Storm Water Management Report

Exchange Place

57 Main Street
Marlborough, MA

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SECTION 1: Hydrologic Design Criteria

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1. **DESIGN STORMS:** Both the existing and proposed conditions were analyzed for the 2, 10, 25 and 100-year storm frequencies. The rainfalls used for the above storms were 3.2, 4.5, 5.5 and 7.0 inches, respectively. The rainfall distribution used for each of the storms was a SCS type III, 24-hour rainfall distribution.

2. **METHODOLOGY:** The HYDROCAD Stormwater Modeling Software was used to calculate the runoff and route the hydrographs through the Stormwater system. This Program uses the hydrology techniques developed by the Soil Conservation Services (SCS) now the Natural Resource Conservation Services (NRCS). The runoff values were derived by the SCS unit hydrograph procedure.

3. **HYDROLOGIC SOIL GROUP:** NRCS mapping defined the onsite soil to be comprised of Charlton Urban Land Complex sandy loam soils at the rear half of the property. The front half of the property has been classified by NRCS as Urban Land with no HSG value. This soil type is classified with a Hydrologic Soil Group (HSG) range from HSG 'A' –'D' . The NRCS soil surveys are mapped at 1:25,000 and include the following statement *"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 a map unit boundaries may be evident."* On site soil testing revealed a top layer of fill that ranged from 40" to 74" deep throughout the property. This fill is representative of a HSG 'C' soil; therefore, HSG 'C' was used for the stormwater calculations.

4. **RUNOFF:** The quantity of rainfall that was calculated as runoff was based on (1) soil types and associated hydrologic soil classification, (2) the area of existing and proposed impervious and pervious surfaces; i.e. driveways, and man-made and natural surface slopes.

SECTION 2: Summary and Conclusions

SECTION 2: Summary & Conclusion

The performance objective was achieved to maintain the peak runoff rates at or below existing conditions rates, provide Stormwater treatment to remove TSS and groundwater recharge.

The table below summarizes compliance with Standard #2 for Post Development Peak Discharge Rates, and provides a comparison between peak rate of runoff for existing and proposed conditions.

TABLE 4-1: PEAK FLOW (CFS)				
DESIGN POINT	**2 YR**	**10YR**	**25YR**	**100YR**
TOTAL				
-EXISTING	1.88	3.10	4.04	5.47
-PROPOSED	1.81	2.56	3.12	5.22
% REDUCTION (TOTAL)	4%	17%	23%	5%

The flow values given in the above table were taken from the HYDROCAD calculations in Appendix “E”

APPENDIX A
DEP Stormwater Management Standards

Documentation & Calculations for DEP Stormwater Management Policy Standards

This project will meet the Stormwater Management Standards. The proposed Best Management Practices (BMP's) will reduce and improve the water quality leaving the site. The following stormwater management standards pertain to the DEP Stormwater Policy.

Standard #1-Untreated Stormwater

This development project and was designed to not discharge untreated contaminated stormwater into, or cause erosion to wetlands or waters of the Commonwealth to the maximum extent practicable. Standards #2, 5-10 have been fully met and Standards #1, #3 and #4 have been met to the maximum extent practicable. The 2400 SF court patio will be permeable pavers for groundwater recharge.

Standard #2-Post Development Peak Discharge Rates

All performance requirements for this standard have been met. Refer to summary and conclusions in Section 4 of this report where runoff flow summaries for both existing and proposed conditions are given.

Standard #3-Recharge To Groundwater

The 2400 SF court patio will be permeable pavers for groundwater recharge.
In accordance with Table 'RR' of Volume #1, Chapter 1 of the Massachusetts Stormwater Handbook " *Required recharge volume must be infiltrated to the maximum extent practicable, if: The site is comprised wholly of C and D soils and bedrock at the land surface…."* This site falls into the aforementioned soil classification and is a redevelopment project that is under one acre.

Standard #4 (Water Quality)

Project TSS removal has been maximized to remove as much of TSS as practicable. Installation of a proprietary TSS removal structure (CDS Hydrodynamic Separator) will treat 22,334 SF of roof runoff. Additional TSS removal will be provided along Hill & Exchange Streets where 3 existing inline CB's will be converted to DMH's and 3 Double and 1 single catch basins will be connected to the converted DMH's. So 25% TSS removal will be removed from both Street flows where no removal is provided currently. The 3 Detention tanks include 2 FT sumps with a total of 347 CF(2596 Gallon) sump volume for additional TSS removal. Refer to the TSS removal calculations on the next page.

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

57 MAIN
MARLBOROUGH, MA

Area	0.51 ac	Unit Site Designation	WQU
Weighted C	0.9	Rainfall Station #	68
t_c	6 min		
CDS Model	1515-3	CDS Treatment Capacity	1.0 cfs

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	9.3%	9.3%	0.01	0.01	9.0
0.04	9.5%	18.8%	0.02	0.02	9.1
0.06	8.7%	27.5%	0.03	0.03	8.3
0.08	10.1%	37.6%	0.04	0.04	9.5
0.10	7.2%	44.8%	0.05	0.05	6.7
0.12	6.0%	50.8%	0.06	0.06	5.6
0.14	6.3%	57.1%	0.06	0.06	5.9
0.16	5.6%	62.7%	0.07	0.07	5.2
0.18	4.7%	67.4%	0.08	0.08	4.3
0.20	3.6%	71.0%	0.09	0.09	3.3
0.25	8.2%	79.1%	0.12	0.12	7.3
0.50	14.9%	94.0%	0.23	0.23	12.2
0.75	3.2%	97.3%	0.35	0.35	2.4
1.00	1.2%	98.5%	0.46	0.46	0.8
1.50	0.7%	99.2%	0.69	0.69	0.4
2.00	0.8%	100.0%	0.92	0.92	0.3
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
					90.2
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**83.7%**

1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Project: 57 Main
Location: Marlborough, MA
Prepared For: Bruce Saluk & Associates

Purpose: To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1" of runoff from the contributing impervious surface.

Reference: Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Procedure: Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi^2/watershed inches (csm/in).

Compute Q Rate using the following equation:

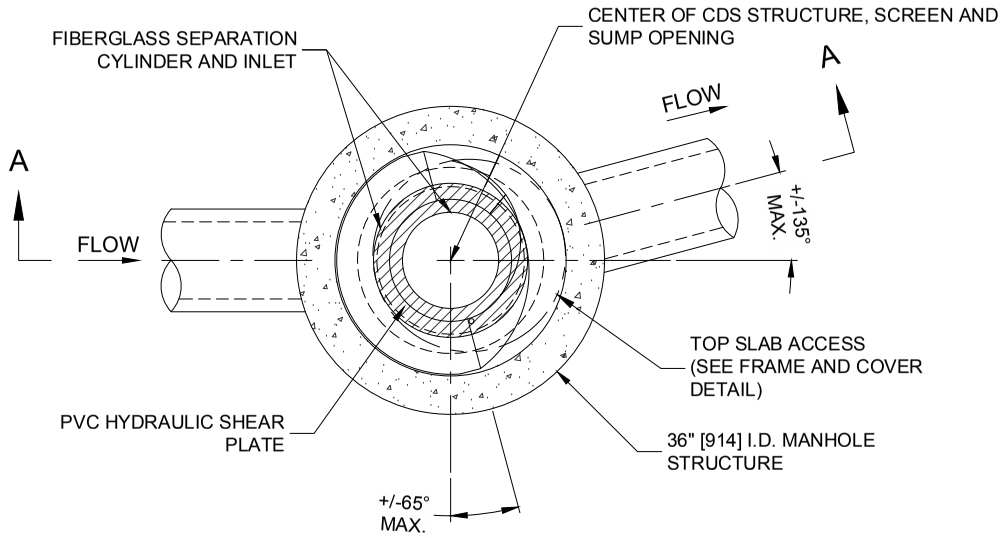
$$Q = (qu)\ (A)\ (WQV)$$

where:

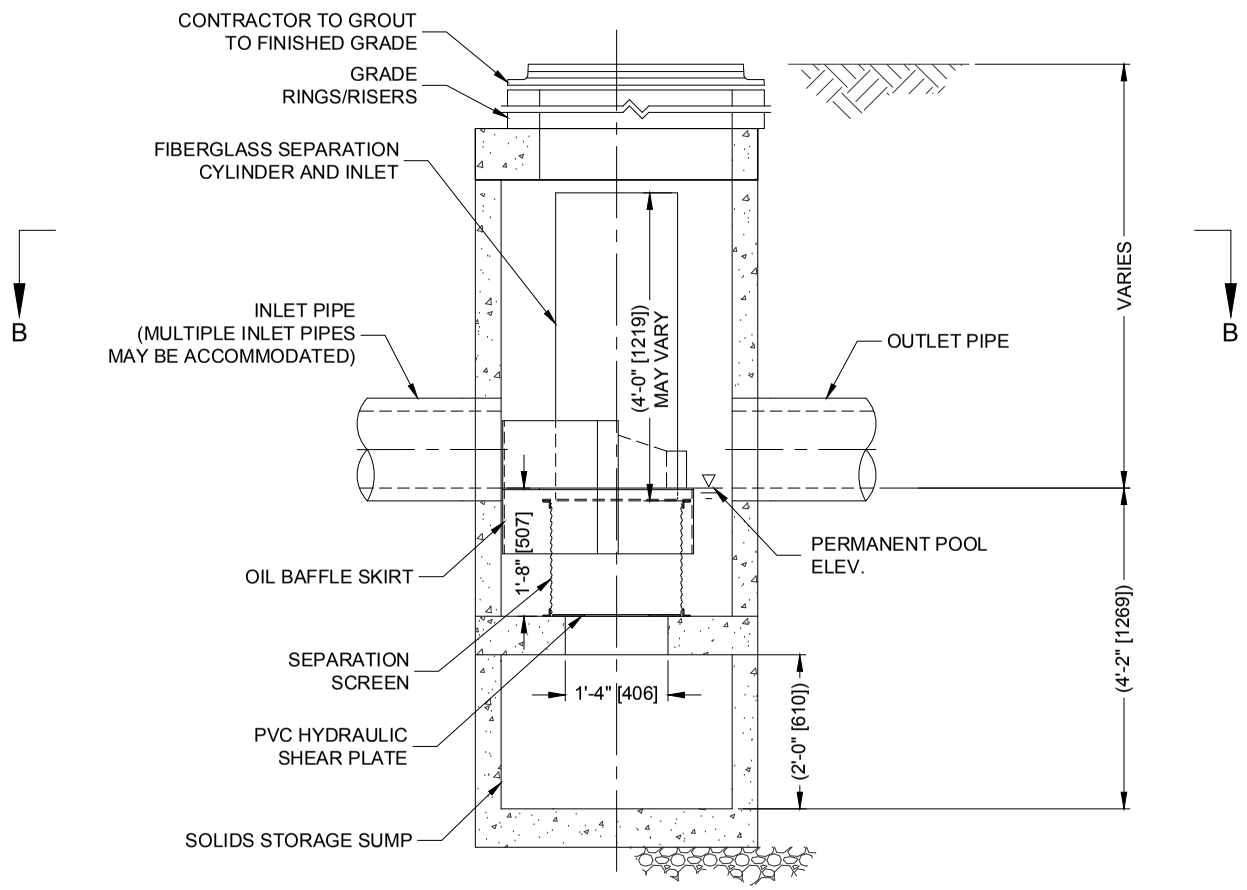
Q = flow rate associated with first 1" of runoff
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area (in square miles)
WQV = water quality volume in watershed inches (1" in this case)

Structure Name	Impv. (acres)	A (miles^2)	t_c (min)	t_c (hr)	WQV (in)	qu (csm/in.)	Q (cfs)
WQU	0.51	0.0008011	6.0	0.100	1.00	774.00	0.62

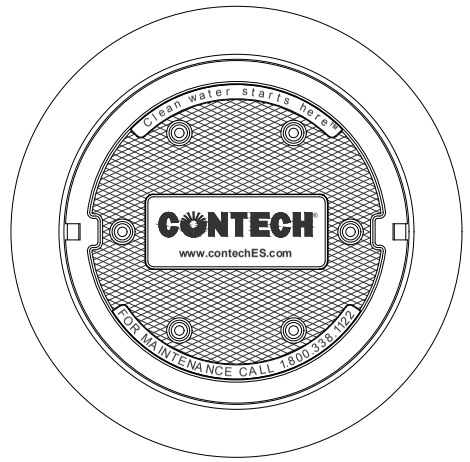
The WQf sizing calculation selects the minimum size CDS/Cascade/StormCeptor model capable of operating at the computed WQf peak flowrate prior to bypassing. It assumes free discharge of the WQf through the unit and ignores the routing effect of any upstream storm drain piping. As with all hydrodynamic separators, there will be some impact to the Hydraulic Gradient of the corresponding drainage system, and evaluation of this impact should be considered in the design.



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

CDS1515-3-C DESIGN NOTES

CDS1515-3-C RATED TREATMENT CAPACITY IS 1.0 CFS, OR PER LOCAL REGULATIONS.

THE STANDARD CDS1515-3-C CONFIGURATION IS SHOWN.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO..
5. IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
6. CDS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
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CDS1515-3-C ONLINE CDS STANDARD DETAIL

Standard #5 Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

This project land use is not subject to higher pollution control requirements

Standard #6 (Protection of Critical Areas)

The project is not located near a Critical area.

Standard #7 (Redevelopment)

This site is a redevelopment project on a property that is under 1 Acre. Standards #2, 5-10 have been fully met and Standards #1, #3 and #4 have been met to the maximum extent practicable.

Standard #8 (Erosion /Sediment Control)

This standard has been fully met. Refer to the "Construction Period Operation and Maintenance Plan" included in Appendix 'C'

Standard #9 (Operation & Maintenance Plan)

This standard has been fully met. Refer to the Long Term Pollution Prevention & Operation and Maintenance Plan in Appendix "B"

Standard #10 (Illicit Discharge Compliance Statement)

This standard has been fully met. The applicant will submit an illicit discharge compliance statement prior to the discharge of any stormwater to post-development BMP's.

APPENDIX B:

Long Term Pollution Prevention, Operation and Maintenance Plan

LONG TERM POLLUTION PREVENTION, OPERATION AND MAINTENANCE PLAN

-STANDARDS 4,9 &10-

For

#57 Main Street
Marlborough, MA

The following items are intended as a guideline for continued maintenance of the storm drain system, permeable pavers and site after construction. There may be other measures that should be applied to certain drainage appurtenances not mentioned herein. Therefore, the applicant, followed by the future users of the Stormwater system should be updating this plan on an as needed basis. The responsible party shall issue a copy of this Long-Term Pollution Prevention, Operation and Maintenance Plan to each of the Companies that will be providing site services for this project, Landscaping, inspection , maintenance work, infrastructure work, property management, etc..

Responsible Party for the Operation, Maintenance & Financing repairs

The responsible party will be the property owner

Inspection and Maintenance Requirements

The applicant and future occupant shall be responsible to retain and pay for inspectional services by a designated person that is qualified and approved to perform such inspectional services. The responsible party shall also pay the maintenance and repair cost. After each inspection, the inspector shall complete the inspection report forms. These reports shall be kept for future review by Federal, State or Local authorities. The frequency of the inspections shall be as updated to the amended DEP Stormwater Management Regulations. Refer to the stated inspection frequency requirements listed on each attached inspection form.

The estimated annual operation & Maintenance Budget for the Stormwater system is $1500

The inspection and maintenance outlined below shall be followed and submitted by the inspector to the owner and the Conservation Commission Officer and the City Engineer by June 1st of each year.

Erosion

Significant erosion along slopes shall be protected with engineered soil reinforcement, jute mesh, ground cover and/or erosion control, as approved.

Detention Tanks

Inspection of the tanks shall determine if the 4ftx4ft outlet control structure located in the center tank is clear of debris and sediment. This includes review the orifice, the 4'x4' weir wall and the 15" diameter outlet pipe. All 3 tanks have a sump below the lowest orifice for the purpose of settlement of suspended solids. The sumps should be cleaned of sediment and debris once the sediment depth reaches ½ the sump depth. To prevent muddy water from entering the downstream municipal system during cleaning, the tanks should be dewatered prior to cleaning to a sufficient depth that prevents water from leaving the tanks during cleaning.

Good House Keeping Practices & Illicit Discharge Prevention

Inspections of the entire site and shall identify and report to the owner any erosion, pollution, and accumulation of any unsuitable material on the site. The inspector shall note and report any sign of an illicit discharge on the property. These illicit discharges may include spills, wastewater discharges, illegal pipe connections to the storm water system, oil and grease. The owner shall hire a qualified Company to fulfill recommendations by the inspector for cleanup and illicit discharge elimination.

All hazardous waste materials discovered will be disposed of in the manner specified by local and state regulation. The owner will be responsible for seeing that these procedures are followed.

Snow removal, Deicing Treatment & Storage Operations

Snow disposal, if required, shall be in accordance with Mass DEP Guideline No. BRPG01-01 requirements. Salt application shall be minimal and shall only be used where necessary. The use of sodium Chloride (NaCl) is prohibited. Storage of Roadway deicing salt shall be offsite. Snow quantities in excess of onsite storage capacity shall be removed from the site by the snow removal contractor.

Accidental Spill Containment & Proper Disposal

The company providing the cleanup services for the spill shall follow public safety practices and cordon off the spill containment work zone for the protection of the public.

Spills of toxic or hazardous material will be reported to the appropriate State or local government agency, regardless of the size.

Storage of Materials and Waste

Long term storage of waste or trash that is harmful to the groundwater and wetland resources is prohibited. Such waste shall be immediately removed from the property by a licensed contractor. Garbage shall be stored inside the building and removal shall be by a commercial trash removal company.

Permeable Concrete Pavers

Minimize salt application and winter sanding. Vacuum sweeping permeable pavers is required as outlined in the inspection form. Replacement of top layers of joint stone should be done in accordance with the requirements of the inspection report.

The inspector shall report all inspections and make recommendations to the owner for actions and maintenance deemed necessary by the inspector.

The above recommendations are applicable to project completion with 100% established vegetative cover and are not intended for construction progress measures.

Vehicle Washing

Vehicle washing is not allowed and shall instead be at commercial car washing facility that already has Environmental controls in place.

Pet Waste Disposal Practices

The property manager shall implement a mandatory policy for pet waste control that includes use of dog waste bags, containment and removal.

Fertilizers, Herbicides, Pesticides and Fungicides

It is recommended that the common application of fertilizers, herbicides, pesticides and fungicides be restricted, and only used on a limited basis in the approved application zone as follows: Application for such chemicals shall only be used on a limited basis. Applications of chemicals shall be applied in a manner that prevents the chemical from being washed down gradient of the application zone, e.g., fertilizer shall be worked into the soil to prevent washout.

INSPECTION REPORT No.____

#57 Main Street
Marlborough, MA

INSPECTION DATE:

INSPECTOR:

1) WATER QUALITY/DETENTION TANKS

The inspector shall refer to the narrative. Inspection frequency shall be once per year.

COMMENTS & RECOMMENDATIONS:

_____
_____
_____
_____

MEASUREMENTS: _____

SIGNS OF ILLICIT DISCHARGES: YES NO
REMOVAL OF SEDIMENT AND /OR DEBRIS REQUIRED: YES NO
IS THE ORIFICE, 4'X4' WEIR AND 15" OUTLET PIPE IN THE CENTER TANK CLEAR OF DEBRIS? _____
HAS THE SEDIMENT DEPTH ANY OF THE SUMPS IN THE 3 TANKS REACHED ½ THE SUMP DEPTH: _____
DATE ACTION TAKEN: _____
PERFORMED BY: _____

2) STORMWATER TREATMENT UNIT:

The procedures and Inspection & maintenance shall follow the manual entitled " CDS Inspection & Maintenance Guide", by Contech at wwww.conteches.com
Inspection frequency shall be 2 times per year for the first 2 years following construction, then no less than once per year thereafter, or as recommended by the manufacturer, whichever occurs more often.

COMMENTS & RECOMMENDATIONS: _____
_____
_____
_____
_____
_____
_____

OBSERVATIONS: _____

CLEANING REQUIRED: YES NO
DATE CLEANED: _____

PERFORMED BY: _____

3) PERMEABLE CONCRETE PAVERS:

Inspection frequency: quarterly

The inspector shall refer to the narrative. The frequency of required vacuum shall be recommended by the inspector followed by each inspection.

COMMENTS & RECOMMENDATIONS: _____
_____
_____
_____
_____
_____
_____

MEASUREMENTS: _____

VACUUM CLEANING REQUIRED: YES NO
JOINT AGGREGATE REPLACEMENT REQUIRED: YES NO

DATE CLEANED: _____

PERFORMED BY: _____

4) EROSION
The inspector shall refer to the narrative. Inspection frequency shall be once per year.

COMMENTS & RECOMMENDATIONS: _____
_____
_____
_____
_____
_____

MEASUREMENTS: _____

CLEANING REQUIRED: YES NO
DATE CLEANED: _____
PERFORMED BY: _____

5) GOOD HOUSE KEEPING & PREVENTION OF ILLICIT DISCHARGES:

The inspector shall refer to the narrative.
Inspection frequency: once per year

COMMENTS & RECOMMENDATIONS: _____
_____
_____
_____
_____
_____

MEASUREMENTS: _____

CLEANING REQUIRED: YES NO
DATE CLEANED: _____

PERFORMED BY: _____

6) PAVEMENT SWEEPING:

The inspector shall refer to the narrative.
Inspection: twice per year

COMMENTS & RECOMMENDATIONS: _____
_____
_____
_____
_____
_____
_____

MEASUREMENTS: _____

CLEANING REQUIRED: YES NO
DATE CLEANED: _____

PERFORMED BY: _____

APPENDIX C:

Construction Period Operation & Maintenance Plan

Construction Pollution Prevention & Erosion/Sedimentation Control Plan

- #57 Main Street- Marlborough, MA-
-STANDARD #8-

Purpose:

The following provides the Construction Period Sequencing, Erosion/ Sedimentation measures, Operation, Maintenance & Pollution Prevention in accordance with Standard #8.

Narrative of surface water flow through the site and receiving downstream resource areas:

The surface runoff enters the municipal drain system that flows in a southerly direction to the Sudbury Reservoir in Southborough.

Responsible Party for Compliance to the Construction Pollution Prevention & Erosion/Sedimentation Control Plan:

The responsible party will be the property owner(s).

Construction Sequencing:

Refer to the general contractor's construction sequence for both the demolition and construction stages.

Throughout the construction period the contractor shall provide erosion control operation, Maintenance & Pollution Prevention Measures in accordance with Standard #8, outlined below.

Erosion and Sedimentation Controls:

Structural Practices

<u>Wattles & Siltation Fencing</u>
Siltation fencing with wattles to be installed to protect the abutting properties, Exchange Street and Main Street. All Erosion control shall be maintained throughout the course of construction until the site has been fully stabilized. The contractor shall have additional straw bales, siltation fencing available to address washouts and other emergencies.

Additional straw bales and siltation fence shall be stored at the site for quick access and reinforcement of selected sections of the erosion control line where necessary.

Exposed Slopes

On exposed slopes, mechanical cultivation of soils shall include grooves created by dozer treads set perpendicular to the slope direction. On long slopes, runoff shall be directed via swales to temporary sedimentation traps where directed by the construction manager.

Demolition, Clearing and Grubbing

Soil stripping shall be done to minimize soil tracking and site erosion. The site superintendent shall implement soil striping if the exposed soil is or will soon become eroded or tracked by vehicles. It is recommended that stripping & stockpile of soils be done in stages to minimize the amount overall exposed soils. Soil stabilization measures shall be implemented immediately after finish grading.

Temporary Sedimentation Traps

Provide sedimentation containment intended for short-term use (overnight to several months). Temporary sedimentation containment can be produced by an excavated depression, or with an impoundment berm. The sediment containment area shall include a dewatering filtration system that treats water before discharge.

Dewatering

Excavated areas, trenches and sediment traps that require dewatering shall not be discharged without treatment. Acceptable practices will include the use of filtration bags and/or additional sedimentation traps where water can be collected and recharged into the ground.

Catch Basin filters

Provide a silt sacks at the existing CB's. Provide additional silt sacks where required. Silt sacks shall be installed and maintained until the site has been fully stabilized.

Drainage swales

Swales will be constructed at various locations throughout the site during construction to divert runoff to the sedimentation containment.

Offsite Vehicle Tracking

A stabilized construction entrance (anti-tracking pad) shall be provided at the construction access point shown on the grading Plan. The anti-tracking pad will be approximately 30-feet long by the width of the drive and will be constructed of 12-inches of 3/4 to 3-inch crushed stone. The removal and stockpiling of topsoil and subsoil in the work zone shall be accomplished as soon as feasible to minimize the amount of cohesive soil exposure to vehicles.

Pavement Sweeping
Pavement areas that have deposits of sediment from the construction area shall be swept using a mechanical street sweeper on an as needed basis.

Stabilization Practices

Temporary Stabilization
Topsoil stockpiles and disturbed portions of the site where construction activity ceases for a growing season will be stabilized with temporary seed and mulch . The temporary seed shall be as follows:

New England Erosion Control / Restoration Mix
Application Rate: 35 lbs. /acre 1,245 sq. ft. /lb.
The New England Erosion Control/Restoration Mix contains a selection of native grasses and wildflowers designed to colonize generally moist, recently disturbed sites where quick growth of vegetation is desired to stabilize the soil surface. This mix is particularly appropriate for detention basins that do not normally hold standing water. The plants in this mix can tolerate infrequent inundation, but no constant flooding. In New England, the best results are obtained with a spring or early fall seeding. Summer and fall seeding can be successful with a light mulching of weed-free straw to conserved moisture. Late fall and winter dormant seeding require a slight increase in the seeding rate. Fertilization is not required unless the soils are particularly infertile. Species include: Swithgrass (*Panicum virgatum*), Creeping Red Fescue (*Festuca rubra*), Virginia Wild Rye (*Elymus vierinicus*), Fox Sedge (*Carex vulpinoidea*), Creeping Bentgrass (*Agrostis stolonifera*), Silky Wild Rye (*Elymus villosus*), Nodding Bur-marigold (*Bidens cernua*), Soft Rush (*Juncus effuses*), Grass-leaved Goldenrod (*Solidago graminifolia*), Sensitive fern (*Onoclea sensibilis*), Joe-Pye Weed (*Eupatorium maculatum*), boneset (*Eupatorium perfoliatum*), Flat-top Aster (*Aster umbellatus*), New York Aster (*Aster novi-belgii*), and Blue Vervain (*Verbena hastate*).

Areas of the site that are to be paved will be temporarily stabilized by installing the subbase until bituminous pavement can be applied.

Other Controls

Waste Disposal

Waste Materials
All waste materials will be collected and stored in metal dumpsters rented from a licensed solid waste management company. The dumpsters will meet all local and state solid waste management regulations. All trash and construction debris from the site will be deposited in the dumpsters. No construction waste will be buried or burned onsite. All personnel will be instructed regarding the correct procedure for waste disposal. The construction site superintendent will be responsible for seeing that these procedures are followed.

Hazardous Waste
All hazardous waste materials will be disposed of in the manner specified by local and state regulation or by the manufacturer. Site personnel will be instructed in these practices and the construction site superintendent will be responsible for seeing that these procedures are followed.

Sanitary Waste
All sanitary waste will be collected from the portable units by a licensed sanitary waste management company, as required by local and state regulation.

Construction Stage Maintenance / Inspection Procedures

Erosion and Sediment Control Inspection and Maintenance Practices

- All control measures will be inspected at least once each week and following any storm event of 0.5 inches or greater
- All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of report
- Accumulated sediment will be removed from silt fence when it has reached a depth of 6-inches.
- Silt fencing will be inspected for depth of sediment to check that fabric is securely set along the bottom attached to the fence posts. Inspection shall confirm that the fence posts are firmly set in the ground.
- All sedimentation containment areas will be inspected for depth of sediment, and accumulated sediment will be removed on a regular basis to allow natural recharge into the ground.
- All diversion dikes and channels will be inspected and any breaches promptly repaired.
- Temporary and permanent seeding and plantings will be inspected for bare spots, washouts, and healthy growth.
- A Construction Stormwater Maintenance Inspection Report will be submitted after each inspection. A copy of the report form to be completed by the inspector is attached.
- The site superintendent will select a site worker who will be responsible for inspections, maintenance and repair activities, and filling out the inspection and maintenance report.

- Personnel selected for inspection and maintenance responsibilities will receive training from the site superintendent. They will be trained in all the inspection and maintenance practices necessary for keeping the erosion and sediment controls used onsite in good working order.

Non-Storm Water Discharges

It is expected that non-rainfall discharges from the site during the construction period will not occur. However, if does occur, non-stormwater discharges will be directed to the sedimentation area.

Construction Spill Prevention

Material Management Practices

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff.

Good Housekeeping – The following good housekeeping practices will be followed onsite during the construction project:

- An effort will be made to store only enough product required to do the job
- All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and if possible under a roof or other enclosure
- Products will be kept in their original containers with the manufacturer's label affixed
- Substances will not be mixed with one another unless recommended by the manufacturer
- Whenever possible, all of a product will be used up before disposing of the container
- Manufacturer's recommendations for proper use and disposal will be followed
- The site superintendent will inspect daily to ensure proper use and disposal of materials

Hazardous Products – These practices are used to reduce the risks associated with hazardous materials.

- Products will be kept in original containers unless they are not resealable
- Original labels and material safety data will be retained; they contain important product information

- If surplus product must be disposed of manufacturers' or local and state recommended methods for proper disposal will be followed.

Construction Practices for Equipment & Products

Use and storage of motorized vehicles/Machinery

Petroleum Products

All onsite vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers that are clearly labeled. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations.

Fertilizers

Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to stormwater. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

Paints

All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the stormwater system but will be properly disposed of according to manufacturer's instructions or State and local regulations.

Spill Control Practices

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:

- Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.

- Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include but not be limited to brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.

- All spills will be cleaned up immediately after discovery.

- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.

- Spills of toxic or hazardous material will be reported to the appropriate State or local government agency, regardless of the size.

- The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included.

- The site superintendent will be the spill prevention and cleanup coordinator. This individual will designate a site worker who will receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel will be posted in the material storage areas and in the office trailer onsite.

Record Keeping

The construction trailer shall include, but not limited to the following:

- Dates of grading, construction activity, and stabilization
- Construction plans
- Inspection reports prepared by the contractor during construction
- Emergency Response Contact & Telephone list of State & Local authorities
- Construction Pollution Prevention & Erosion/Sedimentation Control Plan

INSPECTION AND MAINTENANCE REPORT FORM
For
#57 Main Street
Marlborough, MA

TO BE COMPLETED EVERY 7 DAYS AND WITHIN 24-HOURS OF A RAINFALL EVENT OF 0.5 INCHES OR MORE.

INSPECTOR: _____ DATE: _____

INSPECTOR'S JOB TITLE: _____

DAYS SINCE LAST RAINFALL: _____ AMOUNT OF LAST RAINFALL: _____ INCHES

STABILIZATION MEASURES

ACTION ITEM	(Y/N)	CONDITIION	COMMENTS
Any signs of sediment by-passing wattles or siltation fencing			
Is there sufficient storage available in both sedimentation traps for the next 2-inch rainfall			
Are CB's protected with Silt-Sacs and has the accumulated silt exceeding 6-inches been removed			
Is there sufficient capacity in the sedimentation traps to retain the next rainfall?			
Has any dirt been tracked onto Public Way			
Are materials that are potential stormwater contaminants stored inside or under cover?			
Is the water quality leaving the site clean			
Has the contractor complied with the applicable requirements of the SWPPP & Construction Pollution Prevention & Erosion/Sedimentation Control Plan			

STABILIZATION
REQUIRED:_____
_____
_____

TO BE PERFORMED BY: ON OR BEFORE:

INSPECTION AND MAINTENANCE REPORT FORM

For
#57 Main Street
Marlborough, MA

WATTLE / SILT FENCING:

FROM*	TO*	IS LINE STABILIZED?	WASHOUT OR OVERTOPPING?

*- List erosion control section, or if inspection applies to all sections, list ALL.

MAINTENANCE REQUIRED FOR WATTLES/SILTFENCE LINE:_____
_____
_____
_____

TO BE PERFORMED BY:_____ ON OR BEFORE:_____

INSPECTION AND MAINTENANCE REPORT FORM

For

#57 Main Street
Marlborough, MA

ANTI-TRACKING PAD

LOCATION	SEDIMENT ON ROAD?	IS THE STONE SILTED-UP?	DOES ALL TRAFFIC USE THE PAD?	CONDITION OF DRAINAGE DIVERSION

MAINTENANCE REQUIRED FOR ANTI-TRACKING PADS:_____
_____
_____
_____
_____
_____

TO BE PERFORMED BY:_____ ON OR BEFORE:_____

INSPECTION AND MAINTENANCE REPORT FORM

For

#57 Main Street
Marlborough, MA

SEDIMENTATION BASINS CONTAINMENT

LOCATION	DEPTH OF SEDIMENT	SIGNS OF OVERTOPPING OR WASHOUT?	IS THERE ENOUGH AVAILABLE STORAGE FOR 2-INCH RAINFALL ?	CONDITION / STATUS OF OUTFALL/OUTLET DEVICE/PUMP DOWN TREATMENT SYSTEM

MAINTENANCE REQUIRED FOR SEDIMENTATION BASINS/TRAPS:_____
_____
_____
_____
_____
_____

TO BE PERFORMED BY:_____ ON OR BEFORE:_____

INSPECTION AND MAINTENANCE REPORT FORM

For
#57 Main Street
Marlborough, MA

CHANGES REQUIRED TO THE POLLUTION PREVENTION PLAN:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

REASONS FOR CHANGES:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Signed:_____ Date: _____

APPENDIX D:

Soil data

2685
4/6/18
#57 MAIN ST
MARLBOROUGH

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

CONTRACTOR: ASSABET CONST.
SOIL EVALUATOR: Bruce Saluk
REG. S.E.# 2129

C. On-Site Review (continued)

Deep Observation Hole Number: T1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
-40	Fill					—					
-43-63	BW	2.5YR 6/4				SL			GR	V. Fri	
-67	C1	2.5YR 4/6				SL			GR	V. Fri	
-119	C2	"				LS	30%	10%	SG	loose	

Additional Notes:

GWE 78" weeps @ 28" West side (Perched)
" @ 63" East "
No Refusal ESHGW @ 63"

2000
4/6/18

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: T2 & T3

	Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent		Gravel	Cobbles & Stones			
T2	-40	Fill	—									
	-78	C	2.5YR 4/6				SL	10	30	SG	loose	
	-54	Fill					—					
	-58	A					—					
T3	-65	Bw	10R 7/1				SL			G	Loose	
	-98	C1	2.5YR 4/6				SL	10	30	SG	Loose	

Additional Notes:

T2 Refusal @ 78" ; GW @ 59" ESHGW @ 59"

T3 " @ 98" ; GW @ 77" " @ 77"

4/6/18

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: T4

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
-74	Fill					—					
-106	C	2.5YR 4/6				L/S	15	30	SG	loose	

Additional Notes:

GWE 102" ESHGW @ 102" No weeps

TEST @ OLD STONE MASONRY & BRICK Foundation

United States Department of Agriculture

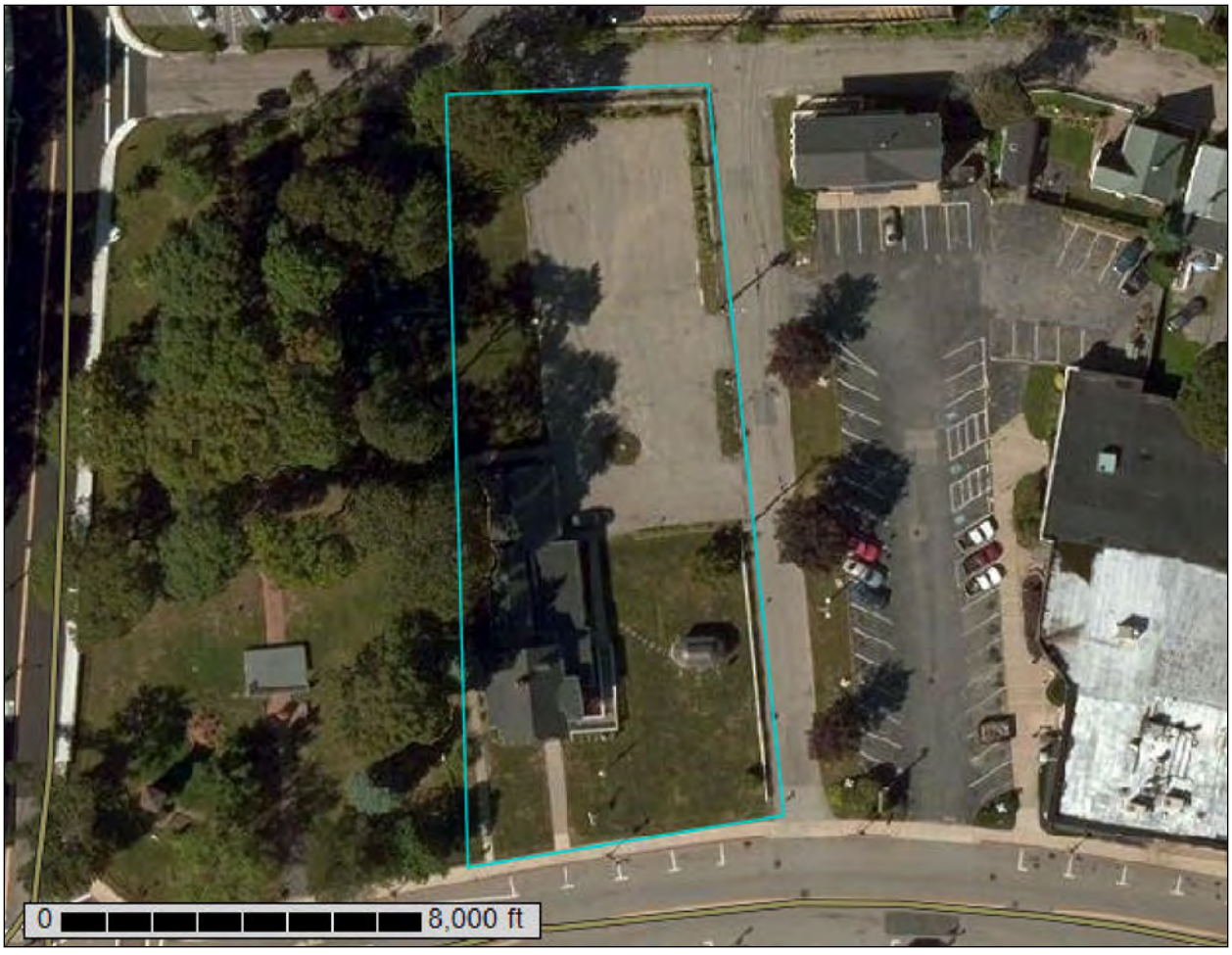
NRCS

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 Middlesex County, Massachusetts

57 Main Street



May 12, 2018

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

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Contents

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: 1:554 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 5 10 20 30

Feet: 0 25 50 100 150

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N 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 1:25,000.

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: Middlesex County, Massachusetts
Survey Area Data: Version 17, Oct 6, 2017

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

Date(s) aerial images were photographed: Sep 12, 2014—Sep 28, 2014

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
602	Urban land	0.4	47.8%
631C	Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky	0.4	52.2%
Totals for Area of Interest		**0.8**	**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.

Middlesex County, Massachusetts

602—Urban land

Map Unit Setting

National map unit symbol: 9950
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Rock outcrop

Percent of map unit: 5 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

Udorthents, wet substratum

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

Udorthents, loamy

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

631C—Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky

Map Unit Setting

National map unit symbol: vr1g
Elevation: 0 to 1,000 feet

Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton and similar soils: 40 percent
Urban land: 40 percent
Hollis and similar soils: 10 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

Landform: Drumlins, ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 22 inches: sandy loam
H3 - 22 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

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

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Description of Hollis

Setting

Landform: Ridges, hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable, shallow loamy basal till over granite and gneiss

Typical profile

H1 - 0 to 2 inches: fine sandy loam
H2 - 2 to 14 inches: fine sandy loam
H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Canton

Percent of map unit: 4 percent
Landform: Hills
Landform position (two-dimensional): Backslope, toeslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Udorthents, loamy

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

Rock outcrop

Percent of map unit: 2 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

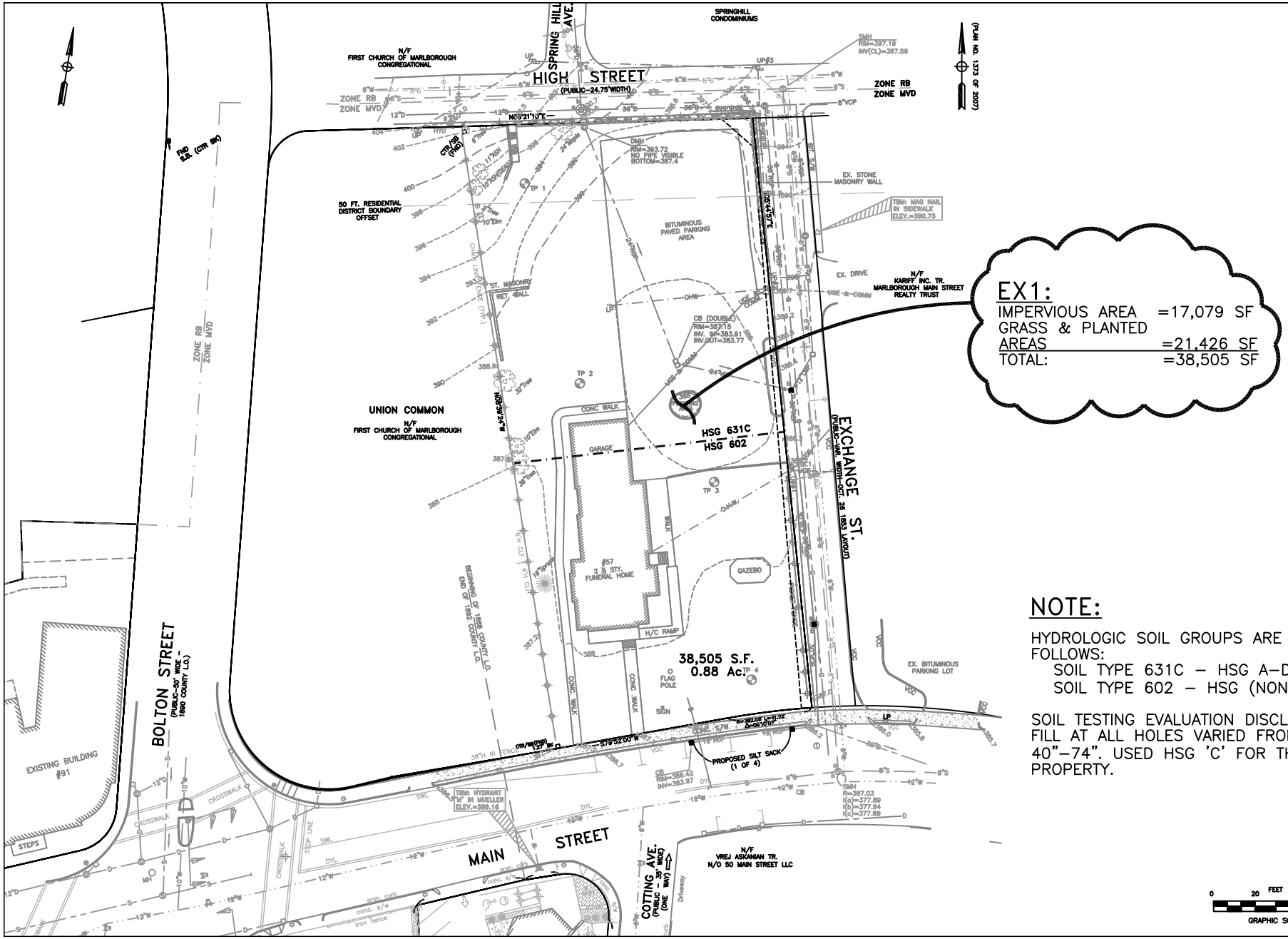
Scituate

Percent of map unit: 1 percent
Landform: Depressions, hillslopes
Landform position (two-dimensional): Toeslope, summit
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Montauk

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Nose slope, head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

APPENDIX E:
Hydrologic Calculations for Peak Runoff Rates
-Existing & Proposed Conditions-



EX1:

IMPERVIOUS AREA	=17,079 SF
GRASS & PLANTED AREAS	=21,426 SF
TOTAL:	=38,505 SF

NOTE:

HYDROLOGIC SOIL GROUPS ARE AS FOLLOWS:
SOIL TYPE 631C – HSG A–D
SOIL TYPE 602 – HSG (NONE)

SOIL TESTING EVALUATION DISCLOSED FILL AT ALL HOLES VARIED FROM 40"–74". USED HSG 'C' FOR THIS PROPERTY.

EX. CONDITIONS DRAINAGE AREA "EXCHANGE PLACE" SITE PLAN – 57 MAIN STREET – MARLBOROUGH, MA

PREPARED BY:
BRUCE SALIK & ASSOC., INC.
CIVIL ENGINEERING & LAND SURVEYING
576 BOSTON POST ROAD EAST
MARLBOROUGH, MA 01752
TEL: 508-485-1662

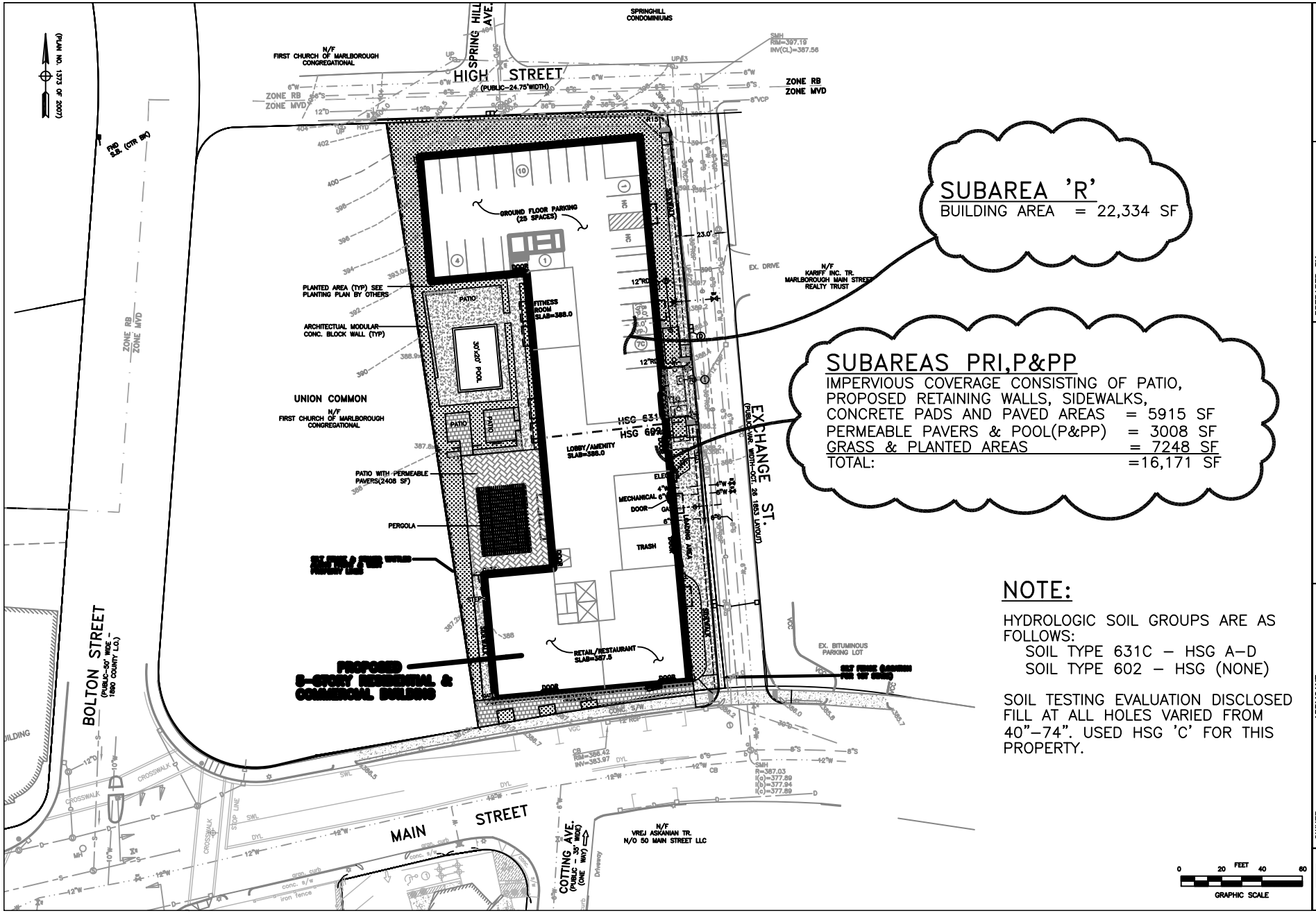
OWNER:
MARLBOROUGH TOTG LLC
205 AYER ROAD, SUITE 5
HARVARD, MA 01451
TEL: (978) 456 8388

APPLICANT:
WILLIAM D. ADAMS
JW CAPITAL PARTNERS, LLC
34 WASHINGTON STREET, SUITE 230
WELLESLEY, MA 02841
TEL: (781) 366 2436

DATE: SEPTEMBER 7, 2022

DA1

FILE: 2916.dwg



SUBAREA 'R'

BUILDING AREA = 22,334 SF

SUBAREAS PRI,P&PP

IMPERVIOUS COVERAGE CONSISTING OF PATIO, PROPOSED RETAINING WALLS, SIDEWALKS, CONCRETE PADS AND PAVED AREAS = 5915 SF
PERMEABLE PAVERS & POOL(P&PP) = 3008 SF
GRASS & PLANTED AREAS = 7248 SF
TOTAL: =16,171 SF

NOTE:

HYDROLOGIC SOIL GROUPS ARE AS FOLLOWS:
SOIL TYPE 631C – HSG A–D
SOIL TYPE 602 – HSG (NONE)

SOIL TESTING EVALUATION DISCLOSED FILL AT ALL HOLES VARIED FROM 40"–74". USED HSG 'C' FOR THIS PROPERTY.

PREPARED BY:
BRUCE SALIK & ASSOC., INC.
CIVIL ENGINEERING & LAND SURVEYING
576 BOSTON POST ROAD EAST
MARLBOROUGH, MA 01752
TEL: 508-485-1662

PROP. CONDITIONS DRAINAGE AREA
"EXCHANGE PLACE"
SITE PLAN
– 57 MAIN STREET –
MARLBOROUGH, MA

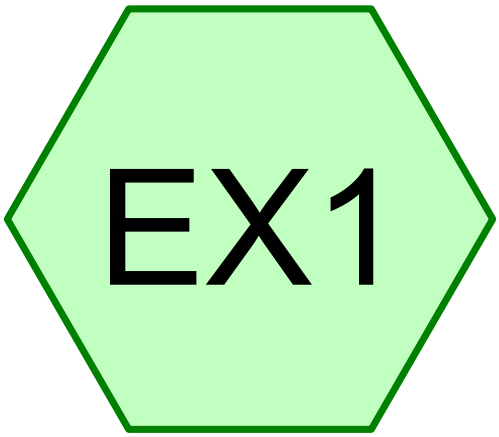
APPLICANT:
WILLIAM D. ADAMS
JW CAPITAL PARTNERS, LLC
34 WASHINGTON STREET, SUITE 230
WELLESLEY, MA 02841
TEL: (781) 366 2436

OWNER:
MARLBOROUGH TOTG LLC
205 AYER ROAD, SUITE 5
HARVARD, MA 01451
TEL: (978) 456 8388

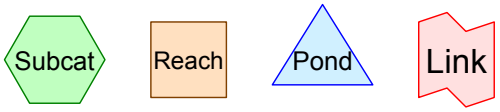
DATE: SEPTEMBER 7, 2022

DA2

FILE: 2916.dwg



EXISTING CONDITIONS



Routing Diagram for Existing Conditions-2916
Prepared by Bruce Saluk & Associates, Printed 9/7/2022

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 YR STORM	Type III 24-hr		Default	24.00	1	3.20	2
2	10 YR STORM	Type III 24-hr		Default	24.00	1	4.50	2
3	25 YR STORM	Type III 24-hr		Default	24.00	1	5.50	2
4	100 YR STORM	Type III 24-hr		Default	24.00	1	7.00	2

Summary for Subcatchment EX1: EXISTING CONDITIONS

Runoff = 1.88 cfs @ 12.08 hrs, Volume= 0.129 af, Depth> 1.76"
Routed to nonexistent node T

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YR STORM Rainfall=3.20"

	Area (sf)	CN	Description
*	17,079	98	Impervious
	21,426	74	>75% Grass cover, Good, HSG C
	38,505	85	Weighted Average
	21,426		55.64% Pervious Area
	17,079		44.36% Impervious Area

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

Summary for Subcatchment EX1: EXISTING CONDITIONS

Runoff = 3.10 cfs @ 12.07 hrs, Volume= 0.214 af, Depth> 2.91"
Routed to nonexistent node T

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YR STORM Rainfall=4.50"

	Area (sf)	CN	Description
*	17,079	98	Impervious
	21,426	74	>75% Grass cover, Good, HSG C
	38,505	85	Weighted Average
	21,426		55.64% Pervious Area
	17,079		44.36% Impervious Area

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

Summary for Subcatchment EX1: EXISTING CONDITIONS

Runoff = 4.04 cfs @ 12.07 hrs, Volume= 0.282 af, Depth> 3.83"
Routed to nonexistent node T

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25 YR STORM Rainfall=5.50"

	Area (sf)	CN	Description
*	17,079	98	Impervious
	21,426	74	>75% Grass cover, Good, HSG C
	38,505	85	Weighted Average
	21,426		55.64% Pervious Area
	17,079		44.36% Impervious Area

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

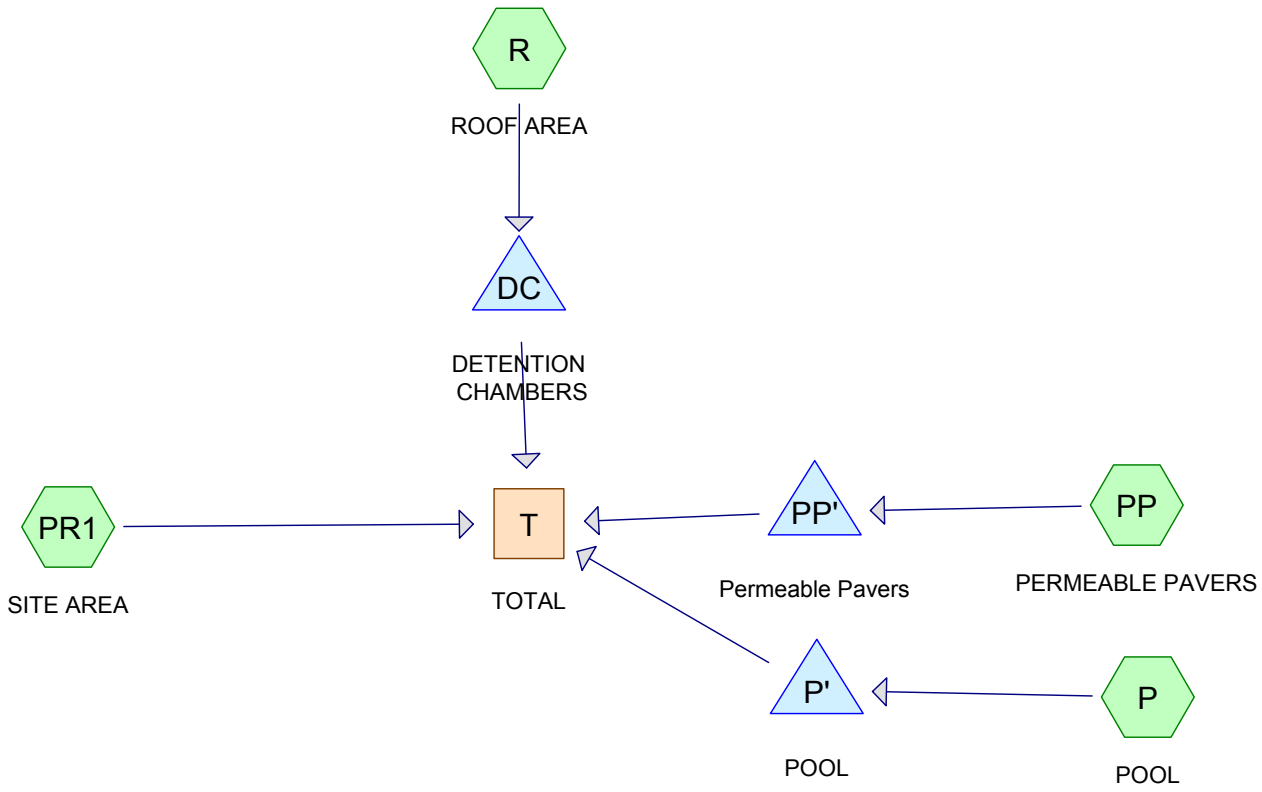
Summary for Subcatchment EX1: EXISTING CONDITIONS

Runoff = 5.47 cfs @ 12.07 hrs, Volume= 0.387 af, Depth> 5.25"
Routed to nonexistent node T

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YR STORM Rainfall=7.00"

	Area (sf)	CN	Description
*	17,079	98	Impervious
	21,426	74	>75% Grass cover, Good, HSG C
	38,505	85	Weighted Average
	21,426		55.64% Pervious Area
	17,079		44.36% Impervious Area

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



Subcat Reach Pond Link

Routing Diagram for Proposed Conditions-2916
Prepared by Bruce Saluk & Associates, Printed 9/7/2022

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 YR STORM	Type III 24-hr		Default	24.00	1	3.20	2
2	10 YR STORM	Type III 24-hr		Default	24.00	1	4.50	2
3	25 YR STORM	Type III 24-hr		Default	24.00	1	5.50	2
4	100 YR STORM	Type III 24-hr		Default	24.00	1	7.00	2

Summary for Subcatchment P: POOL

Runoff = 0.04 cfs @ 12.07 hrs, Volume= 0.003 af, Depth> 2.97"
Routed to Pond P' : POOL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YR STORM Rainfall=3.20"

	Area (sf)	CN	Description
*	600	98	Pool
	600		100.00% Impervious Area

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

Summary for Subcatchment PP: PERMEABLE PAVERS

Runoff = 0.18 cfs @ 12.07 hrs, Volume= 0.014 af, Depth> 2.97"
Routed to Pond PP' : Permeable Pavers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YR STORM Rainfall=3.20"

	Area (sf)	CN	Description
*	2,408	98	Permeable Pavers
	2,408		100.00% Impervious Area

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

Summary for Subcatchment PR1: SITE AREA

Runoff = 0.64 cfs @ 12.08 hrs, Volume= 0.044 af, Depth> 1.76"
Routed to Reach T : TOTAL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YR STORM Rainfall=3.20"

	Area (sf)	CN	Description
*	5,915	98	Impervious
*	7,248	74	>75% Grass & Planted Areas, Good, HSG C
	13,163	85	Weighted Average
	7,248		55.06% Pervious Area
	5,915		44.94% Impervious Area

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

Summary for Subcatchment R: ROOF AREA

Runoff = 1.64 cfs @ 12.07 hrs, Volume= 0.127 af, Depth> 2.97"
Routed to Pond DC : DETENTION CHAMBERS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YR STORM Rainfall=3.20"

	Area (sf)	CN	Description
*	22,334	98	ROOF AREA
	22,334		100.00% Impervious Area

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

Summary for Reach T: TOTAL

Inflow Area = 0.884 ac, 81.18% Impervious, Inflow Depth > 2.27" for 2 YR STORM event
Inflow = 1.81 cfs @ 12.10 hrs, Volume= 0.167 af
Outflow = 1.81 cfs @ 12.10 hrs, Volume= 0.167 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Summary for Pond DC: DETENTION CHAMBERS

Inflow Area = 0.513 ac,100.00% Impervious, Inflow Depth > 2.97" for 2 YR STORM event
Inflow = 1.64 cfs @ 12.07 hrs, Volume= 0.127 af
Outflow = 1.24 cfs @ 12.13 hrs, Volume= 0.123 af, Atten= 25%, Lag= 3.9 min
Primary = 1.24 cfs @ 12.13 hrs, Volume= 0.123 af
Routed to Reach T : TOTAL

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs / 4
Peak Elev= 384.42' @ 12.13 hrs Surf.Area= 347 sf Storage= 494 cf

Plug-Flow detention time= 36.6 min calculated for 0.123 af (97% of inflow)
Center-of-Mass det. time= 17.3 min (772.4 - 755.0)

Volume	Invert	Avail.Storage	Storage Description
#1	383.00'	1,156 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
383.00	347	0	0
386.33	347	1,156	1,156

Device	Routing	Invert	Outlet Devices
#1	Primary	383.00'	**15.0" Round Culvert** L= 2.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 383.00' / 382.88' S= 0.0600 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	383.00'	**7.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	385.90'	**16.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.5' Crest Height

Primary OutFlow Max=1.23 cfs @ 12.13 hrs HW=384.42' TW=383.50' (Fixed TW Elev= 383.50')
└─**1=Culvert** (Passes 1.23 cfs of 4.97 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.23 cfs @ 4.62 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond P': POOL

Inflow Area = 0.014 ac,100.00% Impervious, Inflow Depth > 2.97" for 2 YR STORM event
Inflow = 0.04 cfs @ 12.07 hrs, Volume= 0.003 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach T : TOTAL

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 388.45' @ 24.00 hrs Surf.Area= 600 sf Storage= 148 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	388.20'	360 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
388.20	600	0	0
388.80	600	360	360

Device	Routing	Invert	Outlet Devices
#1	Primary	388.79'	**100.0' long x 5.0' 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 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=388.20' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond PP': Permeable Pavers

Inflow Area = 0.055 ac,100.00% Impervious, Inflow Depth > 2.97" for 2 YR STORM event
Inflow = 0.18 cfs @ 12.07 hrs, Volume= 0.014 af
Outflow = 0.06 cfs @ 11.86 hrs, Volume= 0.014 af, Atten= 68%, Lag= 0.0 min
Discarded = 0.06 cfs @ 11.86 hrs, Volume= 0.014 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach T : TOTAL

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 386.80' @ 12.35 hrs Surf.Area= 2,408 sf Storage= 89 cf

Plug-Flow detention time= 8.2 min calculated for 0.014 af (100% of inflow)
Center-of-Mass det. time= 7.9 min (763.0 - 755.0)

Volume	Invert	Avail.Storage	Storage Description
#1	386.71'	482 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 1,204 cf Overall x 40.0% Voids
#2	387.21'	199 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 795 cf Overall x 25.0% Voids
#3	387.54'	39 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 385 cf Overall x 10.0% Voids
		719 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
386.71	2,408	0	0
387.21	2,408	1,204	1,204

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
387.21	2,408	0	0
387.54	2,408	795	795

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
387.54	2,408	0	0
387.70	2,408	385	385

Device	Routing	Invert	Outlet Devices
#1	Discarded	386.71'	**1.020 in/hr Exfiltration over Horizontal area**
#2	Primary	387.69'	**20.0' long x 5.0' 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 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.06 cfs @ 11.86 hrs HW=386.72' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=386.71' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment P: POOL

Runoff = 0.06 cfs @ 12.07 hrs, Volume= 0.005 af, Depth> 4.26"
Routed to Pond P' : POOL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YR STORM Rainfall=4.50"

	Area (sf)	CN	Description
*	600	98	Pool
	600		100.00% Impervious Area

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

Summary for Subcatchment PP: PERMEABLE PAVERS

Runoff = 0.25 cfs @ 12.07 hrs, Volume= 0.020 af, Depth> 4.26"
Routed to Pond PP' : Permeable Pavers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YR STORM Rainfall=4.50"

	Area (sf)	CN	Description
*	2,408	98	Permeable Pavers
	2,408		100.00% Impervious Area

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

Summary for Subcatchment PR1: SITE AREA

Runoff = 1.06 cfs @ 12.07 hrs, Volume= 0.073 af, Depth> 2.91"
Routed to Reach T : TOTAL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YR STORM Rainfall=4.50"

	Area (sf)	CN	Description
*	5,915	98	Impervious
*	7,248	74	>75% Grass & Planted Areas, Good, HSG C
	13,163	85	Weighted Average
	7,248		55.06% Pervious Area
	5,915		44.94% Impervious Area

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

Summary for Subcatchment R: ROOF AREA

Runoff = 2.33 cfs @ 12.07 hrs, Volume= 0.182 af, Depth> 4.26"
Routed to Pond DC : DETENTION CHAMBERS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YR STORM Rainfall=4.50"

	Area (sf)	CN	Description
*	22,334	98	ROOF AREA
	22,334		100.00% Impervious Area

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

Summary for Reach T: TOTAL

Inflow Area = 0.884 ac, 81.18% Impervious, Inflow Depth > 3.41" for 10 YR STORM event
Inflow = 2.56 cfs @ 12.10 hrs, Volume= 0.251 af
Outflow = 2.56 cfs @ 12.10 hrs, Volume= 0.251 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Summary for Pond DC: DETENTION CHAMBERS

Inflow Area = 0.513 ac,100.00% Impervious, Inflow Depth > 4.26" for 10 YR STORM event
Inflow = 2.33 cfs @ 12.07 hrs, Volume= 0.182 af
Outflow = 1.63 cfs @ 12.14 hrs, Volume= 0.178 af, Atten= 30%, Lag= 4.5 min
Primary = 1.63 cfs @ 12.14 hrs, Volume= 0.178 af
Routed to Reach T : TOTAL

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs / 4
Peak Elev= 385.10' @ 12.14 hrs Surf.Area= 347 sf Storage= 729 cf

Plug-Flow detention time= 28.2 min calculated for 0.178 af (98% of inflow)
Center-of-Mass det. time= 14.2 min (762.7 - 748.5)

Volume	Invert	Avail.Storage	Storage Description
#1	383.00'	1,156 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
383.00	347	0	0
386.33	347	1,156	1,156

Device	Routing	Invert	Outlet Devices
#1	Primary	383.00'	**15.0" Round Culvert** L= 2.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 383.00' / 382.88' S= 0.0600 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	383.00'	**7.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	385.90'	**16.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.5' Crest Height

Primary OutFlow Max=1.63 cfs @ 12.14 hrs HW=385.10' TW=383.50' (Fixed TW Elev= 383.50')
└─**1=Culvert** (Passes 1.63 cfs of 7.17 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.63 cfs @ 6.08 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond P': POOL

Inflow Area = 0.014 ac,100.00% Impervious, Inflow Depth > 4.26" for 10 YR STORM event
Inflow = 0.06 cfs @ 12.07 hrs, Volume= 0.005 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach T : TOTAL

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 388.56' @ 24.00 hrs Surf.Area= 600 sf Storage= 213 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	388.20'	360 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
388.20	600	0	0
388.80	600	360	360

Device	Routing	Invert	Outlet Devices
#1	Primary	388.79'	**100.0' long x 5.0' 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 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=388.20' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond PP': Permeable Pavers

Inflow Area = 0.055 ac,100.00% Impervious, Inflow Depth > 4.26" for 10 YR STORM event
Inflow = 0.25 cfs @ 12.07 hrs, Volume= 0.020 af
Outflow = 0.06 cfs @ 11.76 hrs, Volume= 0.020 af, Atten= 77%, Lag= 0.0 min
Discarded = 0.06 cfs @ 11.76 hrs, Volume= 0.020 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach T : TOTAL

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 386.89' @ 12.45 hrs Surf.Area= 2,408 sf Storage= 177 cf

Plug-Flow detention time= 15.9 min calculated for 0.020 af (100% of inflow)
Center-of-Mass det. time= 15.6 min (764.1 - 748.5)

Volume	Invert	Avail.Storage	Storage Description
#1	386.71'	482 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 1,204 cf Overall x 40.0% Voids
#2	387.21'	199 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 795 cf Overall x 25.0% Voids
#3	387.54'	39 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 385 cf Overall x 10.0% Voids
		719 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
386.71	2,408	0	0
387.21	2,408	1,204	1,204

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
387.21	2,408	0	0
387.54	2,408	795	795

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
387.54	2,408	0	0
387.70	2,408	385	385

Device	Routing	Invert	Outlet Devices
#1	Discarded	386.71'	**1.020 in/hr Exfiltration over Horizontal area**
#2	Primary	387.69'	**20.0' long x 5.0' 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 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.06 cfs @ 11.76 hrs HW=386.72' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=386.71' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment P: POOL

Runoff = 0.08 cfs @ 12.07 hrs, Volume= 0.006 af, Depth> 5.26"
Routed to Pond P' : POOL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25 YR STORM Rainfall=5.50"

	Area (sf)	CN	Description
*	600	98	Pool
	600		100.00% Impervious Area

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

Summary for Subcatchment PP: PERMEABLE PAVERS

Runoff = 0.31 cfs @ 12.07 hrs, Volume= 0.024 af, Depth> 5.26"
Routed to Pond PP' : Permeable Pavers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25 YR STORM Rainfall=5.50"

	Area (sf)	CN	Description
*	2,408	98	Permeable Pavers
	2,408		100.00% Impervious Area

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

Summary for Subcatchment PR1: SITE AREA

Runoff = 1.38 cfs @ 12.07 hrs, Volume= 0.096 af, Depth> 3.83"
Routed to Reach T : TOTAL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25 YR STORM Rainfall=5.50"

	Area (sf)	CN	Description
*	5,915	98	Impervious
*	7,248	74	>75% Grass & Planted Areas, Good, HSG C
	13,163	85	Weighted Average
	7,248		55.06% Pervious Area
	5,915		44.94% Impervious Area

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

Summary for Subcatchment R: ROOF AREA

Runoff = 2.85 cfs @ 12.07 hrs, Volume= 0.225 af, Depth> 5.26"
Routed to Pond DC : DETENTION CHAMBERS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25 YR STORM Rainfall=5.50"

	Area (sf)	CN	Description
*	22,334	98	ROOF AREA
	22,334		100.00% Impervious Area

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

Summary for Reach T: TOTAL

Inflow Area = 0.884 ac, 81.18% Impervious, Inflow Depth > 4.31" for 25 YR STORM event
Inflow = 3.12 cfs @ 12.09 hrs, Volume= 0.317 af
Outflow = 3.12 cfs @ 12.09 hrs, Volume= 0.317 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Summary for Pond DC: DETENTION CHAMBERS

Inflow Area = 0.513 ac,100.00% Impervious, Inflow Depth > 5.26" for 25 YR STORM event
Inflow = 2.85 cfs @ 12.07 hrs, Volume= 0.225 af
Outflow = 1.90 cfs @ 12.15 hrs, Volume= 0.221 af, Atten= 33%, Lag= 4.8 min
Primary = 1.90 cfs @ 12.15 hrs, Volume= 0.221 af
Routed to Reach T : TOTAL

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs / 4
Peak Elev= 385.69' @ 12.15 hrs Surf.Area= 347 sf Storage= 934 cf

Plug-Flow detention time= 24.3 min calculated for 0.221 af (98% of inflow)
Center-of-Mass det. time= 12.7 min (757.8 - 745.1)

Volume	Invert	Avail.Storage	Storage Description
#1	383.00'	1,156 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
383.00	347	0	0
386.33	347	1,156	1,156

Device	Routing	Invert	Outlet Devices
#1	Primary	383.00'	**15.0" Round Culvert** L= 2.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 383.00' / 382.88' S= 0.0600 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	383.00'	**7.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	385.90'	**16.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.5' Crest Height

Primary OutFlow Max=1.90 cfs @ 12.15 hrs HW=385.68' TW=383.50' (Fixed TW Elev= 383.50')
└─**1=Culvert** (Passes 1.90 cfs of 8.48 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.90 cfs @ 7.12 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond P': POOL

Inflow Area = 0.014 ac,100.00% Impervious, Inflow Depth > 5.26" for 25 YR STORM event
Inflow = 0.08 cfs @ 12.07 hrs, Volume= 0.006 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach T : TOTAL

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 388.64' @ 24.00 hrs Surf.Area= 600 sf Storage= 263 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	388.20'	360 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
388.20	600	0	0
388.80	600	360	360

Device	Routing	Invert	Outlet Devices
#1	Primary	388.79'	**100.0' long x 5.0' 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 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=388.20' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond PP': Permeable Pavers

Inflow Area = 0.055 ac,100.00% Impervious, Inflow Depth > 5.26" for 25 YR STORM event
Inflow = 0.31 cfs @ 12.07 hrs, Volume= 0.024 af
Outflow = 0.06 cfs @ 11.70 hrs, Volume= 0.024 af, Atten= 82%, Lag= 0.0 min
Discarded = 0.06 cfs @ 11.70 hrs, Volume= 0.024 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach T : TOTAL

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 386.97' @ 12.50 hrs Surf.Area= 2,408 sf Storage= 252 cf

Plug-Flow detention time= 23.4 min calculated for 0.024 af (100% of inflow)
Center-of-Mass det. time= 23.1 min (768.2 - 745.1)

Volume	Invert	Avail.Storage	Storage Description
#1	386.71'	482 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 1,204 cf Overall x 40.0% Voids
#2	387.21'	199 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 795 cf Overall x 25.0% Voids
#3	387.54'	39 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 385 cf Overall x 10.0% Voids
		719 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
386.71	2,408	0	0
387.21	2,408	1,204	1,204

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
387.21	2,408	0	0
387.54	2,408	795	795

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
387.54	2,408	0	0
387.70	2,408	385	385

Device	Routing	Invert	Outlet Devices
#1	Discarded	386.71'	**1.020 in/hr Exfiltration over Horizontal area**
#2	Primary	387.69'	**20.0' long x 5.0' 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 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.06 cfs @ 11.70 hrs HW=386.72' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=386.71' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment P: POOL

Runoff = 0.10 cfs @ 12.07 hrs, Volume= 0.008 af, Depth> 6.76"
Routed to Pond P' : POOL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YR STORM Rainfall=7.00"

	Area (sf)	CN	Description
*	600	98	Pool
	600		100.00% Impervious Area

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

Summary for Subcatchment PP: PERMEABLE PAVERS

Runoff = 0.39 cfs @ 12.07 hrs, Volume= 0.031 af, Depth> 6.76"
Routed to Pond PP' : Permeable Pavers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YR STORM Rainfall=7.00"

	Area (sf)	CN	Description
*	2,408	98	Permeable Pavers
	2,408		100.00% Impervious Area

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

Summary for Subcatchment PR1: SITE AREA

Runoff = 1.87 cfs @ 12.07 hrs, Volume= 0.132 af, Depth> 5.25"
Routed to Reach T : TOTAL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YR STORM Rainfall=7.00"

	Area (sf)	CN	Description
*	5,915	98	Impervious
*	7,248	74	>75% Grass & Planted Areas, Good, HSG C
	13,163	85	Weighted Average
	7,248		55.06% Pervious Area
	5,915		44.94% Impervious Area

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

Summary for Subcatchment R: ROOF AREA

Runoff = 3.63 cfs @ 12.07 hrs, Volume= 0.289 af, Depth> 6.76"
Routed to Pond DC : DETENTION CHAMBERS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YR STORM Rainfall=7.00"

	Area (sf)	CN	Description
*	22,334	98	ROOF AREA
	22,334		100.00% Impervious Area

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

Summary for Reach T: TOTAL

Inflow Area = 0.884 ac, 81.18% Impervious, Inflow Depth > 5.66" for 100 YR STORM event
Inflow = 5.22 cfs @ 12.09 hrs, Volume= 0.417 af
Outflow = 5.22 cfs @ 12.09 hrs, Volume= 0.417 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Summary for Pond DC: DETENTION CHAMBERS

Inflow Area = 0.513 ac,100.00% Impervious, Inflow Depth > 6.76" for 100 YR STORM event
Inflow = 3.63 cfs @ 12.07 hrs, Volume= 0.289 af
Outflow = 3.43 cfs @ 12.10 hrs, Volume= 0.285 af, Atten= 6%, Lag= 1.7 min
Primary = 3.43 cfs @ 12.10 hrs, Volume= 0.285 af
Routed to Reach T : TOTAL

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs / 4
Peak Elev= 385.99' @ 12.10 hrs Surf.Area= 347 sf Storage= 1,037 cf

Plug-Flow detention time= 19.2 min calculated for 0.285 af (99% of inflow)
Center-of-Mass det. time= 10.9 min (752.5 - 741.6)

Volume	Invert	Avail.Storage	Storage Description
#1	383.00'	1,156 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
383.00	347	0	0
386.33	347	1,156	1,156

Device	Routing	Invert	Outlet Devices
#1	Primary	383.00'	**15.0" Round Culvert** L= 2.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 383.00' / 382.88' S= 0.0600 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	383.00'	**7.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	385.90'	**16.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.5' Crest Height

Primary OutFlow Max=3.39 cfs @ 12.10 hrs HW=385.99' TW=383.50' (Fixed TW Elev= 383.50')
└─**1=Culvert** (Passes 3.39 cfs of 9.08 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.03 cfs @ 7.59 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 1.36 cfs @ 0.97 fps)

Summary for Pond P': POOL

Inflow Area = 0.014 ac,100.00% Impervious, Inflow Depth > 6.76" for 100 YR STORM event
Inflow = 0.10 cfs @ 12.07 hrs, Volume= 0.008 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach T : TOTAL

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 388.76' @ 24.00 hrs Surf.Area= 600 sf Storage= 338 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	388.20'	360 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
388.20	600	0	0
388.80	600	360	360

Device	Routing	Invert	Outlet Devices
#1	Primary	388.79'	**100.0' long x 5.0' 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 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=388.20' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond PP': Permeable Pavers

Inflow Area = 0.055 ac,100.00% Impervious, Inflow Depth > 6.76" for 100 YR STORM event
Inflow = 0.39 cfs @ 12.07 hrs, Volume= 0.031 af
Outflow = 0.06 cfs @ 11.66 hrs, Volume= 0.031 af, Atten= 85%, Lag= 0.0 min
Discarded = 0.06 cfs @ 11.66 hrs, Volume= 0.031 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach T : TOTAL

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 387.09' @ 12.55 hrs Surf.Area= 2,408 sf Storage= 369 cf

Plug-Flow detention time= 36.8 min calculated for 0.031 af (100% of inflow)
Center-of-Mass det. time= 36.5 min (778.1 - 741.6)

Volume	Invert	Avail.Storage	Storage Description
#1	386.71'	482 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 1,204 cf Overall x 40.0% Voids
#2	387.21'	199 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 795 cf Overall x 25.0% Voids
#3	387.54'	39 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 385 cf Overall x 10.0% Voids
		719 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
386.71	2,408	0	0
387.21	2,408	1,204	1,204

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
387.21	2,408	0	0
387.54	2,408	795	795

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
387.54	2,408	0	0
387.70	2,408	385	385

Device	Routing	Invert	Outlet Devices
#1	Discarded	386.71'	**1.020 in/hr Exfiltration over Horizontal area**
#2	Primary	387.69'	**20.0' long x 5.0' 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 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.06 cfs @ 11.66 hrs HW=386.72' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=386.71' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)