

Stormwater Management Report

For the Proposed:

Existing FedEx Ground Hub Parking Expansion

Located at:

49 FedEx Drive
Middletown, Connecticut

Prepared for Submission to:

City of Middletown, Connecticut

February 19,2021

Prepared for:

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Executive Summary

This report has been prepared in support of an application for land use permits from the City of Middletown and the State of Connecticut for the proposed parking area expansion project of the existing FedEx Ground Hub at 49 FedEx Drive. The existing property is approximately 205 acres in size and is currently developed with a ±500,000 square foot distribution hub building and associated impervious paved parking and drive aisle areas. Proposed site improvements consist of paved employee and trailer parking area expansions, retaining walls, fire water utilities, site lighting, and landscaping. The site is located in the Interstate Trade (IT) zone.

The subject parcel spans from Middle Street to Industrial Park Road. The site currently operates as a hub building for FedEx Ground Package Systems. This project is for minor modifications to the employee parking area hub grounds on site for better utilization of the site and the operations of the user. The proposed development will provide an additional connection between the parking lot on Middle Street for employee vehicles only. There will be no additional tractor trailer trips or driveways needed.

The property is bordered by Industrial Park Road and Interstate 91 to the east, residential properties to the north and northwest, and commercial properties to the west and south. There are substantial wetlands located on the property associated with the Mattabesset River and Sawmill Brook, for which detail can be found within the Wetland Identification and Delineation Report. There are no known vernal pools on or adjacent to the proposed development. No direct impact to any wetland system is proposed, however work will occur within a portion of the 100' upland review area.

The property is partially located within a mapped area on the State of Connecticut Department of Energy and Environmental Protection (CTDEEP) Natural Diversity Database. Revisions will be addressed once the state review is completed and recommendations provided by the state. Portions of the site are located in FEMA designated zones Floodway AE, Floodplain AE (100-year floodplain), and Zone X (500-year floodplain) per the FEMA Flood Insurance Rate Map Number 09007C0102G for Middlesex County, Connecticut, map revised on August 28, 2008. A copy of the FEMA Flood Insurance Rate Map has been included in Appendix A for reference. Filling operations are proposed within the 100-year floodplain at the remote lot expansion for which compensatory storage is proposed by means of a hydraulically connected underground detention system beneath the remote lot parking expansion area

The site generally slopes from the east and west toward Sawmill Brook which flows from south to north toward the Mattabesset River. Extensive stormwater management facilities have been installed onsite as part of the original hub building and parking area construction consisting of a series of underground stormwater detention systems and above ground stormwater management

basins connected by underground stormwater piping. Site-wide stormwater quality has previously been addressed through installation of best management practices (BMPs) sized by the appropriate water quality volume or water quality flow criteria. This proposed project will provide additional stormwater quality improvements for the increase in impervious area that is to be installed in the tributary drainage area to Sawmill Brook. Numerous BMPs have been incorporated into the project design to address stormwater quality and include various elements including deep sump hooded catch basins, hydrodynamic separators, and underground detention systems. These features will provide the minimum required 80% TSS removal as required in the CT Stormwater Quality Manual.

The proposed stormwater management improvements will also serve to mitigate the increase in peak runoff flow through underground detention. The proposed system serves to provide water quality improvements, to attenuate peak flows, to maintain the stormwater discharge to the surrounding natural resources and to recharge to the groundwater the increase in the stormwater volume as a result of the impervious cover for the 2, 10, 25 and 100-year storm events.

A HydroCAD model, using TR-55 methodology, was developed to evaluate the existing and proposed drainage conditions of the property. The results of the analyses demonstrate that there will be a decrease in peak stormwater runoff rates for the 2-, 10-, 25-year, and 100-year storm events under the developed site conditions. The proposed stormwater management systems are designed to be in compliance with the current City of Middletown Regulations, the 2002 State of Connecticut Guidelines for Soil Erosion and Sediment Control, and the 2004 Connecticut Stormwater Quality Manual by the Connecticut Department of Environmental Protection (now the Connecticut Department of Energy and Environmental Protection – CTDEEP).

Existing Site Hydrologic Conditions and Drainage Patterns

General Site Information

The project parcel is currently developed, consisting of partially of impervious building and paved areas with considerable areas of lawn, and wooded groundcover remaining. There are formal stormwater management systems currently located on site which convey water to the Sawmill Brook and associated wetlands. No modifications to the existing stormwater management systems are proposed, and they will continue to function as they do currently with no adverse effects from the proposed construction. The drainage areas and design points analyzed encompass the areas of runoff that will be impacted by proposed construction to ensure no increase in peak flow to existing detention structures or other design points.

The site soils identified by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) consist of urban land in the employee lot area and a variety of silt loam and sandy loam soils in the area of the employee lot. Site soils have hydrologic soil group ratings of B, C, and D. Please refer to the USDA NRCS Hydrologic Soil Group Map included in Appendix A for additional information.

Existing Drainage Patterns

The existing hydrologically modeled drainage areas total 68.25 acres and are 16% impervious. Stormwater runoff from the employee lot area is divided into two design points (DPs). A portion of the employee lot area sheet flows to the west into the Middle Street gutter (DP-1), the remaining portion is captured in the existing onsite employee lot stormwater management systems (DP-2). Stormwater runoff from the remote lot area drains to the Sawmill Brook wetland system (DP-3).

The following is a brief analysis of the drainage areas contributing to the existing design points as shown on the enclosed Existing Drainage Mapping (ED-1), in Appendix D.

Existing Drainage Area 10 (EDA-10): The Existing Drainage Area 10 collects stormwater from a 0.93-acre portion of the hydrologically modeled area and is 6.5% impervious. EDA-10 consists of the area of the employee lot site from which stormwater runoff flows offsite to the west into the Middle Street Gutter (DP-1). This drainage area contains mainly of lawn surface cover with a small portion of impervious paved roadway.

Existing Drainage Area 20 (EDA-20): The Existing Drainage Area 20 collects stormwater from a 0.82-acre portion of the hydrologically modeled area and is 38.7% impervious. EDA-20 consists of the area of the employee lot site from which stormwater runoff flows to the east into the existing stormwater management system (DP-2), bypassing the existing underground stormwater detention system in the employee lot area. This drainage area contains mainly of lawn surface cover with a smaller portion of impervious paved driveway.

Existing Drainage Area 21 (EDA-21): The Existing Drainage Area 21 collects stormwater from a 6.30-acre portion of the hydrologically modeled area and is 71.1% impervious. EDA-21 consists of the area of the employee lot site from which stormwater runoff flows into the existing underground stormwater detention system in the employee lot area and eventually flowing to the east into the existing stormwater management system (DP-2). This drainage area contains mainly of paved drive aisle and parking surface with a smaller portion of lawn.

Existing Drainage Area 30 (EDA-30): The Existing Drainage Area 30 collects stormwater from a 53.34-acre portion of the hydrologically modeled area and is 2.2% impervious. EDA-30 consists of the area of the remote lot site from which stormwater runoff flows to the Sawmill Brook wetland system (DP-3), bypassing the existing remote lot above ground stormwater management basin. This drainage area contains mainly of wooded and brush surface cover with smaller portions of lawn and impervious paved roadway.

Existing Drainage Area 31 (EDA-31): The Existing Drainage Area 31 collects stormwater from a 6.86-acre portion of the hydrologically modeled area and is 71.2% impervious. EDA-31 consists of the area of the remote lot site from which stormwater runoff flows to the existing remote lot above ground stormwater management basin and eventually to the Sawmill Brook wetland system (DP-3). This drainage area contains mainly of paved drive aisle and parking surface with a smaller portion of lawn.

Table 1 – Pre-Development (Existing Conditions) Drainage Characteristics.

Drainage Area / Design Point		Area (acres)	Composite Curve Number	Time of Concentration (minutes)
EDA-10	Area to Middle Street	0.93	85	9.9
EDA-20	Area to Employee Lot Drainage	0.82	89	16.4
EDA-21	Area to Ex. Underground Detention	6.30	94	8.2
EDA-30	Area to Sawmill Brook Wetlands	53.34	72	88.6
EDA-31	Area to Ex. Stormwater Basin	6.86	90	5.0

Table 2 – Pre-Development Conditions Peak Flows

Analysis Point	Peak Flow (cfs)			
	2-yr	10-yr	25-yr	100-yr
Design Point 1 – Middle Street Gutter	1.87	3.51	4.53	6.10
Design Point 2 – Employee Lot Drainage	3.55	5.48	6.77	11.81
Design Point 3 – Sawmill Brook Wetlands	16.58	42.50	60.44	88.73

Developed Site Hydrologic Conditions and Drainage Patterns

The proposed hydrologically modeled drainage area totals 68.25 acres and is approximately 25.9% impervious. The site stormwater system will provide stormwater detention and water quality improvements through the installation of deep sump hooded catch basins, hydrodynamic separators, and underground stormwater detention systems. The stormwater management systems have been designed to attenuate the 2, 10, 25, and 100-year storm events.

The site modeling retained the same Design Points as the existing model. The following is a brief analysis of the proposed drainage areas contributing to the design points as shown on the enclosed Proposed Drainage Mapping (PD-1), in Appendix D

Proposed Drainage Area 100 (PDA-100): The Proposed Drainage Area 100 collects stormwater from a 0.90-acre portion of the hydrologically modeled area and is 9.8% impervious. PDA-100 consists of the area of the employee lot site from which stormwater runoff will continue to flow offsite to the west into the Middle Street Gutter (DP-1). This drainage area contains mainly of lawn surface cover with a small portion of impervious paved roadway.

Proposed Drainage Area 200 (PDA-200): The Proposed Drainage Area 200 collects stormwater from a 0.58-acre portion of the hydrologically modeled area and is 58.6% impervious. PDA-200 consists of the area of the employee lot site from which stormwater runoff will continue to flow to the east into the existing stormwater management system (DP-2), bypassing the existing and proposed underground stormwater detention systems in the employee lot area. This drainage area contains mainly of lawn surface cover with a smaller portion of impervious paved driveway.

Proposed Drainage Area 210 (PDA-210): The Proposed Drainage Area 210 collects stormwater from a 6.12-acre portion of the hydrologically modeled area and is 73.9% impervious. PDA-210 consists of the area of the employee lot site from which stormwater runoff will continue to flow into the existing underground stormwater detention system in the employee lot area and eventually flowing to the east into the existing stormwater management system (DP-2). This drainage area contains mainly of paved drive aisle and parking surface with a smaller portion of lawn.

Proposed Drainage Area 220 (PDA-220): The Proposed Drainage Area 220 collects stormwater from a 0.44-acre portion of the hydrologically modeled area and is 83.5% impervious. PDA-220 consists of the newly installed impervious area of the employee lot site from which stormwater runoff will flow into the proposed underground stormwater detention system in the employee lot expansion area, eventually flowing to the east into the existing stormwater management system (DP-2). This drainage area contains mainly of paved drive aisle and parking surface with a smaller portion of lawn.

Proposed Drainage Area 300 (PDA-300): The Proposed Drainage Area 300 collects stormwater from a 45.74-acre portion of the hydrologically modeled area and is 2.6% impervious. PDA-300 consists of the area of the remote lot site from which stormwater runoff will continue to flow to the Sawmill Brook wetland system (DP-3), bypassing the existing remote lot above ground stormwater management basin and proposed underground stormwater detention system. This drainage area contains mainly of wooded and brush surface cover with smaller portions of lawn and impervious paved roadway.

Proposed Drainage Area 310 (PDA-310): The Proposed Drainage Area 310 collects stormwater from a 6.63-acre portion of the hydrologically modeled area and is 67.6% impervious. PDA-310 consists of the area of the remote lot site from which stormwater runoff will continue to flow to the existing remote lot above ground stormwater management basin and eventually to the Sawmill Brook wetland system (DP-3). This drainage area contains mainly of paved drive aisle and parking surface with a smaller portion of lawn.

Proposed Drainage Area 320 (PDA-320): The Proposed Drainage Area 320 collects stormwater from a 7.83-acre portion of the hydrologically modeled area and is 85.5% impervious. PDA-320 consists of the remote lot expansion area from which stormwater runoff will flow to the proposed underground stormwater detention system at the remote lot area and eventually to the Sawmill Brook wetland system (DP-3). This drainage area contains mainly of paved drive aisle and parking surface with a smaller portion of lawn.

Table 3 – Post-Development (Proposed Conditions) Drainage Characteristics.

Drainage Area / Design Point		Area (acres)	Composite Curve Number	Time of Concentration (minutes)
PDA-100	Area to Middle Street	0.90	85	9.9
PDA-200	Area to Employee Lot Drainage	0.58	92	16.4
PDA-210	Area to Ex. Underground Detention	6.12	94	8.2
PDA-220	Area to Pr. Employee Undgd. Det.	0.44	96	5.0
PDA-300	Area to Sawmill Brook Wetlands	45.74	74	88.6
PDA-310	Area to Ex. Stormwater Basin	6.63	88	5.0
PDA-320	Area to Pr. Remote Undgd. Det.	7.83	94	12.3

Table 4 – Post-Development Conditions Peak Flows

Analysis Point	Peak Flow (cfs)			
	2-yr	10-yr	25-yr	100-yr
Design Point 1 – Middle Street Gutter	1.82	3.42	4.41	5.93
Design Point 2 – Employee Lot Drainage	3.46	5.48	6.56	11.66
Design Point 3 – Sawmill Brook Wetlands	16.52	42.12	59.66	87.53

As Table 5 on the next page demonstrates, the proposed stormwater management systems designed for the proposed site development of the subject parcel will result in an overall reduction in the peak discharge of runoff for the 2, 10, 25 and 100-year design storms. The runoff from the proposed development will be captured in a close drainage system, treated to remove at least 80% TSS. The CTDEEP standard Groundwater Recharge depths are 0.40, 0.25, 0.10 and 0.00 inches for soil grounds A, B, C and D respectively. The ponded volumes of the proposed underground detention systems below the first orifice of the outlet control structures are greater than the groundwater recharge volumes required, see Appendix E for the calculations.

Table 5 – Existing vs Proposed Peak Rates of Runoff

	Peak Flow Rate in Cubic Feet per Second (c.f.s.)			
Drainage Area	2-yr	10-yr	25-yr	100-yr
Design Point 1 – Middle Street Gutter				
Existing	1.87	3.51	4.53	6.10
Proposed	1.82	3.42	4.41	5.93
Percent Change	-2.7%	-2.6%	-2.6%	-2.8%
Design Point 2 – Employee Lot Drainage				
Existing	3.55	5.48	6.77	11.81
Proposed	3.46	5.48	6.56	11.66
Percent Change	-2.5%	-0.0%	-3.1%	-1.3%
Design Point 3 – Sawmill Brook Wetland System				
Existing	16.58	42.50	60.44	88.73
Proposed	16.52	42.12	59.66	87.53
Percent Change	-0.4%	-0.9%	-1.3%	-1.4%

Hydrologic Analysis Methodology

Hydrologic Modeling of Tributary Drainage Area

The hydrologic analysis to determine peak stormwater discharge rates was performed using the HydroCAD stormwater modeling system computer program, version 10.00 developed by HydroCAD Software Solutions, LLC. Hydrographs for each watershed were developed using the SCS Synthetic Unit Hydrograph Method with rainfall depths per NOAA Atlas 14 and Antecedent Moisture Condition II for Middletown were used for the calculation of peak flow rates and volumes (see Table 6 below). The drainage areas, or sub-catchments as labeled by the program, are depicted by hexagons on the attached drainage diagrams. Pre-development HydroCAD output can be found in Appendix B and Post-development HydroCAD output can be found in Appendix C.

Table 6 – Rainfall Depths per NOAA Atlas 14

Appendix B - 24-hour Rainfall

Return Period	24-hour Rainfall Depth
2-year	3.29"
10-year	5.18"
50-year	6.35"
100-year	8.16"

Stormwater Quality

Along with the reduction of peak stormwater discharge rates, an important element of the proposed drainage system is to improve the quality of stormwater discharge leaving the Property. Per the DEEP 2004 Stormwater Quality Manual “The pollutant reduction criterion is designed to improve the water quality of stormwater discharges by treating a prescribed water quality volume or associated peak flow, referred to as the water quality flow. Most treatment practices described in this Manual use a volume-based sizing criterion. The exceptions are grass drainage channels, proprietary stormwater treatment devices, and flow diversion structures, where a peak flow rate is utilized.” To adhere to the pollution reduction criteria of the manual, numerous Best Management Practices (BMPs) have been implemented in this design. The most basic preventive measure of the stormwater treatment train is to implement regular sweeping of the paved areas and annual cleaning of the catch basin sumps and hydrodynamic separators. The operation and maintenance manuals for each of the three applications will have a standard required pavement sweeping schedule.

All catch basins in new parking and/or paved areas will have a minimum of four-foot deep sumps to collect sediment carried in the runoff. Catch basins in grassed areas will also have four-foot deep sumps. The standard sump required by the CTDOT drainage manual is 2 feet. The additional 2 feet of sump depth will help to remove more sediment from the stormwater runoff. All catch basin outlets will be fitted with ‘hoods’ which remove floating debris and petroleum based contaminants as they float to the surface in the individual catch basin and are impounded in the structure so they can be properly removed during regular maintenance.

CTDOT approved hydrodynamic separators will be installed downstream of the proposed employee lot and remote lot stormwater collection systems prior to discharge into the new underground stormwater detention systems. This type of unit has been proven to improve stormwater quality and have been designed, analyzed and sized in “in-line” configuration based on the water quality flow (WQF) anticipated and per the 2004 Connecticut Stormwater Quality Manual. The “in-line” hydrodynamic separators have been proven to provide TSS removal rates in excess of the minimum 80%. In addition to the WQF, the required water quality volume (WQV) will also be detained on site. 100% of the required WQV for additional impervious areas per the 2004 Connecticut Stormwater Quality Manual and per the CTDEEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities is detained in the ponded volumes beneath the lowest outlet control structure orifice for both the employee lot and the remote lot proposed underground stormwater detention systems. Please refer to Appendix E for additional information on WQV and WQF calculations.

Outlet protection measures are provided at the new remote lot detention system outlet point (see Appendix E for Outlet Protection Calculations). Riprap outlet protection will be installed for energy dissipation of scour velocities and additional water quality treatment. The remote lot outlet will use a combination of a preformed scour hole with a downstream riprap apron for further scour protection as water flows toward the Sawmill Brook Wetlands.

Floodplain Compensatory Storage

The remote lot expansion portion of the proposed development is located within the FEMA designated floodplain area as determined by both elevation and the FEMA Zone AE boundary line. Fill material is to be placed below the base flood elevation (BFE) of 23' for construction of the proposed trailer lot expansion. Retaining walls have been utilized to minimize the impact and limit of filling within the floodplain area. Compensatory storage is to be provided to replace the floodplain volume lost by filling operations in the form of underground detention beneath the proposed paved trailer lot expansion. The underground detention will be hydraulically connected to the floodplain through openings in the site retaining wall, and flood waters will be allowed to flow into the void space beneath the development.

Elevations within the floodplain area impacted range from 14' up to the BFE of 23'. The existing and proposed condition floodplain volumes have been calculated incrementally and cumulatively by elevation using AutoCAD Civil 3D volume surfaces. The calculations indicate that there is approximately 70,828 cubic yards of storage in the existing floodplain area. The proposed condition volume, including underground detention compensatory storage volume, yields 71,196 cubic yards of storage. This results in a net increase of approximately 368 cubic yards of floodplain storage in the proposed condition. Detailed compensatory storage stage volume calculations can be found in Appendix E.

Summary

The post-development peak discharge rates for the developed site have been reduced for the 2, 10, 25 and 100-year storm events through the installation of subsurface stormwater detention systems. The proposed stormwater treatment train will provide clean stormwater discharge while ensuring improved TSS removal efficiency. This system will meet the stormwater quality requirements of the City of Middletown and the State of Connecticut for this project. All stormwater quality and flow requirements set forth in the 2004 CT Stormwater Quality Manual and the CTDEEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities will be met by proposed BMPs.

APPENDIX A

LOCATION MAPS

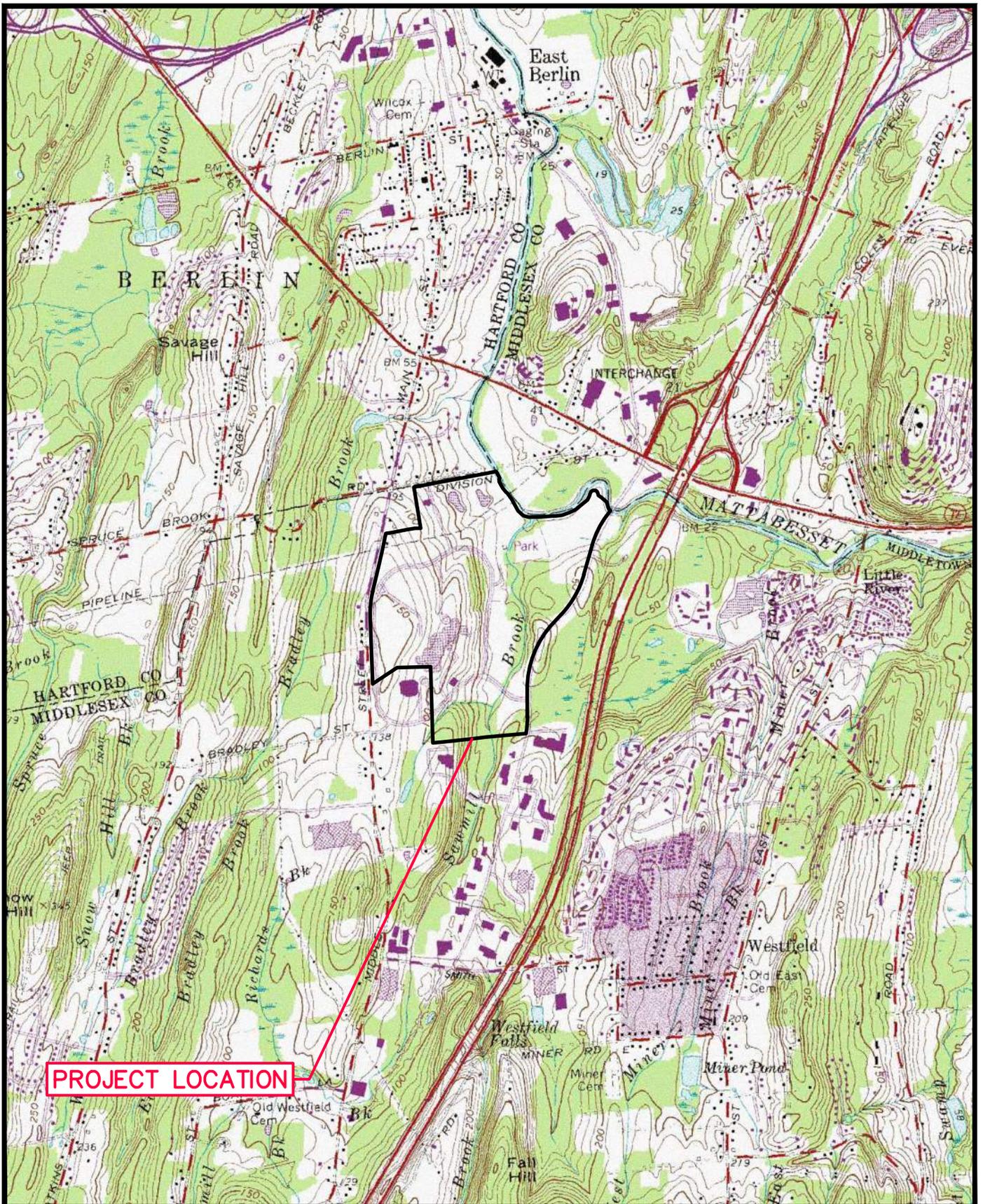
USGS Location Map

Aerial Location Map

NRCS Soil Survey Report

FEMA Federal Insurance Rate Map

NOAA Atlas 14 Storm Data



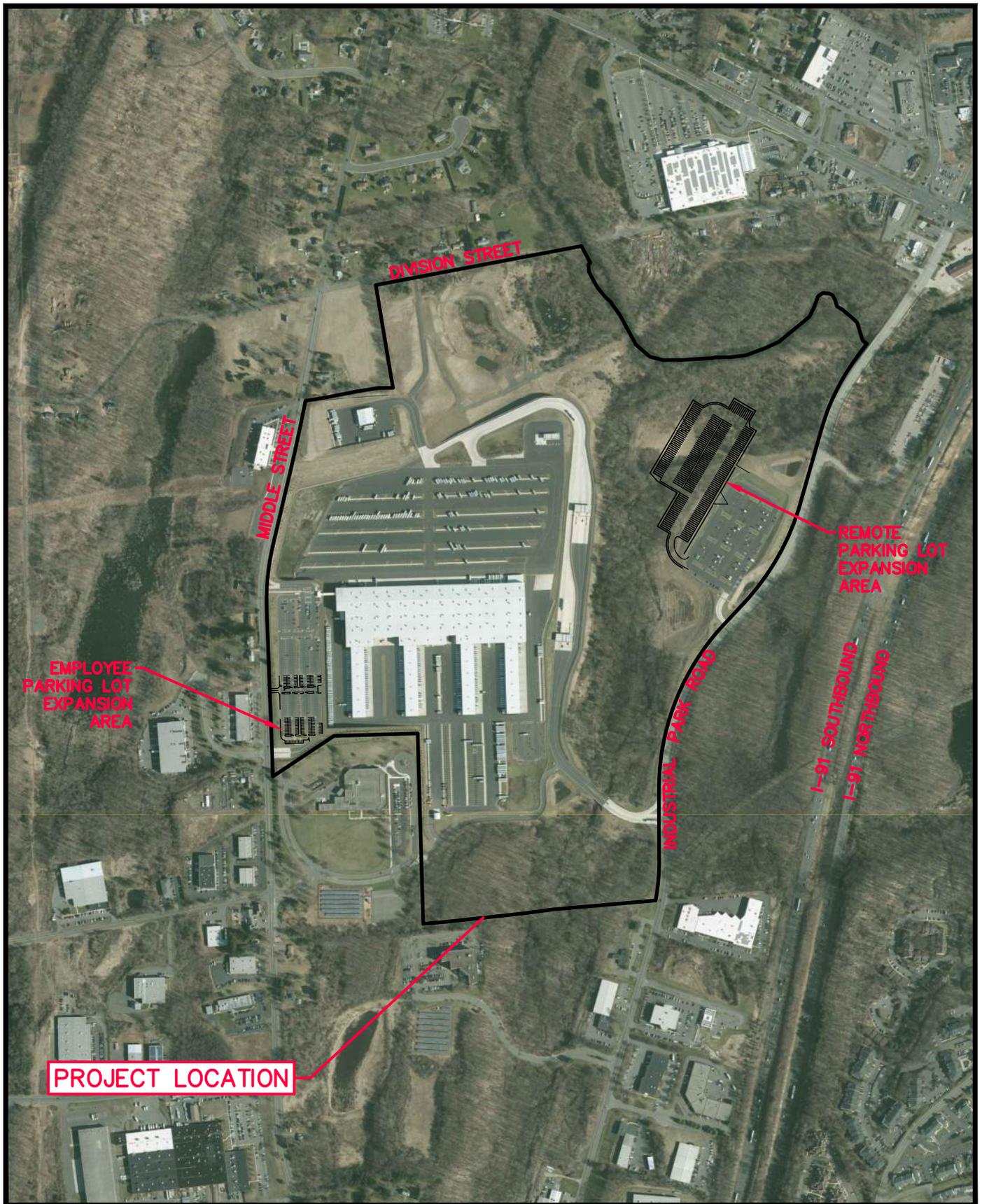
ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING

**EXISTING FEDEX HUB
PARKING EXPANSION**

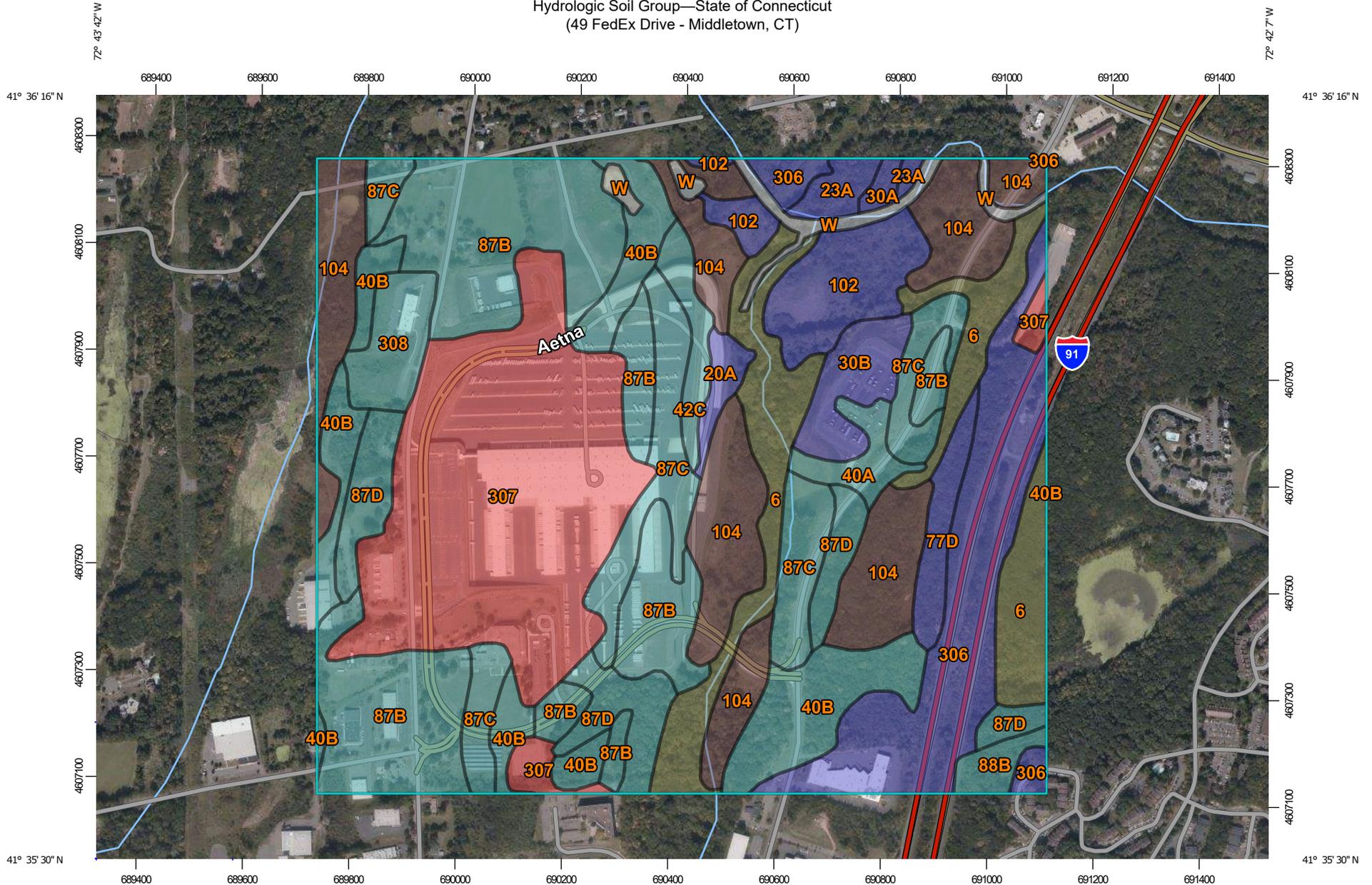
49 FEDEX DRIVE
MIDDLETOWN, CONNECTICUT

Designed	C.J.L.
Drawn	C.J.L.
Checked	J.A.B.
Approved	M.J.B.
Scale	1"=2,000'
Project No.	2001507
Date	02/19/2021
CAD File	LOC200150701

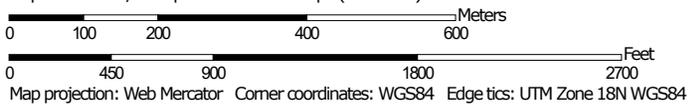
FIGURE 1
USGS LOCATION MAP



Hydrologic Soil Group—State of Connecticut
(49 FedEx Drive - Middletown, CT)



Map Scale: 1:10,100 if printed on A landscape (11" x 8.5") sheet.



MAP LEGEND

Area of Interest (AOI)		 C
Area of Interest (AOI)		 C/D
		 D
		 Not rated or not available
Soils		
Soil Rating Polygons		
 A		
 A/D		
 B		
 B/D		
 C		
 C/D		
 D		
 Not rated or not available		
Soil Rating Lines		
 A		
 A/D		
 B		
 B/D		
 C		
 C/D		
 D		
 Not rated or not available		
Soil Rating Points		
 A		
 A/D		
 B		
 B/D		
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 1:12,000.

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: State of Connecticut
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Aug 30, 2019—Oct 15, 2019

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
6	Wilbraham and Menlo soils, 0 to 8 percent slopes, extremely stony	C/D	34.0	8.4%
20A	Ellington silt loam, 0 to 5 percent slopes	B	2.8	0.7%
23A	Sudbury sandy loam, 0 to 5 percent slopes	B	3.6	0.9%
30A	Branford silt loam, 0 to 3 percent slopes	B	1.2	0.3%
30B	Branford silt loam, 3 to 8 percent slopes	B	8.1	2.0%
40A	Ludlow silt loam, 0 to 3 percent slopes	C	4.6	1.1%
40B	Ludlow silt loam, 3 to 8 percent slopes	C	31.4	7.8%
42C	Ludlow silt loam, 2 to 15 percent slopes, extremely stony	C	4.8	1.2%
77D	Cheshire-Holyoke complex, 15 to 35 percent slopes, very rocky	B	5.7	1.4%
87B	Wethersfield loam, 3 to 8 percent slopes	C	65.3	16.1%
87C	Wethersfield loam, 8 to 15 percent slopes	C	30.3	7.5%
87D	Wethersfield loam, 15 to 25 percent slopes	C	18.2	4.5%
88B	Wethersfield loam, 3 to 8 percent slopes, very stony	C	2.9	0.7%
102	Pootatuck fine sandy loam	B	15.6	3.8%
104	Bash silt loam	B/D	52.2	12.9%
306	Udorthents-Urban land complex	B	38.0	9.4%
307	Urban land	D	72.9	18.0%
308	Udorthents, smoothed	C	7.7	1.9%
W	Water		5.7	1.4%
Totals for Area of Interest			405.1	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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 to landward of 0.0' 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 Connecticut State Plane (NAD83) Zone 0600. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane 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 the 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, NIMS12
 National Geodetic Survey
 SSMC-3, #9202
 1315 East-West Highway
 Silver Spring, MD 20910-3282

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 provided in digital format by the Connecticut Department of Environmental Protection. This information was derived from digital orthophotos produced at a scale of 1:12,000 from aerial photography flown in 2004 supplemented with aerial photography from 2000.

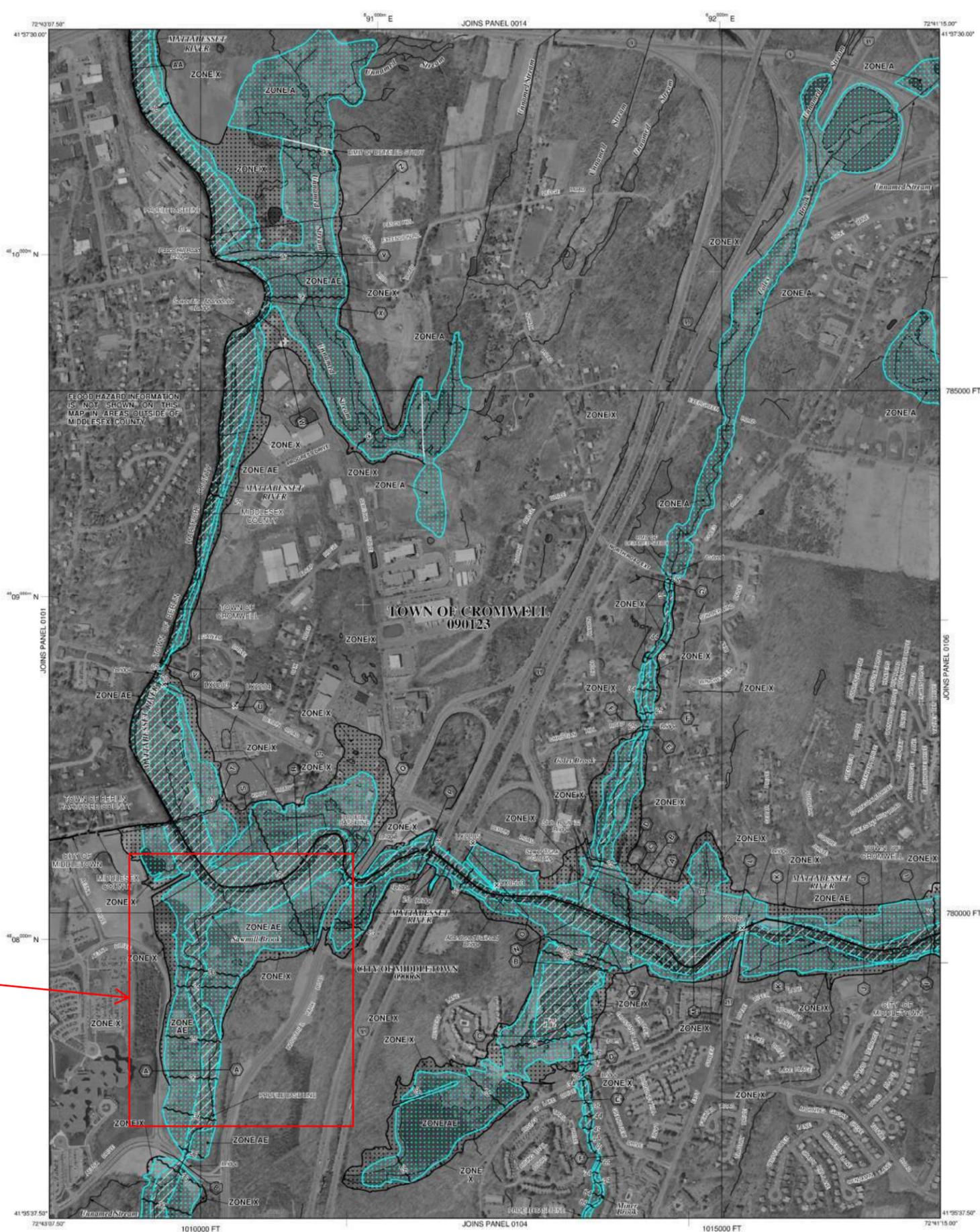
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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.

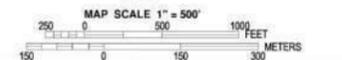
Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at <http://www.nsc.fema.gov/>.

If you have **questions** about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/>.



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 equaled 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, V 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 Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently determined. Zone AR indicates that the former flood control system is being removed 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 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 (NAVD 88)
- Cross section line
 - Transect line
 - Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
 - 1000-meter Universal Transverse Mercator grid, zone 18
 - 5000-foot grid; Connecticut State Plane coordinate system, (NAD83) Zone 0600, Lambert Conformal Conic
 - Bench mark (see explanation in Notes to Users section of the FIRM panel)
 - 1:5 River Mile
- MAP REPOSITORIES
 Refer to Map Repositories list on Map Index
- EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
 August 28, 2008
- 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.



PROJECT AREA

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0102G

FIRM
FLOOD INSURANCE RATE MAP
MIDDLESEX COUNTY,
CONNECTICUT
(ALL JURISDICTIONS)

PANEL 102 OF 450
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CROMWELL TOWN OF	090123	0102	G
MIDDLETOWN CITY OF	090088	0102	G

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
09007C0102G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aeriels](#)

PF tabular

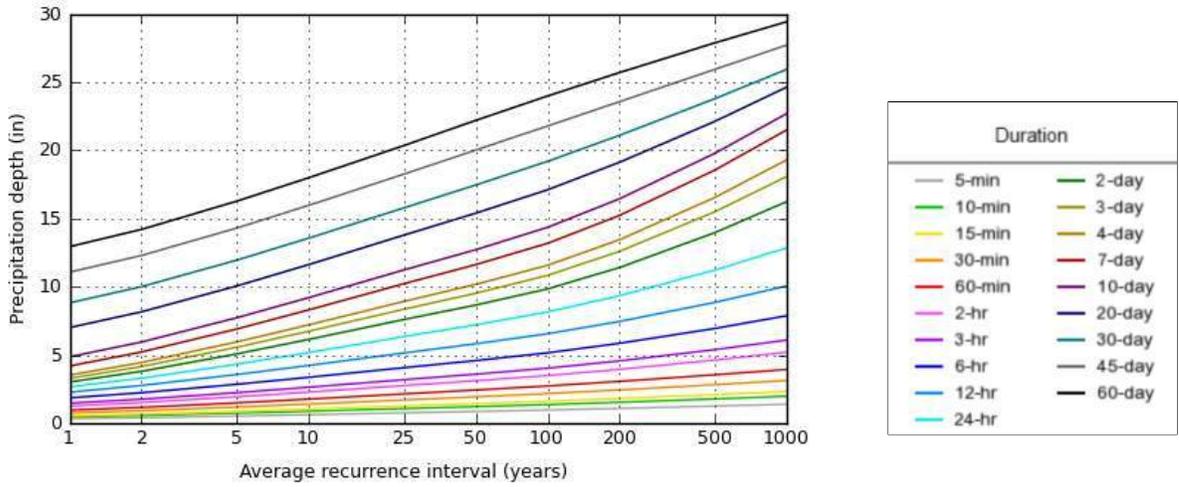
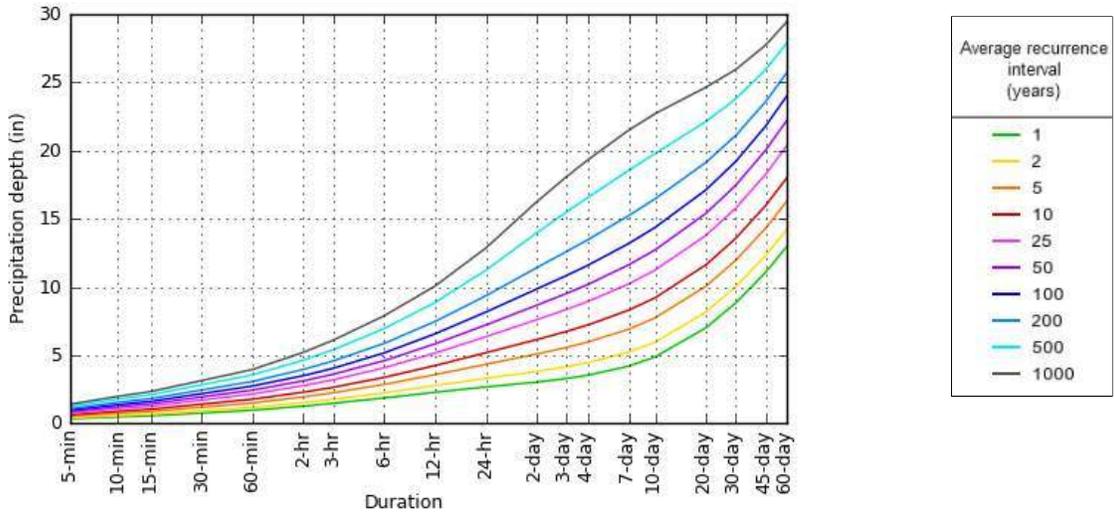
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.329 (0.259-0.410)	0.402 (0.316-0.502)	0.521 (0.408-0.652)	0.620 (0.482-0.781)	0.756 (0.568-0.998)	0.858 (0.631-1.16)	0.965 (0.689-1.36)	1.08 (0.732-1.56)	1.25 (0.813-1.87)	1.39 (0.882-2.13)
10-min	0.467 (0.367-0.581)	0.570 (0.448-0.711)	0.739 (0.578-0.925)	0.879 (0.683-1.11)	1.07 (0.805-1.41)	1.22 (0.895-1.64)	1.37 (0.976-1.92)	1.54 (1.04-2.21)	1.78 (1.15-2.66)	1.97 (1.25-3.01)
15-min	0.549 (0.432-0.684)	0.670 (0.527-0.836)	0.868 (0.680-1.09)	1.03 (0.804-1.30)	1.26 (0.947-1.66)	1.43 (1.05-1.93)	1.61 (1.15-2.26)	1.81 (1.22-2.60)	2.09 (1.36-3.12)	2.32 (1.47-3.55)
30-min	0.752 (0.591-0.937)	0.914 (0.718-1.14)	1.18 (0.923-1.48)	1.40 (1.09-1.76)	1.70 (1.28-2.25)	1.93 (1.42-2.61)	2.17 (1.55-3.05)	2.44 (1.65-3.51)	2.82 (1.83-4.21)	3.13 (1.98-4.78)
60-min	0.955 (0.751-1.19)	1.16 (0.910-1.44)	1.49 (1.17-1.87)	1.77 (1.37-2.22)	2.15 (1.61-2.83)	2.43 (1.79-3.28)	2.73 (1.95-3.84)	3.07 (2.07-4.41)	3.55 (2.30-5.30)	3.94 (2.49-6.02)
2-hr	1.26 (1.00-1.56)	1.52 (1.20-1.88)	1.93 (1.53-2.40)	2.28 (1.79-2.85)	2.76 (2.10-3.63)	3.11 (2.32-4.19)	3.49 (2.53-4.91)	3.95 (2.68-5.65)	4.63 (3.01-6.88)	5.21 (3.31-7.90)
3-hr	1.47 (1.17-1.80)	1.76 (1.40-2.17)	2.24 (1.78-2.77)	2.64 (2.08-3.28)	3.19 (2.43-4.18)	3.59 (2.69-4.83)	4.03 (2.94-5.67)	4.57 (3.10-6.52)	5.39 (3.51-7.98)	6.10 (3.88-9.21)
6-hr	1.86 (1.49-2.27)	2.23 (1.79-2.73)	2.85 (2.28-3.50)	3.36 (2.67-4.16)	4.07 (3.13-5.30)	4.59 (3.46-6.14)	5.16 (3.78-7.22)	5.86 (4.00-8.31)	6.94 (4.54-10.2)	7.88 (5.03-11.8)
12-hr	2.27 (1.85-2.76)	2.77 (2.24-3.36)	3.57 (2.88-4.35)	4.23 (3.39-5.19)	5.15 (3.99-6.66)	5.82 (4.42-7.74)	6.56 (4.84-9.12)	7.46 (5.12-10.5)	8.86 (5.81-12.9)	10.1 (6.44-15.0)
24-hr	2.67 (2.18-3.21)	3.29 (2.69-3.97)	4.32 (3.52-5.23)	5.18 (4.18-6.30)	6.35 (4.97-8.18)	7.21 (5.52-9.54)	8.16 (6.08-11.3)	9.35 (6.44-13.1)	11.2 (7.39-16.3)	12.9 (8.25-19.1)
2-day	3.02 (2.49-3.61)	3.80 (3.13-4.55)	5.08 (4.17-6.10)	6.14 (5.01-7.42)	7.60 (6.00-9.77)	8.66 (6.71-11.5)	9.85 (7.44-13.7)	11.4 (7.88-15.9)	14.0 (9.23-20.2)	16.2 (10.5-23.9)
3-day	3.29 (2.73-3.91)	4.15 (3.44-4.95)	5.57 (4.59-6.66)	6.74 (5.53-8.11)	8.35 (6.63-10.7)	9.52 (7.41-12.6)	10.8 (8.23-15.1)	12.6 (8.72-17.5)	15.5 (10.3-22.3)	18.1 (11.7-26.6)
4-day	3.53 (2.94-4.18)	4.45 (3.70-5.28)	5.96 (4.93-7.10)	7.21 (5.93-8.65)	8.93 (7.11-11.4)	10.2 (7.94-13.4)	11.6 (8.82-16.1)	13.5 (9.33-18.6)	16.5 (11.0-23.7)	19.3 (12.5-28.3)
7-day	4.19 (3.52-4.94)	5.22 (4.38-6.16)	6.90 (5.76-8.18)	8.30 (6.88-9.90)	10.2 (8.19-13.0)	11.6 (9.11-15.2)	13.2 (10.1-18.1)	15.2 (10.6-20.9)	18.6 (12.3-26.5)	21.5 (13.9-31.3)
10-day	4.86 (4.10-5.71)	5.95 (5.01-7.00)	7.73 (6.48-9.12)	9.20 (7.66-10.9)	11.2 (9.02-14.1)	12.7 (9.98-16.5)	14.4 (10.9-19.5)	16.5 (11.5-22.5)	19.8 (13.2-28.1)	22.7 (14.7-33.0)
20-day	7.01 (5.97-8.17)	8.17 (6.94-9.53)	10.1 (8.51-11.8)	11.6 (9.77-13.7)	13.8 (11.1-17.1)	15.4 (12.1-19.6)	17.1 (12.9-22.7)	19.1 (13.5-25.9)	22.1 (14.8-31.2)	24.6 (16.0-35.5)
30-day	8.82 (7.55-10.2)	10.0 (8.55-11.6)	12.0 (10.2-13.9)	13.6 (11.5-15.9)	15.8 (12.8-19.4)	17.5 (13.7-21.9)	19.2 (14.5-25.1)	21.1 (14.9-28.5)	23.8 (16.0-33.4)	25.9 (16.9-37.3)
45-day	11.1 (9.53-12.8)	12.3 (10.6-14.2)	14.3 (12.2-16.6)	16.0 (13.6-18.7)	18.3 (14.8-22.2)	20.0 (15.8-24.9)	21.8 (16.4-28.1)	23.6 (16.8-31.6)	25.9 (17.5-36.2)	27.7 (18.1-39.7)
60-day	12.9 (11.2-14.9)	14.2 (12.3-16.4)	16.3 (14.0-18.8)	18.0 (15.3-21.0)	20.4 (16.6-24.6)	22.2 (17.5-27.4)	24.0 (18.0-30.7)	25.7 (18.3-34.4)	27.9 (18.9-38.8)	29.4 (19.2-42.0)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical

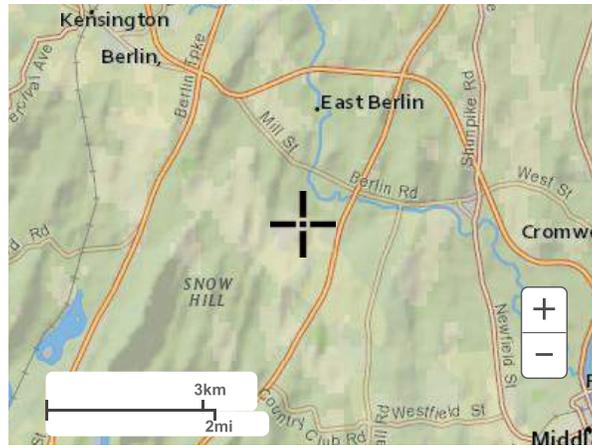
PDS-based depth-duration-frequency (DDF) curves
 Latitude: 41.5982°, Longitude: -72.7171°



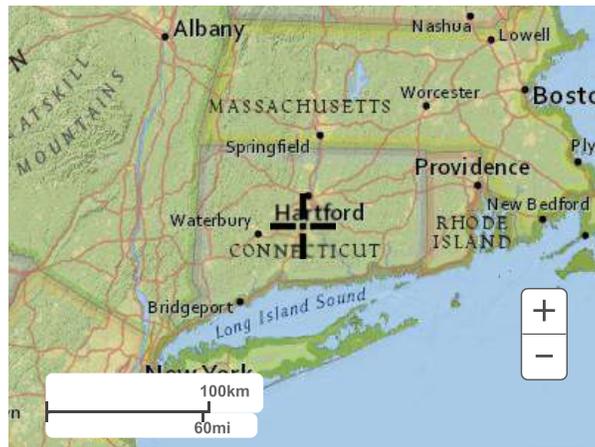
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Maps & aeriels

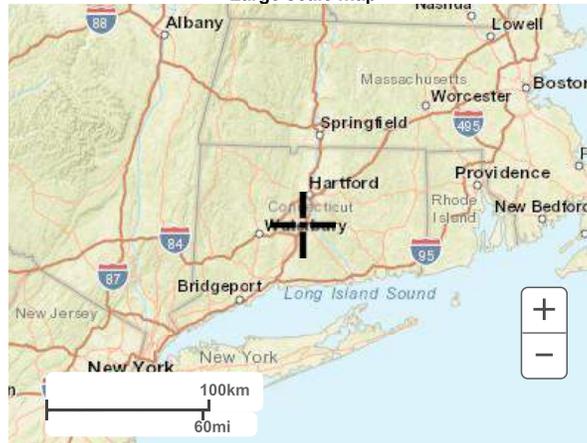
Small scale terrain



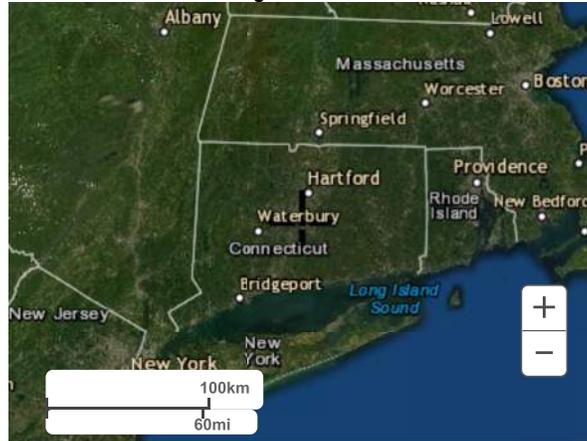
Large scale terrain



Large scale map



Large scale aerial



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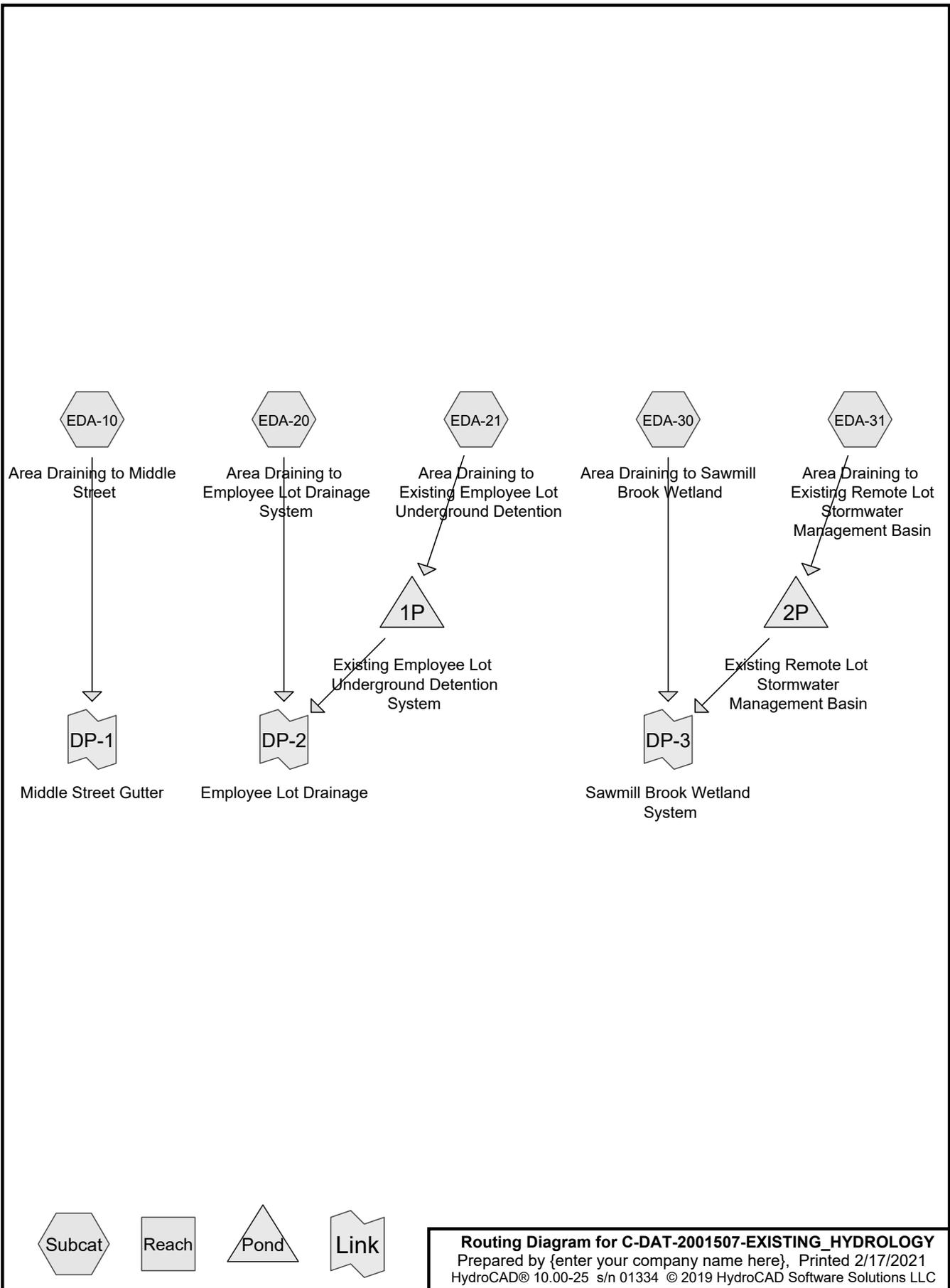
[US Department of Commerce](#)
[National Oceanic and Atmospheric Administration](#)
[National Weather Service](#)
[National Water Center](#)
 1325 East West Highway
 Silver Spring, MD 20910
 Questions?: HDSC.Questions@noaa.gov

[Disclaimer](#)



An Employee-Owned Company
Stormwater Management Report

APPENDIX B
PRE-DEVELOPMENT HYDROLOGY



Routing Diagram for C-DAT-2001507-EXISTING_HYDROLOGY
 Prepared by {enter your company name here}, Printed 2/17/2021
 HydroCAD® 10.00-25 s/n 01334 © 2019 HydroCAD Software Solutions LLC

C-DAT-2001507-EXISTING_HYD CT_Middletown_2001507_Depth 24-hr S1 2-yr Rainfall=3.29"

Prepared by {enter your company name here}

Printed 2/17/2021

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Page 2

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEDA-10: Area Draining to Runoff Area=40,445 sf 6.03% Impervious Runoff Depth>1.83"
Flow Length=962' Tc=9.9 min CN=85 Runoff=1.87 cfs 6,164 cf

SubcatchmentEDA-20: Area Draining to Runoff Area=35,785 sf 38.70% Impervious Runoff Depth>2.15"
Flow Length=786' Tc=16.4 min CN=89 Runoff=1.51 cfs 6,422 cf

SubcatchmentEDA-21: Area Draining to Runoff Area=274,555 sf 70.95% Impervious Runoff Depth>2.63"
Flow Length=815' Tc=8.2 min CN=94 Runoff=19.19 cfs 60,080 cf

SubcatchmentEDA-30: Area Draining to Runoff Area=2,323,615 sf 2.17% Impervious Runoff Depth>0.95"
Flow Length=4,372' Tc=88.6 min CN=72 Runoff=15.19 cfs 183,101 cf

SubcatchmentEDA-31: Area Draining to Runoff Area=298,710 sf 69.55% Impervious Runoff Depth>2.25"
Flow Length=1,004' Tc=5.0 min CN=90 Runoff=21.90 cfs 55,985 cf

Pond 1P: Existing Employee Lot Peak Elev=127.18' Storage=30,302 cf Inflow=19.19 cfs 60,080 cf
Outflow=2.28 cfs 49,190 cf

Pond 2P: Existing Remote Lot Stormwater Peak Elev=23.29' Storage=30,573 cf Inflow=21.90 cfs 55,985 cf
Outflow=1.40 cfs 40,046 cf

Link DP-1: Middle Street Gutter Inflow=1.87 cfs 6,164 cf
Primary=1.87 cfs 6,164 cf

Link DP-2: Employee Lot Drainage Inflow=3.55 cfs 55,612 cf
Primary=3.55 cfs 55,612 cf

Link DP-3: Sawmill Brook Wetland System Inflow=16.58 cfs 223,147 cf
Primary=16.58 cfs 223,147 cf

Total Runoff Area = 2,973,110 sf Runoff Volume = 311,752 cf Average Runoff Depth = 1.26"
84.22% Pervious = 2,503,810 sf 15.78% Impervious = 469,300 sf

Summary for Subcatchment EDA-10: Area Draining to Middle Street

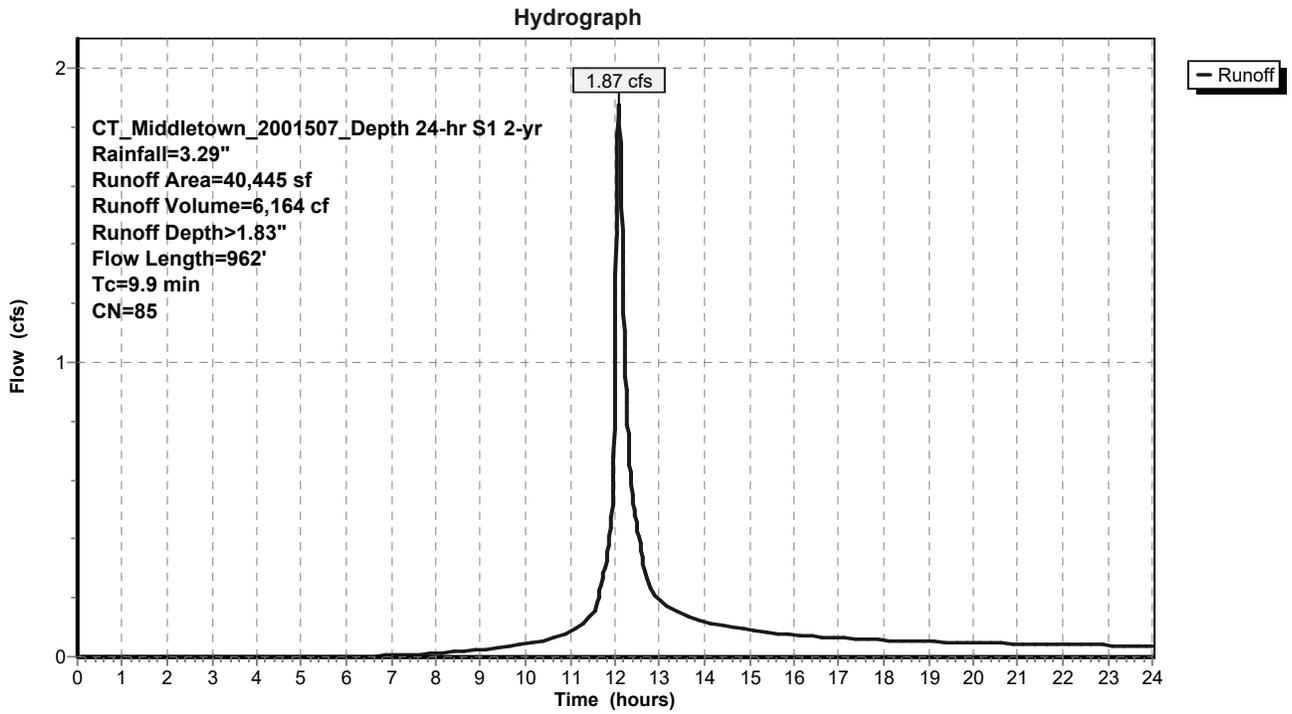
Runoff = 1.87 cfs @ 12.09 hrs, Volume= 6,164 cf, Depth> 1.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 2-yr Rainfall=3.29"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
37,835	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
2,440	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
170	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
40,445	85	Weighted Average
38,005		93.97% Pervious Area
2,440		6.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	28	0.1406	0.20		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
1.1	72	0.0120	1.06		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
6.5	862	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.9	962	Total			

Subcatchment EDA-10: Area Draining to Middle Street



Summary for Subcatchment EDA-20: Area Draining to Employee Lot Drainage System

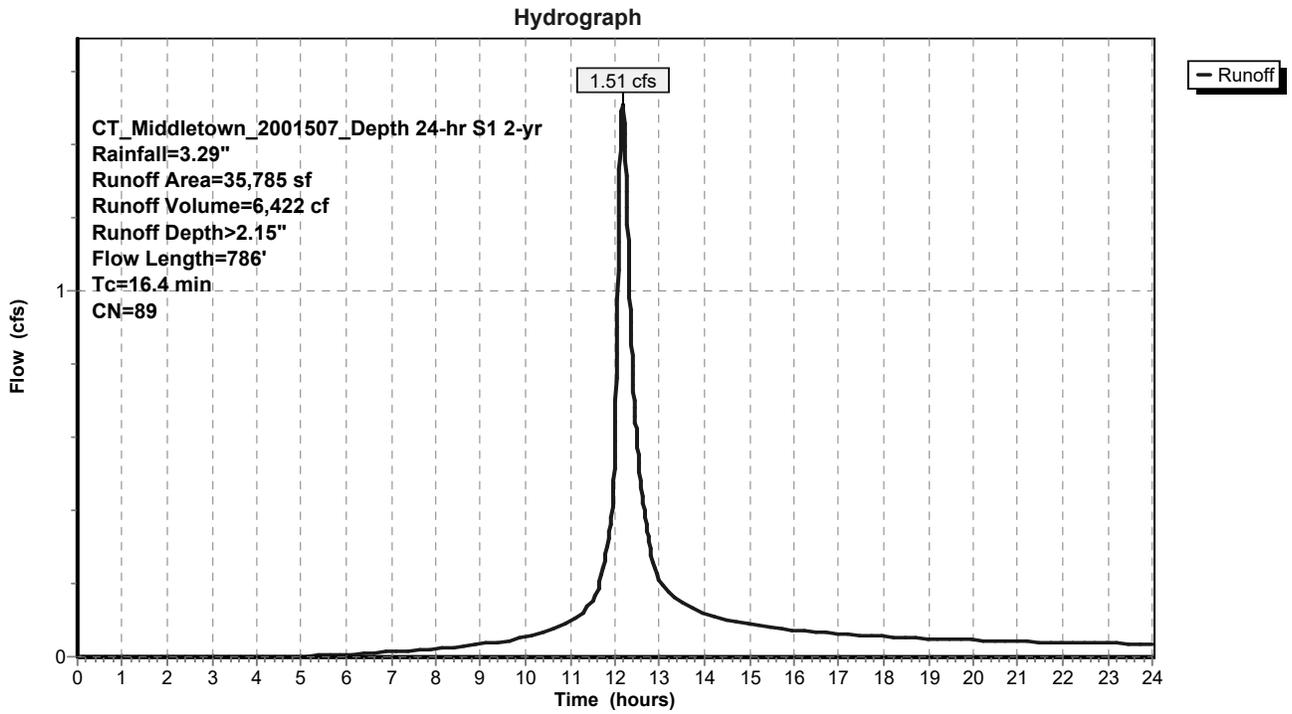
Runoff = 1.51 cfs @ 12.17 hrs, Volume= 6,422 cf, Depth> 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 2-yr Rainfall=3.29"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
21,935	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
13,850	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
35,785	89	Weighted Average
21,935		61.30% Pervious Area
13,850		38.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	72	0.0133	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
0.3	28	0.0357	1.36		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.7	308	0.0211	2.95		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.5	317	0.0050	3.47	2.73	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.2	61	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Concrete pipe, finished
16.4	786	Total			

Subcatchment EDA-20: Area Draining to Employee Lot Drainage System



Summary for Subcatchment EDA-21: Area Draining to Existing Employee Lot Underground Detention

Runoff = 19.19 cfs @ 12.06 hrs, Volume= 60,080 cf, Depth> 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 2-yr Rainfall=3.29"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
79,335	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
194,785	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
435	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
274,555	94	Weighted Average
79,770		29.05% Pervious Area
194,785		70.95% Impervious Area

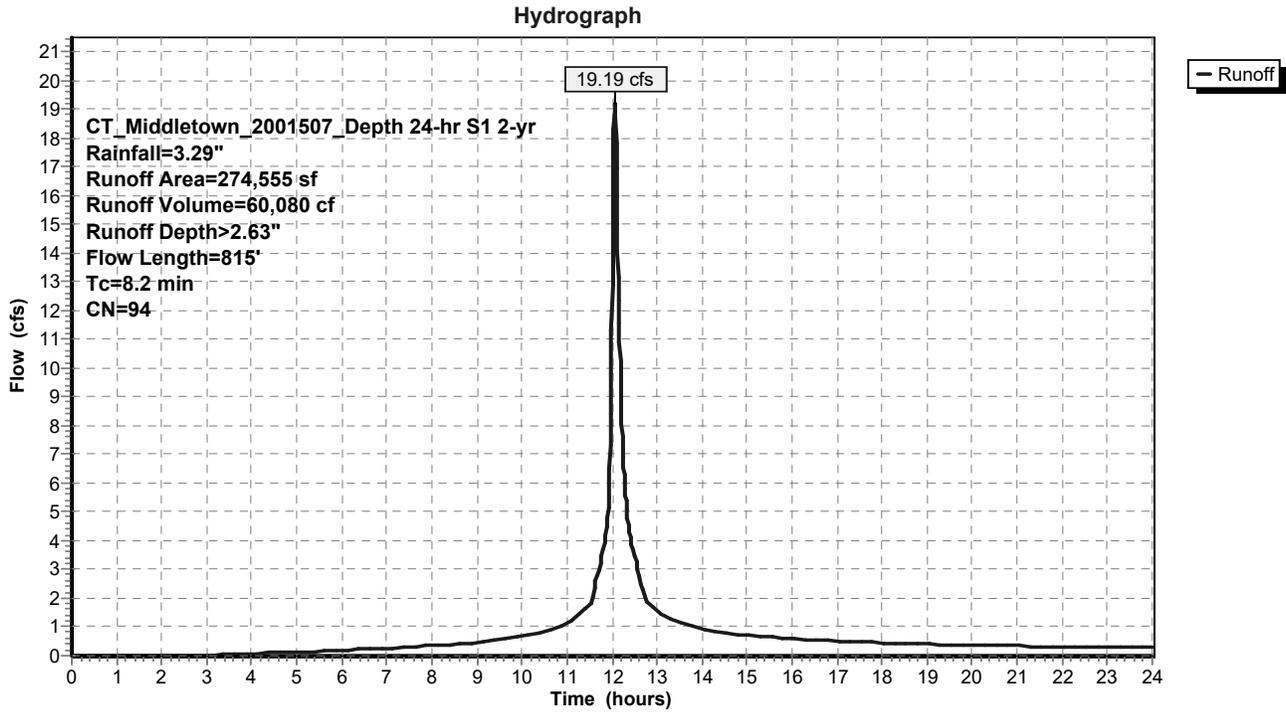
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	19	0.0160	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
1.1	81	0.0160	1.22		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.1	164	0.0160	2.57		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.5	130	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Concrete pipe, finished
0.6	152	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Concrete pipe, finished
0.3	108	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.3	101	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.1	38	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.1	22	0.0050	7.23	51.09	Pipe Channel,

36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'

n= 0.012 Concrete pipe, finished

8.2 815 Total

Subcatchment EDA-21: Area Draining to Existing Employee Lot Underground Detention



Summary for Subcatchment EDA-30: Area Draining to Sawmill Brook Wetland

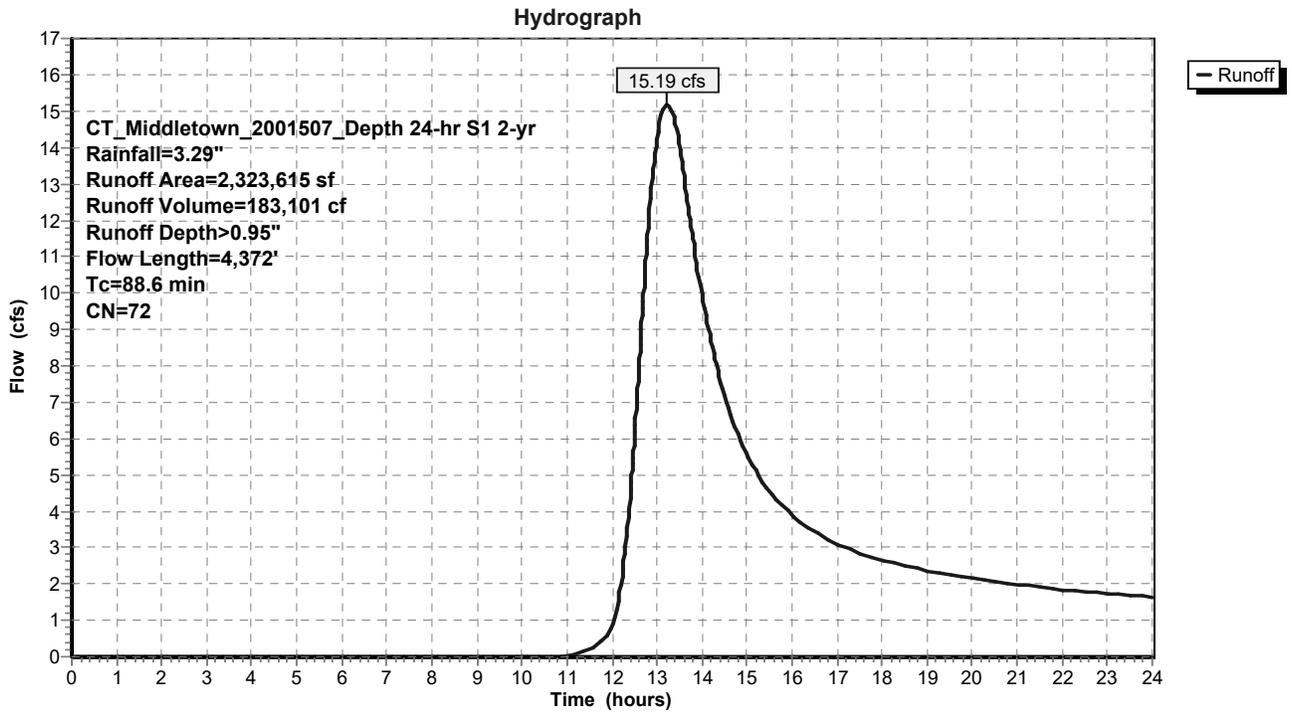
Runoff = 15.19 cfs @ 13.20 hrs, Volume= 183,101 cf, Depth> 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 2-yr Rainfall=3.29"

Area (sf)	CN	Description
740	69	50-75% Grass cover, Fair, HSG B
78,990	79	50-75% Grass cover, Fair, HSG C
29,705	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
15,875	98	Paved parking, HSG C
34,605	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
250	96	Gravel surface, HSG C
355	96	Gravel surface, HSG D
256,170	56	Brush, Fair, HSG B
103,140	70	Brush, Fair, HSG C
9,505	77	Brush, Fair, HSG D
451,555	60	Woods, Fair, HSG B
279,895	73	Woods, Fair, HSG C
1,062,830	79	Woods, Fair, HSG D
2,323,615	72	Weighted Average
2,273,135		97.83% Pervious Area
50,480		2.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.8	100	0.0110	0.04		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.29"
15.4	486	0.0110	0.52		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
26.4	3,786	0.0049	2.39	71.77	Channel Flow, Area= 30.0 sf Perim= 34.0' r= 0.88' n= 0.040 Winding stream, pools & shoals
88.6	4,372	Total			

Subcatchment EDA-30: Area Draining to Sawmill Brook Wetland



Summary for Subcatchment EDA-31: Area Draining to Existing Remote Lot Stormwater Management Basin

Runoff = 21.90 cfs @ 12.03 hrs, Volume= 55,985 cf, Depth> 2.25"

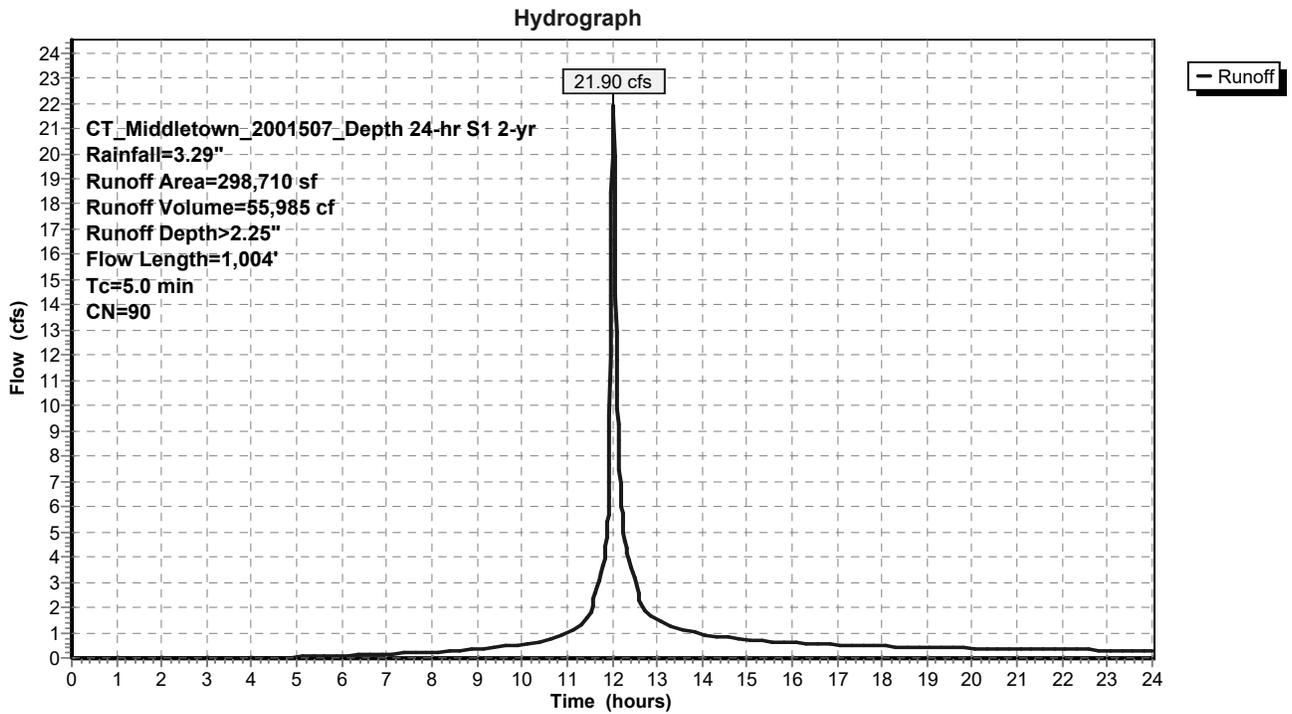
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 2-yr Rainfall=3.29"

Area (sf)	CN	Description
32,870	69	50-75% Grass cover, Fair, HSG B
14,665	79	50-75% Grass cover, Fair, HSG C
0	84	50-75% Grass cover, Fair, HSG D
152,690	98	Paved parking, HSG B
55,055	98	Paved parking, HSG C
0	98	Paved parking, HSG D
2,590	96	Gravel surface, HSG B
2,215	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
12,190	56	Brush, Fair, HSG B
26,435	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
298,710	90	Weighted Average
90,965		30.45% Pervious Area
207,745		69.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0180	1.34		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.0	165	0.0180	2.72		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	80	0.0050	3.47	2.73	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.5	168	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.4	162	0.0050	6.40	31.42	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Concrete pipe, finished
0.3	121	0.0050	6.40	31.42	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Concrete pipe, finished
0.2	70	0.0050	7.23	51.09	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
0.3	138	0.0050	7.23	51.09	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished

4.3 1,004 Total, Increased to minimum Tc = 5.0 min

Subcatchment EDA-31: Area Draining to Existing Remote Lot Stormwater Management Basin



Summary for Pond 1P: Existing Employee Lot Underground Detention System

Inflow Area = 274,555 sf, 70.95% Impervious, Inflow Depth > 2.63" for 2-yr event
 Inflow = 19.19 cfs @ 12.06 hrs, Volume= 60,080 cf
 Outflow = 2.28 cfs @ 12.66 hrs, Volume= 49,190 cf, Atten= 88%, Lag= 36.2 min
 Primary = 2.28 cfs @ 12.66 hrs, Volume= 49,190 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 127.18' @ 12.66 hrs Surf.Area= 11,725 sf Storage= 30,302 cf

Plug-Flow detention time= 232.7 min calculated for 49,170 cf (82% of inflow)
 Center-of-Mass det. time= 148.9 min (945.1 - 796.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	123.50'	2,345 cf	64.19'W x 182.67'L x 9.50'H Field A 111,387 cf Overall - 105,524 cf Embedded = 5,862 cf x 40.0% Voids
#2A	124.00'	83,580 cf	StormTrap ST2 DoubleTrap 8-0x 66 Inside #1 Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf 66 Chambers in 6 Rows 50.88' x 169.35' Core + 6.66' Border = 64.19' x 182.67' System
		85,925 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	125.00'	24.0" Round Culvert L= 1,560.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 125.00' / 85.00' S= 0.0256 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	125.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	129.00'	12.0" Vert. Orifice/Grate C= 0.600
#4	Device 1	132.50'	3.0' long x 2.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=2.28 cfs @ 12.66 hrs HW=127.18' (Free Discharge)

- 1=Culvert (Passes 2.28 cfs of 16.40 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 2.28 cfs @ 6.54 fps)
- 3=Orifice/Grate (Controls 0.00 cfs)
- 4=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 1P: Existing Employee Lot Underground Detention System - Chamber Wizard Field A

Chamber Model = StormTrapST2 DoubleTrap 8-0 (StormTrapST2 DoubleTrap®Type II+IV)

Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf

Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf

11 Chambers/Row x 15.40' Long = 169.35' Row Length +79.9" Border x 2 = 182.67' Base Length

6 Rows x 101.7" Wide + 79.9" Side Border x 2 = 64.19' Base Width

6.0" Base + 108.0" Chamber Height = 9.50' Field Height

66 Chambers x 940.5 cf + 21,503.9 cf Border = 83,579.7 cf Chamber Storage

66 Chambers x 1,174.9 cf + 27,981.2 cf Border = 105,524.2 cf Displacement

111,386.7 cf Field - 105,524.2 cf Chambers = 5,862.5 cf Stone x 40.0% Voids = 2,345.0 cf Stone Storage

Chamber Storage + Stone Storage = 85,924.7 cf = 1.973 af

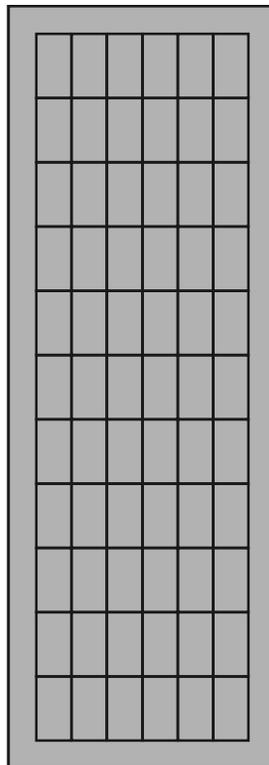
Overall Storage Efficiency = 77.1%

Overall System Size = 182.67' x 64.19' x 9.50'

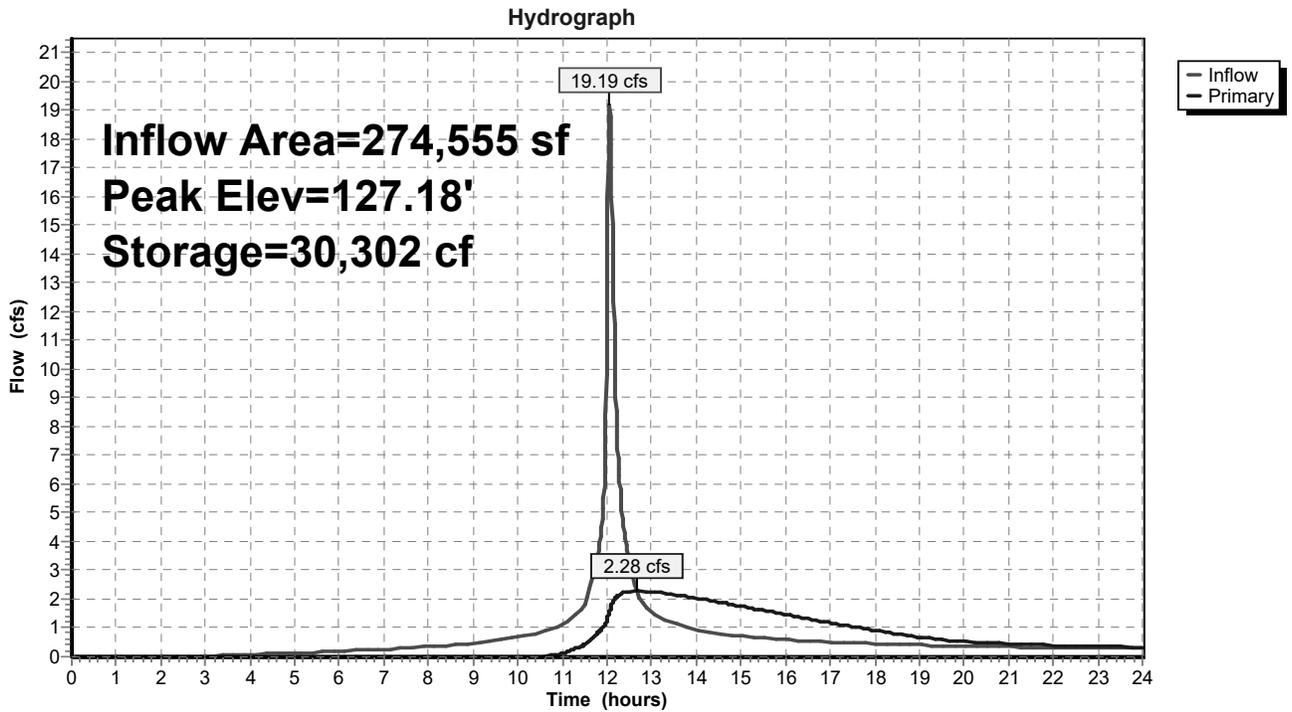
66 Chambers (plus border)

4,125.4 cy Field

217.1 cy Stone



Pond 1P: Existing Employee Lot Underground Detention System



Summary for Pond 2P: Existing Remote Lot Stormwater Management Basin

Inflow Area = 298,710 sf, 69.55% Impervious, Inflow Depth > 2.25" for 2-yr event
 Inflow = 21.90 cfs @ 12.03 hrs, Volume= 55,985 cf
 Outflow = 1.40 cfs @ 13.13 hrs, Volume= 40,046 cf, Atten= 94%, Lag= 66.2 min
 Primary = 1.40 cfs @ 13.13 hrs, Volume= 40,046 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 23.29' @ 13.13 hrs Surf.Area= 13,199 sf Storage= 30,573 cf

Plug-Flow detention time= 322.2 min calculated for 40,046 cf (72% of inflow)
 Center-of-Mass det. time= 211.7 min (1,030.4 - 818.7)

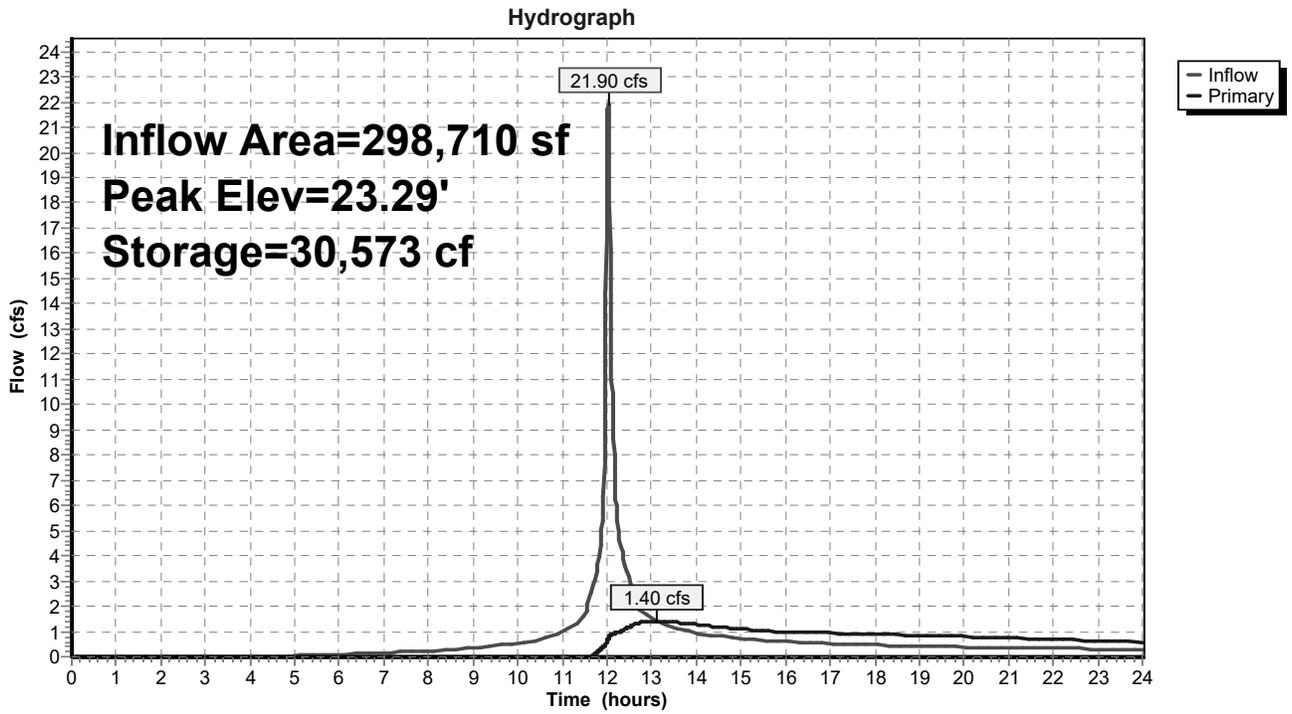
Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	94,737 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	5,895	0	0
21.00	7,748	6,822	6,822
22.00	9,895	8,822	15,643
23.00	12,598	11,247	26,890
24.00	14,704	13,651	40,541
25.00	16,889	15,797	56,337
26.00	19,175	18,032	74,369
27.00	21,560	20,368	94,737

Device	Routing	Invert	Outlet Devices
#1	Primary	21.28'	18.0" Round Culvert L= 55.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 21.28' / 21.00' S= 0.0051 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	21.28'	5.5" Vert. Orifice/Grate C= 0.600
#3	Device 1	23.00'	12.0" Vert. Orifice/Grate X 2 rows with 6.0" cc spacing C= 0.600
#4	Device 1	26.50'	3.0" x 2.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.40 cfs @ 13.13 hrs HW=23.29' (Free Discharge)

- 1=Culvert (Passes 1.40 cfs of 8.44 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.06 cfs @ 6.42 fps)
- 3=Orifice/Grate (Orifice Controls 0.34 cfs @ 1.82 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond 2P: Existing Remote Lot Stormwater Management Basin

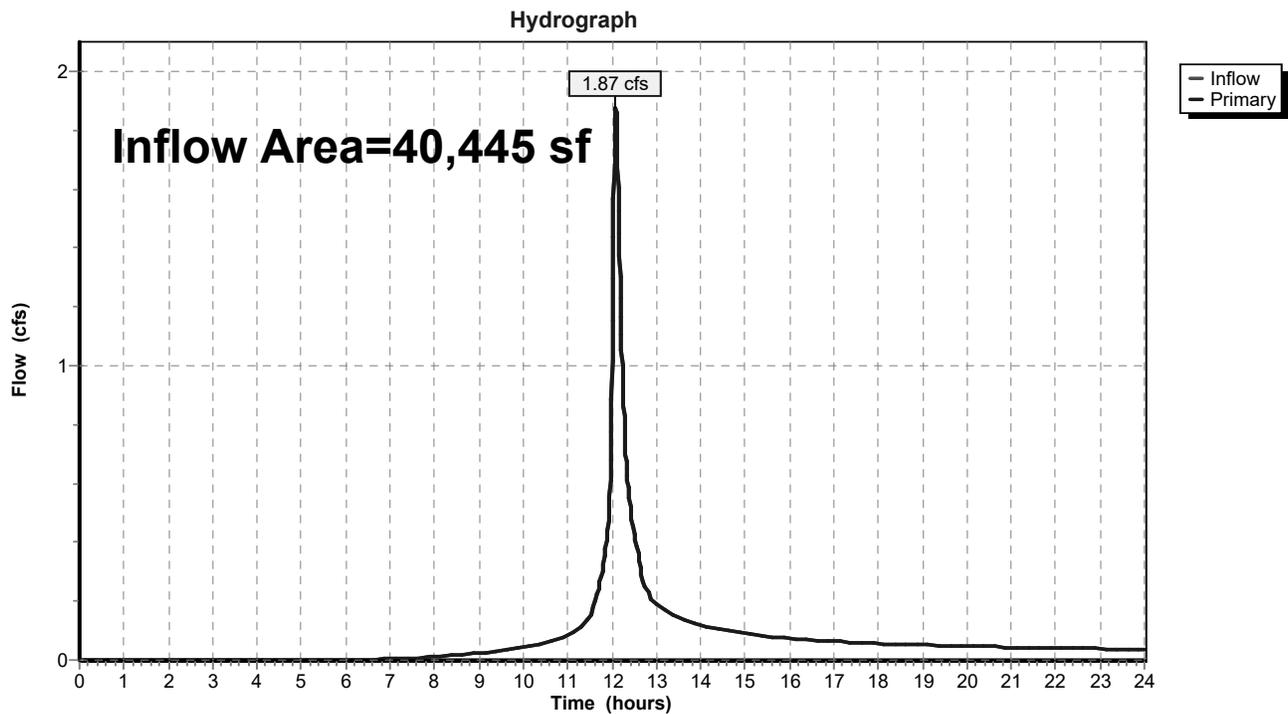


Summary for Link DP-1: Middle Street Gutter

Inflow Area = 40,445 sf, 6.03% Impervious, Inflow Depth > 1.83" for 2-yr event
Inflow = 1.87 cfs @ 12.09 hrs, Volume= 6,164 cf
Primary = 1.87 cfs @ 12.09 hrs, Volume= 6,164 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-1: Middle Street Gutter

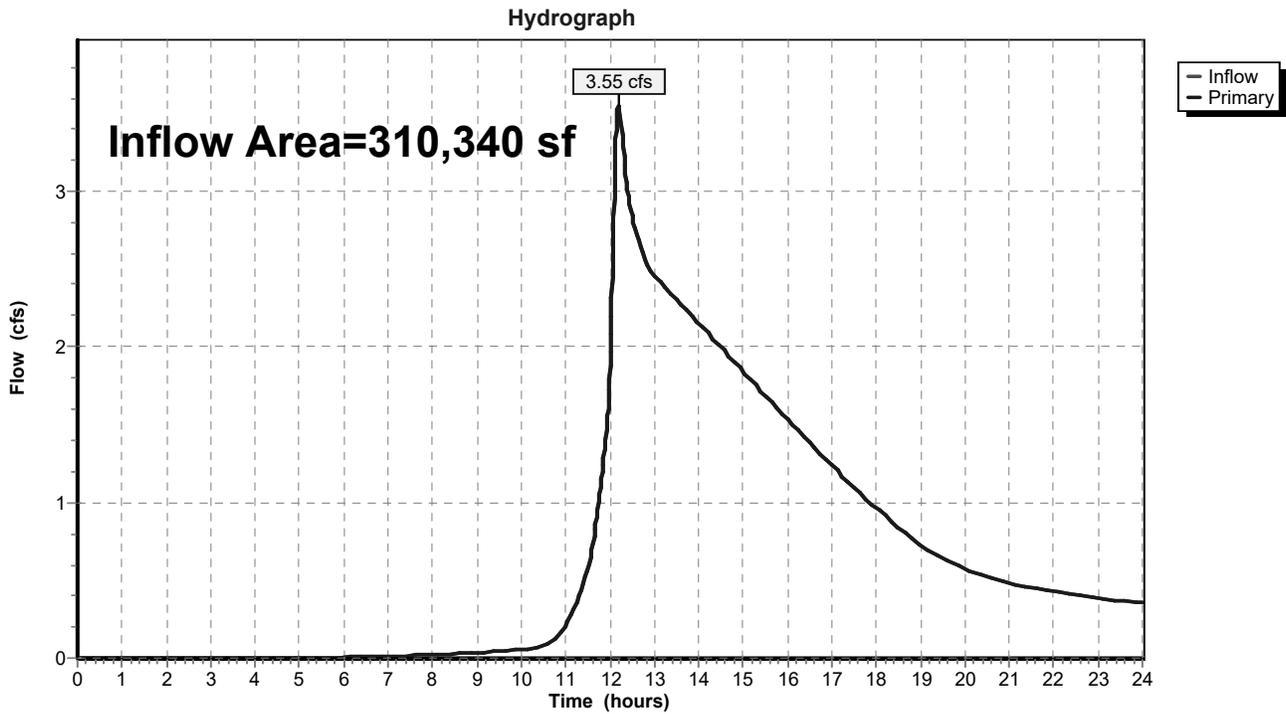


Summary for Link DP-2: Employee Lot Drainage

Inflow Area = 310,340 sf, 67.23% Impervious, Inflow Depth > 2.15" for 2-yr event
Inflow = 3.55 cfs @ 12.19 hrs, Volume= 55,612 cf
Primary = 3.55 cfs @ 12.19 hrs, Volume= 55,612 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-2: Employee Lot Drainage



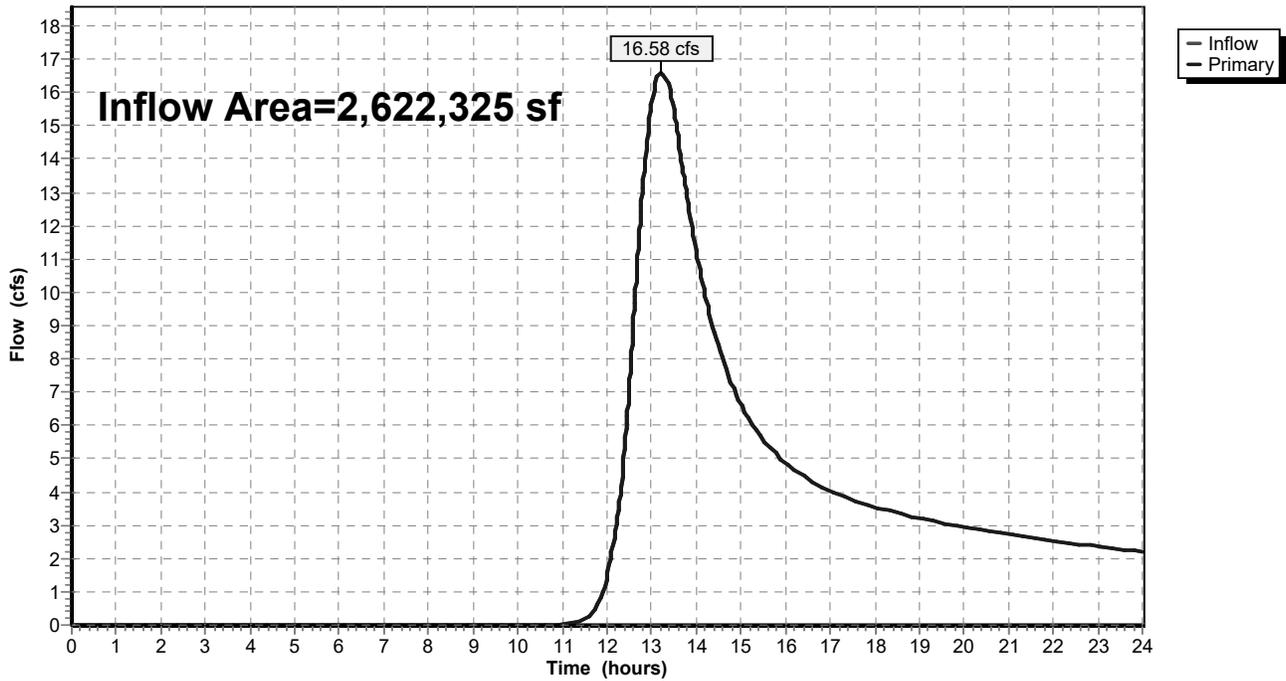
Summary for Link DP-3: Sawmill Brook Wetland System

Inflow Area = 2,622,325 sf, 9.85% Impervious, Inflow Depth > 1.02" for 2-yr event
Inflow = 16.58 cfs @ 13.20 hrs, Volume= 223,147 cf
Primary = 16.58 cfs @ 13.20 hrs, Volume= 223,147 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-3: Sawmill Brook Wetland System

Hydrograph



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEDA-10: Area Draining to Runoff Area=40,445 sf 6.03% Impervious Runoff Depth>3.52"
Flow Length=962' Tc=9.9 min CN=85 Runoff=3.51 cfs 11,880 cf

SubcatchmentEDA-20: Area Draining to Runoff Area=35,785 sf 38.70% Impervious Runoff Depth>3.93"
Flow Length=786' Tc=16.4 min CN=89 Runoff=2.64 cfs 11,711 cf

SubcatchmentEDA-21: Area Draining to Runoff Area=274,555 sf 70.95% Impervious Runoff Depth>4.48"
Flow Length=815' Tc=8.2 min CN=94 Runoff=31.09 cfs 102,428 cf

SubcatchmentEDA-30: Area Draining to Runoff Area=2,323,615 sf 2.17% Impervious Runoff Depth>2.26"
Flow Length=4,372' Tc=88.6 min CN=72 Runoff=38.01 cfs 436,894 cf

SubcatchmentEDA-31: Area Draining to Runoff Area=298,710 sf 69.55% Impervious Runoff Depth>4.04"
Flow Length=1,004' Tc=5.0 min CN=90 Runoff=37.61 cfs 100,690 cf

Pond 1P: Existing Employee Lot Peak Elev=128.89' Storage=48,261 cf Inflow=31.09 cfs 102,428 cf
Outflow=3.17 cfs 90,182 cf

Pond 2P: Existing Remote Lot Peak Elev=24.31' Storage=45,255 cf Inflow=37.61 cfs 100,690 cf
Outflow=6.84 cfs 79,265 cf

Link DP-1: Middle Street Gutter Inflow=3.51 cfs 11,880 cf
Primary=3.51 cfs 11,880 cf

Link DP-2: Employee Lot Drainage Inflow=5.48 cfs 101,893 cf
Primary=5.48 cfs 101,893 cf

Link DP-3: Sawmill Brook Wetland System Inflow=42.50 cfs 516,159 cf
Primary=42.50 cfs 516,159 cf

Total Runoff Area = 2,973,110 sf Runoff Volume = 663,603 cf Average Runoff Depth = 2.68"
84.22% Pervious = 2,503,810 sf 15.78% Impervious = 469,300 sf

Summary for Subcatchment EDA-10: Area Draining to Middle Street

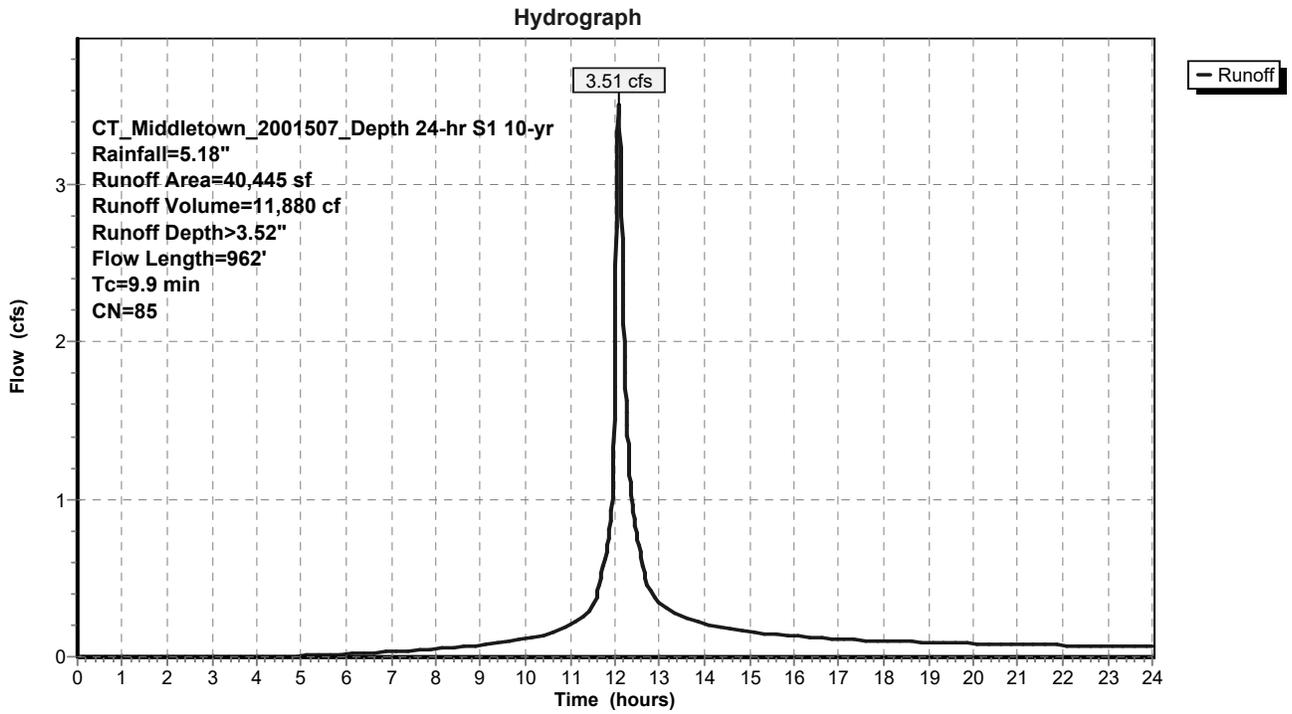
Runoff = 3.51 cfs @ 12.09 hrs, Volume= 11,880 cf, Depth> 3.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 10-yr Rainfall=5.18"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
37,835	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
2,440	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
170	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
40,445	85	Weighted Average
38,005		93.97% Pervious Area
2,440		6.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	28	0.1406	0.20		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
1.1	72	0.0120	1.06		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
6.5	862	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.9	962	Total			

Subcatchment EDA-10: Area Draining to Middle Street



Summary for Subcatchment EDA-20: Area Draining to Employee Lot Drainage System

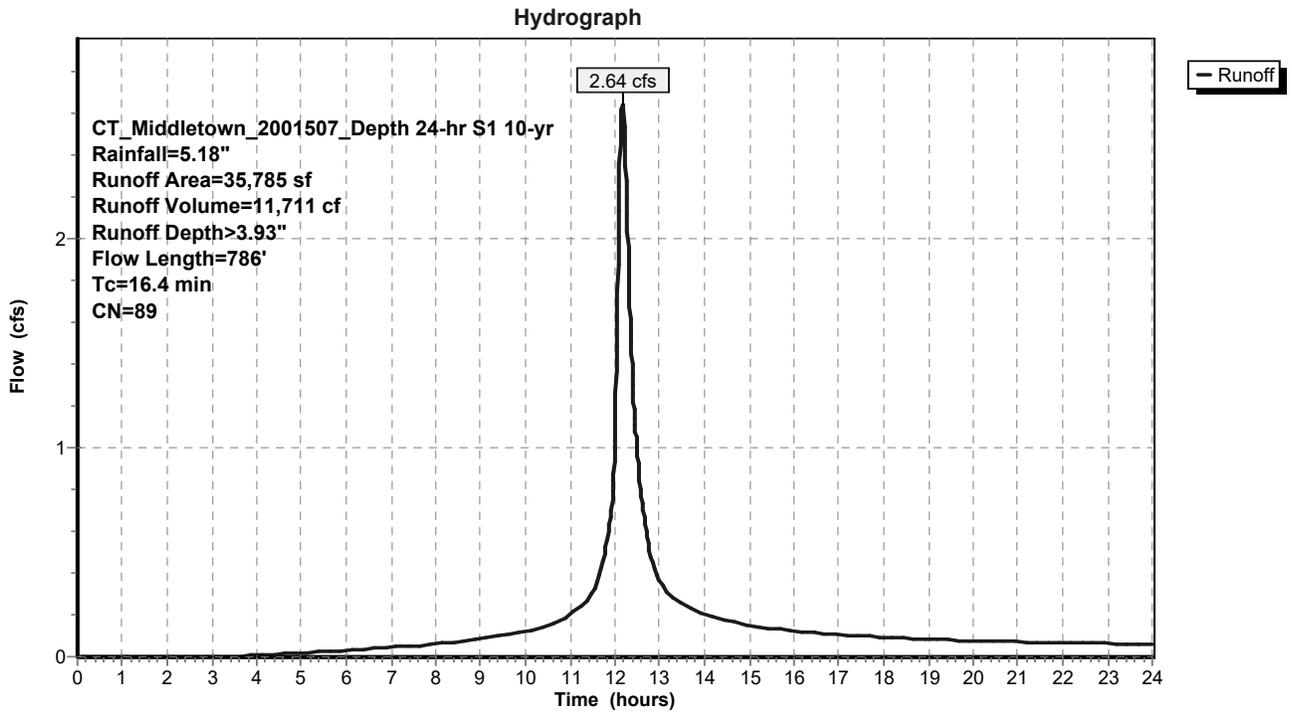
Runoff = 2.64 cfs @ 12.17 hrs, Volume= 11,711 cf, Depth> 3.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 10-yr Rainfall=5.18"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
21,935	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
13,850	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
35,785	89	Weighted Average
21,935		61.30% Pervious Area
13,850		38.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	72	0.0133	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
0.3	28	0.0357	1.36		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.7	308	0.0211	2.95		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.5	317	0.0050	3.47	2.73	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.2	61	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Concrete pipe, finished
16.4	786	Total			

Subcatchment EDA-20: Area Draining to Employee Lot Drainage System



Summary for Subcatchment EDA-21: Area Draining to Existing Employee Lot Underground Detention

Runoff = 31.09 cfs @ 12.06 hrs, Volume= 102,428 cf, Depth> 4.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 10-yr Rainfall=5.18"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
79,335	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
194,785	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
435	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
274,555	94	Weighted Average
79,770		29.05% Pervious Area
194,785		70.95% Impervious Area

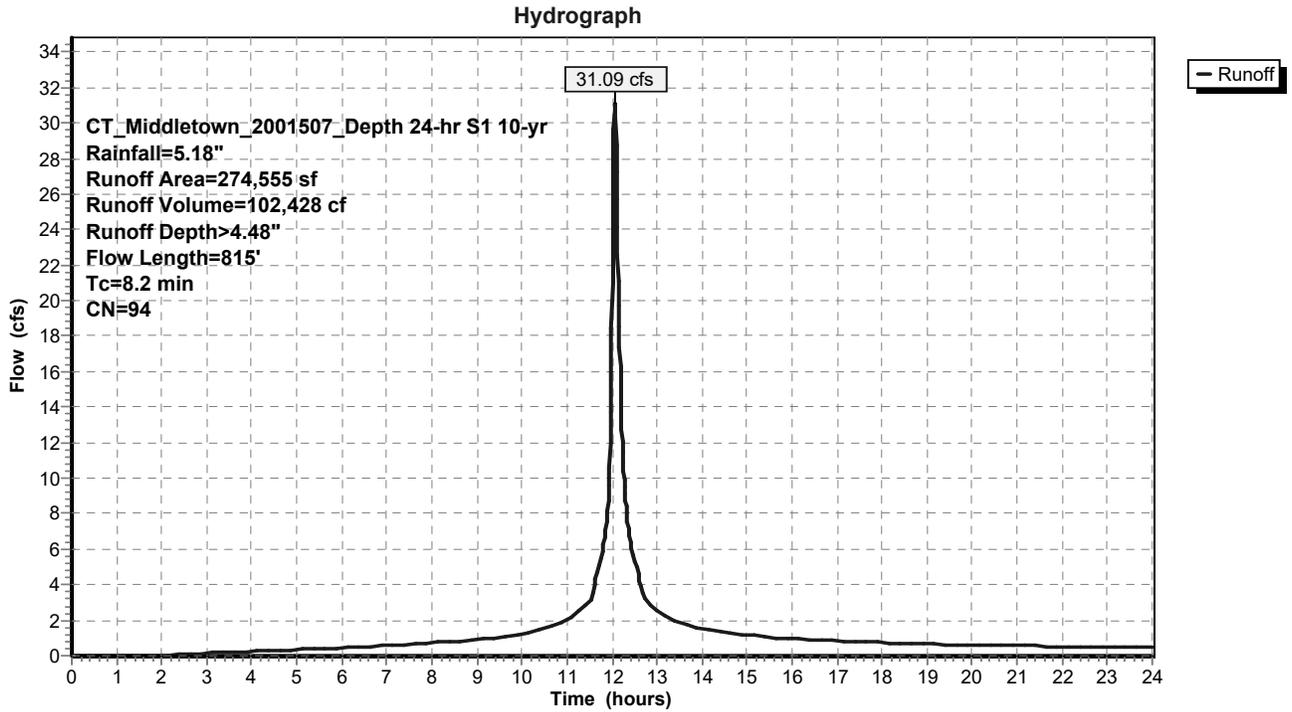
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	19	0.0160	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
1.1	81	0.0160	1.22		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.1	164	0.0160	2.57		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.5	130	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Concrete pipe, finished
0.6	152	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Concrete pipe, finished
0.3	108	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.3	101	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.1	38	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.1	22	0.0050	7.23	51.09	Pipe Channel,

36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'

n= 0.012 Concrete pipe, finished

8.2 815 Total

Subcatchment EDA-21: Area Draining to Existing Employee Lot Underground Detention



Summary for Subcatchment EDA-30: Area Draining to Sawmill Brook Wetland

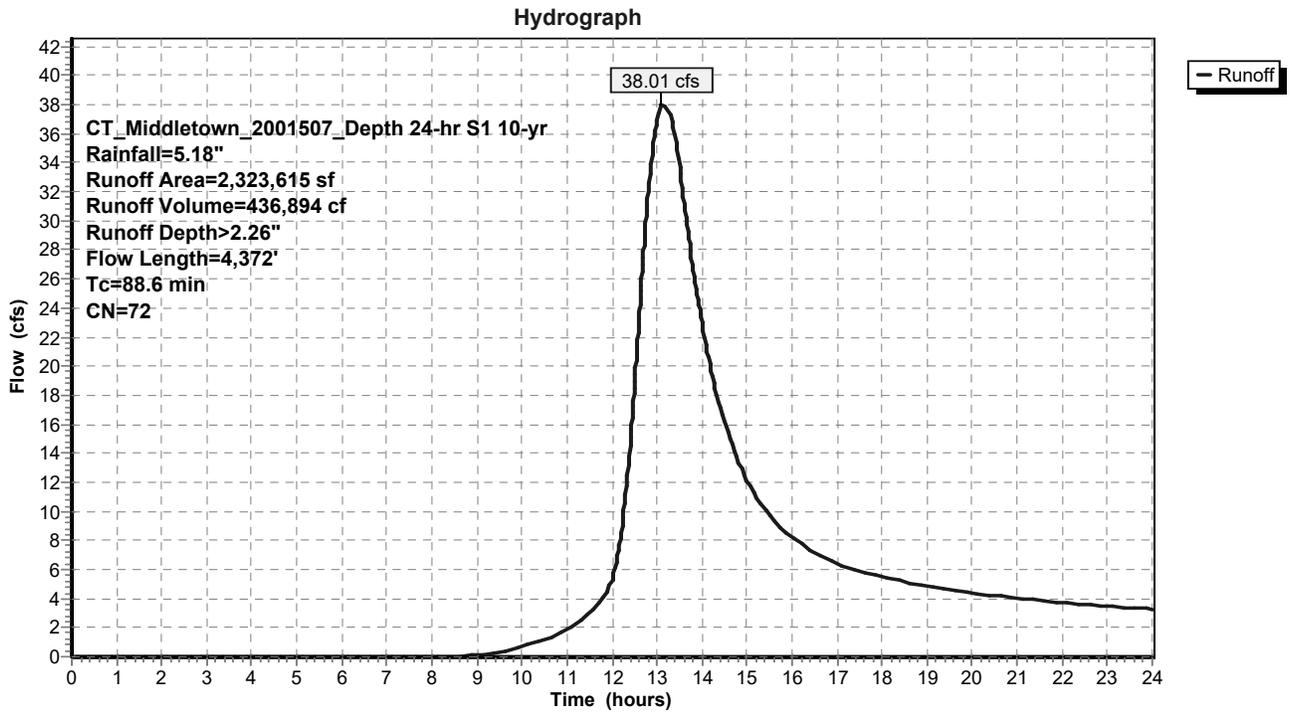
Runoff = 38.01 cfs @ 13.10 hrs, Volume= 436,894 cf, Depth> 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 10-yr Rainfall=5.18"

Area (sf)	CN	Description
740	69	50-75% Grass cover, Fair, HSG B
78,990	79	50-75% Grass cover, Fair, HSG C
29,705	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
15,875	98	Paved parking, HSG C
34,605	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
250	96	Gravel surface, HSG C
355	96	Gravel surface, HSG D
256,170	56	Brush, Fair, HSG B
103,140	70	Brush, Fair, HSG C
9,505	77	Brush, Fair, HSG D
451,555	60	Woods, Fair, HSG B
279,895	73	Woods, Fair, HSG C
1,062,830	79	Woods, Fair, HSG D
2,323,615	72	Weighted Average
2,273,135		97.83% Pervious Area
50,480		2.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.8	100	0.0110	0.04		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.29"
15.4	486	0.0110	0.52		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
26.4	3,786	0.0049	2.39	71.77	Channel Flow, Area= 30.0 sf Perim= 34.0' r= 0.88' n= 0.040 Winding stream, pools & shoals
88.6	4,372	Total			

Subcatchment EDA-30: Area Draining to Sawmill Brook Wetland



Summary for Subcatchment EDA-31: Area Draining to Existing Remote Lot Stormwater Management Basin

Runoff = 37.61 cfs @ 12.03 hrs, Volume= 100,690 cf, Depth> 4.04"

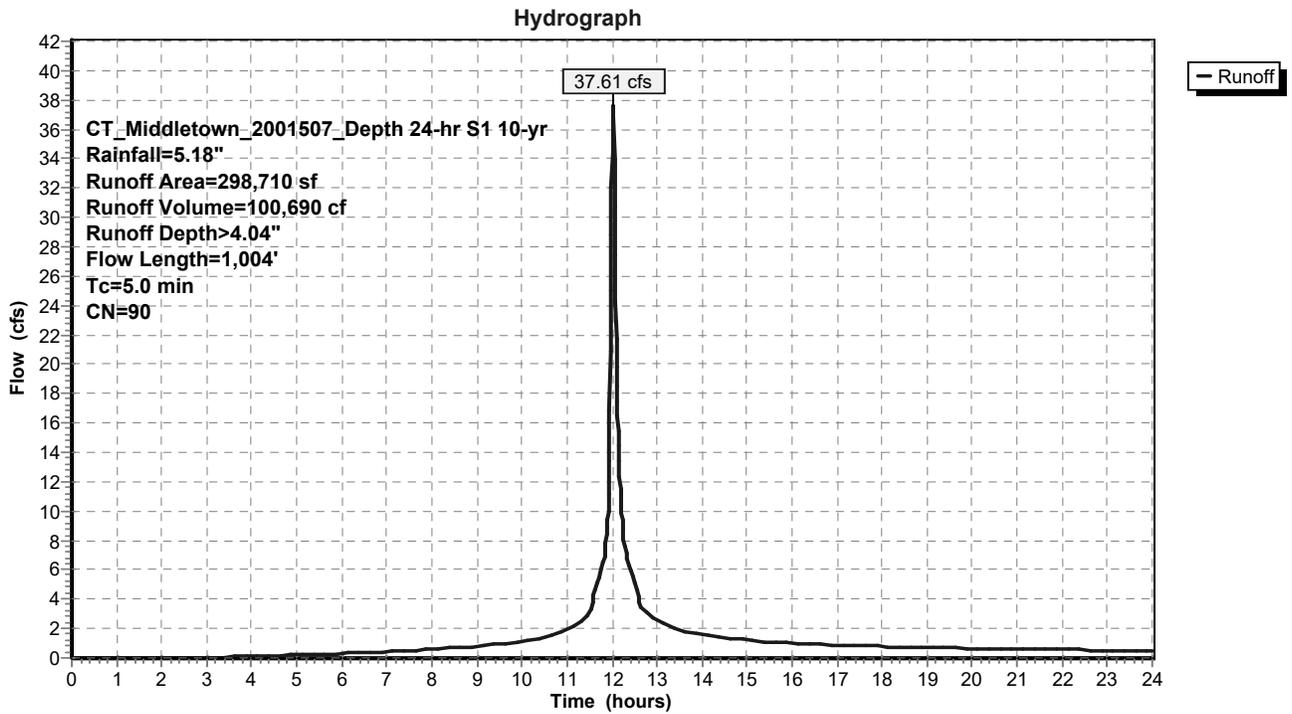
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 10-yr Rainfall=5.18"

Area (sf)	CN	Description
32,870	69	50-75% Grass cover, Fair, HSG B
14,665	79	50-75% Grass cover, Fair, HSG C
0	84	50-75% Grass cover, Fair, HSG D
152,690	98	Paved parking, HSG B
55,055	98	Paved parking, HSG C
0	98	Paved parking, HSG D
2,590	96	Gravel surface, HSG B
2,215	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
12,190	56	Brush, Fair, HSG B
26,435	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
298,710	90	Weighted Average
90,965		30.45% Pervious Area
207,745		69.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0180	1.34		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.0	165	0.0180	2.72		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	80	0.0050	3.47	2.73	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.5	168	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.4	162	0.0050	6.40	31.42	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Concrete pipe, finished
0.3	121	0.0050	6.40	31.42	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Concrete pipe, finished
0.2	70	0.0050	7.23	51.09	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
0.3	138	0.0050	7.23	51.09	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished

4.3 1,004 Total, Increased to minimum Tc = 5.0 min

Subcatchment EDA-31: Area Draining to Existing Remote Lot Stormwater Management Basin



Summary for Pond 1P: Existing Employee Lot Underground Detention System

Inflow Area = 274,555 sf, 70.95% Impervious, Inflow Depth > 4.48" for 10-yr event
 Inflow = 31.09 cfs @ 12.06 hrs, Volume= 102,428 cf
 Outflow = 3.17 cfs @ 12.75 hrs, Volume= 90,182 cf, Atten= 90%, Lag= 41.6 min
 Primary = 3.17 cfs @ 12.75 hrs, Volume= 90,182 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 128.89' @ 12.75 hrs Surf.Area= 11,725 sf Storage= 48,261 cf

Plug-Flow detention time= 231.8 min calculated for 90,182 cf (88% of inflow)
 Center-of-Mass det. time= 168.4 min (948.2 - 779.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	123.50'	2,345 cf	64.19'W x 182.67'L x 9.50'H Field A 111,387 cf Overall - 105,524 cf Embedded = 5,862 cf x 40.0% Voids
#2A	124.00'	83,580 cf	StormTrap ST2 DoubleTrap 8-0x 66 Inside #1 Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf 66 Chambers in 6 Rows 50.88' x 169.35' Core + 6.66' Border = 64.19' x 182.67' System
		85,925 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	125.00'	24.0" Round Culvert L= 1,560.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 125.00' / 85.00' S= 0.0256 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	125.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	129.00'	12.0" Vert. Orifice/Grate C= 0.600
#4	Device 1	132.50'	3.0' long x 2.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=3.17 cfs @ 12.75 hrs HW=128.89' (Free Discharge)

- 1=Culvert (Passes 3.17 cfs of 25.74 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 3.17 cfs @ 9.09 fps)
- 3=Orifice/Grate (Controls 0.00 cfs)
- 4=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 1P: Existing Employee Lot Underground Detention System - Chamber Wizard Field A

Chamber Model = StormTrapST2 DoubleTrap 8-0 (StormTrapST2 DoubleTrap®Type II+IV)

Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf
 Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf

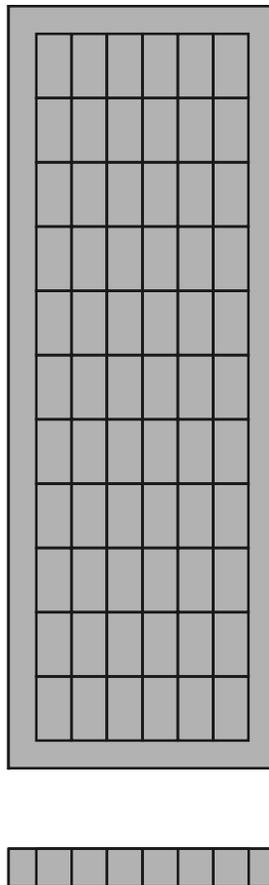
11 Chambers/Row x 15.40' Long = 169.35' Row Length +79.9" Border x 2 = 182.67' Base Length
 6 Rows x 101.7" Wide + 79.9" Side Border x 2 = 64.19' Base Width
 6.0" Base + 108.0" Chamber Height = 9.50' Field Height

66 Chambers x 940.5 cf + 21,503.9 cf Border = 83,579.7 cf Chamber Storage
 66 Chambers x 1,174.9 cf + 27,981.2 cf Border = 105,524.2 cf Displacement

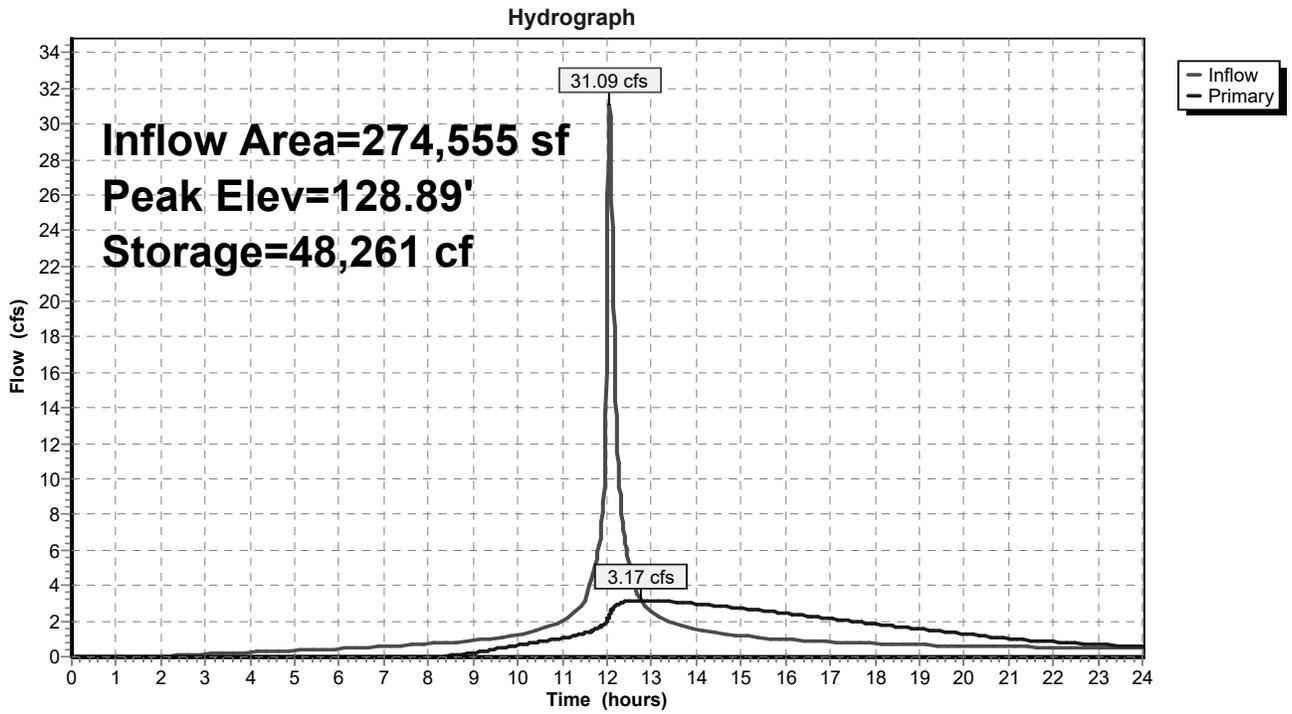
111,386.7 cf Field - 105,524.2 cf Chambers = 5,862.5 cf Stone x 40.0% Voids = 2,345.0 cf Stone Storage

Chamber Storage + Stone Storage = 85,924.7 cf = 1.973 af
 Overall Storage Efficiency = 77.1%
 Overall System Size = 182.67' x 64.19' x 9.50'

66 Chambers (plus border)
 4,125.4 cy Field
 217.1 cy Stone



Pond 1P: Existing Employee Lot Underground Detention System



Summary for Pond 2P: Existing Remote Lot Stormwater Management Basin

Inflow Area = 298,710 sf, 69.55% Impervious, Inflow Depth > 4.04" for 10-yr event
 Inflow = 37.61 cfs @ 12.03 hrs, Volume= 100,690 cf
 Outflow = 6.84 cfs @ 12.34 hrs, Volume= 79,265 cf, Atten= 82%, Lag= 18.7 min
 Primary = 6.84 cfs @ 12.34 hrs, Volume= 79,265 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 24.31' @ 12.34 hrs Surf.Area= 15,389 sf Storage= 45,255 cf

Plug-Flow detention time= 230.4 min calculated for 79,232 cf (79% of inflow)
 Center-of-Mass det. time= 135.9 min (934.9 - 799.0)

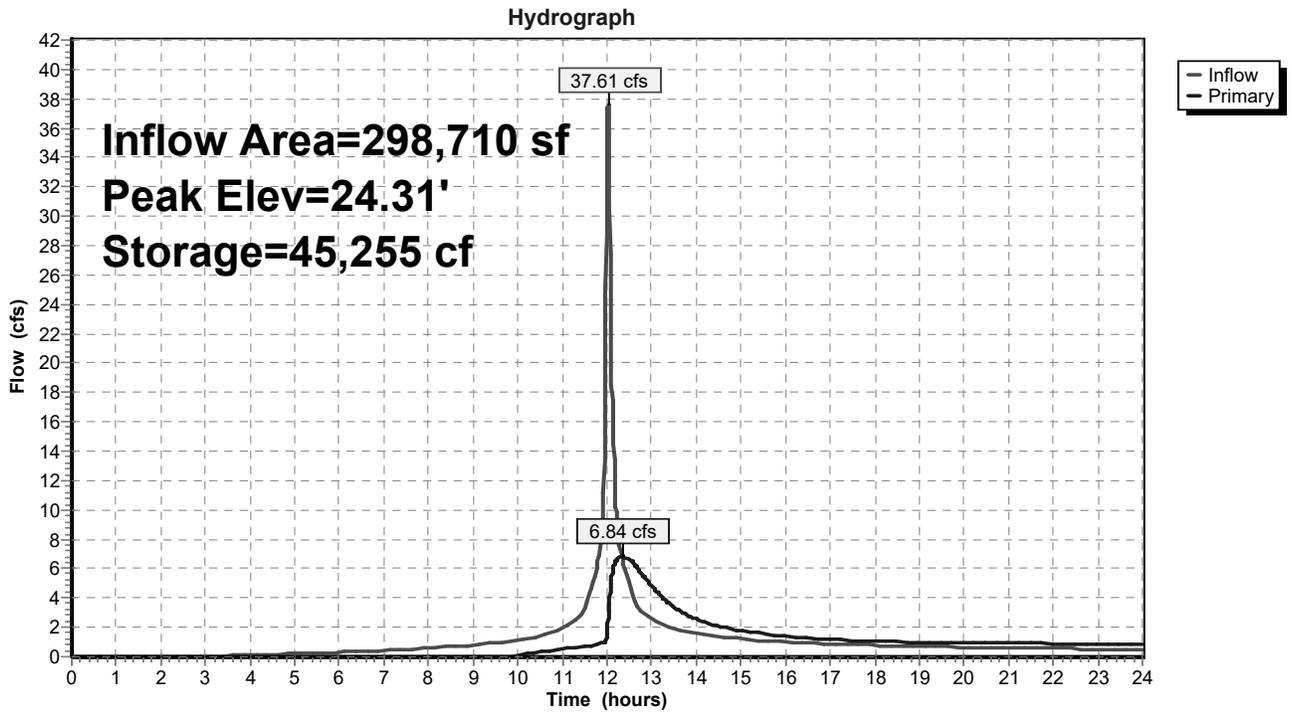
Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	94,737 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	5,895	0	0
21.00	7,748	6,822	6,822
22.00	9,895	8,822	15,643
23.00	12,598	11,247	26,890
24.00	14,704	13,651	40,541
25.00	16,889	15,797	56,337
26.00	19,175	18,032	74,369
27.00	21,560	20,368	94,737

Device	Routing	Invert	Outlet Devices
#1	Primary	21.28'	18.0" Round Culvert L= 55.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 21.28' / 21.00' S= 0.0051 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	21.28'	5.5" Vert. Orifice/Grate C= 0.600
#3	Device 1	23.00'	12.0" Vert. Orifice/Grate X 2 rows with 6.0" cc spacing C= 0.600
#4	Device 1	26.50'	3.0" x 2.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=6.84 cfs @ 12.34 hrs HW=24.31' (Free Discharge)

- 1=Culvert (Passes 6.84 cfs of 12.82 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.33 cfs @ 8.06 fps)
- 3=Orifice/Grate (Orifice Controls 5.51 cfs @ 3.75 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond 2P: Existing Remote Lot Stormwater Management Basin

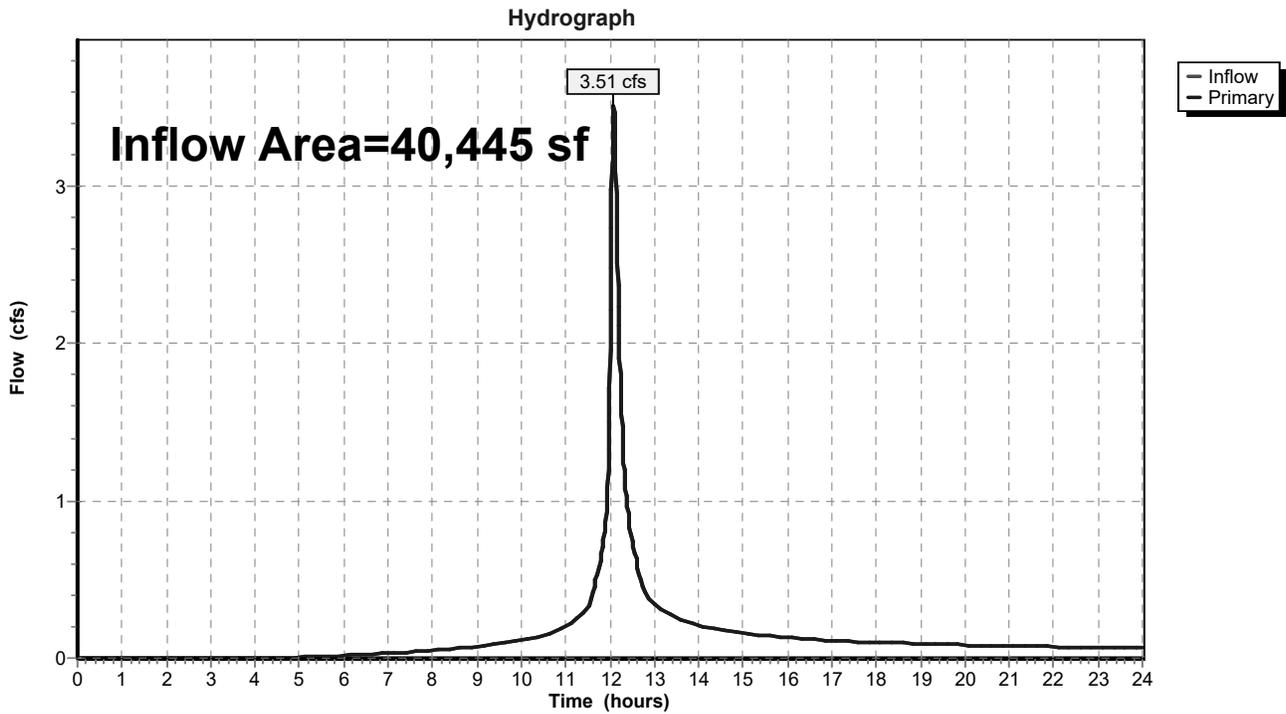


Summary for Link DP-1: Middle Street Gutter

Inflow Area = 40,445 sf, 6.03% Impervious, Inflow Depth > 3.52" for 10-yr event
Inflow = 3.51 cfs @ 12.09 hrs, Volume= 11,880 cf
Primary = 3.51 cfs @ 12.09 hrs, Volume= 11,880 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-1: Middle Street Gutter

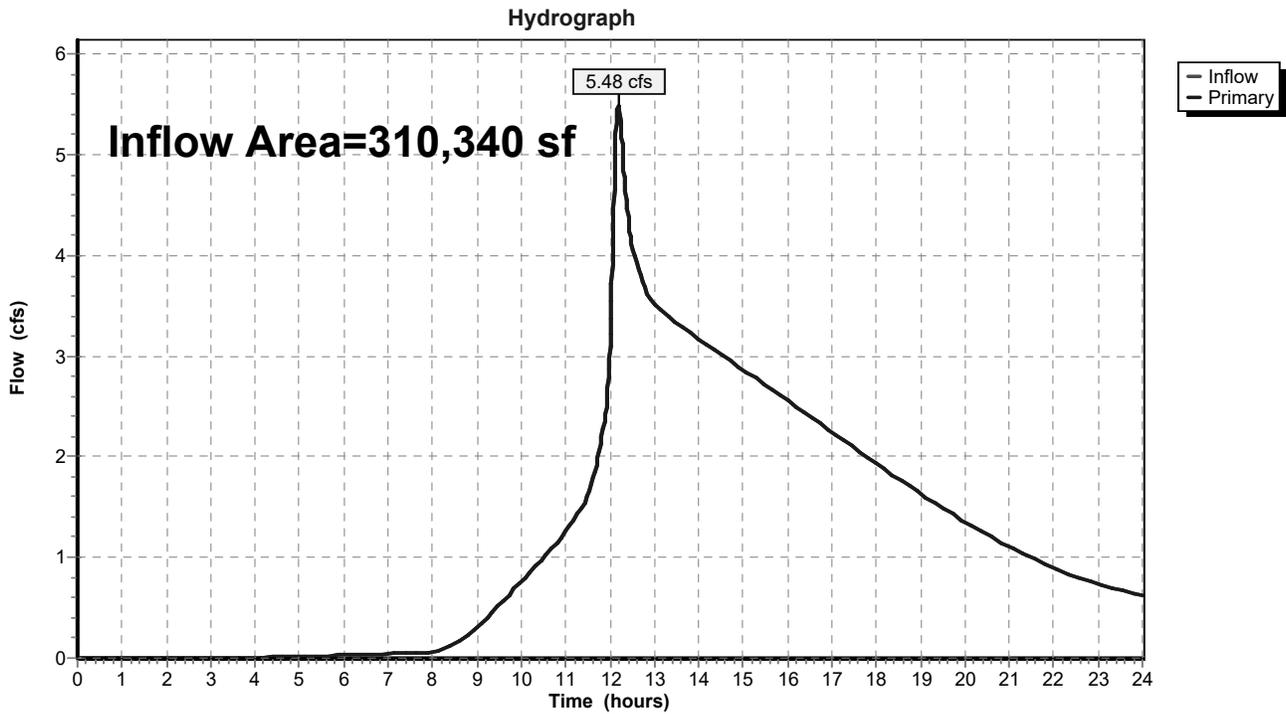


Summary for Link DP-2: Employee Lot Drainage

Inflow Area = 310,340 sf, 67.23% Impervious, Inflow Depth > 3.94" for 10-yr event
Inflow = 5.48 cfs @ 12.19 hrs, Volume= 101,893 cf
Primary = 5.48 cfs @ 12.19 hrs, Volume= 101,893 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-2: Employee Lot Drainage



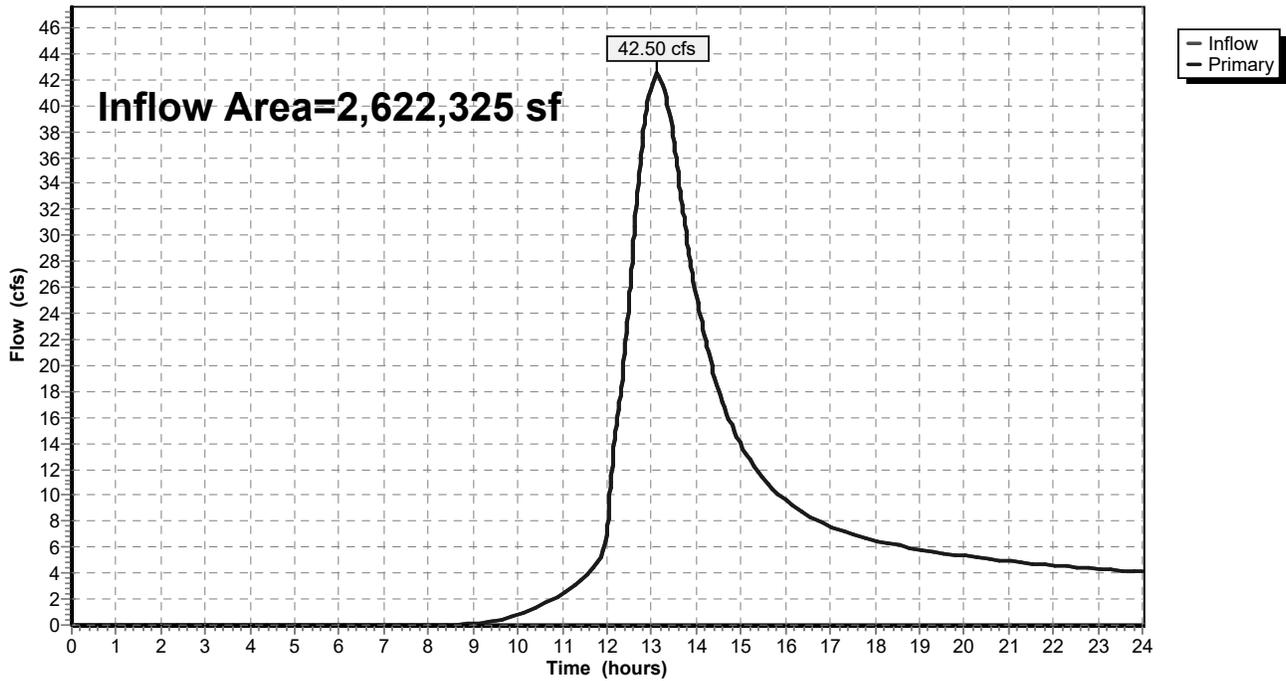
Summary for Link DP-3: Sawmill Brook Wetland System

Inflow Area = 2,622,325 sf, 9.85% Impervious, Inflow Depth > 2.36" for 10-yr event
Inflow = 42.50 cfs @ 13.10 hrs, Volume= 516,159 cf
Primary = 42.50 cfs @ 13.10 hrs, Volume= 516,159 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-3: Sawmill Brook Wetland System

Hydrograph



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEDA-10: Area Draining to Runoff Area=40,445 sf 6.03% Impervious Runoff Depth>4.62"
Flow Length=962' Tc=9.9 min CN=85 Runoff=4.53 cfs 15,574 cf

SubcatchmentEDA-20: Area Draining to Runoff Area=35,785 sf 38.70% Impervious Runoff Depth>5.05"
Flow Length=786' Tc=16.4 min CN=89 Runoff=3.33 cfs 15,069 cf

SubcatchmentEDA-21: Area Draining to Runoff Area=274,555 sf 70.95% Impervious Runoff Depth>5.63"
Flow Length=815' Tc=8.2 min CN=94 Runoff=38.40 cfs 128,870 cf

SubcatchmentEDA-30: Area Draining to Runoff Area=2,323,615 sf 2.17% Impervious Runoff Depth>3.17"
Flow Length=4,372' Tc=88.6 min CN=72 Runoff=53.76 cfs 614,770 cf

SubcatchmentEDA-31: Area Draining to Runoff Area=298,710 sf 69.55% Impervious Runoff Depth>5.18"
Flow Length=1,004' Tc=5.0 min CN=90 Runoff=47.28 cfs 128,964 cf

Pond 1P: Existing Employee Lot Peak Elev=129.74' Storage=57,133 cf Inflow=38.40 cfs 128,870 cf
Outflow=5.37 cfs 115,474 cf

Pond 2P: Existing Remote Lot Peak Elev=24.93' Storage=55,083 cf Inflow=47.28 cfs 128,964 cf
Outflow=9.62 cfs 104,833 cf

Link DP-1: Middle Street Gutter Inflow=4.53 cfs 15,574 cf
Primary=4.53 cfs 15,574 cf

Link DP-2: Employee Lot Drainage Inflow=6.77 cfs 130,543 cf
Primary=6.77 cfs 130,543 cf

Link DP-3: Sawmill Brook Wetland System Inflow=60.44 cfs 719,603 cf
Primary=60.44 cfs 719,603 cf

Total Runoff Area = 2,973,110 sf Runoff Volume = 903,246 cf Average Runoff Depth = 3.65"
84.22% Pervious = 2,503,810 sf 15.78% Impervious = 469,300 sf

Summary for Subcatchment EDA-10: Area Draining to Middle Street

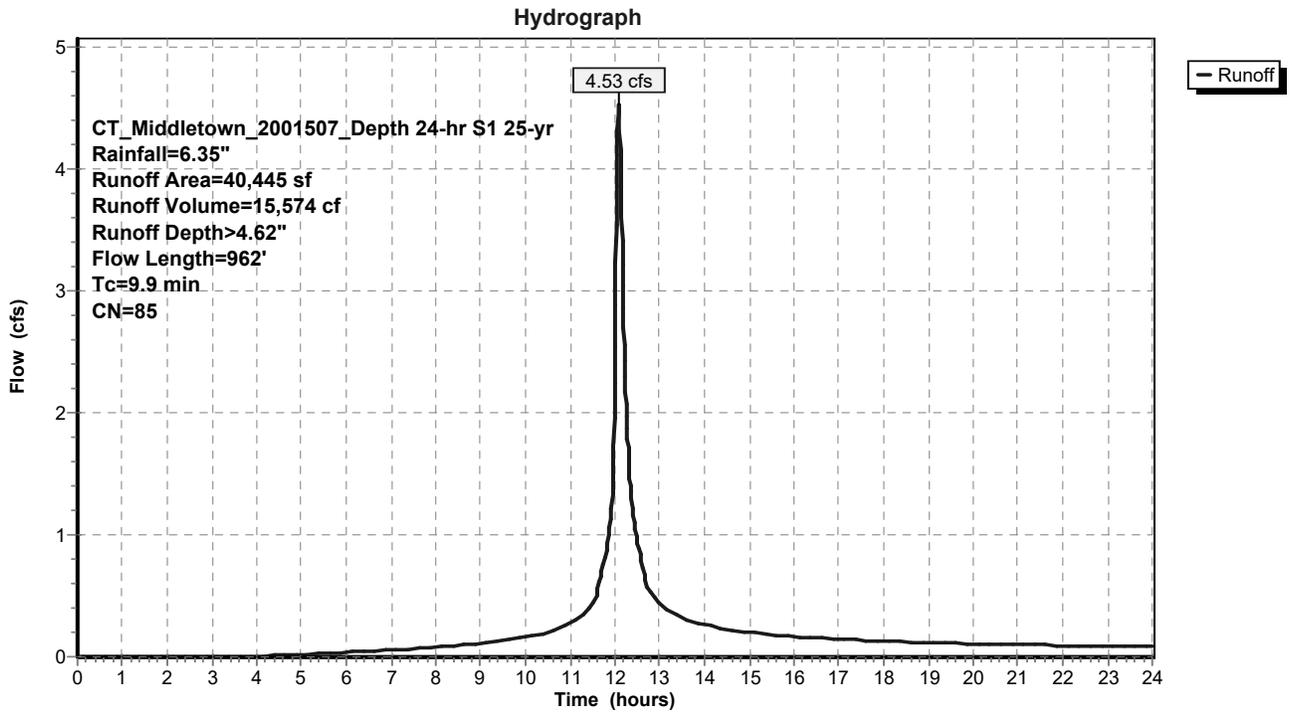
Runoff = 4.53 cfs @ 12.08 hrs, Volume= 15,574 cf, Depth> 4.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 25-yr Rainfall=6.35"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
37,835	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
2,440	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
170	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
40,445	85	Weighted Average
38,005		93.97% Pervious Area
2,440		6.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	28	0.1406	0.20		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
1.1	72	0.0120	1.06		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
6.5	862	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.9	962	Total			

Subcatchment EDA-10: Area Draining to Middle Street



Summary for Subcatchment EDA-20: Area Draining to Employee Lot Drainage System

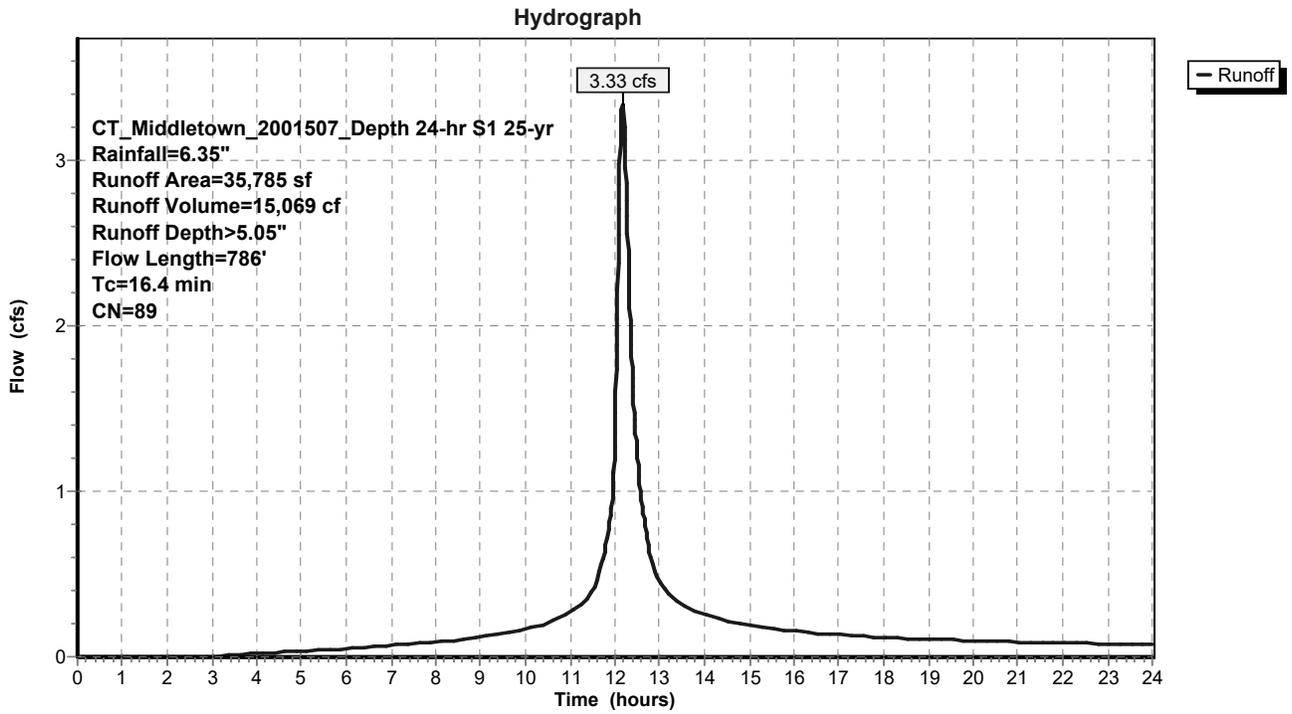
Runoff = 3.33 cfs @ 12.17 hrs, Volume= 15,069 cf, Depth> 5.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 25-yr Rainfall=6.35"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
21,935	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
13,850	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
35,785	89	Weighted Average
21,935		61.30% Pervious Area
13,850		38.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	72	0.0133	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
0.3	28	0.0357	1.36		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.7	308	0.0211	2.95		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.5	317	0.0050	3.47	2.73	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.2	61	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Concrete pipe, finished
16.4	786	Total			

Subcatchment EDA-20: Area Draining to Employee Lot Drainage System



Summary for Subcatchment EDA-21: Area Draining to Existing Employee Lot Underground Detention

Runoff = 38.40 cfs @ 12.06 hrs, Volume= 128,870 cf, Depth> 5.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 25-yr Rainfall=6.35"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
79,335	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
194,785	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
435	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
274,555	94	Weighted Average
79,770		29.05% Pervious Area
194,785		70.95% Impervious Area

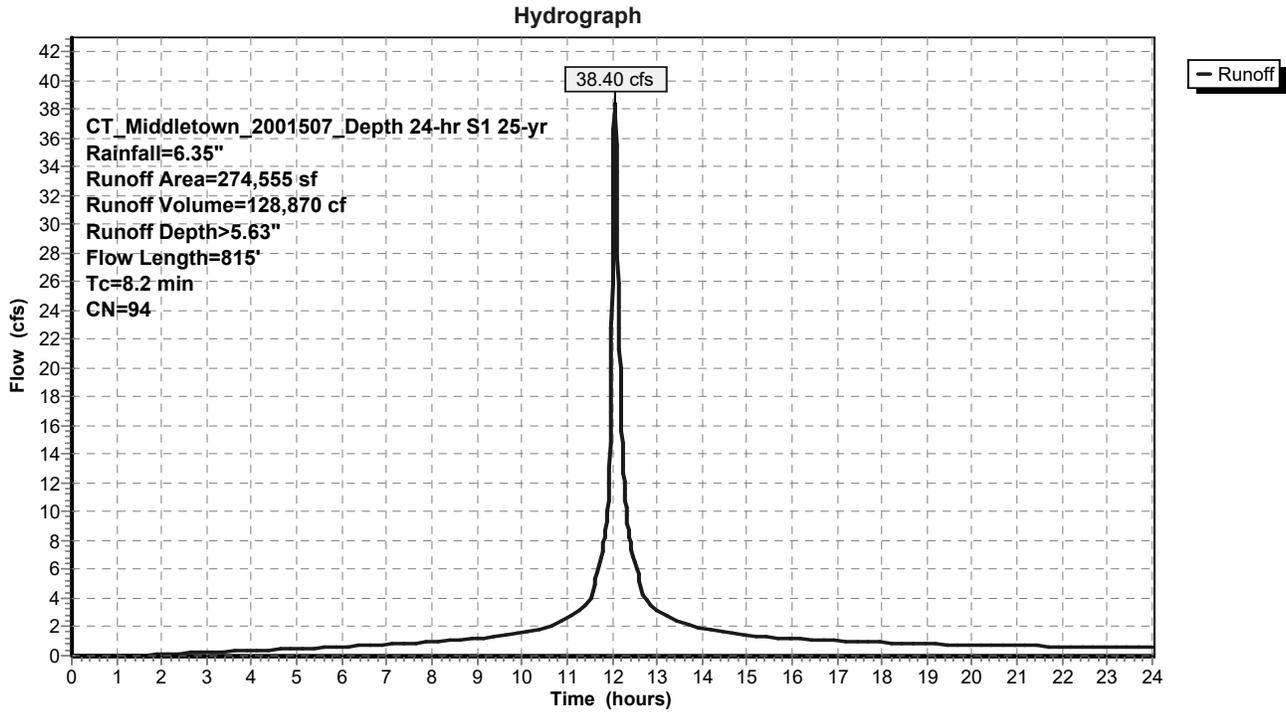
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	19	0.0160	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
1.1	81	0.0160	1.22		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.1	164	0.0160	2.57		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.5	130	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Concrete pipe, finished
0.6	152	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Concrete pipe, finished
0.3	108	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.3	101	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.1	38	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.1	22	0.0050	7.23	51.09	Pipe Channel,

36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'

n= 0.012 Concrete pipe, finished

8.2 815 Total

Subcatchment EDA-21: Area Draining to Existing Employee Lot Underground Detention



Summary for Subcatchment EDA-30: Area Draining to Sawmill Brook Wetland

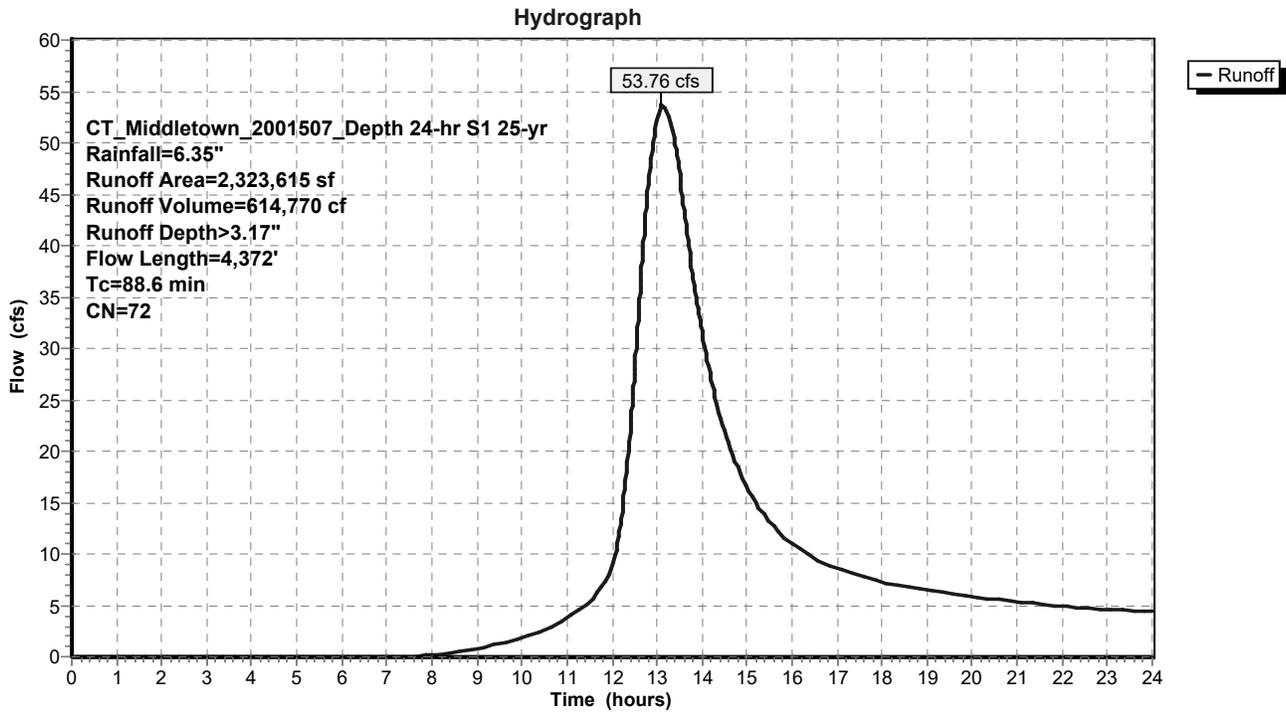
Runoff = 53.76 cfs @ 13.10 hrs, Volume= 614,770 cf, Depth> 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 25-yr Rainfall=6.35"

Area (sf)	CN	Description
740	69	50-75% Grass cover, Fair, HSG B
78,990	79	50-75% Grass cover, Fair, HSG C
29,705	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
15,875	98	Paved parking, HSG C
34,605	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
250	96	Gravel surface, HSG C
355	96	Gravel surface, HSG D
256,170	56	Brush, Fair, HSG B
103,140	70	Brush, Fair, HSG C
9,505	77	Brush, Fair, HSG D
451,555	60	Woods, Fair, HSG B
279,895	73	Woods, Fair, HSG C
1,062,830	79	Woods, Fair, HSG D
2,323,615	72	Weighted Average
2,273,135		97.83% Pervious Area
50,480		2.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.8	100	0.0110	0.04		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.29"
15.4	486	0.0110	0.52		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
26.4	3,786	0.0049	2.39	71.77	Channel Flow, Area= 30.0 sf Perim= 34.0' r= 0.88' n= 0.040 Winding stream, pools & shoals
88.6	4,372	Total			

Subcatchment EDA-30: Area Draining to Sawmill Brook Wetland



Summary for Subcatchment EDA-31: Area Draining to Existing Remote Lot Stormwater Management Basin

Runoff = 47.28 cfs @ 12.03 hrs, Volume= 128,964 cf, Depth> 5.18"

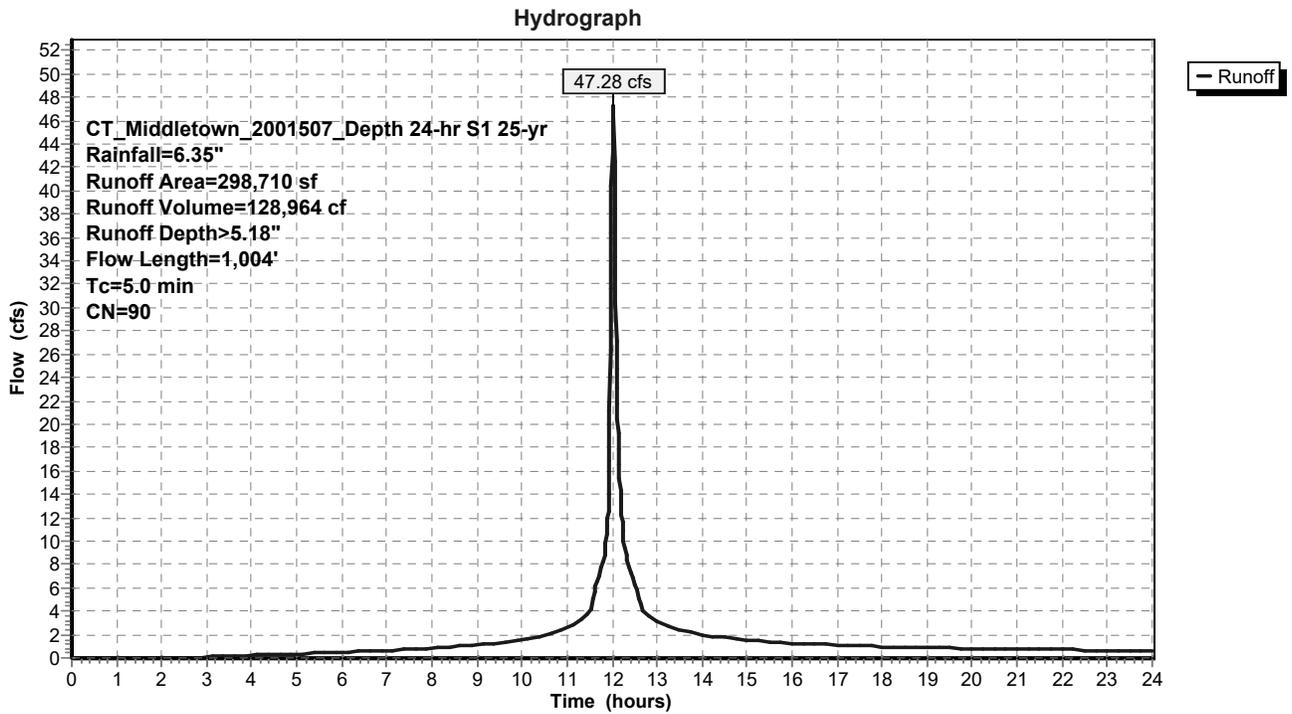
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 25-yr Rainfall=6.35"

Area (sf)	CN	Description
32,870	69	50-75% Grass cover, Fair, HSG B
14,665	79	50-75% Grass cover, Fair, HSG C
0	84	50-75% Grass cover, Fair, HSG D
152,690	98	Paved parking, HSG B
55,055	98	Paved parking, HSG C
0	98	Paved parking, HSG D
2,590	96	Gravel surface, HSG B
2,215	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
12,190	56	Brush, Fair, HSG B
26,435	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
298,710	90	Weighted Average
90,965		30.45% Pervious Area
207,745		69.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0180	1.34		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.0	165	0.0180	2.72		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	80	0.0050	3.47	2.73	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.5	168	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.4	162	0.0050	6.40	31.42	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Concrete pipe, finished
0.3	121	0.0050	6.40	31.42	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Concrete pipe, finished
0.2	70	0.0050	7.23	51.09	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
0.3	138	0.0050	7.23	51.09	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished

4.3 1,004 Total, Increased to minimum Tc = 5.0 min

Subcatchment EDA-31: Area Draining to Existing Remote Lot Stormwater Management Basin



Summary for Pond 1P: Existing Employee Lot Underground Detention System

Inflow Area = 274,555 sf, 70.95% Impervious, Inflow Depth > 5.63" for 25-yr event
 Inflow = 38.40 cfs @ 12.06 hrs, Volume= 128,870 cf
 Outflow = 5.37 cfs @ 12.60 hrs, Volume= 115,474 cf, Atten= 86%, Lag= 32.2 min
 Primary = 5.37 cfs @ 12.60 hrs, Volume= 115,474 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 129.74' @ 12.60 hrs Surf.Area= 11,725 sf Storage= 57,133 cf

Plug-Flow detention time= 221.4 min calculated for 115,426 cf (90% of inflow)
 Center-of-Mass det. time= 164.2 min (937.3 - 773.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	123.50'	2,345 cf	64.19'W x 182.67'L x 9.50'H Field A 111,387 cf Overall - 105,524 cf Embedded = 5,862 cf x 40.0% Voids
#2A	124.00'	83,580 cf	StormTrap ST2 DoubleTrap 8-0x 66 Inside #1 Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf 66 Chambers in 6 Rows 50.88' x 169.35' Core + 6.66' Border = 64.19' x 182.67' System
		85,925 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	125.00'	24.0" Round Culvert L= 1,560.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 125.00' / 85.00' S= 0.0256 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	125.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	129.00'	12.0" Vert. Orifice/Grate C= 0.600
#4	Device 1	132.50'	3.0' long x 2.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=5.37 cfs @ 12.60 hrs HW=129.74' (Free Discharge)

- 1=Culvert (Passes 5.37 cfs of 29.27 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 3.53 cfs @ 10.11 fps)
- 3=Orifice/Grate (Orifice Controls 1.84 cfs @ 2.94 fps)
- 4=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 1P: Existing Employee Lot Underground Detention System - Chamber Wizard Field A

Chamber Model = StormTrapST2 DoubleTrap 8-0 (StormTrapST2 DoubleTrap®Type II+IV)

Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf
Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf

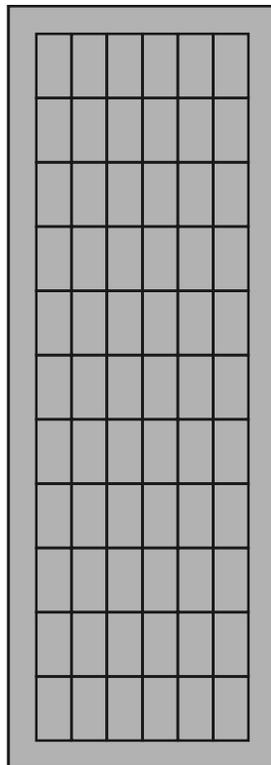
11 Chambers/Row x 15.40' Long = 169.35' Row Length +79.9" Border x 2 = 182.67' Base Length
6 Rows x 101.7" Wide + 79.9" Side Border x 2 = 64.19' Base Width
6.0" Base + 108.0" Chamber Height = 9.50' Field Height

66 Chambers x 940.5 cf + 21,503.9 cf Border = 83,579.7 cf Chamber Storage
66 Chambers x 1,174.9 cf + 27,981.2 cf Border = 105,524.2 cf Displacement

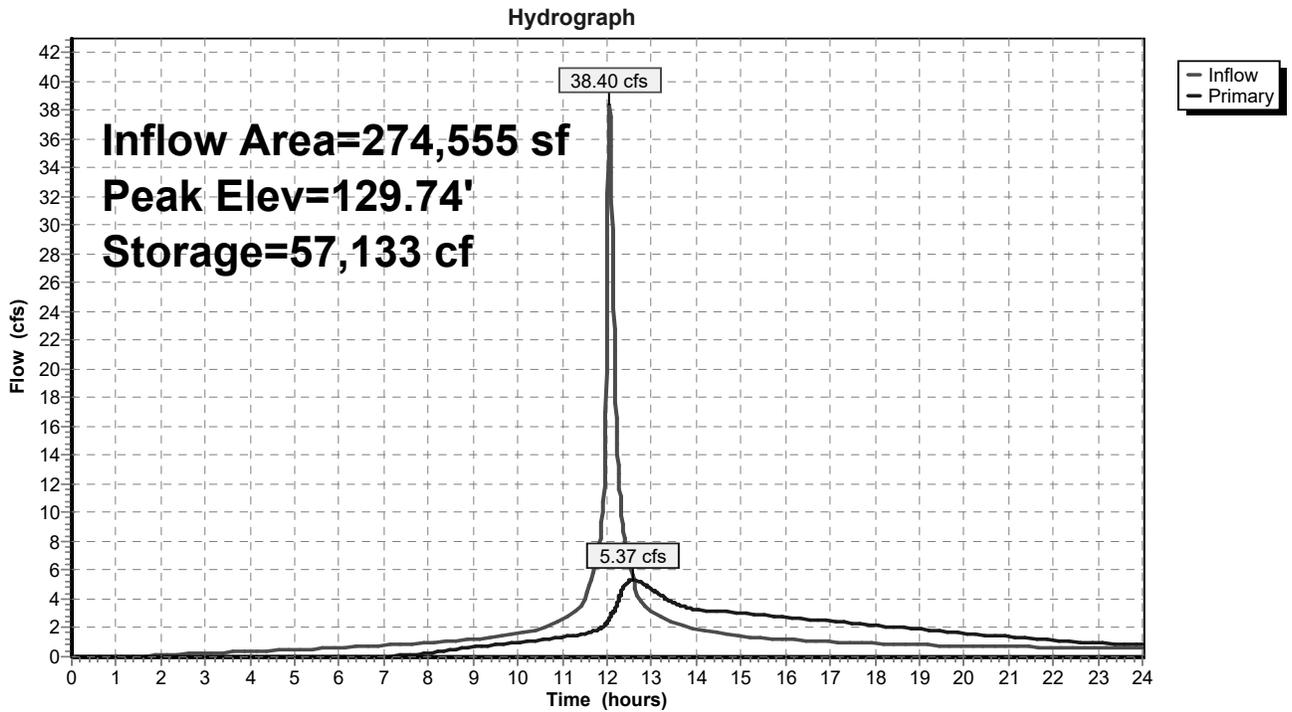
111,386.7 cf Field - 105,524.2 cf Chambers = 5,862.5 cf Stone x 40.0% Voids = 2,345.0 cf Stone Storage

Chamber Storage + Stone Storage = 85,924.7 cf = 1.973 af
Overall Storage Efficiency = 77.1%
Overall System Size = 182.67' x 64.19' x 9.50'

66 Chambers (plus border)
4,125.4 cy Field
217.1 cy Stone



Pond 1P: Existing Employee Lot Underground Detention System



Summary for Pond 2P: Existing Remote Lot Stormwater Management Basin

Inflow Area = 298,710 sf, 69.55% Impervious, Inflow Depth > 5.18" for 25-yr event
 Inflow = 47.28 cfs @ 12.03 hrs, Volume= 128,964 cf
 Outflow = 9.62 cfs @ 12.28 hrs, Volume= 104,833 cf, Atten= 80%, Lag= 15.1 min
 Primary = 9.62 cfs @ 12.28 hrs, Volume= 104,833 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 24.93' @ 12.28 hrs Surf.Area= 16,726 sf Storage= 55,083 cf

Plug-Flow detention time= 201.9 min calculated for 104,789 cf (81% of inflow)
 Center-of-Mass det. time= 114.3 min (905.1 - 790.7)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	94,737 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

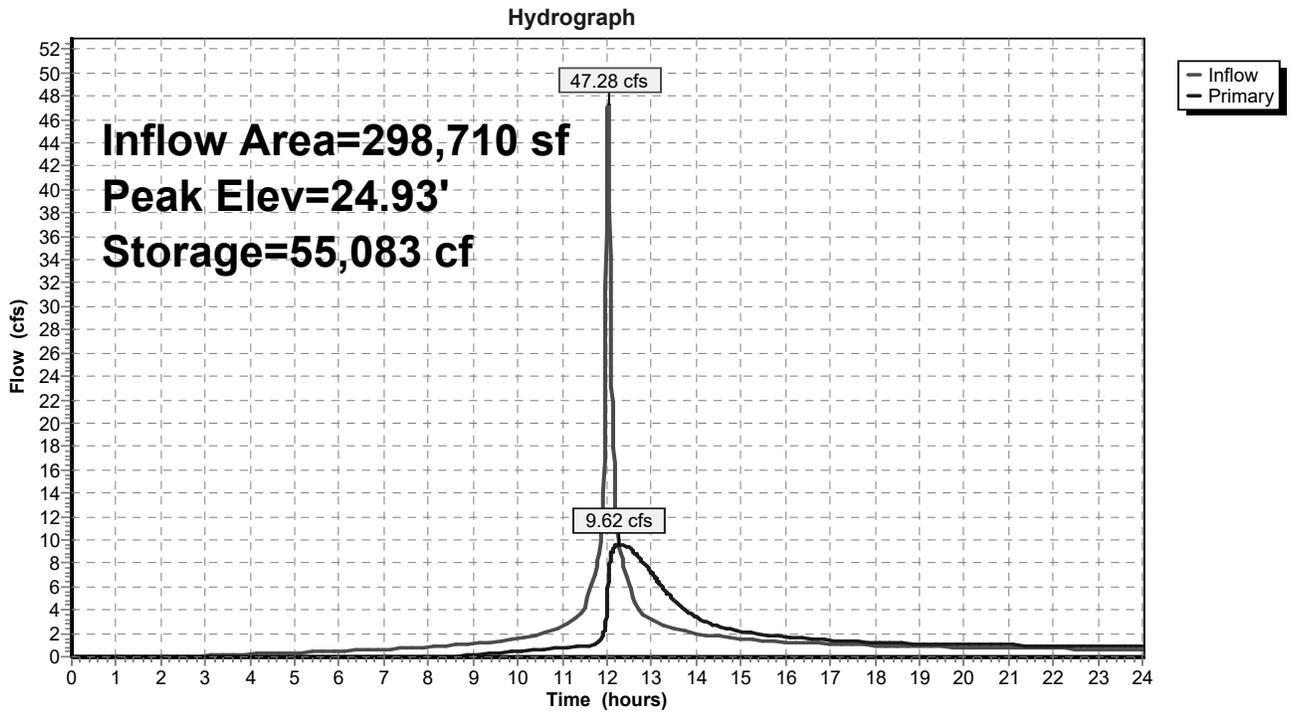
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	5,895	0	0
21.00	7,748	6,822	6,822
22.00	9,895	8,822	15,643
23.00	12,598	11,247	26,890
24.00	14,704	13,651	40,541
25.00	16,889	15,797	56,337
26.00	19,175	18,032	74,369
27.00	21,560	20,368	94,737

Device	Routing	Invert	Outlet Devices
#1	Primary	21.28'	18.0" Round Culvert L= 55.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 21.28' / 21.00' S= 0.0051 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	21.28'	5.5" Vert. Orifice/Grate C= 0.600
#3	Device 1	23.00'	12.0" Vert. Orifice/Grate X 2 rows with 6.0" cc spacing C= 0.600
#4	Device 1	26.50'	3.0" x 2.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=9.62 cfs @ 12.28 hrs HW=24.93' (Free Discharge)

- 1=Culvert (Passes 9.62 cfs of 14.48 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.47 cfs @ 8.90 fps)
- 3=Orifice/Grate (Orifice Controls 8.15 cfs @ 5.19 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond 2P: Existing Remote Lot Stormwater Management Basin

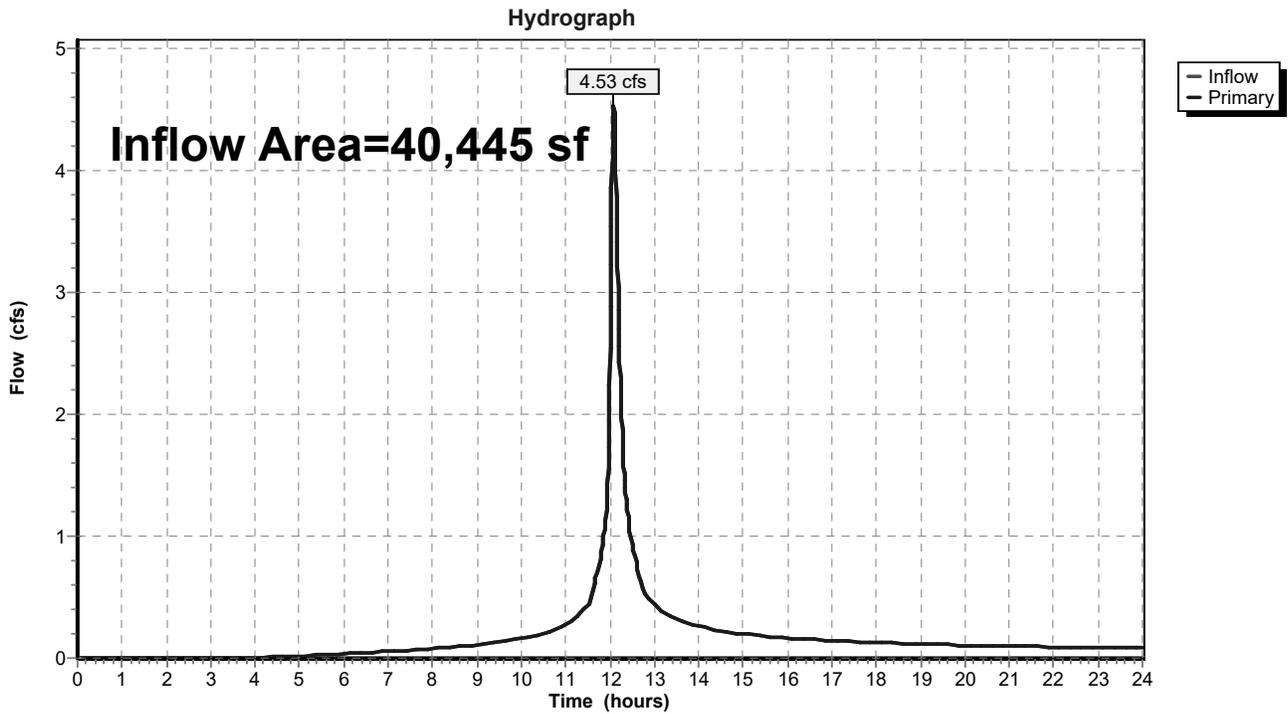


Summary for Link DP-1: Middle Street Gutter

Inflow Area = 40,445 sf, 6.03% Impervious, Inflow Depth > 4.62" for 25-yr event
Inflow = 4.53 cfs @ 12.08 hrs, Volume= 15,574 cf
Primary = 4.53 cfs @ 12.08 hrs, Volume= 15,574 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-1: Middle Street Gutter

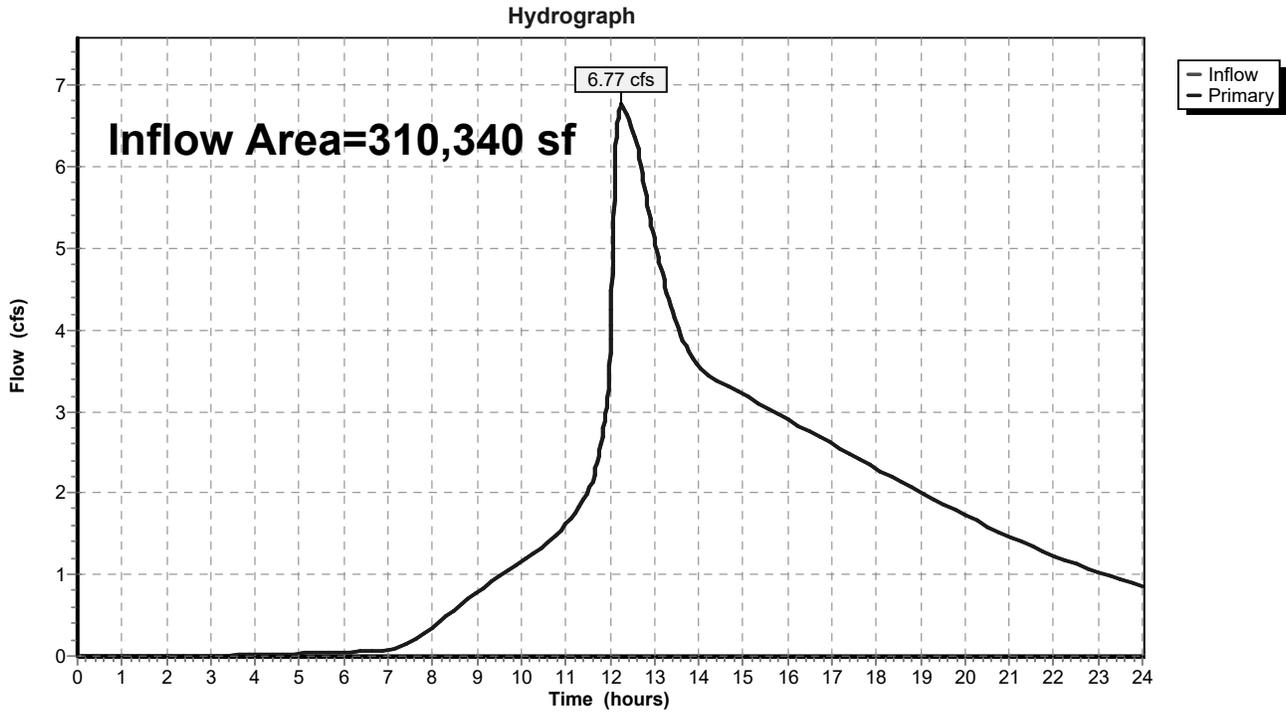


Summary for Link DP-2: Employee Lot Drainage

Inflow Area = 310,340 sf, 67.23% Impervious, Inflow Depth > 5.05" for 25-yr event
Inflow = 6.77 cfs @ 12.26 hrs, Volume= 130,543 cf
Primary = 6.77 cfs @ 12.26 hrs, Volume= 130,543 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-2: Employee Lot Drainage



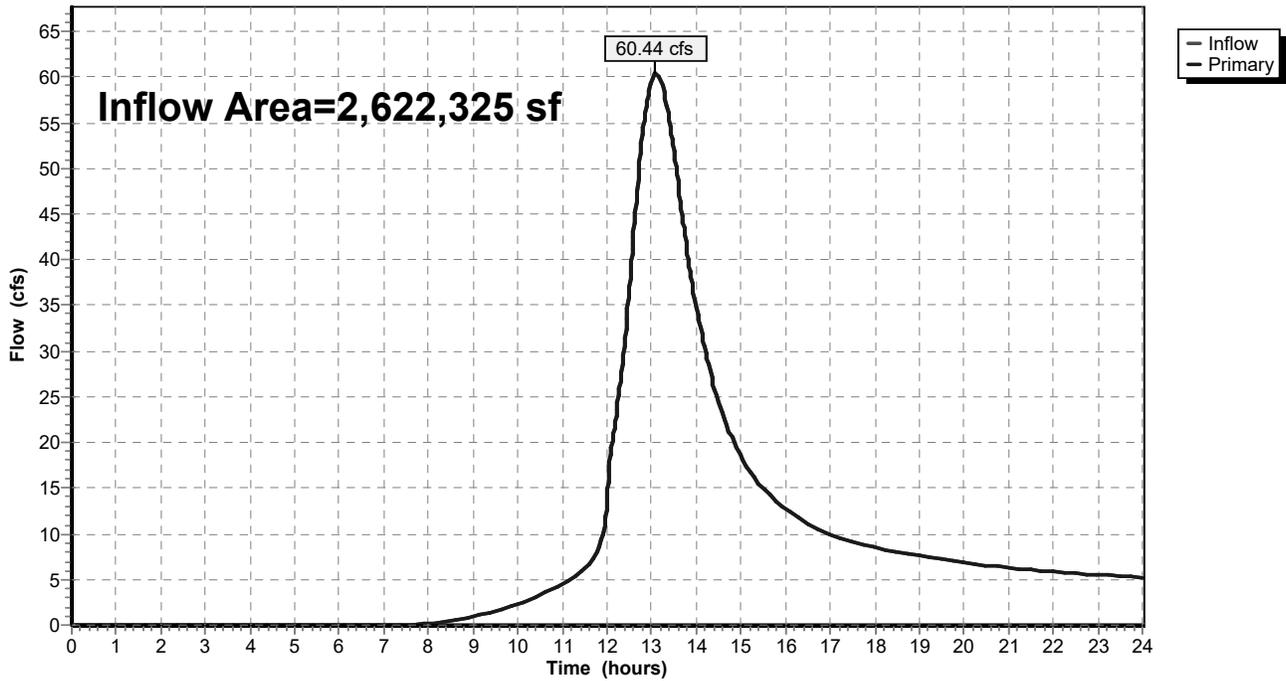
Summary for Link DP-3: Sawmill Brook Wetland System

Inflow Area = 2,622,325 sf, 9.85% Impervious, Inflow Depth > 3.29" for 25-yr event
Inflow = 60.44 cfs @ 13.09 hrs, Volume= 719,603 cf
Primary = 60.44 cfs @ 13.09 hrs, Volume= 719,603 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-3: Sawmill Brook Wetland System

Hydrograph



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEDA-10: Area Draining to Runoff Area=40,445 sf 6.03% Impervious Runoff Depth>6.35"
Flow Length=962' Tc=9.9 min CN=85 Runoff=6.10 cfs 21,405 cf

SubcatchmentEDA-20: Area Draining to Runoff Area=35,785 sf 38.70% Impervious Runoff Depth>6.82"
Flow Length=786' Tc=16.4 min CN=89 Runoff=4.39 cfs 20,323 cf

SubcatchmentEDA-21: Area Draining to Runoff Area=274,555 sf 70.95% Impervious Runoff Depth>7.43"
Flow Length=815' Tc=8.2 min CN=94 Runoff=49.54 cfs 169,922 cf

SubcatchmentEDA-30: Area Draining to Runoff Area=2,323,615 sf 2.17% Impervious Runoff Depth>4.69"
Flow Length=4,372' Tc=88.6 min CN=72 Runoff=78.99 cfs 907,712 cf

SubcatchmentEDA-31: Area Draining to Runoff Area=298,710 sf 69.55% Impervious Runoff Depth>6.95"
Flow Length=1,004' Tc=5.0 min CN=90 Runoff=61.98 cfs 173,121 cf

Pond 1P: Existing Employee Lot Peak Elev=130.92' Storage=69,407 cf Inflow=49.54 cfs 169,922 cf
Outflow=8.48 cfs 154,154 cf

Pond 2P: Existing Remote Lot Peak Elev=25.76' Storage=69,747 cf Inflow=61.98 cfs 173,121 cf
Outflow=12.33 cfs 146,000 cf

Link DP-1: Middle Street Gutter Inflow=6.10 cfs 21,405 cf
Primary=6.10 cfs 21,405 cf

Link DP-2: Employee Lot Drainage Inflow=11.81 cfs 174,477 cf
Primary=11.81 cfs 174,477 cf

Link DP-3: Sawmill Brook Wetland System Inflow=88.73 cfs 1,053,712 cf
Primary=88.73 cfs 1,053,712 cf

Total Runoff Area = 2,973,110 sf Runoff Volume = 1,292,483 cf Average Runoff Depth = 5.22"
84.22% Pervious = 2,503,810 sf 15.78% Impervious = 469,300 sf

Summary for Subcatchment EDA-10: Area Draining to Middle Street

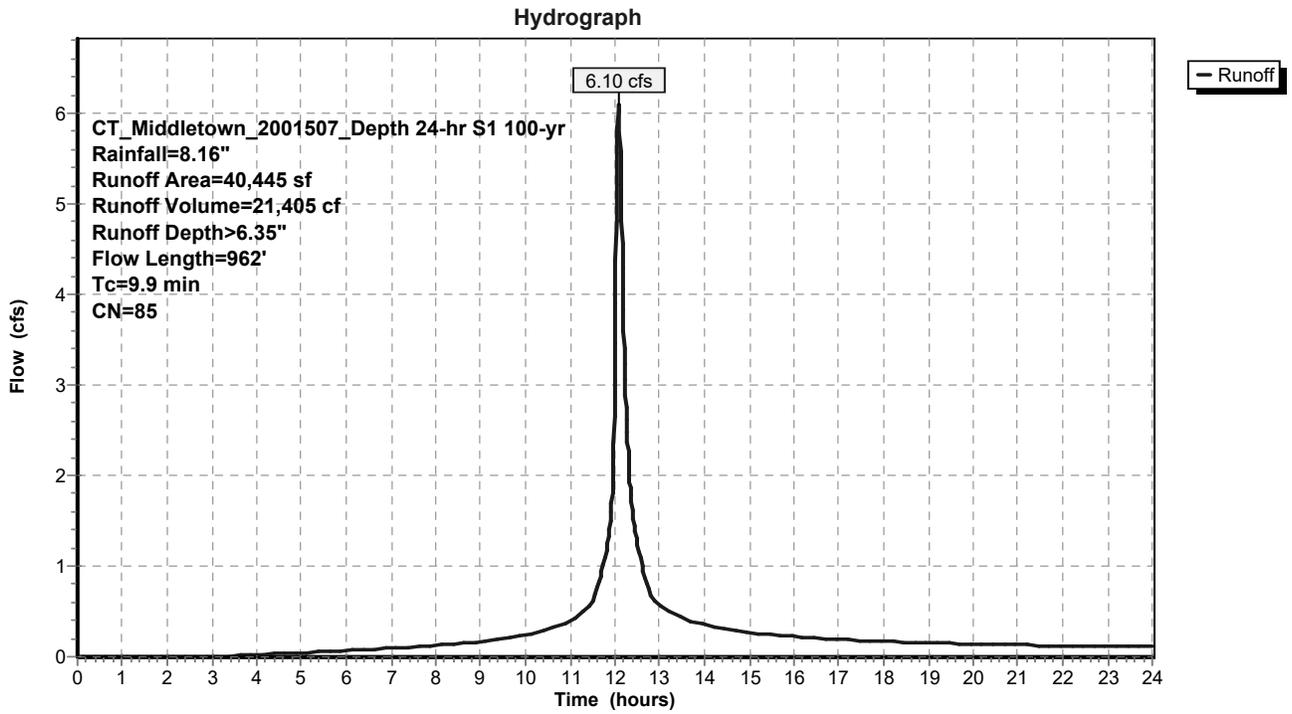
Runoff = 6.10 cfs @ 12.08 hrs, Volume= 21,405 cf, Depth> 6.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 100-yr Rainfall=8.16"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
37,835	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
2,440	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
170	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
40,445	85	Weighted Average
38,005		93.97% Pervious Area
2,440		6.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	28	0.1406	0.20		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
1.1	72	0.0120	1.06		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
6.5	862	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.9	962	Total			

Subcatchment EDA-10: Area Draining to Middle Street



Summary for Subcatchment EDA-20: Area Draining to Employee Lot Drainage System

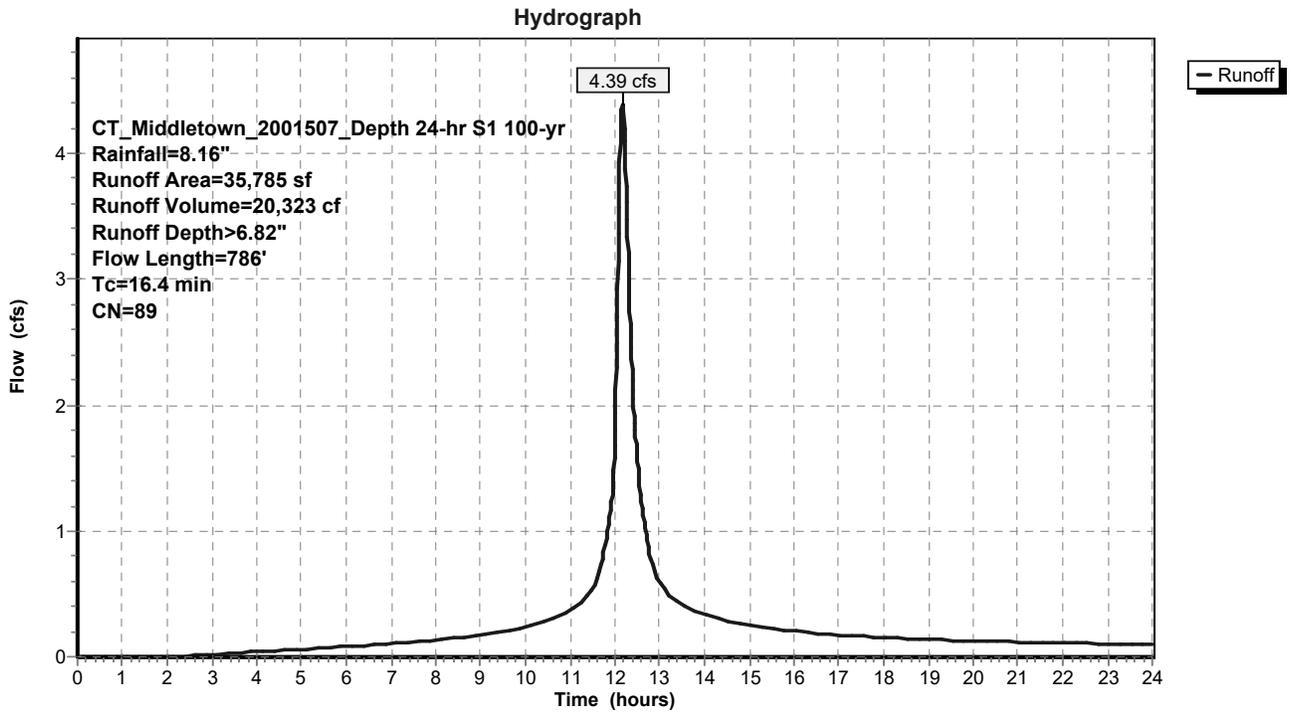
Runoff = 4.39 cfs @ 12.17 hrs, Volume= 20,323 cf, Depth> 6.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 100-yr Rainfall=8.16"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
21,935	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
13,850	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
35,785	89	Weighted Average
21,935		61.30% Pervious Area
13,850		38.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	72	0.0133	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
0.3	28	0.0357	1.36		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.7	308	0.0211	2.95		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.5	317	0.0050	3.47	2.73	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.2	61	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Concrete pipe, finished
16.4	786	Total			

Subcatchment EDA-20: Area Draining to Employee Lot Drainage System



Summary for Subcatchment EDA-21: Area Draining to Existing Employee Lot Underground Detention

Runoff = 49.54 cfs @ 12.06 hrs, Volume= 169,922 cf, Depth> 7.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 100-yr Rainfall=8.16"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
79,335	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
194,785	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
435	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
274,555	94	Weighted Average
79,770		29.05% Pervious Area
194,785		70.95% Impervious Area

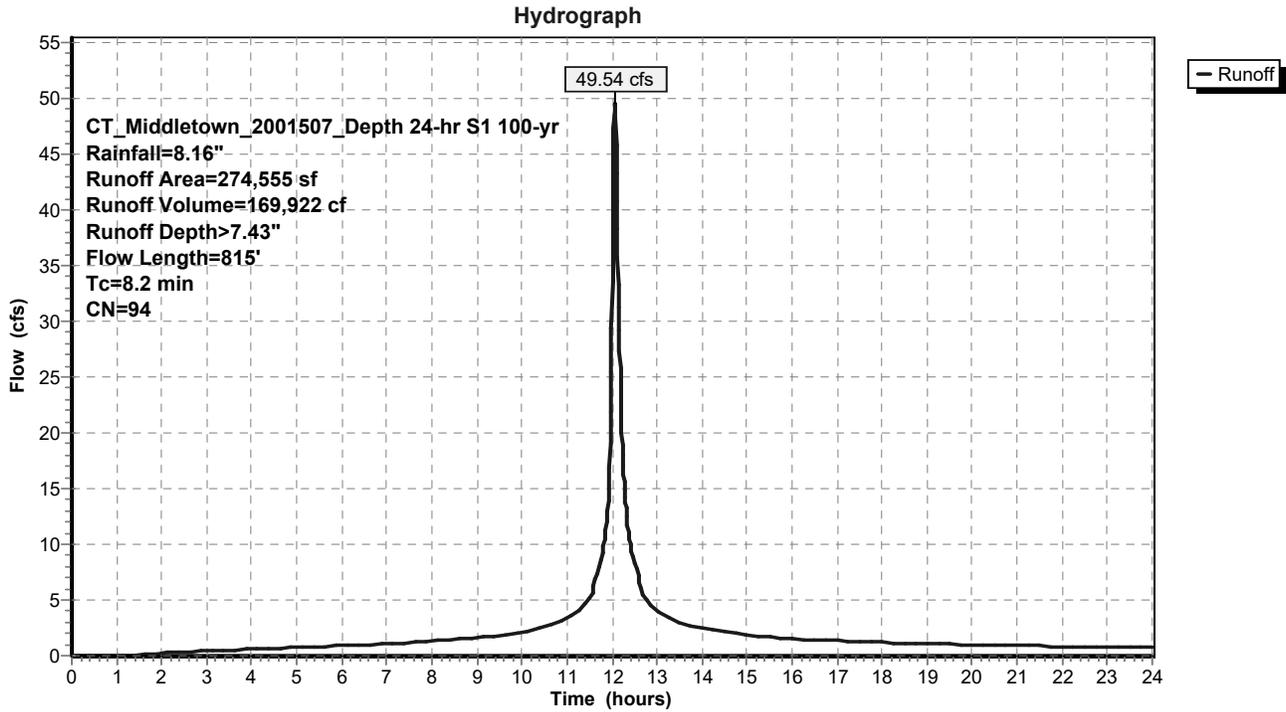
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	19	0.0160	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
1.1	81	0.0160	1.22		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.1	164	0.0160	2.57		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.5	130	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Concrete pipe, finished
0.6	152	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Concrete pipe, finished
0.3	108	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.3	101	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.1	38	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.1	22	0.0050	7.23	51.09	Pipe Channel,

36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'

n= 0.012 Concrete pipe, finished

8.2 815 Total

Subcatchment EDA-21: Area Draining to Existing Employee Lot Underground Detention



Summary for Subcatchment EDA-30: Area Draining to Sawmill Brook Wetland

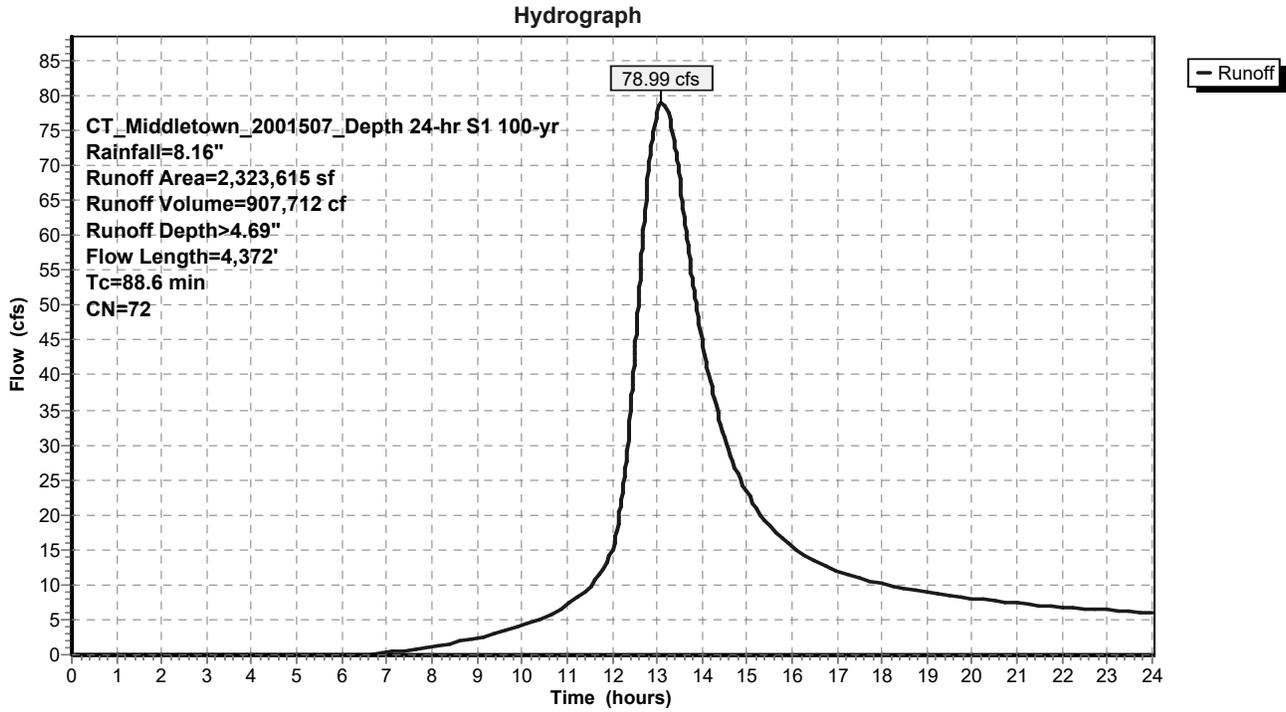
Runoff = 78.99 cfs @ 13.10 hrs, Volume= 907,712 cf, Depth> 4.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 100-yr Rainfall=8.16"

Area (sf)	CN	Description
740	69	50-75% Grass cover, Fair, HSG B
78,990	79	50-75% Grass cover, Fair, HSG C
29,705	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
15,875	98	Paved parking, HSG C
34,605	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
250	96	Gravel surface, HSG C
355	96	Gravel surface, HSG D
256,170	56	Brush, Fair, HSG B
103,140	70	Brush, Fair, HSG C
9,505	77	Brush, Fair, HSG D
451,555	60	Woods, Fair, HSG B
279,895	73	Woods, Fair, HSG C
1,062,830	79	Woods, Fair, HSG D
2,323,615	72	Weighted Average
2,273,135		97.83% Pervious Area
50,480		2.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.8	100	0.0110	0.04		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.29"
15.4	486	0.0110	0.52		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
26.4	3,786	0.0049	2.39	71.77	Channel Flow, Area= 30.0 sf Perim= 34.0' r= 0.88' n= 0.040 Winding stream, pools & shoals
88.6	4,372	Total			

Subcatchment EDA-30: Area Draining to Sawmill Brook Wetland



Summary for Subcatchment EDA-31: Area Draining to Existing Remote Lot Stormwater Management Basin

Runoff = 61.98 cfs @ 12.03 hrs, Volume= 173,121 cf, Depth> 6.95"

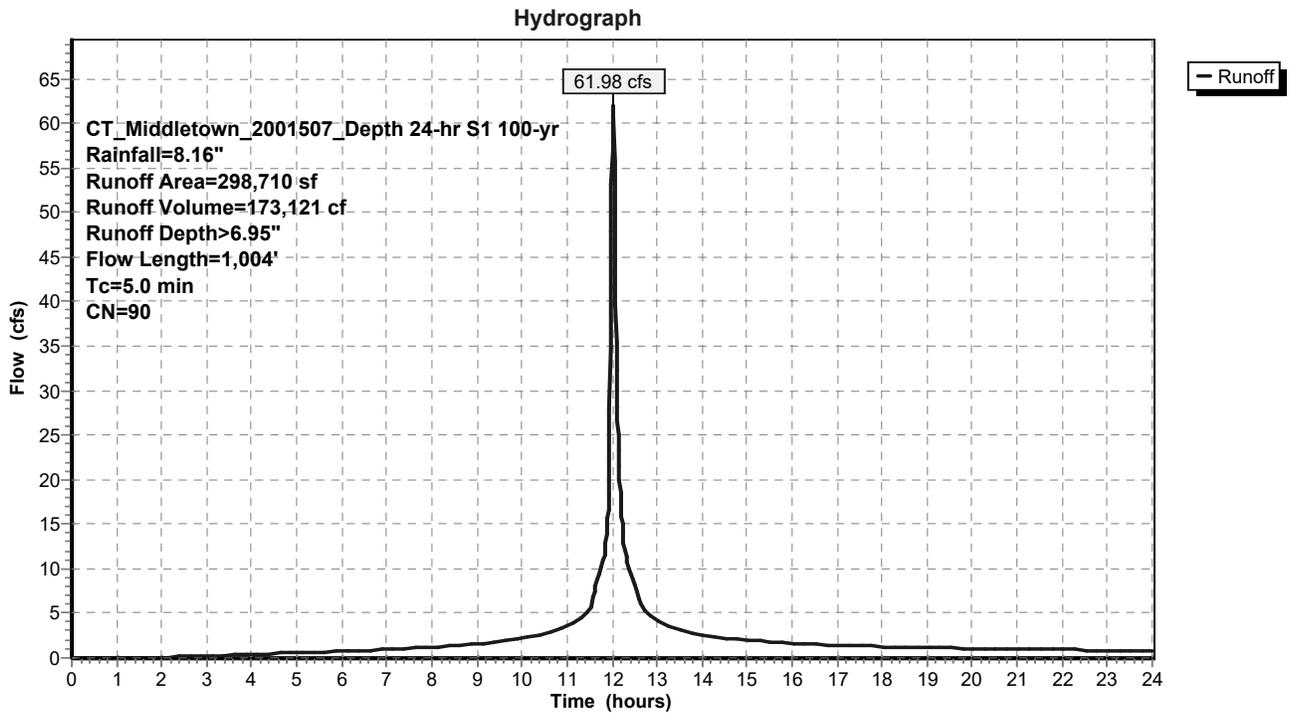
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 100-yr Rainfall=8.16"

Area (sf)	CN	Description
32,870	69	50-75% Grass cover, Fair, HSG B
14,665	79	50-75% Grass cover, Fair, HSG C
0	84	50-75% Grass cover, Fair, HSG D
152,690	98	Paved parking, HSG B
55,055	98	Paved parking, HSG C
0	98	Paved parking, HSG D
2,590	96	Gravel surface, HSG B
2,215	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
12,190	56	Brush, Fair, HSG B
26,435	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
298,710	90	Weighted Average
90,965		30.45% Pervious Area
207,745		69.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0180	1.34		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.0	165	0.0180	2.72		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	80	0.0050	3.47	2.73	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.5	168	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.4	162	0.0050	6.40	31.42	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Concrete pipe, finished
0.3	121	0.0050	6.40	31.42	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Concrete pipe, finished
0.2	70	0.0050	7.23	51.09	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
0.3	138	0.0050	7.23	51.09	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished

4.3 1,004 Total, Increased to minimum Tc = 5.0 min

Subcatchment EDA-31: Area Draining to Existing Remote Lot Stormwater Management Basin



Summary for Pond 1P: Existing Employee Lot Underground Detention System

Inflow Area = 274,555 sf, 70.95% Impervious, Inflow Depth > 7.43" for 100-yr event
 Inflow = 49.54 cfs @ 12.06 hrs, Volume= 169,922 cf
 Outflow = 8.48 cfs @ 12.49 hrs, Volume= 154,154 cf, Atten= 83%, Lag= 25.8 min
 Primary = 8.48 cfs @ 12.49 hrs, Volume= 154,154 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 130.92' @ 12.49 hrs Surf.Area= 11,725 sf Storage= 69,407 cf

Plug-Flow detention time= 199.7 min calculated for 154,154 cf (91% of inflow)
 Center-of-Mass det. time= 146.9 min (912.6 - 765.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	123.50'	2,345 cf	64.19'W x 182.67'L x 9.50'H Field A 111,387 cf Overall - 105,524 cf Embedded = 5,862 cf x 40.0% Voids
#2A	124.00'	83,580 cf	StormTrap ST2 DoubleTrap 8-0x 66 Inside #1 Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf 66 Chambers in 6 Rows 50.88' x 169.35' Core + 6.66' Border = 64.19' x 182.67' System
		85,925 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	125.00'	24.0" Round Culvert L= 1,560.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 125.00' / 85.00' S= 0.0256 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	125.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	129.00'	12.0" Vert. Orifice/Grate C= 0.600
#4	Device 1	132.50'	3.0' long x 2.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=8.48 cfs @ 12.49 hrs HW=130.92' (Free Discharge)

- 1=Culvert (Passes 8.48 cfs of 33.55 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 3.97 cfs @ 11.38 fps)
- 3=Orifice/Grate (Orifice Controls 4.50 cfs @ 5.74 fps)
- 4=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 1P: Existing Employee Lot Underground Detention System - Chamber Wizard Field A

Chamber Model = StormTrapST2 DoubleTrap 8-0 (StormTrapST2 DoubleTrap®Type II+IV)

Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf

Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf

11 Chambers/Row x 15.40' Long = 169.35' Row Length +79.9" Border x 2 = 182.67' Base Length

6 Rows x 101.7" Wide + 79.9" Side Border x 2 = 64.19' Base Width

6.0" Base + 108.0" Chamber Height = 9.50' Field Height

66 Chambers x 940.5 cf + 21,503.9 cf Border = 83,579.7 cf Chamber Storage

66 Chambers x 1,174.9 cf + 27,981.2 cf Border = 105,524.2 cf Displacement

111,386.7 cf Field - 105,524.2 cf Chambers = 5,862.5 cf Stone x 40.0% Voids = 2,345.0 cf Stone Storage

Chamber Storage + Stone Storage = 85,924.7 cf = 1.973 af

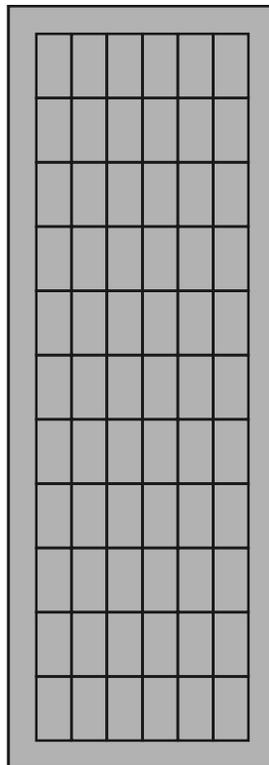
Overall Storage Efficiency = 77.1%

Overall System Size = 182.67' x 64.19' x 9.50'

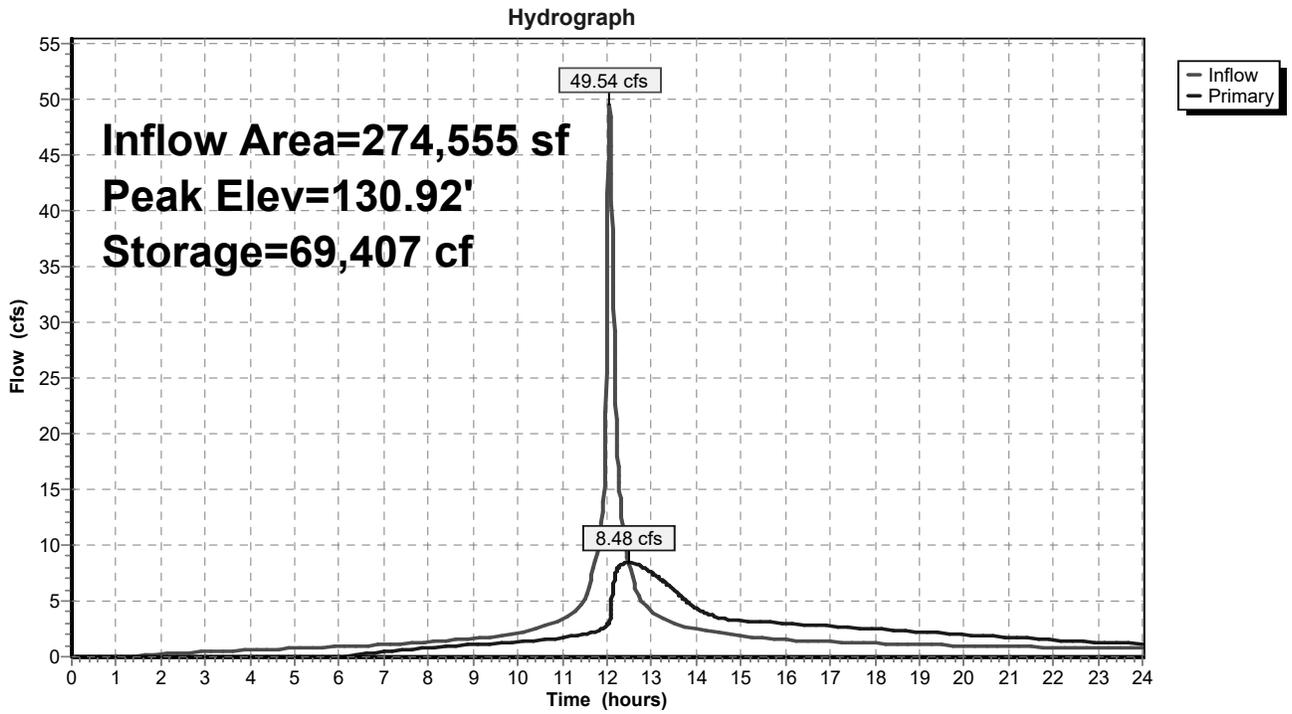
66 Chambers (plus border)

4,125.4 cy Field

217.1 cy Stone



Pond 1P: Existing Employee Lot Underground Detention System



Summary for Pond 2P: Existing Remote Lot Stormwater Management Basin

Inflow Area = 298,710 sf, 69.55% Impervious, Inflow Depth > 6.95" for 100-yr event
 Inflow = 61.98 cfs @ 12.03 hrs, Volume= 173,121 cf
 Outflow = 12.33 cfs @ 12.28 hrs, Volume= 146,000 cf, Atten= 80%, Lag= 15.2 min
 Primary = 12.33 cfs @ 12.28 hrs, Volume= 146,000 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 25.76' @ 12.28 hrs Surf.Area= 18,616 sf Storage= 69,747 cf

Plug-Flow detention time= 177.0 min calculated for 145,939 cf (84% of inflow)
 Center-of-Mass det. time= 98.9 min (880.2 - 781.3)

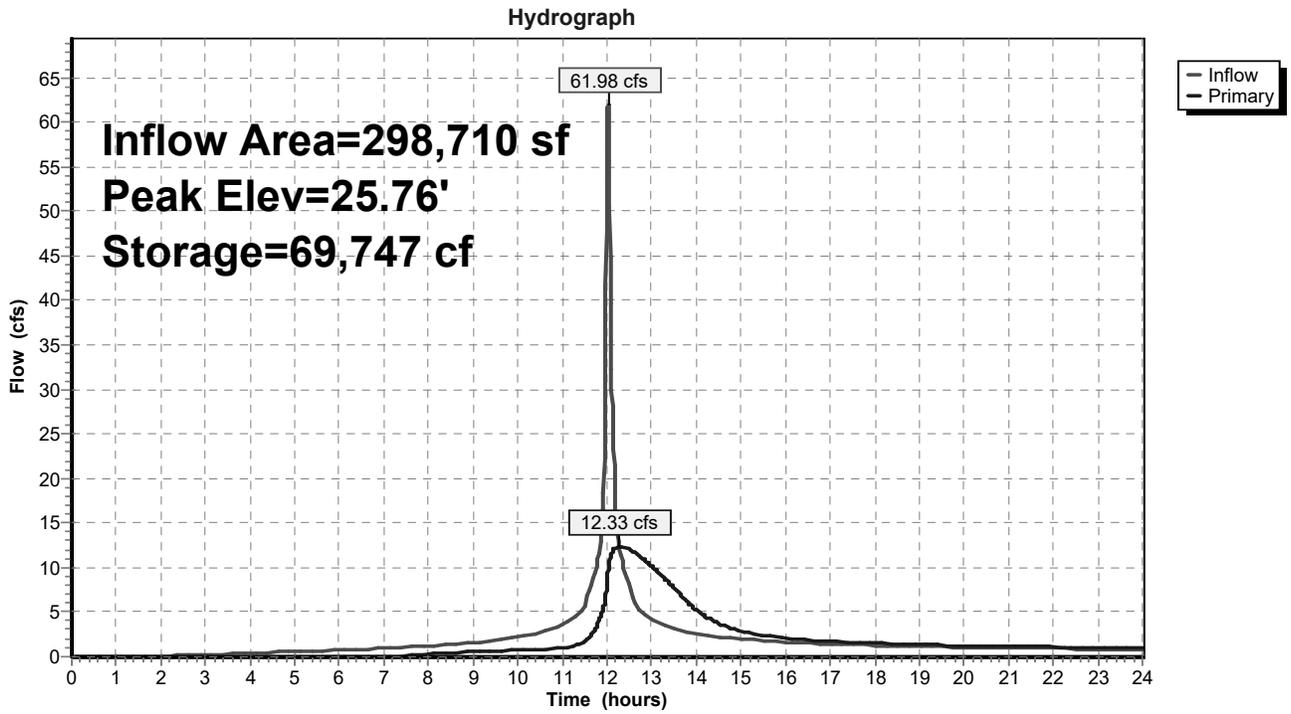
Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	94,737 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	5,895	0	0
21.00	7,748	6,822	6,822
22.00	9,895	8,822	15,643
23.00	12,598	11,247	26,890
24.00	14,704	13,651	40,541
25.00	16,889	15,797	56,337
26.00	19,175	18,032	74,369
27.00	21,560	20,368	94,737

Device	Routing	Invert	Outlet Devices
#1	Primary	21.28'	18.0" Round Culvert L= 55.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 21.28' / 21.00' S= 0.0051 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	21.28'	5.5" Vert. Orifice/Grate C= 0.600
#3	Device 1	23.00'	12.0" Vert. Orifice/Grate X 2 rows with 6.0" cc spacing C= 0.600
#4	Device 1	26.50'	3.0" x 2.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=12.33 cfs @ 12.28 hrs HW=25.76' (Free Discharge)

- 1=Culvert (Passes 12.33 cfs of 16.42 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.64 cfs @ 9.92 fps)
- 3=Orifice/Grate (Orifice Controls 10.69 cfs @ 6.81 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond 2P: Existing Remote Lot Stormwater Management Basin

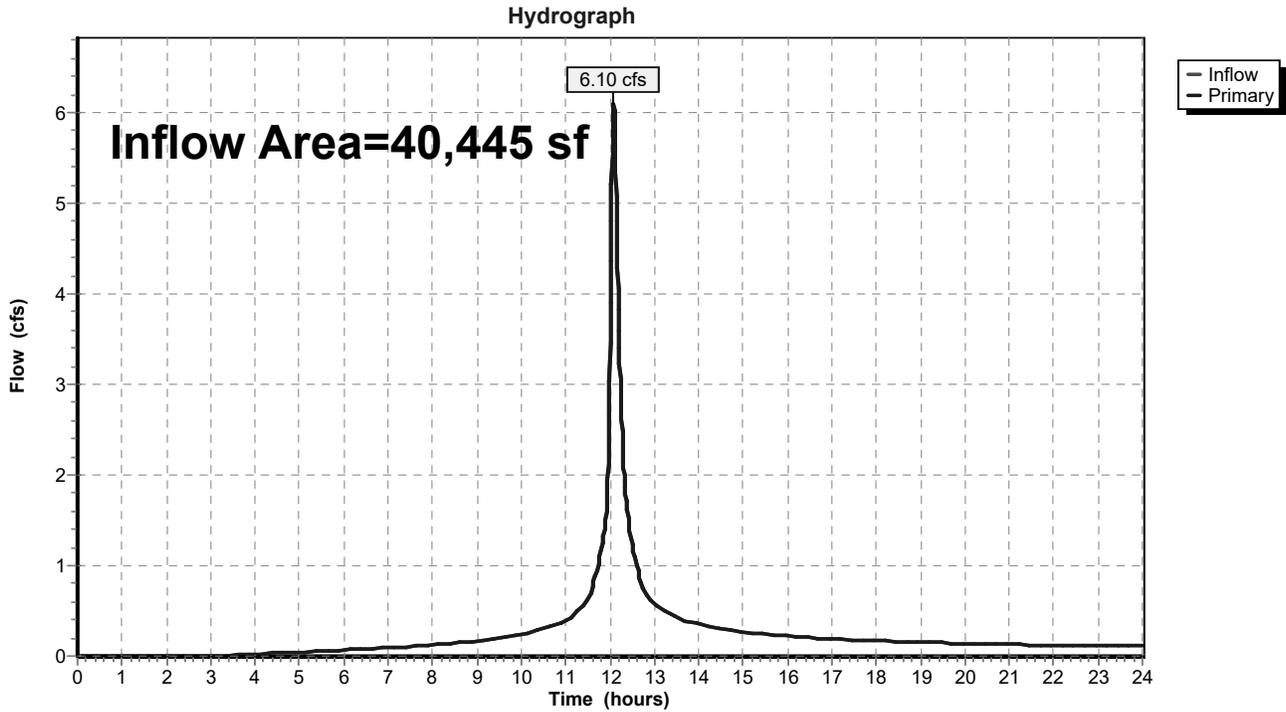


Summary for Link DP-1: Middle Street Gutter

Inflow Area = 40,445 sf, 6.03% Impervious, Inflow Depth > 6.35" for 100-yr event
Inflow = 6.10 cfs @ 12.08 hrs, Volume= 21,405 cf
Primary = 6.10 cfs @ 12.08 hrs, Volume= 21,405 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-1: Middle Street Gutter

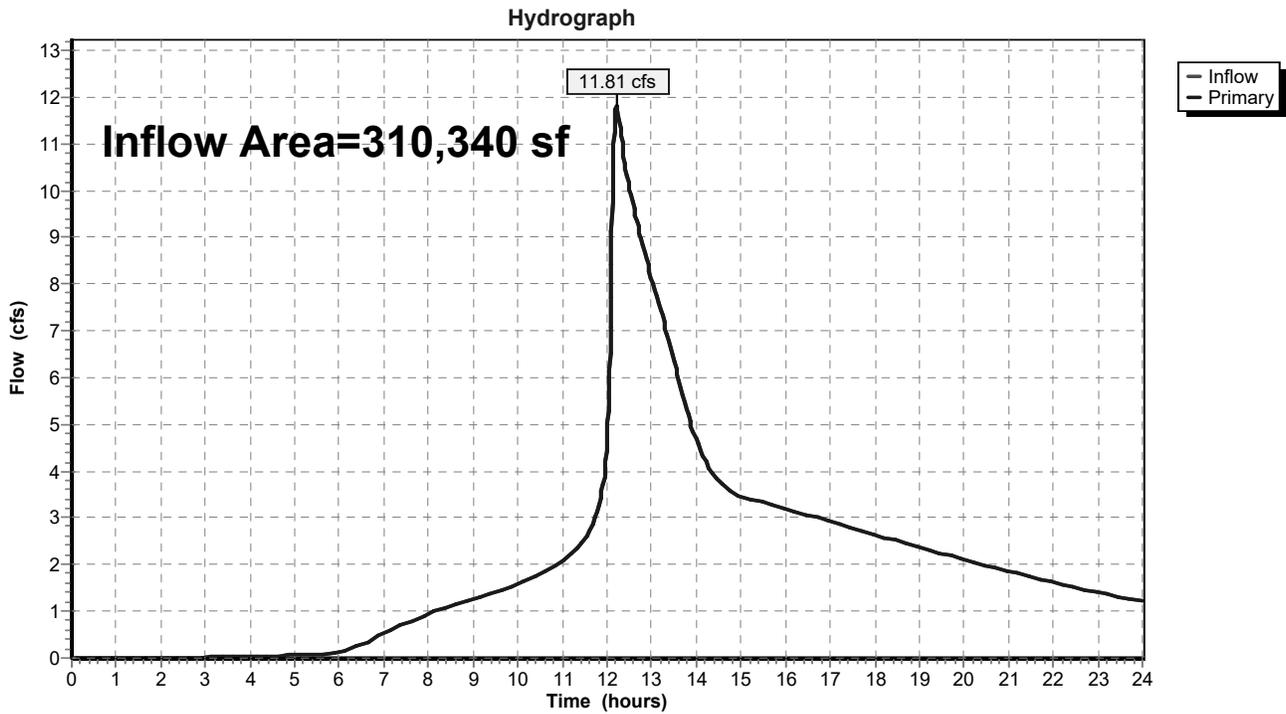


Summary for Link DP-2: Employee Lot Drainage

Inflow Area = 310,340 sf, 67.23% Impervious, Inflow Depth > 6.75" for 100-yr event
Inflow = 11.81 cfs @ 12.22 hrs, Volume= 174,477 cf
Primary = 11.81 cfs @ 12.22 hrs, Volume= 174,477 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-2: Employee Lot Drainage



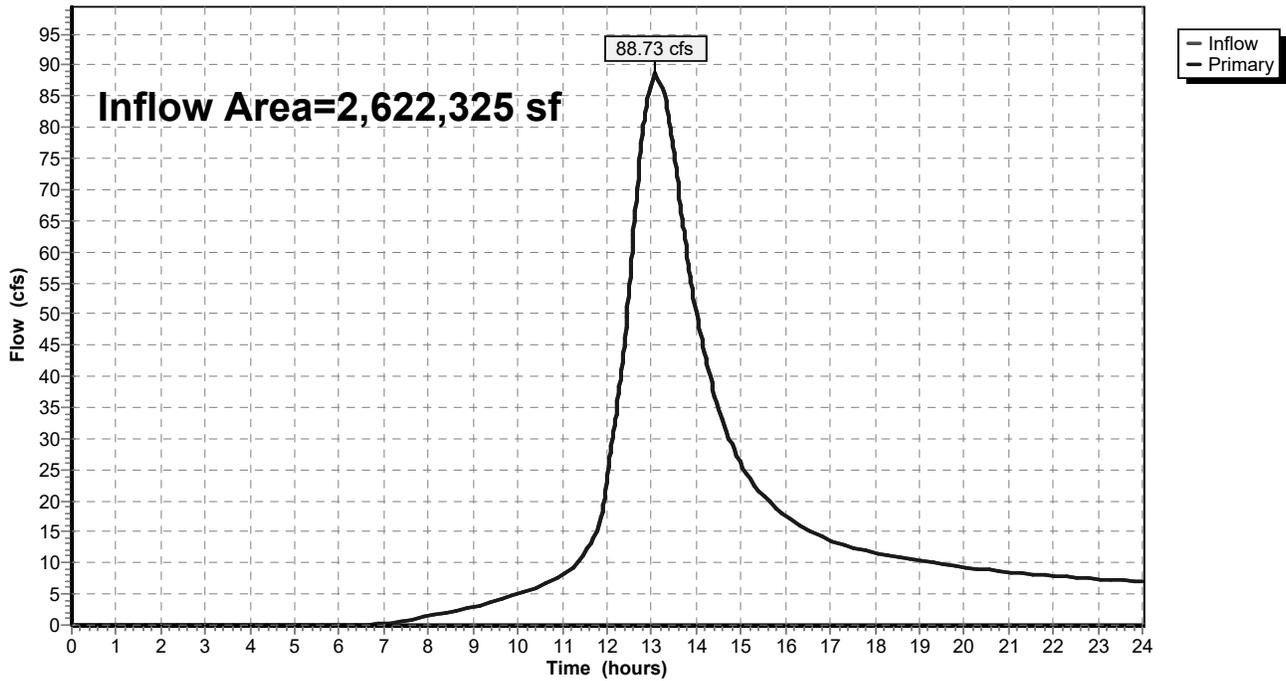
Summary for Link DP-3: Sawmill Brook Wetland System

Inflow Area = 2,622,325 sf, 9.85% Impervious, Inflow Depth > 4.82" for 100-yr event
 Inflow = 88.73 cfs @ 13.09 hrs, Volume= 1,053,712 cf
 Primary = 88.73 cfs @ 13.09 hrs, Volume= 1,053,712 cf, Atten= 0%, Lag= 0.0 min

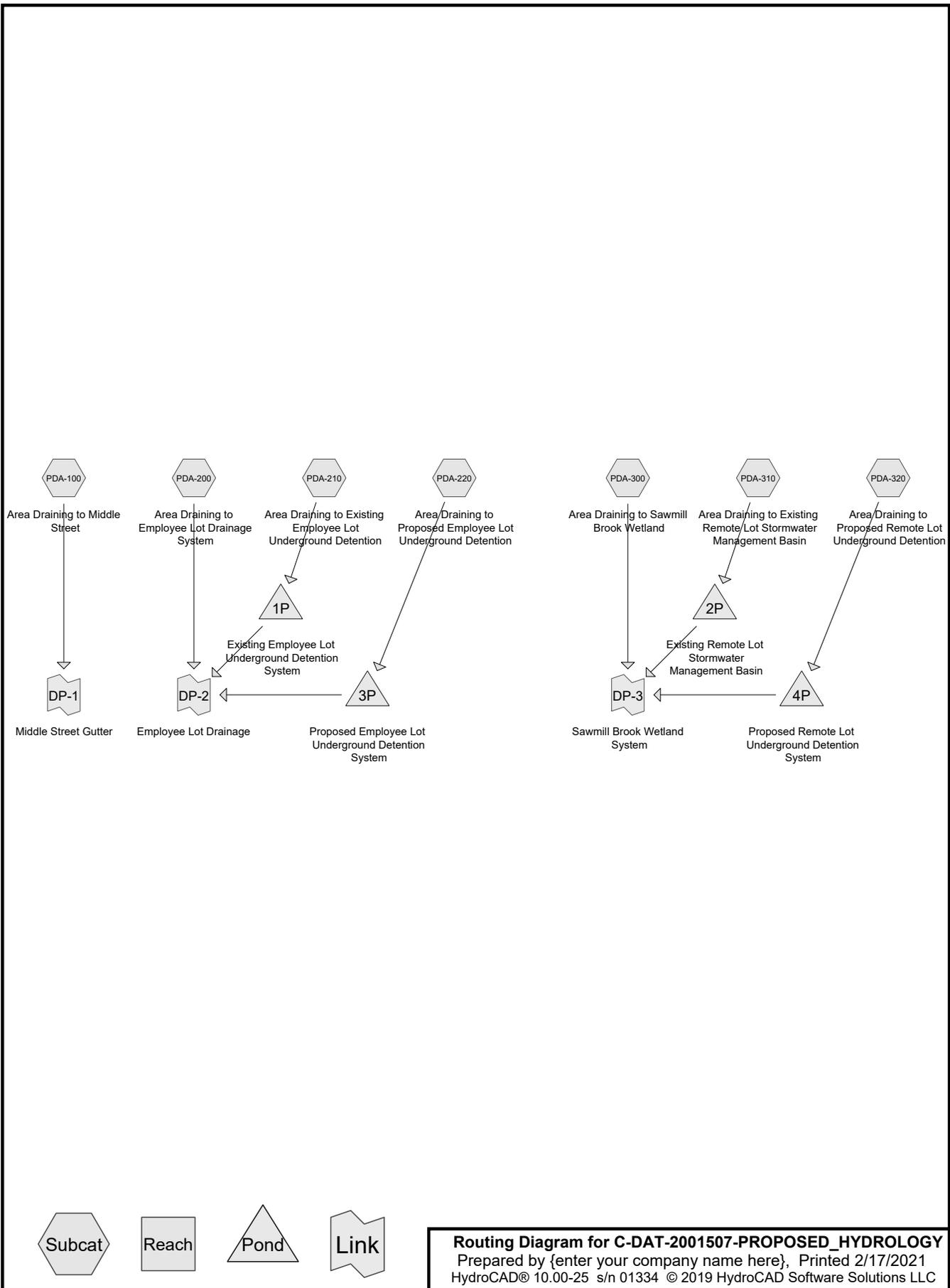
Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-3: Sawmill Brook Wetland System

Hydrograph



APPENDIX C
POST-DEVELOPMENT HYDROLOGY



C-DAT-2001507-PROPOSED_HYCT_Middletown_2001507_Depth 24-hr S1 2-yr Rainfall=3.29"

Prepared by {enter your company name here}

Printed 2/17/2021

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPDA-100: Area Draining to Runoff Area=39,350 sf 9.83% Impervious Runoff Depth>1.83"
Flow Length=962' Tc=9.9 min CN=85 Runoff=1.82 cfs 5,997 cf

SubcatchmentPDA-200: Area Draining to Runoff Area=25,360 sf 58.60% Impervious Runoff Depth>2.43"
Flow Length=786' Tc=16.4 min CN=92 Runoff=1.19 cfs 5,126 cf

SubcatchmentPDA-210: Area Draining to Runoff Area=266,730 sf 73.87% Impervious Runoff Depth>2.63"
Flow Length=815' Tc=8.2 min CN=94 Runoff=18.64 cfs 58,367 cf

SubcatchmentPDA-220: Area Draining to Runoff Area=19,345 sf 83.46% Impervious Runoff Depth>2.83"
Tc=5.0 min CN=96 Runoff=1.69 cfs 4,570 cf

SubcatchmentPDA-300: Area Draining Runoff Area=1,992,600 sf 2.53% Impervious Runoff Depth>1.05"
Flow Length=4,372' Tc=88.6 min CN=74 Runoff=14.90 cfs 175,093 cf

SubcatchmentPDA-310: Area Draining to Runoff Area=288,610 sf 65.96% Impervious Runoff Depth>2.08"
Flow Length=1,004' Tc=5.0 min CN=88 Runoff=19.66 cfs 49,909 cf

SubcatchmentPDA-320: Area Draining to Runoff Area=341,115 sf 85.50% Impervious Runoff Depth>2.62"
Flow Length=807' Tc=12.3 min CN=94 Runoff=19.77 cfs 74,565 cf

Pond 1P: Existing Employee Lot Peak Elev=127.10' Storage=29,522 cf Inflow=18.64 cfs 58,367 cf
Outflow=2.23 cfs 47,534 cf

Pond 2P: Existing Remote Lot Stormwater Peak Elev=23.05' Storage=27,463 cf Inflow=19.66 cfs 49,909 cf
Outflow=1.00 cfs 34,952 cf

Pond 3P: Proposed Employee Lot Peak Elev=133.49' Storage=2,450 cf Inflow=1.69 cfs 4,570 cf
Outflow=0.30 cfs 2,446 cf

Pond 4P: Proposed Remote Lot Peak Elev=21.75' Storage=50,927 cf Inflow=19.77 cfs 74,565 cf
Outflow=0.81 cfs 29,289 cf

Link DP-1: Middle Street Gutter Inflow=1.82 cfs 5,997 cf
Primary=1.82 cfs 5,997 cf

Link DP-2: Employee Lot Drainage Inflow=3.46 cfs 55,106 cf
Primary=3.46 cfs 55,106 cf

Link DP-3: Sawmill Brook Wetland System Inflow=16.52 cfs 239,334 cf
Primary=16.52 cfs 239,334 cf

Total Runoff Area = 2,973,110 sf Runoff Volume = 373,628 cf Average Runoff Depth = 1.51"
74.29% Pervious = 2,208,675 sf 25.71% Impervious = 764,435 sf

Summary for Subcatchment PDA-100: Area Draining to Middle Street

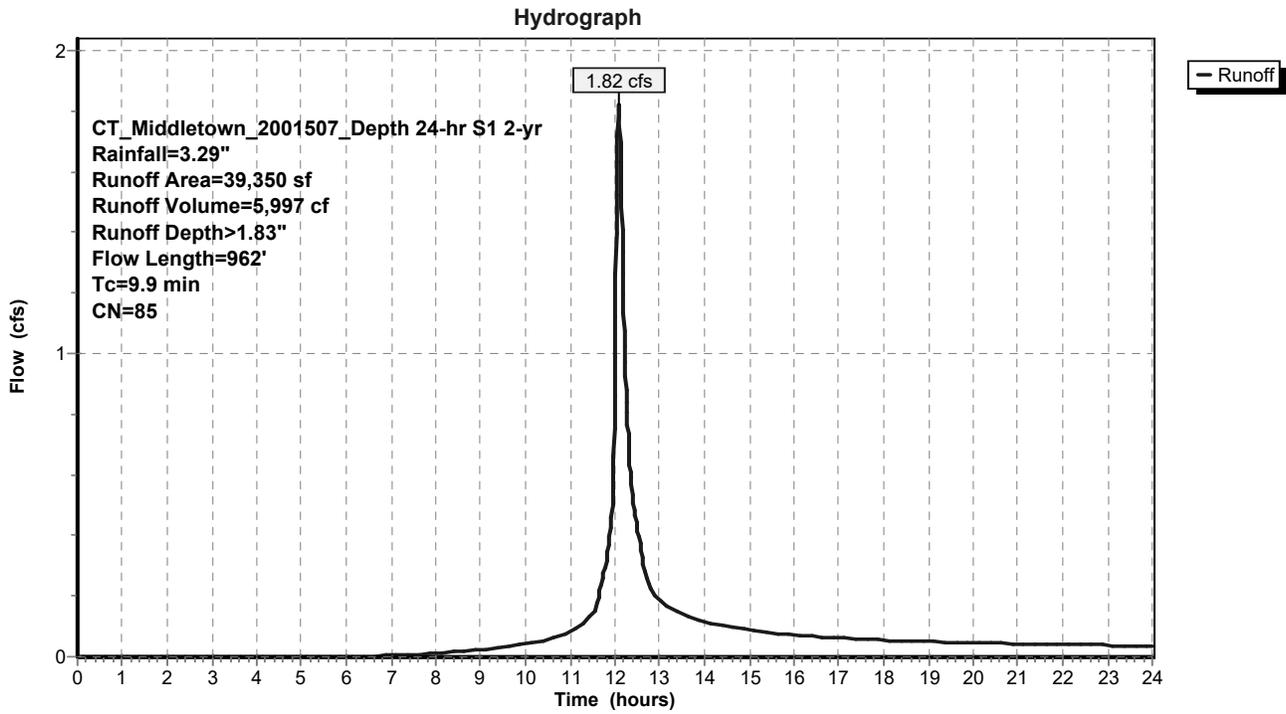
Runoff = 1.82 cfs @ 12.09 hrs, Volume= 5,997 cf, Depth> 1.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 2-yr Rainfall=3.29"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
35,480	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
3,870	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
39,350	85	Weighted Average
35,480		90.17% Pervious Area
3,870		9.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	28	0.1406	0.20		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
1.1	72	0.0120	1.06		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
6.5	862	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.9	962	Total			

Subcatchment PDA-100: Area Draining to Middle Street



Summary for Subcatchment PDA-200: Area Draining to Employee Lot Drainage System

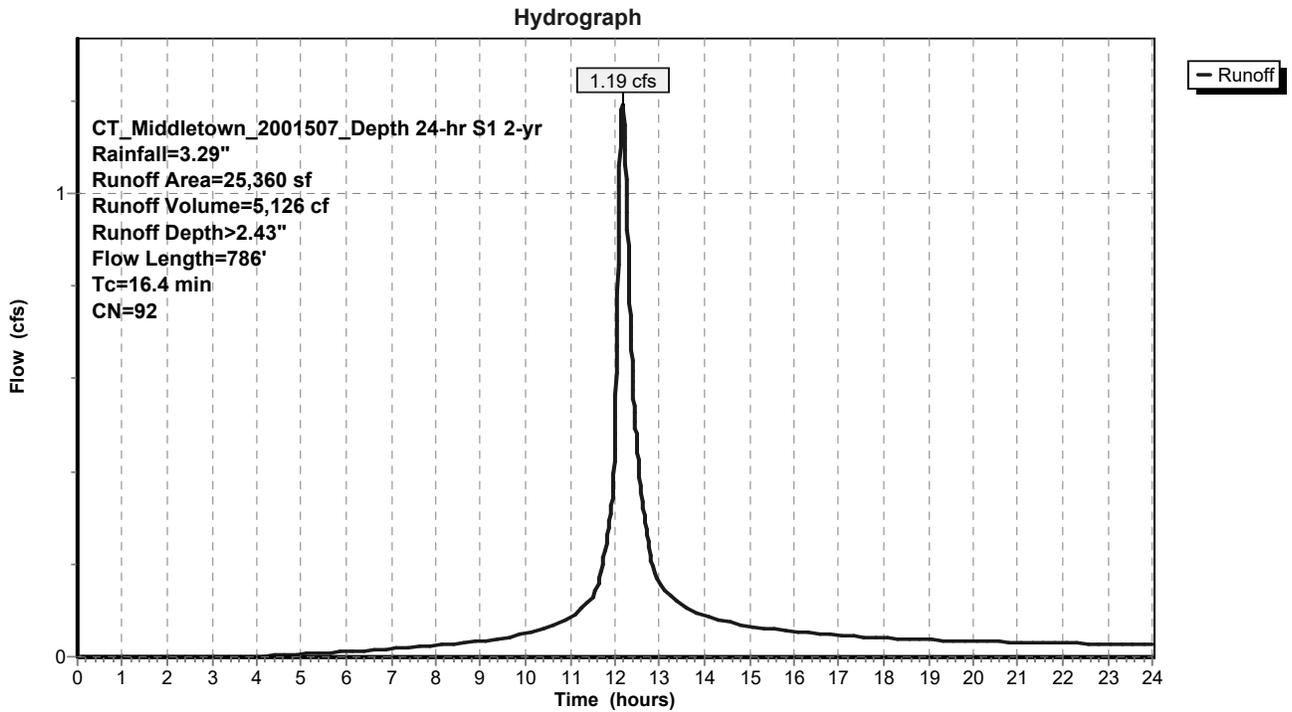
Runoff = 1.19 cfs @ 12.17 hrs, Volume= 5,126 cf, Depth> 2.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 2-yr Rainfall=3.29"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
10,500	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
14,860	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
25,360	92	Weighted Average
10,500		41.40% Pervious Area
14,860		58.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	72	0.0133	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
0.3	28	0.0357	1.36		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.7	308	0.0211	2.95		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.5	317	0.0050	3.47	2.73	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.2	61	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Concrete pipe, finished
16.4	786	Total			

Subcatchment PDA-200: Area Draining to Employee Lot Drainage System



Summary for Subcatchment PDA-210: Area Draining to Existing Employee Lot Underground Detention

Runoff = 18.64 cfs @ 12.06 hrs, Volume= 58,367 cf, Depth> 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 2-yr Rainfall=3.29"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
69,690	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
197,040	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
266,730	94	Weighted Average
69,690		26.13% Pervious Area
197,040		73.87% Impervious Area

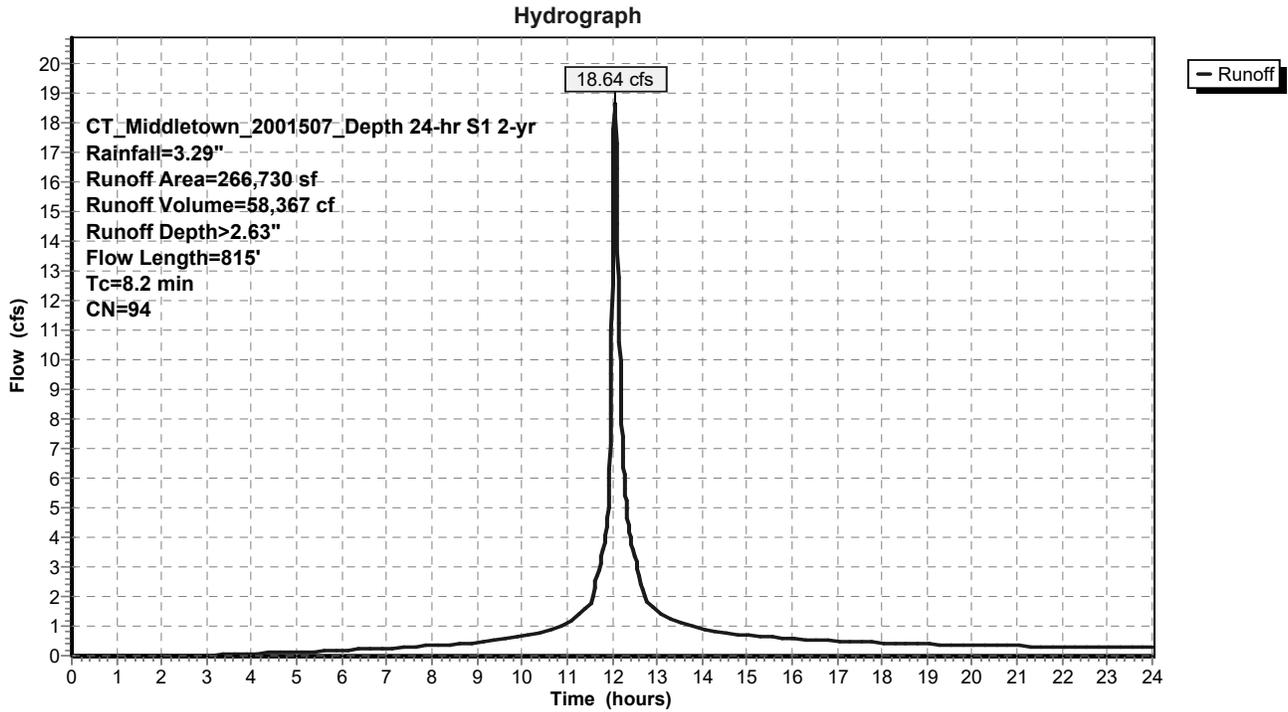
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	19	0.0160	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
1.1	81	0.0160	1.22		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.1	164	0.0160	2.57		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.5	130	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Concrete pipe, finished
0.6	152	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Concrete pipe, finished
0.3	108	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.3	101	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.1	38	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.1	22	0.0050	7.23	51.09	Pipe Channel,

36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'

n= 0.012 Concrete pipe, finished

8.2 815 Total

Subcatchment PDA-210: Area Draining to Existing Employee Lot Underground Detention



Summary for Subcatchment PDA-220: Area Draining to Proposed Employee Lot Underground Detenti

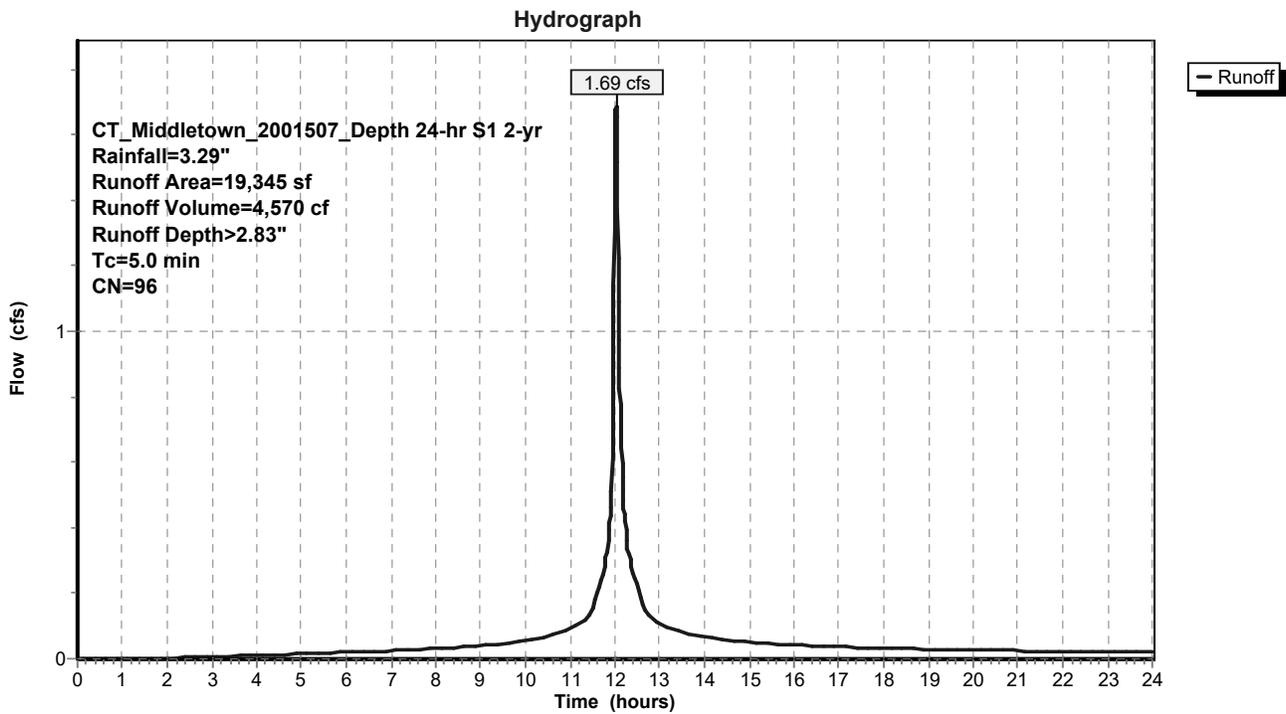
Runoff = 1.69 cfs @ 12.03 hrs, Volume= 4,570 cf, Depth> 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 2-yr Rainfall=3.29"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
3,200	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
16,145	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
19,345	96	Weighted Average
3,200		16.54% Pervious Area
16,145		83.46% Impervious Area

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

Subcatchment PDA-220: Area Draining to Proposed Employee Lot Underground Detention



Summary for Subcatchment PDA-300: Area Draining to Sawmill Brook Wetland

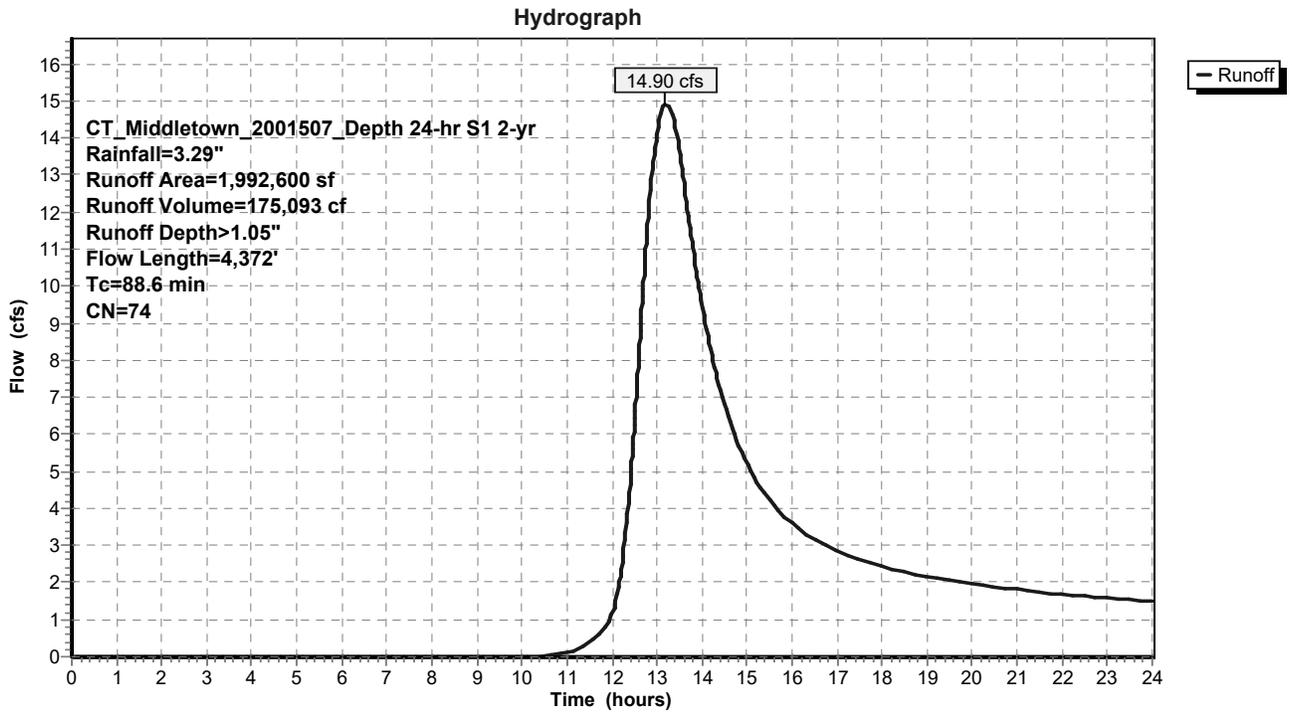
Runoff = 14.90 cfs @ 13.19 hrs, Volume= 175,093 cf, Depth> 1.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 2-yr Rainfall=3.29"

Area (sf)	CN	Description
750	69	50-75% Grass cover, Fair, HSG B
78,990	79	50-75% Grass cover, Fair, HSG C
29,645	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
15,875	98	Paved parking, HSG C
34,605	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
250	96	Gravel surface, HSG C
355	96	Gravel surface, HSG D
128,150	56	Brush, Fair, HSG B
103,140	70	Brush, Fair, HSG C
8,845	77	Brush, Fair, HSG D
291,600	60	Woods, Fair, HSG B
279,895	73	Woods, Fair, HSG C
1,020,500	79	Woods, Fair, HSG D
1,992,600	74	Weighted Average
1,942,120		97.47% Pervious Area
50,480		2.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.8	100	0.0110	0.04		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.29"
15.4	486	0.0110	0.52		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
26.4	3,786	0.0049	2.39	71.77	Channel Flow, Area= 30.0 sf Perim= 34.0' r= 0.88' n= 0.040 Winding stream, pools & shoals
88.6	4,372	Total			

Subcatchment PDA-300: Area Draining to Sawmill Brook Wetland



Summary for Subcatchment PDA-310: Area Draining to Existing Remote Lot Stormwater Management B

Runoff = 19.66 cfs @ 12.03 hrs, Volume= 49,909 cf, Depth> 2.08"

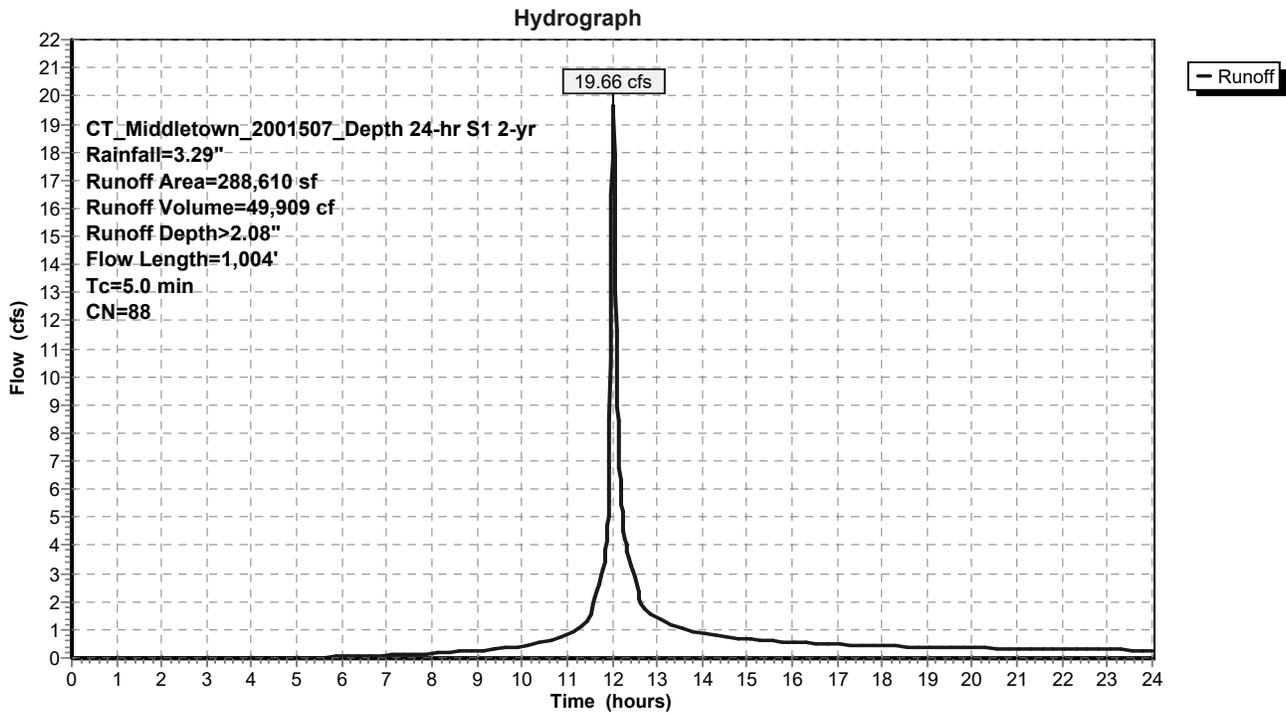
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 2-yr Rainfall=3.29"

Area (sf)	CN	Description
30,695	69	50-75% Grass cover, Fair, HSG B
14,665	79	50-75% Grass cover, Fair, HSG C
0	84	50-75% Grass cover, Fair, HSG D
135,315	98	Paved parking, HSG B
55,055	98	Paved parking, HSG C
0	98	Paved parking, HSG D
2,590	96	Gravel surface, HSG B
2,215	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
21,640	56	Brush, Fair, HSG B
26,435	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
288,610	88	Weighted Average
98,240		34.04% Pervious Area
190,370		65.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0180	1.34		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.0	165	0.0180	2.72		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	80	0.0050	3.47	2.73	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.5	168	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.4	162	0.0050	6.40	31.42	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Concrete pipe, finished
0.3	121	0.0050	6.40	31.42	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Concrete pipe, finished
0.2	70	0.0050	7.23	51.09	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
0.3	138	0.0050	7.23	51.09	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished

4.3 1,004 Total, Increased to minimum Tc = 5.0 min

Subcatchment PDA-310: Area Draining to Existing Remote Lot Stormwater Management Basin



Summary for Subcatchment PDA-320: Area Draining to Proposed Remote Lot Underground Detention

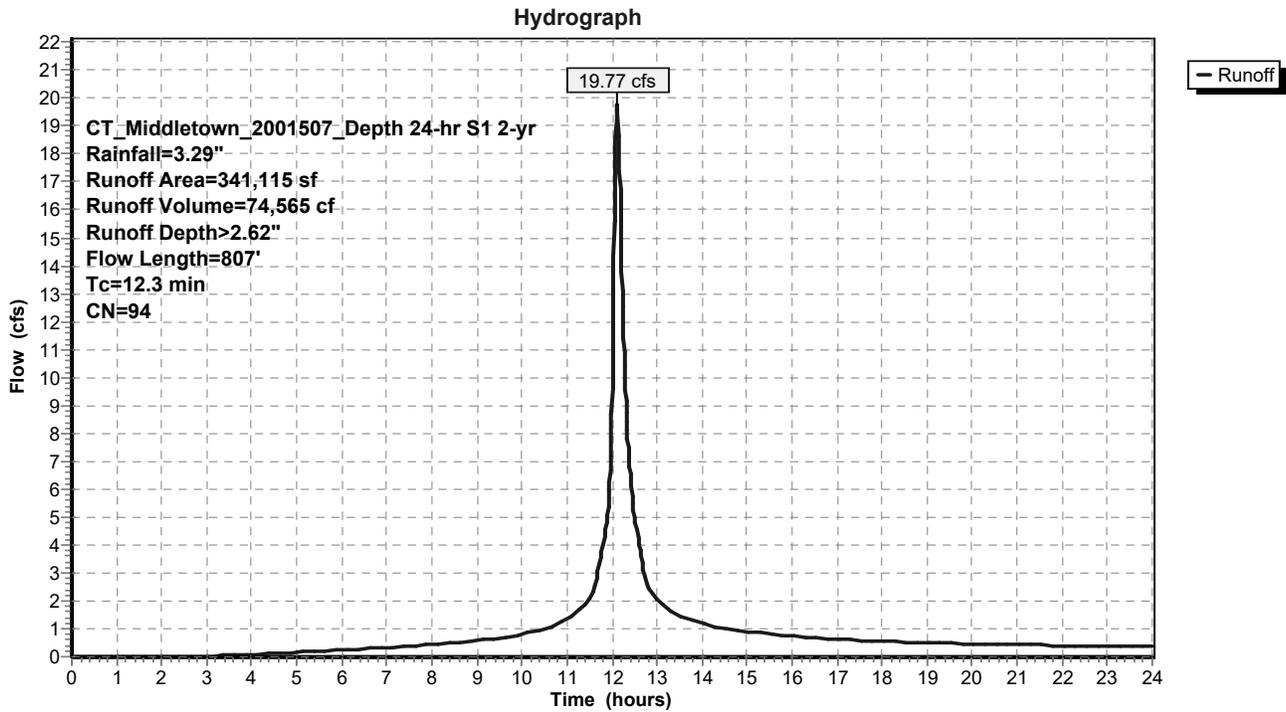
Runoff = 19.77 cfs @ 12.11 hrs, Volume= 74,565 cf, Depth> 2.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 2-yr Rainfall=3.29"

Area (sf)	CN	Description
41,205	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
8,240	84	50-75% Grass cover, Fair, HSG D
256,860	98	Paved parking, HSG B
0	98	Paved parking, HSG C
34,810	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
341,115	94	Weighted Average
49,445		14.50% Pervious Area
291,670		85.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0500	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
0.8	132	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.0	300	0.0050	4.97	8.78	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.4	150	0.0050	6.02	18.90	Pipe Channel, RCP_Round 24" 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.3	125	0.0050	7.89	55.74	Pipe Channel, RCP_Round 36" 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
12.3	807	Total			

Subcatchment PDA-320: Area Draining to Proposed Remote Lot Underground Detention



Summary for Pond 1P: Existing Employee Lot Underground Detention System

Inflow Area = 266,730 sf, 73.87% Impervious, Inflow Depth > 2.63" for 2-yr event
 Inflow = 18.64 cfs @ 12.06 hrs, Volume= 58,367 cf
 Outflow = 2.23 cfs @ 12.66 hrs, Volume= 47,534 cf, Atten= 88%, Lag= 36.0 min
 Primary = 2.23 cfs @ 12.66 hrs, Volume= 47,534 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 127.10' @ 12.66 hrs Surf.Area= 11,725 sf Storage= 29,522 cf

Plug-Flow detention time= 233.6 min calculated for 47,534 cf (81% of inflow)
 Center-of-Mass det. time= 148.4 min (944.6 - 796.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	123.50'	2,345 cf	64.19'W x 182.67'L x 9.50'H Field A 111,387 cf Overall - 105,524 cf Embedded = 5,862 cf x 40.0% Voids
#2A	124.00'	83,580 cf	StormTrap ST2 DoubleTrap 8-0x 66 Inside #1 Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf 66 Chambers in 6 Rows 50.88' x 169.35' Core + 6.66' Border = 64.19' x 182.67' System
		85,925 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	125.00'	24.0" Round Culvert L= 1,560.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 125.00' / 85.00' S= 0.0256 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	125.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	129.00'	12.0" Vert. Orifice/Grate C= 0.600
#4	Device 1	132.50'	3.0' long x 2.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=2.23 cfs @ 12.66 hrs HW=127.10' (Free Discharge)

- 1=Culvert (Passes 2.23 cfs of 15.87 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 2.23 cfs @ 6.40 fps)
- 3=Orifice/Grate (Controls 0.00 cfs)
- 4=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 1P: Existing Employee Lot Underground Detention System - Chamber Wizard Field A

Chamber Model = StormTrapST2 DoubleTrap 8-0 (StormTrapST2 DoubleTrap®Type II+IV)

Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf

Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf

11 Chambers/Row x 15.40' Long = 169.35' Row Length +79.9" Border x 2 = 182.67' Base Length

6 Rows x 101.7" Wide + 79.9" Side Border x 2 = 64.19' Base Width

6.0" Base + 108.0" Chamber Height = 9.50' Field Height

66 Chambers x 940.5 cf + 21,503.9 cf Border = 83,579.7 cf Chamber Storage

66 Chambers x 1,174.9 cf + 27,981.2 cf Border = 105,524.2 cf Displacement

111,386.7 cf Field - 105,524.2 cf Chambers = 5,862.5 cf Stone x 40.0% Voids = 2,345.0 cf Stone Storage

Chamber Storage + Stone Storage = 85,924.7 cf = 1.973 af

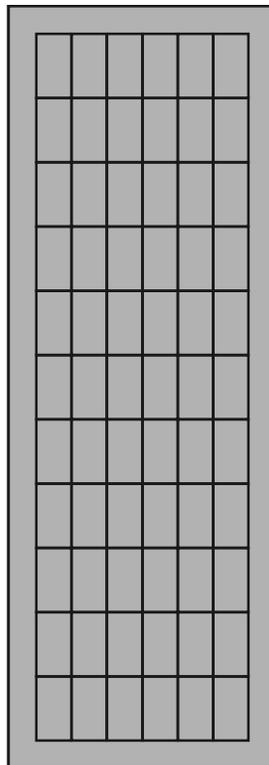
Overall Storage Efficiency = 77.1%

Overall System Size = 182.67' x 64.19' x 9.50'

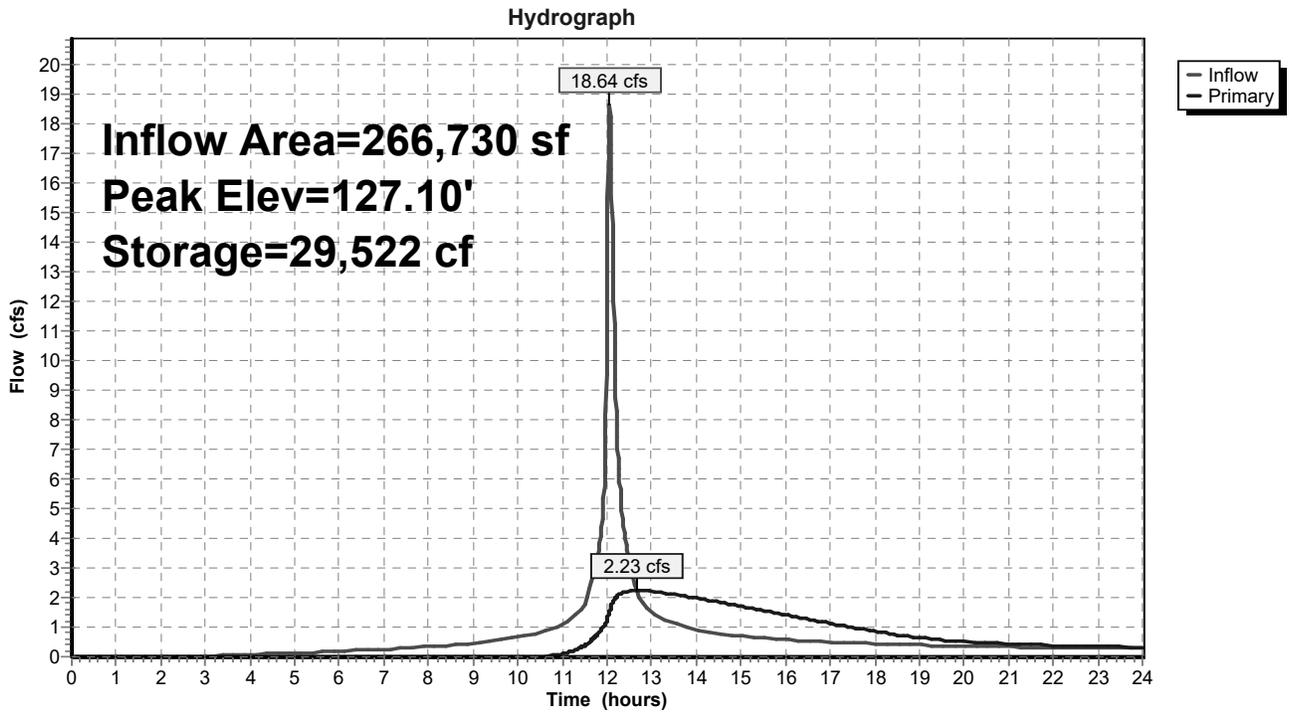
66 Chambers (plus border)

4,125.4 cy Field

217.1 cy Stone



Pond 1P: Existing Employee Lot Underground Detention System



Summary for Pond 2P: Existing Remote Lot Stormwater Management Basin

Inflow Area = 288,610 sf, 65.96% Impervious, Inflow Depth > 2.08" for 2-yr event
 Inflow = 19.66 cfs @ 12.03 hrs, Volume= 49,909 cf
 Outflow = 1.00 cfs @ 13.65 hrs, Volume= 34,952 cf, Atten= 95%, Lag= 97.3 min
 Primary = 1.00 cfs @ 13.65 hrs, Volume= 34,952 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 23.05' @ 13.65 hrs Surf.Area= 12,694 sf Storage= 27,463 cf

Plug-Flow detention time= 329.3 min calculated for 34,938 cf (70% of inflow)
 Center-of-Mass det. time= 215.3 min (1,044.3 - 829.0)

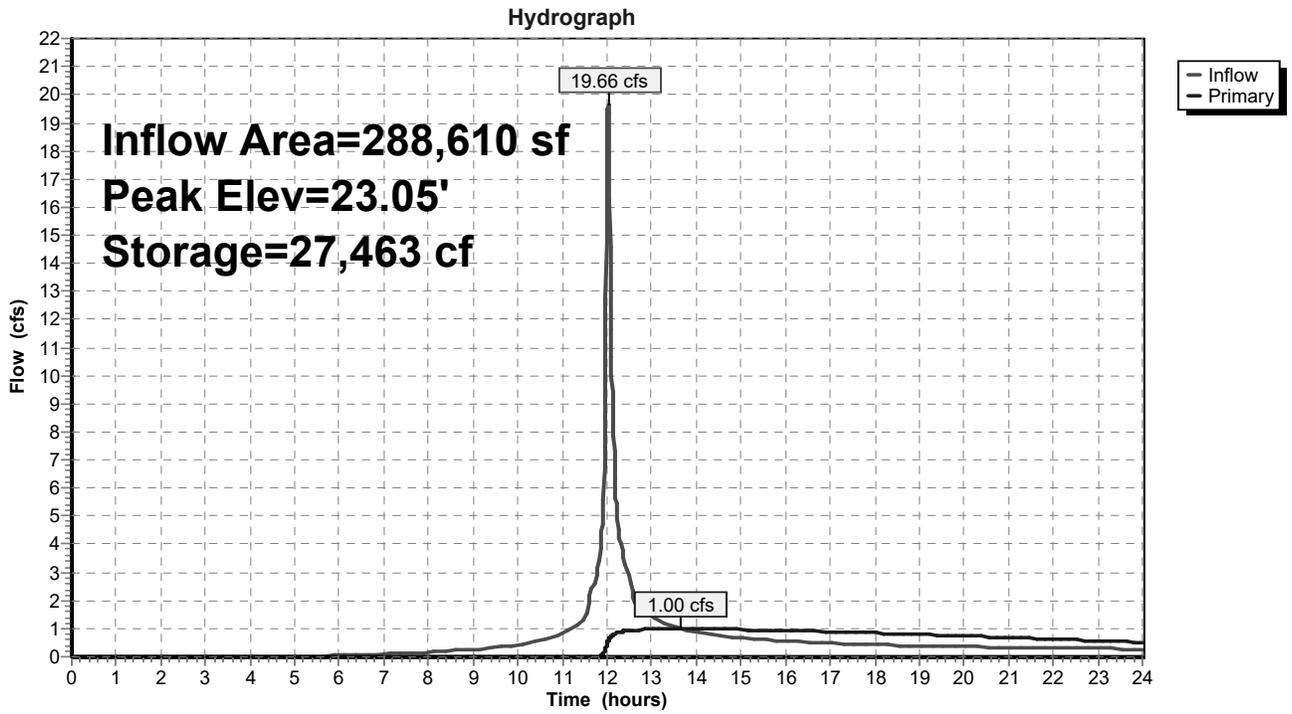
Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	94,737 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	5,895	0	0
21.00	7,748	6,822	6,822
22.00	9,895	8,822	15,643
23.00	12,598	11,247	26,890
24.00	14,704	13,651	40,541
25.00	16,889	15,797	56,337
26.00	19,175	18,032	74,369
27.00	21,560	20,368	94,737

Device	Routing	Invert	Outlet Devices
#1	Primary	21.28'	18.0" Round Culvert L= 55.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 21.28' / 21.00' S= 0.0051 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	21.28'	5.5" Vert. Orifice/Grate C= 0.600
#3	Device 1	23.00'	12.0" Vert. Orifice/Grate X 2 rows with 6.0" cc spacing C= 0.600
#4	Device 1	26.50'	3.0" x 2.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.99 cfs @ 13.65 hrs HW=23.05' (Free Discharge)

- 1=Culvert (Passes 0.99 cfs of 7.83 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.98 cfs @ 5.97 fps)
- 3=Orifice/Grate (Orifice Controls 0.01 cfs @ 0.73 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond 2P: Existing Remote Lot Stormwater Management Basin



Summary for Pond 3P: Proposed Employee Lot Underground Detention System

Inflow Area = 19,345 sf, 83.46% Impervious, Inflow Depth > 2.83" for 2-yr event
 Inflow = 1.69 cfs @ 12.03 hrs, Volume= 4,570 cf
 Outflow = 0.30 cfs @ 12.34 hrs, Volume= 2,446 cf, Atten= 82%, Lag= 19.0 min
 Primary = 0.30 cfs @ 12.34 hrs, Volume= 2,446 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 133.49' @ 12.34 hrs Surf.Area= 869 sf Storage= 2,450 cf

Plug-Flow detention time= 291.0 min calculated for 2,446 cf (54% of inflow)
 Center-of-Mass det. time= 149.5 min (927.2 - 777.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	129.50'	174 cf	30.27'W x 28.71'L x 9.50'H Field A 8,256 cf Overall - 7,821 cf Embedded = 435 cf x 40.0% Voids
#2A	130.00'	6,086 cf	StormTrap ST2 DoubleTrap 8-0x2 Inside #1 Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf 2 Chambers in 2 Rows 16.96' x 15.40' Core + 6.66' Border = 30.27' x 28.71' System
		6,260 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	130.50'	12.0" Round Culvert L= 77.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 130.50' / 129.34' S= 0.0151 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	133.00'	4.0" W x 4.0" H Vert. Orifice/Grate C= 0.600
#3	Device 1	135.25'	4.0" W x 4.0" H Vert. Orifice/Grate C= 0.600
#4	Device 1	136.50'	4.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Primary OutFlow Max=0.30 cfs @ 12.34 hrs HW=133.49' (Free Discharge)

- 1=Culvert (Passes 0.30 cfs of 5.93 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.30 cfs @ 2.72 fps)
- 3=Orifice/Grate (Controls 0.00 cfs)
- 4=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 3P: Proposed Employee Lot Underground Detention System - Chamber Wizard Field A

Chamber Model = StormTrapST2 DoubleTrap 8-0 (StormTrapST2 DoubleTrap®Type II+IV)

Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf
 Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf

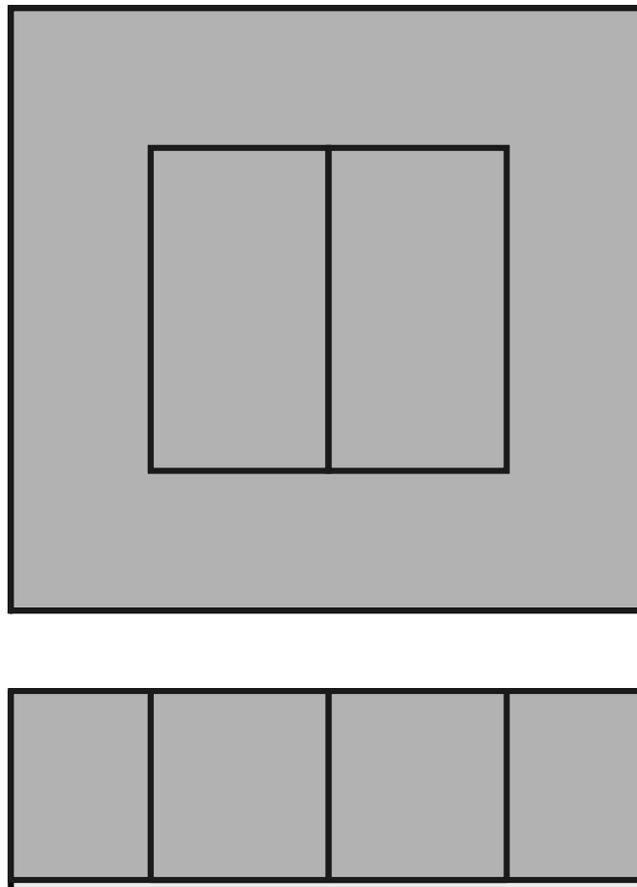
1 Chambers/Row x 15.40' Long = 15.40' Row Length +79.9" Border x 2 = 28.71' Base Length
 2 Rows x 101.7" Wide + 79.9" Side Border x 2 = 30.27' Base Width
 6.0" Base + 108.0" Chamber Height = 9.50' Field Height

2 Chambers x 940.5 cf + 4,204.9 cf Border = 6,085.9 cf Chamber Storage
 2 Chambers x 1,174.9 cf + 5,471.4 cf Border = 7,821.2 cf Displacement

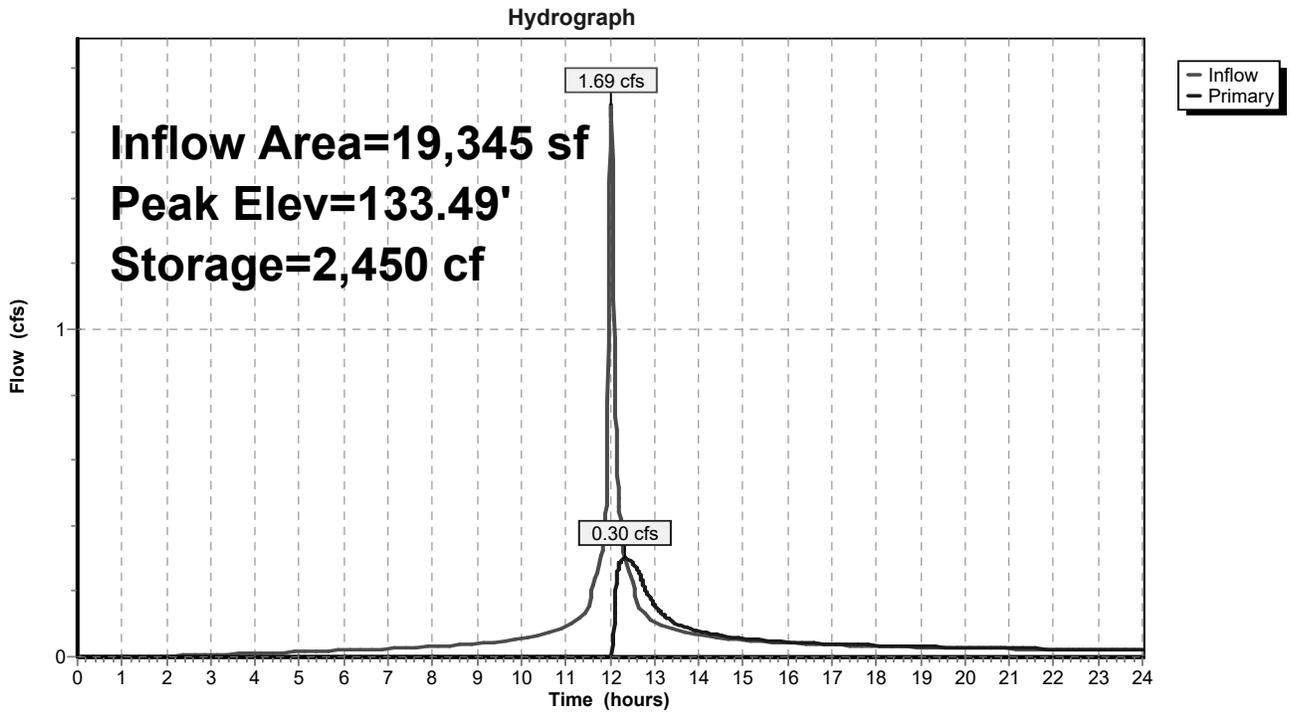
8,255.7 cf Field - 7,821.2 cf Chambers = 434.5 cf Stone x 40.0% Voids = 173.8 cf Stone Storage

Chamber Storage + Stone Storage = 6,259.8 cf = 0.144 af
 Overall Storage Efficiency = 75.8%
 Overall System Size = 28.71' x 30.27' x 9.50'

2 Chambers (plus border)
 305.8 cy Field
 16.1 cy Stone



Pond 3P: Proposed Employee Lot Underground Detention System



Summary for Pond 4P: Proposed Remote Lot Underground Detention System

Inflow Area = 341,115 sf, 85.50% Impervious, Inflow Depth > 2.62" for 2-yr event
 Inflow = 19.77 cfs @ 12.11 hrs, Volume= 74,565 cf
 Outflow = 0.81 cfs @ 15.49 hrs, Volume= 29,289 cf, Atten= 96%, Lag= 202.6 min
 Primary = 0.81 cfs @ 15.49 hrs, Volume= 29,289 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 21.75' @ 15.49 hrs Surf.Area= 16,410 sf Storage= 50,927 cf

Plug-Flow detention time= 439.2 min calculated for 29,289 cf (39% of inflow)
 Center-of-Mass det. time= 276.0 min (1,075.3 - 799.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	17.50'	3,282 cf	98.10'W x 167.27'L x 9.50'H Field A 155,895 cf Overall - 147,690 cf Embedded = 8,205 cf x 40.0% Voids
#2A	18.00'	117,263 cf	StormTrap ST2 DoubleTrap 8-0x 100 Inside #1 Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf 100 Chambers in 10 Rows 84.79' x 153.96' Core + 6.66' Border = 98.10' x 167.27' System
		120,545 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	18.00'	36.0" Round Culvert L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 18.00' / 17.60' S= 0.0050 '/ Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Device 1	20.00'	4.0" W x 4.0" H Vert. Orifice/Grate C= 0.600
#3	Device 1	21.50'	4.0" W x 4.0" H Vert. Orifice/Grate C= 0.600
#4	Device 1	23.00'	12.0" W x 6.0" H Vert. Orifice/Grate C= 0.600
#5	Device 1	25.00'	4.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Primary OutFlow Max=0.81 cfs @ 15.49 hrs HW=21.75' (Free Discharge)

- 1=Culvert (Passes 0.81 cfs of 46.29 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.67 cfs @ 6.06 fps)
- 3=Orifice/Grate (Orifice Controls 0.13 cfs @ 1.61 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)
- 5=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 4P: Proposed Remote Lot Underground Detention System - Chamber Wizard Field A

Chamber Model = StormTrapST2 DoubleTrap 8-0 (StormTrapST2 DoubleTrap®Type II+IV)

Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf

Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf

10 Chambers/Row x 15.40' Long = 153.96' Row Length +79.9" Border x 2 = 167.27' Base Length

10 Rows x 101.7" Wide + 79.9" Side Border x 2 = 98.10' Base Width

6.0" Base + 108.0" Chamber Height = 9.50' Field Height

100 Chambers x 940.5 cf + 23,209.2 cf Border = 117,263.5 cf Chamber Storage

100 Chambers x 1,174.9 cf + 30,200.2 cf Border = 147,689.7 cf Displacement

155,894.7 cf Field - 147,689.7 cf Chambers = 8,205.0 cf Stone x 40.0% Voids = 3,282.0 cf Stone Storage

Chamber Storage + Stone Storage = 120,545.5 cf = 2.767 af

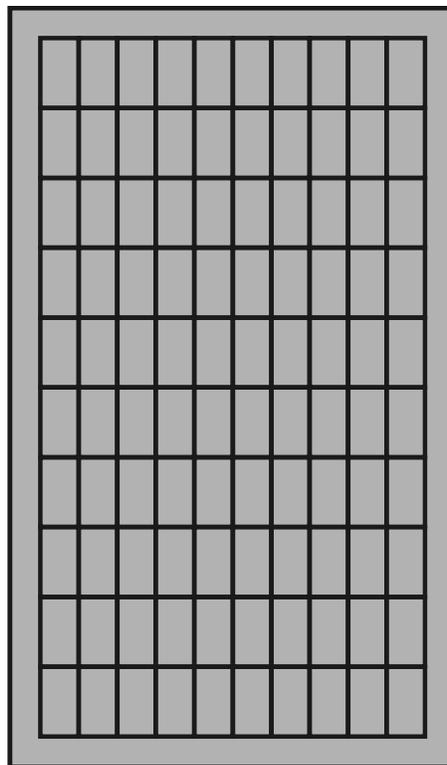
Overall Storage Efficiency = 77.3%

Overall System Size = 167.27' x 98.10' x 9.50'

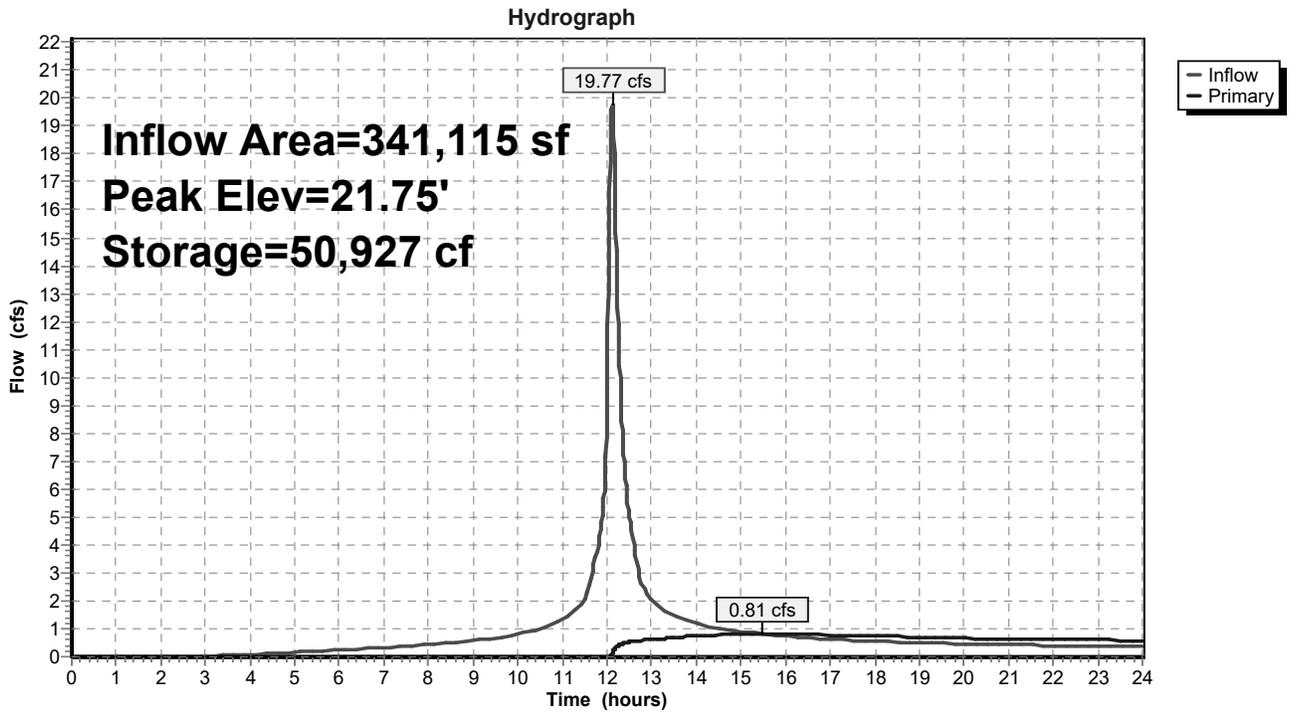
100 Chambers (plus border)

5,773.9 cy Field

303.9 cy Stone



Pond 4P: Proposed Remote Lot Underground Detention System

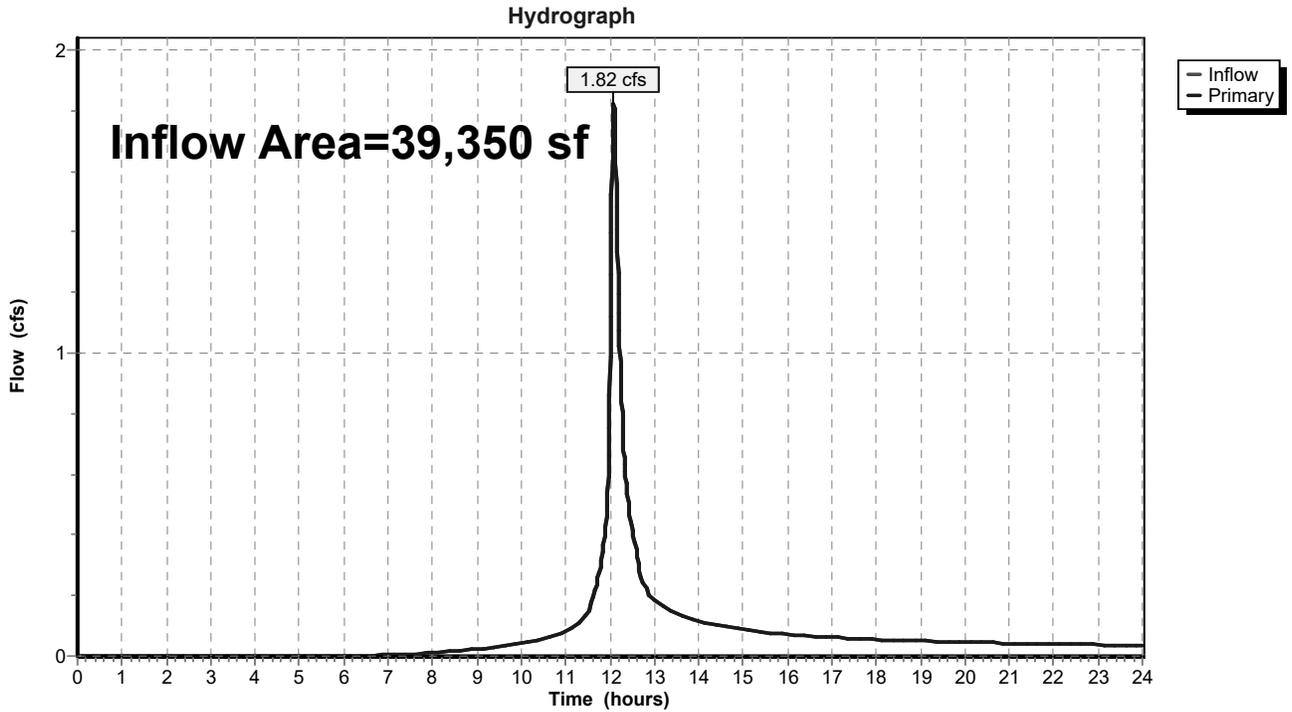


Summary for Link DP-1: Middle Street Gutter

Inflow Area = 39,350 sf, 9.83% Impervious, Inflow Depth > 1.83" for 2-yr event
Inflow = 1.82 cfs @ 12.09 hrs, Volume= 5,997 cf
Primary = 1.82 cfs @ 12.09 hrs, Volume= 5,997 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-1: Middle Street Gutter

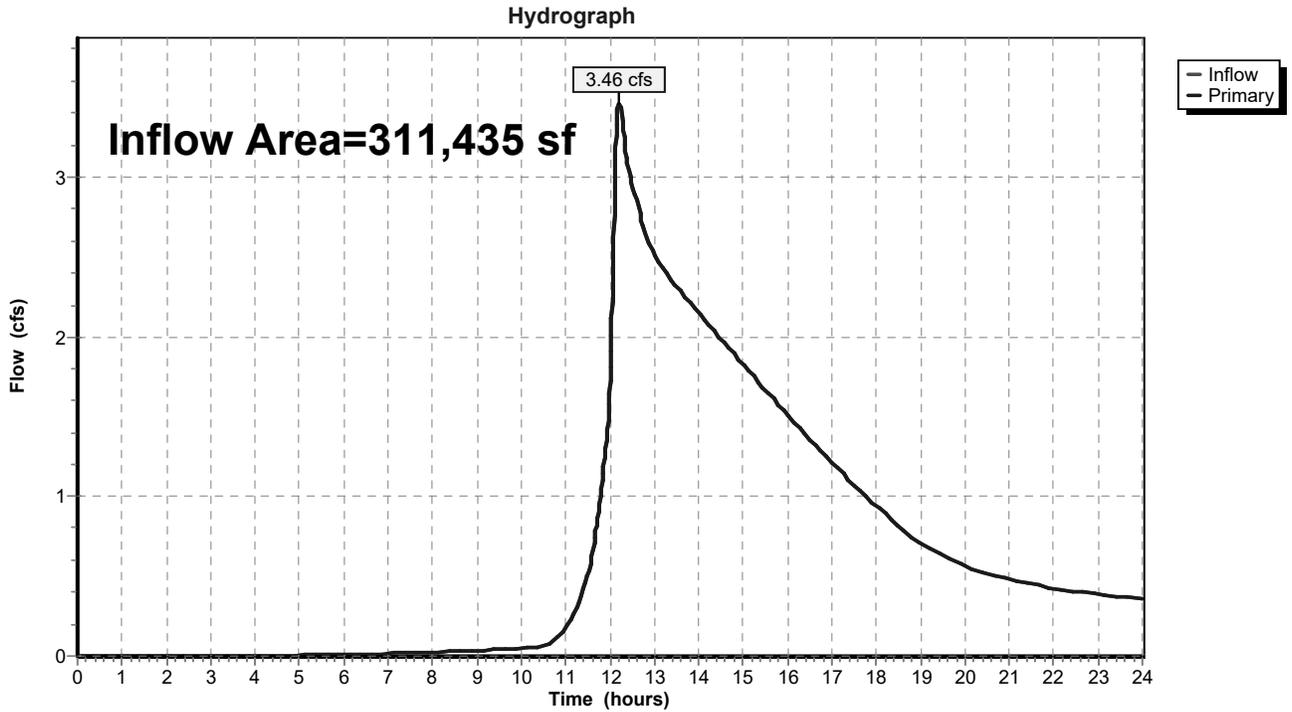


Summary for Link DP-2: Employee Lot Drainage

Inflow Area = 311,435 sf, 73.22% Impervious, Inflow Depth > 2.12" for 2-yr event
Inflow = 3.46 cfs @ 12.21 hrs, Volume= 55,106 cf
Primary = 3.46 cfs @ 12.21 hrs, Volume= 55,106 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-2: Employee Lot Drainage



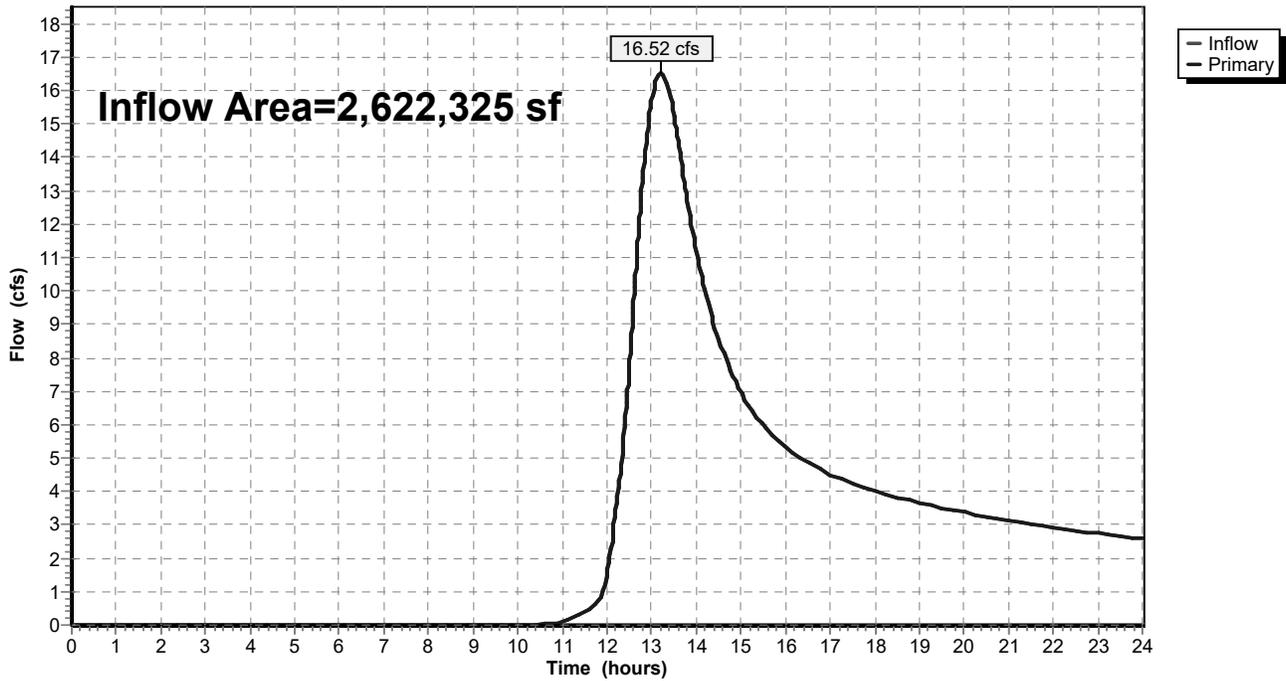
Summary for Link DP-3: Sawmill Brook Wetland System

Inflow Area = 2,622,325 sf, 20.31% Impervious, Inflow Depth > 1.10" for 2-yr event
Inflow = 16.52 cfs @ 13.19 hrs, Volume= 239,334 cf
Primary = 16.52 cfs @ 13.19 hrs, Volume= 239,334 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-3: Sawmill Brook Wetland System

Hydrograph



C-DAT-2001507-PROPOSED_HCT_Middletown_2001507_Depth 24-hr S1 10-yr Rainfall=5.18"

Prepared by {enter your company name here}

Printed 2/17/2021

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPDA-100: Area Draining to Runoff Area=39,350 sf 9.83% Impervious Runoff Depth>3.52"
Flow Length=962' Tc=9.9 min CN=85 Runoff=3.42 cfs 11,558 cf

SubcatchmentPDA-200: Area Draining to Runoff Area=25,360 sf 58.60% Impervious Runoff Depth>4.25"
Flow Length=786' Tc=16.4 min CN=92 Runoff=1.98 cfs 8,976 cf

SubcatchmentPDA-210: Area Draining to Runoff Area=266,730 sf 73.87% Impervious Runoff Depth>4.48"
Flow Length=815' Tc=8.2 min CN=94 Runoff=30.20 cfs 99,509 cf

SubcatchmentPDA-220: Area Draining to Runoff Area=19,345 sf 83.46% Impervious Runoff Depth>4.71"
Tc=5.0 min CN=96 Runoff=2.67 cfs 7,587 cf

SubcatchmentPDA-300: Area Draining Runoff Area=1,992,600 sf 2.53% Impervious Runoff Depth>2.42"
Flow Length=4,372' Tc=88.6 min CN=74 Runoff=35.28 cfs 402,626 cf

SubcatchmentPDA-310: Area Draining to Runoff Area=288,610 sf 65.96% Impervious Runoff Depth>3.84"
Flow Length=1,004' Tc=5.0 min CN=88 Runoff=34.88 cfs 92,238 cf

SubcatchmentPDA-320: Area Draining to Runoff Area=341,115 sf 85.50% Impervious Runoff Depth>4.47"
Flow Length=807' Tc=12.3 min CN=94 Runoff=31.99 cfs 127,129 cf

Pond 1P: Existing Employee Lot Peak Elev=128.77' Storage=46,967 cf Inflow=30.20 cfs 99,509 cf
Outflow=3.12 cfs 87,383 cf

Pond 2P: Existing Remote Lot Stormwater Peak Elev=24.11' Storage=42,225 cf Inflow=34.88 cfs 92,238 cf
Outflow=5.59 cfs 71,412 cf

Pond 3P: Proposed Employee Lot Peak Elev=134.88' Storage=3,509 cf Inflow=2.67 cfs 7,587 cf
Outflow=0.70 cfs 5,438 cf

Pond 4P: Proposed Remote Lot Peak Elev=23.53' Storage=76,982 cf Inflow=31.99 cfs 127,129 cf
Outflow=2.91 cfs 71,828 cf

Link DP-1: Middle Street Gutter Inflow=3.42 cfs 11,558 cf
Primary=3.42 cfs 11,558 cf

Link DP-2: Employee Lot Drainage Inflow=5.48 cfs 101,797 cf
Primary=5.48 cfs 101,797 cf

Link DP-3: Sawmill Brook Wetland System Inflow=42.12 cfs 545,866 cf
Primary=42.12 cfs 545,866 cf

Total Runoff Area = 2,973,110 sf Runoff Volume = 749,623 cf Average Runoff Depth = 3.03"
74.29% Pervious = 2,208,675 sf 25.71% Impervious = 764,435 sf

Summary for Subcatchment PDA-100: Area Draining to Middle Street

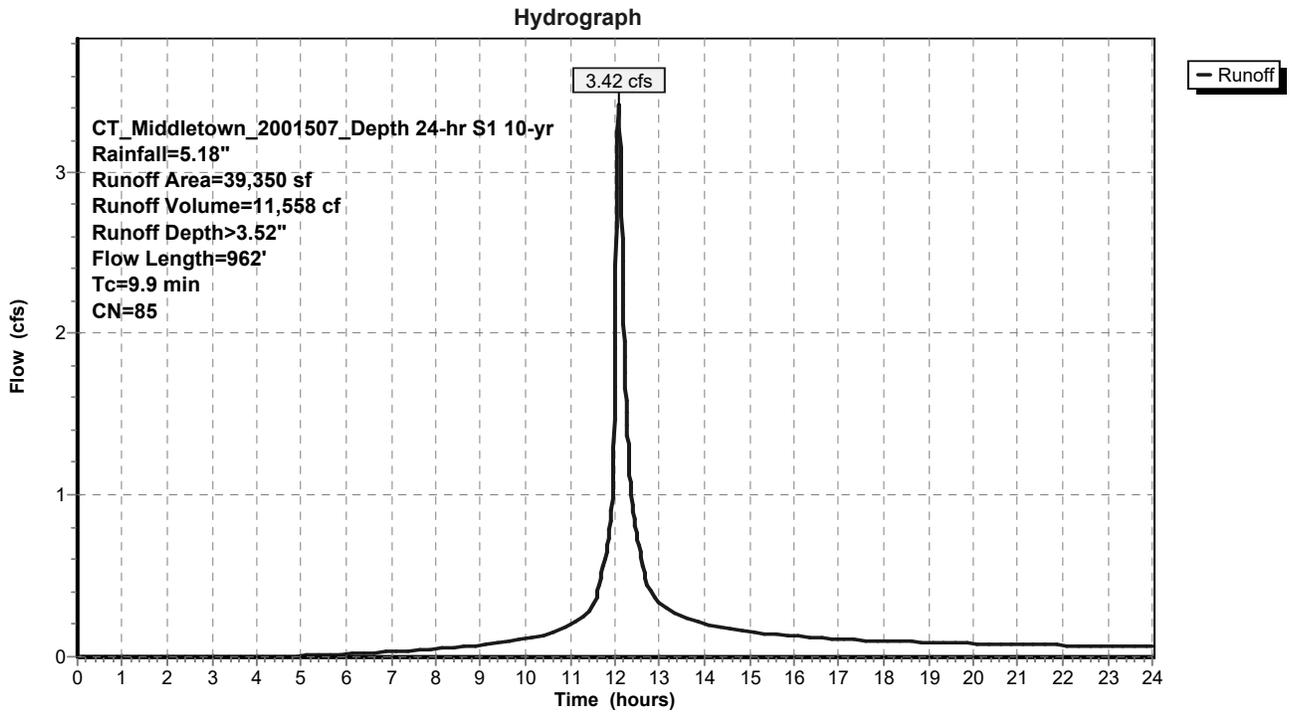
Runoff = 3.42 cfs @ 12.09 hrs, Volume= 11,558 cf, Depth> 3.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 10-yr Rainfall=5.18"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
35,480	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
3,870	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
39,350	85	Weighted Average
35,480		90.17% Pervious Area
3,870		9.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	28	0.1406	0.20		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
1.1	72	0.0120	1.06		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
6.5	862	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.9	962	Total			

Subcatchment PDA-100: Area Draining to Middle Street



Summary for Subcatchment PDA-200: Area Draining to Employee Lot Drainage System

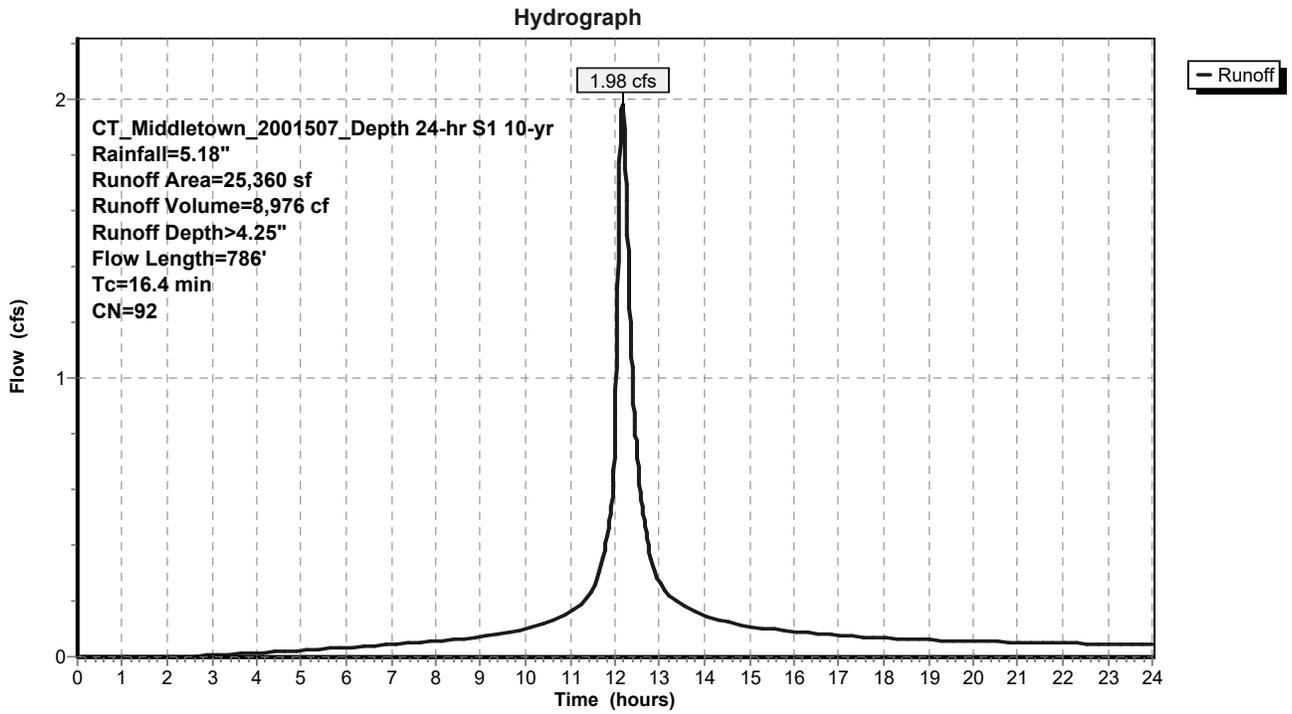
Runoff = 1.98 cfs @ 12.17 hrs, Volume= 8,976 cf, Depth> 4.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 10-yr Rainfall=5.18"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
10,500	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
14,860	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
25,360	92	Weighted Average
10,500		41.40% Pervious Area
14,860		58.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	72	0.0133	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
0.3	28	0.0357	1.36		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.7	308	0.0211	2.95		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.5	317	0.0050	3.47	2.73	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.2	61	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Concrete pipe, finished
16.4	786	Total			

Subcatchment PDA-200: Area Draining to Employee Lot Drainage System



Summary for Subcatchment PDA-210: Area Draining to Existing Employee Lot Underground Detention

Runoff = 30.20 cfs @ 12.06 hrs, Volume= 99,509 cf, Depth> 4.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 10-yr Rainfall=5.18"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
69,690	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
197,040	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
266,730	94	Weighted Average
69,690		26.13% Pervious Area
197,040		73.87% Impervious Area

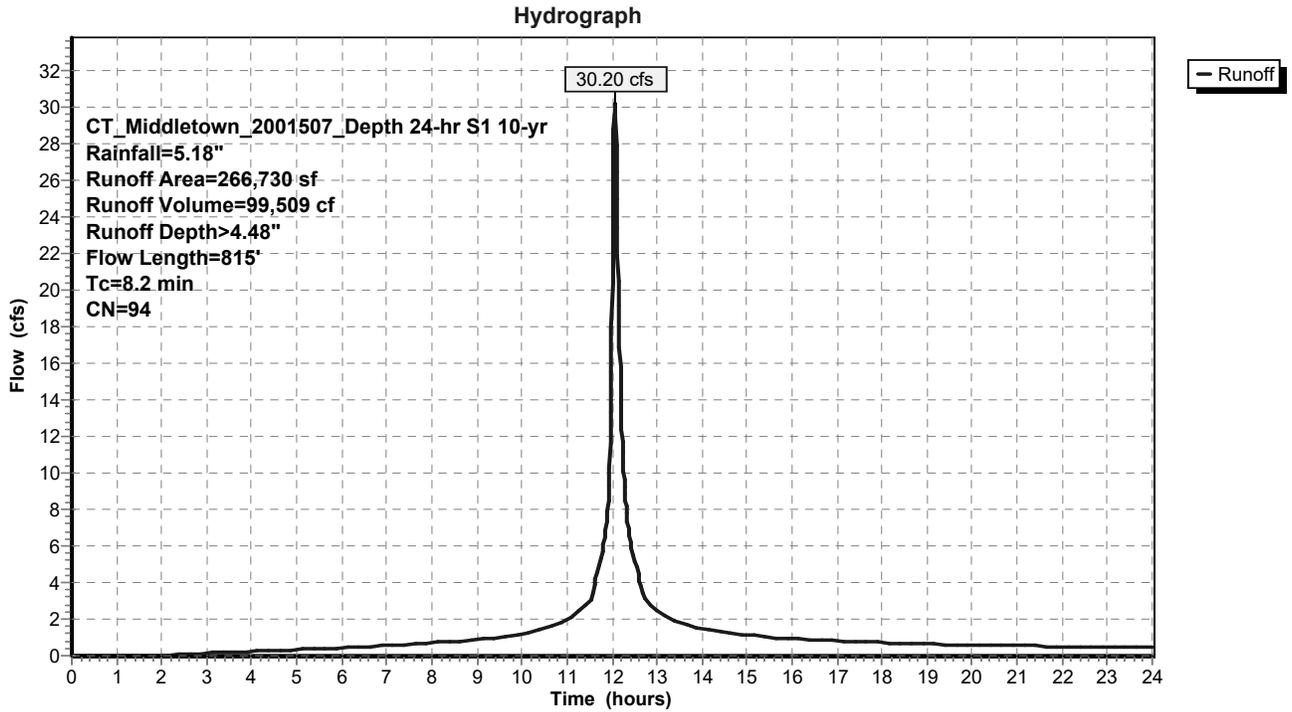
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	19	0.0160	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
1.1	81	0.0160	1.22		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.1	164	0.0160	2.57		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.5	130	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Concrete pipe, finished
0.6	152	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Concrete pipe, finished
0.3	108	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.3	101	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.1	38	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.1	22	0.0050	7.23	51.09	Pipe Channel,

36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'

n= 0.012 Concrete pipe, finished

8.2 815 Total

Subcatchment PDA-210: Area Draining to Existing Employee Lot Underground Detention



Summary for Subcatchment PDA-220: Area Draining to Proposed Employee Lot Underground Detenti

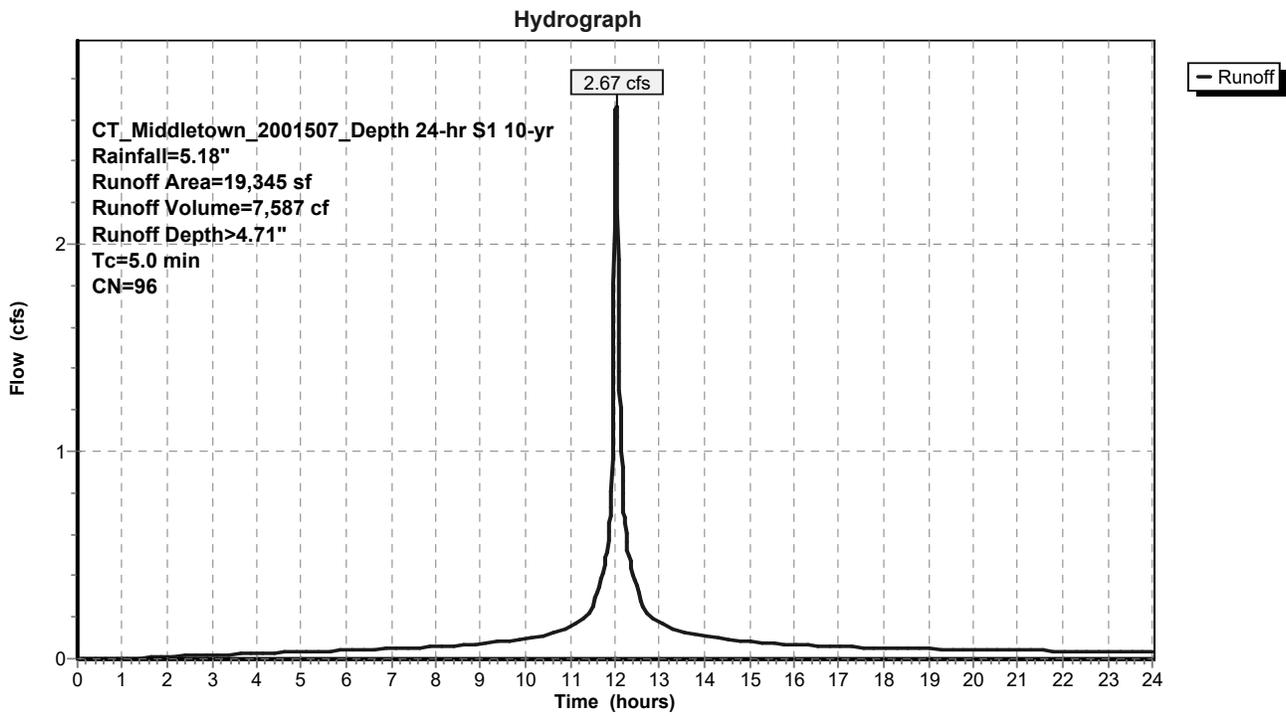
Runoff = 2.67 cfs @ 12.03 hrs, Volume= 7,587 cf, Depth> 4.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 10-yr Rainfall=5.18"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
3,200	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
16,145	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
19,345	96	Weighted Average
3,200		16.54% Pervious Area
16,145		83.46% Impervious Area

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

Subcatchment PDA-220: Area Draining to Proposed Employee Lot Underground Detention



Summary for Subcatchment PDA-300: Area Draining to Sawmill Brook Wetland

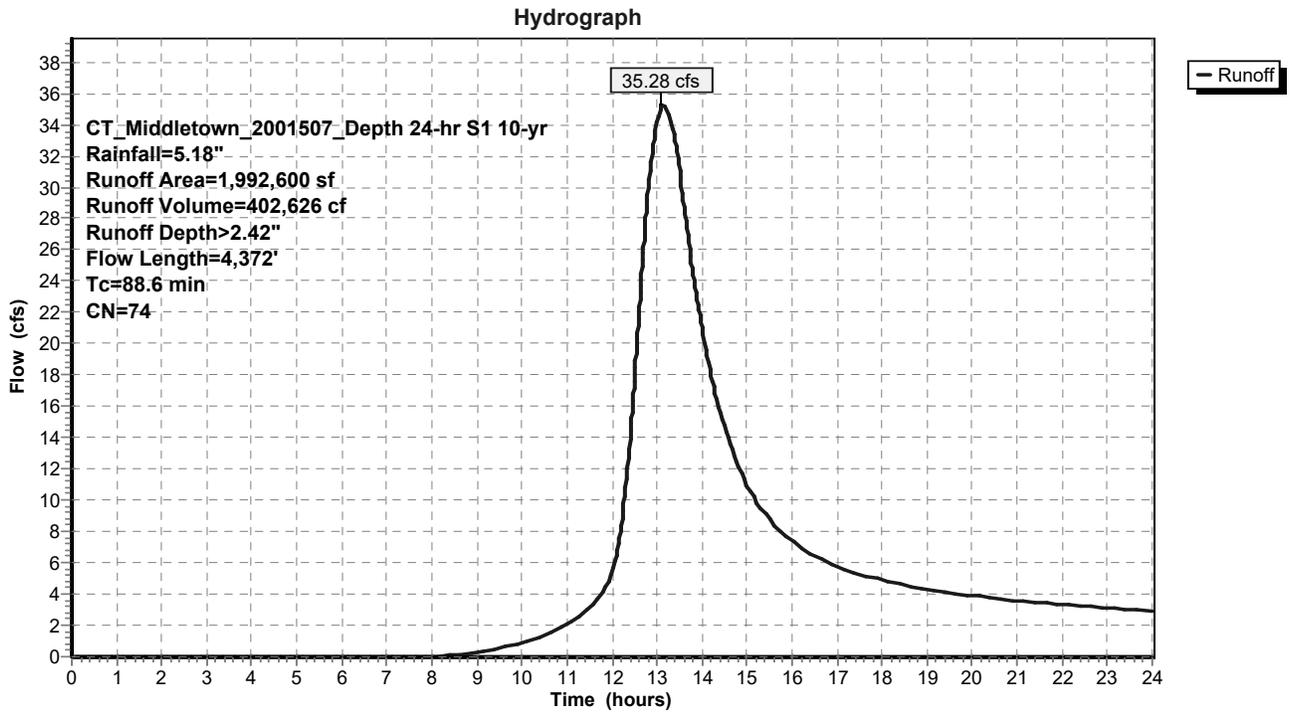
Runoff = 35.28 cfs @ 13.10 hrs, Volume= 402,626 cf, Depth> 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 10-yr Rainfall=5.18"

Area (sf)	CN	Description
750	69	50-75% Grass cover, Fair, HSG B
78,990	79	50-75% Grass cover, Fair, HSG C
29,645	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
15,875	98	Paved parking, HSG C
34,605	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
250	96	Gravel surface, HSG C
355	96	Gravel surface, HSG D
128,150	56	Brush, Fair, HSG B
103,140	70	Brush, Fair, HSG C
8,845	77	Brush, Fair, HSG D
291,600	60	Woods, Fair, HSG B
279,895	73	Woods, Fair, HSG C
1,020,500	79	Woods, Fair, HSG D
1,992,600	74	Weighted Average
1,942,120		97.47% Pervious Area
50,480		2.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.8	100	0.0110	0.04		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.29"
15.4	486	0.0110	0.52		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
26.4	3,786	0.0049	2.39	71.77	Channel Flow, Area= 30.0 sf Perim= 34.0' r= 0.88' n= 0.040 Winding stream, pools & shoals
88.6	4,372	Total			

Subcatchment PDA-300: Area Draining to Sawmill Brook Wetland



Summary for Subcatchment PDA-310: Area Draining to Existing Remote Lot Stormwater Management B

Runoff = 34.88 cfs @ 12.03 hrs, Volume= 92,238 cf, Depth> 3.84"

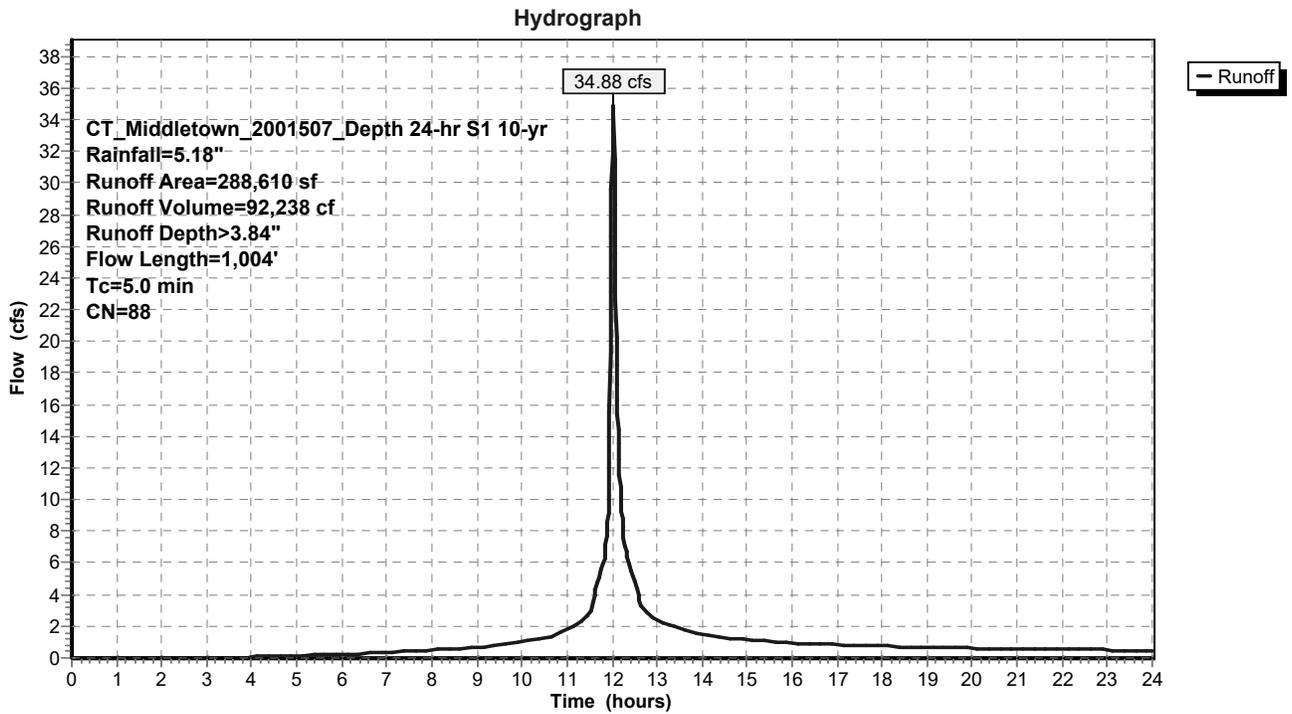
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 10-yr Rainfall=5.18"

Area (sf)	CN	Description
30,695	69	50-75% Grass cover, Fair, HSG B
14,665	79	50-75% Grass cover, Fair, HSG C
0	84	50-75% Grass cover, Fair, HSG D
135,315	98	Paved parking, HSG B
55,055	98	Paved parking, HSG C
0	98	Paved parking, HSG D
2,590	96	Gravel surface, HSG B
2,215	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
21,640	56	Brush, Fair, HSG B
26,435	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
288,610	88	Weighted Average
98,240		34.04% Pervious Area
190,370		65.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0180	1.34		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.0	165	0.0180	2.72		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	80	0.0050	3.47	2.73	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.5	168	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.4	162	0.0050	6.40	31.42	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Concrete pipe, finished
0.3	121	0.0050	6.40	31.42	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Concrete pipe, finished
0.2	70	0.0050	7.23	51.09	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
0.3	138	0.0050	7.23	51.09	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished

4.3 1,004 Total, Increased to minimum Tc = 5.0 min

Subcatchment PDA-310: Area Draining to Existing Remote Lot Stormwater Management Basin



Summary for Subcatchment PDA-320: Area Draining to Proposed Remote Lot Underground Detention

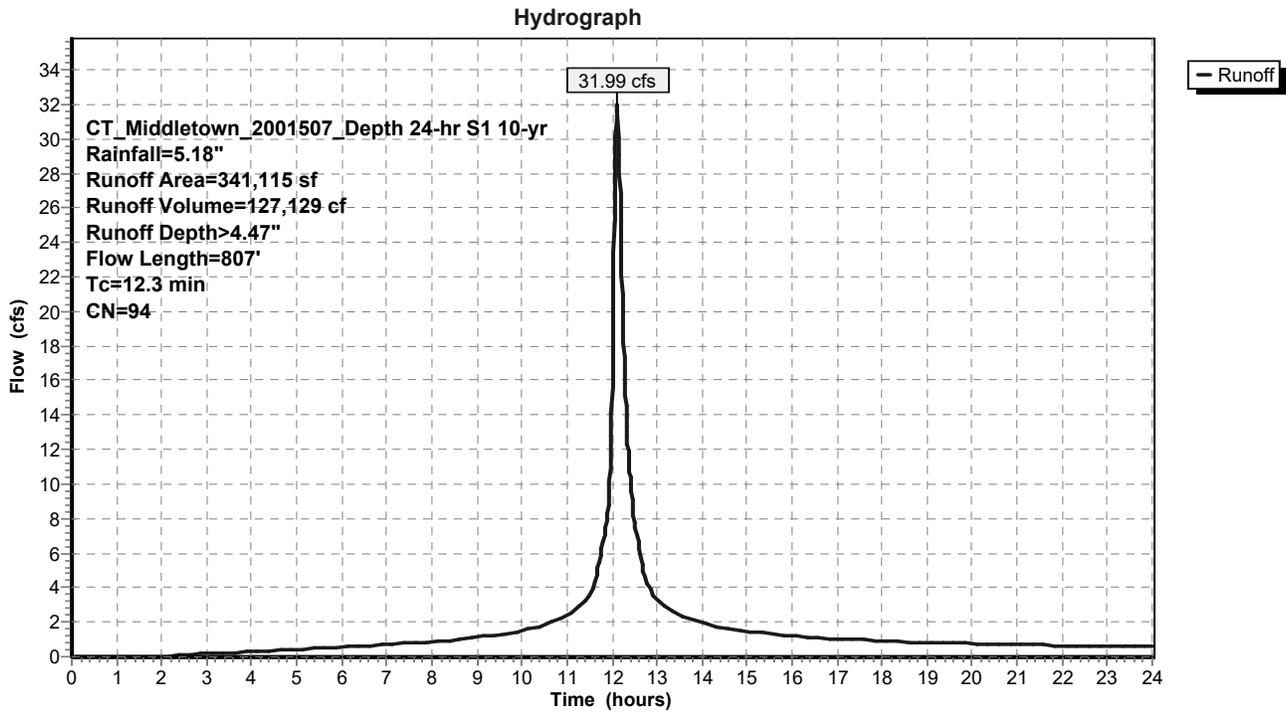
Runoff = 31.99 cfs @ 12.11 hrs, Volume= 127,129 cf, Depth> 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 10-yr Rainfall=5.18"

Area (sf)	CN	Description
41,205	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
8,240	84	50-75% Grass cover, Fair, HSG D
256,860	98	Paved parking, HSG B
0	98	Paved parking, HSG C
34,810	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
341,115	94	Weighted Average
49,445		14.50% Pervious Area
291,670		85.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0500	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
0.8	132	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.0	300	0.0050	4.97	8.78	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.4	150	0.0050	6.02	18.90	Pipe Channel, RCP_Round 24" 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.3	125	0.0050	7.89	55.74	Pipe Channel, RCP_Round 36" 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
12.3	807	Total			

Subcatchment PDA-320: Area Draining to Proposed Remote Lot Underground Detention



Summary for Pond 1P: Existing Employee Lot Underground Detention System

Inflow Area = 266,730 sf, 73.87% Impervious, Inflow Depth > 4.48" for 10-yr event
 Inflow = 30.20 cfs @ 12.06 hrs, Volume= 99,509 cf
 Outflow = 3.12 cfs @ 12.74 hrs, Volume= 87,383 cf, Atten= 90%, Lag= 41.0 min
 Primary = 3.12 cfs @ 12.74 hrs, Volume= 87,383 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 128.77' @ 12.74 hrs Surf.Area= 11,725 sf Storage= 46,967 cf

Plug-Flow detention time= 231.6 min calculated for 87,383 cf (88% of inflow)
 Center-of-Mass det. time= 167.3 min (947.1 - 779.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	123.50'	2,345 cf	64.19'W x 182.67'L x 9.50'H Field A 111,387 cf Overall - 105,524 cf Embedded = 5,862 cf x 40.0% Voids
#2A	124.00'	83,580 cf	StormTrap ST2 DoubleTrap 8-0x 66 Inside #1 Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf 66 Chambers in 6 Rows 50.88' x 169.35' Core + 6.66' Border = 64.19' x 182.67' System
		85,925 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	125.00'	24.0" Round Culvert L= 1,560.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 125.00' / 85.00' S= 0.0256 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	125.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	129.00'	12.0" Vert. Orifice/Grate C= 0.600
#4	Device 1	132.50'	3.0' long x 2.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=3.12 cfs @ 12.74 hrs HW=128.77' (Free Discharge)

- 1=Culvert (Passes 3.12 cfs of 25.18 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 3.12 cfs @ 8.93 fps)
- 3=Orifice/Grate (Controls 0.00 cfs)
- 4=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 1P: Existing Employee Lot Underground Detention System - Chamber Wizard Field A

Chamber Model = StormTrapST2 DoubleTrap 8-0 (StormTrapST2 DoubleTrap®Type II+IV)

Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf
Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf

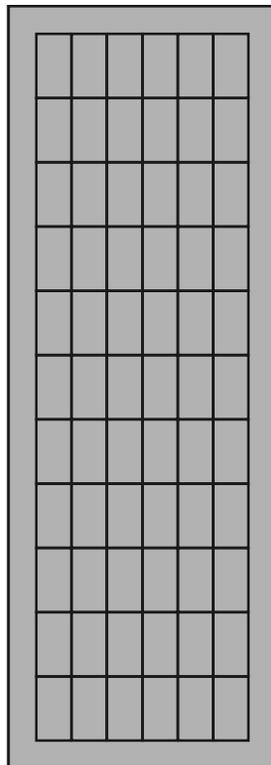
11 Chambers/Row x 15.40' Long = 169.35' Row Length +79.9" Border x 2 = 182.67' Base Length
6 Rows x 101.7" Wide + 79.9" Side Border x 2 = 64.19' Base Width
6.0" Base + 108.0" Chamber Height = 9.50' Field Height

66 Chambers x 940.5 cf + 21,503.9 cf Border = 83,579.7 cf Chamber Storage
66 Chambers x 1,174.9 cf + 27,981.2 cf Border = 105,524.2 cf Displacement

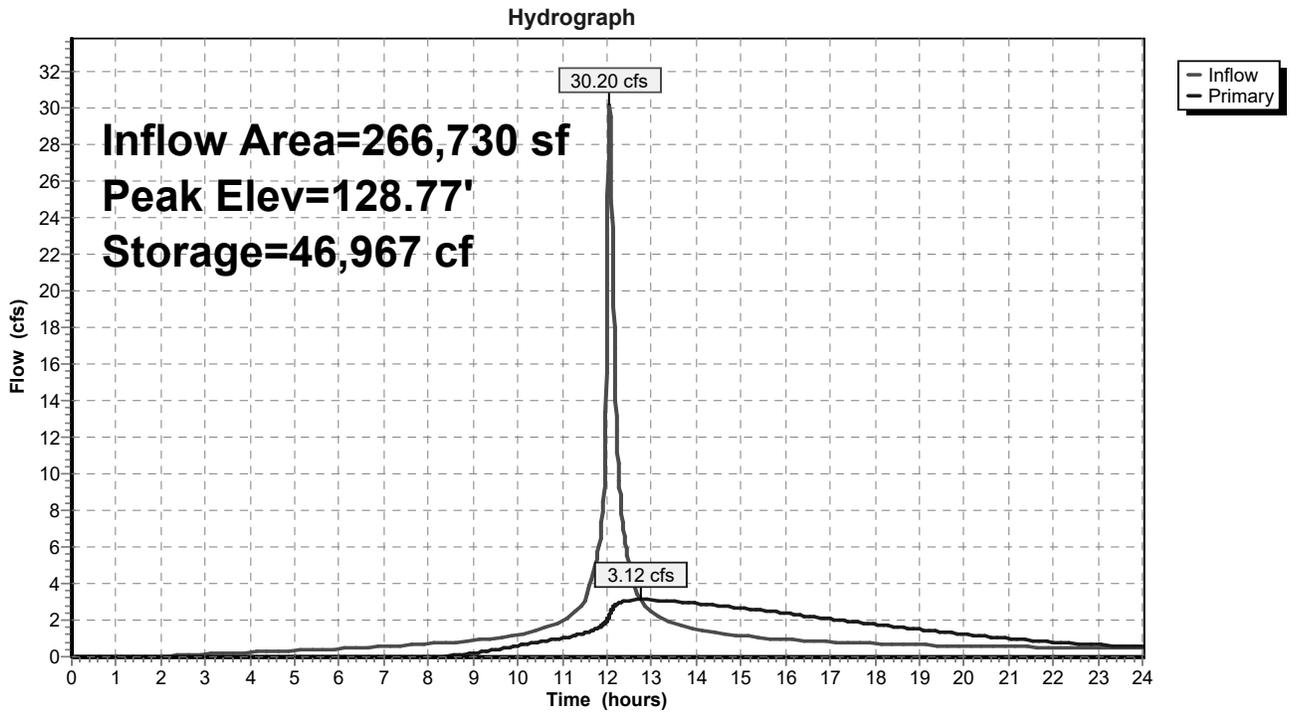
111,386.7 cf Field - 105,524.2 cf Chambers = 5,862.5 cf Stone x 40.0% Voids = 2,345.0 cf Stone Storage

Chamber Storage + Stone Storage = 85,924.7 cf = 1.973 af
Overall Storage Efficiency = 77.1%
Overall System Size = 182.67' x 64.19' x 9.50'

66 Chambers (plus border)
4,125.4 cy Field
217.1 cy Stone



Pond 1P: Existing Employee Lot Underground Detention System



Summary for Pond 2P: Existing Remote Lot Stormwater Management Basin

Inflow Area = 288,610 sf, 65.96% Impervious, Inflow Depth > 3.84" for 10-yr event
 Inflow = 34.88 cfs @ 12.03 hrs, Volume= 92,238 cf
 Outflow = 5.59 cfs @ 12.40 hrs, Volume= 71,412 cf, Atten= 84%, Lag= 22.4 min
 Primary = 5.59 cfs @ 12.40 hrs, Volume= 71,412 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 24.11' @ 12.40 hrs Surf.Area= 14,952 sf Storage= 42,225 cf

Plug-Flow detention time= 240.9 min calculated for 71,412 cf (77% of inflow)
 Center-of-Mass det. time= 142.9 min (951.1 - 808.2)

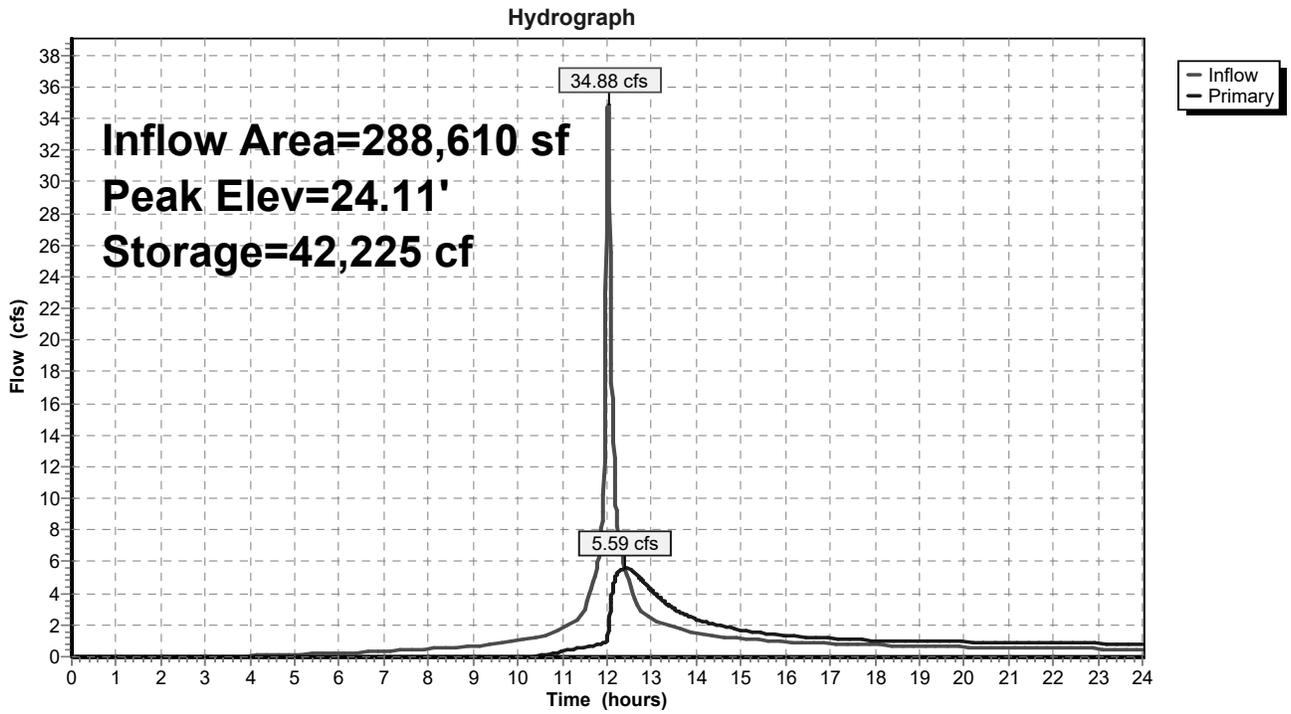
Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	94,737 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	5,895	0	0
21.00	7,748	6,822	6,822
22.00	9,895	8,822	15,643
23.00	12,598	11,247	26,890
24.00	14,704	13,651	40,541
25.00	16,889	15,797	56,337
26.00	19,175	18,032	74,369
27.00	21,560	20,368	94,737

Device	Routing	Invert	Outlet Devices
#1	Primary	21.28'	18.0" Round Culvert L= 55.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 21.28' / 21.00' S= 0.0051 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	21.28'	5.5" Vert. Orifice/Grate C= 0.600
#3	Device 1	23.00'	12.0" Vert. Orifice/Grate X 2 rows with 6.0" cc spacing C= 0.600
#4	Device 1	26.50'	3.0" x 2.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.59 cfs @ 12.40 hrs HW=24.11' (Free Discharge)

- 1=Culvert (Passes 5.59 cfs of 12.09 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.28 cfs @ 7.77 fps)
- 3=Orifice/Grate (Orifice Controls 4.31 cfs @ 3.34 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond 2P: Existing Remote Lot Stormwater Management Basin



Summary for Pond 3P: Proposed Employee Lot Underground Detention System

Inflow Area = 19,345 sf, 83.46% Impervious, Inflow Depth > 4.71" for 10-yr event
 Inflow = 2.67 cfs @ 12.03 hrs, Volume= 7,587 cf
 Outflow = 0.70 cfs @ 12.20 hrs, Volume= 5,438 cf, Atten= 74%, Lag= 10.7 min
 Primary = 0.70 cfs @ 12.20 hrs, Volume= 5,438 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 134.88' @ 12.20 hrs Surf.Area= 869 sf Storage= 3,509 cf

Plug-Flow detention time= 228.3 min calculated for 5,436 cf (72% of inflow)
 Center-of-Mass det. time= 114.3 min (878.1 - 763.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	129.50'	174 cf	30.27'W x 28.71'L x 9.50'H Field A 8,256 cf Overall - 7,821 cf Embedded = 435 cf x 40.0% Voids
#2A	130.00'	6,086 cf	StormTrap ST2 DoubleTrap 8-0x 2 Inside #1 Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf 2 Chambers in 2 Rows 16.96' x 15.40' Core + 6.66' Border = 30.27' x 28.71' System
		6,260 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	130.50'	12.0" Round Culvert L= 77.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 130.50' / 129.34' S= 0.0151 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	133.00'	4.0" W x 4.0" H Vert. Orifice/Grate C= 0.600
#3	Device 1	135.25'	4.0" W x 4.0" H Vert. Orifice/Grate C= 0.600
#4	Device 1	136.50'	4.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Primary OutFlow Max=0.70 cfs @ 12.20 hrs HW=134.88' (Free Discharge)

- 1=Culvert (Passes 0.70 cfs of 7.12 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.70 cfs @ 6.31 fps)
- 3=Orifice/Grate (Controls 0.00 cfs)
- 4=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 3P: Proposed Employee Lot Underground Detention System - Chamber Wizard Field A

Chamber Model = StormTrapST2 DoubleTrap 8-0 (StormTrapST2 DoubleTrap®Type II+IV)

Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf

Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf

1 Chambers/Row x 15.40' Long = 15.40' Row Length +79.9" Border x 2 = 28.71' Base Length

2 Rows x 101.7" Wide + 79.9" Side Border x 2 = 30.27' Base Width

6.0" Base + 108.0" Chamber Height = 9.50' Field Height

2 Chambers x 940.5 cf + 4,204.9 cf Border = 6,085.9 cf Chamber Storage

2 Chambers x 1,174.9 cf + 5,471.4 cf Border = 7,821.2 cf Displacement

8,255.7 cf Field - 7,821.2 cf Chambers = 434.5 cf Stone x 40.0% Voids = 173.8 cf Stone Storage

Chamber Storage + Stone Storage = 6,259.8 cf = 0.144 af

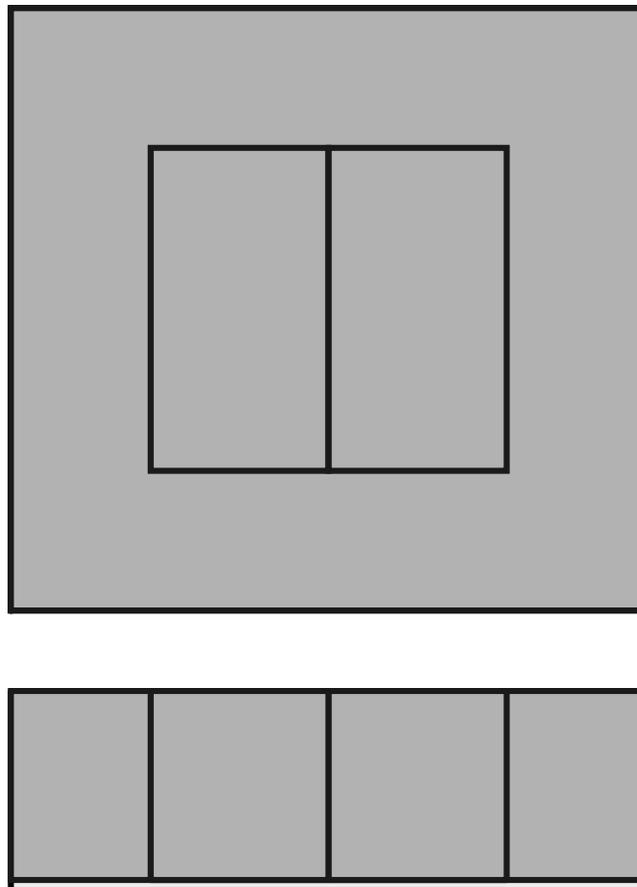
Overall Storage Efficiency = 75.8%

Overall System Size = 28.71' x 30.27' x 9.50'

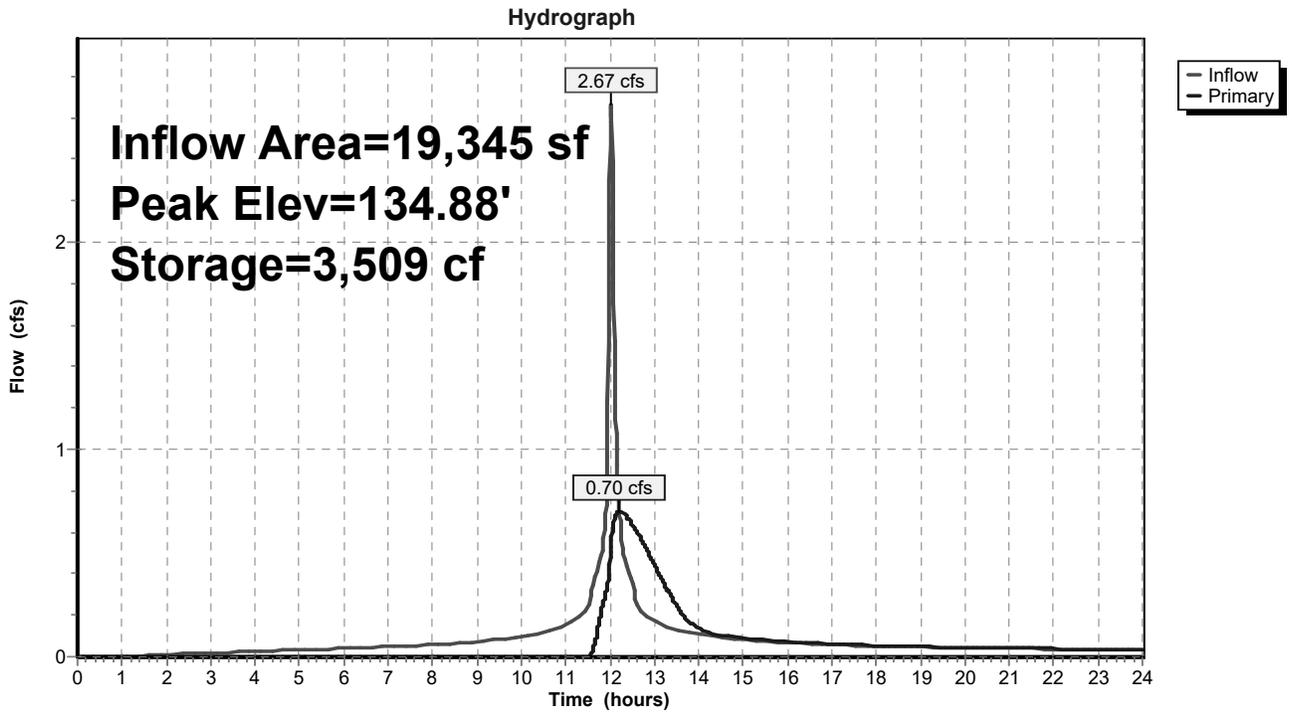
2 Chambers (plus border)

305.8 cy Field

16.1 cy Stone



Pond 3P: Proposed Employee Lot Underground Detention System



Summary for Pond 4P: Proposed Remote Lot Underground Detention System

Inflow Area = 341,115 sf, 85.50% Impervious, Inflow Depth > 4.47" for 10-yr event
 Inflow = 31.99 cfs @ 12.11 hrs, Volume= 127,129 cf
 Outflow = 2.91 cfs @ 13.18 hrs, Volume= 71,828 cf, Atten= 91%, Lag= 63.7 min
 Primary = 2.91 cfs @ 13.18 hrs, Volume= 71,828 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 23.53' @ 13.18 hrs Surf.Area= 16,410 sf Storage= 76,982 cf

Plug-Flow detention time= 380.0 min calculated for 71,828 cf (57% of inflow)
 Center-of-Mass det. time= 240.9 min (1,023.7 - 782.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	17.50'	3,282 cf	98.10'W x 167.27'L x 9.50'H Field A 155,895 cf Overall - 147,690 cf Embedded = 8,205 cf x 40.0% Voids
#2A	18.00'	117,263 cf	StormTrap ST2 DoubleTrap 8-0x 100 Inside #1 Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf 100 Chambers in 10 Rows 84.79' x 153.96' Core + 6.66' Border = 98.10' x 167.27' System
		120,545 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	18.00'	36.0" Round Culvert L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 18.00' / 17.60' S= 0.0050 '/ Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Device 1	20.00'	4.0" W x 4.0" H Vert. Orifice/Grate C= 0.600
#3	Device 1	21.50'	4.0" W x 4.0" H Vert. Orifice/Grate C= 0.600
#4	Device 1	23.00'	12.0" W x 6.0" H Vert. Orifice/Grate C= 0.600
#5	Device 1	25.00'	4.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Primary OutFlow Max=2.93 cfs @ 13.18 hrs HW=23.53' (Free Discharge)

- 1=Culvert (Passes 2.93 cfs of 68.31 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.98 cfs @ 8.83 fps)
- 3=Orifice/Grate (Orifice Controls 0.73 cfs @ 6.57 fps)
- 4=Orifice/Grate (Orifice Controls 1.22 cfs @ 2.43 fps)
- 5=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 4P: Proposed Remote Lot Underground Detention System - Chamber Wizard Field A

Chamber Model = StormTrapST2 DoubleTrap 8-0 (StormTrapST2 DoubleTrap®Type II+IV)

Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf

Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf

10 Chambers/Row x 15.40' Long = 153.96' Row Length +79.9" Border x 2 = 167.27' Base Length

10 Rows x 101.7" Wide + 79.9" Side Border x 2 = 98.10' Base Width

6.0" Base + 108.0" Chamber Height = 9.50' Field Height

100 Chambers x 940.5 cf + 23,209.2 cf Border = 117,263.5 cf Chamber Storage

100 Chambers x 1,174.9 cf + 30,200.2 cf Border = 147,689.7 cf Displacement

155,894.7 cf Field - 147,689.7 cf Chambers = 8,205.0 cf Stone x 40.0% Voids = 3,282.0 cf Stone Storage

Chamber Storage + Stone Storage = 120,545.5 cf = 2.767 af

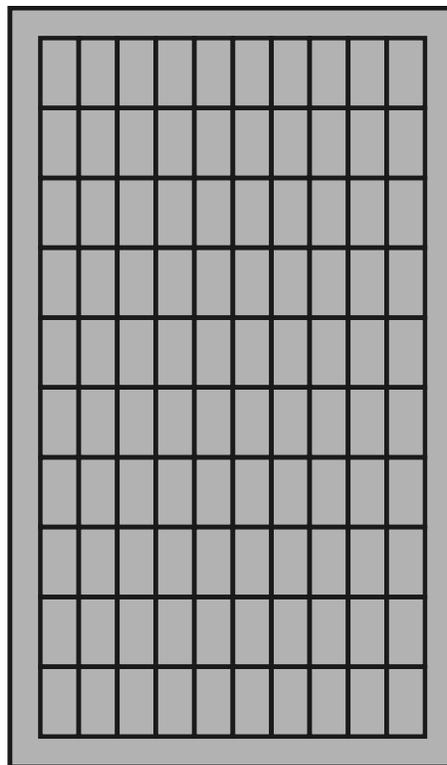
Overall Storage Efficiency = 77.3%

Overall System Size = 167.27' x 98.10' x 9.50'

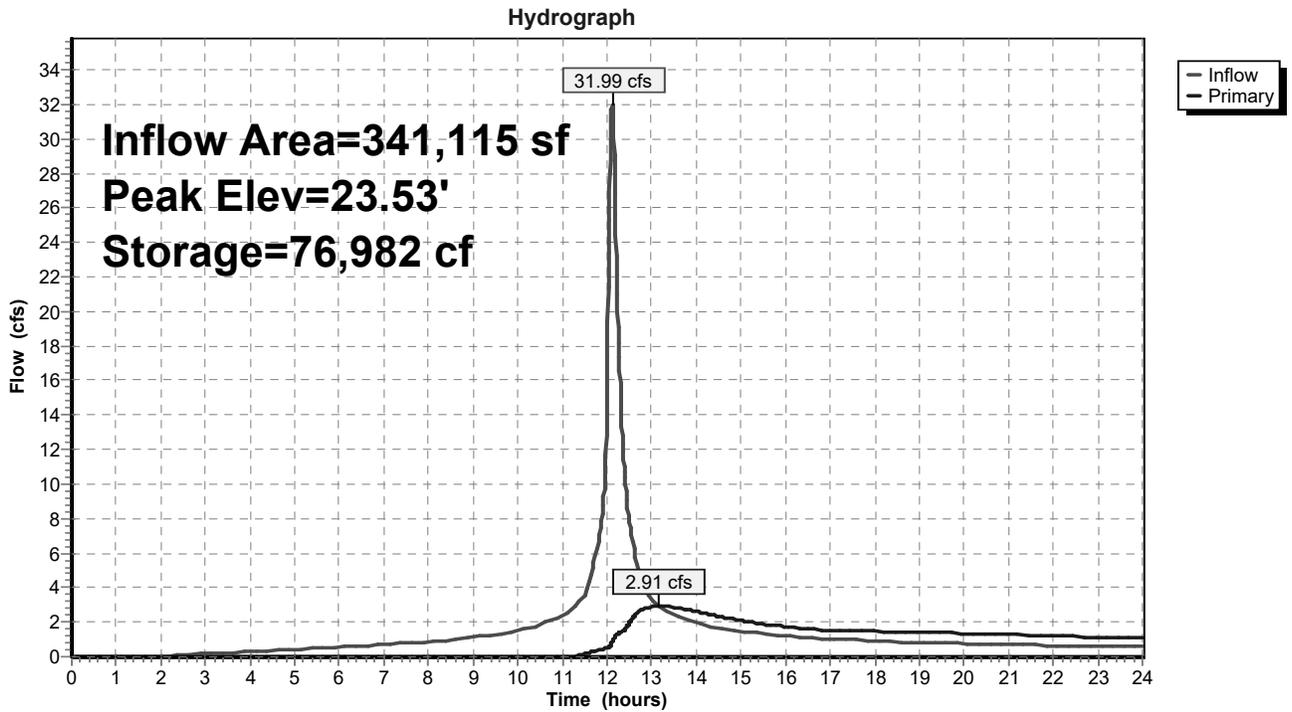
100 Chambers (plus border)

5,773.9 cy Field

303.9 cy Stone



Pond 4P: Proposed Remote Lot Underground Detention System

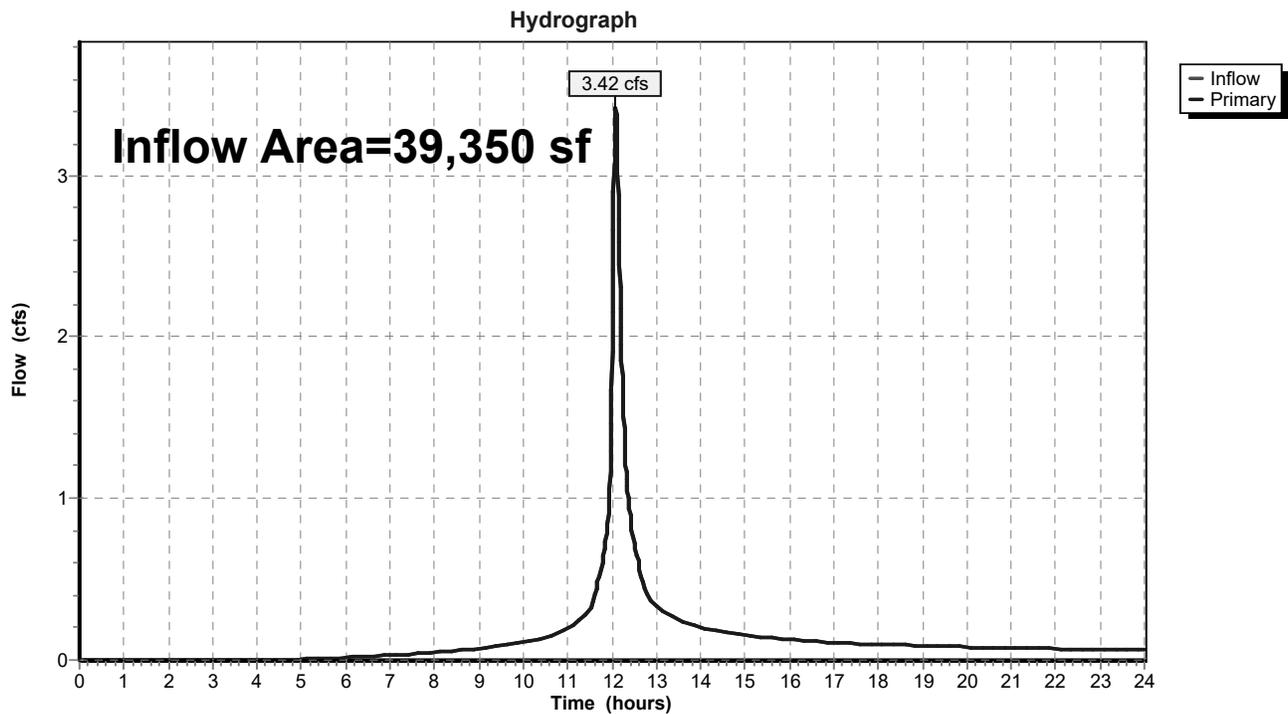


Summary for Link DP-1: Middle Street Gutter

Inflow Area = 39,350 sf, 9.83% Impervious, Inflow Depth > 3.52" for 10-yr event
Inflow = 3.42 cfs @ 12.09 hrs, Volume= 11,558 cf
Primary = 3.42 cfs @ 12.09 hrs, Volume= 11,558 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-1: Middle Street Gutter

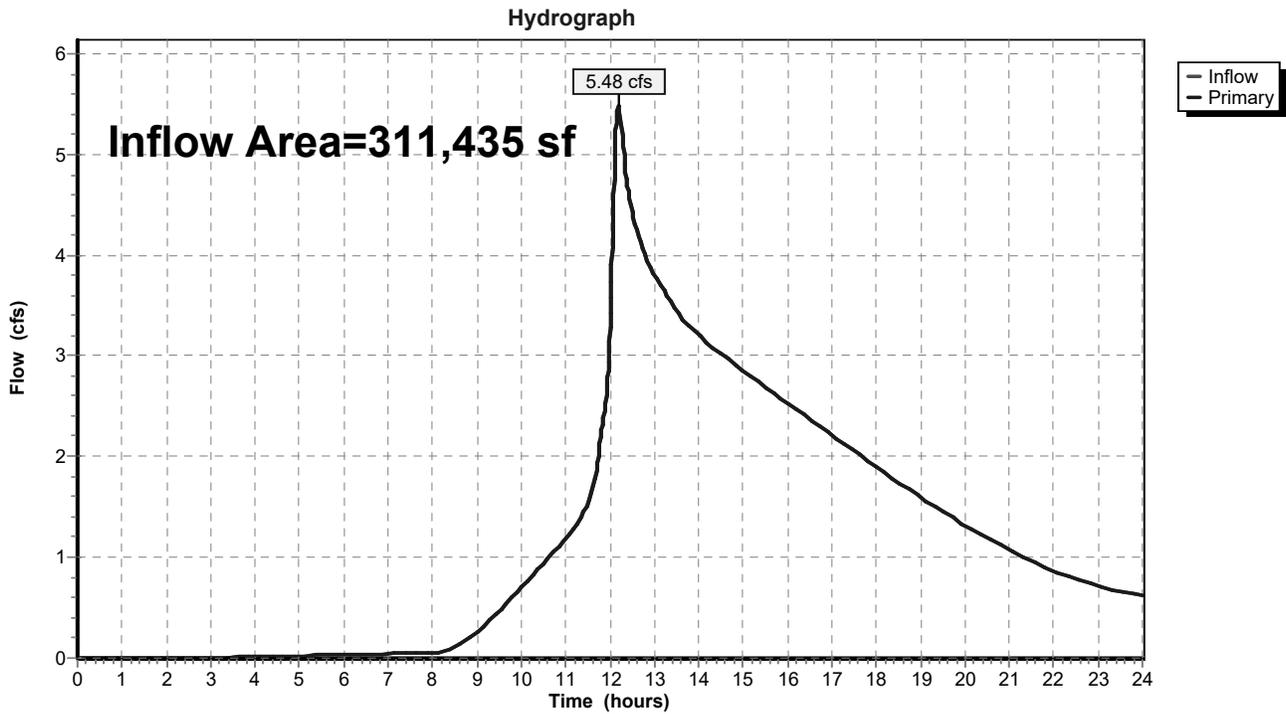


Summary for Link DP-2: Employee Lot Drainage

Inflow Area = 311,435 sf, 73.22% Impervious, Inflow Depth > 3.92" for 10-yr event
Inflow = 5.48 cfs @ 12.19 hrs, Volume= 101,797 cf
Primary = 5.48 cfs @ 12.19 hrs, Volume= 101,797 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-2: Employee Lot Drainage



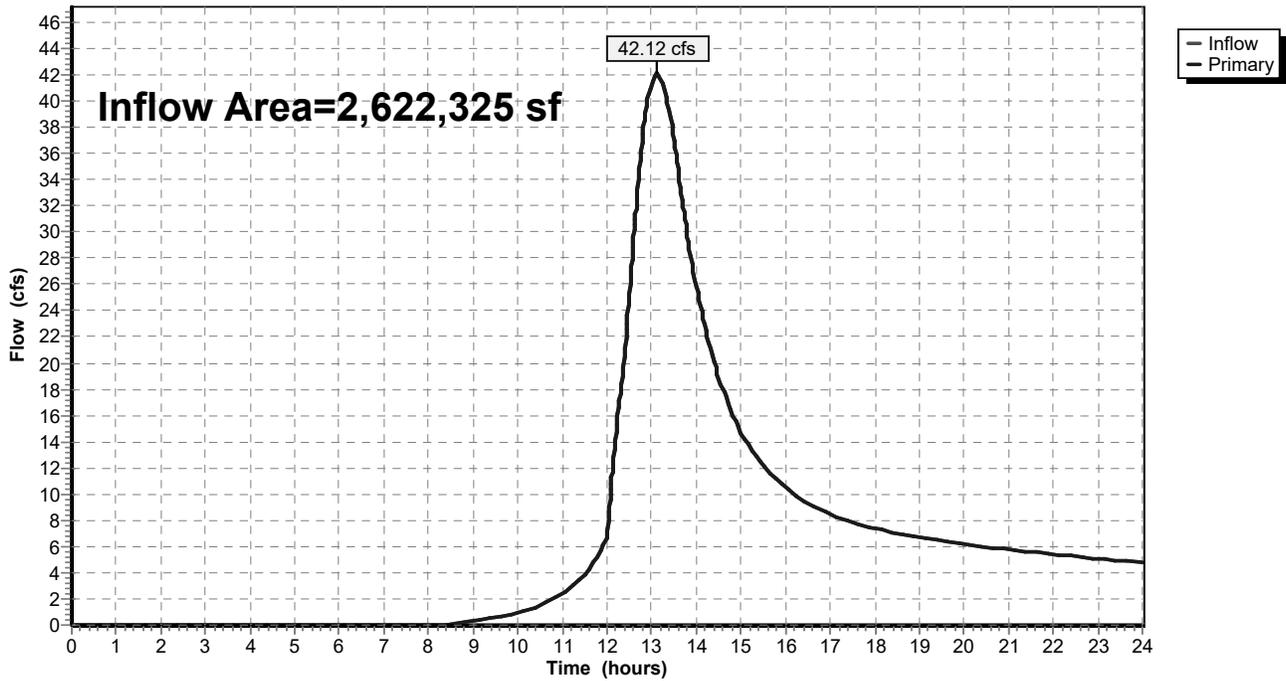
Summary for Link DP-3: Sawmill Brook Wetland System

Inflow Area = 2,622,325 sf, 20.31% Impervious, Inflow Depth > 2.50" for 10-yr event
Inflow = 42.12 cfs @ 13.09 hrs, Volume= 545,866 cf
Primary = 42.12 cfs @ 13.09 hrs, Volume= 545,866 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-3: Sawmill Brook Wetland System

Hydrograph



C-DAT-2001507-PROPOSED_HCT_Middletown_2001507_Depth 24-hr S1 25-yr Rainfall=6.35"

Prepared by {enter your company name here}

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPDA-100: Area Draining to Runoff Area=39,350 sf 9.83% Impervious Runoff Depth>4.62"
Flow Length=962' Tc=9.9 min CN=85 Runoff=4.41 cfs 15,153 cf

SubcatchmentPDA-200: Area Draining to Runoff Area=25,360 sf 58.60% Impervious Runoff Depth>5.39"
Flow Length=786' Tc=16.4 min CN=92 Runoff=2.47 cfs 11,394 cf

SubcatchmentPDA-210: Area Draining to Runoff Area=266,730 sf 73.87% Impervious Runoff Depth>5.63"
Flow Length=815' Tc=8.2 min CN=94 Runoff=37.31 cfs 125,197 cf

SubcatchmentPDA-220: Area Draining to Runoff Area=19,345 sf 83.46% Impervious Runoff Depth>5.87"
Tc=5.0 min CN=96 Runoff=3.27 cfs 9,462 cf

SubcatchmentPDA-300: Area Draining Runoff Area=1,992,600 sf 2.53% Impervious Runoff Depth>3.37"
Flow Length=4,372' Tc=88.6 min CN=74 Runoff=49.10 cfs 559,848 cf

SubcatchmentPDA-310: Area Draining to Runoff Area=288,610 sf 65.96% Impervious Runoff Depth>4.96"
Flow Length=1,004' Tc=5.0 min CN=88 Runoff=44.29 cfs 119,226 cf

SubcatchmentPDA-320: Area Draining to Runoff Area=341,115 sf 85.50% Impervious Runoff Depth>5.63"
Flow Length=807' Tc=12.3 min CN=94 Runoff=39.50 cfs 159,949 cf

Pond 1P: Existing Employee Lot Peak Elev=129.64' Storage=56,070 cf Inflow=37.31 cfs 125,197 cf
Outflow=4.95 cfs 111,984 cf

Pond 2P: Existing Remote Lot Peak Elev=24.70' Storage=51,330 cf Inflow=44.29 cfs 119,226 cf
Outflow=8.72 cfs 95,658 cf

Pond 3P: Proposed Employee Lot Peak Elev=135.45' Storage=3,938 cf Inflow=3.27 cfs 9,462 cf
Outflow=0.90 cfs 7,300 cf

Pond 4P: Proposed Remote Lot Peak Elev=24.52' Storage=91,527 cf Inflow=39.50 cfs 159,949 cf
Outflow=4.73 cfs 100,691 cf

Link DP-1: Middle Street Gutter Inflow=4.41 cfs 15,153 cf
Primary=4.41 cfs 15,153 cf

Link DP-2: Employee Lot Drainage Inflow=6.56 cfs 130,678 cf
Primary=6.56 cfs 130,678 cf

Link DP-3: Sawmill Brook Wetland System Inflow=59.66 cfs 756,197 cf
Primary=59.66 cfs 756,197 cf

Total Runoff Area = 2,973,110 sf Runoff Volume = 1,000,228 cf Average Runoff Depth = 4.04"
74.29% Pervious = 2,208,675 sf 25.71% Impervious = 764,435 sf

Summary for Subcatchment PDA-100: Area Draining to Middle Street

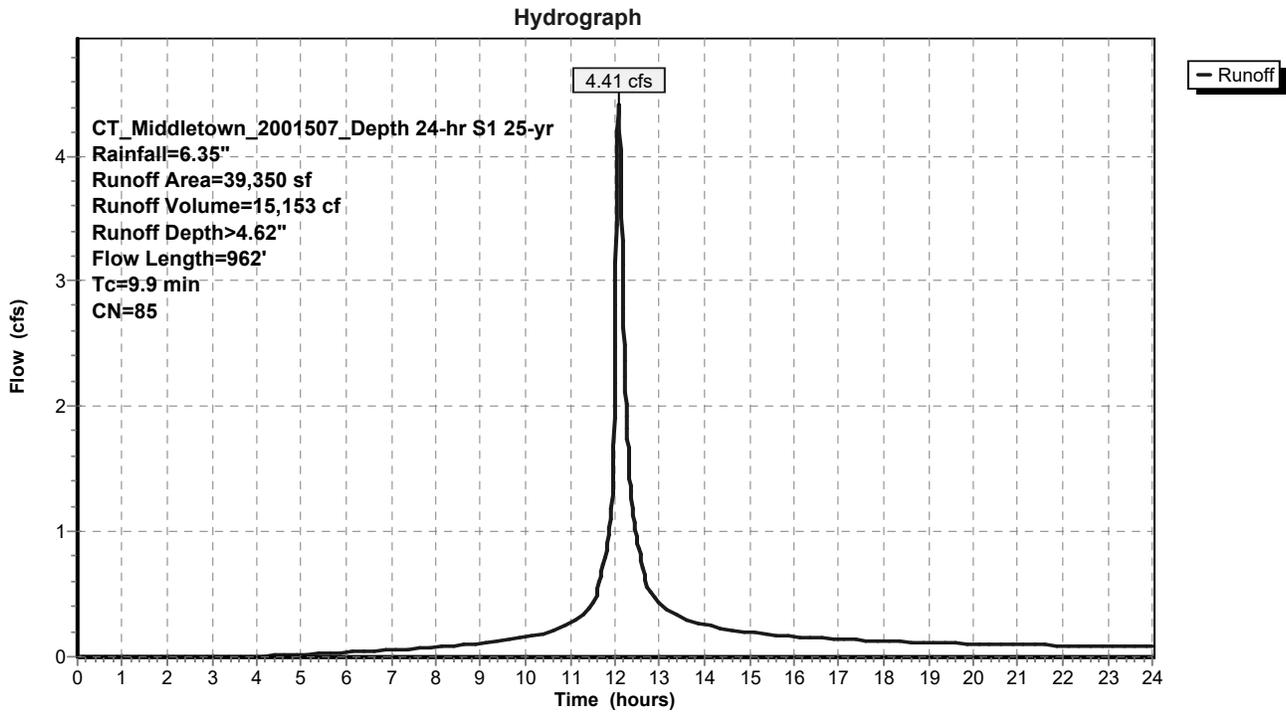
Runoff = 4.41 cfs @ 12.08 hrs, Volume= 15,153 cf, Depth> 4.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 25-yr Rainfall=6.35"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
35,480	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
3,870	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
39,350	85	Weighted Average
35,480		90.17% Pervious Area
3,870		9.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	28	0.1406	0.20		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
1.1	72	0.0120	1.06		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
6.5	862	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.9	962	Total			

Subcatchment PDA-100: Area Draining to Middle Street



Summary for Subcatchment PDA-200: Area Draining to Employee Lot Drainage System

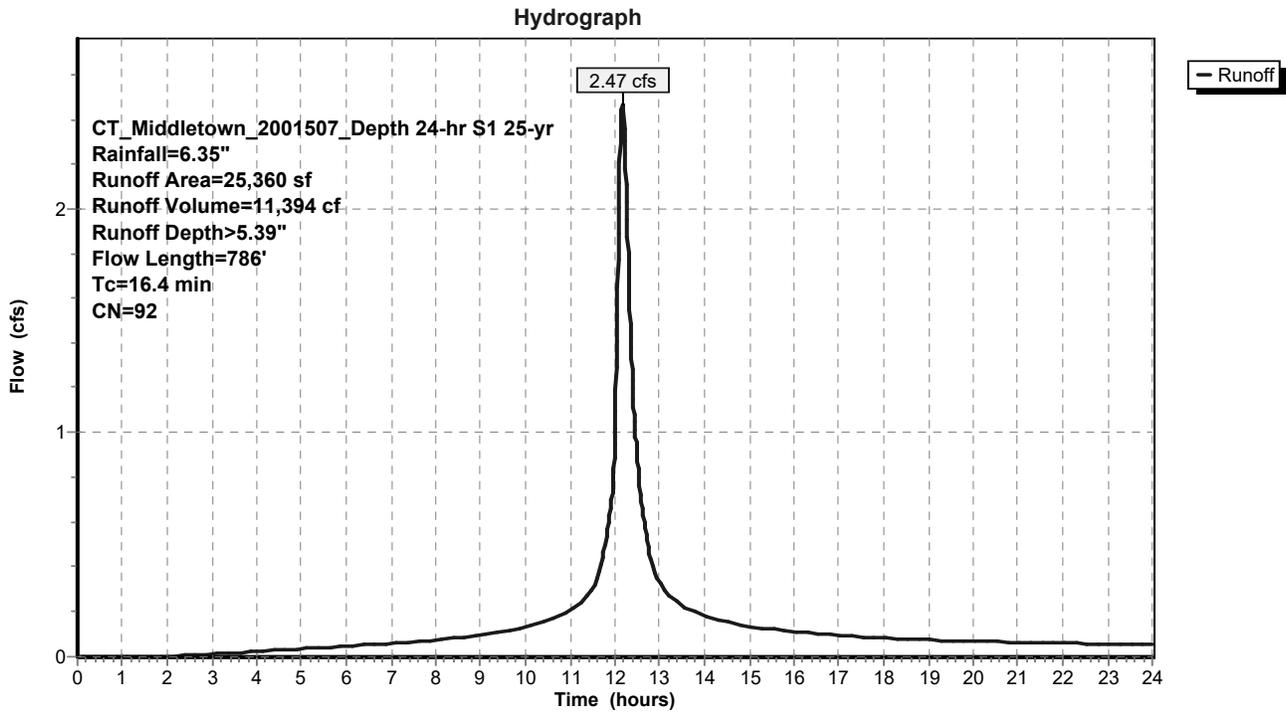
Runoff = 2.47 cfs @ 12.17 hrs, Volume= 11,394 cf, Depth> 5.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 25-yr Rainfall=6.35"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
10,500	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
14,860	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
25,360	92	Weighted Average
10,500		41.40% Pervious Area
14,860		58.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	72	0.0133	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
0.3	28	0.0357	1.36		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.7	308	0.0211	2.95		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.5	317	0.0050	3.47	2.73	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.2	61	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Concrete pipe, finished
16.4	786	Total			

Subcatchment PDA-200: Area Draining to Employee Lot Drainage System



Summary for Subcatchment PDA-210: Area Draining to Existing Employee Lot Underground Detention

Runoff = 37.31 cfs @ 12.06 hrs, Volume= 125,197 cf, Depth> 5.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 25-yr Rainfall=6.35"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
69,690	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
197,040	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
266,730	94	Weighted Average
69,690		26.13% Pervious Area
197,040		73.87% Impervious Area

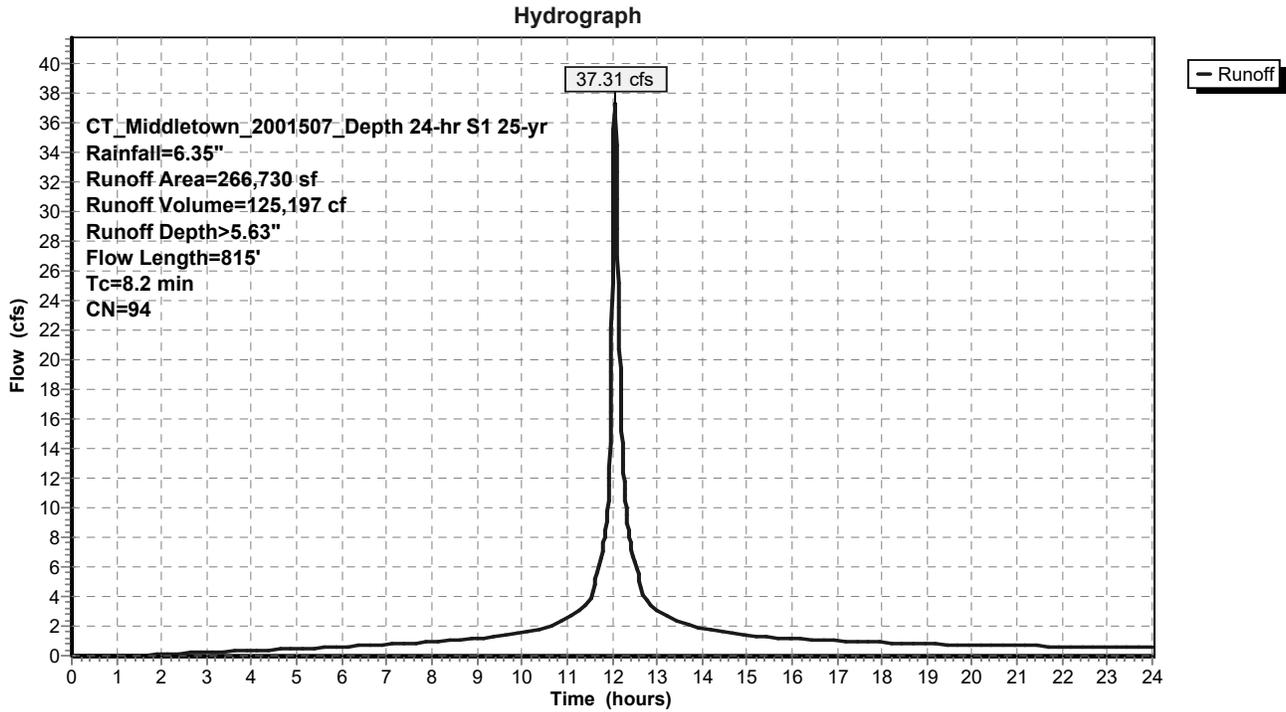
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	19	0.0160	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
1.1	81	0.0160	1.22		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.1	164	0.0160	2.57		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.5	130	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Concrete pipe, finished
0.6	152	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Concrete pipe, finished
0.3	108	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.3	101	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.1	38	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.1	22	0.0050	7.23	51.09	Pipe Channel,

36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'

n= 0.012 Concrete pipe, finished

8.2 815 Total

Subcatchment PDA-210: Area Draining to Existing Employee Lot Underground Detention



Summary for Subcatchment PDA-220: Area Draining to Proposed Employee Lot Underground Detenti

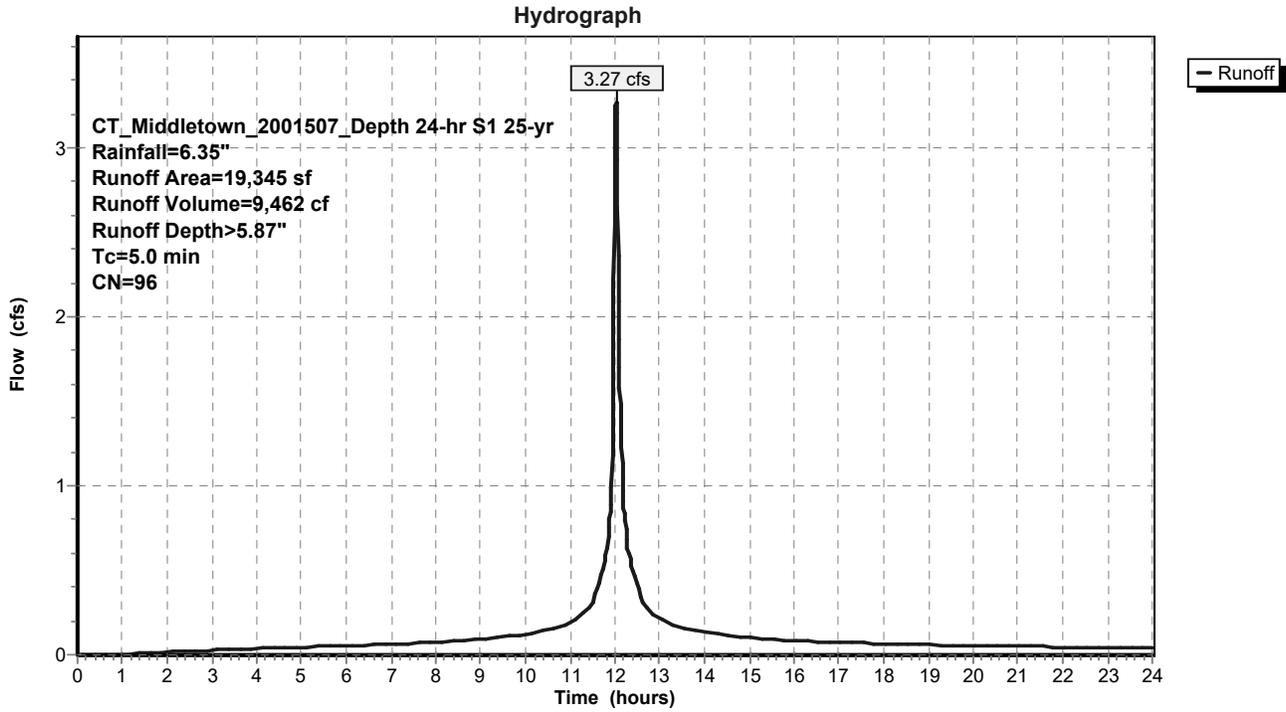
Runoff = 3.27 cfs @ 12.03 hrs, Volume= 9,462 cf, Depth> 5.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 25-yr Rainfall=6.35"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
3,200	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
16,145	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
19,345	96	Weighted Average
3,200		16.54% Pervious Area
16,145		83.46% Impervious Area

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

Subcatchment PDA-220: Area Draining to Proposed Employee Lot Underground Detention



Summary for Subcatchment PDA-300: Area Draining to Sawmill Brook Wetland

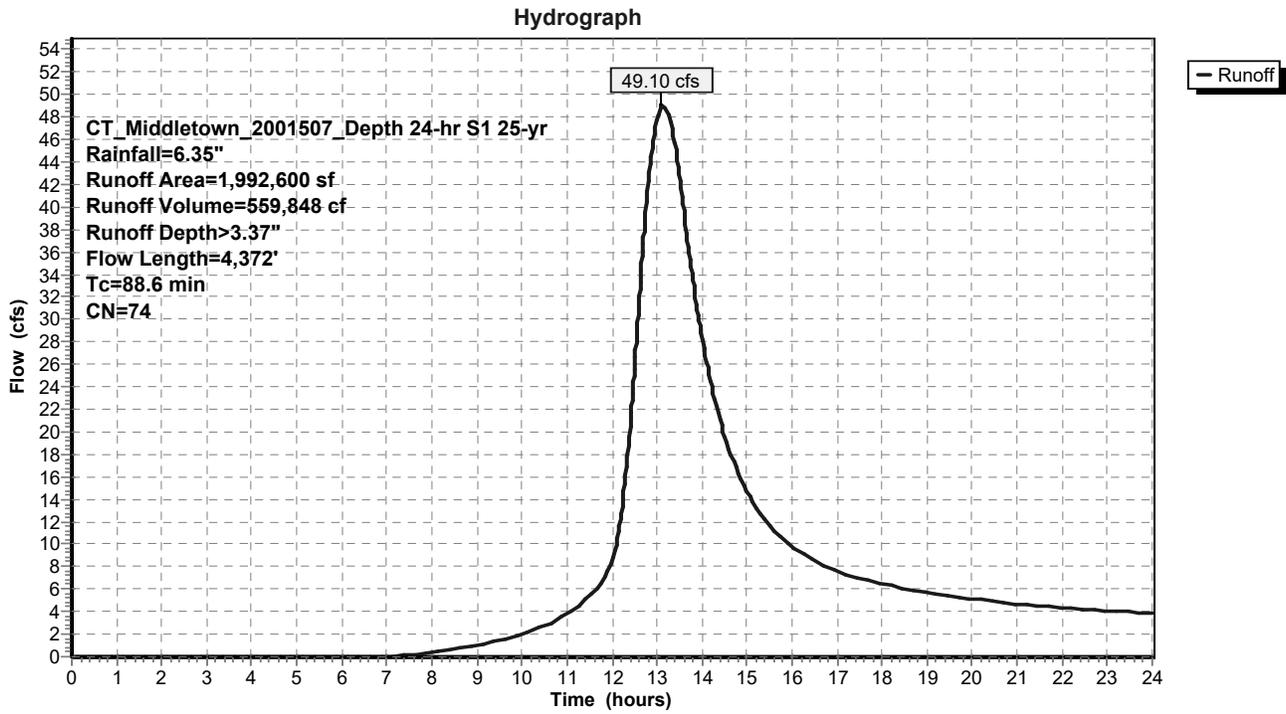
Runoff = 49.10 cfs @ 13.10 hrs, Volume= 559,848 cf, Depth> 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 25-yr Rainfall=6.35"

Area (sf)	CN	Description
750	69	50-75% Grass cover, Fair, HSG B
78,990	79	50-75% Grass cover, Fair, HSG C
29,645	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
15,875	98	Paved parking, HSG C
34,605	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
250	96	Gravel surface, HSG C
355	96	Gravel surface, HSG D
128,150	56	Brush, Fair, HSG B
103,140	70	Brush, Fair, HSG C
8,845	77	Brush, Fair, HSG D
291,600	60	Woods, Fair, HSG B
279,895	73	Woods, Fair, HSG C
1,020,500	79	Woods, Fair, HSG D
1,992,600	74	Weighted Average
1,942,120		97.47% Pervious Area
50,480		2.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.8	100	0.0110	0.04		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.29"
15.4	486	0.0110	0.52		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
26.4	3,786	0.0049	2.39	71.77	Channel Flow, Area= 30.0 sf Perim= 34.0' r= 0.88' n= 0.040 Winding stream, pools & shoals
88.6	4,372	Total			

Subcatchment PDA-300: Area Draining to Sawmill Brook Wetland



Summary for Subcatchment PDA-310: Area Draining to Existing Remote Lot Stormwater Management B

Runoff = 44.29 cfs @ 12.03 hrs, Volume= 119,226 cf, Depth> 4.96"

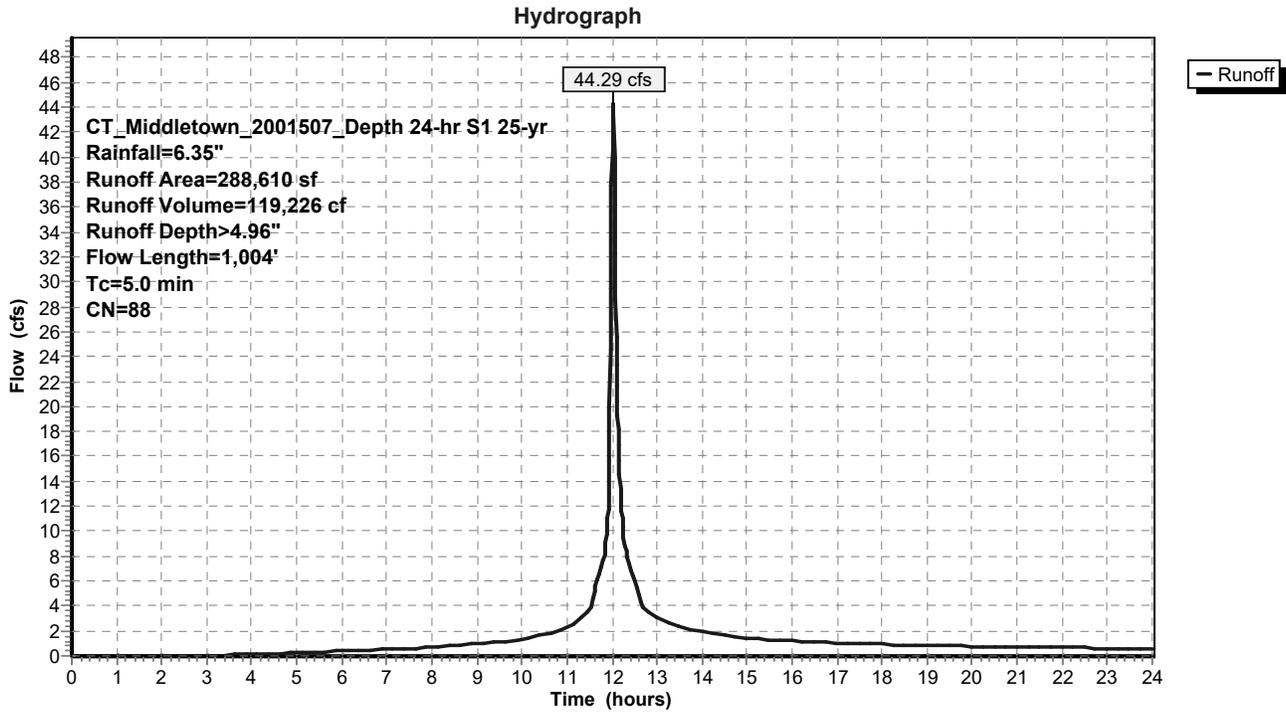
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 25-yr Rainfall=6.35"

Area (sf)	CN	Description
30,695	69	50-75% Grass cover, Fair, HSG B
14,665	79	50-75% Grass cover, Fair, HSG C
0	84	50-75% Grass cover, Fair, HSG D
135,315	98	Paved parking, HSG B
55,055	98	Paved parking, HSG C
0	98	Paved parking, HSG D
2,590	96	Gravel surface, HSG B
2,215	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
21,640	56	Brush, Fair, HSG B
26,435	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
288,610	88	Weighted Average
98,240		34.04% Pervious Area
190,370		65.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0180	1.34		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.0	165	0.0180	2.72		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	80	0.0050	3.47	2.73	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.5	168	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.4	162	0.0050	6.40	31.42	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Concrete pipe, finished
0.3	121	0.0050	6.40	31.42	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Concrete pipe, finished
0.2	70	0.0050	7.23	51.09	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
0.3	138	0.0050	7.23	51.09	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished

4.3 1,004 Total, Increased to minimum Tc = 5.0 min

Subcatchment PDA-310: Area Draining to Existing Remote Lot Stormwater Management Basin



Summary for Subcatchment PDA-320: Area Draining to Proposed Remote Lot Underground Detention

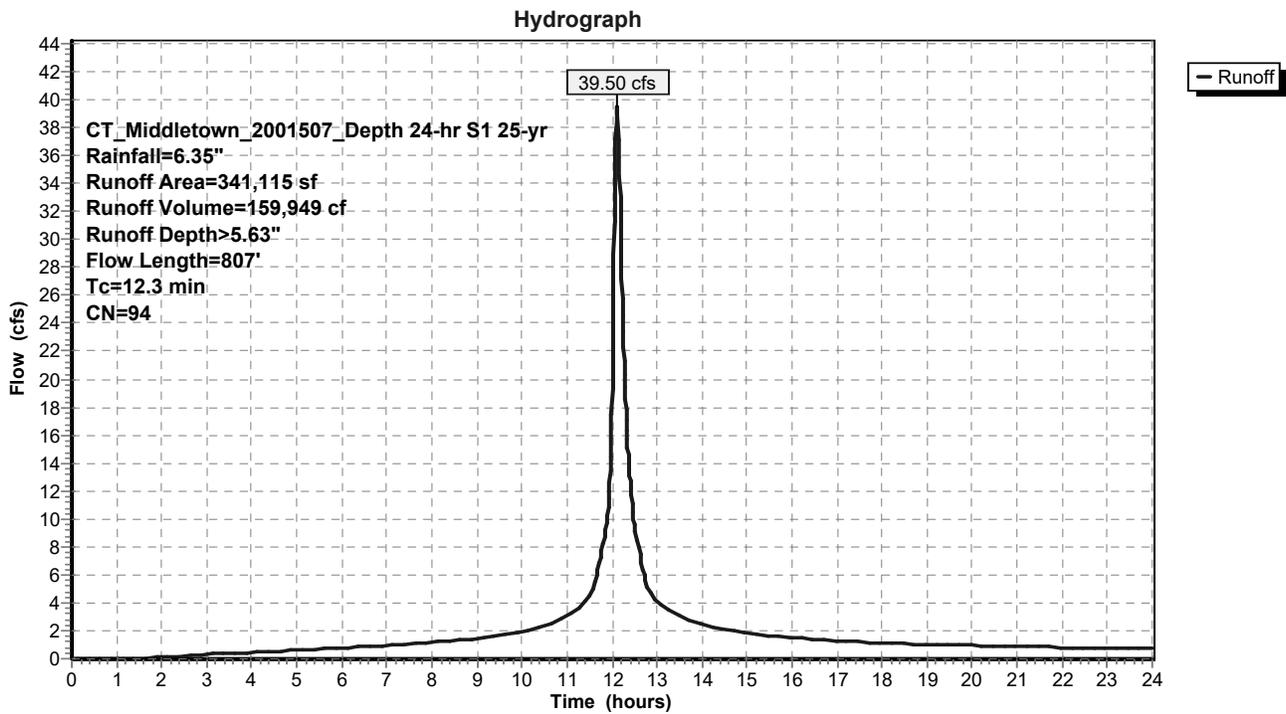
Runoff = 39.50 cfs @ 12.11 hrs, Volume= 159,949 cf, Depth> 5.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 25-yr Rainfall=6.35"

Area (sf)	CN	Description
41,205	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
8,240	84	50-75% Grass cover, Fair, HSG D
256,860	98	Paved parking, HSG B
0	98	Paved parking, HSG C
34,810	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
341,115	94	Weighted Average
49,445		14.50% Pervious Area
291,670		85.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0500	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
0.8	132	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.0	300	0.0050	4.97	8.78	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.4	150	0.0050	6.02	18.90	Pipe Channel, RCP_Round 24" 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.3	125	0.0050	7.89	55.74	Pipe Channel, RCP_Round 36" 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
12.3	807	Total			

Subcatchment PDA-320: Area Draining to Proposed Remote Lot Underground Detention



Summary for Pond 1P: Existing Employee Lot Underground Detention System

Inflow Area = 266,730 sf, 73.87% Impervious, Inflow Depth > 5.63" for 25-yr event
 Inflow = 37.31 cfs @ 12.06 hrs, Volume= 125,197 cf
 Outflow = 4.95 cfs @ 12.62 hrs, Volume= 111,984 cf, Atten= 87%, Lag= 33.3 min
 Primary = 4.95 cfs @ 12.62 hrs, Volume= 111,984 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 129.64' @ 12.62 hrs Surf.Area= 11,725 sf Storage= 56,070 cf

Plug-Flow detention time= 224.0 min calculated for 111,937 cf (89% of inflow)
 Center-of-Mass det. time= 166.1 min (939.2 - 773.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	123.50'	2,345 cf	64.19'W x 182.67'L x 9.50'H Field A 111,387 cf Overall - 105,524 cf Embedded = 5,862 cf x 40.0% Voids
#2A	124.00'	83,580 cf	StormTrap ST2 DoubleTrap 8-0x 66 Inside #1 Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf 66 Chambers in 6 Rows 50.88' x 169.35' Core + 6.66' Border = 64.19' x 182.67' System
		85,925 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	125.00'	24.0" Round Culvert L= 1,560.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 125.00' / 85.00' S= 0.0256 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	125.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	129.00'	12.0" Vert. Orifice/Grate C= 0.600
#4	Device 1	132.50'	3.0' long x 2.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=4.94 cfs @ 12.62 hrs HW=129.64' (Free Discharge)

- 1=Culvert (Passes 4.94 cfs of 28.87 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 3.49 cfs @ 10.00 fps)
- 3=Orifice/Grate (Orifice Controls 1.45 cfs @ 2.73 fps)
- 4=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 1P: Existing Employee Lot Underground Detention System - Chamber Wizard Field A

Chamber Model = StormTrapST2 DoubleTrap 8-0 (StormTrapST2 DoubleTrap®Type II+IV)

Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf

Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf

11 Chambers/Row x 15.40' Long = 169.35' Row Length +79.9" Border x 2 = 182.67' Base Length

6 Rows x 101.7" Wide + 79.9" Side Border x 2 = 64.19' Base Width

6.0" Base + 108.0" Chamber Height = 9.50' Field Height

66 Chambers x 940.5 cf + 21,503.9 cf Border = 83,579.7 cf Chamber Storage

66 Chambers x 1,174.9 cf + 27,981.2 cf Border = 105,524.2 cf Displacement

111,386.7 cf Field - 105,524.2 cf Chambers = 5,862.5 cf Stone x 40.0% Voids = 2,345.0 cf Stone Storage

Chamber Storage + Stone Storage = 85,924.7 cf = 1.973 af

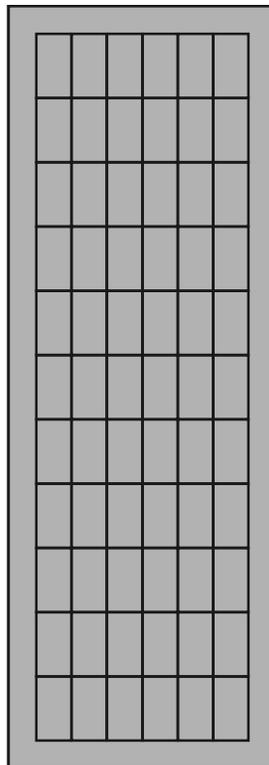
Overall Storage Efficiency = 77.1%

Overall System Size = 182.67' x 64.19' x 9.50'

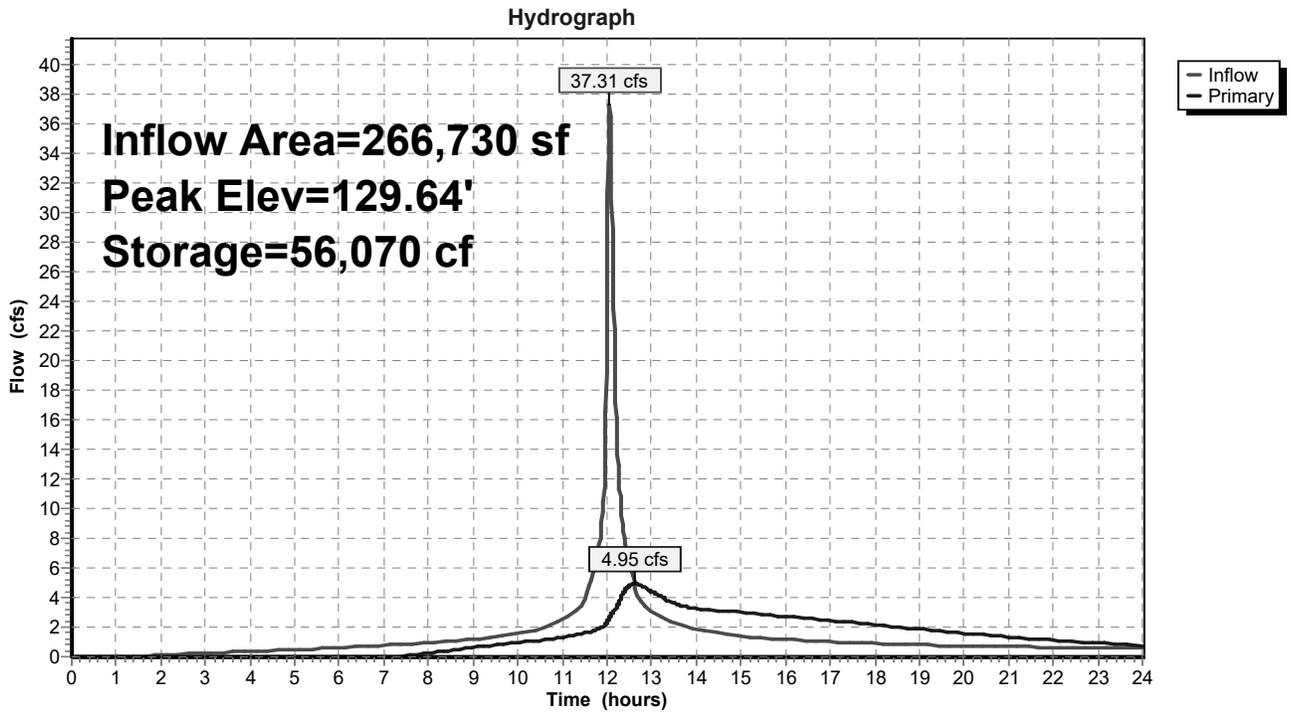
66 Chambers (plus border)

4,125.4 cy Field

217.1 cy Stone



Pond 1P: Existing Employee Lot Underground Detention System



Summary for Pond 2P: Existing Remote Lot Stormwater Management Basin

Inflow Area = 288,610 sf, 65.96% Impervious, Inflow Depth > 4.96" for 25-yr event
 Inflow = 44.29 cfs @ 12.03 hrs, Volume= 119,226 cf
 Outflow = 8.72 cfs @ 12.29 hrs, Volume= 95,658 cf, Atten= 80%, Lag= 15.9 min
 Primary = 8.72 cfs @ 12.29 hrs, Volume= 95,658 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 24.70' @ 12.29 hrs Surf.Area= 16,228 sf Storage= 51,330 cf

Plug-Flow detention time= 208.1 min calculated for 95,658 cf (80% of inflow)
 Center-of-Mass det. time= 117.5 min (916.9 - 799.4)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	94,737 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

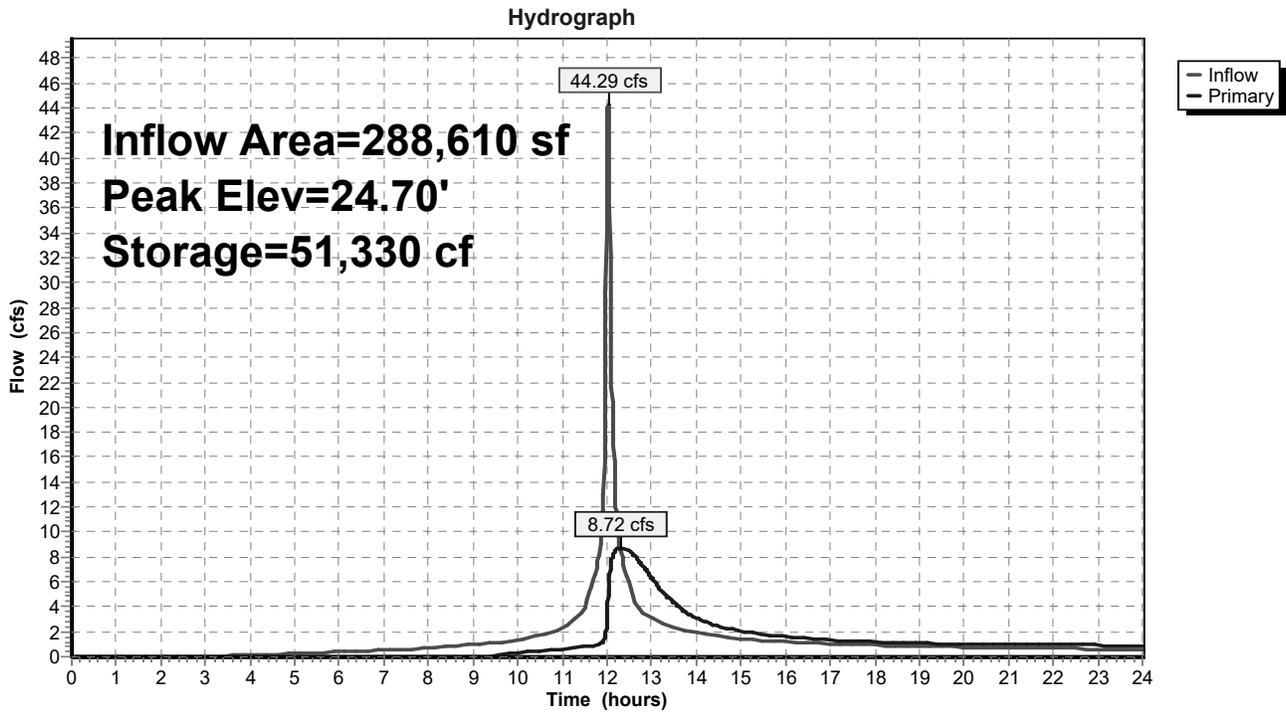
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	5,895	0	0
21.00	7,748	6,822	6,822
22.00	9,895	8,822	15,643
23.00	12,598	11,247	26,890
24.00	14,704	13,651	40,541
25.00	16,889	15,797	56,337
26.00	19,175	18,032	74,369
27.00	21,560	20,368	94,737

Device	Routing	Invert	Outlet Devices
#1	Primary	21.28'	18.0" Round Culvert L= 55.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 21.28' / 21.00' S= 0.0051 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	21.28'	5.5" Vert. Orifice/Grate C= 0.600
#3	Device 1	23.00'	12.0" Vert. Orifice/Grate X 2 rows with 6.0" cc spacing C= 0.600
#4	Device 1	26.50'	3.0" x 2.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=8.72 cfs @ 12.29 hrs HW=24.70' (Free Discharge)

- 1=Culvert (Passes 8.72 cfs of 13.90 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.42 cfs @ 8.60 fps)
- 3=Orifice/Grate (Orifice Controls 7.30 cfs @ 4.65 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond 2P: Existing Remote Lot Stormwater Management Basin



Summary for Pond 3P: Proposed Employee Lot Underground Detention System

Inflow Area = 19,345 sf, 83.46% Impervious, Inflow Depth > 5.87" for 25-yr event
 Inflow = 3.27 cfs @ 12.03 hrs, Volume= 9,462 cf
 Outflow = 0.90 cfs @ 12.19 hrs, Volume= 7,300 cf, Atten= 72%, Lag= 10.0 min
 Primary = 0.90 cfs @ 12.19 hrs, Volume= 7,300 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 135.45' @ 12.19 hrs Surf.Area= 869 sf Storage= 3,938 cf

Plug-Flow detention time= 208.1 min calculated for 7,297 cf (77% of inflow)
 Center-of-Mass det. time= 106.2 min (864.5 - 758.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	129.50'	174 cf	30.27'W x 28.71'L x 9.50'H Field A 8,256 cf Overall - 7,821 cf Embedded = 435 cf x 40.0% Voids
#2A	130.00'	6,086 cf	StormTrap ST2 DoubleTrap 8-0x 2 Inside #1 Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf 2 Chambers in 2 Rows 16.96' x 15.40' Core + 6.66' Border = 30.27' x 28.71' System
		6,260 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	130.50'	12.0" Round Culvert L= 77.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 130.50' / 129.34' S= 0.0151 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	133.00'	4.0" W x 4.0" H Vert. Orifice/Grate C= 0.600
#3	Device 1	135.25'	4.0" W x 4.0" H Vert. Orifice/Grate C= 0.600
#4	Device 1	136.50'	4.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Primary OutFlow Max=0.90 cfs @ 12.19 hrs HW=135.45' (Free Discharge)

- ↑ **1=Culvert** (Passes 0.90 cfs of 7.55 cfs potential flow)
- ↑ **2=Orifice/Grate** (Orifice Controls 0.81 cfs @ 7.27 fps)
- ↑ **3=Orifice/Grate** (Orifice Controls 0.09 cfs @ 1.43 fps)
- ↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Proposed Employee Lot Underground Detention System - Chamber Wizard Field A

Chamber Model = StormTrapST2 DoubleTrap 8-0 (StormTrapST2 DoubleTrap®Type II+IV)

Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf

Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf

1 Chambers/Row x 15.40' Long = 15.40' Row Length +79.9" Border x 2 = 28.71' Base Length

2 Rows x 101.7" Wide + 79.9" Side Border x 2 = 30.27' Base Width

6.0" Base + 108.0" Chamber Height = 9.50' Field Height

2 Chambers x 940.5 cf + 4,204.9 cf Border = 6,085.9 cf Chamber Storage

2 Chambers x 1,174.9 cf + 5,471.4 cf Border = 7,821.2 cf Displacement

8,255.7 cf Field - 7,821.2 cf Chambers = 434.5 cf Stone x 40.0% Voids = 173.8 cf Stone Storage

Chamber Storage + Stone Storage = 6,259.8 cf = 0.144 af

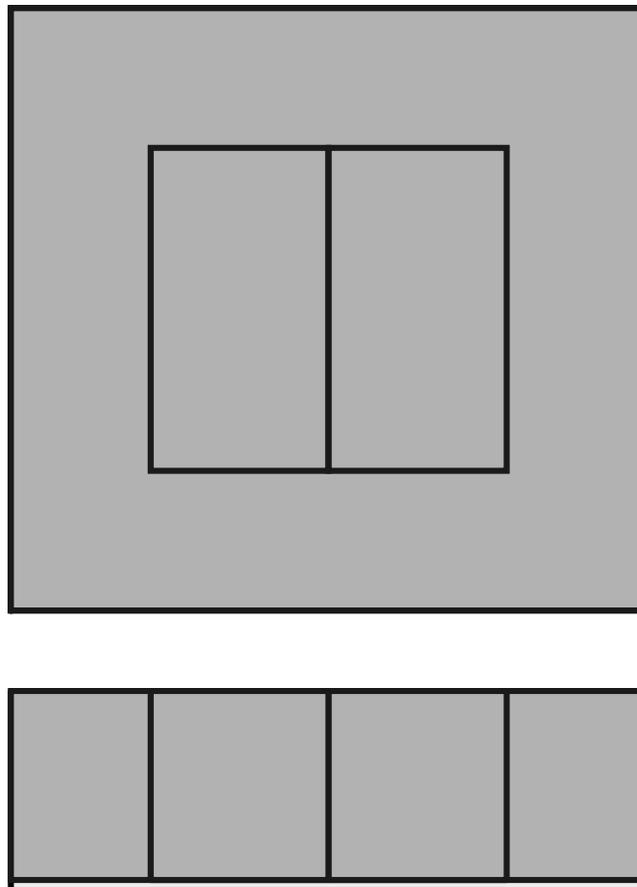
Overall Storage Efficiency = 75.8%

Overall System Size = 28.71' x 30.27' x 9.50'

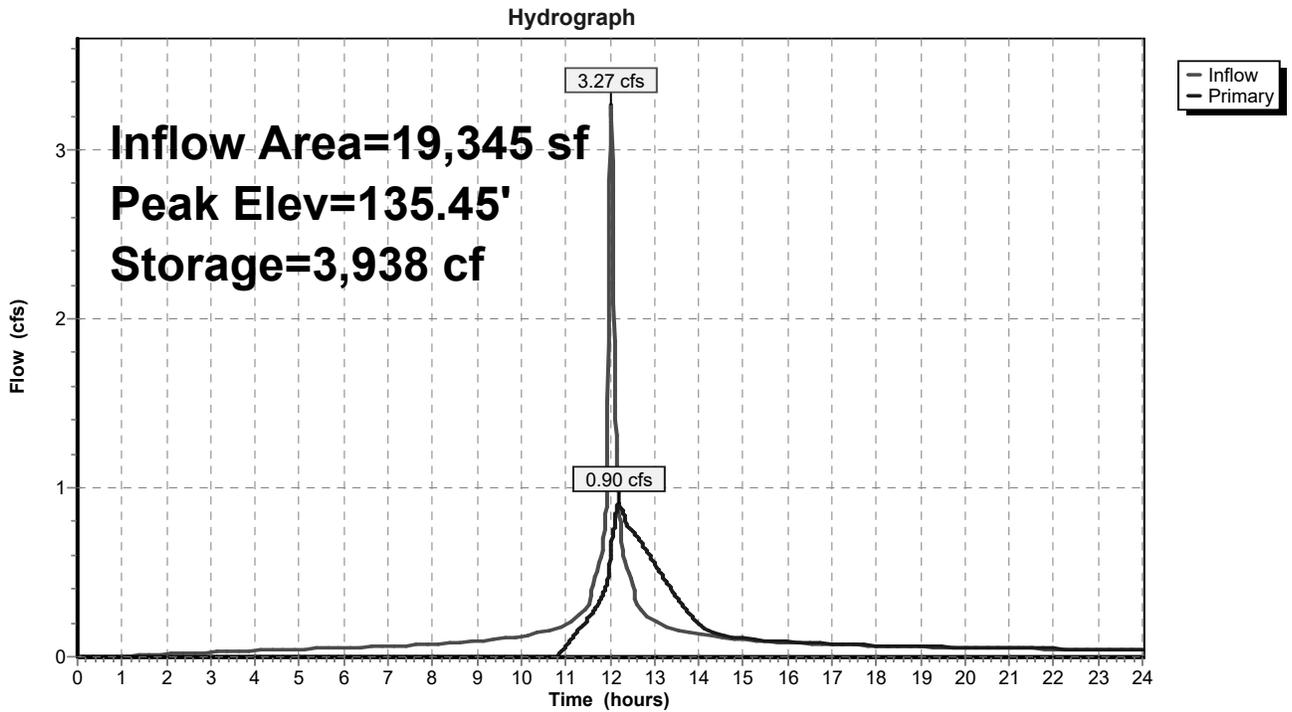
2 Chambers (plus border)

305.8 cy Field

16.1 cy Stone



Pond 3P: Proposed Employee Lot Underground Detention System



Summary for Pond 4P: Proposed Remote Lot Underground Detention System

Inflow Area = 341,115 sf, 85.50% Impervious, Inflow Depth > 5.63" for 25-yr event
 Inflow = 39.50 cfs @ 12.11 hrs, Volume= 159,949 cf
 Outflow = 4.73 cfs @ 12.86 hrs, Volume= 100,691 cf, Atten= 88%, Lag= 44.6 min
 Primary = 4.73 cfs @ 12.86 hrs, Volume= 100,691 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 24.52' @ 12.86 hrs Surf.Area= 16,410 sf Storage= 91,527 cf

Plug-Flow detention time= 335.6 min calculated for 100,649 cf (63% of inflow)
 Center-of-Mass det. time= 205.8 min (982.0 - 776.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	17.50'	3,282 cf	98.10'W x 167.27'L x 9.50'H Field A 155,895 cf Overall - 147,690 cf Embedded = 8,205 cf x 40.0% Voids
#2A	18.00'	117,263 cf	StormTrap ST2 DoubleTrap 8-0x 100 Inside #1 Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf 100 Chambers in 10 Rows 84.79' x 153.96' Core + 6.66' Border = 98.10' x 167.27' System
		120,545 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	18.00'	36.0" Round Culvert L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 18.00' / 17.60' S= 0.0050 '/ Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Device 1	20.00'	4.0" W x 4.0" H Vert. Orifice/Grate C= 0.600
#3	Device 1	21.50'	4.0" W x 4.0" H Vert. Orifice/Grate C= 0.600
#4	Device 1	23.00'	12.0" W x 6.0" H Vert. Orifice/Grate C= 0.600
#5	Device 1	25.00'	4.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Primary OutFlow Max=4.73 cfs @ 12.86 hrs HW=24.52' (Free Discharge)

- 1=Culvert (Passes 4.73 cfs of 76.26 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.12 cfs @ 10.05 fps)
- 3=Orifice/Grate (Orifice Controls 0.90 cfs @ 8.13 fps)
- 4=Orifice/Grate (Orifice Controls 2.71 cfs @ 5.42 fps)
- 5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 4P: Proposed Remote Lot Underground Detention System - Chamber Wizard Field A

Chamber Model = StormTrapST2 DoubleTrap 8-0 (StormTrapST2 DoubleTrap®Type II+IV)

Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf
Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf

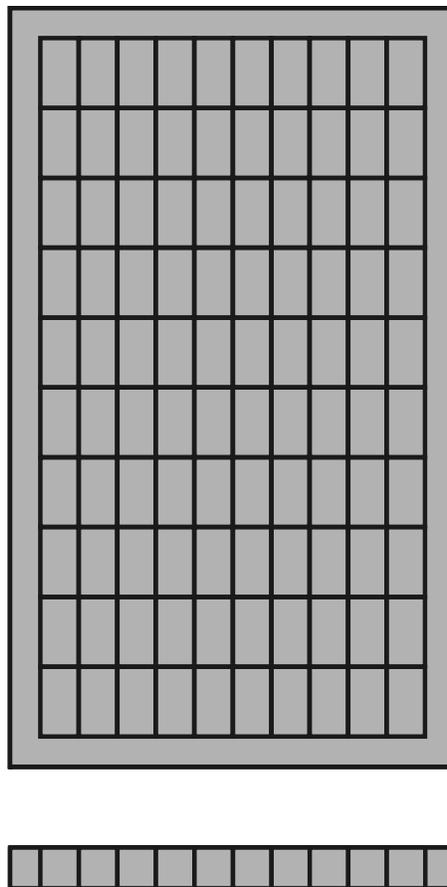
10 Chambers/Row x 15.40' Long = 153.96' Row Length +79.9" Border x 2 = 167.27' Base Length
10 Rows x 101.7" Wide + 79.9" Side Border x 2 = 98.10' Base Width
6.0" Base + 108.0" Chamber Height = 9.50' Field Height

100 Chambers x 940.5 cf + 23,209.2 cf Border = 117,263.5 cf Chamber Storage
100 Chambers x 1,174.9 cf + 30,200.2 cf Border = 147,689.7 cf Displacement

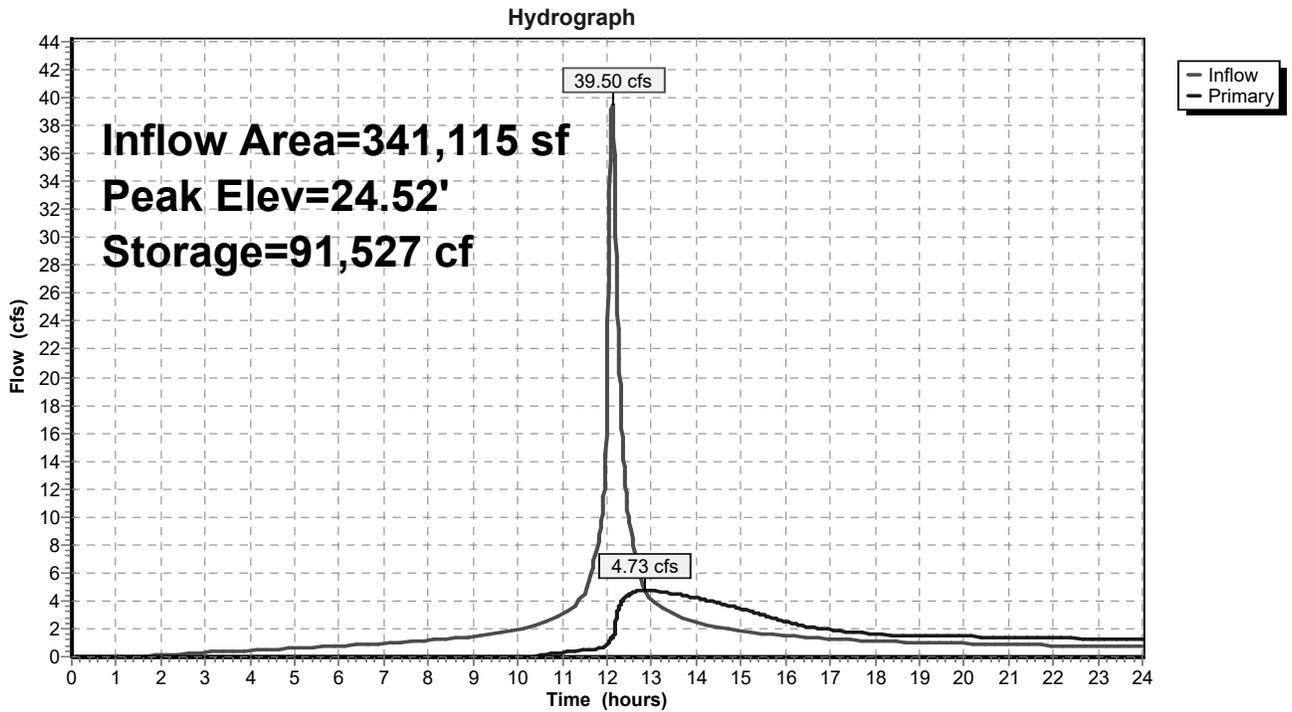
155,894.7 cf Field - 147,689.7 cf Chambers = 8,205.0 cf Stone x 40.0% Voids = 3,282.0 cf Stone Storage

Chamber Storage + Stone Storage = 120,545.5 cf = 2.767 af
Overall Storage Efficiency = 77.3%
Overall System Size = 167.27' x 98.10' x 9.50'

100 Chambers (plus border)
5,773.9 cy Field
303.9 cy Stone



Pond 4P: Proposed Remote Lot Underground Detention System

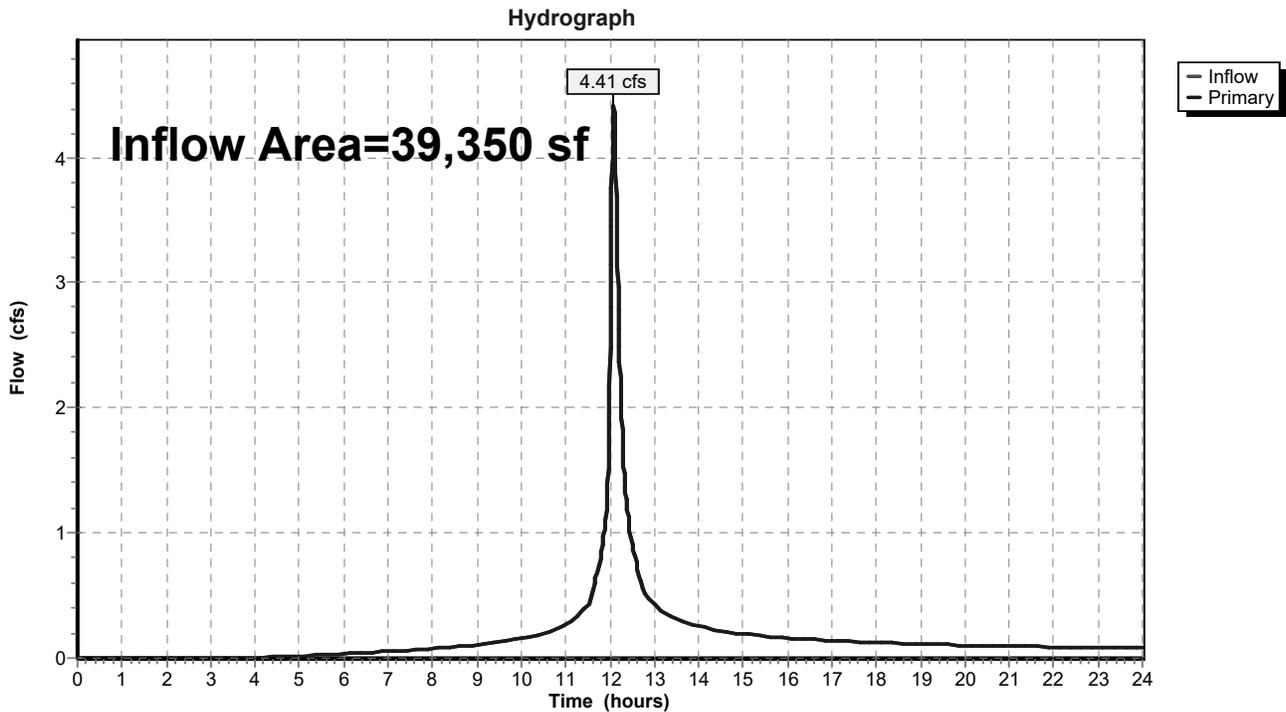


Summary for Link DP-1: Middle Street Gutter

Inflow Area = 39,350 sf, 9.83% Impervious, Inflow Depth > 4.62" for 25-yr event
Inflow = 4.41 cfs @ 12.08 hrs, Volume= 15,153 cf
Primary = 4.41 cfs @ 12.08 hrs, Volume= 15,153 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-1: Middle Street Gutter

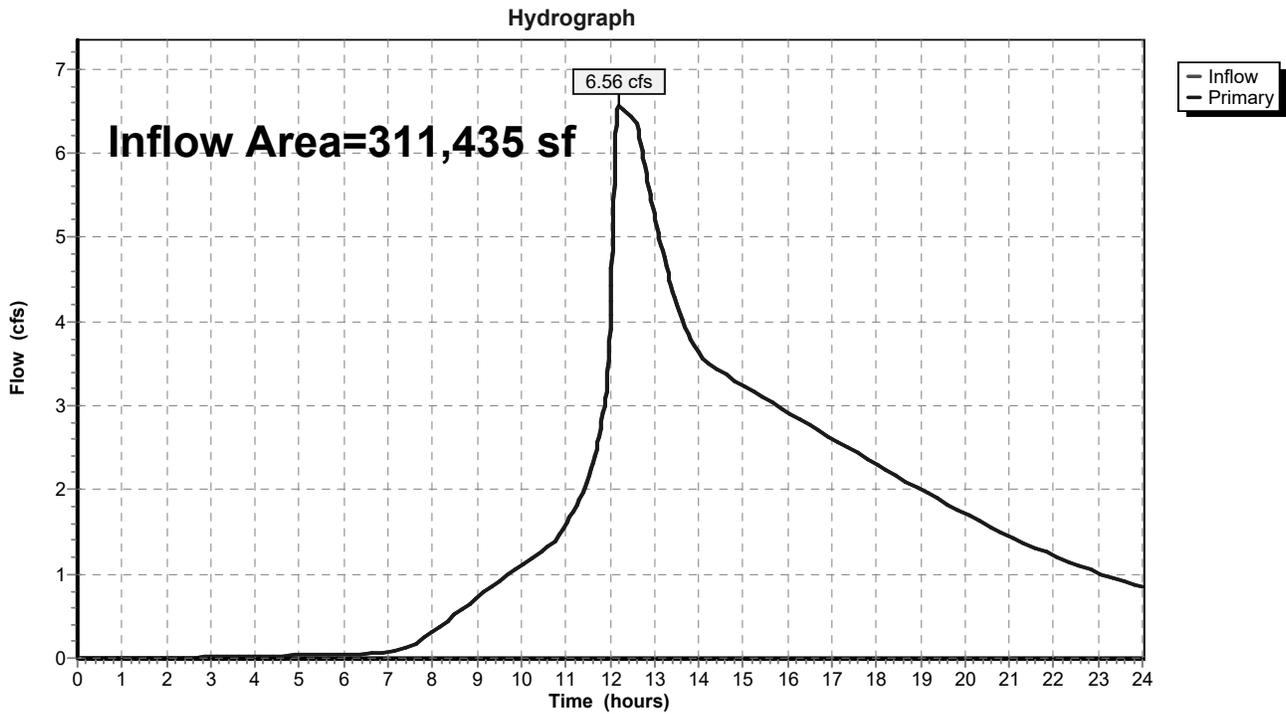


Summary for Link DP-2: Employee Lot Drainage

Inflow Area = 311,435 sf, 73.22% Impervious, Inflow Depth > 5.04" for 25-yr event
Inflow = 6.56 cfs @ 12.20 hrs, Volume= 130,678 cf
Primary = 6.56 cfs @ 12.20 hrs, Volume= 130,678 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-2: Employee Lot Drainage



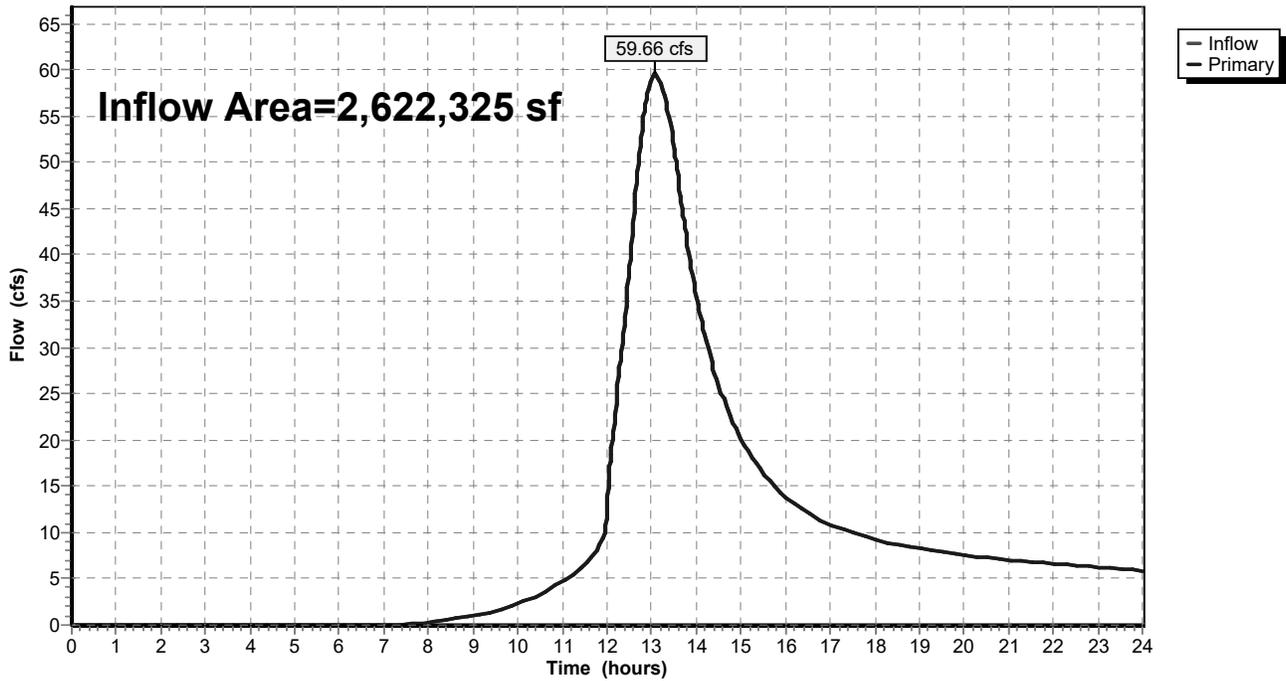
Summary for Link DP-3: Sawmill Brook Wetland System

Inflow Area = 2,622,325 sf, 20.31% Impervious, Inflow Depth > 3.46" for 25-yr event
Inflow = 59.66 cfs @ 13.09 hrs, Volume= 756,197 cf
Primary = 59.66 cfs @ 13.09 hrs, Volume= 756,197 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-3: Sawmill Brook Wetland System

Hydrograph



C-DAT-2001507-PROPOSED CT_Middletown_2001507_Depth 24-hr S1 100-yr Rainfall=8.16"

Prepared by {enter your company name here}

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPDA-100: Area Draining to Runoff Area=39,350 sf 9.83% Impervious Runoff Depth>6.35"
Flow Length=962' Tc=9.9 min CN=85 Runoff=5.93 cfs 20,826 cf

SubcatchmentPDA-200: Area Draining to Runoff Area=25,360 sf 58.60% Impervious Runoff Depth>7.17"
Flow Length=786' Tc=16.4 min CN=92 Runoff=3.20 cfs 15,159 cf

SubcatchmentPDA-210: Area Draining to Runoff Area=266,730 sf 73.87% Impervious Runoff Depth>7.43"
Flow Length=815' Tc=8.2 min CN=94 Runoff=48.12 cfs 165,079 cf

SubcatchmentPDA-220: Area Draining to Runoff Area=19,345 sf 83.46% Impervious Runoff Depth>7.67"
Tc=5.0 min CN=96 Runoff=4.19 cfs 12,368 cf

SubcatchmentPDA-300: Area Draining Runoff Area=1,992,600 sf 2.53% Impervious Runoff Depth>4.92"
Flow Length=4,372' Tc=88.6 min CN=74 Runoff=71.05 cfs 816,775 cf

SubcatchmentPDA-310: Area Draining to Runoff Area=288,610 sf 65.96% Impervious Runoff Depth>6.72"
Flow Length=1,004' Tc=5.0 min CN=88 Runoff=58.61 cfs 161,534 cf

SubcatchmentPDA-320: Area Draining to Runoff Area=341,115 sf 85.50% Impervious Runoff Depth>7.42"
Flow Length=807' Tc=12.3 min CN=94 Runoff=50.93 cfs 210,904 cf

Pond 1P: Existing Employee Lot Peak Elev=130.76' Storage=67,749 cf Inflow=48.12 cfs 165,079 cf
Outflow=8.16 cfs 149,637 cf

Pond 2P: Existing Remote Lot Peak Elev=25.55' Storage=65,971 cf Inflow=58.61 cfs 161,534 cf
Outflow=11.72 cfs 134,807 cf

Pond 3P: Proposed Employee Lot Peak Elev=136.07' Storage=4,413 cf Inflow=4.19 cfs 12,368 cf
Outflow=1.34 cfs 10,191 cf

Pond 4P: Proposed Remote Lot Peak Elev=25.70' Storage=108,809 cf Inflow=50.93 cfs 210,904 cf
Outflow=13.16 cfs 146,753 cf

Link DP-1: Middle Street Gutter Inflow=5.93 cfs 20,826 cf
Primary=5.93 cfs 20,826 cf

Link DP-2: Employee Lot Drainage Inflow=11.66 cfs 174,987 cf
Primary=11.66 cfs 174,987 cf

Link DP-3: Sawmill Brook Wetland System Inflow=87.53 cfs 1,098,336 cf
Primary=87.53 cfs 1,098,336 cf

Total Runoff Area = 2,973,110 sf Runoff Volume = 1,402,645 cf Average Runoff Depth = 5.66"
74.29% Pervious = 2,208,675 sf 25.71% Impervious = 764,435 sf

Summary for Subcatchment PDA-100: Area Draining to Middle Street

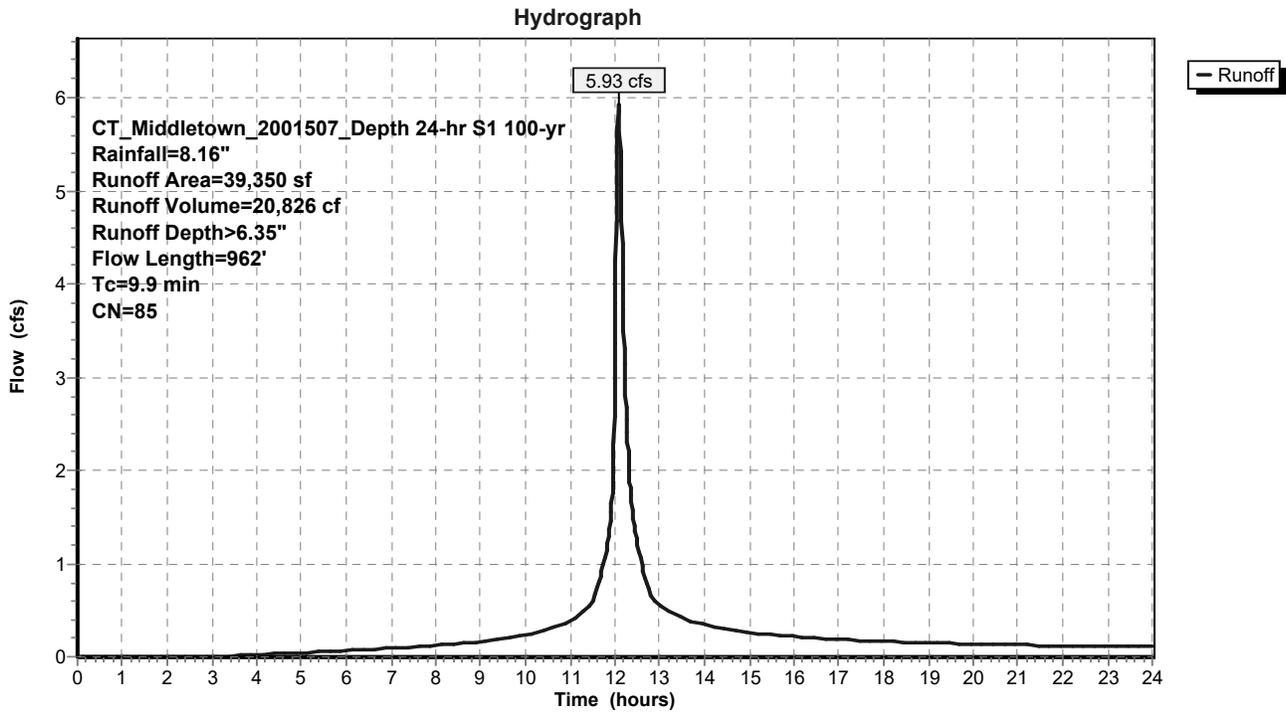
Runoff = 5.93 cfs @ 12.08 hrs, Volume= 20,826 cf, Depth> 6.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 100-yr Rainfall=8.16"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
35,480	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
3,870	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
39,350	85	Weighted Average
35,480		90.17% Pervious Area
3,870		9.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	28	0.1406	0.20		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
1.1	72	0.0120	1.06		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
6.5	862	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.9	962	Total			

Subcatchment PDA-100: Area Draining to Middle Street



Summary for Subcatchment PDA-200: Area Draining to Employee Lot Drainage System

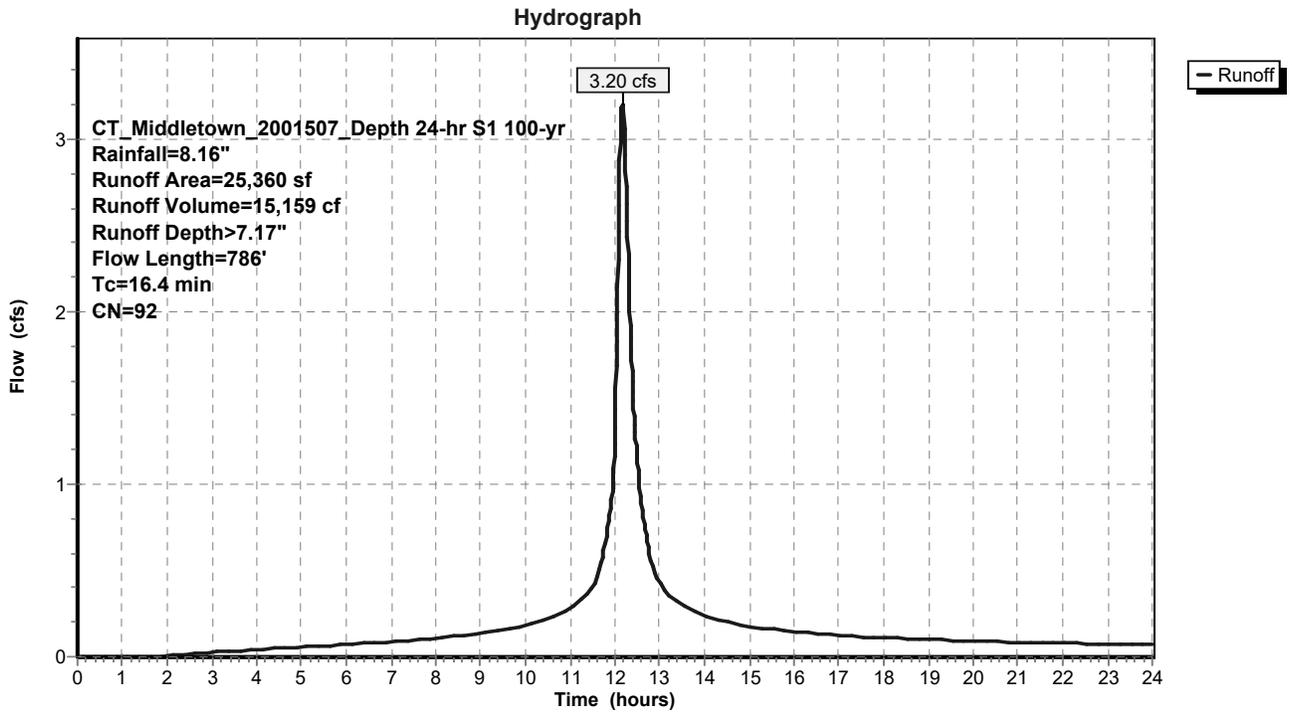
Runoff = 3.20 cfs @ 12.17 hrs, Volume= 15,159 cf, Depth> 7.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 100-yr Rainfall=8.16"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
10,500	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
14,860	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
25,360	92	Weighted Average
10,500		41.40% Pervious Area
14,860		58.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	72	0.0133	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
0.3	28	0.0357	1.36		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.7	308	0.0211	2.95		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.5	317	0.0050	3.47	2.73	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.2	61	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Concrete pipe, finished
16.4	786	Total			

Subcatchment PDA-200: Area Draining to Employee Lot Drainage System



Summary for Subcatchment PDA-210: Area Draining to Existing Employee Lot Underground Detention

Runoff = 48.12 cfs @ 12.06 hrs, Volume= 165,079 cf, Depth> 7.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 100-yr Rainfall=8.16"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
69,690	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
197,040	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
266,730	94	Weighted Average
69,690		26.13% Pervious Area
197,040		73.87% Impervious Area

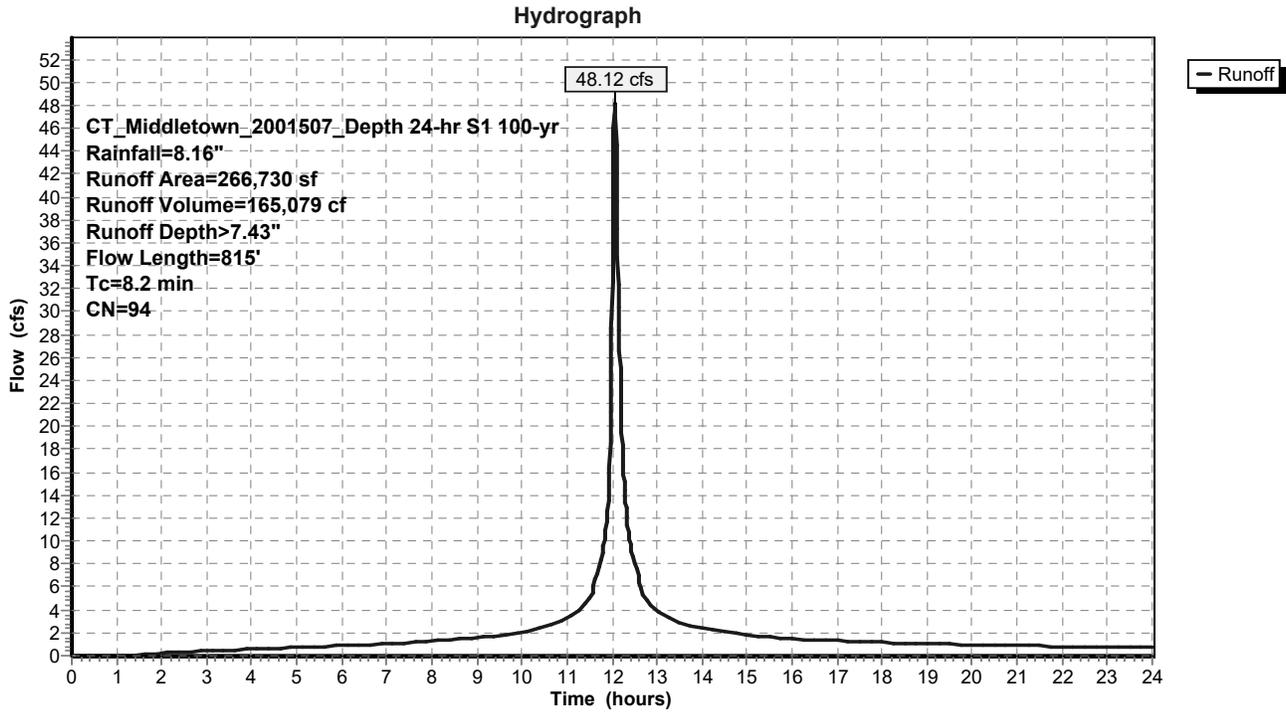
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	19	0.0160	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
1.1	81	0.0160	1.22		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.1	164	0.0160	2.57		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.5	130	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Concrete pipe, finished
0.6	152	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Concrete pipe, finished
0.3	108	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.3	101	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.1	38	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.1	22	0.0050	7.23	51.09	Pipe Channel,

36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'

n= 0.012 Concrete pipe, finished

8.2 815 Total

Subcatchment PDA-210: Area Draining to Existing Employee Lot Underground Detention



Summary for Subcatchment PDA-220: Area Draining to Proposed Employee Lot Underground Detenti

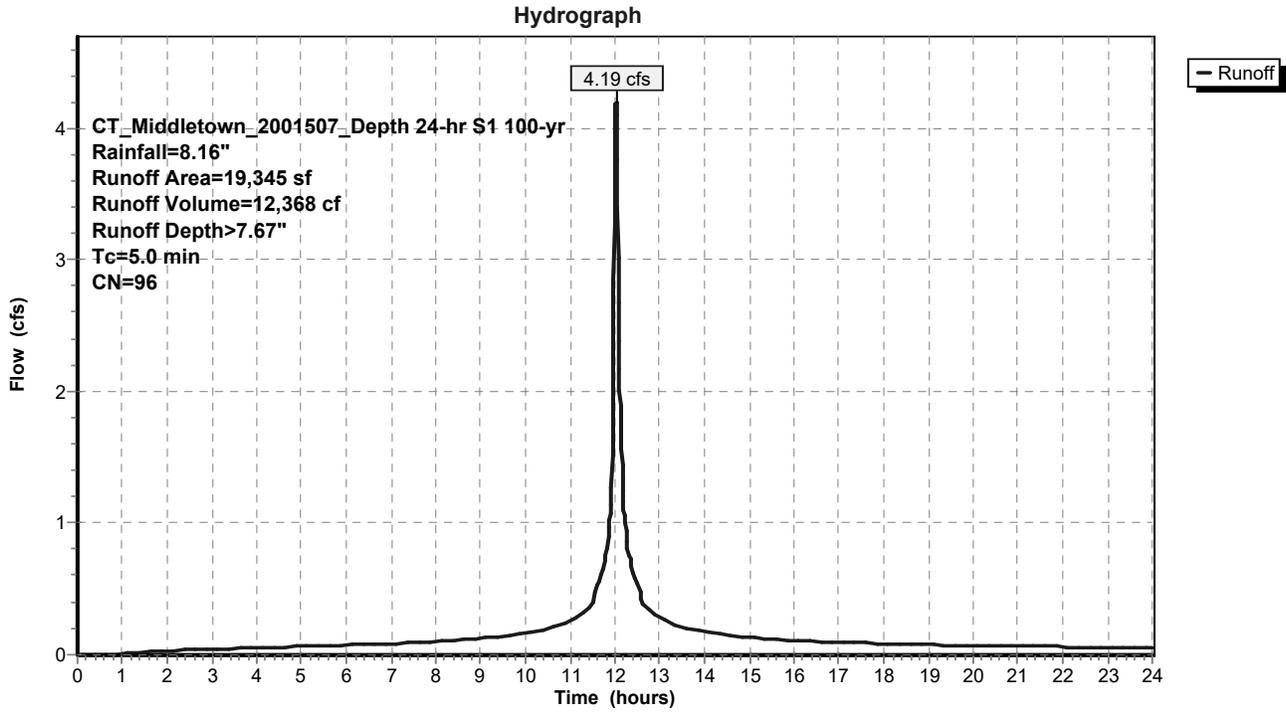
Runoff = 4.19 cfs @ 12.03 hrs, Volume= 12,368 cf, Depth> 7.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 100-yr Rainfall=8.16"

Area (sf)	CN	Description
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
3,200	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
0	98	Paved parking, HSG C
16,145	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
19,345	96	Weighted Average
3,200		16.54% Pervious Area
16,145		83.46% Impervious Area

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

Subcatchment PDA-220: Area Draining to Proposed Employee Lot Underground Detention



Summary for Subcatchment PDA-300: Area Draining to Sawmill Brook Wetland

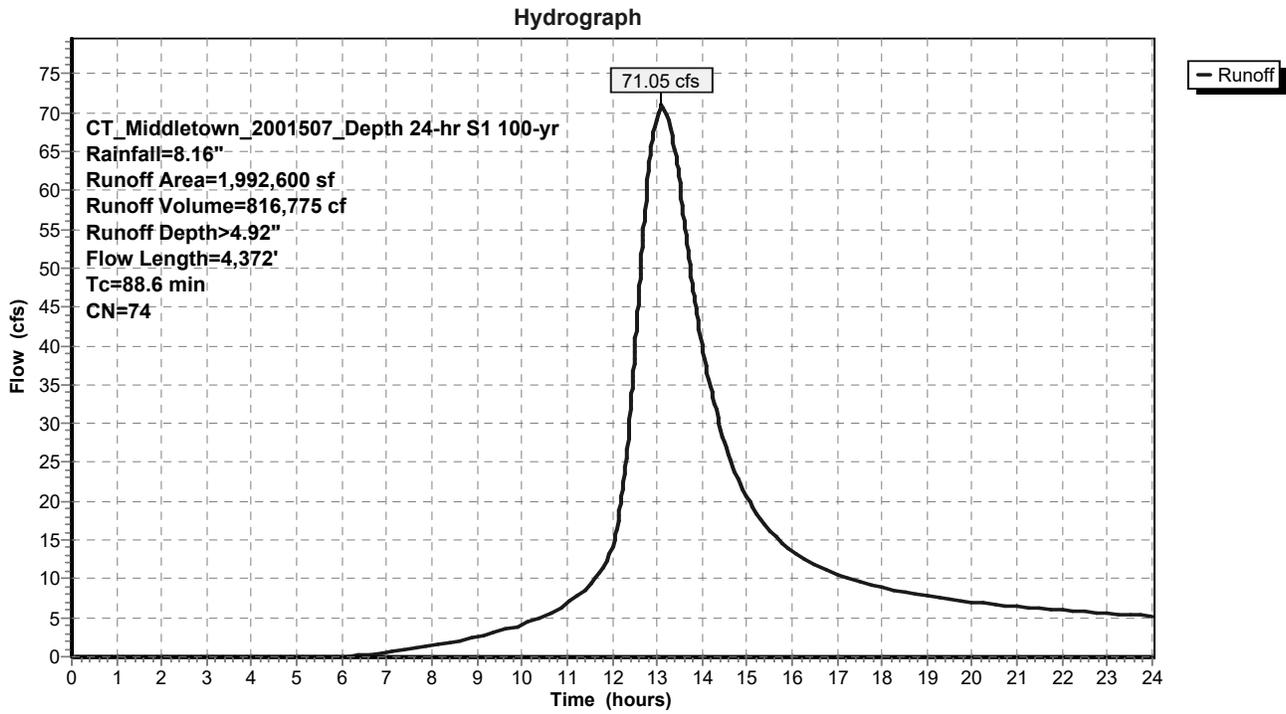
Runoff = 71.05 cfs @ 13.09 hrs, Volume= 816,775 cf, Depth> 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 100-yr Rainfall=8.16"

Area (sf)	CN	Description
750	69	50-75% Grass cover, Fair, HSG B
78,990	79	50-75% Grass cover, Fair, HSG C
29,645	84	50-75% Grass cover, Fair, HSG D
0	98	Paved parking, HSG B
15,875	98	Paved parking, HSG C
34,605	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
250	96	Gravel surface, HSG C
355	96	Gravel surface, HSG D
128,150	56	Brush, Fair, HSG B
103,140	70	Brush, Fair, HSG C
8,845	77	Brush, Fair, HSG D
291,600	60	Woods, Fair, HSG B
279,895	73	Woods, Fair, HSG C
1,020,500	79	Woods, Fair, HSG D
1,992,600	74	Weighted Average
1,942,120		97.47% Pervious Area
50,480		2.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.8	100	0.0110	0.04		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.29"
15.4	486	0.0110	0.52		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
26.4	3,786	0.0049	2.39	71.77	Channel Flow, Area= 30.0 sf Perim= 34.0' r= 0.88' n= 0.040 Winding stream, pools & shoals
88.6	4,372	Total			

Subcatchment PDA-300: Area Draining to Sawmill Brook Wetland



Summary for Subcatchment PDA-310: Area Draining to Existing Remote Lot Stormwater Management B

Runoff = 58.61 cfs @ 12.03 hrs, Volume= 161,534 cf, Depth> 6.72"

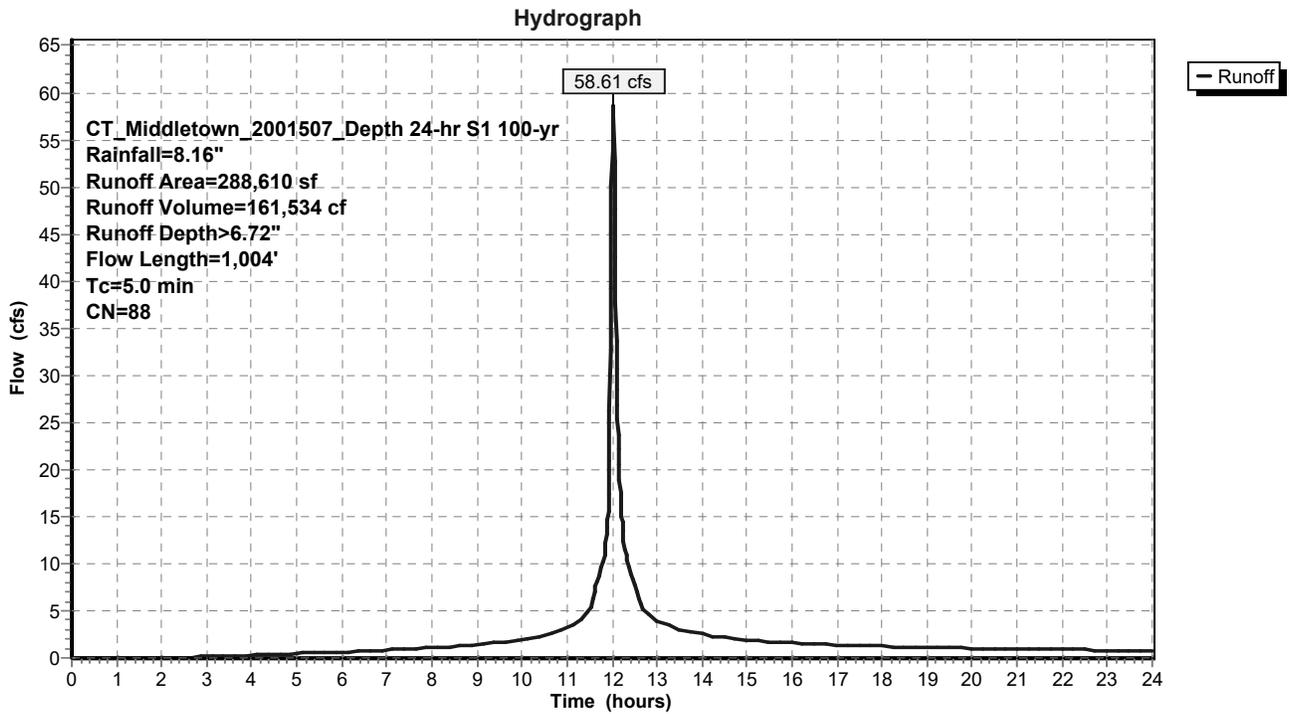
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 100-yr Rainfall=8.16"

Area (sf)	CN	Description
30,695	69	50-75% Grass cover, Fair, HSG B
14,665	79	50-75% Grass cover, Fair, HSG C
0	84	50-75% Grass cover, Fair, HSG D
135,315	98	Paved parking, HSG B
55,055	98	Paved parking, HSG C
0	98	Paved parking, HSG D
2,590	96	Gravel surface, HSG B
2,215	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
21,640	56	Brush, Fair, HSG B
26,435	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
288,610	88	Weighted Average
98,240		34.04% Pervious Area
190,370		65.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0180	1.34		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.29"
1.0	165	0.0180	2.72		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	80	0.0050	3.47	2.73	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.5	168	0.0050	5.52	17.33	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
0.4	162	0.0050	6.40	31.42	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Concrete pipe, finished
0.3	121	0.0050	6.40	31.42	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Concrete pipe, finished
0.2	70	0.0050	7.23	51.09	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished
0.3	138	0.0050	7.23	51.09	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Concrete pipe, finished

4.3 1,004 Total, Increased to minimum Tc = 5.0 min

Subcatchment PDA-310: Area Draining to Existing Remote Lot Stormwater Management Basin



Summary for Subcatchment PDA-320: Area Draining to Proposed Remote Lot Underground Detention

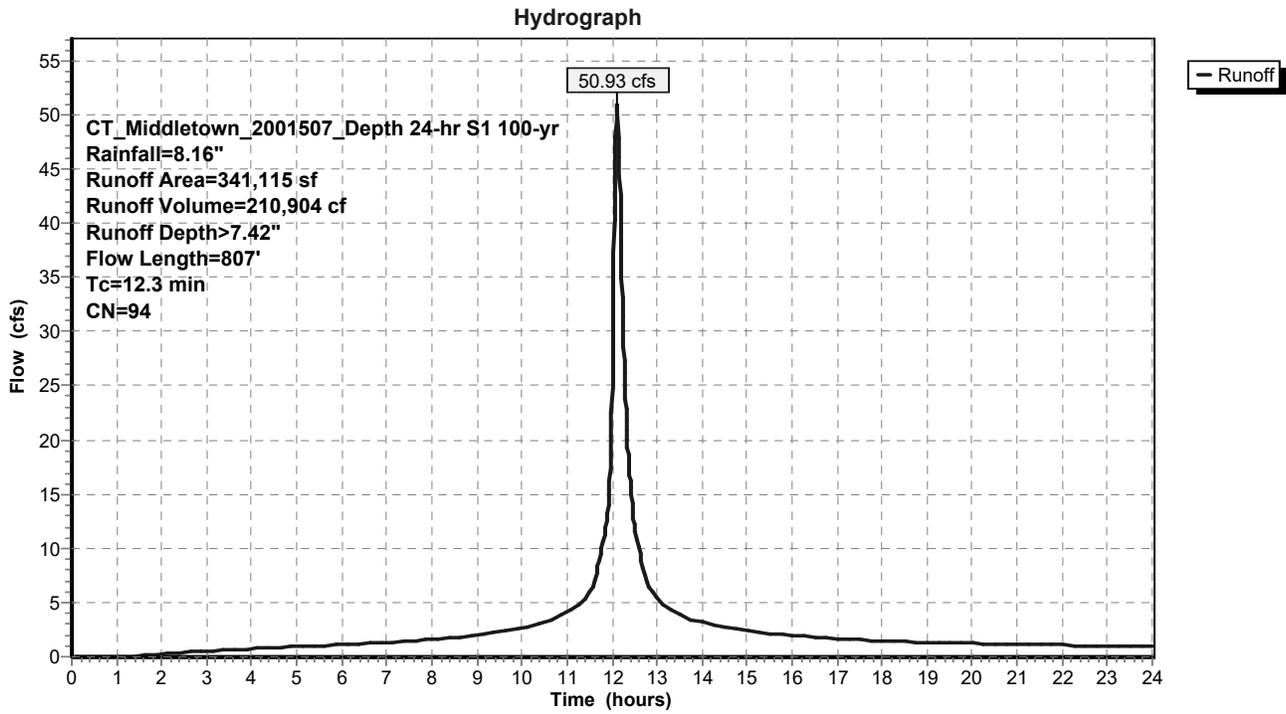
Runoff = 50.93 cfs @ 12.11 hrs, Volume= 210,904 cf, Depth> 7.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 CT_Middletown_2001507_Depth 24-hr S1 100-yr Rainfall=8.16"

Area (sf)	CN	Description
41,205	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
8,240	84	50-75% Grass cover, Fair, HSG D
256,860	98	Paved parking, HSG B
0	98	Paved parking, HSG C
34,810	98	Paved parking, HSG D
0	96	Gravel surface, HSG B
0	96	Gravel surface, HSG C
0	96	Gravel surface, HSG D
0	56	Brush, Fair, HSG B
0	70	Brush, Fair, HSG C
0	77	Brush, Fair, HSG D
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
341,115	94	Weighted Average
49,445		14.50% Pervious Area
291,670		85.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0500	0.17		Sheet Flow, Grass: Dense n= 0.240 P2= 3.29"
0.8	132	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.0	300	0.0050	4.97	8.78	Pipe Channel, RCP_Round 18" 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.4	150	0.0050	6.02	18.90	Pipe Channel, RCP_Round 24" 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.3	125	0.0050	7.89	55.74	Pipe Channel, RCP_Round 36" 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
12.3	807	Total			

Subcatchment PDA-320: Area Draining to Proposed Remote Lot Underground Detention



Summary for Pond 1P: Existing Employee Lot Underground Detention System

Inflow Area = 266,730 sf, 73.87% Impervious, Inflow Depth > 7.43" for 100-yr event
 Inflow = 48.12 cfs @ 12.06 hrs, Volume= 165,079 cf
 Outflow = 8.16 cfs @ 12.50 hrs, Volume= 149,637 cf, Atten= 83%, Lag= 26.1 min
 Primary = 8.16 cfs @ 12.50 hrs, Volume= 149,637 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 130.76' @ 12.50 hrs Surf.Area= 11,725 sf Storage= 67,749 cf

Plug-Flow detention time= 201.9 min calculated for 149,637 cf (91% of inflow)
 Center-of-Mass det. time= 148.8 min (914.4 - 765.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	123.50'	2,345 cf	64.19'W x 182.67'L x 9.50'H Field A 111,387 cf Overall - 105,524 cf Embedded = 5,862 cf x 40.0% Voids
#2A	124.00'	83,580 cf	StormTrap ST2 DoubleTrap 8-0x 66 Inside #1 Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf 66 Chambers in 6 Rows 50.88' x 169.35' Core + 6.66' Border = 64.19' x 182.67' System
		85,925 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	125.00'	24.0" Round Culvert L= 1,560.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 125.00' / 85.00' S= 0.0256 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	125.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	129.00'	12.0" Vert. Orifice/Grate C= 0.600
#4	Device 1	132.50'	3.0' long x 2.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 3.0' Crest Height

Primary OutFlow Max=8.16 cfs @ 12.50 hrs HW=130.76' (Free Discharge)

- 1=Culvert (Passes 8.16 cfs of 33.00 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 3.92 cfs @ 11.22 fps)
- 3=Orifice/Grate (Orifice Controls 4.25 cfs @ 5.41 fps)
- 4=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 1P: Existing Employee Lot Underground Detention System - Chamber Wizard Field A

Chamber Model = StormTrapST2 DoubleTrap 8-0 (StormTrapST2 DoubleTrap®Type II+IV)

Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf

Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf

11 Chambers/Row x 15.40' Long = 169.35' Row Length +79.9" Border x 2 = 182.67' Base Length

6 Rows x 101.7" Wide + 79.9" Side Border x 2 = 64.19' Base Width

6.0" Base + 108.0" Chamber Height = 9.50' Field Height

66 Chambers x 940.5 cf + 21,503.9 cf Border = 83,579.7 cf Chamber Storage

66 Chambers x 1,174.9 cf + 27,981.2 cf Border = 105,524.2 cf Displacement

111,386.7 cf Field - 105,524.2 cf Chambers = 5,862.5 cf Stone x 40.0% Voids = 2,345.0 cf Stone Storage

Chamber Storage + Stone Storage = 85,924.7 cf = 1.973 af

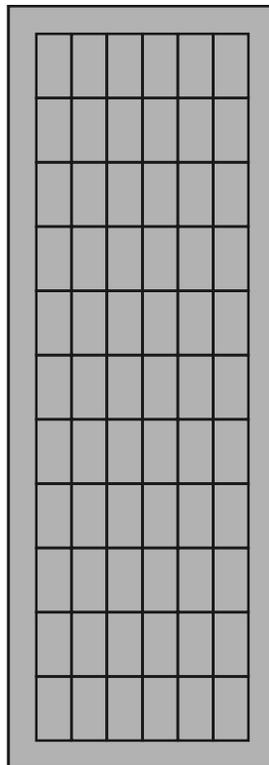
Overall Storage Efficiency = 77.1%

Overall System Size = 182.67' x 64.19' x 9.50'

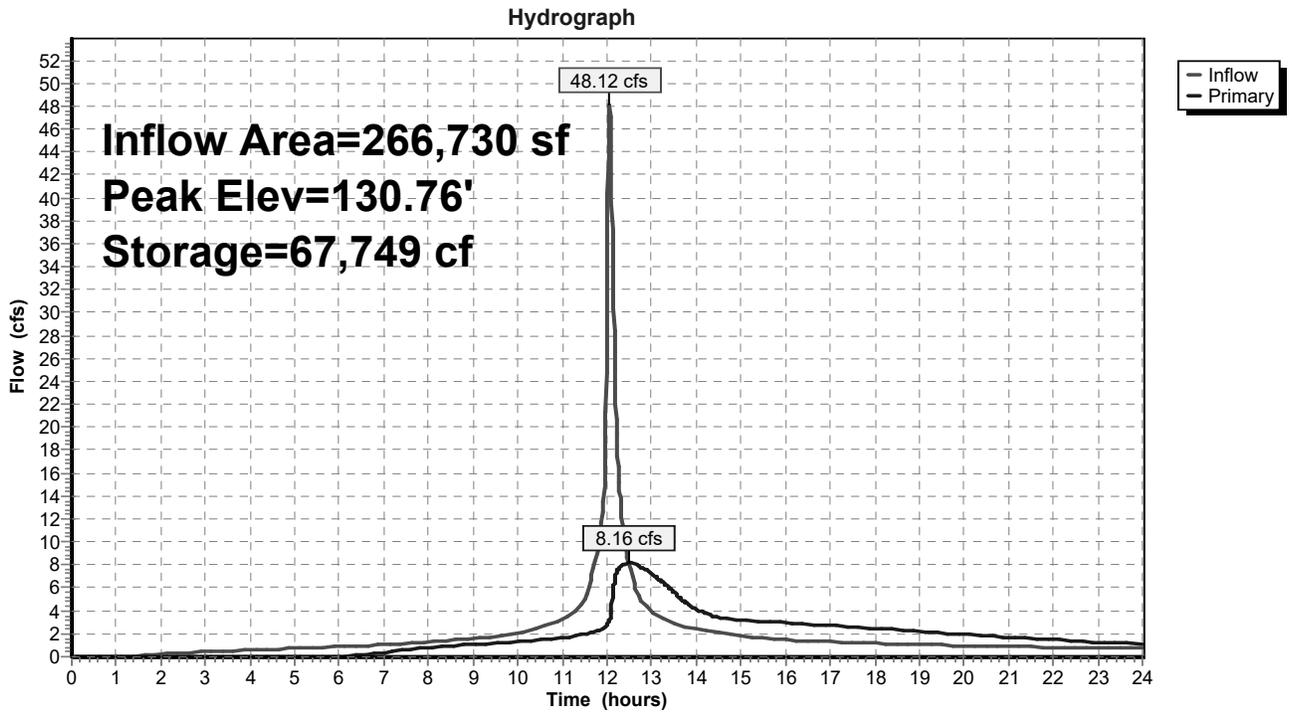
66 Chambers (plus border)

4,125.4 cy Field

217.1 cy Stone



Pond 1P: Existing Employee Lot Underground Detention System



Summary for Pond 2P: Existing Remote Lot Stormwater Management Basin

Inflow Area = 288,610 sf, 65.96% Impervious, Inflow Depth > 6.72" for 100-yr event
 Inflow = 58.61 cfs @ 12.03 hrs, Volume= 161,534 cf
 Outflow = 11.72 cfs @ 12.28 hrs, Volume= 134,807 cf, Atten= 80%, Lag= 15.2 min
 Primary = 11.72 cfs @ 12.28 hrs, Volume= 134,807 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 25.55' @ 12.28 hrs Surf.Area= 18,146 sf Storage= 65,971 cf

Plug-Flow detention time= 180.2 min calculated for 134,751 cf (83% of inflow)
 Center-of-Mass det. time= 99.4 min (888.6 - 789.2)

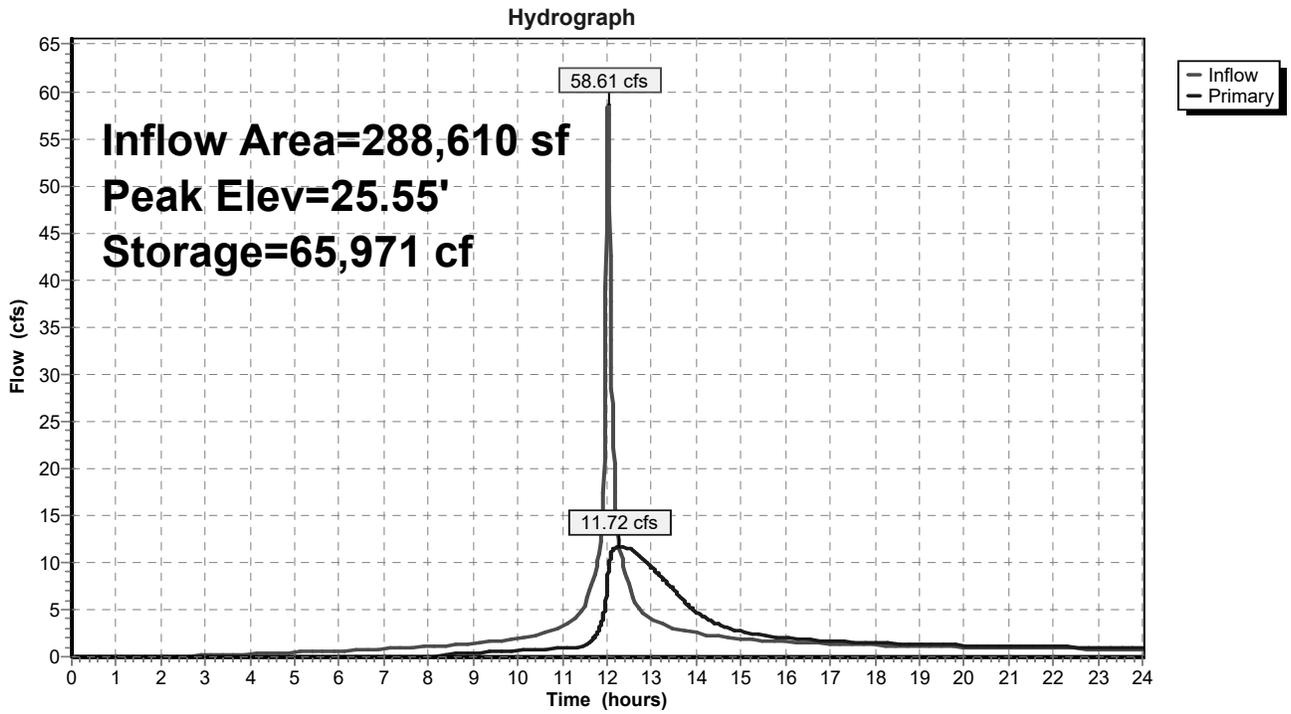
Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	94,737 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	5,895	0	0
21.00	7,748	6,822	6,822
22.00	9,895	8,822	15,643
23.00	12,598	11,247	26,890
24.00	14,704	13,651	40,541
25.00	16,889	15,797	56,337
26.00	19,175	18,032	74,369
27.00	21,560	20,368	94,737

Device	Routing	Invert	Outlet Devices
#1	Primary	21.28'	18.0" Round Culvert L= 55.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 21.28' / 21.00' S= 0.0051 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	21.28'	5.5" Vert. Orifice/Grate C= 0.600
#3	Device 1	23.00'	12.0" Vert. Orifice/Grate X 2 rows with 6.0" cc spacing C= 0.600
#4	Device 1	26.50'	3.0" x 2.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=11.72 cfs @ 12.28 hrs HW=25.55' (Free Discharge)

- 1=Culvert (Passes 11.72 cfs of 15.96 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.60 cfs @ 9.68 fps)
- 3=Orifice/Grate (Orifice Controls 10.12 cfs @ 6.44 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond 2P: Existing Remote Lot Stormwater Management Basin



Summary for Pond 3P: Proposed Employee Lot Underground Detention System

Inflow Area = 19,345 sf, 83.46% Impervious, Inflow Depth > 7.67" for 100-yr event
 Inflow = 4.19 cfs @ 12.03 hrs, Volume= 12,368 cf
 Outflow = 1.34 cfs @ 12.17 hrs, Volume= 10,191 cf, Atten= 68%, Lag= 8.6 min
 Primary = 1.34 cfs @ 12.17 hrs, Volume= 10,191 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 136.07' @ 12.17 hrs Surf.Area= 869 sf Storage= 4,413 cf

Plug-Flow detention time= 182.3 min calculated for 10,187 cf (82% of inflow)
 Center-of-Mass det. time= 95.1 min (847.5 - 752.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	129.50'	174 cf	30.27'W x 28.71'L x 9.50'H Field A 8,256 cf Overall - 7,821 cf Embedded = 435 cf x 40.0% Voids
#2A	130.00'	6,086 cf	StormTrap ST2 DoubleTrap 8-0x2 Inside #1 Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf 2 Chambers in 2 Rows 16.96' x 15.40' Core + 6.66' Border = 30.27' x 28.71' System
		6,260 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	130.50'	12.0" Round Culvert L= 77.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 130.50' / 129.34' S= 0.0151 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	133.00'	4.0" W x 4.0" H Vert. Orifice/Grate C= 0.600
#3	Device 1	135.25'	4.0" W x 4.0" H Vert. Orifice/Grate C= 0.600
#4	Device 1	136.50'	4.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Primary OutFlow Max=1.34 cfs @ 12.17 hrs HW=136.07' (Free Discharge)

- ↑ **1=Culvert** (Passes 1.34 cfs of 8.00 cfs potential flow)
- ↑ **2=Orifice/Grate** (Orifice Controls 0.91 cfs @ 8.21 fps)
- ↑ **3=Orifice/Grate** (Orifice Controls 0.43 cfs @ 3.89 fps)
- ↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Proposed Employee Lot Underground Detention System - Chamber Wizard Field A

Chamber Model = StormTrapST2 DoubleTrap 8-0 (StormTrapST2 DoubleTrap®Type II+IV)

Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf
Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf

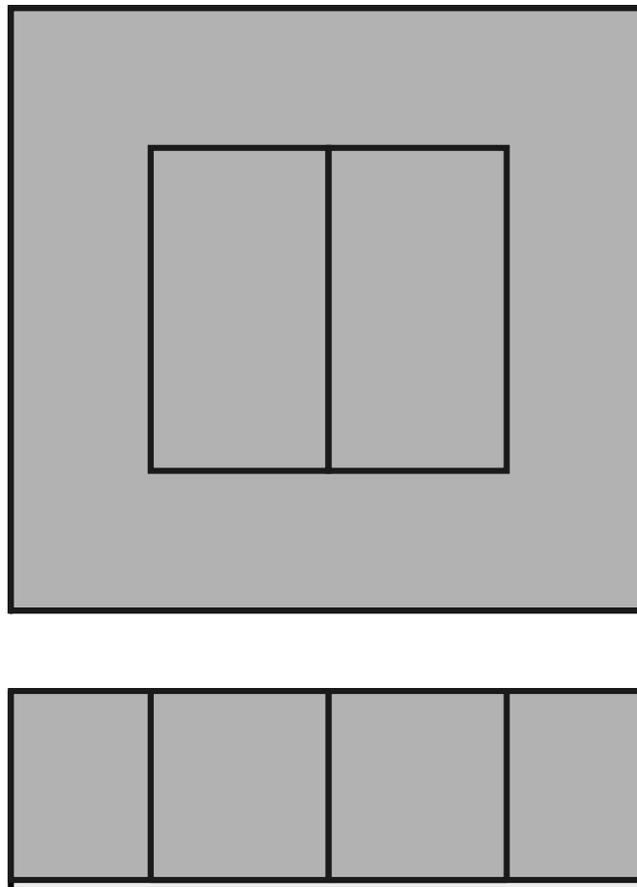
1 Chambers/Row x 15.40' Long = 15.40' Row Length +79.9" Border x 2 = 28.71' Base Length
2 Rows x 101.7" Wide + 79.9" Side Border x 2 = 30.27' Base Width
6.0" Base + 108.0" Chamber Height = 9.50' Field Height

2 Chambers x 940.5 cf + 4,204.9 cf Border = 6,085.9 cf Chamber Storage
2 Chambers x 1,174.9 cf + 5,471.4 cf Border = 7,821.2 cf Displacement

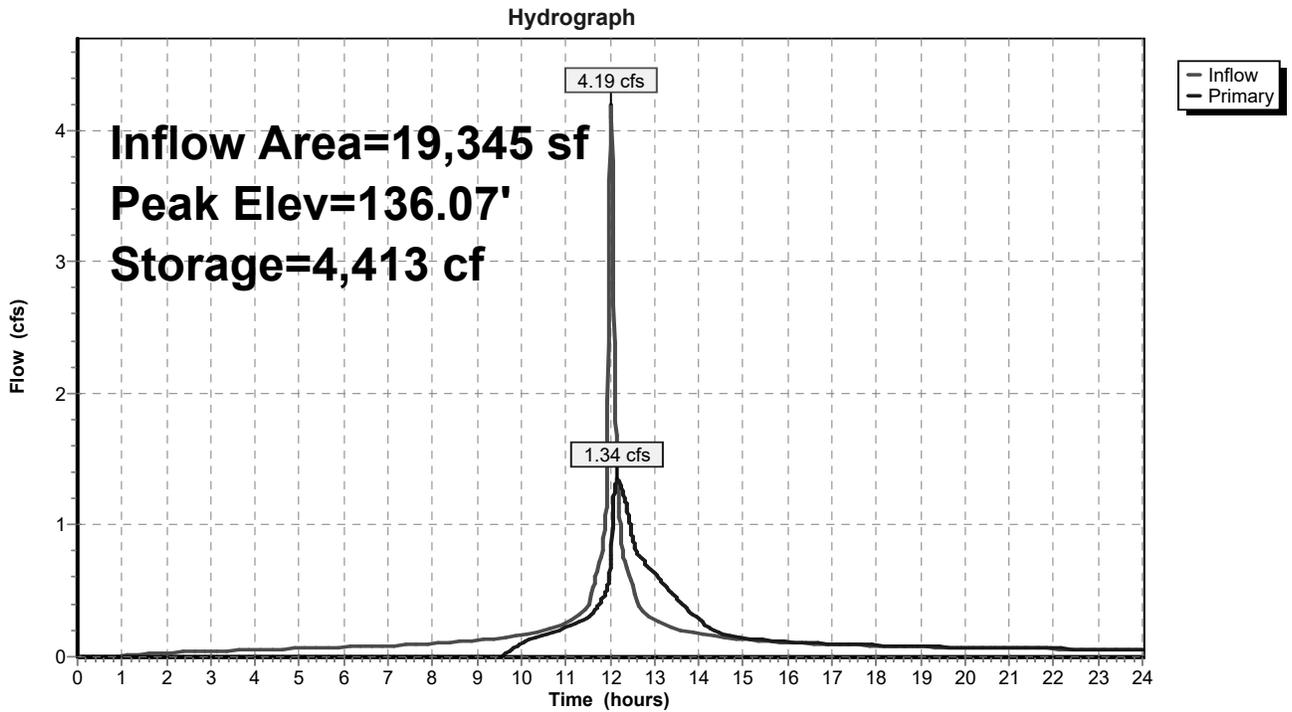
8,255.7 cf Field - 7,821.2 cf Chambers = 434.5 cf Stone x 40.0% Voids = 173.8 cf Stone Storage

Chamber Storage + Stone Storage = 6,259.8 cf = 0.144 af
Overall Storage Efficiency = 75.8%
Overall System Size = 28.71' x 30.27' x 9.50'

2 Chambers (plus border)
305.8 cy Field
16.1 cy Stone



Pond 3P: Proposed Employee Lot Underground Detention System



Summary for Pond 4P: Proposed Remote Lot Underground Detention System

Inflow Area = 341,115 sf, 85.50% Impervious, Inflow Depth > 7.42" for 100-yr event
 Inflow = 50.93 cfs @ 12.11 hrs, Volume= 210,904 cf
 Outflow = 13.16 cfs @ 12.47 hrs, Volume= 146,753 cf, Atten= 74%, Lag= 21.5 min
 Primary = 13.16 cfs @ 12.47 hrs, Volume= 146,753 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 25.70' @ 12.47 hrs Surf.Area= 16,410 sf Storage= 108,809 cf

Plug-Flow detention time= 291.3 min calculated for 146,753 cf (70% of inflow)
 Center-of-Mass det. time= 171.9 min (940.7 - 768.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	17.50'	3,282 cf	98.10'W x 167.27'L x 9.50'H Field A 155,895 cf Overall - 147,690 cf Embedded = 8,205 cf x 40.0% Voids
#2A	18.00'	117,263 cf	StormTrap ST2 DoubleTrap 8-0x 100 Inside #1 Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf 100 Chambers in 10 Rows 84.79' x 153.96' Core + 6.66' Border = 98.10' x 167.27' System
		120,545 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	18.00'	36.0" Round Culvert L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 18.00' / 17.60' S= 0.0050 '/ Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Device 1	20.00'	4.0" W x 4.0" H Vert. Orifice/Grate C= 0.600
#3	Device 1	21.50'	4.0" W x 4.0" H Vert. Orifice/Grate C= 0.600
#4	Device 1	23.00'	12.0" W x 6.0" H Vert. Orifice/Grate C= 0.600
#5	Device 1	25.00'	4.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Primary OutFlow Max=13.14 cfs @ 12.47 hrs HW=25.70' (Free Discharge)

- 1=Culvert (Passes 13.14 cfs of 84.74 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.26 cfs @ 11.33 fps)
- 3=Orifice/Grate (Orifice Controls 1.07 cfs @ 9.67 fps)
- 4=Orifice/Grate (Orifice Controls 3.77 cfs @ 7.53 fps)
- 5=Broad-Crested Rectangular Weir (Weir Controls 7.04 cfs @ 2.52 fps)

Pond 4P: Proposed Remote Lot Underground Detention System - Chamber Wizard Field A

Chamber Model = StormTrapST2 DoubleTrap 8-0 (StormTrapST2 DoubleTrap®Type II+IV)

Inside= 101.7"W x 96.0"H => 61.09 sf x 15.40'L = 940.5 cf
Outside= 101.7"W x 108.0"H => 76.31 sf x 15.40'L = 1,174.9 cf

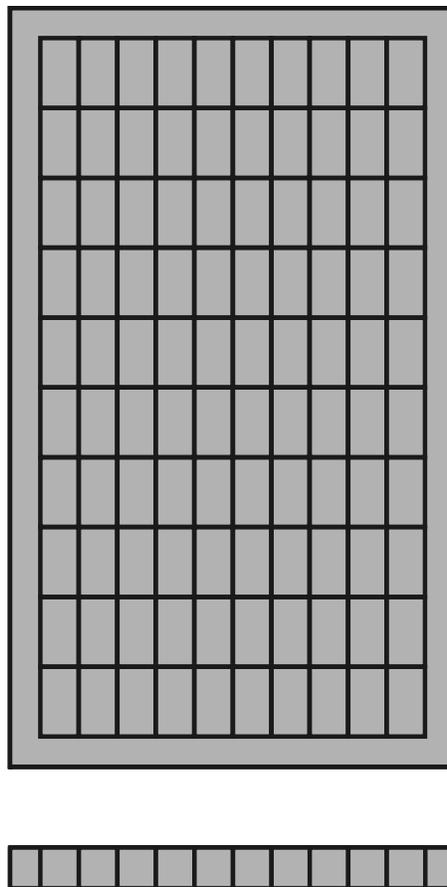
10 Chambers/Row x 15.40' Long = 153.96' Row Length +79.9" Border x 2 = 167.27' Base Length
10 Rows x 101.7" Wide + 79.9" Side Border x 2 = 98.10' Base Width
6.0" Base + 108.0" Chamber Height = 9.50' Field Height

100 Chambers x 940.5 cf + 23,209.2 cf Border = 117,263.5 cf Chamber Storage
100 Chambers x 1,174.9 cf + 30,200.2 cf Border = 147,689.7 cf Displacement

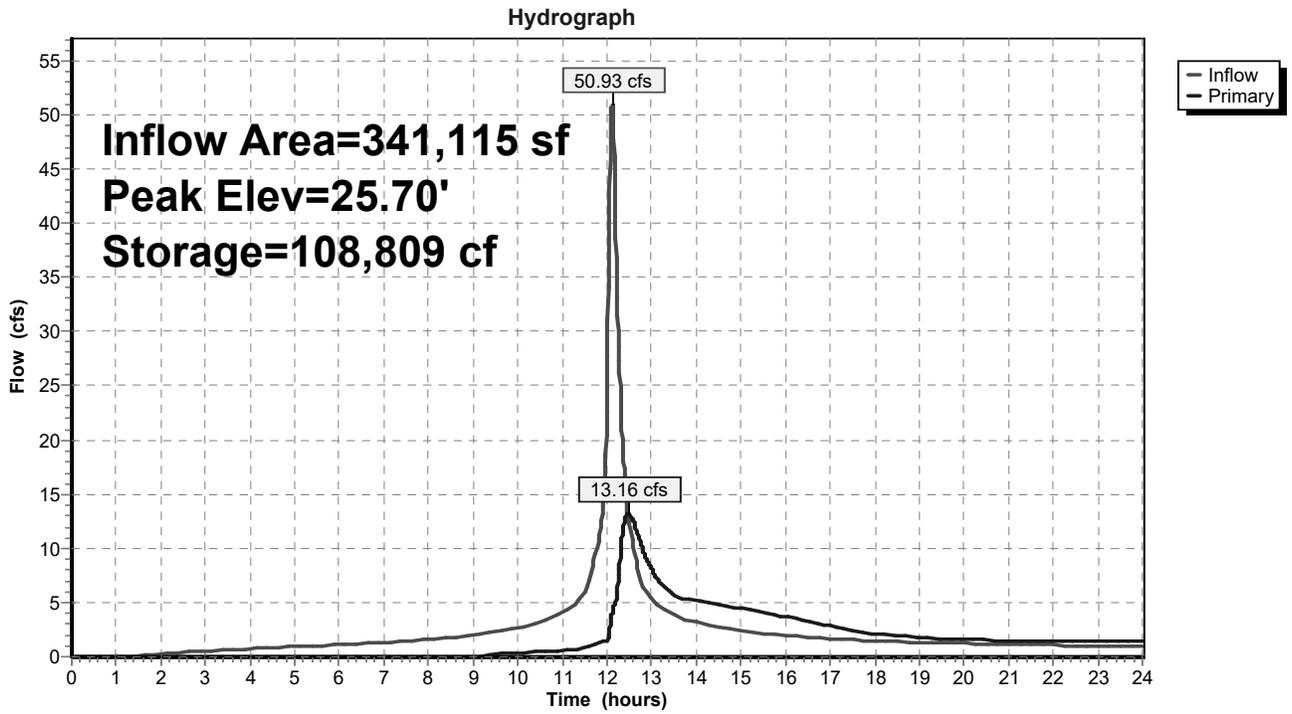
155,894.7 cf Field - 147,689.7 cf Chambers = 8,205.0 cf Stone x 40.0% Voids = 3,282.0 cf Stone Storage

Chamber Storage + Stone Storage = 120,545.5 cf = 2.767 af
Overall Storage Efficiency = 77.3%
Overall System Size = 167.27' x 98.10' x 9.50'

100 Chambers (plus border)
5,773.9 cy Field
303.9 cy Stone



Pond 4P: Proposed Remote Lot Underground Detention System

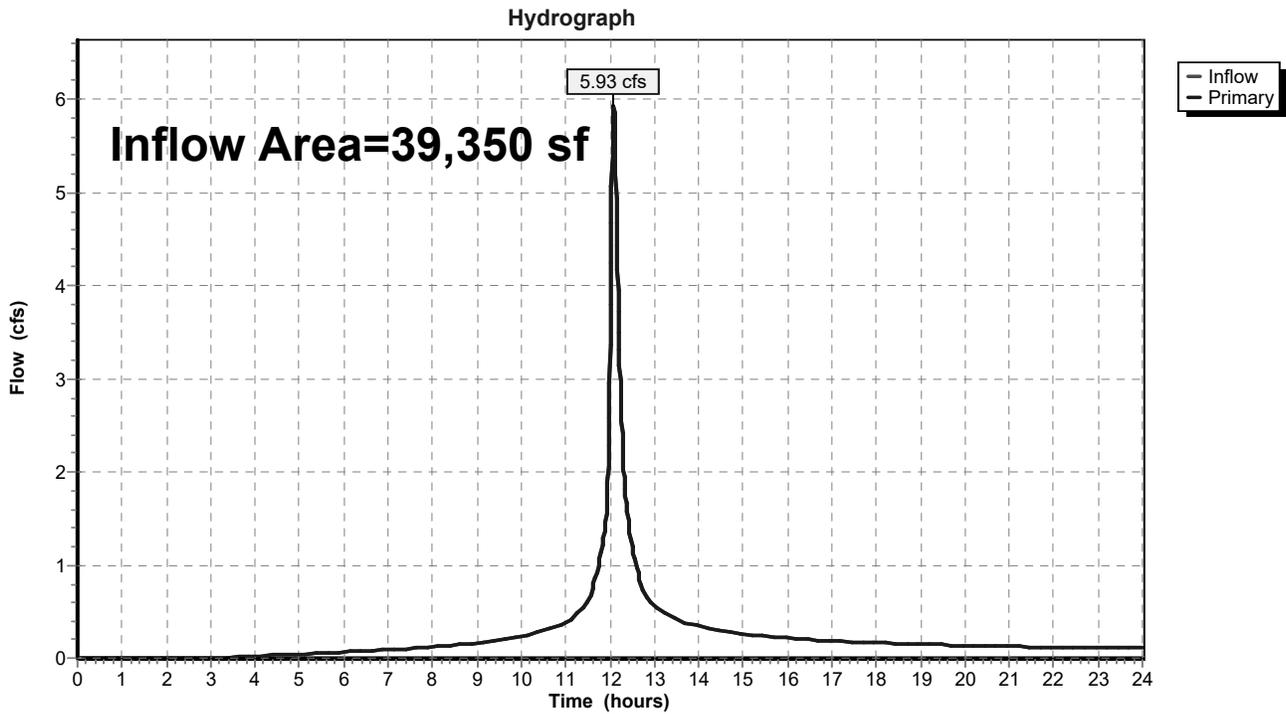


Summary for Link DP-1: Middle Street Gutter

Inflow Area = 39,350 sf, 9.83% Impervious, Inflow Depth > 6.35" for 100-yr event
Inflow = 5.93 cfs @ 12.08 hrs, Volume= 20,826 cf
Primary = 5.93 cfs @ 12.08 hrs, Volume= 20,826 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-1: Middle Street Gutter

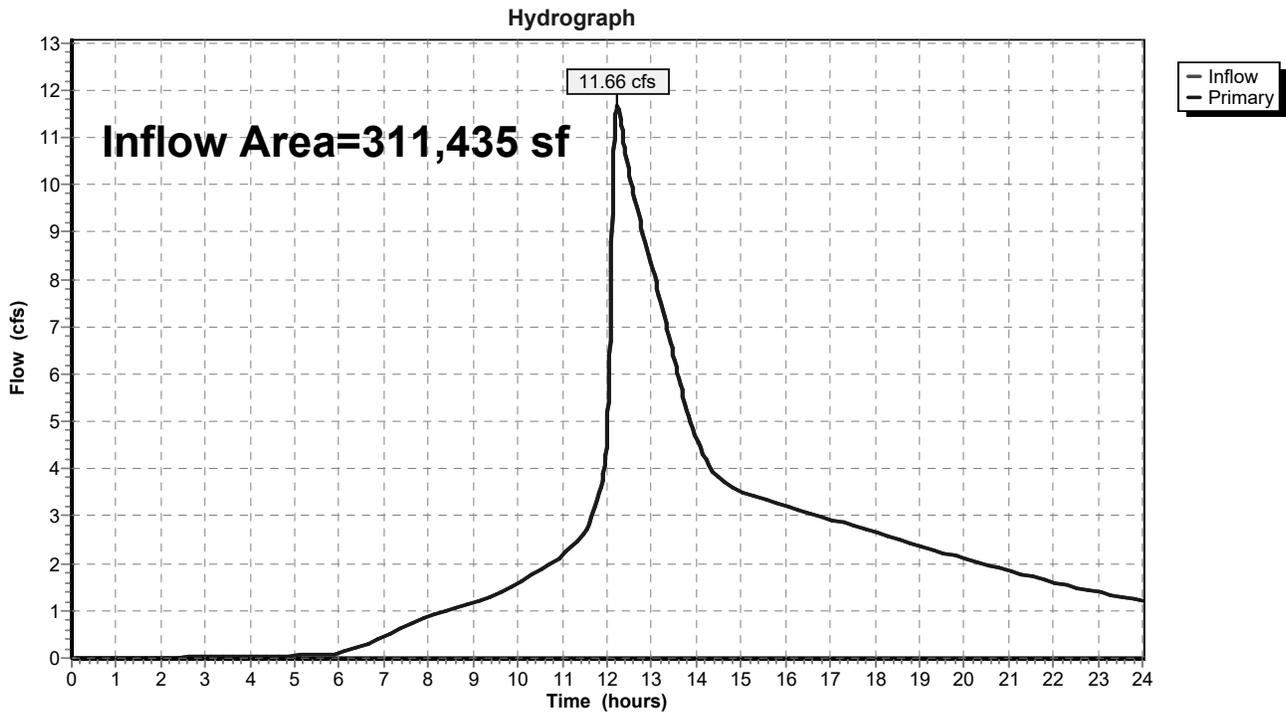


Summary for Link DP-2: Employee Lot Drainage

Inflow Area = 311,435 sf, 73.22% Impervious, Inflow Depth > 6.74" for 100-yr event
Inflow = 11.66 cfs @ 12.23 hrs, Volume= 174,987 cf
Primary = 11.66 cfs @ 12.23 hrs, Volume= 174,987 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-2: Employee Lot Drainage



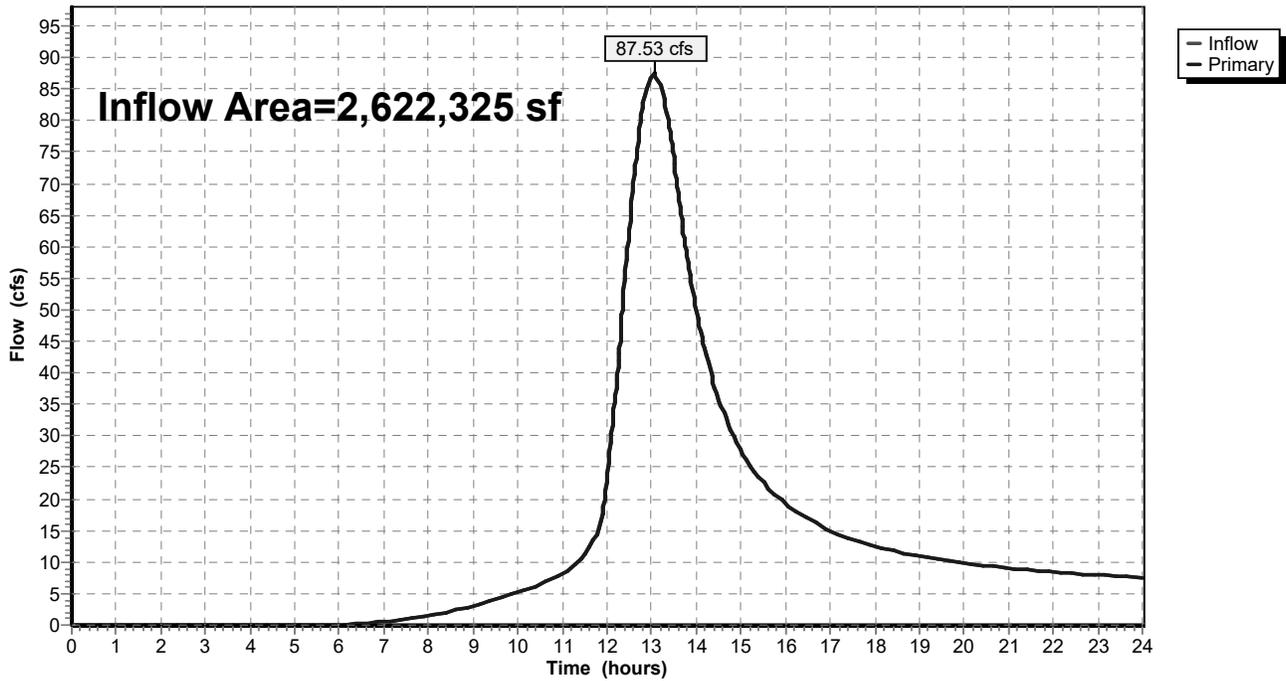
Summary for Link DP-3: Sawmill Brook Wetland System

Inflow Area = 2,622,325 sf, 20.31% Impervious, Inflow Depth > 5.03" for 100-yr event
Inflow = 87.53 cfs @ 13.09 hrs, Volume= 1,098,336 cf
Primary = 87.53 cfs @ 13.09 hrs, Volume= 1,098,336 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link DP-3: Sawmill Brook Wetland System

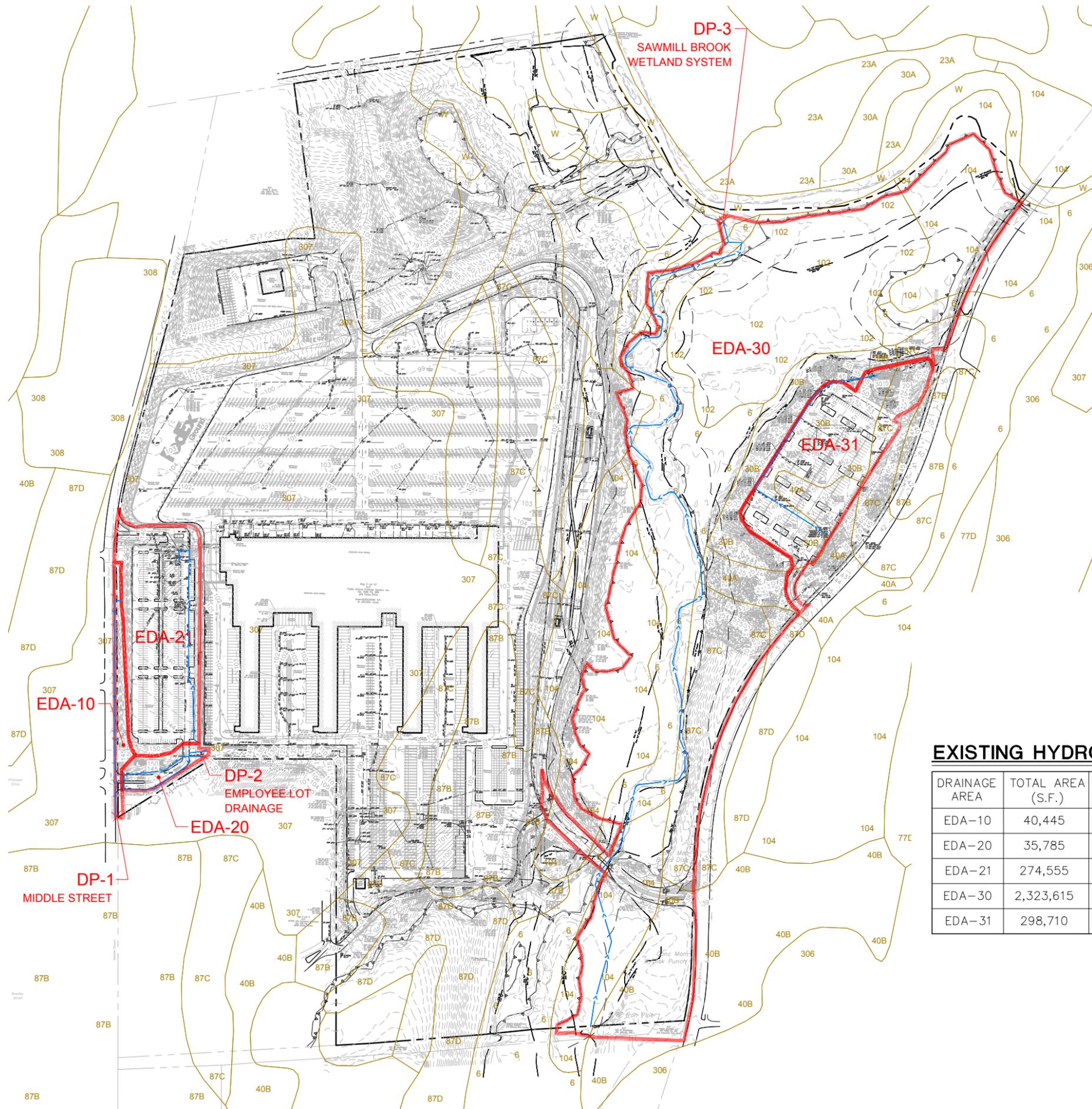
Hydrograph



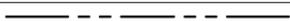
APPENDIX D

DRAINAGE MAPS

Existing Drainage Mapping (ED-1)
Proposed Drainage Mapping (PD-1)
Grading and Drainage Plans

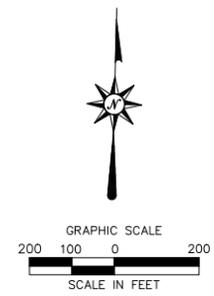


HYDROLOGY LEGEND

-  PROPERTY LINE
-  DRAINAGE AREA BOUNDARY
-  TIME OF CONCENTRATION FLOW PATH
-  SOIL TYPE BOUNDARY
-  SOIL TYPE DESIGNATION

EXISTING HYDROLOGY INFORMATION

DRAINAGE AREA	TOTAL AREA (S.F.)	IMPERVIOUS AREA (S.F.)	PERVIOUS AREA (S.F.)	PERCENT IMPERVIOUS (%)	CN	TIME OF CONCENTRATION (MIN.)
EDA-10	40,445	2,610	37,835	6.5%	85	9.9
EDA-20	35,785	13,850	21,935	38.7%	89	16.4
EDA-21	274,555	195,220	79,335	71.1%	94	8.2
EDA-30	2,323,615	51,085	2,272,530	2.2%	72	88.6
EDA-31	298,710	212,550	86,160	71.2%	90	5.0



REVISIONS

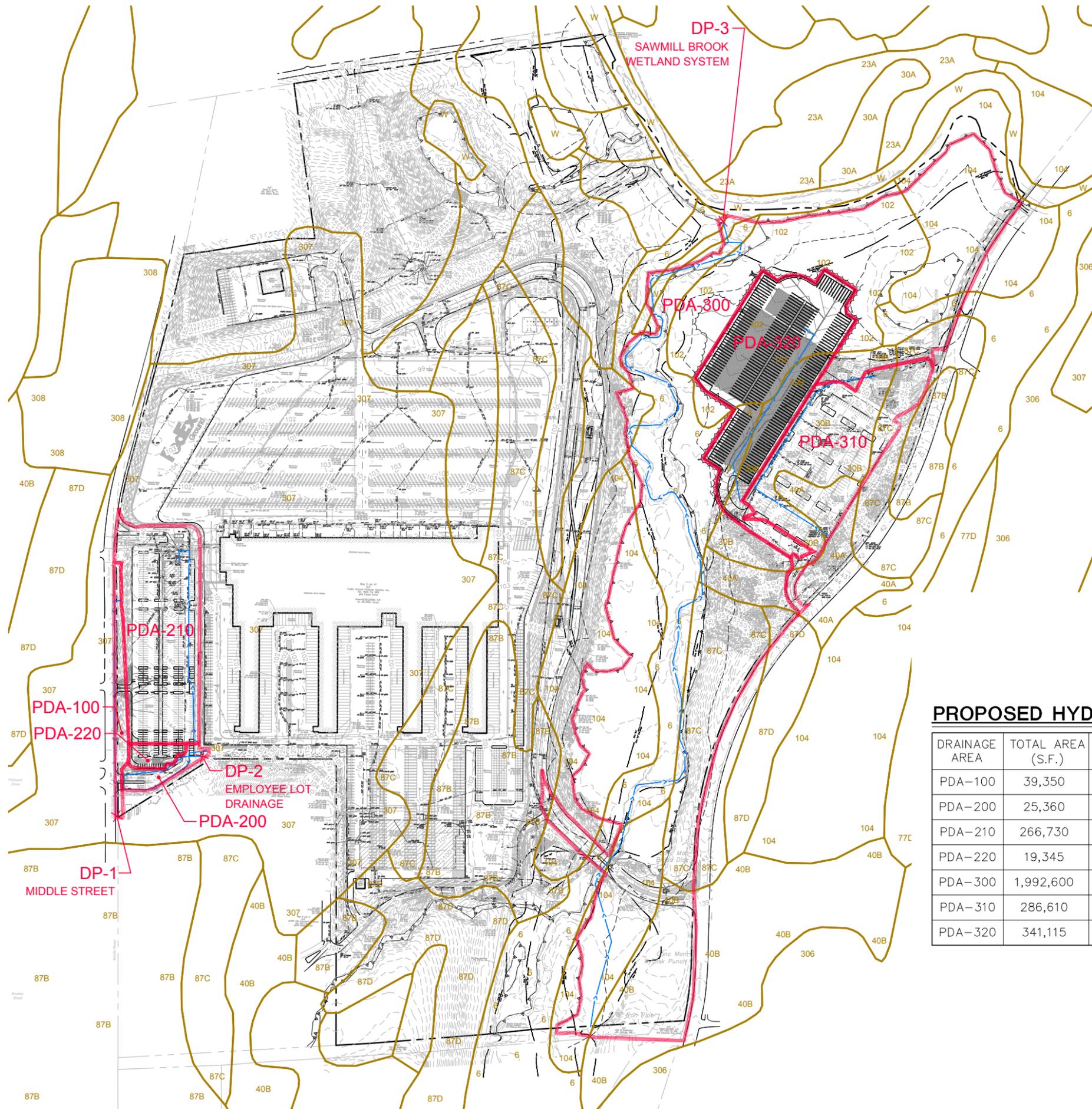
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Drawn: C.J.L.
Reviewed: J.A.B.
Scale: 1"=200'
Project No.: 2001507
Date: 02/19/2021
CAD File: ED200150701

Title: **EXISTING DRAINAGE MAPPING**

Sheet No. **ED-1**

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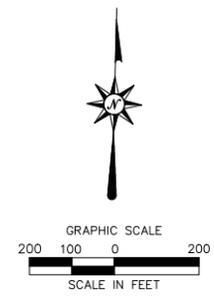


HYDROLOGY LEGEND

-  PROPERTY LINE
-  DRAINAGE AREA BOUNDARY
-  TIME OF CONCENTRATION FLOW PATH
-  SOIL TYPE BOUNDARY
-  SOIL TYPE DESIGNATION

PROPOSED HYDROLOGY INFORMATION

DRAINAGE AREA	TOTAL AREA (S.F.)	IMPERVIOUS AREA (S.F.)	PERVIOUS AREA (S.F.)	PERCENT IMPERVIOUS (%)	CN	TIME OF CONCENTRATION (MIN.)
PDA-100	39,350	3,870	35,480	9.8%	85	9.9
PDA-200	25,360	14,860	10,500	58.6%	92	16.4
PDA-210	266,730	197,040	69,690	73.9%	94	8.2
PDA-220	19,345	16,145	3,200	83.5%	96	5.0
PDA-300	1,992,600	51,085	1,941,515	2.6%	74	88.6
PDA-310	286,610	195,175	93,435	67.6%	88	5.0
PDA-320	341,115	291,670	49,445	85.5%	94	12.3



REVISIONS

No.	Date	Desc.

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Drawn: C.J.L.
Reviewed: J.A.B.
Scale: 1"=200'
Project No.: 2001507
Date: 02/19/2021
CAD File: PD200150701

Title: **PROPOSED DRAINAGE MAPPING**

Sheet No.:

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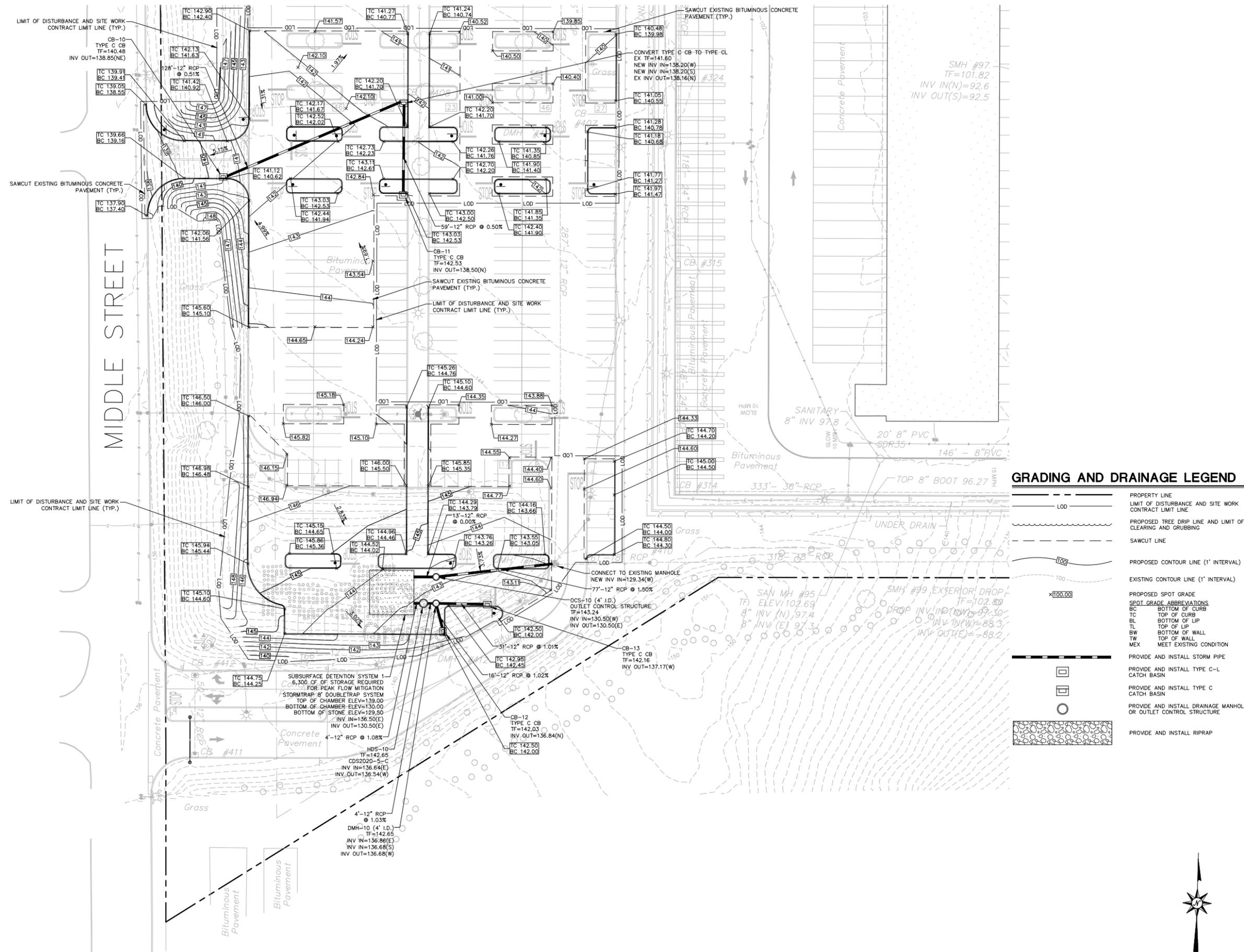
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Drawn	C.J.L.
Reviewed	
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Date	02/19/2021
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GRADING AND DRAINAGE PLAN

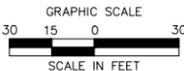
Sheet No.

GD-1



GRADING AND DRAINAGE LEGEND

- LOD
- PROPOSED TREE DRIP LINE AND LIMIT OF CLEARING AND GRUBBING
- SAWCUT LINE
- PROPOSED CONTOUR LINE (1' INTERVAL)
- EXISTING CONTOUR LINE (1' INTERVAL)
- PROPOSED SPOT GRADE
- SPOT GRADE ABBREVIATIONS:
BC BOTTOM OF CURB
TC TOP OF CURB
BL BOTTOM OF LIP
TL TOP OF LIP
BW BOTTOM OF WALL
TW TOP OF WALL
MEX MEET EXISTING CONDITION
- PROVIDE AND INSTALL STORM PIPE
- PROVIDE AND INSTALL TYPE C-L CATCH BASIN
- PROVIDE AND INSTALL TYPE C CATCH BASIN
- PROVIDE AND INSTALL DRAINAGE MANHOLE OR OUTLET CONTROL STRUCTURE
- PROVIDE AND INSTALL RIPRAP



NOT FOR CONSTRUCTION
FOR PERMITTING PURPOSES ONLY

REFER TO SHEET GN-1 FOR
SITE WORK GENERAL NOTES

PHILMACK
DRIVE

MIDDLE STREET

APPENDIX E

CALCULATIONS

Treatment Train Efficiency Worksheets
CT DEEP Water Quality Volume Calculation
CT DEEP Water Quality Flow Calculation
CT DEEP Groundwater Recharge Calculations
Riprap Apron Sizing Calculations
Preformed Scour Hole Sizing Calculations
Compensatory Storage Calculations

Best Management Practice (BMP) Treatment Train Efficiency Worksheet

Prepared for:
FedEx Hub Parking Expansion
49 FedEx Drive
Middletown, Connecticut

Prepared by:
BL Companies
100 Constitution Plaza, 10th Floor
Hartford Connecticut

Date prepared:
February 19, 2021

Overall Site Treatment Train Efficiency

Et=[(1-(E1))(1-E2)(1-E3)(1-E4)(1-E?)]*100	BMP	BMP Description	Type of Treatment	Efficiency Rate %
		E1	Impervious Surface Sweeping***	secondary (conventional)
	E2	Deep Sump and Hooded Catch Basin	Secondary	25
	E3	Hydrodynamic Separator**	Secondary	80

Overall Treatment Train Efficiency (Et)= 87 % Total Suspended Solids (TSS) Removal

* 80% require per CT DEP
 ** Manufacturers claim 80% TSS removal
 *** Schueler 1996 & EPA 1993
 **** University of New Hampshire

BMP	Type of Treatment	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
		Rate	Load	Removed	Load
Impervious Surface Sweeping***	secondary (conventional)	0.10	1.00	0.10	0.90
Deep Sump and Hooded Catch Basin	Secondary	0.25	0.90	0.23	0.68
Hydrodynamic Separator **	Secondary	0.8	0.68	0.54	0.14

Overall Treatment Train Efficiency (%) 87

TSS Removal Rates (adapted from Schueler, 1996, & EPA, 1993)

BMP List	Design Rate	Range of Average TSS Removal Rates	Brief Design Requirements
Extended Detention Pond	70%	60-80%	Sediment forebay
Wet Pond (a)	70%	60-80%	Sediment forebay
Constructed Wetland (b)	80%	65-80%	Designed to infiltrate or retain
Water Quality Swale	70%	60-80%	Designed to infiltrate or retain
Infiltration Trench	80%	75-80%	Pretreatment critical
Infiltration Basin	80%	75-80% (predicted)	Pretreatment critical
Dry Well	80%	80% (predicted)	Rooftop runoff (uncontaminated only)
Sand Filter (c)	80%	80%	Pretreatment
Organic Filter (d)	80%	80%+	Pretreatment
Water Quality Inlet	25%	15-35% w/ cleanout	Off-line only; 0.1" minimum Water Quality Volume (WQV) storage
Sediment Trap (Forebay)	25%	25% w/ cleanout	Storm flows for 2-year event must not cause erosion; 0.1" minimum WQV storage
Drainage Channel	25%	25%	Check dams; non-erosive for 2-yr.
Deep Sump and Hooded Catch Basin	25%	25% w/ cleanout	Deep sump general rule = 4 x pipe diameter or 4.0' for pipes 18" or less
Street Sweeping	10%	10%	Discretionary non-structural credit, must be part of approved plan

Water Quality Calculations

Determine Water Quality Volume

From CT 2004 Stormwater Quality Manual:

$$WQV = \frac{(I)(R)(A)}{12}$$

$$R = 0.05 + 0.009(I)$$

WQV = water quality volume (ac-ft)
 R = volumetric runoff coefficient
 I = percent impervious cover
 A = site area in acres

Area	ID	Total Area		Impervious Area		Impervious Cover	Volumetric Runoff Coefficient	Water Quality Volume (WQV)		Water Quality Volume Provided
		ac	ft ²	ac	ft ²	%	R	acre-feet	ft ³	ft ³
Employee Lot Expansion	PDA-220	0.444	19,345	0.371	16,145	83.56	0.802	0.030	1,307	2,076
Remote Lot Expansion	PDA-320	7.831	341,115	6.696	291,670	85.51	0.820	0.535	23,305	25,269

Notes: The provided Water Quality Volumes for the Underground Detention Systems were derived from the Stage Volume tables in HydroCAD as the volume below the first orifice elevation for each system.

Site-wide water quality volume was previously installed in underground detention systems during original hub construction. Additional water quality volume is to be installed for the increase in impervious cover as a result of this expansion project, therefore only those drainage areas containing newly installed impervious were analyzed for water quality requirements.

Water Quality Calculations

Determine Water Quality Flow

From CT 2004 Stormwater Quality Manual:

$$CN = \frac{1000}{\left[10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{\frac{1}{2}} \right]}$$

$$Q = \frac{[WQV(acre - feet) \times [12(inches / foot)]]}{DrainageArea(acres)}$$

$$WQF = (q_u)(A)(Q)$$

CN = Runoff Curve Number

P = design precipitation, inches, (1" for water quality storm)

Q = runoff depth (in watershed inches)

T_c = time of concentration

I_a = Initial abstraction, inches, from Table 4-1, Chapter 4, TR-55

q_u = unit peak discharge,

WQF = water quality flow (cfs)

Hydrodynamic Separator	Total Area			Imp Area		Imp Cover	R	WQV	Q	P	CN	T _c		I _a	I _a /P	q _u *	WQF
	ft ²	ac	mi ²	ft ²	ac	%	-	acre-feet	in	in	-	mins	hours	in	-	cfs/mi ² /in	cfs
HDS-10	19,345	0.444	0.0007	16,145	0.371	83.56	0.802	0.03	0.81	1.00	98	5.0	0.08	0.041	0.041	650	0.37
HDS-20	341,115	7.831	0.0122	291,670	6.696	85.51	0.820	0.535	0.82	1.00	98	12.3	0.21	0.041	0.041	550	5.52

Groundwater Recharge Volume Calculations

Groundwater Recharge Volume

From CT 2004 Stormwater Quality Manual:

$$GVR = \frac{(D)(A)(I)}{12}$$

GRV Groundwater Recharge Volume (ac-ft)
 D = Depth of Runoff to be Recharged (table 7-4)
 A = site area in acres
 I = impervious cover (decimal)

	A									I				GRV Required		Potential Recharge Pond Volumes Proposed	
	Total Site Area (AC)	Site Area by NRCS Hydrologic Soil Group				Impervious Cover by NRCS Hydrologic Soil Group				Site Imperviousness (Decimal) by NRCS Hydrologic Soil Group				(ac-ft)	(cu ft)	(ac-ft)	(cu ft)
		A	B	C	D	A	B	C	D	A	B	C	D				
Employee Lot	0.44	0.00	0.00	0.00	0.44	0.00	0.00	0.00	0.37	0.00	0.00	0.00	0.83	0.000	0	0.048	2,076
Remote Lot	7.83	0.00	6.84	0.00	0.99	0.00	5.90	0.00	0.80	0.00	0.86	0.00	0.81	0.123	5,351	0.580	25,269

Table from 2004 Connecticut Stormwater Quality Manual

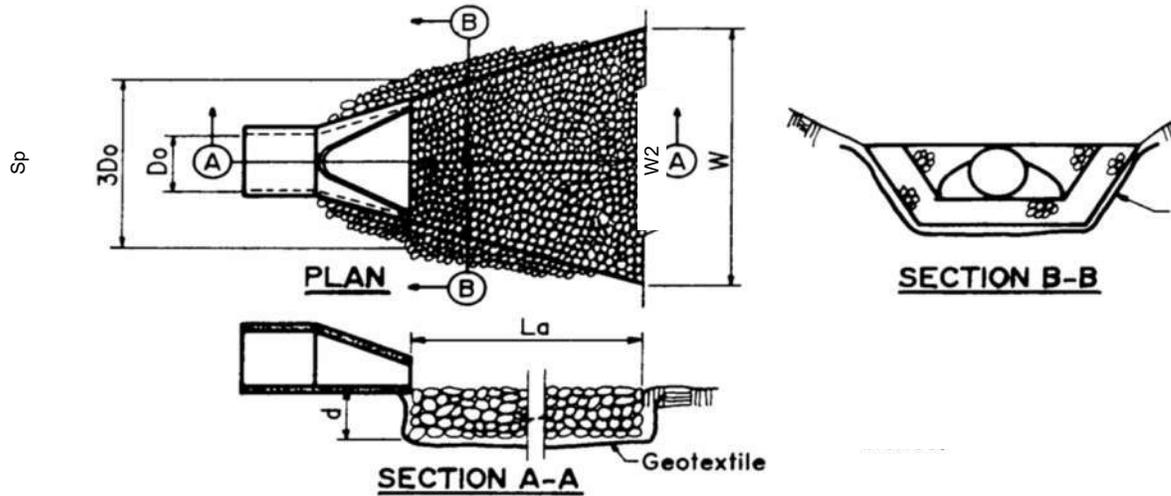
NRCS Hydrologic Soil Group	Average Annual Recharge	Groundwater Recharge Depth (D)
A	18 inches/year	0.4 inches
B	12 inches/year	0.25 inches
C	6 inches/year	0.10 inches
D	3 inches/year	0 inches (waived)

NRCS Hydrologic Soil	Groundwater Recharge
A	0.40
B	0.25
C	0.10
D	0.00

Source: MADEP, 1997.
 NRCS - Natural Resources Conservation Service.

Riprap Apron Outlet Protection

PROJECT NAME: FedEx Hub Parking Area Expansions
 LOCATION: Middletown, Connecticut
 PREPARED BY: C.J.L. DATE: 2/11/2021
 LAST REVISED BY: _____ DATE: _____



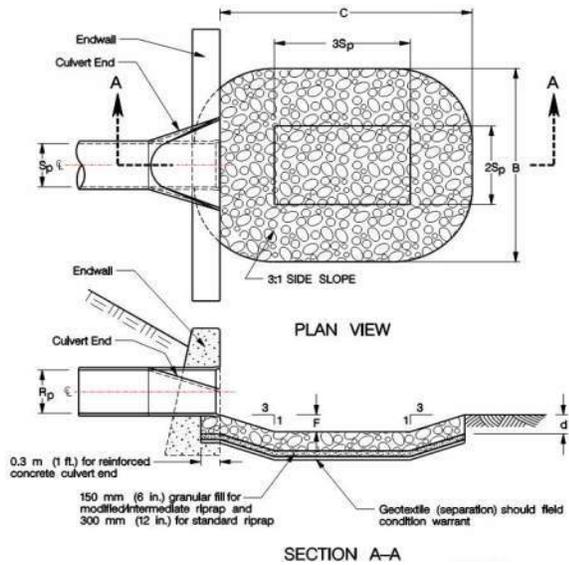
OUTLET NO.	Sp (Diameter, in.)	Q (CFS)	V (FPS)	Apron Type (letter only)	La (ft.)	W1 (ft.)	W2 (ft.)	Riprap Specification
O-20	36	13.16	2.52	B	15	9	15	Modified

Note: Riprap apron design calculations based off of standards provided by the Connecticut Department of Transportation Drainage Manual and the Connecticut Guidelines for Soil Erosion and Sediment Control.

Design: Type A: $La = [1.80(Q-5)/Sp^{1.5}] + 10$
 $W1 = 3Sp$
 $W2 = 3Sp + 0.7La$
 Type B: $La = [3.0(Q-5)/Sp^{1.5}] + 10$
 $W1 = 3Sp$
 $W2 = 3Sp + 0.4La$

Preformed Scour Hole Outlet Protection

PROJECT NAME: FedEx Hub Parking Area Expansions
 LOCATION: Middletown, Connecticut
 PREPARED BY: C.J.L. DATE: 2/11/2021
 LAST REVISED BY: _____ DATE: _____



LEGEND

$S_p = \begin{cases} \text{Max. inside pipe span (non-circular sections)} \\ \text{Inside pipe diameter (circular sections)} \end{cases}$
 $R_p = \begin{cases} \text{Max. inside pipe rise (non-circular sections)} \\ \text{Inside pipe diameter (circular sections)} \end{cases}$
 $d = \begin{cases} 300 \text{ mm (12 in.) Modified Riprap} \\ 450 \text{ mm (18 in.) Intermediate Riprap} \\ 900 \text{ mm (36 in.) Standard Riprap} \end{cases}$

Type 1 $F = 0.5 R_p$
 Type 2 $F = R_p$
 $C = 3S_p + 6F$
 $B = 2S_p + 6F$

Type of riprap required is as follows:

Modified	$d_{50} < 0.42 \text{ ft}$
Intermediate	$0.42 \text{ ft} < d_{50} < 0.67 \text{ ft}$
Standard	$0.67 \text{ ft} < d_{50} < 1.25 \text{ ft}$
Special	$1.25 \text{ ft} < d_{50}$

Where d_{50} is calculated as follows:

Type 1 $d_{50} = (0.0125R_p^2/TW)(Q/R_p^{2.5})^{1.333}$
 Type 2 $d_{50} = (0.0082R_p^2/TW)(Q/R_p^{2.5})^{1.333}$

Where TW= Tailwater depth in ft.

Shear Stress of riprap at outlet calculated as follows:

$T = \gamma d S$ 2002 CTDOT Drainage Manual Eq. 7.12

T= Maximum Shear Stress (lb/ft²)

γ = Unit Weight of Water (62.4 lb/ft³)

d= Maximum flow depth (assumed to be 3/4 pipe diam.) (ft)

S= Average bed slope (assumed to be pipe slope) (ft/ft)

OUTLET NO.	Sp (Diameter, in.)	Pipe Slope (ft/ft)	Q (CFS)	V (FPS)	Type (number only)	F (ft.)	C (ft.)	B (ft.)	TW (ft.)	d_{50} (ft.)	Riprap Specification	Permissible Shear Stress (lb/ft ²)	Calculated Shear Stress (lb/ft ²)
O-20	36	0.029	13.16	2.52	1	1.50	18	15	2.08	0.04	Standard	5.00	4.07

Note: Preformed scour hole design calculations based off of standards provided by the Connecticut Department of Transportation Drainage Manual and the Connecticut Guidelines for Soil Erosion and Sediment Control. Permissible shear stress for riprap ground cover duplicated from the 2000 CTDOT Drainage Manual Table 7-4. All outlet pipe flows (Q), velocities (V), and tailwater depths (TW) represent the conditions during the 100-year storm event.

ACAD Civil 3D Surface Method

Development Area Floodplain - Volume Beneath Incremental Elevations

Elevation	Existing Storage Cumulative (CY)	Existing Storage Incremental (CY)	Proposed Storage Cumulative (CY) Floodplain	Proposed Storage Incremental (CY) Floodplain	Proposed Storage Cumulative (CY) Underground Det.	Proposed Storage Incremental (CY) Underground Det.	Proposed Storage Cumulative (CY) Total	Proposed Storage Incremental (CY) Total	Net Storage Cumulative (CY)	Net Storage Incremental (CY)
14	79.74	79.74	63.03	63.03	2,919.63	2,919.63	2,982.66	2,982.66	+2,902.92	+2,902.92
15	1,623.45	1,543.71	829.42	766.39	8,758.89	5,839.26	9,588.31	6,605.65	+7,964.86	+5,061.94
16	5,258.91	3,635.46	2,165.61	1,336.19	14,598.11	5,839.22	16,763.72	7,175.41	+11,504.81	+3,539.95
17	11,068.65	5,809.74	3,707.30	1,541.69	20,437.37	5,839.26	24,144.67	7,380.95	+13,076.02	+1,571.21
18	17,893.63	6,824.98	5,351.32	1,644.02	26,276.59	5,839.22	31,627.91	7,483.24	+13,734.28	+658.26
19	27,089.56	9,195.93	7,189.64	1,838.32	32,115.85	5,839.26	39,305.49	7,677.58	+12,215.93	-1,518.35
20	35,928.39	8,838.83	9,145.46	1,955.82	37,955.07	5,839.22	47,100.53	7,795.04	+11,172.14	-1,043.79
21	47,975.64	12,047.25	11,295.18	2,149.72	43,794.33	5,839.26	55,089.51	7,988.98	+7,113.87	-4,058.27
22	59,194.50	11,218.86	13,497.98	2,202.80	49,633.59	5,839.26	63,131.57	8,042.06	+3,937.07	-3,176.80
23	70,827.56	11,633.06	15,723.52	2,225.54	55,472.81	5,839.22	71,196.33	8,064.76	+368.77	-3,568.30

APPENDIX F

STORMWATER SYSTEM
OPERATIONS AND MAINTENANCE PLAN

Appendix F:

**Stormwater System
Operations and Maintenance Plan**

For the Proposed:
Existing FedEx Ground Hub Parking Expansion

Located at:
49 FedEx Drive
Middletown, Connecticut

Prepared for Submission to:
City of Middletown, Connecticut

February 19, 2021

Prepared for:
FedEx Ground Package System, Inc.
1000 FedEx Drive
Moon Township, PA 15108

Prepared by:



BL Companies
100 Constitution Plaza, 10th Floor
Hartford, Connecticut 06103
Phone: (860) 249-2200
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BL Project Number: 2001507

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General Overview

The project parcel, located at 49 FedEx Drive in Middletown, CT, is approximately 205 acres in size and is currently developed with a ±500,000 square foot distribution hub building and associated impervious paved parking and drive aisle areas. The property is bordered by Industrial Park Road and Interstate 91 to the east, residential properties to the north and northwest, and commercial properties to the west and south. There are substantial wetlands located on the property associated with the Mattabesset River and Sawmill Brook, for which detail can be found within the Wetland Identification and Delineation Report. There are no known vernal pools on or adjacent to the proposed development. No direct impact to any wetland system is proposed, however work will occur within a portion of the 100' upland review area. Portions of the site are located in FEMA designated zones Floodway AE, Floodplain AE (100-year floodplain), and Zone X (500-year floodplain). Filling operations are proposed within the 100-year floodplain at the remote lot expansion for which compensatory storage is proposed by means of a hydraulically connected underground detention system beneath the remote lot parking expansion area. The site generally slopes from the east and west toward Sawmill Brook which flows from south to north toward the Mattabesset River. Extensive stormwater management facilities have been installed onsite as part of the original hub building and parking area construction consisting of a series of underground stormwater detention systems and above ground stormwater management basins connected by underground stormwater piping. Site-wide stormwater quality volume has previously been addressed through these installations. This proposed project will provide additional stormwater quality improvements for the addition of supplementary impervious area eventually draining to Sawmill Brook. Numerous Water Quality Best Management Practices (BMPs) have been incorporated into the project design and include various elements including deep sump hooded catch basins, hydrodynamic separators, and underground detention systems. Stormwater quality is being addressed by a formalized street sweeping program, deep sump and hooded outlet catch basins, and hydrodynamic separation units. These features will provide the minimum required 80% TSS removal as required in the CT Stormwater Quality Manual. The proposed stormwater management improvements will also serve to mitigate the increase in peak runoff flow through underground detention. The proposed system serves to provide water quality improvements, to attenuate peak flows, to maintain the stormwater discharge to the surrounding natural resources and to recharge to the groundwater the increase in the stormwater volume as a result of the impervious cover for the 2, 10, 25 and 100-year storm events.

The following Operations and Maintenance Plan was prepared specifically for this proposed development in the City of Middletown, Connecticut. The Plan was developed to satisfy the requirements of the Connecticut Department of Energy and Environmental Protection's 2002 Connecticut Guidelines for Soil Erosion and Sediment Control.

Purpose & Goals

The purpose of this Manual is to ensure that the stormwater management components are operated in accordance with all approvals and permits. The primary goal is to inform all the property managers about how the system operates and what maintenance items are necessary to protect downstream wetlands and watercourses. The secondary goal is to provide a practical, efficient means of maintenance planning and record keeping to verify permit compliance.

Responsible Parties

The Property Owner will be responsible for implementing the Plan on the property.

Maintenance inspections shall be performed by a qualified professional.

Some utilities located on the site will be owned and maintained by various utility companies in accordance with their standards. The property owner may maintain the service connections.

List of Permits & Special Conditions

The project will receive several permits, which may contain special conditions that require compliance by the property owner and maintenance contractors. This permit may include the following:

- City of Middletown – Wetlands Permit, Site Plan Permit
- Connecticut Department of Transportation – OSTA Permit
- Connecticut Department of Energy and Environmental Protection – Stormwater General Permit

Maintenance Logs and Checklists

The property owner will keep a record of all maintenance procedures performed, date of inspection/ cleanings, etc. Copies of inspection reports and maintenance records shall be kept on-site.

Forms

The following forms will be developed for annual maintenance. Copies of the forms will be kept on-site as part of the Storm Water Management Plan.

- Annual Checklist
- Quarterly Checklist
- Monthly Checklist

Employee Training

The property owner will have an employee-training program, with annual up-dates, to ensure that the qualified employees charged with maintaining the buildings and grounds do so in accordance with the approved permit conditions. All employees that have maintenance duties will be adequately informed of their responsibilities.

Spill Control

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and clean-up:

- Manufacturer's recommended methods for spill clean-up will be clearly posted and site personnel will be made aware of the procedures and the location of the information and clean-up supplies.
- Materials and equipment necessary for spill clean-up will be kept in the material storage area on-site. Equipment and materials will include but not be limited to: absorbent booms or mats, brooms, dust pans, mops, rags, gloves, goggles, sand, and plastic and metal trash containers specifically for this purpose.
- All spills will be cleaned immediately after discovery.
- The spill area will be kept well-ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with hazardous substance.
- Spills of toxic or hazardous material, regardless of size, will be reported to the appropriate State or local government agency.
- If a spill occurs, this plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean the spill if there is another one. A description of the spill, the cause, and the remediation measures will also be included.

A spill report shall be prepared by the property owner following each occurrence. The spill report shall present a description of the release, including quantity and type of material, date of spill, circumstances leading to the release, location of spill, response actions and personnel, documentation of notifications and corrective measures implemented to prevent reoccurrence.

The property owner shall identify an appropriately qualified and trained site employee involved with day-to-day site operations to be the spill prevention and clean-up coordinator. The name(s) of responsible spill personnel shall be posted on-site. Each employee shall be instructed that all spills are to be reported to the spill prevention and clean-up coordinator.

Storm Water Management

System Components

The storm water management system has several components that are shown on the Grading and Drainage Plans (GD-1 and GD-2), that perform various functions in treating storm water runoff:

Catch Basins and Manholes

The property owner is responsible for cleaning the catch basins and manholes on the property. A Connecticut Licensed hauler shall clean the sumps and dispose of removed sand legally. The road sand may be reused for winter sanding but may not be stored on-site. As part of the hauling contract, the hauler shall notify the property owner in writing where the material is being disposed.

Each catch basin shall be inspected every four months, with one inspection occurring during the month of April. Any debris occurring within one foot from the bottom of each sump shall be removed by Vacuum "Vactor" type of maintenance equipment.

During the inspection of each of the catch basin sumps, the hoods (where provided) on each of the outlet pipes shall also be observed for trash accumulation as well as overall condition. In the event that a hood is damaged or off the hanger, it shall be reset or repaired.

Hydrodynamic Separators (or approved equal)

The hydrodynamic separator manholes will be cleaned periodically during construction, and at the end of construction once the landscaped areas are fully stabilized.

For the first year of operation following construction, inspect each manhole once each month for the months of January, February, March and April, and once every four months thereafter. A graduated measuring device (stadia rod) shall be inserted into each grit chamber and measurements of any accumulations shall be recorded. Any debris, which has accumulated to within one foot of the water surface inside the grit chamber portion of each tank, shall be removed by vacuum "Vactor" type of equipment.

After the first year of operation, each manhole shall be inspected at a minimum, three times yearly with one inspection occurring in the month of April in the same manner as described above for the first season of operation. Any accumulations found to be occurring within one foot of the water surface shall be removed from the manhole and properly disposed off-site. Also, any floating material discovered during inspections shall be removed from the tank.

A detailed maintenance logbook shall be kept for each manhole. Information is to include, but not be limited to, the date of inspection, record of grit depth, condition of baffles, observation of any floatable, and date of cleaning performed.

Subsurface Stormwater Management Systems (Underground Detention Systems)

The underground detention systems shall be inspected every six months in the months of April and October. Each of the inspection ports provided shall be opened and visually checked from the surface. Observation of grit inside of the detention system shall be noted and any deposits found to be 2 inches or more, as measured from the invert of pipe, shall be cleaned and removed. The underground detention system qualifies as a Confined Space under OSHA regulations, and any maintenance involving entry into the pipes should comply with OSHA Confined Space Entry Regulations.

Rip Rap Aprons and Preformed Scour Holes

The riprap aprons and preformed scour holes are excavated depressions which are lined with rock riprap to prevent scouring. The depressions permit the dissipation of excessive energy and turbulence associated with the flow of stormwater being discharged from a conduit system. Management actions include the following measures:

1. Inspect the surface of the scour hole quarterly for the first year and adjust as necessary (but at least annually) to ensure surface is free of debris and the discharge is flowing via sheet flow and not concentrated. Remove accumulated sediment when sediment depth within the scour hole reaches 50% of the total depth. Frequency of cleaning depends on loading rate.
2. Inspect the discharge lip area for low points and down gradient flow areas for active scour or soil erosion. Repair scour and rills with compacted sandy till, and riprap as needed to prevent scouring.

Site Maintenance

Parking Lots

Parking lots and sidewalks shall be swept as necessary by the property owner, or at least once per year, to clean sediment, trash, and other debris. The property owner will sweep parking lots on the property in the spring to remove winter accumulations of road sand.

Landscaping

The management company retained by the property owner will maintain landscaped areas. Normally the landscaping maintenance will consist of pruning, mulching, planting, mowing lawns, raking leaves, etc. Use of fertilizers and pesticides will be controlled and limited to minimal amounts necessary for healthy landscape maintenance.

The lawn areas, once established, will be maintained at a typical height of 3 ½". This will allow the grass to be maintained with minimal impact from weeds and/or pests. The low-maintenance areas will be maintained as a meadow or allowed to revert back to natural conditions. Topsoil, brush, leaves, clippings, woodchips, mulch, equipment, and other material shall be stored off site.

Outdoor Storage

There will be no outdoor storage of hazardous chemicals, de-icing agents, fertilizer, pesticides, or herbicides anywhere around the buildings.

Deicing and Snow Removal & Storage

The use of clean sand may be used to aid traction in conjunction with salt and/or chemicals for deicing, snow melting and other related winter weather management. Snow shall be shoveled

and plowed from sidewalk and parking areas as soon as practical during and after winter storms. Sand accumulation shall be removed from the site at the end of the winter season or appropriate time when seasonal snow has melted. Alternative deicing methods must be submitted prior to use onsite for review to the City of Middletown for approval.

MAINTENANCE SCHEDULE

During the First Year of Operation:		
Task:	Completion Date:	Manager's Initials:
JANUARY:		
Employee Training Program with Spill Program		
*Catch Basin and HDS Inspection		
*Subsurface Stormwater System Inspection		
FEBRUARY:		
*Catch Basin and HDS Inspection		
MARCH:		
*Catch Basin and HDS Inspection		
APRIL:		
*Catch Basin and HDS Inspection		
*Subsurface Stormwater System Inspection		
Sweeping of Paved Surfaces		
Shrub Fertilization		
Lawn Liming (if necessary)		
JUNE:		
*Catch Basin and HDS Inspection		
Sweeping of Paved Surfaces		
SEPTEMBER:		
*Subsurface Stormwater System Inspection		
Sweeping of Paved Surfaces		
Tree and Lawn Fertilization		
DECEMBER:		
*Catch Basin and HDS Inspection		
*Subsurface Stormwater System Inspection		
Sweeping of Paved Surfaces		

*NOTE: Use appropriate worksheet found in this plan to conduct the inspection.

After the First Year of Operation:

FOR YEAR _____

Task:		Completion Date:	Manager's Initials:
JANUARY:			
Employee Training Program with Spill Program			
APRIL:			
*Catch Basin and HDS Inspection			
*Subsurface Stormwater System Inspection			
Sweeping of Paved Surfaces			
Shrub Fertilization			
Lawn Liming (if necessary)			
JUNE:			
*Catch Basin and HDS Inspection			
Sweeping of Paved Surfaces			
SEPTEMBER:			
*Subsurface Stormwater System and Inspection			
Sweeping of Paved Surfaces			
Tree and Lawn Fertilization			
DECEMBER:			
*Catch Basin and HDS Inspection			
Sweeping of Paved Surfaces			

*NOTE: Use appropriate worksheet found in this plan to conduct the inspection.

CATCH BASIN / HDS INSPECTION LOG

Name of Inspector:

Date:

Catch Basin or HDS ID	Condition (circle one)		Debris above 1' within sump? (If yes then catch basin is to be cleaned)		Date of Catch Basin/Cleaning (if debris is greater than 1')		Condition of Hood (if applicable, remove trash/debris if necessary)	Comments:
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							
	Fair	Poor	Yes	No	Yes	No		
	Excellent							

On-site Procedures for Inspection and Maintenance of Catch Basin Inserts

- Secure traffic and pedestrian traffic with cones, barrels, etc.
- Clean surface area around each catch basin.
- Remove grates and set aside
- Clean grates, remove litter and debris that may be trapped within the grate
- Visually inspect condition of outlet hood and remove trash and debris from hood if necessary.
- Remove by vacator hose the debris that has been trapped in the trough area. Dispose of in accordance with local, state and federal regulatory agency requirements. Most debris that is captured in the trough or sump area will fall into the non-hazardous waste category.
- Visually inspect and check the condition of the trough area.
- Replace grate and lockdown as needed.
- Un-secure traffic control area.
- Complete service report and submit to facility owner.

