STORMWATER MANAGEMENT DESIGN REPORT

Bokum Road Business Park

Bokum Road
Essex, Connecticut

July 1, 2021
Revised: 11-29-21

Prepared for:

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1.0 Introduction

This Stormwater Management Design Report has been prepared on behalf of the George C. Field Company, Inc. who has submitted an application to the Town of Essex Inland Wetlands and Watercourses Commission seeking approval to develop an approximate 8.9 acre land parcel located in the south central portion of the Town of Essex (Figure 1). The parcel is an interior lot located on the north side of Bokum Road approximately 0.35 miles southeast of its intersection with Spencer Plains Road (Conn. Route 153).

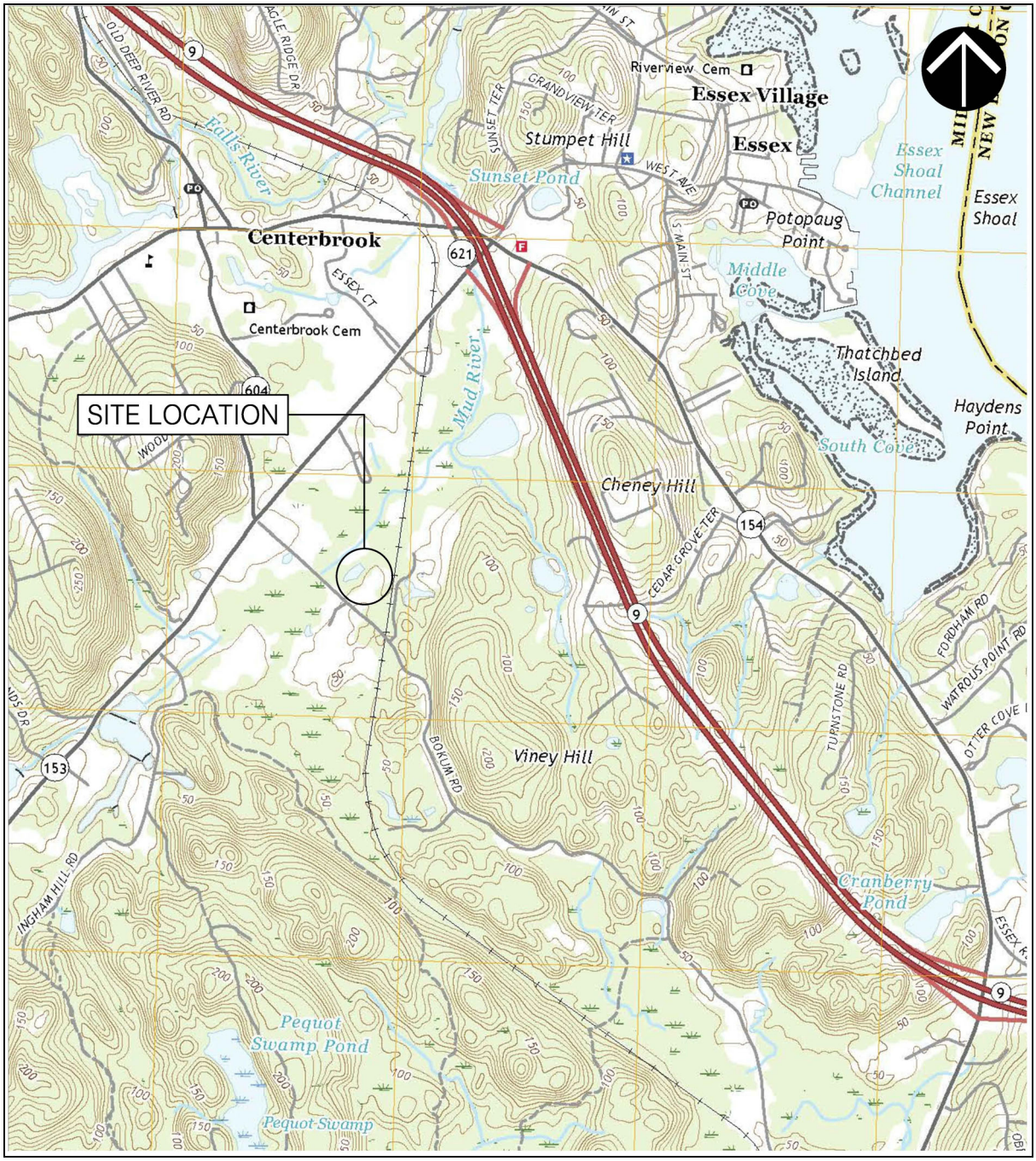

Figure 1. Project Location
U.S.G.S. Essex Connecticut Quadrangle

The planned development proposal consists of the construction of a commercial business park. The improvements include a 28,000 square foot building and a 24,800 square foot building and associated access road, driveways, parking area, retaining wall, utility services, on-site wastewater systems, stormwater management facilities, guiderail, signage, and landscaping.

The project site is located within a Limited Industrial (LI) zoning district and is undeveloped. The existing land uses adjacent to and in the vicinity of the site are residential and commercial and the Connecticut Department of Energy and Environmental Protection Valley Railroad right-of-way adjoins the parcels easterly boundary.

The Connecticut Water Company public water system, and public communication, electric, and gas utilities are located within the Bokum Road right-of-way along the parcels frontage.

The site is located within the Falls River subregional drainage basin (HUC 4019). The Mud River flows northerly to the west of the site and along the site's northern boundary and joins the Falls River approximately 1.1 miles to the north of the site. Inland wetlands associated with the Mud River are located in the southwestern and northern portions of the site and a portion of an excavated pond is located in the southwest corner of the parcel.

The site is located partially within a Special Flood Hazard Area (un-numbered A) Zone and Flood Zone X (Figure 2). The planned development portion of the site is partially located within the special flood hazard area zone.

The site is not located within a public water supply watershed area, an aquifer protection area, or an identified Connecticut Department of Energy and Environmental Protection Natural Diversity Database Area.

The Natural Resources Conservation Service Soil Survey of the State of Connecticut indicates that the upland surficial soil types on and in the near vicinity of the planned development portion of the site are classified as Windsor loamy sands, 3-8% slopes (36B). Test pits excavated on the site generally confirmed these soil type descriptions.

The total area of land disturbance associated with the complete project construction activities is approximately 3.75 acres.

2.0 Inland Wetland and Floodplain Impacts

Two areas of temporary inland wetland disturbance associated with the construction of a retaining wall are included in the projects site construction activities. The development proposal includes the restoration of both of these areas.

Two areas of permanent wetland impact associated with the installation of outlet protection at the stormwater wetland discharge locations are also included in the projects site construction activities.

The total area of temporary and permanent wetland impact is approximately 640 square feet or 0.02 acres and the total area of land disturbance within the 100-foot inland wetland upland review area is approximately 2.7 acres.

As noted in Section 1.0 above, a portion of the planned development is located within the limits of an un-numbered A zone associated with the Mud River as depicted on the effective Flood Insurance Rate Map for the south-central portion of the Town. The limits of the Special Flood Hazard Area zone shown are likely incorrect in this location as they do not follow the general ground surface topography and in particular, in the area of the site development the limits cross ground surface elevations of 23 feet to 33 feet.

A total of approximately 0.45 acres within the depicted Special Flood Hazard Area zone limits are proposed to be impacted by both fill placement associated with the construction of a portion of a building and driveway and parking area, and excavation associated with the construction of a stormwater wetland.

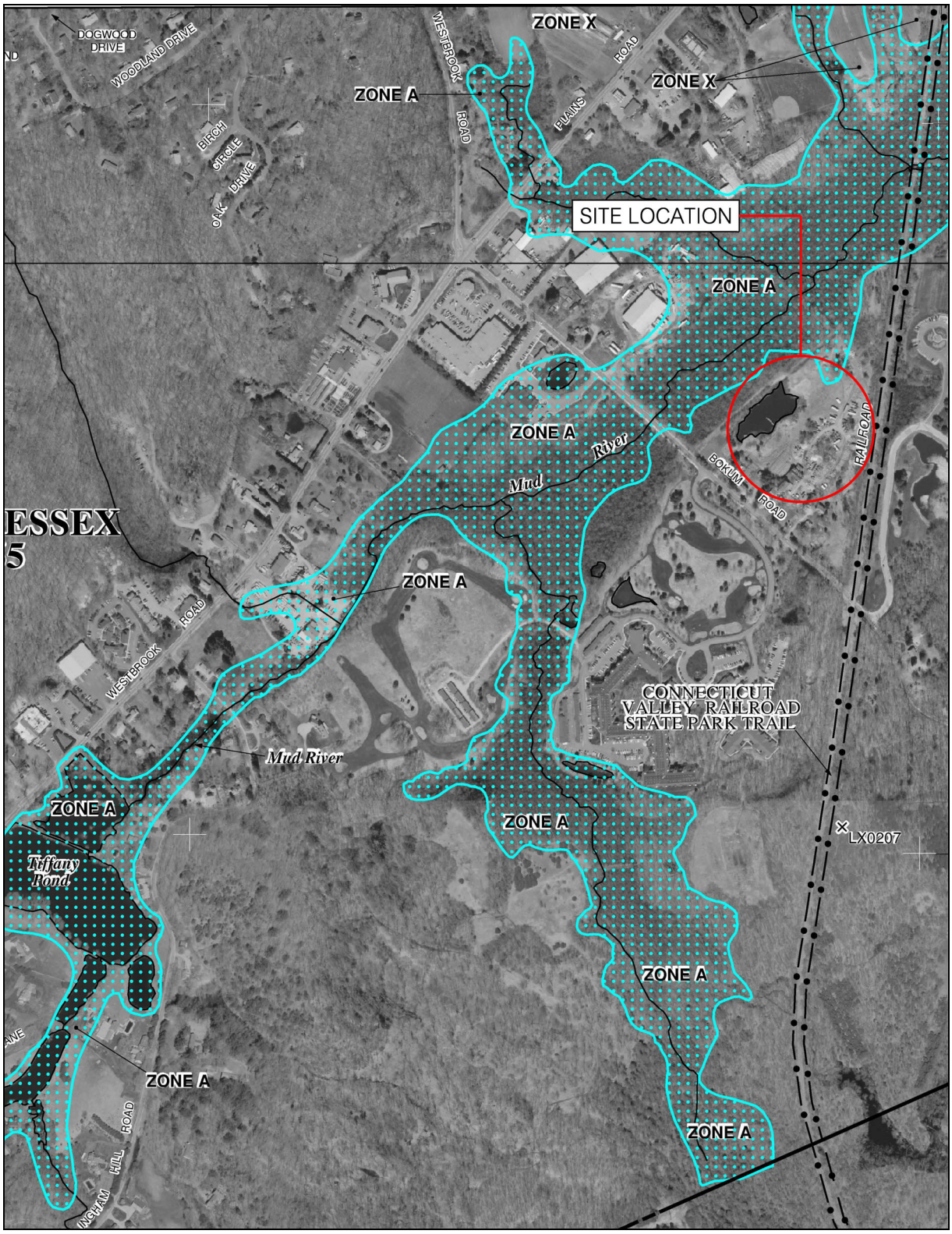

Figure 2. Flood Insurance Rate Map
Map No. 00907C0333G

For regulatory compliance purposes, it can be seen by inspection of the existing conditions mapping and the grading for the development proposal that the additional floodplain storage volume created associated with the excavation required to construct the stormwater wetland both within and outside of the floodplain limits exceeds the loss of floodplain storage volume due to fill placement.

3.0 Hydrologic Model Development

The site stormwater management system for the planned developed site has been designed in accordance with standard hydrologic and hydraulic engineering practices.

HydroCAD Version 10.10 hydrologic modeling software (HydroCAD Software Solutions, LLC) was used to create the hydrologic models and estimates of peak rates of discharge and volumes of stormwater runoff. The U.S. Department of Agriculture Soil Conservation Service (now Natural Resources Conservation Service) Technical Release 20 Computer Program for Project Formulation Hydrology methodology was used within the HydroCAD software program. TR-20 is a single event, lumped parameter surface water hydrologic model that simulates the precipitation-runoff relationships of a drainage area. The model uses the Soil Conservation Service Curve Number and Unit-Hydrograph methods to represent infiltration losses and to transform excess precipitation into runoff, and the Modified Puls (Storage-Indication) method to perform reservoir routing.

NOAA Precipitation Frequency Atlas 14 for the Northeastern States 24-hour rainfall depths in the project site vicinity shown in Table 1 were accessed from the NOAA precipitation frequency data server and entered into the models.

Table 1. 24-Hour Rainfall Depths for the Project Site Vicinity

Recurrence Interval Year	Rainfall Depth Inches
2	3.44
5	4.41
10	5.21
25	6.31
50	7.13
100	8.01

Partial duration series precipitation depth frequency data was also accessed from the NOAA precipitation frequency data server and entered into the models to create a synthetic rainfall distribution specific to the project site vicinity.

Catchment area boundaries were delineated using the existing conditions mapping for the site and the development site plans.

Catchment area composite runoff curve numbers and times of concentration were assumed to be 98 and 0.10 hours respectively using values presented in the National Engineering Handbook, Section 4 - Hydrology (1985).

4.0 Stormwater Management System

The site stormwater management system consists of a typical catch basin inlet structure and storm sewer collection and conveyance system that will direct stormwater runoff from the developed sites access road, driveways, parking area, and building roofs to two constructed stormwater wetlands.

The stormwater collection and conveyance system has been designed in accordance with the procedures outlined in the Connecticut Department of Transportation Drainage Manual. Drainage structure inlets and storm sewers have been designed for peak discharges generated from a 25-year design frequency rainfall event computed using the Rational Method. Partial duration series precipitation intensity frequency data was also accessed from the NOAA precipitation frequency data server and used in the Rational Method

computations and runoff coefficients and times of concentration and were assumed to be 0.90 and 5 minutes.

Stormwater runoff from the access road, driveways, and parking area that enters the collection and conveyance system through the catch basin inlets will be directed to CDS® Model 2015-4-C hydrodynamic separator stormwater treatment structures prior to being discharged to the constructed stormwater wetlands.

The hydrodynamic separator structures were chosen to 1) be listed by the Connecticut Department of Transportation as an approved hydrodynamic separator, 2) have the ability to treat the computed water quality flow for the water quality volume for their contributing catchment areas, and 3) provide the required sediment storage volume for the contributing areas.

The outlet protection measures at the stormwater discharge locations into and from both of the stormwater wetlands were designed for the maximum 100-year design frequency inflow peak discharge.

The water surface elevations and rates of discharge for each of the stormwater wetlands will be controlled by a V-notch weir principal outlet within a precast concrete outlet control structure in each wetland. The elevation of the weir crests have been set such that the storage volume above the design normal water surface elevation and below the weir crests meets or exceeds the water quality volume and annual groundwater recharge volume requirements of the Connecticut Department of Energy and Environmental Protection Stormwater Quality Manual for the developed site.

During less frequent, greater depth rainfall events, when the ponded water surface within the wetlands exceeds the elevation of the principal outlet crests, stormwater will be discharged directly to the adjacent natural wetlands. The stormwater wetlands have been designed to provide a level of attenuation of the peak rates of these discharges as shown in the summaries below.

Table 2. Stormwater Wetland 1 - Peak Discharges and Reservoir Routings

	Recurrence Interval					
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Peak Discharge (cfs)	2.9	3.7	4.4	5.3	6.0	6.7
Routed Outflow (cfs)	0.8	1.1	1.5	1.9	2.3	2.7
Reduction (%)	72	70	66	64	62	60
Peak Stage (ft)	31.5	31.7	31.8	32.0	32.1	32.2

Table 3. Stormwater Wetland 2 - Peak Discharges and Reservoir Routings

	Recurrence Interval					
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Peak Discharge (cfs)	8.3	10.6	12.5	15.2	17.1	19.2
Routed Outflow (cfs)	2.6	3.6	4.4	5.3	5.9	6.6
Reduction (%)	69	66	65	65	65	66
Peak Stage (ft)	23.3	23.5	23.6	23.8	23.9	24.1

An emergency overflow inlet grate at the top of each outlet control structure has been provided. The inlet grates have been chosen to have the capacity to pass the 100-year peak discharge with the principal outlets not operating (completely clogged) with a resultant computed water surface a minimum of one-foot below the top of berm elevation of each of the wetlands. Emergency spillway routings for this condition for each of the wetlands were performed and are also summarized below in Table 4.

Emergency spillways and spillway channels have also been provided for each of the stormwater wetlands. The spillway crest elevations are 0.33 and 0.25 feet below the stormwater wetland 1 and stormwater wetland 2 emergency overflow inlet grate elevations respectively. Note that the routings summarized below conservatively do not consider the outflow from these emergency spillways.

Table 4. Outlet Control Structure Emergency Spillway Routings

	Stormwater Wetland 1	Stormwater Wetland 2
100-yr Peak Discharge (cfs)	6.7	19.2
100-yr Routed Outflow (cfs)	3.6	14.4
100-yr Peak Stage (ft)	33.0	24.5

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Appendix A
Design Computations

Summer Hill

Civil Engineers & Land Surveyors, P.C.

BY: MJO DATE: 7-1-21 SUBJECT: Bokum Road Business Park Essex, Connecticut SHEET No.: 1 OF 4

CHECKED: LJM DATE: 7-1-21 Stormwater Management System Design Computations PROJECT No.: 20-50

1. Water quality volume computed using the CT Stormwater Quality Manual equation

   WQV = 1.0 in(R)(A)/12, where:

   WQV, Water Quality Volume (Ac-ft)
   R, Volumetric Runoff Coefficient = 0.05 + 0.009(I)
   I, Percent impervious cover
   A, Site area (Ac.)

   I = 27.9%
   R = 0.05 + 0.009(27.9) = 0.30
   A = 388,259 ft^2 = 8.91 Ac.

   WQV = 1 in(R)(A)/12 = (1 in)(0.30)(8.91)/12 = 0.2228 Ac-ft = 9,703 ft^3

2. Groundwater recharge volume computed using the CT Stormwater Quality Manual equation

   GRV = D(A)(I)/12, where:

   GRV, Groundwater Recharge Volume (Ac-ft)
   D, Depth of runoff to be recharged (in)
   A, Site area (Ac.)
   I, Net increase in percent of impervious cover

   For Hydrologic Soil Group A, D = 0.40 in

   A = 388,259 ft^2 = 8.91 Ac.

   I (Existing) = 0 ft^2

   I (Proposed) = 108,425 ft^2 / 388,259 ft^2 = 0.279

   Net increase = 0.279 – 0 = 0.279

   GRV = (0.40 in x 8.91 Ac. x 0.279)/12 = 0.0829 Ac-ft = 3,609 ft^3

3. Constructed stormwater wetland storage volumes

Stage-Storage
Stormwater Wetland 1

Elevation ft	Area ft^2	Average Area ft^2	Incremental Volume ft^3	Cumulative Volume ft^3	Cumulative Volume Ac-ft
30.00	3,060	3,060	0	0	0.0000
30.50	3,926	3,493	1,747	1,747	0.0401
31.00	3,537	3,732	1,866	3,612	0.0829
31.50	3,785	3,661	1,831	5,443	0.1249
32.00	4,038	3,912	1,956	7,399	0.1698
32.50	4,299	4,169	2,084	9,483	0.2177
33.00	4,566	4,433	2,216	11,699	0.2686
33.50	4,839	4,703	2,351	14,050	0.3225
34.00	5,118	4,979	2,489	16,540	0.3797

Note: Storage volumes computed from design normal water surface elevation (one foot above wetland bottom elevation

Stage-Storage
Stormwater Wetland 2

Elevation ft	Area ft^2	Average Area ft^2	Incremental Volume ft^3	Cumulative Volume ft^3	Cumulative Volume Ac-ft
22.00	8,590	8,590	0	0	0.0000
22.50	9,007	8,799	4,399	4,399	0.1010
23.00	9,430	9,219	4,609	9,009	0.2068
23.50	9,860	9,645	4,823	13,831	0.3175
24.00	10,295	10,078	5,039	18,870	0.4332
24.50	10,738	10,517	5,258	24,128	0.5539
25.00	11,185	10,962	5,481	29,609	0.6797

Note: Storage volumes computed from design normal water surface elevation (one foot above wetland bottom elevation).

4. Outlet control structure inlet grate capacity computations

Grate inlet capacities using ConnDOT Drainage Manual equations:

Capacity of grate inlet operating as a weir (0 ft $\leq$ d $\leq$ 0.4 ft):

$Q = CPd^{1.5}/CFS$, where:

Q, Discharge (cfs)
C, Weir Discharge Coefficient = 3.0
P, Grate perimeter (ft)
d, Depth over grate (ft)
CFS, Factor of safety for clogging = 1.0 - 2.0

Capacity of grate inlet operating as an orifice (d $\geq$ 1.4 ft):

$Q = CA(2gd)^{0.5}/CFS$, where:

Q, Discharge (cfs)
C, Orifice Discharge Coefficient = 0.67
A, Grate clear opening area (ft^2)
g, Gravitational constant = 32.2 (ft/s^2)
d, Depth over grate (ft)
CFS, Factor of safety for clogging = 1.0 – 2.0

Check grate inlet capacities for a water surface depth over the grate of 1.0 feet (equal to the top of berm elevations):

Grate perimeter (P) = (4 + 4 + 4 +4)ft = 16.0 ft

Grate clear open area (A) (ignore openings at grate perimeter):

4 rows x 10 rows = 40 openings

40 x (0.3125 ft x 0.6458 ft) = = 8.1 ft^2

$Q_w = 3.0(16.0)(1.00)^{1.5}/2.0 = 24.0$ cfs > 9.4 cfs = 100-year inflow

$Q_o = 0.67(8.1)(2(32.2)(1.00))^{0.5}/2.0 = 21.8$ cfs > 9.4 cfs = 100-year inflow

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5. Emergency spillway capacity computations

Spillway crest capacities

Weir equation: $Q = (C)(L)H^{3/2}$

Q, Discharge (cfs)
C, Discharge Coefficient = 3.0
L, Weir Crest Length (ft)
h, Effective Head above Weir Crest (ft)

Stormwater Wetland 1

$Q = (3.0)(6)1.50^{3/2} = 33$ ft^3/s

Stormwater Wetland 2

$Q = (3.0)(6)1.25^{3/2} = 25$ ft^3/s

Spillway channel capacities

Stormwater Wetland 1

Channel bottom width: 6 ft

Channel side slopes: 2:1

Channel n-value: 0.025

Channel slope: 0.0500 ft/ft

100-year inflow peak discharge: 6.7 ft^3/s

Flow depth = 0.25 ft

Stormwater Wetland 2

Channel bottom width: 6 ft

Channel side slopes: 2:1

Channel n-value: 0.025

Channel slope: 0.0250 ft/ft

100-year inflow peak discharge: 19.2 ft^3/s

Flow depth = 0.50 ft

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6. Outlet Protection Computations

Type I Preformed Scour Hole dimensions based on ConnDOT Drainage Manual design procedure:

Q	Design Discharge (ft^3/s)
TW	Tailwater Depth (ft)
$D_{50} = (0.0125R_p^2/TW)\ (Q/R_p^{2.5})^{1.333}$	Median Stable Stone Diameter (ft)
d	Riprap Thickness (ft)
$B = 2S_p + 6F$	Width (ft)
$C = 3S_p + 6F$	Length (ft)
S_p	Culvert Span (ft)
R_p	Culvert Rise (ft)
$F = 0.5R_p$	Type I Scour Hole Depression (ft)

$Q_{100} = 9.4\ ft^3/s$
TW = 1.17 ft (using critical depth)
$S_p = 1.25$ ft
$R_p = 1.25$ ft
$D_{50} = (0.0125(1.25^2)/1.17)\ (9.4/1.25^{2.5})^{1.333} = 0.87$ ft – Use intermediate riprap
d = 1.0 ft
B = 2(1.25) + 6(1.25) = 10.0 ft
C = 3(1.25) + 6(1.25) = 11.3 ft – Use 12 ft
F = 0.5 (1.25) = 0.625 ft – Use 1.0 ft

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Storm Sewer Tabulation

Project Name: 20-50 Bokum Road Business Park

Stormwater Studio 2021 v 3.0.0.27

11-08-2021

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
Line 5	29.00	0.130	0.130	0.90	0.12	0.12	5.0	5.00	8.84	1.03	7.00	1.71	15	1.00	31.25	30.96	31.76	31.78	34.80	34.80	5
Line 4	53.00	0.100	0.230	0.90	0.09	0.21	5.0	5.00	8.84	1.83	7.00	2.10	15	1.00	30.96	30.43	31.64	31.64	34.80	34.17	4
Line 3	13.00	0.220	0.450	0.90	0.20	0.41	5.0	5.00	8.84	3.58	7.00	3.41	15	1.00	30.43	30.30	31.36	31.38	34.17	34.17	3
Line 2	10.00	0.000	0.450	0.00	0.00	0.41	0.0	5.00	8.84	3.58	7.00	4.11	15	1.00	30.30	30.20	31.06	31.13	34.17	34.17	2
Line 1	20.00	0.000	0.450	0.00	0.00	0.41	0.0	5.00	8.84	3.58	7.00	4.60	15	1.00	30.20	30.00	30.96	30.76	32.09	30.00	1

Notes: IDF File = CTEssex1.idf, Return Period = 25-yrs. Pipe travel time suppressed.

Project File: 20-50.sws

Storm Sewer Tabulation

Project Name: 20-50 Bokum Road Business Park

Stormwater Studio 2021 v 3.0.0.27

11-08-2021

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
Line 3	10.00	0.270	0.270	0.90	0.24	0.24	5.0	5.00	8.84	2.15	7.00	3.42	15	1.00	29.10	29.00	29.69	29.70	32.60	33.25	3
Line 2	97.00	0.000	0.270	0.00	0.00	0.24	5.0	5.00	8.84	2.15	7.00	3.80	15	1.00	29.00	28.03	29.59	28.62	33.25	33.90	2
Line 1	102.00	0.520	0.790	0.90	0.47	0.71	5.0	5.00	8.84	6.29	7.00	5.54	15	1.00	23.02	22.00	24.02	23.25	33.90	22.00	1

Notes: IDF File = CTEssex1.idf, Return Period = 25-yrs. Pipe travel time suppressed.

Project File: 20-50-2.sws

Storm Sewer Tabulation

Project Name: 20-50 Bokum Road Business Park

Stormwater Studio 2021 v 3.0.0.27

11-08-2021

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
Line 6	38.00	0.230	0.230	0.90	0.21	0.21	5.0	5.00	8.84	1.83	7.00	1.49	15	1.00	27.02	26.64	31.02	31.00	34.60	34.70	6
Line 5	106.00	0.440	0.440	0.90	0.40	0.40	5.0	5.00	8.84	3.50	7.71	2.85	15	1.21	29.23	27.94	32.41	32.14	32.50	33.90	5
Line 4	130.00	0.320	0.760	0.90	0.29	0.68	5.0	5.00	8.84	6.05	7.00	4.93	15	1.00	27.94	26.64	31.76	30.79	33.90	34.70	4
Line 3	10.00	0.430	1.420	0.90	0.39	1.28	5.0	5.00	8.84	11.30	7.00	9.21	15	1.00	26.64	26.54	28.99	28.73	34.70	31.53	3
Line 2	10.00	0.000	1.420	0.00	0.00	1.28	0.0	5.00	8.84	11.30	7.00	9.21	15	1.00	26.54	26.44	27.95	27.69	31.53	28.35	2
Line 1	28.00	0.000	1.420	0.00	0.00	1.28	0.0	5.00	8.84	11.30	12.12	9.25	15	3.00	22.84	22.00	24.05	23.25	28.35	22.00	1

Notes: IDF File = CTEssex1.idf, Return Period = 25-yrs. Pipe travel time suppressed.

Project File: 20-50-3.sws

Appendix B
Hydrologic Model Input Data and Results

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	CT-Essex 24-hr S1	2-yr	Default	24.00	1	3.44	2
2	5-yr	CT-Essex 24-hr S1	5-yr	Default	24.00	1	4.41	2
3	10-yr	CT-Essex 24-hr S1	10-yr	Default	24.00	1	5.21	2
4	25-yr	CT-Essex 24-hr S1	25-yr	Default	24.00	1	6.31	2
5	50-yr	CT-Essex 24-hr S1	50-yr	Default	24.00	1	7.13	2
6	100-yr	CT-Essex 24-hr S1	100-yr	Default	24.00	1	8.01	2

Summary for Subcatchment 20: DA 1

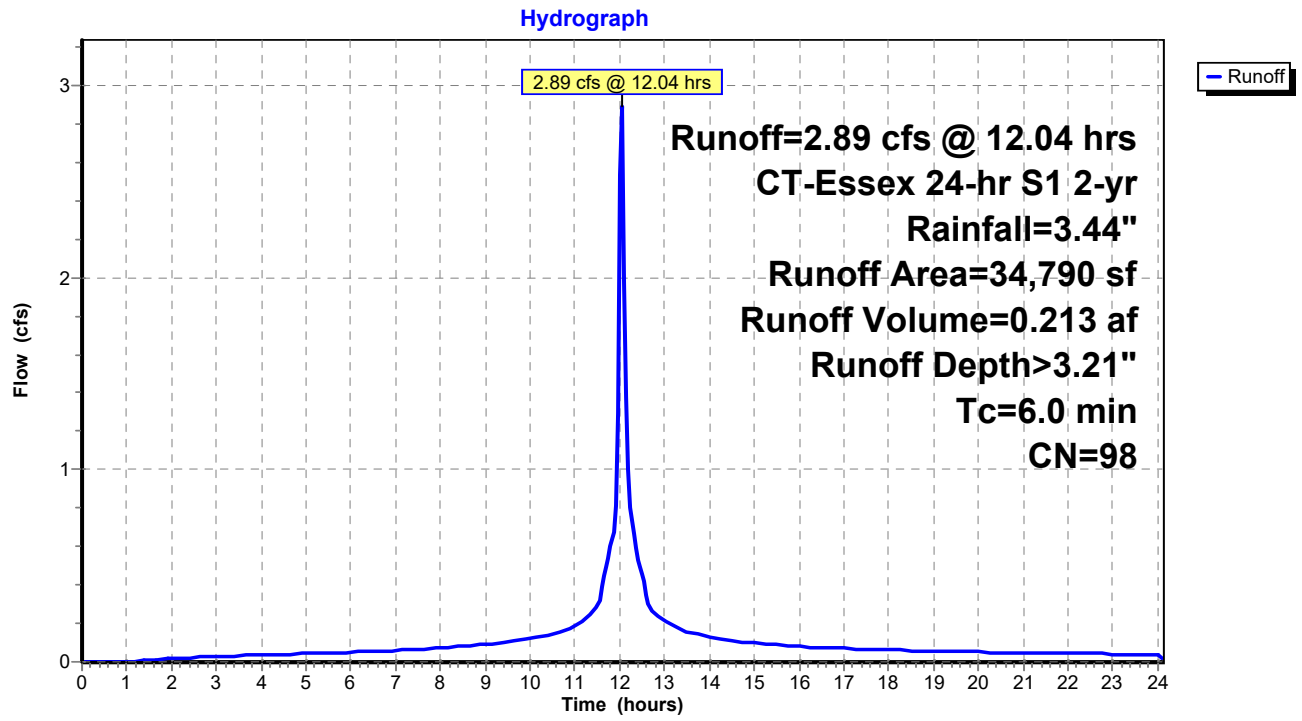
Runoff = 2.89 cfs @ 12.04 hrs, Volume= 0.213 af, Depth> 3.21"
Routed to Pond 25 : SWL 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 2-yr Rainfall=3.44"

	Area (sf)	CN	Description
*	34,790	98	
	34,790		100.00% Impervious Area

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

Subcatchment 20: DA 1



Summary for Pond 25: SWL 1

Inflow Area = 0.799 ac,100.00% Impervious, Inflow Depth > 3.21" for 2-yr event
Inflow = 2.89 cfs @ 12.04 hrs, Volume= 0.213 af
Outflow = 0.75 cfs @ 12.27 hrs, Volume= 0.188 af, Atten= 74%, Lag= 13.9 min
Primary = 0.75 cfs @ 12.27 hrs, Volume= 0.188 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 30.50' Storage= 1,650 cf
Peak Elev= 31.53' @ 12.27 hrs Storage= 5,306 cf (3,656 cf above start)

Plug-Flow detention time= 286.0 min calculated for 0.150 af (70% of inflow)
Center-of-Mass det. time= 112.7 min (869.8 - 757.2)

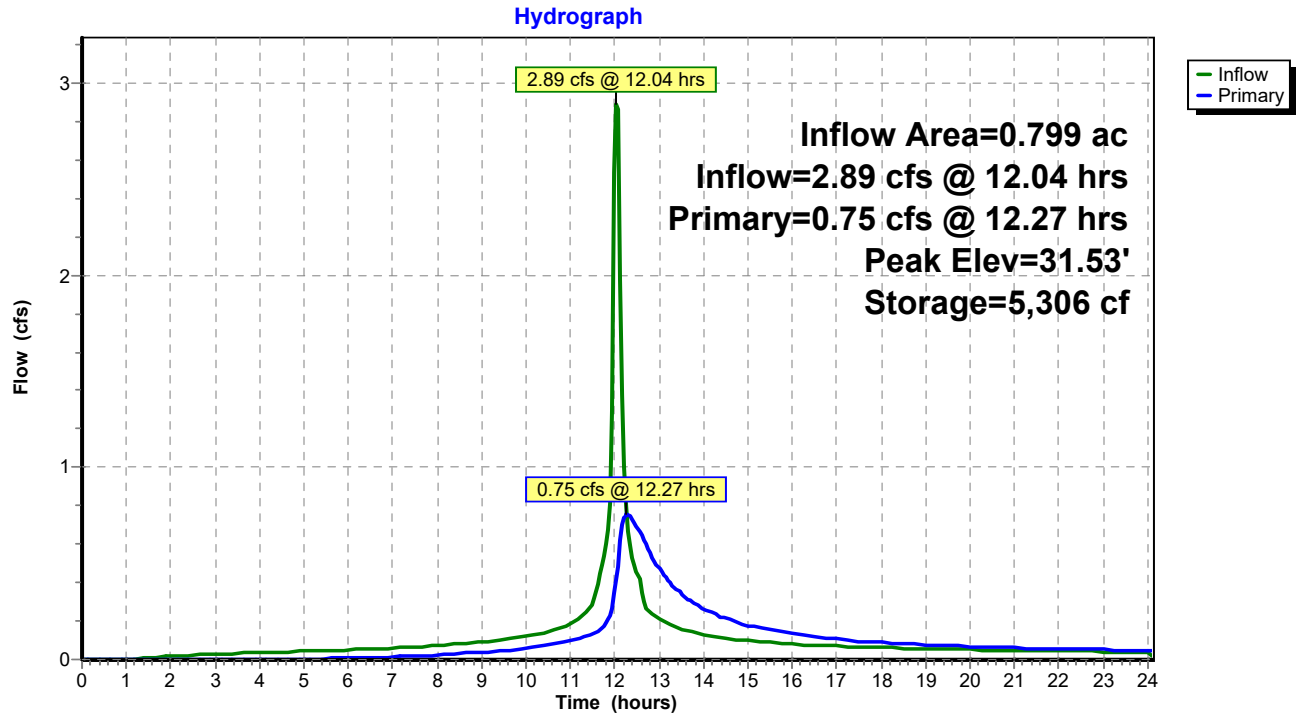
Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	16,231 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	0	0
31.00	3,299	3,299
32.00	3,788	7,087
33.00	4,302	11,389
34.00	4,842	16,231

Device	Routing	Invert	Outlet Devices
#1	Primary	30.00'	**15.0" Round Culvert** L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 30.00' / 29.94' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	30.50'	**30.0 deg x 2.33' rise Sharp-Crested Vee/Trap Weir**Cv= 2.61 (C= 3.26)

Primary OutFlow Max=0.75 cfs @ 12.27 hrs HW=31.53' (Free Discharge)
↑—**1=Culvert** (Passes 0.75 cfs of 4.84 cfs potential flow)
↑—**2=Sharp-Crested Vee/Trap Weir**(Weir Controls 0.75 cfs @ 2.65 fps)

Pond 25: SWL 1



Summary for Subcatchment 20: DA 1

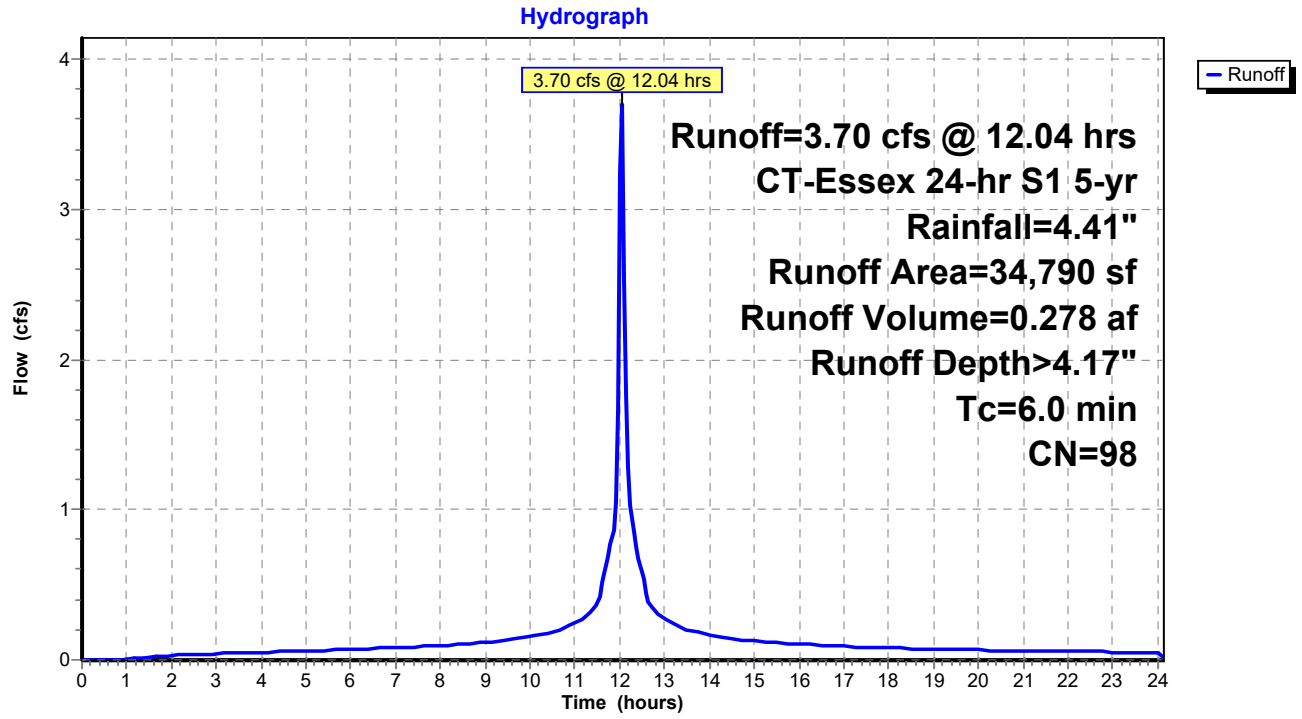
Runoff = 3.70 cfs @ 12.04 hrs, Volume= 0.278 af, Depth> 4.17"
Routed to Pond 25 : SWL 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 5-yr Rainfall=4.41"

	Area (sf)	CN	Description
*	34,790	98	
	34,790		100.00% Impervious Area

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

Subcatchment 20: DA 1



Summary for Pond 25: SWL 1

Inflow Area = 0.799 ac,100.00% Impervious, Inflow Depth > 4.17" for 5-yr event
Inflow = 3.70 cfs @ 12.04 hrs, Volume= 0.278 af
Outflow = 1.12 cfs @ 12.23 hrs, Volume= 0.250 af, Atten= 70%, Lag= 11.8 min
Primary = 1.12 cfs @ 12.23 hrs, Volume= 0.250 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 30.50' Storage= 1,650 cf
Peak Elev= 31.71' @ 12.23 hrs Storage= 5,970 cf (4,321 cf above start)

Plug-Flow detention time= 252.5 min calculated for 0.212 af (76% of inflow)
Center-of-Mass det. time= 100.4 min (852.1 - 751.7)

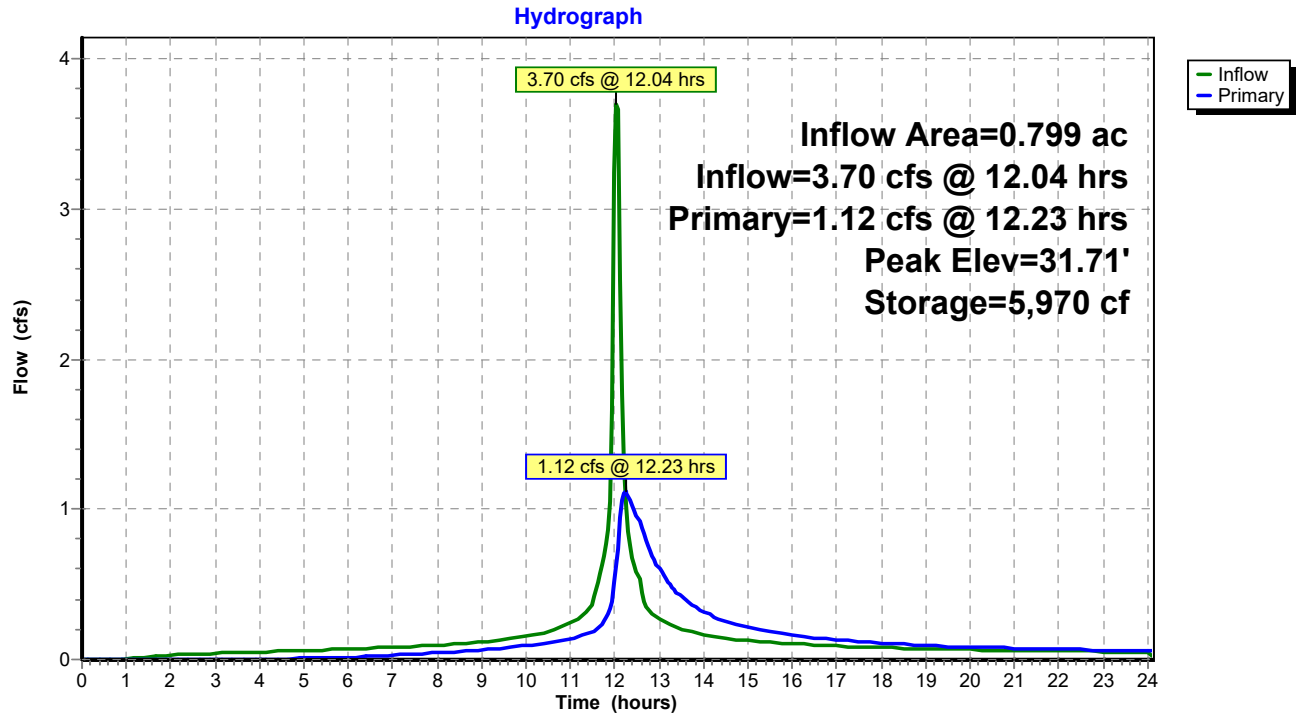
Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	16,231 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	0	0
31.00	3,299	3,299
32.00	3,788	7,087
33.00	4,302	11,389
34.00	4,842	16,231

Device	Routing	Invert	Outlet Devices
#1	Primary	30.00'	**15.0" Round Culvert** L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 30.00' / 29.94' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	30.50'	**30.0 deg x 2.33' rise Sharp-Crested Vee/Trap Weir**Cv= 2.61 (C= 3.26)

Primary OutFlow Max=1.11 cfs @ 12.23 hrs HW=31.70' (Free Discharge)
↑—**1=Culvert** (Passes 1.11 cfs of 5.36 cfs potential flow)
↑—**2=Sharp-Crested Vee/Trap Weir**(Weir Controls 1.11 cfs @ 2.86 fps)

Pond 25: SWL 1



Summary for Subcatchment 20: DA 1

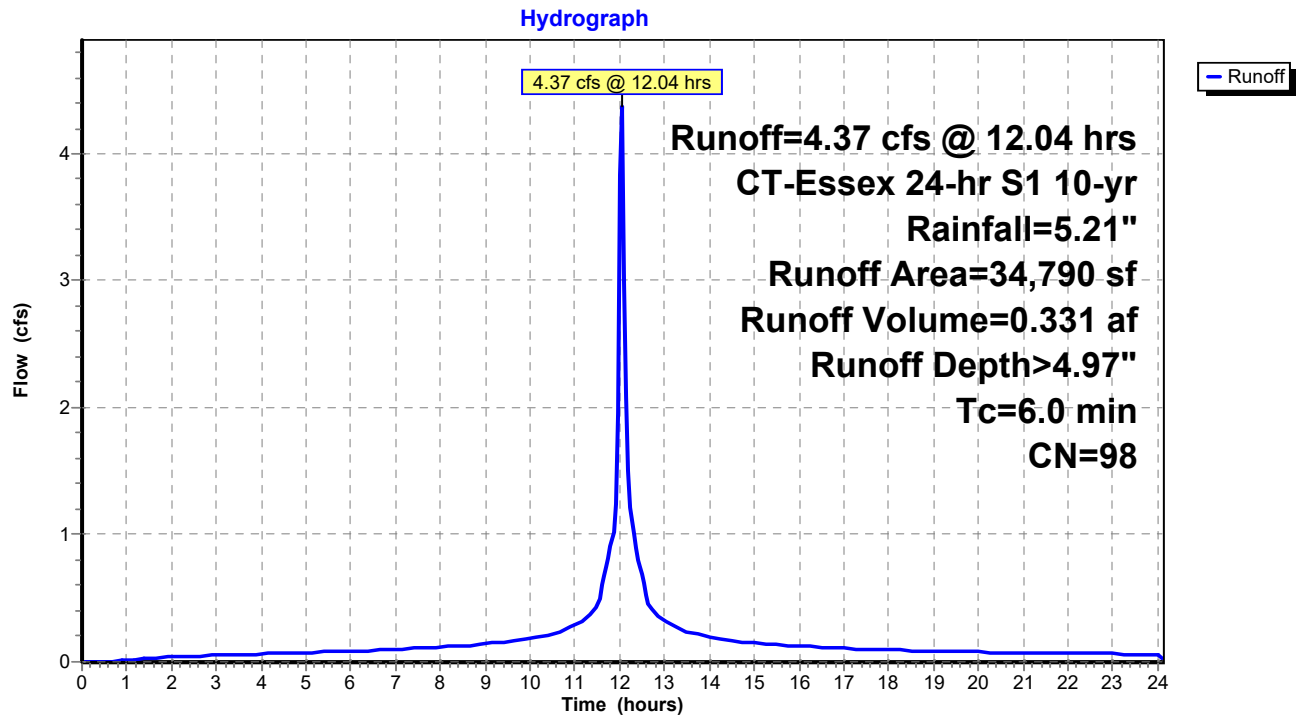
Runoff = 4.37 cfs @ 12.04 hrs, Volume= 0.331 af, Depth> 4.97"
Routed to Pond 25 : SWL 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 10-yr Rainfall=5.21"

	Area (sf)	CN	Description
*	34,790	98	
	34,790		100.00% Impervious Area

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

Subcatchment 20: DA 1



Summary for Pond 25: SWL 1

Inflow Area = 0.799 ac,100.00% Impervious, Inflow Depth > 4.97" for 10-yr event
Inflow = 4.37 cfs @ 12.04 hrs, Volume= 0.331 af
Outflow = 1.45 cfs @ 12.22 hrs, Volume= 0.301 af, Atten= 67%, Lag= 10.7 min
Primary = 1.45 cfs @ 12.22 hrs, Volume= 0.301 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 30.50' Storage= 1,650 cf
Peak Elev= 31.84' @ 12.22 hrs Storage= 6,469 cf (4,820 cf above start)

Plug-Flow detention time= 231.9 min calculated for 0.263 af (79% of inflow)
Center-of-Mass det. time= 92.8 min (841.2 - 748.4)

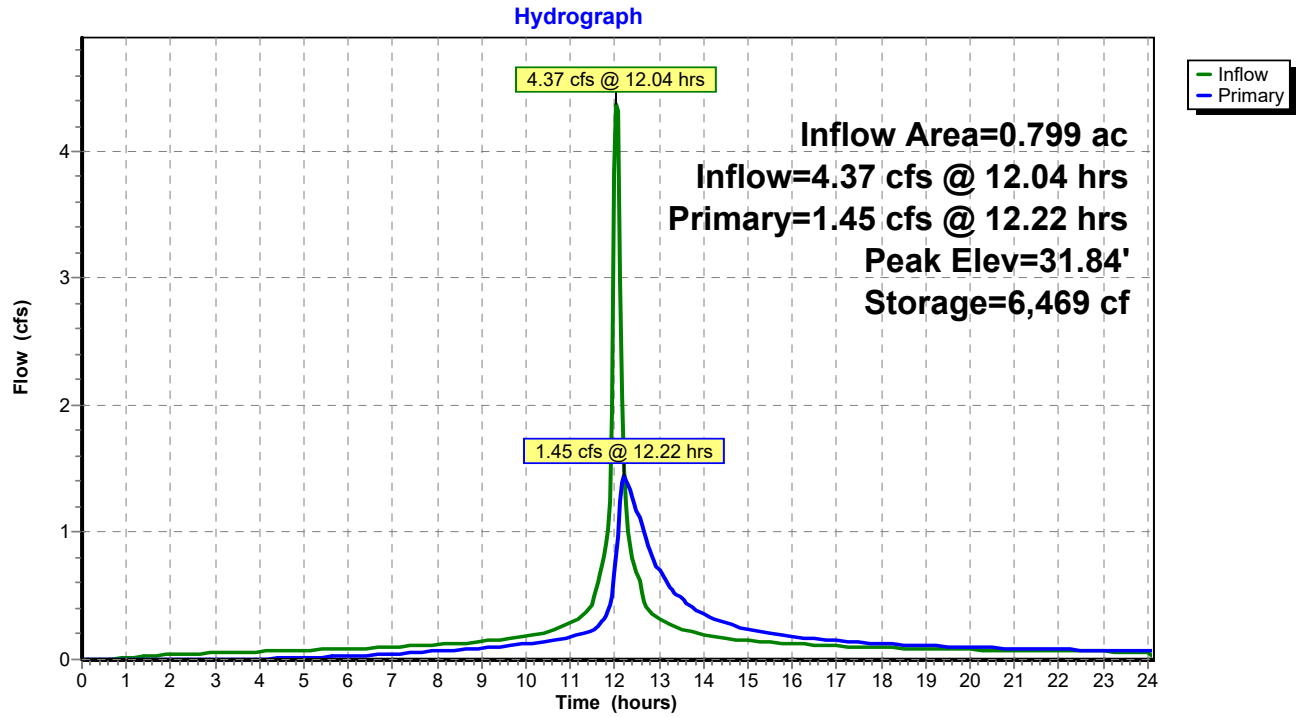
Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	16,231 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	0	0
31.00	3,299	3,299
32.00	3,788	7,087
33.00	4,302	11,389
34.00	4,842	16,231

Device	Routing	Invert	Outlet Devices
#1	Primary	30.00'	**15.0" Round Culvert** L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 30.00' / 29.94' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	30.50'	**30.0 deg x 2.33' rise Sharp-Crested Vee/Trap Weir**Cv= 2.61 (C= 3.26)

Primary OutFlow Max=1.44 cfs @ 12.22 hrs HW=31.83' (Free Discharge)
↑—**1=Culvert** (Passes 1.44 cfs of 6.00 cfs potential flow)
↑—**2=Sharp-Crested Vee/Trap Weir**(Weir Controls 1.44 cfs @ 3.02 fps)

Pond 25: SWL 1



Summary for Subcatchment 20: DA 1

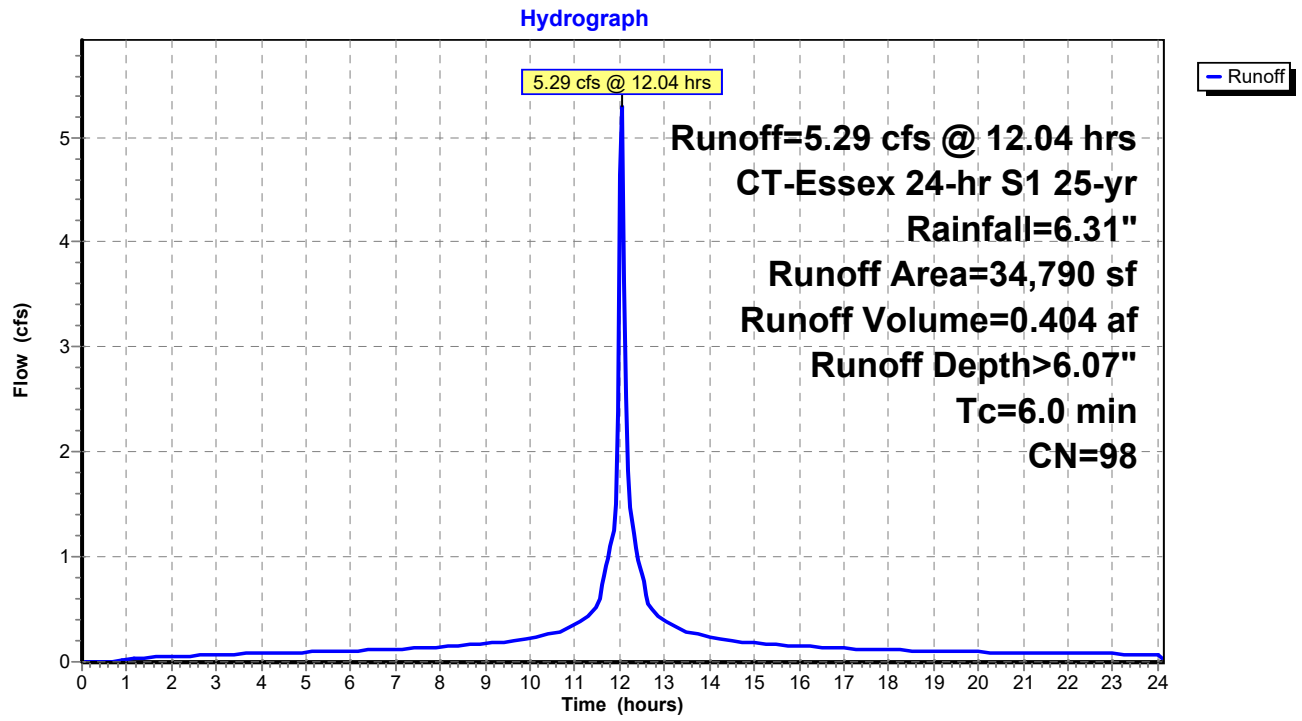
Runoff = 5.29 cfs @ 12.04 hrs, Volume= 0.404 af, Depth> 6.07"
Routed to Pond 25 : SWL 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 25-yr Rainfall=6.31"

	Area (sf)	CN	Description
*	34,790	98	
	34,790		100.00% Impervious Area

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

Subcatchment 20: DA 1



Summary for Pond 25: SWL 1

Inflow Area = 0.799 ac,100.00% Impervious, Inflow Depth > 6.07" for 25-yr event
Inflow = 5.29 cfs @ 12.04 hrs, Volume= 0.404 af
Outflow = 1.93 cfs @ 12.20 hrs, Volume= 0.372 af, Atten= 63%, Lag= 9.7 min
Primary = 1.93 cfs @ 12.20 hrs, Volume= 0.372 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 30.50' Storage= 1,650 cf
Peak Elev= 32.00' @ 12.20 hrs Storage= 7,096 cf (5,446 cf above start)

Plug-Flow detention time= 210.3 min calculated for 0.335 af (83% of inflow)
Center-of-Mass det. time= 84.6 min (829.6 - 745.0)

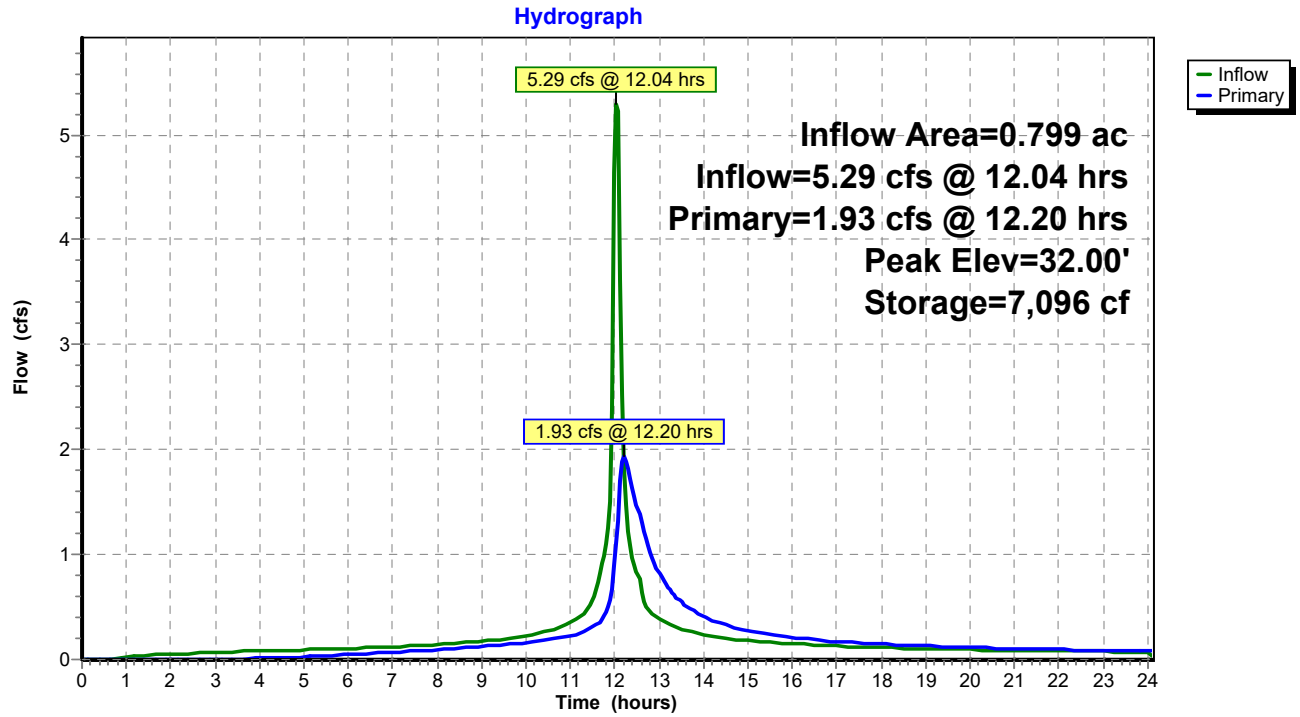
Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	16,231 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	0	0
31.00	3,299	3,299
32.00	3,788	7,087
33.00	4,302	11,389
34.00	4,842	16,231

Device	Routing	Invert	Outlet Devices
#1	Primary	30.00'	**15.0" Round Culvert** L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 30.00' / 29.94' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	30.50'	**30.0 deg x 2.33' rise Sharp-Crested Vee/Trap Weir**Cv= 2.61 (C= 3.26)

Primary OutFlow Max=1.93 cfs @ 12.20 hrs HW=32.00' (Free Discharge)
↑—**1=Culvert** (Passes 1.93 cfs of 6.73 cfs potential flow)
↑—**2=Sharp-Crested Vee/Trap Weir**(Weir Controls 1.93 cfs @ 3.20 fps)

Pond 25: SWL 1



Summary for Subcatchment 20: DA 1

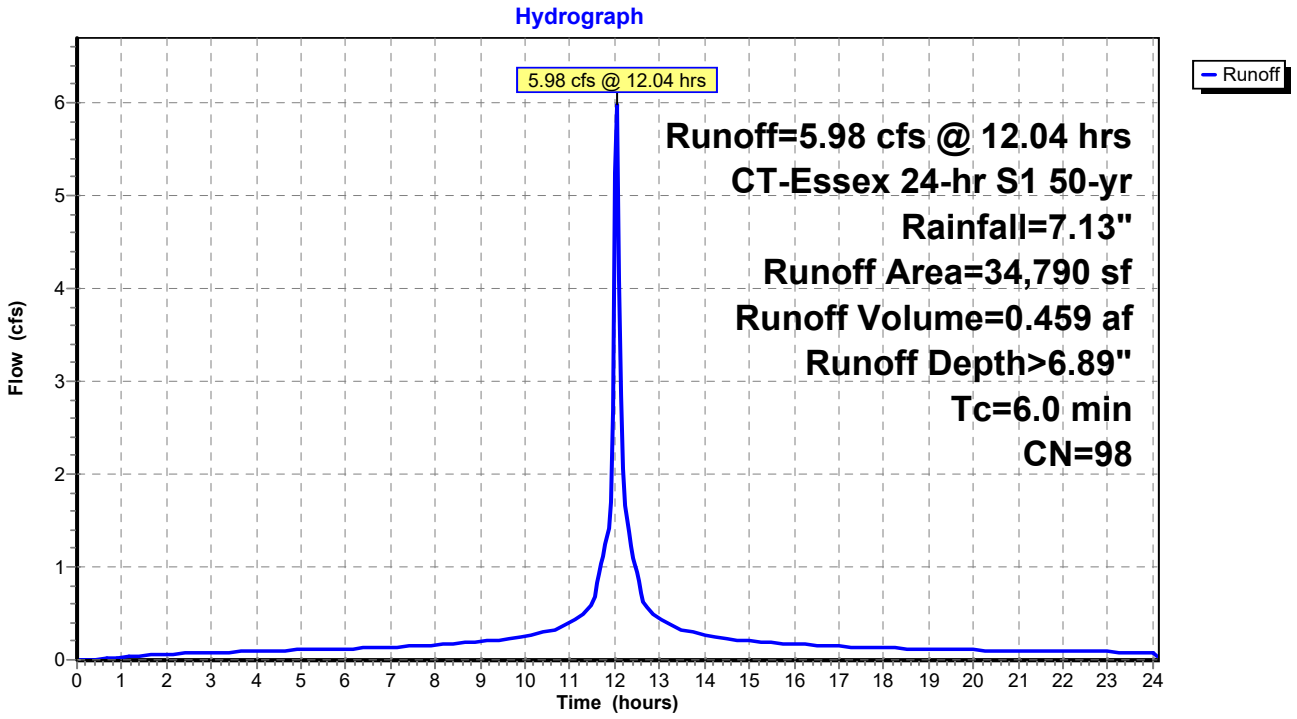
Runoff = 5.98 cfs @ 12.04 hrs, Volume= 0.459 af, Depth> 6.89"
Routed to Pond 25 : SWL 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 50-yr Rainfall=7.13"

	Area (sf)	CN	Description
*	34,790	98	
	34,790		100.00% Impervious Area

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

Subcatchment 20: DA 1



Summary for Pond 25: SWL 1

Inflow Area = 0.799 ac,100.00% Impervious, Inflow Depth > 6.89" for 50-yr event
Inflow = 5.98 cfs @ 12.04 hrs, Volume= 0.459 af
Outflow = 2.28 cfs @ 12.19 hrs, Volume= 0.426 af, Atten= 62%, Lag= 9.2 min
Primary = 2.28 cfs @ 12.19 hrs, Volume= 0.426 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 30.50' Storage= 1,650 cf
Peak Elev= 32.10' @ 12.19 hrs Storage= 7,537 cf (5,887 cf above start)

Plug-Flow detention time= 196.3 min calculated for 0.387 af (84% of inflow)
Center-of-Mass det. time= 79.7 min (822.8 - 743.1)

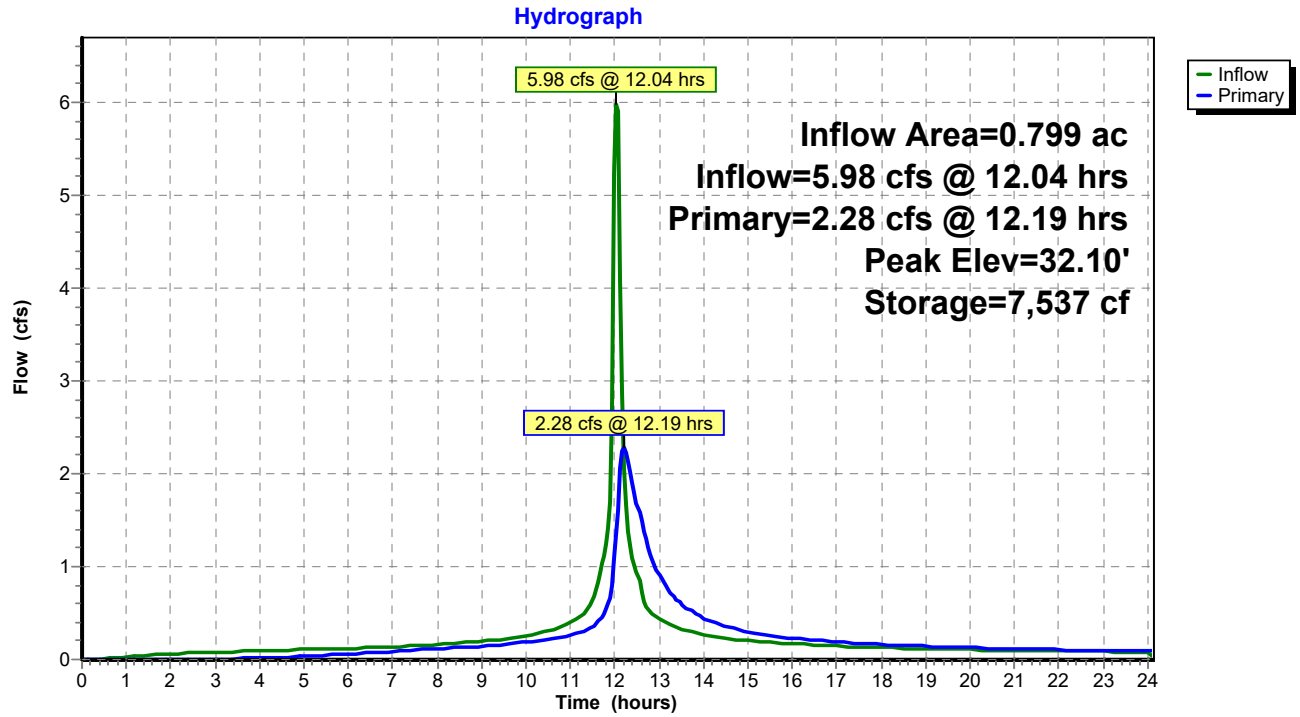
Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	16,231 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	0	0
31.00	3,299	3,299
32.00	3,788	7,087
33.00	4,302	11,389
34.00	4,842	16,231

Device	Routing	Invert	Outlet Devices
#1	Primary	30.00'	**15.0" Round Culvert** L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 30.00' / 29.94' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	30.50'	**30.0 deg x 2.33' rise Sharp-Crested Vee/Trap Weir**Cv= 2.61 (C= 3.26)

Primary OutFlow Max=2.27 cfs @ 12.19 hrs HW=32.10' (Free Discharge)
↑—**1=Culvert** (Passes 2.27 cfs of 7.14 cfs potential flow)
↑—**2=Sharp-Crested Vee/Trap Weir**(Weir Controls 2.27 cfs @ 3.30 fps)

Pond 25: SWL 1



Summary for Subcatchment 20: DA 1

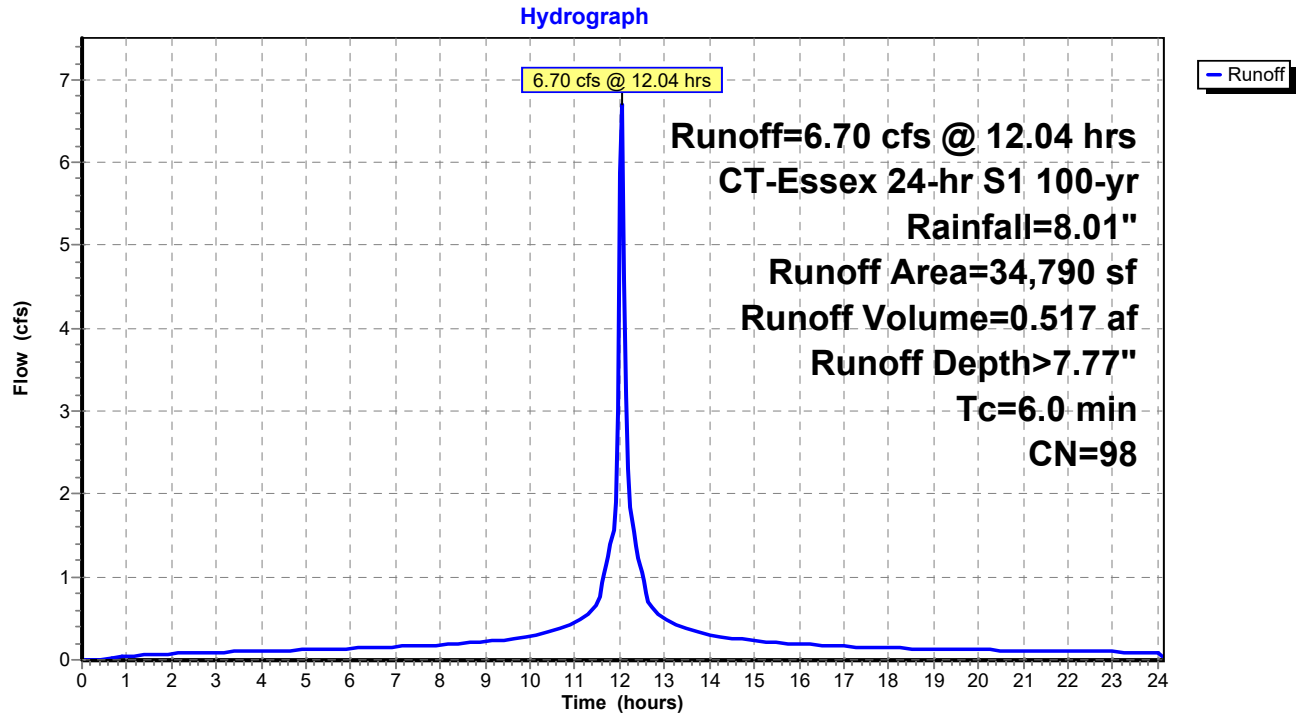
Runoff = 6.70 cfs @ 12.04 hrs, Volume= 0.517 af, Depth> 7.77"
Routed to Pond 25 : SWL 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 100-yr Rainfall=8.01"

	Area (sf)	CN	Description
*	34,790	98	
	34,790		100.00% Impervious Area

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

Subcatchment 20: DA 1



Summary for Pond 25: SWL 1

Inflow Area = 0.799 ac,100.00% Impervious, Inflow Depth > 7.77" for 100-yr event
Inflow = 6.70 cfs @ 12.04 hrs, Volume= 0.517 af
Outflow = 2.66 cfs @ 12.18 hrs, Volume= 0.483 af, Atten= 60%, Lag= 8.7 min
Primary = 2.66 cfs @ 12.18 hrs, Volume= 0.483 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Starting Elev= 30.50' Storage= 1,650 cf
Peak Elev= 32.21' @ 12.18 hrs Storage= 7,976 cf (6,326 cf above start)

Plug-Flow detention time= 184.9 min calculated for 0.445 af (86% of inflow)
Center-of-Mass det. time= 75.4 min (816.8 - 741.4)

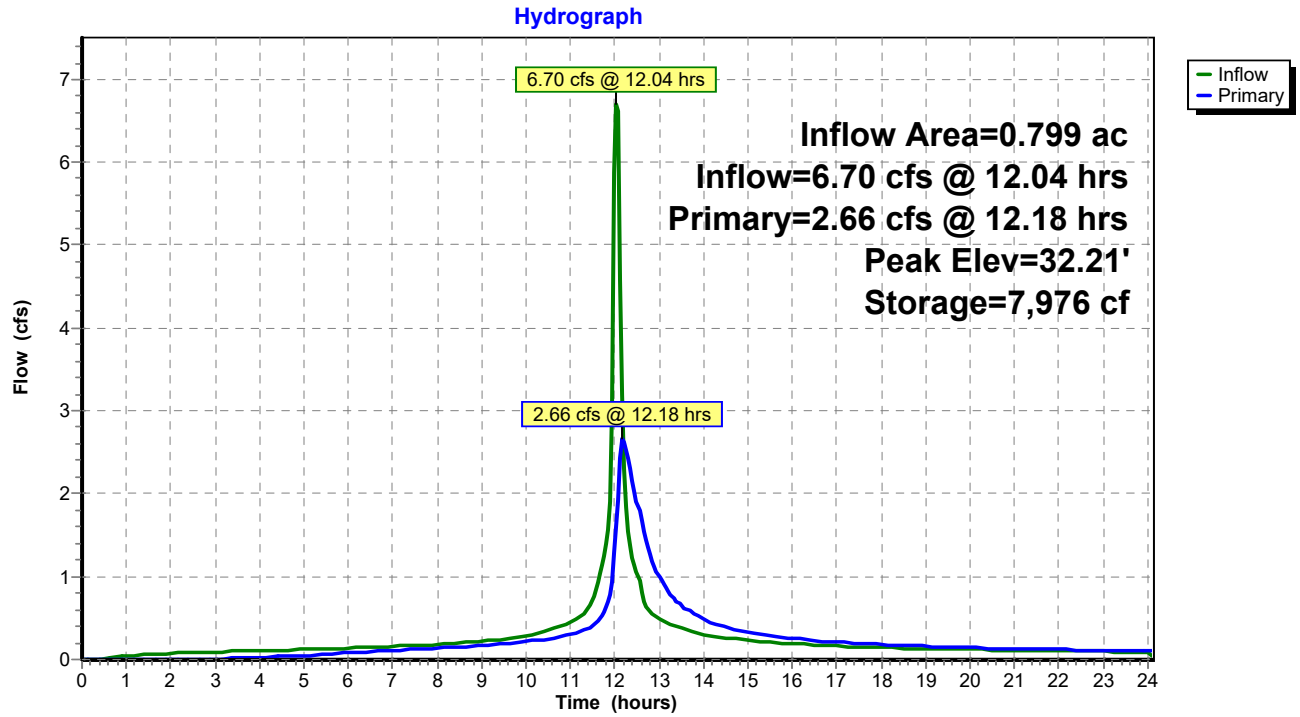
Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	16,231 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	0	0
31.00	3,299	3,299
32.00	3,788	7,087
33.00	4,302	11,389
34.00	4,842	16,231

Device	Routing	Invert	Outlet Devices
#1	Primary	30.00'	**15.0" Round Culvert** L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 30.00' / 29.94' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Device 1	30.50'	**30.0 deg x 2.33' rise Sharp-Crested Vee/Trap Weir**Cv= 2.61 (C= 3.26)

Primary OutFlow Max=2.65 cfs @ 12.18 hrs HW=32.20' (Free Discharge)
↑—**1=Culvert** (Passes 2.65 cfs of 7.42 cfs potential flow)
↑—**2=Sharp-Crested Vee/Trap Weir**(Weir Controls 2.65 cfs @ 3.41 fps)

Pond 25: SWL 1



Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	100-yr	CT-Essex 24-hr S1	100-yr	Default	24.00	1	8.01	2

Summary for Subcatchment 20: DA 1

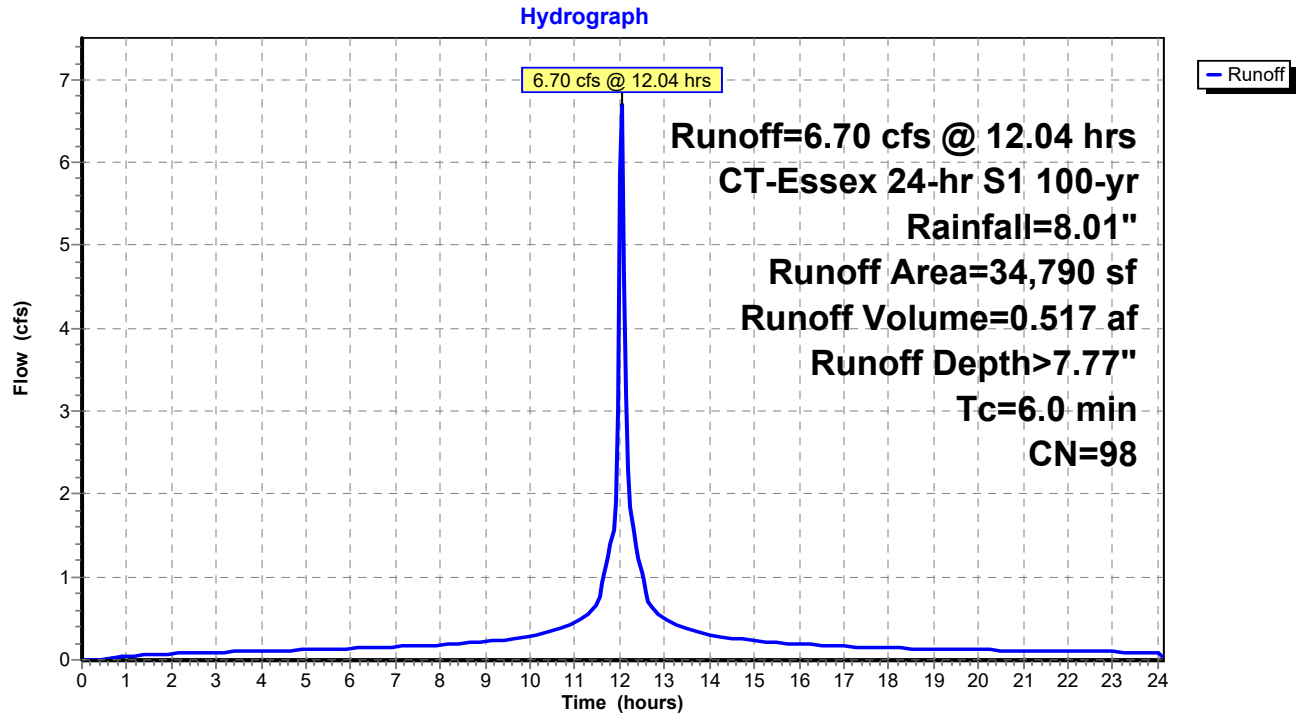
Runoff = 6.70 cfs @ 12.04 hrs, Volume= 0.517 af, Depth> 7.77"
Routed to Pond 25 : SWL 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 100-yr Rainfall=8.01"

	Area (sf)	CN	Description
*	34,790	98	
	34,790		100.00% Impervious Area

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

Subcatchment 20: DA 1



Summary for Pond 25: SWL 1

Inflow Area = 0.799 ac,100.00% Impervious, Inflow Depth > 7.77" for 100-yr event
Inflow = 6.70 cfs @ 12.04 hrs, Volume= 0.517 af
Outflow = 3.64 cfs @ 12.15 hrs, Volume= 0.271 af, Atten= 46%, Lag= 6.5 min
Primary = 3.64 cfs @ 12.15 hrs, Volume= 0.271 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Peak Elev= 33.04' @ 12.15 hrs Storage= 11,591 cf

Plug-Flow detention time= 329.1 min calculated for 0.271 af (52% of inflow)
Center-of-Mass det. time= 166.4 min (907.8 - 741.4)

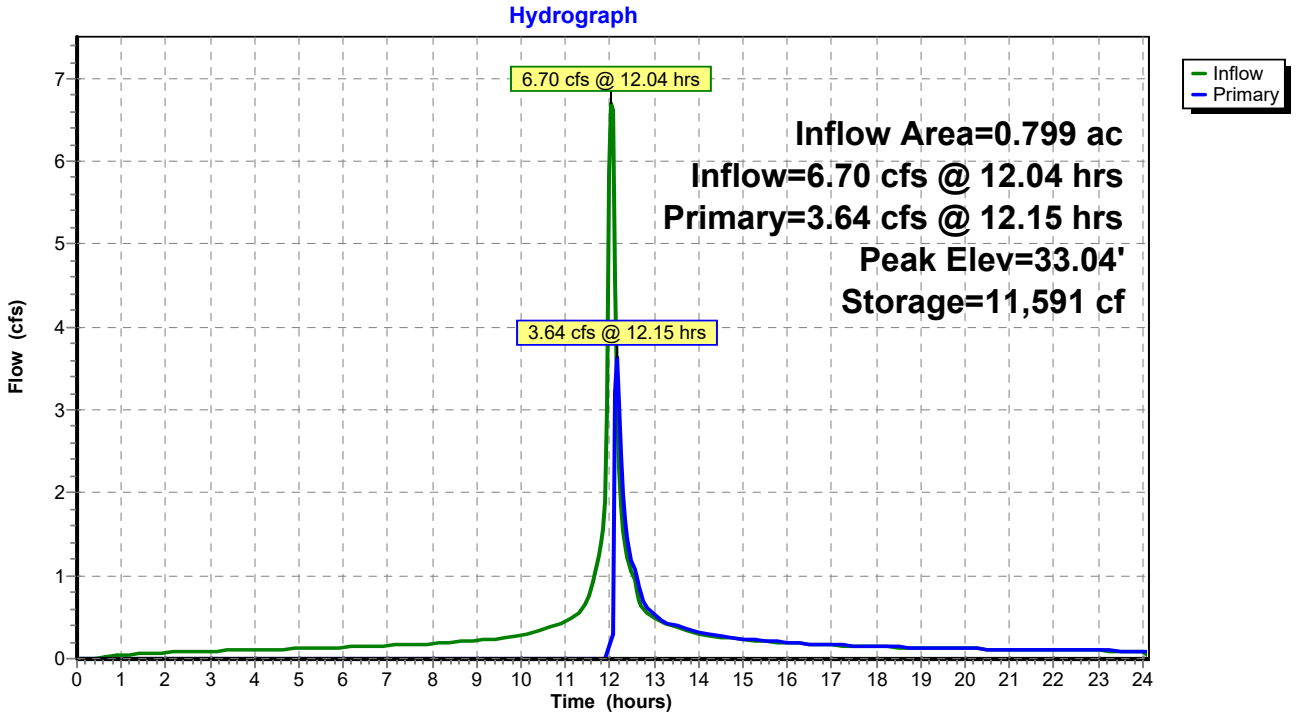
Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	16,231 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	0	0
31.00	3,299	3,299
32.00	3,788	7,087
33.00	4,302	11,389
34.00	4,842	16,231

Device	Routing	Invert	Outlet Devices
#1	Primary	32.83'	**7.7" x 3.7" Horiz. Orifice/Grate X 4.00 columns** X 10 rows C= 0.600 in 31.0" x 37.5" Grate (98% open area) Limited to weir flow at low heads

Primary OutFlow Max=3.61 cfs @ 12.15 hrs HW=33.04' (Free Discharge)
↑—**1=Orifice/Grate** (Weir Controls 3.61 cfs @ 1.50 fps)

Pond 25: SWL 1



Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	CT-Essex 24-hr S1	2-yr	Default	24.00	1	3.44	2
2	5-yr	CT-Essex 24-hr S1	5-yr	Default	24.00	1	4.41	2
3	10-yr	CT-Essex 24-hr S1	10-yr	Default	24.00	1	5.21	2
4	25-yr	CT-Essex 24-hr S1	25-yr	Default	24.00	1	6.31	2
5	50-yr	CT-Essex 24-hr S1	50-yr	Default	24.00	1	7.13	2
6	100-yr	CT-Essex 24-hr S1	100-yr	Default	24.00	1	8.01	2

Summary for Subcatchment 20: DA 2

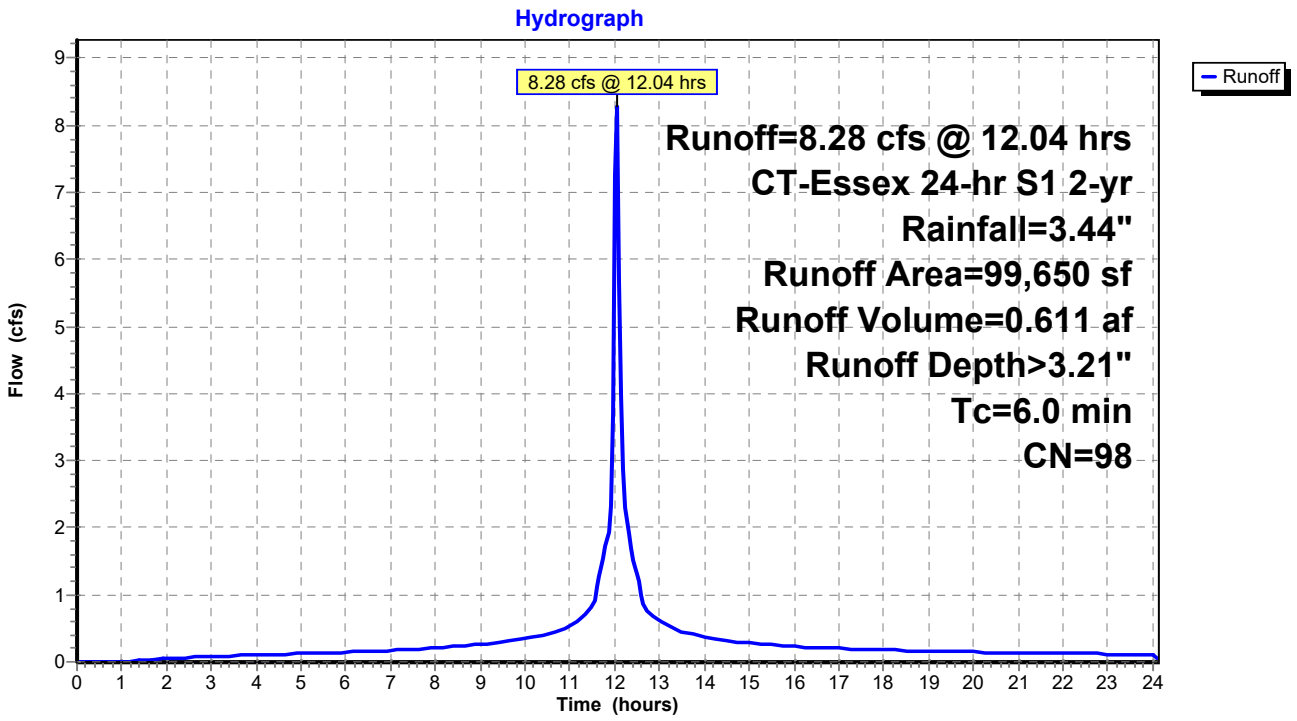
Runoff = 8.28 cfs @ 12.04 hrs, Volume= 0.611 af, Depth> 3.21"
Routed to Pond 25 : SWL 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 2-yr Rainfall=3.44"

	Area (sf)	CN	Description
*	99,650	98	
	99,650		100.00% Impervious Area

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

Subcatchment 20: DA 2



Summary for Pond 25: SWL 2

Inflow Area = 2.288 ac,100.00% Impervious, Inflow Depth > 3.21" for 2-yr event
Inflow = 8.28 cfs @ 12.04 hrs, Volume= 0.611 af
Outflow = 2.57 cfs @ 12.23 hrs, Volume= 0.476 af, Atten= 69%, Lag= 11.3 min
Primary = 2.57 cfs @ 12.23 hrs, Volume= 0.476 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Peak Elev= 23.30' @ 12.23 hrs Storage= 11,979 cf

Plug-Flow detention time= 223.7 min calculated for 0.475 af (78% of inflow)
Center-of-Mass det. time= 125.4 min (882.6 - 757.2)

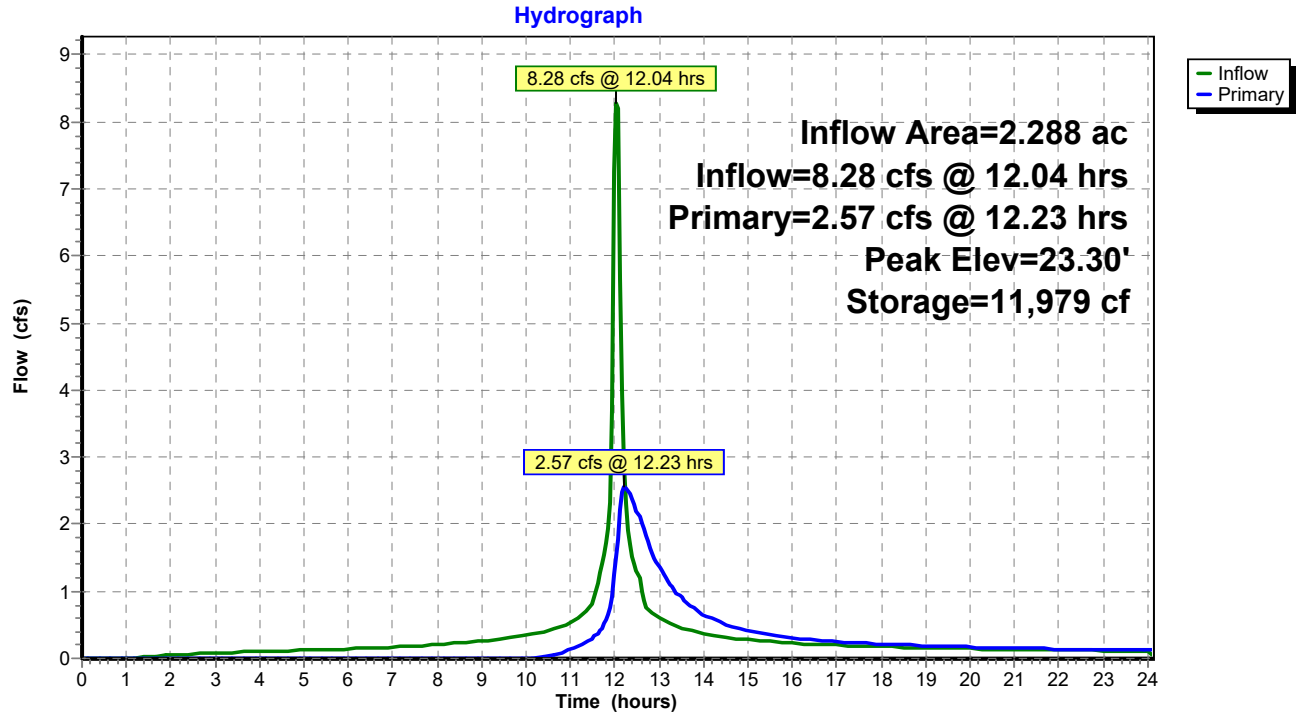
Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	29,613 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	0	0
23.00	9,010	9,010
24.00	9,863	18,873
25.00	10,740	29,613

Device	Routing	Invert	Outlet Devices
#1	Primary	22.50'	**15.0" Round Culvert** L= 6.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 22.50' / 22.20' S= 0.0462 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Primary	23.00'	**30.0 deg x 1.50' rise Sharp-Crested Vee/Trap Weir**Cv= 2.61 (C= 3.26)

Primary OutFlow Max=2.56 cfs @ 12.23 hrs HW=23.30' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.53 cfs @ 3.05 fps)
└**2=Sharp-Crested Vee/Trap Weir**(Weir Controls 0.03 cfs @ 1.43 fps)

Pond 25: SWL 2



Summary for Subcatchment 20: DA 2

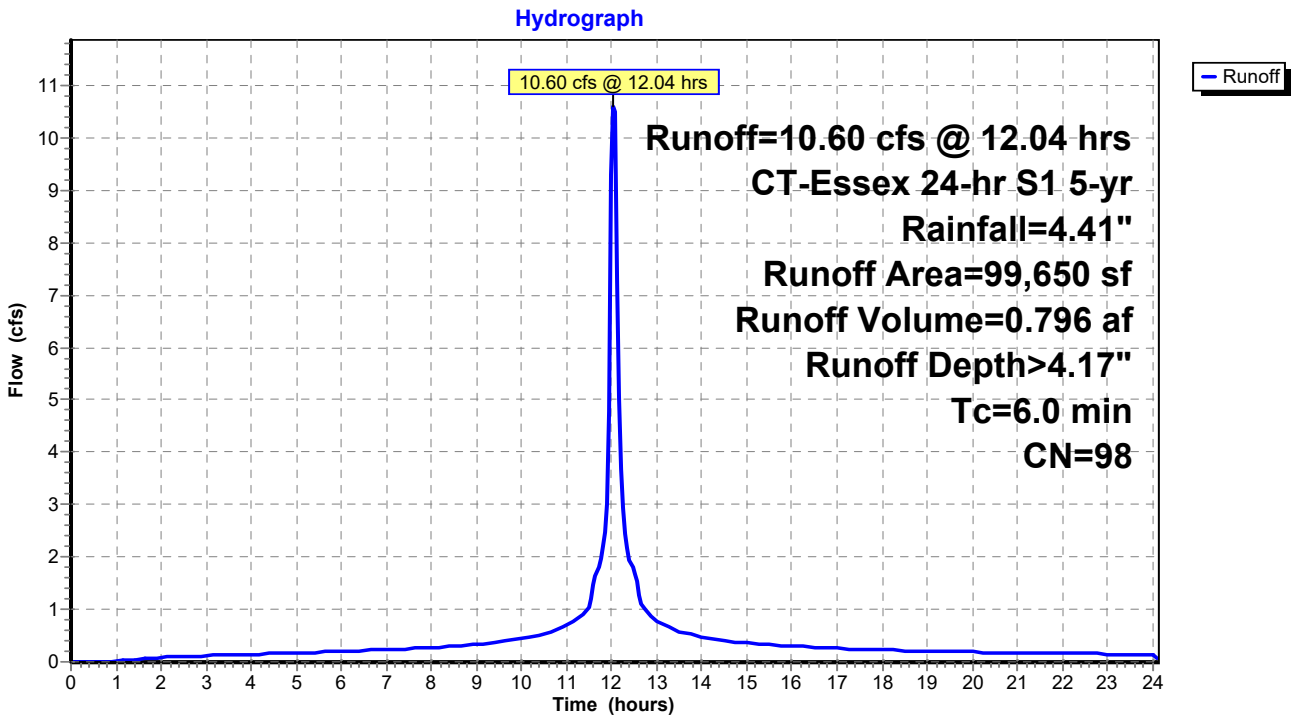
Runoff = 10.60 cfs @ 12.04 hrs, Volume= 0.796 af, Depth> 4.17"
Routed to Pond 25 : SWL 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 5-yr Rainfall=4.41"

	Area (sf)	CN	Description
*	99,650	98	
	99,650		100.00% Impervious Area

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

Subcatchment 20: DA 2



Summary for Pond 25: SWL 2

Inflow Area = 2.288 ac,100.00% Impervious, Inflow Depth > 4.17" for 5-yr event
Inflow = 10.60 cfs @ 12.04 hrs, Volume= 0.796 af
Outflow = 3.61 cfs @ 12.21 hrs, Volume= 0.656 af, Atten= 66%, Lag= 10.4 min
Primary = 3.61 cfs @ 12.21 hrs, Volume= 0.656 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Peak Elev= 23.48' @ 12.21 hrs Storage= 13,769 cf

Plug-Flow detention time= 198.5 min calculated for 0.656 af (82% of inflow)
Center-of-Mass det. time= 112.3 min (864.0 - 751.7)

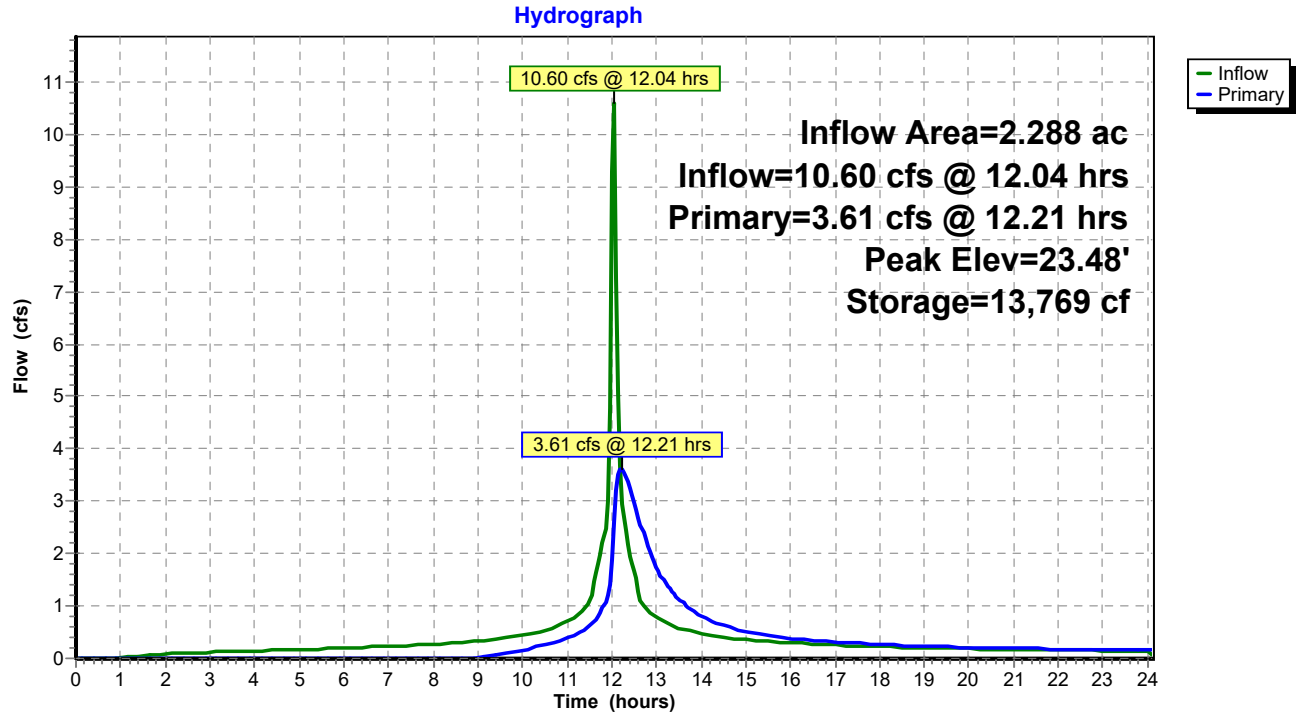
Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	29,613 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	0	0
23.00	9,010	9,010
24.00	9,863	18,873
25.00	10,740	29,613

Device	Routing	Invert	Outlet Devices
#1	Primary	22.50'	**15.0" Round Culvert** L= 6.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 22.50' / 22.20' S= 0.0462 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Primary	23.00'	**30.0 deg x 1.50' rise Sharp-Crested Vee/Trap Weir**Cv= 2.61 (C= 3.26)

Primary OutFlow Max=3.59 cfs @ 12.21 hrs HW=23.48' (Free Discharge)
└**1=Culvert** (Inlet Controls 3.48 cfs @ 3.37 fps)
└**2=Sharp-Crested Vee/Trap Weir**(Weir Controls 0.11 cfs @ 1.81 fps)

Pond 25: SWL 2



Summary for Subcatchment 20: DA 2

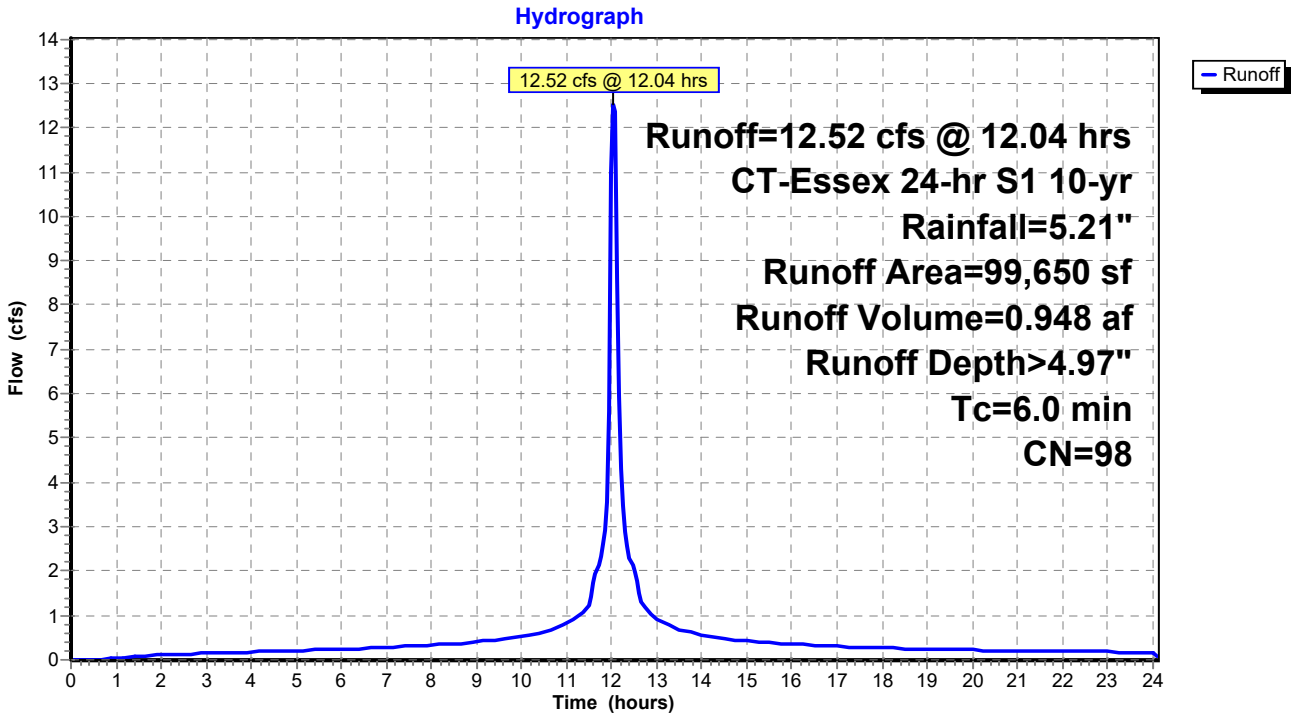
Runoff = 12.52 cfs @ 12.04 hrs, Volume= 0.948 af, Depth> 4.97"
Routed to Pond 25 : SWL 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 10-yr Rainfall=5.21"

	Area (sf)	CN	Description
*	99,650	98	
	99,650		100.00% Impervious Area

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

Subcatchment 20: DA 2



Summary for Pond 25: SWL 2

Inflow Area = 2.288 ac,100.00% Impervious, Inflow Depth > 4.97" for 10-yr event
Inflow = 12.52 cfs @ 12.04 hrs, Volume= 0.948 af
Outflow = 4.37 cfs @ 12.21 hrs, Volume= 0.805 af, Atten= 65%, Lag= 10.1 min
Primary = 4.37 cfs @ 12.21 hrs, Volume= 0.805 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Peak Elev= 23.62' @ 12.21 hrs Storage= 15,096 cf

Plug-Flow detention time= 181.9 min calculated for 0.805 af (85% of inflow)
Center-of-Mass det. time= 104.0 min (852.4 - 748.4)

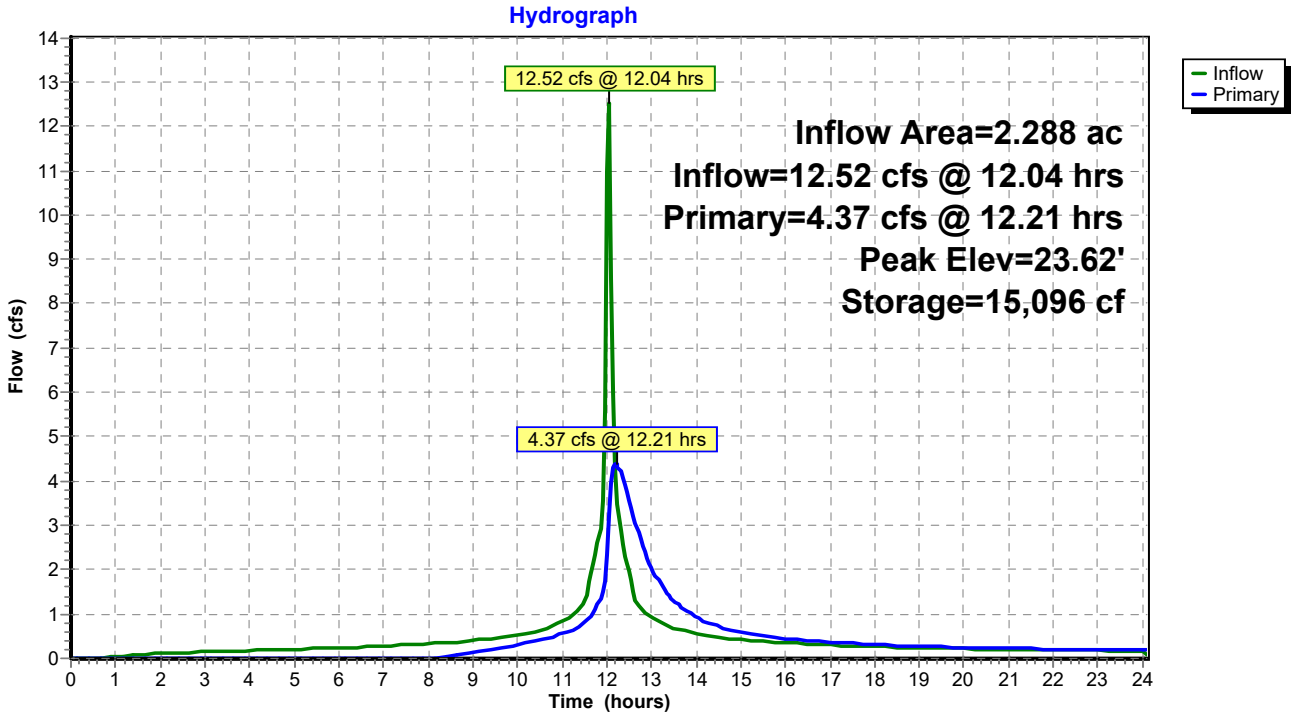
Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	29,613 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	0	0
23.00	9,010	9,010
24.00	9,863	18,873
25.00	10,740	29,613

Device	Routing	Invert	Outlet Devices
#1	Primary	22.50'	**15.0" Round Culvert** L= 6.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 22.50' / 22.20' S= 0.0462 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Primary	23.00'	**30.0 deg x 1.50' rise Sharp-Crested Vee/Trap Weir**Cv= 2.61 (C= 3.26)

Primary OutFlow Max=4.37 cfs @ 12.21 hrs HW=23.62' (Free Discharge)
└**1=Culvert** (Inlet Controls 4.16 cfs @ 3.60 fps)
└**2=Sharp-Crested Vee/Trap Weir**(Weir Controls 0.21 cfs @ 2.05 fps)

Pond 25: SWL 2



Summary for Subcatchment 20: DA 2

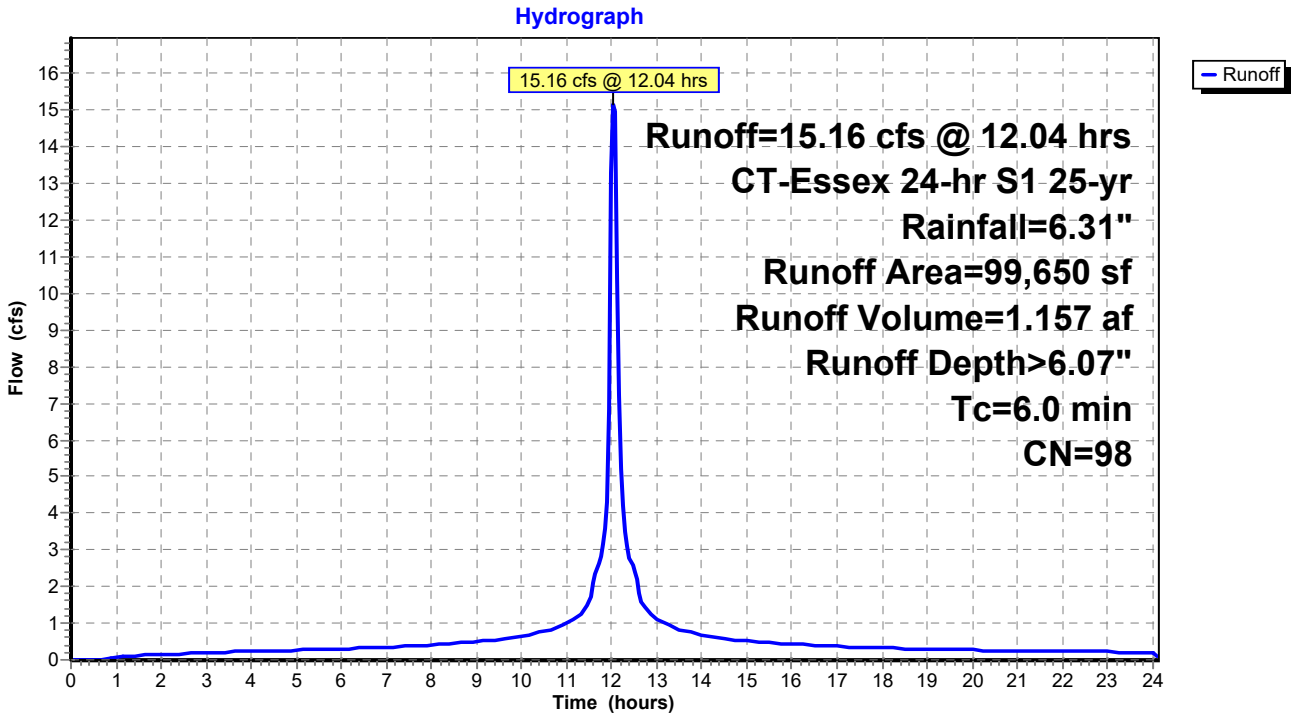
Runoff = 15.16 cfs @ 12.04 hrs, Volume= 1.157 af, Depth> 6.07"
Routed to Pond 25 : SWL 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 25-yr Rainfall=6.31"

	Area (sf)	CN	Description
*	99,650	98	
	99,650		100.00% Impervious Area

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

Subcatchment 20: DA 2



Summary for Pond 25: SWL 2

Inflow Area = 2.288 ac,100.00% Impervious, Inflow Depth > 6.07" for 25-yr event
Inflow = 15.16 cfs @ 12.04 hrs, Volume= 1.157 af
Outflow = 5.27 cfs @ 12.21 hrs, Volume= 1.011 af, Atten= 65%, Lag= 10.2 min
Primary = 5.27 cfs @ 12.21 hrs, Volume= 1.011 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Peak Elev= 23.80' @ 12.21 hrs Storage= 16,928 cf

Plug-Flow detention time= 163.2 min calculated for 1.008 af (87% of inflow)
Center-of-Mass det. time= 94.9 min (839.9 - 745.0)

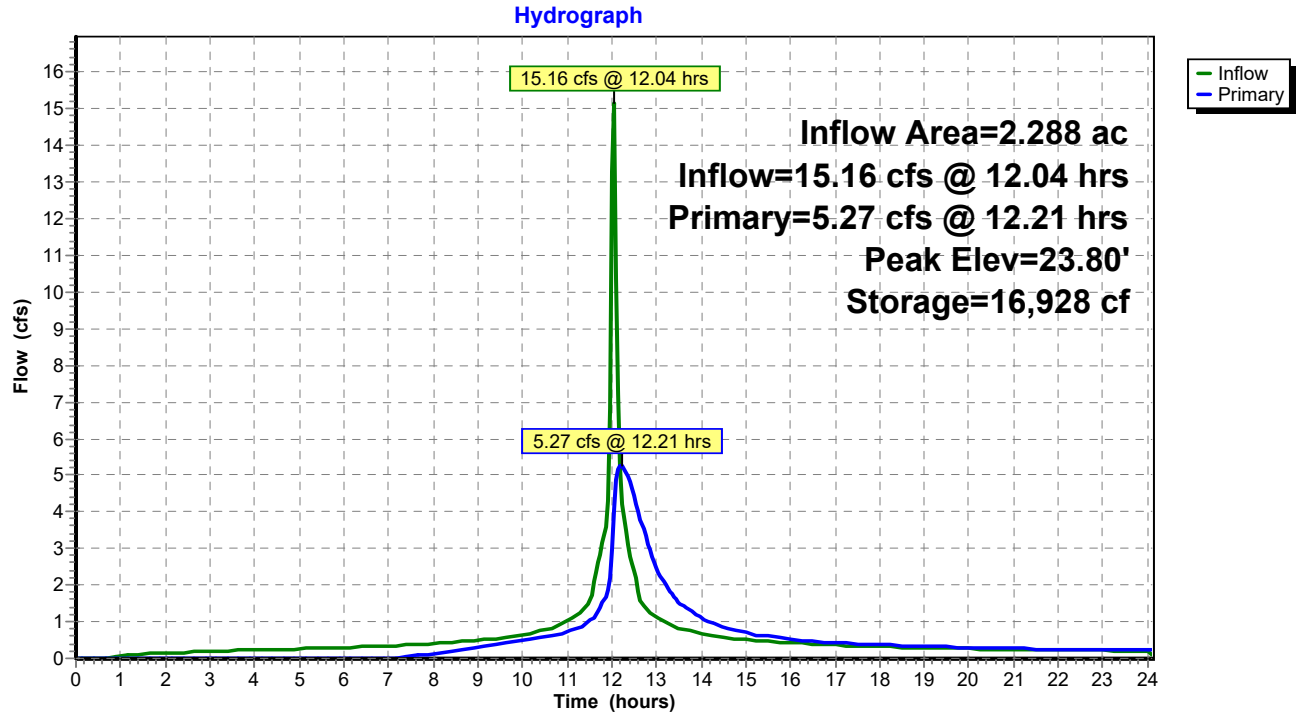
Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	29,613 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	0	0
23.00	9,010	9,010
24.00	9,863	18,873
25.00	10,740	29,613

Device	Routing	Invert	Outlet Devices
#1	Primary	22.50'	**15.0" Round Culvert** L= 6.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 22.50' / 22.20' S= 0.0462 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Primary	23.00'	**30.0 deg x 1.50' rise Sharp-Crested Vee/Trap Weir**Cv= 2.61 (C= 3.26)

Primary OutFlow Max=5.26 cfs @ 12.21 hrs HW=23.80' (Free Discharge)
└**1=Culvert** (Inlet Controls 4.86 cfs @ 3.96 fps)
└**2=Sharp-Crested Vee/Trap Weir**(Weir Controls 0.40 cfs @ 2.34 fps)

Pond 25: SWL 2



Summary for Subcatchment 20: DA 2

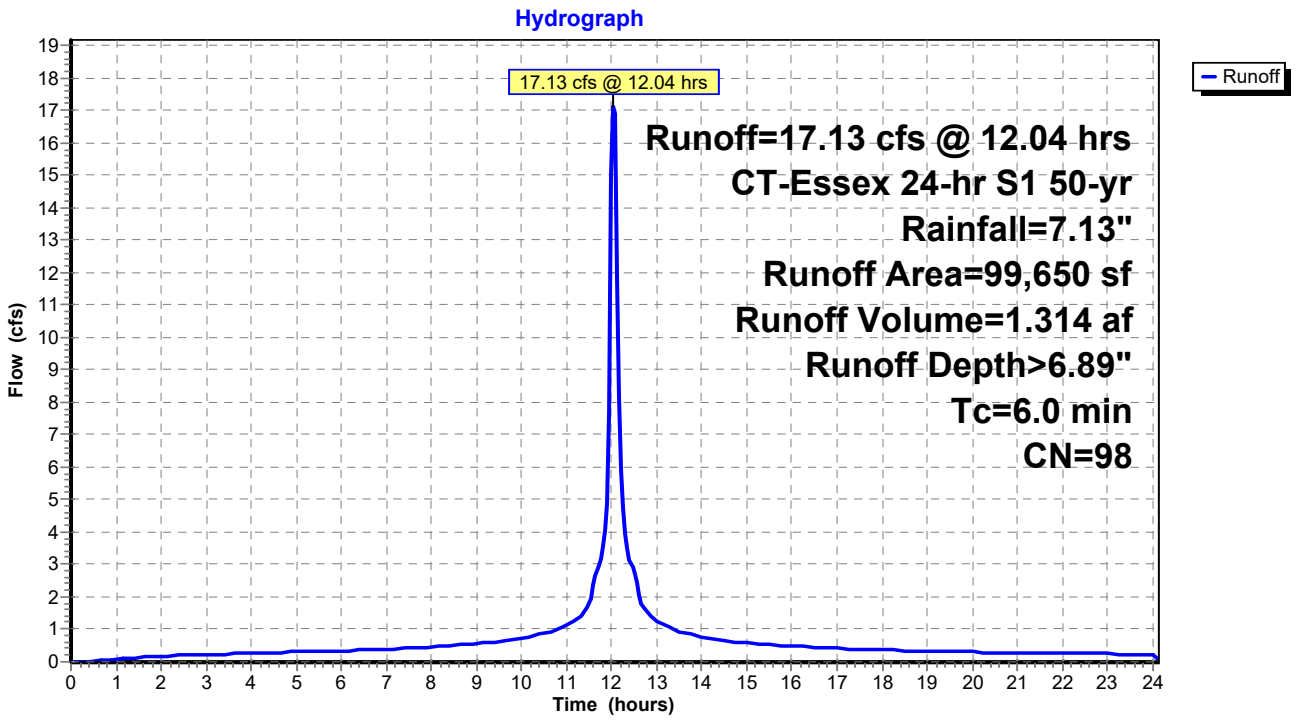
Runoff = 17.13 cfs @ 12.04 hrs, Volume= 1.314 af, Depth> 6.89"
Routed to Pond 25 : SWL 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 50-yr Rainfall=7.13"

	Area (sf)	CN	Description
*	99,650	98	
	99,650		100.00% Impervious Area

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

Subcatchment 20: DA 2



Summary for Pond 25: SWL 2

Inflow Area = 2.288 ac,100.00% Impervious, Inflow Depth > 6.89" for 50-yr event
Inflow = 17.13 cfs @ 12.04 hrs, Volume= 1.314 af
Outflow = 5.93 cfs @ 12.21 hrs, Volume= 1.164 af, Atten= 65%, Lag= 10.2 min
Primary = 5.93 cfs @ 12.21 hrs, Volume= 1.164 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Peak Elev= 23.94' @ 12.21 hrs Storage= 18,276 cf

Plug-Flow detention time= 152.5 min calculated for 1.162 af (88% of inflow)
Center-of-Mass det. time= 89.4 min (832.5 - 743.1)

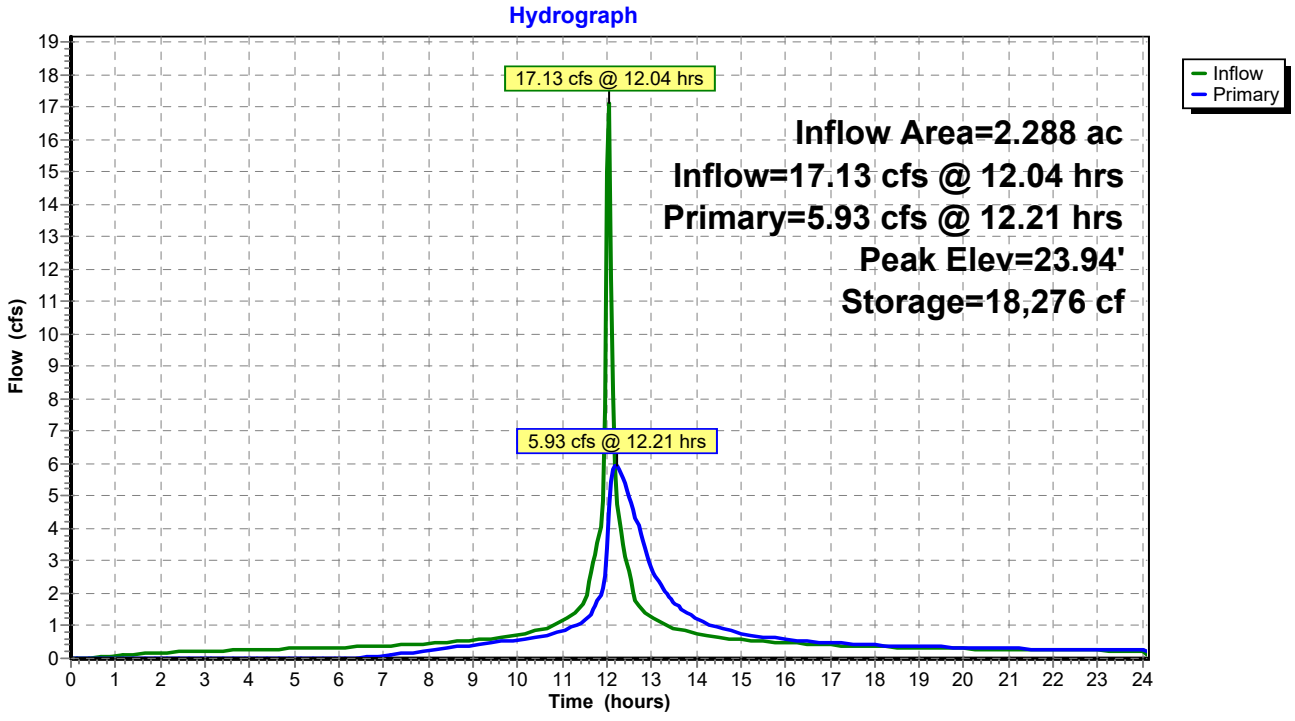
Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	29,613 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	0	0
23.00	9,010	9,010
24.00	9,863	18,873
25.00	10,740	29,613

Device	Routing	Invert	Outlet Devices
#1	Primary	22.50'	**15.0" Round Culvert** L= 6.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 22.50' / 22.20' S= 0.0462 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Primary	23.00'	**30.0 deg x 1.50' rise Sharp-Crested Vee/Trap Weir**Cv= 2.61 (C= 3.26)

Primary OutFlow Max=5.92 cfs @ 12.21 hrs HW=23.94' (Free Discharge)
└**1=Culvert** (Inlet Controls 5.33 cfs @ 4.34 fps)
└**2=Sharp-Crested Vee/Trap Weir**(Weir Controls 0.59 cfs @ 2.53 fps)

Pond 25: SWL 2



Summary for Subcatchment 20: DA 2

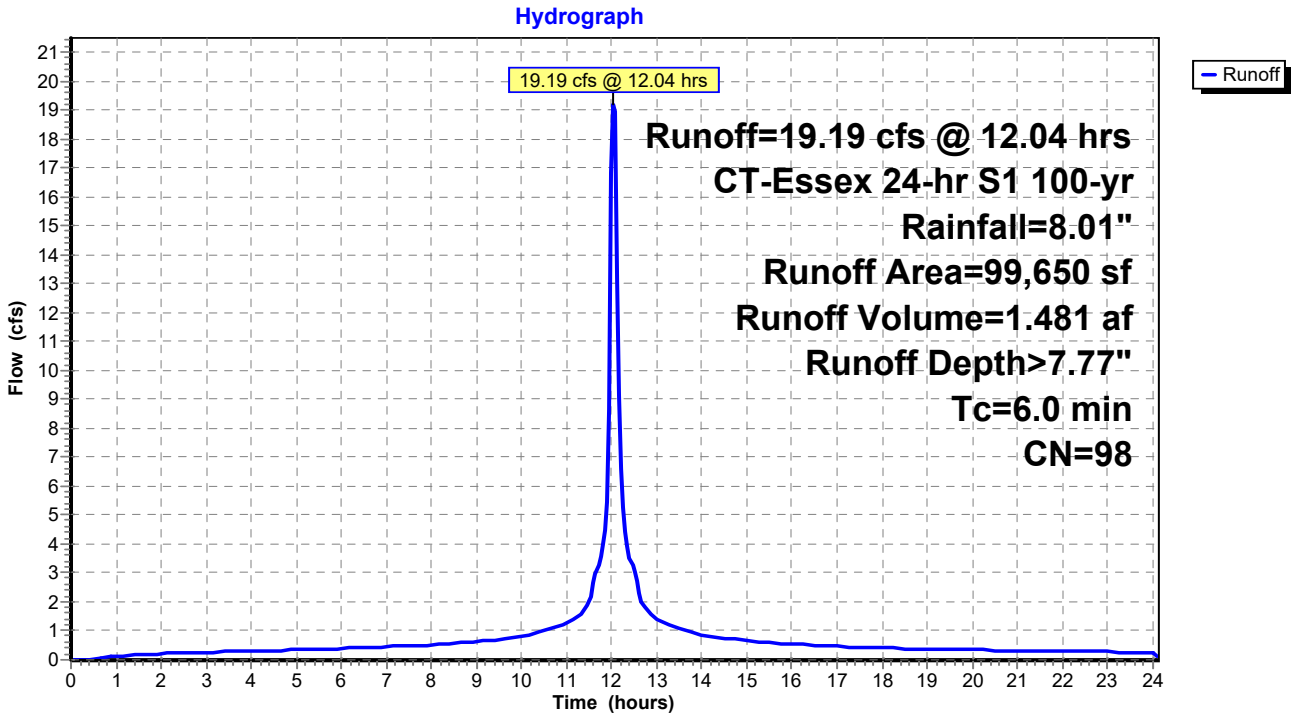
Runoff = 19.19 cfs @ 12.04 hrs, Volume= 1.481 af, Depth> 7.77"
Routed to Pond 25 : SWL 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 100-yr Rainfall=8.01"

	Area (sf)	CN	Description
*	99,650	98	
	99,650		100.00% Impervious Area

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

Subcatchment 20: DA 2



Summary for Pond 25: SWL 2

Inflow Area = 2.288 ac,100.00% Impervious, Inflow Depth > 7.77" for 100-yr event
Inflow = 19.19 cfs @ 12.04 hrs, Volume= 1.481 af
Outflow = 6.60 cfs @ 12.21 hrs, Volume= 1.329 af, Atten= 66%, Lag= 10.2 min
Primary = 6.60 cfs @ 12.21 hrs, Volume= 1.329 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Peak Elev= 24.08' @ 12.21 hrs Storage= 19,683 cf

Plug-Flow detention time= 142.9 min calculated for 1.326 af (90% of inflow)
Center-of-Mass det. time= 84.5 min (825.9 - 741.4)

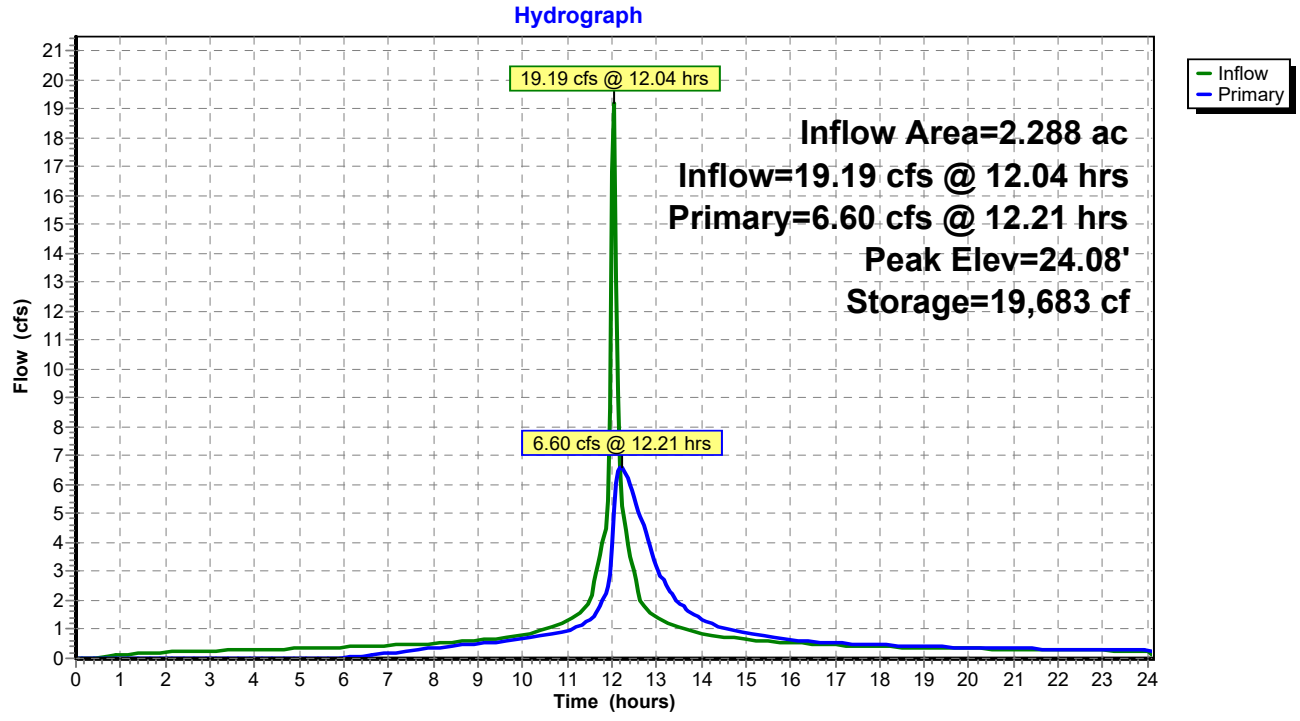
Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	29,613 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	0	0
23.00	9,010	9,010
24.00	9,863	18,873
25.00	10,740	29,613

Device	Routing	Invert	Outlet Devices
#1	Primary	22.50'	**15.0" Round Culvert** L= 6.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 22.50' / 22.20' S= 0.0462 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#2	Primary	23.00'	**30.0 deg x 1.50' rise Sharp-Crested Vee/Trap Weir**Cv= 2.61 (C= 3.26)

Primary OutFlow Max=6.59 cfs @ 12.21 hrs HW=24.07' (Free Discharge)
└**1=Culvert** (Inlet Controls 5.75 cfs @ 4.69 fps)
└**2=Sharp-Crested Vee/Trap Weir**(Weir Controls 0.83 cfs @ 2.70 fps)

Pond 25: SWL 2



Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	100-yr	CT-Essex 24-hr S1	100-yr	Default	24.00	1	8.01	2

Summary for Subcatchment 20: DA 2

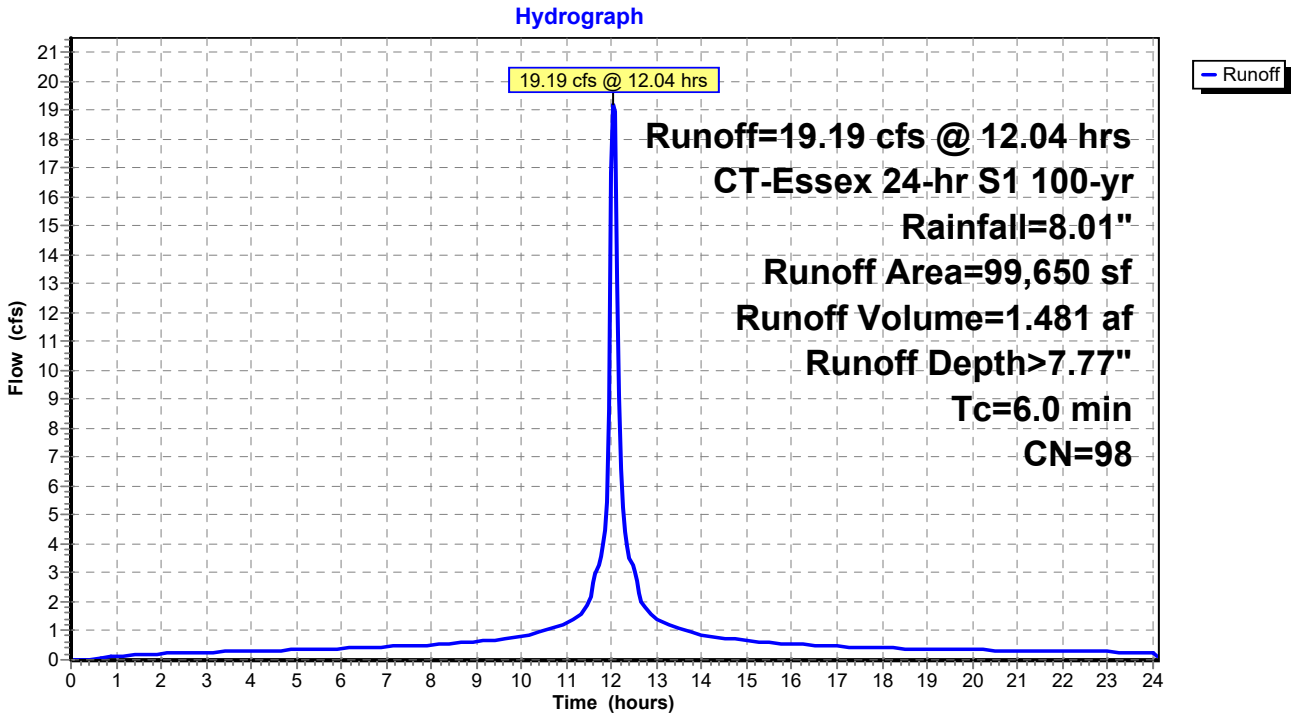
Runoff = 19.19 cfs @ 12.04 hrs, Volume= 1.481 af, Depth> 7.77"
Routed to Pond 25 : SWL 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
CT-Essex 24-hr S1 100-yr Rainfall=8.01"

	Area (sf)	CN	Description
*	99,650	98	
	99,650		100.00% Impervious Area

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

Subcatchment 20: DA 2



Summary for Pond 25: SWL 2

Inflow Area = 2.288 ac,100.00% Impervious, Inflow Depth > 7.77" for 100-yr event
Inflow = 19.19 cfs @ 12.04 hrs, Volume= 1.481 af
Outflow = 14.43 cfs @ 12.10 hrs, Volume= 1.040 af, Atten= 25%, Lag= 3.7 min
Primary = 14.43 cfs @ 12.10 hrs, Volume= 1.040 af

Routing by Stor-Ind method, Time Span= 0.00-24.10 hrs, dt= 0.05 hrs
Peak Elev= 24.53' @ 12.10 hrs Storage= 24,572 cf

Plug-Flow detention time= 242.1 min calculated for 1.040 af (70% of inflow)
Center-of-Mass det. time= 121.2 min (862.6 - 741.4)

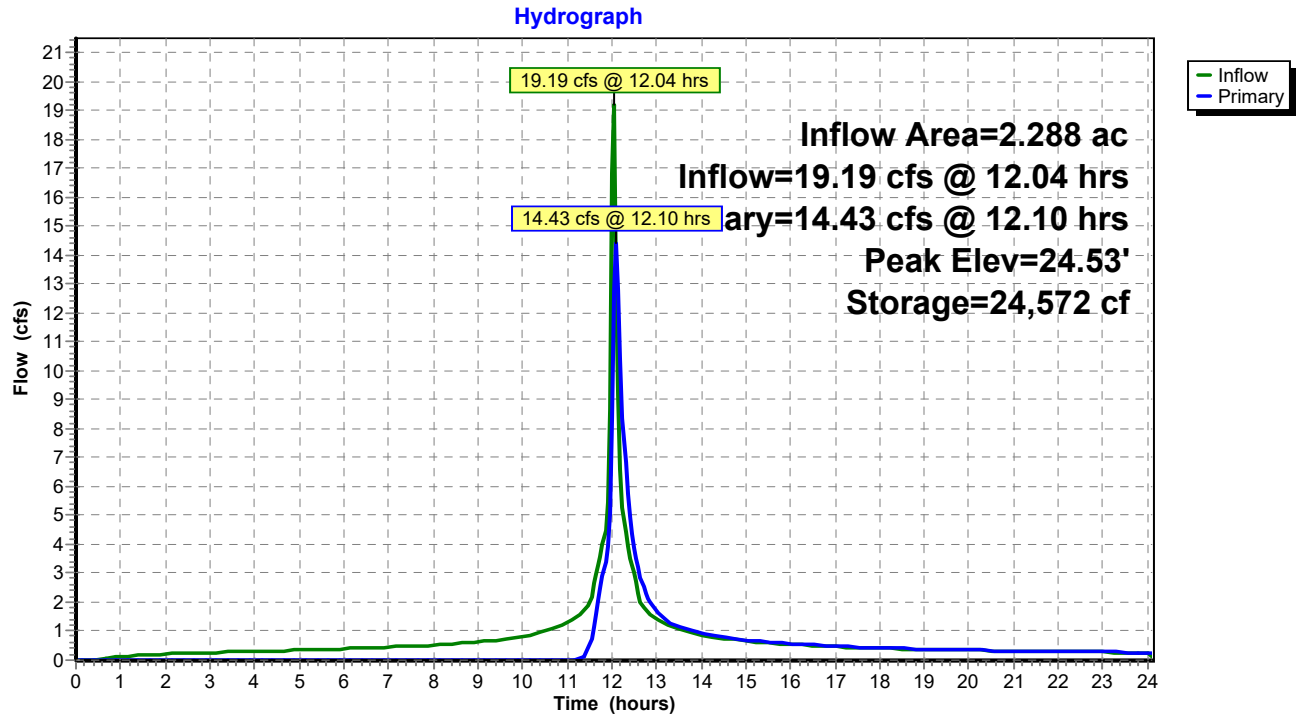
Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	29,613 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	0	0
23.00	9,010	9,010
24.00	9,863	18,873
25.00	10,740	29,613

Device	Routing	Invert	Outlet Devices
#1	Primary	24.00'	**7.7" x 3.7" Horiz. Orifice/Grate X 4.00 columns** X 10 rows C= 0.600 in 31.0" x 37.5" Grate (98% open area) Limited to weir flow at low heads

Primary OutFlow Max=14.43 cfs @ 12.10 hrs HW=24.53' (Free Discharge)
1=Orifice/Grate (Weir Controls 14.43 cfs @ 2.38 fps)

Pond 25: SWL 2



Appendix C
NRCS Soil Type Information

Custom Soil Resource Report
Soil Map

Map Scale: 1:4,210 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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: Dec 31, 2009—Sep 6, 2017

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
13	Walpole sandy loam, 0 to 3 percent slopes	4.2	4.8%
17	Timakwa and Natchaug soils, 0 to 2 percent slopes	34.1	38.6%
18	Catden and Freetown soils, 0 to 2 percent slopes	0.0	0.0%
23A	Sudbury sandy loam, 0 to 5 percent slopes	2.7	3.1%
29B	Agawam fine sandy loam, 3 to 8 percent slopes	4.4	4.9%
36B	Windsor loamy sand, 3 to 8 percent slopes	30.2	34.1%
73C	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	0.1	0.1%
221A	Ninigret-Urban land complex, 0 to 5 percent slopes	0.8	0.9%
307	Urban land	9.9	11.2%
701A	Ninigret fine sandy loam, 0 to 3 percent slopes	0.9	1.0%
W	Water	1.2	1.3%
Totals for Area of Interest		**88.3**	**100.0%**

Map Unit Descriptions

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

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

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a

Landform position (three-dimensional): Head slope, nose slope, side slope, crest, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Merrimac

Percent of map unit: 3 percent
Landform: Kames, eskers, moraines, outwash terraces, outwash plains
Landform position (two-dimensional): Backslope, footslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 2 percent
Landform: Deltas, outwash plains, dunes, outwash terraces
Landform position (three-dimensional): Riser, tread
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

36B—Windsor loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svkf
Elevation: 0 to 1,210 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Windsor, loamy sand, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor, Loamy Sand

Setting

Landform: Outwash terraces, deltas, outwash plains, dunes
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

O - 0 to 1 inches: moderately decomposed plant material

A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley, loamy sand

Percent of map unit: 10 percent
Landform: Eskers, kames, deltas, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Deerfield, loamy sand

Percent of map unit: 5 percent
Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

73C—Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky

Map Unit Setting

National map unit symbol: 2w698
Elevation: 0 to 1,550 feet
Mean annual precipitation: 36 to 71 inches

Appendix D
NOAA Atlas 14 Precipitation Information

NOAA Atlas 14, Volume 10, Version 3
Location name: Essex, Connecticut, USA*
Latitude: 41.3393°, Longitude: -72.4089°
Elevation: 28.95 ft**
* source: ESRI Maps
** source: USGS

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_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.338** (0.259-0.436)	**0.406** (0.311-0.523)	**0.517** (0.394-0.667)	**0.610** (0.462-0.791)	**0.737** (0.543-0.989)	**0.832** (0.601-1.13)	**0.932** (0.657-1.31)	**1.05** (0.700-1.49)	**1.21** (0.780-1.76)	**1.34** (0.847-1.99)
10-min	**0.479** (0.367-0.617)	**0.576** (0.440-0.742)	**0.734** (0.560-0.948)	**0.864** (0.655-1.12)	**1.04** (0.769-1.40)	**1.18** (0.853-1.61)	**1.32** (0.931-1.86)	**1.48** (0.992-2.11)	**1.71** (1.11-2.50)	**1.90** (1.20-2.82)
15-min	**0.564** (0.431-0.726)	**0.677** (0.518-0.872)	**0.862** (0.656-1.11)	**1.02** (0.770-1.32)	**1.23** (0.904-1.65)	**1.39** (1.00-1.89)	**1.55** (1.10-2.18)	**1.74** (1.17-2.48)	**2.01** (1.30-2.94)	**2.23** (1.41-3.32)
30-min	**0.784** (0.599-1.01)	**0.940** (0.719-1.21)	**1.20** (0.912-1.55)	**1.41** (1.07-1.83)	**1.70** (1.25-2.29)	**1.92** (1.39-2.62)	**2.15** (1.52-3.03)	**2.41** (1.62-3.44)	**2.79** (1.80-4.07)	**3.09** (1.96-4.59)
60-min	**1.00** (0.767-1.29)	**1.20** (0.920-1.55)	**1.53** (1.17-1.98)	**1.80** (1.37-2.34)	**2.18** (1.60-2.92)	**2.46** (1.78-3.35)	**2.75** (1.94-3.87)	**3.09** (2.07-4.39)	**3.56** (2.30-5.21)	**3.95** (2.50-5.86)
2-hr	**1.31** (1.01-1.68)	**1.58** (1.21-2.02)	**2.00** (1.54-2.57)	**2.36** (1.80-3.04)	**2.85** (2.11-3.80)	**3.21** (2.34-4.36)	**3.60** (2.56-5.04)	**4.05** (2.72-5.73)	**4.72** (3.06-6.85)	**5.28** (3.35-7.77)
3-hr	**1.53** (1.18-1.94)	**1.83** (1.41-2.33)	**2.33** (1.79-2.97)	**2.74** (2.09-3.51)	**3.30** (2.46-4.39)	**3.72** (2.72-5.04)	**4.18** (2.98-5.83)	**4.71** (3.17-6.62)	**5.50** (3.58-7.95)	**6.17** (3.92-9.05)
6-hr	**1.95** (1.51-2.46)	**2.33** (1.81-2.95)	**2.96** (2.29-3.76)	**3.48** (2.68-4.44)	**4.20** (3.15-5.55)	**4.74** (3.48-6.37)	**5.31** (3.81-7.37)	**5.99** (4.05-8.37)	**7.01** (4.57-10.0)	**7.86** (5.02-11.4)
12-hr	**2.42** (1.90-3.05)	**2.91** (2.27-3.65)	**3.69** (2.88-4.65)	**4.34** (3.37-5.50)	**5.24** (3.95-6.87)	**5.91** (4.37-7.88)	**6.63** (4.77-9.11)	**7.47** (5.07-10.3)	**8.71** (5.71-12.4)	**9.77** (6.25-14.1)
24-hr	**2.85** (2.24-3.55)	**3.44** (2.71-4.29)	**4.41** (3.45-5.52)	**5.21** (4.06-6.55)	**6.31** (4.78-8.23)	**7.13** (5.30-9.46)	**8.01** (5.82-11.0)	**9.07** (6.19-12.5)	**10.7** (7.00-15.0)	**12.0** (7.71-17.2)
2-day	**3.18** (2.52-3.94)	**3.89** (3.08-4.82)	**5.05** (3.98-6.27)	**6.01** (4.71-7.50)	**7.33** (5.60-9.51)	**8.31** (6.23-11.0)	**9.37** (6.87-12.8)	**10.7** (7.32-14.6)	**12.7** (8.40-17.8)	**14.5** (9.36-20.6)
3-day	**3.44** (2.74-4.25)	**4.21** (3.35-5.20)	**5.47** (4.33-6.77)	**6.51** (5.13-8.09)	**7.94** (6.08-10.3)	**9.00** (6.77-11.8)	**10.2** (7.47-13.8)	**11.6** (7.95-15.7)	**13.8** (9.13-19.3)	**15.8** (10.2-22.3)
4-day	**3.70** (2.95-4.55)	**4.50** (3.59-5.55)	**5.82** (4.62-7.18)	**6.91** (5.46-8.57)	**8.41** (6.46-10.8)	**9.52** (7.18-12.5)	**10.7** (7.90-14.6)	**12.2** (8.40-16.6)	**14.6** (9.63-20.2)	**16.6** (10.7-23.3)
7-day	**4.42** (3.54-5.40)	**5.29** (4.24-6.48)	**6.71** (5.36-8.24)	**7.90** (6.27-9.73)	**9.52** (7.34-12.2)	**10.7** (8.11-13.9)	**12.0** (8.86-16.1)	**13.6** (9.39-18.3)	**16.0** (10.6-22.1)	**18.1** (11.7-25.3)
10-day	**5.12** (4.12-6.24)	**6.03** (4.85-7.36)	**7.52** (6.02-9.20)	**8.76** (6.97-10.7)	**10.5** (8.07-13.3)	**11.7** (8.87-15.1)	**13.1** (9.63-17.4)	**14.7** (10.2-19.6)	**17.1** (11.4-23.4)	**19.1** (12.4-26.6)
20-day	**7.27** (5.89-8.80)	**8.25** (6.68-10.0)	**9.87** (7.96-12.0)	**11.2** (8.98-13.7)	**13.0** (10.1-16.4)	**14.4** (10.9-18.4)	**15.9** (11.6-20.7)	**17.5** (12.2-23.1)	**19.7** (13.2-26.7)	**21.5** (14.0-29.6)
30-day	**9.07** (7.38-10.9)	**10.1** (8.21-12.2)	**11.8** (9.55-14.3)	**13.2** (10.6-16.0)	**15.1** (11.7-18.8)	**16.6** (12.6-20.9)	**18.1** (13.2-23.3)	**19.6** (13.7-25.9)	**21.7** (14.5-29.3)	**23.2** (15.2-31.9)
45-day	**11.3** (9.25-13.6)	**12.4** (10.1-14.9)	**14.2** (11.5-17.1)	**15.6** (12.6-18.9)	**17.7** (13.8-21.8)	**19.2** (14.6-24.1)	**20.8** (15.2-26.5)	**22.2** (15.6-29.2)	**24.1** (16.2-32.4)	**25.4** (16.6-34.7)
60-day	**13.2** (10.8-15.8)	**14.3** (11.7-17.2)	**16.2** (13.2-19.4)	**17.7** (14.3-21.3)	**19.8** (15.4-24.3)	**21.4** (16.3-26.7)	**23.0** (16.8-29.1)	**24.4** (17.2-31.9)	**26.1** (17.6-35.0)	**27.3** (17.9-37.1)

[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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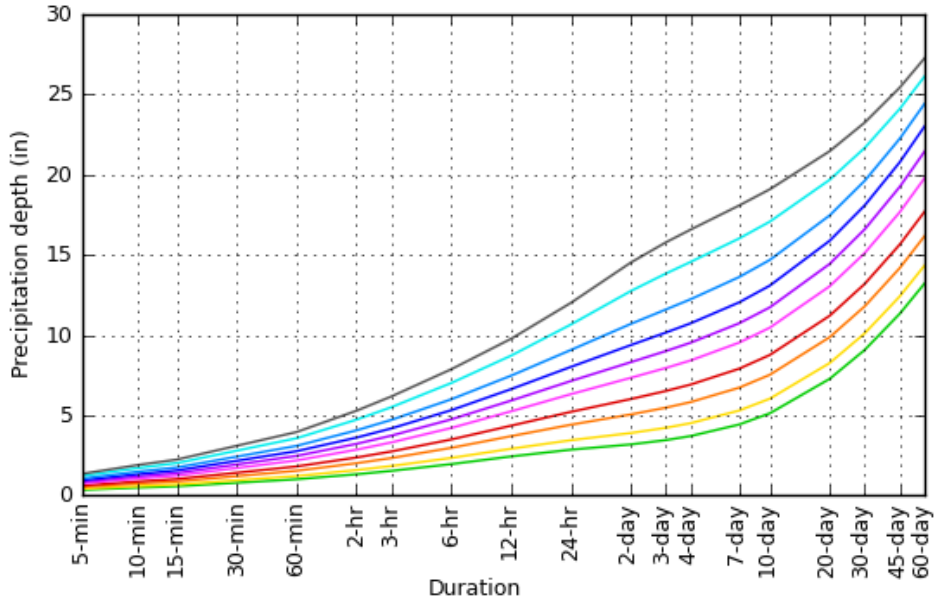
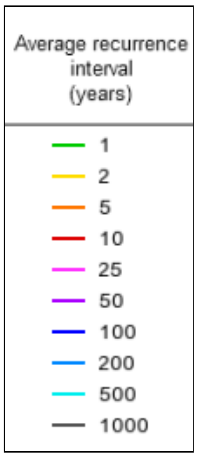
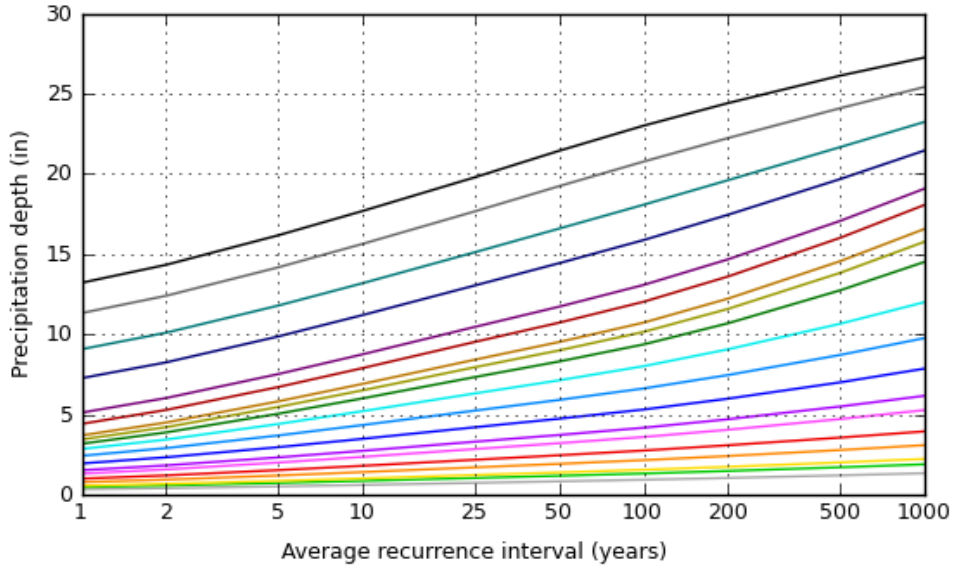
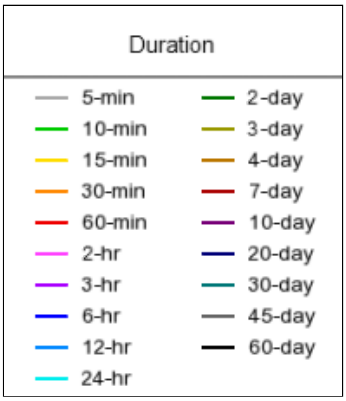
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 41.3393°, Longitude: -72.4089°









NOAA Atlas 14, Volume 10, Version 3

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Maps & aerials

Small scale terrain

NOAA Atlas 14, Volume 10, Version 3
Location name: Essex, Connecticut, USA*
Latitude: 41.3393°, Longitude: -72.4089°
Elevation: 28.95 ft**
* source: ESRI Maps
** source: USGS

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_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.06** (3.11-5.23)	**4.87** (3.73-6.28)	**6.20** (4.73-8.00)	**7.32** (5.54-9.49)	**8.84** (6.52-11.9)	**9.98** (7.21-13.6)	**11.2** (7.88-15.7)	**12.5** (8.40-17.8)	**14.5** (9.36-21.2)	**16.1** (10.2-23.9)
10-min	**2.87** (2.20-3.70)	**3.46** (2.64-4.45)	**4.40** (3.36-5.69)	**5.18** (3.93-6.72)	**6.26** (4.61-8.41)	**7.07** (5.12-9.65)	**7.93** (5.59-11.1)	**8.89** (5.95-12.7)	**10.3** (6.64-15.0)	**11.4** (7.21-16.9)
15-min	**2.26** (1.72-2.90)	**2.71** (2.07-3.49)	**3.45** (2.62-4.45)	**4.06** (3.08-5.27)	**4.91** (3.62-6.59)	**5.55** (4.01-7.57)	**6.22** (4.38-8.73)	**6.97** (4.67-9.92)	**8.04** (5.20-11.8)	**8.93** (5.65-13.3)
30-min	**1.57** (1.20-2.02)	**1.88** (1.44-2.42)	**2.39** (1.82-3.09)	**2.82** (2.14-3.66)	**3.41** (2.51-4.57)	**3.85** (2.78-5.25)	**4.31** (3.04-6.05)	**4.83** (3.23-6.87)	**5.57** (3.60-8.15)	**6.18** (3.91-9.18)
60-min	**1.00** (0.767-1.29)	**1.20** (0.920-1.55)	**1.53** (1.17-1.98)	**1.80** (1.37-2.34)	**2.18** (1.60-2.92)	**2.46** (1.78-3.35)	**2.75** (1.94-3.87)	**3.09** (2.07-4.39)	**3.56** (2.30-5.21)	**3.95** (2.50-5.86)
2-hr	**0.656** (0.506-0.840)	**0.788** (0.606-1.01)	**1.00** (0.768-1.28)	**1.18** (0.899-1.52)	**1.42** (1.06-1.90)	**1.61** (1.17-2.18)	**1.80** (1.28-2.52)	**2.03** (1.36-2.86)	**2.36** (1.53-3.42)	**2.64** (1.67-3.89)
3-hr	**0.508** (0.393-0.647)	**0.609** (0.470-0.776)	**0.774** (0.596-0.989)	**0.911** (0.697-1.17)	**1.10** (0.819-1.46)	**1.24** (0.907-1.68)	**1.39** (0.993-1.94)	**1.57** (1.06-2.21)	**1.83** (1.19-2.65)	**2.05** (1.31-3.01)
6-hr	**0.325** (0.253-0.411)	**0.389** (0.302-0.493)	**0.495** (0.383-0.628)	**0.582** (0.448-0.741)	**0.702** (0.526-0.927)	**0.791** (0.582-1.06)	**0.887** (0.637-1.23)	**1.00** (0.677-1.40)	**1.17** (0.763-1.68)	**1.31** (0.838-1.91)
12-hr	**0.201** (0.157-0.253)	**0.241** (0.188-0.303)	**0.306** (0.239-0.386)	**0.361** (0.279-0.456)	**0.435** (0.327-0.570)	**0.491** (0.362-0.654)	**0.550** (0.396-0.756)	**0.620** (0.421-0.858)	**0.723** (0.474-1.03)	**0.811** (0.519-1.17)
24-hr	**0.119** (0.093-0.148)	**0.143** (0.113-0.179)	**0.184** (0.144-0.230)	**0.217** (0.169-0.273)	**0.263** (0.199-0.343)	**0.297** (0.221-0.394)	**0.334** (0.242-0.457)	**0.378** (0.258-0.520)	**0.444** (0.292-0.626)	**0.500** (0.321-0.716)
2-day	**0.066** (0.052-0.082)	**0.081** (0.064-0.100)	**0.105** (0.083-0.131)	**0.125** (0.098-0.156)	**0.153** (0.117-0.198)	**0.173** (0.130-0.229)	**0.195** (0.143-0.267)	**0.223** (0.152-0.304)	**0.265** (0.175-0.371)	**0.302** (0.195-0.429)
3-day	**0.048** (0.038-0.059)	**0.059** (0.047-0.072)	**0.076** (0.060-0.094)	**0.090** (0.071-0.112)	**0.110** (0.085-0.143)	**0.125** (0.094-0.165)	**0.141** (0.104-0.192)	**0.161** (0.110-0.219)	**0.192** (0.127-0.267)	**0.219** (0.141-0.309)
4-day	**0.039** (0.031-0.047)	**0.047** (0.037-0.058)	**0.061** (0.048-0.075)	**0.072** (0.057-0.089)	**0.088** (0.067-0.113)	**0.099** (0.075-0.130)	**0.112** (0.082-0.152)	**0.127** (0.088-0.172)	**0.152** (0.100-0.210)	**0.173** (0.112-0.243)
7-day	**0.026** (0.021-0.032)	**0.031** (0.025-0.039)	**0.040** (0.032-0.049)	**0.047** (0.037-0.058)	**0.057** (0.044-0.072)	**0.064** (0.048-0.083)	**0.072** (0.053-0.096)	**0.081** (0.056-0.109)	**0.095** (0.063-0.131)	**0.108** (0.070-0.150)
10-day	**0.021** (0.017-0.026)	**0.025** (0.020-0.031)	**0.031** (0.025-0.038)	**0.036** (0.029-0.045)	**0.044** (0.034-0.055)	**0.049** (0.037-0.063)	**0.055** (0.040-0.072)	**0.061** (0.042-0.082)	**0.071** (0.047-0.098)	**0.080** (0.052-0.111)
20-day	**0.015** (0.012-0.018)	**0.017** (0.014-0.021)	**0.021** (0.017-0.025)	**0.023** (0.019-0.028)	**0.027** (0.021-0.034)	**0.030** (0.023-0.038)	**0.033** (0.024-0.043)	**0.036** (0.025-0.048)	**0.041** (0.027-0.056)	**0.045** (0.029-0.062)
30-day	**0.013** (0.010-0.015)	**0.014** (0.011-0.017)	**0.016** (0.013-0.020)	**0.018** (0.015-0.022)	**0.021** (0.016-0.026)	**0.023** (0.017-0.029)	**0.025** (0.018-0.032)	**0.027** (0.019-0.036)	**0.030** (0.020-0.041)	**0.032** (0.021-0.044)
45-day	**0.010** (0.009-0.013)	**0.011** (0.009-0.014)	**0.013** (0.011-0.016)	**0.014** (0.012-0.018)	**0.016** (0.013-0.020)	**0.018** (0.014-0.022)	**0.019** (0.014-0.025)	**0.021** (0.014-0.027)	**0.022** (0.015-0.030)	**0.024** (0.015-0.032)
60-day	**0.009** (0.008-0.011)	**0.010** (0.008-0.012)	**0.011** (0.009-0.013)	**0.012** (0.010-0.015)	**0.014** (0.011-0.017)	**0.015** (0.011-0.019)	**0.016** (0.012-0.020)	**0.017** (0.012-0.022)	**0.018** (0.012-0.024)	**0.019** (0.012-0.026)

[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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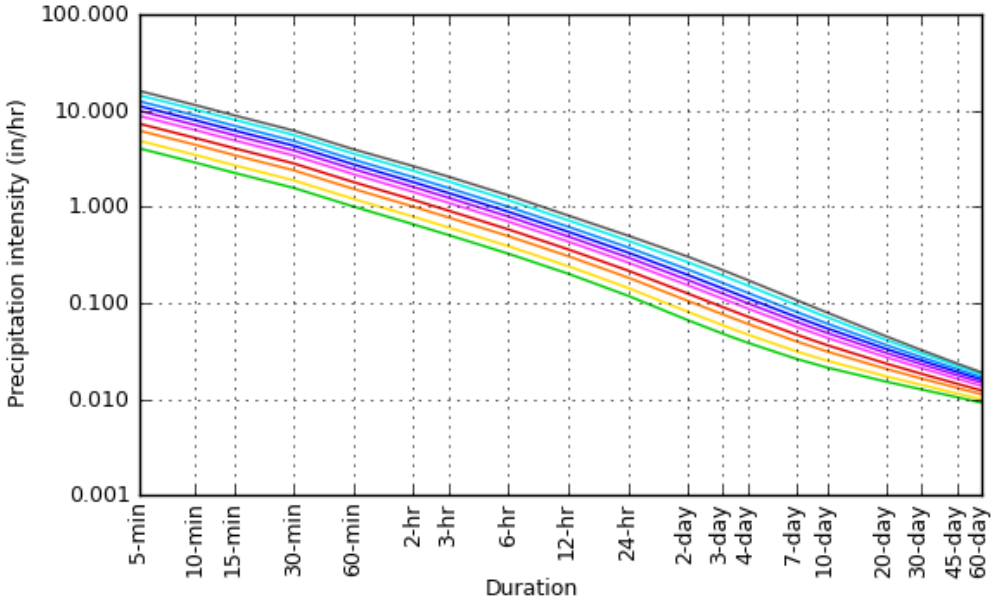
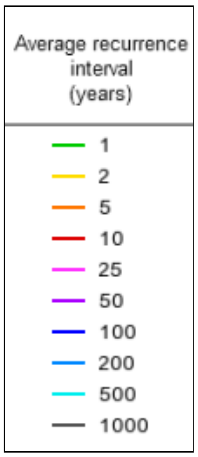
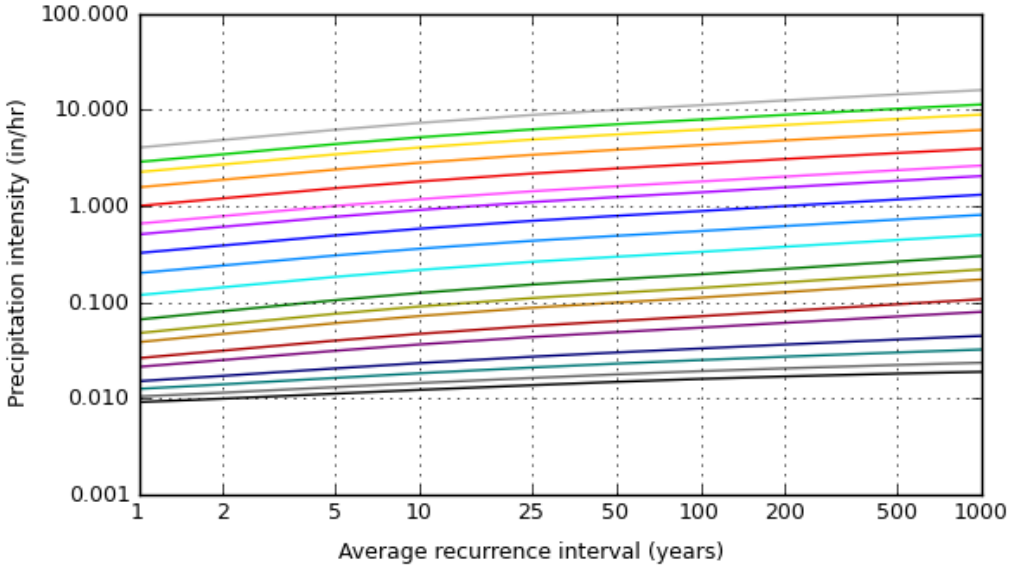
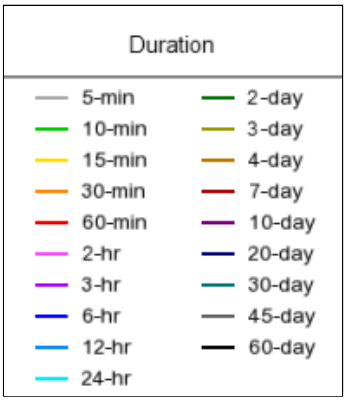
PF graphical

PDS-based intensity-duration-frequency (IDF) curves
Latitude: 41.3393°, Longitude: -72.4089°









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Maps & aerials

Small scale terrain

Appendix E
General Site Operation and Maintenance Plan

General Site Operation and Maintenance Plan

Bokum Road Business Park
Essex, Connecticut

- This Site Operation and Maintenance Plan outlines practices and procedures intended to minimize stormwater pollution resulting from the developed sites operation and its infrastructure. Stormwater runoff from the site drains to adjacent inland wetlands associated with the Mud River and the natural soils on the site are well drained. Therefore, the minimization of stormwater pollution from the site and the protection of surface and groundwater resources is of particular importance.

- The plan includes typical standard of practice best management and good housekeeping practices and pollution prevention measures and procedures for the sites operation and infrastructure including driveways, vehicle parking areas, stormwater management system, and maintained lawn and landscaped areas.

- The responsible party for implementation of the best management and good housekeeping practices and pollution prevention measures and procedures should be the site owner or its designated agent.

- The responsible party should maintain a copy of this plan and the site development plans for the site that depict the sites infrastructure including its stormwater management system.

- The responsible party should also maintain records of site inspections and maintenance actions completed and response actions for spills of potentially harmful materials that may occur.

1. Spill Response and Clean-up

   Maintain spill response and clean-up materials on-site for accidental spills of vehicle or other source related fuels, oils, and other liquid materials.

   Spill response materials should include barriers to prevent the entry of spilled materials into catch basin inlets and the stormwater wetlands and to prevent spilled materials from entering the adjoining Town road right-of-way or adjoining properties.

   Should a spill occur, the Town of Essex Fire Marshalls Office (860-767-4340) should be notified.

2. Routine Site Inspections and Good Housekeeping Practices

   The minimum frequency of routine site inspections should be twice annually after foliage season and in the spring after winter season snow and ice control operations have ceased. In addition, routine site inspections should be completed after significant rainfall events (a rainfall event with a depth of one-half inch or greater).

   Other than refuse and recyclable containers, do not store any materials outdoors that may be exposed to stormwater and introduce pollutants into stormwater runoff.

   Hazardous, toxic, or contaminated materials stored within the site's buildings shall be stored in containers or vessels constructed of non-porous materials.

   Containers or vessels storing liquid hazardous, toxic, or contaminated materials within the site's buildings shall provide secondary containment adequate to store the full volume of the container or vessel.

   Ensure that all refuse and recyclables are stored within proper receptacles.

   Ensure that receptacle tops are operational and remain in the closed position.

   Ensure that drain hole plugs are installed on all receptacles.

Routinely pick up trash and debris and dispose of properly.

Repair eroded slopes and lawn areas as required.

Adjust and maintain irrigation system sprinkler heads to minimize overspray onto pavements and runoff.

Install drip irrigation where feasible to increase efficiency and minimize water loss due to over-spray and wind.

Monitor system run times to maximize soil absorption and minimize runoff.

Ensure that exterior water spigots are not leaking.

3. Lawn Care and Landscaping Practices

Perform properly timed routine maintenance of all lawn and planted areas.

Use only slow release fertilizers and use fertilizers and pesticides judiciously and in accordance with manufacturer's instructions.

4. Pavement Sweeping

Sweep driveways and vehicle parking areas annually at a minimum and periodically as required to remove sediment and debris, reduce exposure of these materials to stormwater and reduce the potential for sediment to leave the paved surfaces in stormwater runoff.

Typically, sweeping operations should be performed in the spring after winter snow and ice control operations have ceased.

Dispose of sweepings off-site properly in accordance with applicable regulations.

5. Winter Season Snow and Ice Control

The use of sodium chloride based anti-icing or de-icing chemicals on this site should be prohibited.

The preferred method of snow and ice removal for driveways and vehicle parking areas should be mechanical removal.

Apply non sodium chloride based anti-icing and de-icing chemicals for use at building entrances in accordance with manufacturer's instructions and minimize their use as is practicable.

Do not store anti-icing or de-icing chemicals outdoors.

Store snow removed from pavements in lawn areas where melt waters will not drain to catch basin inlets or the stormwater wetlands, or off site to the adjoining Town road right-of-way or adjoining properties.

6. Stormwater Management System

A. Collection and Conveyance System

Clear leaves, trash, and other debris from catch basin inlet grates routinely.

Remove sediment from catch basin sumps periodically as required. Sediment removal should be performed when accumulated sediment in the catch basin sumps reaches one-half of the sump depth.

Sediment removal should typically be performed in the spring after winter season snow and ice control operations have ceased.

Dispose of sediment off-site properly in accordance with applicable regulations.

Inspect the interior of catch basin and manhole structures to ensure that they are in good structural condition and perform any debris removal or maintenance required.

Inspect storm sewers to ensure that they are in good structural condition and free flowing and perform any maintenance or debris removal required.

B. Hydrodynamic Separators

Inspect the interior of hydrodynamic separator structures periodically. Inspections should include one in the spring after winter season snow and ice control operations have ceased.

Ensure that the internal system components are in working order and that there are no blockages or obstructions in the inlet, separation screen, and outlet.

Remove trash and debris from the separator chamber periodically as required.

Remove sediment from the isolation chamber periodically as required. Sediment removal should be performed when accumulated sediment reaches the removal depth recommended by the manufacturer.

Trash, debris, and sediment removal should be performed in dry weather conditions in accordance with the manufacturers instructions.

Dispose of sediment off-site properly in accordance with applicable regulations.

C. Stormwater Wetlands

Clear leaves, trash, and other debris from the stormwater wetlands and the outlet control structure overflow grates routinely.

Under the guidance of a professional wetland scientist, inspect the stormwater wetlands annually for the presence of invasive species and remove as required.

Ensure that stormwater wetland bottom wetland plantings remain well established. Replant as may be required under the guidance of a professional wetland scientist.

Ensure that all stormwater wetland slopes, and the top of berms have adequate vegetation cover. Seed low percentage cover areas and establish adequate cover.

Mow the stormwater management basin slopes and top of berm twice per year to prevent the establishment of woody vegetation.

Inspect the outlet control structure to ensure that it is in good structural condition and that all water outlet ports, and the structure outlet pipe are free flowing and perform any maintenance or debris removal required.

Inspect stone riprap outlet protection to ensure the areas are free of accumulated debris and that there is no settlement of the stone, displaced stones, or erosion. Perform any maintenance or debris removal required.

General Site Operation and Maintenance Plan

Bokum Road Business Park
Essex, Connecticut

Facility Inspection Form

Inspection Date: _____ Inspection Time: _____

Weather: _____

Date of Previous Rainfall Event: _____ Rainfall Depth: _____

Area	Yes	No	Comments
1. Spill Response Equipment and Materials Spill equipment and materials maintained on site			
2. Outside Materials Storage Spills or leaks evident Materials stored in appropriate containers			
3. Refuse Containers Covers functional and closed Drain plugs installed			
4. Trash/Debris Removal required			
5. Pavement Sweeping Sweeping required			
6. Irrigation System Leaks evident Sprinkler head adjustments required			
7. Outdoor Water Spigots Leaks evident			
8. Lawn and Landscaped Area Vegetation Cover Overseeding required Eroded areas evident			

General Site Operation and Maintenance Plan

Bokum Road Business Park
Essex, Connecticut

Facility Inspection Form

Area	Yes	No	Comments
9. Stormwater Facilities			
Catch basin inlet grate leave and debris removal required			
Catch basin and manhole structure sediment and debris removal required			
Hydrodynamic separator structure sediment and debris removal required			
Discharge locations clear of debris and sediment			
Stone outlet protection settlement/displacement			
Stormwater wetland sediment and debris removal required			
Stormwater wetland slope and berm vegetation cover adequate			
Evidence of erosion			
Slope and berm mowing required			
Outlet control structure water ports and inlet grate leaves and debris removal required			

General Site Operation and Maintenance Plan

Bokum Road Business Park
Essex, Connecticut

Facility Inspection Form

Non-compliance incidents observed: _____

_____

_____

_____

_____

Corrective actions required: _____

_____

_____

_____

_____

Corrective actions completed: _____

_____

_____

_____

_____

Inspector: _____ Title: _____

_____
Signature Date

Appendix F
Catchment Area Maps

REVISIONS:	TITLE:	SEAL:	PREPARED BY:	PROJECT:
NO. / DATE / DESCRIPTION	LAND OF GEORGE C. FIELD COMPANY, INC. BOKUM ROAD ESSEX, CONNECTICUT		Summer Hill Civil Engineers & Land Surveyors, P.C. 60 Wall Street P.O. Box 708 Madison, Connecticut 06443-0708 Telephone: (203) 245-0722	BOKUM ROAD BUSINESS PARK BOKUM ROAD ESSEX, CONNECTICUT
REVISIONS				

DATE:	7-1-21	SHEET:	CATCHMENT AREA MAP	SHEET NO.: CA 1
SCALE:	1"=40'			
DESIGNED:	MJO			
CHECKED:	LJM	FIELD BOOK: -	PROJECT NO.: 20-50	