

Hydrologic Report

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Westport Light State Park
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List of Acronyms

3-D	three-dimensional
μS/cm	microsiemens per centimeter
cfs	cubic feet per second
CLN	Connected Linear Networks
CN	curve number
ft ² /d	square foot per day
ft ³	cubic feet
FEMA	Federal Emergency Management Agency
GWF	groundwater flow
HSG	hydrologic soil group
in/hr	inches per hour
lbs	pounds
LiDAR	Light Intensity Distance and Ranging
NOAA	National Oceanic and Atmospheric Administration
NRCS	National Resources Conservation Service
Park	Westport Light State Park
RMSE	root mean square error
TOC	time of concentration
USGS	United States Geological Survey
WSDOT	Washington Department of Transportation
WSPRC	Washington State Parks and Recreation Commission

1 Introduction

Washington State Parks and Recreation Commission (WSPRC) manages the Westport Light State Park (Park) within the City of Westport, Washington. The Park is approximately 600 acres, with 1,215 linear feet of shoreline bordering the Pacific Ocean and Half Moon Bay. WSPRC is currently preparing a Master Plan for the Park.

In 2016, WSPRC approved development of a Recreation Concession Area within the Park boundaries. These areas may potentially include campgrounds, cottages, food services, and an 18-hole, links-style golf course. The proposed developments will impact how stormwater and groundwater move throughout the Park. Thus, it is important to understand how these various developments could influence the site, so that adverse impacts to the local hydrology can be mitigated or avoided.

The purpose of this report is to document findings from groundwater and surface water assessments performed by AECOM to evaluate potential hydrologic impacts from the 18-hole golf course the associated golf course facilities proposed within the Park. The assessments were completed for existing site conditions as well as for several predictive simulations for development.

2 Project Background

2.1 Project Location

The Park is located in the City of Westport, Grays Harbor County, Washington. Geographically, the Park occurs at the north end of a narrow peninsula, with the Pacific Ocean to the west and Grays Harbor to the north and east (**Figure 2-1**). The Public Land Survey System description of the Park is Sections 1 and 12, Township 16 North, Range 12 West (Willamette Meridian).

The study area for the surface water hydrology assessment includes the Park east of the primary dune and paved foot path. It is bordered by Jetty Haul Road (State Park Access Road) on the north, West Ocean Avenue on the south, North Forrest Street and West Wilson Road along the northeast, and Grays Harbor Lighthouse along the southeast (**Figure 2-2**). The study area does not include the Seashore Conservation Area west of the dune or north of Jetty Haul Road (along the Half Moon Bay, Grays Harbor shoreline). Nor does it include an undeveloped 37-acre parcel owned by the City of Westport between the east boundary of the Park and North Forrest Street. The size of the study area is estimated at approximately 500 acres.

2.2 Topography

Light Intensity Distance and Ranging (LiDAR) survey data for the study area were obtained from the Washington State Department of Natural Resources, which collects and provides publicly available LiDAR data across the state (DNR 2021). LiDAR data for the study area were collected as part of the Southwest WA Olympic Peninsula and Southwest Counties 2019 project by the Washington Geologic Survey, the United States Geological Survey (USGS), and other local Washington partners. Data collection took place between the fall of 2017 and the winter of 2019. LiDAR data indicate that overall, the site is flat with several prominent low-lying areas. In general, the site slopes from the southwest to the northeast.

2.3 Land Cover

The hydrologic study area is mostly undeveloped; however, the north half of the Park includes extensive areas that were disturbed approximately 15 years ago (prior to inclusion in the Park) for the development of a golf course. This project, known as Links at Half Moon Bay, was abandoned prior to completion. Current development on-site includes two parking lots with comfort stations and an Americans with Disabilities Act-compliant trail along the primary dune, located on the west side of the Park.



Figure 2-1. Westport vicinity map

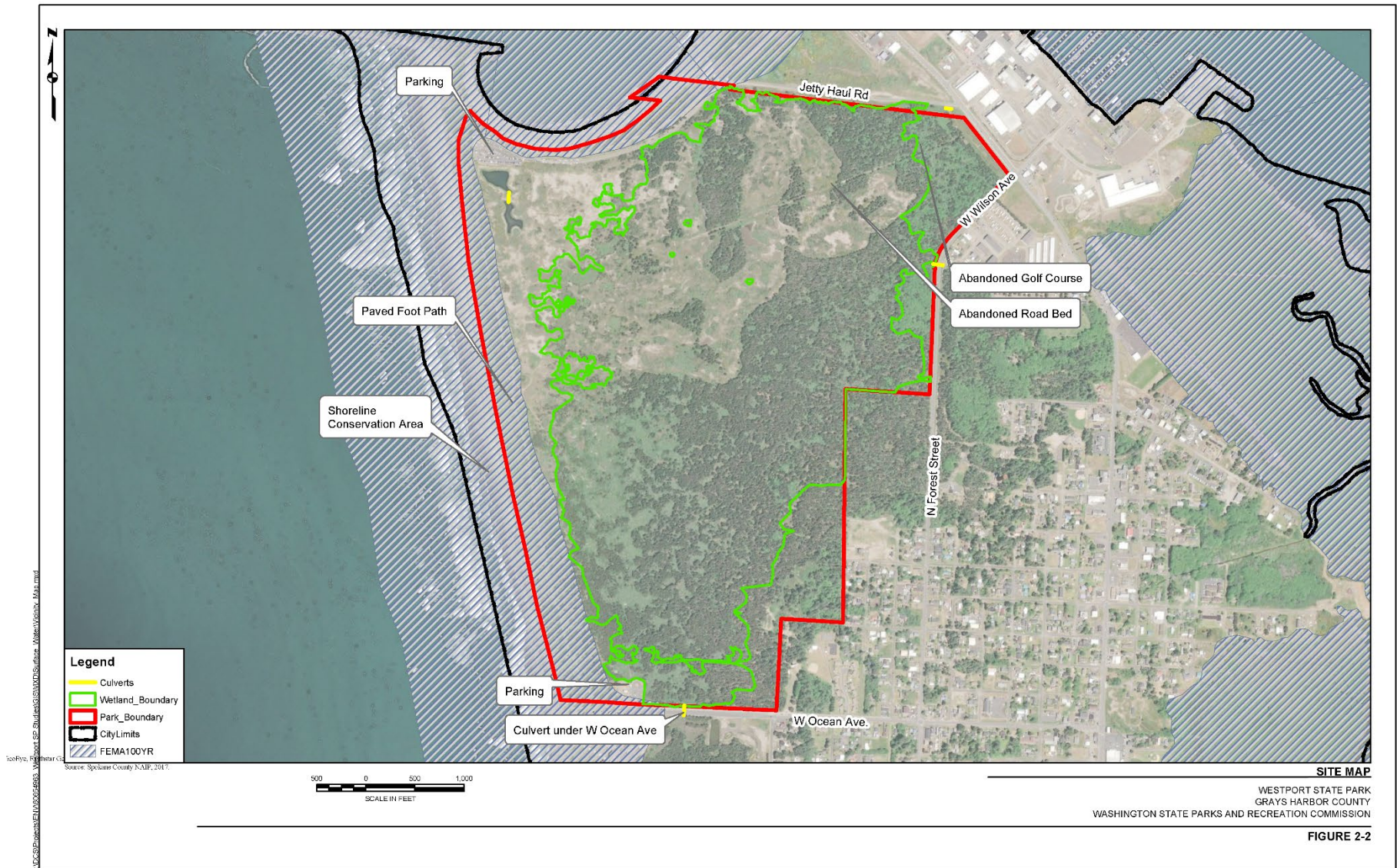


Figure 2-2. Surface water investigation study area map

The southern half and northern third of the Park are characterized by forested wetlands with shore pine (*Pinus contorta* var. *contorta*) /slough sedge (*Carex obnupta*) swamp forest as the dominant plant association (AECOM 2017; AECOM 2021a; Morrison and Smith 2007). The shore pines are approximately 25 to 40 years old. Some stands contain minor components of Sitka spruce (*Picea sitchensis*). Western crabapple (*Malus fusca*) and black twinberry (*Lonicera involucrata* var. *involucrata*) are also scattered throughout the community. Slough sedge is the dominant herbaceous species. Evergreen huckleberry (*Vaccinium ovatum*), Pacific bayberry (*Morella californica*), and sword fern (*Polystichum munitum*) are present on small hummocks. This community commonly occurs within coastal wetland mosaics.

Red alder (*Alnus rubra*)/slough sedge forest occurs mainly along the eastern study area boundary. Red alder is the dominant tree, with individual plants that are approximately 30 to 50 years old. The woody understory is dominated by salmonberry (*Rubus spectabilis*), black twinberry, Pacific crabapple, and Douglas spiraea (*Spiraea douglasii* var. *douglasii*). Slough sedge dominates the herbaceous layer.

Scrub-shrub wetlands are predominant within the interior of the south half of the Park but also occur scattered throughout the surface water hydrology study area. The dominant scrub-shrub plant association is the coastal willow (*Salix hookeriana*)/slough sedge shrub swamp (AECOM 2017; AECOM 2021a; Morrison and Smith 2007). This community contains almost pure stands of coastal willow, with a large proportion of decadent or dead material. Pacific crabapple, Douglas spiraea, and black twinberry are sometimes present in small amounts. The herbaceous layer is dominated by slough sedge, with minor components of marsh speedwell (*Veronica scutellata*), purslane speedwell (*Veronica peregrina* var. *xalapensis*), small bedstraw (*Galium trifidum*), and marsh violet (*Viola palustris*).

Emergent wetlands occur both as small, scattered openings within the forest and shrub communities and as discreet wetlands in seasonally ponded depressions and swales in the north half of the Park. The dominant emergent community type in the north half of the Park is the falcate rush (*Juncus falcatus*)/dune rush (*J. nevadensis*) wet meadow (AECOM 2017). The dominant herbaceous species are slough sedge, falcate rush, Brewer's rush (*J. breweri*), and dune rush. Marsh speedwell is also common (AECOM 2021b).

2.4 Soils

Soil data were gathered from the National Resources Conservation Service (NRCS) Web Soil Survey (NRCS 2021a) ([Appendix A](#)). The two primary soil types found on the site are Dune land (77%) and Yaquina loamy fine sand (15%). Soils comprising a smaller percentage of the study area include Westport fine sand, 3 to 10 percent slopes (6%), Udorthents, level (1%), and beaches (1%). More detailed descriptions of each soil type are provided below.

- **Dune land** is a miscellaneous land type that occurs in deep eolian sands on recently formed dunes. It lacks horizon development.
- **Yaquina** soils are mapped in the main deflation plain east of the primary dune. They are very deep, somewhat poorly drained soils formed in eolian sands in depressions. Permeability is high. Depth to seasonal high water table is at the soil surface. They are frequently ponded. Yaquina is listed as a hydric soil (NRCS 2021a, 2021b).
- **Westport** soils are mapped in the large transverse dune in the southeast corner of the Park. They are very deep, excessively drained soils formed in eolian sands on dunes. Permeability is very high. Depth to seasonal high water table is greater than 80 inches. The map unit includes 6 percent hydric soil inclusions in depressions.
- **Udorthents** are mapped in the extreme northeast corner of the Park along Montesano Road. They occur in sandy or loamy fill material from dredging and are very deep and moderately well drained. Permeability is high. Depth to a seasonal high water table is 24 to 72 inches.
- **Beaches** are mapped in the southwest corner of the Park and along the northern Park boundary, which follows the shoreline of Half Moon Bay. Beach soils consist of beach sand and gravelly sand. Depth to seasonal high water table is 0 to 72 inches, and soils are frequently flooded. Beaches are listed as hydric (NRCS 2021a, 2021b).

2.5 Hydrology

The Park is located outside of the Federal Emergency Management Agency (FEMA) 100-year floodplain ([Appendix B](#)); however, the study area has a seasonal high water table. Conditions of surface saturation and/or inundation are estimated to occur from November through April or May in a typical year. As part of AECOM's wetland assessment, multiple site visits were conducted. During these visits, surface saturation or inundation was observed in all sampled areas for the first field investigation, which took place from March 30–April 2, 2021. Water depths of 2 feet or more were observed during this investigation. For subsequent field investigations, taking place from mid-April to the end of April, only about half of the wetland plots had free water. The deepest ponding occurred in the coastal willow swamps and some of the wet meadows. It was noted that normal precipitation conditions were present in the 3 months prior to the field visits. Drier than normal precipitation conditions were present prior to the April 26–30 field visit, and only very light precipitation was recorded in the 10 days preceding the field work. The soils were determined to be highly permeable, and the water table appeared to drop quickly as precipitation declined toward the end of the winter months (AECOM 2021b).

There is one known culvert in the vicinity of the project that extends from north to south under West Ocean Avenue. During periods of inundation, this culvert directs flow from the low-lying area on the south end of the study area under the street to a vegetated ditch that continues off-site.

The Washington Department of Transportation (WSDOT) retains precipitation data for various storms around the state in the form of isopluvial maps for the 6-month, 2-year, 10-year, 25-year, 50-year, and 100-year, 24-hour design storms ([Appendix C](#)). [Table 2-1](#) summarizes the rainfall depths for each of these storms.

Table 2-1. Design Storms and Corresponding Rainfall

	6-month, 24-hour	2-year, 24-hour	25-year, 24-hour	50-year, 24-hour	100-year, 24-hour
Rainfall Depth (inches)	2.50	3.43	4.50	5.00	5.50

3 Surface Water Investigation

3.1 Existing Conditions HydroCAD Model

To further the understanding of how surface water moves through the existing site, a HydroCAD model was developed. HydroCAD is a hydrologic and hydraulic modeling software that enables the user to easily input parameters such as land use cover, soil types, infiltration, rainfall, and topography to estimate the amount of runoff and/or ponding in a project site. For the purposes of this project, HydroCAD is useful to estimate the amount of storage the existing low-lying and wetland areas provide. The existing conditions model was set up assuming a “worst-case” scenario for which during a winter period of inundation, large precipitation events occur.

3.1.1 Approach and Methodology

To begin the set up of the existing conditions model, it was important to understand existing flow patterns on-site. Using the LiDAR information obtained for this project (see Section 2.2), drainage patterns were observed and subcatchments were delineated using AutoCAD software. Eleven major subcatchments (1S-11S) were identified: two for ponds that were excavated in the northwest corner as part of the abandoned golf course project, several smaller catchments along the western and southern boundaries of the Park, and one large subcatchment that encompasses the central and northeast portions of the site.

For each of these subcatchments, information related to land area, time of concentration (TOC), and curve number (CN) were entered into the model. Land area and TOC were estimated using aerial

imagery and LiDAR contour data. CNs were based on NRCS soils data and land cover (estimated from aerial imagery). According to the NRCS soils report, the predominant soils present in the study area are Dune land and Yaquina loamy fine sand. Yaquina loamy fine sand has a hydrologic soil group (HSG) of A/D.¹ Because this model represents a winter period of inundation, a type D HSG was chosen for these areas (NRCS 2021a). The HSG for Dune land, the primary soil encompassing the project area, was not identified in the soils report. Therefore, this soil type was given an HSG of D, based on surrounding soils. The study area is also composed of several small deposits of Westport fine sand, 3 to 10 percent slopes, and Udorthents, level, both of which are classified as HSG A. There are small deposits of “Beaches” in the southwest corner of the site and along the northern Park boundary. Beaches are not assigned an HSG in the NRCS Soils report. See [Table 3-1](#) for CN descriptions used in the HydroCAD model and [Table 3-2](#) for a summary of subcatchments inputs.

Table 3-1. Land Use and Corresponding Curve Number

Description	Hydrologic Soil Group	Curve Number
Woods/grass combination, Good	A	32
Woods/grass combination, Good	D	79
Brush, Good	D	73
Paved	D	98
Paved	A	98

Table 3-2. Subcatchment Area, Existing Condition Model Inputs

Subcatchment	Area (acres) and Description	Weighted CN	TOC (minutes)
1S	6.1 (Brush, Good, HSG D) 1.1 (Paved Parking, HSG D)	77	4.9
2S	4.3 (Brush, Good, HSG D)	73	7.8
3S	14.4 (Brush, Good, HSG D)	73	6.7
4S	26.6 (Brush, Good, HSG D)	73	56.2
5S	23.5 (Brush, Good, HSG D) 1.4 (Woods/grass comb, Good, HSG D)	73	11.1
6S	8.7 (Woods/grass comb, Good, HSG D) 12.6 (Brush, Good, HSG D)	75	127.5
7S	0.5 (Paved, HSG D) 21.4 (Brush, Good, HSG D) 32.7 (Woods/grass comb, Good, HSG D)	77	135.3
8S	0.6 (Brush, Good, HSG D) 0.8 (Paved, HSG D) 15.6 (Woods/grass comb, Good, HSG D)	78	88.6

¹ Soils in the United States are assigned to four hydrologic soil groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D) based on estimates of runoff potential (NRCS 2009). Group A soils have a high infiltration rate (low runoff potential) and Group D soils have a very low infiltration rate (high runoff potential). For soils assigned to a dual hydrologic group, the first letter applies to the drained condition, and the second applies to the undrained condition.

Subcatchment	Area (acres) and Description	Weighted CN	TOC (minutes)
9S	0.9 (Woods/grass comb, Good, HSG D) 21.8 (Brush, Good, HSG D)	73	23.9
10S	223.0 (Woods/grass comb, Good HSG D) 12.9 (Goods/grass comb, Good, HSG A) 0.7 (Paved, HSG A) 5.3 (Paved, HSG D) 83.2 (Brush, Good, HSG D)	76	393.8
11S	18.5 (Woods/grass comb, Good, HSG A) 2.0 (Woods/grass comb, Good, HSG D) 3.2 (Brush, Good, HSG D)	41	126.8

Key: CN = curve number; HSG = hydrologic soil group (ranging from A [low runoff] to D [high runoff]); TOC = time of concentration.

Within each catchment area, low-lying areas were input to the model as pond nodes. Required inputs for pond nodes include storage data, which was delineated based on LiDAR contours and aerial imagery. Photos from the wetland site visit were used to validate ponding depths throughout the site. In catchments where there were multiple low-lying areas, these areas were entered into the model as one pond, to maintain simplicity. Pond nodes typically require infiltration data to be input to the model; however, for this model the infiltration was left as 0 inches/hour (in/hr) to represent the saturated underlying soils that would be present during the “worst-case” scenario. This was true for all ponded areas aside from pond 11P. This pond is in the southeast corner of the site, where Westport fine sand soils are mapped. According to the NRCS soils report, this is a well-draining soil with a very high hydraulic conductivity rate ranging between 19.98 and 99.90 in/hr (NRCS 2021a). Because the existing conditions model is meant to be conservative, the lowest hydraulic conductivity rate provided by the NRCS report (19.98 in/hr) was used as the exfiltration rate for this pond.

Each pond node was given a “Broad Crested Weir” outlet, set at the height of the top of each low-lying area. This outlet is not intended to represent any feature of the site; rather, this outlet placement provides an easy way for the model to show when these areas flood and overtop. The ponds were then connected to each other such that any flow resulting from overtopping areas would represent surface flows through the study area. Pond 8P was given one additional outlet, representing a culvert under West Ocean Avenue, observed during an AECOM site visit. Features of the culvert (length, inverts) were estimated from LiDAR data.

There is one reach input into the model, 8R. This node represents the ditch that the culvert under West Ocean Avenue discharges to. Required input information for this reach including length, slope, and Manning’s n number were estimated using LiDAR data and aerial imagery.

Nodes were connected to one another based on observations in the LiDAR data. The nodes representing the catchment at the south end of the site draining to the culvert under West Ocean Avenue (8S, 8P, 8R) were not connected to the rest of the site. The remainder of the ponds were connected, ultimately conveying their flow toward the northeast portion of the site and node 10P.

Rainfall data were entered using the hydrologic conditions for the various storm events, as previously described in this report. A Type IA-24-hr rainfall distribution was used for all design storms, representing the prevalent storm type within the Pacific Northwest.

3.1.2 Results and Conclusions

The existing conditions HydroCAD model was run for the 6-month, 2-year, 25-year, 50-year, and 100-year recurrence intervals. Results indicate that, while the smaller ponded areas on-site will overtop and spill over into downstream ponded areas, the largest low-lying area on the site (10P) is sufficient in size to

store flows from the study area. This area will not overtop during any of the design storms analyzed. Complete results of the analysis are presented in [Appendix D](#).

3.2 Proposed Conditions Model

Two proposed site options were developed by DMK Golf Design ([Appendix E](#)). Both options are very similar in terms of the layouts of the site's golf course, practice range, par-3 course, golf operations, and dune trail areas; however, Option 2 has a slightly larger footprint for the interior trails (3.4 vs 1.8 acres). To understand how the site's proposed development will impact how surface water moves and ponds throughout the site, a proposed conditions HydroCAD model was developed.

3.2.1 Approach and Methodology

To begin setup of the proposed conditions HydroCAD model, the proposed site layout, as shown in Option 1 ([Appendix E](#)) was overlaid with the catchments and ponded areas delineated for the existing conditions model. It was determined that the land use for each of the 11 subcatchments would be altered under the proposed conditions. Therefore, the CNs and TOCs for each catchment were revised to reflect the proposed conditions. It was also determined that several of the ponded areas would be replaced with the golf course (ponds 2P, 3P, 4P, 9P, 11P from the existing conditions model). These ponds were excluded from the proposed conditions model and catchments updated accordingly. This table reflects the conditions for Option 1 of the proposed golf course. Two new CNs were also introduced as part of the proposed conditions model. The CN for the golf course area was taken from the Washington State Department of Transportation's *Highway Runoff Manual*. This manual notes that the CN for open spaces, including golf courses, in good condition for HSG D is 90 and for HSG A is 68 (WSDOT 2014). Proposed trails were assigned a CN of 98, representing paved areas. See [Table 3-3](#) for the revised, proposed conditions catchment.

Table 3-3. Subcatchment Area Proposed Condition, Option 1

Subcatchment	Area (acres) and Description	Weighted CN	TOC (minutes)
1S	3.5 (Brush, Good, HSG D) 1.2 (Paved Parking, HSG D) 2.4 (Golf Course, HSG A) 0.2 (Trail, HSG D)	84	4.9
2S	8.4 (Brush, Good, HSG D) 0.8 (Paved Parking, HSG D) 31.7 (Golf Course, HSG A) 0.2 (Trail, HSG D) 0.3 (Woods/grass comb, Good, HSG D)	87	122.9
4S	13.1 (Brush, Good, HSG D) 0.2 (Trail, HSG D) 13.3 (Golf Course, HSG A)	82	38.6
5S	13.9 (Brush, Good, HSG D) 0.5 (Woods/grass comb, Good, HSG D) 10.5 (Golf Course, HSG A)	80	11.1
6S	12.1 (Brush, Good, HSG D) 8.0 (Woods/grass comb, Good, HSG D) 0.2 (Trail, HSG D) 1.0 (Golf Course, HSG A)	76	127.5

Subcatchment	Area (acres) and Description	Weighted CN	TOC (minutes)
7S	25.2 (Woods/grass comb, Good, HSG D) 8.7 (Brush, Good, HSG D) 0.5 (Paved, HSG D) 0.2 (Trail, HSG D) 20.3 (Golf Course, HSG A)	82	140.5
8S	0.8 (Paved, HSG D) 0.6 (Brush, Good, HSG D) 1.8 (Woods/grass comb, Good, HSG D) 13.2 (Golf Course, HSG A)	87	45.3
10S	198.3 (Woods/grass comb, Good HSG D) 12.7 (Goods/grass comb, Good, HSG A) 0.7 (Paved, HSG A) 5.7 (Paved, HSG D) 30.3 (Brush, Good, HSG D) 1.8 (Trail, HSG D) 75.3 (Golf Course, HSG A)	80	393.8
11S	2.1 (Woods/grass comb, Good HSG D) 21.2 (Golf Course, HSG A)	65	49.7

Key: CN = curve number; HSG = hydrologic soil group (ranging from A [low runoff] to D [high runoff]); TOC = time of concentration.

As previously mentioned, several ponded areas included in the existing conditions model will be eliminated with the proposed golf course layout. Therefore, ponds 2P, 3P, 4P, and 11P were not included in the proposed conditions model. The remaining ponds from the existing conditions model were copied into the proposed conditions model. Reach 8R, representing the reach downstream of the culvert, represented by 8P, was also included in the proposed conditions model.

Hydrologic information, including the rainfall depth and distribution, remained the same between the existing and proposed conditions model.

Once the proposed conditions model for Option 1 was finalized, the model for Option 2 was developed. All elements of the model for Option 2 remained the same aside from one subcatchment, 10S. This catchment was updated to reflect the larger footprint of the proposed trails and additional comfort area associated with this option. See [Table 3-4](#).

Table 3-4. Subcatchment Area Proposed Condition, Option 2

Subcatchment	Area (acres) and Description	Weighted CN	TOC (minutes)
10S	195.8 (Woods/grass comb, Good HSG D) 12.7 (Goods/grass comb, Good, HSG A) 0.7 (Paved, HSG A) 5.7 (Paved, HSG D) 30.3 (Brush, Good, HSG D) 4.3 (Trail, HSG D) 75.3 (Golf Course, HSG A)	80	393.8

Key: CN = curve number; HSG = hydrologic soil group (ranging from A [low runoff] to D [high runoff]); TOC = time of concentration.

3.2.2 Results and Conclusions

Results of the proposed HydroCAD model indicate the golf course development will impact how surface water moves throughout the site. Mainly, for the low-lying area on the northeast side of the study area where most of the stormwater from the site is directed, an increase in peak flow of 22.4 cubic feet per second (cfs) is anticipated, compared to the existing condition (for Option 1). This value does not change between Option 1 and Option 2. Due to this increase in peak flow, this low-lying area in the northeast corner of the site is anticipated to overtop the surrounding roadway, spilling approximately 96.0 cfs of flow into the surrounding areas. On the south end of the site, the proposed land use changes will lead to an increase in peak flows through the culvert under West Ocean Avenue of approximately 5.6 cfs.

See [Appendix F](#) for full results of the proposed conditions HydroCAD models.

3.2.3 HY-8 Culvert Analysis

To determine whether the culvert under West Ocean Avenue has sufficient capacity to pass the anticipated increase in peak flows due to land use changes, an HY-8 model was developed. This model, developed by the Federal Highway Administration, is a simple way to verify a culvert's capacity and determine any impacts to the roadway. Flows from catchment 8S were taken from the proposed conditions model (the same flows are anticipated between Options 1 and 2) and entered into HY8. Culvert information was entered based on LiDAR data. The HY-8 model indicates that the culvert has sufficient capacity to pass the increased peak flow associated with the proposed site. No changes to the existing culvert are required. This HY-8 analysis assumes that the existing culvert is, in fact, a 36-inch-diameter culvert flowing freely with no obstructions. This assumption should be verified prior to any land used changes occurring. See [Appendix G](#) for the HY-8 report.

3.3 Climate Change

A recent tool developed by the University of Washington's Climate Impacts Group allows the user to visualize the projected changes in heavy rainfall events across the Pacific Northwest due to climate change. The tool provides extreme precipitation projections as a function of location, decade, duration, and return interval. Each model presented assumes the greenhouse gas scenario of 8.5, the worst-case, and most conservative, scenario. Each model, however, varies in how the percent change in precipitation is calculated.

Chart 3-1 shows the predicted percent change in precipitation for the 100-year, 24-hour event as a function of decade. This figure presents the results from various individual models as well as an average across the individual models. For each decade presented, the model average indicates that precipitation intensity will increase.

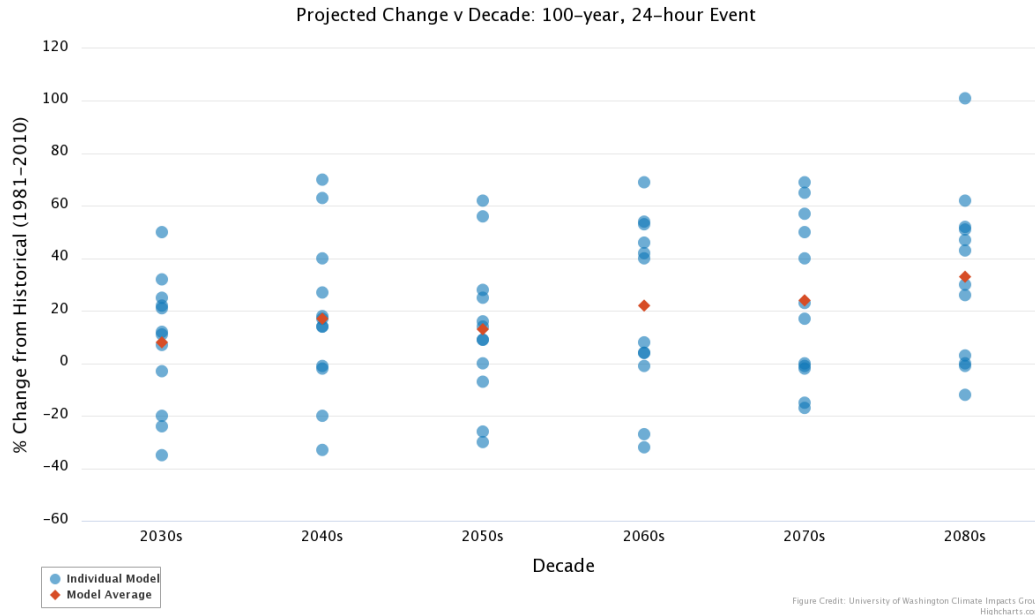


Chart 3-1. Projected change in extreme precipitation (Morgan et al. 2021)

If the model average values for the predicted percent change in the 100-year, 24-hour event are taken for the 2040s and 2080s, we can see a predicted increase in this storm event. For the 2040s, precipitation is anticipated to increase by 17 percent. For the 2080s, precipitation is anticipated to increase by 33 percent. This equates to a rainfall depth of 6.43 inches for the 100-year, 24-hour design storm for the 2040s and 7.32 inches for the 100-year, 24-hour design storm for the 2080s.

If these two new rainfall scenarios are entered into the HydroCAD model, the effects both climate change and the proposed land use will have on the existing site can be estimated. As shown in [Table 3-5](#), the effects of climate change will exacerbate peak flows when coupled with proposed land use changes in the long term. The 100-year peak flow estimated for the year 2080 was also run through the HY-8 model. The results of the model indicate that this culvert is able to pass the increased flow due to climate change, with all assumptions about the culvert slope, size, and maintenance holding true.

Table 3-5. Estimated Peak Flows (100-year, 24-hour Design Storm) for Pond 10P with Current Rainfall Estimates and Predictions Based on Climate Change

Scenario	Current Rainfall (cfs)	2040 Decade (cfs)	2080 Decade (cfs)
Existing Conditions	86.4	109	133
Proposed Conditions*	108.8	135.4	161.3
Δ	22.4	26.4	28.3

Notes: *Values presented for the proposed conditions remain the same between Option 1 and Option 2.

Key: cfs = cubic feet per second.

3.4 Discussion

The proposed land use changes will affect how surface water moves through the existing site. Removing native brush and forests and replacing with grass and miscellaneous impervious surfaces, along with removing natural detention areas, will increase peak flows throughout the site and lead to flooding issues. These issues can be mitigated, through installing stormwater detention facilities such as underground detention vaults or prefabricated chambers, detention ponds, or constructed wetlands. These facilities,

along with stormwater facilities intended to treat for water quality, should be installed on the proposed project site to minimize the environmental impacts to adjacent wetlands and other nearby, fragile areas.

The culvert on the south side of the site is also anticipated to have capacity to handle increased peak flows associated with the land use changes and climate change.

4 Water Budget

4.1 Approach and Methodology

A water budget was developed to understand the changes of the hydrological regime of the wetlands over the course of the year and evaluate how they may be impacted by proposed scenarios. The water budget ultimately calculates the change in water level depth in the wetlands as a function of inflows (precipitation and surface water runoff) and outflows (evapotranspiration, groundwater exfiltration, and surface water outflow). Essentially, a water balance is a mass balance to estimate how water comes into and leaves the system and is estimated for each month of the year.

The water budget equation is as follows:

$$\Delta S = P + RO - ET - GWO - SWO$$

Where,

ΔS = change in water level depth
 P = Precipitation
 RO = Surface water runoff
 ET = Evapotranspiration
 GWO = Groundwater exfiltration
 SWO = Surface water outflow

These variables are discussed in further detailed in the subsequent sections.

4.1.1 Precipitation

Precipitation is determined based on historical data from the nearest weather station. The nearest weather station was determined to be the Ocean Shores Station, and data were collected from the National Oceanic and Atmospheric Administration (NOAA) website. See [Table 4-1](#) for station information. Ocean Shores is located on the peninsula just north of Westport and is a good representation of the rainfall for Westport ([Figure 4-1](#)). Based on the best available science, an analysis was completed for the wettest year in the last decade (2012).

Table 4-1. Precipitation Station ID and Location

Name	ID	Lat/Long
OCEAN SHORES 0.9 SSE, WA US	GHCND:US1WAGH0033	46.95828, -124.14772

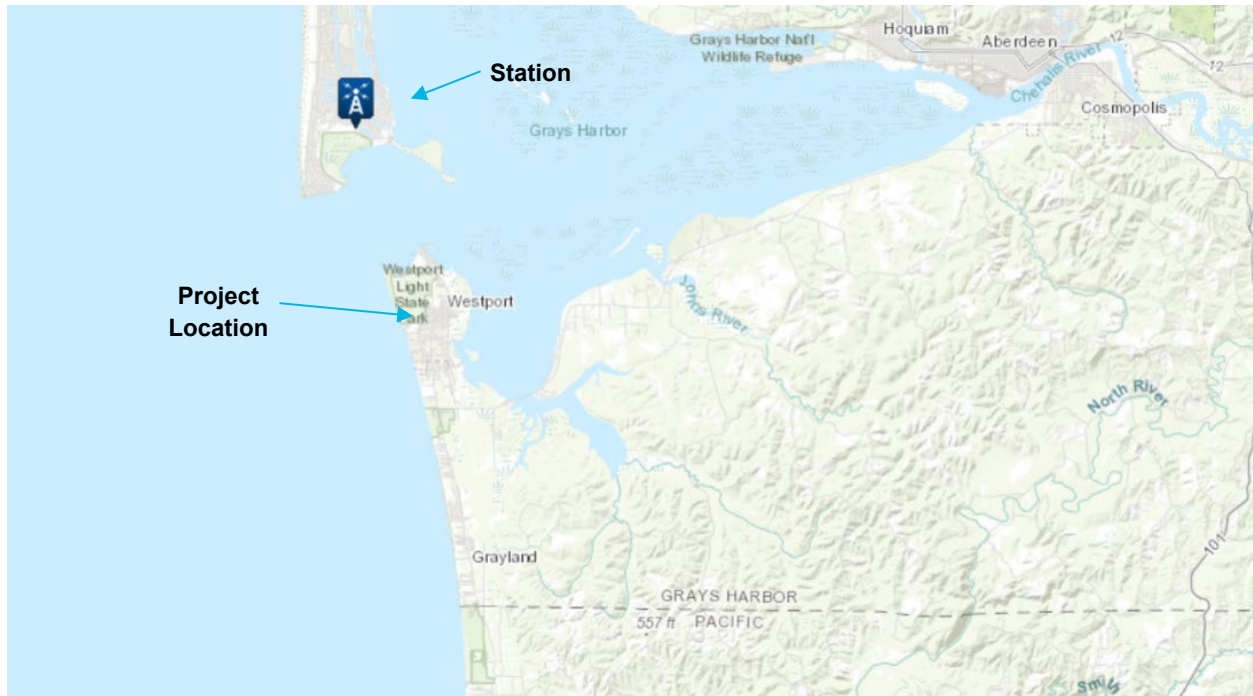


Figure 4-1. Precipitation station and project location

4.1.2 Surface Water Runoff

Surface water runoff is a function of rainfall, water retention based on surface depressions, and infiltration. This was calculated by finding the inches of runoff over the watershed for each daily rainfall event. The daily runoff (in inches) was multiplied by the net contributing watershed area to get the total volume of runoff. To calculate the daily depth of runoff, the total volume of runoff was divided by the area of the wetland. This process was repeated for each daily storm event, then summed for each month.

To calculate the inches of runoff over the watershed, daily precipitation data were used along with a CN. The CN was found from the existing conditions HydroCAD model (see Section 3.1). The weighted CN for the entire site was found to be 76.

4.1.3 Evapotranspiration

Evapotranspiration was calculated using the Thornthwaite ET Method. The Thornthwaite ET Method is an empirical formula using the mean monthly temperatures. There is a lack of historical temperature data for Westport, Washington, and the closest available station with such data is located in Black Knob, Washington (Figure 4-2). Information from this gage was taken and plugged into the Thornthwaite equation to estimate this value.

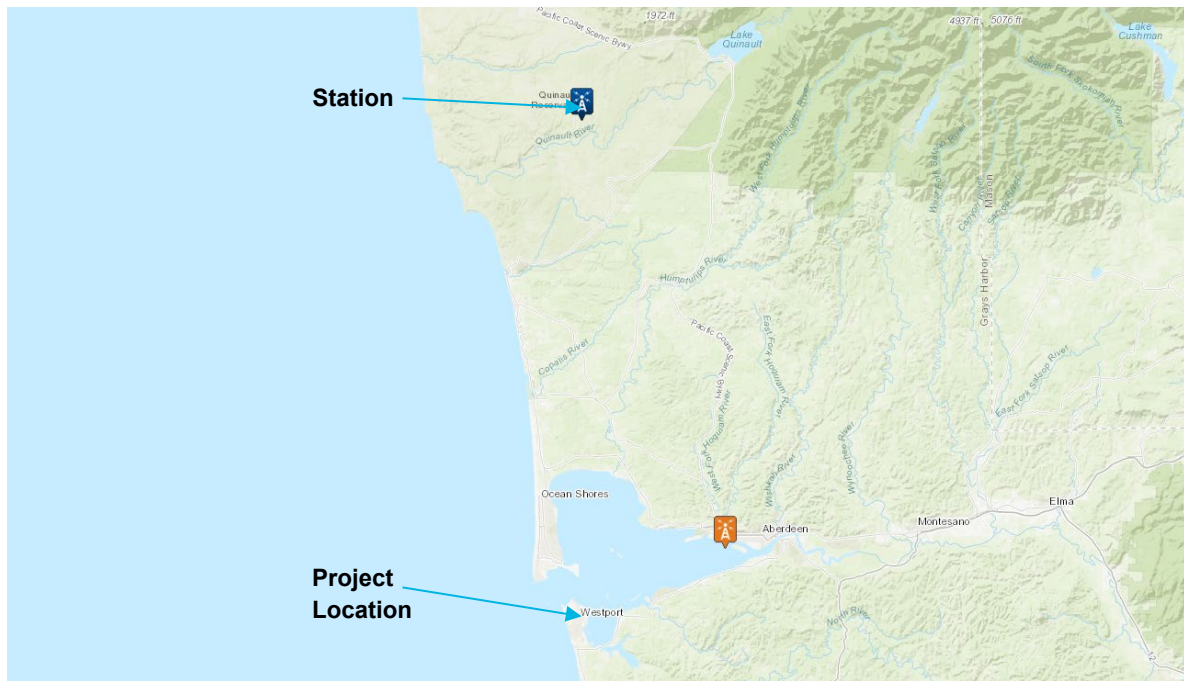


Figure 4-2. Black Knob, Washington, temperature station and project location

4.1.4 Groundwater Exfiltration

Exfiltration is the groundwater outflow and is a function of the hydraulic conductivity of soils. Based on NRCS soil data, the site is made up of primarily Dune land soil type and Yaquina loamy fine sand soil type (NRCS 2021a). The Yaquina loamy fine sand has an HSG of A/D and an estimated hydraulic conductivity rate between 1.98 in/hr and 5.95 in/hr. The HSG for the Dune land soil type was not identified by the NRCS; for the purposes of this study, this soil type was given an HSG of D. Similarly, the hydraulic conductivity rate for Dune land is unknown; therefore, other sources were used to determine this soil's conductivity. One useful paper presented in the *American Journal of Environmental Sciences* produced a saturated hydraulic conductivity of 0.02 centimeters per second (28.34 in/hr) for dune sand soil (Inoue et al. 2008). Therefore, this value was used for this soil type.

Next, a weighted composite hydraulic conductivity rate was calculated to be 24.35 inches/hour, based on the percentage of each soil type within the project area. This hydraulic conductivity rate was taken to be the maximum infiltration rate and applied to the driest month for the region (August). As previously described, infiltration is assumed to be 0 during the winter months, due to the observed presence of ponding throughout the project site. Therefore, the maximum infiltration rate (24.35 inches/hour) was applied to August, and the minimum hydraulic conductivity (0 inches/hour) was applied to the winter months (October through March). Hydraulic conductivity rates for the remainder of the year were taken as averages of these values.

4.1.5 Outflow

Outflow for the wetland budget was input as 0. There is one culvert in the project vicinity, under West Ocean Avenue. As previously described, only a small portion of the project site ultimately discharges offsite via this culvert. The area which drains to the culvert also does not have any identified wetlands. There are no additional outlets to adjacent properties via culverts, ditches, etc. from the remainder of the project site, where wetlands are present.

4.2 Results and Conclusions

As anticipated, the results of the wetland budget conclude that the wetland is anticipated to be dry (indicated by the water surface being below the bottom of the wetland) during the summer months (May through September). During the winter, or wetter months, the wetland is anticipated to store water, with the peak storage being close to 2 feet during the month of March. **Chart 4-1** shows the results of the wetland budget. It should be noted that these results are for the wettest season on record in the past 10 years.

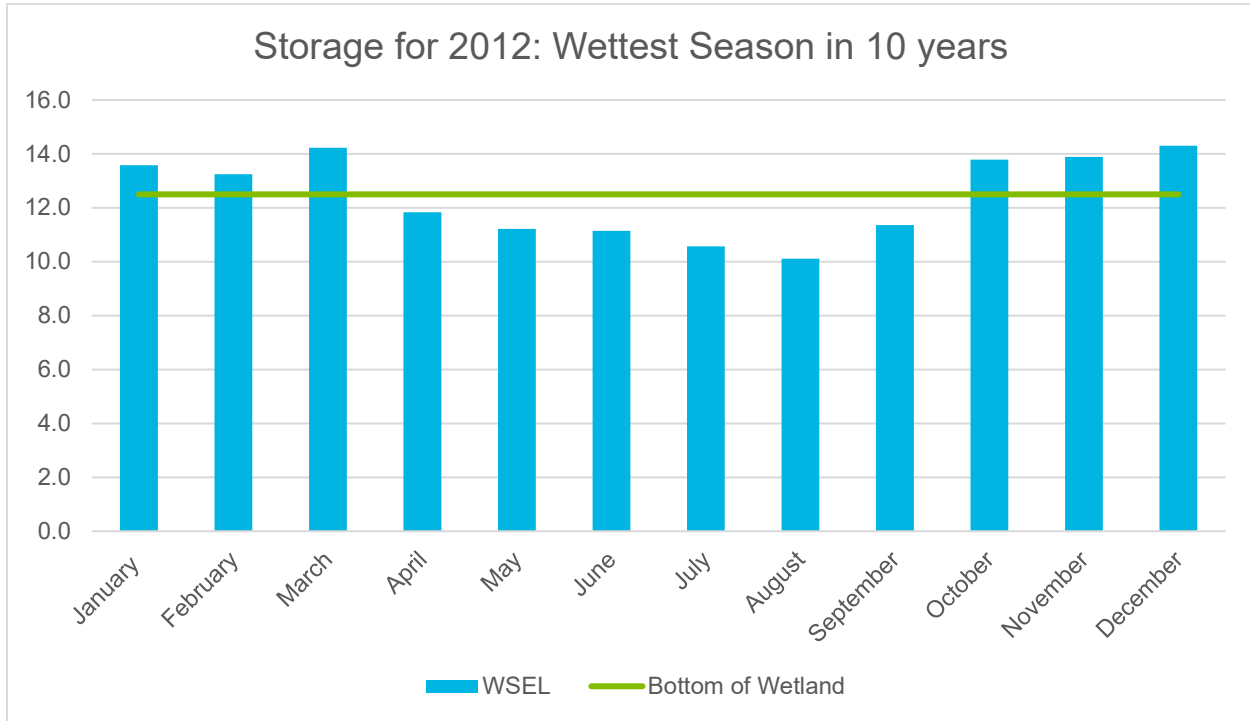


Chart 4-1. Wetland budget results

5 Groundwater Assessment

5.1 Introduction

AECOM also performed a groundwater assessment as part of the hydrologic study for the Park. The groundwater study area includes the northern portion of Westport Peninsula south to approximately Cohasset Beach (**Figure 5-1**). The purpose of the assessment was to characterize current groundwater conditions within the Park and surrounding area, particularly in relation to wetlands, and then use predictive tools to estimate the impacts of golf course development on groundwater levels, groundwater contributions to wetlands, water quality, and saltwater intrusion potential. The scope of the assessment included review of existing data and studies, development of a hydrogeological conceptual site model, development of a numerical groundwater model, model calibration to historical data, predictive simulations for golf course development, and a sensitivity/uncertainty analysis.

Hydrologic data for the groundwater assessment were provided by the City of Westport or collected from publicly available sources such as NOAA and the USGS. Data used for the study included pressure transducer data for groundwater levels on the peninsula, boring logs, site topography (LiDAR), aquifer testing results, water well locations and pumping rates, precipitation, groundwater quality data, and tidal data. Additionally, plans and details for the proposed golf course development were outlined in meetings and email correspondence with Westport Golf Links.

The hydrogeological conceptual model development included evaluation of hydro-stratigraphic units, groundwater levels, the freshwater-saltwater interface, aquifer hydraulic properties, tidal influences, recharge from precipitation, groundwater recharge and discharge areas, vegetation types within the Park, and identification of water users.

The numerical model developed for this study was based on previous modeling work performed by Robinson & Noble, Inc. (1994). The Robinson & Noble, Inc., model was updated and recalibrated to newly available data with emphasis on simulation of the wetland interactions with groundwater. After calibration, golf course development plans were incorporated to construct a predictive model. Results from current conditions and golf course development simulations were then compared to assess potential groundwater impacts. A sensitivity and uncertainty analysis was also performed to bound the uncertainty in model predictions.



Figure 5-1. Groundwater assessment study area map

5.2 Hydrogeological Conceptual Model

5.2.1 Climate

The climate in Westport is generally mild and temperate with an annual average temperature of 50.8°F (Climate-Data.org 2021). August is the warmest month of the year, with a temperature of 61.3°F, and December is the coolest, with an average temperature of 42.2°F. Precipitation data used in this study were downloaded from NOAA (2021) and spanned the period from November 2011 through October 2021. On average, approximately 79 inches of precipitation fall per year. The highest precipitation months include November through January, with each of these months averaging more than 10 inches of rainfall, while July and August average less than 1.5 inches. Monthly precipitation data averaged over the 10-year period from November 2011 through October 2021 are shown on [Chart 5-1](#).

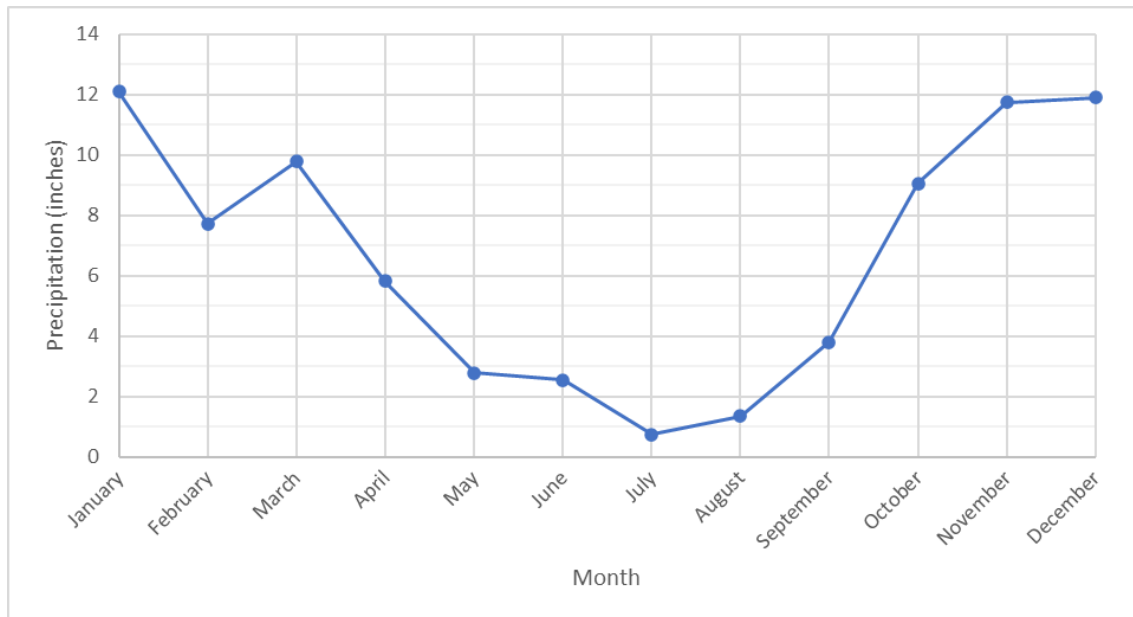


Chart 5-1. Average monthly precipitation from November 2011 through October 2021 (NOAA 2021)

5.2.2 Geology

Geologic information used in this study was sourced from the Westport Hydrogeologic Characterization Study (Robinson & Noble, Inc. 1994), as well as the Geologic Map of the Chehalis River and Westport Quadrangles, Washington (Logan 1987), shown on [Figure 5-2](#). Several subsequent studies have been performed for the city of Westport, typically relating to water supply well evaluations, including Roberts Ranch Hydrogeologic Characterization (Robinson & Noble, Inc. 1998a), Construction and Testing of the North Wellfield Deep Test Well (Robinson & Noble, Inc. 2009), Southern Exploration Test Wells (Robinson & Noble, Inc. 1998b), Eastside/Ocosta Hydrogeologic Investigation (Robinson & Noble, Inc. 1998c), and North Wellfield Assessment (Robinson & Noble, Inc. 2014). No new boreholes or wells were drilled or installed for the purpose of AECOM's study.

The peninsula is composed of three principal geologic units, as described by Robinson & Noble, Inc.:

Beach Deposits (Map Symbol, Qb) – These are the surface sands, including active tidal beaches, nearshore dunes, and inland stable dunes. At depth, and especially to the north, the Beach Deposits include coarser sand and gravel that was transported by longshore currents. Some of the Beach Deposits at depth are "muddy" and appear to have been deposited in a slack water environment equivalent to today's Grays Harbor. The major shallow aquifers occur in the Beach Deposits unit.

Alluvium (Map Symbol, Qa) – These deposits are limited to the area east of Twin Harbors State Park at the south end of South Bay. They represent a slack water fill of the back bay and are the modern equivalent of the "mud" intervals in the Beach Deposit unit.

Satsop Formation (Map Symbol, Qs) – The Satsop Formation is an early Pleistocene (Ice Age) semi-consolidated sequence of clay with beds of sand and gravel. The Washington State Geologic Map designates this unit as "Quaternary Terrace" (Logan 1987). The term "Satsop" should be considered as an informal and general designation for all Quaternary age deposits in the Westport area that are not otherwise designated as Beach or Alluvium. Newcomb (1947) described the Satsop as being a Pleistocene-age alluvial deposit, consisting mainly of compact, weathered clays and decomposed sandstone and conglomerates. These coarse deposits occur locally in lenses and often have a reddish, oxidized color.

The Satsop Formation occurs as a bench east and south of the Westport peninsula and is exposed in bluffs east of Grayland. The western margin of the bench is wave-cut (Wegner 1956). The Satsop is also identified in well logs from the Ocosta-Bay City area, on the east side of South Bay. The upper surface of the Satsop dips to the north and is found at a depth of approximately 125 feet at the Westport South Well Field and probably deeper at the North Field where it was not encountered during drilling (Robinson & Noble, Inc. 1994).

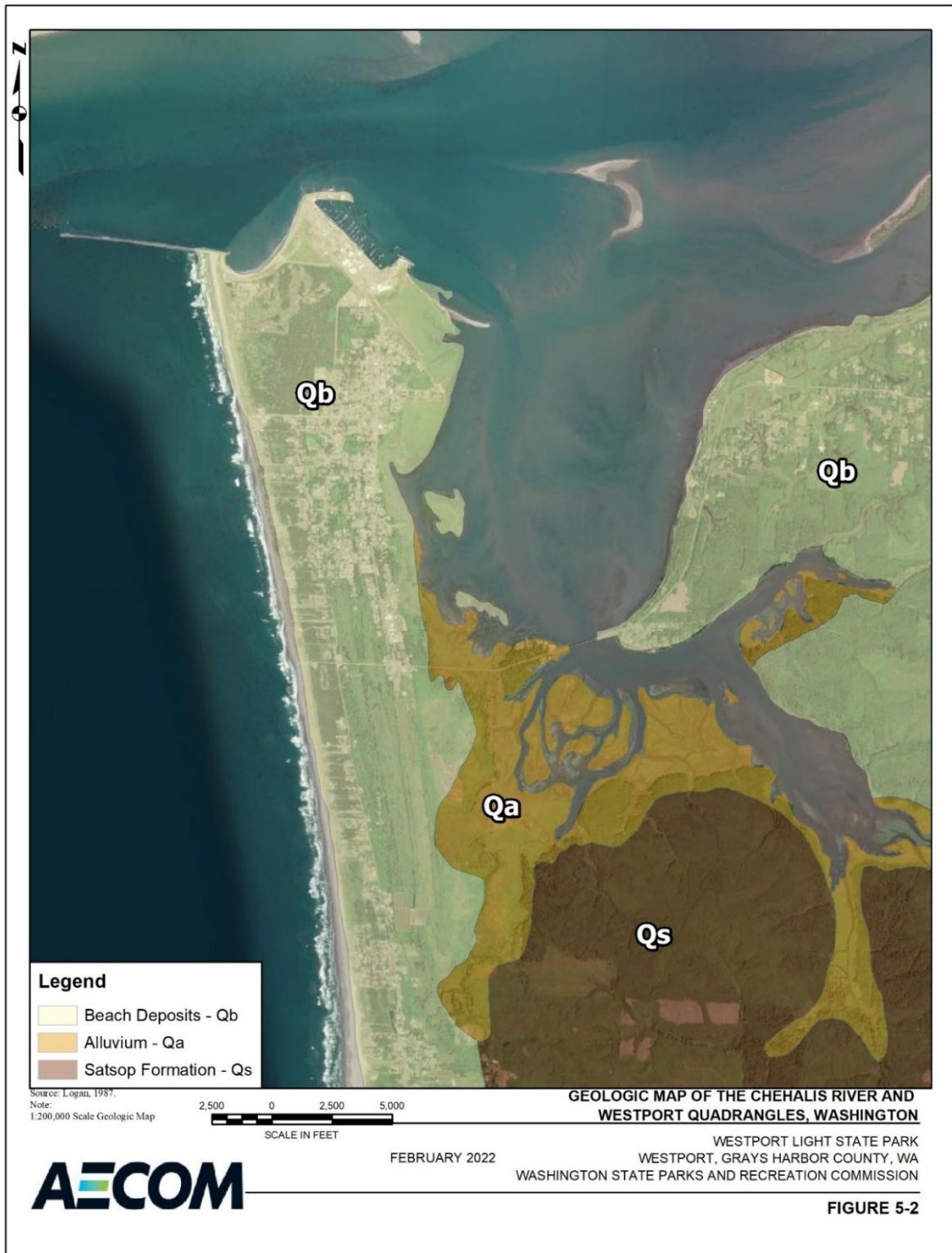


Figure 5-2. Geologic map of the Chehalis River and Westport quadrangles, Washington (Logan 1987)

5.2.3 Hydrogeology

The Beach Deposits represent the primary aquifer beneath the Park. Near ground surface, these deposits consist of fine-grained sand to silty sand that readily infiltrates precipitation. The finer sand material grades to coarser-grained sand and gravel with depth, forming a highly permeable water-bearing zone that extends from approximately 40 to 90 feet below ground surface. Beneath the coarse sand and gravel interval exists another layer of fine-grained to silty sand that extends to the Satsop Formation, approximately 125 feet below ground surface. Although most water supply wells on the peninsula are installed in the coarse sands and gravels, the upper and lower fine-grained sand layers and intermediate coarse-grained sediments are hydraulically connected and represent a continuous, unconfined aquifer.

The Satsop Formation occurs below the Beach Deposits aquifer and consists of fine-grained consolidated material. It was considered a no-flow boundary for the purpose of this study. A conceptual geologic cross-section of the peninsula is shown on [Figure 5-3](#).

The principal source of groundwater on the peninsula is recharge from precipitation, which after reaching the water table, eventually discharges to Grays Harbor or the Pacific Ocean. Besides discharge, other sinks for groundwater include evapotranspiration and water supply well pumping.

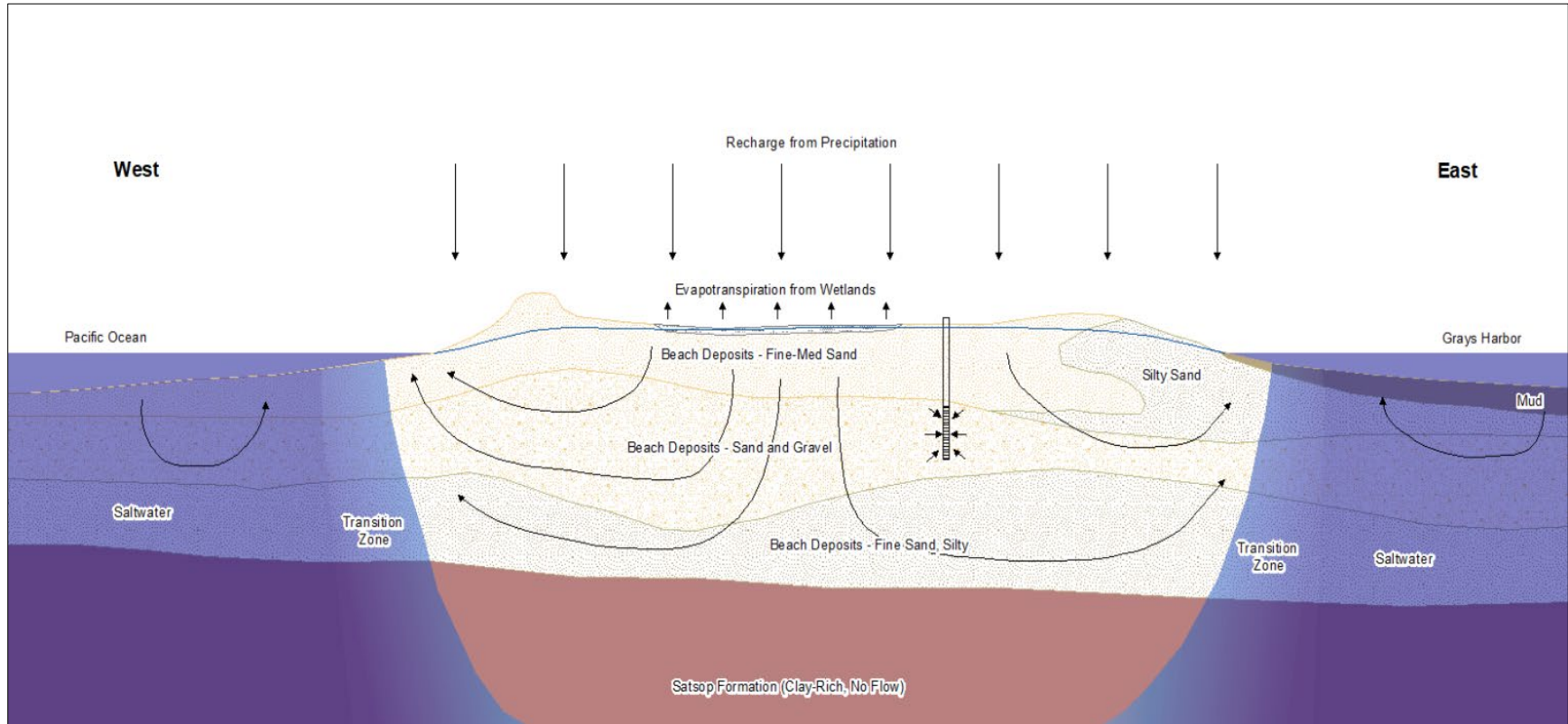


Figure 5-3. Conceptual geologic cross-section of Westport Peninsula (modified from Robinson & Noble, Inc. 1994)

Hydraulic Properties

Aquifer testing has been performed during several studies in the deeper coarse sands and gravels of the Beach Deposit aquifer on the peninsula; however, several of the investigations have taken place to the south of the study area. The nearest aquifer tests were performed at the North Well Field, located east of the Park, as shown on [Figure 5-1](#). [Table 5-1](#) summarizes reported values for hydraulic conductivity and the aquifer storage coefficient from various studies. The table shows that the aquifer conductivity is relatively high (approximately 300 to 4,500 feet per day), particularly around the North and South Well fields, both of which are in the groundwater study area ([Figure 5-1](#)). These well fields are installed in the coarse sand and gravel layer of the Beach Deposit aquifer. The hydraulic conductivity of the overlying fine sand and silty sand deposits is likely lower than the coarse sand and gravels targeted by the two municipal well fields.

Table 5-1. Summary of Hydraulic Parameters from Aquifer Testing

Location	Transmissivity (gpd/ft)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/d)	Storage Coefficient (Unitless)	Source	Comments
North Field	135,000 to 2,000,000	60	301 to 4,456	0.001	Robinson & Noble, Inc. 1994	In Study Area
South Well Field	40,000 to 200,000	15	356 to 1,782	-	Robinson & Noble, Inc. 1994	In Study Area
Roberts farm well	88,000	20	588	-	Robinson & Noble, Inc. 1998a	Outside Study Area
Well C-2 (Roberts Farm)	1,400	13	14	-	Robinson & Noble, Inc. 1998a	Outside Study Area
Well C-1 (Roberts Farm)	48,180	80	80	0.0001 to 0.00002	Robinson & Noble, Inc. 1998a	Outside Study Area
Roberts Farm Aquifer	95,000	81	157	0.0007	Robinson & Noble, Inc. 1998a	Outside Study Area
Y Well (south Well Field)	60,000 to 75,000	36	278	-	Robinson & Noble, Inc. 1998a	Outside Study Area

Note: All wells are screened in the coarse sand and gravel layer of Beach Deposits.

Key: ft = feet; ft/d = feet per day; gpd/ft = gallons per day per foot.

Groundwater Levels

Groundwater level measurements were provided to AECOM by the City of Westport. The water level dataset includes five monitoring wells on the peninsula, with pressure transducer readings every 30 minutes from April 2015 through April 2021. Each of the five monitoring wells is screened within the coarse sand and gravel layer of the Beach Deposits aquifer. As shown on the well hydrographs ([Chart 5-2](#)), water levels fluctuate over the course of each day in response to tidal changes and precipitation events, as well as seasonally in response to changing precipitation patterns. The water levels generally peak around the end of February then decline through September. The largest seasonal fluctuations of approximately 8 feet were observed at the Lighthouse monitoring well, while the Harms and Jetty monitoring wells fluctuated approximately 4 feet.

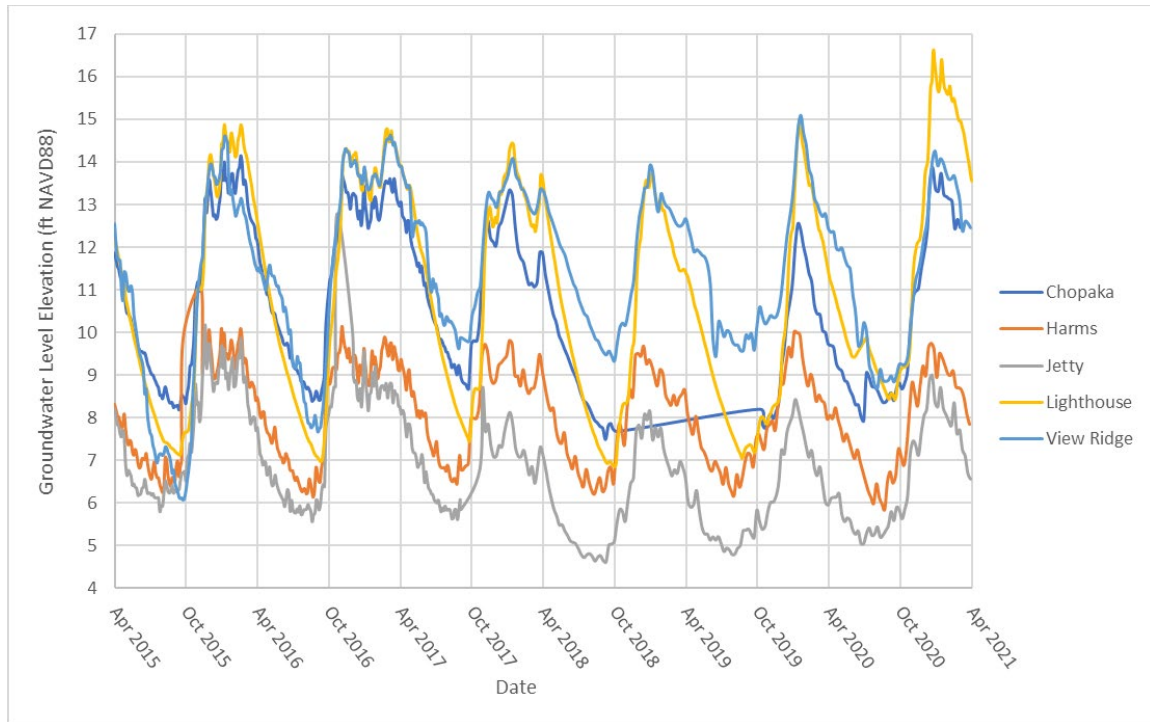


Chart 5-2. Monitoring well hydrographs

Field data collected by AECOM, presented in the *Final Wetland Assessment Report* (AECOM 2021b), was also used to estimate groundwater levels within the Park footprint. During the wetland field study, groundwater was encountered at or near ground surface in small test pits at a total of 23 sample locations. Sample dates ranged from March 30, 2021, to April 27, 2021. The depth to water measured at each location was subtracted from the ground surface elevation obtained from LiDAR data (DNR 2021) to calculate the groundwater elevation.

A potentiometric map combining the wetland sample point groundwater elevations and average water levels from the five monitoring wells over the same period (March 30, 2021 to April 27, 2021) is presented on [Figure 5-4](#). Because the monitoring wells are located in a lower aquifer interval compared to the wetland points, 2 feet were added to the groundwater elevations from each well. The addition of 2 feet was intended to compensate for the downward hydraulic gradient caused by aerial recharge on the peninsula and make the map generally representative of regional water table conditions, hydraulic gradients, and groundwater flow directions.



Figure 5-4. Potentiometric surface map – April 2021

Groundwater Recharge

At the Park, the primary mechanism responsible for recharge to the water table is infiltration from precipitation events. Groundwater levels rise and fall in response to recent precipitation, both seasonally and in the short term after individual events. To quantify the percentage of precipitation that reaches the water table, the Water Table Fluctuation method was used (USGS 2017). The Water Table Fluctuation method examines the water level rise in a piezometer in response to a precipitation event (Chart 5-3). The change in water level in the piezometer is multiplied by the specific yield of the aquifer to calculate the amount of rainfall that reached the water table.

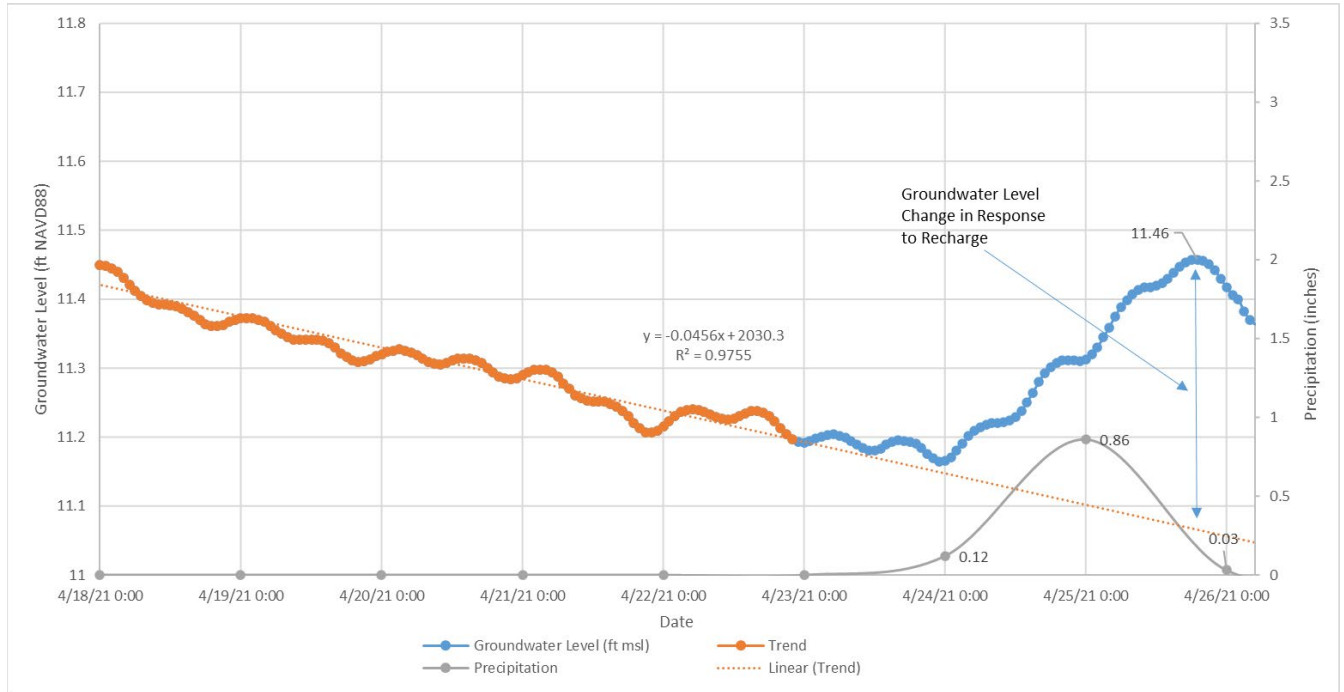


Chart 5-3. Example of Water Table Fluctuation method from Chopaka monitoring well

For the recharge analysis, AECOM compared pressure transducer data from January 2020 through April 2021 to precipitation data from the Ocean Shores Weather Station (ID: US1WAGH0033) (NOAA 2021). A total of 34 rainfall events were analyzed during this period, with the effects of at least two storms per quarter analyzed at each monitoring well, except for View Ridge. No response to rainfall was observed at the View Ridge well. Additionally, water level changes in wells during the month of July did not appear to be related to precipitation, indicating that little if any recharge occurs that month. A summary of the estimated recharge rates is presented in Table 5-2. On average, AECOM’s analysis suggests that the proportion of rainfall recharging the aquifer is 65 percent from November to January, 57 percent from February to May, 23 percent from June to August, and 38 percent from September to October. Months were grouped together in calculating these averages to combine periods of similar precipitation. The results are reasonably consistent with, though slightly lower than, previous recharge estimates from Robinson & Noble, Inc. (1994), which suggested that approximately 72 percent of precipitation reaches the water table as recharge.

Table 5-2. Summary of Water Table Fluctuation Method Analysis Results

Well ID	Peak Date	Projected Baseline Water Level (ft msl)	Peak Water Level (ft msl)	Increase (inches)	Precipitation (inches)	Recharge (inches)	Recharge Percentage of Rainfall
Lighthouse	1/26/2020	12.61	13.62	12.07	3.09	1.81	58.58%
Jetty	2/23/2020	7.43	7.69	3.15	0.58	0.47	81.40%
Harms	2/23/2020	8.98	9.15	2.11	0.58	0.32	54.51%
Harms	3/24/2020	8.19	8.41	2.66	0.58	0.40	68.78%
Harms	4/23/2020	7.86	7.99	1.50	0.43	0.23	52.45%
Harms	5/17/2020	7.70	7.99	3.51	0.71	0.53	74.14%
Jetty	5/17/2020	6.08	6.36	3.36	0.66	0.50	76.36%
Lighthouse	5/18/2020	10.41	10.59	2.06	0.62	0.31	49.74%
Lighthouse	6/9/2020	9.63	9.80	1.99	1.48	0.30	20.17%
Jetty	6/10/2020	5.45	5.93	5.77	1.8	0.87	48.07%
Chopaka	7/12/2020	No Recharge Response Observed					0.00%
Harms	7/1/2020	No Recharge Response Observed					0.00%
Jetty	7/1/2020	No Recharge Response Observed					0.00%
Lighthouse	7/1/2020	No Recharge Response Observed					0.00%
Chopaka	8/21/2020	8.66	8.85	2.32	0.82	0.35	42.52%
Harms	8/21/2020	6.48	6.65	2.05	0.55	0.31	55.91%
Lighthouse	8/21/2020	9.09	9.18	1.03	0.39	0.15	39.55%
Chopaka	9/25/2020	8.34	8.72	4.58	2.48	0.69	27.72%
Jetty	9/25/2020	5.47	6.11	7.76	2.48	1.16	46.93%
Lighthouse	9/29/2020	8.26	8.63	4.38	3.22	0.66	20.42%
Chopaka	10/13/202	8.10	8.88	9.33	3.21	1.40	43.59%
Lighthouse	10/22/202	8.13	9.14	12.22	3.69	1.83	49.68%
Harms	11/5/2020	6.77	7.47	8.34	1.57	1.25	79.71%
Jetty	11/6/2020	5.70	6.38	8.08	1.57	1.21	77.23%
Chopaka	11/30/2020	10.90	11.12	2.64	0.82	0.40	48.23%
Lighthouse	12/5/2020	9.48	12.12	31.74	8.79	4.76	54.16%
Jetty	12/9/2020	6.85	7.41	6.82	1.33	1.02	76.92%
Harms	12/9/2020	8.01	8.57	6.79	1.35	1.02	75.40%
Jetty	1/12/2021	7.93	9.70	21.30	4.63	3.19	69.00%
Lighthouse	1/13/2021	15.79	16.72	11.17	3.08	1.68	54.40%
Chopaka	2/3/2021	13.17	13.99	9.87	4.38	1.48	33.80%
Chopaka	2/22/2021	12.94	13.37	5.20	2.39	0.78	32.65%
Chopaka	4/10/2021	11.71	11.78	0.81	0.44	0.12	27.78%
Chopaka	4/25/2021	11.07	11.46	4.67	0.98	0.70	71.46%

Key: ft msl = feet mean sea level; ID = identifier.

5.2.4 Water Supply Wells

In the groundwater study area, two municipal well fields extract water from the Beach Deposits aquifer for public supply (Figure 5-1). The North Well Field includes three wells located less than 1,000 feet east of the Park, and the South Well Field includes four wells approximately 1.25 miles south of the Park. Both well fields are operated by the City of Westport. A summary of the average monthly water use from the North and South Well Fields between 2009 and 2015 is presented in Table 5-3.

Table 5-3. Average Monthly Water Use from North and South Well Fields from 2009 through 2015

Month	Volume of Water Used (Million Gallons)	
	North Well Field	South Well Field
January	7.08	0.00
February	3.39	0.00
March	1.24	0.00
April	8.38	0.65
May	16.69	1.71
June	23.61	1.97
July	30.72	2.94
August	27.03	0.20
September	21.08	0.64
October	15.99	0.00
November	6.16	0.00
December	7.61	0.00
Total (million gallons)	168.98	8.10
Number of Wells	3	4
Flow Rate (gpm) per Well	107.09	3.85

Key: gpm = gallons per minute.

5.2.5 Tidal Influences

Water levels in the Park vicinity are influenced by tidal changes over the course of each tidal cycle. To compare tides and groundwater levels in the Beach Deposits aquifer, 15-minute tidal data were plotted against water levels from the five monitoring wells with pressure transducers. The data were plotted for a period of 1 week from February 1, 2021 through February 7, 2021, shown on Chart 5-4.

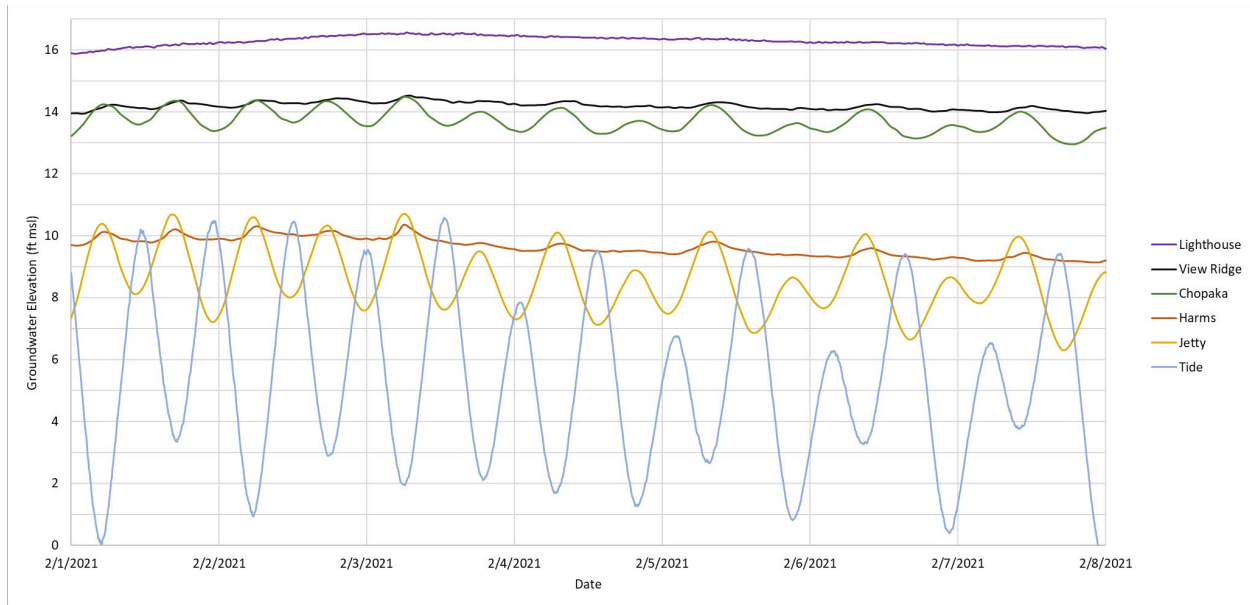


Chart 5-4. Tidal fluctuations compared to groundwater levels

As shown on the chart, stronger correlations between tides and groundwater levels are observed in monitoring wells close to the Pacific Ocean, specifically at the Jetty and Chopaka monitoring wells. Quantitative measures of tidal influence on groundwater include tidal efficiency, referring to the percentage of groundwater fluctuation amplitude compared to the tidal amplitude, and time lag function, which refers to the time difference between a peak tide elevation and a peak groundwater elevation (Oberle, Swarzenski and Storlazzi 2017, Fetter 2001). Three tidal fluctuation cycles were analyzed for each well, except the Lighthouse well, which showed no tidal response, to develop tidal efficiency and time lag function correlations, presented in [Chart 5-5](#) and [Chart 5-6](#), respectively. Typically, the tidal efficiency decreases exponentially with distance from the shoreline. This relationship was observed for wells on the peninsula ([Chart 5-5](#)), with wells near the shoreline showing a higher efficiency percentage. The time lag typically increases linearly with distance. While [Chart 5-6](#) shows a reasonable linear correlation for the time lag function, some deviation may be due to the wells being screened in the deeper sand and gravel unit beneath the fine sands that are directly connected to the ocean at the shoreline.

Within the Park, it is likely that tidal efficiency ranges from 10 percent to 30 percent of the tidal amplitude range. The typical tidal fluctuations in the week of February 1 to 7, 2021, were approximately 8 feet; therefore, the corresponding groundwater fluctuations would be in the range of 0.8 to 2.4 feet. Although groundwater fluctuations in the short term respond to tidal fluctuation, over the course of a year, the dominant mechanism driving groundwater level change is recharge from precipitation. Groundwater levels at wells nearer to the shoreline fluctuate less due to precipitation on a yearly scale because of the influence of the ocean, while interior wells are more affected by recharge and exhibit larger seasonal variations.

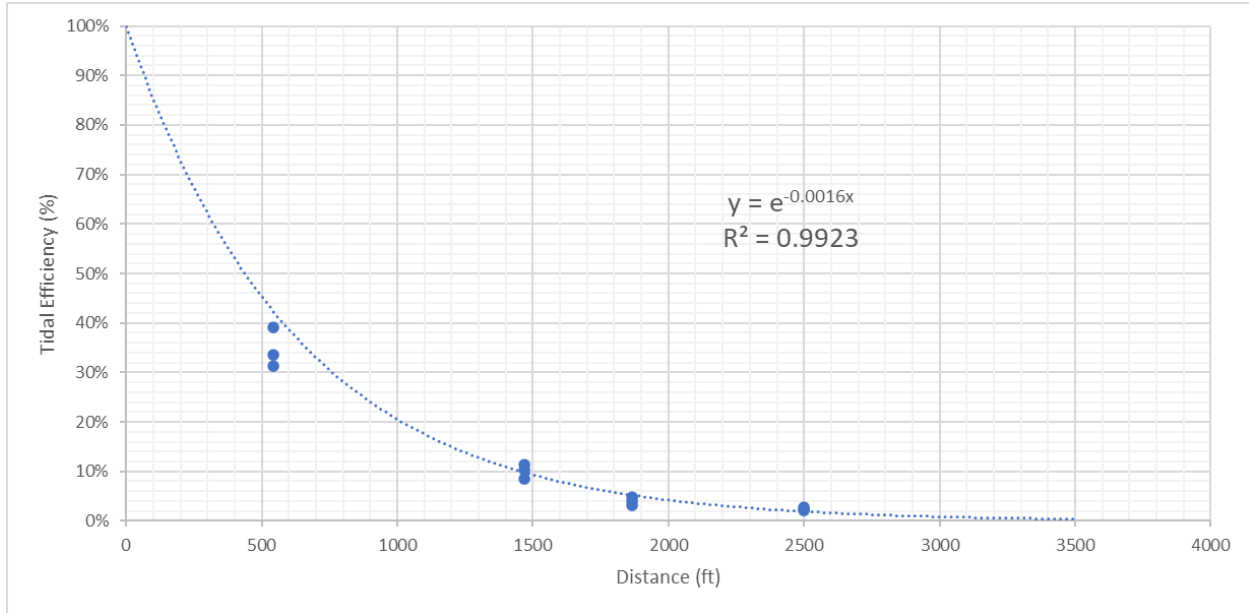


Chart 5-5. Tidal efficiency correlation for Westport monitoring wells

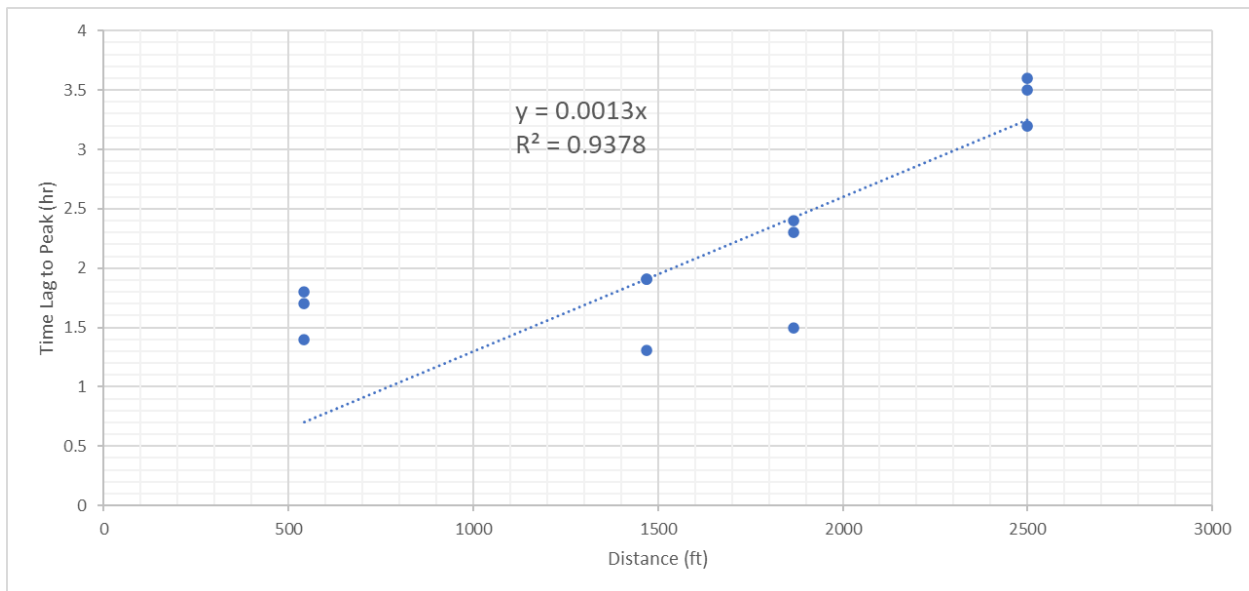


Chart 5-6. Time Lag Function for Westport monitoring wells

5.2.6 Freshwater-Saltwater Interface

Saltwater intrusion was previously assessed by Robinson & Noble, Inc. (1994) through water quality data and numerical modeling. From the standpoint of water quality, there was no evidence of saltwater intrusion on the peninsula. Electrical conductivity data indicate that the saltwater/freshwater interface beneath the peninsula is below the base of the Beach Deposits aquifer. The Ghyben-Herzberg relationship (Freeze and Cherry 1979) is often used as a simplified way to calculate the freshwater-saltwater interface location and generally states that the freshwater-saltwater interface is 40 times deeper than the maximum groundwater head above sea level, assuming vertical equilibrium. In much of the Park, water levels are approximately 8 feet above sea level, indicating that the freshwater-saltwater interface is approximately 320 feet below sea level, which is below the aquifer base. The numerical modeling by Robinson & Noble, Inc. (Robinson & Noble, Inc. 1994) compared water levels around production wells to

sea level; this comparison showed that water levels around the North Well Field could drop below sea level with increased pumping withdrawals, increasing the risk of saltwater intrusion.

The pressure transducers at the five monitoring wells on the peninsula also record electrical conductivity. **Chart 5-7** presents electrical conductivity data collected from 2015 through April 2021. Typically, freshwater has an electrical conductivity ranging from 200 to 800 microsiemens per centimeter ($\mu\text{S}/\text{cm}$), while seawater has an electrical conductivity of approximately 50,000 $\mu\text{S}/\text{cm}$ (Freeze and Cherry 1979, Oki 2005). Generally, conductivity data for the monitoring wells falls within the range of freshwater, except for several points from December 2016 at the Jetty monitoring well. The potential cause or validity of the high conductivity data points is unknown; however, no spikes or upward trends have been observed at the Jetty monitoring well since. Only the Chopaka monitoring well shows a small upward trend but is still well below the upper limit for freshwater conductivity of 800 $\mu\text{S}/\text{cm}$. These data do not indicate that saltwater intrusion is occurring and support the conclusion that the freshwater-saltwater interface is located below the aquifer base.

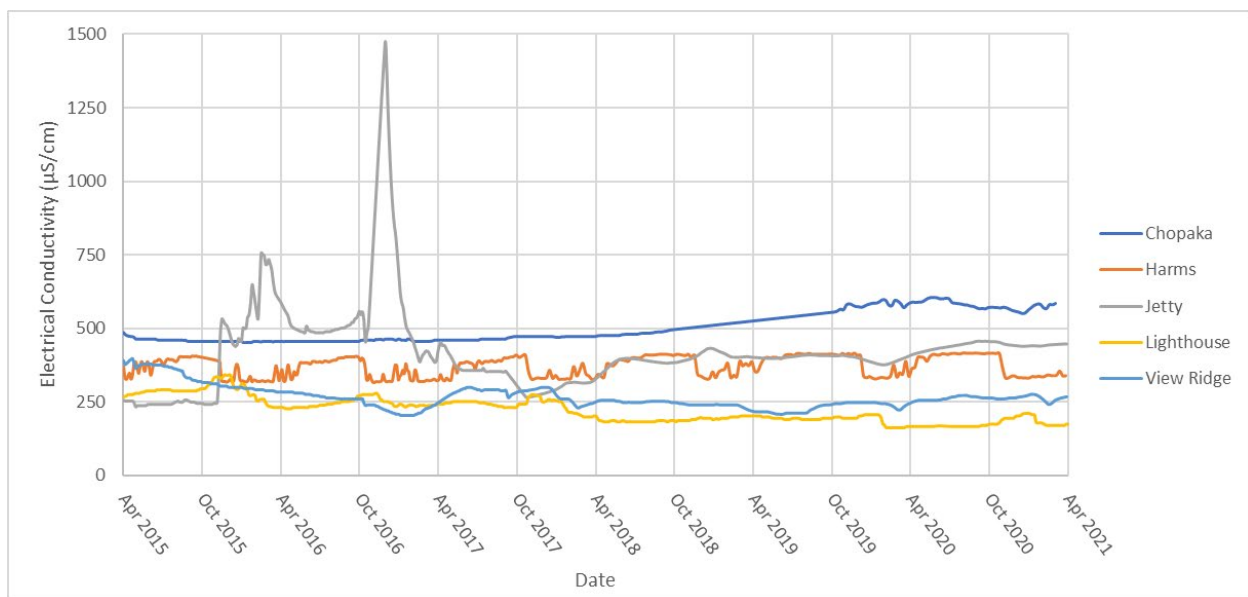


Chart 5-7. Electrical conductivity from Westport monitoring wells, 2015-2021

5.3 Numerical Groundwater Model Setup

Robinson & Noble, Inc. previously developed a numerical groundwater flow model for the Westport peninsula in MODFLOW to evaluate water supply scenarios for the City of Westport. These model files were obtained by AECOM and used as a starting point for the current modeling study. The model provided was a three-layer transient groundwater flow model, developed in the Groundwater Modeling Systems Graphical User Interface. As part of the Park study, AECOM made several refinements and updates to the model, including use of a newer model code, grid and layer refinements, updates to calibration targets, updates to water supply well pumping rates, incorporation of Park wetlands, and incorporation of a seawater concentration boundary.

The workflow for the numerical groundwater model study was as follows:

1. Numerical model setup based on the existing numerical model and the hydrogeological conceptual model discussed in the previous section;
2. Transient calibration to monitoring well water levels collected from 2015 through April 2021, and to the 23 wetland test pit locations dug in April 2021;

3. Construction of a transient model based on average seasonal conditions that was used as a baseline for predictive simulation comparisons;
4. Predictive simulations incorporating the golf course design into the average seasonal conditions model; and
5. Sensitivity analysis to bracket uncertainty.

The information presented in this report has been prepared in accordance with the following ASTM International standards:

- D5447-17 Standard Guide for Application of a Numerical Groundwater Flow Model to a Site-Specific Problem (2017)
- D5609-16 Standard Guide for Defining Boundary Conditions in Groundwater Flow Modeling (2016a)
- D5981M-18 Standard Guide for Calibrating a Groundwater Flow Model Application (2018)
- D5611-94 Standard Guide for Conducting a Sensitivity Analysis for a Groundwater Flow Model Application (2016a)
- D5718-13 Standard Guide for Documenting a Groundwater Flow Model Application (2013)

When necessary, professional judgment and assumptions consistent with industry standard practice were applied. The modeling results presented herein are based on evaluation of technical information available and partly on general experience with similar projects.

5.3.1 Model Code and Software Selection

The numerical groundwater modeling code selected for this application was MODFLOW-USG and USG-Transport. MODFLOW-USG is a code for simulating three-dimensional (3-D) groundwater flow (GWF) and connected linear networks (CLN) based on an underlying control volume finite difference formulation in which a cell can be connected to a number of adjacent cells (Panday et al. 2017). Several structured and unstructured grid types are supported by the code, including nested grids and grids based on prismatic triangles, rectangles, hexagons, and other cell shapes. Various hydrogeological stresses can be applied, including injection/extraction wells, head boundaries, specified fluxes, recharge, no-flows, and horizontal flow barriers.

AECOM also used MODFLOW USG-Transport to assist the simulation of saltwater intrusion. USG-Transport is an enhancement of the public domain MODFLOW-USG code that includes simulation of solute transport as well as the Richards equation for unsaturated flow. The code solves for transport of multiple solute species in the flow-field derived by a MODFLOW-USG simulation. Flow and transport through the GWF domain representing the porous medium and the CLN domain representing linear features such as fractures, conduits, wells, streams, or channels are fully coupled. Density coupling of flow and transport can also be simulated for saltwater intrusion evaluations.

The graphical user interface program package, Groundwater Vistas Version 8 (Rumbaugh and Rumbaugh 2020), and ArcGIS (ESRI 2020) were used under license to AECOM for pre- and post-processing of the MODFLOW-USG and USG-Transport applications.

5.3.2 Model Construction

Model Domain and Discretization

The model domain was limited to the Westport peninsula. The model cells were oriented to coincide with the general alignment of the peninsula, or 13 degrees west of north-south. The domain is approximately 4.3 miles by 2.5 miles, encompassing an active area of approximately 6.95 square miles.

The model grid was defined as a parent grid with 100-foot by 100-foot grid cells, and a nested grid encompassing the Park area with 20-foot by 20-foot grid cells. The total number of active cells in the domain is 205,236. The model setup is presented on [Figure 5-5](#). Vertically, the model was divided into six layers by splitting each of the original model layers in half. The top of layer 1 was set equal to the ground

surface elevation derived from LiDAR data (DNR 2021). The layers represent the following hydro-stratigraphic units:

- Layers 1 and 2 – fine to medium sands (approximately 40 feet thick)
- Layers 3 and 4 – coarse sand and gravel deposits (approximately 50 feet thick)
- Layers 5 and 6 – fine to silty sand (approximately 45 feet thick)

AECOM constructed the model with a transient time discretization to address seasonal fluctuations in precipitation and tides. Each year of the transient simulation was divided into four stress periods: November through January, February through May, June through August, and September through October. The selected stress period setup grouped together months with similar amounts of average precipitation. Within each stress period, adaptive time stepping was applied, which varies the length of each time step to account for the changes in hydraulic stresses. The model simulation time spans a period of approximately 6.5 years from November of 2014 through May of 2021, with a total of 26 stress periods. The stress period setup is shown in [Table 5-4](#).

Table 5-4. Numerical Model Stress Period Setup

Stress Period	Start Date	Duration (days)
1	11/1/2014	92
2	2/1/2015	120
3	6/1/2015	92
4	9/1/2015	61
5	11/1/2015	92
6	2/1/2016	121
7	6/1/2016	92
8	9/1/2016	61
9	11/1/2016	92
10	2/1/2017	120
11	6/1/2017	92
12	9/1/2017	61
13	11/1/2017	92
14	2/1/2018	120
15	6/1/2018	92
16	9/1/2018	61
17	11/1/2018	92
18	2/1/2019	120
19	6/1/2019	92
20	9/1/2019	61
21	11/1/2019	92
22	2/1/2020	121
23	6/1/2020	92
24	9/1/2020	61
25	11/1/2020	92
26	2/1/2021	120

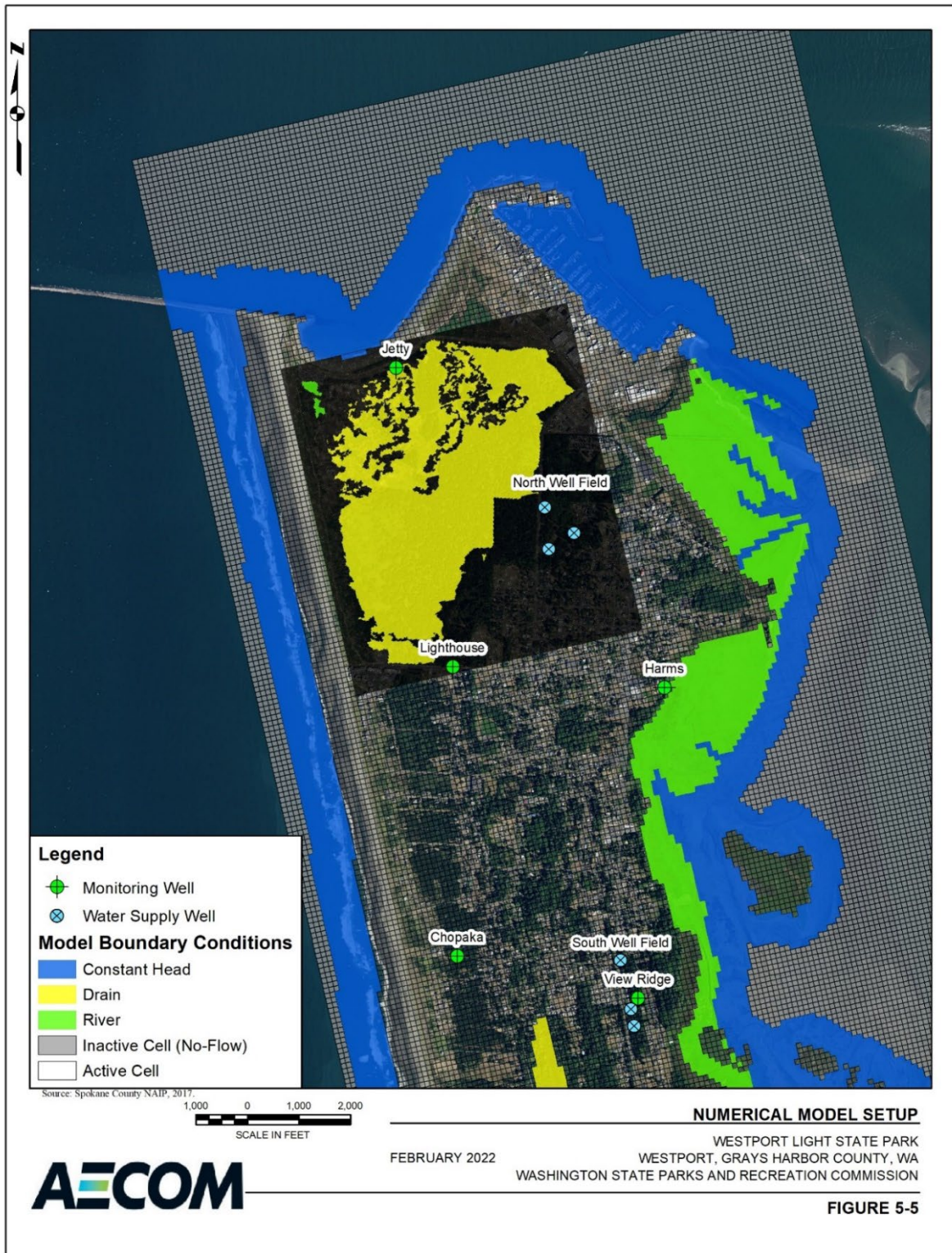


Figure 5-5. Numerical model setup

Numerical Solver

AECOM used the Sparse Matrix Solver to solve the system of equations formulated by MODFLOW-USG. The head change criteria were set to 1×10^{-3} foot for inner iterations and 1×10^{-5} foot for outer iterations, with a maximum of 600 inner iterations and 250 outer iterations.

Boundary Conditions

Boundary conditions are implemented to represent various types of groundwater sinks and sources within a numerical groundwater flow model. Boundary condition types used in the development of this model include constant heads, drains, river cells, wells, no-flow boundaries, and recharge. Implementation of each boundary condition in layer 1 is presented on [Figure 5-5](#). The only boundary condition type present in the underlying layers is no-flow boundaries representing the approximate lateral limits of the freshwater-saltwater interface, and the contact between the Beach Deposits aquifer and the Satsop Formation.

A constant head boundary fixes the water level within a model cell, allowing water to freely move in or out of the model as dictated by the surrounding water levels. Constant head boundary cells were used to represent the Pacific Ocean and Grays Harbor in layer 1. The elevation at each constant head cell was set to average sea level for each stress period based on NOAA data referenced to the vertical datum NAVD88 (NOAA 2021).

A drain boundary has a fixed elevation where water is only allowed to leave the model. A conductance term is applied to the drain cell to constrain the rate of water flow into the cell, based on the head difference between the simulated groundwater level and the drain elevation. Drain boundary conditions were used to simulate the presence of wetlands within the model. A segment of wetlands in the southern portion of the model was simulated with drains set to the ground surface elevation and a high conductance value to allow unrestricted flow into the wetlands. Within the Park, the wetlands were simulated in a more detailed fashion with the elevation of the drains set to the approximate root depth of the dominant plant type. For herbaceous species, a root depth of 2 feet below ground surface was used, and for woody species, a root depth of 4 feet below ground surface was used. The conductance was calibrated to 1 square foot/day (ft^2/d), which corresponds to a hydraulic conductivity of 0.0025 foot/day. The layout of the drains within the Park is shown on [Figure 5-6](#).

River boundary conditions function similarly to constant head cells; however, they include a conductance term to account for the permeability of riverbed sediments. River cells were used to represent the two ponds within the Park and the coastal wetlands along Grays Harbor. Elevations for the river boundary conditions were set equal to the LiDAR elevation for each model cell where this boundary condition was used (DNR 2021). The conductance term for the ponds was set to 4 ft^2/d in the 20-foot by 20-foot grid cells, and 100 ft^2/d for the wetlands in the 100-foot by 100-foot grid cells, which both correspond to a 1-foot thickness of riverbed sediments with a hydraulic conductivity of 0.01 ft/d.

No flow boundaries are cells where no groundwater flow can occur. These boundary conditions were used along the southern boundary and along the outside of the constant head cells within layer 1 and continue through all lower model layers.

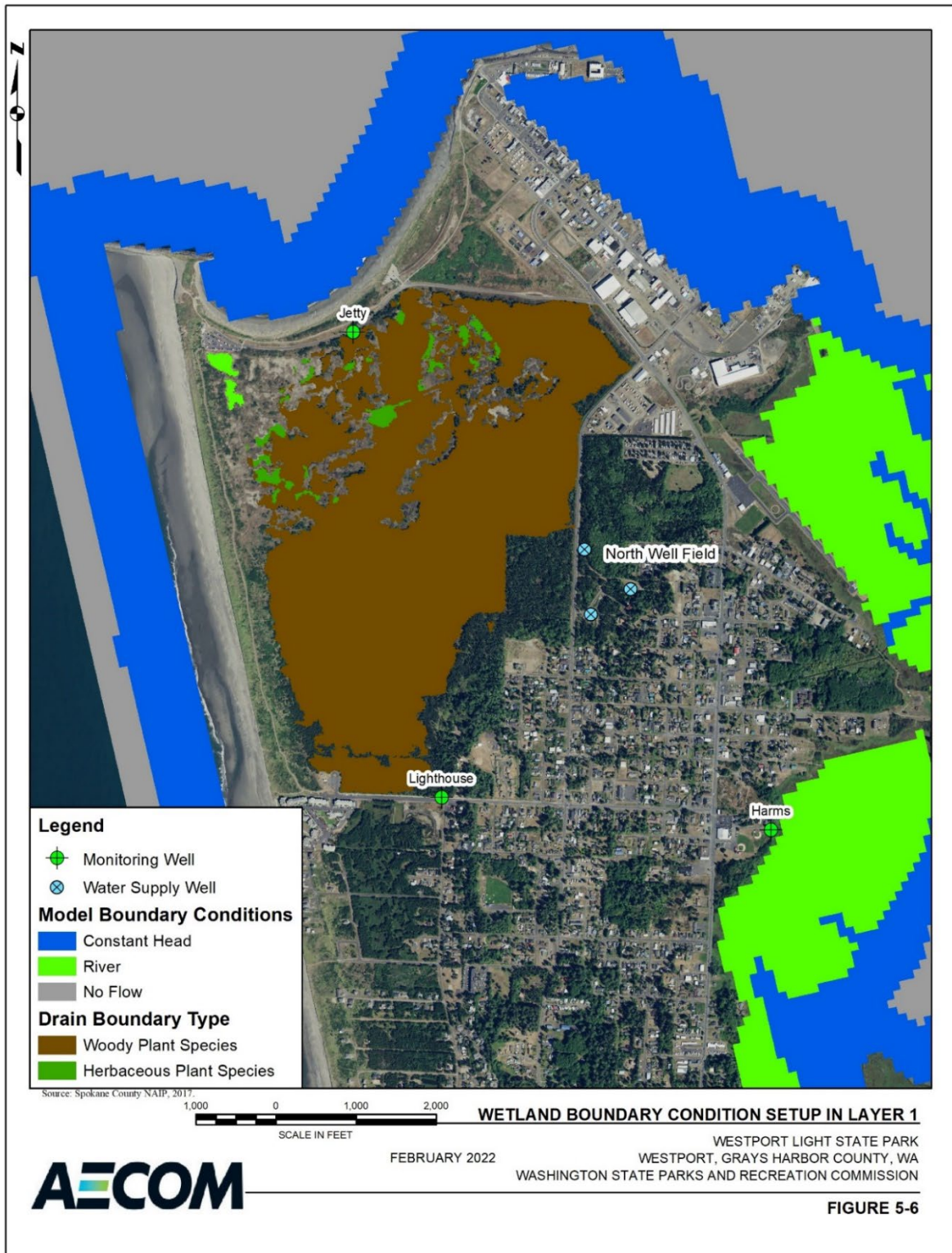


Figure 5-6. Wetland boundary condition setup in model layer 1

Groundwater recharge was input into the model by multiplying total precipitation by the average percentage of rainfall that recharges the aquifer during the months represented by each stress period, as derived from [Table 5-2](#). A summary of the recharge applied by stress period is presented in [Table 5-5](#).

Table 5-5. Recharge Simulated in Calibration

Stress Period	Start Date	Duration (days)	Total Precipitation (inches)	Precipitation Rate (ft/d)	Recharge Multiplier	Recharge Rate (ft/d)
1	11/1/2014	92	15.2	1.38E-02	66.0%	9.07E-03
2	2/1/2015	120	19.2	1.34E-02	56.6%	7.57E-03
3	6/1/2015	92	2.4	2.21E-03	22.9%	5.05E-04
4	9/1/2015	61	9.8	1.34E-02	37.7%	5.04E-03
5	11/1/2015	92	44.3	4.02E-02	66.0%	2.65E-02
6	2/1/2016	121	28.0	1.93E-02	56.6%	1.09E-02
7	6/1/2016	92	4.5	4.07E-03	22.9%	9.33E-04
8	9/1/2016	61	22.5	3.07E-02	37.7%	1.16E-02
9	11/1/2016	92	34.5	3.12E-02	66.0%	2.06E-02
10	2/1/2017	120	40.3	2.80E-02	56.6%	1.59E-02
11	6/1/2017	92	4.9	4.40E-03	22.9%	1.01E-03
12	9/1/2017	61	10.5	1.44E-02	37.7%	5.42E-03
13	11/1/2017	92	43.7	3.96E-02	66.0%	2.61E-02
14	2/1/2018	120	23.0	1.60E-02	56.6%	9.04E-03
15	6/1/2018	92	2.8	2.53E-03	22.9%	5.81E-04
16	9/1/2018	61	11.2	1.52E-02	37.7%	5.74E-03
17	11/1/2018	92	33.2	3.01E-02	66.0%	1.98E-02
18	2/1/2019	120	16.2	1.13E-02	56.6%	6.38E-03
19	6/1/2019	92	4.2	3.81E-03	22.9%	8.73E-04
20	9/1/2019	61	11.4	1.56E-02	37.7%	5.87E-03
21	11/1/2019	92	37.7	3.41E-02	66.0%	2.25E-02
22	2/1/2020	121	17.7	1.22E-02	56.6%	6.91E-03
23	6/1/2020	92	5.4	4.93E-03	22.9%	1.13E-03
24	9/1/2020	61	8.9	1.22E-02	37.7%	4.60E-03
25	11/1/2020	92	44.5	4.03E-02	66.0%	2.66E-02
26	2/1/2021	120	20.2	1.40E-02	56.6%	7.95E-03

Key: ft/d = feet per day.

5.4 Numerical Groundwater Model Calibration

5.4.1 Approach

Model calibration is a step of numerical model development to demonstrate that the model can reasonably reproduce observed conditions within a domain, reducing uncertainty in predictive simulations. A transient calibration was performed to match observed water levels from the wetland test pits and five peninsula monitoring wells to simulated water levels for the period from November 2014 through April 2021. Wetland test pits were weighted heavier than the monitoring well water levels during

the calibration process due to their relevance to the area of interest. The calibration was carried out by adjusting various model parameters to best match the observed water levels.

AECOM used the software package PEST (Watermark Numerical Computing 2016) to optimize the model calibration. PEST is a model-independent parameter estimation and uncertainty analysis tool used for automated calibration and calibration constrained uncertainty analysis. Pilot points were utilized within the PEST software. The technique of applying pilot points to model calibration requires several pilot points for a given parameter. The pilot point values are then interpolated by kriging to create a parameter field over the model domain, bridging the gap between changing the value at each model cell and estimating parameter values through zones across the domain (Doherty, Fienen, and Hunt 2010). Further details on the parameters adjusted in model calibration are discussed in the following sections.

5.4.2 Hydrogeological Parameters

Horizontal and vertical hydraulic conductivity were the parameters included in the model calibration process, which consisted of 19 horizontal hydraulic conductivity pilot points and two hydraulic conductivity anisotropy ratios (defined as the ratio between the horizontal and vertical hydraulic conductivity of an aquifer). Several other model parameters were deemed to be insensitive and thus were not included in the PEST calibration process, such as the hydraulic properties of layers 5 and 6, the aquifer specific storage, and porosity. Additionally, the aquifer specific yield value of 15 percent used for the water table fluctuation analysis was input as a fixed parameter in the transient model. Parameter settings and final calibrated values are shown in [Table 5-6](#).

Table 5-6. Numerical Model Parameters

Type	Layer	Setup	Minimum Value	Maximum Value	Calibrated Value	Unit
Horizontal Hydraulic	1-2	8 pilot	0.1	100	0.9 to 6.5	ft/d
Anisotropy Ratio	1-2	Uniform	1	100	10	-
Horizontal Hydraulic	3-4	11 pilot	250	3000	260 to 2970	ft/d
Anisotropy Ratio	3-4	Uniform	1	100	10	-
Horizontal Hydraulic	5-6	Uniform	Not Calibrated (Insensitive)		1	ft/d
Anisotropy Ratio	5-6	Uniform	Not Calibrated (Insensitive)		10	-
Specific Storage	All	Uniform	Not Calibrated (Insensitive)		1.00E-04	-
Specific Yield	All	Uniform	Estimates from Water Table Fluctuation Analysis		15%	-
Porosity	All	Uniform	Not Calibrated (Transport Only)		16%	-

Key: ft/d = feet per day.

5.4.3 Calibration Results

The model was calibrated by adjusting the horizontal hydraulic conductivity field and vertical anisotropy ratio for layers 1 through 4 until the model-simulated groundwater elevations best matched the groundwater head calibration targets. Qualitative and quantitative comparisons were also made between observed and simulated heads as well as vertical hydraulic gradients. A summary of statistics comparisons between observed and simulated heads is shown in [Table 5-7](#). The calibration residual (observed head – computed head) mean for the entire model domain is 0.02 feet. The root mean square error (RMSE) is 1.15 feet, and the scaled RMSE is 9.4 percent. Scaled RMSE is a commonly utilized statistic comparing the model simulated values to observed values and is calculated by dividing the square root of the average squared residual over the range of observed values. A scaled RMSE value of less than 10 percent is typically considered indicative of an acceptable calibration.

Table 5-7. Numerical Model Calibration Statistics

Statistic (unit)	Value
Residual Mean (ft)	0.02
Absolute Residual Mean (ft)	1.15
Residual Std. Deviation (ft)	0.92
Sum of Squares (ft ²)	3.04E+03
RMS Error (ft)	1.15
Min. Residual (ft)	-3.53
Max. Residual (ft)	2.93
Number of Observations (-)	2313
Range in Observations (ft)	12.15
Scaled Residual Std.	9.4%
Scaled Absolute Residual	7.6%
Scaled RMS Error	9.4%

Key: ft = feet, RMS = root mean square; Std. = standard.

A plot of simulated versus observed water levels is shown on [Chart 5-8](#). The points generally fall along the exact match line without significant bias in slope or magnitude, though the wetland test pit water levels are generally simulated about 1 foot low. This is likely related to the root depth estimation for wetland species as well as water table variability over short distances in the wetlands compared to model simulated averages over the 20-foot by 20-foot model cells. Hydrographs of simulated and observed water levels at the five peninsula monitoring wells are shown on [Chart 5-9](#). The simulated water levels match the observed seasonality well and indicate adequate model calibration. The simulated potentiometric surface is shown on [Figure 5-7](#).

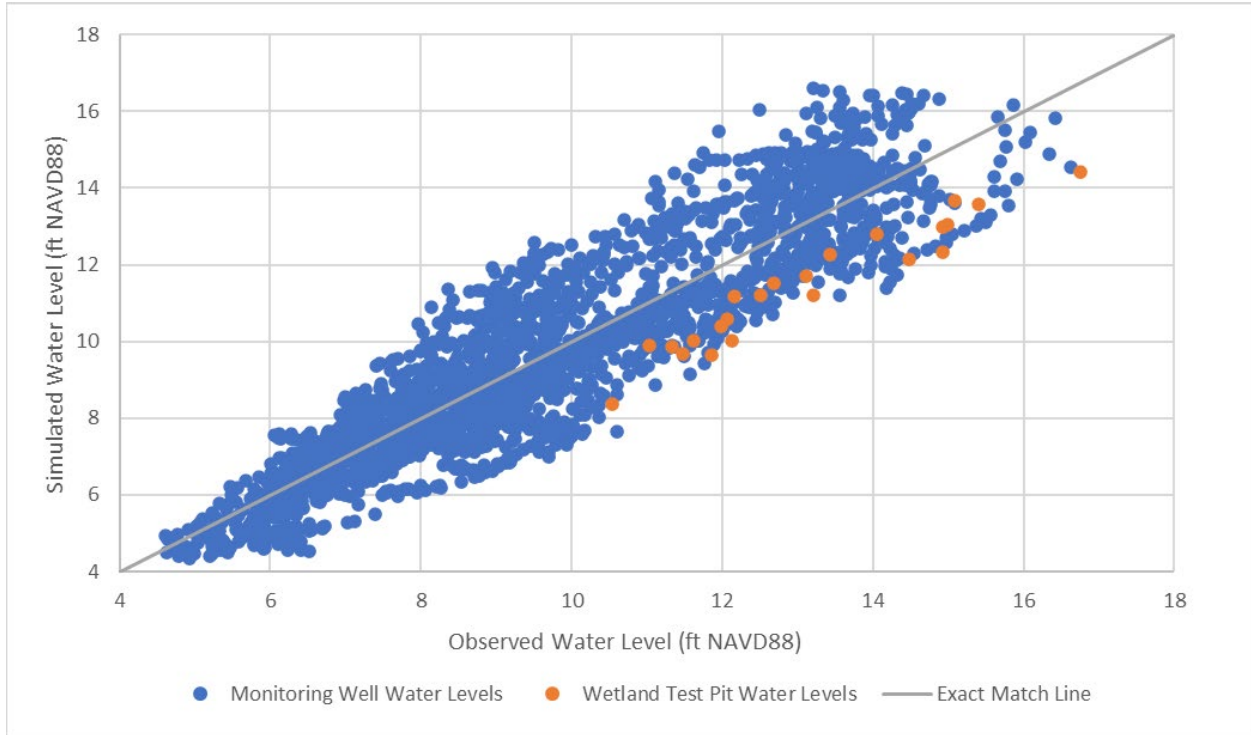
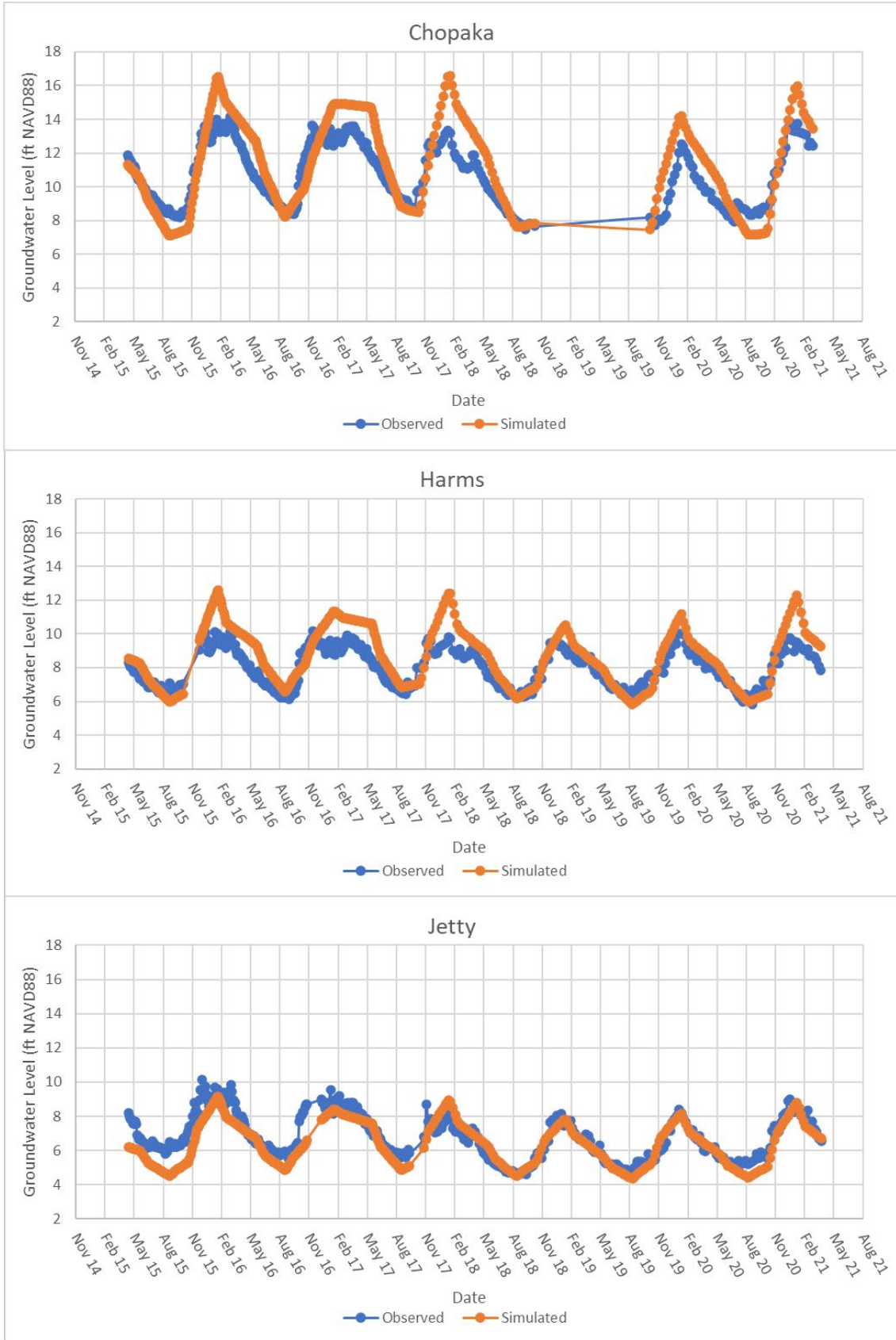


Chart 5-8. Simulated vs. observed water levels



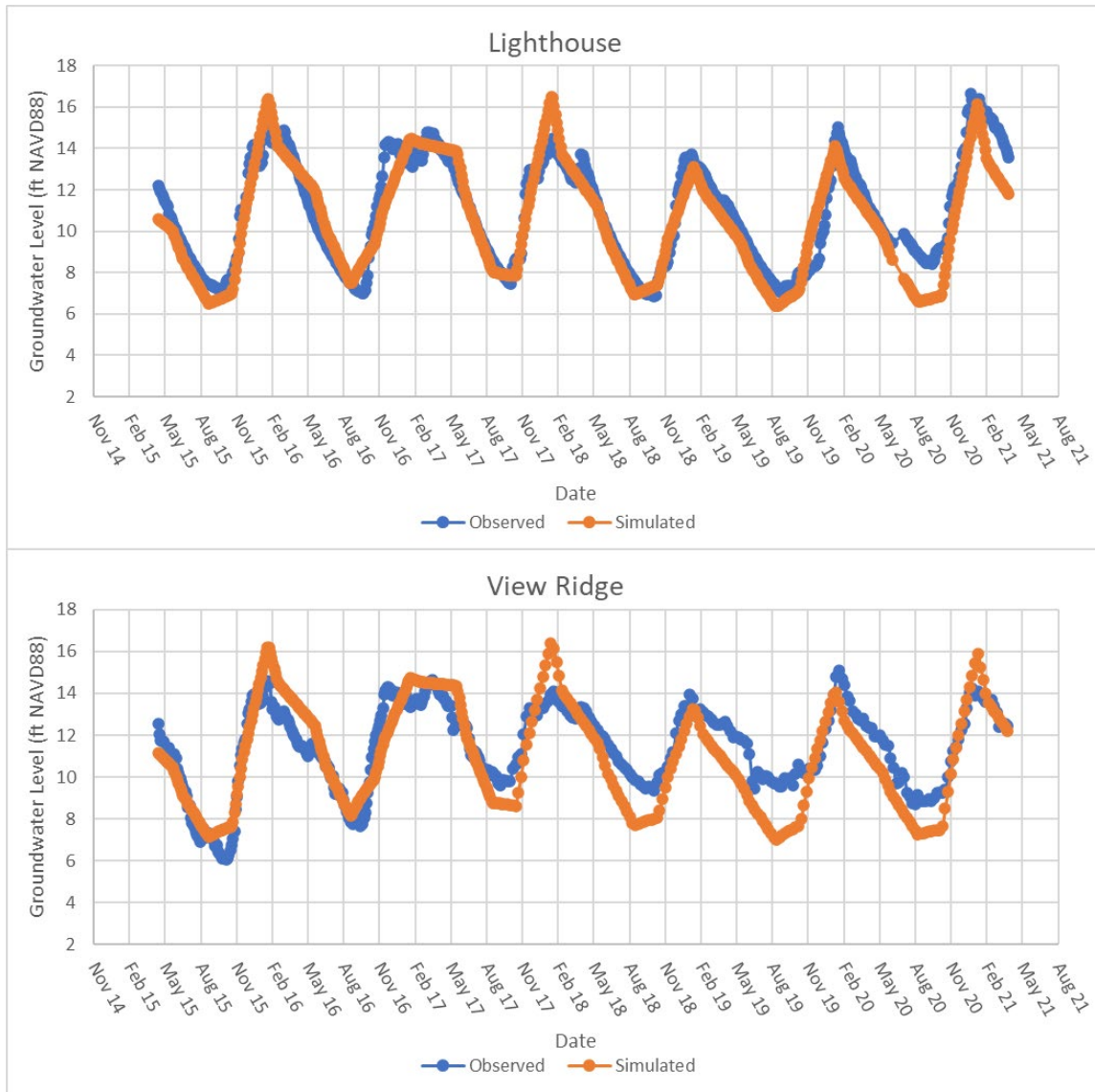


Chart 5-9. Simulated and observed groundwater levels at the Peninsula monitoring wells



Figure 5-7. Simulated potentiometric surface map – April 2021

5.5 Predictive Simulations for Golf Course Development

5.5.1 Approach

Details on the proposed golf course development were outlined in meetings and email correspondence with Westport Golf Links. The proposed development would include an 18-hole golf course, a par-3 golf course, a practice range area, a “surf shack” hangout, expanded parking/golf-carpark shared space, a dunes trail, several interior trails within the Park, and a golf course operations area that would include a clubhouse, maintenance building, and lodging. Excerpts of the integrated management plan from Bandon Dunes Golf Resort were used to justify assumptions for much of the golf course maintenance practices (email from Mark Merkelbach to author, December 20, 2021). Based on the developer’s preliminary design, AECOM understands that the golf course fairways and greens would mostly be in upland areas to avoid direct impacts to lower-lying wetlands. As such, the biggest change to the hydrologic system would likely occur from irrigation of maintained grass areas and reduction in recharge where new facilities are constructed. Because irrigation estimates for the course range from 400,000 to 600,000 gallons per day, an assumption of 500,000 gallons per day was used for the predictive simulations. Irrigation was assumed to only occur in the summer months when evapotranspiration exceeds rainfall. Per the developer, irrigation would be performed dynamically with data from an on-site weather station and soil moisture meters with the goal of limiting excess watering.

Fertilizer application for the course would primarily occur in the spring and summer, with small amounts applied in the winter and fall as necessary. Slow-release fertilizer would be used in conjunction with soil testing to ensure that excess nutrients are not washed below the root zone, particularly during the winter months when groundwater recharge is highest. Pest management would primarily be performed through efficient irrigation practices, ensuring that the course is not over- or under-watered. A groundwater monitoring well network, sampled quarterly, has been proposed to detect changes in dissolved oxygen, pH levels, temperature, conductivity, turbidity, phosphorus, nitrogen, and ammonia.

For predictive simulations, the calibrated model was adapted to represent average conditions through the four stress periods per year used in calibration. Average recharge and tidal data from a period of 10 years, from 2011 to 2021, were incorporated into the appropriate boundary conditions for each stress period. To derive an appropriate initial flow condition for the predictive simulation, the four stress periods representing one year of average conditions were repeated for several years until equilibrium was reached and the model mass balance no longer changed when comparing each stress period to the corresponding stress period of the previous year. Model inputs for the four stress periods are shown in [Table 5-8](#).

Table 5-8. Average Conditions Predictive Model Setup

Stress Period	Months	Average Sea Level (ft NAVD88) Constant Head	Precipitation (inches)	Precipitation Rate (ft/d)	Recharge Multiplier	Recharge (ft/d)
1	Nov-Jan	4.10	35.73	3.24E-02	66.0%	2.13E-02
2	Feb-May	3.74	26.13	1.81E-02	56.6%	1.03E-02
3	Jun-Aug	3.37	4.68	4.24E-03	22.9%	9.71E-04
4	Sep-Oct	3.69	12.86	1.76E-02	37.7%	6.62E-03

Key: ft = feet; ft/d = feet per day; NAVD88 = North American Vertical Datum of 1988.

The average conditions predictive model was then adjusted to incorporate the proposed golf course development. Effects of the golf course development were simulated by adjusting recharge rates in the model. Zones with modified recharge included fairways/greens, bunkers, the clubhouse and other

structures, and asphalt/trails. Irrigation of the golf course was assumed to occur from June through August each year, totaling 500,000 gallons per day. The irrigation rate expressed here includes natural precipitation, with daily irrigation applied as a supplement to arrive at the 500,000 gallon per day total. Based on the water table fluctuation method, approximately 22 percent of rainfall between June and August recharges groundwater under current vegetation conditions. However, AECOM assumed that the denser grasses planted on fairways and greens would further reduce recharge by 50 percent through enhanced evapotranspiration; therefore, 11 percent of the 500,000 gallons per day was assumed to recharge the aquifer. During non-irrigation months, it was assumed that recharge would be reduced by 25 percent in the fairways and greens. In bunkers it was assumed that 80 percent of precipitation would recharge the aquifer. The clubhouse and other structures were assumed to allow no recharge, and asphalt areas and trails were assumed to allow 1 percent of precipitation as recharge. Recharge zone setups are shown on [Table 5-9](#) and [Figure 5-8](#).

Table 5-9. Recharge Zone Setup for Golf Course Development Simulations

Stress Period	Months	Precipitation (inches)	Precipitation Rate (ft/d)	Background Recharge Multiplier	Bunkers (80% of Precipitation, ft/d)	Fairways/Greens (Irrigation Season: 11% of Irrigation, Non-Irrigation Season: 75% of Background, ft/d)	Clubhouse/ Structures (0% of Precipitation, ft/d)	Asphalt/ Trails (1% of Precipitation, ft/d)
1	Nov-Jan	35.73	3.24E-02	66.0%	2.59E-02	1.60E-02	0	3.24E-04
2	Feb-May	26.13	1.81E-02	56.6%	1.45E-02	7.71E-03	0	1.81E-04
3	Jun-Aug	4.68	4.24E-03	22.9%	3.39E-03	1.97E-03	0	4.24E-05
4	Sep-Oct	12.86	1.76E-02	37.7%	1.41E-02	4.96E-03	0	1.76E-04

Note: The recharge rate for fairways and greens between June and August was calculated based on 500,000 gallons per day of irrigation divided by the total acreage of 89.25 acres of fairways and greens, then multiplied by 11% to calculate the quantity of water arriving at the water table.

Key: ft/d = feet per day.



Figure 5-8. Golf course simulation - recharge zone setup

5.5.2 Results

Results from the average conditions simulation and the golf course development simulation were compared to evaluate changes in groundwater levels and fluxes to the Park wetlands. Relative water level changes over the Park for the months of February and August are shown over time at a comparison location on [Chart 5-10](#) and in plan view on [Figure 5-9](#) and [Figure 5-10](#), which represent the seasonal high (February) and low (August) groundwater periods, respectively. The location of the comparison hydrograph is shown on both figures. The comparison location was selected to be directly below an irrigated golf course feature near the center of the Park in an upland area. This location was selected to illustrate the upper end of predicted groundwater level declines that could occur due to recharge changes from the golf course vegetation. Throughout most of the year, simulated groundwater levels are slightly lower than compared to baseline, reaching a maximum of 1.2 feet lower than baseline in February. This is indicative of the reduced recharge resulting from golf course grasses presumably consuming and transpiring more water than current vegetation. The largest changes are predicted immediately below the golf course features and decrease with distance away from the course. This trend occurs because the adjacent undeveloped areas would retain their native recharge characteristics. During the irrigation season, net recharge to groundwater is predicted to increase due to irrigation; however, the difference in water level during the irrigation season peaks at less than 0.2 feet above baseline conditions ([Chart 5-10](#)).

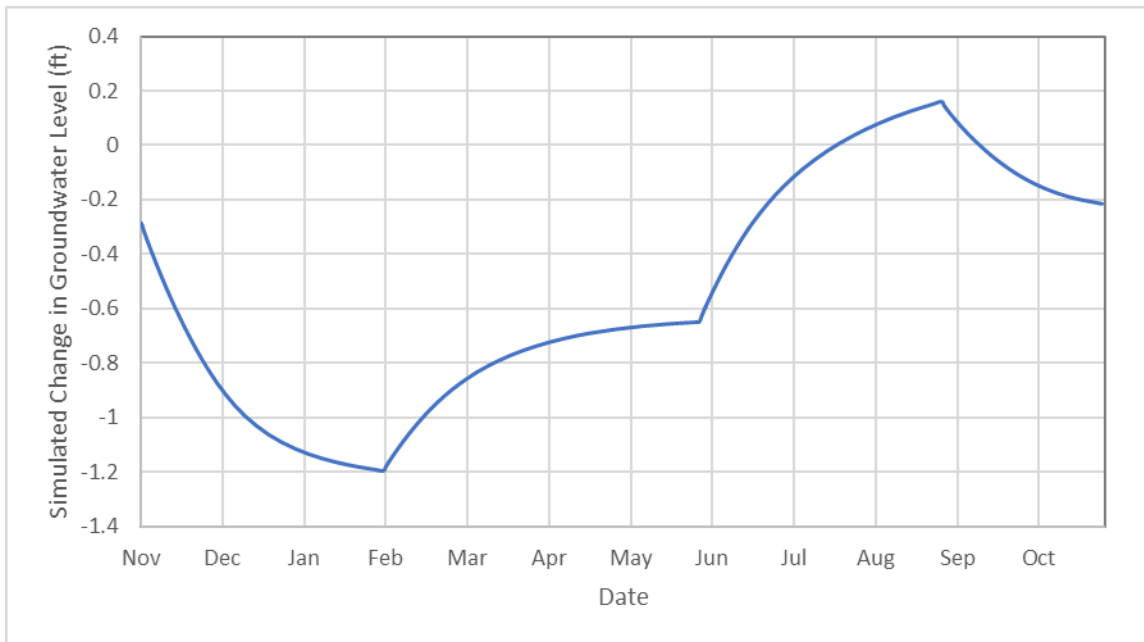


Chart 5-10. Simulated change in groundwater level at comparison location



Figure 5-9. Simulated change in groundwater level with golf course – February



Figure 5-10. Simulated change in groundwater level with golf course – August

Groundwater flux to the wetlands was assessed using model simulated discharge to the drain boundary conditions representing the wetland areas within the Park (**Chart 5-11**). The comparison of drain fluxes followed a similar relative pattern to the groundwater levels; during most of the year, fluxes were slightly lower than baseline conditions. In the baseline simulation, groundwater fluxes to the wetlands during the months of June through September are relatively small, while groundwater levels are lower due to lesser recharge. Simulated fluxes to the wetlands peak at the end of February. During peak discharge in February, the golf course development was simulated to reduce groundwater fluxes to the wetlands by approximately 10 percent. The peak in percentage difference is predicted to occur at the end of May with a 22 percent decrease, though overall fluxes to the wetlands are significantly smaller during that time compared to February. During the summer and early fall, water levels are simulated to be below the bottom root depths of the wetlands; therefore, no groundwater flux was simulated to the wetlands during this time in either the baseline or golf course development simulations.

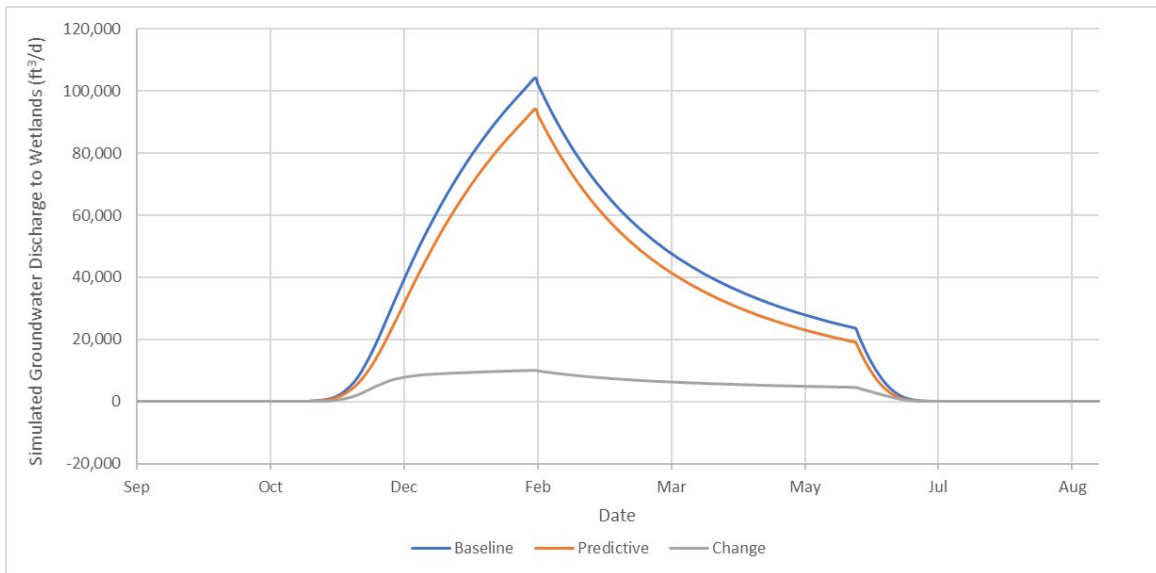


Chart 5-11. Comparison of baseline and golf course water fluxes to wetland drains

Wetlands most sensitive to groundwater level changes are those dominated by herbaceous plant species with shallow root depths, shown on Figure 5-6 in green. Some of these species have a narrow range of hydroperiods in which they can be sustained. A drop in groundwater levels of a few inches, or earlier drawdown in the spring, could eliminate this community from small shallow swales, or cause shifts downslope in larger or deeper swales. Chart 5-12 shows a comparison of simulated groundwater levels between baseline and predictive (post-development) conditions for one of the Park’s herbaceous wetlands. While the change in groundwater levels is only a few inches, the period where water is available to the plant roots may be reduced by approximately 7-10 days on either end of the season.

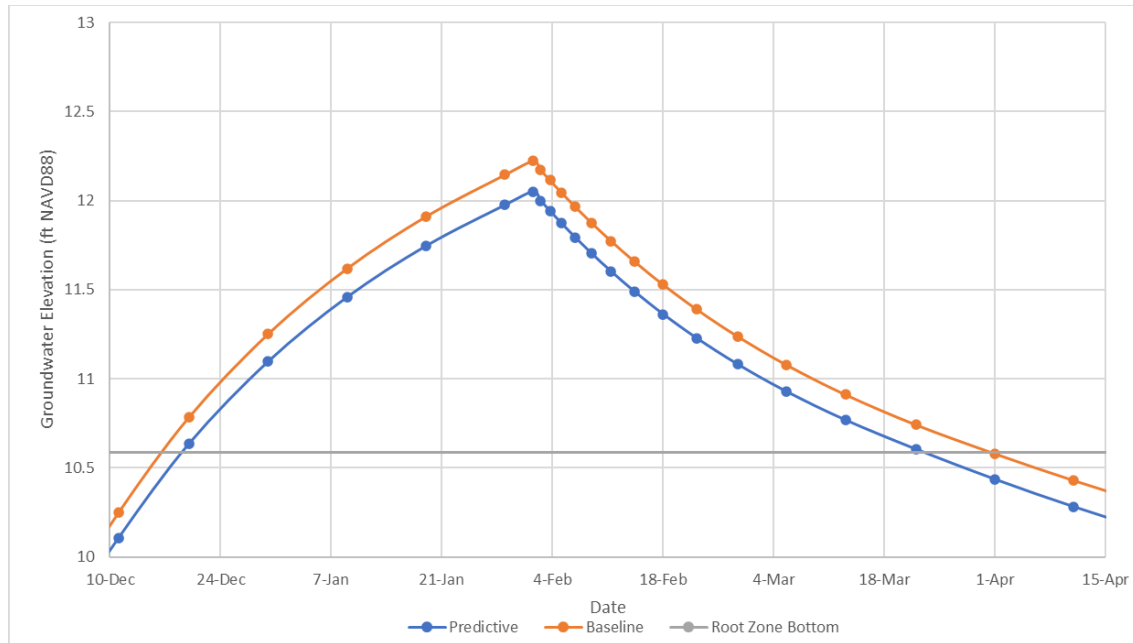


Chart 5-12: Comparison of Simulated Groundwater Levels to Herbaceous Plant Root Depth

Overall, results from the golf course development simulation indicate that groundwater levels and fluxes to the wetlands are expected to be reduced compared to current, or baseline, conditions. Conclusions of the simulations related to water levels and fluxes to the wetlands can be summarized as follows:

- Golf course development resulted in less recharge to groundwater within the Park during much of the year due to reduced infiltration in areas with maintained grasses.
- Recharge would increase slightly during the summer months due to irrigation, though the difference is relatively small because irrigation would be managed to prevent excess infiltration.
- Water levels in upland areas where the course features would be located were simulated to be as much as 1.2 feet lower during the winter months and approximately 0.1 feet higher during summer months due to the proposed golf course development.
- Simulated groundwater discharge to the wetlands is predicted to decrease approximately 10 to 20 percent from November through May, while in the remaining months, the baseline model shows that discharge to the wetlands is relatively small or zero. Thus, little to no change in the groundwater discharge rate would occur from June through October.
- Herbaceous wetland species with shallow root depths will be most susceptible to changes in groundwater levels. The relatively small reduction in groundwater levels estimated in this study could shorten the ponding period sustaining these plants by approximately 7-10 days on either end of the growing season, which may either eliminate these species over time, or cause shifts downslope in larger or deeper swales.
- Results from these simulations are dependent on the assumptions of recharge reduction related to maintained grasses on the golf course. A variety of assumptions are tested in Section 6 of this report.

Water Quality Impacts

Potential impacts to groundwater quality that could result from golf course development were evaluated qualitatively using the groundwater flow model to demonstrate potential flow pathways from areas of the course where fertilizers or herbicides would be applied. While the discussion in this study is conceptual, it provides the framework for mechanisms by which fertilizers may enter groundwater and impact potential receptors including the wetlands and water supply wells.

Fertilization plans for a similar golf course, Bandon Dunes Golf Resort in Bandon, Oregon, were provided by Westport Golf Links as a template for the proposed golf course. Primary components of fertilizers

proposed include nitrogen, phosphorus, and potassium, applied at a maximum rate of 8, 4, and 6 pounds (lbs) per 1,000 square feet annually to the greens. Tees, fairways, and rough would receive progressively less fertilizer. The plans indicate that fall and winter applications of nutrients would be performed cautiously, and soil testing would be performed periodically to ensure that applications are performed when needed and washing of nutrients past the root zone during the months of higher rainfall is minimized. Fertilizers would mainly be applied in the spring, summer, and early fall when rainfall is lower and the potential for recharge to groundwater is less. Fall soil sampling would be used to confirm that residual nutrients are not remaining in the soil at the start of the rainy season. Additionally, where feasible, slow-release fertilizers would be used to further mitigate washing of nutrients past the root zone. Westport Golf Links would also implement a groundwater monitoring program to assess any changes to groundwater quality.

The numerical groundwater flow model was used to assess potential groundwater flow pathways of nutrients or other chemicals that could reach groundwater due to either an exceptionally heavy rainfall event or potential overapplication. A particle tracking program, MODPATH3DU (S.S. Papadopoulos and Associates 2022), was utilized in conjunction with the groundwater flow model. Particle tracks show the flow path of a single groundwater particle based on the flow field generated from a groundwater flow model. They can be used to simulate advective transport of any chemical but do not consider factors that may slow chemical transport such as dispersion, adsorption to the aquifer matrix, or reactions along the flow path.

AECOM placed particles in each model cell representing a green in the proposed golf course. The particles were started at the beginning of June and tracked through termination to a model boundary condition, representing a potential receptor. Results of the particle tracking simulation in both plan and cross section view are shown on [Figure 5-11](#). In general, when the particles reach the groundwater table, downward gradients from recharge force the particles to greater depths before flowing laterally towards the Pacific Ocean or Grays Harbor. Most particles reached their respective receptors within 1 to 2 years. The analysis shows that assuming fertilizers were overapplied in the golf course areas, which is unlikely with proper management, the excess nutrients would likely travel to the ocean or Grays Harbor rather than impacting adjacent wetlands. Several factors contribute to this conclusion, including groundwater highs around the wetlands, radial groundwater flow from the wetlands toward the Pacific Ocean and Grays Harbor, and the location of the golf course around the perimeter of the Park and downgradient of the wetlands. Although the wetlands receive groundwater discharge throughout much of the year ([Chart 5-11](#)), they are generally located near the center of the peninsula where the groundwater level is highest. Therefore, the regional groundwater flow pattern (depicted on [Figures 5-4 and 5-7](#)) is for groundwater to flow radially away from the wetland areas toward the peninsula shorelines. This explains why particles from the golf course features, which are mostly proposed along the Park perimeter, are generally predicted to flow away from the wetlands.

On the southern end of the golf course, AECOM's analysis shows that particles from two greens could be extracted by the North Well Field. However, impacts to the well field are unlikely due to the relatively small amount of nutrients applied to the greens, and the significant volume of water pumped from the well field. Should the golf course move forward, AECOM recommends installing monitoring wells between the proposed golf course and the North Well Field and conducting routine monitoring to provide an early warning of potential nutrient migration.

The groundwater flow paths simulated with the particle tracking software assumed conservative transport only; however, several other attenuation mechanisms could slow the movement of nutrients in groundwater, including dispersion, sorption, and degradation (Freeze and Cherry 1979). Nitrogen is mobile in groundwater as nitrate and has an U.S. Environmental Protection Agency Maximum Contaminant Level of 10 milligrams per liter. Phosphorus is somewhat limited by sorption in groundwater flow and is not a harmful constituent in drinking water; however, it is a greater concern for surface water bodies, where it can accelerate growth of algae and aquatic vegetation. Potassium generally has low mobility in groundwater except in certain fractured geologic environments and does not pose a concern for drinking water.

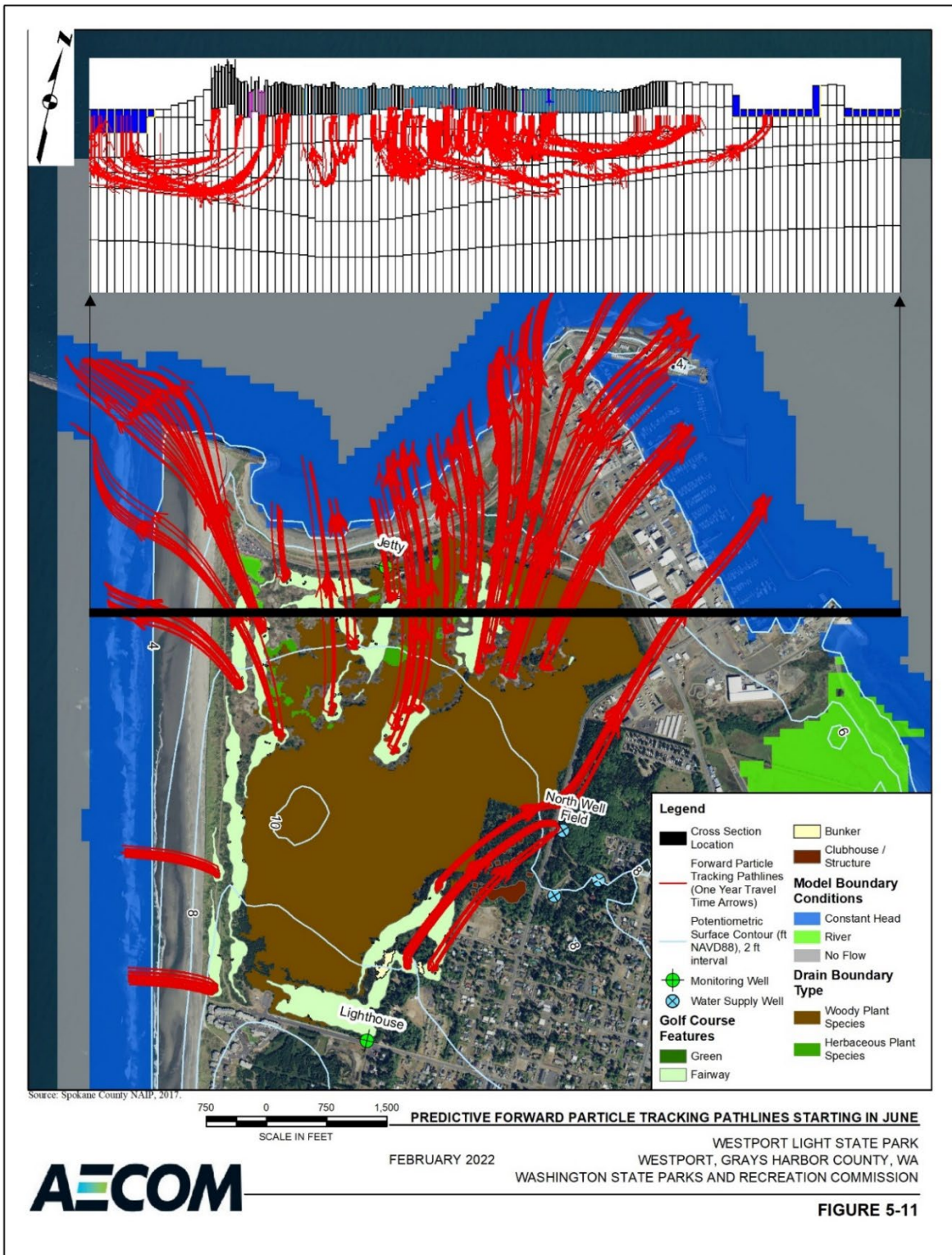


Figure 5-11. Predictive forward particle tracking pathlines starting in June

Saltwater Intrusion

The risk of saltwater intrusion was evaluated using groundwater flow and the density driven flow package in MODFLOW-USG Transport. Implementation of the density driven groundwater flow equation required incorporation of a constant concentration boundary condition in all model cells that were used as a constant head to represent either the Pacific Ocean or Grays Harbor. The constant concentration boundaries were set using an electrical conductivity value of 50,000 $\mu\text{S}/\text{cm}$, while the surrounding aquifer was assigned a value of 250 $\mu\text{S}/\text{cm}$. A linear correlation between freshwater density of 62.4 lb/cubic foot (ft^3) at 250 $\mu\text{S}/\text{cm}$ and seawater density of 64 lb/ ft^3 at 50,000 $\mu\text{S}/\text{cm}$ was established. MODFLOW USG-Transport solves the density dependent groundwater flow and solute transport equations, updating the density of the water based on the simulated concentration in each time step.

In the baseline simulation, the freshwater-saltwater interface did not rise above the top of the Satsop Formation, which is the lower extent of the model domain. This result is consistent with the estimated position of the interface discussed in the hydrogeological conceptual model section of this report. No changes were observed to the position of the freshwater-saltwater interface or simulated electrical conductivity in the predictive simulations for the golf course development. Conceptually, this is expected due to the timing of predicted changes to groundwater levels. While the 1.2-foot decrease in water level simulated during the winter months may cause an approximately 48-foot rise in the freshwater-saltwater interface, it is anticipated that the freshwater lens is located several hundred feet below the base of the aquifer. Additionally, the freshwater-saltwater interface will fluctuate over the course of the year and would be at its lowest during the winter months when groundwater levels are seasonally highest. The relative decrease in simulated groundwater levels in these months due to golf course development is significantly less than the seasonal fluctuations observed in monitoring wells on the peninsula. During the summer months when the freshwater-saltwater interface is the highest, relative groundwater levels are predicted to be slightly higher due to irrigation of the golf course. Therefore, the risk of saltwater intrusion during this time would likely decrease due to golf course development.

Overall, no risk of saltwater intrusion is anticipated based on the numerical modeling results. The only potential for saltwater intrusion could be related to increased pumping of the North Well Field, if this well field is used to supply irrigation water for the golf course. However, the ultimate source of irrigation water is not known at this time; thus, no changes to the wellfield pumping rates were incorporated into AECOM's study.

5.6 Sensitivity and Uncertainty Analysis

A sensitivity analysis was performed on the numerical groundwater model for the purpose of assessing the effects of changes to various parameters on the model calibration and results from predictive simulations. The analysis was performed in accordance with ASTM Standard D5611-94 (2016a). Several model parameters were varied within reasonable ranges from the calibrated model values to assess how the parameter changes affected model head calibration statistics, as well as predictive simulation results. Some parameters that do not influence the flow model calibration (e.g., irrigation rates and assumptions of recharge reduction related to golf course grasses) were also included in the sensitivity analysis. Each parameter was categorized as Type I, II, III, or IV. The definition for these parameter types is as follows:

Type I Sensitivity—When variation of an input causes insignificant changes in the calibration residuals as well as the model's conclusions, then that model has a Type I sensitivity to the input. Type I sensitivity is of no concern because regardless of the value of the input, the conclusion will remain the same.

Type II Sensitivity—When variation of an input causes significant changes in the calibration residuals but insignificant changes in the model's conclusions, then that model has a Type II sensitivity to the input. Type II sensitivity is of no concern because regardless of the value of the input, the conclusion will remain the same.

Type III Sensitivity—When variation of an input causes significant changes to both the calibration residuals and the model's conclusions, then that model has a Type III sensitivity to the input. Type III sensitivity is of no concern because, even though the model's conclusions change as a result of

variation of the input, the parameters used in those simulations cause the model to become uncalibrated. Therefore, the calibration process eliminates those values from being considered to be realistic.

Type IV Sensitivity—If, for some value of the input that is being varied, the model's conclusions are changed but the change in calibration residuals is insignificant, then the model has a Type IV sensitivity to that input. Type IV sensitivity can invalidate model results because over the range of that parameter in which the model can be considered calibrated, the conclusions of the model change. A Type IV sensitivity generally requires additional data collection to decrease the range of possible values of the parameter.

The results of the sensitivity analysis are presented in [Table 5-10](#). The parameters that were adjusted to evaluate their influence on the model calibration resulted in either Type I or II sensitivity, where the conclusions of the predictive simulation results did not change whether the calibration was affected or not. These sensitivity types indicate that predictive results are not sensitive to that parameter. Therefore, the uncertainty in the flow model inputs is sufficiently bracketed and reasonable changes will not likely affect conclusions of the model results.

Sensitivity model runs #9 through #12 adjusted parameters not included in the calibrated model, which could affect the predictive simulations, such as the irrigation rate and the reduction in recharge due to golf course grasses. In the baseline predictive simulation, an average irrigation rate of 500,000 gallons per day was used. But in sensitivity runs #9 and #10, AECOM used the lower and upper irrigation rate estimates provided by Westport Golf Links (400,000 and 600,000 gallons per day, respectively) to evaluate how changes in the irrigation rate could affect the model. As shown in [Table 5-10](#), little change was observed from baseline in these simulations, illustrating the point that winter rainfall exerts the biggest influence on the hydrologic system. Effects from varying rates of summer irrigation are expected to be small by comparison.

The baseline simulation also assumed a 50 percent reduction in groundwater recharge during irrigation months while grasses are growing, and a 25 percent reduction during the remainder of the year. To evaluate the effects of these assumptions, run #11 increased the recharge reduction by 50 percent to 75 percent and 37.5 percent for the irrigation and non-irrigation periods, respectively. Changes to resulting groundwater levels from the lower recharge rates were in the range of inches and only a 3 percent decrease in groundwater flux to the wetlands occurred compared to baseline. Run #12 decreased the recharge reduction by 50 percent to 25 percent and 12.5 percent for the irrigation and non-irrigation periods, respectively. Again, changes to the resulting groundwater levels were in the range of inches, and only a 2 percent increase in groundwater flux to the wetlands occurred compared to baseline. While recharge effects from the golf course are not known with certainty, this sensitivity analysis covered a broad range of assumptions with little change to the simulation results.

Table 5-10. Sensitivity and Uncertainty Analysis Results

Run #	Parameter	Change	Scaled RMSE	Match to Hydrographs	Adequate Calibration?	Range of Relative Change in Water Levels from Baseline at Comparison Point	Percent Difference in Groundwater Flux to Wetlands in Feb (Peak Water Level Period)	Deviation from Baseline Particle Tracking Pathlines	Parameter Sensitivity Type
0	Calibration Model, no changes	-	9.2%	Yes	Yes	+0.15 ft to - 1.20 ft	-10%	-	-
1	Recharge and Specific Yield	+20%	11.1%	No	No	+0.15 ft to - 1.47 ft	-10%	None	Type II
2		-20%	14.3%	No	No	+0.15 ft to - 1.05 ft	-13%	Additional particles from southern greens captured by North Well Field	Type II
3	Horizontal Hydraulic Conductivity	+25%	14.1%	Yes	No	+0.15 ft to - 1.12 ft	-17%	None	Type II
4		-25%	14.2%	Yes	No	+0.16 ft to - 1.43 ft	-10%	None	Type II
5	Vertical Hydraulic Conductivity	+50%	11.4%	Yes	No	+0.14 ft to - 1.07 ft	-13%	Additional particles from southern greens captured by North Well Field	Type II
6		-50%	9.7%	Yes	Yes	+0.16 ft to - 2.62 ft	-12%	None	Type I
9	Irrigation Rate	400,000 gal/d	-	-	-	+0.06 ft to - 1.20 ft	-10%	None	-
10		600,000 gal/d	-	-	-	+0.25 ft to - 1.20 ft	-10%	None	-
11	Recharge Reduction due to Golf Course Grasses	+50% from Baseline	-	-	-	-0.14 ft to - 1.83 ft	-13%	None	-
12		-50% from Baseline	-	-	-	+0.44 ft to - 0.61 ft	-8%	None	-

Key: ft = feet; gal/d = gallon per day; RMSE = root mean square error.

5.7 Conclusions

AECOM completed the following work as part of the groundwater assessment for the Park:

- The hydrogeological conceptual model was updated from previous studies in the area to incorporate newly available data.
- The 3-D transient numerical groundwater model previously developed by Robinson & Noble, Inc. (1994) was updated to incorporate new data and refined in the vicinity of the Park. The model calibration was updated to match water levels from April 2015 through April 2021. The calibrated model meets both qualitative and quantitative standards for groundwater model calibration.
- Details of the conceptual golf course development were provided by Westport Golf Links and include the following key points:
 - Irrigation is anticipated to range from 400,000 to 600,000 gallons per day and would be applied during periods when evapotranspiration exceeds rainfall. Weather station and soil moisture data would be used to guide irrigation.
 - Slow-release fertilizers consisting of nitrogen, phosphorus, and potassium would be applied on maintained grasses, but primarily on greens and fairways, in the spring and summer. Soil sampling would be performed to ensure that excess nutrients are not being washed below the root zone.
 - Pest management would be conducted primarily through proper watering of the maintained grasses.
- Simulations of golf course development were compared to baseline conditions to assess changes in the local hydrogeology.
 - Groundwater recharge rates were updated to reflect irrigation as well as a reduction in recharge from baseline due to the presence of maintained golf course grasses. It was assumed that a 50 percent reduction in recharge would occur during irrigation months, and a 25 percent reduction would occur during the remainder of the year.
 - Relative changes in groundwater levels from baseline to post-golf course development ranged from an increase of 0.15 feet in the summer months to a decrease of 1.2 feet in the winter months. The largest water level changes are predicted to occur immediately below new structures and maintained grass areas and would decrease in magnitude with distance from the course.
 - Simulated groundwater fluxes to the wetlands showed a net decrease throughout much of the year, with no change during the summer months when groundwater levels were simulated to be below the root zone of the wetland plants. The period of peak difference in groundwater flux occurred in February and indicated a 10 percent decrease.
 - Herbaceous wetland species with shallow root depths will be most susceptible to changes in groundwater levels. The relatively small reduction in groundwater levels estimated in this study could shorten the ponding period sustaining these plants by approximately 7-10 days on either end of the growing season, which may either eliminate these species over time, or cause shifts downslope in larger or deeper swales.
 - Particle tracking to estimate groundwater flow paths of recharge from the greens mostly showed groundwater flowing towards either the Pacific Ocean or Grays Harbor. However, some particles from the southernmost greens were captured by the North Well Field.
 - No risk of saltwater intrusion is predicted due to the golf course development.
 - A sensitivity analysis indicated that reasonable changes to model input parameters did not significantly change the conclusions of the predictive simulations, regardless of their effects on model calibration.
 - Uncertainty analysis of the irrigation rates and assumed recharge reduction due to golf course grasses did not significantly affect the conclusions of the predictive simulations. Recharge reduction due to golf course grasses appears to be the most significant hydrogeological change to be caused by the proposed course. Small changes to the irrigation

rate, or the amount of irrigation water infiltrating past the root zone, had little effect on the predictive model outcome because the hydrologic system is more heavily influenced by recharge that occurs during the wetter non-irrigation months.

- Key risks of the golf course development include:
 - Small reduction in groundwater levels during the winter months;
 - A reduction in groundwater fluxes to the wetlands that ranges from approximately 10 to 20 percent over the course of the year, though the greatest absolute difference would be in the late winter when water levels are the highest. During this period the reduction is approximately 10 percent; and
 - Risk of nutrients, particularly nitrogen, washing past the root zone in the southern portion of the golf course and being captured by the North Well Field.

5.8 Recommendations

The assumptions made in this study are intended to be conservative and bracketed by reasonable uncertainty. Several recommendations can be made to assist in validating the conclusions of this study and safeguarding groundwater in the Park from adverse impacts:

- Ensure that the proposed irrigation and fertilization plans are followed.
- Conduct routine groundwater monitoring (through installation of shallow groundwater wells) in and around the golf course for both water levels and water quality:
 - Continuous monitoring of water levels with pressure transducers will allow for clear interpretation of impacts to groundwater levels caused by irrigation and golf course grasses.
 - Monitoring wells should be placed at strategic locations between the golf course and sensitive receptors including the wetlands and the North Well Field.
- Conduct routine monitoring of soil moisture at and below the root zone of maintained grasses.
- Conduct routine monitoring of soil chemistry to ensure excess nutrients are not washed past the root zone of maintained grasses.
- Establish locations and begin monitoring soil moisture and groundwater for baseline conditions prior to golf course construction.

The model results presented herein are limited by both the horizontal and vertical extent of hydrologic data available for the peninsula. If plans for the golf course change in the future, and additional development scenarios need to be evaluated, AECOM makes the following recommendations for additional data collection and model refinements:

- Most of the groundwater level data used for model development were from wells drilled into the productive coarse sand and gravel layer of the Beach Deposits aquifer. However, the Park wetlands predominantly exist in the upper fine sand layer where little water level data are available. Installing and monitoring a series of shallow piezometers across the peninsula would therefore improve understanding of groundwater movement within the fine sand zone, which may help refine the model predictions.

The work required to implement these recommendations is beyond the scope of AECOM's current study.

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Appendix A NRCS Web Soil Survey



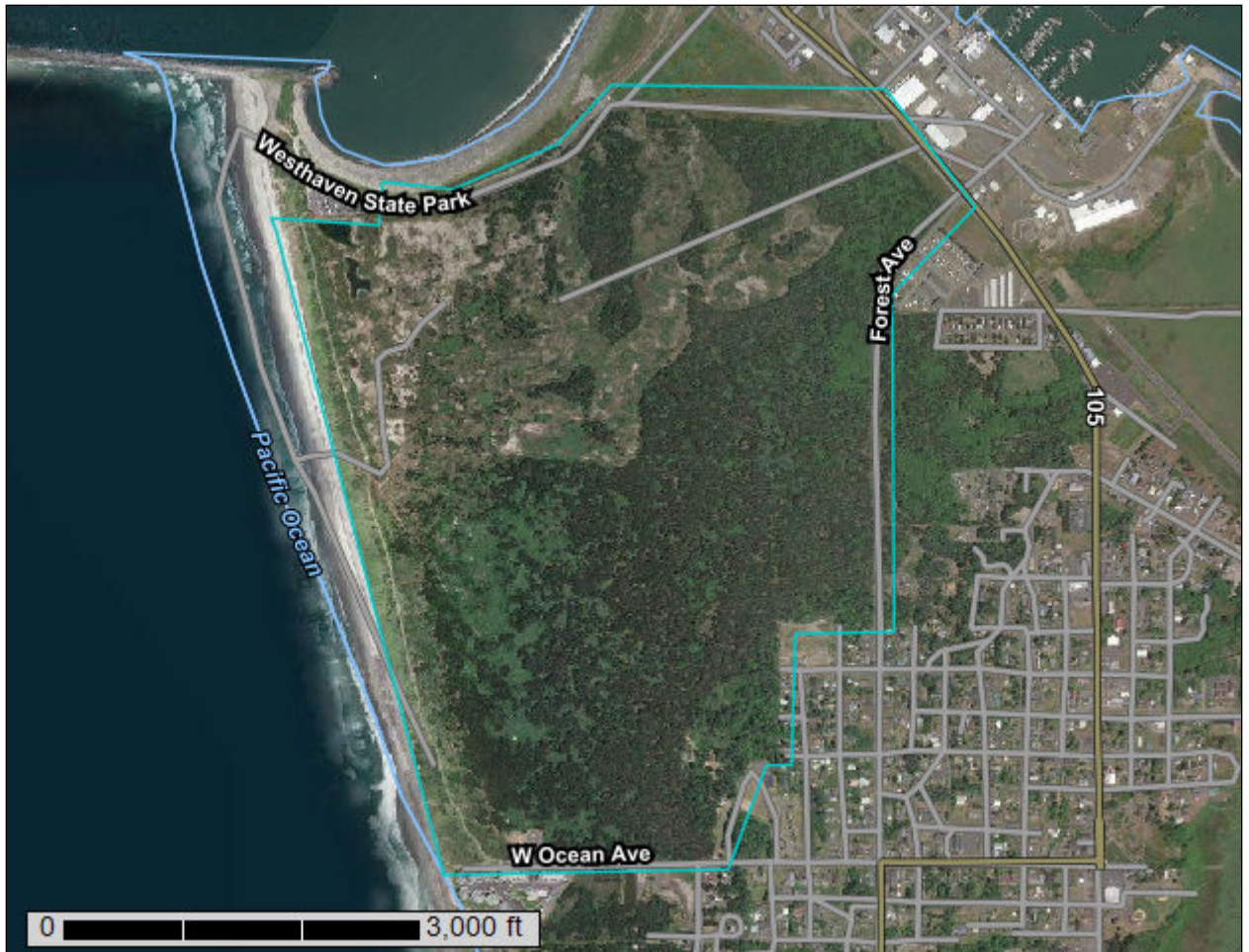
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Natural
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A product of the National
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States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Grays Harbor County Area, Pacific and Wahkiakum Counties, Washington



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

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scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

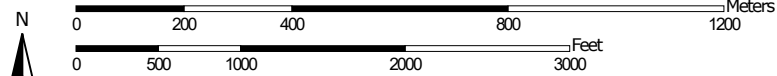
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Map Scale: 1:14,000 if printed on A portrait (8.5" x 11") sheet.




Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)


Soils


 Soil Map Unit Polygons


 Soil Map Unit Lines


 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit


 Clay Spot


 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water


 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot


 Sinkhole

 Slide or Slip


 Sodic Spot


 Spoil Area

 Stony Spot


 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals


Transportation

 Rails


 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Grays Harbor County Area, Pacific and

Wahkiakum Counties, Washington

Survey Area Data: Version 19, Jun 4, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Sep 29, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Beaches	7.6	1.2%
35	Dune land	473.0	76.8%
147	Udorthents, level	8.5	1.4%
153	Westport fine sand, 3 to 10 percent slopes	34.8	5.6%
162	Yaquina loamy fine sand	92.4	15.0%
Totals for Area of Interest		616.2	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate

Custom Soil Resource Report

pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Grays Harbor County Area, Pacific and Wahkiakum Counties, Washington

8—Beaches

Map Unit Setting

National map unit symbol: 2gnq
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 190 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition

Beaches: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Beaches

Setting

Landform: Beaches
Parent material: Beach sand and gravelly sand

Typical profile

H1 - 0 to 60 inches: Error

Properties and qualities

Slope: 1 to 5 percent
Depth to water table: About 0 to 72 inches
Frequency of flooding: Frequent

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Yes

35—Dune land

Map Unit Setting

National map unit symbol: 2gm4
Mean annual air temperature: 32 degrees F
Farmland classification: Not prime farmland

Map Unit Composition

Dune land: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dune Land

Setting

Landform: Dunes
Parent material: Eolian sands

Typical profile

C - 0 to 60 inches: fine sand

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydric soil rating: No

147—Udorthents, level

Map Unit Setting

National map unit symbol: 2gkq

Elevation: 0 to 200 feet

Mean annual precipitation: 60 to 80 inches

Mean annual air temperature: 50 degrees F

Frost-free period: 150 to 200 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Udorthents and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Landform: Tidal flats

Parent material: Sandy and loamy river dredgings

Typical profile

H1 - 0 to 6 inches: sandy loam

H2 - 6 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)

Depth to water table: About 24 to 72 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: A

Hydric soil rating: No

153—Westport fine sand, 3 to 10 percent slopes

Map Unit Setting

National map unit symbol: 2gky
Elevation: 0 to 160 feet
Mean annual precipitation: 60 to 80 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Westport and similar soils: 90 percent
Minor components: 6 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Westport

Setting

Landform: Dunes
Parent material: Eolian sands

Typical profile

H1 - 0 to 7 inches: fine sand
H2 - 7 to 60 inches: fine sand

Properties and qualities

Slope: 3 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very high (19.98 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Forage suitability group: Droughty Soils (G004AC402WA)
Other vegetative classification: Droughty Soils (G004AC402WA)
Hydric soil rating: No

Minor Components

Yaquina

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Seastrand

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

162—Yaquina loamy fine sand

Map Unit Setting

National map unit symbol: 2gl8
Elevation: 10 to 130 feet
Mean annual precipitation: 60 to 100 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 165 to 240 days
Farmland classification: Prime farmland if irrigated and drained

Map Unit Composition

Yaquina and similar soils: 80 percent
Minor components: 11 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yaquina

Setting

Landform: Depressions
Parent material: Beach sand and eolian sands

Typical profile

H1 - 0 to 9 inches: loamy fine sand
H2 - 9 to 24 inches: fine sand
H3 - 24 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water capacity: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Forage suitability group: Wet Soils (G004AC102WA)
Other vegetative classification: Wet Soils (G004AC102WA)
Hydric soil rating: Yes

Minor Components

Seastrand

Percent of map unit: 5 percent

Landform: Depressions

Hydric soil rating: Yes

Seastrand variant

Percent of map unit: 3 percent

Landform: Depressions

Hydric soil rating: Yes

Orcas

Percent of map unit: 3 percent

Landform: Depressions

Hydric soil rating: Yes

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Appendix B FEMA Floodplain Maps

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 10. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, NINGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at <http://www.ngs.noaa.gov>.

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Grays Harbor County GIS Department, WA DNR, and NGS. This information was compiled at various map scales during the time period 2004-2008.

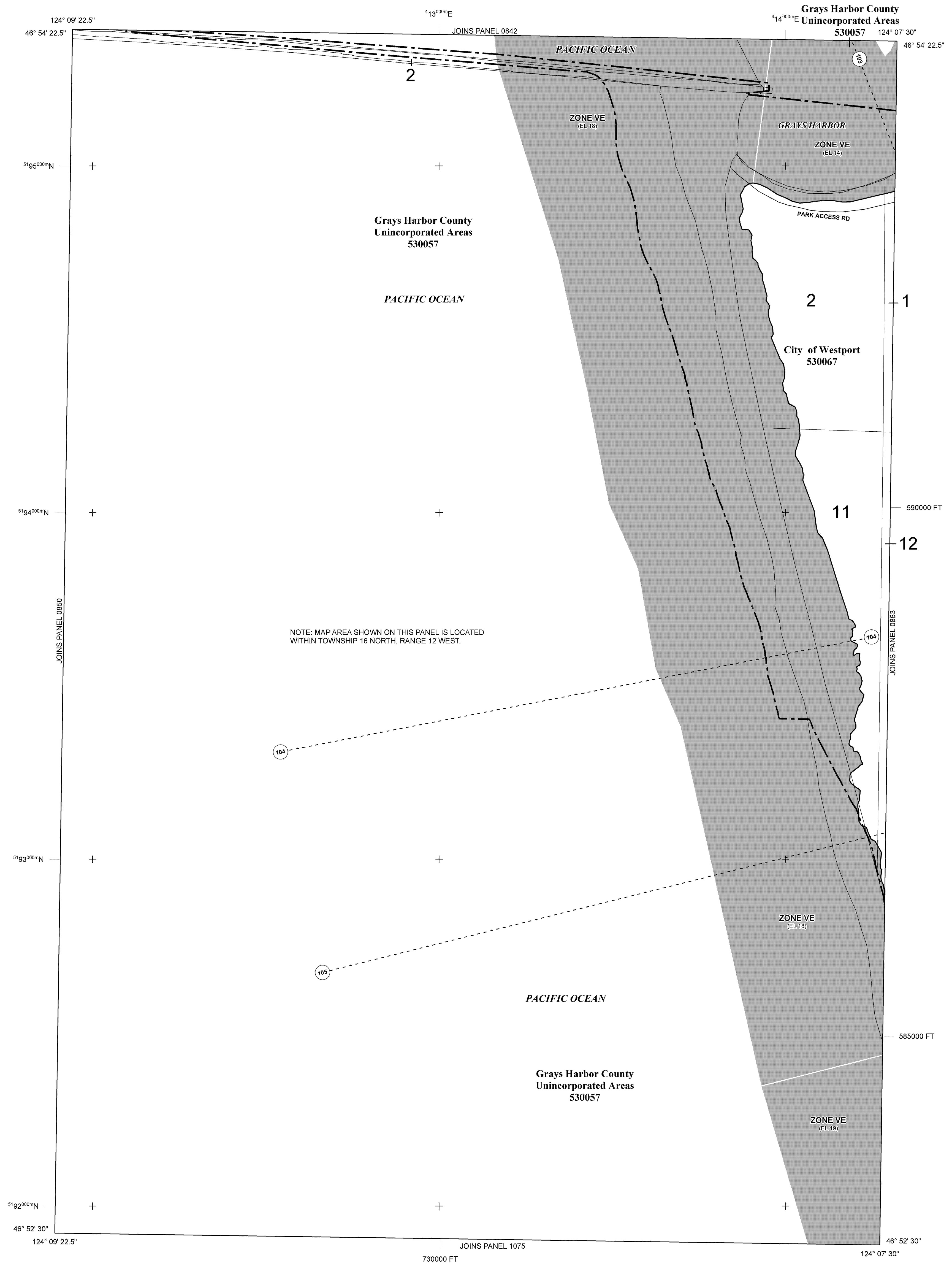
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels, community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at <http://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfip>.

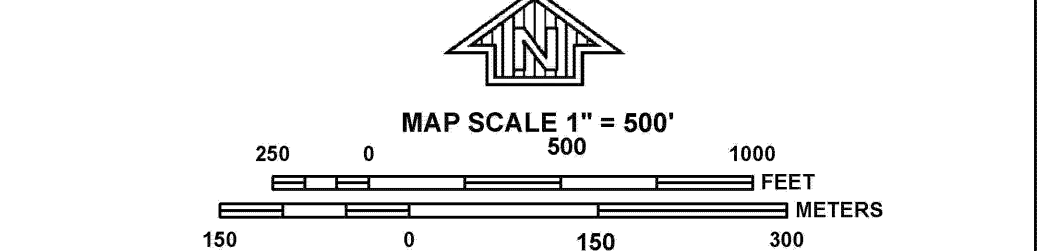


LEGEND

- SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**
The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.
- ZONE A** No Base Flood Elevations determined.
 - ZONE AE** Base Flood Elevations determined.
 - ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
 - ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
 - ZONE AR** Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently deteriorated. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
 - ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
 - ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
 - ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
- FLOODWAY AREAS IN ZONE AE**
- The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.
- OTHER FLOOD AREAS**
 - ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
 - OTHER AREAS**
 - ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
 - ZONE D** Areas in which flood hazards are undetermined, but possible.
 - COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**
 - OTHERWISE PROTECTED AREAS (OPAs)**
- CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.
- 1% Annual Chance Floodplain Boundary
 - 0.2% Annual Chance Floodplain Boundary
 - Floodway boundary
 - Zone D boundary
 - CBRS and OPA boundary
 - Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
 - Base Flood Elevation line and value; elevation in feet*
 - Base Flood Elevation value where uniform within zone; elevation in feet*
- *Referenced to the North American Vertical Datum of 1988
- Cross section line
 - Transect line
 - Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
 - 5000-foot ticks: Washington State Plane South Zone (FIPS Zone 4602), Lambert Conformal Conic projection
 - 1000-meter Universal Transverse Mercator grid values, zone 10
 - Bench mark (see explanation in Notes to Users section of this FIRM panel)
 - River Station
 - MAP REPOSITORIES
 - Refer to Map Repositories list on Map Index
 - EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
 - February 3, 2017
 - EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



PANEL 0844D

FIRM
FLOOD INSURANCE RATE MAP
GRAYS HARBOR,
WASHINGTON
AND INCORPORATED AREAS

PANEL 844 OF 1295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GRAYS HARBOR COUNTY	530057	0844	D
WESTPORT, CITY OF	530067	0844	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
53027C0844D
EFFECTIVE DATE
FEBRUARY 3, 2017

Federal Emergency Management Agency

National Flood Hazard Layer FIRMMette



124°8'6"W 46°53'43"N



Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) Zone A, V, A99	With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X	Future Conditions 1% Annual Chance Flood Hazard Zone X	Area with Reduced Flood Risk due to Levee. See Notes. Zone X	Area with Flood Risk due to Levee Zone D

OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard Zone X	Effective LOMRs	Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer	Levee, Dike, or Floodwall

OTHER FEATURES	Cross Sections with 1% Annual Chance Water Surface Elevation	Coastal Transect	Base Flood Elevation Line (BFE)	Limit of Study	Jurisdiction Boundary	Coastal Transect Baseline	Profile Baseline	Hydrographic Feature

MAP PANELS	Digital Data Available	No Digital Data Available	Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/12/2021 at 1:22 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMMette



124°7'8"W 46°53'36"N



124°6'31"W 46°53'12"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

- | | | |
|------------------------------------|--|--|
| SPECIAL FLOOD HAZARD AREAS | | Without Base Flood Elevation (BFE)
<i>Zone A, V, A99</i> |
| | | With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i> |
| | | Regulatory Floodway |
| OTHER AREAS OF FLOOD HAZARD | | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i> |
| | | Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i> |
| | | Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i> |
| | | Area with Flood Risk due to Levee <i>Zone D</i> |
| OTHER AREAS | | NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i> |
| | | Effective LOMRs |
| GENERAL STRUCTURES | | Area of Undetermined Flood Hazard <i>Zone D</i> |
| | | Channel, Culvert, or Storm Sewer |
| | | Levee, Dike, or Floodwall |
| OTHER FEATURES | | 20.2 Cross Sections with 1% Annual Chance |
| | | 17.5 Water Surface Elevation |
| | | Coastal Transect |
| | | Base Flood Elevation Line (BFE) |
| | | Limit of Study |
| MAP PANELS | | Jurisdiction Boundary |
| | | Coastal Transect Baseline |
| | | Profile Baseline |
| | | Hydrographic Feature |
| | | Digital Data Available |
| | | No Digital Data Available |
| | | Unmapped |
| | | The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location. |



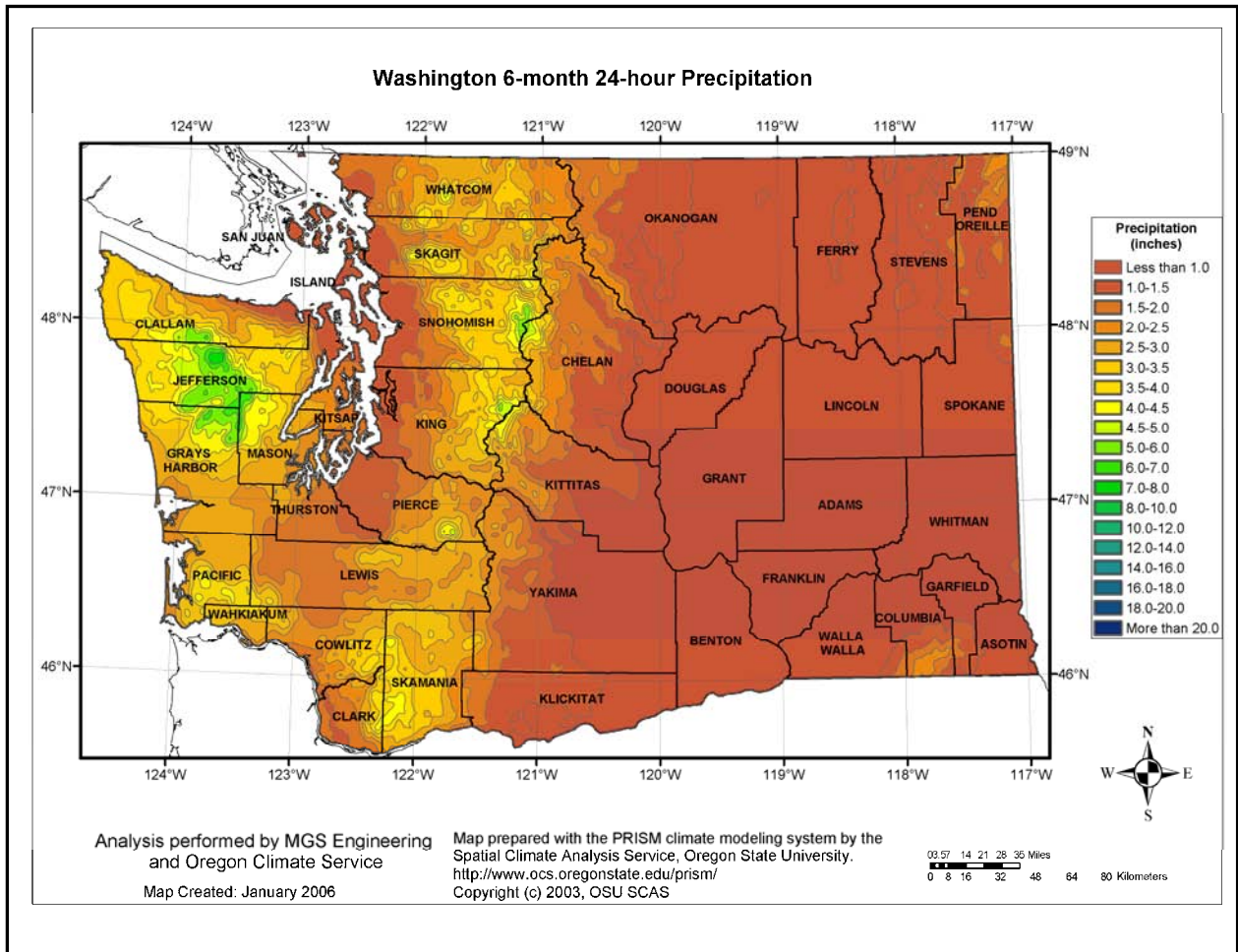
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **8/12/2021 at 1:20 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

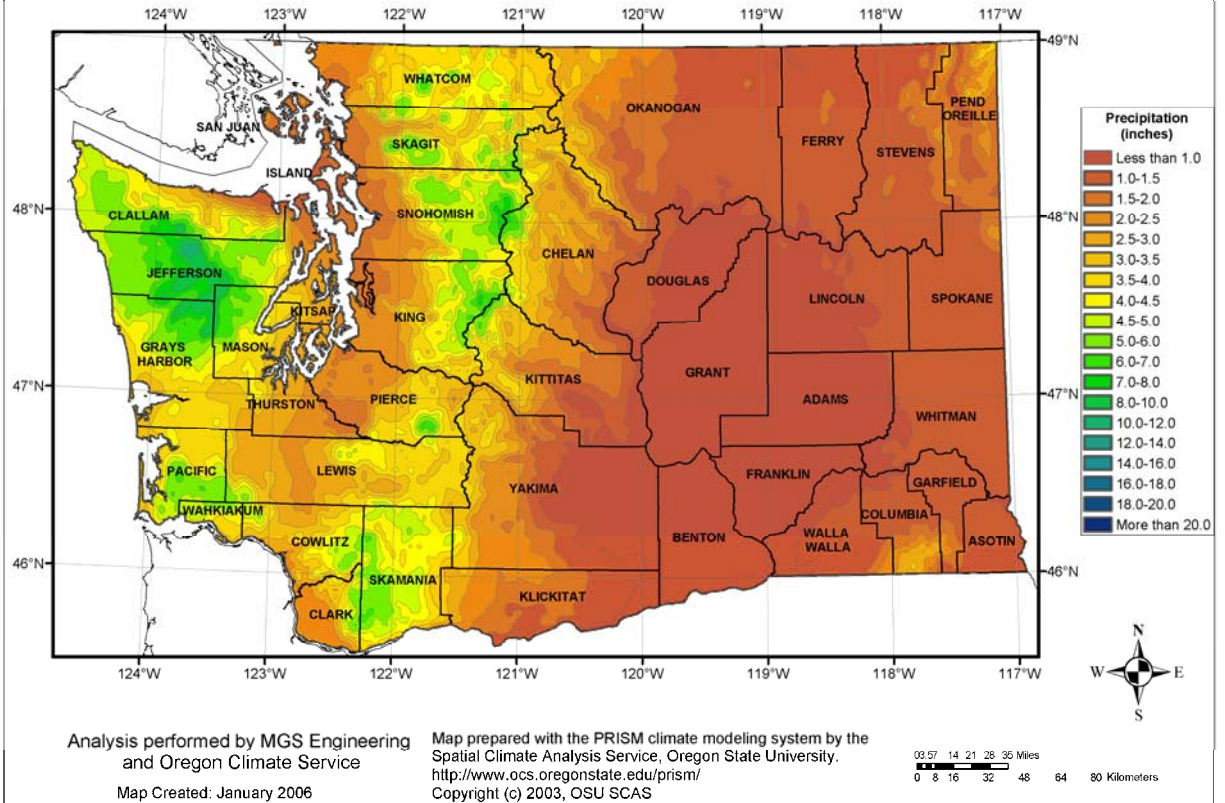
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Appendix C WSDOT 24-Hour Isopluvial Maps

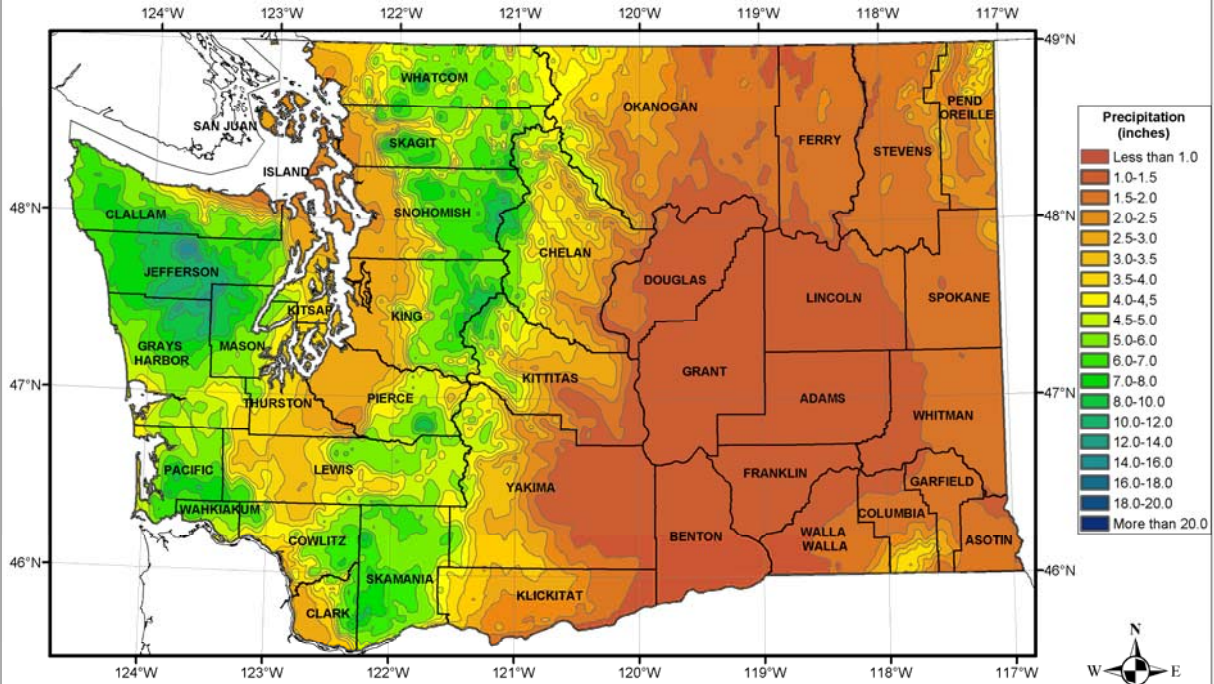
Washington 24-hour Isopluvial Maps
Statewide update on January 2006
Also available on the Environmental Workbench in ArcView



Washington 2-year 24-hour Precipitation

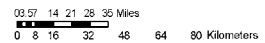


Washington 10-year 24-hour Precipitation

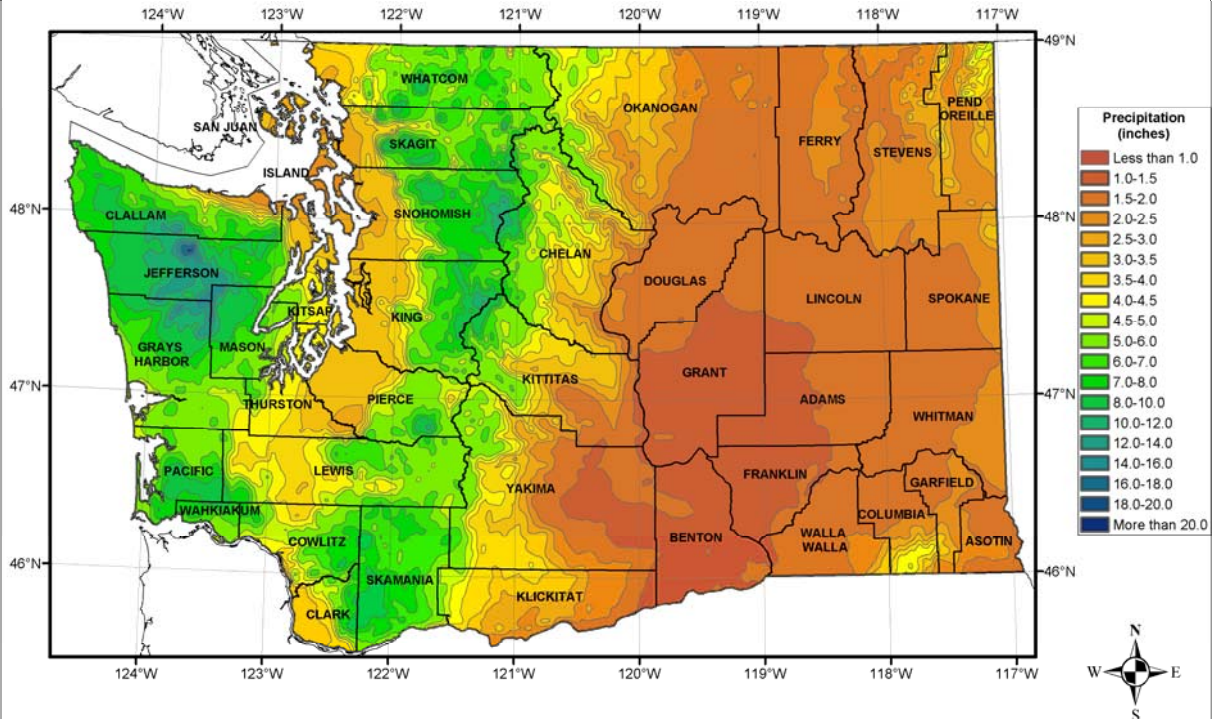


Analysis performed by MGS Engineering
and Oregon Climate Service
Map Created: January 2006

Map prepared with the PRISM climate modeling system by the
Spatial Climate Analysis Service, Oregon State University.
<http://www.ocs.oregonstate.edu/prism/>
Copyright (c) 2003, OSU SCAS



Washington 25-year 24-hour Precipitation

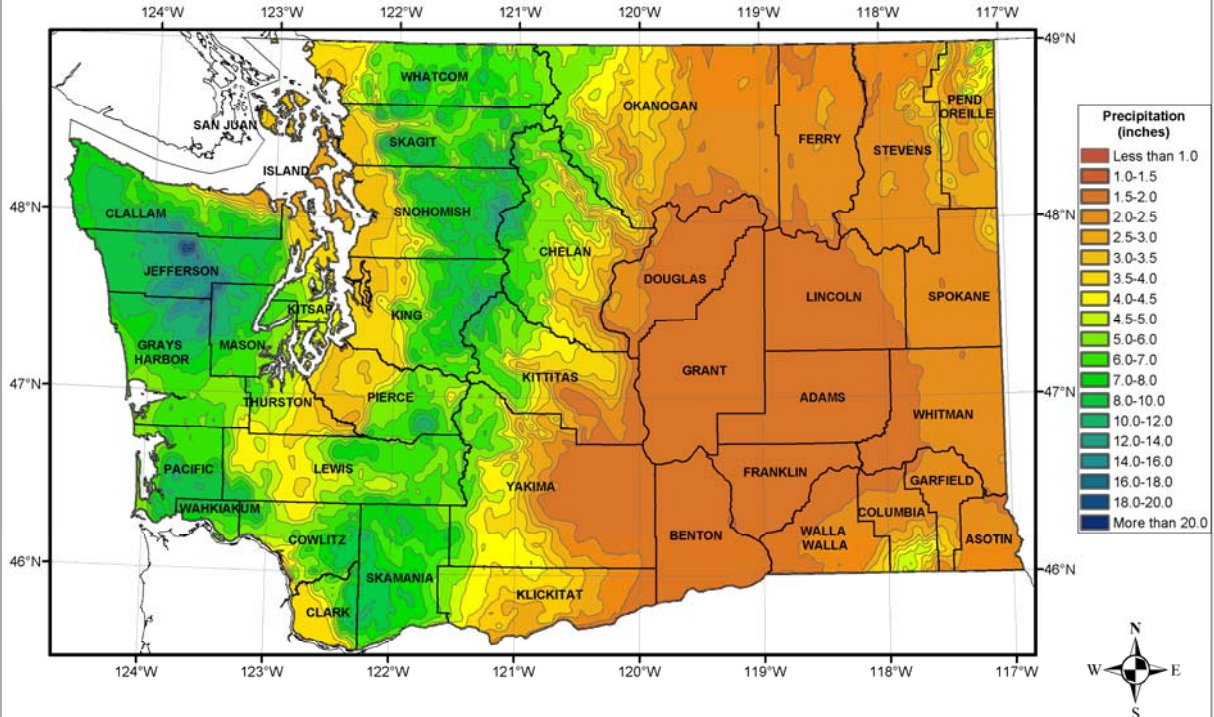


Analysis performed by MGS Engineering and Oregon Climate Service
 Map Created: January 2006

Map prepared with the PRISM climate modeling system by the Spatial Climate Analysis Service, Oregon State University.
<http://www.ocs.oregonstate.edu/prism/>
 Copyright (c) 2003, OSU SCAS



Washington 50-year 24-hour Precipitation

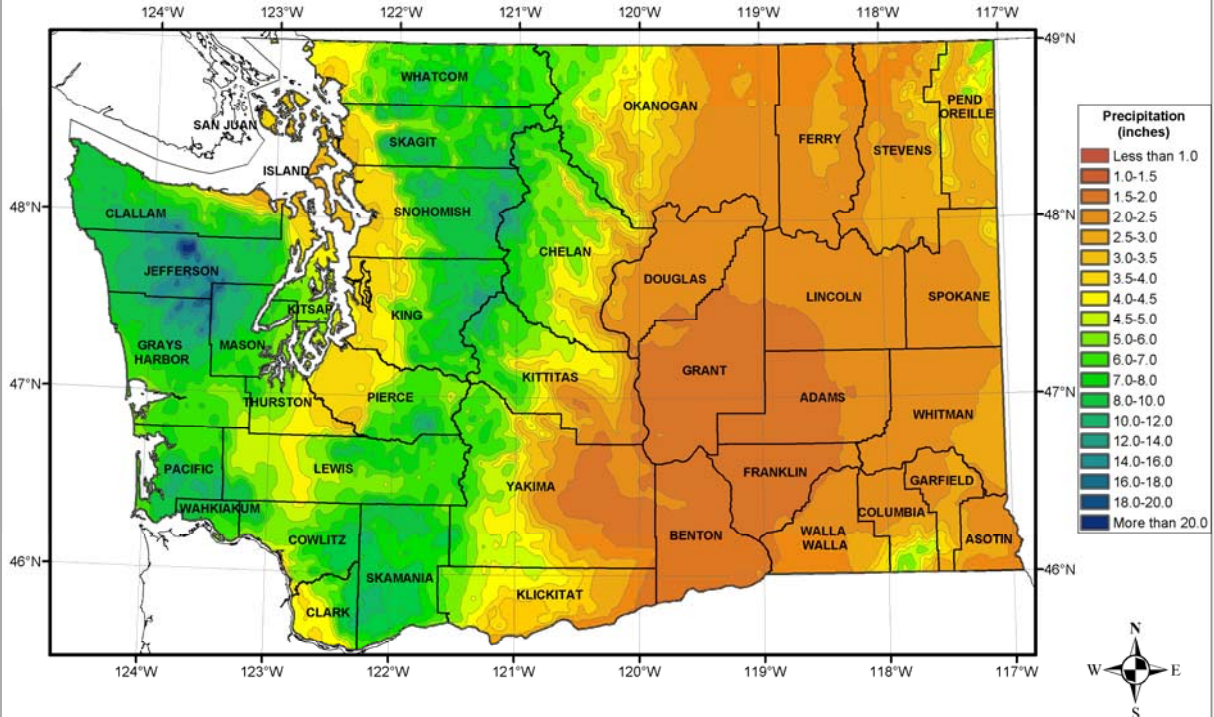


Analysis performed by MGS Engineering and Oregon Climate Service
 Map Created: January 2006

Map prepared with the PRISM climate modeling system by the Spatial Climate Analysis Service, Oregon State University.
<http://www.ocs.oregonstate.edu/prism/>
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Washington 100-year 24-hour Precipitation

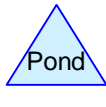
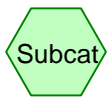


Analysis performed by MGS Engineering and Oregon Climate Service
 Map Created: January 2006

Map prepared with the PRISM climate modeling system by the Spatial Climate Analysis Service, Oregon State University.
<http://www.ocs.oregonstate.edu/prism/>
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Appendix D Existing Conditions HydroCAD Model Results



Routing Diagram for Existing Conditions_mlc
 Prepared by AECOM, Printed 1/21/2022
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Existing_Conditions_mlc

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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Yr	Type IA 24-hr		Default	24.00	1	3.43	2
2	10-Yr	Type IA 24-hr		Default	24.00	1	4.00	2
3	25-Yr	Type IA 24-hr		Default	24.00	1	4.50	2
4	50-Yr	Type IA 24-hr		Default	24.00	1	5.00	2
5	100-Yr	Type IA 24-hr		Default	24.00	1	5.50	2
6	100-Yr-2040	Type IA 24-hr		Default	24.00	1	6.43	2
7	100-Yr-2080	Type IA 24-hr		Default	24.00	1	7.32	2

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.550	30	Brush, Good, HSG A (8S)
217.110	73	Brush, Good, HSG D (1S, 2S, 3S, 4S, 5S, 6S, 7S, 9S, 10S, 11S)
0.660	98	Paved parking, HSG A (10S)
7.800	98	Paved parking, HSG D (1S, 7S, 8S, 10S)
31.020	32	Woods/grass comb., Good, HSG A (10S, 11S)
283.720	79	Woods/grass comb., Good, HSG D (5S, 6S, 7S, 8S, 9S, 10S, 11S)
540.860	74	TOTAL AREA

Existing_Conditions_mlc

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
32.230	HSG A	8S, 10S, 11S
0.000	HSG B	
0.000	HSG C	
508.630	HSG D	1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S
0.000	Other	
540.860		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.550	0.000	0.000	217.110	0.000	217.660	Brush, Good	1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S
0.660	0.000	0.000	7.800	0.000	8.460	Paved parking	1S, 7S, 8S, 10S
31.020	0.000	0.000	283.720	0.000	314.740	Woods/grass comb., Good	5S, 6S, 7S, 8S, 9S, 10S, 11S
32.230	0.000	0.000	508.630	0.000	540.860	TOTAL AREA	

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	8P	16.11	15.29	93.0	0.0088	0.025	0.0	36.0	0.0

Existing Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Time span=0.00-150.00 hrs, dt=0.01 hrs, 15001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S-NW Catchment	Runoff Area=7.320 ac 15.71% Impervious Runoff Depth=1.38" Flow Length=292' Slope=0.0200 '/ Tc=4.9 min CN=77 Runoff=2.19 cfs 0.841 af
Subcatchment 2S: 2S-NW Catchment 2	Runoff Area=4.280 ac 0.00% Impervious Runoff Depth=1.13" Flow Length=314' Tc=7.8 min CN=73 Runoff=0.93 cfs 0.404 af
Subcatchment 3S: 3S-North Catchment	Runoff Area=14.400 ac 0.00% Impervious Runoff Depth=1.13" Flow Length=148' Tc=6.7 min CN=73 Runoff=3.16 cfs 1.359 af
Subcatchment 4S: 4S - West Catchment	Runoff Area=26.590 ac 0.00% Impervious Runoff Depth=1.13" Flow Length=923' Slope=0.0030 '/ Tc=56.2 min CN=73 Runoff=3.77 cfs 2.510 af
Subcatchment 5S: 5S - West Catchment	Runoff Area=24.830 ac 0.00% Impervious Runoff Depth=1.13" Flow Length=660' Tc=11.1 min CN=73 Runoff=5.28 cfs 2.344 af
Subcatchment 6S: 6S - West Catchment	Runoff Area=21.310 ac 0.00% Impervious Runoff Depth=1.25" Flow Length=1,162' Slope=0.0017 '/ Tc=127.5 min CN=75 Runoff=2.59 cfs 2.224 af
Subcatchment 7S: 7S - Southwest	Runoff Area=54.970 ac 0.93% Impervious Runoff Depth=1.38" Flow Length=1,127' Tc=135.3 min CN=77 Runoff=7.57 cfs 6.316 af
Subcatchment 8S: 8S - South Catchment	Runoff Area=16.360 ac 4.95% Impervious Runoff Depth=1.44" Flow Length=1,480' Tc=88.6 min CN=78 Runoff=2.90 cfs 1.969 af
Subcatchment 9S: 9S - North	Runoff Area=22.710 ac 0.00% Impervious Runoff Depth=1.13" Flow Length=597' Tc=23.9 min CN=73 Runoff=4.24 cfs 2.144 af
Subcatchment 10S: 10S - Large Central / NE	Runoff Area=324.760 ac 1.84% Impervious Runoff Depth=1.31" Flow Length=2,575' Slope=0.0019 '/ Tc=393.8 min CN=76 Runoff=26.88 cfs 35.582 af
Subcatchment 11S: 11S - SE	Runoff Area=23.330 ac 0.00% Impervious Runoff Depth=0.03" Flow Length=1,924' Tc=126.8 min CN=42 Runoff=0.13 cfs 0.060 af
Reach 8R: South Ditch	Avg. Flow Depth=0.49' Max Vel=1.30 fps Inflow=2.90 cfs 1.969 af n=0.022 L=579.0' S=0.0012 '/ Capacity=2.94 cfs Outflow=2.88 cfs 1.969 af
Pond 1P: 1P- NW Pond	Peak Elev=11.63' Storage=0.841 af Inflow=2.19 cfs 0.841 af Outflow=0.00 cfs 0.000 af
Pond 2P: 2P-NW Pond 2	Peak Elev=11.42' Storage=0.404 af Inflow=0.93 cfs 0.404 af Outflow=0.00 cfs 0.000 af
Pond 3P: 3P-North Pond	Peak Elev=14.14' Storage=1.375 af Inflow=3.16 cfs 1.375 af Outflow=0.00 cfs 0.000 af
Pond 4P: 4P - West Pond	Peak Elev=13.99' Storage=2.495 af Inflow=3.77 cfs 2.510 af Outflow=0.42 cfs 0.016 af

Existing_Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Pond 5P: 5P - West Pond	Peak Elev=15.00'	Storage=1.855 af	Inflow=5.64 cfs	5.316 af	Outflow=5.52 cfs	3.480 af
Pond 6P: 6P- West Pond	Peak Elev=15.00'	Storage=3.809 af	Inflow=6.96 cfs	5.704 af	Outflow=5.91 cfs	1.921 af
Pond 7P: 7P-Southwest	Peak Elev=14.99'	Storage=3.356 af	Inflow=7.57 cfs	6.316 af	Outflow=4.10 cfs	2.972 af
Pond 8P: 8P	36.0" Round Culvert n=0.025 L=93.0' S=0.0088 '/	Peak Elev=16.92'	Inflow=2.90 cfs	1.969 af	Outflow=2.90 cfs	1.969 af
Pond 9P: 9P - North	Peak Elev=12.99'	Storage=1.412 af	Inflow=4.24 cfs	2.144 af	Outflow=1.38 cfs	0.734 af
Pond 10P: 10P-Large Central/NE	Peak Elev=12.31'	Storage=38.234 af	Inflow=29.57 cfs	38.236 af	Outflow=0.00 cfs	0.000 af
Pond 11P: 11P-SE Pond	Discarded=0.13 cfs 0.060 af	Peak Elev=13.00'	Storage=0.000 af	Inflow=0.13 cfs 0.060 af	Primary=0.00 cfs 0.000 af	Outflow=0.13 cfs 0.060 af

Total Runoff Area = 540.860 ac Runoff Volume = 55.754 af Average Runoff Depth = 1.24"
98.44% Pervious = 532.400 ac 1.56% Impervious = 8.460 ac

Existing Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 1S: 1S-NW Catchment

Runoff = 2.19 cfs @ 8.00 hrs, Volume= 0.841 af, Depth= 1.38"

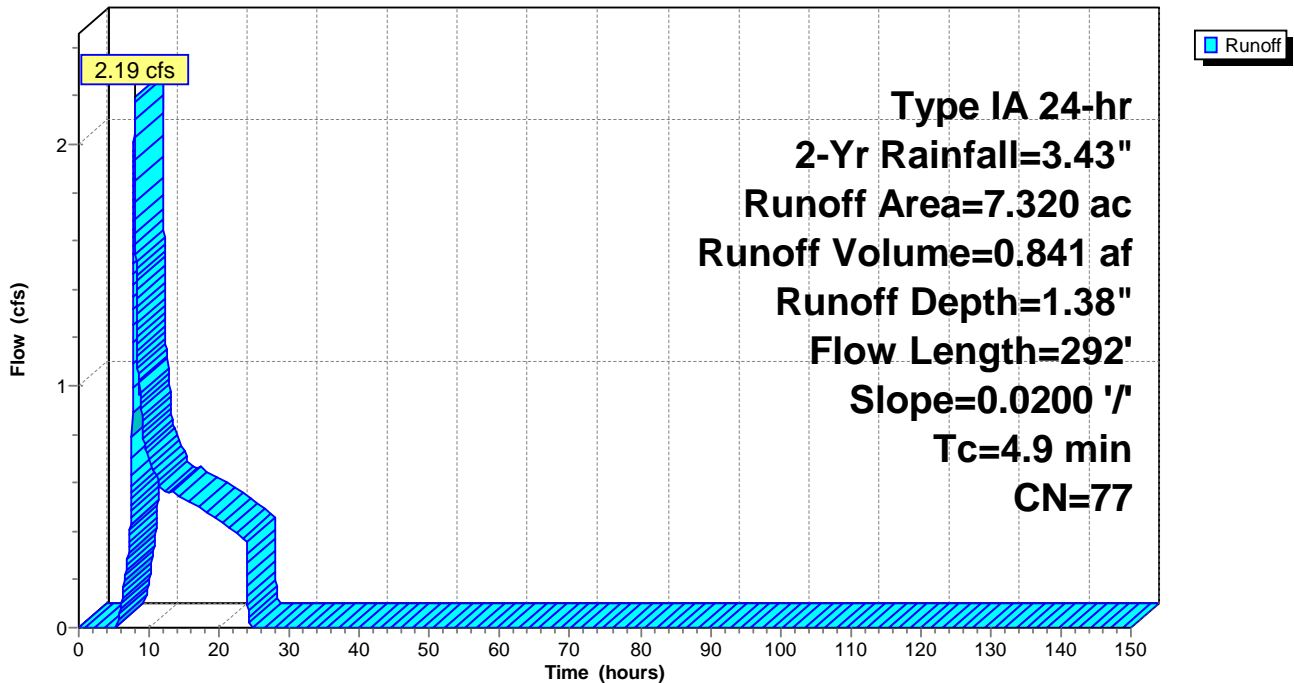
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
6.170	73	Brush, Good, HSG D
1.150	98	Paved parking, HSG D
7.320	77	Weighted Average
6.170	73	84.29% Pervious Area
1.150	98	15.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	292	0.0200	0.99		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps

Subcatchment 1S: 1S-NW Catchment

Hydrograph



Summary for Subcatchment 2S: 2S-NW Catchment 2

Sheet flow - dense comes from "native grasses" considered dense. Characterized by the wetland report.

Runoff = 0.93 cfs @ 8.03 hrs, Volume= 0.404 af, Depth= 1.13"

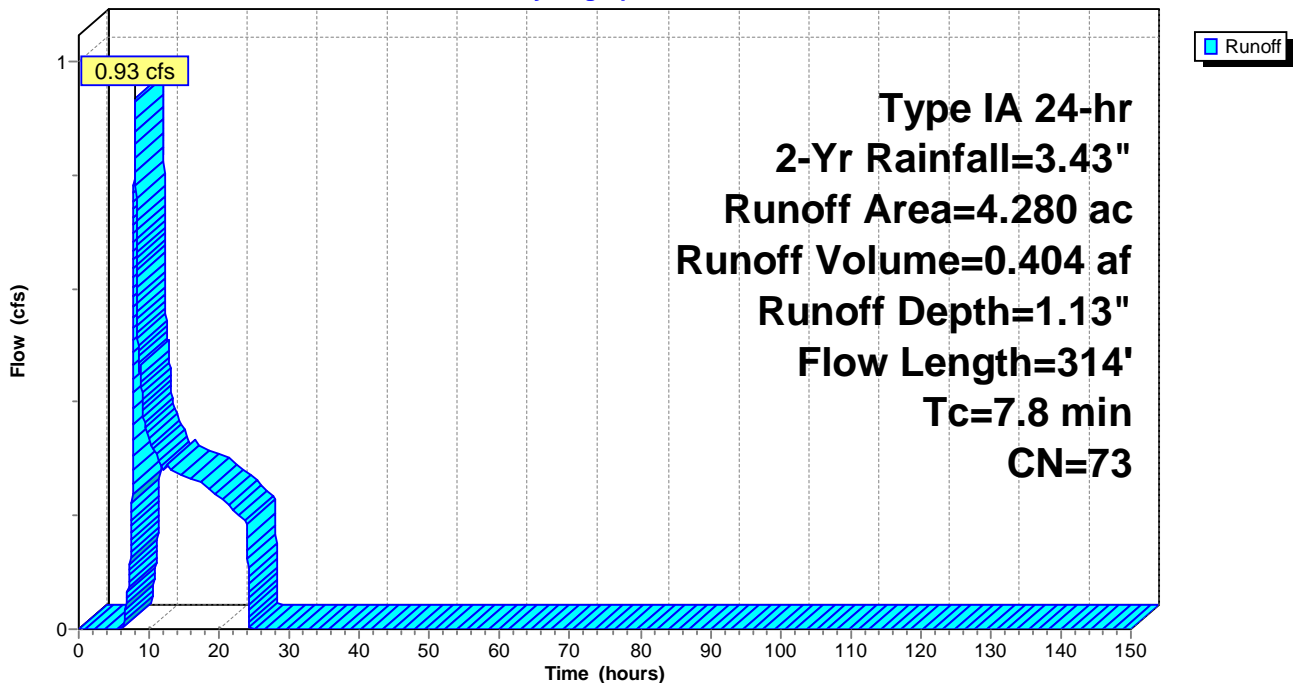
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
4.280	73	Brush, Good, HSG D
4.280	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	76	0.1300	0.24		Sheet Flow, Sheet - Dense, Native Grasses Grass: Dense n= 0.240 P2= 3.43"
2.6	238	0.0460	1.50		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
7.8	314	Total			

Subcatchment 2S: 2S-NW Catchment 2

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 3S: 3S-North Catchment

Runoff = 3.16 cfs @ 8.02 hrs, Volume= 1.359 af, Depth= 1.13"

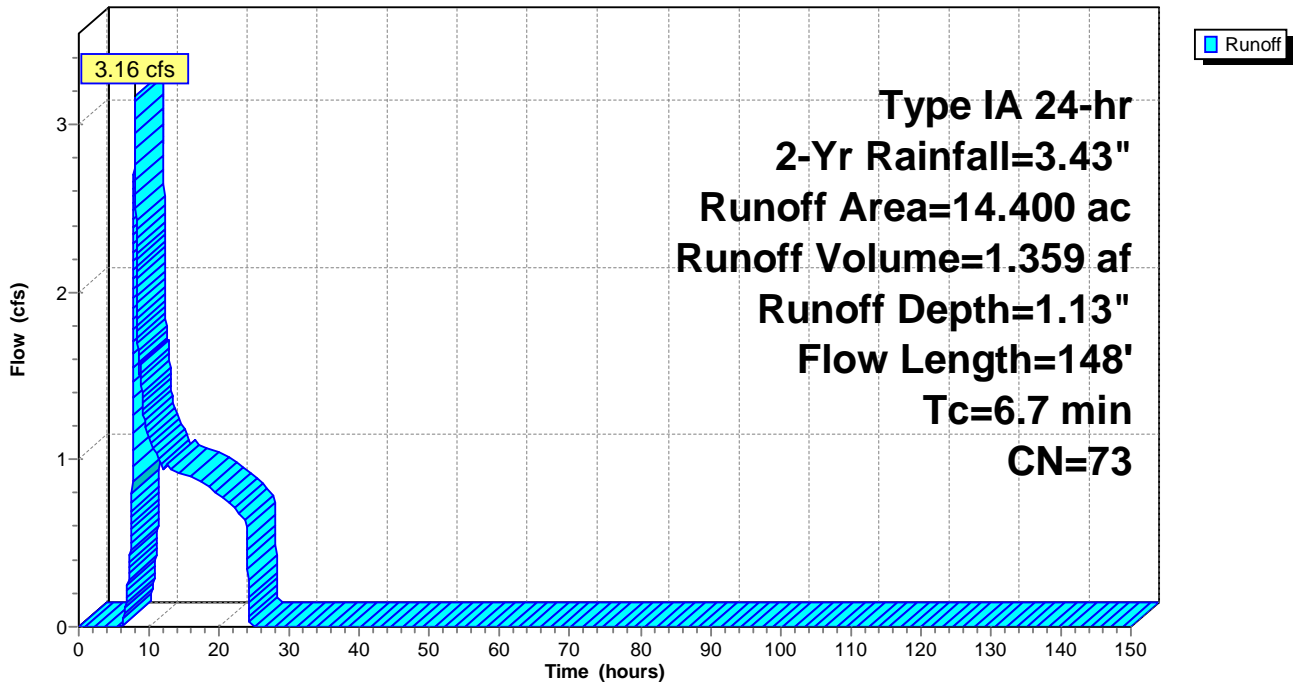
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
14.400	73	Brush, Good, HSG D
14.400	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	95	0.0950	0.33		Sheet Flow, Sheet flow - dune Grass: Short n= 0.150 P2= 3.43"
1.8	53	0.0050	0.49		Shallow Concentrated Flow, Shallow - dune grass Short Grass Pasture Kv= 7.0 fps
6.7	148	Total			

Subcatchment 3S: 3S-North Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 4S: 4S - West Catchment

Runoff = 3.77 cfs @ 8.68 hrs, Volume= 2.510 af, Depth= 1.13"

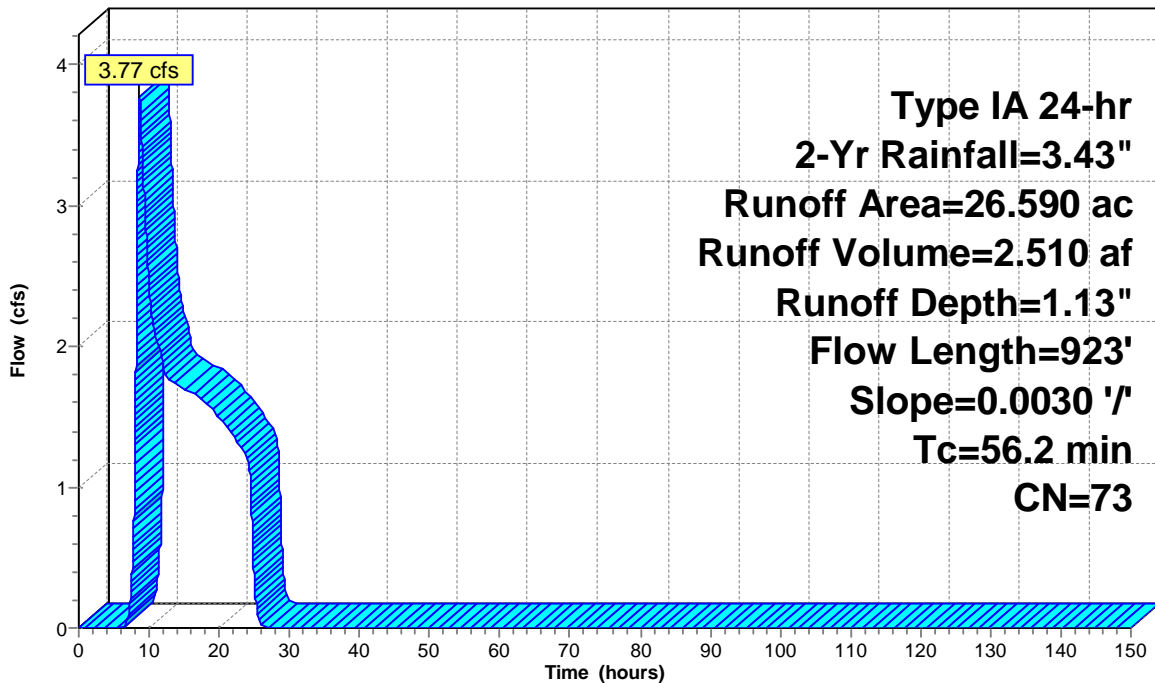
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
26.590	73	Brush, Good, HSG D
26.590	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.2	923	0.0030	0.27		Shallow Concentrated Flow, Shallow - Forest Woodland Kv= 5.0 fps

Subcatchment 4S: 4S - West Catchment

Hydrograph



Runoff

Existing Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 5S: 5S - West Catchment

Runoff = 5.28 cfs @ 8.05 hrs, Volume= 2.344 af, Depth= 1.13"

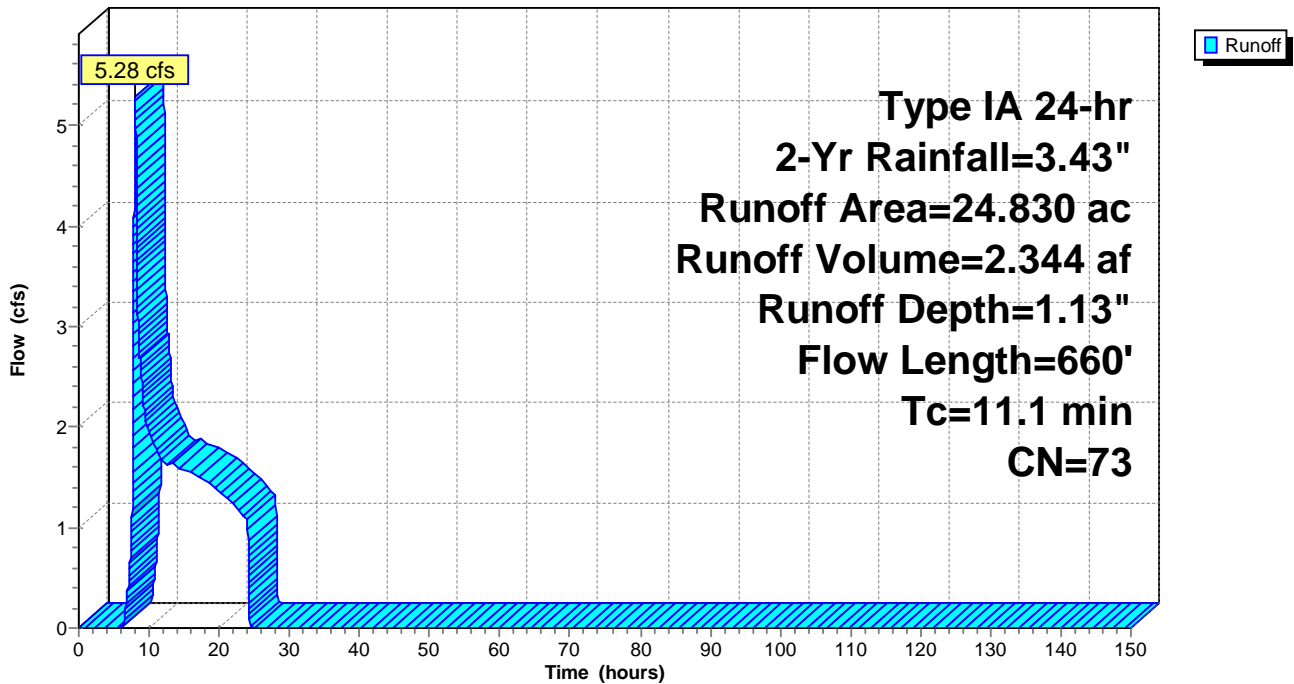
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
23.460	73	Brush, Good, HSG D
1.370	79	Woods/grass comb., Good, HSG D
24.830	73	Weighted Average
24.830	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	608	0.0180	0.94		Shallow Concentrated Flow, Shallow - Forest
					Short Grass Pasture Kv= 7.0 fps
0.3	52	0.1300	2.64		Sheet Flow, Path
					Smooth surfaces n= 0.011 P2= 3.43"
11.1	660	Total			

Subcatchment 5S: 5S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 6S: 6S - West Catchment

Runoff = 2.59 cfs @ 9.91 hrs, Volume= 2.224 af, Depth= 1.25"

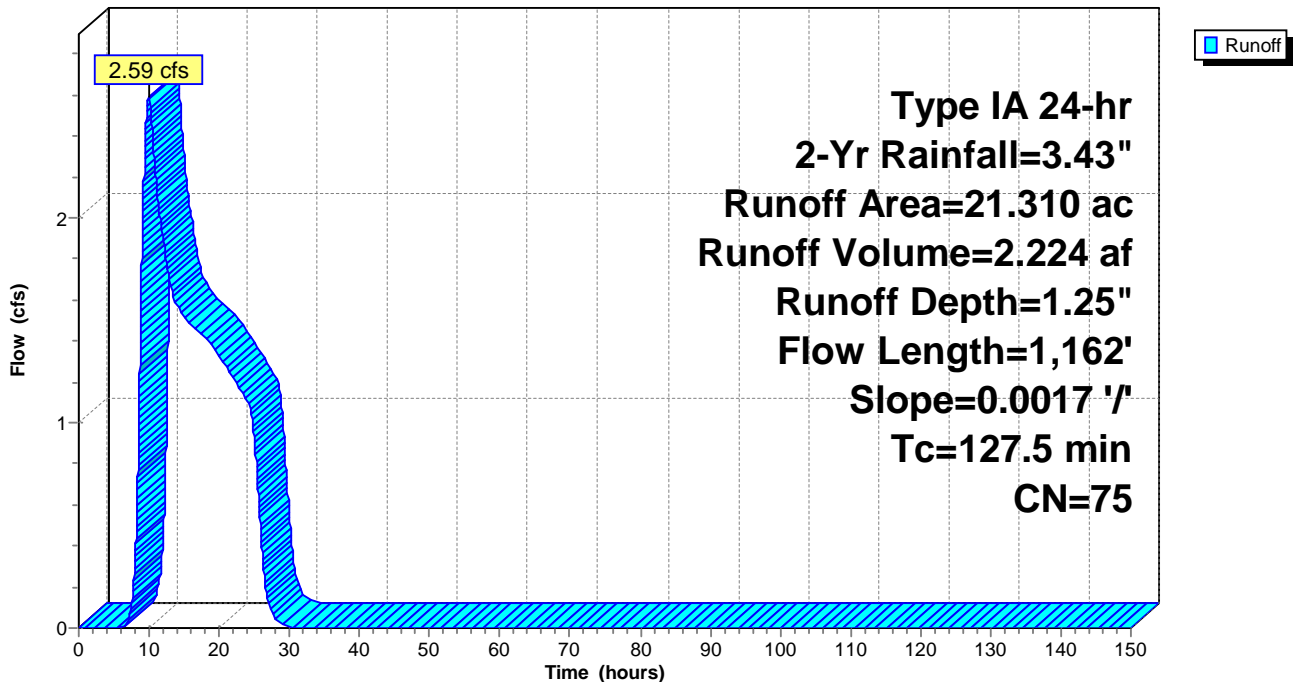
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
8.730	79	Woods/grass comb., Good, HSG D
12.580	73	Brush, Good, HSG D
21.310	75	Weighted Average
21.310	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.6	581	0.0017	0.29		Shallow Concentrated Flow, Grass - Shallow Short Grass Pasture Kv= 7.0 fps
93.9	581	0.0017	0.10		Shallow Concentrated Flow, Forested - Shallow Forest w/Heavy Litter Kv= 2.5 fps
127.5	1,162	Total			

Subcatchment 6S: 6S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 7S: 7S - Southwest

Runoff = 7.57 cfs @ 9.93 hrs, Volume= 6.316 af, Depth= 1.38"

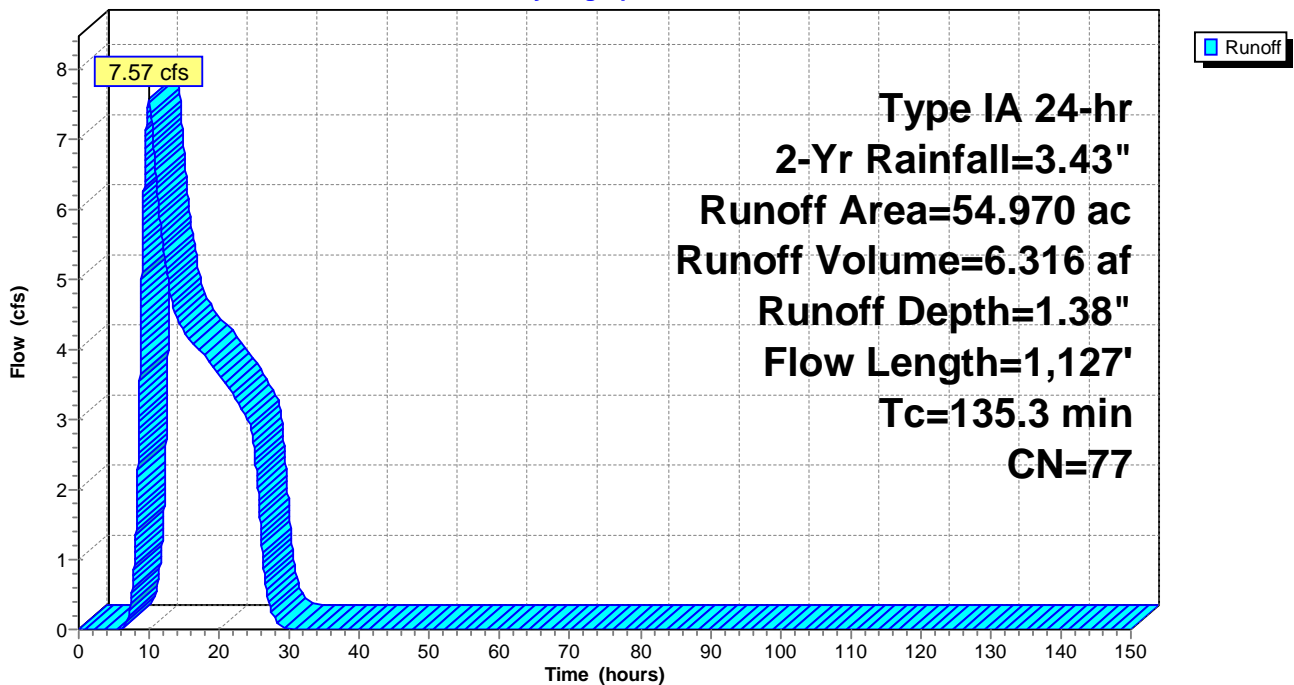
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
21.790	73	Brush, Good, HSG D
32.670	79	Woods/grass comb., Good, HSG D
0.510	98	Paved parking, HSG D
54.970	77	Weighted Average
54.460	77	99.07% Pervious Area
0.510	98	0.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	70	0.1000	0.21		Sheet Flow, Sheet - Paved to Grass Grass: Dense n= 0.240 P2= 3.43"
2.4	202	0.0390	1.38		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
127.5	855	0.0020	0.11		Shallow Concentrated Flow, Shallow - Forest Forest w/Heavy Litter Kv= 2.5 fps
135.3	1,127	Total			

Subcatchment 7S: 7S - Southwest

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 8S: 8S - South Catchment

Runoff = 2.90 cfs @ 9.16 hrs, Volume= 1.969 af, Depth= 1.44"

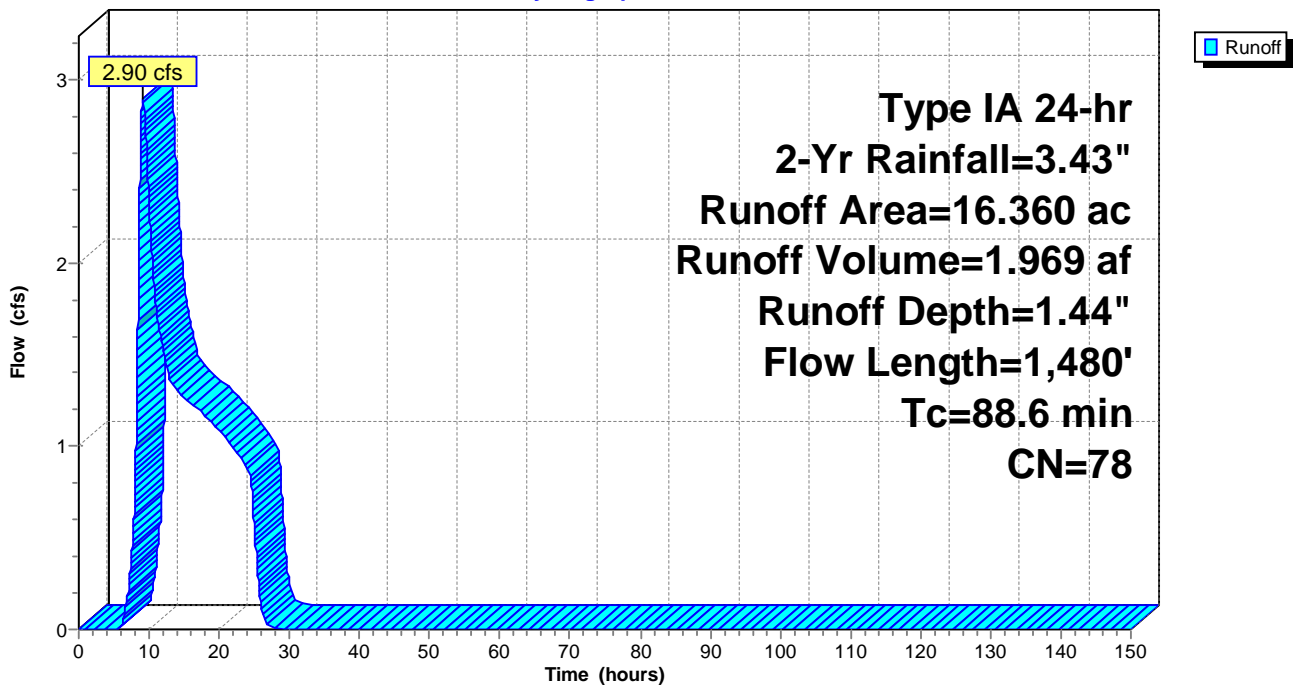
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
15.000	79	Woods/grass comb., Good, HSG D
0.550	30	Brush, Good, HSG A
0.810	98	Paved parking, HSG D
16.360	78	Weighted Average
15.550	77	95.05% Pervious Area
0.810	98	4.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	89	0.0560	0.26		Sheet Flow, Sheet- Dune grass Grass: Short n= 0.150 P2= 3.43"
67.3	844	0.0070	0.21		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps
15.6	547	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
88.6	1,480	Total			

Subcatchment 8S: 8S - South Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 9S: 9S - North

Runoff = 4.24 cfs @ 8.20 hrs, Volume= 2.144 af, Depth= 1.13"

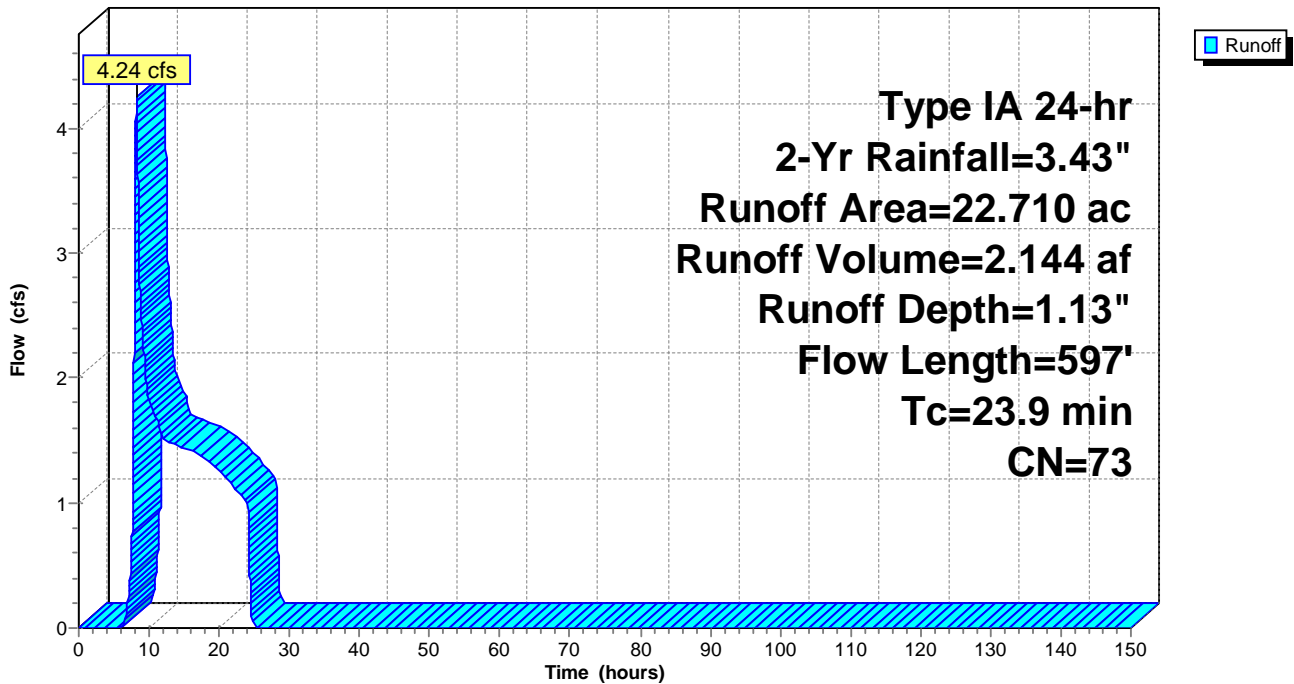
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
21.780	73	Brush, Good, HSG D
0.930	79	Woods/grass comb., Good, HSG D
22.710	73	Weighted Average
22.710	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	67	0.0450	0.15		Sheet Flow, Sheet - Grass Grass: Dense n= 0.240 P2= 3.43"
16.7	530	0.0057	0.53		Shallow Concentrated Flow, Shallow - Woods Short Grass Pasture Kv= 7.0 fps
23.9	597	Total			

Subcatchment 9S: 9S - North

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 10S: 10S - Large Central / NE

Runoff = 26.88 cfs @ 14.88 hrs, Volume= 35.582 af, Depth= 1.31"

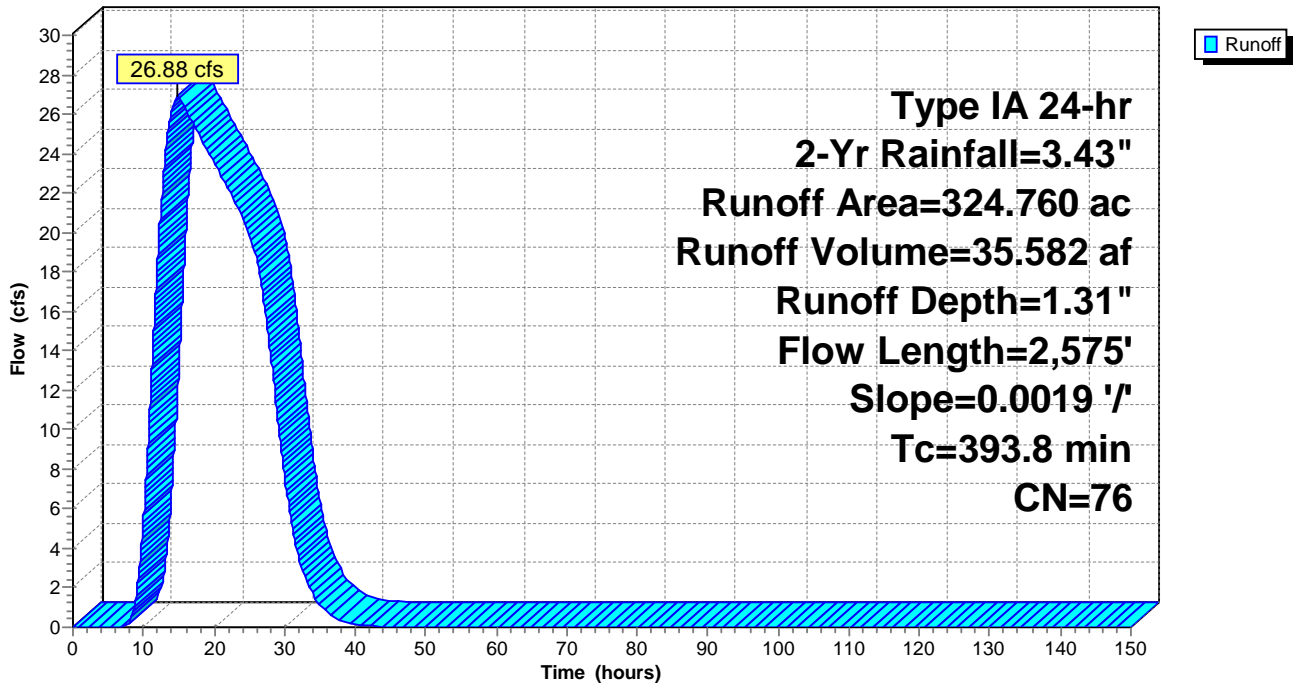
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
223.040	79	Woods/grass comb., Good, HSG D
12.880	32	Woods/grass comb., Good, HSG A
0.660	98	Paved parking, HSG A
5.330	98	Paved parking, HSG D
82.850	73	Brush, Good, HSG D
324.760	76	Weighted Average
318.770	76	98.16% Pervious Area
5.990	98	1.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
393.8	2,575	0.0019	0.11		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps

Subcatchment 10S: 10S - Large Central / NE

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 11S: 11S - SE

Runoff = 0.13 cfs @ 24.37 hrs, Volume= 0.060 af, Depth= 0.03"

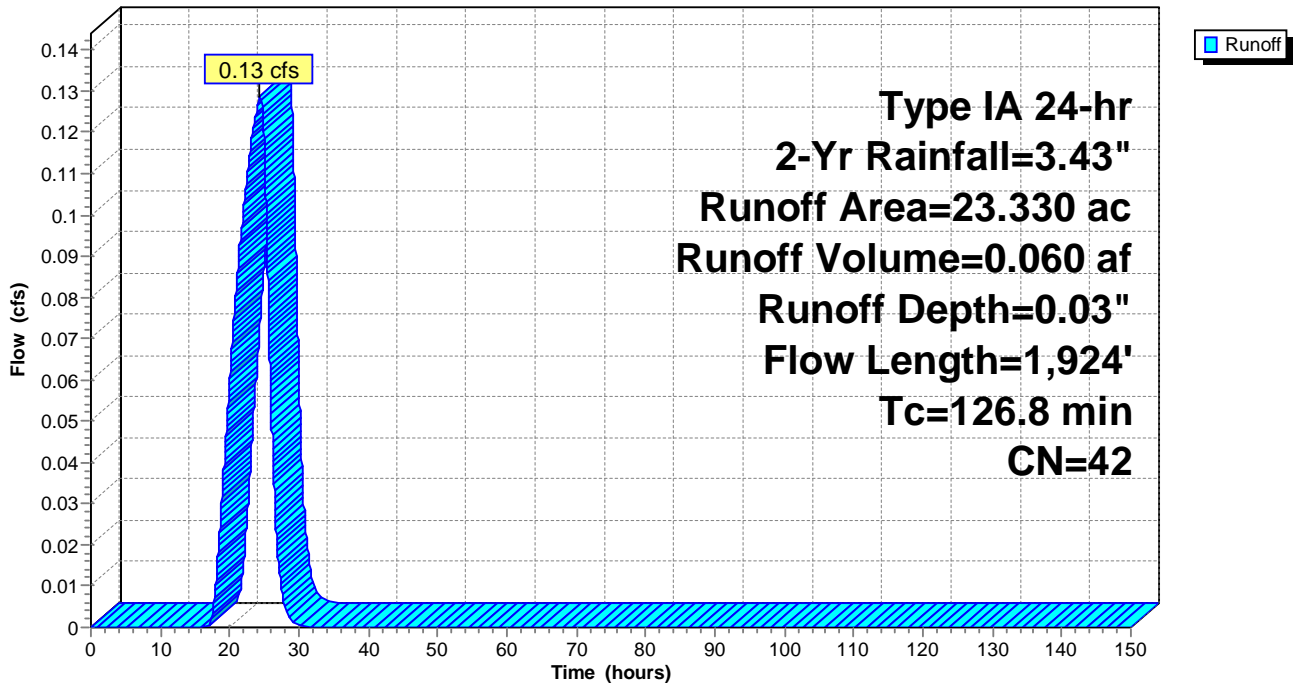
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
18.140	32	Woods/grass comb., Good, HSG A
1.980	79	Woods/grass comb., Good, HSG D
3.210	73	Brush, Good, HSG D
23.330	42	Weighted Average
23.330	42	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	126	0.1800	0.30		Sheet Flow, Sheet-Dune Grass Grass: Dense n= 0.240 P2= 3.43"
119.9	1,798	0.0100	0.25		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps
126.8	1,924	Total			

Subcatchment 11S: 11S - SE

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Reach 8R: South Ditch

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 0.38'

Inflow Area =	16.360 ac,	4.95% Impervious,	Inflow Depth = 1.44"	for 2-Yr event
Inflow =	2.90 cfs @	9.16 hrs,	Volume=	1.969 af
Outflow =	2.88 cfs @	9.36 hrs,	Volume=	1.969 af, Atten= 1%, Lag= 12.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Max. Velocity= 1.30 fps, Min. Travel Time= 7.4 min
 Avg. Velocity = 0.54 fps, Avg. Travel Time= 18.0 min

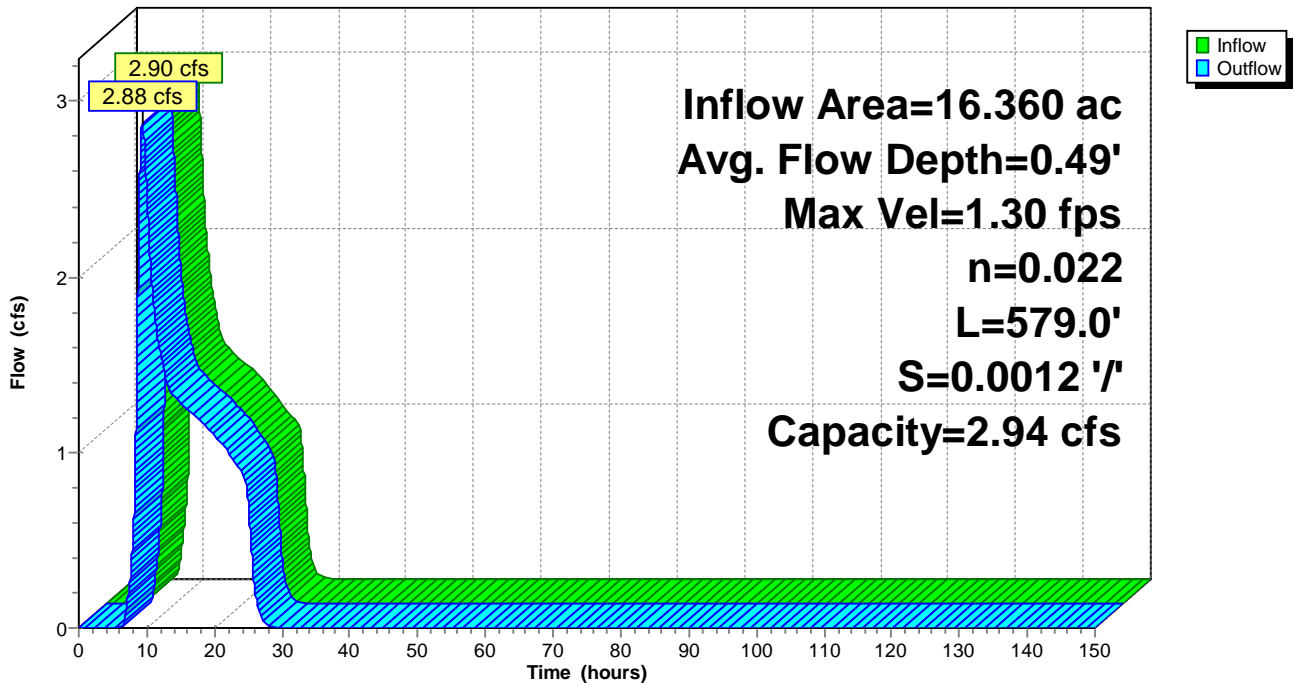
Peak Storage= 1,283 cf @ 9.24 hrs
 Average Depth at Peak Storage= 0.49' , Surface Width= 4.99'
 Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 2.94 cfs

4.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight
 Side Slope Z-value= 1.0 ' / ' Top Width= 5.00'
 Length= 579.0' Slope= 0.0012 ' / '
 Inlet Invert= 16.00', Outlet Invert= 15.30'



Reach 8R: South Ditch

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Pond 1P: 1P- NW Pond

Inflow Area = 7.320 ac, 15.71% Impervious, Inflow Depth = 1.38" for 2-Yr event
 Inflow = 2.19 cfs @ 8.00 hrs, Volume= 0.841 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 11.63' @ 24.29 hrs Surf.Area= 1.395 ac Storage= 0.841 af

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

Volume	Invert	Avail.Storage	Storage Description
#1	11.00'	6.173 af	Custom Stage Data (Irregular) Listed below (Recalc)

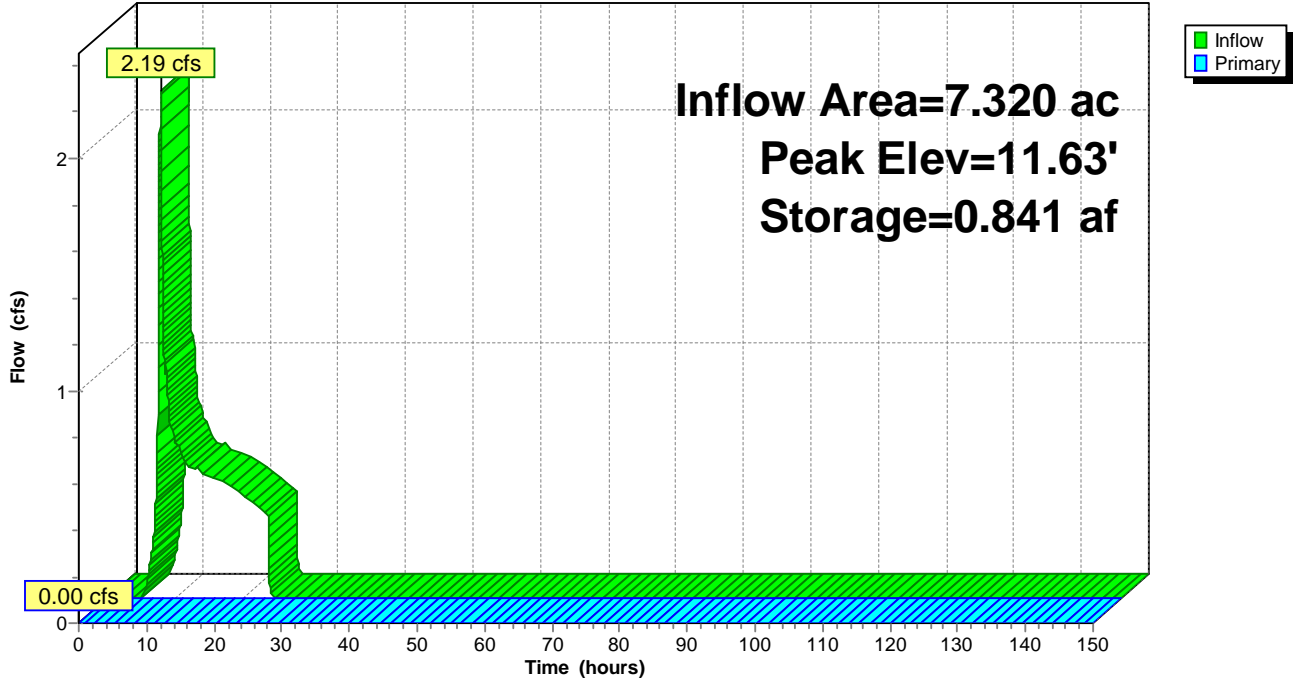
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
11.00	1.290	1,552.0	0.000	0.000	1.290
12.00	1.460	1,164.0	1.374	1.374	3.215
13.00	1.550	1,193.0	1.505	2.879	3.343
14.00	1.640	1,231.0	1.595	4.474	3.514
15.00	1.760	1,333.0	1.700	6.173	3.992

Device	Routing	Invert	Outlet Devices
#1	Primary	14.99'	1,333.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: 1P- NW Pond

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Pond 2P: 2P-NW Pond 2

Inflow Area = 11.600 ac, 9.91% Impervious, Inflow Depth = 0.42" for 2-Yr event
 Inflow = 0.93 cfs @ 8.03 hrs, Volume= 0.404 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 11.42' @ 24.45 hrs Surf.Area= 0.994 ac Storage= 0.404 af

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

Volume	Invert	Avail.Storage	Storage Description			
#1	11.00'	3.348 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
11.00	0.930	1,430.0	0.000	0.000	0.930	
12.00	1.085	1,183.0	1.007	1.007	2.109	
13.00	1.170	1,220.0	1.127	2.134	2.274	
14.00	1.260	1,273.0	1.215	3.348	2.517	

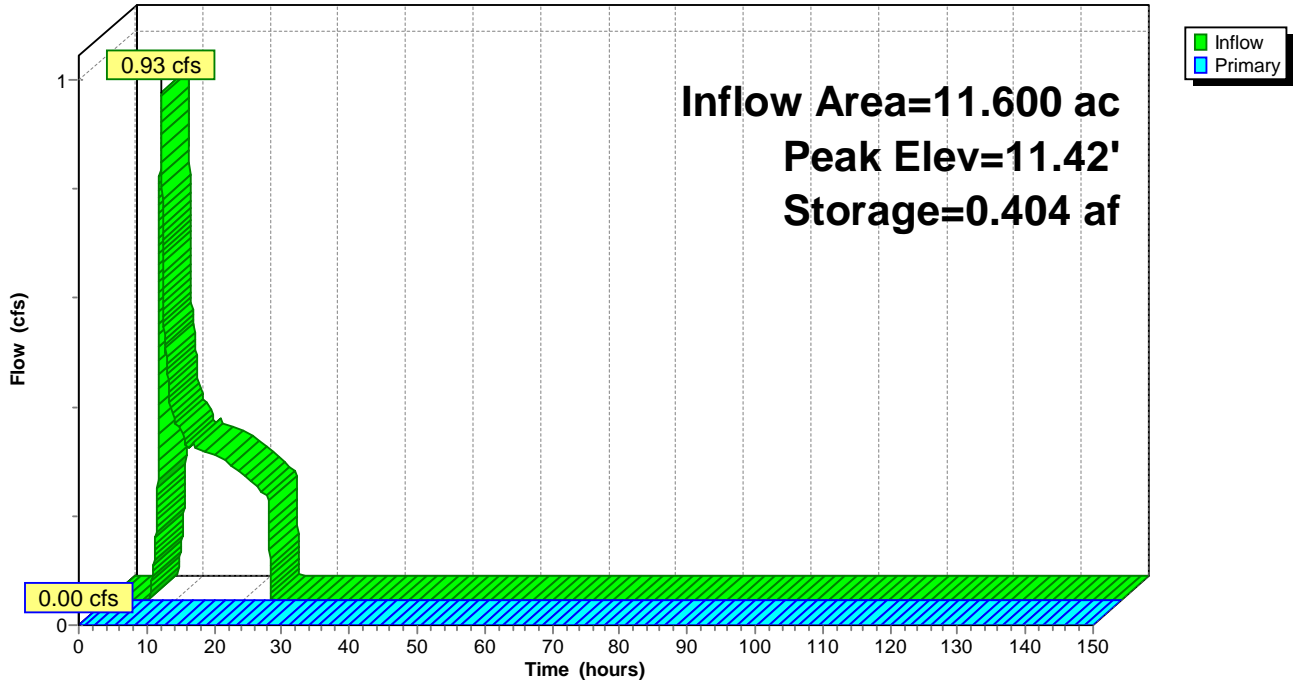
Device	Routing	Invert	Outlet Devices											
#1	Primary	13.99'	1,300.0' long x 4.0' breadth Broad-Crested Rectangular Weir											
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00											
			2.50 3.00 3.50 4.00 4.50 5.00 5.50											
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68											
			2.72 2.73 2.76 2.79 2.88 3.07 3.32											

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: 2P-NW Pond 2

Hydrograph



Existing_Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Pond 3P: 3P-North Pond

[81] Warning: Exceeded Pond 2P by 2.72' @ 149.99 hrs

[81] Warning: Exceeded Pond 4P by 0.15' @ 24.07 hrs

Inflow Area = 52.590 ac, 2.19% Impervious, Inflow Depth = 0.31" for 2-Yr event
 Inflow = 3.16 cfs @ 8.02 hrs, Volume= 1.375 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 14.14' @ 149.99 hrs Surf.Area= 1.514 ac Storage= 1.375 af

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

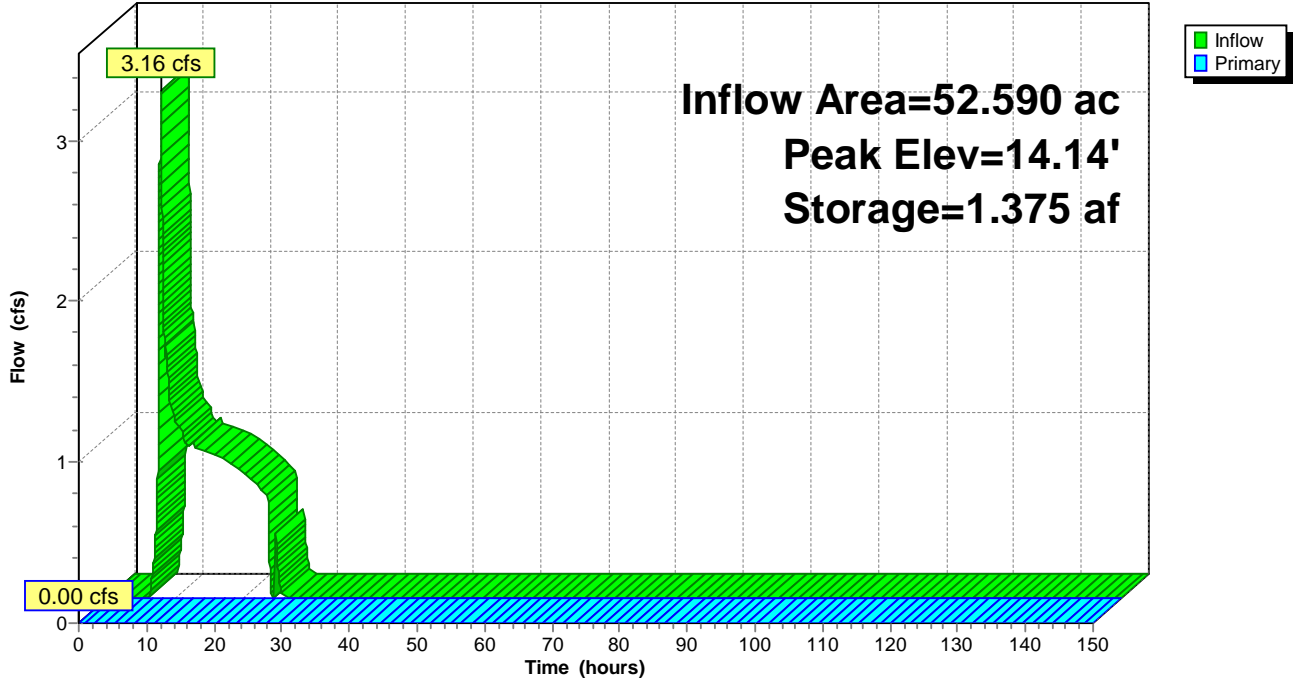
Volume	Invert	Avail.Storage	Storage Description			
#1	12.00'	2.718 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
12.00	0.086	1,508.0	0.000	0.000	0.086	
13.00	0.450	1,395.0	0.244	0.244	0.686	
14.00	1.500	4,156.0	0.924	1.168	28.685	
15.00	1.600	2,946.0	1.550	2.718	44.384	

Device	Routing	Invert	Outlet Devices											
#1	Primary	14.99'	3,000.0' long x 1.0' breadth Broad-Crested Rectangular Weir											
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00											
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32											

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=12.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 3P: 3P-North Pond

Hydrograph



Existing_Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Pond 4P: 4P - West Pond

Inflow Area = 26.590 ac, 0.00% Impervious, Inflow Depth = 1.13" for 2-Yr event
 Inflow = 3.77 cfs @ 8.68 hrs, Volume= 2.510 af
 Outflow = 0.42 cfs @ 24.93 hrs, Volume= 0.016 af, Atten= 89%, Lag= 974.8 min
 Primary = 0.42 cfs @ 24.93 hrs, Volume= 0.016 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 13.99' @ 24.93 hrs Surf.Area= 3.772 ac Storage= 2.495 af

Plug-Flow detention time= 1,072.3 min calculated for 0.016 af (1% of inflow)
 Center-of-Mass det. time= 607.3 min (1,514.7 - 907.5)

Volume	Invert	Avail.Storage	Storage Description
#1	13.00'	2.532 af	Custom Stage Data (Irregular) Listed below (Recalc)

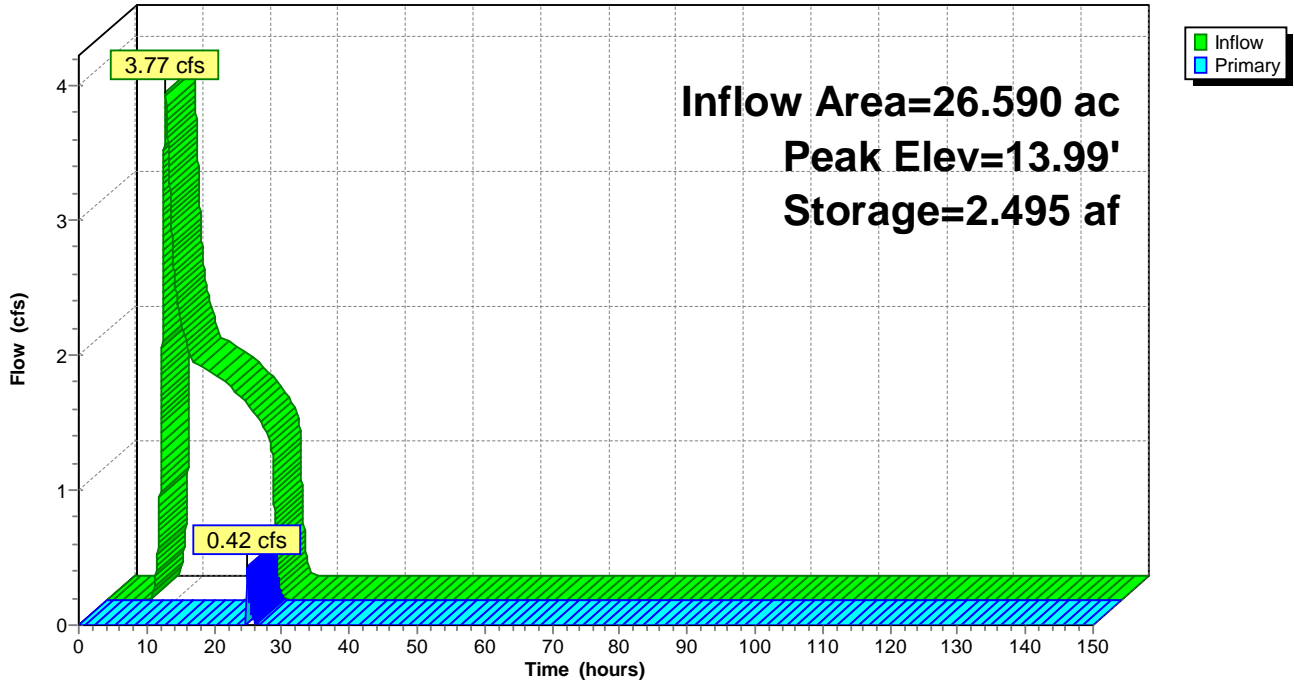
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
13.00	1.450	2,862.0	0.000	0.000	1.450
14.00	3.800	7,496.0	2.532	2.532	89.137

Device	Routing	Invert	Outlet Devices
#1	Primary	13.99'	7,496.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.06 cfs @ 24.93 hrs HW=13.99' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 0.06 cfs @ 0.04 fps)

Pond 4P: 4P - West Pond

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Pond 5P: 5P - West Pond

[79] Warning: Submerged Pond 7P Primary device # 1 by 0.01'

Inflow Area = 79.800 ac, 0.64% Impervious, Inflow Depth = 0.80" for 2-Yr event
 Inflow = 5.64 cfs @ 16.02 hrs, Volume= 5.316 af
 Outflow = 5.52 cfs @ 16.99 hrs, Volume= 3.480 af, Atten= 2%, Lag= 58.4 min
 Primary = 5.52 cfs @ 16.99 hrs, Volume= 3.480 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 15.00' @ 16.99 hrs Surf.Area= 2.664 ac Storage= 1.855 af

Plug-Flow detention time= 347.7 min calculated for 3.480 af (65% of inflow)
 Center-of-Mass det. time= 184.2 min (1,258.3 - 1,074.1)

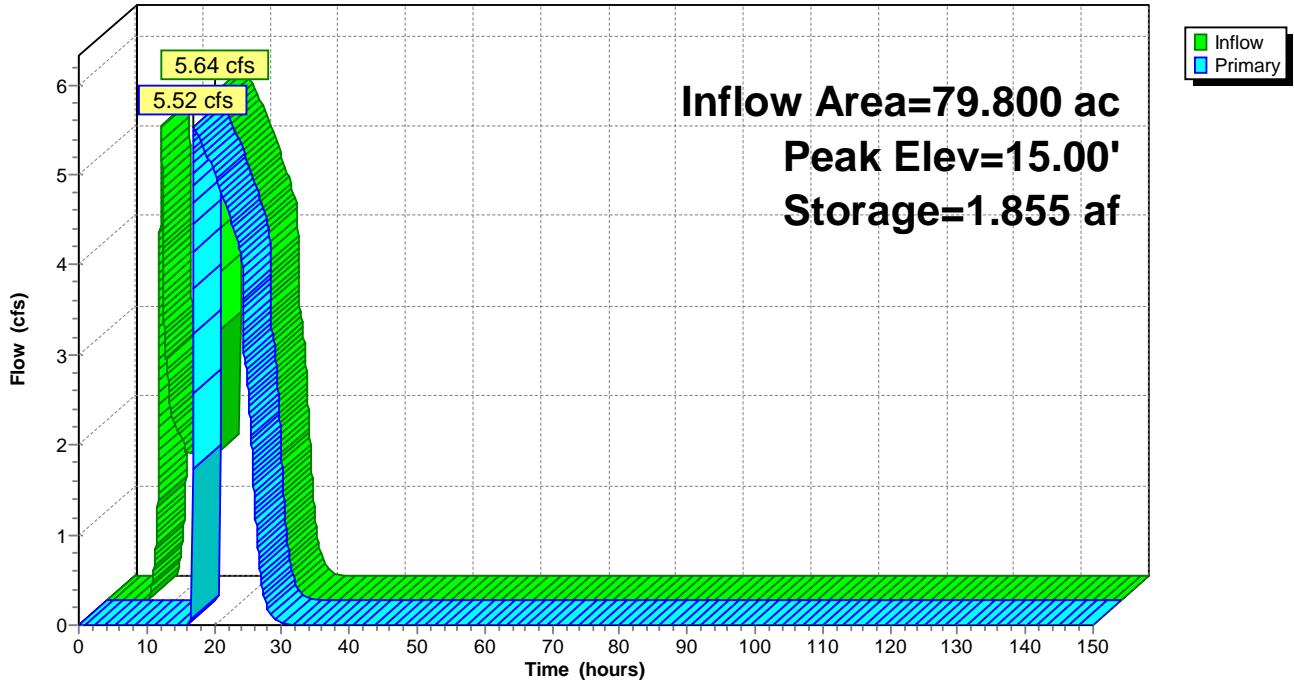
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	5.374 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	1.160	3,026.0	0.000	0.000	1.160	
15.00	2.670	3,968.0	1.863	1.863	13.196	
15.01	999.000	9,999.0	3.511	5.374	167.081	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	3,000.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=4.61 cfs @ 16.99 hrs HW=15.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 4.61 cfs @ 0.22 fps)

Pond 5P: 5P - West Pond

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Pond 6P: 6P- West Pond

[79] Warning: Submerged Pond 5P Primary device # 1 by 0.01'

Inflow Area = 101.110 ac, 0.50% Impervious, Inflow Depth = 0.68" for 2-Yr event
 Inflow = 6.96 cfs @ 16.98 hrs, Volume= 5.704 af
 Outflow = 5.91 cfs @ 21.70 hrs, Volume= 1.921 af, Atten= 15%, Lag= 283.0 min
 Primary = 5.91 cfs @ 21.70 hrs, Volume= 1.921 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 21.70 hrs Surf.Area= 4.800 ac Storage= 3.809 af

Plug-Flow detention time= 585.4 min calculated for 1.921 af (34% of inflow)
 Center-of-Mass det. time= 277.8 min (1,419.7 - 1,141.9)

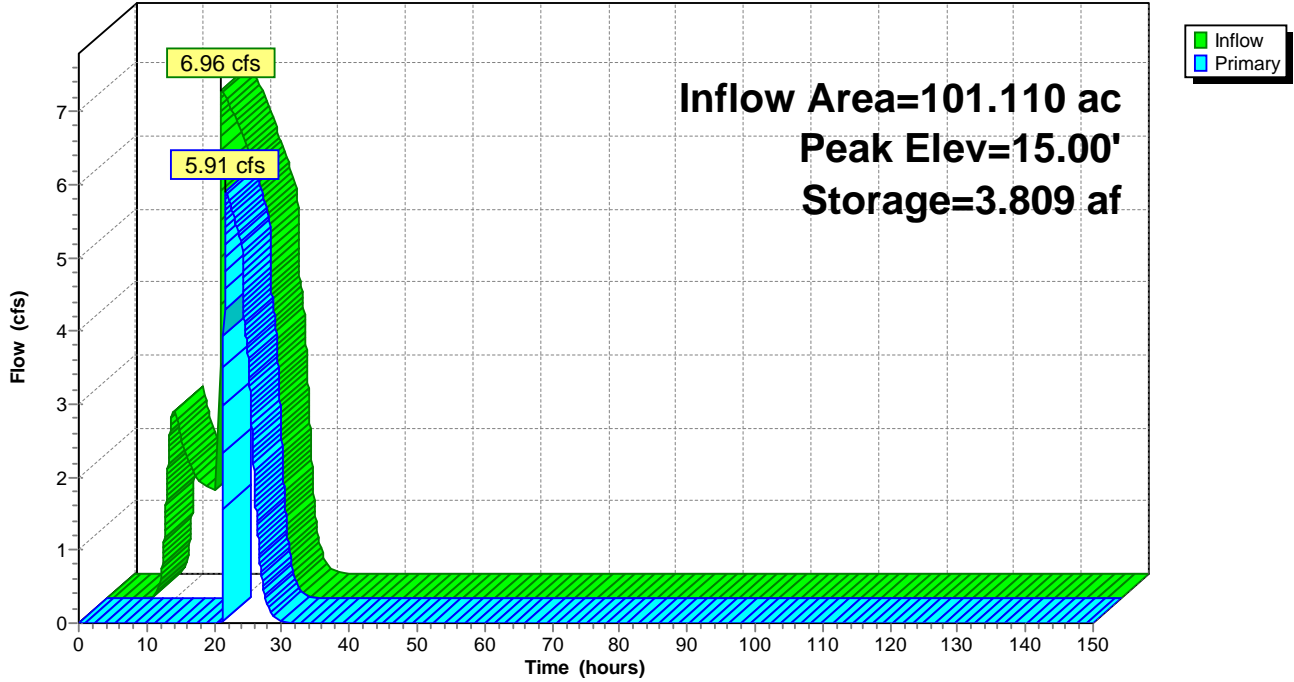
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	37.908 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.930	3,856.0	0.000	0.000	2.930	
15.00	4.810	4,175.0	3.831	3.831	7.611	
15.01	9,999.000	9,999.0	34.077	37.908	158.416	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	4,175.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=4.33 cfs @ 21.70 hrs HW=15.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 4.33 cfs @ 0.20 fps)

Pond 6P: 6P- West Pond

Hydrograph



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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Pond 7P: 7P-Southwest

Inflow Area = 54.970 ac, 0.93% Impervious, Inflow Depth = 1.38" for 2-Yr event
 Inflow = 7.57 cfs @ 9.93 hrs, Volume= 6.316 af
 Outflow = 4.10 cfs @ 16.03 hrs, Volume= 2.972 af, Atten= 46%, Lag= 366.2 min
 Primary = 4.10 cfs @ 16.03 hrs, Volume= 2.972 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 14.99' @ 16.03 hrs Surf.Area= 4.541 ac Storage= 3.356 af

Plug-Flow detention time= 562.4 min calculated for 2.972 af (47% of inflow)
 Center-of-Mass det. time= 284.9 min (1,238.4 - 953.5)

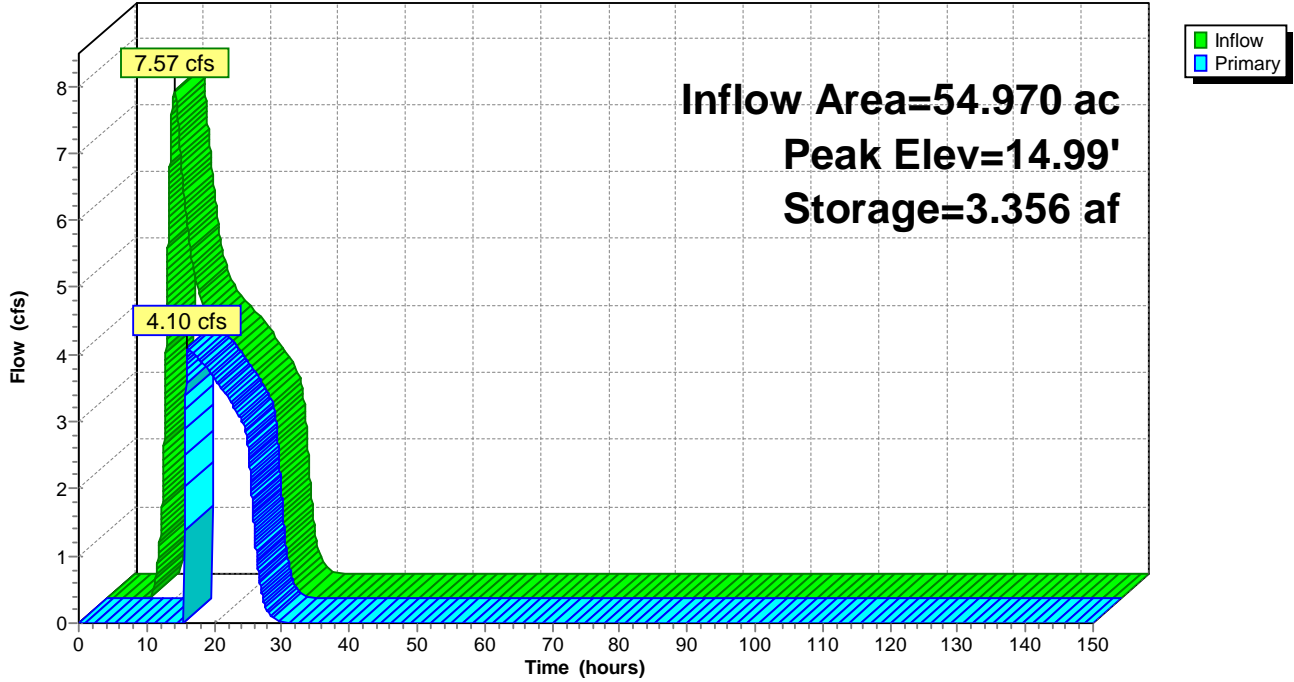
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	39.091 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.340	3,959.0	0.000	0.000	2.340	
15.00	4.560	5,430.0	3.389	3.389	27.571	
15.10	999.000	9,999.0	35.702	39.091	156.355	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	5,430.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=2.17 cfs @ 16.03 hrs HW=14.99' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 2.17 cfs @ 0.14 fps)

Pond 7P: 7P-Southwest

Hydrograph



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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Pond 8P: 8P

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 1.44" for 2-Yr event
 Inflow = 2.90 cfs @ 9.16 hrs, Volume= 1.969 af
 Outflow = 2.90 cfs @ 9.16 hrs, Volume= 1.969 af, Atten= 0%, Lag= 0.0 min
 Primary = 2.90 cfs @ 9.16 hrs, Volume= 1.969 af

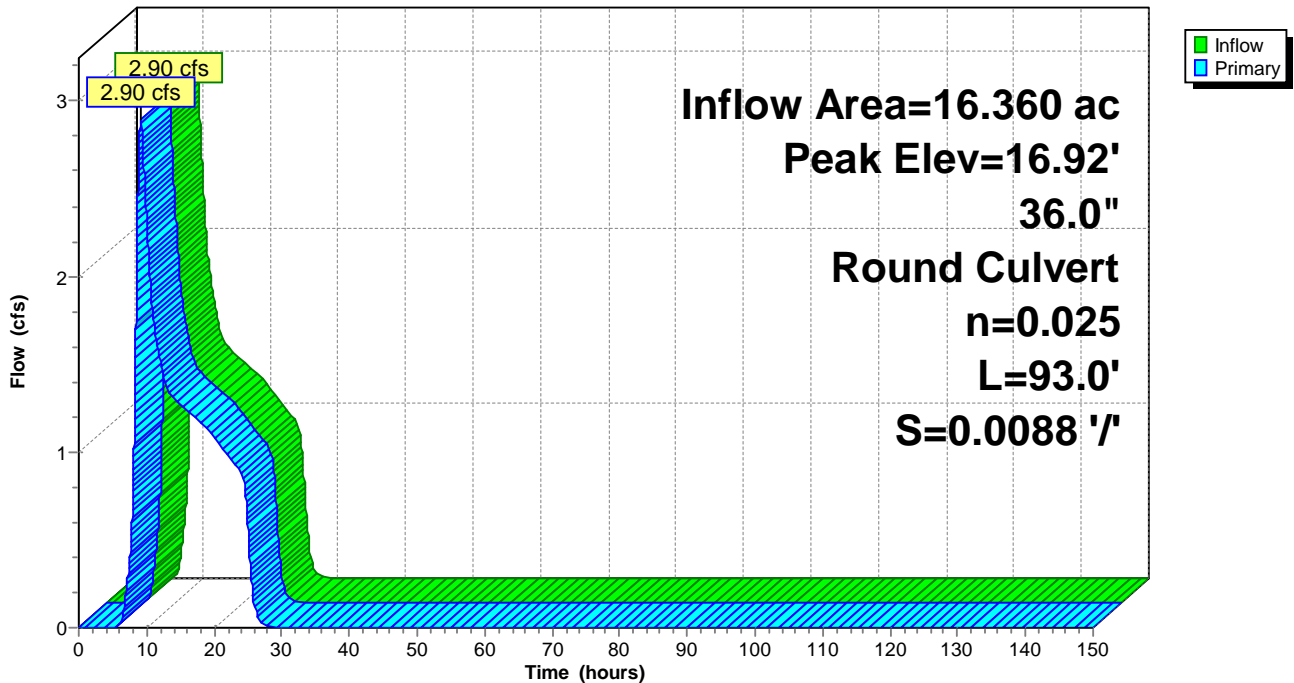
Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Peak Elev= 16.92' @ 9.16 hrs
 Flood Elev= 19.00'

Device #1	Routing	Invert	Outlet Devices
	Primary	16.11'	36.0" Round Culvert L= 93.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.11' / 15.29' S= 0.0088 '/ Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=2.89 cfs @ 9.16 hrs HW=16.92' (Free Discharge)
 ↑ **1=Culvert** (Barrel Controls 2.89 cfs @ 2.81 fps)

Pond 8P: 8P

Hydrograph



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Summary for Pond 9P: 9P - North

Inflow Area = 75.300 ac, 1.53% Impervious, Inflow Depth = 0.34" for 2-Yr event
 Inflow = 4.24 cfs @ 8.20 hrs, Volume= 2.144 af
 Outflow = 1.38 cfs @ 17.14 hrs, Volume= 0.734 af, Atten= 67%, Lag= 536.2 min
 Primary = 1.38 cfs @ 17.14 hrs, Volume= 0.734 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 12.99' @ 17.14 hrs Surf.Area= 3.660 ac Storage= 1.412 af

Plug-Flow detention time= 678.2 min calculated for 0.734 af (34% of inflow)
 Center-of-Mass det. time= 352.4 min (1,229.9 - 877.5)

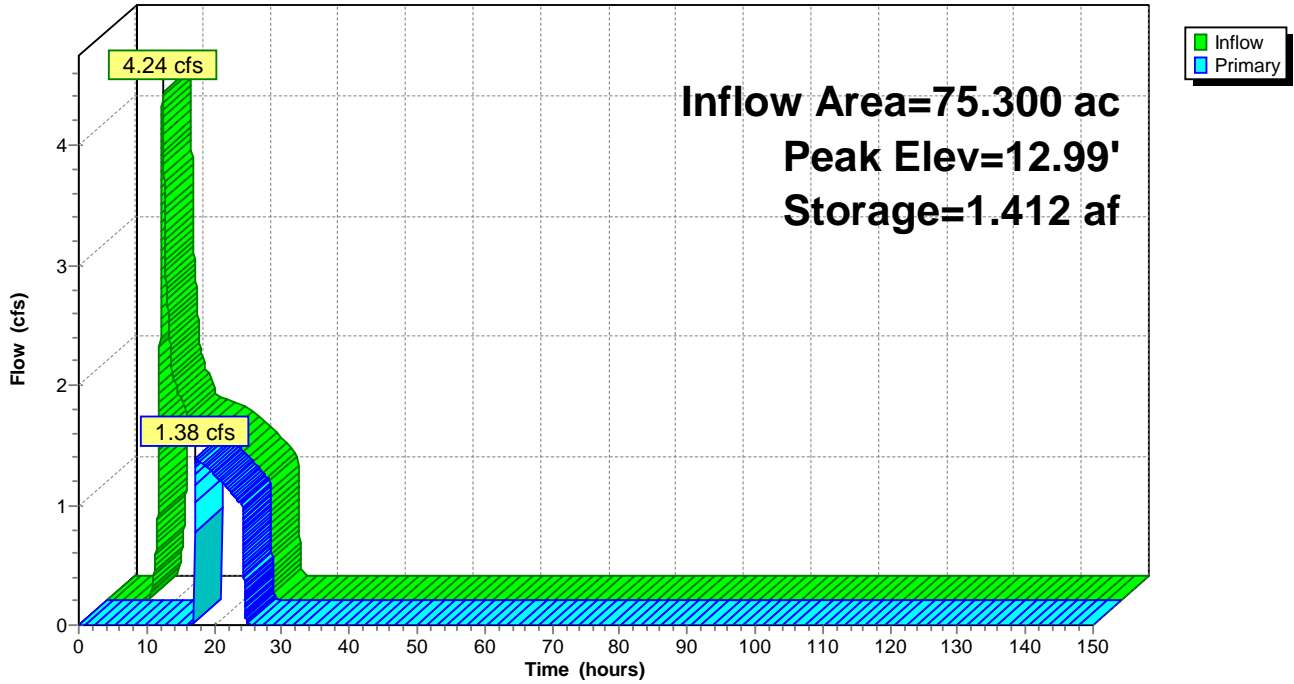
Volume	Invert	Avail.Storage	Storage Description			
#1	12.00'	1.447 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
12.00	0.079	608.0	0.000	0.000	0.079	
13.00	3.720	8,513.0	1.447	1.447	131.797	

Device	Routing	Invert	Outlet Devices					
#1	Primary	12.99'	8,513.0' long x 0.5' breadth Broad-Crested Rectangular Weir					
			Head (feet) 0.20 0.40 0.60 0.80 1.00					
			Coef. (English) 2.80 2.92 3.08 3.30 3.32					

Primary OutFlow Max=0.33 cfs @ 17.14 hrs HW=12.99' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 0.33 cfs @ 0.07 fps)

Pond 9P: 9P - North

Hydrograph



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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Pond 10P: 10P-Large Central/NE

Inflow Area = 524.500 ac, 1.46% Impervious, Inflow Depth = 0.87" for 2-Yr event
 Inflow = 29.57 cfs @ 21.63 hrs, Volume= 38.236 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.31' @ 46.39 hrs Surf.Area= 59.197 ac Storage= 38.234 af

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

Volume	Invert	Avail.Storage	Storage Description			
#1	10.00'	98.335 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.00	0.280	2,536.0	0.000	0.000	0.280	
11.00	6.414	16,985.0	2.678	2.678	515.559	
12.00	38.875	11,909.0	20.360	23.038	783.495	
13.00	119.000	22,186.0	75.297	98.335	1,423.612	

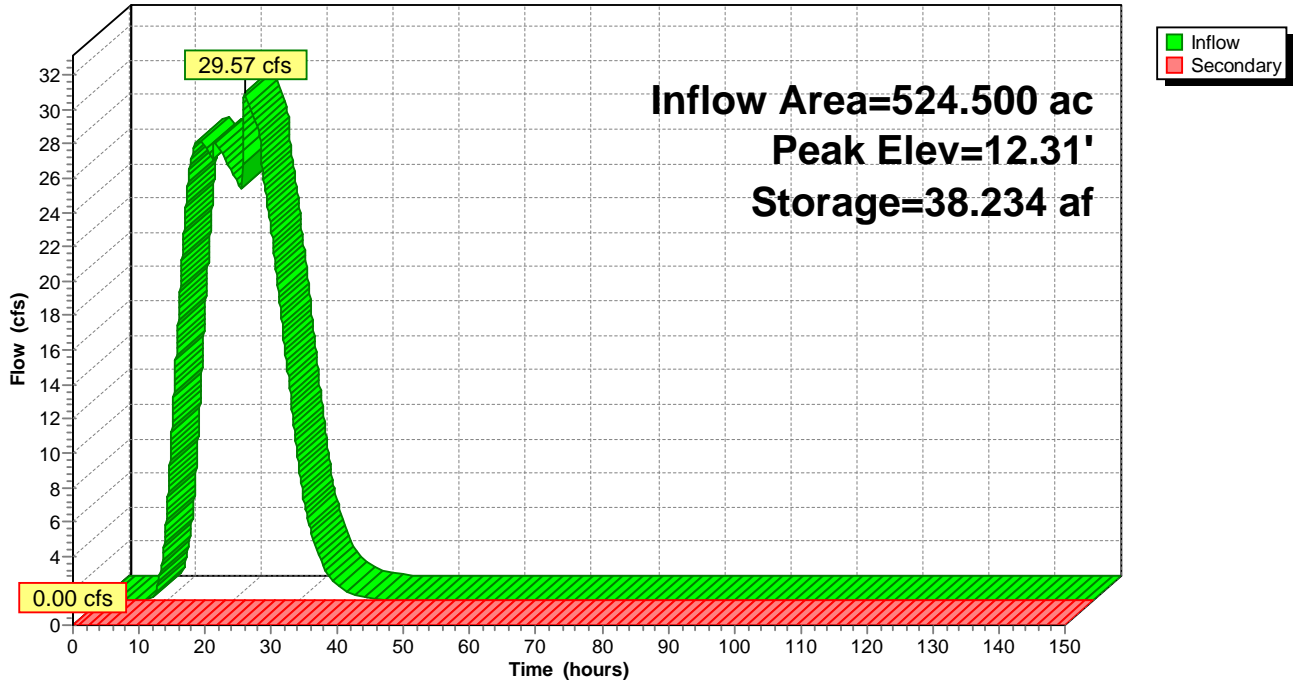
Device	Routing	Invert	Outlet Devices					
#1	Secondary	12.99'	9,999.0' long x 0.5' breadth Broad-Crested Rectangular Weir					
			Head (feet) 0.20 0.40 0.60 0.80 1.00					
			Coef. (English) 2.80 2.92 3.08 3.30 3.32					

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.00' (Free Discharge)

↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 10P: 10P-Large Central/NE

Hydrograph



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Summary for Pond 11P: 11P-SE Pond

Inflow Area = 23.330 ac, 0.00% Impervious, Inflow Depth = 0.03" for 2-Yr event
 Inflow = 0.13 cfs @ 24.37 hrs, Volume= 0.060 af
 Outflow = 0.13 cfs @ 24.39 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.7 min
 Discarded = 0.13 cfs @ 24.39 hrs, Volume= 0.060 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 13.00' @ 24.39 hrs Surf.Area= 0.231 ac Storage= 0.000 af

Plug-Flow detention time= 0.7 min calculated for 0.060 af (100% of inflow)
 Center-of-Mass det. time= 0.7 min (1,379.2 - 1,378.6)

Volume	Invert	Avail.Storage	Storage Description			
#1	13.00'	3.949 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
13.00	0.230	1,892.0	0.000	0.000	0.230	
14.00	2.940	4,273.0	1.331	1.331	27.046	
15.00	2.310	2,361.0	2.619	3.949	50.218	

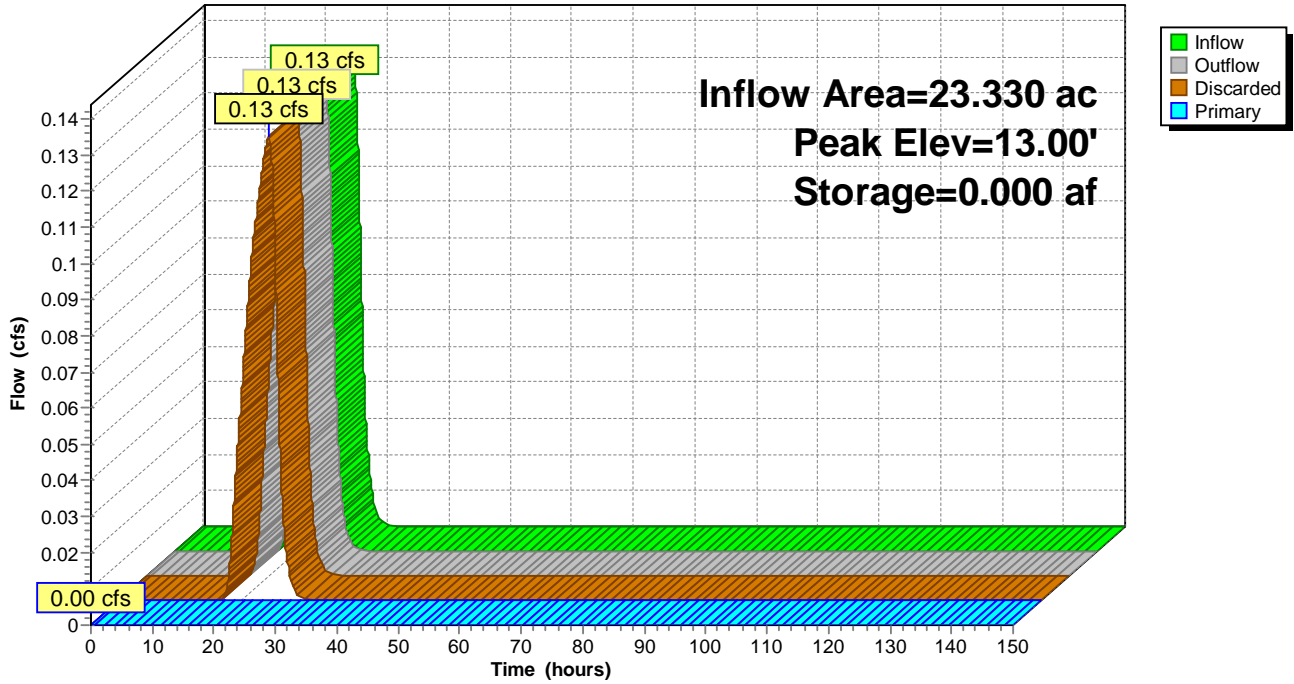
Device	Routing	Invert	Outlet Devices						
#1	Primary	14.99'	2,360.0' long x 0.5' breadth Broad-Crested Rectangular Weir						
			Head (feet) 0.20 0.40 0.60 0.80 1.00						
			Coef. (English) 2.80 2.92 3.08 3.30 3.32						
#2	Discarded	13.00'	19.980 in/hr Exfiltration over Surface area						
			Conductivity to Groundwater Elevation = 1.00'						

Discarded OutFlow Max=4.65 cfs @ 24.39 hrs HW=13.00' (Free Discharge)
 ↑**2=Exfiltration** (Controls 4.65 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=13.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 11P: 11P-SE Pond

Hydrograph



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Type IA 24-hr 10-Yr Rainfall=4.00"

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Time span=0.00-150.00 hrs, dt=0.01 hrs, 15001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S-NW Catchment	Runoff Area=7.320 ac 15.71% Impervious Runoff Depth=1.81" Flow Length=292' Slope=0.0200 '/ Tc=4.9 min CN=77 Runoff=3.03 cfs 1.105 af
Subcatchment 2S: 2S-NW Catchment 2	Runoff Area=4.280 ac 0.00% Impervious Runoff Depth=1.53" Flow Length=314' Tc=7.8 min CN=73 Runoff=1.37 cfs 0.545 af
Subcatchment 3S: 3S-North Catchment	Runoff Area=14.400 ac 0.00% Impervious Runoff Depth=1.53" Flow Length=148' Tc=6.7 min CN=73 Runoff=4.64 cfs 1.833 af
Subcatchment 4S: 4S - West Catchment	Runoff Area=26.590 ac 0.00% Impervious Runoff Depth=1.53" Flow Length=923' Slope=0.0030 '/ Tc=56.2 min CN=73 Runoff=5.63 cfs 3.385 af
Subcatchment 5S: 5S - West Catchment	Runoff Area=24.830 ac 0.00% Impervious Runoff Depth=1.53" Flow Length=660' Tc=11.1 min CN=73 Runoff=7.80 cfs 3.161 af
Subcatchment 6S: 6S - West Catchment	Runoff Area=21.310 ac 0.00% Impervious Runoff Depth=1.67" Flow Length=1,162' Slope=0.0017 '/ Tc=127.5 min CN=75 Runoff=3.71 cfs 2.960 af
Subcatchment 7S: 7S - Southwest	Runoff Area=54.970 ac 0.93% Impervious Runoff Depth=1.81" Flow Length=1,127' Tc=135.3 min CN=77 Runoff=10.57 cfs 8.300 af
Subcatchment 8S: 8S - South Catchment	Runoff Area=16.360 ac 4.95% Impervious Runoff Depth=1.89" Flow Length=1,480' Tc=88.6 min CN=78 Runoff=4.00 cfs 2.573 af
Subcatchment 9S: 9S - North	Runoff Area=22.710 ac 0.00% Impervious Runoff Depth=1.53" Flow Length=597' Tc=23.9 min CN=73 Runoff=6.33 cfs 2.891 af
Subcatchment 10S: 10S - Large Central / NE	Runoff Area=324.760 ac 1.84% Impervious Runoff Depth=1.74" Flow Length=2,575' Slope=0.0019 '/ Tc=393.8 min CN=76 Runoff=36.85 cfs 47.051 af
Subcatchment 11S: 11S - SE	Runoff Area=23.330 ac 0.00% Impervious Runoff Depth=0.10" Flow Length=1,924' Tc=126.8 min CN=42 Runoff=0.28 cfs 0.198 af
Reach 8R: South Ditch	Avg. Flow Depth=0.61' Max Vel=1.43 fps Inflow=4.00 cfs 2.573 af n=0.022 L=579.0' S=0.0012 '/ Capacity=2.94 cfs Outflow=3.98 cfs 2.573 af
Pond 1P: 1P- NW Pond	Peak Elev=11.81' Storage=1.105 af Inflow=3.03 cfs 1.105 af Outflow=0.00 cfs 0.000 af
Pond 2P: 2P-NW Pond 2	Peak Elev=11.56' Storage=0.545 af Inflow=1.37 cfs 0.545 af Outflow=0.00 cfs 0.000 af
Pond 3P: 3P-North Pond	Peak Elev=14.99' Storage=2.703 af Inflow=4.64 cfs 2.723 af Outflow=0.57 cfs 0.021 af
Pond 4P: 4P - West Pond	Peak Elev=13.99' Storage=2.498 af Inflow=5.63 cfs 3.385 af Outflow=1.99 cfs 0.890 af

Existing_Conditions_mlc

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Pond 5P: 5P - West Pond Peak Elev=15.00' Storage=1.863 af Inflow=8.22 cfs 8.117 af
Outflow=7.86 cfs 6.281 af

Pond 6P: 6P- West Pond Peak Elev=15.00' Storage=3.821 af Inflow=9.93 cfs 9.240 af
Outflow=8.80 cfs 5.457 af

Pond 7P: 7P-Southwest Peak Elev=14.99' Storage=3.362 af Inflow=10.57 cfs 8.300 af
Outflow=6.05 cfs 4.957 af

Pond 8P: 8P Peak Elev=17.07' Inflow=4.00 cfs 2.573 af
36.0" Round Culvert n=0.025 L=93.0' S=0.0088 '/ Outflow=4.00 cfs 2.573 af

Pond 9P: 9P - North Peak Elev=12.99' Storage=1.413 af Inflow=6.33 cfs 2.912 af
Outflow=1.95 cfs 1.502 af

Pond 10P: 10P-Large Central/NE Peak Elev=12.54' Storage=54.004 af Inflow=44.19 cfs 54.010 af
Outflow=0.00 cfs 0.000 af

Pond 11P: 11P-SE Pond Peak Elev=13.00' Storage=0.000 af Inflow=0.28 cfs 0.198 af
Discarded=0.28 cfs 0.198 af Primary=0.00 cfs 0.000 af Outflow=0.28 cfs 0.198 af

Total Runoff Area = 540.860 ac Runoff Volume = 74.000 af Average Runoff Depth = 1.64"
98.44% Pervious = 532.400 ac 1.56% Impervious = 8.460 ac

Existing Conditions_mlc

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 1S: 1S-NW Catchment

Runoff = 3.03 cfs @ 7.98 hrs, Volume= 1.105 af, Depth= 1.81"

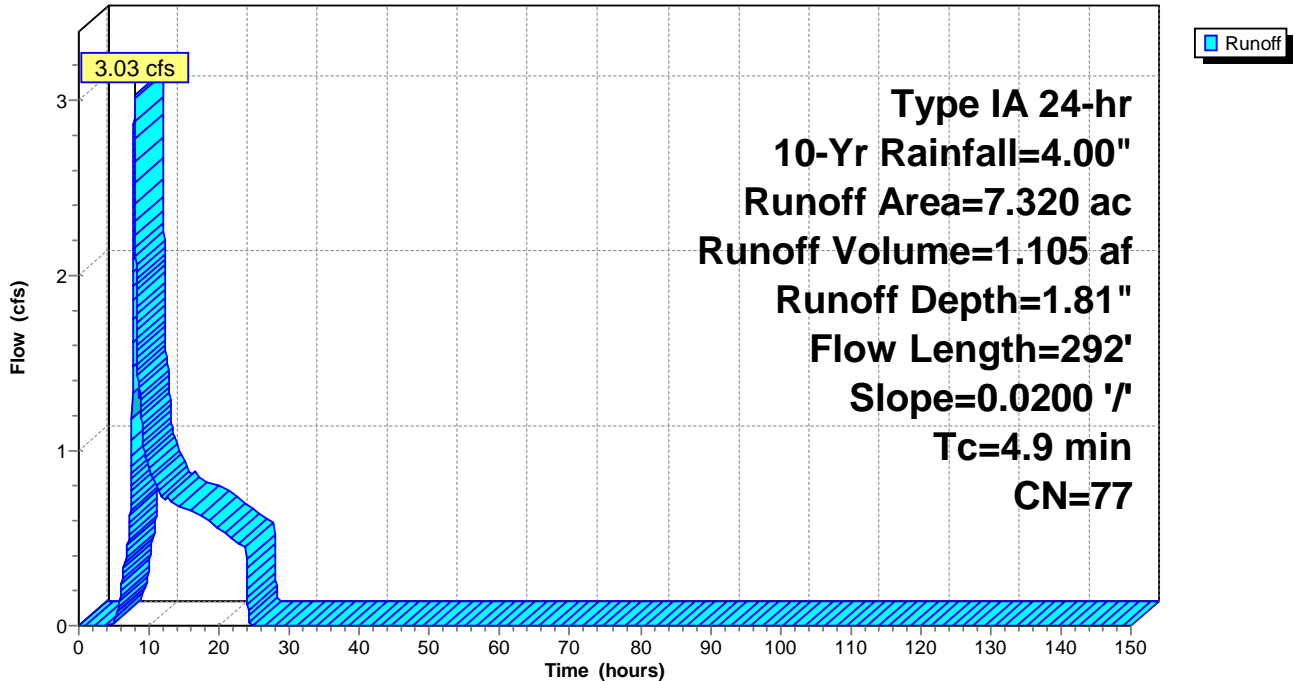
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
6.170	73	Brush, Good, HSG D
1.150	98	Paved parking, HSG D
7.320	77	Weighted Average
6.170	73	84.29% Pervious Area
1.150	98	15.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	292	0.0200	0.99		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps

Subcatchment 1S: 1S-NW Catchment

Hydrograph



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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 2S: 2S-NW Catchment 2

Sheet flow - dense comes from "native grasses" considered dense. Characterized by the wetland report.

Runoff = 1.37 cfs @ 8.02 hrs, Volume= 0.545 af, Depth= 1.53"

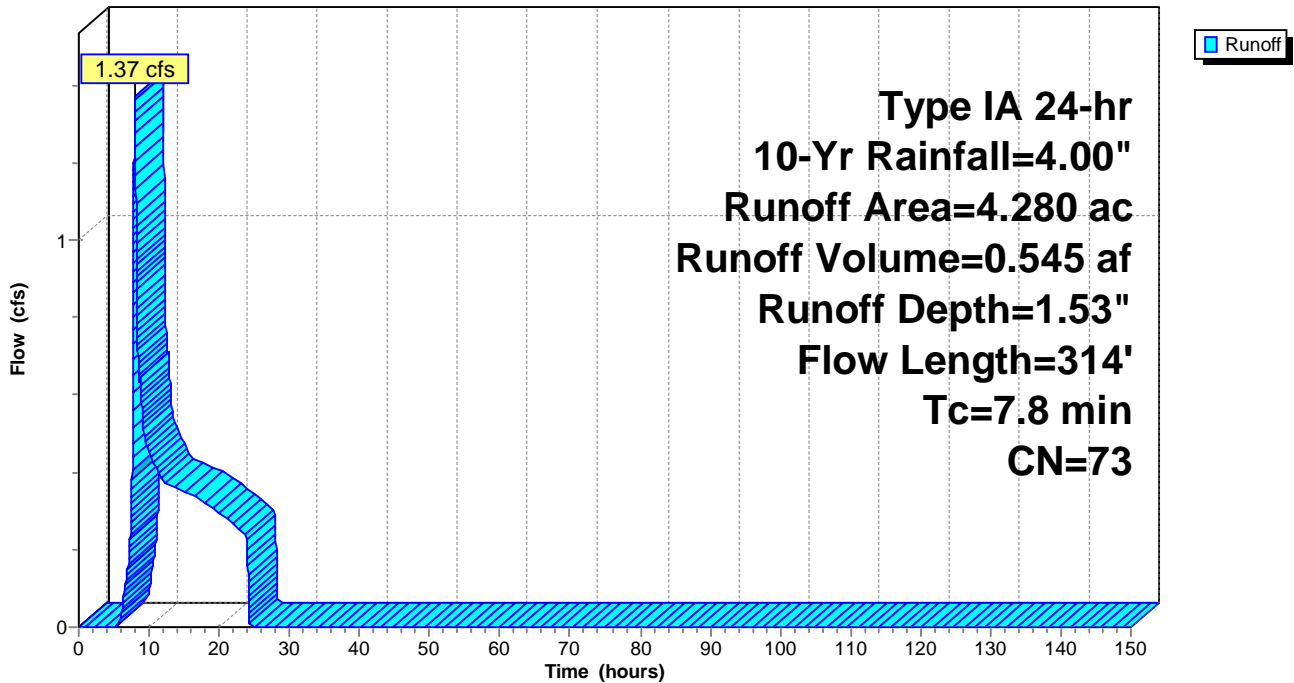
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
4.280	73	Brush, Good, HSG D
4.280	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	76	0.1300	0.24		Sheet Flow, Sheet - Dense, Native Grasses Grass: Dense n= 0.240 P2= 3.43"
2.6	238	0.0460	1.50		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
7.8	314	Total			

Subcatchment 2S: 2S-NW Catchment 2

Hydrograph



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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 3S: 3S-North Catchment

Runoff = 4.64 cfs @ 8.02 hrs, Volume= 1.833 af, Depth= 1.53"

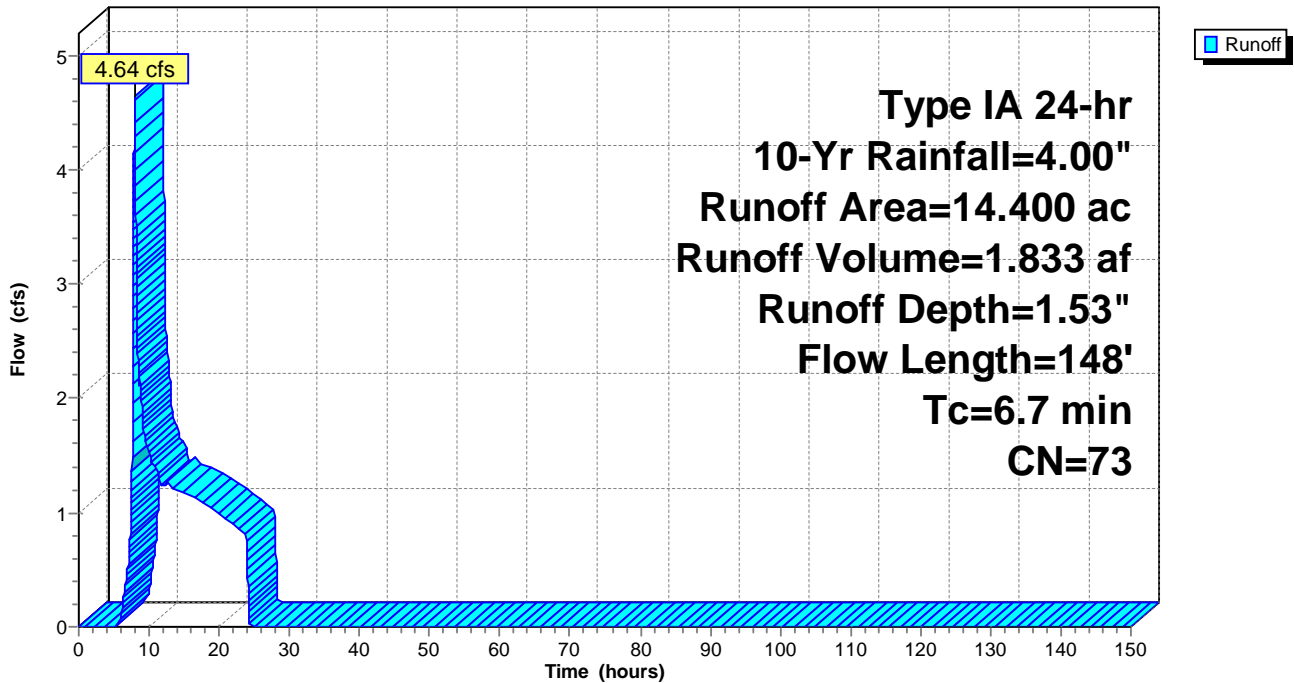
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
14.400	73	Brush, Good, HSG D
14.400	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	95	0.0950	0.33		Sheet Flow, Sheet flow - dune Grass: Short n= 0.150 P2= 3.43"
1.8	53	0.0050	0.49		Shallow Concentrated Flow, Shallow - dune grass Short Grass Pasture Kv= 7.0 fps
6.7	148	Total			

Subcatchment 3S: 3S-North Catchment

Hydrograph



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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 4S: 4S - West Catchment

Runoff = 5.63 cfs @ 8.67 hrs, Volume= 3.385 af, Depth= 1.53"

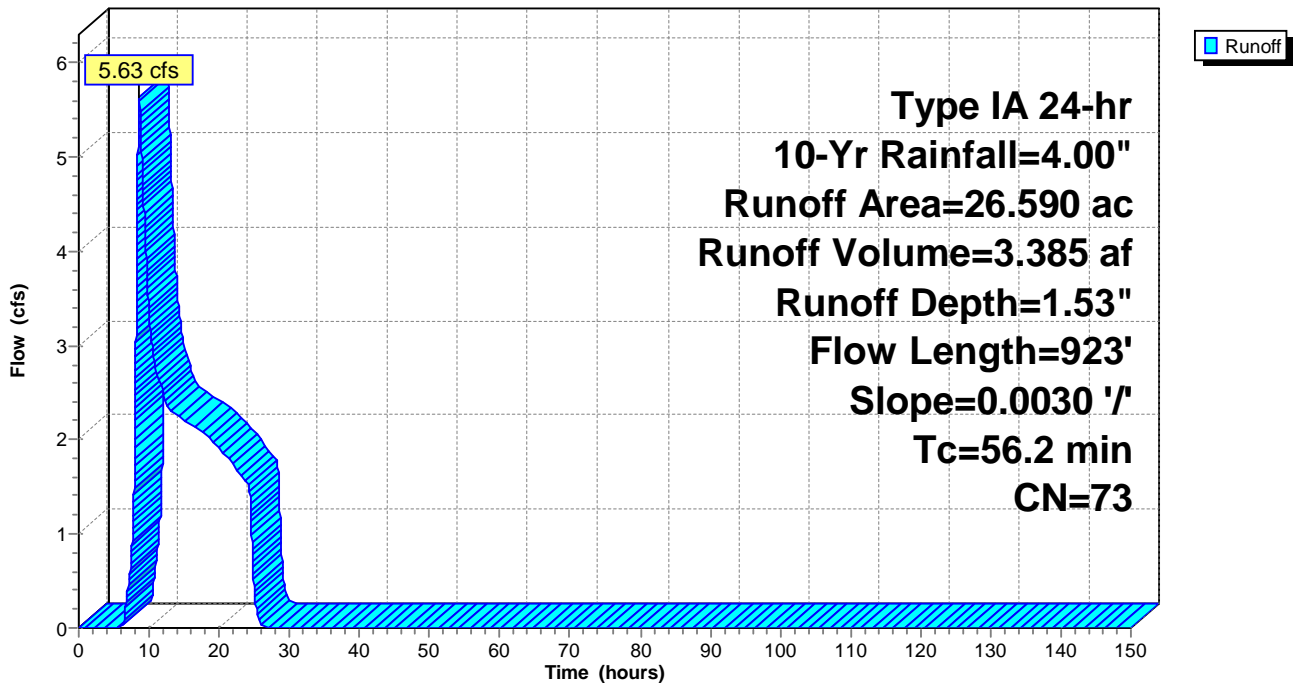
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
26.590	73	Brush, Good, HSG D
26.590	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.2	923	0.0030	0.27		Shallow Concentrated Flow, Shallow - Forest Woodland Kv= 5.0 fps

Subcatchment 4S: 4S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 5S: 5S - West Catchment

Runoff = 7.80 cfs @ 8.05 hrs, Volume= 3.161 af, Depth= 1.53"

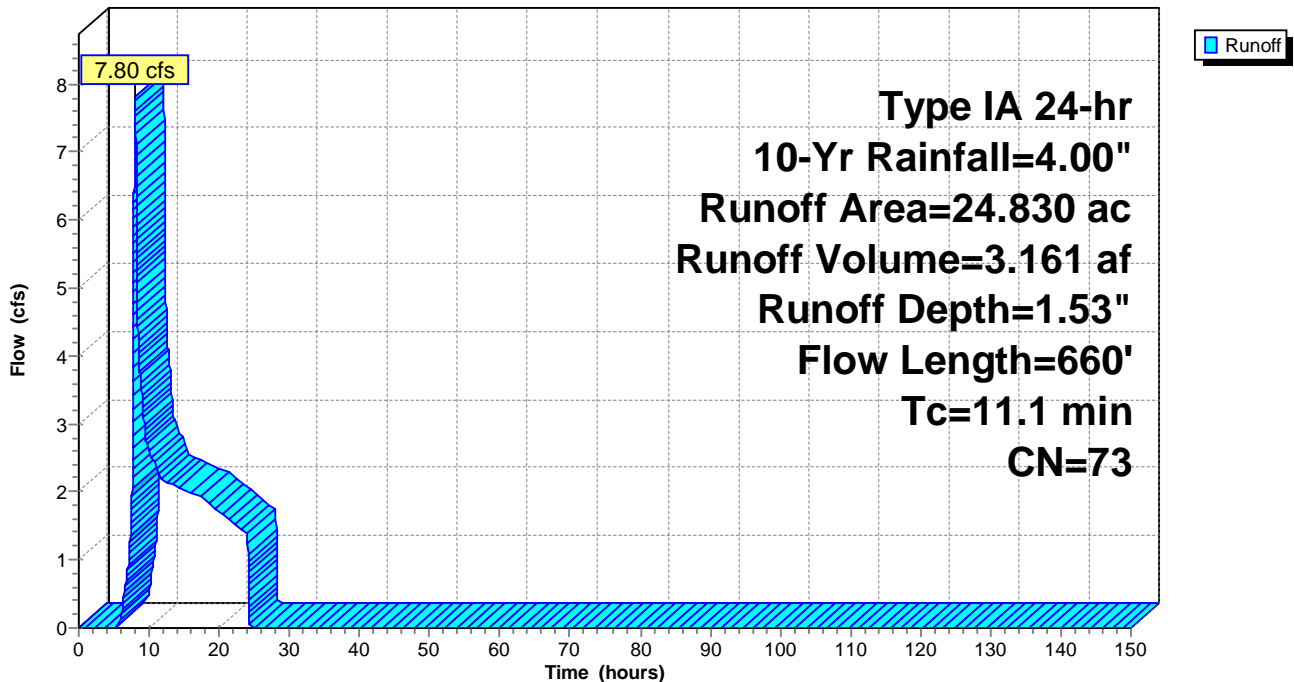
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
23.460	73	Brush, Good, HSG D
1.370	79	Woods/grass comb., Good, HSG D
24.830	73	Weighted Average
24.830	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	608	0.0180	0.94		Shallow Concentrated Flow, Shallow - Forest
					Short Grass Pasture Kv= 7.0 fps
0.3	52	0.1300	2.64		Sheet Flow, Path
					Smooth surfaces n= 0.011 P2= 3.43"
11.1	660	Total			

Subcatchment 5S: 5S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 6S: 6S - West Catchment

Runoff = 3.71 cfs @ 9.78 hrs, Volume= 2.960 af, Depth= 1.67"

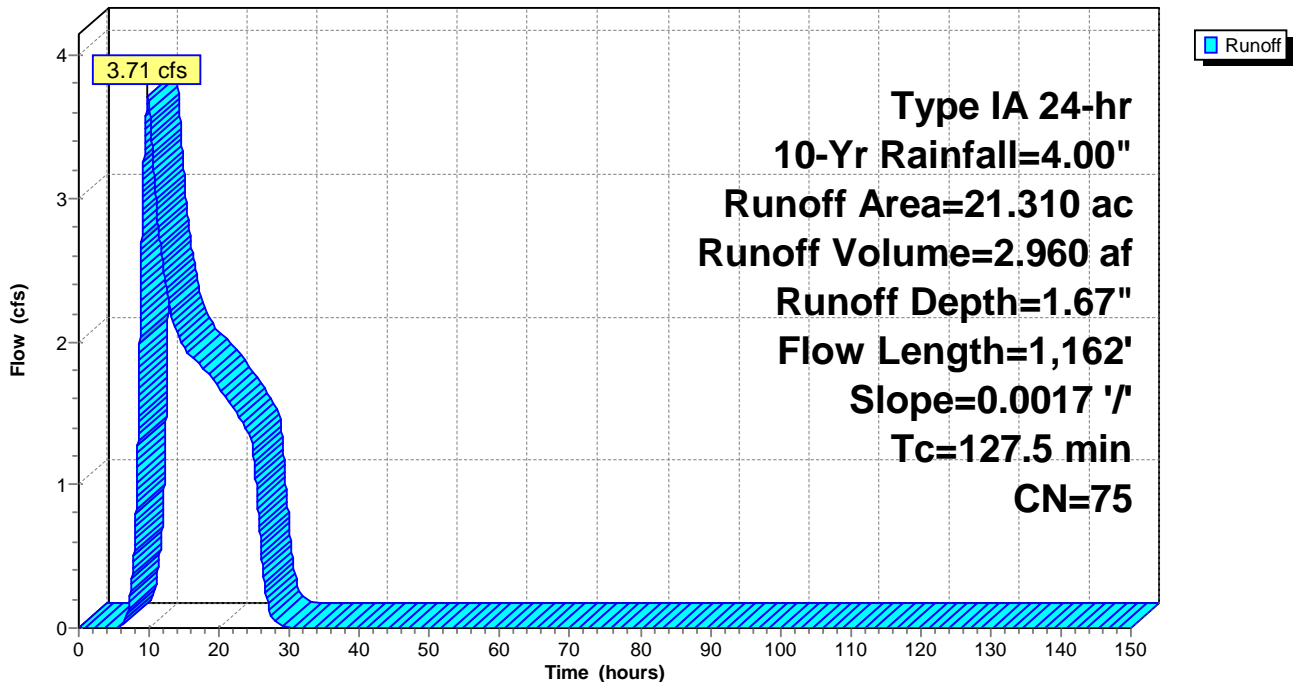
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
8.730	79	Woods/grass comb., Good, HSG D
12.580	73	Brush, Good, HSG D
21.310	75	Weighted Average
21.310	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.6	581	0.0017	0.29		Shallow Concentrated Flow, Grass - Shallow Short Grass Pasture Kv= 7.0 fps
93.9	581	0.0017	0.10		Shallow Concentrated Flow, Forested - Shallow Forest w/Heavy Litter Kv= 2.5 fps
127.5	1,162	Total			

Subcatchment 6S: 6S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 7S: 7S - Southwest

Runoff = 10.57 cfs @ 9.92 hrs, Volume= 8.300 af, Depth= 1.81"

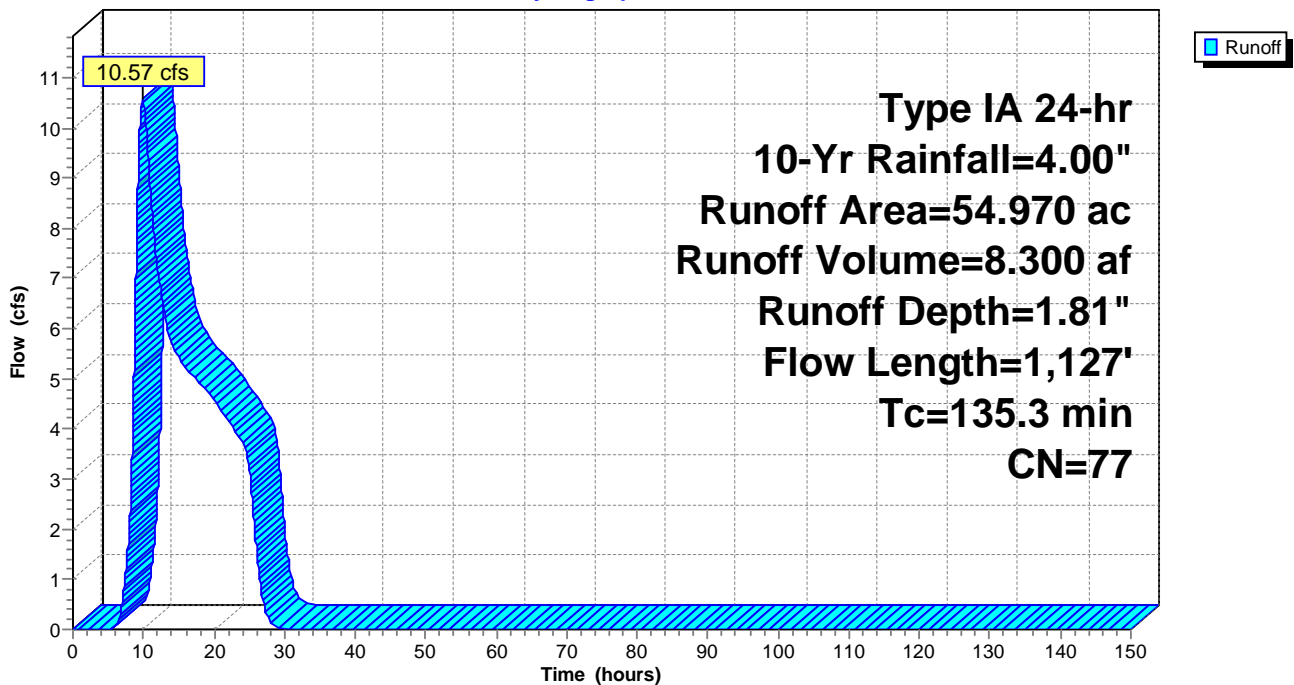
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
21.790	73	Brush, Good, HSG D
32.670	79	Woods/grass comb., Good, HSG D
0.510	98	Paved parking, HSG D
54.970	77	Weighted Average
54.460	77	99.07% Pervious Area
0.510	98	0.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	70	0.1000	0.21		Sheet Flow, Sheet - Paved to Grass Grass: Dense n= 0.240 P2= 3.43"
2.4	202	0.0390	1.38		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
127.5	855	0.0020	0.11		Shallow Concentrated Flow, Shallow - Forest Forest w/Heavy Litter Kv= 2.5 fps
135.3	1,127	Total			

Subcatchment 7S: 7S - Southwest

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 8S: 8S - South Catchment

Runoff = 4.00 cfs @ 9.15 hrs, Volume= 2.573 af, Depth= 1.89"

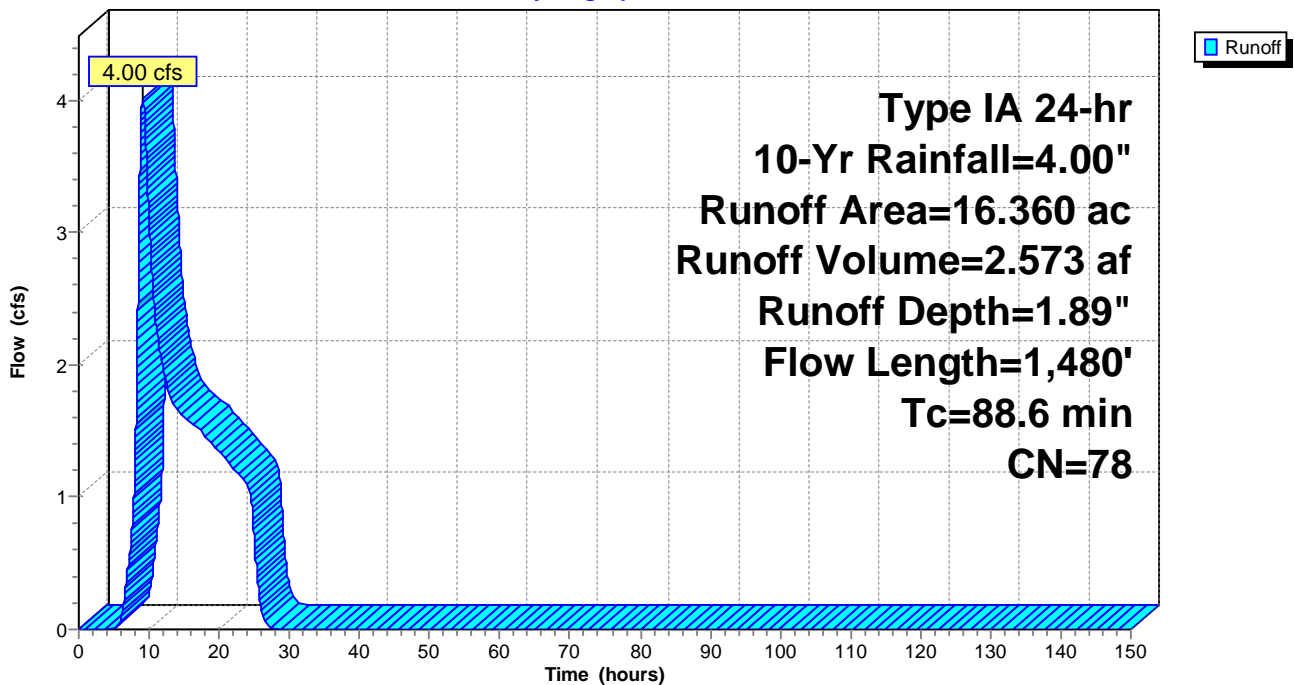
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
15.000	79	Woods/grass comb., Good, HSG D
0.550	30	Brush, Good, HSG A
0.810	98	Paved parking, HSG D
16.360	78	Weighted Average
15.550	77	95.05% Pervious Area
0.810	98	4.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	89	0.0560	0.26		Sheet Flow, Sheet- Dune grass Grass: Short n= 0.150 P2= 3.43"
67.3	844	0.0070	0.21		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps
15.6	547	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
88.6	1,480	Total			

Subcatchment 8S: 8S - South Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 9S: 9S - North

Runoff = 6.33 cfs @ 8.20 hrs, Volume= 2.891 af, Depth= 1.53"

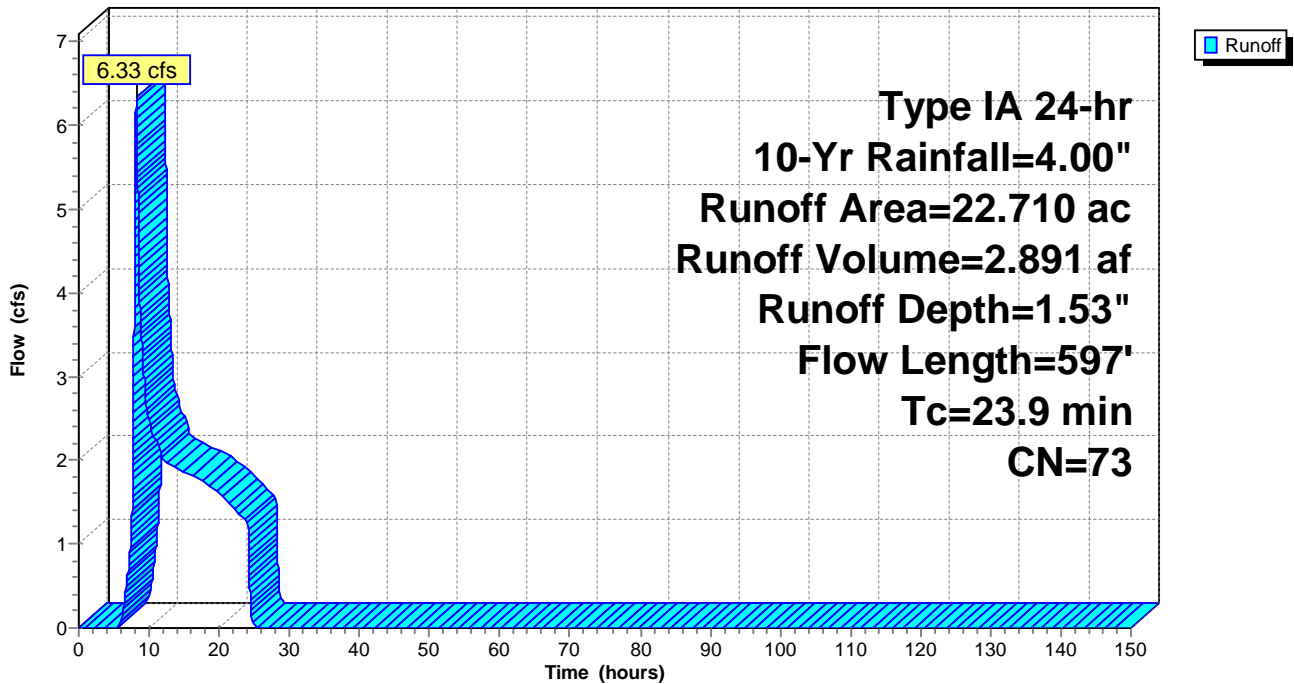
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
21.780	73	Brush, Good, HSG D
0.930	79	Woods/grass comb., Good, HSG D
22.710	73	Weighted Average
22.710	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	67	0.0450	0.15		Sheet Flow, Sheet - Grass Grass: Dense n= 0.240 P2= 3.43"
16.7	530	0.0057	0.53		Shallow Concentrated Flow, Shallow - Woods Short Grass Pasture Kv= 7.0 fps
23.9	597	Total			

Subcatchment 9S: 9S - North

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 10S: 10S - Large Central / NE

Runoff = 36.85 cfs @ 14.44 hrs, Volume= 47.051 af, Depth= 1.74"

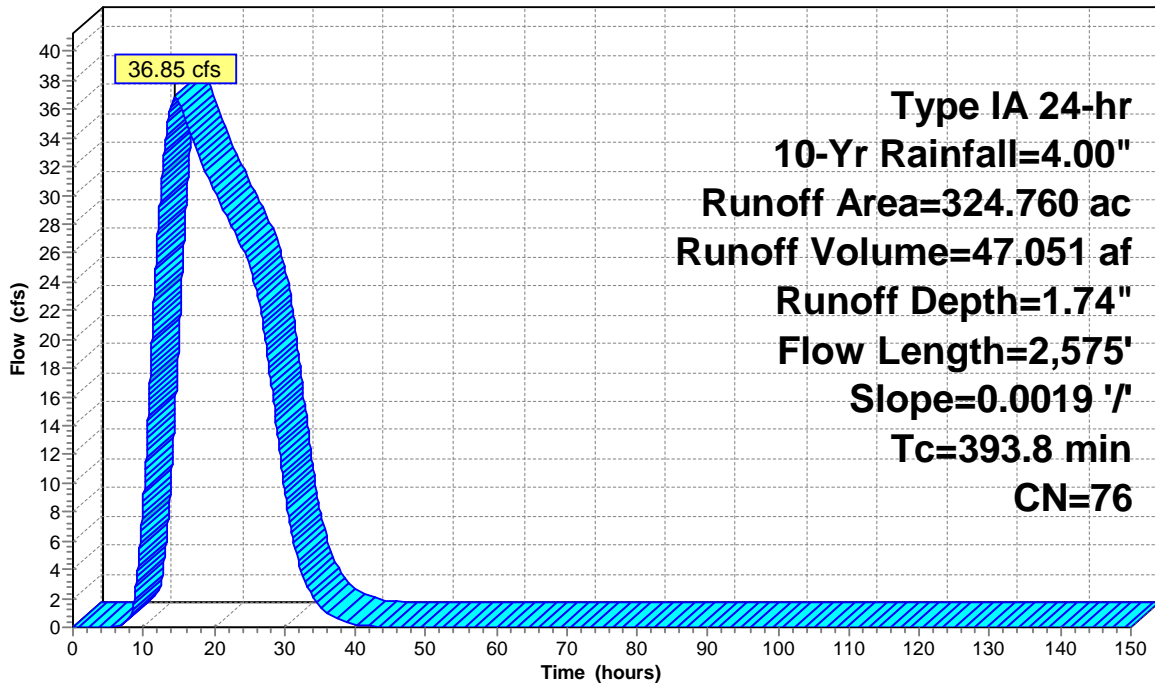
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
223.040	79	Woods/grass comb., Good, HSG D
12.880	32	Woods/grass comb., Good, HSG A
0.660	98	Paved parking, HSG A
5.330	98	Paved parking, HSG D
82.850	73	Brush, Good, HSG D
324.760	76	Weighted Average
318.770	76	98.16% Pervious Area
5.990	98	1.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
393.8	2,575	0.0019	0.11		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps

Subcatchment 10S: 10S - Large Central / NE

Hydrograph



Runoff

Existing Conditions_mlc

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 11S: 11S - SE

Runoff = 0.28 cfs @ 24.09 hrs, Volume= 0.198 af, Depth= 0.10"

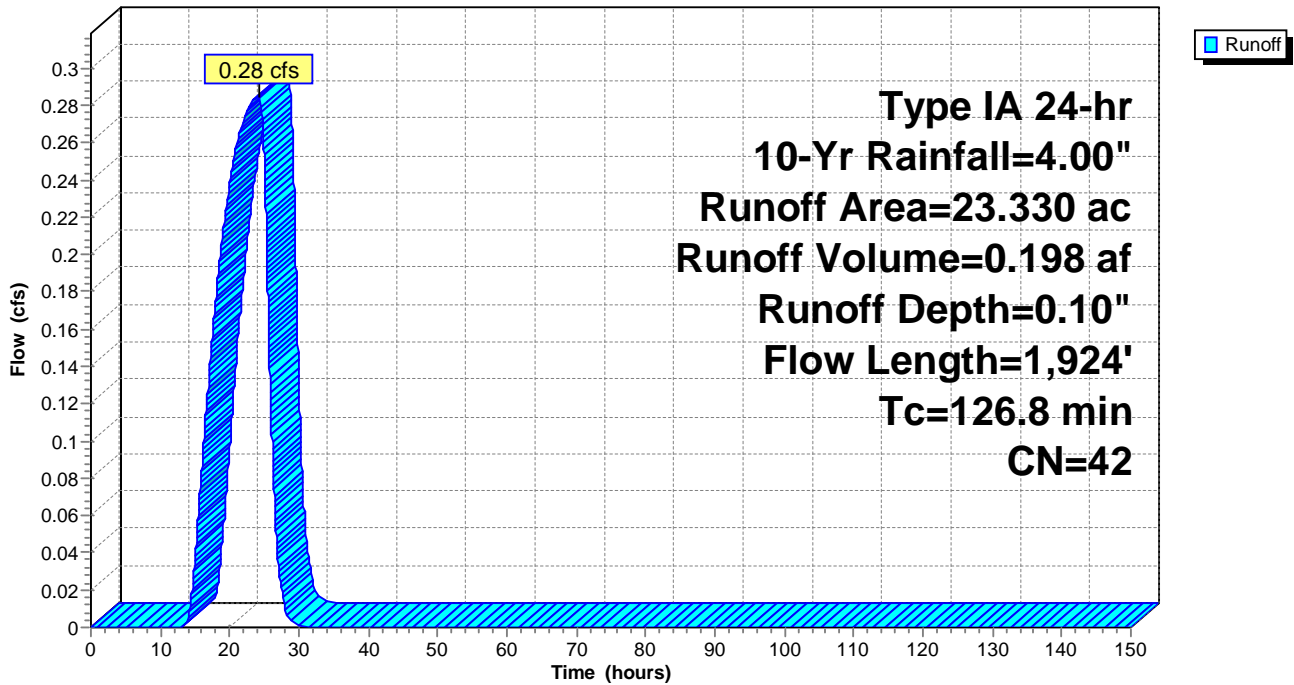
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
18.140	32	Woods/grass comb., Good, HSG A
1.980	79	Woods/grass comb., Good, HSG D
3.210	73	Brush, Good, HSG D
23.330	42	Weighted Average
23.330	42	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	126	0.1800	0.30		Sheet Flow, Sheet-Dune Grass Grass: Dense n= 0.240 P2= 3.43"
119.9	1,798	0.0100	0.25		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps
126.8	1,924	Total			

Subcatchment 11S: 11S - SE

Hydrograph



Existing_Conditions_mlc

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Reach 8R: South Ditch

[91] Warning: Storage range exceeded by 0.11'

[55] Hint: Peak inflow is 136% of Manning's capacity

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 0.50'

Inflow Area =	16.360 ac,	4.95% Impervious,	Inflow Depth = 1.89"	for 10-Yr event
Inflow =	4.00 cfs @	9.15 hrs,	Volume=	2.573 af
Outflow =	3.98 cfs @	9.31 hrs,	Volume=	2.573 af, Atten= 1%, Lag= 9.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs

Max. Velocity= 1.43 fps, Min. Travel Time= 6.7 min

Avg. Velocity = 0.58 fps, Avg. Travel Time= 16.6 min

Peak Storage= 1,608 cf @ 9.20 hrs

Average Depth at Peak Storage= 0.61', Surface Width= 5.21'

Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 2.94 cfs

4.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 1.0 '/' Top Width= 5.00'

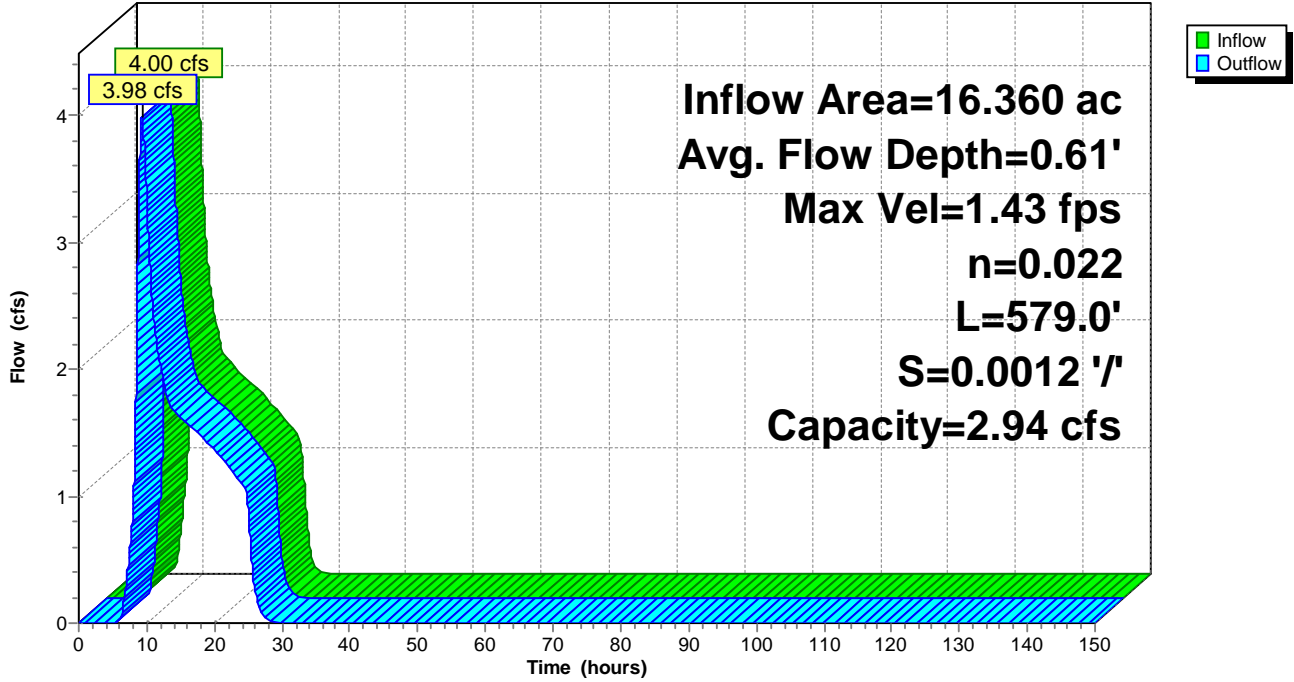
Length= 579.0' Slope= 0.0012 '/'

Inlet Invert= 16.00', Outlet Invert= 15.30'



Reach 8R: South Ditch

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 1P: 1P- NW Pond

Inflow Area = 7.320 ac, 15.71% Impervious, Inflow Depth = 1.81" for 10-Yr event
 Inflow = 3.03 cfs @ 7.98 hrs, Volume= 1.105 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 11.81' @ 24.29 hrs Surf.Area= 1.428 ac Storage= 1.105 af

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

Volume	Invert	Avail.Storage	Storage Description
#1	11.00'	6.173 af	Custom Stage Data (Irregular) Listed below (Recalc)

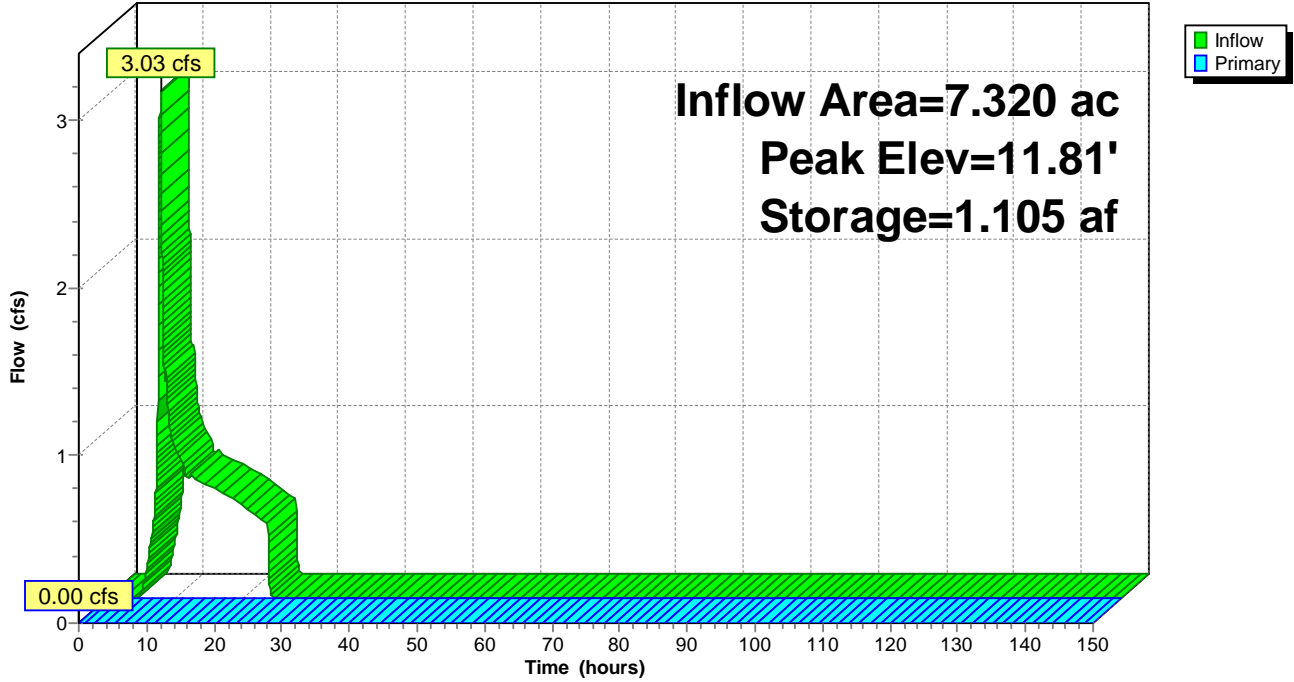
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
11.00	1.290	1,552.0	0.000	0.000	1.290
12.00	1.460	1,164.0	1.374	1.374	3.215
13.00	1.550	1,193.0	1.505	2.879	3.343
14.00	1.640	1,231.0	1.595	4.474	3.514
15.00	1.760	1,333.0	1.700	6.173	3.992

Device	Routing	Invert	Outlet Devices
#1	Primary	14.99'	1,333.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: 1P- NW Pond

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 2P: 2P-NW Pond 2

Inflow Area = 11.600 ac, 9.91% Impervious, Inflow Depth = 0.56" for 10-Yr event
 Inflow = 1.37 cfs @ 8.02 hrs, Volume= 0.545 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 11.56' @ 24.45 hrs Surf.Area= 1.015 ac Storage= 0.545 af

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

Volume	Invert	Avail.Storage	Storage Description			
#1	11.00'	3.348 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
11.00	0.930	1,430.0	0.000	0.000	0.930	
12.00	1.085	1,183.0	1.007	1.007	2.109	
13.00	1.170	1,220.0	1.127	2.134	2.274	
14.00	1.260	1,273.0	1.215	3.348	2.517	

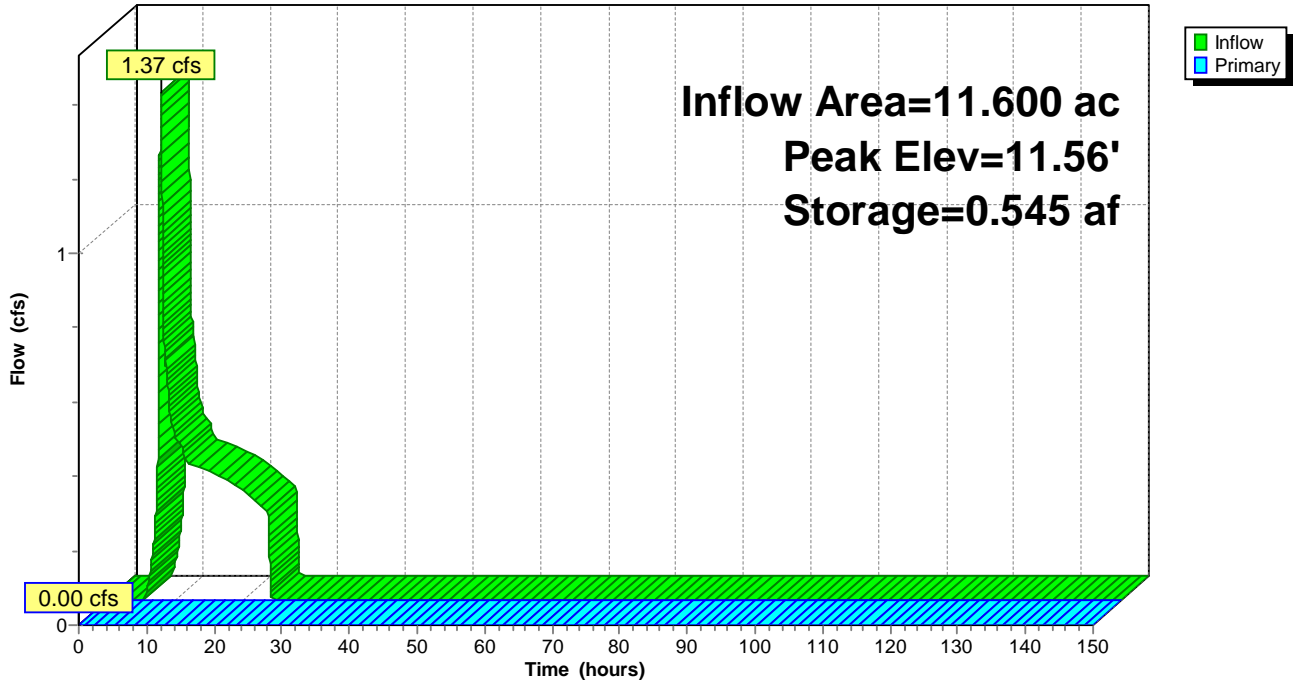
Device	Routing	Invert	Outlet Devices											
#1	Primary	13.99'	1,300.0' long x 4.0' breadth Broad-Crested Rectangular Weir											
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00											
			2.50 3.00 3.50 4.00 4.50 5.00 5.50											
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68											
			2.72 2.73 2.76 2.79 2.88 3.07 3.32											

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)

↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: 2P-NW Pond 2

Hydrograph



Existing_Conditions_mlc

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 3P: 3P-North Pond

[81] Warning: Exceeded Pond 2P by 3.43' @ 24.93 hrs

[81] Warning: Exceeded Pond 4P by 1.00' @ 24.94 hrs

Inflow Area = 52.590 ac, 2.19% Impervious, Inflow Depth = 0.62" for 10-Yr event
 Inflow = 4.64 cfs @ 8.02 hrs, Volume= 2.723 af
 Outflow = 0.57 cfs @ 24.93 hrs, Volume= 0.021 af, Atten= 88%, Lag= 1,014.8 min
 Primary = 0.57 cfs @ 24.93 hrs, Volume= 0.021 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 14.99' @ 24.93 hrs Surf.Area= 1.599 ac Storage= 2.703 af

Plug-Flow detention time= 1,126.5 min calculated for 0.021 af (1% of inflow)
 Center-of-Mass det. time= 523.5 min (1,514.6 - 991.1)

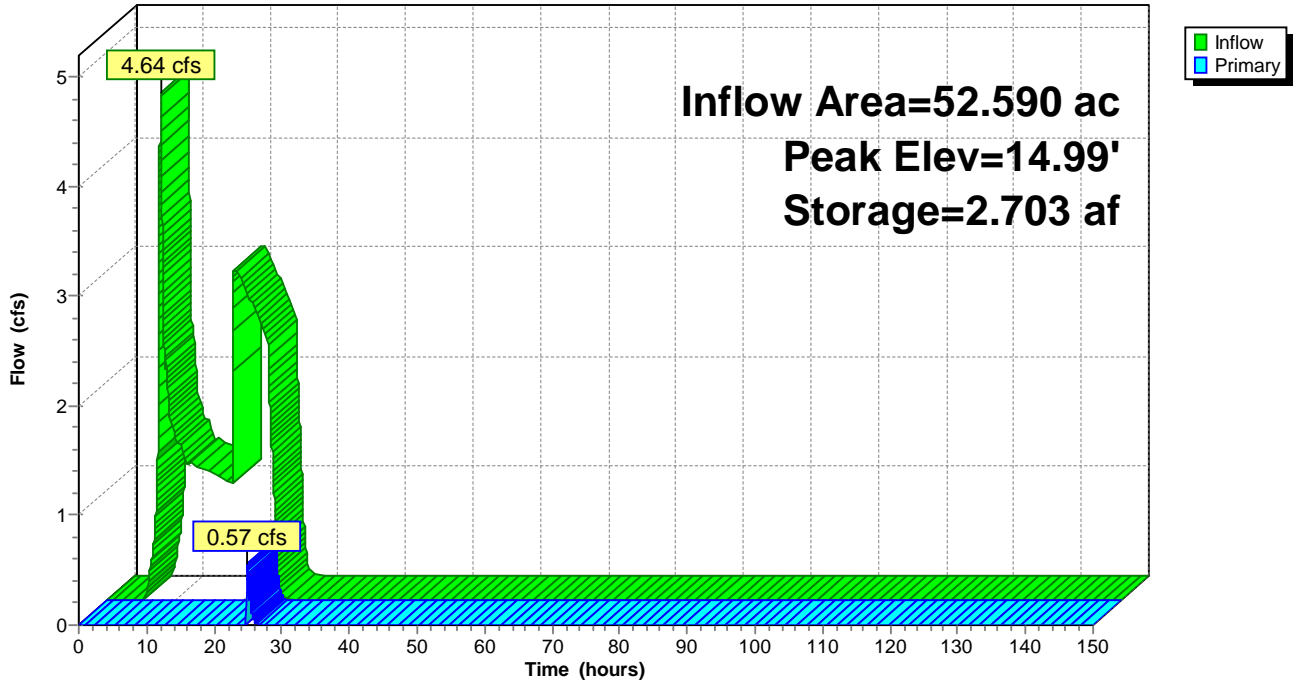
Volume	Invert	Avail.Storage	Storage Description			
#1	12.00'	2.718 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
12.00	0.086	1,508.0	0.000	0.000	0.086	
13.00	0.450	1,395.0	0.244	0.244	0.686	
14.00	1.500	4,156.0	0.924	1.168	28.685	
15.00	1.600	2,946.0	1.550	2.718	44.384	

Device	Routing	Invert	Outlet Devices											
#1	Primary	14.99'	3,000.0' long x 1.0' breadth Broad-Crested Rectangular Weir											
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00											
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32											

Primary OutFlow Max=0.15 cfs @ 24.93 hrs HW=14.99' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 0.15 cfs @ 0.07 fps)

Pond 3P: 3P-North Pond

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 4P: 4P - West Pond

Inflow Area = 26.590 ac, 0.00% Impervious, Inflow Depth = 1.53" for 10-Yr event
 Inflow = 5.63 cfs @ 8.67 hrs, Volume= 3.385 af
 Outflow = 1.99 cfs @ 18.84 hrs, Volume= 0.890 af, Atten= 65%, Lag= 610.0 min
 Primary = 1.99 cfs @ 18.84 hrs, Volume= 0.890 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 13.99' @ 18.84 hrs Surf.Area= 3.774 ac Storage= 2.498 af

Plug-Flow detention time= 763.7 min calculated for 0.890 af (26% of inflow)
 Center-of-Mass det. time= 411.7 min (1,299.1 - 887.4)

Volume	Invert	Avail.Storage	Storage Description
#1	13.00'	2.532 af	Custom Stage Data (Irregular) Listed below (Recalc)

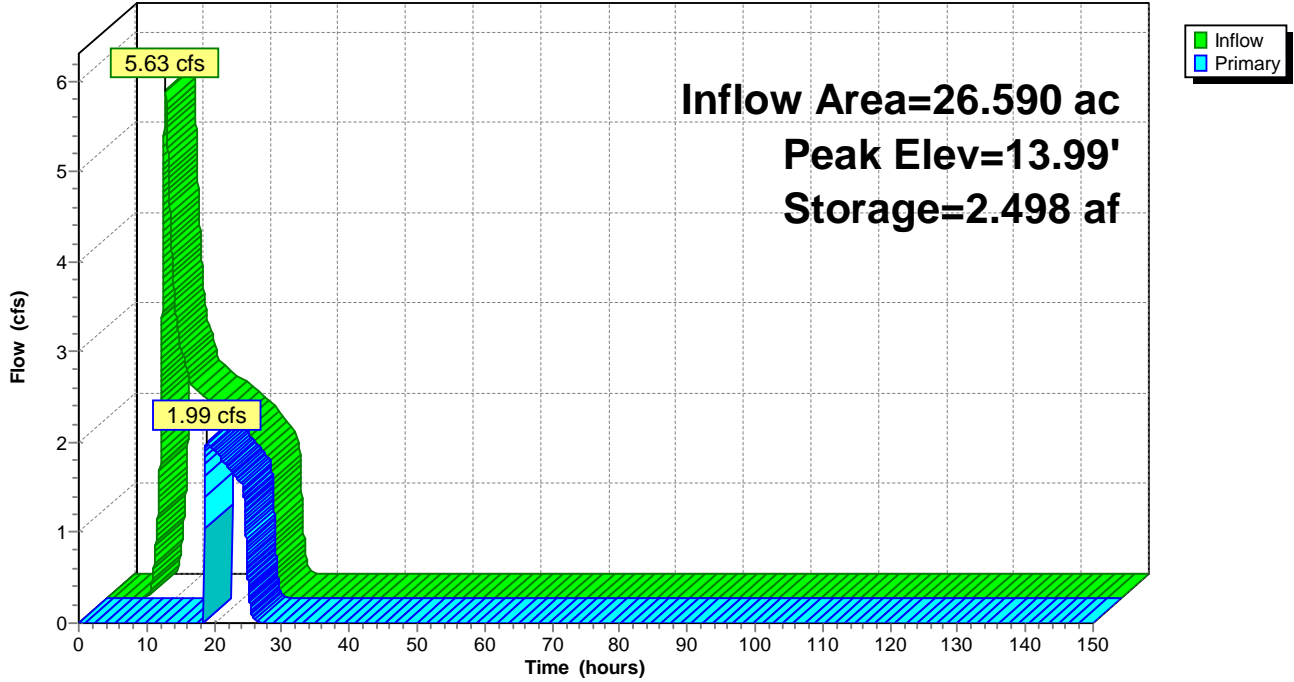
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
13.00	1.450	2,862.0	0.000	0.000	1.450
14.00	3.800	7,496.0	2.532	2.532	89.137

Device	Routing	Invert	Outlet Devices
#1	Primary	13.99'	7,496.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.61 cfs @ 18.84 hrs HW=13.99' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 0.61 cfs @ 0.09 fps)

Pond 4P: 4P - West Pond

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 5P: 5P - West Pond

[81] Warning: Exceeded Pond 7P by 0.01' @ 13.85 hrs

Inflow Area = 79.800 ac, 0.64% Impervious, Inflow Depth = 1.22" for 10-Yr event
 Inflow = 8.22 cfs @ 13.31 hrs, Volume= 8.117 af
 Outflow = 7.86 cfs @ 13.83 hrs, Volume= 6.281 af, Atten= 4%, Lag= 31.5 min
 Primary = 7.86 cfs @ 13.83 hrs, Volume= 6.281 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 15.00' @ 13.83 hrs Surf.Area= 2.670 ac Storage= 1.863 af

Plug-Flow detention time= 236.0 min calculated for 6.280 af (77% of inflow)
 Center-of-Mass det. time= 123.1 min (1,151.3 - 1,028.2)

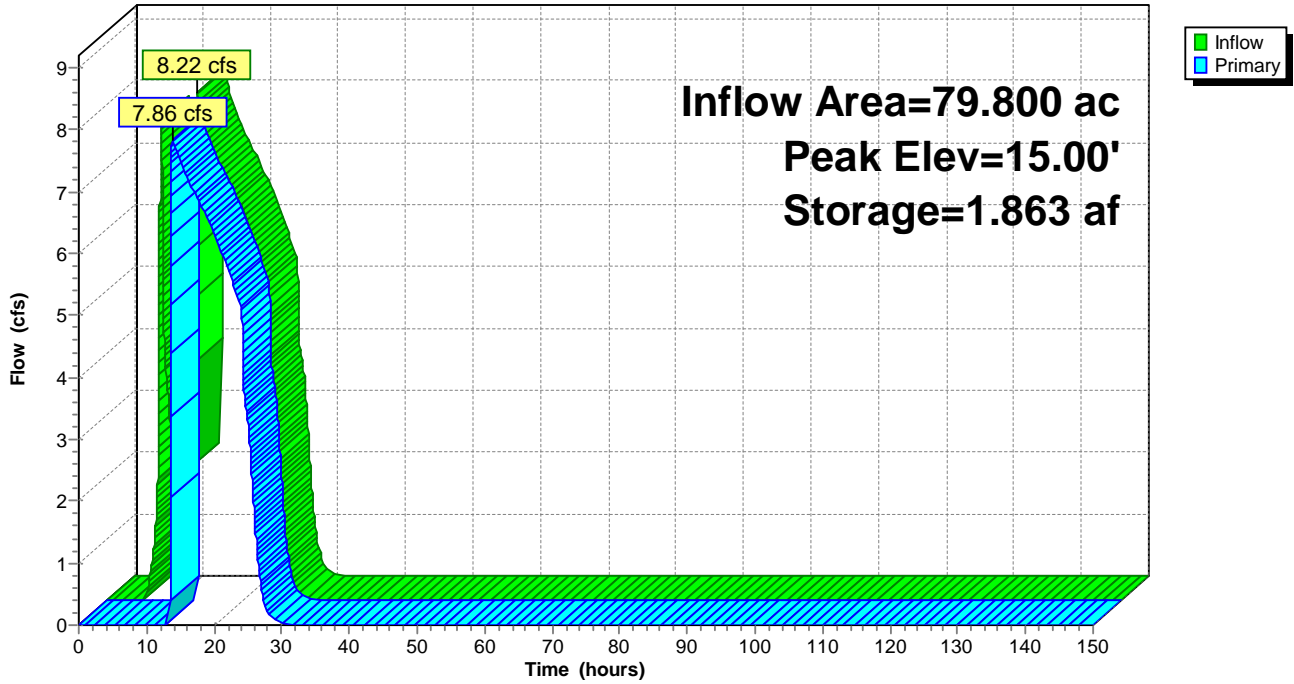
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	5.374 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	1.160	3,026.0	0.000	0.000	1.160	
15.00	2.670	3,968.0	1.863	1.863	13.196	
15.01	999.000	9,999.0	3.511	5.374	167.081	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	3,000.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=7.82 cfs @ 13.83 hrs HW=15.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 7.82 cfs @ 0.27 fps)

Pond 5P: 5P - West Pond

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 6P: 6P- West Pond

[79] Warning: Submerged Pond 5P Primary device # 1 by 0.01'

Inflow Area = 101.110 ac, 0.50% Impervious, Inflow Depth = 1.10" for 10-Yr event
 Inflow = 9.93 cfs @ 13.82 hrs, Volume= 9.240 af
 Outflow = 8.80 cfs @ 17.23 hrs, Volume= 5.457 af, Atten= 11%, Lag= 204.5 min
 Primary = 8.80 cfs @ 17.23 hrs, Volume= 5.457 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 17.23 hrs Surf.Area= 4.806 ac Storage= 3.821 af

Plug-Flow detention time= 363.1 min calculated for 5.457 af (59% of inflow)
 Center-of-Mass det. time= 183.1 min (1,267.1 - 1,083.9)

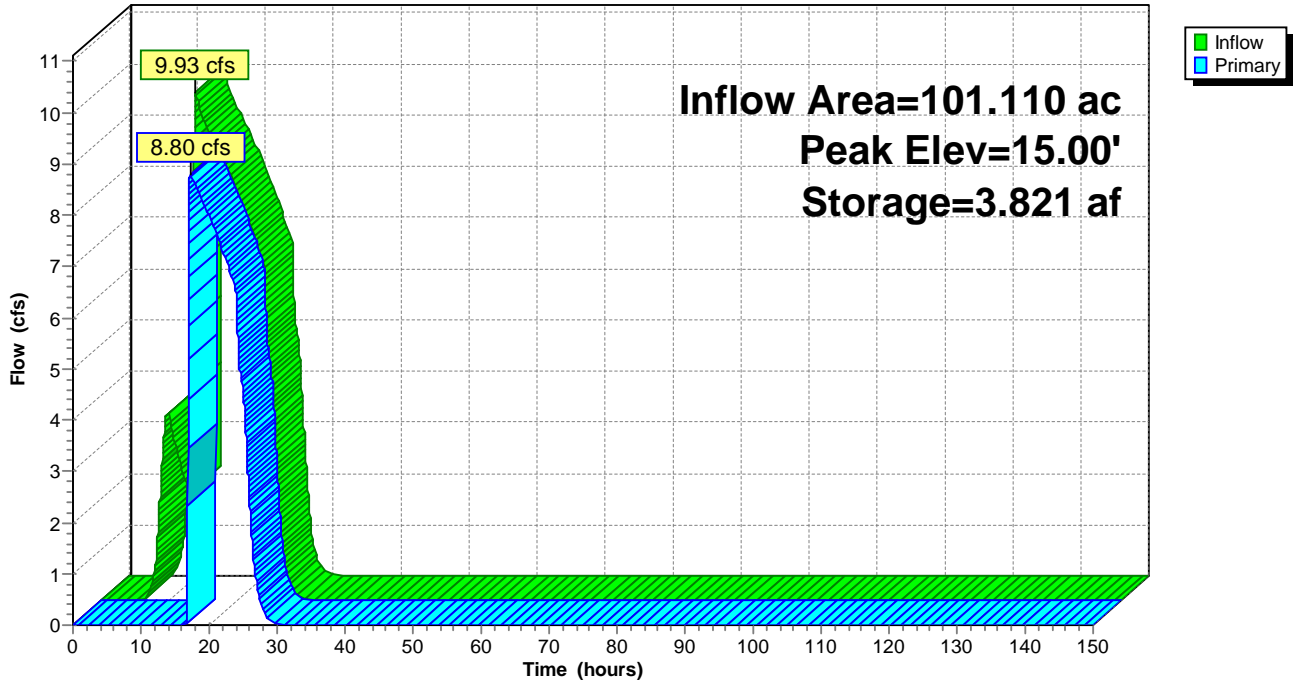
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	37.908 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.930	3,856.0	0.000	0.000	2.930	
15.00	4.810	4,175.0	3.831	3.831	7.611	
15.01	9,999.000	9,999.0	34.077	37.908	158.416	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	4,175.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=7.87 cfs @ 17.23 hrs HW=15.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 7.87 cfs @ 0.24 fps)

Pond 6P: 6P- West Pond

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 7P: 7P-Southwest

Inflow Area = 54.970 ac, 0.93% Impervious, Inflow Depth = 1.81" for 10-Yr event
 Inflow = 10.57 cfs @ 9.92 hrs, Volume= 8.300 af
 Outflow = 6.05 cfs @ 13.31 hrs, Volume= 4.957 af, Atten= 43%, Lag= 203.6 min
 Primary = 6.05 cfs @ 13.31 hrs, Volume= 4.957 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 14.99' @ 13.31 hrs Surf.Area= 4.545 ac Storage= 3.362 af

Plug-Flow detention time= 430.3 min calculated for 4.957 af (60% of inflow)
 Center-of-Mass det. time= 208.5 min (1,144.6 - 936.0)

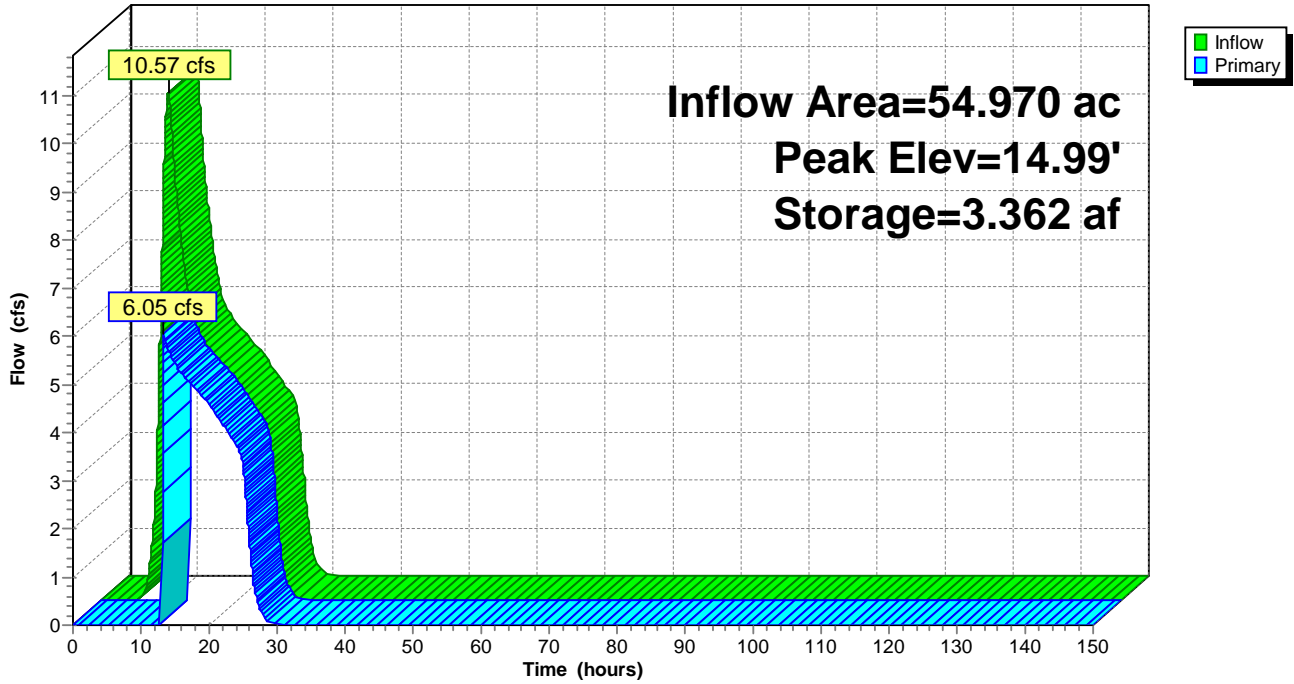
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	39.091 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.340	3,959.0	0.000	0.000	2.340	
15.00	4.560	5,430.0	3.389	3.389	27.571	
15.10	999.000	9,999.0	35.702	39.091	156.355	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	5,430.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=3.90 cfs @ 13.31 hrs HW=14.99' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 3.90 cfs @ 0.17 fps)

Pond 7P: 7P-Southwest

Hydrograph



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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 8P: 8P

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 1.89" for 10-Yr event
 Inflow = 4.00 cfs @ 9.15 hrs, Volume= 2.573 af
 Outflow = 4.00 cfs @ 9.15 hrs, Volume= 2.573 af, Atten= 0%, Lag= 0.0 min
 Primary = 4.00 cfs @ 9.15 hrs, Volume= 2.573 af

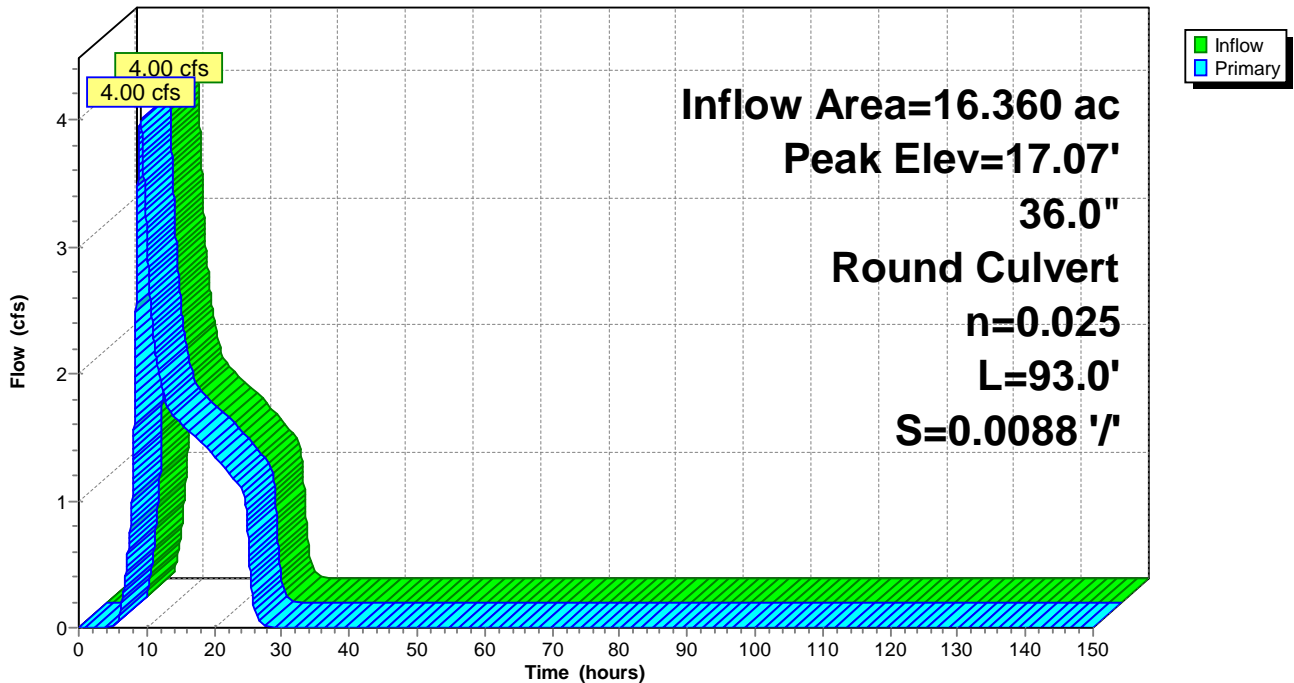
Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Peak Elev= 17.07' @ 9.15 hrs
 Flood Elev= 19.00'

Device #1	Routing	Invert	Outlet Devices
	Primary	16.11'	36.0" Round Culvert L= 93.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.11' / 15.29' S= 0.0088 '/ Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=4.00 cfs @ 9.15 hrs HW=17.07' (Free Discharge)
 ↑ **1=Culvert** (Barrel Controls 4.00 cfs @ 3.07 fps)

Pond 8P: 8P

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 9P: 9P - North

Inflow Area = 75.300 ac, 1.53% Impervious, Inflow Depth = 0.46" for 10-Yr event
 Inflow = 6.33 cfs @ 8.20 hrs, Volume= 2.912 af
 Outflow = 1.95 cfs @ 13.57 hrs, Volume= 1.502 af, Atten= 69%, Lag= 322.2 min
 Primary = 1.95 cfs @ 13.57 hrs, Volume= 1.502 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 12.99' @ 13.57 hrs Surf.Area= 3.662 ac Storage= 1.413 af

Plug-Flow detention time= 512.3 min calculated for 1.502 af (52% of inflow)
 Center-of-Mass det. time= 255.4 min (1,117.6 - 862.2)

Volume	Invert	Avail.Storage	Storage Description
#1	12.00'	1.447 af	Custom Stage Data (Irregular) Listed below (Recalc)

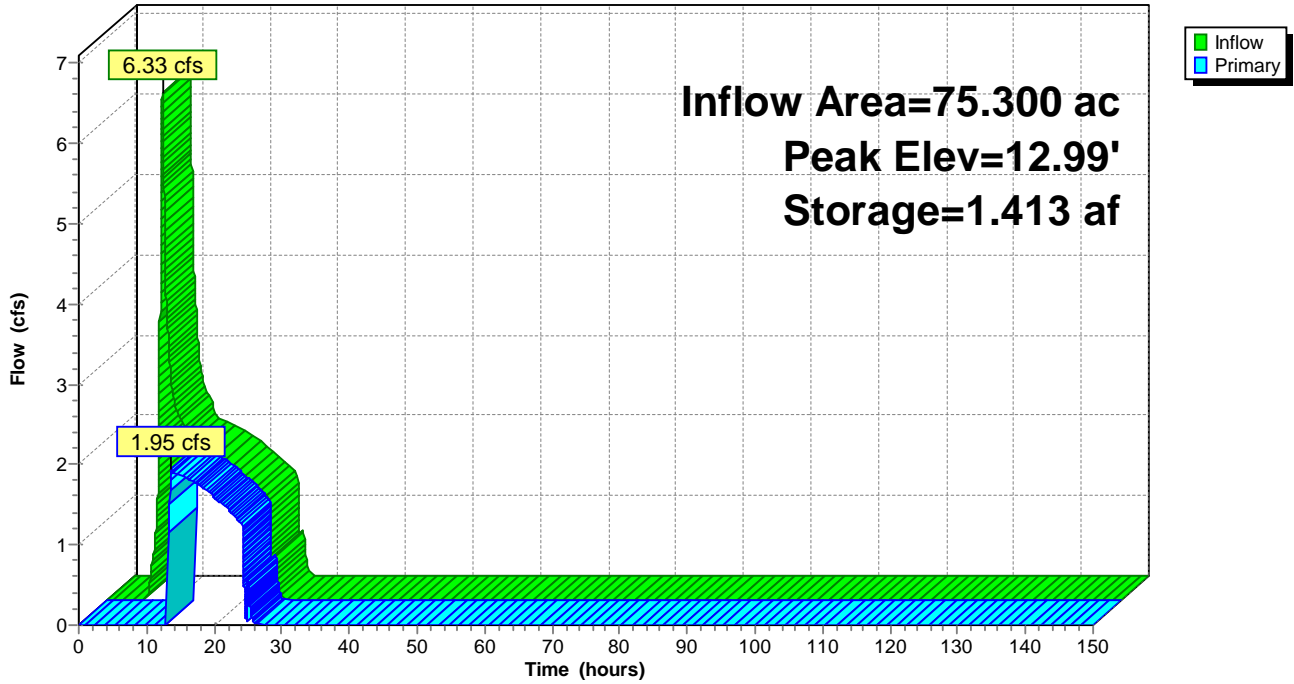
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
12.00	0.079	608.0	0.000	0.000	0.079
13.00	3.720	8,513.0	1.447	1.447	131.797

Device	Routing	Invert	Outlet Devices
#1	Primary	12.99'	8,513.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.56 cfs @ 13.57 hrs HW=12.99' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 0.56 cfs @ 0.08 fps)

Pond 9P: 9P - North

Hydrograph



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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 10P: 10P-Large Central/NE

Inflow Area = 524.500 ac, 1.46% Impervious, Inflow Depth = 1.24" for 10-Yr event
 Inflow = 44.19 cfs @ 17.14 hrs, Volume= 54.010 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.54' @ 46.39 hrs Surf.Area= 77.068 ac Storage= 54.004 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description			
#1	10.00'	98.335 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.00	0.280	2,536.0	0.000	0.000	0.280	
11.00	6.414	16,985.0	2.678	2.678	515.559	
12.00	38.875	11,909.0	20.360	23.038	783.495	
13.00	119.000	22,186.0	75.297	98.335	1,423.612	

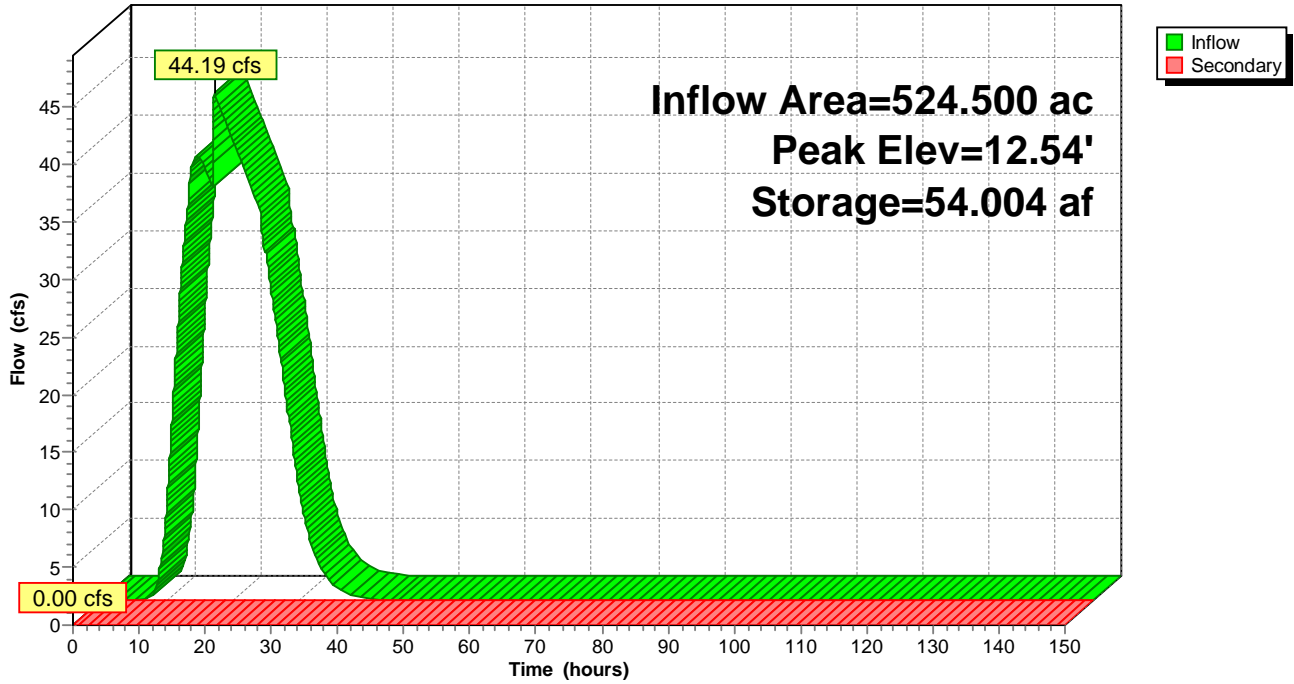
Device	Routing	Invert	Outlet Devices					
#1	Secondary	12.99'	9,999.0' long x 0.5' breadth Broad-Crested Rectangular Weir					
			Head (feet) 0.20 0.40 0.60 0.80 1.00					
			Coef. (English) 2.80 2.92 3.08 3.30 3.32					

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.00' (Free Discharge)

↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 10P: 10P-Large Central/NE

Hydrograph



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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 11P: 11P-SE Pond

Inflow Area = 23.330 ac, 0.00% Impervious, Inflow Depth = 0.10" for 10-Yr event
 Inflow = 0.28 cfs @ 24.09 hrs, Volume= 0.198 af
 Outflow = 0.28 cfs @ 24.10 hrs, Volume= 0.198 af, Atten= 0%, Lag= 0.6 min
 Discarded = 0.28 cfs @ 24.10 hrs, Volume= 0.198 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 13.00' @ 24.10 hrs Surf.Area= 0.231 ac Storage= 0.000 af

Plug-Flow detention time= 0.7 min calculated for 0.198 af (100% of inflow)
 Center-of-Mass det. time= 0.7 min (1,289.6 - 1,288.9)

Volume	Invert	Avail.Storage	Storage Description			
#1	13.00'	3.949 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
13.00	0.230	1,892.0	0.000	0.000	0.230	
14.00	2.940	4,273.0	1.331	1.331	27.046	
15.00	2.310	2,361.0	2.619	3.949	50.218	

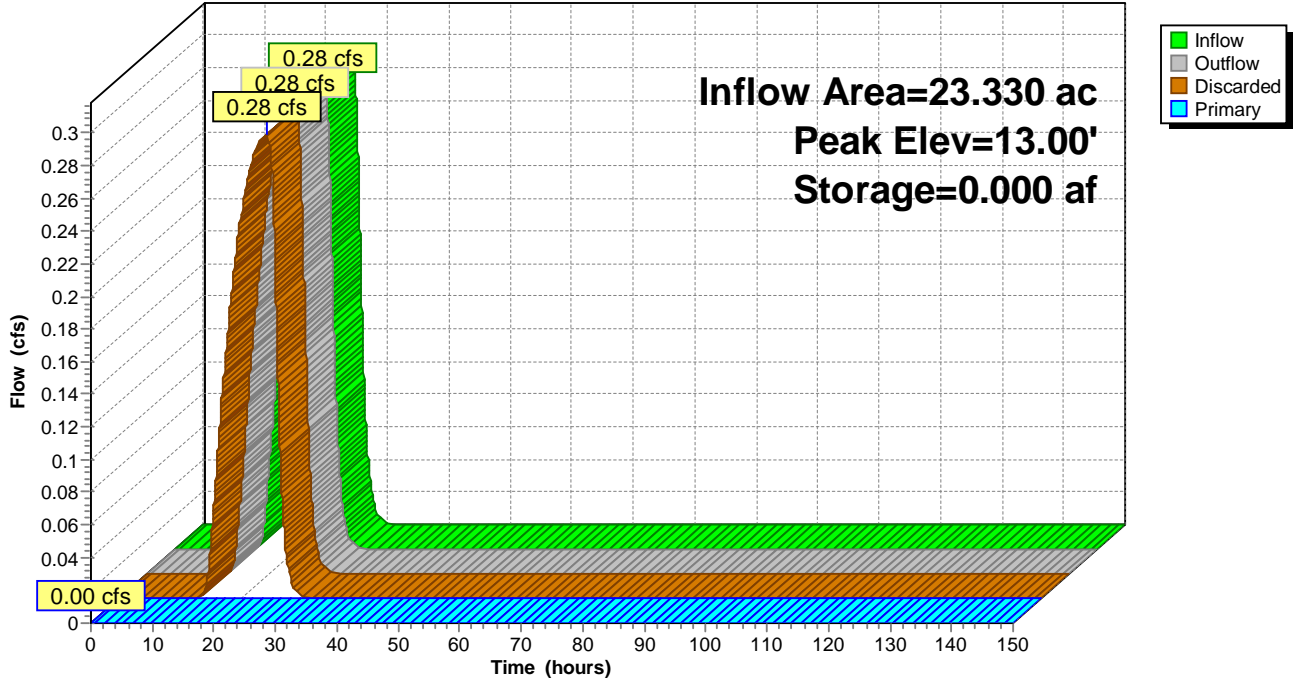
Device	Routing	Invert	Outlet Devices						
#1	Primary	14.99'	2,360.0' long x 0.5' breadth Broad-Crested Rectangular Weir						
			Head (feet) 0.20 0.40 0.60 0.80 1.00						
			Coef. (English) 2.80 2.92 3.08 3.30 3.32						
#2	Discarded	13.00'	19.980 in/hr Exfiltration over Surface area						
			Conductivity to Groundwater Elevation = 1.00'						

Discarded OutFlow Max=4.66 cfs @ 24.10 hrs HW=13.00' (Free Discharge)
 ↑**2=Exfiltration** (Controls 4.66 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=13.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 11P: 11P-SE Pond

Hydrograph



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Type IA 24-hr 25-Yr Rainfall=4.50"

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Time span=0.00-150.00 hrs, dt=0.01 hrs, 15001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S-NW Catchment	Runoff Area=7.320 ac 15.71% Impervious Runoff Depth=2.21" Flow Length=292' Slope=0.0200 '/ Tc=4.9 min CN=77 Runoff=3.81 cfs 1.348 af
Subcatchment 2S: 2S-NW Catchment 2	Runoff Area=4.280 ac 0.00% Impervious Runoff Depth=1.90" Flow Length=314' Tc=7.8 min CN=73 Runoff=1.79 cfs 0.676 af
Subcatchment 3S: 3S-North Catchment	Runoff Area=14.400 ac 0.00% Impervious Runoff Depth=1.90" Flow Length=148' Tc=6.7 min CN=73 Runoff=6.03 cfs 2.275 af
Subcatchment 4S: 4S - West Catchment	Runoff Area=26.590 ac 0.00% Impervious Runoff Depth=1.90" Flow Length=923' Slope=0.0030 '/ Tc=56.2 min CN=73 Runoff=7.41 cfs 4.201 af
Subcatchment 5S: 5S - West Catchment	Runoff Area=24.830 ac 0.00% Impervious Runoff Depth=1.90" Flow Length=660' Tc=11.1 min CN=73 Runoff=10.19 cfs 3.922 af
Subcatchment 6S: 6S - West Catchment	Runoff Area=21.310 ac 0.00% Impervious Runoff Depth=2.05" Flow Length=1,162' Slope=0.0017 '/ Tc=127.5 min CN=75 Runoff=4.76 cfs 3.641 af
Subcatchment 7S: 7S - Southwest	Runoff Area=54.970 ac 0.93% Impervious Runoff Depth=2.21" Flow Length=1,127' Tc=135.3 min CN=77 Runoff=13.37 cfs 10.126 af
Subcatchment 8S: 8S - South Catchment	Runoff Area=16.360 ac 4.95% Impervious Runoff Depth=2.29" Flow Length=1,480' Tc=88.6 min CN=78 Runoff=5.03 cfs 3.126 af
Subcatchment 9S: 9S - North	Runoff Area=22.710 ac 0.00% Impervious Runoff Depth=1.90" Flow Length=597' Tc=23.9 min CN=73 Runoff=8.32 cfs 3.588 af
Subcatchment 10S: 10S - Large Central / NE	Runoff Area=324.760 ac 1.84% Impervious Runoff Depth=2.13" Flow Length=2,575' Slope=0.0019 '/ Tc=393.8 min CN=76 Runoff=46.20 cfs 57.640 af
Subcatchment 11S: 11S - SE	Runoff Area=23.330 ac 0.00% Impervious Runoff Depth=0.19" Flow Length=1,924' Tc=126.8 min CN=42 Runoff=0.45 cfs 0.378 af
Reach 8R: South Ditch	Avg. Flow Depth=0.71' Max Vel=1.52 fps Inflow=5.03 cfs 3.126 af n=0.022 L=579.0' S=0.0012 '/ Capacity=2.94 cfs Outflow=5.01 cfs 3.126 af
Pond 1P: 1P- NW Pond	Peak Elev=11.98' Storage=1.348 af Inflow=3.81 cfs 1.348 af Outflow=0.00 cfs 0.000 af
Pond 2P: 2P-NW Pond 2	Peak Elev=11.69' Storage=0.676 af Inflow=1.79 cfs 0.676 af Outflow=0.00 cfs 0.000 af
Pond 3P: 3P-North Pond	Peak Elev=14.99' Storage=2.709 af Inflow=6.03 cfs 3.981 af Outflow=3.49 cfs 1.279 af
Pond 4P: 4P - West Pond	Peak Elev=13.99' Storage=2.499 af Inflow=7.41 cfs 4.201 af Outflow=2.62 cfs 1.706 af

Existing_Conditions_mlc

Type IA 24-hr 25-Yr Rainfall=4.50"

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Pond 5P: 5P - West Pond Peak Elev=15.00' Storage=1.869 af Inflow=11.47 cfs 10.706 af
Outflow=9.12 cfs 8.869 af

Pond 6P: 6P- West Pond Peak Elev=15.00' Storage=3.831 af Inflow=11.58 cfs 12.510 af
Outflow=11.20 cfs 8.727 af

Pond 7P: 7P-Southwest Peak Elev=15.00' Storage=3.371 af Inflow=13.37 cfs 10.126 af
Outflow=8.88 cfs 6.783 af

Pond 8P: 8P Peak Elev=17.19' Inflow=5.03 cfs 3.126 af
36.0" Round Culvert n=0.025 L=93.0' S=0.0088 '/ Outflow=5.03 cfs 3.126 af

Pond 9P: 9P - North Peak Elev=12.99' Storage=1.418 af Inflow=8.32 cfs 4.866 af
Outflow=5.40 cfs 3.456 af

Pond 10P: 10P-Large Central/NE Peak Elev=12.73' Storage=69.822 af Inflow=59.19 cfs 69.822 af
Outflow=0.00 cfs 0.000 af

Pond 11P: 11P-SE Pond Peak Elev=13.00' Storage=0.000 af Inflow=0.45 cfs 0.378 af
Discarded=0.45 cfs 0.378 af Primary=0.00 cfs 0.000 af Outflow=0.45 cfs 0.378 af

Total Runoff Area = 540.860 ac Runoff Volume = 90.921 af Average Runoff Depth = 2.02"
98.44% Pervious = 532.400 ac 1.56% Impervious = 8.460 ac

Existing Conditions_mlc

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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 1S: 1S-NW Catchment

Runoff = 3.81 cfs @ 7.96 hrs, Volume= 1.348 af, Depth= 2.21"

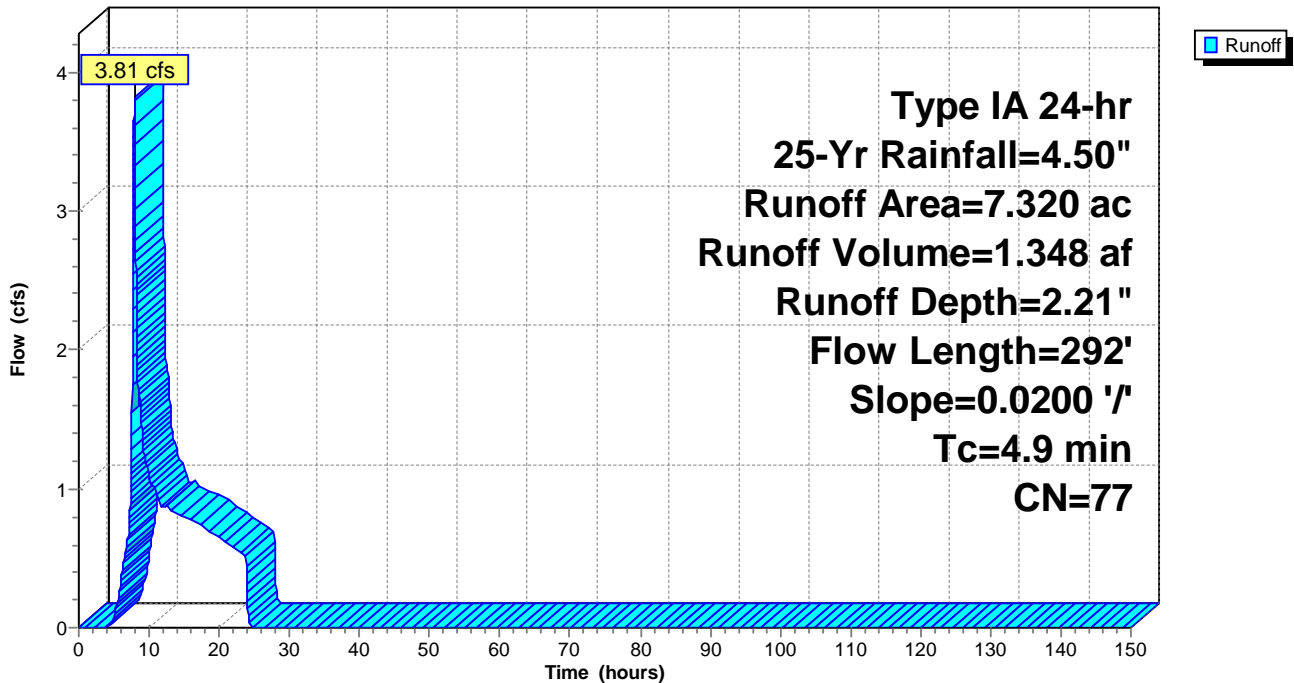
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
6.170	73	Brush, Good, HSG D
1.150	98	Paved parking, HSG D
7.320	77	Weighted Average
6.170	73	84.29% Pervious Area
1.150	98	15.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	292	0.0200	0.99		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps

Subcatchment 1S: 1S-NW Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 2S: 2S-NW Catchment 2

Sheet flow - dense comes from "native grasses" considered dense. Characterized by the wetland report.

Runoff = 1.79 cfs @ 8.02 hrs, Volume= 0.676 af, Depth= 1.90"

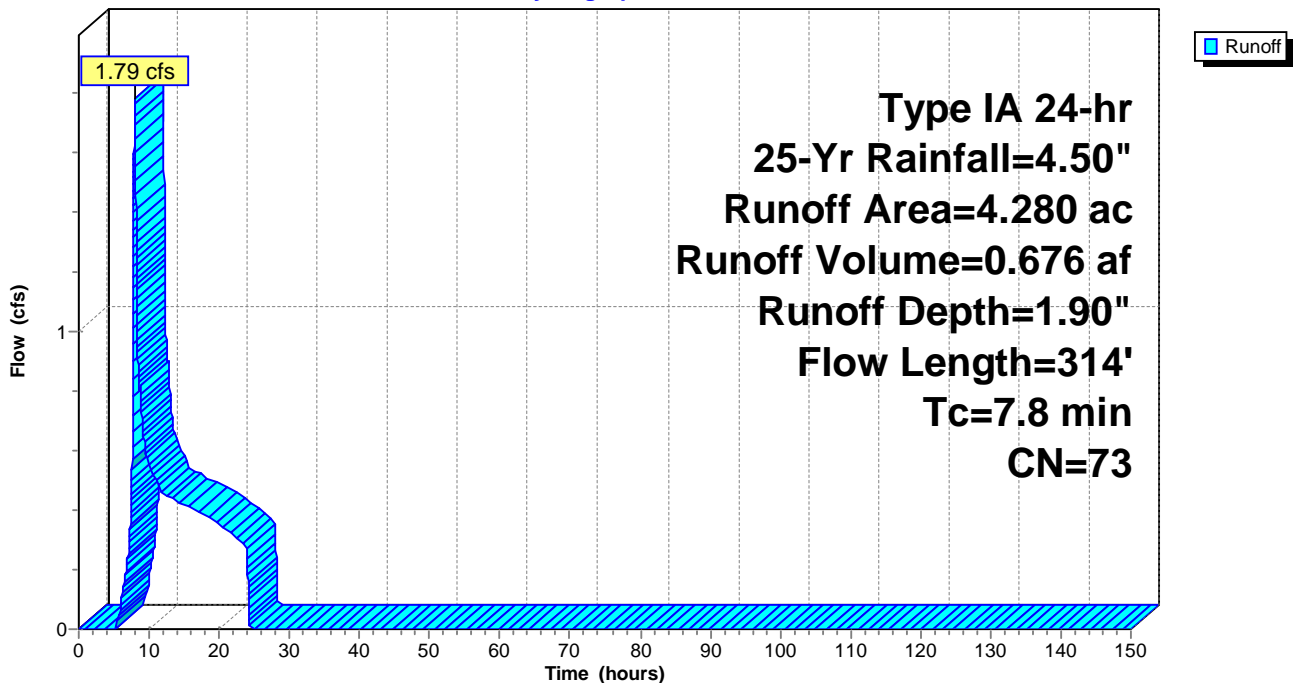
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
4.280	73	Brush, Good, HSG D
4.280	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	76	0.1300	0.24		Sheet Flow, Sheet - Dense, Native Grasses Grass: Dense n= 0.240 P2= 3.43"
2.6	238	0.0460	1.50		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
7.8	314	Total			

Subcatchment 2S: 2S-NW Catchment 2

Hydrograph



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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 3S: 3S-North Catchment

Runoff = 6.03 cfs @ 8.01 hrs, Volume= 2.275 af, Depth= 1.90"

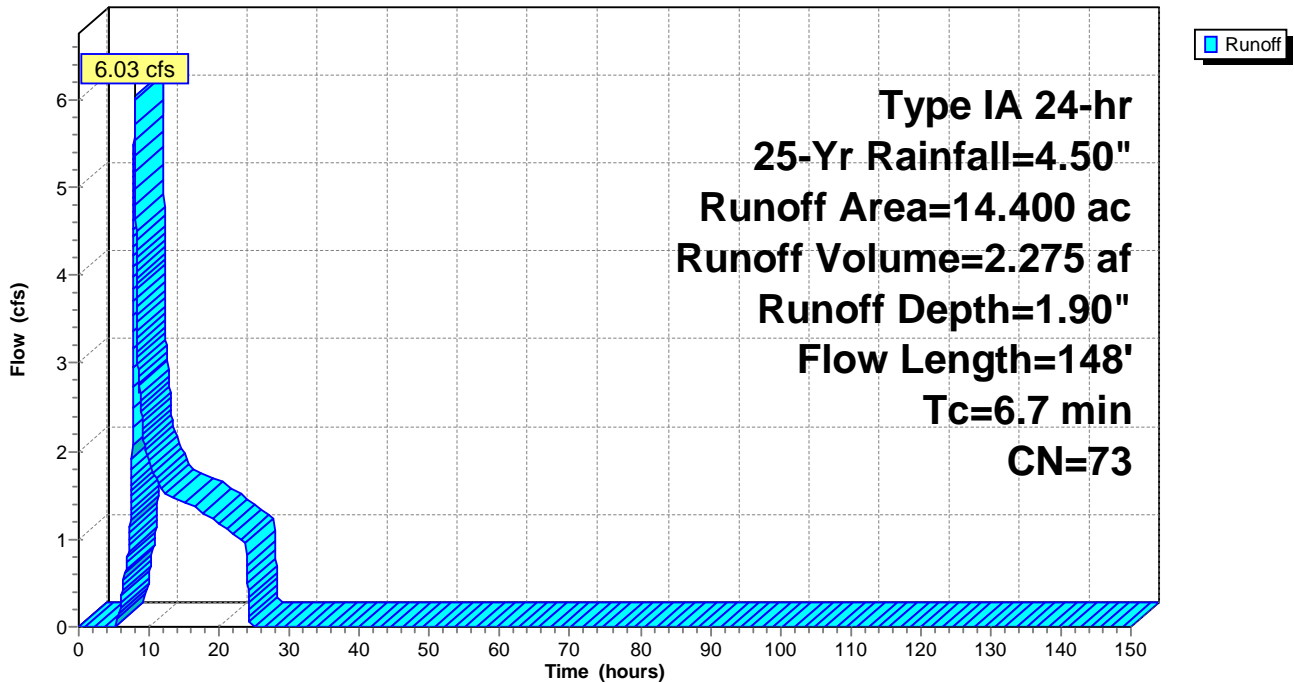
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
14.400	73	Brush, Good, HSG D
14.400	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	95	0.0950	0.33		Sheet Flow, Sheet flow - dune Grass: Short n= 0.150 P2= 3.43"
1.8	53	0.0050	0.49		Shallow Concentrated Flow, Shallow - dune grass Short Grass Pasture Kv= 7.0 fps
6.7	148	Total			

Subcatchment 3S: 3S-North Catchment

Hydrograph



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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 4S: 4S - West Catchment

Runoff = 7.41 cfs @ 8.62 hrs, Volume= 4.201 af, Depth= 1.90"

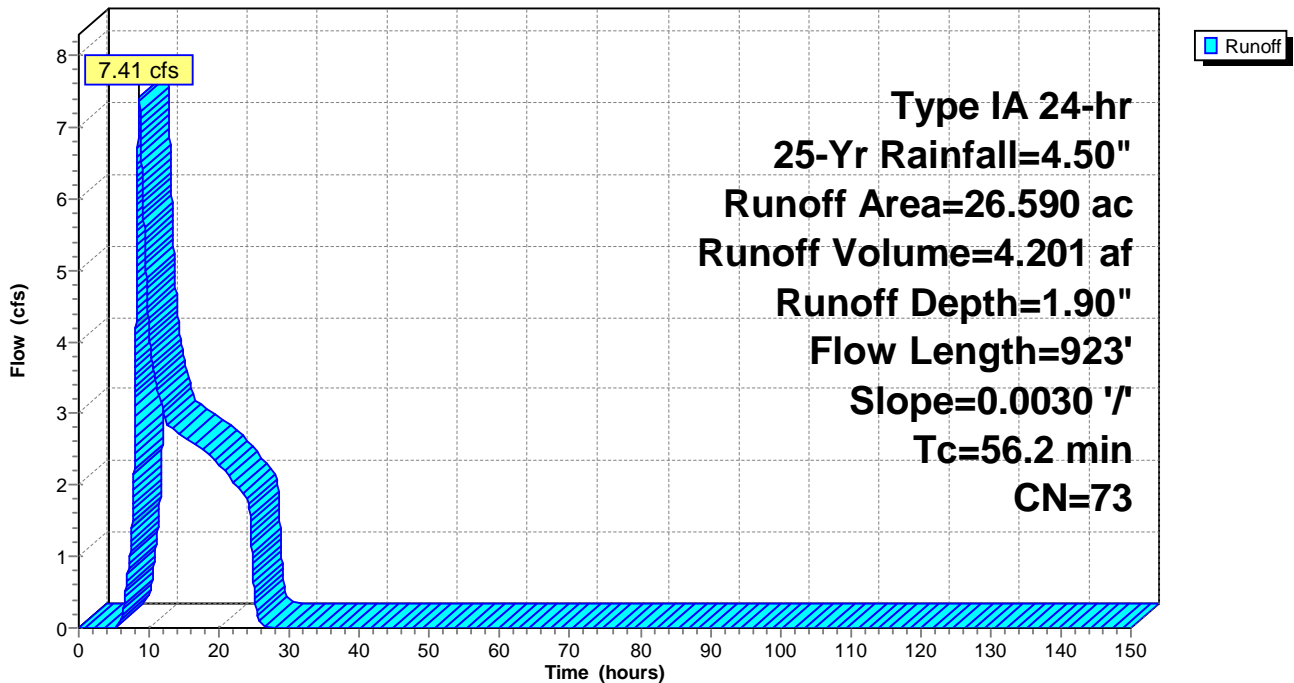
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
26.590	73	Brush, Good, HSG D
26.590	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.2	923	0.0030	0.27		Shallow Concentrated Flow, Shallow - Forest Woodland Kv= 5.0 fps

Subcatchment 4S: 4S - West Catchment

Hydrograph



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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 5S: 5S - West Catchment

Runoff = 10.19 cfs @ 8.05 hrs, Volume= 3.922 af, Depth= 1.90"

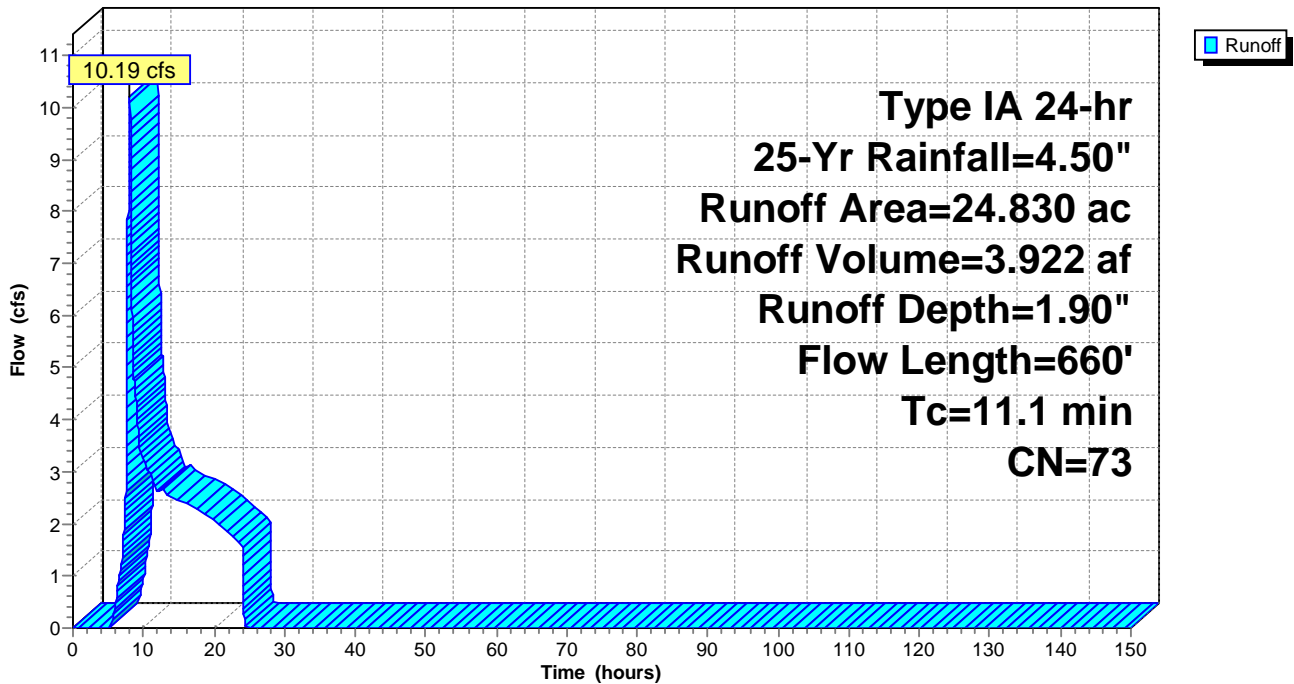
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
23.460	73	Brush, Good, HSG D
1.370	79	Woods/grass comb., Good, HSG D
24.830	73	Weighted Average
24.830	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	608	0.0180	0.94		Shallow Concentrated Flow, Shallow - Forest
					Short Grass Pasture Kv= 7.0 fps
0.3	52	0.1300	2.64		Sheet Flow, Path
					Smooth surfaces n= 0.011 P2= 3.43"
11.1	660	Total			

Subcatchment 5S: 5S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 6S: 6S - West Catchment

Runoff = 4.76 cfs @ 9.77 hrs, Volume= 3.641 af, Depth= 2.05"

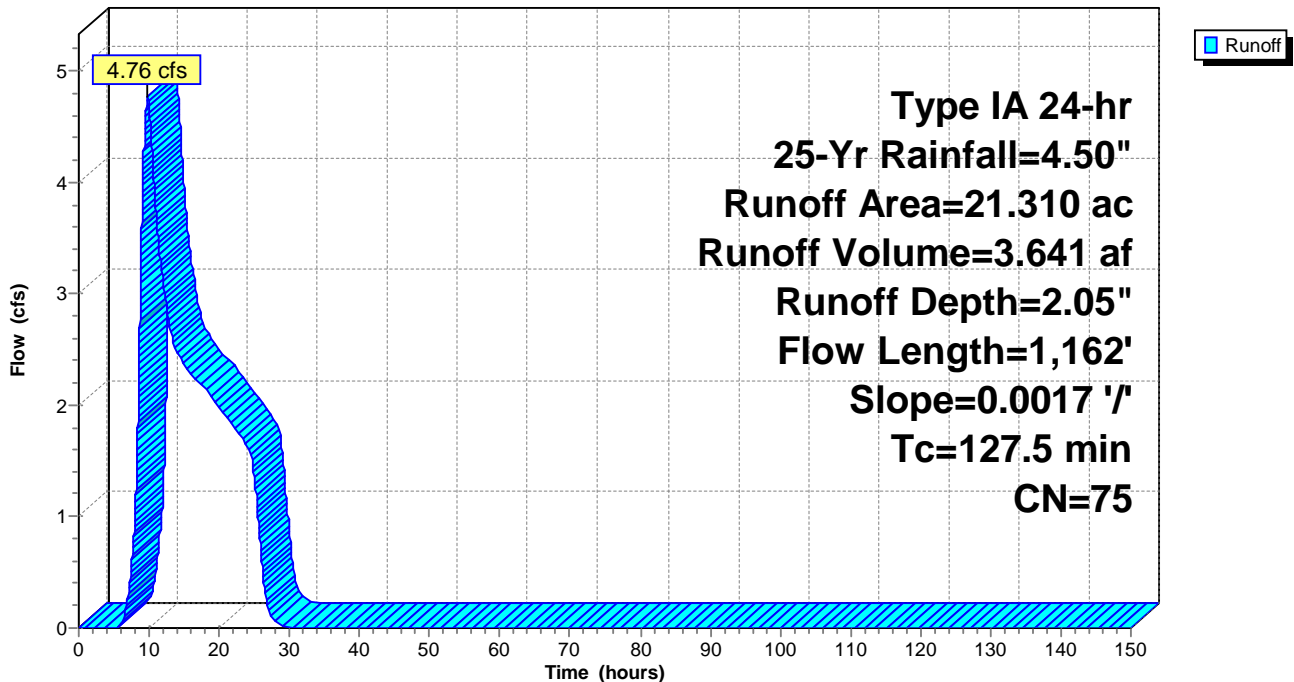
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
8.730	79	Woods/grass comb., Good, HSG D
12.580	73	Brush, Good, HSG D
21.310	75	Weighted Average
21.310	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.6	581	0.0017	0.29		Shallow Concentrated Flow, Grass - Shallow Short Grass Pasture Kv= 7.0 fps
93.9	581	0.0017	0.10		Shallow Concentrated Flow, Forested - Shallow Forest w/Heavy Litter Kv= 2.5 fps
127.5	1,162	Total			

Subcatchment 6S: 6S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 7S: 7S - Southwest

Runoff = 13.37 cfs @ 9.78 hrs, Volume= 10.126 af, Depth= 2.21"

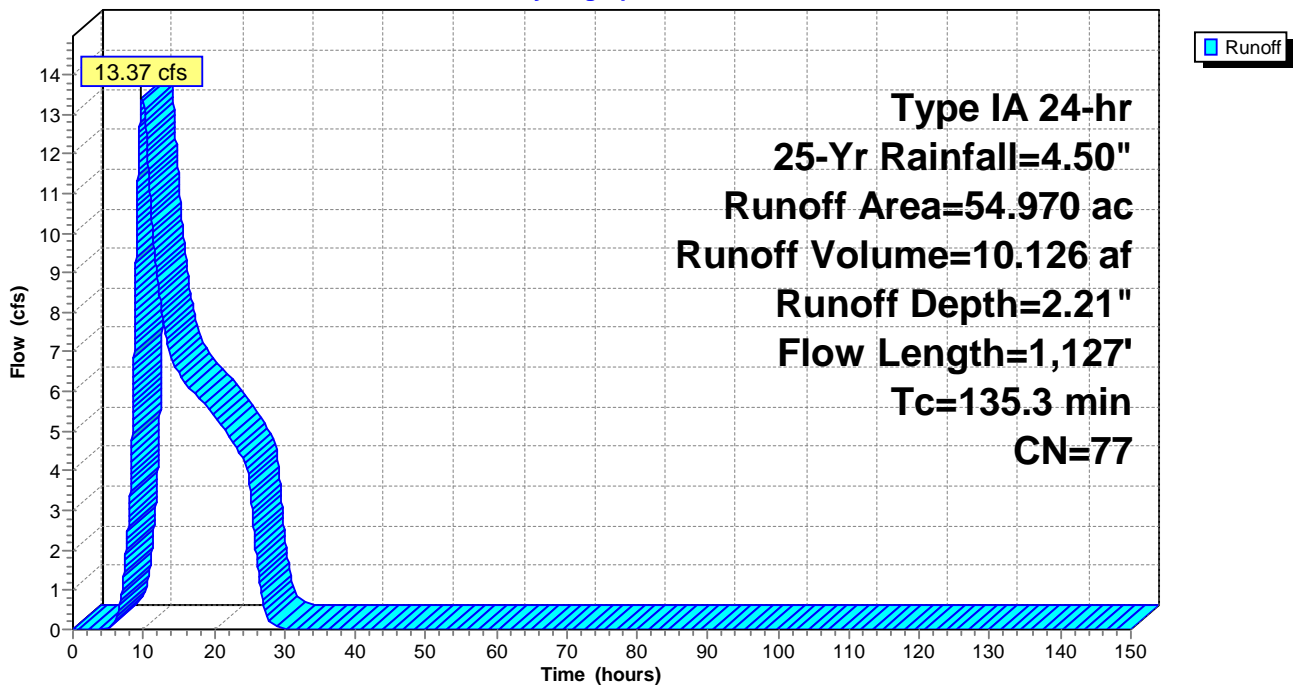
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
21.790	73	Brush, Good, HSG D
32.670	79	Woods/grass comb., Good, HSG D
0.510	98	Paved parking, HSG D
54.970	77	Weighted Average
54.460	77	99.07% Pervious Area
0.510	98	0.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	70	0.1000	0.21		Sheet Flow, Sheet - Paved to Grass Grass: Dense n= 0.240 P2= 3.43"
2.4	202	0.0390	1.38		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
127.5	855	0.0020	0.11		Shallow Concentrated Flow, Shallow - Forest Forest w/Heavy Litter Kv= 2.5 fps
135.3	1,127	Total			

Subcatchment 7S: 7S - Southwest

Hydrograph



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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 8S: 8S - South Catchment

Runoff = 5.03 cfs @ 9.15 hrs, Volume= 3.126 af, Depth= 2.29"

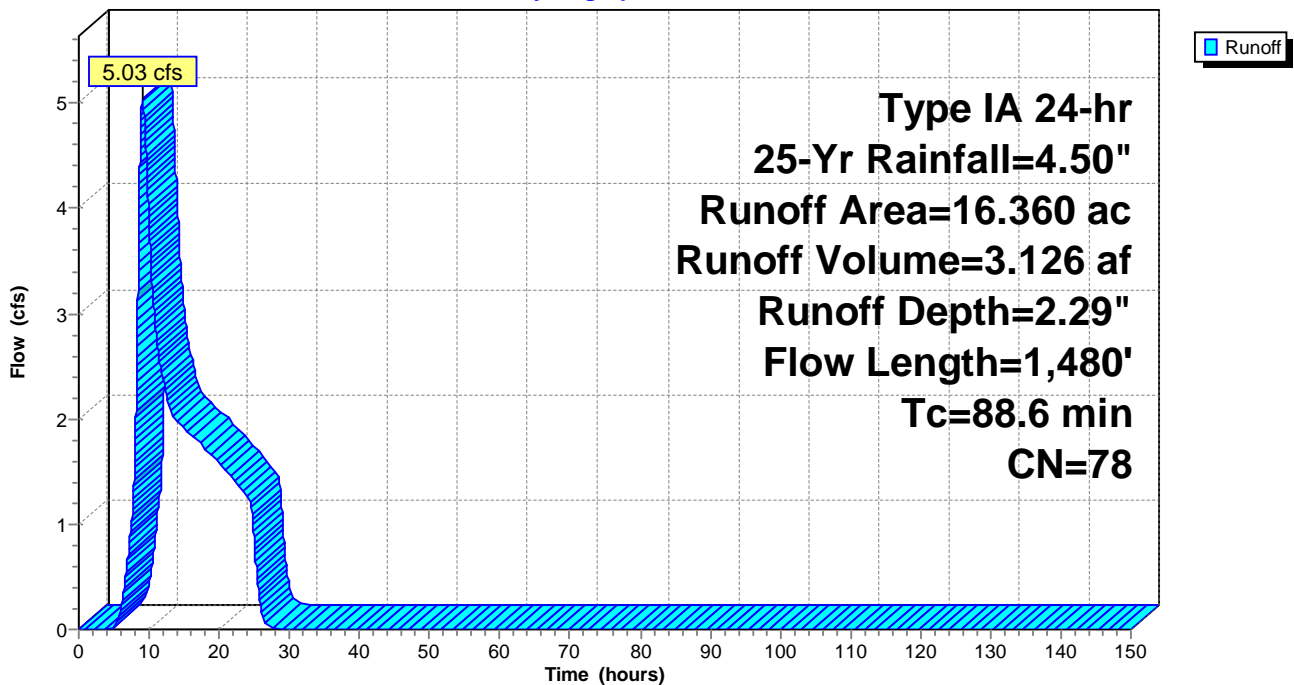
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
15.000	79	Woods/grass comb., Good, HSG D
0.550	30	Brush, Good, HSG A
0.810	98	Paved parking, HSG D
16.360	78	Weighted Average
15.550	77	95.05% Pervious Area
0.810	98	4.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	89	0.0560	0.26		Sheet Flow, Sheet- Dune grass Grass: Short n= 0.150 P2= 3.43"
67.3	844	0.0070	0.21		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps
15.6	547	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
88.6	1,480	Total			

Subcatchment 8S: 8S - South Catchment

Hydrograph



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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 9S: 9S - North

Runoff = 8.32 cfs @ 8.18 hrs, Volume= 3.588 af, Depth= 1.90"

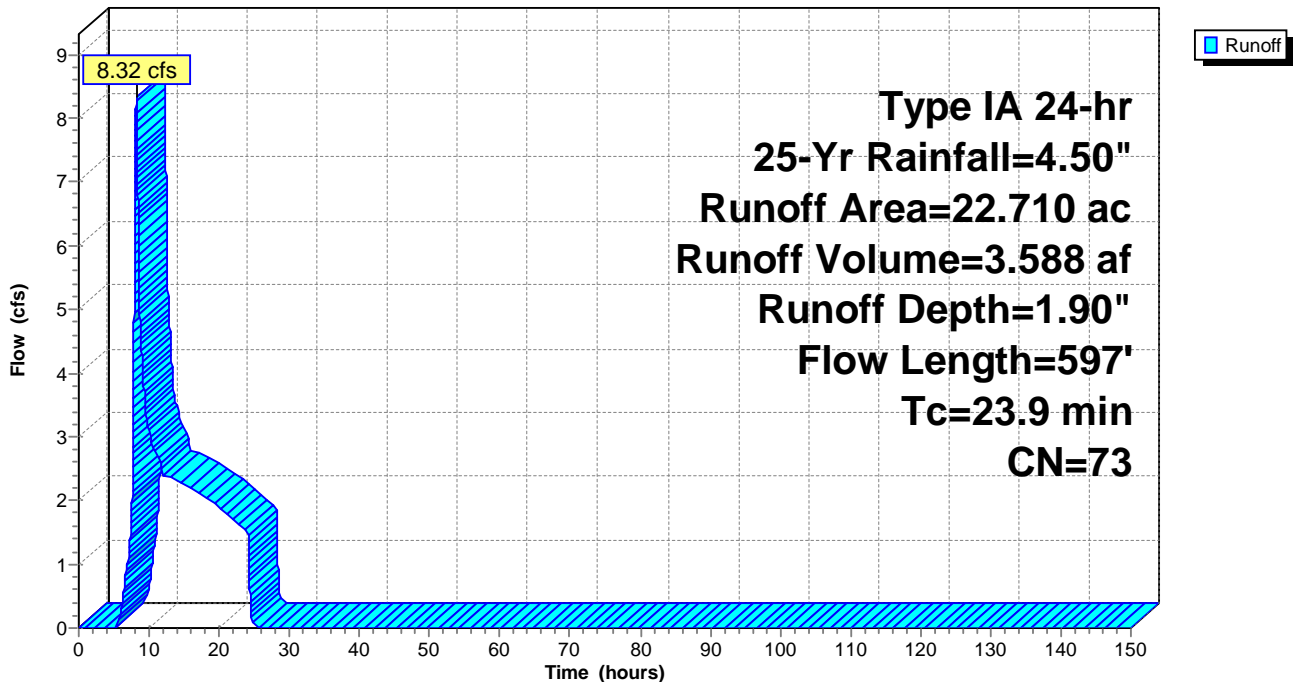
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
21.780	73	Brush, Good, HSG D
0.930	79	Woods/grass comb., Good, HSG D
22.710	73	Weighted Average
22.710	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	67	0.0450	0.15		Sheet Flow, Sheet - Grass Grass: Dense n= 0.240 P2= 3.43"
16.7	530	0.0057	0.53		Shallow Concentrated Flow, Shallow - Woods Short Grass Pasture Kv= 7.0 fps
23.9	597	Total			

Subcatchment 9S: 9S - North

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 10S: 10S - Large Central / NE

Runoff = 46.20 cfs @ 14.44 hrs, Volume= 57.640 af, Depth= 2.13"

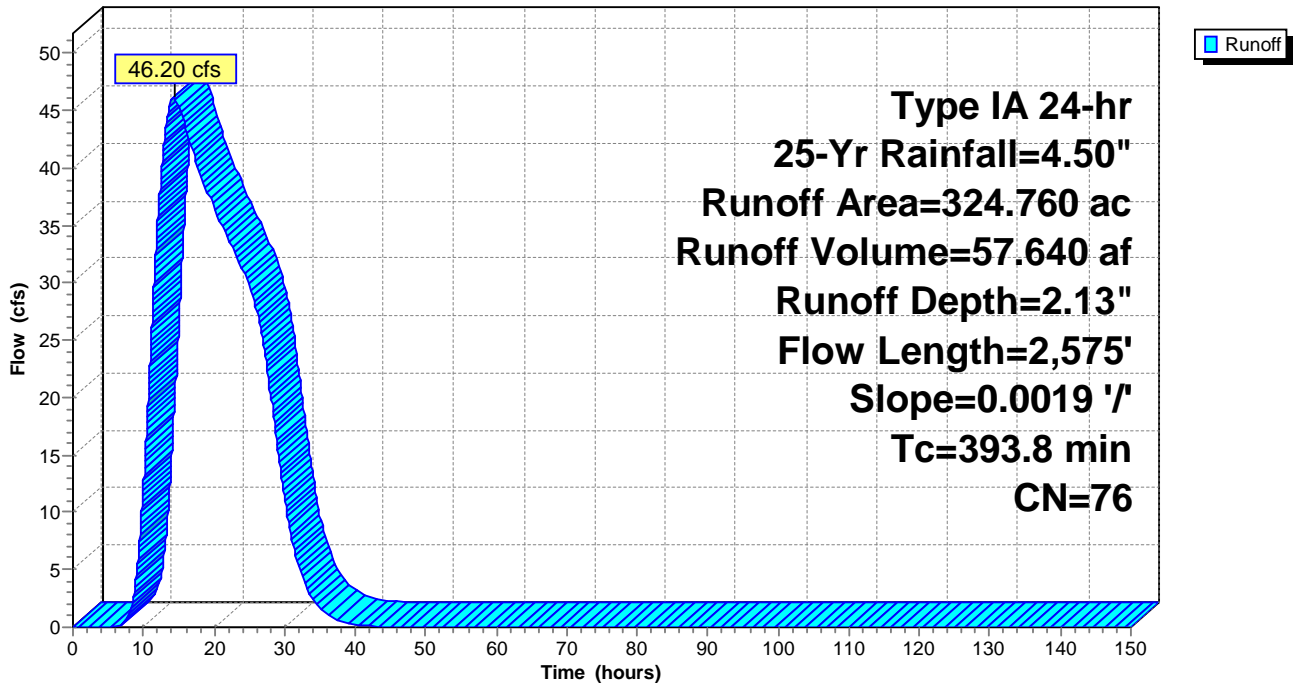
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
223.040	79	Woods/grass comb., Good, HSG D
12.880	32	Woods/grass comb., Good, HSG A
0.660	98	Paved parking, HSG A
5.330	98	Paved parking, HSG D
82.850	73	Brush, Good, HSG D
324.760	76	Weighted Average
318.770	76	98.16% Pervious Area
5.990	98	1.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
393.8	2,575	0.0019	0.11		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps

Subcatchment 10S: 10S - Large Central / NE

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 11S: 11S - SE

Runoff = 0.45 cfs @ 22.68 hrs, Volume= 0.378 af, Depth= 0.19"

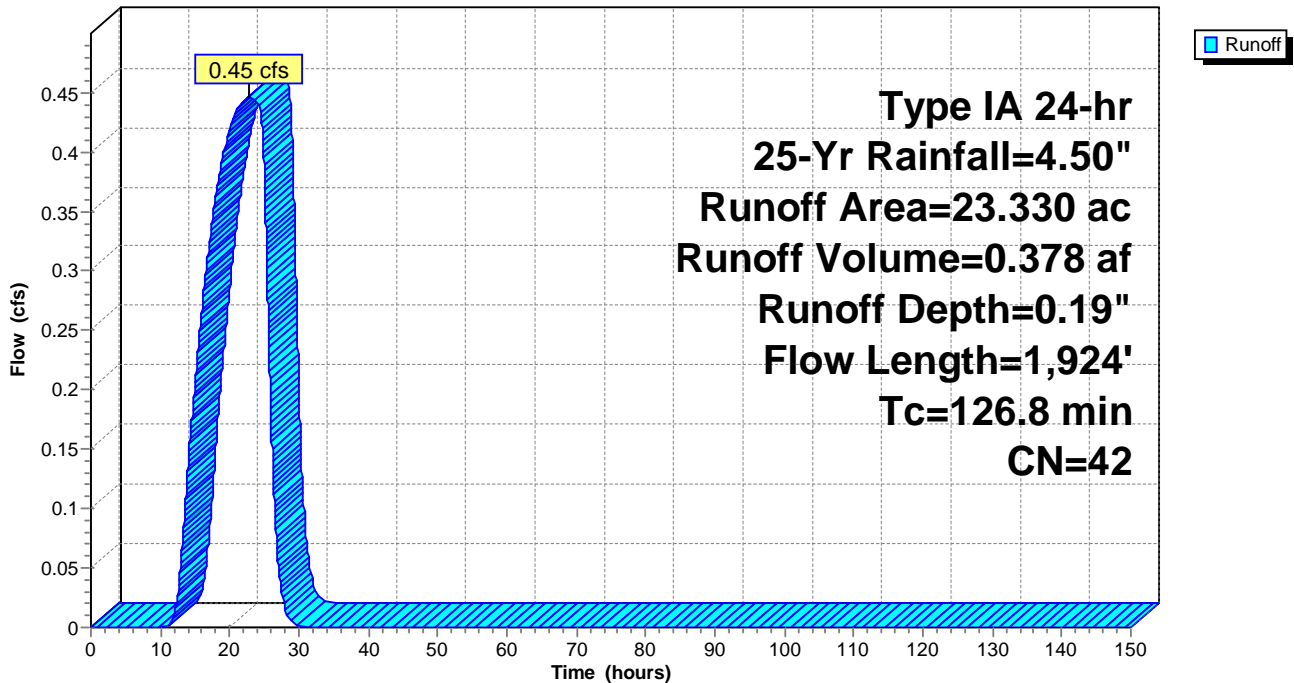
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
18.140	32	Woods/grass comb., Good, HSG A
1.980	79	Woods/grass comb., Good, HSG D
3.210	73	Brush, Good, HSG D
23.330	42	Weighted Average
23.330	42	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	126	0.1800	0.30		Sheet Flow, Sheet-Dune Grass Grass: Dense n= 0.240 P2= 3.43"
119.9	1,798	0.0100	0.25		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps
126.8	1,924	Total			

Subcatchment 11S: 11S - SE

Hydrograph



Existing_Conditions_mlc

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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Reach 8R: South Ditch

[91] Warning: Storage range exceeded by 0.21'

[55] Hint: Peak inflow is 171% of Manning's capacity

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 0.60'

Inflow Area =	16.360 ac,	4.95% Impervious,	Inflow Depth = 2.29"	for 25-Yr event
Inflow =	5.03 cfs @	9.15 hrs,	Volume=	3.126 af
Outflow =	5.01 cfs @	9.29 hrs,	Volume=	3.126 af, Atten= 0%, Lag= 8.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs

Max. Velocity= 1.52 fps, Min. Travel Time= 6.4 min

Avg. Velocity = 0.62 fps, Avg. Travel Time= 15.6 min

Peak Storage= 1,910 cf @ 9.18 hrs

Average Depth at Peak Storage= 0.71' , Surface Width= 5.42'

Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 2.94 cfs

4.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 1.0 ' / ' Top Width= 5.00'

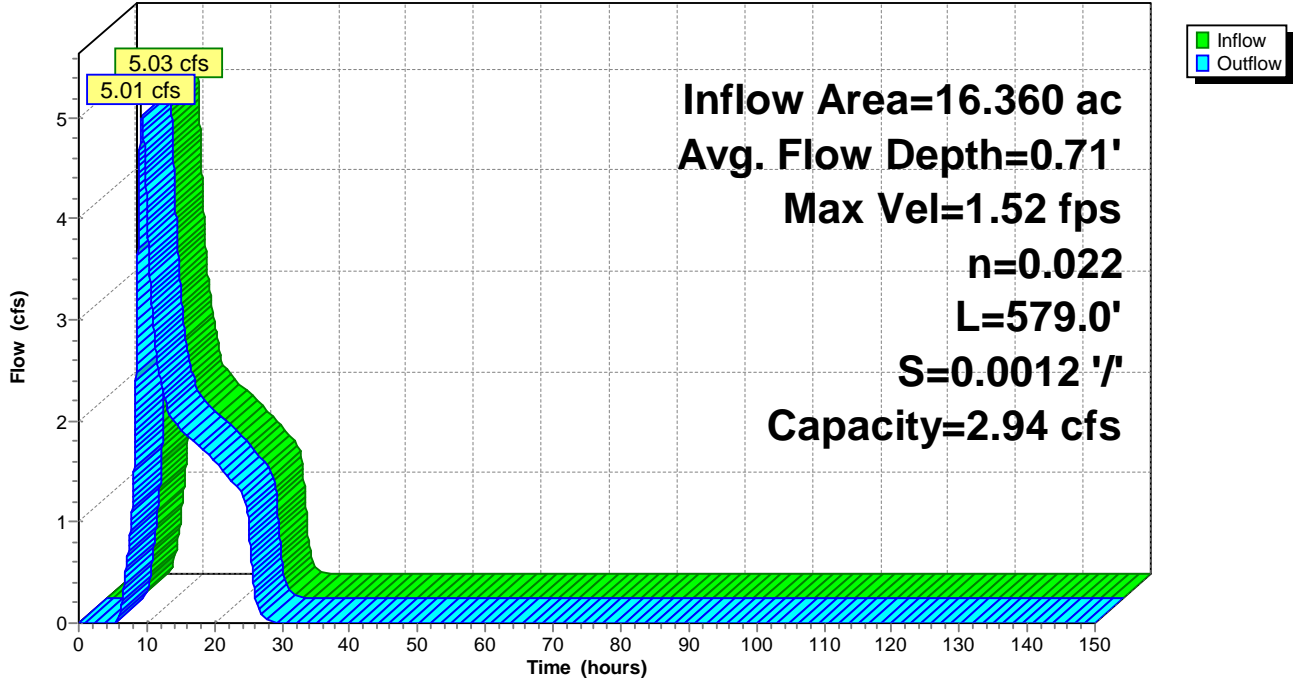
Length= 579.0' Slope= 0.0012 ' / '

Inlet Invert= 16.00', Outlet Invert= 15.30'



Reach 8R: South Ditch

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 1P: 1P- NW Pond

Inflow Area = 7.320 ac, 15.71% Impervious, Inflow Depth = 2.21" for 25-Yr event
 Inflow = 3.81 cfs @ 7.96 hrs, Volume= 1.348 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 11.98' @ 24.29 hrs Surf.Area= 1.457 ac Storage= 1.348 af

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

Volume	Invert	Avail.Storage	Storage Description
#1	11.00'	6.173 af	Custom Stage Data (Irregular) Listed below (Recalc)

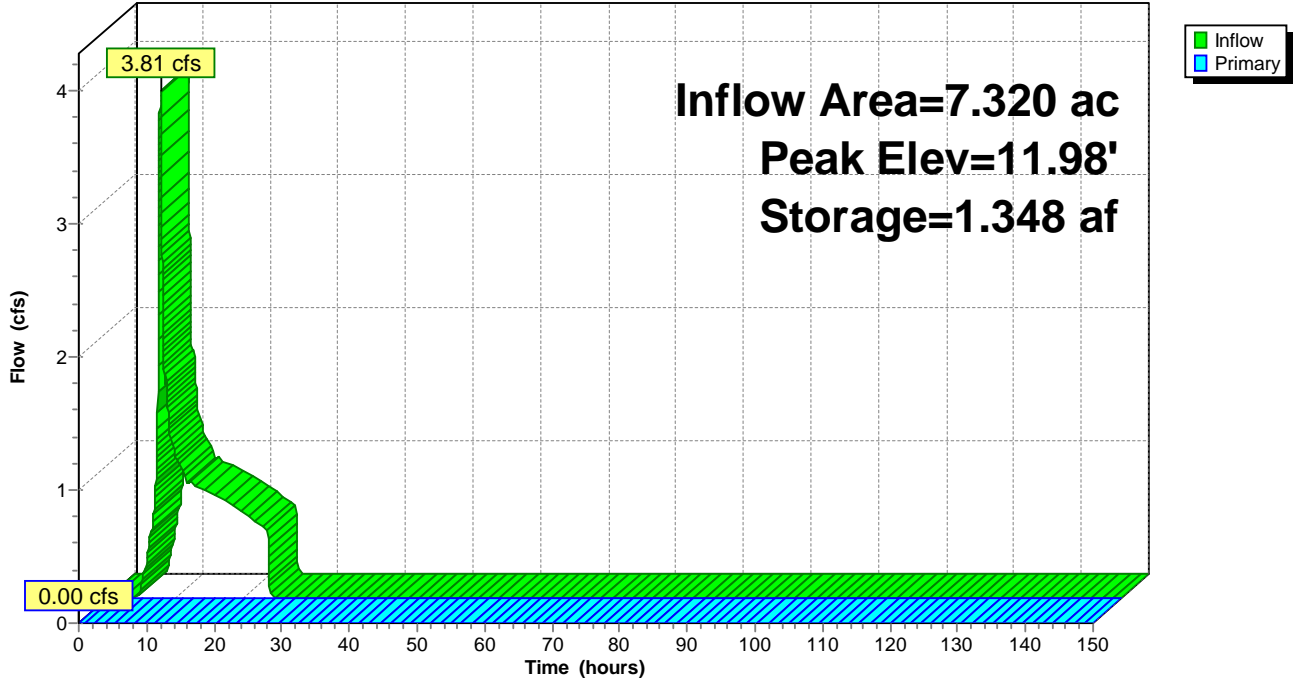
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
11.00	1.290	1,552.0	0.000	0.000	1.290
12.00	1.460	1,164.0	1.374	1.374	3.215
13.00	1.550	1,193.0	1.505	2.879	3.343
14.00	1.640	1,231.0	1.595	4.474	3.514
15.00	1.760	1,333.0	1.700	6.173	3.992

Device	Routing	Invert	Outlet Devices
#1	Primary	14.99'	1,333.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: 1P- NW Pond

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 2P: 2P-NW Pond 2

Inflow Area = 11.600 ac, 9.91% Impervious, Inflow Depth = 0.70" for 25-Yr event
 Inflow = 1.79 cfs @ 8.02 hrs, Volume= 0.676 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 11.69' @ 24.45 hrs Surf.Area= 1.035 ac Storage= 0.676 af

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

Volume	Invert	Avail.Storage	Storage Description			
#1	11.00'	3.348 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
11.00	0.930	1,430.0	0.000	0.000	0.930	
12.00	1.085	1,183.0	1.007	1.007	2.109	
13.00	1.170	1,220.0	1.127	2.134	2.274	
14.00	1.260	1,273.0	1.215	3.348	2.517	

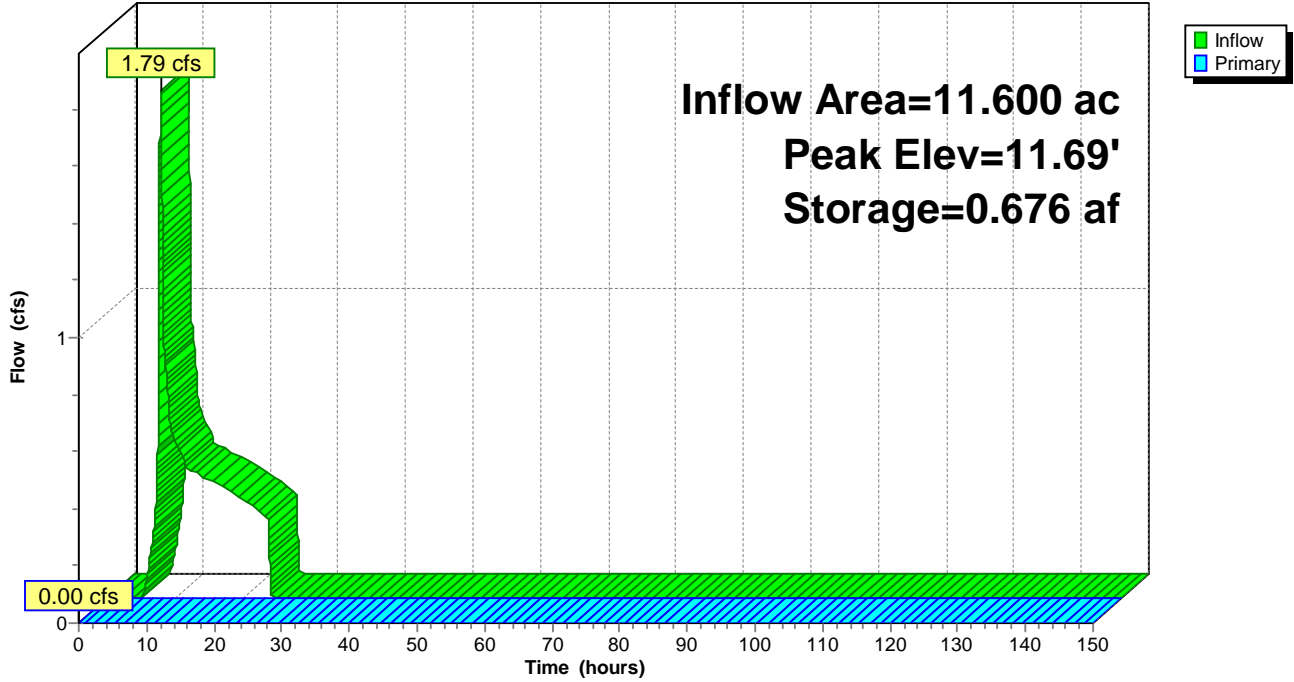
Device	Routing	Invert	Outlet Devices											
#1	Primary	13.99'	1,300.0' long x 4.0' breadth Broad-Crested Rectangular Weir											
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00											
			2.50 3.00 3.50 4.00 4.50 5.00 5.50											
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68											
			2.72 2.73 2.76 2.79 2.88 3.07 3.32											

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)

↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: 2P-NW Pond 2

Hydrograph



Existing_Conditions_mlc

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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 3P: 3P-North Pond

[81] Warning: Exceeded Pond 2P by 3.42' @ 19.66 hrs

[81] Warning: Exceeded Pond 4P by 1.00' @ 19.79 hrs

Inflow Area = 52.590 ac, 2.19% Impervious, Inflow Depth = 0.91" for 25-Yr event
 Inflow = 6.03 cfs @ 8.01 hrs, Volume= 3.981 af
 Outflow = 3.49 cfs @ 19.79 hrs, Volume= 1.279 af, Atten= 42%, Lag= 706.8 min
 Primary = 3.49 cfs @ 19.79 hrs, Volume= 1.279 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 14.99' @ 19.79 hrs Surf.Area= 1.599 ac Storage= 2.709 af

Plug-Flow detention time= 729.4 min calculated for 1.279 af (32% of inflow)
 Center-of-Mass det. time= 337.5 min (1,322.8 - 985.3)

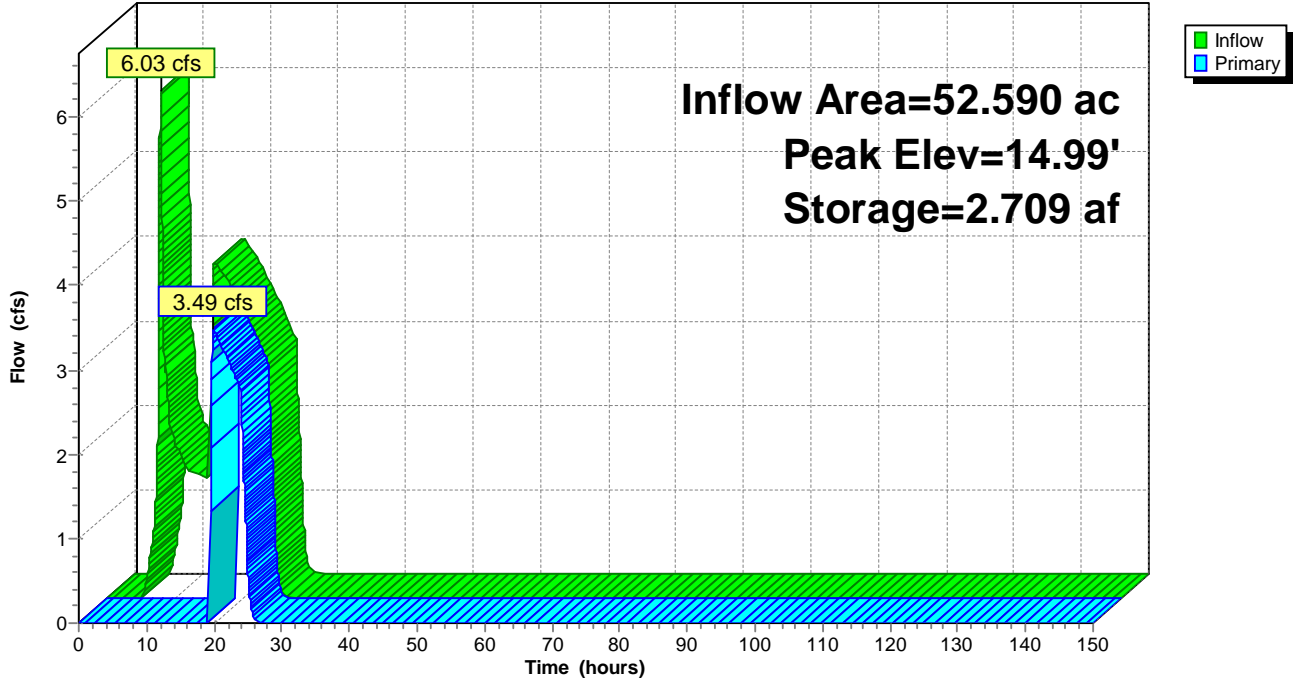
Volume	Invert	Avail.Storage	Storage Description			
#1	12.00'	2.718 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
12.00	0.086	1,508.0	0.000	0.000	0.086	
13.00	0.450	1,395.0	0.244	0.244	0.686	
14.00	1.500	4,156.0	0.924	1.168	28.685	
15.00	1.600	2,946.0	1.550	2.718	44.384	

Device	Routing	Invert	Outlet Devices											
#1	Primary	14.99'	3,000.0' long x 1.0' breadth Broad-Crested Rectangular Weir											
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00											
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32											

Primary OutFlow Max=2.30 cfs @ 19.79 hrs HW=14.99' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 2.30 cfs @ 0.18 fps)

Pond 3P: 3P-North Pond

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 4P: 4P - West Pond

Inflow Area = 26.590 ac, 0.00% Impervious, Inflow Depth = 1.90" for 25-Yr event
 Inflow = 7.41 cfs @ 8.62 hrs, Volume= 4.201 af
 Outflow = 2.62 cfs @ 15.80 hrs, Volume= 1.706 af, Atten= 65%, Lag= 430.4 min
 Primary = 2.62 cfs @ 15.80 hrs, Volume= 1.706 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 13.99' @ 15.80 hrs Surf.Area= 3.775 ac Storage= 2.499 af

Plug-Flow detention time= 623.4 min calculated for 1.706 af (41% of inflow)
 Center-of-Mass det. time= 322.5 min (1,195.9 - 873.4)

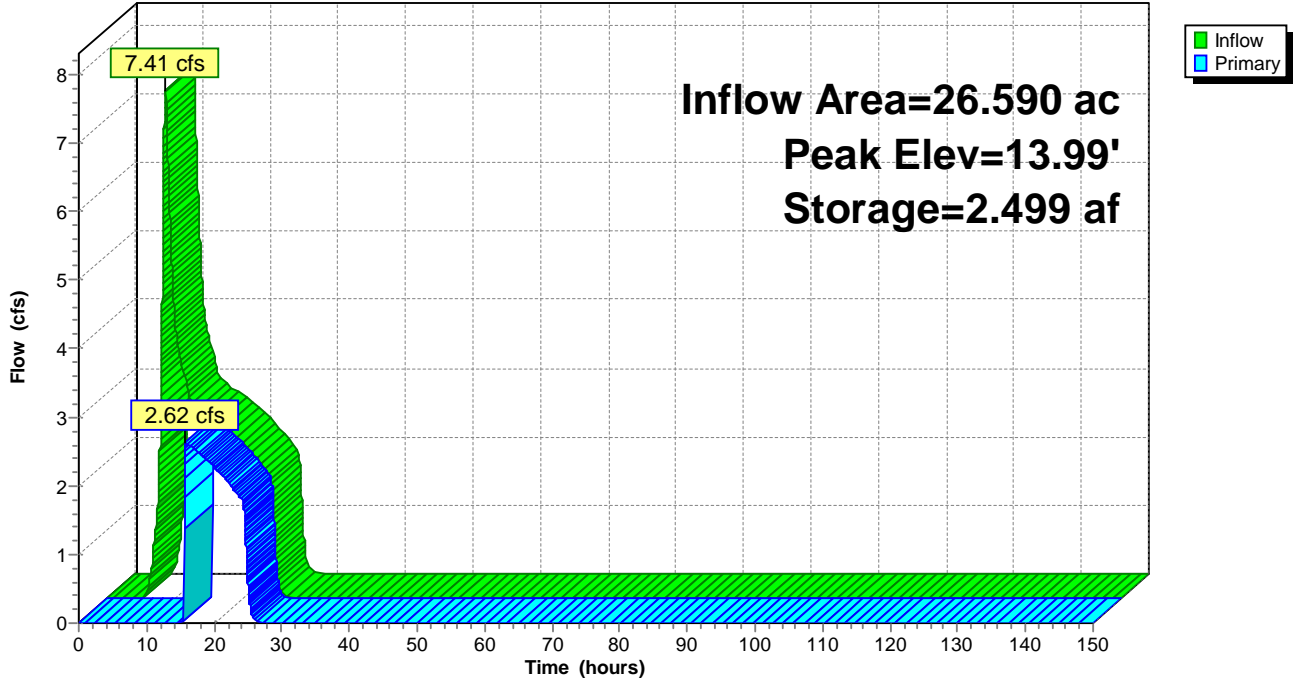
Volume	Invert	Avail.Storage	Storage Description			
#1	13.00'	2.532 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
13.00	1.450	2,862.0	0.000	0.000	1.450	
14.00	3.800	7,496.0	2.532	2.532	89.137	

Device	Routing	Invert	Outlet Devices				
#1	Primary	13.99'	7,496.0' long x 0.5' breadth Broad-Crested Rectangular Weir				
			Head (feet) 0.20 0.40 0.60 0.80 1.00				
			Coef. (English) 2.80 2.92 3.08 3.30 3.32				

Primary OutFlow Max=0.93 cfs @ 15.80 hrs HW=13.99' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 0.93 cfs @ 0.10 fps)

Pond 4P: 4P - West Pond

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 5P: 5P - West Pond

[81] Warning: Exceeded Pond 7P by 0.01' @ 17.47 hrs

Inflow Area = 79.800 ac, 0.64% Impervious, Inflow Depth = 1.61" for 25-Yr event
 Inflow = 11.47 cfs @ 11.95 hrs, Volume= 10.706 af
 Outflow = 9.12 cfs @ 14.58 hrs, Volume= 8.869 af, Atten= 20%, Lag= 158.1 min
 Primary = 9.12 cfs @ 14.58 hrs, Volume= 8.869 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 15.00' @ 14.58 hrs Surf.Area= 14.712 ac Storage= 1.869 af

Plug-Flow detention time= 193.9 min calculated for 8.868 af (83% of inflow)
 Center-of-Mass det. time= 103.0 min (1,097.7 - 994.7)

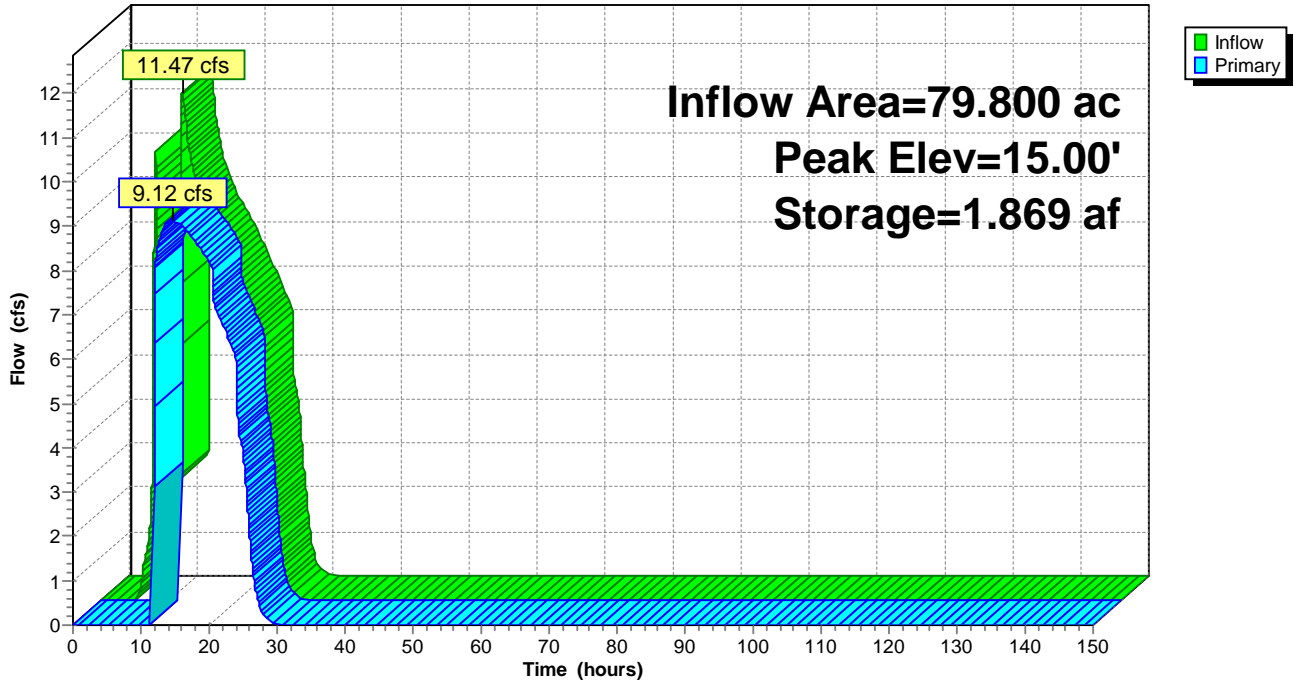
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	5.374 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	1.160	3,026.0	0.000	0.000	1.160	
15.00	2.670	3,968.0	1.863	1.863	13.196	
15.01	999.000	9,999.0	3.511	5.374	167.081	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	3,000.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=8.94 cfs @ 14.58 hrs HW=15.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 8.94 cfs @ 0.28 fps)

Pond 5P: 5P - West Pond

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 6P: 6P- West Pond

[79] Warning: Submerged Pond 5P Primary device # 1 by 0.01'

Inflow Area = 101.110 ac, 0.50% Impervious, Inflow Depth = 1.48" for 25-Yr event
 Inflow = 11.58 cfs @ 13.74 hrs, Volume= 12.510 af
 Outflow = 11.20 cfs @ 16.35 hrs, Volume= 8.727 af, Atten= 3%, Lag= 156.9 min
 Primary = 11.20 cfs @ 16.35 hrs, Volume= 8.727 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 16.35 hrs Surf.Area= 5.054 ac Storage= 3.831 af

Plug-Flow detention time= 280.0 min calculated for 8.726 af (70% of inflow)
 Center-of-Mass det. time= 139.6 min (1,187.9 - 1,048.3)

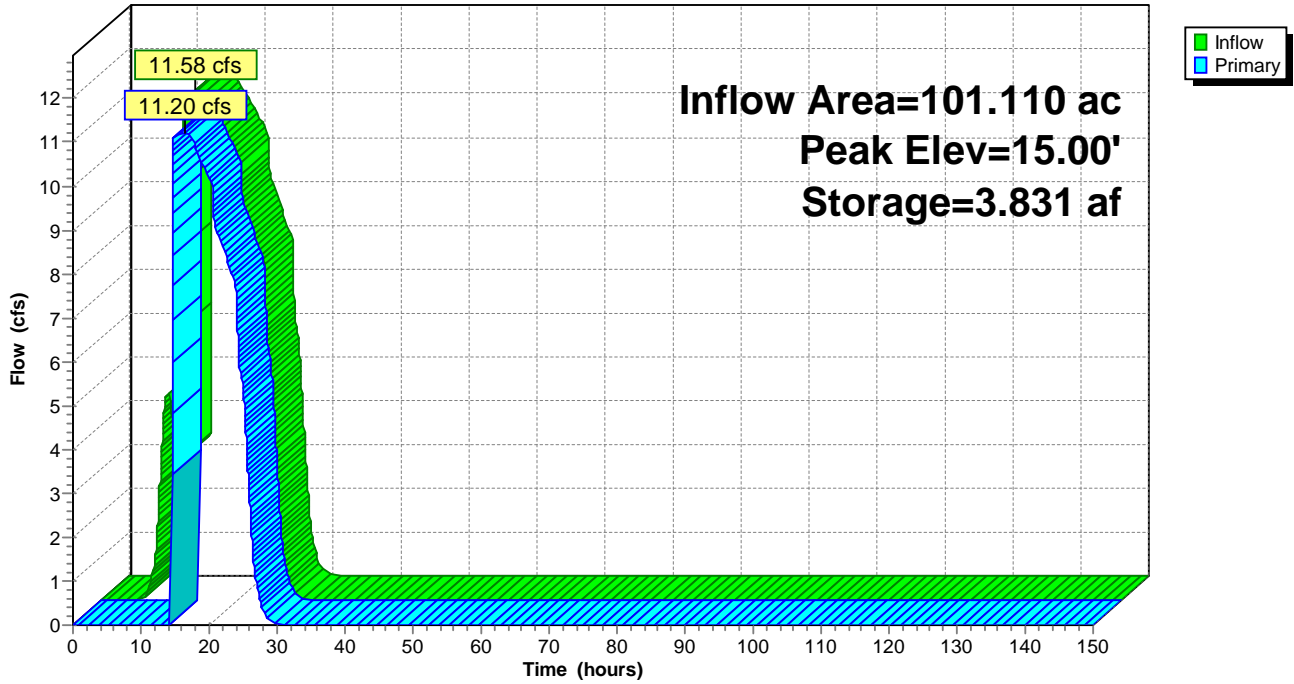
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	37.908 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.930	3,856.0	0.000	0.000	2.930	
15.00	4.810	4,175.0	3.831	3.831	7.611	
15.01	9,999.000	9,999.0	34.077	37.908	158.416	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	4,175.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=11.20 cfs @ 16.35 hrs HW=15.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 11.20 cfs @ 0.27 fps)

Pond 6P: 6P- West Pond

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 7P: 7P-Southwest

Inflow Area = 54.970 ac, 0.93% Impervious, Inflow Depth = 2.21" for 25-Yr event
 Inflow = 13.37 cfs @ 9.78 hrs, Volume= 10.126 af
 Outflow = 8.88 cfs @ 11.95 hrs, Volume= 6.783 af, Atten= 34%, Lag= 129.8 min
 Primary = 8.88 cfs @ 11.95 hrs, Volume= 6.783 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 15.00' @ 11.95 hrs Surf.Area= 4.550 ac Storage= 3.371 af

Plug-Flow detention time= 353.4 min calculated for 6.783 af (67% of inflow)
 Center-of-Mass det. time= 165.5 min (1,089.1 - 923.6)

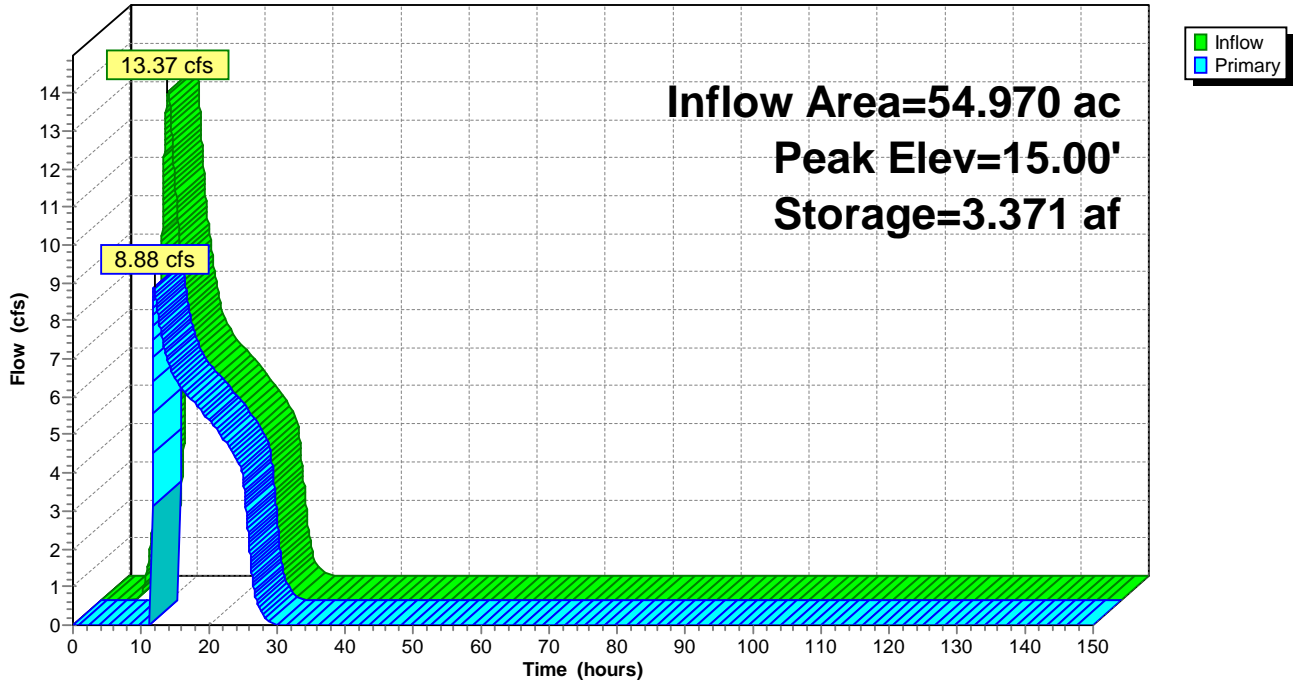
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	39.091 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.340	3,959.0	0.000	0.000	2.340	
15.00	4.560	5,430.0	3.389	3.389	27.571	
15.10	999.000	9,999.0	35.702	39.091	156.355	

Device	Routing	Invert	Outlet Devices								
#1	Primary	14.99'	5,430.0' long x 100.0' breadth Broad-Crested Rectangular Weir								
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60								
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63								

Primary OutFlow Max=6.94 cfs @ 11.95 hrs HW=15.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 6.94 cfs @ 0.21 fps)

Pond 7P: 7P-Southwest

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 8P: 8P

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 2.29" for 25-Yr event
Inflow = 5.03 cfs @ 9.15 hrs, Volume= 3.126 af
Outflow = 5.03 cfs @ 9.15 hrs, Volume= 3.126 af, Atten= 0%, Lag= 0.0 min
Primary = 5.03 cfs @ 9.15 hrs, Volume= 3.126 af

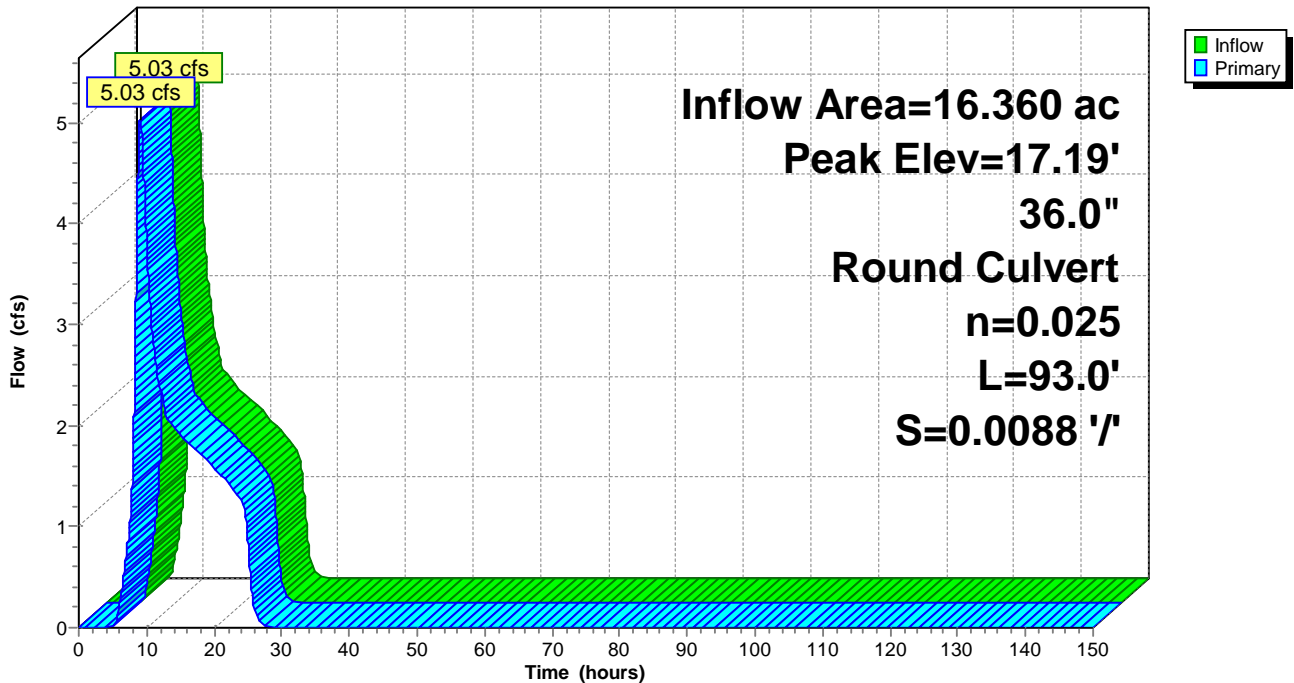
Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Peak Elev= 17.19' @ 9.15 hrs
Flood Elev= 19.00'

Device #1	Routing	Invert	Outlet Devices
	Primary	16.11'	36.0" Round Culvert L= 93.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.11' / 15.29' S= 0.0088 '/ Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=5.03 cfs @ 9.15 hrs HW=17.19' (Free Discharge)
↑ **1=Culvert** (Barrel Controls 5.03 cfs @ 3.27 fps)

Pond 8P: 8P

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 9P: 9P - North

Inflow Area = 75.300 ac, 1.53% Impervious, Inflow Depth = 0.78" for 25-Yr event
 Inflow = 8.32 cfs @ 8.18 hrs, Volume= 4.866 af
 Outflow = 5.40 cfs @ 19.80 hrs, Volume= 3.456 af, Atten= 35%, Lag= 697.4 min
 Primary = 5.40 cfs @ 19.80 hrs, Volume= 3.456 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 12.99' @ 19.80 hrs Surf.Area= 3.671 ac Storage= 1.418 af

Plug-Flow detention time= 336.4 min calculated for 3.456 af (71% of inflow)
 Center-of-Mass det. time= 177.0 min (1,146.5 - 969.4)

Volume	Invert	Avail.Storage	Storage Description
#1	12.00'	1.447 af	Custom Stage Data (Irregular) Listed below (Recalc)

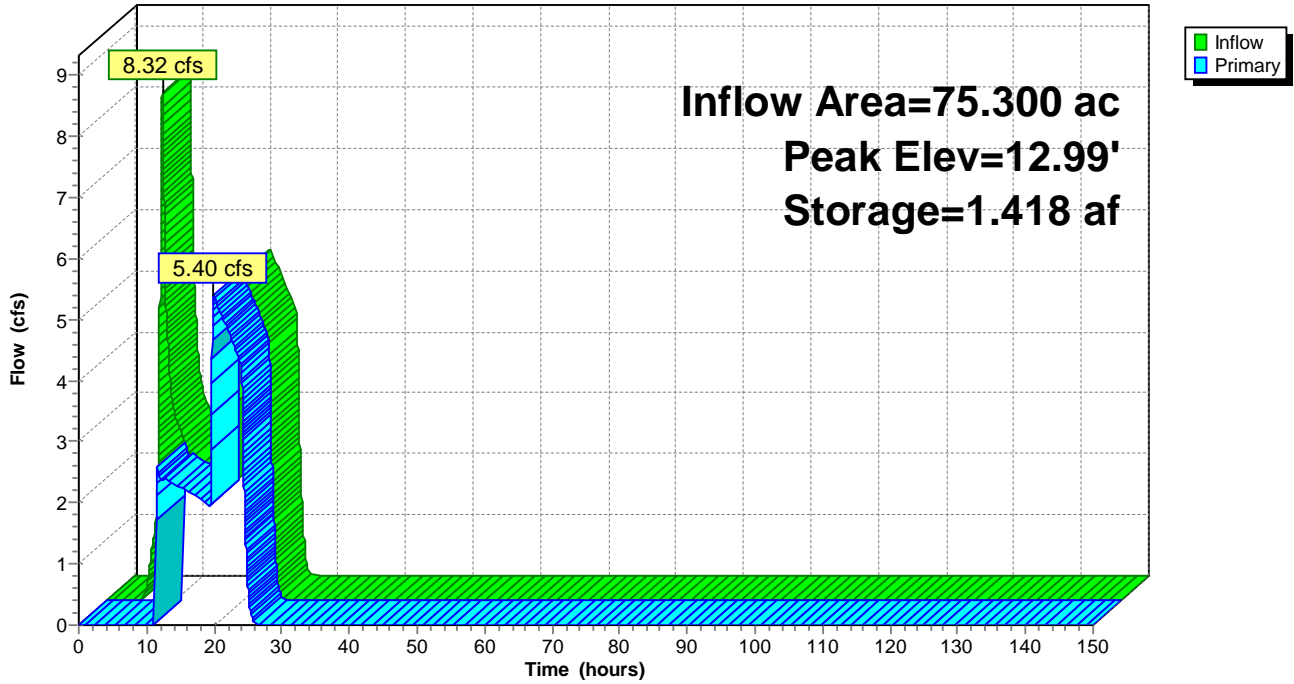
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
12.00	0.079	608.0	0.000	0.000	0.079
13.00	3.720	8,513.0	1.447	1.447	131.797

Device	Routing	Invert	Outlet Devices
#1	Primary	12.99'	8,513.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=2.57 cfs @ 19.80 hrs HW=12.99' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 2.57 cfs @ 0.13 fps)

Pond 9P: 9P - North

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 10P: 10P-Large Central/NE

Inflow Area = 524.500 ac, 1.46% Impervious, Inflow Depth = 1.60" for 25-Yr event
 Inflow = 59.19 cfs @ 14.85 hrs, Volume= 69.822 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.73' @ 46.39 hrs Surf.Area= 93.103 ac Storage= 69.822 af

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

Volume	Invert	Avail.Storage	Storage Description			
#1	10.00'	98.335 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.00	0.280	2,536.0	0.000	0.000	0.280	
11.00	6.414	16,985.0	2.678	2.678	515.559	
12.00	38.875	11,909.0	20.360	23.038	783.495	
13.00	119.000	22,186.0	75.297	98.335	1,423.612	

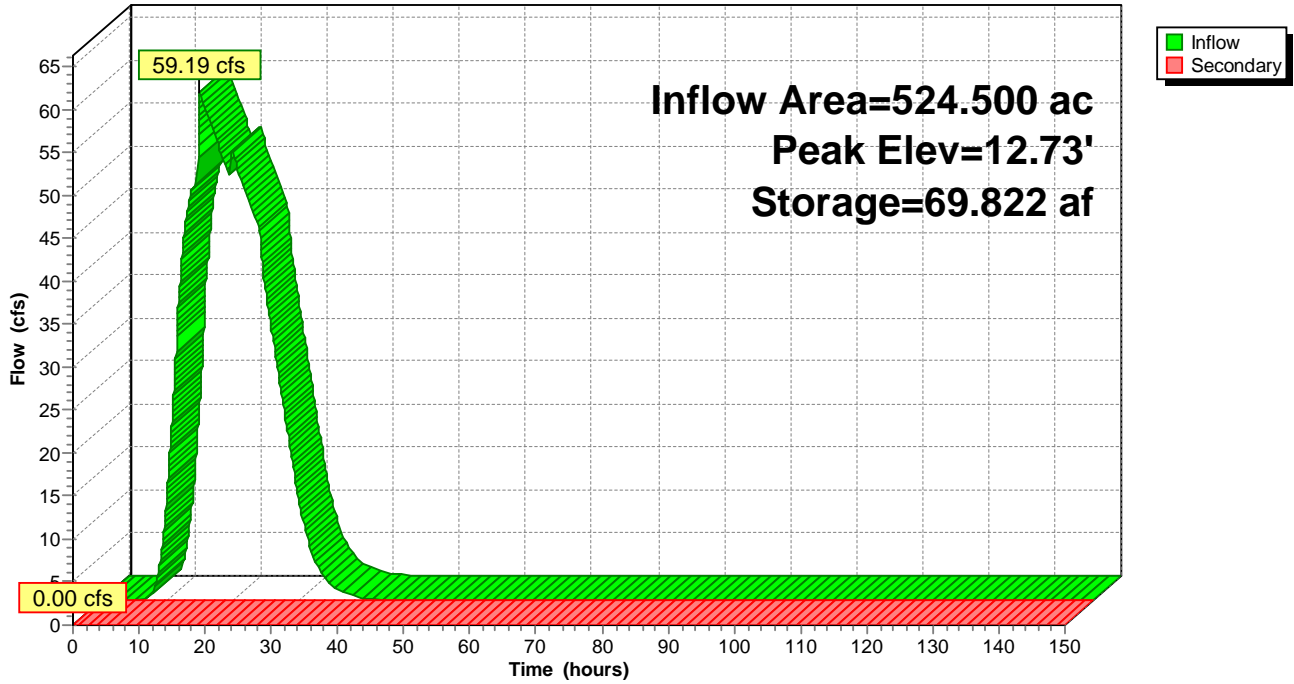
Device	Routing	Invert	Outlet Devices						
#1	Secondary	12.99'	9,999.0' long x 0.5' breadth Broad-Crested Rectangular Weir						
			Head (feet) 0.20 0.40 0.60 0.80 1.00						
			Coef. (English) 2.80 2.92 3.08 3.30 3.32						

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.00' (Free Discharge)

↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 10P: 10P-Large Central/NE

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 11P: 11P-SE Pond

Inflow Area = 23.330 ac, 0.00% Impervious, Inflow Depth = 0.19" for 25-Yr event
 Inflow = 0.45 cfs @ 22.68 hrs, Volume= 0.378 af
 Outflow = 0.45 cfs @ 22.69 hrs, Volume= 0.378 af, Atten= 0%, Lag= 0.6 min
 Discarded = 0.45 cfs @ 22.69 hrs, Volume= 0.378 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 13.00' @ 22.69 hrs Surf.Area= 0.232 ac Storage= 0.000 af

Plug-Flow detention time= 0.7 min calculated for 0.378 af (100% of inflow)
 Center-of-Mass det. time= 0.7 min (1,233.3 - 1,232.6)

Volume	Invert	Avail.Storage	Storage Description			
#1	13.00'	3.949 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
13.00	0.230	1,892.0	0.000	0.000	0.230	
14.00	2.940	4,273.0	1.331	1.331	27.046	
15.00	2.310	2,361.0	2.619	3.949	50.218	

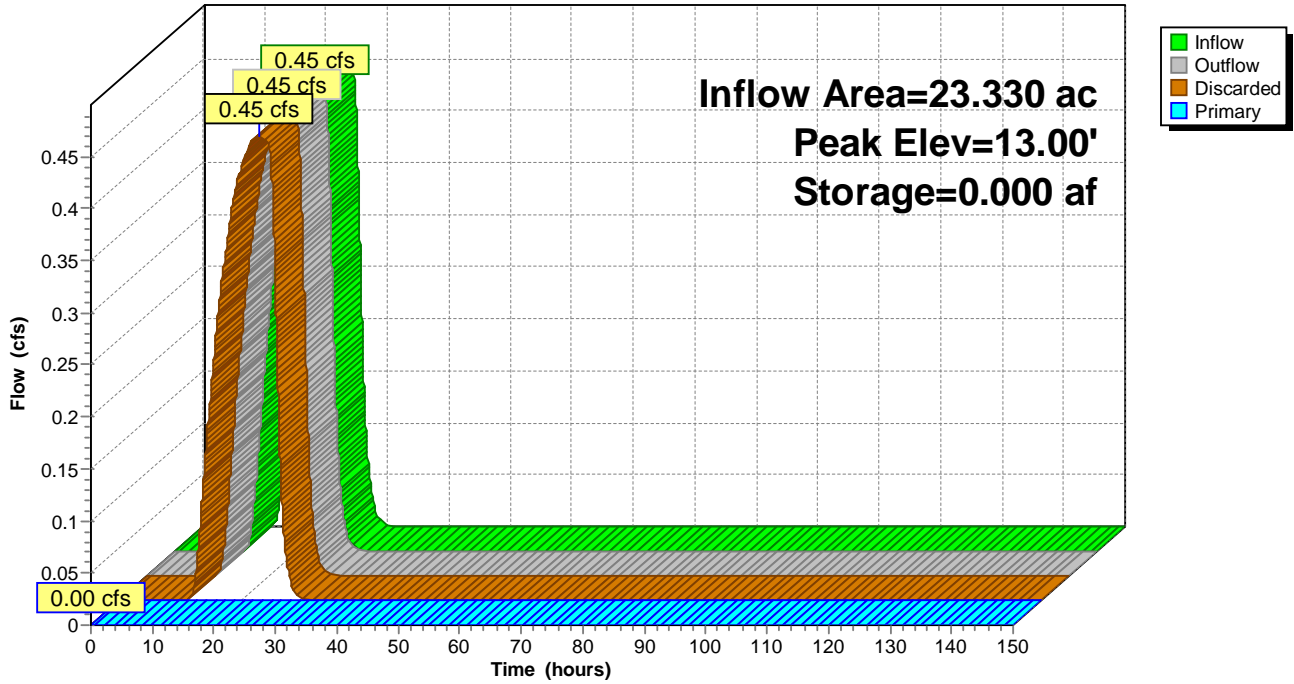
Device	Routing	Invert	Outlet Devices						
#1	Primary	14.99'	2,360.0' long x 0.5' breadth Broad-Crested Rectangular Weir						
			Head (feet) 0.20 0.40 0.60 0.80 1.00						
			Coef. (English) 2.80 2.92 3.08 3.30 3.32						
#2	Discarded	13.00'	19.980 in/hr Exfiltration over Surface area						
			Conductivity to Groundwater Elevation = 1.00'						

Discarded OutFlow Max=4.68 cfs @ 22.69 hrs HW=13.00' (Free Discharge)
 ↑**2=Exfiltration** (Controls 4.68 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=13.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 11P: 11P-SE Pond

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 50-Yr Rainfall=5.00"

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Time span=0.00-150.00 hrs, dt=0.01 hrs, 15001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S-NW Catchment	Runoff Area=7.320 ac 15.71% Impervious Runoff Depth=2.62" Flow Length=292' Slope=0.0200 '/' Tc=4.9 min CN=77 Runoff=4.63 cfs 1.600 af
Subcatchment 2S: 2S-NW Catchment 2	Runoff Area=4.280 ac 0.00% Impervious Runoff Depth=2.28" Flow Length=314' Tc=7.8 min CN=73 Runoff=2.22 cfs 0.813 af
Subcatchment 3S: 3S-North Catchment	Runoff Area=14.400 ac 0.00% Impervious Runoff Depth=2.28" Flow Length=148' Tc=6.7 min CN=73 Runoff=7.50 cfs 2.737 af
Subcatchment 4S: 4S - West Catchment	Runoff Area=26.590 ac 0.00% Impervious Runoff Depth=2.28" Flow Length=923' Slope=0.0030 '/' Tc=56.2 min CN=73 Runoff=9.31 cfs 5.053 af
Subcatchment 5S: 5S - West Catchment	Runoff Area=24.830 ac 0.00% Impervious Runoff Depth=2.28" Flow Length=660' Tc=11.1 min CN=73 Runoff=12.71 cfs 4.719 af
Subcatchment 6S: 6S - West Catchment	Runoff Area=21.310 ac 0.00% Impervious Runoff Depth=2.45" Flow Length=1,162' Slope=0.0017 '/' Tc=127.5 min CN=75 Runoff=5.88 cfs 4.350 af
Subcatchment 7S: 7S - Southwest	Runoff Area=54.970 ac 0.93% Impervious Runoff Depth=2.62" Flow Length=1,127' Tc=135.3 min CN=77 Runoff=16.32 cfs 12.015 af
Subcatchment 8S: 8S - South Catchment	Runoff Area=16.360 ac 4.95% Impervious Runoff Depth=2.71" Flow Length=1,480' Tc=88.6 min CN=78 Runoff=6.11 cfs 3.697 af
Subcatchment 9S: 9S - North	Runoff Area=22.710 ac 0.00% Impervious Runoff Depth=2.28" Flow Length=597' Tc=23.9 min CN=73 Runoff=10.43 cfs 4.316 af
Subcatchment 10S: 10S - Large Central / NE	Runoff Area=324.760 ac 1.84% Impervious Runoff Depth=2.54" Flow Length=2,575' Slope=0.0019 '/' Tc=393.8 min CN=76 Runoff=55.95 cfs 68.620 af
Subcatchment 11S: 11S - SE	Runoff Area=23.330 ac 0.00% Impervious Runoff Depth=0.31" Flow Length=1,924' Tc=126.8 min CN=42 Runoff=0.63 cfs 0.607 af
Reach 8R: South Ditch	Avg. Flow Depth=0.82' Max Vel=1.58 fps Inflow=6.11 cfs 3.697 af n=0.022 L=579.0' S=0.0012 '/' Capacity=2.94 cfs Outflow=6.08 cfs 3.697 af
Pond 1P: 1P- NW Pond	Peak Elev=12.15' Storage=1.600 af Inflow=4.63 cfs 1.600 af Outflow=0.00 cfs 0.000 af
Pond 2P: 2P-NW Pond 2	Peak Elev=11.82' Storage=0.813 af Inflow=2.22 cfs 0.813 af Outflow=0.00 cfs 0.000 af
Pond 3P: 3P-North Pond	Peak Elev=15.00' Storage=2.711 af Inflow=7.50 cfs 5.295 af Outflow=4.58 cfs 2.593 af
Pond 4P: 4P - West Pond	Peak Elev=13.99' Storage=2.500 af Inflow=9.31 cfs 5.053 af Outflow=3.28 cfs 2.558 af

Existing_Conditions_mlc

Type IA 24-hr 50-Yr Rainfall=5.00"

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Pond 5P: 5P - West Pond Peak Elev=15.00' Storage=1.912 af Inflow=15.99 cfs 13.391 af
Outflow=10.99 cfs 11.554 af

Pond 6P: 6P- West Pond Peak Elev=15.00' Storage=3.834 af Inflow=14.01 cfs 15.904 af
Outflow=11.70 cfs 12.120 af

Pond 7P: 7P-Southwest Peak Elev=15.00' Storage=3.382 af Inflow=16.32 cfs 12.015 af
Outflow=12.49 cfs 8.672 af

Pond 8P: 8P Peak Elev=17.30' Inflow=6.11 cfs 3.697 af
36.0" Round Culvert n=0.025 L=93.0' S=0.0088 '/ Outflow=6.11 cfs 3.697 af

Pond 9P: 9P - North Peak Elev=12.99' Storage=1.421 af Inflow=10.43 cfs 6.909 af
Outflow=7.09 cfs 5.499 af

Pond 10P: 10P-Large Central/NE Peak Elev=12.89' Storage=86.227 af Inflow=69.96 cfs 86.238 af
Outflow=0.00 cfs 0.000 af

Pond 11P: 11P-SE Pond Peak Elev=13.00' Storage=0.001 af Inflow=0.63 cfs 0.607 af
Discarded=0.63 cfs 0.607 af Primary=0.00 cfs 0.000 af Outflow=0.63 cfs 0.607 af

Total Runoff Area = 540.860 ac Runoff Volume = 108.526 af Average Runoff Depth = 2.41"
98.44% Pervious = 532.400 ac 1.56% Impervious = 8.460 ac

Existing Conditions_mlc

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 1S: 1S-NW Catchment

Runoff = 4.63 cfs @ 7.95 hrs, Volume= 1.600 af, Depth= 2.62"

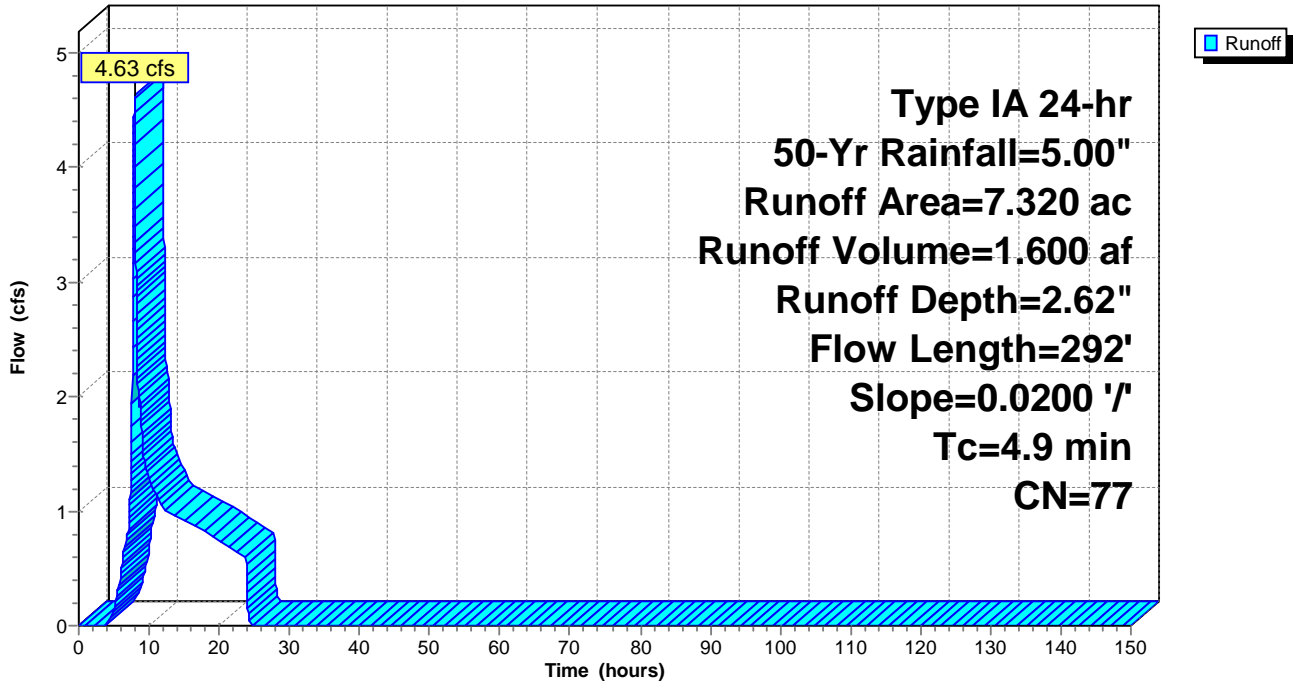
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
6.170	73	Brush, Good, HSG D
1.150	98	Paved parking, HSG D
7.320	77	Weighted Average
6.170	73	84.29% Pervious Area
1.150	98	15.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	292	0.0200	0.99		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps

Subcatchment 1S: 1S-NW Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 2S: 2S-NW Catchment 2

Sheet flow - dense comes from "native grasses" considered dense. Characterized by the wetland report.

Runoff = 2.22 cfs @ 8.01 hrs, Volume= 0.813 af, Depth= 2.28"

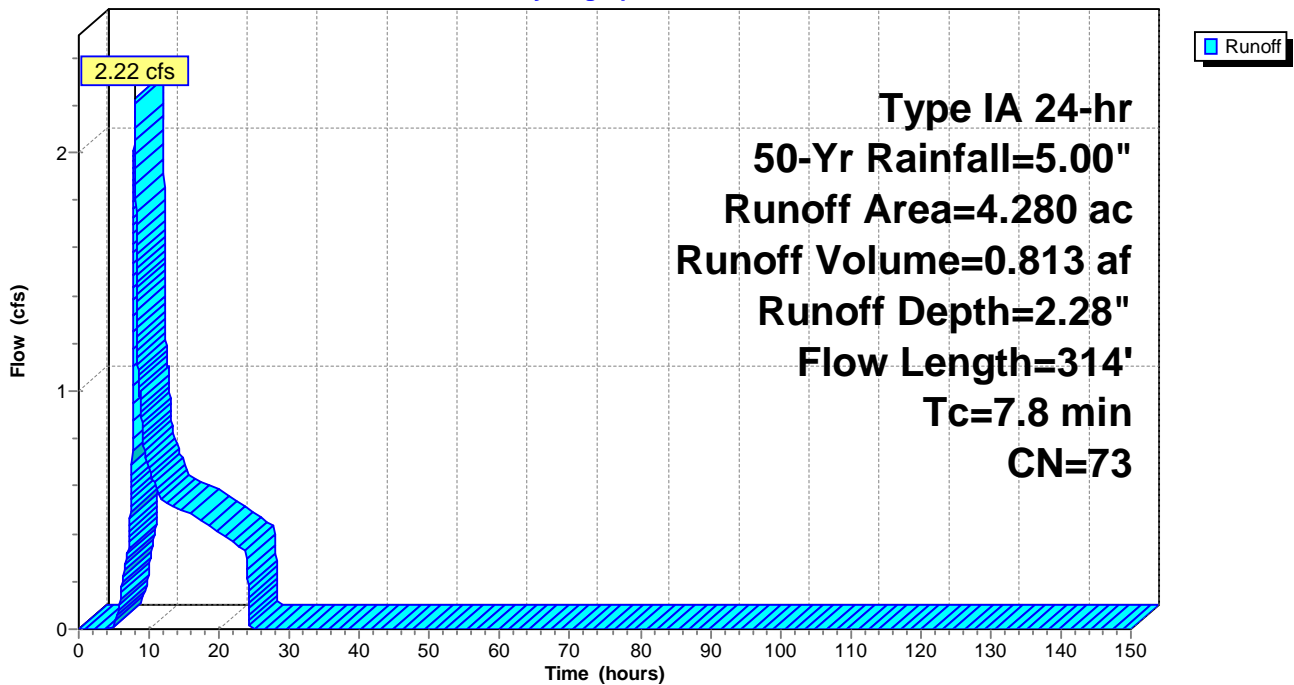
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
4.280	73	Brush, Good, HSG D
4.280	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	76	0.1300	0.24		Sheet Flow, Sheet - Dense, Native Grasses Grass: Dense n= 0.240 P2= 3.43"
2.6	238	0.0460	1.50		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
7.8	314	Total			

Subcatchment 2S: 2S-NW Catchment 2

Hydrograph



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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 3S: 3S-North Catchment

Runoff = 7.50 cfs @ 8.00 hrs, Volume= 2.737 af, Depth= 2.28"

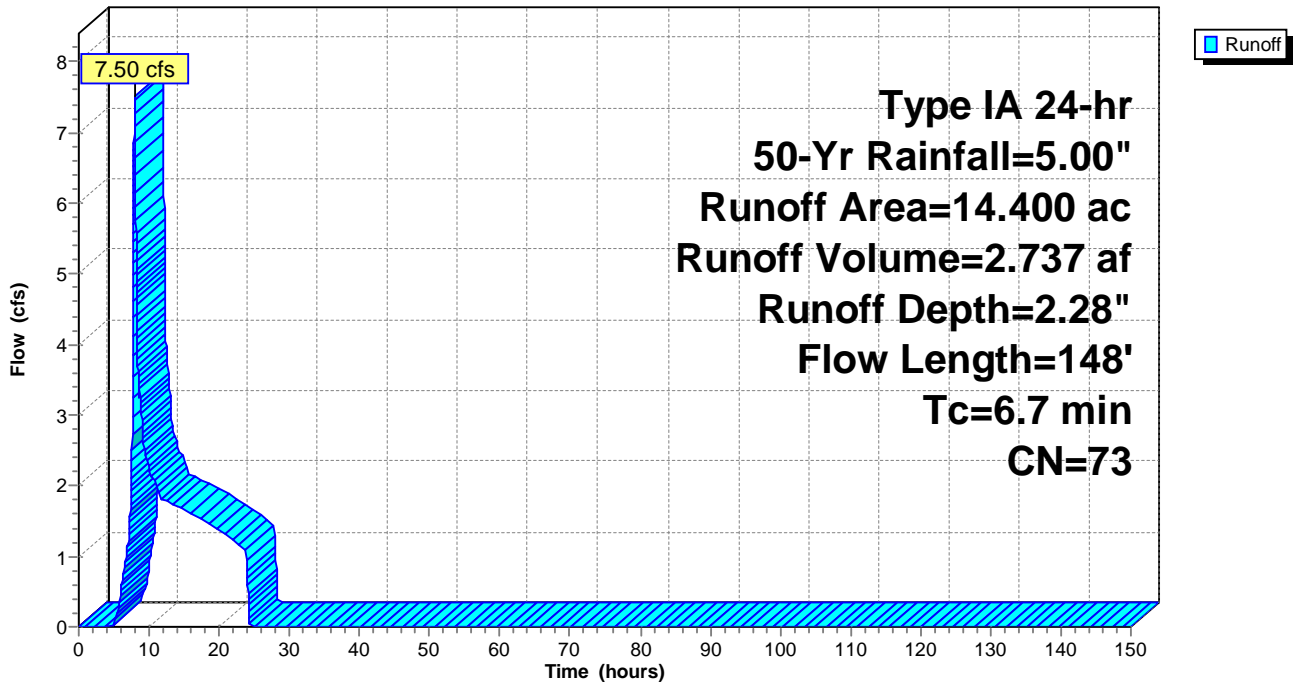
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
14.400	73	Brush, Good, HSG D
14.400	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	95	0.0950	0.33		Sheet Flow, Sheet flow - dune Grass: Short n= 0.150 P2= 3.43"
1.8	53	0.0050	0.49		Shallow Concentrated Flow, Shallow - dune grass Short Grass Pasture Kv= 7.0 fps
6.7	148	Total			

Subcatchment 3S: 3S-North Catchment

Hydrograph



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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 4S: 4S - West Catchment

Runoff = 9.31 cfs @ 8.62 hrs, Volume= 5.053 af, Depth= 2.28"

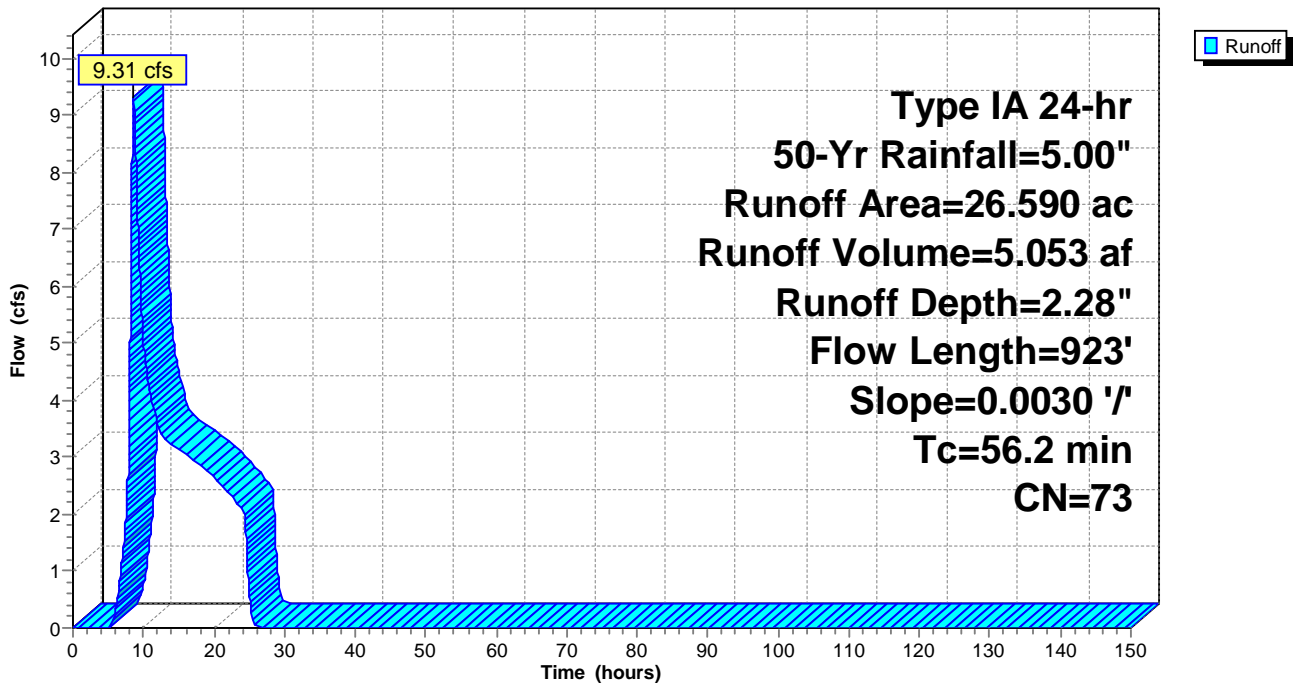
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
26.590	73	Brush, Good, HSG D
26.590	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.2	923	0.0030	0.27		Shallow Concentrated Flow, Shallow - Forest Woodland Kv= 5.0 fps

Subcatchment 4S: 4S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 5S: 5S - West Catchment

Runoff = 12.71 cfs @ 8.03 hrs, Volume= 4.719 af, Depth= 2.28"

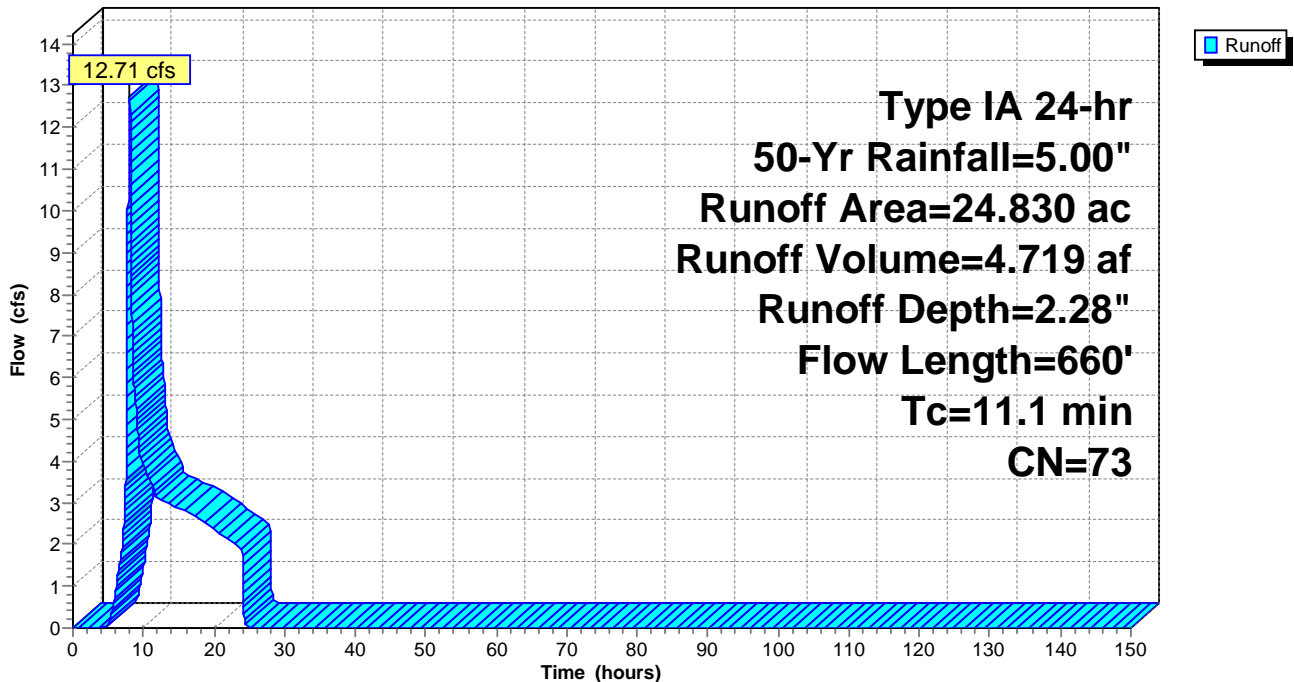
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
23.460	73	Brush, Good, HSG D
1.370	79	Woods/grass comb., Good, HSG D
24.830	73	Weighted Average
24.830	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	608	0.0180	0.94		Shallow Concentrated Flow, Shallow - Forest
					Short Grass Pasture Kv= 7.0 fps
0.3	52	0.1300	2.64		Sheet Flow, Path
					Smooth surfaces n= 0.011 P2= 3.43"
11.1	660	Total			

Subcatchment 5S: 5S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 6S: 6S - West Catchment

Runoff = 5.88 cfs @ 9.77 hrs, Volume= 4.350 af, Depth= 2.45"

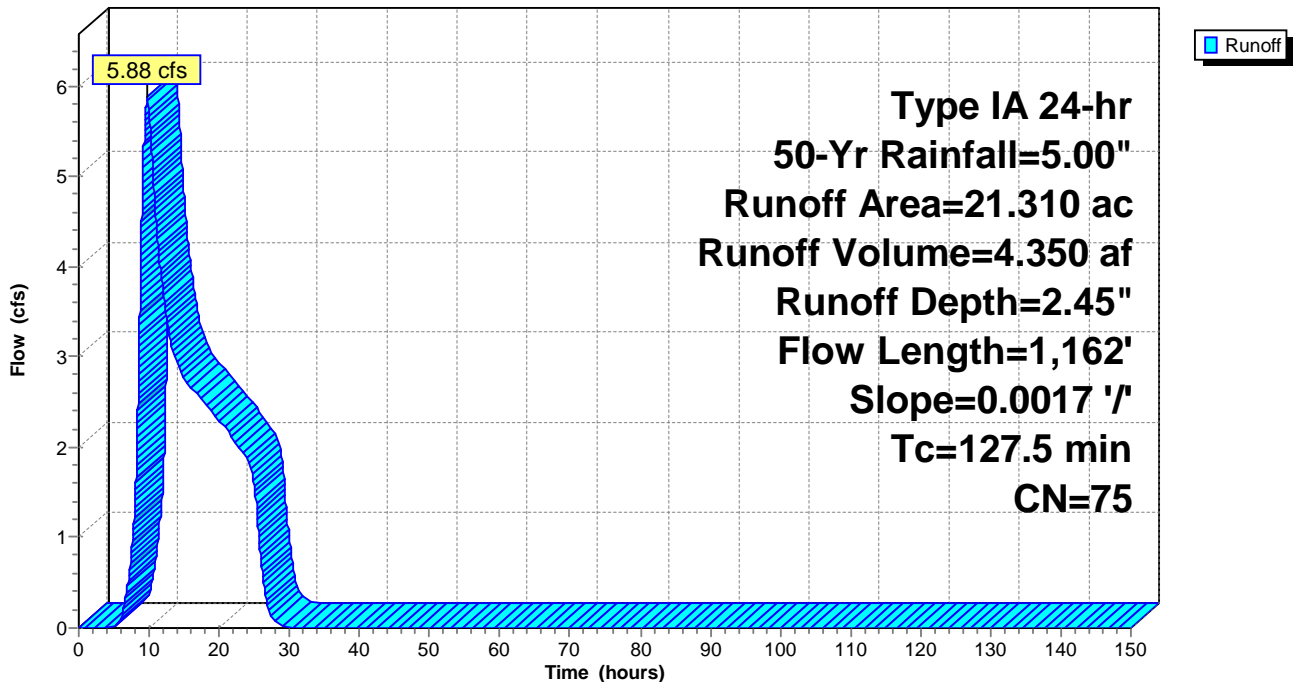
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
8.730	79	Woods/grass comb., Good, HSG D
12.580	73	Brush, Good, HSG D
21.310	75	Weighted Average
21.310	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.6	581	0.0017	0.29		Shallow Concentrated Flow, Grass - Shallow Short Grass Pasture Kv= 7.0 fps
93.9	581	0.0017	0.10		Shallow Concentrated Flow, Forested - Shallow Forest w/Heavy Litter Kv= 2.5 fps
127.5	1,162	Total			

Subcatchment 6S: 6S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 7S: 7S - Southwest

Runoff = 16.32 cfs @ 9.78 hrs, Volume= 12.015 af, Depth= 2.62"

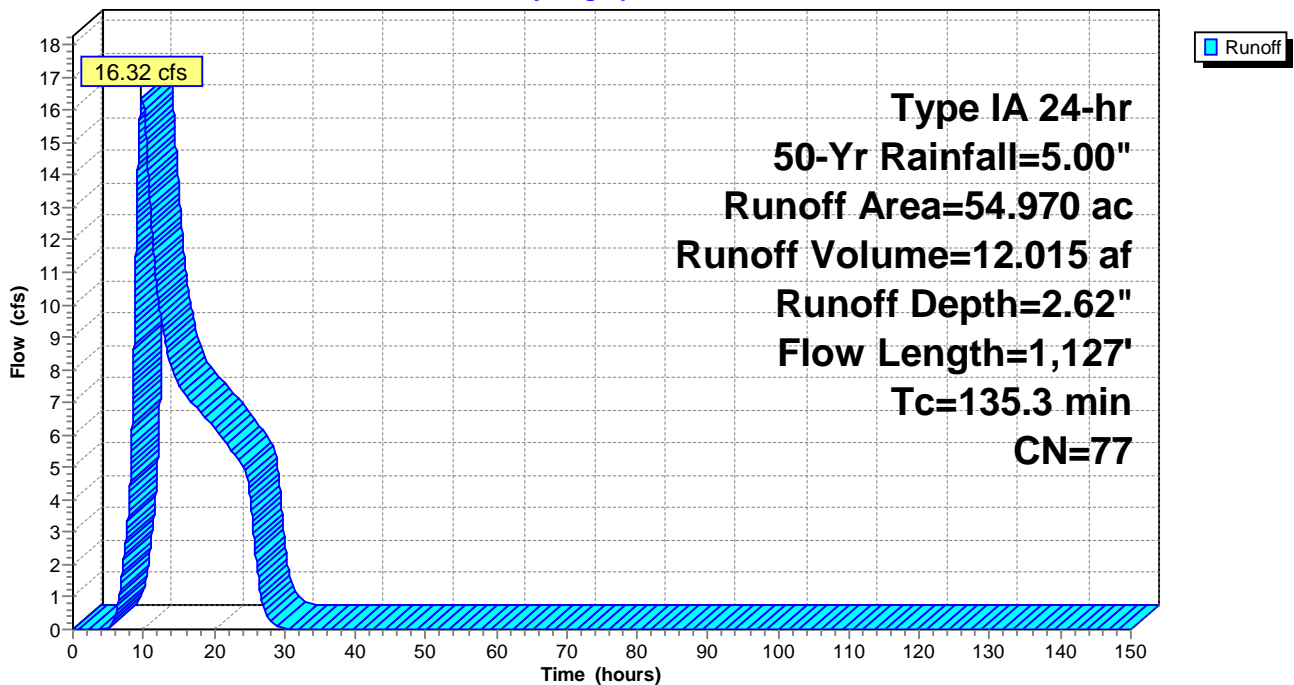
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
21.790	73	Brush, Good, HSG D
32.670	79	Woods/grass comb., Good, HSG D
0.510	98	Paved parking, HSG D
54.970	77	Weighted Average
54.460	77	99.07% Pervious Area
0.510	98	0.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	70	0.1000	0.21		Sheet Flow, Sheet - Paved to Grass Grass: Dense n= 0.240 P2= 3.43"
2.4	202	0.0390	1.38		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
127.5	855	0.0020	0.11		Shallow Concentrated Flow, Shallow - Forest Forest w/Heavy Litter Kv= 2.5 fps
135.3	1,127	Total			

Subcatchment 7S: 7S - Southwest

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 8S: 8S - South Catchment

Runoff = 6.11 cfs @ 9.06 hrs, Volume= 3.697 af, Depth= 2.71"

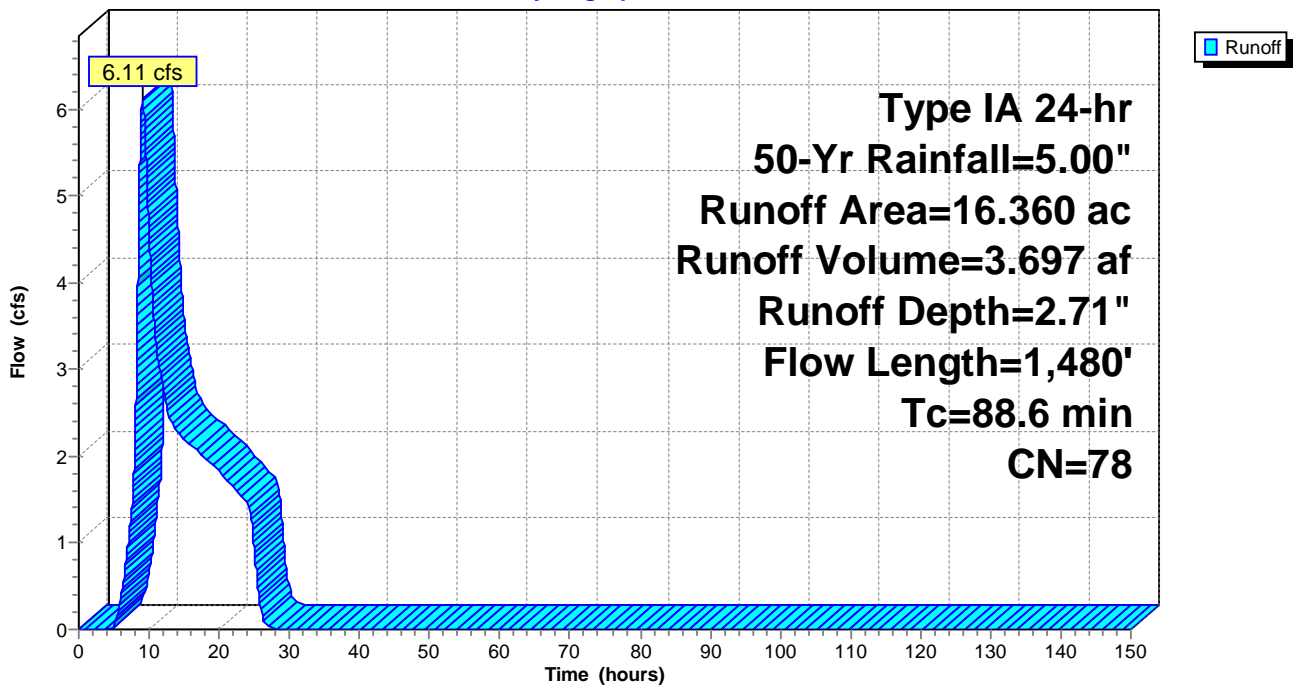
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
15.000	79	Woods/grass comb., Good, HSG D
0.550	30	Brush, Good, HSG A
0.810	98	Paved parking, HSG D
16.360	78	Weighted Average
15.550	77	95.05% Pervious Area
0.810	98	4.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	89	0.0560	0.26		Sheet Flow, Sheet- Dune grass Grass: Short n= 0.150 P2= 3.43"
67.3	844	0.0070	0.21		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps
15.6	547	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
88.6	1,480	Total			

Subcatchment 8S: 8S - South Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 9S: 9S - North

Runoff = 10.43 cfs @ 8.17 hrs, Volume= 4.316 af, Depth= 2.28"

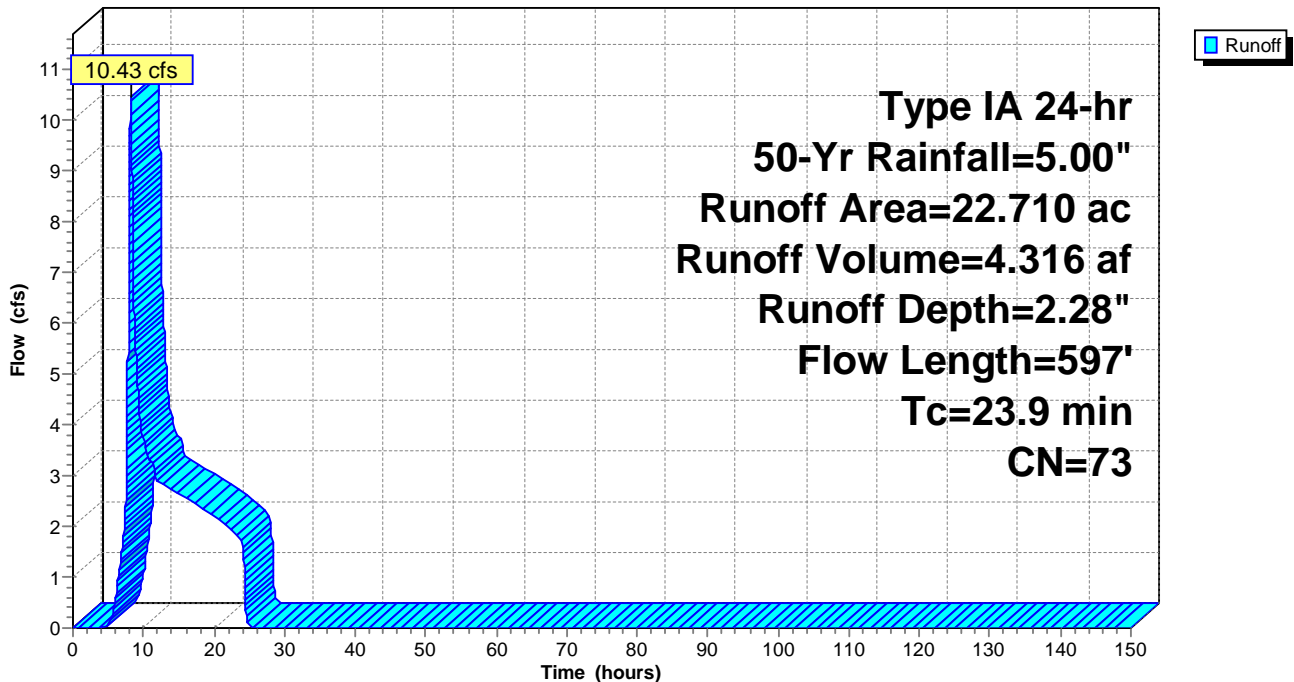
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
21.780	73	Brush, Good, HSG D
0.930	79	Woods/grass comb., Good, HSG D
22.710	73	Weighted Average
22.710	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	67	0.0450	0.15		Sheet Flow, Sheet - Grass Grass: Dense n= 0.240 P2= 3.43"
16.7	530	0.0057	0.53		Shallow Concentrated Flow, Shallow - Woods Short Grass Pasture Kv= 7.0 fps
23.9	597	Total			

Subcatchment 9S: 9S - North

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 10S: 10S - Large Central / NE

Runoff = 55.95 cfs @ 14.43 hrs, Volume= 68.620 af, Depth= 2.54"

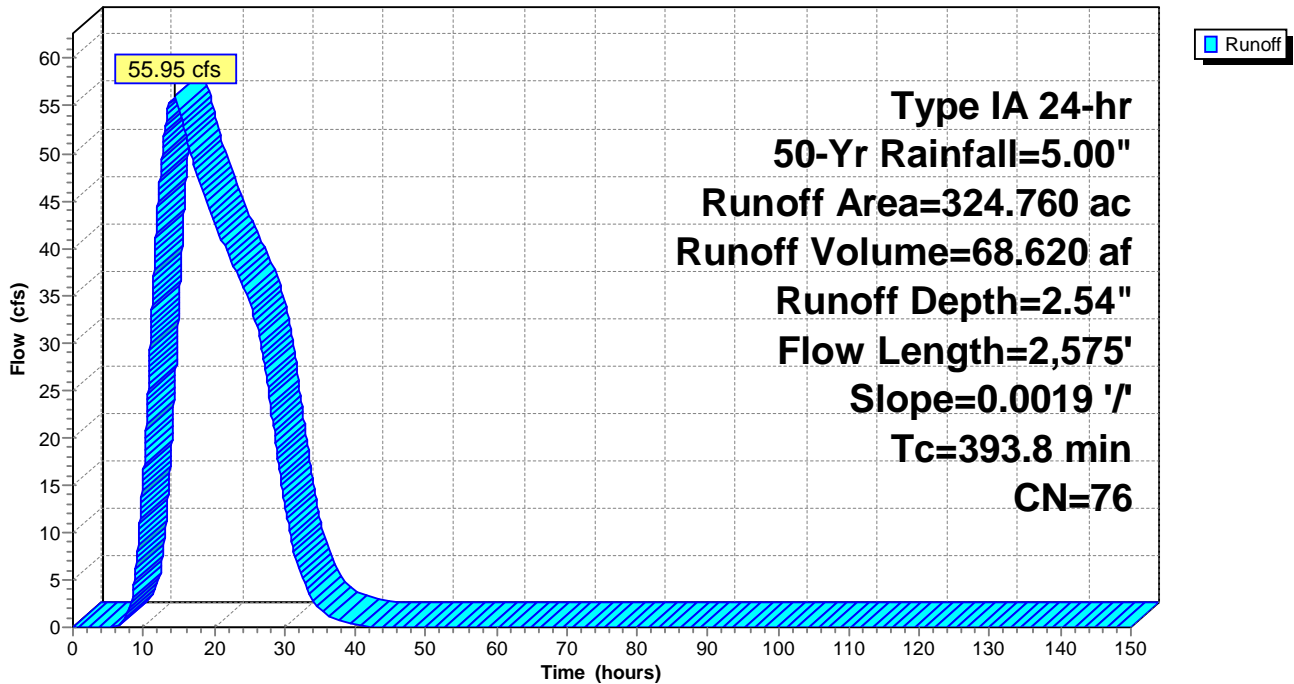
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
223.040	79	Woods/grass comb., Good, HSG D
12.880	32	Woods/grass comb., Good, HSG A
0.660	98	Paved parking, HSG A
5.330	98	Paved parking, HSG D
82.850	73	Brush, Good, HSG D
324.760	76	Weighted Average
318.770	76	98.16% Pervious Area
5.990	98	1.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
393.8	2,575	0.0019	0.11		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps

Subcatchment 10S: 10S - Large Central / NE

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 11S: 11S - SE

Runoff = 0.63 cfs @ 21.56 hrs, Volume= 0.607 af, Depth= 0.31"

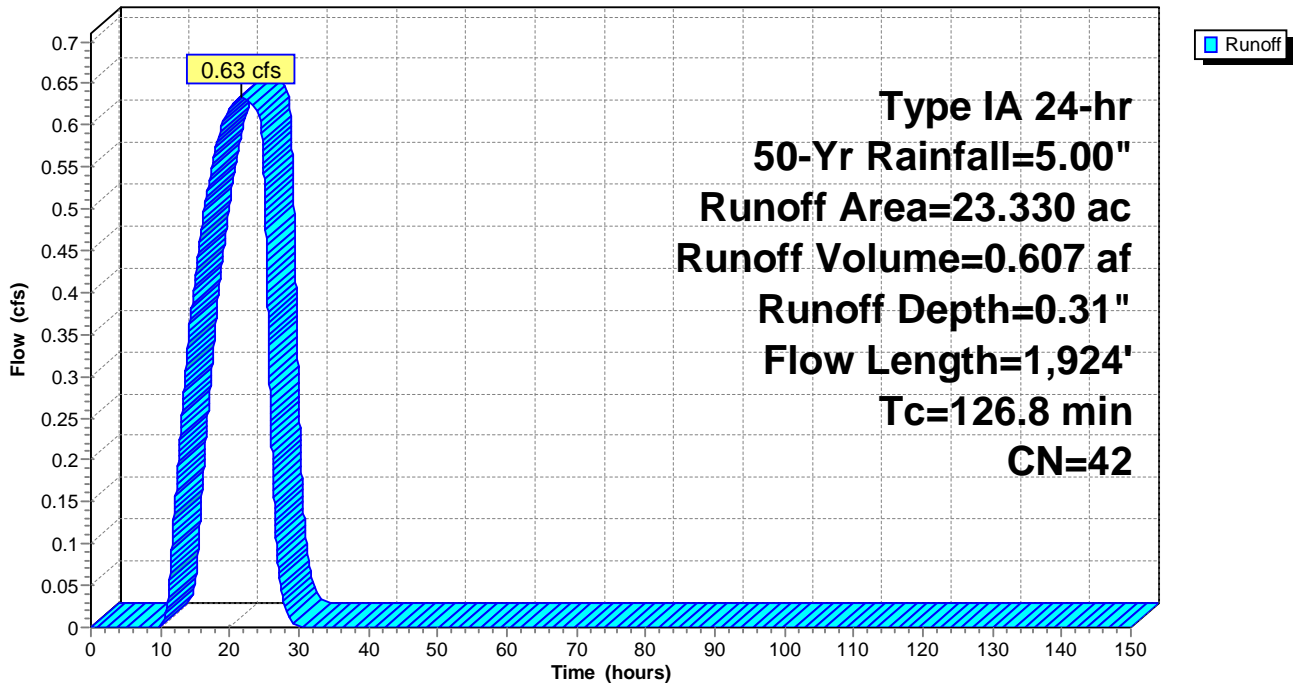
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
18.140	32	Woods/grass comb., Good, HSG A
1.980	79	Woods/grass comb., Good, HSG D
3.210	73	Brush, Good, HSG D
23.330	42	Weighted Average
23.330	42	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	126	0.1800	0.30		Sheet Flow, Sheet-Dune Grass Grass: Dense n= 0.240 P2= 3.43"
119.9	1,798	0.0100	0.25		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps
126.8	1,924	Total			

Subcatchment 11S: 11S - SE

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Reach 8R: South Ditch

[91] Warning: Storage range exceeded by 0.32'

[55] Hint: Peak inflow is 207% of Manning's capacity

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 0.71'

Inflow Area =	16.360 ac,	4.95% Impervious,	Inflow Depth = 2.71"	for 50-Yr event
Inflow =	6.11 cfs @	9.06 hrs,	Volume=	3.697 af
Outflow =	6.08 cfs @	9.27 hrs,	Volume=	3.697 af, Atten= 0%, Lag= 12.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs

Max. Velocity= 1.58 fps, Min. Travel Time= 6.1 min

Avg. Velocity = 0.65 fps, Avg. Travel Time= 14.8 min

Peak Storage= 2,225 cf @ 9.17 hrs

Average Depth at Peak Storage= 0.82', Surface Width= 5.64'

Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 2.94 cfs

4.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 1.0 ' / ' Top Width= 5.00'

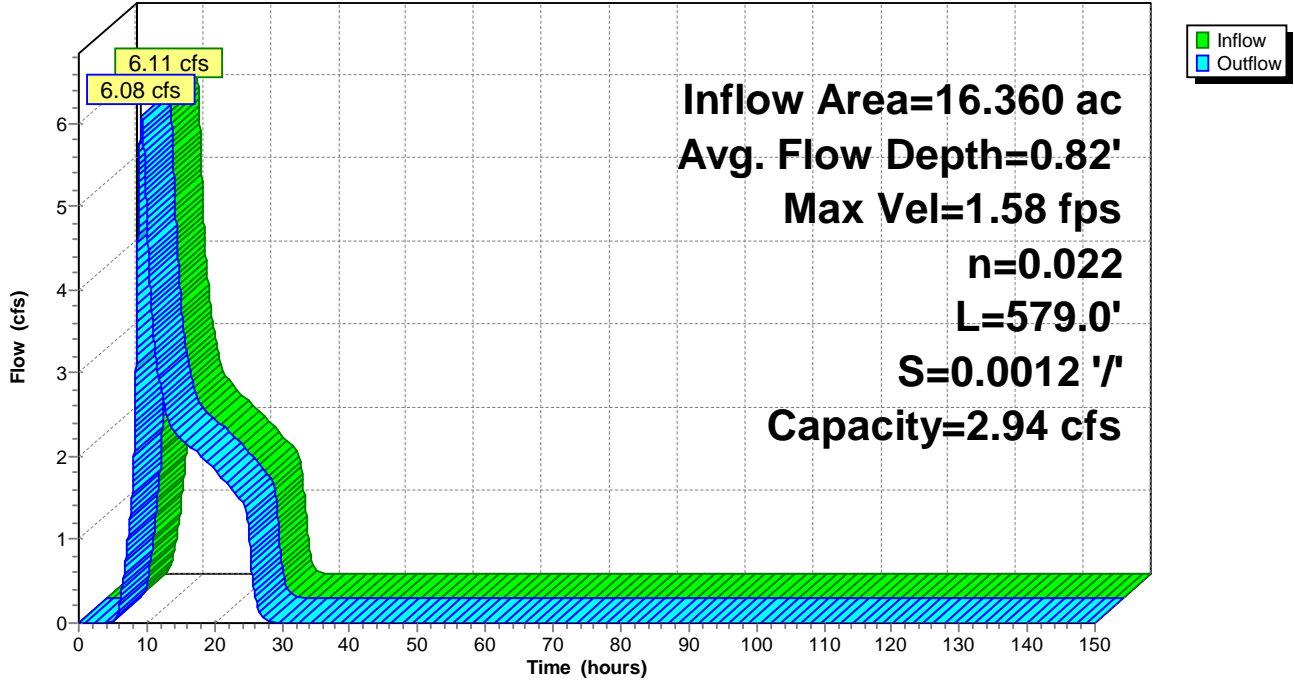
Length= 579.0' Slope= 0.0012 ' / '

Inlet Invert= 16.00', Outlet Invert= 15.30'



Reach 8R: South Ditch

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 1P: 1P- NW Pond

Inflow Area = 7.320 ac, 15.71% Impervious, Inflow Depth = 2.62" for 50-Yr event
 Inflow = 4.63 cfs @ 7.95 hrs, Volume= 1.600 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.15' @ 24.29 hrs Surf.Area= 1.474 ac Storage= 1.600 af

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

Volume	Invert	Avail.Storage	Storage Description
#1	11.00'	6.173 af	Custom Stage Data (Irregular) Listed below (Recalc)

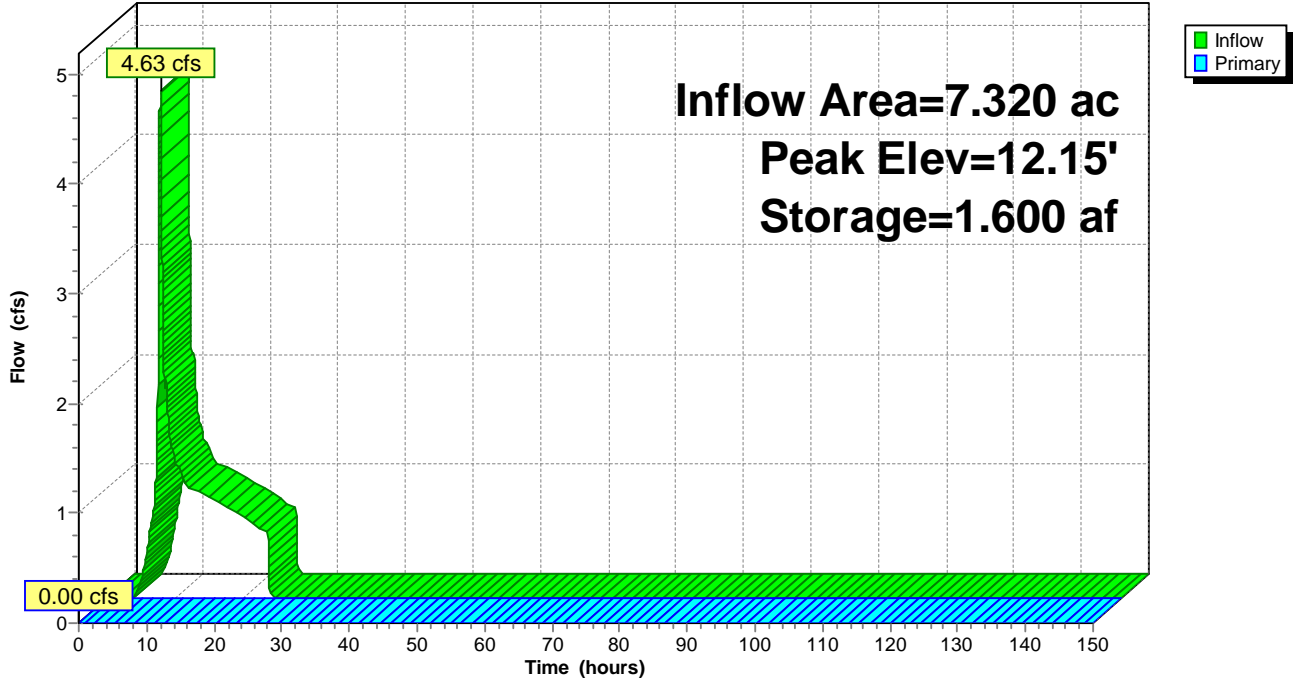
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
11.00	1.290	1,552.0	0.000	0.000	1.290
12.00	1.460	1,164.0	1.374	1.374	3.215
13.00	1.550	1,193.0	1.505	2.879	3.343
14.00	1.640	1,231.0	1.595	4.474	3.514
15.00	1.760	1,333.0	1.700	6.173	3.992

Device	Routing	Invert	Outlet Devices
#1	Primary	14.99'	1,333.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: 1P- NW Pond

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 2P: 2P-NW Pond 2

Inflow Area = 11.600 ac, 9.91% Impervious, Inflow Depth = 0.84" for 50-Yr event
 Inflow = 2.22 cfs @ 8.01 hrs, Volume= 0.813 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 11.82' @ 24.45 hrs Surf.Area= 1.056 ac Storage= 0.813 af

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

Volume	Invert	Avail.Storage	Storage Description			
#1	11.00'	3.348 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
11.00	0.930	1,430.0	0.000	0.000	0.930	
12.00	1.085	1,183.0	1.007	1.007	2.109	
13.00	1.170	1,220.0	1.127	2.134	2.274	
14.00	1.260	1,273.0	1.215	3.348	2.517	

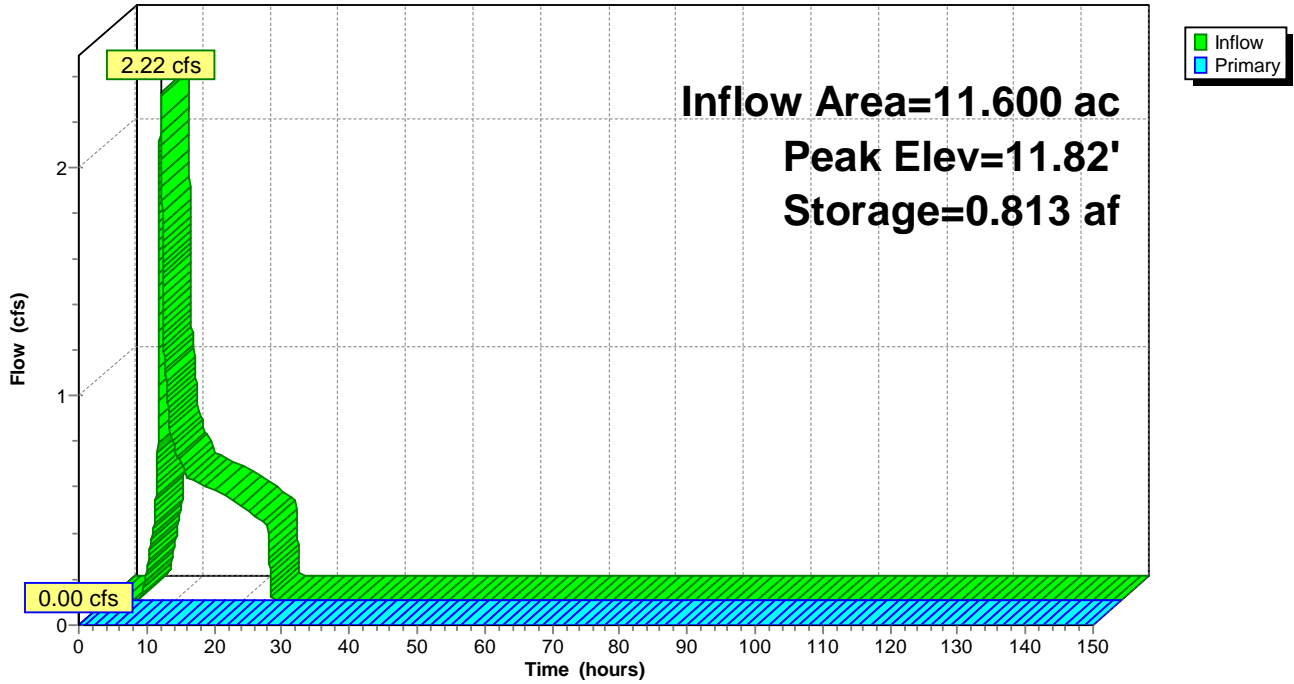
Device	Routing	Invert	Outlet Devices											
#1	Primary	13.99'	1,300.0' long x 4.0' breadth Broad-Crested Rectangular Weir											
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00											
			2.50 3.00 3.50 4.00 4.50 5.00 5.50											
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68											
			2.72 2.73 2.76 2.79 2.88 3.07 3.32											

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)

↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: 2P-NW Pond 2

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 3P: 3P-North Pond

[81] Warning: Exceeded Pond 2P by 3.42' @ 16.58 hrs

[81] Warning: Exceeded Pond 4P by 1.00' @ 16.71 hrs

Inflow Area = 52.590 ac, 2.19% Impervious, Inflow Depth = 1.21" for 50-Yr event
 Inflow = 7.50 cfs @ 8.00 hrs, Volume= 5.295 af
 Outflow = 4.58 cfs @ 16.71 hrs, Volume= 2.593 af, Atten= 39%, Lag= 522.4 min
 Primary = 4.58 cfs @ 16.71 hrs, Volume= 2.593 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 15.00' @ 16.71 hrs Surf.Area= 1.600 ac Storage= 2.711 af

Plug-Flow detention time= 512.9 min calculated for 2.593 af (49% of inflow)
 Center-of-Mass det. time= 256.6 min (1,220.4 - 963.8)

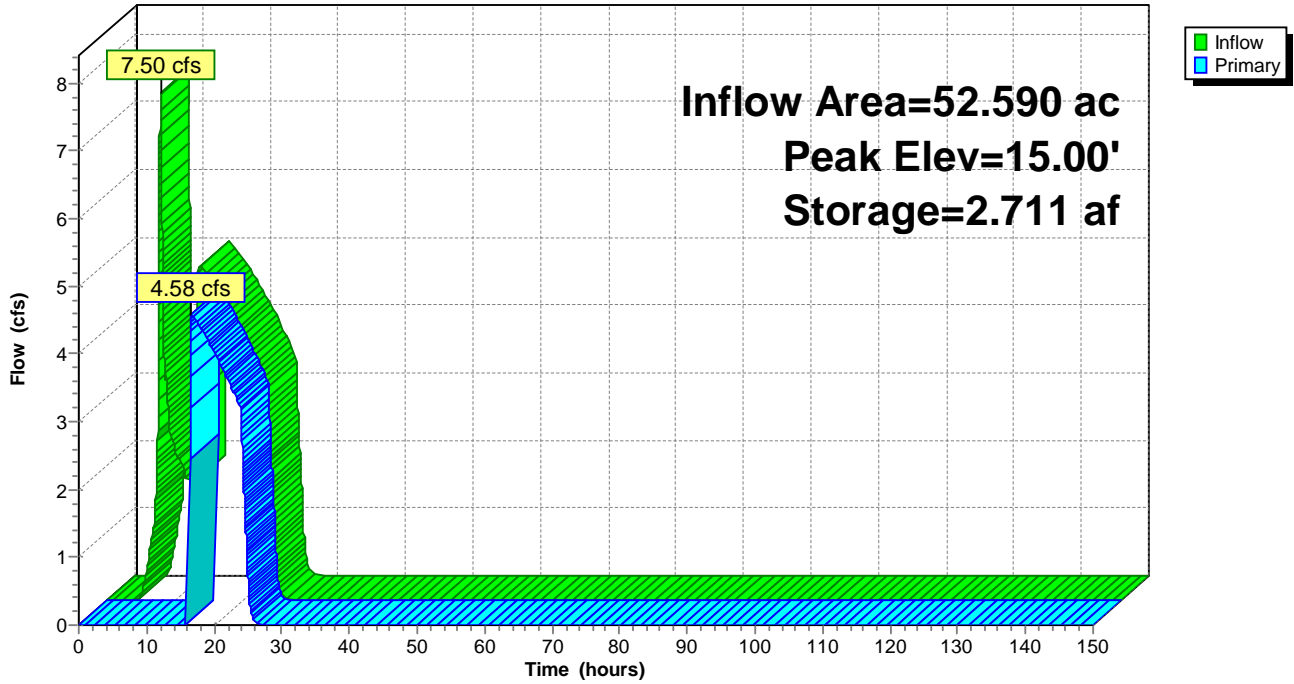
Volume	Invert	Avail.Storage	Storage Description			
#1	12.00'	2.718 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
12.00	0.086	1,508.0	0.000	0.000	0.086	
13.00	0.450	1,395.0	0.244	0.244	0.686	
14.00	1.500	4,156.0	0.924	1.168	28.685	
15.00	1.600	2,946.0	1.550	2.718	44.384	

Device	Routing	Invert	Outlet Devices											
#1	Primary	14.99'	3,000.0' long x 1.0' breadth Broad-Crested Rectangular Weir											
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00											
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32											

Primary OutFlow Max=3.45 cfs @ 16.71 hrs HW=15.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 3.45 cfs @ 0.20 fps)

Pond 3P: 3P-North Pond

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 4P: 4P - West Pond

Inflow Area = 26.590 ac, 0.00% Impervious, Inflow Depth = 2.28" for 50-Yr event
 Inflow = 9.31 cfs @ 8.62 hrs, Volume= 5.053 af
 Outflow = 3.28 cfs @ 13.57 hrs, Volume= 2.558 af, Atten= 65%, Lag= 297.2 min
 Primary = 3.28 cfs @ 13.57 hrs, Volume= 2.558 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 13.99' @ 13.57 hrs Surf.Area= 3.776 ac Storage= 2.500 af

Plug-Flow detention time= 521.1 min calculated for 2.558 af (51% of inflow)
 Center-of-Mass det. time= 260.6 min (1,122.2 - 861.6)

Volume	Invert	Avail.Storage	Storage Description
#1	13.00'	2.532 af	Custom Stage Data (Irregular) Listed below (Recalc)

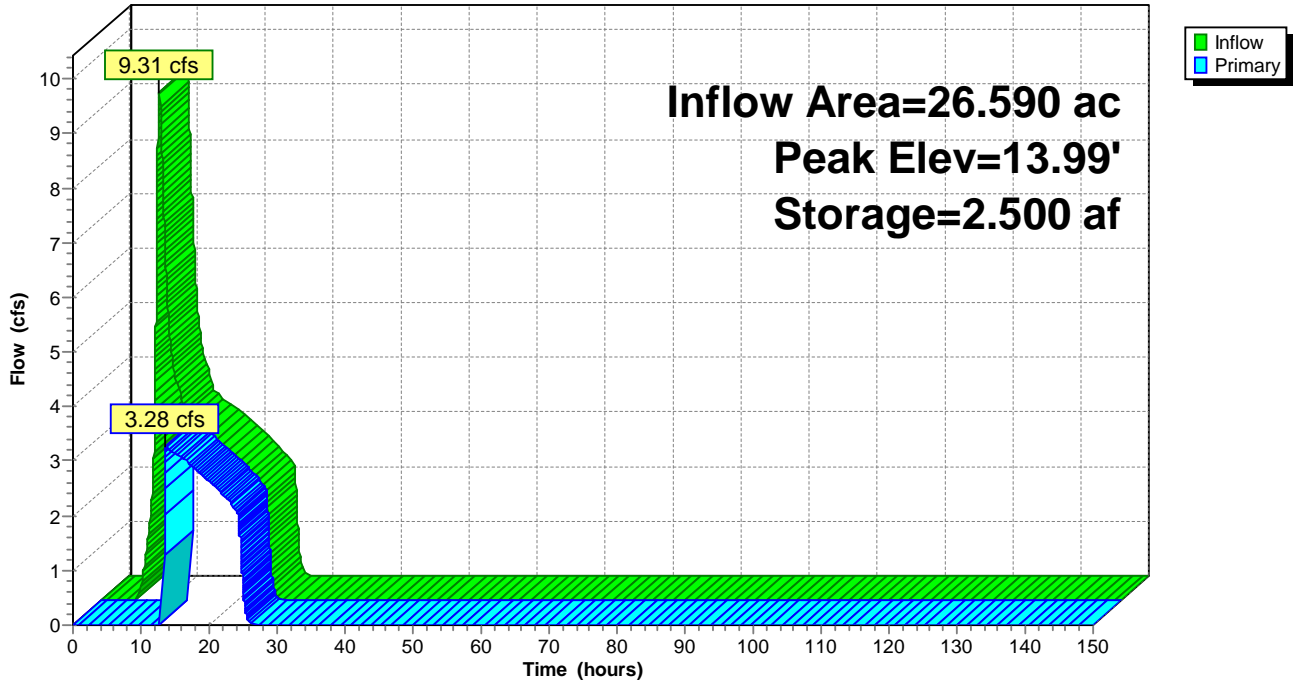
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
13.00	1.450	2,862.0	0.000	0.000	1.450
14.00	3.800	7,496.0	2.532	2.532	89.137

Device	Routing	Invert	Outlet Devices
#1	Primary	13.99'	7,496.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.30 cfs @ 13.57 hrs HW=13.99' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 1.30 cfs @ 0.11 fps)

Pond 4P: 4P - West Pond

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 5P: 5P - West Pond

[81] Warning: Exceeded Pond 7P by 0.02' @ 10.86 hrs

Inflow Area = 79.800 ac, 0.64% Impervious, Inflow Depth = 2.01" for 50-Yr event
 Inflow = 15.99 cfs @ 11.11 hrs, Volume= 13.391 af
 Outflow = 10.99 cfs @ 13.96 hrs, Volume= 11.554 af, Atten= 31%, Lag= 171.0 min
 Primary = 10.99 cfs @ 13.96 hrs, Volume= 11.554 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 15.00' @ 13.96 hrs Surf.Area= 58.419 ac Storage= 1.912 af

Plug-Flow detention time= 180.2 min calculated for 11.553 af (86% of inflow)
 Center-of-Mass det. time= 103.7 min (1,072.1 - 968.3)

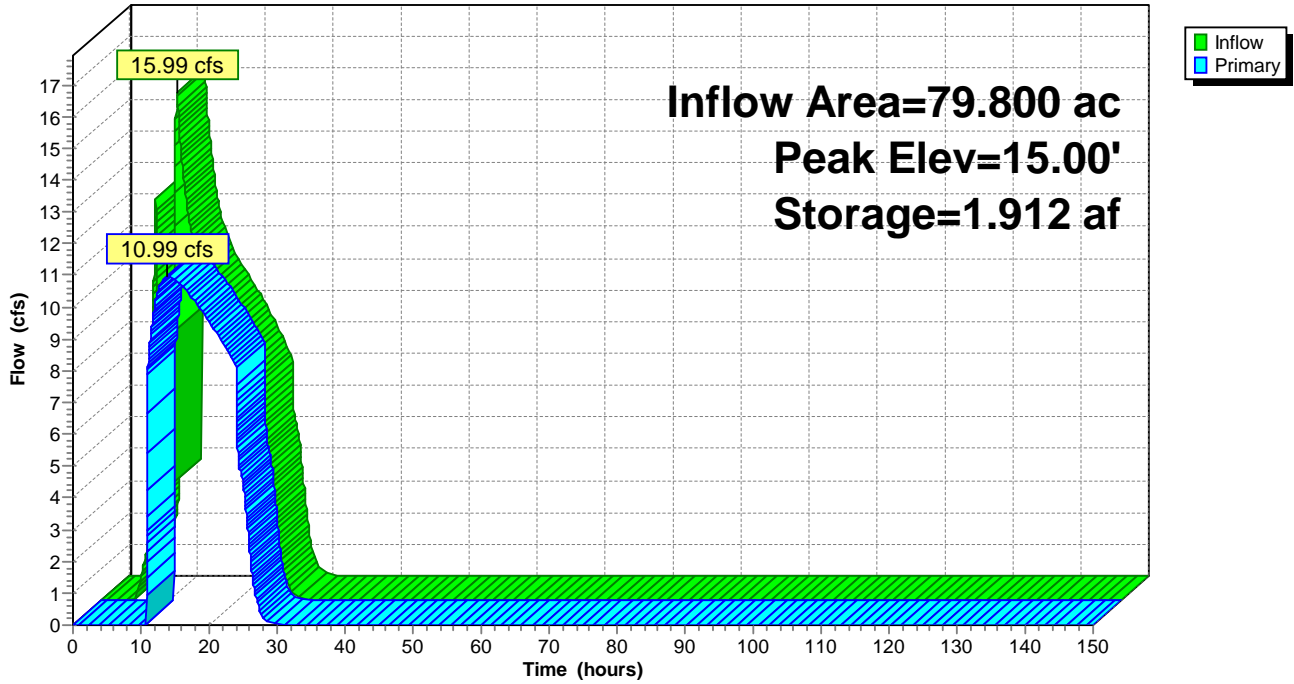
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	5.374 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	1.160	3,026.0	0.000	0.000	1.160	
15.00	2.670	3,968.0	1.863	1.863	13.196	
15.01	999.000	9,999.0	3.511	5.374	167.081	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	3,000.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=10.58 cfs @ 13.96 hrs HW=15.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 10.58 cfs @ 0.29 fps)

Pond 5P: 5P - West Pond

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 6P: 6P- West Pond

[81] Warning: Exceeded Pond 5P by 0.01' @ 25.52 hrs

Inflow Area = 101.110 ac, 0.50% Impervious, Inflow Depth = 1.89" for 50-Yr event
 Inflow = 14.01 cfs @ 12.91 hrs, Volume= 15.904 af
 Outflow = 11.70 cfs @ 20.35 hrs, Volume= 12.120 af, Atten= 16%, Lag= 446.8 min
 Primary = 11.70 cfs @ 20.35 hrs, Volume= 12.120 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 20.35 hrs Surf.Area= 21.686 ac Storage= 3.834 af

Plug-Flow detention time= 265.8 min calculated for 12.119 af (76% of inflow)
 Center-of-Mass det. time= 149.8 min (1,179.3 - 1,029.6)

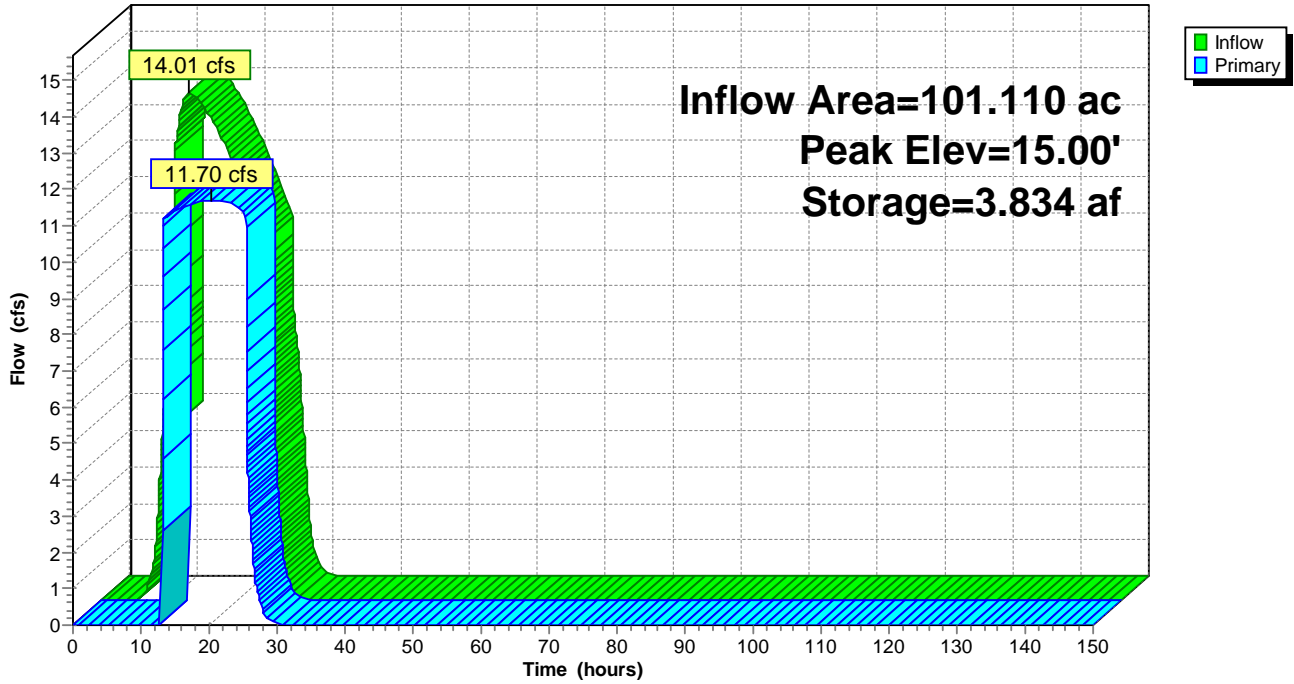
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	37.908 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.930	3,856.0	0.000	0.000	2.930	
15.00	4.810	4,175.0	3.831	3.831	7.611	
15.01	9,999.000	9,999.0	34.077	37.908	158.416	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	4,175.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=11.61 cfs @ 20.35 hrs HW=15.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Weir Controls 11.61 cfs @ 0.27 fps)

Pond 6P: 6P- West Pond

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 7P: 7P-Southwest

Inflow Area = 54.970 ac, 0.93% Impervious, Inflow Depth = 2.62" for 50-Yr event
 Inflow = 16.32 cfs @ 9.78 hrs, Volume= 12.015 af
 Outflow = 12.49 cfs @ 11.11 hrs, Volume= 8.672 af, Atten= 23%, Lag= 80.1 min
 Primary = 12.49 cfs @ 11.11 hrs, Volume= 8.672 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 15.00' @ 11.11 hrs Surf.Area= 4.556 ac Storage= 3.382 af

Plug-Flow detention time= 298.8 min calculated for 8.672 af (72% of inflow)
 Center-of-Mass det. time= 136.0 min (1,049.1 - 913.2)

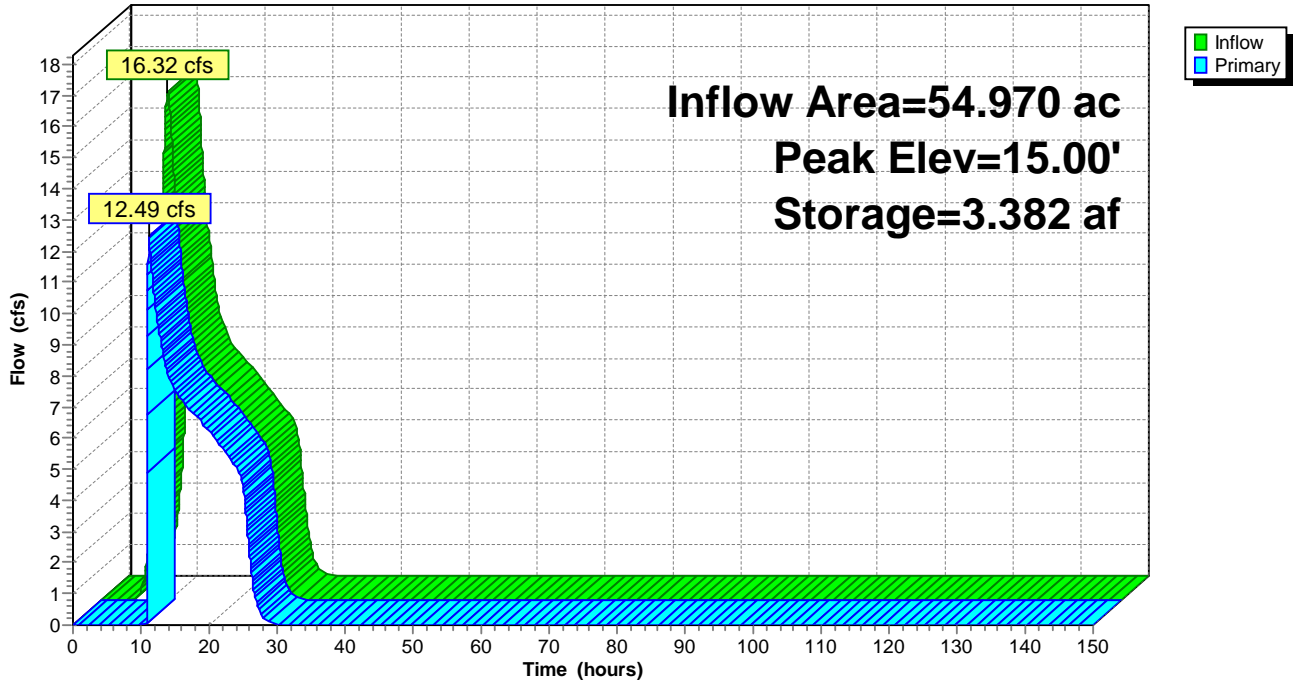
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	39.091 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.340	3,959.0	0.000	0.000	2.340	
15.00	4.560	5,430.0	3.389	3.389	27.571	
15.10	999.000	9,999.0	35.702	39.091	156.355	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	5,430.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=11.57 cfs @ 11.11 hrs HW=15.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 11.57 cfs @ 0.25 fps)

Pond 7P: 7P-Southwest

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 8P: 8P

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 2.71" for 50-Yr event
Inflow = 6.11 cfs @ 9.06 hrs, Volume= 3.697 af
Outflow = 6.11 cfs @ 9.06 hrs, Volume= 3.697 af, Atten= 0%, Lag= 0.0 min
Primary = 6.11 cfs @ 9.06 hrs, Volume= 3.697 af

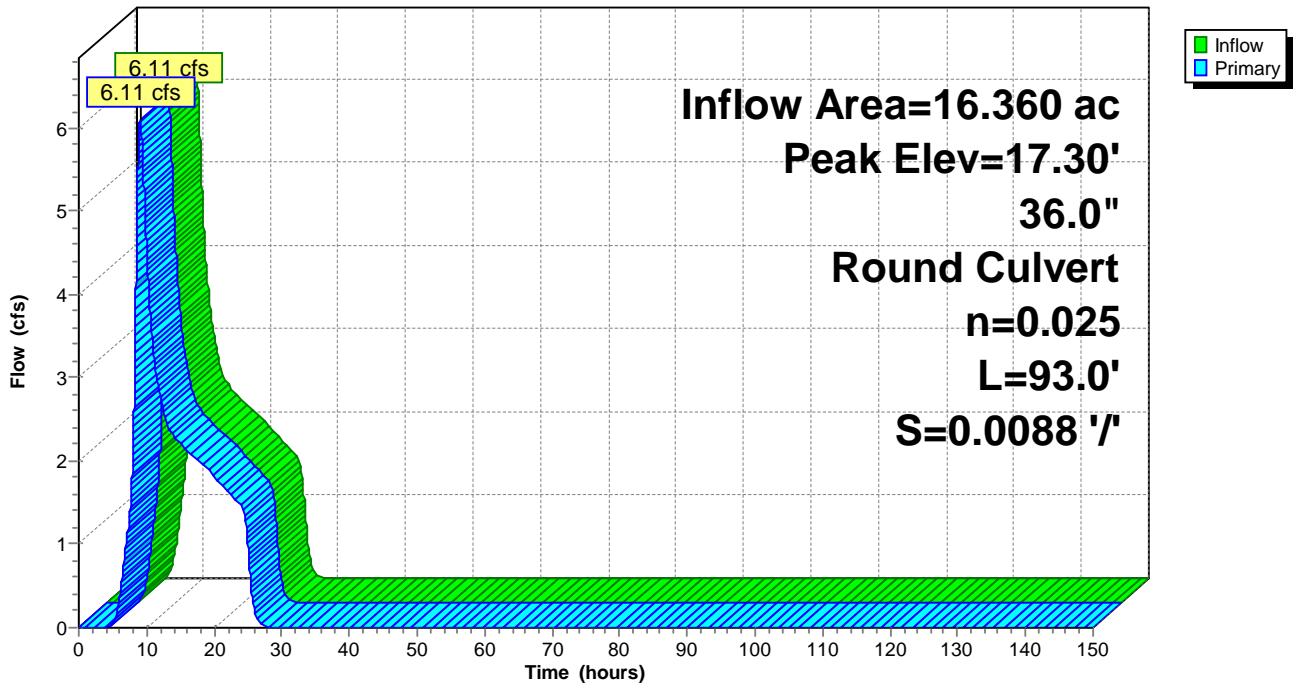
Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Peak Elev= 17.30' @ 9.06 hrs
Flood Elev= 19.00'

Device #1	Routing	Invert	Outlet Devices
	Primary	16.11'	36.0" Round Culvert L= 93.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.11' / 15.29' S= 0.0088 '/ Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=6.10 cfs @ 9.06 hrs HW=17.30' (Free Discharge)
↑ **1=Culvert** (Barrel Controls 6.10 cfs @ 3.45 fps)

Pond 8P: 8P

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 9P: 9P - North

Inflow Area = 75.300 ac, 1.53% Impervious, Inflow Depth = 1.10" for 50-Yr event
 Inflow = 10.43 cfs @ 8.17 hrs, Volume= 6.909 af
 Outflow = 7.09 cfs @ 16.72 hrs, Volume= 5.499 af, Atten= 32%, Lag= 513.1 min
 Primary = 7.09 cfs @ 16.72 hrs, Volume= 5.499 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 12.99' @ 16.72 hrs Surf.Area= 3.675 ac Storage= 1.421 af

Plug-Flow detention time= 224.3 min calculated for 5.499 af (80% of inflow)
 Center-of-Mass det. time= 122.3 min (1,099.9 - 977.6)

Volume	Invert	Avail.Storage	Storage Description
#1	12.00'	1.447 af	Custom Stage Data (Irregular) Listed below (Recalc)

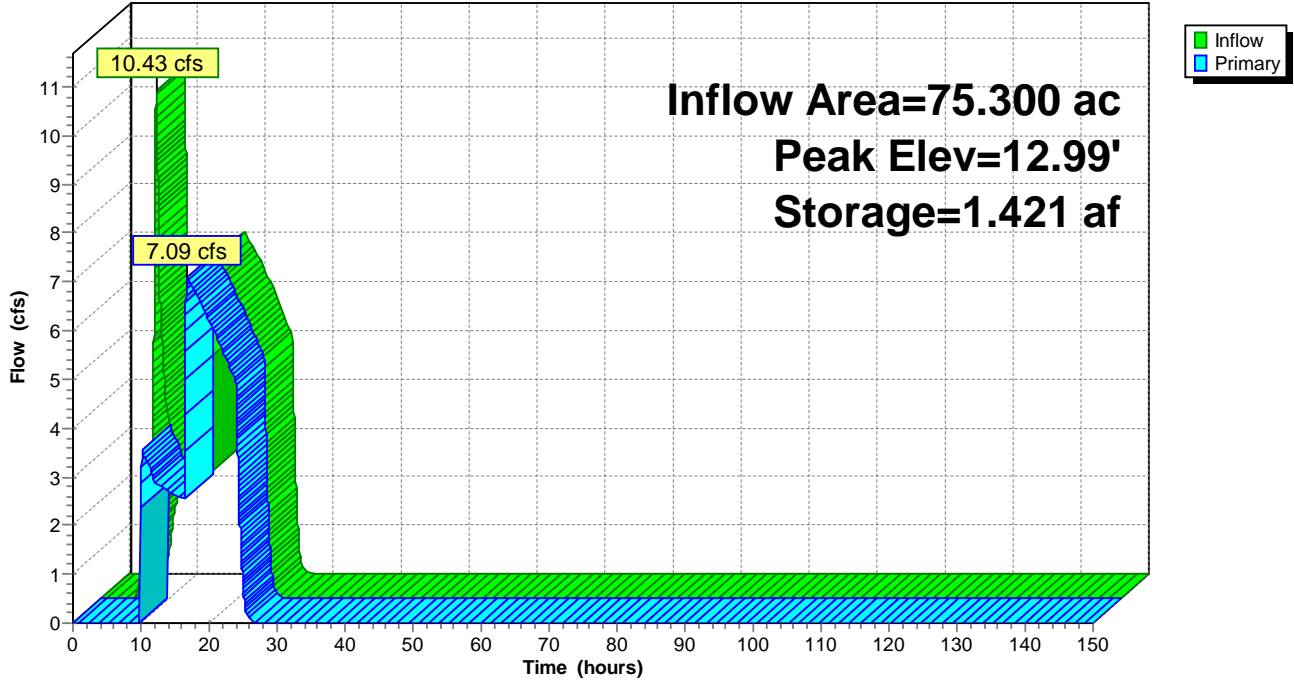
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
12.00	0.079	608.0	0.000	0.000	0.079
13.00	3.720	8,513.0	1.447	1.447	131.797

Device	Routing	Invert	Outlet Devices
#1	Primary	12.99'	8,513.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=3.87 cfs @ 16.72 hrs HW=12.99' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 3.87 cfs @ 0.15 fps)

Pond 9P: 9P - North

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 10P: 10P-Large Central/NE

Inflow Area = 524.500 ac, 1.46% Impervious, Inflow Depth = 1.97" for 50-Yr event
 Inflow = 69.96 cfs @ 14.44 hrs, Volume= 86.238 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.89' @ 46.39 hrs Surf.Area= 108.385 ac Storage= 86.227 af

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

Volume	Invert	Avail.Storage	Storage Description			
#1	10.00'	98.335 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.00	0.280	2,536.0	0.000	0.000	0.280	
11.00	6.414	16,985.0	2.678	2.678	515.559	
12.00	38.875	11,909.0	20.360	23.038	783.495	
13.00	119.000	22,186.0	75.297	98.335	1,423.612	

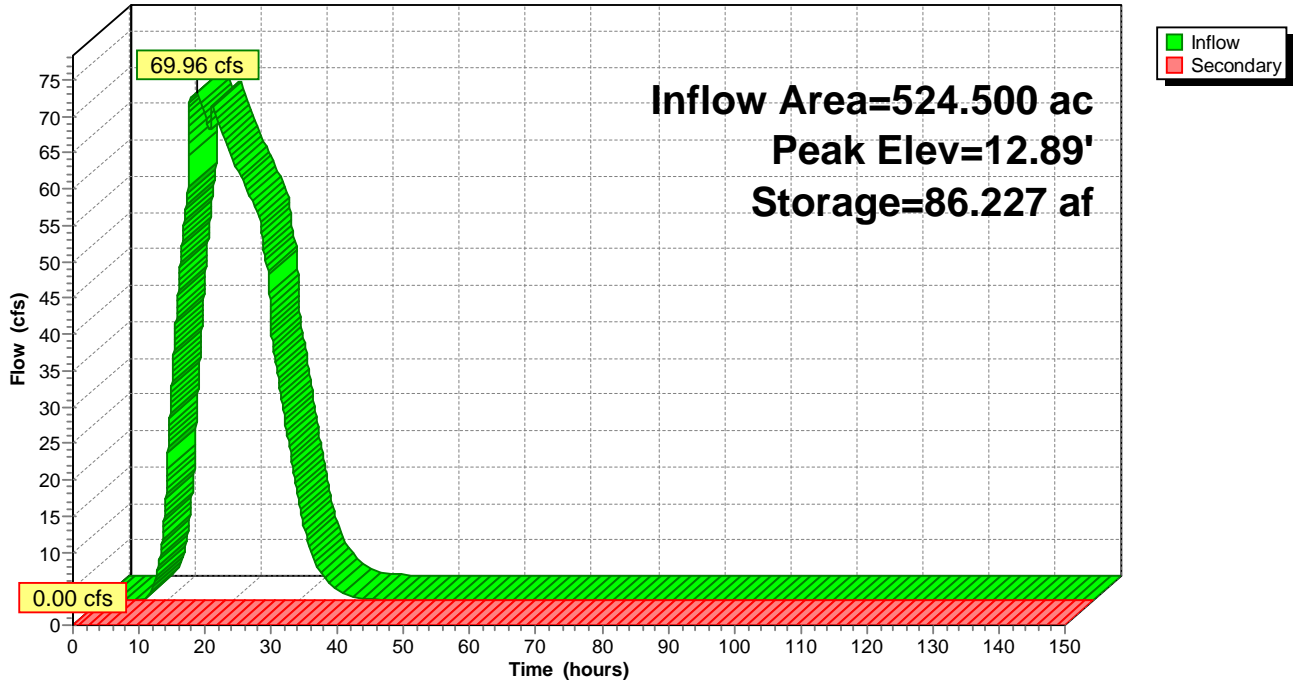
Device	Routing	Invert	Outlet Devices					
#1	Secondary	12.99'	9,999.0' long x 0.5' breadth Broad-Crested Rectangular Weir					
			Head (feet) 0.20 0.40 0.60 0.80 1.00					
			Coef. (English) 2.80 2.92 3.08 3.30 3.32					

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.00' (Free Discharge)

↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 10P: 10P-Large Central/NE

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 11P: 11P-SE Pond

Inflow Area = 23.330 ac, 0.00% Impervious, Inflow Depth = 0.31" for 50-Yr event
 Inflow = 0.63 cfs @ 21.56 hrs, Volume= 0.607 af
 Outflow = 0.63 cfs @ 21.57 hrs, Volume= 0.607 af, Atten= 0%, Lag= 0.6 min
 Discarded = 0.63 cfs @ 21.57 hrs, Volume= 0.607 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 13.00' @ 21.57 hrs Surf.Area= 0.233 ac Storage= 0.001 af

Plug-Flow detention time= 0.7 min calculated for 0.607 af (100% of inflow)
 Center-of-Mass det. time= 0.7 min (1,189.9 - 1,189.2)

Volume	Invert	Avail.Storage	Storage Description			
#1	13.00'	3.949 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
13.00	0.230	1,892.0	0.000	0.000	0.230	
14.00	2.940	4,273.0	1.331	1.331	27.046	
15.00	2.310	2,361.0	2.619	3.949	50.218	

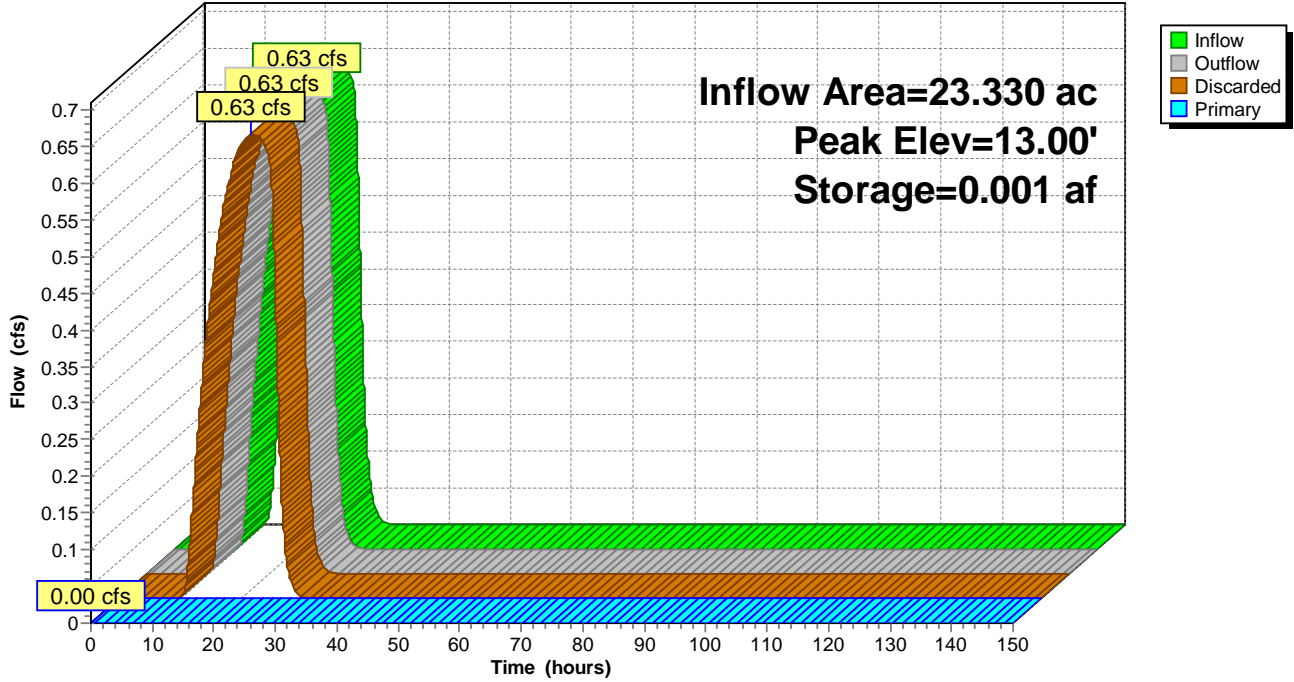
Device	Routing	Invert	Outlet Devices						
#1	Primary	14.99'	2,360.0' long x 0.5' breadth Broad-Crested Rectangular Weir						
			Head (feet) 0.20 0.40 0.60 0.80 1.00						
			Coef. (English) 2.80 2.92 3.08 3.30 3.32						
#2	Discarded	13.00'	19.980 in/hr Exfiltration over Surface area						
			Conductivity to Groundwater Elevation = 1.00'						

Discarded OutFlow Max=4.69 cfs @ 21.57 hrs HW=13.00' (Free Discharge)
 ↑**2=Exfiltration** (Controls 4.69 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=13.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 11P: 11P-SE Pond

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 100-Yr Rainfall=5.50"

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Time span=0.00-150.00 hrs, dt=0.01 hrs, 15001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S-NW Catchment	Runoff Area=7.320 ac 15.71% Impervious Runoff Depth=3.05" Flow Length=292' Slope=0.0200 '/' Tc=4.9 min CN=77 Runoff=5.47 cfs 1.858 af
Subcatchment 2S: 2S-NW Catchment 2	Runoff Area=4.280 ac 0.00% Impervious Runoff Depth=2.68" Flow Length=314' Tc=7.8 min CN=73 Runoff=2.68 cfs 0.955 af
Subcatchment 3S: 3S-North Catchment	Runoff Area=14.400 ac 0.00% Impervious Runoff Depth=2.68" Flow Length=148' Tc=6.7 min CN=73 Runoff=9.04 cfs 3.215 af
Subcatchment 4S: 4S - West Catchment	Runoff Area=26.590 ac 0.00% Impervious Runoff Depth=2.68" Flow Length=923' Slope=0.0030 '/' Tc=56.2 min CN=73 Runoff=11.29 cfs 5.936 af
Subcatchment 5S: 5S - West Catchment	Runoff Area=24.830 ac 0.00% Impervious Runoff Depth=2.68" Flow Length=660' Tc=11.1 min CN=73 Runoff=15.35 cfs 5.543 af
Subcatchment 6S: 6S - West Catchment	Runoff Area=21.310 ac 0.00% Impervious Runoff Depth=2.86" Flow Length=1,162' Slope=0.0017 '/' Tc=127.5 min CN=75 Runoff=7.03 cfs 5.080 af
Subcatchment 7S: 7S - Southwest	Runoff Area=54.970 ac 0.93% Impervious Runoff Depth=3.05" Flow Length=1,127' Tc=135.3 min CN=77 Runoff=19.37 cfs 13.955 af
Subcatchment 8S: 8S - South Catchment	Runoff Area=16.360 ac 4.95% Impervious Runoff Depth=3.14" Flow Length=1,480' Tc=88.6 min CN=78 Runoff=7.22 cfs 4.282 af
Subcatchment 9S: 9S - North	Runoff Area=22.710 ac 0.00% Impervious Runoff Depth=2.68" Flow Length=597' Tc=23.9 min CN=73 Runoff=12.64 cfs 5.070 af
Subcatchment 10S: 10S - Large Central / NE	Runoff Area=324.760 ac 1.84% Impervious Runoff Depth=2.95" Flow Length=2,575' Slope=0.0019 '/' Tc=393.8 min CN=76 Runoff=66.10 cfs 79.917 af
Subcatchment 11S: 11S - SE	Runoff Area=23.330 ac 0.00% Impervious Runoff Depth=0.45" Flow Length=1,924' Tc=126.8 min CN=42 Runoff=0.84 cfs 0.881 af
Reach 8R: South Ditch	Avg. Flow Depth=0.93' Max Vel=1.63 fps Inflow=7.22 cfs 4.282 af n=0.022 L=579.0' S=0.0012 '/' Capacity=2.94 cfs Outflow=7.18 cfs 4.282 af
Pond 1P: 1P- NW Pond	Peak Elev=12.33' Storage=1.858 af Inflow=5.47 cfs 1.858 af Outflow=0.00 cfs 0.000 af
Pond 2P: 2P-NW Pond 2	Peak Elev=11.95' Storage=0.955 af Inflow=2.68 cfs 0.955 af Outflow=0.00 cfs 0.000 af
Pond 3P: 3P-North Pond	Peak Elev=15.00' Storage=2.713 af Inflow=9.04 cfs 6.656 af Outflow=5.59 cfs 3.954 af
Pond 4P: 4P - West Pond	Peak Elev=13.99' Storage=2.502 af Inflow=11.29 cfs 5.936 af Outflow=4.24 cfs 3.441 af

Existing_Conditions_mlc

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Pond 5P: 5P - West Pond Peak Elev=15.00' Storage=2.046 af Inflow=21.01 cfs 16.155 af
Outflow=13.03 cfs 14.318 af

Pond 6P: 6P- West Pond Peak Elev=15.00' Storage=3.853 af Inflow=16.68 cfs 19.398 af
Outflow=12.53 cfs 15.614 af

Pond 7P: 7P-Southwest Peak Elev=15.00' Storage=3.394 af Inflow=19.37 cfs 13.955 af
Outflow=16.81 cfs 10.612 af

Pond 8P: 8P Peak Elev=17.41' Inflow=7.22 cfs 4.282 af
36.0" Round Culvert n=0.025 L=93.0' S=0.0088 '/ Outflow=7.22 cfs 4.282 af

Pond 9P: 9P - North Peak Elev=12.99' Storage=1.423 af Inflow=12.64 cfs 9.024 af
Outflow=8.66 cfs 7.614 af

Pond 10P: 10P-Large Central/NE Peak Elev=13.00' Storage=97.914 af Inflow=86.32 cfs 103.145 af
Outflow=18.09 cfs 5.996 af

Pond 11P: 11P-SE Pond Peak Elev=13.00' Storage=0.001 af Inflow=0.84 cfs 0.881 af
Discarded=0.84 cfs 0.881 af Primary=0.00 cfs 0.000 af Outflow=0.84 cfs 0.881 af

Total Runoff Area = 540.860 ac Runoff Volume = 126.693 af Average Runoff Depth = 2.81"
98.44% Pervious = 532.400 ac 1.56% Impervious = 8.460 ac

Existing Conditions_mlc

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 1S: 1S-NW Catchment

Runoff = 5.47 cfs @ 7.94 hrs, Volume= 1.858 af, Depth= 3.05"

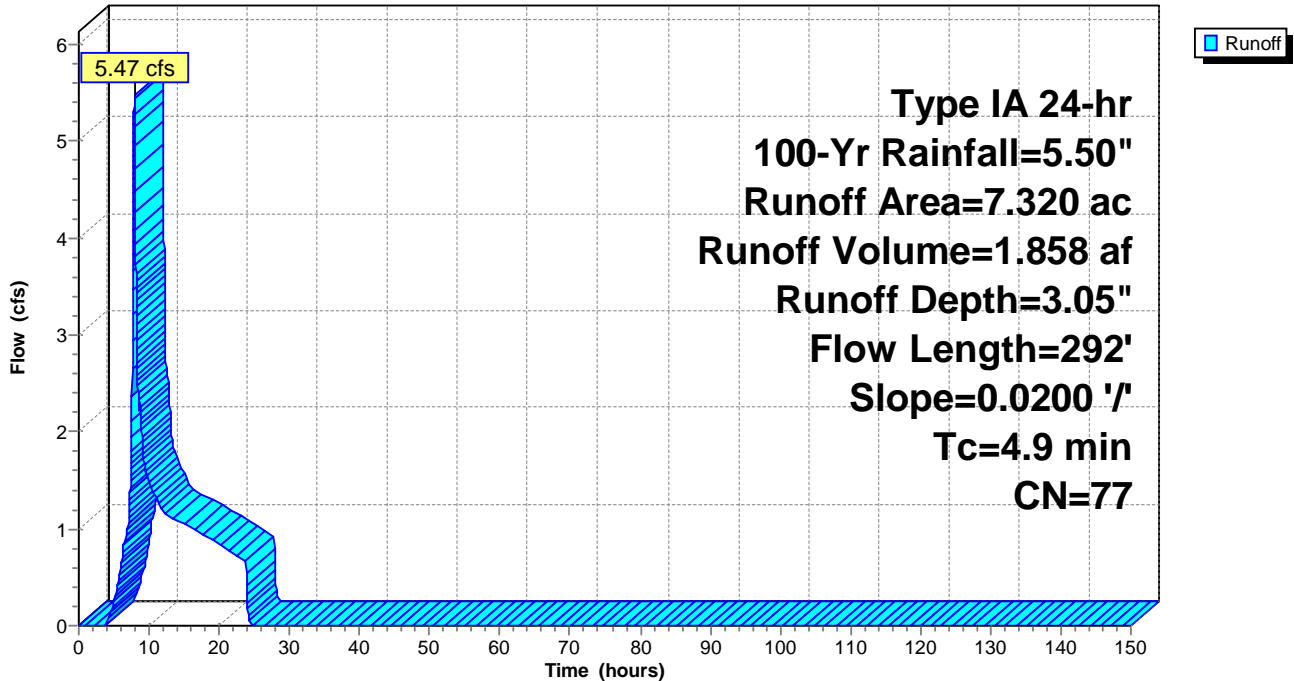
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
6.170	73	Brush, Good, HSG D
1.150	98	Paved parking, HSG D
7.320	77	Weighted Average
6.170	73	84.29% Pervious Area
1.150	98	15.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	292	0.0200	0.99		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps

Subcatchment 1S: 1S-NW Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 2S: 2S-NW Catchment 2

Sheet flow - dense comes from "native grasses" considered dense. Characterized by the wetland report.

Runoff = 2.68 cfs @ 8.00 hrs, Volume= 0.955 af, Depth= 2.68"

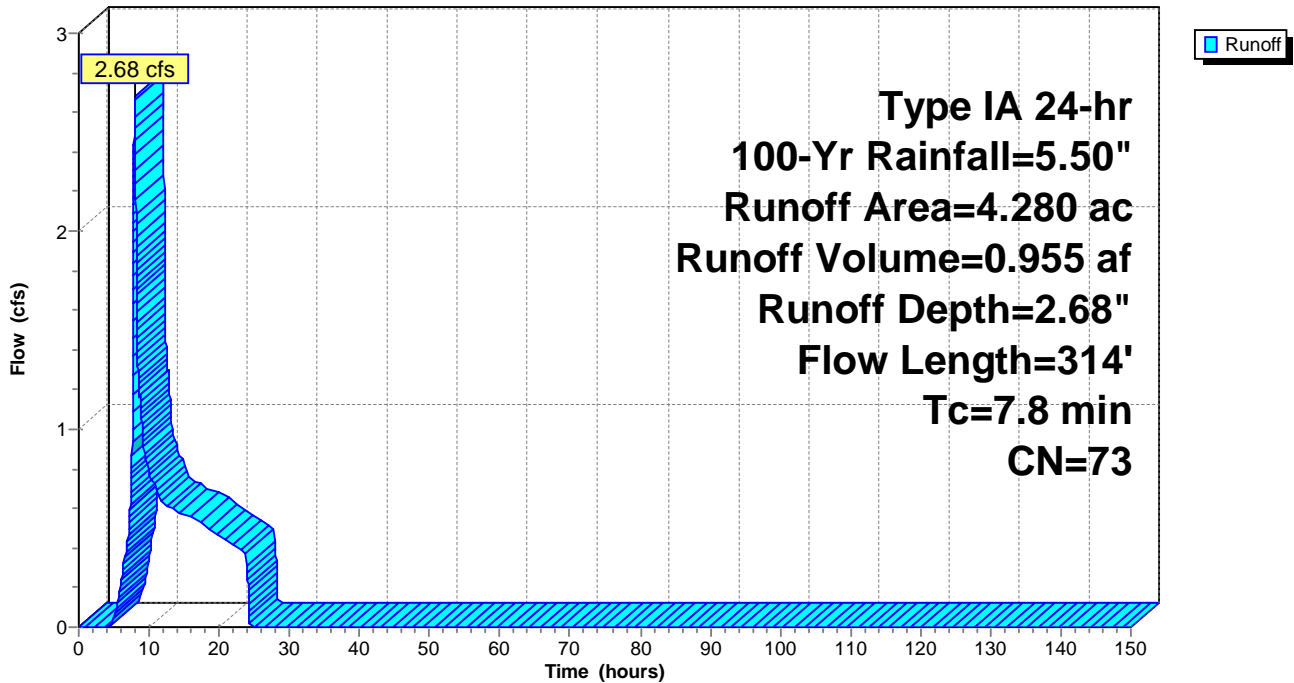
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
4.280	73	Brush, Good, HSG D
4.280	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	76	0.1300	0.24		Sheet Flow, Sheet - Dense, Native Grasses Grass: Dense n= 0.240 P2= 3.43"
2.6	238	0.0460	1.50		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
7.8	314	Total			

Subcatchment 2S: 2S-NW Catchment 2

Hydrograph



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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 3S: 3S-North Catchment

Runoff = 9.04 cfs @ 7.99 hrs, Volume= 3.215 af, Depth= 2.68"

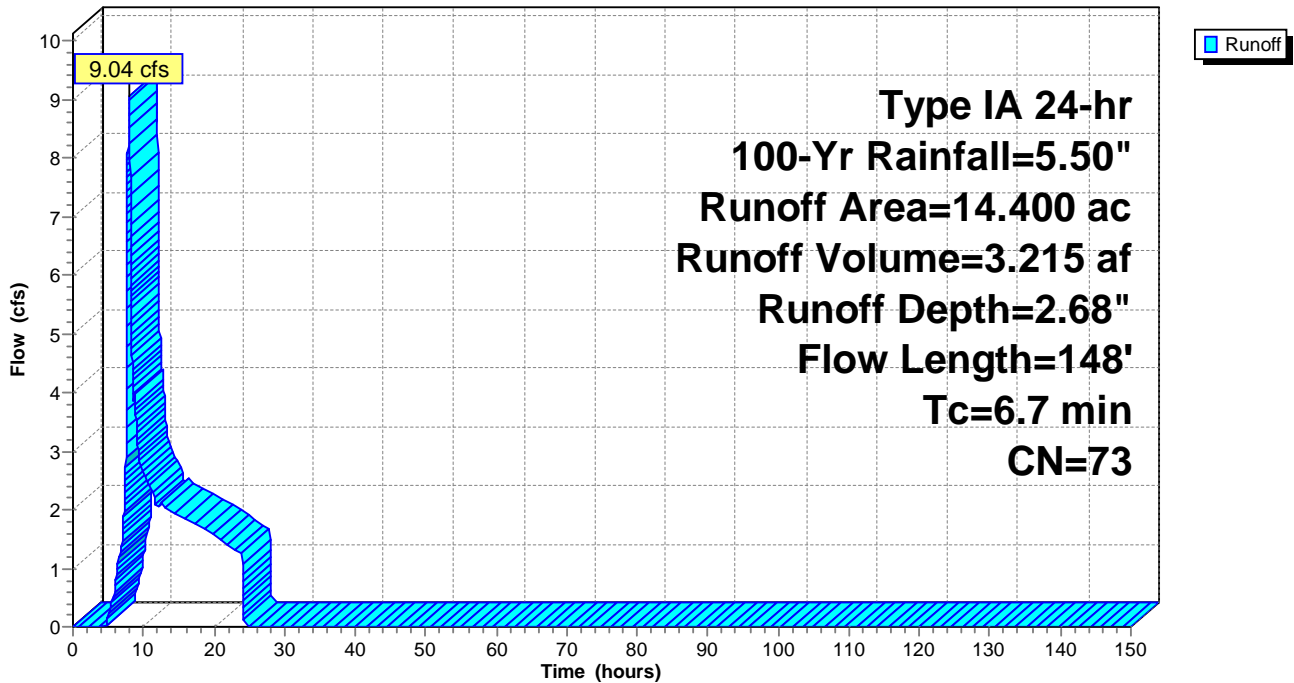
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
14.400	73	Brush, Good, HSG D
14.400	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	95	0.0950	0.33		Sheet Flow, Sheet flow - dune Grass: Short n= 0.150 P2= 3.43"
1.8	53	0.0050	0.49		Shallow Concentrated Flow, Shallow - dune grass Short Grass Pasture Kv= 7.0 fps
6.7	148	Total			

Subcatchment 3S: 3S-North Catchment

Hydrograph



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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 4S: 4S - West Catchment

Runoff = 11.29 cfs @ 8.61 hrs, Volume= 5.936 af, Depth= 2.68"

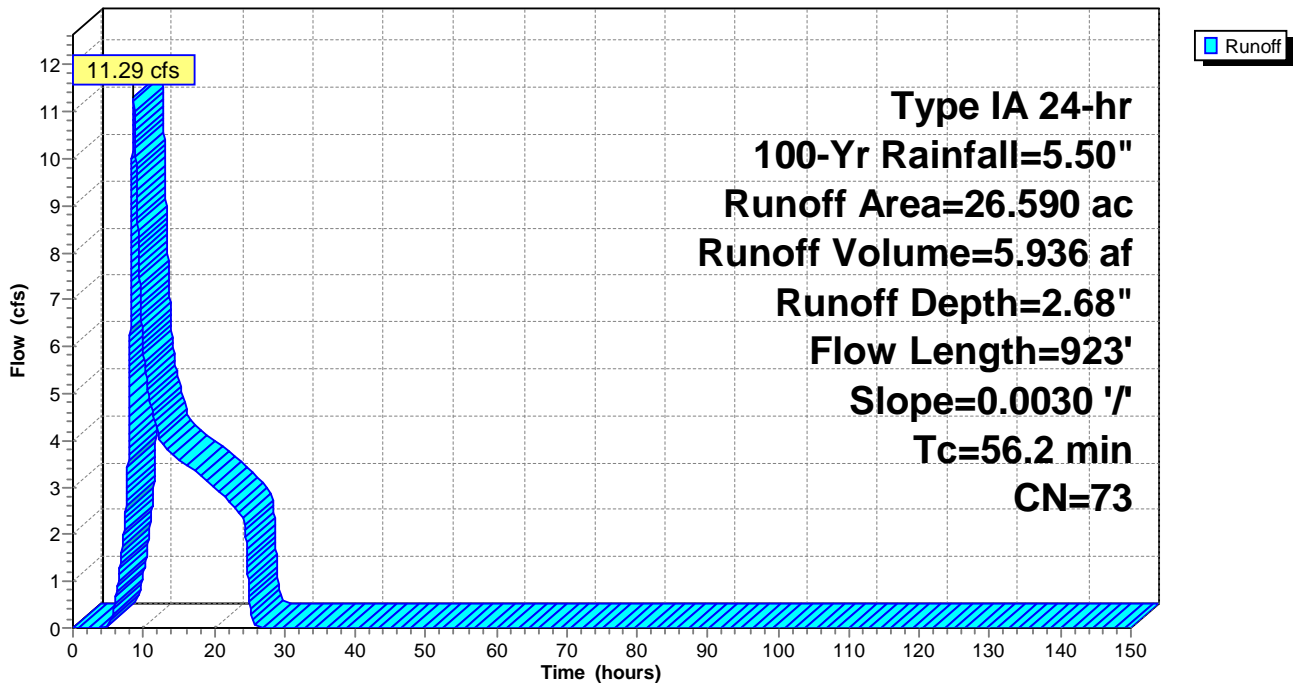
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
26.590	73	Brush, Good, HSG D
26.590	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.2	923	0.0030	0.27		Shallow Concentrated Flow, Shallow - Forest Woodland Kv= 5.0 fps

Subcatchment 4S: 4S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 5S: 5S - West Catchment

Runoff = 15.35 cfs @ 8.03 hrs, Volume= 5.543 af, Depth= 2.68"

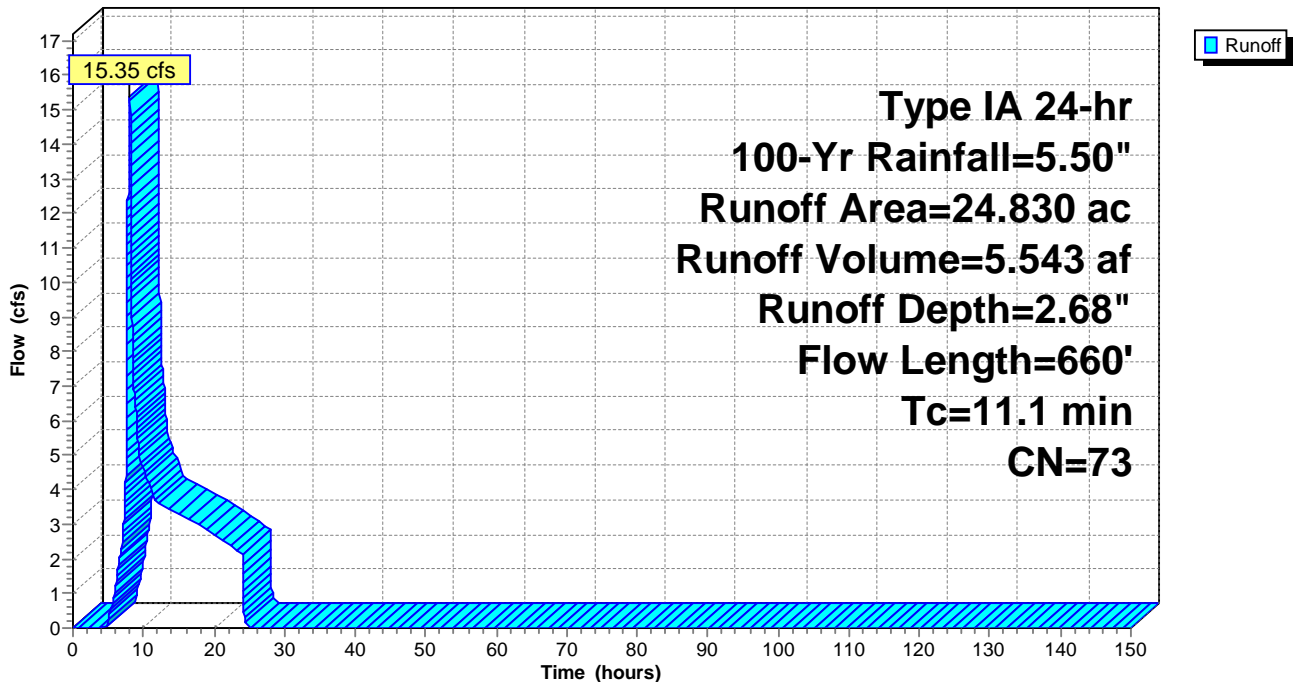
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
23.460	73	Brush, Good, HSG D
1.370	79	Woods/grass comb., Good, HSG D
24.830	73	Weighted Average
24.830	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	608	0.0180	0.94		Shallow Concentrated Flow, Shallow - Forest
					Short Grass Pasture Kv= 7.0 fps
0.3	52	0.1300	2.64		Sheet Flow, Path
					Smooth surfaces n= 0.011 P2= 3.43"
11.1	660	Total			

Subcatchment 5S: 5S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 6S: 6S - West Catchment

Runoff = 7.03 cfs @ 9.77 hrs, Volume= 5.080 af, Depth= 2.86"

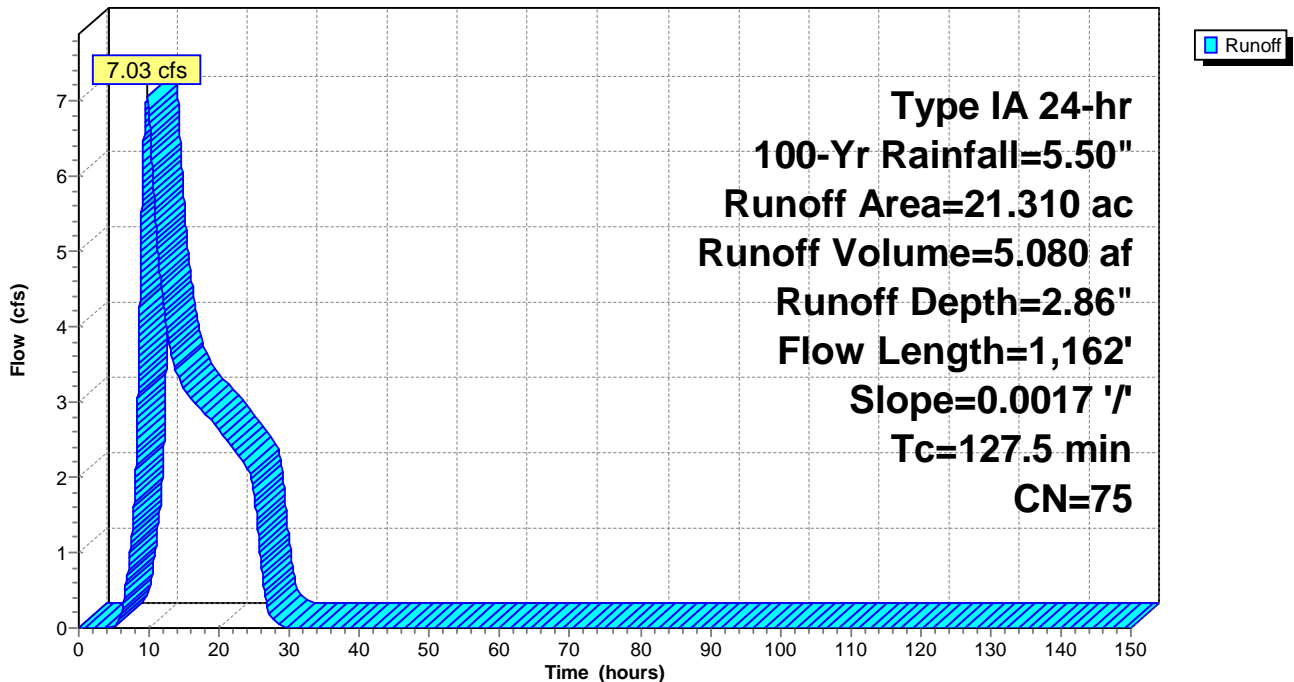
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
8.730	79	Woods/grass comb., Good, HSG D
12.580	73	Brush, Good, HSG D
21.310	75	Weighted Average
21.310	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.6	581	0.0017	0.29		Shallow Concentrated Flow, Grass - Shallow Short Grass Pasture Kv= 7.0 fps
93.9	581	0.0017	0.10		Shallow Concentrated Flow, Forested - Shallow Forest w/Heavy Litter Kv= 2.5 fps
127.5	1,162	Total			

Subcatchment 6S: 6S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 7S: 7S - Southwest

Runoff = 19.37 cfs @ 9.77 hrs, Volume= 13.955 af, Depth= 3.05"

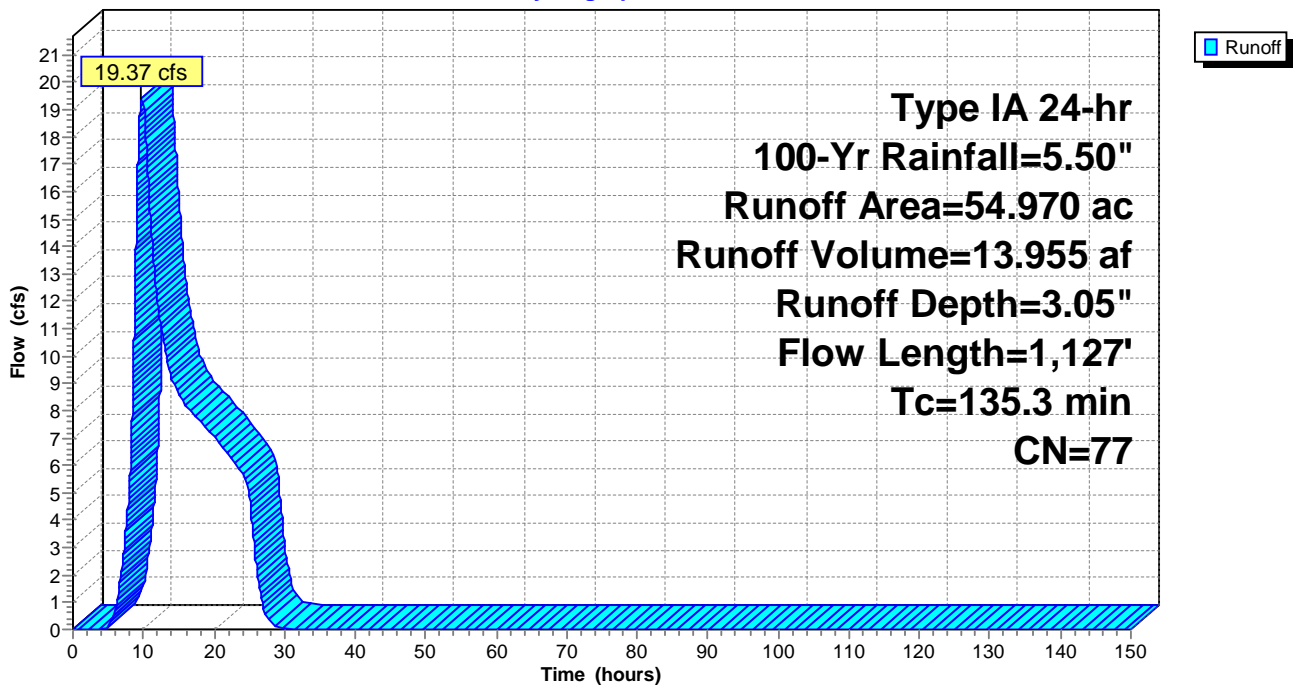
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
21.790	73	Brush, Good, HSG D
32.670	79	Woods/grass comb., Good, HSG D
0.510	98	Paved parking, HSG D
54.970	77	Weighted Average
54.460	77	99.07% Pervious Area
0.510	98	0.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	70	0.1000	0.21		Sheet Flow, Sheet - Paved to Grass Grass: Dense n= 0.240 P2= 3.43"
2.4	202	0.0390	1.38		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
127.5	855	0.0020	0.11		Shallow Concentrated Flow, Shallow - Forest Forest w/Heavy Litter Kv= 2.5 fps
135.3	1,127	Total			

Subcatchment 7S: 7S - Southwest

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 8S: 8S - South Catchment

Runoff = 7.22 cfs @ 9.06 hrs, Volume= 4.282 af, Depth= 3.14"

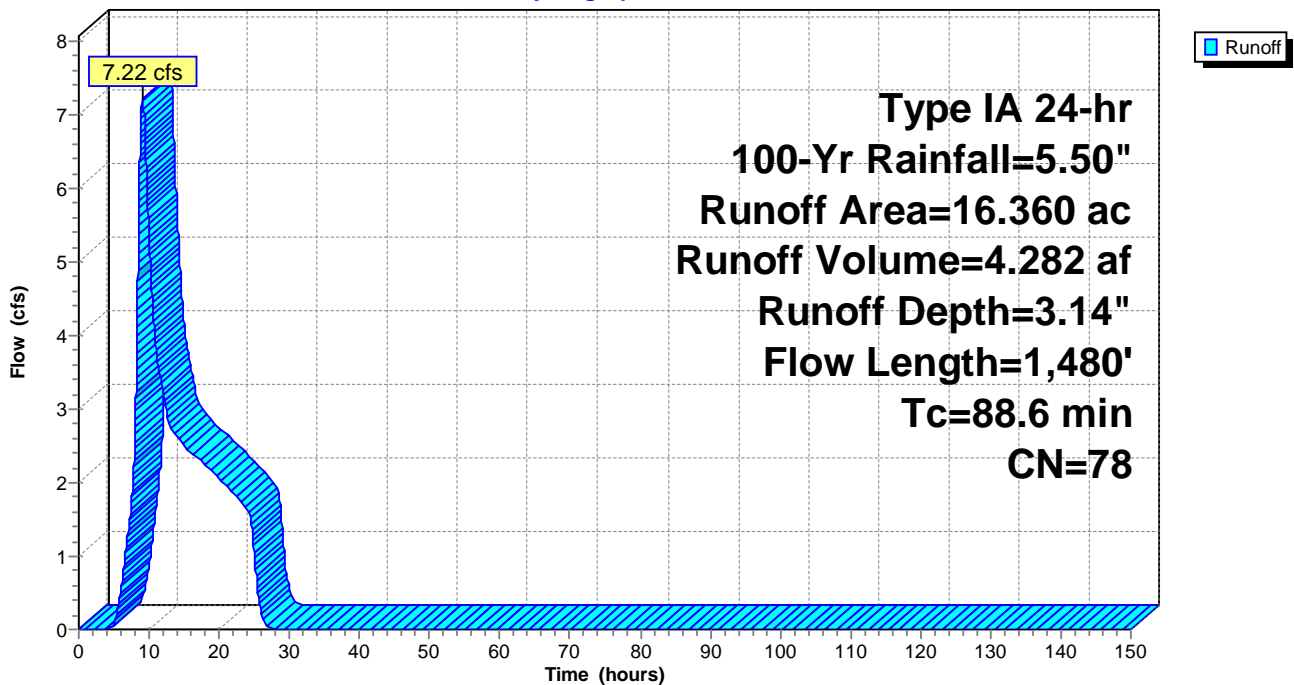
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
15.000	79	Woods/grass comb., Good, HSG D
0.550	30	Brush, Good, HSG A
0.810	98	Paved parking, HSG D
16.360	78	Weighted Average
15.550	77	95.05% Pervious Area
0.810	98	4.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	89	0.0560	0.26		Sheet Flow, Sheet- Dune grass Grass: Short n= 0.150 P2= 3.43"
67.3	844	0.0070	0.21		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps
15.6	547	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
88.6	1,480	Total			

Subcatchment 8S: 8S - South Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 9S: 9S - North

Runoff = 12.64 cfs @ 8.16 hrs, Volume= 5.070 af, Depth= 2.68"

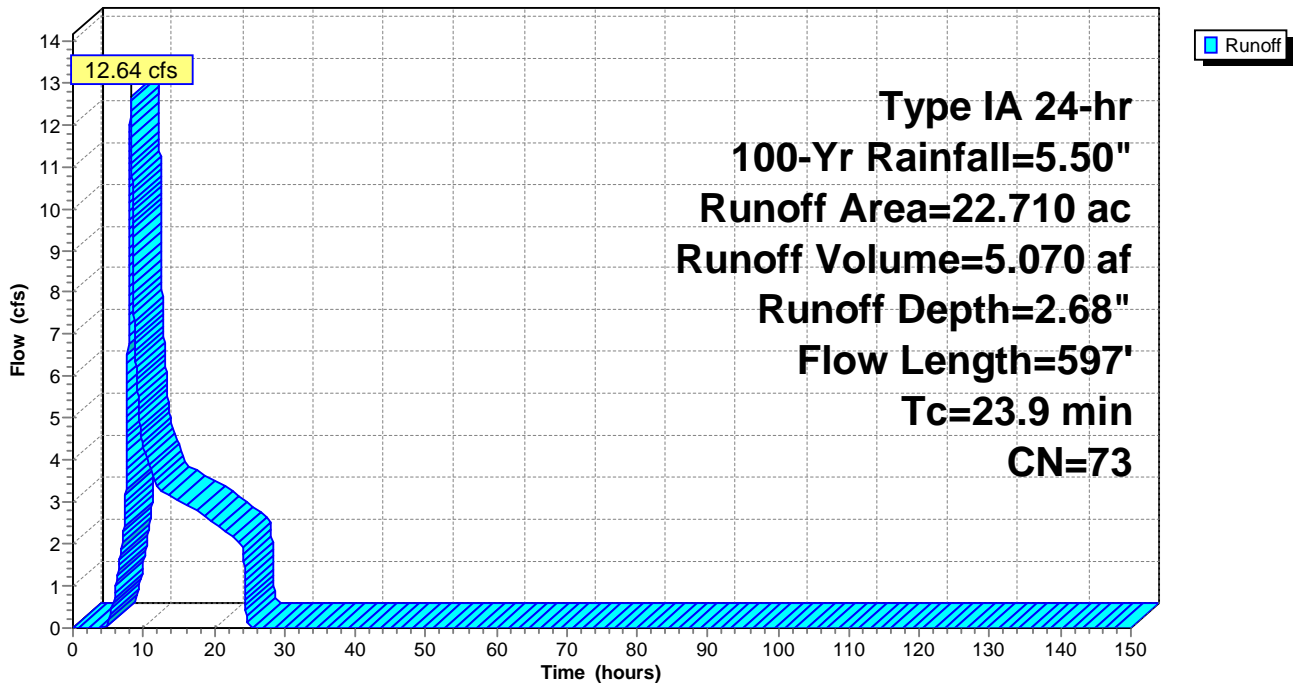
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
21.780	73	Brush, Good, HSG D
0.930	79	Woods/grass comb., Good, HSG D
22.710	73	Weighted Average
22.710	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	67	0.0450	0.15		Sheet Flow, Sheet - Grass Grass: Dense n= 0.240 P2= 3.43"
16.7	530	0.0057	0.53		Shallow Concentrated Flow, Shallow - Woods Short Grass Pasture Kv= 7.0 fps
23.9	597	Total			

Subcatchment 9S: 9S - North

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 10S: 10S - Large Central / NE

Runoff = 66.10 cfs @ 14.01 hrs, Volume= 79.917 af, Depth= 2.95"

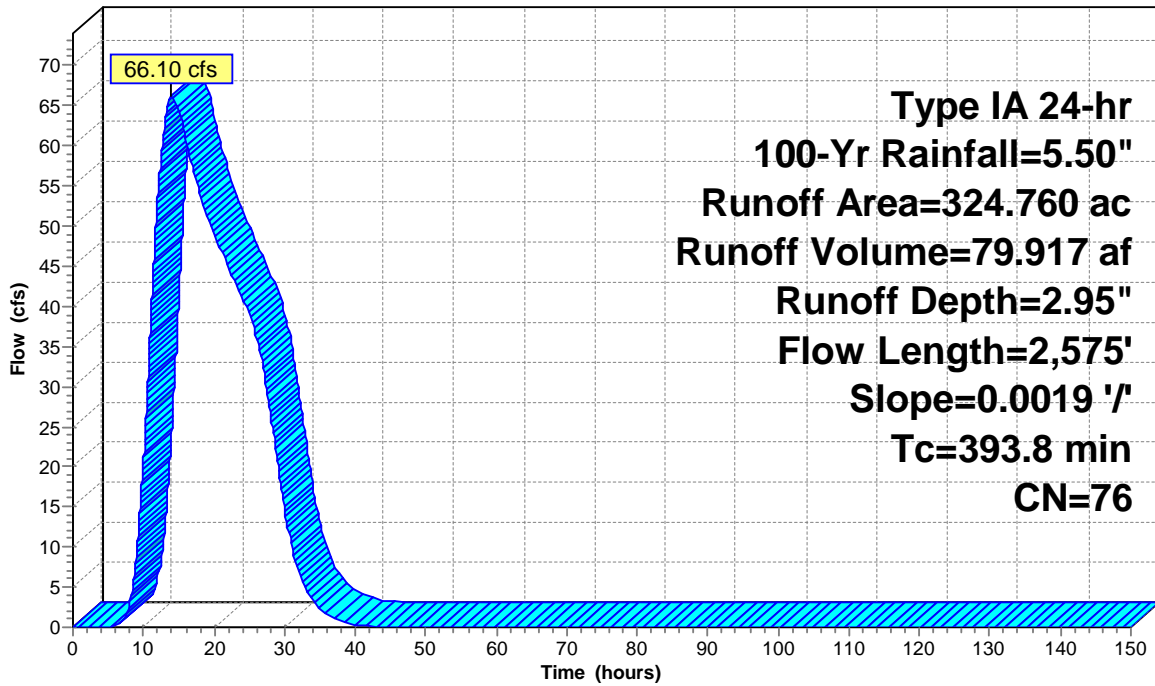
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
223.040	79	Woods/grass comb., Good, HSG D
12.880	32	Woods/grass comb., Good, HSG A
0.660	98	Paved parking, HSG A
5.330	98	Paved parking, HSG D
82.850	73	Brush, Good, HSG D
324.760	76	Weighted Average
318.770	76	98.16% Pervious Area
5.990	98	1.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
393.8	2,575	0.0019	0.11		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps

Subcatchment 10S: 10S - Large Central / NE

Hydrograph



Runoff

Existing Conditions_mlc

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 11S: 11S - SE

Runoff = 0.84 cfs @ 20.71 hrs, Volume= 0.881 af, Depth= 0.45"

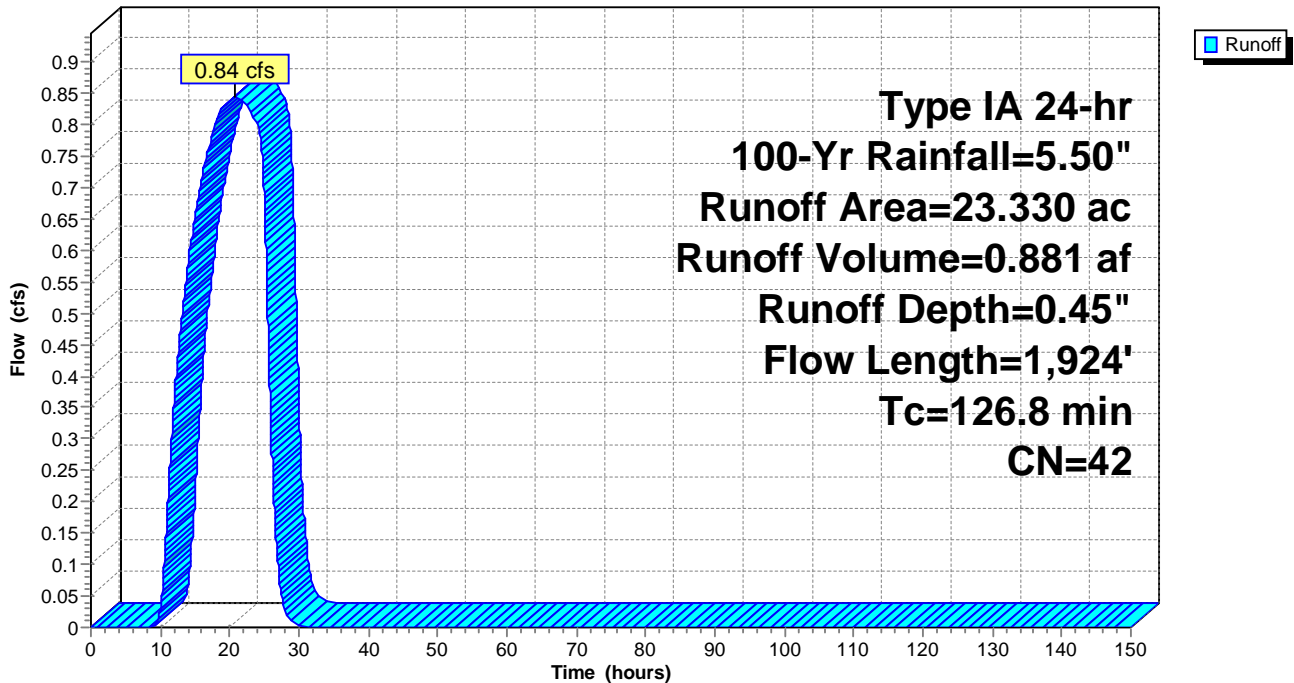
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
18.140	32	Woods/grass comb., Good, HSG A
1.980	79	Woods/grass comb., Good, HSG D
3.210	73	Brush, Good, HSG D
23.330	42	Weighted Average
23.330	42	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	126	0.1800	0.30		Sheet Flow, Sheet-Dune Grass Grass: Dense n= 0.240 P2= 3.43"
119.9	1,798	0.0100	0.25		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps
126.8	1,924	Total			

Subcatchment 11S: 11S - SE

Hydrograph



Existing_Conditions_mlc

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Reach 8R: South Ditch

[91] Warning: Storage range exceeded by 0.43'

[55] Hint: Peak inflow is 245% of Manning's capacity

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 0.82'

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 3.14" for 100-Yr event
Inflow = 7.22 cfs @ 9.06 hrs, Volume= 4.282 af
Outflow = 7.18 cfs @ 9.26 hrs, Volume= 4.282 af, Atten= 0%, Lag= 12.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs

Max. Velocity= 1.63 fps, Min. Travel Time= 5.9 min

Avg. Velocity = 0.68 fps, Avg. Travel Time= 14.2 min

Peak Storage= 2,549 cf @ 9.16 hrs

Average Depth at Peak Storage= 0.93', Surface Width= 5.86'

Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 2.94 cfs

4.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 1.0 '/' Top Width= 5.00'

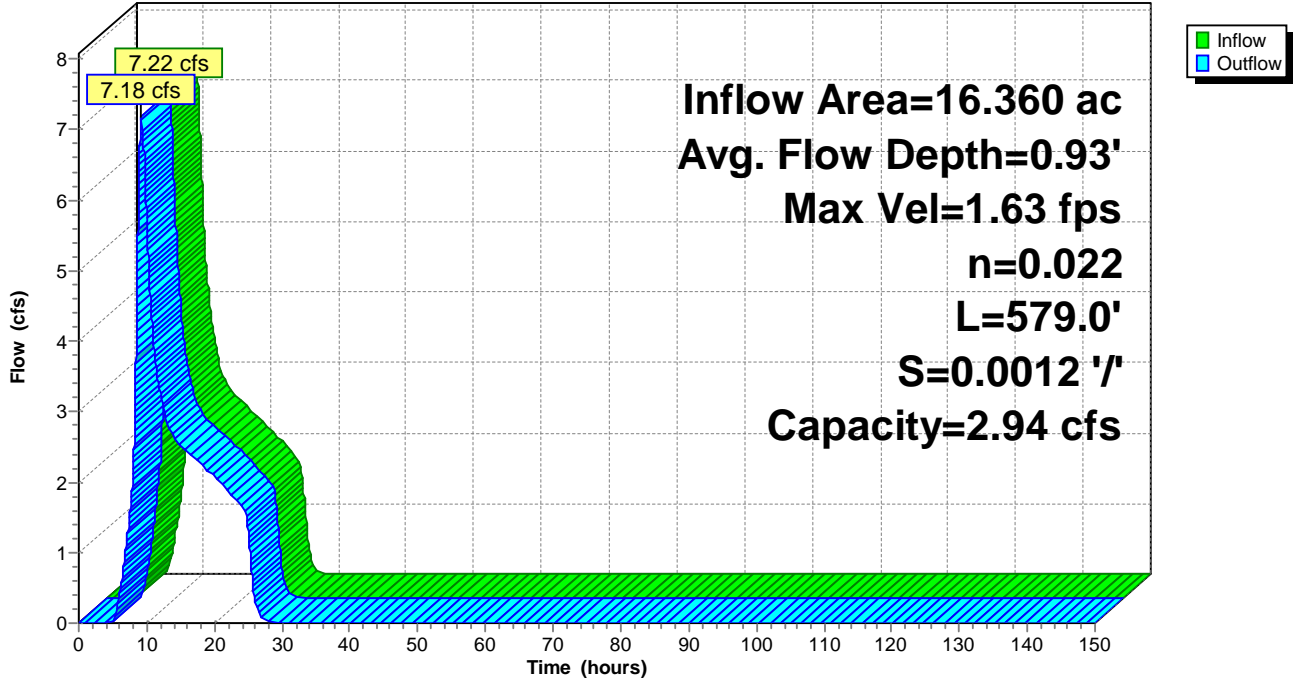
Length= 579.0' Slope= 0.0012 '/'

Inlet Invert= 16.00', Outlet Invert= 15.30'



Reach 8R: South Ditch

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 1P: 1P- NW Pond

Inflow Area = 7.320 ac, 15.71% Impervious, Inflow Depth = 3.05" for 100-Yr event
 Inflow = 5.47 cfs @ 7.94 hrs, Volume= 1.858 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.33' @ 24.29 hrs Surf.Area= 1.489 ac Storage= 1.858 af

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

Volume	Invert	Avail.Storage	Storage Description
#1	11.00'	6.173 af	Custom Stage Data (Irregular) Listed below (Recalc)

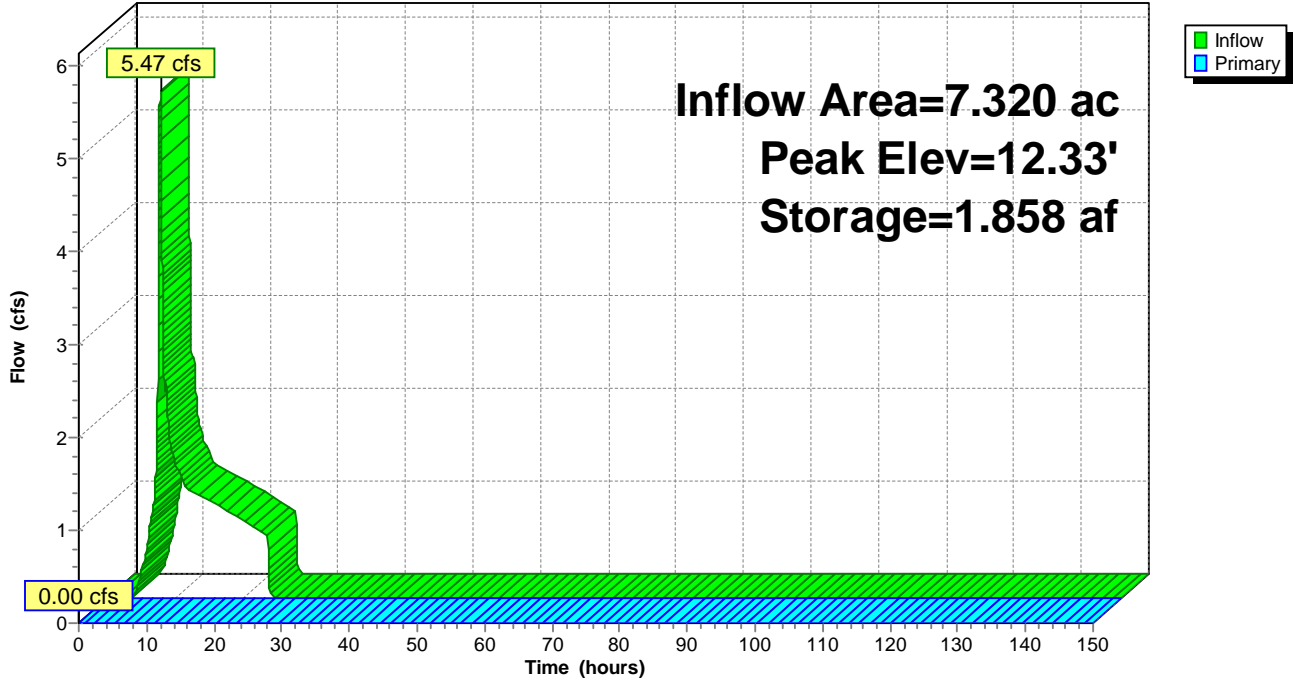
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
11.00	1.290	1,552.0	0.000	0.000	1.290
12.00	1.460	1,164.0	1.374	1.374	3.215
13.00	1.550	1,193.0	1.505	2.879	3.343
14.00	1.640	1,231.0	1.595	4.474	3.514
15.00	1.760	1,333.0	1.700	6.173	3.992

Device	Routing	Invert	Outlet Devices
#1	Primary	14.99'	1,333.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: 1P- NW Pond

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 2P: 2P-NW Pond 2

Inflow Area = 11.600 ac, 9.91% Impervious, Inflow Depth = 0.99" for 100-Yr event
 Inflow = 2.68 cfs @ 8.00 hrs, Volume= 0.955 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 11.95' @ 24.45 hrs Surf.Area= 1.077 ac Storage= 0.955 af

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

Volume	Invert	Avail.Storage	Storage Description			
#1	11.00'	3.348 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
11.00	0.930	1,430.0	0.000	0.000	0.930	
12.00	1.085	1,183.0	1.007	1.007	2.109	
13.00	1.170	1,220.0	1.127	2.134	2.274	
14.00	1.260	1,273.0	1.215	3.348	2.517	

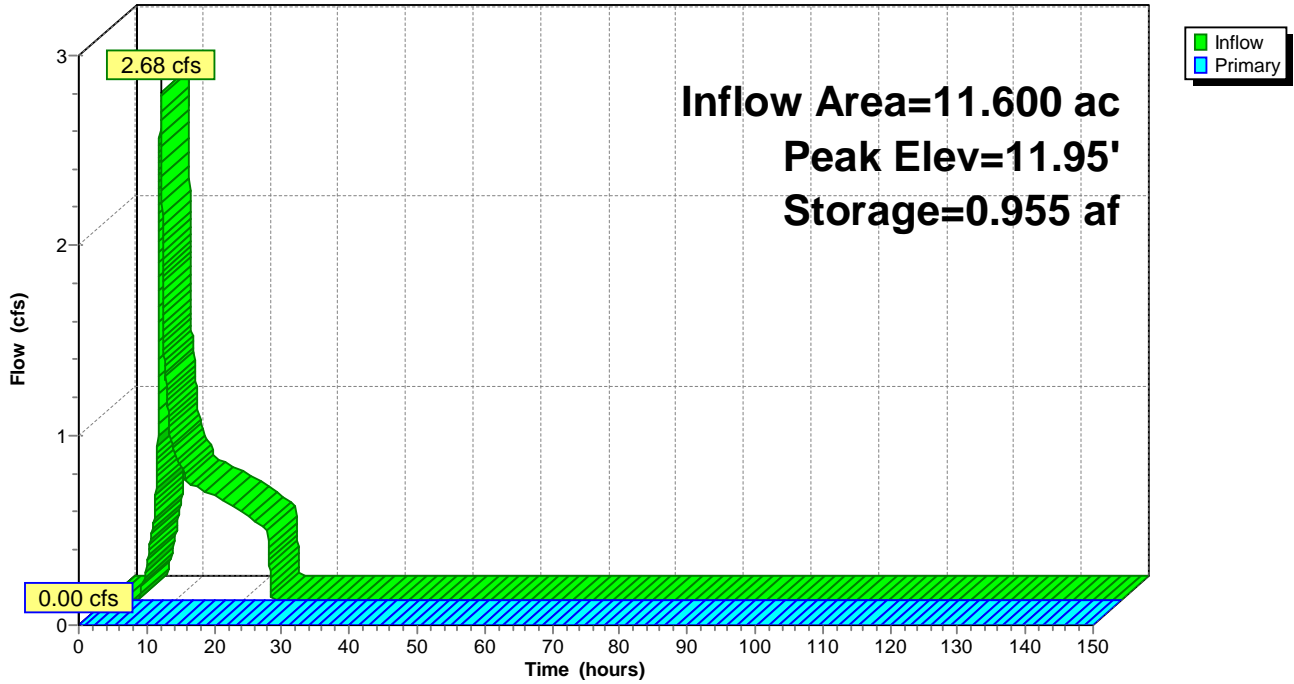
Device	Routing	Invert	Outlet Devices											
#1	Primary	13.99'	1,300.0' long x 4.0' breadth Broad-Crested Rectangular Weir											
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00											
			2.50 3.00 3.50 4.00 4.50 5.00 5.50											
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68											
			2.72 2.73 2.76 2.79 2.88 3.07 3.32											

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: 2P-NW Pond 2

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 3P: 3P-North Pond

[81] Warning: Exceeded Pond 2P by 3.41' @ 14.36 hrs

[81] Warning: Exceeded Pond 4P by 1.01' @ 14.49 hrs

Inflow Area = 52.590 ac, 2.19% Impervious, Inflow Depth = 1.52" for 100-Yr event
 Inflow = 9.04 cfs @ 7.99 hrs, Volume= 6.656 af
 Outflow = 5.59 cfs @ 14.48 hrs, Volume= 3.954 af, Atten= 38%, Lag= 389.3 min
 Primary = 5.59 cfs @ 14.48 hrs, Volume= 3.954 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 15.00' @ 14.48 hrs Surf.Area= 1.600 ac Storage= 2.713 af

Plug-Flow detention time= 408.6 min calculated for 3.954 af (59% of inflow)
 Center-of-Mass det. time= 205.3 min (1,145.8 - 940.6)

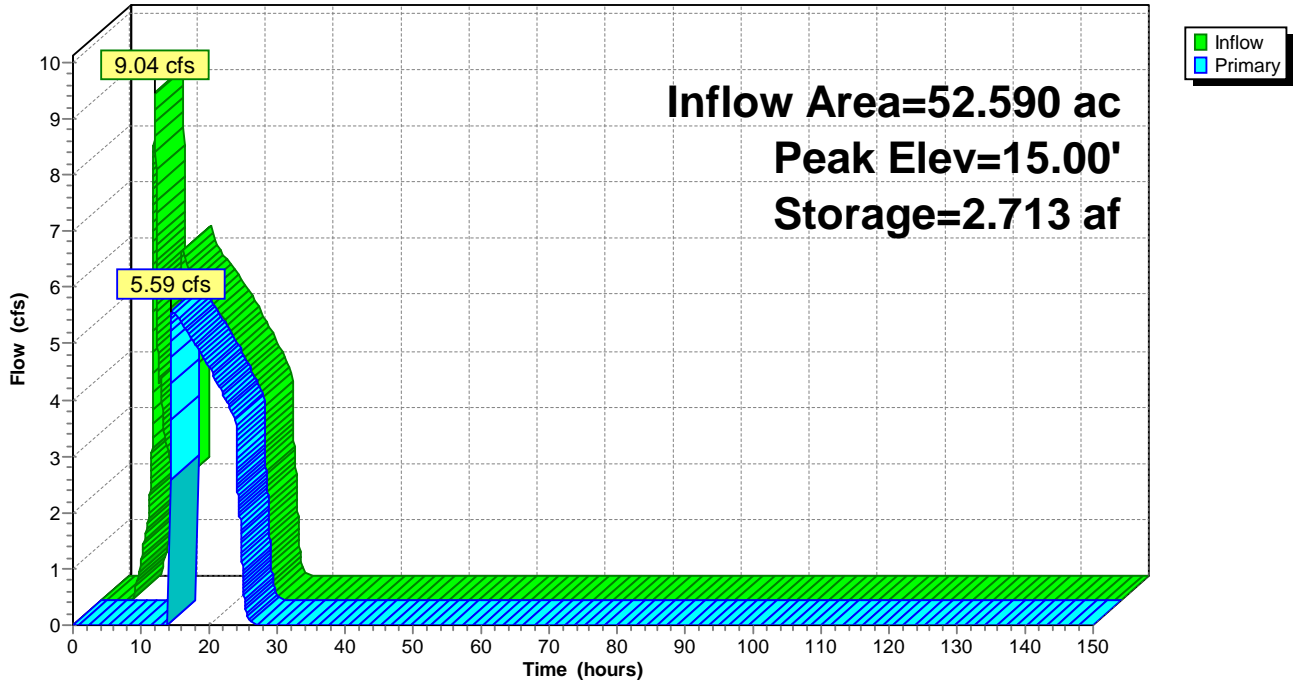
Volume	Invert	Avail.Storage	Storage Description			
#1	12.00'	2.718 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
12.00	0.086	1,508.0	0.000	0.000	0.086	
13.00	0.450	1,395.0	0.244	0.244	0.686	
14.00	1.500	4,156.0	0.924	1.168	28.685	
15.00	1.600	2,946.0	1.550	2.718	44.384	

Device	Routing	Invert	Outlet Devices											
#1	Primary	14.99'	3,000.0' long x 1.0' breadth Broad-Crested Rectangular Weir											
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00											
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32											

Primary OutFlow Max=4.65 cfs @ 14.48 hrs HW=15.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 4.65 cfs @ 0.22 fps)

Pond 3P: 3P-North Pond

Hydrograph



Existing_Conditions_mlc

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 4P: 4P - West Pond

Inflow Area = 26.590 ac, 0.00% Impervious, Inflow Depth = 2.68" for 100-Yr event
 Inflow = 11.29 cfs @ 8.61 hrs, Volume= 5.936 af
 Outflow = 4.24 cfs @ 11.95 hrs, Volume= 3.441 af, Atten= 62%, Lag= 200.7 min
 Primary = 4.24 cfs @ 11.95 hrs, Volume= 3.441 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 13.99' @ 11.95 hrs Surf.Area= 3.777 ac Storage= 2.502 af

Plug-Flow detention time= 444.1 min calculated for 3.441 af (58% of inflow)
 Center-of-Mass det. time= 215.1 min (1,066.6 - 851.6)

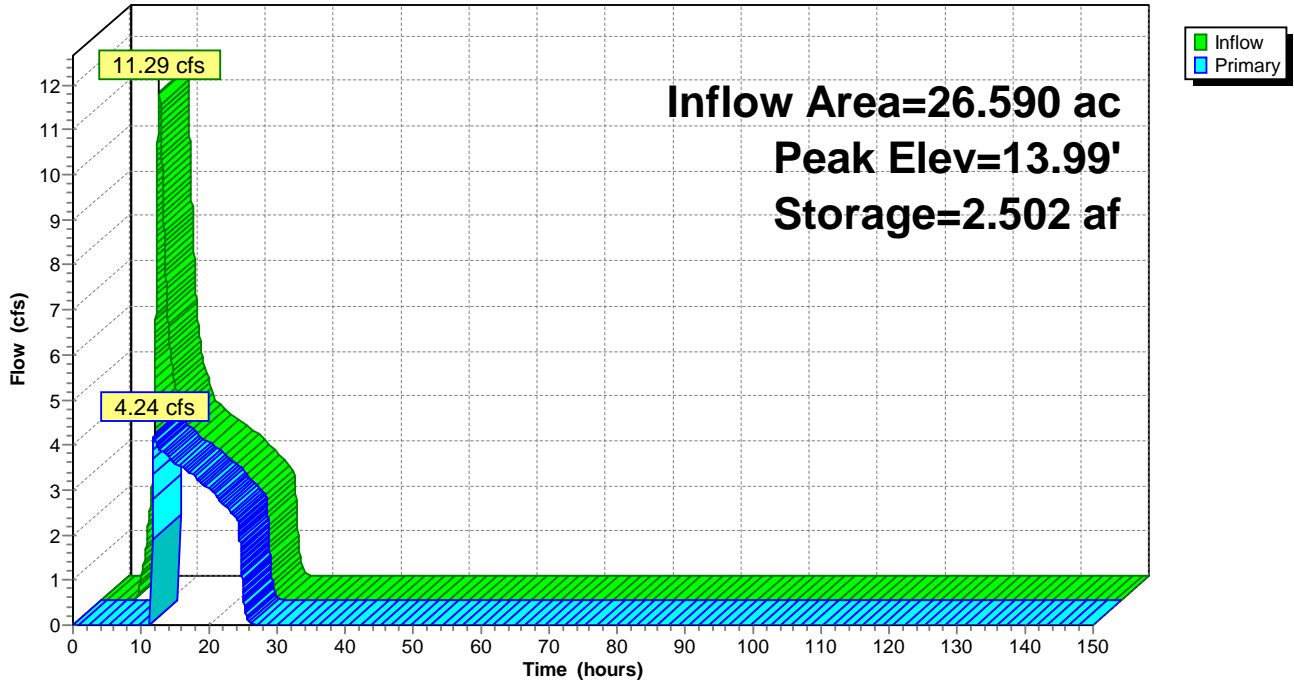
Volume	Invert	Avail.Storage	Storage Description			
#1	13.00'	2.532 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
13.00	1.450	2,862.0	0.000	0.000	1.450	
14.00	3.800	7,496.0	2.532	2.532	89.137	

Device	Routing	Invert	Outlet Devices					
#1	Primary	13.99'	7,496.0' long x 0.5' breadth Broad-Crested Rectangular Weir					
			Head (feet) 0.20 0.40 0.60 0.80 1.00					
			Coef. (English) 2.80 2.92 3.08 3.30 3.32					

Primary OutFlow Max=1.90 cfs @ 11.95 hrs HW=13.99' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 1.90 cfs @ 0.13 fps)

Pond 4P: 4P - West Pond

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 5P: 5P - West Pond

[81] Warning: Exceeded Pond 7P by 0.24' @ 9.75 hrs

Inflow Area = 79.800 ac, 0.64% Impervious, Inflow Depth = 2.43" for 100-Yr event
 Inflow = 21.01 cfs @ 10.57 hrs, Volume= 16.155 af
 Outflow = 13.03 cfs @ 13.57 hrs, Volume= 14.318 af, Atten= 38%, Lag= 180.5 min
 Primary = 13.03 cfs @ 13.57 hrs, Volume= 14.318 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 15.00' @ 13.57 hrs Surf.Area= 139.556 ac Storage= 2.046 af

Plug-Flow detention time= 173.3 min calculated for 14.317 af (89% of inflow)
 Center-of-Mass det. time= 107.4 min (1,054.7 - 947.3)

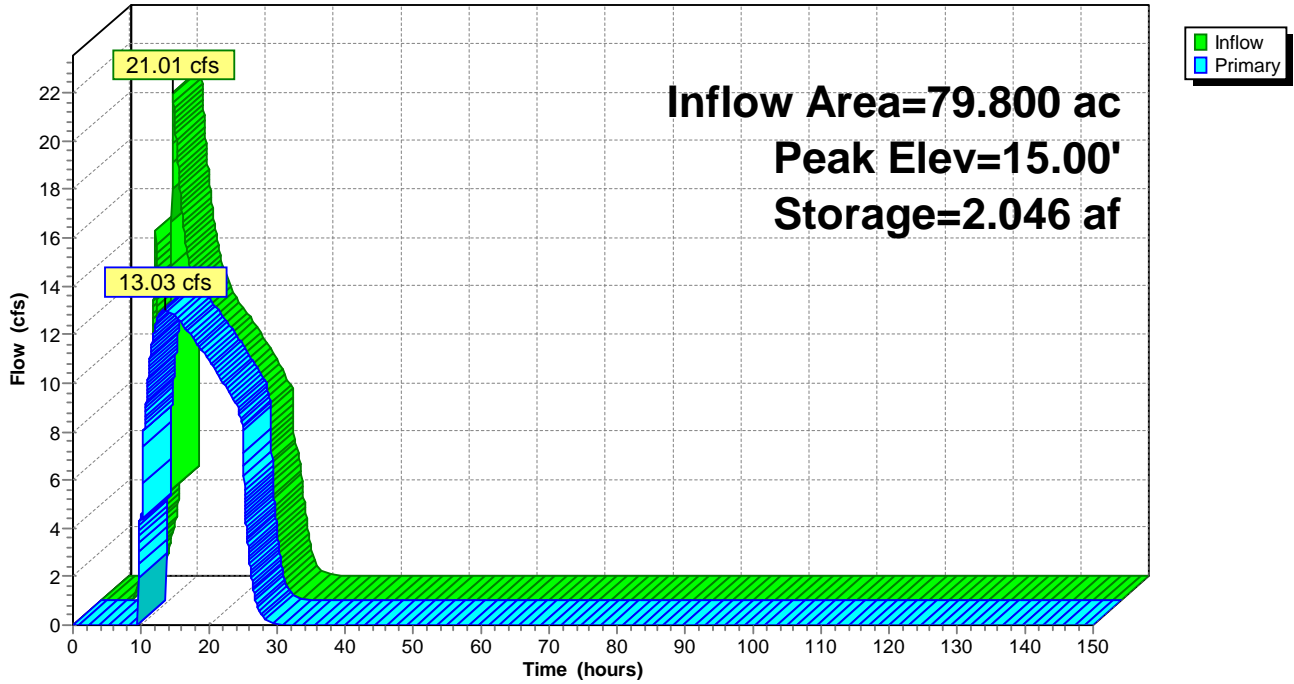
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	5.374 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	1.160	3,026.0	0.000	0.000	1.160	
15.00	2.670	3,968.0	1.863	1.863	13.196	
15.01	999.000	9,999.0	3.511	5.374	167.081	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	3,000.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=12.47 cfs @ 13.57 hrs HW=15.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 12.47 cfs @ 0.31 fps)

Pond 5P: 5P - West Pond

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 6P: 6P- West Pond

[81] Warning: Exceeded Pond 5P by 0.01' @ 27.73 hrs

Inflow Area = 101.110 ac, 0.50% Impervious, Inflow Depth = 2.30" for 100-Yr event
 Inflow = 16.68 cfs @ 12.62 hrs, Volume= 19.398 af
 Outflow = 12.53 cfs @ 21.88 hrs, Volume= 15.614 af, Atten= 25%, Lag= 555.7 min
 Primary = 12.53 cfs @ 21.88 hrs, Volume= 15.614 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 21.88 hrs Surf.Area= 74.265 ac Storage= 3.853 af

Plug-Flow detention time= 288.8 min calculated for 15.613 af (80% of inflow)
 Center-of-Mass det. time= 188.6 min (1,204.7 - 1,016.1)

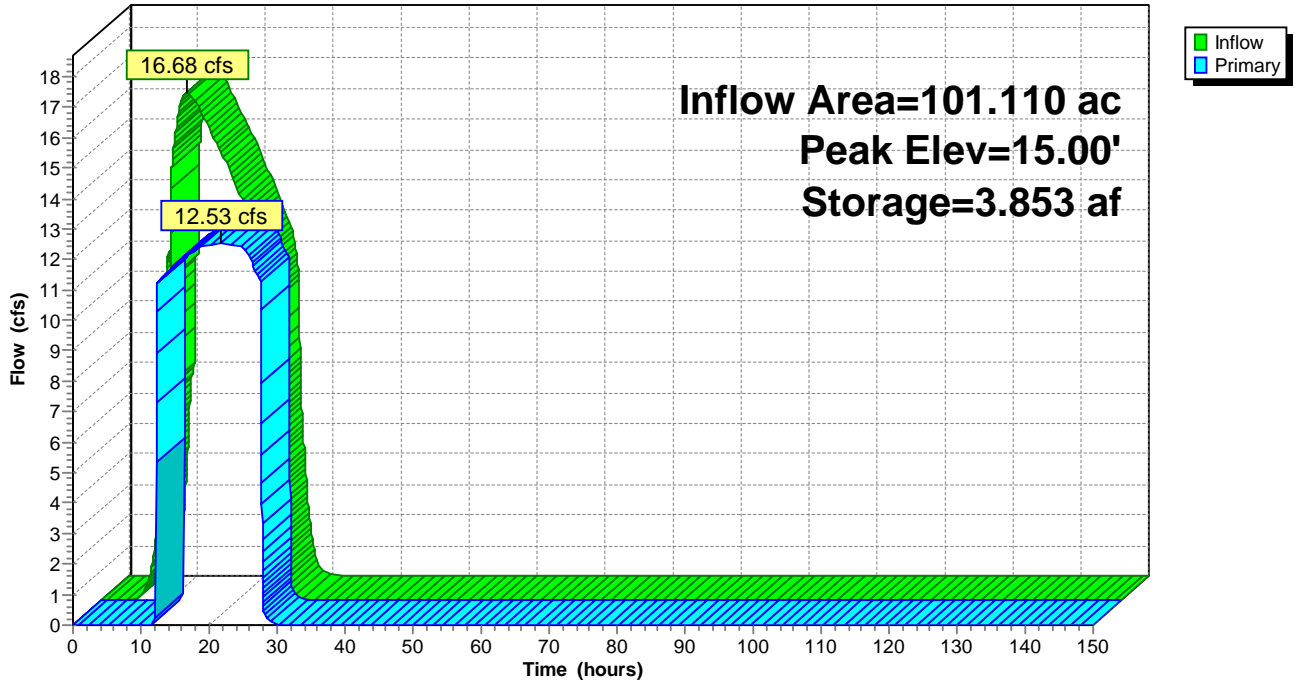
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	37.908 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.930	3,856.0	0.000	0.000	2.930	
15.00	4.810	4,175.0	3.831	3.831	7.611	
15.01	9,999.000	9,999.0	34.077	37.908	158.416	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	4,175.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=12.31 cfs @ 21.88 hrs HW=15.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 12.31 cfs @ 0.28 fps)

Pond 6P: 6P- West Pond

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 7P: 7P-Southwest

Inflow Area = 54.970 ac, 0.93% Impervious, Inflow Depth = 3.05" for 100-Yr event
 Inflow = 19.37 cfs @ 9.77 hrs, Volume= 13.955 af
 Outflow = 16.81 cfs @ 10.56 hrs, Volume= 10.612 af, Atten= 13%, Lag= 47.3 min
 Primary = 16.81 cfs @ 10.56 hrs, Volume= 10.612 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 15.00' @ 10.56 hrs Surf.Area= 5.919 ac Storage= 3.394 af

Plug-Flow detention time= 258.6 min calculated for 10.612 af (76% of inflow)
 Center-of-Mass det. time= 115.0 min (1,019.2 - 904.2)

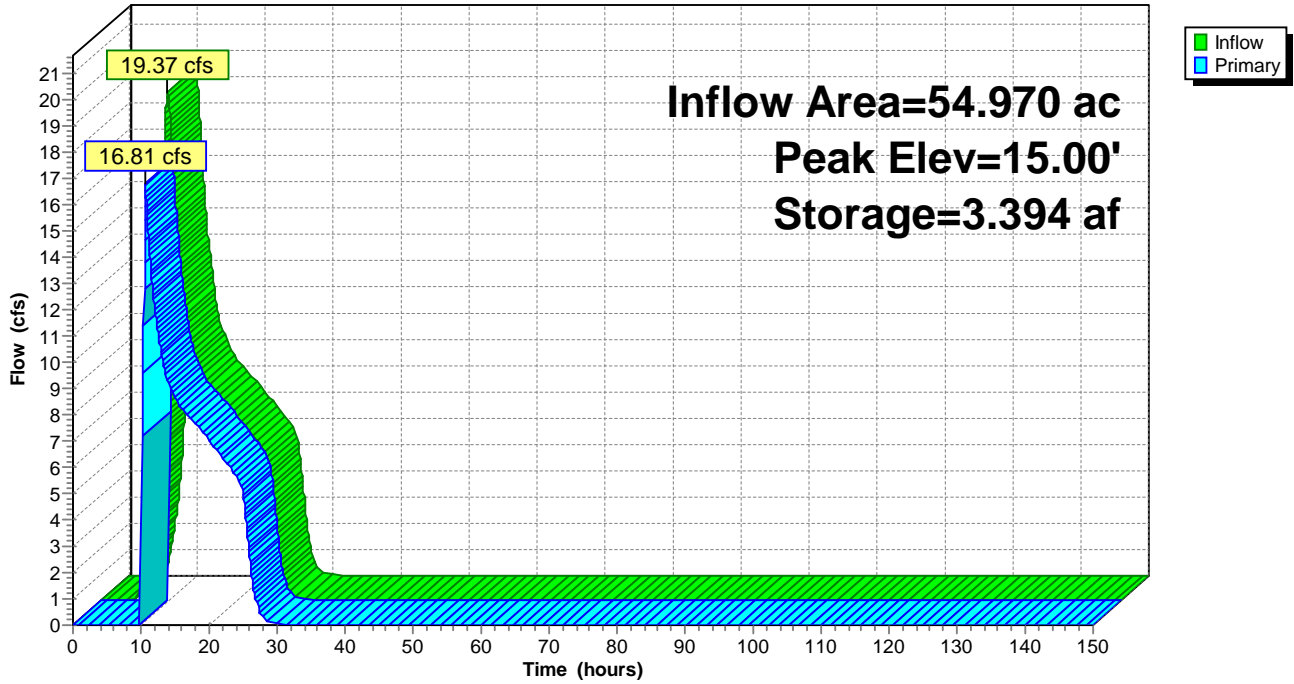
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	39.091 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.340	3,959.0	0.000	0.000	2.340	
15.00	4.560	5,430.0	3.389	3.389	27.571	
15.10	999.000	9,999.0	35.702	39.091	156.355	

Device	Routing	Invert	Outlet Devices								
#1	Primary	14.99'	5,430.0' long x 100.0' breadth Broad-Crested Rectangular Weir								
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60								
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63								

Primary OutFlow Max=16.81 cfs @ 10.56 hrs HW=15.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 16.81 cfs @ 0.28 fps)

Pond 7P: 7P-Southwest

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 8P: 8P

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 3.14" for 100-Yr event
Inflow = 7.22 cfs @ 9.06 hrs, Volume= 4.282 af
Outflow = 7.22 cfs @ 9.06 hrs, Volume= 4.282 af, Atten= 0%, Lag= 0.0 min
Primary = 7.22 cfs @ 9.06 hrs, Volume= 4.282 af

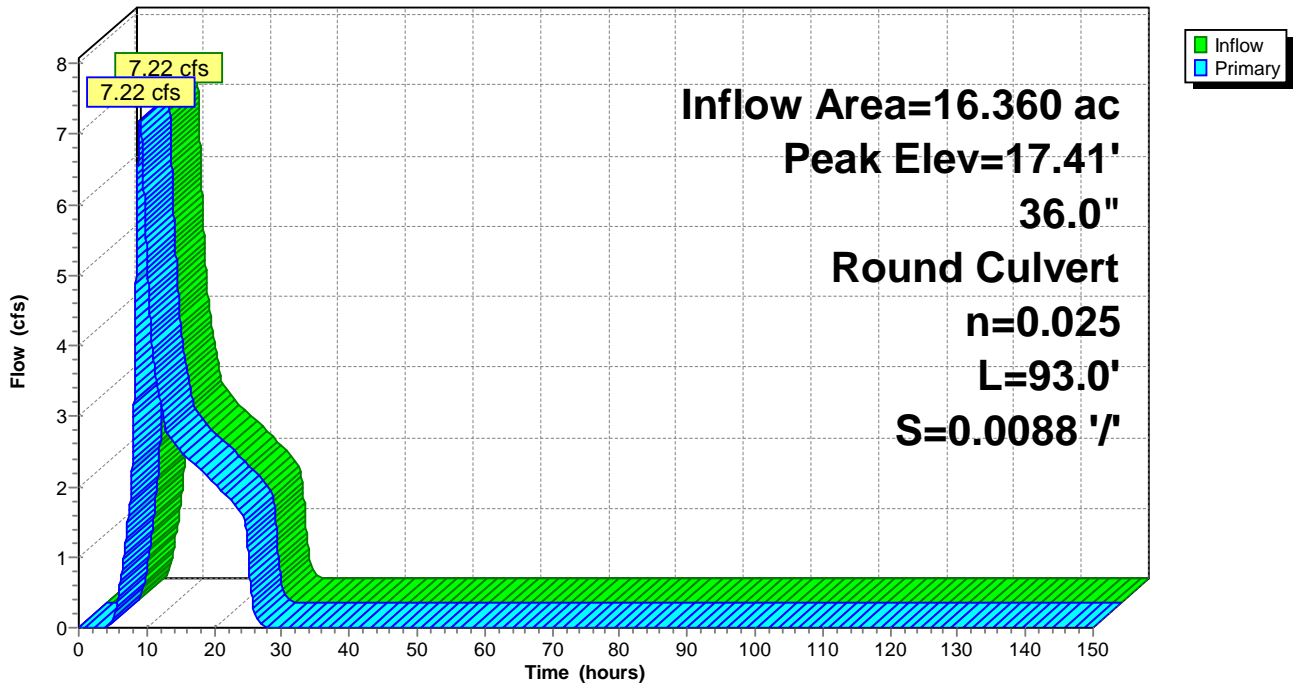
Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Peak Elev= 17.41' @ 9.06 hrs
Flood Elev= 19.00'

Device #1	Routing	Invert	Outlet Devices
	Primary	16.11'	36.0" Round Culvert L= 93.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.11' / 15.29' S= 0.0088 '/ Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=7.21 cfs @ 9.06 hrs HW=17.41' (Free Discharge)
↑ **1=Culvert** (Barrel Controls 7.21 cfs @ 3.60 fps)

Pond 8P: 8P

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 9P: 9P - North

Inflow Area = 75.300 ac, 1.53% Impervious, Inflow Depth = 1.44" for 100-Yr event
 Inflow = 12.64 cfs @ 8.16 hrs, Volume= 9.024 af
 Outflow = 8.66 cfs @ 14.52 hrs, Volume= 7.614 af, Atten= 32%, Lag= 381.6 min
 Primary = 8.66 cfs @ 14.52 hrs, Volume= 7.614 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 12.99' @ 14.52 hrs Surf.Area= 3.680 ac Storage= 1.423 af

Plug-Flow detention time= 168.5 min calculated for 7.614 af (84% of inflow)
 Center-of-Mass det. time= 90.1 min (1,053.8 - 963.7)

Volume	Invert	Avail.Storage	Storage Description
#1	12.00'	1.447 af	Custom Stage Data (Irregular) Listed below (Recalc)

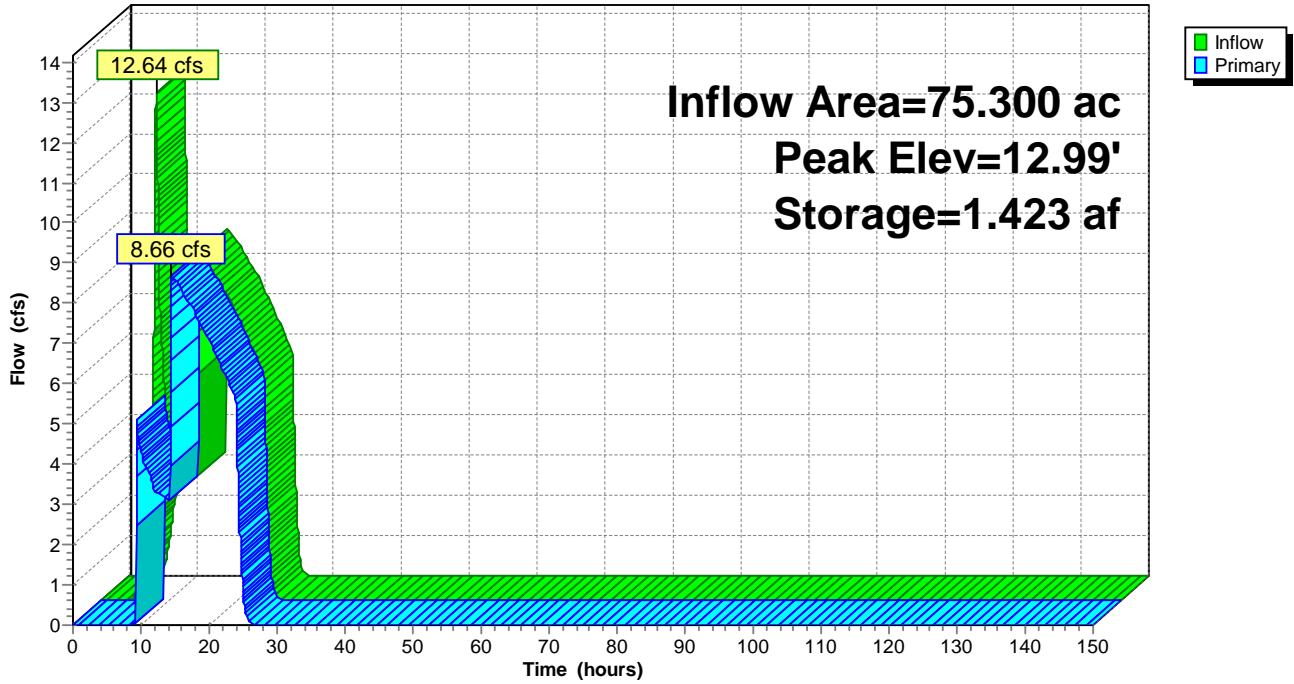
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
12.00	0.079	608.0	0.000	0.000	0.079
13.00	3.720	8,513.0	1.447	1.447	131.797

Device	Routing	Invert	Outlet Devices
#1	Primary	12.99'	8,513.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=5.22 cfs @ 14.52 hrs HW=12.99' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 5.22 cfs @ 0.17 fps)

Pond 9P: 9P - North

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 10P: 10P-Large Central/NE

[81] Warning: Exceeded Pond 9P by 0.01' @ 29.41 hrs

Inflow Area = 524.500 ac, 1.46% Impervious, Inflow Depth = 2.36" for 100-Yr event
 Inflow = 86.32 cfs @ 14.45 hrs, Volume= 103.145 af
 Outflow = 18.09 cfs @ 29.41 hrs, Volume= 5.996 af, Atten= 79%, Lag= 897.3 min
 Secondary = 18.09 cfs @ 29.41 hrs, Volume= 5.996 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 13.00' @ 29.41 hrs Surf.Area= 118.639 ac Storage= 97.914 af

Plug-Flow detention time= 1,274.3 min calculated for 5.996 af (6% of inflow)
 Center-of-Mass det. time= 734.9 min (1,885.3 - 1,150.3)

Volume	Invert	Avail.Storage	Storage Description			
#1	10.00'	98.335 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.00	0.280	2,536.0	0.000	0.000	0.280	
11.00	6.414	16,985.0	2.678	2.678	515.559	
12.00	38.875	11,909.0	20.360	23.038	783.495	
13.00	119.000	22,186.0	75.297	98.335	1,423.612	

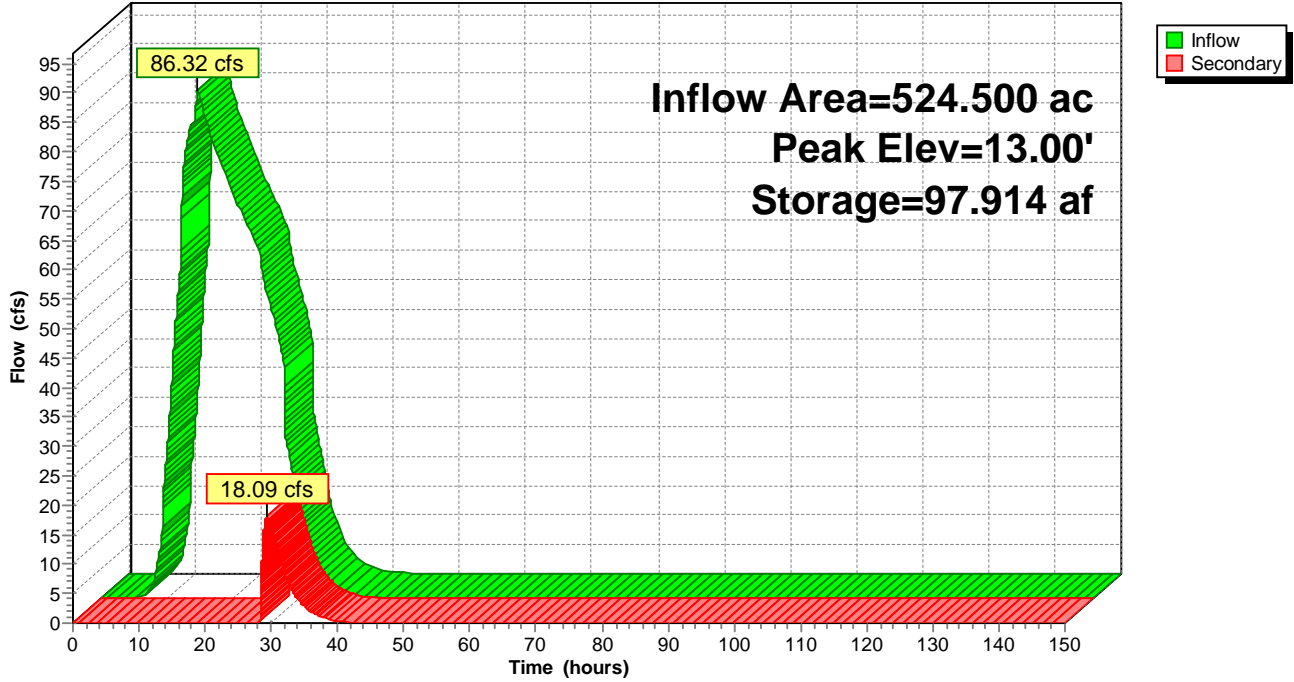
Device	Routing	Invert	Outlet Devices					
#1	Secondary	12.99'	9,999.0' long x 0.5' breadth Broad-Crested Rectangular Weir					
			Head (feet) 0.20 0.40 0.60 0.80 1.00					
			Coef. (English) 2.80 2.92 3.08 3.30 3.32					

Secondary OutFlow Max=14.54 cfs @ 29.41 hrs HW=13.00' (Free Discharge)

↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 14.54 cfs @ 0.23 fps)

Pond 10P: 10P-Large Central/NE

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 11P: 11P-SE Pond

Inflow Area = 23.330 ac, 0.00% Impervious, Inflow Depth = 0.45" for 100-Yr event
 Inflow = 0.84 cfs @ 20.71 hrs, Volume= 0.881 af
 Outflow = 0.84 cfs @ 20.72 hrs, Volume= 0.881 af, Atten= 0%, Lag= 0.6 min
 Discarded = 0.84 cfs @ 20.72 hrs, Volume= 0.881 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 13.00' @ 20.72 hrs Surf.Area= 0.234 ac Storage= 0.001 af

Plug-Flow detention time= 0.7 min calculated for 0.881 af (100% of inflow)
 Center-of-Mass det. time= 0.7 min (1,155.4 - 1,154.7)

Volume	Invert	Avail.Storage	Storage Description			
#1	13.00'	3.949 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
13.00	0.230	1,892.0	0.000	0.000	0.230	
14.00	2.940	4,273.0	1.331	1.331	27.046	
15.00	2.310	2,361.0	2.619	3.949	50.218	

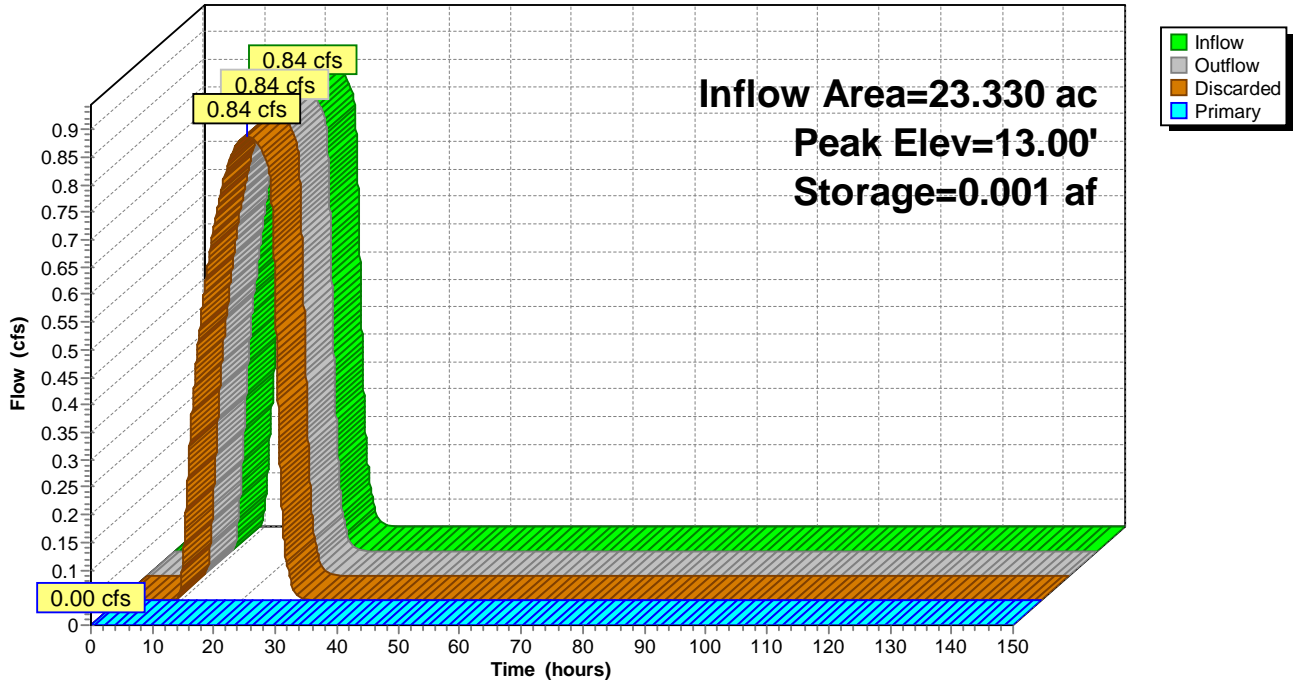
Device	Routing	Invert	Outlet Devices						
#1	Primary	14.99'	2,360.0' long x 0.5' breadth Broad-Crested Rectangular Weir						
			Head (feet) 0.20 0.40 0.60 0.80 1.00						
			Coef. (English) 2.80 2.92 3.08 3.30 3.32						
#2	Discarded	13.00'	19.980 in/hr Exfiltration over Surface area						
			Conductivity to Groundwater Elevation = 1.00'						

Discarded OutFlow Max=4.71 cfs @ 20.72 hrs HW=13.00' (Free Discharge)
 ↑**2=Exfiltration** (Controls 4.71 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=13.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 11P: 11P-SE Pond

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Time span=0.00-150.00 hrs, dt=0.01 hrs, 15001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S-NW Catchment	Runoff Area=7.320 ac 15.71% Impervious Runoff Depth=3.86" Flow Length=292' Slope=0.0200 '/' Tc=4.9 min CN=77 Runoff=7.09 cfs 2.353 af
Subcatchment 2S: 2S-NW Catchment 2	Runoff Area=4.280 ac 0.00% Impervious Runoff Depth=3.45" Flow Length=314' Tc=7.8 min CN=73 Runoff=3.57 cfs 1.230 af
Subcatchment 3S: 3S-North Catchment	Runoff Area=14.400 ac 0.00% Impervious Runoff Depth=3.45" Flow Length=148' Tc=6.7 min CN=73 Runoff=12.03 cfs 4.138 af
Subcatchment 4S: 4S - West Catchment	Runoff Area=26.590 ac 0.00% Impervious Runoff Depth=3.45" Flow Length=923' Slope=0.0030 '/' Tc=56.2 min CN=73 Runoff=15.20 cfs 7.642 af
Subcatchment 5S: 5S - West Catchment	Runoff Area=24.830 ac 0.00% Impervious Runoff Depth=3.45" Flow Length=660' Tc=11.1 min CN=73 Runoff=20.47 cfs 7.136 af
Subcatchment 6S: 6S - West Catchment	Runoff Area=21.310 ac 0.00% Impervious Runoff Depth=3.65" Flow Length=1,162' Slope=0.0017 '/' Tc=127.5 min CN=75 Runoff=9.27 cfs 6.484 af
Subcatchment 7S: 7S - Southwest	Runoff Area=54.970 ac 0.93% Impervious Runoff Depth=3.86" Flow Length=1,127' Tc=135.3 min CN=77 Runoff=25.23 cfs 17.669 af
Subcatchment 8S: 8S - South Catchment	Runoff Area=16.360 ac 4.95% Impervious Runoff Depth=3.96" Flow Length=1,480' Tc=88.6 min CN=78 Runoff=9.34 cfs 5.400 af
Subcatchment 9S: 9S - North	Runoff Area=22.710 ac 0.00% Impervious Runoff Depth=3.45" Flow Length=597' Tc=23.9 min CN=73 Runoff=16.96 cfs 6.527 af
Subcatchment 10S: 10S - Large Central / NE	Runoff Area=324.760 ac 1.84% Impervious Runoff Depth=3.75" Flow Length=2,575' Slope=0.0019 '/' Tc=393.8 min CN=76 Runoff=85.91 cfs 101.595 af
Subcatchment 11S: 11S - SE	Runoff Area=23.330 ac 0.00% Impervious Runoff Depth=0.77" Flow Length=1,924' Tc=126.8 min CN=42 Runoff=1.29 cfs 1.497 af
Reach 8R: South Ditch	Avg. Flow Depth=1.15' Max Vel=1.70 fps Inflow=9.34 cfs 5.400 af n=0.022 L=579.0' S=0.0012 '/' Capacity=2.94 cfs Outflow=9.30 cfs 5.400 af
Pond 1P: 1P- NW Pond	Peak Elev=12.66' Storage=2.353 af Inflow=7.09 cfs 2.353 af Outflow=0.00 cfs 0.000 af
Pond 2P: 2P-NW Pond 2	Peak Elev=12.20' Storage=1.230 af Inflow=3.57 cfs 1.230 af Outflow=0.00 cfs 0.000 af
Pond 3P: 3P-North Pond	Peak Elev=15.00' Storage=2.718 af Inflow=12.03 cfs 9.286 af Outflow=8.26 cfs 6.583 af
Pond 4P: 4P - West Pond	Peak Elev=13.99' Storage=2.507 af Inflow=15.20 cfs 7.642 af Outflow=7.14 cfs 5.147 af

Existing_Conditions_mlc

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Pond 5P: 5P - West Pond Peak Elev=15.01' Storage=2.801 af Inflow=30.21 cfs 21.462 af
Outflow=17.22 cfs 19.625 af

Pond 6P: 6P- West Pond Peak Elev=15.00' Storage=4.021 af Inflow=22.21 cfs 26.110 af
Outflow=14.44 cfs 22.326 af

Pond 7P: 7P-Southwest Peak Elev=15.00' Storage=3.416 af Inflow=25.23 cfs 17.669 af
Outflow=24.43 cfs 14.326 af

Pond 8P: 8P Peak Elev=17.61' Inflow=9.34 cfs 5.400 af
36.0" Round Culvert n=0.025 L=93.0' S=0.0088 '/ Outflow=9.34 cfs 5.400 af

Pond 9P: 9P - North Peak Elev=13.00' Storage=1.430 af Inflow=16.96 cfs 13.110 af
Outflow=12.59 cfs 11.700 af

Pond 10P: 10P-Large Central/NE Peak Elev=13.01' Storage=98.335 af Inflow=109.56 cfs 135.621 af
Outflow=90.81 cfs 46.756 af

Pond 11P: 11P-SE Pond Peak Elev=13.01' Storage=0.001 af Inflow=1.29 cfs 1.497 af
Discarded=1.29 cfs 1.497 af Primary=0.00 cfs 0.000 af Outflow=1.29 cfs 1.497 af

Total Runoff Area = 540.860 ac Runoff Volume = 161.671 af Average Runoff Depth = 3.59"
98.44% Pervious = 532.400 ac 1.56% Impervious = 8.460 ac

Existing Conditions_mlc

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Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 1S: 1S-NW Catchment

Runoff = 7.09 cfs @ 7.93 hrs, Volume= 2.353 af, Depth= 3.86"

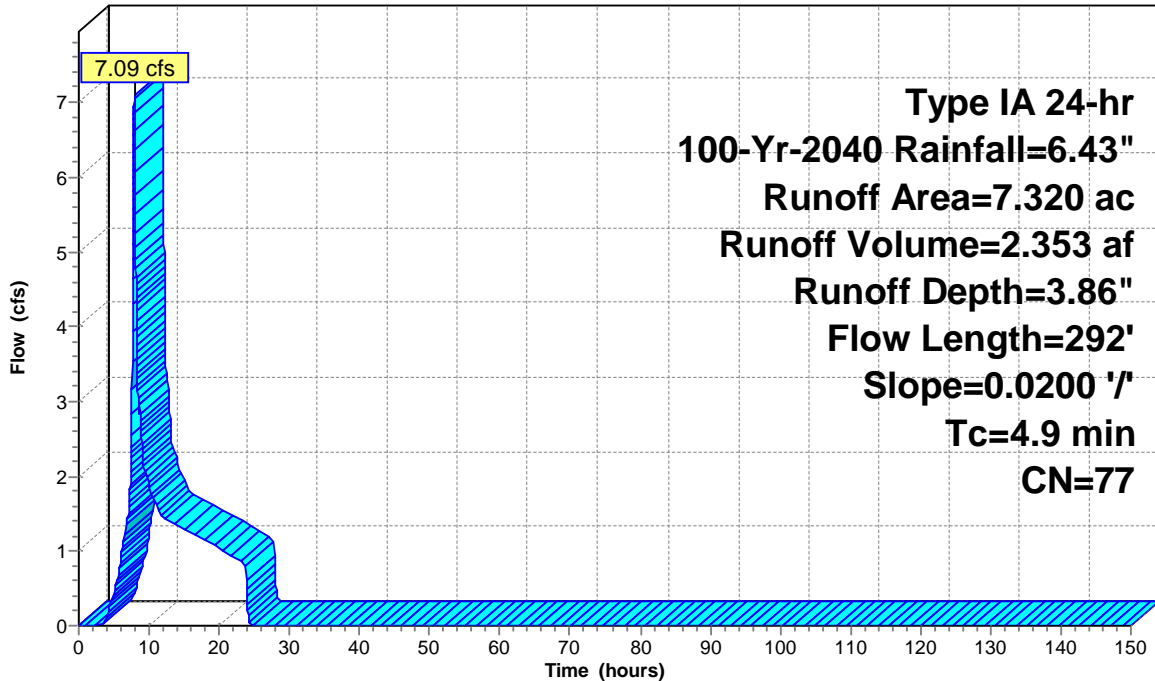
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
6.170	73	Brush, Good, HSG D
1.150	98	Paved parking, HSG D
7.320	77	Weighted Average
6.170	73	84.29% Pervious Area
1.150	98	15.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	292	0.0200	0.99		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps

Subcatchment 1S: 1S-NW Catchment

Hydrograph



Runoff

Existing Conditions_mlc

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Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 2S: 2S-NW Catchment 2

Sheet flow - dense comes from "native grasses" considered dense. Characterized by the wetland report.

Runoff = 3.57 cfs @ 8.00 hrs, Volume= 1.230 af, Depth= 3.45"

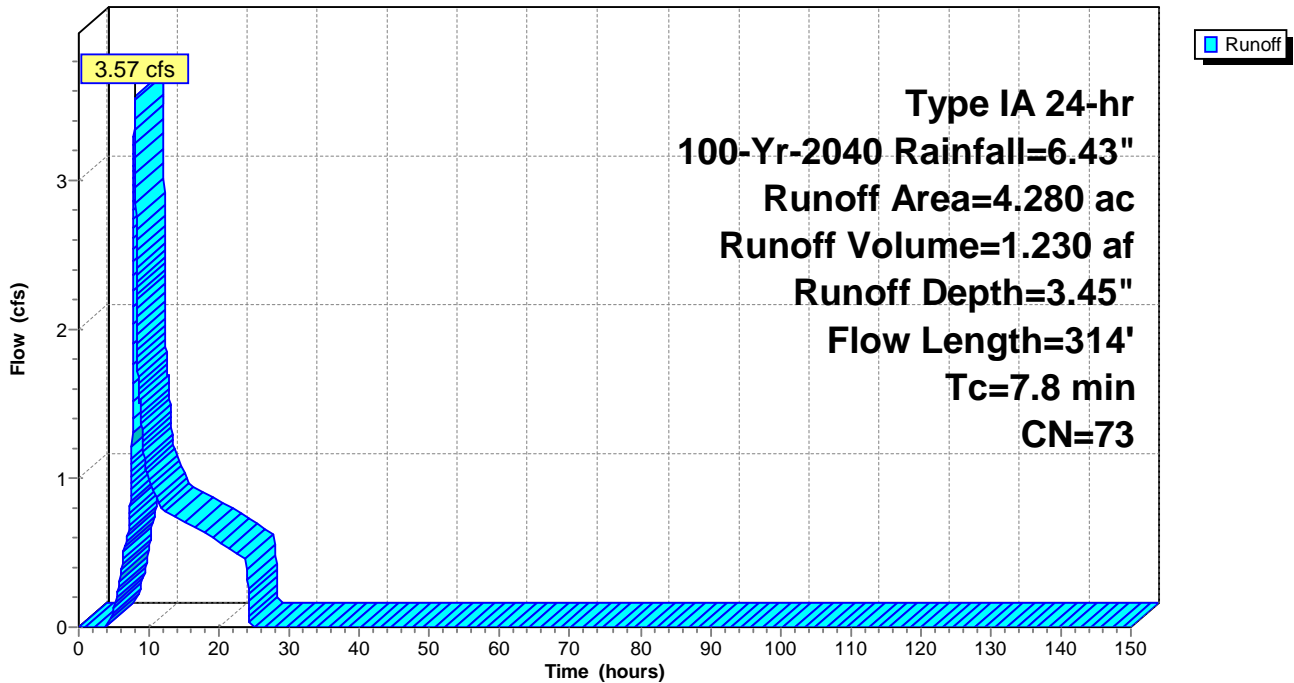
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
4.280	73	Brush, Good, HSG D
4.280	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	76	0.1300	0.24		Sheet Flow, Sheet - Dense, Native Grasses Grass: Dense n= 0.240 P2= 3.43"
2.6	238	0.0460	1.50		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
7.8	314	Total			

Subcatchment 2S: 2S-NW Catchment 2

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 3S: 3S-North Catchment

Runoff = 12.03 cfs @ 7.97 hrs, Volume= 4.138 af, Depth= 3.45"

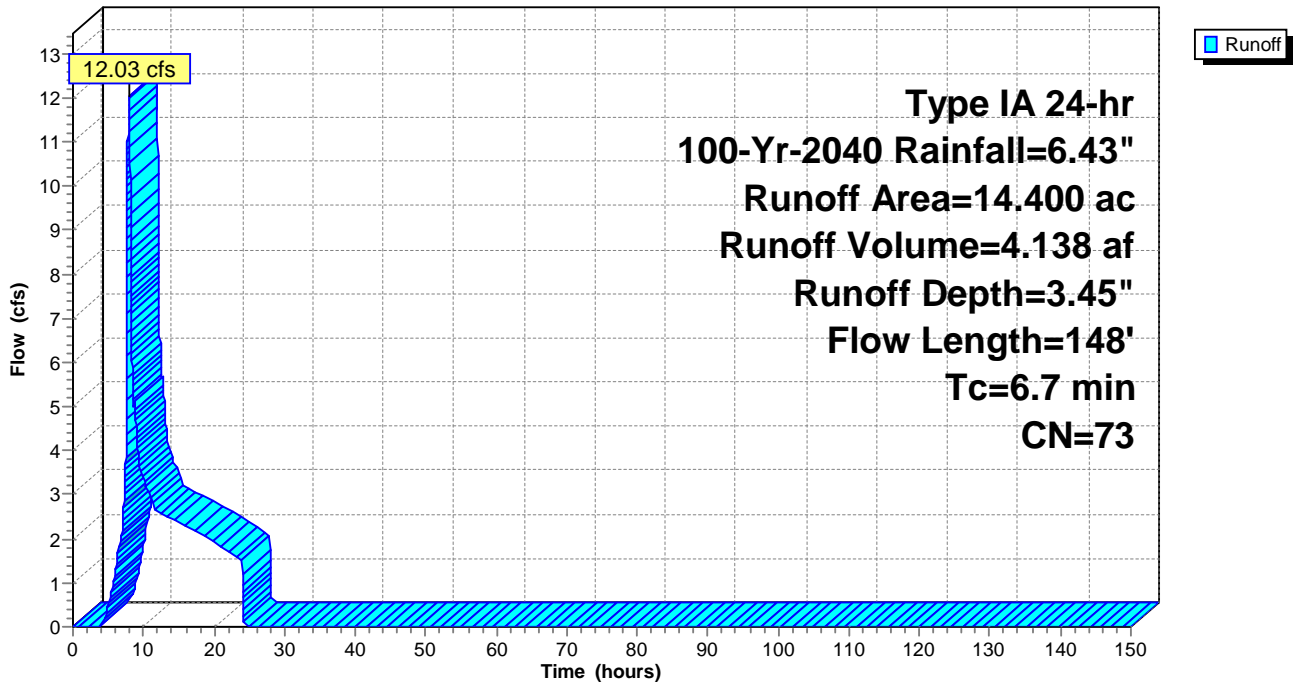
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
14.400	73	Brush, Good, HSG D
14.400	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	95	0.0950	0.33		Sheet Flow, Sheet flow - dune Grass: Short n= 0.150 P2= 3.43"
1.8	53	0.0050	0.49		Shallow Concentrated Flow, Shallow - dune grass Short Grass Pasture Kv= 7.0 fps
6.7	148	Total			

Subcatchment 3S: 3S-North Catchment

Hydrograph



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Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 4S: 4S - West Catchment

Runoff = 15.20 cfs @ 8.56 hrs, Volume= 7.642 af, Depth= 3.45"

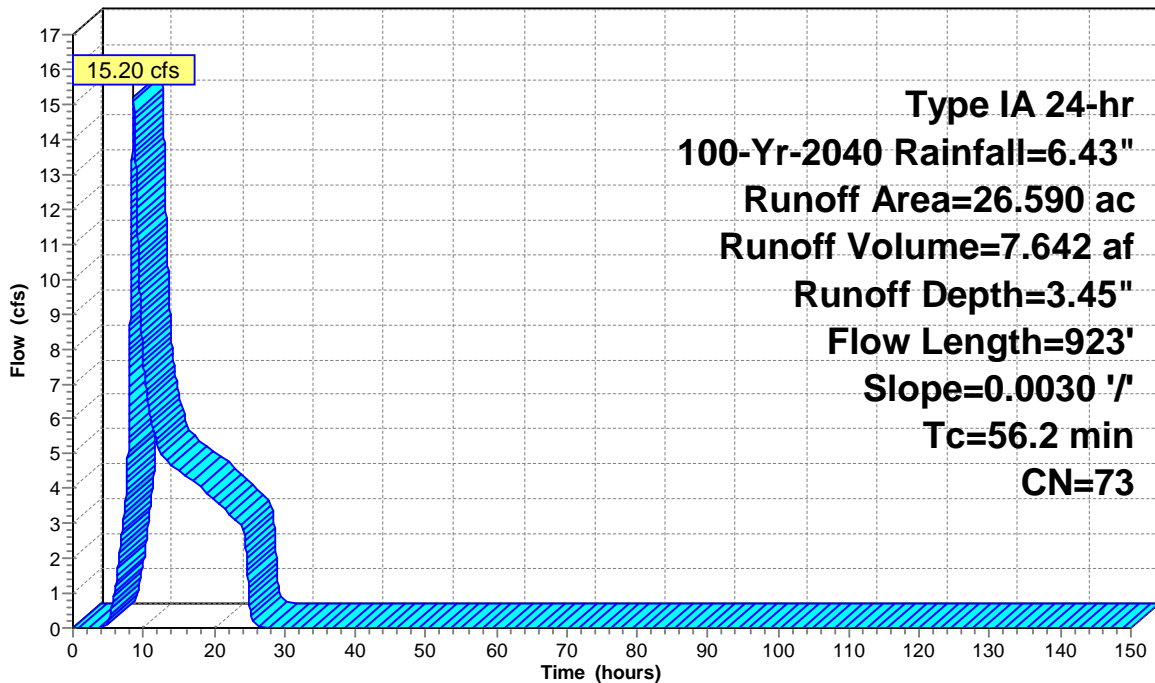
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
26.590	73	Brush, Good, HSG D
26.590	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.2	923	0.0030	0.27		Shallow Concentrated Flow, Shallow - Forest Woodland Kv= 5.0 fps

Subcatchment 4S: 4S - West Catchment

Hydrograph



**Type IA 24-hr
100-Yr-2040 Rainfall=6.43"
Runoff Area=26.590 ac
Runoff Volume=7.642 af
Runoff Depth=3.45"
Flow Length=923'
Slope=0.0030 '/
Tc=56.2 min
CN=73**

Existing Conditions_mlc

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Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 5S: 5S - West Catchment

Runoff = 20.47 cfs @ 8.03 hrs, Volume= 7.136 af, Depth= 3.45"

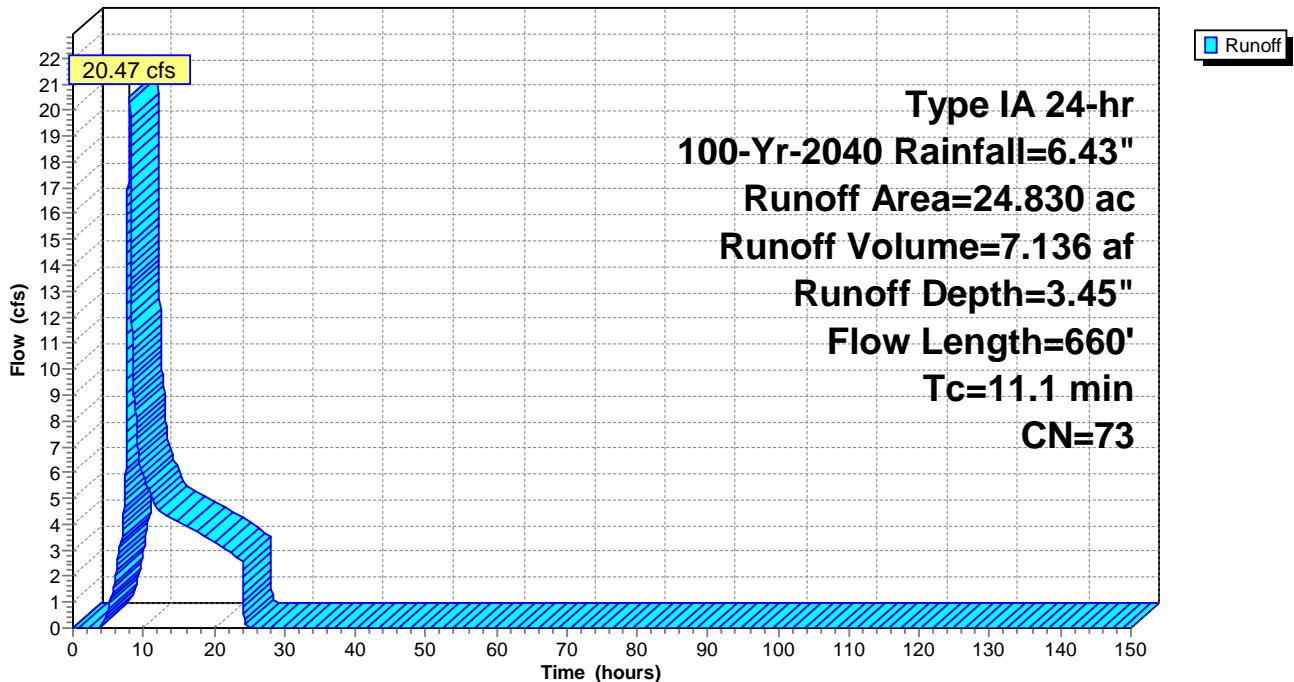
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
23.460	73	Brush, Good, HSG D
1.370	79	Woods/grass comb., Good, HSG D
24.830	73	Weighted Average
24.830	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	608	0.0180	0.94		Shallow Concentrated Flow, Shallow - Forest
					Short Grass Pasture Kv= 7.0 fps
0.3	52	0.1300	2.64		Sheet Flow, Path
					Smooth surfaces n= 0.011 P2= 3.43"
11.1	660	Total			

Subcatchment 5S: 5S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 6S: 6S - West Catchment

Runoff = 9.27 cfs @ 9.64 hrs, Volume= 6.484 af, Depth= 3.65"

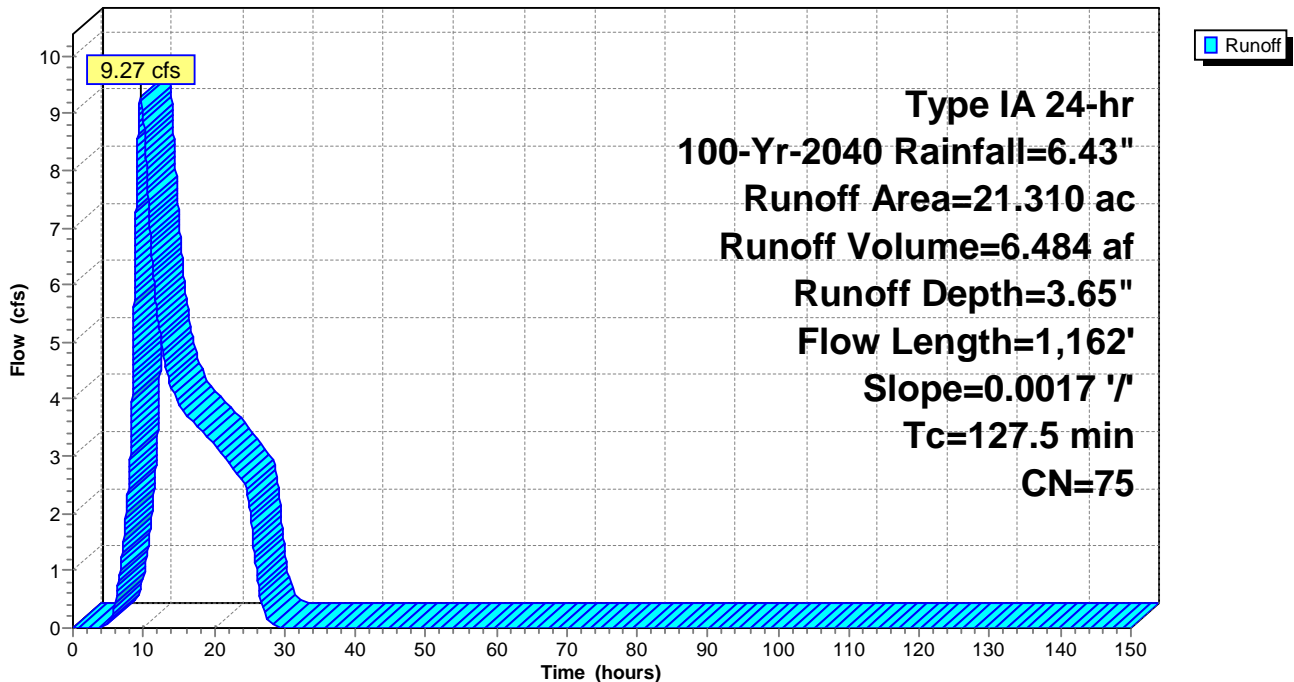
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
8.730	79	Woods/grass comb., Good, HSG D
12.580	73	Brush, Good, HSG D
21.310	75	Weighted Average
21.310	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.6	581	0.0017	0.29		Shallow Concentrated Flow, Grass - Shallow Short Grass Pasture Kv= 7.0 fps
93.9	581	0.0017	0.10		Shallow Concentrated Flow, Forested - Shallow Forest w/Heavy Litter Kv= 2.5 fps
127.5	1,162	Total			

Subcatchment 6S: 6S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 7S: 7S - Southwest

Runoff = 25.23 cfs @ 9.77 hrs, Volume= 17.669 af, Depth= 3.86"

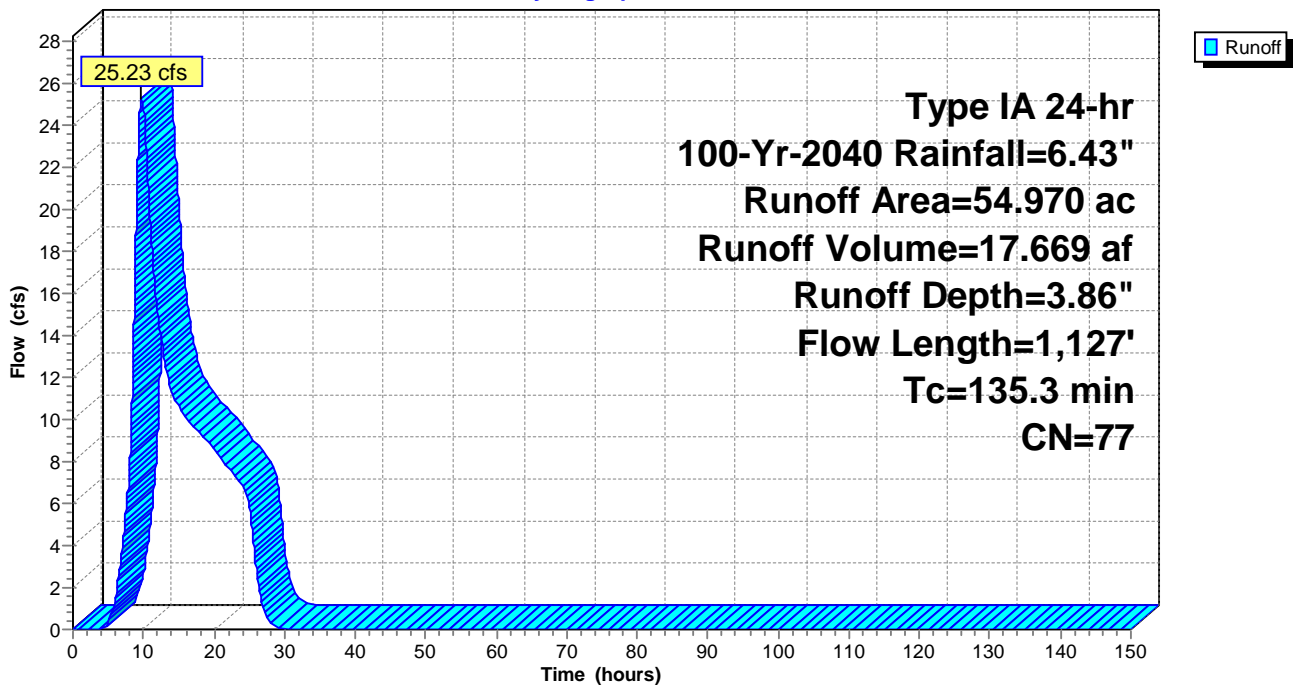
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
21.790	73	Brush, Good, HSG D
32.670	79	Woods/grass comb., Good, HSG D
0.510	98	Paved parking, HSG D
54.970	77	Weighted Average
54.460	77	99.07% Pervious Area
0.510	98	0.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	70	0.1000	0.21		Sheet Flow, Sheet - Paved to Grass Grass: Dense n= 0.240 P2= 3.43"
2.4	202	0.0390	1.38		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
127.5	855	0.0020	0.11		Shallow Concentrated Flow, Shallow - Forest Forest w/Heavy Litter Kv= 2.5 fps
135.3	1,127	Total			

Subcatchment 7S: 7S - Southwest

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 8S: 8S - South Catchment

Runoff = 9.34 cfs @ 9.06 hrs, Volume= 5.400 af, Depth= 3.96"

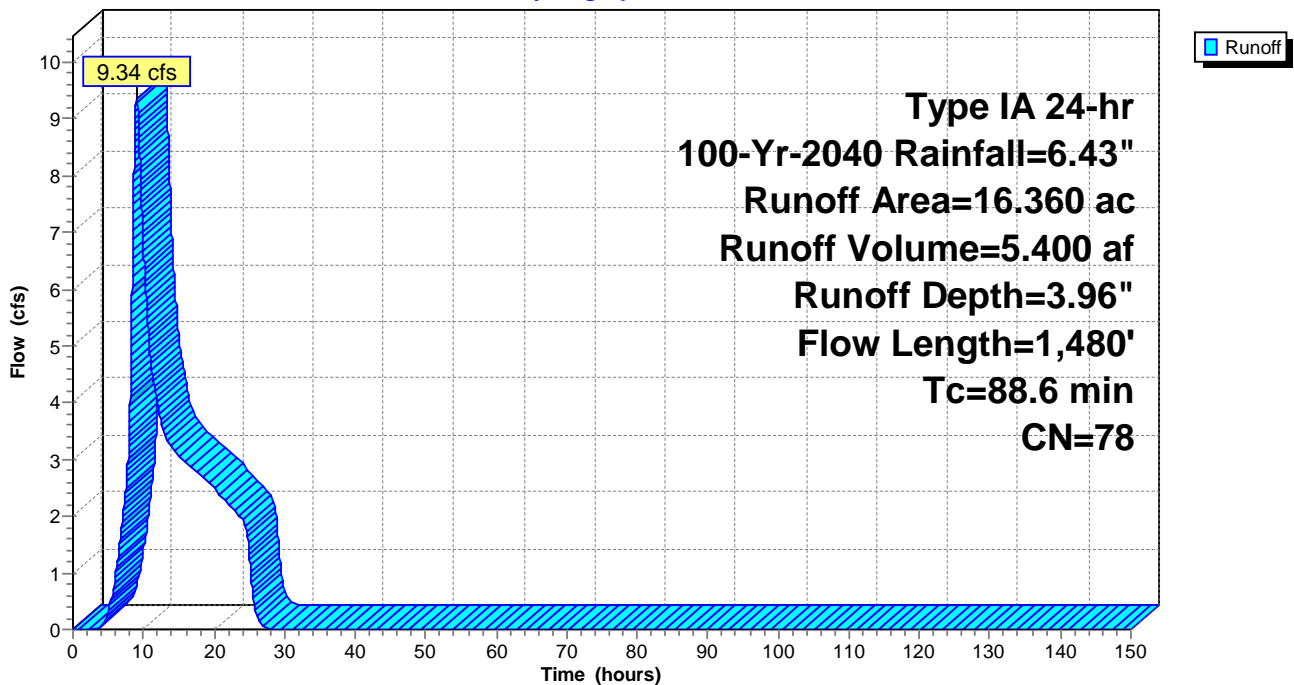
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
15.000	79	Woods/grass comb., Good, HSG D
0.550	30	Brush, Good, HSG A
0.810	98	Paved parking, HSG D
16.360	78	Weighted Average
15.550	77	95.05% Pervious Area
0.810	98	4.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	89	0.0560	0.26		Sheet Flow, Sheet- Dune grass Grass: Short n= 0.150 P2= 3.43"
67.3	844	0.0070	0.21		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps
15.6	547	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
88.6	1,480	Total			

Subcatchment 8S: 8S - South Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 9S: 9S - North

Runoff = 16.96 cfs @ 8.16 hrs, Volume= 6.527 af, Depth= 3.45"

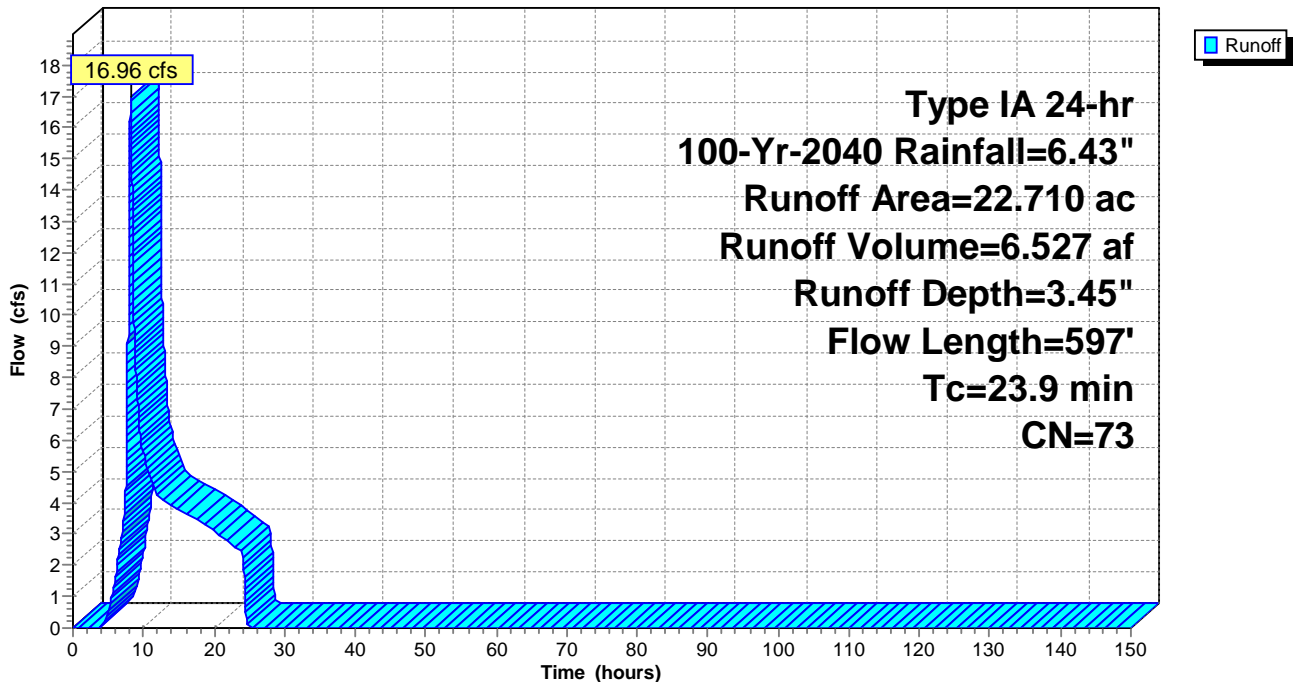
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
21.780	73	Brush, Good, HSG D
0.930	79	Woods/grass comb., Good, HSG D
22.710	73	Weighted Average
22.710	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	67	0.0450	0.15		Sheet Flow, Sheet - Grass Grass: Dense n= 0.240 P2= 3.43"
16.7	530	0.0057	0.53		Shallow Concentrated Flow, Shallow - Woods Short Grass Pasture Kv= 7.0 fps
23.9	597	Total			

Subcatchment 9S: 9S - North

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 10S: 10S - Large Central / NE

Runoff = 85.91 cfs @ 14.00 hrs, Volume= 101.595 af, Depth= 3.75"

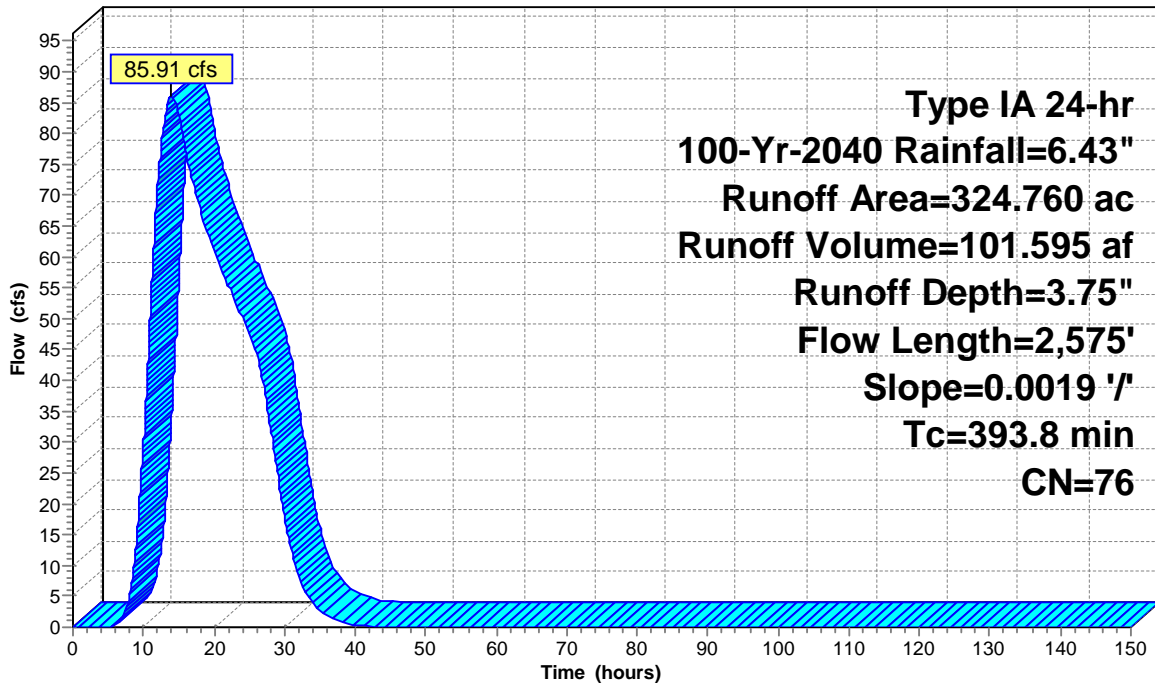
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
223.040	79	Woods/grass comb., Good, HSG D
12.880	32	Woods/grass comb., Good, HSG A
0.660	98	Paved parking, HSG A
5.330	98	Paved parking, HSG D
82.850	73	Brush, Good, HSG D
324.760	76	Weighted Average
318.770	76	98.16% Pervious Area
5.990	98	1.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
393.8	2,575	0.0019	0.11		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps

Subcatchment 10S: 10S - Large Central / NE

Hydrograph



Runoff

**Type IA 24-hr
100-Yr-2040 Rainfall=6.43"
Runoff Area=324.760 ac
Runoff Volume=101.595 af
Runoff Depth=3.75"
Flow Length=2,575'
Slope=0.0019 '/
Tc=393.8 min
CN=76**

Existing_Conditions_mlc

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Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 11S: 11S - SE

Runoff = 1.29 cfs @ 19.58 hrs, Volume= 1.497 af, Depth= 0.77"

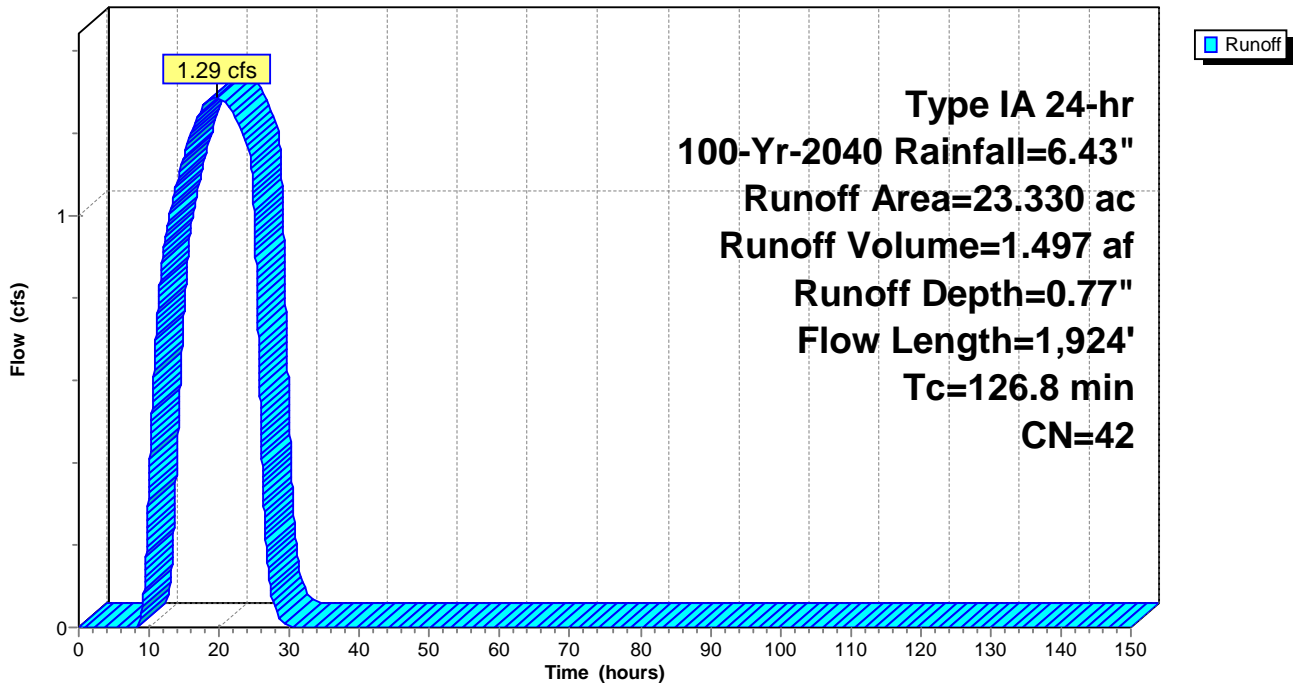
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
18.140	32	Woods/grass comb., Good, HSG A
1.980	79	Woods/grass comb., Good, HSG D
3.210	73	Brush, Good, HSG D
23.330	42	Weighted Average
23.330	42	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	126	0.1800	0.30		Sheet Flow, Sheet-Dune Grass Grass: Dense n= 0.240 P2= 3.43"
119.9	1,798	0.0100	0.25		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps
126.8	1,924	Total			

Subcatchment 11S: 11S - SE

Hydrograph



Summary for Reach 8R: South Ditch

[91] Warning: Storage range exceeded by 0.65'

[55] Hint: Peak inflow is 317% of Manning's capacity

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 1.04'

Inflow Area =	16.360 ac,	4.95% Impervious,	Inflow Depth =	3.96"	for 100-Yr-2040 event
Inflow =	9.34 cfs @	9.06 hrs,	Volume=	5.400 af	
Outflow =	9.30 cfs @	9.24 hrs,	Volume=	5.400 af,	Atten= 1%, Lag= 11.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs

Max. Velocity= 1.70 fps, Min. Travel Time= 5.7 min

Avg. Velocity = 0.73 fps, Avg. Travel Time= 13.3 min

Peak Storage= 3,170 cf @ 9.14 hrs

Average Depth at Peak Storage= 1.15', Surface Width= 6.29'

Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 2.94 cfs

4.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 1.0 '/' Top Width= 5.00'

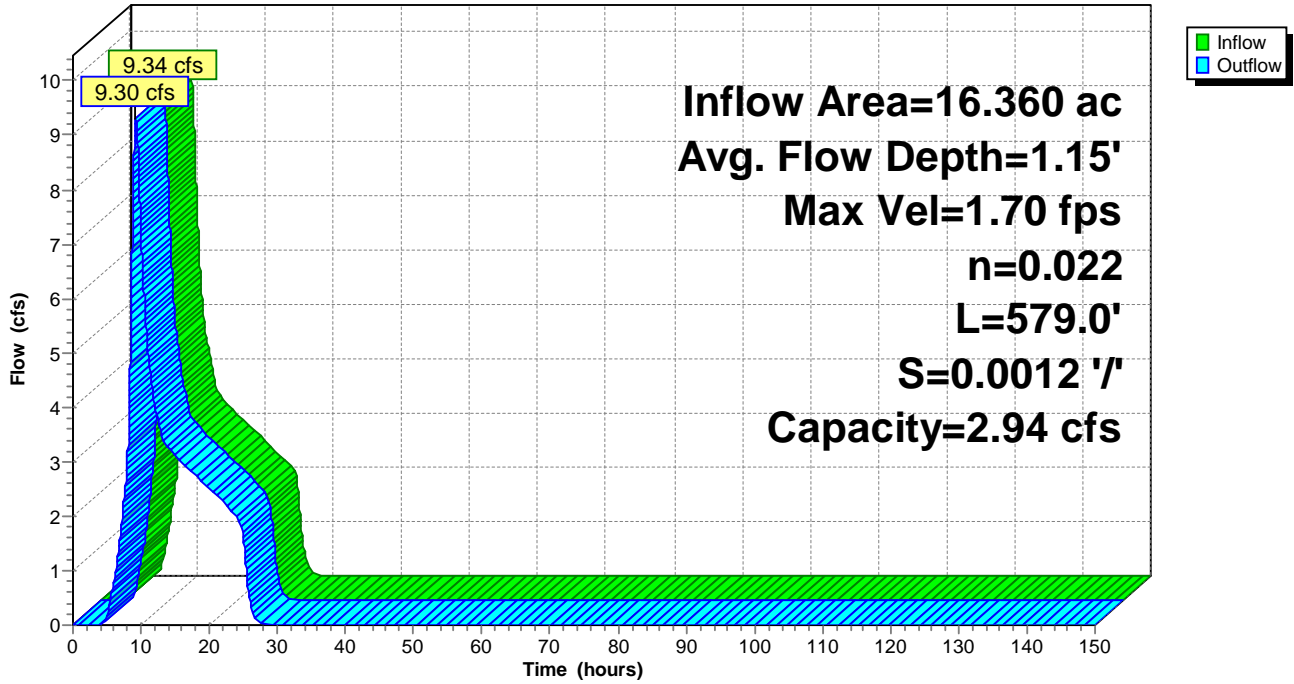
Length= 579.0' Slope= 0.0012 '/'

Inlet Invert= 16.00', Outlet Invert= 15.30'



Reach 8R: South Ditch

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Pond 1P: 1P- NW Pond

Inflow Area = 7.320 ac, 15.71% Impervious, Inflow Depth = 3.86" for 100-Yr-2040 event
 Inflow = 7.09 cfs @ 7.93 hrs, Volume= 2.353 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.66' @ 24.29 hrs Surf.Area= 1.519 ac Storage= 2.353 af

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

Volume	Invert	Avail.Storage	Storage Description
#1	11.00'	6.173 af	Custom Stage Data (Irregular) Listed below (Recalc)

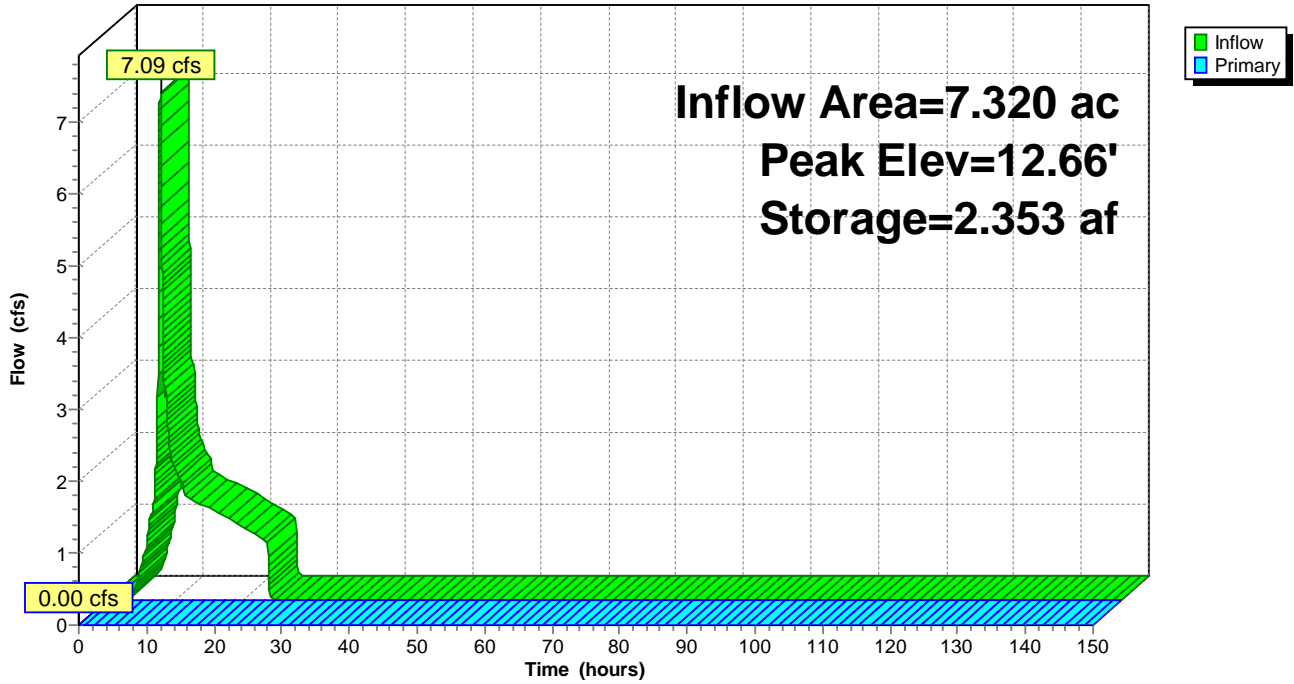
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
11.00	1.290	1,552.0	0.000	0.000	1.290
12.00	1.460	1,164.0	1.374	1.374	3.215
13.00	1.550	1,193.0	1.505	2.879	3.343
14.00	1.640	1,231.0	1.595	4.474	3.514
15.00	1.760	1,333.0	1.700	6.173	3.992

Device	Routing	Invert	Outlet Devices
#1	Primary	14.99'	1,333.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: 1P- NW Pond

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Pond 2P: 2P-NW Pond 2

Inflow Area = 11.600 ac, 9.91% Impervious, Inflow Depth = 1.27" for 100-Yr-2040 event
 Inflow = 3.57 cfs @ 8.00 hrs, Volume= 1.230 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.20' @ 24.45 hrs Surf.Area= 1.102 ac Storage= 1.230 af

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

Volume	Invert	Avail.Storage	Storage Description			
#1	11.00'	3.348 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
11.00	0.930	1,430.0	0.000	0.000	0.930	
12.00	1.085	1,183.0	1.007	1.007	2.109	
13.00	1.170	1,220.0	1.127	2.134	2.274	
14.00	1.260	1,273.0	1.215	3.348	2.517	

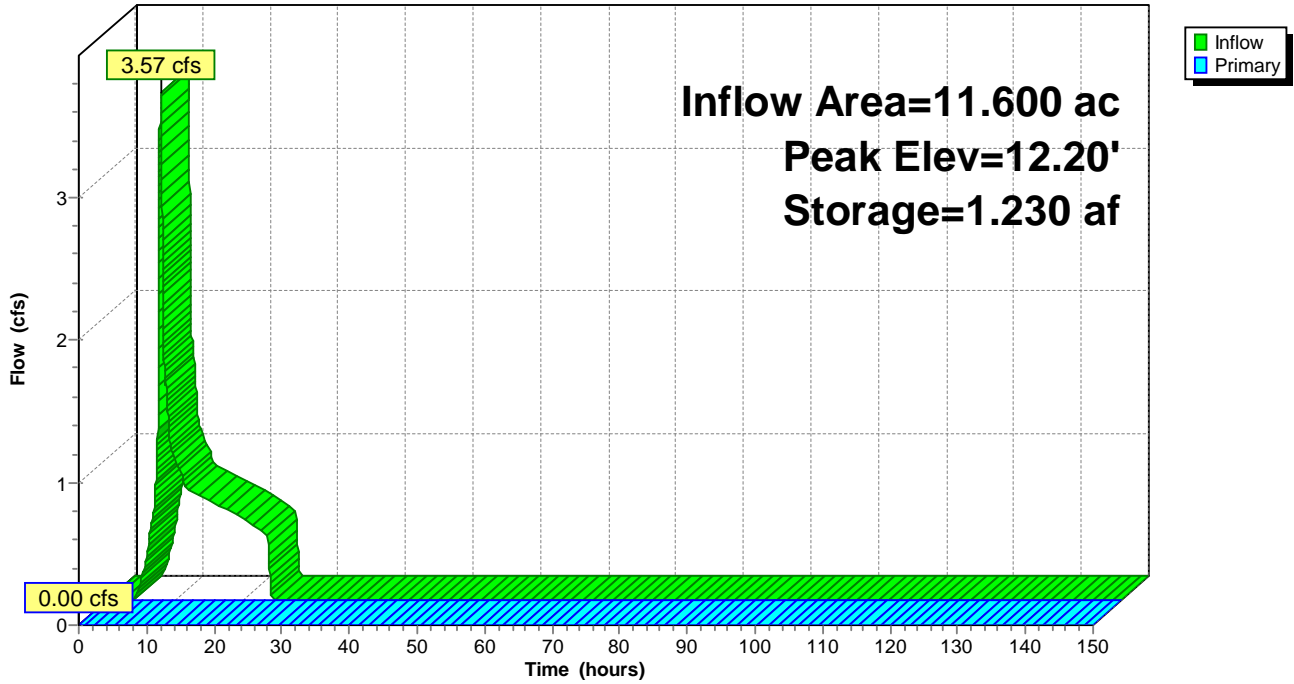
Device	Routing	Invert	Outlet Devices											
#1	Primary	13.99'	1,300.0' long x 4.0' breadth Broad-Crested Rectangular Weir											
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00											
			2.50 3.00 3.50 4.00 4.50 5.00 5.50											
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68											
			2.72 2.73 2.76 2.79 2.88 3.07 3.32											

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)

↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: 2P-NW Pond 2

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Pond 3P: 3P-North Pond

[81] Warning: Exceeded Pond 2P by 3.40' @ 11.60 hrs

[81] Warning: Exceeded Pond 4P by 1.01' @ 11.65 hrs

Inflow Area = 52.590 ac, 2.19% Impervious, Inflow Depth = 2.12" for 100-Yr-2040 event
 Inflow = 12.03 cfs @ 7.97 hrs, Volume= 9.286 af
 Outflow = 8.26 cfs @ 11.65 hrs, Volume= 6.583 af, Atten= 31%, Lag= 221.0 min
 Primary = 8.26 cfs @ 11.65 hrs, Volume= 6.583 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 15.00' @ 11.65 hrs Surf.Area= 1.600 ac Storage= 2.718 af

Plug-Flow detention time= 299.3 min calculated for 6.583 af (71% of inflow)
 Center-of-Mass det. time= 145.5 min (1,048.9 - 903.4)

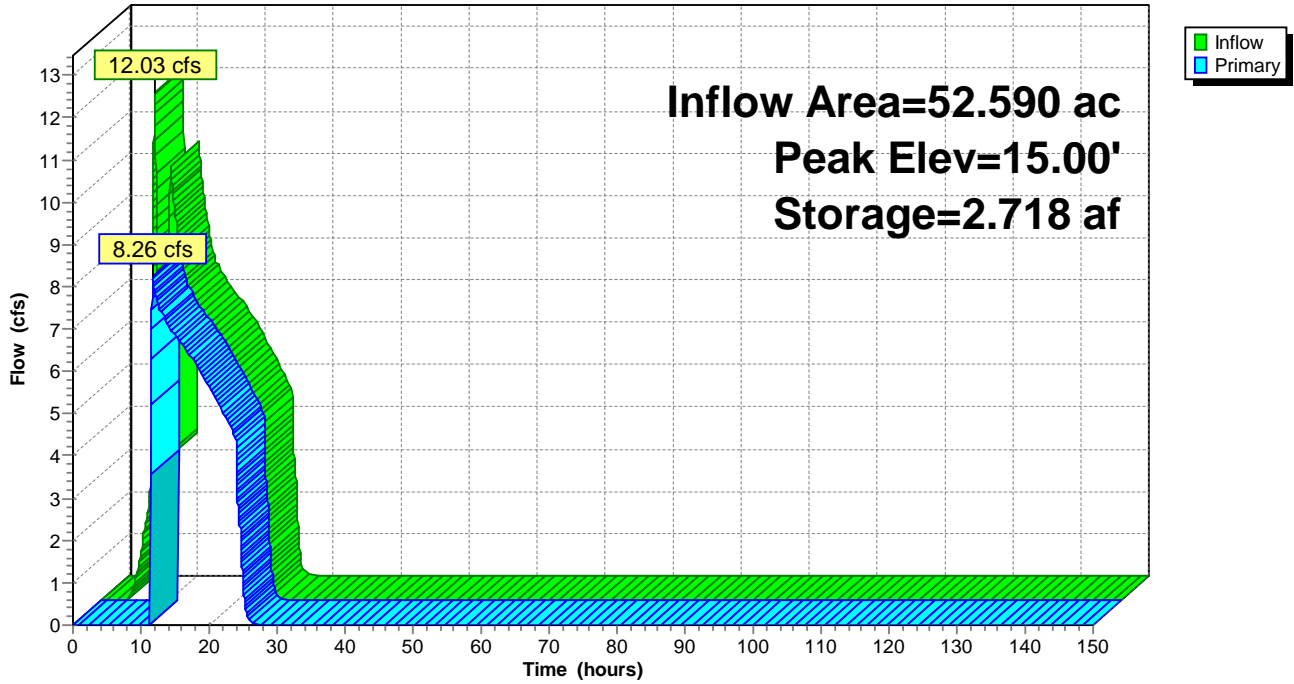
Volume	Invert	Avail.Storage	Storage Description			
#1	12.00'	2.718 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
12.00	0.086	1,508.0	0.000	0.000	0.086	
13.00	0.450	1,395.0	0.244	0.244	0.686	
14.00	1.500	4,156.0	0.924	1.168	28.685	
15.00	1.600	2,946.0	1.550	2.718	44.384	

Device	Routing	Invert	Outlet Devices												
#1	Primary	14.99'	3,000.0' long x 1.0' breadth Broad-Crested Rectangular Weir												
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00												
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32												

Primary OutFlow Max=8.17 cfs @ 11.65 hrs HW=15.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 8.17 cfs @ 0.27 fps)

Pond 3P: 3P-North Pond

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Pond 4P: 4P - West Pond

Inflow Area = 26.590 ac, 0.00% Impervious, Inflow Depth = 3.45" for 100-Yr-2040 event
 Inflow = 15.20 cfs @ 8.56 hrs, Volume= 7.642 af
 Outflow = 7.14 cfs @ 10.21 hrs, Volume= 5.147 af, Atten= 53%, Lag= 98.6 min
 Primary = 7.14 cfs @ 10.21 hrs, Volume= 5.147 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 13.99' @ 10.21 hrs Surf.Area= 3.781 ac Storage= 2.507 af

Plug-Flow detention time= 344.3 min calculated for 5.147 af (67% of inflow)
 Center-of-Mass det. time= 158.1 min (994.3 - 836.2)

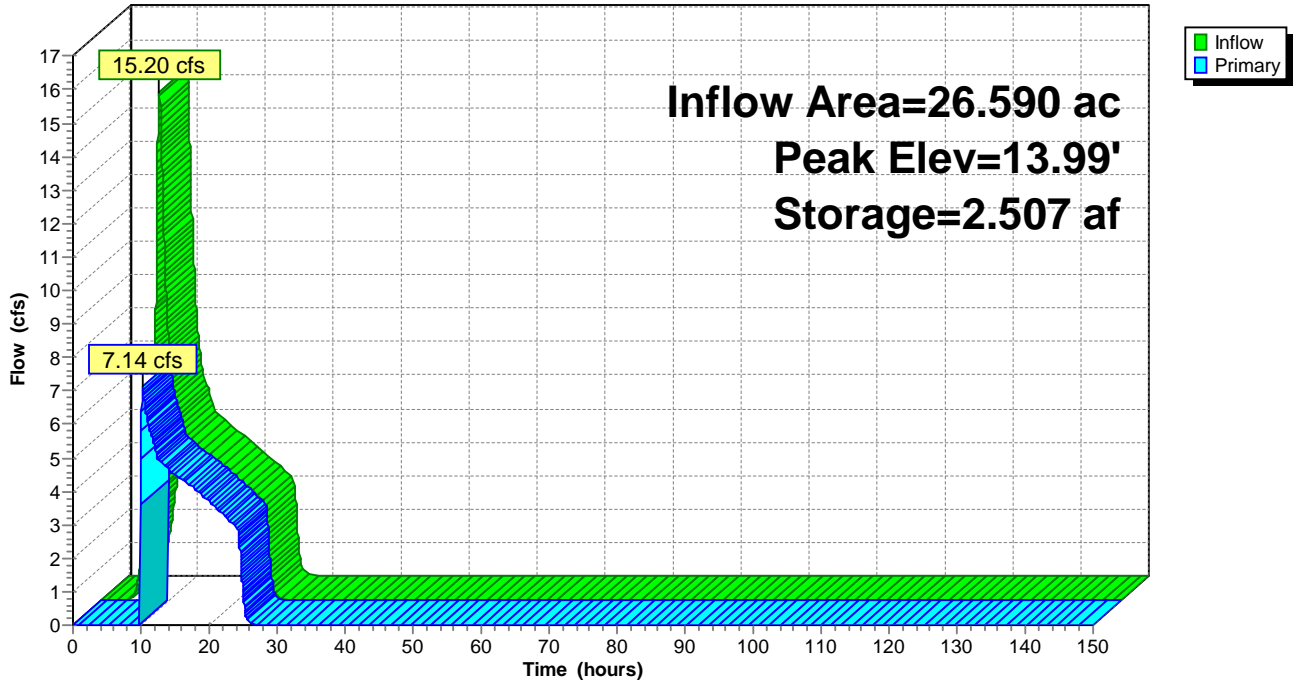
Volume	Invert	Avail.Storage	Storage Description			
#1	13.00'	2.532 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
13.00	1.450	2,862.0	0.000	0.000	1.450	
14.00	3.800	7,496.0	2.532	2.532	89.137	

Device	Routing	Invert	Outlet Devices					
#1	Primary	13.99'	7,496.0' long x 0.5' breadth Broad-Crested Rectangular Weir					
			Head (feet) 0.20 0.40 0.60 0.80 1.00					
			Coef. (English) 2.80 2.92 3.08 3.30 3.32					

Primary OutFlow Max=4.16 cfs @ 10.21 hrs HW=13.99' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 4.16 cfs @ 0.16 fps)

Pond 4P: 4P - West Pond

Hydrograph



Summary for Pond 5P: 5P - West Pond

[81] Warning: Exceeded Pond 7P by 0.53' @ 8.61 hrs

Inflow Area = 79.800 ac, 0.64% Impervious, Inflow Depth = 3.23" for 100-Yr-2040 event
 Inflow = 30.21 cfs @ 10.07 hrs, Volume= 21.462 af
 Outflow = 17.22 cfs @ 12.98 hrs, Volume= 19.625 af, Atten= 43%, Lag= 174.2 min
 Primary = 17.22 cfs @ 12.98 hrs, Volume= 19.625 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 15.01' @ 12.98 hrs Surf.Area= 414.446 ac Storage= 2.801 af

Plug-Flow detention time= 166.5 min calculated for 19.624 af (91% of inflow)
 Center-of-Mass det. time= 114.1 min (1,032.2 - 918.2)

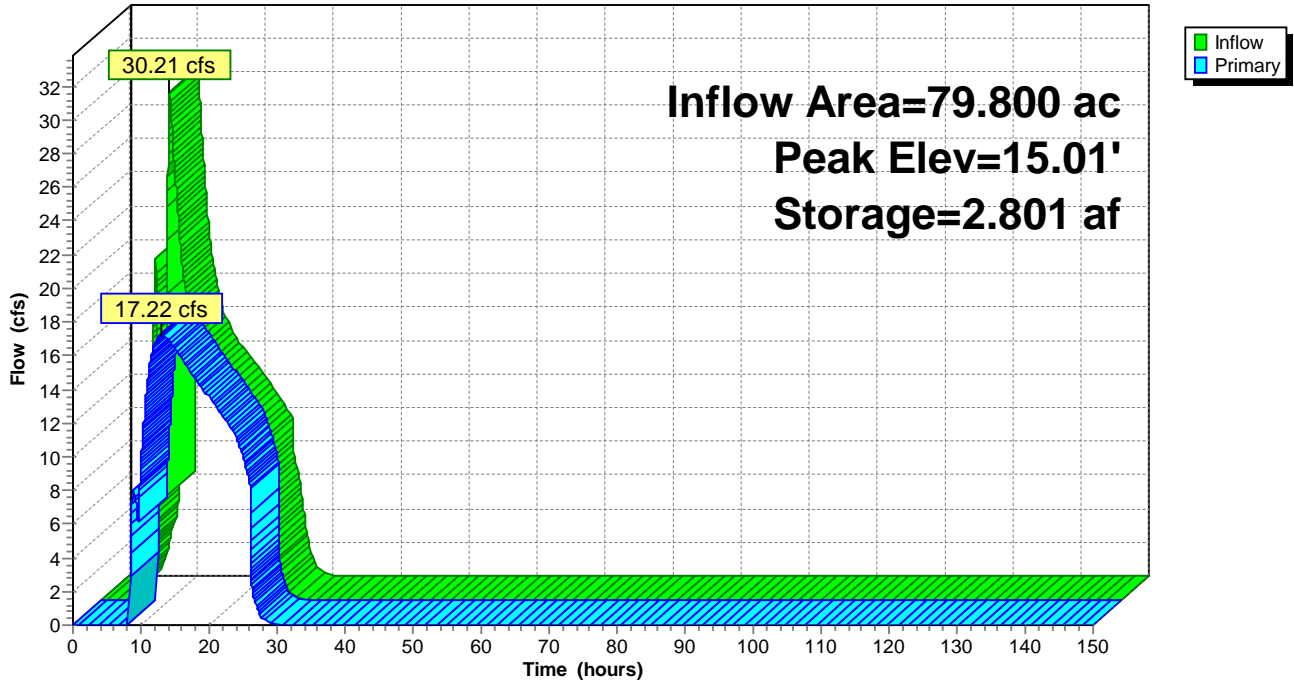
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	5.374 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	1.160	3,026.0	0.000	0.000	1.160	
15.00	2.670	3,968.0	1.863	1.863	13.196	
15.01	999.000	9,999.0	3.511	5.374	167.081	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	3,000.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=16.65 cfs @ 12.98 hrs HW=15.01' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 16.65 cfs @ 0.34 fps)

Pond 5P: 5P - West Pond

Hydrograph



Summary for Pond 6P: 6P- West Pond

[81] Warning: Exceeded Pond 5P by 0.01' @ 28.43 hrs

Inflow Area = 101.110 ac, 0.50% Impervious, Inflow Depth = 3.10" for 100-Yr-2040 event
 Inflow = 22.21 cfs @ 12.04 hrs, Volume= 26.110 af
 Outflow = 14.44 cfs @ 23.16 hrs, Volume= 22.326 af, Atten= 35%, Lag= 667.1 min
 Primary = 14.44 cfs @ 23.16 hrs, Volume= 22.326 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 23.16 hrs Surf.Area= 314.520 ac Storage= 4.021 af

Plug-Flow detention time= 350.4 min calculated for 22.325 af (86% of inflow)
 Center-of-Mass det. time= 269.9 min (1,267.5 - 997.6)

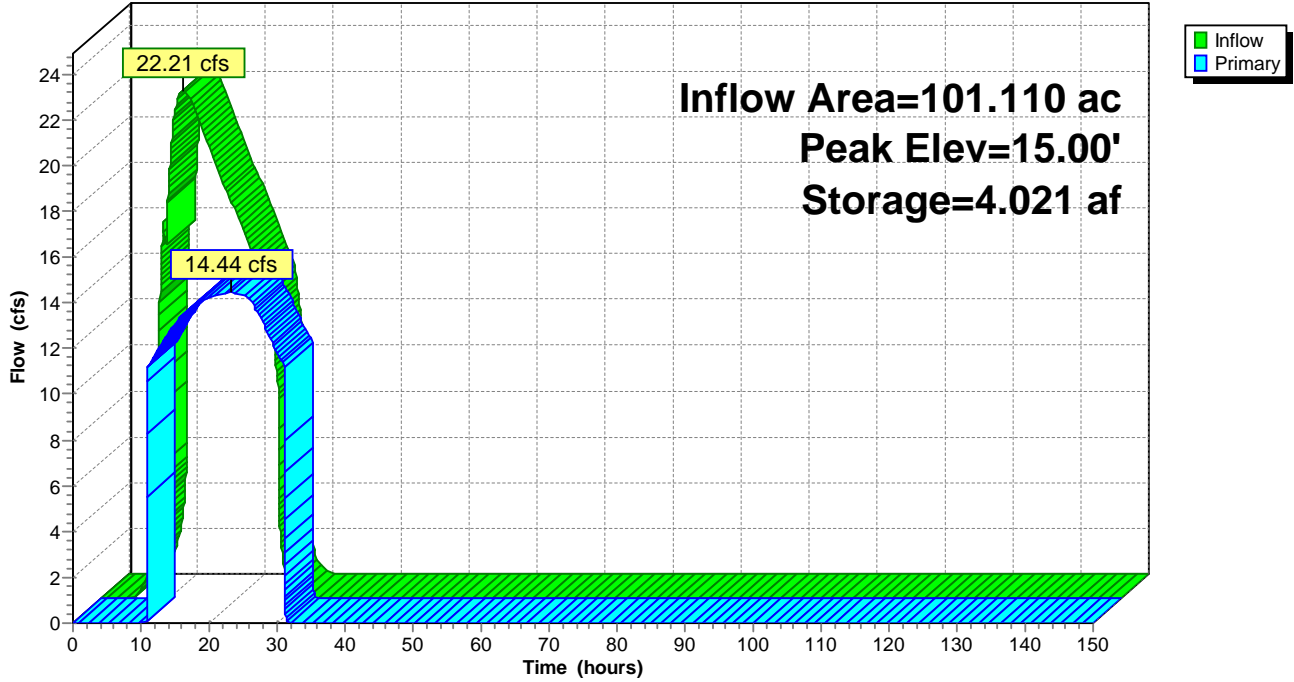
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	37.908 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.930	3,856.0	0.000	0.000	2.930	
15.00	4.810	4,175.0	3.831	3.831	7.611	
15.01	9,999.000	9,999.0	34.077	37.908	158.416	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	4,175.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=13.96 cfs @ 23.16 hrs HW=15.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Weir Controls 13.96 cfs @ 0.29 fps)

Pond 6P: 6P- West Pond

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Pond 7P: 7P-Southwest

Inflow Area = 54.970 ac, 0.93% Impervious, Inflow Depth = 3.86" for 100-Yr-2040 event
 Inflow = 25.23 cfs @ 9.77 hrs, Volume= 17.669 af
 Outflow = 24.43 cfs @ 10.09 hrs, Volume= 14.326 af, Atten= 3%, Lag= 19.0 min
 Primary = 24.43 cfs @ 10.09 hrs, Volume= 14.326 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 15.00' @ 10.09 hrs Surf.Area= 10.478 ac Storage= 3.416 af

Plug-Flow detention time= 206.8 min calculated for 14.325 af (81% of inflow)
 Center-of-Mass det. time= 89.5 min (979.9 - 890.4)

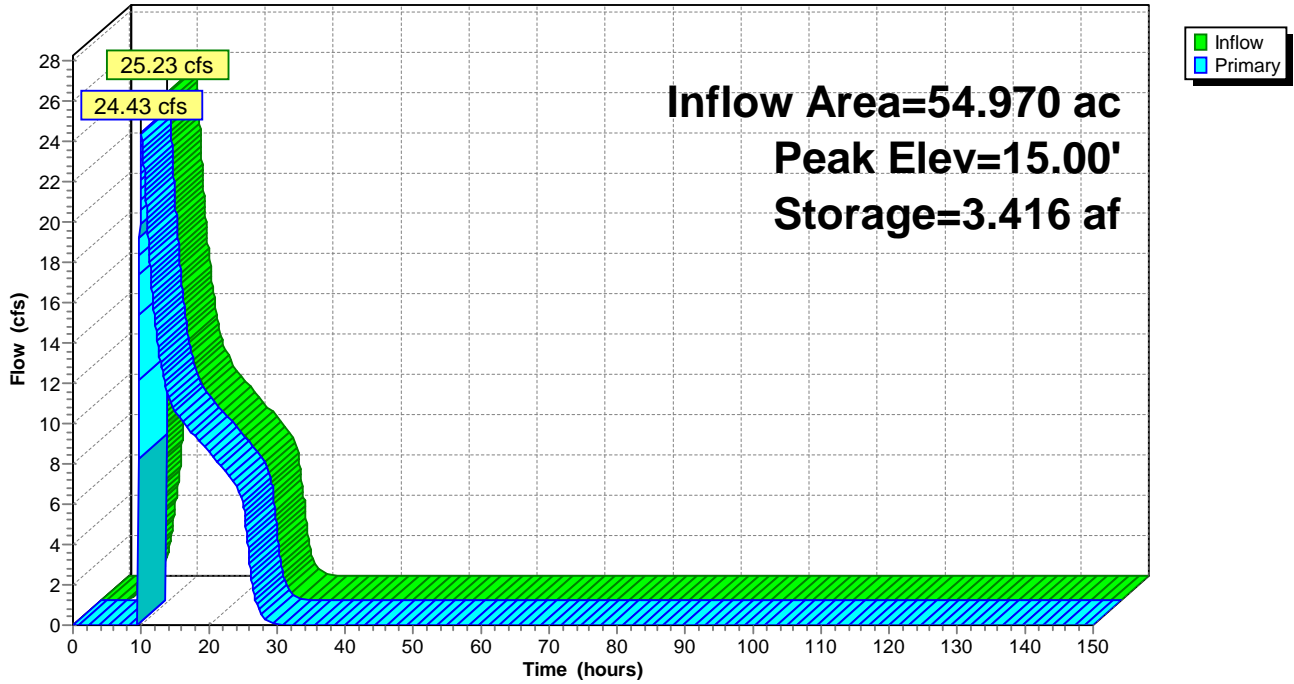
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	39.091 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.340	3,959.0	0.000	0.000	2.340	
15.00	4.560	5,430.0	3.389	3.389	27.571	
15.10	999.000	9,999.0	35.702	39.091	156.355	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	5,430.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=23.43 cfs @ 10.09 hrs HW=15.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 23.43 cfs @ 0.31 fps)

Pond 7P: 7P-Southwest

Hydrograph



Summary for Pond 8P: 8P

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 3.96" for 100-Yr-2040 event
 Inflow = 9.34 cfs @ 9.06 hrs, Volume= 5.400 af
 Outflow = 9.34 cfs @ 9.06 hrs, Volume= 5.400 af, Atten= 0%, Lag= 0.0 min
 Primary = 9.34 cfs @ 9.06 hrs, Volume= 5.400 af

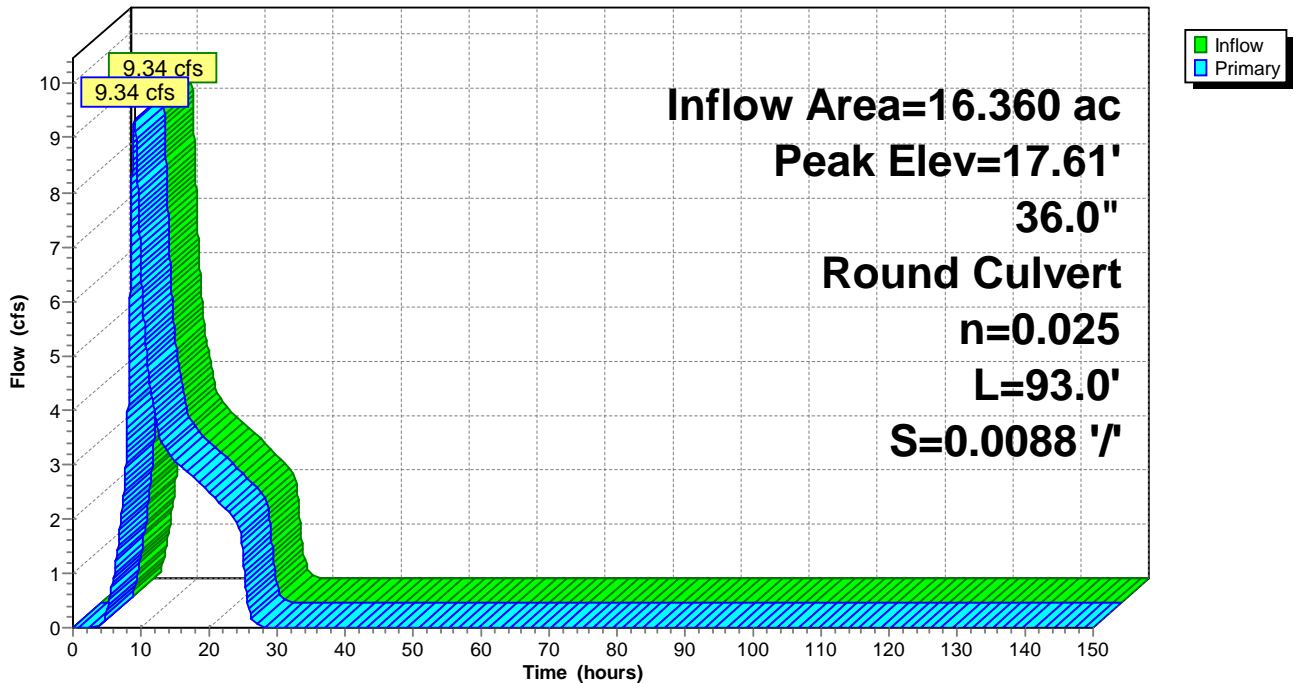
Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Peak Elev= 17.61' @ 9.06 hrs
 Flood Elev= 19.00'

Device #	Routing	Invert	Outlet Devices
#1	Primary	16.11'	36.0" Round Culvert L= 93.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.11' / 15.29' S= 0.0088 '/ Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=9.34 cfs @ 9.06 hrs HW=17.61' (Free Discharge)
 ↑ **1=Culvert** (Barrel Controls 9.34 cfs @ 3.86 fps)

Pond 8P: 8P

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Pond 9P: 9P - North

Inflow Area = 75.300 ac, 1.53% Impervious, Inflow Depth = 2.09" for 100-Yr-2040 event
 Inflow = 16.96 cfs @ 8.16 hrs, Volume= 13.110 af
 Outflow = 12.59 cfs @ 11.70 hrs, Volume= 11.700 af, Atten= 26%, Lag= 212.7 min
 Primary = 12.59 cfs @ 11.70 hrs, Volume= 11.700 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 13.00' @ 11.70 hrs Surf.Area= 3.690 ac Storage= 1.430 af

Plug-Flow detention time= 115.1 min calculated for 11.699 af (89% of inflow)
 Center-of-Mass det. time= 58.0 min (986.1 - 928.1)

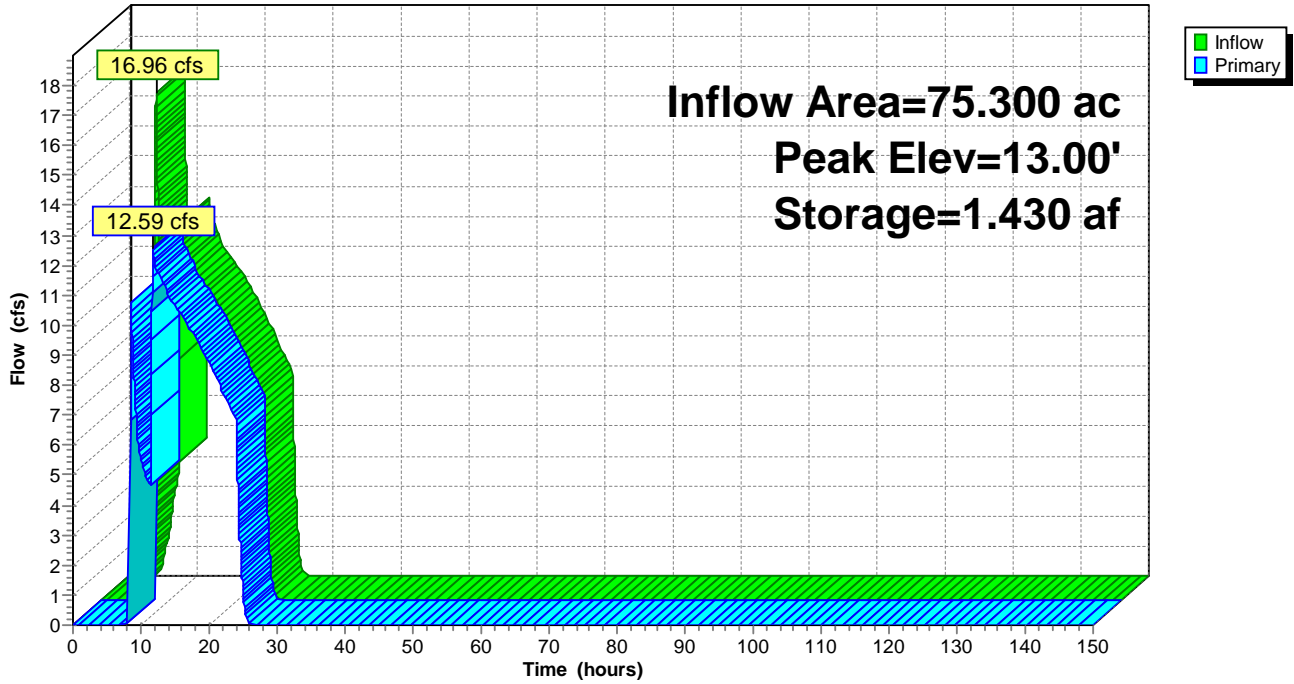
Volume	Invert	Avail.Storage	Storage Description			
#1	12.00'	1.447 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
12.00	0.079	608.0	0.000	0.000	0.079	
13.00	3.720	8,513.0	1.447	1.447	131.797	

Device	Routing	Invert	Outlet Devices					
#1	Primary	12.99'	8,513.0' long x 0.5' breadth Broad-Crested Rectangular Weir					
			Head (feet) 0.20 0.40 0.60 0.80 1.00					
			Coef. (English) 2.80 2.92 3.08 3.30 3.32					

Primary OutFlow Max=9.15 cfs @ 11.70 hrs HW=13.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 9.15 cfs @ 0.20 fps)

Pond 9P: 9P - North

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Pond 10P: 10P-Large Central/NE

[93] Warning: Storage range exceeded by 0.01'

[81] Warning: Exceeded Pond 9P by 0.02' @ 25.14 hrs

Inflow Area = 524.500 ac, 1.46% Impervious, Inflow Depth = 3.10" for 100-Yr-2040 event
 Inflow = 109.56 cfs @ 14.00 hrs, Volume= 135.621 af
 Outflow = 90.81 cfs @ 22.92 hrs, Volume= 46.756 af, Atten= 17%, Lag= 535.3 min
 Secondary = 90.81 cfs @ 22.92 hrs, Volume= 46.756 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 13.01' @ 22.92 hrs Surf.Area= 119.000 ac Storage= 98.335 af

Plug-Flow detention time= 835.2 min calculated for 46.756 af (34% of inflow)
 Center-of-Mass det. time= 463.7 min (1,607.4 - 1,143.7)

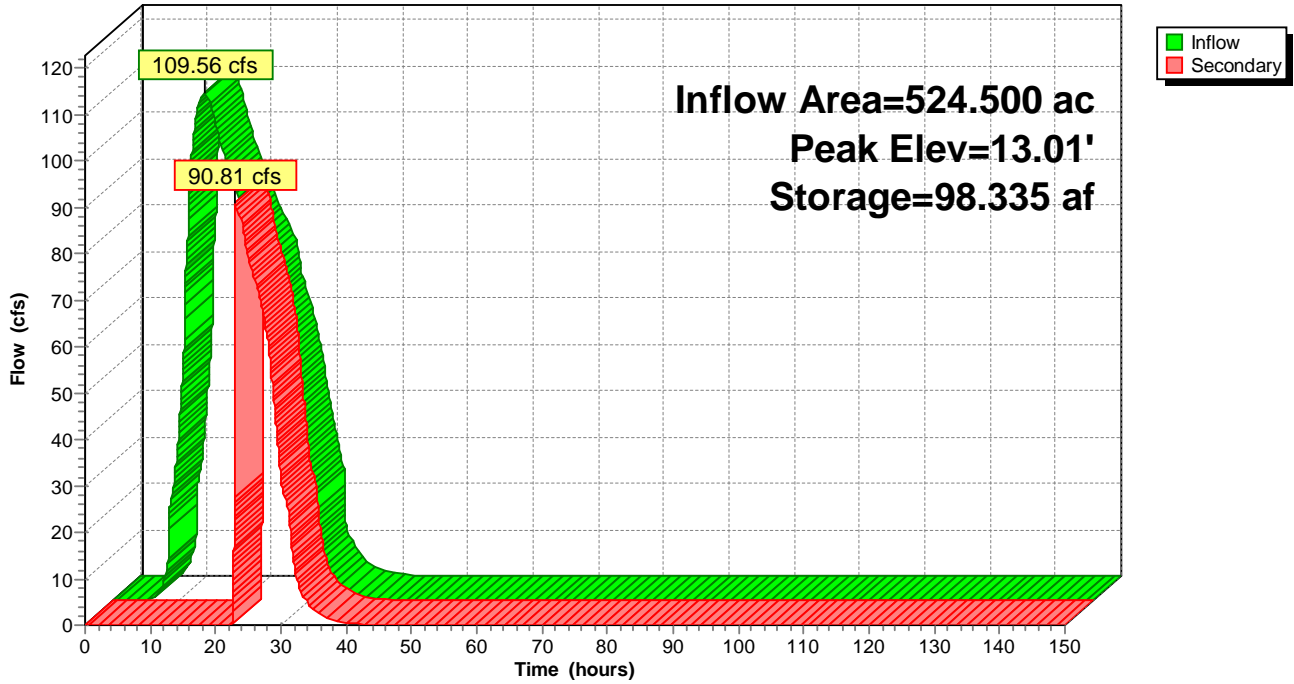
Volume	Invert	Avail.Storage	Storage Description			
#1	10.00'	98.335 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.00	0.280	2,536.0	0.000	0.000	0.280	
11.00	6.414	16,985.0	2.678	2.678	515.559	
12.00	38.875	11,909.0	20.360	23.038	783.495	
13.00	119.000	22,186.0	75.297	98.335	1,423.612	

Device	Routing	Invert	Outlet Devices					
#1	Secondary	12.99'	9,999.0' long x 0.5' breadth Broad-Crested Rectangular Weir					
			Head (feet) 0.20 0.40 0.60 0.80 1.00					
			Coef. (English) 2.80 2.92 3.08 3.30 3.32					

Secondary OutFlow Max=76.91 cfs @ 22.92 hrs HW=13.01' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 76.91 cfs @ 0.39 fps)

Pond 10P: 10P-Large Central/NE

Hydrograph



Summary for Pond 11P: 11P-SE Pond

Inflow Area = 23.330 ac, 0.00% Impervious, Inflow Depth = 0.77" for 100-Yr-2040 event
 Inflow = 1.29 cfs @ 19.58 hrs, Volume= 1.497 af
 Outflow = 1.29 cfs @ 19.59 hrs, Volume= 1.497 af, Atten= 0%, Lag= 0.6 min
 Discarded = 1.29 cfs @ 19.59 hrs, Volume= 1.497 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 13.01' @ 19.59 hrs Surf.Area= 0.236 ac Storage= 0.001 af

Plug-Flow detention time= 0.7 min calculated for 1.497 af (100% of inflow)
 Center-of-Mass det. time= 0.7 min (1,107.3 - 1,106.6)

Volume	Invert	Avail.Storage	Storage Description			
#1	13.00'	3.949 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
13.00	0.230	1,892.0	0.000	0.000	0.230	
14.00	2.940	4,273.0	1.331	1.331	27.046	
15.00	2.310	2,361.0	2.619	3.949	50.218	

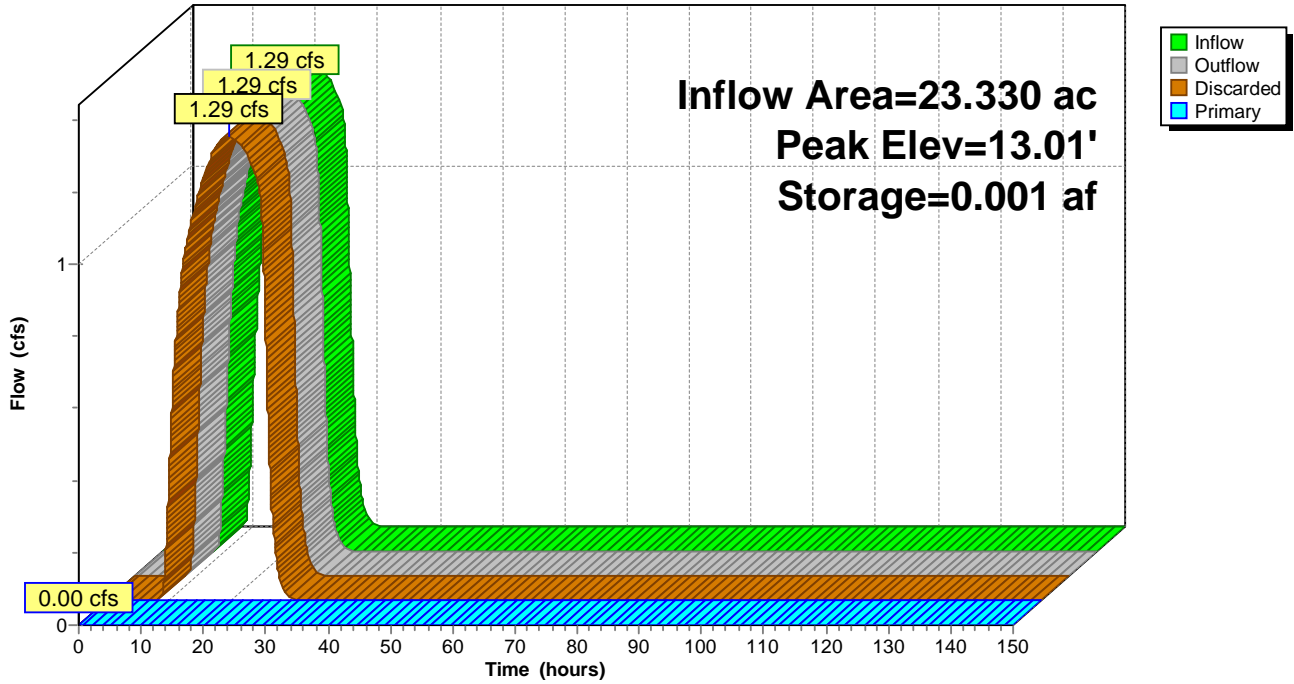
Device	Routing	Invert	Outlet Devices						
#1	Primary	14.99'	2,360.0' long x 0.5' breadth Broad-Crested Rectangular Weir						
			Head (feet) 0.20 0.40 0.60 0.80 1.00						
			Coef. (English) 2.80 2.92 3.08 3.30 3.32						
#2	Discarded	13.00'	19.980 in/hr Exfiltration over Surface area						
			Conductivity to Groundwater Elevation = 1.00'						

Discarded OutFlow Max=4.76 cfs @ 19.59 hrs HW=13.01' (Free Discharge)
 ↑**2=Exfiltration** (Controls 4.76 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=13.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 11P: 11P-SE Pond

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Time span=0.00-150.00 hrs, dt=0.01 hrs, 15001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S-NW Catchment	Runoff Area=7.320 ac 15.71% Impervious Runoff Depth=4.65" Flow Length=292' Slope=0.0200 '/ Tc=4.9 min CN=77 Runoff=8.68 cfs 2.839 af
Subcatchment 2S: 2S-NW Catchment 2	Runoff Area=4.280 ac 0.00% Impervious Runoff Depth=4.21" Flow Length=314' Tc=7.8 min CN=73 Runoff=4.45 cfs 1.502 af
Subcatchment 3S: 3S-North Catchment	Runoff Area=14.400 ac 0.00% Impervious Runoff Depth=4.21" Flow Length=148' Tc=6.7 min CN=73 Runoff=15.01 cfs 5.055 af
Subcatchment 4S: 4S - West Catchment	Runoff Area=26.590 ac 0.00% Impervious Runoff Depth=4.21" Flow Length=923' Slope=0.0030 '/ Tc=56.2 min CN=73 Runoff=19.10 cfs 9.334 af
Subcatchment 5S: 5S - West Catchment	Runoff Area=24.830 ac 0.00% Impervious Runoff Depth=4.21" Flow Length=660' Tc=11.1 min CN=73 Runoff=25.57 cfs 8.716 af
Subcatchment 6S: 6S - West Catchment	Runoff Area=21.310 ac 0.00% Impervious Runoff Depth=4.43" Flow Length=1,162' Slope=0.0017 '/ Tc=127.5 min CN=75 Runoff=11.51 cfs 7.872 af
Subcatchment 7S: 7S - Southwest	Runoff Area=54.970 ac 0.93% Impervious Runoff Depth=4.65" Flow Length=1,127' Tc=135.3 min CN=77 Runoff=31.00 cfs 21.321 af
Subcatchment 8S: 8S - South Catchment	Runoff Area=16.360 ac 4.95% Impervious Runoff Depth=4.77" Flow Length=1,480' Tc=88.6 min CN=78 Runoff=11.43 cfs 6.498 af
Subcatchment 9S: 9S - North	Runoff Area=22.710 ac 0.00% Impervious Runoff Depth=4.21" Flow Length=597' Tc=23.9 min CN=73 Runoff=21.27 cfs 7.972 af
Subcatchment 10S: 10S - Large Central / NE	Runoff Area=324.760 ac 1.84% Impervious Runoff Depth=4.54" Flow Length=2,575' Slope=0.0019 '/ Tc=393.8 min CN=76 Runoff=105.49 cfs 122.957 af
Subcatchment 11S: 11S - SE	Runoff Area=23.330 ac 0.00% Impervious Runoff Depth=1.13" Flow Length=1,924' Tc=126.8 min CN=42 Runoff=1.77 cfs 2.199 af
Reach 8R: South Ditch	Avg. Flow Depth=1.36' Max Vel=1.74 fps Inflow=11.43 cfs 6.498 af n=0.022 L=579.0' S=0.0012 '/ Capacity=2.94 cfs Outflow=11.38 cfs 6.498 af
Pond 1P: 1P- NW Pond	Peak Elev=12.97' Storage=2.839 af Inflow=8.68 cfs 2.839 af Outflow=0.00 cfs 0.000 af
Pond 2P: 2P-NW Pond 2	Peak Elev=12.45' Storage=1.502 af Inflow=4.45 cfs 1.502 af Outflow=0.00 cfs 0.000 af
Pond 3P: 3P-North Pond	Peak Elev=15.00' Storage=2.718 af Inflow=16.95 cfs 11.894 af Outflow=16.34 cfs 9.764 af
Pond 4P: 4P - West Pond	Peak Elev=14.00' Storage=2.517 af Inflow=19.10 cfs 9.334 af Outflow=12.51 cfs 6.839 af

Existing_Conditions_mlc

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Pond 5P: 5P - West Pond Peak Elev=15.01' Storage=4.840 af Inflow=38.16 cfs 26.695 af
Outflow=21.91 cfs 24.858 af

Pond 6P: 6P- West Pond Peak Elev=15.00' Storage=4.551 af Inflow=28.40 cfs 32.729 af
Outflow=16.51 cfs 28.946 af

Pond 7P: 7P-Southwest Peak Elev=15.01' Storage=3.446 af Inflow=31.00 cfs 21.321 af
Outflow=30.85 cfs 17.978 af

Pond 8P: 8P Peak Elev=17.79' Inflow=11.43 cfs 6.498 af
36.0" Round Culvert n=0.025 L=93.0' S=0.0088 1/1' Outflow=11.43 cfs 6.498 af

Pond 9P: 9P - North Peak Elev=13.00' Storage=1.445 af Inflow=22.93 cfs 17.736 af
Outflow=22.49 cfs 16.327 af

Pond 10P: 10P-Large Central/NE Peak Elev=13.01' Storage=98.335 af Inflow=133.16 cfs 168.230 af
Outflow=113.67 cfs 82.998 af

Pond 11P: 11P-SE Pond Peak Elev=13.01' Storage=0.002 af Inflow=1.77 cfs 2.199 af
Discarded=1.77 cfs 2.199 af Primary=0.00 cfs 0.000 af Outflow=1.77 cfs 2.199 af

Total Runoff Area = 540.860 ac Runoff Volume = 196.267 af Average Runoff Depth = 4.35"
98.44% Pervious = 532.400 ac 1.56% Impervious = 8.460 ac

Existing_Conditions_mlc

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Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 1S: 1S-NW Catchment

Runoff = 8.68 cfs @ 7.92 hrs, Volume= 2.839 af, Depth= 4.65"

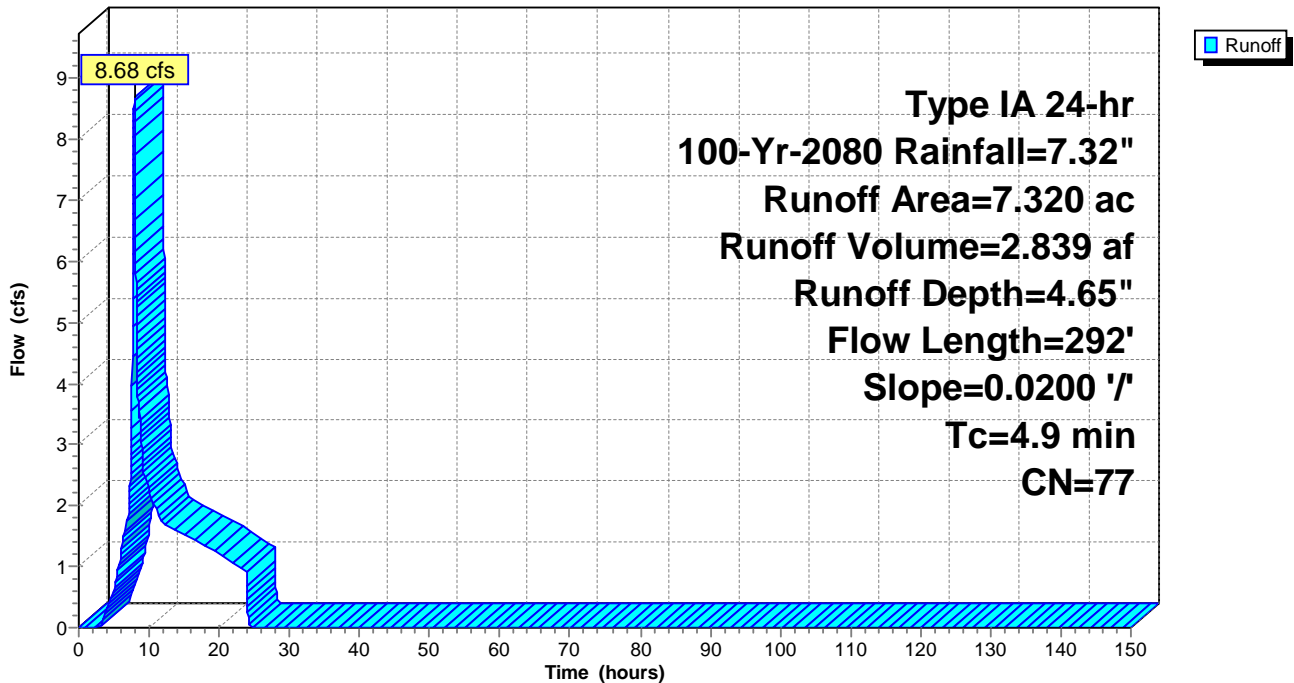
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
6.170	73	Brush, Good, HSG D
1.150	98	Paved parking, HSG D
7.320	77	Weighted Average
6.170	73	84.29% Pervious Area
1.150	98	15.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	292	0.0200	0.99		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps

Subcatchment 1S: 1S-NW Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 2S: 2S-NW Catchment 2

Sheet flow - dense comes from "native grasses" considered dense. Characterized by the wetland report.

Runoff = 4.45 cfs @ 7.98 hrs, Volume= 1.502 af, Depth= 4.21"

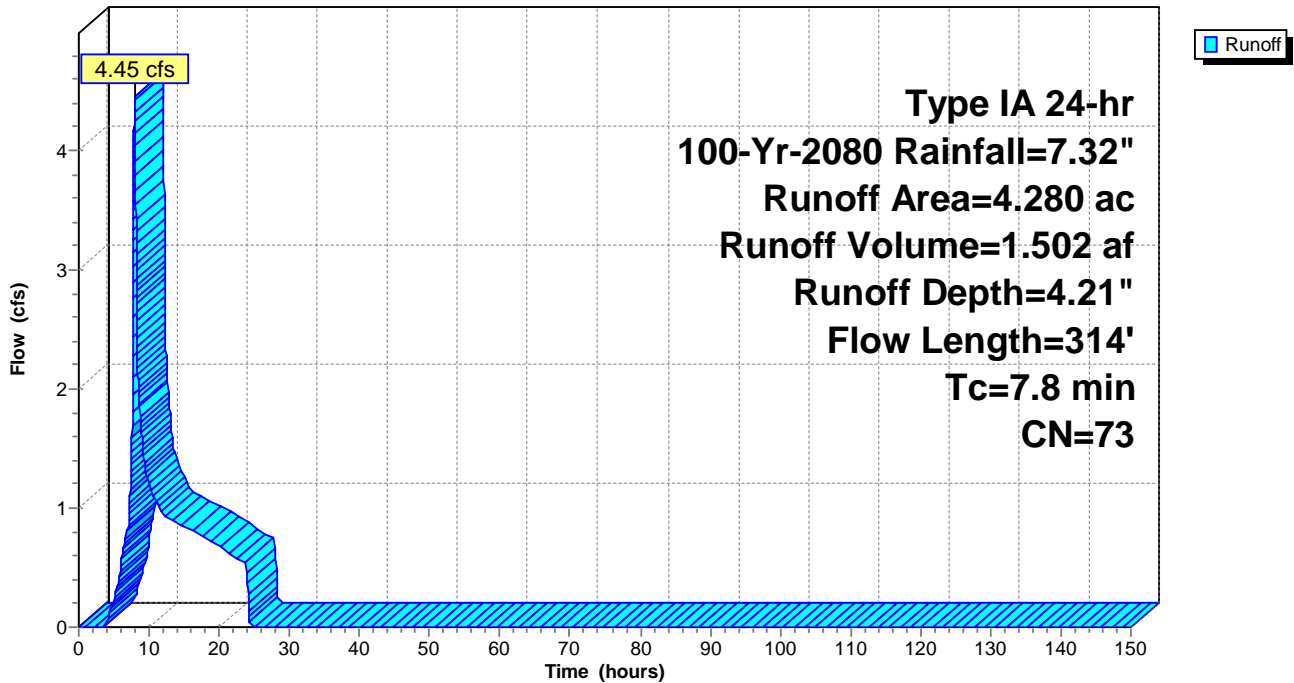
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
4.280	73	Brush, Good, HSG D
4.280	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	76	0.1300	0.24		Sheet Flow, Sheet - Dense, Native Grasses Grass: Dense n= 0.240 P2= 3.43"
2.6	238	0.0460	1.50		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
7.8	314	Total			

Subcatchment 2S: 2S-NW Catchment 2

Hydrograph



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Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 3S: 3S-North Catchment

Runoff = 15.01 cfs @ 7.96 hrs, Volume= 5.055 af, Depth= 4.21"

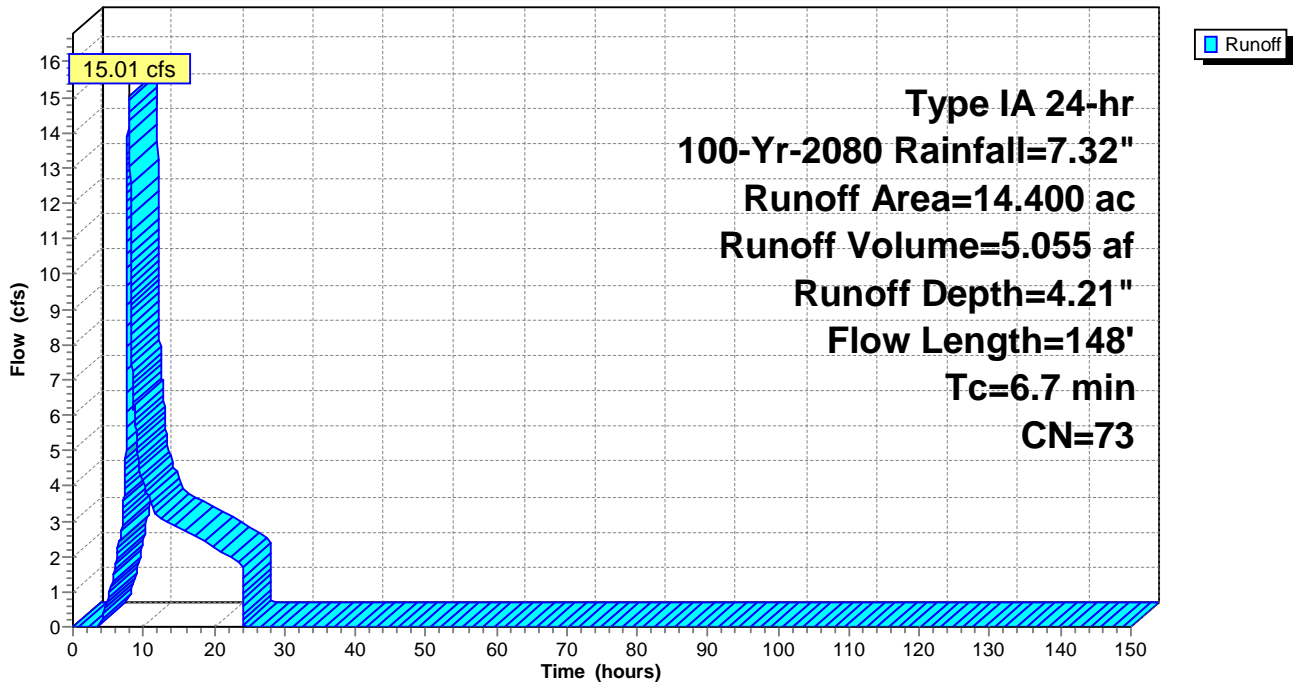
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
14.400	73	Brush, Good, HSG D
14.400	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	95	0.0950	0.33		Sheet Flow, Sheet flow - dune Grass: Short n= 0.150 P2= 3.43"
1.8	53	0.0050	0.49		Shallow Concentrated Flow, Shallow - dune grass Short Grass Pasture Kv= 7.0 fps
6.7	148	Total			

Subcatchment 3S: 3S-North Catchment

Hydrograph



Summary for Subcatchment 4S: 4S - West Catchment

Runoff = 19.10 cfs @ 8.56 hrs, Volume= 9.334 af, Depth= 4.21"

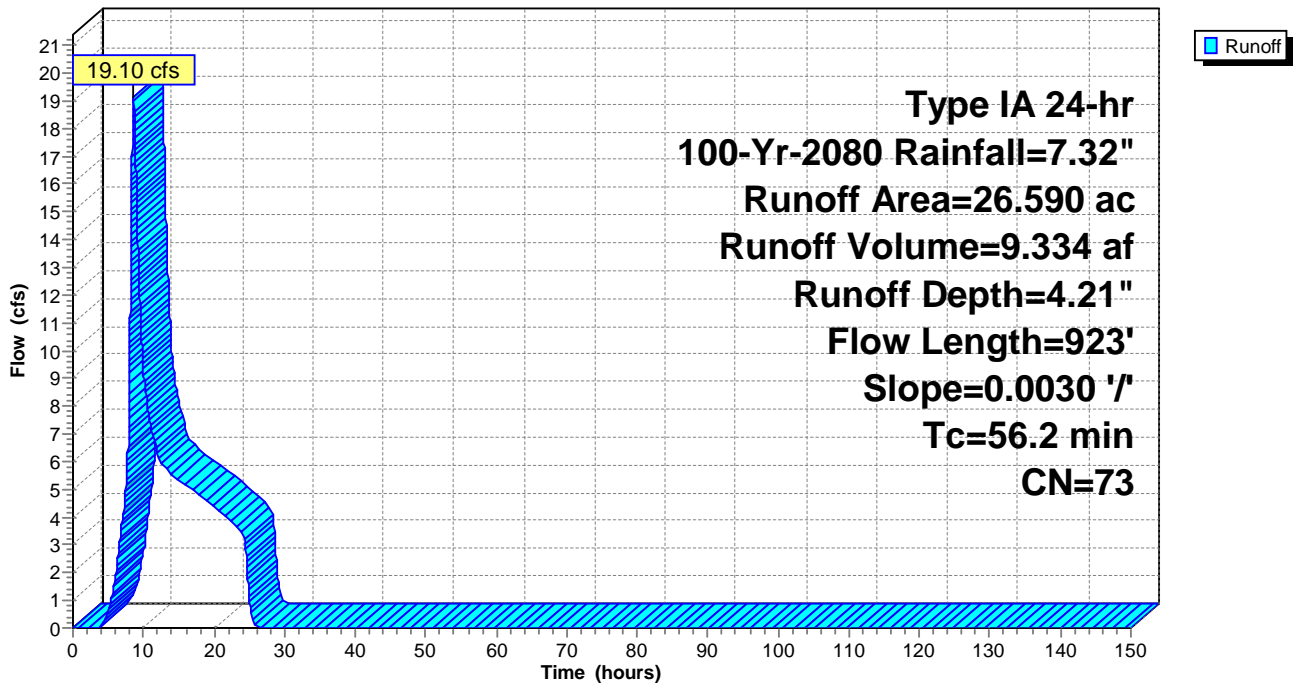
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
26.590	73	Brush, Good, HSG D
26.590	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.2	923	0.0030	0.27		Shallow Concentrated Flow, Shallow - Forest Woodland Kv= 5.0 fps

Subcatchment 4S: 4S - West Catchment

Hydrograph



Summary for Subcatchment 5S: 5S - West Catchment

Runoff = 25.57 cfs @ 8.03 hrs, Volume= 8.716 af, Depth= 4.21"

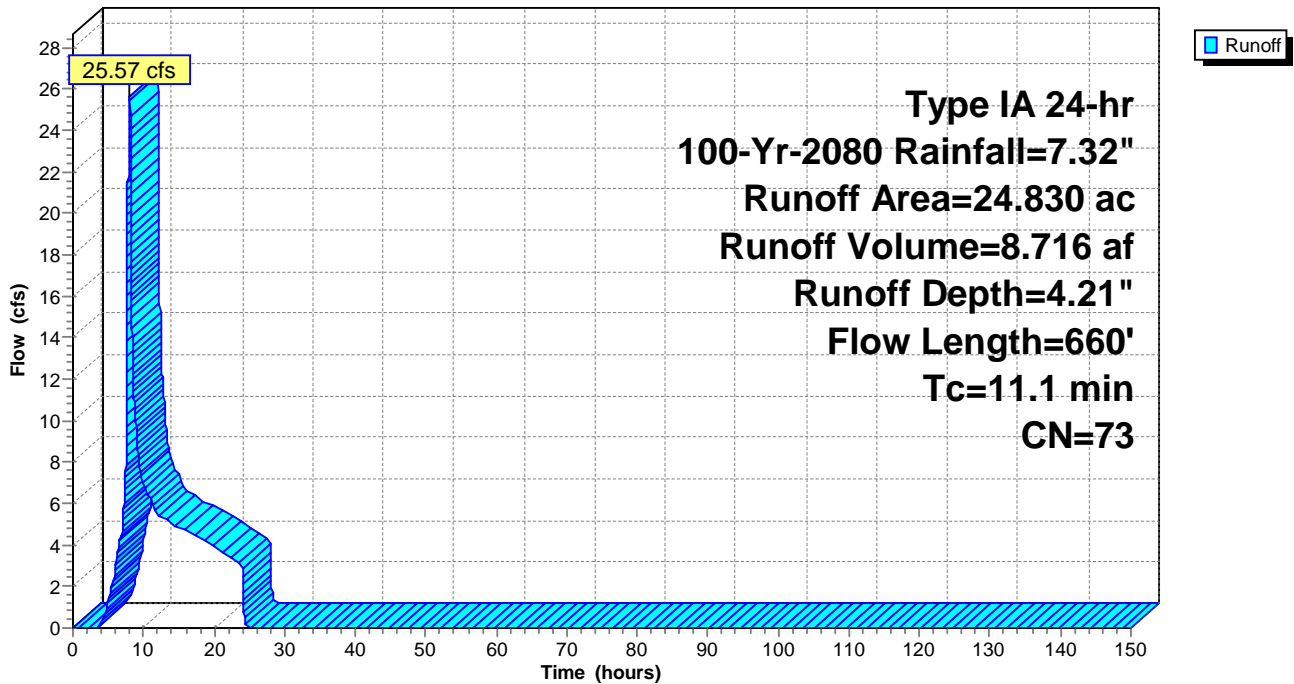
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
23.460	73	Brush, Good, HSG D
1.370	79	Woods/grass comb., Good, HSG D
24.830	73	Weighted Average
24.830	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	608	0.0180	0.94		Shallow Concentrated Flow, Shallow - Forest
					Short Grass Pasture Kv= 7.0 fps
0.3	52	0.1300	2.64		Sheet Flow, Path
					Smooth surfaces n= 0.011 P2= 3.43"
11.1	660	Total			

Subcatchment 5S: 5S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 6S: 6S - West Catchment

Runoff = 11.51 cfs @ 9.63 hrs, Volume= 7.872 af, Depth= 4.43"

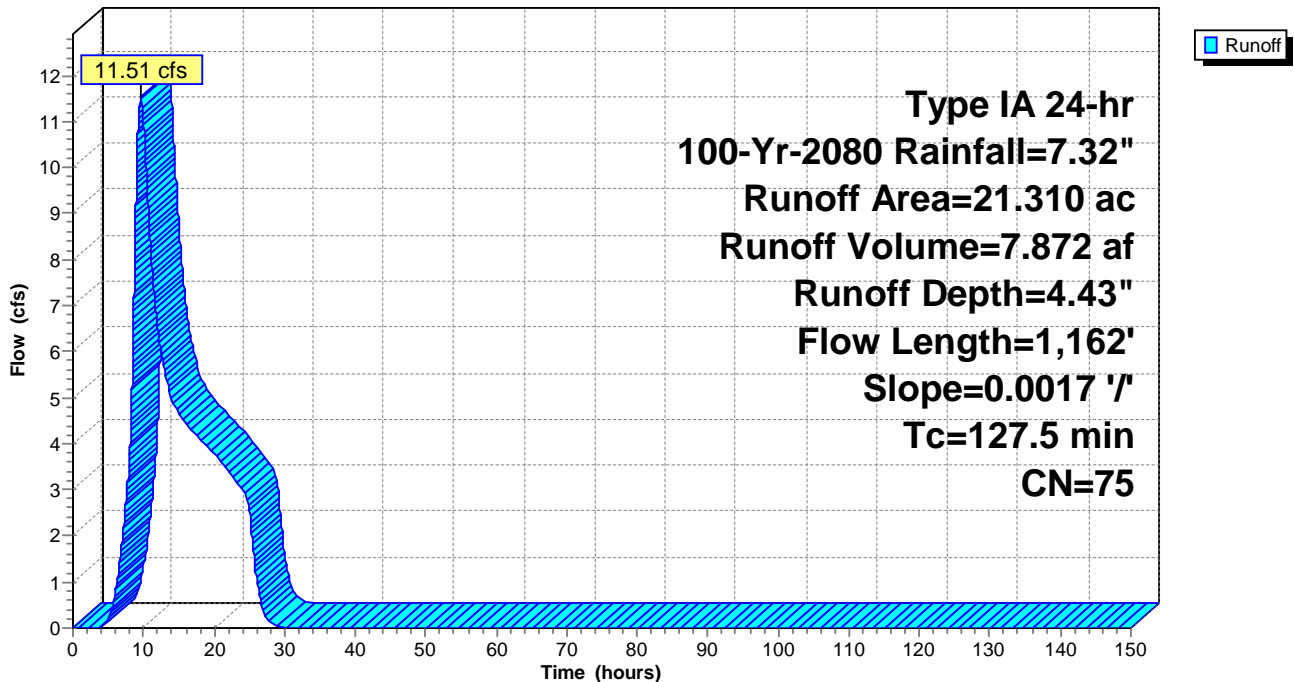
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
8.730	79	Woods/grass comb., Good, HSG D
12.580	73	Brush, Good, HSG D
21.310	75	Weighted Average
21.310	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.6	581	0.0017	0.29		Shallow Concentrated Flow, Grass - Shallow
					Short Grass Pasture Kv= 7.0 fps
93.9	581	0.0017	0.10		Shallow Concentrated Flow, Forested - Shallow
					Forest w/Heavy Litter Kv= 2.5 fps
127.5	1,162	Total			

Subcatchment 6S: 6S - West Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 7S: 7S - Southwest

Runoff = 31.00 cfs @ 9.77 hrs, Volume= 21.321 af, Depth= 4.65"

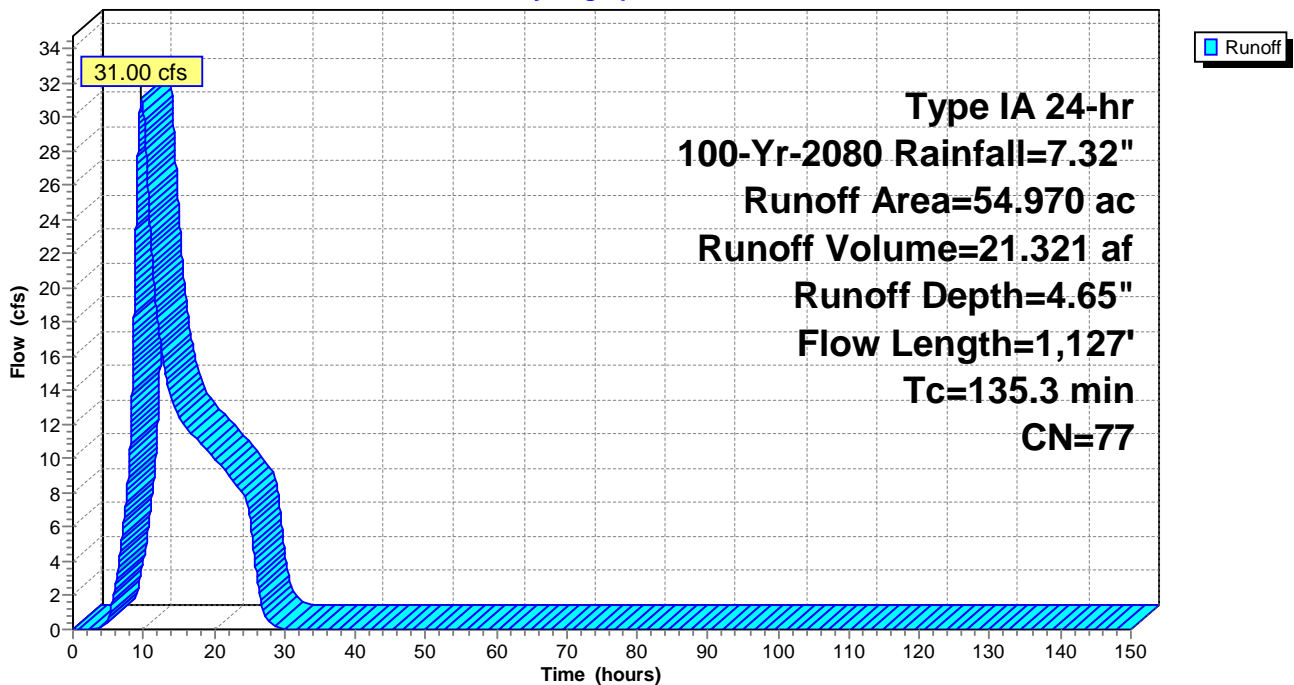
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
21.790	73	Brush, Good, HSG D
32.670	79	Woods/grass comb., Good, HSG D
0.510	98	Paved parking, HSG D
54.970	77	Weighted Average
54.460	77	99.07% Pervious Area
0.510	98	0.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	70	0.1000	0.21		Sheet Flow, Sheet - Paved to Grass Grass: Dense n= 0.240 P2= 3.43"
2.4	202	0.0390	1.38		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
127.5	855	0.0020	0.11		Shallow Concentrated Flow, Shallow - Forest Forest w/Heavy Litter Kv= 2.5 fps
135.3	1,127	Total			

Subcatchment 7S: 7S - Southwest

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 8S: 8S - South Catchment

Runoff = 11.43 cfs @ 9.05 hrs, Volume= 6.498 af, Depth= 4.77"

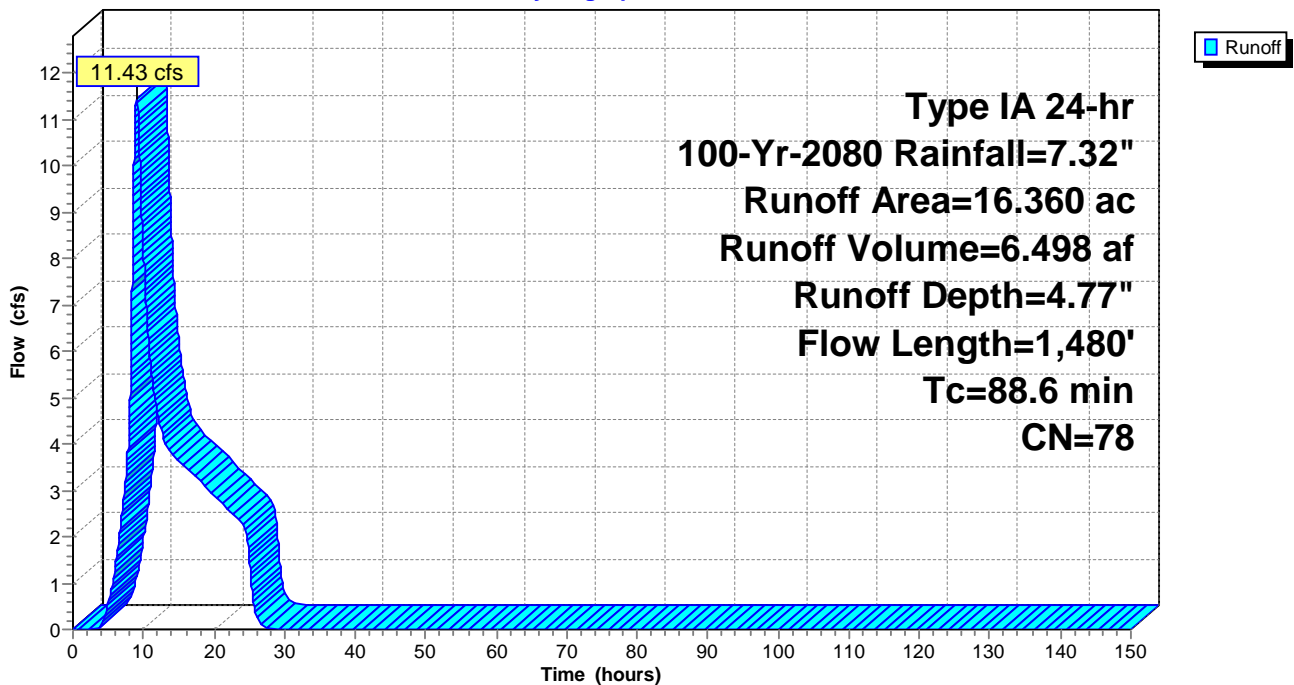
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
15.000	79	Woods/grass comb., Good, HSG D
0.550	30	Brush, Good, HSG A
0.810	98	Paved parking, HSG D
16.360	78	Weighted Average
15.550	77	95.05% Pervious Area
0.810	98	4.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	89	0.0560	0.26		Sheet Flow, Sheet- Dune grass Grass: Short n= 0.150 P2= 3.43"
67.3	844	0.0070	0.21		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps
15.6	547	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
88.6	1,480	Total			

Subcatchment 8S: 8S - South Catchment

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 9S: 9S - North

Runoff = 21.27 cfs @ 8.15 hrs, Volume= 7.972 af, Depth= 4.21"

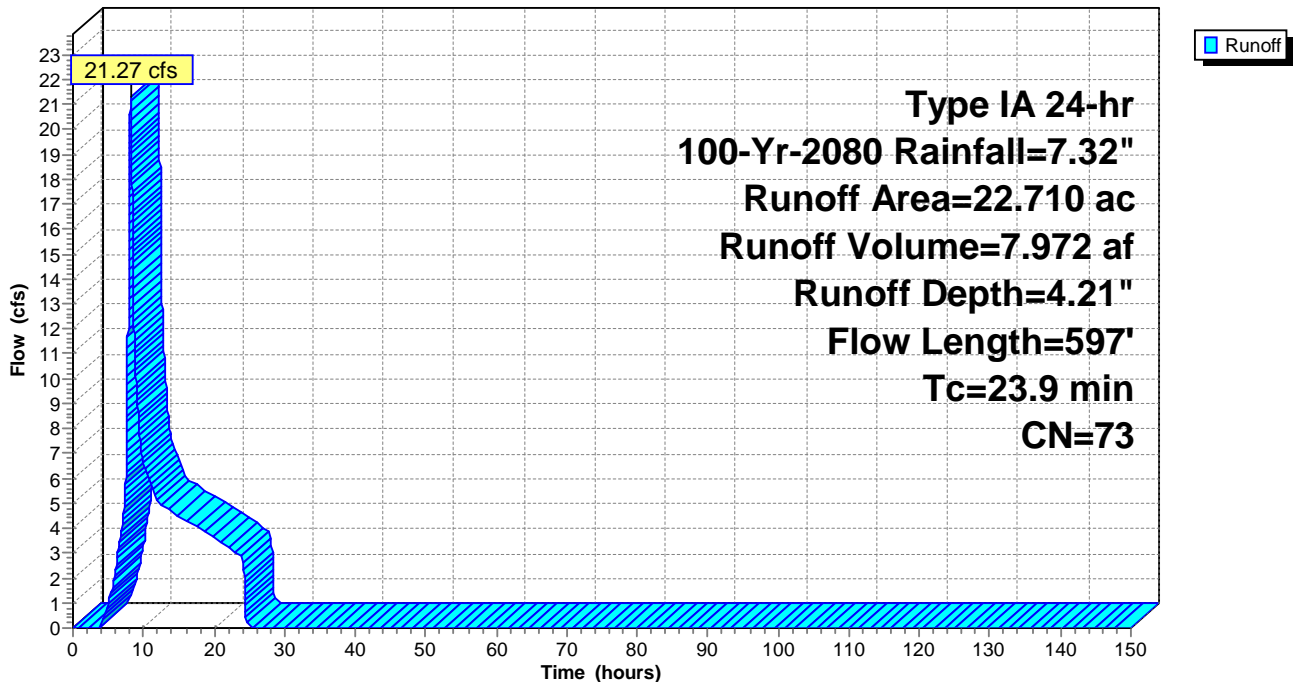
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
21.780	73	Brush, Good, HSG D
0.930	79	Woods/grass comb., Good, HSG D
22.710	73	Weighted Average
22.710	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	67	0.0450	0.15		Sheet Flow, Sheet - Grass Grass: Dense n= 0.240 P2= 3.43"
16.7	530	0.0057	0.53		Shallow Concentrated Flow, Shallow - Woods Short Grass Pasture Kv= 7.0 fps
23.9	597	Total			

Subcatchment 9S: 9S - North

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 10S: 10S - Large Central / NE

Runoff = 105.49 cfs @ 13.99 hrs, Volume= 122.957 af, Depth= 4.54"

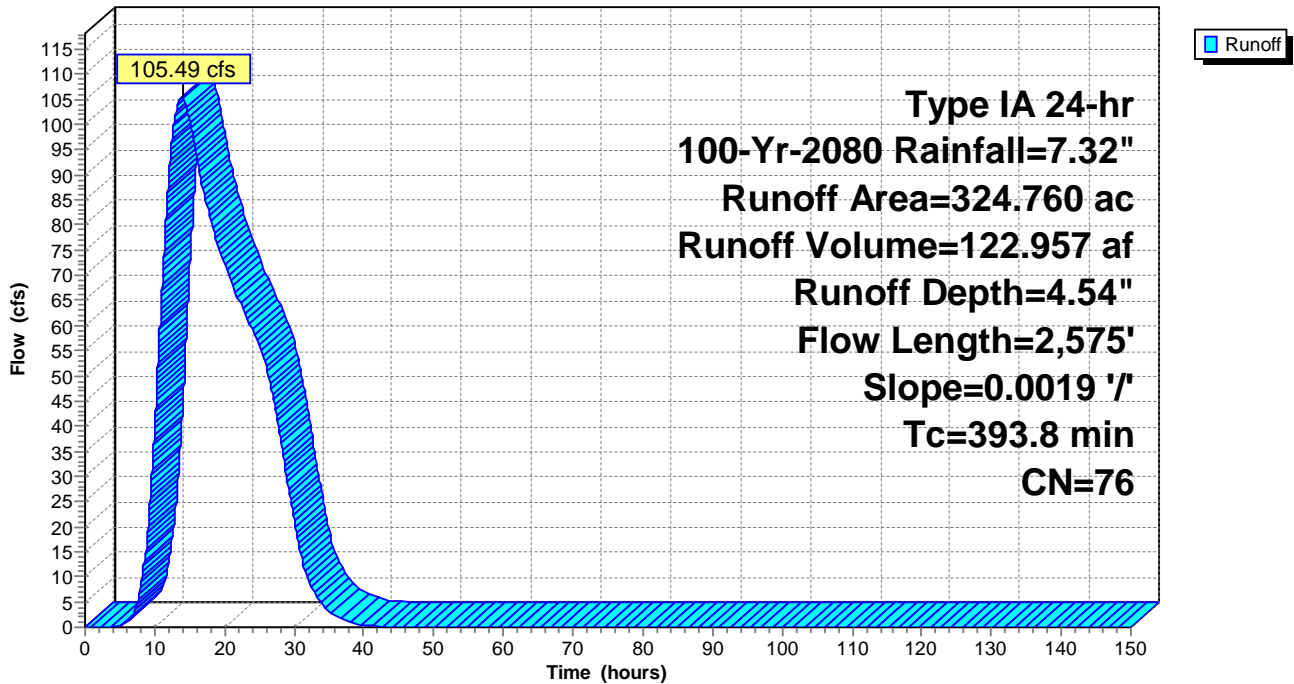
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
223.040	79	Woods/grass comb., Good, HSG D
12.880	32	Woods/grass comb., Good, HSG A
0.660	98	Paved parking, HSG A
5.330	98	Paved parking, HSG D
82.850	73	Brush, Good, HSG D
324.760	76	Weighted Average
318.770	76	98.16% Pervious Area
5.990	98	1.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
393.8	2,575	0.0019	0.11		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps

Subcatchment 10S: 10S - Large Central / NE

Hydrograph



Existing_Conditions_mlc

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Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 11S: 11S - SE

Runoff = 1.77 cfs @ 18.46 hrs, Volume= 2.199 af, Depth= 1.13"

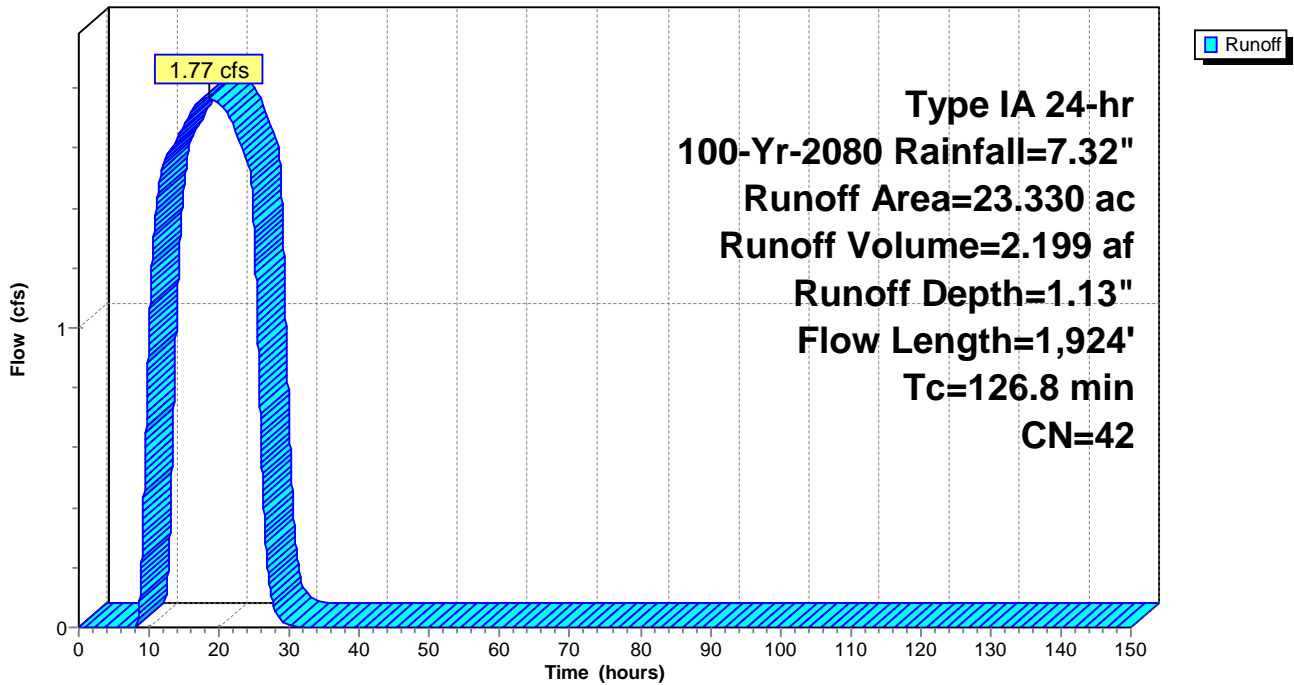
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
18.140	32	Woods/grass comb., Good, HSG A
1.980	79	Woods/grass comb., Good, HSG D
3.210	73	Brush, Good, HSG D
23.330	42	Weighted Average
23.330	42	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	126	0.1800	0.30		Sheet Flow, Sheet-Dune Grass Grass: Dense n= 0.240 P2= 3.43"
119.9	1,798	0.0100	0.25		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps
126.8	1,924	Total			

Subcatchment 11S: 11S - SE

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Reach 8R: South Ditch

[91] Warning: Storage range exceeded by 0.86'

[55] Hint: Peak inflow is 388% of Manning's capacity

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 1.25'

Inflow Area =	16.360 ac,	4.95% Impervious,	Inflow Depth =	4.77"	for 100-Yr-2080 event
Inflow =	11.43 cfs @	9.05 hrs,	Volume=	6.498 af	
Outflow =	11.38 cfs @	9.21 hrs,	Volume=	6.498 af,	Atten= 0%, Lag= 9.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs

Max. Velocity= 1.74 fps, Min. Travel Time= 5.5 min

Avg. Velocity = 0.76 fps, Avg. Travel Time= 12.6 min

Peak Storage= 3,781 cf @ 9.12 hrs

Average Depth at Peak Storage= 1.36', Surface Width= 6.71'

Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 2.94 cfs

4.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 1.0 '/' Top Width= 5.00'

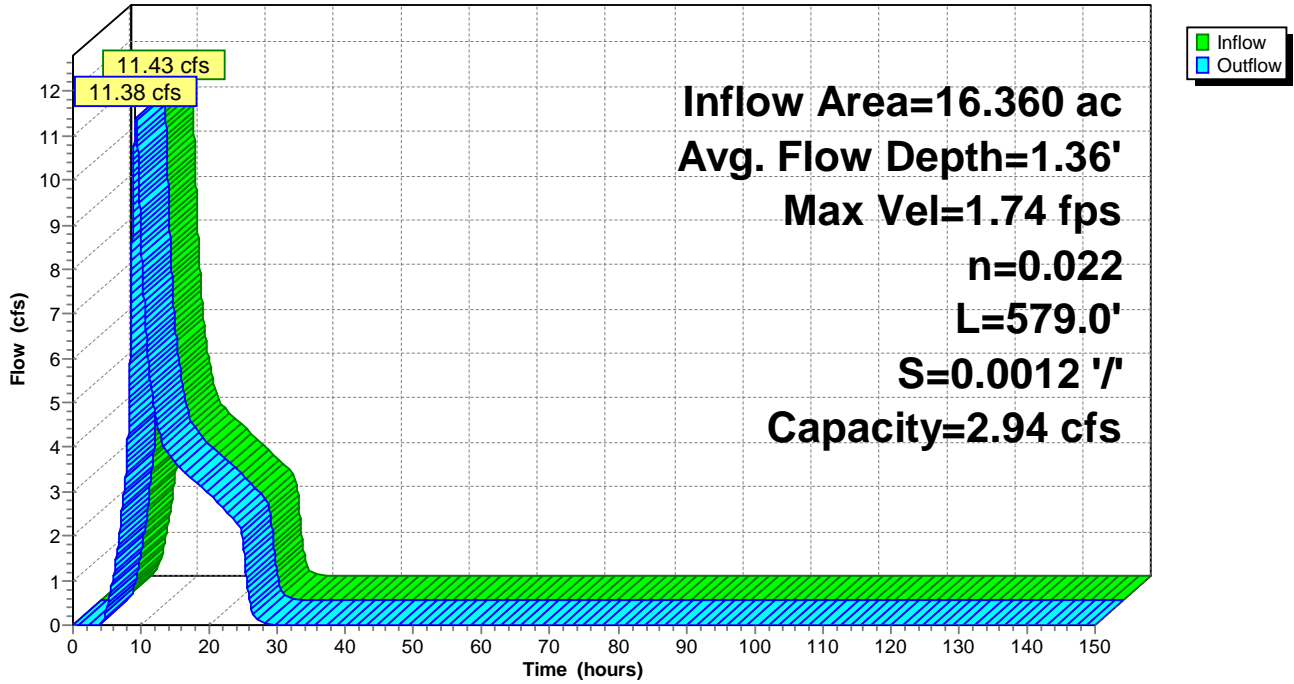
Length= 579.0' Slope= 0.0012 '/'

Inlet Invert= 16.00', Outlet Invert= 15.30'



Reach 8R: South Ditch

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 1P: 1P- NW Pond

Inflow Area = 7.320 ac, 15.71% Impervious, Inflow Depth = 4.65" for 100-Yr-2080 event
 Inflow = 8.68 cfs @ 7.92 hrs, Volume= 2.839 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.97' @ 24.29 hrs Surf.Area= 1.548 ac Storage= 2.839 af

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

Volume	Invert	Avail.Storage	Storage Description
#1	11.00'	6.173 af	Custom Stage Data (Irregular) Listed below (Recalc)

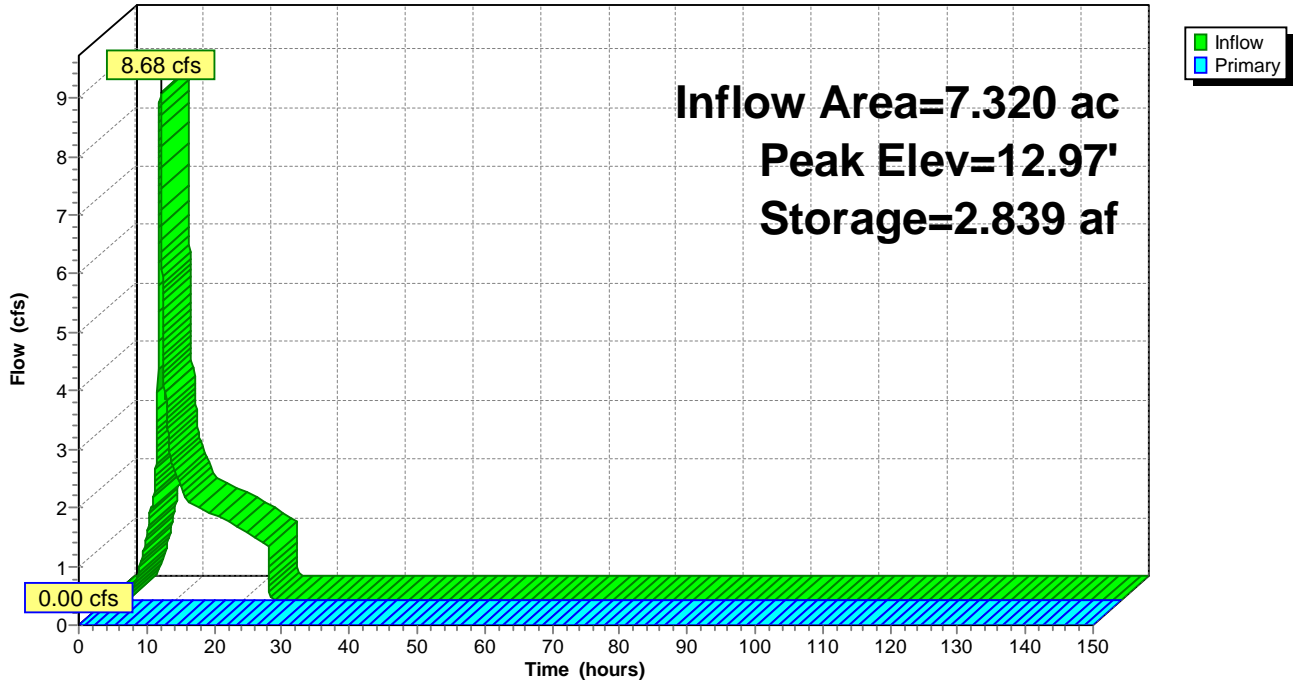
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
11.00	1.290	1,552.0	0.000	0.000	1.290
12.00	1.460	1,164.0	1.374	1.374	3.215
13.00	1.550	1,193.0	1.505	2.879	3.343
14.00	1.640	1,231.0	1.595	4.474	3.514
15.00	1.760	1,333.0	1.700	6.173	3.992

Device	Routing	Invert	Outlet Devices
#1	Primary	14.99'	1,333.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: 1P- NW Pond

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 2P: 2P-NW Pond 2

Inflow Area = 11.600 ac, 9.91% Impervious, Inflow Depth = 1.55" for 100-Yr-2080 event
 Inflow = 4.45 cfs @ 7.98 hrs, Volume= 1.502 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.45' @ 24.45 hrs Surf.Area= 1.123 ac Storage= 1.502 af

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

Volume	Invert	Avail.Storage	Storage Description			
#1	11.00'	3.348 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
11.00	0.930	1,430.0	0.000	0.000	0.930	
12.00	1.085	1,183.0	1.007	1.007	2.109	
13.00	1.170	1,220.0	1.127	2.134	2.274	
14.00	1.260	1,273.0	1.215	3.348	2.517	

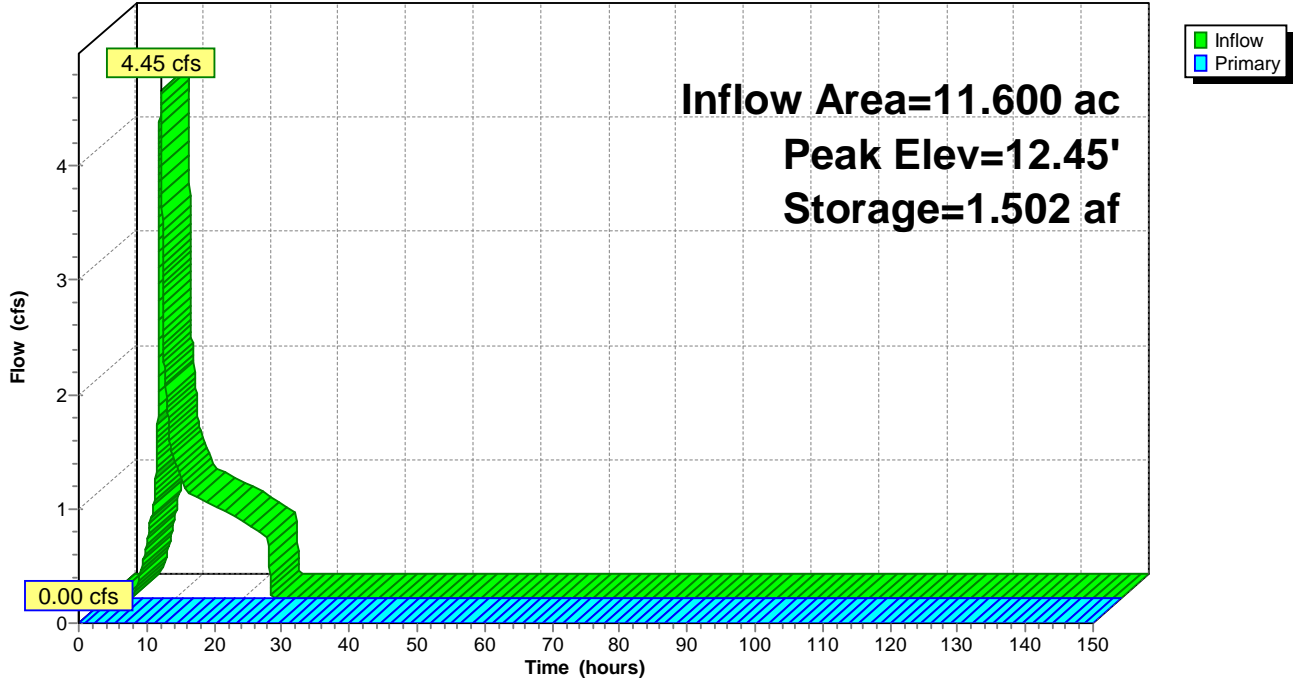
Device	Routing	Invert	Outlet Devices											
#1	Primary	13.99'	1,300.0' long x 4.0' breadth Broad-Crested Rectangular Weir											
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00											
			2.50 3.00 3.50 4.00 4.50 5.00 5.50											
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68											
			2.72 2.73 2.76 2.79 2.88 3.07 3.32											

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)

↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: 2P-NW Pond 2

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 3P: 3P-North Pond

[81] Warning: Exceeded Pond 2P by 3.39' @ 10.10 hrs

[81] Warning: Exceeded Pond 4P by 1.01' @ 10.10 hrs

Inflow Area = 52.590 ac, 2.19% Impervious, Inflow Depth = 2.71" for 100-Yr-2080 event
 Inflow = 16.95 cfs @ 9.38 hrs, Volume= 11.894 af
 Outflow = 16.34 cfs @ 10.10 hrs, Volume= 9.764 af, Atten= 4%, Lag= 43.0 min
 Primary = 16.34 cfs @ 10.10 hrs, Volume= 9.764 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 15.00' @ 10.10 hrs Surf.Area= 1.600 ac Storage= 2.718 af

Plug-Flow detention time= 194.0 min calculated for 9.764 af (82% of inflow)
 Center-of-Mass det. time= 93.1 min (969.4 - 876.3)

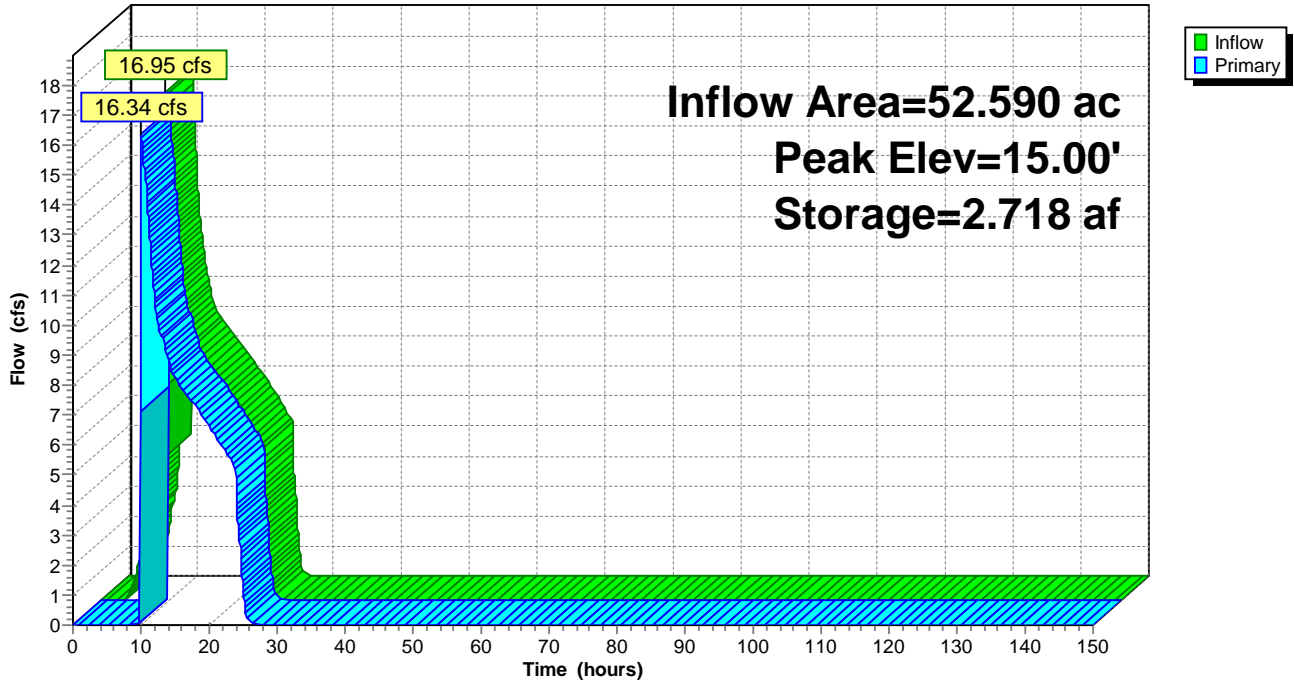
Volume	Invert	Avail.Storage	Storage Description			
#1	12.00'	2.718 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
12.00	0.086	1,508.0	0.000	0.000	0.086	
13.00	0.450	1,395.0	0.244	0.244	0.686	
14.00	1.500	4,156.0	0.924	1.168	28.685	
15.00	1.600	2,946.0	1.550	2.718	44.384	

Device	Routing	Invert	Outlet Devices											
#1	Primary	14.99'	3,000.0' long x 1.0' breadth Broad-Crested Rectangular Weir											
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00											
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32											

Primary OutFlow Max=13.93 cfs @ 10.10 hrs HW=15.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 13.93 cfs @ 0.32 fps)

Pond 3P: 3P-North Pond

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 4P: 4P - West Pond

Inflow Area = 26.590 ac, 0.00% Impervious, Inflow Depth = 4.21" for 100-Yr-2080 event
 Inflow = 19.10 cfs @ 8.56 hrs, Volume= 9.334 af
 Outflow = 12.51 cfs @ 9.39 hrs, Volume= 6.839 af, Atten= 35%, Lag= 49.7 min
 Primary = 12.51 cfs @ 9.39 hrs, Volume= 6.839 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 14.00' @ 9.39 hrs Surf.Area= 3.788 ac Storage= 2.517 af

Plug-Flow detention time= 281.8 min calculated for 6.839 af (73% of inflow)
 Center-of-Mass det. time= 124.4 min (948.7 - 824.3)

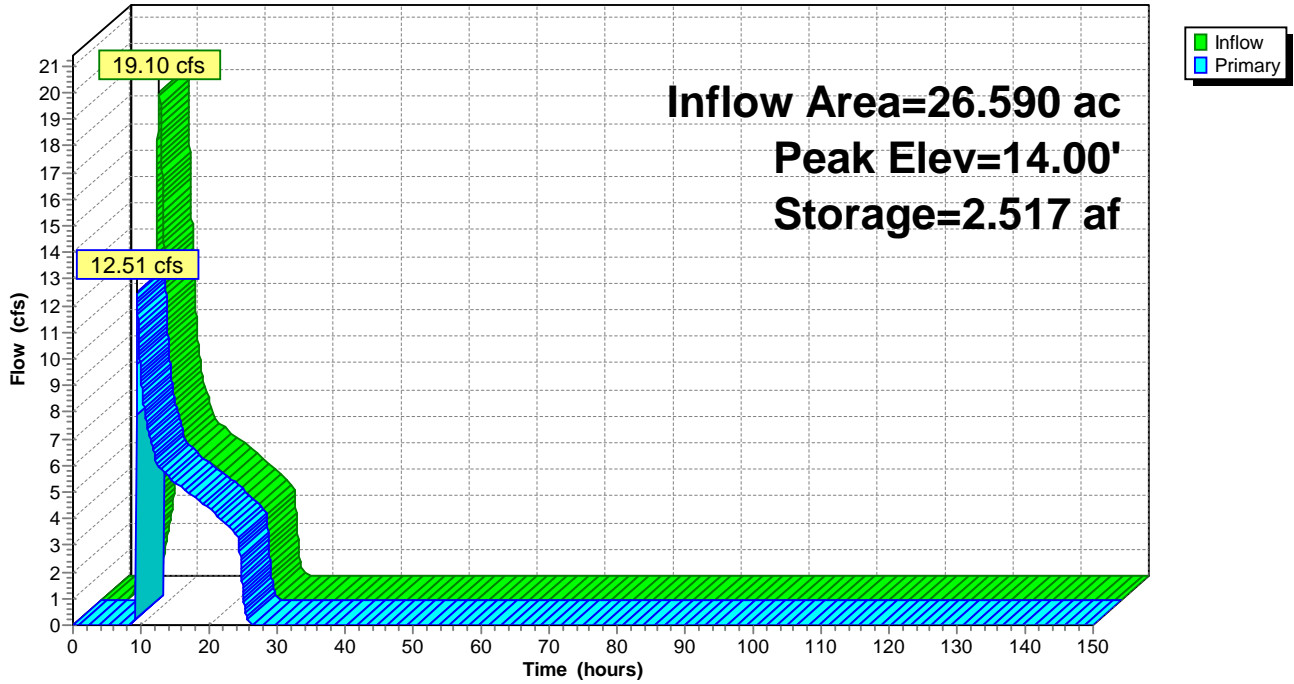
Volume	Invert	Avail.Storage	Storage Description			
#1	13.00'	2.532 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
13.00	1.450	2,862.0	0.000	0.000	1.450	
14.00	3.800	7,496.0	2.532	2.532	89.137	

Device	Routing	Invert	Outlet Devices					
#1	Primary	13.99'	7,496.0' long x 0.5' breadth Broad-Crested Rectangular Weir					
			Head (feet) 0.20 0.40 0.60 0.80 1.00					
			Coef. (English) 2.80 2.92 3.08 3.30 3.32					

Primary OutFlow Max=9.65 cfs @ 9.39 hrs HW=14.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 9.65 cfs @ 0.22 fps)

Pond 4P: 4P - West Pond

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 5P: 5P - West Pond

[81] Warning: Exceeded Pond 7P by 0.56' @ 8.16 hrs

Inflow Area = 79.800 ac, 0.64% Impervious, Inflow Depth = 4.01" for 100-Yr-2080 event
 Inflow = 38.16 cfs @ 9.81 hrs, Volume= 26.695 af
 Outflow = 21.91 cfs @ 12.58 hrs, Volume= 24.858 af, Atten= 43%, Lag= 166.3 min
 Primary = 21.91 cfs @ 12.58 hrs, Volume= 24.858 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 15.01' @ 12.58 hrs Surf.Area= 894.880 ac Storage= 4.840 af

Plug-Flow detention time= 165.5 min calculated for 24.856 af (93% of inflow)
 Center-of-Mass det. time= 121.6 min (1,019.6 - 898.0)

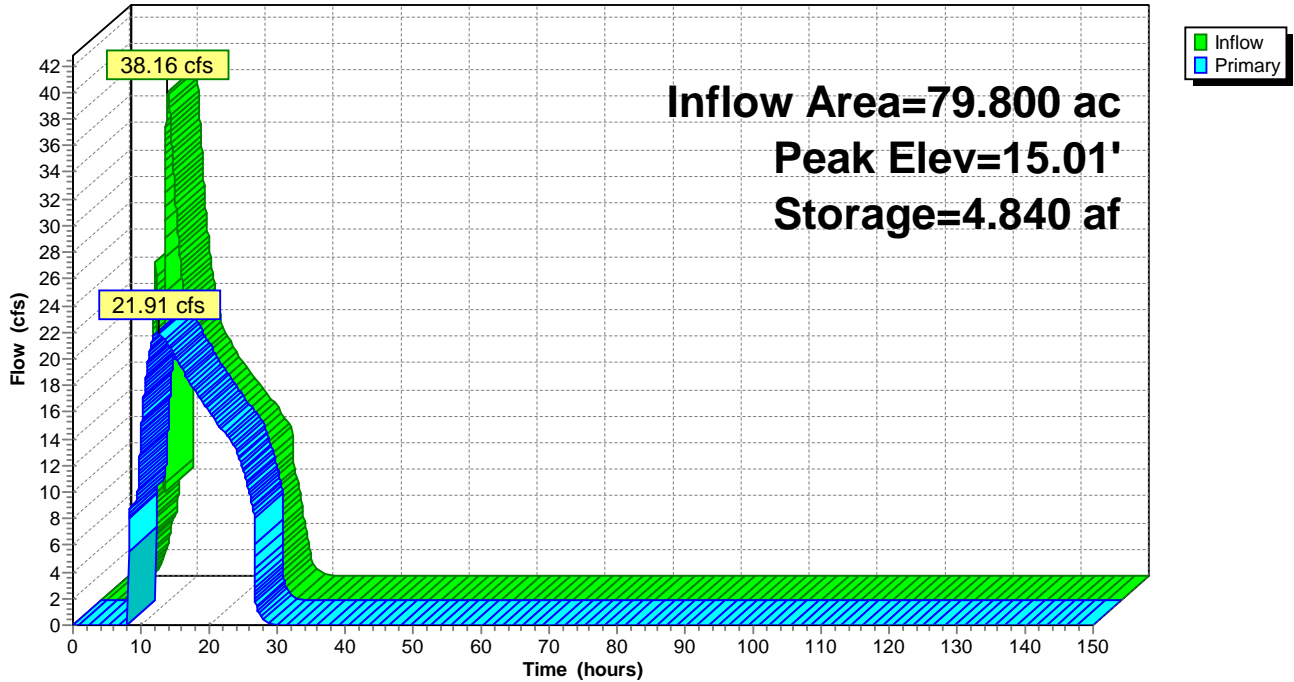
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	5.374 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	1.160	3,026.0	0.000	0.000	1.160	
15.00	2.670	3,968.0	1.863	1.863	13.196	
15.01	999.000	9,999.0	3.511	5.374	167.081	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	3,000.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=21.78 cfs @ 12.58 hrs HW=15.01' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Weir Controls 21.78 cfs @ 0.37 fps)

Pond 5P: 5P - West Pond

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 6P: 6P- West Pond

[81] Warning: Exceeded Pond 5P by 0.01' @ 28.44 hrs

Inflow Area = 101.110 ac, 0.50% Impervious, Inflow Depth = 3.88" for 100-Yr-2080 event
 Inflow = 28.40 cfs @ 11.67 hrs, Volume= 32.729 af
 Outflow = 16.51 cfs @ 23.66 hrs, Volume= 28.946 af, Atten= 42%, Lag= 719.4 min
 Primary = 16.51 cfs @ 23.66 hrs, Volume= 28.946 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 23.66 hrs Surf.Area= 764.249 ac Storage= 4.551 af

Plug-Flow detention time= 411.8 min calculated for 28.946 af (88% of inflow)
 Center-of-Mass det. time= 344.1 min (1,330.5 - 986.4)

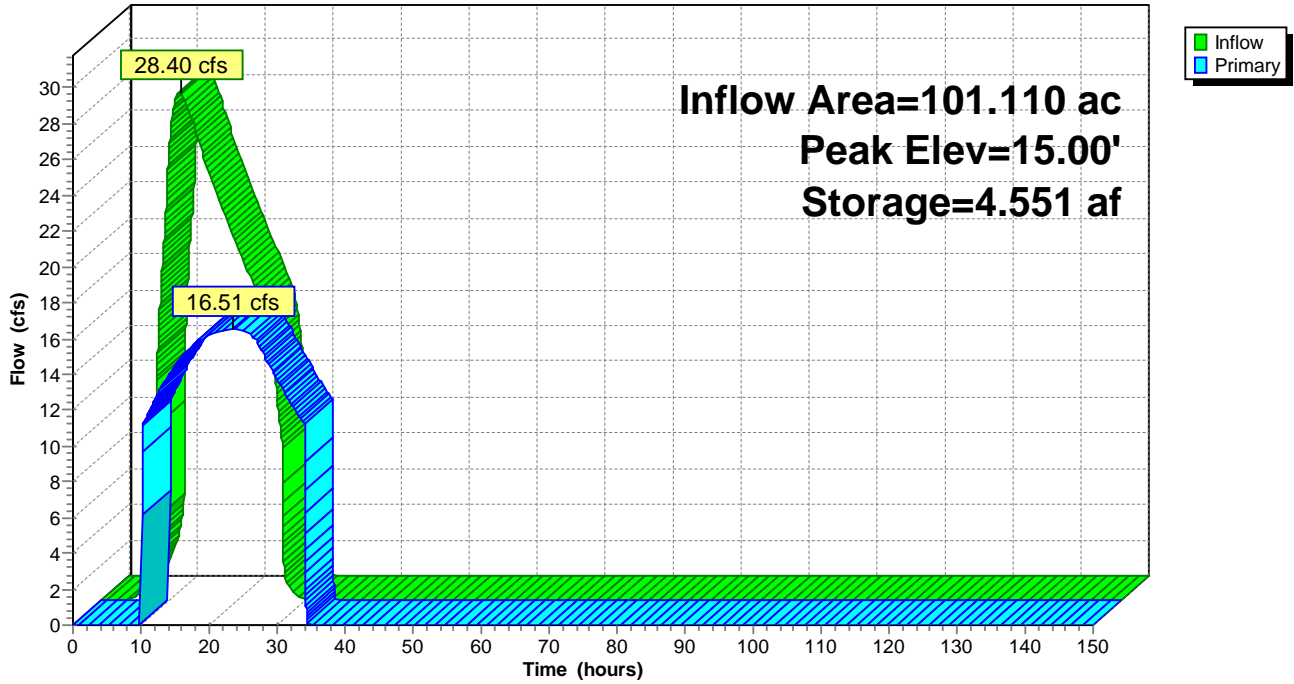
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	37.908 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.930	3,856.0	0.000	0.000	2.930	
15.00	4.810	4,175.0	3.831	3.831	7.611	
15.01	9,999.000	9,999.0	34.077	37.908	158.416	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	4,175.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=15.83 cfs @ 23.66 hrs HW=15.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 15.83 cfs @ 0.30 fps)

Pond 6P: 6P- West Pond

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 7P: 7P-Southwest

Inflow Area = 54.970 ac, 0.93% Impervious, Inflow Depth = 4.65" for 100-Yr-2080 event
 Inflow = 31.00 cfs @ 9.77 hrs, Volume= 21.321 af
 Outflow = 30.85 cfs @ 9.83 hrs, Volume= 17.978 af, Atten= 0%, Lag= 3.9 min
 Primary = 30.85 cfs @ 9.83 hrs, Volume= 17.978 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 15.01' @ 9.83 hrs Surf.Area= 15.326 ac Storage= 3.446 af

Plug-Flow detention time= 174.2 min calculated for 17.977 af (84% of inflow)
 Center-of-Mass det. time= 74.4 min (954.0 - 879.7)

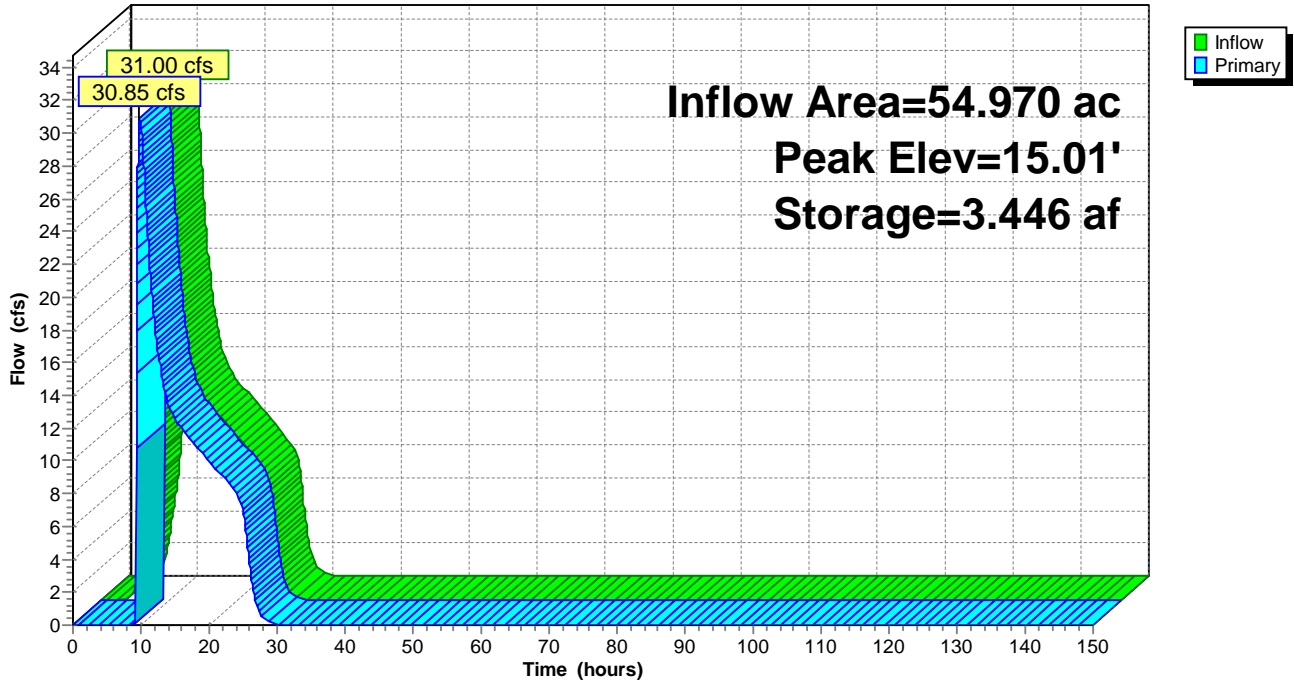
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	39.091 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.340	3,959.0	0.000	0.000	2.340	
15.00	4.560	5,430.0	3.389	3.389	27.571	
15.10	999.000	9,999.0	35.702	39.091	156.355	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	5,430.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=29.56 cfs @ 9.83 hrs HW=15.01' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 29.56 cfs @ 0.34 fps)

Pond 7P: 7P-Southwest

Hydrograph



Existing Conditions_mlc

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Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 8P: 8P

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 4.77" for 100-Yr-2080 event
Inflow = 11.43 cfs @ 9.05 hrs, Volume= 6.498 af
Outflow = 11.43 cfs @ 9.05 hrs, Volume= 6.498 af, Atten= 0%, Lag= 0.0 min
Primary = 11.43 cfs @ 9.05 hrs, Volume= 6.498 af

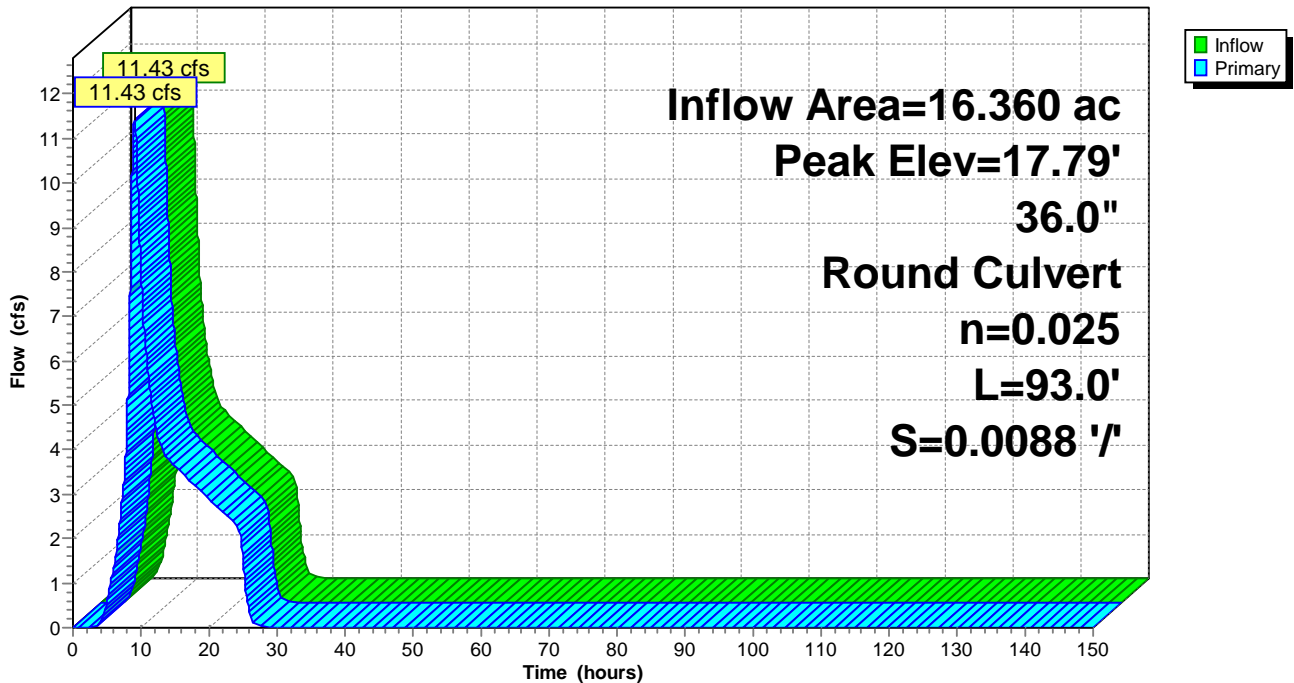
Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Peak Elev= 17.79' @ 9.05 hrs
Flood Elev= 19.00'

Device #1	Routing	Invert	Outlet Devices
	Primary	16.11'	36.0" Round Culvert L= 93.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.11' / 15.29' S= 0.0088 '/ Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=11.43 cfs @ 9.05 hrs HW=17.79' (Free Discharge)
↑ **1=Culvert** (Barrel Controls 11.43 cfs @ 4.07 fps)

Pond 8P: 8P

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 9P: 9P - North

Inflow Area = 75.300 ac, 1.53% Impervious, Inflow Depth = 2.83" for 100-Yr-2080 event
 Inflow = 22.93 cfs @ 10.10 hrs, Volume= 17.736 af
 Outflow = 22.49 cfs @ 10.19 hrs, Volume= 16.327 af, Atten= 2%, Lag= 5.3 min
 Primary = 22.49 cfs @ 10.19 hrs, Volume= 16.327 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 13.00' @ 10.19 hrs Surf.Area= 3.716 ac Storage= 1.445 af

Plug-Flow detention time= 85.5 min calculated for 16.326 af (92% of inflow)
 Center-of-Mass det. time= 40.5 min (931.2 - 890.7)

Volume	Invert	Avail.Storage	Storage Description
#1	12.00'	1.447 af	Custom Stage Data (Irregular) Listed below (Recalc)

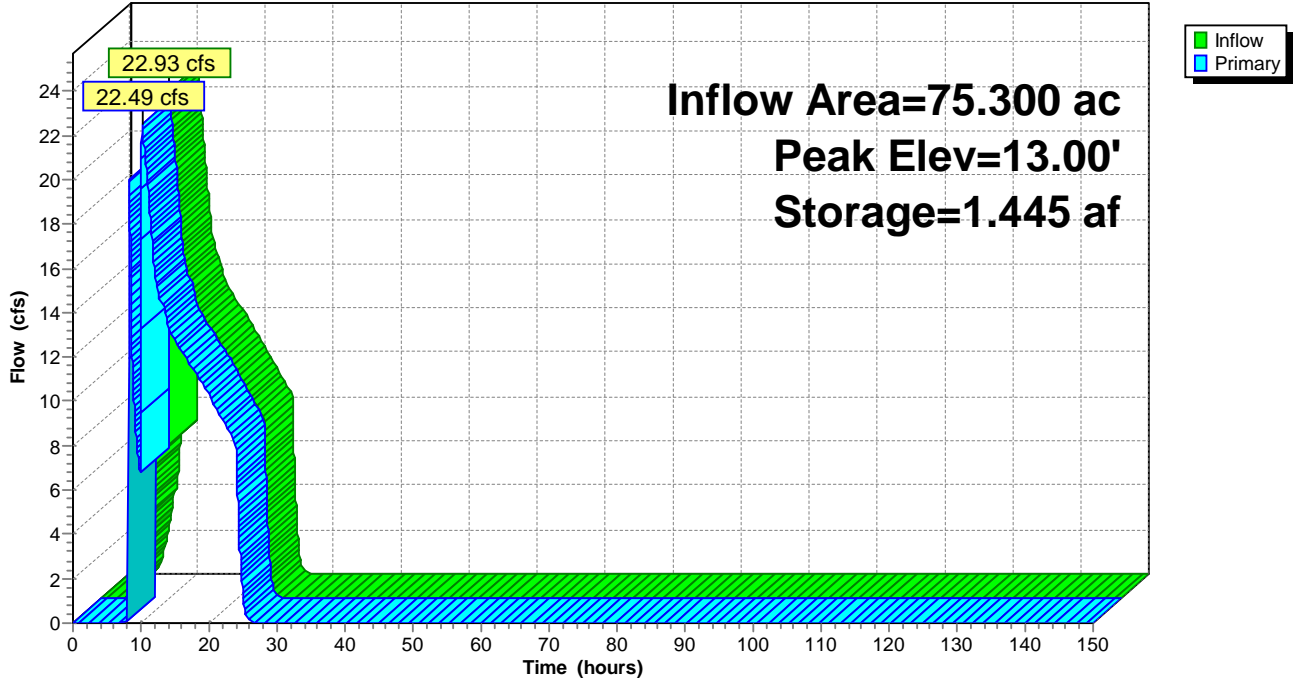
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
12.00	0.079	608.0	0.000	0.000	0.079
13.00	3.720	8,513.0	1.447	1.447	131.797

Device	Routing	Invert	Outlet Devices
#1	Primary	12.99'	8,513.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=21.84 cfs @ 10.19 hrs HW=13.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 21.84 cfs @ 0.27 fps)

Pond 9P: 9P - North

Hydrograph



Existing_Conditions_mlc

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 10P: 10P-Large Central/NE

[93] Warning: Storage range exceeded by 0.01'

[81] Warning: Exceeded Pond 9P by 0.02' @ 19.88 hrs

Inflow Area = 524.500 ac, 1.46% Impervious, Inflow Depth = 3.85" for 100-Yr-2080 event
 Inflow = 133.16 cfs @ 13.57 hrs, Volume= 168.230 af
 Outflow = 113.67 cfs @ 19.88 hrs, Volume= 82.998 af, Atten= 15%, Lag= 378.4 min
 Secondary = 113.67 cfs @ 19.88 hrs, Volume= 82.998 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 13.01' @ 19.88 hrs Surf.Area= 119.000 ac Storage= 98.335 af

Plug-Flow detention time= 688.6 min calculated for 82.992 af (49% of inflow)
 Center-of-Mass det. time= 376.8 min (1,517.4 - 1,140.6)

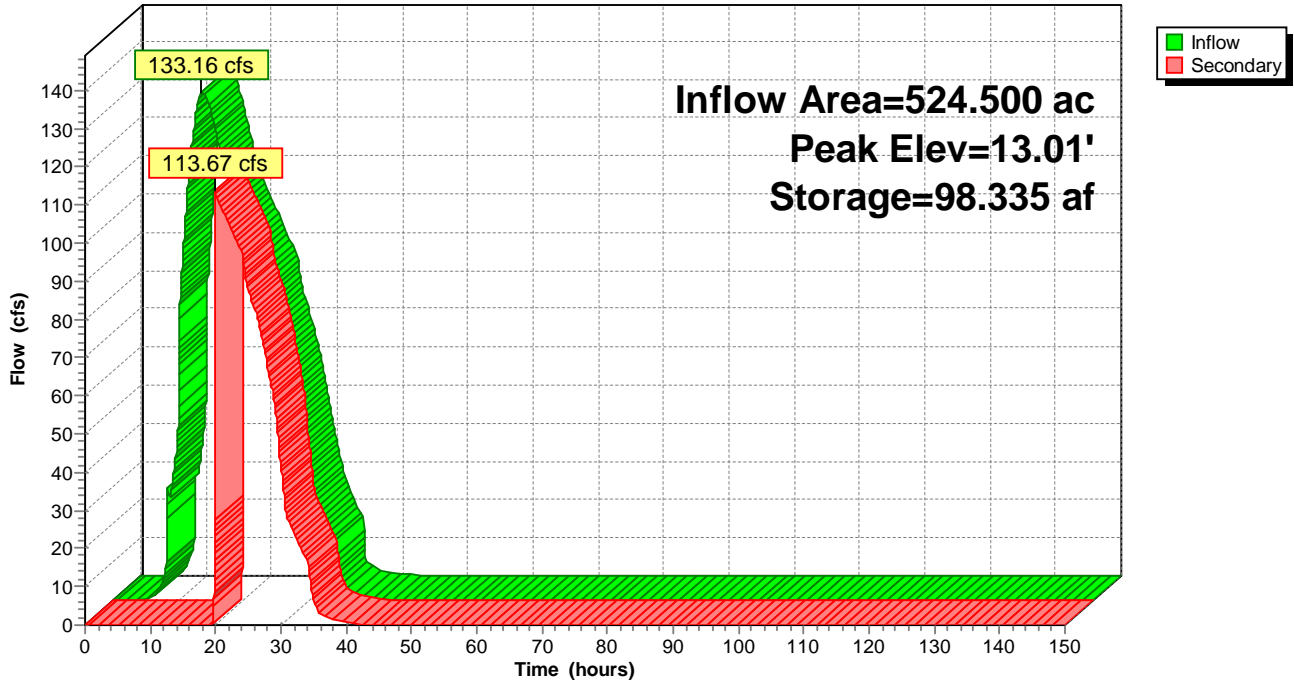
Volume	Invert	Avail.Storage	Storage Description			
#1	10.00'	98.335 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.00	0.280	2,536.0	0.000	0.000	0.280	
11.00	6.414	16,985.0	2.678	2.678	515.559	
12.00	38.875	11,909.0	20.360	23.038	783.495	
13.00	119.000	22,186.0	75.297	98.335	1,423.612	

Device	Routing	Invert	Outlet Devices						
#1	Secondary	12.99'	9,999.0' long x 0.5' breadth Broad-Crested Rectangular Weir						
			Head (feet) 0.20 0.40 0.60 0.80 1.00						
			Coef. (English) 2.80 2.92 3.08 3.30 3.32						

Secondary OutFlow Max=98.39 cfs @ 19.88 hrs HW=13.01' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 98.39 cfs @ 0.43 fps)

Pond 10P: 10P-Large Central/NE

Hydrograph



Existing Conditions_mlc

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 11P: 11P-SE Pond

Inflow Area = 23.330 ac, 0.00% Impervious, Inflow Depth = 1.13" for 100-Yr-2080 event
 Inflow = 1.77 cfs @ 18.46 hrs, Volume= 2.199 af
 Outflow = 1.77 cfs @ 18.47 hrs, Volume= 2.199 af, Atten= 0%, Lag= 0.5 min
 Discarded = 1.77 cfs @ 18.47 hrs, Volume= 2.199 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 13.01' @ 18.47 hrs Surf.Area= 0.238 ac Storage= 0.002 af

Plug-Flow detention time= 0.7 min calculated for 2.199 af (100% of inflow)
 Center-of-Mass det. time= 0.7 min (1,073.9 - 1,073.2)

Volume	Invert	Avail.Storage	Storage Description			
#1	13.00'	3.949 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
13.00	0.230	1,892.0	0.000	0.000	0.230	
14.00	2.940	4,273.0	1.331	1.331	27.046	
15.00	2.310	2,361.0	2.619	3.949	50.218	

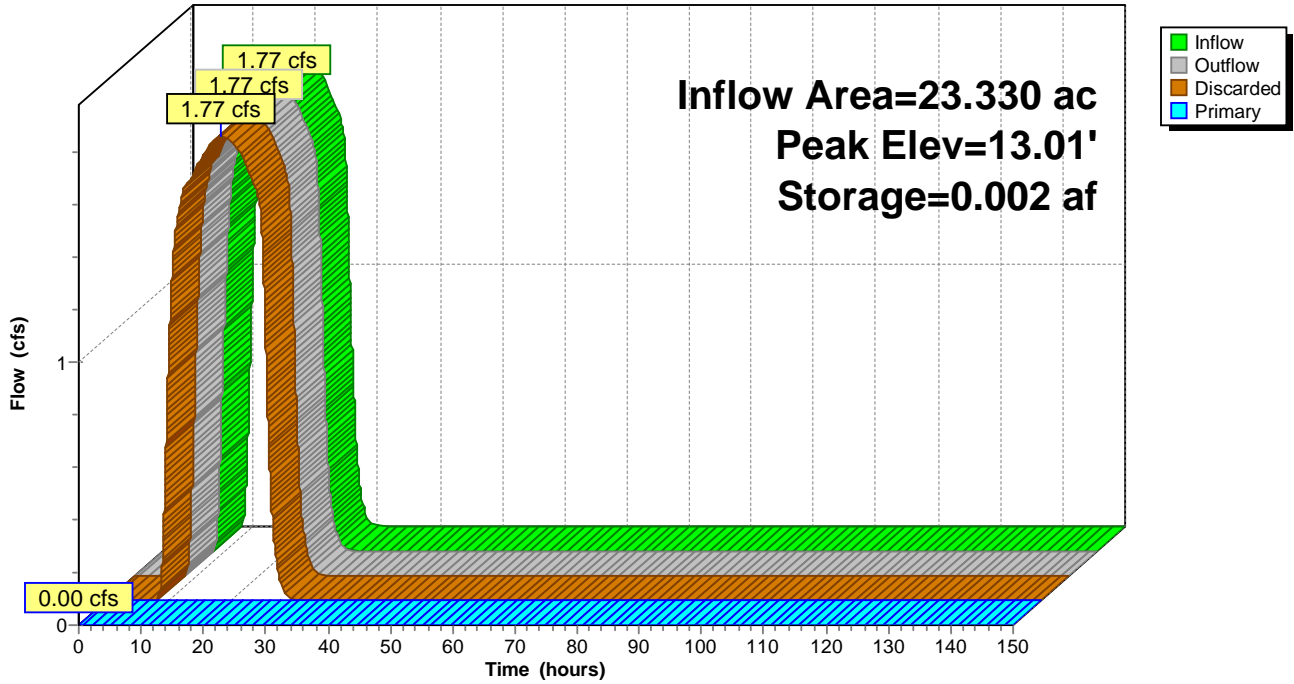
Device	Routing	Invert	Outlet Devices						
#1	Primary	14.99'	2,360.0' long x 0.5' breadth Broad-Crested Rectangular Weir						
			Head (feet) 0.20 0.40 0.60 0.80 1.00						
			Coef. (English) 2.80 2.92 3.08 3.30 3.32						
#2	Discarded	13.00'	19.980 in/hr Exfiltration over Surface area						
			Conductivity to Groundwater Elevation = 1.00'						

Discarded OutFlow Max=4.80 cfs @ 18.47 hrs HW=13.01' (Free Discharge)
 ↑**2=Exfiltration** (Controls 4.80 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=13.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 11P: 11P-SE Pond

Hydrograph



Appendix E Proposed Land Use Conditions

OPTION 1: SMALL FOOTPRINT



WESTPORT GOLF LINKS - LAND-USE/ SITE ANALYSIS

WESTPORT LIGHT STATE PARK, WASHINGTON, USA

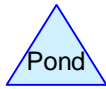
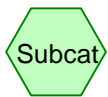
OPTION 2: LARGE FOOTPRINT



WESTPORT GOLF LINKS - LAND-USE/ SITE ANALYSIS

WESTPORT LIGHT STATE PARK, WASHINGTON, USA

Appendix F Proposed Conditions HydroCAD Model



Routing Diagram for Proposed Conditions Option 1
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Proposed Conditions Option 1

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Yr	Type IA 24-hr		Default	24.00	1	3.43	2
2	6-month	Type IA 24-hr		Default	24.00	1	2.50	2
3	10-Yr	Type IA 24-hr		Default	24.00	1	4.00	2
4	25-Yr	Type IA 24-hr		Default	24.00	1	4.50	2
5	50-Yr	Type IA 24-hr		Default	24.00	1	5.00	2
6	100-Yr	Type IA 24-hr		Default	24.00	1	5.50	2
7	100-Yr-2040	Type IA 24-hr		Default	24.00	1	6.43	2
8	100-Yr-2080	Type IA 24-hr		Default	24.00	1	7.32	2

Proposed Conditions Option_1

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.550	30	Brush, Good, HSG A (8S)
89.860	73	Brush, Good, HSG D (1S, 2S, 4S, 5S, 6S, 7S, 10S)
75.300	90	Golf Course (10S)
0.660	98	Paved parking, HSG A (10S)
9.080	98	Paved parking, HSG D (1S, 2S, 7S, 8S, 10S)
2.830	98	Trail (1S, 2S, 4S, 6S, 7S, 10S)
92.400	90	WSDOT - Golf Course (1S, 2S, 4S, 5S, 6S, 7S, 8S)
21.230	68	WSDOT - Golf Course (11S)
14.800	32	Woods/grass comb., Good, HSG A (10S, 11S)
234.140	79	Woods/grass comb., Good, HSG D (2S, 5S, 6S, 7S, 8S, 10S)
540.850	80	TOTAL AREA

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
16.010	HSG A	8S, 10S, 11S
0.000	HSG B	
0.000	HSG C	
333.080	HSG D	1S, 2S, 4S, 5S, 6S, 7S, 8S, 10S
191.760	Other	1S, 2S, 4S, 5S, 6S, 7S, 8S, 10S, 11S
540.850		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.550	0.000	0.000	89.860	0.000	90.410	Brush, Good	1S, 2S, 4S, 5S, 6S, 7S, 8S, 10S
0.000	0.000	0.000	0.000	75.300	75.300	Golf Course	10S
0.660	0.000	0.000	9.080	0.000	9.740	Paved parking	1S, 2S, 7S, 8S, 10S
0.000	0.000	0.000	0.000	2.830	2.830	Trail	1S, 2S, 4S, 6S, 7S, 10S
0.000	0.000	0.000	0.000	113.630	113.630	WSDOT - Golf Course	1S, 2S, 4S, 5S, 6S, 7S, 8S, 11S
14.800	0.000	0.000	234.140	0.000	248.940	Woods/grass comb., Good	2S, 5S, 6S, 7S, 8S, 10S, 11S
16.010	0.000	0.000	333.080	191.760	540.850	TOTAL AREA	

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	8P	16.11	15.29	93.0	0.0088	0.025	0.0	36.0	0.0

Proposed Conditions Option_1

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Time span=0.00-150.00 hrs, dt=0.01 hrs, 15001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S-NW Catchment	Runoff Area=7.320 ac 19.67% Impervious Runoff Depth=1.88" Flow Length=292' Slope=0.0200 '/' Tc=4.9 min CN=84 Runoff=3.36 cfs 1.145 af
Subcatchment 2S: 2S-NW Catchment 2	Runoff Area=41.380 ac 2.39% Impervious Runoff Depth=2.12" Flow Length=2,271' Tc=122.9 min CN=87 Runoff=10.95 cfs 7.309 af
Subcatchment 4S: 4S - West Catchment	Runoff Area=26.590 ac 0.83% Impervious Runoff Depth=1.72" Flow Length=998' Tc=38.6 min CN=82 Runoff=8.47 cfs 3.822 af
Subcatchment 5S: 5S - West Catchment	Runoff Area=24.830 ac 0.00% Impervious Runoff Depth=1.58" Flow Length=660' Tc=11.1 min CN=80 Runoff=8.85 cfs 3.271 af
Subcatchment 6S: 6S - West Catchment	Runoff Area=21.310 ac 1.08% Impervious Runoff Depth=1.31" Flow Length=1,162' Slope=0.0017 '/' Tc=127.5 min CN=76 Runoff=2.79 cfs 2.335 af
Subcatchment 7S: 7S - Southwest	Runoff Area=54.970 ac 1.29% Impervious Runoff Depth=1.72" Flow Length=1,700' Tc=140.5 min CN=82 Runoff=10.36 cfs 7.902 af
Subcatchment 8S: 8S - South Catchment	Runoff Area=16.360 ac 4.95% Impervious Runoff Depth=2.12" Flow Length=1,480' Tc=45.3 min CN=87 Runoff=6.56 cfs 2.890 af
Subcatchment 10S: 10S - Large Central / NE	Runoff Area=324.770 ac 2.52% Impervious Runoff Depth=1.58" Flow Length=2,575' Slope=0.0019 '/' Tc=393.8 min CN=80 Runoff=34.06 cfs 42.789 af
Subcatchment 11S: 11S - SE	Runoff Area=23.320 ac 0.00% Impervious Runoff Depth=0.72" Flow Length=1,924' Tc=49.7 min CN=65 Runoff=1.31 cfs 1.391 af
Reach 8R: South Ditch	Avg. Flow Depth=0.86' Max Vel=1.60 fps Inflow=6.56 cfs 2.890 af n=0.022 L=579.0' S=0.0012 '/' Capacity=2.94 cfs Outflow=6.44 cfs 2.890 af
Pond 1P: 1P- NW Pond	Peak Elev=11.84' Storage=1.145 af Inflow=3.36 cfs 1.145 af Outflow=0.00 cfs 0.000 af
Pond 5P: 5P - West Pond	Peak Elev=15.00' Storage=1.862 af Inflow=15.21 cfs 11.652 af Outflow=10.23 cfs 9.815 af
Pond 6P: 6P- West Pond	Peak Elev=15.01' Storage=4.233 af Inflow=11.93 cfs 12.150 af Outflow=9.79 cfs 8.367 af
Pond 7P: 7P-Southwest	Peak Elev=14.99' Storage=3.361 af Inflow=10.36 cfs 7.902 af Outflow=5.72 cfs 4.558 af
Pond 8P: 8P	Peak Elev=17.35' Inflow=6.56 cfs 2.890 af Primary=6.56 cfs 2.890 af Secondary=0.00 cfs 0.000 af Outflow=6.56 cfs 2.890 af
Pond 10P: 10P-Large Central/NE	Peak Elev=12.62' Storage=59.848 af Inflow=46.18 cfs 59.855 af Outflow=0.00 cfs 0.000 af

Proposed_Conditions_Option_1

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Total Runoff Area = 540.850 ac Runoff Volume = 72.853 af Average Runoff Depth = 1.62"
97.68% Pervious = 528.280 ac 2.32% Impervious = 12.570 ac

Proposed Conditions Option_1

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 1S: 1S-NW Catchment

Runoff = 3.36 cfs @ 7.95 hrs, Volume= 1.145 af, Depth= 1.88"

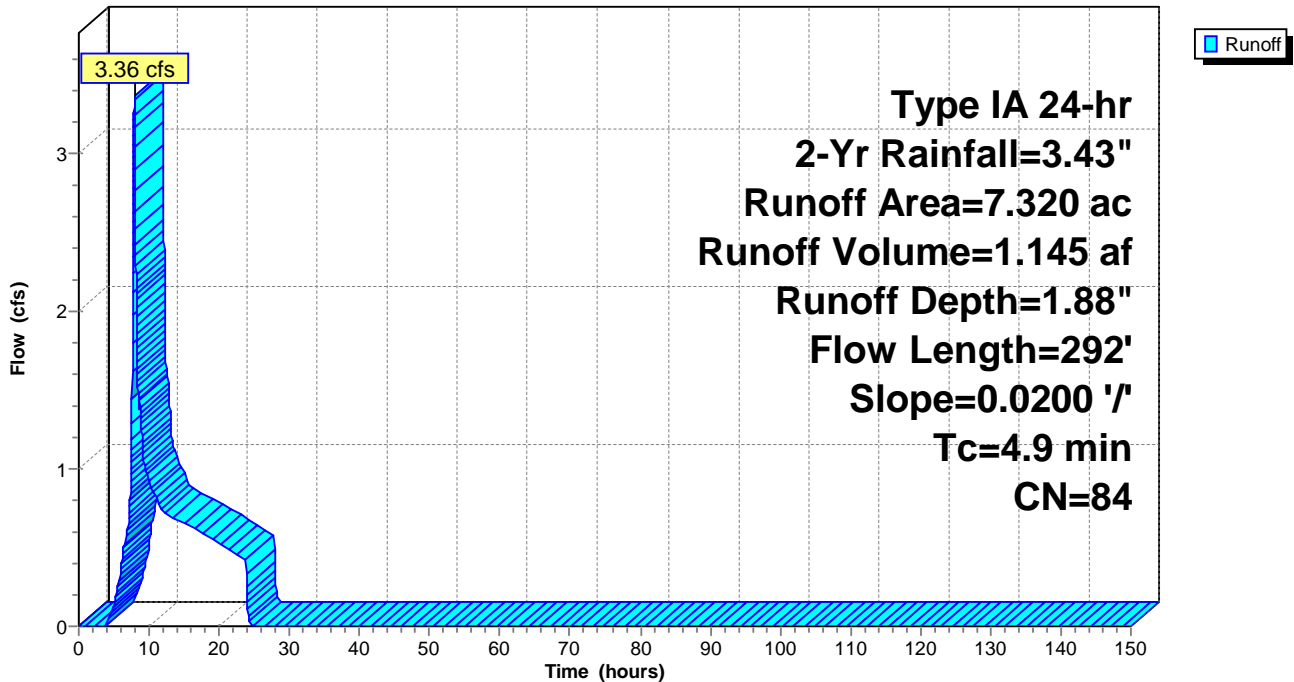
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
3.470	73	Brush, Good, HSG D
1.210	98	Paved parking, HSG D
* 2.410	90	WSDOT - Golf Course
* 0.230	98	Trail
7.320	84	Weighted Average
5.880	80	80.33% Pervious Area
1.440	98	19.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	292	0.0200	0.99		Shallow Concentrated Flow, Shallow - Golf Course Short Grass Pasture Kv= 7.0 fps

Subcatchment 1S: 1S-NW Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 2S: 2S-NW Catchment 2

Sheet flow - dense comes from "native grasses" considered dense. Characterized by the wetland report.

Runoff = 10.95 cfs @ 9.56 hrs, Volume= 7.309 af, Depth= 2.12"

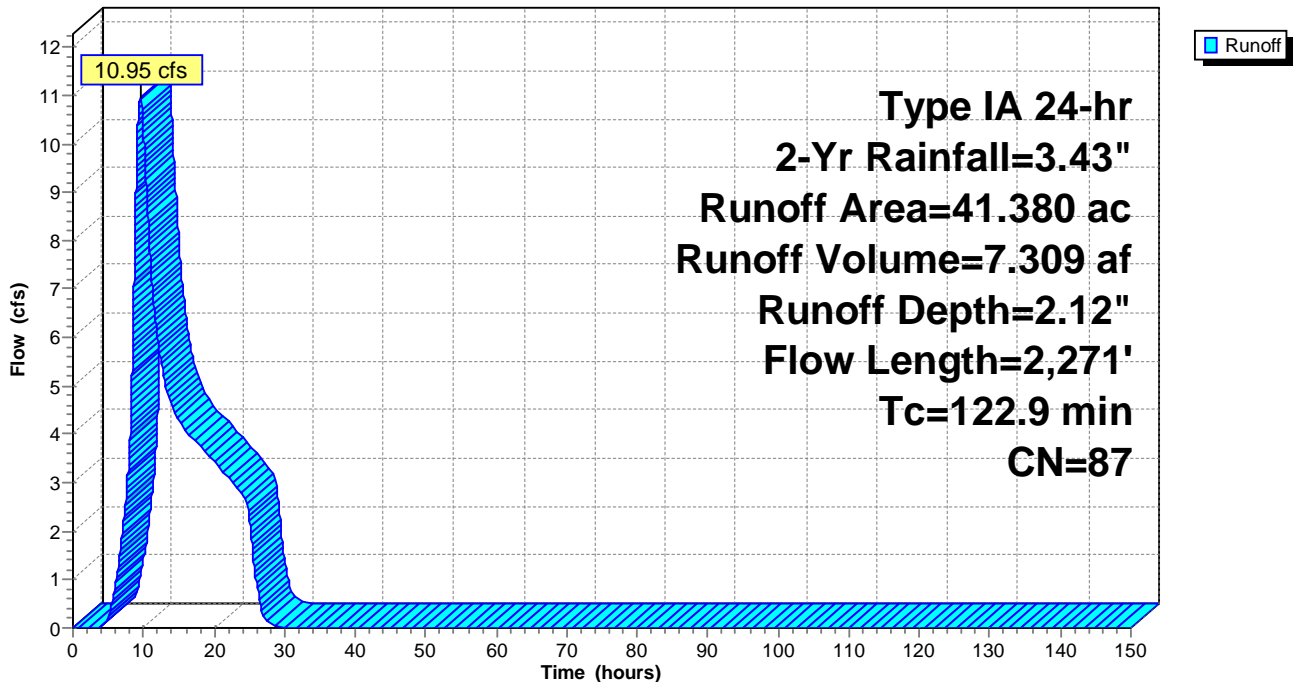
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
8.350	73	Brush, Good, HSG D
0.830	98	Paved parking, HSG D
* 0.160	98	Trail
* 31.710	90	WSDOT - Golf Course
0.330	79	Woods/grass comb., Good, HSG D
41.380	87	Weighted Average
40.390	86	97.61% Pervious Area
0.990	98	2.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	95	0.0950	0.22		Sheet Flow, Sheet - Dense, Native Grasses
					Grass: Dense n= 0.240 P2= 3.43"
115.8	2,176	0.0020	0.31		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
122.9	2,271	Total			

Subcatchment 2S: 2S-NW Catchment 2

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 4S: 4S - West Catchment

Runoff = 8.47 cfs @ 8.36 hrs, Volume= 3.822 af, Depth= 1.72"

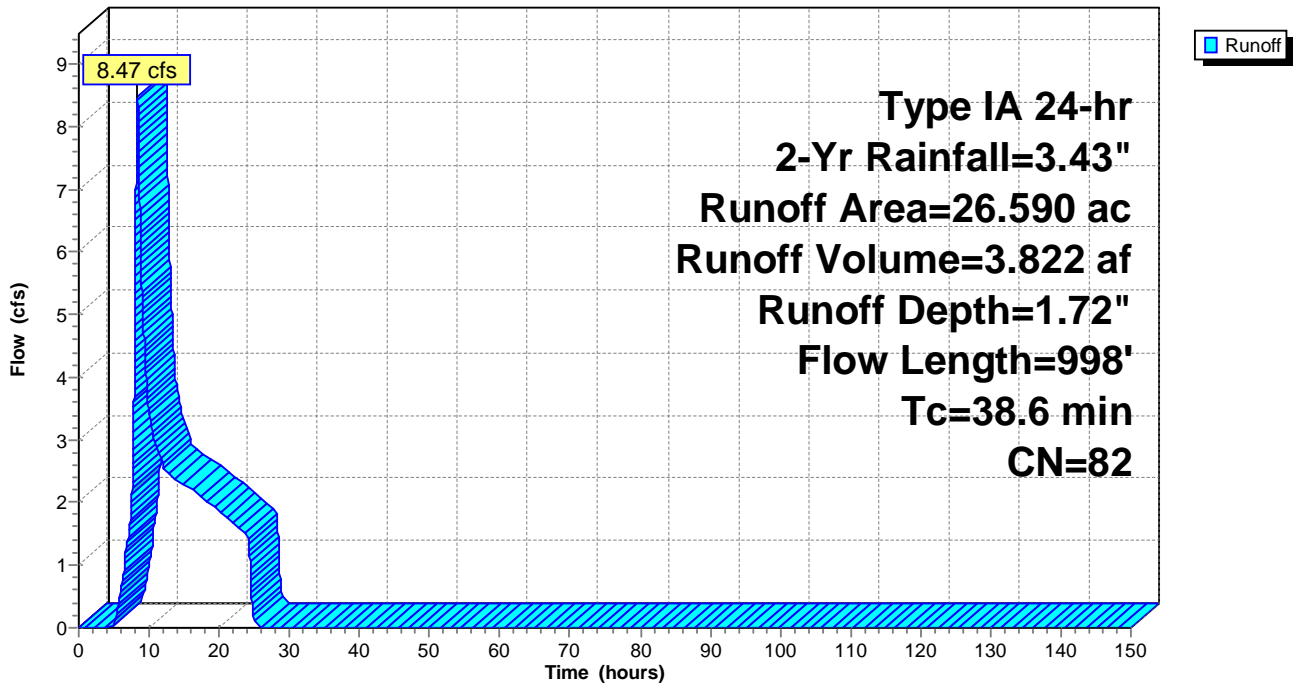
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
13.100	73	Brush, Good, HSG D
* 0.220	98	Trail
* 13.270	90	WSDOT - Golf Course
26.590	82	Weighted Average
26.370	82	99.17% Pervious Area
0.220	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	135	0.0800	1.98		Shallow Concentrated Flow, Shallow - Forest
37.5	863	0.0030	0.38		Short Grass Pasture Kv= 7.0 fps Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
38.6	998	Total			

Subcatchment 4S: 4S - West Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 5S: 5S - West Catchment

Runoff = 8.85 cfs @ 8.03 hrs, Volume= 3.271 af, Depth= 1.58"

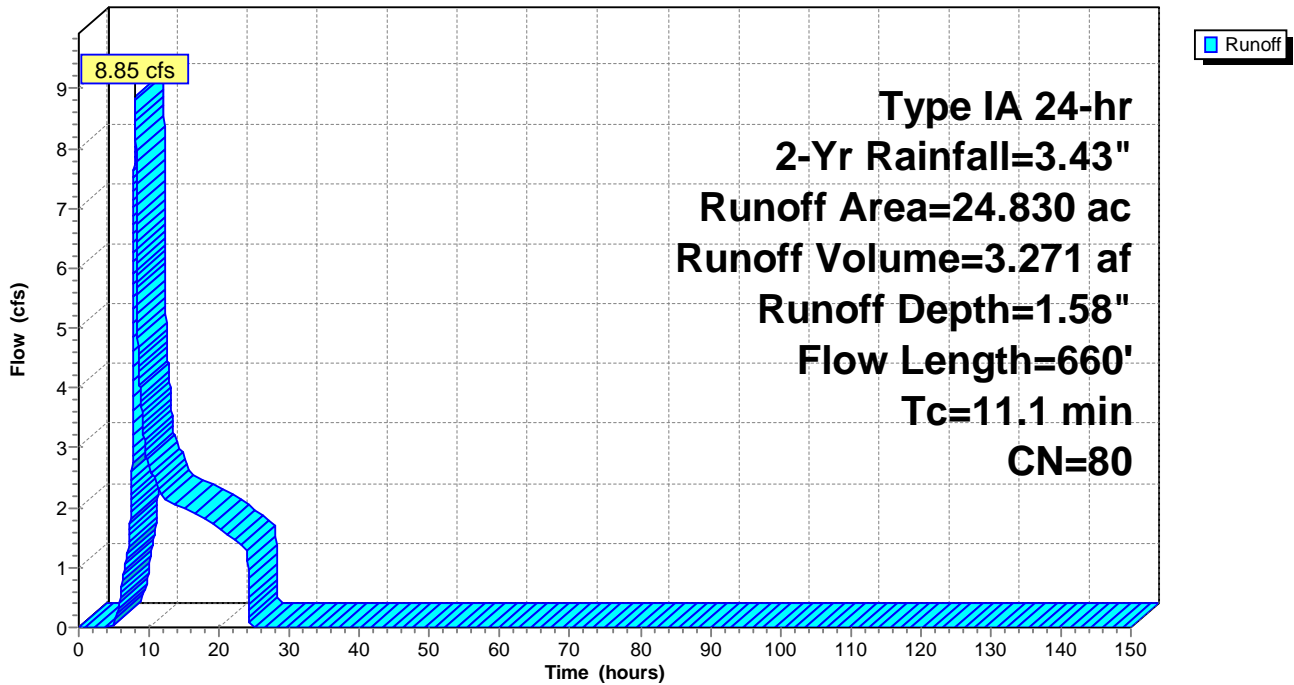
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
13.850	73	Brush, Good, HSG D
0.500	79	Woods/grass comb., Good, HSG D
* 10.480	90	WSDOT - Golf Course
24.830	80	Weighted Average
24.830	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	608	0.0180	0.94		Shallow Concentrated Flow, Shallow - Grass
					Short Grass Pasture Kv= 7.0 fps
0.3	52	0.1300	2.64		Sheet Flow, Path
					Smooth surfaces n= 0.011 P2= 3.43"
11.1	660	Total			

Subcatchment 5S: 5S - West Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 6S: 6S - West Catchment

Runoff = 2.79 cfs @ 9.78 hrs, Volume= 2.335 af, Depth= 1.31"

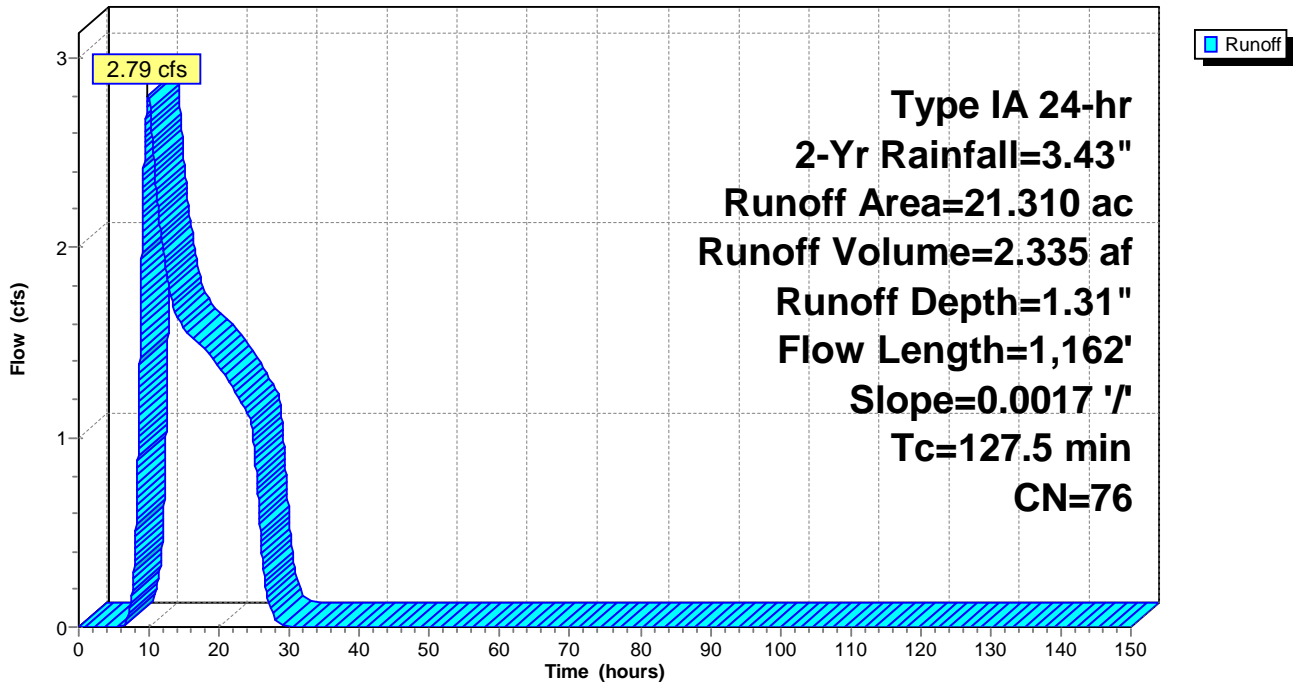
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
8.040	79	Woods/grass comb., Good, HSG D
12.070	73	Brush, Good, HSG D
* 0.970	90	WSDOT - Golf Course
* 0.230	98	Trail
21.310	76	Weighted Average
21.080	76	98.92% Pervious Area
0.230	98	1.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.6	581	0.0017	0.29		Shallow Concentrated Flow, Grass - Shallow Short Grass Pasture Kv= 7.0 fps
93.9	581	0.0017	0.10		Shallow Concentrated Flow, Forested - Shallow Forest w/Heavy Litter Kv= 2.5 fps
127.5	1,162	Total			

Subcatchment 6S: 6S - West Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 7S: 7S - Southwest

Runoff = 10.36 cfs @ 9.84 hrs, Volume= 7.902 af, Depth= 1.72"

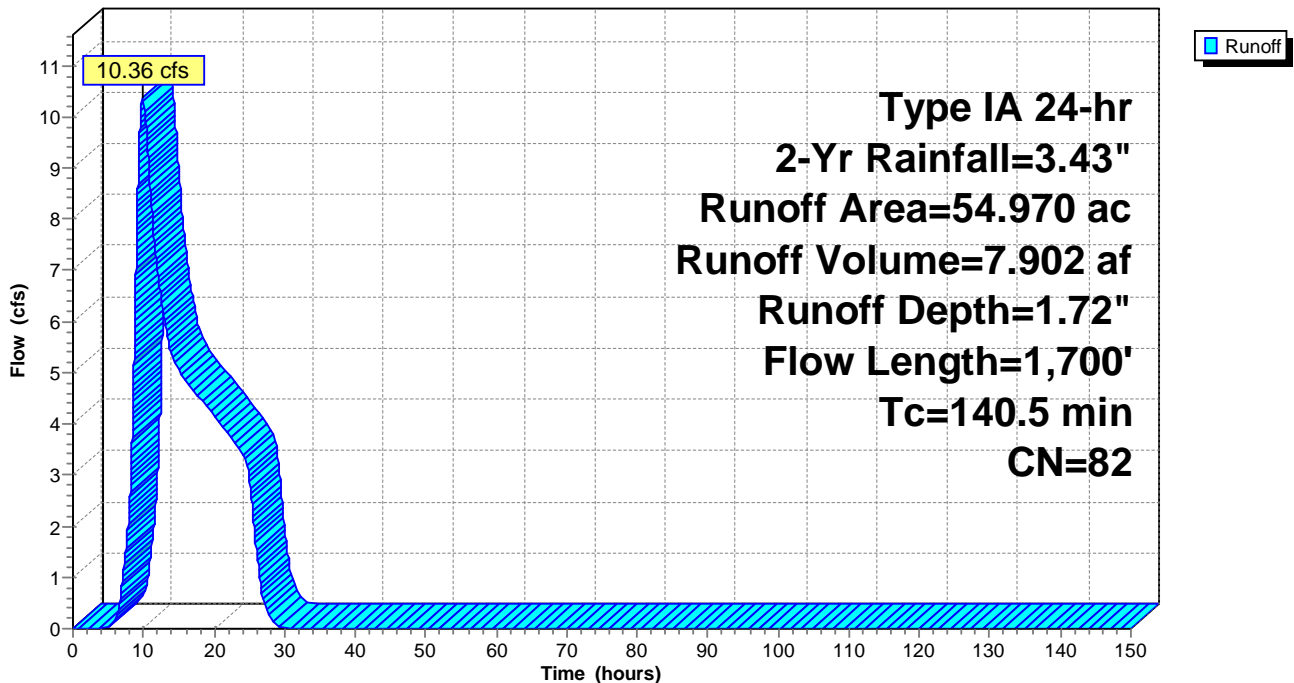
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
8.710	73	Brush, Good, HSG D
25.200	79	Woods/grass comb., Good, HSG D
0.520	98	Paved parking, HSG D
* 0.190	98	Trail
* 20.350	90	WSDOT - Golf Course
54.970	82	Weighted Average
54.260	82	98.71% Pervious Area
0.710	98	1.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	70	0.1000	0.31		Sheet Flow, Sheet - Turf Grass: Short n= 0.150 P2= 3.43"
9.3	775	0.0390	1.38		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
127.5	855	0.0020	0.11		Shallow Concentrated Flow, Shallow - Forest Forest w/Heavy Litter Kv= 2.5 fps
140.5	1,700	Total			

Subcatchment 7S: 7S - Southwest

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 8S: 8S - South Catchment

Runoff = 6.56 cfs @ 8.41 hrs, Volume= 2.890 af, Depth= 2.12"

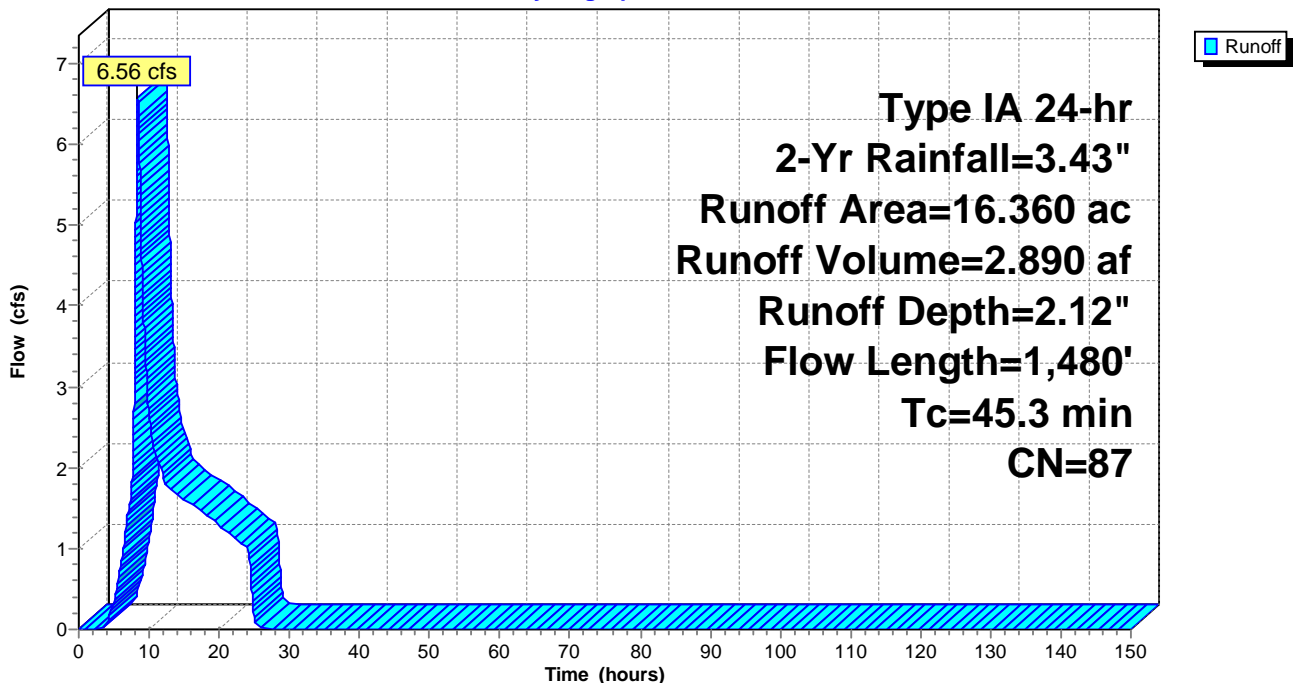
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
1.790	79	Woods/grass comb., Good, HSG D
0.550	30	Brush, Good, HSG A
0.810	98	Paved parking, HSG D
* 13.210	90	WSDOT - Golf Course
16.360	87	Weighted Average
15.550	87	95.05% Pervious Area
0.810	98	4.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	89	0.0560	0.26		Sheet Flow, Sheet- Dune grass Grass: Short n= 0.150 P2= 3.43"
24.0	844	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
15.6	547	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
45.3	1,480	Total			

Subcatchment 8S: 8S - South Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 10S: 10S - Large Central / NE

Runoff = 34.06 cfs @ 14.44 hrs, Volume= 42.789 af, Depth= 1.58"

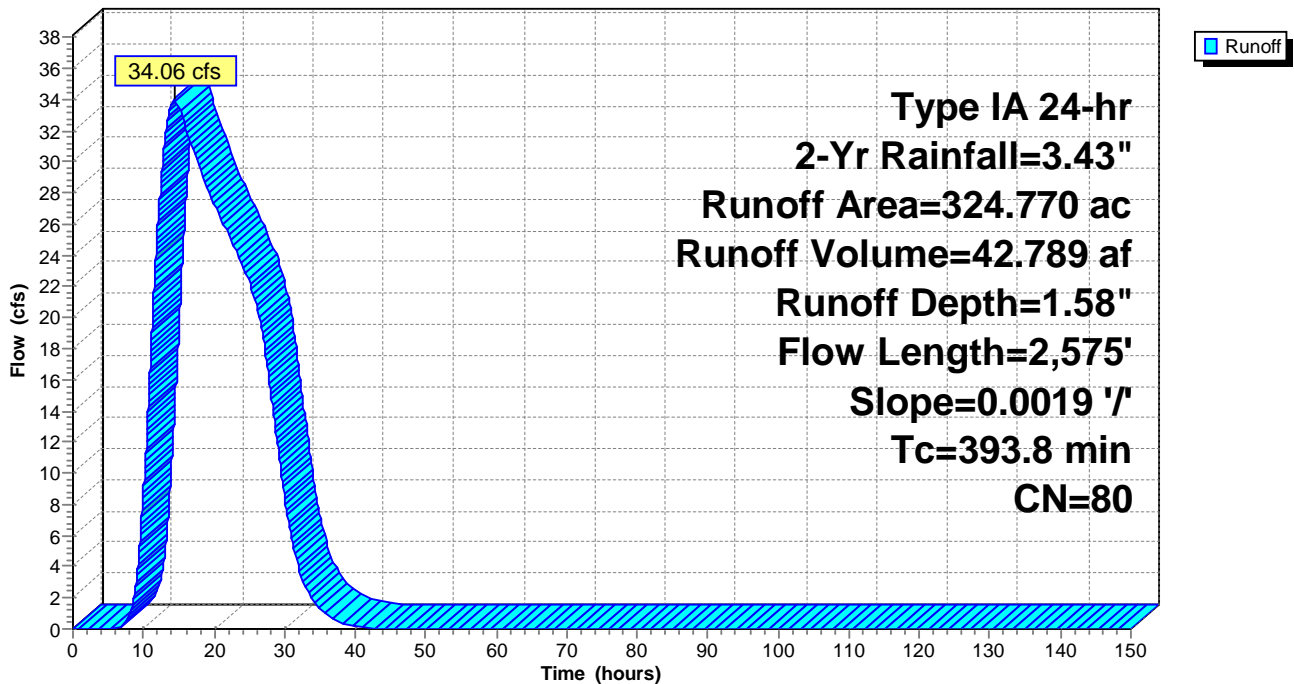
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
198.280	79	Woods/grass comb., Good, HSG D
12.710	32	Woods/grass comb., Good, HSG A
0.660	98	Paved parking, HSG A
5.710	98	Paved parking, HSG D
30.310	73	Brush, Good, HSG D
* 1.800	98	Trail
* 75.300	90	Golf Course
324.770	80	Weighted Average
316.600	79	97.48% Pervious Area
8.170	98	2.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
393.8	2,575	0.0019	0.11		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps

Subcatchment 10S: 10S - Large Central / NE

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Subcatchment 11S: 11S - SE

Runoff = 1.31 cfs @ 8.89 hrs, Volume= 1.391 af, Depth= 0.72"

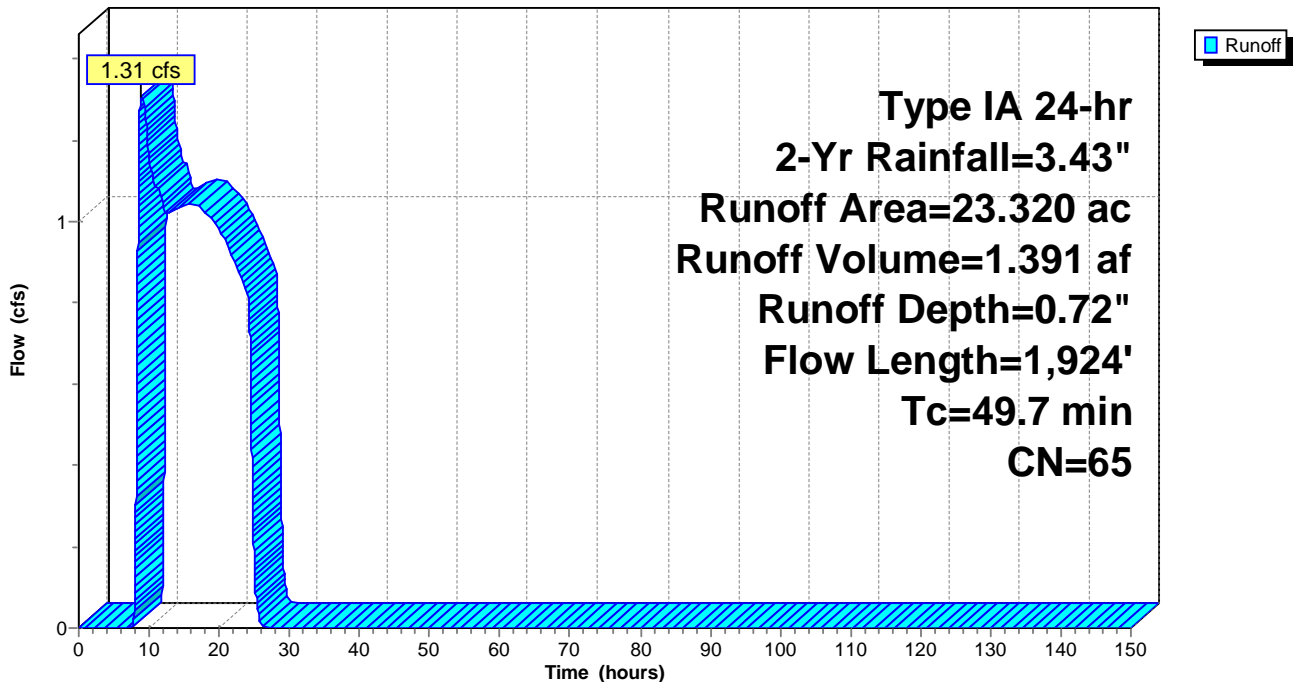
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-Yr Rainfall=3.43"

Area (ac)	CN	Description
2.090	32	Woods/grass comb., Good, HSG A
* 21.230	68	WSDOT - Golf Course
23.320	65	Weighted Average
23.320	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	126	0.1800	0.30		Sheet Flow, Sheet-Dune Grass
					Grass: Dense n= 0.240 P2= 3.43"
42.8	1,798	0.0100	0.70		Shallow Concentrated Flow, Shallow - Grass
					Short Grass Pasture Kv= 7.0 fps
49.7	1,924	Total			

Subcatchment 11S: 11S - SE

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Reach 8R: South Ditch

[91] Warning: Storage range exceeded by 0.36'

[55] Hint: Peak inflow is 223% of Manning's capacity

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 0.75'

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 2.12" for 2-Yr event
Inflow = 6.56 cfs @ 8.41 hrs, Volume= 2.890 af
Outflow = 6.44 cfs @ 8.61 hrs, Volume= 2.890 af, Atten= 2%, Lag= 12.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs

Max. Velocity= 1.60 fps, Min. Travel Time= 6.0 min

Avg. Velocity = 0.61 fps, Avg. Travel Time= 15.8 min

Peak Storage= 2,332 cf @ 8.51 hrs

Average Depth at Peak Storage= 0.86', Surface Width= 5.71'

Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 2.94 cfs

4.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 1.0 '/' Top Width= 5.00'

Length= 579.0' Slope= 0.0012 '/'

Inlet Invert= 16.00', Outlet Invert= 15.30'



Proposed Conditions Option_1

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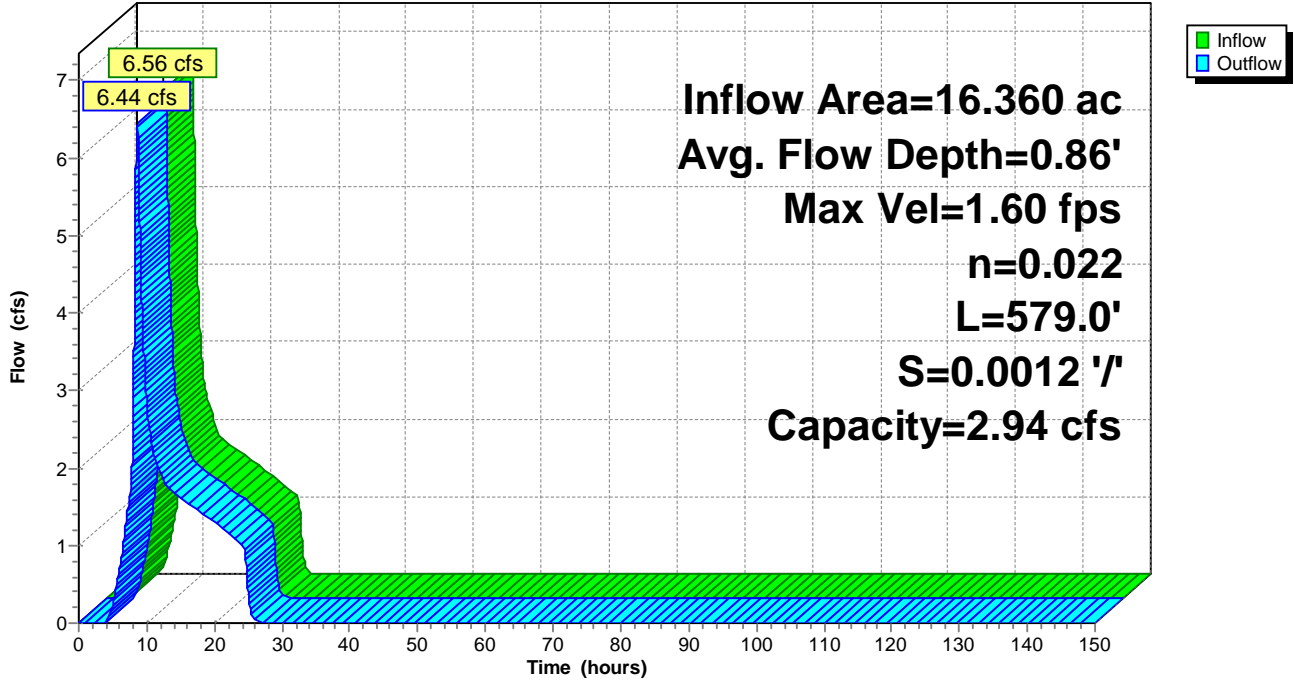
Type IA 24-hr 2-Yr Rainfall=3.43"

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Reach 8R: South Ditch

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Pond 1P: 1P- NW Pond

Inflow Area = 7.320 ac, 19.67% Impervious, Inflow Depth = 1.88" for 2-Yr event
 Inflow = 3.36 cfs @ 7.95 hrs, Volume= 1.145 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 11.84' @ 24.29 hrs Surf.Area= 1.432 ac Storage= 1.145 af

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

Volume	Invert	Avail.Storage	Storage Description
#1	11.00'	6.173 af	Custom Stage Data (Irregular) Listed below (Recalc)

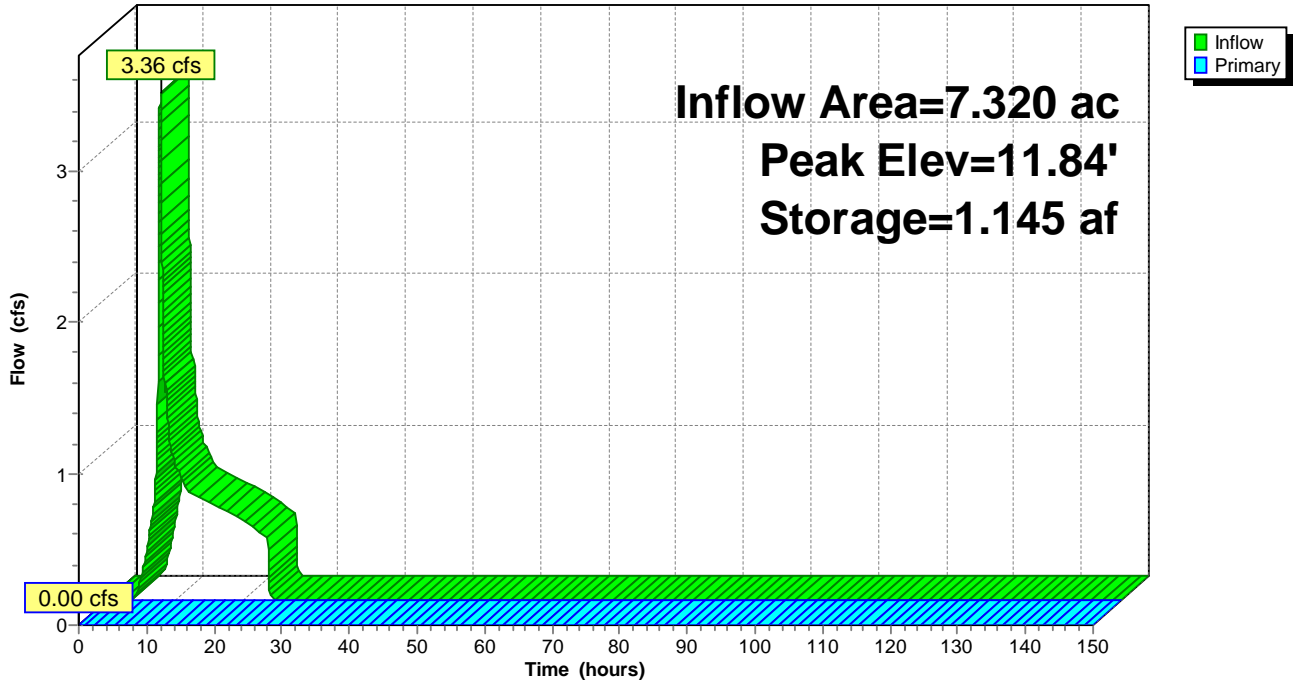
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
11.00	1.290	1,552.0	0.000	0.000	1.290
12.00	1.460	1,164.0	1.374	1.374	3.215
13.00	1.550	1,193.0	1.505	2.879	3.343
14.00	1.640	1,231.0	1.595	4.474	3.514
15.00	1.760	1,333.0	1.700	6.173	3.992

Device	Routing	Invert	Outlet Devices
#1	Primary	14.99'	1,333.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: 1P- NW Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Pond 5P: 5P - West Pond

[81] Warning: Exceeded Pond 7P by 0.75' @ 9.13 hrs

Inflow Area = 106.390 ac, 0.87% Impervious, Inflow Depth = 1.31" for 2-Yr event
 Inflow = 15.21 cfs @ 8.10 hrs, Volume= 11.652 af
 Outflow = 10.23 cfs @ 13.38 hrs, Volume= 9.815 af, Atten= 33%, Lag= 317.3 min
 Primary = 10.23 cfs @ 13.38 hrs, Volume= 9.815 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 13.38 hrs Surf.Area= 2.669 ac Storage= 1.862 af

Plug-Flow detention time= 178.8 min calculated for 9.815 af (84% of inflow)
 Center-of-Mass det. time= 89.7 min (1,039.9 - 950.2)

Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	340.699 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	1.160	3,026.0	0.000	0.000	1.160	
15.00	2.670	3,968.0	1.863	1.863	13.196	
15.10	9,999.000	9,999.0	338.835	340.699	167.081	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	3,968.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=10.03 cfs @ 13.38 hrs HW=15.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 10.03 cfs @ 0.26 fps)

Proposed Conditions Option_1

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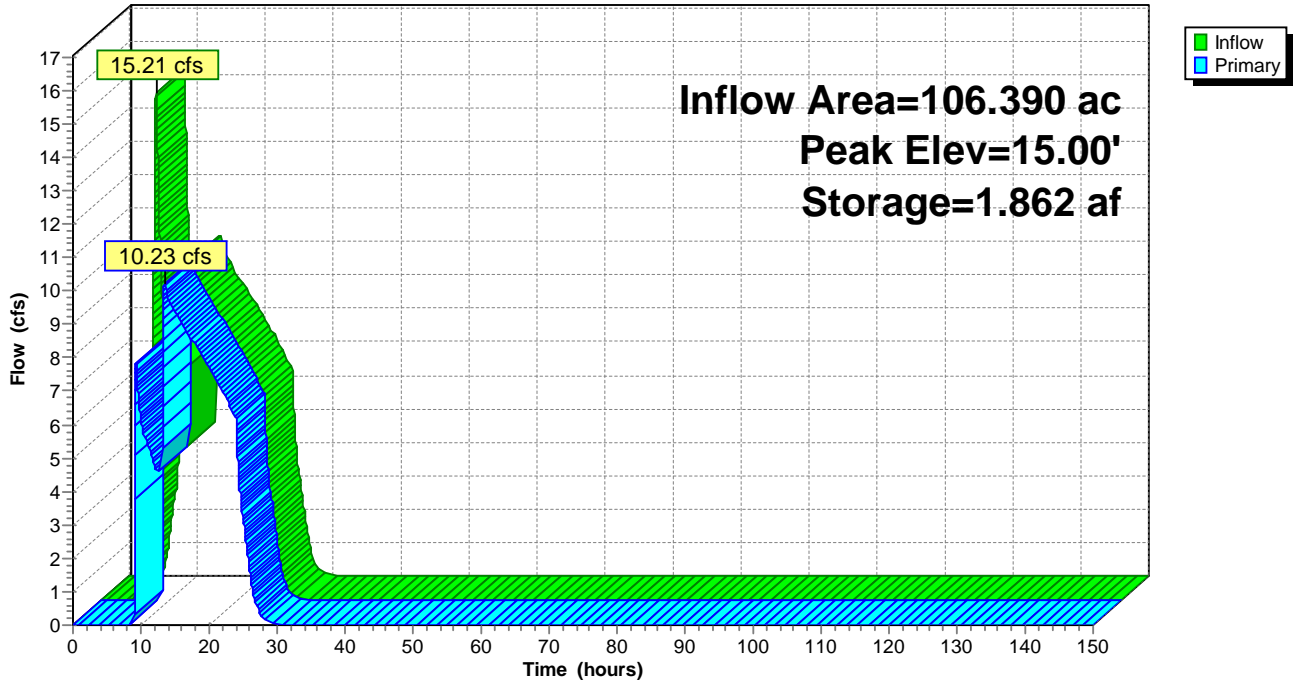
Type IA 24-hr 2-Yr Rainfall=3.43"

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Pond 5P: 5P - West Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Pond 6P: 6P- West Pond

[81] Warning: Exceeded Pond 5P by 0.01' @ 24.66 hrs

Inflow Area = 127.700 ac, 0.91% Impervious, Inflow Depth = 1.14" for 2-Yr event
 Inflow = 11.93 cfs @ 13.38 hrs, Volume= 12.150 af
 Outflow = 9.79 cfs @ 18.14 hrs, Volume= 8.367 af, Atten= 18%, Lag= 285.8 min
 Primary = 9.79 cfs @ 18.14 hrs, Volume= 8.367 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.01' @ 18.14 hrs Surf.Area= 112.196 ac Storage= 4.233 af

Plug-Flow detention time= 339.9 min calculated for 8.366 af (69% of inflow)
 Center-of-Mass det. time= 190.1 min (1,213.3 - 1,023.2)

Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	344.602 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.930	3,856.0	0.000	0.000	2.930	
15.00	4.810	4,175.0	3.831	3.831	7.611	
15.10	9,999.000	9,999.0	340.771	344.602	158.416	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	1,400.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=9.51 cfs @ 18.14 hrs HW=15.01' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 9.51 cfs @ 0.37 fps)

Proposed Conditions Option_1

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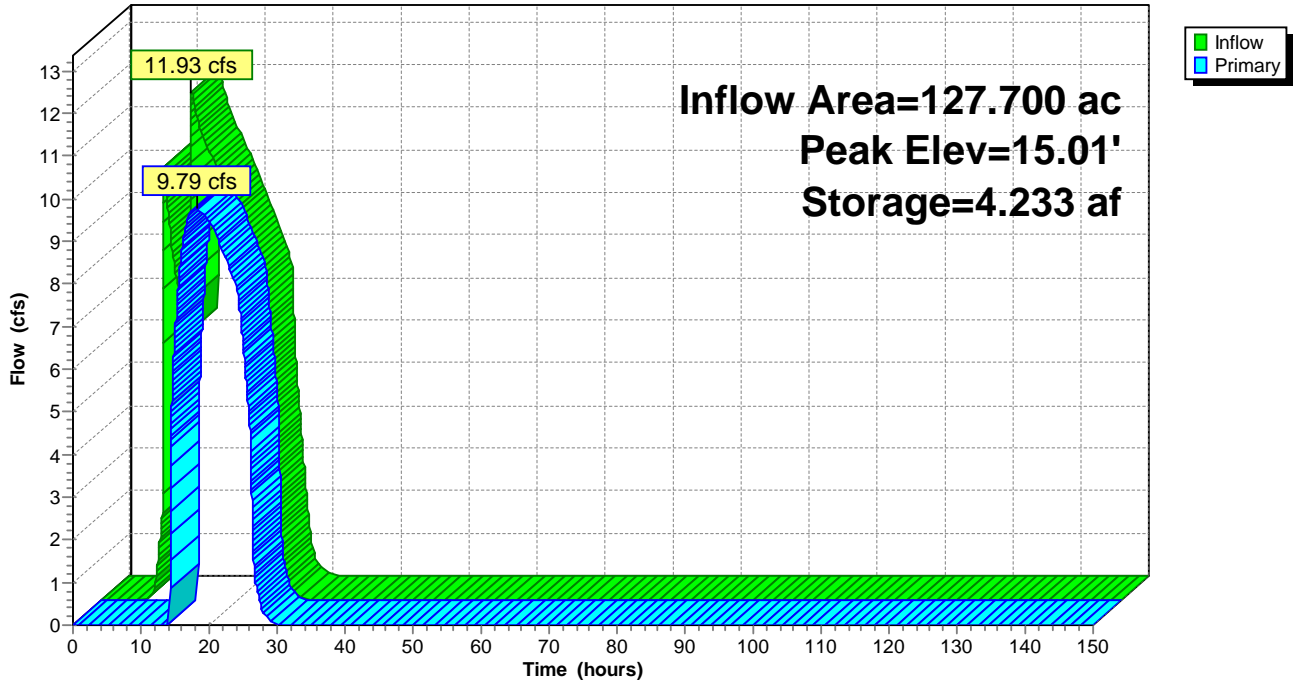
Type IA 24-hr 2-Yr Rainfall=3.43"

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Pond 6P: 6P- West Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Pond 7P: 7P-Southwest

Inflow Area = 54.970 ac, 1.29% Impervious, Inflow Depth = 1.72" for 2-Yr event
 Inflow = 10.36 cfs @ 9.84 hrs, Volume= 7.902 af
 Outflow = 5.72 cfs @ 13.34 hrs, Volume= 4.558 af, Atten= 45%, Lag= 210.0 min
 Primary = 5.72 cfs @ 13.34 hrs, Volume= 4.558 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 14.99' @ 13.34 hrs Surf.Area= 4.544 ac Storage= 3.361 af

Plug-Flow detention time= 454.0 min calculated for 4.558 af (58% of inflow)
 Center-of-Mass det. time= 220.7 min (1,145.5 - 924.8)

Volume	Invert	Avail.Storage	Storage Description
#1	14.00'	37.446 af	Custom Stage Data (Irregular) Listed below (Recalc)

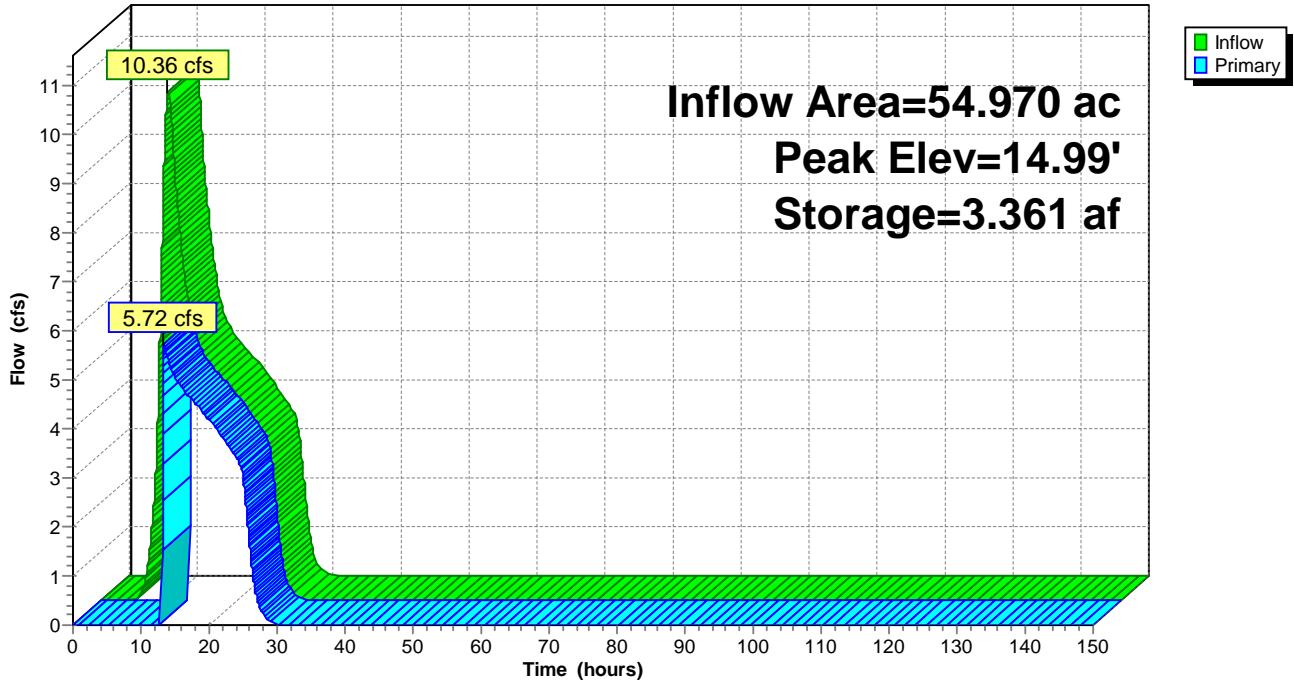
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
14.00	2.340	3,959.0	0.000	0.000	2.340
15.00	4.560	5,430.0	3.389	3.389	27.571
15.01	9,999.000	9,999.0	34.057	37.446	156.355

Device	Routing	Invert	Outlet Devices
#1	Primary	14.99'	5,430.0' long x 100.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=3.61 cfs @ 13.34 hrs HW=14.99' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 3.61 cfs @ 0.17 fps)

Pond 7P: 7P-Southwest

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Pond 8P: 8P

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 2.12" for 2-Yr event
 Inflow = 6.56 cfs @ 8.41 hrs, Volume= 2.890 af
 Outflow = 6.56 cfs @ 8.41 hrs, Volume= 2.890 af, Atten= 0%, Lag= 0.0 min
 Primary = 6.56 cfs @ 8.41 hrs, Volume= 2.890 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Peak Elev= 17.35' @ 8.41 hrs
 Flood Elev= 19.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	16.11'	36.0" Round Culvert L= 93.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.11' / 15.29' S= 0.0088 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	19.00'	100.0' long x 24.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=6.56 cfs @ 8.41 hrs HW=17.35' (Free Discharge)

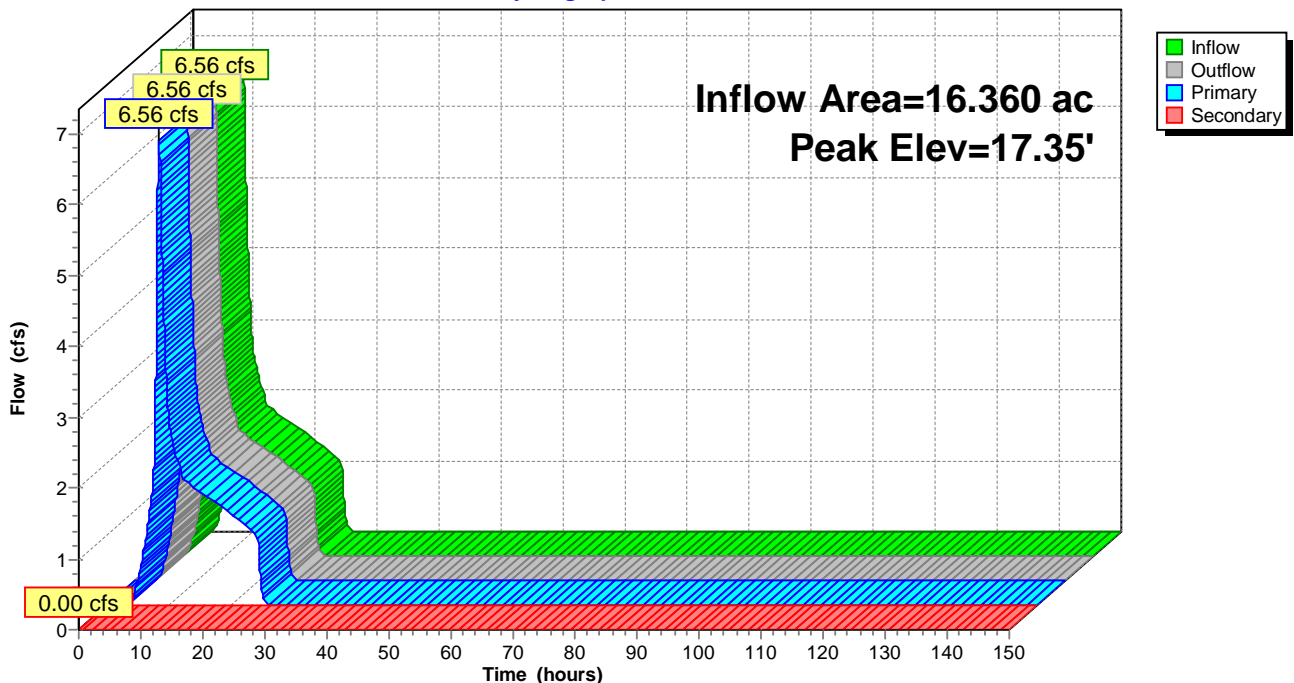
↑**1=Culvert** (Barrel Controls 6.56 cfs @ 3.51 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.11' (Free Discharge)

↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 8P: 8P

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 2-Yr Rainfall=3.43"

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Summary for Pond 10P: 10P-Large Central/NE

Inflow Area = 524.490 ac, 2.24% Impervious, Inflow Depth = 1.37" for 2-Yr event
 Inflow = 46.18 cfs @ 15.62 hrs, Volume= 59.855 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.62' @ 46.39 hrs Surf.Area= 83.171 ac Storage= 59.848 af

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

Volume	Invert	Avail.Storage	Storage Description			
#1	10.00'	98.335 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.00	0.280	2,536.0	0.000	0.000	0.280	
11.00	6.414	16,985.0	2.678	2.678	515.559	
12.00	38.875	11,909.0	20.360	23.038	783.495	
13.00	119.000	22,186.0	75.297	98.335	1,423.612	

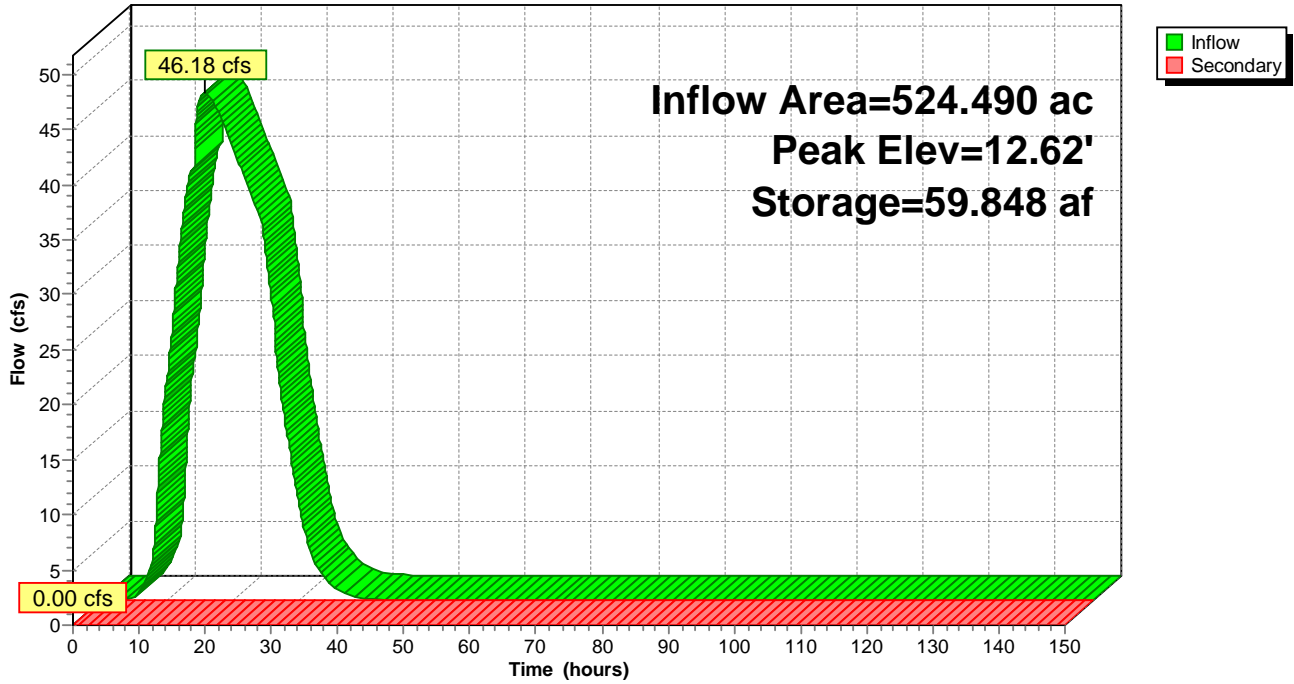
Device	Routing	Invert	Outlet Devices					
#1	Secondary	12.99'	9,999.0' long x 0.5' breadth Broad-Crested Rectangular Weir					
			Head (feet) 0.20 0.40 0.60 0.80 1.00					
			Coef. (English) 2.80 2.92 3.08 3.30 3.32					

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.00' (Free Discharge)

↑ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 10P: 10P-Large Central/NE

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 6-month Rainfall=2.50"

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Time span=0.00-150.00 hrs, dt=0.01 hrs, 15001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S-NW Catchment	Runoff Area=7.320 ac 19.67% Impervious Runoff Depth=1.12" Flow Length=292' Slope=0.0200 '/' Tc=4.9 min CN=84 Runoff=1.86 cfs 0.681 af
Subcatchment 2S: 2S-NW Catchment 2	Runoff Area=41.380 ac 2.39% Impervious Runoff Depth=1.31" Flow Length=2,271' Tc=122.9 min CN=87 Runoff=6.38 cfs 4.521 af
Subcatchment 4S: 4S - West Catchment	Runoff Area=26.590 ac 0.83% Impervious Runoff Depth=1.00" Flow Length=998' Tc=38.6 min CN=82 Runoff=4.34 cfs 2.211 af
Subcatchment 5S: 5S - West Catchment	Runoff Area=24.830 ac 0.00% Impervious Runoff Depth=0.89" Flow Length=660' Tc=11.1 min CN=80 Runoff=4.35 cfs 1.839 af
Subcatchment 6S: 6S - West Catchment	Runoff Area=21.310 ac 1.08% Impervious Runoff Depth=0.69" Flow Length=1,162' Slope=0.0017 '/' Tc=127.5 min CN=76 Runoff=1.20 cfs 1.233 af
Subcatchment 7S: 7S - Southwest	Runoff Area=54.970 ac 1.29% Impervious Runoff Depth=1.00" Flow Length=1,700' Tc=140.5 min CN=82 Runoff=5.38 cfs 4.572 af
Subcatchment 8S: 8S - South Catchment	Runoff Area=16.360 ac 4.95% Impervious Runoff Depth=1.31" Flow Length=1,480' Tc=45.3 min CN=87 Runoff=3.81 cfs 1.787 af
Subcatchment 10S: 10S - Large Central / NE	Runoff Area=324.770 ac 2.52% Impervious Runoff Depth=0.89" Flow Length=2,575' Slope=0.0019 '/' Tc=393.8 min CN=80 Runoff=17.83 cfs 24.057 af
Subcatchment 11S: 11S - SE	Runoff Area=23.320 ac 0.00% Impervious Runoff Depth=0.30" Flow Length=1,924' Tc=49.7 min CN=65 Runoff=0.50 cfs 0.578 af
Reach 8R: South Ditch	Avg. Flow Depth=0.58' Max Vel=1.41 fps Inflow=3.81 cfs 1.787 af n=0.022 L=579.0' S=0.0012 '/' Capacity=2.94 cfs Outflow=3.75 cfs 1.787 af
Pond 1P: 1P- NW Pond	Peak Elev=11.51' Storage=0.681 af Inflow=1.86 cfs 0.681 af Outflow=0.00 cfs 0.000 af
Pond 5P: 5P - West Pond	Peak Elev=14.99' Storage=1.849 af Inflow=7.50 cfs 5.279 af Outflow=4.89 cfs 3.442 af
Pond 6P: 6P- West Pond	Peak Elev=15.00' Storage=3.841 af Inflow=5.70 cfs 4.676 af Outflow=4.47 cfs 0.892 af
Pond 7P: 7P-Southwest	Peak Elev=14.99' Storage=3.352 af Inflow=5.38 cfs 4.572 af Outflow=2.65 cfs 1.228 af
Pond 8P: 8P	Peak Elev=17.05' Inflow=3.81 cfs 1.787 af Primary=3.81 cfs 1.787 af Secondary=0.00 cfs 0.000 af Outflow=3.81 cfs 1.787 af
Pond 10P: 10P-Large Central/NE	Peak Elev=12.16' Storage=30.048 af Inflow=21.38 cfs 30.049 af Outflow=0.00 cfs 0.000 af

Proposed_Conditions_Option_1

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Type IA 24-hr 6-month Rainfall=2.50"

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Total Runoff Area = 540.850 ac Runoff Volume = 41.480 af Average Runoff Depth = 0.92"
97.68% Pervious = 528.280 ac 2.32% Impervious = 12.570 ac

Proposed Conditions Option_1

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Type IA 24-hr 6-month Rainfall=2.50"

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Summary for Subcatchment 1S: 1S-NW Catchment

Runoff = 1.86 cfs @ 7.98 hrs, Volume= 0.681 af, Depth= 1.12"

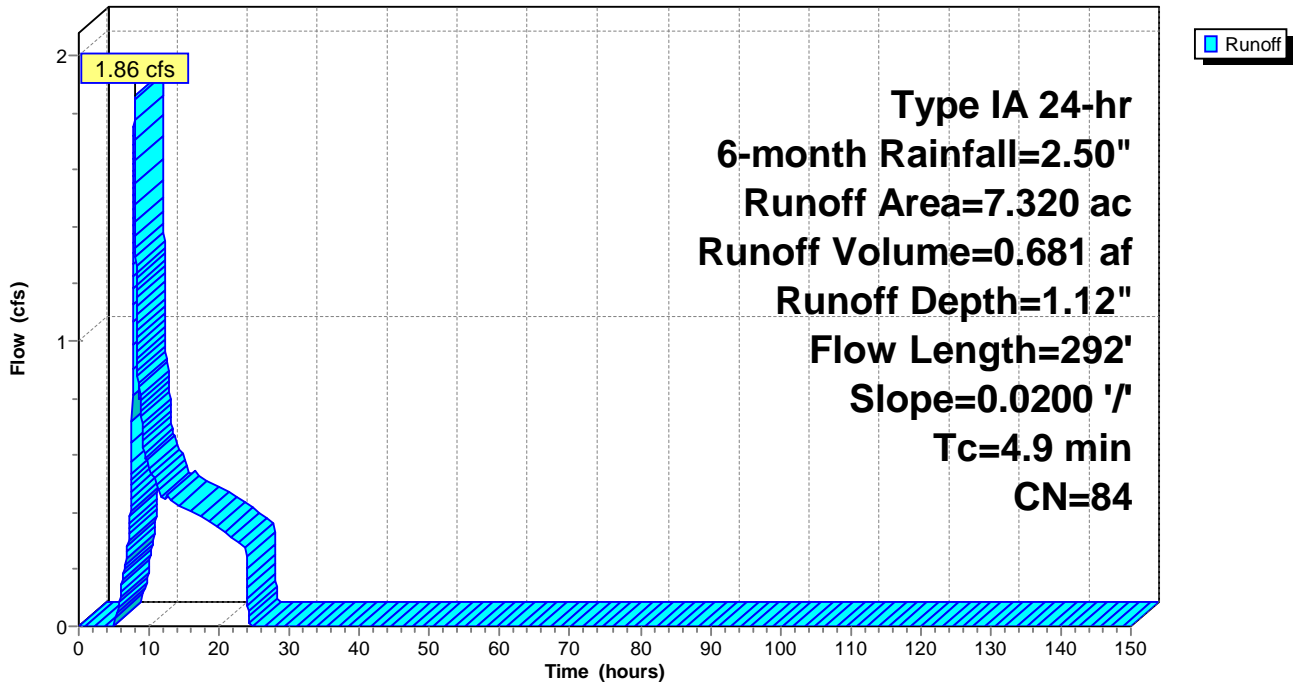
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 6-month Rainfall=2.50"

Area (ac)	CN	Description
3.470	73	Brush, Good, HSG D
1.210	98	Paved parking, HSG D
* 2.410	90	WSDOT - Golf Course
* 0.230	98	Trail
7.320	84	Weighted Average
5.880	80	80.33% Pervious Area
1.440	98	19.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	292	0.0200	0.99		Shallow Concentrated Flow, Shallow - Golf Course Short Grass Pasture Kv= 7.0 fps

Subcatchment 1S: 1S-NW Catchment

Hydrograph



Proposed Conditions Option 1

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Type IA 24-hr 6-month Rainfall=2.50"

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Summary for Subcatchment 2S: 2S-NW Catchment 2

Sheet flow - dense comes from "native grasses" considered dense. Characterized by the wetland report.

Runoff = 6.38 cfs @ 9.69 hrs, Volume= 4.521 af, Depth= 1.31"

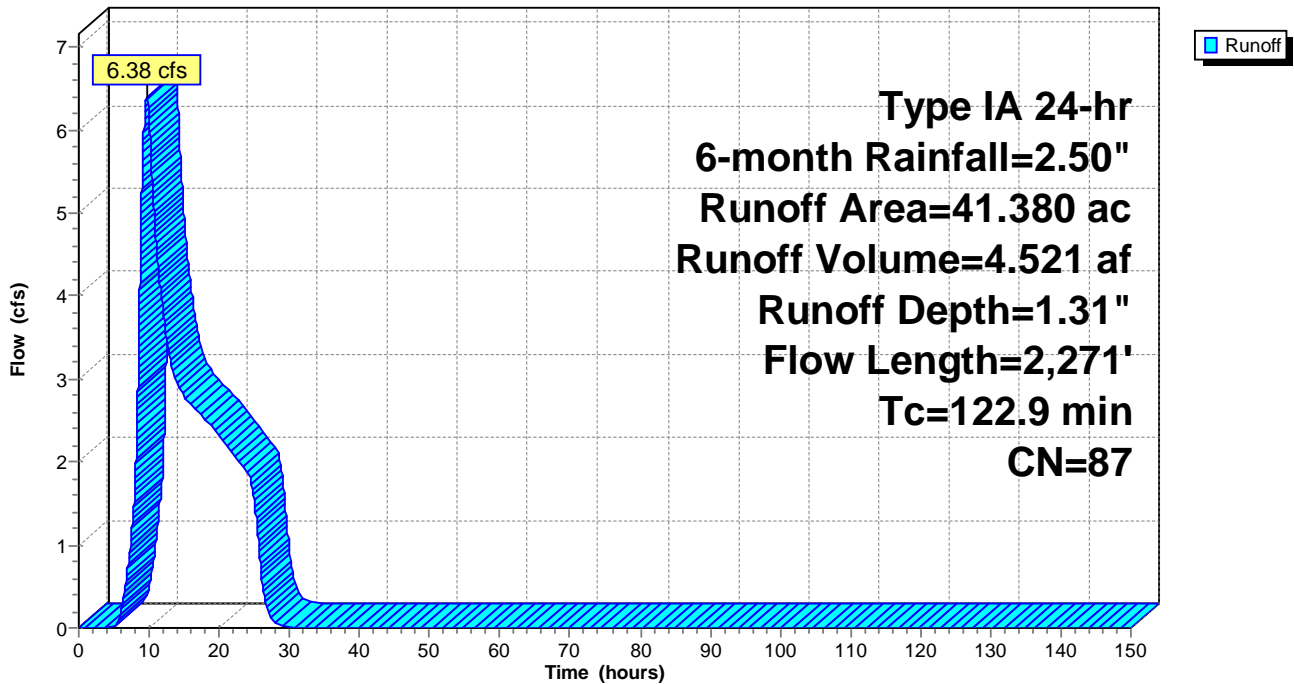
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 6-month Rainfall=2.50"

Area (ac)	CN	Description
8.350	73	Brush, Good, HSG D
0.830	98	Paved parking, HSG D
* 0.160	98	Trail
* 31.710	90	WSDOT - Golf Course
0.330	79	Woods/grass comb., Good, HSG D
41.380	87	Weighted Average
40.390	86	97.61% Pervious Area
0.990	98	2.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	95	0.0950	0.22		Sheet Flow, Sheet - Dense, Native Grasses
					Grass: Dense n= 0.240 P2= 3.43"
115.8	2,176	0.0020	0.31		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
122.9	2,271	Total			

Subcatchment 2S: 2S-NW Catchment 2

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 6-month Rainfall=2.50"

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Summary for Subcatchment 4S: 4S - West Catchment

Runoff = 4.34 cfs @ 8.37 hrs, Volume= 2.211 af, Depth= 1.00"

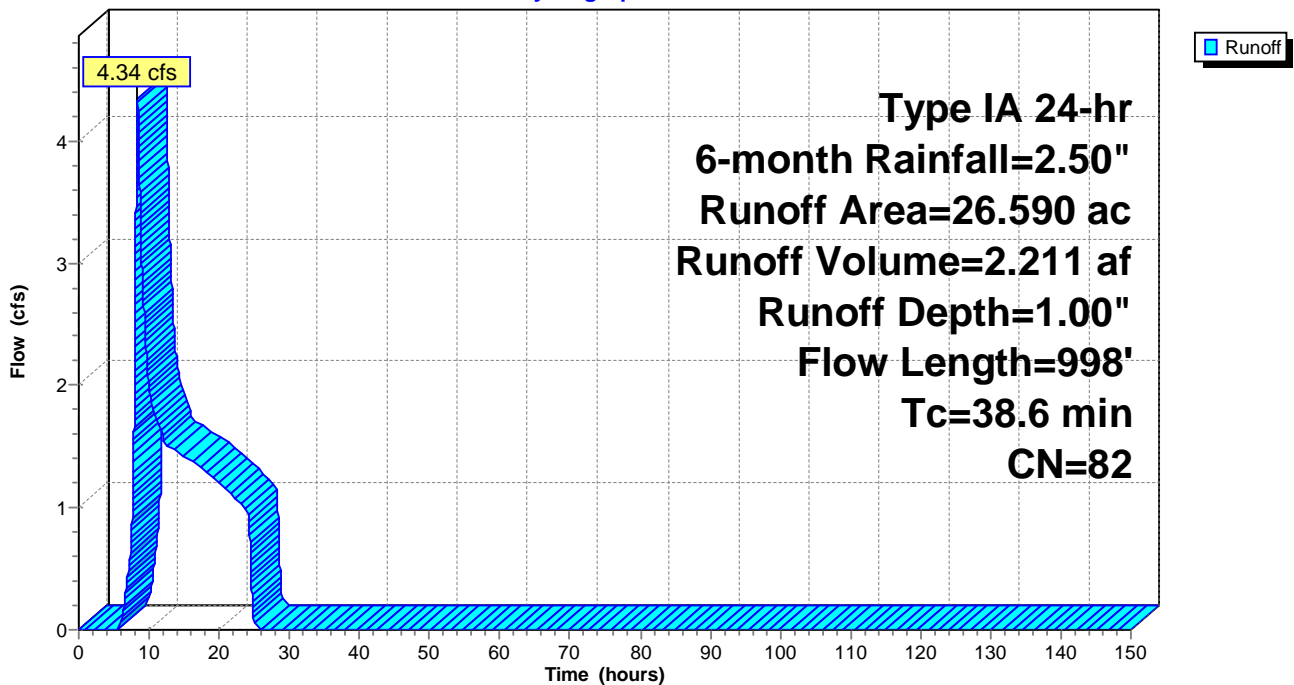
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 6-month Rainfall=2.50"

Area (ac)	CN	Description
13.100	73	Brush, Good, HSG D
* 0.220	98	Trail
* 13.270	90	WSDOT - Golf Course
26.590	82	Weighted Average
26.370	82	99.17% Pervious Area
0.220	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	135	0.0800	1.98		Shallow Concentrated Flow, Shallow - Forest
37.5	863	0.0030	0.38		Short Grass Pasture Kv= 7.0 fps Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
38.6	998	Total			

Subcatchment 4S: 4S - West Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 6-month Rainfall=2.50"

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Summary for Subcatchment 5S: 5S - West Catchment

Runoff = 4.35 cfs @ 8.05 hrs, Volume= 1.839 af, Depth= 0.89"

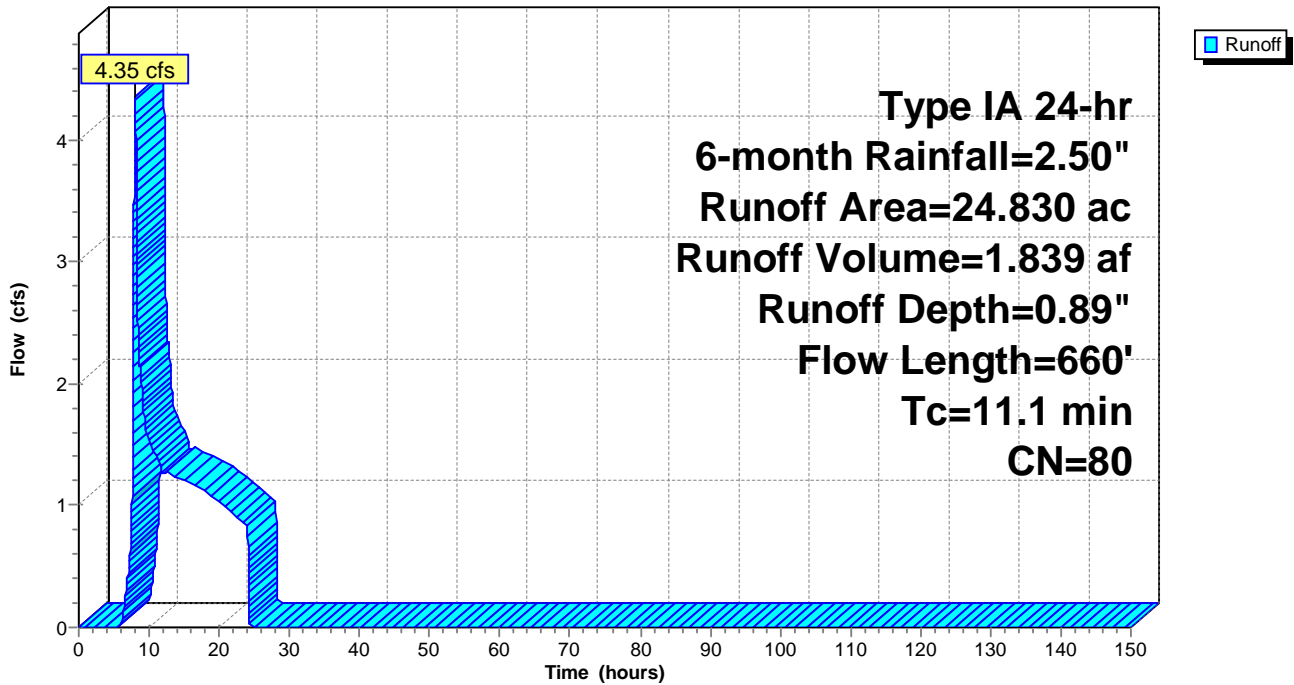
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 6-month Rainfall=2.50"

Area (ac)	CN	Description
13.850	73	Brush, Good, HSG D
0.500	79	Woods/grass comb., Good, HSG D
* 10.480	90	WSDOT - Golf Course
24.830	80	Weighted Average
24.830	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	608	0.0180	0.94		Shallow Concentrated Flow, Shallow - Grass
					Short Grass Pasture Kv= 7.0 fps
0.3	52	0.1300	2.64		Sheet Flow, Path
					Smooth surfaces n= 0.011 P2= 3.43"
11.1	660	Total			

Subcatchment 5S: 5S - West Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 6-month Rainfall=2.50"

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Summary for Subcatchment 6S: 6S - West Catchment

Runoff = 1.20 cfs @ 10.06 hrs, Volume= 1.233 af, Depth= 0.69"

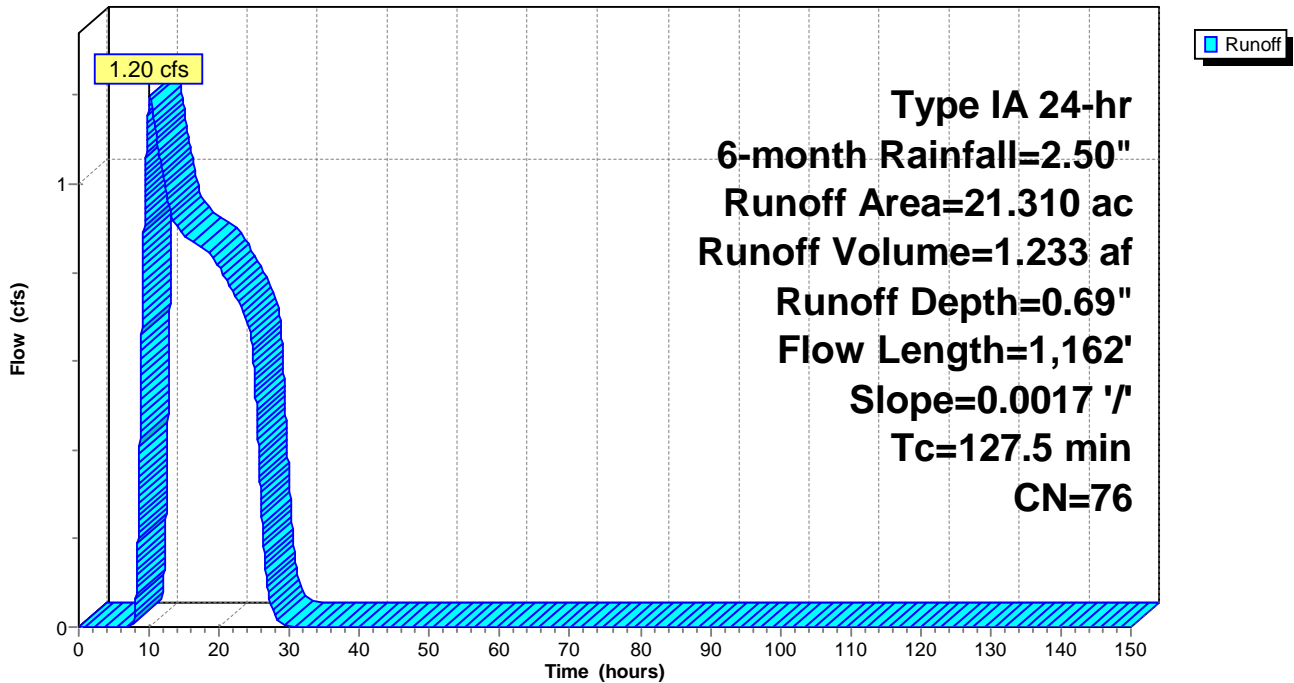
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 6-month Rainfall=2.50"

Area (ac)	CN	Description
8.040	79	Woods/grass comb., Good, HSG D
12.070	73	Brush, Good, HSG D
* 0.970	90	WSDOT - Golf Course
* 0.230	98	Trail
21.310	76	Weighted Average
21.080	76	98.92% Pervious Area
0.230	98	1.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.6	581	0.0017	0.29		Shallow Concentrated Flow, Grass - Shallow Short Grass Pasture Kv= 7.0 fps
93.9	581	0.0017	0.10		Shallow Concentrated Flow, Forested - Shallow Forest w/Heavy Litter Kv= 2.5 fps
127.5	1,162	Total			

Subcatchment 6S: 6S - West Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 6-month Rainfall=2.50"

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Summary for Subcatchment 7S: 7S - Southwest

Runoff = 5.38 cfs @ 10.14 hrs, Volume= 4.572 af, Depth= 1.00"

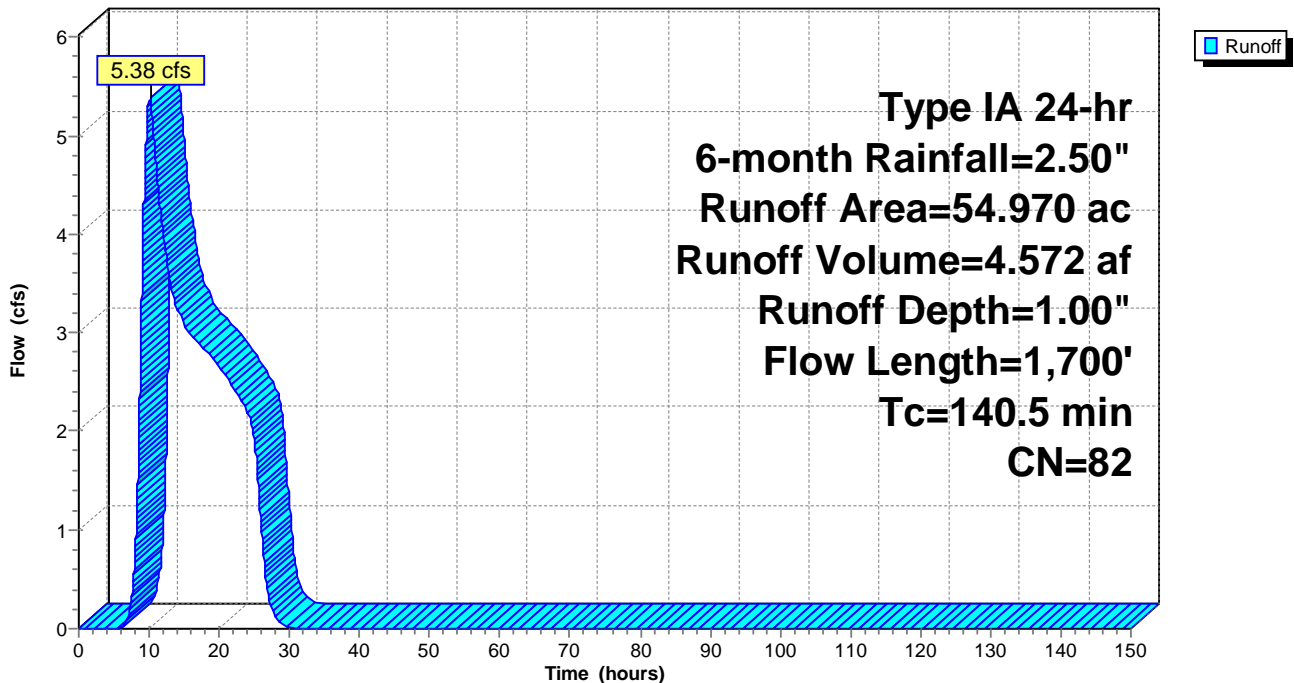
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 6-month Rainfall=2.50"

Area (ac)	CN	Description
8.710	73	Brush, Good, HSG D
25.200	79	Woods/grass comb., Good, HSG D
0.520	98	Paved parking, HSG D
* 0.190	98	Trail
* 20.350	90	WSDOT - Golf Course
54.970	82	Weighted Average
54.260	82	98.71% Pervious Area
0.710	98	1.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	70	0.1000	0.31		Sheet Flow, Sheet - Turf Grass: Short n= 0.150 P2= 3.43"
9.3	775	0.0390	1.38		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
127.5	855	0.0020	0.11		Shallow Concentrated Flow, Shallow - Forest Forest w/Heavy Litter Kv= 2.5 fps
140.5	1,700	Total			

Subcatchment 7S: 7S - Southwest

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 6-month Rainfall=2.50"

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Summary for Subcatchment 8S: 8S - South Catchment

Runoff = 3.81 cfs @ 8.45 hrs, Volume= 1.787 af, Depth= 1.31"

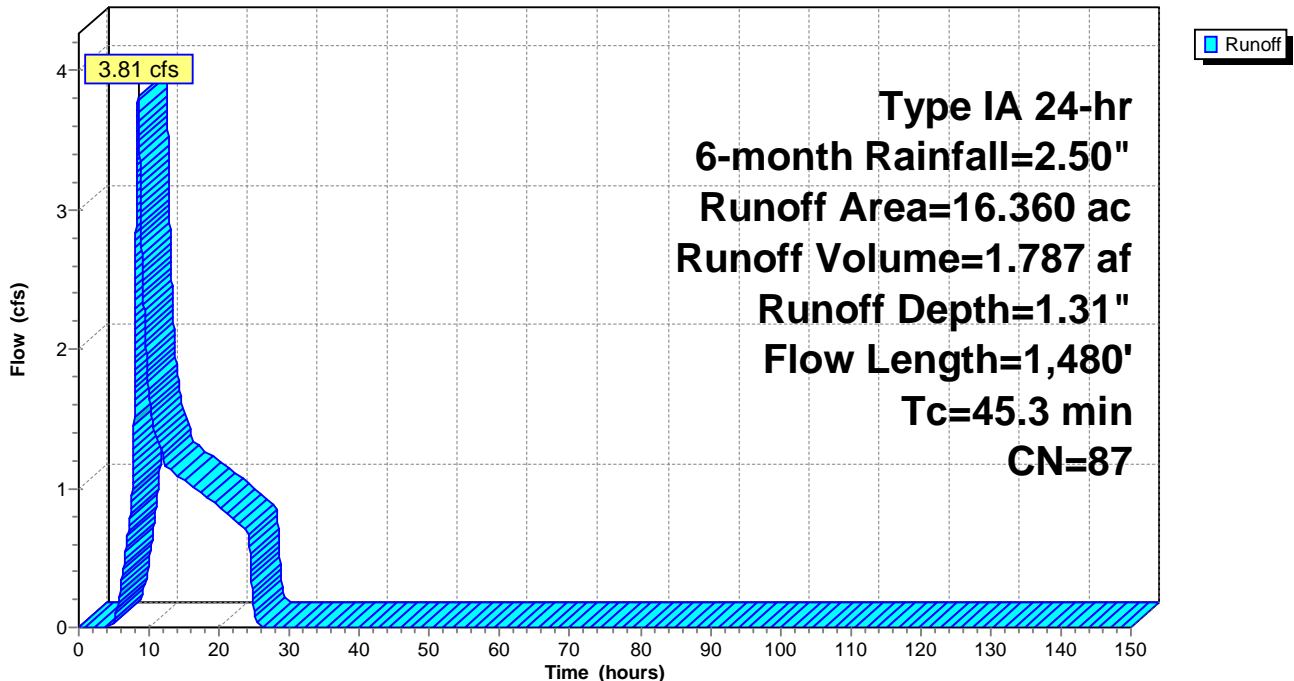
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 6-month Rainfall=2.50"

Area (ac)	CN	Description
1.790	79	Woods/grass comb., Good, HSG D
0.550	30	Brush, Good, HSG A
0.810	98	Paved parking, HSG D
* 13.210	90	WSDOT - Golf Course
16.360	87	Weighted Average
15.550	87	95.05% Pervious Area
0.810	98	4.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	89	0.0560	0.26		Sheet Flow, Sheet- Dune grass Grass: Short n= 0.150 P2= 3.43"
24.0	844	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
15.6	547	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
45.3	1,480	Total			

Subcatchment 8S: 8S - South Catchment

Hydrograph



Proposed Conditions Option 1

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Type IA 24-hr 6-month Rainfall=2.50"

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Summary for Subcatchment 10S: 10S - Large Central / NE

Runoff = 17.83 cfs @ 15.31 hrs, Volume= 24.057 af, Depth= 0.89"

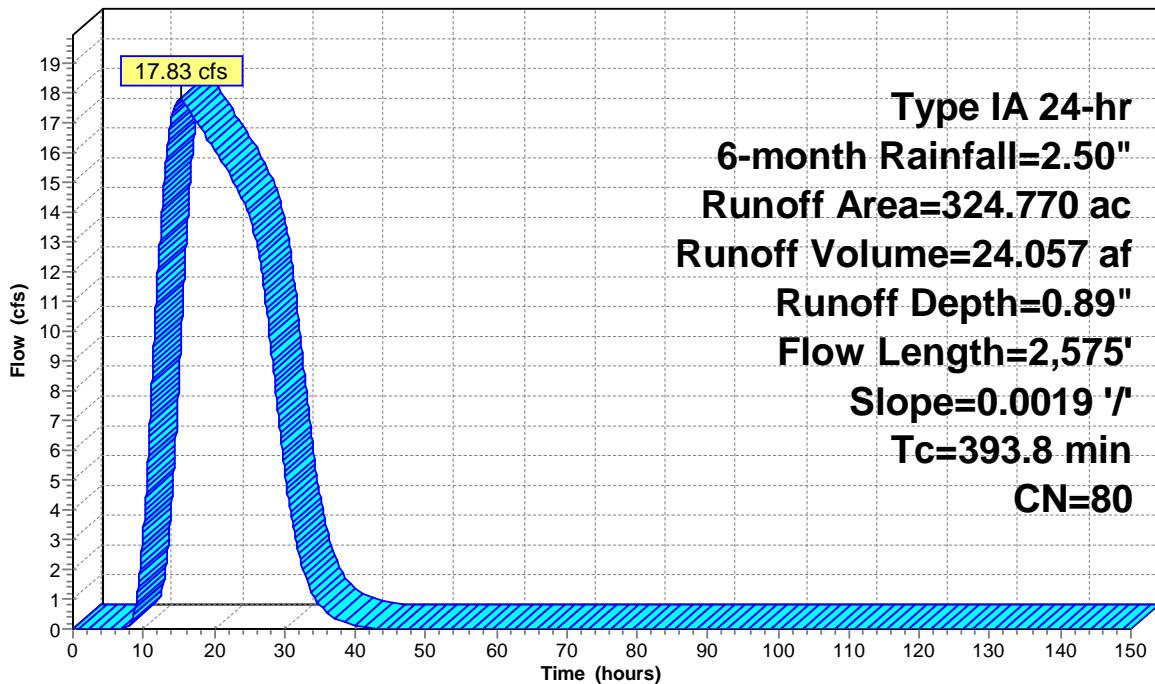
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 6-month Rainfall=2.50"

Area (ac)	CN	Description
198.280	79	Woods/grass comb., Good, HSG D
12.710	32	Woods/grass comb., Good, HSG A
0.660	98	Paved parking, HSG A
5.710	98	Paved parking, HSG D
30.310	73	Brush, Good, HSG D
* 1.800	98	Trail
* 75.300	90	Golf Course
324.770	80	Weighted Average
316.600	79	97.48% Pervious Area
8.170	98	2.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
393.8	2,575	0.0019	0.11		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps

Subcatchment 10S: 10S - Large Central / NE

Hydrograph



**Type IA 24-hr
6-month Rainfall=2.50"
Runoff Area=324.770 ac
Runoff Volume=24.057 af
Runoff Depth=0.89"
Flow Length=2,575'
Slope=0.0019 '/
Tc=393.8 min
CN=80**

Proposed Conditions Option_1

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Type IA 24-hr 6-month Rainfall=2.50"

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Summary for Subcatchment 11S: 11S - SE

Runoff = 0.50 cfs @ 18.28 hrs, Volume= 0.578 af, Depth= 0.30"

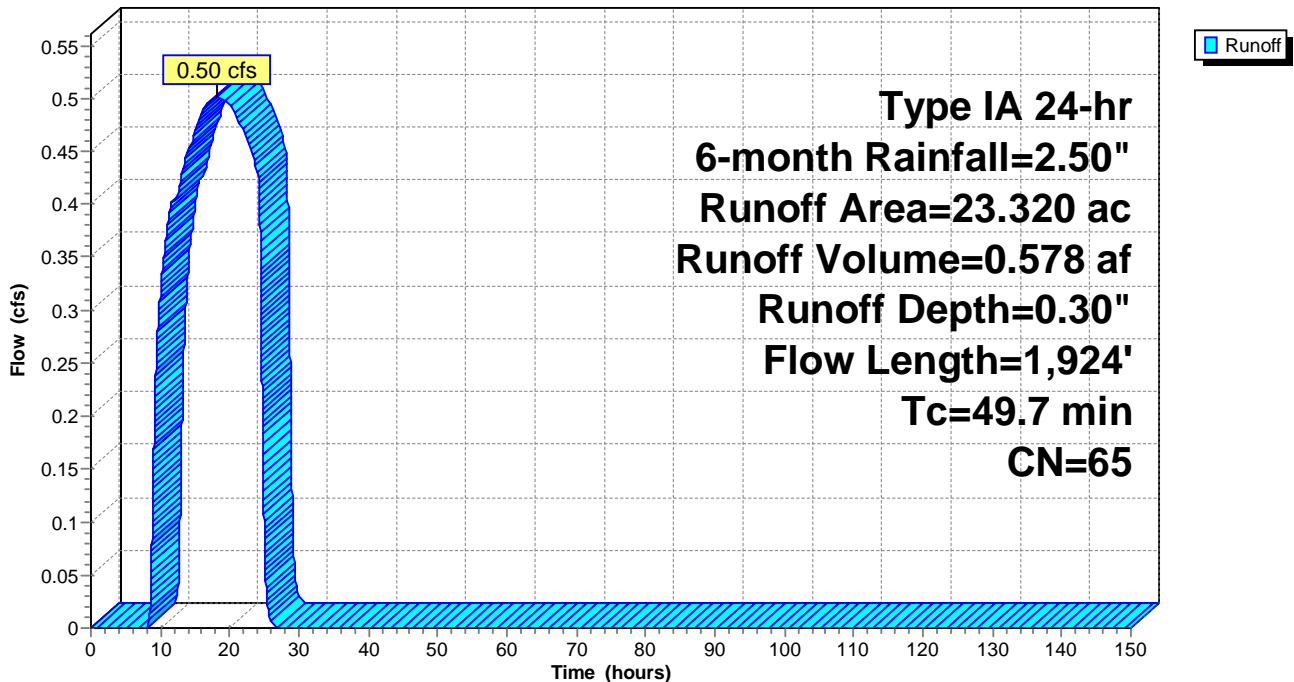
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 6-month Rainfall=2.50"

Area (ac)	CN	Description
2.090	32	Woods/grass comb., Good, HSG A
* 21.230	68	WSDOT - Golf Course
23.320	65	Weighted Average
23.320	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	126	0.1800	0.30		Sheet Flow, Sheet-Dune Grass Grass: Dense n= 0.240 P2= 3.43"
42.8	1,798	0.0100	0.70		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
49.7	1,924	Total			

Subcatchment 11S: 11S - SE

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 6-month Rainfall=2.50"

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Summary for Reach 8R: South Ditch

[91] Warning: Storage range exceeded by 0.08'

[55] Hint: Peak inflow is 129% of Manning's capacity

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 0.47'

Inflow Area =	16.360 ac,	4.95% Impervious,	Inflow Depth = 1.31"	for 6-month event
Inflow =	3.81 cfs @	8.45 hrs,	Volume=	1.787 af
Outflow =	3.75 cfs @	8.64 hrs,	Volume=	1.787 af, Atten= 2%, Lag= 11.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs

Max. Velocity= 1.41 fps, Min. Travel Time= 6.8 min

Avg. Velocity = 0.52 fps, Avg. Travel Time= 18.4 min

Peak Storage= 1,540 cf @ 8.53 hrs

Average Depth at Peak Storage= 0.58' , Surface Width= 5.16'

Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 2.94 cfs

4.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 1.0 ' / ' Top Width= 5.00'

Length= 579.0' Slope= 0.0012 ' / '

Inlet Invert= 16.00', Outlet Invert= 15.30'



Proposed Conditions Option_1

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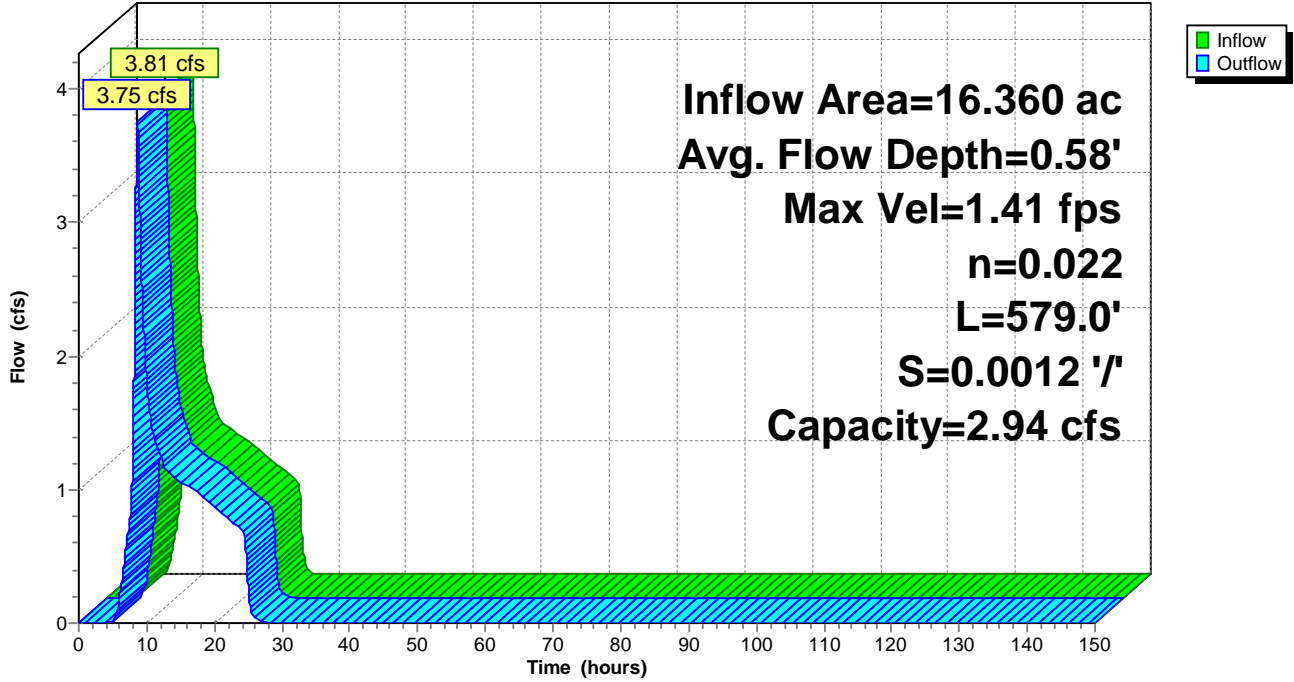
Type IA 24-hr 6-month Rainfall=2.50"

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Reach 8R: South Ditch

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 6-month Rainfall=2.50"

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Summary for Pond 1P: 1P- NW Pond

Inflow Area = 7.320 ac, 19.67% Impervious, Inflow Depth = 1.12" for 6-month event
 Inflow = 1.86 cfs @ 7.98 hrs, Volume= 0.681 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 11.51' @ 24.29 hrs Surf.Area= 1.376 ac Storage= 0.681 af

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

Volume	Invert	Avail.Storage	Storage Description
#1	11.00'	6.173 af	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
11.00	1.290	1,552.0	0.000	0.000	1.290
12.00	1.460	1,164.0	1.374	1.374	3.215
13.00	1.550	1,193.0	1.505	2.879	3.343
14.00	1.640	1,231.0	1.595	4.474	3.514
15.00	1.760	1,333.0	1.700	6.173	3.992

Device	Routing	Invert	Outlet Devices
#1	Primary	14.99'	1,333.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Proposed Conditions Option_1

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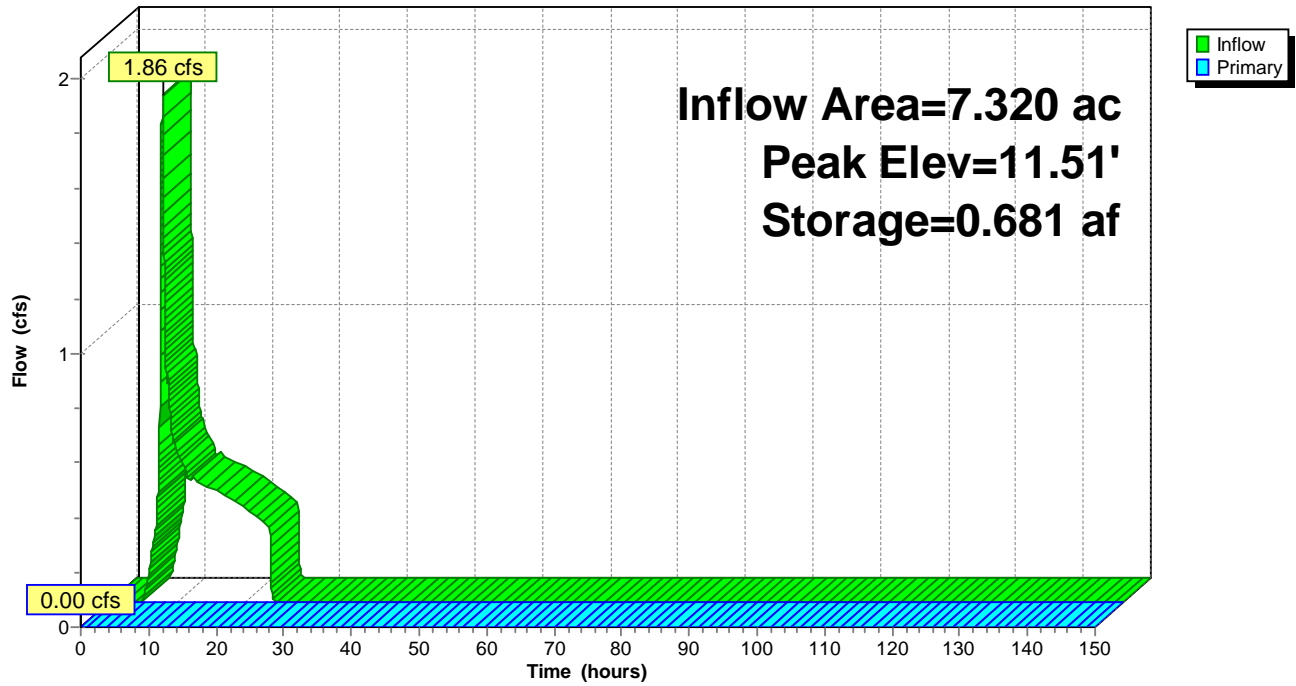
Type IA 24-hr 6-month Rainfall=2.50"

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Pond 1P: 1P- NW Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 6-month Rainfall=2.50"

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Summary for Pond 5P: 5P - West Pond

[81] Warning: Exceeded Pond 7P by 0.43' @ 12.88 hrs

Inflow Area = 106.390 ac, 0.87% Impervious, Inflow Depth = 0.60" for 6-month event
 Inflow = 7.50 cfs @ 8.10 hrs, Volume= 5.279 af
 Outflow = 4.89 cfs @ 20.06 hrs, Volume= 3.442 af, Atten= 35%, Lag= 717.6 min
 Primary = 4.89 cfs @ 20.06 hrs, Volume= 3.442 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 14.99' @ 20.06 hrs Surf.Area= 2.660 ac Storage= 1.849 af

Plug-Flow detention time= 422.2 min calculated for 3.442 af (65% of inflow)
 Center-of-Mass det. time= 215.6 min (1,196.1 - 980.5)

Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	340.699 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	1.160	3,026.0	0.000	0.000	1.160	
15.00	2.670	3,968.0	1.863	1.863	13.196	
15.10	9,999.000	9,999.0	338.835	340.699	167.081	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	3,968.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=3.31 cfs @ 20.06 hrs HW=14.99' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 3.31 cfs @ 0.18 fps)

Proposed Conditions Option_1

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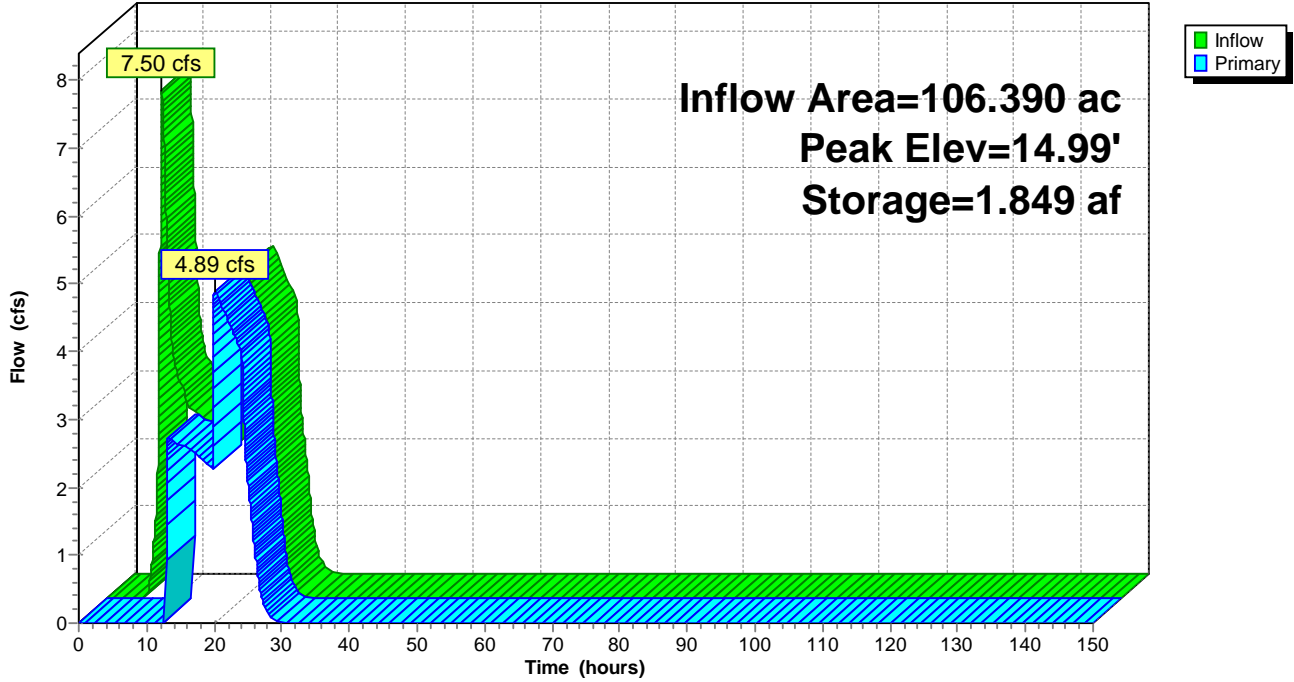
Type IA 24-hr 6-month Rainfall=2.50"

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Pond 5P: 5P - West Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 6-month Rainfall=2.50"

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Summary for Pond 6P: 6P- West Pond

[81] Warning: Exceeded Pond 5P by 0.01' @ 24.48 hrs

Inflow Area = 127.700 ac, 0.91% Impervious, Inflow Depth = 0.44" for 6-month event
 Inflow = 5.70 cfs @ 20.06 hrs, Volume= 4.676 af
 Outflow = 4.47 cfs @ 24.13 hrs, Volume= 0.892 af, Atten= 22%, Lag= 244.5 min
 Primary = 4.47 cfs @ 24.13 hrs, Volume= 0.892 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 24.13 hrs Surf.Area= 11.346 ac Storage= 3.841 af

Plug-Flow detention time= 732.1 min calculated for 0.892 af (19% of inflow)
 Center-of-Mass det. time= 341.7 min (1,485.2 - 1,143.5)

Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	344.602 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.930	3,856.0	0.000	0.000	2.930	
15.00	4.810	4,175.0	3.831	3.831	7.611	
15.10	9,999.000	9,999.0	340.771	344.602	158.416	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	1,400.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=4.45 cfs @ 24.13 hrs HW=15.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 4.45 cfs @ 0.28 fps)

Proposed Conditions Option_1

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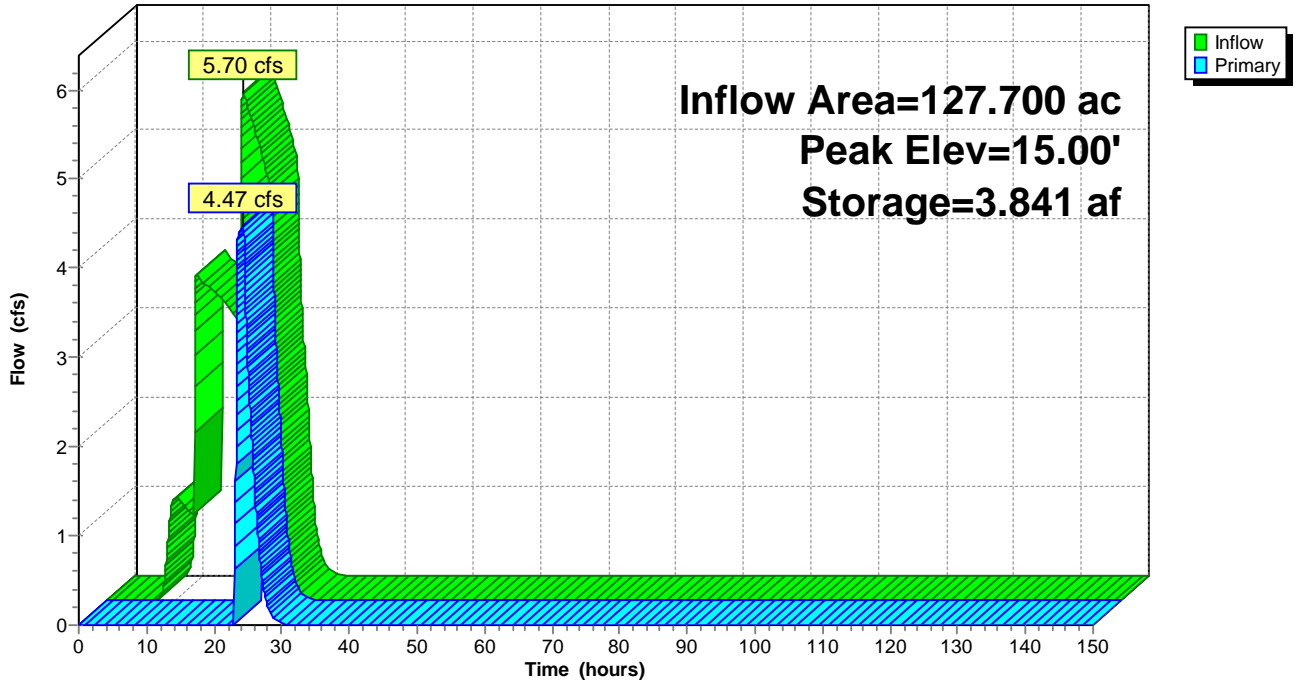
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Pond 6P: 6P- West Pond

Hydrograph



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Type IA 24-hr 6-month Rainfall=2.50"

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Summary for Pond 7P: 7P-Southwest

Inflow Area = 54.970 ac, 1.29% Impervious, Inflow Depth = 1.00" for 6-month event
 Inflow = 5.38 cfs @ 10.14 hrs, Volume= 4.572 af
 Outflow = 2.65 cfs @ 20.05 hrs, Volume= 1.228 af, Atten= 51%, Lag= 594.6 min
 Primary = 2.65 cfs @ 20.05 hrs, Volume= 1.228 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 14.99' @ 20.05 hrs Surf.Area= 4.539 ac Storage= 3.352 af

Plug-Flow detention time= 774.0 min calculated for 1.228 af (27% of inflow)
 Center-of-Mass det. time= 416.4 min (1,375.7 - 959.3)

Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	37.446 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.340	3,959.0	0.000	0.000	2.340	
15.00	4.560	5,430.0	3.389	3.389	27.571	
15.01	9,999.000	9,999.0	34.057	37.446	156.355	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	5,430.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=1.14 cfs @ 20.05 hrs HW=14.99' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 1.14 cfs @ 0.11 fps)

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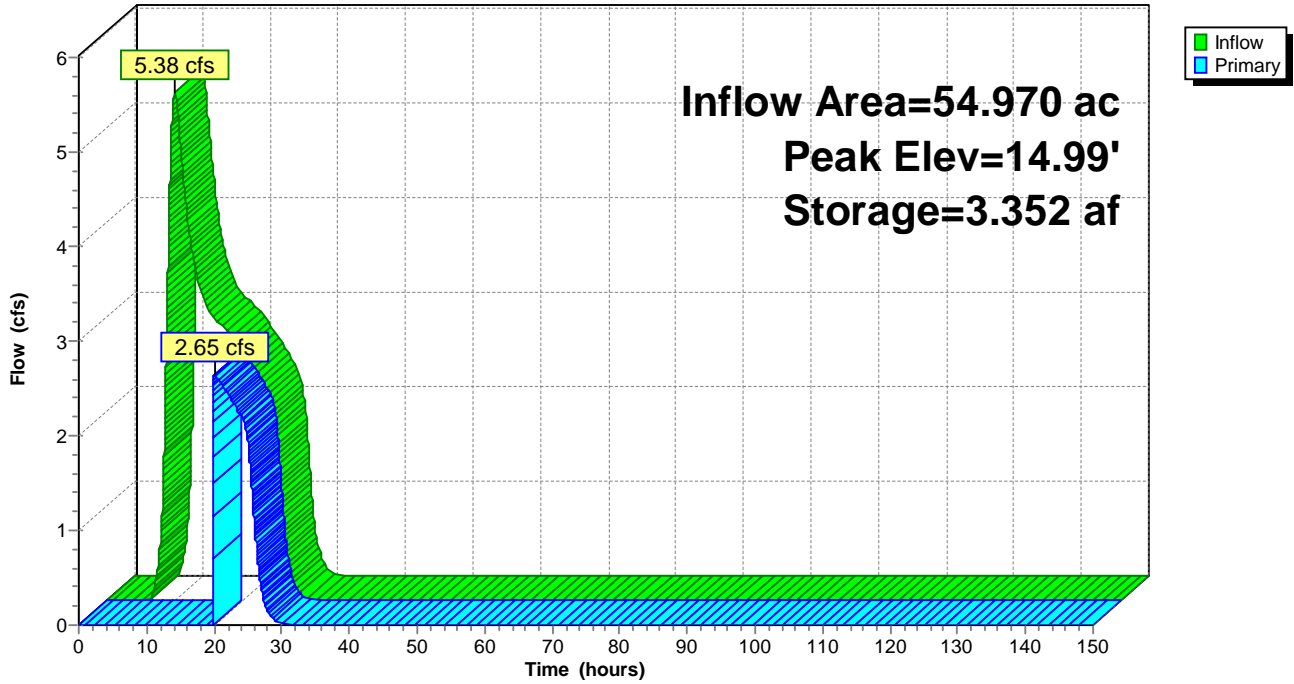
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Pond 7P: 7P-Southwest

Hydrograph



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Type IA 24-hr 6-month Rainfall=2.50"

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Summary for Pond 8P: 8P

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 1.31" for 6-month event
 Inflow = 3.81 cfs @ 8.45 hrs, Volume= 1.787 af
 Outflow = 3.81 cfs @ 8.45 hrs, Volume= 1.787 af, Atten= 0%, Lag= 0.0 min
 Primary = 3.81 cfs @ 8.45 hrs, Volume= 1.787 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Peak Elev= 17.05' @ 8.45 hrs
 Flood Elev= 19.00'

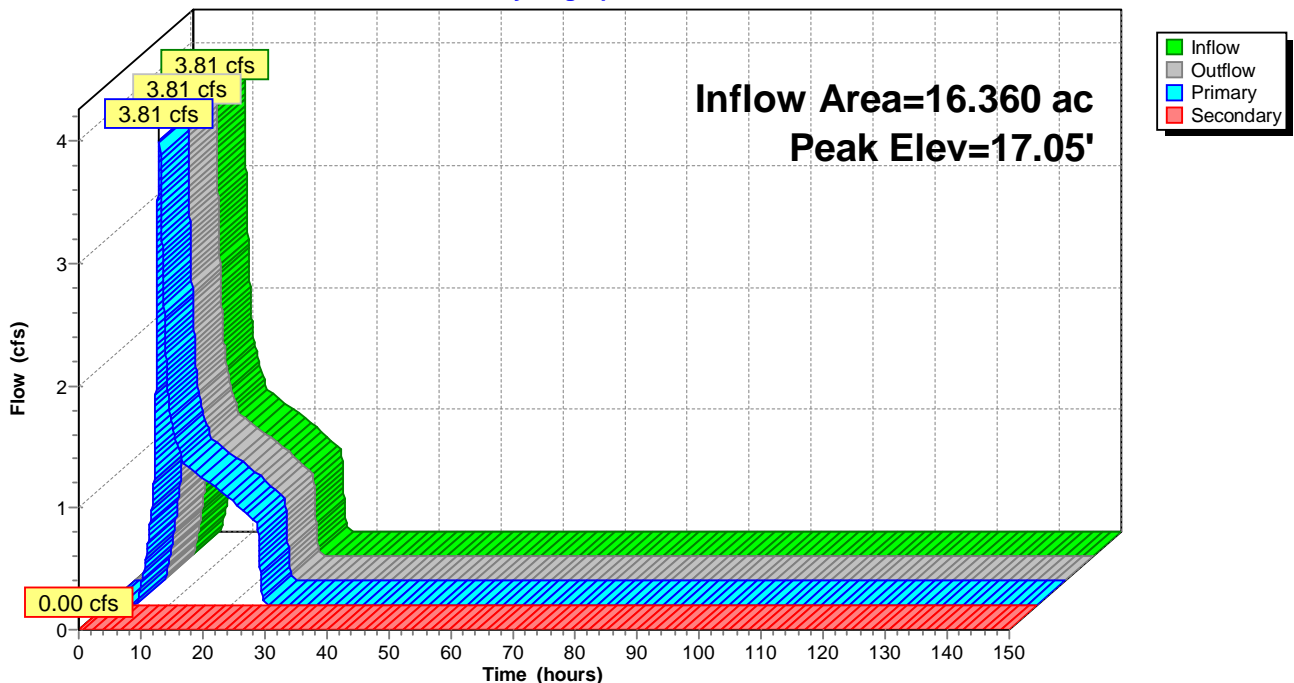
Device	Routing	Invert	Outlet Devices
#1	Primary	16.11'	36.0" Round Culvert L= 93.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.11' / 15.29' S= 0.0088 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	19.00'	100.0' long x 24.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=3.81 cfs @ 8.45 hrs HW=17.05' (Free Discharge)
 ↑1=Culvert (Barrel Controls 3.81 cfs @ 3.03 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.11' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 8P: 8P

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 6-month Rainfall=2.50"

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Summary for Pond 10P: 10P-Large Central/NE

Inflow Area = 524.490 ac, 2.24% Impervious, Inflow Depth = 0.69" for 6-month event
 Inflow = 21.38 cfs @ 23.50 hrs, Volume= 30.049 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.16' @ 46.39 hrs Surf.Area= 48.779 ac Storage= 30.048 af

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

Volume	Invert	Avail.Storage	Storage Description			
#1	10.00'	98.335 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.00	0.280	2,536.0	0.000	0.000	0.280	
11.00	6.414	16,985.0	2.678	2.678	515.559	
12.00	38.875	11,909.0	20.360	23.038	783.495	
13.00	119.000	22,186.0	75.297	98.335	1,423.612	

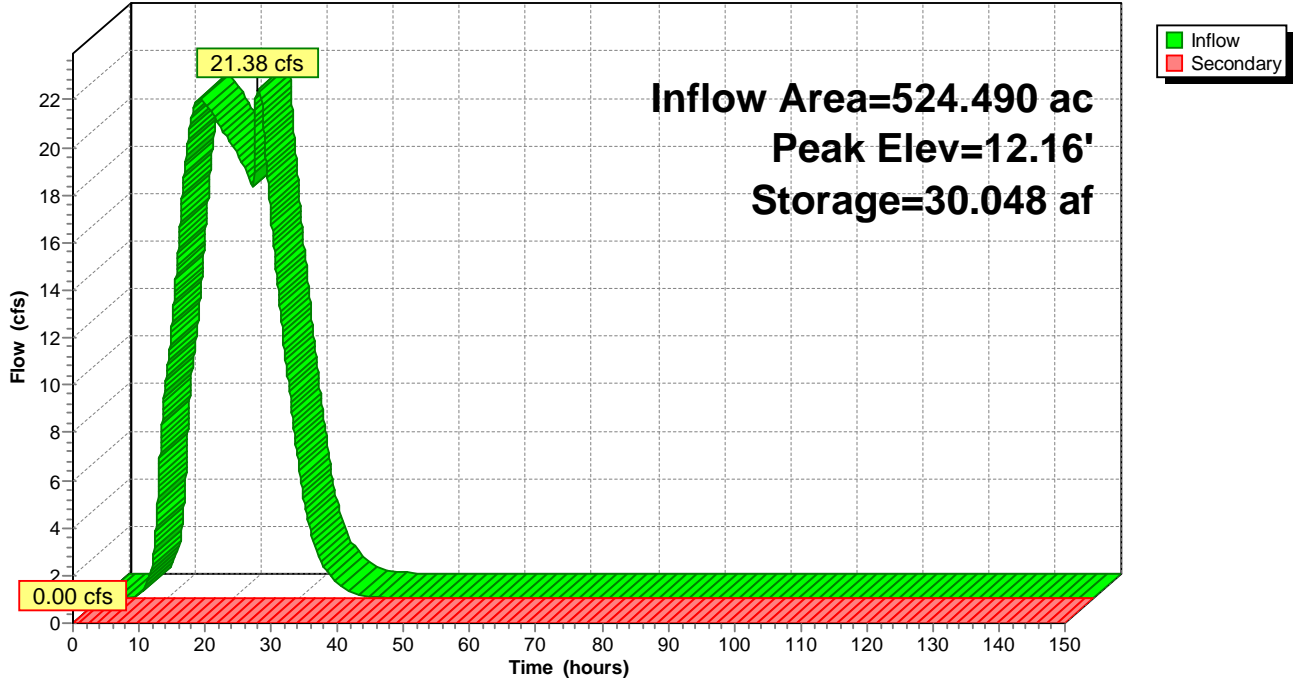
Device	Routing	Invert	Outlet Devices					
#1	Secondary	12.99'	9,999.0' long x 0.5' breadth Broad-Crested Rectangular Weir					
			Head (feet) 0.20 0.40 0.60 0.80 1.00					
			Coef. (English) 2.80 2.92 3.08 3.30 3.32					

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.00' (Free Discharge)

↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 10P: 10P-Large Central/NE

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 10-Yr Rainfall=4.00"

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Time span=0.00-150.00 hrs, dt=0.01 hrs, 15001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S-NW Catchment	Runoff Area=7.320 ac 19.67% Impervious Runoff Depth=2.37" Flow Length=292' Slope=0.0200 '/ Tc=4.9 min CN=84 Runoff=4.34 cfs 1.446 af
Subcatchment 2S: 2S-NW Catchment 2	Runoff Area=41.380 ac 2.39% Impervious Runoff Depth=2.64" Flow Length=2,271' Tc=122.9 min CN=87 Runoff=13.88 cfs 9.092 af
Subcatchment 4S: 4S - West Catchment	Runoff Area=26.590 ac 0.83% Impervious Runoff Depth=2.20" Flow Length=998' Tc=38.6 min CN=82 Runoff=11.23 cfs 4.881 af
Subcatchment 5S: 5S - West Catchment	Runoff Area=24.830 ac 0.00% Impervious Runoff Depth=2.04" Flow Length=660' Tc=11.1 min CN=80 Runoff=11.91 cfs 4.225 af
Subcatchment 6S: 6S - West Catchment	Runoff Area=21.310 ac 1.08% Impervious Runoff Depth=1.74" Flow Length=1,162' Slope=0.0017 '/ Tc=127.5 min CN=76 Runoff=3.95 cfs 3.087 af
Subcatchment 7S: 7S - Southwest	Runoff Area=54.970 ac 1.29% Impervious Runoff Depth=2.20" Flow Length=1,700' Tc=140.5 min CN=82 Runoff=13.73 cfs 10.091 af
Subcatchment 8S: 8S - South Catchment	Runoff Area=16.360 ac 4.95% Impervious Runoff Depth=2.64" Flow Length=1,480' Tc=45.3 min CN=87 Runoff=8.32 cfs 3.595 af
Subcatchment 10S: 10S - Large Central / NE	Runoff Area=324.770 ac 2.52% Impervious Runoff Depth=2.04" Flow Length=2,575' Slope=0.0019 '/ Tc=393.8 min CN=80 Runoff=45.12 cfs 55.256 af
Subcatchment 11S: 11S - SE	Runoff Area=23.320 ac 0.00% Impervious Runoff Depth=1.03" Flow Length=1,924' Tc=49.7 min CN=65 Runoff=2.46 cfs 1.999 af
Reach 8R: South Ditch	Avg. Flow Depth=1.03' Max Vel=1.67 fps Inflow=8.32 cfs 3.595 af n=0.022 L=579.0' S=0.0012 '/ Capacity=2.94 cfs Outflow=8.17 cfs 3.595 af
Pond 1P: 1P- NW Pond	Peak Elev=12.05' Storage=1.446 af Inflow=4.34 cfs 1.446 af Outflow=0.00 cfs 0.000 af
Pond 5P: 5P - West Pond	Peak Elev=15.00' Storage=1.877 af Inflow=20.43 cfs 15.854 af Outflow=14.27 cfs 14.017 af
Pond 6P: 6P- West Pond	Peak Elev=15.01' Storage=4.884 af Inflow=16.81 cfs 17.105 af Outflow=12.86 cfs 13.321 af
Pond 7P: 7P-Southwest	Peak Elev=15.00' Storage=3.373 af Inflow=13.73 cfs 10.091 af Outflow=9.40 cfs 6.748 af
Pond 8P: 8P	Peak Elev=17.52' Inflow=8.32 cfs 3.595 af Primary=8.32 cfs 3.595 af Secondary=0.00 cfs 0.000 af Outflow=8.32 cfs 3.595 af
Pond 10P: 10P-Large Central/NE	Peak Elev=12.83' Storage=79.658 af Inflow=64.55 cfs 79.668 af Outflow=0.00 cfs 0.000 af

Proposed_Conditions_Option_1

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Total Runoff Area = 540.850 ac Runoff Volume = 93.673 af Average Runoff Depth = 2.08"
97.68% Pervious = 528.280 ac 2.32% Impervious = 12.570 ac

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 1S: 1S-NW Catchment

Runoff = 4.34 cfs @ 7.93 hrs, Volume= 1.446 af, Depth= 2.37"

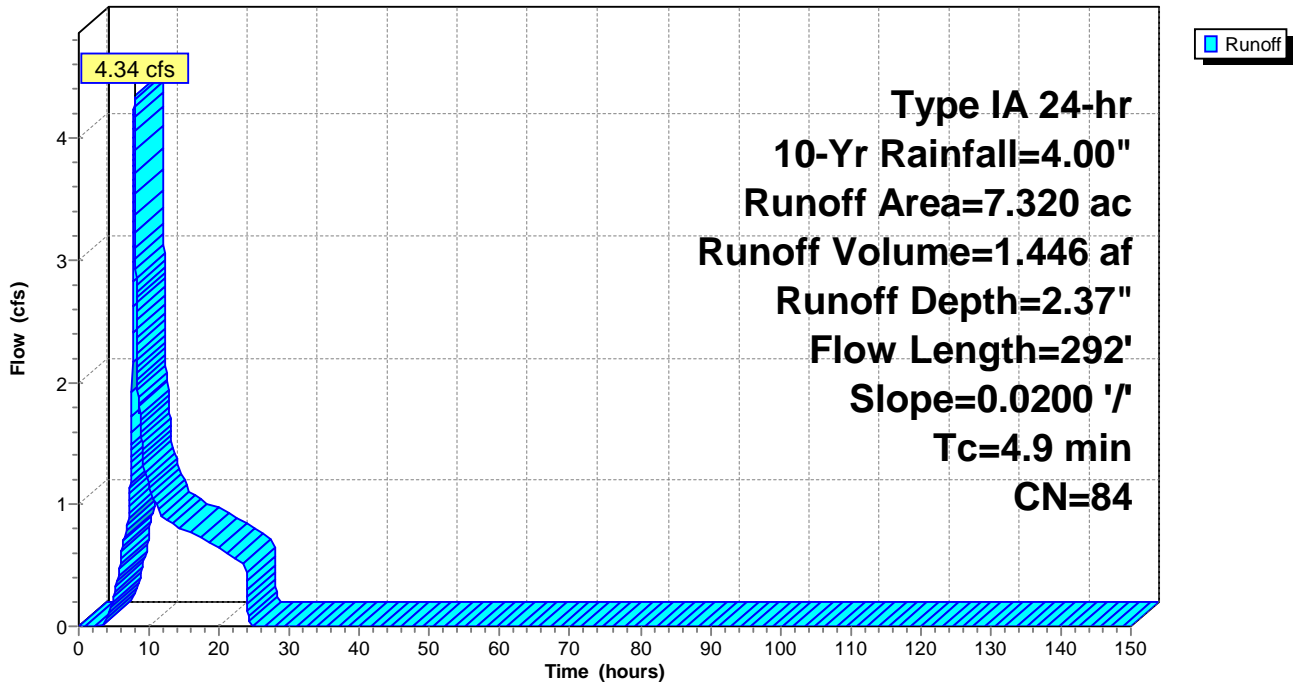
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
3.470	73	Brush, Good, HSG D
1.210	98	Paved parking, HSG D
* 2.410	90	WSDOT - Golf Course
* 0.230	98	Trail
7.320	84	Weighted Average
5.880	80	80.33% Pervious Area
1.440	98	19.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	292	0.0200	0.99		Shallow Concentrated Flow, Shallow - Golf Course Short Grass Pasture Kv= 7.0 fps

Subcatchment 1S: 1S-NW Catchment

Hydrograph



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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 2S: 2S-NW Catchment 2

Sheet flow - dense comes from "native grasses" considered dense. Characterized by the wetland report.

Runoff = 13.88 cfs @ 9.56 hrs, Volume= 9.092 af, Depth= 2.64"

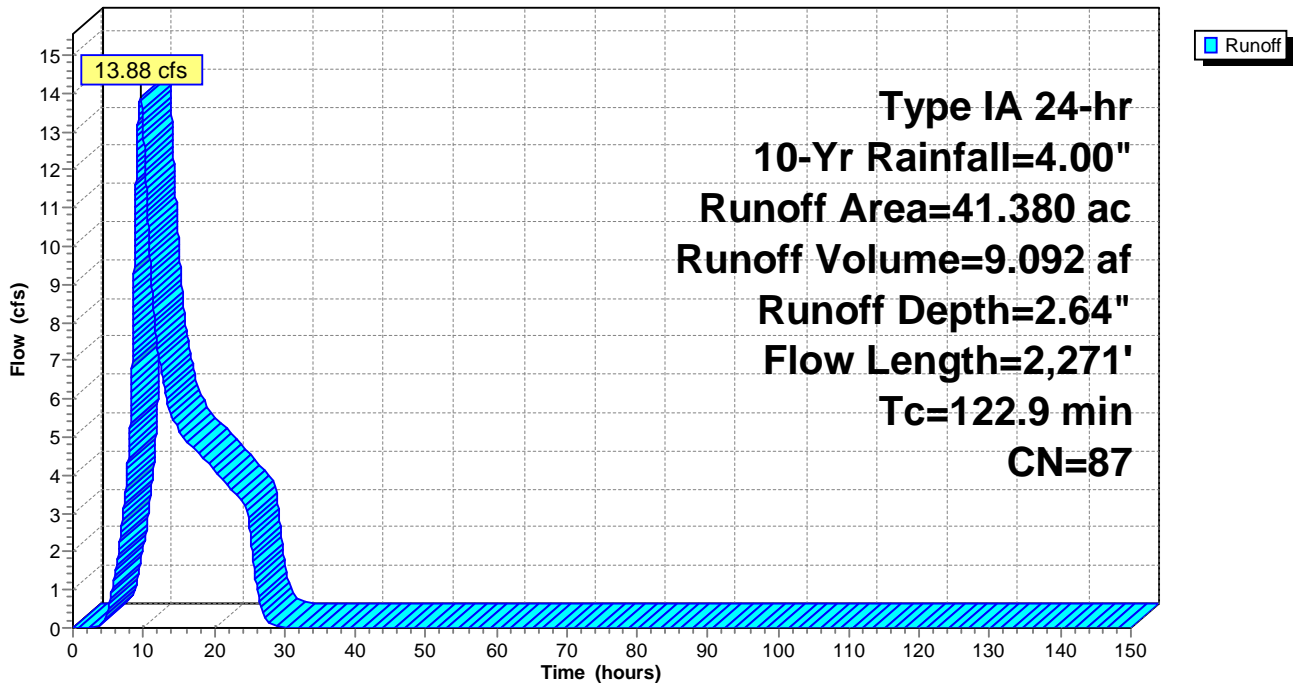
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
8.350	73	Brush, Good, HSG D
0.830	98	Paved parking, HSG D
* 0.160	98	Trail
* 31.710	90	WSDOT - Golf Course
0.330	79	Woods/grass comb., Good, HSG D
41.380	87	Weighted Average
40.390	86	97.61% Pervious Area
0.990	98	2.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	95	0.0950	0.22		Sheet Flow, Sheet - Dense, Native Grasses Grass: Dense n= 0.240 P2= 3.43"
115.8	2,176	0.0020	0.31		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
122.9	2,271	Total			

Subcatchment 2S: 2S-NW Catchment 2

Hydrograph



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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 4S: 4S - West Catchment

Runoff = 11.23 cfs @ 8.36 hrs, Volume= 4.881 af, Depth= 2.20"

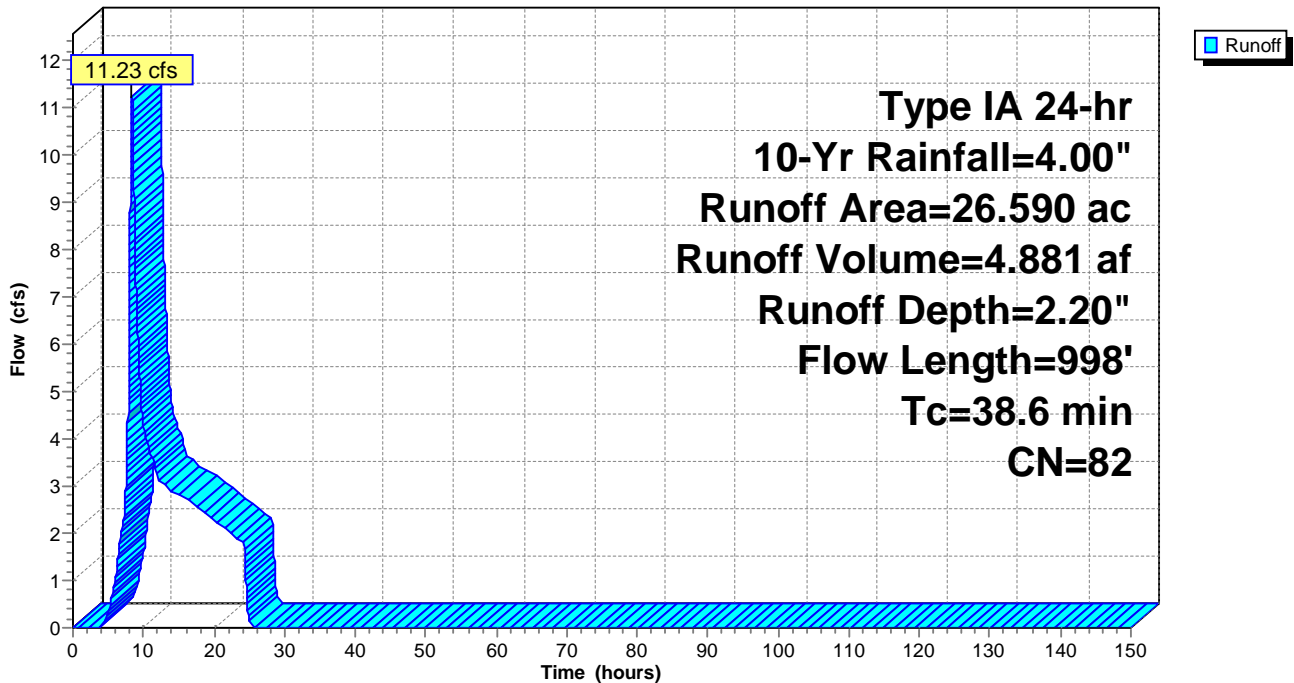
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
13.100	73	Brush, Good, HSG D
* 0.220	98	Trail
* 13.270	90	WSDOT - Golf Course
26.590	82	Weighted Average
26.370	82	99.17% Pervious Area
0.220	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	135	0.0800	1.98		Shallow Concentrated Flow, Shallow - Forest
37.5	863	0.0030	0.38		Short Grass Pasture Kv= 7.0 fps Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
38.6	998	Total			

Subcatchment 4S: 4S - West Catchment

Hydrograph



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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 5S: 5S - West Catchment

Runoff = 11.91 cfs @ 8.03 hrs, Volume= 4.225 af, Depth= 2.04"

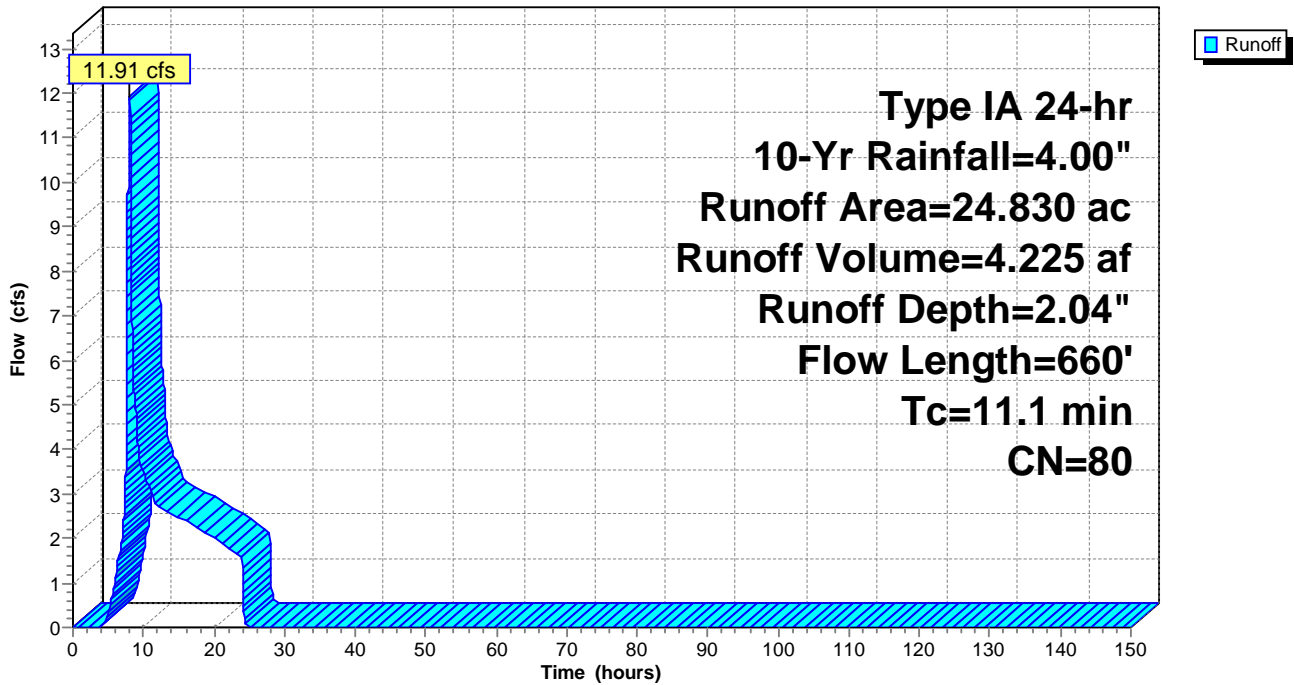
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
13.850	73	Brush, Good, HSG D
0.500	79	Woods/grass comb., Good, HSG D
* 10.480	90	WSDOT - Golf Course
24.830	80	Weighted Average
24.830	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	608	0.0180	0.94		Shallow Concentrated Flow, Shallow - Grass
					Short Grass Pasture Kv= 7.0 fps
0.3	52	0.1300	2.64		Sheet Flow, Path
					Smooth surfaces n= 0.011 P2= 3.43"
11.1	660	Total			

Subcatchment 5S: 5S - West Catchment

Hydrograph



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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 6S: 6S - West Catchment

Runoff = 3.95 cfs @ 9.78 hrs, Volume= 3.087 af, Depth= 1.74"

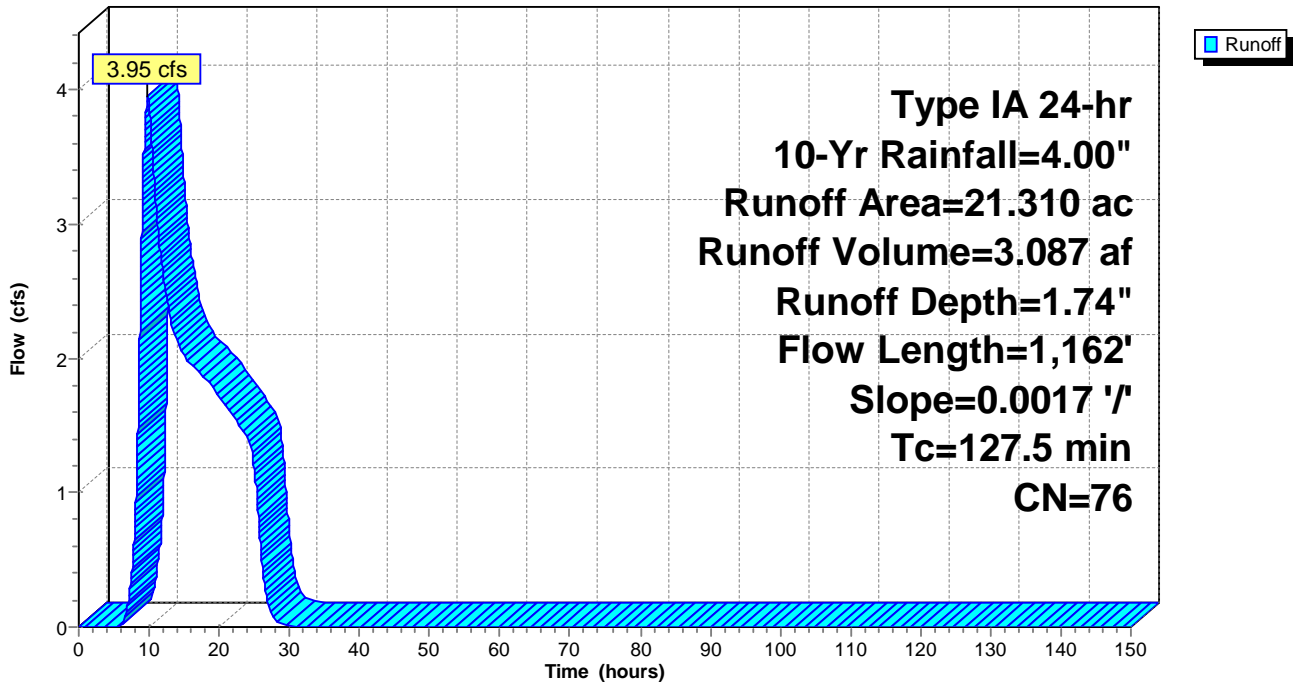
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
8.040	79	Woods/grass comb., Good, HSG D
12.070	73	Brush, Good, HSG D
* 0.970	90	WSDOT - Golf Course
* 0.230	98	Trail
21.310	76	Weighted Average
21.080	76	98.92% Pervious Area
0.230	98	1.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.6	581	0.0017	0.29		Shallow Concentrated Flow, Grass - Shallow Short Grass Pasture Kv= 7.0 fps
93.9	581	0.0017	0.10		Shallow Concentrated Flow, Forested - Shallow Forest w/Heavy Litter Kv= 2.5 fps
127.5	1,162	Total			

Subcatchment 6S: 6S - West Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 7S: 7S - Southwest

Runoff = 13.73 cfs @ 9.84 hrs, Volume= 10.091 af, Depth= 2.20"

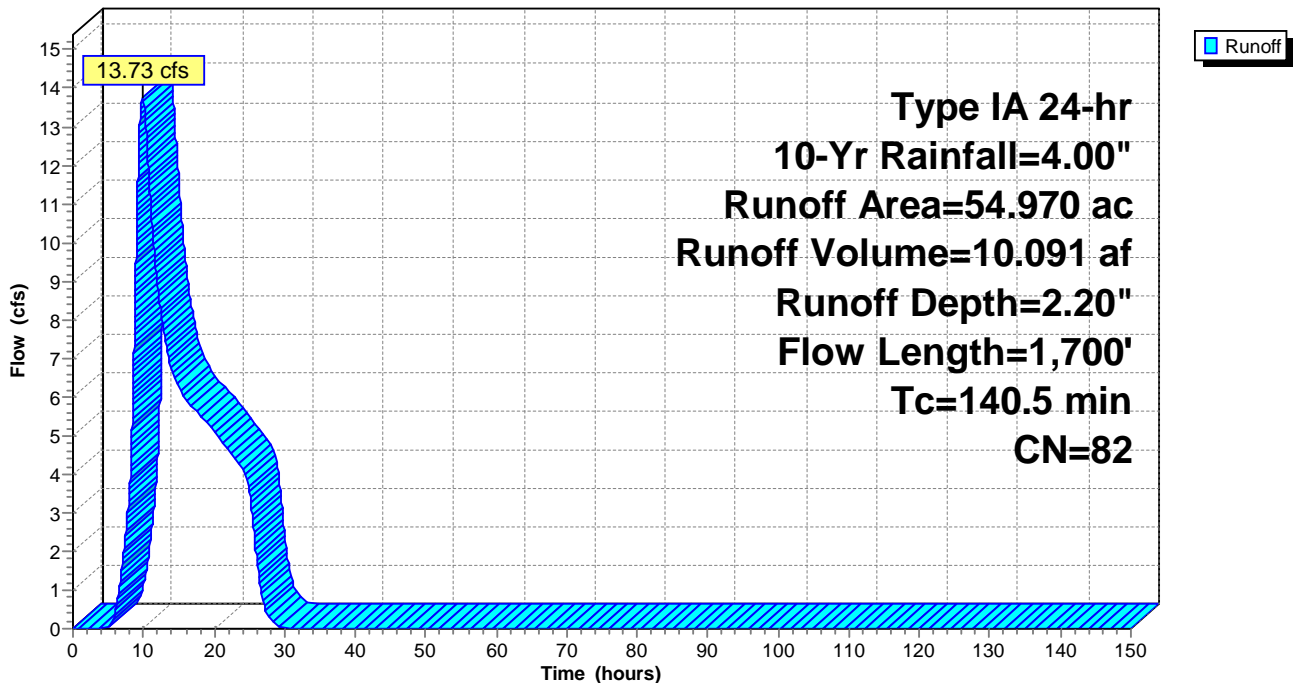
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
8.710	73	Brush, Good, HSG D
25.200	79	Woods/grass comb., Good, HSG D
0.520	98	Paved parking, HSG D
* 0.190	98	Trail
* 20.350	90	WSDOT - Golf Course
54.970	82	Weighted Average
54.260	82	98.71% Pervious Area
0.710	98	1.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	70	0.1000	0.31		Sheet Flow, Sheet - Turf Grass: Short n= 0.150 P2= 3.43"
9.3	775	0.0390	1.38		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
127.5	855	0.0020	0.11		Shallow Concentrated Flow, Shallow - Forest Forest w/Heavy Litter Kv= 2.5 fps
140.5	1,700	Total			

Subcatchment 7S: 7S - Southwest

Hydrograph



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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 8S: 8S - South Catchment

Runoff = 8.32 cfs @ 8.41 hrs, Volume= 3.595 af, Depth= 2.64"

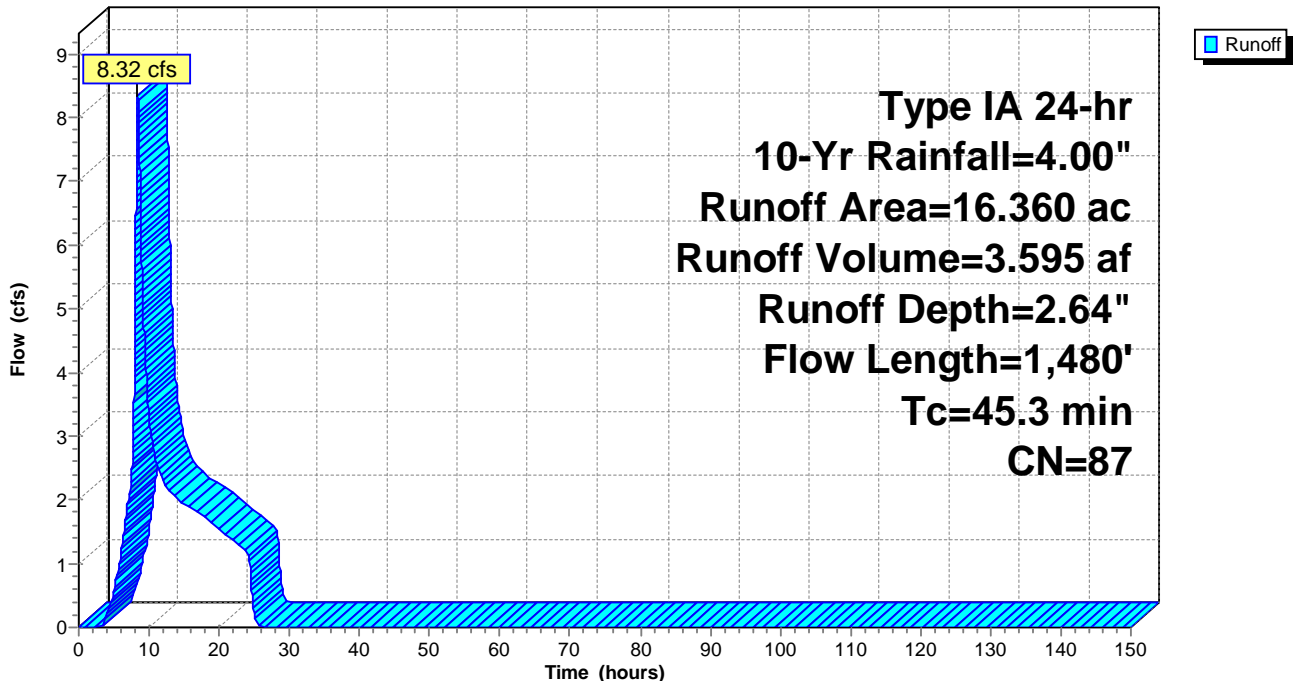
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
1.790	79	Woods/grass comb., Good, HSG D
0.550	30	Brush, Good, HSG A
0.810	98	Paved parking, HSG D
* 13.210	90	WSDOT - Golf Course
16.360	87	Weighted Average
15.550	87	95.05% Pervious Area
0.810	98	4.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	89	0.0560	0.26		Sheet Flow, Sheet- Dune grass Grass: Short n= 0.150 P2= 3.43"
24.0	844	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
15.6	547	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
45.3	1,480	Total			

Subcatchment 8S: 8S - South Catchment

Hydrograph



Proposed Conditions Option 1

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 10S: 10S - Large Central / NE

Runoff = 45.12 cfs @ 14.43 hrs, Volume= 55.256 af, Depth= 2.04"

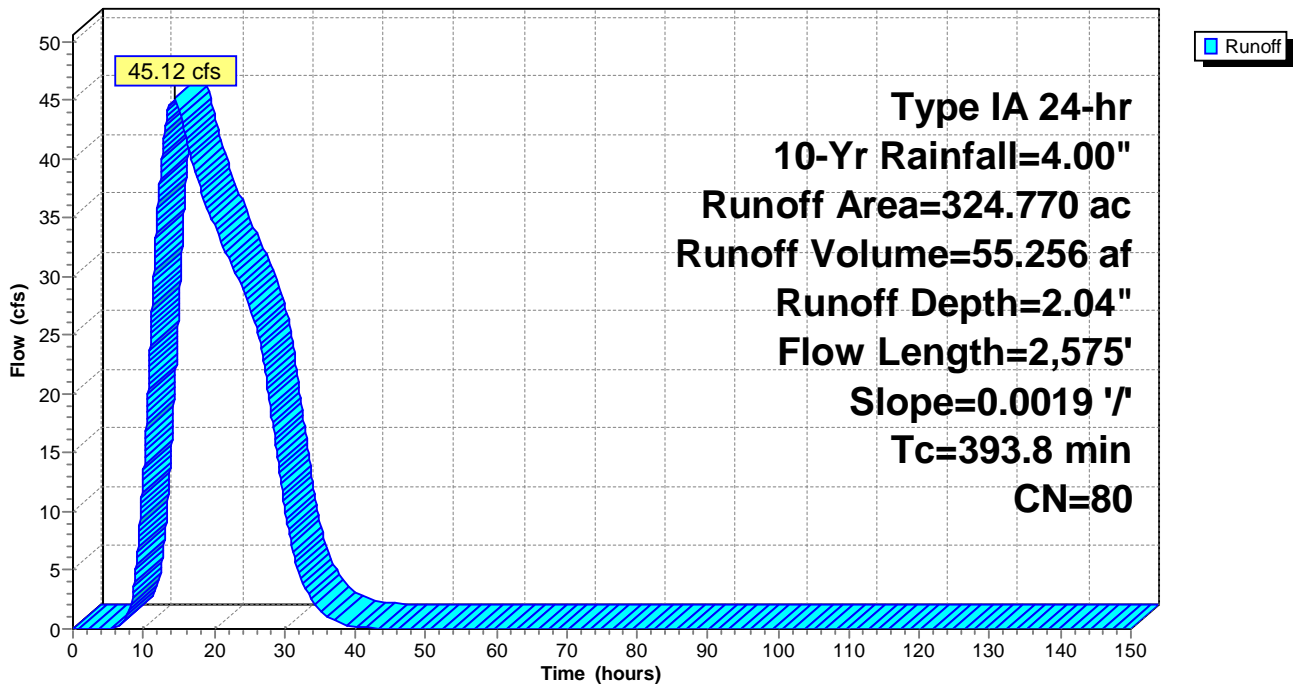
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
198.280	79	Woods/grass comb., Good, HSG D
12.710	32	Woods/grass comb., Good, HSG A
0.660	98	Paved parking, HSG A
5.710	98	Paved parking, HSG D
30.310	73	Brush, Good, HSG D
* 1.800	98	Trail
* 75.300	90	Golf Course
324.770	80	Weighted Average
316.600	79	97.48% Pervious Area
8.170	98	2.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
393.8	2,575	0.0019	0.11		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps

Subcatchment 10S: 10S - Large Central / NE

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Subcatchment 11S: 11S - SE

Runoff = 2.46 cfs @ 8.67 hrs, Volume= 1.999 af, Depth= 1.03"

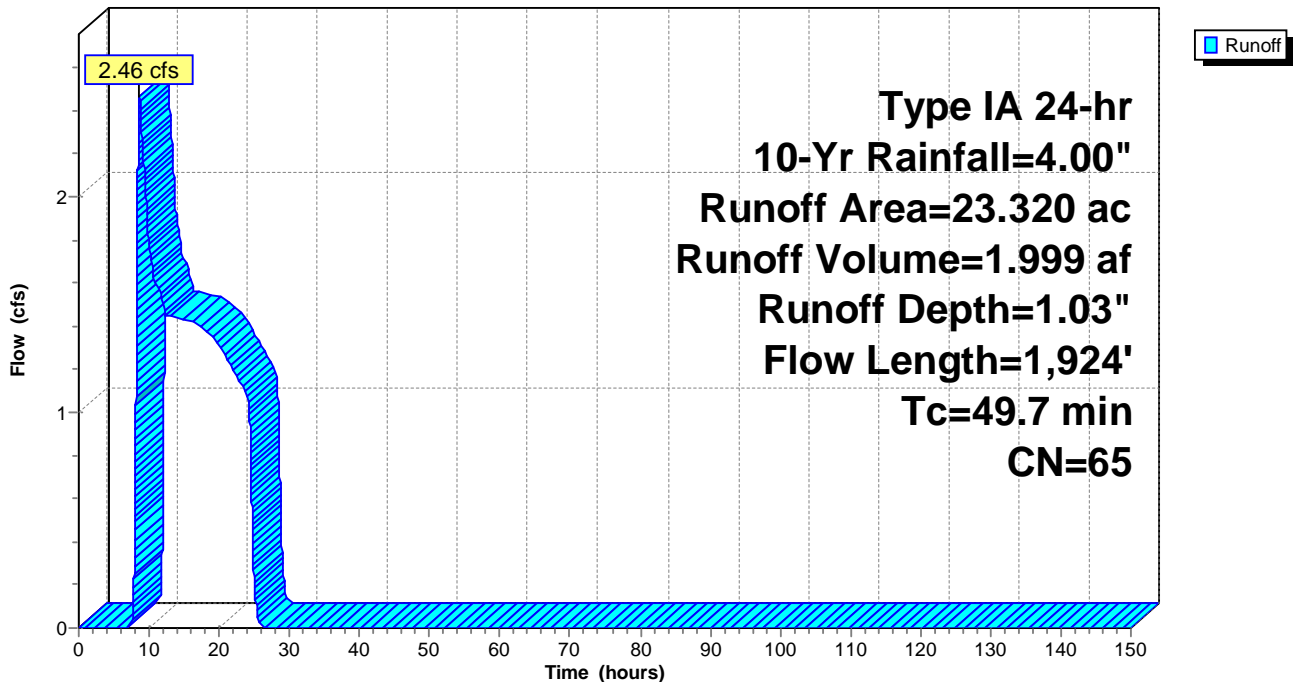
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-Yr Rainfall=4.00"

Area (ac)	CN	Description
2.090	32	Woods/grass comb., Good, HSG A
* 21.230	68	WSDOT - Golf Course
23.320	65	Weighted Average
23.320	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	126	0.1800	0.30		Sheet Flow, Sheet-Dune Grass
					Grass: Dense n= 0.240 P2= 3.43"
42.8	1,798	0.0100	0.70		Shallow Concentrated Flow, Shallow - Grass
					Short Grass Pasture Kv= 7.0 fps
49.7	1,924	Total			

Subcatchment 11S: 11S - SE

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Reach 8R: South Ditch

[91] Warning: Storage range exceeded by 0.53'

[55] Hint: Peak inflow is 283% of Manning's capacity

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 0.92'

Inflow Area =	16.360 ac,	4.95% Impervious,	Inflow Depth = 2.64"	for 10-Yr event
Inflow =	8.32 cfs @	8.41 hrs,	Volume=	3.595 af
Outflow =	8.17 cfs @	8.60 hrs,	Volume=	3.595 af, Atten= 2%, Lag= 11.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs

Max. Velocity= 1.67 fps, Min. Travel Time= 5.8 min

Avg. Velocity = 0.65 fps, Avg. Travel Time= 14.8 min

Peak Storage= 2,840 cf @ 8.50 hrs

Average Depth at Peak Storage= 1.03', Surface Width= 6.06'

Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 2.94 cfs

4.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 1.0 '/' Top Width= 5.00'

Length= 579.0' Slope= 0.0012 '/'

Inlet Invert= 16.00', Outlet Invert= 15.30'



Proposed Conditions Option_1

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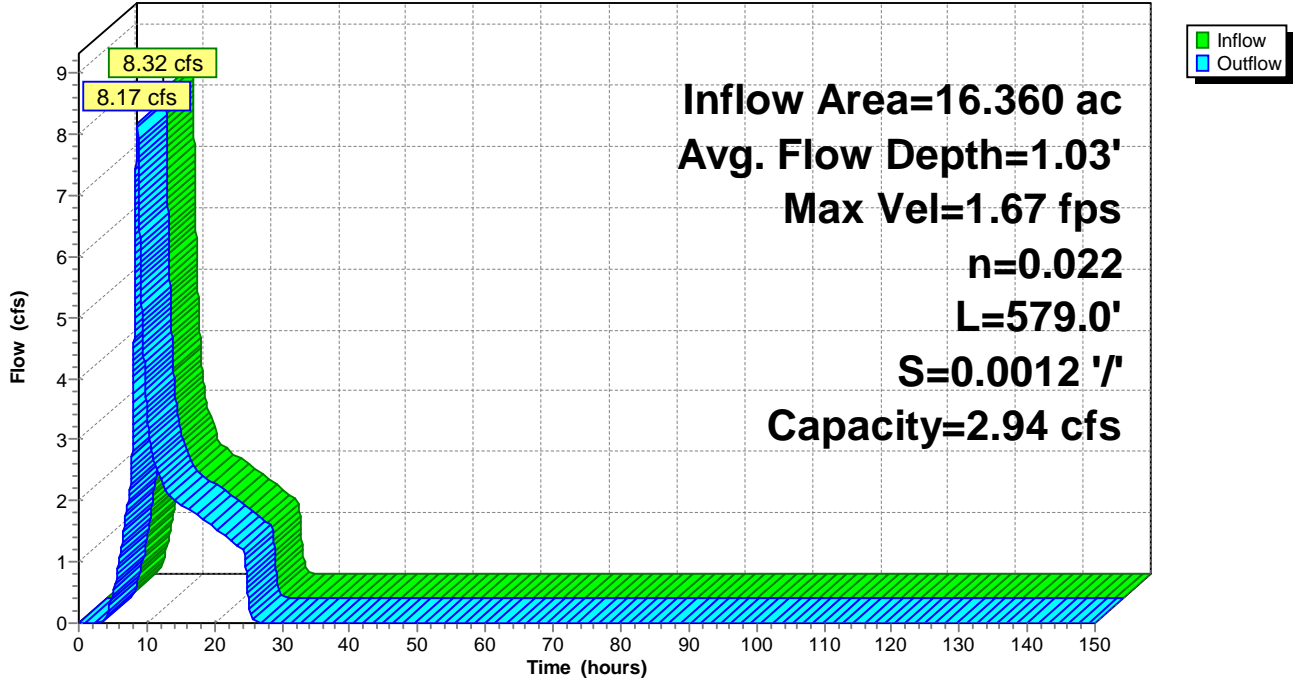
Type IA 24-hr 10-Yr Rainfall=4.00"

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Reach 8R: South Ditch

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 1P: 1P- NW Pond

Inflow Area = 7.320 ac, 19.67% Impervious, Inflow Depth = 2.37" for 10-Yr event
 Inflow = 4.34 cfs @ 7.93 hrs, Volume= 1.446 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.05' @ 24.29 hrs Surf.Area= 1.464 ac Storage= 1.446 af

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

Volume	Invert	Avail.Storage	Storage Description
#1	11.00'	6.173 af	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
11.00	1.290	1,552.0	0.000	0.000	1.290
12.00	1.460	1,164.0	1.374	1.374	3.215
13.00	1.550	1,193.0	1.505	2.879	3.343
14.00	1.640	1,231.0	1.595	4.474	3.514
15.00	1.760	1,333.0	1.700	6.173	3.992

Device	Routing	Invert	Outlet Devices
#1	Primary	14.99'	1,333.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Proposed Conditions Option_1

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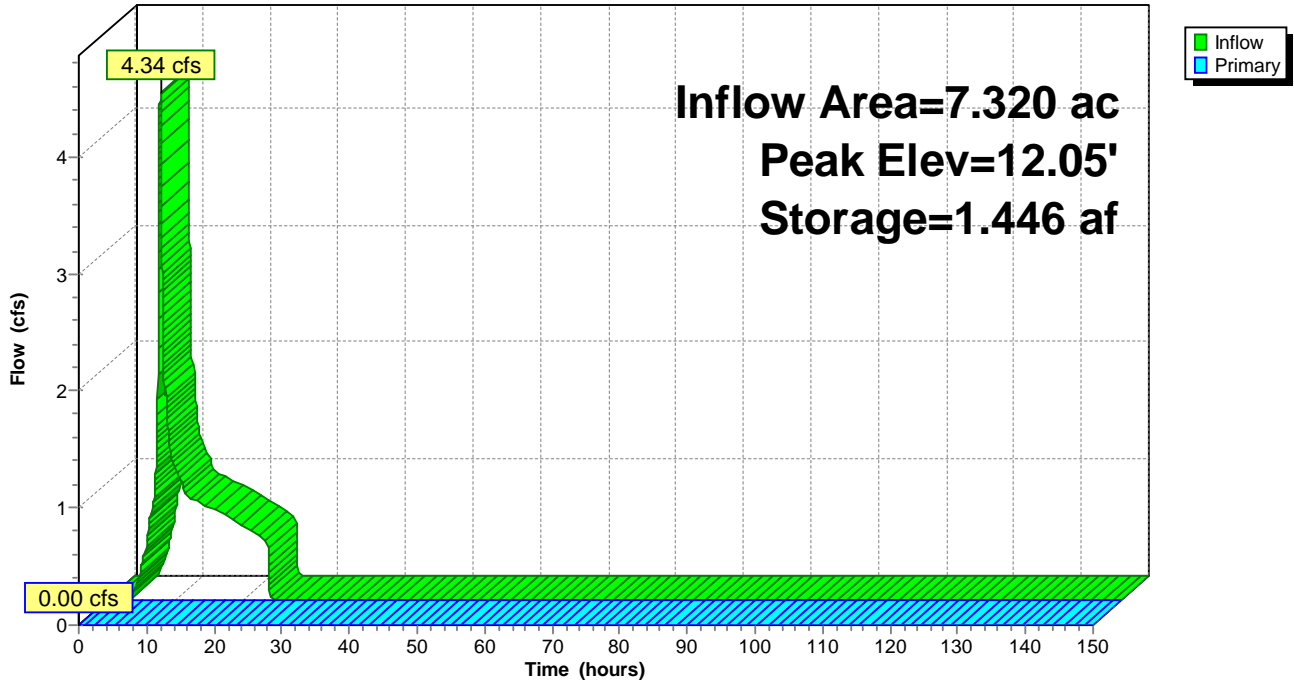
Type IA 24-hr 10-Yr Rainfall=4.00"

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Pond 1P: 1P- NW Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 5P: 5P - West Pond

[81] Warning: Exceeded Pond 7P by 0.80' @ 8.49 hrs

Inflow Area = 106.390 ac, 0.87% Impervious, Inflow Depth = 1.79" for 10-Yr event
 Inflow = 20.43 cfs @ 8.09 hrs, Volume= 15.854 af
 Outflow = 14.27 cfs @ 12.28 hrs, Volume= 14.017 af, Atten= 30%, Lag= 251.3 min
 Primary = 14.27 cfs @ 12.28 hrs, Volume= 14.017 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 12.28 hrs Surf.Area= 12.832 ac Storage= 1.877 af

Plug-Flow detention time= 132.6 min calculated for 14.017 af (88% of inflow)
 Center-of-Mass det. time= 63.8 min (986.3 - 922.6)

Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	340.699 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	1.160	3,026.0	0.000	0.000	1.160	
15.00	2.670	3,968.0	1.863	1.863	13.196	
15.10	9,999.000	9,999.0	338.835	340.699	167.081	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	3,968.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=13.95 cfs @ 12.28 hrs HW=15.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 13.95 cfs @ 0.29 fps)

Proposed Conditions Option_1

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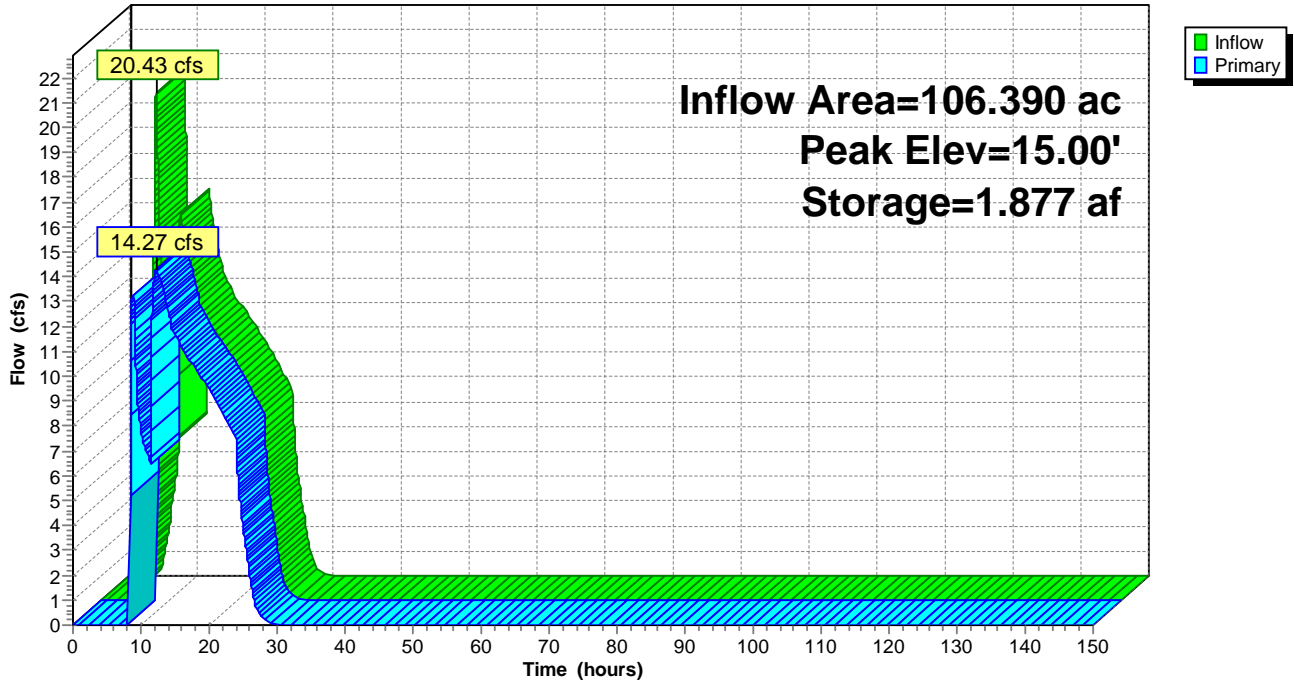
Type IA 24-hr 10-Yr Rainfall=4.00"

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Pond 5P: 5P - West Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 6P: 6P- West Pond

[81] Warning: Exceeded Pond 5P by 0.01' @ 20.58 hrs

Inflow Area = 127.700 ac, 0.91% Impervious, Inflow Depth = 1.61" for 10-Yr event
 Inflow = 16.81 cfs @ 12.20 hrs, Volume= 17.105 af
 Outflow = 12.86 cfs @ 16.46 hrs, Volume= 13.321 af, Atten= 24%, Lag= 255.9 min
 Primary = 12.86 cfs @ 16.46 hrs, Volume= 13.321 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.01' @ 16.46 hrs Surf.Area= 212.518 ac Storage= 4.884 af

Plug-Flow detention time= 278.6 min calculated for 13.321 af (78% of inflow)
 Center-of-Mass det. time= 162.4 min (1,139.5 - 977.0)

Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	344.602 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.930	3,856.0	0.000	0.000	2.930	
15.00	4.810	4,175.0	3.831	3.831	7.611	
15.10	9,999.000	9,999.0	340.771	344.602	158.416	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	1,400.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=12.80 cfs @ 16.46 hrs HW=15.01' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 12.80 cfs @ 0.40 fps)

Proposed Conditions Option_1

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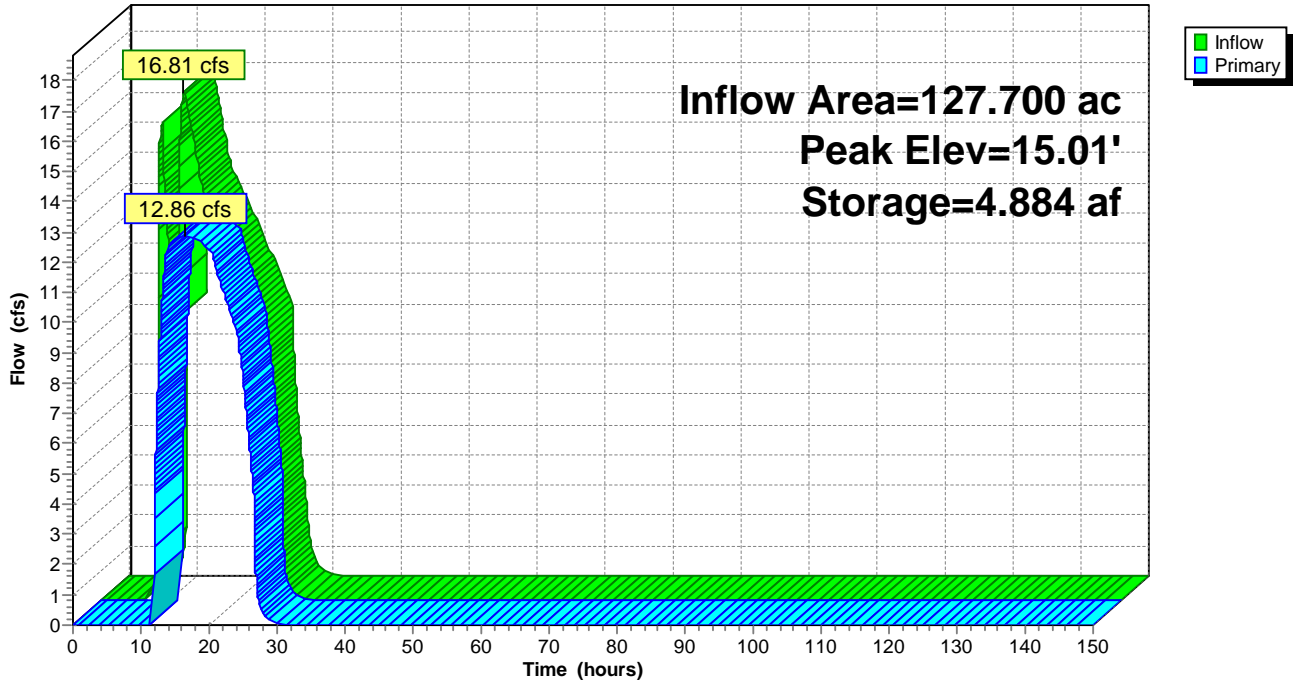
Type IA 24-hr 10-Yr Rainfall=4.00"

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Pond 6P: 6P- West Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 7P: 7P-Southwest

Inflow Area = 54.970 ac, 1.29% Impervious, Inflow Depth = 2.20" for 10-Yr event
 Inflow = 13.73 cfs @ 9.84 hrs, Volume= 10.091 af
 Outflow = 9.40 cfs @ 11.69 hrs, Volume= 6.748 af, Atten= 32%, Lag= 111.3 min
 Primary = 9.40 cfs @ 11.69 hrs, Volume= 6.748 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 11.69 hrs Surf.Area= 4.551 ac Storage= 3.373 af

Plug-Flow detention time= 356.3 min calculated for 6.748 af (67% of inflow)
 Center-of-Mass det. time= 165.3 min (1,075.3 - 910.0)

Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	37.446 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.340	3,959.0	0.000	0.000	2.340	
15.00	4.560	5,430.0	3.389	3.389	27.571	
15.01	9,999.000	9,999.0	34.057	37.446	156.355	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	5,430.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=7.61 cfs @ 11.69 hrs HW=15.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 7.61 cfs @ 0.22 fps)

Proposed Conditions Option_1

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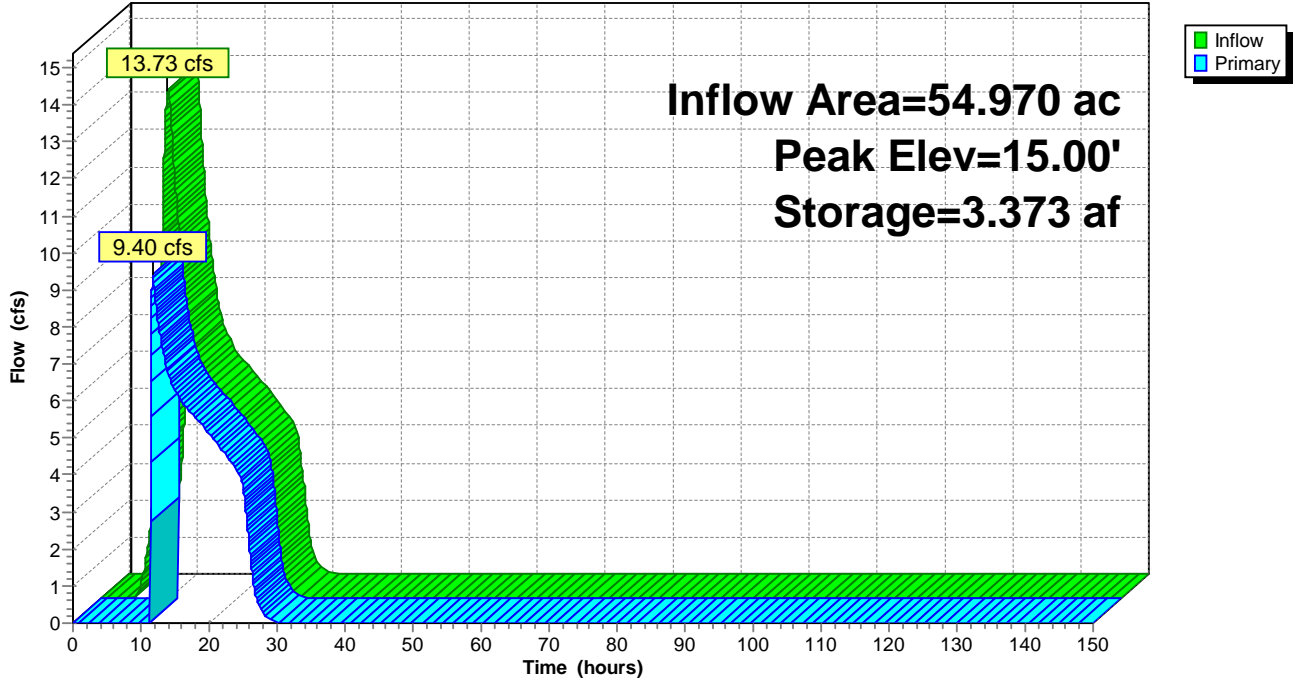
Type IA 24-hr 10-Yr Rainfall=4.00"

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Pond 7P: 7P-Southwest

Hydrograph



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Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 8P: 8P

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 2.64" for 10-Yr event
 Inflow = 8.32 cfs @ 8.41 hrs, Volume= 3.595 af
 Outflow = 8.32 cfs @ 8.41 hrs, Volume= 3.595 af, Atten= 0%, Lag= 0.0 min
 Primary = 8.32 cfs @ 8.41 hrs, Volume= 3.595 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Peak Elev= 17.52' @ 8.41 hrs
 Flood Elev= 19.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	16.11'	36.0" Round Culvert L= 93.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.11' / 15.29' S= 0.0088 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	19.00'	100.0' long x 24.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=8.32 cfs @ 8.41 hrs HW=17.52' (Free Discharge)

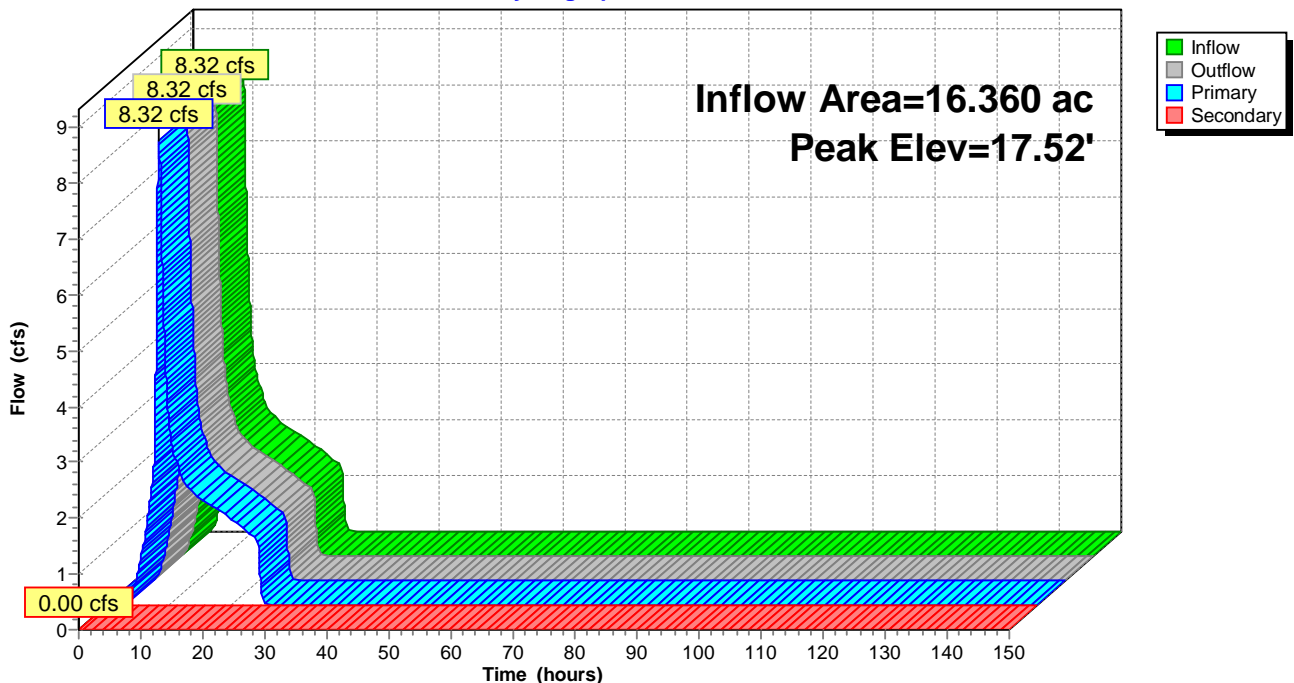
↑**1=Culvert** (Barrel Controls 8.32 cfs @ 3.74 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.11' (Free Discharge)

↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 8P: 8P

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 10-Yr Rainfall=4.00"

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Summary for Pond 10P: 10P-Large Central/NE

Inflow Area = 524.490 ac, 2.24% Impervious, Inflow Depth = 1.82" for 10-Yr event
 Inflow = 64.55 cfs @ 14.42 hrs, Volume= 79.668 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.83' @ 46.39 hrs Surf.Area= 102.404 ac Storage= 79.658 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description			
#1	10.00'	98.335 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.00	0.280	2,536.0	0.000	0.000	0.280	
11.00	6.414	16,985.0	2.678	2.678	515.559	
12.00	38.875	11,909.0	20.360	23.038	783.495	
13.00	119.000	22,186.0	75.297	98.335	1,423.612	

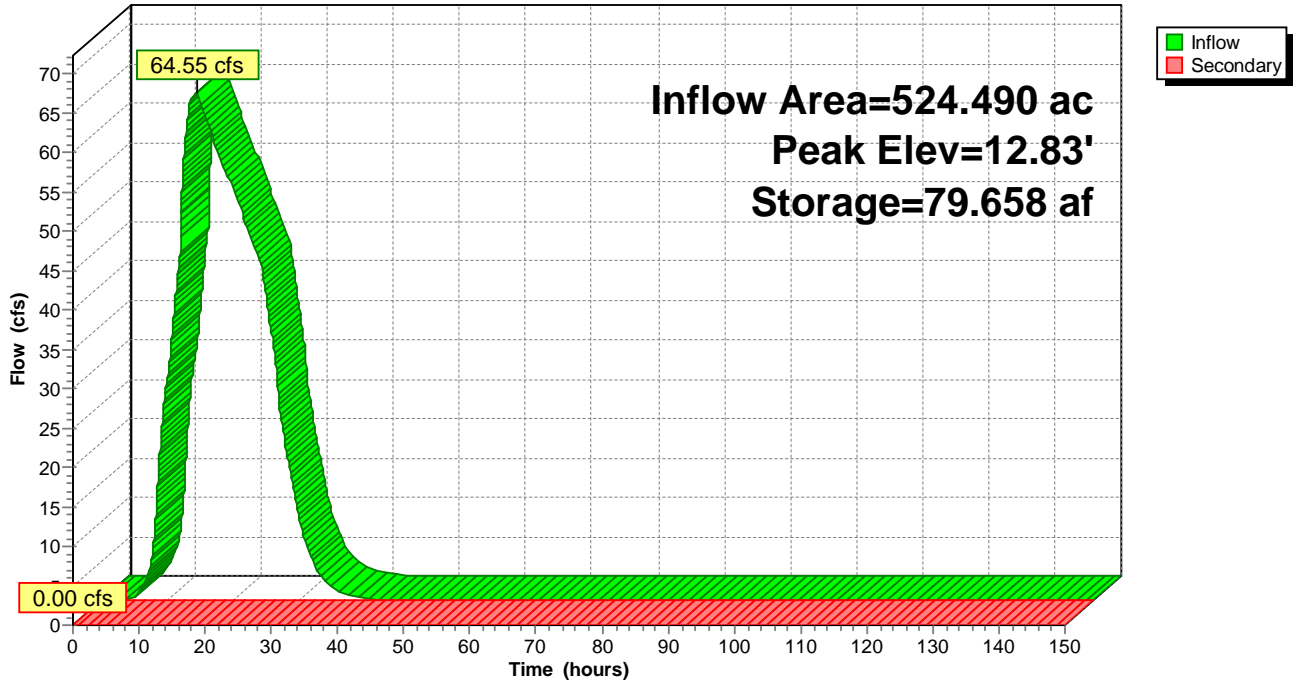
Device	Routing	Invert	Outlet Devices					
#1	Secondary	12.99'	9,999.0' long x 0.5' breadth Broad-Crested Rectangular Weir					
			Head (feet) 0.20 0.40 0.60 0.80 1.00					
			Coef. (English) 2.80 2.92 3.08 3.30 3.32					

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.00' (Free Discharge)

↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 10P: 10P-Large Central/NE

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 25-Yr Rainfall=4.50"

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Time span=0.00-150.00 hrs, dt=0.01 hrs, 15001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S-NW Catchment	Runoff Area=7.320 ac 19.67% Impervious Runoff Depth=2.82" Flow Length=292' Slope=0.0200 '/' Tc=4.9 min CN=84 Runoff=5.23 cfs 1.718 af
Subcatchment 2S: 2S-NW Catchment 2	Runoff Area=41.380 ac 2.39% Impervious Runoff Depth=3.10" Flow Length=2,271' Tc=122.9 min CN=87 Runoff=16.50 cfs 10.686 af
Subcatchment 4S: 4S - West Catchment	Runoff Area=26.590 ac 0.83% Impervious Runoff Depth=2.64" Flow Length=998' Tc=38.6 min CN=82 Runoff=13.74 cfs 5.841 af
Subcatchment 5S: 5S - West Catchment	Runoff Area=24.830 ac 0.00% Impervious Runoff Depth=2.46" Flow Length=660' Tc=11.1 min CN=80 Runoff=14.71 cfs 5.093 af
Subcatchment 6S: 6S - West Catchment	Runoff Area=21.310 ac 1.08% Impervious Runoff Depth=2.13" Flow Length=1,162' Slope=0.0017 '/' Tc=127.5 min CN=76 Runoff=5.03 cfs 3.782 af
Subcatchment 7S: 7S - Southwest	Runoff Area=54.970 ac 1.29% Impervious Runoff Depth=2.64" Flow Length=1,700' Tc=140.5 min CN=82 Runoff=16.81 cfs 12.075 af
Subcatchment 8S: 8S - South Catchment	Runoff Area=16.360 ac 4.95% Impervious Runoff Depth=3.10" Flow Length=1,480' Tc=45.3 min CN=87 Runoff=9.89 cfs 4.225 af
Subcatchment 10S: 10S - Large Central / NE	Runoff Area=324.770 ac 2.52% Impervious Runoff Depth=2.46" Flow Length=2,575' Slope=0.0019 '/' Tc=393.8 min CN=80 Runoff=55.38 cfs 66.619 af
Subcatchment 11S: 11S - SE	Runoff Area=23.320 ac 0.00% Impervious Runoff Depth=1.33" Flow Length=1,924' Tc=49.7 min CN=65 Runoff=3.68 cfs 2.585 af
Reach 8R: South Ditch	Avg. Flow Depth=1.19' Max Vel=1.71 fps Inflow=9.89 cfs 4.225 af n=0.022 L=579.0' S=0.0012 '/' Capacity=2.94 cfs Outflow=9.71 cfs 4.225 af
Pond 1P: 1P- NW Pond	Peak Elev=12.23' Storage=1.718 af Inflow=5.23 cfs 1.718 af Outflow=0.00 cfs 0.000 af
Pond 5P: 5P - West Pond	Peak Elev=15.00' Storage=1.929 af Inflow=25.22 cfs 19.666 af Outflow=18.94 cfs 17.830 af
Pond 6P: 6P- West Pond	Peak Elev=15.02' Storage=5.571 af Inflow=22.40 cfs 21.612 af Outflow=15.39 cfs 17.829 af
Pond 7P: 7P-Southwest	Peak Elev=15.00' Storage=3.386 af Inflow=16.81 cfs 12.075 af Outflow=13.60 cfs 8.732 af
Pond 8P: 8P	Peak Elev=17.66' Inflow=9.89 cfs 4.225 af Primary=9.89 cfs 4.225 af Secondary=0.00 cfs 0.000 af Outflow=9.89 cfs 4.225 af
Pond 10P: 10P-Large Central/NE	Peak Elev=12.99' Storage=97.228 af Inflow=78.55 cfs 97.720 af Outflow=1.85 cfs 0.570 af

Proposed_Conditions_Option_1

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Type IA 24-hr 25-Yr Rainfall=4.50"

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Total Runoff Area = 540.850 ac Runoff Volume = 112.626 af Average Runoff Depth = 2.50"
97.68% Pervious = 528.280 ac 2.32% Impervious = 12.570 ac

Proposed Conditions Option_1

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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 1S: 1S-NW Catchment

Runoff = 5.23 cfs @ 7.92 hrs, Volume= 1.718 af, Depth= 2.82"

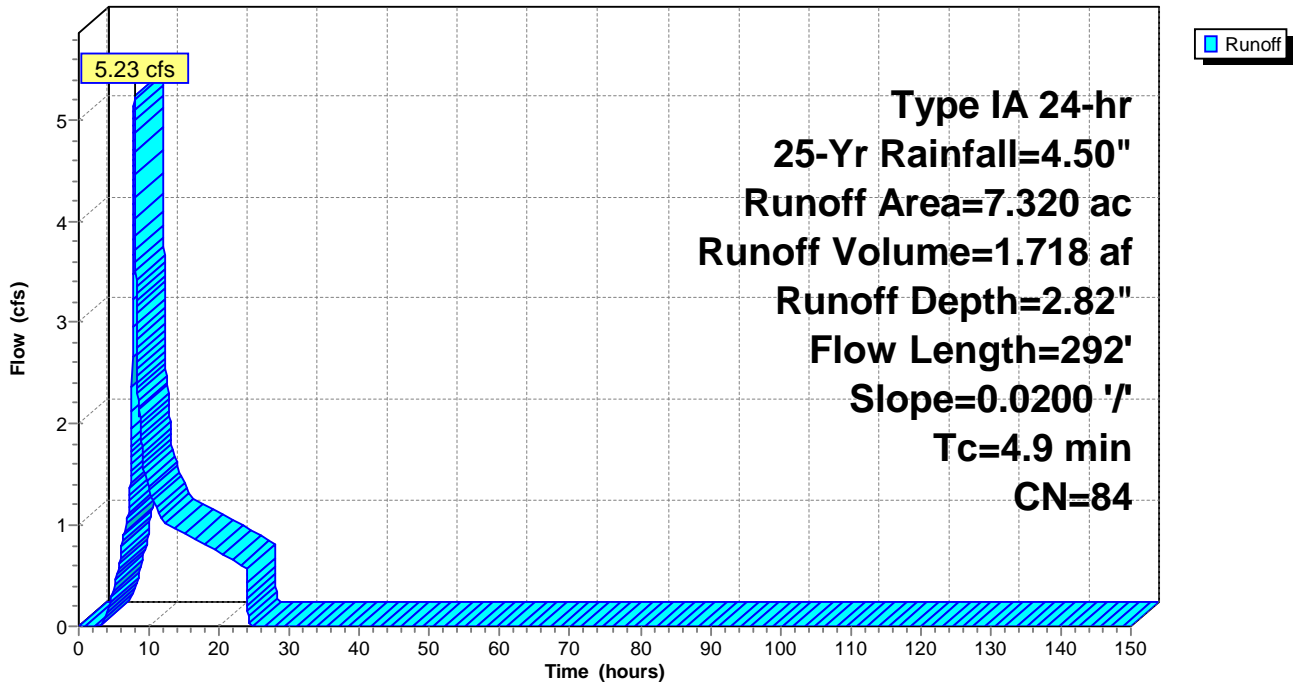
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
3.470	73	Brush, Good, HSG D
1.210	98	Paved parking, HSG D
* 2.410	90	WSDOT - Golf Course
* 0.230	98	Trail
7.320	84	Weighted Average
5.880	80	80.33% Pervious Area
1.440	98	19.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	292	0.0200	0.99		Shallow Concentrated Flow, Shallow - Golf Course Short Grass Pasture Kv= 7.0 fps

Subcatchment 1S: 1S-NW Catchment

Hydrograph



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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 2S: 2S-NW Catchment 2

Sheet flow - dense comes from "native grasses" considered dense. Characterized by the wetland report.

Runoff = 16.50 cfs @ 9.55 hrs, Volume= 10.686 af, Depth= 3.10"

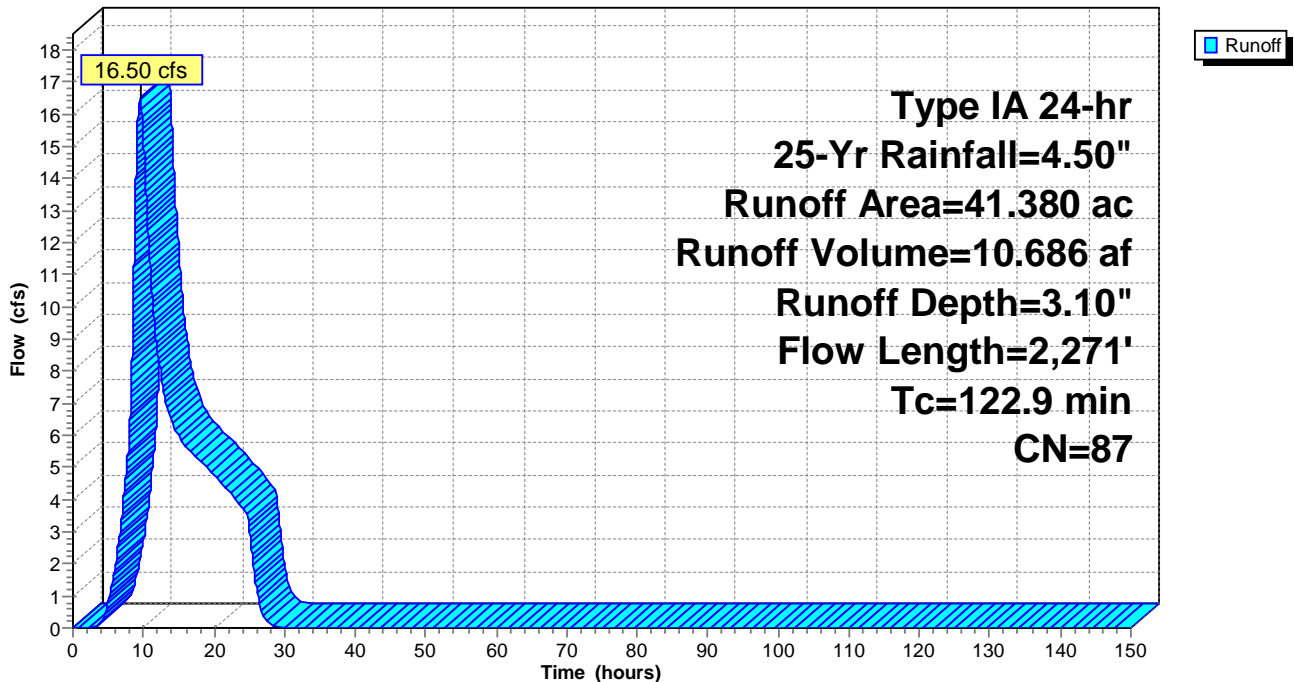
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
8.350	73	Brush, Good, HSG D
0.830	98	Paved parking, HSG D
* 0.160	98	Trail
* 31.710	90	WSDOT - Golf Course
0.330	79	Woods/grass comb., Good, HSG D
41.380	87	Weighted Average
40.390	86	97.61% Pervious Area
0.990	98	2.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	95	0.0950	0.22		Sheet Flow, Sheet - Dense, Native Grasses
					Grass: Dense n= 0.240 P2= 3.43"
115.8	2,176	0.0020	0.31		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
122.9	2,271	Total			

Subcatchment 2S: 2S-NW Catchment 2

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 4S: 4S - West Catchment

Runoff = 13.74 cfs @ 8.36 hrs, Volume= 5.841 af, Depth= 2.64"

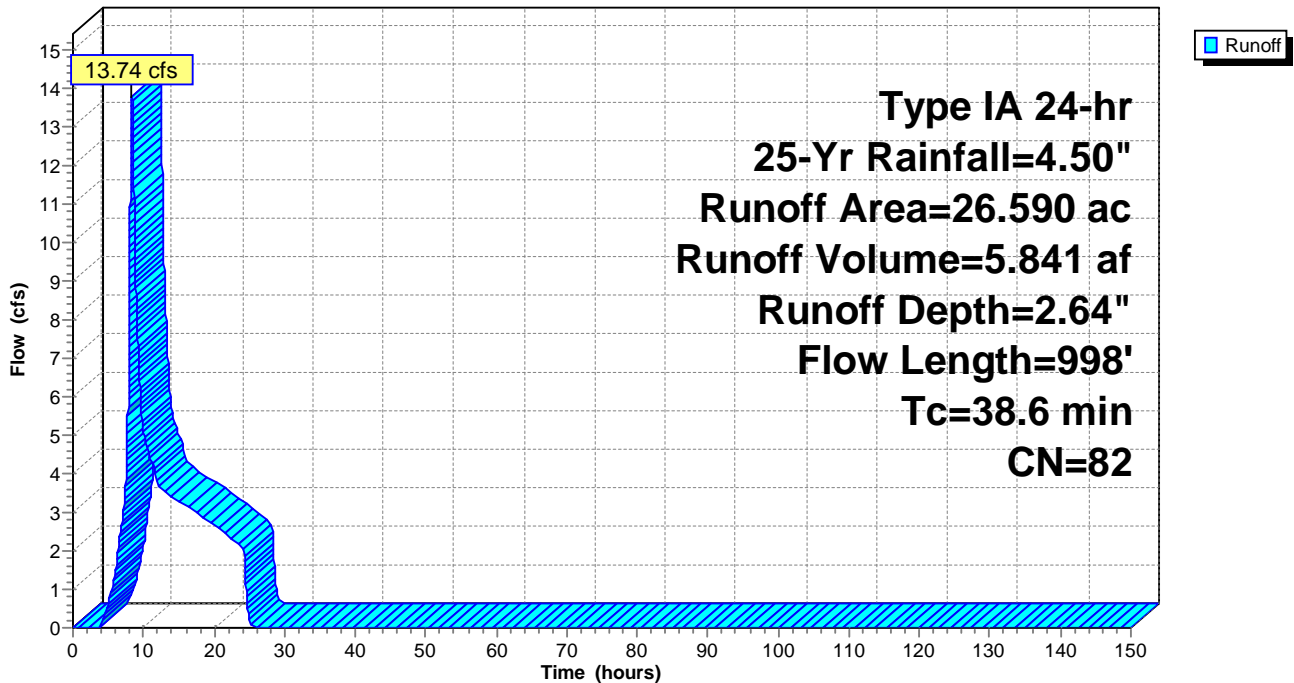
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
13.100	73	Brush, Good, HSG D
* 0.220	98	Trail
* 13.270	90	WSDOT - Golf Course
26.590	82	Weighted Average
26.370	82	99.17% Pervious Area
0.220	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	135	0.0800	1.98		Shallow Concentrated Flow, Shallow - Forest
37.5	863	0.0030	0.38		Short Grass Pasture Kv= 7.0 fps Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
38.6	998	Total			

Subcatchment 4S: 4S - West Catchment

Hydrograph



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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 5S: 5S - West Catchment

Runoff = 14.71 cfs @ 8.03 hrs, Volume= 5.093 af, Depth= 2.46"

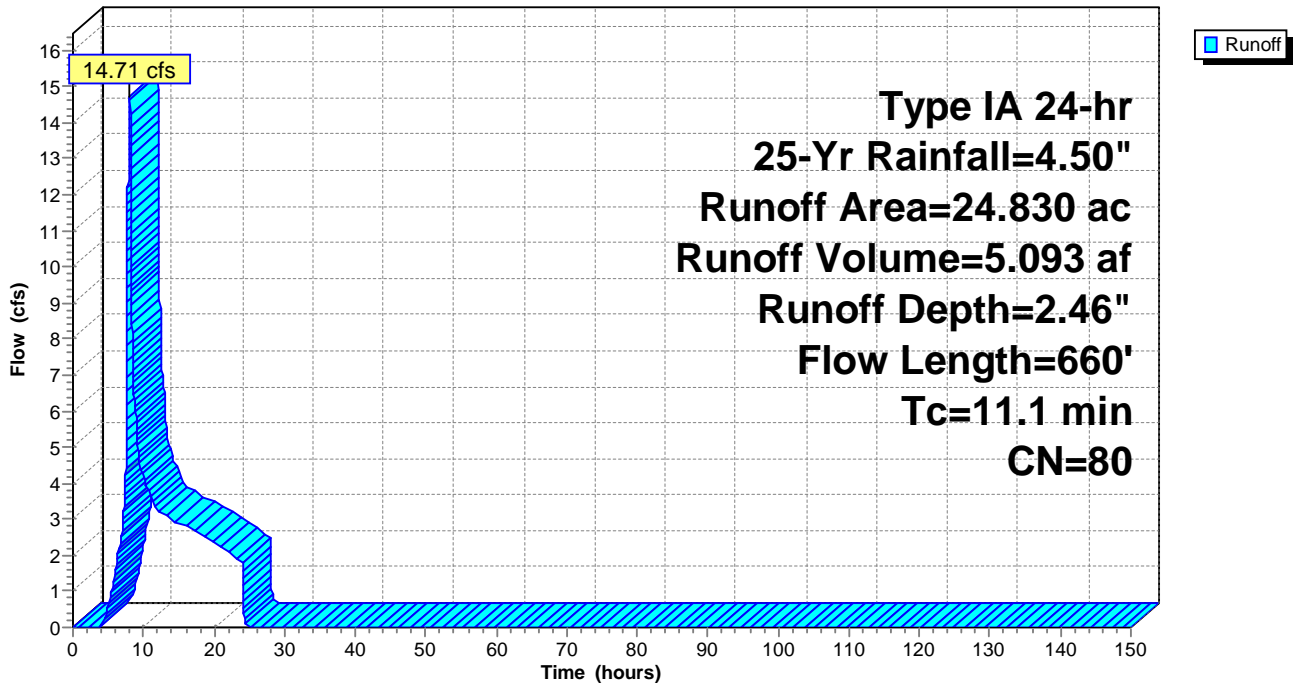
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
13.850	73	Brush, Good, HSG D
0.500	79	Woods/grass comb., Good, HSG D
* 10.480	90	WSDOT - Golf Course
24.830	80	Weighted Average
24.830	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	608	0.0180	0.94		Shallow Concentrated Flow, Shallow - Grass
					Short Grass Pasture Kv= 7.0 fps
0.3	52	0.1300	2.64		Sheet Flow, Path
					Smooth surfaces n= 0.011 P2= 3.43"
11.1	660	Total			

Subcatchment 5S: 5S - West Catchment

Hydrograph



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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 6S: 6S - West Catchment

Runoff = 5.03 cfs @ 9.77 hrs, Volume= 3.782 af, Depth= 2.13"

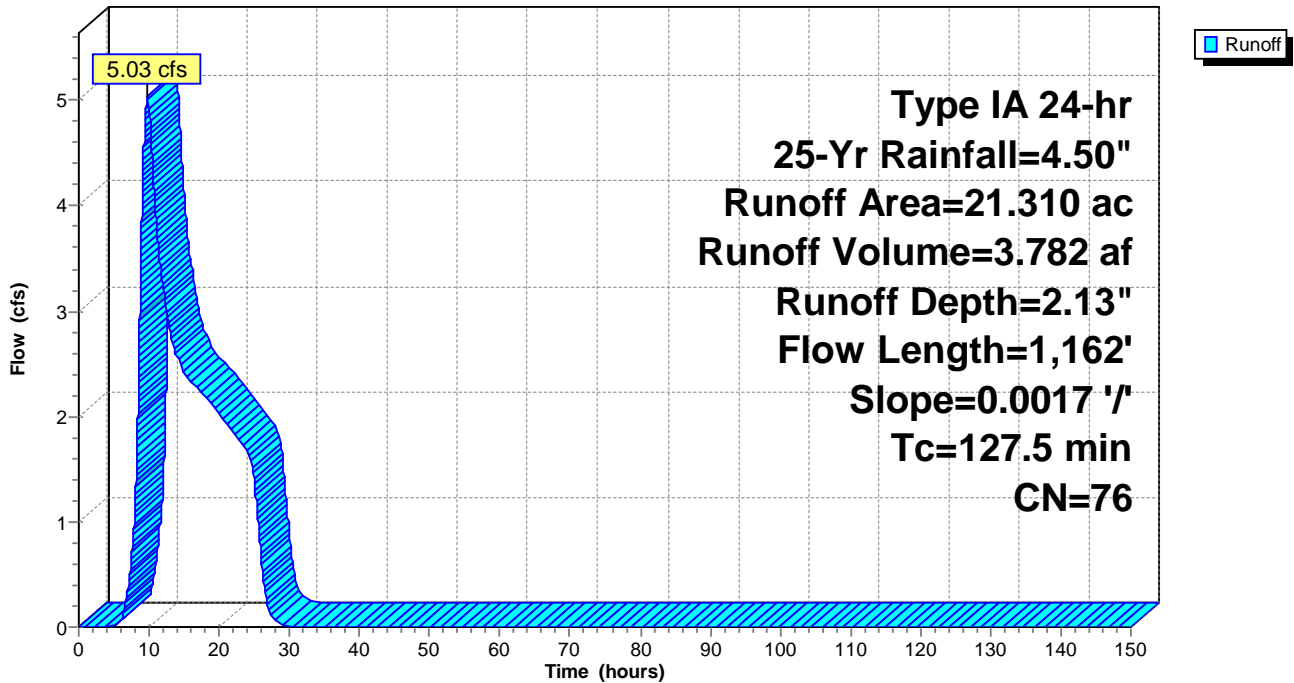
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
8.040	79	Woods/grass comb., Good, HSG D
12.070	73	Brush, Good, HSG D
* 0.970	90	WSDOT - Golf Course
* 0.230	98	Trail
21.310	76	Weighted Average
21.080	76	98.92% Pervious Area
0.230	98	1.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.6	581	0.0017	0.29		Shallow Concentrated Flow, Grass - Shallow Short Grass Pasture Kv= 7.0 fps
93.9	581	0.0017	0.10		Shallow Concentrated Flow, Forested - Shallow Forest w/Heavy Litter Kv= 2.5 fps
127.5	1,162	Total			

Subcatchment 6S: 6S - West Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 7S: 7S - Southwest

Runoff = 16.81 cfs @ 9.84 hrs, Volume= 12.075 af, Depth= 2.64"

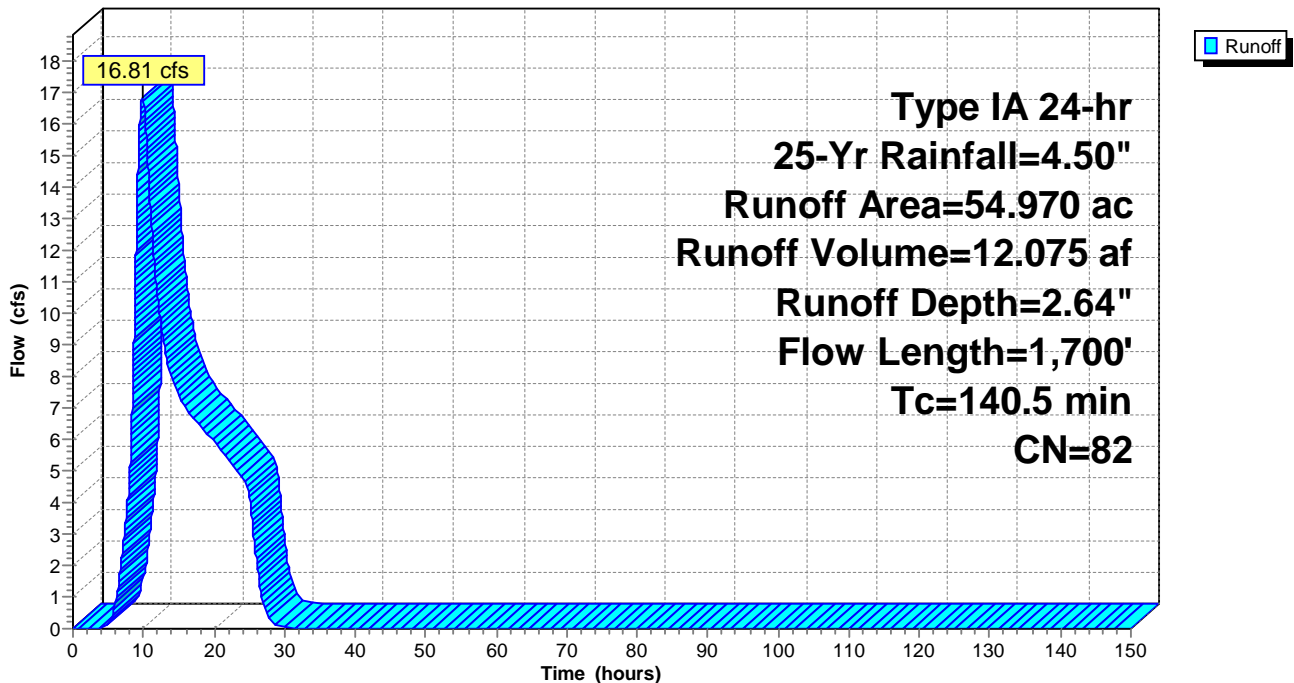
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
8.710	73	Brush, Good, HSG D
25.200	79	Woods/grass comb., Good, HSG D
0.520	98	Paved parking, HSG D
* 0.190	98	Trail
* 20.350	90	WSDOT - Golf Course
54.970	82	Weighted Average
54.260	82	98.71% Pervious Area
0.710	98	1.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	70	0.1000	0.31		Sheet Flow, Sheet - Turf Grass: Short n= 0.150 P2= 3.43"
9.3	775	0.0390	1.38		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
127.5	855	0.0020	0.11		Shallow Concentrated Flow, Shallow - Forest Forest w/Heavy Litter Kv= 2.5 fps
140.5	1,700	Total			

Subcatchment 7S: 7S - Southwest

Hydrograph



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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 8S: 8S - South Catchment

Runoff = 9.89 cfs @ 8.41 hrs, Volume= 4.225 af, Depth= 3.10"

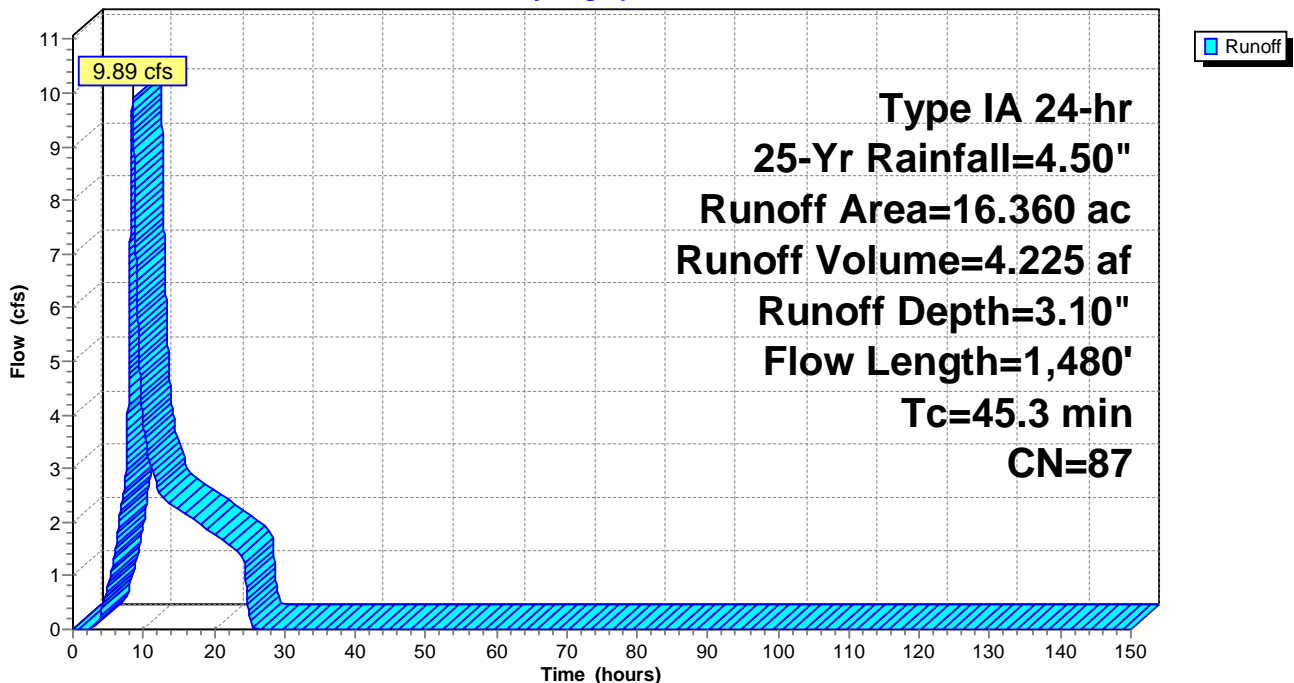
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
1.790	79	Woods/grass comb., Good, HSG D
0.550	30	Brush, Good, HSG A
0.810	98	Paved parking, HSG D
* 13.210	90	WSDOT - Golf Course
16.360	87	Weighted Average
15.550	87	95.05% Pervious Area
0.810	98	4.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	89	0.0560	0.26		Sheet Flow, Sheet- Dune grass Grass: Short n= 0.150 P2= 3.43"
24.0	844	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
15.6	547	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
45.3	1,480	Total			

Subcatchment 8S: 8S - South Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 10S: 10S - Large Central / NE

Runoff = 55.38 cfs @ 14.01 hrs, Volume= 66.619 af, Depth= 2.46"

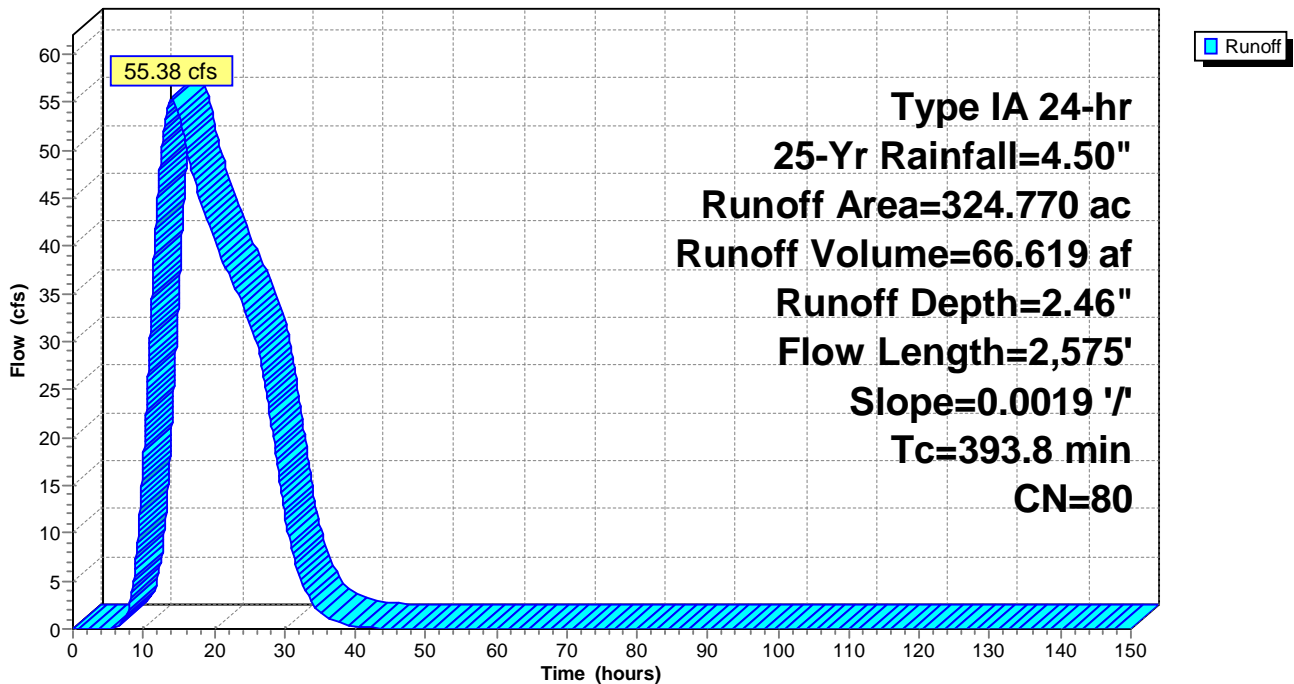
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
198.280	79	Woods/grass comb., Good, HSG D
12.710	32	Woods/grass comb., Good, HSG A
0.660	98	Paved parking, HSG A
5.710	98	Paved parking, HSG D
30.310	73	Brush, Good, HSG D
* 1.800	98	Trail
* 75.300	90	Golf Course
324.770	80	Weighted Average
316.600	79	97.48% Pervious Area
8.170	98	2.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
393.8	2,575	0.0019	0.11		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps

Subcatchment 10S: 10S - Large Central / NE

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Subcatchment 11S: 11S - SE

Runoff = 3.68 cfs @ 8.62 hrs, Volume= 2.585 af, Depth= 1.33"

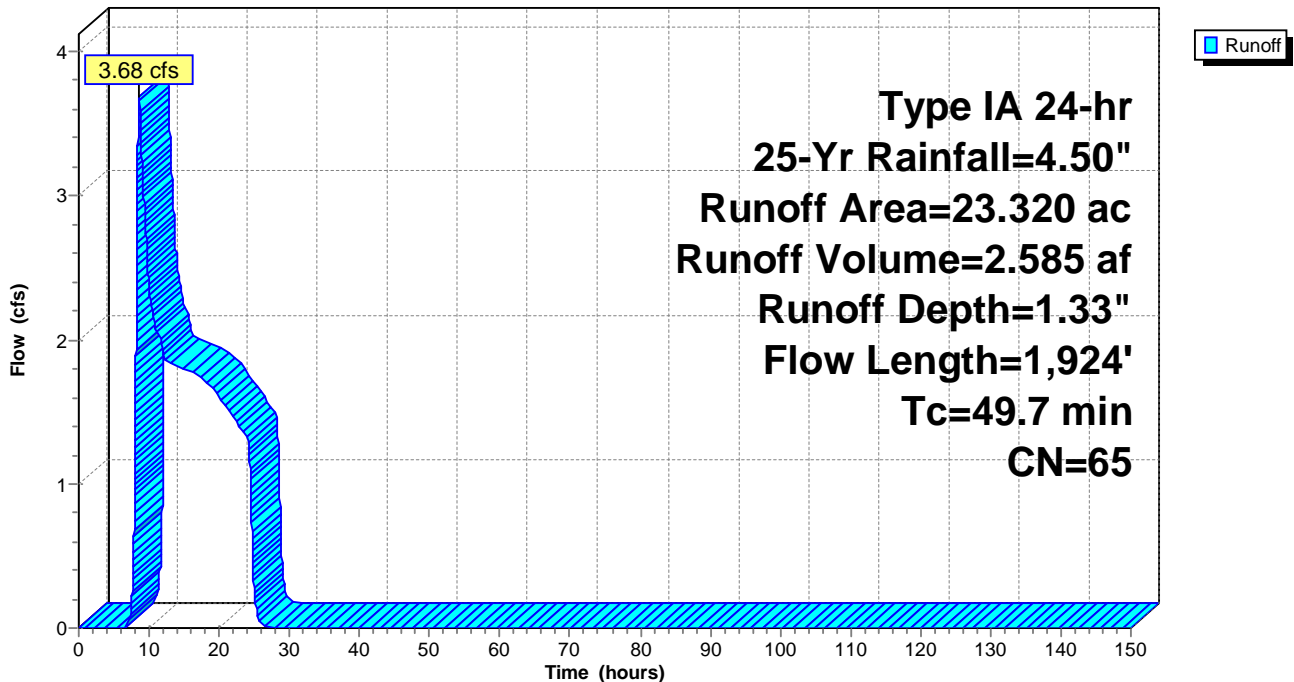
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-Yr Rainfall=4.50"

Area (ac)	CN	Description
2.090	32	Woods/grass comb., Good, HSG A
* 21.230	68	WSDOT - Golf Course
23.320	65	Weighted Average
23.320	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	126	0.1800	0.30		Sheet Flow, Sheet-Dune Grass Grass: Dense n= 0.240 P2= 3.43"
42.8	1,798	0.0100	0.70		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
49.7	1,924	Total			

Subcatchment 11S: 11S - SE

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Reach 8R: South Ditch

[91] Warning: Storage range exceeded by 0.69'

[55] Hint: Peak inflow is 336% of Manning's capacity

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 1.08'

Inflow Area =	16.360 ac,	4.95% Impervious,	Inflow Depth = 3.10"	for 25-Yr event
Inflow =	9.89 cfs @	8.41 hrs,	Volume=	4.225 af
Outflow =	9.71 cfs @	8.59 hrs,	Volume=	4.225 af, Atten= 2%, Lag= 11.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs

Max. Velocity= 1.71 fps, Min. Travel Time= 5.7 min

Avg. Velocity = 0.69 fps, Avg. Travel Time= 14.1 min

Peak Storage= 3,293 cf @ 8.50 hrs

Average Depth at Peak Storage= 1.19', Surface Width= 6.38'

Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 2.94 cfs

4.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 1.0 '/' Top Width= 5.00'

Length= 579.0' Slope= 0.0012 '/'

Inlet Invert= 16.00', Outlet Invert= 15.30'



Proposed Conditions Option_1

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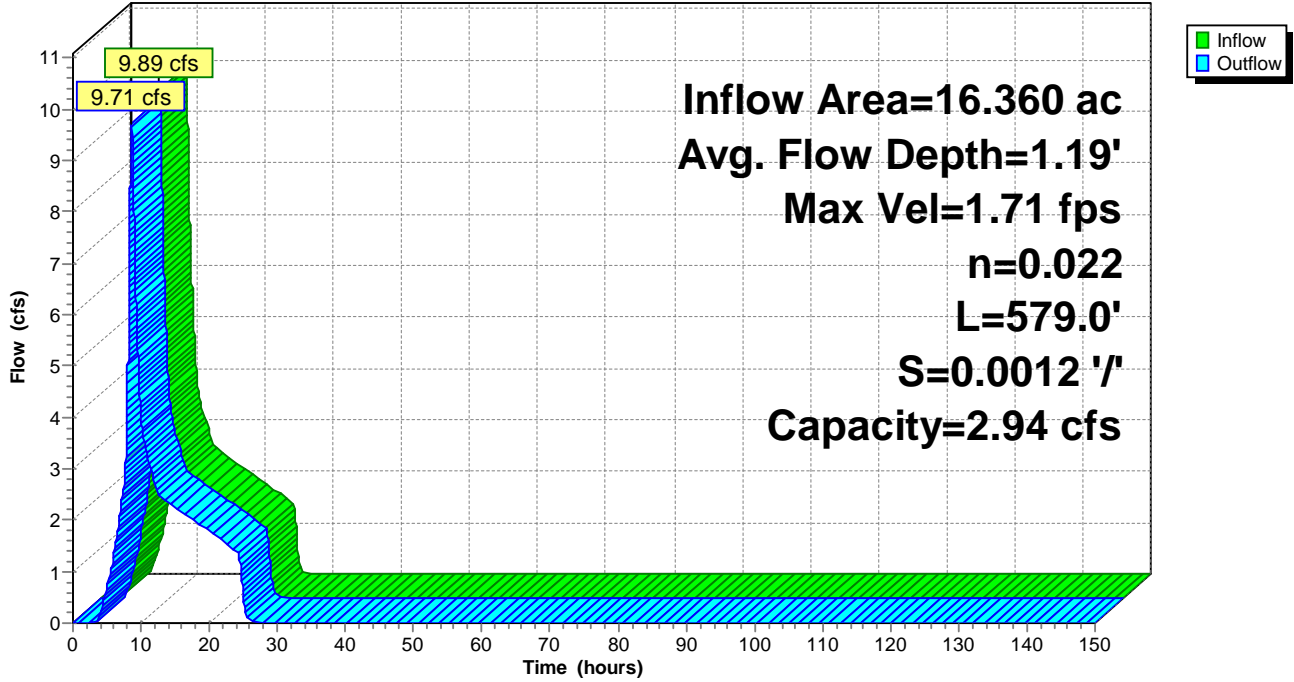
Type IA 24-hr 25-Yr Rainfall=4.50"

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Reach 8R: South Ditch

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 1P: 1P- NW Pond

Inflow Area = 7.320 ac, 19.67% Impervious, Inflow Depth = 2.82" for 25-Yr event
 Inflow = 5.23 cfs @ 7.92 hrs, Volume= 1.718 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.23' @ 24.29 hrs Surf.Area= 1.481 ac Storage= 1.718 af

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

Volume	Invert	Avail.Storage	Storage Description
#1	11.00'	6.173 af	Custom Stage Data (Irregular) Listed below (Recalc)

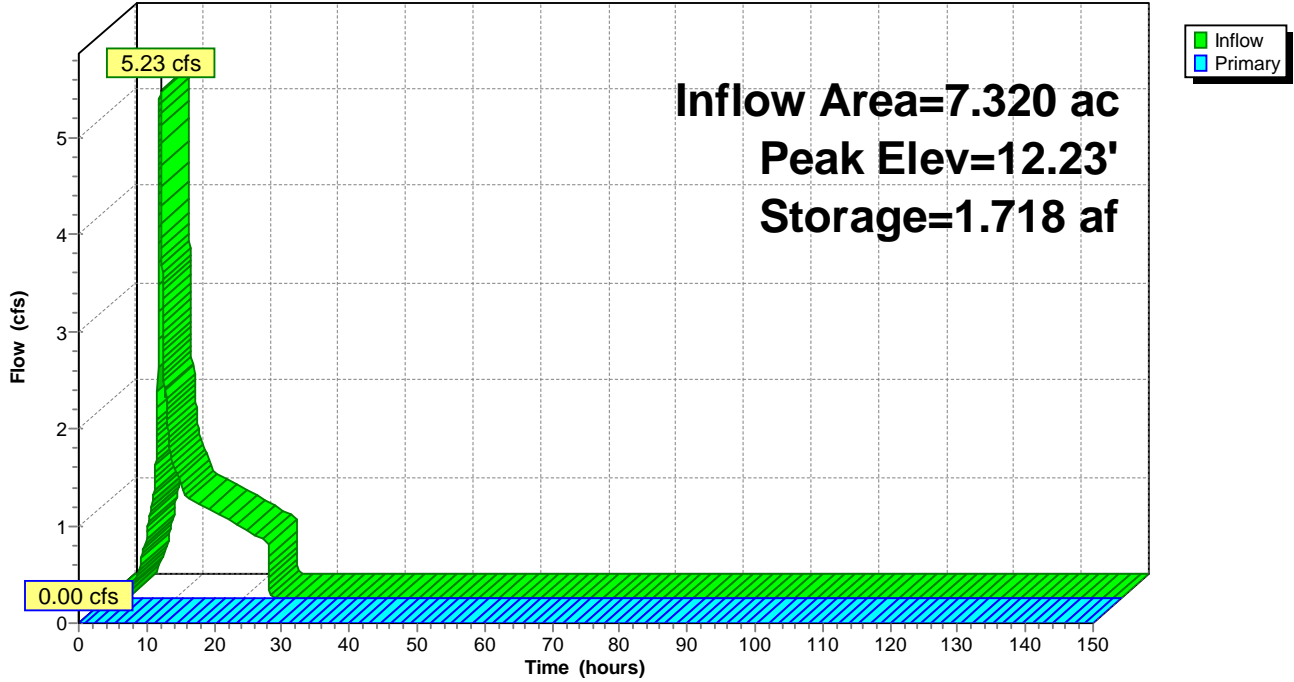
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
11.00	1.290	1,552.0	0.000	0.000	1.290
12.00	1.460	1,164.0	1.374	1.374	3.215
13.00	1.550	1,193.0	1.505	2.879	3.343
14.00	1.640	1,231.0	1.595	4.474	3.514
15.00	1.760	1,333.0	1.700	6.173	3.992

Device	Routing	Invert	Outlet Devices
#1	Primary	14.99'	1,333.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: 1P- NW Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 5P: 5P - West Pond

[81] Warning: Exceeded Pond 7P by 0.79' @ 8.19 hrs

Inflow Area = 106.390 ac, 0.87% Impervious, Inflow Depth = 2.22" for 25-Yr event
 Inflow = 25.22 cfs @ 8.08 hrs, Volume= 19.666 af
 Outflow = 18.94 cfs @ 11.61 hrs, Volume= 17.830 af, Atten= 25%, Lag= 211.7 min
 Primary = 18.94 cfs @ 11.61 hrs, Volume= 17.830 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 11.61 hrs Surf.Area= 34.055 ac Storage= 1.929 af

Plug-Flow detention time= 110.4 min calculated for 17.830 af (91% of inflow)
 Center-of-Mass det. time= 52.8 min (955.8 - 903.0)

Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	340.699 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	1.160	3,026.0	0.000	0.000	1.160	
15.00	2.670	3,968.0	1.863	1.863	13.196	
15.10	9,999.000	9,999.0	338.835	340.699	167.081	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	3,968.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=18.13 cfs @ 11.61 hrs HW=15.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 18.13 cfs @ 0.32 fps)

Proposed Conditions Option_1

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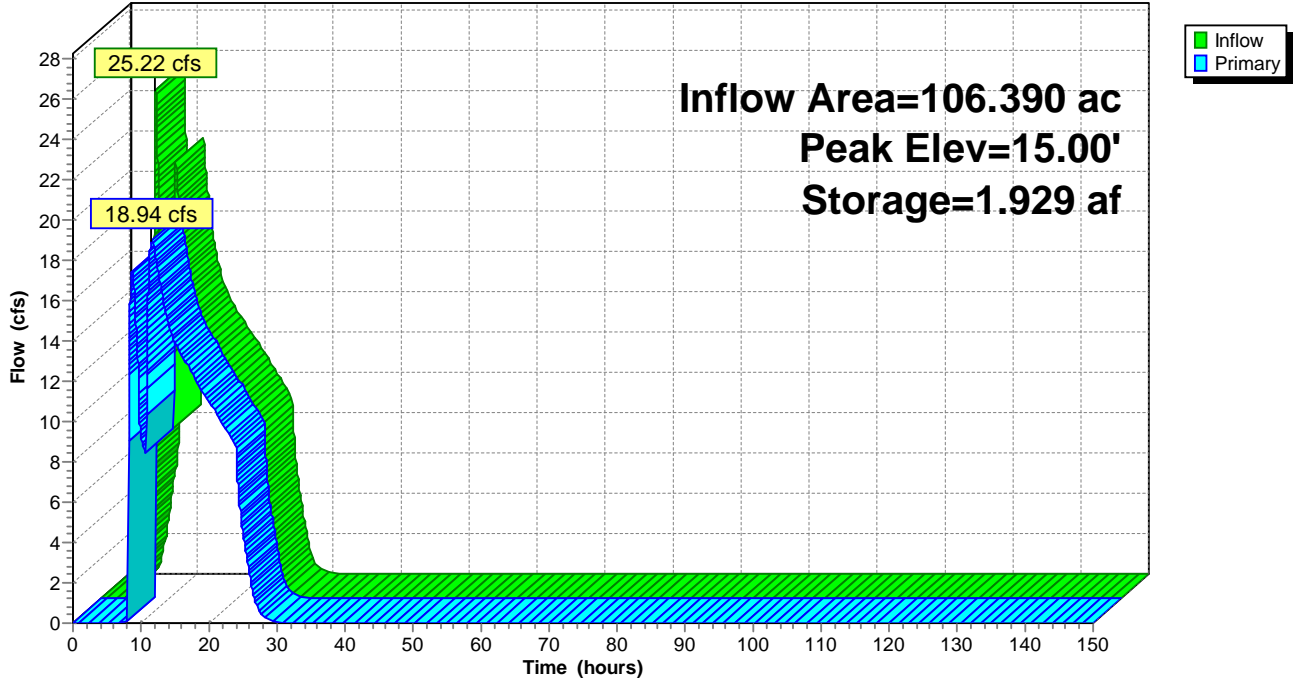
Type IA 24-hr 25-Yr Rainfall=4.50"

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Pond 5P: 5P - West Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 6P: 6P- West Pond

[81] Warning: Exceeded Pond 5P by 0.02' @ 24.79 hrs

Inflow Area = 127.700 ac, 0.91% Impervious, Inflow Depth = 2.03" for 25-Yr event
 Inflow = 22.40 cfs @ 11.54 hrs, Volume= 21.612 af
 Outflow = 15.39 cfs @ 16.30 hrs, Volume= 17.829 af, Atten= 31%, Lag= 285.5 min
 Primary = 15.39 cfs @ 16.30 hrs, Volume= 17.829 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.02' @ 16.30 hrs Surf.Area= 296.885 ac Storage= 5.571 af

Plug-Flow detention time= 266.1 min calculated for 17.828 af (82% of inflow)
 Center-of-Mass det. time= 169.2 min (1,119.1 - 949.9)

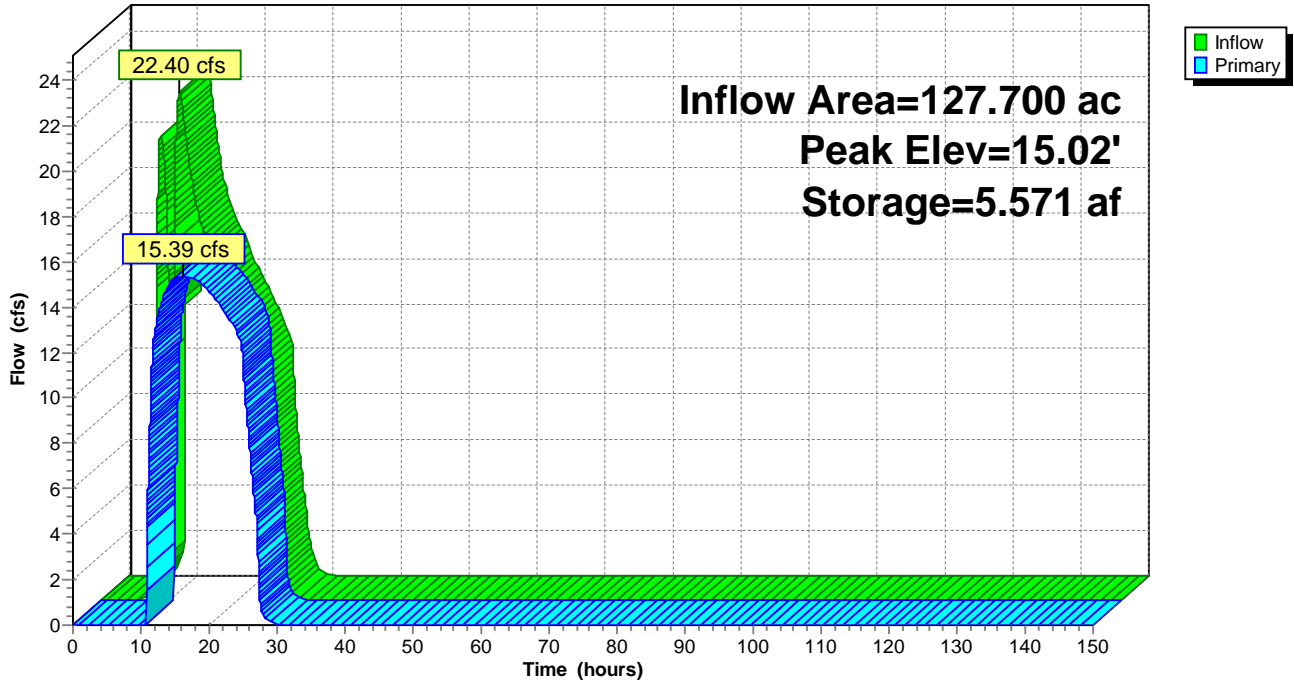
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	344.602 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.930	3,856.0	0.000	0.000	2.930	
15.00	4.810	4,175.0	3.831	3.831	7.611	
15.10	9,999.000	9,999.0	340.771	344.602	158.416	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	1,400.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=15.17 cfs @ 16.30 hrs HW=15.02' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Weir Controls 15.17 cfs @ 0.43 fps)

Pond 6P: 6P- West Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 7P: 7P-Southwest

Inflow Area = 54.970 ac, 1.29% Impervious, Inflow Depth = 2.64" for 25-Yr event
 Inflow = 16.81 cfs @ 9.84 hrs, Volume= 12.075 af
 Outflow = 13.60 cfs @ 10.89 hrs, Volume= 8.732 af, Atten= 19%, Lag= 63.4 min
 Primary = 13.60 cfs @ 10.89 hrs, Volume= 8.732 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 10.89 hrs Surf.Area= 4.558 ac Storage= 3.386 af

Plug-Flow detention time= 298.9 min calculated for 8.731 af (72% of inflow)
 Center-of-Mass det. time= 134.5 min (1,033.9 - 899.4)

Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	37.446 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.340	3,959.0	0.000	0.000	2.340	
15.00	4.560	5,430.0	3.389	3.389	27.571	
15.01	9,999.000	9,999.0	34.057	37.446	156.355	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	5,430.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=13.24 cfs @ 10.89 hrs HW=15.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 13.24 cfs @ 0.26 fps)

Proposed Conditions Option_1

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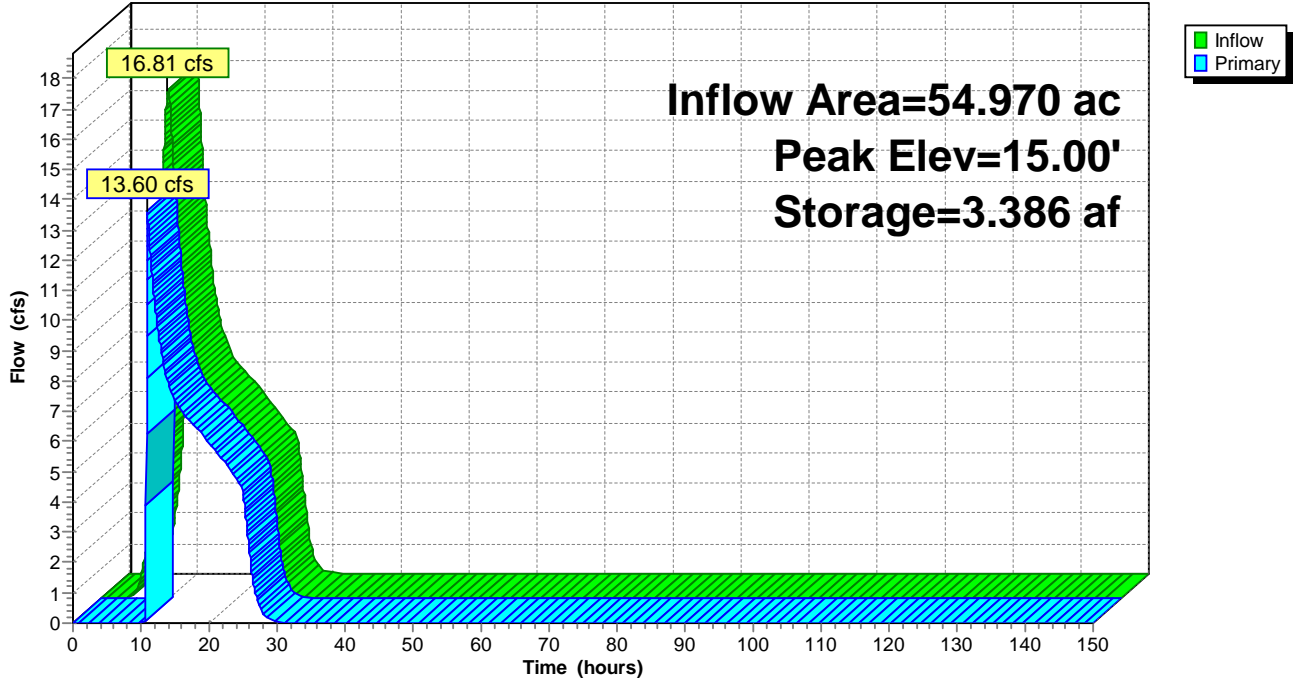
Type IA 24-hr 25-Yr Rainfall=4.50"

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Pond 7P: 7P-Southwest

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 8P: 8P

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 3.10" for 25-Yr event
 Inflow = 9.89 cfs @ 8.41 hrs, Volume= 4.225 af
 Outflow = 9.89 cfs @ 8.41 hrs, Volume= 4.225 af, Atten= 0%, Lag= 0.0 min
 Primary = 9.89 cfs @ 8.41 hrs, Volume= 4.225 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Peak Elev= 17.66' @ 8.41 hrs
 Flood Elev= 19.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	16.11'	36.0" Round Culvert L= 93.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.11' / 15.29' S= 0.0088 '/ Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	19.00'	100.0' long x 24.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=9.89 cfs @ 8.41 hrs HW=17.66' (Free Discharge)

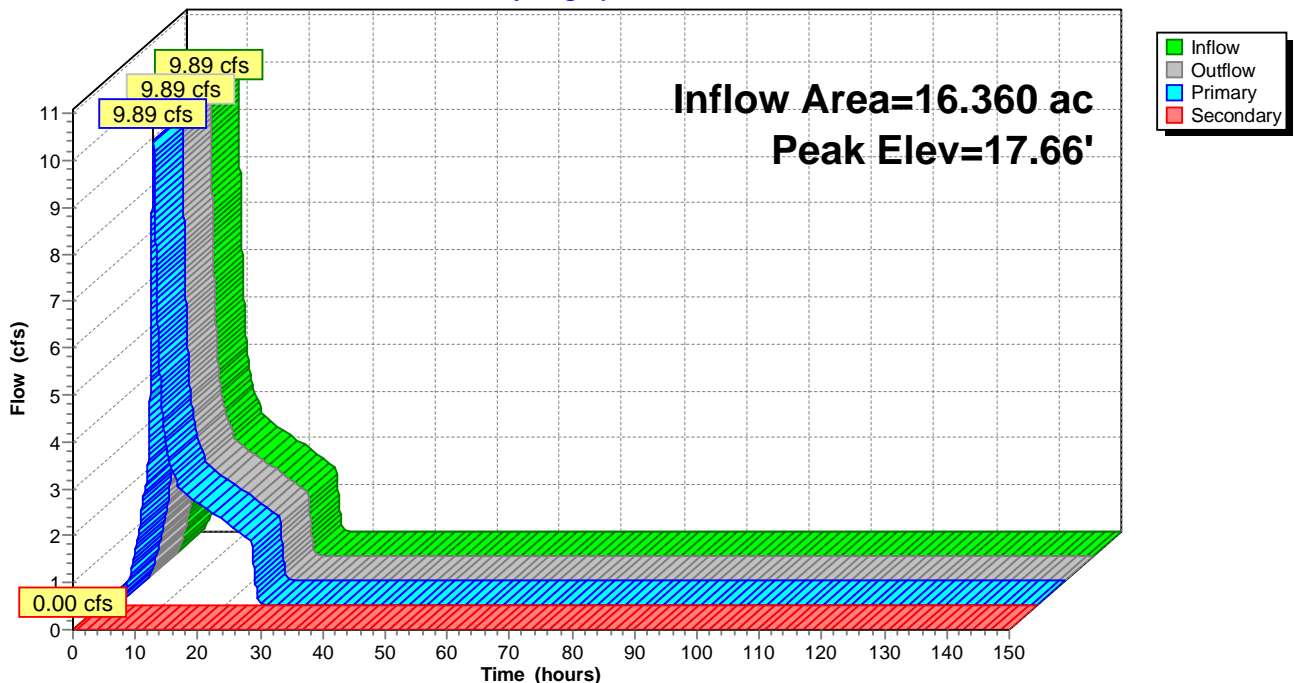
↑**1=Culvert** (Barrel Controls 9.89 cfs @ 3.92 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.11' (Free Discharge)

↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 8P: 8P

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 25-Yr Rainfall=4.50"

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Summary for Pond 10P: 10P-Large Central/NE

Inflow Area = 524.490 ac, 2.24% Impervious, Inflow Depth = 2.24" for 25-Yr event
 Inflow = 78.55 cfs @ 14.00 hrs, Volume= 97.720 af
 Outflow = 1.85 cfs @ 34.97 hrs, Volume= 0.570 af, Atten= 98%, Lag= 1,258.0 min
 Secondary = 1.85 cfs @ 34.97 hrs, Volume= 0.570 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.99' @ 34.97 hrs Surf.Area= 118.050 ac Storage= 97.228 af

Plug-Flow detention time= 1,823.2 min calculated for 0.570 af (1% of inflow)
 Center-of-Mass det. time= 1,103.0 min (2,205.8 - 1,102.8)

Volume	Invert	Avail.Storage	Storage Description			
#1	10.00'	98.335 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.00	0.280	2,536.0	0.000	0.000	0.280	
11.00	6.414	16,985.0	2.678	2.678	515.559	
12.00	38.875	11,909.0	20.360	23.038	783.495	
13.00	119.000	22,186.0	75.297	98.335	1,423.612	

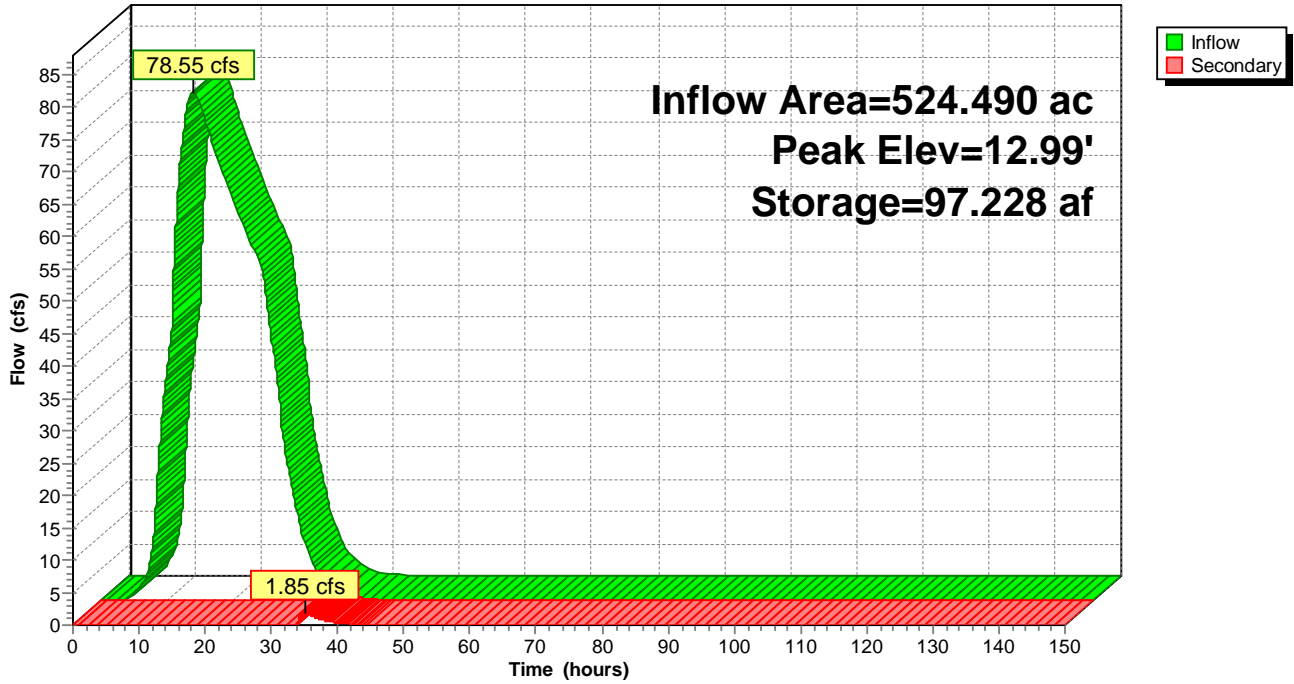
Device	Routing	Invert	Outlet Devices					
#1	Secondary	12.99'	9,999.0' long x 0.5' breadth Broad-Crested Rectangular Weir					
			Head (feet) 0.20 0.40 0.60 0.80 1.00					
			Coef. (English) 2.80 2.92 3.08 3.30 3.32					

Secondary OutFlow Max=0.48 cfs @ 34.97 hrs HW=12.99' (Free Discharge)

↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 0.48 cfs @ 0.07 fps)

Pond 10P: 10P-Large Central/NE

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 50-Yr Rainfall=5.00"

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Time span=0.00-150.00 hrs, dt=0.01 hrs, 15001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S-NW Catchment Runoff Area=7.320 ac 19.67% Impervious Runoff Depth=3.27"
Flow Length=292' Slope=0.0200 '/ Tc=4.9 min CN=84 Runoff=6.14 cfs 1.995 af

Subcatchment 2S: 2S-NW Catchment 2 Runoff Area=41.380 ac 2.39% Impervious Runoff Depth=3.57"
Flow Length=2,271' Tc=122.9 min CN=87 Runoff=19.17 cfs 12.301 af

Subcatchment 4S: 4S - West Catchment Runoff Area=26.590 ac 0.83% Impervious Runoff Depth=3.08"
Flow Length=998' Tc=38.6 min CN=82 Runoff=16.31 cfs 6.823 af

Subcatchment 5S: 5S - West Catchment Runoff Area=24.830 ac 0.00% Impervious Runoff Depth=2.89"
Flow Length=660' Tc=11.1 min CN=80 Runoff=17.59 cfs 5.986 af

Subcatchment 6S: 6S - West Catchment Runoff Area=21.310 ac 1.08% Impervious Runoff Depth=2.54"
Flow Length=1,162' Slope=0.0017 '/ Tc=127.5 min CN=76 Runoff=6.17 cfs 4.503 af

Subcatchment 7S: 7S - Southwest Runoff Area=54.970 ac 1.29% Impervious Runoff Depth=3.08"
Flow Length=1,700' Tc=140.5 min CN=82 Runoff=19.97 cfs 14.105 af

Subcatchment 8S: 8S - South Catchment Runoff Area=16.360 ac 4.95% Impervious Runoff Depth=3.57"
Flow Length=1,480' Tc=45.3 min CN=87 Runoff=11.48 cfs 4.863 af

Subcatchment 10S: 10S - Large Central / NE Runoff Area=324.770 ac 2.52% Impervious Runoff Depth=2.89"
Flow Length=2,575' Slope=0.0019 '/ Tc=393.8 min CN=80 Runoff=66.05 cfs 78.293 af

Subcatchment 11S: 11S - SE Runoff Area=23.320 ac 0.00% Impervious Runoff Depth=1.65"
Flow Length=1,924' Tc=49.7 min CN=65 Runoff=5.05 cfs 3.213 af

Reach 8R: South Ditch Avg. Flow Depth=1.35' Max Vel=1.74 fps Inflow=11.48 cfs 4.863 af
n=0.022 L=579.0' S=0.0012 '/ Capacity=2.94 cfs Outflow=11.27 cfs 4.863 af

Pond 1P: 1P- NW Pond Peak Elev=12.42' Storage=1.995 af Inflow=6.14 cfs 1.995 af
Outflow=0.00 cfs 0.000 af

Pond 5P: 5P - West Pond Peak Elev=15.01' Storage=2.028 af Inflow=30.15 cfs 23.570 af
Outflow=23.19 cfs 21.733 af

Pond 6P: 6P- West Pond Peak Elev=15.02' Storage=6.644 af Inflow=27.36 cfs 26.235 af
Outflow=18.23 cfs 22.452 af

Pond 7P: 7P-Southwest Peak Elev=15.00' Storage=3.389 af Inflow=19.97 cfs 14.105 af
Outflow=14.68 cfs 10.761 af

Pond 8P: 8P Peak Elev=17.79' Inflow=11.48 cfs 4.863 af
Primary=11.48 cfs 4.863 af Secondary=0.00 cfs 0.000 af Outflow=11.48 cfs 4.863 af

Pond 10P: 10P-Large Central/NE Peak Elev=13.00' Storage=98.335 af Inflow=93.49 cfs 116.259 af
Outflow=34.20 cfs 15.448 af

Proposed_Conditions_Option_1

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Total Runoff Area = 540.850 ac Runoff Volume = 132.082 af Average Runoff Depth = 2.93"
97.68% Pervious = 528.280 ac 2.32% Impervious = 12.570 ac

Proposed Conditions Option_1

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 1S: 1S-NW Catchment

Runoff = 6.14 cfs @ 7.92 hrs, Volume= 1.995 af, Depth= 3.27"

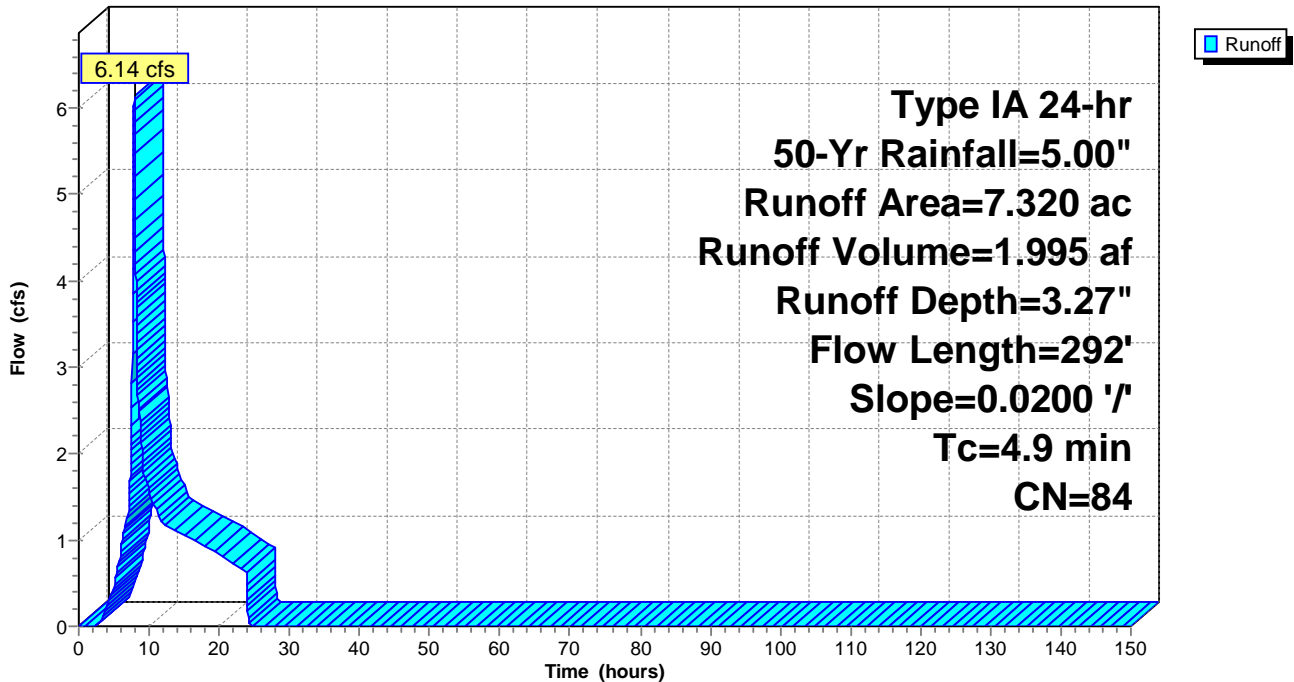
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
3.470	73	Brush, Good, HSG D
1.210	98	Paved parking, HSG D
* 2.410	90	WSDOT - Golf Course
* 0.230	98	Trail
7.320	84	Weighted Average
5.880	80	80.33% Pervious Area
1.440	98	19.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	292	0.0200	0.99		Shallow Concentrated Flow, Shallow - Golf Course Short Grass Pasture Kv= 7.0 fps

Subcatchment 1S: 1S-NW Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 2S: 2S-NW Catchment 2

Sheet flow - dense comes from "native grasses" considered dense. Characterized by the wetland report.

Runoff = 19.17 cfs @ 9.43 hrs, Volume= 12.301 af, Depth= 3.57"

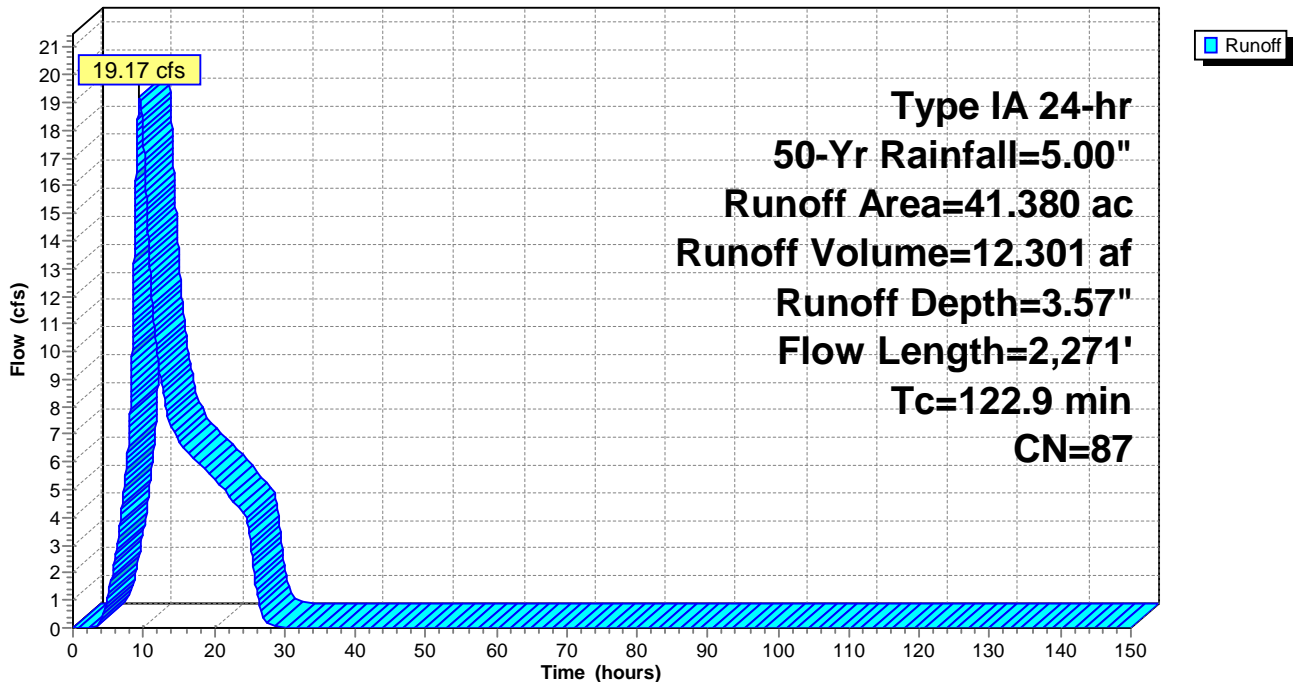
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
8.350	73	Brush, Good, HSG D
0.830	98	Paved parking, HSG D
* 0.160	98	Trail
* 31.710	90	WSDOT - Golf Course
0.330	79	Woods/grass comb., Good, HSG D
41.380	87	Weighted Average
40.390	86	97.61% Pervious Area
0.990	98	2.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	95	0.0950	0.22		Sheet Flow, Sheet - Dense, Native Grasses
					Grass: Dense n= 0.240 P2= 3.43"
115.8	2,176	0.0020	0.31		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
122.9	2,271	Total			

Subcatchment 2S: 2S-NW Catchment 2

Hydrograph



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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 4S: 4S - West Catchment

Runoff = 16.31 cfs @ 8.33 hrs, Volume= 6.823 af, Depth= 3.08"

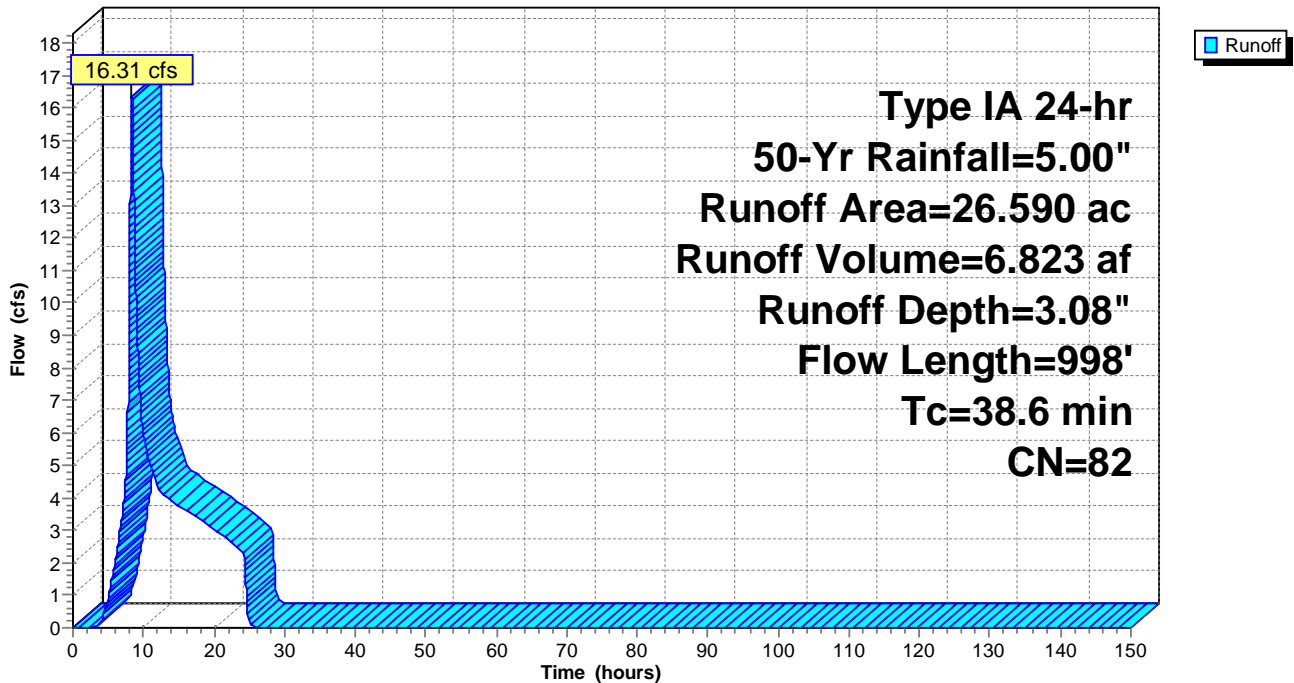
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
13.100	73	Brush, Good, HSG D
* 0.220	98	Trail
* 13.270	90	WSDOT - Golf Course
26.590	82	Weighted Average
26.370	82	99.17% Pervious Area
0.220	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	135	0.0800	1.98		Shallow Concentrated Flow, Shallow - Forest
37.5	863	0.0030	0.38		Short Grass Pasture Kv= 7.0 fps Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
38.6	998	Total			

Subcatchment 4S: 4S - West Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 5S: 5S - West Catchment

Runoff = 17.59 cfs @ 8.03 hrs, Volume= 5.986 af, Depth= 2.89"

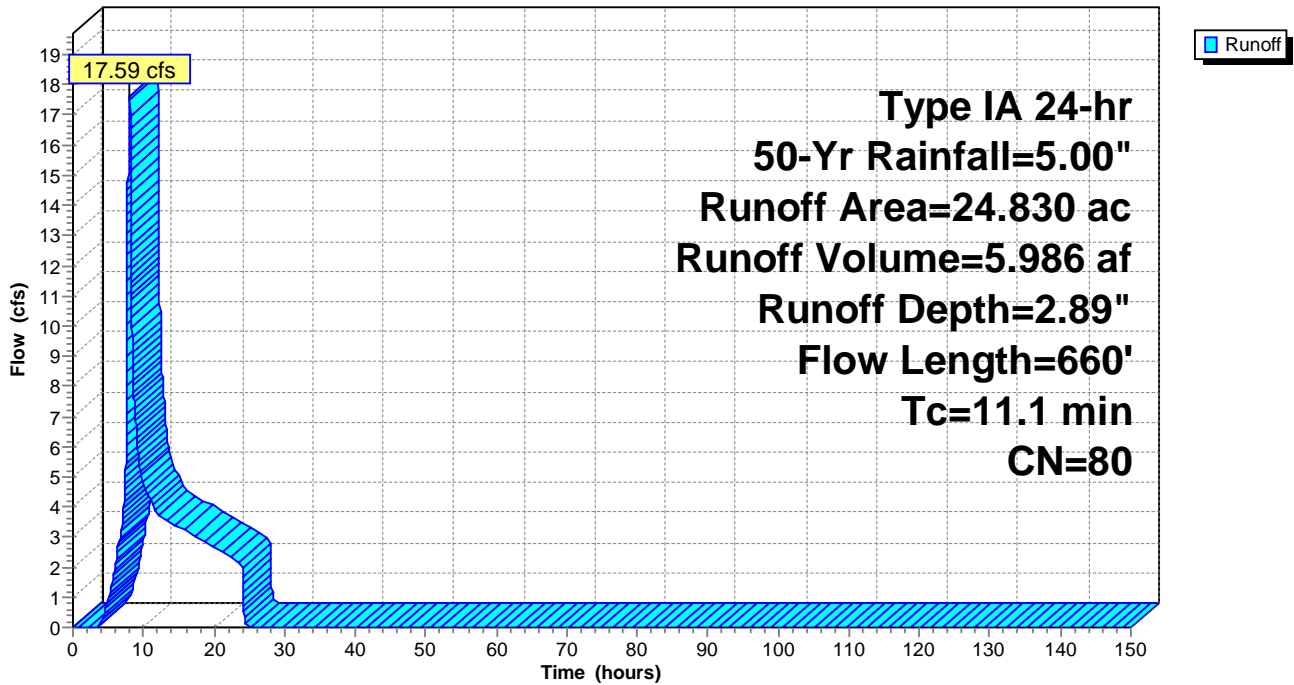
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
13.850	73	Brush, Good, HSG D
0.500	79	Woods/grass comb., Good, HSG D
* 10.480	90	WSDOT - Golf Course
24.830	80	Weighted Average
24.830	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	608	0.0180	0.94		Shallow Concentrated Flow, Shallow - Grass
					Short Grass Pasture Kv= 7.0 fps
0.3	52	0.1300	2.64		Sheet Flow, Path
					Smooth surfaces n= 0.011 P2= 3.43"
11.1	660	Total			

Subcatchment 5S: 5S - West Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 6S: 6S - West Catchment

Runoff = 6.17 cfs @ 9.77 hrs, Volume= 4.503 af, Depth= 2.54"

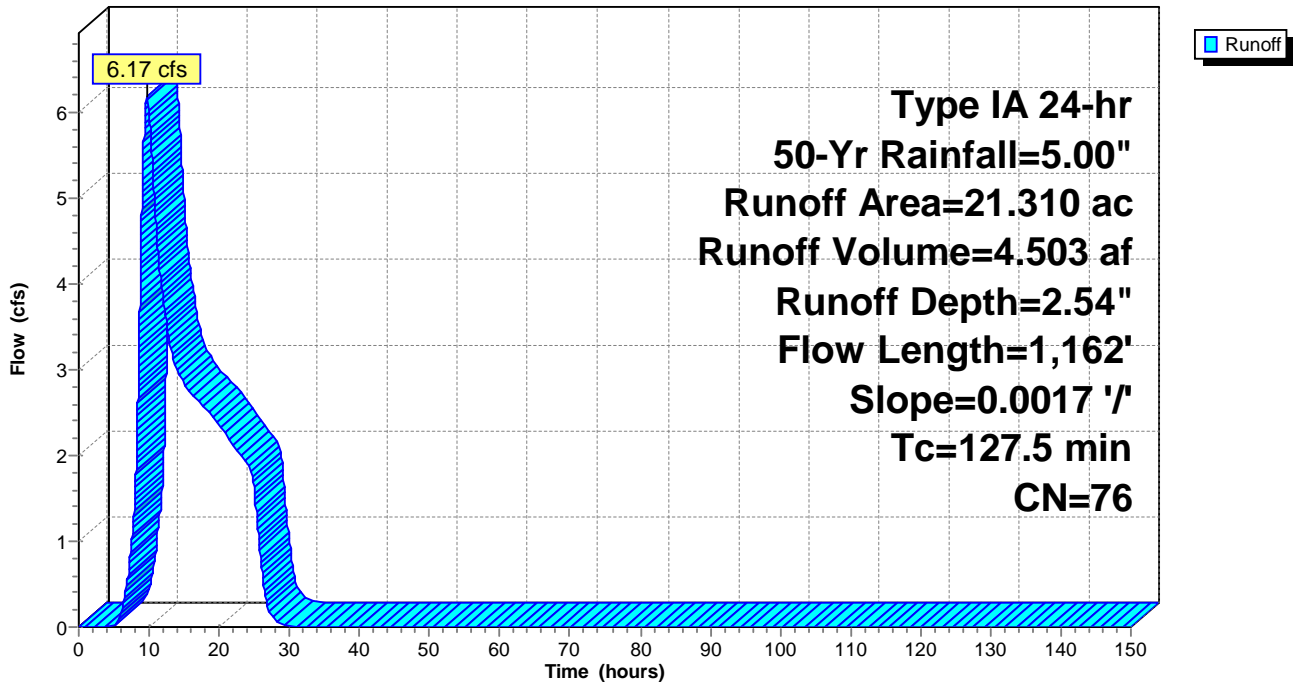
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
8.040	79	Woods/grass comb., Good, HSG D
12.070	73	Brush, Good, HSG D
* 0.970	90	WSDOT - Golf Course
* 0.230	98	Trail
21.310	76	Weighted Average
21.080	76	98.92% Pervious Area
0.230	98	1.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.6	581	0.0017	0.29		Shallow Concentrated Flow, Grass - Shallow Short Grass Pasture Kv= 7.0 fps
93.9	581	0.0017	0.10		Shallow Concentrated Flow, Forested - Shallow Forest w/Heavy Litter Kv= 2.5 fps
127.5	1,162	Total			

Subcatchment 6S: 6S - West Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 7S: 7S - Southwest

Runoff = 19.97 cfs @ 9.84 hrs, Volume= 14.105 af, Depth= 3.08"

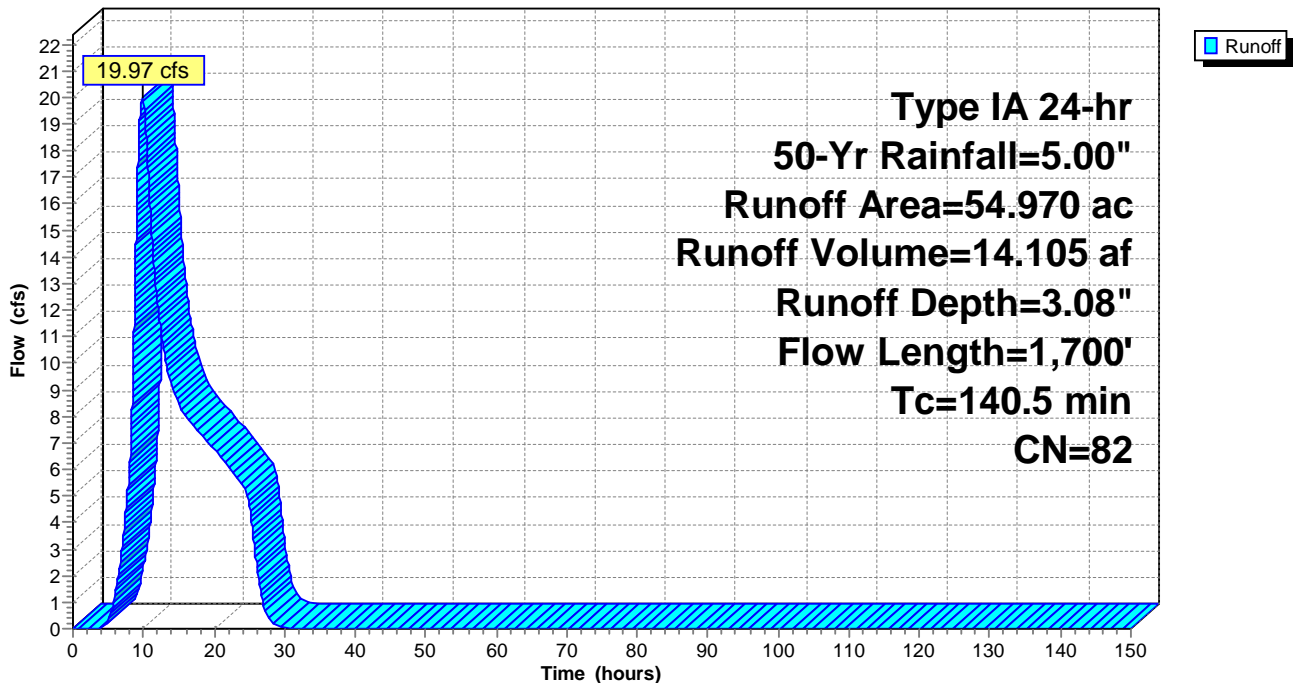
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
8.710	73	Brush, Good, HSG D
25.200	79	Woods/grass comb., Good, HSG D
0.520	98	Paved parking, HSG D
* 0.190	98	Trail
* 20.350	90	WSDOT - Golf Course
54.970	82	Weighted Average
54.260	82	98.71% Pervious Area
0.710	98	1.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	70	0.1000	0.31		Sheet Flow, Sheet - Turf Grass: Short n= 0.150 P2= 3.43"
9.3	775	0.0390	1.38		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
127.5	855	0.0020	0.11		Shallow Concentrated Flow, Shallow - Forest Forest w/Heavy Litter Kv= 2.5 fps
140.5	1,700	Total			

Subcatchment 7S: 7S - Southwest

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 8S: 8S - South Catchment

Runoff = 11.48 cfs @ 8.41 hrs, Volume= 4.863 af, Depth= 3.57"

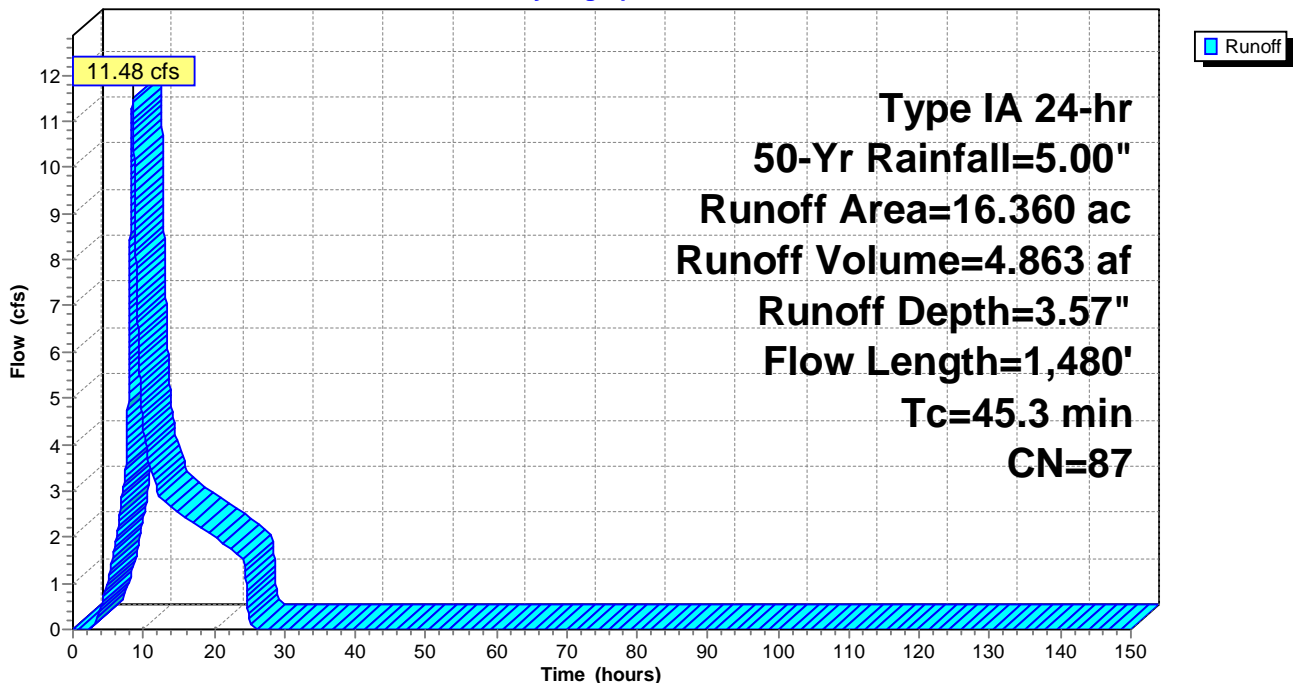
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
1.790	79	Woods/grass comb., Good, HSG D
0.550	30	Brush, Good, HSG A
0.810	98	Paved parking, HSG D
* 13.210	90	WSDOT - Golf Course
16.360	87	Weighted Average
15.550	87	95.05% Pervious Area
0.810	98	4.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	89	0.0560	0.26		Sheet Flow, Sheet- Dune grass Grass: Short n= 0.150 P2= 3.43"
24.0	844	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
15.6	547	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
45.3	1,480	Total			

Subcatchment 8S: 8S - South Catchment

Hydrograph



Proposed Conditions Option 1

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 10S: 10S - Large Central / NE

Runoff = 66.05 cfs @ 14.00 hrs, Volume= 78.293 af, Depth= 2.89"

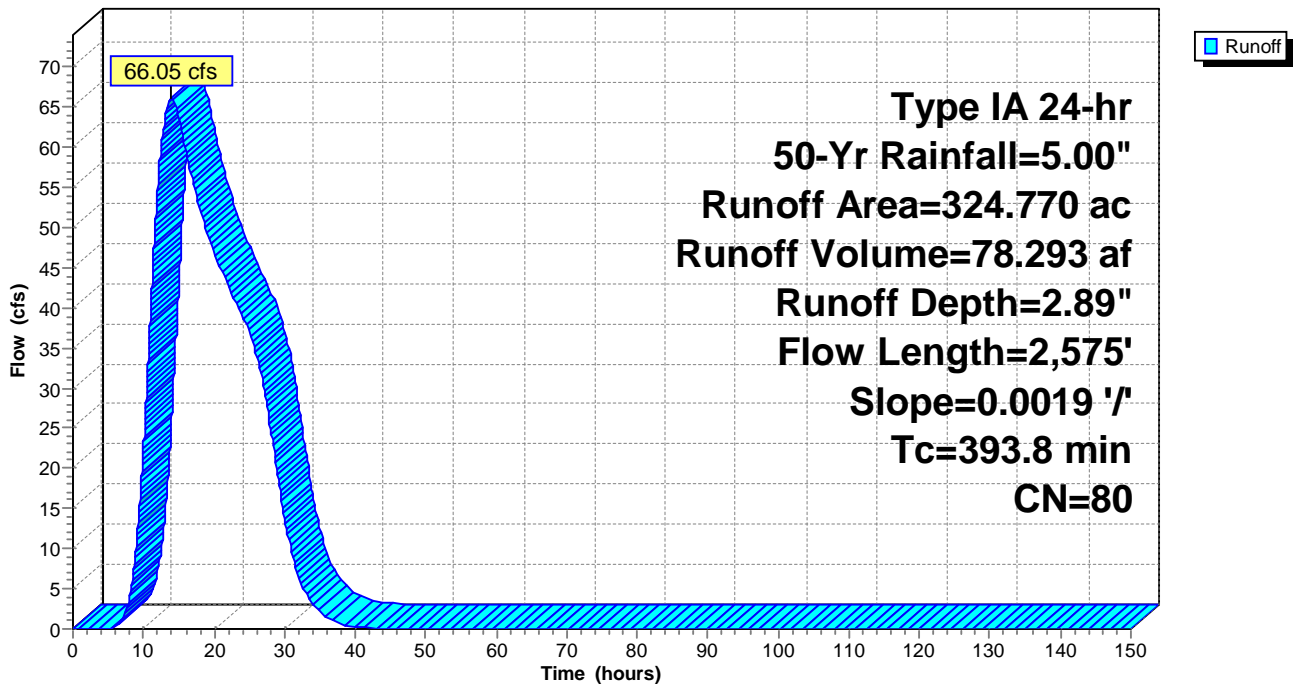
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
198.280	79	Woods/grass comb., Good, HSG D
12.710	32	Woods/grass comb., Good, HSG A
0.660	98	Paved parking, HSG A
5.710	98	Paved parking, HSG D
30.310	73	Brush, Good, HSG D
* 1.800	98	Trail
* 75.300	90	Golf Course
324.770	80	Weighted Average
316.600	79	97.48% Pervious Area
8.170	98	2.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
393.8	2,575	0.0019	0.11		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps

Subcatchment 10S: 10S - Large Central / NE

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Subcatchment 11S: 11S - SE

Runoff = 5.05 cfs @ 8.56 hrs, Volume= 3.213 af, Depth= 1.65"

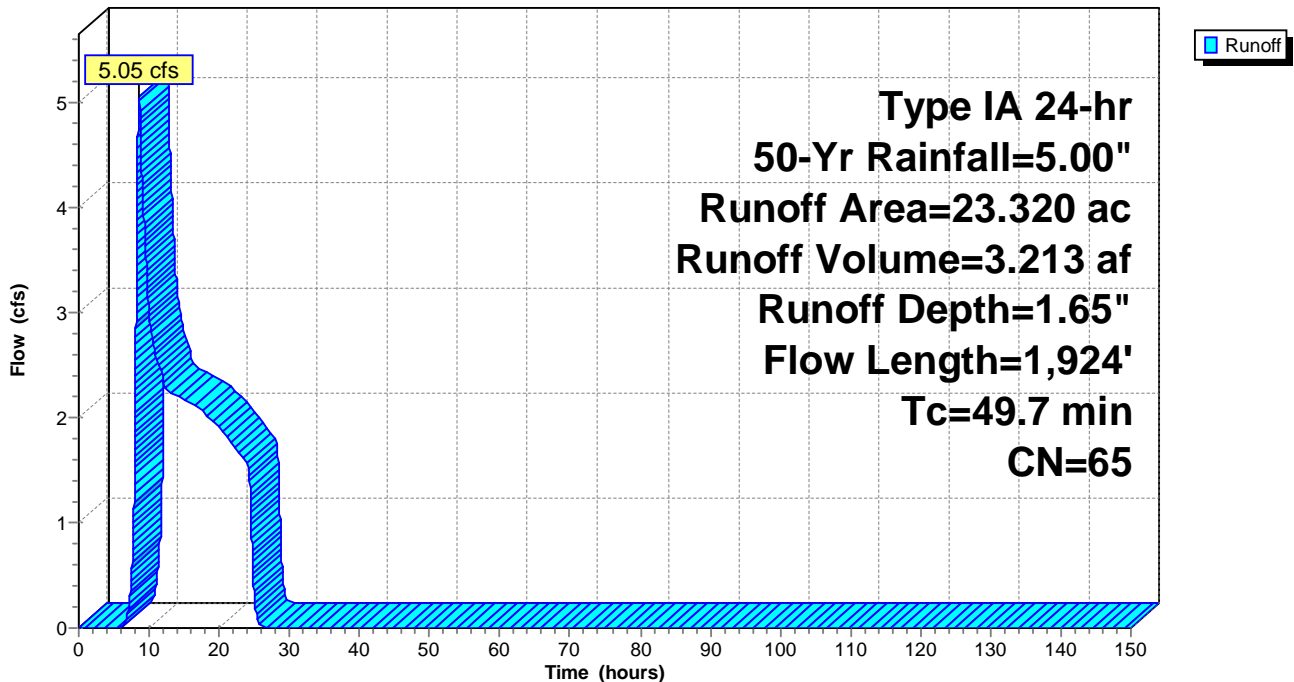
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=5.00"

Area (ac)	CN	Description
2.090	32	Woods/grass comb., Good, HSG A
* 21.230	68	WSDOT - Golf Course
23.320	65	Weighted Average
23.320	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	126	0.1800	0.30		Sheet Flow, Sheet-Dune Grass Grass: Dense n= 0.240 P2= 3.43"
42.8	1,798	0.0100	0.70		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
49.7	1,924	Total			

Subcatchment 11S: 11S - SE

Hydrograph



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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Reach 8R: South Ditch

[91] Warning: Storage range exceeded by 0.85'

[55] Hint: Peak inflow is 390% of Manning's capacity

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 1.24'

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 3.57" for 50-Yr event
Inflow = 11.48 cfs @ 8.41 hrs, Volume= 4.863 af
Outflow = 11.27 cfs @ 8.59 hrs, Volume= 4.863 af, Atten= 2%, Lag= 10.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs

Max. Velocity= 1.74 fps, Min. Travel Time= 5.5 min

Avg. Velocity = 0.72 fps, Avg. Travel Time= 13.5 min

Peak Storage= 3,750 cf @ 8.49 hrs

Average Depth at Peak Storage= 1.35', Surface Width= 6.69'

Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 2.94 cfs

4.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 1.0 '/' Top Width= 5.00'

Length= 579.0' Slope= 0.0012 '/'

Inlet Invert= 16.00', Outlet Invert= 15.30'



Proposed Conditions Option_1

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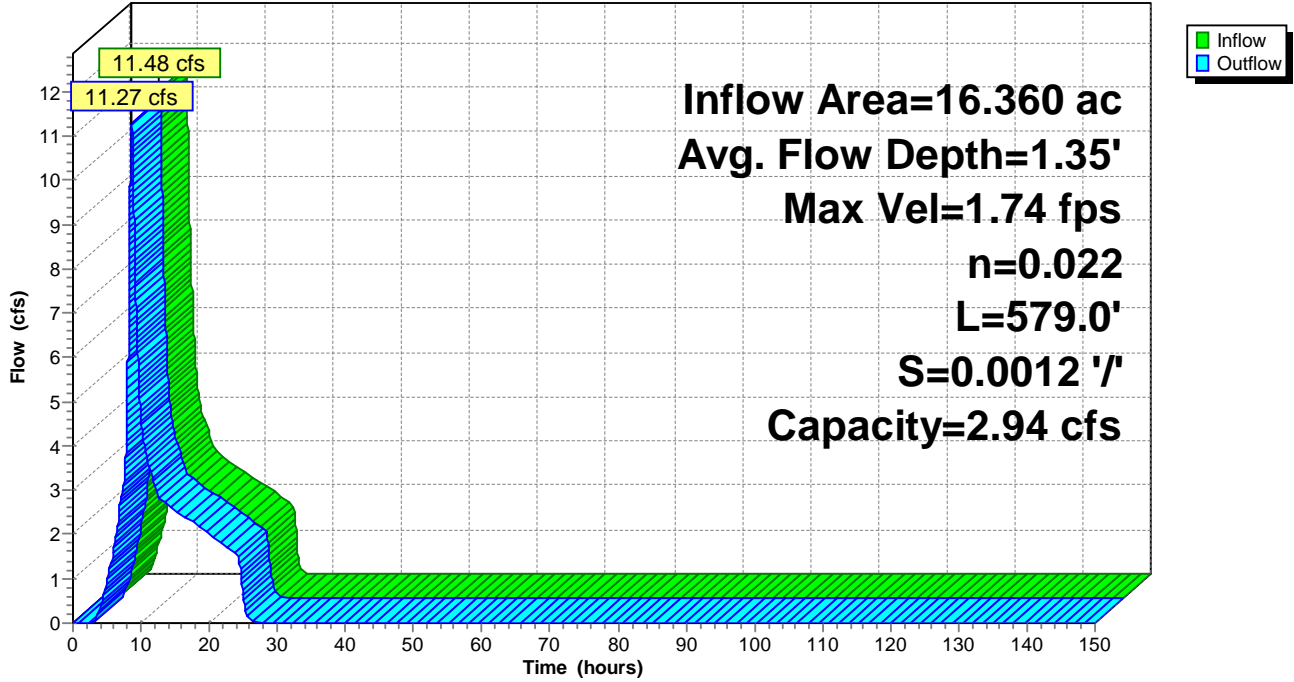
Type IA 24-hr 50-Yr Rainfall=5.00"

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Reach 8R: South Ditch

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 1P: 1P- NW Pond

Inflow Area = 7.320 ac, 19.67% Impervious, Inflow Depth = 3.27" for 50-Yr event
 Inflow = 6.14 cfs @ 7.92 hrs, Volume= 1.995 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.42' @ 24.29 hrs Surf.Area= 1.497 ac Storage= 1.995 af

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

Volume	Invert	Avail.Storage	Storage Description
#1	11.00'	6.173 af	Custom Stage Data (Irregular) Listed below (Recalc)

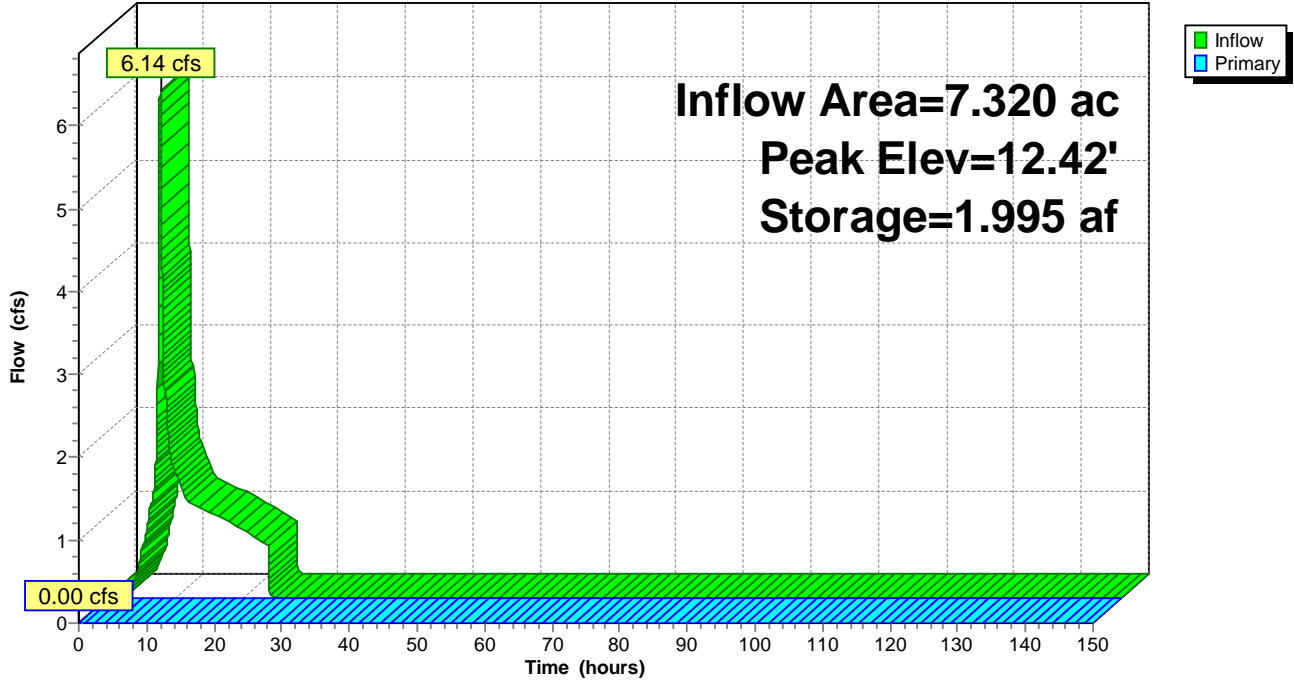
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
11.00	1.290	1,552.0	0.000	0.000	1.290
12.00	1.460	1,164.0	1.374	1.374	3.215
13.00	1.550	1,193.0	1.505	2.879	3.343
14.00	1.640	1,231.0	1.595	4.474	3.514
15.00	1.760	1,333.0	1.700	6.173	3.992

Device	Routing	Invert	Outlet Devices
#1	Primary	14.99'	1,333.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: 1P- NW Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 5P: 5P - West Pond

[81] Warning: Exceeded Pond 7P by 0.76' @ 7.99 hrs

Inflow Area = 106.390 ac, 0.87% Impervious, Inflow Depth = 2.66" for 50-Yr event
 Inflow = 30.15 cfs @ 8.08 hrs, Volume= 23.570 af
 Outflow = 23.19 cfs @ 11.63 hrs, Volume= 21.733 af, Atten= 23%, Lag= 212.7 min
 Primary = 23.19 cfs @ 11.63 hrs, Volume= 21.733 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.01' @ 11.63 hrs Surf.Area= 62.208 ac Storage= 2.028 af

Plug-Flow detention time= 96.5 min calculated for 21.733 af (92% of inflow)
 Center-of-Mass det. time= 47.0 min (934.8 - 887.7)

Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	340.699 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	1.160	3,026.0	0.000	0.000	1.160	
15.00	2.670	3,968.0	1.863	1.863	13.196	
15.10	9,999.000	9,999.0	338.835	340.699	167.081	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	3,968.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=22.25 cfs @ 11.63 hrs HW=15.01' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 22.25 cfs @ 0.34 fps)

Proposed Conditions Option_1

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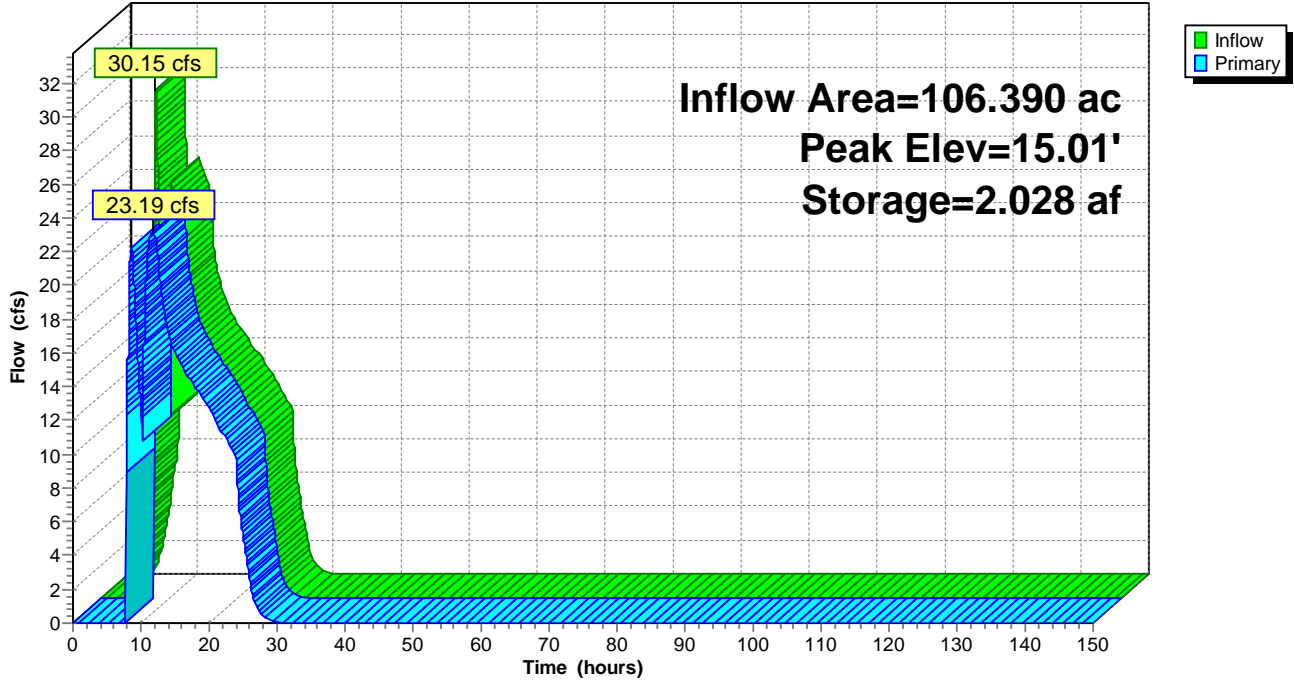
Type IA 24-hr 50-Yr Rainfall=5.00"

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Pond 5P: 5P - West Pond

Hydrograph



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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 6P: 6P- West Pond

[81] Warning: Exceeded Pond 5P by 0.02' @ 25.98 hrs

Inflow Area = 127.700 ac, 0.91% Impervious, Inflow Depth = 2.47" for 50-Yr event
 Inflow = 27.36 cfs @ 11.44 hrs, Volume= 26.235 af
 Outflow = 18.23 cfs @ 15.60 hrs, Volume= 22.452 af, Atten= 33%, Lag= 249.7 min
 Primary = 18.23 cfs @ 15.60 hrs, Volume= 22.452 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.02' @ 15.60 hrs Surf.Area= 408.734 ac Storage= 6.644 af

Plug-Flow detention time= 262.5 min calculated for 22.450 af (86% of inflow)
 Center-of-Mass det. time= 179.6 min (1,110.3 - 930.7)

Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	344.602 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.930	3,856.0	0.000	0.000	2.930	
15.00	4.810	4,175.0	3.831	3.831	7.611	
15.10	9,999.000	9,999.0	340.771	344.602	158.416	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	1,400.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=17.98 cfs @ 15.60 hrs HW=15.02' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 17.98 cfs @ 0.45 fps)

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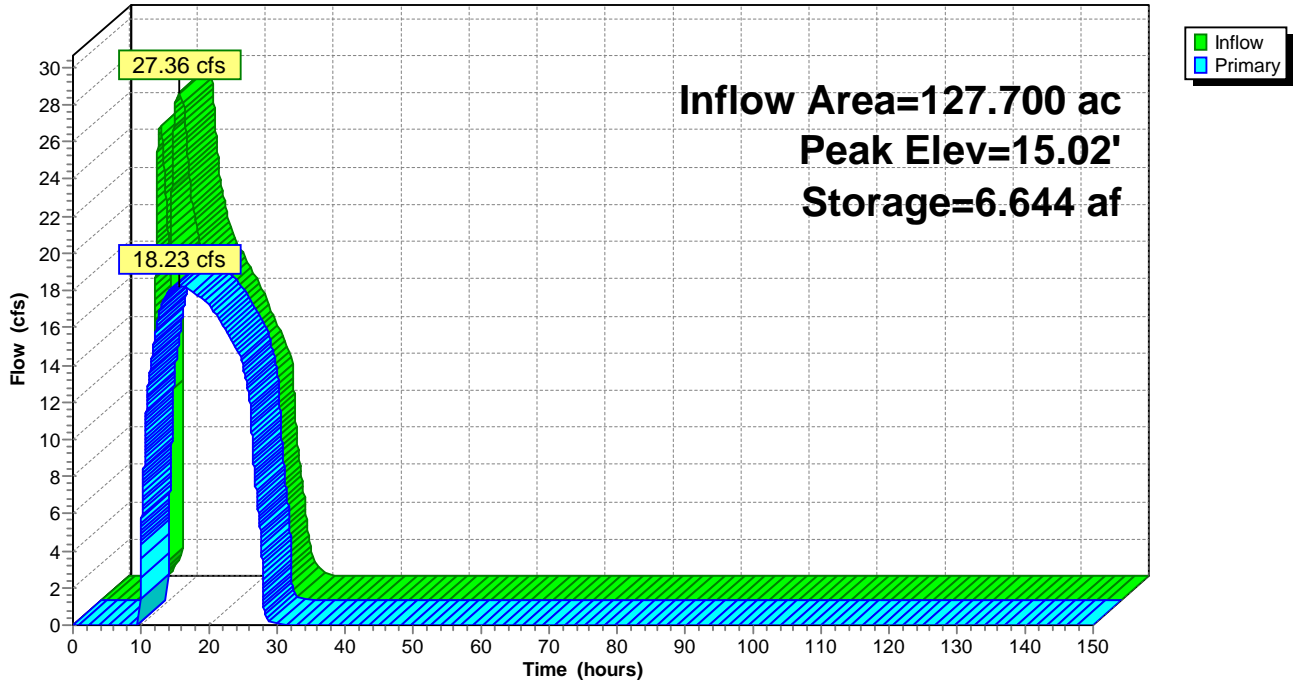
Type IA 24-hr 50-Yr Rainfall=5.00"

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Pond 6P: 6P- West Pond

Hydrograph



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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 7P: 7P-Southwest

Inflow Area = 54.970 ac, 1.29% Impervious, Inflow Depth = 3.08" for 50-Yr event
 Inflow = 19.97 cfs @ 9.84 hrs, Volume= 14.105 af
 Outflow = 14.68 cfs @ 11.21 hrs, Volume= 10.761 af, Atten= 27%, Lag= 82.5 min
 Primary = 14.68 cfs @ 11.21 hrs, Volume= 10.761 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 11.21 hrs Surf.Area= 6.731 ac Storage= 3.389 af

Plug-Flow detention time= 258.8 min calculated for 10.760 af (76% of inflow)
 Center-of-Mass det. time= 114.5 min (1,005.0 - 890.5)

Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	37.446 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.340	3,959.0	0.000	0.000	2.340	
15.00	4.560	5,430.0	3.389	3.389	27.571	
15.01	9,999.000	9,999.0	34.057	37.446	156.355	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	5,430.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=14.65 cfs @ 11.21 hrs HW=15.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 14.65 cfs @ 0.27 fps)

Proposed Conditions Option_1

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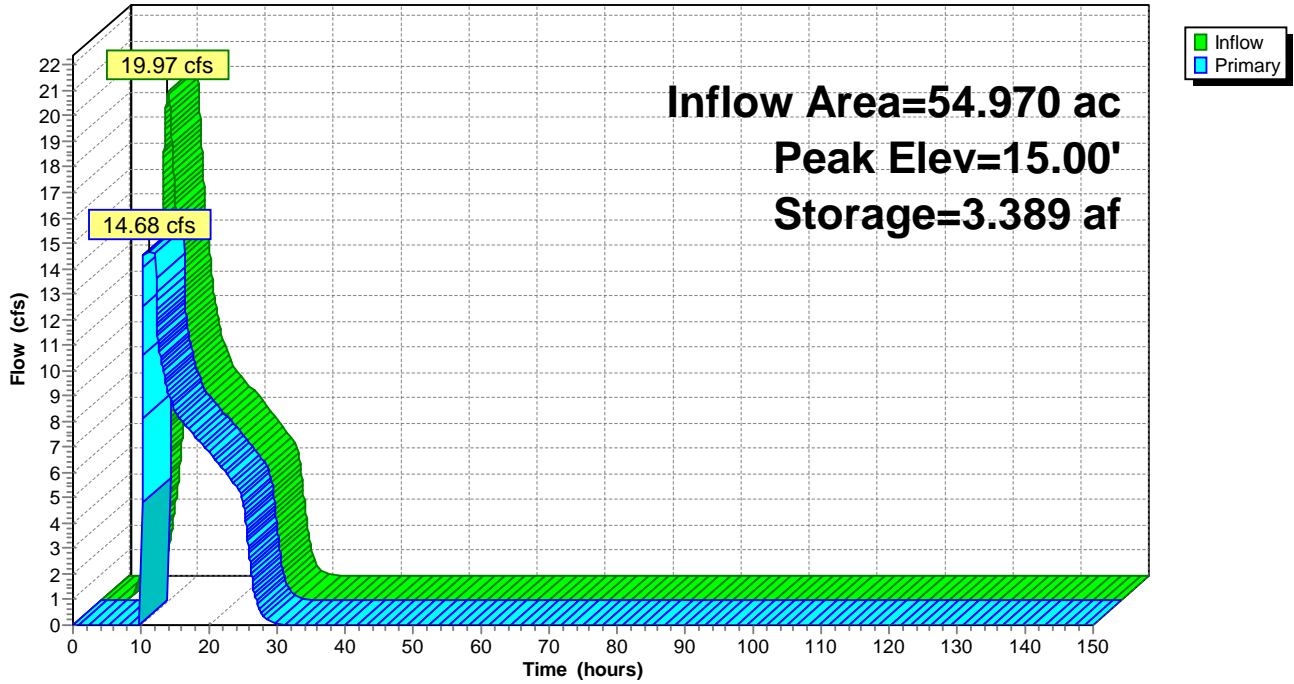
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Pond 7P: 7P-Southwest

Hydrograph



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Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 8P: 8P

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 3.57" for 50-Yr event
 Inflow = 11.48 cfs @ 8.41 hrs, Volume= 4.863 af
 Outflow = 11.48 cfs @ 8.41 hrs, Volume= 4.863 af, Atten= 0%, Lag= 0.0 min
 Primary = 11.48 cfs @ 8.41 hrs, Volume= 4.863 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Peak Elev= 17.79' @ 8.41 hrs
 Flood Elev= 19.00'

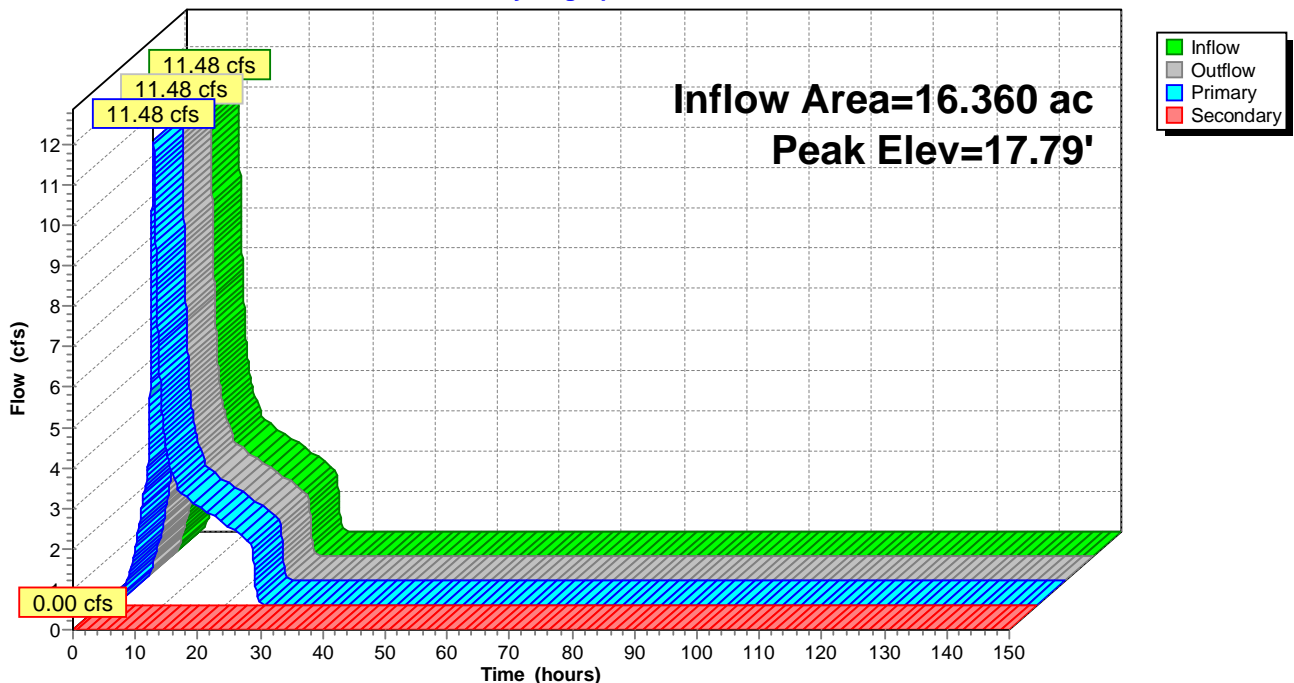
Device	Routing	Invert	Outlet Devices
#1	Primary	16.11'	36.0" Round Culvert L= 93.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.11' / 15.29' S= 0.0088 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	19.00'	100.0' long x 24.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=11.48 cfs @ 8.41 hrs HW=17.79' (Free Discharge)
 ↑1=Culvert (Barrel Controls 11.48 cfs @ 4.07 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.11' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 8P: 8P

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 50-Yr Rainfall=5.00"

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Summary for Pond 10P: 10P-Large Central/NE

Inflow Area = 524.490 ac, 2.24% Impervious, Inflow Depth = 2.66" for 50-Yr event
 Inflow = 93.49 cfs @ 14.00 hrs, Volume= 116.259 af
 Outflow = 34.20 cfs @ 24.84 hrs, Volume= 15.448 af, Atten= 63%, Lag= 650.5 min
 Secondary = 34.20 cfs @ 24.84 hrs, Volume= 15.448 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 13.00' @ 24.84 hrs Surf.Area= 119.000 ac Storage= 98.335 af

Plug-Flow detention time= 1,104.9 min calculated for 15.448 af (13% of inflow)
 Center-of-Mass det. time= 611.6 min (1,705.5 - 1,093.9)

Volume	Invert	Avail.Storage	Storage Description			
#1	10.00'	98.335 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.00	0.280	2,536.0	0.000	0.000	0.280	
11.00	6.414	16,985.0	2.678	2.678	515.559	
12.00	38.875	11,909.0	20.360	23.038	783.495	
13.00	119.000	22,186.0	75.297	98.335	1,423.612	

Device	Routing	Invert	Outlet Devices					
#1	Secondary	12.99'	9,999.0' long x 0.5' breadth Broad-Crested Rectangular Weir					
			Head (feet) 0.20 0.40 0.60 0.80 1.00					
			Coef. (English) 2.80 2.92 3.08 3.30 3.32					

Secondary OutFlow Max=32.08 cfs @ 24.84 hrs HW=13.00' (Free Discharge)

↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 32.08 cfs @ 0.29 fps)

Proposed Conditions Option_1

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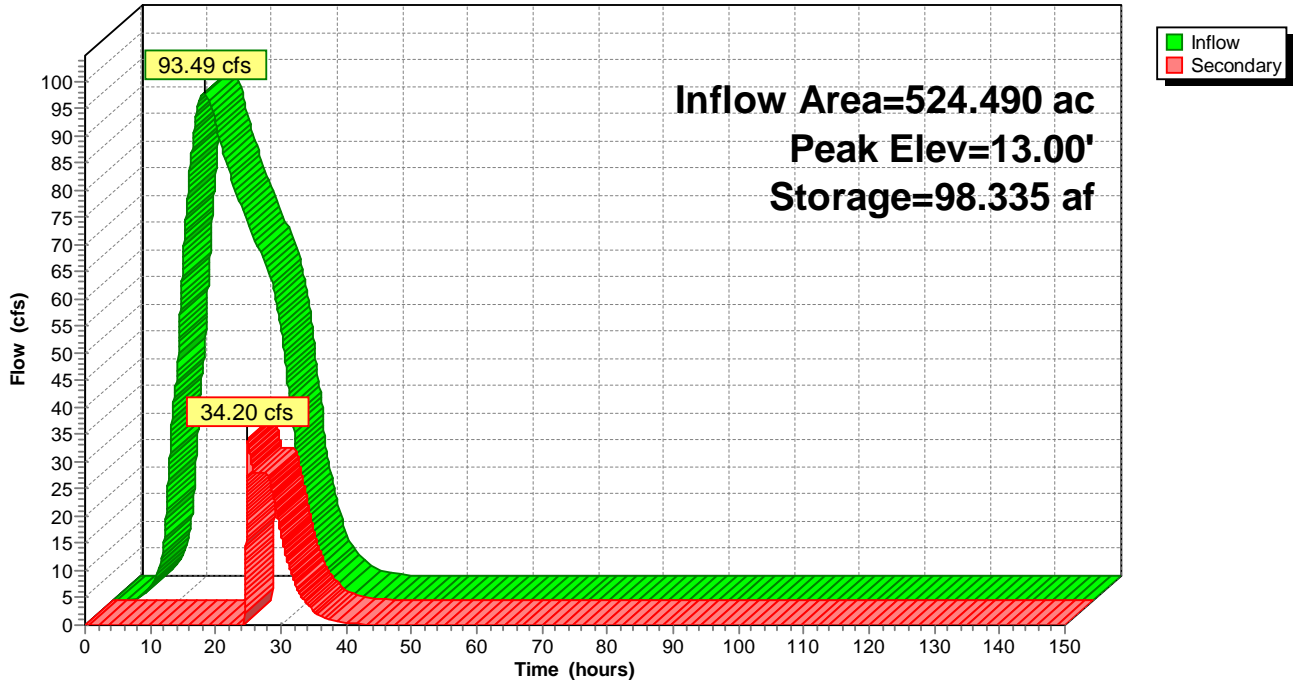
Type IA 24-hr 50-Yr Rainfall=5.00"

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Pond 10P: 10P-Large Central/NE

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr Rainfall=5.50"

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Time span=0.00-150.00 hrs, dt=0.01 hrs, 15001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S-NW Catchment	Runoff Area=7.320 ac 19.67% Impervious Runoff Depth=3.73" Flow Length=292' Slope=0.0200 '/' Tc=4.9 min CN=84 Runoff=7.06 cfs 2.276 af
Subcatchment 2S: 2S-NW Catchment 2	Runoff Area=41.380 ac 2.39% Impervious Runoff Depth=4.04" Flow Length=2,271' Tc=122.9 min CN=87 Runoff=21.86 cfs 13.933 af
Subcatchment 4S: 4S - West Catchment	Runoff Area=26.590 ac 0.83% Impervious Runoff Depth=3.53" Flow Length=998' Tc=38.6 min CN=82 Runoff=18.95 cfs 7.822 af
Subcatchment 5S: 5S - West Catchment	Runoff Area=24.830 ac 0.00% Impervious Runoff Depth=3.33" Flow Length=660' Tc=11.1 min CN=80 Runoff=20.53 cfs 6.897 af
Subcatchment 6S: 6S - West Catchment	Runoff Area=21.310 ac 1.08% Impervious Runoff Depth=2.95" Flow Length=1,162' Slope=0.0017 '/' Tc=127.5 min CN=76 Runoff=7.34 cfs 5.244 af
Subcatchment 7S: 7S - Southwest	Runoff Area=54.970 ac 1.29% Impervious Runoff Depth=3.53" Flow Length=1,700' Tc=140.5 min CN=82 Runoff=23.19 cfs 16.170 af
Subcatchment 8S: 8S - South Catchment	Runoff Area=16.360 ac 4.95% Impervious Runoff Depth=4.04" Flow Length=1,480' Tc=45.3 min CN=87 Runoff=13.08 cfs 5.508 af
Subcatchment 10S: 10S - Large Central / NE	Runoff Area=324.770 ac 2.52% Impervious Runoff Depth=3.33" Flow Length=2,575' Slope=0.0019 '/' Tc=393.8 min CN=80 Runoff=76.98 cfs 90.214 af
Subcatchment 11S: 11S - SE	Runoff Area=23.320 ac 0.00% Impervious Runoff Depth=1.99" Flow Length=1,924' Tc=49.7 min CN=65 Runoff=6.54 cfs 3.876 af
Reach 8R: South Ditch	Avg. Flow Depth=1.51' Max Vel=1.77 fps Inflow=13.08 cfs 5.508 af n=0.022 L=579.0' S=0.0012 '/' Capacity=2.94 cfs Outflow=12.83 cfs 5.508 af
Pond 1P: 1P- NW Pond	Peak Elev=12.61' Storage=2.276 af Inflow=7.06 cfs 2.276 af Outflow=0.00 cfs 0.000 af
Pond 5P: 5P - West Pond	Peak Elev=15.01' Storage=2.177 af Inflow=35.17 cfs 27.546 af Outflow=27.09 cfs 25.709 af
Pond 6P: 6P- West Pond	Peak Elev=15.02' Storage=8.451 af Inflow=30.90 cfs 30.953 af Outflow=21.69 cfs 27.169 af
Pond 7P: 7P-Southwest	Peak Elev=15.00' Storage=3.391 af Inflow=23.19 cfs 16.170 af Outflow=15.03 cfs 12.827 af
Pond 8P: 8P	Peak Elev=17.92' Inflow=13.08 cfs 5.508 af Primary=13.08 cfs 5.508 af Secondary=0.00 cfs 0.000 af Outflow=13.08 cfs 5.508 af
Pond 10P: 10P-Large Central/NE	Peak Elev=13.01' Storage=98.335 af Inflow=108.80 cfs 135.192 af Outflow=84.89 cfs 43.296 af

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Total Runoff Area = 540.850 ac Runoff Volume = 151.940 af Average Runoff Depth = 3.37"
97.68% Pervious = 528.280 ac 2.32% Impervious = 12.570 ac

Proposed Conditions Option_1

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 1S: 1S-NW Catchment

Runoff = 7.06 cfs @ 7.91 hrs, Volume= 2.276 af, Depth= 3.73"

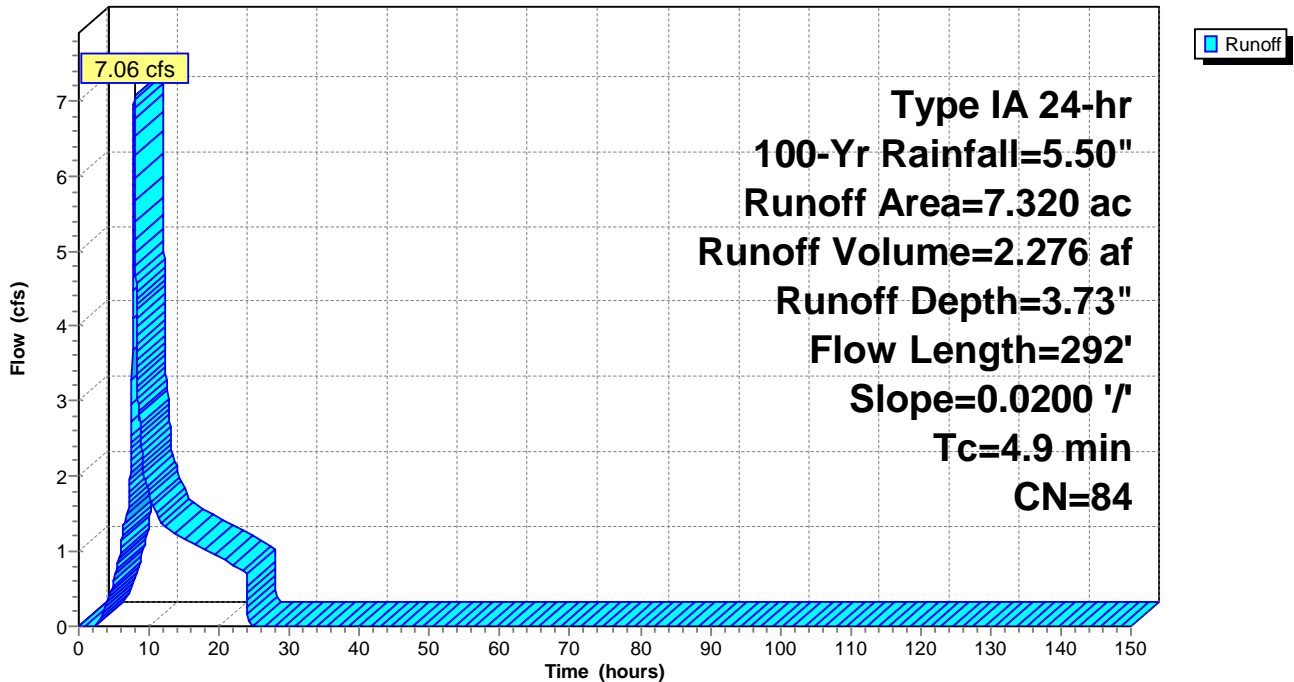
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
3.470	73	Brush, Good, HSG D
1.210	98	Paved parking, HSG D
* 2.410	90	WSDOT - Golf Course
* 0.230	98	Trail
7.320	84	Weighted Average
5.880	80	80.33% Pervious Area
1.440	98	19.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	292	0.0200	0.99		Shallow Concentrated Flow, Shallow - Golf Course Short Grass Pasture Kv= 7.0 fps

Subcatchment 1S: 1S-NW Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 2S: 2S-NW Catchment 2

Sheet flow - dense comes from "native grasses" considered dense. Characterized by the wetland report.

Runoff = 21.86 cfs @ 9.43 hrs, Volume= 13.933 af, Depth= 4.04"

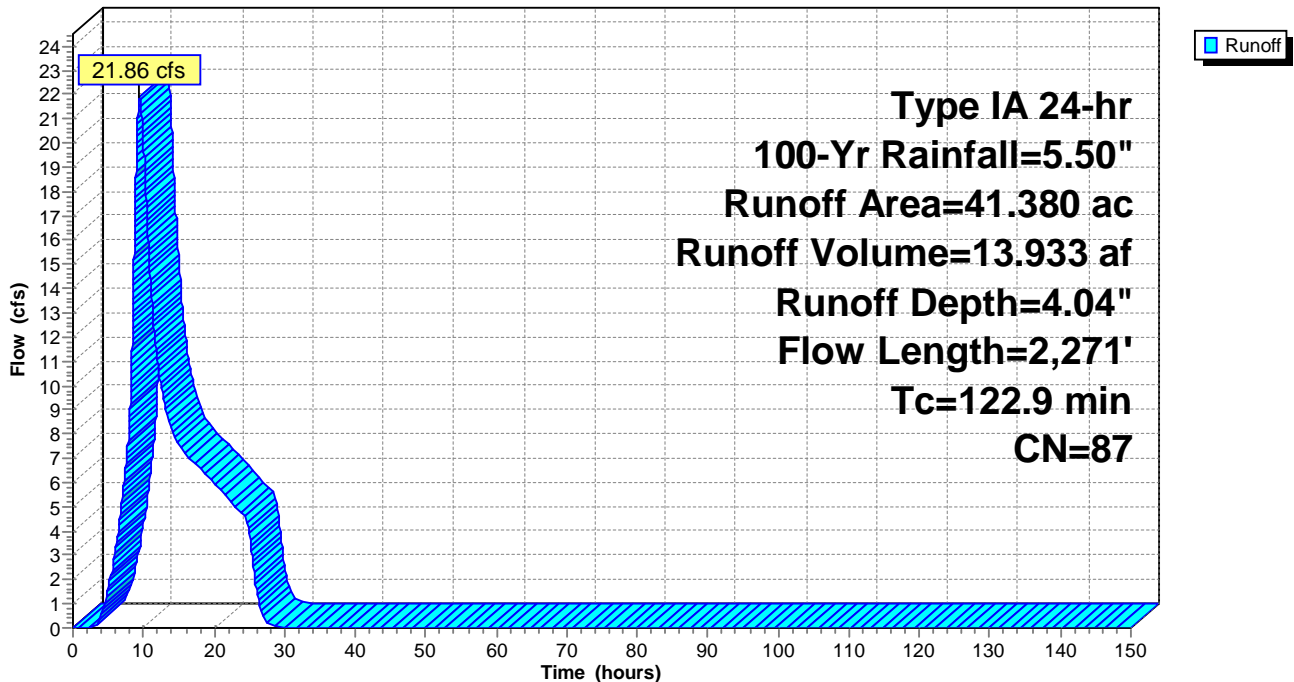
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
8.350	73	Brush, Good, HSG D
0.830	98	Paved parking, HSG D
* 0.160	98	Trail
* 31.710	90	WSDOT - Golf Course
0.330	79	Woods/grass comb., Good, HSG D
41.380	87	Weighted Average
40.390	86	97.61% Pervious Area
0.990	98	2.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	95	0.0950	0.22		Sheet Flow, Sheet - Dense, Native Grasses
					Grass: Dense n= 0.240 P2= 3.43"
115.8	2,176	0.0020	0.31		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
122.9	2,271	Total			

Subcatchment 2S: 2S-NW Catchment 2

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 4S: 4S - West Catchment

Runoff = 18.95 cfs @ 8.32 hrs, Volume= 7.822 af, Depth= 3.53"

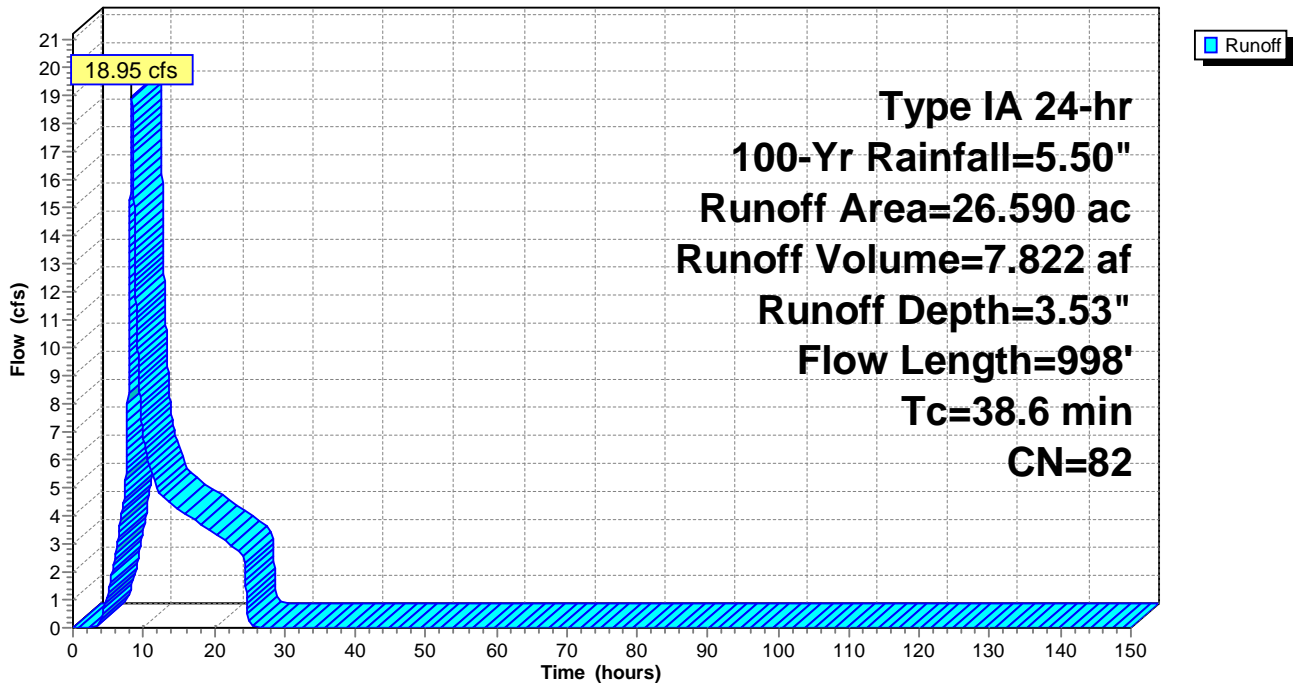
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
13.100	73	Brush, Good, HSG D
* 0.220	98	Trail
* 13.270	90	WSDOT - Golf Course
26.590	82	Weighted Average
26.370	82	99.17% Pervious Area
0.220	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	135	0.0800	1.98		Shallow Concentrated Flow, Shallow - Forest
37.5	863	0.0030	0.38		Short Grass Pasture Kv= 7.0 fps Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
38.6	998	Total			

Subcatchment 4S: 4S - West Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 5S: 5S - West Catchment

Runoff = 20.53 cfs @ 8.01 hrs, Volume= 6.897 af, Depth= 3.33"

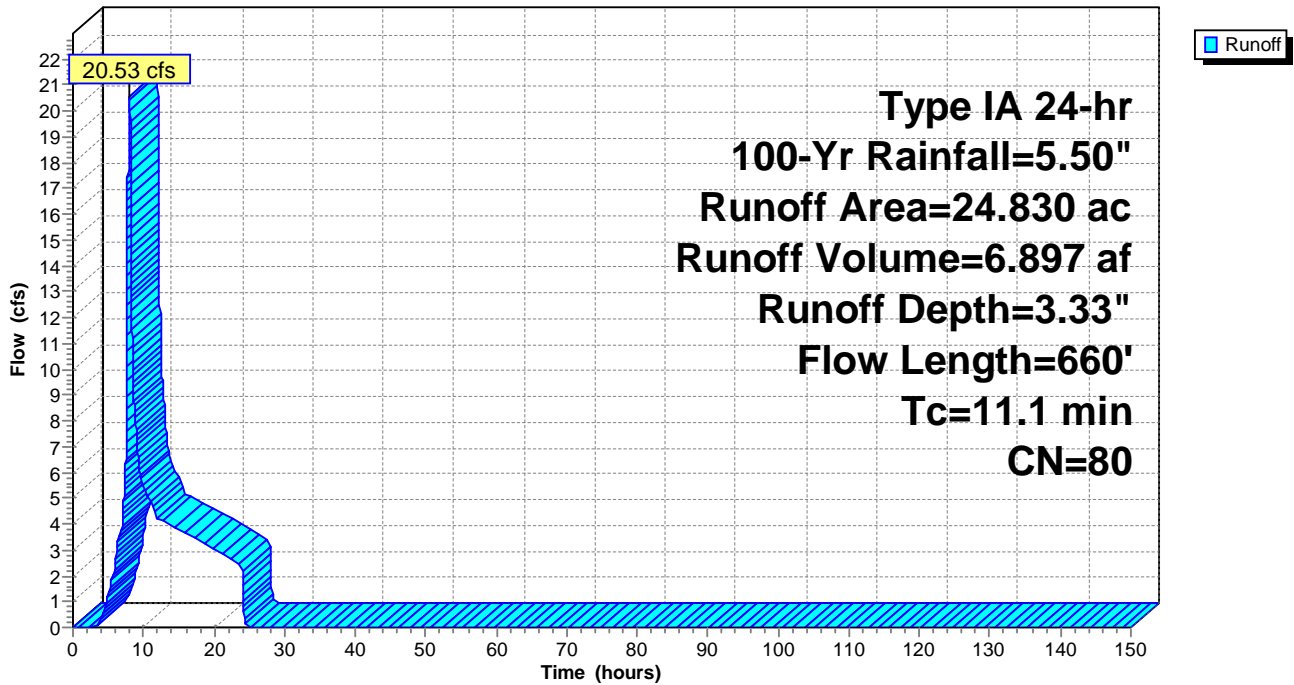
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
13.850	73	Brush, Good, HSG D
0.500	79	Woods/grass comb., Good, HSG D
* 10.480	90	WSDOT - Golf Course
24.830	80	Weighted Average
24.830	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	608	0.0180	0.94		Shallow Concentrated Flow, Shallow - Grass
					Short Grass Pasture Kv= 7.0 fps
0.3	52	0.1300	2.64		Sheet Flow, Path
					Smooth surfaces n= 0.011 P2= 3.43"
11.1	660	Total			

Subcatchment 5S: 5S - West Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 6S: 6S - West Catchment

Runoff = 7.34 cfs @ 9.77 hrs, Volume= 5.244 af, Depth= 2.95"

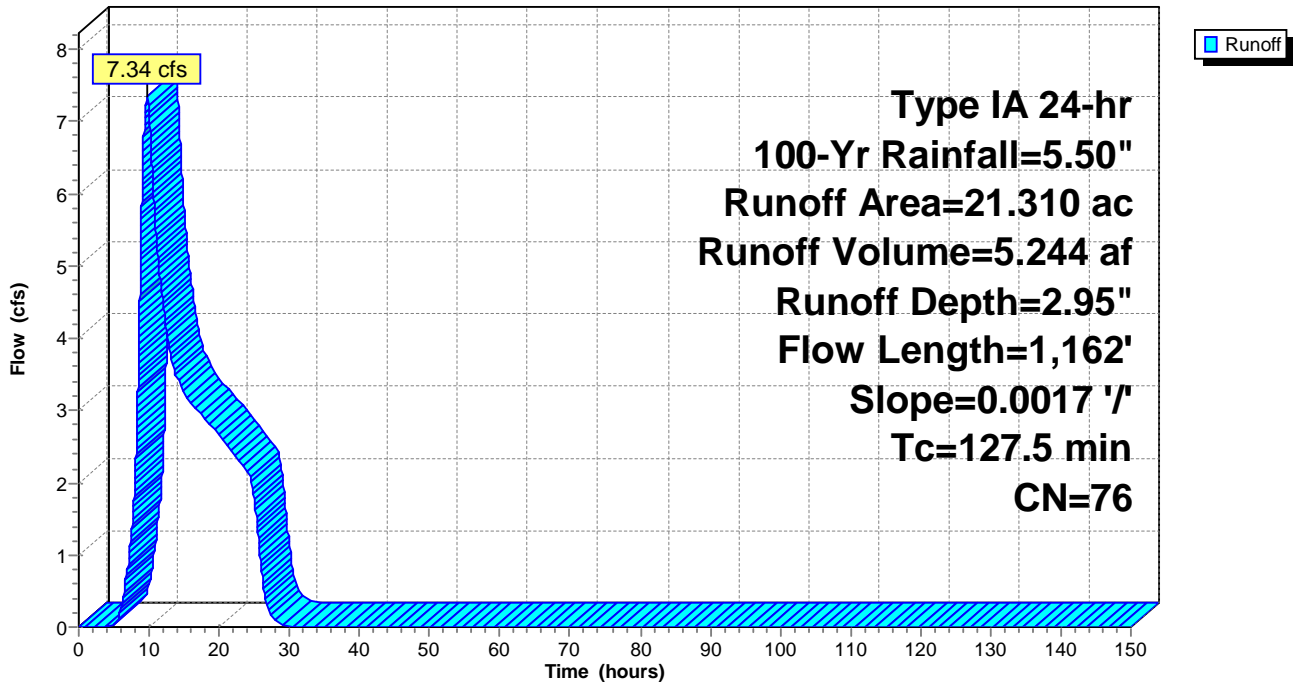
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
8.040	79	Woods/grass comb., Good, HSG D
12.070	73	Brush, Good, HSG D
* 0.970	90	WSDOT - Golf Course
* 0.230	98	Trail
21.310	76	Weighted Average
21.080	76	98.92% Pervious Area
0.230	98	1.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.6	581	0.0017	0.29		Shallow Concentrated Flow, Grass - Shallow Short Grass Pasture Kv= 7.0 fps
93.9	581	0.0017	0.10		Shallow Concentrated Flow, Forested - Shallow Forest w/Heavy Litter Kv= 2.5 fps
127.5	1,162	Total			

Subcatchment 6S: 6S - West Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 7S: 7S - Southwest

Runoff = 23.19 cfs @ 9.83 hrs, Volume= 16.170 af, Depth= 3.53"

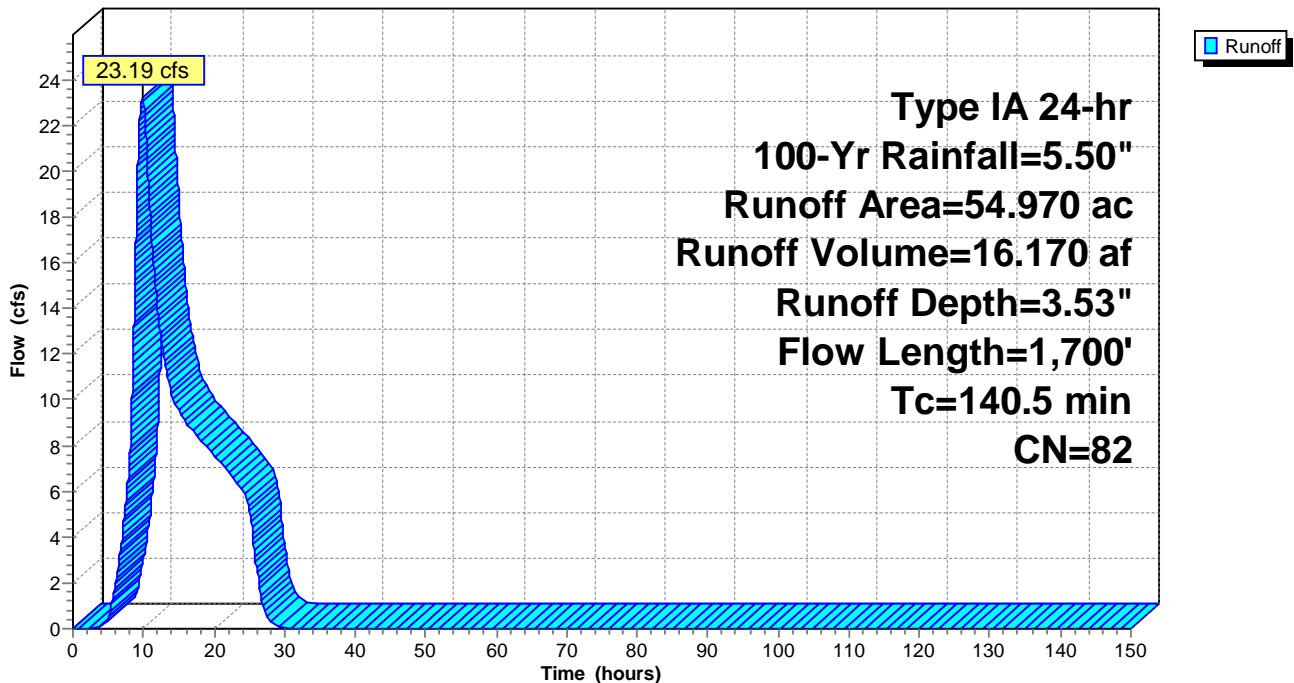
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
8.710	73	Brush, Good, HSG D
25.200	79	Woods/grass comb., Good, HSG D
0.520	98	Paved parking, HSG D
* 0.190	98	Trail
* 20.350	90	WSDOT - Golf Course
54.970	82	Weighted Average
54.260	82	98.71% Pervious Area
0.710	98	1.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	70	0.1000	0.31		Sheet Flow, Sheet - Turf Grass: Short n= 0.150 P2= 3.43"
9.3	775	0.0390	1.38		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
127.5	855	0.0020	0.11		Shallow Concentrated Flow, Shallow - Forest Forest w/Heavy Litter Kv= 2.5 fps
140.5	1,700	Total			

Subcatchment 7S: 7S - Southwest

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 8S: 8S - South Catchment

Runoff = 13.08 cfs @ 8.41 hrs, Volume= 5.508 af, Depth= 4.04"

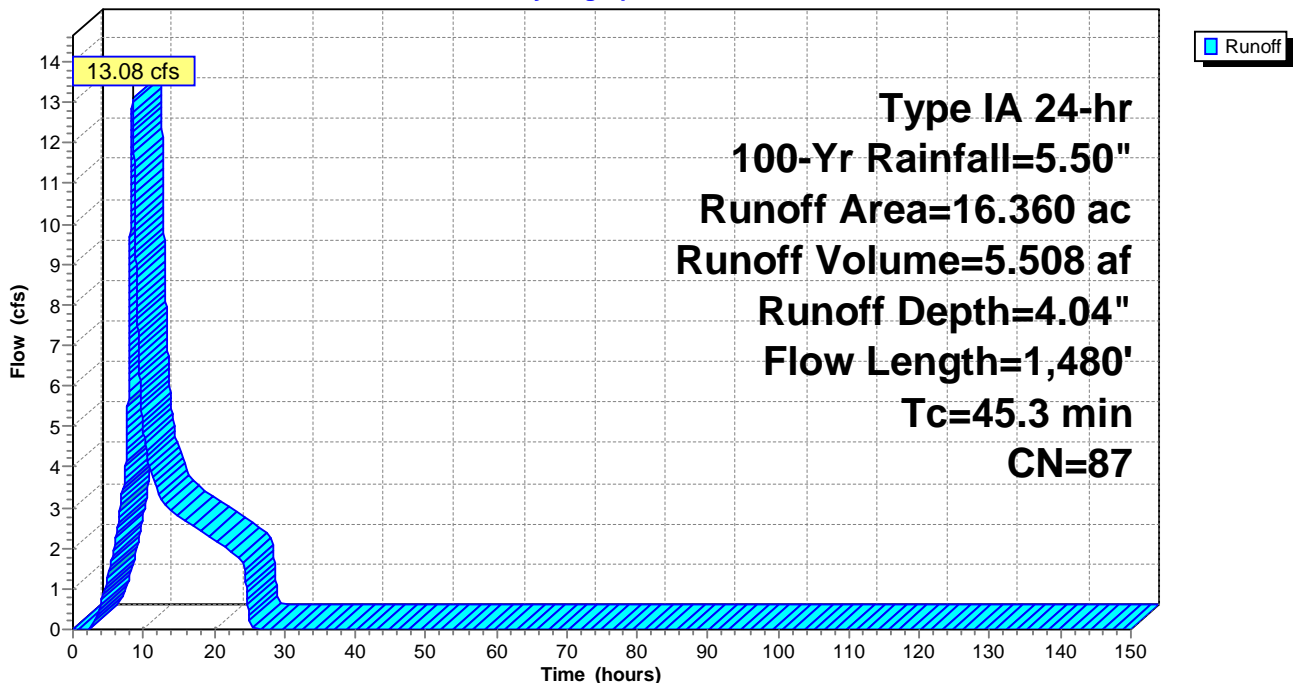
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
1.790	79	Woods/grass comb., Good, HSG D
0.550	30	Brush, Good, HSG A
0.810	98	Paved parking, HSG D
* 13.210	90	WSDOT - Golf Course
16.360	87	Weighted Average
15.550	87	95.05% Pervious Area
0.810	98	4.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	89	0.0560	0.26		Sheet Flow, Sheet- Dune grass Grass: Short n= 0.150 P2= 3.43"
24.0	844	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
15.6	547	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
45.3	1,480	Total			

Subcatchment 8S: 8S - South Catchment

Hydrograph



Proposed Conditions Option 1

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 10S: 10S - Large Central / NE

Runoff = 76.98 cfs @ 14.00 hrs, Volume= 90.214 af, Depth= 3.33"

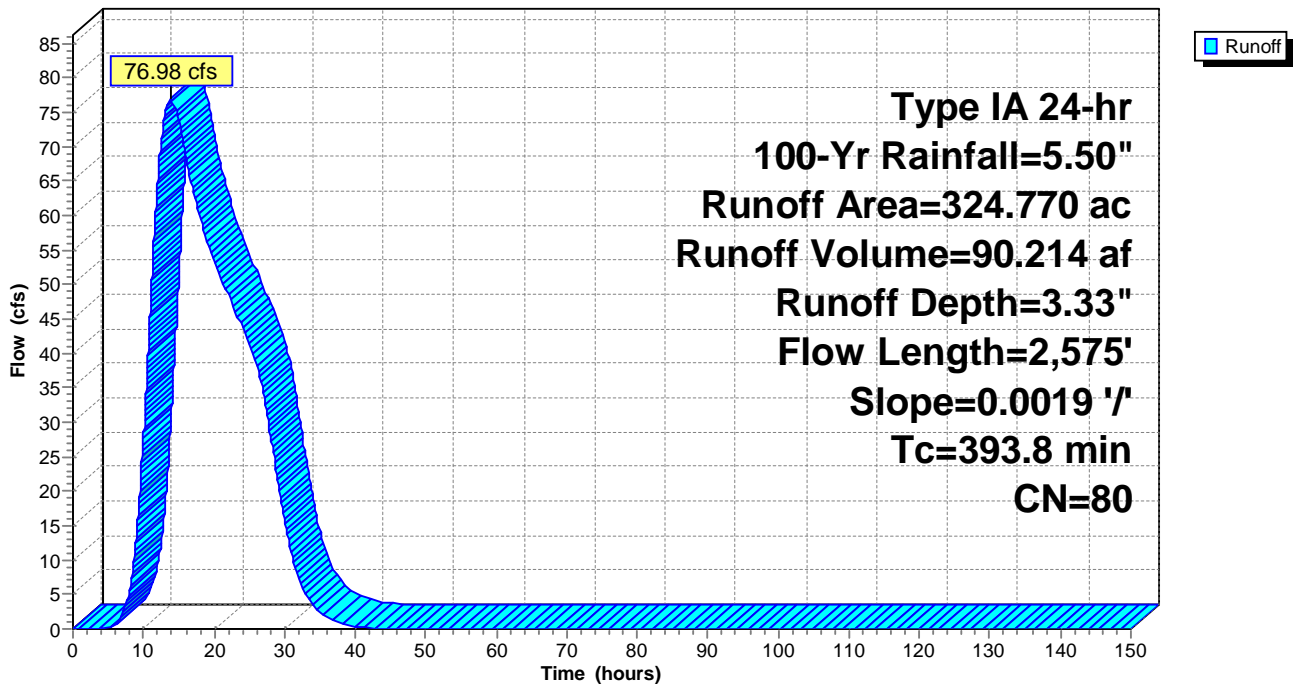
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
198.280	79	Woods/grass comb., Good, HSG D
12.710	32	Woods/grass comb., Good, HSG A
0.660	98	Paved parking, HSG A
5.710	98	Paved parking, HSG D
30.310	73	Brush, Good, HSG D
* 1.800	98	Trail
* 75.300	90	Golf Course
324.770	80	Weighted Average
316.600	79	97.48% Pervious Area
8.170	98	2.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
393.8	2,575	0.0019	0.11		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps

Subcatchment 10S: 10S - Large Central / NE

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Subcatchment 11S: 11S - SE

Runoff = 6.54 cfs @ 8.56 hrs, Volume= 3.876 af, Depth= 1.99"

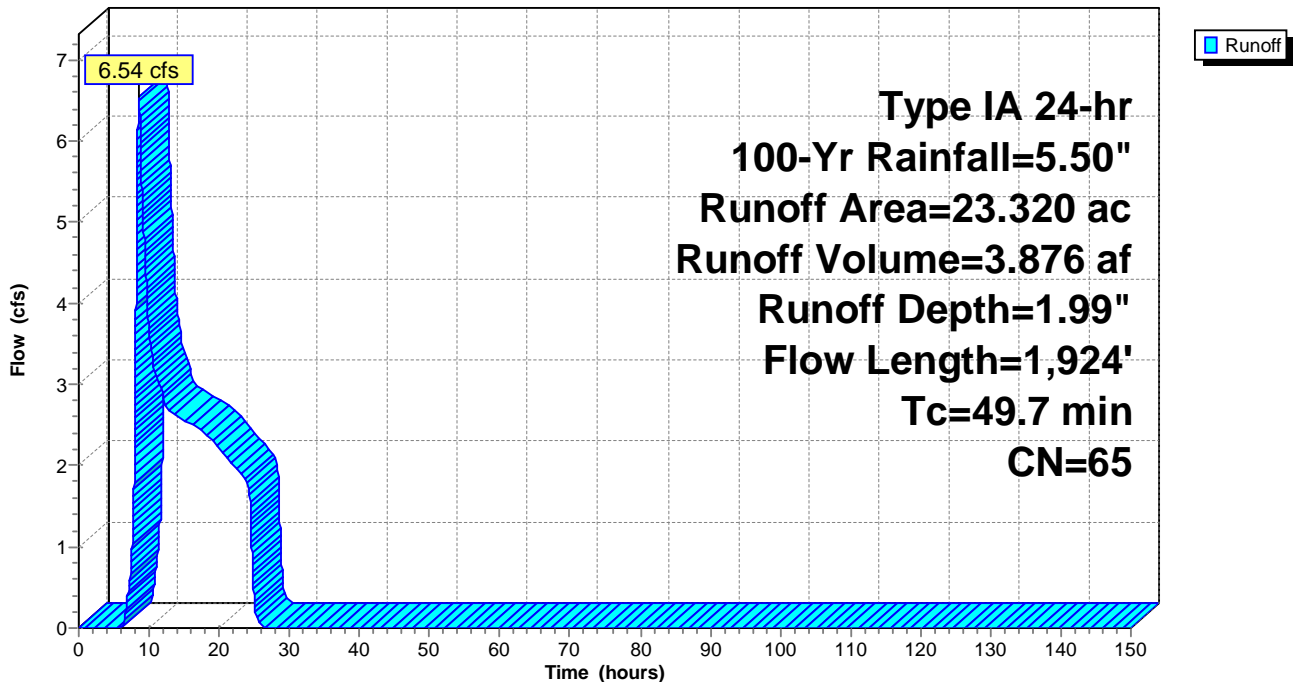
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr Rainfall=5.50"

Area (ac)	CN	Description
2.090	32	Woods/grass comb., Good, HSG A
* 21.230	68	WSDOT - Golf Course
23.320	65	Weighted Average
23.320	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	126	0.1800	0.30		Sheet Flow, Sheet-Dune Grass Grass: Dense n= 0.240 P2= 3.43"
42.8	1,798	0.0100	0.70		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
49.7	1,924	Total			

Subcatchment 11S: 11S - SE

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Reach 8R: South Ditch

[91] Warning: Storage range exceeded by 1.01'

[55] Hint: Peak inflow is 444% of Manning's capacity

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 1.40'

Inflow Area =	16.360 ac,	4.95% Impervious,	Inflow Depth = 4.04"	for 100-Yr event
Inflow =	13.08 cfs @	8.41 hrs,	Volume=	5.508 af
Outflow =	12.83 cfs @	8.58 hrs,	Volume=	5.508 af, Atten= 2%, Lag= 10.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs

Max. Velocity= 1.77 fps, Min. Travel Time= 5.5 min

Avg. Velocity = 0.74 fps, Avg. Travel Time= 13.0 min

Peak Storage= 4,210 cf @ 8.49 hrs

Average Depth at Peak Storage= 1.51', Surface Width= 7.01'

Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 2.94 cfs

4.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 1.0 '/' Top Width= 5.00'

Length= 579.0' Slope= 0.0012 '/'

Inlet Invert= 16.00', Outlet Invert= 15.30'



Proposed Conditions Option_1

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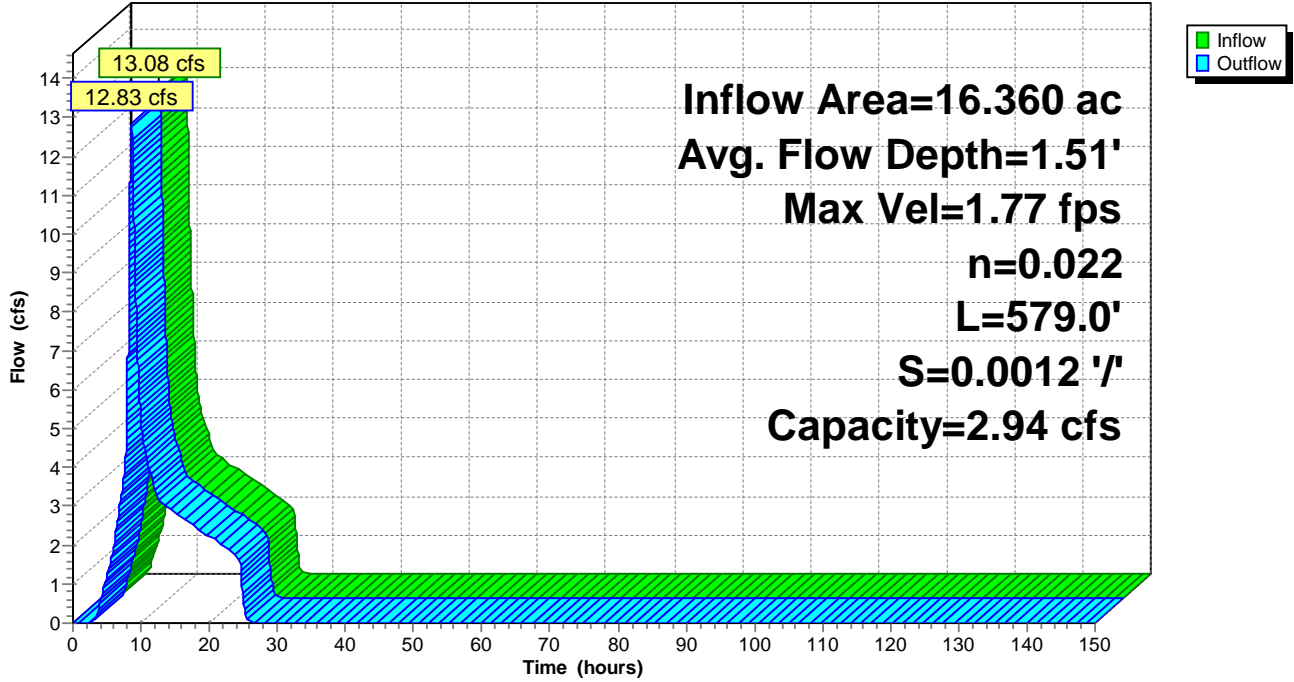
Type IA 24-hr 100-Yr Rainfall=5.50"

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Reach 8R: South Ditch

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 1P: 1P- NW Pond

Inflow Area = 7.320 ac, 19.67% Impervious, Inflow Depth = 3.73" for 100-Yr event
 Inflow = 7.06 cfs @ 7.91 hrs, Volume= 2.276 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.61' @ 24.29 hrs Surf.Area= 1.514 ac Storage= 2.276 af

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

Volume	Invert	Avail.Storage	Storage Description
#1	11.00'	6.173 af	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
11.00	1.290	1,552.0	0.000	0.000	1.290
12.00	1.460	1,164.0	1.374	1.374	3.215
13.00	1.550	1,193.0	1.505	2.879	3.343
14.00	1.640	1,231.0	1.595	4.474	3.514
15.00	1.760	1,333.0	1.700	6.173	3.992

Device	Routing	Invert	Outlet Devices
#1	Primary	14.99'	1,333.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Proposed Conditions Option_1

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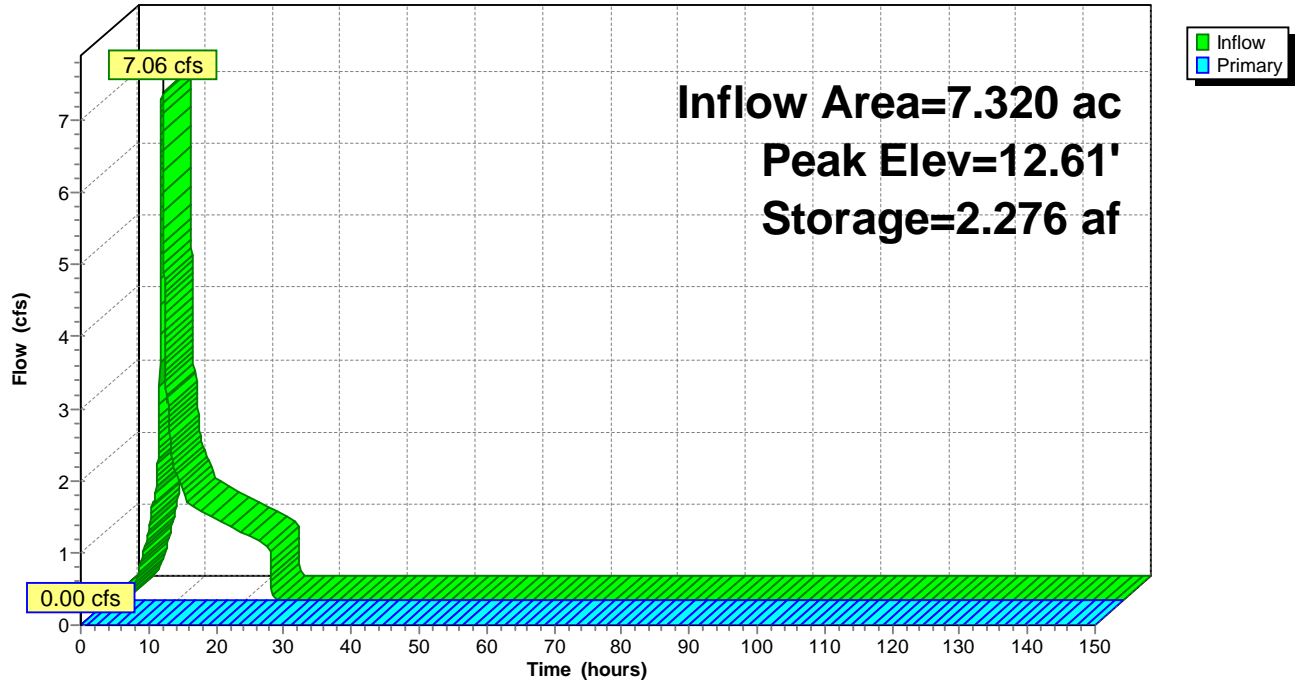
Type IA 24-hr 100-Yr Rainfall=5.50"

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Pond 1P: 1P- NW Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 5P: 5P - West Pond

[81] Warning: Exceeded Pond 7P by 0.73' @ 7.81 hrs

Inflow Area = 106.390 ac, 0.87% Impervious, Inflow Depth = 3.11" for 100-Yr event
 Inflow = 35.17 cfs @ 8.08 hrs, Volume= 27.546 af
 Outflow = 27.09 cfs @ 8.49 hrs, Volume= 25.709 af, Atten= 23%, Lag= 24.7 min
 Primary = 27.09 cfs @ 8.49 hrs, Volume= 25.709 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.01' @ 8.49 hrs Surf.Area= 95.359 ac Storage= 2.177 af

Plug-Flow detention time= 87.1 min calculated for 25.709 af (93% of inflow)
 Center-of-Mass det. time= 43.9 min (921.9 - 877.9)

Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	340.699 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	1.160	3,026.0	0.000	0.000	1.160	
15.00	2.670	3,968.0	1.863	1.863	13.196	
15.10	9,999.000	9,999.0	338.835	340.699	167.081	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	3,968.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=26.25 cfs @ 8.49 hrs HW=15.01' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Weir Controls 26.25 cfs @ 0.36 fps)

Proposed Conditions Option_1

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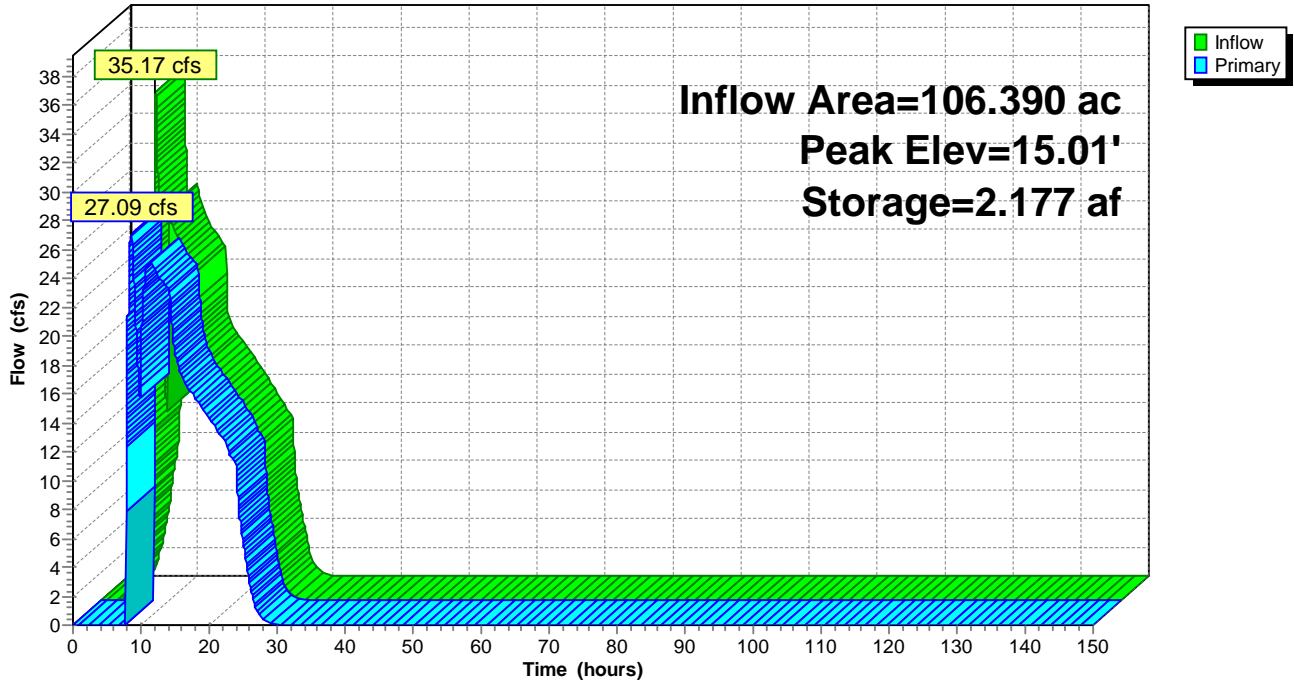
Type IA 24-hr 100-Yr Rainfall=5.50"

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Pond 5P: 5P - West Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 6P: 6P- West Pond

[81] Warning: Exceeded Pond 5P by 0.02' @ 26.20 hrs

Inflow Area = 127.700 ac, 0.91% Impervious, Inflow Depth = 2.91" for 100-Yr event
 Inflow = 30.90 cfs @ 8.59 hrs, Volume= 30.953 af
 Outflow = 21.69 cfs @ 15.16 hrs, Volume= 27.169 af, Atten= 30%, Lag= 394.0 min
 Primary = 21.69 cfs @ 15.16 hrs, Volume= 27.169 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.02' @ 15.16 hrs Surf.Area= 568.818 ac Storage= 8.451 af

Plug-Flow detention time= 261.9 min calculated for 27.168 af (88% of inflow)
 Center-of-Mass det. time= 189.8 min (1,108.4 - 918.5)

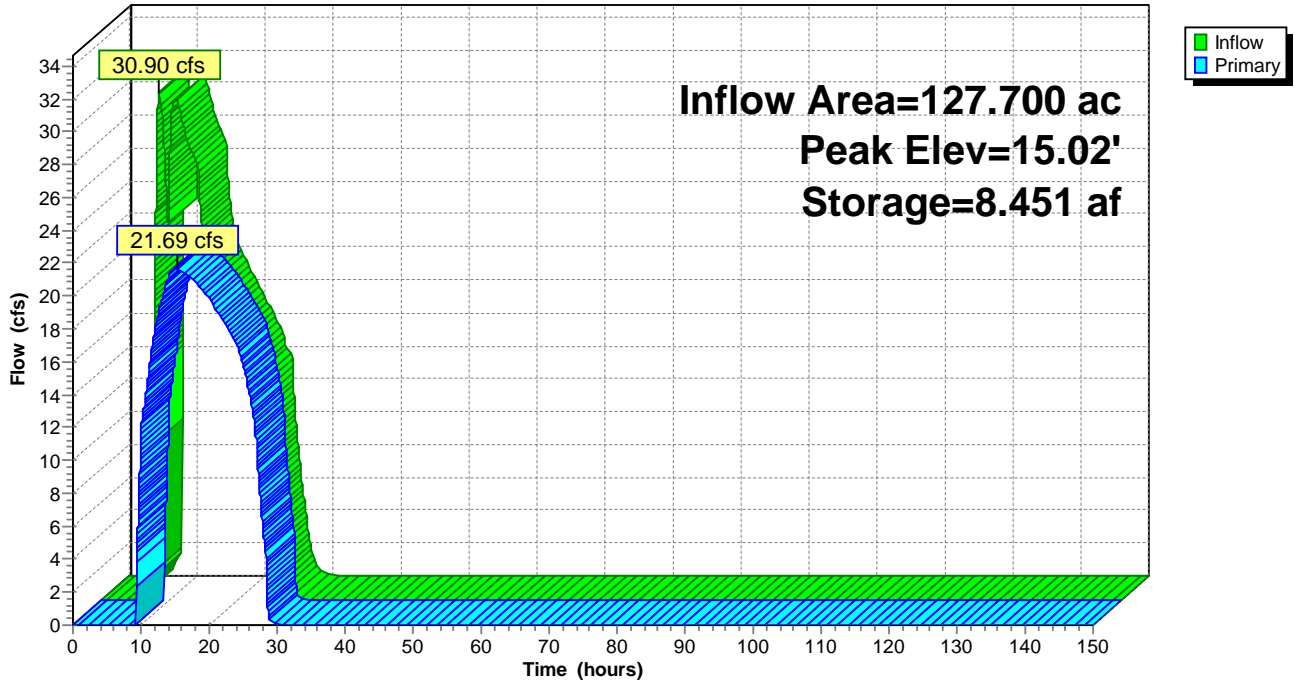
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	344.602 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.930	3,856.0	0.000	0.000	2.930	
15.00	4.810	4,175.0	3.831	3.831	7.611	
15.10	9,999.000	9,999.0	340.771	344.602	158.416	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	1,400.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=21.62 cfs @ 15.16 hrs HW=15.02' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 21.62 cfs @ 0.48 fps)

Pond 6P: 6P- West Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 7P: 7P-Southwest

Inflow Area = 54.970 ac, 1.29% Impervious, Inflow Depth = 3.53" for 100-Yr event
 Inflow = 23.19 cfs @ 9.83 hrs, Volume= 16.170 af
 Outflow = 15.03 cfs @ 11.68 hrs, Volume= 12.827 af, Atten= 35%, Lag= 110.5 min
 Primary = 15.03 cfs @ 11.68 hrs, Volume= 12.827 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 11.68 hrs Surf.Area= 15.123 ac Storage= 3.391 af

Plug-Flow detention time= 234.8 min calculated for 12.826 af (79% of inflow)
 Center-of-Mass det. time= 106.2 min (988.9 - 882.8)

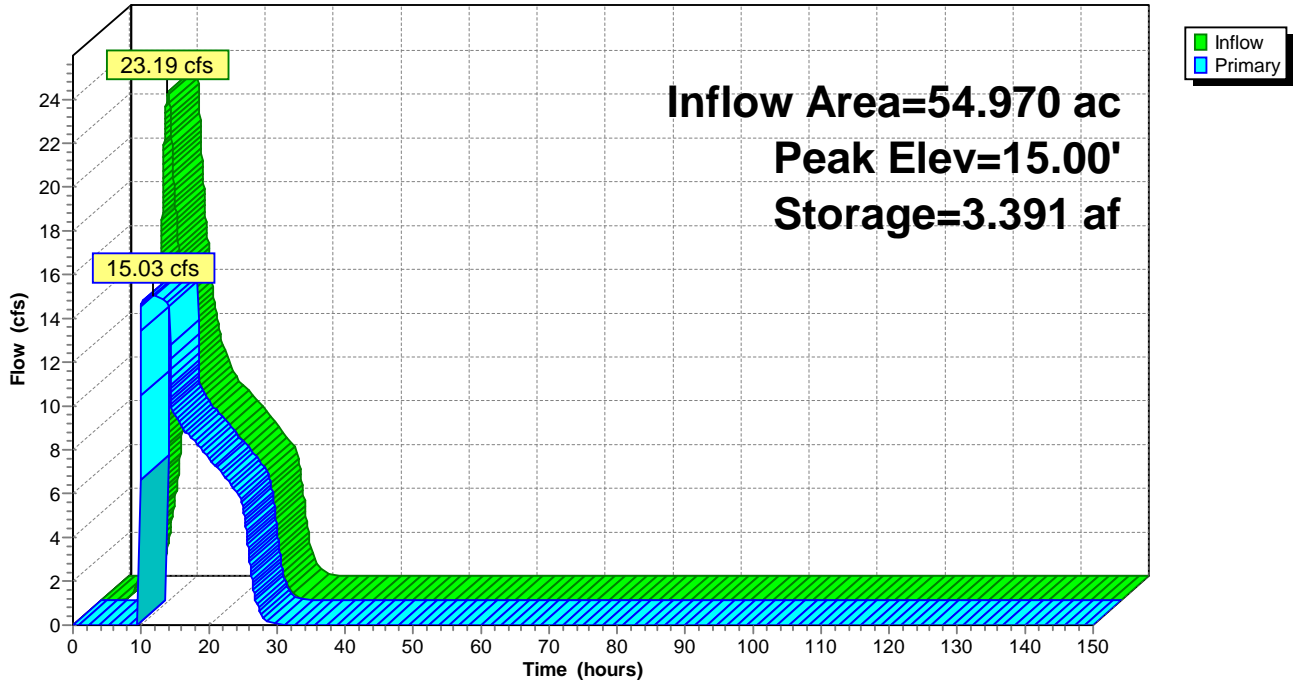
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	37.446 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.340	3,959.0	0.000	0.000	2.340	
15.00	4.560	5,430.0	3.389	3.389	27.571	
15.01	9,999.000	9,999.0	34.057	37.446	156.355	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	5,430.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=14.95 cfs @ 11.68 hrs HW=15.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 14.95 cfs @ 0.27 fps)

Pond 7P: 7P-Southwest

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 8P: 8P

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 4.04" for 100-Yr event
 Inflow = 13.08 cfs @ 8.41 hrs, Volume= 5.508 af
 Outflow = 13.08 cfs @ 8.41 hrs, Volume= 5.508 af, Atten= 0%, Lag= 0.0 min
 Primary = 13.08 cfs @ 8.41 hrs, Volume= 5.508 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Peak Elev= 17.92' @ 8.41 hrs
 Flood Elev= 19.00'

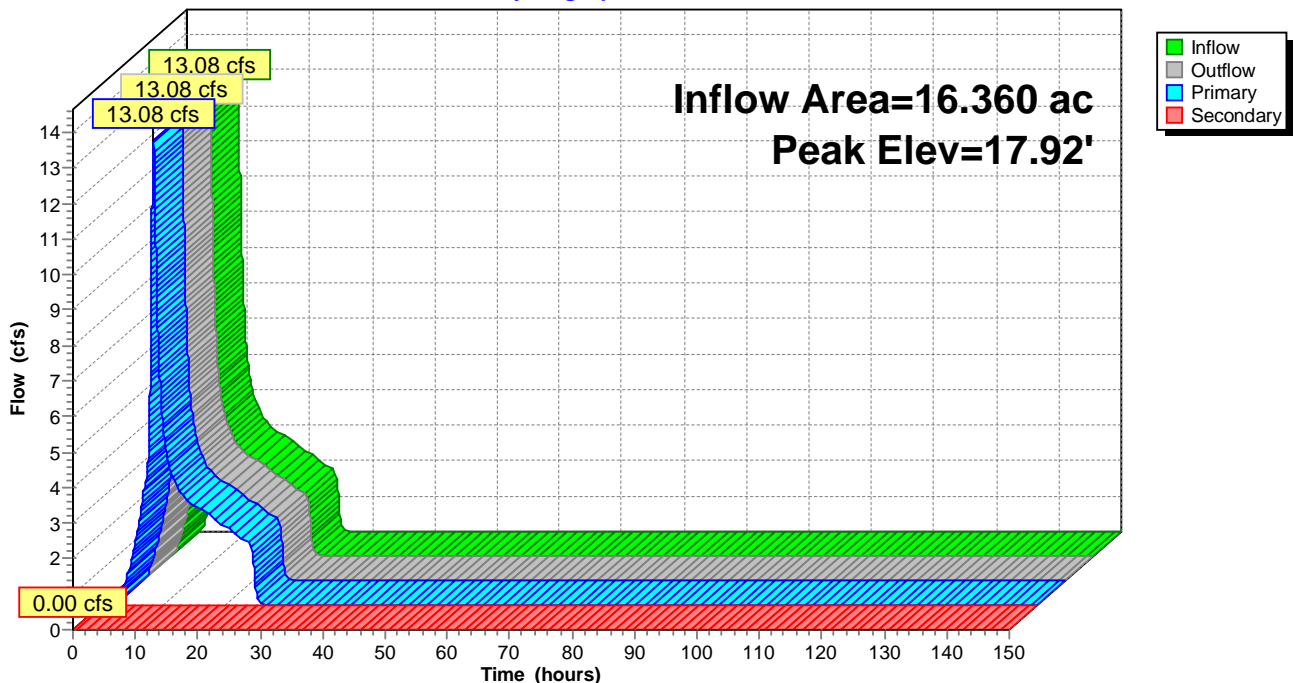
Device	Routing	Invert	Outlet Devices
#1	Primary	16.11'	36.0" Round Culvert L= 93.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.11' / 15.29' S= 0.0088 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	19.00'	100.0' long x 24.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=13.07 cfs @ 8.41 hrs HW=17.92' (Free Discharge)
 ↑1=Culvert (Barrel Controls 13.07 cfs @ 4.21 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.11' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 8P: 8P

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr Rainfall=5.50"

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Summary for Pond 10P: 10P-Large Central/NE

[93] Warning: Storage range exceeded by 0.01'

Inflow Area = 524.490 ac, 2.24% Impervious, Inflow Depth = 3.09" for 100-Yr event
 Inflow = 108.80 cfs @ 14.00 hrs, Volume= 135.192 af
 Outflow = 84.89 cfs @ 22.00 hrs, Volume= 43.296 af, Atten= 22%, Lag= 480.1 min
 Secondary = 84.89 cfs @ 22.00 hrs, Volume= 43.296 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 13.01' @ 22.00 hrs Surf.Area= 119.000 ac Storage= 98.335 af

Plug-Flow detention time= 847.1 min calculated for 43.296 af (32% of inflow)
 Center-of-Mass det. time= 464.4 min (1,551.8 - 1,087.4)

Volume	Invert	Avail.Storage	Storage Description			
#1	10.00'	98.335 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.00	0.280	2,536.0	0.000	0.000	0.280	
11.00	6.414	16,985.0	2.678	2.678	515.559	
12.00	38.875	11,909.0	20.360	23.038	783.495	
13.00	119.000	22,186.0	75.297	98.335	1,423.612	

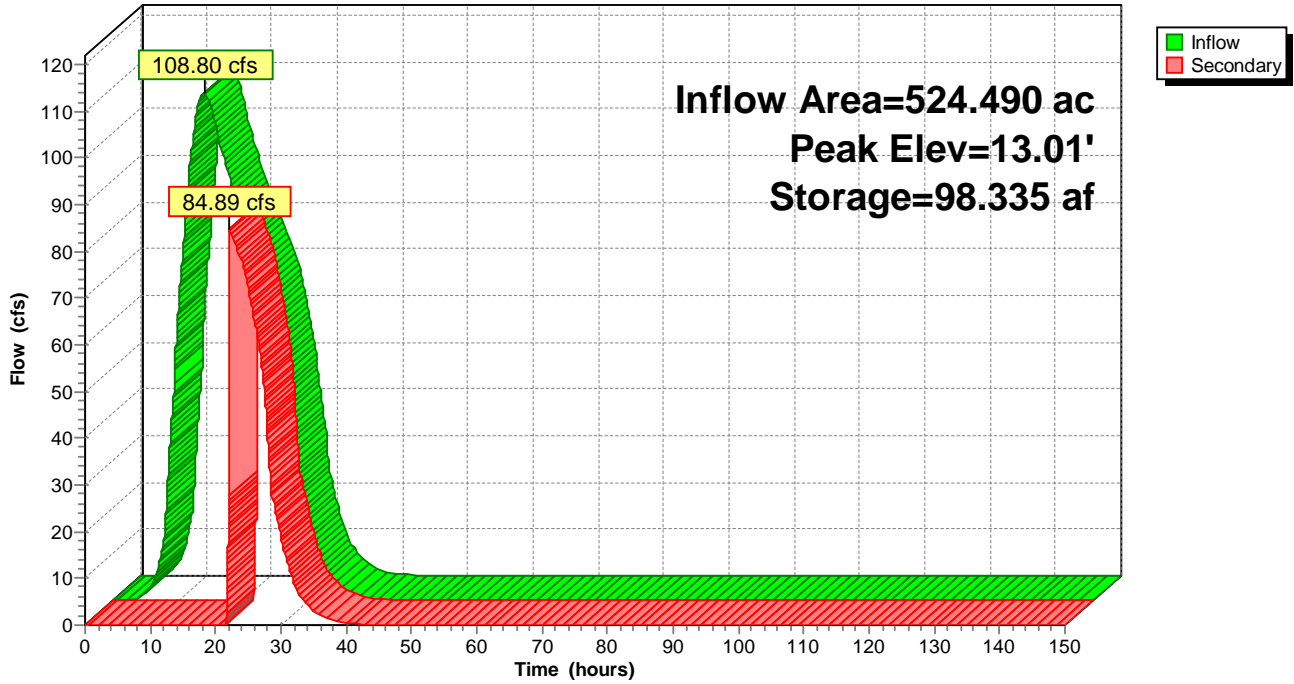
Device	Routing	Invert	Outlet Devices					
#1	Secondary	12.99'	9,999.0' long x 0.5' breadth Broad-Crested Rectangular Weir					
			Head (feet) 0.20 0.40 0.60 0.80 1.00					
			Coef. (English) 2.80 2.92 3.08 3.30 3.32					

Secondary OutFlow Max=71.64 cfs @ 22.00 hrs HW=13.01' (Free Discharge)

↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 71.64 cfs @ 0.38 fps)

Pond 10P: 10P-Large Central/NE

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Time span=0.00-150.00 hrs, dt=0.01 hrs, 15001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S-NW Catchment	Runoff Area=7.320 ac 19.67% Impervious Runoff Depth=4.60" Flow Length=292' Slope=0.0200 '/' Tc=4.9 min CN=84 Runoff=8.78 cfs 2.806 af
Subcatchment 2S: 2S-NW Catchment 2	Runoff Area=41.380 ac 2.39% Impervious Runoff Depth=4.93" Flow Length=2,271' Tc=122.9 min CN=87 Runoff=26.89 cfs 16.999 af
Subcatchment 4S: 4S - West Catchment	Runoff Area=26.590 ac 0.83% Impervious Runoff Depth=4.38" Flow Length=998' Tc=38.6 min CN=82 Runoff=23.92 cfs 9.715 af
Subcatchment 5S: 5S - West Catchment	Runoff Area=24.830 ac 0.00% Impervious Runoff Depth=4.17" Flow Length=660' Tc=11.1 min CN=80 Runoff=26.14 cfs 8.631 af
Subcatchment 6S: 6S - West Catchment	Runoff Area=21.310 ac 1.08% Impervious Runoff Depth=3.75" Flow Length=1,162' Slope=0.0017 '/' Tc=127.5 min CN=76 Runoff=9.63 cfs 6.666 af
Subcatchment 7S: 7S - Southwest	Runoff Area=54.970 ac 1.29% Impervious Runoff Depth=4.38" Flow Length=1,700' Tc=140.5 min CN=82 Runoff=29.27 cfs 20.085 af
Subcatchment 8S: 8S - South Catchment	Runoff Area=16.360 ac 4.95% Impervious Runoff Depth=4.93" Flow Length=1,480' Tc=45.3 min CN=87 Runoff=16.05 cfs 6.721 af
Subcatchment 10S: 10S - Large Central / NE	Runoff Area=324.770 ac 2.52% Impervious Runoff Depth=4.17" Flow Length=2,575' Slope=0.0019 '/' Tc=393.8 min CN=80 Runoff=98.03 cfs 112.895 af
Subcatchment 11S: 11S - SE	Runoff Area=23.320 ac 0.00% Impervious Runoff Depth=2.67" Flow Length=1,924' Tc=49.7 min CN=65 Runoff=9.52 cfs 5.186 af
Reach 8R: South Ditch	Avg. Flow Depth=1.80' Max Vel=1.80 fps Inflow=16.05 cfs 6.721 af n=0.022 L=579.0' S=0.0012 '/' Capacity=2.94 cfs Outflow=15.76 cfs 6.721 af
Pond 1P: 1P- NW Pond	Peak Elev=12.95' Storage=2.806 af Inflow=8.78 cfs 2.806 af Outflow=0.00 cfs 0.000 af
Pond 5P: 5P - West Pond	Peak Elev=15.01' Storage=2.690 af Inflow=44.72 cfs 35.088 af Outflow=34.79 cfs 33.251 af
Pond 6P: 6P- West Pond	Peak Elev=15.03' Storage=10.907 af Inflow=40.14 cfs 39.918 af Outflow=25.65 cfs 36.135 af
Pond 7P: 7P-Southwest	Peak Elev=15.00' Storage=3.402 af Inflow=29.27 cfs 20.085 af Outflow=15.99 cfs 16.741 af
Pond 8P: 8P	Peak Elev=18.15' Inflow=16.05 cfs 6.721 af Primary=16.05 cfs 6.721 af Secondary=0.00 cfs 0.000 af Outflow=16.05 cfs 6.721 af
Pond 10P: 10P-Large Central/NE	Peak Elev=13.02' Storage=98.335 af Inflow=135.46 cfs 171.215 af Outflow=155.15 cfs 108.776 af

Proposed_Conditions_Option_1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Total Runoff Area = 540.850 ac Runoff Volume = 189.706 af Average Runoff Depth = 4.21"
97.68% Pervious = 528.280 ac 2.32% Impervious = 12.570 ac

Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 1S: 1S-NW Catchment

Runoff = 8.78 cfs @ 7.90 hrs, Volume= 2.806 af, Depth= 4.60"

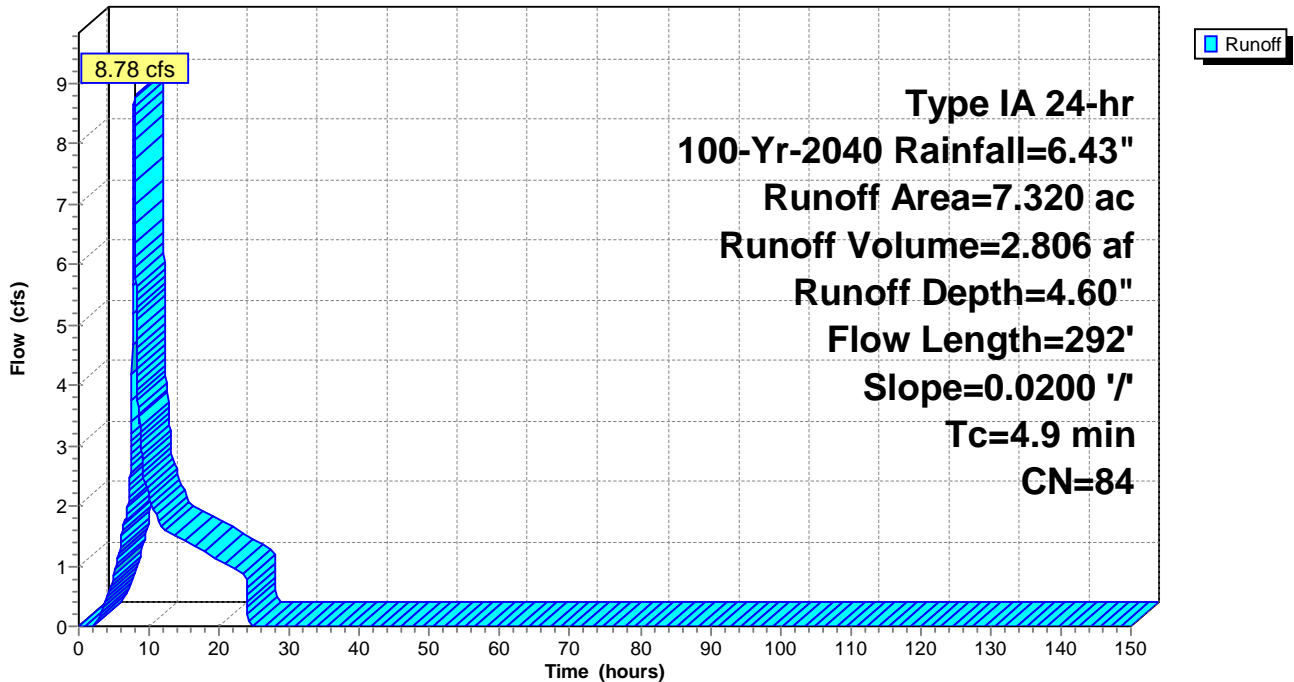
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
3.470	73	Brush, Good, HSG D
1.210	98	Paved parking, HSG D
* 2.410	90	WSDOT - Golf Course
* 0.230	98	Trail
7.320	84	Weighted Average
5.880	80	80.33% Pervious Area
1.440	98	19.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	292	0.0200	0.99		Shallow Concentrated Flow, Shallow - Golf Course Short Grass Pasture Kv= 7.0 fps

Subcatchment 1S: 1S-NW Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 2S: 2S-NW Catchment 2

Sheet flow - dense comes from "native grasses" considered dense. Characterized by the wetland report.

Runoff = 26.89 cfs @ 9.43 hrs, Volume= 16.999 af, Depth= 4.93"

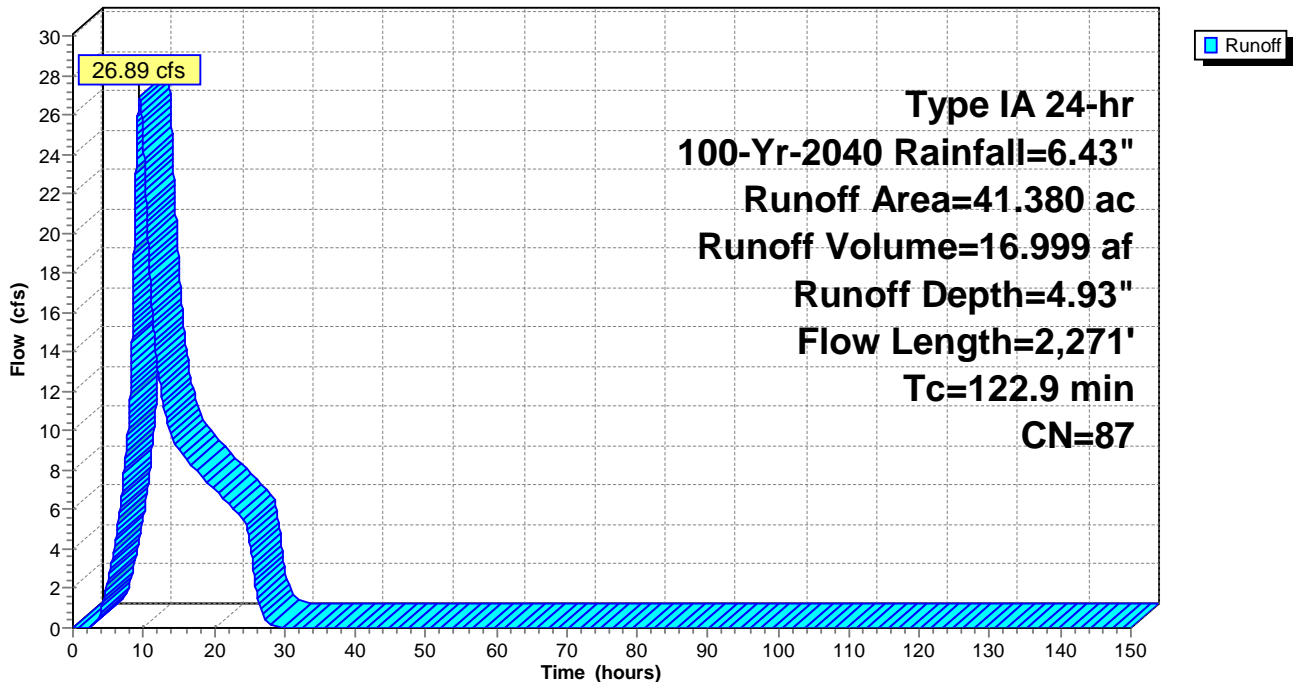
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
8.350	73	Brush, Good, HSG D
0.830	98	Paved parking, HSG D
* 0.160	98	Trail
* 31.710	90	WSDOT - Golf Course
0.330	79	Woods/grass comb., Good, HSG D
41.380	87	Weighted Average
40.390	86	97.61% Pervious Area
0.990	98	2.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	95	0.0950	0.22		Sheet Flow, Sheet - Dense, Native Grasses
					Grass: Dense n= 0.240 P2= 3.43"
115.8	2,176	0.0020	0.31		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
122.9	2,271	Total			

Subcatchment 2S: 2S-NW Catchment 2

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 4S: 4S - West Catchment

Runoff = 23.92 cfs @ 8.32 hrs, Volume= 9.715 af, Depth= 4.38"

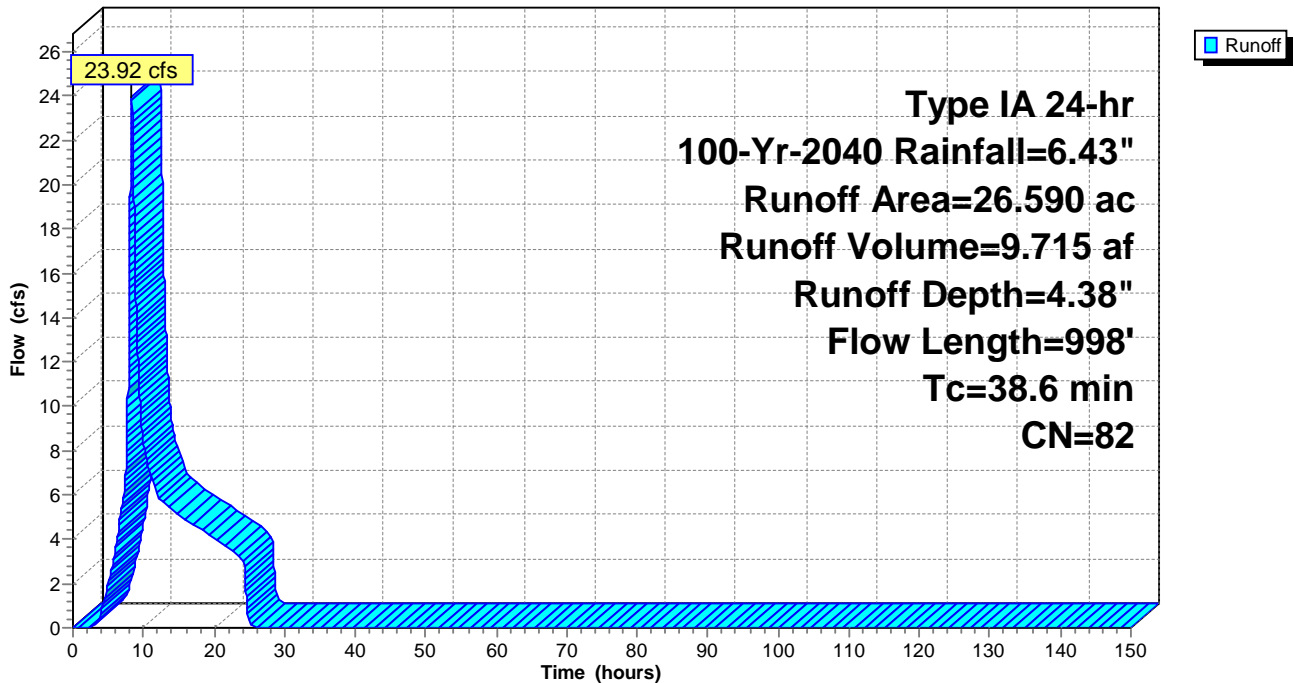
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
13.100	73	Brush, Good, HSG D
* 0.220	98	Trail
* 13.270	90	WSDOT - Golf Course
26.590	82	Weighted Average
26.370	82	99.17% Pervious Area
0.220	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	135	0.0800	1.98		Shallow Concentrated Flow, Shallow - Forest
37.5	863	0.0030	0.38		Short Grass Pasture Kv= 7.0 fps Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
38.6	998	Total			

Subcatchment 4S: 4S - West Catchment

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 5S: 5S - West Catchment

Runoff = 26.14 cfs @ 8.01 hrs, Volume= 8.631 af, Depth= 4.17"

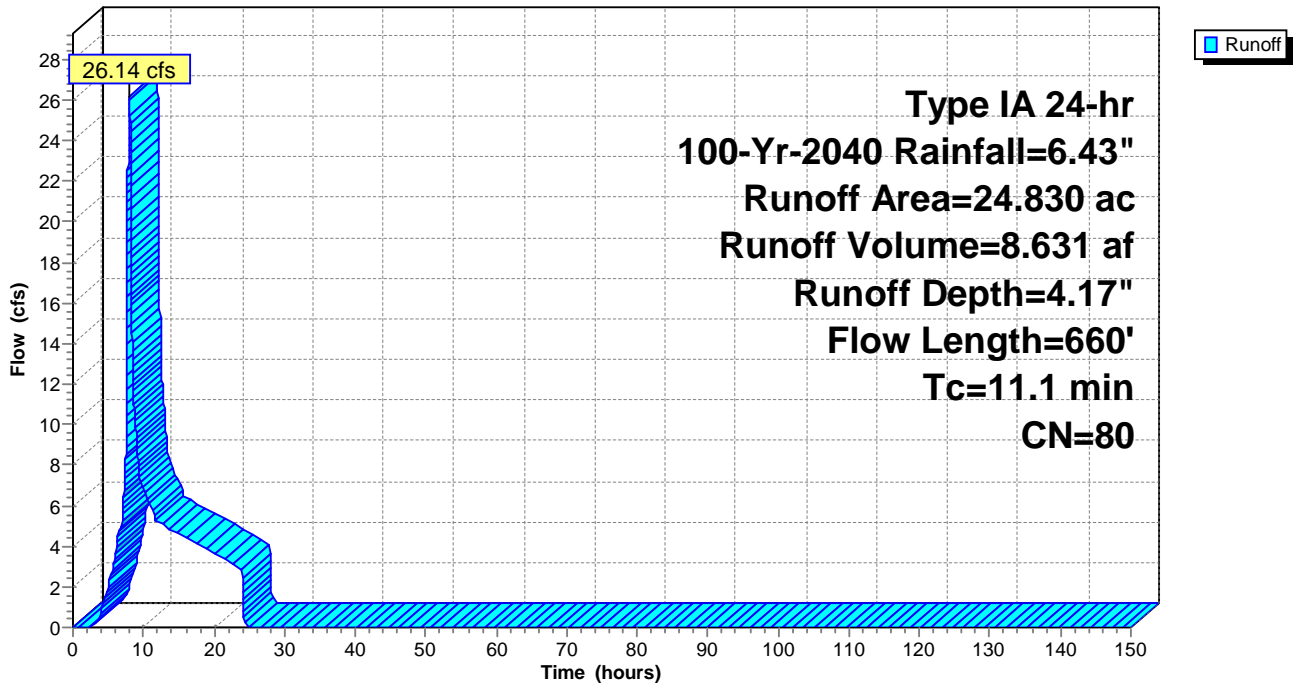
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
13.850	73	Brush, Good, HSG D
0.500	79	Woods/grass comb., Good, HSG D
* 10.480	90	WSDOT - Golf Course
24.830	80	Weighted Average
24.830	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	608	0.0180	0.94		Shallow Concentrated Flow, Shallow - Grass
					Short Grass Pasture Kv= 7.0 fps
0.3	52	0.1300	2.64		Sheet Flow, Path
					Smooth surfaces n= 0.011 P2= 3.43"
11.1	660	Total			

Subcatchment 5S: 5S - West Catchment

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 6S: 6S - West Catchment

Runoff = 9.63 cfs @ 9.64 hrs, Volume= 6.666 af, Depth= 3.75"

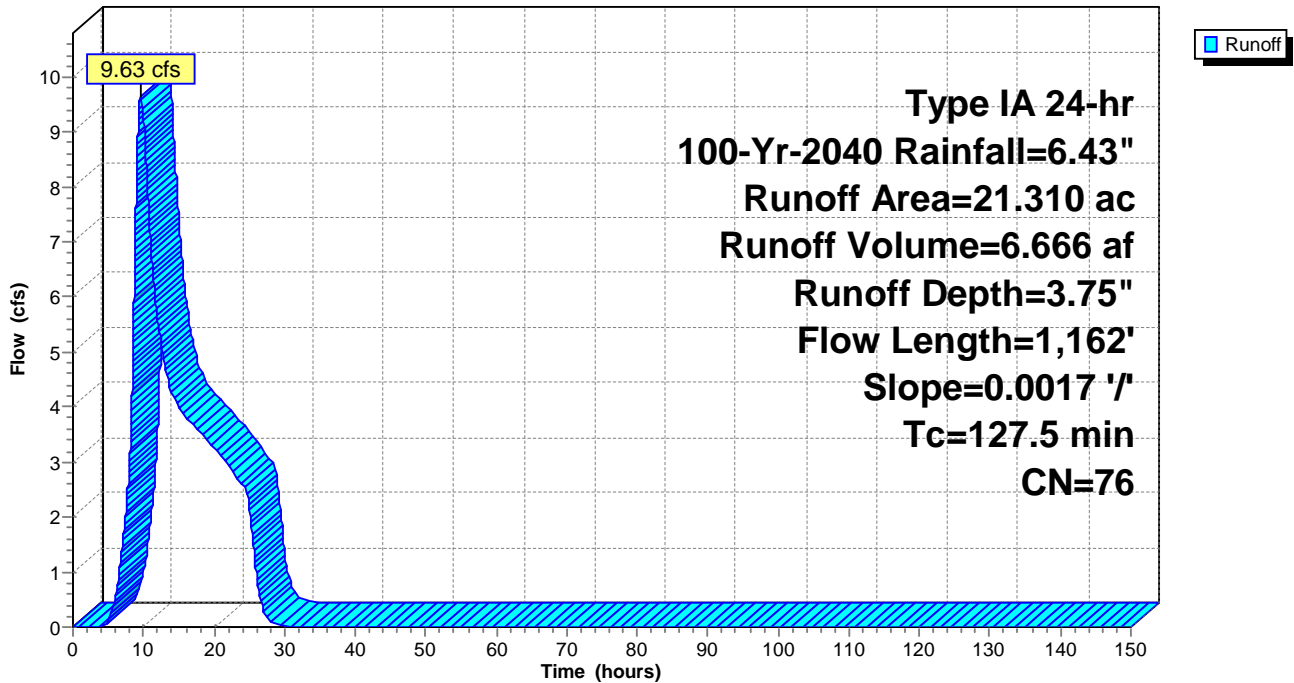
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
8.040	79	Woods/grass comb., Good, HSG D
12.070	73	Brush, Good, HSG D
* 0.970	90	WSDOT - Golf Course
* 0.230	98	Trail
21.310	76	Weighted Average
21.080	76	98.92% Pervious Area
0.230	98	1.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.6	581	0.0017	0.29		Shallow Concentrated Flow, Grass - Shallow Short Grass Pasture Kv= 7.0 fps
93.9	581	0.0017	0.10		Shallow Concentrated Flow, Forested - Shallow Forest w/Heavy Litter Kv= 2.5 fps
127.5	1,162	Total			

Subcatchment 6S: 6S - West Catchment

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 7S: 7S - Southwest

Runoff = 29.27 cfs @ 9.83 hrs, Volume= 20.085 af, Depth= 4.38"

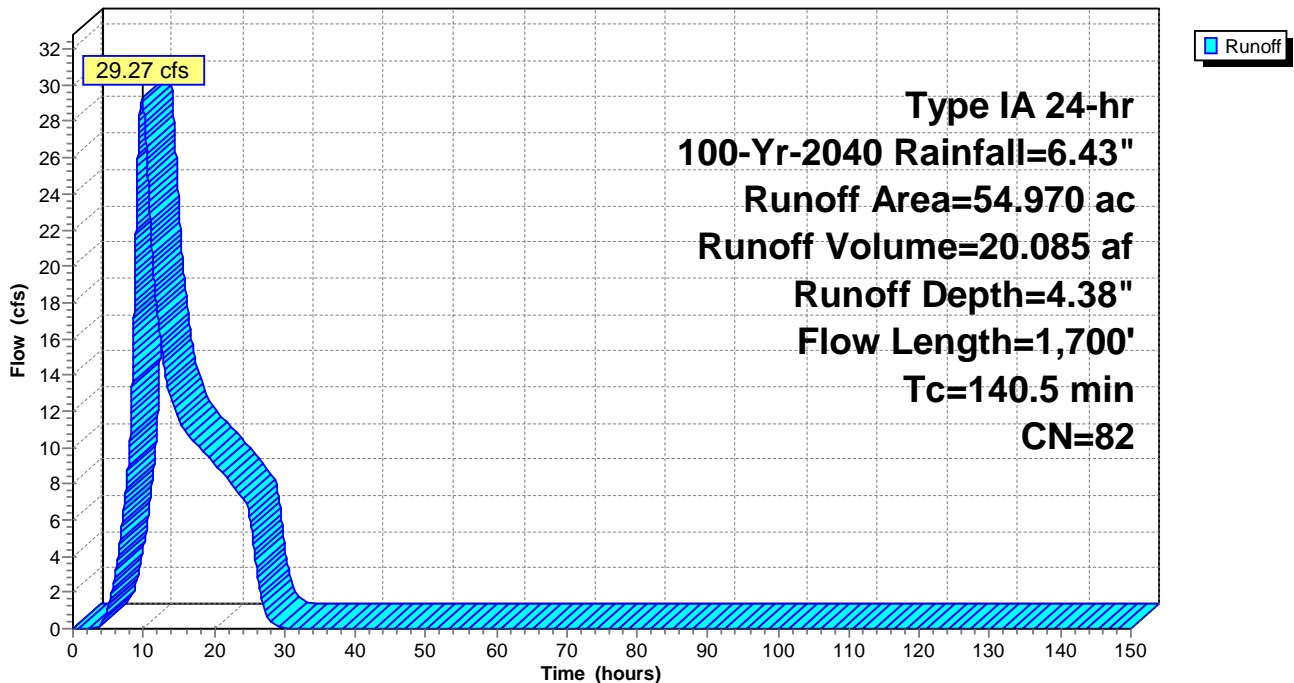
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
8.710	73	Brush, Good, HSG D
25.200	79	Woods/grass comb., Good, HSG D
0.520	98	Paved parking, HSG D
* 0.190	98	Trail
* 20.350	90	WSDOT - Golf Course
54.970	82	Weighted Average
54.260	82	98.71% Pervious Area
0.710	98	1.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	70	0.1000	0.31		Sheet Flow, Sheet - Turf Grass: Short n= 0.150 P2= 3.43"
9.3	775	0.0390	1.38		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
127.5	855	0.0020	0.11		Shallow Concentrated Flow, Shallow - Forest Forest w/Heavy Litter Kv= 2.5 fps
140.5	1,700	Total			

Subcatchment 7S: 7S - Southwest

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 8S: 8S - South Catchment

Runoff = 16.05 cfs @ 8.41 hrs, Volume= 6.721 af, Depth= 4.93"

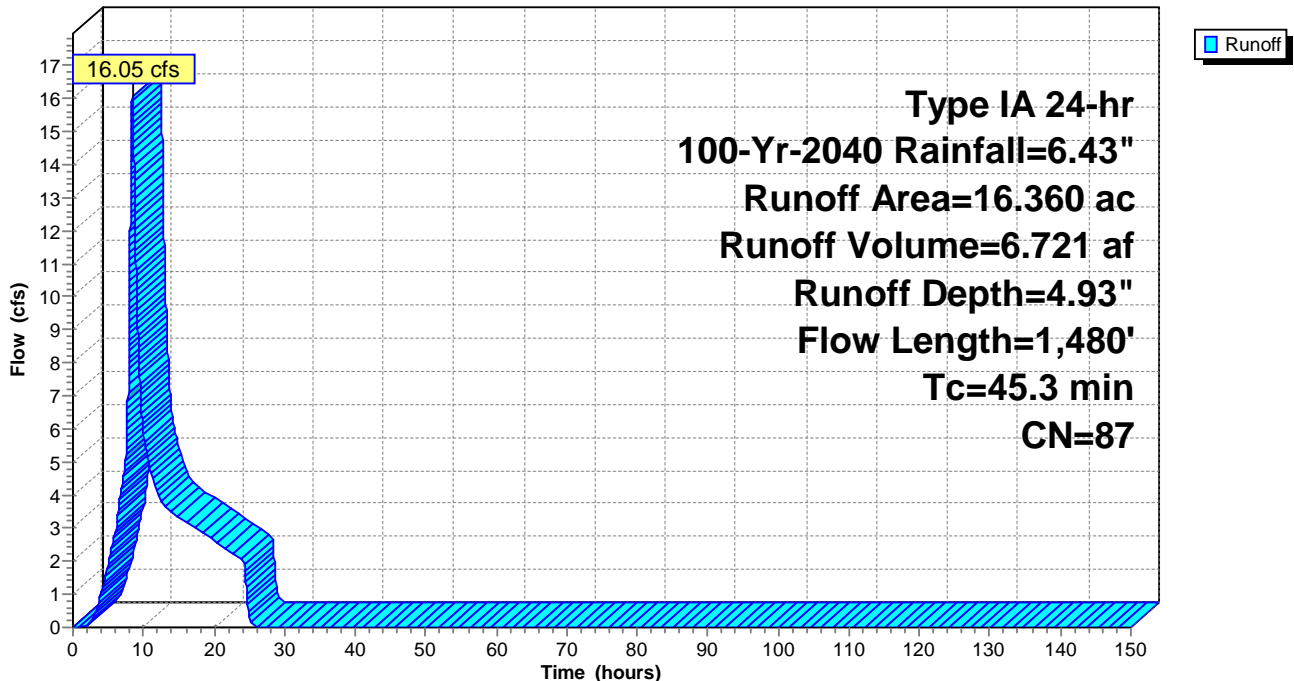
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
1.790	79	Woods/grass comb., Good, HSG D
0.550	30	Brush, Good, HSG A
0.810	98	Paved parking, HSG D
* 13.210	90	WSDOT - Golf Course
16.360	87	Weighted Average
15.550	87	95.05% Pervious Area
0.810	98	4.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	89	0.0560	0.26		Sheet Flow, Sheet- Dune grass Grass: Short n= 0.150 P2= 3.43"
24.0	844	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
15.6	547	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
45.3	1,480	Total			

Subcatchment 8S: 8S - South Catchment

Hydrograph



Proposed Conditions Option 1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 10S: 10S - Large Central / NE

Runoff = 98.03 cfs @ 13.57 hrs, Volume= 112.895 af, Depth= 4.17"

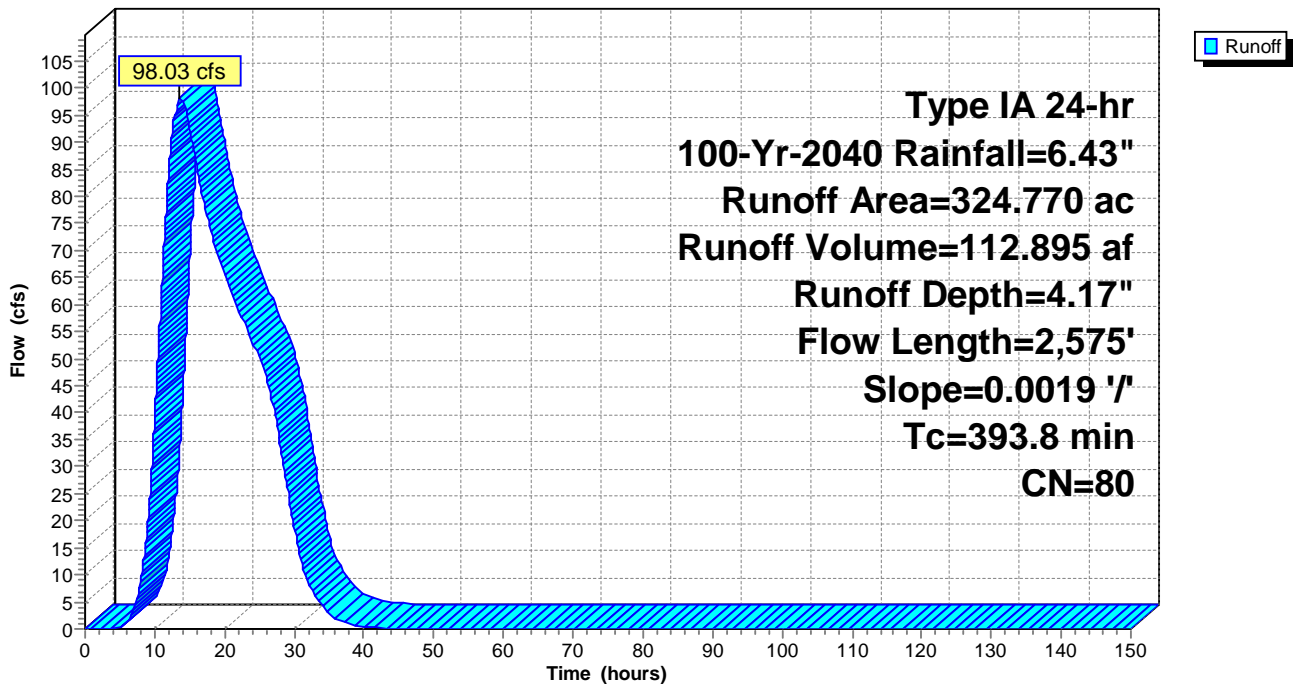
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
198.280	79	Woods/grass comb., Good, HSG D
12.710	32	Woods/grass comb., Good, HSG A
0.660	98	Paved parking, HSG A
5.710	98	Paved parking, HSG D
30.310	73	Brush, Good, HSG D
* 1.800	98	Trail
* 75.300	90	Golf Course
324.770	80	Weighted Average
316.600	79	97.48% Pervious Area
8.170	98	2.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
393.8	2,575	0.0019	0.11		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps

Subcatchment 10S: 10S - Large Central / NE

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Subcatchment 11S: 11S - SE

Runoff = 9.52 cfs @ 8.56 hrs, Volume= 5.186 af, Depth= 2.67"

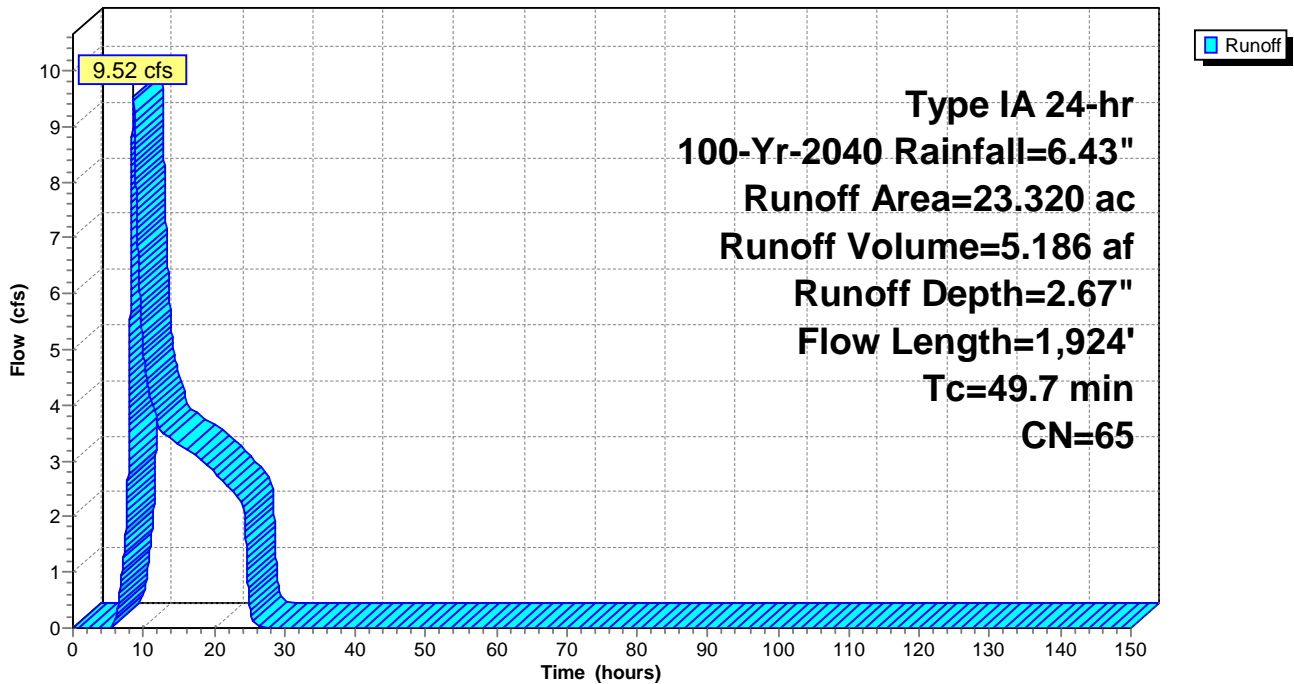
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

Area (ac)	CN	Description
2.090	32	Woods/grass comb., Good, HSG A
* 21.230	68	WSDOT - Golf Course
23.320	65	Weighted Average
23.320	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	126	0.1800	0.30		Sheet Flow, Sheet-Dune Grass
					Grass: Dense n= 0.240 P2= 3.43"
42.8	1,798	0.0100	0.70		Shallow Concentrated Flow, Shallow - Grass
					Short Grass Pasture Kv= 7.0 fps
49.7	1,924	Total			

Subcatchment 11S: 11S - SE

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Reach 8R: South Ditch

[91] Warning: Storage range exceeded by 1.30'

[55] Hint: Peak inflow is 546% of Manning's capacity

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 1.69'

Inflow Area =	16.360 ac,	4.95% Impervious,	Inflow Depth =	4.93"	for 100-Yr-2040 event
Inflow =	16.05 cfs @	8.41 hrs,	Volume=	6.721 af	
Outflow =	15.76 cfs @	8.58 hrs,	Volume=	6.721 af,	Atten= 2%, Lag= 10.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs

Max. Velocity= 1.80 fps, Min. Travel Time= 5.4 min

Avg. Velocity = 0.79 fps, Avg. Travel Time= 12.3 min

Peak Storage= 5,069 cf @ 8.49 hrs

Average Depth at Peak Storage= 1.80', Surface Width= 7.60'

Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 2.94 cfs

4.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 1.0 '/' Top Width= 5.00'

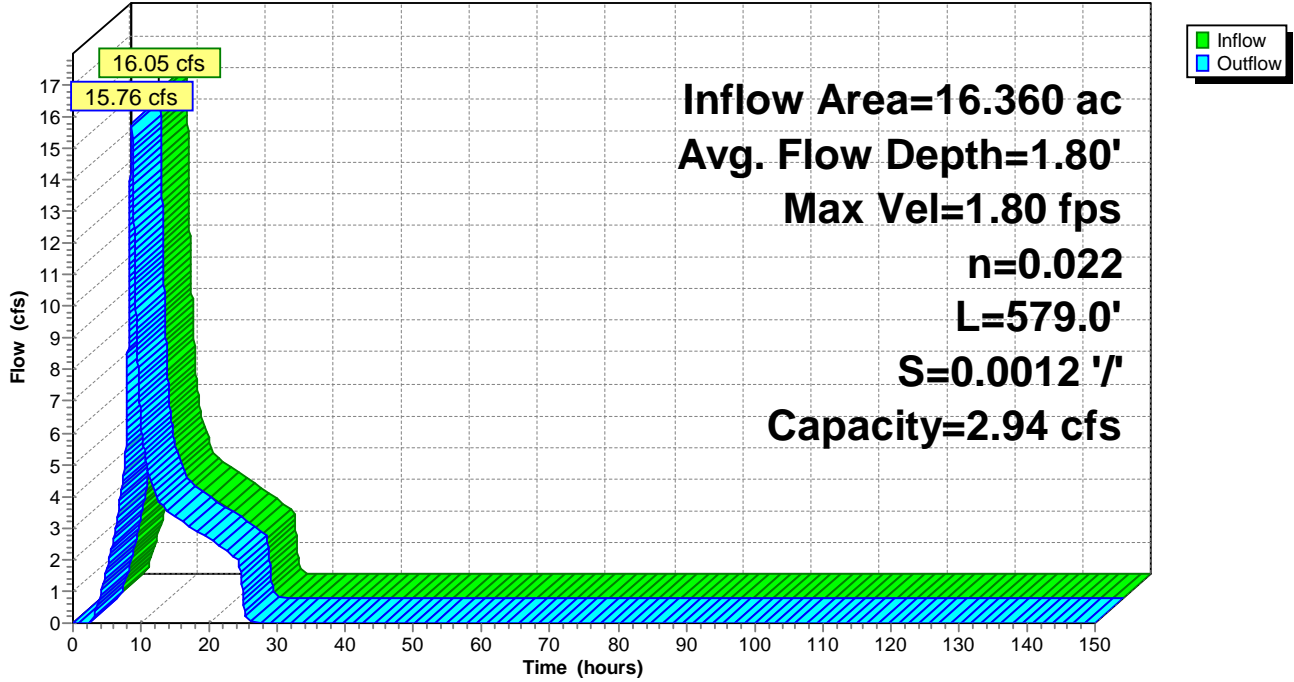
Length= 579.0' Slope= 0.0012 '/'

Inlet Invert= 16.00', Outlet Invert= 15.30'



Reach 8R: South Ditch

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Pond 1P: 1P- NW Pond

Inflow Area = 7.320 ac, 19.67% Impervious, Inflow Depth = 4.60" for 100-Yr-2040 event
 Inflow = 8.78 cfs @ 7.90 hrs, Volume= 2.806 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 12.95' @ 24.29 hrs Surf.Area= 1.546 ac Storage= 2.806 af

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

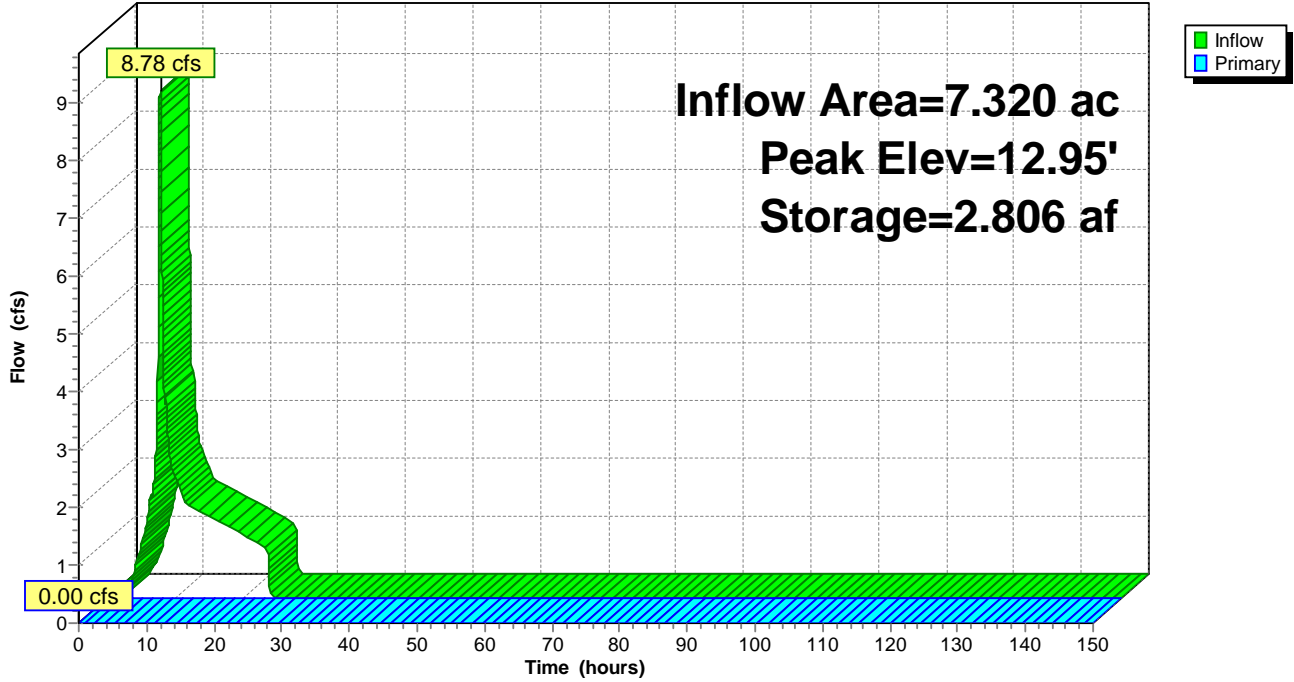
Volume	Invert	Avail.Storage	Storage Description			
#1	11.00'	6.173 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
11.00	1.290	1,552.0	0.000	0.000	1.290	
12.00	1.460	1,164.0	1.374	1.374	3.215	
13.00	1.550	1,193.0	1.505	2.879	3.343	
14.00	1.640	1,231.0	1.595	4.474	3.514	
15.00	1.760	1,333.0	1.700	6.173	3.992	

Device	Routing	Invert	Outlet Devices											
#1	Primary	14.99'	1,333.0' long x 4.0' breadth Broad-Crested Rectangular Weir											
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00											
			2.50 3.00 3.50 4.00 4.50 5.00 5.50											
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68											
			2.72 2.73 2.76 2.79 2.88 3.07 3.32											

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: 1P- NW Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Pond 5P: 5P - West Pond

[81] Warning: Exceeded Pond 7P by 0.70' @ 7.36 hrs

Inflow Area = 106.390 ac, 0.87% Impervious, Inflow Depth = 3.96" for 100-Yr-2040 event
 Inflow = 44.72 cfs @ 8.08 hrs, Volume= 35.088 af
 Outflow = 34.79 cfs @ 8.47 hrs, Volume= 33.251 af, Atten= 22%, Lag= 23.3 min
 Primary = 34.79 cfs @ 8.47 hrs, Volume= 33.251 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.01' @ 8.47 hrs Surf.Area= 181.504 ac Storage= 2.690 af

Plug-Flow detention time= 75.2 min calculated for 33.249 af (95% of inflow)
 Center-of-Mass det. time= 40.9 min (913.7 - 872.8)

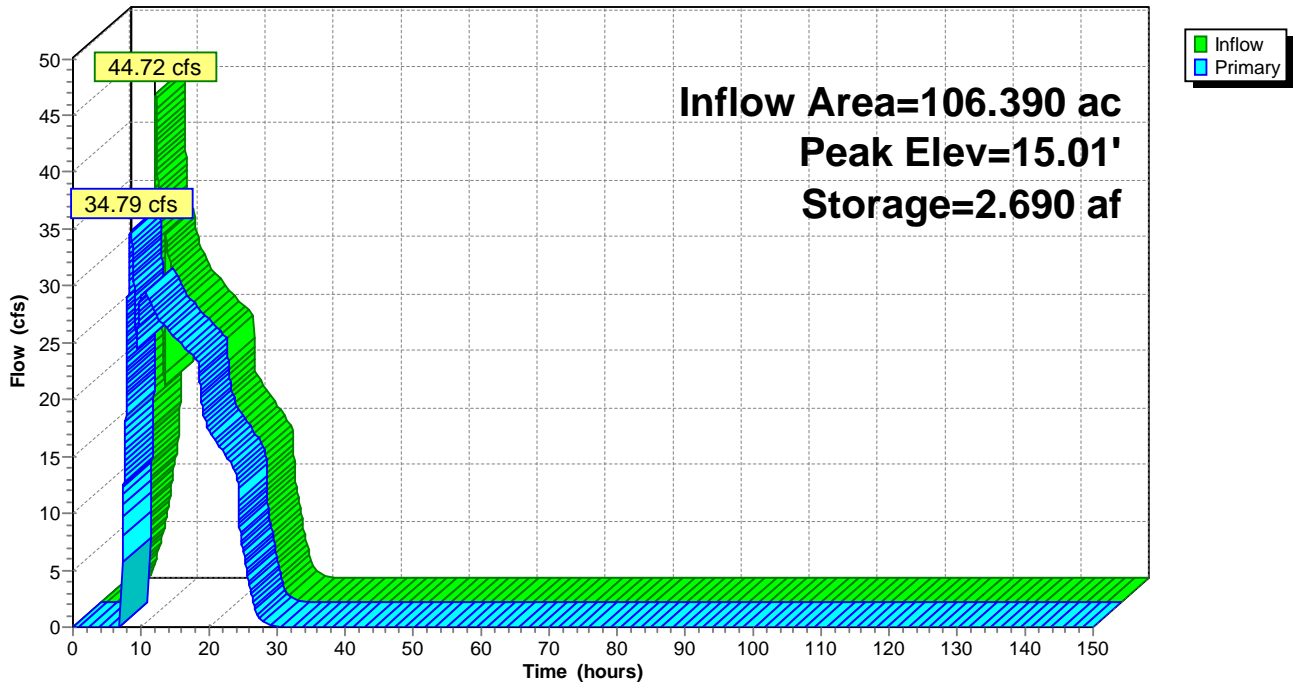
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	340.699 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	1.160	3,026.0	0.000	0.000	1.160	
15.00	2.670	3,968.0	1.863	1.863	13.196	
15.10	9,999.000	9,999.0	338.835	340.699	167.081	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	3,968.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=34.79 cfs @ 8.47 hrs HW=15.01' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 34.79 cfs @ 0.40 fps)

Pond 5P: 5P - West Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Pond 6P: 6P- West Pond

[81] Warning: Exceeded Pond 5P by 0.03' @ 25.95 hrs

Inflow Area = 127.700 ac, 0.91% Impervious, Inflow Depth = 3.75" for 100-Yr-2040 event
 Inflow = 40.14 cfs @ 8.57 hrs, Volume= 39.918 af
 Outflow = 25.65 cfs @ 18.59 hrs, Volume= 36.135 af, Atten= 36%, Lag= 600.9 min
 Primary = 25.65 cfs @ 18.59 hrs, Volume= 36.135 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.03' @ 18.59 hrs Surf.Area= 755.596 ac Storage= 10.907 af

Plug-Flow detention time= 278.4 min calculated for 36.132 af (91% of inflow)
 Center-of-Mass det. time= 221.2 min (1,130.6 - 909.4)

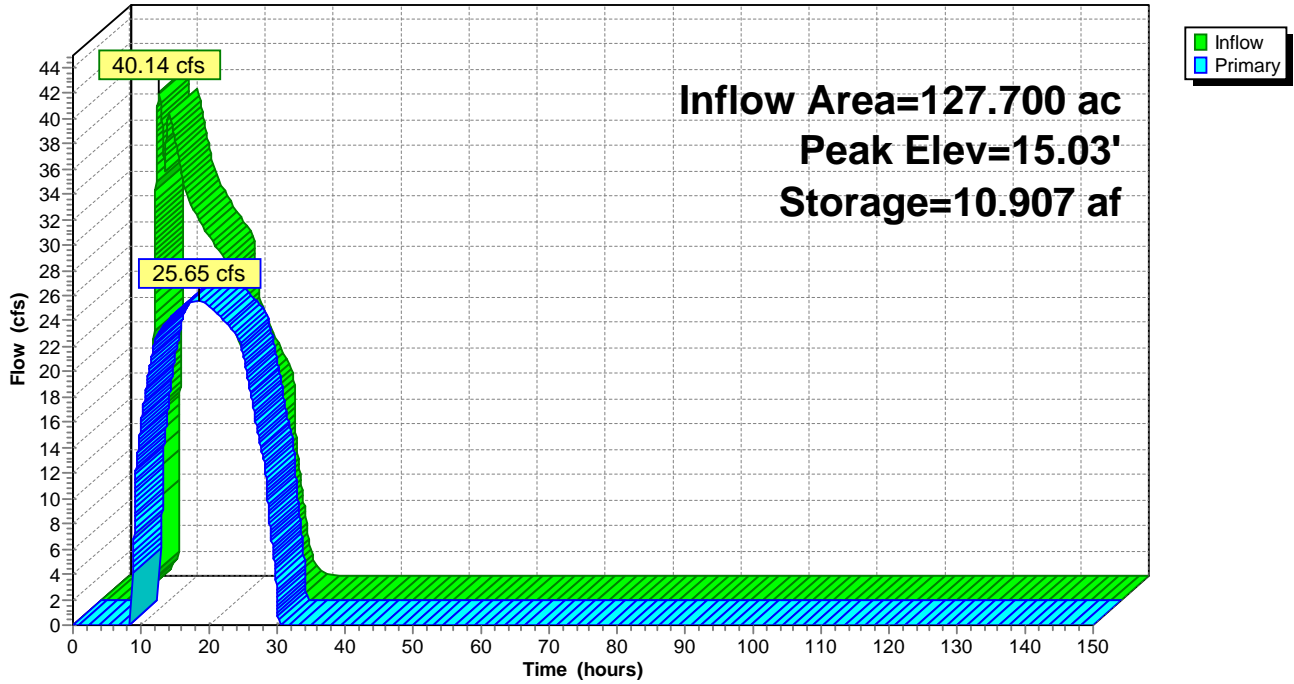
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	344.602 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.930	3,856.0	0.000	0.000	2.930	
15.00	4.810	4,175.0	3.831	3.831	7.611	
15.10	9,999.000	9,999.0	340.771	344.602	158.416	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	1,400.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=25.48 cfs @ 18.59 hrs HW=15.03' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Weir Controls 25.48 cfs @ 0.51 fps)

Pond 6P: 6P- West Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Pond 7P: 7P-Southwest

Inflow Area = 54.970 ac, 1.29% Impervious, Inflow Depth = 4.38" for 100-Yr-2040 event
 Inflow = 29.27 cfs @ 9.83 hrs, Volume= 20.085 af
 Outflow = 15.99 cfs @ 12.38 hrs, Volume= 16.741 af, Atten= 45%, Lag= 152.8 min
 Primary = 15.99 cfs @ 12.38 hrs, Volume= 16.741 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 12.38 hrs Surf.Area= 54.831 ac Storage= 3.402 af

Plug-Flow detention time= 222.7 min calculated for 16.740 af (83% of inflow)
 Center-of-Mass det. time= 115.7 min (986.6 - 870.9)

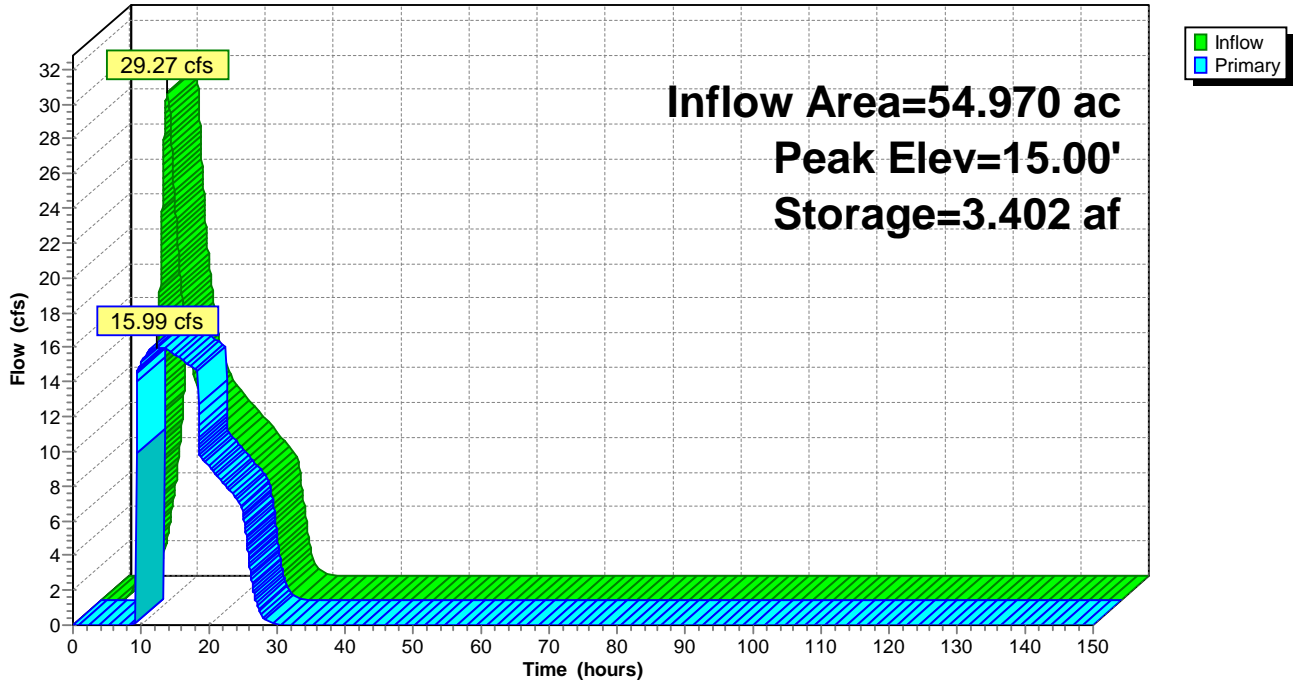
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	37.446 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.340	3,959.0	0.000	0.000	2.340	
15.00	4.560	5,430.0	3.389	3.389	27.571	
15.01	9,999.000	9,999.0	34.057	37.446	156.355	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	5,430.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=15.74 cfs @ 12.38 hrs HW=15.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 15.74 cfs @ 0.28 fps)

Pond 7P: 7P-Southwest

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Pond 8P: 8P

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 4.93" for 100-Yr-2040 event
 Inflow = 16.05 cfs @ 8.41 hrs, Volume= 6.721 af
 Outflow = 16.05 cfs @ 8.41 hrs, Volume= 6.721 af, Atten= 0%, Lag= 0.0 min
 Primary = 16.05 cfs @ 8.41 hrs, Volume= 6.721 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Peak Elev= 18.15' @ 8.41 hrs
 Flood Elev= 19.00'

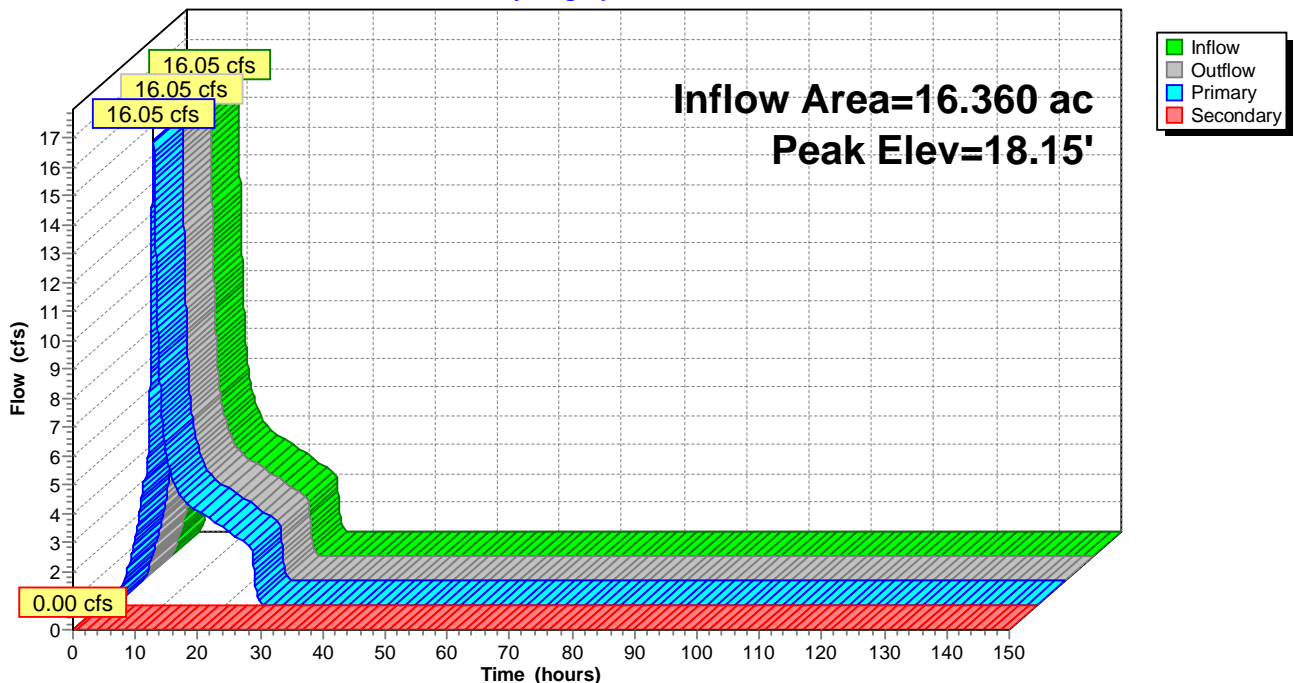
Device	Routing	Invert	Outlet Devices
#1	Primary	16.11'	36.0" Round Culvert L= 93.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.11' / 15.29' S= 0.0088 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	19.00'	100.0' long x 24.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=16.05 cfs @ 8.41 hrs HW=18.15' (Free Discharge)
 ↑1=Culvert (Barrel Controls 16.05 cfs @ 4.43 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.11' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 8P: 8P

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2040 Rainfall=6.43"

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Summary for Pond 10P: 10P-Large Central/NE

[93] Warning: Storage range exceeded by 0.02'

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 524.490 ac, 2.24% Impervious, Inflow Depth = 3.92" for 100-Yr-2040 event
 Inflow = 135.46 cfs @ 13.57 hrs, Volume= 171.215 af
 Outflow = 155.15 cfs @ 18.79 hrs, Volume= 108.776 af, Atten= 0%, Lag= 313.3 min
 Secondary = 155.15 cfs @ 18.79 hrs, Volume= 108.776 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 13.02' @ 18.79 hrs Surf.Area= 119.000 ac Storage= 98.335 af

Plug-Flow detention time= 568.6 min calculated for 108.769 af (64% of inflow)
 Center-of-Mass det. time= 342.1 min (1,424.7 - 1,082.7)

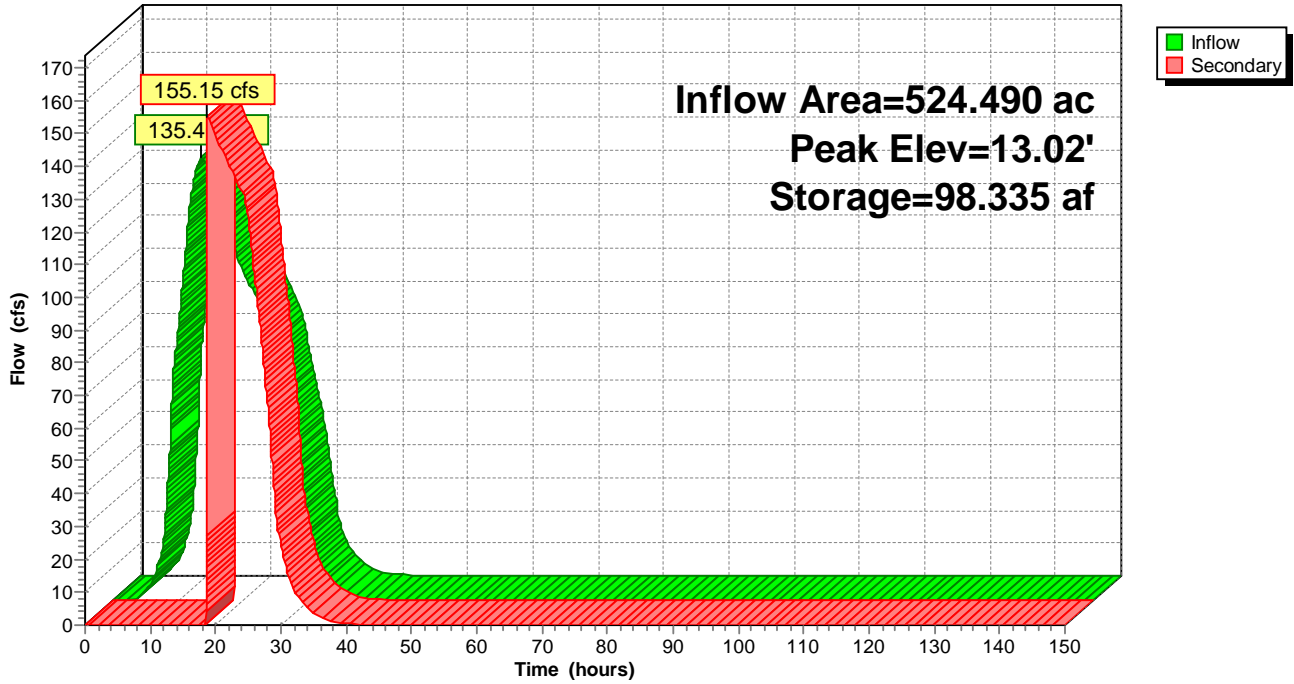
Volume	Invert	Avail.Storage	Storage Description			
#1	10.00'	98.335 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.00	0.280	2,536.0	0.000	0.000	0.280	
11.00	6.414	16,985.0	2.678	2.678	515.559	
12.00	38.875	11,909.0	20.360	23.038	783.495	
13.00	119.000	22,186.0	75.297	98.335	1,423.612	

Device	Routing	Invert	Outlet Devices						
#1	Secondary	12.99'	9,999.0' long x 0.5' breadth Broad-Crested Rectangular Weir						
			Head (feet) 0.20 0.40 0.60 0.80 1.00						
			Coef. (English) 2.80 2.92 3.08 3.30 3.32						

Secondary OutFlow Max=141.59 cfs @ 18.79 hrs HW=13.02' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Weir Controls 141.59 cfs @ 0.48 fps)

Pond 10P: 10P-Large Central/NE

Hydrograph



Proposed Conditions Option 1

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Time span=0.00-150.00 hrs, dt=0.01 hrs, 15001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S-NW Catchment Runoff Area=7.320 ac 19.67% Impervious Runoff Depth=5.44"
Flow Length=292' Slope=0.0200 '/ Tc=4.9 min CN=84 Runoff=10.44 cfs 3.321 af

Subcatchment 2S: 2S-NW Catchment 2 Runoff Area=41.380 ac 2.39% Impervious Runoff Depth=5.79"
Flow Length=2,271' Tc=122.9 min CN=87 Runoff=31.71 cfs 19.963 af

Subcatchment 4S: 4S - West Catchment Runoff Area=26.590 ac 0.83% Impervious Runoff Depth=5.22"
Flow Length=998' Tc=38.6 min CN=82 Runoff=28.75 cfs 11.559 af

Subcatchment 5S: 5S - West Catchment Runoff Area=24.830 ac 0.00% Impervious Runoff Depth=4.99"
Flow Length=660' Tc=11.1 min CN=80 Runoff=31.60 cfs 10.326 af

Subcatchment 6S: 6S - West Catchment Runoff Area=21.310 ac 1.08% Impervious Runoff Depth=4.54"
Flow Length=1,162' Slope=0.0017 '/ Tc=127.5 min CN=76 Runoff=11.90 cfs 8.068 af

Subcatchment 7S: 7S - Southwest Runoff Area=54.970 ac 1.29% Impervious Runoff Depth=5.22"
Flow Length=1,700' Tc=140.5 min CN=82 Runoff=35.18 cfs 23.897 af

Subcatchment 8S: 8S - South Catchment Runoff Area=16.360 ac 4.95% Impervious Runoff Depth=5.79"
Flow Length=1,480' Tc=45.3 min CN=87 Runoff=18.90 cfs 7.892 af

Subcatchment 10S: 10S - Large Central / NE Runoff Area=324.770 ac 2.52% Impervious Runoff Depth=4.99"
Flow Length=2,575' Slope=0.0019 '/ Tc=393.8 min CN=80 Runoff=118.77 cfs 135.066 af

Subcatchment 11S: 11S - SE Runoff Area=23.320 ac 0.00% Impervious Runoff Depth=3.35"
Flow Length=1,924' Tc=49.7 min CN=65 Runoff=12.60 cfs 6.514 af

Reach 8R: South Ditch Avg. Flow Depth=2.09' Max Vel=1.82 fps Inflow=18.90 cfs 7.892 af
n=0.022 L=579.0' S=0.0012 '/ Capacity=2.94 cfs Outflow=18.56 cfs 7.892 af

Pond 1P: 1P- NW Pond Peak Elev=13.28' Storage=3.321 af Inflow=10.44 cfs 3.321 af
Outflow=0.00 cfs 0.000 af

Pond 5P: 5P - West Pond Peak Elev=15.01' Storage=2.902 af Inflow=54.00 cfs 42.439 af
Outflow=37.65 cfs 40.602 af

Pond 6P: 6P- West Pond Peak Elev=15.03' Storage=13.261 af Inflow=48.50 cfs 48.671 af
Outflow=28.77 cfs 44.887 af

Pond 7P: 7P-Southwest Peak Elev=15.00' Storage=3.440 af Inflow=35.18 cfs 23.897 af
Outflow=17.09 cfs 20.553 af

Pond 8P: 8P Peak Elev=18.36' Inflow=18.90 cfs 7.892 af
Primary=18.90 cfs 7.892 af Secondary=0.00 cfs 0.000 af Outflow=18.90 cfs 7.892 af

Pond 10P: 10P-Large Central/NE Peak Elev=13.03' Storage=98.335 af Inflow=161.30 cfs 206.430 af
Outflow=205.47 cfs 170.180 af

Proposed_Conditions_Option_1

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Total Runoff Area = 540.850 ac Runoff Volume = 226.608 af Average Runoff Depth = 5.03"
97.68% Pervious = 528.280 ac 2.32% Impervious = 12.570 ac

Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 1S: 1S-NW Catchment

Runoff = 10.44 cfs @ 7.89 hrs, Volume= 3.321 af, Depth= 5.44"

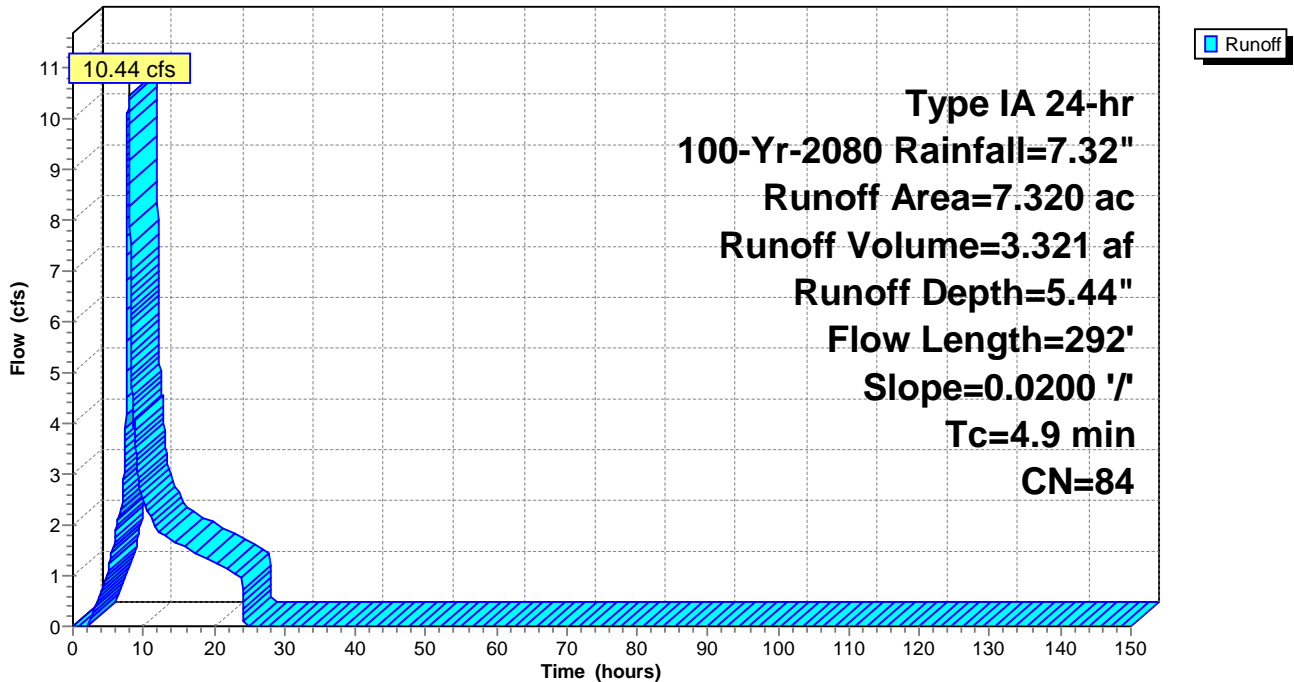
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
3.470	73	Brush, Good, HSG D
1.210	98	Paved parking, HSG D
* 2.410	90	WSDOT - Golf Course
* 0.230	98	Trail
7.320	84	Weighted Average
5.880	80	80.33% Pervious Area
1.440	98	19.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	292	0.0200	0.99		Shallow Concentrated Flow, Shallow - Golf Course Short Grass Pasture Kv= 7.0 fps

Subcatchment 1S: 1S-NW Catchment

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 2S: 2S-NW Catchment 2

Sheet flow - dense comes from "native grasses" considered dense. Characterized by the wetland report.

Runoff = 31.71 cfs @ 9.43 hrs, Volume= 19.963 af, Depth= 5.79"

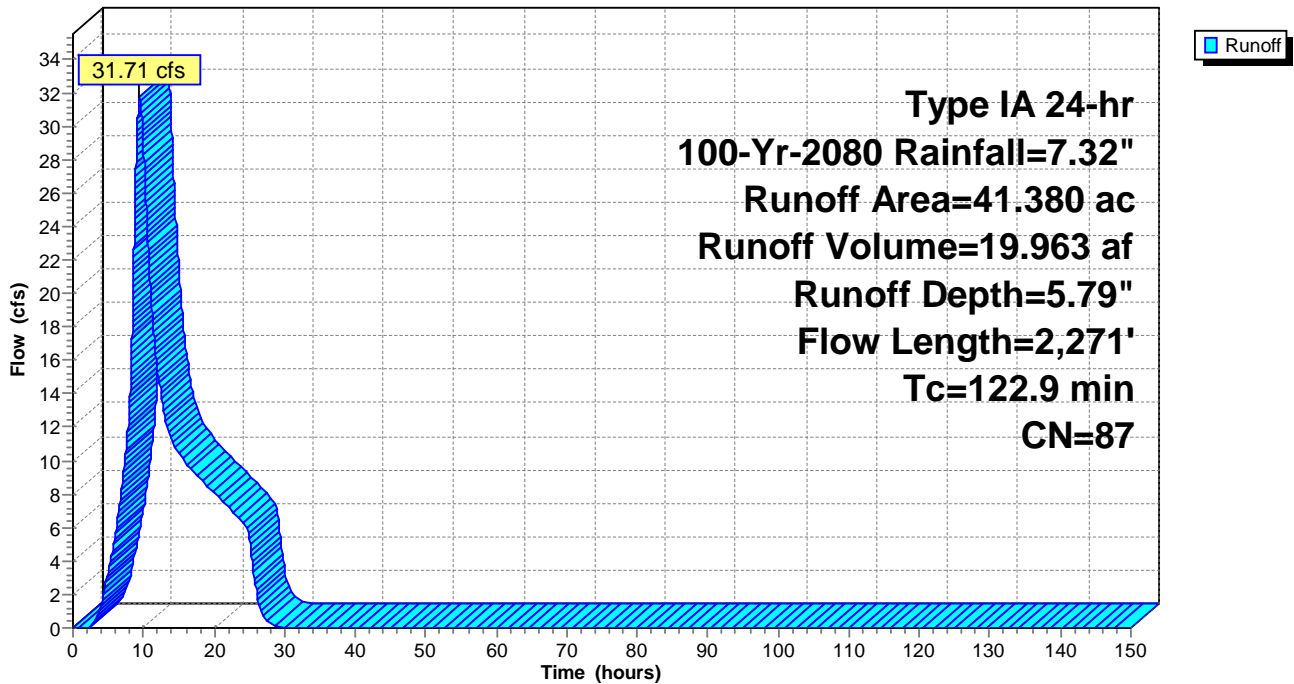
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
8.350	73	Brush, Good, HSG D
0.830	98	Paved parking, HSG D
* 0.160	98	Trail
* 31.710	90	WSDOT - Golf Course
0.330	79	Woods/grass comb., Good, HSG D
41.380	87	Weighted Average
40.390	86	97.61% Pervious Area
0.990	98	2.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	95	0.0950	0.22		Sheet Flow, Sheet - Dense, Native Grasses
					Grass: Dense n= 0.240 P2= 3.43"
115.8	2,176	0.0020	0.31		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
122.9	2,271	Total			

Subcatchment 2S: 2S-NW Catchment 2

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 4S: 4S - West Catchment

Runoff = 28.75 cfs @ 8.32 hrs, Volume= 11.559 af, Depth= 5.22"

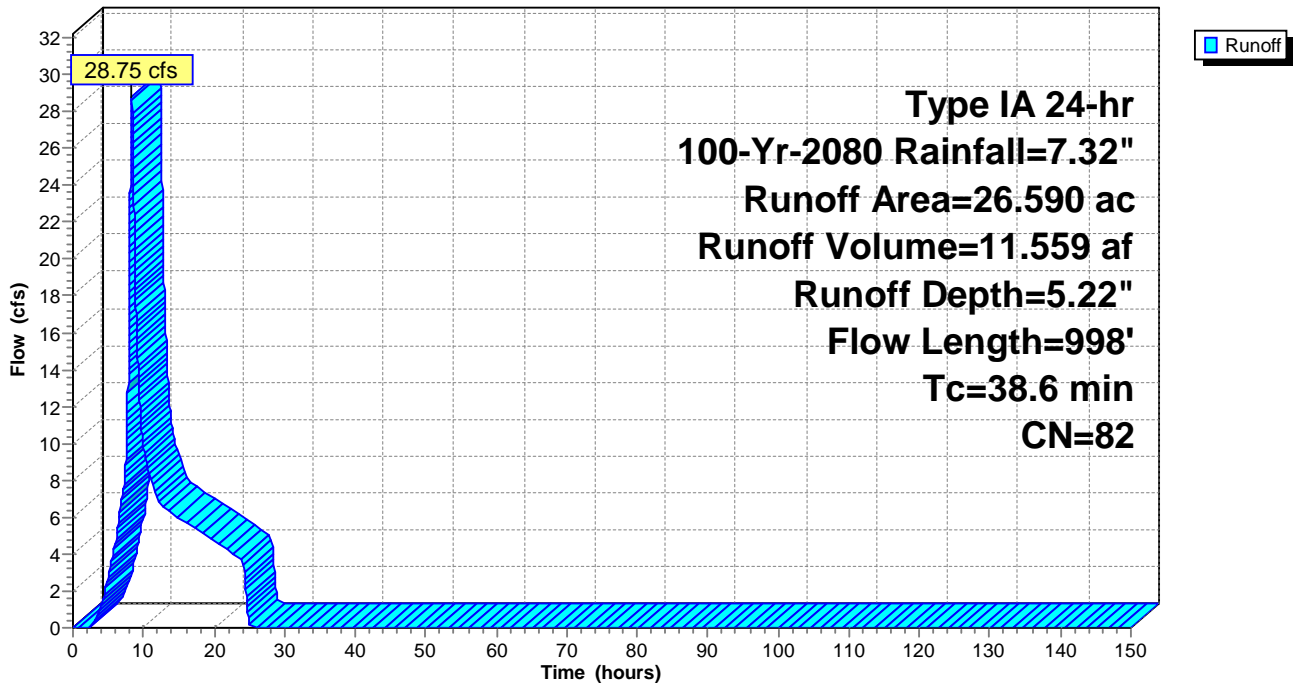
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
13.100	73	Brush, Good, HSG D
* 0.220	98	Trail
* 13.270	90	WSDOT - Golf Course
26.590	82	Weighted Average
26.370	82	99.17% Pervious Area
0.220	98	0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	135	0.0800	1.98		Shallow Concentrated Flow, Shallow - Forest
37.5	863	0.0030	0.38		Short Grass Pasture Kv= 7.0 fps Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
38.6	998	Total			

Subcatchment 4S: 4S - West Catchment

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 5S: 5S - West Catchment

Runoff = 31.60 cfs @ 8.00 hrs, Volume= 10.326 af, Depth= 4.99"

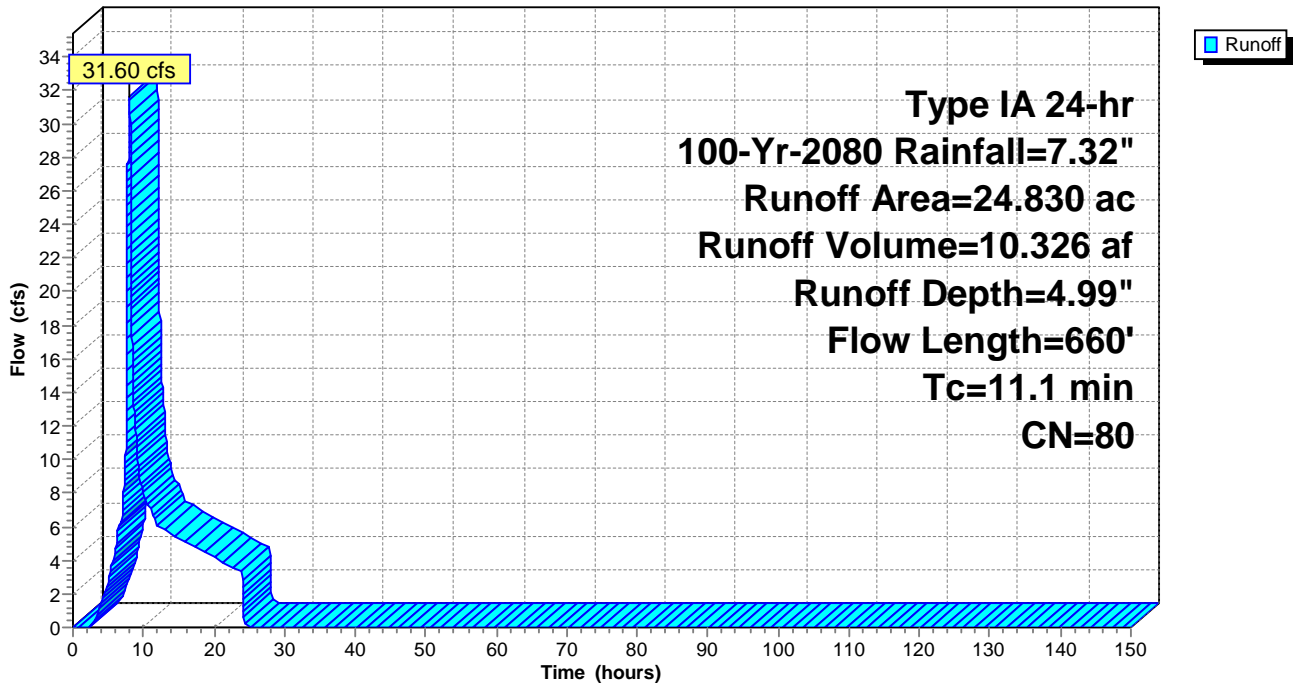
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
13.850	73	Brush, Good, HSG D
0.500	79	Woods/grass comb., Good, HSG D
* 10.480	90	WSDOT - Golf Course
24.830	80	Weighted Average
24.830	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	608	0.0180	0.94		Shallow Concentrated Flow, Shallow - Grass
					Short Grass Pasture Kv= 7.0 fps
0.3	52	0.1300	2.64		Sheet Flow, Path
					Smooth surfaces n= 0.011 P2= 3.43"
11.1	660	Total			

Subcatchment 5S: 5S - West Catchment

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 6S: 6S - West Catchment

Runoff = 11.90 cfs @ 9.63 hrs, Volume= 8.068 af, Depth= 4.54"

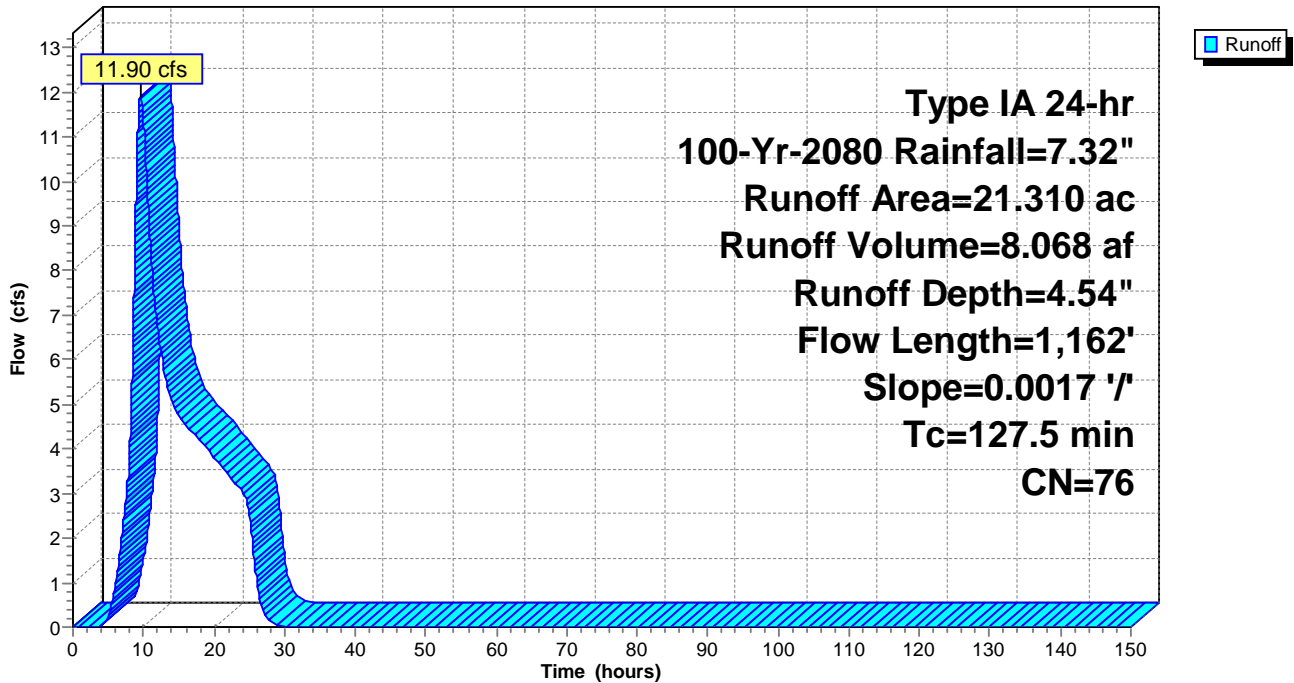
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
8.040	79	Woods/grass comb., Good, HSG D
12.070	73	Brush, Good, HSG D
* 0.970	90	WSDOT - Golf Course
* 0.230	98	Trail
21.310	76	Weighted Average
21.080	76	98.92% Pervious Area
0.230	98	1.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.6	581	0.0017	0.29		Shallow Concentrated Flow, Grass - Shallow
					Short Grass Pasture Kv= 7.0 fps
93.9	581	0.0017	0.10		Shallow Concentrated Flow, Forested - Shallow
					Forest w/Heavy Litter Kv= 2.5 fps
127.5	1,162	Total			

Subcatchment 6S: 6S - West Catchment

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 7S: 7S - Southwest

Runoff = 35.18 cfs @ 9.83 hrs, Volume= 23.897 af, Depth= 5.22"

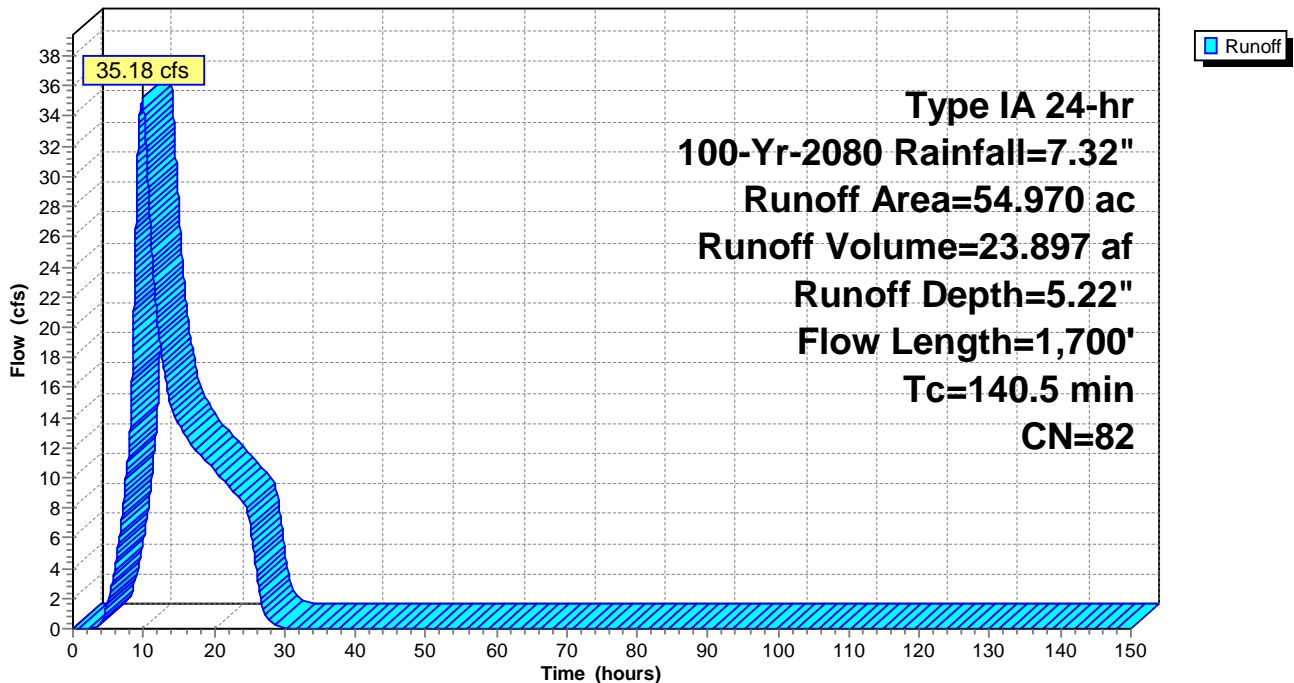
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
8.710	73	Brush, Good, HSG D
25.200	79	Woods/grass comb., Good, HSG D
0.520	98	Paved parking, HSG D
* 0.190	98	Trail
* 20.350	90	WSDOT - Golf Course
54.970	82	Weighted Average
54.260	82	98.71% Pervious Area
0.710	98	1.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	70	0.1000	0.31		Sheet Flow, Sheet - Turf Grass: Short n= 0.150 P2= 3.43"
9.3	775	0.0390	1.38		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
127.5	855	0.0020	0.11		Shallow Concentrated Flow, Shallow - Forest Forest w/Heavy Litter Kv= 2.5 fps
140.5	1,700	Total			

Subcatchment 7S: 7S - Southwest

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 8S: 8S - South Catchment

Runoff = 18.90 cfs @ 8.40 hrs, Volume= 7.892 af, Depth= 5.79"

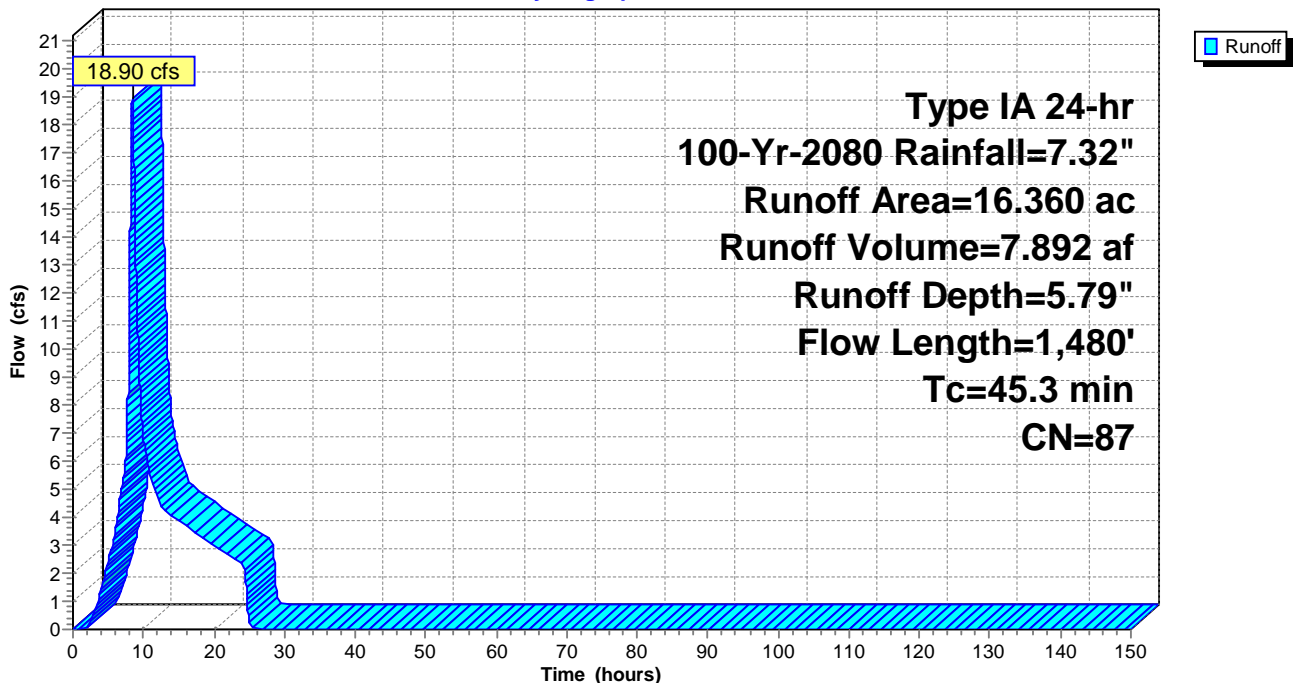
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
1.790	79	Woods/grass comb., Good, HSG D
0.550	30	Brush, Good, HSG A
0.810	98	Paved parking, HSG D
* 13.210	90	WSDOT - Golf Course
16.360	87	Weighted Average
15.550	87	95.05% Pervious Area
0.810	98	4.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	89	0.0560	0.26		Sheet Flow, Sheet- Dune grass Grass: Short n= 0.150 P2= 3.43"
24.0	844	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
15.6	547	0.0070	0.59		Shallow Concentrated Flow, Shallow - Grassed Short Grass Pasture Kv= 7.0 fps
45.3	1,480	Total			

Subcatchment 8S: 8S - South Catchment

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 10S: 10S - Large Central / NE

Runoff = 118.77 cfs @ 13.57 hrs, Volume= 135.066 af, Depth= 4.99"

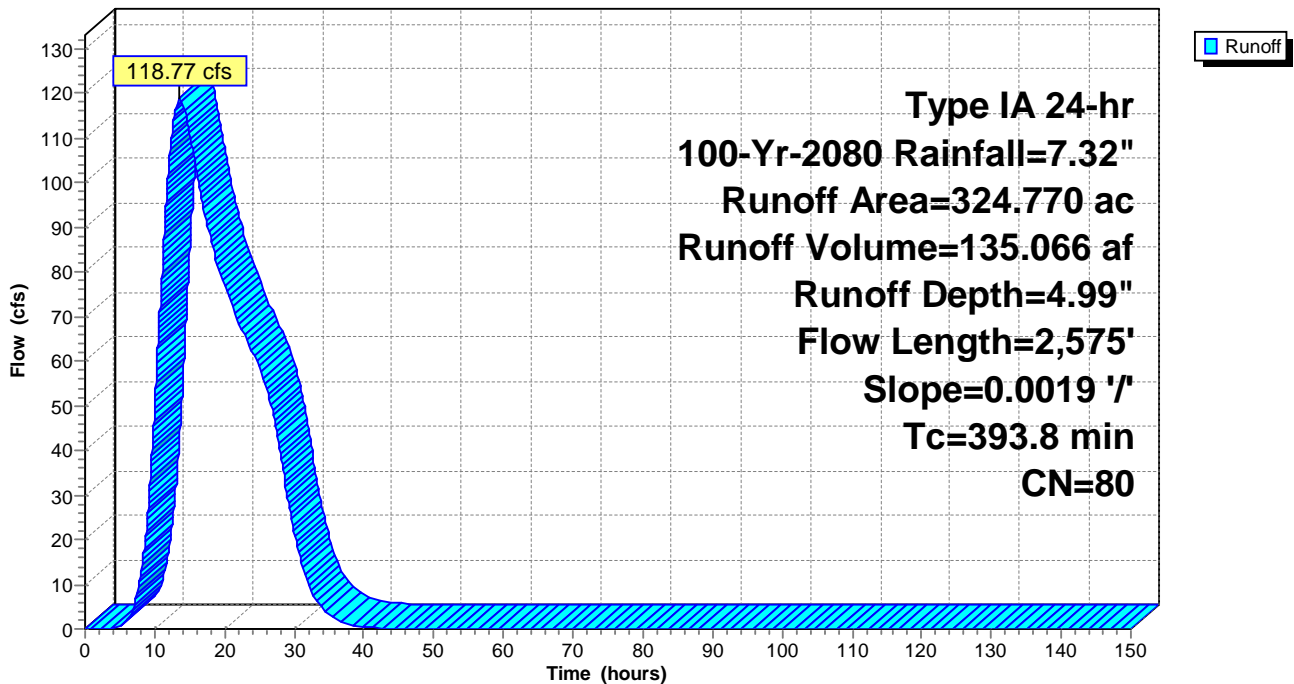
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
198.280	79	Woods/grass comb., Good, HSG D
12.710	32	Woods/grass comb., Good, HSG A
0.660	98	Paved parking, HSG A
5.710	98	Paved parking, HSG D
30.310	73	Brush, Good, HSG D
* 1.800	98	Trail
* 75.300	90	Golf Course
324.770	80	Weighted Average
316.600	79	97.48% Pervious Area
8.170	98	2.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
393.8	2,575	0.0019	0.11		Shallow Concentrated Flow, Shallow - Forested Forest w/Heavy Litter Kv= 2.5 fps

Subcatchment 10S: 10S - Large Central / NE

Hydrograph



Proposed Conditions Option_1

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Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Subcatchment 11S: 11S - SE

Runoff = 12.60 cfs @ 8.51 hrs, Volume= 6.514 af, Depth= 3.35"

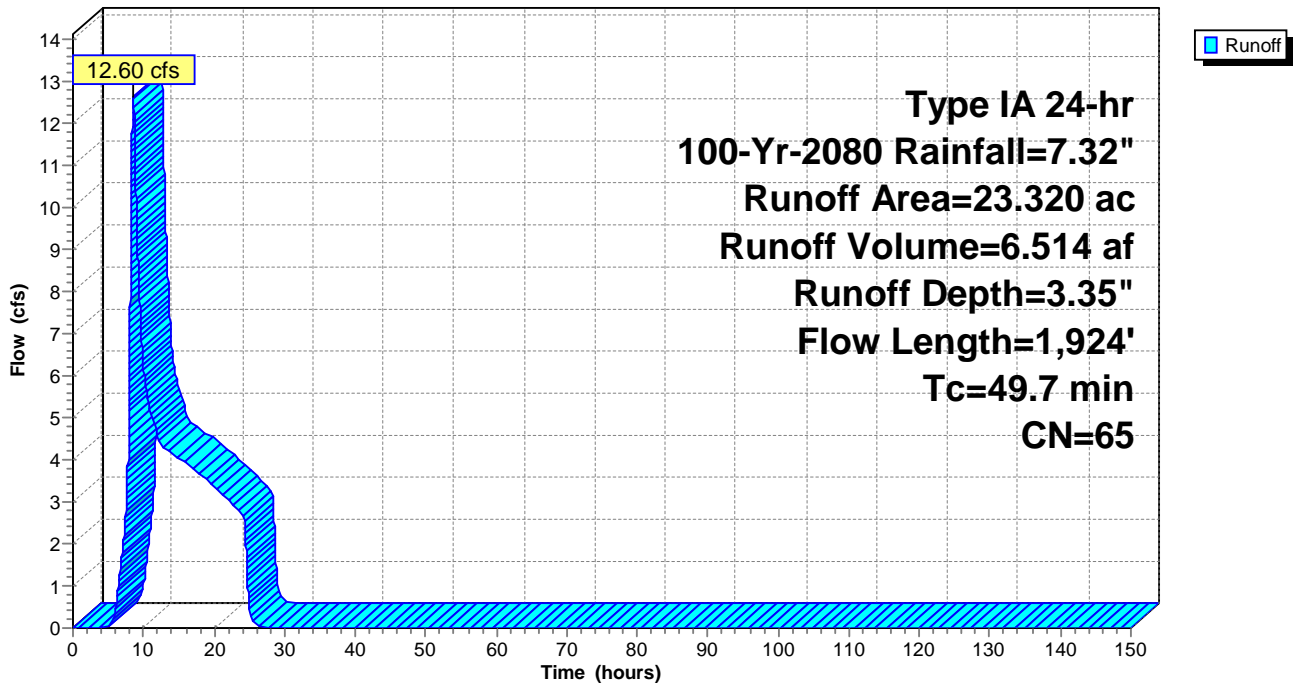
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

Area (ac)	CN	Description
2.090	32	Woods/grass comb., Good, HSG A
* 21.230	68	WSDOT - Golf Course
23.320	65	Weighted Average
23.320	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	126	0.1800	0.30		Sheet Flow, Sheet-Dune Grass Grass: Dense n= 0.240 P2= 3.43"
42.8	1,798	0.0100	0.70		Shallow Concentrated Flow, Shallow - Grass Short Grass Pasture Kv= 7.0 fps
49.7	1,924	Total			

Subcatchment 11S: 11S - SE

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Reach 8R: South Ditch

[91] Warning: Storage range exceeded by 1.59'

[55] Hint: Peak inflow is 642% of Manning's capacity

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 1.98'

Inflow Area =	16.360 ac,	4.95% Impervious,	Inflow Depth =	5.79"	for 100-Yr-2080 event
Inflow =	18.90 cfs @	8.40 hrs,	Volume=	7.892 af	
Outflow =	18.56 cfs @	8.57 hrs,	Volume=	7.892 af,	Atten= 2%, Lag= 10.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs

Max. Velocity= 1.82 fps, Min. Travel Time= 5.3 min

Avg. Velocity = 0.82 fps, Avg. Travel Time= 11.7 min

Peak Storage= 5,892 cf @ 8.48 hrs

Average Depth at Peak Storage= 2.09' , Surface Width= 8.17'

Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 2.94 cfs

4.00' x 0.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 1.0 ' / ' Top Width= 5.00'

Length= 579.0' Slope= 0.0012 ' / '

Inlet Invert= 16.00', Outlet Invert= 15.30'



Proposed Conditions Option_1

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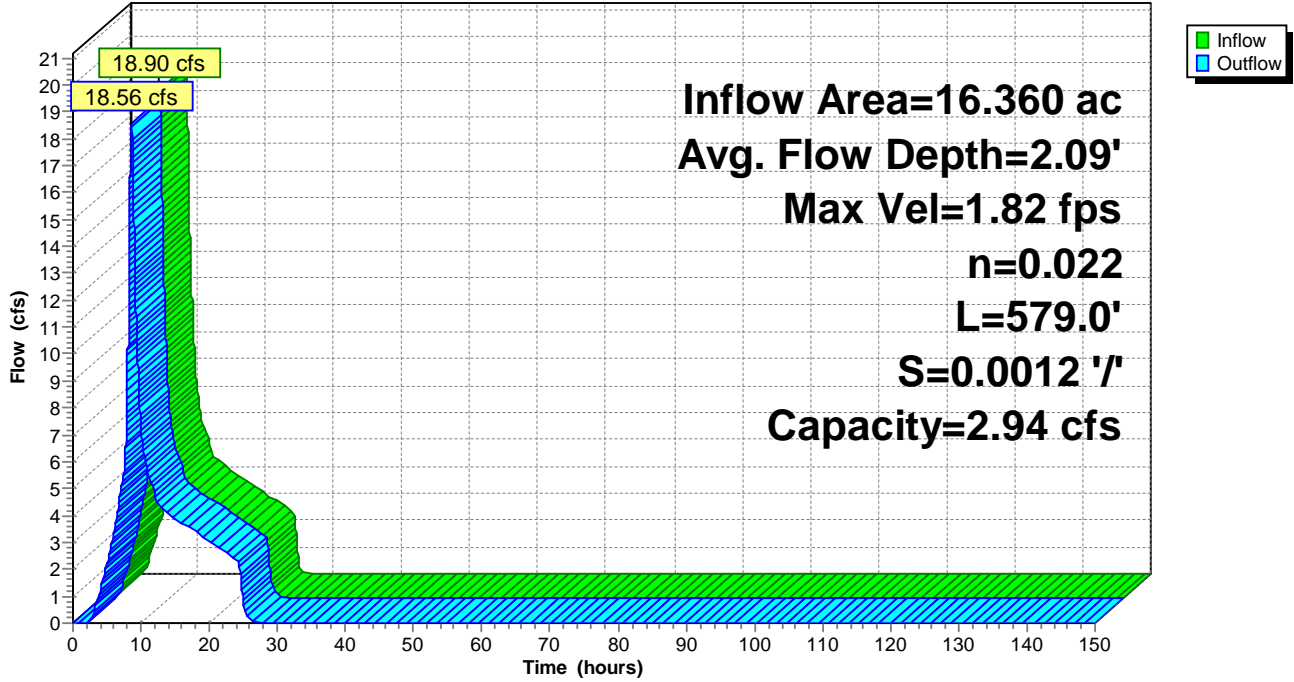
Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Reach 8R: South Ditch

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 1P: 1P- NW Pond

Inflow Area = 7.320 ac, 19.67% Impervious, Inflow Depth = 5.44" for 100-Yr-2080 event
 Inflow = 10.44 cfs @ 7.89 hrs, Volume= 3.321 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 13.28' @ 24.29 hrs Surf.Area= 1.575 ac Storage= 3.321 af

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

Volume	Invert	Avail.Storage	Storage Description
#1	11.00'	6.173 af	Custom Stage Data (Irregular) Listed below (Recalc)

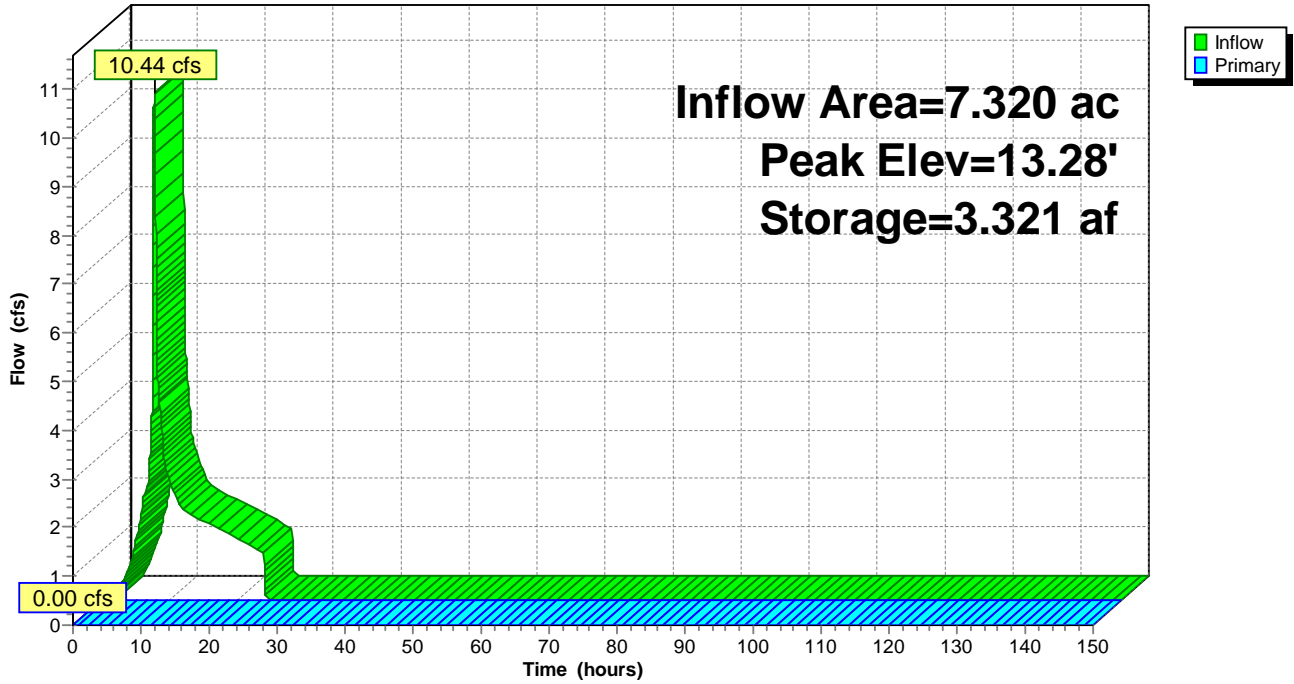
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
11.00	1.290	1,552.0	0.000	0.000	1.290
12.00	1.460	1,164.0	1.374	1.374	3.215
13.00	1.550	1,193.0	1.505	2.879	3.343
14.00	1.640	1,231.0	1.595	4.474	3.514
15.00	1.760	1,333.0	1.700	6.173	3.992

Device	Routing	Invert	Outlet Devices
#1	Primary	14.99'	1,333.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.00' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: 1P- NW Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 5P: 5P - West Pond

[81] Warning: Exceeded Pond 7P by 0.71' @ 6.85 hrs

Inflow Area = 106.390 ac, 0.87% Impervious, Inflow Depth = 4.79" for 100-Yr-2080 event
 Inflow = 54.00 cfs @ 8.08 hrs, Volume= 42.439 af
 Outflow = 37.65 cfs @ 8.57 hrs, Volume= 40.602 af, Atten= 30%, Lag= 29.8 min
 Primary = 37.65 cfs @ 8.57 hrs, Volume= 40.602 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.01' @ 8.57 hrs Surf.Area= 211.259 ac Storage= 2.902 af

Plug-Flow detention time= 68.3 min calculated for 40.600 af (96% of inflow)
 Center-of-Mass det. time= 40.1 min (919.7 - 879.6)

Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	340.699 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	1.160	3,026.0	0.000	0.000	1.160	
15.00	2.670	3,968.0	1.863	1.863	13.196	
15.10	9,999.000	9,999.0	338.835	340.699	167.081	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	3,968.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=37.37 cfs @ 8.57 hrs HW=15.01' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 37.37 cfs @ 0.41 fps)

Proposed Conditions Option_1

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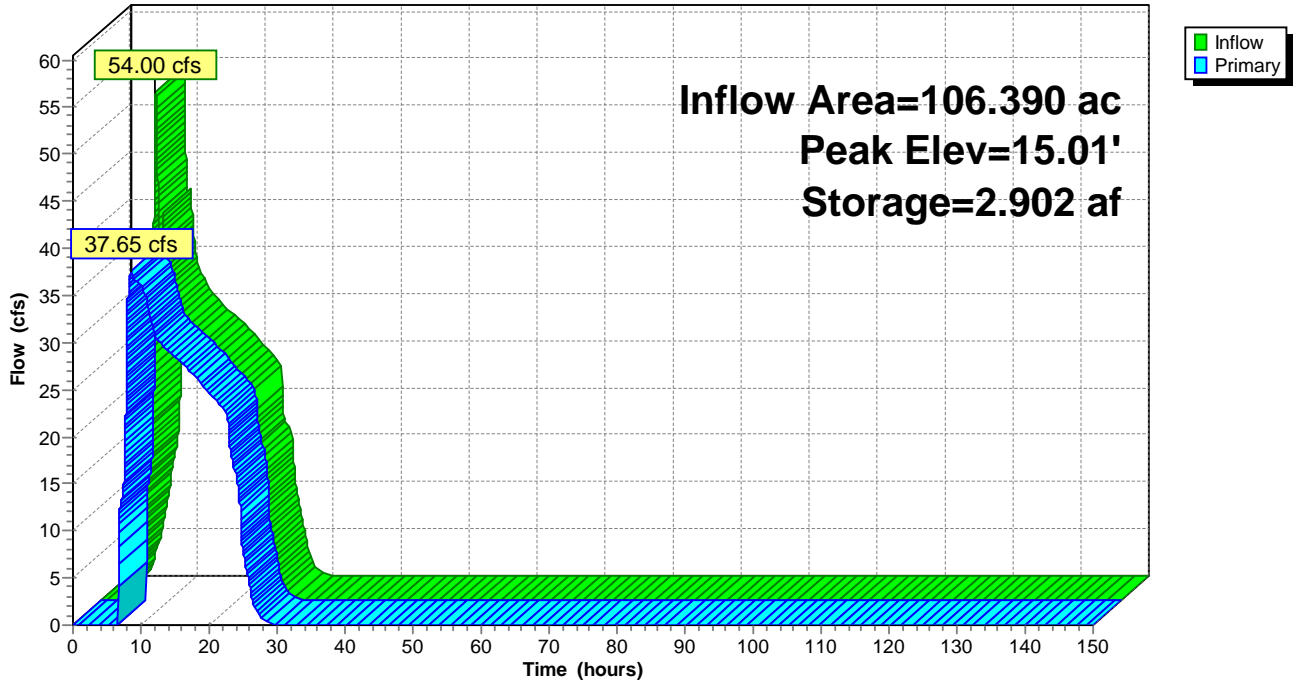
Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Pond 5P: 5P - West Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 6P: 6P- West Pond

[81] Warning: Exceeded Pond 5P by 0.03' @ 26.75 hrs

Inflow Area = 127.700 ac, 0.91% Impervious, Inflow Depth = 4.57" for 100-Yr-2080 event
 Inflow = 48.50 cfs @ 9.50 hrs, Volume= 48.671 af
 Outflow = 28.77 cfs @ 19.78 hrs, Volume= 44.887 af, Atten= 41%, Lag= 616.4 min
 Primary = 28.77 cfs @ 19.78 hrs, Volume= 44.887 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.03' @ 19.78 hrs Surf.Area= 914.994 ac Storage= 13.261 af

Plug-Flow detention time= 302.3 min calculated for 44.884 af (92% of inflow)
 Center-of-Mass det. time= 255.2 min (1,167.8 - 912.6)

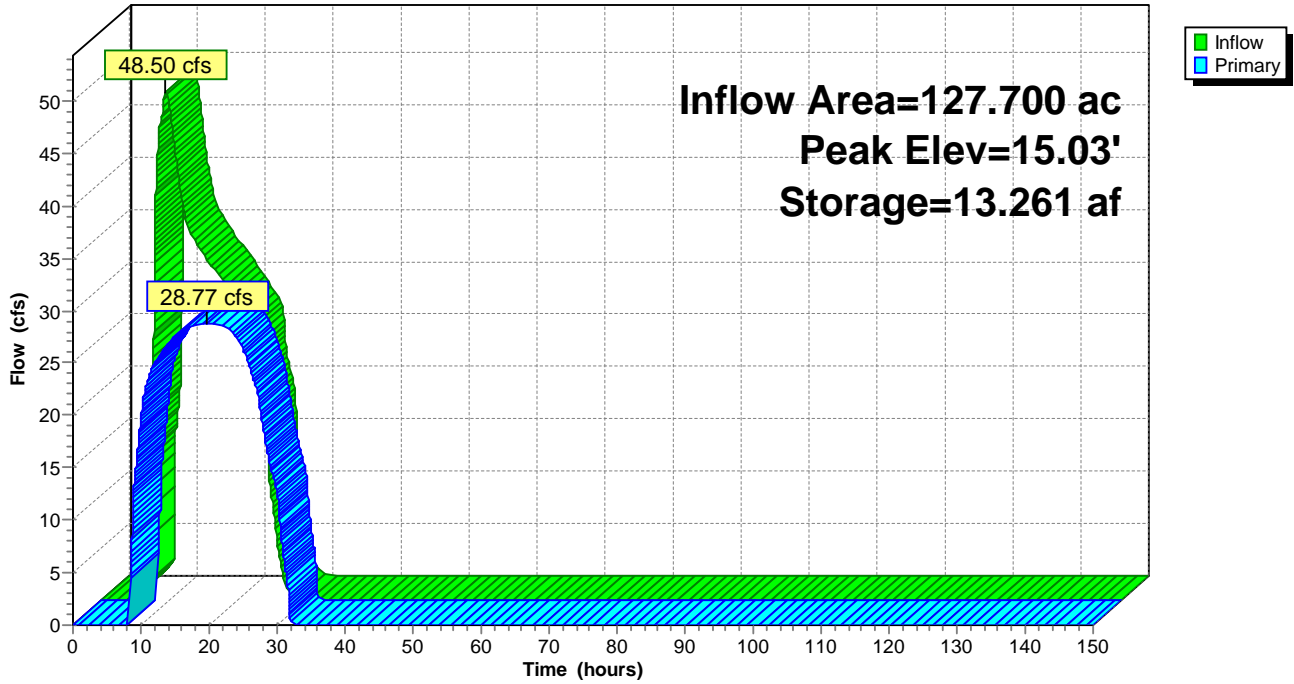
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	344.602 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.930	3,856.0	0.000	0.000	2.930	
15.00	4.810	4,175.0	3.831	3.831	7.611	
15.10	9,999.000	9,999.0	340.771	344.602	158.416	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	1,400.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=28.55 cfs @ 19.78 hrs HW=15.03' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Weir Controls 28.55 cfs @ 0.53 fps)

Pond 6P: 6P- West Pond

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 7P: 7P-Southwest

Inflow Area = 54.970 ac, 1.29% Impervious, Inflow Depth = 5.22" for 100-Yr-2080 event
 Inflow = 35.18 cfs @ 9.83 hrs, Volume= 23.897 af
 Outflow = 17.09 cfs @ 12.89 hrs, Volume= 20.553 af, Atten= 51%, Lag= 183.7 min
 Primary = 17.09 cfs @ 12.89 hrs, Volume= 20.553 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 4
 Peak Elev= 15.00' @ 12.89 hrs Surf.Area= 131.882 ac Storage= 3.440 af

Plug-Flow detention time= 238.1 min calculated for 20.552 af (86% of inflow)
 Center-of-Mass det. time= 145.9 min (1,007.6 - 861.7)

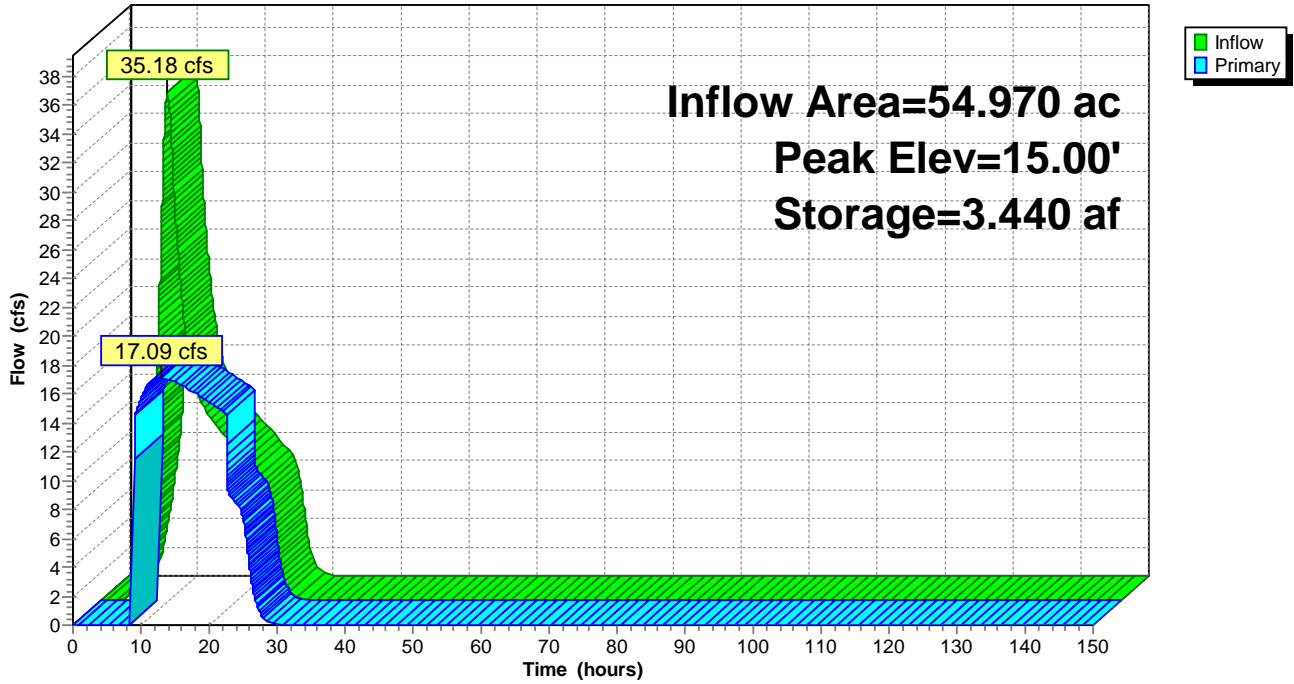
Volume	Invert	Avail.Storage	Storage Description			
#1	14.00'	37.446 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
14.00	2.340	3,959.0	0.000	0.000	2.340	
15.00	4.560	5,430.0	3.389	3.389	27.571	
15.01	9,999.000	9,999.0	34.057	37.446	156.355	

Device	Routing	Invert	Outlet Devices									
#1	Primary	14.99'	5,430.0' long x 100.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=16.69 cfs @ 12.89 hrs HW=15.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Weir Controls 16.69 cfs @ 0.28 fps)

Pond 7P: 7P-Southwest

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 8P: 8P

Inflow Area = 16.360 ac, 4.95% Impervious, Inflow Depth = 5.79" for 100-Yr-2080 event
 Inflow = 18.90 cfs @ 8.40 hrs, Volume= 7.892 af
 Outflow = 18.90 cfs @ 8.40 hrs, Volume= 7.892 af, Atten= 0%, Lag= 0.0 min
 Primary = 18.90 cfs @ 8.40 hrs, Volume= 7.892 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs
 Peak Elev= 18.36' @ 8.40 hrs
 Flood Elev= 19.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	16.11'	36.0" Round Culvert L= 93.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.11' / 15.29' S= 0.0088 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	19.00'	100.0' long x 24.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=18.90 cfs @ 8.40 hrs HW=18.36' (Free Discharge)

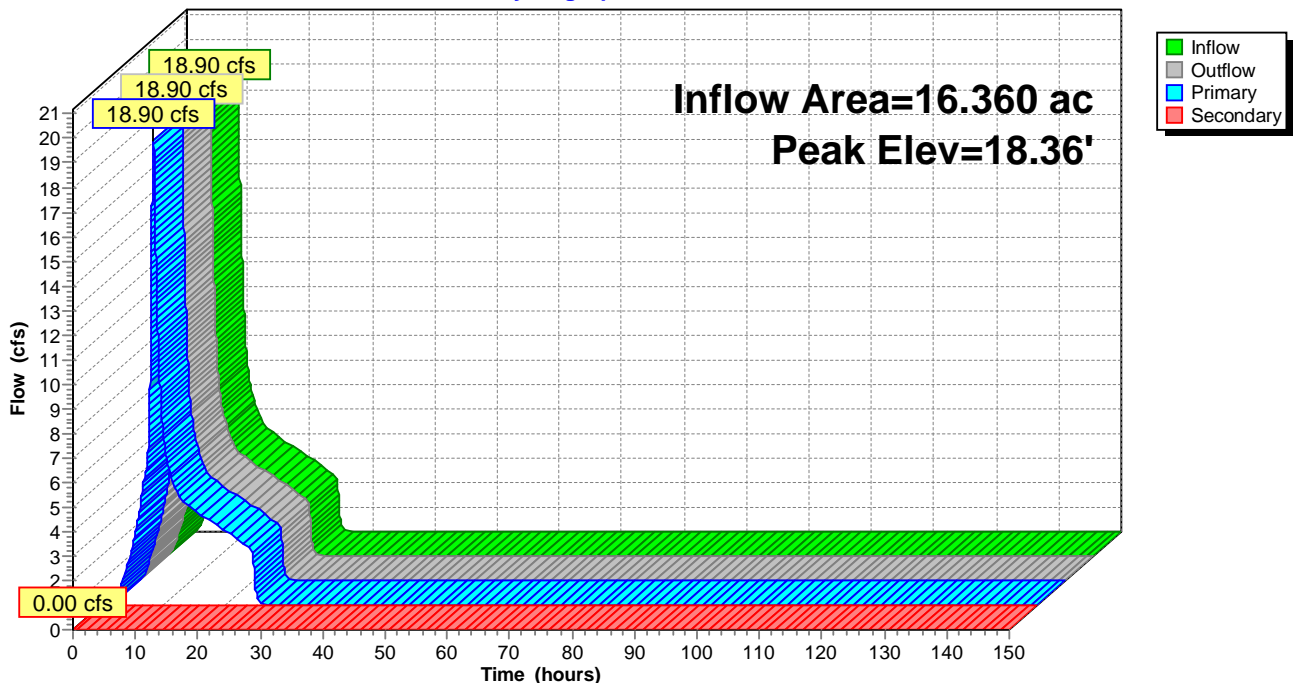
↑1=Culvert (Barrel Controls 18.90 cfs @ 4.62 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.11' (Free Discharge)

↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 8P: 8P

Hydrograph



Proposed Conditions Option_1

Type IA 24-hr 100-Yr-2080 Rainfall=7.32"

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Summary for Pond 10P: 10P-Large Central/NE

[93] Warning: Storage range exceeded by 0.03'

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 524.490 ac, 2.24% Impervious, Inflow Depth = 4.72" for 100-Yr-2080 event
 Inflow = 161.30 cfs @ 13.57 hrs, Volume= 206.430 af
 Outflow = 205.47 cfs @ 16.91 hrs, Volume= 170.180 af, Atten= 0%, Lag= 200.7 min
 Secondary = 205.47 cfs @ 16.91 hrs, Volume= 170.180 af

Routing by Stor-Ind method, Time Span= 0.00-150.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 13.03' @ 16.91 hrs Surf.Area= 119.000 ac Storage= 98.335 af

Plug-Flow detention time= 405.3 min calculated for 170.168 af (82% of inflow)
 Center-of-Mass det. time= 282.7 min (1,366.3 - 1,083.7)

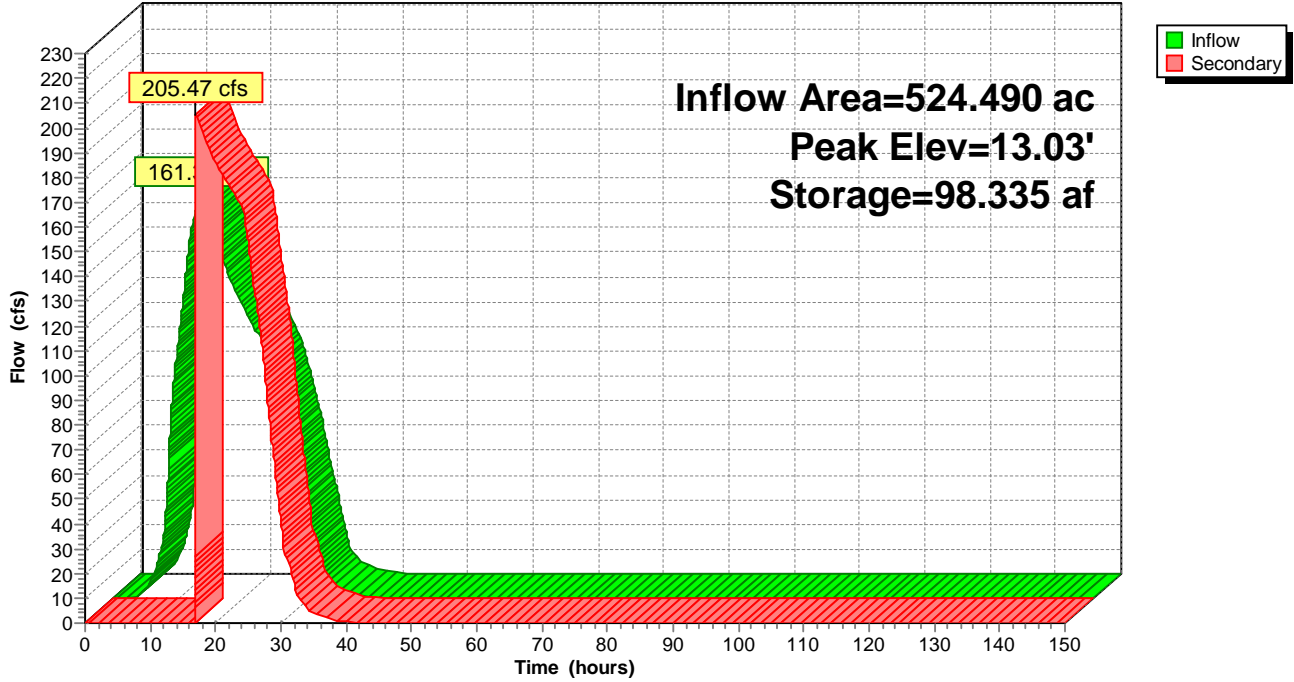
Volume	Invert	Avail.Storage	Storage Description			
#1	10.00'	98.335 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.00	0.280	2,536.0	0.000	0.000	0.280	
11.00	6.414	16,985.0	2.678	2.678	515.559	
12.00	38.875	11,909.0	20.360	23.038	783.495	
13.00	119.000	22,186.0	75.297	98.335	1,423.612	

Device	Routing	Invert	Outlet Devices						
#1	Secondary	12.99'	9,999.0' long x 0.5' breadth Broad-Crested Rectangular Weir						
			Head (feet) 0.20 0.40 0.60 0.80 1.00						
			Coef. (English) 2.80 2.92 3.08 3.30 3.32						

Secondary OutFlow Max=200.61 cfs @ 16.91 hrs HW=13.03' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 200.61 cfs @ 0.54 fps)

Pond 10P: 10P-Large Central/NE

Hydrograph



Appendix G HY-8 Report

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: Existing

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Existing Discharge (cfs)	Roadway Discharge (cfs)	Iterations
16.97	2 year	3.00	3.00	0.00	1
17.11	10 year	4.00	4.00	0.00	1
17.24	25 year	5.00	5.00	0.00	1
17.35	50 year	6.00	6.00	0.00	1
17.56	100 year	8.00	8.00	0.00	1
19.00	Overtopping	27.46	27.46	0.00	Overtopping

Table 2 - Culvert Summary Table: Existing

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)
2 year	3.00	3.00	16.97	0.786	0.863	3-M1t	0.598	0.537	0.645	0.435	2.691
10 year	4.00	4.00	17.11	0.913	1.003	3-M1t	0.691	0.620	0.723	0.513	3.049
25 year	5.00	5.00	17.24	1.026	1.128	3-M1t	0.773	0.697	0.793	0.583	3.347
50 year	6.00	6.00	17.35	1.128	1.242	3-M1t	0.849	0.766	0.856	0.646	3.605
100 year	8.00	8.00	17.56	1.316	1.448	3-M2t	0.986	0.887	0.970	0.760	4.045

Straight Culvert
Inlet Elevation (invert): 16.11 ft, Outlet Elevation (invert): 15.29 ft
Culvert Length: 93.00 ft, Culvert Slope: 0.0088

Site Data - Existing

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 16.11 ft
Outlet Station: 93.00 ft
Outlet Elevation: 15.29 ft
Number of Barrels: 1

Culvert Data Summary - Existing

Barrel Shape: Circular
Barrel Diameter: 3.00 ft
Barrel Material: Corrugated Aluminum
Embedment: 0.00 in
Barrel Manning's n: 0.0250
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting
Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Existing)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
3.00	15.93	0.43	0.74	0.03	0.21
4.00	16.01	0.51	0.82	0.03	0.22
5.00	16.08	0.58	0.88	0.04	0.22
6.00	16.15	0.65	0.93	0.04	0.22
8.00	16.26	0.76	1.02	0.05	0.23

Tailwater Channel Data - Existing

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 3.00 (1:1)

Channel Slope: 0.0010

Channel Manning's n: 0.0330

Channel Invert Elevation: 15.50 ft

Roadway Data for Crossing: Existing

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 19.00 ft

Roadway Surface: Paved

Roadway Top Width: 24.00 ft

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 4 - Summary of Culvert Flows at Crossing: Proposed

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Proposed Discharge (cfs)	Roadway Discharge (cfs)	Iterations
17.21	2 year	7.00	7.00	0.00	1
17.29	10 year	8.00	8.00	0.00	1
17.44	25 year	10.00	10.00	0.00	1
17.57	50 year	12.00	12.00	0.00	1
17.62	100 year	13.00	13.00	0.00	1
17.95	500 year	19.00	19.00	0.00	1
19.00	Overtopping	44.43	44.43	0.00	Overtopping

Table 5 - Culvert Summary Table: Proposed

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)
2 year	7.00	7.00	17.21	0.995	1.105	3-M1t	0.733	0.685	0.915	0.705	2.570
10 year	8.00	8.00	17.29	1.066	1.183	3-M1t	0.783	0.733	0.970	0.760	2.699
25 year	10.00	10.00	17.44	1.195	1.330	3-M1t	0.871	0.822	1.070	0.860	2.927
50 year	12.00	12.00	17.57	1.313	1.462	3-M1t	0.953	0.902	1.162	0.952	3.123
100 year	13.00	13.00	17.62	1.370	1.512	3-M1t	0.990	0.940	1.204	0.994	3.213
500 year	19.00	19.00	17.95	1.665	1.841	3-M1t	1.194	1.139	1.432	1.222	3.672

Straight Culvert
Inlet Elevation (invert): 16.11 ft, Outlet Elevation (invert): 15.29 ft
Culvert Length: 93.00 ft, Culvert Slope: 0.0088

Site Data - Proposed

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 16.11 ft
Outlet Station: 93.00 ft
Outlet Elevation: 15.29 ft
Number of Barrels: 1

Culvert Data Summary - Proposed

Barrel Shape: Circular
Barrel Diameter: 6.00 ft
Barrel Material: Corrugated Aluminum
Embedment: 0.00 in
Barrel Manning's n: 0.0250
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting
Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: Proposed)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
7.00	16.21	0.71	0.98	0.04	0.23
8.00	16.26	0.76	1.02	0.05	0.23
10.00	16.36	0.86	1.10	0.05	0.23
12.00	16.45	0.95	1.16	0.06	0.24
13.00	16.49	0.99	1.19	0.06	0.24
19.00	16.72	1.22	1.33	0.08	0.24

Tailwater Channel Data - Proposed

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 3.00 (3:1)

Channel Slope: 0.0010

Channel Manning's n: 0.0330

Channel Invert Elevation: 15.50 ft

Roadway Data for Crossing: Proposed

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 19.00 ft

Roadway Surface: Paved

Roadway Top Width: 24.00 ft

