

March 9, 2021

VIA HAND DELIVERY

Mark Montanari, Chairman
Planning Board
Town of Littleton
Littleton Town Offices
37 Shattuck Street
Littleton, Massachusetts 01460

Re: Site Plan and Special Permit Applications - 289 Great Road, Littleton
Northern Bank & Trust Company

Dear Mr. Chairman and Members of the Planning Board:

This office and the undersigned represent Northern Bank & Trust Company (“Applicant”) and 289 Great Road Realty Trust (“Property Owner”) (collectively, the Petitioner) regarding property situated at 289 Great Road, Littleton, Massachusetts (“Premises”). The Premises is located within the Village Common (VC) Zoning District.

The Applicant is proposing a redevelopment of the Premises, including the demolition of the existing building and improvements, to accommodate the construction of a full service bank branch with drive-through facilities and associated site improvements (“Project”). The Project location is unique, as it is a transitional area situated between residential homes on Robinson Road and the existing commercial district along Great Road. This geographic factor, coupled with the unique triangular shape of the Premises has resulted in a building layout, which is respectful of the abutting residential neighborhood while providing the interactive frontage desired along the primary commercial district. The building design embodies the community vision prescribed in the VC District Zoning Bylaw by utilizing elements reminiscent of a New England barn design. In addition, the Project incorporates enhanced vehicle circulation and further supports a walkable community with new pedestrian accommodations. The Project and associated improvements are subject to Planning Board Site Plan and Special Permit authorization, and as such, we respectfully request consideration of these applications to allow the development as proposed.

For your consideration of this request, please find three (3) copies of the following materials:

1. Special Permit Application Form;

2. Site Plan Checklist;
3. Certified Abutters List;
4. Project Narrative;
5. Existing conditions photos;
6. Stormwater Report and Operation and Maintenance Plan prepared by Oak Consulting Group, LLC;
7. Check in the amount of \$3,500 made payable to the Town of Littleton (\$1,500.00/Site Plan Application Fee and \$2,000/Special Permit Fee);
8. Building elevation and renderings prepared by Maugel Architects; and,
9. Site Plan set prepared by Oak Consulting Group, LLC;

We look forward to presenting this matter to the Board during the upcoming April 8, 2021 public hearing. In the interim if you require any additional information please do not hesitate to contact me.

Very truly yours,



Mark T. Vaughan

MTV:mmc
Enclosures

Cc: Sean Mahoney, Northern Bank & Trust Company (w/enclosures)
Sean Malone, Oak Consulting Group (w/enclosures)
Daniel Barton, Maugel Architects (w/enclosures)

2689530.1



LITTLETON PLANNING BOARD

Littleton Town Offices
37 Shattuck Street, Room 303
Littleton, MA 01460

received

3/10/21 1:35 PM

Smolinski Cylle

<input checked="" type="checkbox"/> Filing Date:	3-10-21
Planning Board:	
Town Clerk:	
<input checked="" type="checkbox"/> Filing Fee:	Rec'd MAT

SPECIAL PERMIT APPLICATION

Updated Oct 15, 2018

PART I. BASIC APPLICATION

Project Summary & Applicant Information

Project Name: Northern Bank and Trust Company

Location (Street Address): 289 Great Road

Assessor's Map/Parcel (s): U07 22 0

Applicant: Northern Bank and Trust Company

Address: c/o Mark T. Vaughan, Esquire Riemer & Braunstein LLP 700 District Ave, 11th Floor Burlington, MA 01803

Telephone: 617-880-3457

Email: mvaughan@riemerlaw.com

Property Owner: 289 Great Road Realty Trust

Address: c/o Mark T. Vaughan, Esquire Riemer & Braunstein LLP 700 District Ave, 11th Floor Burlington, MA 01803

Telephone: 617-880-3457

Email: mvaughan@riemerlaw.com

Registry: Middlesex South

Book: 63344

Page: 416

Site Information

Total Area

(Acres): 0.66+/- acres Lot Frontage (Lin. Ft): 219' 6" +/-

Residence

Village Common

Industrial-A

Business

Industrial-B

Zoning District(s):

Wetlands

Floodplains

Water Resource

Aquifer District

Registered Marijuana Dispensary Overlay District

District

Littleton Village Overlay District West —Beaver Brook Area

All or a portion of the Site is also located in one or more overlay districts:

PART II. SPECIAL PERMIT REQUESTED

- Accessory Business Uses at Active Farms (§173-57)
- Adult Uses (§173-140 - §173-142)
- Aquifer and Water Resource District (§173-61 - §173-64); *Attach Form 1A.*
- Commercial Solar Photovoltaic Installations (§173-180 - §173-184); *Attach Form 1D.*
- Conversion of Municipal Building (§173-69)
- Inclusionary Housing (§ 173-196 - § 173-205); *Attach Form 1F.*
- Littleton Village Overlay District West-Beaver Brook Area (§173-167 - §173-179)
- Major Commercial or Industrial Use (§173-86 - §173-88)
- Master Planned Development (§173-89)
- Mixed Use in Village Common Business District (§173-165 - §173-166)
- Open Space Development (§173-93 - §173-118)
- Senior Residential Development (§173-145 - §173-152); *Attach Form 1E.*
- Shared Residential Driveways (§173-125 - §173-127)
- Vehicular Retail Sales (§173-26)
- Wireless Telecommunications Towers and Facilities (§173-128 - §173-133); *Attach Form 1B.*
- Registered Marijuana Dispensary (§ 173-85 – § 173-92) *Attach Form 1C.*
- Adult Use Marijuana Establishment (§ 173-194 – § 173-202) *Attach Form 1G*

Sidewalk Curb Cuts (Section 173-224 H)

PART III. APPLICANT AND OWNER CERTIFICATIONS

The undersigned hereby certifies that he/she has read and examined this Application, including all attachments hereto, and that the proposed project is accurately represented in the statements made in this Application. The undersigned also certifies that this application has been filed both with the Planning Board and Town Clerk, and that all submission requirements in the Planning Board's Rules and Regulations have been met.

Property Owner

I/we hereby acknowledge that the Applicant is authorized to act on my/our behalf and that any and all representations made by the Applicant will be binding on me/us as Owners of the property.

Signature: 
Print: Mark T. Vaughan, Esquire on behalf of the Property Owner

Date: March 9, 2021

Signature: _____

Date: _____

Print: _____

Applicant

Signature: 
Print: Mark T. Vaughan, Esquire on behalf of the Applicant

Date: March 9, 2021

Signature: _____

Date: _____

Print: _____

Applicant is: Owner Agent/Attorney Purchaser

SUBMISSION REQUIREMENTS

- ☒ Special Permit Application Form: 7 print copies and one electronic copy.
- ☒ Site Plan; 2 full-sheet sets and 5 reduced copies (11" x 17"). Plans and drawings must be sealed by a registered professional engineer, registered architect, landscape architect, surveyor, or other design professional in their area of expertise.
 - Vicinity map showing all lots, streets, and driveways within 500 feet from the exterior boundary of the lot
 - Existing conditions plan, showing existing uses; inventory of natural features; all watercourses, wetlands, bogs, swamps, marshes, and boundaries of public water supply watersheds and environmentally sensitive zones; floodways and floodplain boundaries; zoning districts
 - Existing and proposed contours at 2' intervals
 - Construction limit line, showing all areas to remain undisturbed
 - Site layout plan for proposed use(s) of the property showing required setbacks and other information required for zoning compliance
 - Utilities plan, i.e., existing and proposed fire hydrants and sewer, water, gas, electric, and other utility lines and easements
 - Storm drainage provisions
 - Existing and proposed street rights-of-way and paved surfaces, including those abutting the site
 - Existing and proposed parking and loading spaces and areas, including stalls, aisles, driveways, turning radii, landscaped areas and islands, and their dimensions as required
 - All existing and proposed points of vehicular access to the site, and clear sight triangles for corner lots; and sight lines for proposed driveways
 - Location, height, and materials of all retaining walls.
 - Location of proposed outdoor bulk trash containers or dumpsters, and screening details
 - Location of proposed on-site sewage disposal systems and reserve areas, and design computations
 - Exterior lighting plan
 - A block containing the following information:
 - Zoning district(s) in which the property lies;
 - Total area of the property to at least the nearest hundredths of a square foot;
 - Gross floor area of each building;
 - Proposed percentages of building coverage and impervious surface coverage;
 - Maximum height of all existing and proposed buildings and other structures in feet and stories;

- Number of parking spaces required and provided for each use, plus visitor spaces, and method of calculation;
- Number of handicap parking spaces required and provided;
- Proposed overall density for each lot (number of dwelling units per acre);
- Total trip generation of existing and proposed use(s);
- Minimum common and usable open space required and provided, in square feet.

Architectural Plans and Drawings

- Elevations of all buildings and structures. Elevations shall be drawn to scale, showing the height, location, and extent of all material.
- Roof top plan showing all proposed mechanical equipment and screening.

Landscaping Plan

Master Signage Plan/Conceptual signage

Drainage Report and Calculations (3 copies)

Traffic Impact Assessment



**Littleton Planning Board
SITE PLAN REVIEW CHECKLIST**
Drawing # _____
Drawing Date: _____

Proposed Title Northern Bank Littleton Branch
289 Great Road Littleton, MA Reviewer _____

Applicant Northern Bank and Trust Company

Application Date March 10, 2021

Date of Formal Review by Planning Board _____

Project Description: The Applicant is proposing a redevelopment of the Premises, including the demolition of the existing building and improvements, to accommodate the construction of a full service bank branch with drive-through facilities and associated site improvements.

(See application cover letter.)

PLANNING BOARD ACTION

APPROVED

APPROVED SUBJECT TO MODIFICATION

DISAPPROVED

By vote of the Littleton Planning Board

Date: _____

Date of Notice to Building Commissioner _____

POLICY ON TRAFFIC & PEDESTRIAN MITIGATION

Calculated Fee (\$100 per parking space) _____

Fee Paid

Fee Waived

DRAWING REQUIREMENT: §173-17: Littleton Zoning Bylaw

Boundary Lines

Adjacent streets and ways shown

Topography, existing and proposed

Structures, existing and proposed

Walkways

Principal drives

Service entries

Parking

Landscaping

Screening

N/A Park or recreation areas

Utilities:

a. Water

b. Electricity

c. Gas

N/A d. Telephone

x Sanitary sewerage

x Storm drainage

x Seal of registered Architect, Landscape Architect, or Professional Engineer

+++++

DESIGN REQUIREMENTS §173-18

Internal Circulation safe

Egress safe

Access via minor streets minimized

Visibility of parking areas minimized

Lighting avoids glare

Major topography change, tree removal minimized

Adequate access to each structure for emergency equipment

Utilities adequate

Drainage adequate

++++++

USE AND INTENSITY REGULATION

§173-22: Establishment of districts

Parcel is located in zoning district type: Village Commons

Section 173-25: Use Regulations

Use for which application is made: Bank

 Use allowed **OR**

Special Permit Required (§173-7) because:

(Sidewalk Curb Cuts Section 173-224 H - Special Permit)

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§173-27 & 173-31: Intensity of Use Regulation & Schedule

<u>N/A</u>	Lot area adequate (see also Definitions)
<u>N/A</u>	Lot frontage adequate
<u>N/A</u>	Reduced lot frontage approved, if applicable
<u>X</u>	Front yard adequate (see also Definitions)
<u>N/A</u>	Smaller setback approved, if applicable
<u>X</u>	Side, rear yards adequate (see also Definitions)
<u>X</u>	Building height conforming (see also Definitions)
<u>N/A</u>	Greater building height approved, if applicable
<u>X</u>	Building coverage conforming (see also Definitions)
<u>X</u>	Building plus paving coverage conforming
<u>N/A</u>	Floor area ratio conforming

GENERAL REGULATIONS §173-32 & 173-33 (Project in compliance with Section 173-224 Site Standards A. Required Parking Spaces)

<u>X</u>	Parking and Loading Requirements
<u>X</u>	Location of parking conforming
<u>X</u>	Number of spaces adequate or waived
<u>X</u>	Computation <u>11 spaces proposed</u>

§173-32 Parking Area Design (N/A)

<u>N/A</u>	No parking within 10 feet of street line
<u>N/A</u>	Parking paved, bumper guards conforming or waived
<u>N/A</u>	No backing into public way (§173-32, C.1)
<u>N/A</u>	Egress spacing adequate (§173-32 C. C1)

N/A Screened from abutting residential uses, public ways (§173-32, C.3) for 8 or more cars

§ 173-33: Loading Requirements

X No need for trucks to back onto or off a public way

X No need for trucks to park on a public way while loading, unloading, or waiting to do so

§ 173-34: Sign Regulation administered by Board of Selectmen, not included in Site Plan Review.

§ 173-43: Landscaping and Screening

N/A Outdoor sales display, commercial outdoor recreation screened

N/A Industrial "A" buffer provided

N/A Corner vision clear

N/A Exterior lighting complies

SPECIAL REGULATIONS

§ 173-52: Motor Vehicle Services

N/A Requirements met, if applicable

§ 173-53: Accessory Uses

N/A Floor and Land area requirements met, if applicable

173-61: Aquifer and Water Resource District

N/A Aquifer District applicable

N/A Water Resource District applicable

N/A Regulations met, if applicable (See separate checklist)

173-72: Wetlands and Flood Plain Regulations

N/A Wetlands and flood plain regulations met, if applicable

173-78: Noise Regulations

X Applicant informed of existence of requirements



**TOWN OF LITTLETON
BOARD OF ASSESSORS**
P.O. BOX 1305
LITTLETON, MA 01460
(978) 540-2410 FAX: (978) 952-2321

Date: February 19, 2021

Re: Certified List of Abutters for Planning Board (300 feet - public hearings, special permits)

Applicant: Northern Bank and Trust Co
Name of Firm: Reimer & Braunstein LLP
Mailing Address 700 District Ave, 11th Floor, Burlington, MA 01803

Subject Parcel Location: 289 Great Road, Littleton
Subject Owner: 289 Great Road Realty Trust, Kenny Francis - Trustee
Subject Parcel ID: U07 22 0

M.G.L. Chapter 40A, Section 11. "In all cases where notice of a public hearing is required notice shall be given by publication in a newspaper of general circulation in the city or town once in each of two successive weeks, the first publication to be not less than fourteen days before the day of the hearing and by posting such notice in a conspicuous place in the city or town hall for a period of not less than fourteen days before the day of such hearing. In all cases where notice to individuals or specific boards or other agencies is required, notice shall be sent by mail, postage prepaid. **"Parties in interest" as used in this chapter shall mean the petitioner, abutters, owners of land directly opposite on any public or private street or way, and abutters to the abutters within three hundred feet of the property line of the petitioner as they appear on the most recent applicable tax list, notwithstanding that the land of any such owner is located in another city or town, the planning board of the city or town, and the planning board of every abutting city or town.** The assessors maintaining any applicable tax list shall certify to the permit granting authority or special permit granting authority the **names and addresses of parties in interest and such certification shall be conclusive for all purposes.** The permit granting authority or special permit granting authority may accept a waiver of notice from or an affidavit of actual notice to any party in interest or, in his stead, any successor owner of record who may not have received a notice by mail, and may order special notice to any such person, giving not less than five nor more than ten additional days to reply."

I hereby certify the attached list of abutter(s) as stated in the M.G.L. Chapter 40A, Section 11.

Number of Abutter(s) 33 including the subject parcel.

Certified by:

Christine Kumar

Christine Kumar, Assistant Assessor

319 GREAT RD	U07 12 0	22 ROBINSON RD	U07 17 0	288 GREAT RD	U07 36 0
MARY REALTY TRUST	LUC: 013	YATES JEFFREY D	LUC: 101	FLEET NATIONAL/BANK OF AMERICA	LUC: 341
HOLLINGER/COWLEY HOLLINGER TRS		YATES LAURA A		CORP R.E ASSESSMENT NC1-001-03-81	
319 GREAT RD		22 ROBINSON RD		101 N TRYON ST	
LITTLETON, MA 01460		LITTLETON, MA 01460		CHARLOTTE, NC 28255	
311 GREAT RD 1	U07 13 1	28 ROBINSON RD	U07 19 1	294 GREAT RD	U07 37 0
GOULD SHERRY TRUSTEE OF	LUC: 344	CARTER RICHARD A	LUC: 101	MONTE CRISTO HOLDINGS LLC	LUC: 031
SHERRY REALTY TRUST		CARTER JENNIFER E		298 GREAT RD STE 1	
PO BOX 1212		28 ROBINSON RD		LITTLETON, MA 01460	
LITTLETON, MA 01460		LITTLETON, MA 01460			
311 GREAT RD 2	U07 13 2	25 ROBINSON RD	U07 20 0	298 GREAT RD	U07 38 0
GOULD SHERRY TRUSTEE OF	LUC: 344	NBTC GREAT ROAD LLC	LUC: 101	MONTE CRISTO HOLDINGS LLC	LUC: 329
SHERRY REALTY TRUST		275 MISHAWUM ROAD		298 GREAT RD STE 1	
PO BOX 1212		WOBURN, MA 01801		LITTLETON, MA 01460	
LITTLETON, MA 01460					
311 GREAT RD 3	U07 13 3	289 GREAT RD	U07 22 0	308 GREAT RD	U07 39 0
GOULD SHERRY TRUSTEE OF	LUC: 344	289 GREAT ROAD REALTY TRUST	LUC: 325	MIDDLESEX SAVINGS BANK	LUC: 341
SHERRY REALTY TRUST		KENNEY FRANCIS TRUSTEE		C/O ACCOUNTING DEPT	
PO BOX 1212		275 MISHAWUM ROAD 4TH FL		36 SUMMER ST	
LITTLETON, MA 01460		WOBURN, MA 01801		NATICK, MA 01760	
311 GREAT RD 4	U07 13 4	287 GREAT RD	U07 23 0	312 GREAT RD	U07 40 0
BLW REALTY LLC	LUC: 344	NBTC GREAT ROAD LLC	LUC: 325	GOULD SHERRILL R TRUSTEE OF	
PO BOX 1551		275 MISHAWUM ROAD		HOME REALTY TRUST	
LITTLETON, MA 01460		WOBURN, MA 01801		P O BOX 1212	
				LITTLETON, MA 01460	
311 GREAT RD 5	U07 13 5	277 GREAT RD	U07 24 0	27 ROBINSON RD	U07 43 0
GOULD SHERRY TRUSTEE OF	LUC: 344	289 GREAT ROAD REALTY TRUST	LUC: 334	CASALE 2016 TRUST	
SHERRY REALTY TRUST		KENNEY FRANCIS TRUSTEE		CASALE WILLIAM & SANDRA - TRS	
PO BOX 1212		275 MISHAWUM ROAD 4TH FL		27 ROBINSON RD	
LITTLETON, MA 01460		WOBURN, MA 01801		LITTLETON, MA 01460	
311 GREAT RD 6	U07 13 6	265 GREAT RD	U07 25 0	1 VILLAGE LN	U07 6 2
BLW REALTY LLC	LUC: 344	NORTHERN BANK TRUST COMPANY	LUC: 341	ZHANG FRANK	
PO BOX 1551		275 MISHAWUM RD		ZENG PING	
LITTLETON, MA 01460		ATTN: AP		1 VILLAGE LANE	
		WOBURN, MA 01801		LITTLETON, MA 01460	
4 ROBINSON RD	U07 14 0	268 GREAT RD	U07 33 0	10 ADAMS ST	U10 3 0
GIANINO STEPHEN F & ANDREA TRS	LUC: 031	CHL REALTY TRUST	LUC: 341	VIOLETTE BRIAN	
FOUR ROBINSON ROAD REALTY TR		HAJJAR CHARLES & ANNE TAMER TR		DASCOLI LIANNE T	
P.O. BOX 1064		30 ADAMS ST		10 ADAMS ST	
LITTLETON, MA 01460		MILTON, MA 02186		LITTLETON, MA 01460	
12 ROBINSON RD	U07 15 0	272 GREAT RD	U07 34 0	14 ADAMS ST	U10 4 0
LITTLETON TOWN OF	LUC: 931	SHAMES REATLY TR/CITIZENS BANK	LUC: 341	NADEAU ANDREW E	
P O BOX 1305		SHAMES ALBERT - TRUSTEE		14 ADAMS ST	
LITTLETON, MA 01460		C/O RYAN PO BOX 460049		LITTLETON, MA 01460	
		HOUSTON, TX 77056			
18 ROBINSON RD	U07 16 0	278 GREAT RD	U07 35 0	18 ADAMS ST	U10 5 A
MURPHY PATRICK P	LUC: 101	WONG WAI MING	LUC: 104	MONTE CRISTO HOLDINGS LLC	
VALENTE JILLIAN C		LEE WAI LIN		298 GREAT RD STE 1	
18 ROBINSON RD		133 FOSTER ST		LITTLETON, MA 01460	
LITTLETON, MA 01460		LITTLETON, MA 01460			

22 ADAMS ST

U10 7 0

LUC: 101

LANDFORS ALLISON T

22 ADAMS STREET

LITTLETON, MA 01460

24 ADAMS ST

U10 8 0

LUC: 104

LOMBARDO MARK R

LOTHROP-LOMBARDO MATTHEW G

24 ADAMS ST

LITTLETON, MA 01460

28 ADAMS ST

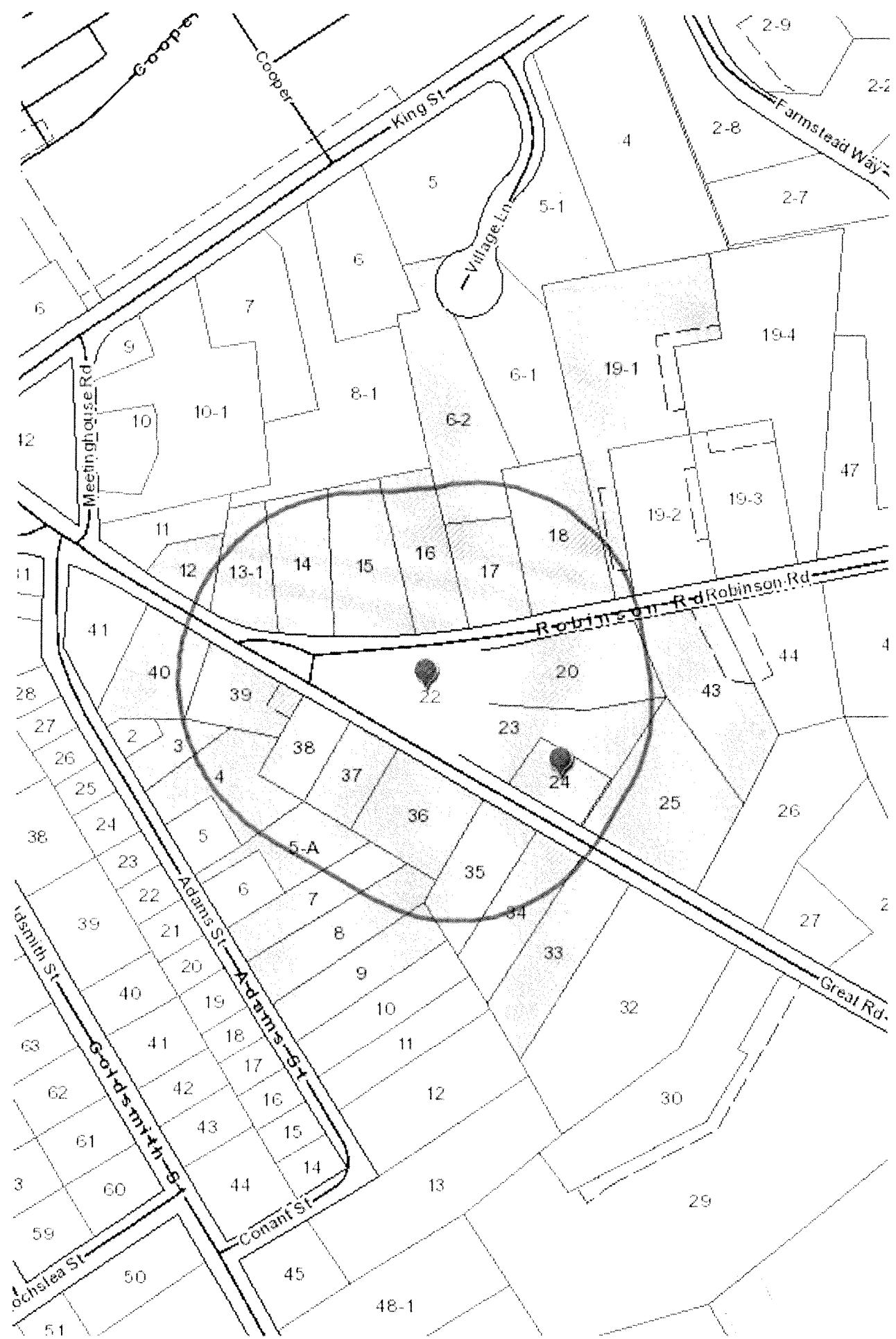
U10 9 0

LUC: 101

HEBERT LAWRENCE P

28 ADAMS ST

LITTLETON, MA 01460



TOWN OF LITTLETON

REQUEST FOR CERTIFIED LIST OF ABUTTERS

THE FEE FOR PREPARING THE LIST IS AS FOLLOWS:

Within 300 feet: \$25.00	- updated list up to 6 mo.: \$10.00
Within 100 feet: \$10.00	- updated list up to 6 mo: \$5.00
Direct & across the street: \$5.00	- updated list up to 6 mo: no charge

THE FEE MUST BE PAID AT THE TIME THE REQUEST IS MADE

Applicant: Northern Bank & Trust CO **Name of Firm:** Riemer & Braunstein LLP
Address: 700 District Ave, 11th Floor, Burlington, MA 01803
Contact Phone #: Melissa Cushing 617-880-3548
Email Address: mcushing@riemerlaw.com

Request abutters list for:

Owner Name: 289 Great Road Realty Trust, Kenny Francis Trustee c/o Northern Bank & Trust CO

Property Location: 289 Great Road, Littleton, MA

Parcel ID: U07-22-0

Date you need the list by: As soon as possible please

The Assessors' Office will generate & certify the requested **abutters list**, for the appropriate boards. Please check the appropriate departments.

Planning Board	<input checked="" type="checkbox"/>	Ch 40A Sec 11 (300 feet)
" "	<input type="checkbox"/>	Ch 41 Sec 81T (anr) (applicant & abutters)
" "	<input type="checkbox"/>	RMD Special Permit 300 feet & 1500 feet
Board of Appeals	<input type="checkbox"/>	Ch 40A Sec 11 (300 feet)
Conservation Comm	<input type="checkbox"/>	Ch 131 Sec 40 (100 feet) or (1000 feet)
Board of Selectmen	<input type="checkbox"/>	Ch 138 Sec 12, 15A (abutters & 500 ft if Within school, church or hosp)
Board of Health	<input type="checkbox"/>	310 CMR 15.000 (direct & across the street)
Other	<input type="checkbox"/>	Specify

We are no longer able to provide mailing labels.

**NORTHERN BANK
289 GREAT ROAD
LITTLETON, MASSACHUSETTS**

PROJECT NARRATIVE

Project Overview

Northern Bank and Trust Company (Bank) has maintained a bank branch at 265 Great Road for many years. The building no longer meets its needs and the Bank is proposing construction of a new branch on a previously developed site at the corner of Great Road and Robinson Road.

The project site is a +/-0.66-acre commercial parcel located within the Littleton Village Common district. The site bounded by Great Road to the south, Robinson Road to the north, a residential property to the northeast and commercial property to the southeast. The site is currently developed with a one-story commercial building, previously used as a greenhouse/flower shop. The +/-3,400 sf building is located at the center of the site with a paved parking area and 100-foot-wide curb cut on Great Road.

The site is currently serviced by municipal water and overhead electric from Robinson Road and an on-site septic system as well as natural gas from Great Road. Existing site lighting consists of spotlight type fixtures mounted approximately 30 feet above grade on a utility pole.

Access and Circulation

Site Access will be via a relocated, smaller curb cut on Great Road. The proposed curb cut is less than 24' measured at the right of way line. Ten paved parking spaces, including one van-accessible space are provided as required by zoning. This parking is served by a twenty-foot-wide drive. A 2-bay teller and ATM drive-thru is provided at the rear of the site with a 9' bypass lane exiting onto Robinson Road. This egress has been designed as an exit only and angled to discourage a right turn onto Robinson Road. Because the project consists of relocating an existing use in the area and the new branch will be smaller than the current branch, there will likely be no increase in traffic or changes in traffic flow on Great Road.

A ten-foot-wide sidewalk is proposed along Great Road. This sidewalk is connected directly to the main entrance to the building facing Great Road. New curbing to close the existing 100-foot-wide curb cut and define the Great Road travel way is proposed along the site frontage.

Great Road is designated as State Routes 2A and 119 and the general area of the project is commercially developed. Due to the State Road designation, a Highway Access Permit from the Massachusetts Department of Transportation (MaDOT) will be required and the curb cut will be required to meet MaDOT requirements.

Trip Generation

To compare site specific anticipated vehicle usage of the site, we performed a trip generation analysis using ITE (Institute of Transportation Engineers) Trip Generation Manual, 8th Edition.

We understand the most recent uses of the existing site has been a flower shop and a thrift store. These uses most closely relate to ITE categories “Nursery-Garden Center” and “Free-standing Discount Store” respectively. The trip generation for these two uses were very similar and for the purposes of this analysis the highest generator was used.

The proposed bank anticipated trips were generated using the ITE “Drive-in Bank” category. In this category the anticipated trips can be calculated several ways. We calculated trips using the building size as well as the number of drive-thru lanes. For each of the analysis period, the highest generator was used.

Trips indicated include one-way arrival or departure from the site. In other words, two trips equal one car using the site. The following summarizes the results of this analysis:

Period	Free-standing Discount Store Existing Trips	Drive-in Bank Proposed Trips	Change
Weekday Total	195	370	175
Weekday AM Peak Hour	19	43	24
Weekday PM Peak Hour	19	67	48
Saturday Total	242	216	-26
Saturday Peak Hour	25	66	41

As shown above, there is anticipated to be an increase in trips to and from the 289 Great Road site. However, the analysis also shows overall the bank will be a low traffic generator. Additionally, the project consists of relocating an existing use in the area and the new bank branch will be smaller than the current branch. Based on the results of this analysis we anticipate no significant changes in traffic flow on Great Road.

Utilities

We understand the town is in planning stages to provide municipal sanitary sewer system to the area. At this time, the timeline for completion of this sewer is unknown; however, the purposes of this proposal, it is assumed that the new bank branch will be served by public sewer.

The bank is a small wastewater generator with bathrooms used primarily by employee. To assess anticipated sanitary flow MADEP Title V sewer flows for a retail store was used. The anticipated sanitary sewer flow is as follows:

$$\text{Bank: } 2,500 \text{ sf} @ 50 \text{ gpd/1,000 sf} = \underline{125 \text{ gpd}}$$

New domestic water and gas services are proposed from existing mains in Great Road and electric and tel/com utilities will be constructed underground from the existing utility pole on Robinson Road.

Stormwater

The proposed project incorporates Best Management Practices (BMP's) to manage stormwater. Stormwater from roof areas will be directed to shallow grassed infiltration areas at the front of the site. Stormwater from the parking area and drive will be directed to a grassed infiltration basin with sediment forebays at the rear of the site. The stormwater management system has been designed to meet the standards of the Massachusetts Stormwater Policy and will reduce the rate and volume of runoff from the site.

Please see the enclosed Stormwater Management Study for additional information on the drainage system.

Site Layout and Screening

The site has been laid out to position the building to create a welcoming presence to the Village Common district. The site is a triangle shaped corner lot and the building has been placed to address both frontages with a primary focus on Great Road. The location of the access drive maximizes the distance from the intersection of Great Road and Robinson Road which will help maintain safe access to and from the site.

The site abuts a residentially zoned property to the northeast. As required by zoning, a 4' high screen fence and evergreen plantings are provided to screen the site.

Architecture

Northern Bank's proposed Littleton Branch is designed to respect and enhance the existing context of the town's center, becoming a vital part of its Village Common character. Its primary form and materials evoke the iconic New England barn, interpreted through a modern design aesthetic.

The new bank welcomes visitors with expansive glazed areas and open porches. Individual components are designed to a human scale, complementing nearby residential and historic properties. Its design is further supplemented by contextual site features, including mature trees, native plantings, generous pathways, and front garden area.

The orientation of the building takes advantage of the site's triangular geometry and its location within the town center. Pointing toward the town green and aligning with the properties along Robinson Road, the structure's position and design aesthetic creates a visually dynamic element to the Great Road corridor.

**STORMWATER REPORT
NORTHERN BANK
GREAT ROAD
LITTLETON, MASSACHUSETTS**

Prepared for:

Northern Bank and Trust Company
275 Mishawum Road
Woburn, Massachusetts

Prepared by:

Oak Consulting Group, LLC
P.O. Box 1123
Newburyport, Massachusetts 01950
978.312.3120

Project 18017
February 2021

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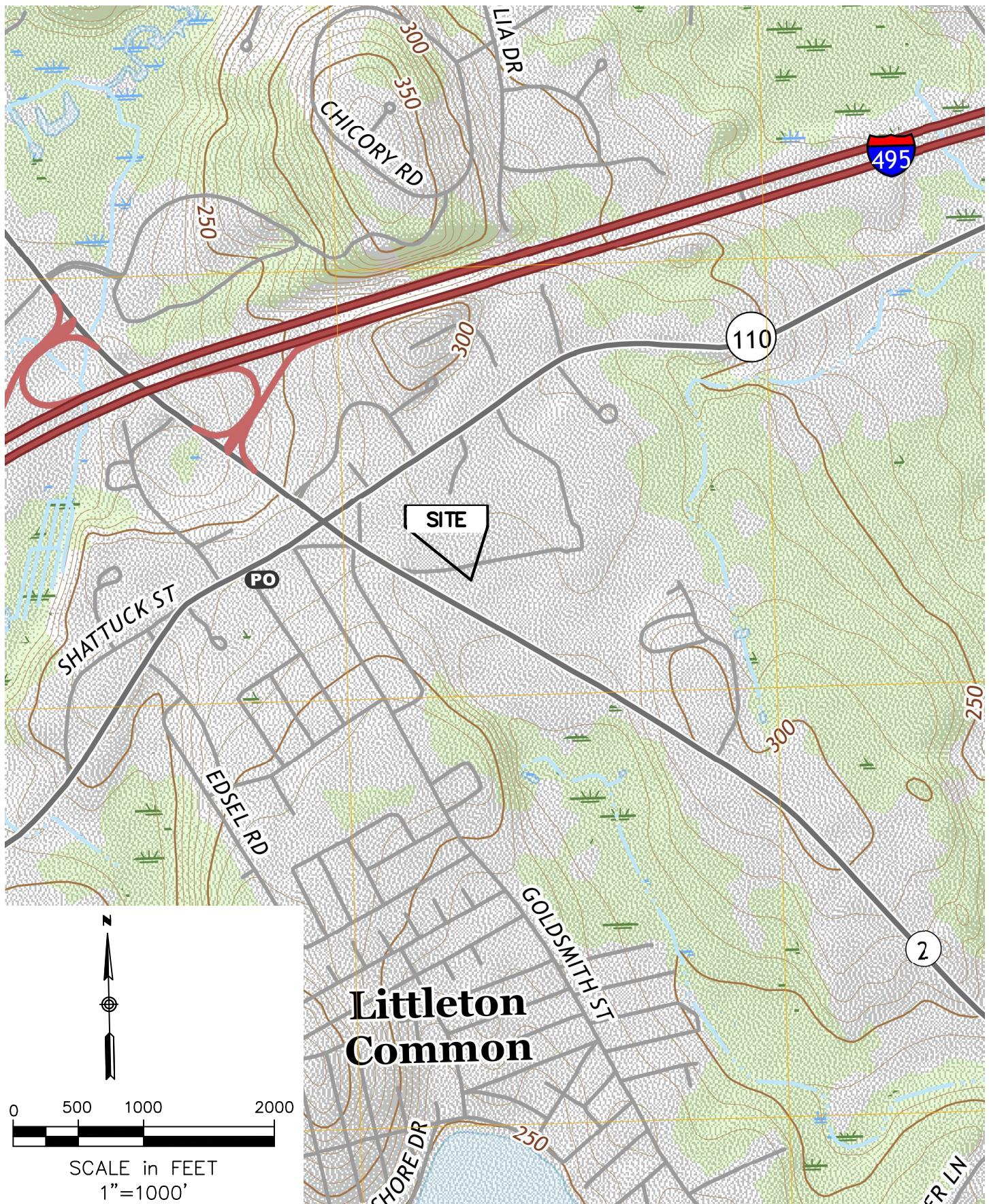
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Appendix C:	Rainfall and Soils Information
Appendix D:	Pre-development Stormwater Calculations
Appendix E:	Post-development Stormwater Calculations



Northern Bank

289 Great Road
Littleton, Massachusetts

OCG

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SITE LOCATION USGS MAP
2018 Westford Quadrangle
7.5 Minute Series

DRAWN BY:
SPM
PROJECT
18017

CHECKED BY:
SPM
DATE:
01/22/2021

FIGURE NO.
1

1.0 INTRODUCTION

On behalf of the Northern Bank and Trust Company (NBTC), Oak Consulting Group, LLC (OCG) has prepared the following Stormwater Report for a new stand-alone bank branch with associated site improvements at the corner of Great Road and Robinson Road in Littleton, Massachusetts. The purpose of this report is to demonstrate compliance with the Town of Littleton Stormwater Regulations, the Massachusetts Department of Environmental Protection's (DEP's) Stormwater Policy and standard engineering practice.

1.1 Current Conditions

The project site is a +/-0.66-acre commercial parcel located at the corner of Great Road and Robinson Road, within the Littleton Village Common district. The site bounded by Great Road to the south, Robinson Road to the north, a residential property to the northeast and commercial property to the southeast. The site is currently developed with a commercial building, previously used as a greenhouse/flower shop, at the center of the site and a paved parking area on the southern portion of the site directly abutting Great Road.

The site consists of a single watershed area draining to a tributary to the Nashoba Brook southwest of the project site. This watershed was divided into three smaller subcatchments to assess the potential of localized impacts to redevelopment of the project site. These subcatchment areas are shown on Pre-Development Subcatchment Plan, DR-01.

1.2 Site Geology and Hydrogeology

According to the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Web Soil Survey, the soils within the project area are classified as Woodbridge-Urban land complex with a Hydrologic Soil Group (HSG) "C" designation. This soil description is indicative of a previously development site. Based on information obtained at the Littleton Board of Health for the site and surrounding sites, the estimated seasonal high groundwater elevation in the area is approximately elevation 276.0. The soils data is enclosed as Appendix A.

1.3 Proposed Improvements

The Project consists of construction of an approximately 2,500 square-foot (sf) footprint stand-alone building housing a bank branch with new parking, utilities and drainage infrastructure. As part of the project the existing building and pavement will be removed.

Under proposed conditions, stormwater patterns will generally replicate existing conditions. As shown on the Post-Development Subcatchment Plan, sheet DR-02, the Pre-development subcatchments were divided into smaller subcatchment areas with the same discharge points used in the Pre-Development condition analysis. These smaller areas were used to assess the proposed stormwater Best Management Practices implemented to treat, detain and infiltrate stormwater from the redeveloped area.

1.4 Methodology

Drainage conditions of the project area were analyzed in both the pre-development and post-development condition using the computer program HydroCAD. This program utilized the SCS TR-20 drainage model to generate estimated peak rates of runoff for the Subcatchment areas modeled. Rainfall Data for the drainage model was obtained from the NOAA Atlas 14, volume 10, version 2. A copy of the rainfall table used can be found in Appendix C. The time of concentration was calculated

using the TR-20 lag method. The site soils classified as sandy loams. The infiltration rate used in the analysis was 0.52 inches per hour based on the Rawl's Table texture class "loam".

The pre-development analysis divided the site into three sub-catchments based on the locations of drainage discharges from the site. In the post-development analysis these subcatchment areas were broken down to several smaller subcatchment areas to analyze the proposed BMP's for the project, while keeping the same points of discharge used in the Pre-development analysis. The Pre-Development Subcatchment Plans and Post-Development Subcatchment Plans depicting the sub-areas analyzed can be found in Appendices D and E, respectively.

2.0 STORMWATER MANAGEMENT STANDARDS CONFORMANCE

The measures taken to address each of the performance standards of the MA DEP Stormwater Policy are presented below.

2.1 Untreated Stormwater (Standard 1)

The proposed project will not result in new untreated discharges or outfalls. Existing stormwater runoff patterns will be maintained.

2.2 Post-Expansion Peak Discharge Rates (Standard 2)

Pre- and Post-Development runoff rates were calculated using HydroCAD. As shown in the table below, peak discharge rates to the Municipal and State drainage systems in Robinson Road and Great Road as well as the overall runoff from the site will not increase in the Post-Redevelopment condition for all storm events.

Table 2.2.1		Peak Rate of Runoff (CFS)			
		2-Year (3.18 Inches) (Pre/Post)	10-Year (4.91 Inches) (Pre/Post)	25-Year (5.99 Inches) (Pre/Post)	100-Year (7.66 Inches) (Pre/Post)
Robinson Road		0.04/ 0	0.1/ 0	0.13/ 0	0.2/ 0
Great Road		0.73/ 0.13	1.31/ 0.21	1.69/ 0.27	2.29/ 0.36
Total Site		1.17/ 0.69	2.23/ 1.23	2.94/ 1.58	4.07/ 2.13
Site Change		-0.48(-41%)	-1.0(-45%)	-1.36(-46%)	-1.94(-48%)

Additionally, as shown in the table below, volume of runoff to from the site will not increase in the Post-Redevelopment condition.

Table 2.2.2		Volume of Runoff (CFS)			
		2-Year (3.18 Inches) (Pre/Post)	10-Year (4.91 Inches) (Pre/Post)	25-Year (5.99 Inches) (Pre/Post)	100-Year (7.66 Inches) (Pre/Post)
Robinson Road		0.003/ 0	0.006/ 0	0.008/ 0	0.012/ 0
Great Road		0.054/ 0.009	0.095/ 0.014	0.123/ 0.018	0.166/ 0.029
Total Site		0.083/ 0.038	0.156/ 0.074	0.205/ 0.098	0.283/ 0.141
Site Change		-0.045(-54%)	-0.082(-53%)	-0.107(-52%)	-0.142(-50%)

2.3 Recharge to Groundwater (Standard 3)

The groundwater recharge performance standard requires that the recharge in the Post-development condition shall approximate the annual recharge in the Pre-development condition. This standard will be met through increased infiltration on the site. As shown in table 2.2.2, the volume of runoff from the site will be reduced for all storm events. This reduction in stormwater volume represents an increase in infiltration through capture of impervious areas which are then directed to grassed infiltration areas, thus meeting the groundwater recharge standard.

2.4 Water Quality (Standard 4)

Runoff from paved areas will be directed into the site to the extent practicable. This runoff will be directed to one of two sediment forebays then to a grassed infiltration basin. Due to existing grades of the site and Great Road a small amount of the entrance drive into the site can not be captured and will continue to drain to the Great Road drainage system, however the area from the site draining to this system has been drastically reduced. This reduction will represent a decrease in runoff and potential pollutant transport to this system, thus improving the water quality meeting the water quality requirements for Redevelopment Projects.

2.5 Land Uses with Higher Potential Pollutant Loads (Standard 5)

The project site is a small bank branch with minimal traffic generation and does not meet the definition of a Land Use with Higher Potential Pollutant Loads (LUHPPPL) as defined by the MA DEP.

2.6 Protection of Critical Areas (Standard 6)

The site does not contain critical environmental resource areas.

2.7 Redevelopment Project (Standard 7)

The proposed project constitutes a redevelopment project and the MA DEP Stormwater Standards have been met to extent practicable.

2.8 Construction Period Erosion/Sediment Control (Standard 8)

Erosion and sediment control barriers are proposed at the downstream end of the project area as shown on the project plans. In addition, inlet protection will be provided for catch basins receiving runoff from the project site. These measures will be installed prior to the start of work and maintained by the Contractor for the duration of project construction. Additional Erosion control notes and required measures are provided on Sheet C-005.

2.9 Operation and Maintenance Plan (Standard 9)

An Operation and Maintenance (O&M) Plan is enclosed as Appendix B.

2.10 Prohibition of Illicit Discharges (Standard 10)

The project does not include any illicit discharges.

APPENDIX A

Stormwater Treatment and Sizing Calculations

Northern Bank
Great Road
Littleton, Massachusetts

Project 18017
By SPM
Date 1/22/2021

Northern Bank
Littleton, MA
Basin Sizing Analysis

Basin 1A	Contour	Area	Incr Stor	Storage
	279	29		44
Outlet	280	145	87	
Elev				
W				
L				

Basin 1B	Contour	Area	Incr Stor	WQ Storage
	279	11		67
Outlet	280	208	134	
Elev				
W				
L				

Basin 1C	Contour	Area	Incr Stor	Storage
	278.5	143		294
Outlet	280	327	353	
Elev				
W				
L				

Basin 2A	Contour	Area	Incr Stor	WQ Storage
	280	128		67
Outlet	281	3,534	2,253	
Elev				
W				
L				

Basin 3	Contour	Area	Incr Stor	Storage
	280	1,509		3,100
Outlet	281	4,690	3,100	
Elev				
W				
L				

Basin 2B	Contour	Area	Incr Stor	WQ Storage
	280	128		67
Outlet	281	3,534	2,253	
Elev				
W				
L				

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Subcatchment 1A

TSS Removal

Calculation Worksheet

BMP ¹	C TSS Removal Rate ¹	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Infiltration Basin	0.80	1.00	0.80	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20

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

Total TSS Removal =

Project: Northern Bank

Prepared By: SPM

Date: 1/22/2021

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

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Subcatchment 1B

TSS Removal

Calculation Worksheet

BMP ¹	C TSS Removal Rate ¹	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Infiltration Basin	0.80	1.00	0.80	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20

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

Total TSS Removal =

Project: Northern Bank

Prepared By: SPM

Date: 1/22/2021

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

APPENDIX B

Operation and Maintenance Plan

Northern Bank
Great Road
Littleton, Massachusetts

**Long Term Pollution Prevention and
Stormwater Operation and Maintenance Plan**

For

Northern Bank

289 Great Road
Littleton, Massachusetts

FEBRUARY 2021

Prepared by:



P.O. Box 1123
Newburyport, Massachusetts
(978) 312-3120

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Appendix A: Stormwater System O&M Inspection Report

1.0 INTRODUCTION

This Pollution Prevention and Operation and Maintenance (O&M) Plan has been prepared to implement procedures for the Northern Bank (Project) which will minimize the potential for stormwater pollution. This plan has been prepared to identify pollution prevention measures to be implemented as part of daily operations, including O&M practices and procedures for stormwater Best Management Practices (BMPs).

The Project encompasses approximately 0.67 acres located between the corner of Great Road and Robinson Road in Littleton, Massachusetts. A plan showing the configuration of the Project stormwater systems is provided on Sheet C-003, Grading, Drainage & Erosion Control Plan. Inspection forms for Stormwater BMPs are enclosed in Appendix A.

1.1 Roles and Responsibilities

Owner

Northern Bank and Trust Company (Owner)

Implementation

This plan shall be maintained by the Owner and distributed outside contractors responsible for implementation.

2.0 POLLUTION PREVENTION

The following section presents methods and procedures implemented by the Project as part of daily operations to minimize potential stormwater pollution. The procedures presented below have been developed to be practical to implement and sufficiently protective of nearby resource areas and the environment in general.

2.1 Equipment and Material Storage

Seasonal equipment is not to be permanently stored on-site. This equipment is generally limited to snow plows, lawn mowers and other miscellaneous equipment used by the personnel or companies conducting routine maintenance at the Project. Equipment used at the Project shall be generally clean and free of oil leaks and/or hazardous material which could potentially impact storm water quality.

Supplies such as sand, grass seed, fertilizers, and other materials which may be affected by weather or become airborne shall not be stored on site.

2.2 Fuel Storage

There is no proposed fuel storage at the Project.

2.3 Trash and Recyclables Collection

Trash and recyclables will be picked up from the Project on a routine basis by an outside, licensed hauler. Trash and recyclable containers shall have covers.

2.4 General Housekeeping

Cleanup to remove accumulated trash and debris shall be performed on both an as-needed and scheduled basis. Routine cleanup activities include the following:

2.4.1 Trash and Debris Pickup

Trash and debris pickup shall be performed continuously as needed. Landscape and maintenance contractors shall be responsible for removing litter from the grounds.

2.4.2 Spring and Fall Cleanup

Spring and fall cleanups shall be performed once per year following snow melt and tree defoliation, respectively. The majority of the spring and fall cleanup efforts shall focus on landscaped and lawn areas throughout the Project. Yard waste, including leaves, grass cuttings, nuisance vegetation, branches, stumps, rocks, etc., shall be disposed of off-site in accordance with all applicable state, local and federal laws.

2.5 Snow Plowing/Deicing

Snow and ice removal operations shall be performed on an as-needed basis. Snow from driveways, parking areas and walkways shall be plowed to the sides of the paved surfaces in accordance with customary snow plowing procedures. Snow banks or piles may be removed from parking areas or other critical areas as needed. Snow which may be removed in this manner shall be disposed of off-site in accordance with applicable state, local and federal laws.

Deicing operations consist of applying sand or salt to walkways and other paved surfaces as needed for vehicle and pedestrian safety. Salt shall be applied at the minimal acceptable rates to provide safe vehicle and pedestrian safety.

2.6 Landscape Maintenance

Lawn and landscape areas shall be regularly maintained by a qualified landscape contractor. The landscape contractor shall be responsible for the maintenance and upkeep of the stormwater Basins including by not limited to replacement of dead or dying vegetation, and removal of sediment.

3.0 OPERATION AND MAINTENANCE

An outside contractor shall inspect the stormwater management systems on a routine basis. Refer to the Grading, Drainage & Erosion Control Plan (Plan) for drainage structure locations. Inspection and maintenance shall be performed as follows:

3.1 Stormwater Basins

Stormwater basins consist of sediment forebays and grassed infiltration basins. The basins will be inspected for sediment and debris accumulation on regular basis. Vegetation will also be inspected and mowed or replaced as needed. The maintenance schedule for stormwater basins is as follows:

Activity	Time of Year	Frequency
Inspect and Remove Trash	Year round	Biannually
Mow	Fall	Annually
Replace Dead Vegetation	Spring	Annually
Prune	Spring	Annually
Repair areas of erosion and revegetate	Spring	As necessary, but not less than once a year.
Inspect basin to ensure it is operating as designed	Summer	First few months after construction and semi-annually thereafter
Remove sediment from basin	Spring	As necessary

3.2 Drain Outfalls

Drain outfalls shall be inspected annually. Any signs of erosion shall be promptly repaired. Accumulated sediment and/or debris shall be removed and disposed off-site. Any observed erosion shall be repaired with the placement of new rip-rap as needed.

3.3 Record Keeping

The Association shall complete the Stormwater System Inspection Report (Appendix A) as part of routine inspections. Copies of completed reports shall be kept for at least 5 years. Receipts of catch basin cleaning and other O&M activities which require contracted services shall also be kept on file for a minimum of 5 years.

APPENDIX A

Stormwater System O&M Inspection Report

Northern Bank
289 Great Road
Littleton, Massachusetts

STORMWATER MANAGEMENT OPERATIONS AND MAINTENANCE PLAN

Northern Bank
289 Great Road
Littleton, Massachusetts

The following Stormwater Management Operation and Maintenance (O&M) Plan has been prepared to operate and maintain the stormwater management system for the Littleton Branch of the Northern Bank and Trust Company (Owner). The Owner shall be responsible for maintenance of all BMP's and drainage structures on-site.

Owner/Operator: Northern Bank and Trust Company or their assigns

Inspection and Maintenance Schedule

Persons designated by the owner will inspect the stormwater management system on a routine basis not less than once per month for the first 6 months of operation and annually thereafter. Refer to Sheets C-003, Grading, Drainage & Erosion Control Plan.

Inspection and maintenance shall be performed as follows:

1. Grassed Swales and Lawn/Landscaped Areas shall be inspected and maintained on a regular basis. Swales shall be inspected at least twice per year and any sediment or debris shall be removed. Areas of erosion will be stabilized and reseeded immediately. These operations will be performed as part of ongoing routine grounds maintenance operations.
2. Infiltration basins shall be visually inspected monthly for the first three months of use and at least twice a year thereafter. Promptly repair any settlement or erosion to grass, remove any trash or accumulated sediment. Sediment removal shall be when basin bottom is dry. Basins shall be mowed two times a year and grass clippings shall be removed. If grass is disturbed by sediment removal, deep till remaining soils and revegetate as soon as possible.
5. Drain outfalls shall be inspected annually. Any signs of erosion shall be promptly repaired. Accumulated sediment and/or debris shall be removed and disposed off-site. Any observed erosion shall be repaired with the placement of new rip-rap as needed.
6. Sediment Forebays shall be inspected and accumulated sediment and debris shall be removed at least 2 times per year. After removing sediment in forebays replace any grass by reseeding or sodding immediately.

Stormwater System Inspection Report

General Information			
Location: Paradise Valley Club			
Date of Inspection		Start/End Time	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Purpose of Inspection			
Weather Information			
Has it rained since the last inspection?			
<input type="checkbox"/> Yes <input type="checkbox"/> No			
Weather at time of this inspection?			

Site-Specific Stormwater Devices

	Description	Installed and Operating Properly?	Corrective Action Needed	Date for Corrective Action/Responsible Person
1	Forebay 1A	<input type="checkbox"/> Yes <input type="checkbox"/> No		
2	Forebay 1B	<input type="checkbox"/> Yes <input type="checkbox"/> No		
3	Basin 1	<input type="checkbox"/> Yes <input type="checkbox"/> No		
4	Basin 2	<input type="checkbox"/> Yes <input type="checkbox"/> No		
5	Basin 3	<input type="checkbox"/> Yes <input type="checkbox"/> No		
6		<input type="checkbox"/> Yes <input type="checkbox"/> No		
7		<input type="checkbox"/> Yes <input type="checkbox"/> No		
8		<input type="checkbox"/> Yes <input type="checkbox"/> No		
9		<input type="checkbox"/> Yes <input type="checkbox"/> No		
10		<input type="checkbox"/> Yes <input type="checkbox"/> No		

Overall Site Issues

	Description		Corrective Action	Date for Corrective Action/Responsible Person
1	Are all slopes properly stabilized?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
2	Are discharge points free of sediment deposits?	<input type="checkbox"/> Yes <input type="checkbox"/> No		

Certification Statement:

“I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

Print name: _____

Signature: _____ Date: _____

APPENDIX C

Rainfall and Soils Information

Northern Bank
Great Road
Littleton, Massachusetts



NOAA Atlas 14, Volume 10, Version 3
Location name: Littleton, Massachusetts, USA*
Latitude: 42.5459°, Longitude: -71.4741°
Elevation: 269.26 ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerials](#)

PF tabular

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.322 (0.254-0.405)	0.383 (0.302-0.482)	0.483 (0.378-0.609)	0.566 (0.441-0.718)	0.681 (0.514-0.900)	0.767 (0.566-1.03)	0.858 (0.615-1.20)	0.963 (0.650-1.37)	1.12 (0.726-1.64)	1.25 (0.789-1.86)
10-min	0.456 (0.360-0.574)	0.543 (0.428-0.683)	0.685 (0.537-0.865)	0.803 (0.626-1.02)	0.965 (0.728-1.27)	1.09 (0.802-1.46)	1.22 (0.871-1.70)	1.36 (0.922-1.93)	1.58 (1.03-2.32)	1.77 (1.12-2.63)
15-min	0.537 (0.423-0.675)	0.639 (0.503-0.804)	0.806 (0.632-1.02)	0.944 (0.735-1.20)	1.14 (0.856-1.50)	1.28 (0.944-1.72)	1.43 (1.02-2.00)	1.60 (1.08-2.28)	1.86 (1.21-2.73)	2.08 (1.32-3.09)
30-min	0.731 (0.576-0.919)	0.871 (0.686-1.10)	1.10 (0.863-1.39)	1.29 (1.01-1.64)	1.55 (1.17-2.05)	1.75 (1.29-2.36)	1.96 (1.40-2.73)	2.19 (1.48-3.11)	2.55 (1.65-3.73)	2.84 (1.80-4.24)
60-min	0.926 (0.729-1.16)	1.10 (0.869-1.39)	1.40 (1.10-1.76)	1.64 (1.27-2.08)	1.97 (1.49-2.60)	2.22 (1.64-2.99)	2.48 (1.78-3.47)	2.79 (1.88-3.95)	3.24 (2.10-4.73)	3.61 (2.29-5.38)
2-hr	1.17 (0.929-1.46)	1.42 (1.12-1.77)	1.82 (1.44-2.27)	2.15 (1.69-2.70)	2.61 (1.98-3.43)	2.95 (2.20-3.96)	3.31 (2.40-4.63)	3.76 (2.55-5.29)	4.44 (2.89-6.44)	5.02 (3.19-7.42)
3-hr	1.34 (1.07-1.67)	1.64 (1.30-2.03)	2.11 (1.68-2.63)	2.51 (1.98-3.14)	3.05 (2.33-4.00)	3.45 (2.58-4.62)	3.89 (2.84-5.42)	4.42 (3.01-6.20)	5.26 (3.43-7.59)	5.97 (3.80-8.78)
6-hr	1.71 (1.38-2.11)	2.09 (1.68-2.58)	2.71 (2.17-3.35)	3.22 (2.56-4.00)	3.92 (3.02-5.10)	4.44 (3.35-5.91)	5.01 (3.68-6.93)	5.71 (3.90-7.94)	6.80 (4.45-9.74)	7.74 (4.94-11.3)
12-hr	2.17 (1.76-2.65)	2.64 (2.14-3.23)	3.41 (2.75-4.18)	4.05 (3.25-4.99)	4.93 (3.82-6.36)	5.58 (4.23-7.35)	6.29 (4.64-8.62)	7.16 (4.90-9.86)	8.49 (5.57-12.1)	9.63 (6.16-13.9)
24-hr	2.60 (2.13-3.15)	3.18 (2.60-3.86)	4.13 (3.35-5.02)	4.91 (3.97-6.00)	5.99 (4.67-7.66)	6.79 (5.18-8.87)	7.66 (5.67-10.4)	8.72 (6.00-11.9)	10.3 (6.82-14.6)	11.7 (7.54-16.8)
2-day	2.96 (2.44-3.55)	3.65 (3.00-4.38)	4.78 (3.91-5.76)	5.71 (4.65-6.92)	7.00 (5.51-8.89)	7.95 (6.12-10.3)	8.99 (6.71-12.1)	10.3 (7.11-13.9)	12.3 (8.11-17.1)	14.0 (9.02-19.9)
3-day	3.23 (2.68-3.86)	3.97 (3.28-4.75)	5.18 (4.27-6.22)	6.19 (5.06-7.46)	7.57 (5.97-9.55)	8.59 (6.63-11.1)	9.70 (7.26-13.0)	11.1 (7.67-14.9)	13.2 (8.74-18.3)	15.0 (9.70-21.3)
4-day	3.49 (2.90-4.16)	4.26 (3.53-5.08)	5.51 (4.55-6.59)	6.55 (5.37-7.87)	7.98 (6.31-10.0)	9.03 (6.99-11.6)	10.2 (7.64-13.6)	11.6 (8.06-15.6)	13.8 (9.14-19.1)	15.7 (10.1-22.0)
7-day	4.21 (3.52-4.98)	5.02 (4.19-5.94)	6.33 (5.26-7.52)	7.42 (6.13-8.85)	8.92 (7.09-11.1)	10.0 (7.79-12.8)	11.2 (8.43-14.8)	12.7 (8.84-16.9)	14.9 (9.90-20.4)	16.7 (10.8-23.4)
10-day	4.89 (4.11-5.76)	5.72 (4.79-6.74)	7.07 (5.90-8.36)	8.19 (6.79-9.73)	9.73 (7.76-12.0)	10.9 (8.46-13.7)	12.1 (9.09-15.8)	13.6 (9.49-18.0)	15.7 (10.5-21.4)	17.5 (11.3-24.3)
20-day	6.88 (5.83-8.04)	7.77 (6.57-9.09)	9.23 (7.77-10.8)	10.4 (8.73-12.3)	12.1 (9.70-14.8)	13.4 (10.4-16.6)	14.7 (11.0-18.8)	16.1 (11.3-21.1)	18.0 (12.1-24.3)	19.5 (12.7-26.8)
30-day	8.53 (7.26-9.91)	9.48 (8.06-11.0)	11.0 (9.33-12.9)	12.3 (10.3-14.4)	14.1 (11.3-17.0)	15.4 (12.1-19.0)	16.8 (12.5-21.2)	18.2 (12.8-23.7)	19.9 (13.4-26.8)	21.2 (13.8-29.1)
45-day	10.6 (9.06-12.3)	11.6 (9.92-13.4)	13.3 (11.3-15.4)	14.6 (12.4-17.1)	16.5 (13.3-19.8)	18.0 (14.1-22.0)	19.5 (14.5-24.3)	20.8 (14.8-26.9)	22.4 (15.2-30.0)	23.5 (15.4-32.1)
60-day	12.3 (10.6-14.2)	13.4 (11.5-15.5)	15.2 (12.9-17.5)	16.6 (14.1-19.3)	18.6 (15.1-22.2)	20.2 (15.8-24.5)	21.7 (16.2-26.9)	23.0 (16.4-29.7)	24.6 (16.7-32.8)	25.7 (16.8-34.9)

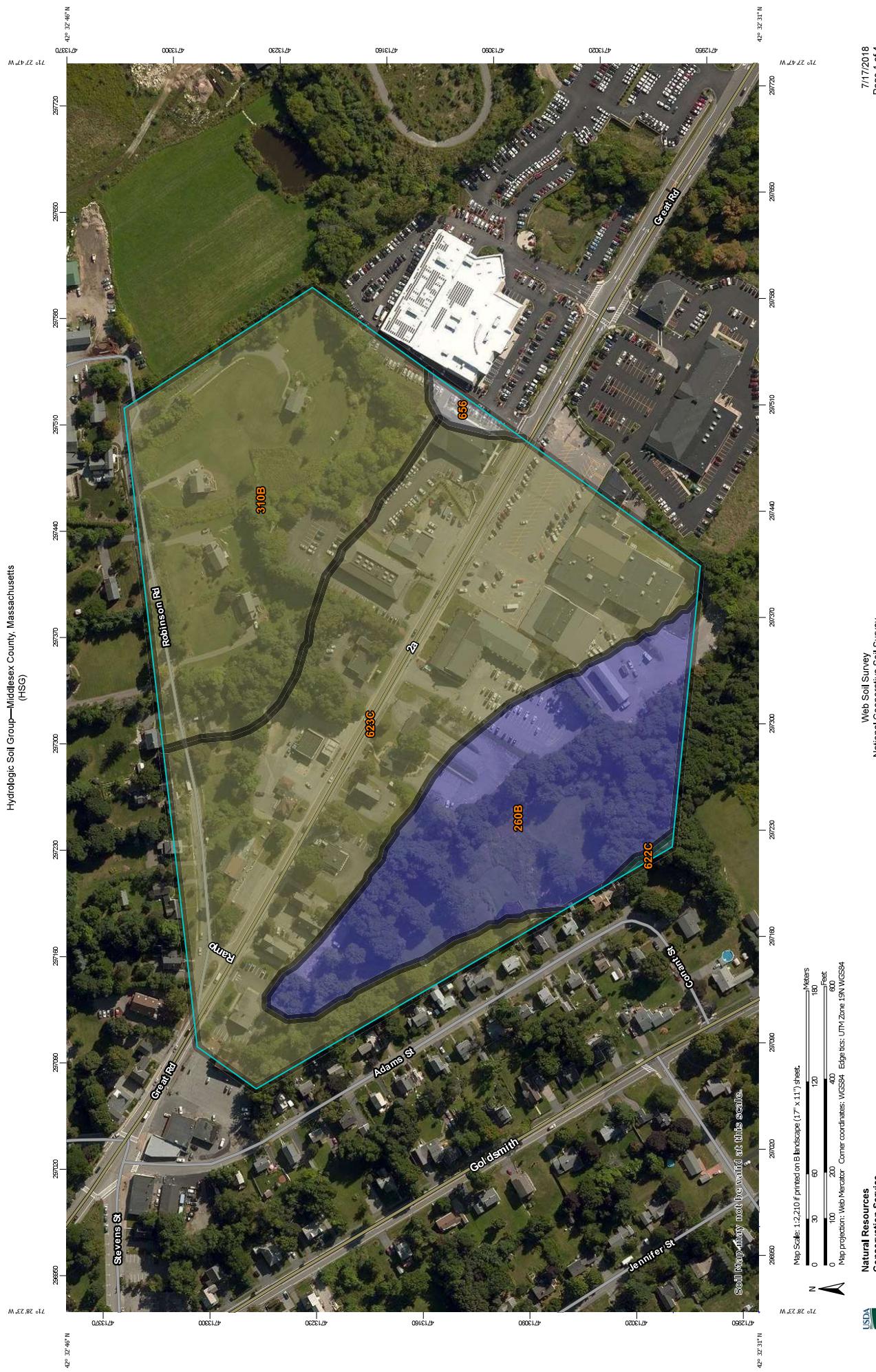
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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

Please refer to NOAA Atlas 14 document for more information.

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PF graphical



MAP LEGEND

Area of Interest (AOI)	 Area of Interest (AOI)	 C	 C/D
Soils		 D	 Not rated or not available
Soil Rating Polygons	 A	 A/D	 B
	 B/D	 C	 C/D
	 D	 A/D	 B
	 Not rated or not available		
Water Features	 Streams and Canals		
Transportation	 Rails	 Interstate Highways	 US Routes
	 Major Roads	 Major Roads	 Local Roads
Soil Rating Lines	 Background	 Aerial Photography	
	 A	 A/D	
	 B	 B/D	
	 C	 C/D	
	 D	 D	
	 Not rated or not available		
Soil Rating Points	 A	 A/D	 B
	 B/D		

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 Date: 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: Aug 29, 2014—Sep 19, 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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
260B	Sudbury fine sandy loam, 3 to 8 percent slopes	B	7.6	23.1%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	9.3	28.1%
622C	Paxton-Urban land complex, 3 to 15 percent slopes	C	0.1	0.2%
623C	Woodbridge-Urban land complex, 3 to 15 percent slopes	C/D	15.8	47.9%
656	Udorthents-Urban land complex		0.3	0.8%
Totals for Area of Interest			33.0	100.0%