RIEMER | BRAUNSTEIN

Mark T. Vaughan
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September 13, 2022

Littleton Planning Board

SEP 13 2022

Received

VIA HAND DELIVERY

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

Re: **Site Plan Application/Northern Bank & Trust Company**
265, 277, 287 and 289 Great Road and 25 Robinson Road, Littleton
("Premises")

Dear Mr. Chairman and Members of the Planning Board:

Please note that this office and the undersigned represent Northern Bank & Trust Company ("Applicant") and the associated Premises property owners (See Form 1/Attachment "A" Property Owner Listing) regarding the enclosed Site Plan application for the redevelopment of the Premises. The Premises is situated within the Village Common ("VC") Zoning District.

Project Overview

As you may recall, the Applicant and the Town of Littleton have been engaged for more than two years in support of their shared vision for the adoption of zoning which would permit a master-planned Town Center, utilizing traditional New England village design concepts within an integrated, walkable layout. Following a series of preliminary discussions with the Town to review the Applicant's conceptual design program and the favorable action of Town Meeting rezoning 25 Robinson Road into the VC District, the Applicant expanded the physical limits of the project area which allows the enclosed redevelopment program to capture a meaningful segment of the Great Road corridor. As provided within the enclosed materials, the proposal entails the demolition of all existing structures within the Premises and the construction of five (5) commercial/mixed-use buildings (37,880+/- sf in total) with each structure uniquely designed in accordance with the applicable VC Zoning Bylaw provisions ("Project").

The Project is anchored by a new full-service bank, with drive-through situated at the Great Road/Robinson Road intersection which interconnects its parking lot and pedestrian walkways with that of the adjacent commercial buildings. Further, the Project design provides significnt vehicular safety improvements through the reduction/consolidation of existing curb cuts and the implementation of a new, enhanced stormwater management system designed in accordance with applicable local regulations and the Wetlands Protection Act. These improvements will yield significant environmental, safety and visual benefits to the Premises and immediate area. Further, the Project landscape design embodies the intent of the VC requirements and provides extensive screening along shared property lines with particular attention to the Premises residential neighbors. Overall, the Project meets the prescribed language of the VC Zoning Bylaws, Article XXX, §173-215 Intent and §173-216 Purpose which will be presented to the Planning Board during the applicable Site Plan Review process.

Permitting Requirements

The Project and associated improvements are subject to Planning Board Site Plan approval and as such, we have enclosed three (3) copies of the following materials for your review:

1. Site Plan Application Forms and Checklists:
    a. Form 1 Application – Part I. Basic Application with Attachment "A".
    b. Form 1H: Village Common & King St Common Supplement.
    c. Form VC & KC Form-Based Code Area Checklist.
    d. Site Plan Review Checklist.
2. Filing Fee - Check in the amount of $8,470.00 made payable to the Town of Littleton.
3. Development Team Qualifications.
4. Project Narrative.
5. Design Guidelines Narrative.
6. Existing conditions photos.
7. Building elevations, cross sections perspective views prepared by Maugel Destefano Architects.
8. Stormwater Management Study and associated memo prepared by Oak Consulting Group.
9. Transpiration Impact Assessment prepared by Vanasse & Associates, Inc.
10. Project Site Plan set and vehicle turning plans prepared by Oak Consulting Group (Two, 24"x36" and one 11"x17").

We look forward to presenting this matter to the Board during the upcoming October 6, 2022 Planning Board meeting and respectfully request your consideration of the Site Plan approval in accordance with the provisions of Article IV Site Plan Regulations

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)

3175538.4

SITE PLAN APPLICATION FORMS AND CHECKLISTS

Littleton Town Offices
37 Shattuck Street
Room 303
Littleton, MA 01460
(978) 540-2425

TOWN OF TLITTLETON
PLANNING BOARD
FORM 1 APPLICATION
ADOPTED FEB. 2. 2022

Filing Date:
Planning Board: 9-14-2022
Town Clerk: 9-13-22
Filing Fee: OK
☑ Abutters List Attached

PART I. BASIC APPLICATION

Project Summary & Applicant Information

Project Name: Northern Bank and Trust Company

Location (Street Address): 265, 277, 287, 289 Great Road and 25 Robinson Road

Assessor's Map/Parcel (s): U07 25 0; U07 24 0; U07 23 0; U07 22 0; U07 20 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: See Attachment "A"

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: * Page: *

* See Attachment "A" for Book and Page references

Site Information

Total Area (Acres): 3.83+/- acres Lot Frontage (Lin. Ft): 716+/-

Zoning District(s):

- ☐ Residence
- ☒ Village Common
- ☐ Business
- ☐ King Street Common
- ☐ Industrial-A
- ☐ Industrial-B

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

- ☐ Wetlands
- ☐ Floodplains
- ☐ Aquifer District
- ☑ Adult Use Marijuana District
- ☐ Water Resource District
- ☐ Littleton Village Overlay District West—Beaver Brook Area

PART II. SPECIAL PERMIT(S) REQUESTED (check all that apply)

- ☒ Site Plan Review
- ☐ 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 FBC District (§173-166) *Attach form 1H.*
- ☐ 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 Cut (§173-224) *Attach Form 1H.*
- ☒ VC District + AWRD Lot Coverage (§173-224) *Attach Form 1H.*

PART III. APPLICANT AND OWNER CERTIFICATIONS

The undersigned hereby certifies that they have 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: Mark T. Vaughan Date: 9-13-22

Print: Mark T. Vaughan, Esquire on behalf of the Property Owners (See Attachment "A" for listing of Property Owners)

Signature: ______________________ Date: ______________

Print: ______________________

Applicant

Signature: Mark T. Vaughan Date: 9-13-22

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

Signature: ______________________ Date: ______________

Print: ______________________

Applicant is: ☐ Owner ☒ Agent/Attorney ☐ Purchaser

PART IV. SUBMITTAL REQUIREMENTS

ALL APPLICATIONS

	Required Materials	Notes
☒	Application Cover Page	2 prints 1 electronic
☒	Plans sealed by a registered professional engineer, registered architect, landscape architect, surveyor, or other design professional in their area of expertise.	1 full size print 1 reduced print (11x17) 1 electronic

SPECIAL PERMIT APPLICATIONS

	Required Information & Materials	Notes
☐	Forms & Checklists	See Application Cover Page for required forms & checklists based on specific special permits requested
☐	Summary Table (Required/Existing/Proposed)	Zoning District Lot Area Gross Floor Area Lot Coverage Building Height Parking Spaces Density Trip Generation Open Space
☐	Vicinity map	all lots, streets, and driveways within 500 feet from the exterior boundary of the lot
☐	Existing conditions plan	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 & proposed topography	contours at 2' intervals
☐	Construction area plan	showing all areas to remain undisturbed
☐	Site layout plan	showing required setbacks and other information required for zoning compliance; 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
☐	Utility plan	existing and proposed fire hydrants and sewer, water, gas, electric, and other utility lines and easements

☐	Storm drainage plan	
☐	Parking, loading, & access plan	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
☐	Exterior lighting plan	
☐	Architectural plans	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
☐	Landscape plan	
☐	Sign plan	
☐	Drainage report (with calculations)	
☐	Traffic impact assessment	

SITE PLAN REVIEW APPLICATIONS

	Required Information & Materials	Notes
☒	Site Plan Review Checklist	

SITE PLAN REVIEW APPLICATIONS
(Village Common & King Street Common FBC Area)

	Required Information & Materials	Notes
☒	Site Plan Review Checklist	
☒	Form 1H	
☒	VC & KSC FBC Area Checklist	

If you wish to review application requirements and/or materials with Planning Department Staff prior to submitting your application, please call or email us.

TOWN OF LITTLETON
SITE PLAN REVIEW CHECKLIST

Littleton Town Offices
37 Shattuck Street
Room 303
Littleton, MA 01460
(978) 540-2425

Drawing #__________
Drawing Date________

Proposed Title Northern Bank Town Common Reviewer______________________

Applicant Northern Bank and Trust Company

Application Date September 12, 2022

Date of Formal Review by Planning Board______________________

Project Description:

The proposed development envisions the redevelopment of the subject premises (5 separate parcels) for the purposes of developing a new, mixed-use commercial project compliant with the design intent of the VC District Bylaw. The proposed project, which is further detailed in the enclosed materials, includes the demolition of all existing structures and the construction of five (5) new buildings fronting along Great Road. The corner building (at the intersection of Great Road and Robinson Road) has been designed to accommodate a new Northern Bank and Trust retail bank branch location.

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

___X___ Boundary Lines

___X___ Adjacent streets and ways shown

___X___ Topography, existing and proposed

___X___ Structures, existing and proposed

___X___ Walkways

___X___ Principal drives

___X___ Service entries

___X___ Parking

___X___ Landscaping

___X___ Screening

___N/A___ Park or recreation areas

___X___ Utilities:

- ___X___ a. Water
- ___X___ b. Electricity
- ___X___ c. Gas
- ___X___ d. Telephone

___X___ Sanitary sewerage

___X___ Storm drainage

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

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DESIGN REQUIREMENTS §173-18

___X___ Internal Circulation safe

___X___ Egress safe

___X___ Access via minor streets minimized

___X___ Visibility of parking areas minimized

___X___ Lighting avoids glare

___X___ Major topography change, tree removal minimized

___X___ Adequate access to each structure for emergency equipment

___X___ Utilities adequate

___X___ Drainage adequate

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USE AND INTENSITY REGULATION

§173-22: Establishment of districts

Parcel is located in zoning district type: Village Center

Section 173-25: Use Regulations

Use for which application is made: Restaurant, Commercial, Office and Bank Uses

__________ Use allowed **OR**

Special Permit Required (§173-7) because:

____

____

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§173-27 & 173-31: Intensity of Use Regulation & Schedule N/A - Refers to Article XXX (Village Common)

__________ Lot area adequate (see also Definitions)

__________ Lot frontage adequate

__________ Reduced lot frontage approved, if applicable

__________ Front yard adequate (see also Definitions)

__________ Smaller setback approved, if applicable

__________ Side, rear yards adequate (see also Definitions)

__________ Building height conforming (see also Definitions)

__________ Greater building height approved, if applicable

__________ Building coverage conforming (see also Definitions)

__________ Building plus paving coverage conforming

__________ Floor area ratio conforming

GENERAL REGULATIONS §173-32 & 173-33 Project complies with 173-33 as applicable

X Parking and Loading Requirements

__________ Location of parking conforming

__________ Number of spaces adequate or waived

__________ Computation See Site Plans

§173-32 Parking Area Design N/A

__________ No parking within 10 feet of street line

__________ Parking paved, bumper guards conforming or waived

__________ No backing into public way (§173-32, C.1)

__________ Egress spacing adequate (§173-32 C. C1)

__________ 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 Project complies with Article XXX Village Common

__________ Outdoor sales display, commercial outdoor recreation screened

__________ Industrial "A" buffer provided

__________ Corner vision clear

__________ 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

__________ Regulations met, if applicable (See separate checklist)

173-72: Wetlands and Flood Plain Regulations

____X____ Wetlands and flood plain regulations met, if applicable

173-78: Noise Regulations

____X____ Applicant informed of existence of requirements

TOWN OF LITTLETON
APPLICATION TO THE PLANNING BOARD
Village Common & King Street Common FBC Area
ADOPTED Feb. 3, 2022

Littleton Town Offices
37 Shattuck Street
Room 303
Littleton, MA 01460
(978) 540-2425

*Submit this Application with Form 1H Checklist for any project that is required to comply with Article XXX and applicable sections of Article XXXI

PART I. PROJECT SUMMARY

Project Name: Northern Bank Town Common

Project Type: ☒ New Construction ☐ Interior Renovation (No exterior change) ☐ Exterior Renovation and/or Addition ☐ Other

Project Uses: (e.g., Multifamily dwelling)	Existing Gross Sq. Ft.	Proposed Gross Sq. Ft.	If Residential, Number of Units
Bank with associated office	2,800+/- sf	4,006+/- sf	N/A
Retail sales, service	6,590+/- sf	30,374+/- sf	
Restaurant	1,050+/- sf	3,500+/- sf	
Single family home	3,100+/- sf	N/A	
Total:	13,540+/- sf	37,800+/- sf	

*For additional uses, please attach a separate sheet.

Total Off-street Parking Spaces: 158

Site Coverage:

1. Total Site Area (sq. ft.) 166,877+/- sf
2. Total Building Footprint (sq. ft.) 23,810+/- sf
3. Total Building Coverage (%) 16.7%
4. Total Paved Surfaces (sq. ft.) (including access drives, parking, walkways, etc.) 80,334+/- sf
5. Total Impervious Area (sq. ft.) (#2 + #4) 108,187+/- sf
6. Total Impervious Cover Ratio (%) 64.8%

PART II. PROJECT TEAM & EXPERIENCE

DEVELOPER

Name of Entity & Business Address	Contact:
Name: Northern Bank and Trust Company	Name: Sean Mahoney, General Counsel
Address Line 1: 275 Mishawum Road	Phone: 781-404-1952
Address Line 2:	Email: smahoney@nbtc.com
City/State/Zip: Woburn, MA 01801	
Phone: 781-404-1952	

SITE / CIVIL ENGINEER

Name of Entity & Business Address	Contact:
Name: Oak Consulting Group	Name: Sean Malone, P.E.
Address Line 1: P.O. Box 1123	Phone: 978-518-2058
Address Line 2:	Email: smalone.ogc@gmail.com
City/State/Zip: Newburyport, MA 01950	
Phone: 978-312-3120	

ARCHITECT

Name of Entity & Business Address	Contact:
Name: Maugel Destefano Architects	Name: Dan Barton, AIA
Address Line 1: 200 Ayer Road, Suite 200	Phone: 978-273-3291
Address Line 2:	Email: dbarton@maugel.com
City/State/Zip: Harvard, MA 01451	
Phone: 978-273-3291	

LANDSCAPE ARCHITECT

Name of Entity & Business Address	Contact:
Name: Allen & Major Associates	Name: Beth Dermody
Address Line 1: 400 Harvey Road, Suite D	Phone: 603-627-5500
Address Line 2:	Email: bdermody@allenmajor.com
City/State/Zip: Manchester, NH 03103	
Phone: 603-627-5500	

*For additional team members, please attach a separate sheet.

PART III: REQUIRED ATTACHMENTS

Submitted materials must provide the following, based on the scope of the proposed development:

☒ **Project Narrative.** Applicant must provide a detailed project narrative providing enough information for the Planning Board to understand the proposed development and how it will meet the goals of the Village Common or King St Common districts. In particular, the narrative must address, at minimum, the following:

- Economic development
- Pedestrian safety (including, but not limited to, accessibility and universal design,
- Sustainability (including, but not limited to, stormwater management, low-impact development, energy efficiency, photovoltaic (PV) devices, electrical vehicle charging)
- Site and landscape design (including, but not limited to, open space gathering areas, native plantings, outdoor lighting control, noise mitigation)

☒ **Development Team Qualifications.** A narrative description of the experience and qualifications of members of the development team. Identify recent comparable developments completed in Massachusetts by project name, location, year completed, and summary details. Identify developments where proposed team members collaborated on projects in the past.

To facilitate Lot Standards (§173-220) and Site Standards (§173-224) review:

☒ **Site Plan(s).** In addition to Site Plan Review requirements, the VC/KC Site Plan(s) must include the following information:

- General:
  - North arrow and graphic scale
  - Lot lines
  - Adjacent rights-of-way, street names, and easements
  - Abutting properties and respective uses
- Buildings:
  - Position of all existing and proposed buildings
  - Indication and overall dimensions of primary massing(s) and building component(s)
  - Distance of all building setbacks measured perpendicular to lot lines
  - Distance of separation between all buildings, including existing and proposed
  - Sidewalk width(s) along front lot line(s)
- Vehicular Access and Parking:
  - Location and design of proposed curb cut(s) and widths, if applicable
  - Location and width(s) of driveway(s)
  - Location and number of off-street parking spaces, including handicap spaces
  - Distance of parking setback from front lot line(s)
  - Location of shared driveway and/or cross-access connection(s), if applicable
  - Screens where abutting residential use
  - Parking structure, if applicable
- Lot Development:
  - Total lot area (sq. ft.)

    - Building footprint(s) (sq. ft.)
    - Paved surfaces (sq. ft.), including access drives, parking, walkways, etc.
- Façade Build Out and Frontage Types:
    - Total lot width
    - Total width of all building façade(s)
    - Indication of frontage type(s) along front lot line(s)
- Open Space:
    - Pedestrian walkways
    - Parks and recreation areas
- Screens:
    - Location of screens for loading facilities, service areas, and mechanical equipment

To facilitate Building Standards (§173-221) review, submit the following drawing set (Conceptual Building Plan(s), Building Elevations, and Cross Sections) for each proposed building.

☒ **Conceptual Building Plan(s) per building**, showing:
- General:
    - North arrow and graphic scale
    - Adjacent rights-of-way, street names, and easements, if applicable
- Primary Massing(s) and Building Assembly:
    - Indication of primary massing(s) and building component(s)
    - Width and depths of primary massing(s)
    - If more than one primary massing, distance of offset between exterior walls of primary massings
- Uses and Features:
    - Indication of use(s) and floor area per floor
    - For residential use, number of dwelling units
    - Indication of principal entrance(s)
- Building Components:
    - Dimension requirements for all building component(s), including, but not limited to, setback from primary massing, widths, depths, stories, heights, projections, and setback encroachments.
- Frontage Types:
    - Indication of frontage type(s)
    - Dimension and design requirements for all frontage type(s), including, but not limited to, paved areas, landscaped areas, structure projections, bicycle parking, and seating.

☒ **Minimum Four (4) Building Elevations per building**, showing:
- General:
    - Graphic scale
- Primary Massing(s):
    - Widths, depths, and heights of primary massing(s)
    - Indication of roof pitch type
    - Indication of roof architectural features, including, but not limited to, mechanical and stairwell; penthouses; vents or exhausts; solar pens or skylights; etc. (§173-221.I.a.)
- Building Height and Features:

- Total building height (as defined in Article II, Definitions)
  - Indication of principal entrance(s)
- Building Components:
  - Dimension requirements for all building component(s), including, but not limited to, setback from primary massing, widths, depths, stories, heights, projections, and setback encroachments.
- Fenestration:
  - Ground story fenestration dimensions and total glazing percent
  - Upper story fenestration dimensions and total glazing percent
- Frontage Types:
  - Indication of frontage type
  - Dimension and design requirements for all frontage type(s), including, but not limited to, paved areas, landscaped areas, structure projections, bicycle parking, and seating.
- Screens:
  - Dimensions and design of screens for loading facilities, service area, and mechanical area

☒ **Minimum Two (2) Cross Sections per building**, showing:
- General:
  - Graphic scale
- Story Height:
  - Heights of ground story and second story (as defined in §173-221.D.a.i.)
  - Heights of half story(ies), (as defined in §173-221.D.a.ii.)
  - For half story(ies), distance between where roof rafters intersect the wall plate or top of wall frame of the exterior walls and the finished floor of the half story (as defined in §173-221.D.b.).
- Number of Stories:
  - Indication of the number of stories (as defined in §173-221.E.)

☒ **Perspective Views.** Perspective views are strongly encouraged, but not required and can include:
- Aerial view(s) showing the full extent of the project and lot
- Ground-level view(s) from the primary rights-of-way
- Ground-level view(s) of principal building frontage areas and entrances

To facilitate Design Guidelines (§173-222) review:

☐ **Written Design Guidelines Narrative.** Narrative explaining consistency with the Design Guidelines, referencing application drawings or additional drawings as necessary.

If you wish to review application requirements and/or materials with Planning Department Staff prior to submitting your application, please call 978-540-2425, or email the Planning Department.

TOWN OF LITTLETON
CHECKLIST
Village Common & King Street Common FBC Area
ADOPTED Feb. 3, 2022

Littleton Town Offices
37 Shattuck Street
Room 303
Littleton, MA 01460
(978) 540-2425

*Submit this Checklist with the Form 1H Application for any project that is required to comply with Article XXX and applicable sections of Article XXXI

LOT STANDARDS (§173-220)

BUILDING "A"

Fill out columns "Existing" and "Proposed", as applicable:

Standards	Required	Existing	Proposed	Compliant (Internal Use Only)
Building Setbacks				
Front Setback, Primary (min / max)	10 ft / 20 ft (Subject to the sidewalk setback requirements of §173-220.A.d.)	55+/- ft	12+/- ft	☐
Front Setback, Secondary, if applicable (min / max)	10 ft / 20 ft	55+/- ft	12+/- ft	☐
Left Side Setback (min)	10 ft	12+/- ft	26+/- ft	☐
Right Side Setback (min)	10 ft	50+/- ft	585+/- ft	☐
Rear Setback (min)	10 ft	72+/- ft	368+/- ft	☐
Parking (Total Site)				
Parking Setback, Primary (min)	20 ft	17+/- ft	20+/- ft	☐
Parking Setback, Secondary, if applicable (min)	20 ft			☐
Parking Spaces (min) (See §173-224.A. and include calculations)		50+/-	158 Refer to Site Plan Table	☐
Lot Development (Total Site)				
Lot Coverage (max)	80% (Subject to the requirements of the Article XIV Aquifer and Water Resource District and §173-224.J.)	8.1%	64.8%	☐
Façade Build Out (min)	60%	0%	62% Overall	☐

SITE STANDARDS (§173-224)
Check if Compliant (Internal Use Only):

Parking Standards (§173-224.A. thru G.):
- ☐ Parking & Driveway Location
- ☐ Driveway Design
- ☐ Parking Lot Design
- ☐ Parking Lot Access
- ☐ Parking Structure, if applicable (§173-224.G.a. and §173-233.H.d.)

Sidewalk Curb Cuts (Optional and only allowed by Special Permit per §173-221.H.a.):
- ☐ If the location of the new curb cut will minimize potentially dangerous conflicts between motor vehicles are pedestrians;
- ☐ If the property owner has, to every extent practicable, attempted to avoid the creation of a new curb cut by creating a cross-access connection between parking lots, utilizing or establishing shared driveway access, or creating a parking lot that is shared between multiple uses on the same block face; and
- ☐ If efforts have been made to locate the new curb cut on Great Road, King Street, Meetinghouse Road or Stevens Street. Locating the curb cut on side streets shall be discouraged.

Screening Standards (§173-224.I.):
- ☐ Loading Facilities
- ☐ Service Areas
- ☐ Mechanical Equipment

Impervious Area Lot Coverage Maximum (excess of maximum only allowed by Special Permit per §173-224.J.b.):
- ☐ The Littleton Water Department has been given an opportunity to review and comment on the Special Permit application, including the proposed impervious area lot coverage and provisions for stormwater management and artificial recharge of groundwater.
- ☐ The development complies with the Massachusetts Department of Environmental Protection Stormwater Standards and the Littleton Planning Board Stormwater Management and Erosion Control Regulations. Up to date precipitation data, such as in NOAA Atlas 14, must be used for meaningful stormwater control.
- ☐ The artificial recharge provided as part of the development's stormwater management design will not degrade groundwater.
- ☐ The proposed development is compliant with §173-63.A. through F. of Article XIV, Aquifer and Water Resource District.
- ☐ The proposed development is compliant with §173-220 Lot Standards of this Article.

Site Design Guidelines (§173-222)
- ☐ Landscape design in the frontage area complements adjacent sidewalk and provides additional pedestrian amenities.
- ☐ Site landscaping prioritize materials common to Littleton's agrarian history.
- ☐ Site landscaping prioritize native plant species and xeriscape.
- ☐ Rain gardens and bioswales installed to infiltrate runoff from impervious surfaces.
- ☐ Existing historic structures preserved and incorporated into new development to every extent practicable.
- ☐ Where vegetative solutions are not feasible, porous concrete or porous asphalt should be used for impervious surfaces to infiltrate stormwater.

BUILDING STANDARDS (§173-221) Building Name/Address/No.: Building "A"

Fill out columns "Existing and "Proposed". Attach separate Building Standards sheets (pages 8 & 9) for each additional building.

Standards	Required	Existing	Proposed	Compliant (Internal Use Only)
Primary Massing(s)				
Width(s) (max)	45 ft (If narrow end oriented front)		30 ft	☐
	60 ft (If long side oriented front)		59.5 ft	
Depth(s) (max)	90 ft (If narrow end oriented front)		76 ft	☐
	45 ft (If long side oriented front)		30 ft	
Heights (Subject to §173-233.H. in applicable areas of the KC district)				
Number of Stories (max)	2.5		1.5	☐
Ground Story Height	14 ft (If Commercial)		14 ft or less Varies	☐
	10 ft min / 12 ft max (If Residential)		N/A	
Second Story Height, if applicable (min / max)	10 ft / 12 ft		N/A	☐
Half Story Height, if applicable (min / max)	10 ft / 16 ft (If Commercial)		<10 ft Sm. Mezzanine	☐
	10 ft / 12 ft (If Residential)		N/A	
Building Height (max)	36 ft (If Mixed Use)		26 ft	☐
	32 ft (If All Residential)		N/A	
Use and Features			(Bank)	
Ground Story	Any Use, subject to the requirements of Article V and §173-221.J		Commercial Space >20' w/ Entries	☐
Upper Story	Any Use, subject to the requirements of Article V and §173-221.J		Staff Space	☐
Ground Story Fenestration	60% min (If Commercial)		63% See Chart	☐
	15% min / 25% max (If Residential)		N/A	
Upper Story Fenestration (min / max)	15% / 25%		<15% Sm. Mezz. Only	☐
Continued on next page				

Building Separation				
Distance from any other building(s) (min)	20 ft		99.6 ft To Building D	❑

Check if Compliant (Internal Use Only):

- ❑ Roof Features (§173-221.I.)
- ❑ Building Assembly (§173-221.M.)

Building Component (§173-221.L.):
- ❑ Side Addition(s), if applicable
- ❑ Rear Addition(s), if applicable
- ❑ Projecting Gable(s), if applicable
- ❑ Projecting Storefront(s), if applicable
- ❑ Dormer(s), if applicable
- ❑ Cross Gable(s), if applicable
- ❑ Bay Window(s), if applicable
- ❑ Balcony(ies), if applicable

Frontage Types (§173-221.N.):
- ❑ Gallery(ies), if applicable
- ❑ Entry Plaza(s), if applicable
- ❑ Dining Patio(s), if applicable
- ❑ Front Garden(s), if applicable
- ❑ Porch(es), if applicable
- ❑ Dooryard(s) or Stoop(s), if applicable
- ❑ Common Lobby(ies), if applicable

Building Design Guidelines (§173-222):
- ❑ Building assembly differs on abutting lots.
- ❑ Architectural design complements the Town's architectural character.
- ❑ Consistent and harmonious composition of materials, windows, doors, and ornamentation.
- ❑ Type and color of materials for building kept to a minimum, and wall materials have the appearance of natural materials.
- ❑ Galleries and porches constructed out of light steel, wood, or wood-appearing materials.
- ❑ Buildings for people age fifty-five (55) and over designed with features specified in §173-149 Age-appropriate design.

If you wish to review application requirements and/or materials with Planning Department Staff prior to submitting your application, please call 978-54-2425, or email the Planning Department.

TOWN OF LITTLETON
CHECKLIST
Village Common & King Street Common FBC Area

ADOPTED Feb. 3, 2022

Littleton Town Offices
37 Shattuck Street
Room 303
Littleton, MA 01460
(978) 540-2425

*Submit this Checklist with the Form 1H Application for any project that is required to comply with Article XXX and applicable sections of Article XXXI

LOT STANDARDS (§173-220)

BUILDING "B"

Fill out columns "Existing" and "Proposed", as applicable:

Standards	Required	Existing	Proposed	Compliant (Internal Use Only)
Building Setbacks				
Front Setback, Primary (min / max)	10 ft / 20 ft (Subject to the sidewalk setback requirements of §173-220.A.d.)	29+/- ft	13+/- ft	☐
Front Setback, Secondary, if applicable (min / max)	10 ft / 20 ft	29+/- ft	13+/- ft	☐
Left Side Setback (min)	10 ft	149+/- ft	122+/- ft	☐
Right Side Setback (min)	10 ft	394+/- ft	364+/- ft	☐
Rear Setback (min)	10 ft	259+/- ft	219+/- ft	☐
Parking (Total Site)				
Parking Setback, Primary (min)	20 ft	17+/- ft	20+/- ft	☐
Parking Setback, Secondary, if applicable (min)	20 ft			☐
Parking Spaces (min) (See §173-224.A. and include calculations)		50+/-	158 Refer to Site Plan Table	☐
Lot Development (Total Site)				
Lot Coverage (max)	80% (Subject to the requirements of the Article XIV Aquifer and Water Resource District and §173-224.J.)	8.1%	64.8%	☐
Façade Build Out (min)	60%	0%	62% Overall	☐

SITE STANDARDS (§173-224)
Check if Compliant (Internal Use Only):

Parking Standards (§173-224.A. thru G.):
- ❑ Parking & Driveway Location
- ❑ Driveway Design
- ❑ Parking Lot Design
- ❑ Parking Lot Access
- ❑ Parking Structure, if applicable (§173-224.G.a. and §173-233.H.d.)

Sidewalk Curb Cuts (Optional and only allowed by Special Permit per §173-221.H.a.):
- ❑ If the location of the new curb cut will minimize potentially dangerous conflicts between motor vehicles are pedestrians;
- ❑ If the property owner has, to every extent practicable, attempted to avoid the creation of a new curb cut by creating a cross-access connection between parking lots, utilizing or establishing shared driveway access, or creating a parking lot that is shared between multiple uses on the same block face; and
- ❑ If efforts have been made to locate the new curb cut on Great Road, King Street, Meetinghouse Road or Stevens Street. Locating the curb cut on side streets shall be discouraged.

Screening Standards (§173-224.I.):
- ❑ Loading Facilities
- ❑ Service Areas
- ❑ Mechanical Equipment

Impervious Area Lot Coverage Maximum (excess of maximum only allowed by Special Permit per §173-224.J.b.):
- ❑ The Littleton Water Department has been given an opportunity to review and comment on the Special Permit application, including the proposed impervious area lot coverage and provisions for stormwater management and artificial recharge of groundwater.
- ❑ The development complies with the Massachusetts Department of Environmental Protection Stormwater Standards and the Littleton Planning Board Stormwater Management and Erosion Control Regulations. Up to date precipitation data, such as in NOAA Atlas 14, must be used for meaningful stormwater control.
- ❑ The artificial recharge provided as part of the development's stormwater management design will not degrade groundwater.
- ❑ The proposed development is compliant with §173-63.A. through F. of Article XIV, Aquifer and Water Resource District.
- ❑ The proposed development is compliant with §173-220 Lot Standards of this Article.

Site Design Guidelines (§173-222)
- ❑ Landscape design in the frontage area complements adjacent sidewalk and provides additional pedestrian amenities.
- ❑ Site landscaping prioritize materials common to Littleton's agrarian history.
- ❑ Site landscaping prioritize native plant species and xeriscape.
- ❑ Rain gardens and bioswales installed to infiltrate runoff from impervious surfaces.
- ❑ Existing historic structures preserved and incorporated into new development to every extent practicable.
- ❑ Where vegetative solutions are not feasible, porous concrete or porous asphalt should be used for impervious surfaces to infiltrate stormwater.

BUILDING STANDARDS (§173-221) Building Name/Address/No.: Building "B"

Fill out columns "Existing and "Proposed". Attach separate Building Standards sheets (pages 8 & 9) for each additional building.

Standards	Required	Existing	Proposed	Compliant (Internal Use Only)
Primary Massing(s)				
Width(s) (max)	45 ft (If narrow end oriented front)		44.8 ft	❑
	60 ft (If long side oriented front)		53 ft	
Depth(s) (max)	90 ft (If narrow end oriented front)		90 ft	❑
	45 ft (If long side oriented front)		42 ft	
Heights (Subject to §173-233.H. in applicable areas of the KC district)				
Number of Stories (max)	2.5		1.5	❑
Ground Story Height	14 ft (If Commercial)		14 ft	❑
	10 ft min / 12 ft max (If Residential)		N/A	
Second Story Height, if applicable (min / max)	10 ft / 12 ft		N/A	❑
Half Story Height, if applicable (min / max)	10 ft / 16 ft (If Commercial)		+/- 12 ft Mezzanine	❑
	10 ft / 12 ft (If Residential)		N/A	
Building Height (max)	36 ft (If Mixed Use)		30.75 ft	❑
	32 ft (If All Residential)		N/A	
Use and Features			(Retail)	
Ground Story	Any Use, subject to the requirements of Article V and §173-221.J		Commercial Space >20' w/ Entries	❑
Upper Story	Any Use, subject to the requirements of Article V and §173-221.J		Office Mezzanine	❑
Ground Story Fenestration	60% min (If Commercial)		54% See Chart	❑
	15% min / 25% max (If Residential)		N/A	
Upper Story Fenestration (min / max)	15% / 25%		<15% Mezzanine Only	❑
Continued on next page				

Building Separation				
Distance from any other building(s) (min)	20 ft		54.7 ft To Building C	❑

Check if Compliant (Internal Use Only):

- ❑ Roof Features (§173-221.I.)
- ❑ Building Assembly (§173-221.M.)

Building Component (§173-221.L.):
- ❑ Side Addition(s), if applicable
- ❑ Rear Addition(s), if applicable
- ❑ Projecting Gable(s), if applicable
- ❑ Projecting Storefront(s), if applicable
- ❑ Dormer(s), if applicable
- ❑ Cross Gable(s), if applicable
- ❑ Bay Window(s), if applicable
- ❑ Balcony(ies), if applicable

Frontage Types (§173-221.N.):
- ❑ Gallery(ies), if applicable
- ❑ Entry Plaza(s), if applicable
- ❑ Dining Patio(s), if applicable
- ❑ Front Garden(s), if applicable
- ❑ Porch(es), if applicable
- ❑ Dooryard(s) or Stoop(s), if applicable
- ❑ Common Lobby(ies), if applicable

Building Design Guidelines (§173-222):
- ❑ Building assembly differs on abutting lots.
- ❑ Architectural design complements the Town's architectural character.
- ❑ Consistent and harmonious composition of materials, windows, doors, and ornamentation.
- ❑ Type and color of materials for building kept to a minimum, and wall materials have the appearance of natural materials.
- ❑ Galleries and porches constructed out of light steel, wood, or wood-appearing materials.
- ❑ Buildings for people age fifty-five (55) and over designed with features specified in §173-149 Age-appropriate design.

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TOWN OF LITTLETON
CHECKLIST
Village Common & King Street Common FBC Area
ADOPTED Feb. 3, 2022

Littleton Town Offices
37 Shattuck Street
Room 303
Littleton, MA 01460
(978) 540-2425

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LOT STANDARDS (§173-220)

BUILDING "C"

Fill out columns "Existing" and "Proposed", as applicable:

Standards	Required	Existing	Proposed	Compliant (Internal Use Only)
Building Setbacks				
Front Setback, Primary (min / max)	10 ft / 20 ft (Subject to the sidewalk setback requirements of §173-220.A.d.)	43+/- ft	17.1+/- ft	❑
Front Setback, Secondary, if applicable (min / max)	10 ft / 20 ft	43+/- ft	17.1+/- ft	❑
Left Side Setback (min)	10 ft	203+/- ft	202+/- ft	❑
Right Side Setback (min)	10 ft	279+/- ft	208+/- ft	❑
Rear Setback (min)	10 ft	197+/- ft	150+/- ft	❑
Parking (Total Site)				
Parking Setback, Primary (min)	20 ft	17+/- ft	20+/- ft	❑
Parking Setback, Secondary, if applicable (min)	20 ft			❑
Parking Spaces (min) (See §173-224.A. and include calculations)		50+/-	158 Refer to Site Plan Table	❑
Lot Development (Total Site)				
Lot Coverage (max)	80% (Subject to the requirements of the Article XIV Aquifer and Water Resource District and §173-224.J.)	8.1%	64.8%	❑
Façade Build Out (min)	60%	0%	62% Overall	❑

SITE STANDARDS (§173-224)
Check if Compliant (Internal Use Only):

Parking Standards (§173-224.A. thru G.):
- ❑ Parking & Driveway Location
- ❑ Driveway Design
- ❑ Parking Lot Design
- ❑ Parking Lot Access
- ❑ Parking Structure, if applicable (§173-224.G.a. and §173-233.H.d.)

Sidewalk Curb Cuts (Optional and only allowed by Special Permit per §173-221.H.a.):
- ❑ If the location of the new curb cut will minimize potentially dangerous conflicts between motor vehicles are pedestrians;
- ❑ If the property owner has, to every extent practicable, attempted to avoid the creation of a new curb cut by creating a cross-access connection between parking lots, utilizing or establishing shared driveway access, or creating a parking lot that is shared between multiple uses on the same block face; and
- ❑ If efforts have been made to locate the new curb cut on Great Road, King Street, Meetinghouse Road or Stevens Street. Locating the curb cut on side streets shall be discouraged.

Screening Standards (§173-224.I.):
- ❑ Loading Facilities
- ❑ Service Areas
- ❑ Mechanical Equipment

Impervious Area Lot Coverage Maximum (excess of maximum only allowed by Special Permit per §173-224.J.b.):
- ❑ The Littleton Water Department has been given an opportunity to review and comment on the Special Permit application, including the proposed impervious area lot coverage and provisions for stormwater management and artificial recharge of groundwater.
- ❑ The development complies with the Massachusetts Department of Environmental Protection Stormwater Standards and the Littleton Planning Board Stormwater Management and Erosion Control Regulations. Up to date precipitation data, such as in NOAA Atlas 14, must be used for meaningful stormwater control.
- ❑ The artificial recharge provided as part of the development's stormwater management design will not degrade groundwater.
- ❑ The proposed development is compliant with §173-63.A. through F. of Article XIV, Aquifer and Water Resource District.
- ❑ The proposed development is compliant with §173-220 Lot Standards of this Article.

Site Design Guidelines (§173-222)
- ❑ Landscape design in the frontage area complements adjacent sidewalk and provides additional pedestrian amenities.
- ❑ Site landscaping prioritize materials common to Littleton's agrarian history.
- ❑ Site landscaping prioritize native plant species and xeriscape.
- ❑ Rain gardens and bioswales installed to infiltrate runoff from impervious surfaces.
- ❑ Existing historic structures preserved and incorporated into new development to every extent practicable.
- ❑ Where vegetative solutions are not feasible, porous concrete or porous asphalt should be used for impervious surfaces to infiltrate stormwater.

BUILDING STANDARDS (§173-221) Building Name/Address/No.: Building "C"

Fill out columns "Existing and "Proposed". Attach separate Building Standards sheets (pages 8 & 9) for each additional building.

Standards	Required	Existing	Proposed	Compliant (Internal Use Only)
Primary Massing(s)				
Width(s) (max)	45 ft (If narrow end oriented front)		35 ft	❑
	60 ft (If long side oriented front)		58 ft	
Depth(s) (max)	90 ft (If narrow end oriented front)		41 ft	❑
	45 ft (If long side oriented front)		35 ft	
Heights (Subject to §173-233.H. in applicable areas of the KC district)				
Number of Stories (max)	2.5		2	❑
Ground Story Height	14 ft (If Commercial)		14 ft	❑
	10 ft min / 12 ft max (If Residential)		N/A	
Second Story Height, if applicable (min / max)	10 ft / 12 ft		10 ft	❑
Half Story Height, if applicable (min / max)	10 ft / 16 ft (If Commercial)		N/A	❑
	10 ft / 12 ft (If Residential)		N/A	
Building Height (max)	36 ft (If Mixed Use)		34 ft	❑
	32 ft (If All Residential)		N/A	
Use and Features				
Ground Story	Any Use, subject to the requirements of Article V and §173-221.J		Commercial Space >20' w/ Entries	❑
Upper Story	Any Use, subject to the requirements of Article V and §173-221.J		Prof. Office Space(s)	❑
Ground Story Fenestration	60% min (If Commercial)		64% See Chart	❑
	15% min / 25% max (If Residential)		N/A	
Upper Story Fenestration (min / max)	15% / 25%		18% See Chart	❑
Continued on next page				

Building Separation				
Distance from any other building(s) (min)	20 ft		27 ft To Building D	❑

Check if Compliant (Internal Use Only):

- ❑ Roof Features (§173-221.I.)
- ❑ Building Assembly (§173-221.M.)

Building Component (§173-221.L.):
- ❑ Side Addition(s), if applicable
- ❑ Rear Addition(s), if applicable
- ❑ Projecting Gable(s), if applicable
- ❑ Projecting Storefront(s), if applicable
- ❑ Dormer(s), if applicable
- ❑ Cross Gable(s), if applicable
- ❑ Bay Window(s), if applicable
- ❑ Balcony(ies), if applicable

Frontage Types (§173-221.N.):
- ❑ Gallery(ies), if applicable
- ❑ Entry Plaza(s), if applicable
- ❑ Dining Patio(s), if applicable
- ❑ Front Garden(s), if applicable
- ❑ Porch(es), if applicable
- ❑ Dooryard(s) or Stoop(s), if applicable
- ❑ Common Lobby(ies), if applicable

Building Design Guidelines (§173-222):
- ❑ Building assembly differs on abutting lots.
- ❑ Architectural design complements the Town's architectural character.
- ❑ Consistent and harmonious composition of materials, windows, doors, and ornamentation.
- ❑ Type and color of materials for building kept to a minimum, and wall materials have the appearance of natural materials.
- ❑ Galleries and porches constructed out of light steel, wood, or wood-appearing materials.
- ❑ Buildings for people age fifty-five (55) and over designed with features specified in §173-149 Age-appropriate design.

If you wish to review application requirements and/or materials with Planning Department Staff prior to submitting your application, please call 978-54-2425, or email the Planning Department.

Littleton Town Offices
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TOWN OF LITTLETON
CHECKLIST
Village Common & King Street Common FBC Area

ADOPTED Feb. 3, 2022

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BUILDING "D"

LOT STANDARDS (§173-220)

Fill out columns "Existing" and "Proposed", as applicable:

Standards	Required	Existing	Proposed	Compliant (Internal Use Only)
Building Setbacks				
Front Setback, Primary (min / max)	10 ft / 20 ft (Subject to the sidewalk setback requirements of §173-220.A.d.)	43+/- ft	19 ft	❑
Front Setback, Secondary, if applicable (min / max)	10 ft / 20 ft	43+/- ft	26+/- ft	❑
Left Side Setback (min)	10 ft	203+/- ft	290+/- ft	❑
Right Side Setback (min)	10 ft	279+/- ft	145+/- ft	❑
Rear Setback (min)	10 ft	197+/- ft	118+/- ft	❑
Parking (Total Site)				
Parking Setback, Primary (min)	20 ft	17+/- ft	20+/- ft	❑
Parking Setback, Secondary, if applicable (min)	20 ft			❑
Parking Spaces (min) (See §173-224.A. and include calculations)		50+/-	158 Refer to Site Plan Table	❑
Lot Development (Total Site)				
Lot Coverage (max)	80% (Subject to the requirements of the Article XIV Aquifer and Water Resource District and §173-224.J.)	8.1%	64.8%	❑
Façade Build Out (min)	60%	0%	62% Overall	❑

SITE STANDARDS (§173-224)
Check if Compliant (Internal Use Only):

Parking Standards (§173-224.A. thru G.):
- ❑ Parking & Driveway Location
- ❑ Driveway Design
- ❑ Parking Lot Design
- ❑ Parking Lot Access
- ❑ Parking Structure, if applicable (§173-224.G.a. and §173-233.H.d.)

Sidewalk Curb Cuts (Optional and only allowed by Special Permit per §173-221.H.a.):
- ❑ If the location of the new curb cut will minimize potentially dangerous conflicts between motor vehicles are pedestrians;
- ❑ If the property owner has, to every extent practicable, attempted to avoid the creation of a new curb cut by creating a cross-access connection between parking lots, utilizing or establishing shared driveway access, or creating a parking lot that is shared between multiple uses on the same block face; and
- ❑ If efforts have been made to locate the new curb cut on Great Road, King Street, Meetinghouse Road or Stevens Street. Locating the curb cut on side streets shall be discouraged.

Screening Standards (§173-224.I.):
- ❑ Loading Facilities
- ❑ Service Areas
- ❑ Mechanical Equipment

Impervious Area Lot Coverage Maximum (excess of maximum only allowed by Special Permit per §173-224.J.b.):
- ❑ The Littleton Water Department has been given an opportunity to review and comment on the Special Permit application, including the proposed impervious area lot coverage and provisions for stormwater management and artificial recharge of groundwater.
- ❑ The development complies with the Massachusetts Department of Environmental Protection Stormwater Standards and the Littleton Planning Board Stormwater Management and Erosion Control Regulations. Up to date precipitation data, such as in NOAA Atlas 14, must be used for meaningful stormwater control.
- ❑ The artificial recharge provided as part of the development's stormwater management design will not degrade groundwater.
- ❑ The proposed development is compliant with §173-63.A. through F. of Article XIV, Aquifer and Water Resource District.
- ❑ The proposed development is compliant with §173-220 Lot Standards of this Article.

Site Design Guidelines (§173-222)
- ❑ Landscape design in the frontage area complements adjacent sidewalk and provides additional pedestrian amenities.
- ❑ Site landscaping prioritize materials common to Littleton's agrarian history.
- ❑ Site landscaping prioritize native plant species and xeriscape.
- ❑ Rain gardens and bioswales installed to infiltrate runoff from impervious surfaces.
- ❑ Existing historic structures preserved and incorporated into new development to every extent practicable.
- ❑ Where vegetative solutions are not feasible, porous concrete or porous asphalt should be used for impervious surfaces to infiltrate stormwater.

BUILDING STANDARDS (§173-221) Building Name/Address/No.: Building "D"

Fill out columns "Existing and "Proposed". Attach separate Building Standards sheets (pages 8 & 9) for each additional building.

Standards	Required	Existing	Proposed	Compliant (Internal Use Only)
Primary Massing(s)				
Width(s) (max)	45 ft (If narrow end oriented front)		36 ft	❑
	60 ft (If long side oriented front)		N/A	
Depth(s) (max)	90 ft (If narrow end oriented front)		90 ft	❑
	45 ft (If long side oriented front)		N/A	
Heights (Subject to §173-233.H. in applicable areas of the KC district)				
Number of Stories (max)	2.5		2.5	❑
Ground Story Height	14 ft (If Commercial)		14 ft	❑
	10 ft min / 12 ft max (If Residential)		N/A	
Second Story Height, if applicable (min / max)	10 ft / 12 ft		10.5 ft	❑
Half Story Height, if applicable (min / max)	10 ft / 16 ft (If Commercial)		10 ft	❑
	10 ft / 12 ft (If Residential)		N/A	
Building Height (max)	36 ft (If Mixed Use)		32 ft	❑
	32 ft (If All Residential)		N/A	
Use and Features				
Ground Story	Any Use, subject to the requirements of Article V and §173-221.J		Commercial Space >20' w/ Entries	❑
Upper Story	Any Use, subject to the requirements of Article V and §173-221.J		Prof. Office Space(s)	❑
Ground Story Fenestration	60% min (If Commercial)		61% See Chart	❑
	15% min / 25% max (If Residential)		N/A	
Upper Story Fenestration (min / max)	15% / 25%		19% See Chart	❑
Continued on next page				

Building Separation				
Distance from any other building(s) (min)	20 ft		27 ft To Building C	❑

Check if Compliant (Internal Use Only):

- ❑ Roof Features (§173-221.I.)
- ❑ Building Assembly (§173-221.M.)

Building Component (§173-221.L.):

- ❑ Side Addition(s), if applicable
- ❑ Rear Addition(s), if applicable
- ❑ Projecting Gable(s), if applicable
- ❑ Projecting Storefront(s), if applicable
- ❑ Dormer(s), if applicable
- ❑ Cross Gable(s), if applicable
- ❑ Bay Window(s), if applicable
- ❑ Balcony(ies), if applicable

Frontage Types (§173-221.N.):

- ❑ Gallery(ies), if applicable
- ❑ Entry Plaza(s), if applicable
- ❑ Dining Patio(s), if applicable
- ❑ Front Garden(s), if applicable
- ❑ Porch(es), if applicable
- ❑ Dooryard(s) or Stoop(s), if applicable
- ❑ Common Lobby(ies), if applicable

Building Design Guidelines (§173-222):

- ❑ Building assembly differs on abutting lots.
- ❑ Architectural design complements the Town's architectural character.
- ❑ Consistent and harmonious composition of materials, windows, doors, and ornamentation.
- ❑ Type and color of materials for building kept to a minimum, and wall materials have the appearance of natural materials.
- ❑ Galleries and porches constructed out of light steel, wood, or wood-appearing materials.
- ❑ Buildings for people age fifty-five (55) and over designed with features specified in §173-149 Age-appropriate design.

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CHECKLIST
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BUILDING "E"

LOT STANDARDS (§173-220)

Fill out columns "Existing" and "Proposed", as applicable:

Standards	Required	Existing	Proposed	Compliant (Internal Use Only)
Building Setbacks				
Front Setback, Primary (min / max)	10 ft / 20 ft (Subject to the sidewalk setback requirements of §173-220.A.d.)	34+/- ft	16.1+/- ft	☐
Front Setback, Secondary, if applicable (min / max)	10 ft / 20 ft	34+/- ft	16.1+/- ft	☐
Left Side Setback (min)	10 ft	357+/- ft	397+/- ft	☐
Right Side Setback (min)	10 ft	50+/- ft	11+/- ft	☐
Rear Setback (min)	10 ft	110+/- ft	80+/- ft	☐
Parking (Total Site)				
Parking Setback, Primary (min)	20 ft	17+/- ft	20+/- ft	☐
Parking Setback, Secondary, if applicable (min)	20 ft			☐
Parking Spaces (min) (See §173-224.A. and include calculations)		50+/-	158 Refer to Site Plan Table	☐
Lot Development (Total Site)				
Lot Coverage (max)	80% (Subject to the requirements of the Article XIV Aquifer and Water Resource District and §173-224.J.)	8.1%	64.8%	☐
Façade Build Out (min)	60%	0%	62 % Overall	☐

SITE STANDARDS (§173-224)
Check if Compliant (Internal Use Only):

Parking Standards (§173-224.A. thru G.):

- ❑ Parking & Driveway Location
- ❑ Driveway Design
- ❑ Parking Lot Design
- ❑ Parking Lot Access
- ❑ Parking Structure, if applicable (§173-224.G.a. and §173-233.H.d.)

Sidewalk Curb Cuts (Optional and only allowed by Special Permit per §173-221.H.a.):

- ❑ If the location of the new curb cut will minimize potentially dangerous conflicts between motor vehicles are pedestrians;
- ❑ If the property owner has, to every extent practicable, attempted to avoid the creation of a new curb cut by creating a cross-access connection between parking lots, utilizing or establishing shared driveway access, or creating a parking lot that is shared between multiple uses on the same block face; and
- ❑ If efforts have been made to locate the new curb cut on Great Road, King Street, Meetinghouse Road or Stevens Street. Locating the curb cut on side streets shall be discouraged.

Screening Standards (§173-224.I.):

- ❑ Loading Facilities
- ❑ Service Areas
- ❑ Mechanical Equipment

Impervious Area Lot Coverage Maximum (excess of maximum only allowed by Special Permit per §173-224.J.b.):

- ❑ The Littleton Water Department has been given an opportunity to review and comment on the Special Permit application, including the proposed impervious area lot coverage and provisions for stormwater management and artificial recharge of groundwater.
- ❑ The development complies with the Massachusetts Department of Environmental Protection Stormwater Standards and the Littleton Planning Board Stormwater Management and Erosion Control Regulations. Up to date precipitation data, such as in NOAA Atlas 14, must be used for meaningful stormwater control.
- ❑ The artificial recharge provided as part of the development's stormwater management design will not degrade groundwater.
- ❑ The proposed development is compliant with §173-63.A. through F. of Article XIV, Aquifer and Water Resource District.
- ❑ The proposed development is compliant with §173-220 Lot Standards of this Article.

Site Design Guidelines (§173-222)

- ❑ Landscape design in the frontage area complements adjacent sidewalk and provides additional pedestrian amenities.
- ❑ Site landscaping prioritize materials common to Littleton's agrarian history.
- ❑ Site landscaping prioritize native plant species and xeriscape.
- ❑ Rain gardens and bioswales installed to infiltrate runoff from impervious surfaces.
- ❑ Existing historic structures preserved and incorporated into new development to every extent practicable.
- ❑ Where vegetative solutions are not feasible, porous concrete or porous asphalt should be used for impervious surfaces to infiltrate stormwater.

BUILDING STANDARDS (§173-221) Building Name/Address/No.: Building "E"

Fill out columns "Existing and "Proposed". Attach separate Building Standards sheets (pages 8 & 9) for each additional building.

Standards	Required	Existing	Proposed	Compliant (Internal Use Only)
Primary Massing(s)				
Width(s) (max)	45 ft (If narrow end oriented front)		38 ft	❑
	60 ft (If long side oriented front)		N/A	
Depth(s) (max)	90 ft (If narrow end oriented front)		83 ft	❑
	45 ft (If long side oriented front)		N/A	
Heights (Subject to §173-233.H. in applicable areas of the KC district)				
Number of Stories (max)	2.5		1 (One)	❑
Ground Story Height	14 ft (If Commercial)		12.5 ft	❑
	10 ft min / 12 ft max (If Residential)		N/A	
Second Story Height, if applicable (min / max)	10 ft / 12 ft		N/A	❑
Half Story Height, if applicable (min / max)	10 ft / 16 ft (If Commercial)		N/A	❑
	10 ft / 12 ft (If Residential)		N/A	
Building Height (max)	36 ft (If Mixed Use)		21.75 ft	❑
	32 ft (If All Residential)		N/A	
Use and Features				
Ground Story	Any Use, subject to the requirements of Article V and §173-221.J		Restaurant Space >20'	❑
Upper Story	Any Use, subject to the requirements of Article V and §173-221.J		N/A	❑
Ground Story Fenestration	60% min (If Commercial)		61% See Chart	❑
	15% min / 25% max (If Residential)		N/A	
Upper Story Fenestration (min / max)	15% / 25%		N/A	❑
Continued on next page				

Building Separation				
Distance from any other building(s) (min)	20 ft		74.4 ft To Building D	❑

Check if Compliant (Internal Use Only):

- ❑ Roof Features (§173-221.I.)
- ❑ Building Assembly (§173-221.M.)

Building Component (§173-221.L.):
- ❑ Side Addition(s), if applicable
- ❑ Rear Addition(s), if applicable
- ❑ Projecting Gable(s), if applicable
- ❑ Projecting Storefront(s), if applicable
- ❑ Dormer(s), if applicable
- ❑ Cross Gable(s), if applicable
- ❑ Bay Window(s), if applicable
- ❑ Balcony(ies), if applicable

Frontage Types (§173-221.N.):
- ❑ Gallery(ies), if applicable
- ❑ Entry Plaza(s), if applicable
- ❑ Dining Patio(s), if applicable
- ❑ Front Garden(s), if applicable
- ❑ Porch(es), if applicable
- ❑ Dooryard(s) or Stoop(s), if applicable
- ❑ Common Lobby(ies), if applicable

Building Design Guidelines (§173-222):
- ❑ Building assembly differs on abutting lots.
- ❑ Architectural design complements the Town's architectural character.
- ❑ Consistent and harmonious composition of materials, windows, doors, and ornamentation.
- ❑ Type and color of materials for building kept to a minimum, and wall materials have the appearance of natural materials.
- ❑ Galleries and porches constructed out of light steel, wood, or wood-appearing materials.
- ❑ Buildings for people age fifty-five (55) and over designed with features specified in §173-149 Age-appropriate design.

If you wish to review application requirements and/or materials with Planning Department Staff prior to submitting your application, please call 978-54-2425, or email the Planning Department.

Nortern Bank Town Common

Fenestration Calculation

Maugel DeStefano Architects | September 9,2022

	Facade SF Area	Requirement		Actual	Total %	Notes
		Min	Max			
Bulding A (Bank Branch) Ground Floor Requirement: 60% Second Floor Requirement: 15% - 20%	 1,527.88 NA	 916.73 NA	 NA NA	 961.70 NA	 63%	
Building B (Barn/Food Shop) Ground Floor Requirement: 60% Second Floor Requirement: 15% - 20%	 1,293.40 NA	 776.04 NA	 NA NA	 702.02 NA	 54%	*Includes height of glass entry. Bldg. B achieves < 60% fenestration due to building design representing an iconic NE barn with regularly spaced, smaller openings.*
Building C (Mixed Use)* Ground Floor Requirement: 60% Second Floor Requirement: 15% - 20%	 1,504.55 1,136.24	 902.73 170.44	 NA 284.06	 966.00 201.45	 64% 18%	
Building D (Mixed Use)* Ground Floor Requirement: 60% Second Floor Requirement: 15% - 20%	 507.63 424.89	 304.58 63.73	 NA 106.22	 308.58 80.76	 61% 19%	
Building E (Coffee Shop) Ground Floor Requirement: 60% Second Floor Requirement: N/A	 349.97 NA	 209.98 NA	 NA NA	 213.12 NA	 61%	

** Does not include elevated bridge between Buildings C&D*

Attachment "A"

- 265 Great Road - Owner: Northern Bank & Trust Company. Book 21510 Page 452
- 277 Great Road - Owner: 289 Great Road Realty Trust. Book 64652 Page 343
- 287 Great Road - Owner: NBTC Great Road, LLC. Book 70232 Page 62
- 289 Great Road - Owner: 289 Great Road Realty Trust. Book 63344 Page 416
- 25 Robinson Road - Owner: NBTC Great Road, LLC. Book 70571-437

FILING FEE

DEVELOPMENT TEAM QUALIFICATIONS

Northern Bank

Northern Bank is a full-service bank dedicated to providing practical, common sense financial solutions to help our customers' lives and businesses grow. From deposit products to loans to payment and collections services, we work hands on with our entrepreneurial customers, both locally and across the country, to provide the financial support they need to realize their personal and business goals. Founded in 1960, Northern Bank has assets of $2.8 billion with 13 locations serving communities throughout Middlesex County. Northern Bank is a Member of the FDIC, an Equal Housing Lender, and consistently ranked among the best performing community banks in New England.

Project Profiles:

Northern Bank, Mishawum Road, Woburn, Massachusetts

Northern Bank relocated its existing headquarters to this location in 2009. The project involved construction of a 50,000 square foot, five-story building with surface and subsurface parking, as well as construction of direct access (via a ramp system) to an adjacent MBTA commuter rail station. The property required significant environmental remediation and the adoption of new zoning.

Northern Bank, Main Street, Stoneham, Massachusetts

Northern Bank leased an existing building in Stoneham to accommodate a new bank branch office. The building reflects a modern design and functionality that will be replicated at new branches and buildouts of existing bank locations. The project involved associated permitting entitlements in support of a full building redevelopment.

Northern Bank, Sudbury, Massachusetts

Northern Bank acquired a former automotive service property to accommodate a new local branch office. The property was transformed through the development of a colonial style building that was part of the community vision for redevelopment of the project corridor. The project involved significant environmental remediation, as well as associated permitting entitlements and the full construction of a new building.

(before)

(after)

Northern Bank, Reading, Massachusetts

Northern Bank acquired an historic building in the downtown area of Reading to accommodate a new local branch office. Northern Bank worked with the local historic commission on the transformation of the commercial space, while maintaining the historic architectural design of the building. The project involved associated permitting entitlements and the renovation of the building.

RIEMER | BRAUNSTEIN

LAND USE / LAND USE LITIGATION

Integrating the firm's Land Use and Land Use Litigation practice areas to provide the expertise necessary to assist real estate clients with the development and implementation of cohesive and effective land use and permitting strategies.

Riemer & Braunstein's Land Use / Land Use Litigation Department integrates the firm's Land Use practice and its Litigation practice areas into a cohesive practice group to provide clients with quality targeted legal advice. Oftentimes, development projects entail potential assessments of challenges to permits as well as environmental and other governmental regulation implications. The firm's attorneys in these practice areas have extensive experience working together in all phases of real estate development projects and advocating for, and defending, our clients' rights from numerous challenges and before various forums at the Federal, State and local levels. By coordinating these two practice areas, the firm has the ability to bring experienced talent to unique and often complex issues to develop cohesive and effective strategies in connection with the permitting of projects.

The firm's land use practice is spearheaded by Robert Buckley and Mark Vaughan, two well-known and very experienced practitioners in representing real estate developers, property owners, and tenants in guiding real estate projects through the complicated network of Federal, State and local land use permitting. Our Burlington and Boston based attorneys focus on representing developers on projects throughout Massachusetts and cover the full spectrum of land use law, including the permitting and development of large corporate campuses and office parks, retail and mixed use redevelopments, and other commercial, industrial, and life science projects, as well as the permitting of multi-family housing developments, transit-oriented housing, and affordable housing developments approved pursuant to MGL Chapter 40B and Chapter 40R. Our staff also includes the services of a land use planner. The Burlington, Massachusetts office has been at the forefront of these activities for its more than 45 years of operation.

Allocation of land use litigation resources to support this permitting effort is currently coordinated by Dennis E. McKenna who is a member of the firm's Management Team and Chairman of the firm's Litigation Department. Through this position, he is able to effectively mobilize resources on an as needed basis. Our land use litigation attorneys handle not only hearings before boards and agencies, but have extensive experience representing developers and real estate property owners in connection with zoning appeals, as well as before administrative agencies such as the Massachusetts Department of Environmental Protection. Many times to successfully assist in the entitlement of a development project, we have to work to resolve challenges by zealous third parties.

This group also has recognized expertise in wetlands and environmental law and regulations, and their impact on real estate development. It has represented clients in the redevelopment of two federal Superfund sites, the negotiation of consent orders with the Massachusetts Department of Environmental Protection (DEP) and the litigation of environmental contamination claims. It also has made numerous successful appearances before the DEP to obtain superseding orders of conditions on appeals from local conservation commissions. In many more instances, attorneys in the group have been able to work out solutions acceptable to our clients through discussions with local conservation commissions.

This practice area works closely with the firm's Real Estate/Business Law practice area to provide a broad array of services to our real estate clients.

RANGE OF SERVICES

- Permitting
- Zoning – including overlay, mixed-use and form based
- Environmental law
- Liquor licensing
- Subdivisions

- Appeals before various judicial and regulatory bodies including the Massachusetts Land Court; Massachusetts Superior Court; Housing Appeals Committee; Division of Administrative Law Appeals in environmental cases; and Department of Environmental Protection

REPRESENTATIVE PROJECTS

- Repositioning for market of a 150-acre parcel and its subsequent permitting and development into the eastern United States campus of a major software company. The development currently consists of 1 million square feet of mixed-use office, research and non-destination accessory retail space and is expected to be 1.3 million square feet when fully built out.
- Development of the Woburn Industri-Plex Superfund site, including obtaining PWED grants for the construction of roadway improvements and the permitting of over 1 million square feet of office and retail space, including a mixed office and research building for a leading bio tech company, the first Target store opened in Massachusetts and its own interstate highway interchange. The redevelopment of the site has received critical acclaim and awards.
- Federal, state and local permitting of a regional outlet mall for a national retail development Real Estate Investment Trust (REIT)
- Master planning and development of a major Brownfields site to include approximately 1 million square feet of office space, research and development space, and complementary uses, including an extended-stay hotel
- Rezoning, permitting and approval for several mixed-use development districts, including:
    - a project consisting of 500 luxury residential units, 500,000 square feet of commercial space and amenities. The project is part of a master plan to create a "rail transit district" zoning overlay, which has received national recognition as an example of creative and responsible zoning.
    - a 625,000 square-foot development consisting of 500,000 square feet of commercial space and 125,000 square feet of residential space
    - a 750,000 square-foot commercial space, 500 unit residential and 150 room hotel project through the utilization of award winning zoning initiatives
- Representation of national and local home builders in the permitting of multi-family housing units with affordable components utilizing the Massachusetts Comprehensive Permit Law, MGL Chapter 40B and the Smart Growth Zoning Overlay District Act, MGL Chapter 40R
- Negotiation and implementation of a four-parcel "land swap" that resulted in the creation of 228 units of luxury and affordable housing and the development of 326,000 square feet of commercial office space. The project was awarded the Kenneth Pickard Municipal Innovation Award by the Massachusetts Municipal Association.
- Creation of numerous retail developments, including acquisition, permitting and lease negotiations

CONTACT

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OCG
Oak Consulting Group

P.O. Box 1123
Newburyport, MA 01950
978 312-3120

COMPANY PROFILE

PURPOSE

Oak Consulting Group, LLC (OCG) is a team of land use consultants and civil engineers founded in 2012 to provide our clients with a comprehensive range of technical and advisory services. Our business is based on our core strength as site/civil engineers. However, our broad understanding of multiple disciplines has enabled our business to evolve beyond traditional site engineering.

And we like what we do. Our business is built on trust earned from our clients by delivering project solutions and enabling the rewards of exceptional teamwork.

SERVICES

As a land use consulting and engineering firm, our scope of services encompasses a wide spectrum of disciplines and capabilities. Through years of professional experience our staff has gained diverse knowledge and skill sets, but OCG's fundamental areas of expertise can be classified into these major categories:

Feasibility Studies/Due Diligence

Determining the best use of a property is a complex task which requires careful review of entitlements, regulatory constraints, available infrastructure and physical site characteristics which may affect construction costs and project feasibility.

OCG offers complete feasibility study and due diligence services to identify key site planning issues. These services typically include assessing environmental constraints such as wetlands, researching property encumbrances, evaluating zoning restrictions, performing an inventory and evaluation of utility infrastructure and determining permit needs. Once these factors are understood, we are able to explore conceptual site plan alternatives to determine the best strategy for achieving project goals.

Site Plan Development

We offer complete engineering support for site plan development. Our projects include institutional, commercial, industrial, and residential developments. We provide a full range of services from project programming and conceptual design through construction including preliminary design, final design and permitting, construction documents, construction administration and project closure.

These services typically include working with our clients and other members of the project team to develop site plan layouts to meet the project objectives in consideration of applicable regulations, site circulation constraints, construction costs and logistics, and other criteria. We provide site engineering for coordinated grading, drainage, and utility services for new and redevelopment sites to meet the needs of the project and obtain any necessary permits.

Stormwater Hydrology

We are specialists in stormwater management and hydrology. Our projects typically include performing detailed drainage analysis and developing Best Management Practices (BMPs) to address stormwater management issues such as flooding, erosion control, and water quality. Many of our projects have been at complex redevelopment sites which require innovative approaches to meet multiple performance objectives. Our engineers use current computer modeling tools to develop designs for stormwater management and BMPs and evaluate the performance of these measures for multiple storm scenarios.

Stormwater quality has become a very important topic within the industry. Most states and municipalities have adopted new rules to help combat potential stormwater pollution from development by using Low Impact Design (LID) techniques. OCG is keenly aware of the importance to both the project proponent and the community to pursue development in a sustainable and responsible manner. We work to stay informed of the latest regulations and technologies to meet these objectives.

Utilities and Infrastructure

We prepare plans and specifications for installation and/or repair of utilities and infrastructure systems. Our engineers design water supply systems, storm drains, sanitary sewers and pump stations, and subsurface disposal systems. OCG staff work with local utility companies to prepare coordinated plans for other utility site work such as electrical, telephone, and gas.

Permitting

OCG provides comprehensive support services for both environmental and site plan development permitting. Our areas of permitting expertise include planning and zoning board review, utility connection permits, wetlands and waterways protection, marine and coastal development, and permitting for environmental programs pertaining to stormwater discharges. Our services range from obtaining local planning board and conservation commission approvals to state environmental impact permits and permits from federal agencies such as the U.S. Army Corps of Engineers.

Construction Administration

OCG's engineering services do not end after design and approval of a project. We take pride in seeing a project through successful completion of construction. Our construction administration tasks typically include cost estimation, bid review, shop drawing review, response to requests for information (RFIs), change-order processing, and quality-control inspection and reporting. Many of our projects have been on difficult urban sites. When unforeseen conditions arise, OCG works closely with the contractor and relevant authorities to quickly resolve issues to minimize impacts to project schedules and costs.

SUSTAINABILITY

As a company, we are committed to sustainable engineering practices. We have completed numerous projects which have earned Leadership in Energy and Environmental Design (LEED) certifications.

Regardless of whether our clients are seeking LEED certifications, we promote the use of sustainable engineering practices in our site designs. By using techniques such as Low Impact Design we help our clients achieve socially responsible development which will result in a project which succeeds both environmentally and economically.

STAFF/CAPABILITIES

Our team has significant depth in education, with individual certifications including licensed professional engineers. Our staff holds advanced degrees and professional registrations in states throughout New England.

OCG's staff has a strong understanding of today's regulatory environment, including current federal, state, and local regulations. OCG has sound working relationships with state regulatory authorities in the northeastern U.S., the U.S. Army Corps of Engineers, and the U.S. Environmental Protection Agency. OCG staff regularly attends seminars and outreach programs to stay current with new and changing regulations which may affect our clients.

Sean P. Malone, P.E.
Vice President

Sean Malone is a licensed Professional Engineer with over 20 years of experience in civil/site design and project management. Sean has been lead engineer and project manager, as well as performing construction inspection and management, for a diverse selection of large and small capital projects. Sean has successfully managed his projects through local, state and federal permitting throughout New England and is committed to completing a project in the best interests of the client.

Representative Experience

Concord Academy: Campus Planning, Concord, Massachusetts
Provided consultation to the project team for a Campus Master Planning effort. Areas of consultation consisted of campus utilities, stormwater management, layout, land use regulations and environmental considerations.

Carroll School, Wayland, Massachusetts
Lead Civil Engineer for site design and permitting of conversion of an existing estate property to a new campus for the Carroll School. The project included site design of new parking and drives, stormwater management and two athletic fields as well as permitting.

Nashoba Brooks School: Campus Planning, Concord, Massachusetts
Lead Civil Engineer for schematic design of a multi-phase project and master plan for a private elementary and middle school on a +/-28 acre campus.

Shapiro Ambulatory Care Center, Boston, Massachusetts
Lead Civil Engineer for design and permitting of 9-story, 245,000-square-foot medical building containing doctors' offices and outpatient services.

Inflow/Infiltration Study, Boston, Massachusetts
Lead Civil Engineer for identification, study, and proposed abatement of existing combined sewer discharges on the Boston University Medical Center Campus.

College of the Holy Cross Residence Hall, Worcester, Massachusetts
Lead Civil Engineer for design and permitting of LEED Silver Certifiable, 250-bed, apartment-style residence hall at The College of the Holy Cross.

Brickstone Square, Andover, Massachusetts
Lead Civil Engineer for BMP design and permitting of improvements to the drainage discharge from the Brickstone Square Office park to the Shawsheen River as mandated by a Conservation Commission/DEP Enforcement Order.

Daland Library, Mont Vernon, NH
Lead Civil Engineer for site design and permitting of a new municipal library and community center. Project included special consideration for stormwater management and design around existing wetlands in a rural setting.

Verizon Work Center, Danvers, MA
Lead Civil Engineer and Project Manager for site design, permitting, and construction administration of the renovation of an existing Verizon Work Center/Garage.

Qualifications

Education
BS in Civil Engineering
University of New Hampshire

Professional Registrations
Professional Engineer
- Rhode Island 9152
- New Hampshire 11080
- Maine 11541
- Massachusetts 48204

OCG
Oak Consulting Group

SHAPING THE EXCEPTIONAL

MAUGEL DESTEFANO

ARCHITECTS

BIO

Maugel DeStefano Architects

09 SEPTEMBER 2022

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SHAPING THE EXCEPTIONAL

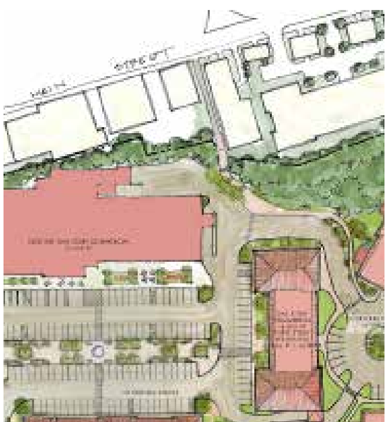
MAUGEL DESTEFANO
ARCHITECTS

ABOUT THE FIRM

Every project we take on — whether for a company, organization or institution — begins with the question “How?”

How can we bring your vision to the world? How can we maximize your value from the project? How can we anticipate your needs today and tomorrow? Lastly, how can our shared endeavor be exceptional and visionary in every way?

About
Maugel DeStefano Architects



SHAPING THE EXCEPTIONAL

Our Story

For nearly 30 years, Maugel DeStefano Architects has been shaping exceptional residential properties. Our designs come to life in millions of square feet of commercial real estate throughout New England for a wide range of industries, including multifamily, custom residential, mixed-use, healthcare, life science and industrial.

With a staff of 40 professionals in strategic planning, architecture, and interior design, Maugel DeStefano has the expertise to provide services for everything from long-range master planning, to the design and execution of complex multi-million dollar construction projects and asset repositioning.

We are fortunate to have a wide range of mixed-use experience that includes the design and renovation of retail establishments, restaurants, and multifamily housing. Maugel DeStefano's projects are designed with people in mind: the clients who collaborate on the design process; the people who will work, live or play in the space; and the people who may use it in the future.

We take the long view beginning with our first conversation. It is our responsibility to understand your wishes and leverage our expertise to present an array of pathways you can take to achieve your vision. We value long term partnerships with our clients, many of whom choose Maugel DeStefano time and again to help them realize their vision.

Project Approach

Project Approach

Relationship-building is an important part of what we do. Taking the time to understand what's important to our clients is one of our core values. Mutual respect, understanding and openness are the keys to designing a project that expresses not only a shared goal, but a shared vision.

OUR WORKSTYLE

A member of your team

We become a member of your team and look out for your interests. We listen, roll up our sleeves and work side by side to design environments that exceed your expectations in the most strategic, advantageous, functional, and visually expressive way possible.

Maugel DeStefano recognizes that enjoying each other's company is just as important as enjoying the work. The energy it creates is contagious for our clients and helps build relationships that last. We understand that going through the architectural process can have its unique challenges. Our staff is responsive, attentive and receptive, with the goal of making the process as easy and enjoyable as possible. We are always available to answer questions, adjust strategy and address concerns.

What's different about us is that everyone on the project team is well-versed in all phases of the project, from planning to design to delivery. Our design teams have partnered with a wide variety of clients to create custom, exceptional visions for projects. Because we have agile dedicated teams with deep experience in mixed-use design, we can assign experts to focus on your specific needs and partner with you throughout the process. We always make sure there is a senior designer on every project — which means you'll be getting our A-team every time.

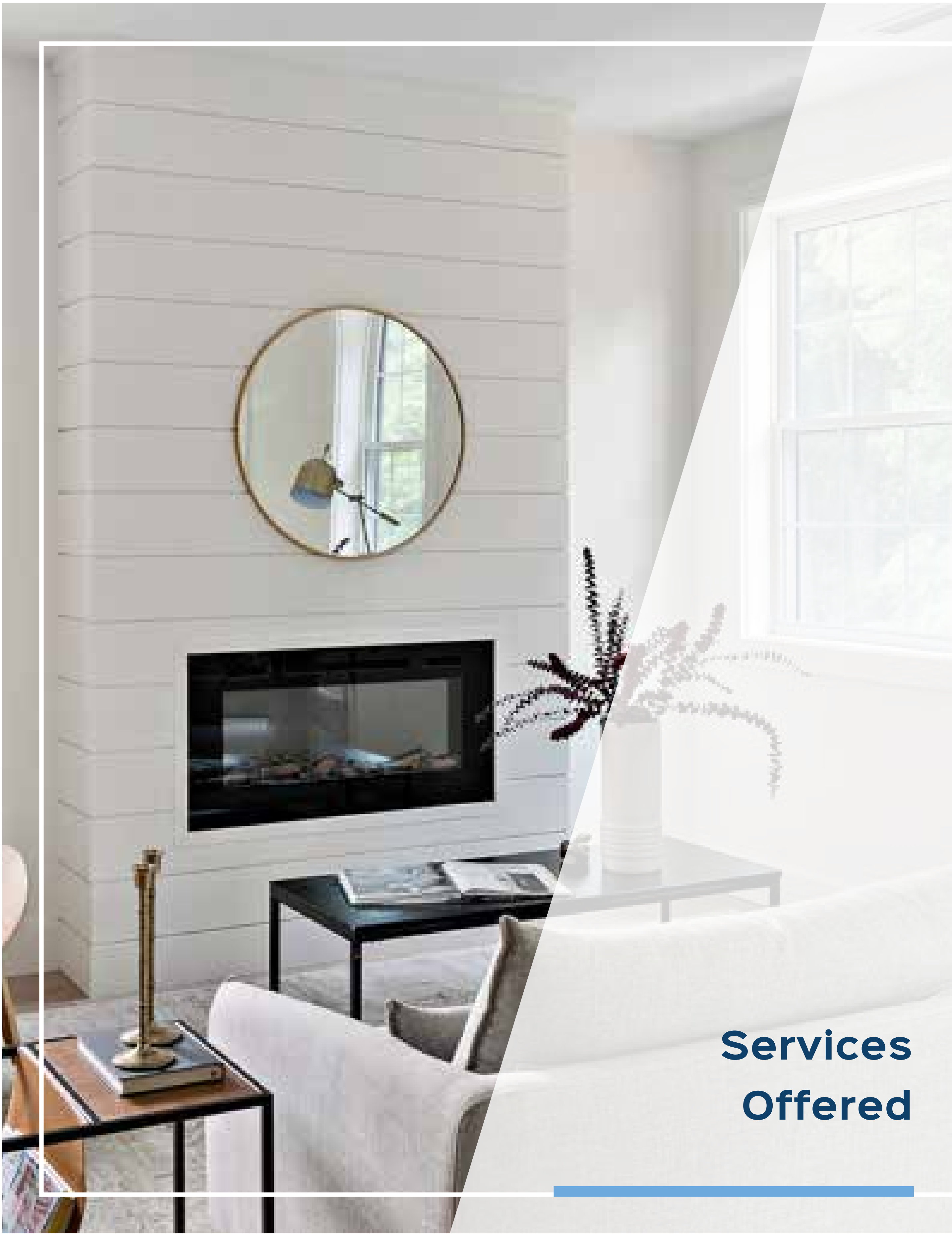
INNOVATIVE PROBLEM SOLVING

A fresh approach to any challenge

Everyone likes to lay claim to "being innovative," but at Maugel DeStefano Architects, we utilize innovation to solve problems. We're not afraid to think differently, or think big, because that approach has always served our clients well in all of the industries we serve.

As architects, we're problem solvers who take innovation to the next level in finding you the best solution and design. Everyone at Maugel DeStefano Architects goes above and beyond what's requested. We take into account our clients' needs for future growth and property sustainability, developing a fresh approach to any design challenge. We approach all projects with an open mind, looking for opportunities to use our design expertise to create innovative solutions and present multiple design options for clients.

Our approach is to never say "No," but always ask "How?" to find creative and novel approaches to client requests, tight budgets or unique design challenges. We avoid overdesign that can lead to high construction costs with little end-user benefit, favoring instead an approach that addresses current needs and anticipates future needs. Our clients have benefited from millions of dollars in savings resulting from smart design recommendations, making Maugel the ideal choice for long-term return on your



Services Offered

Services Offered

Maugel DeStefano has served as a trusted strategic advisor to many of the New England's most successful commercial real estate entities for nearly 30 years.

STRATEGIC PLANNING

A trusted advisor

As true partners, we assist clients in planning for strategic growth, expansion, renovation, and repurposing their real estate assets. We emphasize ROI, while leveraging leadership expertise to eliminate short term obstacles.

Our team instills a culture of accountability, strategic thinking and innovation. We have an exceptionally high ratio of senior design professionals readily available to quickly respond to your needs. Some of the strategic planning services we provide include the following:

- Property Assessments
- Site Analysis and Site Planning
- Zoning Compliance and Approval Strategies
- Asset Repurposing Strategies
- Mixed-use Master Plan Design
- Property and Building Branding
- Smart Growth Community Design

ARCHITECTURAL SERVICES

Experts in creating value

Maugel DeStefano Architects has one of the most diverse design portfolios in New England—ranging dramatically in size, complexity and building type. We are particularly adept at needs assessment, envisioning, branding and bringing your vision to life. It is our mission to shape exceptional solutions to your goals and objectives and to maximize the value of your property by virtue of great design.

Our team is agile, responsive, and committed to anticipating your short term needs and your long term vision. We provide the following architectural services:

- Envisioning and Branding
- Best-use Property Assessments
- Concepts Design
- 3D Illustrations and Virtual Reality Videos
- Zoning Assessments/Approvals
- Sustainable Design/Rooftop Gardens Design
- Schematic Design
- Design Development
- Construction Documents
- Construction Administration

Services Offered

CONTINUED

INTERIOR DESIGN

Designed with people in mind

We design branded residential developments that engender a sense of well-being and community. At Maugel DeStefano Architects, we believe that spaces need to be designed with people in mind: the clients who collaborate on the design process; the people who work, live, or play in the space; and the people who may use it in the future. While always functional and pragmatic, our designs dramatically enhance the visual, cultural and branding identity for your company.

We partner with you to fully understand your mission and provide a clear vision of how to attain it. We have a highly skilled interior design team devoted to sustainability in finishes, furniture, and product selections that will help shape and execute your vision. We provide the following interior design services:

- Fit Plans
- Space Planning
- Programming
- Master Planning for Future Growth
- Phasing
- Corporate Branding & Identity Design
- Furniture, Finishes and Equipment Selection
- Schematic Design
- Design Development
- Construction Documents
- Building Code Analysis

Mixed-use Experience

EXPERIENCE

Portwalk Place

Portsmouth, NH

SCOPE

- Urban Redevelopment
- Mixed-use
- Restaurants
- Retail
- Hotels
- Residential

SIZE

- 400,000 SF
- 5 Acres

Part of a major Portsmouth urban redevelopment effort, Portwalk combines a mix of uses including retail shops, restaurants, hotels and residential units, providing sustainable commerce opportunities to Portsmouth and the Seacoast. Working in conjunction with the development team and city officials, our Portsmouth team was the Consulting Architect focused on creating a pedestrian-friendly neighborhood consistent with the architectural language of the historic city.


British Beer Company
British Beer Company


BRGR
- BAR -


Hilton
Garden Inn

EXPERIENCE

25 Maplewood Ave

Portsmouth, NH

SCOPE

- Urban Redevelopment
- Mixed-use
- Commercial Offices
- Retail Banking
- Residential

SIZE

- 40,000 SF

An outdated law office building on a prominent corner in downtown Portsmouth was demolished and to make way for a three-and-a-half story, 40,000 SF mixed-use development. The building will feature a Provident Bank branch location on the first floor and corporate offices for the bank on the second floor. The third and fourth floors will feature ten condominiums, each with an accompanying balcony. An atrium in the center of the building will allow natural light to wash down through open hallways and covered parking tucked into the hill.

EXPERIENCE

Northern Bank Littleton Common

Littleton, MA

SCOPE

- Mixed-use
- Development Opportunity Evaluations
- Land Use Planning
- Building Design Services

A vibrant place to engage community, Northern Bank's Littleton Common exemplifies the objectives of Littleton's newly adopted Form-Based Zoning. Through planning that intentionally prioritizes the relationship between building forms and the public realm, this rural New England development will transform a series of town center properties into a lively and welcoming mixed-use destination.

Individual building components are designed to a human scale, complementing nearby residential and historic properties. Contextual site features including mature trees, native plantings, and stone walls further enhance the project's character and quality, while generous pathways and landscaped open spaces invite active use of outdoor areas.

Prominent features of the project are Northern Bank's central community green and its signature branch building. The bank is designed to evoke an iconic New England Barn, interpreted through a modern design aesthetic, and positioned as a dynamic element along the Great Road corridor.


Northern Bank


Northern Bank


EAT HERE


OP HERE

EXPERIENCE

Blake Block

Bedford, MA

SCOPE

- Mixed-use

SIZE

- 30,000 SF

This mixed-use project on Bedford's historic Main Street is serving as a catalyst to residential and commercial revitalization in one of New England's most historic towns. The complex has been designed to appear as several distinct buildings constructed at different periods through time. Restaurants and shops line Main Street at the first level and are supported by abundant parking behind the new structure. The seven second floor condominiums units featuring abundant window lines, balconies, and cathedral ceilings.

BEFORE

EXPERIENCE

788 Boston Road

South Coast Development / Groton, MA

SCOPE

- Site planning
- Zoning Approvals
- 4 Building Mixed-use

SIZE

- 20,700 SF

South Coast Development selected the firm to design this four-building mixed-use development on a highly visible parcel in the town of Groton. The team secured site plan approvals for the site, which includes a 7,500 SF medical office building, a 7,500 SF retail building, a 3,200 SF bank and a 2,500 SF coffee shop.


RBT
Rollstone
Bank & Trust


DUNKIN'

EXPERIENCE

Sudbury Square Retail Mall

Sudbury, MA

SCOPE

- Mixed-use

SIZE

- 60,000 SF

Maugel designed extensive additions and alterations to this 60,000 square foot retail plaza in Sudbury, MA. The design includes new vertical circulation cores, new pedestrian links, and outdoor amenity spaces.

BEFORE

Project Team

Daniel Barton AIA

PRINCIPAL

PROFESSIONAL REGISTRATIONS

Registered Architect: MA #20717

National Council of Architects Registration Board: #87486

CERTIFICATIONS AND AFFILIATIONS

American Institute of Architects

Boston Society of Architects

National Trust for Historic Preservation

Historic New England

AWARDS

IFMA Boston Award of Excellence for World Academy School

Glassman Design Award, Boston Architectural Center

VOLUNTEER WORK

Groton Community School Trustee President

Groton Historic Districts Commission Chairman: 1998-2015

Design Review Committee, Groton Chairman: 2012-2015

Station Ave Overlay Committee

Groton Sign Bylaw Committee

Youth Group Co-leader FRS Carlisle

EDUCATION

Bachelor of Architecture, Boston Architectural College

Dan is a principal in the firm and leads Maugel DeStefano's Strategic Planning efforts.

With more than 30 years of planning and architectural design experience, Dan leads the firm's strategic planning services efforts. He has particular expertise in the areas of master planning, strategic planning, facility design, feasibility analysis, consensus-building, and multidisciplinary team coordination. Dan has developed strategic plans and supported fundraising activities for numerous non-profit organizations and has successfully implemented programs that fostered stakeholder participation and built excitement for various project types.

Much of Dan's experience involves renovations to existing buildings and working with historically significant structures, many within historic districts that required state or federal historical commission reviews. He understands the value of preservation and the stewardship of old buildings, while also facilitating building improvements to address the programmatic needs of their current occupants.

While no two projects are ever the same, Dan has developed a deep understanding of the steps involved in a successful design process; one that is embraced and enjoyed by everyone involved. His approach promotes interactive and collaborative activities, which include meeting on a regular basis and respectfully acknowledging the contributions of all constituents. Dan has particular expertise in the following areas: strategic master planning, visioning, needs analysis, logistics, accessibility requirements, renovation and ground-up building design.

Mike Kunz

PRINCIPAL

CERTIFICATIONS AND AFFILIATIONS

NAIOP

American Institute of Architects

EDUCATION

Boston Architectural College, 1998-2004

Mike is a principal in the firm and manages large-scale projects in the commercial and industrial markets

With over 20 years in the industry, Mike's collaborative work style enables him to effectively manage projects that are delivered on time and on budget.

- **Burlington Heights, Burlington, MA**
  Maugel DeStefano designed this high quality 48-unit condominium complex in the historic business overlay district on Cambridge Street in Burlington, MA. The permitting process included approvals of the Route 3 business district sub-committee and the planning board. The buildings feature oversized two bedroom dwelling units on three levels over subterranean covered parking.
- **Boynton Meadows, Groton, MA**
  The team designed this 18-dwelling unit, mixed-use project on Main Street and guided the permitting process through the Historic Districts Commission, the Design Review Committee, the Conservation Commission, and the Planning Board. In addition to the construction of 15 townhouse units, a historic colonial building on Main Street received a retail addition and a full restoration.
- **Blake Block Housing, Bedford, MA.**
  This mixed-use project on Bedford's historic Main Street is serving as a catalyst to residential and commercial revitalization in one of New England's most historic towns. The complex has been designed to appear as several distinct buildings constructed at different periods through time. Restaurants and shops line Main Street at the first level and are supported by abundant parking behind the new structure. The seven second floor condominiums feature abundant window lines, balconies, and cathedral ceilings.
- **Bowers Brook Senior Housing, Harvard, MA.**
  Maugel DeStefano designed this three-story 40-dwelling residential home for seniors at the Harvard Park mixed-use development. The units feature large one and two-bedroom units with solid surface kitchens, energy star appliances, and hardwood floors throughout. The facility has common laundry rooms on each floor and a banquet room adjacent to an outdoor seating garden.

Mike Kunz

RESUME CONTINUED

- **Norwood Crossing, Norwood, MA**
  Norwood Crossing is a 105-unit, dense residential complex amidst a suburban commercial environment. Set upon a two-level parking deck, four-story structures enclose a landscaped courtyard, which also contains a swimming pool and social meeting places. During construction, Maugel DeStefano was recognized for creatively addressing budget and schedule challenges.
- **Warner Woods, Concord, MA**
  The team designed this complex of large rental units to include townhouses with lofts in the upper two floors. Gabled roofs, masonry exterior walls and traditional detailing complement the context of this historical town.
- **Shaw's Landing, New London, CT**
  Maugel DeStefano designed this unique modular four-story structure above a subterranean parking garage on the shore of New London's historic waterfront. Phase one of this three phased project built by Tocci Building Companies features water views from all the dwelling units and secured grounds with a clubhouse, pool and other amenities.
- **Five Chimneys, Concord, MA**
  Five Chimneys is a unique mixed-use building located in Concord. The design of the building includes parking beneath the building, office space on the middle floor and housing on the top floor. This structure was thoughtfully designed to put living spaces within the roof structure, thereby reducing the apparent height of the building.
- **Oakridge Burlington, Burlington, MA**
  Maugel DeStefano designed this townhouse community in the central business district of Burlington as part of the mixed-use overlay zoning for the Route 3A corridor. These units feature federal style detailing and individual private entry ways, enclosed parking garages, bay windows, and cathedral ceilings.

Mark Pelletier AIA

PRINCIPAL

PROFESSIONAL REGISTRATIONS

Registered Architect:
MA #20053, NH #03887

National Council of Architects Registration Board: #38496

Leadership in Energy and Environmental Design Accredited Professional, 2008

CERTIFICATIONS AND AFFILIATIONS

Clean Room Design-Build Short Course

American Institute of Architects

Boston Society of Architects

EDUCATION

Bachelor of Architecture, Wentworth Institute of Technology

Mark is a principal in the firm. He has over 20 years of experience in the design of complex projects in the residential, recreation and commercial sectors.

Marks's expertise includes master planning and programming, building design and detailing, code analysis, and project support through construction.

- **Project Manager/Designer, Residential Housing**
  Mark was responsible for schematic design, design development, programming, construction documents, construction administration, and estimating in the area of residential architecture and multi-family housing. He is knowledgeable in wood frame construction and code requirements relating independent building and shared communities.
- **Lynn YMCA, Lynn, MA**
  Mark was the lead architect for the new 70,000 SF Lynn YMCA located in Lynn. The new facility features a community wing that includes a wellness clinic, an instructional kitchen, and community gathering spaces. Exercise venues feature a state-of-the-art wellness center, gymnasium, indoor track, and aquatics center.
- **Grist Mill Apartments, Chelmsford, MA**
  Mark worked closely with Winstanley and Princeton Properties to design a mix of unit sizes appropriately scaled to the neighborhood. To complement the historical context of the community, the building features a mansard roof and traditional detailing in cornice mouldings, window trim, and dormers. A mix of underground and surface parking was also designed to provide ample parking for 138 vehicles.
- **Project Manager/Designer, Health Care Facilities**
  Mark designed and assisted in the project management of a series of highly specialized adult day care facilities for Boston University and East Boston Neighborhood Health Center in the greater Boston area. Other projects included the expansion of the rehab and adult day care services for Cape Cod Hospital, a 45-bed Alzheimer Suite for the German Center for Extended Care, and a state-of-the-art sports therapy and rehab facility in Salem.

Jeremy Baldwin AIA

ARCHITECT

PROFESSIONAL REGISTRATIONS

Registered Architect: MA #951043

CERTIFICATIONS AND AFFILIATIONS

American Institute of Architects

Boston Society of Architects

National Council Architectural Registration Board (NCARB)

EDUCATION

Master of Architecture, Boston Architectural College

Bachelor of Architectural Engineering Tech, Wentworth Institute of Technology

Jeremy joined Maugel DeStefano in 2017. He is a Registered Architect with over 20 years of design and project management experience.

Jeremy has led teams on a broad range of project types and sizes and has a long track record of helping clients formulate strategy and execute projects efficiently. He has particular expertise in the multifamily housing sector and is experienced with 3D/4D modeling, specifications writing, and building code analysis. He is also an experienced presenter to town forums and historical committees.

- **274 Franklin Street, Worcester, MA**
  Maugel DeStefano Architects is working with the joint venture of GoVenture Capital Group and The Michaels Organization for development of 274 Franklin Street. The design includes 421 residential dwelling units of approximately 431,000 SF along with a four-story precast parking structure with 360 parking spaces. The design team will build a Construction Document set from the Site Planning, Conceptual Design Services, and Planning Board/ Permitting phases previously provided by Maugel DeStefano.
- **The Kiln at 222 Brooks St, Worcester, MA**
  The Kiln is a new 111-unit apartment development located in the Greendale neighborhood of Worcester. Cost efficiency is the highlight of the project. Creative building code solutions, along with innovative structural and mechanical design, make this building product extremely cost-effective during a time of escalating material cost. The building features four stories of residential living with an open parking garage below.
- **Lake Point Village Senior Housing, Lakeville, MA**
  The 66-unit Lake Point senior housing residences pay homage to the elegance of a bygone era often seen in large New England lake houses and turn of the century homes in the Hamptons. The spacious two bedrooms units feature a den, smart technologies, sustainable materials and panoramic views of Lakeville ponds.
- **Village at Bedford Woods, Bedford, MA**
  Four distinct housing types were designed to create a village-style aesthetic for the 26-unit Bedford Woods townhome development. Located on Albion Road, the three building development

Jeremy Baldwin AIA

RESUME CONTINUED

was designed with several different roof configurations to provide distinct character while preserving continuity throughout the project.

- **Cedar Crossing, Walpole MA**
  This 300 unit apartment development in Walpole is designed around wetlands to create three neighborhoods with distinct housing styles:
  the first is a four building, 4-story garden style apartment complex with a clubhouse; the second is a townhouse community; and the third neighborhood will feature single family homes.
- **Northgate Meadows, Sterling, MA**
  Northgate Meadows is a 72-unit multi-residential housing development located on Research Drive in Sterling. The 106,000 SF podium-style building features four stories of residential living with one and two bedroom affordable and market rate units. Rentable storage units and plenty of open space are located on each floor.
  The 26,500 SF of parking located beneath the building provides ample space for vehicles and a dog grooming station.
- **Genesis Healthcare, Dracut, MA**
  Jeremy is the lead architect for Genesis Healthcare's new four-story, 80,000 SF skilled rehabilitation facility in Dracut. d 40 long term beds — all with private rooms, a therapy space, and cooked-to-order restaurant.
- **Nashawtuc Country Club, Concord, MA**
  As part of Nashawtuc Country Club's master plan, an extensive 45,000 SF renovation is planned to upgrade the club's recreational and social facilities. The goal of the plan is to provide members with a state-of-the-art fitness center, enhanced casual dining, and expanded family-centered amenities.

Testimonials & References

Client Testimonials

Omni Properties

Omni Properties has partnered with Maugel DeStefano since 1999. Our projects require multiple iterations because of ongoing permitting. We have relied heavily on their flexibility and their ability to respond quickly and accurately while producing outstanding work. Their team is an integral part of our design process from conception to finish—our success is due in large part to the Maugel DeStefano team.

David Hale, Partner, Omni Properties

LR Russo Development

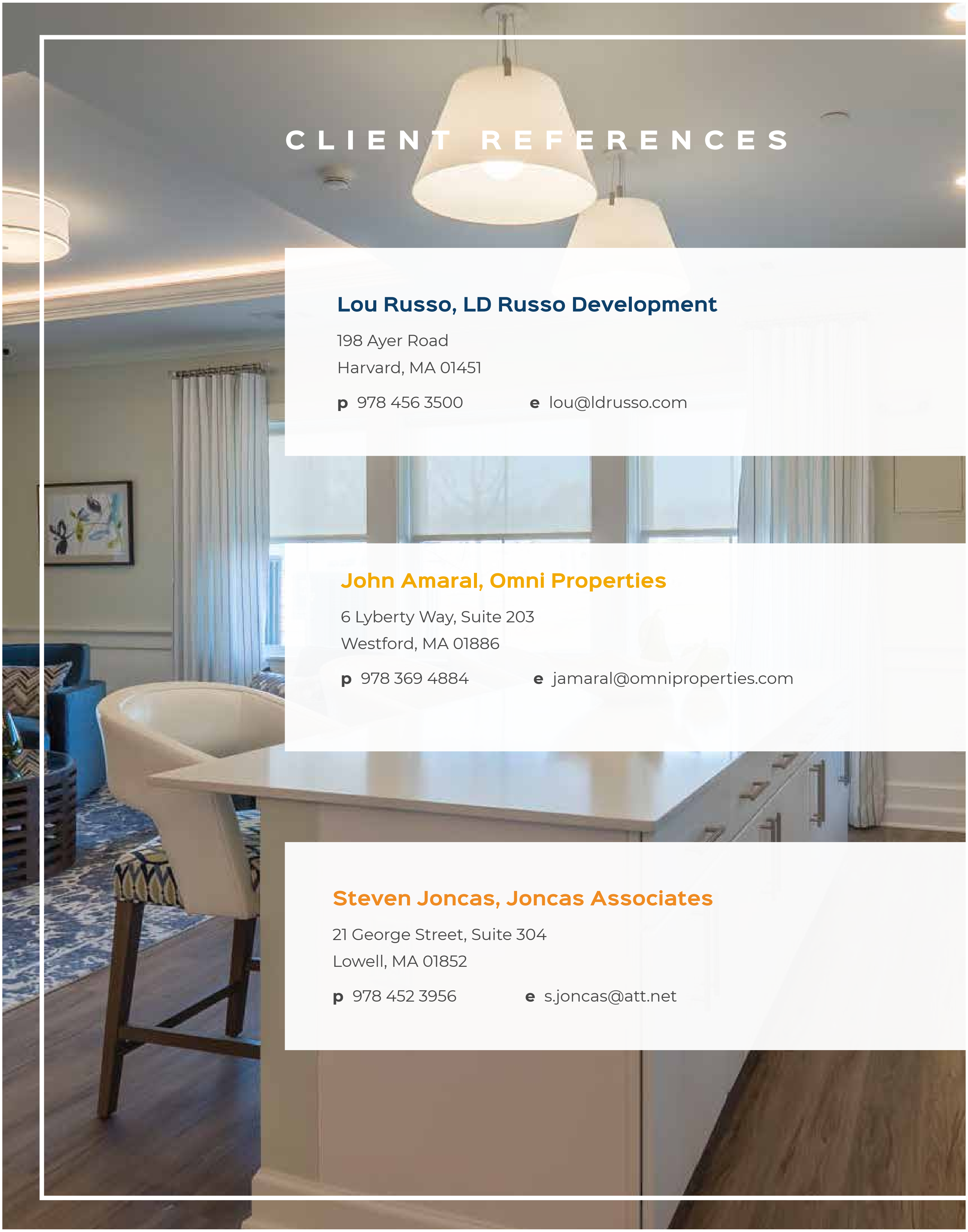
“As developers, we rely on thoughtful design and accurate construction documents. For over 20 years, Maugel DeStefano has consistently provided both. While their design skills are exceptional, their real value to us is their knowledge of how to design great looking buildings while respecting our budgetary constraints. Maugel DeStefano's thoroughness, accuracy, and attention to detail has saved us significant constructions costs.”

Lou Russo, President, LD Russo Development

Fidelity Bank

“We strive to operate as a 120 year old “start up” company, attempting to strike a balance between old-fashioned customer service and cutting edge technology. Maugel DeStefano was instrumental in designing a corporate center that reflected this philosophy to our clients and the communities we serve, while providing Class A office space to our employees.”

Ed Manzi, President, Fidelity Bank



CLIENT REFERENCES

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Westford, MA 01886

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Lowell, MA 01852

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ALLEN & MAJOR ASSOCIATES, INC.

Summary of Qualifications

allenmajor.com

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FIRM QUALIFICATIONS

About Us

The team of Allen & Major Associates, Inc. (A&M) is a multi-disciplinary consulting firm dedicated to the practices of civil engineering, environmental consulting, land survey, and landscape architecture. Our work is an integral part of site development and we use our skills to optimize performance, site functionality, and land value. With offices in Woburn MA, Lakeville MA, and Manchester NH, we provide services throughout the Northeast corridor.

Land use planning and development is complicated. It takes experience to be able to master the nuances of the process. It also takes foresight to responsibly develop a site. Our goal with every project is to blend the built environment with the natural environment it surrounds. By utilizing the features that make a site unique, rather than altering them, we produce responsible, appealing designs that meet the needs of the communities we serve. We believe this approach also makes the development process less encumbered.

We work collaboratively with other members of the project design team including, architects, construction management firms, land use attorneys, and local/State/Federal regulators to recognize your vision. Our work informs theirs.

We have a staff of 35+ professionals in conceptual & master planning, site design, environmental permitting, stormwater, and landscape architecture. Our portfolio of projects represents the following markets:

- **Academic & Student Housing**
- **Commercial & Industrial**
- **Healthcare**
- **Hospitality & Entertainment**
- **Master Planning & Landscape Architecture**
- **Multi-Family Residential**
- **Public, Municipal & Government**
- **Retail & Mixed-Use**
- **Senior Housing & Assisted Living**
- **Sports & Recreation**

Civil Engineering

Civil site engineering is a dynamic approach to problem-solving. The A&M civil team is comprised of Professional Engineers (PE), Engineers in Training (EIT), and support staff. They have a broad perspective of project development based on their years of experience and training and can provide insight as to what IS or ISN'T necessary to drive a project to completion. They utilize state-of-the-art means and methods to lower project costs, eliminate schedule delays, and anticipate site opportunities and constraints.

We provide planning, design, preservation, and rehabilitation of the natural and built environments within urban and rural settings for both public and private sector clients.

Our services include:

- **Construction Consultation**
- **Due Diligence & Feasibility Studies**
- **Federal, State & Local Permitting**
- **Grading & Drainage Design**
- **Master Planning**
- **Peer Review Services**
- **Parking & Roadway Design**
- **Septic Design**
- **Site Development & Re-Development**
- **Soil Evaluations**
- **Utility Design Services**
- **Wetland Resources**

We are proud members of the U.S. Green Building Council and support sustainable construction, Best Management Practices, and renovation initiatives.

Environmental Consulting

Environmental permitting approvals are the bottom line to moving a development project forward. A thorough and complete understanding of the ever-changing regulations and requirements is the most valuable tool for a successful project. A&M applies our multi-disciplinary team approach to the design of a project while stressing the avoidance and minimization of adverse impacts on the environment. This approach has allowed us to establish and maintain excellent working relationships with resource and permitting agencies, while also saving our clients critical time and money.

Our Environmental Consulting Services include:

- **Chapter 91 Applications**
- **Massachusetts Endangered Species Act (MESA)**
- **Massachusetts Environmental Policy Act (MEPA)**
- **New Hampshire Natural Heritage & Endangered Species (NHESP) Review**
- **National Pollutant Discharge Elimination Systems (NPDES)**
- **Stormwater Pollution Prevention Plans (SWPPP)**
- **Wetland Replication Design**
- **Wetland Delineation**

Land Surveying

Our Land Surveying Division offers comprehensive land surveying services to meet the needs of our various clients. Division staff includes Professional Land Surveyors licensed in Connecticut, Massachusetts, New Hampshire, and Rhode Island. Our field crews are supported by in-house project managers who provide quality control and oversee drafting. Our field crews utilize state of the art technology including Carlson SurvCE, Leica GPS and Robotic Total stations.

Our staff has vast Civil 3D training and adheres strict AutoCAD standards. This ensures a consistent quality product between our thee office locations. Quality AutoCAD base plans can ensure a seamless workflow throughout the duration of your project.

A&M is a pre-qualified vendor through the Operational Services Division under PRF-69, as well as MassDOT. Our team can quickly and efficiently provide the following services to meet various project needs:

- ALTA/NSPS Land Title Surveys
- As-Built Surveys
- AutoCAD Services
- Construction Layout
- Existing Conditions & Topographic Surveys
- FEMA Flood Certification
- Interior Building Survey for Fit-up or Expansion
- Property Line Surveys
- Roadway & Right-of-Way Surveys
- Site Planning
- Subdivision & Condominium Surveys
- Utility Location Surveys & Layout
- Zoning Board & Variance Support

Landscape Architecture

The physical landscape around us influences our sense of place, our feelings of wellbeing and inspires us. By integrating the power of the aesthetic with our civil engineering sensibilities, we can shape and reshape the physical environment to meet the ever-changing needs of the communities in which we live.

Landscape architecture encompasses all elements of the design, restoration, and preservation of outdoor spaces. While many projects that we undertake are strictly about landscape design, A&M's landscape architecture team applies its artistic and technical design standards to enhance almost all of the designs that we produce. Through our team approach, all of our projects are not only technically sound but aesthetically beautiful.

We offer the following landscape architectural services:

- **Urban, Rural, or Neighborhood Planning**
- **Accessible Design**
- **Healing Gardens**
- **Multi-Modal Transportation**
- **Native Plantings & Pollinator Development**
- **Pedestrian Connectivity**
- **Rain Gardens & Bioretention**
- **Streetscape Design**
- **Residential Landscape Design**
- **Wetland Replication & Mitigation**

Why A&M?

The success of your project is just as important to US as it is to YOU. We take ownership for the work that we do and want the best outcome for every project. There are hundreds of companies to choose from but finding a team that is available, responsive, provides solid work and you can build a long-term relationship with is hard to find.

Here's why we think you should consider A&M.

We Plan for You:

Before an Architect can put pen to paper, before a shovel goes in the ground, critical decisions need to be made that can determine your project's success or failure. We provide you with clear, concise, and relevant information that will determine opportunities and constraints. From existing conditions to zoning, to building and roadway placement, our work can inform your build program, and your budget.

We Design for Your Needs:

Engineering design is a dynamic approach to problem-solving. No two sites are alike, and no one design approach works for every site. We provide options and experienced solutions so you can get your projects permitted and shovels in the ground as quickly and efficiently as possible.

We Innovate for All:

By utilizing new, and re-imagining existing technologies, we can improve sustainability and reduce environmental impacts. We don't just innovate for the sake of innovation, we do it to solve your problems, and honor our commitment to design projects that are purpose-driven, and responsible.

REPRESENTATIVE PROJECTS

PROJECT STATS

CVS Caremark Corporation

Corporate Campus

250 Acres

Completed in 2017

CVS Corporate Campus

Woonsocket, Rhode Island

In partnership with CVS Caremark Corporation, Allen & Major Associates, Inc. (A&M) provided land surveying, civil engineering, landscape architecture, and structural engineering services for the 250-acre corporate campus, spanning the Town of Cumberland and City of Woonsocket in Rhode Island.

- Six separate sites were engineered, including three new buildings and three building additions.
- The two largest sites within the campus are the Retail Pharmacy Customer Care Center and the Customer Support Center.
    - The Retail Pharmacy Customer Care Center is situated on 12-acres and was designed to meet LEED Silver Certification. The site accommodates a 165,000 SF building and a 427 vehicle parking garage.
    - The Customer Support Center, which is adjacent to the main CVS Corporate Headquarters building, houses a 292,000 SF corporate operations space with a 3-level, open air parking garage adjoining the Customer Care Building with vehicular entrance at three different levels of the site.
    - A&M worked closely with the design team to meet the extremely tight completion deadlines for each of these sites. Consistent communication with the development team allowed A&M to provide construction administration for these two sites despite the challenge of an ever evolving and expanding design.

Project Profile

PROJECT STATS

W/S Development

Mixed-Use
Retail Development

47 Acres

Completed in 2013

Legacy Place

Dedham, Massachusetts

Allen & Major Associates, Inc. (A&M), in partnership with W/S Development, provided land surveying, civil and structural engineering, environmental consulting, and landscape architectural services for Legacy Place, an 47-acre open-air lifestyle retail shopping center in Dedham, Massachusetts.

- Upon completion Legacy Place is one of the largest mixed-use developments in the Northeast.
- Low-impact design components include rainwater capture, bio-retention areas, and wetland restoration to include LEED components and sustainable design.
- Design features also include the restructuring and realignment of Enterprise Drive & Commercial Circle, including the reconstruction of all drainage systems.
- An elevated parking deck was designed that accommodates 2,928 parking spaces within the project site.
- Landscape design features include cafe seating areas and benches throughout the site, ADA access ramps with tactile warning systems, individual planters for seasonal interest year round along the walk ways, and brick paver pads enclosed with granite edging.

Winner of ICSC's 2010 Gold Medal for Most Innovative Design & Development of a New Mixed-Use Retail Project in the United States

Project Profile

PROJECT STATS

MGM Resorts Int'l.

Mixed-Use
Gaming Resort

14.5 Acres
3 City Blocks

Completed in 2018

MGM Springfield

Springfield, Massachusetts

Allen & Major Associates, Inc. (A&M), in partnership with MGM Resorts International, provided land surveying, master planning, civil and structural engineering, and landscape/hardscape design services for MGM Springfield located in Springfield, Massachusetts

- Land surveying services include boundary surveys, easement plans, roadway takings, and construction layout/monitoring, as well as extensive MassDOT rotary and roadway surveys.
- Stormwater management design included deep sump hooded catch basins, a stormwater infiltration system, multiple hydrodynamic separators, a 70,000 gallon detention tank, and a 20,000 gallon stormwater capture cistern for irrigation.
- Improvements within Union Street, State Street, Howard Street, MGM Way, Bliss Street, and East Columbus Street involved the rehabilitation and reconstruction of over 5,500 LF of new and existing sewer and water lines, gas and electrical service, and telecommunication services.
- To round of the project, streetscape improvements included the design for nearly 5,000 LF of sidewalks.

US Green Building Council LEED Platinum Certification for a Gaming Resort

2019 American Council of Engineering Companies of Massachusetts Gold Award Winner for Outstanding Professional Design Excellence

Project Profile

PROJECT STATS

Wood Partners

Multi-Family Residential

261 Units/SF

Completed in 2020

ALTA Clara at the Fells

Stoneham, MA

Allen & Major Associates, Inc. provided land survey, civil engineering and landscape architecture design and construction support for this multi-family development located adjacent to the Middlesex Fells Reservation. The project included the following:

- Three (3) buildings, 261 total units, a club house, and 6 garages.
- All runoff from the site is captured and treated by structural Best Management Practices (BMPs) including two (2) underground infiltration systems with a combined storage capacity of 63k c.f.
- Permitting began back in 2010 but did not move forward until 2016. The project was sold and value engineered over the following 2 years until a shovel was finally put in the ground around May of 2018 and completed in the fall of 2020.
- Landscape elements included:
  - » Zero entrance pool, with associated cabana outbuilding featuring gas grills, outdoor kitchen area & restrooms
  - » Extensive hardscape including undulating stacked stone walls, stamped and stained concrete, and pavers for visual texture
  - » Firepit lounge area for extending the seasons
  - » Full variety of site furnishings
  - » Dog park area for pet friendly community
  - » Extensive plantings including trees, evergreens, and native perennials, raised planters, and earthen berms for noise reduction
  - » Walking paths including connection to hiking trails in the Middlesex Fells Reservation

Project Profile

PROJECT STATS

Sam Park & Company

Mixed-Use
Retail & Hospitality

500,000 SF on 90 Acres

Completed in 2018

The Point

Littleton, Massachusetts

Allen & Major Associates, Inc. (A&M) provided engineering design, permitting, and landscape architecture for this 500,000 SF mixed-use development located in Littleton, Massachusetts.

- The project showcases a dynamic mix of office, retail, restaurants, hotel, and entertainment, on a parcel area of just over 90 acres, sitting atop a hillside adjacent to Interstate 495 off of Route 119.
    - Its unique position along the I-495 corridor is anticipated to attract shoppers from all directions where closer alternatives of this size and kind do not exist.
- The project features a "stacked" retail concept allowing the development to sit seamlessly within the hill and natural grades that surround it.
- Using urban design principals, the design features a mix of amenities that draw consumers to places to connect and socialize.
- Despite its great size, The Point showcases the ability of a large scale development to occur adjacent to priority environmental resource areas without risk of degradation.
    - The development is sensitive to copious wetlands and waterways that exist on the property, which required coordination with the Littleton Conservation Commission.

2017 American Council of Engineering Companies of Massachusetts Bronze Award Winner for Outstanding Professional Design Excellence

Project Profile

PROJECT STATS

ProCon, Inc.

Assisted Living Facility

160 Units

Completed in 2016

Brightview Canton

Canton, Massachusetts

In partnership with ProCon, Inc., Allen & Major Associates, Inc. (A&M) provided land surveying, civil engineering, and permitting services for this 3-story assisted living facility, featuring 160-units of independent living, assisted living, and memory and Alzheimer's care apartment homes.

- The community is situated 15 miles from Boston and lies at the foot of Great Blue Hill Preservation.
- Located on a former sand and gravel pit, the project required thoughtful approach to engineering and a forward thinking development team to turn a mostly barren and impervious site into an environmentally responsible and modern development.
- Innovative solutions included bioretention swales around the entire developed area to capture, treat, and recharge stormwater runoff, and planting low-nutrient, grassland in order to provide habitat.
- A quarter mile walking loop was designed within the grasslands as an amenity to allow residents an enjoyable space and a vibrant much needed ecological space.
- 13-acres of open space and parkland contiguous to the site of Brightview Canton were donated to the Town of Canton for the use and enjoyment of the community.

2017 American Council of Engineering Companies of Massachusetts Bronze Award Winner for Outstanding Professional Design Excellence

Project Profile

PROJECT STATS

Orion UNH, LLC

Off-Campus Student Housing

179 Beds in 52 Apartments
8,800 SF of Retail Space

Completed in 2016

University Edge Apartments

Durham, New Hampshire

Allen & Major Associates, Inc. provided land survey, civil and structural engineering, and landscape architectural services for the design and permitting for this redevelopment project, providing much needed housing for students attending the University of New Hampshire.

- The goal was to provide enough units to make the project economically viable, while the development team needed to meet the challenges of designing a redevelopment project within a highly dense and historically significant area.
    - This encouraged the development team to incorporate Smart Growth Solutions not normally seen in a traditional residential development project.
- Walkability was the primary focus of the project and includes many attributes of a walkable community, including a mix of uses, street connections, and pedestrian links.
- The design and placement of the buildings allows for density as well as easy accessibility to any destination within town.
- Additional design considerations included covered bike storage areas and bike racks and widening the existing sidewalk along the entire frontage of Main Street to 8-feet, making room for multiple pedestrians.
- Best Management Practices utilized include rain gardens, roof drains, and porous pavers to infiltrate all of the on-site stormwater.

Winner of the 2016 Plan NH Merit Award

Project Profile

PROJECT STATS

Winchester Hospital

Not-for-Profit Hospital

11 Acre Site Bound by the Aberjona River

Completed in 2015

Winchester Hospital

Winchester, Massachusetts

Allen & Major Associates, Inc. provided land surveying, civil and structural engineering, and landscape architecture services for the improvements to Winchester Hospital in Winchester, Massachusetts.

- Phase 1, the Center for Cancer Care, involved demolishing an abandoned industrial building that was attached to the historic portion of the Winn Watch Factory building. The remaining building façade was restored and the interior was renovated and incorporated as a wing to the new 44,247 SF Main Center. The Center was designed according to LEED for Healthcare and was awarded LEED Gold Certification upon completion
- Phase 2, the Ambulatory Surgery Center, was considered the most challenging for the development team, with the parcel bisected by three active, large diameter sewer trunk-lines, A&M worked closely with the MWRA to avoid impacts to the trunk-lines and made provisions to the design for the maintenance needs of these utilities which includes a deep foundation wall that was engineered by A&M's Structural Division
- Phase 3, the Healing Garden, was created to incorporate the use of sensory stimuli with a four season approach for visual interest year round. The garden design includes granite boulders made into a water feature, large granite piers, teak trellises, granite benches, and a labyrinth style seating area. The garden has been received as one of the most valued portions of the new Center.

2014 American Council of Engineering Companies of Massachusetts Bronze Award Winner for Outstanding Professional Design Excellence

COMPANY BIOS

ALLEN & MAJOR
ASSOCIATES, INC.

100 Commerce Way, Suite 5
Woburn, MA 01801

(781) 935-6889 Ext. 9448

(781) 589-0363

twilliams@allenmajor.com

EXPERIENCE

A&M - 17 Years
Overall - 32 Years

EDUCATION

1993, B.S., Civil Engineering, Central Connectict State University

REGISTRATIONS

Professional Engineer —
CT (PEN.0021386)
ME (PE14158)
MA (43119)
NH (12916)

allenmajor.com

Timothy J. Williams, PE

Principal

Team Role: Principal-in-Charge

Tim Williams serves as a Principal at Allen & Major Associates, Inc. With over 30 years of experience, his extensive background includes planning, design, permitting, and construction document preparation for numerous public and private sector projects. His background also includes specification writing, quantity cost estimation, field studies and investigations, and analysis, as well as construction oversight services. Recognized for his expertise and ability, Tim has managed the design efforts for some of the largest and most significant projects within the firm's history. Throughout the duration of each project, Tim will be responsible for the overall delivery of professional service provided by Allen & Major Associates, Inc. He will provide support to the A&M team, oversee quality control on all deliverables to the development team, and will represent the project team at any meetings as requested.

PROJECT EXPERIENCE

Residential

- Harvard Mills - Wakefield, MA
- 120 Commerce Way - Woburn, MA
- Residences on the Charles - Watertown, MA

Commercial/Industrial

- The Center at Lennox - Lenox, MA
- Legacy Place - Dedham, MA
- Woburn Foreign Motors - Woburn, MA
- Langwood Commons - Stoneham, MA
- Amazon Sorting Facility - Northborough, MA

Healthcare

- Lahey Hospital & Medical Center - Burlington, MA
- Anna Jacques Hospital - Newburyport, MA

Public/Municipal

- Boston Planning & Development Agency
- Cambridge Housing Authority
- Department of Conservation & Recreation
- Department of Housing & Community Development

Specialty

- Logan ConRAC - Boston, MA
- MGM Springfield - Springfield, MA

400 Harvey Road, Suite D
Manchester, NH 03103

(603) 627-5500 Ext. 9404

(781) 953-8559

rclarke@allenmajor.com

EXPERIENCE

A&M - 17 Years
Overall - 30 Years

EDUCATION

1993, B.S., Landscape Architecture, University of Massachusetts, Amherst

REGISTRATIONS

Professional Landscape Architect —

- ME (LAR4194)
- MA (1355)
- NH (030)
- RI (LA.0000444)

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ALLEN & MAJOR ASSOCIATES, INC.

Robert P. Clarke, PLA, ASLA

Co-Owner and Principal

Team Role: Principal-in-Charge

Robert Clarke serves as the Principal-in-Charge at Allen & Major Associates, Inc. Bob's approach to site development is differentiating. As a landscape architect, his approach to a project always starts with the aspiration to preserve and rehabilitate the natural environment while demonstrating his commitment to create exceptional and enduring spaces. As a civil engineer, his ability to see creative solutions to site constraints, work within limited budgets and time sensitive deadlines, and navigate the complex state and local permitting process minimizes the pressure that is part of the decision making process for the client. Combined both approaches allow for exploration of design solutions that can advance projects beyond the typical or expected.

PROJECT EXPERIENCE

Residential

- Saugus Ridge - Saugus, MA
- Tidewater at Salisbury - Salisbury, MA
- Elan Union Market - Watertown, MA
- University Edge - Durham, NH

Commercial

- CVS Corporate Headquarters - Cumberland/Woonsocket, RI
- 3-5 Centennial Drive - Peabody, MA
- Walmart Supercenter - Saugus, MA

Institutional

- The Residences at Silver Square - Dover, NH
- Southern New Hampshire Medical Center - Various Locations
- Winchester Hospital Healing Garden - Winchester, MA

Hospitality

- AC Marriott - Worcester, MA
- Giorgio's Ristorante - Manchester, NH
- Domino's & Starbucks Franchise Stores - Various Locations

Specialty

- Indian Ridge Country Club - Andover, MA
- Sports Complexes - Middleton,Worcester, MA
- Storage Barn - Hillsborough, NH

10 Main Street
Lakeville, MA 02347

(508) 923-1010 Ext. 9473

(508) 509-5222

pcordeiro@allenmajor.com

EXPERIENCE

A&M - 21 Years
Overall - 21 Years

EDUCATION

2000, B.S., Civil Engineering, University of Massachusetts, Dartmouth

REGISTRATIONS

Professional Engineer —
CT (PEN.0026532)
MA (47083)
PA (PE083852)
RI (PE.0008972)

Certifications —
MA Soil Evaluator (SE2786)
MA Title 5 System Inspector (SI4419)

allenmajor.com

ALLEN & MAJOR ASSOCIATES, INC.

Philip L. Cordeiro, PE

Lakeville Branch Manager

Team Role: Branch Manager

Philip (Phil) Cordeiro serves as a Senior Civil Project Manager at Allen & Major Associates, Inc. He has a wide range of project experience in municipal, residential, corporate, industrial, and retail development. Phil's diverse background in civil engineering includes site engineering, drainage design, hydrology and hydraulic analysis, water resources, stormwater and sewer design. This provides a full range of civil engineering knowledge and expertise within the design process. Phil has indispensable hands on field experience, having managed construction administration tasks for many projects to date and because of this is able to anticipate and work through site challenges.

PROJECT EXPERIENCE

Residential

- Arbella at Ashland – Ashland, MA
- Oasis at Plymouth – Plymouth, MA
- ALTA Nashoba – Bolton, MA
- ALTA Abington Station – Abington, MA
- Rochester Crossroads – Rochester, MA

Commercial/Mixed-Use

- BJ's Regional Distribution Center - Uxbridge, MA
- Amazon Distribution Center - Middleborough, MA
- The Point - Littleton, MA

Senior Living/Healthcare

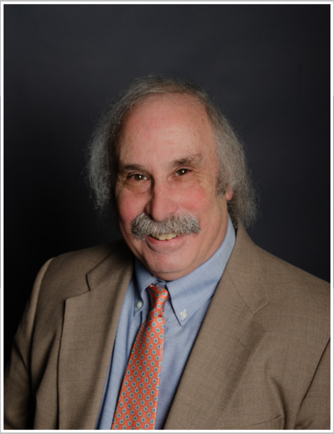
- Oak Hill Community - Attleboro, MA
- All American Assisted Living - Wareham, MA
- Oak Point - Middleborough, MA

Public/Municipal

- City of Boston Public Facilities - House Doctor Program
- Peer Review Services - East & West Bridgewater, MA
- Peer Review Services - Tyngsborough, MA

Sports & Recreation

- Peterson Pool - Braintree, MA
- Thayer Sports Center -Braintree, MA
- Boston Sports Institute - Wellesley, MA



100 Commerce Way
Woburn, MA 01801

(781) 935-6889 Ext. 9416

(781) 640-0207

nlipsitz@allenmajor.com

EXPERIENCE

A&M - 4 Years
Overall - 48 Years

EDUCATION

1973, A.S. Civil Engineering, Wentworth Institute of Technology

REGISTRATIONS

Professional Land Surveyor —
CT (LSX.0014660)
MA (28446)
RI (LS.0001772)

allenmajor.com

Norman I. Lipsitz, PLS

Survey Department Manager

Team Role: Survey Dept. Manager

Norm Lipsitz serves as the Survey Department Manager at Allen & Major Associates, Inc. He oversees the day to day operations, ensuring the completeness of all plans and documentation issued by the department. Norm manages project staffing, as well as the overall project deliverables and budget control. Within each project that he undertakes, Norm will interpret the field and office data collected to ensure accuracy, prepare any necessary reports, legal descriptions, and plans, and attend any meetings with the Client's team as requested. Norm has provided numerous land survey services to various public and private agencies within the New England area throughout his career, which has included property line surveys, agricultural restriction plans, roadway surveys, existing conditions and topographic surveys, and easement plans to meet the various needs of each project.

PROJECT EXPERIENCE

Residential

- Saugus Ridge - Saugus, MA
- Alpine Village - Billerica, MA
- Elan Union Market - Watertown, MA
- Jefferson Park - Cambridge, MA
- Noquochoke Village - Westport, MA

Commercial

- Cambridge Center - Kendall Square, Cambridge, MA
- Gloucester Crossing - Gloucester, MA
- Woburn Landing - Woburn, MA

Recreation

- Thayer Academy South Athletic Complex - Braintree, MA
- Wellesley Sports Center - Wellesley, MA
- Worcester Ice Center - Worcester, MA

Public/Municipal

- Boston Planning & Development Agency
- Department of Fisheries and Wildlife
- Department of Housing & Community Development
- Massachusetts Department of Transportation

Specialty

- Lahey Hospital & Helideck - Burlington, MA
- MGM Springfield - Springfield, MA

ALLEN & MAJOR
ASSOCIATES, INC.

James P. Smith, LLS

Land Survey Department Head NH

400 Harvey Road, Suite D
Manchester, NH 03103

(603) 627-5500 Ext. 9409

(339) 999-1236

jsmith@allenmajor.com

EXPERIENCE

A&M - 6 Years
Overall - 35 Years

EDUCATION

1993, A.S., Civil Technology, Northern Essex Community College

REGISTRATIONS

Licensed Land Surveyor —
NH (908)

Certifications—
NH DOT LPA Certification (1831)
NH Subsurface Designer (1533)
Presby Environmental (6040)

allenmajor.com

Team Role: Land Surveyor of Record

James Smith serves as the Department Head of the New Hampshire Land Survey Division. Jim oversees the field personnel and serves as the Surveyor of Record on his projects. He has 35 years of experience in both residential and commercial land surveys. His background is diverse and includes scope such as boundary control, septic design, easements, roadway, and right-of-way surveys. Jim specializes in performing ancient deeds and historical research, a challenging process that takes years of experience and is in fact, not a survey but a study to determine important facts about modern land boundaries that can be found in old deeds. With each project that he undertakes, Jim interprets the field and office data collected to ensure accuracy, prepares any necessary reports, writes legal descriptions, and attends meetings with the Client and/or development team as needed. Jim is a member of the New Hampshire Land Surveyors Association and Massachusetts Association of Land Surveyors and Civil Engineers.

PROJECT EXPERIENCE

Residential

- 158-159 Temple Street - Nashua NH
- University Edge Apartments - Durham, NH
- John M. Kelleher Park - Newburyport, MA
- ALTA Clara at the Fells - Stoneham, MA

Commercial/Mixed-Use

- Infiniti of Nashua - Nashua, NH
- Old Navy - Nashua, NH
- Pelham Plaza - Pelham, NH
- Plaistow Center - Plaistow, NH
- Prime Subaru of Manchester - Manchester, NH
- Silver Square - Dover, NH

Public/Municipal

- Compressed Natural Gas Distribution Center, Liberty Utilities - Concord, NH
- Power Line & Sub-Station Field Survey, Unitil - Plaistow, NH
- City of Rochester NH - 10 North Main Street

Specialty

- USDA Natural Resource Conservation Service Easement Program Survey - Temple, NH
- Franklin Falls Dam Wall Survey - Franklin, NH

Carlton M. Quinn, PE

Senior Project Manager

100 Commerce Way, Suite 5
Woburn, MA 01801

(781) 935-6889 Ext. 9431

(781) 640-7856

cquinn@allenmajor.com

EXPERIENCE

A&M - 18 Years
Overall - 18 Years

EDUCATION

2003, B.S., Civil Engineering, University of Massachusetts, Lowell

REGISTRATIONS

Professional Engineer —
MA (49923)

Certifications —
MA Soil Evaluator (SE13936)

allenmajor.com

Team Role: Project Manager

Carlton Quinn serves as a Senior Project Manager within the Civil Engineering Division at Allen & Major Associates, Inc. Carlton has extensive experience managing complex projects from concept through construction completion. A seasoned professional, he strives to provide sustainable, cost-effective, and time sensitive solutions. Carlton's expertise in drainage design and analysis, land use regulations, and site design allows him to anticipate challenges early in the design process and provide valuable insight to clients, keeping projects running smoothly while meeting client's time-lines, budgets, and expectations. Carlton also has a proven track record of facilitating effective communication between clients, consultants, contractors, and municipal agencies, allowing for efficient, high-quality resolutions to design process challenges and ensuring client satisfaction.

PROJECT EXPERIENCE

Residential

- ALTA at Rivers Edge - Wayland, MA
- Broadstone 305 - Waltham, MA
- 25 River Street - Winchester, MA
- 555 Metropolitan Ave - Hyde Park, MA

Commercial/Mixed Use

- 68 Middlesex Turnpike - Burlington, MA
- 150 Hayes Memorial Drive - Marlborough, MA
- North Shore Crossing - Beverly, MA
- Woburn Foreign Motors - Woburn, MA

Corporate/Life Sciences

- 10 Maguire Road - Lexington, MA
- MITRE Corporate Campus - Bedford, MA
- Summit Office Park - Burlington, MA

Assisted Living/Healthcare

- Brightview Billerica & Canton- Billerica & Canton, MA
- ConvenientMD - Burlington & Framingham, MA

Specialty

- Soka Gakkai International Cultural Center - Brookline, MA
- St. Mary's High School - Lynn, MA
- Cornerstone Church - Manchester by the Sea, MA

ALLEN & MAJOR ASSOCIATES, INC.

Brian D. Jones, PE

Senior Project Manager

400 Harvey Road, Suite D
Manchester, NH 03103

(603) 627-5500 Ext. 9405

(781) 929-7554

bjones@allenmajor.com

EXPERIENCE

A&M - 17 Years
Overall - 22 Years

EDUCATION

1999, B.S., Civil Engineering, University of Massachusetts, Lowell

REGISTRATIONS

Professional Engineer —
- MA (49212)
- NH (13809)
- RI (0011089)

MA Soil Evaluator (SE2731)

allenmajor.com

Team Role: Project Manager

Brian Jones serves as a Senior Project Manager within the Civil Division at Allen & Major Associates, Inc. Brian's experience is focused in the areas of civil design, environmental permitting, sustainable practices, and construction observation. His extensive knowledge of civil engineering design principles, federal, state, and local land use regulations, computer engineering applications, and field experience provides him with a solid foundation for effective design solutions. Brian's design approach is tailored to each sites unique constraints, resulting in an efficient yet appealing design. Brian's goal for each project he undertakes is to design the built environment so as to not be viewed as an engineered product.

PROJECT EXPERIENCE

Residential
- Saugus Ridge - Saugus, MA
- Hathon - Medway, MA
- The Washingtons - Melrose, MA
- The Sto (Formerly Taj Estates) - Stoughton, MA

Commercial
- NH Liquor & Wine Outlet - Tilton & Littleton NH
- Infiniti of Nashua - Nashua, NH
- Northern Bank & Trust Corporate Headquarters - Woburn, MA
- Pelham Plaza - Pelham, NH

Senior Living/Healthcare
- Benchmark Senior Living at Woburn - Woburn, MA
- ConvenientMD - Belmont, NH
- Lahey Health IT Building - Woburn, MA
- MedExpress - Various Locations
- Southern New Hampshire Health Systems - Various Locations
- Winchester Hospital - Winchester, MA

Public/Municipal
- Newburyport Intermodal Transit Facility - Newburyport, MA
- Walnut Hill Parking Garage - Woburn, MA

Specialty
- BAE Systems MER23 Expansion - Merrimack, NH
- Wiggins Airways Hanger - Manchester, NH

Recreational:
- Dave & Buster's Entertainment Complex - Woburn, MA
- Worcester Ice Center - Worcester, MA
- West Suburban YMCA Camp Chickami - Wayland, MA

ALLEN & MAJOR
ASSOCIATES, INC.

Michael A. Malynowski, PE

Senior Project Manager

400 Harvey Road, Suite D
Manchester, NH 03103

(603) 627-5500 Ext. 9411

(781) 640-7650

mmalynowski@allenmajor.com

EXPERIENCE

A&M - 9 Years
Overall - 25 Years

EDUCATION

1996, B.S., Civil Engineering Technology, Wentworth Institute of Technology

REGISTRATIONS

Professional Engineer —

ME (PE11522)
MA (47269)
NH (12205)

Certifications —

NHDES Subsurface Septic Designer/Installer (1739)

allenmajor.com

Team Role: Project Manager

Michael Malynowski serves as a Senior Project Manager at Allen & Major Associates, Inc. Michael's experience spans a variety of site and building projects for public and private sector clients. As a Project Manager, Michael provides technical oversight and coordination of project engineering. He strives to give his clients the personal service and quality that they expect from each project that he undertakes. Michael brings first-hand experience in site design, including utilities, zoning, parking, ADA accessibility, and storm water management. He is directly involved in bringing projects through local and state permitting agencies with a demonstrated ability to work through site challenges and design constraints. Relationship building and collaboration with team members and municipalities at all levels illustrates his ability to manage projects through successful completion.

PROJECT EXPERIENCE

Residential

- 90 Antwerp Street - Brighton, MA
- Melnea Residence - Roxbury, MA
- Oriole Landing - Lincoln, MA

Commercial

- Cooks Corner - Brunswick, ME
- Freudenburg-NOK - Londonderry, NH
- Plaistow Center - Plaistow, NH
- Silver Square - Dover, NH

Hospitality

- Fairfield Inn & Suites - Cambridge, MA
- Hilton Homewood Suites - Chelsea, MA
- Hampton Inn & Suites - Worcester, MA
- Holiday Inn Express & Residence Inn - Chelsea, MA
- Residence Inn by Marriott - Roxbury, MA
- Town Place Suites by Marriott - Chelsea, MA

Public/Municipal

- Montachusett Regional Transit Authority - Fitchburg, MA
- NH Dept. of Environmental Services Facility - Concord, NH

Specialty

- Ground Mount Solar Array - Chelmsford, MA
- Indian Ridge Country Club - Andover, MA

Paul G. Matos, PE, PLS

Project Manager

10 Main Street
Lakeville, MA 02347

(508) 923-1010 Ext. 9472

(781) 457-7987

pmatos@allenmajor.com

EXPERIENCE

A&M - 7 Years
Overall - 26 Years

EDUCATION

1996, B.S., Civil Engineering, University of Massachusetts, Dartmouth

2018, Professional Land Surveying Certificate Program, Wentworth Institute of Technology

REGISTRATIONS

Professional Engineer —
MA (52850)
NH (15103)
RI (PE.0011939)

Professional Land Surveyor
MA (55454)

Certifications —
MA Soil Evaluator (SE1511)
MA Title 5 System Inspector (SI3733)

allenmajor.com

Team Role: Project Manager

Paul Matos serves as a Project Manager within the Civil Engineering Division at Allen & Major Associates, Inc. Paul's extensive experience includes conducting zoning analysis and preparation of site development plans to include layout, erosion control, drainage, grading, and utilities. Paul's sustainable approach to drainage analysis, and the subsequent design of stormwater management systems, makes him a valuable member of the development team. Additionally, Paul provides construction administration services, which includes shop drawing approvals, pay requisitions, and preparation of responses to RFI's. Paul is responsible for preparing various reports, such as feasibility, drainage, impact statements, and SWPPP, applications, letters, construction documents, specifications, cost estimates, quantity takeoffs, and client proposals.

PROJECT EXPERIENCE

Residential

- Alta Union House - Framingham, MA
- Noquochoke Village - Westport, MA
- The Oasis at Plymouth - Plymouth, MA
- The Westerly at Village Forge - Franklin, MA

Commercial/Mixed-Use

- Fairfield Inn - Plymouth, MA
- Homewood Suites - Needham, MA
- Amazon - Middleborough, MA
- Southcoast Market Place - Fall River, MA
- The Chocolate Factory - Mansfield, MA

Senior Living/Healthcare

- All American Assisted Living - Wareham, MA

Public/Municipal

- Herring Cove Beach - Provincetown, MA
- Peer Reviewer - West Bridgewater and Tyngsborough, MA

Specialty

- BASF Facility - Plainville, MA
- Boston Scientific - Conventry, RI
- Thayer Sports Center - Braintree, MA
- Wellesley Sports Center - Wellesley, MA
- Vertex Pharmaceuticals - Providence, RI

ALLEN & MAJOR ASSOCIATES, INC.

STAY CONNECTED

Woburn, MA: (781) 935-6889

Lakeville, MA: (508) 923-1010

Manchester, NH: (603) 627-5500

Or email an inquiry to: info@allenmajor.com

allenmajor.com

Project Profile

PROJECT STATS

Sam Park & Company

Mixed-Use
Retail & Hospitality

500,000 SF on 90 Acres

Completed in 2018

The Point

Littleton, Massachusetts

Allen & Major Associates, Inc. (A&M) provided engineering design, permitting, and landscape architecture for this 500,000 SF mixed-use development located in Littleton, Massachusetts.

- The project showcases a dynamic mix of office, retail, restaurants, hotel, and entertainment, on a parcel area of just over 90 acres, sitting atop a hillside adjacent to Interstate 495 off of Route 119.
- Its unique position along the I-495 corridor is anticipated to attract shoppers from all directions where closer alternatives of this size and kind do not exist.
- The project features a "stacked" retail concept allowing the development to sit seamlessly within the hill and natural grades that surround it.
- Using urban design principals, the design features a mix of amenities that draw consumers to places to connect and socialize.
- Despite its great size, The Point showcases the ability of a large scale development to occur adjacent to priority environmental resource areas without risk of degradation.
- The development is sensitive to copious wetlands and waterways that exist on the property, which required coordination with the Littleton Conservation Commission.

2017 American Council of Engineering Companies of Massachusetts Bronze Award Winner for Outstanding Professional Design Excellence

Project Profile

PROJECT STATS

Northern Bank & Trust Company

Mixed-Use

50,000 SF

Completed in 2013

Northern Bank & Trust

Woburn, Massachusetts

Allen & Major Associates, Inc. provided land surveying, civil engineering, landscape architecture, and structural engineering services for the development of the Northern Bank & Trust Building, situated on Mishawum Road in Woburn, Massachusetts.

- The project consists of a 50,000 square foot, five-story building with surface and subsurface parking. Initial plans included a multi-unit residential development which did not move forward.
- A unique element to this project is that it is adjacent to I95/128 and an active MBTA commuter rail station. In order to complete the program, direct access via a ramp system to the MBTA commuter rail station was included as part of the final layout.
- The project was divided into four tasks, including rezoning, which created a Transportation Overlay District, subdivision of the site and design, permitting and construction administration.

Vanasse & Associates, Inc. (VAI) is a 20-person Traffic Engineering and Transportation Planning firm specializing in land development, transportation planning, traffic engineering and highway/roadway design. VAI is a privately held partnership headquartered in Andover, Massachusetts, and was founded in 1990 by Robert D. Vanasse, P.E., a leader in the transportation engineering field with over forty years of professional experience. The firm is owned and managed by Jeffrey S. Dirk, P.E., PTOE, and Stephen M. Boudreau, P.E., who have significant collective experience and depth of knowledge in the fields of Traffic Engineering, Transportation Planning and Roadway Design, and a proven record of successfully managing complex projects for private, municipal and institutional clients.

Setting an industry standard for service and technical excellence, VAI serves a broad spectrum of clients comprising private industry and public agencies. Privately sponsored projects range from transportation planning for land development projects, to environmental impact studies and state and local permitting for major commercial and residential developments and sporting and event facilities. Public sector efforts include professional review services for cities and towns; transportation impact assessments; parking studies; transportation master plans; roadway corridor studies; traffic signal system and roadway design; safety evaluations and studies; and evaluation of transportation plans for consistency with local zoning, state and community master plans and capital expenditure planning goals.

VAI provides a full complement of transportation planning and design services for public and private sector clients. These include traffic impact assessments; access planning; highway route location analyses; corridor, parking, and pedestrian studies; transportation modeling; roadway safety evaluations and traffic signal system and roadway design. On behalf of municipal clients, VAI has undertaken traffic impact assessments and peer reviews of privately proposed development projects such as major retail centers, residential and industrial developments and office parks. State transportation planning agencies have retained VAI to conduct area-wide land-use planning and zoning studies relating traffic use and impacts.

The breadth of VAI's professional engineering staff's expertise enables VAI to advance a project from the conceptual planning, environmental analysis, and community coordination phases, to project cost assessment, value engineering, detailed design and construction management. VAI is engaged in projects of varying size and complexity and is experienced in completing projects and professional review services requiring coordination with multiple parties and agencies within defined schedules. All services completed by VAI are performed under the direction of a Professional Engineer licensed in the applicable jurisdiction with demonstrated experience in the fields of Traffic Engineering and Transportation Planning.

Today's complex and challenging projects often require extensive interface between client, municipality, and state agencies. On behalf of its clients, VAI acts as liaison to agencies overseeing transportation and traffic issues, and helps navigate an increasingly complex network of local, state, and federal regulation. VAI's successful track record in working cooperatively with government agencies at all levels has helped clients realize significant savings in project time and effort.

Projects today also receive increasingly intense public scrutiny at the local level. VAI is noted not only for its fine technical work but also for effective communication with neighborhood interest groups and municipal review bodies. Through cogent oral presentation and comprehensible graphics, VAI is able to successfully convey a project's issues and solutions to lay people and experts alike.

PROJECT NARRATIVE

1. Economic Development

It is anticipated that the Town of Littleton will realize a favorable fiscal impact from the Project as a result of one-time Building Permit fees and future annual tax revenue increases (new structures and future meals tax). In addition, the project will support temporary construction jobs as well as a variety of permanent part-time and full-time employment opportunities.

2. Pedestrian Safety (including, but not limited to, accessibility and universal design)

The Project provides extensive pedestrian circulation paths which interconnect the buildings and parking lots as well as a sidewalk along the Great Road frontage which will extend access to adjacent properties.

3. Sustainability (including but not limited to, stormwater management, low-impact development, energy efficiency, photovoltaic (PV) devices, electrical vehicle charging).

The project proposes to redevelop an existing commercial corridor on Great Road. The existing site has little or no stormwater management BMP's. The proposed site has been designed to meet the MADEP Stormwater Standards greatly improving the quality of stormwater leaving the site and providing groundwater recharge greater than the required volume.

4. Site and landscape design (including but not limited to, open space gathering areas, native plantings, outdoor lighting control, noise mitigation)

Site landscape design for the plaza will include native plantings, open space gathering areas and native rain garden plantings. There will be patios for outdoor dining and a main gathering space with a pergola, benches and patio. Stone seat walls will complement the landscape at appropriate areas. There will be an evergreen buffer to screen the plaza from neighboring residential properties. This will include spruce, pine and balsam trees as well as a 6' tall privacy fence. A berm along Robinson Road with evergreens and the fence will provide noise mitigation. Lighting will be dark sky compliant. Pedestrian amenities such as benches and pedestrian level landscaping are provided along sidewalks. Evergreens will screen utility areas. Trees are spaced appropriately for shade in the parking lot areas. Street trees and simple planting with rows of grasses, shrubs and perennials are provided to complement the agrarian style and provide shade in and around the plaza.

5. Building Standards

Each of the proposed buildings in Northern Bank's Town Common project is unique. They are comprised of one or more primary massings, with a variety of accessory elements, such as porches, pergolas, framed storefronts, and porticos that are individual to each. All proposed buildings comply with the Village Common Building Standards relative to massing variation, number and height of stories, building height, building separation, and use and features. Four out of the five buildings comply with the fenestration requirements. Building B achieves marginally less than the 60% ground floor fenestration requirement because its stylistic approach was intended to represent an iconic large New England barn with regularly spaced, smaller openings.

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DESIGN GUIDELINES NARRATIVE

DESIGN GUIDELINES NARRATIVE
NORTHERN BANK TOWN CENTER

The project meets the intent of the guidelines in § 173-222 Design Guidelines of the Zoning Bylaws, as follows:

a. The assembly of primary massings and building components should differ for buildings on abutting lots, except in circumstances where lot width restricts the assembly options that are available.

Each building for Northern Bank's Town Common project has a unique character, which when placed together are complementary, welcoming, and comprising a cohesive overall mixed-use village campus.

Northern Bank's marquee branch (Building A) is designed to respect and enhance the existing context of the town's center and become a vital part of its Village Common character. Its primary form and materials evoke simple local building forms, interpreted through a modern design aesthetic. The bank's orientation takes advantage of the site's triangular geometry, pointing toward the town's green and adding a visually dynamic element to the Great Road corridor.

Building B is in the form of an iconic barn with an over-sized central glass feature on its primary Great Road face. The building's primary central mass is flanked by a dormered ell on the west and a large farmers porch on the east. Windows around the entire building are organized in a regular pattern, fitting for a New England barn.

Buildings C and D represent two distinct building components, each with stylistic differences, and connected by a floating, glass bridge. Building C, with its long face oriented to Great Road, is a conventional two-story building form with gabled pitched roofs. It is punctuated at the ground floor with oversized windows and boxed bays, and features open porches above. In contrast, Building D's narrow end faces Great Road, with a three-bay central entrance and pilasters. It has a four-bay second floor and is topped with a hipped roof and side dormers.

Building E represents the simplest and lowest building form on the campus. With materials and features similar to the other buildings, it is intentionally designed as a simplified one-story agrarian structure, with a large side entry porch and front glass feature.

b. Architectural design should not seek to exactly replicate the Town of Littleton's existing historic structures, but rather complement the Town's architectural character with contemporary design that references underlying patterns in window configuration, wall materials, and visually interesting architectural details such as siding, corner details, window and door surrounds, shutters, and awnings.

Individual components for all of the proposed buildings are designed to a human scale, using appropriate local materials to complement the vernacular of the town's residential and historic properties. The overall campus is designed with a New England agrarian sensibility. Buildings are finished with predominantly wood detailing, using multiple shapes and sizes of wood or composite lumber/trim (e.g. Hardie or Boral), with opportunities for small areas of masonry or stone as the design of each building is finalized. Roofing materials will be mostly architectural asphalt shingles or standing seam metal. Trim styles and patterns vary between buildings, as do window styles, doors, and individual building features. The overall Northern Bank Town Common is designed to respect, not replicate other properties in Littleton and surrounding communities.

c. The selection of materials, windows, doors, and ornamentation should result in a consistent and harmonious composition that appears as a unified whole rather than a collection of unrelated parts, whatever the architectural style.

Refer to sections above. See campus renderings.

d. The type and color of materials used for a building should be kept to a minimum, preferably three or less. Wall materials should have the appearance of natural materials such as wood or stone with a non-metallic finish and should be consistent on all exterior walls.

Building colors have not been finalized. Each is of Northern Bank's Town Common buildings will be primarily clad in composite wood or wood materials (e.g. Boral or Fiber-Cement products). The scale, orientation, and profiles of these products will vary building-to-building, giving an individual identity to each, while promoting overall consistency and compatibility.

e. Galleries and porches should be constructed out of light steel, wood, or other material(s) with the appearance of wood.

Galleries, porches, bays, and pergolas will be constructed in compliance. See campus renderings.

f. Landscape design in the frontage area should be coordinated with the abutting public sidewalk to provide additional pedestrian amenities such as seating opportunities and additional trees.

Pedestrian amenities such as benches and pedestrian level landscaping are provided. Street trees and simple planting with rows of grasses, shrubs and perennials is provided to complement the agrarian style.

g. Site landscaping should prioritize the use of materials that are common to Littleton's agrarian cultural history, such as short stone walls, pervious ground covers, and wood decking.

Materials that are common to Littleton's agrarian cultural history are provided such as stone walls and stone seat walls at the green. Ground covers such as grasses, wildflower meadow and perennials will be used. Concrete with wood decking stamp will considered as an alternate to brick or pavers.

h. Site landscaping should prioritize the use of native plant species and xeriscape.

The Project landscape plan utilizes native plant species and xeriscape where appropriate.

i. Rain Gardens and bioswales should be installed to infiltrate runoff from parking lots, thoroughfares, entry plazas, dining patios, and other impervious surfaces.

The use of Rain Gardens, bioswales and other stormwater BMP's areas are not feasible for this site. The most feasible area for these BMP's would be the open area of the ILSF at the rear of the site, however this area does not meet the groundwater separation requirements prescribed by the Stormwater Rules for stormwater BMP's. Additionally, this area has been maximized to meet the requirements for ILSF areas.

j. Where vegetative solutions are not feasible, porous concrete or porous asphalt should be used for sidewalks, parking lots, entry plazas, and dining patios to infiltrate stormwater.

Pervious pavers are proposed in various locations across the project area. These areas are generally hardscape pedestrian areas. Pervious pavement is not proposed in the parking areas and drives because the high turnover nature of a commercial plaza with a lot of wheel turning tends to limit the effective life of pervious pavements. As an alternative, underground infiltration areas are proposed, and the project meets the infiltration storage requirements of the Stormwater Rules.

k. Existing historic structures should be preserved and incorporated into new development to every extent practicable.

The Historic Commission has evaluated the existing structures and determined that there is nothing of historic significance that should be preserved. (TBD filing timeline for demolition permit)

l. Buildings intended for people age 55 or over should be designed with the features specified in § 173-150, Age-appropriate design.

There are no residential components to the Project.

3186987.1

EXISITING CONDITIONS PHOTOS

265 Great Road

265 Great Road

265 Great Road

277 Great Road

Parking lot between 287 and 277 Great Road

287 Great Road

287 Great Road

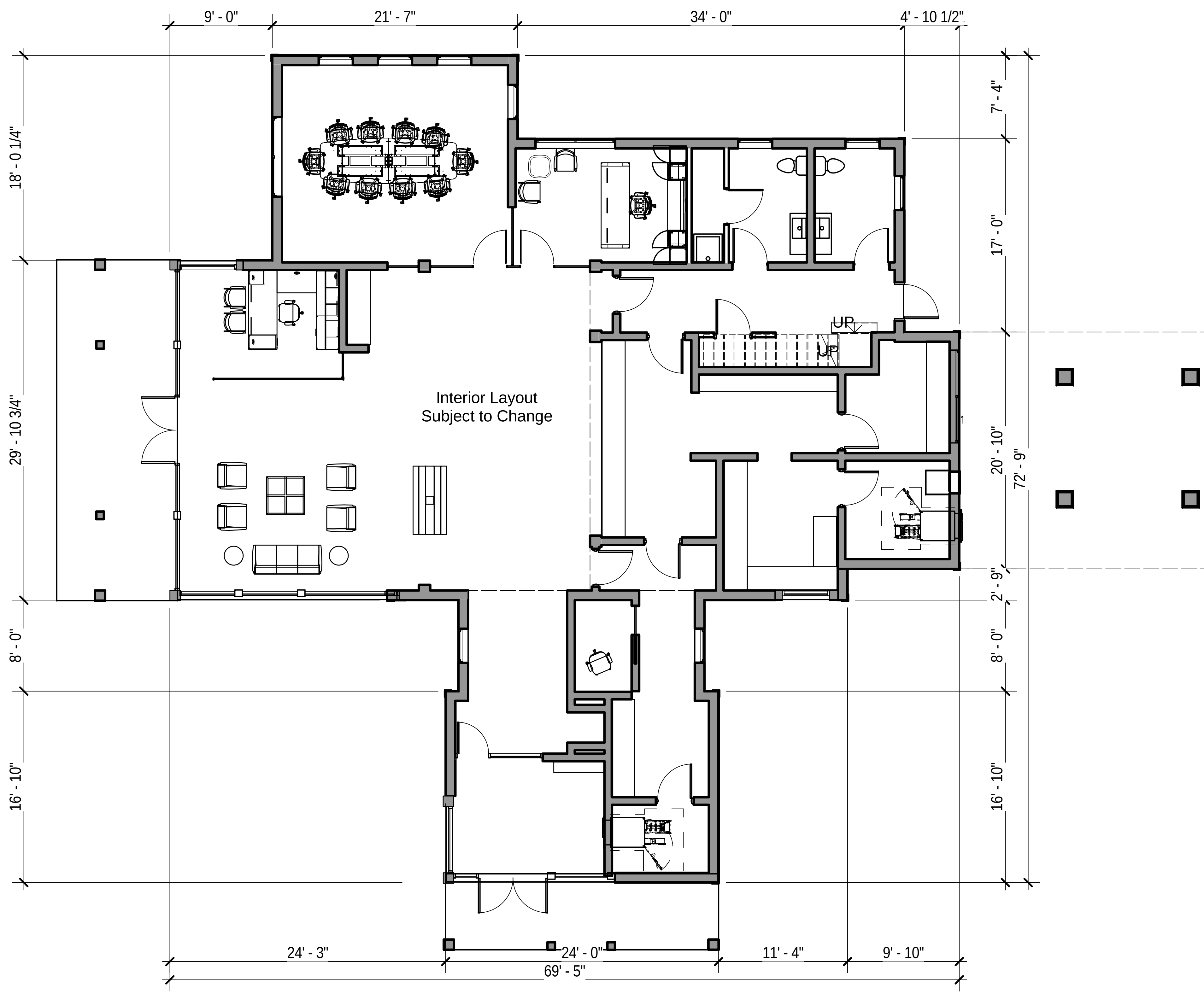
287 Great Road

287 Great Road

289 Great Road

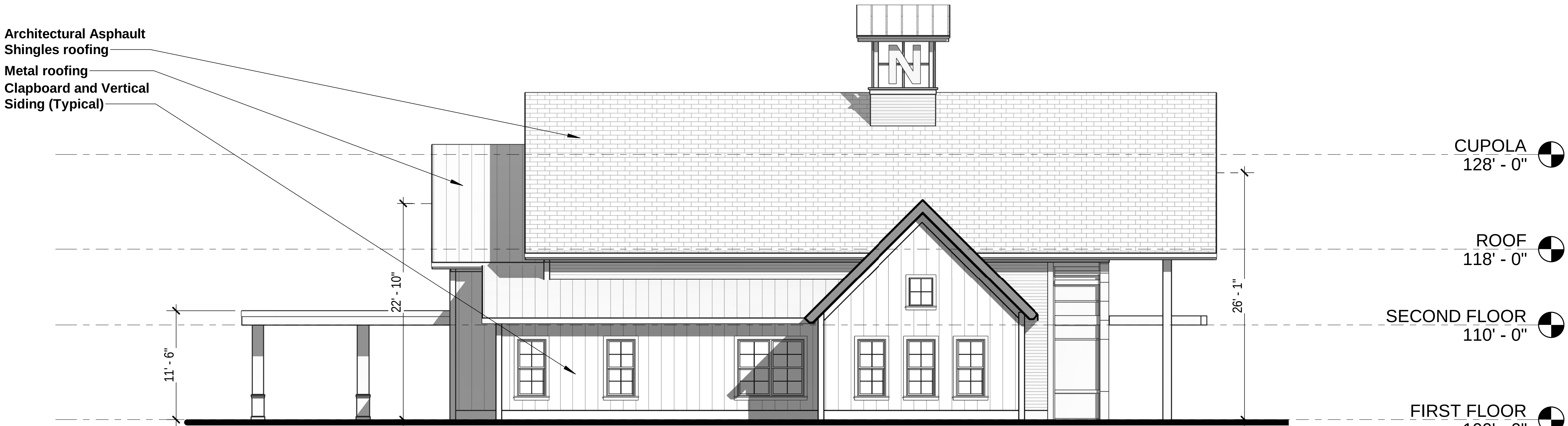
25 Robinson Road

ARCHIECTURAL MATERIALS



First Floor Plan
Building A - 3,319 SF

Northern Bank / BUILDING A - FLOOR PLAN / September 9, 2022



NORTH ELEVATION -Facing Robinson Road

SOUTH ELEVATION -Facing Great Road

REGISTERED ARCHITECT DANIEL J. BARTON NO. 20717 MIDDLESEX MASSACHUSETTS COMMONWEALTH OF MASSACHUSETTS

Northern Bank / BUILDING A - ELEVATIONS / September 9, 2022

Shaping the Exceptional / 200 Ayer Road / Suite 200 / Harvard, MA 01451 / 978 456 2800
22 Ladd Street / Portsmouth, NH 03081 / 603 431 8701

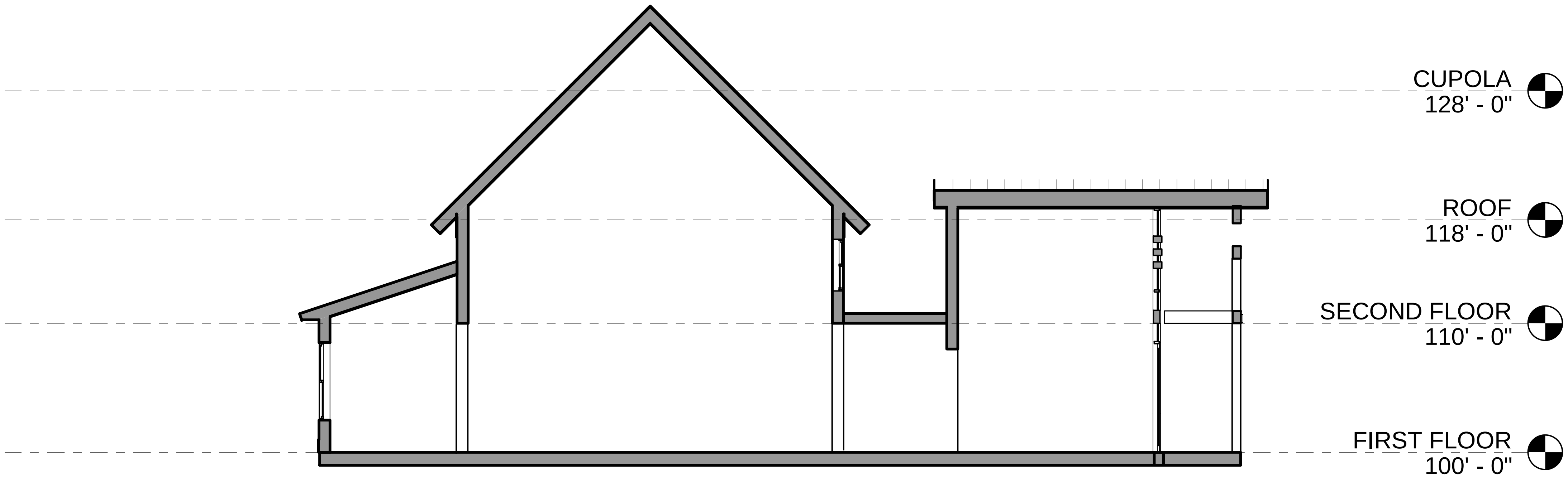
MAUGEL DESTEFANO ARCHITECTS

NORTH ELEVATION -Facing Robinson Road

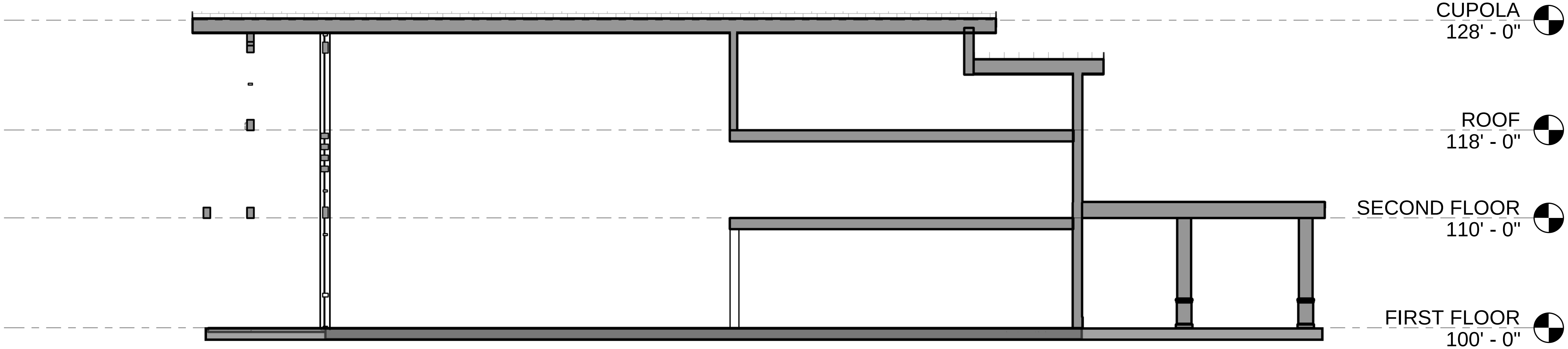
SOUTH ELEVATION -Facing Great Road

REGISTERED ARCHITECT DANIEL J. BARTON NO. 20717 MIDDLESEX MASSACHUSETTS COMMONWEALTH OF MASSACHUSETTS

Northern Bank / BUILDING A - ELEVATIONS / September 9, 2022



BUILDING SECTION



BUILDING SECTION

REGISTERED ARCHITECT DANIEL J. BARTON NO. 20717 MIDDLESEX MASSACHUSETTS COMMONWEALTH OF MASSACHUSETTS

Northern Bank / BUILDING A - SECTION / September 9, 2022

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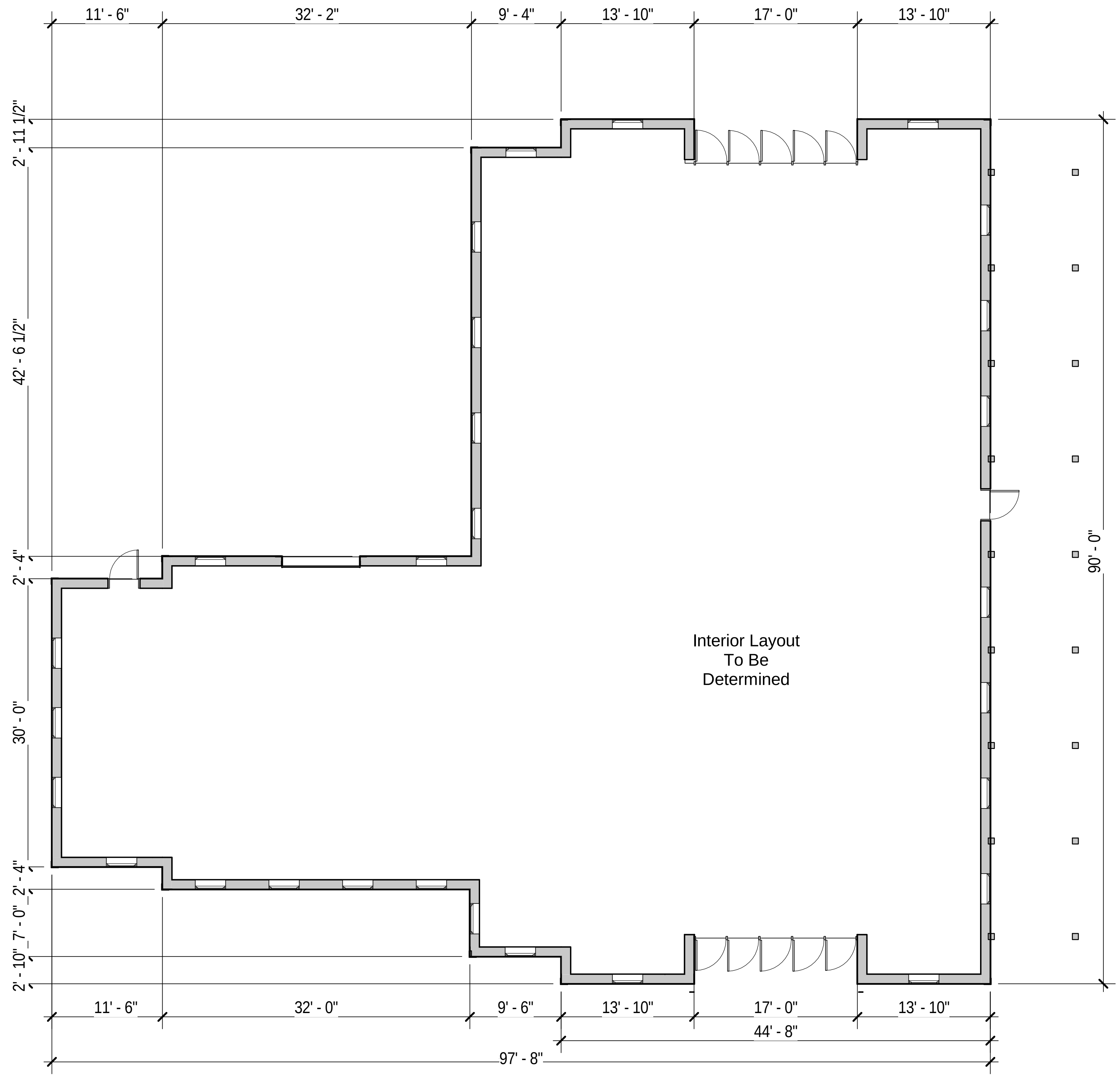
MAUGEL DESTEFANO ARCHITECTS



First Floor Plan
Building B - 6,436 SF

REGISTERED ARCHITECT DANIEL J. BARTON NO. 20717 MIDDLESEX MASSACHUSETTS COMMONWEALTH OF MASSACHUSETTS

Northern Bank / BUILDING B - FLOOR PLAN / September 9, 2022

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22 Ladd Street / Portsmouth, NH 03081 / 603 431 8701

MAUGEL DESTEFANO ARCHITECTS

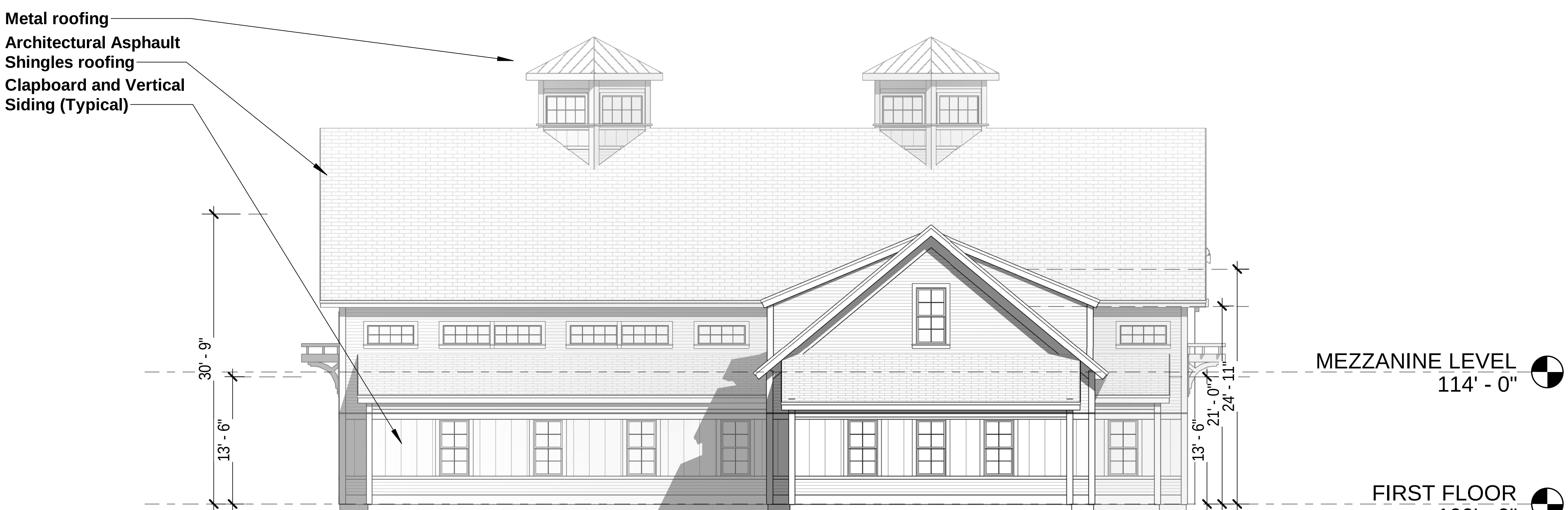
NORTH ELEVATION

SOUTH ELEVATION -Facing Great Road

REGISTERED ARCHITECT DANIEL J. BARTON NO. 20717 MIDDLESEX MASSACHUSETTS COMMONWEALTH OF MASSACHUSETTS

Northern Bank / BUILDING B - ELEVATIONS / September 9, 2022

NORTH ELEVATION



SOUTH ELEVATION -Facing Great Road

Northern Bank / BUILDING B - ELEVATIONS / September 9, 2022

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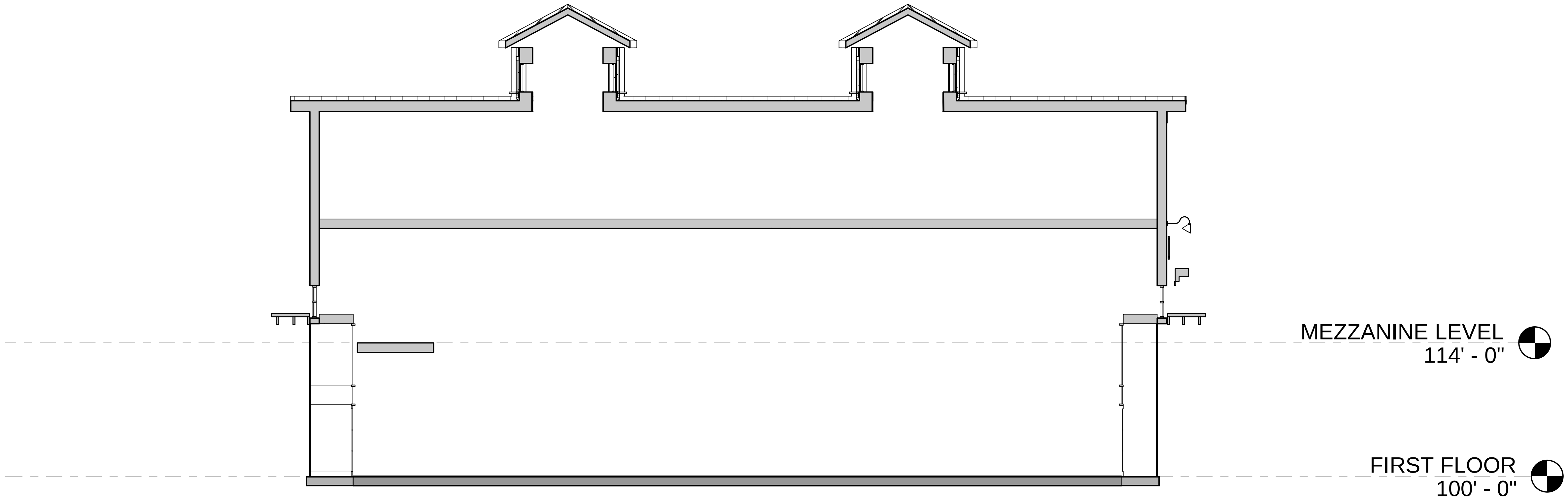
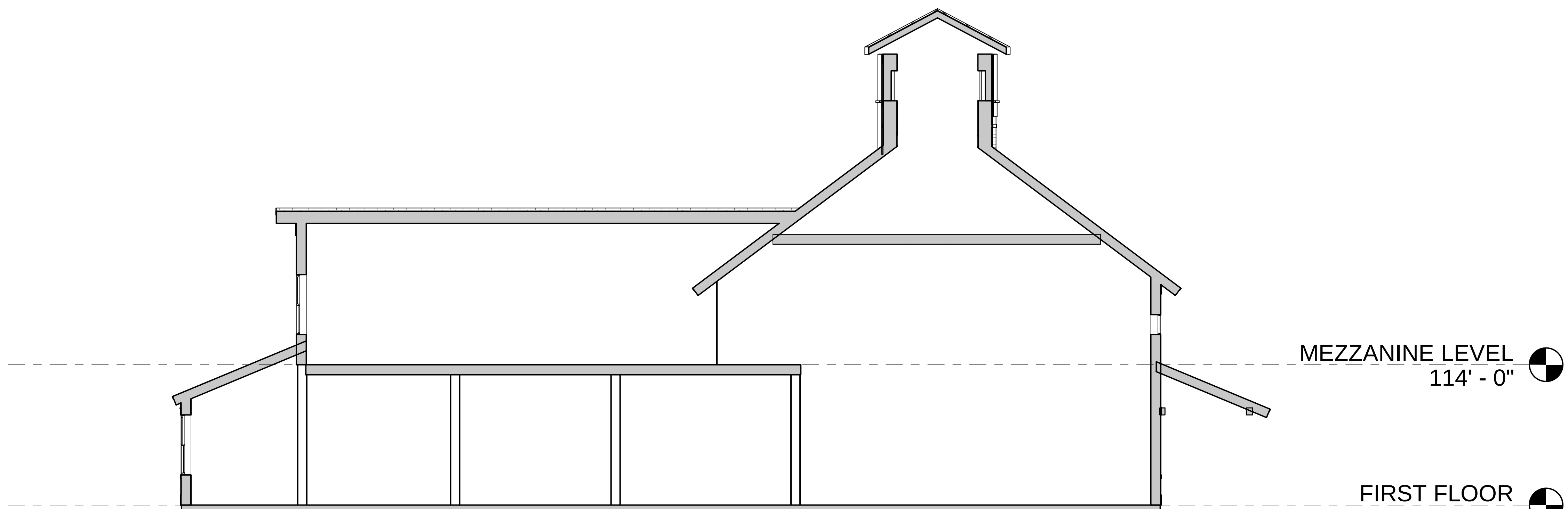
22 Ladd Street / Portsmouth, NH 03081 / 603 431 8701

MAUGEL DESTEFANO ARCHITECTS



BUILDING SECTION



BUILDING SECTION

Northern Bank / BUILDING B - SECTIONS / September 9, 2022

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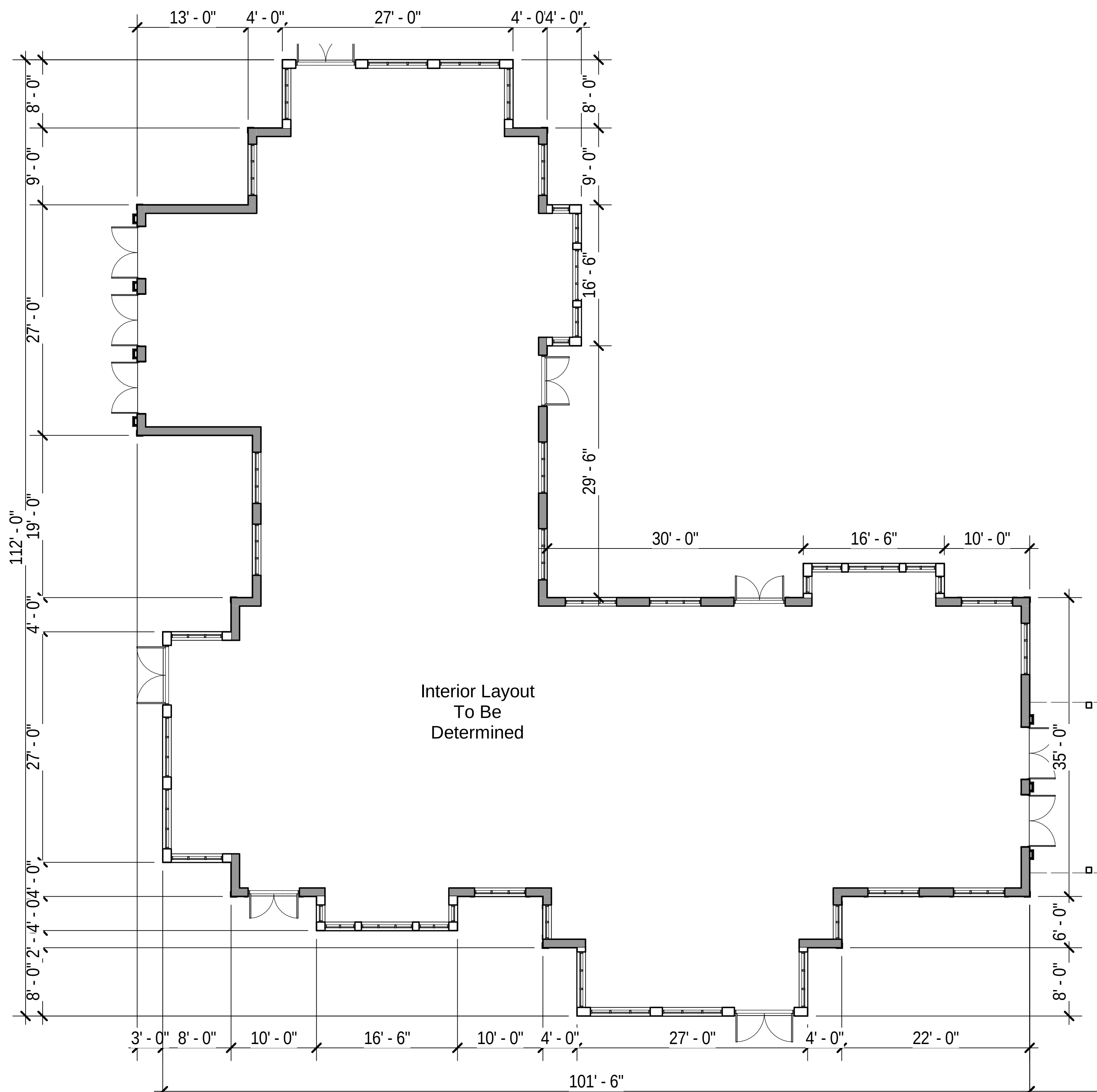
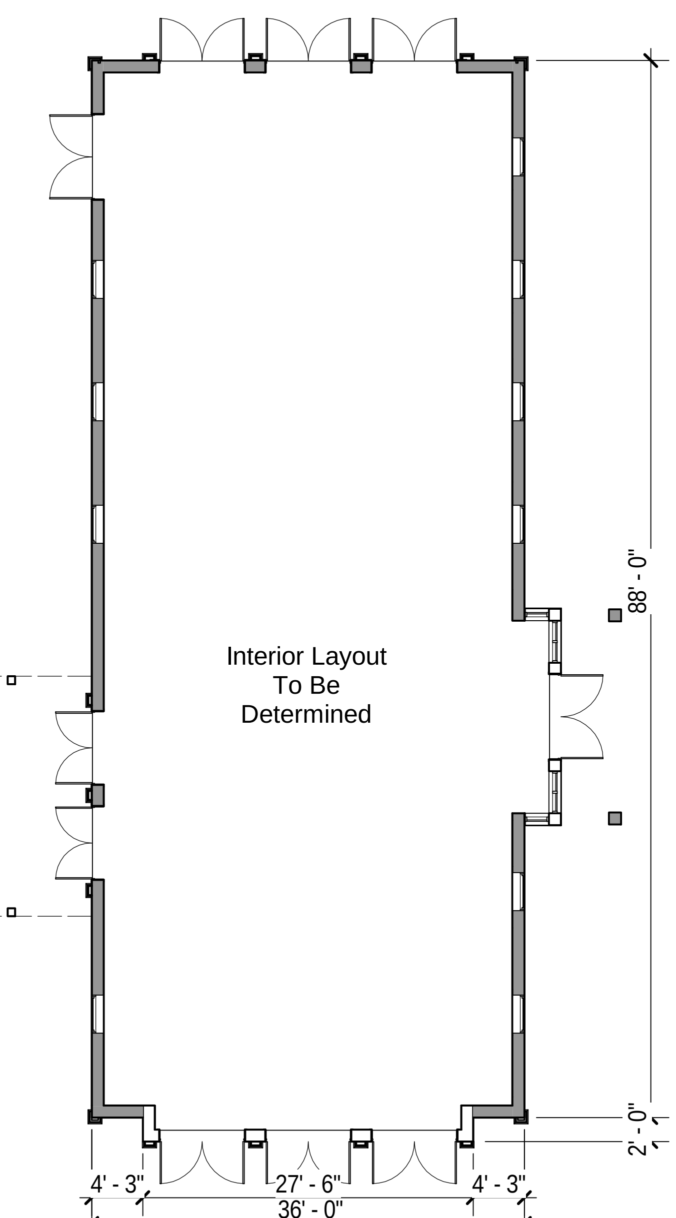
MAUGEL DESTEFANO ARCHITECTS



First Floor Plan
Building C - 6,595 SF



First Floor Plan
Building D - 3,204 SF

REGISTERED ARCHITECT
DANIEL J. BARTON
NO. 20717
MIDDLESEX
MASSACHUSETTS
COMMONWEALTH OF MASSACHUSETTS

Northern Bank / BUILDING C & D - FLOOR PLAN / September 9, 2022

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22 Ladd Street / Portsmouth, NH 03081 / 603 431 8701

MAUGEL DESTEFANO ARCHITECTS

NORTH ELEVATION

Fenestration:

	Bldg C:	Bldg D:
First Floor -	64%	61%
Second Floor -	18%	19%

SOUTH ELEVATION -Facing Great Road

Northern Bank / BUILDING C & D ELEVATIONS / September 9, 2022

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MAUGEL DESTEFANO ARCHITECTS

WEST ELEVATION - Building C

EAST ELEVATION - Building C

REGISTERED ARCHITECT
DANIEL J. BARTON
NO. 20717
MIDDLESEX
MASSACHUSETTS
COMMONWEALTH OF MASSACHUSETTS

Northern Bank / BUILDING C & D ELEVATIONS / September 9, 2022

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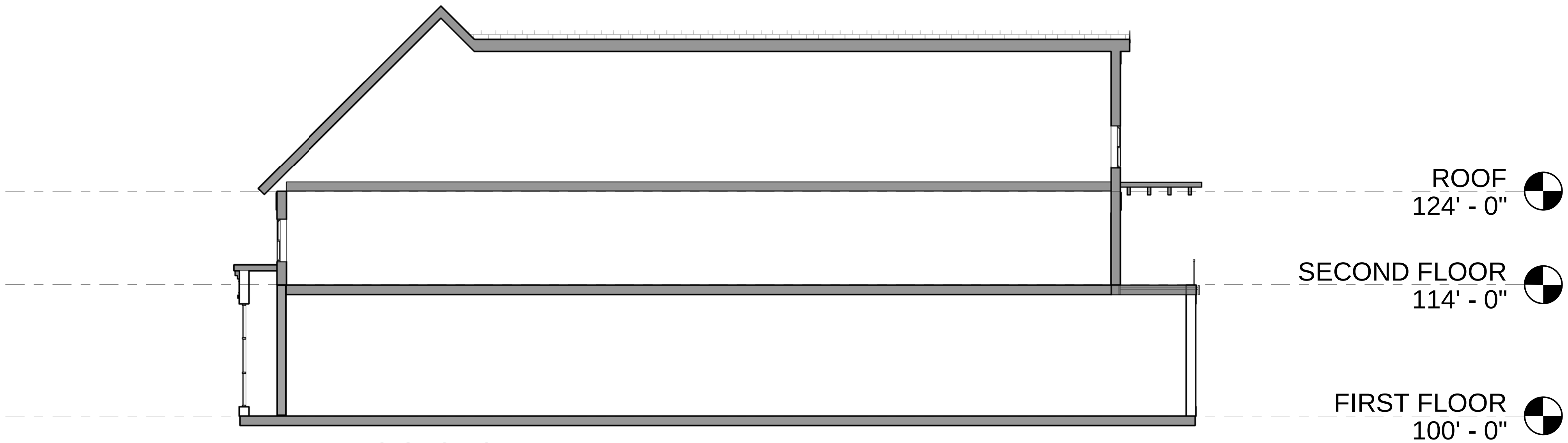
MAUGEL DESTEFANO ARCHITECTS

WEST ELEVATION - Building D

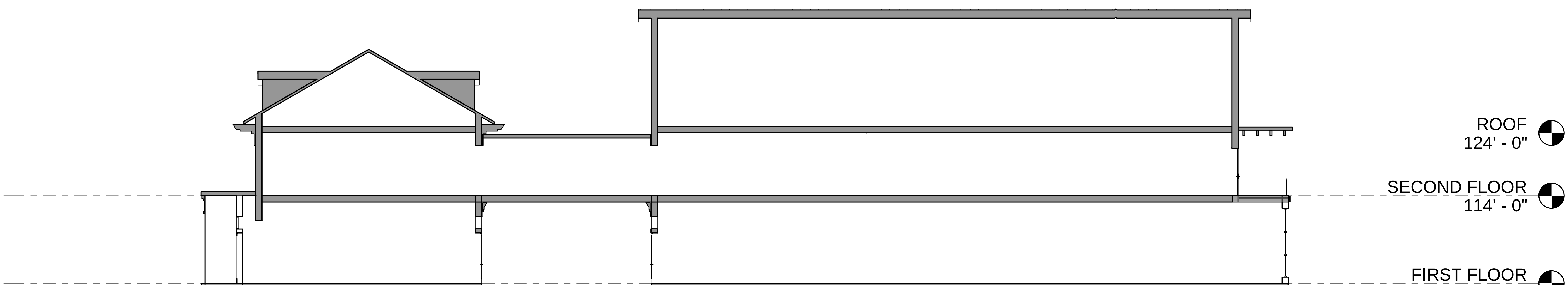
EAST ELEVATION - Building D

REGISTERED ARCHITECT
DANIEL J. BARTON
NO. 20717
MIDDLESEX
MASSACHUSETTS
COMMONWEALTH OF MASSACHUSETTS

Northern Bank / BUILDING C & D ELEVATIONS / September 9, 2022



BUILDING SECTION



BUILDING SECTION

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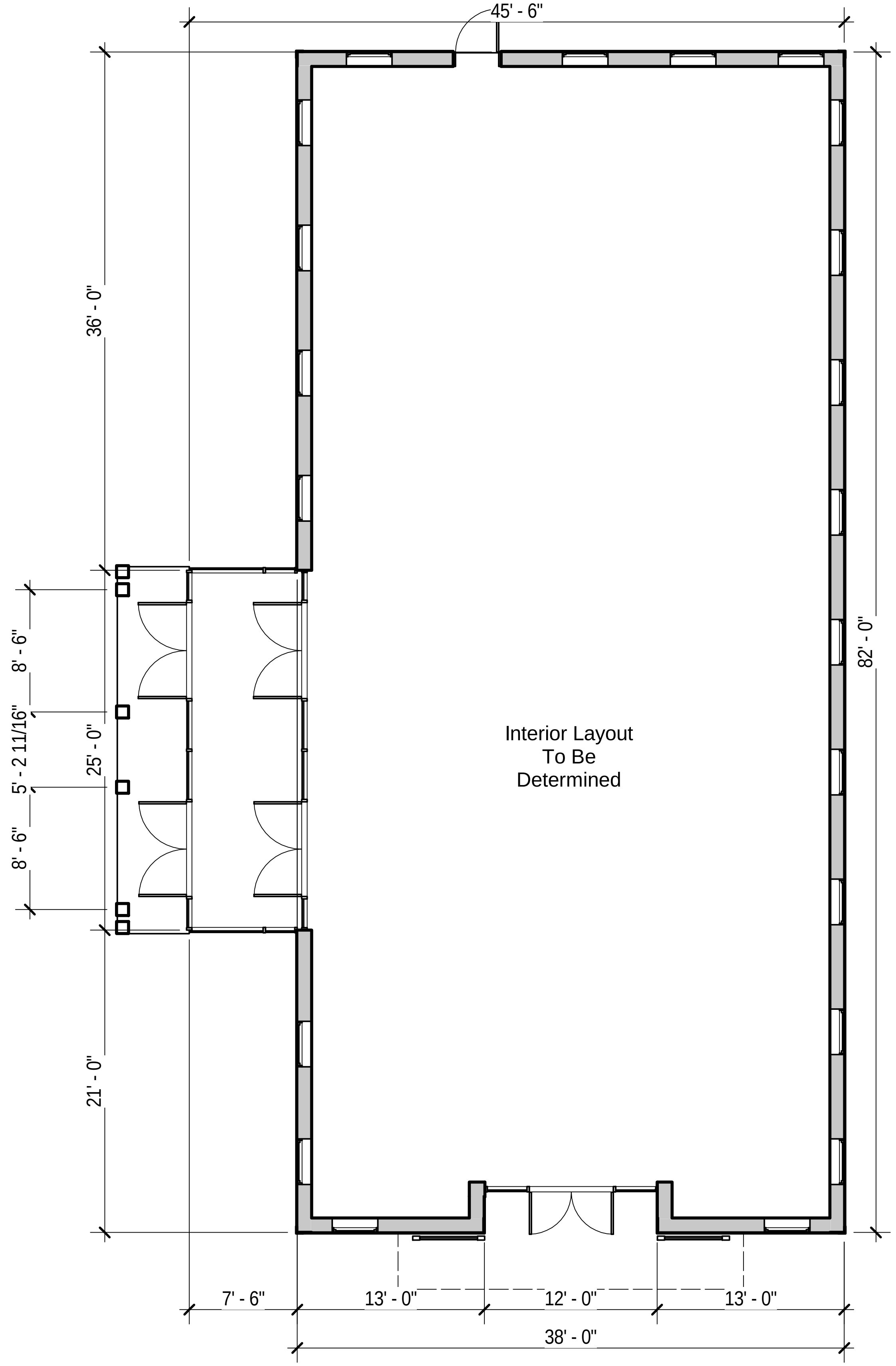
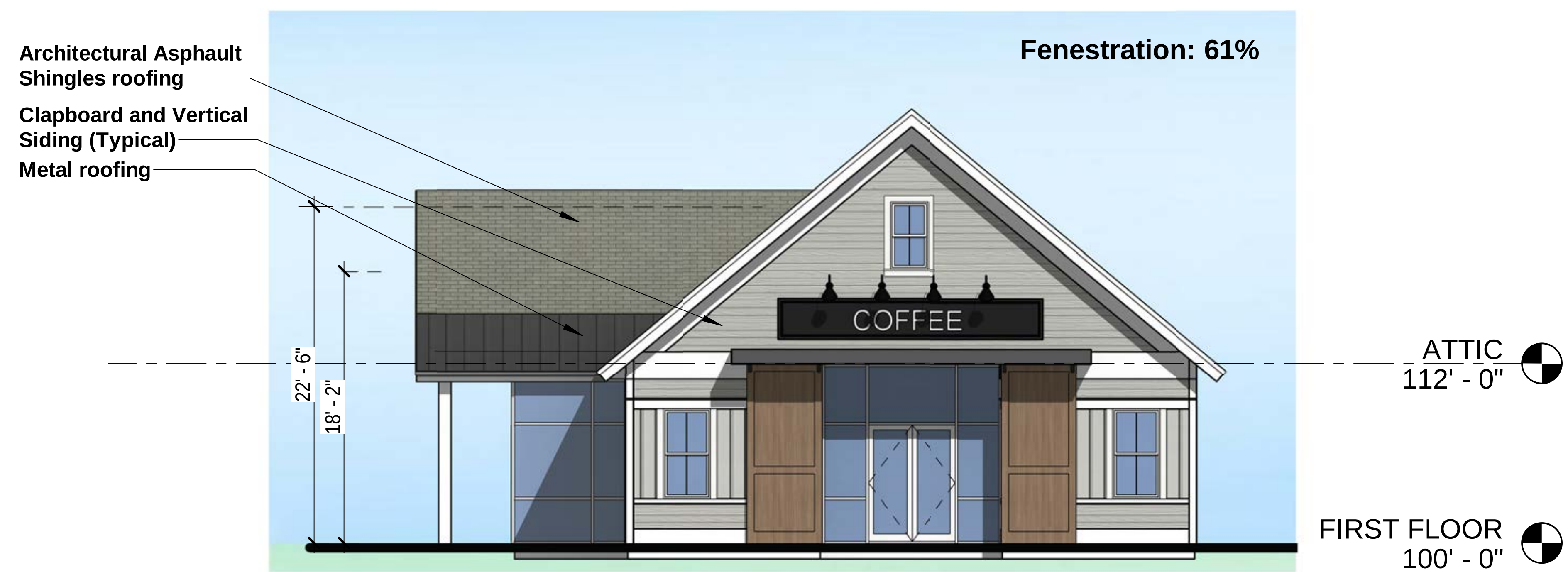
MAUGEL DESTEFANO ARCHITECTS



First Floor Plan
Building E - 3,236 SF

NORTH ELEVATION



SOUTH ELEVATION - Facing Great Road

Northern Bank / BUILDING E - FLOOR PLAN / September 9, 2022

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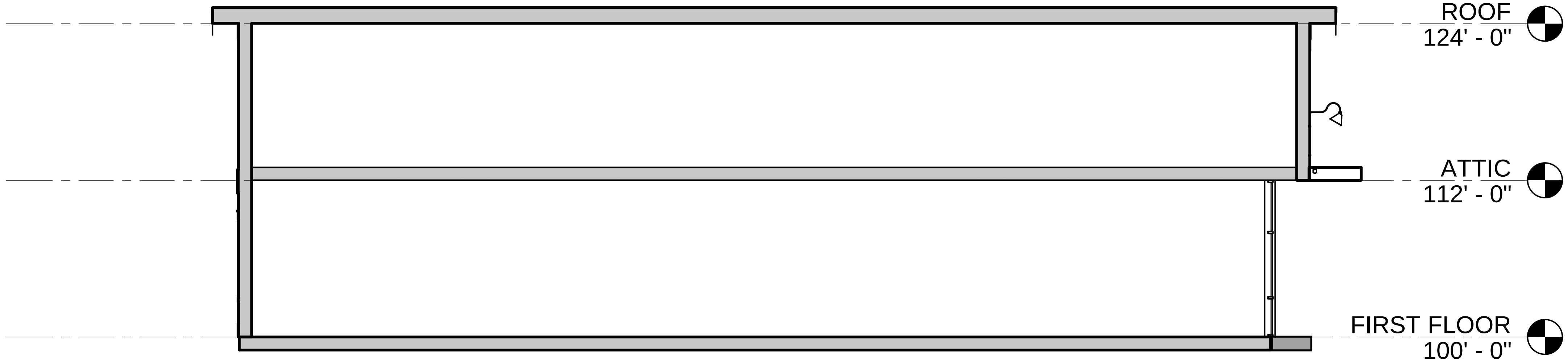
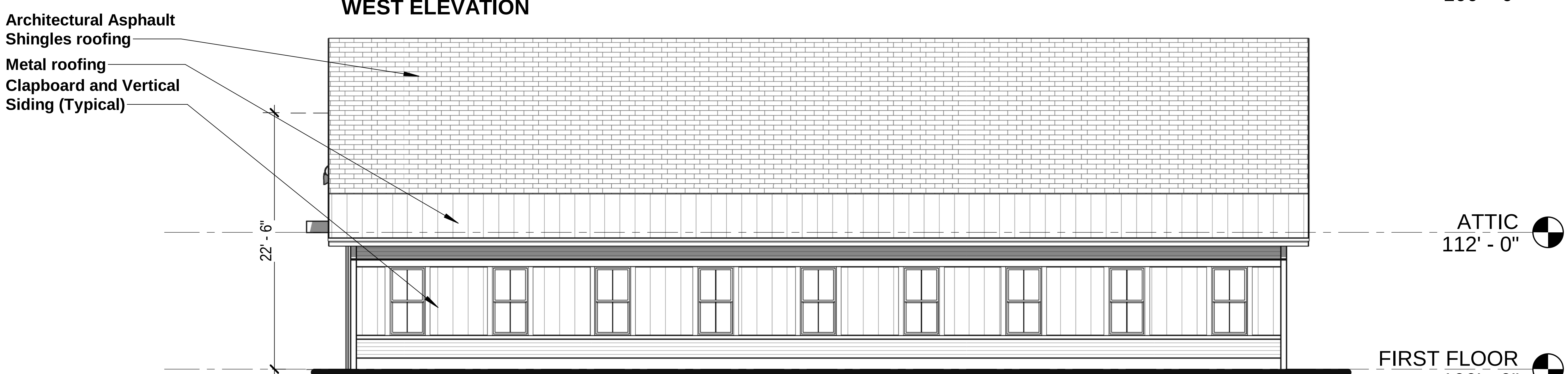
MAUGEL DESTEFANO
ARCHITECTS



BUILDING SECTION

WEST ELEVATION



EAST ELEVATION

Northern Bank / BUILDING E - ELEVATIONS / September 9, 2022

REGISTERED ARCHITECT
DANIEL J. BARTON
NO. 20717
MIDDLESEX
MASSACHUSETTS
COMMONWEALTH OF MASSACHUSETTS

Northern Bank / Rendering / September 9, 2022

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MAUGEL DESTEFANO ARCHITECTS

Northern Bank / RENDERINGS / September 9, 2022

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MAUGEL DESTEFANO ARCHITECTS

STORMWATER MANAGEMENT STUDY

OCG
Oak Consulting Group

September 9, 2022 Project 18017

Maren Toohill, AICP, Town Planner
Town of Littleton
37 Shattuck Street
Littleton, Massachusetts 01460

RE: Northern Bank Town Common
Stormwater Permit

Dear Maren:

We have prepared this letter as a supplement to the Stormwater Management Study prepared for the above referenced project and dated August 2022. The purpose of this letter is to document the project's compliance with the phosphorus removal requirement in updated Stormwater Management and Erosion Control Regulations (Regulations).

The project is a redevelopment project and falls under Section 4.1.3.6 of the regulations which, in addition to the 80% TSS removal, requires 50% of the annual load of Total Phosphorus. Section 4.1.3.6.2 indicates that this standard is met by retaining (infiltrating) a volume equal to or greater than 0.8 inches times the total post-construction impervious surface area on a redeveloped site. The required volume was calculated as follows:

(27,853 sf (Total Roof Area) + 75,750 sf (Total pavement and walks)) x (0.8inches/12 inches per foot)
Total volume required = <u>6,906.87</u> cubic feet.

The project proposes two subsurface infiltration systems with a total storage volume of <u>12,498</u> cubic feet, exceeding the required amount to meet the standard.

As shown above and in the Stormwater Management Study, the project's stormwater management system is compliant with the regulations. Please feel free to contact me at if you have any questions or require additional information.

Sincerely,

OAK CONSULTING GROUP, LLC

Sean P. Malone, P.E.
Vice President

SPM:

STORMWATER MANAGEMENT STUDY
FOR
NORTHERN BANK TOWN COMMON

Littleton, Massachusetts

Prepared for:

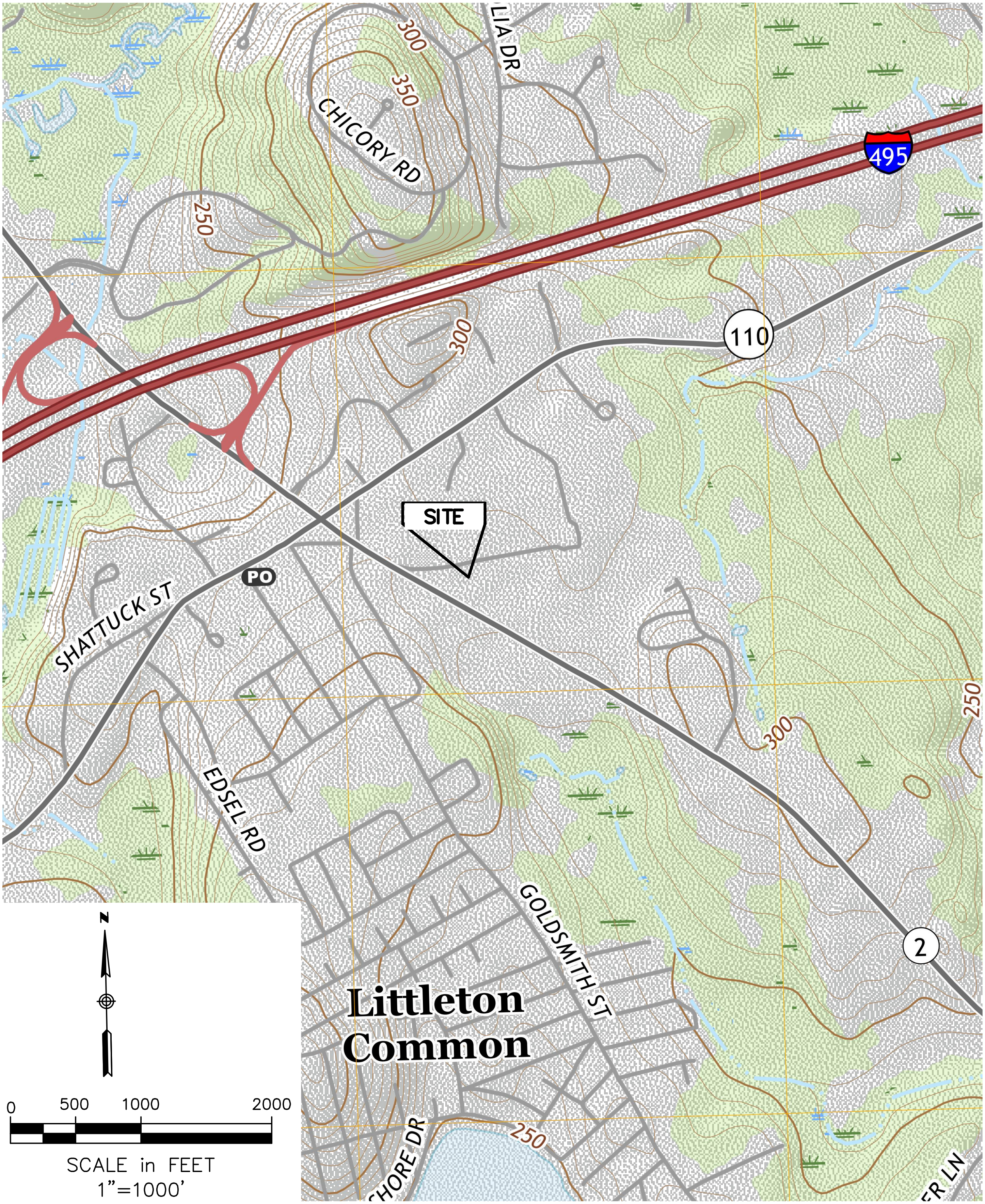
Northern Bank
275 Mishawum Road
Woburn, Massachusetts 01801

Prepared by:

Oak Consulting Group
P.O. Box 1123
Newburyport, Massachusetts 01950
(978) 312.3120

Project 18017
August 2022

TABLE OF CONTENTS



Northern Bank
289 Great Road
Littleton, Massachusetts

OCG Oak Consulting Group
P.O. Box 1123
Newburyport, MA 01950
Ph.978.312.3120

SITE LOCATION USGS MAP
2018 Westford Quadrangle
7.5 Minute Series

DRAWN BY:	CHECKED BY:	FIGURE NO.
SPM	SPM	1
PROJECT	DATE:	
18017	08/26/2022	

1.0 INTRODUCTION

Oak Consulting Group has prepared the following Stormwater Management Study for the proposed redevelopment of the property at 265, 277, 287, and 289 Great Road and 25 Robinson Road in Watertown, Massachusetts. The objective of this study was to engineer a drainage design using Best Management Practices (BMPs) that meet the Stormwater Management Standards set forth in the Massachusetts Department of Environmental Protection's (MA DEP's) Stormwater Policy, the Town of Littleton Stormwater Bylaw and standard engineering practice.

The project consists of redeveloping the project site with a commercial development to be known as Northern Bank Town Common.

The total area of disturbance is approximately 4.0 acres.

1.1 Existing Conditions

The Project Area is located on +/-4.75 acres, and is bounded by Great Road to the south and west, Robinson Road to the north, residential property to the northeast and commercial development to the southeast. The site is within the Village Common Zoning district.

The site is substantially developed with a Northern Bank branch, two commercial buildings, a residential building and a gas station as well as paved parking and loading areas, driveways, and lawn and landscape areas. There is also a wooded area with a non-jurisdictional wetland along the western boundary.

The site is characterized by four subcatchment areas. These areas are shown on the enclosed Pre-development Subcatchment Plan.

Subcatchment 1 consists of runoff from the central portion of the site. This subcatchment was divided into two smaller subcatchments to account for the runoff which flows into two small ponding areas. Runoff Subcatchment 1B flows to the low spot then overflows into Subcatchment 1A. This Subcatchment then flows to the rear of the site where it is retained in a larger ponding area. Once a depth of approximately 1.5 feet is reached, this ponding area outlets by the low point in the Northern Bank driveway where the overflow sheets to the Great Road drainage system.

Other than a deep sump catch basin in the Northern Bank parking area, there is no stormwater treatment for any paved or gravel parking and drives prior to stormwater being discharged to the low area in the rear of the site.

Subcatchment 2 consists of runoff from the southern portion of the site. This subcatchment was divided into two smaller subcatchments to account for the runoff which sheet into Great Road (Subcatchment 2A) and runoff which is piped directly into the Great Road drainage system (Subcatchment 2B).

There is no stormwater treatment for any paved or gravel parking and drives prior to stormwater being discharged to the Great Road drainage system.

Subcatchment 3 consists of a small catchment area in the northern portion of the site flowing to Robinson Road.

There is no stormwater treatment for any paved parking and drives prior to stormwater being discharged to the Robinson Road drainage system.

Subcatchment 4 consists of an offsite catchment area east of the site. This area is developed with a single-family home and drains to the ponding area described in Subcatchment 1A, thus combining with stormwater generated by the site.

There is no stormwater treatment for any paved parking and drives prior to stormwater being discharged to low area at the rear of the project site.

1.2 Site Geology and Hydrogeology

The NRCS has documented the site as having Woodbridge fine sandy loam with a Hydrologic Soil Group (HSG) C/D. In May 2022, six (6) test pits were conducted across the site. These test pits revealed the subsoils to be generally loamy and silty with shallow groundwater. Soils below the water table in the eastern portion of the site were coarse sands. The HSG C rating was used for site based on these results. Copies of the NCRS soils map and HSG map and test pit logs are enclosed in Appendix E.

The subsoils were classified as silt loam with a Rawl’s infiltration rate of 0.27 inches/hour.

1.3 Proposed Condition

The project proposes to redevelop the site with a new commercial development consistent with the intents of the Village Common form-based code. The site will be redeveloped with a new bank branch and 4 commercial buildings as well as parking and loading areas needed to support the project. Hardscape outdoor gathering areas will be constructed with pervious pavers and all disturbed areas will be landscaped or created into lawn area.

The proposed drainage system has been designed to treat and detain stormwater so that the rate of discharge from the site is less than the existing condition at the same points of discharge to mimic the existing condition. The system has also been designed so as to not increase the ponding elevation of the low area to the east of the site.

Stormwater quality will be improved with the introduction of new pervious pavers as well as a closed drain system with new deep sump catchbasins, stormwater treatment units, subsurface infiltration areas and a subsurface detention 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 2-, 10-, and 25-year storm events was obtained from the NOAA Atlas 14, volume 10, version 2. The time of concentration was calculated using the SCS lag method.

Soils in the area of the proposed infiltration areas was found to be silty loams. The Rawl’s Table for these soils indicates an infiltration rate of 0.27 in/hr which was used in the analysis.

2.0 STORMWATER MANAGEMENT STANDARDS

The plans included with this drainage study present the existing and proposed storm drain systems and erosion control measures proposed for the project. The stormwater BMPs were designed to meet and exceed the performance standards described in the MADEP Stormwater Handbook. The measures taken to address each of the standards are presented below.

2.1 No New Untreated Discharges (Standard 1)

The proposed project will not result in new untreated discharges. Runoff from new impervious areas will be captured, treated to remove total suspended solids (TSS). Treated runoff will be discharged at a rate not to exceed and at approximately the same location as the Pre-development condition.

2.2 Peak Rate Attenuation (Standard 2)

The Post-development rate of runoff from the site will be less than the Pre-development Conditions for all design storms. HydroCAD stormwater calculations are provided in Appendices A and B and are summarized in the table below. The existing and proposed drainage conditions were evaluated at the same points of discharge.

Table 1.2.1 - Rate of Discharge from Site

	Peak Rate of Runoff for 2-Year Storm Event (3.18") Pre/**Post**	**Peak Rate of Runoff for 10-Year Storm Event (4.91")** Pre/**Post**	**Peak Rate of Runoff for 25-Year Storm Event (5.99")** Pre/**Post**	**Peak Rate of Runoff for 100-Year Storm Event (7.66")** Pre/**Post**
Great Road	0.18/**0.09** cfs	0.31/**0.22** cfs	0.40/**0.30** cfs	0.54/**0.44** cfs
Robinson Road	2.52/**1.99** cfs	4.32/**3.12** cfs	5.47/**3.84** cfs	8.27/**4.94** cfs
Total Site	2.67/**2.05**cfs	4.57/**3.25** cfs	5.79/**4.02** cfs	8.37/**5.20** cfs
Total Site Change	**-0.62 cfs (-23%)**	**-1.32 cfs (-29%)**	**-1.77 cfs (-31%)**	**-3.17 cfs (-38%)**

As shown above, the rate of runoff from the site in the post-development condition will be less than pre-development conditions for all design storm events.

2.3 Groundwater Recharge (Standard 3)

The Massachusetts Department of Environmental Protection Stormwater performance standards require an approximate restoration of groundwater recharge in post-development conditions. Soil data was obtained from the NRC Web Soil Survey.

Below is a calculation of the required recharge volume for the new site impervious area.

Volume required in HSG C Soils
38,705 sf x (0.25 in) / (12 in/ft) = 806.35 cubic feet

Total recharge volume required = 806.35 cubic feet

The project will use two subsurface infiltration systems consisting of HDPE perforated pipe embedded in crushed stone. These basins were sized to capture and hold a stormwater volume greater than the required recharge volume. The total recharge volume for the systems was calculated to 12,498 cf.

2.4 Water Quality (Standard 4)

Runoff generated by the site will be treated to reduce total annual load of Total Suspended Solids (TSS). BMP's used include, new pervious pavers, deep sump catchbasins, stormwater treatment units, and Stormwater Infiltration. Treatment train calculations can be found in Appendix C.

2.5 Land Use with Higher Potential Pollutant Loads (LUHPPLs) (Standard 5)

The proposed project consists of a shopping center with more than 1,000 vehicle trips per day and this use is associated with higher potential pollutant loads. The stormwater system has been designed to pretreat stormwater from all parking and loading areas to at least 44% TSS removal prior to discharging to an infiltration area and provide treatment for all parking lot runoff.

2.6 Critical Areas (Standard 6)

The site does not contain critical environmental resource areas.

2.7 Redevelopments and Other Projects Subject to the Standards Only to the Maximum Extent Practicable (Standard 7)

The project area is developed with both commercial and residential development and nearly the entire project area has been previously disturbed. All new developed are is treated to full compliance with the stormwater rules with the exception of Subcatchment 2A. This subcatchment is along the perimeter of the project abutting the state Right-of-way which sheet flows to the street.

In the Pre-development condition, this subcatchment includes roof area, gravel and paved driveways, gravel and paved parking areas and some pervious area. In the Post-development condition, this subcatchment includes only roof area, sidewalks and some pervious area and the total impervious area is reduced. The Post-development condition will result in a significant improvement in stormwater quality.

2.8 Construction-Period Pollution Prevention and Erosion and Sedimentation Control (Standard 8)

Below is a summary of the erosion and sediment control procedures. Additional detail can be found on Sheet C-005, Erosion Control Notes, and details provided on the project plans.

Land-disturbing activities proposed under this project will include the items listed in, and be sequenced according to, the following preliminary construction schedule:

1. Installation of temporary erosion controls (construction entrances, sedimentation barriers, and catchbasin inlet protection).

2. Clearing and grubbing. Stockpile or remove topsoil. Demolish existing structures and infrastructure.

3. Excavation, rough grading of site.

4. Construction of building pads, parking areas, and drainage and utilities.

5. Install landscaping and final stabilization.

6. Removal of temporary erosion controls and any trapped sediment.

Erosion/sediment controls will be in place throughout the site during all phases of construction. All existing catchbasins in the project area will have a silt basket installed under the grate. The Contractor shall be responsible for checking all of the erosion/sediment control measures periodically and after every storm. The Contractor shall repair, replace, and maintain all erosion/sediment control measures throughout construction until all disturbed areas have been stabilized. Efforts will be made to establish vegetative cover over all disturbed areas as soon as possible after the work in that area is complete. All disturbed areas will be treated with a 4-inch depth of loam and seed or mulch and landscaping.

The occurrence of an extended shutdown during the construction phase of this project is not anticipated and is unlikely. Should unexpected events dictate, measures will be taken to stabilize the disturbed areas of the site as a last construction activity before the start of an extended shutdown. These measures will include careful planning of the immediate construction schedule so that further land disturbance is kept to a minimum and the re-stabilization of existing disturbed areas is maximized prior to the extended shutdown. Other measures will include the reinforcement and repair of all erosion/sediment controls in place at the time of the extended shutdown.

2.9 Operation and Maintenance Plan (Standard 9)

See Appendix C.

2.10 Prohibition of Illicit Discharges

Illicit discharges are prohibited. An Illicit Discharge Statement will be provided prior to the start of construction.

3.0 ISOLATED LAND SUBJECT TO FLOODING

The rear portion of the site contains a low area with no specific drain outlet. This area is bound by the commercial and residential development on the existing site as well as a residence to the east and has been documented by the abutting resident as an area that frequently floods both on their land as well as the project site.

This area was reviewed by Goddard Consulting in June of 2022. A portion of the area was flagged as an isolated non-jurisdictional wetland. With the documented flooding noted by the abutter, this area was reviewed to see if it met the criteria of 310 CMR 10.57(2)(b) and would be defined as Isolated Land Subject to Flooding (ILSF). The result of that analysis showed the area retained a volume of 12,876 cf for the 1-year storm event (2.62 inches). This volume exceeds the threshold of 0.25 acre/feet (10,890 cf) defining an ILSF and therefore the area is regulated as an ILSF.

The project proposes work with in the ILSF area as well as areas on the site flowing to it. The project will result in filling portions of the ILSF but also some redeveloped areas currently flowing to it, will be rerouted to new subsurface infiltration and detention areas. Below is a summary of the ILSF Performance Standards defined by 310 CMR 10.57(4)(b) and explanation on how the protect meets the standard.

A proposed project in Isolated Land Subject to Flooding shall not result in the following:

1. *"Flood damage due to filling which causes lateral displacement of water that would otherwise be confined within said area."*

   The proposed project will decrease the area contributing runoff to the ILSF as well as provide an outlet in the form of a catchbasin. The catchbasin rim will be at the same elevation as the existing outlet from the ILSF. Below is a summary the highwater elevation of the ILSF area before and after construction for the rainfall amounts defined in C10 CMR 10.57(4)(b) and 10.57(2)(b).

Table 3.1 – ILSF Elevations	1-Year Storm Peak Elevation (ft)	7" Storm Peak Elevation (ft)
Pre-development	277.06	277.66
Post-development	276.44	277.52

   As shown above the Post-development peak elevation will be less than Pre-development peak elevation and therefore the lateral extent of the flooding will not be increased particularly as it relates to the abutting property to the east.

   The above stormwater calculations for Peak Rate Attenuation (Standard 2) show that the peak rates from the site do no increase for all storms demonstrating that lateral extent of flooding is also not diverted off-site by the sites stormwater systems.

2. *An adverse effect on public and private water supply or ground water supply, where said area is underlain by pervious material.*

   Test pits conducted in proximity to the ILSF area suggest at least portions of it are underlain by a sandy loam over a coarse sand and gravel layer within the water table. The project has been designed to provide a static storage volume on-site to match or exceed the pre-development storage volume of the ILSF. This is accomplished with the remaining open ILSF basin as well as new subsurface infiltration areas.

Table 3.2 – ILSF Volumes	1-Year Storm Volume (cf)	7" Storm Volume (cf)
Pre-development ILSF Basin	12,086	31,681
Post-development ILSF Basin	4,940	22,109
Post-development Basin 1B	5,415	6,668
Post-development Basin 1C	2,621	5,660

   As shown above the total static storage for recharge in the Post-development condition will be 12,976 cf for the 1-year Storm and 34,437 cf for the 7" Storm. After subtracting the required

806.35 cf of recharge required by the redevelopment, the ILSF storage is still exceeds the existing condition. The elimination of untreated stormwater discharges to the ILSF while also adding the additional recharge will also protect natural groundwater supply in the area.

3. *An adverse effect on the capacity of said area to prevent pollution of the groundwater, where the area is underlain by pervious material which in turn is covered by a mat of organic peat and muck.*

   All redeveloped areas are directed away from the ILSF area in the Post-development condition. The areas receive treatment in excess of the minimum requirements of the MADEP Stormwater Standards. With less stormwater being routed to the ILSF area and new treatment for other areas previously draining to it, there is no adverse effect of the ILSF areas capacity for pollution prevention.

4. *An impairment of its capacity to provide wildlife habitat where said area is a vernal pool habitat, as determined by procedures contained within 310 CMR 10.60.*

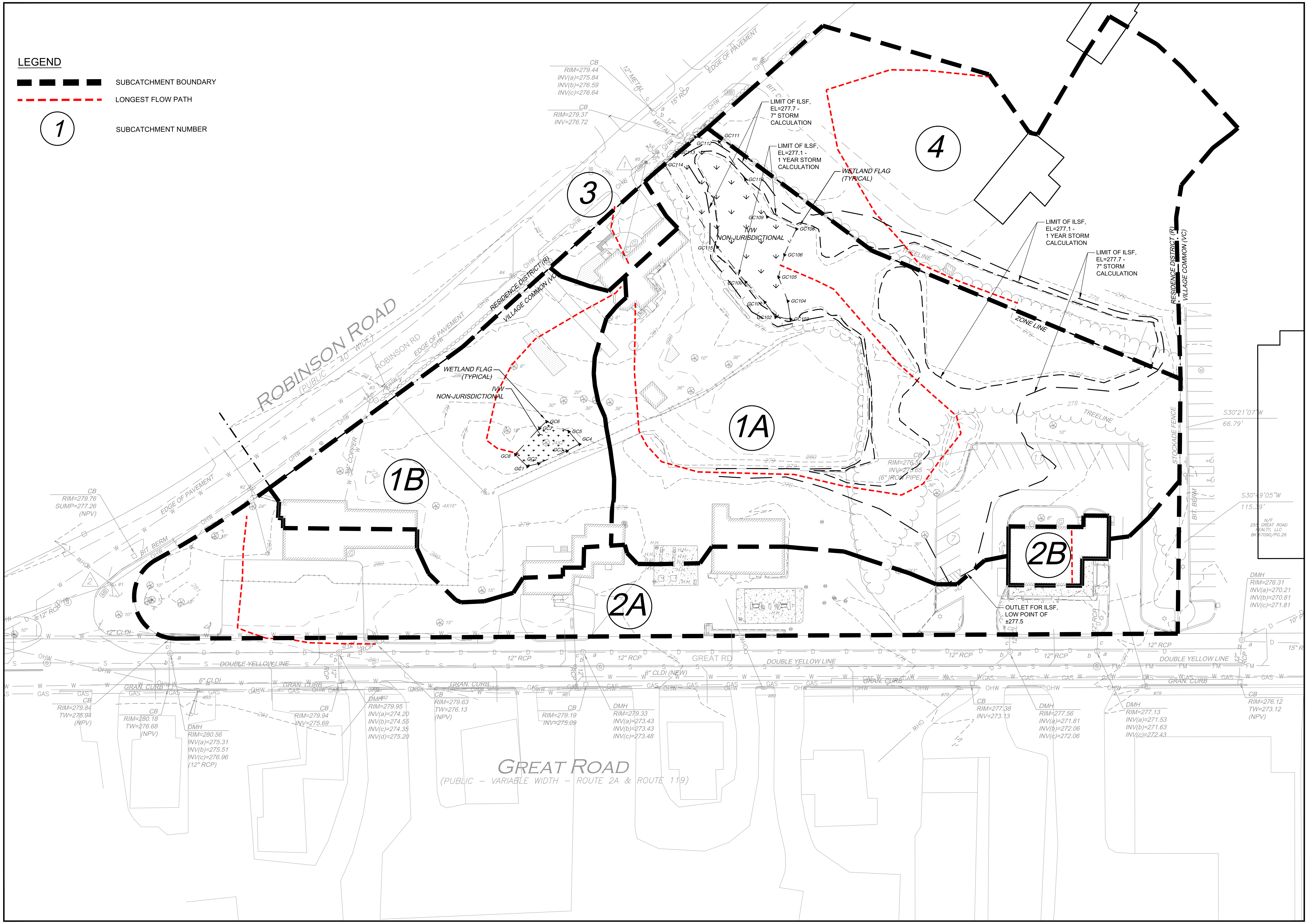
   No certified or potential vernal pools were identified in the ILSF area.

APPENDIX A

Pre-Development Drainage Calculations

Northern Bank Town Common
Littleton, Massachusetts

Oak Consulting Group
Project 18017



Site:

NORTHERN BANK
TOWN COMMON

265-289 GREAT ROAD
LITTLETON, MASSACHUSETTS

Prepared for:

NORTHERN BANK AND
TRUST COMPANY

275 MISHAWUM ROAD
WOBURN, MASSACHUSETTS

SEAN P. MALONE CIVIL No. 48204

OCG
Oak Consulting Group
P.O. Box 1123
Newburyport, MA 01950
Ph. 978.312.3120

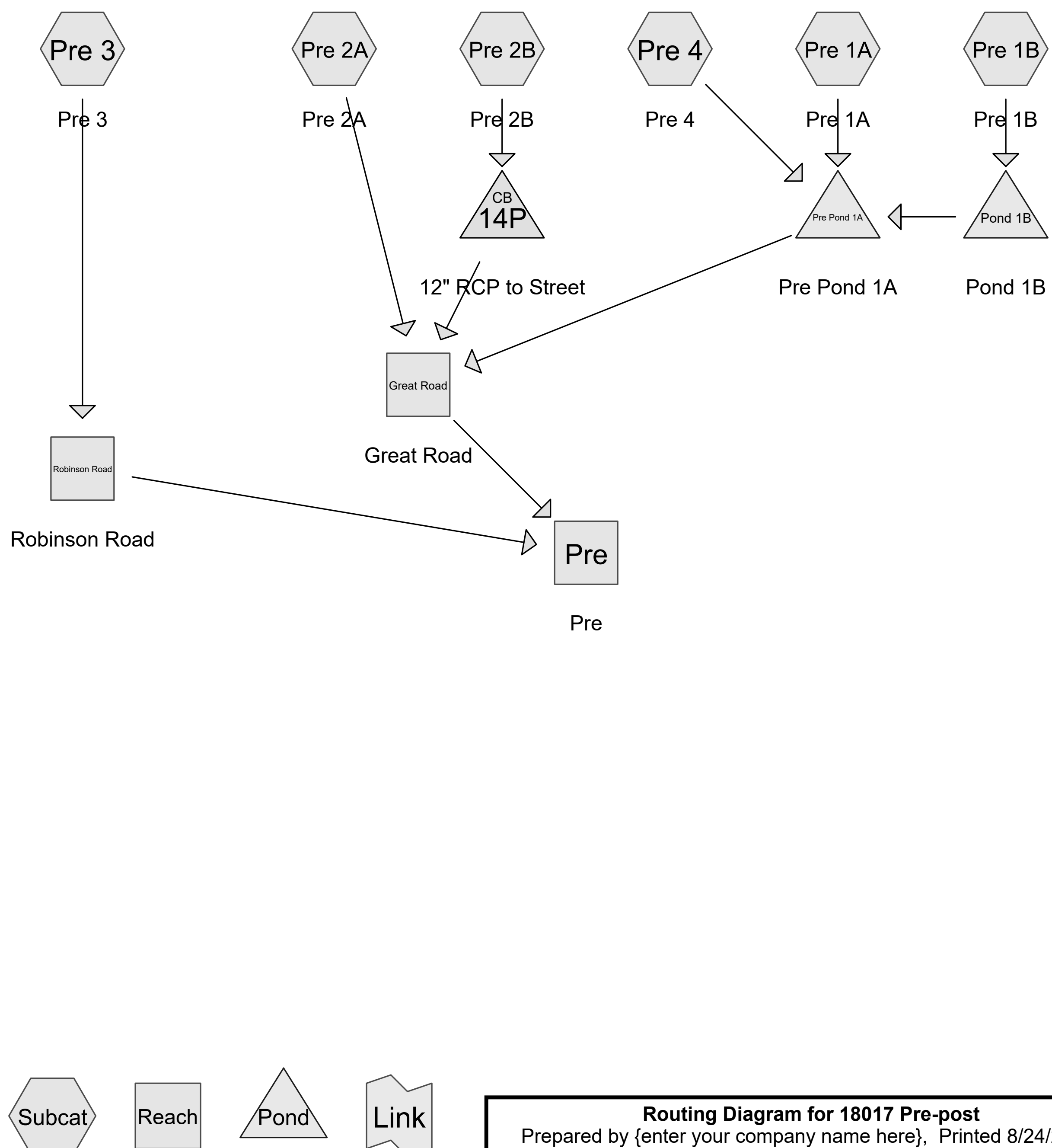
PRE-DEVELOPMENT
SUBCATCHMENT
PLAN

No.	Revision/Issue	Date

Design by: SPM	Checked by: SPM
Drawn by: SPM	Approved by: SPM
Project: 18017	Date: August 26, 2022

Sheet:

DR-01



Routing Diagram for 18017 Pre-post
Prepared by {enter your company name here}, Printed 8/24/2022
HydroCAD® 10.00-26 s/n 01151 © 2020 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.724	74	>75% Grass cover, Good, HSG C (Pre 1A, Pre 1B, Pre 2A, Pre 3, Pre 4)
1.143	98	Paved parking, HSG C (Pre 1A, Pre 1B, Pre 2A, Pre 3, Pre 4)
0.346	98	Roofs, HSG C (Pre 1A, Pre 1B, Pre 2A, Pre 2B, Pre 3, Pre 4)
0.799	70	Woods, Good, HSG C (Pre 1A, Pre 2A)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

SubcatchmentPre 1A: Pre 1A Runoff Area=84,149 sf 25.13% Impervious Runoff Depth=1.42"
Flow Length=465' Slope=0.0360 '/' Tc=9.7 min CN=WQ Runoff=2.53 cfs 0.229 af

SubcatchmentPre 1B: Pre 1B Runoff Area=32,952 sf 24.30% Impervious Runoff Depth=1.49"
Flow Length=155' Slope=0.0300 '/' Tc=4.1 min CN=WQ Runoff=1.27 cfs 0.094 af

SubcatchmentPre 2A: Pre 2A Runoff Area=43,695 sf 58.46% Impervious Runoff Depth=2.14"
Flow Length=173' Slope=0.0150 '/' Tc=4.8 min CN=WQ Runoff=2.31 cfs 0.179 af

SubcatchmentPre 2B: Pre 2B Runoff Area=2,798 sf 100.00% Impervious Runoff Depth=2.95"
Flow Length=37' Slope=0.0100 '/' Tc=1.1 min CN=WQ Runoff=0.22 cfs 0.016 af

SubcatchmentPre 3: Pre 3 Runoff Area=3,249 sf 51.92% Impervious Runoff Depth=2.02"
Flow Length=44' Slope=0.0450 '/' Tc=1.0 min CN=WQ Runoff=0.18 cfs 0.013 af

SubcatchmentPre 4: Pre 4 Runoff Area=51,513 sf 11.10% Impervious Runoff Depth=1.24"
Flow Length=340' Slope=0.0450 '/' Tc=6.9 min CN=WQ Runoff=1.53 cfs 0.122 af

Reach Great Road: Great Road Inflow=2.52 cfs 0.195 af
Outflow=2.52 cfs 0.195 af

Reach Pre: Pre Inflow=2.67 cfs 0.208 af
Outflow=2.67 cfs 0.208 af

Reach Robinson Road: Robinson Road Inflow=0.18 cfs 0.013 af
Outflow=0.18 cfs 0.013 af

Pond 14P: 12" RCP to Street Peak Elev=272.97' Inflow=0.22 cfs 0.016 af
12.0" Round Culvert n=0.013 L=30.0' S=0.0100 '/' Outflow=0.22 cfs 0.016 af

Pond Pond 1B: Pond 1B Peak Elev=278.20' Storage=1,445 cf Inflow=1.27 cfs 0.094 af
Discarded=0.02 cfs 0.041 af Primary=0.74 cfs 0.048 af Outflow=0.76 cfs 0.089 af

Pond Pre Pond 1A: Pre Pond 1A Peak Elev=277.05' Storage=11,732 cf Inflow=4.52 cfs 0.399 af
Discarded=0.15 cfs 0.339 af Primary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.339 af

Summary for Subcatchment Pre 1A: Pre 1A

Runoff = 2.53 cfs @ 12.14 hrs, Volume= 0.229 af, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR NOAA Rainfall=3.18"

Area (sf)	CN	Description
2,349	98	Roofs, HSG C
18,796	98	Paved parking, HSG C
29,044	74	>75% Grass cover, Good, HSG C
33,960	70	Woods, Good, HSG C
84,149		Weighted Average
63,004	72	74.87% Pervious Area
21,145	98	25.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	465	0.0360	0.80		**Lag/CN Method, Pre 1A**

Summary for Subcatchment Pre 1B: Pre 1B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.27 cfs @ 12.06 hrs, Volume= 0.094 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR NOAA Rainfall=3.18"

Area (sf)	CN	Description
2,684	98	Roofs, HSG C
5,324	98	Paved parking, HSG C
24,944	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
32,952		Weighted Average
24,944	74	75.70% Pervious Area
8,008	98	24.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	155	0.0300	0.63		**Lag/CN Method, Pre 1B**

Summary for Subcatchment Pre 2A: Pre 2A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.31 cfs @ 12.07 hrs, Volume= 0.179 af, Depth= 2.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR NOAA Rainfall=3.18"

Area (sf)	CN	Description
3,784	98	Roofs, HSG C
21,760	98	Paved parking, HSG C
17,314	74	>75% Grass cover, Good, HSG C
837	70	Woods, Good, HSG C
43,695		Weighted Average
18,151	74	41.54% Pervious Area
25,544	98	58.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	173	0.0150	0.60		**Lag/CN Method, Pre 2**

Summary for Subcatchment Pre 2B: Pre 2B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.22 cfs @ 12.01 hrs, Volume= 0.016 af, Depth= 2.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR NOAA Rainfall=3.18"

Area (sf)	CN	Description
2,798	98	Roofs, HSG C
0	98	Paved parking, HSG C
0	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
2,798		Weighted Average
2,798	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	37	0.0100	0.57		**Lag/CN Method, Pre 2B**

Summary for Subcatchment Pre 3: Pre 3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.18 cfs @ 12.02 hrs, Volume= 0.013 af, Depth= 2.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR NOAA Rainfall=3.18"

Area (sf)	CN	Description
901	98	Roofs, HSG C
786	98	Paved parking, HSG C
1,562	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
3,249		Weighted Average
1,562	74	48.08% Pervious Area
1,687	98	51.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	44	0.0450	0.73		**Lag/CN Method, Pre 3**

Summary for Subcatchment Pre 4: Pre 4

Runoff = 1.53 cfs @ 12.11 hrs, Volume= 0.122 af, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR NOAA Rainfall=3.18"

Area (sf)	CN	Description
2,572	98	Roofs, HSG C
3,144	98	Paved parking, HSG C
45,797	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
51,513		Weighted Average
45,797	74	88.90% Pervious Area
5,716	98	11.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	340	0.0450	0.82		**Lag/CN Method, Pre 4**

Summary for Reach Great Road: Great Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.938 ac, 29.39% Impervious, Inflow Depth = 0.47" for 2-YR NOAA event
Inflow = 2.52 cfs @ 12.07 hrs, Volume= 0.195 af
Outflow = 2.52 cfs @ 12.12 hrs, Volume= 0.195 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Pre: Pre

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.013 ac, 29.72% Impervious, Inflow Depth = 0.50" for 2-YR NOAA event
Inflow = 2.67 cfs @ 12.12 hrs, Volume= 0.208 af
Outflow = 2.67 cfs @ 12.17 hrs, Volume= 0.208 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Robinson Road: Robinson Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.075 ac, 51.92% Impervious, Inflow Depth = 2.02" for 2-YR NOAA event
Inflow = 0.18 cfs @ 12.02 hrs, Volume= 0.013 af
Outflow = 0.18 cfs @ 12.07 hrs, Volume= 0.013 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond 14P: 12" RCP to Street

[57] Hint: Peaked at 272.97' (Flood elevation advised)

Inflow Area = 0.064 ac,100.00% Impervious, Inflow Depth = 2.95" for 2-YR NOAA event
Inflow = 0.22 cfs @ 12.01 hrs, Volume= 0.016 af
Outflow = 0.22 cfs @ 12.06 hrs, Volume= 0.016 af, Atten= 0%, Lag= 3.0 min
Primary = 0.22 cfs @ 12.06 hrs, Volume= 0.016 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 272.97' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.73'	**12.0" Round Culvert** L= 30.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.73' / 272.43' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.21 cfs @ 12.06 hrs HW=272.96' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.21 cfs @ 2.28 fps)

Summary for Pond Pond 1B: Pond 1B

Inflow Area = 0.756 ac, 24.30% Impervious, Inflow Depth = 1.49" for 2-YR NOAA event
Inflow = 1.27 cfs @ 12.06 hrs, Volume= 0.094 af
Outflow = 0.76 cfs @ 12.21 hrs, Volume= 0.089 af, Atten= 40%, Lag= 8.4 min
Discarded = 0.02 cfs @ 12.21 hrs, Volume= 0.041 af
Primary = 0.74 cfs @ 12.21 hrs, Volume= 0.048 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 278.20' @ 12.21 hrs Surf.Area= 3,094 sf Storage= 1,445 cf

Plug-Flow detention time= 374.6 min calculated for 0.089 af (94% of inflow)
Center-of-Mass det. time= 344.5 min (1,154.3 - 809.8)

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	2,558 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.00	71	0	0
277.50	672	186	186
278.00	2,215	722	908
278.50	4,385	1,650	2,558

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	278.10'	**8.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 12.21 hrs HW=278.20' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.73 cfs @ 12.21 hrs HW=278.20' TW=276.64' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 0.73 cfs @ 0.89 fps)

Summary for Pond Pre Pond 1A: Pre Pond 1A

[86] Warning: Oscillations may require smaller dt (severity=35)

Inflow Area = 3.871 ac, 20.68% Impervious, Inflow Depth = 1.24" for 2-YR NOAA event
Inflow = 4.52 cfs @ 12.15 hrs, Volume= 0.399 af
Outflow = 0.15 cfs @ 17.52 hrs, Volume= 0.339 af, Atten= 97%, Lag= 322.3 min
Discarded = 0.15 cfs @ 17.52 hrs, Volume= 0.339 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 277.05' @ 17.52 hrs Surf.Area= 23,590 sf Storage= 11,732 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 736.5 min (1,558.5 - 821.9)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	47,715 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
276.00	4,053	0	0
276.50	8,187	3,060	3,060
277.00	22,091	7,570	10,630
277.50	37,615	14,927	25,556
278.00	51,019	22,159	47,715

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	277.50'	**30.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.15 cfs @ 17.52 hrs HW=277.05' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=276.00' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

SubcatchmentPre 1A: Pre 1A Runoff Area=84,149 sf 25.13% Impervious Runoff Depth=2.76"
Flow Length=465' Slope=0.0360 '/' Tc=9.7 min CN=WQ Runoff=5.11 cfs 0.444 af

SubcatchmentPre 1B: Pre 1B Runoff Area=32,952 sf 24.30% Impervious Runoff Depth=2.87"
Flow Length=155' Slope=0.0300 '/' Tc=4.1 min CN=WQ Runoff=2.52 cfs 0.181 af

SubcatchmentPre 2A: Pre 2A Runoff Area=43,695 sf 58.46% Impervious Runoff Depth=3.68"
Flow Length=173' Slope=0.0150 '/' Tc=4.8 min CN=WQ Runoff=3.98 cfs 0.307 af

SubcatchmentPre 2B: Pre 2B Runoff Area=2,798 sf 100.00% Impervious Runoff Depth=4.67"
Flow Length=37' Slope=0.0100 '/' Tc=1.1 min CN=WQ Runoff=0.34 cfs 0.025 af

SubcatchmentPre 3: Pre 3 Runoff Area=3,249 sf 51.92% Impervious Runoff Depth=3.53"
Flow Length=44' Slope=0.0450 '/' Tc=1.0 min CN=WQ Runoff=0.31 cfs 0.022 af

SubcatchmentPre 4: Pre 4 Runoff Area=51,513 sf 11.10% Impervious Runoff Depth=2.56"
Flow Length=340' Slope=0.0450 '/' Tc=6.9 min CN=WQ Runoff=3.29 cfs 0.252 af

Reach Great Road: Great Road Inflow=4.32 cfs 0.349 af
Outflow=4.32 cfs 0.349 af

Reach Pre: Pre Inflow=4.57 cfs 0.371 af
Outflow=4.57 cfs 0.371 af

Reach Robinson Road: Robinson Road Inflow=0.31 cfs 0.022 af
Outflow=0.31 cfs 0.022 af

Pond 14P: 12" RCP to Street Peak Elev=273.03' Inflow=0.34 cfs 0.025 af
12.0" Round Culvert n=0.013 L=30.0' S=0.0100 '/' Outflow=0.34 cfs 0.025 af

Pond Pond 1B: Pond 1B Peak Elev=278.32' Storage=1,844 cf Inflow=2.52 cfs 0.181 af
Discarded=0.02 cfs 0.043 af Primary=2.34 cfs 0.133 af Outflow=2.36 cfs 0.176 af

Pond Pre Pond 1A: Pre Pond 1A Peak Elev=277.51' Storage=25,963 cf Inflow=10.61 cfs 0.829 af
Discarded=0.24 cfs 0.603 af Primary=0.09 cfs 0.017 af Outflow=0.33 cfs 0.620 af

Summary for Subcatchment Pre 1A: Pre 1A

Runoff = 5.11 cfs @ 12.14 hrs, Volume= 0.444 af, Depth= 2.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR-NOAA Rainfall=4.91"

Area (sf)	CN	Description
2,349	98	Roofs, HSG C
18,796	98	Paved parking, HSG C
29,044	74	>75% Grass cover, Good, HSG C
33,960	70	Woods, Good, HSG C
84,149		Weighted Average
63,004	72	74.87% Pervious Area
21,145	98	25.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	465	0.0360	0.80		**Lag/CN Method, Pre 1A**

Summary for Subcatchment Pre 1B: Pre 1B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.52 cfs @ 12.06 hrs, Volume= 0.181 af, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR-NOAA Rainfall=4.91"

Area (sf)	CN	Description
2,684	98	Roofs, HSG C
5,324	98	Paved parking, HSG C
24,944	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
32,952		Weighted Average
24,944	74	75.70% Pervious Area
8,008	98	24.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	155	0.0300	0.63		**Lag/CN Method, Pre 1B**

Summary for Subcatchment Pre 2A: Pre 2A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 3.98 cfs @ 12.07 hrs, Volume= 0.307 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR-NOAA Rainfall=4.91"

Area (sf)	CN	Description
3,784	98	Roofs, HSG C
21,760	98	Paved parking, HSG C
17,314	74	>75% Grass cover, Good, HSG C
837	70	Woods, Good, HSG C
43,695		Weighted Average
18,151	74	41.54% Pervious Area
25,544	98	58.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	173	0.0150	0.60		**Lag/CN Method, Pre 2**

Summary for Subcatchment Pre 2B: Pre 2B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.34 cfs @ 12.01 hrs, Volume= 0.025 af, Depth= 4.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR-NOAA Rainfall=4.91"

Area (sf)	CN	Description
2,798	98	Roofs, HSG C
0	98	Paved parking, HSG C
0	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
2,798		Weighted Average
2,798	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	37	0.0100	0.57		**Lag/CN Method, Pre 2B**

Summary for Subcatchment Pre 3: Pre 3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.31 cfs @ 12.01 hrs, Volume= 0.022 af, Depth= 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR-NOAA Rainfall=4.91"

Area (sf)	CN	Description
901	98	Roofs, HSG C
786	98	Paved parking, HSG C
1,562	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
3,249		Weighted Average
1,562	74	48.08% Pervious Area
1,687	98	51.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	44	0.0450	0.73		**Lag/CN Method, Pre 3**

Summary for Subcatchment Pre 4: Pre 4

Runoff = 3.29 cfs @ 12.10 hrs, Volume= 0.252 af, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR-NOAA Rainfall=4.91"

Area (sf)	CN	Description
2,572	98	Roofs, HSG C
3,144	98	Paved parking, HSG C
45,797	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
51,513		Weighted Average
45,797	74	88.90% Pervious Area
5,716	98	11.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	340	0.0450	0.82		**Lag/CN Method, Pre 4**

Summary for Reach Great Road: Great Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.938 ac, 29.39% Impervious, Inflow Depth = 0.85" for 10-YR-NOAA event
Inflow = 4.32 cfs @ 12.07 hrs, Volume= 0.349 af
Outflow = 4.32 cfs @ 12.12 hrs, Volume= 0.349 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Pre: Pre

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.013 ac, 29.72% Impervious, Inflow Depth = 0.89" for 10-YR-NOAA event
Inflow = 4.57 cfs @ 12.12 hrs, Volume= 0.371 af
Outflow = 4.57 cfs @ 12.17 hrs, Volume= 0.371 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Robinson Road: Robinson Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.075 ac, 51.92% Impervious, Inflow Depth = 3.53" for 10-YR-NOAA event
Inflow = 0.31 cfs @ 12.01 hrs, Volume= 0.022 af
Outflow = 0.31 cfs @ 12.06 hrs, Volume= 0.022 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond 14P: 12" RCP to Street

[57] Hint: Peaked at 273.03' (Flood elevation advised)

Inflow Area = 0.064 ac,100.00% Impervious, Inflow Depth = 4.67" for 10-YR-NOAA event
Inflow = 0.34 cfs @ 12.01 hrs, Volume= 0.025 af
Outflow = 0.34 cfs @ 12.06 hrs, Volume= 0.025 af, Atten= 0%, Lag= 3.0 min
Primary = 0.34 cfs @ 12.06 hrs, Volume= 0.025 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 273.03' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.73'	**12.0" Round Culvert** L= 30.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.73' / 272.43' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.33 cfs @ 12.06 hrs HW=273.02' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.33 cfs @ 2.55 fps)

Summary for Pond Pond 1B: Pond 1B

Inflow Area = 0.756 ac, 24.30% Impervious, Inflow Depth = 2.87" for 10-YR-NOAA event
Inflow = 2.52 cfs @ 12.06 hrs, Volume= 0.181 af
Outflow = 2.36 cfs @ 12.12 hrs, Volume= 0.176 af, Atten= 6%, Lag= 3.7 min
Discarded = 0.02 cfs @ 12.12 hrs, Volume= 0.043 af
Primary = 2.34 cfs @ 12.12 hrs, Volume= 0.133 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 278.32' @ 12.12 hrs Surf.Area= 3,611 sf Storage= 1,844 cf

Plug-Flow detention time= 203.9 min calculated for 0.175 af (97% of inflow)
Center-of-Mass det. time= 187.5 min (988.5 - 801.0)

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	2,558 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.00	71	0	0
277.50	672	186	186
278.00	2,215	722	908
278.50	4,385	1,650	2,558

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	278.10'	**8.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 12.12 hrs HW=278.32' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=2.25 cfs @ 12.12 hrs HW=278.32' TW=276.92' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 2.25 cfs @ 1.30 fps)

Summary for Pond Pre Pond 1A: Pre Pond 1A

[86] Warning: Oscillations may require smaller dt (severity=18)

Inflow Area = 3.871 ac, 20.68% Impervious, Inflow Depth = 2.57" for 10-YR-NOAA event
Inflow = 10.61 cfs @ 12.12 hrs, Volume= 0.829 af
Outflow = 0.33 cfs @ 16.84 hrs, Volume= 0.620 af, Atten= 97%, Lag= 283.3 min
Discarded = 0.24 cfs @ 16.84 hrs, Volume= 0.603 af
Primary = 0.09 cfs @ 16.84 hrs, Volume= 0.017 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 277.51' @ 16.84 hrs Surf.Area= 37,904 sf Storage= 25,963 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 815.3 min (1,628.8 - 813.5)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	47,715 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
276.00	4,053	0	0
276.50	8,187	3,060	3,060
277.00	22,091	7,570	10,630
277.50	37,615	14,927	25,556
278.00	51,019	22,159	47,715

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	277.50'	**30.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.24 cfs @ 16.84 hrs HW=277.51' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.24 cfs)

Primary OutFlow Max=0.09 cfs @ 16.84 hrs HW=277.51' TW=0.00' (Dynamic Tailwater)
└—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.09 cfs @ 0.29 fps)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

SubcatchmentPre 1A: Pre 1A Runoff Area=84,149 sf 25.13% Impervious Runoff Depth=3.67"
Flow Length=465' Slope=0.0360 '/' Tc=9.7 min CN=WQ Runoff=6.85 cfs 0.591 af

SubcatchmentPre 1B: Pre 1B Runoff Area=32,952 sf 24.30% Impervious Runoff Depth=3.80"
Flow Length=155' Slope=0.0300 '/' Tc=4.1 min CN=WQ Runoff=3.36 cfs 0.240 af

SubcatchmentPre 2A: Pre 2A Runoff Area=43,695 sf 58.46% Impervious Runoff Depth=4.67"
Flow Length=173' Slope=0.0150 '/' Tc=4.8 min CN=WQ Runoff=5.05 cfs 0.391 af

SubcatchmentPre 2B: Pre 2B Runoff Area=2,798 sf 100.00% Impervious Runoff Depth=5.75"
Flow Length=37' Slope=0.0100 '/' Tc=1.1 min CN=WQ Runoff=0.42 cfs 0.031 af

SubcatchmentPre 3: Pre 3 Runoff Area=3,249 sf 51.92% Impervious Runoff Depth=4.51"
Flow Length=44' Slope=0.0450 '/' Tc=1.0 min CN=WQ Runoff=0.40 cfs 0.028 af

SubcatchmentPre 4: Pre 4 Runoff Area=51,513 sf 11.10% Impervious Runoff Depth=3.46"
Flow Length=340' Slope=0.0450 '/' Tc=6.9 min CN=WQ Runoff=4.48 cfs 0.341 af

Reach Great Road: Great Road Inflow=5.47 cfs 0.701 af
Outflow=5.47 cfs 0.701 af

Reach Pre: Pre Inflow=5.79 cfs 0.729 af
Outflow=5.79 cfs 0.729 af

Reach Robinson Road: Robinson Road Inflow=0.40 cfs 0.028 af
Outflow=0.40 cfs 0.028 af

Pond 14P: 12" RCP to Street Peak Elev=273.07' Inflow=0.42 cfs 0.031 af
12.0" Round Culvert n=0.013 L=30.0' S=0.0100 '/' Outflow=0.42 cfs 0.031 af

Pond Pond 1B: Pond 1B Peak Elev=278.37' Storage=2,026 cf Inflow=3.36 cfs 0.240 af
Discarded=0.02 cfs 0.044 af Primary=3.19 cfs 0.190 af Outflow=3.21 cfs 0.234 af

Pond Pre Pond 1A: Pre Pond 1A Peak Elev=277.56' Storage=27,865 cf Inflow=14.35 cfs 1.122 af
Discarded=0.25 cfs 0.624 af Primary=1.24 cfs 0.279 af Outflow=1.48 cfs 0.903 af

Summary for Subcatchment Pre 1A: Pre 1A

Runoff = 6.85 cfs @ 12.14 hrs, Volume= 0.591 af, Depth= 3.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR NOAA Rainfall=5.99"

Area (sf)	CN	Description
2,349	98	Roofs, HSG C
18,796	98	Paved parking, HSG C
29,044	74	>75% Grass cover, Good, HSG C
33,960	70	Woods, Good, HSG C
84,149		Weighted Average
63,004	72	74.87% Pervious Area
21,145	98	25.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	465	0.0360	0.80		**Lag/CN Method, Pre 1A**

Summary for Subcatchment Pre 1B: Pre 1B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 3.36 cfs @ 12.06 hrs, Volume= 0.240 af, Depth= 3.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR NOAA Rainfall=5.99"

Area (sf)	CN	Description
2,684	98	Roofs, HSG C
5,324	98	Paved parking, HSG C
24,944	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
32,952		Weighted Average
24,944	74	75.70% Pervious Area
8,008	98	24.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	155	0.0300	0.63		**Lag/CN Method, Pre 1B**

Summary for Subcatchment Pre 2A: Pre 2A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 5.05 cfs @ 12.07 hrs, Volume= 0.391 af, Depth= 4.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR NOAA Rainfall=5.99"

Area (sf)	CN	Description
3,784	98	Roofs, HSG C
21,760	98	Paved parking, HSG C
17,314	74	>75% Grass cover, Good, HSG C
837	70	Woods, Good, HSG C
43,695		Weighted Average
18,151	74	41.54% Pervious Area
25,544	98	58.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	173	0.0150	0.60		**Lag/CN Method, Pre 2**

Summary for Subcatchment Pre 2B: Pre 2B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.42 cfs @ 12.01 hrs, Volume= 0.031 af, Depth= 5.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR NOAA Rainfall=5.99"

Area (sf)	CN	Description
2,798	98	Roofs, HSG C
0	98	Paved parking, HSG C
0	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
2,798		Weighted Average
2,798	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	37	0.0100	0.57		**Lag/CN Method, Pre 2B**

Summary for Subcatchment Pre 3: Pre 3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.40 cfs @ 12.01 hrs, Volume= 0.028 af, Depth= 4.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR NOAA Rainfall=5.99"

Area (sf)	CN	Description
901	98	Roofs, HSG C
786	98	Paved parking, HSG C
1,562	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
3,249		Weighted Average
1,562	74	48.08% Pervious Area
1,687	98	51.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	44	0.0450	0.73		**Lag/CN Method, Pre 3**

Summary for Subcatchment Pre 4: Pre 4

Runoff = 4.48 cfs @ 12.10 hrs, Volume= 0.341 af, Depth= 3.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR NOAA Rainfall=5.99"

Area (sf)	CN	Description
2,572	98	Roofs, HSG C
3,144	98	Paved parking, HSG C
45,797	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
51,513		Weighted Average
45,797	74	88.90% Pervious Area
5,716	98	11.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	340	0.0450	0.82		**Lag/CN Method, Pre 4**

Summary for Reach Great Road: Great Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.938 ac, 29.39% Impervious, Inflow Depth = 1.70" for 25-YR NOAA event
Inflow = 5.47 cfs @ 12.07 hrs, Volume= 0.701 af
Outflow = 5.47 cfs @ 12.12 hrs, Volume= 0.701 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Pre: Pre

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.013 ac, 29.72% Impervious, Inflow Depth = 1.74" for 25-YR NOAA event
Inflow = 5.79 cfs @ 12.12 hrs, Volume= 0.729 af
Outflow = 5.79 cfs @ 12.17 hrs, Volume= 0.729 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Robinson Road: Robinson Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.075 ac, 51.92% Impervious, Inflow Depth = 4.51" for 25-YR NOAA event
Inflow = 0.40 cfs @ 12.01 hrs, Volume= 0.028 af
Outflow = 0.40 cfs @ 12.06 hrs, Volume= 0.028 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond 14P: 12" RCP to Street

[57] Hint: Peaked at 273.07' (Flood elevation advised)

Inflow Area = 0.064 ac,100.00% Impervious, Inflow Depth = 5.75" for 25-YR NOAA event
Inflow = 0.42 cfs @ 12.01 hrs, Volume= 0.031 af
Outflow = 0.42 cfs @ 12.06 hrs, Volume= 0.031 af, Atten= 0%, Lag= 3.0 min
Primary = 0.42 cfs @ 12.06 hrs, Volume= 0.031 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 273.07' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.73'	**12.0" Round Culvert** L= 30.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.73' / 272.43' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.40 cfs @ 12.06 hrs HW=273.06' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.40 cfs @ 2.67 fps)

Summary for Pond Pond 1B: Pond 1B

Inflow Area = 0.756 ac, 24.30% Impervious, Inflow Depth = 3.80" for 25-YR NOAA event
Inflow = 3.36 cfs @ 12.06 hrs, Volume= 0.240 af
Outflow = 3.21 cfs @ 12.12 hrs, Volume= 0.234 af, Atten= 4%, Lag= 3.5 min
Discarded = 0.02 cfs @ 12.12 hrs, Volume= 0.044 af
Primary = 3.19 cfs @ 12.12 hrs, Volume= 0.190 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 278.37' @ 12.12 hrs Surf.Area= 3,823 sf Storage= 2,026 cf

Plug-Flow detention time= 159.2 min calculated for 0.234 af (98% of inflow)
Center-of-Mass det. time= 146.9 min (943.2 - 796.3)

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	2,558 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.00	71	0	0
277.50	672	186	186
278.00	2,215	722	908
278.50	4,385	1,650	2,558

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	278.10'	**8.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 12.12 hrs HW=278.36' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=3.06 cfs @ 12.12 hrs HW=278.36' TW=277.10' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 3.06 cfs @ 1.46 fps)

Summary for Pond Pre Pond 1A: Pre Pond 1A

[86] Warning: Oscillations may require smaller dt (severity=12)

Inflow Area = 3.871 ac, 20.68% Impervious, Inflow Depth = 3.48" for 25-YR NOAA event
Inflow = 14.35 cfs @ 12.12 hrs, Volume= 1.122 af
Outflow = 1.48 cfs @ 13.09 hrs, Volume= 0.903 af, Atten= 90%, Lag= 58.3 min
Discarded = 0.25 cfs @ 13.09 hrs, Volume= 0.624 af
Primary = 1.24 cfs @ 13.09 hrs, Volume= 0.279 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 277.56' @ 13.09 hrs Surf.Area= 39,226 sf Storage= 27,865 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 593.7 min (1,402.5 - 808.8)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	47,715 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
276.00	4,053	0	0
276.50	8,187	3,060	3,060
277.00	22,091	7,570	10,630
277.50	37,615	14,927	25,556
278.00	51,019	22,159	47,715

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	277.50'	**30.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.25 cfs @ 13.09 hrs HW=277.56' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.25 cfs)

Primary OutFlow Max=1.24 cfs @ 13.09 hrs HW=277.56' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 1.24 cfs @ 0.69 fps)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

SubcatchmentPre 1A: Pre 1A Runoff Area=84,149 sf 25.13% Impervious Runoff Depth=5.14"
Flow Length=465' Slope=0.0360 '/' Tc=9.7 min CN=WQ Runoff=9.63 cfs 0.828 af

SubcatchmentPre 1B: Pre 1B Runoff Area=32,952 sf 24.30% Impervious Runoff Depth=5.30"
Flow Length=155' Slope=0.0300 '/' Tc=4.1 min CN=WQ Runoff=4.68 cfs 0.334 af

SubcatchmentPre 2A: Pre 2A Runoff Area=43,695 sf 58.46% Impervious Runoff Depth=6.25"
Flow Length=173' Slope=0.0150 '/' Tc=4.8 min CN=WQ Runoff=6.75 cfs 0.522 af

SubcatchmentPre 2B: Pre 2B Runoff Area=2,798 sf 100.00% Impervious Runoff Depth=7.42"
Flow Length=37' Slope=0.0100 '/' Tc=1.1 min CN=WQ Runoff=0.54 cfs 0.040 af

SubcatchmentPre 3: Pre 3 Runoff Area=3,249 sf 51.92% Impervious Runoff Depth=6.08"
Flow Length=44' Slope=0.0450 '/' Tc=1.0 min CN=WQ Runoff=0.54 cfs 0.038 af

SubcatchmentPre 4: Pre 4 Runoff Area=51,513 sf 11.10% Impervious Runoff Depth=4.93"
Flow Length=340' Slope=0.0450 '/' Tc=6.9 min CN=WQ Runoff=6.38 cfs 0.486 af

Reach Great Road: Great Road Inflow=8.27 cfs 1.293 af
Outflow=8.27 cfs 1.293 af

Reach Pre: Pre Inflow=8.37 cfs 1.331 af
Outflow=8.37 cfs 1.331 af

Reach Robinson Road: Robinson Road Inflow=0.54 cfs 0.038 af
Outflow=0.54 cfs 0.038 af

Pond 14P: 12" RCP to Street Peak Elev=273.12' Inflow=0.54 cfs 0.040 af
12.0" Round Culvert n=0.013 L=30.0' S=0.0100 '/' Outflow=0.54 cfs 0.040 af

Pond Pond 1B: Pond 1B Peak Elev=278.44' Storage=2,297 cf Inflow=4.68 cfs 0.334 af
Discarded=0.03 cfs 0.046 af Primary=4.54 cfs 0.283 af Outflow=4.56 cfs 0.329 af

Pond Pre Pond 1A: Pre Pond 1A Peak Elev=277.68' Storage=32,890 cf Inflow=20.32 cfs 1.598 af
Discarded=0.27 cfs 0.640 af Primary=6.58 cfs 0.731 af Outflow=6.84 cfs 1.371 af

Summary for Subcatchment Pre 1A: Pre 1A

Runoff = 9.63 cfs @ 12.14 hrs, Volume= 0.828 af, Depth= 5.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR NOAA Rainfall=7.66"

Area (sf)	CN	Description
2,349	98	Roofs, HSG C
18,796	98	Paved parking, HSG C
29,044	74	>75% Grass cover, Good, HSG C
33,960	70	Woods, Good, HSG C
84,149		Weighted Average
63,004	72	74.87% Pervious Area
21,145	98	25.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	465	0.0360	0.80		**Lag/CN Method, Pre 1A**

Summary for Subcatchment Pre 1B: Pre 1B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 4.68 cfs @ 12.06 hrs, Volume= 0.334 af, Depth= 5.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR NOAA Rainfall=7.66"

Area (sf)	CN	Description
2,684	98	Roofs, HSG C
5,324	98	Paved parking, HSG C
24,944	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
32,952		Weighted Average
24,944	74	75.70% Pervious Area
8,008	98	24.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	155	0.0300	0.63		**Lag/CN Method, Pre 1B**

Summary for Subcatchment Pre 2A: Pre 2A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 6.75 cfs @ 12.07 hrs, Volume= 0.522 af, Depth= 6.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR NOAA Rainfall=7.66"

Area (sf)	CN	Description
3,784	98	Roofs, HSG C
21,760	98	Paved parking, HSG C
17,314	74	>75% Grass cover, Good, HSG C
837	70	Woods, Good, HSG C
43,695		Weighted Average
18,151	74	41.54% Pervious Area
25,544	98	58.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	173	0.0150	0.60		**Lag/CN Method, Pre 2**

Summary for Subcatchment Pre 2B: Pre 2B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.54 cfs @ 12.01 hrs, Volume= 0.040 af, Depth= 7.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR NOAA Rainfall=7.66"

Area (sf)	CN	Description
2,798	98	Roofs, HSG C
0	98	Paved parking, HSG C
0	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
2,798		Weighted Average
2,798	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	37	0.0100	0.57		**Lag/CN Method, Pre 2B**

Summary for Subcatchment Pre 3: Pre 3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.54 cfs @ 12.01 hrs, Volume= 0.038 af, Depth= 6.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR NOAA Rainfall=7.66"

Area (sf)	CN	Description
901	98	Roofs, HSG C
786	98	Paved parking, HSG C
1,562	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
3,249		Weighted Average
1,562	74	48.08% Pervious Area
1,687	98	51.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	44	0.0450	0.73		**Lag/CN Method, Pre 3**

Summary for Subcatchment Pre 4: Pre 4

Runoff = 6.38 cfs @ 12.10 hrs, Volume= 0.486 af, Depth= 4.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR NOAA Rainfall=7.66"

Area (sf)	CN	Description
2,572	98	Roofs, HSG C
3,144	98	Paved parking, HSG C
45,797	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
51,513		Weighted Average
45,797	74	88.90% Pervious Area
5,716	98	11.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	340	0.0450	0.82		**Lag/CN Method, Pre 4**

Summary for Reach Great Road: Great Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.938 ac, 29.39% Impervious, Inflow Depth = 3.14" for 100-YR NOAA event
Inflow = 8.27 cfs @ 12.43 hrs, Volume= 1.293 af
Outflow = 8.27 cfs @ 12.48 hrs, Volume= 1.293 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Pre: Pre

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.013 ac, 29.72% Impervious, Inflow Depth = 3.19" for 100-YR NOAA event
Inflow = 8.37 cfs @ 12.48 hrs, Volume= 1.331 af
Outflow = 8.37 cfs @ 12.53 hrs, Volume= 1.331 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Robinson Road: Robinson Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.075 ac, 51.92% Impervious, Inflow Depth = 6.08" for 100-YR NOAA event
Inflow = 0.54 cfs @ 12.01 hrs, Volume= 0.038 af
Outflow = 0.54 cfs @ 12.06 hrs, Volume= 0.038 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond 14P: 12" RCP to Street

[57] Hint: Peaked at 273.12' (Flood elevation advised)

Inflow Area = 0.064 ac,100.00% Impervious, Inflow Depth = 7.42" for 100-YR NOAA event
Inflow = 0.54 cfs @ 12.01 hrs, Volume= 0.040 af
Outflow = 0.54 cfs @ 12.06 hrs, Volume= 0.040 af, Atten= 0%, Lag= 3.0 min
Primary = 0.54 cfs @ 12.06 hrs, Volume= 0.040 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 273.12' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.73'	**12.0" Round Culvert** L= 30.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.73' / 272.43' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.51 cfs @ 12.06 hrs HW=273.11' TW=0.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.51 cfs @ 2.83 fps)

Summary for Pond Pond 1B: Pond 1B

Inflow Area = 0.756 ac, 24.30% Impervious, Inflow Depth = 5.30" for 100-YR NOAA event
Inflow = 4.68 cfs @ 12.06 hrs, Volume= 0.334 af
Outflow = 4.56 cfs @ 12.12 hrs, Volume= 0.329 af, Atten= 3%, Lag= 3.3 min
Discarded = 0.03 cfs @ 12.12 hrs, Volume= 0.046 af
Primary = 4.54 cfs @ 12.12 hrs, Volume= 0.283 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 278.44' @ 12.12 hrs Surf.Area= 4,119 sf Storage= 2,297 cf

Plug-Flow detention time= 121.1 min calculated for 0.329 af (98% of inflow)
Center-of-Mass det. time= 110.9 min (901.3 - 790.4)

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	2,558 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.00	71	0	0
277.50	672	186	186
278.00	2,215	722	908
278.50	4,385	1,650	2,558

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	278.10'	**8.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.03 cfs @ 12.12 hrs HW=278.43' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=4.36 cfs @ 12.12 hrs HW=278.43' TW=277.35' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 4.36 cfs @ 1.65 fps)

Summary for Pond Pre Pond 1A: Pre Pond 1A

Inflow Area = 3.871 ac, 20.68% Impervious, Inflow Depth = 4.95" for 100-YR NOAA event
Inflow = 20.32 cfs @ 12.12 hrs, Volume= 1.598 af
Outflow = 6.84 cfs @ 12.48 hrs, Volume= 1.371 af, Atten= 66%, Lag= 22.0 min
Discarded = 0.27 cfs @ 12.48 hrs, Volume= 0.640 af
Primary = 6.58 cfs @ 12.48 hrs, Volume= 0.731 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 277.68' @ 12.48 hrs Surf.Area= 42,522 sf Storage= 32,890 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 407.4 min (1,209.9 - 802.5)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	47,715 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
276.00	4,053	0	0
276.50	8,187	3,060	3,060
277.00	22,091	7,570	10,630
277.50	37,615	14,927	25,556
278.00	51,019	22,159	47,715

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	277.50'	**30.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00

Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.27 cfs @ 12.48 hrs HW=277.68' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.27 cfs)

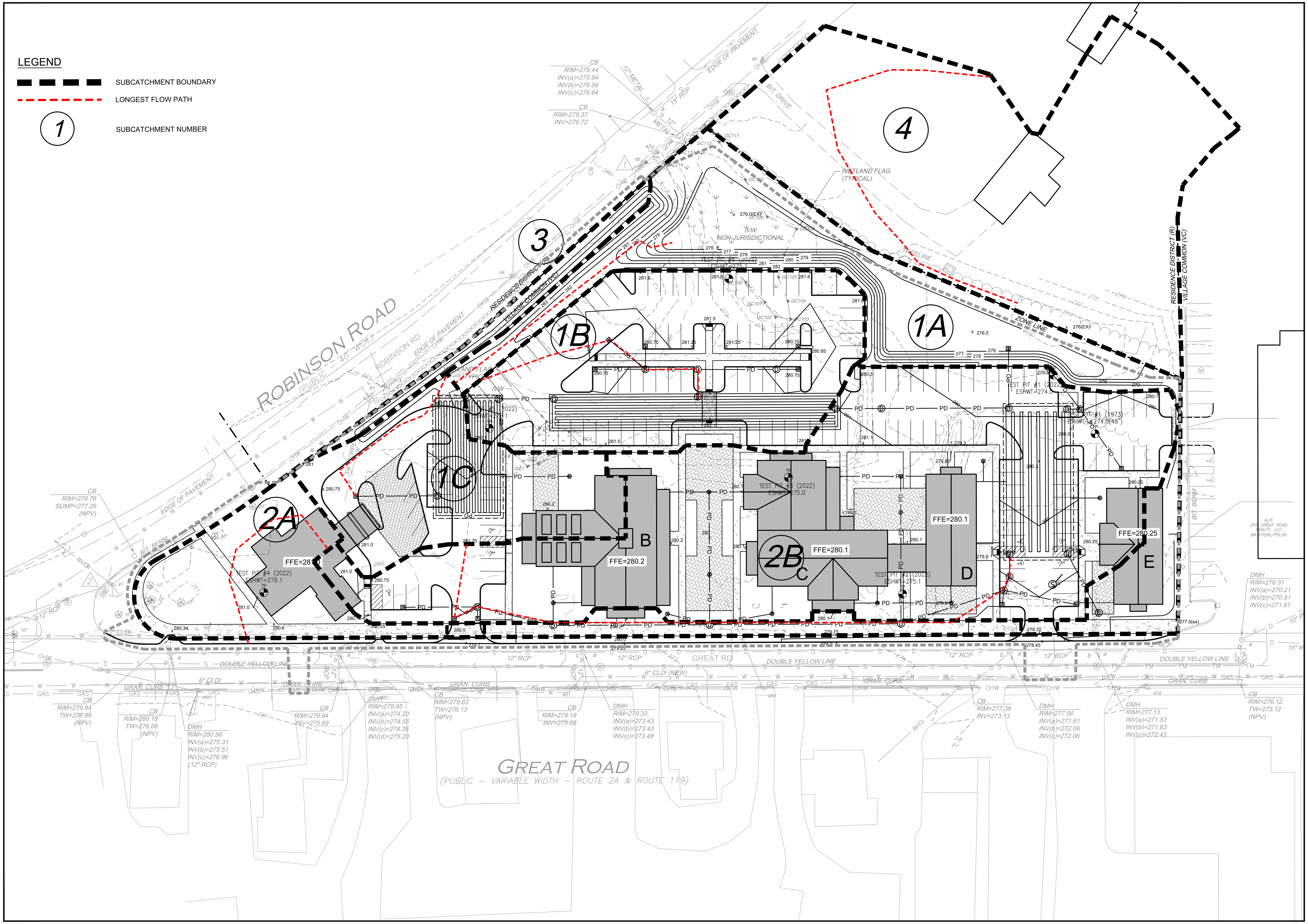
Primary OutFlow Max=6.55 cfs @ 12.48 hrs HW=277.68' TW=0.00' (Dynamic Tailwater)
└—**2=Broad-Crested Rectangular Weir** (Weir Controls 6.55 cfs @ 1.20 fps)

APPENDIX B

Post-Development Drainage Calculations

Northern Bank Town Common
Littleton, Massachusetts

Oak Consulting Group
Project 18017



Site:

NORTHERN BANK TOWN COMMON

265-289 GREAT ROAD
LITTLETON, MASSACHUSETTS

Prepared for:

NORTHERN BANK AND TRUST COMPANY

275 MISHAWUM ROAD
WOBURN, MASSACHUSETTS

SEAN P. MALONE CIVIL No. 48204

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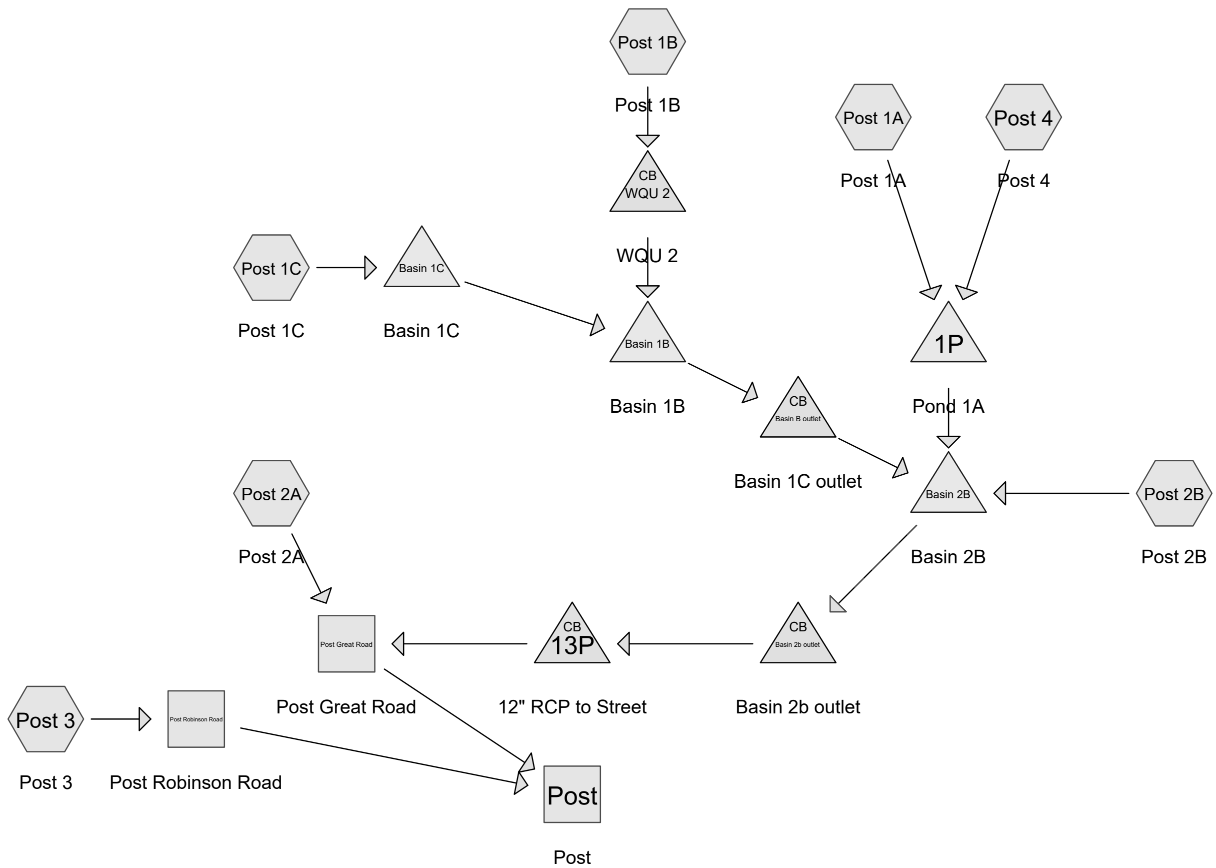
POST-DEVELOPMENT SUBCATCHMENT PLAN

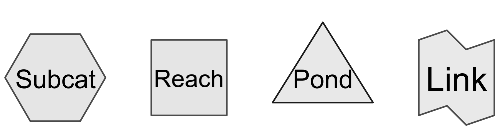
No.	Revision/Issue	Date

Design by: SPM	Checked by: SPM
Drawn by: SPM	Approved by: SPM
Project: 18017	Date: August 26, 2022

Sheet:

DR-02





Routing Diagram for 18017 Pre-post
Prepared by {enter your company name here}, Printed 8/24/2022
HydroCAD® 10.00-26 s/n 01151 © 2020 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.293	74	>75% Grass cover, Good, HSG C (Post 1A, Post 1B, Post 1C, Post 2A, Post 2B, Post 3, Post 4)
1.739	98	Paved parking, HSG C (Post 1B, Post 1C, Post 2A, Post 2B, Post 4)
0.105	74	Pervious Pavers, HSG C (Post 2A, Post 2B)
0.639	98	Roofs, HSG C (Post 1C, Post 2A, Post 2B, Post 4)
0.236	70	Woods, Good, HSG C (Post 1A)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

SubcatchmentPost 1A: Post 1A Runoff Area=24,084 sf 0.00% Impervious Runoff Depth=0.94"
Flow Length=41' Slope=0.0350 '/' Tc=1.7 min CN=WQ Runoff=0.62 cfs 0.043 af

SubcatchmentPost 1B: Post 1B Runoff Area=30,303 sf 85.46% Impervious Runoff Depth=2.67"
Flow Length=210' Slope=0.0150 '/' Tc=4.2 min CN=WQ Runoff=2.03 cfs 0.155 af

SubcatchmentPost 1C: Post 1C Runoff Area=17,604 sf 64.78% Impervious Runoff Depth=2.27"
Flow Length=128' Slope=0.0125 '/' Tc=3.9 min CN=WQ Runoff=1.02 cfs 0.076 af

SubcatchmentPost 2A: Post 2A Runoff Area=23,498 sf 59.30% Impervious Runoff Depth=2.16"
Flow Length=207' Slope=0.0150 '/' Tc=5.6 min CN=WQ Runoff=1.22 cfs 0.097 af

SubcatchmentPost 2B: Post 2B Runoff Area=68,249 sf 68.35% Impervious Runoff Depth=2.34"
Flow Length=479' Slope=0.0150 '/' Tc=10.1 min CN=WQ Runoff=3.33 cfs 0.305 af

SubcatchmentPost 3: Post 3 Runoff Area=3,105 sf 0.00% Impervious Runoff Depth=1.02"
Flow Length=20' Slope=0.2500 '/' Tc=0.3 min CN=WQ Runoff=0.09 cfs 0.006 af

SubcatchmentPost 4: Post 4 Runoff Area=51,513 sf 11.10% Impervious Runoff Depth=1.24"
Flow Length=340' Slope=0.0450 '/' Tc=6.9 min CN=WQ Runoff=1.53 cfs 0.122 af

Reach Post: Post Inflow=2.00 cfs 0.408 af
Outflow=2.00 cfs 0.408 af

Reach Post Great Road: Post Great Road Inflow=1.94 cfs 0.402 af
Outflow=1.94 cfs 0.402 af

Reach Post Robinson Road: Post Robinson Road Inflow=0.09 cfs 0.006 af
Outflow=0.09 cfs 0.006 af

Pond 1P: Pond 1A Peak Elev=276.38' Storage=4,164 cf Inflow=1.98 cfs 0.165 af
Discarded=0.08 cfs 0.184 af Primary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.184 af

Pond 13P: 12" RCP to Street Peak Elev=273.35' Inflow=1.24 cfs 0.305 af
12.0" Round Culvert n=0.013 L=30.0' S=0.0100 '/' Outflow=1.24 cfs 0.305 af

Pond Basin 1B: Basin 1B Peak Elev=278.72' Storage=4,563 cf Inflow=2.03 cfs 0.155 af
Discarded=0.03 cfs 0.124 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.124 af

Pond Basin 1C: Basin 1C Peak Elev=278.03' Storage=1,906 cf Inflow=1.02 cfs 0.076 af
Discarded=0.03 cfs 0.080 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.080 af

Pond Basin 2B: Basin 2B Peak Elev=274.18' Storage=3,409 cf Inflow=3.33 cfs 0.305 af
Primary=1.24 cfs 0.305 af Secondary=0.00 cfs 0.000 af Outflow=1.24 cfs 0.305 af

Pond Basin 2b outlet: Basin 2b outlet Peak Elev=273.64' Inflow=1.24 cfs 0.305 af
12.0" Round Culvert n=0.012 L=40.0' S=0.0050 '/' Outflow=1.24 cfs 0.305 af

Pond Basin B outlet: Basin 1C outlet Peak Elev=276.10' Inflow=0.00 cfs 0.000 af
15.0" Round Culvert n=0.012 L=86.0' S=0.0360 '/' Outflow=0.00 cfs 0.000 af

Pond WQU 2: WQU 2 Peak Elev=278.72' Inflow=2.03 cfs 0.155 af
18.0" Round Culvert n=0.012 L=20.0' S=0.0050 '/' Outflow=2.03 cfs 0.155 af

Summary for Subcatchment Post 1A: Post 1A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.62 cfs @ 12.04 hrs, Volume= 0.043 af, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR NOAA Rainfall=3.18"

Area (sf)	CN	Description
0	98	Roofs, HSG C
0	98	Paved parking, HSG C
13,794	74	>75% Grass cover, Good, HSG C
10,290	70	Woods, Good, HSG C
24,084		Weighted Average
24,084	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	41	0.0350	0.41		**Lag/CN Method, Post 1A**

Summary for Subcatchment Post 1B: Post 1B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.03 cfs @ 12.06 hrs, Volume= 0.155 af, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR NOAA Rainfall=3.18"

Area (sf)	CN	Description
0	98	Roofs, HSG C
25,897	98	Paved parking, HSG C
4,406	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
30,303		Weighted Average
4,406	74	14.54% Pervious Area
25,897	98	85.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	210	0.0150	0.84		**Lag/CN Method, Post 1B**

Summary for Subcatchment Post 1C: Post 1C

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.02 cfs @ 12.06 hrs, Volume= 0.076 af, Depth= 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR NOAA Rainfall=3.18"

	Area (sf)	CN	Description
	2,014	98	Roofs, HSG C
	9,390	98	Paved parking, HSG C
	6,200	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	17,604		Weighted Average
	6,200	74	35.22% Pervious Area
	11,404	98	64.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	128	0.0125	0.55		**Lag/CN Method, Post 1C**

Summary for Subcatchment Post 2A: Post 2A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.22 cfs @ 12.08 hrs, Volume= 0.097 af, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR NOAA Rainfall=3.18"

	Area (sf)	CN	Description
	5,481	98	Roofs, HSG C
	8,454	98	Paved parking, HSG C
*	570	74	Pervious Pavers, HSG C
	8,993	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	23,498		Weighted Average
	9,563	74	40.70% Pervious Area
	13,935	98	59.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	207	0.0150	0.62		**Lag/CN Method, Post 2A**

Summary for Subcatchment Post 2B: Post 2B

Runoff = 3.33 cfs @ 12.14 hrs, Volume= 0.305 af, Depth= 2.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR NOAA Rainfall=3.18"

	Area (sf)	CN	Description
	17,786	98	Roofs, HSG C
	28,865	98	Paved parking, HSG C
*	4,014	74	Pervious Pavers, HSG C
	17,584	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	68,249		Weighted Average
	21,598	74	31.65% Pervious Area
	46,651	98	68.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	479	0.0150	0.79		**Lag/CN Method, Post 2B**

Summary for Subcatchment Post 3: Post 3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.09 cfs @ 12.01 hrs, Volume= 0.006 af, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR NOAA Rainfall=3.18"

Area (sf)	CN	Description
0	98	Roofs, HSG C
0	98	Paved parking, HSG C
3,105	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
3,105		Weighted Average
3,105	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.2500	1.00		**Lag/CN Method, Post 3**

Summary for Subcatchment Post 4: Post 4

Runoff = 1.53 cfs @ 12.11 hrs, Volume= 0.122 af, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR NOAA Rainfall=3.18"

Area (sf)	CN	Description
2,572	98	Roofs, HSG C
3,144	98	Paved parking, HSG C
45,797	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
51,513		Weighted Average
45,797	74	88.90% Pervious Area
5,716	98	11.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	340	0.0450	0.82		**Lag/CN Method, Pre 4**

Summary for Reach Post: Post

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.013 ac, 47.45% Impervious, Inflow Depth = 0.98" for 2-YR NOAA event
Inflow = 2.00 cfs @ 12.14 hrs, Volume= 0.408 af
Outflow = 2.00 cfs @ 12.19 hrs, Volume= 0.408 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Post Great Road: Post Great Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.941 ac, 48.13% Impervious, Inflow Depth = 0.98" for 2-YR NOAA event
Inflow = 1.94 cfs @ 12.10 hrs, Volume= 0.402 af
Outflow = 1.94 cfs @ 12.15 hrs, Volume= 0.402 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Post Robinson Road: Post Robinson Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.071 ac, 0.00% Impervious, Inflow Depth = 1.02" for 2-YR NOAA event
Inflow = 0.09 cfs @ 12.01 hrs, Volume= 0.006 af
Outflow = 0.09 cfs @ 12.06 hrs, Volume= 0.006 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Pond 1A

[86] Warning: Oscillations may require smaller dt (severity=95)

Inflow Area = 1.735 ac, 7.56% Impervious, Inflow Depth = 1.14" for 2-YR NOAA event
Inflow = 1.98 cfs @ 12.09 hrs, Volume= 0.165 af
Outflow = 0.08 cfs @ 17.04 hrs, Volume= 0.184 af, Atten= 96%, Lag= 297.3 min
Discarded = 0.08 cfs @ 17.04 hrs, Volume= 0.184 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 276.38' @ 17.04 hrs Surf.Area= 12,100 sf Storage= 4,164 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 470.4 min (1,313.1 - 842.7)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	32,320 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
276.00	9,903	0	0
276.50	12,805	5,677	5,677
277.00	15,998	7,201	12,878
277.50	19,310	8,827	21,705
278.00	23,151	10,615	32,320

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	277.50'	**2.0" x 2.0" Horiz. Orifice/Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.08 cfs @ 17.04 hrs HW=276.38' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=276.00' TW=273.00' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 13P: 12" RCP to Street

[57] Hint: Peaked at 273.35' (Flood elevation advised)

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth > 0.83" for 2-YR NOAA event
Inflow = 1.24 cfs @ 12.50 hrs, Volume= 0.305 af
Outflow = 1.24 cfs @ 12.55 hrs, Volume= 0.305 af, Atten= 0%, Lag= 3.0 min
Primary = 1.24 cfs @ 12.55 hrs, Volume= 0.305 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 273.35' @ 12.55 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.73'	**12.0" Round Culvert** L= 30.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.73' / 272.43' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.24 cfs @ 12.55 hrs HW=273.35' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.24 cfs @ 3.43 fps)

Summary for Pond Basin 1B: Basin 1B

[86] Warning: Oscillations may require smaller dt (severity=44)
[80] Warning: Exceeded Pond Basin 1C by 0.97' @ 40.05 hrs (0.40 cfs 3.380 af)
[80] Warning: Exceeded Pond WQU 2 by 0.03' @ 12.60 hrs (0.50 cfs 0.145 af)

Inflow Area =	1.100 ac, 77.86% Impervious,	Inflow Depth = 1.69"	for 2-YR NOAA event	
Inflow =	2.03 cfs @	12.11 hrs, Volume=	0.155 af	
Outflow =	0.03 cfs @	1.40 hrs, Volume=	0.124 af,	Atten= 98%, Lag= 0.0 min
Discarded =	0.03 cfs @	1.40 hrs, Volume=	0.124 af	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 278.72' @ 18.13 hrs Surf.Area= 5,408 sf Storage= 4,563 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 784.5 min (1,548.4 - 763.9)

Volume	Invert	Avail.Storage	Storage Description
#1	277.10'	4,529 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 13,520 cf Overall - 2,198 cf Embedded = 11,322 cf x 40.0% Voids
#2	277.60'	2,198 cf	**18.0" Round Pipe Storage** Inside #1 L= 1,244.0'
		6,727 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.10	5,408	0	0
279.60	5,408	13,520	13,520

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.10'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	279.00'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.03 cfs @ 1.40 hrs HW=277.10' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=277.10' TW=276.10' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond Basin 1C: Basin 1C

[86] Warning: Oscillations may require smaller dt (severity=64)

Inflow Area =	0.404 ac, 64.78% Impervious,	Inflow Depth = 2.27"	for 2-YR NOAA event	
Inflow =	1.02 cfs @	12.06 hrs, Volume=	0.076 af	
Outflow =	0.03 cfs @	1.35 hrs, Volume=	0.080 af,	Atten= 97%, Lag= 0.0 min
Discarded =	0.03 cfs @	1.35 hrs, Volume=	0.080 af	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 278.03' @ 16.35 hrs Surf.Area= 4,400 sf Storage= 1,906 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 557.0 min (1,328.4 - 771.4)

Volume	Invert	Avail.Storage	Storage Description
#1	277.10'	3,656 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 11,000 cf Overall - 1,859 cf Embedded = 9,141 cf x 40.0% Voids
#2	277.60'	1,859 cf	**18.0" Round Pipe Storage** Inside #1 L= 1,052.0'
		5,515 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.10	4,400	0	0
279.60	4,400	11,000	11,000

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.10'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	277.60'	**12.0" Round Culvert** L= 35.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 277.60' / 277.60' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Discarded OutFlow Max=0.03 cfs @ 1.35 hrs HW=277.10' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=277.10' TW=277.10' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.00 cfs)

Summary for Pond Basin 2B: Basin 2B

Inflow Area =	4.402 ac, 46.76% Impervious, Inflow Depth = 0.83" for 2-YR NOAA event			
Inflow =	3.33 cfs @	12.14 hrs, Volume=	0.305 af	
Outflow =	1.24 cfs @	12.45 hrs, Volume=	0.305 af,	Atten= 63%, Lag= 18.5 min
Primary =	1.24 cfs @	12.45 hrs, Volume=	0.305 af	
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 274.18' @ 12.49 hrs Surf.Area= 5,600 sf Storage= 3,409 cf

Plug-Flow detention time= 52.9 min calculated for 0.305 af (100% of inflow)
Center-of-Mass det. time= 53.1 min (828.1 - 775.0)

Volume	Invert	Avail.Storage	Storage Description
#1	273.00'	6,696 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 28,000 cf Overall - 11,259 cf Embedded = 16,741 cf x 40.0% Voids
#2	273.50'	11,259 cf	**48.0" Round Pipe Storage** Inside #1 L= 896.0'
		17,956 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
273.00	5,600	0	0
278.00	5,600	28,000	28,000

Device	Routing	Invert	Outlet Devices
#1	Secondary	277.50'	**6.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	273.00'	**8.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.23 cfs @ 12.45 hrs HW=274.18' TW=273.64' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Orifice Controls 1.23 cfs @ 3.53 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=273.00' TW=272.90' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond Basin 2b outlet: Basin 2b outlet

[57] Hint: Peaked at 273.64' (Flood elevation advised)

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth > 0.83" for 2-YR NOAA event
Inflow = 1.24 cfs @ 12.45 hrs, Volume= 0.305 af
Outflow = 1.24 cfs @ 12.50 hrs, Volume= 0.305 af, Atten= 0%, Lag= 3.0 min
Primary = 1.24 cfs @ 12.50 hrs, Volume= 0.305 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 273.64' @ 12.52 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.90'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.90' / 272.70' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=1.23 cfs @ 12.50 hrs HW=273.64' TW=273.35' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.23 cfs @ 2.74 fps)

Summary for Pond Basin B outlet: Basin 1C outlet

[57] Hint: Peaked at 276.10' (Flood elevation advised)

Inflow Area = 1.100 ac, 77.86% Impervious, Inflow Depth = 0.00" for 2-YR NOAA event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 276.10' @ 0.00 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	276.10'	**15.0" Round Culvert** L= 86.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 276.10' / 273.00' S= 0.0360 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=276.10' TW=273.00' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)

Summary for Pond WQU 2: WQU 2

[57] Hint: Peaked at 278.72' (Flood elevation advised)

Inflow Area = 0.696 ac, 85.46% Impervious, Inflow Depth = 2.67" for 2-YR NOAA event
Inflow = 2.03 cfs @ 12.06 hrs, Volume= 0.155 af
Outflow = 2.03 cfs @ 12.11 hrs, Volume= 0.155 af, Atten= 0%, Lag= 3.0 min
Primary = 2.03 cfs @ 12.11 hrs, Volume= 0.155 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 278.72' @ 18.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	277.70'	**18.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 277.70' / 277.60' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=1.97 cfs @ 12.11 hrs HW=278.47' TW=277.90' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.97 cfs @ 3.15 fps)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

SubcatchmentPost 1A: Post 1A Runoff Area=24,084 sf 0.00% Impervious Runoff Depth=2.15"
Flow Length=41' Slope=0.0350 '/' Tc=1.7 min CN=WQ Runoff=1.52 cfs 0.099 af

SubcatchmentPost 1B: Post 1B Runoff Area=30,303 sf 85.46% Impervious Runoff Depth=4.33"
Flow Length=210' Slope=0.0150 '/' Tc=4.2 min CN=WQ Runoff=3.25 cfs 0.251 af

SubcatchmentPost 1C: Post 1C Runoff Area=17,604 sf 64.78% Impervious Runoff Depth=3.83"
Flow Length=128' Slope=0.0125 '/' Tc=3.9 min CN=WQ Runoff=1.72 cfs 0.129 af

SubcatchmentPost 2A: Post 2A Runoff Area=23,498 sf 59.30% Impervious Runoff Depth=3.70"
Flow Length=207' Slope=0.0150 '/' Tc=5.6 min CN=WQ Runoff=2.09 cfs 0.167 af

SubcatchmentPost 2B: Post 2B Runoff Area=68,249 sf 68.35% Impervious Runoff Depth=3.92"
Flow Length=479' Slope=0.0150 '/' Tc=10.1 min CN=WQ Runoff=5.58 cfs 0.512 af

SubcatchmentPost 3: Post 3 Runoff Area=3,105 sf 0.00% Impervious Runoff Depth=2.29"
Flow Length=20' Slope=0.2500 '/' Tc=0.3 min CN=WQ Runoff=0.22 cfs 0.014 af

SubcatchmentPost 4: Post 4 Runoff Area=51,513 sf 11.10% Impervious Runoff Depth=2.56"
Flow Length=340' Slope=0.0450 '/' Tc=6.9 min CN=WQ Runoff=3.29 cfs 0.252 af

Reach Post: Post Inflow=3.20 cfs 0.760 af
Outflow=3.20 cfs 0.760 af

Reach Post Great Road: Post Great Road Inflow=3.07 cfs 0.746 af
Outflow=3.07 cfs 0.746 af

Reach Post Robinson Road: Post Robinson Road Inflow=0.22 cfs 0.014 af
Outflow=0.22 cfs 0.014 af

Pond 1P: Pond 1A Peak Elev=276.86' Storage=10,750 cf Inflow=4.39 cfs 0.351 af
Discarded=0.09 cfs 0.292 af Primary=0.00 cfs 0.000 af Outflow=0.09 cfs 0.292 af

Pond 13P: 12" RCP to Street Peak Elev=273.51' Inflow=1.76 cfs 0.579 af
12.0" Round Culvert n=0.013 L=30.0' S=0.0100 '/' Outflow=1.76 cfs 0.579 af

Pond Basin 1B: Basin 1B Peak Elev=279.16' Storage=5,776 cf Inflow=3.25 cfs 0.251 af
Discarded=0.03 cfs 0.128 af Primary=0.69 cfs 0.068 af Outflow=0.72 cfs 0.196 af

Pond Basin 1C: Basin 1C Peak Elev=278.75' Storage=3,809 cf Inflow=1.72 cfs 0.129 af
Discarded=0.03 cfs 0.101 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.101 af

Pond Basin 2B: Basin 2B Peak Elev=274.92' Storage=6,451 cf Inflow=5.58 cfs 0.580 af
Primary=1.76 cfs 0.579 af Secondary=0.00 cfs 0.000 af Outflow=1.76 cfs 0.579 af

Pond Basin 2b outlet: Basin 2b outlet Peak Elev=273.83' Inflow=1.76 cfs 0.579 af
12.0" Round Culvert n=0.012 L=40.0' S=0.0050 '/' Outflow=1.76 cfs 0.579 af

Pond Basin B outlet: Basin 1C outlet Peak Elev=276.49' Inflow=0.69 cfs 0.068 af
15.0" Round Culvert n=0.012 L=86.0' S=0.0360 '/' Outflow=0.69 cfs 0.068 af

Pond WQU 2: WQU 2 Peak Elev=279.17' Inflow=3.25 cfs 0.251 af
18.0" Round Culvert n=0.012 L=20.0' S=0.0050 '/' Outflow=3.25 cfs 0.251 af

Summary for Subcatchment Post 1A: Post 1A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.52 cfs @ 12.04 hrs, Volume= 0.099 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR-NOAA Rainfall=4.91"

Area (sf)	CN	Description
0	98	Roofs, HSG C
0	98	Paved parking, HSG C
13,794	74	>75% Grass cover, Good, HSG C
10,290	70	Woods, Good, HSG C
24,084		Weighted Average
24,084	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	41	0.0350	0.41		**Lag/CN Method, Post 1A**

Summary for Subcatchment Post 1B: Post 1B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 3.25 cfs @ 12.06 hrs, Volume= 0.251 af, Depth= 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR-NOAA Rainfall=4.91"

Area (sf)	CN	Description
0	98	Roofs, HSG C
25,897	98	Paved parking, HSG C
4,406	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
30,303		Weighted Average
4,406	74	14.54% Pervious Area
25,897	98	85.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	210	0.0150	0.84		**Lag/CN Method, Post 1B**

Summary for Subcatchment Post 1C: Post 1C

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.72 cfs @ 12.06 hrs, Volume= 0.129 af, Depth= 3.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR-NOAA Rainfall=4.91"

	Area (sf)	CN	Description
	2,014	98	Roofs, HSG C
	9,390	98	Paved parking, HSG C
	6,200	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	17,604		Weighted Average
	6,200	74	35.22% Pervious Area
	11,404	98	64.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	128	0.0125	0.55		**Lag/CN Method, Post 1C**

Summary for Subcatchment Post 2A: Post 2A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.09 cfs @ 12.08 hrs, Volume= 0.167 af, Depth= 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR-NOAA Rainfall=4.91"

	Area (sf)	CN	Description
	5,481	98	Roofs, HSG C
	8,454	98	Paved parking, HSG C
*	570	74	Pervious Pavers, HSG C
	8,993	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	23,498		Weighted Average
	9,563	74	40.70% Pervious Area
	13,935	98	59.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	207	0.0150	0.62		**Lag/CN Method, Post 2A**

Summary for Subcatchment Post 2B: Post 2B

Runoff = 5.58 cfs @ 12.14 hrs, Volume= 0.512 af, Depth= 3.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR-NOAA Rainfall=4.91"

	Area (sf)	CN	Description
	17,786	98	Roofs, HSG C
	28,865	98	Paved parking, HSG C
*	4,014	74	Pervious Pavers, HSG C
	17,584	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	68,249		Weighted Average
	21,598	74	31.65% Pervious Area
	46,651	98	68.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	479	0.0150	0.79		**Lag/CN Method, Post 2B**

Summary for Subcatchment Post 3: Post 3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.22 cfs @ 12.01 hrs, Volume= 0.014 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR-NOAA Rainfall=4.91"

Area (sf)	CN	Description
0	98	Roofs, HSG C
0	98	Paved parking, HSG C
3,105	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
3,105		Weighted Average
3,105	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.2500	1.00		**Lag/CN Method, Post 3**

Summary for Subcatchment Post 4: Post 4

Runoff = 3.29 cfs @ 12.10 hrs, Volume= 0.252 af, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR-NOAA Rainfall=4.91"

Area (sf)	CN	Description
2,572	98	Roofs, HSG C
3,144	98	Paved parking, HSG C
45,797	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
51,513		Weighted Average
45,797	74	88.90% Pervious Area
5,716	98	11.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	340	0.0450	0.82		**Lag/CN Method, Pre 4**

Summary for Reach Post: Post

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.013 ac, 47.45% Impervious, Inflow Depth = 1.82" for 10-YR-NOAA event
Inflow = 3.20 cfs @ 12.14 hrs, Volume= 0.760 af
Outflow = 3.20 cfs @ 12.19 hrs, Volume= 0.760 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Post Great Road: Post Great Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.941 ac, 48.13% Impervious, Inflow Depth = 1.81" for 10-YR-NOAA event
Inflow = 3.07 cfs @ 12.09 hrs, Volume= 0.746 af
Outflow = 3.07 cfs @ 12.14 hrs, Volume= 0.746 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Post Robinson Road: Post Robinson Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.071 ac, 0.00% Impervious, Inflow Depth = 2.29" for 10-YR-NOAA event
Inflow = 0.22 cfs @ 12.01 hrs, Volume= 0.014 af
Outflow = 0.22 cfs @ 12.06 hrs, Volume= 0.014 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Pond 1A

[86] Warning: Oscillations may require smaller dt (severity=85)

Inflow Area = 1.735 ac, 7.56% Impervious, Inflow Depth = 2.43" for 10-YR-NOAA event
Inflow = 4.39 cfs @ 12.08 hrs, Volume= 0.351 af
Outflow = 0.09 cfs @ 19.45 hrs, Volume= 0.292 af, Atten= 98%, Lag= 442.5 min
Discarded = 0.09 cfs @ 19.45 hrs, Volume= 0.292 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 276.86' @ 19.45 hrs Surf.Area= 15,125 sf Storage= 10,750 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 773.3 min (1,599.1 - 825.8)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	32,320 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
276.00	9,903	0	0
276.50	12,805	5,677	5,677
277.00	15,998	7,201	12,878
277.50	19,310	8,827	21,705
278.00	23,151	10,615	32,320

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	277.50'	**2.0" x 2.0" Horiz. Orifice/Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.09 cfs @ 19.45 hrs HW=276.86' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=276.00' TW=273.00' (Dynamic Tailwater)
2=Orifice/Grate (Controls 0.00 cfs)

Summary for Pond 13P: 12" RCP to Street

[57] Hint: Peaked at 273.51' (Flood elevation advised)

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth = 1.58" for 10-YR-NOAA event
Inflow = 1.76 cfs @ 12.68 hrs, Volume= 0.579 af
Outflow = 1.76 cfs @ 12.73 hrs, Volume= 0.579 af, Atten= 0%, Lag= 3.0 min
Primary = 1.76 cfs @ 12.73 hrs, Volume= 0.579 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 273.51' @ 12.73 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.73'	**12.0" Round Culvert** L= 30.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.73' / 272.43' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.76 cfs @ 12.73 hrs HW=273.51' TW=0.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 1.76 cfs @ 3.69 fps)

Summary for Pond Basin 1B: Basin 1B

[86] Warning: Oscillations may require smaller dt (severity=26)
[80] Warning: Exceeded Pond Basin 1C by 0.82' @ 12.45 hrs (2.95 cfs 4.956 af)
[80] Warning: Exceeded Pond WQU 2 by 0.14' @ 12.30 hrs (2.50 cfs 0.072 af)

Inflow Area = 1.100 ac, 77.86% Impervious, Inflow Depth = 2.74" for 10-YR-NOAA event
Inflow = 3.25 cfs @ 12.11 hrs, Volume= 0.251 af
Outflow = 0.72 cfs @ 12.53 hrs, Volume= 0.196 af, Atten= 78%, Lag= 25.0 min
Discarded = 0.03 cfs @ 0.95 hrs, Volume= 0.128 af
Primary = 0.69 cfs @ 12.53 hrs, Volume= 0.068 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 279.16' @ 12.53 hrs Surf.Area= 5,408 sf Storage= 5,776 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 526.8 min (1,283.4 - 756.7)

Volume	Invert	Avail.Storage	Storage Description
#1	277.10'	4,529 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 13,520 cf Overall - 2,198 cf Embedded = 11,322 cf x 40.0% Voids
#2	277.60'	2,198 cf	**18.0" Round Pipe Storage** Inside #1 L= 1,244.0'
		6,727 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.10	5,408	0	0
279.60	5,408	13,520	13,520

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.10'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	279.00'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.03 cfs @ 0.95 hrs HW=277.10' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.68 cfs @ 12.53 hrs HW=279.16' TW=276.46' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.68 cfs @ 1.07 fps)

Summary for Pond Basin 1C: Basin 1C

[86] Warning: Oscillations may require smaller dt (severity=49)

Inflow Area = 0.404 ac, 64.78% Impervious, Inflow Depth = 3.83" for 10-YR-NOAA event
Inflow = 1.72 cfs @ 12.06 hrs, Volume= 0.129 af
Outflow = 0.03 cfs @ 0.90 hrs, Volume= 0.101 af, Atten= 98%, Lag= 0.0 min
Discarded = 0.03 cfs @ 0.90 hrs, Volume= 0.101 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 278.75' @ 18.79 hrs Surf.Area= 4,400 sf Storage= 3,809 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 774.7 min (1,540.0 - 765.3)

Volume	Invert	Avail.Storage	Storage Description
#1	277.10'	3,656 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 11,000 cf Overall - 1,859 cf Embedded = 9,141 cf x 40.0% Voids
#2	277.60'	1,859 cf	**18.0" Round Pipe Storage** Inside #1 L= 1,052.0'
		5,515 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.10	4,400	0	0
279.60	4,400	11,000	11,000

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.10'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	277.60'	**12.0" Round Culvert** L= 35.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 277.60' / 277.60' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Discarded OutFlow Max=0.03 cfs @ 0.90 hrs HW=277.10' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=277.10' TW=277.10' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.00 cfs)

Summary for Pond Basin 2B: Basin 2B

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth = 1.58" for 10-YR-NOAA event
Inflow = 5.58 cfs @ 12.14 hrs, Volume= 0.580 af
Outflow = 1.76 cfs @ 12.63 hrs, Volume= 0.579 af, Atten= 68%, Lag= 29.3 min
Primary = 1.76 cfs @ 12.63 hrs, Volume= 0.579 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 274.92' @ 12.65 hrs Surf.Area= 5,600 sf Storage= 6,451 cf

Plug-Flow detention time= 52.6 min calculated for 0.579 af (100% of inflow)
Center-of-Mass det. time= 52.1 min (831.9 - 779.8)

Volume	Invert	Avail.Storage	Storage Description
#1	273.00'	6,696 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 28,000 cf Overall - 11,259 cf Embedded = 16,741 cf x 40.0% Voids
#2	273.50'	11,259 cf	**48.0" Round Pipe Storage** Inside #1 L= 896.0'
		17,956 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
273.00	5,600	0	0
278.00	5,600	28,000	28,000

Device	Routing	Invert	Outlet Devices
#1	Secondary	277.50'	**6.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	273.00'	**8.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.75 cfs @ 12.63 hrs HW=274.92' TW=273.83' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Orifice Controls 1.75 cfs @ 5.03 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=273.00' TW=272.90' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond Basin 2b outlet: Basin 2b outlet

[57] Hint: Peaked at 273.83' (Flood elevation advised)

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth = 1.58" for 10-YR-NOAA event
Inflow = 1.76 cfs @ 12.63 hrs, Volume= 0.579 af
Outflow = 1.76 cfs @ 12.68 hrs, Volume= 0.579 af, Atten= 0%, Lag= 3.0 min
Primary = 1.76 cfs @ 12.68 hrs, Volume= 0.579 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 273.83' @ 12.72 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.90'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.90' / 272.70' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=1.75 cfs @ 12.68 hrs HW=273.83' TW=273.51' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.75 cfs @ 2.98 fps)

Summary for Pond Basin B outlet: Basin 1C outlet

[57] Hint: Peaked at 276.49' (Flood elevation advised)

Inflow Area = 1.100 ac, 77.86% Impervious, Inflow Depth = 0.74" for 10-YR-NOAA event
Inflow = 0.69 cfs @ 12.53 hrs, Volume= 0.068 af
Outflow = 0.69 cfs @ 12.58 hrs, Volume= 0.068 af, Atten= 0%, Lag= 3.0 min
Primary = 0.69 cfs @ 12.58 hrs, Volume= 0.068 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 276.49' @ 12.58 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	276.10'	**15.0" Round Culvert** L= 86.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 276.10' / 273.00' S= 0.0360 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.68 cfs @ 12.58 hrs HW=276.49' TW=274.91' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.68 cfs @ 2.12 fps)

Summary for Pond WQU 2: WQU 2

[57] Hint: Peaked at 279.17' (Flood elevation advised)

Inflow Area =	0.696 ac, 85.46% Impervious, Inflow Depth = 4.33"		for 10-YR-NOAA event
Inflow =	3.25 cfs @	12.06 hrs, Volume=	0.251 af
Outflow =	3.25 cfs @	12.11 hrs, Volume=	0.251 af, Atten= 0%, Lag= 3.0 min
Primary =	3.25 cfs @	12.11 hrs, Volume=	0.251 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 279.17' @ 12.57 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	277.70'	**18.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 277.70' / 277.60' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=2.95 cfs @ 12.11 hrs HW=278.71' TW=278.41' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 2.95 cfs @ 3.28 fps)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

SubcatchmentPost 1A: Post 1A Runoff Area=24,084 sf 0.00% Impervious Runoff Depth=3.01"
Flow Length=41' Slope=0.0350 '/' Tc=1.7 min CN=WQ Runoff=2.14 cfs 0.139 af

SubcatchmentPost 1B: Post 1B Runoff Area=30,303 sf 85.46% Impervious Runoff Depth=5.38"
Flow Length=210' Slope=0.0150 '/' Tc=4.2 min CN=WQ Runoff=4.03 cfs 0.312 af

SubcatchmentPost 1C: Post 1C Runoff Area=17,604 sf 64.78% Impervious Runoff Depth=4.84"
Flow Length=128' Slope=0.0125 '/' Tc=3.9 min CN=WQ Runoff=2.18 cfs 0.163 af

SubcatchmentPost 2A: Post 2A Runoff Area=23,498 sf 59.30% Impervious Runoff Depth=4.70"
Flow Length=207' Slope=0.0150 '/' Tc=5.6 min CN=WQ Runoff=2.66 cfs 0.211 af

SubcatchmentPost 2B: Post 2B Runoff Area=68,249 sf 68.35% Impervious Runoff Depth=4.94"
Flow Length=479' Slope=0.0150 '/' Tc=10.1 min CN=WQ Runoff=7.01 cfs 0.645 af

SubcatchmentPost 3: Post 3 Runoff Area=3,105 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=20' Slope=0.2500 '/' Tc=0.3 min CN=WQ Runoff=0.30 cfs 0.019 af

SubcatchmentPost 4: Post 4 Runoff Area=51,513 sf 11.10% Impervious Runoff Depth=3.46"
Flow Length=340' Slope=0.0450 '/' Tc=6.9 min CN=WQ Runoff=4.48 cfs 0.341 af

Reach Post: Post Inflow=3.96 cfs 1.017 af
Outflow=3.96 cfs 1.017 af

Reach Post Great Road: Post Great Road Inflow=3.78 cfs 0.998 af
Outflow=3.78 cfs 0.998 af

Reach Post Robinson Road: Post Robinson Road Inflow=0.30 cfs 0.019 af
Outflow=0.30 cfs 0.019 af

Pond 1P: Pond 1A Peak Elev=277.16' Storage=15,557 cf Inflow=6.03 cfs 0.480 af
Discarded=0.11 cfs 0.330 af Primary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.330 af

Pond 13P: 12" RCP to Street Peak Elev=273.64' Inflow=2.21 cfs 0.786 af
12.0" Round Culvert n=0.013 L=30.0' S=0.0100 '/' Outflow=2.21 cfs 0.786 af

Pond Basin 1B: Basin 1B Peak Elev=279.33' Storage=6,152 cf Inflow=4.03 cfs 0.327 af
Discarded=0.03 cfs 0.129 af Primary=2.08 cfs 0.142 af Outflow=2.12 cfs 0.271 af

Pond Basin 1C: Basin 1C Peak Elev=279.08' Storage=4,595 cf Inflow=2.18 cfs 0.163 af
Discarded=0.03 cfs 0.102 af Primary=0.38 cfs 0.016 af Outflow=0.41 cfs 0.118 af

Pond Basin 2B: Basin 2B Peak Elev=275.72' Storage=9,921 cf Inflow=7.01 cfs 0.787 af
Primary=2.21 cfs 0.786 af Secondary=0.00 cfs 0.000 af Outflow=2.21 cfs 0.786 af

Pond Basin 2b outlet: Basin 2b outlet Peak Elev=274.00' Inflow=2.21 cfs 0.786 af
12.0" Round Culvert n=0.012 L=40.0' S=0.0050 '/' Outflow=2.21 cfs 0.786 af

Pond Basin B outlet: Basin 1C outlet Peak Elev=276.82' Inflow=2.08 cfs 0.142 af
15.0" Round Culvert n=0.012 L=86.0' S=0.0360 '/' Outflow=2.08 cfs 0.142 af

Pond WQU 2: WQU 2 Peak Elev=279.37' Inflow=4.03 cfs 0.312 af
18.0" Round Culvert n=0.012 L=20.0' S=0.0050 '/' Outflow=4.03 cfs 0.312 af

Summary for Subcatchment Post 1A: Post 1A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.14 cfs @ 12.03 hrs, Volume= 0.139 af, Depth= 3.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR NOAA Rainfall=5.99"

Area (sf)	CN	Description
0	98	Roofs, HSG C
0	98	Paved parking, HSG C
13,794	74	>75% Grass cover, Good, HSG C
10,290	70	Woods, Good, HSG C
24,084		Weighted Average
24,084	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	41	0.0350	0.41		**Lag/CN Method, Post 1A**

Summary for Subcatchment Post 1B: Post 1B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 4.03 cfs @ 12.06 hrs, Volume= 0.312 af, Depth= 5.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR NOAA Rainfall=5.99"

Area (sf)	CN	Description
0	98	Roofs, HSG C
25,897	98	Paved parking, HSG C
4,406	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
30,303		Weighted Average
4,406	74	14.54% Pervious Area
25,897	98	85.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	210	0.0150	0.84		**Lag/CN Method, Post 1B**

Summary for Subcatchment Post 1C: Post 1C

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.18 cfs @ 12.06 hrs, Volume= 0.163 af, Depth= 4.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR NOAA Rainfall=5.99"

	Area (sf)	CN	Description
	2,014	98	Roofs, HSG C
	9,390	98	Paved parking, HSG C
	6,200	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	17,604		Weighted Average
	6,200	74	35.22% Pervious Area
	11,404	98	64.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	128	0.0125	0.55		**Lag/CN Method, Post 1C**

Summary for Subcatchment Post 2A: Post 2A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.66 cfs @ 12.08 hrs, Volume= 0.211 af, Depth= 4.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR NOAA Rainfall=5.99"

	Area (sf)	CN	Description
	5,481	98	Roofs, HSG C
	8,454	98	Paved parking, HSG C
*	570	74	Pervious Pavers, HSG C
	8,993	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	23,498		Weighted Average
	9,563	74	40.70% Pervious Area
	13,935	98	59.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	207	0.0150	0.62		**Lag/CN Method, Post 2A**

Summary for Subcatchment Post 2B: Post 2B

Runoff = 7.01 cfs @ 12.14 hrs, Volume= 0.645 af, Depth= 4.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR NOAA Rainfall=5.99"

	Area (sf)	CN	Description
	17,786	98	Roofs, HSG C
	28,865	98	Paved parking, HSG C
*	4,014	74	Pervious Pavers, HSG C
	17,584	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	68,249		Weighted Average
	21,598	74	31.65% Pervious Area
	46,651	98	68.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	479	0.0150	0.79		**Lag/CN Method, Post 2B**

Summary for Subcatchment Post 3: Post 3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.30 cfs @ 12.01 hrs, Volume= 0.019 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR NOAA Rainfall=5.99"

Area (sf)	CN	Description
0	98	Roofs, HSG C
0	98	Paved parking, HSG C
3,105	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
3,105		Weighted Average
3,105	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.2500	1.00		**Lag/CN Method, Post 3**

Summary for Subcatchment Post 4: Post 4

Runoff = 4.48 cfs @ 12.10 hrs, Volume= 0.341 af, Depth= 3.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR NOAA Rainfall=5.99"

Area (sf)	CN	Description
2,572	98	Roofs, HSG C
3,144	98	Paved parking, HSG C
45,797	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
51,513		Weighted Average
45,797	74	88.90% Pervious Area
5,716	98	11.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	340	0.0450	0.82		**Lag/CN Method, Pre 4**

Summary for Reach Post: Post

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.013 ac, 47.45% Impervious, Inflow Depth = 2.43" for 25-YR NOAA event
Inflow = 3.96 cfs @ 12.13 hrs, Volume= 1.017 af
Outflow = 3.96 cfs @ 12.18 hrs, Volume= 1.017 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Post Great Road: Post Great Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.941 ac, 48.13% Impervious, Inflow Depth = 2.42" for 25-YR NOAA event
Inflow = 3.78 cfs @ 12.09 hrs, Volume= 0.998 af
Outflow = 3.78 cfs @ 12.14 hrs, Volume= 0.998 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Post Robinson Road: Post Robinson Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.071 ac, 0.00% Impervious, Inflow Depth = 3.18" for 25-YR NOAA event
Inflow = 0.30 cfs @ 12.01 hrs, Volume= 0.019 af
Outflow = 0.30 cfs @ 12.06 hrs, Volume= 0.019 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Pond 1A

[86] Warning: Oscillations may require smaller dt (severity=79)

Inflow Area = 1.735 ac, 7.56% Impervious, Inflow Depth = 3.32" for 25-YR NOAA event
Inflow = 6.03 cfs @ 12.08 hrs, Volume= 0.480 af
Outflow = 0.11 cfs @ 20.88 hrs, Volume= 0.330 af, Atten= 98%, Lag= 528.0 min
Discarded = 0.11 cfs @ 20.88 hrs, Volume= 0.330 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 277.16' @ 20.88 hrs Surf.Area= 17,071 sf Storage= 15,557 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 795.7 min (1,614.2 - 818.4)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	32,320 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
276.00	9,903	0	0
276.50	12,805	5,677	5,677
277.00	15,998	7,201	12,878
277.50	19,310	8,827	21,705
278.00	23,151	10,615	32,320

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	277.50'	**2.0" x 2.0" Horiz. Orifice/Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.11 cfs @ 20.88 hrs HW=277.16' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=276.00' TW=273.00' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 13P: 12" RCP to Street

[57] Hint: Peaked at 273.64' (Flood elevation advised)

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth = 2.14" for 25-YR NOAA event
Inflow = 2.21 cfs @ 12.67 hrs, Volume= 0.786 af
Outflow = 2.21 cfs @ 12.72 hrs, Volume= 0.786 af, Atten= 0%, Lag= 3.0 min
Primary = 2.21 cfs @ 12.72 hrs, Volume= 0.786 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 273.64' @ 12.72 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.73'	**12.0" Round Culvert** L= 30.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.73' / 272.43' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=2.21 cfs @ 12.72 hrs HW=273.64' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 2.21 cfs @ 3.88 fps)

Summary for Pond Basin 1B: Basin 1B

[86] Warning: Oscillations may require smaller dt (severity=15)
[80] Warning: Exceeded Pond Basin 1C by 0.90' @ 12.25 hrs (3.44 cfs 1.030 af)
[80] Warning: Exceeded Pond WQU 2 by 0.27' @ 12.25 hrs (4.46 cfs 0.157 af)

Inflow Area =	1.100 ac, 77.86% Impervious, Inflow Depth = 3.57"	for 25-YR NOAA event	
Inflow =	4.03 cfs @ 12.11 hrs, Volume=	0.327 af	
Outflow =	2.12 cfs @ 12.27 hrs, Volume=	0.271 af, Atten= 47%, Lag= 9.5 min	
Discarded =	0.03 cfs @ 0.80 hrs, Volume=	0.129 af	
Primary =	2.08 cfs @ 12.27 hrs, Volume=	0.142 af	

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 279.33' @ 12.27 hrs Surf.Area= 5,408 sf Storage= 6,152 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 394.0 min (1,157.6 - 763.6)

Volume	Invert	Avail.Storage	Storage Description
#1	277.10'	4,529 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 13,520 cf Overall - 2,198 cf Embedded = 11,322 cf x 40.0% Voids
#2	277.60'	2,198 cf	**18.0" Round Pipe Storage** Inside #1 L= 1,244.0'
		6,727 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.10	5,408	0	0
279.60	5,408	13,520	13,520

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.10'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	279.00'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.03 cfs @ 0.80 hrs HW=277.10' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.95 cfs @ 12.27 hrs HW=279.32' TW=276.66' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 1.95 cfs @ 1.53 fps)

Summary for Pond Basin 1C: Basin 1C

[86] Warning: Oscillations may require smaller dt (severity=63)

Inflow Area =	0.404 ac, 64.78% Impervious, Inflow Depth = 4.84"	for 25-YR NOAA event	
Inflow =	2.18 cfs @ 12.06 hrs, Volume=	0.163 af	
Outflow =	0.41 cfs @ 14.50 hrs, Volume=	0.118 af, Atten= 81%, Lag= 146.5 min	
Discarded =	0.03 cfs @ 0.75 hrs, Volume=	0.102 af	
Primary =	0.38 cfs @ 14.50 hrs, Volume=	0.016 af	

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 279.08' @ 14.48 hrs Surf.Area= 4,400 sf Storage= 4,595 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 687.2 min (1,449.7 - 762.6)

Volume	Invert	Avail.Storage	Storage Description
#1	277.10'	3,656 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 11,000 cf Overall - 1,859 cf Embedded = 9,141 cf x 40.0% Voids
#2	277.60'	1,859 cf	**18.0" Round Pipe Storage** Inside #1 L= 1,052.0'
		5,515 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.10	4,400	0	0
279.60	4,400	11,000	11,000

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.10'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	277.60'	**12.0" Round Culvert** L= 35.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 277.60' / 277.60' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Discarded OutFlow Max=0.03 cfs @ 0.75 hrs HW=277.10' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.43 cfs @ 14.50 hrs HW=279.08' TW=279.06' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 0.43 cfs @ 0.54 fps)

Summary for Pond Basin 2B: Basin 2B

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth = 2.14" for 25-YR NOAA event
Inflow = 7.01 cfs @ 12.14 hrs, Volume= 0.787 af
Outflow = 2.21 cfs @ 12.62 hrs, Volume= 0.786 af, Atten= 69%, Lag= 28.7 min
Primary = 2.21 cfs @ 12.62 hrs, Volume= 0.786 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 275.72' @ 12.66 hrs Surf.Area= 5,600 sf Storage= 9,921 cf

Plug-Flow detention time= 56.4 min calculated for 0.786 af (100% of inflow)
Center-of-Mass det. time= 55.9 min (838.0 - 782.2)

Volume	Invert	Avail.Storage	Storage Description
#1	273.00'	6,696 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 28,000 cf Overall - 11,259 cf Embedded = 16,741 cf x 40.0% Voids
#2	273.50'	11,259 cf	**48.0" Round Pipe Storage** Inside #1 L= 896.0'
		17,956 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
273.00	5,600	0	0
278.00	5,600	28,000	28,000

Device	Routing	Invert	Outlet Devices
#1	Secondary	277.50'	**6.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	273.00'	**8.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=2.20 cfs @ 12.62 hrs HW=275.71' TW=273.99' (Dynamic Tailwater)
└—**2=Orifice/Grate** (Orifice Controls 2.20 cfs @ 6.31 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=273.00' TW=272.90' (Dynamic Tailwater)
└—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond Basin 2b outlet: Basin 2b outlet

[57] Hint: Peaked at 274.00' (Flood elevation advised)

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth = 2.14" for 25-YR NOAA event
Inflow = 2.21 cfs @ 12.62 hrs, Volume= 0.786 af
Outflow = 2.21 cfs @ 12.67 hrs, Volume= 0.786 af, Atten= 0%, Lag= 3.0 min
Primary = 2.21 cfs @ 12.67 hrs, Volume= 0.786 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 274.00' @ 12.72 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.90'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.90' / 272.70' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=2.19 cfs @ 12.67 hrs HW=274.00' TW=273.64' (Dynamic Tailwater)
└—**1=Culvert** (Outlet Controls 2.19 cfs @ 3.17 fps)

Summary for Pond Basin B outlet: Basin 1C outlet

[57] Hint: Peaked at 276.82' (Flood elevation advised)

Inflow Area = 1.100 ac, 77.86% Impervious, Inflow Depth = 1.55" for 25-YR NOAA event
Inflow = 2.08 cfs @ 12.27 hrs, Volume= 0.142 af
Outflow = 2.08 cfs @ 12.32 hrs, Volume= 0.142 af, Atten= 0%, Lag= 3.0 min
Primary = 2.08 cfs @ 12.32 hrs, Volume= 0.142 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 276.82' @ 12.32 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	276.10'	**15.0" Round Culvert** L= 86.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 276.10' / 273.00' S= 0.0360 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=1.95 cfs @ 12.32 hrs HW=276.79' TW=275.18' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.95 cfs @ 2.82 fps)

Summary for Pond WQU 2: WQU 2

[57] Hint: Peaked at 279.37' (Flood elevation advised)

Inflow Area = 0.696 ac, 85.46% Impervious, Inflow Depth = 5.38" for 25-YR NOAA event
Inflow = 4.03 cfs @ 12.06 hrs, Volume= 0.312 af
Outflow = 4.03 cfs @ 12.11 hrs, Volume= 0.312 af, Atten= 0%, Lag= 3.0 min
Primary = 4.03 cfs @ 12.11 hrs, Volume= 0.312 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 279.37' @ 12.32 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	277.70'	**18.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 277.70' / 277.60' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=2.67 cfs @ 12.11 hrs HW=278.91' TW=278.76' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 2.67 cfs @ 2.38 fps)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

SubcatchmentPost 1A: Post 1A Runoff Area=24,084 sf 0.00% Impervious Runoff Depth=4.43"
Flow Length=41' Slope=0.0350 '/' Tc=1.7 min CN=WQ Runoff=3.14 cfs 0.204 af

SubcatchmentPost 1B: Post 1B Runoff Area=30,303 sf 85.46% Impervious Runoff Depth=7.01"
Flow Length=210' Slope=0.0150 '/' Tc=4.2 min CN=WQ Runoff=5.22 cfs 0.407 af

SubcatchmentPost 1C: Post 1C Runoff Area=17,604 sf 64.78% Impervious Runoff Depth=6.44"
Flow Length=128' Slope=0.0125 '/' Tc=3.9 min CN=WQ Runoff=2.89 cfs 0.217 af

SubcatchmentPost 2A: Post 2A Runoff Area=23,498 sf 59.30% Impervious Runoff Depth=6.28"
Flow Length=207' Slope=0.0150 '/' Tc=5.6 min CN=WQ Runoff=3.54 cfs 0.282 af

SubcatchmentPost 2B: Post 2B Runoff Area=68,249 sf 68.35% Impervious Runoff Depth=6.54"
Flow Length=479' Slope=0.0150 '/' Tc=10.1 min CN=WQ Runoff=9.26 cfs 0.853 af

SubcatchmentPost 3: Post 3 Runoff Area=3,105 sf 0.00% Impervious Runoff Depth=4.62"
Flow Length=20' Slope=0.2500 '/' Tc=0.3 min CN=WQ Runoff=0.44 cfs 0.027 af

SubcatchmentPost 4: Post 4 Runoff Area=51,513 sf 11.10% Impervious Runoff Depth=4.93"
Flow Length=340' Slope=0.0450 '/' Tc=6.9 min CN=WQ Runoff=6.38 cfs 0.486 af

Reach Post: Post Inflow=5.14 cfs 1.492 af
Outflow=5.14 cfs 1.492 af

Reach Post Great Road: Post Great Road Inflow=4.88 cfs 1.465 af
Outflow=4.88 cfs 1.465 af

Reach Post Robinson Road: Post Robinson Road Inflow=0.44 cfs 0.027 af
Outflow=0.44 cfs 0.027 af

Pond 1P: Pond 1A Peak Elev=277.52' Storage=22,034 cf Inflow=8.72 cfs 0.690 af
Discarded=0.12 cfs 0.376 af Primary=0.17 cfs 0.045 af Outflow=0.30 cfs 0.421 af

Pond 13P: 12" RCP to Street Peak Elev=273.83' Inflow=2.82 cfs 1.183 af
12.0" Round Culvert n=0.013 L=30.0' S=0.0100 '/' Outflow=2.82 cfs 1.183 af

Pond Basin 1B: Basin 1B Peak Elev=279.61' Storage=6,727 cf Inflow=5.22 cfs 0.473 af
Discarded=0.03 cfs 0.131 af Primary=5.24 cfs 0.285 af Outflow=5.27 cfs 0.415 af

Pond Basin 1C: Basin 1C Peak Elev=279.34' Storage=5,054 cf Inflow=2.89 cfs 0.217 af
Discarded=0.03 cfs 0.104 af Primary=1.12 cfs 0.066 af Outflow=1.14 cfs 0.170 af

Pond Basin 2B: Basin 2B Peak Elev=277.14' Storage=15,738 cf Inflow=13.11 cfs 1.183 af
Primary=2.82 cfs 1.183 af Secondary=0.00 cfs 0.000 af Outflow=2.82 cfs 1.183 af

Pond Basin 2b outlet: Basin 2b outlet Peak Elev=274.37' Inflow=2.82 cfs 1.183 af
12.0" Round Culvert n=0.012 L=40.0' S=0.0050 '/' Outflow=2.82 cfs 1.183 af

Pond Basin B outlet: Basin 1C outlet Peak Elev=277.49' Inflow=5.24 cfs 0.285 af
15.0" Round Culvert n=0.012 L=86.0' S=0.0360 '/' Outflow=5.24 cfs 0.285 af

Pond WQU 2: WQU 2 Peak Elev=279.74' Inflow=5.22 cfs 0.407 af
18.0" Round Culvert n=0.012 L=20.0' S=0.0050 '/' Outflow=5.22 cfs 0.407 af

Summary for Subcatchment Post 1A: Post 1A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 3.14 cfs @ 12.03 hrs, Volume= 0.204 af, Depth= 4.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR NOAA Rainfall=7.66"

Area (sf)	CN	Description
0	98	Roofs, HSG C
0	98	Paved parking, HSG C
13,794	74	>75% Grass cover, Good, HSG C
10,290	70	Woods, Good, HSG C
24,084		Weighted Average
24,084	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	41	0.0350	0.41		**Lag/CN Method, Post 1A**

Summary for Subcatchment Post 1B: Post 1B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 5.22 cfs @ 12.06 hrs, Volume= 0.407 af, Depth= 7.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR NOAA Rainfall=7.66"

Area (sf)	CN	Description
0	98	Roofs, HSG C
25,897	98	Paved parking, HSG C
4,406	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
30,303		Weighted Average
4,406	74	14.54% Pervious Area
25,897	98	85.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	210	0.0150	0.84		**Lag/CN Method, Post 1B**

Summary for Subcatchment Post 1C: Post 1C

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.89 cfs @ 12.06 hrs, Volume= 0.217 af, Depth= 6.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR NOAA Rainfall=7.66"

	Area (sf)	CN	Description
	2,014	98	Roofs, HSG C
	9,390	98	Paved parking, HSG C
	6,200	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	17,604		Weighted Average
	6,200	74	35.22% Pervious Area
	11,404	98	64.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	128	0.0125	0.55		**Lag/CN Method, Post 1C**

Summary for Subcatchment Post 2A: Post 2A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 3.54 cfs @ 12.08 hrs, Volume= 0.282 af, Depth= 6.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR NOAA Rainfall=7.66"

	Area (sf)	CN	Description
	5,481	98	Roofs, HSG C
	8,454	98	Paved parking, HSG C
*	570	74	Pervious Pavers, HSG C
	8,993	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	23,498		Weighted Average
	9,563	74	40.70% Pervious Area
	13,935	98	59.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	207	0.0150	0.62		**Lag/CN Method, Post 2A**

Summary for Subcatchment Post 2B: Post 2B

Runoff = 9.26 cfs @ 12.14 hrs, Volume= 0.853 af, Depth= 6.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR NOAA Rainfall=7.66"

	Area (sf)	CN	Description
	17,786	98	Roofs, HSG C
	28,865	98	Paved parking, HSG C
*	4,014	74	Pervious Pavers, HSG C
	17,584	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	68,249		Weighted Average
	21,598	74	31.65% Pervious Area
	46,651	98	68.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	479	0.0150	0.79		**Lag/CN Method, Post 2B**

Summary for Subcatchment Post 3: Post 3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.44 cfs @ 12.01 hrs, Volume= 0.027 af, Depth= 4.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR NOAA Rainfall=7.66"

Area (sf)	CN	Description
0	98	Roofs, HSG C
0	98	Paved parking, HSG C
3,105	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
3,105		Weighted Average
3,105	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.2500	1.00		**Lag/CN Method, Post 3**

Summary for Subcatchment Post 4: Post 4

Runoff = 6.38 cfs @ 12.10 hrs, Volume= 0.486 af, Depth= 4.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR NOAA Rainfall=7.66"

Area (sf)	CN	Description
2,572	98	Roofs, HSG C
3,144	98	Paved parking, HSG C
45,797	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
51,513		Weighted Average
45,797	74	88.90% Pervious Area
5,716	98	11.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	340	0.0450	0.82		**Lag/CN Method, Pre 4**

Summary for Reach Post: Post

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.013 ac, 47.45% Impervious, Inflow Depth = 3.57" for 100-YR NOAA event
Inflow = 5.14 cfs @ 12.13 hrs, Volume= 1.492 af
Outflow = 5.14 cfs @ 12.18 hrs, Volume= 1.492 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Post Great Road: Post Great Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.941 ac, 48.13% Impervious, Inflow Depth = 3.56" for 100-YR NOAA event
Inflow = 4.88 cfs @ 12.09 hrs, Volume= 1.465 af
Outflow = 4.88 cfs @ 12.14 hrs, Volume= 1.465 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Post Robinson Road: Post Robinson Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.071 ac, 0.00% Impervious, Inflow Depth = 4.62" for 100-YR NOAA event
Inflow = 0.44 cfs @ 12.01 hrs, Volume= 0.027 af
Outflow = 0.44 cfs @ 12.06 hrs, Volume= 0.027 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Pond 1A

[86] Warning: Oscillations may require smaller dt (severity=71)

Inflow Area = 1.735 ac, 7.56% Impervious, Inflow Depth = 4.77" for 100-YR NOAA event
Inflow = 8.72 cfs @ 12.07 hrs, Volume= 0.690 af
Outflow = 0.30 cfs @ 16.26 hrs, Volume= 0.421 af, Atten= 97%, Lag= 250.9 min
Discarded = 0.12 cfs @ 16.26 hrs, Volume= 0.376 af
Primary = 0.17 cfs @ 16.26 hrs, Volume= 0.045 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 277.52' @ 16.26 hrs Surf.Area= 19,440 sf Storage= 22,034 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 754.7 min (1,564.3 - 809.6)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	32,320 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
276.00	9,903	0	0
276.50	12,805	5,677	5,677
277.00	15,998	7,201	12,878
277.50	19,310	8,827	21,705
278.00	23,151	10,615	32,320

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	277.50'	**2.0" x 2.0" Horiz. Orifice/Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.12 cfs @ 16.26 hrs HW=277.52' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.17 cfs @ 16.26 hrs HW=277.52' TW=274.11' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Weir Controls 0.17 cfs @ 0.43 fps)

Summary for Pond 13P: 12" RCP to Street

[57] Hint: Peaked at 273.83' (Flood elevation advised)

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth = 3.22" for 100-YR NOAA event
Inflow = 2.82 cfs @ 12.71 hrs, Volume= 1.183 af
Outflow = 2.82 cfs @ 12.76 hrs, Volume= 1.183 af, Atten= 0%, Lag= 3.0 min
Primary = 2.82 cfs @ 12.76 hrs, Volume= 1.183 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 273.83' @ 12.76 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.73'	**12.0" Round Culvert** L= 30.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.73' / 272.43' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=2.81 cfs @ 12.76 hrs HW=273.83' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 2.81 cfs @ 4.08 fps)

Summary for Pond Basin 1B: Basin 1B

[93] Warning: Storage range exceeded by 0.01'
[89] Warning: Qout>Qin may require smaller dt
[80] Warning: Exceeded Pond Basin 1C by 1.01' @ 12.15 hrs (3.79 cfs 0.417 af)
[80] Warning: Exceeded Pond WQU 2 by 0.24' @ 12.10 hrs (4.20 cfs 0.324 af)

Inflow Area =	1.100 ac, 77.86% Impervious, Inflow Depth = 5.16" for 100-YR NOAA event			
Inflow =	5.22 cfs @	12.11 hrs, Volume=	0.473 af	
Outflow =	5.27 cfs @	12.17 hrs, Volume=	0.415 af,	Atten= 0%, Lag= 3.4 min
Discarded =	0.03 cfs @	0.65 hrs, Volume=	0.131 af	
Primary =	5.24 cfs @	12.17 hrs, Volume=	0.285 af	

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 279.61' @ 12.17 hrs Surf.Area= 5,408 sf Storage= 6,727 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 270.5 min (1,038.1 - 767.6)

Volume	Invert	Avail.Storage	Storage Description
#1	277.10'	4,529 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 13,520 cf Overall - 2,198 cf Embedded = 11,322 cf x 40.0% Voids
#2	277.60'	2,198 cf	**18.0" Round Pipe Storage** Inside #1 L= 1,244.0'
		6,727 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.10	5,408	0	0
279.60	5,408	13,520	13,520

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.10'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	279.00'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.03 cfs @ 0.65 hrs HW=277.10' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=4.89 cfs @ 12.17 hrs HW=279.58' TW=277.09' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 4.89 cfs @ 2.10 fps)

Summary for Pond Basin 1C: Basin 1C

[86] Warning: Oscillations may require smaller dt (severity=74)

Inflow Area =	0.404 ac, 64.78% Impervious, Inflow Depth = 6.44" for 100-YR NOAA event			
Inflow =	2.89 cfs @	12.06 hrs, Volume=	0.217 af	
Outflow =	1.14 cfs @	12.65 hrs, Volume=	0.170 af,	Atten= 60%, Lag= 35.3 min
Discarded =	0.03 cfs @	0.60 hrs, Volume=	0.104 af	
Primary =	1.12 cfs @	12.65 hrs, Volume=	0.066 af	

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 279.34' @ 12.50 hrs Surf.Area= 4,400 sf Storage= 5,054 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 499.3 min (1,258.5 - 759.1)

Volume	Invert	Avail.Storage	Storage Description
#1	277.10'	3,656 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 11,000 cf Overall - 1,859 cf Embedded = 9,141 cf x 40.0% Voids
#2	277.60'	1,859 cf	**18.0" Round Pipe Storage** Inside #1 L= 1,052.0'
		5,515 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.10	4,400	0	0
279.60	4,400	11,000	11,000

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.10'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	277.60'	**12.0" Round Culvert** L= 35.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 277.60' / 277.60' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Discarded OutFlow Max=0.03 cfs @ 0.60 hrs HW=277.10' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.13 cfs @ 12.65 hrs HW=279.32' TW=279.23' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 1.13 cfs @ 1.43 fps)

Summary for Pond Basin 2B: Basin 2B

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth = 3.22" for 100-YR NOAA event
Inflow = 13.11 cfs @ 12.19 hrs, Volume= 1.183 af
Outflow = 2.82 cfs @ 12.66 hrs, Volume= 1.183 af, Atten= 79%, Lag= 27.9 min
Primary = 2.82 cfs @ 12.66 hrs, Volume= 1.183 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 277.14' @ 12.68 hrs Surf.Area= 5,600 sf Storage= 15,738 cf

Plug-Flow detention time= 64.6 min calculated for 1.183 af (100% of inflow)
Center-of-Mass det. time= 64.1 min (856.8 - 792.7)

Volume	Invert	Avail.Storage	Storage Description
#1	273.00'	6,696 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 28,000 cf Overall - 11,259 cf Embedded = 16,741 cf x 40.0% Voids
#2	273.50'	11,259 cf	**48.0" Round Pipe Storage** Inside #1 L= 896.0'
		17,956 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
273.00	5,600	0	0
278.00	5,600	28,000	28,000

Device	Routing	Invert	Outlet Devices
#1	Secondary	277.50'	**6.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	273.00'	**8.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=2.81 cfs @ 12.66 hrs HW=277.14' TW=274.35' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Orifice Controls 2.81 cfs @ 8.04 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=273.00' TW=272.90' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond Basin 2b outlet: Basin 2b outlet

[57] Hint: Peaked at 274.37' (Flood elevation advised)

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth = 3.22" for 100-YR NOAA event
Inflow = 2.82 cfs @ 12.66 hrs, Volume= 1.183 af
Outflow = 2.82 cfs @ 12.71 hrs, Volume= 1.183 af, Atten= 0%, Lag= 3.0 min
Primary = 2.82 cfs @ 12.71 hrs, Volume= 1.183 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 274.37' @ 12.79 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.90'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.90' / 272.70' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=2.80 cfs @ 12.71 hrs HW=274.37' TW=273.82' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.80 cfs @ 3.56 fps)

Summary for Pond Basin B outlet: Basin 1C outlet

[57] Hint: Peaked at 277.49' (Flood elevation advised)

Inflow Area = 1.100 ac, 77.86% Impervious, Inflow Depth = 3.11" for 100-YR NOAA event
Inflow = 5.24 cfs @ 12.17 hrs, Volume= 0.285 af
Outflow = 5.24 cfs @ 12.22 hrs, Volume= 0.285 af, Atten= 0%, Lag= 3.0 min
Primary = 5.24 cfs @ 12.22 hrs, Volume= 0.285 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 277.49' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	276.10'	**15.0" Round Culvert** L= 86.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 276.10' / 273.00' S= 0.0360 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=4.89 cfs @ 12.22 hrs HW=277.41' TW=275.52' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 4.89 cfs @ 3.99 fps)

Summary for Pond WQU 2: WQU 2

[57] Hint: Peaked at 279.74' (Flood elevation advised)

Inflow Area =	0.696 ac, 85.46% Impervious, Inflow Depth = 7.01"	for 100-YR NOAA event	
Inflow =	5.22 cfs @	12.06 hrs, Volume=	0.407 af
Outflow =	5.22 cfs @	12.11 hrs, Volume=	0.407 af, Atten= 0%, Lag= 3.0 min
Primary =	5.22 cfs @	12.11 hrs, Volume=	0.407 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 279.74' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	277.70'	**18.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 277.70' / 277.60' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=2.36 cfs @ 12.11 hrs HW=279.50' TW=279.42' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.36 cfs @ 1.33 fps)

APPENDIX C

Stormwater Checklist and Treatment Calculations

Northern Bank Town Common
Littleton, Massachusetts

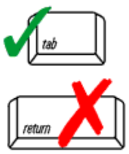
Oak Consulting Group
Project 18017

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

SEAN P.
MALONE
CIVIL
No. 48204

8-26-22

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☒ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of “country drainage” versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☒ Grass Channel
- ☐ Green Roof
- ☒ Other (describe): Stormwater Treatment Units and Subsurface Infiltration

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☒ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☒ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☒ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☒ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☒ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

INSTRUCTIONS:
1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

TSS Removal Calculation Worksheet

Location: Subcatchment 1B

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump CB	25%	1.00	0.25	0.75
Stormceptor Unit	77%	0.75	0.58	0.17
Infiltration Basin	80%	0.17	0.14	0.03

Total TSS Removal = 97%

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

Project: Northern Bank-Littleton
Prepared By: SPM
Date: 8/12/22

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:
1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

TSS Removal Calculation Worksheet

Location: Subcatchment 1C

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Stormceptor Unit	77%	**1.00**	0.77	0.23
Infiltration Basin	80%	0.23	0.18	0.05

Total TSS Removal = 95%

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

Project: Northern Bank-Littleton
Prepared By: SPM
Date: 8/12/22

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

TSS Removal Calculation Worksheet

Location: Subcatchment 2B

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump CB	25%	**1.00**	0.25	0.75
Stormceptor Unit	77%	0.75	0.58	0.17

Total TSS Removal = 83%

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

Project: Northern Bank-Littleton
Prepared By: SPM
Date: 8/12/22

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

	17003	Northern Bank Town Common	
By	SPM	Recharge Sizing	
Date	8/18/2022		

Required				
		B (0.35)	C (0.25)	D (0.1)
Proposed Impervious			103,603.00	
Existing Impervious			64,898.00	
Net Change in Impervious			38,705.00	
Requirement			806.35	
Total Required	806.35			
Total Provided	12,498.00			

Provided	Volume Provided	Water Quality Required (1"xImpervious Area)
Basin 1B	6,252.00	2,158
Basin 1C	6,246.00	905

	B	C	D
Recharge Volume to Basin 1B		539.52	
Recharge Volume to Basin 1C		226.17	
	0	765.69	0

765.69 Total Required Volume to Recharge Basins

Caputure Adjustment

Total Site New Impervious	38,705.00		
Impervious to Recharge	36,753.00	New Impervious captured	
Ratio	1.053		95%
Adjusted Required Volume	849.18		
Surplus	11,648.82		

Drawdown Calculations

	Total Storage (cf)	Surface Area (sf)	Rate (in/hr)	Drawdown Time (hr)
Basin 1B	6,252	5,408	0.27	51.38
Basin 1C	6,246	4,400	0.27	63.09

	18017	Northern Bank Town Common
By	SPM	Treatment Unit Sizing
Date	8/18/2022	

		Impervious Area (sqft)	Impervious Area (acre)	Model Needed
WQU 1	(Subcatchment 1C)	8,842.00	0.20	STC 900
WQU 2	(Subcatchment 1B)	25,897.00	0.59	STC 1200
WQU 3	(Subcatchment 2B)	16,962.00	0.39	STC 900
WQU 4	(Subcatchment 2B)	30,237.00	0.69	STC 900

Fact Sheet #4

Stormwater Technology: Stormceptor

(Hydro Conduit, formerly CSR New England Pipe)

Revised February 2003

*The **Stormceptor Fact Sheet** is one in a series of fact sheets for stormwater technologies and related performance evaluations, which are undertaken by the **Massachusetts STrategic Envirotechnology Partnership (STEP).***

The STEP evaluation entitled, *Technology Assessment, Stormceptor CSR New England Pipe*, January 1998 is the information source for this fact sheet. When a more thorough understanding of a system is required, the full *Technology Assessment* should be reviewed. Copies are available for downloading from the STEP Web site (www.STEPSITE.org/) or by contacting the STEP Program (Phone: 617/626/1197, FAX: 617/626/1180, email: linda.benevides@state.ma.us). This fact sheet is subject to future updates as additional performance information becomes available.

Description/Definition

Stormceptor is a prefabricated, underground unit that separates oils, grease, and sediment from stormwater runoff when installed with an existing or new pipe conveyance system. The unit is divided into two chambers–a treatment and a flow bypass chamber. During typical storm events, runoff is directed by the inflow weir through a drop pipe into the lower treatment chamber where sediment, oil, and grease are separated from the flow by gravity. The bypass chamber is designed to convey excess stormwater, which overtops the inflow weir, through the system without treatment.

Equipment and Sizing

The on-line Stormceptor units are available in eight sizes ranging from six and twelve feet in diameter with capacities of 900 to 7200 gallons. Since issuing the STEP assessment in 1998, the manufacturer has expanded the Stormceptor product line to include a storm drain inlet (STC 450i) and three units (Models STC 11000, STC 13000, and STC16000). These systems are not included in the STEP evaluation. Users and decision-makers may require additional field test results and new data for these new systems in order to accept performance ratings, particularly if they are higher than those reported in the STEP technology assessment and this fact sheet.

Stormceptor units are available in either precast concrete or fiberglass for special applications. Concrete units are pre-engineered for HS-20 min. traffic loading at the surface. Fiberglass units can be used in areas where there is a potential for oil and chemical spills.

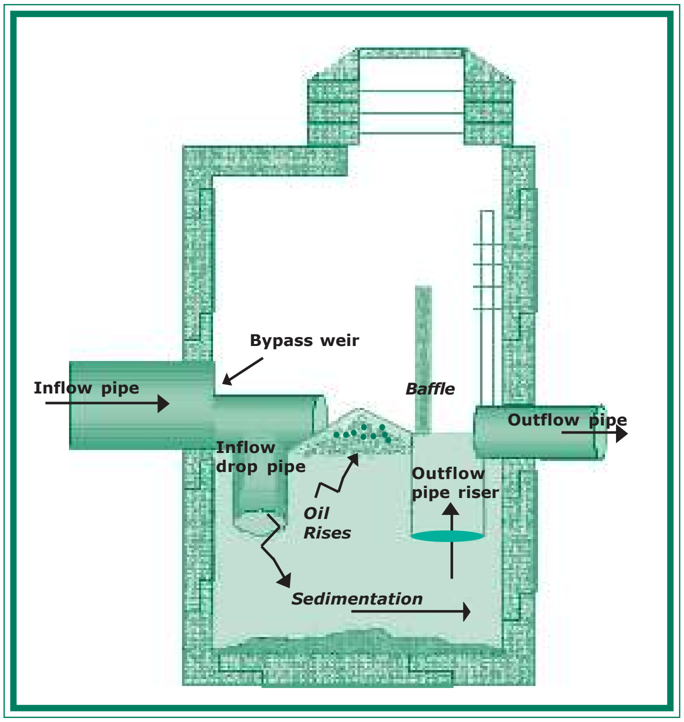


Figure 1. Stormceptor operation during average flow conditions.

Performance/Effectiveness

The system is designed to provide separation of sediment, oil, and grease from stormwater by routing runoff into a low-turbulence environment where solids settle and oils float out of solution. The system sizing is based on the drainage area, historical rainfall data, and the solids removal efficiency required. It is recommended that the system be used in combination with other stormwater controls to conform with the Massachusetts Stormwater Management Policy and standards.

An Imperial Model STC 2000 (equivalent to the Model STC 2400) in Edmonton, Canada treats flow from a 9.8 acre commercial parking lot. This system was monitored during four storm events in 1996 and shown to have an average total suspended solids (TSS) removal efficiency of 52 percent. In designing a system to achieve a comparable removal efficiency, the relationship between system size and impervious drainage area should be considered, as detailed in Table 1 and the Technology Assessment Report.

A Model STC 1200 in Westwood, Massachusetts treats flow from 0.65 acres consisting of a paved truck loading area at a manufacturing facility. The unit was monitored for six storm events in 1997, but only four events had measurable TSS influent concentrations. Of these four events, the average TSS removal efficiency was calculated to be 77 percent, which is less than the 80 percent removal targeted by the manufacturer.

Based on these field monitoring results, and when the unit sizing follows the guidance in Table 1, removal efficiencies between 52 percent and 77 percent may be achieved where installations have similar rainfall and land use characteristics as those reviewed for the STEP evaluation. It is recommended that additional field research and new data be evaluated to validate performance ratings higher than those verified by STEP.

Specific performance claims for oil and grease were not evaluated by STEP. However, total petroleum hydrocarbons (TPH) were analyzed during the Westwood study. Results indicated that the unit was effective in capturing oils.

Stormceptor	Maximum Impervious Area (acres)	
Model Number	77% TSS removal	52% TSS removal
STC 900	0.45	0.9
STC 1200	0.7	1.45
STC 1800	1.25	2.55
STC 2400	1.65	3.35
STC 3600	2.6	5.3
STC 4800	3.6	7.25
STC 6000	4.6	9.25
STC 7200	5.55	11.25

Table 1: Sizing for TSS removal (adapted from the manufacturer's sizing in the 1998 STEP Report) Use the table to determine a TSS removal rate. Use the new Rinker method for sizing Stormceptor units. The sizing method has been changed since publication of the STEP Report. **Note:** To achieve 52% and 77% TSS removal rates on some sites, it may be necessary to use lower maximum impervious areas than those in Table 1.

Technology Status

The Stormceptor system provides greater solids separation and higher TSS removal efficiencies than oil and grit separators. Stormceptor systems are among the category of hydrodynamic separators, which are flow-through devices with the capacity to settle or separate grit, oil, sediment, or other pollutants from stormwater. According to the U.S. Environmental Protection Agency, "Hydrodynamic separators are most effective where the materials to be removed from runoff are heavy particulates - which can be settled - or floatables - which can be captured, rather than solids with poor settleability or dissolved pollutants."

The field studies evaluated for the STEP assessment predate the Stormwater Best Management Practice Demonstration Tier II Protocol (2001), which is applicable in Massachusetts and other states in the Technology Acceptance Reciprocity Partnership (TARP), to ensure quality controlled studies that can be shared among participating states. Therefore, interstate reciprocity is not available to the manufacturer, based on performance claims that were evaluated by STEP in 1998. If the TARP Protocol requirements are fulfilled in the future, the manufacturer could pursue reciprocal verification for Stormceptor systems in participating TARP states. More information on the TARP Protocol is available on the following Web site: www.dep.state.pa.us/dep/deputate/pollprev/techservices/tarp.

Applications/Advantages

- Stormceptor systems identified in Table 1 should be used in combination with other BMPs to remove 80 percent of the average annual load of TSS (DEP Stormwater Policy Standard 4). Systems may be well suited for pretreatment in a mixed component system designed for stormwater recharge.
- Performance data show that Stormceptor may provide TSS removal rates in the range of 52 percent to 77 percent when sized according to Table 1. Higher TSS removal rates were achieved during low flow, low intensity storms with less than one third of an inch of runoff. Also, by reducing the impervious drainage area, relative to the system size, the STEP Technology Assessment Report indicated that higher removal efficiencies may be achievable. However, STEP recommends collection of additional data "representing a varied set of operating conditions over a realistic maintenance cycle to verify TSS removal rates greater than 80 percent."
- The Stormceptor system is suitable for new and retrofit applications. For retrofit applications, it should not

take the place of a catch basin for the systems that have been verified. Also, for retrofit applications, it should be installed in lateral lines and not main trunk lines.

- The system is particularly well suited in constricted areas and where space is limited.
- It also is suitable for use in areas of high potential pollutant loads (DEP Stormwater Policy Standard 5), where it may be used effectively in capturing and containing oil and chemical spills. *Web site:* www.state.ma.us/dep/brp/stormwtr/stormpub.htm.

Considerations/Limitations

- Systems are not expected to provide significant nutrient (nitrogen and phosphorus) or fecal coliform removal.
- The systems are not recommended for use in critical areas, such as public drinking water supplies, certified vernal pools, public swimming beaches, shellfish growing areas, cold water fisheries, and some Areas of Critical Environmental Concern (ACECs), except as a pretreatment device for BMPs that have been approved by DEP for use in critical areas. The structural BMPs approved for use in critical areas are described in Standard 6 of the Stormwater Management Policy, www.state.ma.us/dep/brp/stormwtr/stormpub.htm.
- There is a limited set of useful data for predicting the relationship between treatment efficiency and loading rates. Removal efficiencies have not been demonstrated for all unit sizes.
- Further research is needed to determine how much TSS bypasses the treatment chamber during certain, higher velocity storm events which recur less frequently.
- Systems require regular maintenance to minimize the potential for washout of the accumulated sediments.

Reliability/Maintenance

All BMPs require scheduled, routine maintenance to ensure that they operate as efficiently as possible. Although maintenance requirements are site specific, a general relationship between cleaning needs and depths of sediment has been established by the manufacturer. Inspection of the Stormceptor interior should be done after major storm events, particularly in the first year of operation. It is recommended that material in the treatment chamber be pumped out by a vacuum truck semiannually, or when the sediment and pollutant loads reach about 15 percent of the total storage. If the unit is used for spill containment, it should be pumped after the event is contained. Typical cleaning costs were estimated by the manufacturer in 1998 to be $250, with disposal costs averaging $300 to $500. The expected life of a system has been estimated to be 50 to 100 years.

Sediment Depths Indicating Required Maintenance	
Model Number	**Sediment Depth (feet)**
STC 900	0.5
STC 1200	0.75
STC 1800	1
STC 2400	1
STC 3600	1.25
STC 4800	1
STC 6000	1.5
STC 7200	1.25

Table 2: The Stormceptor clean out is based on 15 percent of the sediment storage volume in the

References

Winkler, E.S. 1998. "Technology Assessment, Stormceptor." University of Massachusetts, Amherst, MA.
STEP Web site: www.STEPSITE.org/

Massachusetts Department of Environmental Protection and Office of Coastal Zone Management. 1997. "Stormwater Management Handbooks, Volumes One and Two." Boston, MA. *Handbooks Web site:* www.state.ma.us/dep/brp/stormwtr/stormpub.htm.

United States Environmental Protection Agency. "Storm Water Technology Fact Sheet Hydrodynamic Separators." EPA 832-F-99-017.

Stormceptor Web sites: www.rinkermaterials.com/stormceptor

TARP Web site: www.dep.state.pa.us/dep/deputate/pollprev/techservices/tarp

STEP Verification vs. Regulatory Approval

STEP assistance to developers of innovative technologies and STEP verification of stormwater treatment systems is not required to receive necessary approvals from conservation commissions or the Department of Environmental Protection (DEP). However, if a system has received verfication, a conservation commission shall presume that the technology will function as proposed, provided the conditions are similar to those in which performance was verified. STEP reports are not technology approvals, and do not constitute an endorsement or recommendation for use. Questions on regulatory issues should be referred to the DEP regional offices.

APPENDIX D

Rainfall and Soils Information

Northern Bank Town Common
Littleton, Massachusetts

Oak Consulting Group
Project 18017

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

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.322 (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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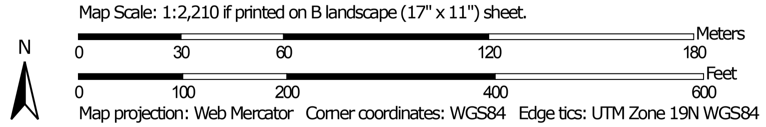
PF graphical

Hydrologic Soil Group—Middlesex County, Massachusetts
(HSG)

Map Scale: 1:2,210 if printed on B landscape (17" x 11") sheet.



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 Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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: 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%**

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

C. On-Site Review (continued)

Date: 5/19/22
By: SPM
Cloudy and drizzle/light rain - 50's

Deep Observation Hole Number: TP-1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	A(fill)	10YR 3/2	-	-	-	SL	5-10	-	MASSIVE	FRIABLE	
6-24	B(fill)	10YR 6/6	-	-	-	C. SAND	5-10	-	LOOSE	SINGLE	
24-40	A(b)	10YR 2/1	36"	-	-	SL	-	-	MASSIVE	FRIABLE	
40-69	B/C	10YR 3/6	-	-	-	SAND	10-25	10-25	LOOSE	SINGLE	

Additional Notes:
STANDING WATER @56" - ROOTS TO 56"

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

C. On-Site Review (continued)

Date: 5/19/22
By: SPM
Cloudy and drizzle/light rain - 50's

Deep Observation Hole Number: TP-2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12	A(fill)	10YR 2/2	-	-	-	SL	-	-	MASSIVE	FRIABLE	
12-21	B(fill)	10YR 5/6	-	-	-	SAND	-	-	LOOSE	SINGLE	
21-39	FILL	10YR 4/3	35"	-	-	LS	5-10	5-10	MASSIVE	FRIABLE	
39-55	A(b)	10YR 2/6	-	-	-	SiL	10-25	10-25	MASSIVE	FRIABLE	
55-66	B/C	10YR 2/2	-	-	-	SiL	10-20	10-20	MASSIVE	FRIABLE	

Additional Notes:
STANDING WATER @62" - ROOTS TO 60"

B/C APPEARS TO HAVE ORGANIC CONTENT (DARK SOIL), VERY STICKY WHEN WET

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

C. On-Site Review (continued)

Date: 5/19/22
By: SPM
Cloudy and drizzle/light rain - 50's

Deep Observation Hole Number: TP-3

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-35	FILL	-	-	-	-	LS	5-10	-	MASSIVE	FRIABLE	
35-50	B	10YR 5/6	36"	-	-	SiL	5-10	-	MASSIVE	FRIABLE	

Additional Notes:
STANDING WATER @46"

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

C. On-Site Review (continued)

Date: 5/19/22
By: SPM
Cloudy and drizzle/light rain - 50's

Deep Observation Hole Number: TP-4

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-3	ASPHLT	-	-	-	-	-	-	-	-	-	
3-32	FILL - MISC CONSTRUCTION DEBRIS AND GRANULAR SOIL										
32-50	B	10YR 7/3	-	-	-	M SAND	-	-	LOOSE	SIGNLE	
50-78	C	10YR 7/2	50	-	-	SiSL	5-10	-	MASSIVE	FRIABLE	

Additional Notes:
NO STANDING WATER - ROOTS TO 50"

C LOOKS LIKE TYPICAL TILL, BOTTOM OF HOLE IS WET SILTY TILL.

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

C. On-Site Review (continued)

Date: 5/19/22
By: SPM
Cloudy and drizzle/light rain - 50's

Deep Observation Hole Number: TP-5

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10	A	10YR 2/2	-	-	-	SL	-	-	MASSIVE	FRIABLE	
10-32	B	10YR 4/6	32"	-	-	SiL	0-10	-	MASSIVE	FRIABLE	
32-50	C	10YR 6/1	-	-	-	SiL	0-10	-	MASSIVE	FRIABLE	

Additional Notes:
STANDING WATER @35"

C STICKY WHEN WET

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

C. On-Site Review (continued)

Date: 5/19/22
By: SPM
Cloudy and drizzle/light rain - 50's

Deep Observation Hole Number: TP-6

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12	A	10YR 2/2	-	-	-	SL	-	-	MASSIVE	FRIABLE	
12-30	B	10YR 5/6	29"	-	-	SL	-	-	MASSIVE	FRIABLE	
30-47	C	10YR 4/6	-	-	-	S	20-40	0-10	SINGLE	LOOSE	

Additional Notes:
STANDING WATER @43"

BOTTOM OF HOLE VERY GRAVELLY

APPENDIX E

Operation and Maintenance Plan

Northern Bank Town Common
Littleton, Massachusetts

Oak Consulting Group
Project 18017

Long Term Pollution Prevention and Stormwater Operation and Maintenance Plan

For

Northern Bank Town Common

Great Road
Littleton, Massachusetts

AUGUST 2022

Prepared by:

OCG
Oak Consulting Group

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

TABLE OF CONTENTS

1.0 INTRODUCTION

This Pollution Prevention and Operation and Maintenance (O&M) Plan has been prepared to implement procedures for the Northern Bank Town Common (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 5.0 acres on 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 Catch Basins and Manholes

Catch basins and manholes shall be inspected for accumulation of silt, sediment, or debris on a semi-annual basis. Cleaning will be performed at least once per year or more frequently if the sediment level rises 2 feet above the bottom of the sump. Removed sediment will be disposed off site by a qualified waste disposal contractor in accordance with local, state and federal regulations.

3.2 Stormwater Basins

Stormwater basins consist of sub-surface infiltration and detention basins. The basins will be inspected for sediment and debris accumulation on regular basis. The maintenance schedule for stormwater basins is as follows:

Activity	Time of Year	Frequency
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

3.3 Stormwater Treatment Units

Stormwater Treatment Units shall be visually inspected annually and be cleaned out per the manufacturer's recommendations. Removed sediment will be disposed of off-site by a qualified waste disposal contractor in accordance with state and federal regulations.

3.4 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 kept on file for a minimum of 5 years.

APPENDIX A

Stormwater System O&M Inspection Report

Northern Bank Town Common
Great Road
Littleton, Massachusetts

Oak Consulting Group, LLC
Project 18017

STORMWATER MANAGEMENT
OPERATIONS AND MAINTENANCE PLAN

Northern Bank Town Common
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 Northern Bank Town Common. 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. Catch Basins and Drain Inlets shall be inspected for accumulation of silt, sediment, or debris on a quarterly basis. Cleaning will be performed whenever the sediment level rises to within 1 foot of the invert elevation of the outlet pipe. Removed sediment will be disposed of off-site by a qualified waste disposal contractor in accordance with state and federal regulations.

2. Landscaped Areas shall be inspected and maintained on a regular basis. Areas which may be subject to erosion will be stabilized and reseeded immediately. These operations will be performed as part of ongoing routine grounds maintenance operations.

3. Subsurface infiltration and detention system shall be inspected via the access ports for accumulation of sediment or standing water twice per year at the end of the winter season. Accumulated sediment or debris shall be removed by a vac-truck and disposed off-site by a licensed handler. See enclosed Manufactures O&M procedures.

4. Stormwater Treatment Units shall be visually inspected annually and be cleaned out per the manufacturer's recommendations. Removed sediment will be disposed of off-site by a qualified waste disposal contractor in accordance with state and federal regulations. See enclosed Manufactures O&M procedures.

.

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? ❑Yes ❑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		❑Yes ❑No		
2		❑Yes ❑No		
3		❑Yes ❑No		
4		❑Yes ❑No		
5		❑Yes ❑No		
6		❑Yes ❑No		
7		❑Yes ❑No		
8		❑Yes ❑No		
9		❑Yes ❑No		
10		❑Yes ❑No		

	Description	Installed and Operating Properly?	Corrective Action Needed	Date for Corrective Action/Responsible Person
11		❑Yes ❑No		
12		❑Yes ❑No		
13		❑Yes ❑No		
14		❑Yes ❑No		
15		❑Yes ❑No		
16		❑Yes ❑No		
17		❑Yes ❑No		
18		❑Yes ❑No		
19		❑Yes ❑No		
20		❑Yes ❑No		

Overall Site Issues

	Description		Corrective Action	Date for Corrective Action/Responsible Person
1	Are all slopes properly stabilized?	❑Yes ❑No		
2	Are discharge points free of sediment deposits?	❑Yes ❑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: ___________________________________

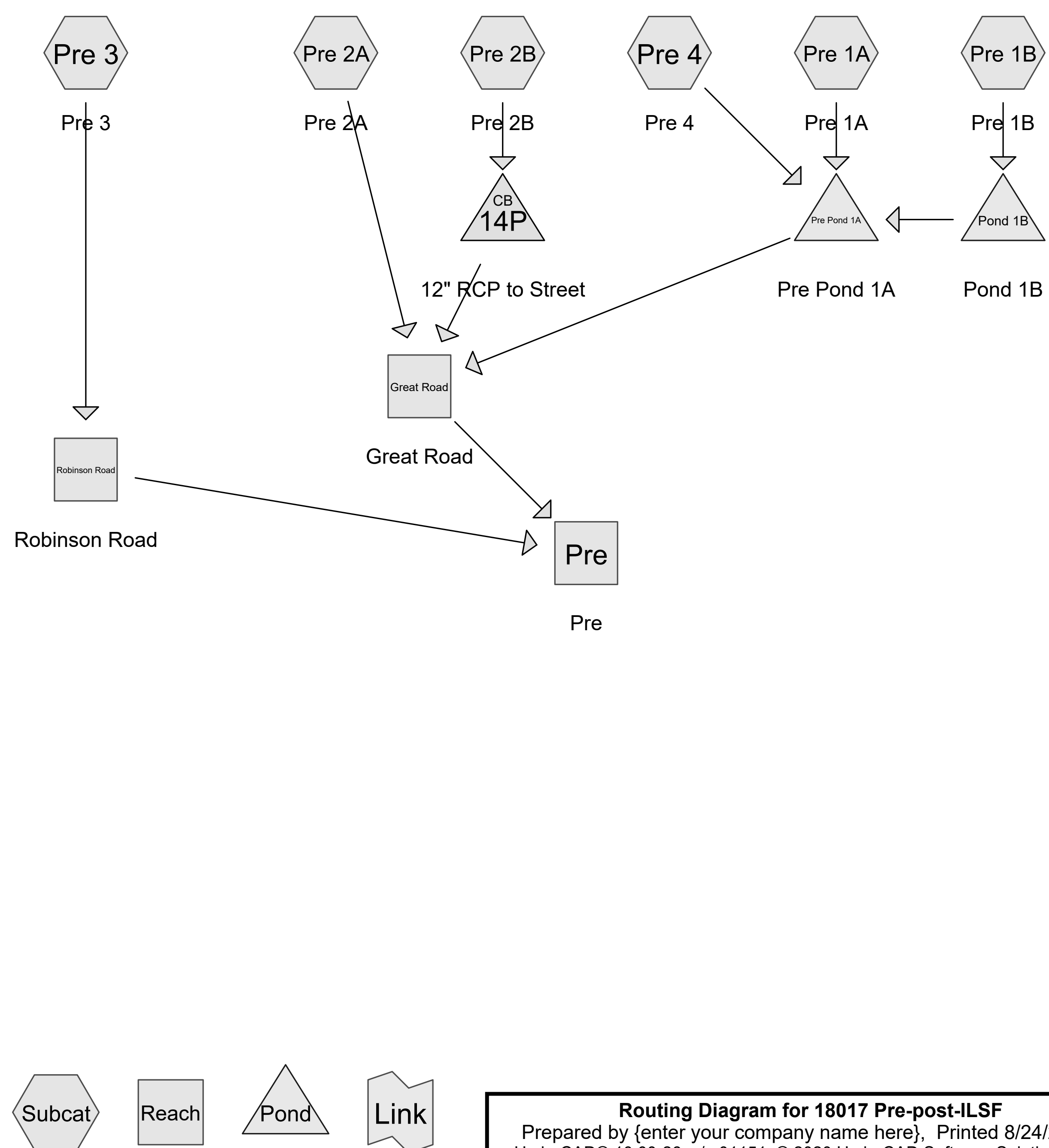
Signature: ____Date: __________________

APPENDIX F

ILSF Stormwater Calculations

Northern Bank Town Common
Littleton, Massachusetts

Oak Consulting Group
Project 18017



Routing Diagram for 18017 Pre-post-ILSF
Prepared by {enter your company name here}, Printed 8/24/2022
HydroCAD® 10.00-26 s/n 01151 © 2020 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

SubcatchmentPre 1A: Pre 1A Runoff Area=84,149 sf 25.13% Impervious Runoff Depth=1.04"
Flow Length=465' Slope=0.0360 '/' Tc=9.7 min CN=WQ Runoff=1.79 cfs 0.168 af

SubcatchmentPre 1B: Pre 1B Runoff Area=32,952 sf 24.30% Impervious Runoff Depth=1.09"
Flow Length=155' Slope=0.0300 '/' Tc=4.1 min CN=WQ Runoff=0.91 cfs 0.069 af

SubcatchmentPre 2A: Pre 2A Runoff Area=43,695 sf 58.46% Impervious Runoff Depth=1.68"
Flow Length=173' Slope=0.0150 '/' Tc=4.8 min CN=WQ Runoff=1.79 cfs 0.140 af

SubcatchmentPre 2B: Pre 2B Runoff Area=2,798 sf 100.00% Impervious Runoff Depth=2.39"
Flow Length=37' Slope=0.0100 '/' Tc=1.1 min CN=WQ Runoff=0.18 cfs 0.013 af

SubcatchmentPre 3: Pre 3 Runoff Area=3,249 sf 51.92% Impervious Runoff Depth=1.57"
Flow Length=44' Slope=0.0450 '/' Tc=1.0 min CN=WQ Runoff=0.14 cfs 0.010 af

SubcatchmentPre 4: Pre 4 Runoff Area=51,513 sf 11.10% Impervious Runoff Depth=0.87"
Flow Length=340' Slope=0.0450 '/' Tc=6.9 min CN=WQ Runoff=1.03 cfs 0.085 af

Reach Great Road: Great Road Inflow=1.97 cfs 0.153 af
Outflow=1.97 cfs 0.153 af

Reach Pre: Pre Inflow=2.08 cfs 0.163 af
Outflow=2.08 cfs 0.163 af

Reach Robinson Road: Robinson Road Inflow=0.14 cfs 0.010 af
Outflow=0.14 cfs 0.010 af

Pond 14P: 12" RCP to Street Peak Elev=272.95' Inflow=0.18 cfs 0.013 af
12.0" Round Culvert n=0.013 L=30.0' S=0.0100 '/' Outflow=0.18 cfs 0.013 af

Pond Pond 1B: Pond 1B Peak Elev=278.15' Storage=1,302 cf Inflow=0.91 cfs 0.069 af
Discarded=0.02 cfs 0.039 af Primary=0.29 cfs 0.024 af Outflow=0.30 cfs 0.064 af

Pond Pre Pond 1A: Pre Pond 1A Peak Elev=277.06' Storage=12,086 cf Inflow=2.75 cfs 0.277 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment Pre 1A: Pre 1A

Runoff = 1.79 cfs @ 12.15 hrs, Volume= 0.168 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YR NOAA Rainfall=2.62"

Area (sf)	CN	Description
2,349	98	Roofs, HSG C
18,796	98	Paved parking, HSG C
29,044	74	>75% Grass cover, Good, HSG C
33,960	70	Woods, Good, HSG C
84,149		Weighted Average
63,004	72	74.87% Pervious Area
21,145	98	25.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	465	0.0360	0.80		**Lag/CN Method, Pre 1A**

Summary for Subcatchment Pre 1B: Pre 1B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.91 cfs @ 12.07 hrs, Volume= 0.069 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YR NOAA Rainfall=2.62"

Area (sf)	CN	Description
2,684	98	Roofs, HSG C
5,324	98	Paved parking, HSG C
24,944	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
32,952		Weighted Average
24,944	74	75.70% Pervious Area
8,008	98	24.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	155	0.0300	0.63		**Lag/CN Method, Pre 1B**

Summary for Subcatchment Pre 2A: Pre 2A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.79 cfs @ 12.07 hrs, Volume= 0.140 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YR NOAA Rainfall=2.62"

Area (sf)	CN	Description
3,784	98	Roofs, HSG C
21,760	98	Paved parking, HSG C
17,314	74	>75% Grass cover, Good, HSG C
837	70	Woods, Good, HSG C
43,695		Weighted Average
18,151	74	41.54% Pervious Area
25,544	98	58.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	173	0.0150	0.60		**Lag/CN Method, Pre 2**

Summary for Subcatchment Pre 2B: Pre 2B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.18 cfs @ 12.01 hrs, Volume= 0.013 af, Depth= 2.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YR NOAA Rainfall=2.62"

Area (sf)	CN	Description
2,798	98	Roofs, HSG C
0	98	Paved parking, HSG C
0	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
2,798		Weighted Average
2,798	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	37	0.0100	0.57		**Lag/CN Method, Pre 2B**

Summary for Subcatchment Pre 3: Pre 3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.14 cfs @ 12.02 hrs, Volume= 0.010 af, Depth= 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YR NOAA Rainfall=2.62"

Area (sf)	CN	Description
901	98	Roofs, HSG C
786	98	Paved parking, HSG C
1,562	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
3,249		Weighted Average
1,562	74	48.08% Pervious Area
1,687	98	51.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	44	0.0450	0.73		**Lag/CN Method, Pre 3**

Summary for Subcatchment Pre 4: Pre 4

Runoff = 1.03 cfs @ 12.11 hrs, Volume= 0.085 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YR NOAA Rainfall=2.62"

Area (sf)	CN	Description
2,572	98	Roofs, HSG C
3,144	98	Paved parking, HSG C
45,797	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
51,513		Weighted Average
45,797	74	88.90% Pervious Area
5,716	98	11.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	340	0.0450	0.82		**Lag/CN Method, Pre 4**

Summary for Reach Great Road: Great Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.938 ac, 29.39% Impervious, Inflow Depth = 0.37" for 1-YR NOAA event
Inflow = 1.97 cfs @ 12.07 hrs, Volume= 0.153 af
Outflow = 1.97 cfs @ 12.12 hrs, Volume= 0.153 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Pre: Pre

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.013 ac, 29.72% Impervious, Inflow Depth = 0.39" for 1-YR NOAA event
Inflow = 2.08 cfs @ 12.12 hrs, Volume= 0.163 af
Outflow = 2.08 cfs @ 12.17 hrs, Volume= 0.163 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Robinson Road: Robinson Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.075 ac, 51.92% Impervious, Inflow Depth = 1.57" for 1-YR NOAA event
Inflow = 0.14 cfs @ 12.02 hrs, Volume= 0.010 af
Outflow = 0.14 cfs @ 12.07 hrs, Volume= 0.010 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond 14P: 12" RCP to Street

[57] Hint: Peaked at 272.95' (Flood elevation advised)

Inflow Area = 0.064 ac,100.00% Impervious, Inflow Depth = 2.39" for 1-YR NOAA event
Inflow = 0.18 cfs @ 12.01 hrs, Volume= 0.013 af
Outflow = 0.18 cfs @ 12.06 hrs, Volume= 0.013 af, Atten= 0%, Lag= 3.0 min
Primary = 0.18 cfs @ 12.06 hrs, Volume= 0.013 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 272.95' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.73'	**12.0" Round Culvert** L= 30.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.73' / 272.43' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.17 cfs @ 12.06 hrs HW=272.94' TW=0.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.17 cfs @ 2.17 fps)

Summary for Pond Pond 1B: Pond 1B

Inflow Area = 0.756 ac, 24.30% Impervious, Inflow Depth = 1.09" for 1-YR NOAA event
Inflow = 0.91 cfs @ 12.07 hrs, Volume= 0.069 af
Outflow = 0.30 cfs @ 12.41 hrs, Volume= 0.064 af, Atten= 66%, Lag= 20.9 min
Discarded = 0.02 cfs @ 12.41 hrs, Volume= 0.039 af
Primary = 0.29 cfs @ 12.41 hrs, Volume= 0.024 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 278.15' @ 12.41 hrs Surf.Area= 2,886 sf Storage= 1,302 cf

Plug-Flow detention time= 504.2 min calculated for 0.064 af (93% of inflow)
Center-of-Mass det. time= 464.5 min (1,277.4 - 813.0)

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	2,558 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.00	71	0	0
277.50	672	186	186
278.00	2,215	722	908
278.50	4,385	1,650	2,558

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	278.10'	**8.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 12.41 hrs HW=278.15' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.28 cfs @ 12.41 hrs HW=278.15' TW=276.69' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.28 cfs @ 0.65 fps)

Summary for Pond Pre Pond 1A: Pre Pond 1A

Inflow Area = 3.871 ac, 20.68% Impervious, Inflow Depth = 0.86" for 1-YR NOAA event
Inflow = 2.75 cfs @ 12.13 hrs, Volume= 0.277 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

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 277.06' @ 24.60 hrs Surf.Area= 24,051 sf Storage= 12,086 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	276.00'	47,715 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
276.00	4,053	0	0
276.50	8,187	3,060	3,060
277.00	22,091	7,570	10,630
277.50	37,615	14,927	25,556
278.00	51,019	22,159	47,715

Device	Routing	Invert	Outlet Devices
#1	Primary	277.50'	**30.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=276.00' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

SubcatchmentPre 1A: Pre 1A Runoff Area=84,149 sf 25.13% Impervious Runoff Depth=4.55"
Flow Length=465' Slope=0.0360 '/' Tc=9.7 min CN=WQ Runoff=8.52 cfs 0.733 af

SubcatchmentPre 1B: Pre 1B Runoff Area=32,952 sf 24.30% Impervious Runoff Depth=4.70"
Flow Length=155' Slope=0.0300 '/' Tc=4.1 min CN=WQ Runoff=4.15 cfs 0.296 af

SubcatchmentPre 2A: Pre 2A Runoff Area=43,695 sf 58.46% Impervious Runoff Depth=5.62"
Flow Length=173' Slope=0.0150 '/' Tc=4.8 min CN=WQ Runoff=6.08 cfs 0.470 af

SubcatchmentPre 2B: Pre 2B Runoff Area=2,798 sf 100.00% Impervious Runoff Depth=6.76"
Flow Length=37' Slope=0.0100 '/' Tc=1.1 min CN=WQ Runoff=0.49 cfs 0.036 af

SubcatchmentPre 3: Pre 3 Runoff Area=3,249 sf 51.92% Impervious Runoff Depth=5.45"
Flow Length=44' Slope=0.0450 '/' Tc=1.0 min CN=WQ Runoff=0.49 cfs 0.034 af

SubcatchmentPre 4: Pre 4 Runoff Area=51,513 sf 11.10% Impervious Runoff Depth=4.34"
Flow Length=340' Slope=0.0450 '/' Tc=6.9 min CN=WQ Runoff=5.63 cfs 0.428 af

Reach Great Road: Great Road Inflow=6.57 cfs 1.327 af
Outflow=6.57 cfs 1.327 af

Reach Pre: Pre Inflow=6.96 cfs 1.361 af
Outflow=6.96 cfs 1.361 af

Reach Robinson Road: Robinson Road Inflow=0.49 cfs 0.034 af
Outflow=0.49 cfs 0.034 af

Pond 14P: 12" RCP to Street Peak Elev=273.10' Inflow=0.49 cfs 0.036 af
12.0" Round Culvert n=0.013 L=30.0' S=0.0100 '/' Outflow=0.49 cfs 0.036 af

Pond Pond 1B: Pond 1B Peak Elev=278.41' Storage=2,191 cf Inflow=4.15 cfs 0.296 af
Discarded=0.03 cfs 0.045 af Primary=4.00 cfs 0.246 af Outflow=4.03 cfs 0.291 af

Pond Pre Pond 1A: Pre Pond 1A Peak Elev=277.65' Storage=31,681 cf Inflow=17.94 cfs 1.407 af
Outflow=5.09 cfs 0.821 af

Summary for Subcatchment Pre 1A: Pre 1A

Runoff = 8.52 cfs @ 12.14 hrs, Volume= 0.733 af, Depth= 4.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr ILSF Limit Rainfall=7.00"

Area (sf)	CN	Description
2,349	98	Roofs, HSG C
18,796	98	Paved parking, HSG C
29,044	74	>75% Grass cover, Good, HSG C
33,960	70	Woods, Good, HSG C
84,149		Weighted Average
63,004	72	74.87% Pervious Area
21,145	98	25.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	465	0.0360	0.80		**Lag/CN Method, Pre 1A**

Summary for Subcatchment Pre 1B: Pre 1B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 4.15 cfs @ 12.06 hrs, Volume= 0.296 af, Depth= 4.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr ILSF Limit Rainfall=7.00"

Area (sf)	CN	Description
2,684	98	Roofs, HSG C
5,324	98	Paved parking, HSG C
24,944	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
32,952		Weighted Average
24,944	74	75.70% Pervious Area
8,008	98	24.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	155	0.0300	0.63		**Lag/CN Method, Pre 1B**

Summary for Subcatchment Pre 2A: Pre 2A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 6.08 cfs @ 12.07 hrs, Volume= 0.470 af, Depth= 5.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr ILSF Limit Rainfall=7.00"

Area (sf)	CN	Description
3,784	98	Roofs, HSG C
21,760	98	Paved parking, HSG C
17,314	74	>75% Grass cover, Good, HSG C
837	70	Woods, Good, HSG C
43,695		Weighted Average
18,151	74	41.54% Pervious Area
25,544	98	58.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	173	0.0150	0.60		**Lag/CN Method, Pre 2**

Summary for Subcatchment Pre 2B: Pre 2B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.49 cfs @ 12.01 hrs, Volume= 0.036 af, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr ILSF Limit Rainfall=7.00"

Area (sf)	CN	Description
2,798	98	Roofs, HSG C
0	98	Paved parking, HSG C
0	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
2,798		Weighted Average
2,798	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	37	0.0100	0.57		**Lag/CN Method, Pre 2B**

Summary for Subcatchment Pre 3: Pre 3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.49 cfs @ 12.01 hrs, Volume= 0.034 af, Depth= 5.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr ILSF Limit Rainfall=7.00"

Area (sf)	CN	Description
901	98	Roofs, HSG C
786	98	Paved parking, HSG C
1,562	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
3,249		Weighted Average
1,562	74	48.08% Pervious Area
1,687	98	51.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	44	0.0450	0.73		**Lag/CN Method, Pre 3**

Summary for Subcatchment Pre 4: Pre 4

Runoff = 5.63 cfs @ 12.10 hrs, Volume= 0.428 af, Depth= 4.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr ILSF Limit Rainfall=7.00"

Area (sf)	CN	Description
2,572	98	Roofs, HSG C
3,144	98	Paved parking, HSG C
45,797	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
51,513		Weighted Average
45,797	74	88.90% Pervious Area
5,716	98	11.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	340	0.0450	0.82		**Lag/CN Method, Pre 4**

Summary for Reach Great Road: Great Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.938 ac, 29.39% Impervious, Inflow Depth = 3.22" for ILSF Limit event
Inflow = 6.57 cfs @ 12.07 hrs, Volume= 1.327 af
Outflow = 6.57 cfs @ 12.12 hrs, Volume= 1.327 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Pre: Pre

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.013 ac, 29.72% Impervious, Inflow Depth = 3.26" for ILSF Limit event
Inflow = 6.96 cfs @ 12.12 hrs, Volume= 1.361 af
Outflow = 6.96 cfs @ 12.17 hrs, Volume= 1.361 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Robinson Road: Robinson Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	0.075 ac, 51.92% Impervious,	Inflow Depth = 5.45"	for ILSF Limit event	
Inflow =	0.49 cfs @	12.01 hrs, Volume=	0.034 af	
Outflow =	0.49 cfs @	12.06 hrs, Volume=	0.034 af,	Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond 14P: 12" RCP to Street

[57] Hint: Peaked at 273.10' (Flood elevation advised)

Inflow Area =	0.064 ac,100.00% Impervious,	Inflow Depth = 6.76"	for ILSF Limit event	
Inflow =	0.49 cfs @	12.01 hrs, Volume=	0.036 af	
Outflow =	0.49 cfs @	12.06 hrs, Volume=	0.036 af,	Atten= 0%, Lag= 3.0 min
Primary =	0.49 cfs @	12.06 hrs, Volume=	0.036 af	

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 273.10' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.73'	**12.0" Round Culvert** L= 30.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.73' / 272.43' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.47 cfs @ 12.06 hrs HW=273.09' TW=0.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.47 cfs @ 2.77 fps)

Summary for Pond Pond 1B: Pond 1B

Inflow Area =	0.756 ac, 24.30% Impervious,	Inflow Depth = 4.70"	for ILSF Limit event	
Inflow =	4.15 cfs @	12.06 hrs, Volume=	0.296 af	
Outflow =	4.03 cfs @	12.12 hrs, Volume=	0.291 af,	Atten= 3%, Lag= 3.3 min
Discarded =	0.03 cfs @	12.12 hrs, Volume=	0.045 af	
Primary =	4.00 cfs @	12.12 hrs, Volume=	0.246 af	

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 278.41' @ 12.12 hrs Surf.Area= 4,006 sf Storage= 2,191 cf

Plug-Flow detention time= 134.0 min calculated for 0.291 af (98% of inflow)
Center-of-Mass det. time= 122.7 min (915.2 - 792.6)

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	2,558 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.00	71	0	0
277.50	672	186	186
278.00	2,215	722	908
278.50	4,385	1,650	2,558

Device	Routing	Invert	Outlet Devices
#1	Discarded	277.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	278.10'	**8.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 12.12 hrs HW=278.40' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=3.84 cfs @ 12.12 hrs HW=278.40' TW=277.31' (Dynamic Tailwater)
2=Broad-Crested Rectangular Weir (Weir Controls 3.84 cfs @ 1.58 fps)

Summary for Pond Pre Pond 1A: Pre Pond 1A

Inflow Area = 3.871 ac, 20.68% Impervious, Inflow Depth = 4.36" for ILSF Limit event
Inflow = 17.94 cfs @ 12.12 hrs, Volume= 1.407 af
Outflow = 5.09 cfs @ 12.54 hrs, Volume= 0.821 af, Atten= 72%, Lag= 25.1 min
Primary = 5.09 cfs @ 12.54 hrs, Volume= 0.821 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 277.65' @ 12.54 hrs Surf.Area= 41,752 sf Storage= 31,681 cf

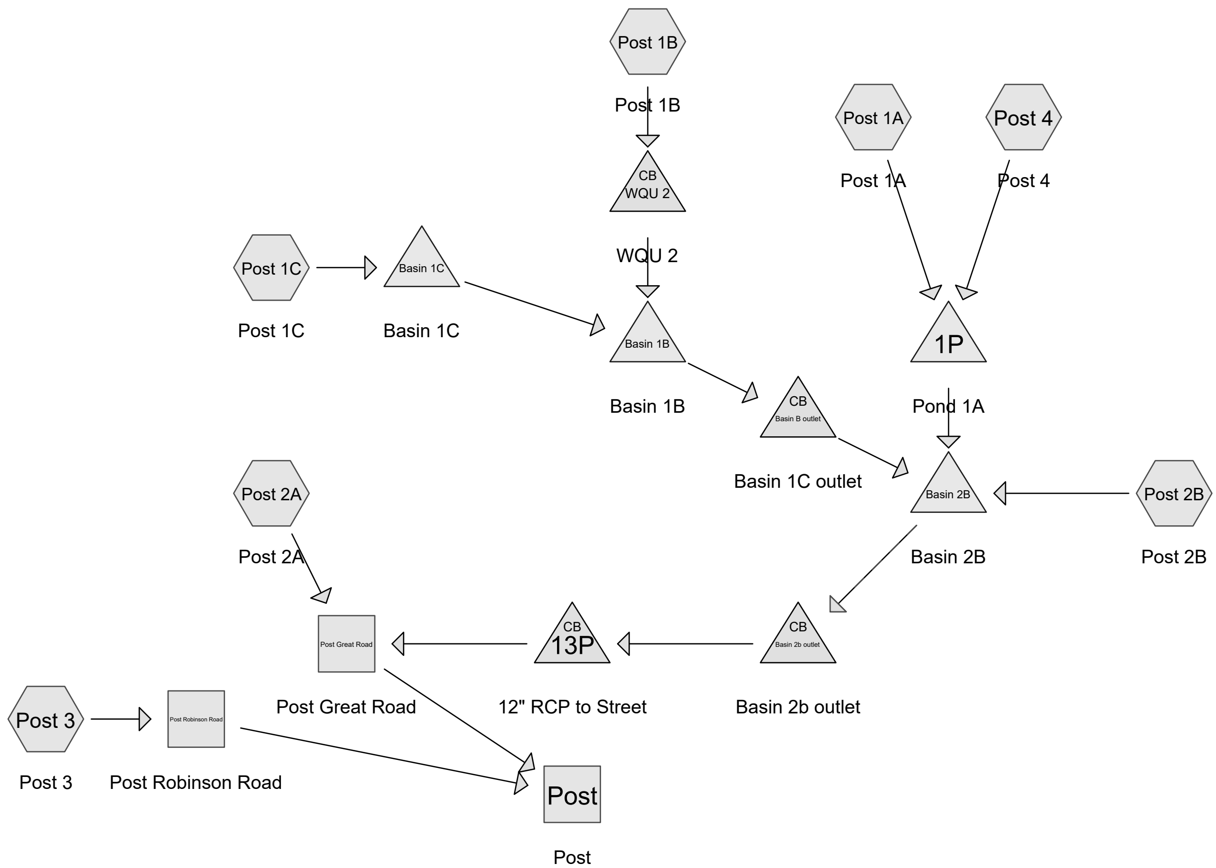
Plug-Flow detention time= 232.5 min calculated for 0.821 af (58% of inflow)
Center-of-Mass det. time= 124.0 min (928.9 - 804.9)

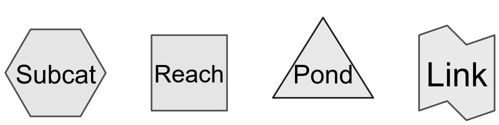
Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	47,715 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
276.00	4,053	0	0
276.50	8,187	3,060	3,060
277.00	22,091	7,570	10,630
277.50	37,615	14,927	25,556
278.00	51,019	22,159	47,715

Device	Routing	Invert	Outlet Devices
#1	Primary	277.50'	**30.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=5.07 cfs @ 12.54 hrs HW=277.65' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 5.07 cfs @ 1.10 fps)





Routing Diagram for 18017 Pre-post-ILSF
Prepared by {enter your company name here}, Printed 8/24/2022
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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

SubcatchmentPost 1A: Post 1A Runoff Area=24,084 sf 0.00% Impervious Runoff Depth=0.61"
Flow Length=41' Slope=0.0350 '/' Tc=1.7 min CN=WQ Runoff=0.38 cfs 0.028 af

SubcatchmentPost 1B: Post 1B Runoff Area=30,303 sf 85.46% Impervious Runoff Depth=2.14"
Flow Length=210' Slope=0.0150 '/' Tc=4.2 min CN=WQ Runoff=1.64 cfs 0.124 af

SubcatchmentPost 1C: Post 1C Runoff Area=17,604 sf 64.78% Impervious Runoff Depth=1.79"
Flow Length=128' Slope=0.0125 '/' Tc=3.9 min CN=WQ Runoff=0.80 cfs 0.060 af

SubcatchmentPost 2A: Post 2A Runoff Area=23,498 sf 59.30% Impervious Runoff Depth=1.69"
Flow Length=207' Slope=0.0150 '/' Tc=5.6 min CN=WQ Runoff=0.95 cfs 0.076 af

SubcatchmentPost 2B: Post 2B Runoff Area=68,249 sf 68.35% Impervious Runoff Depth=1.85"
Flow Length=479' Slope=0.0150 '/' Tc=10.1 min CN=WQ Runoff=2.63 cfs 0.241 af

SubcatchmentPost 3: Post 3 Runoff Area=3,105 sf 0.00% Impervious Runoff Depth=0.68"
Flow Length=20' Slope=0.2500 '/' Tc=0.3 min CN=WQ Runoff=0.06 cfs 0.004 af

SubcatchmentPost 4: Post 4 Runoff Area=51,513 sf 11.10% Impervious Runoff Depth=0.87"
Flow Length=340' Slope=0.0450 '/' Tc=6.9 min CN=WQ Runoff=1.03 cfs 0.085 af

Reach Post: Post Inflow=1.57 cfs 0.322 af
Outflow=1.57 cfs 0.322 af

Reach Post Great Road: Post Great Road Inflow=1.54 cfs 0.318 af
Outflow=1.54 cfs 0.318 af

Reach Post Robinson Road: Post Robinson Road Inflow=0.06 cfs 0.004 af
Outflow=0.06 cfs 0.004 af

Pond 1P: Pond 1A Peak Elev=276.44' Storage=4,940 cf Inflow=1.31 cfs 0.113 af
Outflow=0.00 cfs 0.000 af

Pond 13P: 12" RCP to Street Peak Elev=273.30' Inflow=1.06 cfs 0.242 af
12.0" Round Culvert n=0.013 L=30.0' S=0.0100 '/' Outflow=1.06 cfs 0.242 af

Pond Basin 1B: Basin 1B Peak Elev=279.01' Storage=5,415 cf Inflow=1.64 cfs 0.124 af
Outflow=0.01 cfs 0.001 af

Pond Basin 1C: Basin 1C Peak Elev=278.30' Storage=2,621 cf Inflow=0.80 cfs 0.060 af
12.0" Round Culvert n=0.012 L=35.0' S=0.0000 '/' Outflow=0.00 cfs 0.000 af

Pond Basin 2B: Basin 2B Peak Elev=273.97' Storage=2,614 cf Inflow=2.63 cfs 0.242 af
Primary=1.06 cfs 0.242 af Secondary=0.00 cfs 0.000 af Outflow=1.06 cfs 0.242 af

Pond Basin 2b outlet: Basin 2b outlet Peak Elev=273.58' Inflow=1.06 cfs 0.242 af
12.0" Round Culvert n=0.012 L=40.0' S=0.0050 '/' Outflow=1.06 cfs 0.242 af

Pond Basin B outlet: Basin 1C outlet Peak Elev=276.14' Inflow=0.01 cfs 0.001 af
15.0" Round Culvert n=0.012 L=86.0' S=0.0360 '/' Outflow=0.01 cfs 0.001 af

Pond WQU 2: WQU 2 Peak Elev=279.01' Inflow=1.64 cfs 0.124 af
18.0" Round Culvert n=0.012 L=20.0' S=0.0050 '/' Outflow=1.64 cfs 0.124 af

Summary for Subcatchment Post 1A: Post 1A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.38 cfs @ 12.05 hrs, Volume= 0.028 af, Depth= 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YR NOAA Rainfall=2.62"

Area (sf)	CN	Description
0	98	Roofs, HSG C
0	98	Paved parking, HSG C
13,794	74	>75% Grass cover, Good, HSG C
10,290	70	Woods, Good, HSG C
24,084		Weighted Average
24,084	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	41	0.0350	0.41		**Lag/CN Method, Post 1A**

Summary for Subcatchment Post 1B: Post 1B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.64 cfs @ 12.06 hrs, Volume= 0.124 af, Depth= 2.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YR NOAA Rainfall=2.62"

Area (sf)	CN	Description
0	98	Roofs, HSG C
25,897	98	Paved parking, HSG C
4,406	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
30,303		Weighted Average
4,406	74	14.54% Pervious Area
25,897	98	85.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	210	0.0150	0.84		**Lag/CN Method, Post 1B**

Summary for Subcatchment Post 1C: Post 1C

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.80 cfs @ 12.06 hrs, Volume= 0.060 af, Depth= 1.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YR NOAA Rainfall=2.62"

	Area (sf)	CN	Description
	2,014	98	Roofs, HSG C
	9,390	98	Paved parking, HSG C
	6,200	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	17,604		Weighted Average
	6,200	74	35.22% Pervious Area
	11,404	98	64.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	128	0.0125	0.55		**Lag/CN Method, Post 1C**

Summary for Subcatchment Post 2A: Post 2A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.95 cfs @ 12.08 hrs, Volume= 0.076 af, Depth= 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YR NOAA Rainfall=2.62"

	Area (sf)	CN	Description
	5,481	98	Roofs, HSG C
	8,454	98	Paved parking, HSG C
*	570	74	Pervious Pavers, HSG C
	8,993	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	23,498		Weighted Average
	9,563	74	40.70% Pervious Area
	13,935	98	59.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	207	0.0150	0.62		**Lag/CN Method, Post 2A**

Summary for Subcatchment Post 2B: Post 2B

Runoff = 2.63 cfs @ 12.14 hrs, Volume= 0.241 af, Depth= 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YR NOAA Rainfall=2.62"

	Area (sf)	CN	Description
	17,786	98	Roofs, HSG C
	28,865	98	Paved parking, HSG C
*	4,014	74	Pervious Pavers, HSG C
	17,584	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	68,249		Weighted Average
	21,598	74	31.65% Pervious Area
	46,651	98	68.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	479	0.0150	0.79		**Lag/CN Method, Post 2B**

Summary for Subcatchment Post 3: Post 3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.06 cfs @ 12.02 hrs, Volume= 0.004 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YR NOAA Rainfall=2.62"

Area (sf)	CN	Description
0	98	Roofs, HSG C
0	98	Paved parking, HSG C
3,105	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
3,105		Weighted Average
3,105	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.2500	1.00		**Lag/CN Method, Post 3**

Summary for Subcatchment Post 4: Post 4

Runoff = 1.03 cfs @ 12.11 hrs, Volume= 0.085 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YR NOAA Rainfall=2.62"

Area (sf)	CN	Description
2,572	98	Roofs, HSG C
3,144	98	Paved parking, HSG C
45,797	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
51,513		Weighted Average
45,797	74	88.90% Pervious Area
5,716	98	11.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	340	0.0450	0.82		**Lag/CN Method, Pre 4**

Summary for Reach Post: Post

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.013 ac, 47.45% Impervious, Inflow Depth > 0.77" for 1-YR NOAA event
Inflow = 1.57 cfs @ 12.15 hrs, Volume= 0.322 af
Outflow = 1.57 cfs @ 12.20 hrs, Volume= 0.322 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Post Great Road: Post Great Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.941 ac, 48.13% Impervious, Inflow Depth > 0.77" for 1-YR NOAA event
Inflow = 1.54 cfs @ 12.10 hrs, Volume= 0.318 af
Outflow = 1.54 cfs @ 12.15 hrs, Volume= 0.318 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Post Robinson Road: Post Robinson Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.071 ac, 0.00% Impervious, Inflow Depth = 0.68" for 1-YR NOAA event
Inflow = 0.06 cfs @ 12.02 hrs, Volume= 0.004 af
Outflow = 0.06 cfs @ 12.07 hrs, Volume= 0.004 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Pond 1A

Inflow Area = 1.735 ac, 7.56% Impervious, Inflow Depth = 0.78" for 1-YR NOAA event
Inflow = 1.31 cfs @ 12.10 hrs, Volume= 0.113 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

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 276.44' @ 24.45 hrs Surf.Area= 12,467 sf Storage= 4,940 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	276.00'	32,320 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
276.00	9,903	0	0
276.50	12,805	5,677	5,677
277.00	15,998	7,201	12,878
277.50	19,310	8,827	21,705
278.00	23,151	10,615	32,320

Device	Routing	Invert	Outlet Devices
#1	Primary	277.50'	**2.0" x 2.0" Horiz. Orifice/Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=276.00' TW=273.00' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 13P: 12" RCP to Street

[57] Hint: Peaked at 273.30' (Flood elevation advised)

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth > 0.66" for 1-YR NOAA event
Inflow = 1.06 cfs @ 12.47 hrs, Volume= 0.242 af
Outflow = 1.06 cfs @ 12.52 hrs, Volume= 0.242 af, Atten= 0%, Lag= 3.0 min
Primary = 1.06 cfs @ 12.52 hrs, Volume= 0.242 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 273.30' @ 12.52 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.73'	**12.0" Round Culvert** L= 30.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.73' / 272.43' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.06 cfs @ 12.52 hrs HW=273.30' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.06 cfs @ 3.32 fps)

Summary for Pond Basin 1B: Basin 1B

[80] Warning: Exceeded Pond Basin 1C by 0.71' @ 24.10 hrs (2.58 cfs 7.143 af)
[80] Warning: Exceeded Pond WQU 2 by 0.03' @ 12.55 hrs (0.53 cfs 0.399 af)

Inflow Area = 1.100 ac, 77.86% Impervious, Inflow Depth = 1.36" for 1-YR NOAA event
Inflow = 1.64 cfs @ 12.11 hrs, Volume= 0.124 af
Outflow = 0.01 cfs @ 24.14 hrs, Volume= 0.001 af, Atten= 99%, Lag= 721.6 min
Primary = 0.01 cfs @ 24.14 hrs, Volume= 0.001 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 279.01' @ 24.14 hrs Surf.Area= 5,408 sf Storage= 5,415 cf

Plug-Flow detention time= 1,314.2 min calculated for 0.001 af (1% of inflow)
Center-of-Mass det. time= 733.6 min (1,502.6 - 769.1)

Volume	Invert	Avail.Storage	Storage Description
#1	277.10'	4,529 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 13,520 cf Overall - 2,198 cf Embedded = 11,322 cf x 40.0% Voids
#2	277.60'	2,198 cf	**18.0" Round Pipe Storage** Inside #1 L= 1,244.0'
		6,727 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.10	5,408	0	0
279.60	5,408	13,520	13,520

Device	Routing	Invert	Outlet Devices
#1	Primary	279.00'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.01 cfs @ 24.14 hrs HW=279.01' TW=276.14' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.25 fps)

Summary for Pond Basin 1C: Basin 1C

Inflow Area = 0.404 ac, 64.78% Impervious, Inflow Depth = 1.79" for 1-YR NOAA event
Inflow = 0.80 cfs @ 12.06 hrs, Volume= 0.060 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

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 278.30' @ 24.25 hrs Surf.Area= 4,400 sf Storage= 2,621 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	277.10'	3,656 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 11,000 cf Overall - 1,859 cf Embedded = 9,141 cf x 40.0% Voids
#2	277.60'	1,859 cf	**18.0" Round Pipe Storage** Inside #1 L= 1,052.0'
		5,515 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.10	4,400	0	0
279.60	4,400	11,000	11,000

Device	Routing	Invert	Outlet Devices
#1	Primary	277.60'	**12.0" Round Culvert** L= 35.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 277.60' / 277.60' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=277.10' TW=277.10' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)

Summary for Pond Basin 2B: Basin 2B

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth = 0.66" for 1-YR NOAA event
Inflow = 2.63 cfs @ 12.14 hrs, Volume= 0.242 af
Outflow = 1.06 cfs @ 12.42 hrs, Volume= 0.242 af, Atten= 60%, Lag= 17.0 min
Primary = 1.06 cfs @ 12.42 hrs, Volume= 0.242 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 273.97' @ 12.46 hrs Surf.Area= 5,600 sf Storage= 2,614 cf

Plug-Flow detention time= 55.4 min calculated for 0.241 af (100% of inflow)
Center-of-Mass det. time= 55.4 min (835.5 - 780.1)

Volume	Invert	Avail.Storage	Storage Description
#1	273.00'	6,696 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 28,000 cf Overall - 11,259 cf Embedded = 16,741 cf x 40.0% Voids
#2	273.50'	11,259 cf	**48.0" Round Pipe Storage** Inside #1 L= 896.0'
		17,956 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
273.00	5,600	0	0
278.00	5,600	28,000	28,000

Device	Routing	Invert	Outlet Devices
#1	Secondary	277.50'	**6.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	273.00'	**8.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.05 cfs @ 12.42 hrs HW=273.97' TW=273.57' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Orifice Controls 1.05 cfs @ 3.01 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=273.00' TW=272.90' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond Basin 2b outlet: Basin 2b outlet

[57] Hint: Peaked at 273.58' (Flood elevation advised)

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth > 0.66" for 1-YR NOAA event
Inflow = 1.06 cfs @ 12.42 hrs, Volume= 0.242 af
Outflow = 1.06 cfs @ 12.47 hrs, Volume= 0.242 af, Atten= 0%, Lag= 3.0 min
Primary = 1.06 cfs @ 12.47 hrs, Volume= 0.242 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 273.58' @ 12.49 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.90'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.90' / 272.70' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=1.06 cfs @ 12.47 hrs HW=273.58' TW=273.30' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.06 cfs @ 2.64 fps)

Summary for Pond Basin B outlet: Basin 1C outlet

[57] Hint: Peaked at 276.14' (Flood elevation advised)

Inflow Area = 1.100 ac, 77.86% Impervious, Inflow Depth > 0.01" for 1-YR NOAA event
Inflow = 0.01 cfs @ 24.14 hrs, Volume= 0.001 af
Outflow = 0.01 cfs @ 24.19 hrs, Volume= 0.001 af, Atten= 0%, Lag= 3.0 min
Primary = 0.01 cfs @ 24.19 hrs, Volume= 0.001 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 276.14' @ 24.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	276.10'	**15.0" Round Culvert** L= 86.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 276.10' / 273.00' S= 0.0360 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.01 cfs @ 24.19 hrs HW=276.14' TW=273.10' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.01 cfs @ 0.69 fps)

Summary for Pond WQU 2: WQU 2

[57] Hint: Peaked at 279.01' (Flood elevation advised)

Inflow Area = 0.696 ac, 85.46% Impervious, Inflow Depth = 2.14" for 1-YR NOAA event
Inflow = 1.64 cfs @ 12.06 hrs, Volume= 0.124 af
Outflow = 1.64 cfs @ 12.11 hrs, Volume= 0.124 af, Atten= 0%, Lag= 3.0 min
Primary = 1.64 cfs @ 12.11 hrs, Volume= 0.124 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 279.01' @ 24.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	277.70'	**18.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 277.70' / 277.60' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=1.59 cfs @ 12.11 hrs HW=278.38' TW=278.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.59 cfs @ 2.99 fps)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment Post 1A: Post 1A Runoff Area=24,084 sf 0.00% Impervious Runoff Depth=3.86"
Flow Length=41' Slope=0.0350 '/' Tc=1.7 min CN=WQ Runoff=2.74 cfs 0.178 af

Subcatchment Post 1B: Post 1B Runoff Area=30,303 sf 85.46% Impervious Runoff Depth=6.37"
Flow Length=210' Slope=0.0150 '/' Tc=4.2 min CN=WQ Runoff=4.75 cfs 0.369 af

Subcatchment Post 1C: Post 1C Runoff Area=17,604 sf 64.78% Impervious Runoff Depth=5.80"
Flow Length=128' Slope=0.0125 '/' Tc=3.9 min CN=WQ Runoff=2.60 cfs 0.195 af

Subcatchment Post 2A: Post 2A Runoff Area=23,498 sf 59.30% Impervious Runoff Depth=5.65"
Flow Length=207' Slope=0.0150 '/' Tc=5.6 min CN=WQ Runoff=3.19 cfs 0.254 af

Subcatchment Post 2B: Post 2B Runoff Area=68,249 sf 68.35% Impervious Runoff Depth=5.90"
Flow Length=479' Slope=0.0150 '/' Tc=10.1 min CN=WQ Runoff=8.37 cfs 0.770 af

Subcatchment Post 3: Post 3 Runoff Area=3,105 sf 0.00% Impervious Runoff Depth=4.04"
Flow Length=20' Slope=0.2500 '/' Tc=0.3 min CN=WQ Runoff=0.39 cfs 0.024 af

Subcatchment Post 4: Post 4 Runoff Area=51,513 sf 11.10% Impervious Runoff Depth=4.34"
Flow Length=340' Slope=0.0450 '/' Tc=6.9 min CN=WQ Runoff=5.63 cfs 0.428 af

Reach Post: Post Inflow=4.67 cfs 1.495 af
Outflow=4.67 cfs 1.495 af

Reach Post Great Road: Post Great Road Inflow=4.45 cfs 1.471 af
Outflow=4.45 cfs 1.471 af

Reach Post Robinson Road: Post Robinson Road Inflow=0.39 cfs 0.024 af
Outflow=0.39 cfs 0.024 af

Pond 1P: Pond 1A Peak Elev=277.52' Storage=22,109 cf Inflow=7.61 cfs 0.606 af
Outflow=0.24 cfs 0.108 af

Pond 13P: 12" RCP to Street Peak Elev=273.79' Inflow=2.72 cfs 1.217 af
12.0" Round Culvert n=0.013 L=30.0' S=0.0100 '/' Outflow=2.72 cfs 1.217 af

Pond Basin 1B: Basin 1B Peak Elev=279.57' Storage=6,668 cf Inflow=4.75 cfs 0.463 af
Outflow=4.76 cfs 0.339 af

Pond Basin 1C: Basin 1C Peak Elev=279.41' Storage=5,181 cf Inflow=2.60 cfs 0.195 af
12.0" Round Culvert n=0.012 L=35.0' S=0.0000 '/' Outflow=1.32 cfs 0.094 af

Pond Basin 2B: Basin 2B Peak Elev=276.91' Storage=14,911 cf Inflow=12.08 cfs 1.217 af
Primary=2.72 cfs 1.217 af Secondary=0.00 cfs 0.000 af Outflow=2.72 cfs 1.217 af

Pond Basin 2b outlet: Basin 2b outlet Peak Elev=274.31' Inflow=2.72 cfs 1.217 af
12.0" Round Culvert n=0.012 L=40.0' S=0.0050 '/' Outflow=2.72 cfs 1.217 af

Pond Basin B outlet: Basin 1C outlet Peak Elev=277.37' Inflow=4.76 cfs 0.339 af
15.0" Round Culvert n=0.012 L=86.0' S=0.0360 '/' Outflow=4.76 cfs 0.339 af

Pond WQU 2: WQU 2 Peak Elev=279.70' Inflow=4.75 cfs 0.369 af
18.0" Round Culvert n=0.012 L=20.0' S=0.0050 '/' Outflow=4.75 cfs 0.369 af

Summary for Subcatchment Post 1A: Post 1A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.74 cfs @ 12.03 hrs, Volume= 0.178 af, Depth= 3.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr ILSF Limit Rainfall=7.00"

Area (sf)	CN	Description
0	98	Roofs, HSG C
0	98	Paved parking, HSG C
13,794	74	>75% Grass cover, Good, HSG C
10,290	70	Woods, Good, HSG C
24,084		Weighted Average
24,084	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	41	0.0350	0.41		**Lag/CN Method, Post 1A**

Summary for Subcatchment Post 1B: Post 1B

[49] Hint: Tc<2dt may require smaller dt

Runoff = 4.75 cfs @ 12.06 hrs, Volume= 0.369 af, Depth= 6.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr ILSF Limit Rainfall=7.00"

Area (sf)	CN	Description
0	98	Roofs, HSG C
25,897	98	Paved parking, HSG C
4,406	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
30,303		Weighted Average
4,406	74	14.54% Pervious Area
25,897	98	85.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	210	0.0150	0.84		**Lag/CN Method, Post 1B**

Summary for Subcatchment Post 1C: Post 1C

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.60 cfs @ 12.06 hrs, Volume= 0.195 af, Depth= 5.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr ILSF Limit Rainfall=7.00"

	Area (sf)	CN	Description
	2,014	98	Roofs, HSG C
	9,390	98	Paved parking, HSG C
	6,200	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	17,604		Weighted Average
	6,200	74	35.22% Pervious Area
	11,404	98	64.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	128	0.0125	0.55		**Lag/CN Method, Post 1C**

Summary for Subcatchment Post 2A: Post 2A

[49] Hint: Tc<2dt may require smaller dt

Runoff = 3.19 cfs @ 12.08 hrs, Volume= 0.254 af, Depth= 5.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr ILSF Limit Rainfall=7.00"

	Area (sf)	CN	Description
	5,481	98	Roofs, HSG C
	8,454	98	Paved parking, HSG C
*	570	74	Pervious Pavers, HSG C
	8,993	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	23,498		Weighted Average
	9,563	74	40.70% Pervious Area
	13,935	98	59.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	207	0.0150	0.62		**Lag/CN Method, Post 2A**

Summary for Subcatchment Post 2B: Post 2B

Runoff = 8.37 cfs @ 12.14 hrs, Volume= 0.770 af, Depth= 5.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr ILSF Limit Rainfall=7.00"

	Area (sf)	CN	Description
	17,786	98	Roofs, HSG C
	28,865	98	Paved parking, HSG C
*	4,014	74	Pervious Pavers, HSG C
	17,584	74	>75% Grass cover, Good, HSG C
	0	70	Woods, Good, HSG C
	68,249		Weighted Average
	21,598	74	31.65% Pervious Area
	46,651	98	68.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	479	0.0150	0.79		**Lag/CN Method, Post 2B**

Summary for Subcatchment Post 3: Post 3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.39 cfs @ 12.01 hrs, Volume= 0.024 af, Depth= 4.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr ILSF Limit Rainfall=7.00"

Area (sf)	CN	Description
0	98	Roofs, HSG C
0	98	Paved parking, HSG C
3,105	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
3,105		Weighted Average
3,105	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.2500	1.00		**Lag/CN Method, Post 3**

Summary for Subcatchment Post 4: Post 4

Runoff = 5.63 cfs @ 12.10 hrs, Volume= 0.428 af, Depth= 4.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr ILSF Limit Rainfall=7.00"

Area (sf)	CN	Description
2,572	98	Roofs, HSG C
3,144	98	Paved parking, HSG C
45,797	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
51,513		Weighted Average
45,797	74	88.90% Pervious Area
5,716	98	11.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	340	0.0450	0.82		**Lag/CN Method, Pre 4**

Summary for Reach Post: Post

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.013 ac, 47.45% Impervious, Inflow Depth = 3.58" for ILSF Limit event
Inflow = 4.67 cfs @ 12.13 hrs, Volume= 1.495 af
Outflow = 4.67 cfs @ 12.18 hrs, Volume= 1.495 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Post Great Road: Post Great Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.941 ac, 48.13% Impervious, Inflow Depth = 3.57" for ILSF Limit event
Inflow = 4.45 cfs @ 12.09 hrs, Volume= 1.471 af
Outflow = 4.45 cfs @ 12.14 hrs, Volume= 1.471 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach Post Robinson Road: Post Robinson Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.071 ac, 0.00% Impervious, Inflow Depth = 4.04" for ILSF Limit event
Inflow = 0.39 cfs @ 12.01 hrs, Volume= 0.024 af
Outflow = 0.39 cfs @ 12.06 hrs, Volume= 0.024 af, Atten= 0%, Lag= 3.0 min

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Pond 1A

Inflow Area = 1.735 ac, 7.56% Impervious, Inflow Depth = 4.19" for ILSF Limit event
Inflow = 7.61 cfs @ 12.08 hrs, Volume= 0.606 af
Outflow = 0.24 cfs @ 16.81 hrs, Volume= 0.108 af, Atten= 97%, Lag= 284.1 min
Primary = 0.24 cfs @ 16.81 hrs, Volume= 0.108 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 277.52' @ 16.81 hrs Surf.Area= 19,470 sf Storage= 22,109 cf

Plug-Flow detention time= 543.7 min calculated for 0.108 af (18% of inflow)
Center-of-Mass det. time= 370.6 min (1,183.4 - 812.8)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	32,320 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
276.00	9,903	0	0
276.50	12,805	5,677	5,677
277.00	15,998	7,201	12,878
277.50	19,310	8,827	21,705
278.00	23,151	10,615	32,320

Device	Routing	Invert	Outlet Devices
#1	Primary	277.50'	**2.0" x 2.0" Horiz. Orifice/Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.24 cfs @ 16.81 hrs HW=277.52' TW=273.82' (Dynamic Tailwater)
1=Orifice/Grate (Weir Controls 0.24 cfs @ 0.47 fps)

Summary for Pond 13P: 12" RCP to Street

[57] Hint: Peaked at 273.79' (Flood elevation advised)

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth = 3.32" for ILSF Limit event
Inflow = 2.72 cfs @ 12.78 hrs, Volume= 1.217 af
Outflow = 2.72 cfs @ 12.83 hrs, Volume= 1.217 af, Atten= 0%, Lag= 3.0 min
Primary = 2.72 cfs @ 12.83 hrs, Volume= 1.217 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 273.79' @ 12.83 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.73'	**12.0" Round Culvert** L= 30.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.73' / 272.43' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=2.72 cfs @ 12.83 hrs HW=273.79' TW=0.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 2.72 cfs @ 4.05 fps)

Summary for Pond Basin 1B: Basin 1B

[89] Warning: Qout>Qin may require smaller dt
[80] Warning: Exceeded Pond Basin 1C by 0.84' @ 12.10 hrs (3.47 cfs 0.665 af)
[80] Warning: Exceeded Pond WQU 2 by 0.19' @ 12.05 hrs (3.72 cfs 0.514 af)

Inflow Area = 1.100 ac, 77.86% Impervious, Inflow Depth = 5.05" for ILSF Limit event
Inflow = 4.75 cfs @ 12.11 hrs, Volume= 0.463 af
Outflow = 4.76 cfs @ 12.16 hrs, Volume= 0.339 af, Atten= 0%, Lag= 3.1 min
Primary = 4.76 cfs @ 12.16 hrs, Volume= 0.339 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 279.57' @ 12.16 hrs Surf.Area= 5,408 sf Storage= 6,668 cf

Plug-Flow detention time= 190.0 min calculated for 0.339 af (73% of inflow)
Center-of-Mass det. time= 89.7 min (875.8 - 786.1)

Volume	Invert	Avail.Storage	Storage Description
#1	277.10'	4,529 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 13,520 cf Overall - 2,198 cf Embedded = 11,322 cf x 40.0% Voids
#2	277.60'	2,198 cf	**18.0" Round Pipe Storage** Inside #1 L= 1,244.0'
		6,727 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.10	5,408	0	0
279.60	5,408	13,520	13,520

Device	Routing	Invert	Outlet Devices
#1	Primary	279.00'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=4.57 cfs @ 12.16 hrs HW=279.56' TW=277.11' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Weir Controls 4.57 cfs @ 2.05 fps)

Summary for Pond Basin 1C: Basin 1C

[86] Warning: Oscillations may require smaller dt (severity=53)

Inflow Area = 0.404 ac, 64.78% Impervious, Inflow Depth = 5.80" for ILSF Limit event
Inflow = 2.60 cfs @ 12.06 hrs, Volume= 0.195 af
Outflow = 1.32 cfs @ 12.76 hrs, Volume= 0.094 af, Atten= 49%, Lag= 42.2 min
Primary = 1.32 cfs @ 12.76 hrs, Volume= 0.094 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 279.41' @ 12.54 hrs Surf.Area= 4,400 sf Storage= 5,181 cf

Plug-Flow detention time= 294.5 min calculated for 0.094 af (48% of inflow)
Center-of-Mass det. time= 161.8 min (922.2 - 760.4)

Volume	Invert	Avail.Storage	Storage Description
#1	277.10'	3,656 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 11,000 cf Overall - 1,859 cf Embedded = 9,141 cf x 40.0% Voids
#2	277.60'	1,859 cf	**18.0" Round Pipe Storage** Inside #1 L= 1,052.0'
		5,515 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
277.10	4,400	0	0
279.60	4,400	11,000	11,000

Device	Routing	Invert	Outlet Devices
#1	Primary	277.60'	**12.0" Round Culvert** L= 35.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 277.60' / 277.60' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=1.22 cfs @ 12.76 hrs HW=279.29' TW=279.18' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.22 cfs @ 1.55 fps)

Summary for Pond Basin 2B: Basin 2B

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth = 3.32" for ILSF Limit event
Inflow = 12.08 cfs @ 12.18 hrs, Volume= 1.217 af
Outflow = 2.72 cfs @ 12.73 hrs, Volume= 1.217 af, Atten= 77%, Lag= 32.6 min
Primary = 2.72 cfs @ 12.73 hrs, Volume= 1.217 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 276.91' @ 12.74 hrs Surf.Area= 5,600 sf Storage= 14,911 cf

Plug-Flow detention time= 60.4 min calculated for 1.215 af (100% of inflow)
Center-of-Mass det. time= 60.6 min (893.6 - 833.0)

Volume	Invert	Avail.Storage	Storage Description
#1	273.00'	6,696 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 28,000 cf Overall - 11,259 cf Embedded = 16,741 cf x 40.0% Voids
#2	273.50'	11,259 cf	**48.0" Round Pipe Storage** Inside #1 L= 896.0'
		17,956 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
273.00	5,600	0	0
278.00	5,600	28,000	28,000

Device	Routing	Invert	Outlet Devices
#1	Secondary	277.50'	**6.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	273.00'	**8.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=2.71 cfs @ 12.73 hrs HW=276.91' TW=274.30' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Orifice Controls 2.71 cfs @ 7.77 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=273.00' TW=272.90' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond Basin 2b outlet: Basin 2b outlet

[57] Hint: Peaked at 274.31' (Flood elevation advised)

Inflow Area = 4.402 ac, 46.76% Impervious, Inflow Depth = 3.32" for ILSF Limit event
Inflow = 2.72 cfs @ 12.73 hrs, Volume= 1.217 af
Outflow = 2.72 cfs @ 12.78 hrs, Volume= 1.217 af, Atten= 0%, Lag= 3.0 min
Primary = 2.72 cfs @ 12.78 hrs, Volume= 1.217 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 274.31' @ 12.77 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.90'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.90' / 272.70' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=2.72 cfs @ 12.78 hrs HW=274.31' TW=273.79' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.72 cfs @ 3.46 fps)

Summary for Pond Basin B outlet: Basin 1C outlet

[57] Hint: Peaked at 277.37' (Flood elevation advised)

Inflow Area = 1.100 ac, 77.86% Impervious, Inflow Depth = 3.70" for ILSF Limit event
Inflow = 4.76 cfs @ 12.16 hrs, Volume= 0.339 af
Outflow = 4.76 cfs @ 12.21 hrs, Volume= 0.339 af, Atten= 0%, Lag= 3.0 min
Primary = 4.76 cfs @ 12.21 hrs, Volume= 0.339 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 277.37' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	276.10'	**15.0" Round Culvert** L= 86.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 276.10' / 273.00' S= 0.0360 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=4.60 cfs @ 12.21 hrs HW=277.32' TW=275.39' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 4.60 cfs @ 3.77 fps)

Summary for Pond WQU 2: WQU 2

[57] Hint: Peaked at 279.70' (Flood elevation advised)

Inflow Area =	0.696 ac,	85.46% Impervious,	Inflow Depth = 6.37"	for ILSF Limit event
Inflow =	4.75 cfs @	12.06 hrs, Volume=	0.369 af	
Outflow =	4.75 cfs @	12.11 hrs, Volume=	0.369 af,	Atten= 0%, Lag= 3.0 min
Primary =	4.75 cfs @	12.11 hrs, Volume=	0.369 af	

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 279.70' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	277.70'	**18.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 277.70' / 277.60' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=3.34 cfs @ 12.11 hrs HW=279.62' TW=279.47' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 3.34 cfs @ 1.89 fps)