Stormwater Management Report

Twin Manufacturing
273 Chapel Rd
South Windsor, CT

Prepared for:

Twin Manufacturing Co.
273 Chapel Road
South Windsor, CT 06074

Prepared by:

Design Professionals, Inc.
21 Jeffrey Drive
South Windsor, CT 06074

June 26, 2020

Table of Contents

Introduction

Twin Manufacturing Co. is proposing a 9,420 ± SF building expansion to their existing 37,155 ± SF building. Twin Manufacturing's 4.60 ± acre parcel is located at 273 Chapel Road, South Windsor, Connecticut. The property is referenced on the Town of South Windsor Tax Assessors map as GIS#18000273. The proposed development will include the construction of the 9,420± sf building expansion and associated site improvements to include, but not be limited to, new parking areas for standard vehicles and trucks, sidewalks, landscaping, lighting, and stormwater management BMP's.

Of the 4.60± acre parcel, approximately 1.55± acres are proposed to be disturbed for the construction of the industrial facility. There are no wetlands located on site. For more information, please refer to the plans entitled "Twin Manufacturing Site Plan Modification ~ 273 Chapel Road ~ South Windsor, CT ~ GIS#18000273" prepared by Design Professionals, Inc. and dated June 26th, 2020, as amended.

Pre-Development Site Conditions

The existing site currently operates as an industrial manufacturing facility with a mix of impervious areas including parking spaces, drive aisles, and the existing 37,155 SF building. Lawn and woodland areas along the outskirts of property boundaries make up the remaining land cover features on site.

All runoff generated on site sheet flows across its southern, western, and eastern property lines. After leaving the site, accumulated runoff is collected in the storm water management system for the 360 Ellington Road Distribution Center. Please refer to the storm water management report titled "Stormwater Management Report ~ 360 Ellington Road Distribution Center ~ 360 Ellington Rd, 245 Chapel Rd & R008 John Fitch Boulevard, South Windsor, CT" for more information on that system. The 360 Ellington Road Distribution Center's stormwater management system is comprised of a multi-infiltration basin network designed to infiltrate all stormwater on site for all storms up to and including the 100-year storm. Evaluation of the impact to this offsite stormwater management system due to Twin Manufacturing's proposed building expansion, will be based on the final 100-storm elevation provided for the two infiltration basins considering the proposed site changes. The two infiltration basins for 360 Ellington Road will be the design points of this drainage evaluation, descriptions for each are provided below:

- **Design Point 1:** IB-01- Surface Infiltration Basin located at the north-west corner of 360 Ellington Road.
- **Design Point 2:** UGC-01 – Underground Infiltration System under the north-west truck parking/circulation area.

Existing condition watershed delineations are identified in the Existing Conditions Drainage Map located in **Appendix E**.

Based on Natural Resources Conservation Service (NRCS) Hydrologic Soil Group (HSG) mapping, only type C soils are located on site. See **Appendix C** for The NRCS Soil Map & Data.

To determine the change in elevation for the two 360 Ellington Road infiltration systems an evaluation was performed to quantify the peak rate of stormwater discharge to each (**DP#1 & DP#2**). The Natural Resources Conservation Service's TR-55 Manual was followed in predicting the peak rates of runoff and volumes. HydroCAD computer modeling software was utilized.

Existing elevations of the two infiltration basins were evaluated for the 100-year storm event. For more information, please refer to the enclosed Pre-Development Drainage HydroCAD Report located in **Appendix A**.

Post-Development Site Conditions

The subject project proposes the construction of a 9,420 SF ± building expansion and associated site improvements. A water quality basin is also proposed to provide treatment of surface runoff from proposed pavement areas south of the building addition. The water quality basin will also provide some attenuation of onsite flows and was included in the proposed condition stormwater model. Observed test pit data from the 360 Ellington Road Stormwater Management Report indicated that this area has high permeable native soils. The water quality basin is expected to drain between storm events remaining in a predominantly dry state due to expected infiltration based on this information.

Proposed condition elevations of the two infiltration basins were evaluated for the100-year storm event. For more information, please refer to the enclosed Post-Development Drainage HydroCAD Report located in **Appendix B**.

Analysis of Results

The pre-development and post-development conditions were analyzed using HydroCAD consistent with National Resource Conservation Service (NRCS) hydrology methods. The two infiltration basins identified as points of interest for assessing offsite effects were modeled using this software. The comparison of the existing vs proposed elevation achieved in each basin will determine if the two infiltration systems have the capacity to accept the proposed site changes. The following table contains the data generated from the HydroCAD:

Reach	(FT)	100 Year ELEV
DP#1: IB-01 Surface Infiltration Basin	Existing Elevation	55.01
	Proposed Elevation	54.91
DP#2: UGC-01 Underground Infiltration System	Existing Elevation	61.63
	Proposed Elevation	61.62

As seen in the table above, the subject project will result in slight decreases to the existing elevations for two infiltration basins. Evaluation of the final outflow from 360 Ellington Road's infiltration basin IB-01 yielded 0 CFS peak outflow rates for all storm events up to and including the 100-year storm. This shows conformance to the original 100% infiltration design intent for the distribution center at 360 Ellington Road.

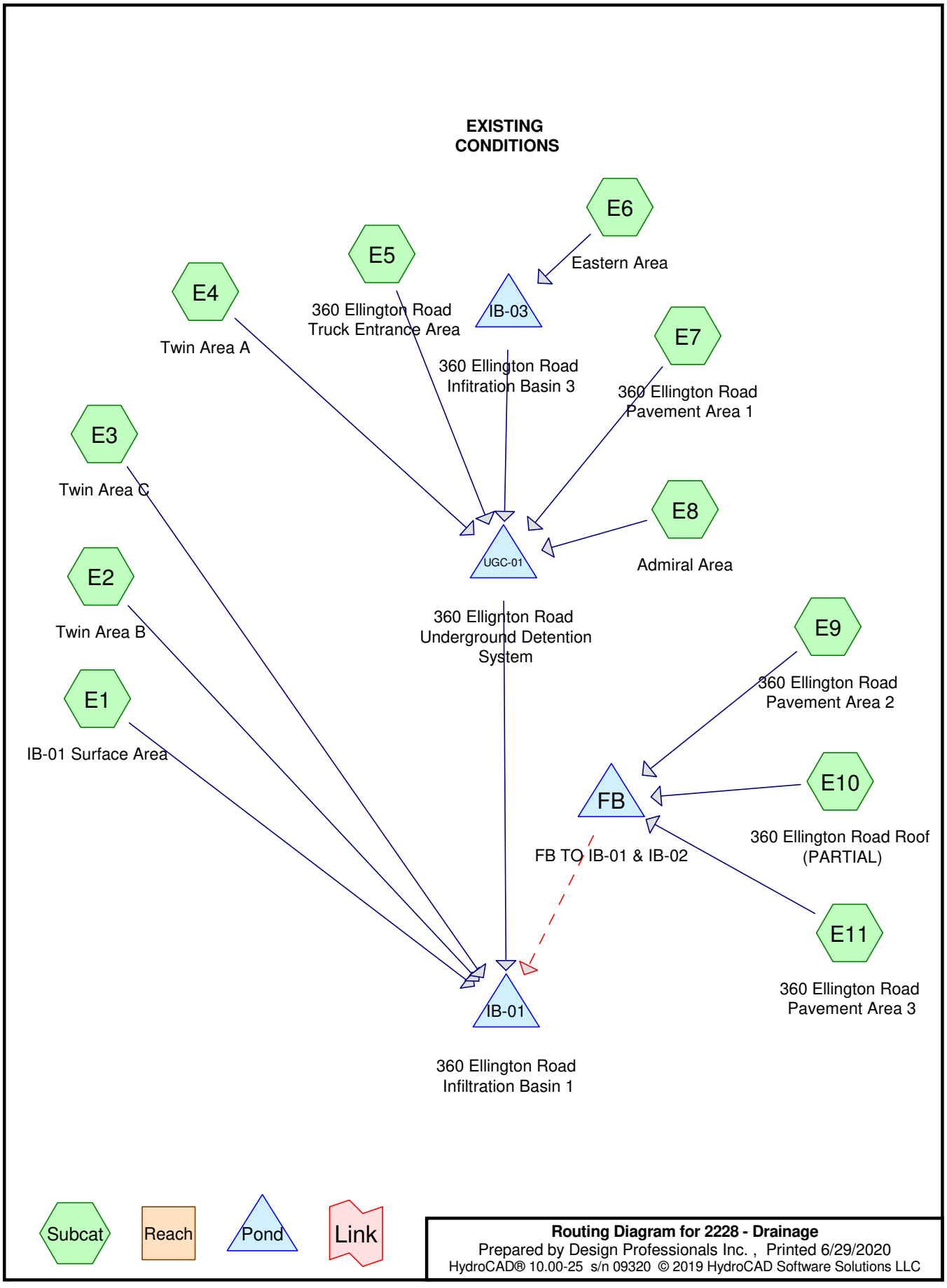
Water Quality

Underground chamber system (UGC-01) was designed with an isolation row capable of treating 80% of the total suspended solids from the 360 Ellington Road site and the north/east portion of Twin Manufacturing. Please refer to the storm water management report titled "Stormwater Management Report ~ 360 Ellington Road Distribution Center ~ 360 Ellington Rd, 245 Chapel Rd & R008 John Fitch Boulevard South Windsor, CT" for more information on that system. The proposed water quality basin at the southern portion of Twin Manufacturing will also provide storage for more than 100% of the determined water quality volume for the new pavement area south of the proposed addition. Water quality volume calculations and stage storage volumes for this depression are included in **Appendix D** of this report.

Conclusion

The proposed stormwater management system as discussed herein and shown on the referenced plans is appropriate for the proposed development on the subject site, is consistent with Town and State requirements, and should not pose any detrimental impacts to the surrounding stormwater conditions.

APPENDIX A
Watershed Computations
(Pre-Development Drainage HydroCAD Report)


EXISTING
CONDITIONS
E6
Eastern Area
E5
360 Ellington Road
Truck Entrance Area
IB-03
E4
Twin Area A
E7
360 Ellington Road
Pavement Area 1
360 Ellington Road
Infitration Basin 3
E3
Twin Area C
E8
Admiral Area
UGC-01
E2
Twin Area B
360 Ellignton Road
Underground Detention
System
E9
360 Ellington Road
Pavement Area 2
E1
IB-01 Surface Area
FB
E10
360 Ellington Road Roof
(PARTIAL)
FB TO IB-01 & IB-02
E11
360 Ellington Road
Pavement Area 3
IB-01
360 Ellington Road
Infiltration Basin 1
Subcat
Reach
Pond
Link
Routing Diagram for 2228 - Drainage
Prepared by Design Professionals Inc. , Printed 6/29/2020
HydroCAD® 10.00-25 s/n 09320 © 2019 HydroCAD Software Solutions LLC

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

Subcatchment E1: IB-01 Surface Area Runoff Area=4.790 ac 0.00% Impervious Runoff Depth>4.37"
Tc=8.0 min CN=71 Runoff=22.96 cfs 1.746 af

Subcatchment E10: 360 Ellington Road Runoff Area=4.834 ac 100.00% Impervious Runoff Depth>7.52"
Tc=6.0 min CN=98 Runoff=36.87 cfs 3.031 af

Subcatchment E11: 360 Ellington Road Runoff Area=6.214 ac 81.49% Impervious Runoff Depth>7.05"
Tc=8.0 min CN=94 Runoff=43.47 cfs 3.648 af

Subcatchment E2: Twin Area B Runoff Area=0.704 ac 66.76% Impervious Runoff Depth>6.81"
Tc=7.0 min CN=92 Runoff=5.01 cfs 0.399 af

Subcatchment E3: Twin Area C Runoff Area=1.940 ac 43.40% Impervious Runoff Depth>6.57"
Tc=7.0 min CN=90 Runoff=13.54 cfs 1.063 af

Subcatchment E4: Twin Area A Runoff Area=1.901 ac 71.65% Impervious Runoff Depth>7.05"
Tc=8.0 min CN=94 Runoff=13.30 cfs 1.116 af

Subcatchment E5: 360 Ellington Road Runoff Area=0.250 ac 100.00% Impervious Runoff Depth>7.52"
Tc=8.0 min CN=98 Runoff=1.78 cfs 0.157 af

Subcatchment E6: Eastern Area Runoff Area=5.040 ac 17.32% Impervious Runoff Depth>5.75"
Tc=10.0 min CN=83 Runoff=29.05 cfs 2.414 af

Subcatchment E7: 360 Ellington Road Runoff Area=0.693 ac 100.00% Impervious Runoff Depth>7.52"
Tc=8.0 min CN=98 Runoff=4.94 cfs 0.434 af

Subcatchment E8: Admiral Area Runoff Area=8.673 ac 76.01% Impervious Runoff Depth>6.45"
Tc=10.0 min CN=89 Runoff=54.33 cfs 4.663 af

Subcatchment E9: 360 Ellington Road Runoff Area=0.544 ac 100.00% Impervious Runoff Depth>7.52"
Tc=8.0 min CN=98 Runoff=3.88 cfs 0.341 af

Pond FB: FB TO IB-01 & IB-02 Peak Elev=56.97' Storage=78,680 cf Inflow=83.32 cfs 7.020 af
Primary=6.35 cfs 0.683 af Secondary=37.08 cfs 5.603 af Outflow=43.43 cfs 6.286 af

Pond IB-01: 360 Ellington Road Peak Elev=55.01' Storage=190,874 cf Inflow=143.29 cfs 14.498 af
Discarded=31.71 cfs 14.497 af Primary=0.00 cfs 0.000 af Outflow=31.71 cfs 14.497 af

Pond IB-03: 360 Ellington Road Infitration Peak Elev=64.38' Storage=0.408 af Inflow=29.05 cfs 2.414 af
Discarded=7.82 cfs 1.968 af Primary=5.79 cfs 0.446 af Outflow=13.45 cfs 2.414 af

Pond UGC-01: 360 Ellignton Road Peak Elev=61.63' Storage=0.606 af Inflow=78.43 cfs 6.816 af
Discarded=1.05 cfs 0.833 af Primary=72.02 cfs 5.688 af Outflow=73.07 cfs 6.521 af

Summary for Pond IB-01: 360 Ellington Road Infiltration Basin 1

Inflow Area = 23.991 ac, 46.19% Impervious, Inflow Depth > 7.25" for 100-yr event
Inflow = 143.29 cfs @ 12.15 hrs, Volume= 14.498 af
Outflow = 31.71 cfs @ 12.95 hrs, Volume= 14.497 af, Atten= 78%, Lag= 48.4 min
Discarded = 31.71 cfs @ 12.95 hrs, Volume= 14.497 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 55.01' @ 12.95 hrs Surf.Area= 68,499 sf Storage= 190,874 cf

Plug-Flow detention time= 41.4 min calculated for 14.497 af (100% of inflow)
Center-of-Mass det. time= 41.4 min (837.1 - 795.7)

Volume	Invert	Avail.Storage	Storage Description
#1	53.00'	274,073 cf	**Exfiltration Area (Conic)** Listed below (Recalc)
#2	53.00'	123,602 cf	**Non Exfiltration Area (Conic)** Listed below (Recalc) -Impervious
		397,675 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
53.00	62,779	0	0	62,779
54.00	65,554	64,161	64,161	65,696
55.00	68,459	67,001	131,163	68,742
56.00	71,412	69,930	201,093	71,840
57.00	74,560	72,980	274,073	75,131

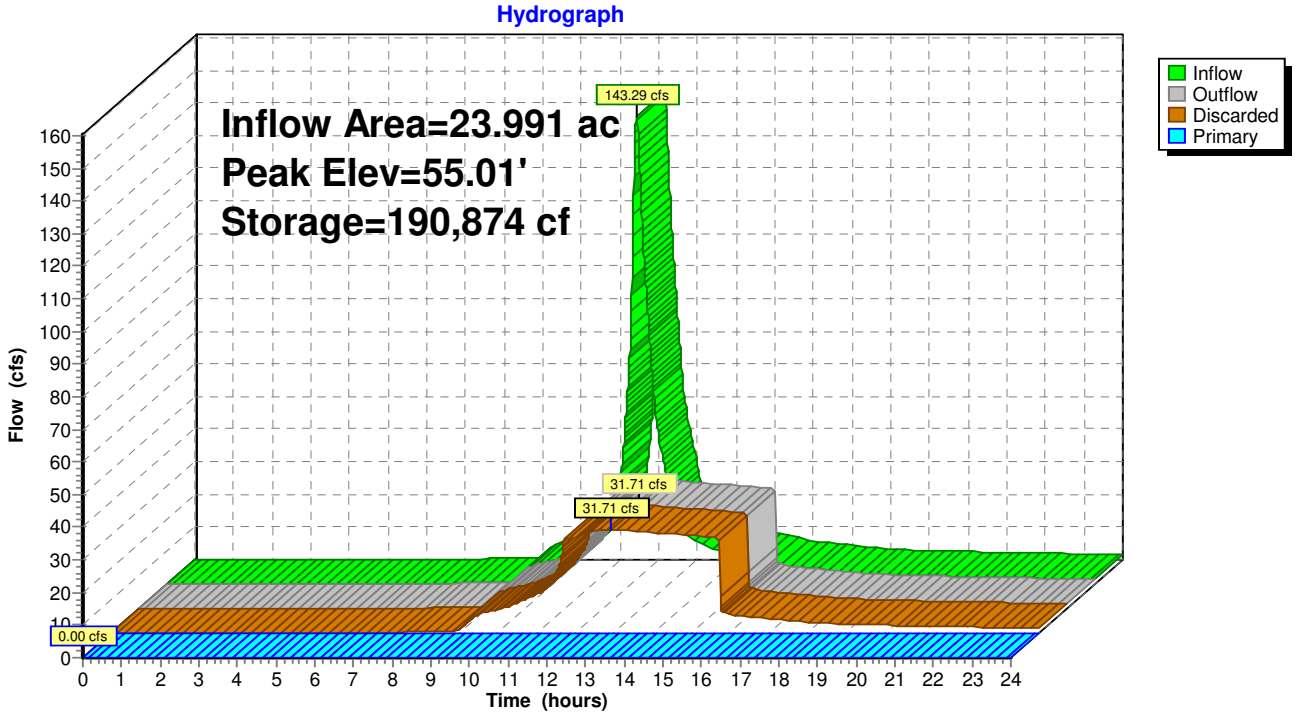
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
53.00	27,612	0	0	27,612
54.00	29,177	28,391	28,391	29,287
55.00	30,749	29,960	58,350	30,975
56.00	32,328	31,535	89,886	32,674
57.00	35,123	33,716	123,602	35,544

Device	Routing	Invert	Outlet Devices
#1	Discarded	53.00'	**20.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	48.81'	**36.0" Round 36" HDPE** L= 81.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 48.81' / 48.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#3	Device 2	56.60'	**70.0" W x 20.0" H Vert. "C-L" CB DOUBLE TYPE 2 X 2.00** C= 0.600

Discarded OutFlow Max=31.71 cfs @ 12.95 hrs HW=55.01' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 31.71 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=53.00' (Free Discharge)
↑**2=36" HDPE** (Passes 0.00 cfs of 55.52 cfs potential flow)
↑**3="C-L" CB DOUBLE TYPE 2** (Controls 0.00 cfs)

Pond IB-01: 360 Ellington Road Infiltration Basin 1



Summary for Pond UGC-01: 360 Ellignton Road Underground Detention System

Inflow Area = 16.557 ac, 59.01% Impervious, Inflow Depth > 4.94" for 100-yr event
Inflow = 78.43 cfs @ 12.13 hrs, Volume= 6.816 af
Outflow = 73.07 cfs @ 12.17 hrs, Volume= 6.521 af, Atten= 7%, Lag= 2.6 min
Discarded = 1.05 cfs @ 12.17 hrs, Volume= 0.833 af
Primary = 72.02 cfs @ 12.17 hrs, Volume= 5.688 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 61.63' @ 12.17 hrs Surf.Area= 0.180 ac Storage= 0.606 af

Plug-Flow detention time= 45.6 min calculated for 6.521 af (96% of inflow)
Center-of-Mass det. time= 20.9 min (794.7 - 773.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	57.00'	0.287 af	**37.58'W x 208.37'L x 6.75'H Field A** 1.213 af Overall - 0.495 af Embedded = 0.718 af x 40.0% Voids
#2A	57.75'	0.495 af	**ADS_StormTech MC-4500 +Cap** x 200 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 200 Chambers in 4 Rows Cap Storage= +35.7 cf x 2 x 4 rows = 285.6 cf
		0.783 af	Total Available Storage

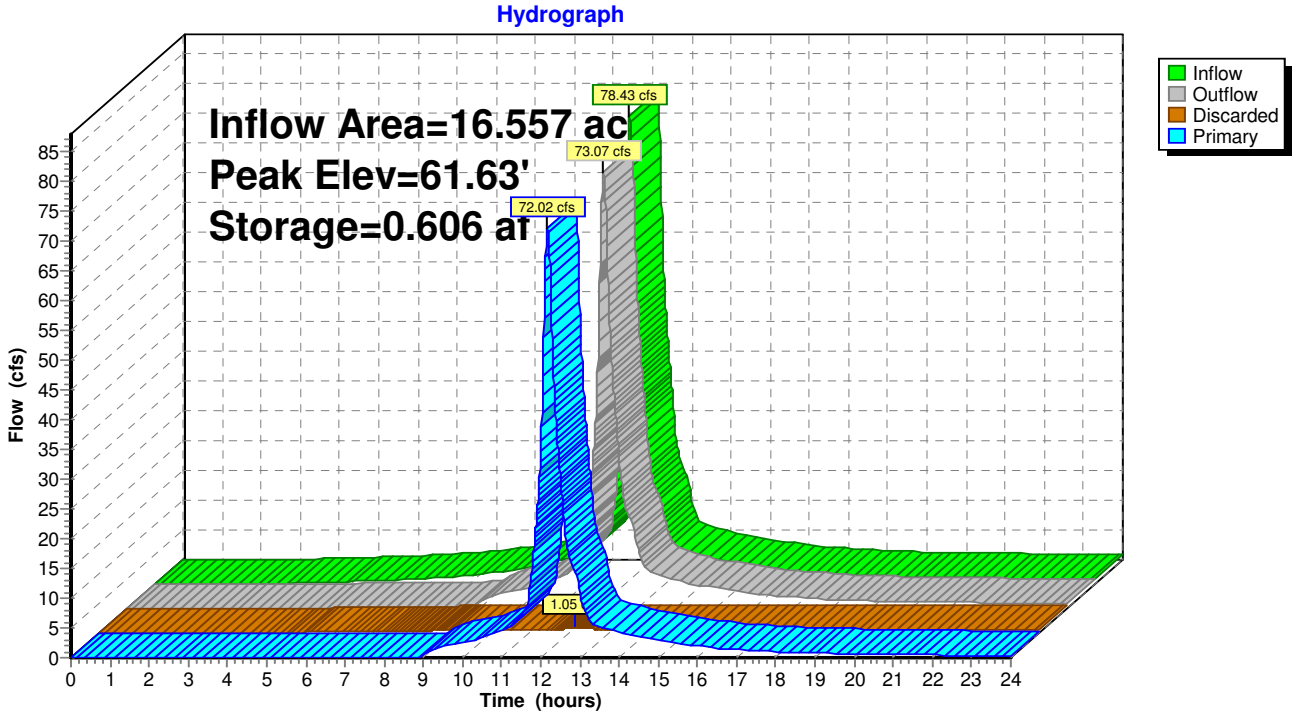
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	57.00'	**20.000 in/hr Exfiltration over Wetted area above 57.00'** Excluded Wetted area = 0.180 ac Phase-In= 0.01'
#2	Primary	59.21'	**24.0" Round Culvert X 4.00** L= 150.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 59.21' / 58.09' S= 0.0075 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf

Discarded OutFlow Max=1.05 cfs @ 12.17 hrs HW=61.63' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 1.05 cfs)

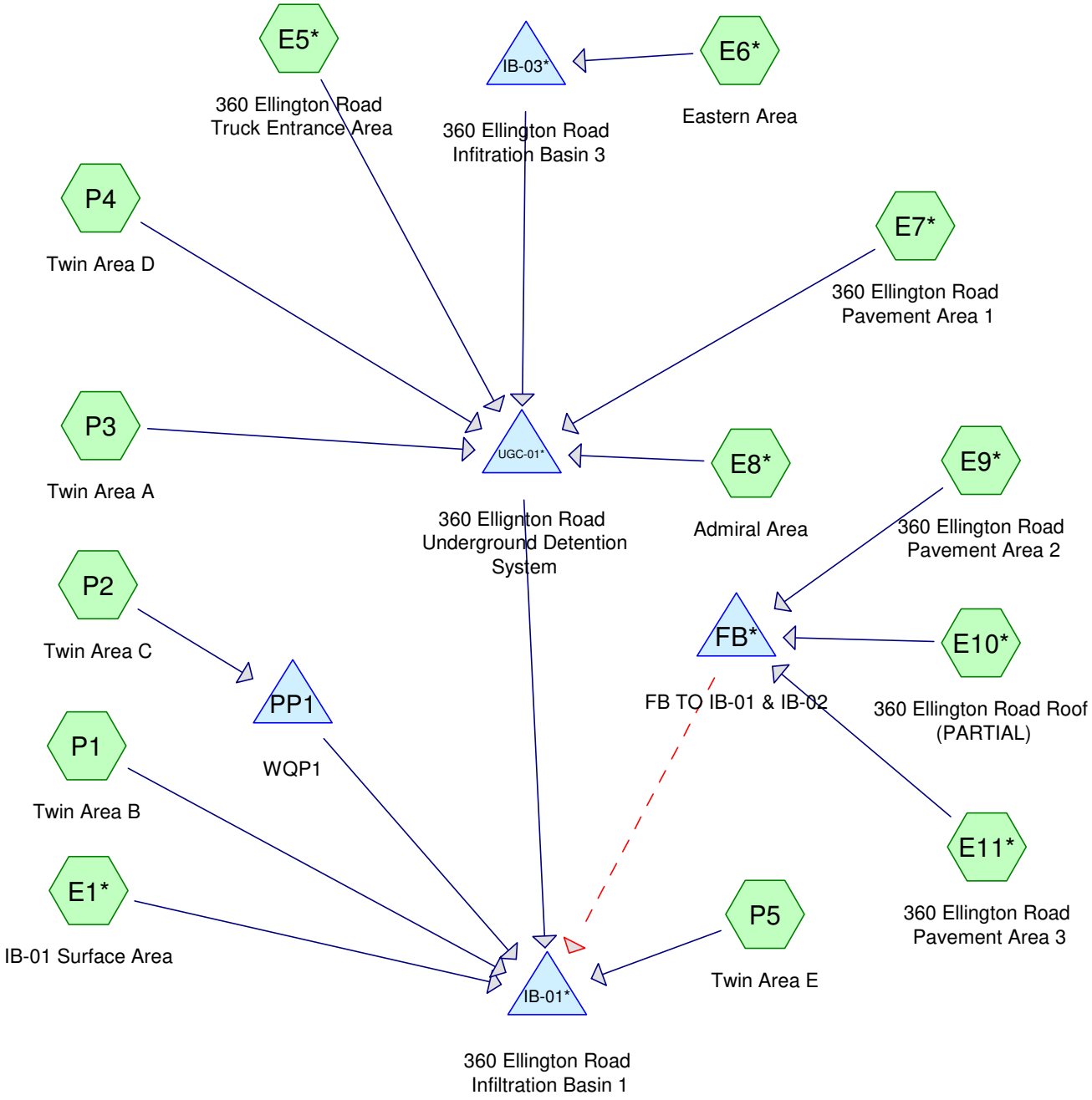
Primary OutFlow Max=71.99 cfs @ 12.17 hrs HW=61.63' TW=53.84' (Dynamic Tailwater)
↑**2=Culvert** (Inlet Controls 71.99 cfs @ 5.73 fps)

Pond UGC-01: 360 Ellignton Road Underground Detention System



APPENDIX B
Watershed Computations
(Post-Development Drainage HydroCAD Report)

PROPOSED CONDITIONS



Subcat Reach Pond Link

Routing Diagram for 2228 - Drainage
Prepared by Design Professionals Inc. , Printed 6/29/2020

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

Subcatchment E1*: IB-01 Surface Area Runoff Area=4.790 ac 0.00% Impervious Runoff Depth>4.37"
Tc=8.0 min CN=71 Runoff=22.96 cfs 1.746 af

Subcatchment E10*: 360 Ellington Road Runoff Area=4.834 ac 100.00% Impervious Runoff Depth>7.52"
Tc=6.0 min CN=98 Runoff=36.87 cfs 3.031 af

Subcatchment E11*: 360 Ellington Road Runoff Area=6.214 ac 81.49% Impervious Runoff Depth>7.05"
Tc=8.0 min CN=94 Runoff=43.47 cfs 3.648 af

Subcatchment E5*: 360 Ellington Road Runoff Area=0.250 ac 100.00% Impervious Runoff Depth>7.52"
Tc=8.0 min CN=98 Runoff=1.78 cfs 0.157 af

Subcatchment E6*: Eastern Area Runoff Area=5.040 ac 17.32% Impervious Runoff Depth>5.75"
Tc=10.0 min CN=83 Runoff=29.05 cfs 2.414 af

Subcatchment E7*: 360 Ellington Road Runoff Area=0.693 ac 100.00% Impervious Runoff Depth>7.52"
Tc=8.0 min CN=98 Runoff=4.94 cfs 0.434 af

Subcatchment E8*: Admiral Area Runoff Area=8.673 ac 76.01% Impervious Runoff Depth>6.45"
Tc=10.0 min CN=89 Runoff=54.33 cfs 4.663 af

Subcatchment E9*: 360 Ellington Road Runoff Area=0.544 ac 100.00% Impervious Runoff Depth>7.52"
Tc=8.0 min CN=98 Runoff=3.88 cfs 0.341 af

Subcatchment P1: Twin Area B Runoff Area=0.704 ac 68.75% Impervious Runoff Depth>6.93"
Tc=7.0 min CN=93 Runoff=5.05 cfs 0.406 af

Subcatchment P2: Twin Area C Runoff Area=1.624 ac 60.53% Impervious Runoff Depth>6.81"
Tc=7.0 min CN=92 Runoff=11.56 cfs 0.921 af

Subcatchment P3: Twin Area A Runoff Area=1.358 ac 85.35% Impervious Runoff Depth>7.17"
Tc=7.0 min CN=95 Runoff=9.88 cfs 0.811 af

Subcatchment P4: Twin Area D Runoff Area=0.543 ac 37.38% Impervious Runoff Depth>6.45"
Tc=8.0 min CN=89 Runoff=3.63 cfs 0.292 af

Subcatchment P5: Twin Area E Runoff Area=0.316 ac 16.46% Impervious Runoff Depth>6.10"
Tc=7.0 min CN=86 Runoff=2.10 cfs 0.161 af

Pond FB*: FB TO IB-01 & IB-02 Peak Elev=56.97' Storage=78,680 cf Inflow=83.32 cfs 7.020 af
Primary=6.35 cfs 0.683 af Secondary=37.08 cfs 5.603 af Outflow=43.43 cfs 6.286 af

Pond IB-01*: 360 Ellington Road Peak Elev=54.91' Storage=180,744 cf Inflow=133.60 cfs 14.045 af
Discarded=31.57 cfs 14.044 af Primary=0.00 cfs 0.000 af Outflow=31.57 cfs 14.044 af

Pond IB-03*: 360 Ellington Road Infitration Peak Elev=64.38' Storage=0.408 af Inflow=29.05 cfs 2.414 af
Discarded=7.82 cfs 1.968 af Primary=5.79 cfs 0.446 af Outflow=13.45 cfs 2.414 af

Pond PP1: WQP1 Peak Elev=64.55' Storage=20,884 cf Inflow=11.56 cfs 0.921 af
Outflow=6.35 cfs 0.454 af

Pond UGC-01*: 360 Ellignton Road Peak Elev=61.62' Storage=0.605 af Inflow=78.30 cfs 6.803 af
Discarded=1.05 cfs 0.832 af Primary=71.89 cfs 5.676 af Outflow=72.94 cfs 6.508 af

Summary for Pond IB-01*: 360 Ellington Road Infiltration Basin 1

Inflow Area = 23.991 ac, 47.06% Impervious, Inflow Depth > 7.03" for 100-yr event
Inflow = 133.60 cfs @ 12.15 hrs, Volume= 14.045 af
Outflow = 31.57 cfs @ 12.96 hrs, Volume= 14.044 af, Atten= 76%, Lag= 48.2 min
Discarded = 31.57 cfs @ 12.96 hrs, Volume= 14.044 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 54.91' @ 12.96 hrs Surf.Area= 68,199 sf Storage= 180,744 cf

Plug-Flow detention time= 39.3 min calculated for 14.038 af (100% of inflow)
Center-of-Mass det. time= 39.2 min (839.3 - 800.1)

Volume	Invert	Avail.Storage	Storage Description
#1	53.00'	274,073 cf	**Exfiltration Area (Conic)** Listed below (Recalc)
#2	53.00'	123,602 cf	**Non Exfiltration Area (Conic)** Listed below (Recalc) -Impervious
		397,675 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
53.00	62,779	0	0	62,779
54.00	65,554	64,161	64,161	65,696
55.00	68,459	67,001	131,163	68,742
56.00	71,412	69,930	201,093	71,840
57.00	74,560	72,980	274,073	75,131

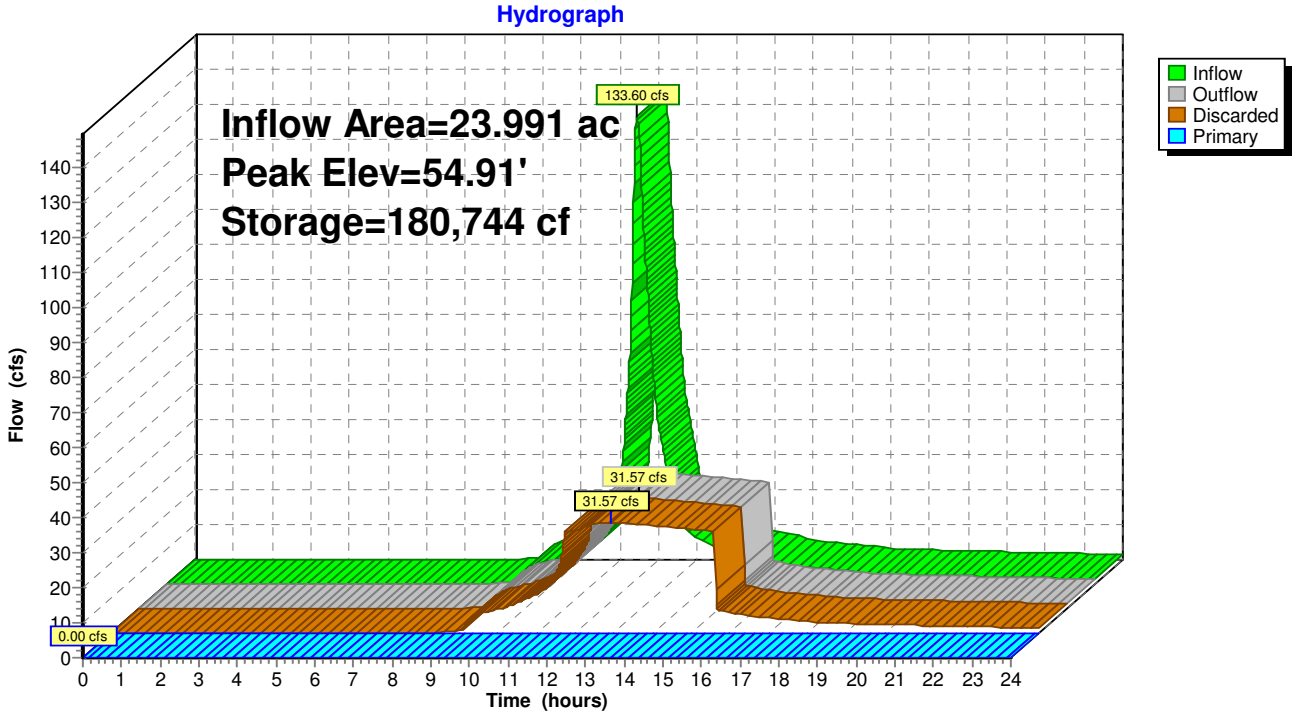
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
53.00	27,612	0	0	27,612
54.00	29,177	28,391	28,391	29,287
55.00	30,749	29,960	58,350	30,975
56.00	32,328	31,535	89,886	32,674
57.00	35,123	33,716	123,602	35,544

Device	Routing	Invert	Outlet Devices
#1	Discarded	53.00'	**20.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	48.81'	**36.0" Round 36" HDPE** L= 81.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 48.81' / 48.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#3	Device 2	56.60'	**70.0" W x 20.0" H Vert. "C-L" CB DOUBLE TYPE 2 X 2.00** C= 0.600

Discarded OutFlow Max=31.57 cfs @ 12.96 hrs HW=54.91' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 31.57 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=53.00' (Free Discharge)
↑**2=36" HDPE** (Passes 0.00 cfs of 55.52 cfs potential flow)
↑**3="C-L" CB DOUBLE TYPE 2** (Controls 0.00 cfs)

Pond IB-01*: 360 Ellington Road Infiltration Basin 1



Summary for Pond PP1: WQP1

Inflow Area = 1.624 ac, 60.53% Impervious, Inflow Depth > 6.81" for 100-yr event
Inflow = 11.56 cfs @ 12.10 hrs, Volume= 0.921 af
Outflow = 6.35 cfs @ 12.23 hrs, Volume= 0.454 af, Atten= 45%, Lag= 8.1 min
Primary = 6.35 cfs @ 12.23 hrs, Volume= 0.454 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 64.55' @ 12.23 hrs Surf.Area= 10,807 sf Storage= 20,884 cf

Plug-Flow detention time= 241.7 min calculated for 0.454 af (49% of inflow)
Center-of-Mass det. time= 122.3 min (892.5 - 770.1)

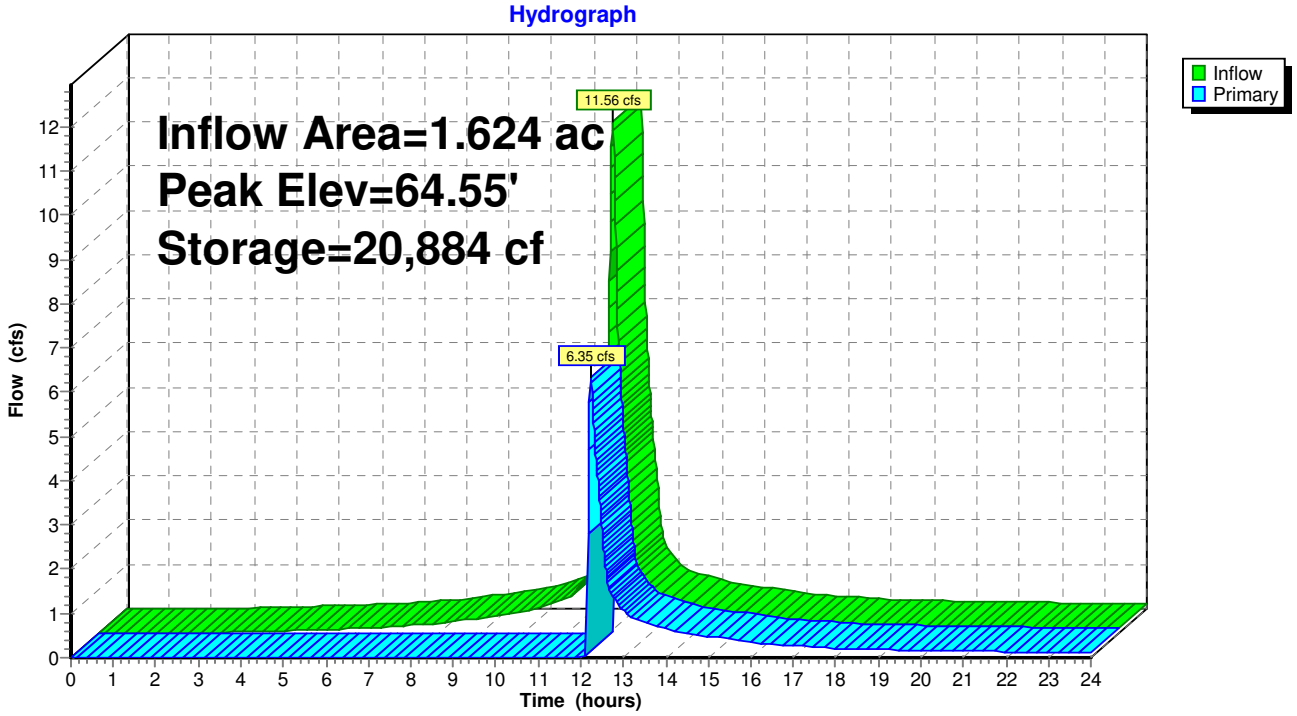
Volume	Invert	Avail.Storage	Storage Description
#1	62.00'	26,004 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
62.00	6,150	0	0
63.00	7,659	6,905	6,905
64.00	9,227	8,443	15,348
65.00	12,086	10,657	26,004

Device	Routing	Invert	Outlet Devices
#1	Primary	64.50'	**195.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=6.34 cfs @ 12.23 hrs HW=64.55' TW=53.98' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 6.34 cfs @ 0.62 fps)

Pond PP1: WQP1



Summary for Pond UGC-01*: 360 Ellignton Road Underground Detention System

Inflow Area = 16.557 ac, 59.01% Impervious, Inflow Depth > 4.93" for 100-yr event
Inflow = 78.30 cfs @ 12.12 hrs, Volume= 6.803 af
Outflow = 72.94 cfs @ 12.17 hrs, Volume= 6.508 af, Atten= 7%, Lag= 2.6 min
Discarded = 1.05 cfs @ 12.17 hrs, Volume= 0.832 af
Primary = 71.89 cfs @ 12.17 hrs, Volume= 5.676 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 61.62' @ 12.17 hrs Surf.Area= 0.180 ac Storage= 0.605 af

Plug-Flow detention time= 45.5 min calculated for 6.505 af (96% of inflow)
Center-of-Mass det. time= 20.8 min (794.9 - 774.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	57.00'	0.287 af	**37.58'W x 208.37'L x 6.75'H Field A** 1.213 af Overall - 0.495 af Embedded = 0.718 af x 40.0% Voids
#2A	57.75'	0.495 af	**ADS_StormTech MC-4500 +Cap** x 200 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 200 Chambers in 4 Rows Cap Storage= +35.7 cf x 2 x 4 rows = 285.6 cf
		0.783 af	Total Available Storage

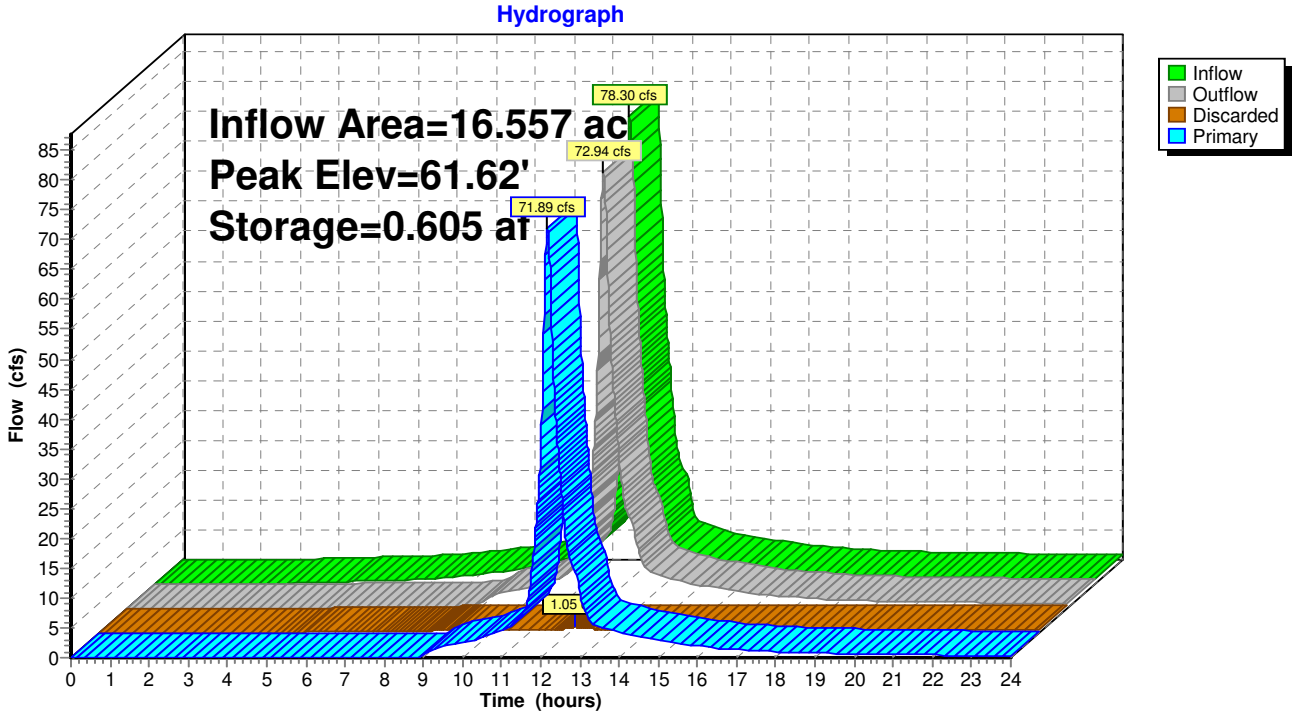
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	57.00'	**20.000 in/hr Exfiltration over Wetted area above 57.00'** Excluded Wetted area = 0.180 ac Phase-In= 0.01'
#2	Primary	59.21'	**24.0" Round Culvert X 4.00** L= 150.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 59.21' / 58.09' S= 0.0075 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf

Discarded OutFlow Max=1.05 cfs @ 12.17 hrs HW=61.62' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.05 cfs)

Primary OutFlow Max=71.84 cfs @ 12.17 hrs HW=61.62' TW=53.73' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 71.84 cfs @ 5.72 fps)

Pond UGC-01*: 360 Ellington Road Underground Detention System



APPENDIX C
NRCS Soil Map & Data

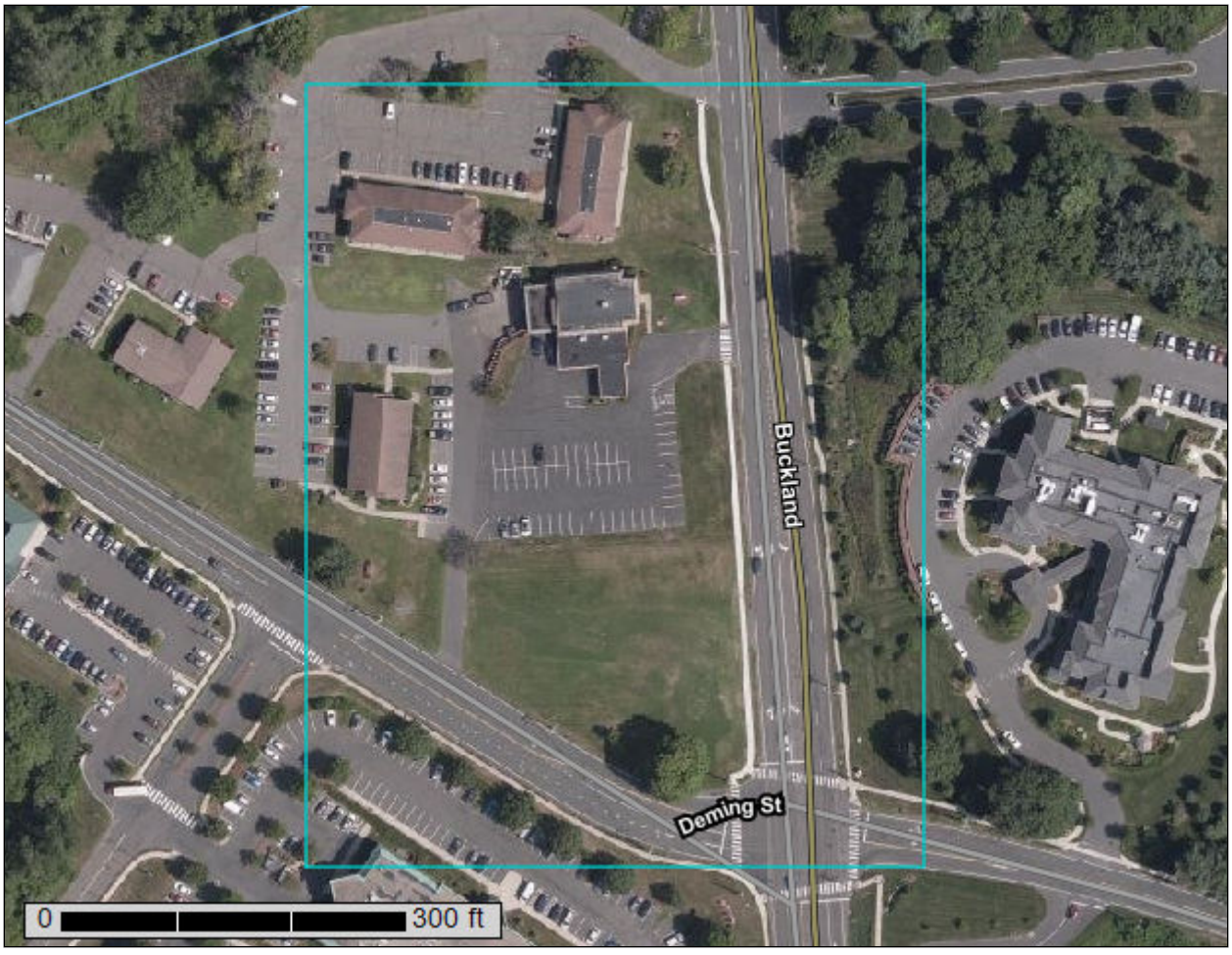
United States Department of Agriculture

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



February 11, 2020

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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

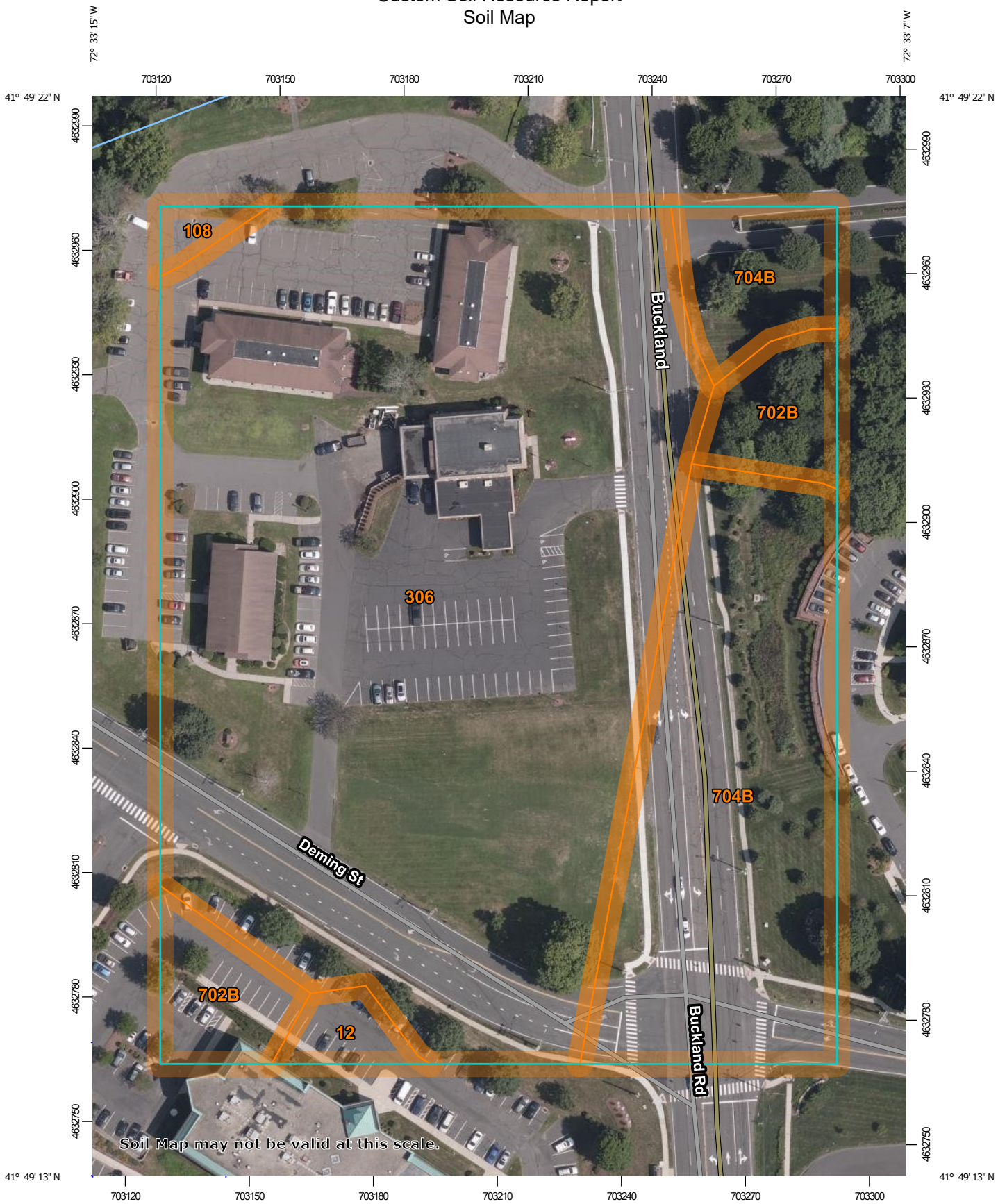
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:1,270 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

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
Survey Area Data: Version 19, Sep 13, 2019

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

Date(s) aerial images were photographed: Jul 15, 2019—Aug 29, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12	Raypol silt loam	0.1	1.3%
108	Saco silt loam	0.1	0.7%
306	Udorthents-Urban land complex	5.7	67.7%
702B	Tisbury silt loam, 3 to 8 percent slopes	0.5	5.9%
704B	Enfield silt loam, 3 to 8 percent slopes	2.0	24.4%
Totals for Area of Interest		**8.4**	**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

12—Raypol silt loam

Map Unit Setting

National map unit symbol: 9ljx
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: Farmland of statewide importance

Map Unit Composition

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

Description of Raypol

Setting

Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

Ap - 0 to 8 inches: silt loam
Bg1 - 8 to 12 inches: very fine sandy loam
Bg2 - 12 to 20 inches: silt loam
Bw1 - 20 to 26 inches: silt loam
Bw2 - 26 to 29 inches: very fine sandy loam
2C1 - 29 to 52 inches: stratified very gravelly coarse sand to loamy fine sand
2C2 - 52 to 65 inches: stratified very gravelly coarse sand to loamy fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

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

Enfield
Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Ninigret
Percent of map unit: 3 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

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

Tisbury
Percent of map unit: 2 percent
Landform: Outwash plains, terraces
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

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

Unnamed, loamy substratum
Percent of map unit: 1 percent

108—Saco silt loam

Map Unit Setting
National map unit symbol: 9ljv

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: Not prime farmland

Map Unit Composition

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

Description of Saco

Setting

Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-silty alluvium

Typical profile

A - 0 to 12 inches: silt loam
Cg1 - 12 to 32 inches: silt loam
Cg2 - 32 to 48 inches: silt loam
2Cg3 - 48 to 60 inches: stratified very gravelly coarse sand to loamy fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Available water storage in profile: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Lim

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Limerick

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave

Hydric soil rating: Yes

Winooski

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

Rippowam

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Hadley

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Bash

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

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: 35 percent
Minor components: 15 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: Drift

Typical profile

A - 0 to 5 inches: loam
C1 - 5 to 21 inches: gravelly loam
C2 - 21 to 80 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural 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: About 54 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

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: 8 percent
Hydric soil rating: No

Udorthents, wet substratum

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

Rock outcrop

Percent of map unit: 2 percent
Hydric soil rating: No

702B—Tisbury silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2y07h
Elevation: 0 to 1,260 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Tisbury

Setting

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

Typical profile

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

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 24 to 36 inches to strongly contrasting textural stratification
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

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

Hydric soil rating: No

Minor Components

Agawam

Percent of map unit: 5 percent
Landform: Outwash plains, kame terraces, outwash terraces, kames, moraines
Landform position (two-dimensional): Backslope, shoulder, footslope, summit, toeslope
Landform position (three-dimensional): Side slope, crest, head slope, nose slope, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Merrimac

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

Ninigret

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

Raypol

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

704B—Enfield silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2y07q
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

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

Description of Enfield

Setting

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

Typical profile

Ap - 0 to 7 inches: silt loam
Bw1 - 7 to 15 inches: silt loam
Bw2 - 15 to 25 inches: silt loam
2C - 25 to 60 inches: stratified very gravelly coarse sand to loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 16 to 39 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Haven

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

Tisbury

Percent of map unit: 5 percent
Landform: Valley trains, outwash terraces, outwash plains, deltas
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave

Hydric soil rating: No

Agawam

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

Raypol

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

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:

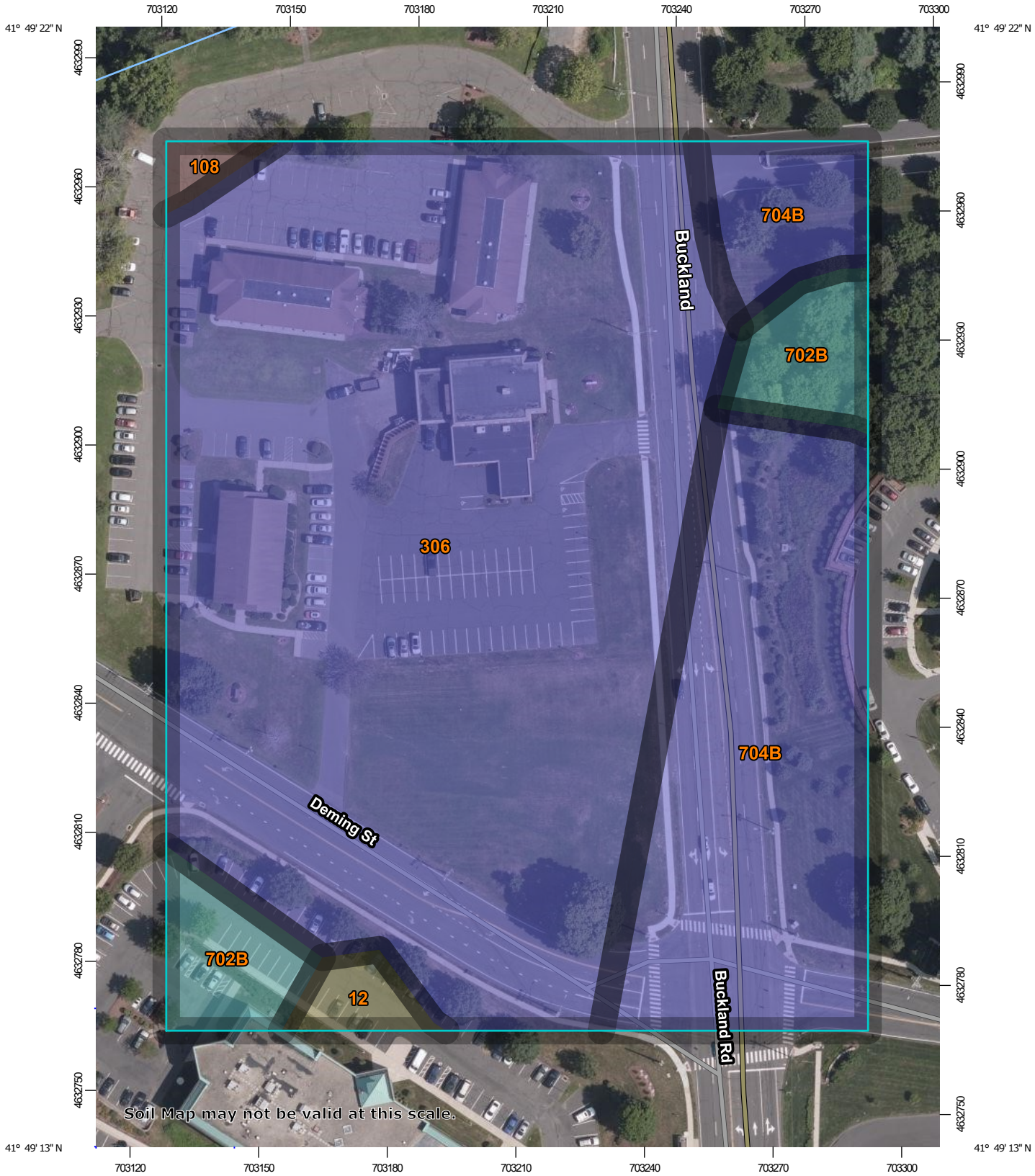
Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

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.



Map Scale: 1:1,270 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

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
Survey Area Data: Version 19, Sep 13, 2019

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

Date(s) aerial images were photographed: Jul 15, 2019—Aug 29, 2019

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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
12	Raypol silt loam	C/D	0.1	1.3%
108	Saco silt loam	B/D	0.1	0.7%
306	Udorthents-Urban land complex	B	5.7	67.7%
702B	Tisbury silt loam, 3 to 8 percent slopes	C	0.5	5.9%
704B	Enfield silt loam, 3 to 8 percent slopes	B	2.0	24.4%
Totals for Area of Interest			**8.4**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

APPENDIX D
Water Quality Calculations

273 Chapel Road – DPI Project No.:2228
June 26, 2020

Water Quality Volume Calculations
Per 2004 Connecticut Stormwater Quality Manual, Section 7.4.1:

Areas for Calculation: On Site to Water Quality Basin PP1 (P2)

	P2
Impervious	0.983
Pervious	0.641
Total Area	1.624
%Impervious	60.53%

Water Quality Volume (WQV) = (1")(R)(A)/12, where:

R = unitless volumetric runoff coefficient = 0.05 + 0.009(I), where:
I = percent impervious cover of drainage area = 60.53%
R = 0.05 + 0.009(I)
R = 0.05 + 0.009(60.53)
R = 0.595

A = drainage area in acres = 1.624 acres

WQV = (1")(R)(A acres)/12 inches per foot
WQV = (1")(0.595)(1.624 acres)/12 inches per foot
WQV = 0.08 acre-feet required = 3,498 cft

Proposed BMP
The proposed forebay is proposed to provide **32,691 cft** (below orifice at Elev. 56.00). The forebay will provide storage for **228.4%** of the determined water quality volume draining to the basin.

273 Chapel Road – DPI Project No.:2228
June 17, 2020

Water Quality Volume Calculations
Per 2004 Connecticut Stormwater Quality Manual, Section 7.4.1:

Areas for Calculation: On Site to Forebay (P2)

	P2
Impervious	0.983
Pervious	0.641
Total Area	1.624
%Impervious	60.53%

Water Quality Volume (WQV) = (1")(R)(A)/12, where:

R = unitless volumetric runoff coefficient = 0.05 + 0.009(I), where:
I = percent impervious cover of drainage area = 60.53%
R = 0.05 + 0.009(I)
R = 0.05 + 0.009(60.53)
R = 0.614

A = drainage area in acres = 0.534 acres

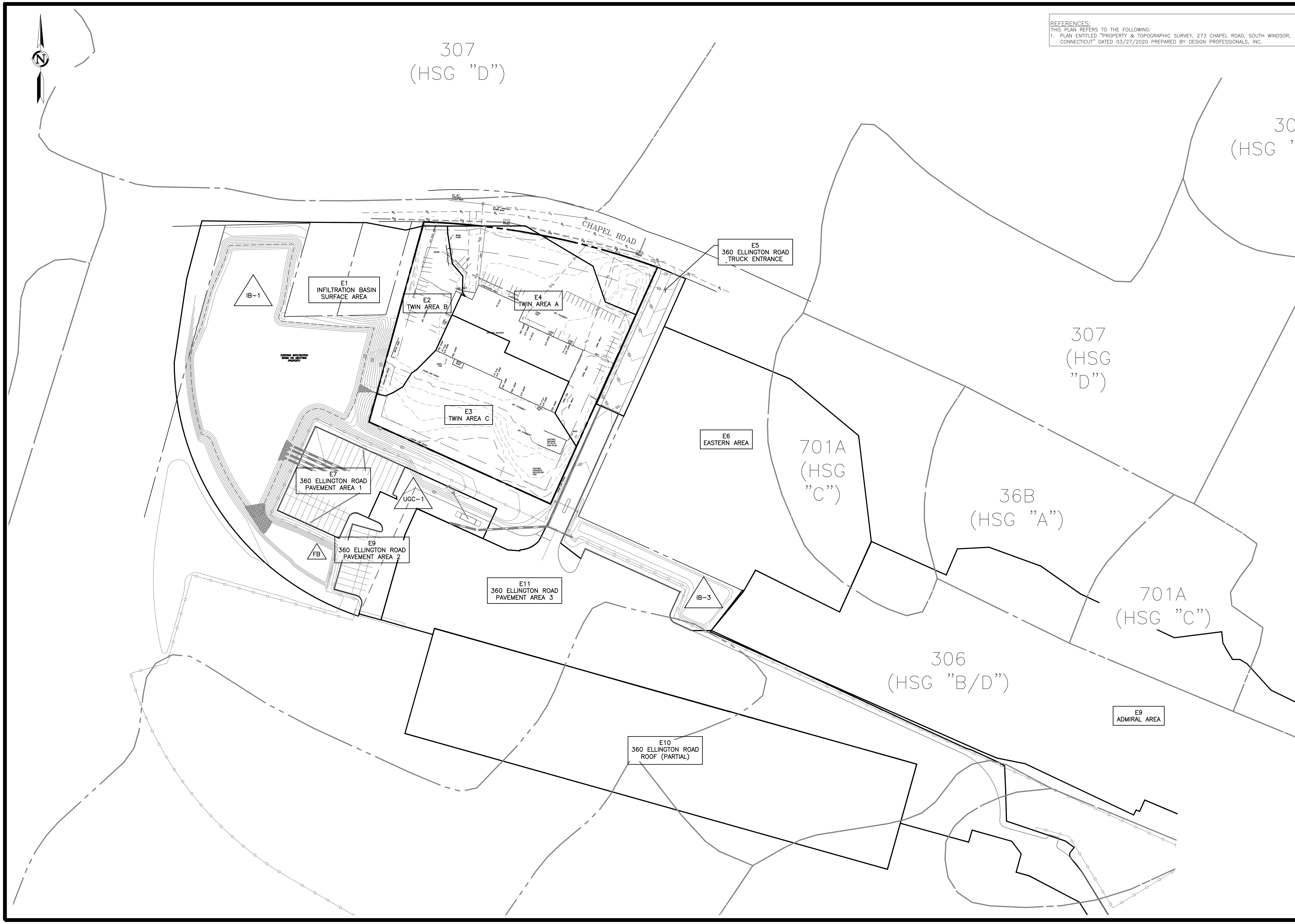
WQV = (1")(R)(A acres)/12 inches per foot
WQV = (1")(0.595)(1.624 acres)/12 inches per foot
WQV = 0.03 acre-feet required = 3,498 cft

Proposed BMP
The proposed forebay is proposed to provide **32,691 cft** (below orifice at Elev. 56.00). The forebay will provide storage for **228.4%** of the determined water quality volume draining to the basin.

Stage-Area-Storage for Pond PP1: WQP1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
62.00	6,150	0
62.05	6,225	309
62.10	6,301	623
62.15	6,376	939
62.20	6,452	1,260
62.25	6,527	1,585
62.30	6,603	1,913
62.35	6,678	2,245
62.40	6,754	2,581
62.45	6,829	2,920
62.50	6,905	3,264
62.55	6,980	3,611
62.60	7,055	3,962
62.65	7,131	4,316
62.70	7,206	4,675
62.75	7,282	5,037
62.80	7,357	5,403
62.85	7,433	5,773
62.90	7,508	6,146
62.95	7,584	6,523
63.00	7,659	6,905
63.05	7,737	7,289
63.10	7,816	7,678
63.15	7,894	8,071
63.20	7,973	8,468
63.25	8,051	8,868
63.30	8,129	9,273
63.35	8,208	9,681
63.40	8,286	10,094
63.45	8,365	10,510
63.50	8,443	10,930
63.55	8,521	11,354
63.60	8,600	11,782
63.65	8,678	12,214
63.70	8,757	12,650
63.75	8,835	13,090
63.80	8,913	13,533
63.85	8,992	13,981
63.90	9,070	14,433
63.95	9,149	14,888
64.00	9,227	15,348
64.05	9,370	15,812
64.10	9,513	16,284
64.15	9,656	16,764
64.20	9,799	17,250
64.25	9,942	17,744
64.30	10,085	18,244
64.35	10,228	18,752
64.40	10,371	19,267
64.45	10,514	19,789
64.50	10,657	20,318
64.55	10,799	20,855
64.60	10,942	21,398
64.65	11,085	21,949
64.70	11,228	22,507
64.75	11,371	23,072
64.80	11,514	23,644
64.85	11,657	24,223
64.90	11,800	24,810
64.95	11,943	25,403
65.00	**12,086**	**26,004**

APPENDIX E
Drainage Area Maps



21 JEFFREY DRIVE
P.O. BOX 1167
SOUTH WINDSOR, CT 06074
860-291-8755 – T
860-291-8757 – F
www.designprofessionalsinc.com

design professionals INC
CIVIL & TRAFFIC ENGINEERS / LAND SURVEYORS
PLANNERS / LANDSCAPE ARCHITECTS

- This plan is invalid unless it bears the seal or stamp, and original signature of the Professional Engineer, Land Surveyor, or Landscape Architect
- Reproduction techniques used in the production of this plan can stretch or shrink the paper. Scaling of this drawing may be inaccurate. Contact DPI if additional information is required.
- This plan and other items prepared by Design Professionals, Inc. (DPI) are instruments of service and remain its property. The use of these items by DPI's client is subject to the terms set forth in the agreement between client and DPI. Additional use of these items is prohibited without the written consent of DPI.

PREPARED FOR:
Daniel Peach, President
Twin Manufacturing Co.
273 Chapel Road
South Windsor, CT 06074
860-289-6041 T

PROJECT NO.:	2228
DATE:	6/26/2020
DESIGN BY:	DHJ
DRAWN BY:	REM
CHECKED BY:	DHJ

TWIN MANUFACTURING SITE PLAN MODIFICATION
273 CHAPEL ROAD
SOUTH WINDSOR, CONNECTICUT
GIS #18000273

REVISIONS

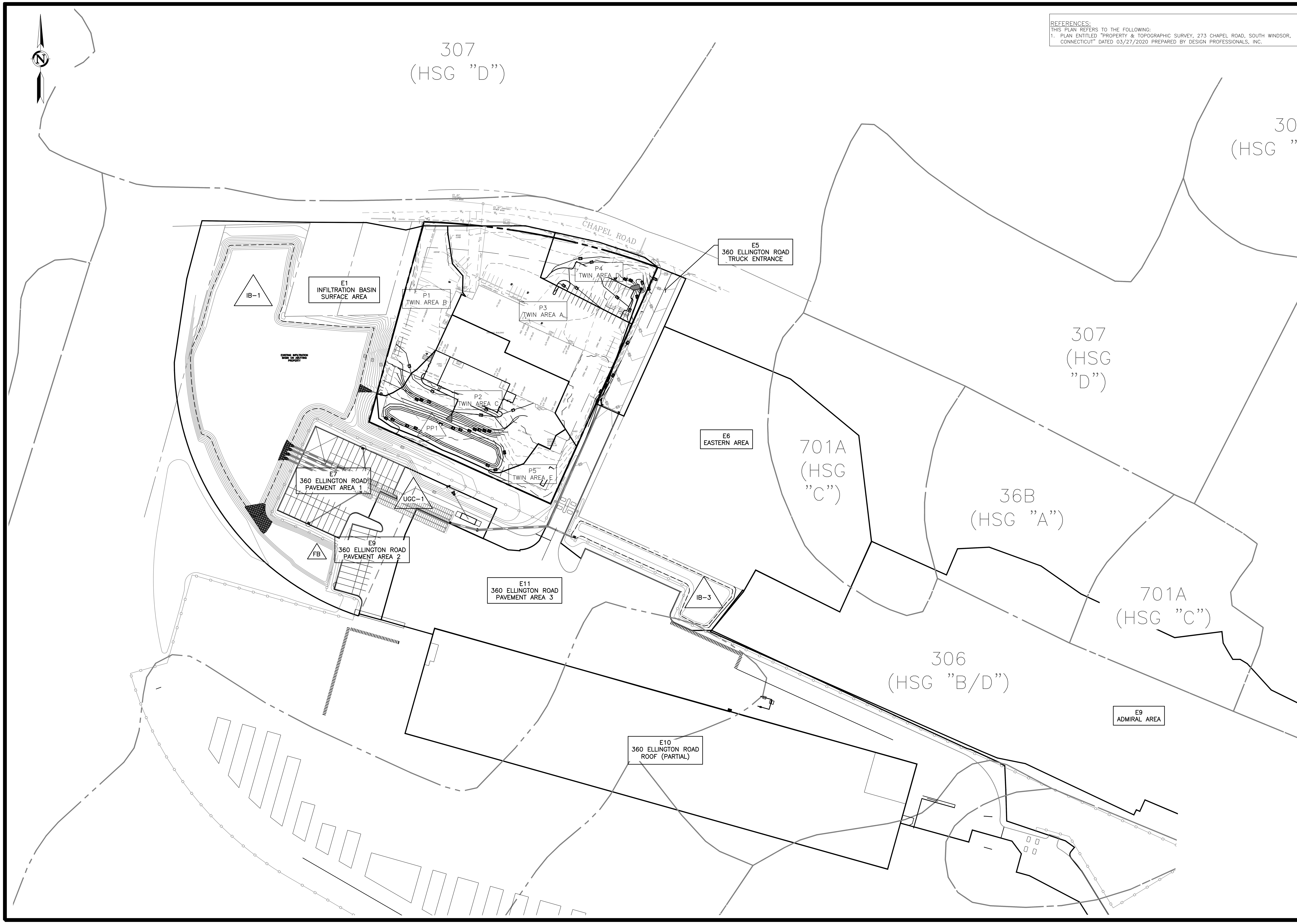
NO.	DATE	REVISIONS	BY

EXISTING DRAINAGE AREA MAP

SCALE: 1" = 80' (0, 40', 80', 160')

SHEET
C-DA1
SHEET 1 OF 2

File: C:\jobs\2228\Engineering\Stormwater\2228 – Drainage.dwg Layout: 01 C-DA1 Plotted: 6/26/2020 11:42 AM Last Saved: 6/26/2020 11:41 AM Last Saved By: danieljameson



REFERENCES:
THIS PLAN REFERS TO THE FOLLOWING:
1. PLAN ENTITLED "PROPERTY & TOPOGRAPHIC SURVEY, 273 CHAPEL ROAD, SOUTH WINDSOR, CONNECTICUT" DATED 03/27/2020 PREPARED BY DESIGN PROFESSIONALS, INC.

Design Professionals INC
CIVIL & TRAFFIC ENGINEERS / LAND SURVEYORS
PLANNERS / LANDSCAPE ARCHITECTS
21 JEFFREY DRIVE
P.O. BOX 1167
SOUTH WINDSOR, CT 06074
860-291-8755 – T
860-291-8757 – F
www.designprofessionalsinc.com

PREPARED FOR:
Daniel Peach, President
Twin Manufacturing Co.
273 Chapel Road
South Windsor, CT 06074
860-289-6041 T

PROJECT NO: 2228
DATE: 6/26/2020
DESIGN BY: DHJ
DRAWN BY: REM
CHECKED BY: DHJ

TWIN MANUFACTURING SITE PLAN MODIFICATION

273 CHAPEL ROAD
SOUTH WINDSOR, CONNECTICUT
GIS #18000273

NO.	DATE	REVISIONS	BY

EXISTING DRAINAGE AREA MAP

SCALE: 1" = 80'
0 40' 80' 160'

SHEET
C-DA2
SHEET 2 OF 2

File: C:\Jobs\2228\Engineering\Stormwater\2228 – Drainage.dwg Layout: 01 C-DA2 Plotted: 6/29/2020 7:01 PM Last Saved: 6/29/2020 6:44 PM Last Saved By: danieljameson