FULLER ENGINEERING & LAND SURVEYING, LLC
525 John Street • Second Floor
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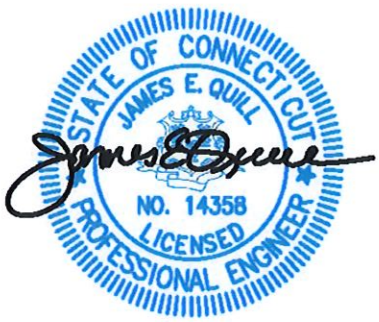
(203) 333-9465 (203) 336-1769 FAX

Information prepared for:

WESTERN GROUP, LLC

#245 Route 32
Montville, CT
&
Town of Montville
Department of Public Works / Engineering Department

Project Name: Wilton's Way Proposed Residential Development



STORMWATER STUDY

Documentation

Dated: January 25, 2022

FULLER ENGINEERING & LAND SURVEYING, LLC
525 JOHN STREET 2ND FLOOR BRIDGEPORT, CONNECTICUT 06604
PHONE (203)333-9465; FAX (203)336-1769

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FULLER ENGINEERING & LAND SURVEYING, LLC
525 John Street – Second Floor – Bridgeport, CT 06604

Phone: (203) 333-9465 **Fax: (203) 336-1769**

OWNER/APPLICANT: WESTERN GROUP, LLC
PROJECT LOCATION: WILTONS WAY #245 Route 32,
Montville, Connecticut

DRAINAGE STUDY

INTRODUCTION

The purpose of this study is to outline the storm water analysis for the proposed development at #245 Norwich-New London Road Town of Montville, Route 32 Uncasville, CT. The storm water management plan is based on a hydrologic analysis of pre-development and post-development conditions using a Type III-24 Hour, for 25 –year frequency storms. The peak flow rate and the increase in runoff for up to the 100-year storm frequency is being compared in this study. The hydrological analysis is conducted within the area of the property as bounded by the property lines shown on the plan only.

245 Route 32 Associates is proposing to construct two multi-level residential condominium buildings, basements, new driveways and miscellaneous landscaping at 245 Norwich-New London Road, Route 32 Montville, CT. The proposed development is located on the east side of State Route 32 travelling northbound. Refer to the plan titled "Residential Development" dated January 4, 2022, prepared for Western Group, LLC prepared by Fuller Engineering & Land Surveying, LLC for the extent of the proposed development.

The proposed development will increase the amount of impervious area on the site, and will therefore increase the runoff rain water leaving the site. The analysis did not consider back-to-back storms.

PRE-DEVELOPMENT CONDITIONS

The site considered in this study is the entire area of the property which is located in the C-1 District, which is a Commercial Zone, although the proposed development will be strictly residential use.. The total area (79,607 s.f.) (1.828 acre) currently is composed of mainly pervious surfaces will little impervious land surfaces..

The runoff from this area sheet flows towards the East at the low point on the property (considered as POC "A") (outfall 1L in Hydrocad). The peak flow towards POC "A" for a Type III-24 Hour, for 25 –year frequency storms is 2.66 cfs.

PROPOSED POST-DEVELOPMENT CONDITIONS

The proposed developments on said parcel with area of (79,607 s.f.) will be two (2) multi story residential condominium buildings, common drive and independent driveway/parking and miscellaneous landscaping. The proposed development will increase the impervious surface by 29,165 s.f. within the watershed encompassing POC "A". Stormwater runoff from the proposed building and basement driveway will be directed to the inlet structure which is connected to 60 units 4' x 8' x 4' Concrete Galleys in 2 groups, first set of 28 embedded in 58' x 18.6' x 5.17' gravel bed, and a second set of 32 embedded in 66' x 18.6' x 5.17' gravel bed to help treat water quality and attenuate the storm water runoff going to the control structure at the back of the retaining wall before discharging to 12" RCP flared end to the Rip-Rap Plunge Poo/ moving towards POC "A" (outfall 1L in Hydrocad). Storm water runoff from the driveways and common drive will sheet flow into common drive catch basin distributing the stormwater along the edge of the common drive in a storm sewer system. Roof drains will be directly connected underground to the concrete galley system. The overflow of the concrete galley system will be directed to a control structure which will discharge the water into a energy dissipating rip-rap plunge pool. The peak flow towards POC "A" for a Type III-24 Hour, for 25 –year frequency storm, post development is 1.94 cfs. which is less than the pre development conditions.

DESIGN METHODOLOGY

The site consists of a Hydrological Soil Group (HSG) rating C (refer to Appendix B) which is used in the analysis. The following CN values are used; (a) 98 for impervious surfaces; (b) 81 for HSG C , 30% imp. 1/3 acre residential; (c) 65 for HSG C, 50-75% grass cover,good condition.

HydroCAD Version 10.0 was utilized to evaluate the runoff volume and peak discharge rates of the pre and post-development conditions. The design storm frequencies considered are the 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year storm frequencies. They were used in the analysis with the following 24-hour rainfall total; 2-year, 3.46 inches; 5-year, 4.36 in.; 10-year, 5.12 inches; 25-year, 6.15 inches;50-year, 6.93 inches; and 100-year, 7.75 inches. The peak flow towards the rip-rap pool at the wooded border is less than the pre-development runoff peak flows as shown in Table 1.

TABLE 1 – Peak Flows in cfs/Volume in C.F.

STORM EVENT	LINK/POC	FLOW/VOLUME	EXISTING	PROPOSED	Δ	Δ (%)
2 Year Storm	LINK 1 (A)	q (ft^3/s)	0.5	0.25	-0.25	-50.0
		v (ft^3)	3386	1193	-2193	-64.8
5 Year Storm	LINK 1 (A)	q (ft^3/s)	1.1	0.48	-0.62	-56.4
		v (ft^3)	6228	2370	-3858	-61.9
10 Year Storm	LINK 1 (A)	q (ft^3/s)	1.72	0.81	-0.91	-52.9
		v (ft^3)	9045	5364	-3681	-40.7
25 Year Storm	LINK 1 (A)	q (ft^3/s)	2.66	1.94	-0.72	-27.1
		v (ft^3)	13330	9858	-3472	-26.0
50 Year Storm	LINK 1 (A)	q (ft^3/s)	3.44	3.36	-0.08	-2.3
		v (ft^3)	16857	13514	-3343	-19.8
100 Year Storm	LINK 1 (A)	q (ft^3/s)	4.29	4.07	-0.22	-5.1
		v (ft^3)	20774	17547	-3227	-15.5

Based on the tabulated results above, the peak flows and the run off volume of the post-development condition are less than the pre-development conditions.

SOIL EROSION AND SEDIMENTATION CONTROL

For temporary condition or during construction a silt fence shall be provided along the property lines. Anti-tracking aprons shall be provided at all access routes from the site to the public road. All planting areas shall be protected with slope stabilization measures.

For permanent condition, all embankments, after being stabilized, shall be sodded. Newly planted areas shall be covered with straw or erosion control blankets.

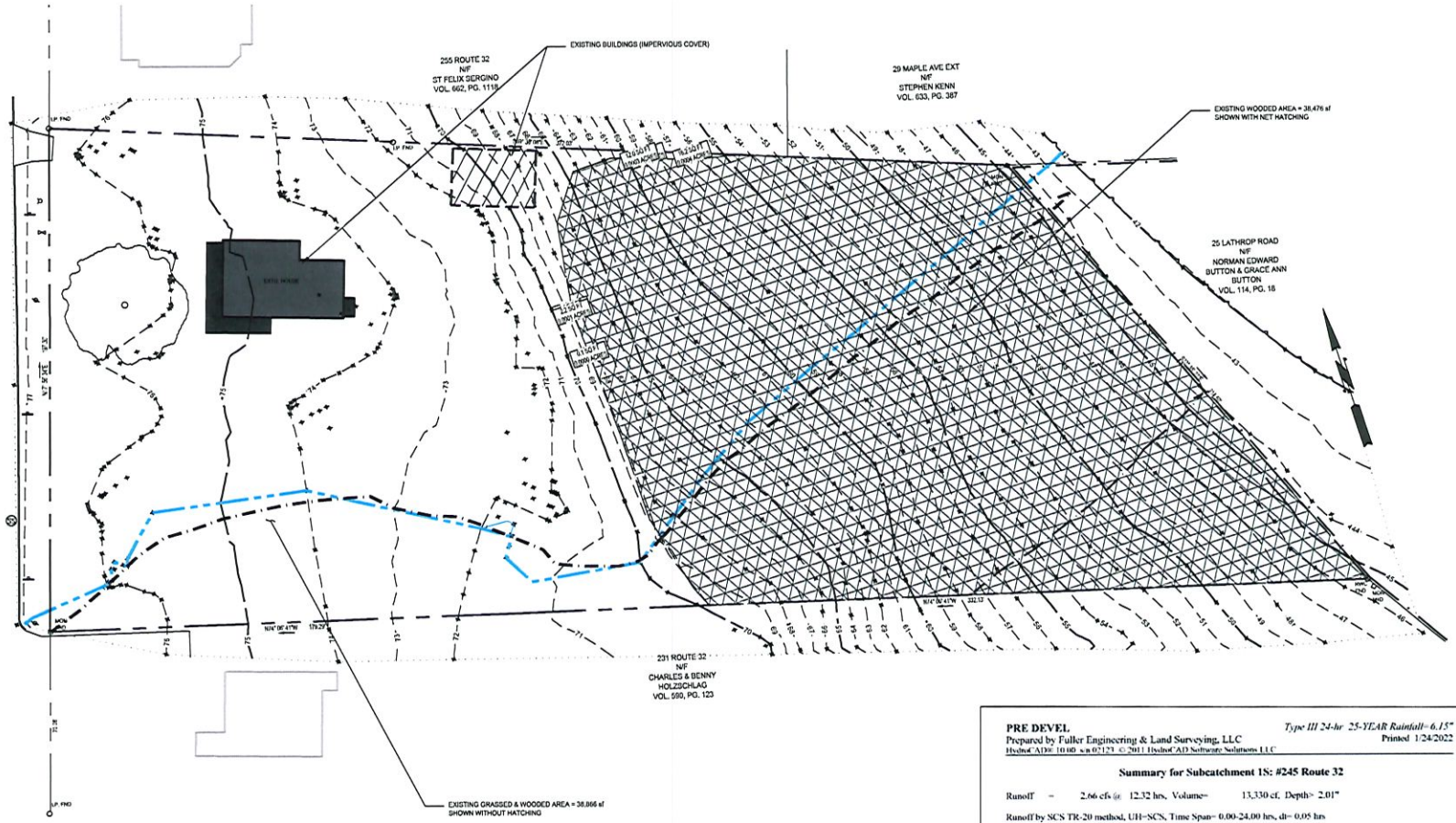
CONCLUSION

The proposed development will increase the impervious coverage on the site thus increase the volume and peak flow rate of runoff generated during a storm event. However, to address the water quality volume and peak flow issues, a subsurface detention/retention system will be installed to treat and attenuate the storm water runoff. The proposed development will not increase the peak flow rate to the POC.

Since the proposed development incorporates pre-treatment and attenuation of runoff to the maximum extent practical, if the proposed development is constructed as depicted on the proposed development plans, then there will be no adverse impacts to adjoining properties and/or street drainage.

EXHIBITS "A" AND "B"

WATERSHED MAPS
FOR
EXISTING & PROPOSED CONDITIONS



PRE DEVEL
Prepared by Fuller Engineering & Land Surveying, LLC
HydroCAD® 10.00 s/n 02123 © 2011 HydroCAD Software Solutions LLC

Type III 24-hr 25-YEAR Rainfall=6.15"
Printed 1/24/2022

Summary for Subcatchment 1S: #245 Route 32

Runoff = 2.66 cfs @ 12.32 hrs, Volume= 13,330 cf, Depth> 2.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YEAR Rainfall=6.15"

Area (sf)	CN	Description
1,661	98	Roofs, HSG B
22	98	Unconnected pavement, HSG B
580	98	Unconnected roofs, HSG D
38,476	58	Woods/grass comb., Good, HSG B
38,866	61	>75% Grass cover, Good, HSG B
79,605	61	Weighted Average, UI Adjusted CN = 60
77,342		97.16% Pervious Area
2,263		2.84% Impervious Area
602		26.60% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	480	0.0605	0.71		**Lag/CN Method, Overland Flow**
10.3	100	0.1160	0.16		**Sheet Flow, Thru the Woods** Woods: Light underbrush n= 0.400 P2= 3.40"
21.6	580	Total			

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APPROVED BY THE MONTVILLE PLANNING AND ZONING COMMISSION
CHAIRMAN _____ DATE _____

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WILTON'S WAY
22 UNIT CONDOMINIUM DEVELOPMENT
245 NORWICH-NEW LONDON ROAD (RT 32)
MONTVILLE, CONNECTICUT
FOR
WESTERN GROUP, LLC

Job Number: FE22-1700

Job Start Date: 1/4/22

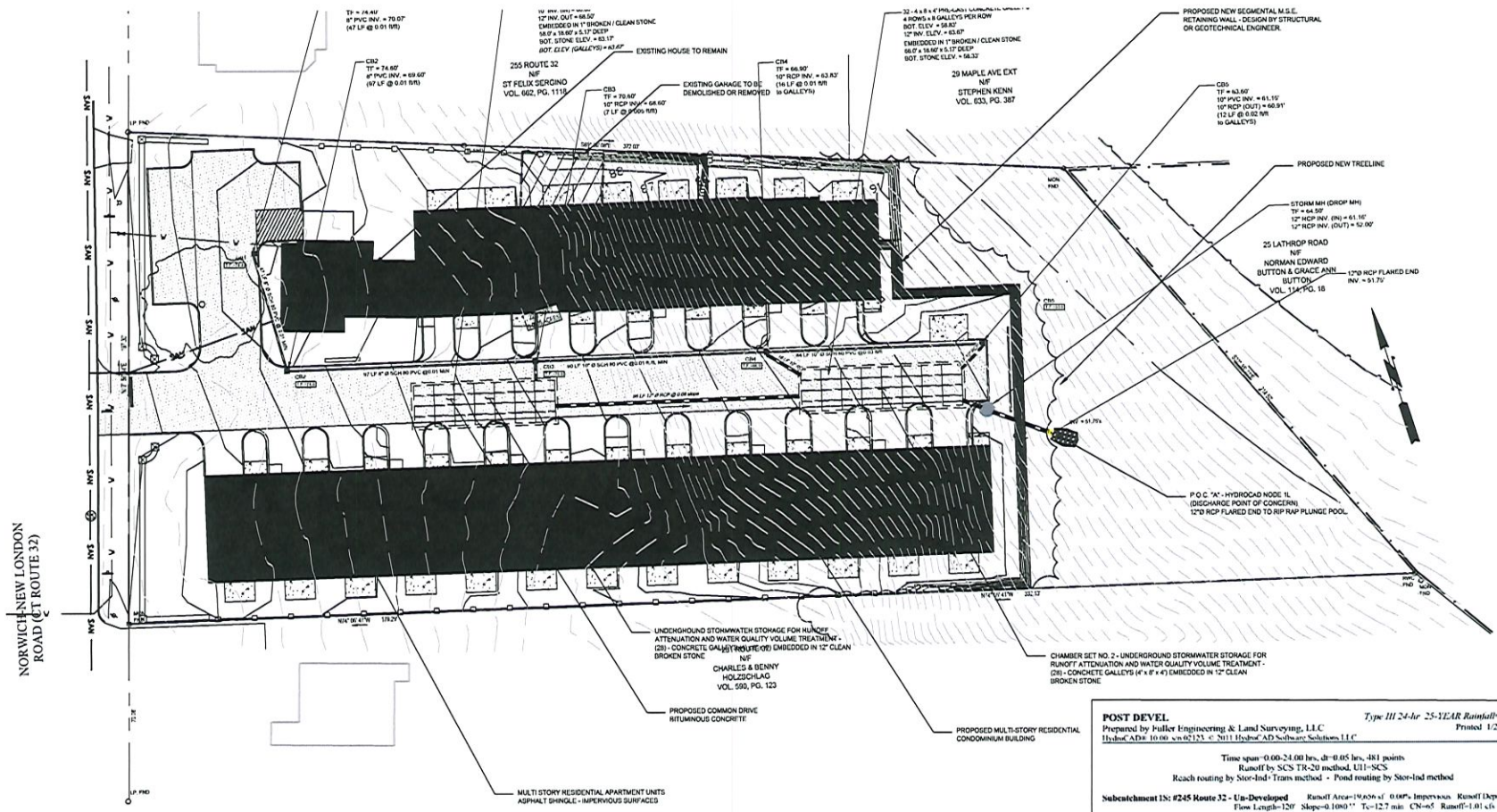
Submission	01/25/22

Drawn By: D.R.R. Checked By: J.E.Q.

Sheet Title: DRAINAGE AREA MAP - EXISTING CONDITIONS

Scale: 1" = 20'

Sheet Number: DA-EX



POST DEVEL *Type III 24-hr 25-YEAR Rainfall= 6.15"*

Prepared by Fuller Engineering & Land Surveying, LLC Printed 1/24/2022

HydroCAD® 10.00 s/n 02123 © 2011 HydroCAD Software Solutions LLC

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

Subcatchment 1S: #245 Route 32 - Un-Developed Runoff Area=19,656 sf 0.00% Impervious Runoff Depth=2.45"
Flow Length=120' Slope=0.1080 '/' Tc=12.7 min CN=65 Runoff=1.01 cfs 4,020 cf

Subcatchment 2S: NEW CONDO'S & Runoff Area=32,401 sf 74.30% Impervious Runoff Depth=5.18"
Flow Length=668' Slope=0.0750 '/' Tc=40.8 min CN=92 Runoff=2.10 cfs 13,998 cf

Subcatchment 3S: Urban Commercial wth Open Runoff Area=27,548 sf 0.00% Impervious Runoff Depth=2.81"
Tc=29.3 min CN=69 Runoff=1.19 cfs 6,455 cf

Reach 1R: CONTROL STRUCTURE Avg. Flow Depth=0.01' Max Vel=154.72 fps Inflow=1.76 cfs 5,838 cf
n=0.013 L=2.0' S=-1.8320 '/' Capacity=3,515.86 cfs Outflow=1.76 cfs 5,838 cf

Reach 2R: Rip Rap Pool Avg. Flow Depth=0.44' Max Vel=2.45 fps Inflow=1.76 cfs 5,838 cf
n=0.040 L=10.0' S=0.0250 '/' Capacity=130.02 cfs Outflow=1.76 cfs 5,838 cf

Pond 1P: 60 CONCRETE GALLEY'S Peak Elev=62.39' Storage=6,666 cf Inflow=3.23 cfs 20,453 cf
Discarded=0.22 cfs 12,033 cf Primary=1.76 cfs 5,838 cf Outflow=1.99 cfs 17,871 cf

Link 1L: POC "A" DRAIN INLET AT S.E. END OF PARCEL Inflow=1.94 cfs 9,858 cf
Primary=1.94 cfs 9,858 cf

Total Runoff Area = 79,605 sf Runoff Volume = 24,473 cf Average Runoff Depth = 3.69"
69.76% Pervious = 55,533 sf 30.24% Impervious = 24,072 sf

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APPROVED BY THE MONTVILLE PLANNING AND ZONING COMMISSION

CHAIRMAN _____ DATE _____

STATE OF CONNECTICUT — JOHN E. QUILTY — NO. 14308 — REGISTERED PROFESSIONAL ENGINEER

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WILTON'S WAY
22 UNIT CONDOMINIUM DEVELOPMENT
245 NORWICH-NEW LONDON ROAD (RT 32)
MONTVILLE, CONNECTICUT
PREPARED FOR
WESTERN GROUP, LLC

Job Number: FE22-1700

Job Start Date: 1/4/22

Submission	01/25/22

Drawn By: D.R.R. Checked By: J.E.Q.

Sheet Title: DRAINAGE AREA MAP - PROPOSED CONDITIONS

Scale: 1" = 20'

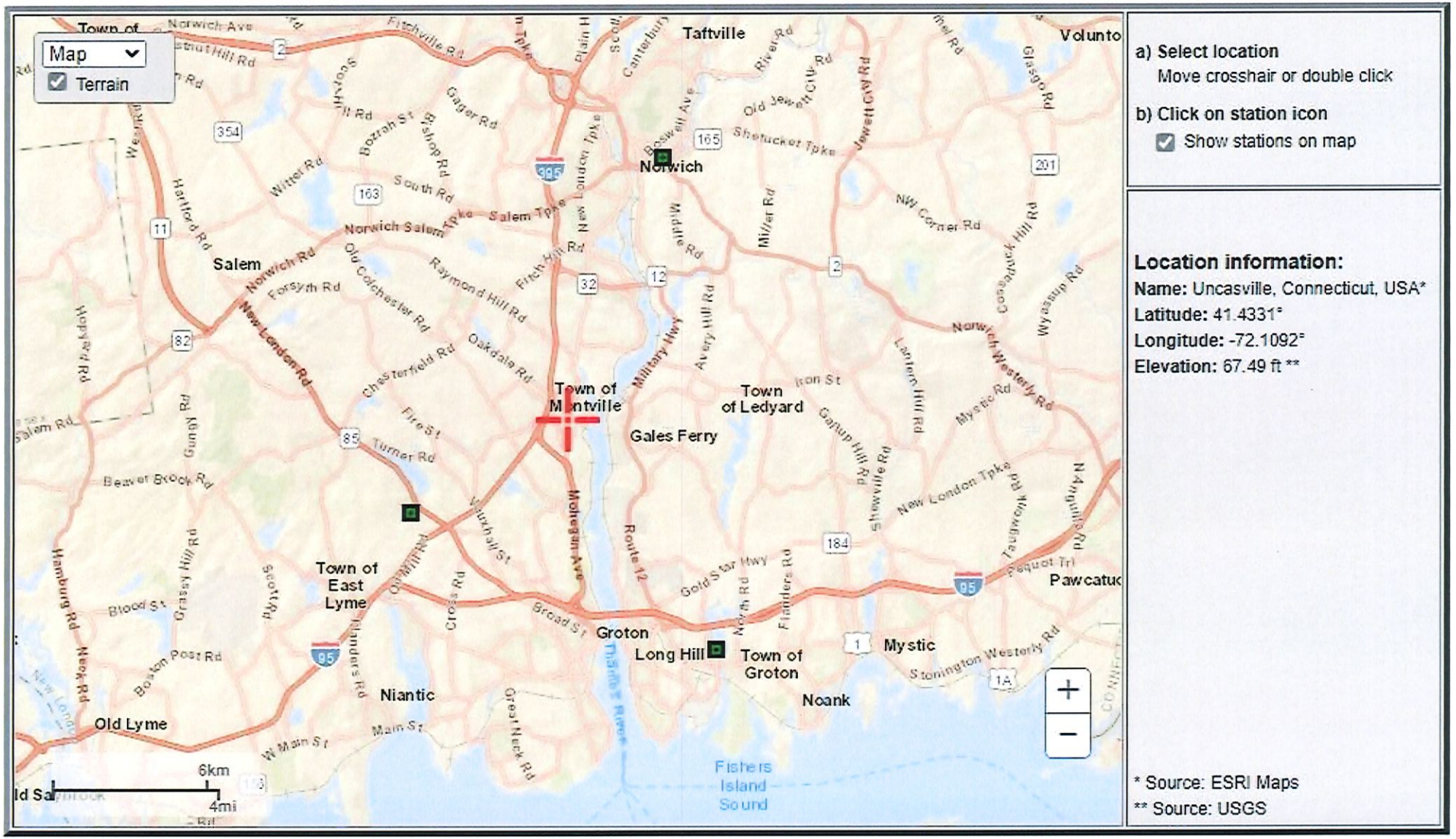
Sheet Number: DA-PRO

APPENDIX "A"

MONTVILLE PRECIPITATION FREQUENCY (PF)
RAINFALL DATA

NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: CT

#245 Norwich New London Road (CT State RTE. 32) Montville, CT



NOAA Atlas 14, Volume 10, Version 3
Location name: Uncasville, Connecticut, USA*
Latitude: 41.4331°, Longitude: -72.1092°
Elevation: 67.49 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	0.340 (0.266-0.427)	0.406 (0.317-0.510)	0.514 (0.400-0.648)	0.604 (0.467-0.763)	0.727 (0.545-0.952)	0.820 (0.601-1.09)	0.918 (0.654-1.26)	1.03 (0.693-1.43)	1.19 (0.770-1.70)	1.32 (0.835-1.91)
10-min	0.482 (0.377-0.605)	0.576 (0.449-0.723)	0.729 (0.567-0.918)	0.856 (0.662-1.08)	1.03 (0.772-1.35)	1.16 (0.853-1.55)	1.30 (0.926-1.78)	1.46 (0.982-2.02)	1.68 (1.09-2.40)	1.87 (1.18-2.71)
15-min	0.567 (0.443-0.712)	0.677 (0.529-0.851)	0.857 (0.667-1.08)	1.01 (0.779-1.27)	1.21 (0.908-1.59)	1.37 (1.00-1.82)	1.53 (1.09-2.10)	1.71 (1.16-2.38)	1.98 (1.28-2.83)	2.20 (1.39-3.19)
30-min	0.803 (0.627-1.01)	0.958 (0.747-1.20)	1.21 (0.942-1.53)	1.42 (1.10-1.80)	1.71 (1.28-2.24)	1.93 (1.41-2.57)	2.16 (1.54-2.96)	2.42 (1.63-3.36)	2.79 (1.81-3.99)	3.10 (1.96-4.50)
60-min	1.04 (0.811-1.30)	1.24 (0.966-1.56)	1.57 (1.22-1.97)	1.84 (1.42-2.32)	2.21 (1.66-2.89)	2.49 (1.83-3.32)	2.79 (1.99-3.82)	3.12 (2.10-4.34)	3.61 (2.34-5.15)	4.01 (2.53-5.81)
2-hr	1.36 (1.08-1.70)	1.63 (1.28-2.03)	2.05 (1.61-2.57)	2.41 (1.88-3.02)	2.90 (2.19-3.77)	3.26 (2.41-4.31)	3.65 (2.62-4.97)	4.10 (2.78-5.65)	4.75 (3.09-6.72)	5.28 (3.36-7.59)
3-hr	1.58 (1.25-1.96)	1.89 (1.49-2.34)	2.38 (1.88-2.96)	2.79 (2.19-3.48)	3.35 (2.54-4.34)	3.78 (2.81-4.97)	4.22 (3.05-5.73)	4.74 (3.22-6.50)	5.49 (3.59-7.74)	6.12 (3.90-8.75)
6-hr	2.01 (1.60-2.47)	2.39 (1.90-2.94)	3.00 (2.39-3.70)	3.51 (2.78-4.35)	4.22 (3.22-5.41)	4.75 (3.55-6.19)	5.30 (3.85-7.13)	5.95 (4.07-8.08)	6.89 (4.52-9.61)	7.67 (4.91-10.9)
12-hr	2.48 (2.00-3.02)	2.94 (2.36-3.59)	3.69 (2.96-4.52)	4.31 (3.44-5.30)	5.17 (3.98-6.58)	5.81 (4.38-7.52)	6.49 (4.74-8.65)	7.28 (5.00-9.80)	8.42 (5.55-11.6)	9.37 (6.02-13.2)
24-hr	2.90 (2.36-3.51)	3.46 (2.80-4.18)	4.36 (3.53-5.30)	5.12 (4.11-6.24)	6.15 (4.77-7.77)	6.93 (5.26-8.89)	7.75 (5.71-10.3)	8.71 (6.02-11.6)	10.1 (6.71-13.9)	11.3 (7.31-15.7)
2-day	3.25 (2.66-3.89)	3.91 (3.20-4.69)	4.99 (4.06-6.00)	5.88 (4.77-7.11)	7.12 (5.57-8.92)	8.03 (6.15-10.3)	9.02 (6.71-11.9)	10.2 (7.09-13.5)	12.0 (7.97-16.3)	13.5 (8.75-18.6)
3-day	3.52 (2.90-4.20)	4.23 (3.48-5.06)	5.40 (4.43-6.47)	6.37 (5.19-7.66)	7.70 (6.06-9.62)	8.69 (6.69-11.0)	9.76 (7.29-12.8)	11.0 (7.70-14.5)	13.0 (8.66-17.5)	14.6 (9.51-20.0)
4-day	3.78 (3.12-4.50)	4.53 (3.74-5.39)	5.75 (4.73-6.87)	6.77 (5.53-8.12)	8.17 (6.45-10.2)	9.21 (7.11-11.7)	10.3 (7.73-13.5)	11.7 (8.15-15.3)	13.7 (9.16-18.4)	15.4 (10.0-21.0)
7-day	4.50 (3.75-5.33)	5.32 (4.43-6.30)	6.66 (5.52-7.90)	7.77 (6.40-9.26)	9.30 (7.38-11.5)	10.4 (8.10-13.1)	11.7 (8.75-15.1)	13.1 (9.20-17.0)	15.2 (10.2-20.3)	17.0 (11.1-23.1)
10-day	5.22 (4.37-6.15)	6.08 (5.08-7.16)	7.48 (6.22-8.83)	8.64 (7.14-10.2)	10.2 (8.16-12.5)	11.4 (8.90-14.2)	12.7 (9.55-16.3)	14.2 (9.99-18.4)	16.3 (11.0-21.6)	18.0 (11.8-24.3)
20-day	7.42 (6.26-8.66)	8.33 (7.03-9.74)	9.83 (8.25-11.5)	11.1 (9.23-13.0)	12.8 (10.2-15.4)	14.1 (11.0-17.2)	15.4 (11.5-19.3)	16.8 (11.9-21.5)	18.7 (12.7-24.6)	20.1 (13.3-26.9)
30-day	9.25 (7.85-10.7)	10.2 (8.65-11.9)	11.8 (9.92-13.7)	13.0 (10.9-15.3)	14.8 (11.9-17.7)	16.2 (12.7-19.6)	17.5 (13.1-21.7)	18.9 (13.5-24.0)	20.5 (14.0-26.8)	21.7 (14.4-28.9)
45-day	11.5 (9.82-13.3)	12.5 (10.7-14.5)	14.1 (12.0-16.4)	15.5 (13.1-18.0)	17.4 (14.0-20.7)	18.9 (14.8-22.7)	20.3 (15.2-24.8)	21.5 (15.4-27.2)	23.0 (15.7-29.9)	24.0 (15.9-31.7)
60-day	13.4 (11.5-15.4)	14.4 (12.3-16.6)	16.2 (13.8-18.7)	17.6 (14.9-20.4)	19.6 (15.8-23.1)	21.1 (16.6-25.3)	22.6 (16.9-27.5)	23.8 (17.1-30.0)	25.2 (17.3-32.6)	26.1 (17.4-34.3)

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

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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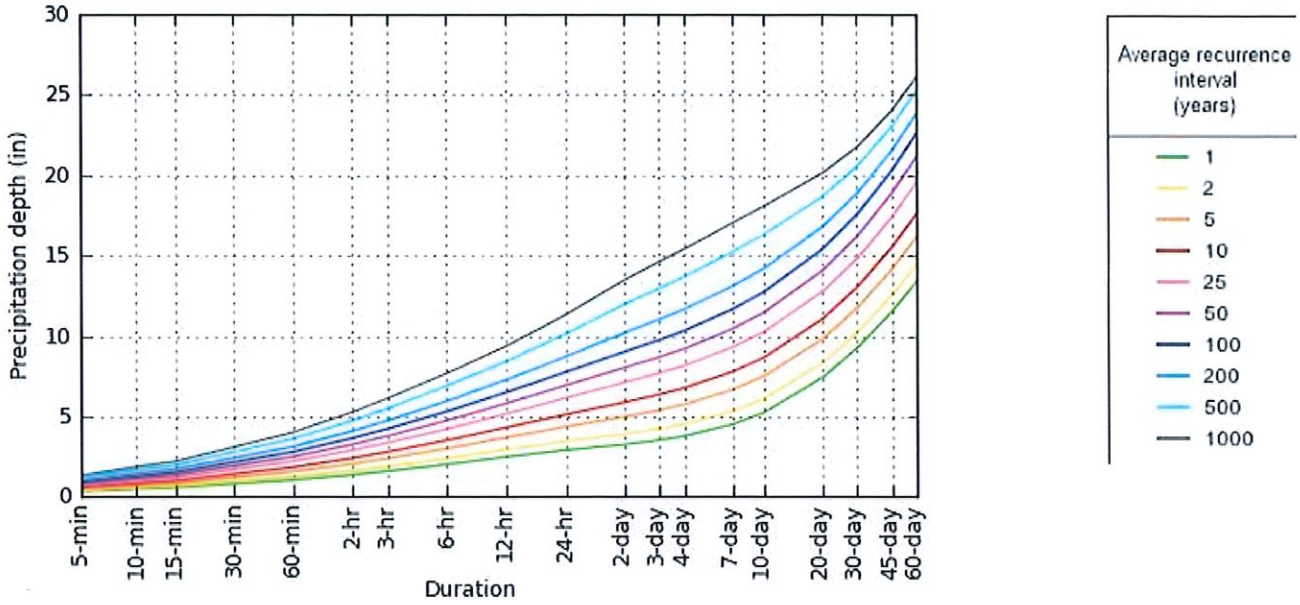
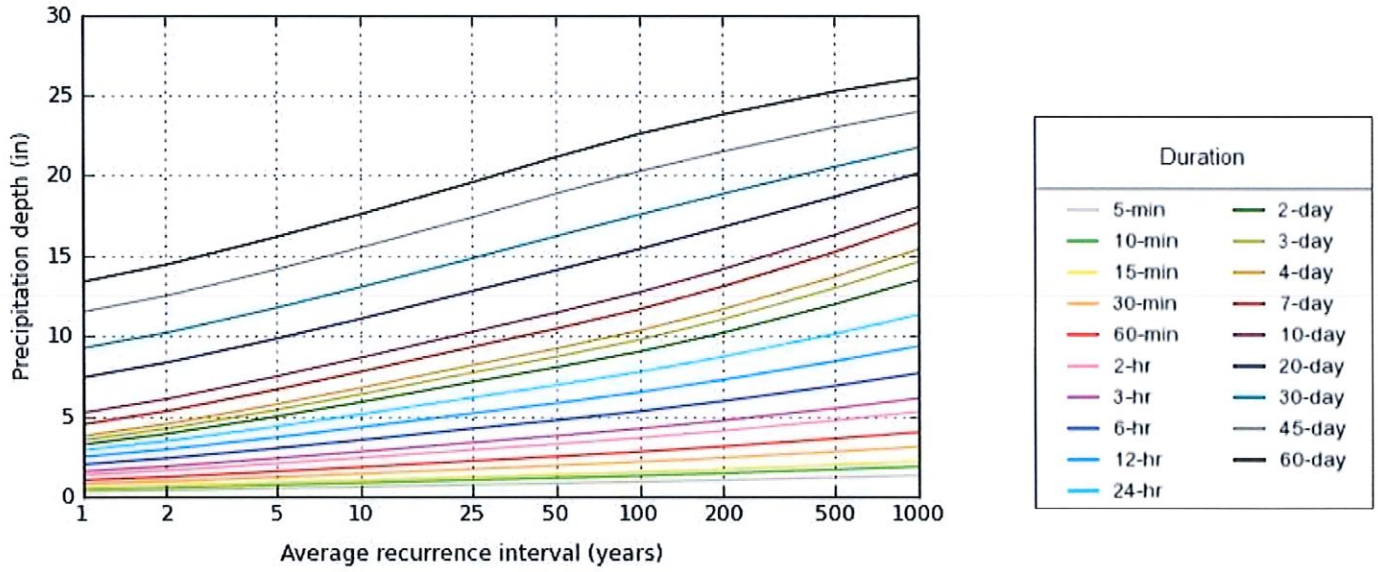
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 41.4331°, Longitude: -72.1092°





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Created (GMT): Thu Jan 20 18:50:23 2022

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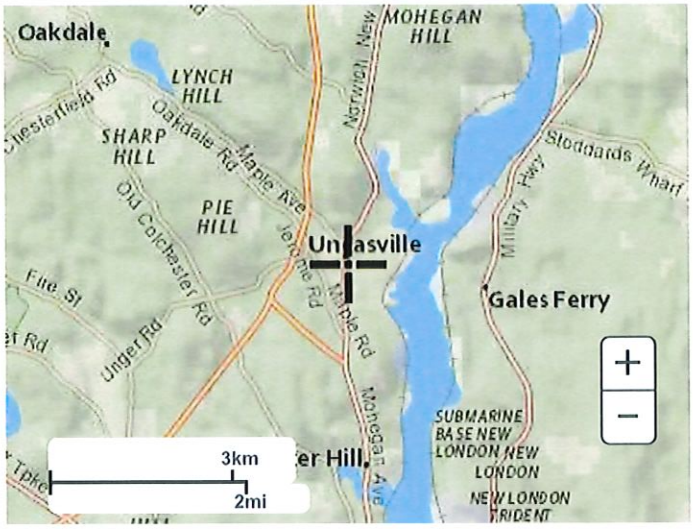
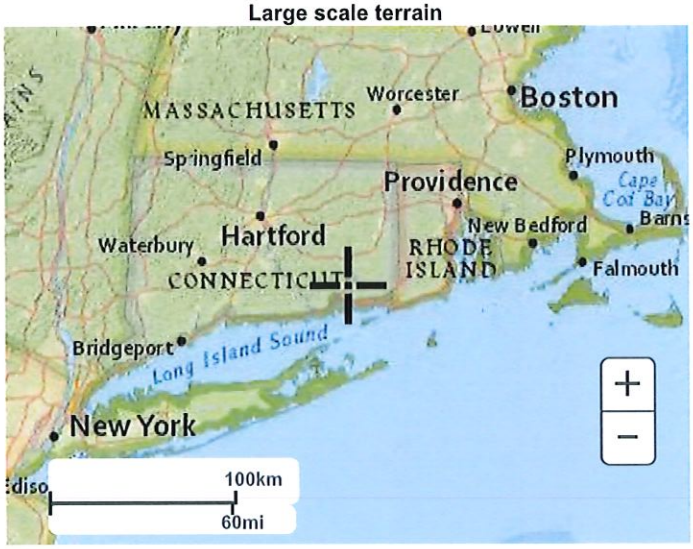
Maps & aerials

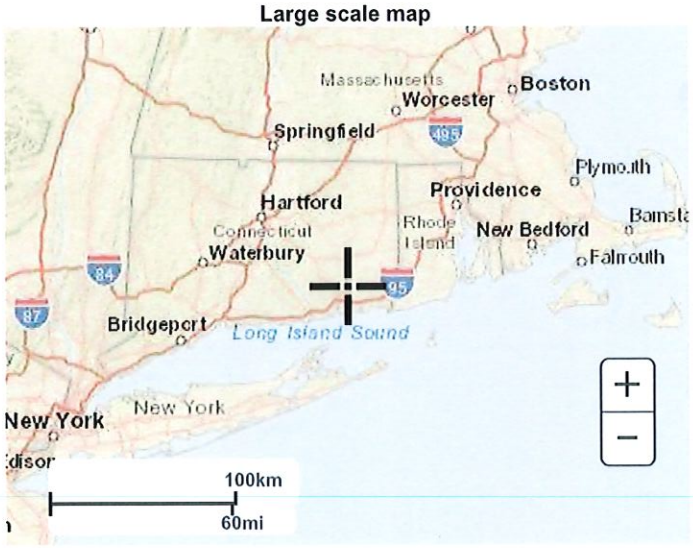
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

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

Disclaimer

APPENDIX "B"

NRCS SOIL MAP AND HYDROLOGIC SOIL GROUP RATINGS

Soil Map—State of Connecticut
(Vicinity Around #245 Route 32)

PROJECT PARCEL SHOWN
HIGHLIGHTED
LOCATION IS APPROX. ONLY

Map Scale: 1:2,720 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

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

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for State of Connecticut

January 24, 2022

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

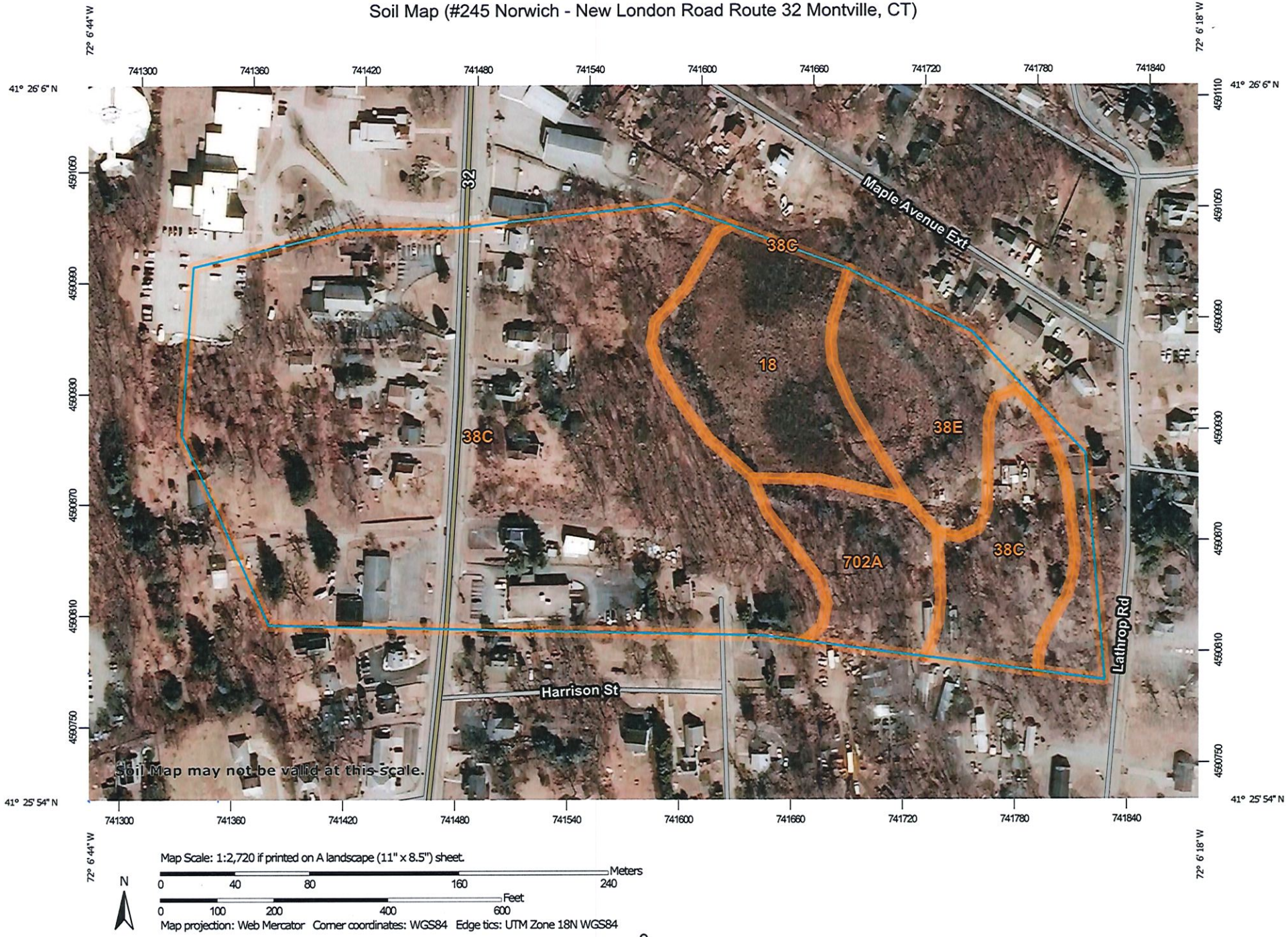
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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

Soil Map

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

Custom Soil Resource Report
Soil Map (#245 Norwich - New London Road Route 32 Montville, CT)



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 21, Sep 7, 2021

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

Date(s) aerial images were photographed: Mar 20, 2019—Mar 27, 2019

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

Map Unit Legend (#245 Norwich - New London Road Route 32 Montville, CT)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
18	Catden and Freetown soils, 0 to 2 percent slopes	2.8	11.7%
38C	Hinckley loamy sand, 3 to 15 percent slopes	17.0	70.7%
38E	Hinckley loamy sand, 15 to 45 percent slopes	2.7	11.1%
702A	Tisbury silt loam, 0 to 3 percent slopes	1.6	6.5%
Totals for Area of Interest		**24.0**	**100.0%**

Map Unit Descriptions (#245 Norwich - New London Road Route 32 Montville, CT)

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

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

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

was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

State of Connecticut

18—Catden and Freetown soils, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2t2r2
Elevation: 0 to 1,390 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: Not prime farmland

Map Unit Composition

Catden and similar soils: 45 percent
Freetown and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Catden

Setting

Landform: Depressions, kettles, marshes, swamps, depressions, bogs, fens, depressions
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed herbaceous organic material and/or highly decomposed woody organic material

Typical profile

Oa1 - 0 to 2 inches: muck
Oa2 - 2 to 79 inches: muck

Properties and qualities

Slope: 0 to 2 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: NoneRare
Frequency of ponding: Frequent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Very high (about 26.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY042NY - Semi-Rich Organic Wetlands
Hydric soil rating: Yes

Description of Freetown

Setting

Landform: Depressions, marshes, depressions, bogs, swamps, kettles
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material

Typical profile

Oe - 0 to 2 inches: mucky peat
Oa - 2 to 79 inches: muck

Properties and qualities

Slope: 0 to 2 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: NoneRare
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Very high (about 26.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY043MA - Acidic Organic Wetlands
Hydric soil rating: Yes

Minor Components

Natchaug

Percent of map unit: 7 percent
Landform: Depressions, depressions, depressions
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman

Percent of map unit: 6 percent
Landform: Drainageways, depressions
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Timakwa

Percent of map unit: 5 percent
Landform: Depressions
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave

Hydric soil rating: Yes

Scarboro

Percent of map unit: 2 percent
Landform: Depressions, drainageways, outwash deltas, outwash terraces
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave, linear
Hydric soil rating: Yes

38C—Hinckley loamy sand, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svmb
Elevation: 0 to 1,290 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

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

Description of Hinckley

Setting

Landform: Outwash deltas, outwash terraces, moraines, eskers, kames, outwash plains, kame terraces
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser, tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained
Runoff class: Very 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 supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent
Landform: Kames, outwash plains, outwash terraces, moraines, eskers
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Moraines, eskers, kames, outwash deltas, outwash terraces, outwash plains, kame terraces
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser, tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Agawam

Percent of map unit: 3 percent
Landform: Outwash deltas, outwash terraces, moraines, eskers, kames, outwash plains, kame terraces
Landform position (two-dimensional): Summit, shoulder, backslope, toeslope, footslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser, tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 2 percent

Landform: Outwash deltas, moraines, outwash plains, kame terraces, outwash terraces
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

38E—Hinckley loamy sand, 15 to 45 percent slopes

Map Unit Setting

National map unit symbol: 2svmj
Elevation: 0 to 1,280 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: Not prime farmland

Map Unit Composition

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

Description of Hinckley

Setting

Landform: Eskers, kames, outwash deltas, outwash terraces, moraines, outwash plains, kame terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 15 to 45 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 supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 5 percent
Landform: Eskers, kames, moraines, outwash deltas, outwash terraces, outwash plains, kame terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent
Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Agawam

Percent of map unit: 3 percent
Landform: Eskers, kame terraces, outwash deltas, outwash terraces, moraines, kames, outwash plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 2 percent
Landform: Kames, eskers, outwash deltas, outwash plains, kame terraces, outwash terraces, moraines
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave

Hydric soil rating: No

702A—Tisbury silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2y07g
Elevation: 0 to 1,260 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Tisbury

Setting

Landform: Outwash terraces, deltas, outwash plains, valley trains
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-silty eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite, schist, and/or gneiss

Typical profile

Ap - 0 to 8 inches: silt loam
Bw1 - 8 to 18 inches: silt loam
Bw2 - 18 to 26 inches: silt loam
2C - 26 to 65 inches: extremely gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 24 to 36 inches to strongly contrasting textural stratification
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C

Ecological site: F144AY026CT - Moist Silty Outwash
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent
Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, crest, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Agawam

Percent of map unit: 5 percent
Landform: Kame terraces, outwash plains, outwash terraces, moraines, kames
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, crest, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Ninigret

Percent of map unit: 3 percent
Landform: Kame terraces, outwash plains, moraines, kames, outwash terraces
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Convex, linear
Across-slope shape: Convex, concave
Hydric soil rating: No

Raypol

Percent of map unit: 2 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

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APPENDIX "C"

RETENTION SYSTEM STRUCTURE
RATING TABLE'S

Stage-Area-Storage for Pond 1P: 60 CONCRETE GALLEY'S

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
58.33	**2,269**	0	59.39	2,269	1,428
58.35	2,269	18	59.41	2,269	1,464
58.37	2,269	36	59.43	2,269	1,499
58.39	2,269	54	59.45	2,269	1,534
58.41	2,269	73	59.47	2,269	1,569
58.43	2,269	91	59.49	2,269	1,605
58.45	2,269	109	59.51	2,269	1,640
58.47	2,269	127	59.53	2,269	1,675
58.49	2,269	145	59.55	2,269	1,711
58.51	2,269	163	59.57	2,269	1,746
58.53	2,269	182	59.59	2,269	1,781
58.55	2,269	200	59.61	2,269	1,816
58.57	2,269	218	59.63	2,269	1,852
58.59	2,269	236	59.65	2,269	1,887
58.61	2,269	254	59.67	2,269	1,922
58.63	2,269	272	59.69	2,269	1,957
58.65	2,269	290	59.71	2,269	1,992
58.67	2,269	309	59.73	2,269	2,028
58.69	2,269	327	59.75	2,269	2,063
58.71	2,269	345	59.77	2,269	2,098
58.73	2,269	363	59.79	2,269	2,133
58.75	2,269	381	59.81	2,269	2,168
58.77	2,269	399	59.83	2,269	2,204
58.79	2,269	418	59.85	2,269	2,239
58.81	2,269	436	59.87	2,269	2,274
58.83	2,269	454	59.89	2,269	2,309
58.85	2,269	488	59.91	2,269	2,344
58.87	2,269	522	59.93	2,269	2,380
58.89	2,269	556	59.95	2,269	2,415
58.91	2,269	590	59.97	2,269	2,450
58.93	2,269	624	59.99	2,269	2,485
58.95	2,269	658	60.01	2,269	2,520
58.97	2,269	692	60.03	2,269	2,555
58.99	2,269	726	60.05	2,269	2,590
59.01	2,269	760	60.07	2,269	2,625
59.03	2,269	794	60.09	2,269	2,661
59.05	2,269	829	60.11	2,269	2,696
59.07	2,269	863	60.13	2,269	2,731
59.09	2,269	898	60.15	2,269	2,766
59.11	2,269	933	60.17	2,269	2,801
59.13	2,269	969	60.19	2,269	2,836
59.15	2,269	1,004	60.21	2,269	2,871
59.17	2,269	1,039	60.23	2,269	2,906
59.19	2,269	1,075	60.25	2,269	2,941
59.21	2,269	1,110	60.27	2,269	2,976
59.23	2,269	1,146	60.29	2,269	3,011
59.25	2,269	1,181	60.31	2,269	3,046
59.27	2,269	1,216	60.33	2,269	3,082
59.29	2,269	1,252	60.35	2,269	3,117
59.31	2,269	1,287	60.37	2,269	3,152
59.33	2,269	1,322	60.39	2,269	3,187
59.35	2,269	1,358	60.41	2,269	3,222
59.37	2,269	1,393	60.43	2,269	3,257

Stage-Area-Storage for Pond 1P: 60 CONCRETE GALLEY'S (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
60.45	2,269	3,292
60.47	2,269	3,327
60.49	2,269	3,362
60.51	2,269	3,397
60.53	2,269	3,432
60.55	2,269	3,467
60.57	2,269	3,502
60.59	2,269	3,537
60.61	2,269	3,572
60.63	2,269	3,607
60.65	2,269	3,642
60.67	2,269	3,676
60.69	2,269	3,711
60.71	2,269	3,746
60.73	2,269	3,781
60.75	2,269	3,816
60.77	2,269	3,851
60.79	2,269	3,886
60.81	2,269	3,921
60.83	2,269	3,956
60.85	2,269	3,991
60.87	2,269	4,026
60.89	2,269	4,061
60.91	2,269	4,095
60.93	2,269	4,130
60.95	2,269	4,165
60.97	2,269	4,200
60.99	2,269	4,235
61.01	2,269	4,270
61.03	2,269	4,305
61.05	2,269	4,339
61.07	2,269	4,374
61.09	2,269	4,409
61.11	2,269	4,444
61.13	2,269	4,479
61.15	2,269	4,514
61.17	2,269	4,548
61.19	2,269	4,583
61.21	2,269	4,618
61.23	2,269	4,653
61.25	2,269	4,688
61.27	2,269	4,722
61.29	2,269	4,757
61.31	2,269	4,792
61.33	2,269	4,827
61.35	2,269	4,861
61.37	2,269	4,896
61.39	2,269	4,931
61.41	2,269	4,966
61.43	2,269	5,000
61.45	2,269	5,035
61.47	2,269	5,070
61.49	2,269	5,105
61.51	2,269	5,139
61.53	2,269	5,174
61.55	2,269	5,209
61.57	2,269	5,243
61.59	2,269	5,278
61.61	2,269	5,313
61.63	2,269	5,347
61.65	2,269	5,382
61.67	2,269	5,417
61.69	2,269	5,451
61.71	2,269	5,486
61.73	2,269	5,521
61.75	2,269	5,555
61.77	2,269	5,590
61.79	2,269	5,625
61.81	2,269	5,659
61.83	2,269	5,694
61.85	2,269	5,728
61.87	2,269	5,763
61.89	2,269	5,798
61.91	2,269	5,832
61.93	2,269	5,867
61.95	2,269	5,901
61.97	2,269	5,936
61.99	2,269	5,971
62.01	2,269	6,005
62.03	2,269	6,040
62.05	2,269	6,074
62.07	2,269	6,109
62.09	2,269	6,143
62.11	2,269	6,178
62.13	2,269	6,212
62.15	2,269	6,247
62.17	2,269	6,282
62.19	2,269	6,316
62.21	2,269	6,351
62.23	2,269	6,385
62.25	2,269	6,420
62.27	2,269	6,454
62.29	2,269	6,489
62.31	2,269	6,523
62.33	2,269	6,558
62.35	2,269	6,592
62.37	2,269	6,626
62.39	2,269	6,661
62.41	2,269	6,695
62.43	2,269	6,699
62.45	2,269	6,703
62.47	2,269	6,707
62.49	2,269	6,711
62.51	2,269	6,715
62.53	2,269	6,719
62.55	2,269	6,723

Stage-Area-Storage for Pond 1P: 60 CONCRETE GALLEY'S (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
62.57	2,269	6,727
62.59	2,269	6,731
62.61	2,269	6,735
62.63	2,269	6,739
62.65	2,269	6,743
62.67	2,269	6,747
62.69	2,269	6,751
62.71	2,269	6,755
62.73	2,269	6,759
62.75	2,269	6,763
62.77	2,269	6,767
62.79	2,269	6,771
62.81	2,269	6,775
62.83	2,269	6,779
62.85	2,269	6,797
62.87	2,269	6,815
62.89	2,269	6,833
62.91	2,269	6,852
62.93	2,269	6,870
62.95	2,269	6,888
62.97	2,269	6,906
62.99	2,269	6,924
63.01	2,269	6,942
63.03	2,269	6,961
63.05	2,269	6,979
63.07	2,269	6,997
63.09	2,269	7,015
63.11	2,269	7,033
63.13	2,269	7,051
63.15	2,269	7,069
63.17	2,269	7,088
63.19	2,269	7,106
63.21	2,269	7,124
63.23	2,269	7,142
63.25	2,269	7,160
63.27	2,269	7,178
63.29	2,269	7,197
63.31	2,269	7,215
63.33	2,269	7,233
63.35	2,269	7,251
63.37	2,269	7,269
63.39	2,269	7,287
63.41	2,269	7,305
63.43	2,269	7,324
63.45	2,269	7,342
63.47	2,269	7,360
63.49	2,269	**7,378**

APPENDIX "D"

WATER QUALITY VOLUME CALCULATION

Fuller Engineering & Land Surveying, LLC
525 John Street • Second Floor
Bridgeport, CT 06604
(203) 333-9465 (203) 336-1769 FAX

Project: #245 Norwich New London Rd. CT Route 32
MONTVILLE, CT

Date: 1/24/22

Water Quality Volume Calc
Connecticut Stormwater Quality Manual Methodology

Completed By: SDU

Drainage Area: SITE

Checked By:

Step 1: Calculate Water Quality Volume, (WQv)

$$WQv = (1" \times R \times A) / 12$$

Where:

R = Rvl * %I + RvT * %T + RvF * %F
Rvl = Runoff Coefficient for Impervious Cover (SEE MANUAL TABLE 5.5)
%I = Percent of Site in Impervious Cover (Fraction)
RvT = Runoff Coefficient for Lawn
%T = Percent of Site in Lawn (Fraction)
RvF = Runoff Coefficient for Forest Cover
%F = Percent of Site in Forest (Fraction)
A = Tributary Drainage Area (Acre)
WQv = Required Water Quality Volume
P = 2 Year Frequency Storm (3.4)

Design Parameters									Water Quality Volume
P (in)	A (SF)	Rvl	%I	RvT	%T	RvF	%F	R	(Cu. Ft.)
1.0	79,605.00	0.95	0.40	0.08	0.35	0.05	0.247	0.41584	2758.58

Volume Required to Store On-Site for Cleaning: **2,759 CU. FT.**

Inundated Volume provided by the subsurface systems is > 7,000 Cu. Ft.

Vol. provided by the subsurface sys. with inv. set at 61.67' (60 count) = 5,417 Cu. Ft.

Therefore the WQV is Satisfied

APPENDIX "E"

RUNOFF VOLUME REDUCTION CALCULATION

Fuller Engineering & Land Surveying, LLC
525 John Street • Second Floor
Bridgeport, CT 06604
(203) 333-9465 (203) 336-1769 FAX

Project: #245 Norwich New London Rd. CT Route 32
MONTVILLE, CT

Date: 1/22/22

Runoff Volume Reduction Calc
Connecticut Stormwater Quality Manual Methodology

Completed By: SDU

Drainage Area: Site

Checked By:

Step 2: Calculate Runoff Volume Reduction, (RRV)

$$RRV = V_{post}\ (2yr) - V_{pre}\ (2yr)$$

Where: V_{post} (2yr) = Total Runoff Volume of Post-Construction Site Condition (2 yr, 24 hour storm)
V_{pre} (2yr) = Total Runoff Volume of Pre-Construction Site Condition (2 yr, 24 hour storm)

Design Parameters		Runoff Reduction Volume
Vpost (2yr)	Vpre (2yr)	(Cu. Ft.)
10278.00	3386.00	**6892.00**

Runoff will be infiltrated in proposed underground retention system.

V_{pre} (2yr) = Total Runoff Volume of Pre-Construction Site Condition (2 yr, 24 hour storm) =3,386.0 CF

V_{post} (2yr) = Total Runoff Volume of Post-Construction Site Condition (2 yr, 24 hour storm)(No BMP) =10,278.0 CF

RRV = V_{post} (2yr) - V_{pre} (2yr) = 6,892.0 CF

RSV = Proposed Retention Storage Volume * (Total Allowable for system) = 7,378 CF
* Refer to Appendix "C" for Retention Strorage Volume Calculations.

V_{post_BMP} = Total Runoff Volume of Post-Construction with BMP's (2 yr, 24 hour storm)

V_{post_BMP} =V_{post} (2yr) - RSV =10,278 - 7,378 = 2,900 CF

V_{post_BMP} < V_{pre} (2yr) **Therefore the Runoff Volume Reduction Standard is met.**

APPENDIX "f"

GROUND WATER RECHARGE VOLUME CALCULATION

Fuller Engineering & Land Surveying, LLC
525 John Street • Second Floor
Bridgeport, CT 06604
(203) 333-9465 (203) 336-1769 FAX

Project: #245 Norwich New London Rd. CT Route 32
MONTVILLE, CT

Date: 1/24/22

Ground Water Recharge Volume Calculations
Connecticut Stormwater Quality Manual Methodology

Completed By: SDU

Drainage Area: Urban Area (69.8% of Area)

Checked By:

Calculate Ground Water Recharge, (GWR)

$$GRV = F \times I$$

Where: GRV = Groundwater Recharge Volume (cubic-ft)
F = Target Depth Factor associated with Hydrologic Soil Group (inches)
I = Impervious Area on the Post-Development Site (sq. ft)

	Design Parameters		Groundwater Recharge Volume
	Target Depth Factor	Impervious Area	
HSG C	0.25	24,072	501.50

Ground Water Recharge Volume: **501.5 CU. FT.**

Total Retention Storage Volume provided by 60 Concrete Galley with gravel bed is 5,417 Cu. Ft.

Total Retention Storage Volume > Groundwater Recharge Volume, therefore Standard is met

APPENDIX "G"

TSS (TOTAL SUSPENDED SOLIDS) REMOVAL CALCULATION

TSS Removal Calculation Worksheet

Location: 28 CONCRETE GALLEYS

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
DEEP SUMP CATCH BASIN	25%	1.00	0.25	0.75
SUBSURFACE STRUCTURE	90%	0.75	0.68	0.08
		0.08	0.00	0.08
		0.08	0.00	0.08
		0.08	0.00	0.08

Total TSS Removal = 93%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 245 ROUTE 32
Prepared By: SDU
Date: 1/24/2022

*Equals remaining load from previous BMP (E) which enters the BMP

TSS Removal Calculation Worksheet

Location: 32 CONCRETE GALLEYS

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
SUBSURFACE STRUCTURE	90%	0.08	0.07	0.01
DEEP SUMP CATCH BASIN	25%	0.01	0.00	0.01
		0.01	0.00	0.01
		0.01	0.00	0.01
		0.01	0.00	0.01

Total TSS Removal = 99%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 245 ROUTE 32
Prepared By: SDU
Date: 1/24/2022

*Equals remaining load from previous BMP (E) which enters the BMP

APPENDIX "H"

INFILTRATION SYSTEM DRAWDOWN CALCULATION

FULLER ENGINEERING & LAND SURVEYING, LLC

525 John Street • Second Floor
Bridgeport, CT 06604
(203) 333-9465 (203) 336-1769 FAX

DRAWDOWN CALCULATIONS:

245 NORWICH-NEW LONDON ROAD
STATE ROUTE 32
MONTVILLE, CT

(60) - 4' x 8' x 4' High CONCRETE GALLEY DETENTION/RETENTION SYSTEM

The storage capacity of this retention system is 5,417 cf.
Refer to Appendix "C" for a structure rating table of the system.

$$\text{Time} = \frac{DV}{K \times A}$$

SOIL CONDUCTIVITY
RATE = 20 MIN PER IN
3 IN PER HR
SAFETY FACTOR OF 2
RATE = 1.5 IN PER HR

DV =	DESIGN VOLUME	5,417	cf
K=	INFILTRATION RATE	1.5	in/hr (rate based on Soil Class)
A=	BOTTOM AREA	907.68	sf surface area x porosity of stone (122 x 18.6 x 0.4)

$$\text{Time} = \frac{5417}{(1.5) \times (907.7)(1/12)}$$

Time = 47.7 hrs

The proposed Concrete Galley System volume will drawdown within 48 Hours.

DRAWDOWN CALCULATION BASED ON THE FOLLOWING:

(Using a conservative Percolation Rate of 20 min./in & Test Pit Data By Others):

TEST HOLE DATA
PERFORMED 9/30/14, BY P. LAFAYETTE, P.E.

TH-1
0-12" TOPSOIL
12-47" TAN FINE-MED. SAND W/SOME SILT
47-130" MED.-COARSE SAND AND STONES

NO MOTTLING, NO WATER, NO LEDGE

TH-2
0-6" TOPSOIL
6-40" TAN FINE-MED. SAND W/SOME SILT
40-128" MED.-COARSE SAND AND STONES

NO MOTTLING, NO WATER, NO LEDGE

TH-3
0-4" TOPSOIL
4-32" ORANGE FINE SAND W/SOME SILT & S
32-125" MED.-COARSE SAND AND STONES

NO MOTTLING, NO WATER, NO LEDGE

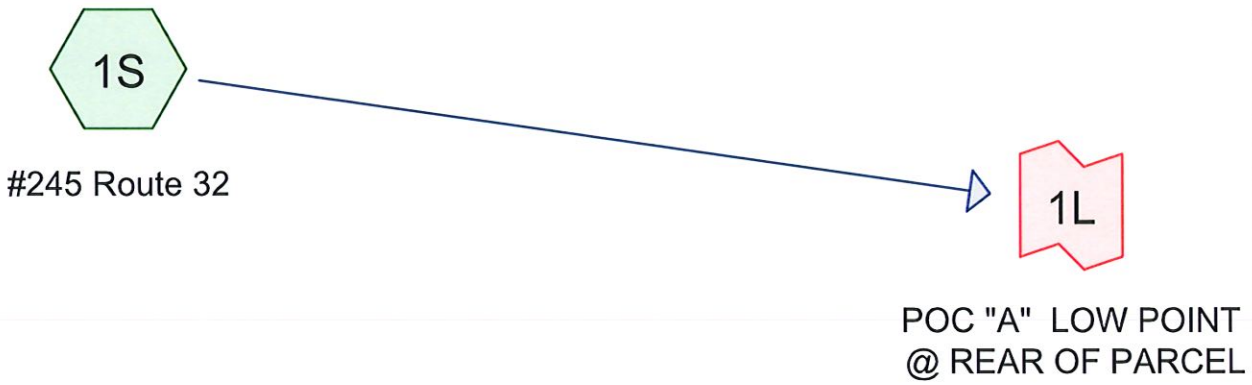
TH-2
0-10" TOPSOIL
10-52" ORANGE FINE SAND W/SOME SILT & S
52-136" MED.-COARSE SAND AND STONES

NO MOTTLING, NO WATER, NO LEDGE

NOTE: SOIL TESTING DATA PROVIDED BY OTHERS. DEVELOPMENT SOLUTIONS, LLC GRADING, DRAINAGE & UTILITY PLAN - COMMERCIAL/RESIDENTIAL COMPLEX NORWICH-NEW LONDON ROAD (ROUTE 32) MONTVILLE, CONNECTICUT. PREPARED FOR TOMASHE LLC 19 TULSA COURT MONMOUTH JUNCTION, NJ 08852. DATED SEPTEMBER 19, 2014, SCALE: 1" = 20', DRAWING NO. DS - 14 - 545.

APPENDIX "J"

HYDROCAD ANALYSIS 25-Year Storm Frequency
EXISTING CONDITIONS



Subcat Reach Pond Link

Routing Diagram for PRE DEVEL
Prepared by Fuller Engineering & Land Surveying, LLC, Printed 1/24/2022
HydroCAD® 10.00 s/n 02123 © 2011 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
38,476	58	Woods/grass comb., Good, HSG B (1S)
38,866	61	>75% Grass cover, Good, HSG B (1S)
1,661	98	Roofs, HSG B (1S)
22	98	Unconnected pavement, HSG B (1S)
580	98	Unconnected roofs, HSG D (1S)
79,605	**61**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
79,025	HSG B	1S
0	HSG C	
580	HSG D	1S
0	Other	
79,605		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
0	38,866	0	0	0	38,866	>75% Grass cover, Good	1S
0	22	0	0	0	22	Unconnected pavement	1S
0	1,661	0	0	0	1,661	Roofs	1S
0	0	0	580	0	580	Unconnected roofs	1S
0	38,476	0	0	0	38,476	Woods/grass comb., Good	1S
0	**79,025**	**0**	**580**	**0**	**79,605**	**TOTAL AREA**	

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

Subcatchment 1S: #245 Route 32 Runoff Area=79,605 sf 2.84% Impervious Runoff Depth>2.01"
Flow Length=580' Tc=21.6 min UI Adjusted CN=60 Runoff=2.66 cfs 13,330 cf

Link 1L: POC "A" LOW POINT @ REAR OF PARCEL Inflow=2.66 cfs 13,330 cf
Primary=2.66 cfs 13,330 cf

Total Runoff Area = 79,605 sf Runoff Volume = 13,330 cf Average Runoff Depth = 2.01"
97.16% Pervious = 77,342 sf 2.84% Impervious = 2,263 sf

Summary for Subcatchment 1S: #245 Route 32

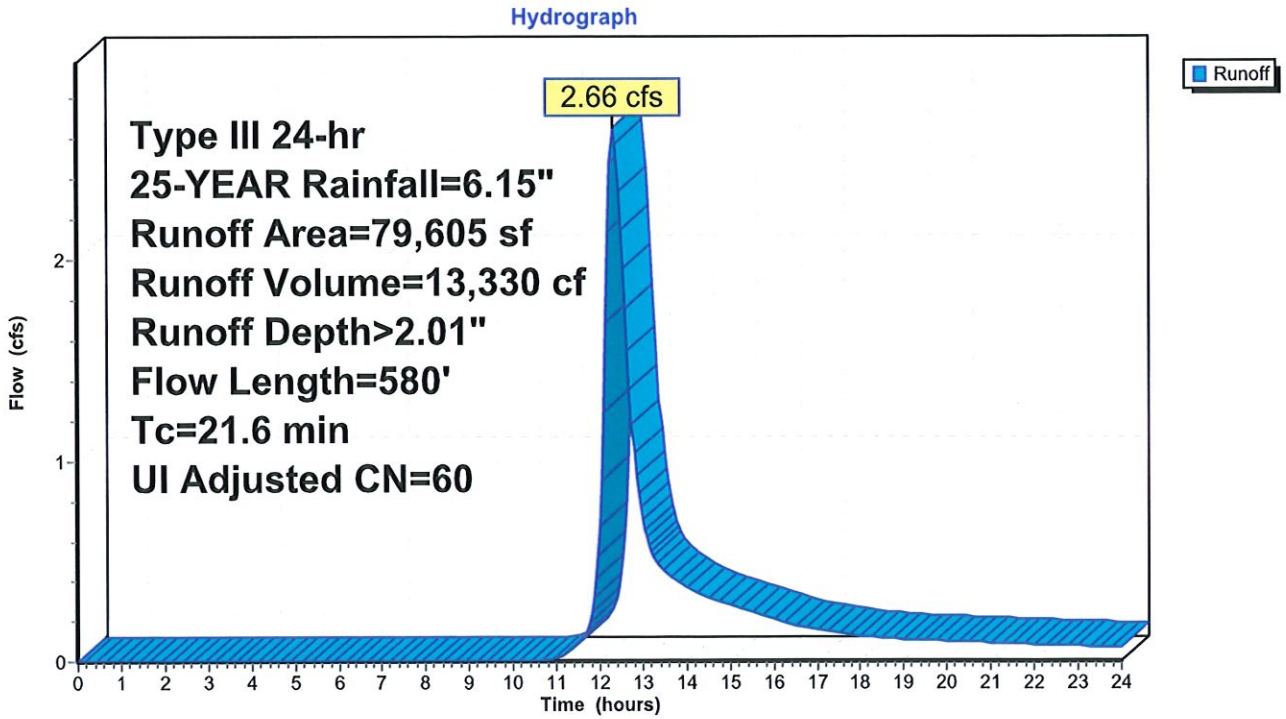
Runoff = 2.66 cfs @ 12.32 hrs, Volume= 13,330 cf, Depth> 2.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YEAR Rainfall=6.15"

Area (sf)	CN	Description
1,661	98	Roofs, HSG B
22	98	Unconnected pavement, HSG B
580	98	Unconnected roofs, HSG D
38,476	58	Woods/grass comb., Good, HSG B
38,866	61	>75% Grass cover, Good, HSG B
79,605	61	Weighted Average, UI Adjusted CN = 60
77,342		97.16% Pervious Area
2,263		2.84% Impervious Area
602		26.60% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	480	0.0695	0.71		**Lag/CN Method, Overland Flow**
10.3	100	0.1160	0.16		**Sheet Flow, Thru the Woods** Woods: Light underbrush n= 0.400 P2= 3.40"
21.6	580	Total			

Subcatchment 1S: #245 Route 32



Hydrograph for Subcatchment 1S: #245 Route 32

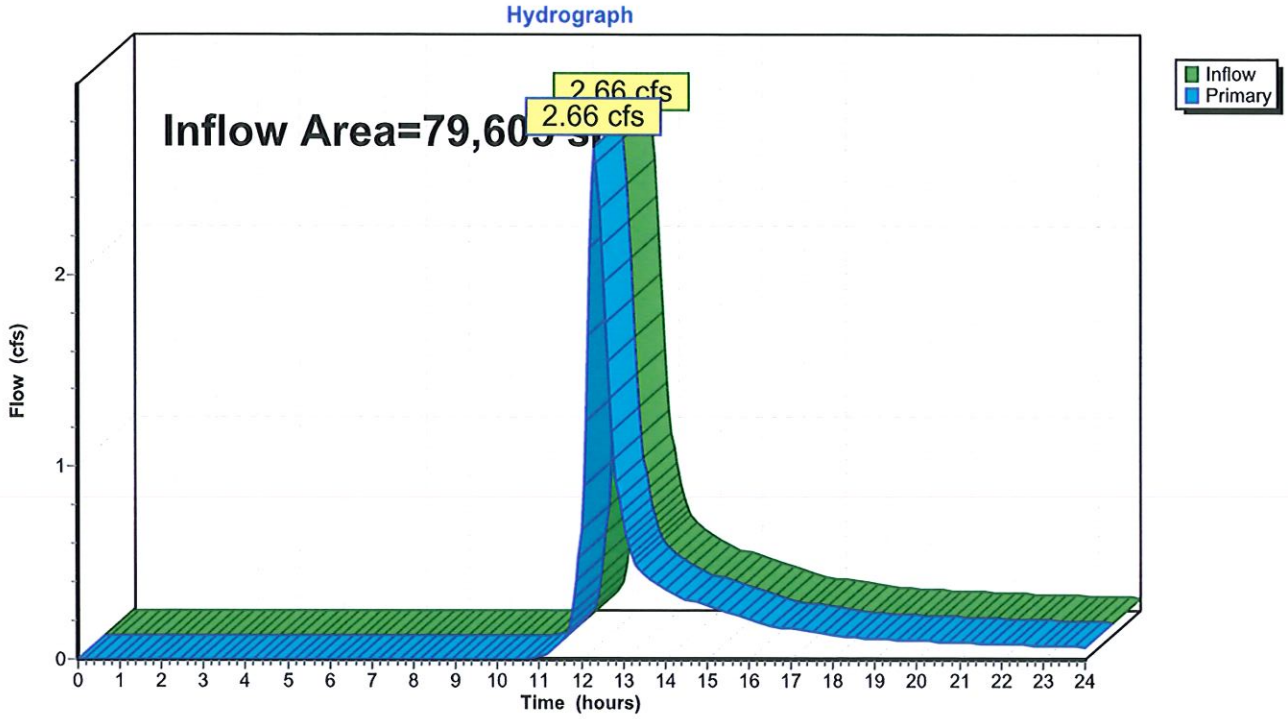
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	13.00	4.61	1.08	0.71
0.25	0.02	0.00	0.00	13.25	4.72	1.14	0.52
0.50	0.03	0.00	0.00	13.50	4.82	1.20	0.44
0.75	0.05	0.00	0.00	13.75	4.91	1.25	0.40
1.00	0.06	0.00	0.00	14.00	4.99	1.29	0.37
1.25	0.08	0.00	0.00	14.25	5.06	1.34	0.34
1.50	0.09	0.00	0.00	14.50	5.13	1.38	0.31
1.75	0.11	0.00	0.00	14.75	5.19	1.42	0.30
2.00	0.12	0.00	0.00	15.00	5.25	1.45	0.28
2.25	0.14	0.00	0.00	15.25	5.31	1.49	0.26
2.50	0.15	0.00	0.00	15.50	5.36	1.52	0.24
2.75	0.17	0.00	0.00	15.75	5.41	1.54	0.23
3.00	0.19	0.00	0.00	16.00	5.45	1.57	0.21
3.25	0.21	0.00	0.00	16.25	5.49	1.60	0.19
3.50	0.23	0.00	0.00	16.50	5.53	1.62	0.18
3.75	0.24	0.00	0.00	16.75	5.56	1.64	0.17
4.00	0.26	0.00	0.00	17.00	5.59	1.66	0.16
4.25	0.28	0.00	0.00	17.25	5.62	1.68	0.15
4.50	0.31	0.00	0.00	17.50	5.65	1.70	0.14
4.75	0.33	0.00	0.00	17.75	5.68	1.72	0.14
5.00	0.35	0.00	0.00	18.00	5.71	1.73	0.13
5.25	0.37	0.00	0.00	18.25	5.73	1.75	0.12
5.50	0.39	0.00	0.00	18.50	5.76	1.76	0.11
5.75	0.42	0.00	0.00	18.75	5.78	1.78	0.11
6.00	0.44	0.00	0.00	19.00	5.80	1.79	0.11
6.25	0.47	0.00	0.00	19.25	5.82	1.81	0.11
6.50	0.50	0.00	0.00	19.50	5.84	1.82	0.10
6.75	0.53	0.00	0.00	19.75	5.87	1.83	0.10
7.00	0.56	0.00	0.00	20.00	5.89	1.85	0.10
7.25	0.59	0.00	0.00	20.25	5.91	1.86	0.10
7.50	0.62	0.00	0.00	20.50	5.92	1.87	0.09
7.75	0.66	0.00	0.00	20.75	5.94	1.88	0.09
8.00	0.70	0.00	0.00	21.00	5.96	1.90	0.09
8.25	0.74	0.00	0.00	21.25	5.98	1.91	0.09
8.50	0.79	0.00	0.00	21.50	6.00	1.92	0.09
8.75	0.84	0.00	0.00	21.75	6.01	1.93	0.08
9.00	0.90	0.00	0.00	22.00	6.03	1.94	0.08
9.25	0.96	0.00	0.00	22.25	6.05	1.95	0.08
9.50	1.02	0.00	0.00	22.50	6.06	1.96	0.08
9.75	1.09	0.00	0.00	22.75	6.08	1.97	0.08
10.00	1.16	0.00	0.00	23.00	6.09	1.98	0.07
10.25	1.24	0.00	0.00	23.25	6.11	1.99	0.07
10.50	1.33	0.00	0.00	23.50	6.12	2.00	0.07
10.75	1.43	0.00	0.00	23.75	6.14	2.01	0.07
11.00	1.54	0.01	0.02	24.00	**6.15**	**2.02**	0.07
11.25	1.67	0.02	0.04				
11.50	1.83	0.03	0.09				
11.75	2.18	0.10	0.19				
12.00	3.07	0.36	0.68				
12.25	3.97	0.74	**2.48**				
12.50	4.32	0.92	**2.15**				
12.75	4.48	1.01	1.18				

Summary for Link 1L: POC "A" LOW POINT @ REAR OF PARCEL

Inflow Area = 79,605 sf, 2.84% Impervious, Inflow Depth > 2.01" for 25-YEAR event
Inflow = 2.66 cfs @ 12.32 hrs, Volume= 13,330 cf
Primary = 2.66 cfs @ 12.32 hrs, Volume= 13,330 cf, Atten= 0%, Lag= 0.0 min

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

Link 1L: POC "A" LOW POINT @ REAR OF PARCEL

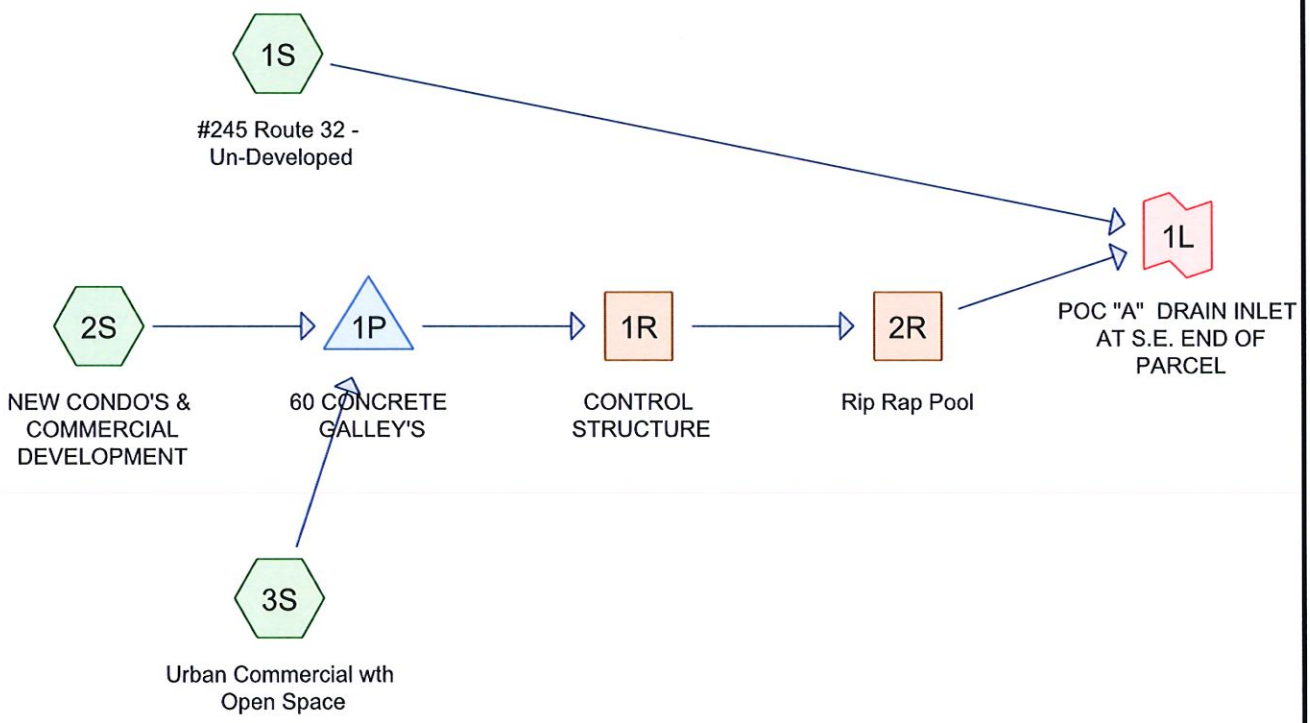


Hydrograph for Link 1L: POC "A" LOW POINT @ REAR OF PARCEL

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	**0.00**	0.00	13.00	0.71	0.00	0.71
0.25	0.00	0.00	0.00	13.25	0.52	0.00	0.52
0.50	0.00	0.00	0.00	13.50	0.44	0.00	0.44
0.75	0.00	0.00	0.00	13.75	0.40	0.00	0.40
1.00	0.00	0.00	0.00	14.00	0.37	0.00	0.37
1.25	0.00	0.00	0.00	14.25	0.34	0.00	0.34
1.50	0.00	0.00	0.00	14.50	0.31	0.00	0.31
1.75	0.00	0.00	0.00	14.75	0.30	0.00	0.30
2.00	0.00	0.00	0.00	15.00	0.28	0.00	0.28
2.25	0.00	0.00	0.00	15.25	0.26	0.00	0.26
2.50	0.00	0.00	0.00	15.50	0.24	0.00	0.24
2.75	0.00	0.00	0.00	15.75	0.23	0.00	0.23
3.00	0.00	0.00	0.00	16.00	0.21	0.00	0.21
3.25	0.00	0.00	0.00	16.25	0.19	0.00	0.19
3.50	0.00	0.00	0.00	16.50	0.18	0.00	0.18
3.75	0.00	0.00	0.00	16.75	0.17	0.00	0.17
4.00	0.00	0.00	0.00	17.00	0.16	0.00	0.16
4.25	0.00	0.00	0.00	17.25	0.15	0.00	0.15
4.50	0.00	0.00	0.00	17.50	0.14	0.00	0.14
4.75	0.00	0.00	0.00	17.75	0.14	0.00	0.14
5.00	0.00	0.00	0.00	18.00	0.13	0.00	0.13
5.25	0.00	0.00	0.00	18.25	0.12	0.00	0.12
5.50	0.00	0.00	0.00	18.50	0.11	0.00	0.11
5.75	0.00	0.00	0.00	18.75	0.11	0.00	0.11
6.00	0.00	0.00	0.00	19.00	0.11	0.00	0.11
6.25	0.00	0.00	0.00	19.25	0.11	0.00	0.11
6.50	0.00	0.00	0.00	19.50	0.10	0.00	0.10
6.75	0.00	0.00	0.00	19.75	0.10	0.00	0.10
7.00	0.00	0.00	0.00	20.00	0.10	0.00	0.10
7.25	0.00	0.00	0.00	20.25	0.10	0.00	0.10
7.50	0.00	0.00	0.00	20.50	0.09	0.00	0.09
7.75	0.00	0.00	0.00	20.75	0.09	0.00	0.09
8.00	0.00	0.00	0.00	21.00	0.09	0.00	0.09
8.25	0.00	0.00	0.00	21.25	0.09	0.00	0.09
8.50	0.00	0.00	0.00	21.50	0.09	0.00	0.09
8.75	0.00	0.00	0.00	21.75	0.08	0.00	0.08
9.00	0.00	0.00	0.00	22.00	0.08	0.00	0.08
9.25	0.00	0.00	0.00	22.25	0.08	0.00	0.08
9.50	0.00	0.00	0.00	22.50	0.08	0.00	0.08
9.75	0.00	0.00	0.00	22.75	0.08	0.00	0.08
10.00	0.00	0.00	0.00	23.00	0.07	0.00	0.07
10.25	0.00	0.00	0.00	23.25	0.07	0.00	0.07
10.50	0.00	0.00	0.00	23.50	0.07	0.00	0.07
10.75	0.00	0.00	0.00	23.75	0.07	0.00	0.07
11.00	0.02	0.00	0.02	24.00	0.07	0.00	0.07
11.25	0.04	0.00	0.04				
11.50	0.09	0.00	0.09				
11.75	0.19	0.00	0.19				
12.00	0.68	0.00	0.68				
12.25	**2.48**	0.00	**2.48**				
12.50	**2.15**	0.00	**2.15**				
12.75	1.18	0.00	1.18				

APPENDIX "K"

HYDROCAD ANALYSIS 25-Year Storm Frequency
PROPOSED CONDITIONS



Subcat Reach Pond Link

Routing Diagram for POST DEVEL
Prepared by Fuller Engineering & Land Surveying, LLC, Printed 1/24/2022
HydroCAD® 10.00 s/n 02123 © 2011 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
19,656	65	Brush, Good, HSG C (1S)
27,548	69	50-75% Grass cover, Fair, HSG B (3S)
11,898	81	1/3 acre lots, 30% imp, HSG C (2S)
20,503	98	Roofs, HSG B (2S)
79,605	**77**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
48,051	HSG B	2S, 3S
31,554	HSG C	1S, 2S
0	HSG D	
0	Other	
79,605		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
0	27,548	0	0	0	27,548	50-75% Grass cover, Fair	3S
0	20,503	0	0	0	20,503	Roofs	2S
0	0	11,898	0	0	11,898	1/3 acre lots, 30% imp	2S
0	0	19,656	0	0	19,656	Brush, Good	1S
0	**48,051**	**31,554**	**0**	**0**	**79,605**	**TOTAL AREA**	

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

Subcatchment 1S: #245 Route 32 - Un-Developed Runoff Area=19,656 sf 0.00% Impervious Runoff Depth>2.45"
Flow Length=120' Slope=0.1080 '/' Tc=12.7 min CN=65 Runoff=1.01 cfs 4,020 cf

Subcatchment 2S: NEW CONDO'S & Runoff Area=32,401 sf 74.30% Impervious Runoff Depth>5.18"
Flow Length=668' Slope=0.0750 '/' Tc=40.8 min CN=92 Runoff=2.10 cfs 13,998 cf

Subcatchment 3S: Urban Commercial wth Open Runoff Area=27,548 sf 0.00% Impervious Runoff Depth>2.81"
Tc=29.3 min CN=69 Runoff=1.19 cfs 6,455 cf

Reach 1R: CONTROL STRUCTURE Avg. Flow Depth=0.01' Max Vel=154.72 fps Inflow=1.76 cfs 5,838 cf
n=0.013 L=5.0' S=1.8320 '/' Capacity=3,515.86 cfs Outflow=1.76 cfs 5,838 cf

Reach 2R: Rip Rap Pool Avg. Flow Depth=0.44' Max Vel=2.45 fps Inflow=1.76 cfs 5,838 cf
n=0.040 L=10.0' S=0.0250 '/' Capacity=130.02 cfs Outflow=1.76 cfs 5,838 cf

Pond 1P: 60 CONCRETE GALLEY'S Peak Elev=62.39' Storage=6,666 cf Inflow=3.23 cfs 20,453 cf
Discarded=0.22 cfs 12,033 cf Primary=1.76 cfs 5,838 cf Outflow=1.99 cfs 17,871 cf

Link 1L: POC "A" DRAIN INLET AT S.E. END OF PARCEL Inflow=1.94 cfs 9,858 cf
Primary=1.94 cfs 9,858 cf

Total Runoff Area = 79,605 sf Runoff Volume = 24,473 cf Average Runoff Depth = 3.69"
69.76% Pervious = 55,533 sf 30.24% Impervious = 24,072 sf

Summary for Subcatchment 1S: #245 Route 32 - Un-Developed

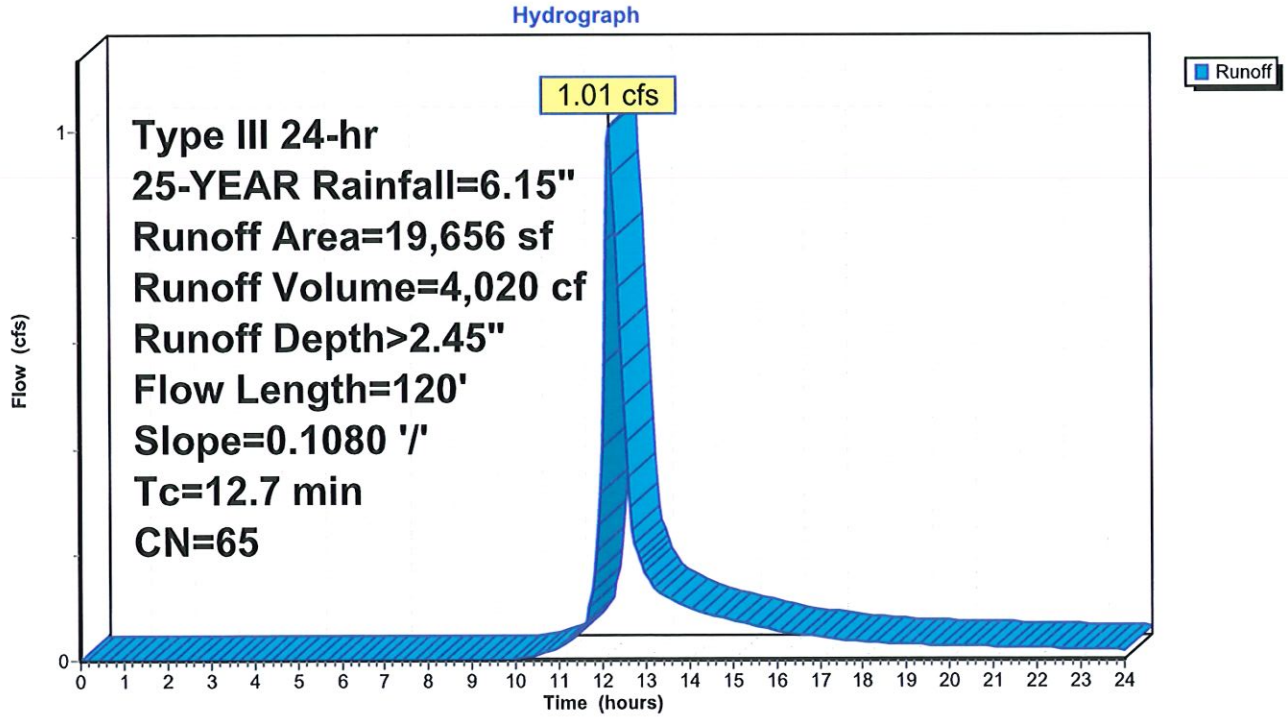
Runoff = 1.01 cfs @ 12.19 hrs, Volume= 4,020 cf, Depth> 2.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YEAR Rainfall=6.15"

Area (sf)	CN	Description
19,656	65	Brush, Good, HSG C
19,656		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	120	0.1080	0.74		**Lag/CN Method, Overland Flow**
10.0					**Direct Entry, HydroStatic Seepage from Wall**
12.7	120	Total			

Subcatchment 1S: #245 Route 32 - Un-Developed



Hydrograph for Subcatchment 1S: #245 Route 32 - Un-Developed

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	13.00	4.61	1.40	0.16
0.25	0.02	0.00	0.00	13.25	4.72	1.47	0.13
0.50	0.03	0.00	0.00	13.50	4.82	1.53	0.12
0.75	0.05	0.00	0.00	13.75	4.91	1.59	0.11
1.00	0.06	0.00	0.00	14.00	4.99	1.65	0.10
1.25	0.08	0.00	0.00	14.25	5.06	1.69	0.09
1.50	0.09	0.00	0.00	14.50	5.13	1.74	0.09
1.75	0.11	0.00	0.00	14.75	5.19	1.78	0.08
2.00	0.12	0.00	0.00	15.00	5.25	1.82	0.08
2.25	0.14	0.00	0.00	15.25	5.31	1.86	0.07
2.50	0.15	0.00	0.00	15.50	5.36	1.90	0.07
2.75	0.17	0.00	0.00	15.75	5.41	1.93	0.06
3.00	0.19	0.00	0.00	16.00	5.45	1.96	0.05
3.25	0.21	0.00	0.00	16.25	5.49	1.99	0.05
3.50	0.23	0.00	0.00	16.50	5.53	2.01	0.05
3.75	0.24	0.00	0.00	16.75	5.56	2.04	0.05
4.00	0.26	0.00	0.00	17.00	5.59	2.06	0.04
4.25	0.28	0.00	0.00	17.25	5.62	2.08	0.04
4.50	0.31	0.00	0.00	17.50	5.65	2.10	0.04
4.75	0.33	0.00	0.00	17.75	5.68	2.12	0.04
5.00	0.35	0.00	0.00	18.00	5.71	2.14	0.03
5.25	0.37	0.00	0.00	18.25	5.73	2.16	0.03
5.50	0.39	0.00	0.00	18.50	5.76	2.17	0.03
5.75	0.42	0.00	0.00	18.75	5.78	2.19	0.03
6.00	0.44	0.00	0.00	19.00	5.80	2.21	0.03
6.25	0.47	0.00	0.00	19.25	5.82	2.22	0.03
6.50	0.50	0.00	0.00	19.50	5.84	2.24	0.03
6.75	0.53	0.00	0.00	19.75	5.87	2.25	0.03
7.00	0.56	0.00	0.00	20.00	5.89	2.27	0.03
7.25	0.59	0.00	0.00	20.25	5.91	2.28	0.03
7.50	0.62	0.00	0.00	20.50	5.92	2.30	0.03
7.75	0.66	0.00	0.00	20.75	5.94	2.31	0.03
8.00	0.70	0.00	0.00	21.00	5.96	2.32	0.02
8.25	0.74	0.00	0.00	21.25	5.98	2.34	0.02
8.50	0.79	0.00	0.00	21.50	6.00	2.35	0.02
8.75	0.84	0.00	0.00	21.75	6.01	2.36	0.02
9.00	0.90	0.00	0.00	22.00	6.03	2.37	0.02
9.25	0.96	0.00	0.00	22.25	6.05	2.39	0.02
9.50	1.02	0.00	0.00	22.50	6.06	2.40	0.02
9.75	1.09	0.00	0.00	22.75	6.08	2.41	0.02
10.00	1.16	0.00	0.00	23.00	6.09	2.42	0.02
10.25	1.24	0.00	0.01	23.25	6.11	2.43	0.02
10.50	1.33	0.01	0.01	23.50	6.12	2.44	0.02
10.75	1.43	0.02	0.02	23.75	6.14	2.45	0.02
11.00	1.54	0.04	0.02	24.00	**6.15**	**2.46**	0.02
11.25	1.67	0.06	0.04				
11.50	1.83	0.09	0.06				
11.75	2.18	0.19	0.13				
12.00	3.07	0.54	**0.40**				
12.25	3.97	1.01	**0.92**				
12.50	4.32	1.22	0.48				
12.75	4.48	1.32	0.22				

Summary for Subcatchment 2S: NEW CONDO'S & COMMERCIAL DEVELOPMENT

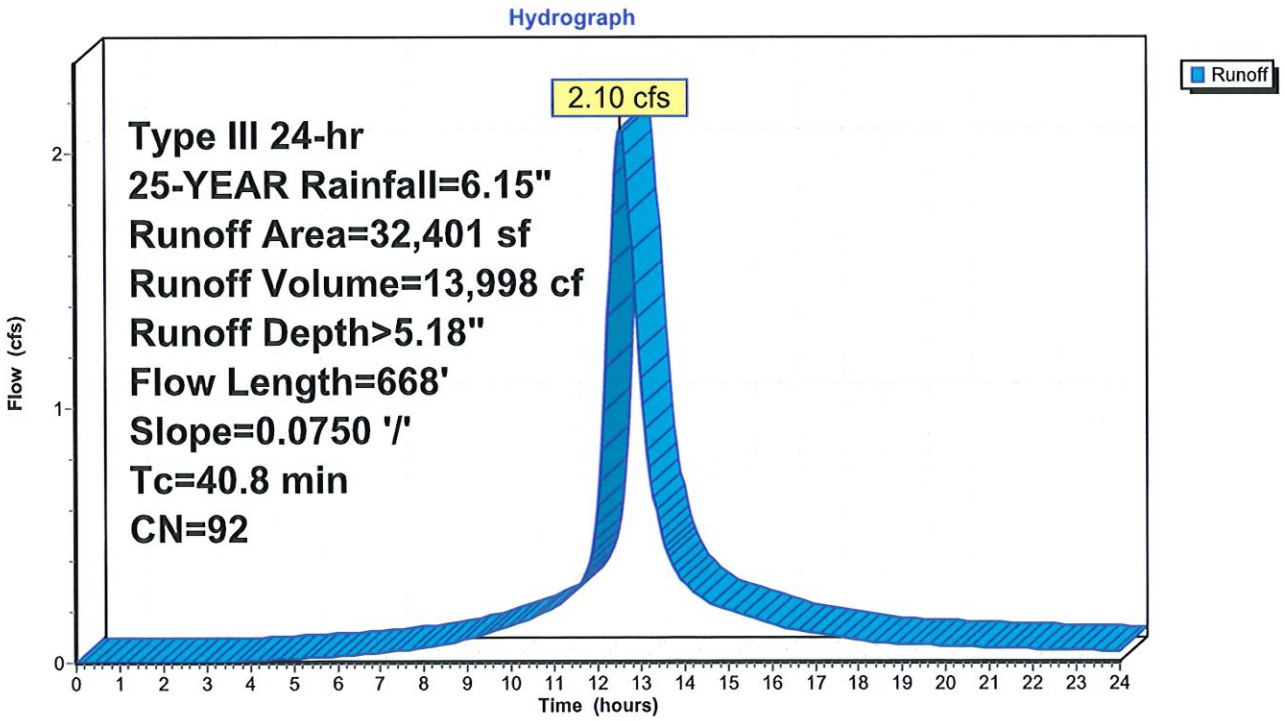
Runoff = 2.10 cfs @ 12.54 hrs, Volume= 13,998 cf, Depth> 5.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YEAR Rainfall=6.15"

Area (sf)	CN	Description
20,503	98	Roofs, HSG B
11,898	81	1/3 acre lots, 30% imp, HSG C
32,401	92	Weighted Average
8,329		25.70% Pervious Area
24,072		74.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry, DIRECT**
0.6	456		12.69		**Lake or Reservoir, DETENTION**
					Mean Depth= 5.00'
10.2	212	0.0750	0.35		**Sheet Flow, OverLand Flow**
					Grass: Short n= 0.150 P2= 3.40"
40.8	668	Total			

Subcatchment 2S: NEW CONDO'S & COMMERCIAL DEVELOPMENT



Hydrograph for Subcatchment 2S: NEW CONDO'S & COMMERCIAL DEVELOPMENT

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	13.00	4.61	3.71	1.11
0.25	0.02	0.00	0.00	13.25	4.72	3.82	0.70
0.50	0.03	0.00	0.00	13.50	4.82	3.91	0.49
0.75	0.05	0.00	0.00	13.75	4.91	4.00	0.37
1.00	0.06	0.00	0.00	14.00	4.99	4.08	0.31
1.25	0.08	0.00	0.00	14.25	5.06	4.15	0.27
1.50	0.09	0.00	0.00	14.50	5.13	4.22	0.24
1.75	0.11	0.00	0.00	14.75	5.19	4.28	0.22
2.00	0.12	0.00	0.00	15.00	5.25	4.34	0.20
2.25	0.14	0.00	0.00	15.25	5.31	4.39	0.19
2.50	0.15	0.00	0.00	15.50	5.36	4.44	0.18
2.75	0.17	0.00	0.00	15.75	5.41	4.49	0.16
3.00	0.19	0.00	0.00	16.00	5.45	4.53	0.15
3.25	0.21	0.00	0.00	16.25	5.49	4.57	0.14
3.50	0.23	0.00	0.00	16.50	5.53	4.60	0.13
3.75	0.24	0.01	0.00	16.75	5.56	4.64	0.12
4.00	0.26	0.01	0.01	17.00	5.59	4.67	0.11
4.25	0.28	0.01	0.01	17.25	5.62	4.70	0.10
4.50	0.31	0.02	0.01	17.50	5.65	4.73	0.10
4.75	0.33	0.02	0.01	17.75	5.68	4.76	0.09
5.00	0.35	0.03	0.01	18.00	5.71	4.78	0.09
5.25	0.37	0.04	0.02	18.25	5.73	4.81	0.08
5.50	0.39	0.04	0.02	18.50	5.76	4.83	0.08
5.75	0.42	0.05	0.02	18.75	5.78	4.85	0.07
6.00	0.44	0.06	0.02	19.00	5.80	4.87	0.07
6.25	0.47	0.07	0.03	19.25	5.82	4.90	0.07
6.50	0.50	0.09	0.03	19.50	5.84	4.92	0.07
6.75	0.53	0.10	0.03	19.75	5.87	4.94	0.06
7.00	0.56	0.12	0.04	20.00	5.89	4.96	0.06
7.25	0.59	0.13	0.04	20.25	5.91	4.98	0.06
7.50	0.62	0.15	0.05	20.50	5.92	5.00	0.06
7.75	0.66	0.18	0.05	20.75	5.94	5.01	0.06
8.00	0.70	0.20	0.06	21.00	5.96	5.03	0.06
8.25	0.74	0.23	0.06	21.25	5.98	5.05	0.06
8.50	0.79	0.26	0.07	21.50	6.00	5.07	0.05
8.75	0.84	0.29	0.08	21.75	6.01	5.08	0.05
9.00	0.90	0.33	0.09	22.00	6.03	5.10	0.05
9.25	0.96	0.37	0.10	22.25	6.05	5.12	0.05
9.50	1.02	0.42	0.12	22.50	6.06	5.13	0.05
9.75	1.09	0.47	0.13	22.75	6.08	5.15	0.05
10.00	1.16	0.53	0.14	23.00	6.09	5.16	0.05
10.25	1.24	0.59	0.16	23.25	6.11	5.18	0.05
10.50	1.33	0.66	0.17	23.50	6.12	5.19	0.04
10.75	1.43	0.74	0.19	23.75	6.14	5.20	0.04
11.00	1.54	0.83	0.22	24.00	**6.15**	**5.22**	0.04
11.25	1.67	0.94	0.24				
11.50	1.83	1.09	0.29				
11.75	2.18	1.40	0.36				
12.00	3.07	2.23	0.61				
12.25	3.97	3.08	1.36				
12.50	4.32	3.42	**2.09**				
12.75	4.48	3.59	**1.76**				