Stormwater Management Report

East Haddam Firehouse #2 – Town of East Haddam

44 William F. Palmer Road, East Haddam, CT



Prepared For:

Town of East Haddam
1 Plains Road
Moodus, CT 06469

Prepared By:

Benesch
200 Glastonbury Boulevard, Suite 201
Glastonbury, CT 06033
www.benesch.com
P 860-633-8341

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Benesch
200 Glastonbury Boulevard, Suite 201
Glastonbury, CT 06033
www.benesch.com

TABLE OF CONTENTS

1 INTRODUCTION 4

1.1 General Information 4
1.2 Project Summary 5
1.3 Existing Site Conditions 6
1.3.1 Topography 6
1.3.2 Soils 6
1.3.3 On-site and Adjacent Waterbody Information 6
1.3.4 Additional Site Considerations 6

2 HYDROLOGY 6

2.1 Methodology 6
2.2 Existing Conditions 7
2.2.1 Watershed Boundaries and Design Points. 7
2.3 Proposed Conditions 8
2.3.1 Watershed Boundaries and Design Points 8
2.4 Compliance with Performance Criteria 9
2.4.1 Compliance with Local Criteria 9
2.4.2 Compliance with Connecticut Stormwater Quality Manual 9

3 HYDRAULICS 10

3.1 Compliance with Performance Criteria 11
3.1.1 Compliance with Local Criteria 11
3.1.2 Compliance with State Criteria 11

4 WATER QUALITY 11

4.1 Methodology 11
4.2 Compliance with Performance Criteria 11
4.2.1 Compliance with Local Criteria 11
4.2.2 Compliance with Connecticut Stormwater Quality Manual 12

5 SOIL EROSION AND SEDIMENT CONTROL 13

5.1 Methodology 13

6 OPERATION AND MAINTENANCE 14

6.1 Inspection Frequency and Criteria 14

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APPENDIX A Existing Watershed Data
APPENDIX B Proposed Watershed Data
APPENDIX C Hydraulic Analysis
APPENDIX D Water Quality Computations
APPENDIX E NOAA Rainfall Data
APPENDIX F NRCS Soil Survey
APPENDIX G Grading & Drainage Plan
APPENDIX H Geotechnical Report

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Existing East Haddam Firehouse #2

(Google Street View)

44 William F. Palmer Road

Moodus, CT 06469

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1 INTRODUCTION

1.1 General Information

The subject parcel addressed 44 William F. Palmer Road, East Haddam, CT, is located at the intersection of Oak Grove and William F. Palmer Road. It is situated in the CBIG (Moodus Village) Zone and the subject parcel and directly neighboring parcels are denoted and characterized as (per East Haddam GIS):

- 44 William F. Palmer Road – Book 234 / Page 154 – East Haddam Firehouse #2 (project site)
- North – Automotive Repair Center
- East – Oak Grove Apartments
- South – East Haddam Youth & Family Services Center
- West – Residential and Commercial Properties

The project proposes the construction of a new firehouse (approximately 13,900 GFA), demolition of existing firehouse and associated utilities, and removal of bituminous pavement and curbing. Construction of the firehouse, including site improvements and amenities, will consist of the following:

- New Firehouse
- New Fire Truck Garages
- New Bituminous Pavement and Concrete Curbing
- Associated Utilities and Storm Drainage System
- New Septic System
- New Underground Fire Storage Tank
- Generator and Transformer
- Concrete Walks
- ADA Accessibility Parking and Pedestrian Routing
- Revised Site Landscaping and Plantings
- New Concrete Underground Detention System

The existing site is comprised of the existing brick firehouse, five garages, diesel generator, propane tank, and bituminous parking areas. The existing site is approximately 30% impervious; the site enhancements will increase impervious cover by approximately 0.39 acres.

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Site Location Map

The project was designed utilizing the Town of East Haddam Regulations, the 2002 Connecticut Department of Transportation (ConnDOT) Drainage Manual, the latest Connecticut Guidelines for Soil Erosion and Sediment Control, and the latest Connecticut Department of Energy and Environmental Protection (CT DEEP) Water Quality Manual.

1.2 Project Summary

This project proposed to:

- Construct a new firehouse with fire truck garages.
- Provide adequate site drainage.
- Provide ADA accessibility to the public safety building.
- Construct a new septic system and underground detention system for the proposed building.

The project will disturb approximately 1.87 acres, including approximately 0.06 acres of ROW improvements. The entirety of site work will consist of the construction of a firehouse, rehabilitation of the parking lots and sidewalks and providing conformance with town regulations for site layout.

1.3 Existing Site Conditions

1.3.1 Topography

The project site slopes from the southeast to northwest/southwest with flow being conveyed into the on-site drainage system and into William F. Palmer Road, or directly off-site to the north and southwest into Oak Grove and William F. Palmer Road respectively. A small portion of flow ends up off-site to the northeast into an existing depression. The existing site elevations (NAVD 88) range from approximately 263 ft at the southeast side of the site to 251 ft located at the southwest corner of the site.

1.3.2 Soils

NRCS soils mapping indicates 3 soil types located within the project limits; defined as:

- 57B – Udorthent-Urban Land Complex – Hydrologic Soil Group A
- 306 – Udorthent-Urban Land Complex – Hydrologic Soil Group B
- 308 – Udorthent-Urban Land Complex – Hydrologic Soil Group B

1.3.3 On-site and Adjacent Waterbody Information

There are no waterbodies directly connected or adjacent to this project site. All flow from this site under existing and proposed conditions will eventually end up off-site in either the Oak Grove or William F. Palmer Road ROW. A small portion of wetlands is present adjacent to the site in the northeast, they are a result of a man-made stormwater management system.

1.3.4 Additional Site Considerations

- The site is not located within a Coastal Management Area, per Town of East Haddam, CT GIS.
- The site is not located within an Aquifer Protection Area, per Town of East Haddam, CT.
- The site is not located within a FEMA Flood Zone, per Town of East Haddam, CT FEMA Flood Map, (August 2008).
- The site is not located within a Natural Diversity Database Area, per Town of East Haddam, CT GIS.

2 HYDROLOGY

2.1 Methodology

The analysis to determine peak flows generated from the site was prepared using TR-55 procedures for calculating peak rates of runoff resulting from precipitation events and procedures for developing runoff hydrographs. HydroCAD software was utilized to perform hydrologic computations. Rainfall frequency estimates for precipitation, based on National Oceanic and Atmospheric Administration (NOAA) data from 44 William F. Palmer Road, East Haddam CT, were utilized to generate the flows.

The following 24-hour, precipitation estimates were utilized:

2-Year	3.43 inches
10-Year	5.21 inches
25-Year	6.32 inches
50-Year	7.14 inches
100-Year	8.03 inches

Design Storm Type: NOAA, 24-hour Type D

Project Type: Construction

2.2 Existing Conditions

2.2.1 Watershed Boundaries and Design Points.

Drainage from the existing site is contained within three (3) watersheds for analysis.

- **Watershed E1 (Flow to William F. Palmer Road):** This watershed consists of overland and piped flow from both the project site and southeastern neighboring property (East Haddam Youth & Family Services Center) being conveyed off-site into the William F. Palmer Road ROW. This watershed is currently comprised of existing grass areas, existing firehouse, concrete walks, bituminous driveways and parking lot, propane tank, and concrete pads. This watershed is denoted as NRCS Hydrologic Soil Groups A and B.

- **Watershed E2 (Flow Offsite North to Oak Grove):** This watershed consists of overland flow from the southeast being conveyed off-site to the north into the Oak Grove ROW. This watershed is currently comprised of an existing grass area, septic system, open field, and trees. This watershed is denoted as NRCS Hydrologic Soil Group B.

- **Watershed E3 (Flow to Existing Depression):** This watershed consists of overland flow from the southeast being conveyed off-site into an existing depression east of the site. This watershed is currently comprised of an existing grass area, wooded area, and wetlands. This watershed is denoted as NRCS Hydrologic Soil Groups A and B.

  Existing Watershed Data (Existing Cover Characteristics, Existing Watershed Area Map, and Hydrologic Computations) have been included in Appendix A. Existing drainage patterns are being maintained.

2.3 Proposed Conditions

2.3.1 Watershed Boundaries and Design Points

This project proposes to provide water quality through a concrete underground detention system. Peak flow reduction is achieved by retention utilizing the underground detention system. Drainage from the proposed site consists of four (4) watersheds for analysis.

- **Watershed P1-1 (Flow to William F. Palmer Road Detained):** This watershed consists of overland and piped flow from both the project site and southeastern neighboring property (East Haddam Youth & Family Services Center) being conveyed off-site into the William F. Palmer Road ROW. Flows are directed into the on-site underground detention system through the drainage system and overland flow. Once in the underground detention system, flows are detained and then conveyed into the municipal drainage system in the William F. Palmer Road ROW using underdrains and an outlet control structure. The proposed watershed consists of curbing, bituminous pavement and driveways, proposed firehouse and garages, a grass area, concrete walks, a portion of the septic system, and landscaped areas. This watershed is denoted as NRCS Hydrologic Soil Groups A and B.

- **Watershed P1-2 (Flow to William F. Palmer Road Direct):** This watershed consists of overland flow from the project site being conveyed off-site into the William F. Palmer Road ROW. The proposed watershed consists of curbing, bituminous pavement and driveways, a grass area, transformer, generator, concrete walks, and landscaped areas. This watershed is denoted as NRCS Hydrologic Soil Group B.

- **Watershed P2 (Flow Offsite North to Oak Grove):** This watershed consists of overland flow from the southeast being conveyed off-site to the north into the Oak Grove ROW. This watershed is currently comprised of an existing grass area, a portion of the septic system, open field, and trees. This watershed is denoted as NRCS Hydrologic Soil Group B.

- **Watershed P3 (Flow to Existing Depression):** This watershed consists of overland flow from the southeast being conveyed off-site into an existing depression east of the site. This watershed is currently comprised of an existing grass area, wooded area, and wetlands. This watershed is denoted as NRCS Hydrologic Soil Groups A and B.

  Proposed Watershed Data (Proposed Cover Characteristics, Proposed Watershed Area Map, and Hydrologic Computations) have been included in Appendix B.

2.4 Compliance with Performance Criteria

2.4.1 Compliance with Local Criteria

This project has been designed per the Town of East Haddam's Regulations, as amended.

2.4.2 Compliance with Connecticut Stormwater Quality Manual

Ct DEEP Stormwater Quality Manual, as amended.

2.4.2.1 Standard 1 – Runoff Volume Reduction

The method of analysis for this stormwater management system is providing site specific peak runoff volume reduction for the 2, 10, 25, 50, or 100-year Type NOAA, 24-hr Type D storm.

Peak flow runoff will be mitigated through the use of an underground detention system. The system will be a closed system due to the presence of bed rock and decomposed rock. The system will consist of open bottom concrete chambers sitting on top of 18" of crushed stoned under laid by an impermeable plastic liner which will wrap round the entirety of the system. Outlet control will be provided to regulate discharge out of the system. The low flow orifice will be set 12" above the bottom of the chambers. To all for the removal of stormwater within the stone as well as the chamber area below the low flow orifice a 4" perforated underdrain system was place at the bottom of the crushed stone layer. The underdrain outlet will by pass the outlet control structure as that is the only way to fully drain the system after a rainfall event.

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Peak Flow Comparison

Peak flows at the off-site analysis point are as follows:

Watershed	Storm Event (NOAA Type D)	Discharge Existing (cfs)	Discharge Proposed (cfs)	Δ (%)
Flow to William F. Palmer Road	2-year	2.42	0.82	-66%
	10-year	4.53	2.36	-41%
	25-year	5.87	3.68	-37%
	50-Year	6.87	4.31	-37%
	100-year	7.95	6.55	-18%
Flow Offsite North to Oak Grove	2-year	0.28	0.16	-43%
	10-year	1.01	0.56	-45%
	25-year	1.55	0.86	-45%
	50-Year	1.98	1.10	-44%
	100-year	2.47	1.37	-45%
Flow to Existing Depression	2-year	0.04	0.04	0%
	10-year	0.30	0.18	-40%
	25-year	0.51	0.28	-45%
	50-Year	0.68	0.36	-47%
	100-year	0.88	0.46	-48%
Total Site	2-year	2.71	1.00	-63%
	10-year	5.77	3.21	-44%
	25-year	7.84	4.75	-39%
	50-Year	9.41	5.27	-44%
	100-year	11.15	7.80	-30%

Peak flow rates have been maintained or reduced for each of the analyzed storm events.

2.4.2.2 Standard 2 – Stormwater Runoff Quantity Control

See table in the above section.

3 HYDRAULICS

The intent of the hydraulic analysis is to ensure that proposed on-site drainage facilities are designed to accommodate and safely convey runoff produced up to and including the 10-year storm event. Calculations for the 25-year storm event have been shown as well; however the hydraulic grade line is above a number of structure grates during the 25-year storm.

3.1 Compliance with Performance Criteria

The site has been designed with a series of drainage facilities, including six (6) proposed area drains, four (4) proposed type CL catch basins, four (4) proposed type C catch basin, and three (3) proposed manhole structures. This drainage system has been designed to remove stormwater from impervious surfaces and divert it through the underground detention system. Minimal flow from grass and landscaped areas will be diverted directly overland to the Oak Grove and William F. Palmer Road ROW. The drainage system has been designed to safely convey flows up to and including the 10-year design storm event. The proposed pipes are designed with sufficient capacity to maintain the hydraulic grade line sufficiently below proposed grade.

3.1.1 Compliance with Local Criteria

The proposed storm sewer system has been designed in compliance with Town of East Haddam's Regulations, as amended.

3.1.2 Compliance with State Criteria

The proposed storm sewer system has been designed in compliance with the State of Connecticut's Drainage Regulations per the 2002 ConnDOT Drainage Manual. (latest revisions)

Computations for the hydraulic analysis can be viewed in Appendix C.

4 WATER QUALITY

4.1 Methodology

The project has been designed to address both short-term and long-term stormwater quality. Short term (during construction) water quality has been provided in the form of erosion control measures and long-term (post construction) water quality has been provided through the use of primary and secondary treatment practices. Erosion control has been designed per the latest Connecticut Erosion Control Guidelines and long-term stormwater quality has been designed per the latest CT DEEP Stormwater Quality Manual.

4.2 Compliance with Performance Criteria

4.2.1 Compliance with Local Criteria

This project has been designed in coordination with the Town of East Haddam's Regulations, as amended.

See appendix D, for water quality volume and flow calculations.

4.2.2 Compliance with Connecticut Stormwater Quality Manual

4.2.2.1 Standard 1 – Pollutant Reduction

Long Term Stormwater Quality

The project was designed with guidance from the latest Connecticut Stormwater Quality Manual. The intent of the design is to provide a "stormwater treatment train," where stormwater quality is achieved through a series of treatment measures. Harmful pollutants, such as sediment, pathogens, organic material, hydrocarbons, metals, synthetic organic chemicals, and/or deicing compounds are typically carried by the low-flow storms. Since pollutants typically attach themselves to solid particles, treatment practices are designed to remove suspended solids.

The treatment for this site includes:

- Source Control and Pollution Prevention
- Storm Drainage System Maintenance
- Above Ground Retention and Infiltration

Primary Treatment Practices

- Water Quality Unit / Hydrodynamic Separator – This structure is designed to pretreat flows by capturing oils, temporarily suspended solids, and debris. It will be utilized as a form of pre-treatment.
- The underground detention system will be a closed system due to the presence of bed rock and decomposed rock. The system will consist of open bottom concrete chambers sitting on top of 18" of crushed stoned under laid by an impermeable plastic liner which will wrap round the entirety of the system. There will be a pervious fabric on top of the crushed stone that will act to provide sediment removal. Access ports will be provided so the system can regularly be check and any accumulated sediment can be removed.
- Deep Sump Catch Basins – These BMPs are designed to treat the inflow of stormwater and reduce stormwater contamination of sediment, temporary solids, soil/grease, and other debris by allowing it to settle on the bottom of the basin sump. It will be utilized in the form of pre-treatment.

Computations for Water Quality can be viewed in Appendix D.

5 SOIL EROSION AND SEDIMENT CONTROL

5.1 Methodology

The proposed soil erosion and sediment controls have been designed in accordance with local regulations, the Connecticut Guidelines for Soil Erosion and Sediment Control, and the requirements of the CTDEEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities, as applicable. The proposed design considers the specific site characteristics of the site and anticipated construction activities. See the plan set for location and design of proposed short term soil erosion and sediment control measures to be used throughout construction.

Short Term Erosion Control

The proposed erosion and sedimentation controls consider the specific characteristics of the site and the anticipated construction activities. They have been designed in accordance with the latest CT DEEP Guidelines for Soil Erosion and Sediment Control.

Construction Entrances

Construction entrances will be utilized to remove sediment from construction vehicle tires and prevent it from being tracked onto adjoining paved roadway areas.

Erosion Control Barriers

Prior to any construction activity, hay bales, silt fence, or combination hay bale/silt fence barriers will be placed at the downgradient limits of construction. Throughout construction, additional barriers will be installed as necessary at the toe of slopes equal to or in excess of 15 feet. These barriers will be inspected once every seven calendar days and within 24 hours after every rainfall generating a discharge and replaced as necessary. Collected silt will be removed when one-half the barrier height is reached.

Temporary Seeding

Temporary Seeding will be utilized on portions where the phasing and sequencing require an initial disturbance followed by an extended period of inactivity that is greater than 30 days but less than 1 year. Temporary seeding will be conducted within 7 days after the suspension of grading work in disturbed areas where the suspension of work is expected to be more than 30 days but less than 1 year.

Soil Stabilization - Mulches

Structural (non-living) soil stabilization will be utilized to protect the soil surface on a temporary basis without the intention of promoting plant growth. When grading of the disturbed area will

be suspended for a period of 30 or more consecutive days, but less than 5 months, disturbed areas will be stabilized within 7 days of the suspension of grading through the use of mulch, non-bituminous tackifiers, erosion control netting, or other approved materials appropriate for use as a temporary soil protector. For surfaces that are not to be reworked within 5 months but will be reworked within 1 year, use temporary seeding, seeding-type mulch (hay, straw, or cellulose fiber) or when slopes are less than 3:1, wood chips, bark chips or shredded bark.

Temporary Filter Inserts

Temporary Filter Inserts will be placed in each existing catch basin and yard drains prior to the start of construction, and in each new catch basin or yard drain during construction. These devices will be removed upon final site stabilization. Filter inserts will be inspected once every seven (7) calendar days and within 24 hours after every rainfall generating a discharge. Replacement of the inserts will be as often as necessary to maintain function of the drainage structure and prevent excessive ponding due to clogged fabric. Ripped or otherwise damaged inserts will be replaced immediately.

Stockpile Management

The topsoil stockpiles which will be idle for at least 30 days will be stabilized with temporary seed and mulch no later than 7 days from the last use. Small stockpiles may be covered with impervious tarps or erosion control matting in lieu of seeding and mulching.

A geotextile silt fence or hay bale barrier will be installed around the stockpile area approximately 10 feet from the proposed toe of the slope.

6 OPERATION AND MAINTENANCE

6.1 Inspection Frequency and Criteria

Maintenance and operation will be provided as follows.

During Construction

- **Dust Control:** Moisten disturbed soil areas with water periodically or use a non-asphaltic soil tackifier to minimize dust.
- **Temporary Soil Protection:** Inspect seeded areas weekly and within 24 hours after a storm generating a discharge.
- **Catch Basin Filter Inserts:** Inspect the fabric at least once a week and within 24 hours after the end of a storm generating a discharge. Check the fabric for structural soundness

(i.e. tears), proper anchoring/alignment within the grate and ability to drain runoff (i.e. percent of clogging by sediment). Remove the sediment every week, or sooner if ponding is excessive. Each time the sediment is removed, replace the section of fabric removed with a new section. Do not remove the sediment and reuse the same section of fabric.

- **Hay Bale/ Silt Fence Barrier:** Inspect the barrier at least once a week and within 24 hours after the end of a storm generating a discharge. For dewatering operations, inspect frequently before, during and after pumping operations. Remove the sediment deposits when the depth reaches one half the barrier's height. Repair or replace a barrier within 24 hours of observed failure. Maintain the barrier until the contributing disturbed area is stabilized.
- **Construction Entrance/Exit Pad:** Maintain the pad in a condition that will prevent tracking and washing of sediment onto paved surfaces. Place additional clean gravel on top of gravel that has become silted, or remove the silted gravel and replace the gravel to the depth removed with clean gravel, as conditions warrant. Remove immediately all sediment spilled, dropped, washed or tracked onto paved surfaces. Roads adjacent to the construction site shall be cleaned at the end of each day by hand sweeping or sweeper truck.
- **Existing Catch Basins and Sumps:** Inspect the filter baskets as specified above. After final removal of the filter baskets at the end of construction, clean the sump of all silt and debris.
- **New Catch Basins and Sumps:** As new catch basins are constructed, a sediment trap shall be installed in the unit and a sediment barrier installed around the grate. Inspect the trap and barrier weekly and within 24 hours after a storm generating a discharge. After stabilization of the drainage area entering the catch basin, remove the trap and barrier and clean the basin sump of all silt and debris.
- **Temporary Stockpiles:** Inspect temporary stockpiles at the end of each workday to ensure that tarps are in place and secured. Temporary stockpiles that are expected to be inactive for more than 30 days should be temporarily seeded (see above).

After Construction

- **Catch Basins and Sumps:** Maintenance includes removal of trash from the grate and the sump, as well as sediment from the sump. They shall be inspected semi-annually and cleaned when the sump is one half full of sediment. One of the inspections shall be after the snow and ice removal season is over, and prior to the spring rainfall events. If the

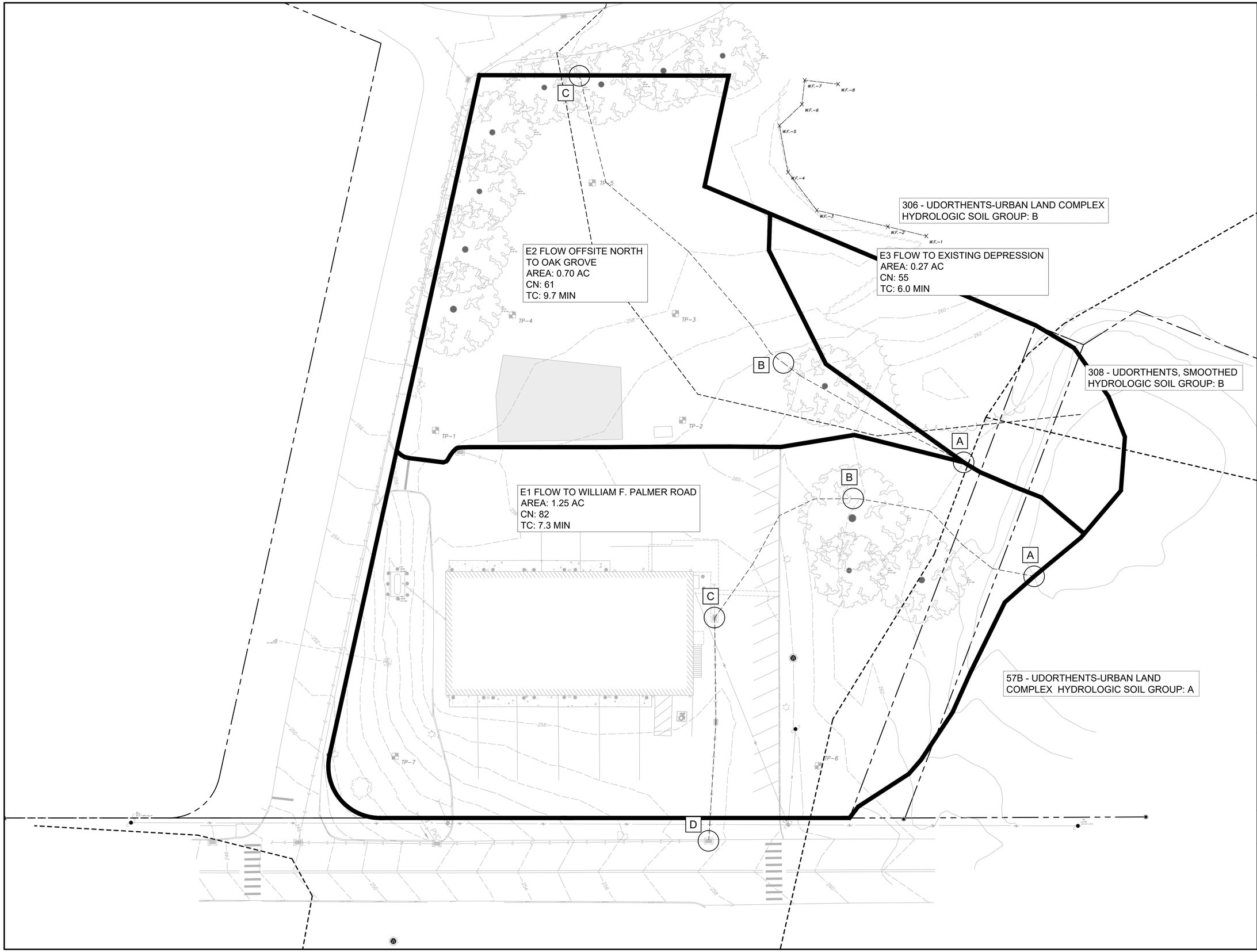
sumps is filled more than half-filled with sediment at the semi-annual inspections, they shall be inspected quarterly.

- **Landscaped Areas:** Inspect semi-annually for erosion or dying vegetation. Repair and stabilize any bare or eroded areas and replace vegetation as soon as possible.
- **Underground Detention:** Per manufacturers recommendations.
- **Water Quality Unit and Hydrodynamic Separator:** Per manufacturers recommendations.

APPENDIX A

Existing Watershed Data

benesch



Prepared by:
benesch
Alfred Benesch & Company
200 Glastonbury Boulevard, Suite 201
Glastonbury, Connecticut 06033
860-633-8341

Prepared for:

NEW CONSTRUCTION
EAST HADDAM FIREHOUSE #2
44 WILLIAM F. PALMER ROAD MOODUS, CT 06423

DATE:	REVISION:

KEY PLAN

0 20' 40'
SCALE: 1" = 20'

PROJECT NO.: 70903.00
SCALE: 1" = 20'
DATE: 01/13/2026

DRAWN BY: RLC
CHECKED BY: WGW

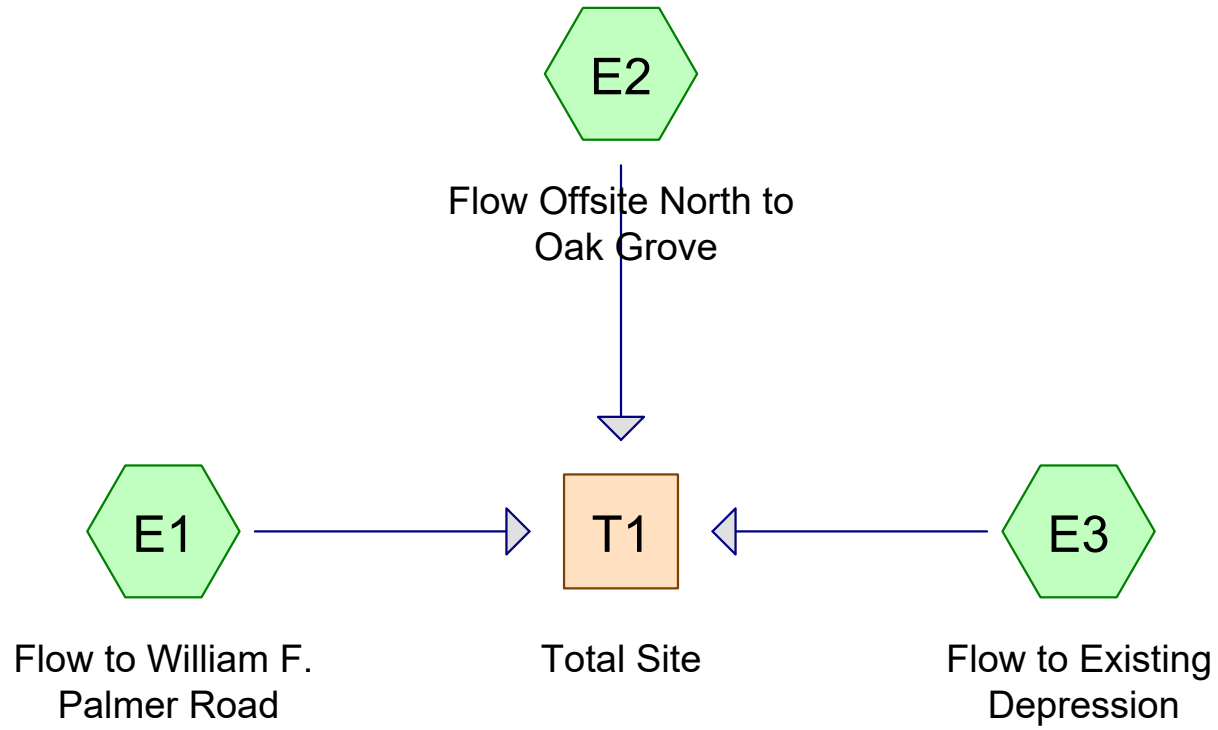
EXISTING WATERSHED AREA MAP

DRAWING NO.:
EWAM

Watershed Cover Characteristics
44 William Palmer Road, Moodus CT
Project # 70903.00

Existing:

Watershed	Description	Total Area (ac)	Grass A	Grass B	Woods B	Impervious	CN	Tc (min)
E1	Flow to William F. Palmer Road	1.25	0.19	0.36	0.00	0.70	82	7.3
E2	Flow Offsite North to Oak Grove	0.70	0.00	0.70	0.00	0.00	61	9.7
E3	Flow to Existing Depression	0.27	0.05	0.12	0.10	0.00	55	6
TOTAL	Total Site	2.22	0.24	1.18	0.10	0.70	-	-



Subcat Reach Pond Link

Routing Diagram for EWAM
Prepared by Alfred Benesch & Company, Printed 1/30/2026
HydroCAD® 10.20-5c s/n 06318 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	NOAA 24-hr	D	Default	24.00	1	3.43	2
2	10-year	NOAA 24-hr	D	Default	24.00	1	5.21	2
3	25-year	NOAA 24-hr	D	Default	24.00	1	6.32	2
4	50-year	NOAA 24-hr	D	Default	24.00	1	7.14	2
5	100-year	NOAA 24-hr	D	Default	24.00	1	8.03	2

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.940	HSG A	E1, E3
1.280	HSG B	E1, E2, E3
0.000	HSG C	
0.000	HSG D	
0.000	Other	
2.220		**TOTAL AREA**

Summary for Subcatchment E1: Flow to William F. Palmer Road

Runoff = 2.42 cfs @ 12.15 hrs, Volume= 0.180 af, Depth= 1.72"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-year Rainfall=3.43"

Area (ac)	CN	Description
0.190	49	50-75% Grass cover, Fair, HSG A
0.360	69	50-75% Grass cover, Fair, HSG B
0.700	98	Paved parking, HSG A
1.250	82	Weighted Average
0.550		44.00% Pervious Area
0.700		56.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0450	0.24		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
0.4	97	0.0350	3.80		**Shallow Concentrated Flow, B TO C** Paved Kv= 20.3 fps
0.1	109	0.0420	14.40	25.44	**Pipe Channel, C TO D** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
7.3	306	Total			

Summary for Subcatchment E2: Flow Offsite North to Oak Grove

Runoff = 0.28 cfs @ 12.19 hrs, Volume= 0.032 af, Depth= 0.54"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-year Rainfall=3.43"

Area (ac)	CN	Description
0.700	61	>75% Grass cover, Good, HSG B
0.700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0290	0.20		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
1.5	177	0.0150	1.97		**Shallow Concentrated Flow, B TO C** Unpaved Kv= 16.1 fps
9.7	277	Total			

Summary for Subcatchment E3: Flow to Existing Depression

Runoff = 0.04 cfs @ 12.16 hrs, Volume= 0.007 af, Depth= 0.32"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-year Rainfall=3.43"

Area (ac)	CN	Description
0.050	39	>75% Grass cover, Good, HSG A
0.120	61	>75% Grass cover, Good, HSG B
0.100	55	Woods, Good, HSG B
0.270	55	Weighted Average
0.270		100.00% Pervious Area

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

Summary for Reach T1: Total Site

Inflow Area = 2.220 ac, 31.53% Impervious, Inflow Depth = 1.18" for 2-year event
Inflow = 2.71 cfs @ 12.15 hrs, Volume= 0.219 af
Outflow = 2.71 cfs @ 12.15 hrs, Volume= 0.219 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Subcatchment E1: Flow to William F. Palmer Road

Runoff = 4.53 cfs @ 12.14 hrs, Volume= 0.340 af, Depth= 3.27"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-year Rainfall=5.21"

Area (ac)	CN	Description
0.190	49	50-75% Grass cover, Fair, HSG A
0.360	69	50-75% Grass cover, Fair, HSG B
0.700	98	Paved parking, HSG A
1.250	82	Weighted Average
0.550		44.00% Pervious Area
0.700		56.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0450	0.24		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
0.4	97	0.0350	3.80		**Shallow Concentrated Flow, B TO C** Paved Kv= 20.3 fps
0.1	109	0.0420	14.40	25.44	**Pipe Channel, C TO D** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
7.3	306	Total			

Summary for Subcatchment E2: Flow Offsite North to Oak Grove

Runoff = 1.01 cfs @ 12.18 hrs, Volume= 0.087 af, Depth= 1.50"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-year Rainfall=5.21"

Area (ac)	CN	Description
0.700	61	>75% Grass cover, Good, HSG B
0.700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0290	0.20		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
1.5	177	0.0150	1.97		**Shallow Concentrated Flow, B TO C** Unpaved Kv= 16.1 fps
9.7	277	Total			

Summary for Subcatchment E3: Flow to Existing Depression

Runoff = 0.30 cfs @ 12.14 hrs, Volume= 0.024 af, Depth= 1.09"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-year Rainfall=5.21"

Area (ac)	CN	Description
0.050	39	>75% Grass cover, Good, HSG A
0.120	61	>75% Grass cover, Good, HSG B
0.100	55	Woods, Good, HSG B
0.270	55	Weighted Average
0.270		100.00% Pervious Area

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

Summary for Reach T1: Total Site

Inflow Area = 2.220 ac, 31.53% Impervious, Inflow Depth = 2.44" for 10-year event
Inflow = 5.77 cfs @ 12.15 hrs, Volume= 0.452 af
Outflow = 5.77 cfs @ 12.15 hrs, Volume= 0.452 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Subcatchment E1: Flow to William F. Palmer Road

Runoff = 5.87 cfs @ 12.14 hrs, Volume= 0.446 af, Depth= 4.28"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-year Rainfall=6.32"

Area (ac)	CN	Description
0.190	49	50-75% Grass cover, Fair, HSG A
0.360	69	50-75% Grass cover, Fair, HSG B
0.700	98	Paved parking, HSG A
1.250	82	Weighted Average
0.550		44.00% Pervious Area
0.700		56.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0450	0.24		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
0.4	97	0.0350	3.80		**Shallow Concentrated Flow, B TO C** Paved Kv= 20.3 fps
0.1	109	0.0420	14.40	25.44	**Pipe Channel, C TO D** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
7.3	306	Total			

Summary for Subcatchment E2: Flow Offsite North to Oak Grove

Runoff = 1.55 cfs @ 12.18 hrs, Volume= 0.130 af, Depth= 2.22"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-year Rainfall=6.32"

Area (ac)	CN	Description
0.700	61	>75% Grass cover, Good, HSG B
0.700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0290	0.20		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
1.5	177	0.0150	1.97		**Shallow Concentrated Flow, B TO C** Unpaved Kv= 16.1 fps
9.7	277	Total			

Summary for Subcatchment E3: Flow to Existing Depression

Runoff = 0.51 cfs @ 12.14 hrs, Volume= 0.038 af, Depth= 1.71"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-year Rainfall=6.32"

Area (ac)	CN	Description
0.050	39	>75% Grass cover, Good, HSG A
0.120	61	>75% Grass cover, Good, HSG B
0.100	55	Woods, Good, HSG B
0.270	55	Weighted Average
0.270		100.00% Pervious Area

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

Summary for Reach T1: Total Site

Inflow Area = 2.220 ac, 31.53% Impervious, Inflow Depth = 3.32" for 25-year event
Inflow = 7.84 cfs @ 12.15 hrs, Volume= 0.614 af
Outflow = 7.84 cfs @ 12.15 hrs, Volume= 0.614 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Subcatchment E1: Flow to William F. Palmer Road

Runoff = 6.87 cfs @ 12.14 hrs, Volume= 0.526 af, Depth= 5.05"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 50-year Rainfall=7.14"

Area (ac)	CN	Description
0.190	49	50-75% Grass cover, Fair, HSG A
0.360	69	50-75% Grass cover, Fair, HSG B
0.700	98	Paved parking, HSG A
1.250	82	Weighted Average
0.550		44.00% Pervious Area
0.700		56.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0450	0.24		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
0.4	97	0.0350	3.80		**Shallow Concentrated Flow, B TO C** Paved Kv= 20.3 fps
0.1	109	0.0420	14.40	25.44	**Pipe Channel, C TO D** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
7.3	306	Total			

Summary for Subcatchment E2: Flow Offsite North to Oak Grove

Runoff = 1.98 cfs @ 12.17 hrs, Volume= 0.164 af, Depth= 2.80"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 50-year Rainfall=7.14"

Area (ac)	CN	Description
0.700	61	>75% Grass cover, Good, HSG B
0.700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0290	0.20		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
1.5	177	0.0150	1.97		**Shallow Concentrated Flow, B TO C** Unpaved Kv= 16.1 fps
9.7	277	Total			

Summary for Subcatchment E3: Flow to Existing Depression

Runoff = 0.68 cfs @ 12.14 hrs, Volume= 0.050 af, Depth= 2.21"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 50-year Rainfall=7.14"

Area (ac)	CN	Description
0.050	39	>75% Grass cover, Good, HSG A
0.120	61	>75% Grass cover, Good, HSG B
0.100	55	Woods, Good, HSG B
0.270	55	Weighted Average
0.270		100.00% Pervious Area

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

Summary for Reach T1: Total Site

Inflow Area = 2.220 ac, 31.53% Impervious, Inflow Depth = 4.00" for 50-year event
Inflow = 9.41 cfs @ 12.15 hrs, Volume= 0.739 af
Outflow = 9.41 cfs @ 12.15 hrs, Volume= 0.739 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Subcatchment E1: Flow to William F. Palmer Road

Runoff = 7.95 cfs @ 12.14 hrs, Volume= 0.613 af, Depth= 5.89"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-year Rainfall=8.03"

Area (ac)	CN	Description
0.190	49	50-75% Grass cover, Fair, HSG A
0.360	69	50-75% Grass cover, Fair, HSG B
0.700	98	Paved parking, HSG A
1.250	82	Weighted Average
0.550		44.00% Pervious Area
0.700		56.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0450	0.24		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
0.4	97	0.0350	3.80		**Shallow Concentrated Flow, B TO C** Paved Kv= 20.3 fps
0.1	109	0.0420	14.40	25.44	**Pipe Channel, C TO D** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
7.3	306	Total			

Summary for Subcatchment E2: Flow Offsite North to Oak Grove

Runoff = 2.47 cfs @ 12.17 hrs, Volume= 0.202 af, Depth= 3.47"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-year Rainfall=8.03"

Area (ac)	CN	Description
0.700	61	>75% Grass cover, Good, HSG B
0.700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0290	0.20		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
1.5	177	0.0150	1.97		**Shallow Concentrated Flow, B TO C** Unpaved Kv= 16.1 fps
9.7	277	Total			

Summary for Subcatchment E3: Flow to Existing Depression

Runoff = 0.88 cfs @ 12.14 hrs, Volume= 0.063 af, Depth= 2.80"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-year Rainfall=8.03"

Area (ac)	CN	Description
0.050	39	>75% Grass cover, Good, HSG A
0.120	61	>75% Grass cover, Good, HSG B
0.100	55	Woods, Good, HSG B
0.270	55	Weighted Average
0.270		100.00% Pervious Area

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

Summary for Reach T1: Total Site

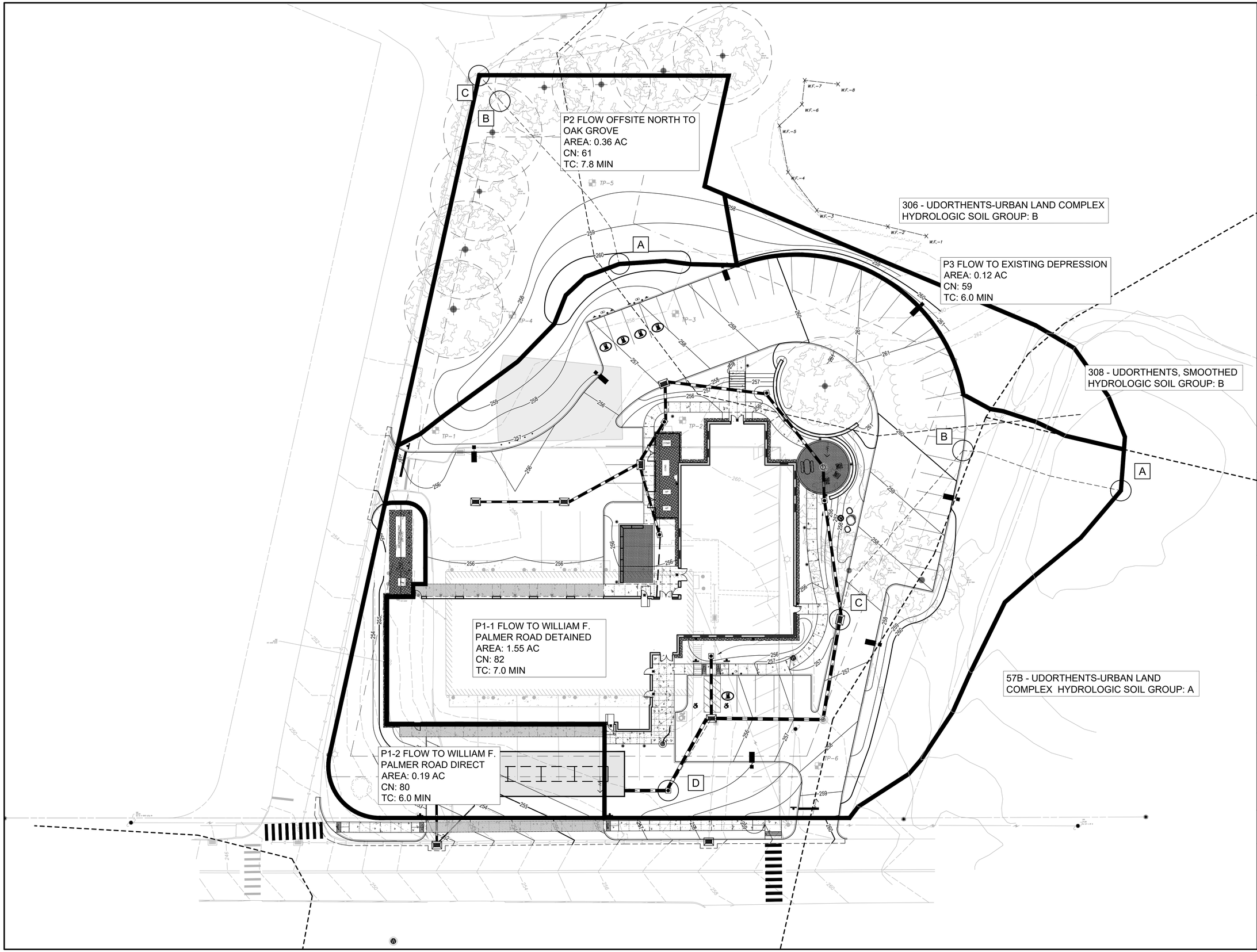
Inflow Area = 2.220 ac, 31.53% Impervious, Inflow Depth = 4.75" for 100-year event
Inflow = 11.15 cfs @ 12.15 hrs, Volume= 0.879 af
Outflow = 11.15 cfs @ 12.15 hrs, Volume= 0.879 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

APPENDIX B

Proposed Watershed Data

benesch



Prepared by:
benesch
Alfred Benesch & Company
200 Glastonbury Boulevard, Suite 201
Glastonbury, Connecticut 06033
860-633-8341

Prepared for:

NEW CONSTRUCTION
EAST HADDAM FIREHOUSE #2
44 WILLIAM F. PALMER ROAD **MOODUS, CT 06423**

DATE:	REVISION:

KEY PLAN

0 20' 40'
SCALE: 1" = 20'

PROJECT NO.: 70903.00
SCALE: 1" = 20'
DATE: 01/13/2026
DRAWN BY: RLC
CHECKED BY: WGW

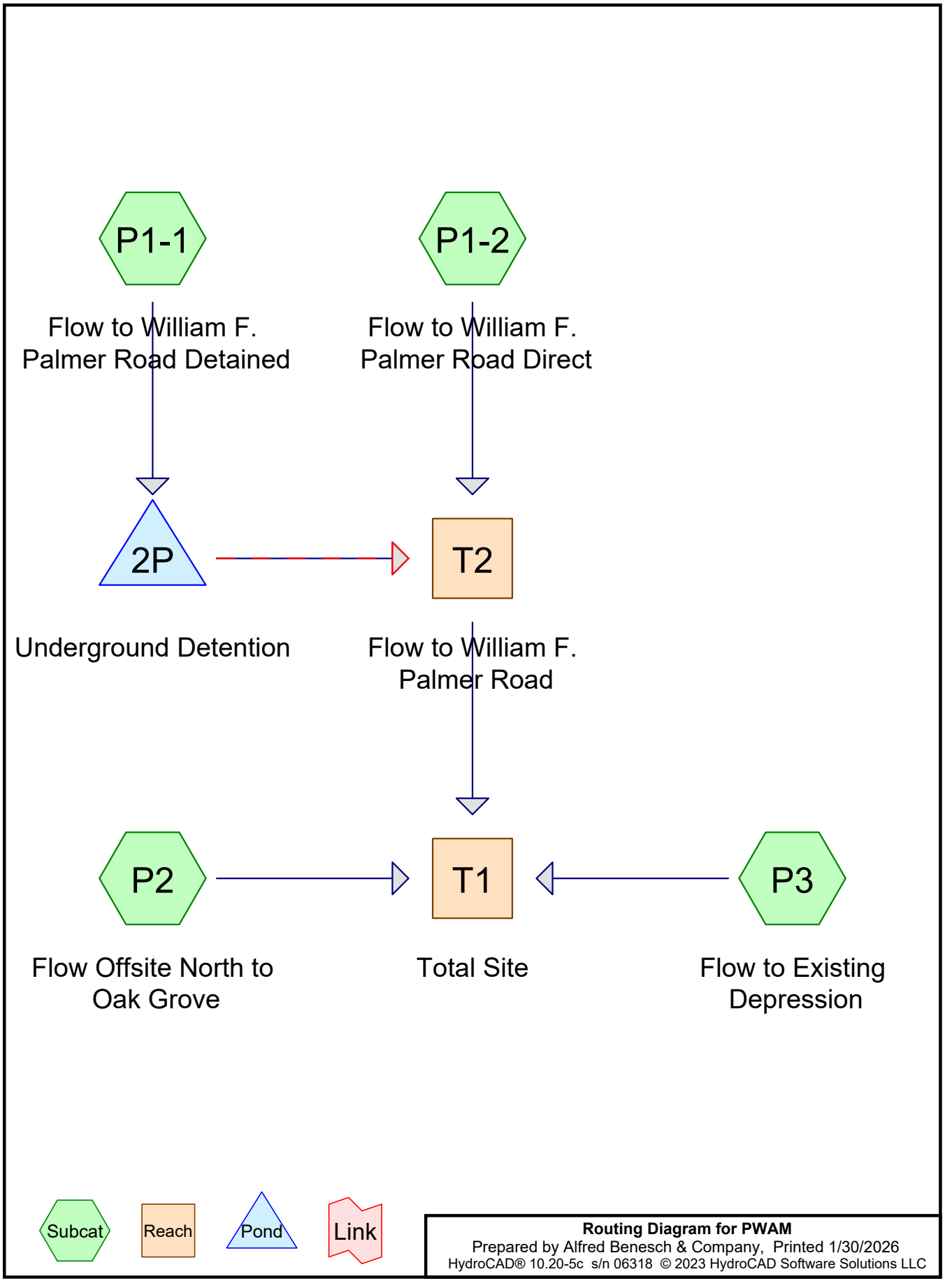
PROPOSED WATERSHED AREA MAP

DRAWING NO.:
PWAM

Watershed Cover Characteristics
44 William Palmer Road, Moodus CT
Project # 70903.00

Proposed:

Watershed	Description	Total Area (ac)	Grass A	Grass B	Woods B	Impervious	CN	Tc (min)
P1-1	Flow to William F. Palmer Road Detained	1.55	0.22	0.34	0.00	0.99	82	7
P1-2	Flow to William F. Palmer Road Direct	0.19	0.00	0.09	0.00	0.10	80	6
P2	Flow Offsite North to Oak Grove	0.36	0.00	0.36	0.00	0.00	61	7.8
P3	Flow to Existing Depression	0.12	0.00	0.08	0.04	0.00	59	6
TOTAL	Total Site	2.22	0.22	0.87	0.04	1.09	-	-



Routing Diagram for PWAM
Prepared by Alfred Benesch & Company, Printed 1/30/2026
HydroCAD® 10.20-5c s/n 06318 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	NOAA 24-hr	D	Default	24.00	1	3.43	2
2	10-year	NOAA 24-hr	D	Default	24.00	1	5.21	2
3	25-year	NOAA 24-hr	D	Default	24.00	1	6.32	2
4	50-year	NOAA 24-hr	D	Default	24.00	1	7.14	2
5	100-year	NOAA 24-hr	D	Default	24.00	1	8.03	2

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
1.310	HSG A	P1-1, P1-2
0.910	HSG B	P1-1, P1-2, P2, P3
0.000	HSG C	
0.000	HSG D	
0.000	Other	
2.220		**TOTAL AREA**

Summary for Subcatchment P1-1: Flow to William F. Palmer Road Detained

Runoff = 3.03 cfs @ 12.14 hrs, Volume= 0.223 af, Depth= 1.72"
Routed to Pond 2P : Underground Detention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-year Rainfall=3.43"

Area (ac)	CN	Description
0.220	39	>75% Grass cover, Good, HSG A
0.340	61	>75% Grass cover, Good, HSG B
0.990	98	Paved parking, HSG A
1.550	82	Weighted Average
0.560		36.13% Pervious Area
0.990		63.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	80	0.0400	0.22		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
0.4	103	0.0410	4.11		**Shallow Concentrated Flow, B TO C** Paved Kv= 20.3 fps
0.6	162	0.0050	4.40	5.40	**Pipe Channel, C TO D** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
7.0	345	Total			

Summary for Subcatchment P1-2: Flow to William F. Palmer Road Direct

Runoff = 0.35 cfs @ 12.13 hrs, Volume= 0.025 af, Depth= 1.58"
Routed to Reach T2 : Flow to William F. Palmer Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-year Rainfall=3.43"

Area (ac)	CN	Description
0.090	61	>75% Grass cover, Good, HSG B
0.100	98	Paved parking, HSG A
0.190	80	Weighted Average
0.090		47.37% Pervious Area
0.100		52.63% Impervious Area

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

Summary for Subcatchment P2: Flow Offsite North to Oak Grove

Runoff = 0.16 cfs @ 12.16 hrs, Volume= 0.016 af, Depth= 0.54"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-year Rainfall=3.43"

Area (ac)	CN	Description
0.360	61	>75% Grass cover, Good, HSG B
0.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	100	0.0340	0.22		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
0.1	16	0.0630	4.04		**Shallow Concentrated Flow, B TO C** Unpaved Kv= 16.1 fps
7.8	116	Total			

Summary for Subcatchment P3: Flow to Existing Depression

Runoff = 0.04 cfs @ 12.15 hrs, Volume= 0.005 af, Depth= 0.46"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-year Rainfall=3.43"

Area (ac)	CN	Description
0.080	61	>75% Grass cover, Good, HSG B
0.040	55	Woods, Good, HSG B
0.120	59	Weighted Average
0.120		100.00% Pervious Area

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

Summary for Reach T1: Total Site

Inflow Area = 2.220 ac, 49.10% Impervious, Inflow Depth > 1.45" for 2-year event
Inflow = 1.00 cfs @ 12.15 hrs, Volume= 0.269 af
Outflow = 1.00 cfs @ 12.15 hrs, Volume= 0.269 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Reach T2: Flow to William F. Palmer Road

Inflow Area = 1.740 ac, 62.64% Impervious, Inflow Depth > 1.71" for 2-year event
Inflow = 0.82 cfs @ 12.45 hrs, Volume= 0.248 af
Outflow = 0.82 cfs @ 12.45 hrs, Volume= 0.248 af, Atten= 0%, Lag= 0.0 min
Routed to Reach T1 : Total Site

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Pond 2P: Underground Detention

Inflow Area = 1.550 ac, 63.87% Impervious, Inflow Depth = 1.72" for 2-year event
Inflow = 3.03 cfs @ 12.14 hrs, Volume= 0.223 af
Outflow = 0.74 cfs @ 12.47 hrs, Volume= 0.223 af, Atten= 76%, Lag= 19.8 min
Primary = 0.21 cfs @ 12.47 hrs, Volume= 0.009 af
Routed to Reach T2 : Flow to William F. Palmer Road
Secondary = 0.53 cfs @ 12.47 hrs, Volume= 0.214 af
Routed to Reach T2 : Flow to William F. Palmer Road

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 247.28' @ 12.47 hrs Surf.Area= 1,632 sf Storage= 2,820 cf

Plug-Flow detention time= 52.1 min calculated for 0.223 af (100% of inflow)
Center-of-Mass det. time= 52.1 min (896.2 - 844.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	244.50'	979 cf	**21.79'W x 74.90'L x 7.00'H Field A** 11,425 cf Overall - 8,977 cf Embedded = 2,448 cf x 40.0% Voids
#2A	246.00'	7,173 cf	**StormTrap SingleTrap 5-0** x 4 Inside #1 Inside= 101.7"W x 60.0"H => 38.33 sf x 15.40'L = 590.2 cf Outside= 101.7"W x 66.0"H => 46.64 sf x 15.40'L = 718.0 cf 8.48' x 61.58' Core + 6.66' Border = 21.79' x 74.90' System
		8,152 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	247.00'	**12.0" Round 31' - 12" HDPE @ 1.00%** L= 31.0' Ke= 0.700 Inlet / Outlet Invert= 247.00' / 246.69' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	247.00'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	248.00'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 1	250.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	244.50'	**4.0" Round 29' - 4" HDPE @ 0.52%** L= 29.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 244.50' / 244.35' S= 0.0052 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.09 sf
#6	Device 5	244.50'	**4.0" Vert. 4" Underdrain Outlet** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.21 cfs @ 12.47 hrs HW=247.28' (Free Discharge)
└─**1=31' - 12" HDPE @ 1.00%** (Passes 0.21 cfs of 0.29 cfs potential flow)
  ├─**2=6" Orifice** (Orifice Controls 0.21 cfs @ 1.81 fps)
  ├─**3=6" Orifice** (Controls 0.00 cfs)
  └─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.53 cfs @ 12.47 hrs HW=247.28' (Free Discharge)
└─**5=29' - 4" HDPE @ 0.52%** (Barrel Controls 0.53 cfs @ 6.09 fps)
  └─**6=4" Underdrain Outlet** (Passes 0.53 cfs of 0.68 cfs potential flow)

Pond 2P: Underground Detention - Chamber Wizard Field A

Chamber Model = StormTrap SingleTrap 5-0 (StormTrap SingleTrap® Type II+IV)
Inside= 101.7"W x 60.0"H => 38.33 sf x 15.40'L = 590.2 cf
Outside= 101.7"W x 66.0"H => 46.64 sf x 15.40'L = 718.0 cf

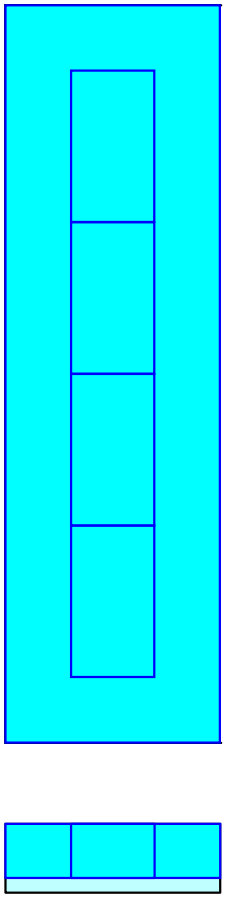
4 Chambers/Row x 15.40' Long = 61.58' Row Length +79.9" Border x 2 = 74.90' Base Length
1 Rows x 101.7" Wide + 79.9" Side Border x 2 = 21.79' Base Width
18.0" Stone Base + 66.0" Chamber Height = 7.00' Field Height

4 Chambers x 590.2 cf + 4,812.2 cf Border = 7,172.9 cf Chamber Storage
4 Chambers x 718.0 cf + 6,104.6 cf Border = 8,976.6 cf Displacement

11,424.7 cf Field - 8,976.6 cf Chambers = 2,448.2 cf Stone x 40.0% Voids = 979.3 cf Stone Storage

Chamber Storage + Stone Storage = 8,152.2 cf = 0.187 af
Overall Storage Efficiency = 71.4%
Overall System Size = 74.90' x 21.79' x 7.00'

4 Chambers (plus border)
423.1 cy Field
90.7 cy Stone



Summary for Subcatchment P1-1: Flow to William F. Palmer Road Detained

Runoff = 5.68 cfs @ 12.14 hrs, Volume= 0.422 af, Depth= 3.27"
Routed to Pond 2P : Underground Detention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-year Rainfall=5.21"

Area (ac)	CN	Description
0.220	39	>75% Grass cover, Good, HSG A
0.340	61	>75% Grass cover, Good, HSG B
0.990	98	Paved parking, HSG A
1.550	82	Weighted Average
0.560		36.13% Pervious Area
0.990		63.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	80	0.0400	0.22		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
0.4	103	0.0410	4.11		**Shallow Concentrated Flow, B TO C** Paved Kv= 20.3 fps
0.6	162	0.0050	4.40	5.40	**Pipe Channel, C TO D** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
7.0	345	Total			

Summary for Subcatchment P1-2: Flow to William F. Palmer Road Direct

Runoff = 0.68 cfs @ 12.13 hrs, Volume= 0.049 af, Depth= 3.08"
Routed to Reach T2 : Flow to William F. Palmer Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-year Rainfall=5.21"

Area (ac)	CN	Description
0.090	61	>75% Grass cover, Good, HSG B
0.100	98	Paved parking, HSG A
0.190	80	Weighted Average
0.090		47.37% Pervious Area
0.100		52.63% Impervious Area

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

Summary for Subcatchment P2: Flow Offsite North to Oak Grove

Runoff = 0.56 cfs @ 12.16 hrs, Volume= 0.045 af, Depth= 1.50"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-year Rainfall=5.21"

Area (ac)	CN	Description
0.360	61	>75% Grass cover, Good, HSG B
0.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	100	0.0340	0.22		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
0.1	16	0.0630	4.04		**Shallow Concentrated Flow, B TO C** Unpaved Kv= 16.1 fps
7.8	116	Total			

Summary for Subcatchment P3: Flow to Existing Depression

Runoff = 0.18 cfs @ 12.14 hrs, Volume= 0.014 af, Depth= 1.36"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-year Rainfall=5.21"

Area (ac)	CN	Description
0.080	61	>75% Grass cover, Good, HSG B
0.040	55	Woods, Good, HSG B
0.120	59	Weighted Average
0.120		100.00% Pervious Area

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

Summary for Reach T1: Total Site

Inflow Area = 2.220 ac, 49.10% Impervious, Inflow Depth > 2.86" for 10-year event
Inflow = 3.21 cfs @ 12.20 hrs, Volume= 0.529 af
Outflow = 3.21 cfs @ 12.20 hrs, Volume= 0.529 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Reach T2: Flow to William F. Palmer Road

Inflow Area = 1.740 ac, 62.64% Impervious, Inflow Depth > 3.25" for 10-year event
Inflow = 2.68 cfs @ 12.25 hrs, Volume= 0.471 af
Outflow = 2.68 cfs @ 12.25 hrs, Volume= 0.471 af, Atten= 0%, Lag= 0.0 min
Routed to Reach T1 : Total Site

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Pond 2P: Underground Detention

Inflow Area = 1.550 ac, 63.87% Impervious, Inflow Depth = 3.27" for 10-year event
Inflow = 5.68 cfs @ 12.14 hrs, Volume= 0.422 af
Outflow = 2.40 cfs @ 12.29 hrs, Volume= 0.422 af, Atten= 58%, Lag= 8.8 min
Primary = 1.74 cfs @ 12.29 hrs, Volume= 0.102 af
Routed to Reach T2 : Flow to William F. Palmer Road
Secondary = 0.66 cfs @ 12.29 hrs, Volume= 0.320 af
Routed to Reach T2 : Flow to William F. Palmer Road

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 248.67' @ 12.29 hrs Surf.Area= 1,632 sf Storage= 4,814 cf

Plug-Flow detention time= 45.8 min calculated for 0.422 af (100% of inflow)
Center-of-Mass det. time= 45.7 min (869.5 - 823.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	244.50'	979 cf	**21.79'W x 74.90'L x 7.00'H Field A** 11,425 cf Overall - 8,977 cf Embedded = 2,448 cf x 40.0% Voids
#2A	246.00'	7,173 cf	**StormTrap SingleTrap 5-0** x 4 Inside #1 Inside= 101.7"W x 60.0"H => 38.33 sf x 15.40'L = 590.2 cf Outside= 101.7"W x 66.0"H => 46.64 sf x 15.40'L = 718.0 cf 8.48' x 61.58' Core + 6.66' Border = 21.79' x 74.90' System
		8,152 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	247.00'	**12.0" Round 31' - 12" HDPE @ 1.00%** L= 31.0' Ke= 0.700 Inlet / Outlet Invert= 247.00' / 246.69' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	247.00'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	248.00'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 1	250.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	244.50'	**4.0" Round 29' - 4" HDPE @ 0.52%** L= 29.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 244.50' / 244.35' S= 0.0052 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.09 sf
#6	Device 5	244.50'	**4.0" Vert. 4" Underdrain Outlet** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.74 cfs @ 12.29 hrs HW=248.67' (Free Discharge)
└─**1=31' - 12" HDPE @ 1.00%** (Passes 1.74 cfs of 3.61 cfs potential flow)
  ├─**2=6" Orifice** (Orifice Controls 1.13 cfs @ 5.74 fps)
  ├─**3=6" Orifice** (Orifice Controls 0.61 cfs @ 3.13 fps)
  └─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.66 cfs @ 12.29 hrs HW=248.67' (Free Discharge)
└─**5=29' - 4" HDPE @ 0.52%** (Barrel Controls 0.66 cfs @ 7.54 fps)
  └─**6=4" Underdrain Outlet** (Passes 0.66 cfs of 0.84 cfs potential flow)

Pond 2P: Underground Detention - Chamber Wizard Field A

Chamber Model = StormTrap SingleTrap 5-0 (StormTrap SingleTrap® Type II+IV)
Inside= 101.7"W x 60.0"H => 38.33 sf x 15.40'L = 590.2 cf
Outside= 101.7"W x 66.0"H => 46.64 sf x 15.40'L = 718.0 cf

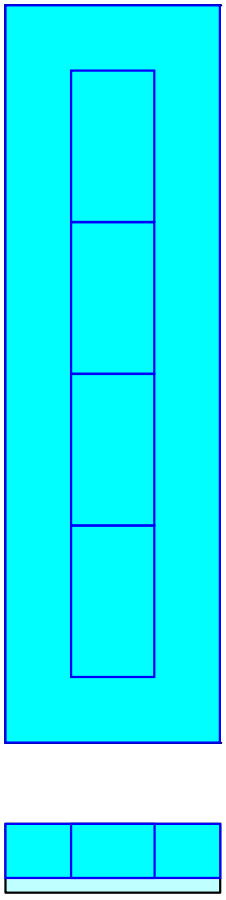
4 Chambers/Row x 15.40' Long = 61.58' Row Length +79.9" Border x 2 = 74.90' Base Length
1 Rows x 101.7" Wide + 79.9" Side Border x 2 = 21.79' Base Width
18.0" Stone Base + 66.0" Chamber Height = 7.00' Field Height

4 Chambers x 590.2 cf + 4,812.2 cf Border = 7,172.9 cf Chamber Storage
4 Chambers x 718.0 cf + 6,104.6 cf Border = 8,976.6 cf Displacement

11,424.7 cf Field - 8,976.6 cf Chambers = 2,448.2 cf Stone x 40.0% Voids = 979.3 cf Stone Storage

Chamber Storage + Stone Storage = 8,152.2 cf = 0.187 af
Overall Storage Efficiency = 71.4%
Overall System Size = 74.90' x 21.79' x 7.00'

4 Chambers (plus border)
423.1 cy Field
90.7 cy Stone



Summary for Subcatchment P1-1: Flow to William F. Palmer Road Detained

Runoff = 7.36 cfs @ 12.14 hrs, Volume= 0.553 af, Depth= 4.28"
Routed to Pond 2P : Underground Detention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-year Rainfall=6.32"

Area (ac)	CN	Description
0.220	39	>75% Grass cover, Good, HSG A
0.340	61	>75% Grass cover, Good, HSG B
0.990	98	Paved parking, HSG A
1.550	82	Weighted Average
0.560		36.13% Pervious Area
0.990		63.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	80	0.0400	0.22		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
0.4	103	0.0410	4.11		**Shallow Concentrated Flow, B TO C** Paved Kv= 20.3 fps
0.6	162	0.0050	4.40	5.40	**Pipe Channel, C TO D** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
7.0	345	Total			

Summary for Subcatchment P1-2: Flow to William F. Palmer Road Direct

Runoff = 0.90 cfs @ 12.13 hrs, Volume= 0.064 af, Depth= 4.07"
Routed to Reach T2 : Flow to William F. Palmer Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-year Rainfall=6.32"

Area (ac)	CN	Description
0.090	61	>75% Grass cover, Good, HSG B
0.100	98	Paved parking, HSG A
0.190	80	Weighted Average
0.090		47.37% Pervious Area
0.100		52.63% Impervious Area

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

Summary for Subcatchment P2: Flow Offsite North to Oak Grove

Runoff = 0.86 cfs @ 12.15 hrs, Volume= 0.067 af, Depth= 2.22"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-year Rainfall=6.32"

Area (ac)	CN	Description
0.360	61	>75% Grass cover, Good, HSG B
0.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	100	0.0340	0.22		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
0.1	16	0.0630	4.04		**Shallow Concentrated Flow, B TO C** Unpaved Kv= 16.1 fps
7.8	116	Total			

Summary for Subcatchment P3: Flow to Existing Depression

Runoff = 0.28 cfs @ 12.14 hrs, Volume= 0.020 af, Depth= 2.05"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-year Rainfall=6.32"

Area (ac)	CN	Description
0.080	61	>75% Grass cover, Good, HSG B
0.040	55	Woods, Good, HSG B
0.120	59	Weighted Average
0.120		100.00% Pervious Area

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

Summary for Reach T1: Total Site

Inflow Area = 2.220 ac, 49.10% Impervious, Inflow Depth = 3.81" for 25-year event
Inflow = 4.75 cfs @ 12.17 hrs, Volume= 0.705 af
Outflow = 4.75 cfs @ 12.17 hrs, Volume= 0.705 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Reach T2: Flow to William F. Palmer Road

Inflow Area = 1.740 ac, 62.64% Impervious, Inflow Depth = 4.26" for 25-year event
Inflow = 3.68 cfs @ 12.19 hrs, Volume= 0.618 af
Outflow = 3.68 cfs @ 12.19 hrs, Volume= 0.618 af, Atten= 0%, Lag= 0.0 min
Routed to Reach T1 : Total Site

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Pond 2P: Underground Detention

Inflow Area = 1.550 ac, 63.87% Impervious, Inflow Depth = 4.28" for 25-year event
Inflow = 7.36 cfs @ 12.14 hrs, Volume= 0.553 af
Outflow = 3.26 cfs @ 12.28 hrs, Volume= 0.553 af, Atten= 56%, Lag= 8.2 min
Primary = 2.53 cfs @ 12.28 hrs, Volume= 0.173 af
Routed to Reach T2 : Flow to William F. Palmer Road
Secondary = 0.73 cfs @ 12.28 hrs, Volume= 0.380 af
Routed to Reach T2 : Flow to William F. Palmer Road

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 249.58' @ 12.28 hrs Surf.Area= 1,632 sf Storage= 6,118 cf

Plug-Flow detention time= 43.9 min calculated for 0.553 af (100% of inflow)
Center-of-Mass det. time= 43.8 min (859.0 - 815.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	244.50'	979 cf	**21.79'W x 74.90'L x 7.00'H Field A** 11,425 cf Overall - 8,977 cf Embedded = 2,448 cf x 40.0% Voids
#2A	246.00'	7,173 cf	**StormTrap SingleTrap 5-0** x 4 Inside #1 Inside= 101.7"W x 60.0"H => 38.33 sf x 15.40'L = 590.2 cf Outside= 101.7"W x 66.0"H => 46.64 sf x 15.40'L = 718.0 cf 8.48' x 61.58' Core + 6.66' Border = 21.79' x 74.90' System
		8,152 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	247.00'	**12.0" Round 31' - 12" HDPE @ 1.00%** L= 31.0' Ke= 0.700 Inlet / Outlet Invert= 247.00' / 246.69' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	247.00'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	248.00'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 1	250.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	244.50'	**4.0" Round 29' - 4" HDPE @ 0.52%** L= 29.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 244.50' / 244.35' S= 0.0052 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.09 sf
#6	Device 5	244.50'	**4.0" Vert. 4" Underdrain Outlet** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.53 cfs @ 12.28 hrs HW=249.58' (Free Discharge)
└─**1=31' - 12" HDPE @ 1.00%** (Passes 2.53 cfs of 4.81 cfs potential flow)
  ├─**2=6" Orifice** (Orifice Controls 1.44 cfs @ 7.35 fps)
  ├─**3=6" Orifice** (Orifice Controls 1.09 cfs @ 5.56 fps)
  └─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.73 cfs @ 12.28 hrs HW=249.58' (Free Discharge)
└─**5=29' - 4" HDPE @ 0.52%** (Barrel Controls 0.73 cfs @ 8.35 fps)
  └─**6=4" Underdrain Outlet** (Passes 0.73 cfs of 0.93 cfs potential flow)

Pond 2P: Underground Detention - Chamber Wizard Field A

Chamber Model = StormTrap SingleTrap 5-0 (StormTrap SingleTrap® Type II+IV)
Inside= 101.7"W x 60.0"H => 38.33 sf x 15.40'L = 590.2 cf
Outside= 101.7"W x 66.0"H => 46.64 sf x 15.40'L = 718.0 cf

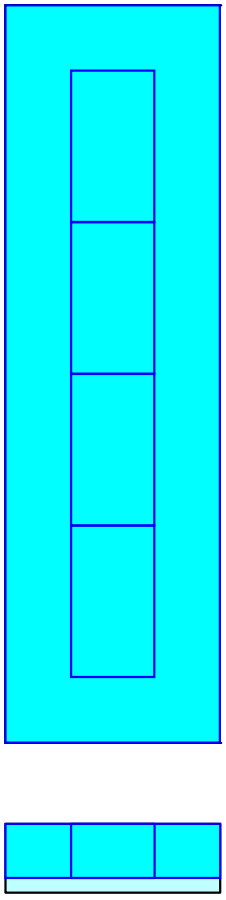
4 Chambers/Row x 15.40' Long = 61.58' Row Length +79.9" Border x 2 = 74.90' Base Length
1 Rows x 101.7" Wide + 79.9" Side Border x 2 = 21.79' Base Width
18.0" Stone Base + 66.0" Chamber Height = 7.00' Field Height

4 Chambers x 590.2 cf + 4,812.2 cf Border = 7,172.9 cf Chamber Storage
4 Chambers x 718.0 cf + 6,104.6 cf Border = 8,976.6 cf Displacement

11,424.7 cf Field - 8,976.6 cf Chambers = 2,448.2 cf Stone x 40.0% Voids = 979.3 cf Stone Storage

Chamber Storage + Stone Storage = 8,152.2 cf = 0.187 af
Overall Storage Efficiency = 71.4%
Overall System Size = 74.90' x 21.79' x 7.00'

4 Chambers (plus border)
423.1 cy Field
90.7 cy Stone



Summary for Subcatchment P1-1: Flow to William F. Palmer Road Detained

Runoff = 8.60 cfs @ 12.14 hrs, Volume= 0.652 af, Depth= 5.05"
Routed to Pond 2P : Underground Detention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 50-year Rainfall=7.14"

Area (ac)	CN	Description
0.220	39	>75% Grass cover, Good, HSG A
0.340	61	>75% Grass cover, Good, HSG B
0.990	98	Paved parking, HSG A
1.550	82	Weighted Average
0.560		36.13% Pervious Area
0.990		63.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	80	0.0400	0.22		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
0.4	103	0.0410	4.11		**Shallow Concentrated Flow, B TO C** Paved Kv= 20.3 fps
0.6	162	0.0050	4.40	5.40	**Pipe Channel, C TO D** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
7.0	345	Total			

Summary for Subcatchment P1-2: Flow to William F. Palmer Road Direct

Runoff = 1.05 cfs @ 12.13 hrs, Volume= 0.076 af, Depth= 4.82"
Routed to Reach T2 : Flow to William F. Palmer Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 50-year Rainfall=7.14"

Area (ac)	CN	Description
0.090	61	>75% Grass cover, Good, HSG B
0.100	98	Paved parking, HSG A
0.190	80	Weighted Average
0.090		47.37% Pervious Area
0.100		52.63% Impervious Area

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

Summary for Subcatchment P2: Flow Offsite North to Oak Grove

Runoff = 1.10 cfs @ 12.15 hrs, Volume= 0.084 af, Depth= 2.80"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 50-year Rainfall=7.14"

Area (ac)	CN	Description
0.360	61	>75% Grass cover, Good, HSG B
0.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	100	0.0340	0.22		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
0.1	16	0.0630	4.04		**Shallow Concentrated Flow, B TO C** Unpaved Kv= 16.1 fps
7.8	116	Total			

Summary for Subcatchment P3: Flow to Existing Depression

Runoff = 0.36 cfs @ 12.14 hrs, Volume= 0.026 af, Depth= 2.60"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 50-year Rainfall=7.14"

Area (ac)	CN	Description
0.080	61	>75% Grass cover, Good, HSG B
0.040	55	Woods, Good, HSG B
0.120	59	Weighted Average
0.120		100.00% Pervious Area

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

Summary for Reach T1: Total Site

Inflow Area = 2.220 ac, 49.10% Impervious, Inflow Depth = 4.53" for 50-year event
Inflow = 5.72 cfs @ 12.16 hrs, Volume= 0.838 af
Outflow = 5.72 cfs @ 12.16 hrs, Volume= 0.838 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Reach T2: Flow to William F. Palmer Road

Inflow Area = 1.740 ac, 62.64% Impervious, Inflow Depth = 5.02" for 50-year event
Inflow = 4.31 cfs @ 12.18 hrs, Volume= 0.728 af
Outflow = 4.31 cfs @ 12.18 hrs, Volume= 0.728 af, Atten= 0%, Lag= 0.0 min
Routed to Reach T1 : Total Site

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Pond 2P: Underground Detention

Inflow Area = 1.550 ac, 63.87% Impervious, Inflow Depth = 5.05" for 50-year event
Inflow = 8.60 cfs @ 12.14 hrs, Volume= 0.652 af
Outflow = 3.77 cfs @ 12.28 hrs, Volume= 0.652 af, Atten= 56%, Lag= 8.3 min
Primary = 2.99 cfs @ 12.28 hrs, Volume= 0.229 af
Routed to Reach T2 : Flow to William F. Palmer Road
Secondary = 0.78 cfs @ 12.28 hrs, Volume= 0.423 af
Routed to Reach T2 : Flow to William F. Palmer Road

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 250.28' @ 12.28 hrs Surf.Area= 1,632 sf Storage= 7,121 cf

Plug-Flow detention time= 43.2 min calculated for 0.652 af (100% of inflow)
Center-of-Mass det. time= 43.1 min (853.2 - 810.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	244.50'	979 cf	**21.79'W x 74.90'L x 7.00'H Field A** 11,425 cf Overall - 8,977 cf Embedded = 2,448 cf x 40.0% Voids
#2A	246.00'	7,173 cf	**StormTrap SingleTrap 5-0** x 4 Inside #1 Inside= 101.7"W x 60.0"H => 38.33 sf x 15.40'L = 590.2 cf Outside= 101.7"W x 66.0"H => 46.64 sf x 15.40'L = 718.0 cf 8.48' x 61.58' Core + 6.66' Border = 21.79' x 74.90' System
		8,152 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	247.00'	**12.0" Round 31' - 12" HDPE @ 1.00%** L= 31.0' Ke= 0.700 Inlet / Outlet Invert= 247.00' / 246.69' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	247.00'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	248.00'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 1	250.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	244.50'	**4.0" Round 29' - 4" HDPE @ 0.52%** L= 29.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 244.50' / 244.35' S= 0.0052 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.09 sf
#6	Device 5	244.50'	**4.0" Vert. 4" Underdrain Outlet** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.99 cfs @ 12.28 hrs HW=250.28' (Free Discharge)
└─**1=31' - 12" HDPE @ 1.00%** (Passes 2.99 cfs of 5.56 cfs potential flow)
  ├─**2=6" Orifice** (Orifice Controls 1.65 cfs @ 8.38 fps)
  ├─**3=6" Orifice** (Orifice Controls 1.35 cfs @ 6.86 fps)
  └─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.78 cfs @ 12.28 hrs HW=250.28' (Free Discharge)
└─**5=29' - 4" HDPE @ 0.52%** (Barrel Controls 0.78 cfs @ 8.93 fps)
  └─**6=4" Underdrain Outlet** (Passes 0.78 cfs of 1.00 cfs potential flow)

Pond 2P: Underground Detention - Chamber Wizard Field A

Chamber Model = StormTrap SingleTrap 5-0 (StormTrap SingleTrap® Type II+IV)
Inside= 101.7"W x 60.0"H => 38.33 sf x 15.40'L = 590.2 cf
Outside= 101.7"W x 66.0"H => 46.64 sf x 15.40'L = 718.0 cf

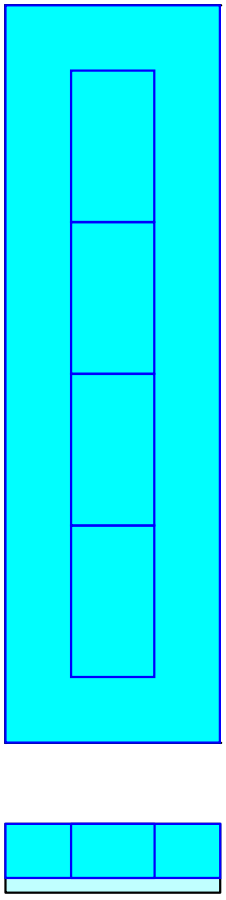
4 Chambers/Row x 15.40' Long = 61.58' Row Length +79.9" Border x 2 = 74.90' Base Length
1 Rows x 101.7" Wide + 79.9" Side Border x 2 = 21.79' Base Width
18.0" Stone Base + 66.0" Chamber Height = 7.00' Field Height

4 Chambers x 590.2 cf + 4,812.2 cf Border = 7,172.9 cf Chamber Storage
4 Chambers x 718.0 cf + 6,104.6 cf Border = 8,976.6 cf Displacement

11,424.7 cf Field - 8,976.6 cf Chambers = 2,448.2 cf Stone x 40.0% Voids = 979.3 cf Stone Storage

Chamber Storage + Stone Storage = 8,152.2 cf = 0.187 af
Overall Storage Efficiency = 71.4%
Overall System Size = 74.90' x 21.79' x 7.00'

4 Chambers (plus border)
423.1 cy Field
90.7 cy Stone



Summary for Subcatchment P1-1: Flow to William F. Palmer Road Detained

Runoff = 9.96 cfs @ 12.14 hrs, Volume= 0.761 af, Depth= 5.89"
Routed to Pond 2P : Underground Detention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-year Rainfall=8.03"

Area (ac)	CN	Description
0.220	39	>75% Grass cover, Good, HSG A
0.340	61	>75% Grass cover, Good, HSG B
0.990	98	Paved parking, HSG A
1.550	82	Weighted Average
0.560		36.13% Pervious Area
0.990		63.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	80	0.0400	0.22		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
0.4	103	0.0410	4.11		**Shallow Concentrated Flow, B TO C** Paved Kv= 20.3 fps
0.6	162	0.0050	4.40	5.40	**Pipe Channel, C TO D** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
7.0	345	Total			

Summary for Subcatchment P1-2: Flow to William F. Palmer Road Direct

Runoff = 1.23 cfs @ 12.13 hrs, Volume= 0.090 af, Depth= 5.65"
Routed to Reach T2 : Flow to William F. Palmer Road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-year Rainfall=8.03"

Area (ac)	CN	Description
0.090	61	>75% Grass cover, Good, HSG B
0.100	98	Paved parking, HSG A
0.190	80	Weighted Average
0.090		47.37% Pervious Area
0.100		52.63% Impervious Area

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

Summary for Subcatchment P2: Flow Offsite North to Oak Grove

Runoff = 1.37 cfs @ 12.15 hrs, Volume= 0.104 af, Depth= 3.47"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-year Rainfall=8.03"

Area (ac)	CN	Description
0.360	61	>75% Grass cover, Good, HSG B
0.360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	100	0.0340	0.22		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.43"
0.1	16	0.0630	4.04		**Shallow Concentrated Flow, B TO C** Unpaved Kv= 16.1 fps
7.8	116	Total			

Summary for Subcatchment P3: Flow to Existing Depression

Runoff = 0.46 cfs @ 12.13 hrs, Volume= 0.032 af, Depth= 3.24"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-year Rainfall=8.03"

Area (ac)	CN	Description
0.080	61	>75% Grass cover, Good, HSG B
0.040	55	Woods, Good, HSG B
0.120	59	Weighted Average
0.120		100.00% Pervious Area

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

Summary for Reach T1: Total Site

Inflow Area = 2.220 ac, 49.10% Impervious, Inflow Depth = 5.33" for 100-year event
Inflow = 7.80 cfs @ 12.22 hrs, Volume= 0.986 af
Outflow = 7.80 cfs @ 12.22 hrs, Volume= 0.986 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Reach T2: Flow to William F. Palmer Road

Inflow Area = 1.740 ac, 62.64% Impervious, Inflow Depth = 5.86" for 100-year event
Inflow = 6.55 cfs @ 12.22 hrs, Volume= 0.850 af
Outflow = 6.55 cfs @ 12.22 hrs, Volume= 0.850 af, Atten= 0%, Lag= 0.0 min
Routed to Reach T1 : Total Site

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Pond 2P: Underground Detention

Inflow Area = 1.550 ac, 63.87% Impervious, Inflow Depth = 5.89" for 100-year event
Inflow = 9.96 cfs @ 12.14 hrs, Volume= 0.761 af
Outflow = 5.91 cfs @ 12.23 hrs, Volume= 0.761 af, Atten= 41%, Lag= 5.3 min
Primary = 5.10 cfs @ 12.23 hrs, Volume= 0.294 af
Routed to Reach T2 : Flow to William F. Palmer Road
Secondary = 0.81 cfs @ 12.23 hrs, Volume= 0.467 af
Routed to Reach T2 : Flow to William F. Palmer Road

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 250.79' @ 12.23 hrs Surf.Area= 1,632 sf Storage= 7,854 cf

Plug-Flow detention time= 42.2 min calculated for 0.761 af (100% of inflow)
Center-of-Mass det. time= 42.2 min (847.4 - 805.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	244.50'	979 cf	**21.79'W x 74.90'L x 7.00'H Field A** 11,425 cf Overall - 8,977 cf Embedded = 2,448 cf x 40.0% Voids
#2A	246.00'	7,173 cf	**StormTrap SingleTrap 5-0** x 4 Inside #1 Inside= 101.7"W x 60.0"H => 38.33 sf x 15.40'L = 590.2 cf Outside= 101.7"W x 66.0"H => 46.64 sf x 15.40'L = 718.0 cf 8.48' x 61.58' Core + 6.66' Border = 21.79' x 74.90' System
		8,152 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	247.00'	**12.0" Round 31' - 12" HDPE @ 1.00%** L= 31.0' Ke= 0.700 Inlet / Outlet Invert= 247.00' / 246.69' S= 0.0100 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	247.00'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	248.00'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 1	250.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	244.50'	**4.0" Round 29' - 4" HDPE @ 0.52%** L= 29.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 244.50' / 244.35' S= 0.0052 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.09 sf
#6	Device 5	244.50'	**4.0" Vert. 4" Underdrain Outlet** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.09 cfs @ 12.23 hrs HW=250.79' (Free Discharge)
└─**1=31' - 12" HDPE @ 1.00%** (Passes 5.09 cfs of 6.05 cfs potential flow)
  ├─**2=6" Orifice** (Orifice Controls 1.78 cfs @ 9.06 fps)
  ├─**3=6" Orifice** (Orifice Controls 1.51 cfs @ 7.68 fps)
  └─**4=Broad-Crested Rectangular Weir** (Weir Controls 1.80 cfs @ 1.54 fps)

Secondary OutFlow Max=0.81 cfs @ 12.23 hrs HW=250.79' (Free Discharge)
└─**5=29' - 4" HDPE @ 0.52%** (Barrel Controls 0.81 cfs @ 9.33 fps)
  └─**6=4" Underdrain Outlet** (Passes 0.81 cfs of 1.04 cfs potential flow)

Pond 2P: Underground Detention - Chamber Wizard Field A

Chamber Model = StormTrap SingleTrap 5-0 (StormTrap SingleTrap® Type II+IV)
Inside= 101.7"W x 60.0"H => 38.33 sf x 15.40'L = 590.2 cf
Outside= 101.7"W x 66.0"H => 46.64 sf x 15.40'L = 718.0 cf

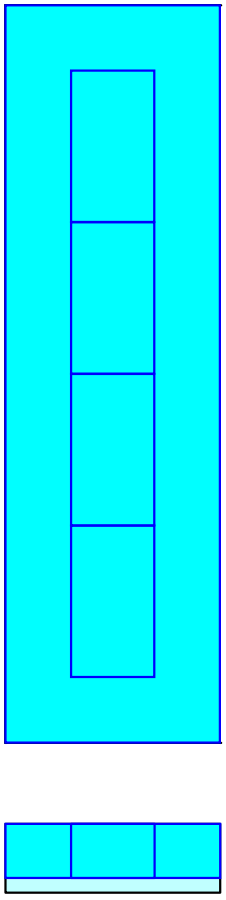
4 Chambers/Row x 15.40' Long = 61.58' Row Length +79.9" Border x 2 = 74.90' Base Length
1 Rows x 101.7" Wide + 79.9" Side Border x 2 = 21.79' Base Width
18.0" Stone Base + 66.0" Chamber Height = 7.00' Field Height

4 Chambers x 590.2 cf + 4,812.2 cf Border = 7,172.9 cf Chamber Storage
4 Chambers x 718.0 cf + 6,104.6 cf Border = 8,976.6 cf Displacement

11,424.7 cf Field - 8,976.6 cf Chambers = 2,448.2 cf Stone x 40.0% Voids = 979.3 cf Stone Storage

Chamber Storage + Stone Storage = 8,152.2 cf = 0.187 af
Overall Storage Efficiency = 71.4%
Overall System Size = 74.90' x 21.79' x 7.00'

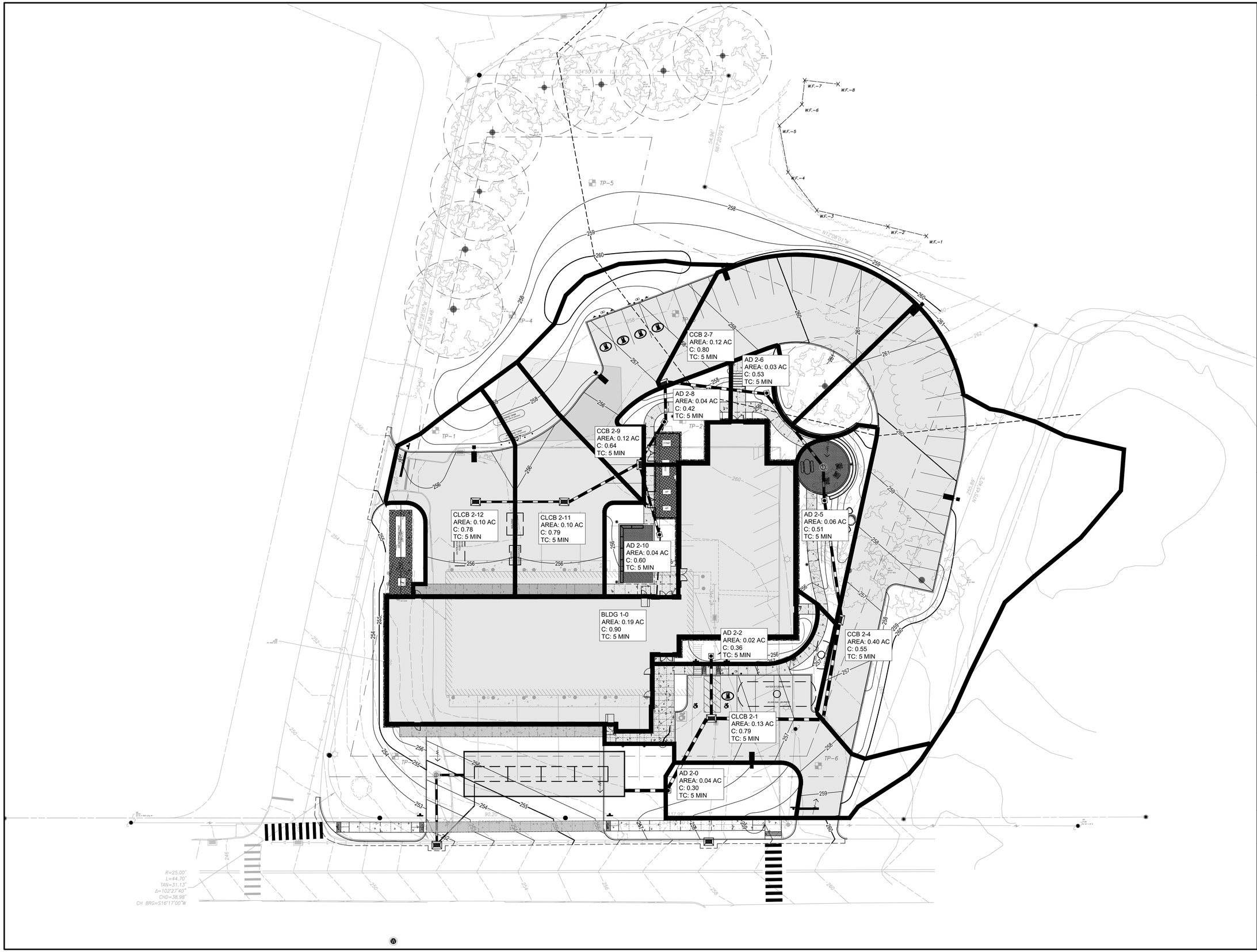
4 Chambers (plus border)
423.1 cy Field
90.7 cy Stone



APPENDIX C

Hydraulic Analysis

benesch



Prepared by:

benesch

Alfred Benesch & Company
200 Glastonbury Boulevard, Suite 201
Glastonbury, Connecticut 06033
860-633-8341

Prepared for:

NEW CONSTRUCTION
EAST HADDAM FIREHOUSE #2
44 WILLIAM F. PALMER ROAD MOODUS, CT 06423

DATE:	REVISION:

KEY PLAN

PROJECT NO.: 70903.00
SCALE: 1" = 20'
DATE: 01/13/2026

DRAWN BY: RLC
CHECKED BY: WGW

CATCHMENT AREA MAP

DRAWING NO.:
CAM

C-Values
44 William Palmer Road
Moodus, CT

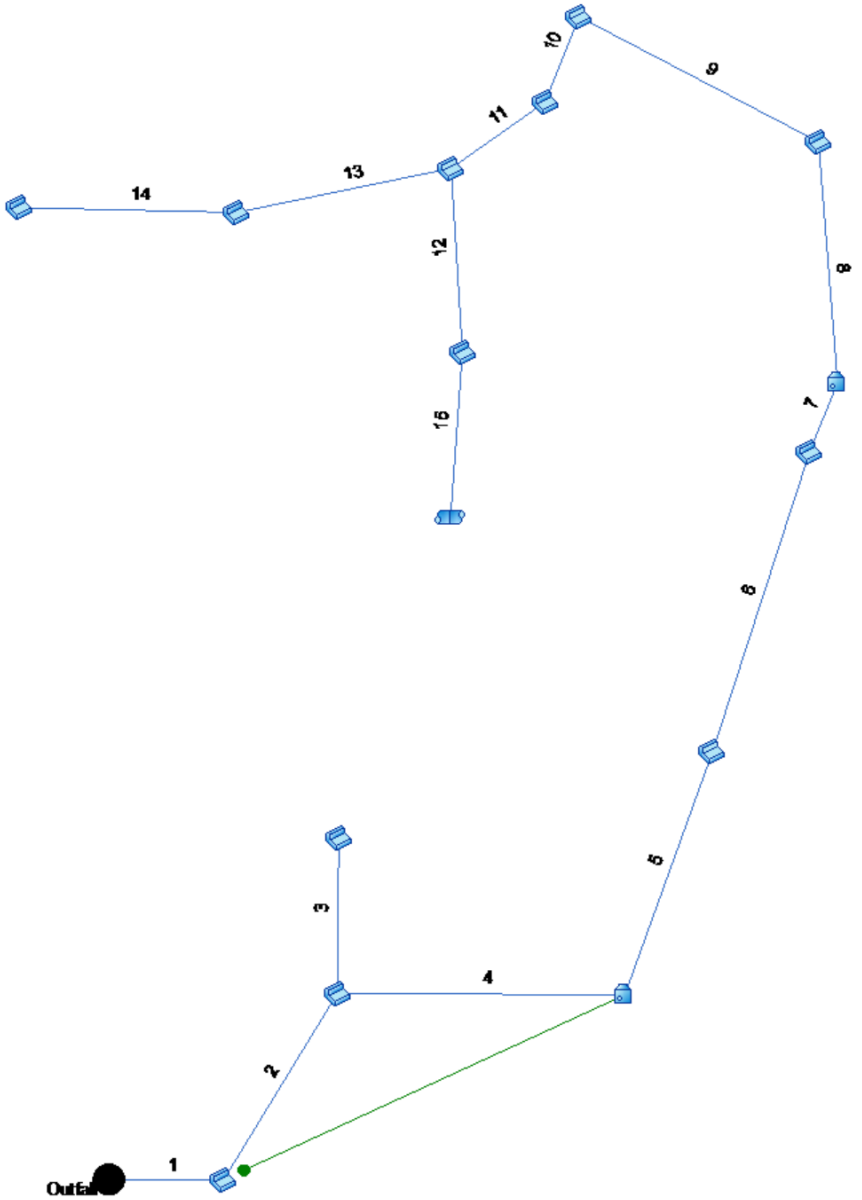
1/30/2026

Job Number: 70903.00 NJU

Drainage Areas

BASIN	TOTAL (AC.)	IMPERVIOUS (AC.)	PERVIOUS (AC.)	C-Value	Tc (Min.)
AD 2-0	0.04	0.00	0.04	0.30	5.00
CLCB 2-1	0.13	0.11	0.03	0.79	5.00
AD 2-2	0.02	0.00	0.02	0.36	5.00
CCB 2-4	0.40	0.16	0.23	0.55	5.00
AD 2-5	0.06	0.02	0.04	0.51	5.00
AD 2-6	0.03	0.01	0.02	0.53	5.00
CCB 2-7	0.12	0.10	0.02	0.80	5.00
AD 2-8	0.04	0.01	0.03	0.42	5.00
CCB 2-9	0.12	0.07	0.05	0.64	5.00
AD 2-10	0.04	0.02	0.02	0.60	5.00
CLCB 2-11	0.10	0.08	0.02	0.79	5.00
CLCB 2-12	0.10	0.08	0.02	0.78	5.00
BLDG 1-0	0.32	0.32	0.00	0.90	5.00
TOTAL	1.53	0.99	0.50		

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: 70903.00_Hydraulic_Analysis.stm	Number of lines: 15	Date: 1/30/2026

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	20.000	0.04	1.52	0.30	0.01	1.05	5.0	12.0	4.8	5.04	10.50	2.85	18	1.00	247.00	247.20	249.42	249.47	251.00	256.50	AD 2-0
2	1	38.000	0.13	1.48	0.79	0.10	1.04	5.0	11.7	4.9	5.03	7.43	2.85	18	0.50	247.20	247.39	249.63	249.72	256.50	255.40	CLCB 2-1
3	2	27.000	0.02	0.02	0.36	0.01	0.01	5.0	5.0	7.3	0.05	5.04	0.07	12	2.00	248.07	248.61	249.89	249.89	255.40	255.00	AD 2-2
4	2	50.000	0.00	1.33	0.00	0.00	0.93	0.0	7.3	6.2	5.70	10.50	3.22	18	1.00	247.57	248.07	249.89	250.03	255.40	258.00	DMH 2-3
5	4	45.000	0.40	1.33	0.55	0.22	0.93	5.0	7.1	6.3	5.78	10.50	3.27	18	1.00	247.57	248.02	250.19	250.32	258.00	256.30	CCB 2-4
6	5	55.000	0.06	0.93	0.51	0.03	0.71	5.0	6.9	6.4	4.48	6.46	3.65	15	1.00	248.52	249.07	250.41	250.67	256.30	255.00	AD 2-5
7	6	13.000	0.00	0.87	0.00	0.00	0.67	0.0	6.8	6.4	4.30	6.46	3.51	15	1.00	249.07	249.20	250.78	250.83	255.00	255.60	DMH 2-5A
8	7	42.000	0.03	0.87	0.53	0.02	0.67	5.0	6.6	6.5	4.36	6.46	3.55	15	1.00	249.20	249.62	250.93	251.12	255.60	255.50	AD 2-6
9	8	47.000	0.12	0.84	0.80	0.10	0.66	5.0	6.5	6.5	4.30	3.56	5.48	12	1.00	249.62	250.09	251.38	252.06	255.50	257.10	CCB 2-7
10	9	16.000	0.04	0.72	0.42	0.02	0.56	5.0	6.4	6.6	3.69	2.52	4.70	12	0.50	250.09	250.17	252.76	252.94	257.10	255.30	AD 2-8
11	10	20.000	0.12	0.68	0.64	0.08	0.55	5.0	6.3	6.6	3.60	2.52	4.58	12	0.50	250.17	250.27	253.24	253.45	255.30	255.10	CCB 2-9
12	11	32.000	0.04	0.36	0.60	0.02	0.31	5.0	5.0	7.3	2.27	3.56	2.88	12	1.00	250.27	250.59	253.95	254.08	255.10	255.20	AD 2-10
13	11	38.000	0.10	0.20	0.79	0.08	0.16	5.0	5.9	6.8	1.07	2.52	1.36	12	0.50	250.27	250.46	253.95	253.98	255.10	255.20	CLCB 2-11
14	13	38.000	0.10	0.10	0.78	0.08	0.08	5.0	5.0	7.3	0.57	2.52	0.72	12	0.50	250.46	250.65	254.00	254.01	255.20	255.20	CLCB 2-12
15	12	29.000	0.32	0.32	0.90	0.29	0.29	5.0	5.0	7.3	2.10	0.56	10.69	6	1.00	250.59	250.88	254.14	258.21	255.20	265.00	BLDG 1-0

Project File: 70903.00_Hydraulic_Analysis.stm

Number of lines: 15

Run Date: 1/30/2026

NOTES:Intensity = 35.00 / (Inlet time + 3.90) ^ 0.72; Return period =Yrs. 10 ; c = cir e = ellip b = box

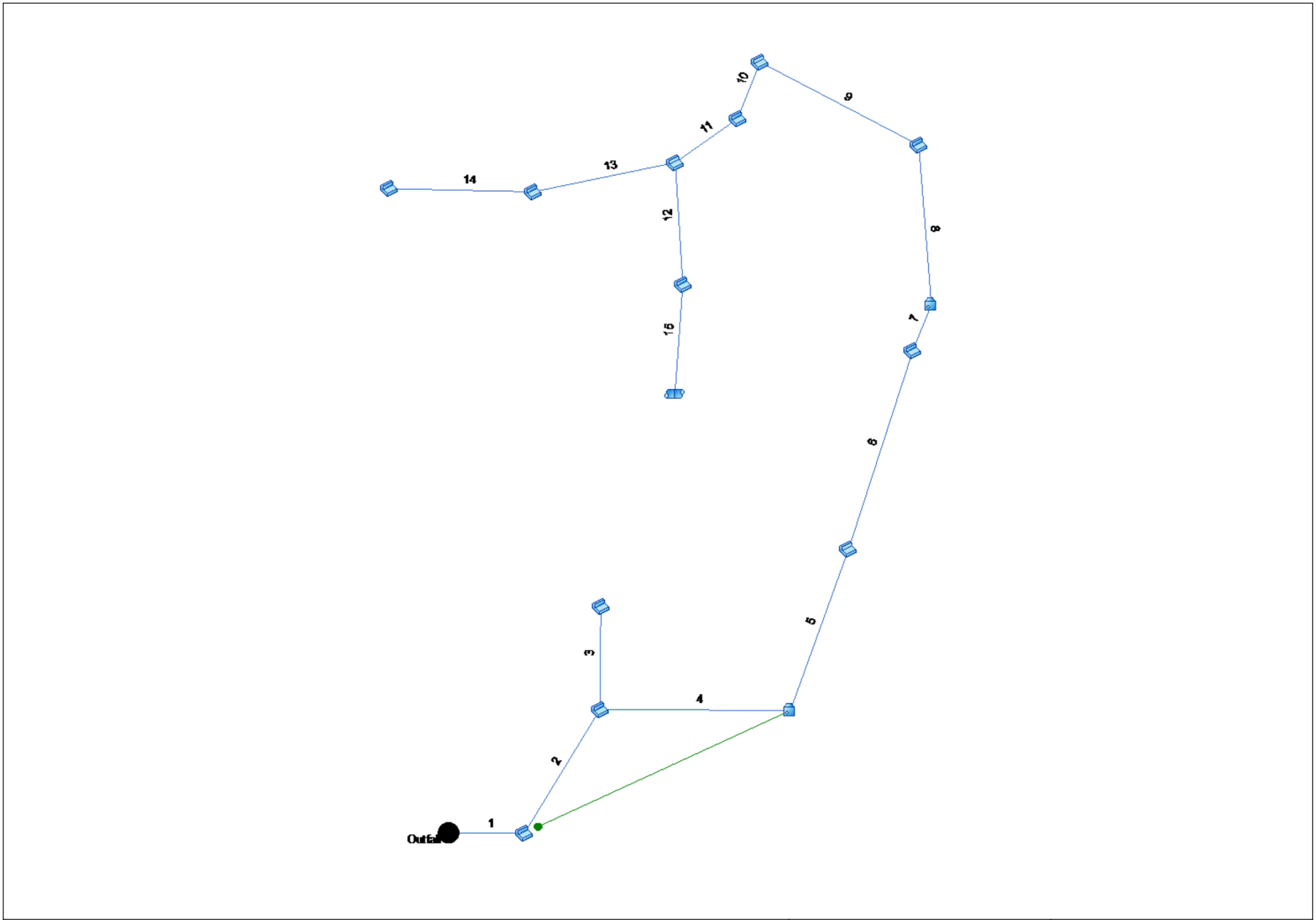
Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	18	5.04	247.00	249.42	1.50	1.77	2.85	0.13	249.55	0.230	20.000	247.20	249.47	1.50	1.77	2.85	0.13	249.59	0.230	0.230	0.046	1.32	0.17
2	18	5.03	247.20	249.63	1.50	1.77	2.85	0.13	249.76	0.230	38.000	247.39	249.72	1.50	1.77	2.85	0.13	249.85	0.230	0.230	0.087	1.32	0.17
3	12	0.05	248.07	249.89	1.00	0.79	0.07	0.00	249.89	0.000	27.000	248.61	249.89	1.00	0.79	0.07	0.00	249.89	0.000	0.000	0.000	1.00	0.00
4	18	5.70	247.57	249.89	1.50	1.77	3.23	0.16	250.05	0.295	50.000	248.07	250.03	1.50	1.77	3.22	0.16	250.20	0.294	0.294	0.147	0.95	0.15
5	18	5.78	247.57	250.19	1.50	1.77	3.27	0.17	250.35	0.303	45.000	248.02	250.32	1.50	1.77	3.27	0.17	250.49	0.303	0.303	0.136	0.50	0.08
6	15	4.48	248.52	250.41	1.25	1.23	3.65	0.21	250.61	0.482	55.000	249.07	250.67	1.25	1.23	3.65	0.21	250.88	0.481	0.482	0.265	0.50	0.10
7	15	4.30	249.07	250.78	1.25	1.23	3.51	0.19	250.97	0.444	13.000	249.20	250.83	1.25	1.23	3.51	0.19	251.03	0.444	0.444	0.058	0.50	0.10
8	15	4.36	249.20	250.93	1.25	1.23	3.55	0.20	251.13	0.456	42.000	249.62	251.12	1.25	1.23	3.55	0.20	251.32	0.456	0.456	0.192	1.31	0.26
9	12	4.30	249.62	251.38	1.00	0.79	5.48	0.47	251.84	1.459	47.000	250.09	252.06	1.00	0.79	5.48	0.47	252.53	1.458	1.459	0.686	1.50	0.70
10	12	3.69	250.09	252.76	1.00	0.79	4.70	0.34	253.11	1.073	16.000	250.17	252.94	1.00	0.79	4.70	0.34	253.28	1.073	1.073	0.172	0.90	0.31
11	12	3.60	250.17	253.24	1.00	0.79	4.58	0.33	253.57	1.020	20.000	250.27	253.45	1.00	0.79	4.58	0.33	253.77	1.020	1.020	0.204	1.53	0.50
12	12	2.27	250.27	253.95	1.00	0.79	2.88	0.13	254.08	0.405	32.000	250.59	254.08	1.00	0.79	2.88	0.13	254.21	0.405	0.405	0.130	0.50	0.06
13	12	1.07	250.27	253.95	1.00	0.79	1.36	0.03	253.98	0.090	38.000	250.46	253.98	1.00	0.79	1.36	0.03	254.01	0.090	0.090	0.034	0.50	0.01
14	12	0.57	250.46	254.00	1.00	0.79	0.72	0.01	254.00	0.025	38.000	250.65	254.01	1.00	0.79	0.72	0.01	254.01	0.025	0.025	0.010	1.00	0.01
15	6	2.10	250.59	254.14	0.50	0.20	10.69	1.78	255.92	14.014	29.000	250.88	258.21	0.50**	0.20	10.69	1.78	259.98	14.009	14.011	4.063	1.00	1.78

Project File: 70903.00_Hydraulic_Analysis.stm | Number of lines: 15 | Run Date: 1/30/2026

Notes: ; ** Critical depth. ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: 70903.00_Hydraulic_Analysis.stm	Number of lines: 15	Date: 1/30/2026

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	20.000	0.04	1.52	0.30	0.01	1.05	5.0	10.7	6.2	6.49	10.50	3.67	18	1.00	247.00	247.20	249.42	249.50	251.00	256.50	AD 2-0
2	1	38.000	0.13	1.48	0.79	0.10	1.04	5.0	10.5	6.3	6.47	7.43	3.66	18	0.50	247.20	247.39	249.77	249.92	256.50	255.40	CLCB 2-1
3	2	27.000	0.02	0.02	0.36	0.01	0.01	5.0	5.0	8.9	0.06	5.04	0.08	12	2.00	248.07	248.61	250.19	250.19	255.40	255.00	AD 2-2
4	2	50.000	0.00	1.33	0.00	0.00	0.93	0.0	6.9	7.7	7.13	10.50	4.03	18	1.00	247.57	248.07	250.19	250.42	255.40	258.00	DMH 2-3
5	4	45.000	0.40	1.33	0.55	0.22	0.93	5.0	6.7	7.8	7.22	10.50	4.08	18	1.00	247.57	248.02	250.66	250.88	258.00	256.30	CCB 2-4
6	5	55.000	0.06	0.93	0.51	0.03	0.71	5.0	6.5	7.9	5.58	6.46	4.55	15	1.00	248.52	249.07	251.01	251.42	256.30	255.00	AD 2-5
7	6	13.000	0.00	0.87	0.00	0.00	0.67	0.0	6.5	7.9	5.35	6.46	4.36	15	1.00	249.07	249.20	251.58	251.67	255.00	255.60	DMH 2-5A
8	7	42.000	0.03	0.87	0.53	0.02	0.67	5.0	6.3	8.0	5.41	6.46	4.41	15	1.00	249.20	249.62	251.82	252.11	255.60	255.50	AD 2-6
9	8	47.000	0.12	0.84	0.80	0.10	0.66	5.0	6.2	8.1	5.33	3.56	6.79	12	1.00	249.62	250.09	252.51	253.56	255.50	257.10	CCB 2-7
10	9	16.000	0.04	0.72	0.42	0.02	0.56	5.0	6.2	8.1	4.57	2.52	5.82	12	0.50	250.09	250.17	254.63	254.90	257.10	255.30	AD 2-8
11	10	20.000	0.12	0.68	0.64	0.08	0.55	5.0	6.1	8.2	4.45	2.52	5.67	12	0.50	250.17	250.27	255.37	255.68	255.30	255.10	CCB 2-9
12	11	32.000	0.04	0.36	0.60	0.02	0.31	5.0	5.0	8.8	2.76	3.56	3.51	12	1.00	250.27	250.59	256.45	256.64	255.10	255.20	AD 2-10
13	11	38.000	0.10	0.20	0.79	0.08	0.16	5.0	5.7	8.4	1.32	2.52	1.68	12	0.50	250.27	250.46	256.45	256.50	255.10	255.20	CLCB 2-11
14	13	38.000	0.10	0.10	0.78	0.08	0.08	5.0	5.0	8.9	0.69	2.52	0.88	12	0.50	250.46	250.65	256.52	256.53	255.20	255.20	CLCB 2-12
15	12	29.000	0.32	0.32	0.90	0.29	0.29	5.0	5.0	8.9	2.55	0.56	13.00	6	1.00	250.59	250.88	256.73	262.75	255.20	265.00	BLDG 1-0

Project File: 70903.00_Hydraulic_Analysis.stm

Number of lines: 15

Run Date: 1/30/2026

NOTES:Intensity = 42.88 / (Inlet time + 3.90) ^ 0.72; Return period =Yrs. 25 ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	18	6.49	247.00	249.42	1.50	1.77	3.68	0.21	249.63	0.382	20.000	247.20	249.50	1.50	1.77	3.67	0.21	249.71	0.382	0.382	0.076	1.32	0.28
2	18	6.47	247.20	249.77	1.50	1.77	3.66	0.21	249.98	0.380	38.000	247.39	249.92	1.50	1.77	3.66	0.21	250.13	0.380	0.380	0.144	1.32	0.28
3	12	0.06	248.07	250.19	1.00	0.79	0.08	0.00	250.19	0.000	27.000	248.61	250.19	1.00	0.79	0.08	0.00	250.19	0.000	0.000	0.000	1.00	0.00
4	18	7.13	247.57	250.19	1.50	1.77	4.03	0.25	250.45	0.461	50.000	248.07	250.42	1.50	1.77	4.03	0.25	250.68	0.461	0.461	0.230	0.95	0.24
5	18	7.22	247.57	250.66	1.50	1.77	4.08	0.26	250.92	0.473	45.000	248.02	250.88	1.50	1.77	4.08	0.26	251.14	0.472	0.472	0.213	0.50	0.13
6	15	5.58	248.52	251.01	1.25	1.23	4.55	0.32	251.33	0.746	55.000	249.07	251.42	1.25	1.23	4.54	0.32	251.74	0.746	0.746	0.410	0.50	0.16
7	15	5.35	249.07	251.58	1.25	1.23	4.36	0.30	251.87	0.688	13.000	249.20	251.67	1.25	1.23	4.36	0.30	251.96	0.687	0.688	0.089	0.50	0.15
8	15	5.41	249.20	251.82	1.25	1.23	4.41	0.30	252.12	0.703	42.000	249.62	252.11	1.25	1.23	4.41	0.30	252.41	0.703	0.703	0.295	1.31	0.40
9	12	5.33	249.62	252.51	1.00	0.79	6.79	0.72	253.22	2.240	47.000	250.09	253.56	1.00	0.79	6.79	0.72	254.28	2.239	2.240	1.053	1.50	1.07
10	12	4.57	250.09	254.63	1.00	0.79	5.82	0.53	255.16	1.646	16.000	250.17	254.90	1.00	0.79	5.82	0.53	255.42	1.645	1.645	0.263	0.90	0.47
11	12	4.45	250.17	255.37	1.00	0.79	5.67	0.50	255.87	1.562	20.000	250.27	255.68	1.00	0.79	5.67	0.50	256.18	1.561	1.562	0.312	1.53	0.76
12	12	2.76	250.27	256.45	1.00	0.79	3.51	0.19	256.64	0.600	32.000	250.59	256.64	1.00	0.79	3.51	0.19	256.83	0.600	0.600	0.192	0.50	0.10
13	12	1.32	250.27	256.45	1.00	0.79	1.68	0.04	256.49	0.137	38.000	250.46	256.50	1.00	0.79	1.68	0.04	256.54	0.137	0.137	0.052	0.50	0.02
14	12	0.69	250.46	256.52	1.00	0.79	0.88	0.01	256.53	0.038	38.000	250.65	256.53	1.00	0.79	0.88	0.01	256.55	0.038	0.038	0.014	1.00	0.01
15	6	2.55	250.59	256.73	0.50	0.20	13.01	2.63	259.36	20.743	29.000	250.88	262.75	0.50**	0.20	13.00	2.63	265.38	20.735	20.739	6.014	1.00	2.63

Project File: 70903.00_Hydraulic_Analysis.stm | Number of lines: 15 | Run Date: 1/30/2026

Notes: ; ** Critical depth. ; c = cir e = ellip b = box

APPENDIX D

Water Quality Volume

benesch

Water Quality Volume Computations
44 William Palmer Road, Moodus CT
Project # 70903.00

Designation	Description	Total Area (ac)	Total Impervious Area (ac)	Impervious Coverage, I (%)	Volumetric Runoff Coefficient (R)	WQV (ac-ft, apply 1.3")	Required WQV (cf)	50% Required WQV (cf)	Provided WQV (cf)
					R = 0.05 + 0.009*(I)	WQV = (1.3")*(R)*(A)/12			
1	Total Site	2.22	1.09	48.96	0.49	0.118	5,137	2,569	
2	Underground Detention	1.55	0.99	63.84	0.62	0.105	4,576	2,288	2,414
3	Hydrodynamic Seperator AD 2-0	1.55	0.99	63.87	0.62	0.105	4,570	2,285	HS-5

Water Quality Flow Calculation

Designation	Description	WQV Applied Impervious Area (ac-ft)	Total Drainage Area (ac)	Total Drainage Area (sq. mi)	Watershed Runoff Depth (Q, in)	P (1.3" for water quality storm, in)	NRCS Runoff Curve Number		Ia, (in, Table 4-1, TR-55)	Ia/P	Tc, (hr)	Peak unit discharge, qu, (csm/in, Exhibit 4-III, TR-55	Total WQF (cfs)	Hydroworks Treatment Unit
4	Hydrodynamic Seperator AD 2-0	0.105	1.55	0.0024	0.81	1.3	69		0.899	0.691538	0.1	200	0.39	HS-5

Hydroworks Sizing Summary

East Haddam FH AD 2-0

01-30-2026

Recommended Size: HydroStorm HS 5

Hydroworks Sizing Program Version 5.8.5

A HydroStorm HS 5 is recommended to provide 80 % annual TSS removal based on a drainage area of 1.55 (ac) with an imperviousness of 64 % and Moodus Reservoir, Connecticut rainfall for the Hydroworks standard particle size distribution.

The recommended HydroStorm HS 5 treats 99 % of the annual runoff and provides 82 % annual TSS removal for the Moodus Reservoir rainfall records and Hydroworks standard particle size distribution.

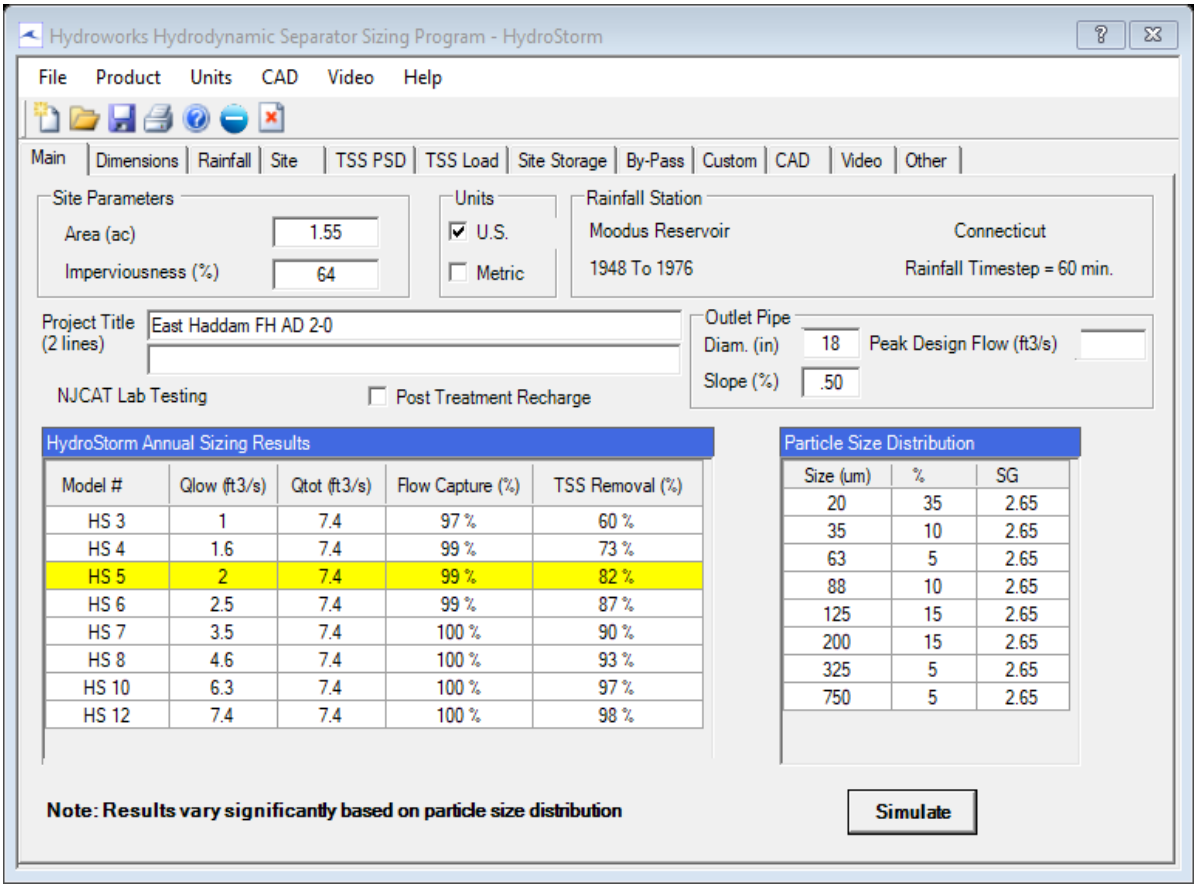
The HydroStorm has a headloss coefficient (K) of 1.04. Since a peak flow was not specified, headloss was calculated using the full pipe flow of 7.43 (ft3/s) for the given 18 (in) pipe diameter at .5% slope. The headloss was calculated to be 3 (in) based on a flow depth of 18 (in) (full pipe flow).

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

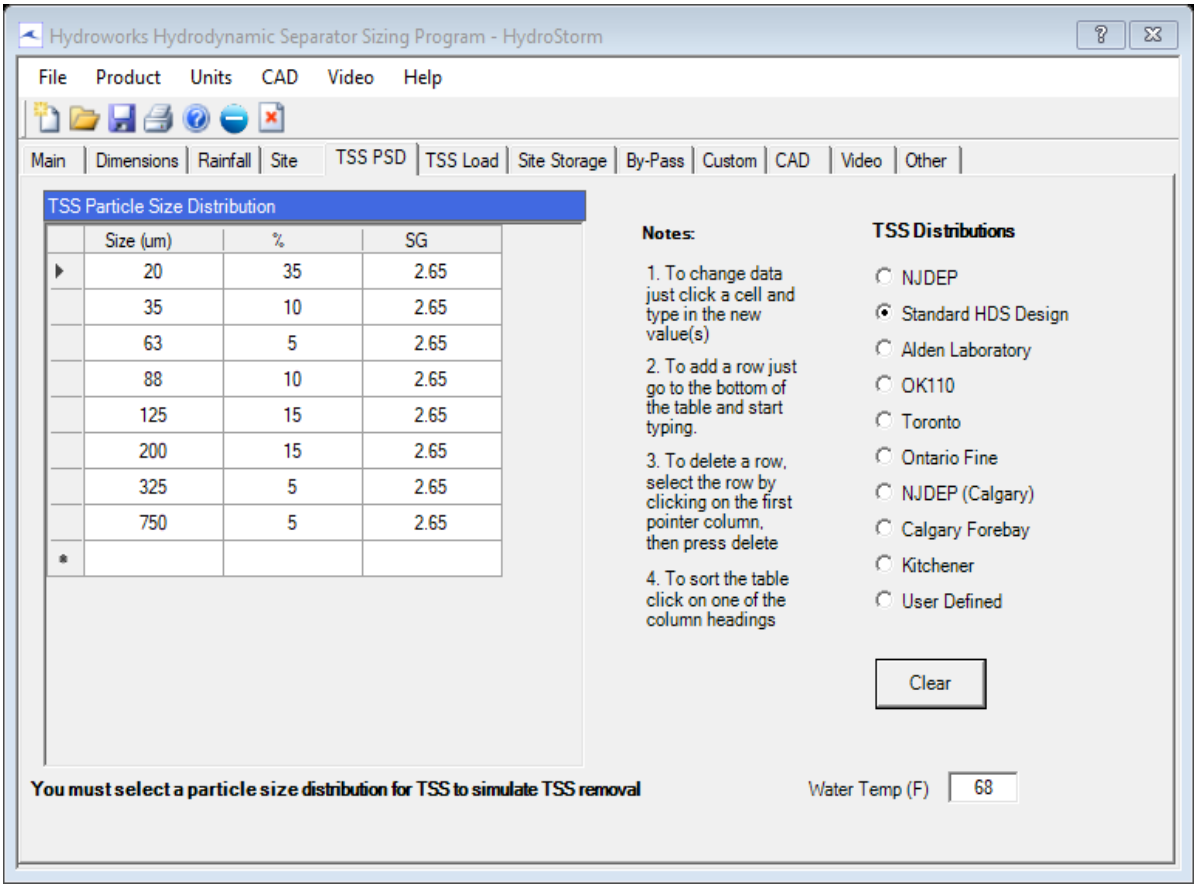
If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroStorm .

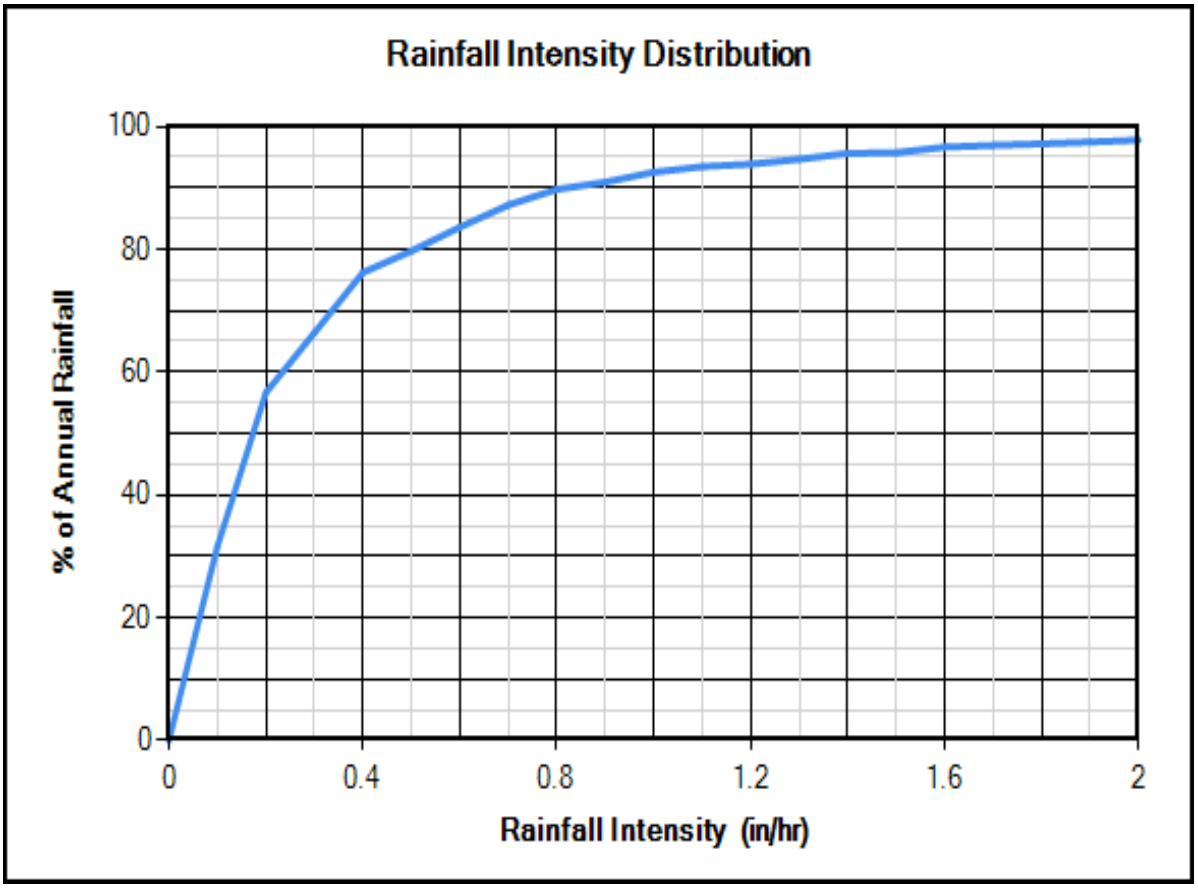
TSS Removal Sizing Summary



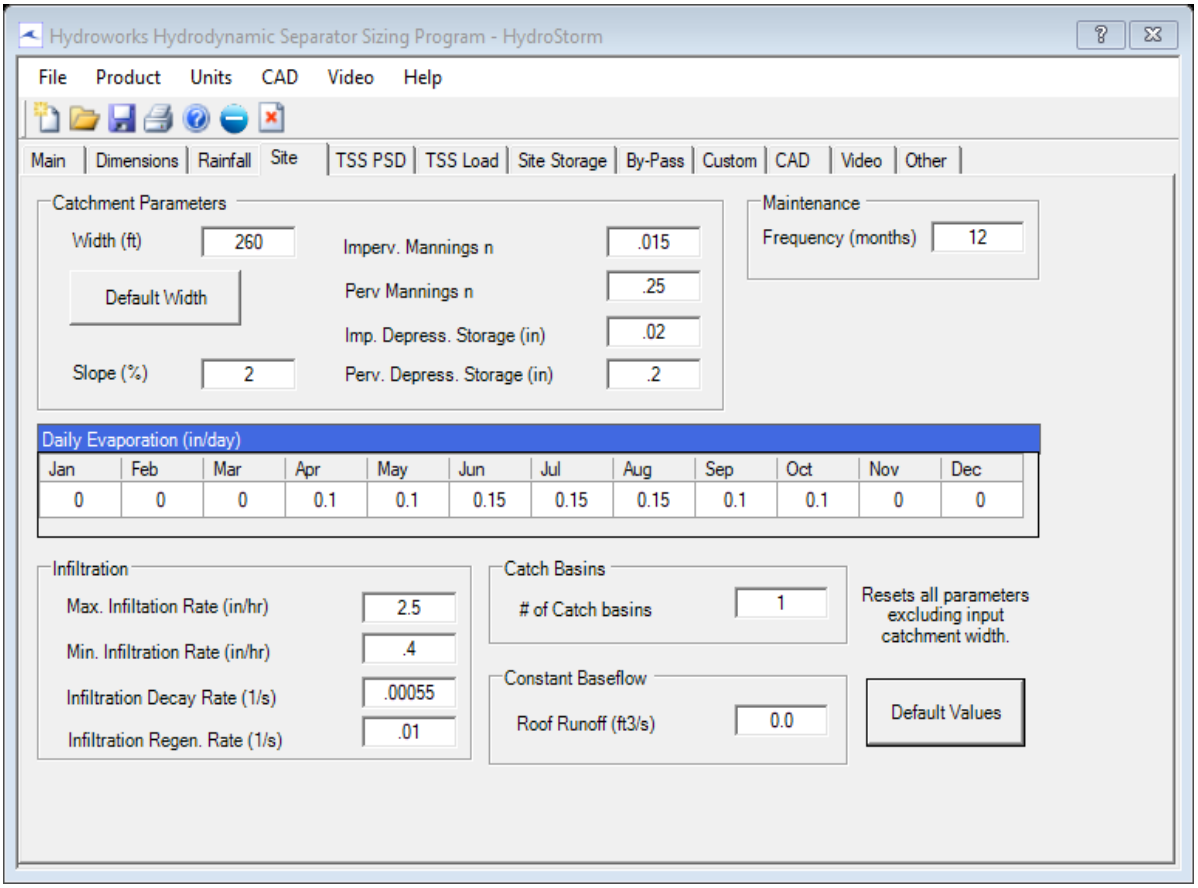
TSS Particle Size Distribution



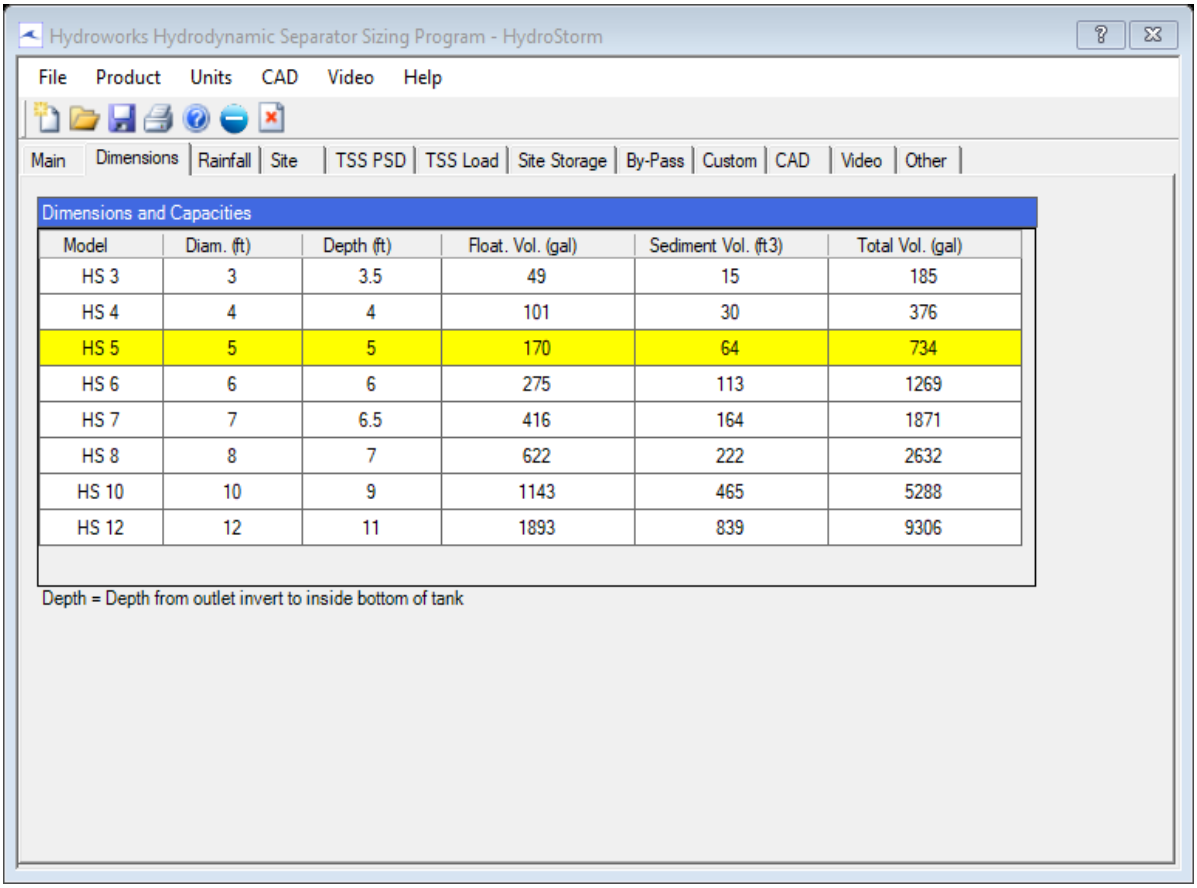
Rainfall Station - Moodus Reservoir, Connecticut(1948 To 1976)



Site Physical Characteristics



Dimensions And Capacities

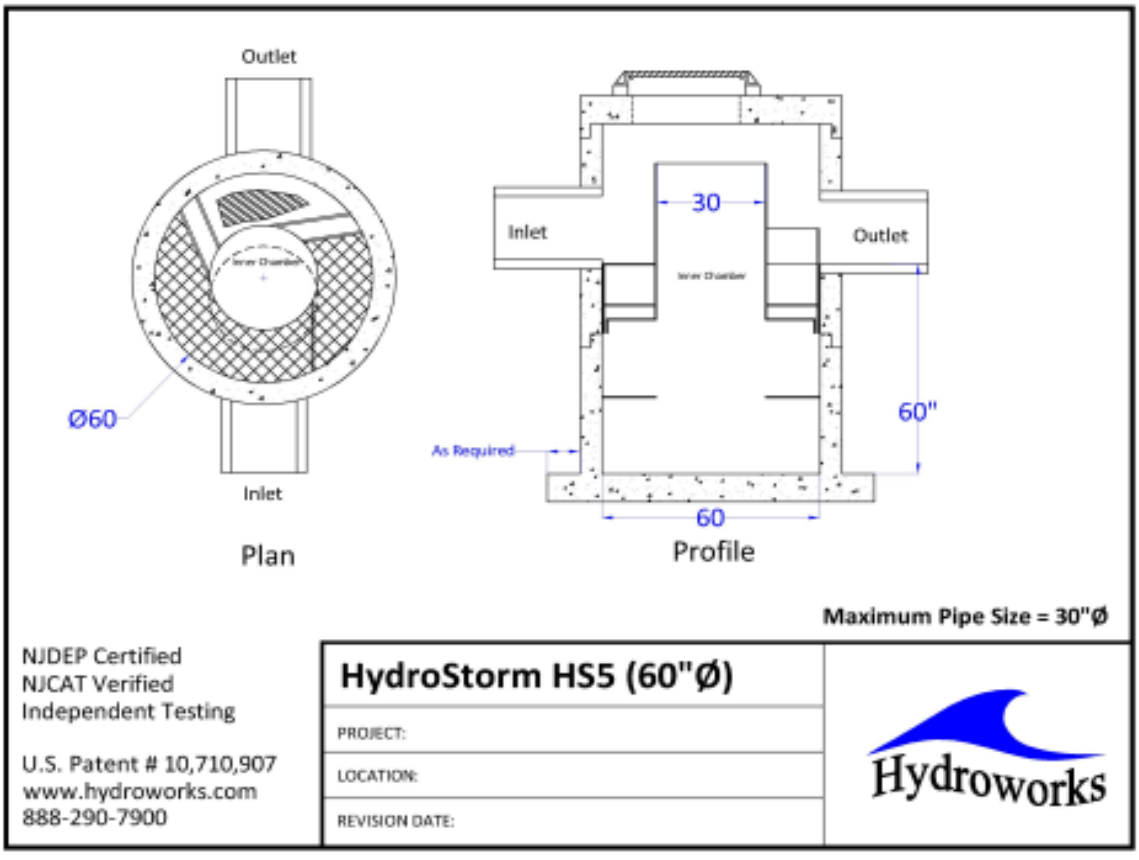


Dimensions and Capacities

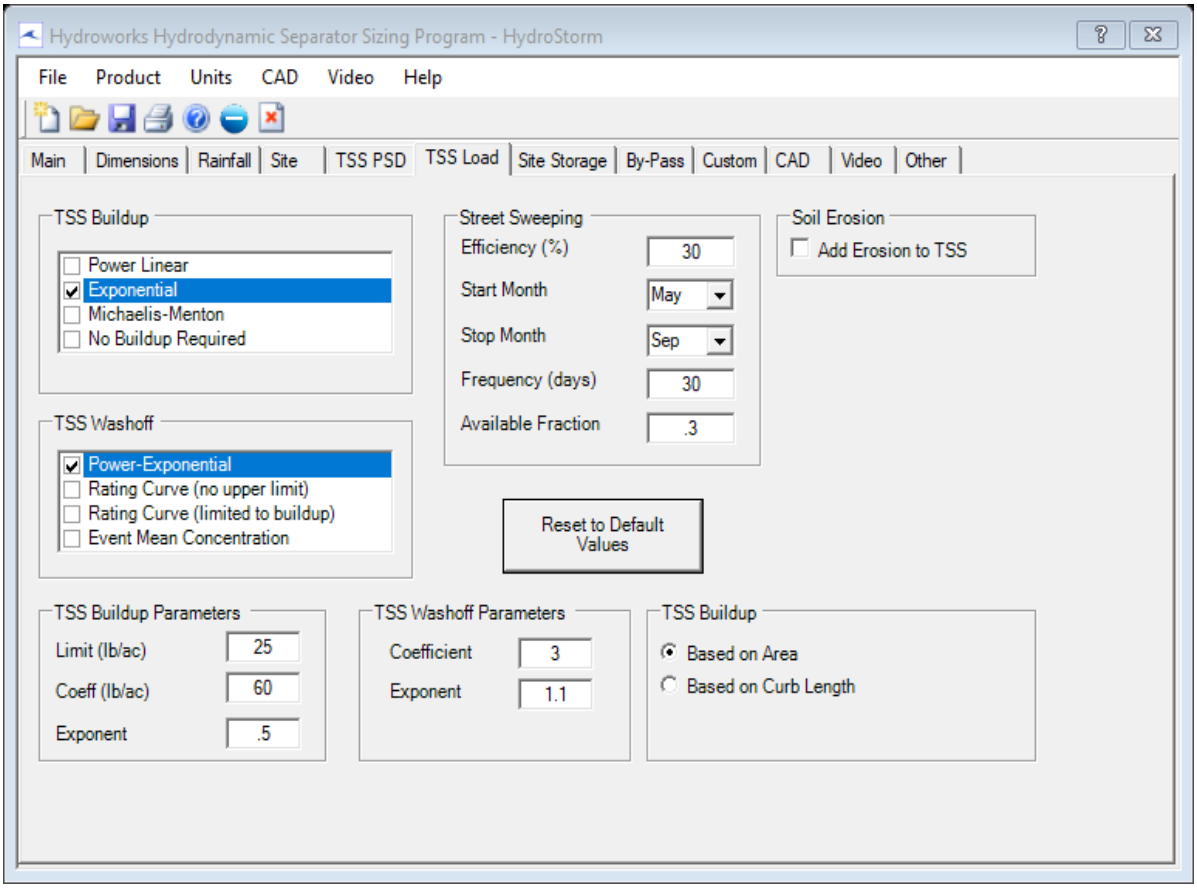
Model	Diam. (ft)	Depth (ft)	Float. Vol. (gal)	Sediment Vol. (ft3)	Total Vol. (gal)
HS 3	3	3.5	49	15	185
HS 4	4	4	101	30	376
HS 5	5	5	170	64	734
HS 6	6	6	275	113	1269
HS 7	7	6.5	416	164	1871
HS 8	8	7	622	222	2632
HS 10	10	9	1143	465	5288
HS 12	12	11	1893	839	9306

Depth = Depth from outlet invert to inside bottom of tank

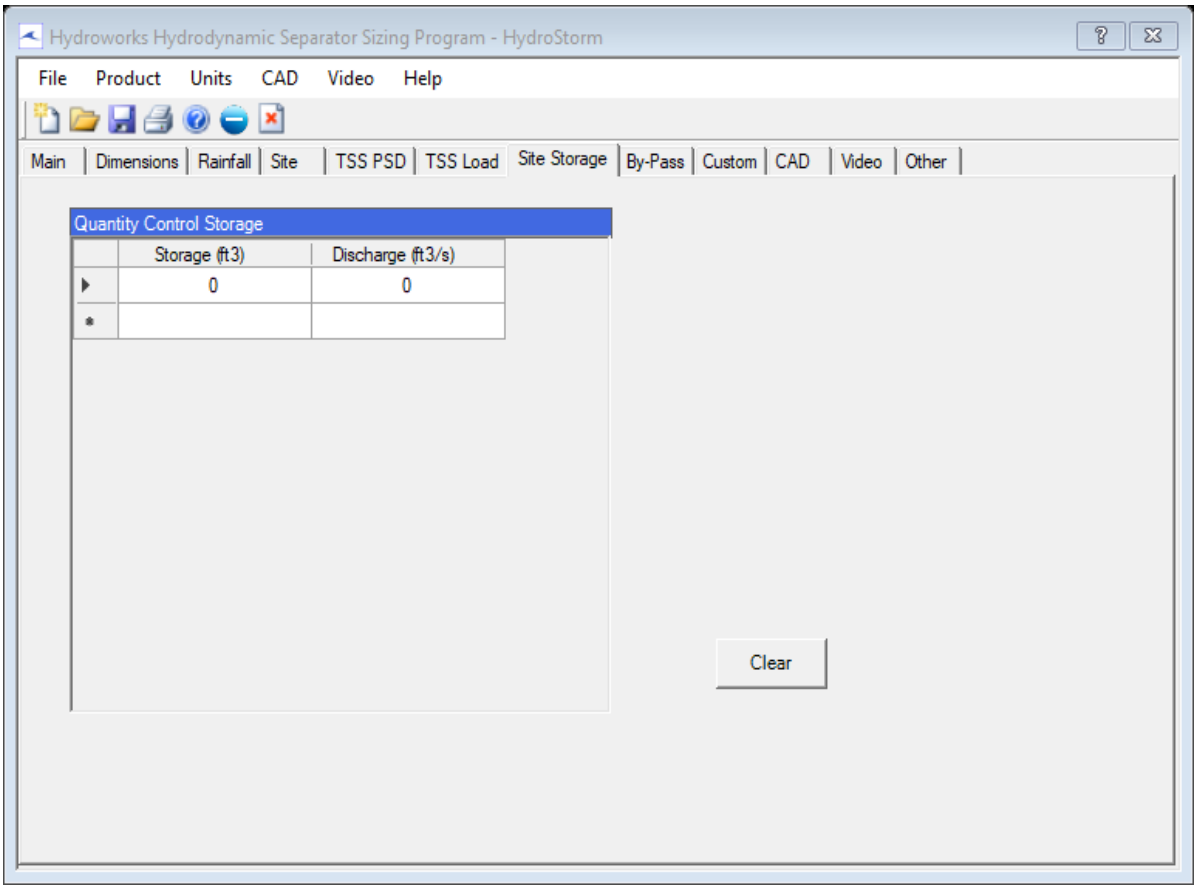
Generic HS 5 CAD Drawing



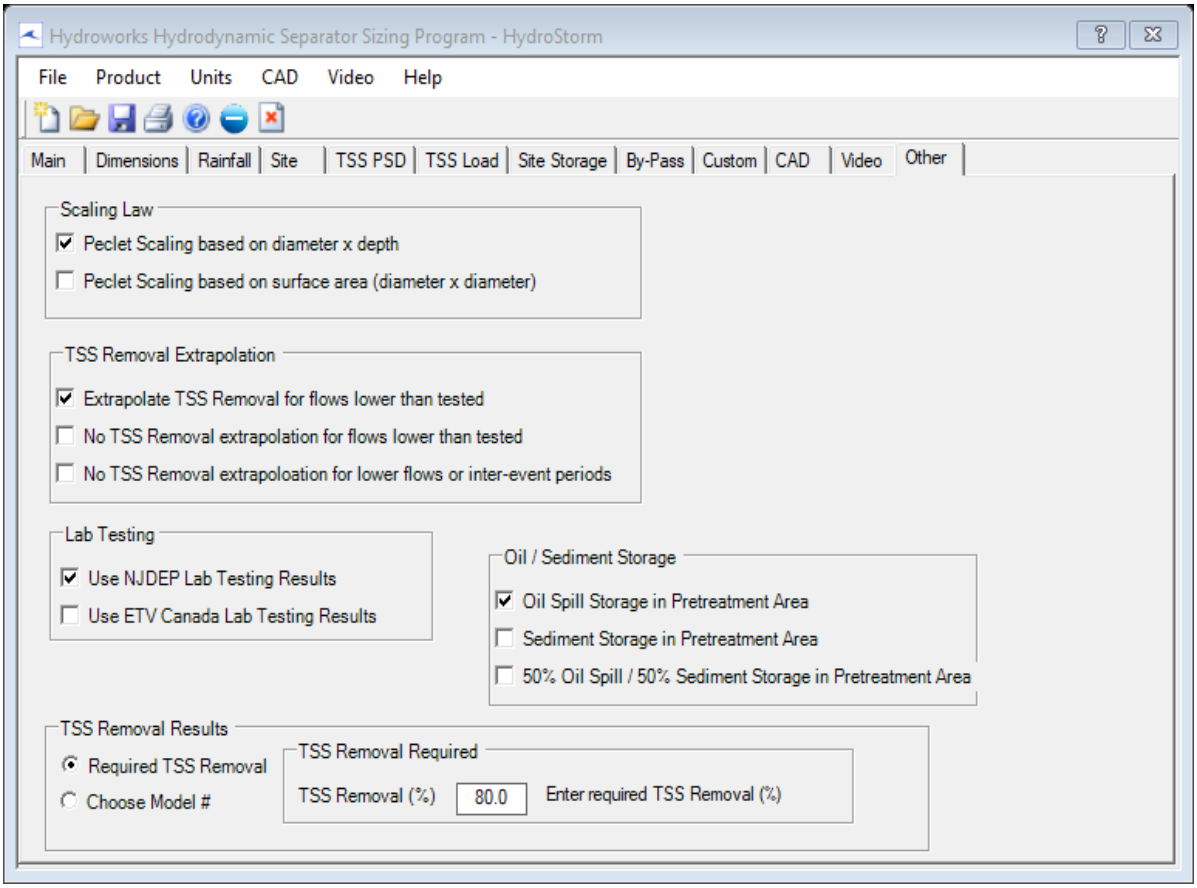
TSS Buildup And Washoff



Upstream Quantity Storage



Other Parameters



Flagged Issues

None

Hydroworks Sizing Program - Version 5.8.5
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1-800-290-7900
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APPENDIX E

NOAA Rainfall Data

NOAA Atlas 14, Volume 10, Version 3
Location name: Moodus, Connecticut, USA*
Latitude: 41.5031°, Longitude: -72.446°
Elevation: 259 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	**0.333** (0.257-0.417)	**0.402** (0.311-0.504)	**0.515** (0.397-0.648)	**0.609** (0.466-0.771)	**0.739** (0.548-0.971)	**0.836** (0.609-1.12)	**0.938** (0.664-1.30)	**1.05** (0.708-1.49)	**1.22** (0.788-1.77)	**1.35** (0.855-2.00)
10-min	**0.472** (0.365-0.591)	**0.570** (0.440-0.714)	**0.730** (0.562-0.918)	**0.863** (0.661-1.09)	**1.05** (0.776-1.38)	**1.18** (0.861-1.59)	**1.33** (0.941-1.84)	**1.49** (1.00-2.11)	**1.72** (1.12-2.51)	**1.91** (1.21-2.84)
15-min	**0.555** (0.429-0.695)	**0.670** (0.518-0.840)	**0.859** (0.661-1.08)	**1.02** (0.776-1.28)	**1.23** (0.914-1.62)	**1.39** (1.01-1.87)	**1.56** (1.11-2.17)	**1.75** (1.18-2.48)	**2.03** (1.31-2.96)	**2.25** (1.42-3.34)
30-min	**0.761** (0.588-0.953)	**0.920** (0.710-1.15)	**1.18** (0.907-1.48)	**1.39** (1.07-1.76)	**1.69** (1.25-2.22)	**1.91** (1.39-2.56)	**2.14** (1.52-2.97)	**2.40** (1.62-3.40)	**2.78** (1.80-4.05)	**3.08** (1.95-4.58)
60-min	**0.968** (0.748-1.21)	**1.17** (0.902-1.46)	**1.50** (1.15-1.88)	**1.77** (1.35-2.24)	**2.14** (1.59-2.82)	**2.43** (1.77-3.25)	**2.72** (1.93-3.77)	**3.05** (2.05-4.32)	**3.53** (2.28-5.14)	**3.92** (2.48-5.81)
2-hr	**1.29** (1.00-1.60)	**1.54** (1.20-1.92)	**1.96** (1.52-2.44)	**2.31** (1.78-2.89)	**2.78** (2.08-3.63)	**3.14** (2.30-4.18)	**3.52** (2.51-4.85)	**3.95** (2.67-5.54)	**4.59** (2.98-6.63)	**5.12** (3.25-7.53)
3-hr	**1.51** (1.18-1.87)	**1.80** (1.41-2.23)	**2.28** (1.78-2.83)	**2.68** (2.08-3.34)	**3.23** (2.43-4.20)	**3.64** (2.68-4.83)	**4.07** (2.92-5.60)	**4.58** (3.10-6.38)	**5.33** (3.47-7.66)	**5.96** (3.79-8.72)
6-hr	**1.94** (1.53-2.38)	**2.31** (1.83-2.84)	**2.93** (2.30-3.61)	**3.44** (2.69-4.26)	**4.14** (3.14-5.34)	**4.66** (3.46-6.13)	**5.21** (3.77-7.12)	**5.87** (3.99-8.11)	**6.85** (4.48-9.76)	**7.68** (4.90-11.1)
12-hr	**2.42** (1.93-2.95)	**2.89** (2.31-3.53)	**3.68** (2.92-4.50)	**4.32** (3.42-5.32)	**5.22** (3.99-6.69)	**5.88** (4.40-7.69)	**6.59** (4.80-8.93)	**7.43** (5.08-10.2)	**8.69** (5.70-12.3)	**9.74** (6.24-14.0)
24-hr	**2.83** (2.28-3.43)	**3.43** (2.76-4.15)	**4.40** (3.53-5.35)	**5.21** (4.15-6.36)	**6.32** (4.87-8.04)	**7.14** (5.39-9.28)	**8.03** (5.90-10.8)	**9.10** (6.24-12.3)	**10.7** (7.05-15.0)	**12.1** (7.76-17.2)
2-day	**3.16** (2.57-3.80)	**3.87** (3.14-4.66)	**5.03** (4.08-6.07)	**6.00** (4.83-7.27)	**7.33** (5.70-9.28)	**8.31** (6.34-10.7)	**9.38** (6.96-12.6)	**10.7** (7.37-14.4)	**12.8** (8.42-17.7)	**14.5** (9.36-20.5)
3-day	**3.42** (2.80-4.09)	**4.20** (3.43-5.03)	**5.47** (4.45-6.57)	**6.52** (5.27-7.87)	**7.97** (6.24-10.0)	**9.04** (6.93-11.6)	**10.2** (7.61-13.7)	**11.7** (8.06-15.6)	**13.9** (9.22-19.2)	**15.9** (10.3-22.3)
4-day	**3.67** (3.02-4.38)	**4.49** (3.69-5.36)	**5.84** (4.77-6.99)	**6.96** (5.65-8.36)	**8.49** (6.67-10.7)	**9.62** (7.40-12.3)	**10.9** (8.12-14.5)	**12.4** (8.59-16.5)	**14.8** (9.81-20.3)	**16.9** (10.9-23.5)
7-day	**4.38** (3.63-5.19)	**5.30** (4.38-6.28)	**6.79** (5.60-8.08)	**8.04** (6.57-9.60)	**9.75** (7.70-12.1)	**11.0** (8.51-14.0)	**12.4** (9.28-16.3)	**14.1** (9.79-18.6)	**16.7** (11.1-22.7)	**18.9** (12.3-26.2)
10-day	**5.09** (4.23-6.01)	**6.06** (5.04-7.16)	**7.65** (6.33-9.06)	**8.96** (7.37-10.7)	**10.8** (8.54-13.3)	**12.1** (9.38-15.3)	**13.6** (10.2-17.7)	**15.3** (10.7-20.2)	**18.0** (12.0-24.3)	**20.2** (13.1-27.8)
20-day	**7.31** (6.14-8.56)	**8.36** (7.02-9.80)	**10.1** (8.42-11.9)	**11.5** (9.55-13.6)	**13.5** (10.7-16.4)	**15.0** (11.6-18.6)	**16.5** (12.3-21.1)	**18.2** (12.8-23.7)	**20.6** (13.8-27.6)	**22.6** (14.7-30.8)
30-day	**9.18** (7.76-10.7)	**10.3** (8.67-12.0)	**12.1** (10.1-14.1)	**13.5** (11.3-15.9)	**15.6** (12.5-18.9)	**17.2** (13.4-21.1)	**18.7** (14.0-23.6)	**20.4** (14.4-26.4)	**22.6** (15.2-30.1)	**24.3** (15.8-32.9)
45-day	**11.5** (9.79-13.4)	**12.7** (10.7-14.7)	**14.5** (12.3-16.9)	**16.1** (13.5-18.8)	**18.2** (14.6-21.9)	**19.9** (15.5-24.2)	**21.5** (16.0-26.8)	**23.1** (16.4-29.6)	**25.0** (16.9-33.1)	**26.4** (17.3-35.6)
60-day	**13.5** (11.5-15.6)	**14.7** (12.5-17.0)	**16.6** (14.1-19.3)	**18.2** (15.3-21.2)	**20.4** (16.5-24.4)	**22.2** (17.3-26.8)	**23.8** (17.8-29.4)	**25.3** (18.0-32.4)	**27.1** (18.4-35.7)	**28.3** (18.5-38.0)

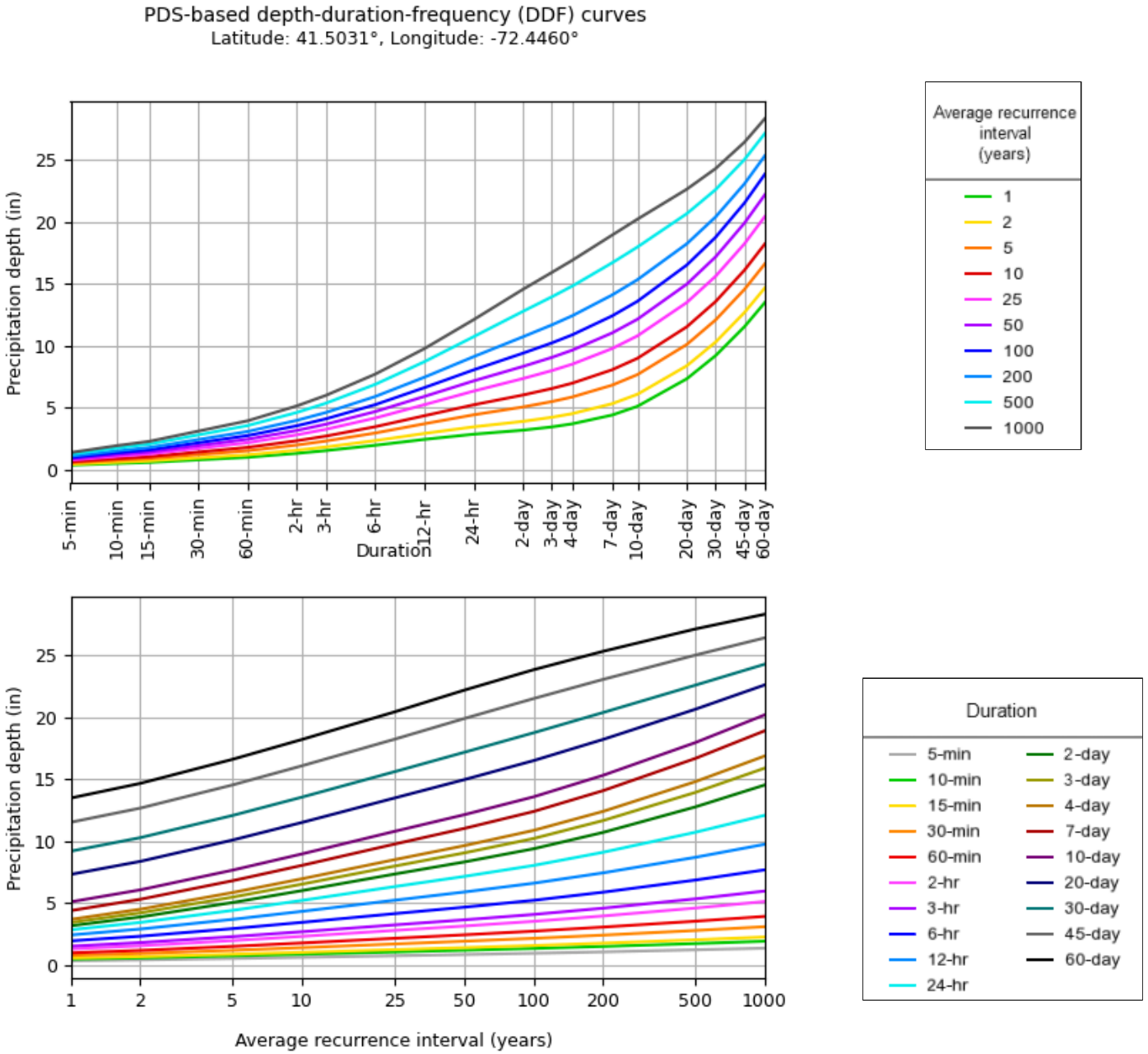
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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

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Back to Top

PF graphical

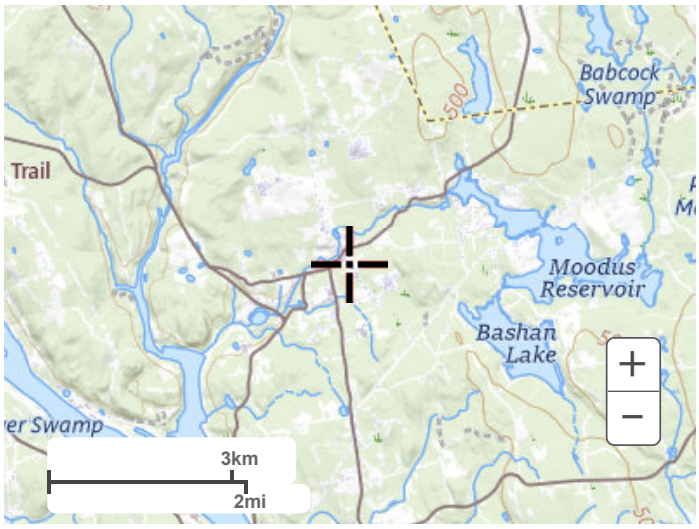


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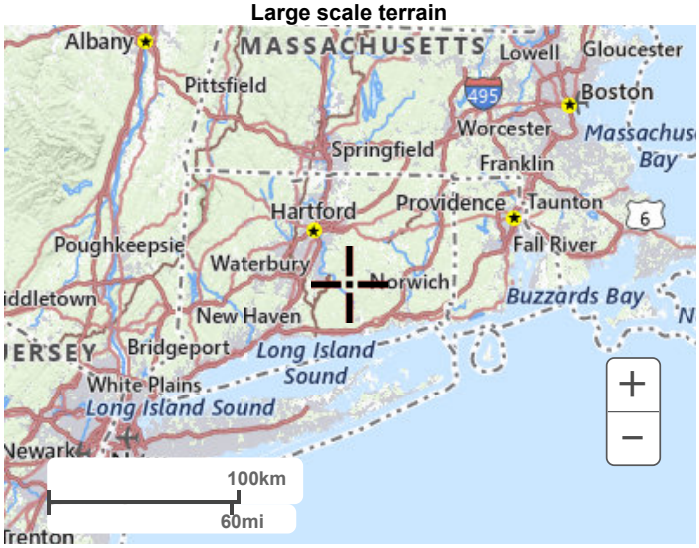
Back to Top

Maps & aerials

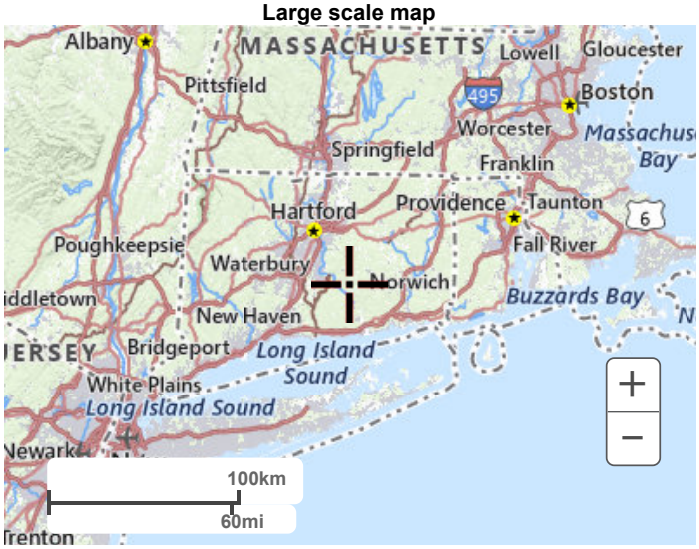
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



Back to Top

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

NOAA Atlas 14, Volume 10, Version 3
Location name: Moodus, Connecticut, USA*
Latitude: 41.5031°, Longitude: -72.446°
Elevation: 259 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.00** (3.08-5.00)	**4.82** (3.73-6.05)	**6.18** (4.76-7.78)	**7.31** (5.59-9.25)	**8.87** (6.58-11.7)	**10.0** (7.31-13.5)	**11.3** (7.97-15.6)	**12.6** (8.50-17.8)	**14.6** (9.46-21.3)	**16.2** (10.3-24.1)
10-min	**2.83** (2.19-3.55)	**3.42** (2.64-4.28)	**4.38** (3.37-5.51)	**5.18** (3.97-6.55)	**6.28** (4.66-8.26)	**7.10** (5.17-9.52)	**7.97** (5.65-11.1)	**8.95** (6.01-12.6)	**10.3** (6.70-15.1)	**11.5** (7.27-17.0)
15-min	**2.22** (1.72-2.78)	**2.68** (2.07-3.36)	**3.44** (2.64-4.32)	**4.06** (3.10-5.13)	**4.92** (3.66-6.48)	**5.57** (4.06-7.47)	**6.25** (4.43-8.67)	**7.02** (4.71-9.91)	**8.11** (5.25-11.8)	**9.00** (5.70-13.4)
30-min	**1.52** (1.18-1.91)	**1.84** (1.42-2.30)	**2.36** (1.81-2.96)	**2.79** (2.13-3.52)	**3.38** (2.51-4.44)	**3.82** (2.78-5.12)	**4.29** (3.03-5.94)	**4.81** (3.23-6.79)	**5.56** (3.60-8.10)	**6.17** (3.90-9.16)
60-min	**0.968** (0.748-1.21)	**1.17** (0.902-1.46)	**1.50** (1.15-1.88)	**1.77** (1.35-2.24)	**2.14** (1.59-2.82)	**2.43** (1.77-3.25)	**2.72** (1.93-3.77)	**3.05** (2.05-4.32)	**3.53** (2.28-5.14)	**3.92** (2.48-5.81)
2-hr	**0.643** (0.502-0.800)	**0.771** (0.600-0.959)	**0.979** (0.760-1.22)	**1.15** (0.889-1.45)	**1.39** (1.04-1.82)	**1.57** (1.15-2.09)	**1.76** (1.26-2.42)	**1.98** (1.33-2.77)	**2.29** (1.49-3.32)	**2.56** (1.62-3.77)
3-hr	**0.502** (0.393-0.621)	**0.599** (0.469-0.742)	**0.759** (0.592-0.943)	**0.892** (0.692-1.11)	**1.07** (0.808-1.40)	**1.21** (0.893-1.61)	**1.36** (0.973-1.86)	**1.52** (1.03-2.12)	**1.78** (1.16-2.55)	**1.99** (1.26-2.90)
6-hr	**0.323** (0.256-0.397)	**0.386** (0.305-0.475)	**0.488** (0.384-0.602)	**0.573** (0.449-0.710)	**0.690** (0.523-0.891)	**0.777** (0.578-1.02)	**0.870** (0.629-1.19)	**0.980** (0.666-1.35)	**1.14** (0.747-1.63)	**1.28** (0.817-1.86)
12-hr	**0.200** (0.160-0.244)	**0.240** (0.191-0.293)	**0.305** (0.242-0.373)	**0.358** (0.283-0.441)	**0.433** (0.331-0.554)	**0.488** (0.365-0.638)	**0.547** (0.398-0.741)	**0.617** (0.421-0.844)	**0.720** (0.473-1.02)	**0.808** (0.517-1.16)
24-hr	**0.118** (0.095-0.142)	**0.142** (0.115-0.173)	**0.183** (0.147-0.222)	**0.216** (0.172-0.264)	**0.263** (0.203-0.335)	**0.297** (0.224-0.386)	**0.334** (0.245-0.450)	**0.379** (0.260-0.514)	**0.446** (0.293-0.623)	**0.503** (0.323-0.715)
2-day	**0.065** (0.053-0.079)	**0.080** (0.065-0.096)	**0.104** (0.084-0.126)	**0.124** (0.100-0.151)	**0.152** (0.118-0.193)	**0.173** (0.131-0.223)	**0.195** (0.144-0.262)	**0.222** (0.153-0.299)	**0.265** (0.175-0.368)	**0.302** (0.195-0.426)
3-day	**0.047** (0.038-0.056)	**0.058** (0.047-0.069)	**0.075** (0.061-0.091)	**0.090** (0.073-0.109)	**0.110** (0.086-0.139)	**0.125** (0.096-0.161)	**0.141** (0.105-0.189)	**0.161** (0.111-0.216)	**0.193** (0.128-0.266)	**0.220** (0.142-0.309)
4-day	**0.038** (0.031-0.045)	**0.046** (0.038-0.055)	**0.060** (0.049-0.072)	**0.072** (0.058-0.087)	**0.088** (0.069-0.111)	**0.100** (0.077-0.128)	**0.113** (0.084-0.150)	**0.129** (0.089-0.172)	**0.154** (0.102-0.211)	**0.175** (0.113-0.245)
7-day	**0.026** (0.021-0.030)	**0.031** (0.026-0.037)	**0.040** (0.033-0.048)	**0.047** (0.039-0.057)	**0.058** (0.045-0.072)	**0.065** (0.050-0.083)	**0.073** (0.055-0.097)	**0.083** (0.058-0.110)	**0.099** (0.066-0.135)	**0.112** (0.072-0.155)
10-day	**0.021** (0.017-0.025)	**0.025** (0.020-0.029)	**0.031** (0.026-0.037)	**0.037** (0.030-0.044)	**0.044** (0.035-0.055)	**0.050** (0.039-0.063)	**0.056** (0.042-0.073)	**0.063** (0.044-0.083)	**0.074** (0.049-0.101)	**0.084** (0.054-0.115)
20-day	**0.015** (0.012-0.017)	**0.017** (0.014-0.020)	**0.020** (0.017-0.024)	**0.023** (0.019-0.028)	**0.028** (0.022-0.034)	**0.031** (0.024-0.038)	**0.034** (0.025-0.043)	**0.037** (0.026-0.049)	**0.043** (0.028-0.057)	**0.047** (0.030-0.064)
30-day	**0.012** (0.010-0.014)	**0.014** (0.012-0.016)	**0.016** (0.014-0.019)	**0.018** (0.015-0.022)	**0.021** (0.017-0.026)	**0.023** (0.018-0.029)	**0.026** (0.019-0.032)	**0.028** (0.019-0.036)	**0.031** (0.021-0.041)	**0.033** (0.021-0.045)
45-day	**0.010** (0.009-0.012)	**0.011** (0.009-0.013)	**0.013** (0.011-0.015)	**0.014** (0.012-0.017)	**0.016** (0.013-0.020)	**0.018** (0.014-0.022)	**0.019** (0.014-0.024)	**0.021** (0.015-0.027)	**0.023** (0.015-0.030)	**0.024** (0.015-0.032)
60-day	**0.009** (0.007-0.010)	**0.010** (0.008-0.011)	**0.011** (0.009-0.013)	**0.012** (0.010-0.014)	**0.014** (0.011-0.016)	**0.015** (0.012-0.018)	**0.016** (0.012-0.020)	**0.017** (0.012-0.022)	**0.018** (0.012-0.024)	**0.019** (0.012-0.026)

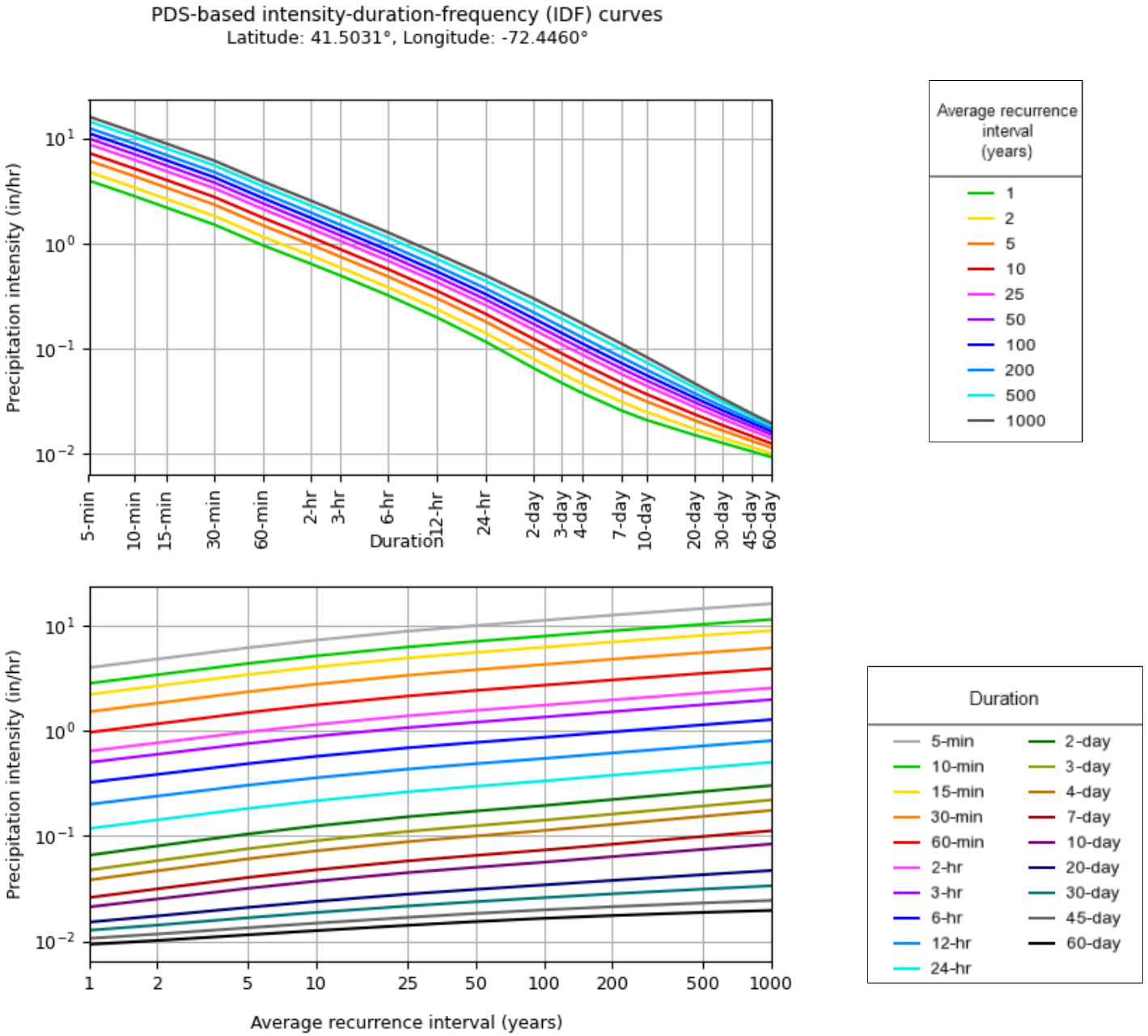
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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

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Back to Top

PF graphical



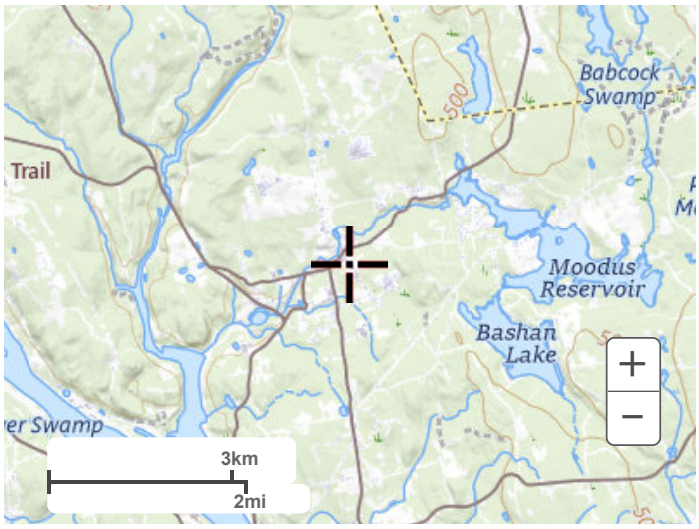
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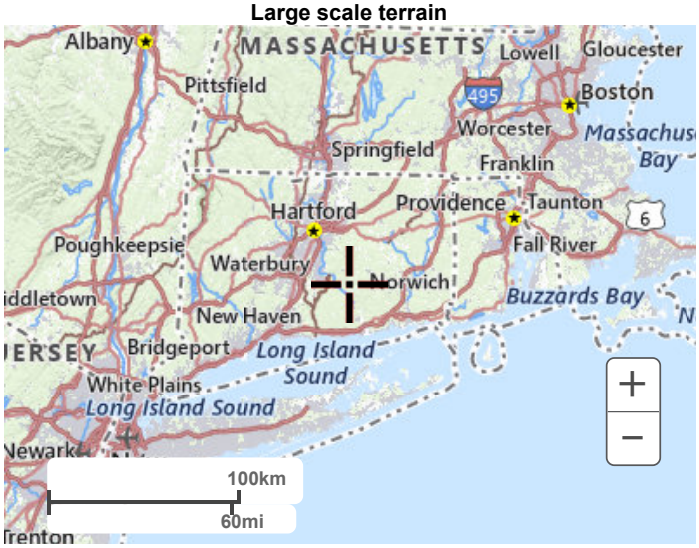
Back to Top

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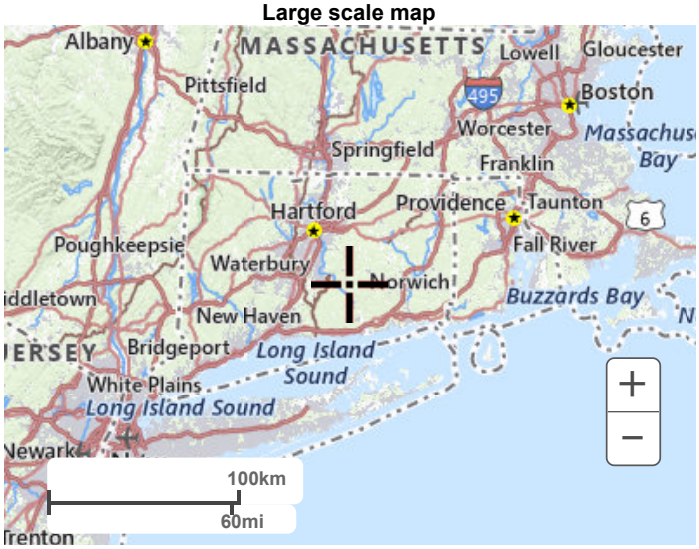
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



Back to Top

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APPENDIX F

NRCS Soil Survey

benesch

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, Eastern Part



September 15, 2025

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

Preface.....2
How Soil Surveys Are Made.....5
Soil Map.....8
Soil Map.....9
Legend.....10
Map Unit Legend.....11
Map Unit Descriptions.....11
State of Connecticut, Eastern Part.....13
23A—Sudbury sandy loam, 0 to 5 percent slopes.....13
57B—Gloucester gravelly sandy loam, 3 to 8 percent slopes.....14
306—Udorthents-Urban land complex.....16
307—Urban land.....17
308—Udorthents, smoothed.....18
Soil Information for All Uses.....20
Soil Properties and Qualities.....20
Soil Qualities and Features.....20
Hydrologic Soil Group.....20
References.....25

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.

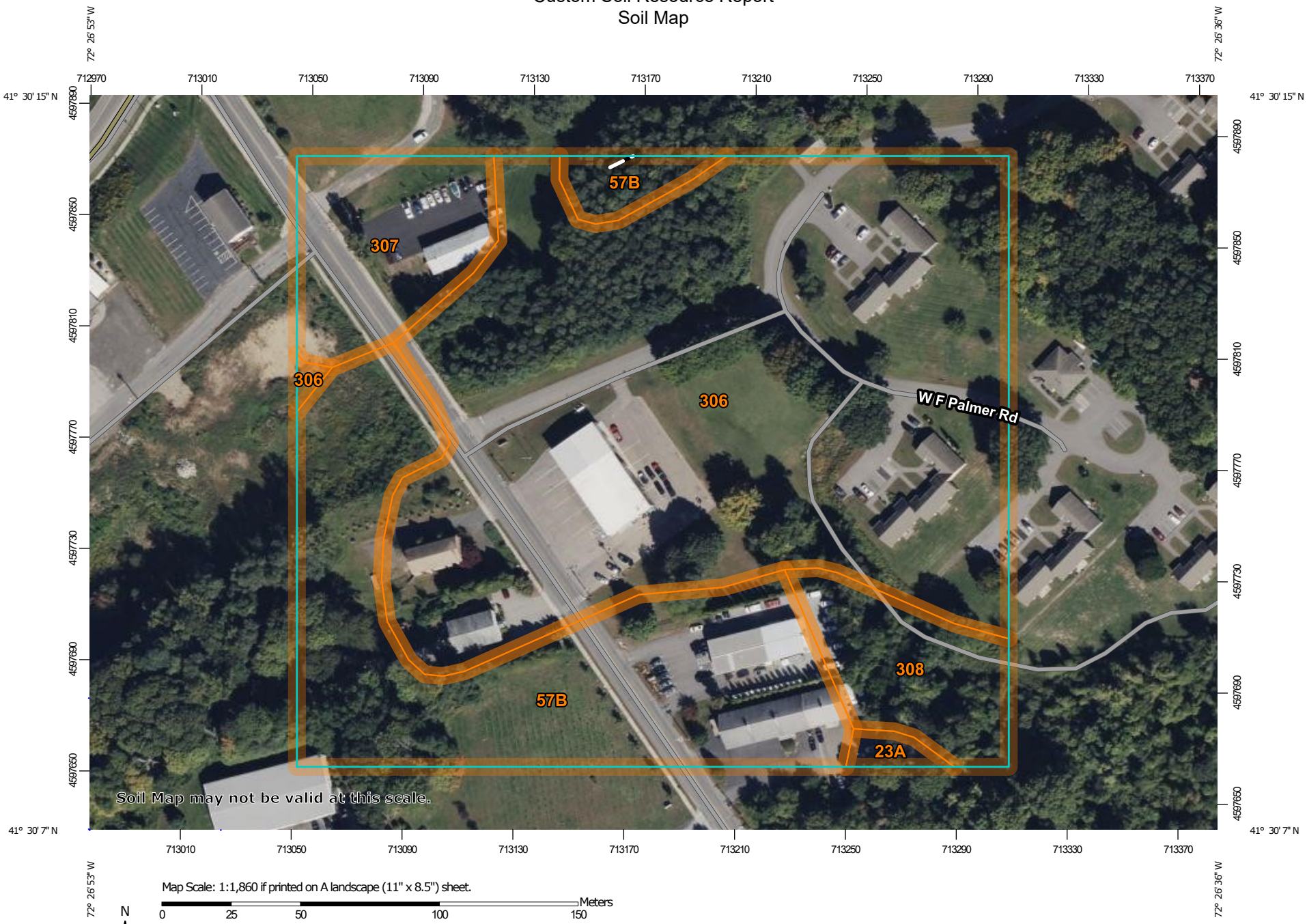
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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



Map Scale: 1:1,860 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: State of Connecticut, Eastern Part
Survey Area Data: Version 2, Aug 30, 2024

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

Date(s) aerial images were photographed: Jun 14, 2022—Oct 6, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
23A	Sudbury sandy loam, 0 to 5 percent slopes	0.1	0.7%
57B	Gloucester gravelly sandy loam, 3 to 8 percent slopes	3.7	26.2%
306	Udorthents-Urban land complex	8.3	59.2%
307	Urban land	1.1	7.8%
308	Udorthents, smoothed	0.9	6.1%
Totals for Area of Interest		**14.0**	**100.0%**

Map Unit Descriptions

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

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

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

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

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, Eastern Part

23A—Sudbury sandy loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 9lkv
Elevation: 0 to 1,200 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

Sudbury and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sudbury

Setting

Landform: Terraces, outwash plains
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 5 inches: sandy loam
Bw1 - 5 to 17 inches: gravelly sandy loam
Bw2 - 17 to 25 inches: sandy loam
2C - 25 to 60 inches: stratified gravel to sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 17 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A/D
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Agawam

Percent of map unit: 5 percent

Landform: Terraces, outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Merrimac
Percent of map unit: 5 percent
Landform: Terraces, outwash plains, kames
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Ninigret
Percent of map unit: 5 percent
Landform: Terraces, outwash plains
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Tisbury
Percent of map unit: 3 percent
Landform: Terraces, outwash plains
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

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

57B—Gloucester gravelly sandy loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 9lpd
Elevation: 0 to 1,200 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
Gloucester and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gloucester

Setting

Landform: Hills
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Ap - 0 to 4 inches: gravelly sandy loam
Bw1 - 4 to 12 inches: gravelly sandy loam
Bw2 - 12 to 25 inches: very gravelly loamy sand
C1 - 25 to 35 inches: very gravelly loamy coarse sand
C2 - 35 to 60 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F144AY032NH - Dry Till Uplands
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 5 percent
Landform: Terraces, outwash plains, kames, eskers
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Canton

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Charlton

Percent of map unit: 3 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Paxton
Percent of map unit: 3 percent
Landform: Till plains, hills, drumlins
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

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

Sutton
Percent of map unit: 2 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

306—Udorthents-Urban land complex

Map Unit Setting
National map unit symbol: 9lmg
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition
Udorthents and similar soils: 50 percent
Urban land: 39 percent
Minor components: 11 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting
Parent material: Human-transported material

Typical profile
^A - 0 to 5 inches: loam
^C1 - 5 to 21 inches: gravelly loam
^C2 - 21 to 79 inches: very gravelly sandy loam

Properties and qualities
Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Urban Land

Typical profile
M - 0 to 6 inches: cemented material

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Udorthents, wet substratum
Percent of map unit: 9 percent
Hydric soil rating: No

Rock outcrop
Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

307—Urban land

Map Unit Setting
National map unit symbol: 9lmh
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 80 percent

Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Typical profile
H - 0 to 6 inches: material

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Unnamed, undisturbed soils
Percent of map unit: 10 percent
Hydric soil rating: No

Udorthents, wet substratum
Percent of map unit: 10 percent
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

308—Udorthents, smoothed

Map Unit Setting
National map unit symbol: 9lmj
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition
Udorthents and similar soils: 87 percent
Minor components: 13 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Human-transported material

Typical profile
^A - 0 to 5 inches: loam
^C1 - 5 to 21 inches: gravelly loam
^C2 - 21 to 79 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Udorthents, wet substratum

Percent of map unit: 7 percent
Hydric soil rating: No

Urban land

Percent of map unit: 5 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 1 percent
Landform: Hills
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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

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

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

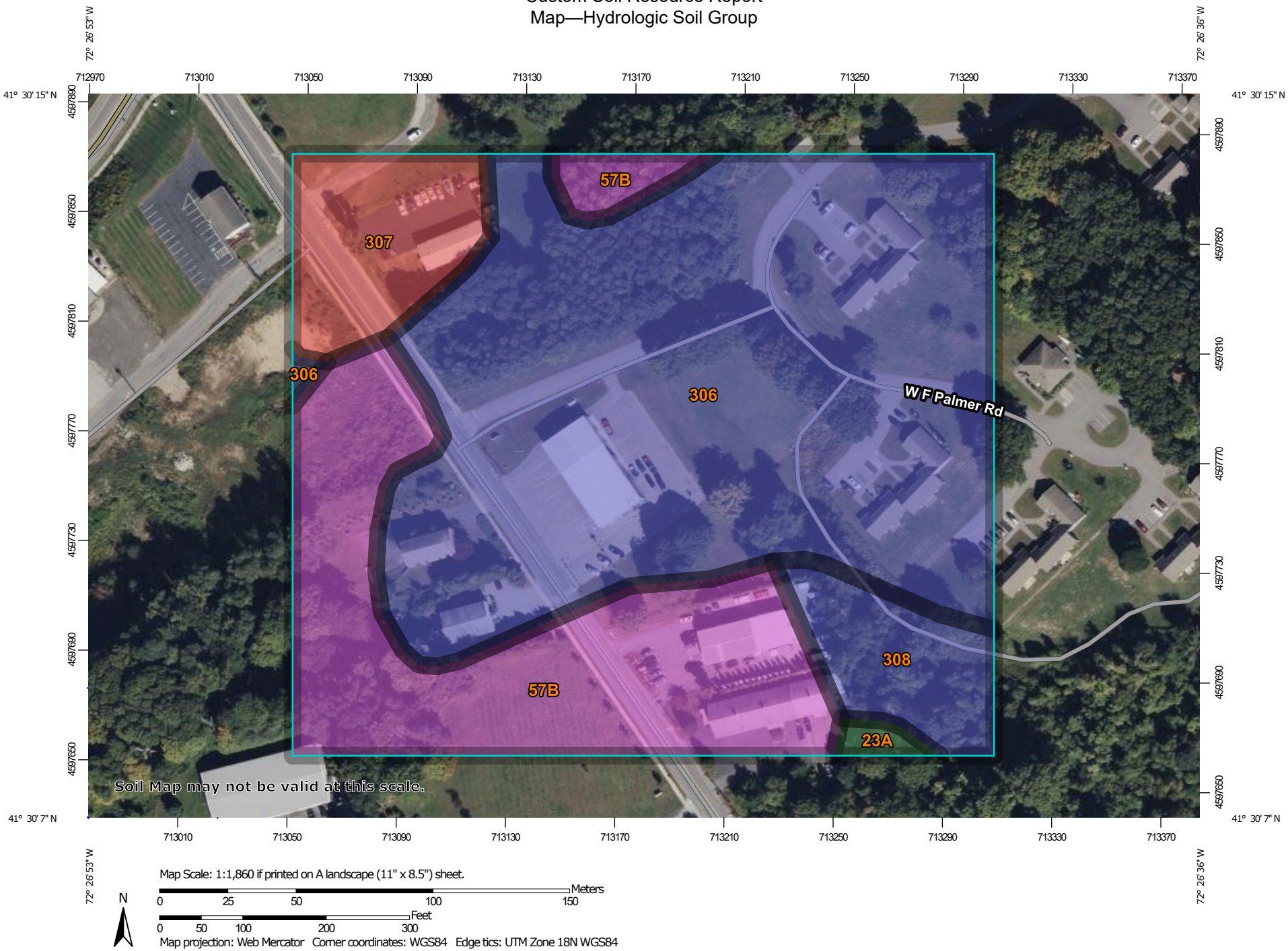
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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

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

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

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:1,860 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

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, Eastern Part
Survey Area Data: Version 2, Aug 30, 2024

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

Date(s) aerial images were photographed: Jun 14, 2022—Oct 6, 2022

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
23A	Sudbury sandy loam, 0 to 5 percent slopes	A/D	0.1	0.7%
57B	Gloucester gravelly sandy loam, 3 to 8 percent slopes	A	3.7	26.2%
306	Udorthents-Urban land complex	B	8.3	59.2%
307	Urban land	D	1.1	7.8%
308	Udorthents, smoothed	B	0.9	6.1%
Totals for Area of Interest			**14.0**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

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APPENDIX G

Grading and Drainage Plan

benesch

STORM SEWER NOTES

1. ALL PIPES ARE TO BE 12" HDPE WITH A MINIMUM 1.0% SLOPE AND 2 FT OF COVER UNLESS OTHERWISE NOTED.
2. CONTRACTOR IS RESPONSIBLE TO ENSURE ADEQUATE SIZING OF MANHOLES TO ACCEPT PROPOSED PIPES.
3. ALL EXISTING UTILITY LINES TO BE ABANDONED SHALL BE ABANDONED ACCORDING TO UTILITY COMPANY REQUIREMENTS.
4. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH APPLICABLE STANDARDS.
5. DAMAGE TO EXISTING UTILITIES AS A RESULT OF THE CONTRACTOR'S OR ANY OF HIS SUBCONTRACTOR'S ACTIVITIES DURING THE CONSTRUCTION PROCESS SHALL BE REPAIRED AS DIRECTED BY THE ENGINEER AT NO ADDITIONAL COST TO THE OWNER.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DEWATERING DURING THE EXECUTION OF HIS WORK. REFER TO GEOTECHNNICAL REPORT FOR GROUNDWATER OBSERVATIONS.
7. THE LOCATION OF EXISTING UNDERGROUND UTILITIES IS DEVELOPED FROM THE BEST AVAILABLE INFORMATION. THE ACTUAL LOCATION OF EXISTING UTILITIES SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO THE START OF EXCAVATION ACTIVITIES.
8. CARE IS TO BE TAKEN WHEN EXCAVATING NEAR EXISTING DRAINAGE PIPES TO REMAIN. CONTRACTOR TO SUPPORT PIPE AS NEEDED/HAND EXCAVATE TO ENSURE PIPE FUNCTIONALITY IS MAINTAINED.
9. PRESERVED EXISTING MANHOLE COVERS AND FRAMES SHALL BE ADJUSTED TO PROPOSED GRADE AS REQUIRED.

DRAINAGE NOTES

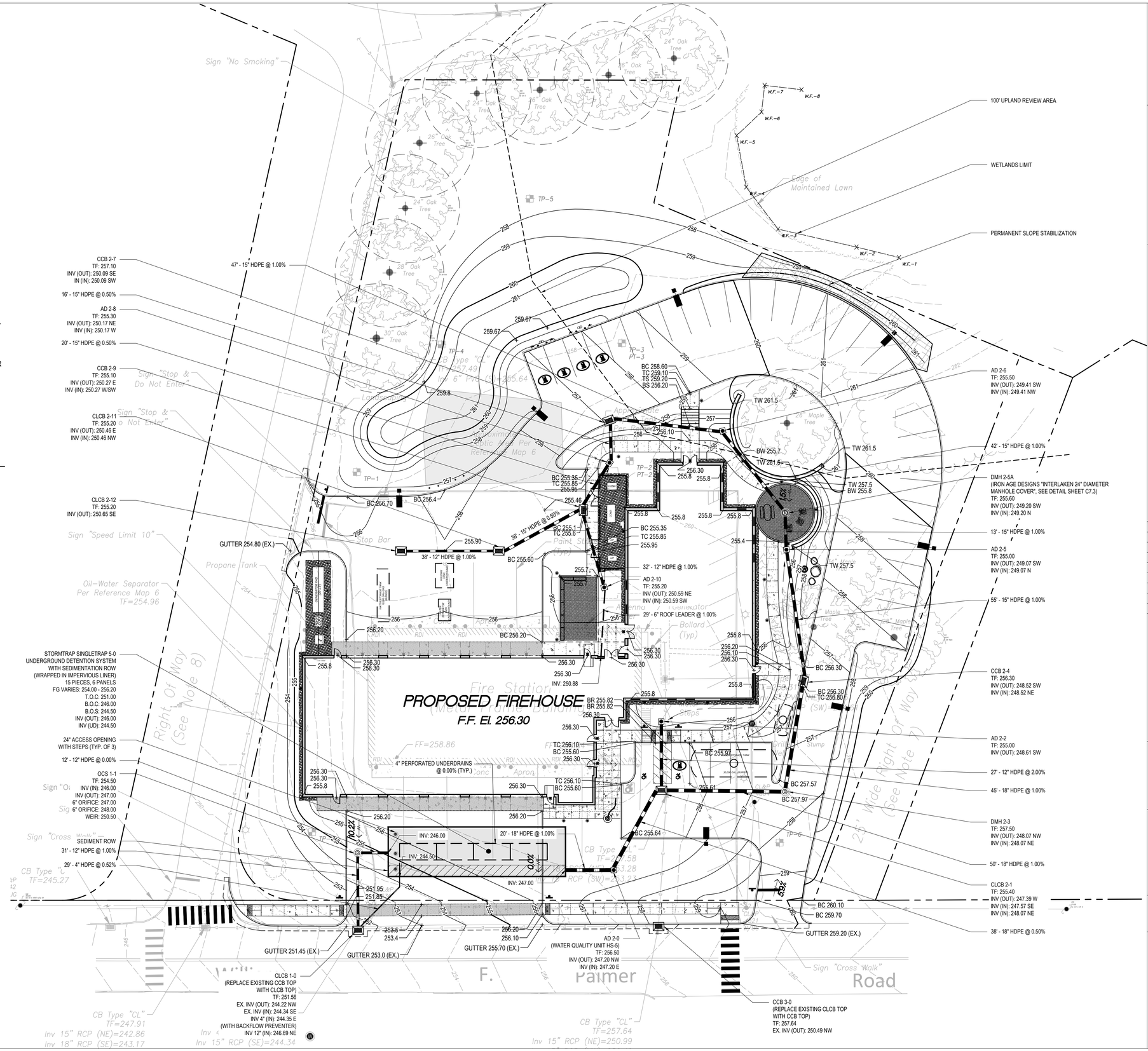
1. CONTRACTOR IS RESPONSIBLE TO ENSURE THAT PROPER STORM DRAINAGE IS MAINTAINED THROUGHOUT CONSTRUCTION AND SHALL MAINTAIN ALL EXISTING AND NEW UTILITIES IN GOOD WORKING ORDER AND SHALL PROTECT THEM AT ALL TIMES UNTIL THE WORK IS COMPLETED AND ACCEPTED.
2. FUNCTIONAL COMPLETION OF STORM WATER DETENTION SYSTEMS AND STRUCTURES SHALL PRECEDE SITE DEVELOPMENT OF AREAS, ROADS, OR LOTS CONTRIBUTING TO THESE SYSTEMS.

GRADING LEGEND

- DIRECTION OF SURFACE DRAINAGE FLOW
- 123 — PROPOSED INTERMEDIATE CONTOUR
- 120 — PROPOSED INDEX CONTOUR
- 123.45 / TW 123.45 / BW 122.45 — PROPOSED SPOT ELEVATION
- 123.45 (ME) — MATCH EXISTING SPOT ELEVATION

DRAINAGE LEGEND

- STORM DRAINAGE PIPE
- CATCH BASIN
- AREA/YARD DRAIN
- MANHOLE



Prepared by:

benesch

Alfred Benesch & Company
200 Glastonbury Boulevard, Suite 201
Glastonbury, Connecticut 06033
860-633-8341

Prepared for:

NEW CONSTRUCTION
EAST HADDAM FIREHOUSE #2
44 WILLIAM F. PALMER ROAD — **MOODUS, CT 06423**

DATE:	REVISION:
02/16/2026	PLANNING & ZONING SUBMISSION

KEY PLAN

PROJECT NO.: 70903.00
SCALE: 1" = 20'
DATE: 01/13/2026
DRAWN BY: RLC
CHECKED BY: WGW

GRADING & DRAINAGE PLAN

DRAWING NO.:
C3.0

APPENDIX H

Geotechnical Report

benesch

DOWN TO EARTH CONSULTING, LLC
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERING

GEOTECHNICAL ENGINEERING REPORT
PROPOSED EAST HADDAM FIRE DEPARTMENT BUILDING
44 WILLIAM F. PALMER ROAD
MOODUS, CONNECTICUT

Prepared for:

Silver Petrucelli & Associates
3190 Whitney Avenue
Hamden, Connecticut 06320

Prepared by:

Down To Earth Consulting, LLC
27 Siemon Company Drive - Suite No. 363 West
Watertown, Connecticut 06795

October 2025
File No. 0276-024.00

DOWN TO EARTH CONSULTING, LLC
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERING

October 17, 2025
File No. 0276-024.00

Mr. Eric Cantar, AIA
Silver Petrucelli & Associates
3190 Whitney Avenue
Hamden, Connecticut 06320

Via email: ecantar@silverpetrucelli.com

Re: Geotechnical Engineering Report
Proposed East Haddam Fire Department Building
44 William F. Palmer Road
Moodus, Connecticut

Dear Mr. Cantar,

Down To Earth Consulting, LLC (DTE) is pleased to submit this geotechnical engineering report for the proposed East Haddam Fire Department Building that will be located at 44 William F. Palmer Road in East Haddam, Connecticut. We appreciate this opportunity to work with you. Please call if you have any questions.

Sincerely,

Down To Earth Consulting, LLC



Thomas J. Orszulak, P.E.
Project Manager



Daniel F. LaMesa, P.E.
Principal/Reviewer

TABLE OF CONTENTS

1.0 INTRODUCTION 1
2.0 SUBSURFACE DATA 1
2.1 GENERAL SITE GEOLOGY 1
2.2 TEST BORINGS 1
3.0 SUBSURFACE CONDITIONS 2
3.1 SUBSURFACE PROFILE 2
3.1.1 Fill 2
3.1.2 Sand Deposits 2
3.1.3 Decomposed Rock/Inferred Bedrock 3
3.2 GROUNDWATER 3
4.0 GEOTECHNICAL RECOMMENDATIONS 3
4.1 FOUNDATIONS 3
4.1.1 Foundation Type and Bearing Strata 3
4.1.2 Footing Levels and Sizes 3
4.1.3 Allowable Bearing Pressures and Settlement Estimates 4
4.1.4 Resistance to Lateral Loads 4
4.1.5 Drainage 4
4.2 SLAB-ON-GRADE 4
4.2.1 Subgrade 4
4.2.2 Modulus of Subgrade Reaction 5
4.2.3 Drainage and Damp-Proofing 5
4.3 RETAINING WALLS 5
4.3.1 Backfill and Drainage 5
4.3.2 Lateral Earth Pressures 6
4.4 SEISMIC DESIGN 6
5.0 MATERIALS RECOMMENDATIONS 6
5.1 ON-SITE MATERIALS 6
5.2 COMPACTED GRANULAR FILL 7
5.3 CRUSHED STONE 7
5.4 SAND AND GRAVEL 7
5.5 COMMON FILL 7
5.6 COMPACTION REQUIRMENTS 8
5.7 GEOTEXTILE FABRIC 9
6.0 CONSTRUCTION RECOMMENDATIONS 9
6.1 REMOVAL OF BURIED STRUCTURES AND UTILITIES 9
6.2 SUBGRADE PREPARATION 9
6.3 ROCK REMOVAL 10
6.4 TEMPORARY EXCAVATIONS 10
6.5 TEMPORARY GROUNDWATER CONTROL 11
7.0 REVIEW OF FINAL DESIGN, PLANS, AND SPECIFICATIONS 11
8.0 CONSTRUCTION QUALITY CONTROL 11
9.0 LIMITATIONS 11

APPENDICES

APPENDIX 1 – FIGURES
APPENDIX 2 – BORING LOGS
APPENDIX 3 – LIMITATIONS

1.0 INTRODUCTION

Down To Earth Consulting, LLC (DTE) is pleased to submit this geotechnical engineering report for the proposed East Haddam Fire Department Building that will be located at 44 William F. Palmer Road in Moodus, Connecticut. Refer to Figures 1 and 2 (in Appendix 1) for the approximate site and proposed building locations, respectively.

The project site is currently occupied by the existing firehouse building and an associated parking lot. Site grading generally slopes from about elevation (El.) 250 at the western extent of the Site to about El. 260 at the eastern extent of the site, and the current building has a finished floor elevation of about El. 258.8. We understand that the existing firehouse building will be demolished and a new firehouse will be constructed in its place and extend into the existing parking lot. The proposed firehouse building will have a slab-on-grade (i.e. no basement level) that will be at about El. 256.3. Foundation and slab loads were not available at the time this report was prepared. Associated driveways, parking lots, sidewalks, drainage structures, and landscaped areas will also be constructed.

Our geotechnical engineering services included: reviewing project plans, observing test borings, characterizing subsurface conditions within the limits of the proposed building, performing geotechnical engineering analyses, and providing geotechnical design and construction recommendations for the proposed development. Our services were performed in accordance with our August 25, 2025 proposal and the drawing titled *New Construction, East Haddam Firehouse #2, Site Plan,* C2.0, prepared by Alfred Benesch & Company dated August 29, 2025.

Elevations (El.) stated in this report are in feet and based on the datum of the above-reference Site Plan. Our recommendations are based in part on guidance from the 2021 International Building Code (IBC) with the 2022 Connecticut Amendment. Design recommendations are based on Allowable Stress Design Methods.

2.0 SUBSURFACE DATA

2.1 GENERAL SITE GEOLOGY

Published surficial and bedrock geological map data *(1:24,000 scale, Surficial Geology of the Niantic Quadrangle, Connecticut, Richard Goldsmith, 1964* and *1:24,000 scale, Bedrock Geologic Map of the Niantic Quadrangle, Richard Goldsmith, 1967*) was reviewed. The Site surficial material is mapped as a variable mixture of gravel, sand, silt, and clay that is intermixed with cobbles and boulders (Glacial Till). The underlying bedrock is classified as gray schist and gneiss.

2.2 TEST BORINGS

We observed and logged five test borings (B-1 to B-5) drilled by our subcontractor SITE, LLC on September 30, 2025. Boring locations are depicted on Figure 2 (Appendix 1) and the logs are included in Appendix 2. Borings were located in the field by taping from existing site features, and their elevations were scaled from the above referenced plan. The boring locations and elevations should be considered approximate.

The borings were drilled to explore the soil and groundwater conditions in the project area. The borings were advanced to depths of approximately 10.8 to 15.1 feet below existing grades. All test borings were terminated in Decomposed Rock. Borings B-1, B-3, and B-5 were ended due to auger refusal on inferred Bedrock.

Representative soil samples were obtained for soil classification in the borings by split barrel sampling procedures in general accordance with ASTM D-1586. The split-spoon sampling procedure utilizes a standard 2-inch O.D. split-barrel sampler that is driven into the bottom of the boring with a 140-pound hammer falling a distance of 30 inches. The number of blows required to advance the sampler the middle 12-inches of a normal 24-inch penetration is recorded as the Standard Penetration Resistance Value (N). The blows (i.e., "N-Value") are indicated on the boring logs at their depth of occurrence and provide an indication of the relative consistency of the material.

Groundwater levels were measured using a weighted tape in open drill holes.

3.0 SUBSURFACE CONDITIONS

3.1 SUBSURFACE PROFILE

The subsurface conditions from the borings generally consisted of Fill overlying natural Sand Deposits and Decomposed Rock/Bedrock. A surficial layer of about 3 to 5-inches of Asphalt and 8 to 24 inches of Topsoil/Subsoil was encountered within paved and landscaped areas, respectively.

The following is a more detailed description of the subsurface materials encountered at the site.

3.1.1 Fill

Uncontrolled Fill (Fill) was encountered adjacent to the existing building at Borings B-1, B-2, and B-3 and extended to depths of about 3 to 5 feet below existing grades. The Fill generally consisted of very loose to loose, dark brown to orange-brown, fine to coarse sand with varying amounts of fine to coarse gravel and silt. Trace (0 to 10%) amounts of wood were encountered within the Fill at Boring B-1. The thickness, character, and consistency of the Fill will vary between boring locations.

A buried Topsoil/Subsoil layer was encountered at Boring B-2 between about 4 to 6 feet below existing grades. The material generally consisted of medium dense, orange-brown, fine to coarse sand with some (20 to 35%) amounts of silt and little (10 to 20%) amounts of fine to coarse gravel.

3.1.2 Sand Deposits

Natural Sand Deposits were encountered beneath the Fill at Borings B-1 and B-3 and beneath the Topsoil/Subsoil at Borings B-2, B-4, and B-5. The Sand Deposits extended to depths of about 5 to 7 feet below existing grades and generally consisted of loose to dense, light brown to gray-brown, fine to coarse sand with little to some (10 to 35%) amounts of fine to coarse gravel and trace to little (0 to 20%) amounts of silt.

3.1.3 Decomposed Rock/Inferred Bedrock

Decomposed Rock was encountered beneath the natural Sand Deposits at each boring location at depths between about 5 and 7 feet (approximate El. 255 to 247) below existing grades. The Decomposed Rock was very dense based on the Standard Penetration Test Results.

Auger refusal was encountered at Borings B-1, B-3, and B-5 at depths ranging between about 7.8 and 8.9 feet (approximate El. 252.2 to 245.1) below existing grades which was inferred to be Bedrock.

3.2 GROUNDWATER

Groundwater was observed at Borings B-2 and B-4 at about 12.8 and 9.7 feet (approximate El. 245.2 and 251.3) below existing site grades, respectively. Groundwater was not observed within the limits of the Borings B-1, B-3, or B-5. Groundwater levels measured in the boreholes may not have had sufficient time to stabilize and should be considered approximate. Groundwater levels will vary depending on factors such as temperature, season, precipitation, construction activity, and other conditions, which may be different from those at the time of these measurements.

4.0 GEOTECHNICAL RECOMMENDATIONS

We offer the following geotechnical design recommendations based on the subsurface conditions encountered at the site, available project information, and the proposed construction.

4.1 FOUNDATIONS

4.1.1 Foundation Type and Bearing Strata

We recommend supporting the proposed building on conventional, shallow spread footings. The footings should bear below the uncontrolled Fill, Topsoil, and Subsoil on the undisturbed, natural Sand Deposits, Decomposed Rock, Bedrock, or on Structural Fill (hereinafter specified as Compacted Granular Fill, CGF) over natural Sand Deposits, Decomposed Rock, and/or Bedrock. Existing Fill, Topsoil, Subsoil, Asphalt, and buried structures (e.g., utilities, foundations) are not suitable for support of foundations and should be completely removed and replaced with CGF. Actual bottom of unsuitable bearing soil elevations will vary across the site and must be verified during construction excavation by a DTE representative.

When CGF is used beneath the footings (e.g., in fill areas), we recommend that it be placed one foot beyond the edge of the footings and at a one horizontal to one vertical slope away and down from the bottom outside edge of the footings. Crushed Stone can be used in place of CGF as it is much easier to compact.

4.1.2 Footing Levels and Sizes

Exterior footings (and footings in unheated areas) should be constructed at a minimum frost depth of 42-inches below proposed site grades. Interior footings, in heated areas, should be constructed

at a minimum depth of 24-inches below proposed top of slab-on-grade levels. The minimum footing width should be 2 feet.

4.1.3 Allowable Bearing Pressures and Settlement Estimates

We recommend a maximum allowable design bearing pressure of five kips per square foot (ksf) for footings bearing on the recommended bearing materials. DTE should be consulted if higher bearing pressures are needed by the structural engineer. Based on the recommended bearing strata and anticipated loads, we anticipate that footings will undergo less than one inch of total settlement and less than a half inch of differential settlement. Settlements will occur as the loads are applied and are expected to be complete at the end of construction. DTE should be provided the final foundation loads and geometries once they are available to confirm the above recommended bearing capacity and settlement estimates.

4.1.4 Resistance to Lateral Loads

The lateral load on footings can be resisted by friction at the base of the footings in contact with the proposed bearing soils. We recommend a maximum coefficient of friction of 0.5 between foundations and the recommended bearing strata.

In general, passive pressures against shallow interior column footings, wall footings, and at the base of retaining walls should be ignored in calculating lateral load resistance (unless DTE is consulted).

4.1.5 Drainage

Due to the presence of shallow Bedrock, we recommend the use of perimeter foundation drains. Drains should consist of 4-inch diameter perforated PVC pipe, surrounded by 6-inches of Crushed Stone, wrapped in non-woven filter fabric. Cleanouts should be installed in the direction of flow at the beginning of piping runs and consist of 45-degree elbows (90-degree elbows should not be allowed). The drains should be gravity drained to the site drainage system, sump pits with pumps, or daylight with a rodent screen at the end of pipe(s).

4.2 SLAB-ON-GRADE

4.2.1 Subgrade

We recommend placing cast-in-place concrete floor slabs over a minimum twelve-inch-thick base course layer of compacted Crushed Stone placed over the surface of undisturbed, suitable, natural Sand Deposits, or on CGF over natural Sand Deposits.

The base course layer may also be placed on inorganic Site soils that has been improved with surface densification under the observation of a qualified Geotechnical Engineer. This procedure consists of removing all surficial organic and debris materials and compacting the surface with a minimum of four passes with a vibratory drum roller having a minimum dynamic force of 8,000 lbs. per foot of drum width. Areas exhibiting instability shall receive additional compaction and/or be over-excavated and replaced with CGF, as recommended by the Geotechnical Engineer.

Existing Fill improvement will require careful observation by an experienced Geotechnical Engineer. Surface densification will improve loose zones and/or collapse potential of voids in the top 2 to 3 feet of Fill. It will not prevent organics or other deleterious materials from decaying and potentially causing slab settlements. Periodic slab resurfacing and repair may be required if there are slab settlements. A layer of Tensar InterAx NX750 (or equivalent) geogrid should be placed over the densified Fill to help further mitigate slab settlements.

If project stakeholders are not willing to accept some risk associated with potential slab settlement and cracking, the proposed slabs should be constructed over CGF over prepared, natural (non-organic) soil deposits.

4.2.2 Modulus of Subgrade Reaction

We recommended a modulus of subgrade reaction (ksl) of 350 pounds per cubic inch (pci) for the slab subgrades grades prepared in accordance with Section 4.2.1. Note, however, that the value of ksl is for a one square foot area. The ksl value should be adjusted for larger areas using the following expression:

Modulus of Subgrade Reaction (ks) = ksl $[(B+1)/(2B)]^2$

Where: ks = Coefficient of vertical subgrade reaction for loaded area,
ksl = Coefficient of vertical subgrade reaction for 1 x 1 square foot area, and
B = Width of load area (footing) in feet.

4.2.3 Drainage and Damp-Proofing

Damp-proofing of the slab is recommended. Slab damp-proofing must be installed between the slab and base course and consist of not less than 6-mil polyethylene with joints lapped at least 6-inches.

4.3 RETAINING WALLS

4.3.1 Backfill and Drainage

We recommend backfilling earth retaining structures with compacted Sand and Gravel and installing footing drains. The drains should consist of 4-inch diameter perforated PVC pipe, surrounded by 6-inches of Crushed Stone, and wrapped in non-woven filter fabric. Footing drain inverts should be set flush with or up to 6-inches above bottom of footing level. The drains should be gravity drained to the site drainage system or daylight.

Weep holes may be installed in place of footing drains where they can discharge to non-paved areas (e.g., grassed areas). In paved areas such as sidewalks, weep holes should be avoided to reduce the potential for ice formation in pedestrian access ways. Where weep holes are appropriate, we recommend installing Crushed Stone (minimum diameter of 12 inches), wrapped in non-woven filter fabric at each weep hole location, to prevent movement of wall backfill materials into the weep holes.

4.3.2 Lateral Earth Pressures

Walls that are free to rotate at the top, not braced, and retaining level backfill should be designed to resist an equivalent active static horizontal fluid earth pressure equal to 36 pcf (based on φ' = 34°, c = 0, Ka = 0.28, and ɣ = 128 pcf). Braced retaining walls (or walls with little to no movement) retaining level backfill should be designed to resist an equivalent at-rest static horizontal fluid earth pressure equal to 58 pcf (based on φ' = 34°, c = 0, Ko = 0.45, and ɣ = 128 pcf). This assumes no unbalanced hydrostatic pressures, seismic forces, or surcharges from traffic loads. We recommend using a minimum surcharge load of 250 psf for walls subjected to traffic or equipment loading. As mentioned earlier, due to the limited expected wall movement and depth of footings, we do not recommend the use of passive earth pressures against the base of walls unless DTE is consulted.

The minimum factors of safety for sliding and overturning of retaining walls under static loads should be 1.5 and 2, respectively. If the stability or factor of safety against sliding of the building foundation walls depend on additional resistance of the completed structure, the structural engineer should identify on the plans when the walls may be backfilled.

For mechanically stabilized modular block retaining walls, factors of safety and designs should be in accordance with the manufacturer's recommendations and the latest edition of the Design Manual for Segmental Retaining Walls as published by the National Concrete Masonry Association (NCMA).

4.4 SEISMIC DESIGN

The site class is "C" per the Building Code. Based on the standard penetration test results, visual soil classification, and design peak ground acceleration at this locale, the site soils are not susceptible to liquefaction.

5.0 MATERIALS RECOMMENDATIONS

5.1 ON-SITE MATERIALS

Based on our visual soil classifications, some site soils may be reuseable if they meet the gradation requirements below. Reuse of onsite materials may require processing, mixing, culling, screening, and/or crushing to meet the gradation requirements below. The elevated fines (i.e., soil particles passing the No. 200 sieve) content of some site soils could make them difficult to place and compact. Success in using these materials will depend on their moisture content and prevailing weather conditions when they are excavated, placed, and compacted.

Topsoil and Soil with organics should only be reused in landscaped areas for planting grass and other vegetation.

5.2 COMPACTED GRANULAR FILL

Compacted Granular Fill (CGF) for use as structural fill shall consist of inorganic soil free of clay, loam, ice and snow, tree stumps, roots, and other organic matter; graded within the following limits:

Sieve Size	Percent finer by weight
4-inches	100%
No. 10	30 - 100
No. 40	10 - 90
No. 200	0 - 12

5.3 CRUSHED STONE

Crushed Stone for use around drains or below foundations and slabs shall consist of sound, tough, durable, rock that is graded within the following:

Sieve Size	Percent finer by weight
5/8-inches	100%
1/2-inch	85 - 100
3/8 inch	15 - 45
No. 4	0 - 15
No. 8	0 - 5

5.4 SAND AND GRAVEL

Sand and Gravel for use as retaining wall backfill shall consist of hard, durable sand and gravel; free of ice, clay, shale, roots, sod, rubbish, and other organic matter; graded within the following limits:

Sieve Size	Percent finer by weight
2-inches	100%
1/2-inch	50 - 85
No. 4	40 - 75
No. 40	10 - 35
No. 200	0 - 5

5.5 COMMON FILL

Common Fill for use outside the structures and deeper than 16-inches below pavement shall consist of soil; free of ice, clay, shale, roots, sod, rubbish, and other organic matter; graded within the following limits:

Sieve Size	Percent finer by weight
8-inches	100%
No. 200	0 - 25

5.6 COMPACTION REQUIRMENTS

The required degree of compaction shall be based on a maximum dry density as determined by a Modified Proctor (ASTM D1557). The degree of compaction for fill placed in various areas shall be as follows:

Placement areas	Minimum degree of compaction
1. Below foundations and slabs	95%
2. Below utility trenches and pavement	92%
3. Against foundations and retaining walls	92%
4. Landscaped areas	90%

Crushed stone is considered to be self-compacting, and would negate the need to run laboratory proctor testing and have field density testing of in-place lifts. The crushed stone should be plate compacted to "chink up" the working surface in lifts. We recommend placing Crushed Stone in maximum 12-inch lifts and compacting the lifts with a minimum of four passes with a vibratory plate compactor weight of a minimum of 1,000 pounds and with a minimum centrifugal force of 10,000 pounds. Generalized loose lift thickness for granular fill and the minimum number of passes of compaction equipment are summarized on the table below. Specifications should require the contractor to adjust loose lift thicknesses as required to meet the required compaction requirements.

Compaction Method	Maximum Stone Size	Maximum Loose Lift Thickness		Minimum Number of Passes	
		Below Structures	Less Critical Areas	Below Structures	Less Critical Areas
Hand-operated vibratory plate or light roller in confined areas	4"	6"	8"	6	4
Hand-operated vibratory drum rollers weighing at least 1,000 lbs.	6"	8"	10"	6	4
Light vibratory roller, min. dynamic force 3,000 lbs. per ft. of drum width	6"	10"	14"	6	4
Medium vibratory roller, min. dynamic force 5,000 lbs. per ft. of drum width	8"	12"	18"	6	4
Large vibratory roller, min. dynamic force 8,000 lbs. per ft. of drum width	10"	16"	24"	6	4

The Contractor should reduce or stop drum vibration if pumping or weaving of the subgrade is observed.

Extra care should be used when compacting adjacent to walls. Hand-operated rollers or plate compactors weighing not more than 250 pounds should be used within a lateral distance of 5 feet of walls. Where walls are buried on both sides, backfill and compaction should proceed on both sides of the wall so that the difference in top of fill on either side of the wall does not exceed 2 feet.

5.7 GEOTEXTILE FABRIC

Geotextile fabric placed around crushed stone pipe bedding or used as a separation fabric for crushed stone and soil material should meet the following criteria:

Property	Criteria	Test Method
Grab Strength	min. 80lbs	ASTM D4632
Static (CBR) Puncture	min. 50lbs	ASTM D6241
Trapezoid Tear	min. 25lbs	ASTM D4533
Apparent Opening Size	No. 70-100 U.S. Sieve Size	ASTM D4751

Fabric should be needle-punched non-woven material. Seams should be overlapped a minimum of six inches. During stone placement, the stone drop height should not exceed three feet and equipment traffic should be kept off the fabric until at least 6 to 12 inches of material is placed.

6.0 CONSTRUCTION RECOMMENDATIONS

6.1 REMOVAL OF BURIED STRUCTURES AND UTILITIES

All existing substructures and utilities within the proposed development areas must be removed in their entirety prior to construction of new foundations and slabs. Disturbed materials must be removed down to the level of firm, natural soil and the resulting excavations must be backfilled with Compacted Granular Fill to achieve required subgrades. Additional fill materials placed in the building area should be placed in accordance with Section 5.0.

6.2 SUBGRADE PREPARATION

Footing excavations should be cut relatively level for soil subgrades and no steeper than 24H:1V for Bedrock subgrades (unless concrete sub footings or rock dowels are used at the direction of DTE). We recommend the use of smooth-edged excavator buckets (not back-bladed) to make the final excavations and placing and compacting a 12-inch-thick layer of Crushed Stone over footing subgrades to provide a transition between Bedrock and soil subgrades (refer to Figure 3). The stone is not required if there is at least 12 inches of natural soils or CGF below the footings.

The base of footing and slab excavations should be free of debris materials, water, ice, and loose and frozen soils prior placing CGF, Crushed Stone, or concrete. Should the materials at bearing level become disturbed, the affected materials should be removed prior to placing CGF, Crushed Stone, or concrete. Boulders encountered at the exposed foundation subgrade should be removed to a depth of at least 12 inches below bottom of footings. The stone is not required if footings are bearing on at least 12 inches of natural soil or GCF. Voids that result from boulder

excavations should be backfilled with CGF or Crushed Stone. All disturbed rock from Bedrock removal activities (Section 6.3) should be removed down to sound Bedrock.

The base of footing and slab subgrades should be proof compacted with a minimum of six passes of a large vibratory roller having a minimum dynamic force of 3,000 pounds per foot drum width. Any weak or unstable areas identified should be over excavated and replaced with compacted CGF, at the direction of DTE. Vibrations should be discontinued if disturbance or weaving of the subgrade is observed.

Soil bearing surfaces below completed foundations and slabs should be protected against freezing before and after concrete placement. If construction is performed during winter weather, footings bearing on soil should be backfilled to a sufficient depth as soon as possible after they are constructed. Alternatively, insulating blankets or other measures should be used for protection against freezing.

6.3 ROCK REMOVAL

Shallow rock is present at the site and may be encountered during foundation excavation. Decomposed Rock and boulders likely can be removed with a large excavator and ripping bucket. For sound Bedrock removal, hydraulic splitters, air rams, or other more aggressive methods may be required. Based on the anticipated depths of foundations (about 2 to 4 feet below slab level) and encountered Bedrock elevation at the test boring locations, we do not anticipate that blasting will be required to efficiently remove Bedrock. Blasting could be needed if Bedrock is found higher during foundation excavation.

A blast plan should be developed by the contractor and reviewed by the engineer if blasting is used to remove Bedrock. Additional test borings with Bedrock coring may be needed to develop the blast plan. Controlled blasting techniques must be implemented to protect adjacent structures and limit risk of over-blast and excessive fracturing (and unnecessary over-excavation and replacement). Vibration thresholds should be developed for nearby structures by a Professional Engineer registered in the State of Connecticut and monitored during blasting. At least two layers of woven rubber blasting mats should be used to protect each blast. The mats will reduce the blast noise and potential for fly rock.

All disturbed rock, as a result of Bedrock removal activities, should be removed down to sound Bedrock and replaced with CGF or Crushed Stone in accordance with Section 6.2.

6.4 TEMPORARY EXCAVATIONS

The Contractor is responsible for construction site safety and should be aware that slope height, slope inclination, and excavation depths should in no case exceed those specified in local, state, or federal safety regulations (e.g., OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926).

The Fill and natural site soils are classified as OSHA Class “C” soil and can be cut at a maximum one vertical to one and a half horizontal (1V:1.5H) slope up to a maximum excavation depth of 20 feet. These maximum slope and excavation depths assume no surcharge load (i.e., stockpiles,

construction equipment, traffic, etc.) at the top of the excavations or groundwater seepage. Slopes that are not fully dewatered should be no steeper than 3H:1V. As a safety measure, it is recommended that all vehicles and earth stockpiles be kept a lateral distance away from the edge of excavations at least equal to the slope height. Protect slope faces against the weather elements.

Care should be taken to not undermine the adjacent roads, sidewalks, foundations, utilities, and other structures. If excavations cannot be sloped in accordance with OSHA requirements or will undermine adjacent structures, temporary excavation support systems will be required. These systems should be chosen and installed by the contractor and designed by a Professional Engineer registered in the State of Connecticut.

6.5 TEMPORARY GROUNDWATER CONTROL

We expect that temporary groundwater/storm water control can be accomplished by means of shallow trenches and sumps, and grading the excavation to low points. Dewatering should be performed as necessary to allow excavation and observation of the subgrades in the dry and to maintain a stable and dry bottom. In addition, constructing small temporary earth berms and grading to allow drainage away from the excavation is recommended to control surface water runoff. The construction dewatering system means and methods should be chosen by the contractor and designed by a Professional Engineer registered in the State of Connecticut. This should include providing a discharge water management plan that avoids endangering public health and nearby property and meets applicable local, state, and environmental regulations.

7.0 REVIEW OF FINAL DESIGN, PLANS, AND SPECIFICATIONS

When project plans and specifications are available they should be provided to DTE for review of conformance with our geotechnical recommendations. The recommendations provided in this report will need to be verified by DTE for applicability when project drawings and foundation loads are developed.

8.0 CONSTRUCTION QUALITY CONTROL

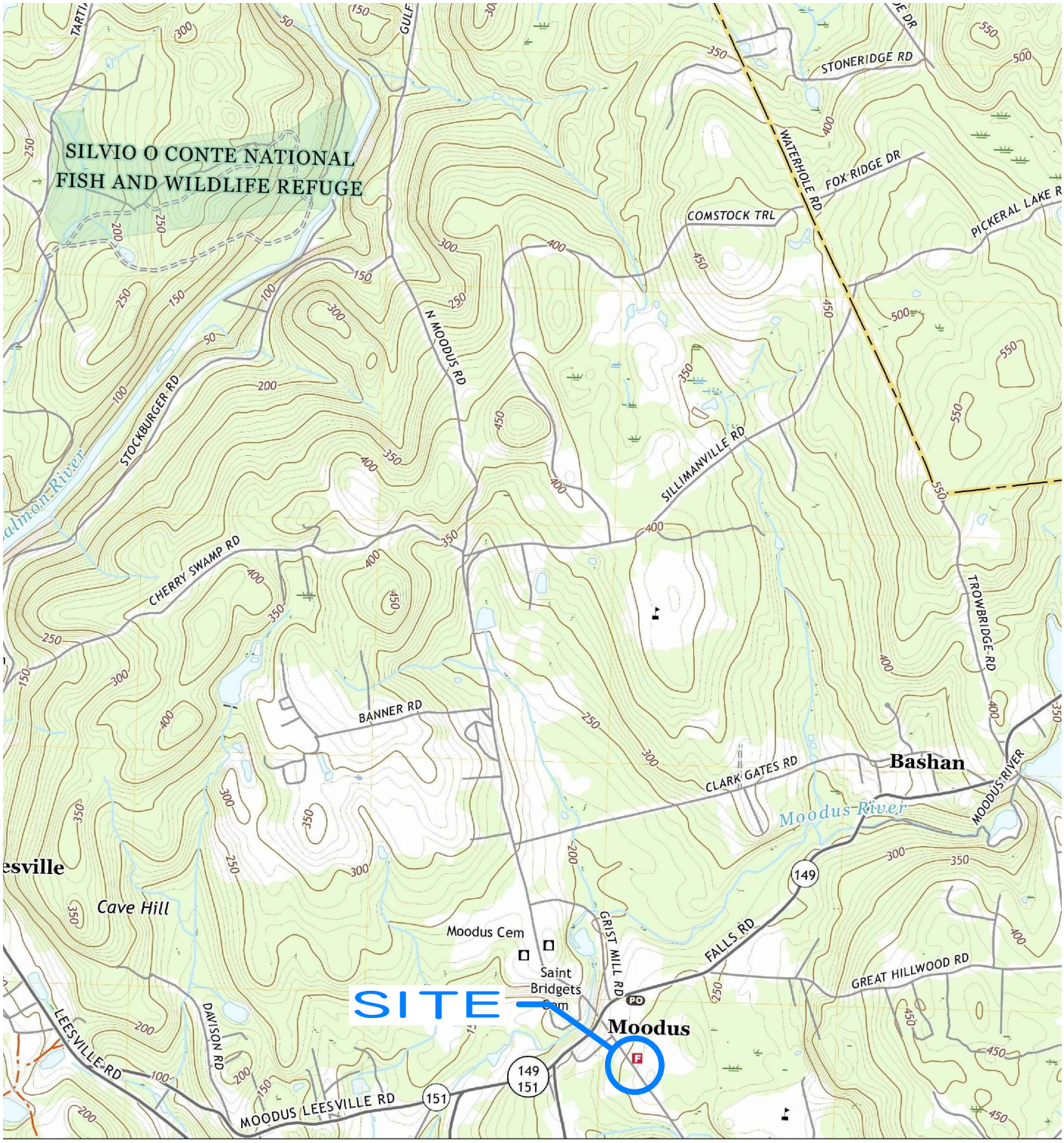
We recommend that DTE make field observations of excavations for foundation and slab subgrade preparation to monitor compliance with our recommendations and project specifications. Specifically, we recommend field observation of excavations, support of excavation construction, removal of unsuitable materials, footing subgrades, surface compaction of existing Fill, and Fill placement and compaction to monitor compliance with project specifications. We can also assist in classifying material on-site for the purpose of segregation and/or mixing for re-use on-site.

9.0 LIMITATIONS

This report is subject to the limitations included in Appendix 3.

APPENDIX 1 -

FIGURES



DOWN TO EARTH CONSULTING, LLC
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERING

27 SIEMON COMPANY DRIVE – SUITE 363W
WATERTOWN, CONNECTICUT 06795



QUADRANGLE LOCATION

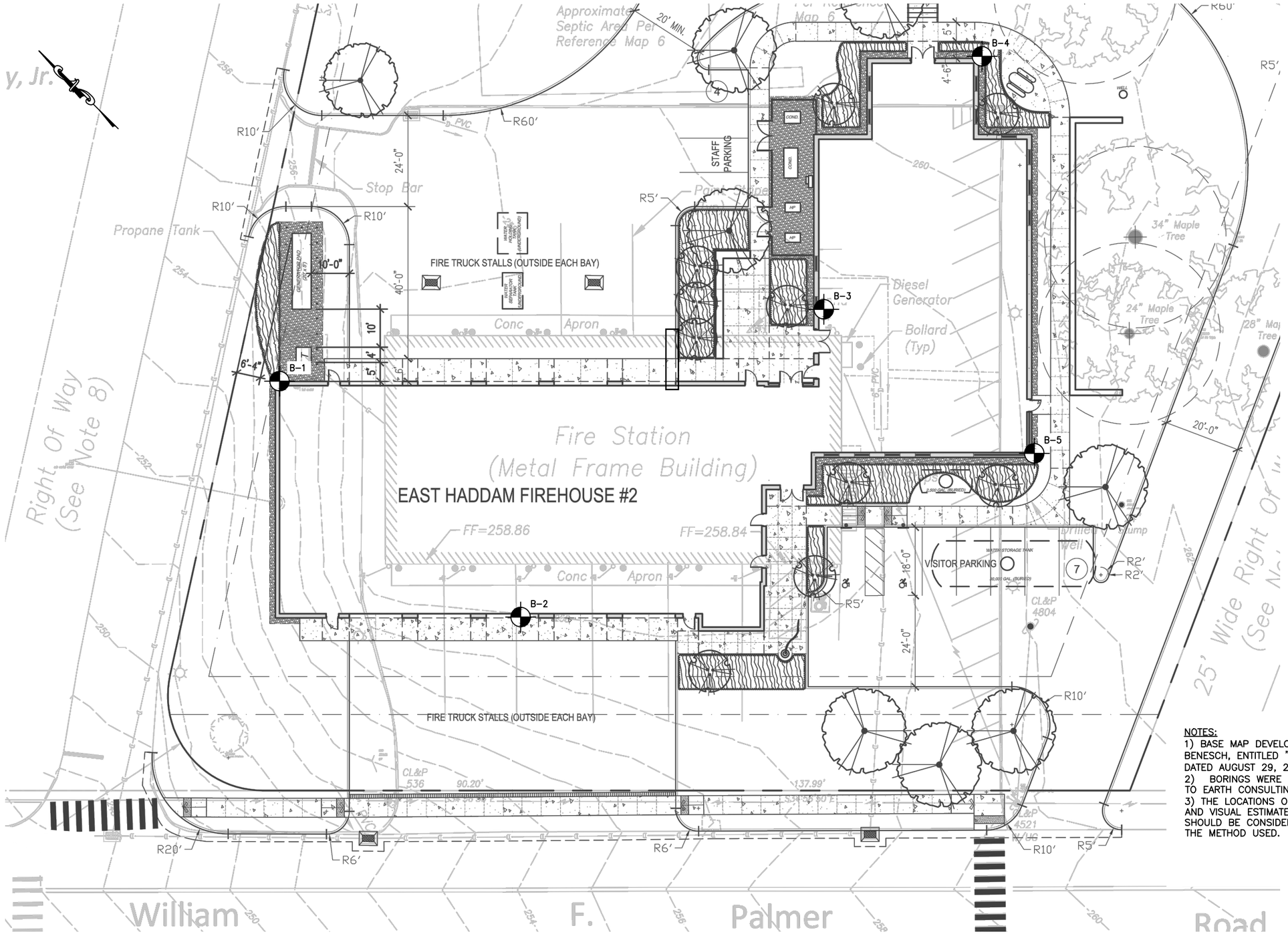
AREA PLAN
PROPOSED FIRE DEPARTMENT BUILDING
44 WILLIAM F PALMER ROAD
MOODUS, CONNECTICUT

REFERENCE:
USGS TOPOGRAPHIC QUADRANGLE: MOODUS, CT

SCALE 1"= 2,000'

2,000' 1,000' 0 2,000'

DRAWN BY: MF	REVIEWED BY: DFL
PROJECT NO. 0276-024.00	
DATE: 9/5/25	
FIGURE NO. 1	



LEGEND

B-3 — TEST BORING NO. AND APPROXIMATE LOCATION

NOTES:

1) BASE MAP DEVELOPED FROM AN ELECTRONIC FILE PREPARED BY BENESCH, ENTITLED "NEW CONSTRUCTION EAST HADDAM FIREHOUSE #2", DATED AUGUST 29, 2025. ORIGINAL SCALE 1" = 30'.
2) BORINGS WERE COMPLETED BY SITE, LLC AND OBSERVED BY DOWN TO EARTH CONSULTING, LLC.
3) THE LOCATIONS OF THE EXPLORATIONS WERE DETERMINED BY TAPING AND VISUAL ESTIMATES FROM EXISTING SITE FEATURES. THESE LOCATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

DESIGNED BY OTHERS						
DRAWN BY MF						
CHECKED BY DFL	NO.	DATE		DRWN.	CHKD	APPVD
APPROVED BY DFL	REVISIONS					

SCALE 1"= 40'

40' 20' 0 40'

DOWN TO EARTH CONSULTING, LLC
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERING
27 SIEMON COMPANY DRIVE #363W
WATERTOWN, CONNECTICUT 06795

PROJECT
PROPOSED FIRE DEPARTMENT BUILDING
44 WILLIAM F PALMER ROAD
MOODUS, CONNECTICUT

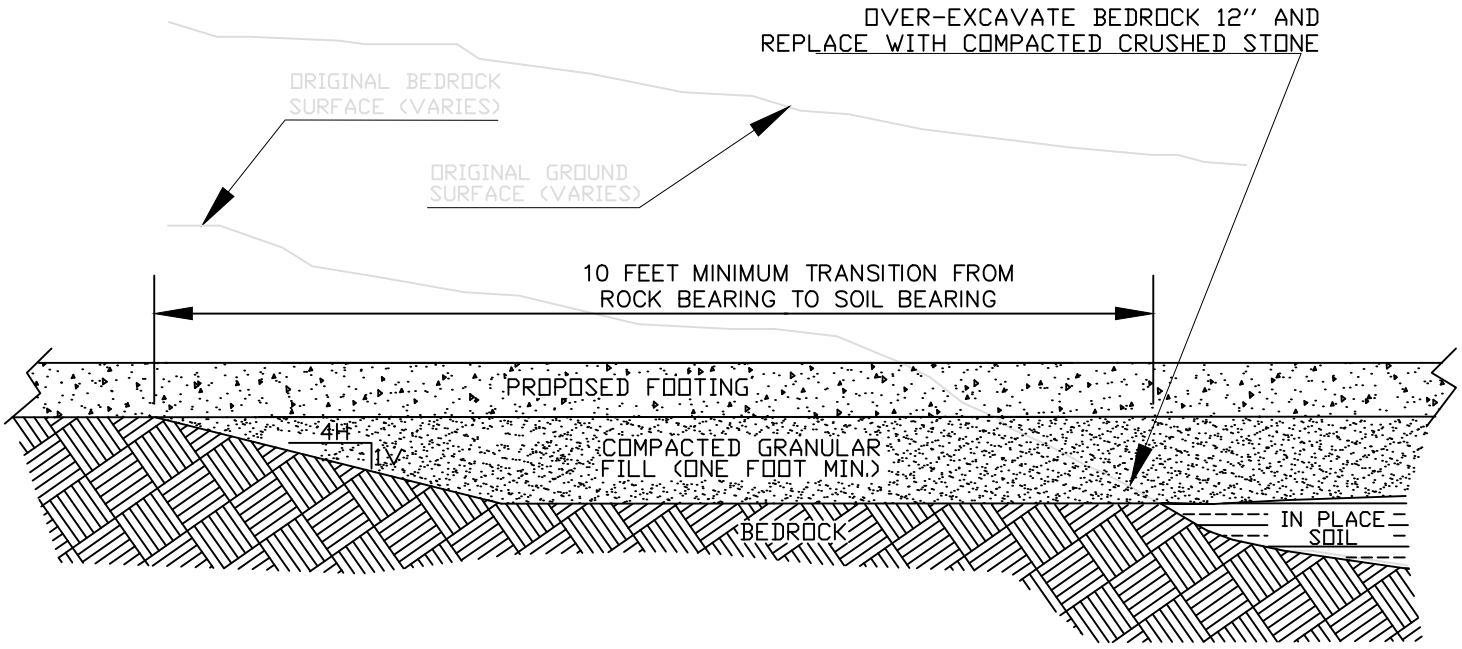
DWG. TITLE.
SITE AND BORING LOCATION PLAN

DTE FILE NO. 0276-024.00

SCALE AS NOTED

DATE 9/16/25

FIGURE NO. 2



DOWN TO EARTH CONSULTING, LLC
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERING

27 SIEMON COMPANY DRIVE #363W
WATERTOWN, CONNECTICUT 06795

TRANSITION DETAIL FOR FOOTING SUBGRADE PREPARATION IN ROCK / SOIL
PROPOSED FIRE DEPARTMENT BUILDING
44 WILLIAM PALMER ROAD
MOODUS, CONNECTICUT

DRAWN BY: TJO	REVIEWED BY: DFL	NOT TO SCALE

PROJECT NO.	0276-024.00
DATE:	10/17/2025
FIGURE NO.	3

APPENDIX 2 -

TEST BORING LOGS

DOWN TO EARTH CONSULTING, LLC
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERING

PROJECT
PROPOSED FIRE DEPARTMENT BUILDING
44 WILLIAM F PALMER ROAD
MOODUS, CONNECTICUT

BORING NO. B-1
SHEET 1 of 1
FILE NO. 0276-024.00
CHKD. BY TJO

Boring Co.	Site, LLC	Boring Location	See Boring Location Plan		
Driller	J. DeAngelis	Ground Surface El.	254'+/-	Datum	Not Available
Logged By	B.Vargas	Date Start	9/30/2025	Date End	9/30/2025

Hammer Type:	Automatic Hammer
Sampler Size:	1-3/8"-ID Split Spoon Sampler
Type Drill Rig:	CME 55 Track-Mounted Drill Rig
Drilling Method:	2.25-inch Hollow Stem Augers

Groundwater Readings (from ground surface)

Date	Time	Depth (ft)	Elev.	Stabilization Time
9/30/25	-	-	-	Not Observed

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	Core Time (min./ft)	SAMPLE DESCRIPTION	STRATA
1		S-1	9/24	0 to 2	1-3-2-1		Loose, dark brown, fine to coarse SAND, some Silt, little fine to coarse Gravel	8"+/- Topsoil
2								
3		S-2	16/24	2 to 4	2-2-2-3		Very loose, brown/orange brown, fine to medium SAND, little fine Gravel, little Silt, trace Wood	FILL
4								
5								5'
6		S-3	20/24	5 to 7	2-3-3-8		Loose, gray/brown, fine to coarse SAND, little Silt, little fine Gravel	SAND
7								7'
8		S-4	17/17	7 to 8.4	14-25-50/5"		Very dense, gray, DECOMPOSED ROCK	DECOMPOSED ROCK
9								
10							END OF EXPLORATION AT 8.9 FEET BELOW GROUND SURFACE	INFERRED BEDROCK
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SPT N-Values	SPT N-Values	Proportions	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	Trace = 0 to 10%	1. S denotes split-barrel sampler.	7. WH denotes weight of hammer
5 to 10 - Loose	3 to 4 - Soft	Little = 10 to 20%	2. ST denotes 3-inch O.D. undisturbed sample.	8. WR denotes weight of rods
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	Some = 20 to 35%	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	And = 35 to 50%	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff		5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard		6. SPT denotes Standard Penetration Test.	12. C denotes core run number.

FIELD NOTES: 1) Stratification lines represent approximate boundaries between soil types, transitions may be gradual.
2) Water level readings have been made at times and under conditions stated, fluctuations may occur due to other factors.
3) Auger refusal on inferred bedrock at 8.9 ft

DOWN TO EARTH CONSULTING, LLC
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERING

PROJECT
PROPOSED FIRE DEPARTMENT BUILDING
44 WILLIAM F PALMER ROAD
MOODUS, CONNECTICUT

BORING NO. B-2
SHEET 1 of 1
FILE NO. 0276-024.00
CHKD. BY TJO

Boring Co.	Site, LLC	Boring Location	See Boring Location Plan		
Driller	J. DeAngelis	Ground Surface El.	258'+/-	Datum	Not Available
Logged By	B.Vargas	Date Start	9/30/2025	Date End	9/30/2025

Hammer Type:	Automatic Hammer
Sampler Size:	1-3/8"-ID Split Spoon Sampler
Type Drill Rig:	CME 55 Track-Mounted Drill Rig
Drilling Method:	2.25-inch Hollow Stem Augers

Groundwater Readings (from ground surface)

Date	Time	Depth (ft)	Elev.	Stabilization Time
9/30/25	-	12.8	245.2'	1 hr. after drilling in open hole

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	Core Time (min./ft)	SAMPLE DESCRIPTION	STRATA
1								5"+/- Asphalt
2		S-1	14/24	1 to 3	3-4-3-2		Loose, brown, fine to coarse SAND, little Silt, little fine to coarse Gravel	FILL
3								
4		S-2	14/24	3 to 5	4-17-7-4		Medium dense, orange brown, fine to coarse SAND, some Silt, little fine to coarse Gravel	4'
5								BURIED
6		S-3	20/24	5 to 7	1-3-7-11		Loose, brown/orange-brown, fine to coarse SAND, some Silt, trace fine to coarse Gravel	6' TOPSOIL/SUBSOIL
7								7' SAND
8		S-4	24/24	7 to 9	13-27-32-42		Very dense, gray, DECOMPOSED ROCK	
9								
10								
11		S-5	21/21	10 to 11.8	22-24-36-50/3"		Very dense, gray, DECOMPOSED ROCK	DECOMPOSED ROCK
12								
13								
14								
15								
16		S-6	1/1	15 to 15.1	50/1"		Very dense, gray, DECOMPOSED ROCK	
17							END OF EXPLORATION AT 15.1 FEET BELOW GROUND SURFACE	
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SPT N-Values	SPT N-Values	Proportions	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	Trace = 0 to 10%	1. S denotes split-barrel sampler.	7. WH denotes weight of hammer
5 to 10 - Loose	3 to 4 - Soft	Little = 10 to 20%	2. ST denotes 3-inch O.D. undisturbed sample.	8. WR denotes weight of rods
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	Some = 20 to 35%	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	And = 35 to 50%	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff		5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard		6. SPT denotes Standard Penetration Test.	12. C denotes core run number.

FIELD NOTES: 1) Stratification lines represent approximate boundaries between soil types, transitions may be gradual.
2) Water level readings have been made at times and under conditions stated, fluctuations may occur due to other factors.

DOWN TO EARTH CONSULTING, LLC
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERING

PROJECT
PROPOSED FIRE DEPARTMENT BUILDING
44 WILLIAM F PALMER ROAD
MOODUS, CONNECTICUT

BORING NO. B-3
SHEET 1 of 1
FILE NO. 0276-024.00
CHKD. BY TJO

Boring Co.	Site, LLC	Boring Location	See Boring Location Plan		
Driller	J. DeAngelis	Ground Surface El.	259'+/-	Datum	Not Available
Logged By	B.Vargas	Date Start	9/30/2025	Date End	9/30/2025

Hammer Type:	Automatic Hammer
Sampler Size:	1-3/8"-ID Split Spoon Sampler
Type Drill Rig:	CME 55 Track-Mounted Drill Rig
Drilling Method:	2.25-inch Hollow Stem Augers

Groundwater Readings (from ground surface)

Date	Time	Depth (ft)	Elev.	Stabilization Time
9/30/25	-	-	-	Not Observed

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	Core Time (min./ft)	SAMPLE DESCRIPTION	STRATA
1								3"+/- Asphalt
2		S-1	18/24	1 to 3	4-4-4-4		Loose, brown, fine to coarse SAND, little Silt, little fine to coarse Gravel	FILL
3								3'
4		S-2	20/24	3 to 5	4-11-23-34		Dense, gray/brown, fine to medium SAND and fine to coarse GRAVEL, little Silt	SAND
5								5'
6		S-3	24/24	5 to 7	24-34-30-35		Very dense, gray/brown, DECOMPOSED ROCK	DECOMPOSED ROCK
7								
8		S-4	5/8	7 to 7.8	32-50/2"		Very dense, gray, DECOMPOSED ROCK	
9							END OF EXPLORATION AT 8.3 FEET BELOW GROUND SURFACE	INFERRED BEDROCK
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SPT N-Values	SPT N-Values	Proportions	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	Trace = 0 to 10%	1. S denotes split-barrel sampler.	7. WH denotes weight of hammer
5 to 10 - Loose	3 to 4 - Soft	Little = 10 to 20%	2. ST denotes 3-inch O.D. undisturbed sample.	8. WR denotes weight of rods
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	Some = 20 to 35%	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	And = 35 to 50%	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff		5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard		6. SPT denotes Standard Penetration Test.	12. C denotes core run number.

FIELD NOTES: 1) Stratification lines represent approximate boundaries between soil types, transitions may be gradual.
2) Water level readings have been made at times and under conditions stated, fluctuations may occur due to other factors.
3) Auger refusal on infered bedrock at 8.3 ft

DOWN TO EARTH CONSULTING, LLC
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERING

PROJECT
PROPOSED FIRE DEPARTMENT BUILDING
44 WILLIAM F PALMER ROAD
MOODUS, CONNECTICUT

BORING NO. B-4
SHEET 1 of 1
FILE NO. 0276-024.00
CHKD. BY TJO

Boring Co.	Site, LLC	Boring Location	See Boring Location Plan		
Driller	J. DeAngelis	Ground Surface El.	261'+/-	Datum	Not Available
Logged By	B.Vargas	Date Start	9/30/2025	Date End	9/30/2025

Hammer Type:	Automatic Hammer
Sampler Size:	1-3/8"-ID Split Spoon Sampler
Type Drill Rig:	CME 55 Track-Mounted Drill Rig
Drilling Method:	2.25-inch Hollow Stem Augers

Groundwater Readings (from ground surface)

Date	Time	Depth (ft)	Elev.	Stabilization Time
9/30/25	-	9.7	251.3	4 hrs. after drilling in open hole

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	Core Time (min./ft)	SAMPLE DESCRIPTION	STRATA
1		S-1	13/24	0 to 2	1-3-3-2		Loose, brown, fine to coarse SAND, little fine to coarse Gravel, little Silt	11"+/- Topsoil SUBSOIL
2								2'
3		S-2	16/24	2 to 4	3-4-4-7		Loose, light brown, fine to medium SAND, little fine Gravel, trace Silt	
4								
5								SAND
6		S-3	19/24	5 to 7	9-11-17-17		Medium dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt	
7								7'
8		S-4	10/10	7 to 7.8	45-50/4"		Very dense, gray, DECOMPOSED ROCK	
9								DECOMPOSED ROCK
10								
11		S-5	5/5	10 to 10.4	50/5"		Very dense, gray, DECOMPOSED ROCK	
12							END OF EXPLORATION AT 10.4 FEET BELOW GROUND SURFACE	
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SPT N-Values	SPT N-Values	Proportions	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	Trace = 0 to 10%	1. S denotes split-barrel sampler.	7. WH denotes weight of hammer
5 to 10 - Loose	3 to 4 - Soft	Little = 10 to 20%	2. ST denotes 3-inch O.D. undisturbed sample.	8. WR denotes weight of rods
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	Some = 20 to 35%	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	And = 35 to 50%	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff		5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard		6. SPT denotes Standard Penetration Test.	12. C denotes core run number.

FIELD NOTES: 1) Stratification lines represent approximate boundaries between soil types, transitions may be gradual.
2) Water level readings have been made at times and under conditions stated, fluctuations may occur due to other factors.

DOWN TO EARTH CONSULTING, LLC
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERING

PROJECT
PROPOSED FIRE DEPARTMENT BUILDING
44 WILLIAM F PALMER ROAD
MOODUS, CONNECTICUT

BORING NO. B-5
SHEET 1 of 1
FILE NO. 0276-024.00
CHKD. BY TJO

Boring Co.	Site, LLC	Boring Location	See Boring Location Plan		
Driller	J. DeAngelis	Ground Surface El.	260'+/-	Datum	Not Available
Logged By	B.Vargas	Date Start	9/30/2025	Date End	9/30/2025

Hammer Type:	Automatic Hammer
Sampler Size:	1-3/8"-ID Split Spoon Sampler
Type Drill Rig:	CME 55 Track-Mounted Drill Rig
Drilling Method:	2.25-inch Hollow Stem Augers

Groundwater Readings (from ground surface)

Date	Time	Depth (ft)	Elev.	Stabilization Time
9/30/25	-	-	-	Not Observed

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	Core Time (min./ft)	SAMPLE DESCRIPTION	STRATA
1		S-1	18/24	0 to 2	1-2-3-5		Loose, brown, fine to coarse SAND, little fine to coarse Gravel, little Silt	9"+/- Topsoil SUBSOIL
2								2'
3		S-2	16/24	2 to 4	7-6-8-11		Medium dense, light brown, fine to coarse SAND, little fine Gravel, trace Silt	SAND
4								
5								5'
6		S-3	24/24	5 to 7	16-29-44-40		Very dense, gray/brown, DECOMPOSED ROCK	DECOMPOSED ROCK
7								
8		S-4	5/5	7 to 7.4	50/5"		Very dense, gray, DECOMPOSED ROCK	
9							END OF EXPLORATION AT 7.8 FEET BELOW GROUND SURFACE	INFERRED BEDROCK
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SPT N-Values	SPT N-Values	Proportions	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	Trace = 0 to 10%	1. S denotes split-barrel sampler.	7. WH denotes weight of hammer
5 to 10 - Loose	3 to 4 - Soft	Little = 10 to 20%	2. ST denotes 3-inch O.D. undisturbed sample.	8. WR denotes weight of rods
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	Some = 20 to 35%	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	And = 35 to 50%	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff		5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard		6. SPT denotes Standard Penetration Test.	12. C denotes core run number.

FIELD NOTES: 1) Stratification lines represent approximate boundaries between soil types, transitions may be gradual.
2) Water level readings have been made at times and under conditions stated, fluctuations may occur due to other factors.
3) Auger refusal on inferred bedrock at 7.8 ft

APPENDIX 3 -

LIMITATIONS

LIMITATIONS

Explorations

1. The analyses and recommendations submitted in this report are based in part upon the data obtained from subsurface explorations by Down To Earth Consulting, LLC (DTE) and others. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more erratic. For specific information, refer to the boring logs.

3. Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, tidal, temperature, and other factors occurring since the time measurements were made.

Review

4. In the event that any changes in the nature, design or location of the proposed buildings are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by DTE. It is recommended that this firm be provided the opportunity for a general review of final design and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications.

Construction

5. It is recommended that this firm be retained to provide soil engineering services during construction of the earthworks and foundation phases of the work. This is to observe compliance with the design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

Use of Report

6. This report has been prepared for the exclusive use of Silver Petrucelli & Associates for specific application to the project noted in this geotechnical report in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made.

7. This soil and foundation engineering report has been prepared for this project by DTE. This report is for design purposes only and is not sufficient to prepare an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to design considerations only.

8. This report may contain comparative cost estimates for the purpose of evaluating alternative foundation schemes. These estimates may also involve approximate quantity evaluations. It should be noted that quantity estimates may not be accurate enough for construction bids. Since DTE has no control over labor and materials cost and design, the estimates of construction costs have been made on the basis of experience. DTE does not guarantee the accuracy of cost estimates as compared to contractor's bids for construction costs.