Length
(10) Slope
(10a) Slope V_1 applies to the first 500 feet of travel distance;
Developed V_1 = 20.2*(S/100)^1/2
(10b) V_2 applies to the remaining travel distance;
Developed V_2 = 30.6*(S/100)^1/2
(11) Tt = 500/(V1*60)+(Travel Length-500)/(V2*60)
(12) Tc = Ti + Tt
(13) Tc Check = L/180+10 (select smaller Tc)
(14) Tlag = 0.6 Tc/60
(15) Rainfall in inches

REFERENCE: Calculations based on the Clark County Regional Flood Control District HCDDM

STANDARD FORM 4

HEC-HMS Computation Output

RGS HEC-HMS Basin Model Schematic



Project: RGS_Landfill_Run_on_and_Run
Simulation Run: Run 1
Simulation Start: 15 October 2026, 24:00
Simulation End: 17 October 2026, 12:00

HMS Version: 4.13
Executed: 13 October 2026, 21:29

Global Parameter Summary - Subbasin

	Downstream
Element Name	**Downstream**
Sub1	Cwps1
SLLE - 2	Cwps1
Sub2	Cwps1
SLLE - 1	Cwps1
Sub2a	SWB1 - SWB2
Sub3	SWB1 - SWB2
Sub2c	SWB1 - SWB2
Sub2b	SWB1 - SWB2
Sub4	Junction - 2
Sub5a	Junction - 2
Sub5	Swb4
Sub6	Junction - 3
Sub7	Junction - 3
Sub11	Stormwater Retention Basins
Sub9	Junction - 1
Sub10	Junction - 1
Sub8	Junction - 1
Sub12a	Swb7
Sub3a	Swb3
Sub12	Swb6
SLLE - 3	Outlet - 10

Loss Rate: Scs

Element Name	Percent Impervious Area	Curve Number
Sub1	0	83
SLLE - 2	0	83
Sub2	0	83
SLLE - 1	0	83
Sub2a	0	83
Sub3	0	83
Sub2c	0	83
Sub2b	0	83
Sub4	0	83
Sub5a	0	83
Sub5	0	83
Sub6	0	83
Sub7	0	83
Sub11	0	83
Sub9	0	83
Sub10	0	83
Sub8	0	83
Sub12a	0	83
Sub3a	0	83
Sub12	0	83
SLLE - 3	0	83

Transform: Scs

Element Name	Lag	Unitgraph Type
Sub1	6.23	Standard
SLLE - 2	7.16	Standard
Sub2	6.11	Standard
SLLE - 1	7.95	Standard
Sub2a	7.79	Standard
Sub3	11.63	Standard
Sub2c	4.13	Standard
Sub2b	3.91	Standard
Sub4	7.2	Standard
Sub5a	3.48	Standard
Sub5	4.9	Standard
Sub6	3.65	Standard
Sub7	5.29	Standard
Sub11	6.84	Standard
Sub9	4.72	Standard
Sub10	3.47	Standard
Sub8	3.78	Standard
Sub12a	4.93	Standard
Sub3a	3.47	Standard
Sub12	5.11	Standard
SLLE - 3	4.3	Standard

Global Results Summary

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Sub1	0.03	20.41	16Oct2026, 12:00	0.72
SLLE - 2	0.02	12.7	16Oct2026, 12:01	0.72
Sub2	0.01	7.29	16Oct2026, 12:00	0.72
SLLE - 1	0.01	6.17	16Oct2026, 12:02	0.72
Cwps1	0.07	46.42	16Oct2026, 12:01	0.72
Cwps	0.07	0	15Oct2026, 24:00	0
Outlet - 9	0.07	0	15Oct2026, 24:00	0
Sub2a	0.02	13.53	16Oct2026, 12:02	0.72
Sub3	0.01	6.97	16Oct2026, 12:06	0.72
Sub2c	0.01	4.62	16Oct2026, 11:58	0.72
Sub2b	0.01	3.79	16Oct2026, 11:58	0.72
SWB1 - SWB2	0.05	0	15Oct2026, 24:00	0
Outlet - 5	0.05	0	15Oct2026, 24:00	0
Sub4	0.02	14.44	16Oct2026, 12:01	0.72
Sub5a	0	1.92	16Oct2026, 11:58	0.72
Junction - 2	0.03	16.07	16Oct2026, 12:01	0.72

Sub5	0	3.01	16Oct2026, 11:59	0.72
Swb4	0.03	0	15Oct2026, 24:00	0
Sub6	0.02	17	16Oct2026, 11:58	0.72
Sub7	0.01	6.03	16Oct2026, 11:59	0.72
Junction - 3	0.03	22.88	16Oct2026, 11:58	0.72
Swb5	0.03	0	15Oct2026, 24:00	0
Outlet - 2	0.03	0	15Oct2026, 24:00	0
Outlet - 3	0.03	0	15Oct2026, 24:00	0
Sub11	0.02	12.01	16Oct2026, 12:01	0.72
Stormwater Retention Basins	0.02	0	15Oct2026, 24:00	0
Outlet - 1	0.02	0	15Oct2026, 24:00	0
Sub9	0.01	5	16Oct2026, 11:59	0.72
Sub10	0.01	3.77	16Oct2026, 11:58	0.72
Sub8	0	2.42	16Oct2026, 11:58	0.72
Junction - 1	0.02	11.14	16Oct2026, 11:58	0.72
Swb8	0.02	0	15Oct2026, 24:00	0
Outlet - 8	0.02	0	15Oct2026, 24:00	0
Sub12a	0.01	3.56	16Oct2026, 11:59	0.72
Swb7	0.01	0	15Oct2026, 24:00	0
Outlet - 7	0.01	0	15Oct2026, 24:00	0
Sub3a	0	3.11	16Oct2026, 11:58	0.72
Swb3	0	0	15Oct2026, 24:00	0
Outlet - 4	0	0	15Oct2026, 24:00	0
Sub12	0	1.94	16Oct2026, 11:59	0.72
Swb6	0	0	15Oct2026, 24:00	0
Outlet - 6	0	0	15Oct2026, 24:00	0
SLLE - 3	0	0.43	16Oct2026, 11:58	0.72
Outlet - 10	0	0.43	16Oct2026, 11:58	0.72

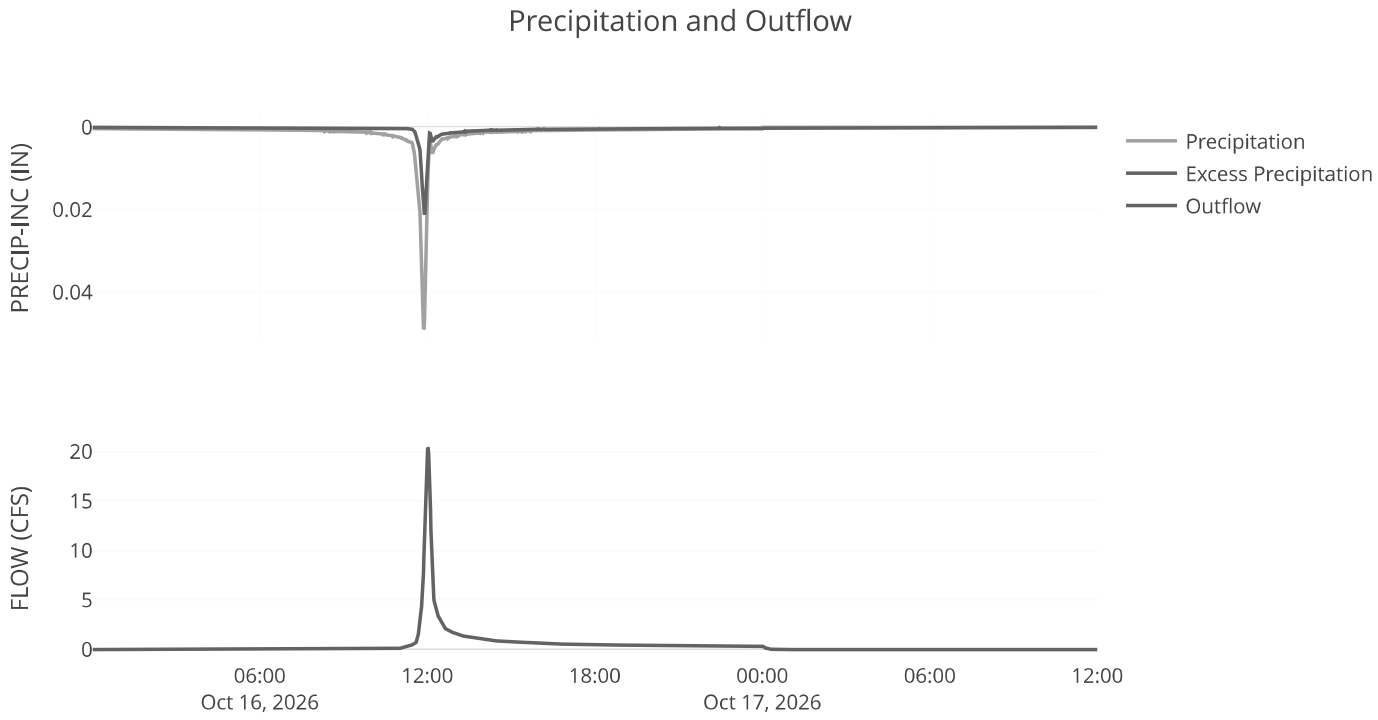
Subbasin: SUB1

Downstream : Cwps1

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	6.23
Unitgraph Type	Standard

Results: SUB1	
Peak Discharge (CFS)	20.41
Time of Peak Discharge	16Oct2026, 12:00
Volume (IN)	0.72
Precipitation Volume (AC - FT)	3.36
Loss Volume (AC - FT)	2.17
Excess Volume (AC - FT)	1.18
Direct Runoff Volume (AC - FT)	1.18
Baseflow Volume (AC - FT)	0



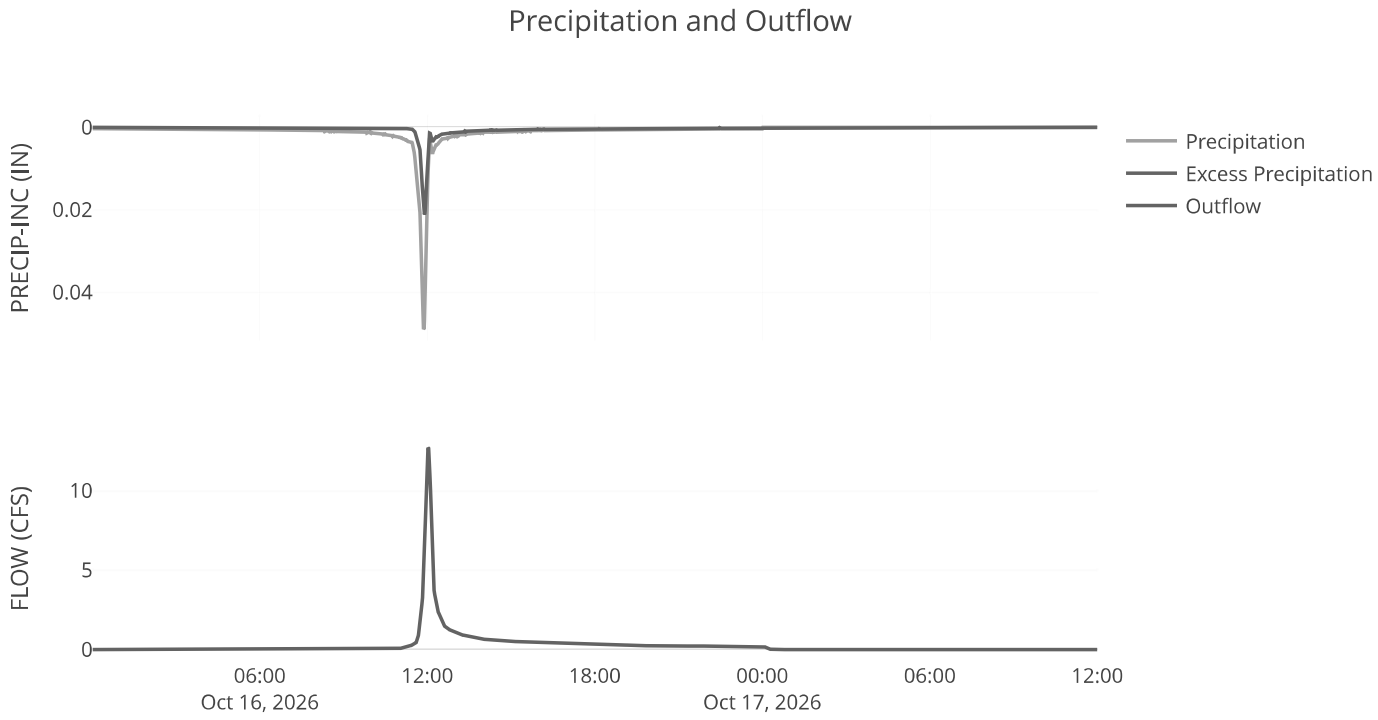
Subbasin: SLLE-2

Downstream : Cwps1

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	7.16
Unitgraph Type	Standard

Results: SLLE-2	
Peak Discharge (CFS)	12.7
Time of Peak Discharge	16Oct2026, 12:01
Volume (IN)	0.72
Precipitation Volume (AC - FT)	2.18
Loss Volume (AC - FT)	1.41
Excess Volume (AC - FT)	0.77
Direct Runoff Volume (AC - FT)	0.77
Baseflow Volume (AC - FT)	0



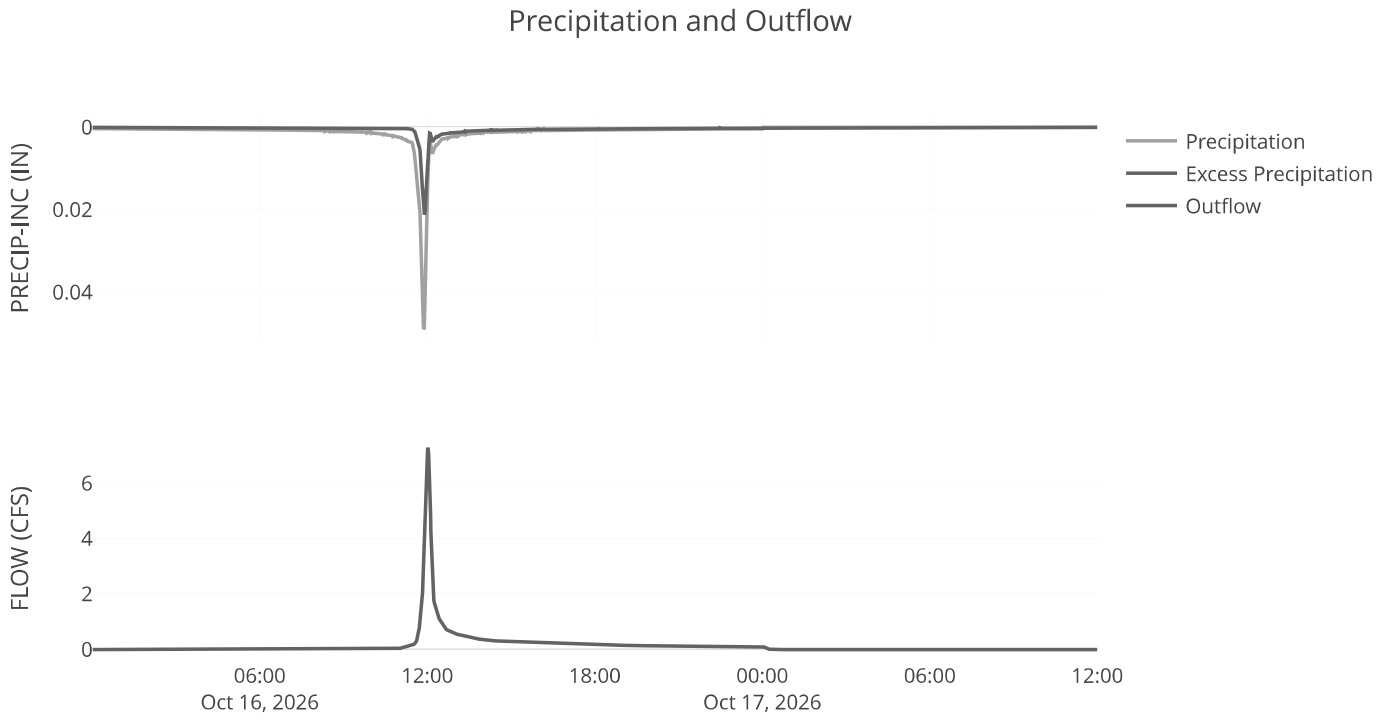
Subbasin: SUB2

Downstream : Cwps1

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	6.11
Unitgraph Type	Standard

Results: SUB2	
Peak Discharge (CFS)	7.29
Time of Peak Discharge	16Oct2026, 12:00
Volume (IN)	0.72
Precipitation Volume (AC - FT)	1.19
Loss Volume (AC - FT)	0.77
Excess Volume (AC - FT)	0.42
Direct Runoff Volume (AC - FT)	0.42
Baseflow Volume (AC - FT)	0



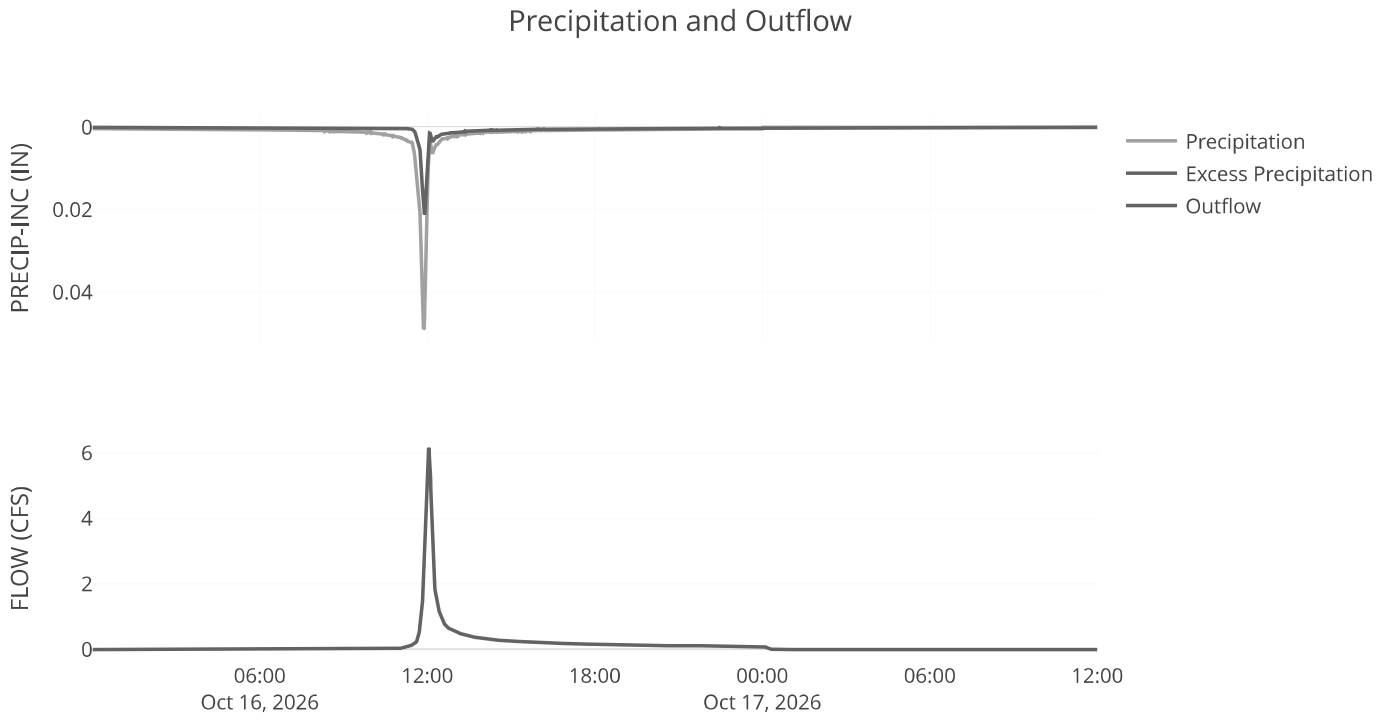
Subbasin: SLLE-1

Downstream : Cwps1

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	7.95
Unitgraph Type	Standard

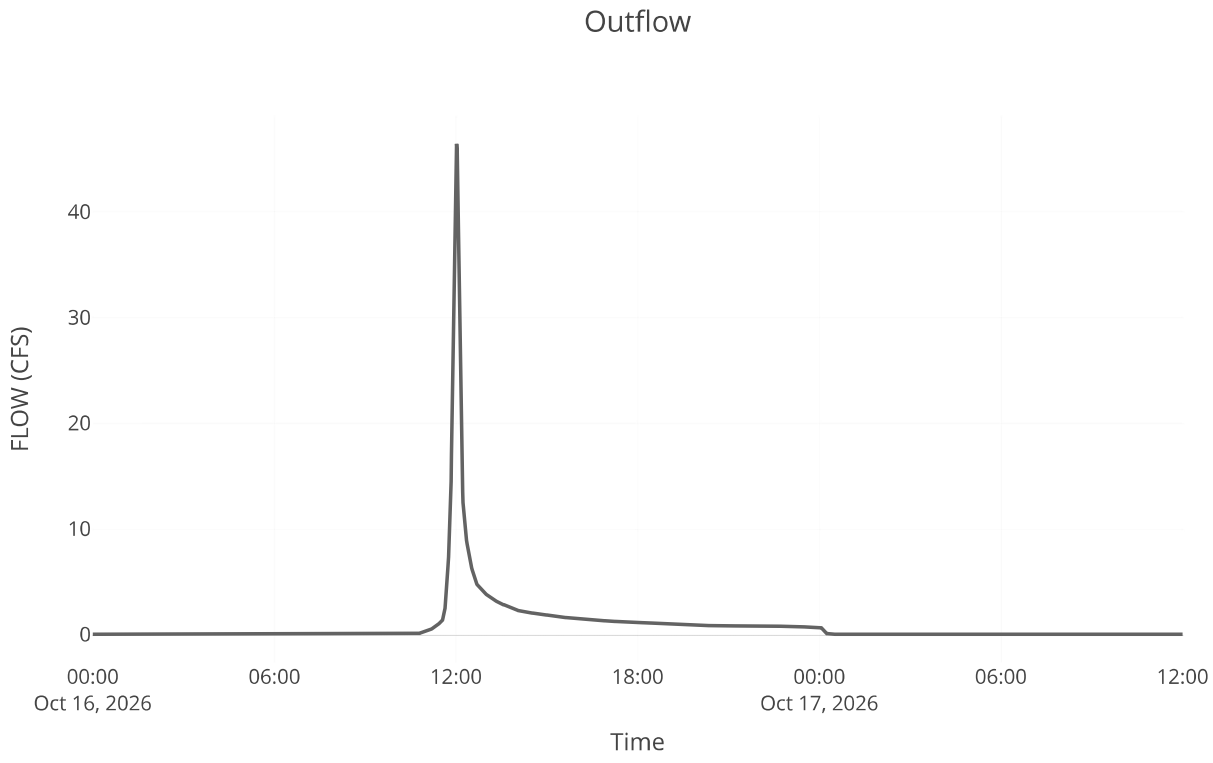
Results: SLLE-1	
Peak Discharge (CFS)	6.17
Time of Peak Discharge	16Oct2026, 12:02
Volume (IN)	0.72
Precipitation Volume (AC - FT)	1.09
Loss Volume (AC - FT)	0.71
Excess Volume (AC - FT)	0.39
Direct Runoff Volume (AC - FT)	0.39
Baseflow Volume (AC - FT)	0



Junction: CWPS1

Downstream : Cwps

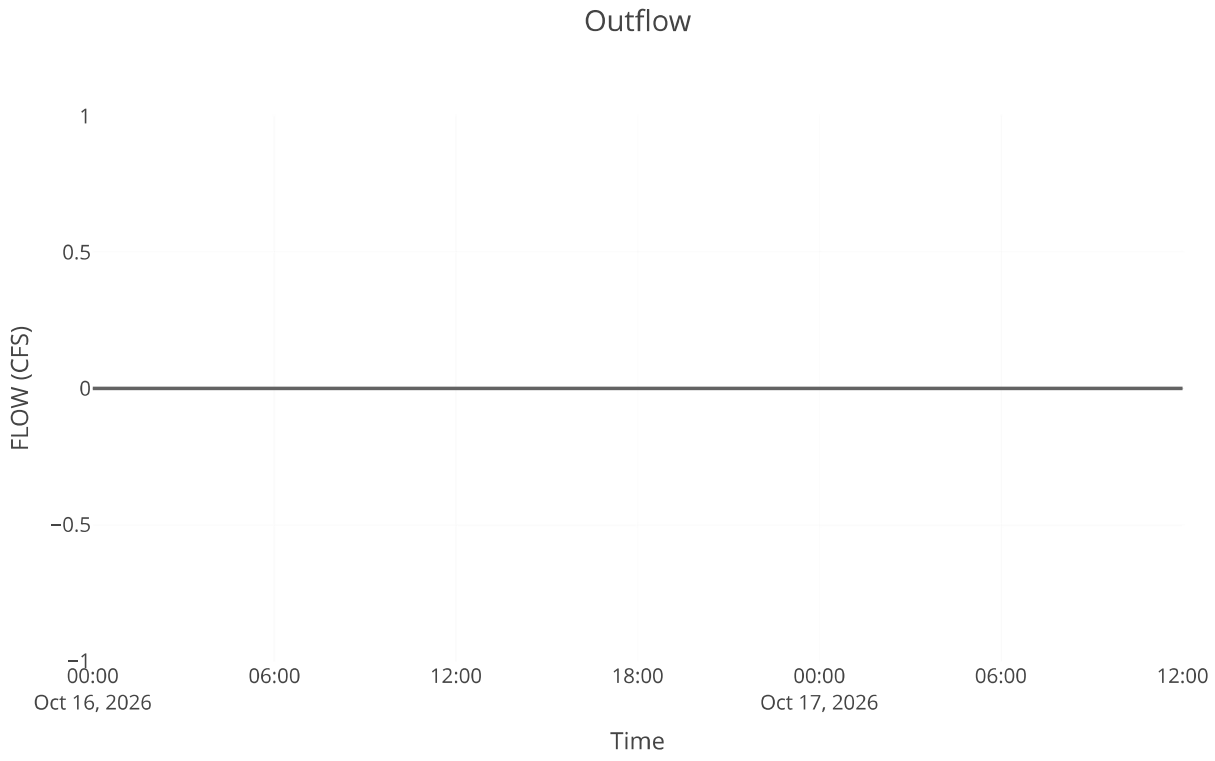
Results: CWPS1	
Peak Discharge (CFS)	46.42
Time of Peak Discharge	16Oct2026, 12:01
Volume (IN)	0.72



Reservoir: CWPS

Downstream : Outlet - 9

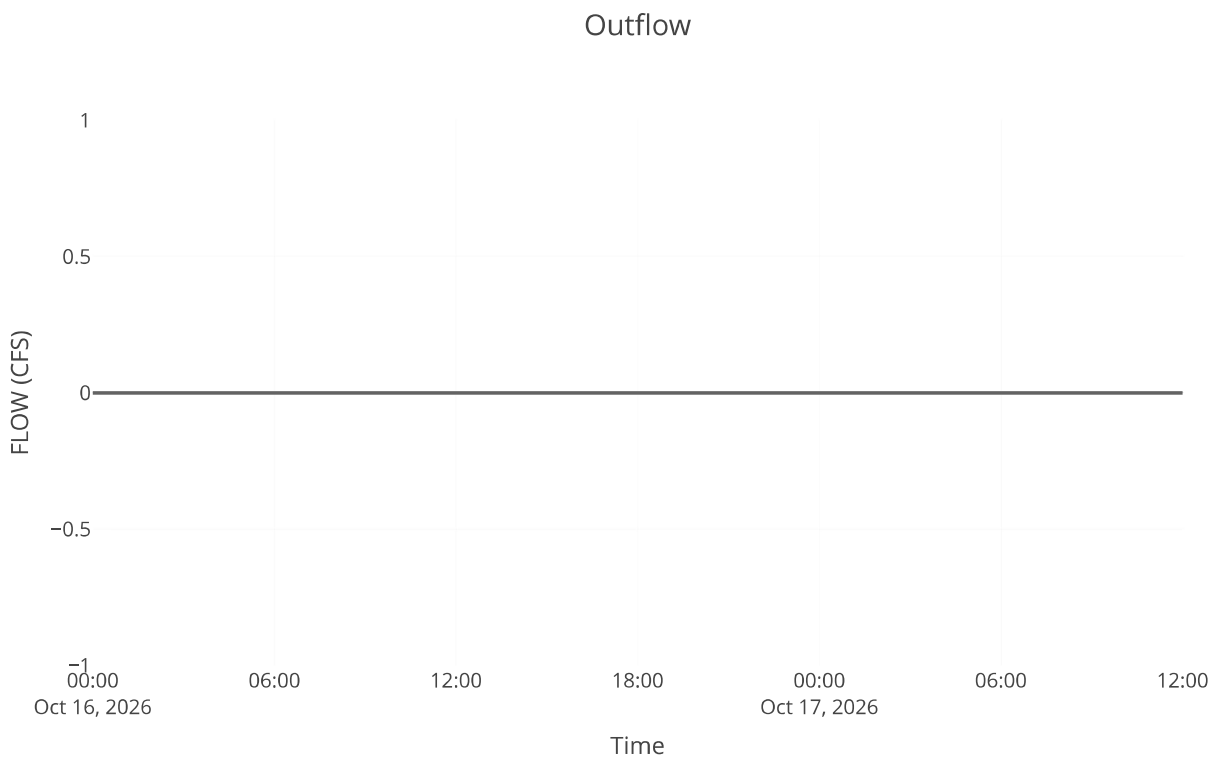
Results: CWPS	
Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0
Peak Inflow (CFS)	46.42
Time of Peak Inflow	16Oct2026, 12:01
Inflow Volume (AC - FT)	2.76
Maximum Storage (AC - FT)	2.76
Peak Elevation (FT)	3.28
Discharge Volume (AC - FT)	0



Junction: Outlet-9

Results: Outlet-9

Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0



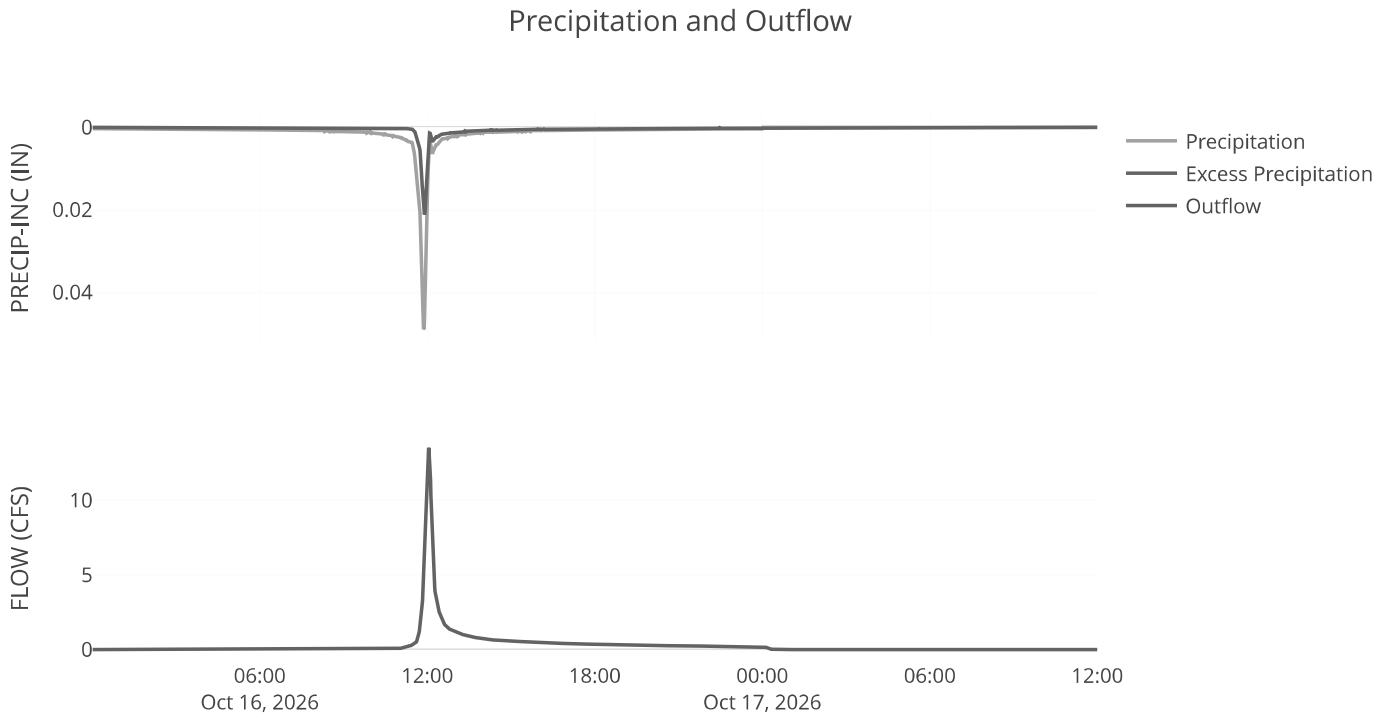
Subbasin: SUB2A

Downstream : SWB1 - SWB2

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	7.79
Unitgraph Type	Standard

Results: SUB2A	
Peak Discharge (CFS)	13.53
Time of Peak Discharge	16Oct2026, 12:02
Volume (IN)	0.72
Precipitation Volume (AC - FT)	2.38
Loss Volume (AC - FT)	1.54
Excess Volume (AC - FT)	0.84
Direct Runoff Volume (AC - FT)	0.84
Baseflow Volume (AC - FT)	0



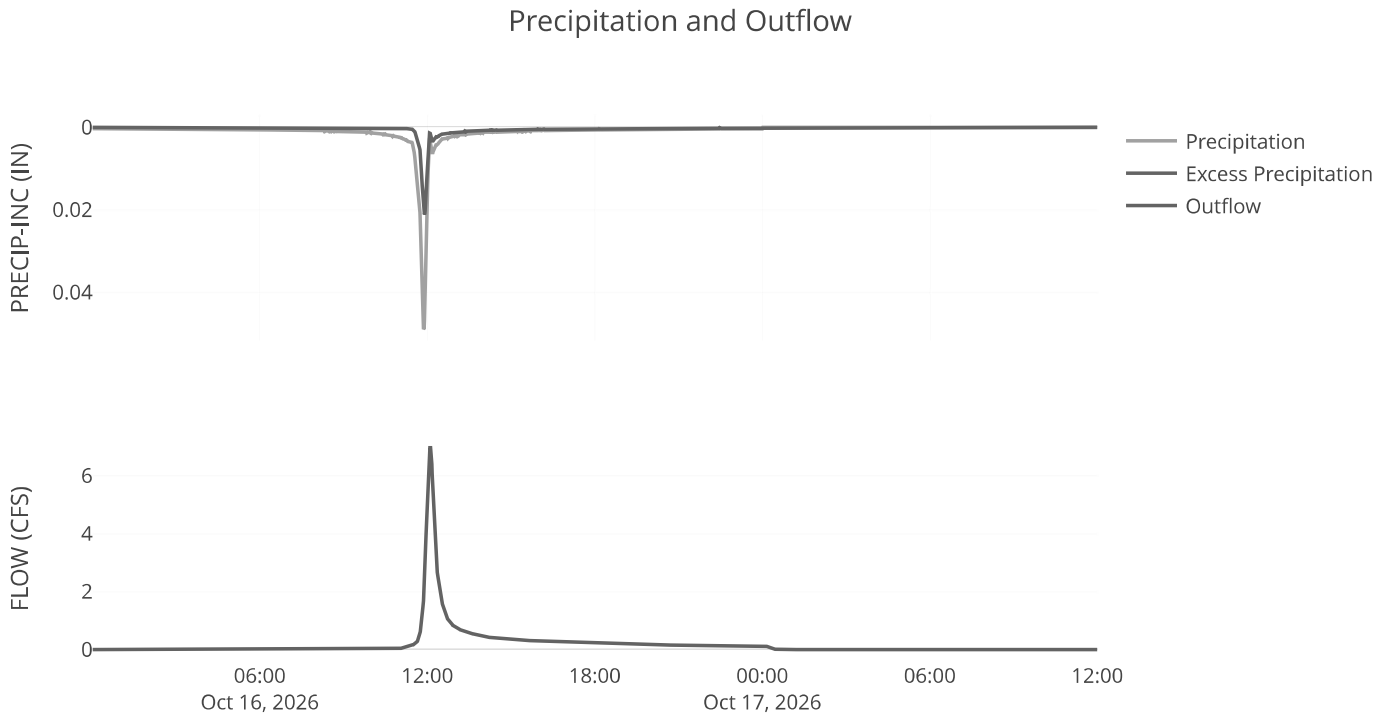
Subbasin: SUB3

Downstream : SWB1 - SWB2

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	11.63
Unitgraph Type	Standard

Results: SUB3	
Peak Discharge (CFS)	6.97
Time of Peak Discharge	16Oct2026, 12:06
Volume (IN)	0.72
Precipitation Volume (AC - FT)	1.46
Loss Volume (AC - FT)	0.95
Excess Volume (AC - FT)	0.52
Direct Runoff Volume (AC - FT)	0.52
Baseflow Volume (AC - FT)	0



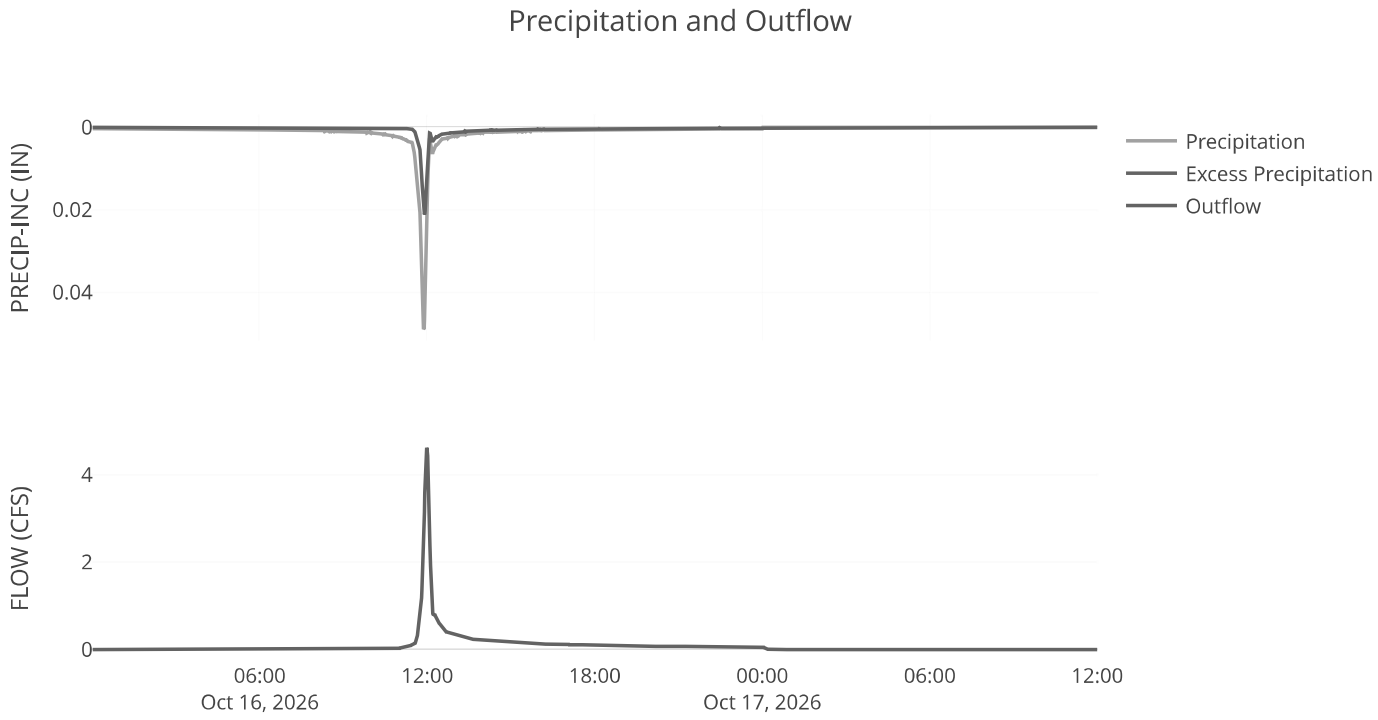
Subbasin: SUB2C

Downstream : SWB1 - SWB2

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	4.13
Unitgraph Type	Standard

Results: SUB2C	
Peak Discharge (CFS)	4.62
Time of Peak Discharge	16Oct2026, 11:58
Volume (IN)	0.72
Precipitation Volume (AC - FT)	0.69
Loss Volume (AC - FT)	0.45
Excess Volume (AC - FT)	0.24
Direct Runoff Volume (AC - FT)	0.24
Baseflow Volume (AC - FT)	0



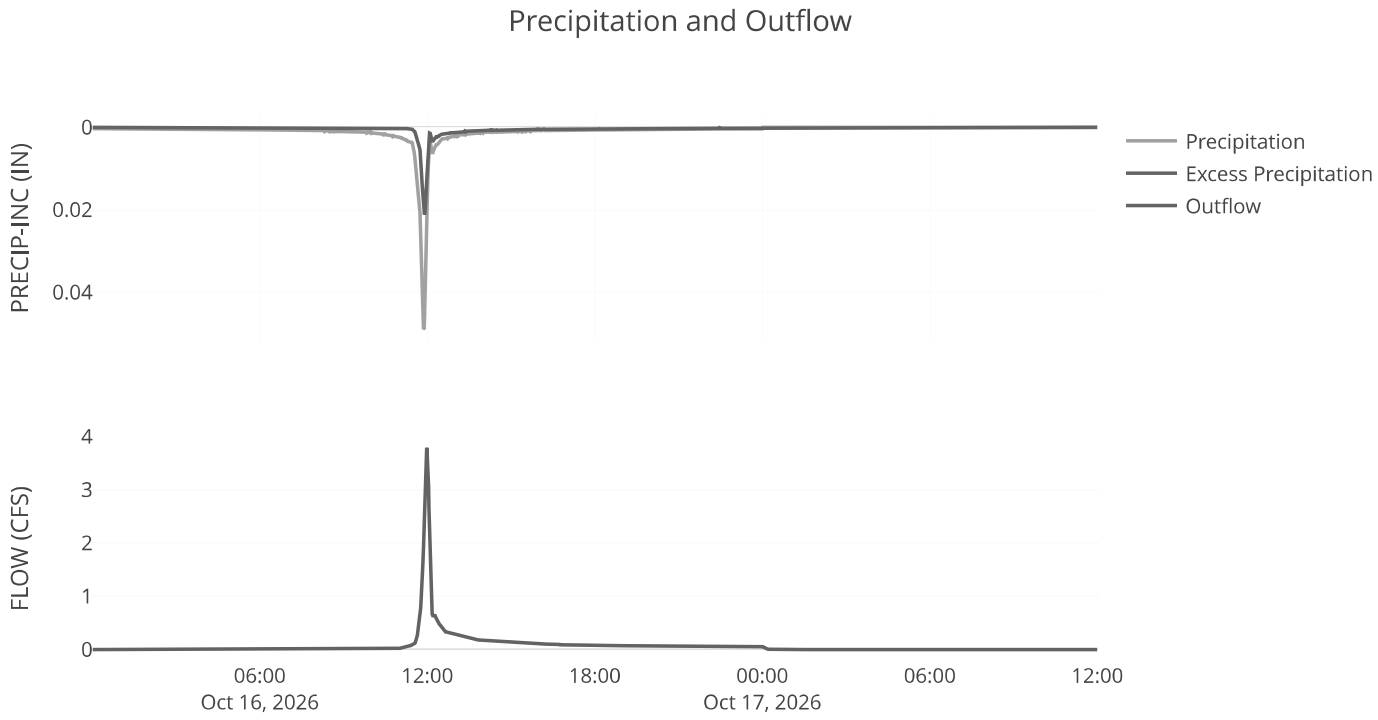
Subbasin: SUB2B

Downstream : SWB1 - SWB2

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	3.91
Unitgraph Type	Standard

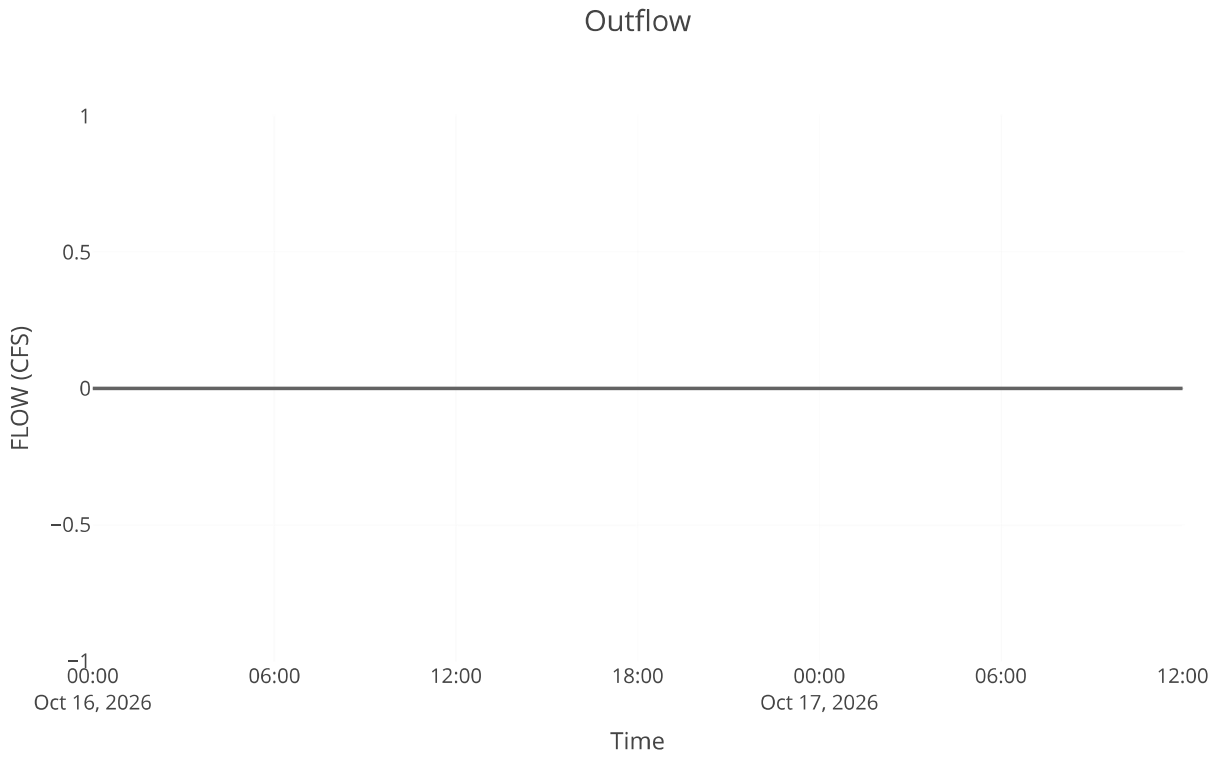
Results: SUB2B	
Peak Discharge (CFS)	3.79
Time of Peak Discharge	16Oct2026, 11:58
Volume (IN)	0.72
Precipitation Volume (AC - FT)	0.56
Loss Volume (AC - FT)	0.36
Excess Volume (AC - FT)	0.2
Direct Runoff Volume (AC - FT)	0.2
Baseflow Volume (AC - FT)	0



Reservoir: SWB1-SWB2

Downstream : Outlet - 5

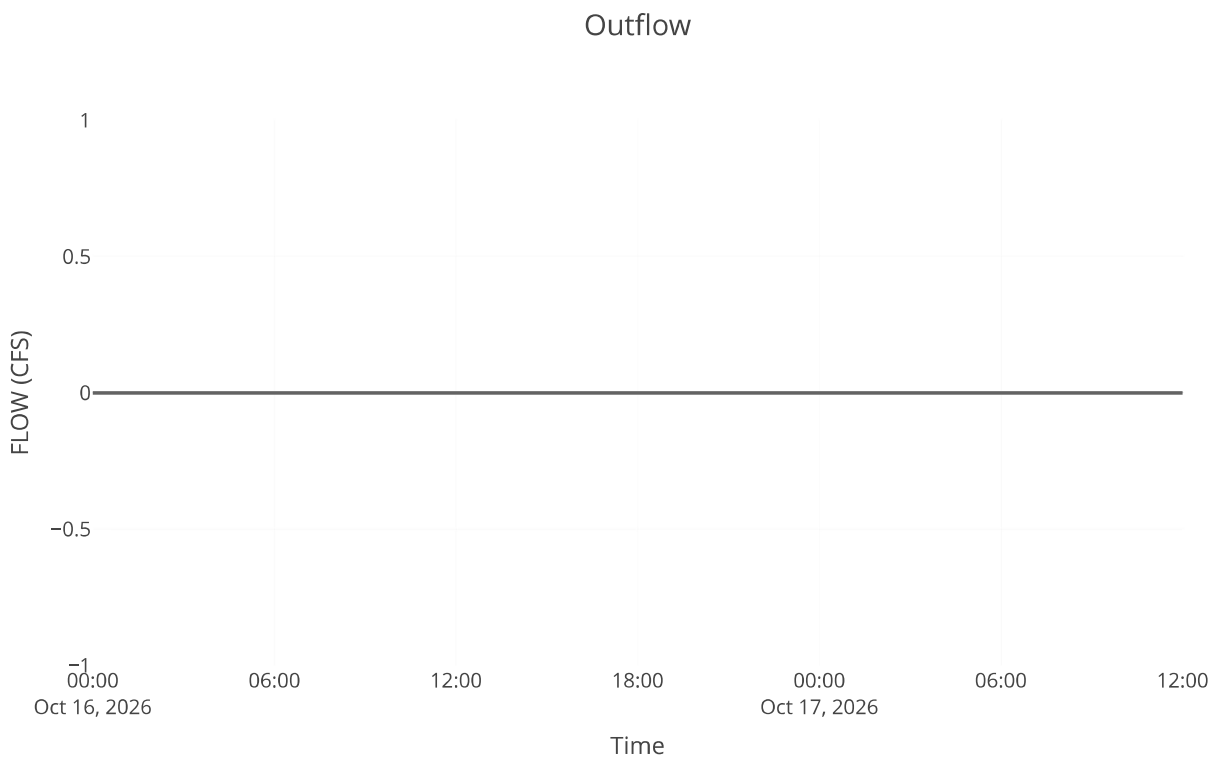
Results: SWB1-SWB2	
Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0
Peak Inflow (CFS)	26.85
Time of Peak Inflow	16Oct2026, 12:01
Inflow Volume (AC - FT)	1.8
Maximum Storage (AC - FT)	1.8
Peak Elevation (FT)	2.32
Discharge Volume (AC - FT)	0



Junction: Outlet-5

Results: Outlet-5

Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0



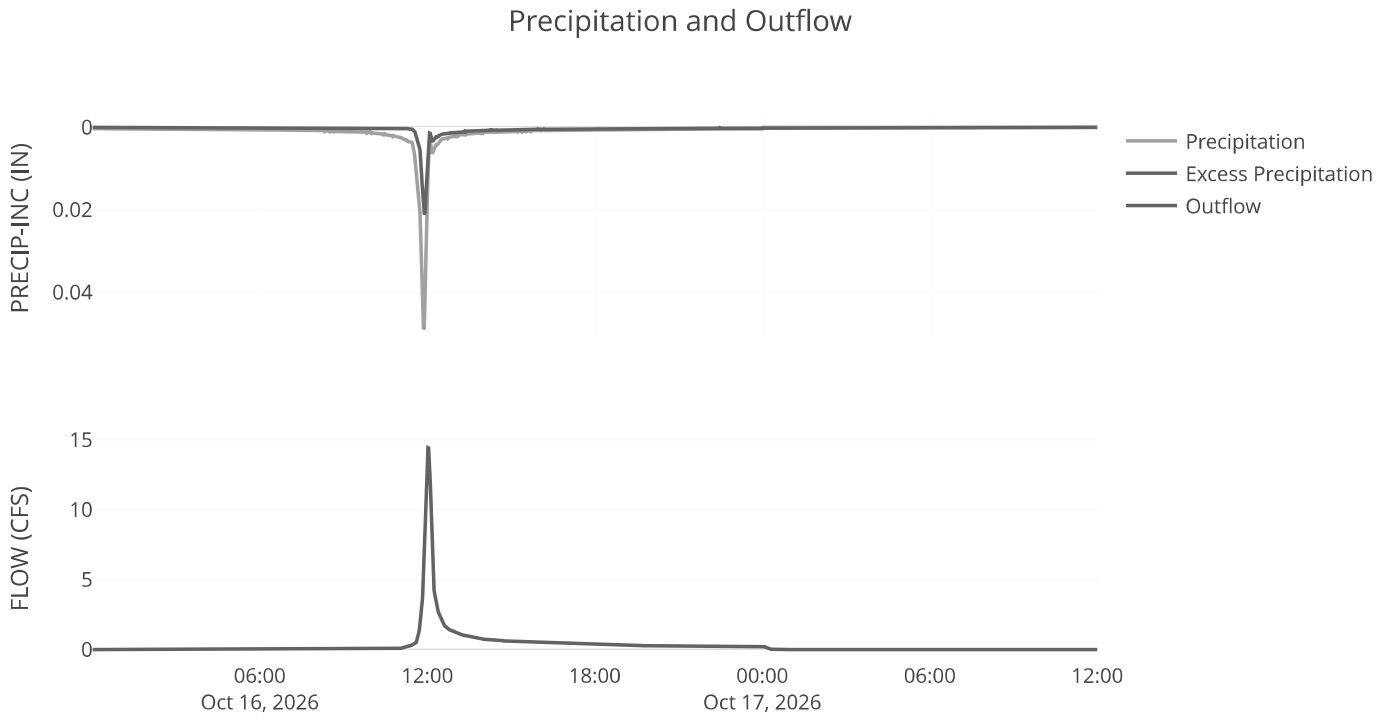
Subbasin: SUB4

Downstream : Junction - 2

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	7.2
Unitgraph Type	Standard

Results: SUB4	
Peak Discharge (CFS)	14.44
Time of Peak Discharge	16Oct2026, 12:01
Volume (IN)	0.72
Precipitation Volume (AC - FT)	2.48
Loss Volume (AC - FT)	1.61
Excess Volume (AC - FT)	0.87
Direct Runoff Volume (AC - FT)	0.87
Baseflow Volume (AC - FT)	0



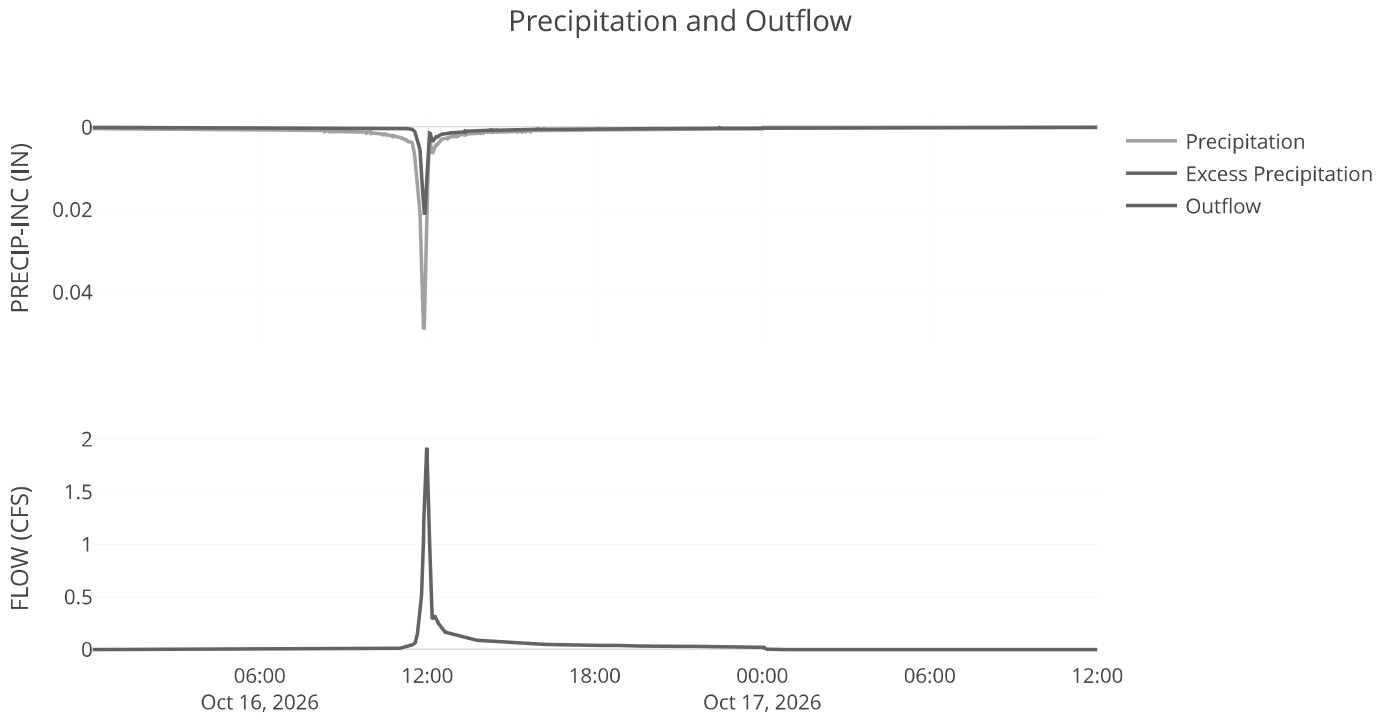
Subbasin: SUB5A

Downstream : Junction - 2

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	3.48
Unitgraph Type	Standard

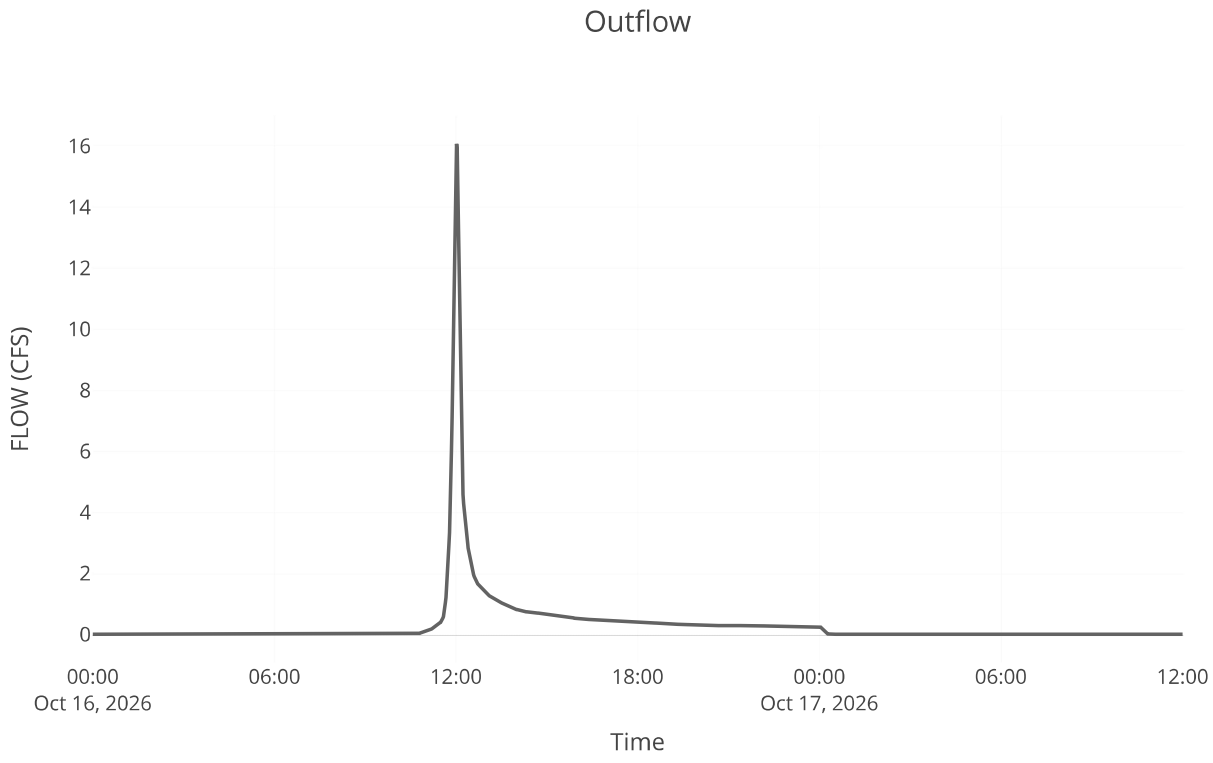
Results: SUB5A	
Peak Discharge (CFS)	1.92
Time of Peak Discharge	16Oct2026, 11:58
Volume (IN)	0.72
Precipitation Volume (AC - FT)	0.28
Loss Volume (AC - FT)	0.18
Excess Volume (AC - FT)	0.1
Direct Runoff Volume (AC - FT)	0.1
Baseflow Volume (AC - FT)	0



Junction: Junction-2

Downstream : Swb4

Results: Junction-2	
Peak Discharge (CFS)	16.07
Time of Peak Discharge	16Oct2026, 12:01
Volume (IN)	0.72



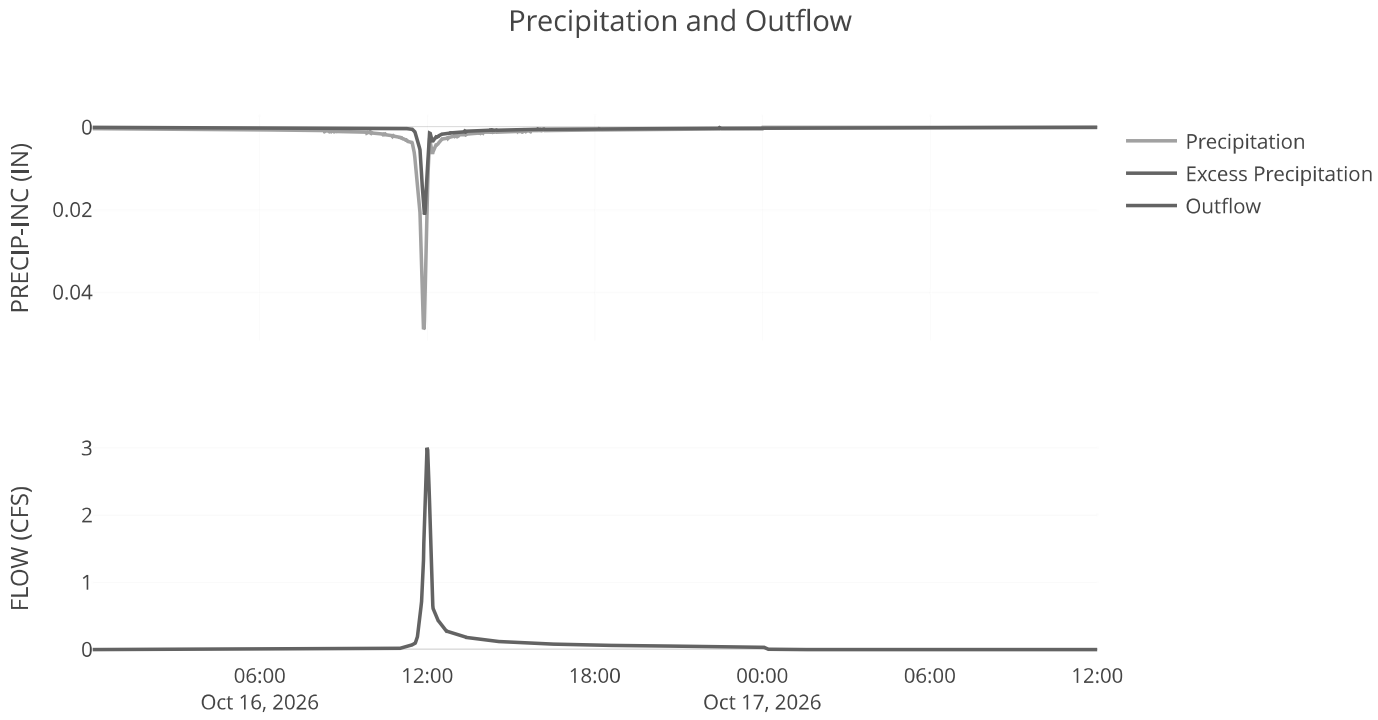
Subbasin: SUB5

Downstream : Swb4

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	4.9
Unitgraph Type	Standard

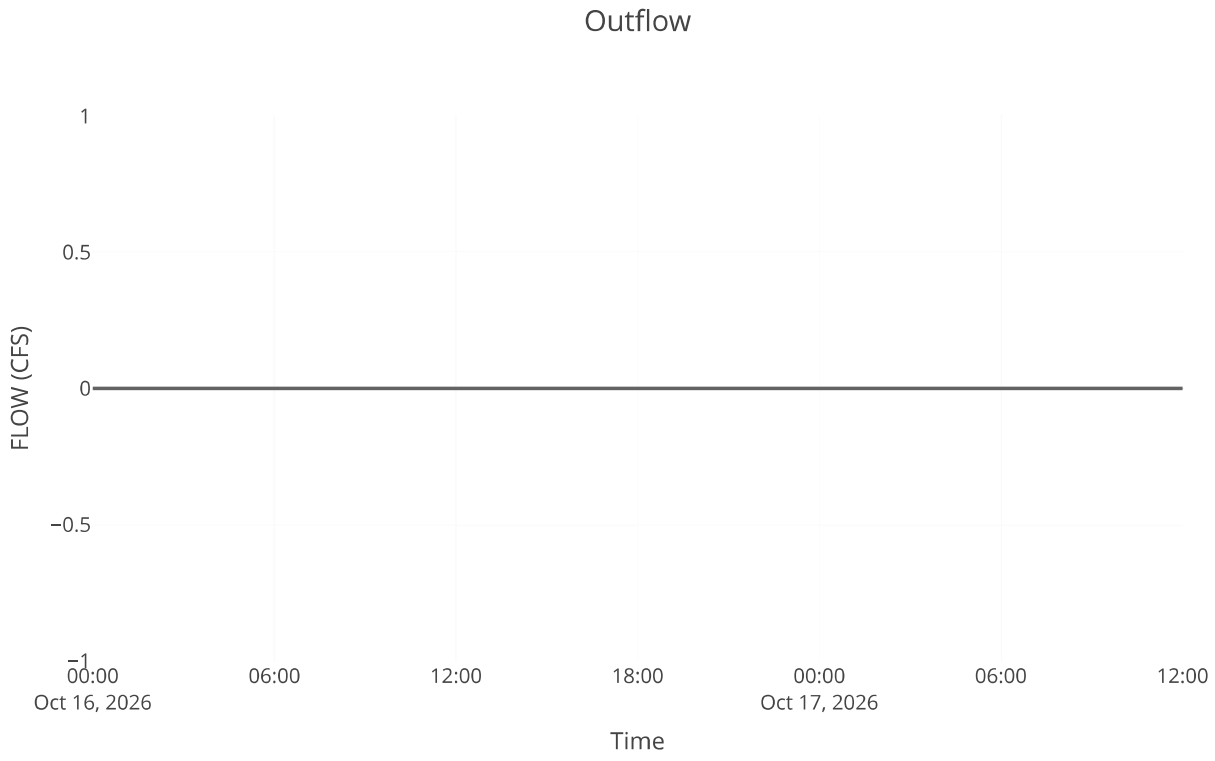
Results: SUB5	
Peak Discharge (CFS)	3.01
Time of Peak Discharge	16Oct2026, 11:59
Volume (IN)	0.72
Precipitation Volume (AC - FT)	0.47
Loss Volume (AC - FT)	0.3
Excess Volume (AC - FT)	0.16
Direct Runoff Volume (AC - FT)	0.16
Baseflow Volume (AC - FT)	0



Reservoir: SWB4

Downstream : Outlet - 3

Results: SWB4	
Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0
Peak Inflow (CFS)	18.93
Time of Peak Inflow	16Oct2026, 12:01
Inflow Volume (AC - FT)	1.14
Maximum Storage (AC - FT)	1.14
Peak Elevation (FT)	2.13
Discharge Volume (AC - FT)	0



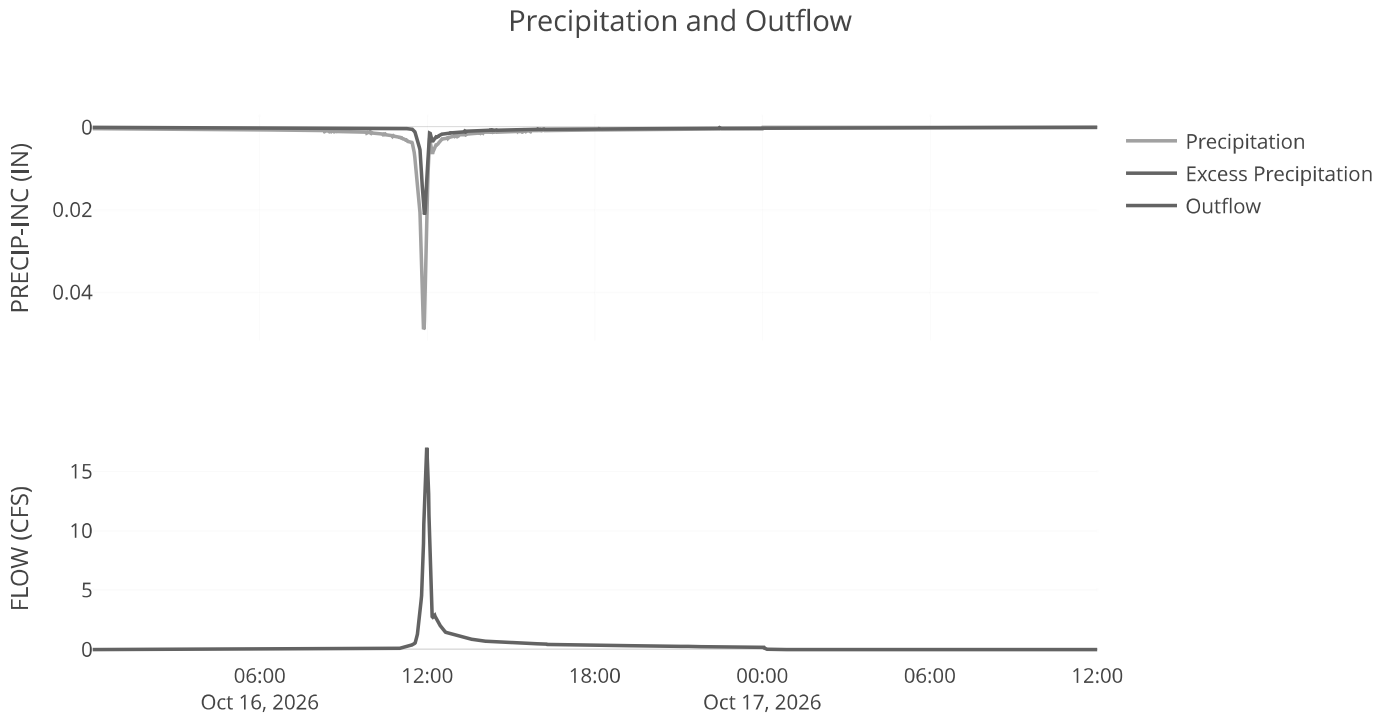
Subbasin: SUB6

Downstream : Junction - 3

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	3.65
Unitgraph Type	Standard

Results: SUB6	
Peak Discharge (CFS)	17
Time of Peak Discharge	16Oct2026, 11:58
Volume (IN)	0.72
Precipitation Volume (AC - FT)	2.5
Loss Volume (AC - FT)	1.62
Excess Volume (AC - FT)	0.88
Direct Runoff Volume (AC - FT)	0.88
Baseflow Volume (AC - FT)	0



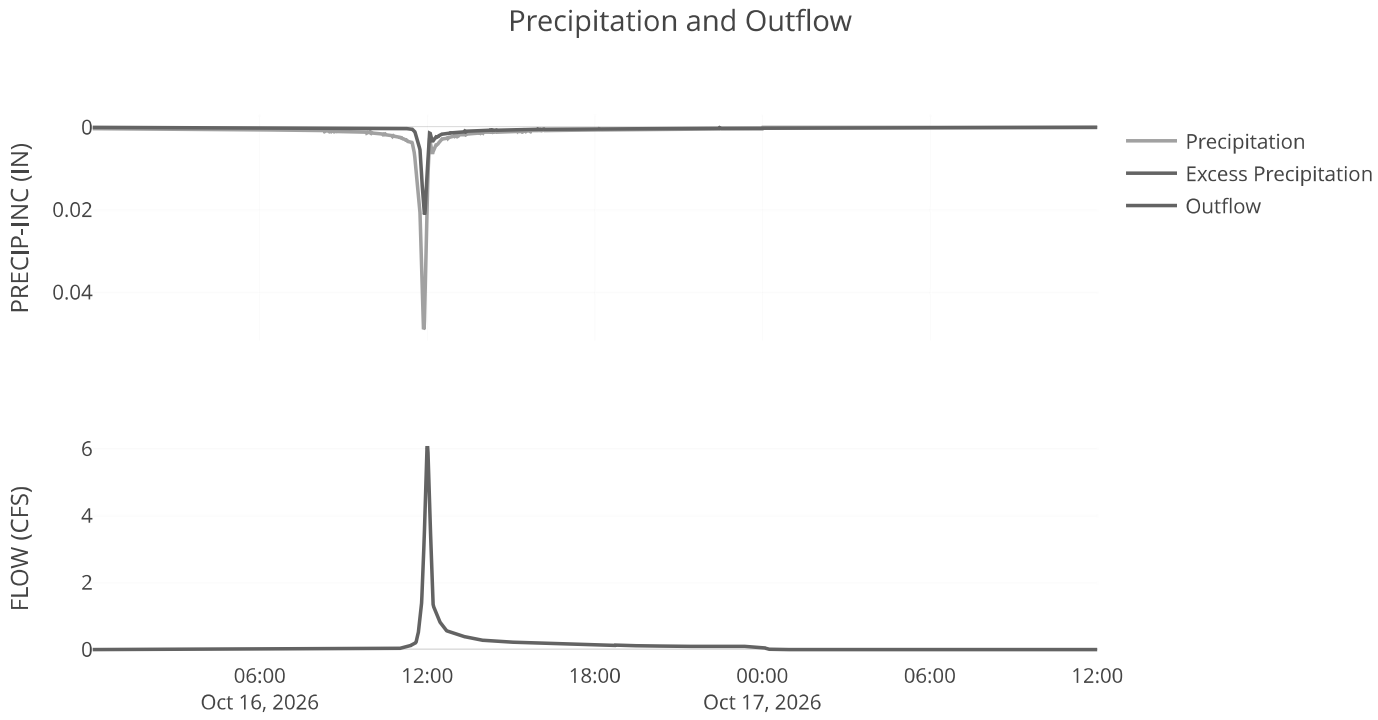
Subbasin: SUB7

Downstream : Junction - 3

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	5.29
Unitgraph Type	Standard

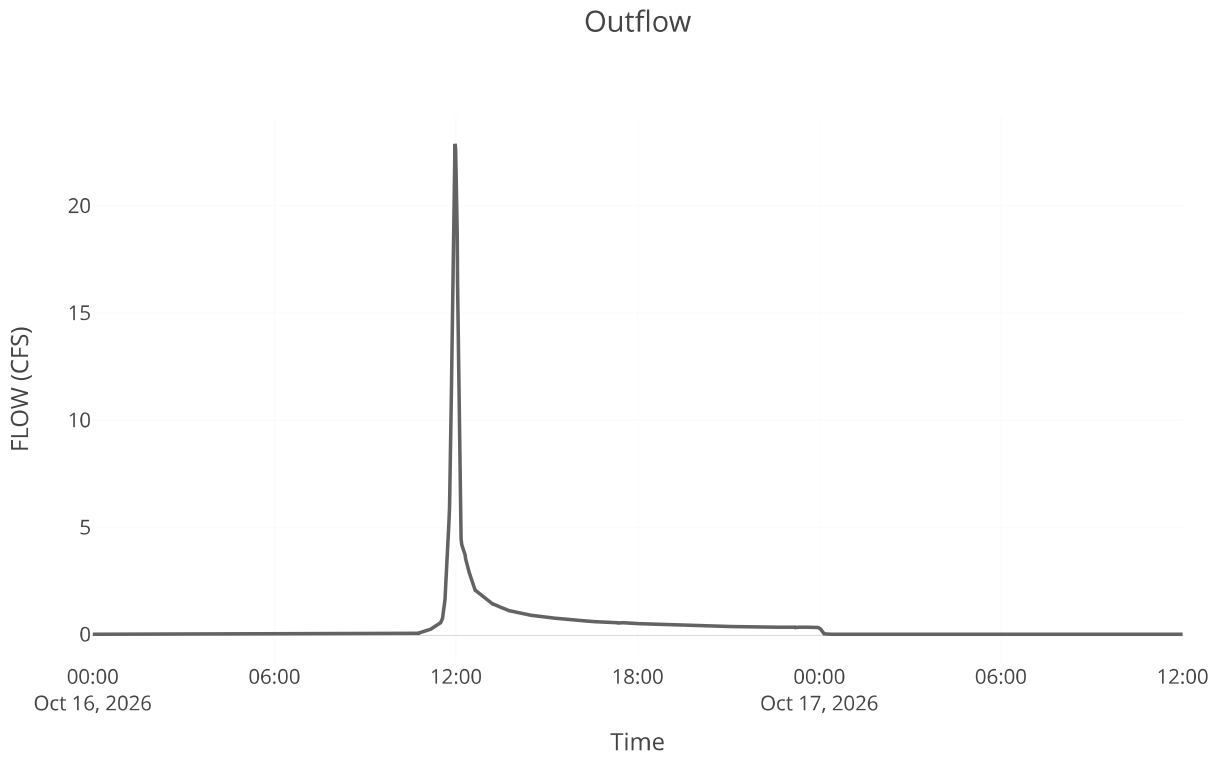
Results: SUB7	
Peak Discharge (CFS)	6.03
Time of Peak Discharge	16Oct2026, 11:59
Volume (IN)	0.72
Precipitation Volume (AC - FT)	0.95
Loss Volume (AC - FT)	0.62
Excess Volume (AC - FT)	0.34
Direct Runoff Volume (AC - FT)	0.34
Baseflow Volume (AC - FT)	0



Junction: Junction-3

Downstream : Swb5

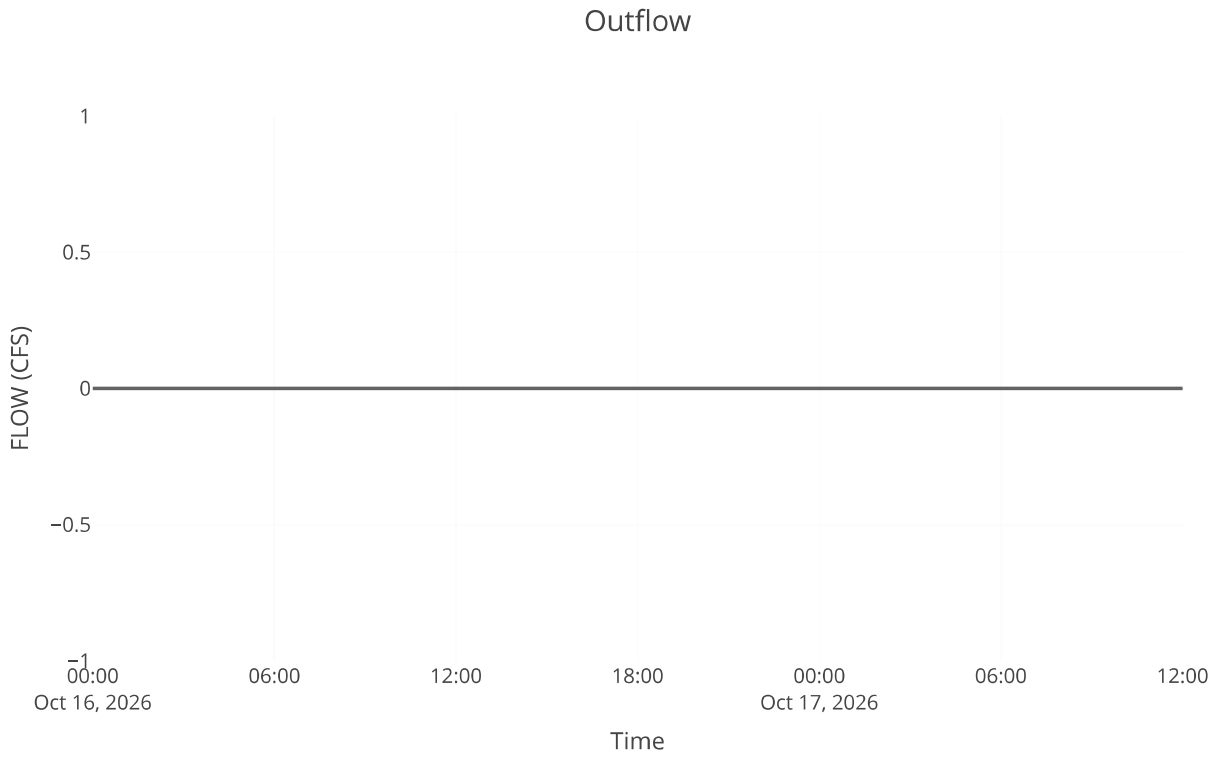
Results: Junction-3	
Peak Discharge (CFS)	22.88
Time of Peak Discharge	16Oct2026, 11:58
Volume (IN)	0.72



Reservoir: SWB5

Downstream : Outlet - 2

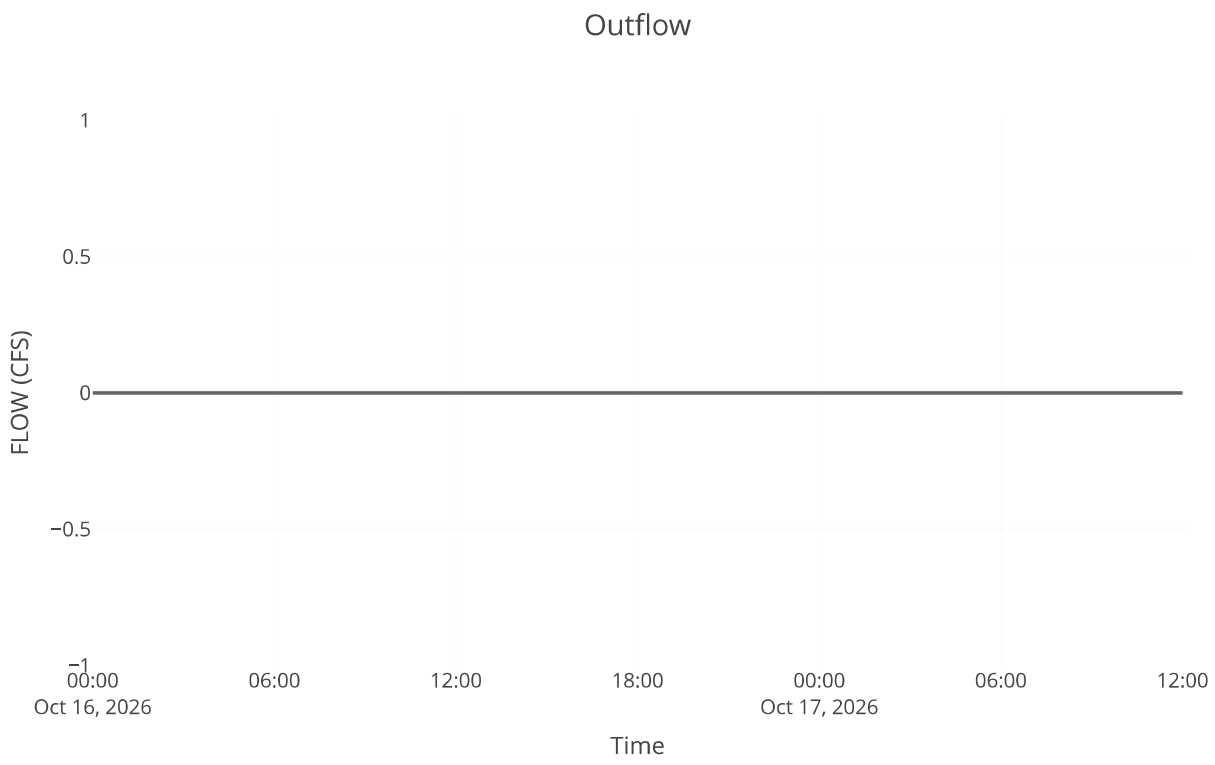
Results: SWB5	
Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0
Peak Inflow (CFS)	22.88
Time of Peak Inflow	16Oct2026, 11:58
Inflow Volume (AC - FT)	1.22
Maximum Storage (AC - FT)	1.22
Peak Elevation (FT)	5.22
Discharge Volume (AC - FT)	0



Junction: Outlet-2

Results: Outlet-2

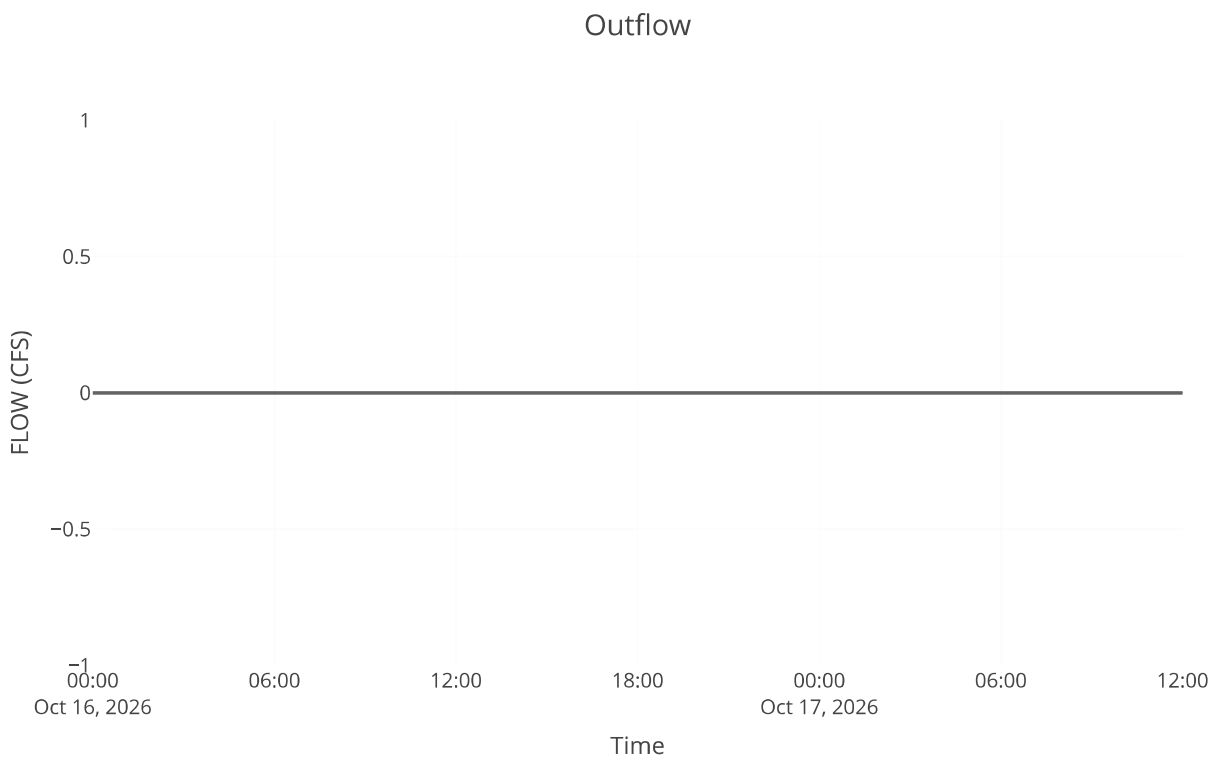
Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0



Junction: Outlet-3

Results: Outlet-3

Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0



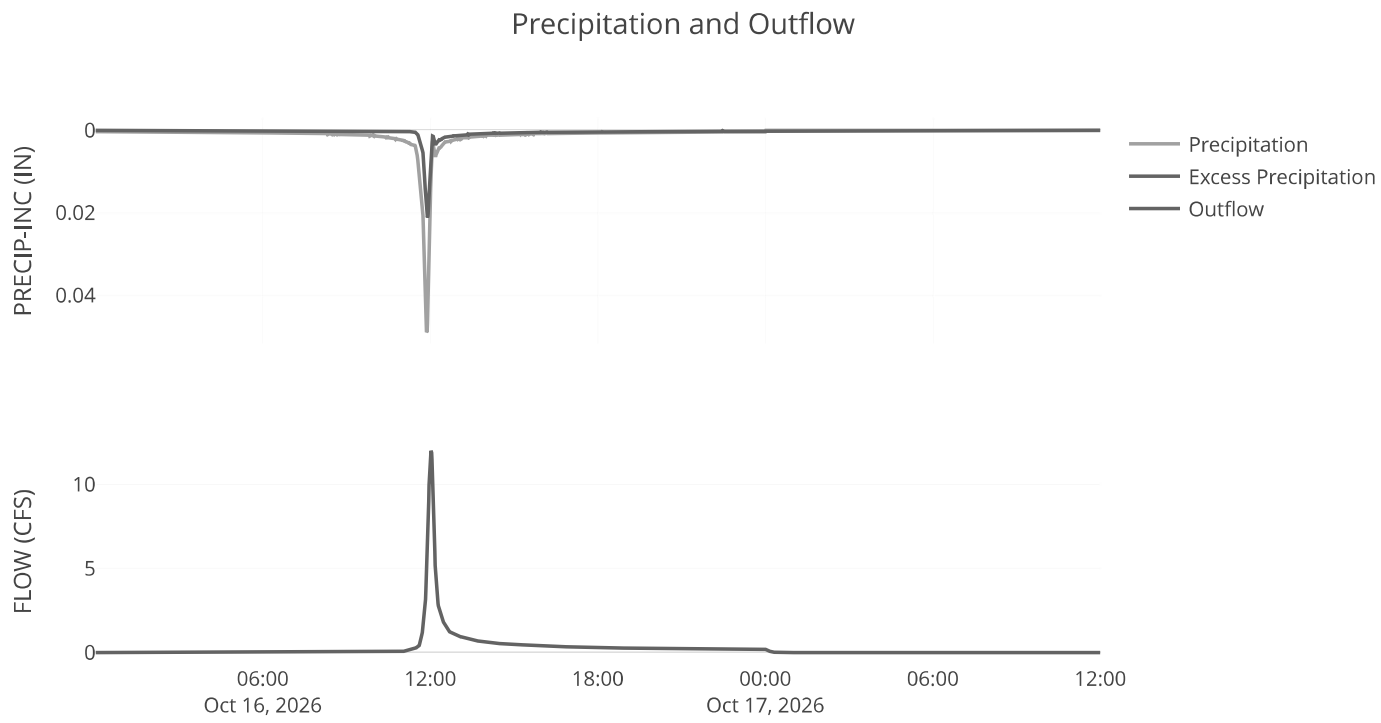
Subbasin: SUB11

Downstream : Stormwater Retention Basins

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	6.84
Unitgraph Type	Standard

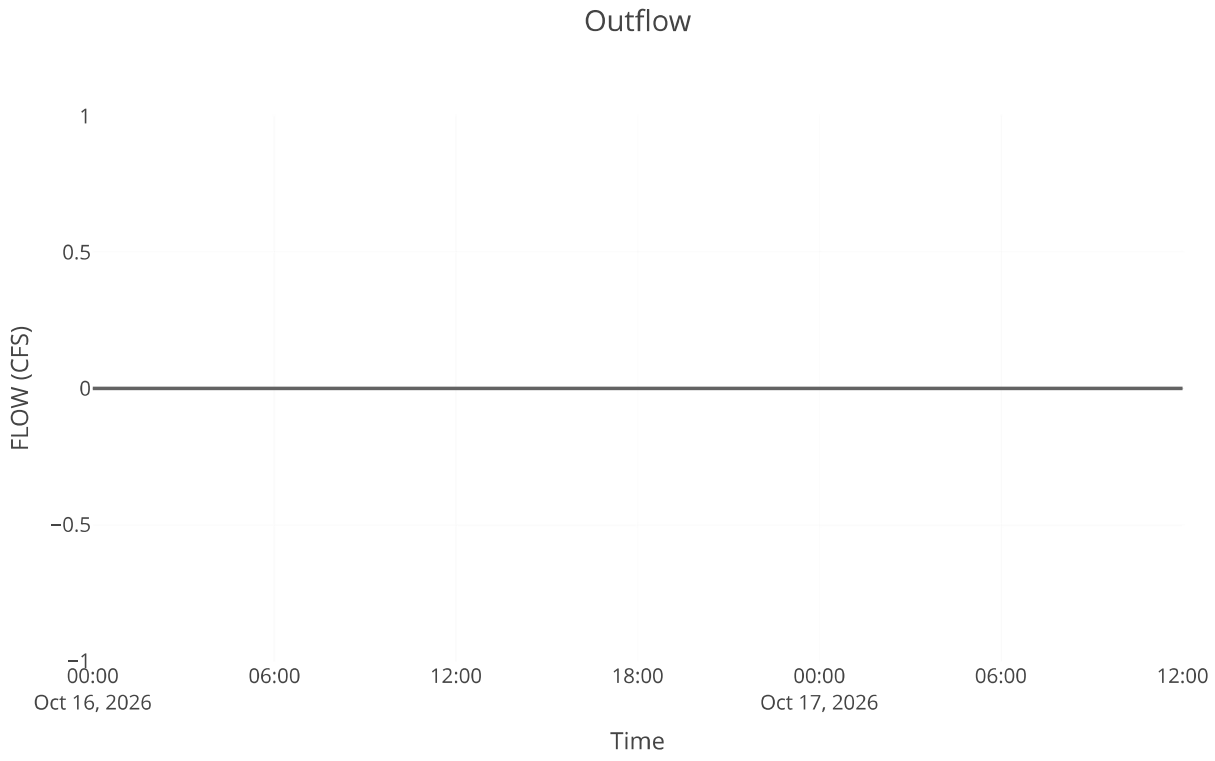
Results: SUB11	
Peak Discharge (CFS)	12.01
Time of Peak Discharge	16Oct2026, 12:01
Volume (IN)	0.72
Precipitation Volume (AC - FT)	2.02
Loss Volume (AC - FT)	1.31
Excess Volume (AC - FT)	0.71
Direct Runoff Volume (AC - FT)	0.71
Baseflow Volume (AC - FT)	0



Reservoir: Stormwater Retention Basins

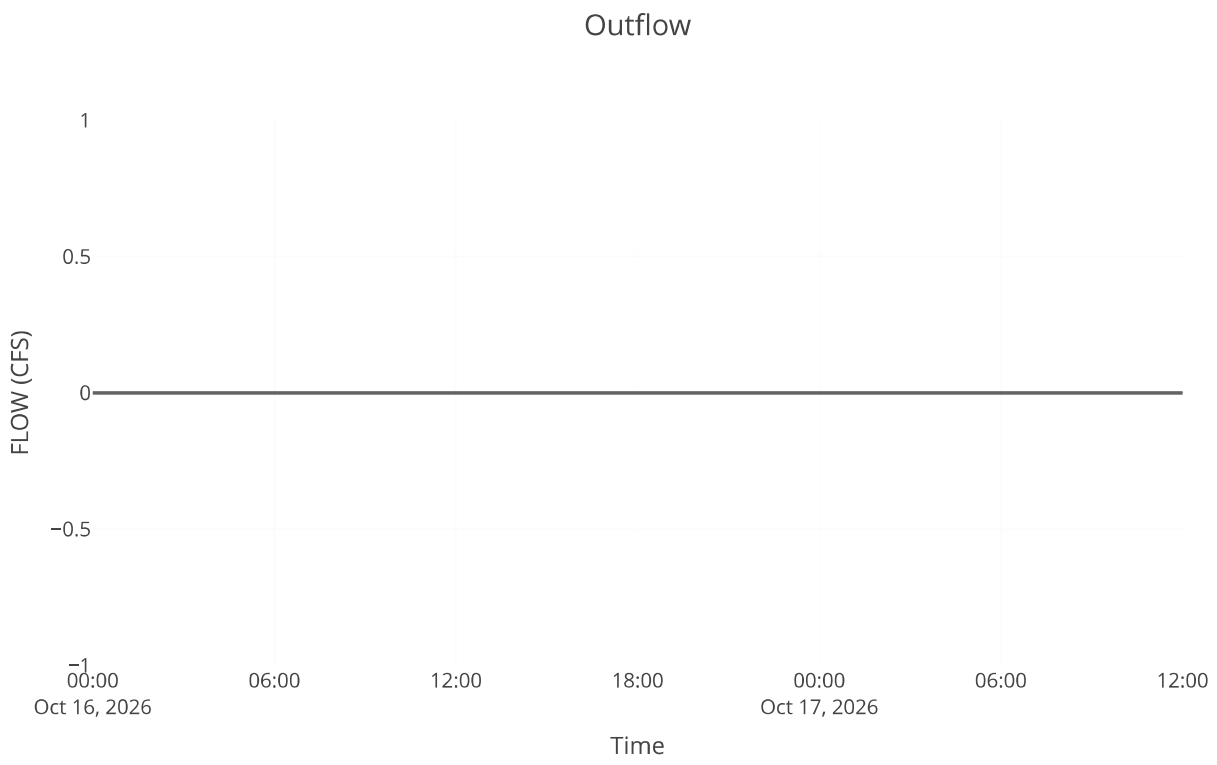
Downstream : Outlet - 1

Results: Stormwater Retention Basins	
Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0
Peak Inflow (CFS)	12.01
Time of Peak Inflow	16Oct2026, 12:01
Inflow Volume (AC - FT)	0.71
Maximum Storage (AC - FT)	0.71
Peak Elevation (FT)	0.2
Discharge Volume (AC - FT)	0



Junction: Outlet-1

Results: Outlet-1	
Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0



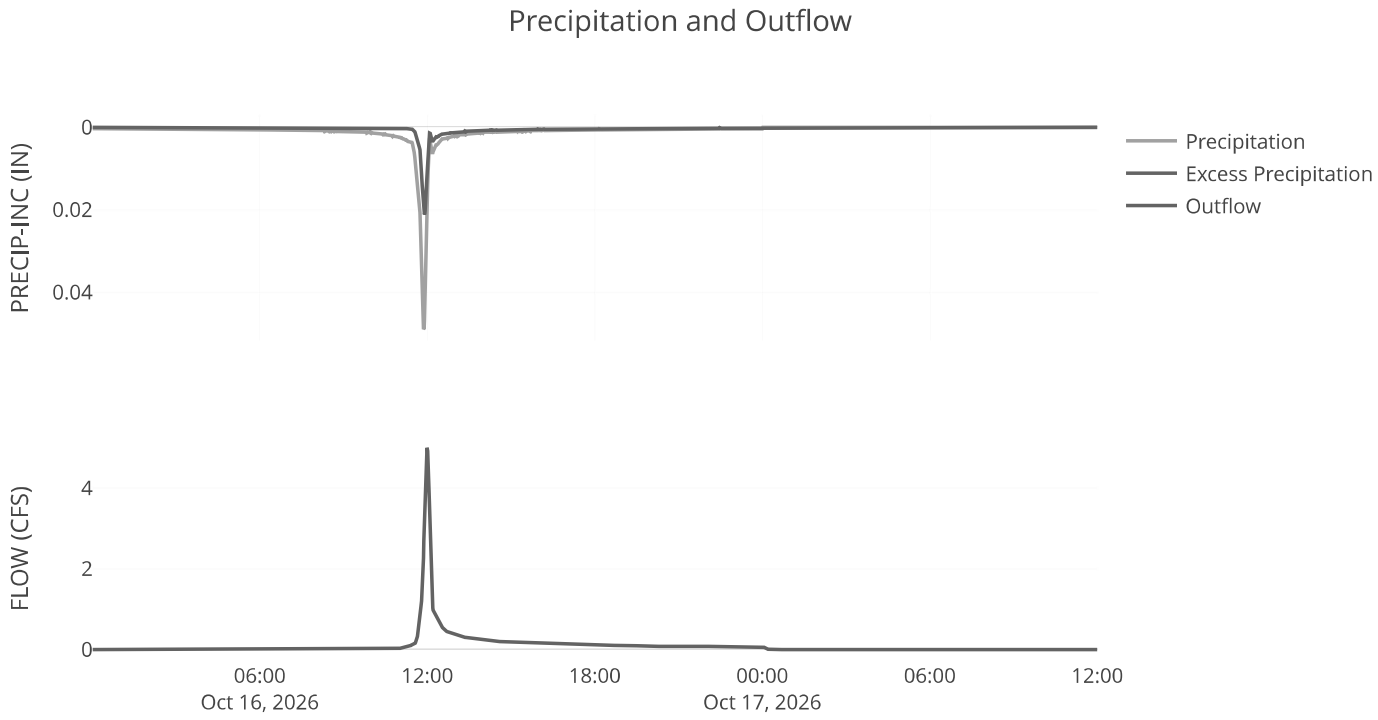
Subbasin: SUB9

Downstream : Junction - 1

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	4.72
Unitgraph Type	Standard

Results: SUB9	
Peak Discharge (CFS)	5
Time of Peak Discharge	16Oct2026, 11:59
Volume (IN)	0.72
Precipitation Volume (AC - FT)	0.77
Loss Volume (AC - FT)	0.5
Excess Volume (AC - FT)	0.27
Direct Runoff Volume (AC - FT)	0.27
Baseflow Volume (AC - FT)	0



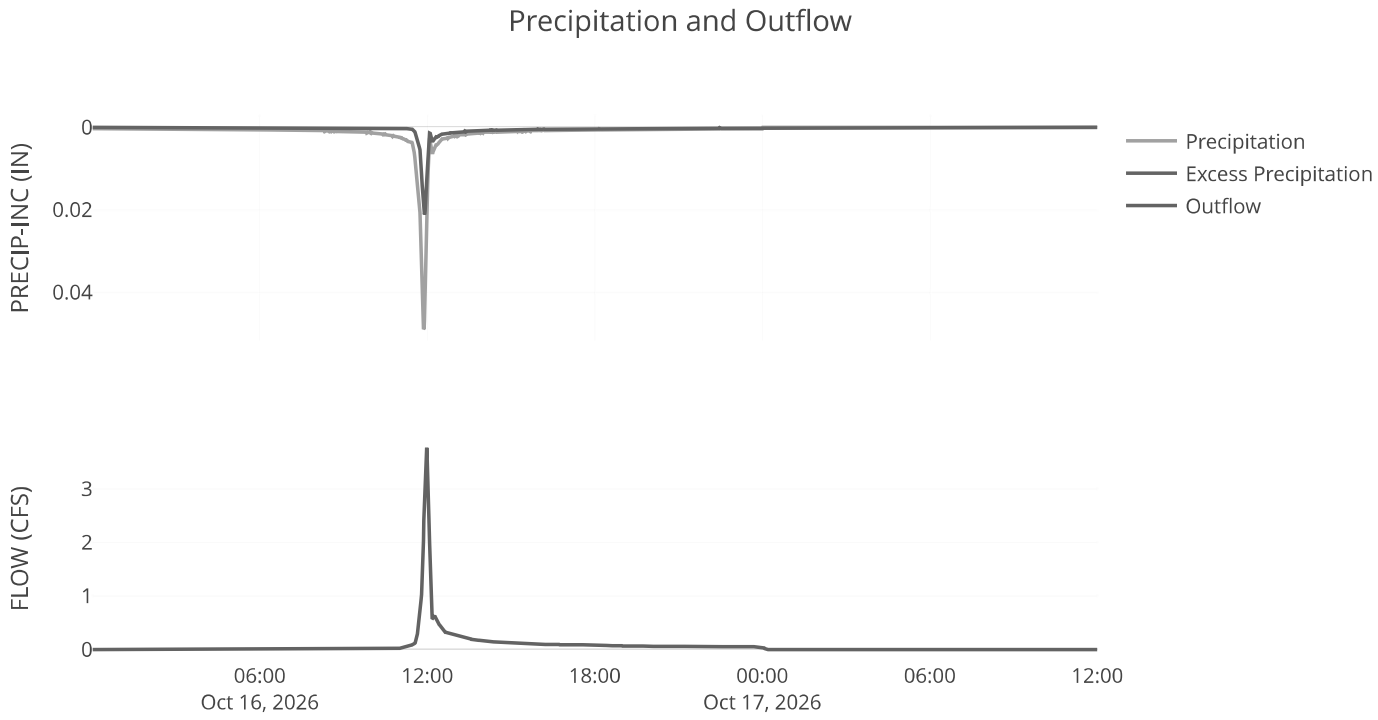
Subbasin: SUB10

Downstream : Junction - 1

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	3.47
Unitgraph Type	Standard

Results: SUB10	
Peak Discharge (CFS)	3.77
Time of Peak Discharge	16Oct2026, 11:58
Volume (IN)	0.72
Precipitation Volume (AC - FT)	0.55
Loss Volume (AC - FT)	0.36
Excess Volume (AC - FT)	0.19
Direct Runoff Volume (AC - FT)	0.19
Baseflow Volume (AC - FT)	0



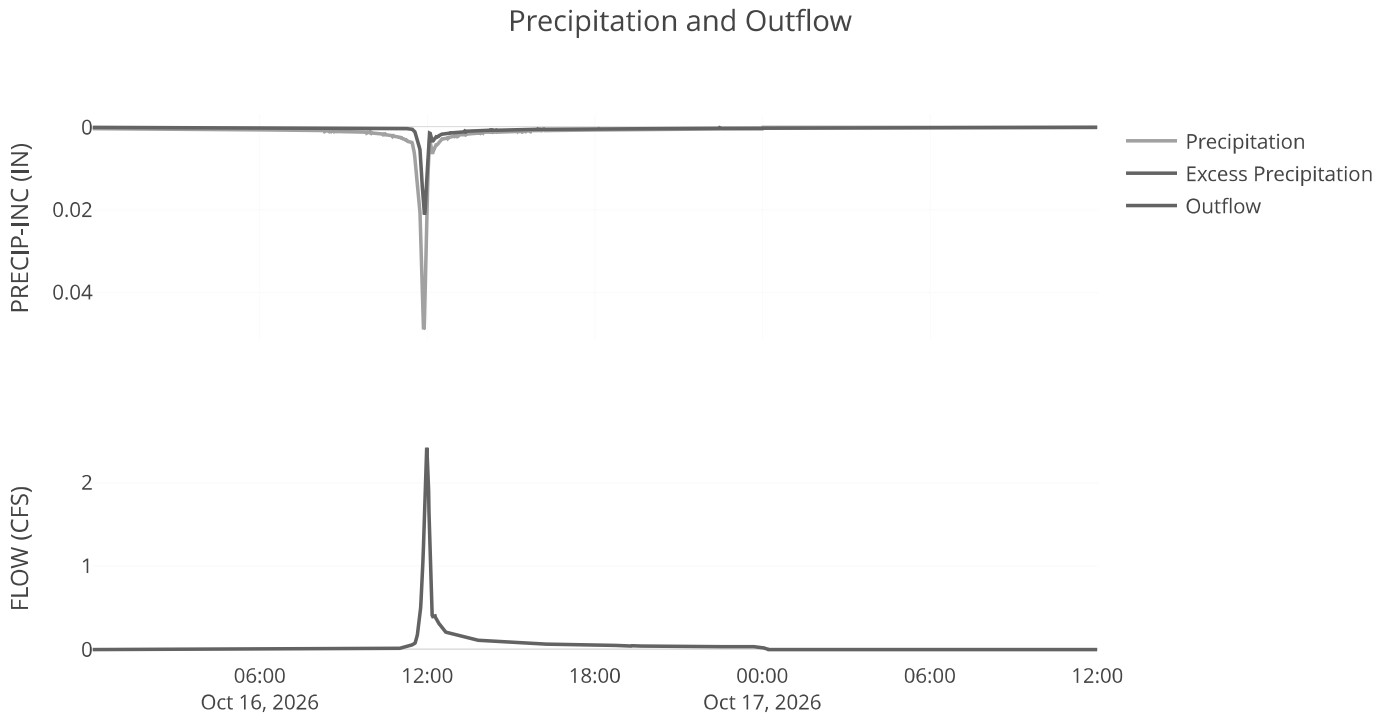
Subbasin: SUB8

Downstream : Junction - 1

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	3.78
Unitgraph Type	Standard

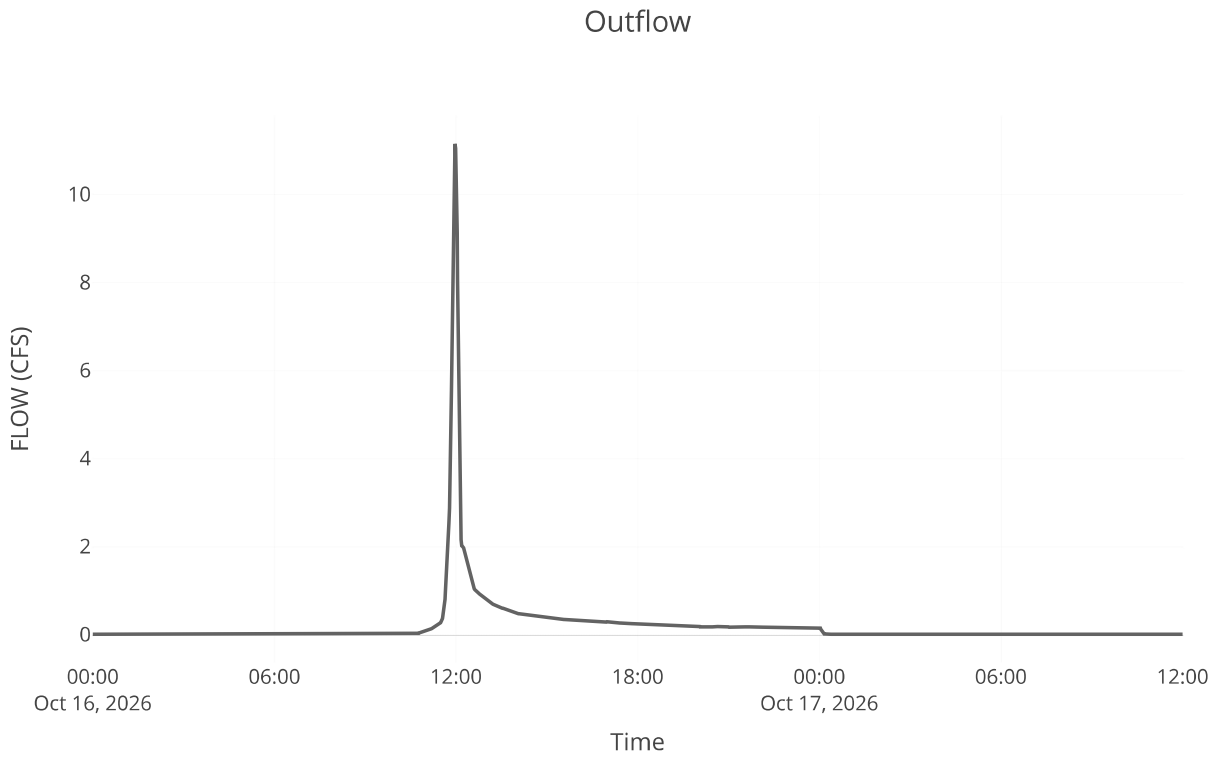
Results: SUB8	
Peak Discharge (CFS)	2.42
Time of Peak Discharge	16Oct2026, 11:58
Volume (IN)	0.72
Precipitation Volume (AC - FT)	0.36
Loss Volume (AC - FT)	0.23
Excess Volume (AC - FT)	0.13
Direct Runoff Volume (AC - FT)	0.13
Baseflow Volume (AC - FT)	0



Junction: Junction-1

Downstream : Swb8

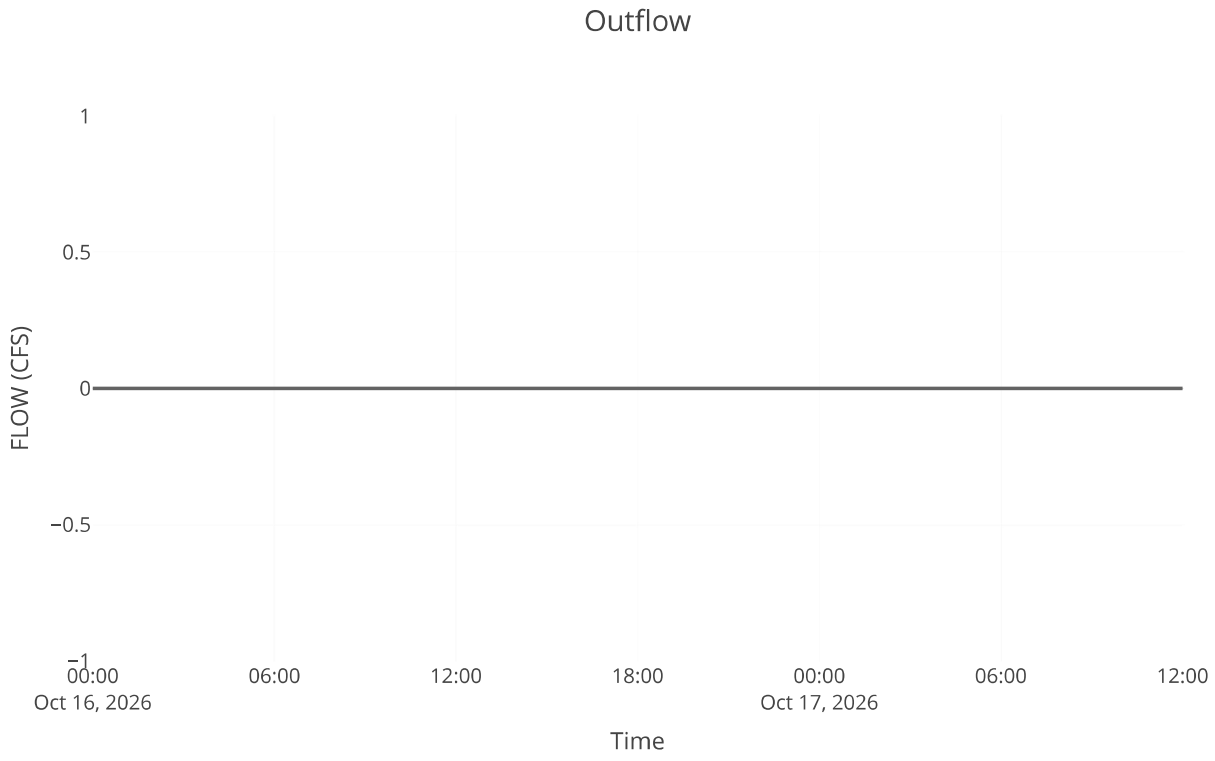
Results: Junction-1	
Peak Discharge (CFS)	11.14
Time of Peak Discharge	16Oct2026, 11:58
Volume (IN)	0.72



Reservoir: SWB8

Downstream : Outlet - 8

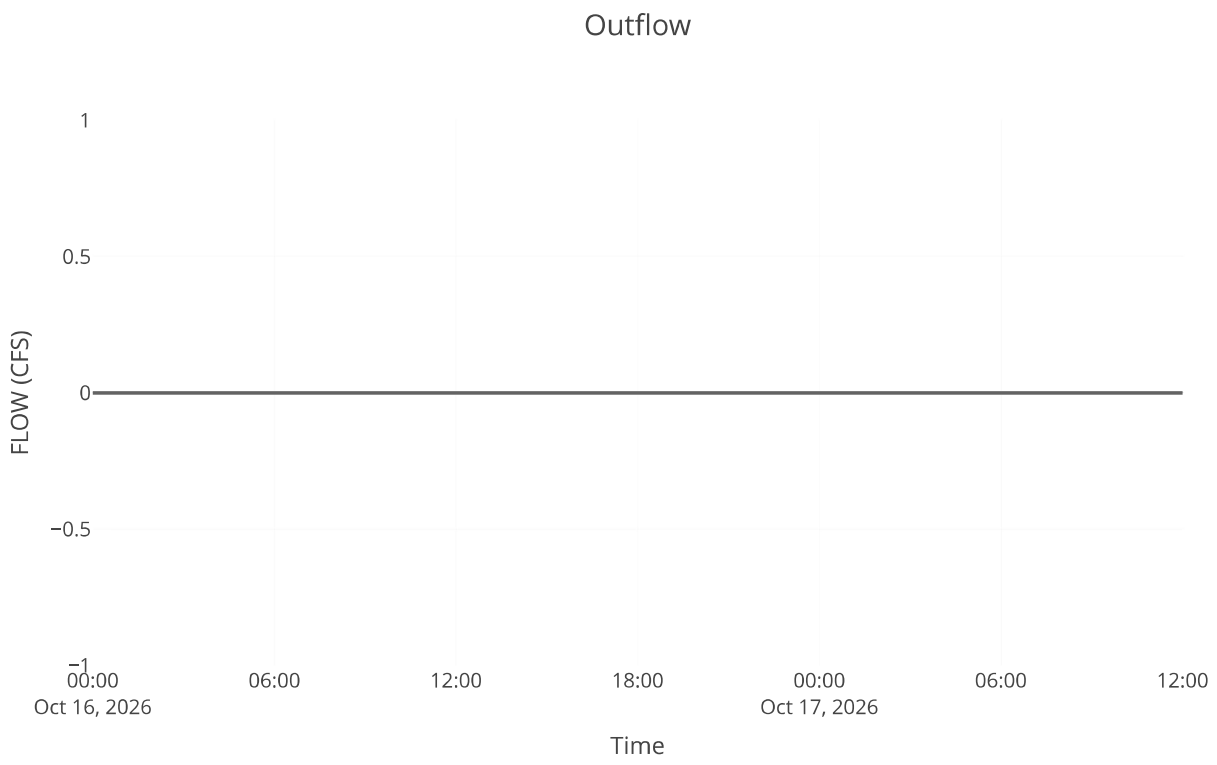
Results: SWB8	
Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0
Peak Inflow (CFS)	11.14
Time of Peak Inflow	16Oct2026, 11:58
Inflow Volume (AC - FT)	0.59
Maximum Storage (AC - FT)	0.59
Peak Elevation (FT)	4.6
Discharge Volume (AC - FT)	0



Junction: Outlet-8

Results: Outlet-8

Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0



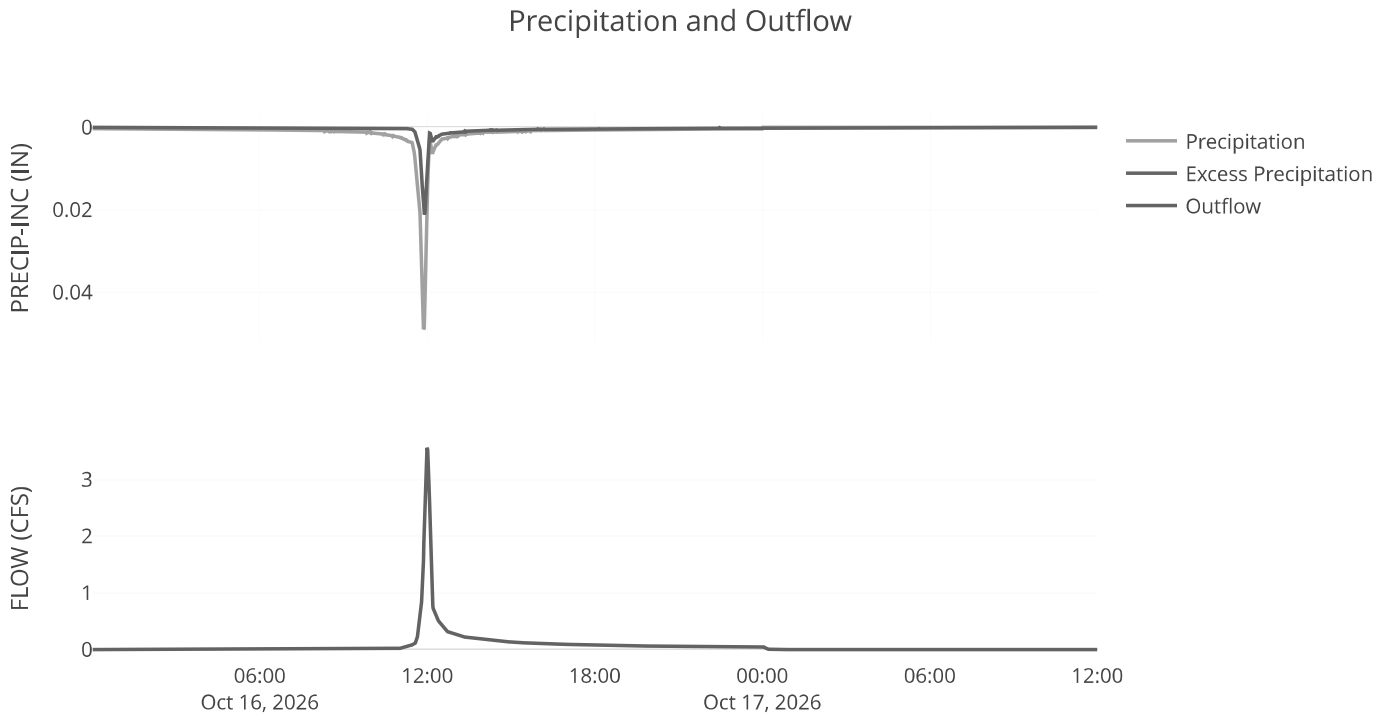
Subbasin: SUB12A

Downstream : Swb7

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	4.93
Unitgraph Type	Standard

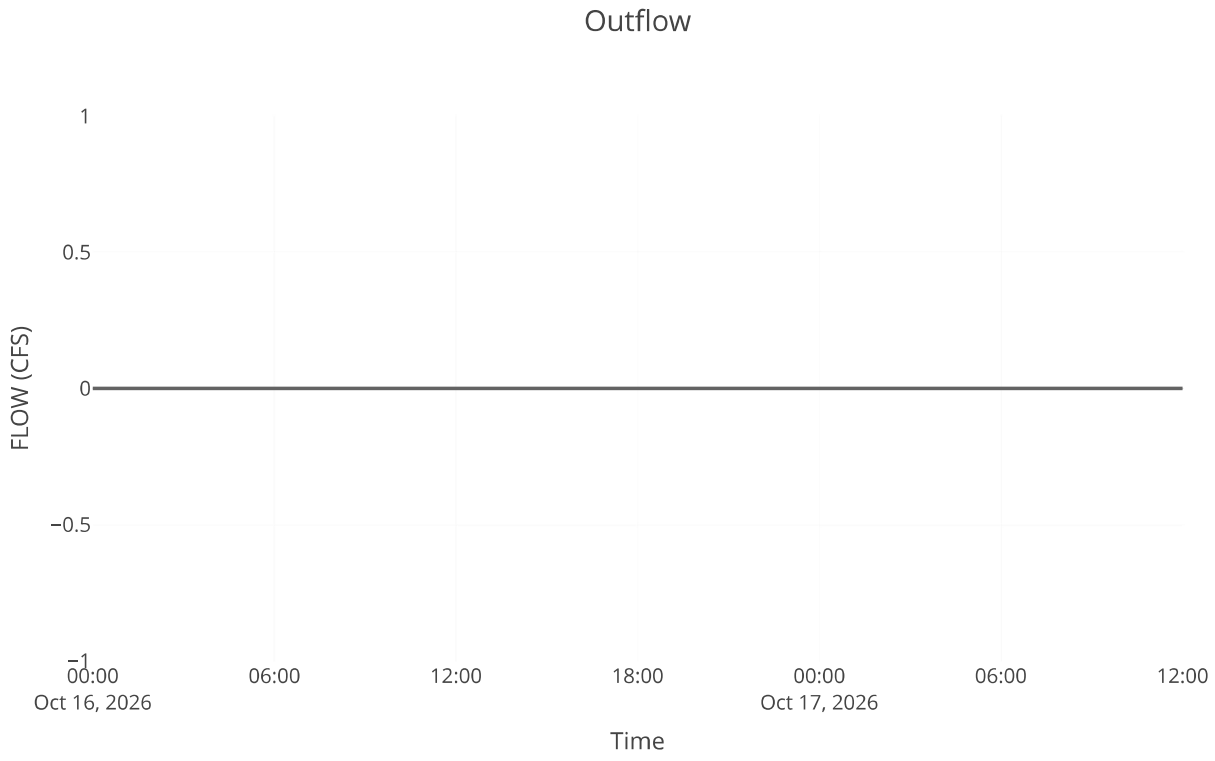
Results: SUB12A	
Peak Discharge (CFS)	3.56
Time of Peak Discharge	16Oct2026, 11:59
Volume (IN)	0.72
Precipitation Volume (AC - FT)	0.55
Loss Volume (AC - FT)	0.36
Excess Volume (AC - FT)	0.19
Direct Runoff Volume (AC - FT)	0.19
Baseflow Volume (AC - FT)	0



Reservoir: SWB7

Downstream : Outlet - 7

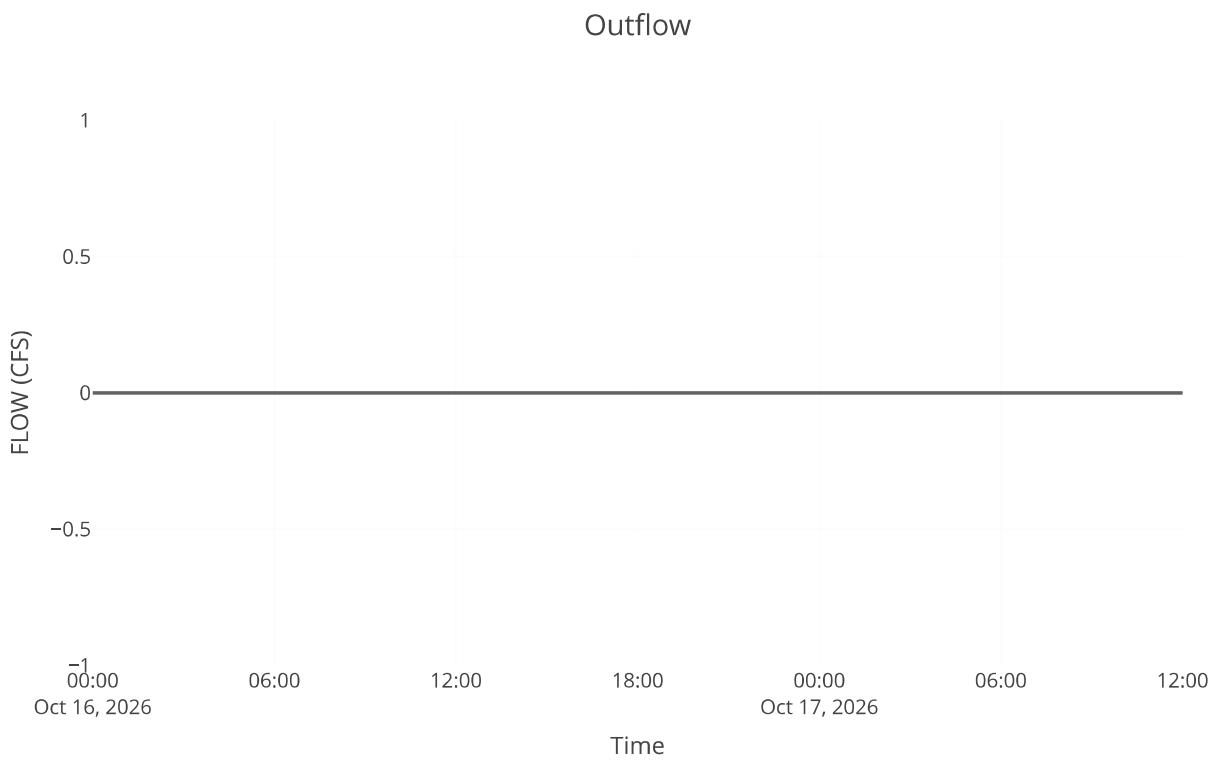
Results: SWB7	
Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0
Peak Inflow (CFS)	3.56
Time of Peak Inflow	16Oct2026, 11:59
Inflow Volume (AC - FT)	0.19
Maximum Storage (AC - FT)	0.19
Peak Elevation (FT)	3.89
Discharge Volume (AC - FT)	0



Junction: Outlet-7

Results: Outlet-7

Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0



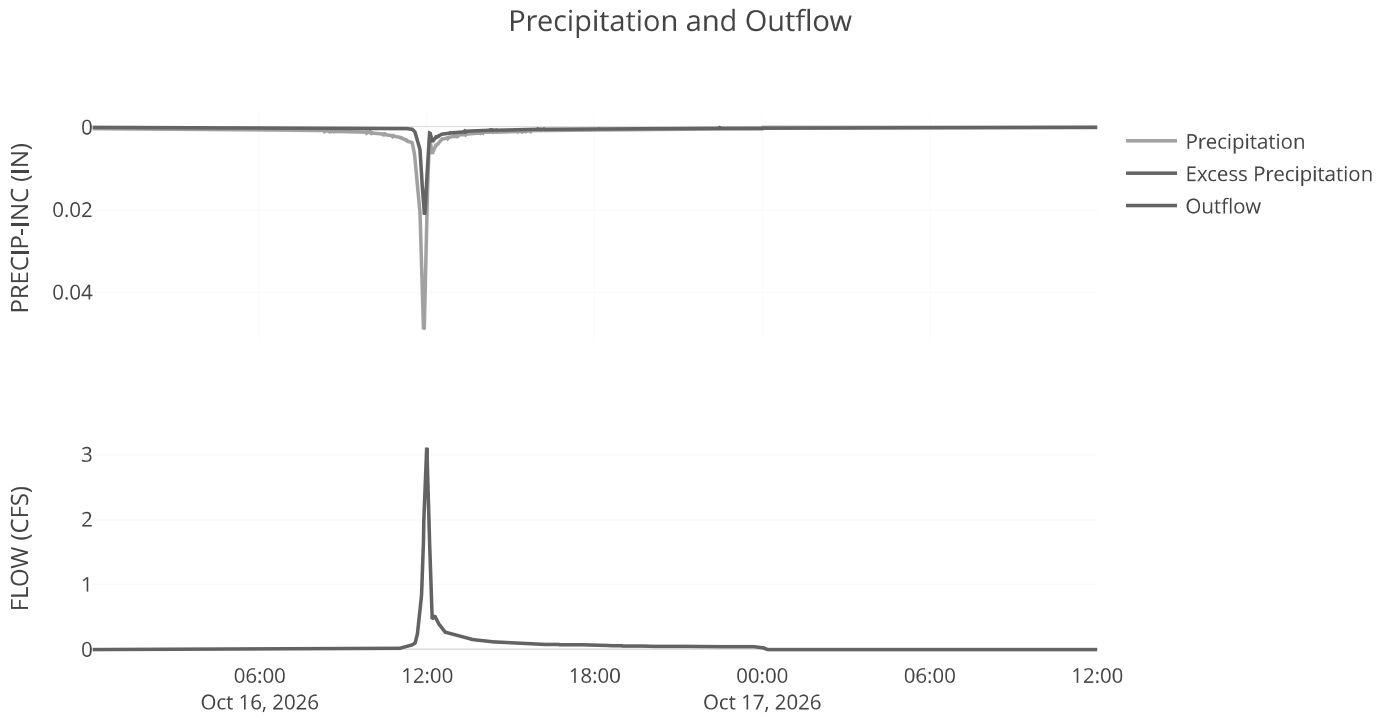
Subbasin: SUB3A

Downstream : Swb3

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	3.47
Unitgraph Type	Standard

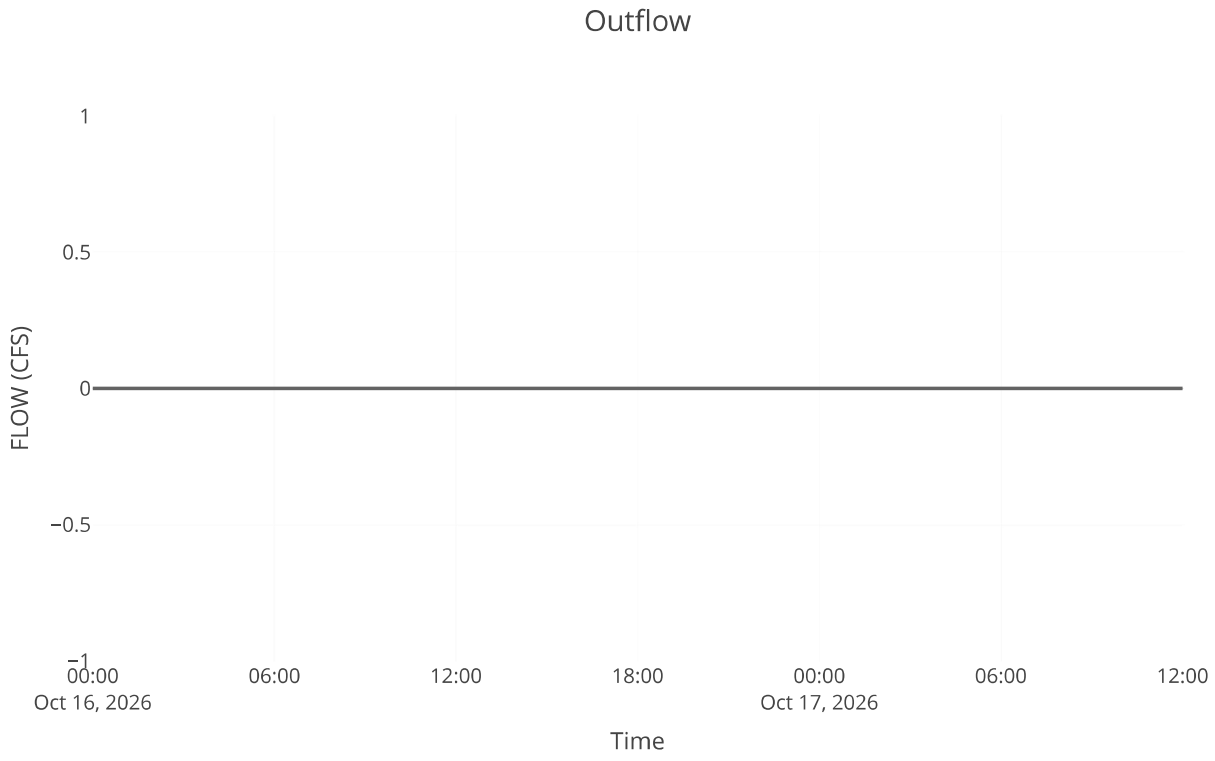
Results: SUB3A	
Peak Discharge (CFS)	3.11
Time of Peak Discharge	16Oct2026, 11:58
Volume (IN)	0.72
Precipitation Volume (AC - FT)	0.45
Loss Volume (AC - FT)	0.29
Excess Volume (AC - FT)	0.16
Direct Runoff Volume (AC - FT)	0.16
Baseflow Volume (AC - FT)	0



Reservoir: SWB3

Downstream : Outlet - 4

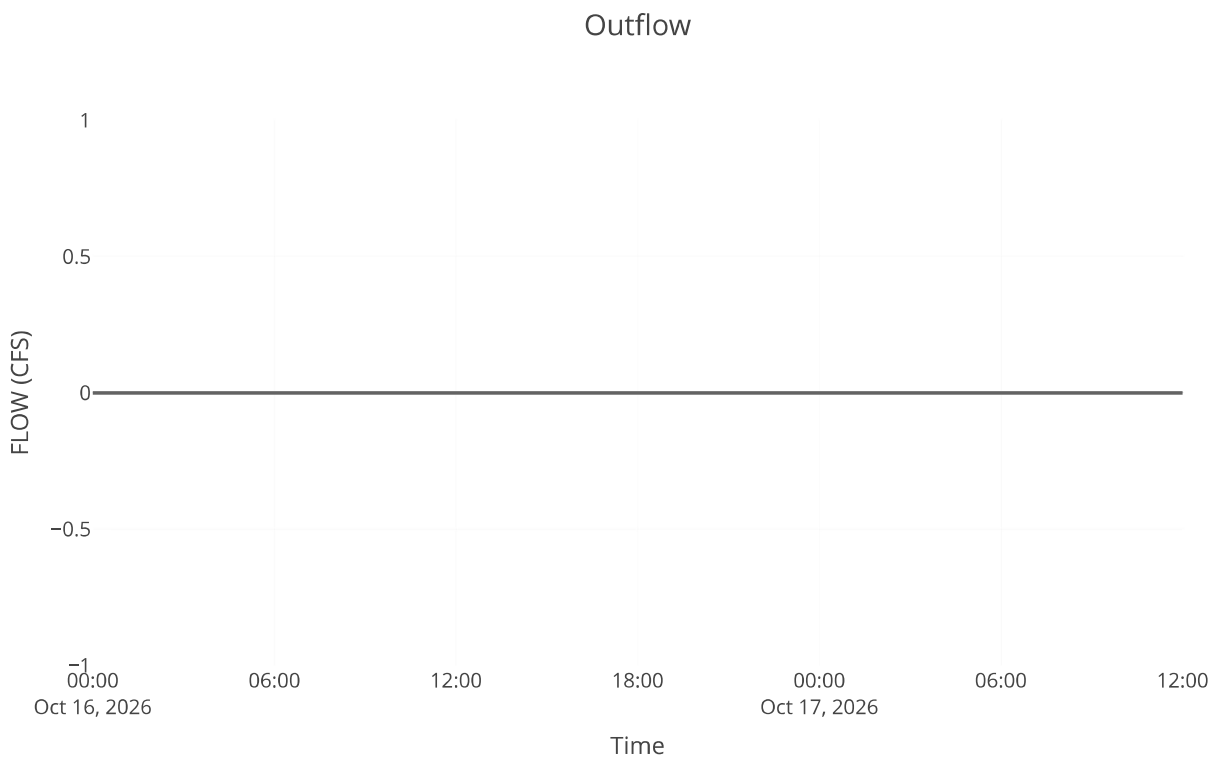
Results: SWB3	
Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0
Peak Inflow (CFS)	3.11
Time of Peak Inflow	16Oct2026, 11:58
Inflow Volume (AC - FT)	0.16
Maximum Storage (AC - FT)	0.16
Peak Elevation (FT)	1.6
Discharge Volume (AC - FT)	0



Junction: Outlet-4

Results: Outlet-4

Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0



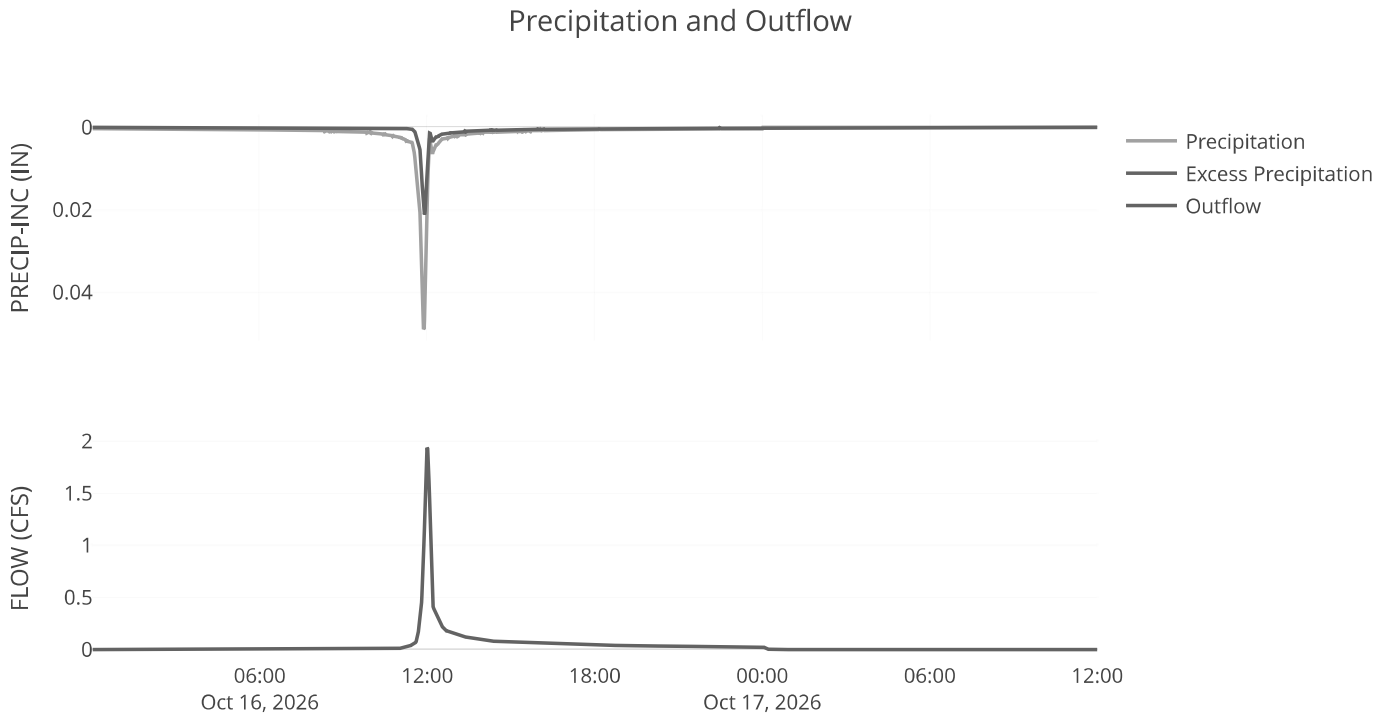
Subbasin: SUB12

Downstream : Swb6

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

Transform: Scs	
Lag	5.11
Unitgraph Type	Standard

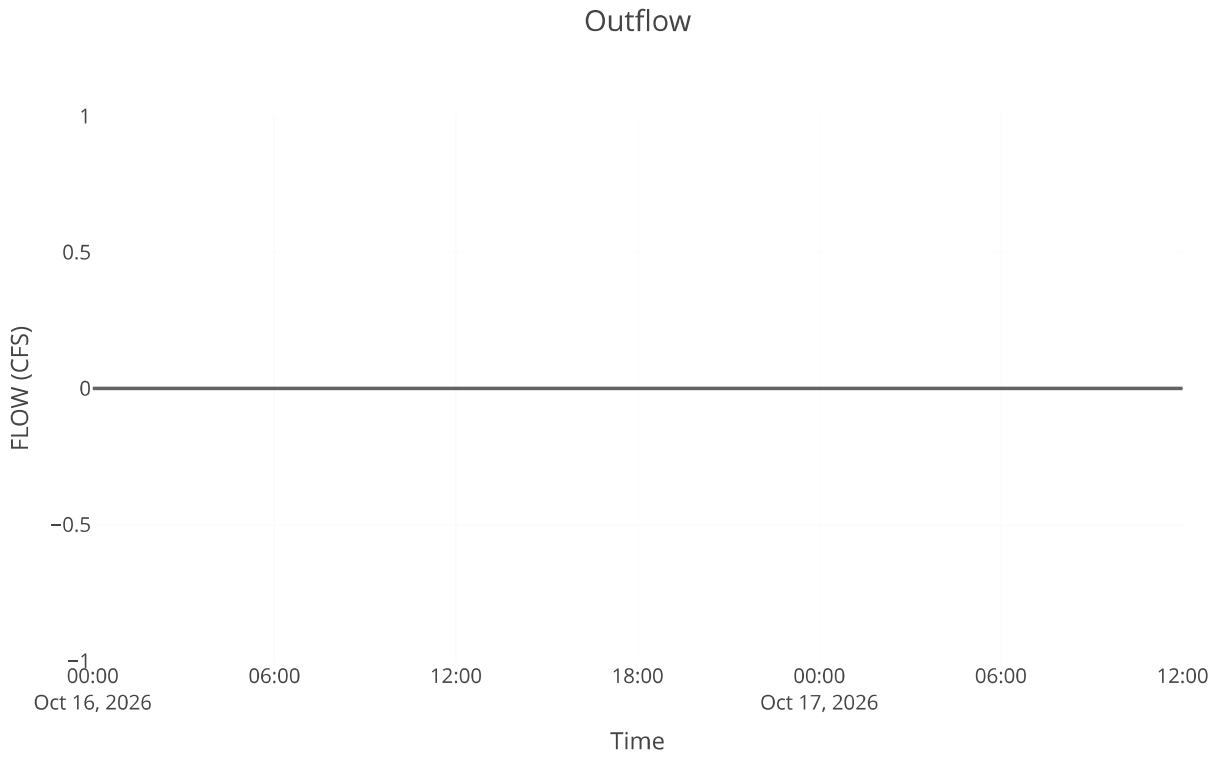
Results: SUB12	
Peak Discharge (CFS)	1.94
Time of Peak Discharge	16Oct2026, 11:59
Volume (IN)	0.72
Precipitation Volume (AC - FT)	0.3
Loss Volume (AC - FT)	0.2
Excess Volume (AC - FT)	0.11
Direct Runoff Volume (AC - FT)	0.11
Baseflow Volume (AC - FT)	0



Reservoir: SWB6

Downstream : Outlet - 6

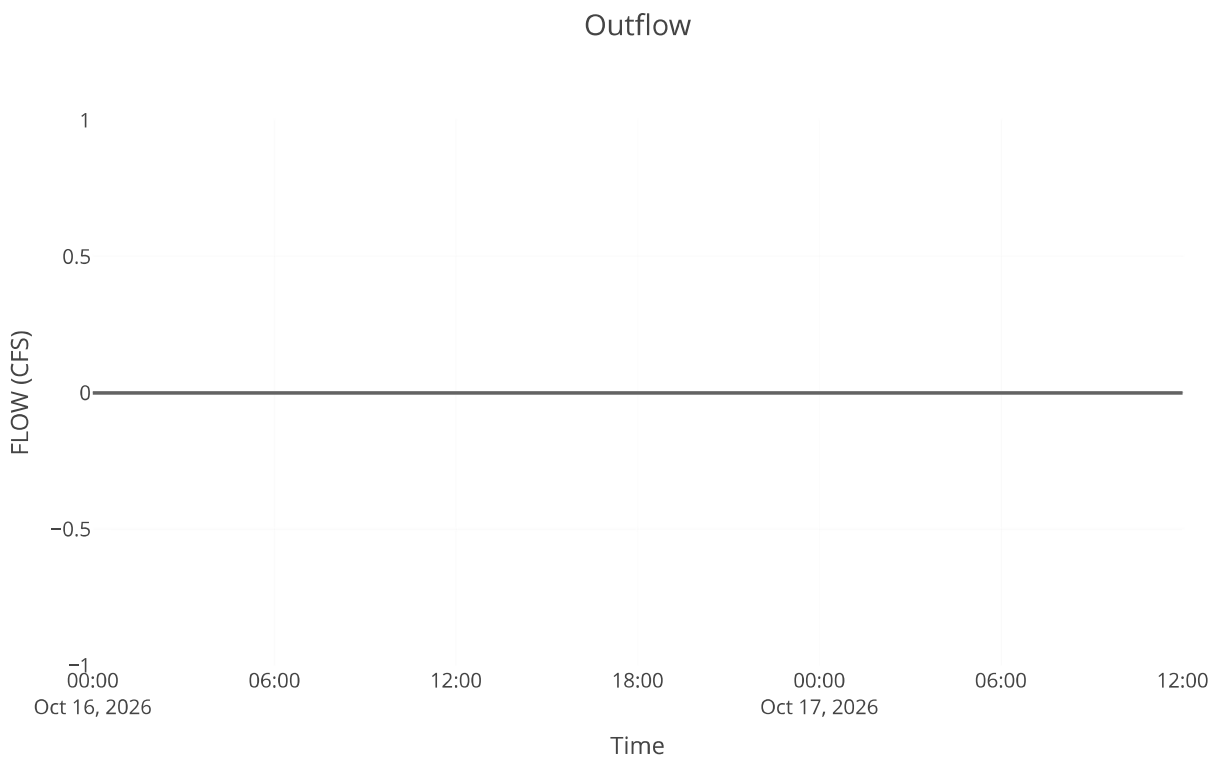
Results: SWB6	
Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0
Peak Inflow (CFS)	1.94
Time of Peak Inflow	16Oct2026, 11:59
Inflow Volume (AC - FT)	0.11
Maximum Storage (AC - FT)	0.11
Peak Elevation (FT)	1.6
Discharge Volume (AC - FT)	0



Junction: Outlet-6

Results: Outlet-6

Peak Discharge (CFS)	0
Time of Peak Discharge	15Oct2026, 24:00
Volume (IN)	0



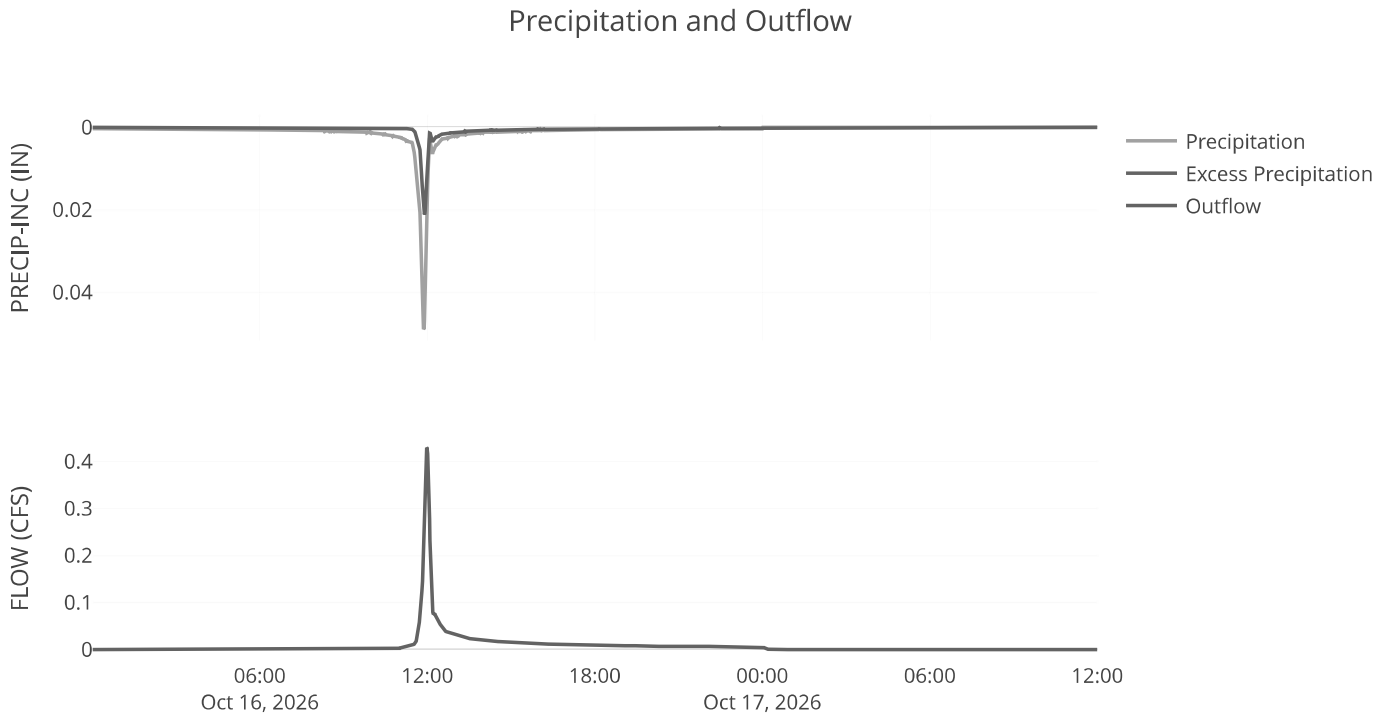
Subbasin: SLLE-3

Downstream : Outlet - 10

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	83

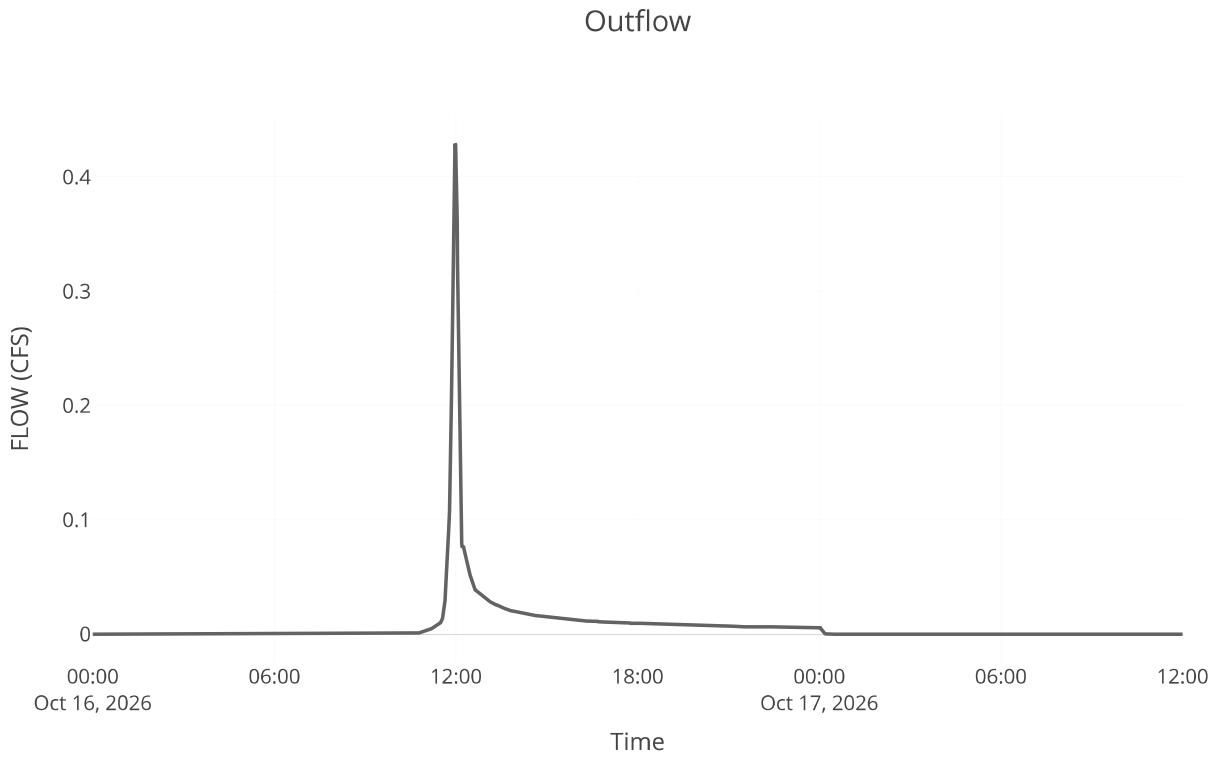
Transform: Scs	
Lag	4.3
Unitgraph Type	Standard

Results: SLLE-3	
Peak Discharge (CFS)	0.43
Time of Peak Discharge	16Oct2026, 11:58
Volume (IN)	0.72
Precipitation Volume (AC - FT)	0.06
Loss Volume (AC - FT)	0.04
Excess Volume (AC - FT)	0.02
Direct Runoff Volume (AC - FT)	0.02
Baseflow Volume (AC - FT)	0



Junction: Outlet-10

Results: Outlet-10	
Peak Discharge (CFS)	0.43
Time of Peak Discharge	16Oct2026, 11:58
Volume (IN)	0.72



ATTACHMENT 2
HYDRAULIC CALCULATIONS

CWPS Ditch Capacity

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.025
Channel Slope	5.00 %
Normal Depth	1.00 ft
Left Side Slope	2.50 H:V
Right Side Slope	10.00 H:V

Results	
Discharge	51.66 cfs
Flow Area	6.3 ft²
Wetted Perimeter	12.7 ft
Hydraulic Radius	0.49 ft
Top Width	12.50 ft
Critical Depth	1.34 ft
Critical Slope	1.07 %
Velocity	8.27 ft/s
Velocity Head	1.06 ft
Specific Energy	2.06 ft
Froude Number	2.061
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.00 ft
Critical Depth	1.34 ft
Channel Slope	5.00 %
Critical Slope	1.07 %

V-Ditch 1 Capacity

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.025
Channel Slope	2.00 %
Normal Depth	1.00 ft
Left Side Slope	20.00 H:V
Right Side Slope	2.00 H:V

Results	
Discharge	57.79 cfs
Flow Area	11.0 ft²
Wetted Perimeter	22.3 ft
Hydraulic Radius	0.49 ft
Top Width	22.00 ft
Critical Depth	1.11 ft
Critical Slope	1.12 %
Velocity	5.25 ft/s
Velocity Head	0.43 ft
Specific Energy	1.43 ft
Froude Number	1.310
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.00 ft
Critical Depth	1.11 ft
Channel Slope	2.00 %
Critical Slope	1.12 %

V-Ditch 2 (MIN SLOPE) Capacity

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.025
Channel Slope	0.30 %
Normal Depth	1.00 ft
Left Side Slope	6.00 H:V
Right Side Slope	20.00 H:V

Results	
Discharge	26.59 cfs
Flow Area	13.0 ft²
Wetted Perimeter	26.1 ft
Hydraulic Radius	0.50 ft
Top Width	26.00 ft
Critical Depth	0.76 ft
Critical Slope	1.26 %
Velocity	2.05 ft/s
Velocity Head	0.07 ft
Specific Energy	1.07 ft
Froude Number	0.510
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	1.00 ft
Critical Depth	0.76 ft
Channel Slope	0.30 %
Critical Slope	1.26 %

V-Ditch 2 (MAX SLOPE) Capacity

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.025
Channel Slope	1.50 %
Normal Depth	1.00 ft
Left Side Slope	6.00 H:V
Right Side Slope	20.00 H:V

Results	
Discharge	59.45 cfs
Flow Area	13.0 ft²
Wetted Perimeter	26.1 ft
Hydraulic Radius	0.50 ft
Top Width	26.00 ft
Critical Depth	1.05 ft
Critical Slope	1.13 %
Velocity	4.57 ft/s
Velocity Head	0.33 ft
Specific Energy	1.33 ft
Froude Number	1.140
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.00 ft
Critical Depth	1.05 ft
Channel Slope	1.50 %
Critical Slope	1.13 %

V-Ditch 3 Capacity

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.025
Channel Slope	2.00 %
Normal Depth	1.00 ft
Left Side Slope	30.00 H:V
Right Side Slope	5.00 H:V

Results	
Discharge	92.46 cfs
Flow Area	17.5 ft²
Wetted Perimeter	35.1 ft
Hydraulic Radius	0.50 ft
Top Width	35.00 ft
Critical Depth	1.12 ft
Critical Slope	1.11 %
Velocity	5.28 ft/s
Velocity Head	0.43 ft
Specific Energy	1.43 ft
Froude Number	1.317
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.00 ft
Critical Depth	1.12 ft
Channel Slope	2.00 %
Critical Slope	1.11 %

Low Water Crossing Capacity

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.025
Channel Slope	1.00 %
Normal Depth	1.00 ft
Left Side Slope	5.00 H:V
Right Side Slope	5.00 H:V
Bottom Width	15.00 ft

Results	
Discharge	101.90 cfs
Flow Area	20.0 ft²
Wetted Perimeter	25.2 ft
Hydraulic Radius	0.79 ft
Top Width	25.00 ft
Critical Depth	1.00 ft
Critical Slope	0.99 %
Velocity	5.10 ft/s
Velocity Head	0.40 ft
Specific Energy	1.40 ft
Froude Number	1.004
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.00 ft
Critical Depth	1.00 ft
Channel Slope	1.00 %
Critical Slope	0.99 %

Riprap Lined Downdrain Capacity

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data		
Roughness Coefficient	0.040	
Channel Slope	18.40	%
Normal Depth	1.50	ft
Left Side Slope	2.00	H:V
Right Side Slope	2.00	H:V
Bottom Width	2.00	ft

Results		
Discharge	108.18	cfs
Flow Area	7.5	ft²
Wetted Perimeter	8.7	ft
Hydraulic Radius	0.86	ft
Top Width	8.00	ft
Critical Depth	2.38	ft
Critical Slope	2.36	%
Velocity	14.42	ft/s
Velocity Head	3.23	ft
Specific Energy	4.73	ft
Froude Number	2.626	
Flow Type	Supercritical	

GVF Input Data		
Downstream Depth	0.00	ft
Length	0.0	ft
Number Of Steps	0	

GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.50	ft
Critical Depth	2.38	ft
Channel Slope	18.40	%
Critical Slope	2.36	%

SLLE Runoff Ditch Capacity

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.025
Channel Slope	3.50 %
Normal Depth	1.00 ft
Left Side Slope	4.00 H:V
Right Side Slope	4.00 H:V
Bottom Width	1.00 ft

Results	
Discharge	36.90 cfs
Flow Area	5.0 ft²
Wetted Perimeter	9.2 ft
Hydraulic Radius	0.54 ft
Top Width	9.00 ft
Critical Depth	1.28 ft
Critical Slope	1.07 %
Velocity	7.38 ft/s
Velocity Head	0.85 ft
Specific Energy	1.85 ft
Froude Number	1.746
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.00 ft
Critical Depth	1.28 ft
Channel Slope	3.50 %
Critical Slope	1.07 %

Berm 1 Capacity

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.025
Channel Slope	1.00 %
Normal Depth	1.00 ft
Left Side Slope	15.00 H:V
Right Side Slope	3.00 H:V

Results

Discharge	33.46 cfs
Flow Area	9.0 ft²
Wetted Perimeter	18.2 ft
Hydraulic Radius	0.49 ft
Top Width	18.00 ft
Critical Depth	0.97 ft
Critical Slope	1.18 %
Velocity	3.72 ft/s
Velocity Head	0.21 ft
Specific Energy	1.21 ft
Froude Number	0.927
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.00 ft
Critical Depth	0.97 ft
Channel Slope	1.00 %
Critical Slope	1.18 %

Berm 2 Capacity

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.025
Channel Slope	2.00 %
Normal Depth	1.00 ft
Left Side Slope	15.00 H:V
Right Side Slope	3.00 H:V

Results	
Discharge	47.31 cfs
Flow Area	9.0 ft²
Wetted Perimeter	18.2 ft
Hydraulic Radius	0.49 ft
Top Width	18.00 ft
Critical Depth	1.11 ft
Critical Slope	1.12 %
Velocity	5.26 ft/s
Velocity Head	0.43 ft
Specific Energy	1.43 ft
Froude Number	1.311
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.00 ft
Critical Depth	1.11 ft
Channel Slope	2.00 %
Critical Slope	1.12 %

Berm 4 Capacity

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.025
Channel Slope	0.35 %
Normal Depth	1.00 ft
Left Side Slope	4.50 H:V
Right Side Slope	8.00 H:V
Bottom Width	1.50 ft

Results	
Discharge	18.22 cfs
Flow Area	7.8 ft²
Wetted Perimeter	14.2 ft
Hydraulic Radius	0.55 ft
Top Width	14.00 ft
Critical Depth	0.77 ft
Critical Slope	1.22 %
Velocity	2.35 ft/s
Velocity Head	0.09 ft
Specific Energy	1.09 ft
Froude Number	0.557
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.00 ft
Critical Depth	0.77 ft
Channel Slope	0.35 %
Critical Slope	1.22 %

Berm 5 Capacity

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.025
Channel Slope	0.50 %
Normal Depth	1.00 ft
Left Side Slope	4.50 H:V
Right Side Slope	8.00 H:V
Bottom Width	1.50 ft

Results	
Discharge	21.78 cfs
Flow Area	7.8 ft²
Wetted Perimeter	14.2 ft
Hydraulic Radius	0.55 ft
Top Width	14.00 ft
Critical Depth	0.83 ft
Critical Slope	1.19 %
Velocity	2.81 ft/s
Velocity Head	0.12 ft
Specific Energy	1.12 ft
Froude Number	0.666
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.00 ft
Critical Depth	0.83 ft
Channel Slope	0.50 %
Critical Slope	1.19 %

Worksheet - SLLE Run-on Ditch Capacity

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.025
Channel Slope	0.55 %
Normal Depth	0.50 ft
Left Side Slope	2.00 H:V
Right Side Slope	10.00 H:V

Results	
Discharge	2.58 cfs
Flow Area	1.5 ft²
Wetted Perimeter	6.1 ft
Hydraulic Radius	0.24 ft
Top Width	6.00 ft
Critical Depth	0.41 ft
Critical Slope	1.59 %
Velocity	1.72 ft/s
Velocity Head	0.05 ft
Specific Energy	0.55 ft
Froude Number	0.607
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.50 ft
Critical Depth	0.41 ft
Channel Slope	0.55 %
Critical Slope	1.59 %

HY-8 Culvert Calculations

HY-8 Culvert Analysis Report

Table 1 - Project Headwater Table

Crossing Name	Culvert Name	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Outlet Velocity (ft/s)
SWB8 Culvert	SWB8 Culvert	11.10	11.10	1733.73	2.25	0.026	1.50	0.81	1.27	0.81	11.45
SWB5 Culvert	SWB5 Culvert	22.90	22.90	1744.66	3.41	1.540	1.70	1.14	1.70	1.19	11.78

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 11.00 cfs
Design Flow: 11.10 cfs
Maximum Flow: 11.10 cfs

Table 2 - Summary of Culvert Flows at crossing: SWB8 Culvert

Headwater Elevation (ft)	Total Discharge (cfs)	SWB8 Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1733.71	11.00	11.00	0.00	1
1733.71	11.01	11.01	0.00	1
1733.72	11.02	11.02	0.00	1
1733.72	11.03	11.03	0.00	1
1733.72	11.04	11.04	0.00	1
1733.72	11.05	11.05	0.00	1
1733.73	11.06	11.06	0.00	1
1733.73	11.07	11.07	0.00	1
1733.73	11.08	11.08	0.00	1
1733.73	11.09	11.09	0.00	1
1733.73	11.10	11.10	0.00	1
1734.66	14.61	14.61	0.00	Overtopping

Table 3 - Culvert Summary Table: SWB8 Culvert

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
11.00	11.00	1733.71	2.23	0.0*	1.49	5-S2n	0.80	1.27	0.80	0.13	11.43	10.01
11.01	11.01	1733.71	2.23	0.0*	1.49	5-S2n	0.80	1.27	0.80	0.13	11.43	10.01
11.02	11.02	1733.72	2.24	0.0*	1.49	5-S2n	0.80	1.27	0.80	0.13	11.43	10.01
11.03	11.03	1733.72	2.24	0.003	1.49	5-S2n	0.80	1.27	0.80	0.13	11.43	10.02
11.04	11.04	1733.72	2.24	0.006	1.49	5-S2n	0.80	1.27	0.80	0.13	11.44	10.02
11.05	11.05	1733.72	2.24	0.009	1.50	5-S2n	0.81	1.27	0.81	0.13	11.44	10.02
11.06	11.06	1733.73	2.25	0.013	1.50	5-S2n	0.81	1.27	0.81	0.13	11.44	10.03
11.07	11.07	1733.73	2.25	0.016	1.50	5-S2n	0.81	1.27	0.81	0.13	11.44	10.03
11.08	11.08	1733.73	2.25	0.019	1.50	5-S2n	0.81	1.27	0.81	0.13	11.44	10.04
11.09	11.09	1733.73	2.25	0.023	1.50	5-S2n	0.81	1.27	0.81	0.13	11.45	10.04
11.10	11.10	1733.73	2.25	0.026	1.50	5-S2n	0.81	1.27	0.81	0.13	11.45	10.04
16.15	14.89	1734.74	3.26	1.463	2.18	5-S2n	0.98	1.40	0.98	0.16	12.22	11.56

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 1731.48 ft
Outlet Elevation (invert): 1728.40 ft
Culvert Length: 88.58 ft
Culvert Slope: 0.03 ft/ft

Site Data - SWB8 Culvert

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 1731.48 ft
Outlet Station: 88.53 ft
Outlet Elevation: 1728.40 ft
Number of Barrels: 1

Culvert Data Summary - SWB8 Culvert

Barrel Shape: Circular
Barrel Diameter: 1.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Grooved End Projecting (Ke=0.2)
Inlet Depression: None

Tailwater Channel Data for Crossing: SWB8 Culvert

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 8.00 ft
a_side Slope (H:V): 3.00 (_:1)
Channel Slope: 0.46 ft/ft
Channel Manning's n: 0.0250
Channel Invert Elevation: 1728.40 ft

Table 4 - Downstream Channel Rating Curve (crossing: SWB8 Culvert)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
11.00	1728.53	0.13	10.01	3.73	4.99
11.01	1728.53	0.13	10.01	3.73	4.99
11.02	1728.53	0.13	10.01	3.73	4.98
11.03	1728.53	0.13	10.02	3.73	4.99
11.04	1728.53	0.13	10.02	3.73	4.99
11.05	1728.53	0.13	10.02	3.74	4.99
11.06	1728.53	0.13	10.03	3.74	4.99
11.07	1728.53	0.13	10.03	3.74	4.99
11.08	1728.53	0.13	10.04	3.74	4.99
11.09	1728.53	0.13	10.04	3.74	4.99
11.10	1728.53	0.13	10.04	3.75	4.99

Roadway Data for crossing: SWB8 Culvert

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 20.00 ft
Crest Elevation: 1734.66 ft
Roadway Surface: Gravel
Roadway Top Width: 70.41 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 22.00 cfs
Design Flow: 22.90 cfs
Maximum Flow: 22.90 cfs

Table 5 - Summary of Culvert Flows at crossing: SWB5 Culvert

Headwater Elevation (ft)	Total Discharge (cfs)	SWB5 Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1744.50	22.00	22.00	0.00	1
1744.51	22.09	22.09	0.00	1
1744.53	22.18	22.18	0.00	1
1744.55	22.27	22.27	0.00	1
1744.56	22.36	22.36	0.00	1
1744.58	22.45	22.45	0.00	1
1744.59	22.54	22.54	0.00	1
1744.61	22.63	22.63	0.00	1
1744.63	22.72	22.72	0.00	1
1744.64	22.81	22.81	0.00	1
1744.66	22.90	22.90	0.00	1
1746.00	29.27	29.27	0.00	Overtopping

Table 6 - Culvert Summary Table: SWB5 Culvert

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.00	22.00	1744.50	3.25	1.355	1.62	5-S2n	1.11	1.67	1.16	1.15	11.67	8.35
22.09	22.09	1744.51	3.26	1.373	1.63	5-S2n	1.12	1.68	1.16	1.15	11.68	8.36
22.18	22.18	1744.53	3.28	1.391	1.64	5-S2n	1.12	1.68	1.16	1.15	11.69	8.37
22.27	22.27	1744.55	3.30	1.410	1.65	5-S2n	1.12	1.68	1.17	1.15	11.70	8.37
22.36	22.36	1744.56	3.31	1.428	1.66	5-S2n	1.13	1.69	1.17	1.15	11.71	8.38
22.45	22.45	1744.58	3.33	1.447	1.66	5-S2n	1.13	1.69	1.17	1.16	11.72	8.39
22.54	22.54	1744.59	3.34	1.465	1.67	5-S2n	1.13	1.69	1.18	1.16	11.73	8.40
22.63	22.63	1744.61	3.36	1.484	1.68	5-S2n	1.13	1.69	1.18	1.16	11.74	8.41
22.72	22.72	1744.63	3.38	1.503	1.69	5-S2n	1.14	1.70	1.18	1.16	11.75	8.42
22.81	22.81	1744.64	3.39	1.521	1.70	5-S2n	1.14	1.70	1.19	1.16	11.77	8.42
22.90	22.90	1744.66	3.41	1.540	1.70	5-S2n	1.14	1.70	1.19	1.17	11.78	8.43
33.31	29.88	1746.15	4.90	3.178	2.45	5-S2n	1.37	1.86	1.42	1.34	12.54	9.26

Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 1741.25 ft
Outlet Elevation (invert): 1738.72 ft
Culvert Length: 96.26 ft
Culvert Slope: 0.03 ft/ft

Site Data - SWB5 Culvert

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 1741.25 ft
Outlet Station: 96.23 ft
Outlet Elevation: 1738.72 ft
Number of Barrels: 1

Culvert Data Summary - SWB5 Culvert

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

Tailwater Channel Data for Crossing: SWB5 Culvert

Tailwater Channel Option: Triangular Channel
a_side Slope (H:V): 2.00 (_:1)
Channel Slope: 0.05 ft/ft
Channel Manning's n: 0.0250
Channel Invert Elevation: 1738.72 ft

Table 7 - Downstream Channel Rating Curve (crossing: SWB5 Culvert)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
22.00	1739.87	1.15	8.35	3.44	1.94
22.09	1739.87	1.15	8.36	3.44	1.94
22.18	1739.87	1.15	8.37	3.45	1.94
22.27	1739.87	1.15	8.37	3.45	1.94
22.36	1739.87	1.15	8.38	3.46	1.94
22.45	1739.88	1.16	8.39	3.46	1.94
22.54	1739.88	1.16	8.40	3.47	1.95
22.63	1739.88	1.16	8.41	3.47	1.95
22.72	1739.88	1.16	8.42	3.48	1.95
22.81	1739.88	1.16	8.42	3.48	1.95
22.90	1739.89	1.17	8.43	3.49	1.95

Roadway Data for crossing: SWB5 Culvert

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 20.00 ft
Crest Elevation: 1746.00 ft
Roadway Surface: Paved
Roadway Top Width: 87.00 ft

Retention Basin Storage Summary

Retention Basin Storage Evaluation					
ID	**Required Storage Volume (2026 HEC-HMS Results)**		**Available Storage Volume[a]**		**Additional Volume Required**
	(ac-ft)	**(cy)**	**(cy)**	**(ac-ft)**	**(cy)**
CWPS	2.8	4,517	6,800	4.2	0
SWB1 and SWB2	1.8	2,904	4,928	3.1	0
SWB3	0.2	323	484	0.3	0
SWB4	1.1	1,775	2,597	1.6	0
SWB5	1.2	1,936	2,230	1.4	0
SWB6	0.1	161	250	0.2	0
SWB7	0.2	323	383	0.2	0
SWB8	0.6	968	1,400	0.9	0
Stormwater Retention Basins	0.7	1,129	17,100	10.6	0

Note:

[a] Retention basin storage capacities were estimated using the topographic surface with adjustments based on field observations.

ac-ft = acre-feet

cy = cubic yard