CIVIL ENGINEERS • LAND SURVEYORS • ENVIRONMENTAL CONSULTANTS

FORESITE ENGINEERING

16 Gleasondale Rd., Suite 1-1
Stow, Massachusetts 01775
Phone: (978) 461-2350
Fax: (978) 841-4102
www.foresite1.com

21 CENTURY MILL ROAD

COMMON DRIVEWAY & BACKLAND LOT SPECIAL PERMIT APPLICATION

Assessors Map 3D Parcel 32

July 10, 2018

Prepared for:
21 Century Mill LLC
291 Main Street, Suite 8
Northborough, MA 01532

Prepared by:
FORESITE Engineering Associates, Inc.
16 Gleasondale Road, Suite 1-1
Stow, Massachusetts 01775

CONTENTS

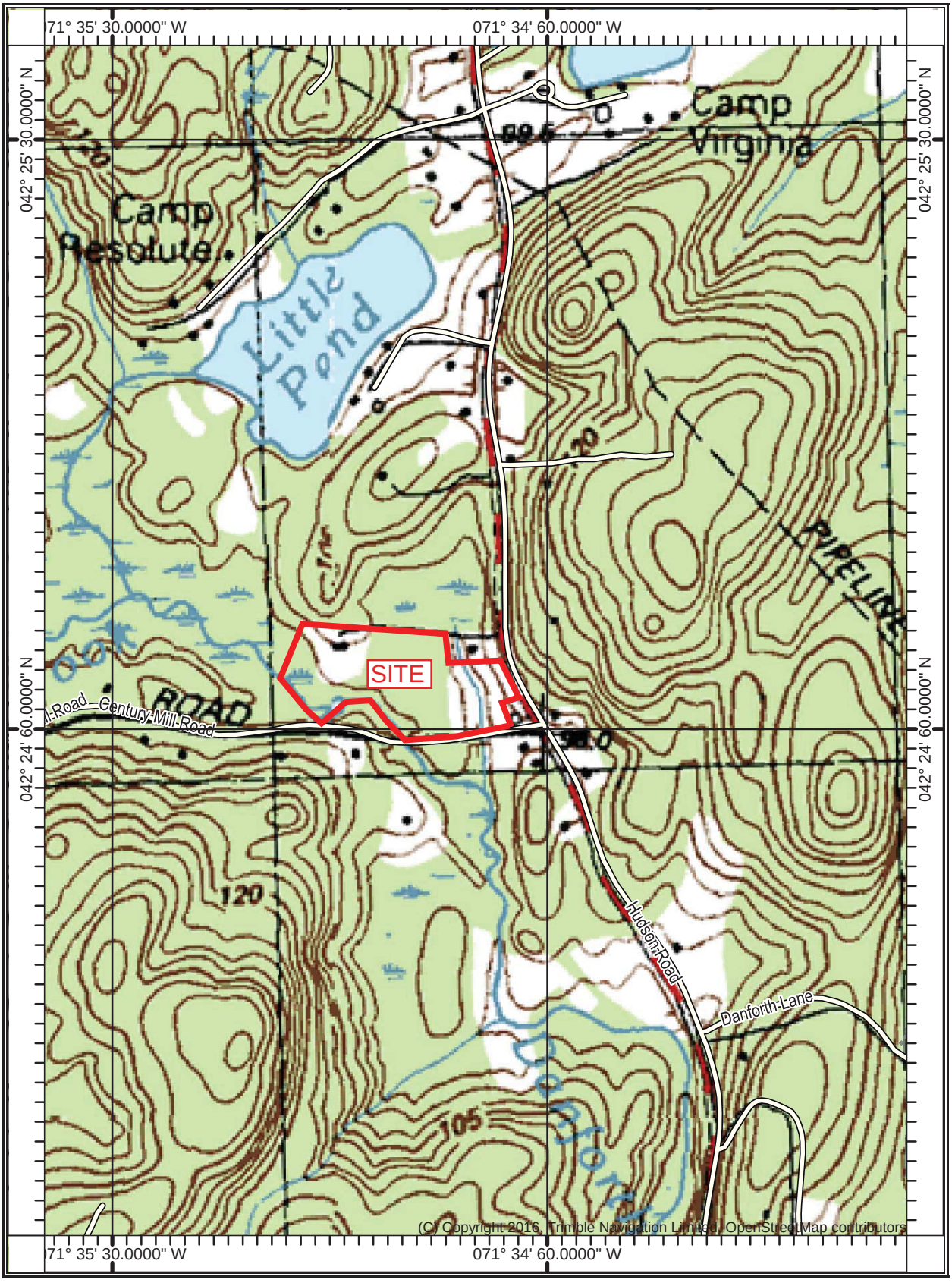
ABSTRACT

21 Century Mill Road is the site of an existing single family dwelling on a 13 acre lot fronting on Century Mill Road and Hudson Road. Approximately 2 acres of the site in the vicinity of the existing dwelling is currently developed for single family residential uses consisting of a dwelling, driveway, lawn and gardens. The remaining 11 acres are currently undeveloped woodlands and wetlands with a portion of the western boundary following the centerline of Danforth Brook to the south and then following the centerline of an abandoned railroad right of way to Century Mill Road. The site is currently accessed by an existing driveway that is approximately 700 feet long constructed of compacted gravel and bituminous concrete pavement. The proposed project involves improving 450 feet of the existing driveway from Century Mill Road to the common driveway standards for gravel base, width, turnouts, paving, and signage for the continued access to the existing dwelling (Lot 1, a backland lot) and 3 additional lots (Lots 2, 3 & 4, ANR lots) as shown on the submitted plans.

Soils in the vicinity of the common driveway are identified by the United States Natural Resources Conservation Service (NRCS) as Ridgebury Fine Sandy Loam 0-3% Slopes (Soil Map Unit 71A). Ridgebury soils consist of nearly level to gently sloping, deep, poorly drained soils in depressions and shallow drainageways of uplands that formed in compact glacial till. Major limitations of Ridgebury Soils are slow permeability in the substratum, stoniness and wetness. Ridgebury soils are in the NRCS classified Hydrologic Soil Group C (HSG C).

The development proposal for the site involves improving the existing compacted gravel driveway with suitable compacted base gravel material (if not already present), constructing required turnouts and roundings and paving the existing driveway to a width of 12 feet for a length of 450 feet from Century Mill Road. These alterations, unmitigated, would increase the rate and volume of runoff from the site to the adjacent down gradient wetland areas. To mitigate impacts of these driveway improvements, an open swale type drainage system is proposed to be installed along the common driveway shoulders. This method was selected due to the relatively level grade of the driveway area and lack of site slope. These measures will result in effectively reducing the rate and volume of runoff from the site following construction to rates and volumes that are similar (marginally less) than under current existing conditions.

Erosion and sediment from construction activities will be mitigated by installation of staked straw wattle erosion control barriers between the limits of the proposed driveway improvements and down gradient wetland areas. Erosion control barriers are to be inspected regularly, maintained and replaced as necessary during construction until all construction activities are complete, and the site is adequately stabilized with vegetation or other suitable stabilizing ground cover.



SCALE 1:9027

0 1000 2000

Feet

FORM A

APPLICATION FOR ENDORSEMENT OF PLAN

BELIEVED NOT TO REQUIRE APPROVAL

The undersigned wishes to record the accompanying plan and requests a determination and endorsement by said Board that approval by it under the Subdivision Control Law is not required.

1. Name of Applicant(s): 21 CENTURY MILL, LLC

Contact Address: 291 MAIN ST. SUITE 8, NORTHBORO, MA 01532

Phone: (508) 393-3784 Email Address: SCOTT_JOANNA@YAHOO.COM

2. Name of Property Owner(s): (SAME AS APPLICANT)

Contact Address: _____

Phone: _____ Email Address: _____

3. Name of Registered Land Surveyor: FORESITE ENGINEERING

Address: 16 GLEASONDALE ROAD, I-1, STOW, MA 01775

Phone: (978) 461-2350 Email Address: SCOTT@FORESITE1.COM

4. Deed of property recorded in: Book No., 55620 Page, 110

of the WORCESTER (SOUTH) Registry of Deeds

5. Property Location: 21 CENTURY MILL ROAD

6. Assessor's Map and Parcel: MAP 3D PARCEL 32

7. Zoning District(s): RESIDENTIAL

8. Property Acreage: 13.025 Ac

9. Number of Existing Lots: 1

10. Proposed Lot(s) Frontage & Acreage: LOT 1 (BACKLAND) 50'F, 5.10AC; LOT 2, 200.94'F 2.521 AC LOT 3, 200'F, 1.844 AC, LOT 4 200.01'F; 2.557 AC; PARCEL A (43,297 SF) - NOT A BUILDABLE LOT

11. List any Board of Appeals decisions pertaining to this site: NONE

12. Reason plan does not constitute a subdivision: NO NEW FRONTAGE

Signature of Applicant: [signature] Date: 6/4/18

Signature of Owner: [signature] Date: 6/4/18

From: Ch. 40A S 9 Each application for a special permit shall be filed by the petitioner with the city or town clerk and a copy or said application, including the date and time of filing certified by the city or town clerk, shall be filed forthwith by the petitioner with the special permit granting authority.

BACKLAND LOT
Application for Special Permit

Bolton, Mass JULY 12 2018
(Date of Filing)

Name of Applicant 21 CENTURY MILL LLC

Address 291 MAIN ST., SUITE 8, NORTHBORO, MA 01532

Name of Engineer or Surveyor FORESITE ENGINEERING

Address 16 GLEASONDALE RD, SUITE 1-1, STOW, MA 01775

Deed or property Recorded in: Book No. 55620 Page 110 of the WORCESTER Co. Registry of Deeds.

Location and Description of Property: 21 CENTURY MILL ROAD - EXISTING SINGLE FAMILY DWELLING + USES

Signature of (Owner) or Agent

Address 291 MAIN ST. SUITE 8, NORTHBORO, MA 01532

Phone Number (508) 393-3784

Date Received

By

Fee Paid

From: Ch. 40A S 9 "Each application for a special permit shall be filed by the petitioner with the city or town clerk and a copy or said application, including the date and time or filing certified by the city or town clerk shall be filed forthwith by the petitioner with the special permit granting authority.

COMMON DRIVEWAY
Application for Special Permit

Bolton, Mass JULY 12 2018
(Date of Filing)

Name of Applicant 21 CENTURY MILL LLC

Address 291 MAIN ST, SUITE 8, NORTHBORO, MA 01532

Name of Engineer or Surveyor FORESITE ENGINEERING

Address 16 GLEASONDALE RD, SUITE 1-1, STOW, MA 01775

Deed or property Recorded in: Book No. 55620 Page 110 of the WORCESTER CO. Registry of Deeds.

Location and Description of Property: 21 CENTURY MILL RD - EXISTING SINGLE FAMILY DWELLING + USES

Number and description of lots to be served: 4 LOTS SERVED; EXISTING HOUSE (LOT 1) + LOT 2, 3 + 4 (SEE PLAN)

I certify that I have filed a copy of the application and plan with:

1. Conservation Commission
2. Fire Department
3. Board of Selectmen

Signature of Owner or Agent [signature]

Address 291 MAIN ST SUITE 8

NORTHBORO MA 01532

Phone Number (508) 393-3784

Date Received _____
By _____
Fee Paid _____

DRAFT COMMON DRIVEWAY EASEMENT AND MAINTENANCE AGREEMENT

WHEREAS, Scott Goddard, Manager of 21 Century Mill Road, LLC ("Goddard") is the owner of Lots 1-4 as shown on a plan entitled: "Common Driveway Plan in Bolton, Mass. Prepared June 2018, by Foresite Engineering Associates, Inc. 16 Gleasondale Road, Suite 1-1, Stow, MA 01775", said plan being recorded with Worcester District Registry of Deeds herewith in Plan Book Page

WHEREAS, it is hereby intended to create and does hereby create specific easements, rights, restrictions and obligations, to enforce and regulate the creation, administration and maintenance of said common driveway over the driveway easement described in GRANT OF DRIVEWAY EASEMENTS paragraph one below; and

WHEREAS Lots 1-4 (collectively the "Member Lots") as heretofore described are served by a Common Driveway, as that term is defined in the Town of Bolton Bylaw, maintenance of which shall be the joint responsibility of each of the owners of said Member Lots; and

WHEREAS, it is intended all of easements, covenants, restrictions and agreements hereinafter set forth in this Agreement (hereinafter together referred to as the "restrictions) shall inure to the benefit of and run with each of the Member Lots.

NOW , THEREFORE, each successor agrees that each Member Lot is, and shall be, held and conveyed subject to and with the benefit of the following easements and restrictions on, over and under Lots 1, 2, and 4, all as shown on a plan of land entitled, "Common Driveway Plan in Bolton, Mass. Prepared June 2018, by Foresite Engineering Associates, Inc. 16 Gleasondale Road, Suite 1-1, Stow, MA 01775'Registry of Deeds in Plan Book ,Page

GRANT OF DRJVEWAY EASEMENTS

1. Each owner of Lots 1, 2, 3 and 4 on the above referenced plans, and their successors and assigns shall have the right in common with the owners of said Lots to use, from time to time, the Common Driveway for all purposes for which private driveways are commonly used, including, without limitation, the right to pass and repass along said driveway from Century Mill Road to the point where the driveway splits off to each Lot served, and the right to install and maintain drains, culverts, and underground and above-ground utilities in and along and across said easement. The installation and maintenance of under-ground and above-ground utilities shall be at the expense of the owner(s) of the Member Lot(s) served by said utilities or the utility company servicing said utility, including the re-paving or repairing of any areas disturbed during the maintenance or repair of those utilities. Use of the Common Driveway by vehicular traffic is restricted to ingress and egress and shall not include parking of vehicles on the Common Driveway. From the points at which the Common Driveway splits to provide separate access to each individual home (the "Private Driveways"), that Lot owner shall have exclusive use over the Private Driveway.

2. The owners of Lots 1, 2, 3, and 4 shall have joint and several responsibility for the repair and maintenance of the Common Driveway. The purpose of the maintenance and repair is to provide continuous year round access for vehicular traffic for the convenience of the owners of the Member Lots, and to provide continuous year round access for all emergency, fire, rescue, police, moving, construction, and maintenance vehicles. The owner of each Member Lot shall be solely responsible for all repair and maintenance for their Private Driveway.

3. Such repair and maintenance of the Common Driveway as set forth in provision 2 above shall include, without limitation:

    a. Maintenance. Repair and maintenance of the Common Driveway including all turnouts, road bends, shoulders, culverts, granite curbing, and headwalls, if any. The Common Driveway shall be maintained in good condition and kept open to all vehicular traffic in all seasons of the year to provide access for all emergency vehicles. All culverts now or hereafter installed shall be kept clear and open.

    b. Snow Removal. The removal and disposal of all snow from the Common Driveway, including turnouts.

    c. Planting & Tree Maintenance. The removal and disposal of all fallen limbs and trees, the clearing and removal of all brush and foliage which might obstruct the sight of vehicles using the Common Driveway, and the preservation of planting and trees.

    d. Grass cutting and grass maintenance along said Common Driveway.

    e. Rubbish removal. All trash for curb-side pick-up, if required to be placed on the Easement, shall be in one location designated by the owners of the Member Lots.

4. The cost of such repair and maintenance shall be divided among the owners of the land which have the benefit of said Common Driveway, on the following basis:

    Lot 1: 25%
    Lot 2: 25%
    Lot 3: 25%
    Lot 4: 25%

    Each owner of the Member Lots served by the Common Driveway shall have the right to enforce these provisions of this Common Driveway Easement and Maintenance Agreement.

5. This Common Driveway Easement and Maintenance Agreement shall run with the title to and shall be binding on the present and all future owners of the Member Lots.

6. The Owner of Lot 2 shall have the sole responsibility to reconstruct the Common Driveway in accordance with the requirements of the afore described Common Driveway plan as prepared by Foresite Engineering Associates, Inc., and the requirements of the Special Permit/Variance approved by the Bolton Planning Board on a copy of said approval shall be recorded herewith at Book Page .

   The Owner of Lot 2 shall be responsible to insure that all work in the reconstruction of the Common Driveway in accordance with the provisions of Paragraph 7 of this agreement is performed in a good and workmanlike manner.

7. The Owner of Lot 2 shall be responsible to insure that all work in the construction of the Common Driveway in accordance with the provisions of Paragraph 7 of this agreement is performed in a good and workmanlike manner by professional contractors. The work shall be performed in a diligent manner and due consideration shall be given to minimize the interruption of access to the other owners during the reconstruction of said driveway. During construction, the driveway shall be kept passable by emergency vehicles. The Owner of Lot 2 shall take due care that the remaining land of the other Member Lots is not disturbed or damaged and that any damage or disturbance of said remaining land will be repaired to the satisfaction of the owner of the damaged or disturbed areas.

8. The owner of Lot 2 shall warrant that all contractors shall be paid sums legally due them in a timely manner, and shall cause any liens placed by contractors or suppliers to be diligently removed by posting of Bond or otherwise.

9. At such time as the Building Inspector of the Town of Bolton issues a certificate of occupancy for the house to be constructed on Lot 2 and that all work has been completed in accordance with the plans prepared by Foresite Engineering Associates, Inc. and with the terms and conditions of the Planning Board Approval, the maintenance of the Common Driveway shall then become the responsibility of the owners of Lots 1-4, in accordance with the terms and conditions of this agreement.

10. Without thereby diminishing the obligations hereunder of the owners of the Member Lots to assure the proper repair and maintenance of the Common Driveway, the owners of the Member Lots by majority Vote may establish reasonable rules and regulations in furtherance of these restrictions, which rules and regulations shall be binding on all of the owners of the Member Lots, their successors and assigns.

UTILITY EASEMENT

11. Easements for the installation and maintenance of utilities are reserved as shown on the recorded plan. Within these easements, no structure, planting or other material shall be placed or permitted to remain which may damage or interfere with the installation and maintenance of utilities. The easement area of each Member Lot and all improvements in it shall be maintained continuously by the owners of the Member Lots served by said utilities and their successors and assigns, except for those improvements for which a public authority or utility company is responsible.

ADMINISTRATION AND ENFORCEMENT

12. Each and every owner of a Member Lot shall have the right to enforce the obligation of every other owner of a Member Lot to participate in accordance with the terms of this agreement in the repair and maintenance of the Common Driveway so as to provide for all safe and convenient year round access for vehicular traffic for owners of the Member Lots, and to provide continuous year round access for all fire, police, ambulance/rescue, moving, construction and maintenance vehicles, and by other restrictions contained herein, as well as to enforce the rules and regulations adopted hereunder, by any legal or equitable means. Such legal and equitable means shall include, but not be limited.to, the provisions of Massachusetts General Laws, Chapter 84, sections 12, 13 and 14. If any owner of a Member Lot fails to pay an amount duly assessed for the cost of such repair and maintenance within 30 days of receiving the expense statement, he/she shall be liable for interest on the amount unpaid and the reasonable costs of collection. In any event, the Member Lot enforcing this agreement shall be entitled to reasonable attorney 's fee incurred in such enforcement or such collection of sums due under this agreement.

13. It is understood, covenanted and agreed that each and every purchaser of the aforesaid Member Lots, their successors and assigns, shall by accepting a deed from their Grantor, be subject to these covenants and conditions; each Grantee covenanting and agreeing with each and every other purchaser of said Member Lots and the original parties to this Agreement, and for their mutual benefit, that said Grantee will diligently and faithfully observe and perform the aforesaid covenants and agreements for the benefit of each and every purchaser and, as part of the general plan of restrictions, each and every purchaser is given the right to enforce by any legal means the performance of said covenants and agreements by each and every purchaser of said Member Lots, their successors and assigns.

SEPARABILITY

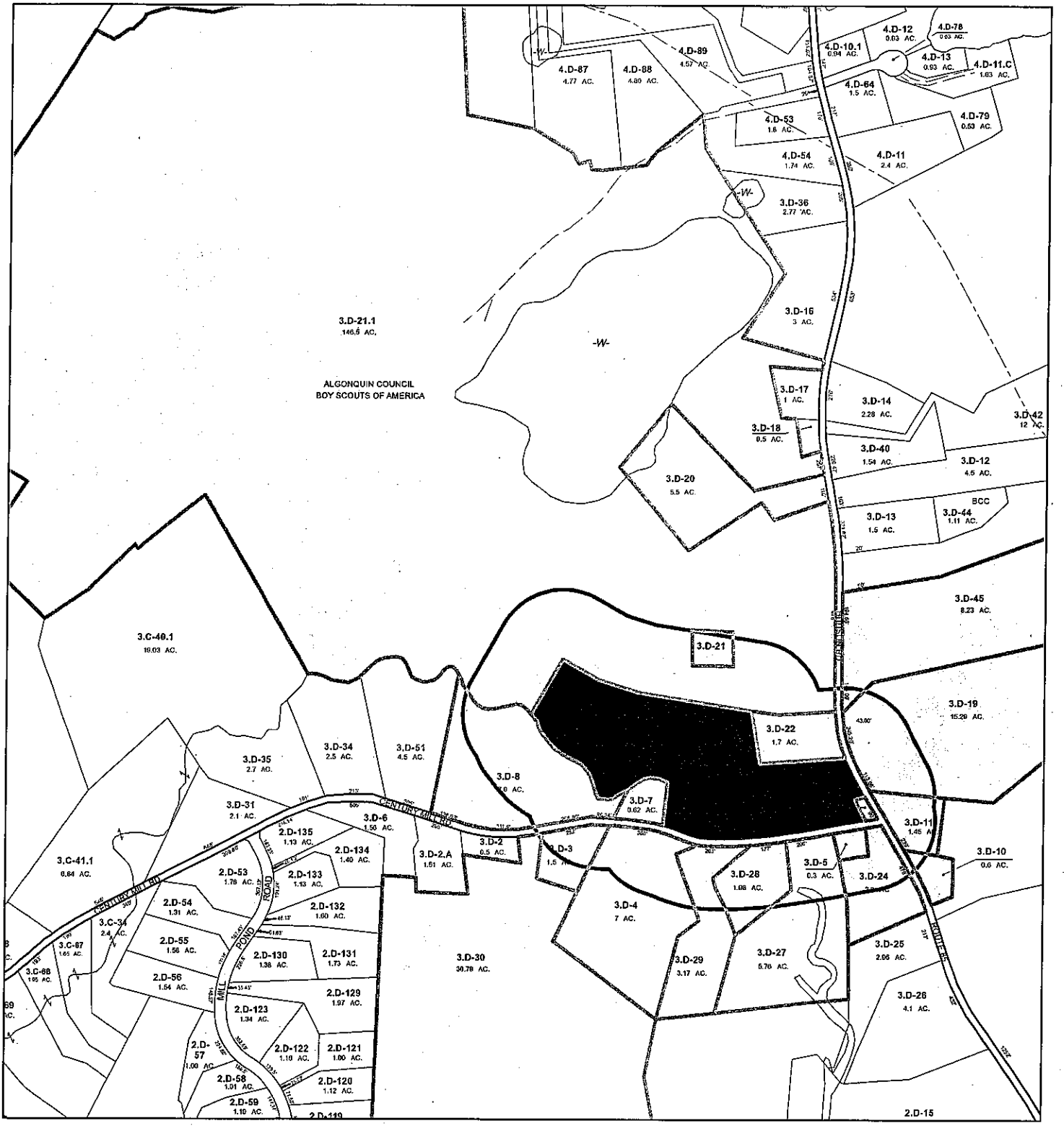
14. If any provisions of this Agreement or the application of such provisions to any person or circumstances shall be held invalid, the remainder of this Agreement or the application of such provisions to persons or circumstances other than those as to which it is held invalid, shall not be affected thereby.

WITNESS our hands and seals this 27th day of June 2018

Commonwealth of Massachusetts Worcester County, SS:

On this 27th day of June, 2018, before me, the undersigned notary public, personally appeared Scott Goddard, Manager of 21 Century Mill LLC, proved to me through satisfactory evidence of - identification , which was/were Massachusetts Driver ID, to be the person(s) whose name(s) is/are signed on the preceding or attached document acknowledged to me that he/she/they signed it voluntarily for its stated purpose .

My Commission Expires:



Abutters List - 300 Ft / Map 3D-32 / 21 Century Mill Rd

Bolton

0 600 1,200

Feet

6/6/2018

Certified: Cynthia Bradley

Abutters List Report

Town of Bolton, MA
June 06, 2018

Subject Properties:

003.D-0032.0 003.D-0000-0032.0 21 CENTURY MILL RD	21 CENTURY MILL LLC 291 MAIN ST, STE 8 NORTHBOROUGH, MA 01532

Parcel Number: Cama Number: Property Address:	003.D-0003.0 003.D-0000-0003.0 56 CENTURY MILL RD 1A	Mailing Address:	KANE MICHAEL G & LOIS WIKSTRO 56 CENTURY MILL RD BOLTON, MA 01740
Parcel Number: Cama Number: Property Address:	003.D-0004.0 003.D-0000-0004.0 40 CENTURY MILL RD	Mailing Address:	FOOTE JAKE GORDON 40 CENTURY MILL RD BOLTON, MA 01740
Parcel Number: Cama Number: Property Address:	003.D-0005.0 003.D-0000-0005.0 6 CENTURY MILL RD	Mailing Address:	MCCARTHY MARY C 6 CENTURY MILL RD BOLTON, MA 01740
Parcel Number: Cama Number: Property Address:	003.D-0007.0 003.D-0000-0007.0 0 CENTURY MILL RD	Mailing Address:	FOOTE JAKE GORDON 40 CENTURY MILL RD BOLTON, MA 01740
Parcel Number: Cama Number: Property Address:	003.D-0008.0 003.D-0000-0008.0 75 CENTURY MILL RD 2	Mailing Address:	~~1000 LLC~~ Gallagher Courtenay + James ~~28 COUNTRY CLUB RD~~ 75 Century Mill Rd ~~MIDDLETON, MA 01949~~ Bolton MA 01740
Parcel Number: Cama Number: Property Address:	003.D-0010.0 003.D-0000-0010.0 218 HUDSON RD	Mailing Address:	GORHAM MELVIN H JR DIANE M GORHAN 218 HUDSON RD BOLTON, MA 01740
Parcel Number: Cama Number: Property Address:	003.D-0011.0 003.D-0000-0011.0 206 HUDSON RD	Mailing Address:	BIRSE WILLIAM A & SUSAN M 206 HUDSON RD BOLTON, MA 01740
Parcel Number: Cama Number: Property Address:	003.D-0019.0 003.D-0000-0019.0 174 HUDSON RD	Mailing Address:	SARGENT JOHN D MARYANN H SARGENT 174 HUDSON RD BOLTON, MA 01740
Parcel Number: Cama Number: Property Address:	003.D-0021.0 003.D-0000-0021.0 75 HUDSON RD	Mailing Address:	ALGONQUIN CNCL BSA 490 UNION AVE FRAMINGHAM, MA 01702
Parcel Number: Cama Number: Property Address:	003.D-0021.1 003.D-0000-0021.1 75 HUDSON RD E SHOR	Mailing Address:	ALGONQUIN CNCL BSA 490 UNION AVE FRAMINGHAM, MA 01702
Parcel Number: Cama Number: Property Address:	003.D-0022.0 003.D-0000-0022.0 185 HUDSON RD	Mailing Address:	DAVIS RICHARD M SUSAN D MOLLER 185 HUDSON RD BOLTON, MA 01740

Subject Properties:

003.D-0032.0
003.D-0000-0032.0
21 CENTURY MILL RD

21 CENTURY MILL LLC
291 MAIN ST, STE 8
NORTHBOROUGH, MA 01532

Parcel Number: 003.D-0023.0
Cama Number: 003.D-0000-0023.0
Property Address: 1 CENTURY MILL RD

Mailing Address: MONTEIRO DAVID
445 MAIN ST
HUDSON, MA 01749

Parcel Number: 003.D-0024.0
Cama Number: 003.D-0000-0024.0
Property Address: 211 HUDSON RD

Mailing Address: STEPHEN P DEMEO REVOCABLE TRU
211 HUDSON RD
BOLTON, MA 01740

Parcel Number: 003.D-0027.0
Cama Number: 003.D-0000-0027.0
Property Address: 16 CENTURY MILL RD 3

Mailing Address: ABYSALH JONATHAN & KRISTINA
16 CENTURY MILL RD
BOLTON, MA 01740

Parcel Number: 003.D-0028.0
Cama Number: 003.D-0000-0028.0
Property Address: 28 CENTURY MILL RD 2

Mailing Address: LUNDBERG KEITH M & MICHELE A W
28 CENTURY MILL RD
BOLTON, MA 01740

Parcel Number: 003.D-0029.0
Cama Number: 003.D-0000-0029.0
Property Address: 32 CENTURY MILL RD 1

Mailing Address: FLATGARD ADRIAN J
SHARON W FLATGARD
32 CENTURY MILL RD
BOLTON, MA 01740

Parcel Number: 003.D-0030.0
Cama Number: 003.D-0000-0030.0
Property Address: 62 CENTURY MILL RD AB

Mailing Address: HUNT ALISON E & ROBERT G COLCL
62 CENTURY MILL RD
BOLTON, MA 01740

Parcel Number: 003.D-0045.0
Cama Number: 003.D-0000-0045.0
Property Address: 184 HUDSON RD 3

Mailing Address: DUBOIS JEREMY H & LAURA B, TR
DBF 2-15 REA;TU TR
184 HUDSON RD
BOLTON, MA 01740

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21 CENTURY MILL RD, BOLTON
DRAINAGE CALCULATIONS

Methodology:

SCS TR-55 & SCS TR-20 utilizing HydroCAD software

References:

A Guide to Hydrologic Analysis Using SCS Methods, Richard McCuen, copyright 1982, Prentice Hall Inc.

Natural Resources Conservation Service (NRCS), Web Soil Survey

Soil Survey of Middlesex County, Massachusetts, published by NRCS

Rawls Infiltration Rates, Rawls, Brakenstein & Saxton, 1982

USGS Quadrangle Hudson, Massachusetts, 1987

Design Criteria:

Study Area: Existing and proposed common driveway (limits of common driveway construction)

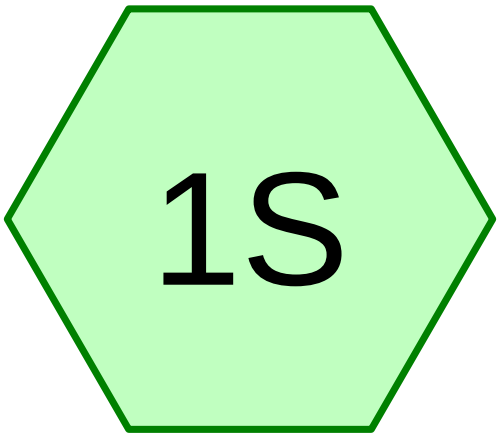
NRCS HSG C

10-YR 24-hr Rainfall, Type III = 4.8 inches

Min. time of concentration = 6 minutes

Minimum required length of 2-ft wide x 1-ft deep grass swale required to mitigate driveway improvements = 250 linear feet = 125 linear feet per driveway side. See plan view for proposed swale locations. Swales effectively reduce both rate and volume of runoff to similar or lesser amounts of runoff for 10-yr design storm analyzed.

Refer to supporting HydroCAD calculations, NRCS Soil data, and Rawls Infiltration Rates supporting this analysis.



PRE DRIVEWAY AND SHOULDERS

Subcat Reach Pond Link

Routing Diagram for 1975 PRE
Prepared by FORESITE ENGINEERING, Printed 7/12/2018
HydroCAD® 10.00-21 s/n 01697 © 2018 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.108	96	Gravel surface, HSG C (1S)
0.249	76	Woods/grass comb., Fair, HSG C (1S)
0.357	**82**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.357	HSG C	1S
0.000	HSG D	
0.000	Other	
0.357		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.108	0.000	0.000	0.108	Gravel surface	1S
0.000	0.000	0.249	0.000	0.000	0.249	Woods/grass comb., Fair	1S
0.000	**0.000**	**0.357**	**0.000**	**0.000**	**0.357**	**TOTAL AREA**	

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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: PRE DRIVEWAY AND Runoff Area=15,561 sf 0.00% Impervious Runoff Depth>2.90"
Flow Length=16' Slope=0.0300 '/' Tc=6.0 min CN=82 Runoff=1.21 cfs 0.086 af

Total Runoff Area = 0.357 ac Runoff Volume = 0.086 af Average Runoff Depth = 2.90"
100.00% Pervious = 0.357 ac 0.00% Impervious = 0.000 ac

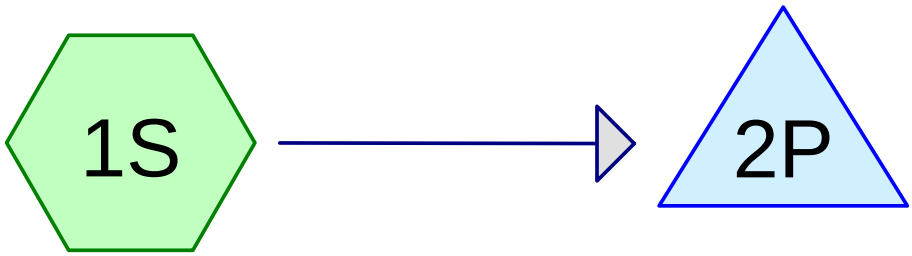
Summary for Subcatchment 1S: PRE DRIVEWAY AND SHOULDERS

Runoff = 1.21 cfs @ 12.09 hrs, Volume= 0.086 af, Depth> 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
4,719	96	Gravel surface, HSG C
10,842	76	Woods/grass comb., Fair, HSG C
15,561	82	Weighted Average
15,561		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0300	0.92		**Sheet Flow, TR-55 Sheet Flow** Smooth surfaces n= 0.011 P2= 3.20"
0.1	10	0.0300	1.21		**Shallow Concentrated Flow, Sh. Conc. Upland Flow** Short Grass Pasture Kv= 7.0 fps
0.2	16	Total, Increased to minimum Tc = 6.0 min			



POST DRIVEWAY & SHOULDERS

SWALES

Subcat Reach Pond Link

Routing Diagram for 1975 POST
Prepared by FORESITE ENGINEERING, Printed 7/12/2018
HydroCAD® 10.00-21 s/n 01697 © 2018 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.158	98	Paved parking, HSG C (1S)
0.199	72	Woods/grass comb., Good, HSG C (1S)
0.357	**84**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.357	HSG C	1S
0.000	HSG D	
0.000	Other	
0.357		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.158	0.000	0.000	0.158	Paved parking	1S
0.000	0.000	0.199	0.000	0.000	0.199	Woods/grass comb., Good	1S
0.000	**0.000**	**0.357**	**0.000**	**0.000**	**0.357**	**TOTAL AREA**	

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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: POST DRIVEWAY & Runoff Area=15,561 sf 44.29% Impervious Runoff Depth>3.08"
Flow Length=16' Tc=6.0 min CN=84 Runoff=1.29 cfs 0.092 af

Pond 2P: SWALES Peak Elev=101.13' Storage=1,203 cf Inflow=1.29 cfs 0.092 af
Discarded=0.01 cfs 0.011 af Primary=1.09 cfs 0.057 af Outflow=1.10 cfs 0.069 af

Total Runoff Area = 0.357 ac Runoff Volume = 0.092 af Average Runoff Depth = 3.08"
55.71% Pervious = 0.199 ac 44.29% Impervious = 0.158 ac

Summary for Subcatchment 1S: POST DRIVEWAY & SHOULDERS

Runoff = 1.29 cfs @ 12.09 hrs, Volume= 0.092 af, Depth> 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
6,892	98	Paved parking, HSG C
8,669	72	Woods/grass comb., Good, HSG C
15,561	84	Weighted Average
8,669		55.71% Pervious Area
6,892		44.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0300	0.92		**Sheet Flow, TR-55 Sheet Flow** Smooth surfaces n= 0.011 P2= 3.20"
0.1	10	0.0300	1.21		**Shallow Concentrated Flow, Sh. Conc. Upland Flow** Short Grass Pasture Kv= 7.0 fps
0.2	16	Total, Increased to minimum Tc = 6.0 min			

Summary for Pond 2P: SWALES

Inflow Area = 0.357 ac, 44.29% Impervious, Inflow Depth > 3.08" for 10-YR event
Inflow = 1.29 cfs @ 12.09 hrs, Volume= 0.092 af
Outflow = 1.10 cfs @ 12.14 hrs, Volume= 0.069 af, Atten= 14%, Lag= 2.9 min
Discarded = 0.01 cfs @ 12.14 hrs, Volume= 0.011 af
Primary = 1.09 cfs @ 12.14 hrs, Volume= 0.057 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 101.13' @ 12.14 hrs Surf.Area= 1,630 sf Storage= 1,203 cf

Plug-Flow detention time= 134.4 min calculated for 0.069 af (75% of inflow)
Center-of-Mass det. time= 48.6 min (860.1 - 811.5)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1,875 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) x 2

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	250	0	0
100.50	500	188	188
101.00	750	313	500
101.50	1,000	438	938

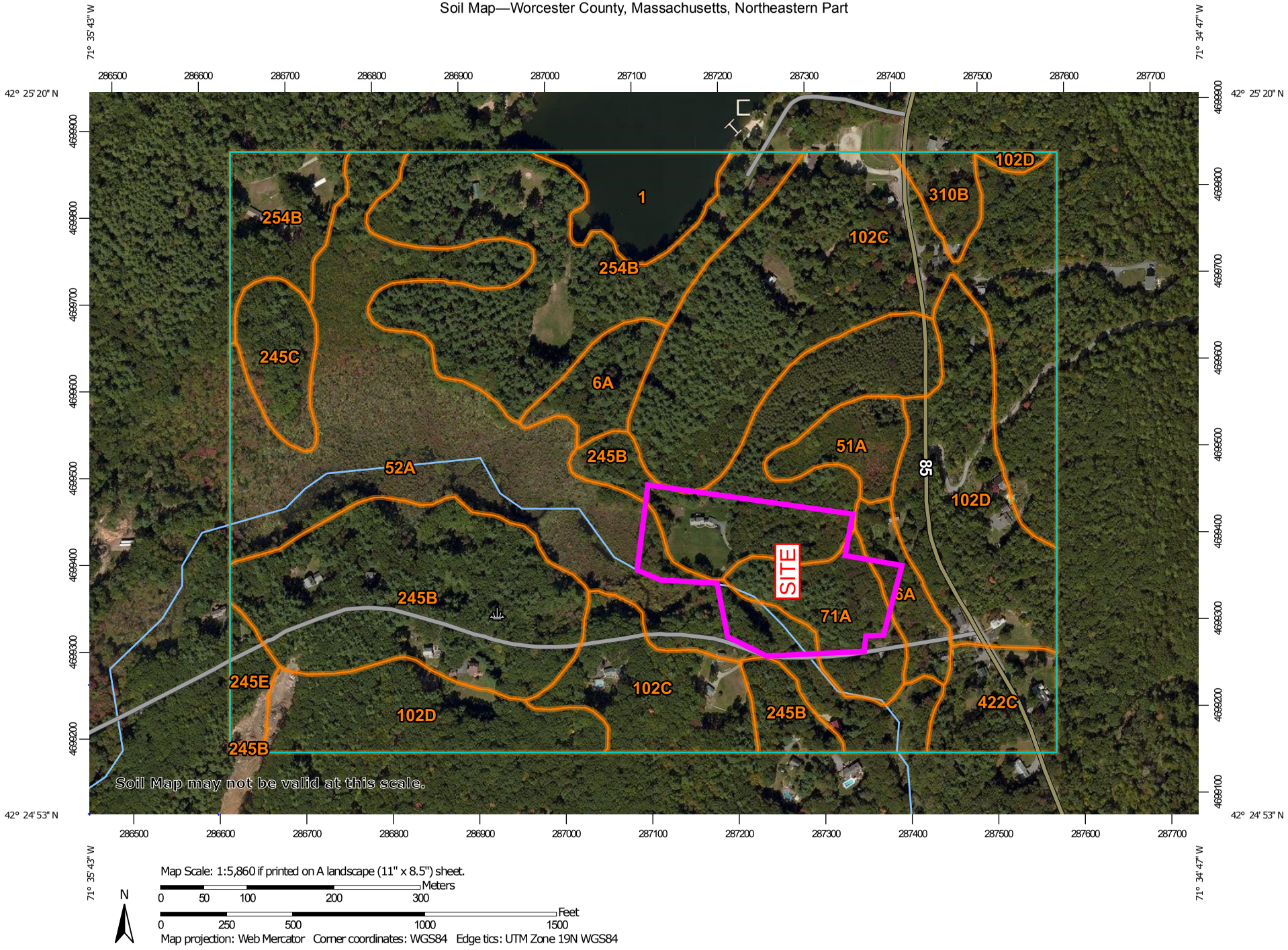
Device	Routing	Invert	Outlet Devices
#1	Discarded	100.00'	**0.140 in/hr Exfiltration X 2.00 over Surface area**
#2	Primary	101.00'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50

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=0.01 cfs @ 12.14 hrs HW=101.13' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.09 cfs @ 12.14 hrs HW=101.13' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 1.09 cfs @ 0.84 fps)

Soil Map—Worcester County, Massachusetts, Northeastern Part



Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	4.4	2.7%
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	5.5	3.3%
51A	Swansea muck, 0 to 1 percent slopes	2.8	1.7%
52A	Freetown muck, 0 to 1 percent slopes	30.7	18.7%
71A	Ridgebury fine sandy loam, 0 to 3 percent slopes, extremely stony	4.9	3.0%
102C	Chatfield-Hollis-Rock outcrop complex, 0 to 15 percent slopes	33.1	20.1%
102D	Chatfield-Hollis-Rock outcrop complex, 15 to 35 percent slopes	19.5	11.9%
245B	Hinckley loamy sand, 3 to 8 percent slopes	30.4	18.5%
245C	Hinckley loamy sand, 8 to 15 percent slopes	3.4	2.1%
245E	Hinckley loamy sand, 25 to 35 percent slopes	1.6	1.0%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	21.9	13.3%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	1.8	1.1%
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	4.1	2.5%
Totals for Area of Interest		**164.0**	**100.0%**

Table D.13.1 Hydrologic Soil Properties Classified by Soil Texture*

Texture Class	Effective Water Capacity (C_w) (inch per inch)	Minimum Infiltration Rate (f) (inches per hour)	Hydrologic Soil Grouping
Sand	0.35	8.27	A
Loamy Sand	0.31	2.41	A
Sandy Loam	0.25	1.02	A
Loam	0.19	0.52	B
Silt Loam	0.17	0.27	B
Sandy Clay Loam	0.14	0.17	C
Clay Loam	0.14	0.09	D
Silty Clay Loam	0.11	0.06	D
Sandy Clay	0.09	0.05	D
Silty Clay	0.09	0.04	D
Clay	0.08	0.02	D

* Source: Rawls, Brakensiek and Saxton, 1982

Based on the soil textural classes and the corresponding minimum infiltration rates, a restriction is established to eliminate unsuitable soil conditions. Soil textures with minimum infiltration rates less than 0.52 inches per hour are not suitable for usage of infiltration practices. These include soils that have a 30 percent clay content, making these soils susceptible to frost heaving and structurally unstable, in addition to having a poor capacity to percolate runoff. Soil textures that are recommended for infiltration systems include those soils with infiltration rates of 0.52 inches per hour or greater, which include loam, sandy loam, loamy sand, and sand.