Drainage Computations

for the Dwelling Addition and Site Improvements
at 37 Spicer Road; Westport, CT

August 3, 2020

Prepared for SPICER37WESTPORT LLC

by Chappa Site Consulting, LLC

CLIENT: SPICER37WESTPORT LLC

PROPERTY LOCATION: 37 Spicer Road; Westport, CT

SOILS: The United States Department of Agriculture, Soil Conservation Service, Soil Survey of Fairfield County, Connecticut indicates that onsite upland soils are Udorthents, smoothed (UD), areas that have been altered by cutting or filling. The onsite soil has been considered a hydrological group "B" soil for the purposes of drainage.

EXISTING CONDITIONS: The site presently contains a single family dwelling and a detached garage. A private horseshoe drive provides access from Spicer Road. The dwelling is serviced by town sanitary sewer and public water supply. A stream and associated wetlands are located in the northern portion of the lot. The stream drains into an existing 36" rcp that bisects the property and eventually runs below Spicer Road. The area to be developed is comprised of level to gentle sloping lawn and garden areas.

PROPOSAL: The applicant is proposing to construct a front porch, dwelling addition and expand the existing drive. The proposed addition, front porch, drive expansion and walk/stairs have an approximate impervious area of 3,226 s.f..

DRAINAGE: 11 - 8' long x 1.0' high x 4' wide precast concrete galleries will be installed to collect the post developed stormwater runoff. The proposed stormwater system has been designed to accommodate the additional runoff produced during a 25 year storm. Furthermore in order to remove storm water pollutants and provide water quality treatment the drainage system has been sized to handle the first 1.0" of rainfall from all proposed areas as recommended in the Connecticut Stormwater Quality Manual. The following pages contain the necessary drainage computations. Future development may require additional storm-water runoff retention/detention

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Client	*Address*	*Project #*
SPICER37WESTPORT LLC	37 Spicer Road; Westport, CT	30286

1. Concrete Gallery & Stone Volume:

Nominal Gallery Dimension = 1.0' High x 4' Wide x 8' Long / Net Volume =18.7 c.f.*

Calculate 40% Trap Rock Void Ratio:
(2.0' wide x 1.5' high x 8' long) x 2 sides = 48 x 0.40 = 19.2 c.f.
Bottom - (4.0' wide x 0.5' high x 8' long) = 16 x 0.40 = 6.4 c.f.
Total Trap Rock Void Volume per 8' section = 25.6
Total Gallery & Trap Rock Void Volume per 8' section = 18.7 cf + 25.6 c.f. = **44.3 c.f.**

* Net Volume Taken from Town of Westport Storm Water Drainage Design Standards

2. Galleries Required for storage of first 1"of runoff:

A. New Impervious Area = **3,226 s.f.***

*(This is the area of the Proposed Dwelling Addition, Front Porch, Walk, Stairs, & Drive Expansion)

B. Volume of runoff from 1" of rainfall

= 3,226 s.f. x (1/12) = 268.83 c.f. - **Use 269 c.f.**

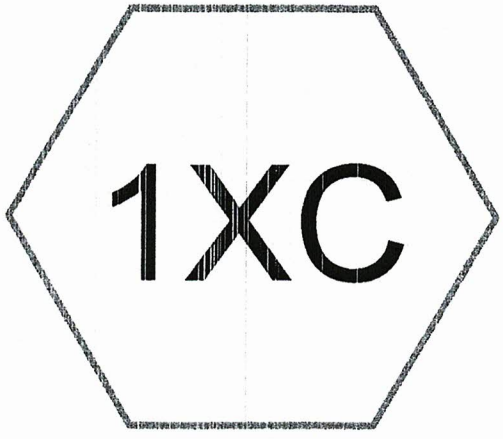
C. Volume Runoff/Gallery Capacity

269 ÷ 44.3 c.f. = **6.07 galleries**

Use 7 galleries or 56 l.f. of 1.0' H x 4' W Gallery

Conclusion:

7 - 1.0' high x 4' wide x 8' long precast concrete galleries will be more than sufficient to handle the first 1" of runoff from the proposed site development, however in order to accommodate the additional runoff produced during a 25 year storm event **11 - 1.0' high x 4' wide x 8' long precast concrete galleries have been proposed.**



PROPOSED ADDITION, FRONT PORCH, WALK, STAIRS & DRIVE EXPANSION AREAS AS LAWN

Subcat Reach Pond Link

Routing Diagram for c30286XCONHYD
Prepared by CHARPAR SITE CONSULTING, LLC, Printed 8/3/2020
HydroCAD® 10.00-1 s/n 01764 © 2014 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
3,226	61	>75% Grass cover, Good, HSG B (1XC)
3,226	**61**	**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1XC: PROPOSED ADDITION, Runoff Area=3,226 sf 0.00% Impervious Runoff Depth>2.27"
Flow Length=150' Slope=0.0267 '/' Tc=11.9 min CN=61 Runoff=0.15 cfs 611 cf

Total Runoff Area = 3,226 sf Runoff Volume = 611 cf Average Runoff Depth = 2.27"
100.00% Pervious = 3,226 sf 0.00% Impervious = 0 sf

Subcatchment 1XC: PROPOSED ADDITION, FRONT PORCH, WALK, STAIRS & DRIVE EXPANSION ARE

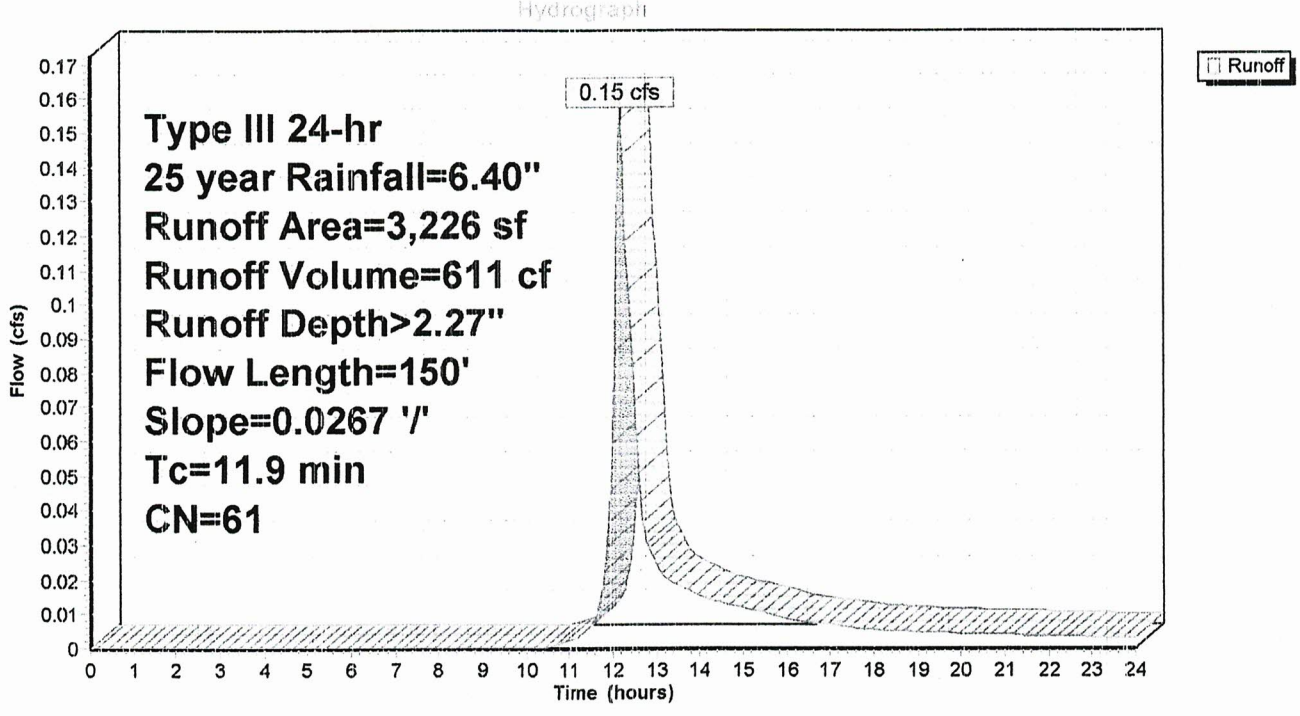
Runoff = 0.15 cfs @ 12.18 hrs, Volume= 611 cf, Depth> 2.27"

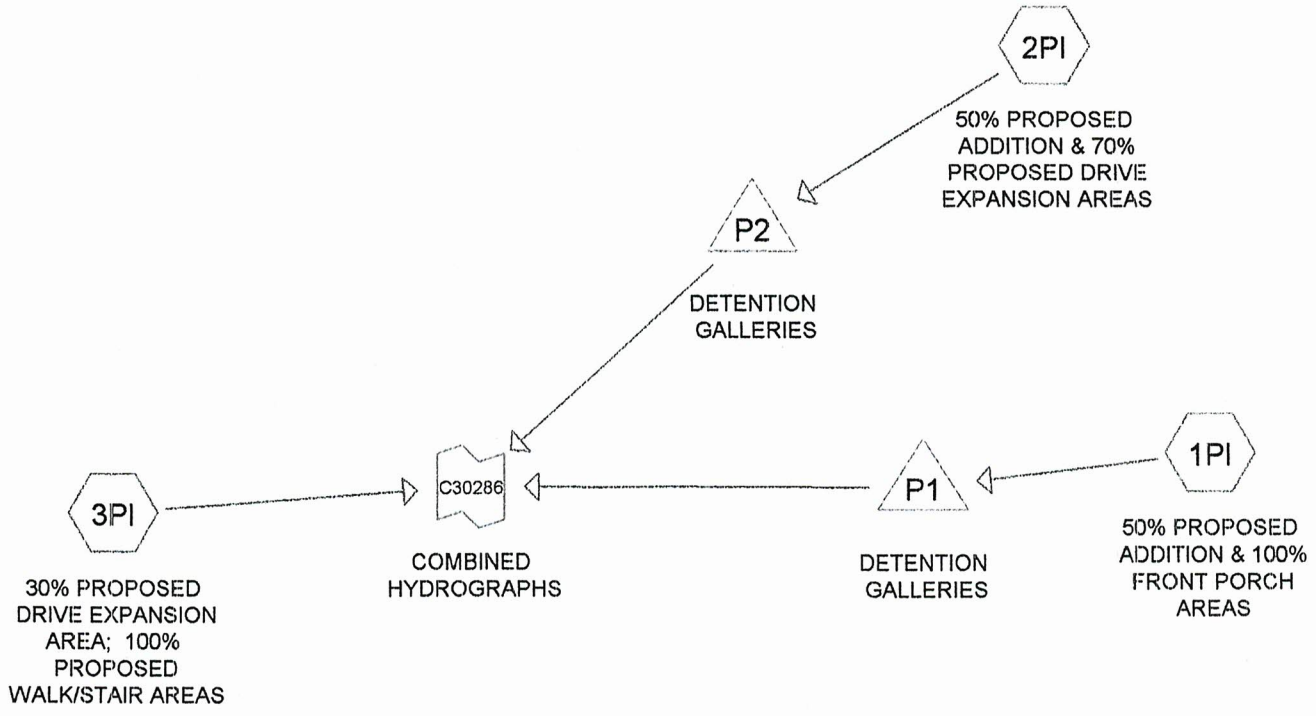
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.40"

Area (sf)	CN	Description
3,226	61	>75% Grass cover, Good, HSG B
3,226		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	150	0.0267	0.21		**Sheet Flow, EXISTING LAWN** Grass: Short n= 0.150 P2= 3.30"

tchment 1XC: PROPOSED ADDITION, FRONT PORCH, WALK, STAIRS & DRIVE EXPANSION AREAS AS





Subcat Reach Pond Link

Routing Diagram for c30286-PROPHYD
Prepared by CHAPPA SITE CONSULTING, LLC, Printed 8/3/2020

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
130	98	100% PROPOSED FRONT PORCH PATIO AREA (1PI)
68	98	100% PROPOSED WALK/STAIRS AREAS (3PI)
565	98	30% PROPOSED DRIVE EXPANSION AREA (3PI)
1,146	98	50% PROPOSED ADDITION AREAS (1PI, 2PI)
1,317	98	70% PROPOSED DRIVE EXDPANSION AREAS (2PI)
3,226	**98**	**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1PI: 50% PROPOSED ADDITION Runoff Area=703 sf 100.00% Impervious Runoff Depth>6.16"
Tc=3.0 min CN=98 Runoff=0.11 cfs 361 cf

Subcatchment 2PI: 50% PROPOSED ADDITION Runoff Area=1,890 sf 100.00% Impervious Runoff Depth>6.16"
Tc=3.0 min CN=98 Runoff=0.29 cfs 970 cf

Subcatchment 3PI: 30% PROPOSED DRIVE Runoff Area=633 sf 100.00% Impervious Runoff Depth>6.16"
Tc=3.0 min CN=98 Runoff=0.10 cfs 325 cf

Pond P1: DETENTION GALLERIES Peak Elev=98.49' Storage=109 cf Inflow=0.11 cfs 361 cf
Outflow=0.01 cfs 361 cf

Pond P2: DETENTION GALLERIES Peak Elev=95.89' Storage=328 cf Inflow=0.29 cfs 970 cf
Outflow=0.03 cfs 970 cf

Link C30286: COMBINED HYDROGRAPHS Inflow=0.10 cfs 325 cf
Primary=0.10 cfs 325 cf

Total Runoff Area = 3,226 sf Runoff Volume = 1,656 cf Average Runoff Depth = 6.16"
0.00% Pervious = 0 sf 100.00% Impervious = 3,226 sf

Summary for Subcatchment 1PI: 50% PROPOSED ADDITION & 100% FRONT PORCH AREAS

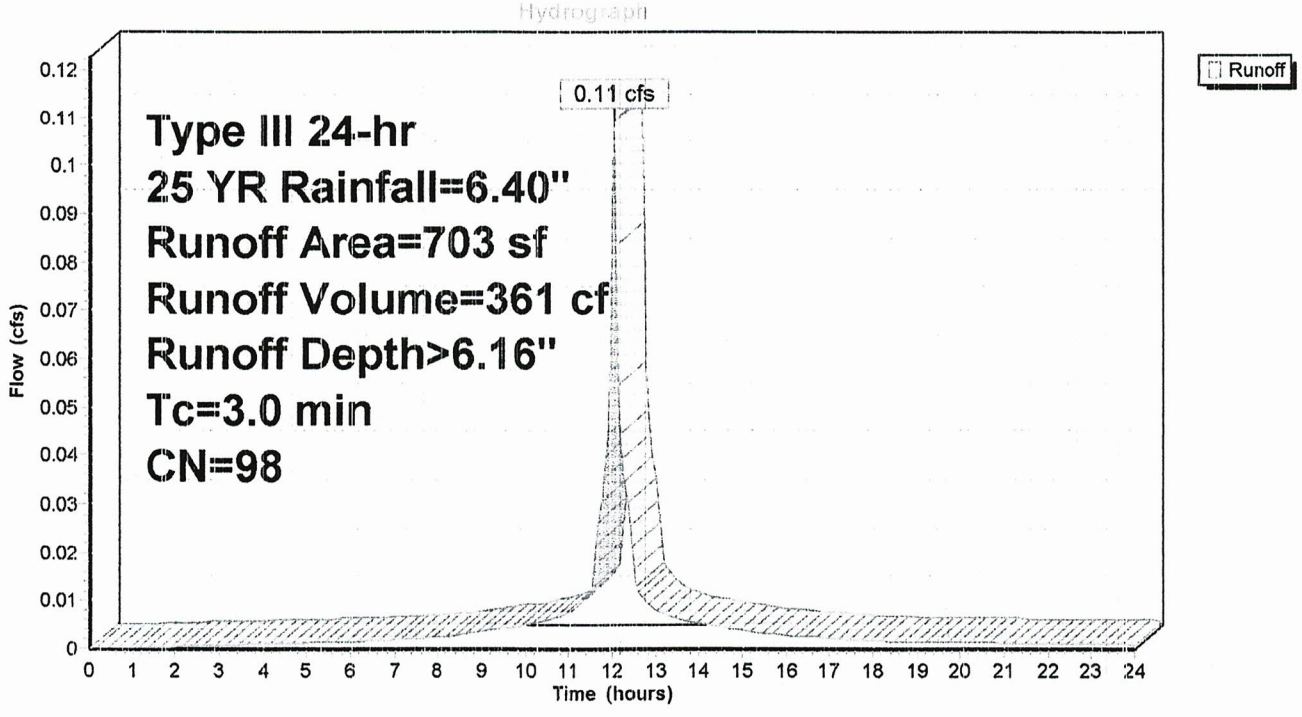
Runoff = 0.11 cfs @ 12.05 hrs, Volume= 361 cf, Depth> 6.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.40"

	Area (sf)	CN	Description
*	130	98	100% PROPOSED FRONT PORCH PATIO AREA
*	573	98	50% PROPOSED ADDITION AREAS
	703	98	Weighted Average
	703		100.00% Impervious Area

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

Subcatchment 1PI: 50% PROPOSED ADDITION & 100% FRONT PORCH AREAS



ımmary for Subcatchment 2PI: 50% PROPOSED ADDITION & 70% PROPOSED DRIVE EXPANSION ARE

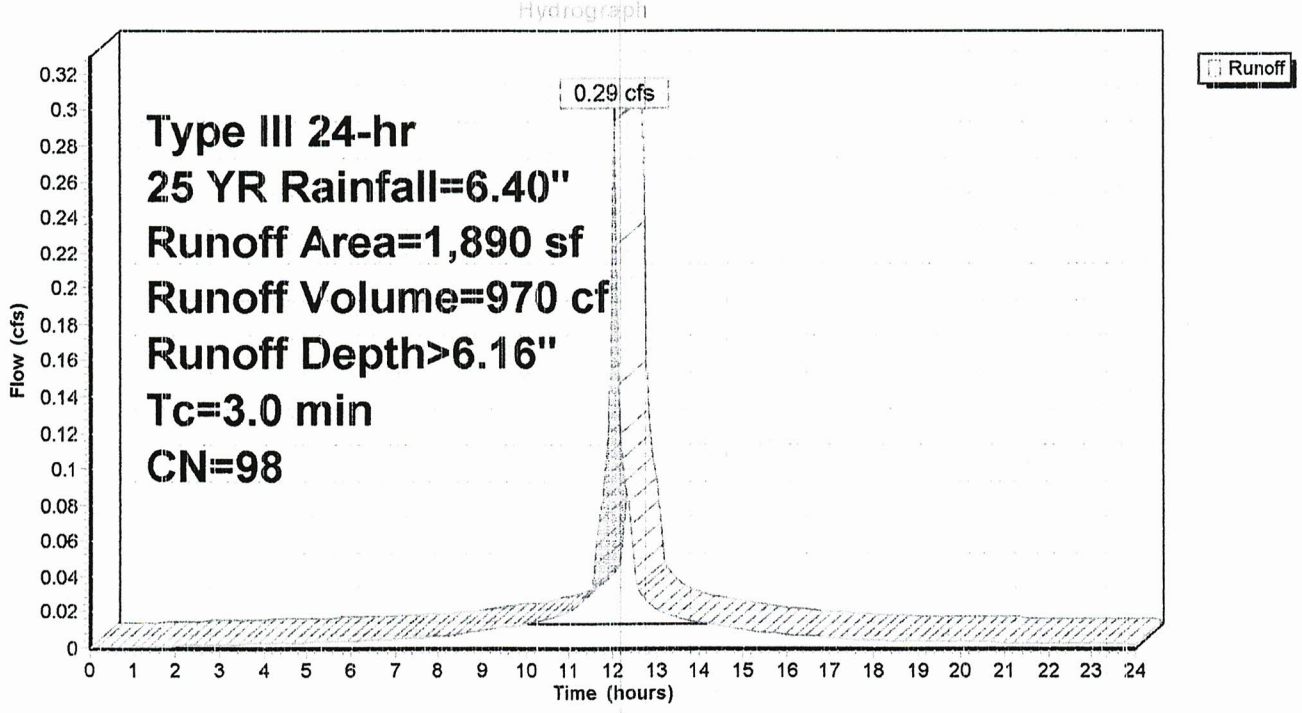
Runoff = 0.29 cfs @ 12.05 hrs, Volume= 970 cf, Depth> 6.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.40"

	Area (sf)	CN	Description
*	1,317	98	70% PROPOSED DRIVE EXDPANSION AREAS
*	573	98	50% PROPOSED ADDITION AREAS
	1,890	98	Weighted Average
	1,890		100.00% Impervious Area

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

Subcatchment 2PI: 50% PROPOSED ADDITION & 70% PROPOSED DRIVE EXPANSION AREAS



ry for Subcatchment 3PI: 30% PROPOSED DRIVE EXPANSION AREA; 100% PROPOSED WALK/STAIR

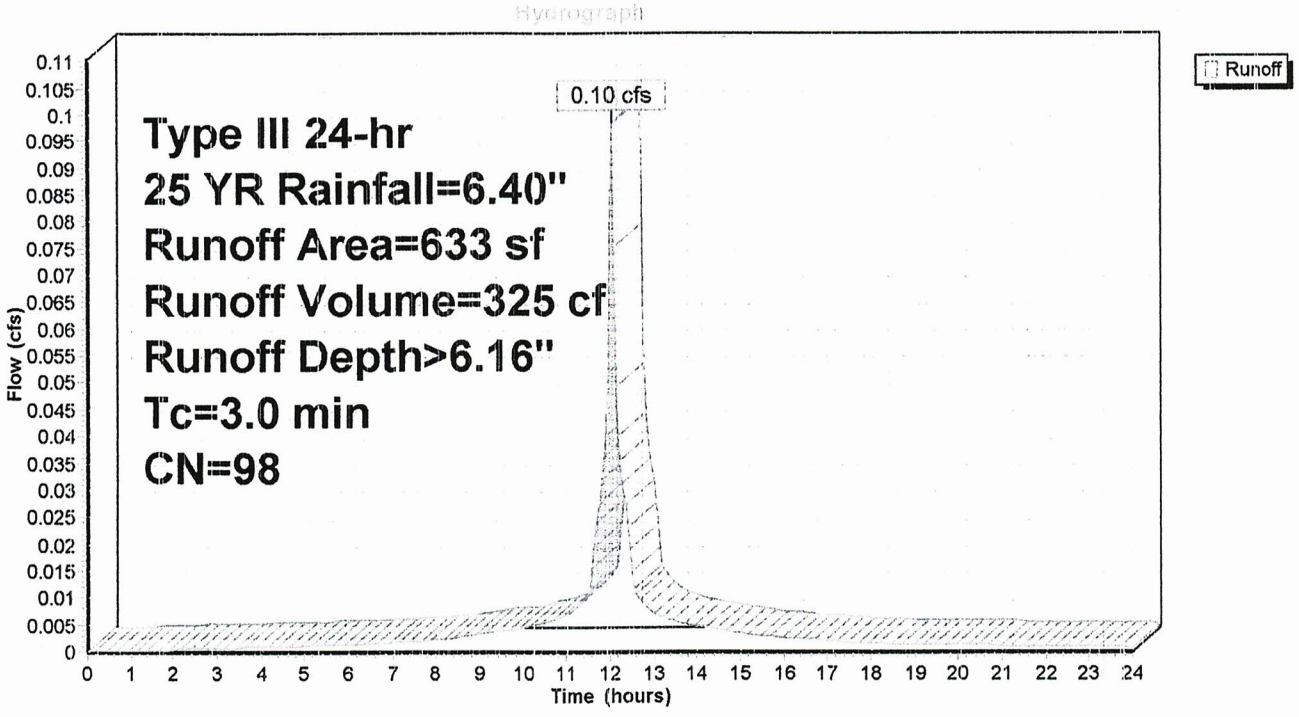
Runoff = 0.10 cfs @ 12.05 hrs, Volume= 325 cf, Depth> 6.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.40"

	Area (sf)	CN	Description
*	68	98	100% PROPOSED WALK/STAIRS AREAS
*	565	98	30% PROPOSED DRIVE EXPANSION AREA
	633	98	Weighted Average
	633		100.00% Impervious Area

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

Subcatchment 3PI: 30% PROPOSED DRIVE EXPANSION AREA; 100% PROPOSED WALK/STAIR AREA



Summary for Pond P1: DETENTION GALLERIES

Inflow Area = 703 sf,100.00% Impervious, Inflow Depth > 6.16" for 25 YR event
Inflow = 0.11 cfs @ 12.05 hrs, Volume= 361 cf
Outflow = 0.01 cfs @ 12.55 hrs, Volume= 361 cf, Atten= 87%, Lag= 30.2 min
Discarded = 0.01 cfs @ 12.55 hrs, Volume= 361 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 98.49' @ 12.55 hrs Surf.Area= 224 sf Storage= 109 cf

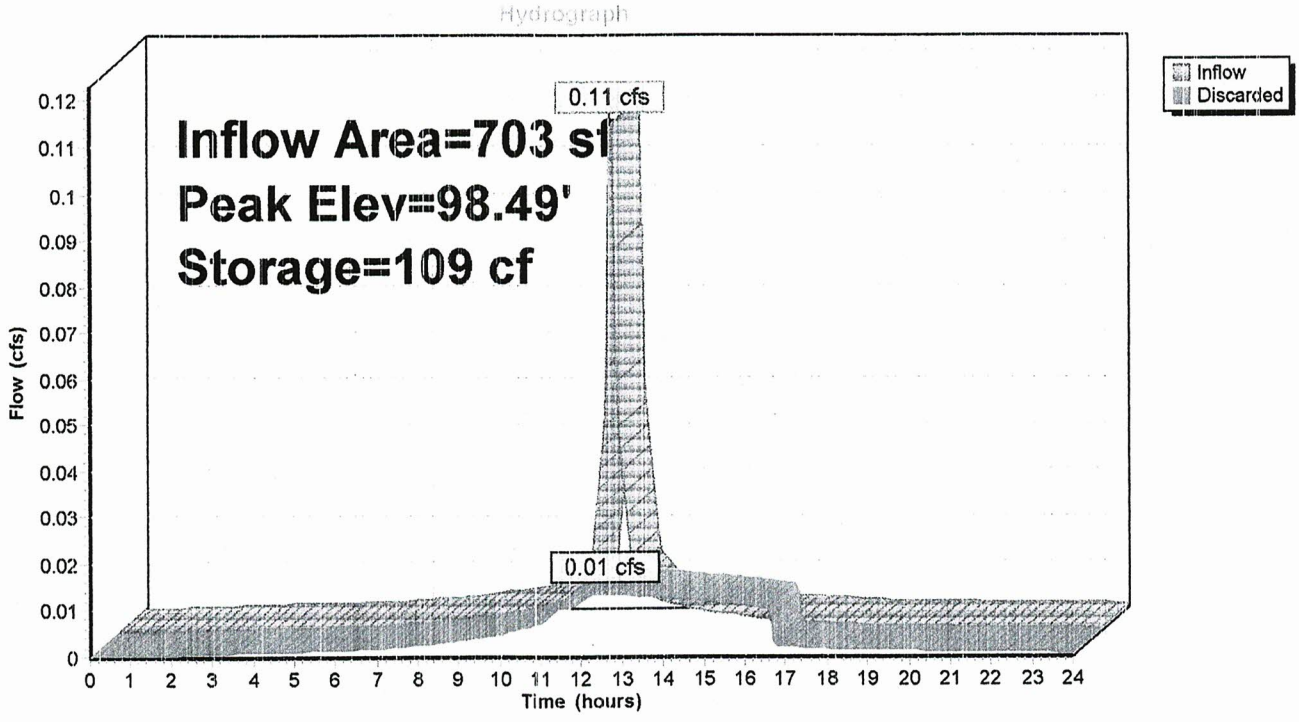
Plug-Flow detention time= 51.4 min calculated for 360 cf (100% of inflow)
Center-of-Mass det. time= 51.0 min (792.3 - 741.3)

Volume	Invert	Avail.Storage	Storage Description
#1	97.50'	97 cf	**8.00'W x 28.00'L x 1.50'H Prismatoid** 336 cf Overall - 93 cf Embedded = 243 cf x 40.0% Voids
#2	98.00'	56 cf	**Galley 4x8x1** x 3 Inside #1 Inside= 42.0"W x 9.0"H => 2.49 sf x 7.50'L = 18.7 cf Outside= 48.0"W x 12.0"H => 3.88 sf x 8.00'L = 31.0 cf
		153 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	97.50'	**2.000 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 12.55 hrs HW=98.49' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond P1: DETENTION GALLERIES



Summary for Pond P2: DETENTION GALLERIES

Inflow Area = 1,890 sf,100.00% Impervious, Inflow Depth > 6.16" for 25 YR event
Inflow = 0.29 cfs @ 12.05 hrs, Volume= 970 cf
Outflow = 0.03 cfs @ 12.76 hrs, Volume= 970 cf, Atten= 91%, Lag= 42.6 min
Discarded = 0.03 cfs @ 12.76 hrs, Volume= 970 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 95.89' @ 12.76 hrs Surf.Area= 480 sf Storage= 328 cf

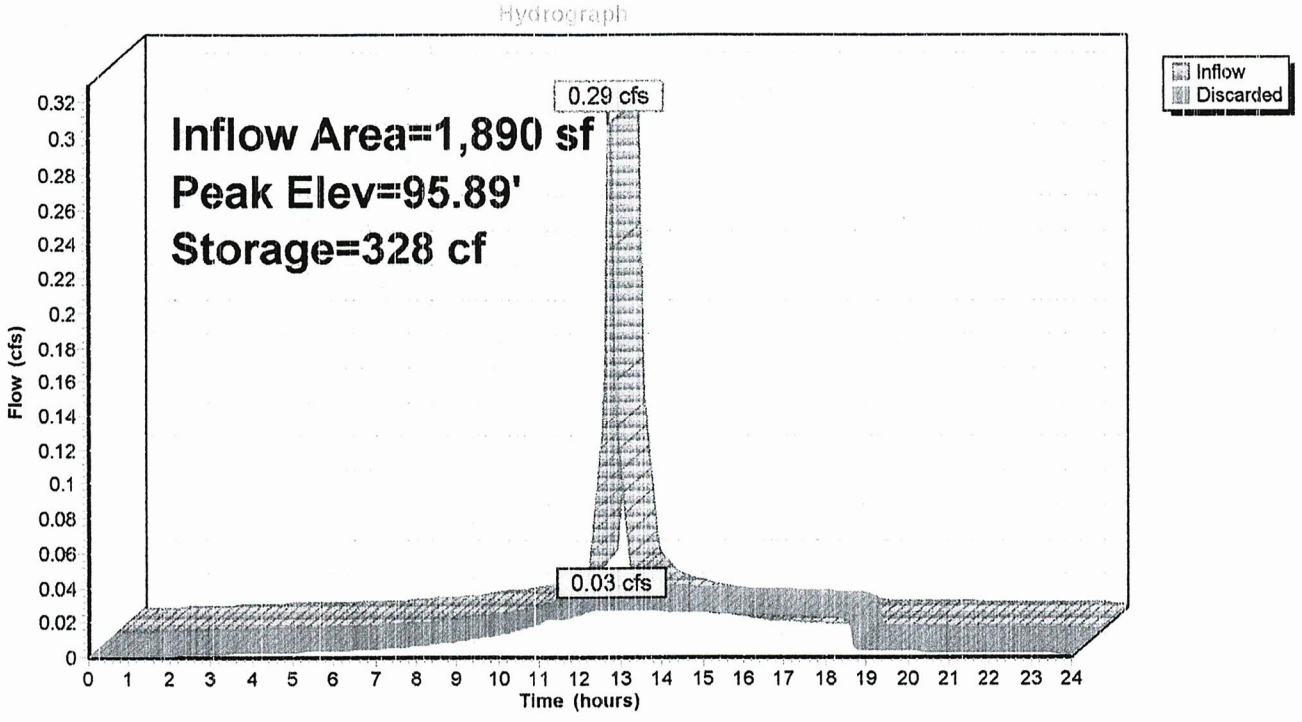
Plug-Flow detention time= 83.5 min calculated for 970 cf (100% of inflow)
Center-of-Mass det. time= 83.3 min (824.6 - 741.3)

Volume	Invert	Avail.Storage	Storage Description
#1	94.50'	189 cf	**20.00'W x 24.00'L x 1.50'H Prismatoid** 720 cf Overall - 248 cf Embedded = 472 cf x 40.0% Voids
#2	95.00'	149 cf	**Galley 4x8x1** x 8 Inside #1 Inside= 42.0"W x 9.0"H => 2.49 sf x 7.50'L = 18.7 cf Outside= 48.0"W x 12.0"H => 3.88 sf x 8.00'L = 31.0 cf 3 Rows of 3 Chambers
		338 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	94.50'	**2.000 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 12.76 hrs HW=95.89' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond P2: DETENTION GALLERIES



Summary for Link C30286: COMBINED HYDROGRAPHS

Inflow Area = 3,226 sf,100.00% Impervious, Inflow Depth > 1.21" for 25 YR event
Inflow = 0.10 cfs @ 12.05 hrs, Volume= 325 cf
Primary = 0.10 cfs @ 12.05 hrs, Volume= 325 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link C30286: COMBINED HYDROGRAPHS