APPLICATION FOR CHAPTER 91 WATERWAYS LICENSE

PROPOSED PEDESTRIAN BRIDGE REPLACEMENT OVER THE CHARLES RIVER
BRIDGE NO. N-12-078 = W-29-062
NEWTON & WESTON, MASSACHUSETTS

GPI

181 Ballardvale Street, Suite 202
Wilmington, MA 01887
(978) 570-2999

SUBMITTED TO:

Department of Environmental Protection
Waterways Regulation Program
One Winter Street, 5th Floor
Boston, MA 02108

October 2021

(GPI Project No. 2013034.40)

Proposed Pedestrian Bridge Replacement over the Charles River – Newton & Weston, MA
Application for Chapter 91 Waterways License
October 2021

October 4, 2021

MAX-2013034 Assign 40

SENT VIA ELECTRONIC MAIL
Mr. Daniel Padien
Department of Environmental Protection
Waterways Regulation Program
One Winter Street, 5th Floor
Boston, MA 02108

SUBJECT: Application for Chapter 91 Waterways License (BRP WW01)
Proposed Pedestrian Bridge Replacement Over the Charles River
Bridge No. N-12-078 = W-29-062
Newton & Weston, Massachusetts

Dear Mr. Padien:

On behalf of the Massachusetts Department of Conservation and Recreation (DCR) and the Massachusetts Department of Transportation (MassDOT), Greenman Pedersen, Inc. (GPI) respectfully submits the attached application for a Chapter 91 Waterways License for the replacement of the existing pedestrian Bridge No. N-12-078 = W-29=062 over the Charles River in Newton & Weston, Massachusetts. The proposed bridge will be constructed in a similar configuration to the existing bridge and provide an improvement over the existing conditions. The proposed bridge replacement is presumed to qualify as a water-dependent activity. MassDOT is responsible for the design and construction of the proposed bridge replacement; DCR will be the owner of the bridge and is responsible for long term operations and maintenance.

The DCR and MassDOT have identified this project as a key element in improving the safety, accessibility, and connectivity of the Upper Charles River Reservation and the Charles River Greenway. The existing bridge over the Charles River consists of a three (3) span steel "stringer" bridge. The bridge is supported by two (2) abutments with concrete footings and timber-tie walls and two (2) piers consisting of reinforced concrete caps over mortared stone masonry walls. The bridge has a width of approximately 7-feet and a length of approximately 187 feet from abutment to abutment. The existing bridge shows numerous signs of deterioration including rotten and collapsed sections of timber decking, rotten or damaged segments of timber rail, and fracturing in the abutments and piers. The existing bridge has been closed to the public since 2016 due to safety concerns.

The proposed replacement bridge will consist of a two (2) span, prefabricated steel truss supported by two (2) cement concrete abutments and one pier consisting of six (6) cement filled steel piles with a reinforced concrete cap. The total length of the proposed bridge is 195 feet. The existing abutments and piers will be removed; the piers will be removed 12 inches below the mudline to ensure that they do not create a hazard to navigation. The installation of the new piers and removal of the existing piers will be conducted from a barge in the Charles River with floating booms and silt curtains in place to prevent any turbidity. Temporary dewatering is proposed around the abutments to allow for the placement of riprap for erosion and scour protection.

Draft paper plans have been included with this application. Final Mylar plans will be prepared once MassDEP's initial review has been completed and all necessary revisions have been made. A copy of this application has been submitted to the City of Newton and Town of Weston Planning Boards for their review in accordance with 310 CMR 9.11(3)(c)(3).

An Environmental Notification Form will be filed under the Massachusetts Environmental Policy Act in August 2021. Wetland Protection Act Notices of Intent will also been filed with the Newton and Weston Conservation Commissions in August 2021. Upon issuance, copies of the MEPA Certificate and Orders of Conditions will be forwarded to MassDEP Waterways.

Pursuant to 310 CMR 9.16(4)(a), the applicant respectfully requests that the application fee be waived. The replacement of the existing Charles River pedestrian bridge is a public service project being undertaken by a public agency. The proposed bridge will restore a pedestrian and bicycle link over the Charles River between Newton and Weston.

Should you have any other questions or require additional information please contact me at (978) 570-2989 or scampbell@gpinet.com.

Sincerely,

GREENMAN-PEDERSEN, INC.

Samuel Campbell
Environmental Scientist

enclosure(s) Chapter 91 Waterways License Application

cc: S. Upson, MassDOT
M. Trepanier, MassDOT
B. Cordeiro, MassDOT
P. Jahnige, DCR
G. Robbins, DCR
B. Myers, GPI

Pedestrian Bridge Replacement over the Charles River (Bridge No. N-12-078 = W-29-062)
Newton & Weston, Massachusetts
MassDOT Project File No. 609066 – MassDEP Transmittal X287622

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Massachusetts Department of Environmental Protection
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Chapter 91 Waterways License Application - 310 CMR 9.00
Water-Dependent, Nonwater-Dependent, Amendment

X287622
Transmittal No.

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

For assistance in completing this application, please see the "Instructions".

A. Application Information (Check one)

NOTE: For Chapter 91 Simplified License application form and information see the Self Licensing Package for BRP WW06.

Name (Complete Application Sections)		Check One	Fee	Application #
WATER-DEPENDENT -				
	General (A-H)	☐ Residential with ≤ 4 units	$215.00	BRP WW01a
		☒ Other	$330.00	BRP WW01b
		☐ Extended Term	$3,350.00	BRP WW01c
	Amendment (A-H)	☐ Residential with ≤ 4 units	$100.00	BRP WW03a
		☐ Other	$125.00	BRP WW03b
NONWATER-DEPENDENT -				
	Full (A-H)	☐ Residential with ≤ 4 units	$665.00	BRP WW15a
		☐ Other	$2,005.00	BRP WW15b
		☐ Extended Term	$3,350.00	BRP WW15c
	Partial (A-H)	☐ Residential with ≤ 4 units	$665.00	BRP WW14a
		☐ Other	$2,005.00	BRP WW14b
		☐ Extended Term	$3,350.00	BRP WW14c
	Municipal Harbor Plan (A-H)	☐ Residential with ≤ 4 units	$665.00	BRP WW16a
		☐ Other	$2,005.00	BRP WW16b
		☐ Extended Term	$3,350.00	BRP WW16c
	Joint MEPA/EIR (A-H)	☐ Residential with ≤ 4 units	$665.00	BRP WW17a
		☐ Other	$2,005.00	BRP WW17b
		☐ Extended Term	$3,350.00	BRP WW17c
	Amendment (A-H)	☐ Residential with ≤ 4 units	$530.00	BRP WW03c
		☐ Other	$1,000.00	BRP WW03d
		☐ Extended Term	$1,335.00	BRP WW03e

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B. Applicant Information Proposed Project/Use Information

Note: Please refer to the "Instructions"

1. Applicant:

Department of Conservation and Recreation
Name

paul.jahnige@state.ma.us
E-mail Address

251 Causeway Street
Mailing Address

Boston
City/Town

MA
State

02114
Zip Code

(413) 586-8706
Telephone Number

Fax Number

2. Authorized Agent (if any):

Samuel Campbell
Name

scampbell@gpinet.com
E-mail Address

181 Ballardvale Street
Mailing Address

Wilmington
City/Town

MA
State

01887
Zip Code

9785702989
Telephone Number

9786583044
Fax Number

C. Proposed Project/Use Information

*The bridge is located on both DCR property and City of Newton right-of-way, property information for the right-of-way is attached with this application.

1. Property Information (all information must be provided):

Department of Conservation & Recreation, Deputy Commissioner Priscilla Geigis (priscilla.geigis@mass.gov)
Owner Name (if different from applicant)

N / A
Tax Assessor's Map and Parcel Numbers

42.34121N
Latitude

71.25824W
Longitude

Newton & Weston
Street Address and City/Town

MA
State

02466 / 02493
Zip Code

2. Registered Land ☐ Yes ☒ No

3. Name of the water body where the project site is located:

Charles River

4. Description of the water body in which the project site is located (check all that apply):

Type	**Nature**	**Designation**
☒ Nontidal river/stream	☒ Natural	☐ Area of Critical Environmental Concern
☐ Flowed tidelands	☐ Enlarged/dammed	☐ Designated Port Area
☐ Filled tidelands	☐ Uncertain	☐ Ocean Sanctuary
☐ Great Pond		☐ Uncertain
☐ Uncertain		

C. Proposed Project/Use Information (cont.)

Select use(s) from Project Type Table on pg. 2 of the "Instructions"

5. Proposed Use/Activity description

   The project proposes to replace the existing, deteriorated three (3) span steel "stringer" pedestrian bridge with a two (2) span, prefabricated steel truss supported by concrete abutments and one (1) pier consisting of six (6) steel piles. The proposed bridge will be constructed in a location and alignment similar to the exisitng bridge.

6. What is the estimated total cost of proposed work (including materials & labor)?

   $

7. List the name & complete mailing address of each abutter (attach additional sheets, if necessary). An abutter is defined as the owner of land that shares a common boundary with the project site, as well as the owner of land that lies within 50' across a waterbody from the project.

Name	Address
Lasell College	1844 Commonwealth Avenue, Auburndale, MA 02466
MWRA	251 Causeway Street - Suite 600, Boston, MA 02114
City of Newton	1000 Commonwealth Avenue, Newton Centre, MA 02459

D. Project Plans

1. I have attached plans for my project in accordance with the instructions contained in (check one):

   ☒ Appendix A (License plan) ☐ Appendix B (Permit plan)

2. Other State and Local Approvals/Certifications

☐ 401 Water Quality Certificate		Date of Issuance
☒ Wetlands	TBD	File Number
☐ Jurisdictional Determination	JD-	File Number
☒ MEPA	TBD	File Number
☒ EOEA Secretary Certificate	TBD	Date
☐ 21E Waste Site Cleanup		RTN Number

E. Certification

All applicants, property owners and authorized agents must sign this page. All future application correspondence may be signed by the authorized agent alone.

"I hereby make application for a permit or license to authorize the activities I have described herein. Upon my signature, I agree to allow the duly authorized representatives of the Massachusetts Department of Environmental Protection and the Massachusetts Coastal Zone Management Program to enter upon the premises of the project site at reasonable times for the purpose of inspection."

"I hereby certify that the information submitted in this application is true and accurate to the best of my knowledge."

Applicant's signature	Date
Property Owner's signature (if different than applicant)	Date
Agent's signature (if applicable)	Date

E. Certification

All applicants, property owners and authorized agents must sign this page. All future application correspondence may be signed by the authorized agent alone.

“I hereby make application for a permit or license to authorize the activities I have described herein. Upon my signature, I agree to allow the duly authorized representatives of the Massachusetts Department of Environmental Protection and the Massachusetts Coastal Zone Management Program to enter upon the premises of the project site at reasonable times for the purpose of inspection.”

"I hereby certify that the information submitted in this application is true and accurate to the best of my knowledge.”

Applicant’s signature	Date
Property Owner’s signature (if different than applicant)	Date
Agent’s signature (if applicable)	Date

F. Waterways Dredging Addendum

1. Provide a description of the dredging project

   ☐ Maintenance Dredging (include last dredge date & permit no.) ☐ Improvement Dredging

   ____
   Purpose of Dredging

2. What is the volume (cubic yards) of material to be dredged?

   ____

3. What method will be used to dredge?

   ☐ Hydraulic ☒ Mechanical ☐ Other

4. Describe disposal method and provide disposal location (include separate disposal site location map)

   ____

   ____

5. Provide copy of grain size analysis. If grain size is compatible for beach nourishment purposes, the Department recommends that the dredged material be used as beach nourishment for public beaches. **Note:** In the event beach nourishment is proposed for private property, pursuant to 310 CMR 9.40(4)(a)1, public access easements below the existing high water mark shall be secured by applicant and submitted to the Department.

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G. Municipal Zoning Certificate

Department of Conservation and Recreation
Name of Applicant

Riverside Road	Charles River	Newton & Weston
Project street address	Waterway	City/Town

Description of use or change in use:

The project proposes to replace an existing, deteriorated three (3) span steel "stringer" pedestrian bridge with a two (2) span, prefabricated truss supported by concrete abutments and one (1) pier consisting of six (6) steel piles. The proposed bridge will be constructed in a location and alignment similar to the existing bridge.

To be completed by municipal clerk or appropriate municipal official:

"I hereby certify that the project described above and more fully detailed in the applicant's waterways license application and plans is not in violation of local zoning ordinances and bylaws."

Printed Name of Municipal Official

Date

Signature of Municipal Official

Title

City/Town

Massachusetts Department of Environmental Protection
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Chapter 91 Waterways License Application - 310 CMR 9.00
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H. Municipal Planning Board Notification

Notice to Applicant:

Section H should be completed and submitted along with the original application material.

Department of Conservation and Recreation
Name of Applicant

Riverside Road	Charles River	Newton & Weston
Project street address	Waterway	City/Town

Description of use or change in use:

The project proposes to replace an existing, deteriorated three (3) span steel "stringer" pedestrian bridge with a two (2) span, prefabricated truss supported by concrete abutments and one (1) pier consisting of six (6) steel piles. The proposed bridge will be constructed in a similar alignment and location and the same location as the existing bridge.

To be completed by municipal clerk or appropriate municipal official:

"I hereby certify that the project described above and more fully detailed in the applicant's waterways license application and plans have been submitted by the applicant to the municipal planning board."

Printed Name of Municipal Official ____________________ Date ____________

Signature of Municipal Official ____________________ Title ____________ City/Town ____________

Note: Any comments, including but not limited to written comments, by the general public, applicant, municipality, and/or an interested party submitted after the close of the public comment period pertaining to this Application shall not be considered, and shall not constitute a basis for standing in any further appeal pursuant to 310 CMR 9.13(4) and/or 310 CMR 9.17.

Appendix A: License Plan Checklist

General View

- ☒ PE or RLS, as deemed appropriate by the Department, stamped and signed, in ink, each sheet within 8 1/2 inch by 11 inch border
- ☒ Format and dimensions conform to “Sample Plan” (attached)
- ☒ Minimum letter size is 1/8 of an inch if freehand lettering, 1/10 of an inch if letter guides are used
- ☒ Sheet number with total number in set on each sheet
- ☒ Title sheet contains the following in lower left: Plans accompanying Petition of [Applicant’s name, structures and/or fill or change in use, waterway and municipality]
- ☒ North arrow
- ☒ Scale is suitable to clearly show proposed structures and enough of shoreline, existing structures and roadways to define its exact location
- ☒ Scale is stated & shown by graphic bar scale on each sheet
- ☒ Initial plans may be printed on bond; final plans due before License issuance must be on 3mil Mylar.

Structures and Fill

- ☒ All Structures and Fill shown in full BLACK lines, clearly labeling which portions are existing, which are Proposed and indicating Existing Waterways Licenses
- ☒ *Cross Section Views* show MHW* and MLW* and structure finish elevations
- ☐ *Dredge or Fill*, actual cubic yardage must be stated and typical cross sections shown
- ☒ All Structures and Fill shown in full BLACK lines, clearly labeling which portions are existing, which are Proposed and indicating Existing Waterways Licenses
- ☒ *Cross Section Views* show MHW* and MLW* and structure finish elevations
- ☒ *Dredge or Fill*, actual cubic yardage must be stated and typical cross sections shown
- ☒ Actual dimensions of structures(s) and or fill and the distance which they extend beyond MHW* or OHW*
- ☐ Change in Use of any structures on site must be stated

* See 310 CMR 9.02, Waterways Regulations definitions of High Water Mark, Historic High Water Mark, Historic Low Water Mark, and Low Water Mark. *Note:* DEP may, at its discretion, accept appropriately scaled preliminary plans in lieu of the plans described above. In general, DEP will accept preliminary plans only for non-water dependent projects and projects covered by MEPA to address site design components such as visual access, landscaping & site coverage. *Anyone wishing to submit preliminary plans must obtain prior approval of the DEP Waterways Program* before

submitting them with their application.

Appendix A: License Plan Checklist (cont.)

Boundaries

- ☒ Property lines, full black lines, ————, along with abutters' names and addresses
- ☒ Mean High Water (MHW)* or Ordinary High Water (OHW)*, full black line ————
- ☒ Mean Low Water (MLW)*, black dotted line, (............)
- ☐ Historic MHW* or OHW* (— — — —)
- ☐ Historic MLW* (..._..._..._)
- ☐ State Harbor Lines, black dot-dash line (– . – . – . –) with indication of Chapter & Act establishing them (Ch. , Acts of)
- ☒ Reference datum is National Geodetic Vertical Datum (NGVD) or (NAVD).
- ☒ Floodplain Boundaries according to most recent FEMA maps
- ☒ Proposed & Existing Easements described in metes & bounds

Water-Dependent Structures

- ☒ Distance from adjacent piers, ramps or floats (minimum distance of 25' from property line, where feasible)
- ☒ Distance from nearest opposite shoreline
- ☐ Distance from outside edge of any Navigable Channel
- ☒ Access stairs at MHW for lateral public passage, or 5 feet of clearance under structure at MHW.

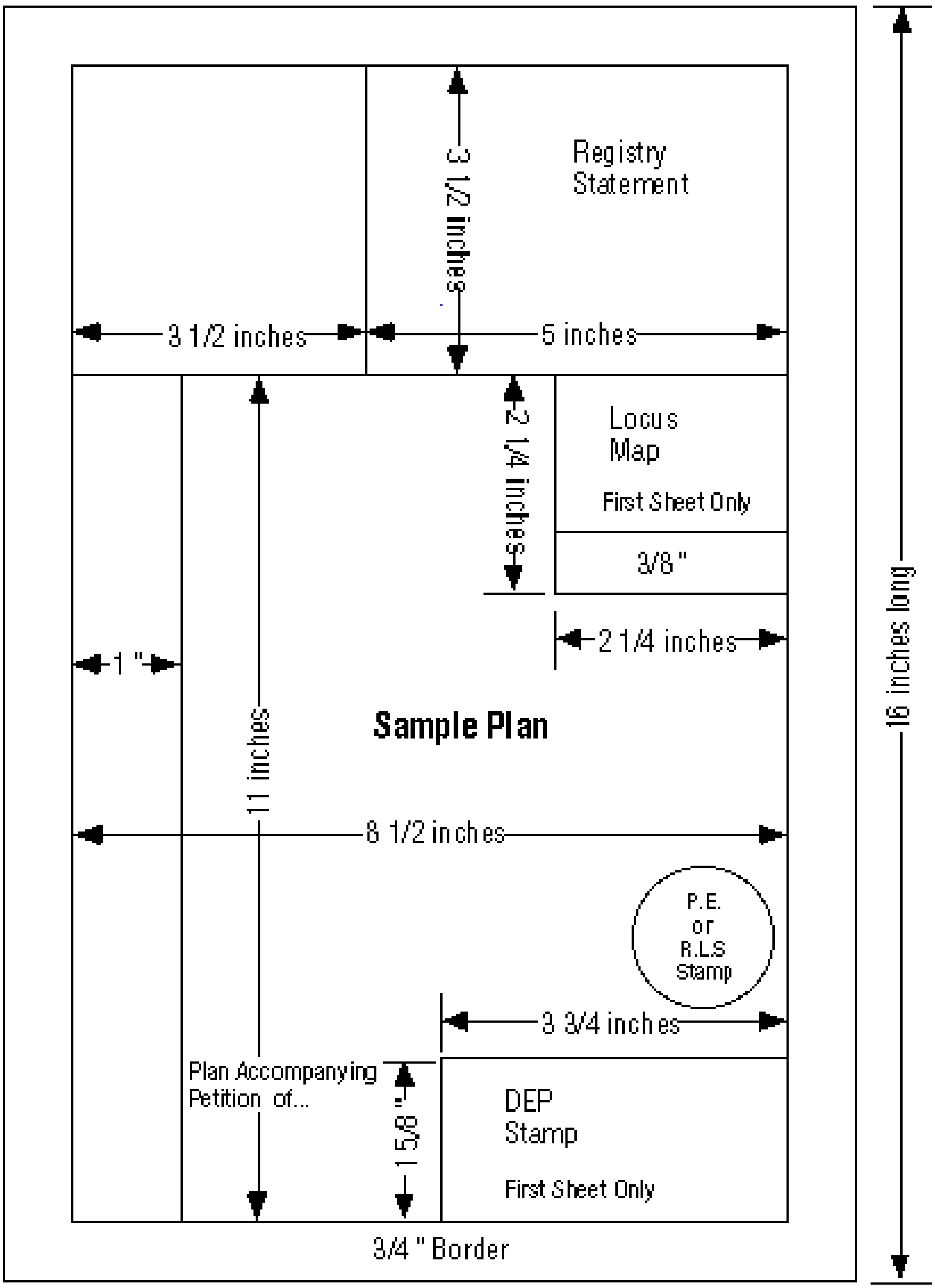
Non Water-Dependent Structures

- ☐ Depict extent of "Water-dependent Use Zone".

See Waterways Regulations at 310 CMR 9.51-9.53 for additional standards for non water-dependent use projects.

Note: Final Mylar project site plans will be required upon notice from the Department, prior to issuance of the Chapter 91 Waterways License.

Appendix A: License Plan Checklist Cont.



Appendix B: Dredging Permit Plan Checklist

For projects applying for dredging permits only, enclose drawings with the General Waterways Application that include the following information:

General View

☐ Submit one original of all drawings. Submit the fewest number of sheets necessary to adequately illustrate the project on 8-1/2 inch X 11 inch paper.

☐ A 1-inch margin should be left at the top edge of each drawing for purposes of reproduction and binding. A 1/2 inch margin is required in the three other edges.

☐ A complete title block on each drawing submitted should identify the project and contain: the name of the waterway; name of the applicant; number of the sheet and total number of sheets in the set; and the date the drawing was prepared.

☐ Use only dot shading, hatching, and dashed or dotted line to show or indicate particular features of the site on the drawings.

☐ If deemed appropriate by the Department, certification by the Registered Professional Engineer or Land Surveyor is included.

Plan View

☐ North Arrow

☐ Locus Map

☐ Standard engineering scale.

☐ Distances from channel lines and structures if appropriate.

☐ Mean high water and mean low water shorelines (see definitions of “High Water Mark” and “Low Water Mark” at 310 CMR 9.02, C. 91 Regulations).

☐ Dimensions of area proposed to be dredged or excavated.

☐ Notation or indication of disposal site.

☐ Volume of proposed dredging or excavation.

☐ Ordinary high water, proposed drawdown level, and natural (historic) high water (for projects lowering waters of Great Ponds).

Section Views

☐ Existing bottom and bank profiles.

☐ Vertical and/or horizontal scales.

☐ Proposed and existing depths relative to an indicated datum.

☐ Elevation and details of control structure (for projects lowering waters of Great Ponds).

Appendix C: Application Completeness Checklist

Please answer all questions in the General Waterways Application form. If a question does not apply to your project write "not applicable" (n/a) in that block. Please print or type all information provided on the form. Use black ink (blue ink or pencil are not easily reproducible, therefore, neither will be accepted). If additional space is needed, attach extra 8-1/2" x 11" sheets of paper.

☐ **Proper Public Purpose:** For nonwater-dependent projects, a statement must be included that explains how the project serves a proper public purpose that provides greater benefit than detriment to public rights in tidelands or great ponds and the manner in which the project meets the applicable standards. If the project is a nonwater-dependent project located in the coastal zone, the statement should explain how the project complies with the standard governing consistency of the policies of the Massachusetts Coastal Zone Management Program, according to 310 CMR 9.54. If the project is located in an area covered by a Municipal Harbor Plan, the statement should describe how the project conforms to any applicable provisions of such plan pursuant to 310 CMR 9.34(2).

☒ **Plans:** Prepared in accordance with the applicable instructions contained in Appendix A-B of this application. For initial filing, meet the requirements of 310 CMR 9.11(3)(b)(3).

☒ **Applicant Certification:** All applications must be signed by “the landowner if other than the applicant. In lieu of the landowner’s signature, the applicant may provide other evidence of legal authority to submit an application for the project site.” If the project is entirely on land owned by the Commonwealth (e.g. most areas below the current low water mark in tidelands and below the historic high water mark of Great Ponds), you may simply state this in lieu of the “landowner’s signature”.

☒ **Municipal Zoning Certification:** If required, applicants must submit a completed and signed Section E of this application by the municipal clerk or appropriate municipal official or, for the initial filing, an explanation of why the form is not included with the initial application. If the project is a public service project subject to zoning but will not require any municipal approvals, submit a certification to that effect pursuant to 310 CMR 9.34(1).

☒ **Municipal Planning Board Notification:** Applicants must submit a copy of this application to the municipal planning board for the municipality where the project is located. Submittal of the complete application to DEP must include Section H signed by the municipal clerk, or appropriate municipal official for the town where the work is to be performed, except in the case of a proposed bridge, dam, or similar structure across a river, cove, or inlet, in which case it must be certified by every municipality into which the tidewater of said river, cove, or inlet extends.

☒ **Final Order of Conditions:** A copy of one of the following three documents is required with the filing of a General Waterways Application: (1) the Final Order of Conditions (with accompanying plan) under the Wetlands Protection Act; (2) a final Determination of Applicability under that Act stating that an Order of Conditions is not required for the project; or (3) the Notice of Intent for the initial filing (if the project does not trigger review under MEPA).

☒ **Massachusetts Environmental Protection Act (MEPA):** MGL 30, subsections 61-61A and 301 CMR 11.00, submit as appropriate: a copy of the Environmental Notification Form (ENF) and a Certificate of the Secretary of Environmental Affairs thereon, or a copy of the final Environmental Impact Report (EIR) and Certificate of the Secretary stating that it adequately and properly complies with MEPA; and any subsequent Notice of Project change and any determination issued thereon in accordance with MEPA. For the initial filing, only a copy of the ENF and the Certificate of the Secretary thereon must be submitted.

Note: If the project is subject to MEPA, the Chapter 91 Public Notice must also be submitted to MEPA for publication in the "Environmental Monitor". MEPA filing deadlines are the 15th and 30th of each month.

Appendix C: Application Completeness Checklist (cont.)

☐ **Water Quality Certificate:** if applicable, pursuant to 310 CMR 9.33, is included.

☐ **Other Approvals:** as applicable pursuant to 310 CMR 9.33 or, for the initial filing, a list of such approvals which must be obtained.

Projects involving dredging:

☐ The term "dredging" means the removal of materials including, but not limited to, rocks, bottom sediments, debris, sand, refuse, plant or animal matter, in any excavating, clearing, deepening, widening or lengthening, either permanently or temporarily, of any flowed tidelands, rivers, streams, ponds or other waters of the Commonwealth. Dredging includes improvement dredging, maintenance dredging, excavating and backfilling or other dredging and subsequent refilling. Included is a completed and signed copy of Part F of the application.

Filing your Completed General Waterways Application:

☒ **For all <u>Water-Dependent</u> applications** – submit a completed General Waterways Application and all required documentation with a *photocopy* of both payment check and DEP's *Transmittal Form for Permit Application & Payment* to the appropriate DEP Boston or regional office (please refer to Pg. 10 of the "Instructions" for the addresses of DEP Regional Offices).

☐ **For all <u>Non Water-Dependent</u> applications** – submit a completed General Waterways Application and all required documentation with a *photocopy* of both payment check and DEP's *Transmittal Form for Permit Application & Payment* to DEP's Boston office.

Department of Environmental Protection
Waterways Regulation Program
One Winter Street
Boston, MA 02108

☐ **Application Fee Payment for <u>ALL Waterways Applications</u>:** Send the appropriate Application fee* (please refer to Page 1 of the "Application"), in the form of a check or money order, along with DEP's *Transmittal Form for Permit Application & Payment*:

Department of Environmental Protection
P.O. Box 4062
Boston, MA 02211

* Under extreme circumstances, DEP grants extended time periods for payment of license and permit application fees. If you qualify, check the box entitles "Hardship Request" on the *Transmittal Form for Permit Application & Payment.* See 310 CMR 4.04(3)(c) to identify procedures for making a hardship request. Send hardship request and supporting documentation to the above address.

NOTE: You may be subject to a ***double*** **application fee** if your application for Chapter 91 authorization results from an enforcement action by the Department or another agency of the Commonwealth or its subdivisions, or if your application seeks authorization for an existing unauthorized structure or use.

Chapter 91 Waterways License Application Project Narrative

Pedestrian Bridge Replacement over the Charles River (Bridge No. N-12-078 = W-29-062)
Newton & Weston, Massachusetts
MassDOT Project File No. 609066 – MassDEP Transmittal X287622

Table of Contents

1.0 Introduction

The Massachusetts Department of Conservation and Recreation (DCR) and Massachusetts Department of Transportation (MassDOT) propose to replace the existing pedestrian bridge No. N-12-078 = W-29-062 over the Charles River in Newton & Weston, Massachusetts. The proposed bridge will be constructed in a similar configuration to the existing bridge and provide an improvement over the existing conditions. The proposed bridge replacement is presumed to qualify as a water-dependent activity. The project limits extend approximately 570 feet from the existing shared use path in Weston to Riverside Road in Newton.

The improvements proposed by this project are intended to restore a pedestrian and bicycle link between Newton and Weston over the Charles River. The proposed bridge replacement will provide a safe and user-friendly, ADA-accessible pedestrian bikeway trail which will serve as a recreational and alternative transportation resource for users of all ages and abilities. The landscape improvements proposed by this project will also result in improved visibility, public access to, and use of the Charles River via Riverside Park in Newton.

2.0 Existing Conditions

The existing bridge over the Charles River consists of a three (3) span steel "stringer" bridge. The bridge is supported by two (2) abutments with concrete footings and timber tie walls and two (2) piers consisting of reinforced concrete caps over mortared stone masonry walls. The bridge has a width of approximately 7-feet and a length of approximately 187 feet from abutment to abutment. The current configuration of the bridge divides the Charles River into three (3) channels with widths of approximately 58 feet (Weston channel), 60 feet (center channel between piers), and 21 feet (Newton channel). In its current condition the bridge shows numerous signs of deterioration including rotten and collapsed sections of timber decking, rotten or damaged segments of timber rail, fracturing or partial collapse in the stone masonry piers, and fracturing in the concrete abutments. The bridge has been deemed too hazardous for use and has been closed to the public since 2016.

Throughout the late 19th and early 20th century, the Auburndale area and Charles River were popular recreational destinations for boaters and picnickers. There were numerous attractions in the area including Norumbega Park, the Boston Athletic Association facilities, the Riverside Recreation Grounds, the Newton Boat Club, and a variety of other boating and canoe clubs. The exact date of construction for the existing bridge is unknown though it is assumed to be sometime after 1899. Chapter 152 of the Acts and Resolves passed by the General Court of Massachusetts in 1899 empowered the Middlesex County Commissioners to establish a highway in the City of Newton from Riverside Road in Weston to Charles Street in Newton. It is assumed that this action by the General Court and Middlesex County Commission resulted in the construction of bridge No. N-12-078 = W-29-062. No other information regarding the bridge or its construction has been found at this time.

Upon completion of the Massachusetts Turnpike in 1957 the bridge experienced a significant decrease in use and was eventually closed to vehicular traffic sometime in the 1960s. Historical aerial images indicate that the bridge superstructure or decking may have been modified (reduced in width) in the late 1960s or early 1970s. Since that time, the bridge has not undergone any significant maintenance or repairs, resulting in its current state of deterioration.

2.1 Ownership

Though MassDOT and the DCR have undertaken significant property, deed, and right of way research, the ownership of the existing bridge has not been determined. The southern end of the existing bridge is located on a parcel of unknown ownership, the northern end is located on City of Newton property. To address this issue, the DCR will take control of the unknown ownership parcel through Eminent Domain. The DCR will be responsible for the operation and maintenance of the proposed bridge.

2.2 Land Use

The primary land uses within the project limits include institutional, industrial, residential, and open space. In Weston, the parcels adjacent to the existing shared use path and proposed bridge replacement are owned and operated by the MWRA. These parcels are developed as wellhead and aqueduct infrastructure or dedicated to their maintenance and operation. In Newton, the parcel west of the proposed bridge replacement is owned by Lasell College. The parcels to the east are owned by the DCR. The area to the north is located within the layout of Riverside Road and is maintained by the City of Newton as a paved roadway, sidewalk, and parking area.

There are three (3) areas of open space located adjacent to the project limits. The Lasell College Stoller Boathouse is located at 11 Riverside Road in Newton and is classified as recreational open space. Lasell College, Brandeis College, and Community Rowing Inc. conduct rowing lessons, team practices, and regattas at this location throughout the year. The undeveloped parcel at 21 Riverside Road is owned by MassDOT and is classified as recreational open space protected in perpetuity. The DCR owns the properties at 1 Riverside Road and 107 Charles Street and maintains them as Riverside Park. The park is open to the public for passive recreation and provides access to the banks of the Charles River. The project will not result in any permanent impacts to these parcels and proposes to enhance public access to the Charles River, Stoller Boathouse, and Riverside Park. The project also proposes landscape improvements within Riverside Park.

2.3 Charles River

Within the vicinity of the proposed bridge replacement the Charles River has an average width of approximately 160 feet, a depth of approximately 4 feet, and generally flows northwest eventually discharging into Boston Harbor. Though the Charles River is dammed in Waltham (approximately 3 miles downstream) the channel within the project limits is generally natural. The banks are primarily vegetated with poison Ivy (*Toxicodendron radicans*), silver maple (*Acer saccharinum*), and purple loosestrife (*Lythrum slalicaria*). The Bank / Mean Annual High-Water mark of the Charles River were delineated by professional scientists and are coincident with Ordinary High Water.

2.4 Wetland Resource Areas

A wetland delineation was conducted in August 2018. Wetland resource areas within the project limits include bank to perennial stream (the Charles River) and Land Under Water (LUW). According to the June 10, 2010 FEMA Flood Insurance Rate Map Number 25017C04E portions of the project site are located with FEMA Flood Zone AE with a Base Flood Elevation of 38 NAVD.

3.0 Proposed Conditions

The proposed replacement bridge will consist of a two (2) span, prefabricated steel truss supported by two (2) cement concrete abutments and one (1) pier consisting of six (6) cement filled steel piles with a reinforced concrete cap. The total length of the proposed bridge is 195 feet. The existing abutments and piers will be removed; the piers will be removed 12 inches below the mudline to ensure that they do not create a hazard to navigation. The installation of the new piers and removal of the existing piers will be conducted from a platform or “barge” in the Charles River. The proposed platform or “barge” will consist of floating pontoons, assembled on site, and launched from the Weston side of the Charles River. The platform is necessary for proposed in water construction and demolition activities including superstructure demolition, pier demolition, pile driving, and concrete pile cap construction. Floating booms and silt curtains will be installed around the limit of work and remain in place for the duration of construction / demolition to prevent any increases in turbidity or total suspended solids. The proposed bridge superstructure will be installed from the Newton side using a crane. Temporary dewatering is proposed around the abutments adjacent to the banks. Proposed dewatering is necessary to accommodate the placement of riprap around the abutments for erosion and scour prevention.

The proposed bridge abutments will be constructed above the existing banks. The proposed north (Newton) abutment will be constructed approximately 4 feet in front of the existing abutment. The proposed south (Weston) abutment will be constructed approximately 9 feet behind the existing abutment. Neither abutment will extend into the Charles River, however, the face of the north (Newton) abutment will be approximately 1.5 feet closer to the bank than the existing abutment. The configuration of the proposed abutments will not impede navigation with the Charles River. The proposed riprap that will protect the abutments from erosion and scour will be installed at the same elevation as the existing stream bed, resulting in no change in depth or hazard to navigation. The construction of the proposed abutments will result in 116 square feet of permanent impacts and 316 square feet of temporary impacts below Ordinary High Water (MHW). The proposed permanent impacts are associated with the placement of riprap below MHW. The proposed temporary impacts are associated with the dewatering that is necessary for excavation and removal of the existing abutments and construction of the proposed abutments. The removal of the existing bridge piers will result in the restoration of approximately 147 square feet of the existing streambed (Land Under Water).

As described in **Section 2.0**, the two (2) piers supporting the existing bridge create three (3) openings beneath the bridge with widths of 58 feet, 60 feet, and 21 feet. The proposed pier will consist of six (6) steel piles with a reinforced concrete cap. The proposed pier will create two (2), larger navigable channels beneath the proposed bridge with widths of approximately 82 feet (Weston channel) and 57 feet (Newton channel). The removal of the existing piers and creation of two, wider openings beneath the bridge will improve navigability within the Charles River in the vicinity of the crossing.

The proposed bridge superstructure will be installed so that the lowest chord is at or above the lowest chord of the existing bridge. There will be no change in the vertical clearance or navigability underneath the bridge. The project proposes to excavate approximately 200 cubic yards of sediment to allow for the placement of 150 cubic yards of riprap and 50 cubic yards of crushed stone adjacent to the bridge abutments. The proposed riprap is necessary to protect the bridge abutments and footings from erosion and scour. The proposed riprap will be installed at the same elevation as the exist riverbed.

3.1 Proposed Improvements

The improvements proposed by this project are intended to restore a pedestrian and bicycle link between Newton and Weston over the Charles River as well as enhance visibility, public access to, and use of the Charles River via Riverside Park in Newton. Specifically, the project includes the construction of an 8- to 12-foot-wide shared use path with 2-foot-wide vegetated shoulders (cement concrete shoulders over the bridge), reconstruction and reconfiguration of the existing parking area in Newton, removal of the existing abutments and stone masonry piers in the Charles River, removal of the existing deteriorated bridge superstructure, construction of reinforced concrete abutments and wingwalls, construction of a reinforced concrete pier on steel piles in the Charles River, construction of a prefabricated truss pedestrian bridge with a concrete deck and Hot Mix Asphalt (HMA) overlay, installation of new granite curbing, installation of pavement markings, stormwater management upgrades including deep sump catch basins, a stone diaphragm, and a water quality swale, and landscape improvements to the existing Riverside Park in Newton. Proposed landscape improvements include the construction of a 5-foot-wide crushed stone footpath, construction of a seating area / overlook with benches, and invasive plant management. These proposed improvements are intended to increase the visibility of the Charles River and enhance public access and enjoyment.

3.2 Wetland and Waterways Impacts

The replacement of bridge No. N-12-078 = W-29-062 will not result in any permanent impacts or impediments to navigation within or public access to the Charles River. During construction and demolition, navigation and public access may be temporarily impacted by proposed in water work including the use of a floating work platform and temporary dewatering. These elements will not occupy the entirety of the Charles River and will only remain in place as long as is necessary to complete bridge demolition and replacement.

3.3 Waterways Mitigation

As described in **Section 3.0**, the design of the proposed replacement bridge will improve navigability within the Charles River. This improvement will be achieved by replacing two (2) existing stone masonry piers with a single pier consisting of six (6) cement filled steel piles with a reinforced concrete cap. These proposed steel piles will occupy approximately 26 square feet within the Charles River, a significant decrease from the 147 square feet occupied by the existing piers. The bridge replacement will also create two (2) larger openings (82 feet and 57 feet) beneath the bridge as opposed to the three (3) narrower (60 feet, 58 feet, and 21 feet) openings found in the existing condition. As a result of the proposed bridge work, navigability within this segment of the Charles River will be greatly improved.

4.0 Jurisdiction

The proposed bridge replacement as part of this project is located over the Charles River, a navigable waterway, and as such is subject to the jurisdiction of M.G.L. Chapter 91 and the Waterways Regulations (310 CRM 9.00).

Pursuant to 310 CMR 9.12(2)(a)4, the project includes pedestrian facilities, specifically a pedestrian bridge and a park created by a public agency, adjacent to and over a waterway and is presumed to be water dependent. The replacement of bridge N-12-078 = W-29-062 over the Charles River is necessary to achieve the project's stated goal of restoring a pedestrian and bicycle link between Newton and Weston over the Charles River.

5.0 Basic License Requirements

In accordance with the requirements of 310 CMR 9.31(1-2), the project complies with the basic requirements for license issuance.

(1) Basic Requirements

a) Includes only structures for uses that have been categorically determined to be eligible for a license, according to the provisions of 310 CMR 9.32;
b) Complies with applicable environmental regulatory programs of the Commonwealth according to the provisions of 310 CMR 9.33:
    1. An Environmental Notification Form (ENF) will be submitted in May 2021 in accordance with the Massachusetts Environmental Policy Act (MEPA) Regulations **11.03(3)(b)(f)** *alteration of one half or more acres of any other wetlands.* After review of the ENF, pursuant to the Massachusetts Environmental Policy Act (MEPA) (G.L.c.30, ss.61-62I) and Section 11.06 of the MEPA Regulations (301 CMR 11.00), it is assumed that the Secretary of Energy and Environmental Affairs will issue a Certificate stating that the proposed project does not require the preparation of an Environmental Impact Report (EIR). A copy of this Certificate will be forwarded to MassDEP Waterways Division upon receipt.
    2. Notices of Intent were filed with the Newton and Weston Conservation Commissions in August 2021. Copies of the Orders of Conditions issued by the Commissions will be forwarded to MassDEP Waterways Division upon receipt. As the project will not result in any impacts to Bordering Vegetated Wetlands and less than 5,000 square feet of cumulative impacts to Land Under Water, it is presumed that the Orders of Conditions will serve as the 401 Water Quality Certifications for this project.
    3. The project proposes work subject to U.S. Army Corps of Engineers (Corps) jurisdiction and as such is subject to review under the Section 404 of the Clean Water Act and the General Permits for the Commonwealth of Massachusetts. The applicant will submit a Preconstruction Notification (PCN) and obtain written verification from the Corps prior to starting work.
    4. The proposed project will disturb more than one acre of earth disturbance in Newton and, therefore, a Stormwater Construction General Permit in accordance with Phase II of the Environmental Protection Agency's National Pollutant Discharge Elimination System (NPDES) program will be filed prior to construction.
    5. Upon completion of Section 106 review, the project has received a "no adverse effect" finding from the Massachusetts Historical Commission (MHC).
c) The project area is not located on private or filled tidelands of the Commonwealth and is not part of a Municipal Harbor Plan. This application has also been submitted to the City of Newton and Town of Weston to ensure compliance with all local by-laws Zoning ;
d) Complies with applicable standards governing the protection of water-dependent uses, according to the provisions 310 CMR 9.36. The project will not result in any impacts to private access to littoral or riparian areas. The project does not include any non-water-dependent uses and will not

displace any existing or former water-dependent uses on the site. The project is not located in a Designated Port Area and will not permanently interfere with any water-dependent uses currently in operation or previously occurring within the Charles River;

e) Complies with applicable standards governing engineering and construction of structures according to the provisions of 310 CMR 9.37;
f) Does not deny access to its services and facilities to any person in a discriminatory manner, as determined in accordance with the constitution of the Commonwealth of Massachusetts, of the Unites States of America, or with any statute, regulation, or executive order governing the prevention of discrimination.

This water-dependent project also serves a proper public purpose improving public access to the Charles River and providing pedestrian and bicycle connectivity between the City of Newton and Town of Weston.

6.0 Summary

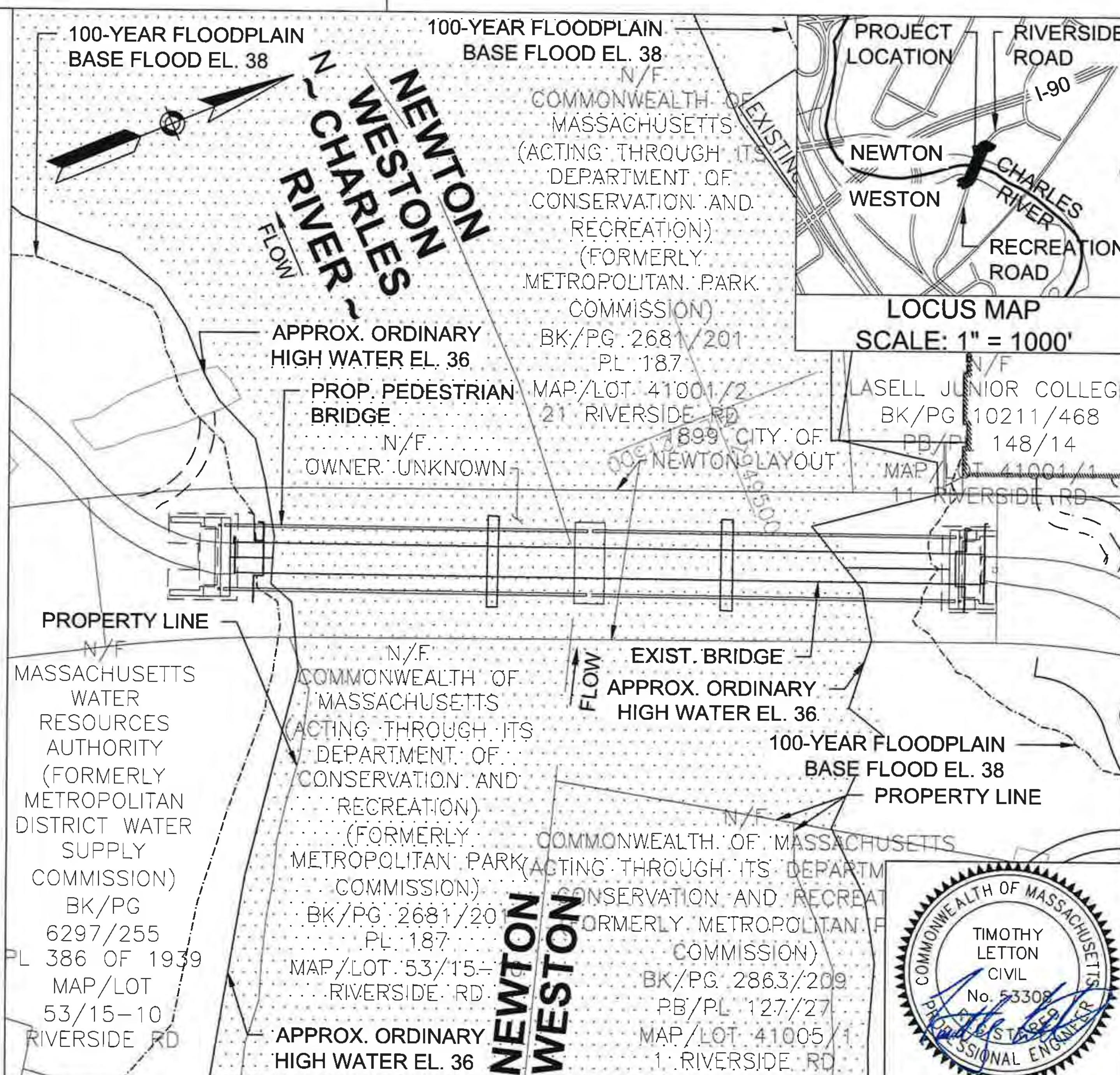
The proposed replacement of bridge No. N-12-078 = W-29-062 over the Charles River and associated improvements are water-dependent activities, pursuant to 310 CMR 9.12(2)(a)4. No additional structures or fill will be placed within the channel that will interfere with the public right of free passage over and through the water. Work will not adversely affect the depth or width of the existing channel and the Hydraulic Study and “No Rise” analysis indicate that the existing floodway and flood elevations will not be impacted by any of the proposed work. None of the proposed work will significantly restrict access to the Charles River. The proposed replacement bridge and associated improvements will provide a greater benefit than detriment to the public and therefore are presumed to qualify for a licensure under M.G.L. Chapter 91 and the Massachusetts Waterways Regulations (310 CMR 9.00).

ATTACHMENT A
License Plans

Sheet 1: **Vicinity Plan**
Sheet 2: **Existing Plan**
Sheet 3: **Proposed Plan**
Sheet 4: **Transverse Bridge Section**
Sheet 5: **Longitudinal Bridge Section 1**
Sheet 6: **Longitudinal Bridge Section 2**

I CERTIFY, THIS PLAN, AS PREPARED, CONFORMS TO THE RULES AND REGULATIONS OF THE REGISTRY OF DEEDS

PROFESSIONAL ENGINEER 11.19.2021 DATE



VICINITY PLAN

0 40 100

SCALE: 1" = 40'

GENERAL NOTES

1. ALL ELEVATIONS ARE REFERENCED TO NAVD88
2. APPROXIMATE BASE FLOOD ELEVATION (BFE) AT 38 (FROM FEMA PANEL 25017C0534E MIDDLESEX COUNTY, MA)
3. APPROXIMATE MEAN HIGH WATER (MHW) AT 36

SHEET 1 OF 6

PLAN ACCOMPANYING PETITION OF MASSDOT PROPOSED REPLACEMENT OF BRIDGE N-12-078=W-29-062 OVER THE CHARLES RIVER, NEWTON & WESTON, MIDDLESEX COUNTY, MASSACHUSETTS

I CERTIFY, THIS PLAN, AS PREPARED, CONFORMS TO THE RULES AND REGULATIONS OF THE REGISTRY OF DEEDS

11.19.2021

PROFESSIONAL ENGINEER DATE

NOTES
1. SEE SHEET 1 FOR GENERAL NOTES

EXISTING PLAN

0 40 100

SCALE: 1" = 40'

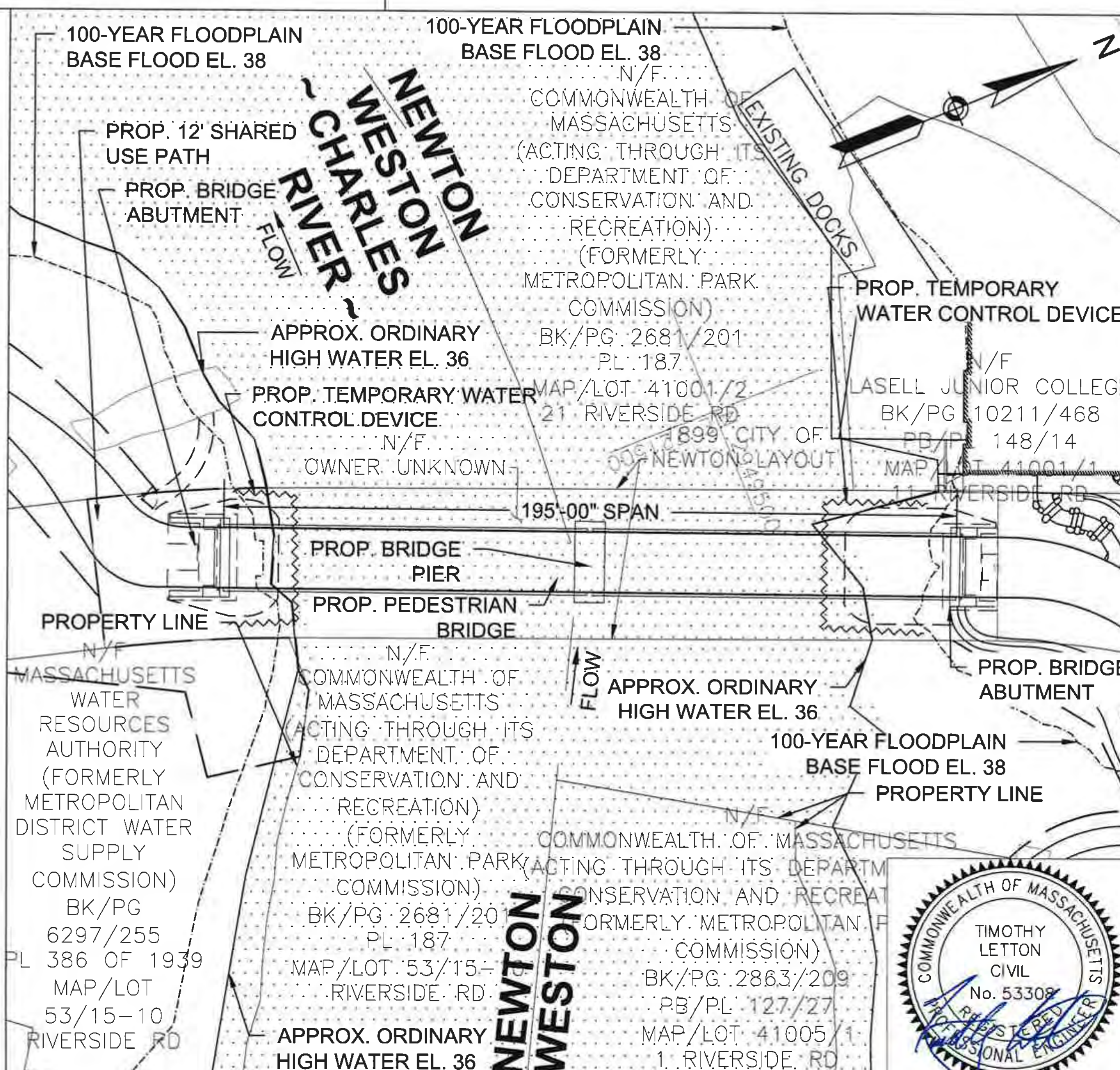
PLAN ACCOMPANYING PETITION OF MASSDOT PROPOSED REPLACEMENT OF BRIDGE N-12-078=W-29-062 OVER THE CHARLES RIVER, NEWTON & WESTON, MIDDLESEX COUNTY, MASSACHUSETTS

SHEET 2 OF 6

I CERTIFY, THIS PLAN, AS PREPARED,
CONFORMS TO THE RULES AND
REGULATIONS OF THE REGISTRY OF DEEDS

11.19.2021

PROFESSIONAL ENGINEER DATE



NOTES
1. SEE SHEET 1 FOR GENERAL NOTES

PROPOSED PLAN

0 40 100

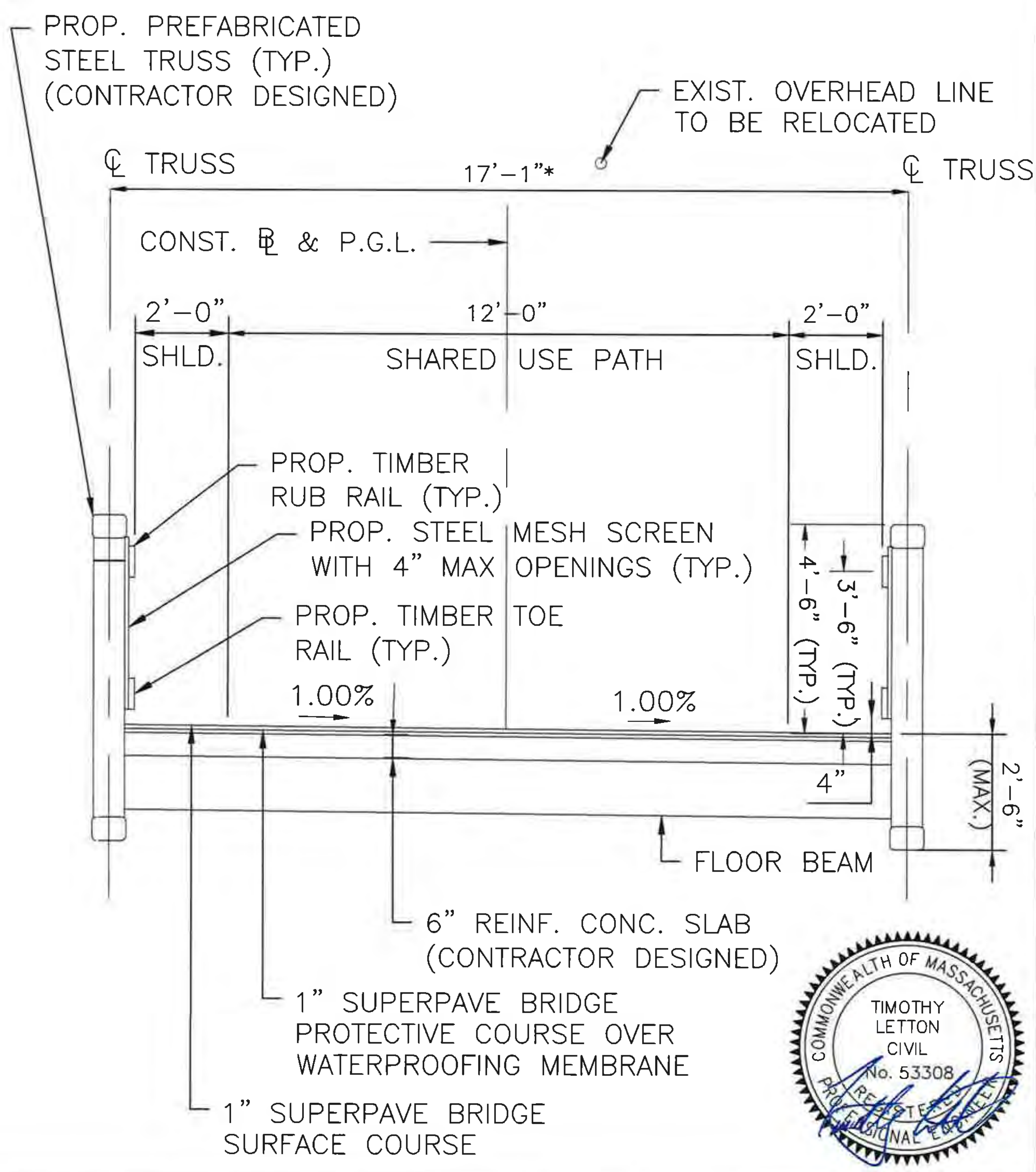
SCALE: 1" = 40'

PLAN ACCOMPANYING PETITION OF
MASSDOT PROPOSED REPLACEMENT
OF BRIDGE N-12-078=W-29-062 OVER
THE CHARLES RIVER, NEWTON &
WESTON, MIDDLESEX COUNTY,
MASSACHUSETTS

SHEET 3 OF 6

I CERTIFY, THIS PLAN, AS PREPARED, CONFORMS TO THE RULES AND REGULATIONS OF THE REGISTRY OF DEEDS

PROFESSIONAL ENGINEER 11.19.2021 DATE



COMMONWEALTH OF MASSACHUSETTS
TIMOTHY LETTON
CIVIL
No. 53308
REGISTERED PROFESSIONAL ENGINEER

TRANSVERSE BRIDGE SECTION

SCALE: NTS

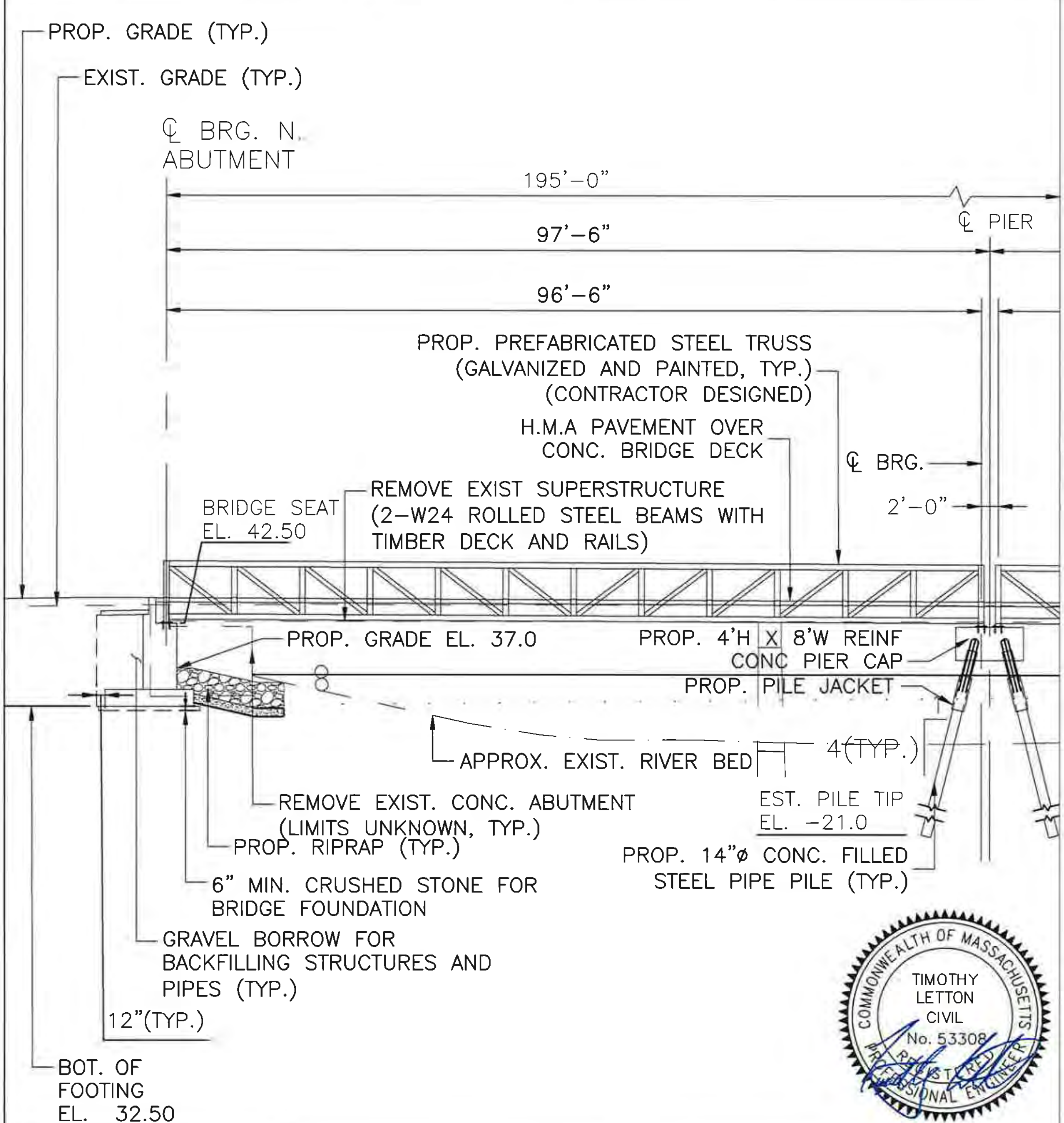
NOTES
1. SEE SHEET 1 FOR GENERAL NOTES

PLAN ACCOMPANYING PETITION OF MASSDOT PROPOSED REPLACEMENT OF BRIDGE N-12-078=W-29-062 OVER THE CHARLES RIVER, NEWTON & WESTON, MIDDLESEX COUNTY, MASSACHUSETTS

I CERTIFY, THIS PLAN, AS PREPARED,
CONFORMS TO THE RULES AND
REGULATIONS OF THE REGISTRY OF DEEDS

11.19.2021

PROFESSIONAL ENGINEER   DATE



LONGITUDINAL BRIDGE SECTION

SCALE: NTS

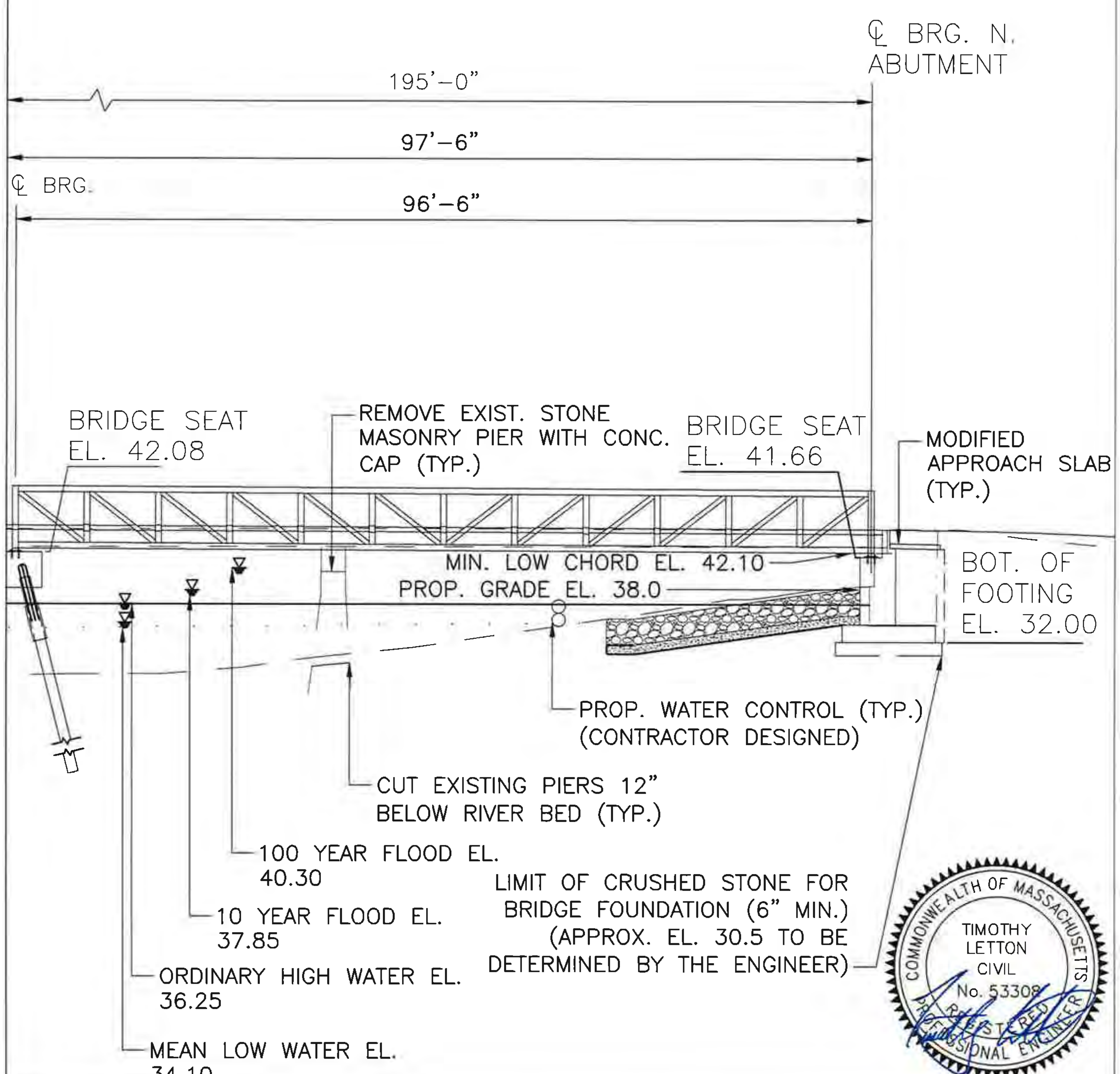
NOTES

1. SEE SHEET 1 FOR GENERAL NOTES

PLAN ACCOMPANYING PETITION OF MASSDOT PROPOSED REPLACEMENT OF BRIDGE N-12-078=W-29-062 OVER THE CHARLES RIVER, NEWTON & WESTON, MIDDLESEX COUNTY, MASSACHUSETTS

I CERTIFY, THIS PLAN, AS PREPARED, CONFORMS TO THE RULES AND REGULATIONS OF THE REGISTRY OF DEEDS

PROFESSIONAL ENGINEER 11.19.2021 DATE



LONGITUDINAL BRIDGE SECTION

SCALE: NTS

NOTES

1. SEE SHEET 1 FOR GENERAL NOTES

PLAN ACCOMPANYING PETITION OF MASSDOT PROPOSED REPLACEMENT OF BRIDGE N-12-078=W-29-062 OVER THE CHARLES RIVER, NEWTON & WESTON, MIDDLESEX COUNTY, MASSACHUSETTS

ATTACHMENT B
Locus Map

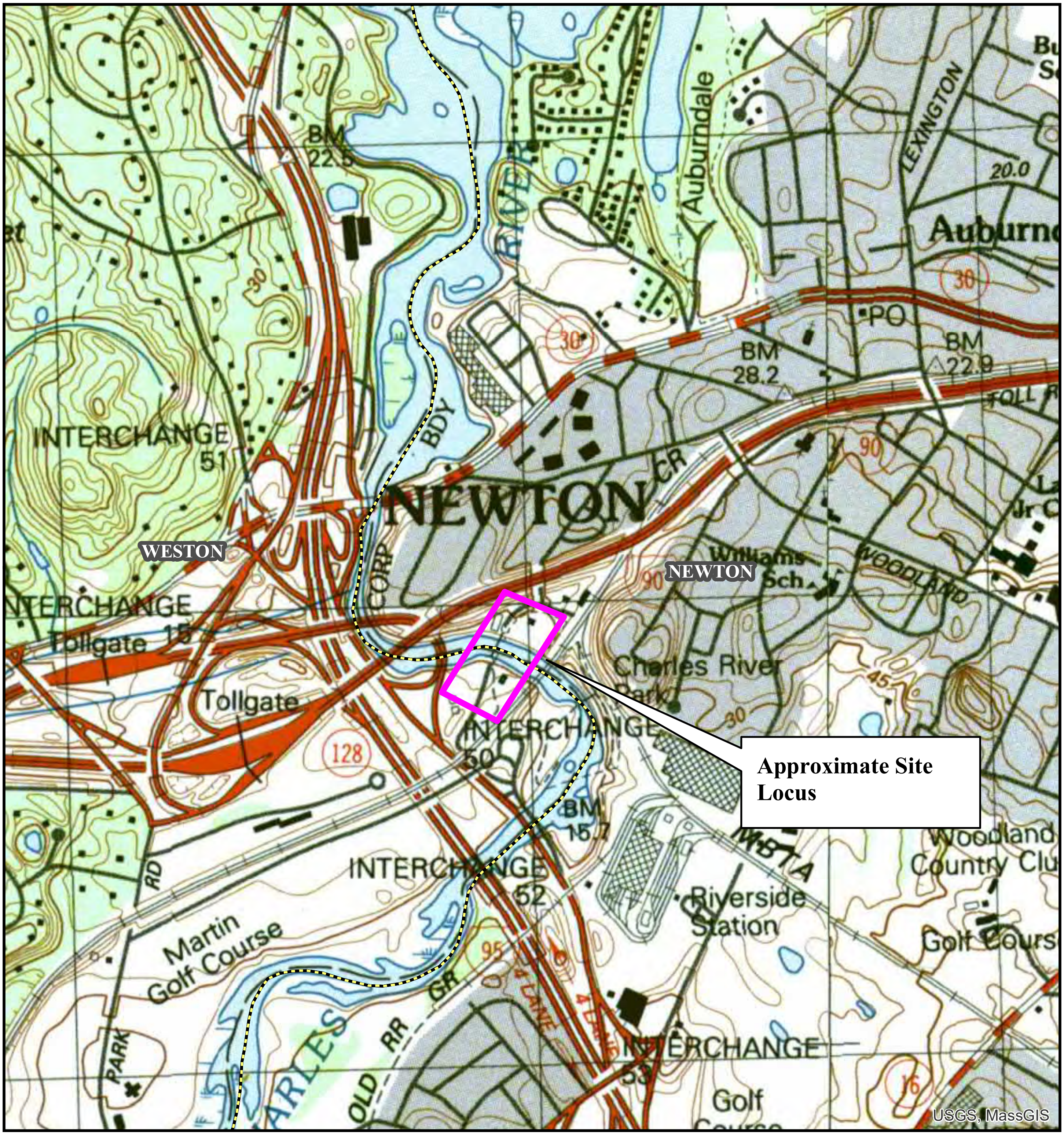


Figure 1
Site Locus
Pedestrian Bridge over the Charles River
Newton and Weston, MA

IMPROVING COMMUNITIES TOGETHER

Legend

Site Locus

Town Boundary

N
W E
S

0 1,000 2,000 Feet

1 inch = 1,000 feet

Data Source: MassGIS USGS Color Ortho Imagery (2009)

ATTACHMENT C
FEMA FIRM Maps

National Flood Hazard Layer FIRMette

42°20'41.67"N

71°15'48.27"W

71°15'10.81"W

42°20'15.07"N

Feet 1:6,000

0 250 500 1,000 1,500 2,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth
- Regulatory Floodway *Zone AE, AO, AH, VE, AR*

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The base map shown complies with FEMA's base map accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/11/2018 at 2:00:55 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: base map imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

ATTACHMENT D
Project Abutters

Abutting Property Address	Owner	Owner Address
21 Riverside Road Newton, MA 02466	Commonwealth of Massachusetts (DCR)	20 Somerset Street Boston, MA 02108
11 Riverside Road Newton, MA 02466	Lasell College	18444 Commonwealth Avenue Auburndale, MA 02466
1 Riverside Road Newton, MA 02466	Commonwealth of Massachusetts (DCR)	20 Somerset Street Boston, MA 02108
107 Charles Street Newton, MA 02466	Commonwealth of Massachusetts (DCR)	1 Monsignor O'Brien Highway Cambridge, MA 02141
Charles Street Newton, MA 02466	ARCURI-5 Realty Trust	132 Charles Street Auburndale, MA 02466
0 Riverside Road Weston, MA 02493	Commonwealth of Massachusetts (MWRA)	251 Causeway Street Suite 600 Boston, MA 02114
0 Riverside Road Weston, MA 02493	Commonwealth of Massachusetts (MassDOT)	10 Park Plaza Suite 5170 Boston, MA 02116

ATTACHMENT E
Photographic Documentation

Photo 1: View of the existing bridge facing southeast from the north (Newton) side of the Charles River.

Photo 2: The south (Weston) end of the existing bridge has been closed to pedestrians using a sheet of plywood. The Lassell College Stoller Boathouse and docks are visible to the left of the bridge.

Photo 3: A collapsed portion of timber decking on the south (Weston) side of the bridge. The timber rails along both sides of the bridge also show significant signs of decay.

Photo 4: Though the bridge is closed to pedestrians, instances of trespassing are common and various methods of closure have been implemented (informally) by residents and local organizations. This photo shows multiple sheets of plywood laid over the collapsed portions of the timber deck to mitigate the safety hazard.

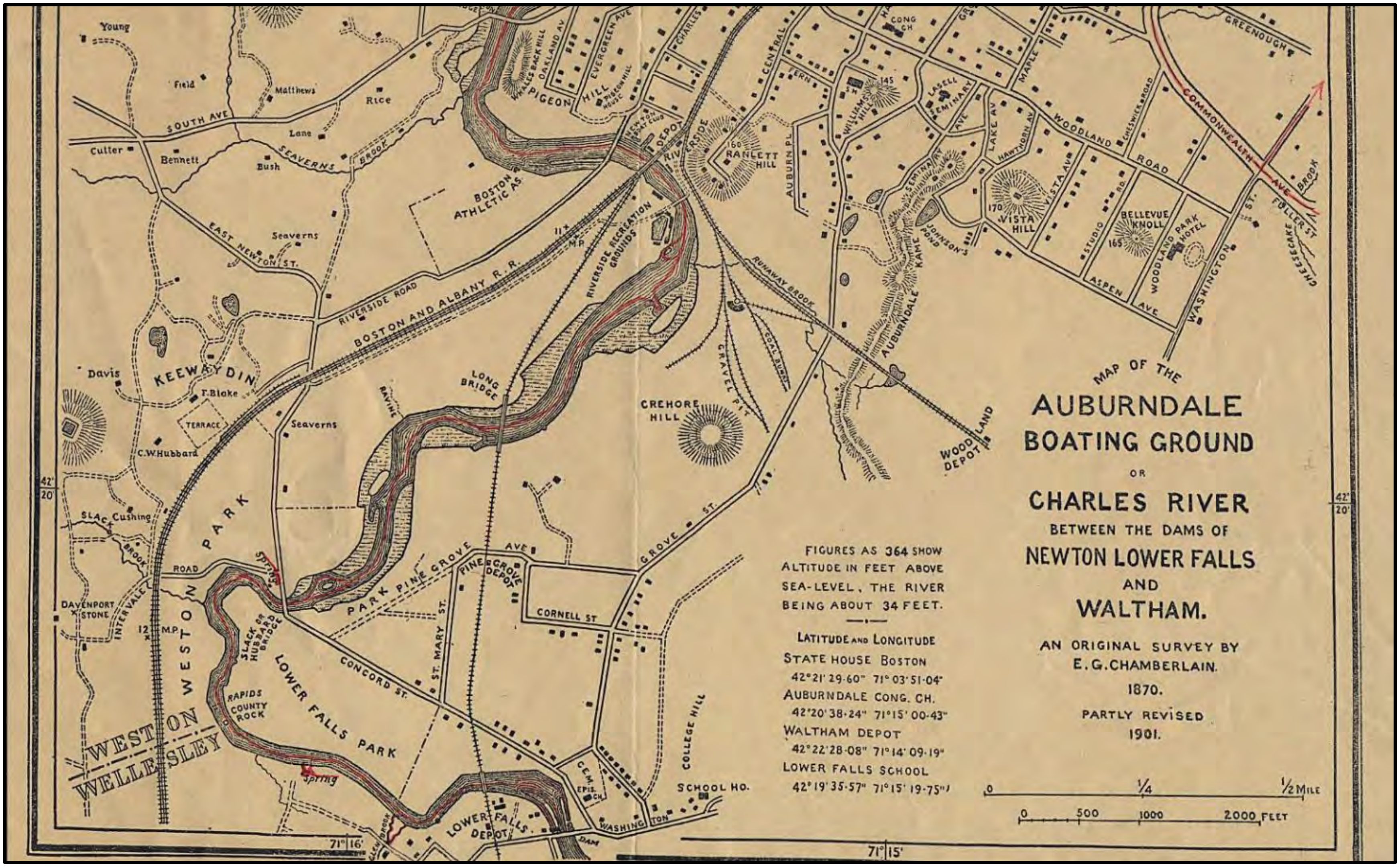
Photo 5: View of the existing stone masonry piers and concrete caps facing northeast from the south (Weston) side of the Charles River.

Photo 6: Evidence of fracturing and collapse along the water line in the stone masonry piers. Fracturing is visible in the concrete caps.

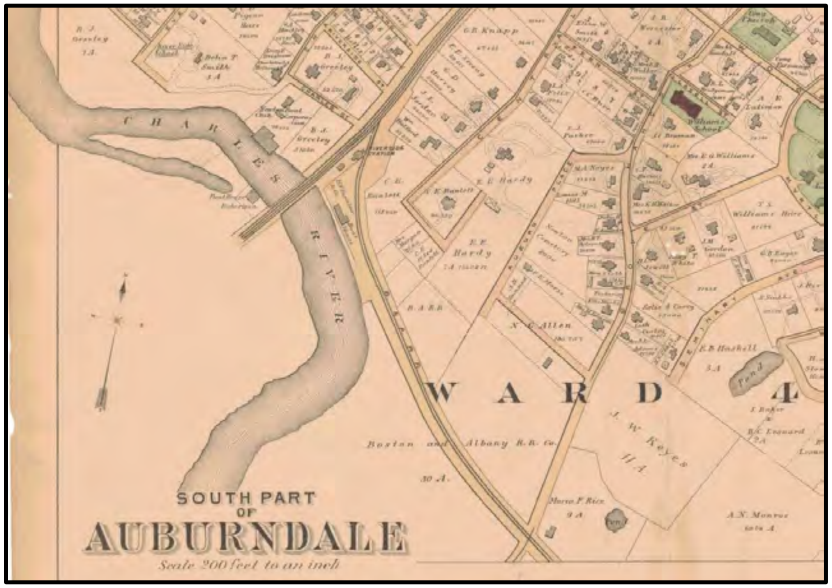
Photo 7: Fracturing in the southwest (Weston) breast wall.

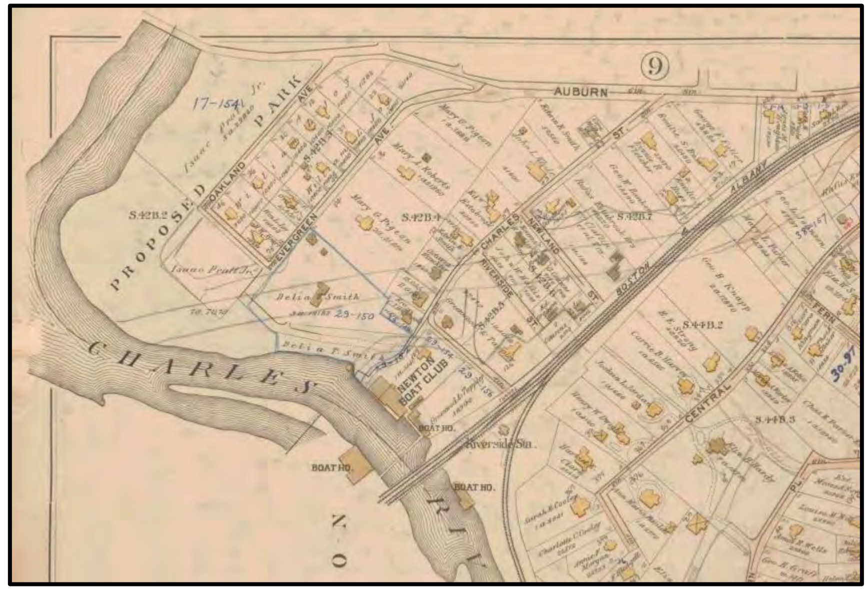
Photo 8: Evidence of fracturing and partial collapse in the north (Newton) abutment.

ATTACHMENT F
Historic Context

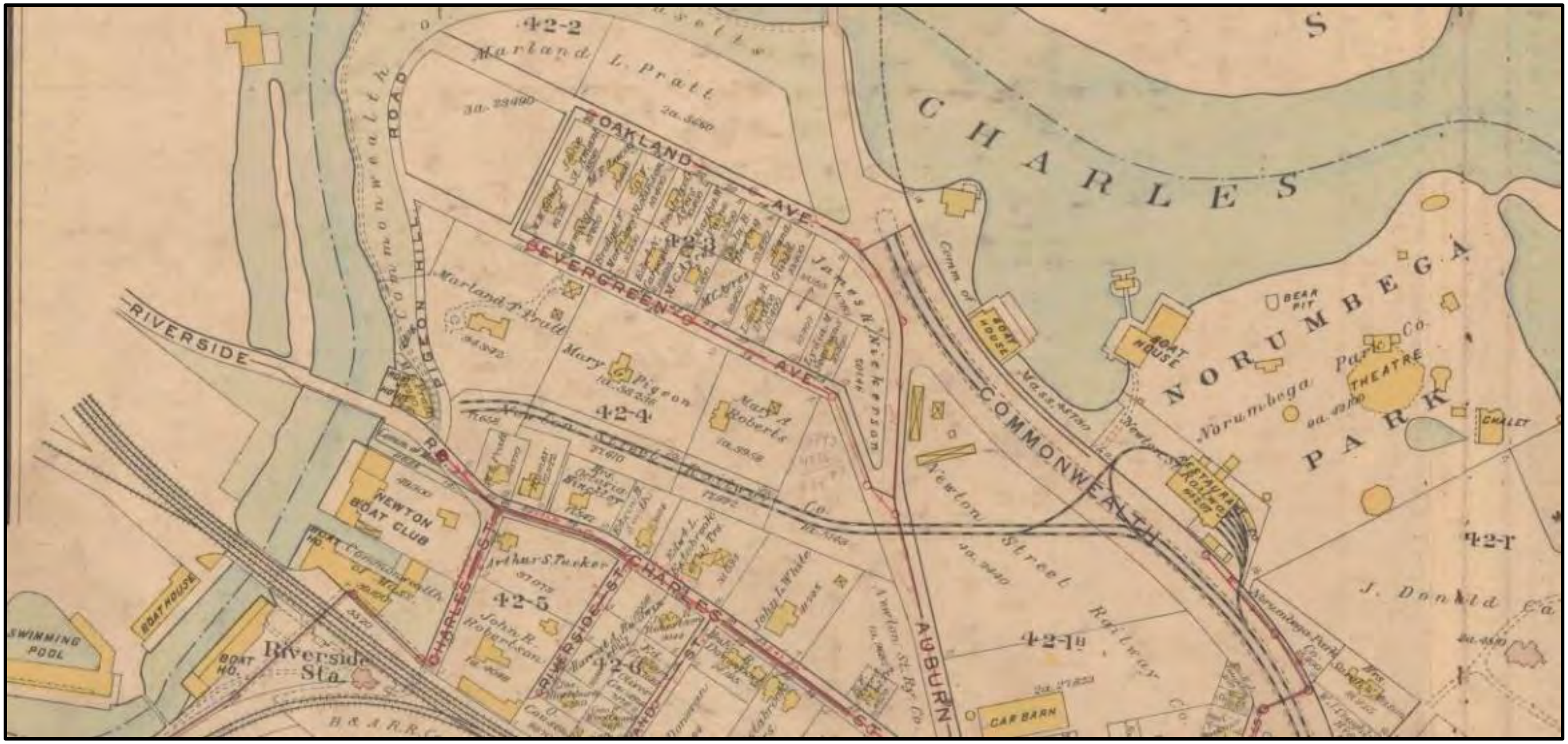


The first depiction of a Charles River crossing in this location appears on a map (above) published for boaters in the Auburndale area. The map was first published in 1870 and partially revised in 1901. Unfortunately, the map does not indicate which features were revised and it is unclear if the bridge was included in the first edition of the map in 1870 or included as part of the 1901 revision.

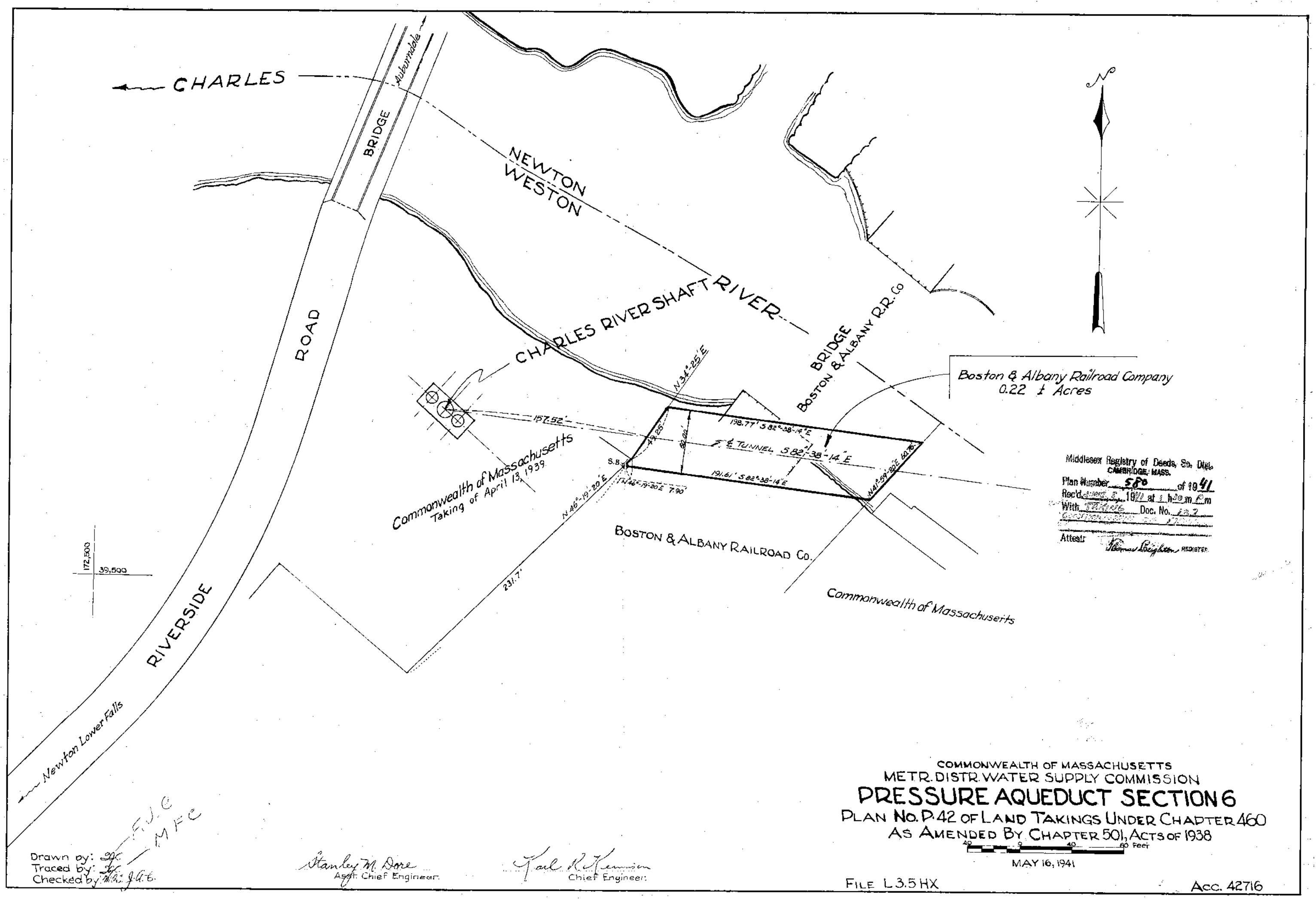




The City of Newton maintains a library of historic maps and atlases from as early as 1700. It is assumed that the Riverside Road bridge was constructed in the second half of the 19th century. The 1886 Atlas of The City of Newton (left) does not depict the Riverside Road crossing in its current location; however, a crossing is depicted on the 1895 edition of the Atlas (right). Interestingly, bridge depicted in the 1895 Atlas appears far narrower and is located further south than the existing crossing. It is unclear whether this discrepancy is due to a mistake in the surveying and creation of the map or if there was a smaller footbridge in this location at the time. Based on these historic resources, it can be concluded with relative certainty that a Charles River crossing was first built in this location between 1886 and 1895.



In the 1907 edition of the Atlas, the Riverside Road crossing is depicted in its current location and configuration. The Atlas also illustrates the popularity of Auburndale segment of the Charles River for recreational users and boaters. In 1907 there were numerous boathouses, parks, and other recreational facilities situated on the Charles River. By the middle of the 20th century the Charles River had become too polluted for swimming and boating and many of the recreational developments fell into decline or closed.



The Riverside Road crossing remained a major east-west connector until the completion of the MassPike in 1957. Traffic on the bridge decreased significantly and it was eventually closed to vehicular use in the 1960s. The land taking plan above, dated May 16, 1941, shows the bridge in its existing alignment and configuration.

AN ACT TO EMPOWER THE COUNTY COMMISSIONERS OF THE COUNTY OF MIDDLESEX TO ESTABLISH A HIGHWAY IN THE CITY OF NEWTON. *Chap.152*

Be it enacted, etc., as follows:

SECTION 1. The county commissioners of the county of Middlesex are hereby empowered to lay out and establish a public highway from Riverside road in the town of Weston to Charles street in the city of Newton. Highway may be established.

SECTION 2. This act shall take effect upon its passage.

Approved March 16, 1899.

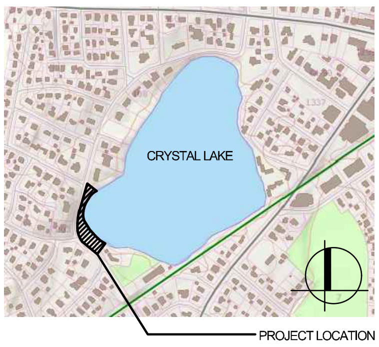
Chapter 152 of the Acts and Resolves passed by the General Court of Massachusetts in 1899 empowered the Middlesex County Commissioners to establish a highway in the City of Newton from Riverside Road in Weston to Charles Street in Newton. It is assumed that this action by the General Court and Middlesex County Commission resulted in the construction of bridge No. N-12-078 = W-29-062.

ATTACHMENT G
MEPA Certificate

ATTACHMENT F
Orders of Conditions

REGISTRY USE ONLY

CITY OF NEWTON, MASSACHUSETTS



LOUISE LEVINGSTON COVE,
NEWTON, MA

LOUISE LEVINGSTON COVE ON CRYSTAL LAKE

CH. 91 PERMITTING SET
- NOT FOR CONSTRUCTION -

NOVEMBER 30, 2021

PLANS ACCOMPANYING PETITION OF CITY OF NEWTON
LAND USE: PUBLIC RIGHT OF WAY
ADDRESS: INTERSECTION OF LAKEWOOD AND LAKE AVENUE,
NEWTON CENTRE, MA, 02459
WATERWAY: CRYSTAL LAKE
MUNICIPALITY: CITY OF NEWTON

LEGEND

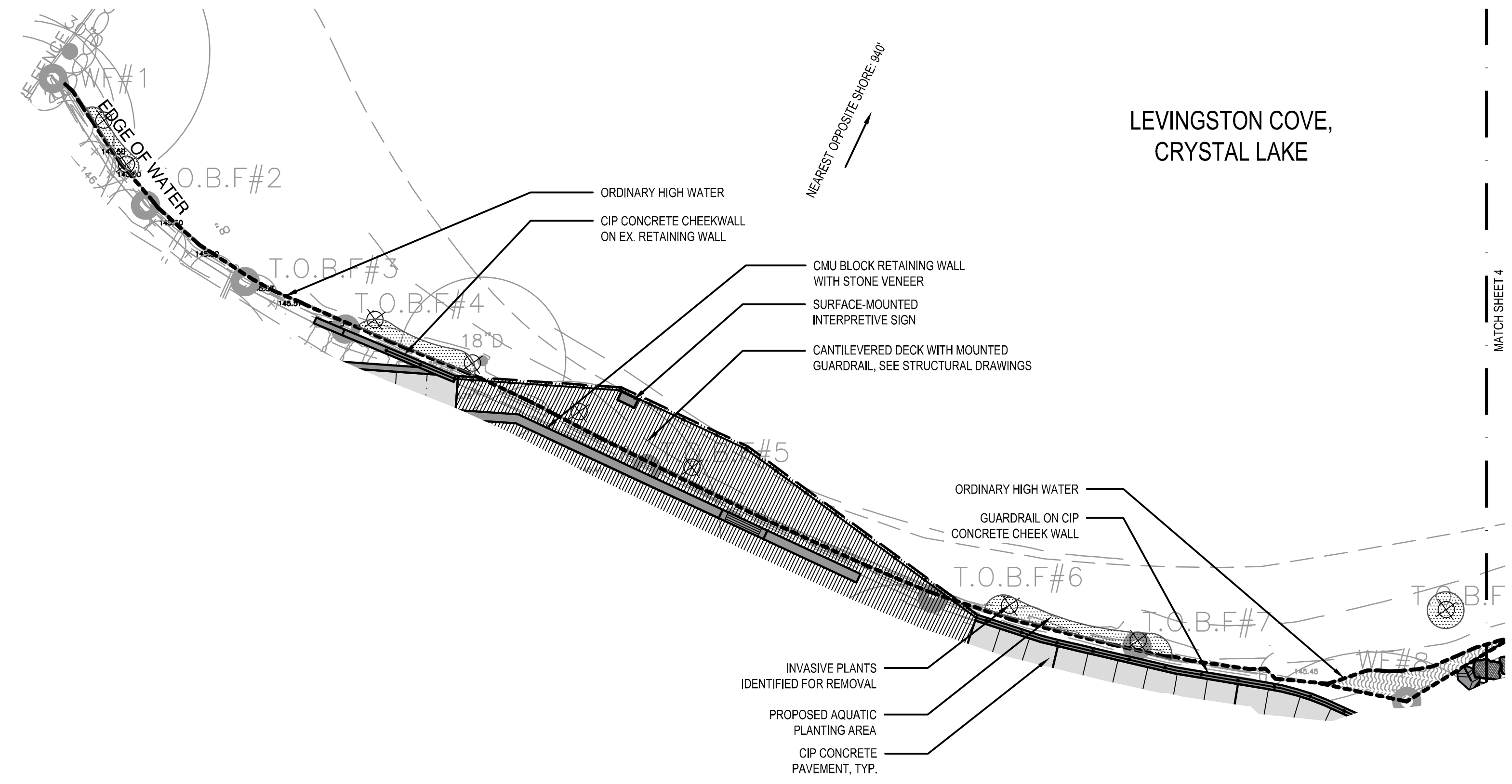
- LIMIT OF WORK
- TOP OF BANK
- EDGE OF WATER
- RETAINING WALL
- DECKING GUARDRAIL
- CIP CONCRETE PAVEMENT
- DECKING
- PROPOSED AQUATIC PLANTING

- INVASIVE PLANTS IDENTIFIED FOR REMOVAL
- EXISTING STONE WALL
- EXISTING TREE
- SALVAGED LANDSCAPE BOULDER
- SALVAGED FLAT GRANITE BLOCK
- INTERPRETIVE SIGN
- BACKED BENCH ON RETAINING WALL

T.O.B.F.	TOP OF BANK FLAG
W.F.	WETLAND FLAG
B.V.W.	BORDERING VEGETATED WETLAND
CIP	CAST IN PLACE
TYP.	TYPICAL

MATERIALS LEGEND

LEVINGSTON COVE
CRYSTAL LAKE
NEWTON, MASSACHUSETTS
SHEET 2

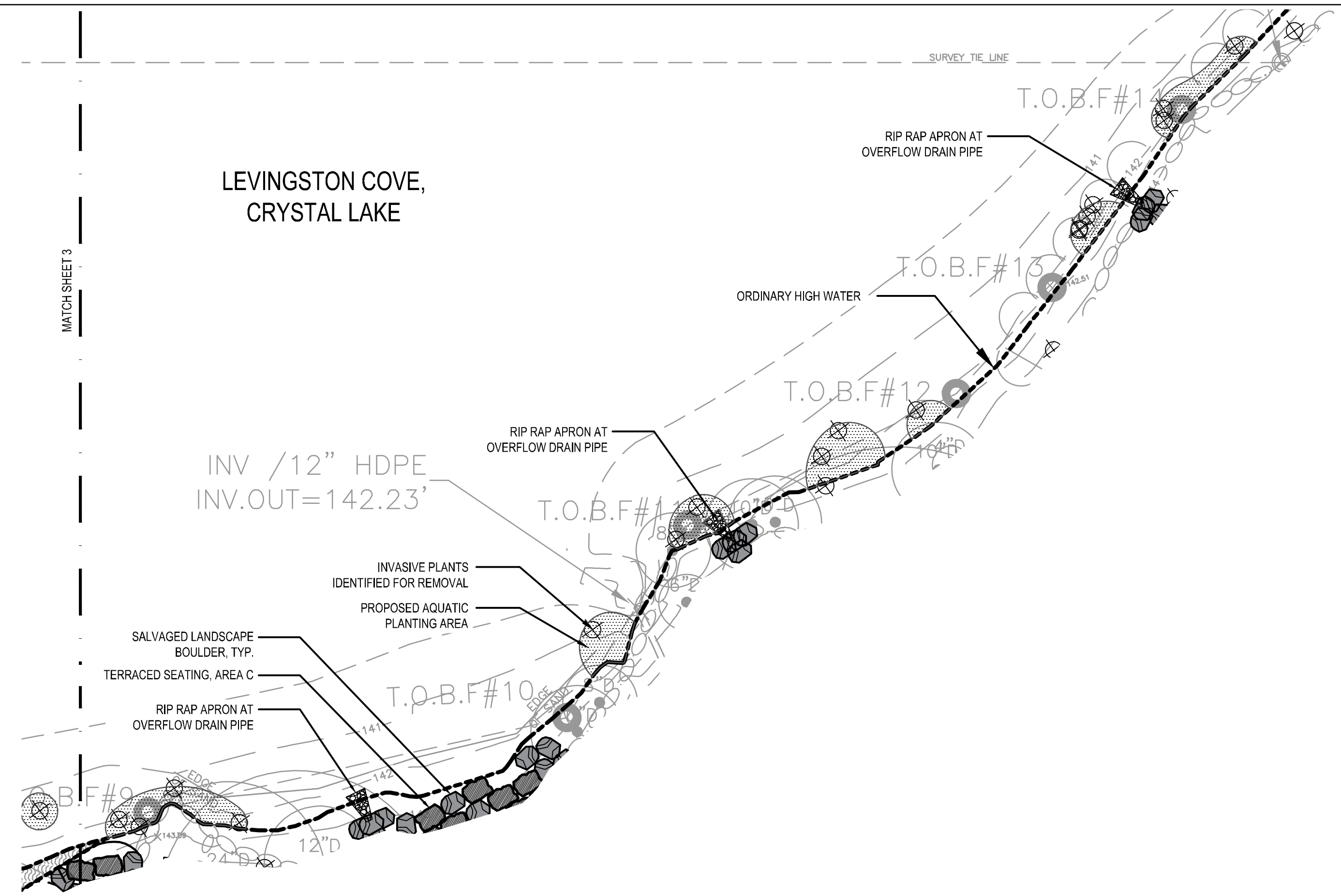


MATERIALS PLAN ENLARGEMENT

30 15 0 30 60

SCALE: 1"=30'

LEVINGSTON COVE
CRYSTAL LAKE
NEWTON, MASSACHUSETTS
SHEET 3

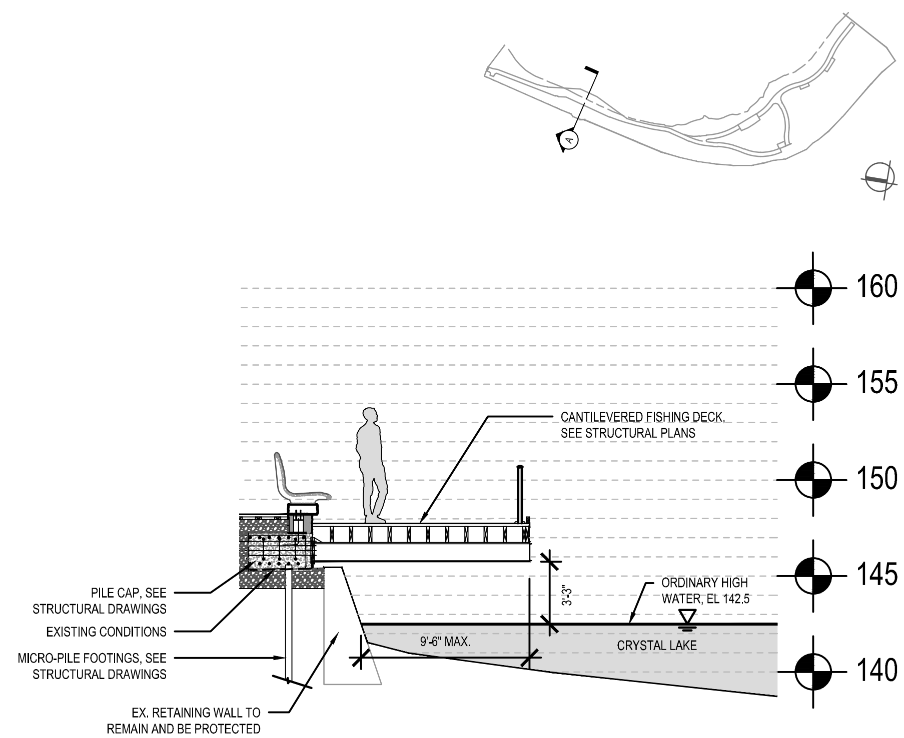


MATERIALS PLAN ENLARGEMENT

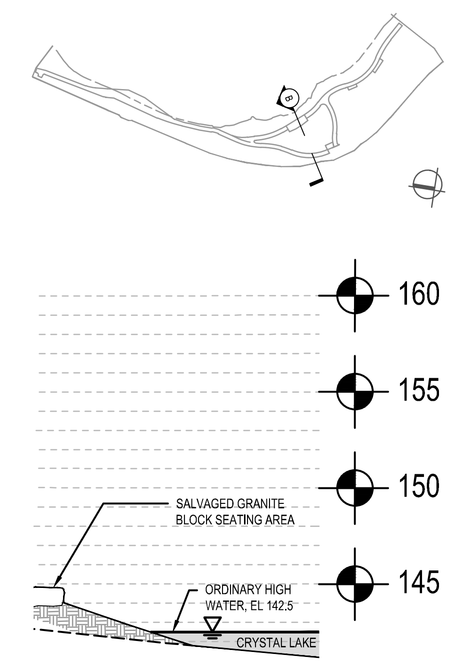
30 15 0 30 60

SCALE: 1"=30'

LEVINGSTON COVE
CRYSTAL LAKE
NEWTON, MASSACHUSETTS
SHEET 4



SECTION A



SECTION B

CROSS SECTIONS

30 15 0 30 60

SCALE: 1"=30'

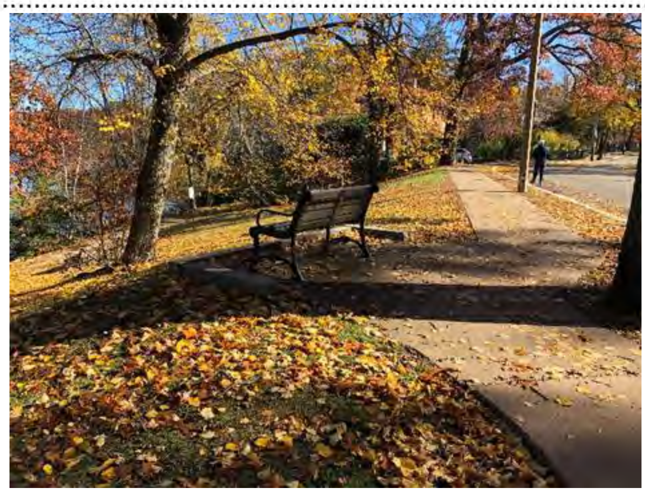
MASSACHUSETTS
Brandon M. Kunkel
NO. 4040
REGISTERED LANDSCAPE ARCHITECT

LEVINGSTON COVE
CRYSTAL LAKE
NEWTON, MASSACHUSETTS
SHEET 5

westonandsampson.com

55 Walkers Brook Drive, Suite 100
Reading, MA 01867
tel: 978.532.1900

Chapter 91 Waterways License



August 2021

CRYSTAL LAKE – LOUISE LEVINGSTON COVE

PREPARED FOR:
CITY OF NEWTON

SUBMITTED TO:
MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

Newton – Crystal Lake, Levingston Cove
WSE Project No. ENG21-0021

August 26, 2021

MassDEP's Boston Office
Waterways Regulation Program,
One Winter Street
Boston, MA 02108

Re: *Chapter 91 Waterways License*
Crystal Lake, Levingston Cove
Newton, MA

To whom it may concern:

On behalf of the City of Newton Weston & Sampson Engineers, Inc. is hereby enclosing one (1) copy of the Chapter 91 Waterways License application, including applicable Plans, to fulfill the requirements of the Massachusetts Chapter 91 Program review. Because work will occur within a Great Pond, this project requires Chapter e91 review.

Along with the Chapter 91 Waterways License application (BRP WW01) and required fees, the following additional information for this license application is included in the following appendices:

Appendix A: Abutters List
Appendix B: Notice of Intent

If you have any questions regarding this submittal, please contact me by phone at (978) 532-1900 or by email at gaspara@wseinc.com

Very truly yours,

WESTON & SAMPSON, INC.

Alexandra Gaspar
Environmental Scientist

Enter your transmittal number → X288181
Transmittal Number

Your unique Transmittal Number can be accessed online:
http://www.mass.gov/eea/agencies/massdep/service/approvals/transmittal-form-for-payment.html

Massachusetts Department of Environmental Protection

Transmittal Form for Permit Application and Payment

1. Please type or print. A separate Transmittal Form must be completed for each permit application.

2. Make your check payable to the Commonwealth of Massachusetts and mail it with a copy of this form to: MassDEP, P.O. Box 4062, Boston, MA 02211.

3. Three copies of this form will be needed.

Copy 1 - the original must accompany your permit application.
Copy 2 must accompany your fee payment.
Copy 3 should be retained for your records

4. Both fee-paying and exempt applicants must mail a copy of this transmittal form to:

MassDEP
P.O. Box 4062
Boston, MA
02211

*** Note:**
For BWSC Permits, enter the LSP.

A. Permit Information

Chapter 91 Waterways License Application
1. Permit Code: 4 to 7 character code from permit instructions

waterways
2. Name of Permit Category

park improvements
3. Type of Project or Activity

B. Applicant Information – Firm or Individual

City of Newton - Parks, Recreation & Culture Department
1. Name of Firm - Or, if party needing this approval is an individual enter name below:

2. **Last Name** of Individual
3. **First Name** of Individual
4. MI

246 Dudley Road
5. Street Address

Newton	MA	02459	617-796-1500	
6. City/Town	7. State	8. Zip Code	9. Telephone #	10. Ext. #

Luis Perez Demorizi
11. Contact Person

lpdemorizi@newtonma.gov
12. e-mail address

C. Facility, Site or Individual Requiring Approval

Levingston Cove/Crystal Lake
1. Name of Facility, Site Or Individual

Lake Ave Ctr (near 230 Lake Ave Ctr)
2. Street Address

Newton	MA	02461		
3. City/Town	4. State	5. Zip Code	6. Telephone #	7. Ext. #

8. DEP Facility Number (if Known)
9. Federal I.D. Number (if Known)
10. BWSC Tracking # (if Known)

D. Application Prepared by (if different from Section B)*

Weston & Sampson Engineers
1. Name of Firm Or Individual

55 Walkers Brook Dr Suite 100
2. Address

Reading	MA	02867	978-532-1900	
3. City/Town	4. State	5. Zip Code	6. Telephone #	7. Ext. #

Alexandra Gaspar
8. Contact Person

9. LSP Number (BWSC Permits only)

E. Permit - Project Coordination

1. Is this project subject to MEPA review? ☐ yes ☒ no
If yes, enter the project's EOEA file number - assigned when an Environmental Notification Form is submitted to the MEPA unit:

EOEA File Number

F. Amount Due

DEP Use Only

Permit No:

Rec'd Date:

Reviewer:

Special Provisions:

1. ☒ **Fee** Exempt (city, town or municipal housing authority)(state agency if fee is $100 or less).
There are no fee exemptions for BWSC permits, regardless of applicant status.
2. ☐ Hardship Request - payment extensions according to 310 CMR 4.04(3)(c).
3. ☐ Alternative Schedule Project (according to 310 CMR 4.05 and 4.10).
4. ☐ Homeowner (according to 310 CMR 4.02).

Check Number
Dollar Amount
Date

X28818
Transmittal No.

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

For assistance in completing this application, please see the "Instructions".

A. Application Information (Check one)

NOTE: For Chapter 91 Simplified License application form and information see the Self Licensing Package for BRP WW06.

Name (Complete Application Sections)		Check One	Fee	Application #
WATER-DEPENDENT -				
	General (A-H)	☐ Residential with ≤ 4 units	$215.00	BRP WW01a
		☒ Other	$330.00	BRP WW01b
		☐ Extended Term	$3,350.00	BRP WW01c
	Amendment (A-H)	☐ Residential with ≤ 4 units	$100.00	BRP WW03a
		☐ Other	$125.00	BRP WW03b
NONWATER-DEPENDENT -				
	Full (A-H)	☐ Residential with ≤ 4 units	$665.00	BRP WW15a
		☐ Other	$2,005.00	BRP WW15b
		☐ Extended Term	$3,350.00	BRP WW15c
	Partial (A-H)	☐ Residential with ≤ 4 units	$665.00	BRP WW14a
		☐ Other	$2,005.00	BRP WW14b
		☐ Extended Term	$3,350.00	BRP WW14c
	Municipal Harbor Plan (A-H)	☐ Residential with ≤ 4 units	$665.00	BRP WW16a
		☐ Other	$2,005.00	BRP WW16b
		☐ Extended Term	$3,350.00	BRP WW16c
	Joint MEPA/EIR (A-H)	☐ Residential with ≤ 4 units	$665.00	BRP WW17a
		☐ Other	$2,005.00	BRP WW17b
		☐ Extended Term	$3,350.00	BRP WW17c
	Amendment (A-H)	☐ Residential with ≤ 4 units	$530.00	BRP WW03c
		☐ Other	$1,000.00	BRP WW03d
		☐ Extended Term	$1,335.00	BRP WW03e

X28818
Transmittal No.

B. Applicant Information Proposed Project/Use Information

Note: Please refer to the "Instructions"

1. Applicant:

Luis Perez Demorizi Name	lpdemorizi@newtonma.gov E-mail Address
246 Dudley Road Mailing Address	
Newton City/Town	MA State	02459 Zip Code
617-796-1500 Telephone Number	 Fax Number

2. Authorized Agent (if any):

Alexandra Gaspar Name	gaspara@wseinc.com E-mail Address	
55 Walkers Brook Drive, Suite 100 Mailing Address		
Reading City/Town	MA State	01867 Zip Code
9785321900 Telephone Number	 Fax Number	

C. Proposed Project/Use Information

1. Property Information (all information must be provided):

same as applicant Owner Name (if different from applicant)		
62001 0004 Tax Assessor's Map and Parcel Numbers	42.326046 Latitude	-71.203387 Longitude
Lave Ave Ctr (between 170 & 230) Newton Street Address and City/Town	MA State	02461 Zip Code

2. Registered Land ☐ Yes ☒ No

3. Name of the water body where the project site is located:
Crystal Lake

4. Description of the water body in which the project site is located (check all that apply):

Type	**Nature**	**Designation**
☐ Nontidal river/stream	☒ Natural	☐ Area of Critical Environmental Concern
☐ Flowed tidelands	☐ Enlarged/dammed	☐ Designated Port Area
☐ Filled tidelands	☐ Uncertain	☐ Ocean Sanctuary
☒ Great Pond		☒ Uncertain
☐ Uncertain		

X28818
Transmittal No.

C. Proposed Project/Use Information (cont.)

Select use(s) from Project Type Table on pg. 2 of the "Instructions"

5. Proposed Use/Activity description

   Improvements to the Crystal Lake/Levingston Cove area See Appendix A for additional information.

6. What is the estimated total cost of proposed work (including materials & labor)?

   $1,440,344

7. List the name & complete mailing address of each abutter (attach additional sheets, if necessary). An abutter is defined as the owner of land that shares a common boundary with the project site, as well as the owner of land that lies within 50' across a waterbody from the project.

Name	Address
see Appendix A	

D. Project Plans

1. I have attached plans for my project in accordance with the instructions contained in (check one):

   ☒ Appendix A (License plan)   ☐ Appendix B (Permit plan)

2. Other State and Local Approvals/Certifications

Approval		
☐ 401 Water Quality Certificate		Date of Issuance
☒ Wetlands	submitted concurently	File Number
☐ Jurisdictional Determination	JD-	File Number
☐ MEPA		File Number
☐ EOEA Secretary Certificate		Date
☐ 21E Waste Site Cleanup		RTN Number

E. Certification

All applicants, property owners and authorized agents must sign this page. All future application correspondence may be signed by the authorized agent alone.

"I hereby make application for a permit or license to authorize the activities I have described herein. Upon my signature, I agree to allow the duly authorized representatives of the Massachusetts Department of Environmental Protection and the Massachusetts Coastal Zone Management Program to enter upon the premises of the project site at reasonable times for the purpose of inspection."

"I hereby certify that the information submitted in this application is true and accurate to the best of my knowledge."

Luis Perez Demorizi
Applicant's signature

07/27/2021
Date

Property Owner's signature (if different than applicant)

Date

Agent's signature (if applicable)

8/23/2021
Date

F. Waterways Dredging Addendum

1. Provide a description of the dredging project

☐ Maintenance Dredging (include last dredge date & permit no.) ☐ Improvement Dredging

NOT APPLICABLE
Purpose of Dredging

2. What is the volume (cubic yards) of material to be dredged?

3. What method will be used to dredge?

☐ Hydraulic ☐ Mechanical ☐ Other

4. Describe disposal method and provide disposal location (include separate disposal site location map)

5. Provide copy of grain size analysis. If grain size is compatible for beach nourishment purposes, the Department recommends that the dredged material be used as beach nourishment for public beaches. **Note:** In the event beach nourishment is proposed for private property, pursuant to 310 CMR 9.40(4)(a)1, public access easements below the existing high water mark shall be secured by applicant and submitted to the Department.

G. Municipal Zoning Certificate

Luis Perez Demorizi
Name of Applicant

Lave Ave Ctr	Crystal Lake	Newton
Project street address	Waterway	City/Town

Description of use or change in use:

No change in use. Park will be improved to include a walking path on the edge of Levingston Cove.

To be completed by municipal clerk or appropriate municipal official:

"I hereby certify that the project described above and more fully detailed in the applicant's waterways license application and plans is not in violation of local zoning ordinances and bylaws."

Printed Name of Municipal Official ____________ Date ____________

Signature of Municipal Official ____________ Title ____________ City/Town ____________

H. Municipal Planning Board Notification

Notice to Applicant:

Section H should be completed and submitted along with the original application material.

Luis Perez Demorizi
Name of Applicant

Lake Ave Ctr	Crystal Lake	Newton
Project street address	Waterway	City/Town

Description of use or change in use:

No change in use. Park will be improved to include a walking path on the edge of Levingston Cove.

To be completed by municipal clerk or appropriate municipal official:

"I hereby certify that the project described above and more fully detailed in the applicant's waterways license application and plans have been submitted by the applicant to the municipal planning board."

Printed Name of Municipal Official — Date

Signature of Municipal Official — Title — City/Town

Note: Any comments, including but not limited to written comments, by the general public, applicant, municipality, and/or an interested party submitted after the close of the public comment period pertaining to this Application shall not be considered, and shall not constitute a basis for standing in any further appeal pursuant to 310 CMR 9.13(4) and/or 310 CMR 9.17.

Appendix A: License Plan Checklist

General View

- ☐ PE or RLS, as deemed appropriate by the Department, stamped and signed, in ink, each sheet within 8 1/2 inch by 11 inch border
- ☐ Format and dimensions conform to “Sample Plan” (attached)
- ☐ Minimum letter size is 1/8 of an inch if freehand lettering, 1/10 of an inch if letter guides are used
- ☐ Sheet number with total number in set on each sheet
- ☐ Title sheet contains the following in lower left: Plans accompanying Petition of [Applicant’s name, structures and/or fill or change in use, waterway and municipality]
- ☐ North arrow
- ☐ Scale is suitable to clearly show proposed structures and enough of shoreline, existing structures and roadways to define its exact location
- ☐ Scale is stated & shown by graphic bar scale on each sheet
- ☐ Initial plans may be printed on bond; final plans due before License issuance must be on 3mil Mylar.

Structures and Fill

- ☐ All Structures and Fill shown in full BLACK lines, clearly labeling which portions are existing, which are Proposed and indicating Existing Waterways Licenses
- ☐ *Cross Section Views* show MHW* and MLW* and structure finish elevations
- ☐ *Dredge or Fill*, actual cubic yardage must be stated and typical cross sections shown
- ☐ All Structures and Fill shown in full BLACK lines, clearly labeling which portions are existing, which are Proposed and indicating Existing Waterways Licenses
- ☐ *Cross Section Views* show MHW* and MLW* and structure finish elevations
- ☐ *Dredge or Fill*, actual cubic yardage must be stated and typical cross sections shown
- ☐ Actual dimensions of structures(s) and or fill and the distance which they extend beyond MHW* or OHW*
- ☐ Change in Use of any structures on site must be stated

* See 310 CMR 9.02, Waterways Regulations definitions of High Water Mark, Historic High Water Mark, Historic Low Water Mark, and Low Water Mark. *Note:* DEP may, at its discretion, accept appropriately scaled preliminary plans in lieu of the plans described above. In general, DEP will accept preliminary plans only for non-water dependent projects and projects covered by MEPA to address site design components such as visual access, landscaping & site coverage. *Anyone wishing to submit preliminary plans must obtain prior approval of the DEP Waterways Program* before submitting them with their application.

Appendix A: License Plan Checklist (cont.)

Boundaries

- ☐ Property lines, full black lines, ————, along with abutters' names and addresses
- ☐ Mean High Water (MHW)* or Ordinary High Water (OHW)*, full black line ————
- ☐ Mean Low Water (MLW)*, black dotted line, (............)
- ☐ Historic MHW* or OHW* (— — — —)
- ☐ Historic MLW* (...__...__...__)
- ☐ State Harbor Lines, black dot-dash line (– . – . – . –) with indication of Chapter & Act establishing them (Ch. , Acts of)
- ☐ Reference datum is National Geodetic Vertical Datum (NGVD) or (NAVD).
- ☐ Floodplain Boundaries according to most recent FEMA maps
- ☐ Proposed & Existing Easements described in metes & bounds

Water-Dependent Structures

- ☐ Distance from adjacent piers, ramps or floats (minimum distance of 25' from property line, where feasible)
- ☐ Distance from nearest opposite shoreline
- ☐ Distance from outside edge of any Navigable Channel
- ☐ Access stairs at MHW for lateral public passage, or 5 feet of clearance under structure at MHW.

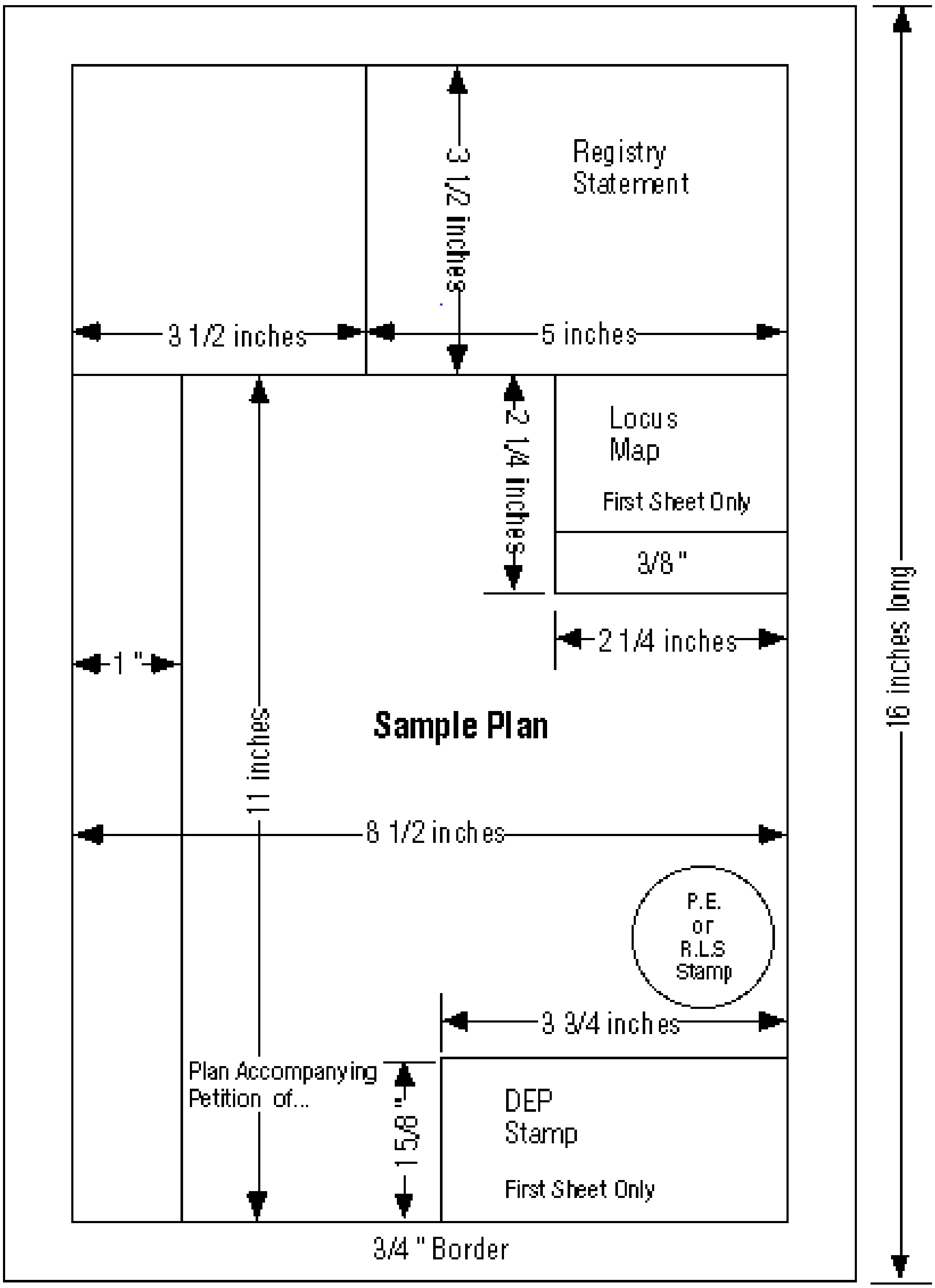
Non Water-Dependent Structures

- ☐ Depict extent of "Water-dependent Use Zone".

See Waterways Regulations at 310 CMR 9.51-9.53 for additional standards for non water-dependent use projects.

Note: Final Mylar project site plans will be required upon notice from the Department, prior to issuance of the Chapter 91 Waterways License.

Appendix A: License Plan Checklist Cont.



Appendix B: Dredging Permit Plan Checklist

For projects applying for dredging permits only, enclose drawings with the General Waterways Application that include the following information:

General View

- ☐ Submit one original of all drawings. Submit the fewest number of sheets necessary to adequately illustrate the project on 8-1/2 inch X 11 inch paper.
- ☐ A 1-inch margin should be left at the top edge of each drawing for purposes of reproduction and binding. A 1/2 inch margin is required in the three other edges.
- ☐ A complete title block on each drawing submitted should identify the project and contain: the name of the waterway; name of the applicant; number of the sheet and total number of sheets in the set; and the date the drawing was prepared.
- ☐ Use only dot shading, hatching, and dashed or dotted line to show or indicate particular features of the site on the drawings.
- ☐ If deemed appropriate by the Department, certification by the Registered Professional Engineer or Land Surveyor is included.

Plan View

- ☐ North Arrow
- ☐ Locus Map
- ☐ Standard engineering scale.
- ☐ Distances from channel lines and structures if appropriate.
- ☐ Mean high water and mean low water shorelines (see definitions of “High Water Mark” and “Low Water Mark” at 310 CMR 9.02, C. 91 Regulations).
- ☐ Dimensions of area proposed to be dredged or excavated.
- ☐ Notation or indication of disposal site.
- ☐ Volume of proposed dredging or excavation.
- ☐ Ordinary high water, proposed drawdown level, and natural (historic) high water (for projects lowering waters of Great Ponds).

Section Views

- ☐ Existing bottom and bank profiles.
- ☐ Vertical and/or horizontal scales.
- ☐ Proposed and existing depths relative to an indicated datum.
- ☐ Elevation and details of control structure (for projects lowering waters of Great Ponds).

Appendix C: Application Completeness Checklist

Please answer all questions in the General Waterways Application form. If a question does not apply to your project write "not applicable" (n/a) in that block. Please print or type all information provided on the form. Use black ink (blue ink or pencil are not easily reproducible, therefore, neither will be accepted). If additional space is needed, attach extra 8-1/2" x 11" sheets of paper.

- ☐ **Proper Public Purpose:** For nonwater-dependent projects, a statement must be included that explains how the project serves a proper public purpose that provides greater benefit than detriment to public rights in tidelands or great ponds and the manner in which the project meets the applicable standards. If the project is a nonwater-dependent project located in the coastal zone, the statement should explain how the project complies with the standard governing consistency of the policies of the Massachusetts Coastal Zone Management Program, according to 310 CMR 9.54. If the project is located in an area covered by a Municipal Harbor Plan, the statement should describe how the project conforms to any applicable provisions of such plan pursuant to 310 CMR 9.34(2).

- ☐ **Plans:** Prepared in accordance with the applicable instructions contained in Appendix A-B of this application. For initial filing, meet the requirements of 310 CMR 9.11(2)(b)(3).

- ☐ **Applicant Certification:** All applications must be signed by “the landowner if other than the applicant. In lieu of the landowner’s signature, the applicant may provide other evidence of legal authority to submit an application for the project site.” If the project is entirely on land owned by the Commonwealth (e.g. most areas below the current low water mark in tidelands and below the historic high water mark of Great Ponds), you may simply state this in lieu of the “landowner’s signature”.

- ☐ **Municipal Zoning Certification:** If required, applicants must submit a completed and signed Section E of this application by the municipal clerk or appropriate municipal official or, for the initial filing, an explanation of why the form is not included with the initial application. If the project is a public service project subject to zoning but will not require any municipal approvals, submit a certification to that effect pursuant to 310 CMR 9.34(1).

- ☐ **Municipal Planning Board Notification:** Applicants must submit a copy of this application to the municipal planning board for the municipality where the project is located. Submittal of the complete application to DEP must include Section H signed by the municipal clerk, or appropriate municipal official for the town where the work is to be performed, except in the case of a proposed bridge, dam, or similar structure across a river, cove, or inlet, in which case it must be certified by every municipality into which the tidewater of said river, cove, or inlet extends.

- ☐ **Final Order of Conditions:** A copy of one of the following three documents is required with the filing of a General Waterways Application: (1) the Final Order of Conditions (with accompanying plan) under the Wetlands Protection Act; (2) a final Determination of Applicability under that Act stating that an Order of Conditions is not required for the project; or (3) the Notice of Intent for the initial filing (if the project does not trigger review under MEPA).

- ☐ **Massachusetts Environmental Protection Act (MEPA):** MGL 30, subsections 61-61A and 301 CMR 11.00, submit as appropriate: a copy of the Environmental Notification Form (ENF) and a Certificate of the Secretary of Environmental Affairs thereon, or a copy of the final Environmental Impact Report (EIR) and Certificate of the Secretary stating that it adequately and properly complies with MEPA; and any subsequent Notice of Project change and any determination issued thereon in accordance with MEPA. For the initial filing, only a copy of the ENF and the Certificate of the Secretary thereon must be submitted.

  Note: If the project is subject to MEPA, the Chapter 91 Public Notice must also be submitted to MEPA for publication in the “Environmental Monitor”. MEPA filing deadlines are the 15th and 30th of each month.

Appendix C: Application Completeness Checklist (cont.)

- ☐ **Water Quality Certificate:** if applicable, pursuant to 310 CMR 9.33, is included.
- ☐ **Other Approvals:** as applicable pursuant to 310 CMR 9.33 or, for the initial filing, a list of such approvals which must be obtained.

Projects involving dredging:

- ☐ The term “dredging” means the removal of materials including, but not limited to, rocks, bottom sediments, debris, sand, refuse, plant or animal matter, in any excavating, clearing, deepening, widening or lengthening, either permanently or temporarily, of any flowed tidelands, rivers, streams, ponds or other waters of the Commonwealth. Dredging includes improvement dredging, maintenance dredging, excavating and backfilling or other dredging and subsequent refilling. Included is a completed and signed copy of Part F of the application.

Filing your Completed General Waterways Application:

- ☒ **For all Water-Dependent applications** – submit a completed General Waterways Application and all required documentation with a *photocopy* of both payment check and DEP’s *Transmittal Form for Permit Application & Payment* to the appropriate DEP Boston or regional office (please refer to Pg. 10 of the “Instructions” for the addresses of DEP Regional Offices).
- ☐ **For all Non Water-Dependent applications** – submit a completed General Waterways Application and all required documentation with a *photocopy* of both payment check and DEP’s *Transmittal Form for Permit Application & Payment* to DEP’s Boston office.

  Department of Environmental Protection
  Waterways Regulation Program
  One Winter Street
  Boston, MA 02108

- ☐ **Application Fee Payment for ALL Waterways Applications:** Send the appropriate Application fee* (please refer to Page 1 of the “Application”), in the form of a check or money order, along with DEP’s *Transmittal Form for Permit Application & Payment*:

  Department of Environmental Protection
  P.O. Box 4062
  Boston, MA 02211

  * Under extreme circumstances, DEP grants extended time periods for payment of license and permit application fees. If you qualify, check the box entitles “Hardship Request” on the *Transmittal Form for Permit Application & Payment.* See 310 CMR 4.04(3)(c) to identify procedures for making a hardship request. Send hardship request and supporting documentation to the above address.

  NOTE: You may be subject to a ***double*** **application fee** if your application for Chapter 91 authorization results from an enforcement action by the Department or another agency of the Commonwealth or its subdivisions, or if your application seeks authorization for an existing unauthorized structure or use.

Appendix A

Direct Abutters List – Newton, Levingston Cove

AYAS KAREN
230 LAKE AVE CTR
NEWTON, MA 02461

CITY OF NEWTON
1000 COMMONWEALTH AVE
NEWTON, MA 02459

CHAN GERALD L & BERYL W TRS
LAKE REAL ESTATE TRUST
PO BOX 590179
NEWTON, MA 02459

Appendix B

westonandsampson.com

55 Walkers Brook Drive, Suite 100
Reading, MA 01867
tel: 978.532.1900

Notice of Intent

August 2021

CRYSTAL LAKE – LOUISE LEVINGSTON COVE

PREPARED FOR:
CITY OF NEWTON

SUBMITTED TO:
NEWTON CONSERVATION COMMISSION

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

Newton – Crystal Lake, Levingston Cove
WSE Project No. ENG21-0021

August 10, 2021

Newton Conservation Commission
1000 Commonwealth Ave
Newton, MA 02459

Re: *NOI Filing*
Crystal Lake - Levingston Cove

Dear Members of the Commission:

On behalf of the City of Newton, Weston & Sampson Engineers, Inc. is hereby enclosing two (2) copies (including original) of the Notice of Intent submittal (including plans) to fulfill the requirements of the Massachusetts Wetlands Protection Act, M.G.L. Chapter 131, Section 40 submittal requirements and the City of Newton submittal requirements. This submittal is a formal Notice of Intent for the improvements to Levingston Cove.

As part of the filing, we have attached the following:

Appendix A: Project Description
Appendix B: Stormwater Report
Appendix C: Project Maps
Appendix D: Applicable Technical Specifications
Appendix E: Abutters Information
Appendix F: Wetlands Memorandum
Appendix G: Photos
Appendix H: Invasive Species Survey
If you have any questions regarding this submittal, please contact me at (978) 532-1900.

Very truly yours,

WESTON & SAMPSON

Alexandra Gaspar
Environmental Scientist

Enter your transmittal number → X288181
Transmittal Number

Your unique Transmittal Number can be accessed online: http://www.mass.gov/eea/agencies/massdep/service/approvals/transmittal-form-for-payment.html

Massachusetts Department of Environmental Protection

Transmittal Form for Permit Application and Payment

1. Please type or print. A separate Transmittal Form must be completed for each permit application.

2. Make your check payable to the Commonwealth of Massachusetts and mail it with a copy of this form to: MassDEP, P.O. Box 4062, Boston, MA 02211.

3. Three copies of this form will be needed.

Copy 1 - the original must accompany your permit application.
Copy 2 must accompany your fee payment.
Copy 3 should be retained for your records

4. Both fee-paying and exempt applicants must mail a copy of this transmittal form to:

MassDEP
P.O. Box 4062
Boston, MA
02211

*** Note:**
For BWSC Permits, enter the LSP.

A. Permit Information

1. Permit Code: 4 to 7 character code from permit instructions: WPA3 Notice of Intent
2. Name of Permit Category: wetlands
3. Type of Project or Activity: park improvements

B. Applicant Information – Firm or Individual

1. Name of Firm - Or, if party needing this approval is an individual enter name below: City of Newton - Parks, Recreation & Culture Department
2. **Last Name** of Individual:
3. **First Name** of Individual:
4. MI:
5. Street Address: 246 Dudley Road
6. City/Town: Newton
7. State: MA
8. Zip Code: 02459
9. Telephone #: 617-796-1500
10. Ext. #:
11. Contact Person: Luis Perez Demorizi
12. e-mail address: lpdemorizi@newtonma.gov

C. Facility, Site or Individual Requiring Approval

1. Name of Facility, Site Or Individual: Levingston Cove/Crystal Lake
2. Street Address: Lake Ave Ctr (near 230 Lake Ave Ctr)
3. City/Town: Newton
4. State: MA
5. Zip Code: 02461
6. Telephone #:
7. Ext. #:
8. DEP Facility Number (if Known):
9. Federal I.D. Number (if Known):
10. BWSC Tracking # (if Known):

D. Application Prepared by (if different from Section B)*

1. Name of Firm Or Individual: Weston & Sampson Engineers
2. Address: 55 Walkers Brook Dr Suite 100
3. City/Town: Reading
4. State: MA
5. Zip Code: 02867
6. Telephone #: 978-532-1900
7. Ext. #:
8. Contact Person: Alexandra Gaspar
9. LSP Number (BWSC Permits only):

E. Permit - Project Coordination

1. Is this project subject to MEPA review? ☐ yes ☒ no
If yes, enter the project's EOEA file number - assigned when an Environmental Notification Form is submitted to the MEPA unit:

EOEA File Number:

F. Amount Due

DEP Use Only

Permit No:

Rec'd Date:

Reviewer:

Special Provisions:

1. ☒ **Fee** Exempt (city, town or municipal housing authority)(state agency if fee is $100 or less).
There are no fee exemptions for BWSC permits, regardless of applicant status.
2. ☐ Hardship Request - payment extensions according to 310 CMR 4.04(3)(c).
3. ☐ Alternative Schedule Project (according to 310 CMR 4.05 and 4.10).
4. ☐ Homeowner (according to 310 CMR 4.02).

Check Number:
Dollar Amount:
Date:

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Newton
City/Town

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

Note: Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

Lake Ave Ctr (between 170 & 230) — a. Street Address
Newton — b. City/Town
02461 — c. Zip Code

Latitude and Longitude:
42.326046 — d. Latitude
-71.203387 — e. Longitude

62001 — f. Assessors Map/Plat Number
0004 — g. Parcel /Lot Number

2. Applicant:

Luis — a. First Name
Perez Demorizi — b. Last Name
City of Newton - Parks, Recreation & Culture Department — c. Organization
246 Dudley Road — d. Street Address
Newton — e. City/Town
MA — f. State
02459 — g. Zip Code
617-796-1500 — h. Phone Number
i. Fax Number
lpdemorizi@newtonma.gov — j. Email Address

3. Property owner (required if different from applicant): ☐ Check if more than one owner

a. First Name
b. Last Name
c. Organization
d. Street Address
e. City/Town
f. State
g. Zip Code
h. Phone Number
i. Fax Number
j. Email address

4. Representative (if any):

Alexandra — a. First Name
Gaspar — b. Last Name
Weston & Sampson Engineers — c. Company
55 Walkers Brook Dr. Suite 100 — d. Street Address
Reading — e. City/Town
MA — f. State
01867 — g. Zip Code
978-532-1900 — h. Phone Number
i. Fax Number
gaspara@wseinc.com — j. Email address

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

exempt — a. Total Fee Paid
b. State Fee Paid
c. City/Town Fee Paid

Massachusetts Department of Environmental Protection
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Provided by MassDEP:

MassDEP File Number

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A. General Information (continued)

6. General Project Description:

improvements to the Levingston Cove area

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

1. ☐ Single Family Home
2. ☐ Residential Subdivision
3. ☐ Commercial/Industrial
4. ☐ Dock/Pier
5. ☐ Utilities
6. ☐ Coastal engineering Structure
7. ☐ Agriculture (e.g., cranberries, forestry)
8. ☐ Transportation
9. ☒ Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. ☐ Yes ☒ No If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

Middlesex
a. County

b. Certificate # (if registered land)

not listed
c. Book

d. Page Number

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

1. ☐ Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
2. ☒ Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

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B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☒ Bank	125.4 1. linear feet	125.4 2. linear feet
b. ☐ Bordering Vegetated Wetland	1. square feet	2. square feet
c. ☒ Land Under Waterbodies and Waterways	1266 1. square feet 0 3. cubic yards dredged	1266 2. square feet

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☐ Bordering Land Subject to Flooding	1. square feet 3. cubic feet of flood storage lost	2. square feet 4. cubic feet replaced
e. ☐ Isolated Land Subject to Flooding	1. square feet 2. cubic feet of flood storage lost	3. cubic feet replaced

f. ☐ Riverfront Area

1. Name of Waterway (if available) - **specify coastal or inland**

2. Width of Riverfront Area (check one):

☐ 25 ft. - Designated Densely Developed Areas only

☐ 100 ft. - New agricultural projects only

☐ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: ____ square feet

4. Proposed alteration of the Riverfront Area:

a. total square feet ____ b. square feet within 100 ft. ____ c. square feet between 100 ft. and 200 ft. ____

5. Has an alternatives analysis been done and is it attached to this NOI? ☐ Yes ☐ No

6. Was the lot where the activity is proposed created prior to August 1, 1996? ☐ Yes ☐ No

3. ☐ Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Note: for coastal riverfront areas, please complete **Section B.2.f**. above.

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B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. ☐ Land Under the Ocean	1. square feet 2. cubic yards dredged	
c. ☐ Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. ☐ Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. ☐ Coastal Dunes	1. square feet	2. cubic yards dune nourishment

	Size of Proposed Alteration	Proposed Replacement (if any)
f. ☐ Coastal Banks	1. linear feet	
g. ☐ Rocky Intertidal Shores	1. square feet	
h. ☐ Salt Marshes	1. square feet	2. sq ft restoration, rehab., creation
i. ☐ Land Under Salt Ponds	1. square feet 2. cubic yards dredged	
j. ☐ Land Containing Shellfish	1. square feet	
k. ☐ Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above 1. cubic yards dredged	
l. ☐ Land Subject to Coastal Storm Flowage	1. square feet	

4. ☐ Restoration/Enhancement

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.

a. square feet of BVW

b. square feet of Salt Marsh

5. ☐ Project Involves Stream Crossings

a. number of new stream crossings

b. number of replacement stream crossings

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C. Other Applicable Standards and Requirements

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

a. ☐ Yes ☒ No

If yes, include proof of mailing or hand delivery of NOI to:

Natural Heritage and Endangered Species Program
Division of Fisheries and Wildlife
1 Rabbit Hill Road
Westborough, MA 01581

2021
b. Date of map

If *yes*, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); *OR* complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

c. Submit Supplemental Information for Endangered Species Review*

1. ☐ Percentage/acreage of property to be altered:

(a) within wetland Resource Area ____________ percentage/acreage

(b) outside Resource Area ____________ percentage/acreage

2. ☐ Assessor's Map or right-of-way plan of site

2. ☐ Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **

(a) ☐ Project description (including description of impacts outside of wetland resource area & buffer zone)

(b) ☐ Photographs representative of the site

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see https://www.mass.gov/ma-endangered-species-act-mesa-regulatory-review).
Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.

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C. Other Applicable Standards and Requirements (cont'd)

(c) ☐ MESA filing fee (fee information available at https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review).
Make check payable to "Commonwealth of Massachusetts - NHESP" and ***mail to NHESP*** at above address

*Projects altering **10 or more acres** of land, also submit:*

(d) ☐ Vegetation cover type map of site

(e) ☐ Project plans showing Priority & Estimated Habitat boundaries

(f) OR Check One of the Following

1. ☐ Project is exempt from MESA review.
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. ☐ Separate MESA review ongoing. ________ a. NHESP Tracking # ________ b. Date submitted to NHESP

3. ☐ Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

a. ☒ Not applicable – project is in inland resource area only b. ☐ Yes ☐ No

If yes, include proof of mailing, hand delivery, or electronic delivery of NOI to either:

South Shore - Cohasset to Rhode Island border, and the Cape & Islands:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: dmf.envreview-south@mass.gov

North Shore - Hull to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: dmf.envreview-north@mass.gov

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

c. ☐ Is this an aquaculture project? d. ☐ Yes ☐ No

If yes, include a copy of the Division of Marine Fisheries Certification Letter (M.G.L. c. 130, § 57).

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Bureau of Resource Protection - Wetlands
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Provided by MassDEP:

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Document Transaction Number

Newton
City/Town

C. Other Applicable Standards and Requirements (cont'd)

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

a. ☐ Yes ☒ No — If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

b. ACEC

5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

a. ☐ Yes ☒ No

6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?

a. ☐ Yes ☒ No

7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?

a. ☒ Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:
   1. ☐ Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)
   2. ☐ A portion of the site constitutes redevelopment
   3. ☐ Proprietary BMPs are included in the Stormwater Management System.

b. ☐ No. Check why the project is exempt:
   1. ☐ Single-family house
   2. ☐ Emergency road repair
   3. ☐ Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. ☒ USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)

2. ☒ Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

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D. Additional Information (cont'd)

3. ☒ Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. ☒ List the titles and dates for all plans and other materials submitted with this NOI.

Improvements to Louise Levingston Cove
a. Plan Title

Weston & Sampson Engineers
b. Prepared By

Brandon Kunkel, RLA
c. Signed and Stamped by

8/10/2021
d. Final Revision Date

1"=10'
e. Scale

f. Additional Plan or Document Title

g. Date

5. ☐ If there is more than one property owner, please attach a list of these property owners not listed on this form.

6. ☐ Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.

7. ☐ Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.

8. ☒ Attach NOI Wetland Fee Transmittal Form

9. ☒ Attach Stormwater Report, if needed.

E. Fees

1. ☒ Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

2. Municipal Check Number

3. Check date

4. State Check Number

5. Check date

6. Payor name on check: First Name

7. Payor name on check: Last Name

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
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Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Newton
City/Town

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

Luis Perez Demorizi — 1. Signature of Applicant | 07/27/2021 — 2. Date

3. Signature of Property Owner (if different) | 4. Date

5. Signature of Representative (if any) | 8/9/2021 — 6. Date

For Conservation Commission:
Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:
One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:
If the applicant has checked the “yes” box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

A. Applicant Information

1. Location of Project:

between 170 & 230 Lake Ave Center — a. Street Address
Newton — b. City/Town
exempt — c. Check number
d. Fee amount

2. Applicant Mailing Address:

Luis — a. First Name
Perez Demorizi — b. Last Name
City of Newton - Parks, Recreation & Culture Department — c. Organization
246 Dudley Road — d. Mailing Address
Newton — e. City/Town
MA — f. State
02459 — g. Zip Code
617-796-1500 — h. Phone Number
i. Fax Number
lpdemorizi@newtonma.gov — j. Email Address

3. Property Owner (if different):

a. First Name
b. Last Name
c. Organization
d. Mailing Address
e. City/Town
f. State
g. Zip Code
h. Phone Number
i. Fax Number
j. Email Address

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).

B. Fees

Fee should be calculated using the following process & worksheet. ***Please see Instructions before filling out worksheet.***

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract $12.50. To calculate the city/town share of the fee, divide the total fee in half and add $12.50.

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
exempt			

Step 5/Total Project Fee: ______

Step 6/Fee Payments:

Total Project Fee: exempt
a. Total Fee from Step 5

State share of filing Fee: exempt
b. 1/2 Total Fee **less $**12.50

City/Town share of filling Fee: exempt
c. 1/2 Total Fee **plus** $12.50

C. Submittal Requirements

a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

Ruthanne Fuller
Mayor

City of Newton, Massachusetts

Department of Planning and Development
1000 Commonwealth Avenue Newton, Massachusetts 02459

Telephone
(617) 796-1120
Telefax
(617) 796-1086
www.newtonma.gov

Barney S. Heath
Director

Cons. Com. Wetland Application Coversheet/Checklist

Date	8/10/2021

Fill in all white cells completely

Parcel address Sec/Block/Lot Book & Page	Lake Ave Ctr (near 170 & 230) 620010004 unlisted	**Applicant** name Address Email Phone	Luis Perez Demorizi 246 Dudley Road Newton MA 02459 lpdemorizi@newtonma.gov 617-796-1500
Owner name Address Email Phone		**Representative** Address Email Phone	Alexandra Gaspar Weston & Sampson Engineers 55 Walkers Brook Dr, Suite 100 Reading, MA 01867 978-532-1900 gaspara@wseinc.com

Wetland type	Bank	**sf/cf affected**	125.4	**Relevant Perf. Standards**	10.54 (4)
Wetland type	Land Under Water	**sf/cf affected**	1266	**Relevant Perf. Standards**	10.56 (4)
Wetland type		**sf/cf affected**		**Relevant Perf. Standards**	10.________

Components of a Complete NOI Application

State Form: NOI Form 3	Included? ☒ Yes ☐ No
Plan* title(s) Plan date Plan stamped by *if legible, plans should be 11"x17"	Improvements to Louise Levingston Cove 8/9/2021 Brandon Kunkel, RLA
Narrative	Included? ☒ Yes ☐ No
Proof that all relevant perf. standards are met	Included? ☒ Yes ☐ No
Locus map	Included? ☒ Yes ☐ No
Delineation lines (backup material)	Included? ☒ Yes ☐ No
Fees • Fee Transmittal form • City portion of state fee _$______ • City fee _$50_	 Included? ☒ Yes ☐ No Included? ☐ Yes ☒ No Included? ☐ Yes ☒ No
Abutter Information • List (within 100') • Abutter letter • Affidavit & proof -- bring to hearing	 Included? ☒ Yes ☐ No Included? ☒ Yes ☐ No *Present them at the hearing*
Other Attachments, e.g.	
Planting Plan	Included? ☒ Yes ☐ No ☐ Not Applicable
Floodplain analysis	Included? ☒ Yes ☐ No ☐ Not Applicable
Stormwater analysis	Included? ☒ Yes ☐ No ☐ Not Applicable
Riverfront Area Alternatives Analysis	Included? ☐ Yes ☐ No ☒ Not Applicable
Restoration or mitigation summary	Included? ☒ Yes ☐ No ☐ Not Applicable
Phasing/Sequencing plan, O&M plan, etc.	Included? ☐ Yes ☐ No ☒ Not Applicable

Components of a Complete NOI Application

Conservation Commission Wetland Permit Process

NOI	RDA	Process
1	-	**Submit applications (see bullets below) by noon of the Tuesday deadline** (16 days before desired hearing)**:** a. To Newton Conservation Commission: 1000 Comm Ave., Newton, MA 02459 • **This coversheet** (1 paper copy) • **Complete application** (2 paper copies and 1 .pdf) -- see other side of this page for checklist • IF LEGIBLE, plans should be provided in 11" x 17" format. • **Check** for city portion of the state fee • **$50 check** for city filing fee b. To Mass DEP Northeast Regional Office: 205B Lowell Street, Wilmington, MA 01887 • **Complete application** (see other side of this page): 1 paper copy • **Photocopy of the two state checks** c. To DEP Lock Box: Box 4062, Boston MA 02211 • **Check** for state portion of the state fee • **Fee transmittal form**
	1	**Submit application by noon of the Tuesday deadline** (16 days before the desired hearing): a. **DEP Form 1 (RDA),** b. **plans,** and c. **$50 check** made out to the City of Newton**.**
-	-	*The Conservation Agent will **schedule a Public hearing/meeting**.*
2	-	**Get a certified list of abutters within 100' of property lines from the Assessor's Office.**
3	-	Once you know the date and time of the hearing, **notify abutters within 100' of the property line** using the City's "**Notification to Abutters Form**" and **certified mail**, **certificate of mailing,** or **hand delivery with signatures**. (N.B. Present proof of notification at the beginning of the public hearing.)
4	2	*The Conservation Agent will **place a legal ad in the TAB** and the **Applicant will be billed for the ad.***
5	-	**Stake the project.** 2 weeks in advance of the public hearing, stake all new structures, erosion control barriers, stormwater systems, etc. within Con Com jurisdiction.
-	-	*The Conservation Agent will perform a **site visit** before the public hearing to confirm existing conditions and proposed work. If you wish to be informed of the time of the visit, please contact the Con Com office.*
6	3	**Attend the public hearing/meeting.** The applicant or representative is expected to **provide proof of abutter notification,** briefly **present the project**, and **answer any questions about possible impacts on wetlands.** At the end of the hearing, the Con Com will either: • **Issue a Determination of Applicability** ("negative" determination means no further permitting is needed), • **Issue an Order of Conditions** (OOC) approving or denying the project, **or** • **Approve a continuation** of the public hearing to allow time for additional information to be provided.
7	4	**Receive and read the decision and understand the conditions.** Contact the Con Com if you have any questions. Some conditions are temporary (such as maintaining erosion controls), and some are perpetual (such maintaining restoration planting areas or limiting the use of fertilizers and outdoor lighting).
8	-	**Wait-out the 10-Day appeal period.** A decision of the Con Com can be appealed to MassDEP by any abutter, applicant, or 10-citizen group within 10 business days of the decision.
9	-	**Record the Order** at the Registry of Deeds. Provide proof of recording to the Conservation office.
10	-	**Install MassDEP file number sign and erosion controls**.
11	-	**Schedule and attend a pre-construction site visit.** Contact the Conservation office to schedule the site visit.
12	5	**Execute the project.** The project must be completed within 3 years, unless an extension of the permit is issued; extensions must be requested least 30 days prior to the expiration of the permit.
13	-	**Request a Certificate of Compliance (COC).** Once the project is completed and all conditions are satisfied, request a COC from the Conservation office by submitting: (1) DEP **Form 8a**, (2) an **as-built plan**, and (3) a **letter from the engineer** stating that everything is in substantial compliance with the approved plans and OOC. The Con Com will perform a site visit to ensure compliance and issue a COC if appropriate.
14	-	**Record the Certificate of Compliance (COC)** at the Registry of Deeds to remove the cloud from the title. **Provide proof of recording to the Conservation office**.

INCOMPLETE APPLICATIONS WILL NOT BE ACCEPTED.

PROJECT DESCRIPTION

Background

Levingston Cove, located on Lake Avenue between Berwick Avenue and Lakewood Avenue in Newton, Massachusetts, is a small, yet much loved neighborhood green space where residents have long congregated for fishing, walking, picnicking, sunbathing, and enjoying the views to Crystal Lake. The park's long and narrow geographic footprint, very steep terrain, heavy tree canopy, and poorly managed circulation have resulted in considerable erosional and stormwater issues into the lake, degraded walking surfaces and lack of vegetation growth in high use zones. These planned improvements seek to correct these issues by incorporating the following:

- a decking system that will cantilever out over the edge of Crystal Lake and add much needed passive recreation space to the park's small footprint
- new ADA-compliant circulation systems
- regrading and introduction of terraced walls that ease steep slopes
- new native plantings to stabilize eroded slopes and replace invasive species along the bank
- rain gardens at the toe of steep slopes that collect and convey stormwater

Site Description

The Park is comprised of approximately 0.5 acres of open land used for recreational activities listed above. Its landscape consists of open lawn under deciduous tree canopy, a non-compliant concrete ramp, walkway along a 99-year-old concrete retaining wall and water access areas. See Appendix G for site photographs.

Crystal Lake forms the eastern edge of the park. Lake Avenue forms the western edge. 230 Lake Avenue and 170 Lake Avenue form the northern and southern edges, respectively. The surrounding neighborhood is comprised of a residential neighborhood to the west, north and south.

Scope of Work

Much of the park consists of highly eroded slopes. In the northern area of the park, a terraced walkway and cantilever deck system will sit above and over the existing retaining wall, elevating grades and reducing the slope from Lake Avenue as a result. The slope between Lake Avenue and the walkway will be planted with native species to further stabilize and restore the slope. In the core of the park where slopes are severely eroded and experience significant use by the public, a multipronged strategy will ease the steepness of the slope and strengthen the turf itself. The following, in combination, will improve the slope in this critical area of the park:

- Regrading around two terraced retaining walls will lift the slope
- The soil profile will be augmented with a turf reinforcement system that utilizes the stabilization and reinforcement of base, root zone mix, and turf while offering an improved drainable soil profile. New loam blended into a custom 70-20-10 sand-soil-

- superpeat mix will be added that maximizes water holding capacity in the absence of irrigation. The synthetic turf reinforcement material will be mixed off-site to eliminate any possibility of the material migrating into Crystal Lake during installation.
- A custom shade-loving seed mix will be utilized in this zone. This mix will consist of grasses that grow during the early spring, late spring, summer and early fall seasons with the intention that turf is growing during the full extents of the season.

Stormwater test pits revealed sandy soils with high infiltrative capacity, as outlined in the stormwater report included in Appendix B. Four rain gardens will be located at the toe of slope, along the park's lakeside pathway, and installed with overflow drains and drainage pipe that runs to outfalls at the lake. Each outfall includes flared end sections and riprap to minimize erosion and better disperse flows into the lake.

This project will also include the addition of stone veneer to the outside face of the existing retaining wall. To accomplish this, the surrounding area must be dewatered. A cofferdam and sandbags will be utilized to ensure impacts to surrounding areas is minimal.

Invasive species along the bank have been identified and located. These plants will be removed by way of the recommended method included in the attached memorandum included in Appendix H. The removal areas will be naturally vegetated with grass and shrub species to bring an improved aesthetic and habitat value along the entire length of the bank. The design calls for the planting of native species that will help promote ecological diversity along the riverbank. We believe this restoration plan will help to reduce the erosion and create a much more diverse habitat than what is currently on site.

Environmental Considerations

Two resource areas protected by the Massachusetts Wetland Protection Act will be impacted as a result of this project. Top of Bank (Bank) will be impacted to accommodate the walkway/deck system, and Land Under Water will be impacted to accommodate the river stone bank stabilization at the terraced seating locations, as well as the dewatering occurring to add stone veneer to the face of the existing retaining wall.

This project will also impact the Watershed Protection Area associated with Crystal Lake; a zone protected by the City of Newton Floodplain Ordinances.

Before work begins, sedimentation and erosion control devices will be placed at the site to minimize sediment migration off-site into Crystal Lake. This will include straw wattles at the downgradient most work area, between the work area and wetland resource area. A turbidity curtain will be installed just off the water's edge in Crystal Lake. Inlet sediment controls will be installed in all Lake Avenue catch basins adjacent to the park property.

Please see below for our response to the General Performance Standards for each impacted resource area.

Land Under Water

Where the presumption set forth in 310 CMR 10.56(3) is not overcome, any proposed work within Land under Water Bodies and Waterways shall not impair the following:

1. The water carrying capacity within the defined channel, which is provided by said land in conjunction with the banks;

As this is a lake and not a stream, no impacts to defined channel are anticipated.

2. Ground and surface water quality;

There will be no impacts to ground and surface water quality.

3. The capacity of said land to provide breeding habitat, escape cover and food for fisheries; and

This project will improve the capacity of the land to provide suitable habitat. Aquatic plantings will be added in multiple areas, which will increase the amount of breeding habitat, escape cover and food.

4. The capacity of said land to provide important wildlife habitat functions. A project or projects on a single lot, for which Notice(s) of intent is filed on or after November 1, 1987, that (cumulatively) alter(s) up to 10% or 5,000 square feet (whichever is less) of land in this resource area found to be significant to the protection of wildlife habitat, shall not be deemed to impair its capacity to provide important wildlife habitat functions. Additional alterations beyond the above threshold may be permitted if they will have no adverse effects on wildlife habitat, as determined by procedures established under 310 CMR 10.60.

See answer above. This project will improve the quality of wildlife habitat in the area.

5. Work on a stream crossing shall be presumed to meet the performance standard set forth in 310 CMR 10.56(4)(a) provided the work is performed in compliance with the Massachusetts Stream Crossing Standards by consisting of a span or embedded culvert in which, at a minimum, the bottom of a span structure or the upper surface of an embedded culvert is above the elevation of the top of the bank, and the structure spans the channel width by a minimum of 1.2 times the bankfull width. This presumption is rebuttable and may be overcome by the submittal of credible evidence from a competent source. Notwithstanding the requirements of 310 CMR 10.56(4)(a)4., the impact on Land under Water Bodies and Waterways caused by the installation of a stream crossing is exempt from the requirement to perform a habitat evaluation in accordance with the procedures established under 310 CMR 10.60.

Not applicable

Top of Bank

Where the presumption set forth in 310 CMR 10.54(3) is not overcome, any proposed work on a Bank shall not impair the following:

1. the physical stability of the Bank;

This project will result in an improvement of bank stability. In their current condition, the banks are highly eroded. As noted above, this project will improve bank stability by doing the following:

- Regrading around two terraced retaining walls will lift the slope
- The soil profile will be augmented with a turf reinforcement system that utilizes the stabilization and reinforcement of base, root zone mix, and turf while offering an improved drainable soil profile. New loam blended into a custom 70-20-10 sand-soil-superpeat mix will be added that maximizes water holding capacity in the absence of irrigation. The synthetic turf reinforcement material will be mixed off-site to eliminate any possibility of the material migrating into Crystal Lake during installation.
- A custom shade-loving seed mix will be utilized in this zone. This mix will consist of grasses that grow during the early spring, late spring, summer and early fall seasons with the intention that turf is growing during the full extents of the season.

2. the water carrying capacity of the existing channel within the Bank;

As this is a lake and not a channel, the carrying capacity will not be impacted.

3. ground water and surface water quality;

Groundwater and surface water will likely be improved by the addition of aquatic and native plantings.

4. the capacity of the Bank to provide breeding habitat, escape cover and food for fisheries;

The addition of native and aquatic plantings is anticipated to improve the habitat.

5. the capacity of the Bank to provide important wildlife habitat functions. A project or projects on a single lot, for which Notice(s) of Intent is filed on or after November 1, 1987, that (cumulatively) alter(s) up to 10% or 50 feet (whichever is less) of the length of the bank found to be significant to the protection of wildlife habitat, shall not be deemed to impair its capacity to provide important wildlife habitat functions. In the case of a bank of a river or an intermittent stream, the impact shall be measured on each side of the stream or river. Additional alterations beyond the above threshold may be permitted if they will have no adverse effects on wildlife habitat, as determined by procedures contained in 310 CMR 10.60.

See above. This project will improve habitat functions.

<u>Watershed Protection Area – Crystal Lake</u>

Work will be occurring within the Watershed Protection Area of Crystal Lake. This area is defined as area below el. 149. Below please find the response to each purpose of the Floodplain/Watershed Protection District.

(1) assure the continuation of the natural flow patterns of watercourses within the city;

As work is occurring within a lake and not a flowing stream/channel, it is not anticipated that flow patterns of watercourses will be impacted.

(2) **provide adequate and safe floodwater storage capacity in order to protect persons and property against increase in the hazards of flood inundation.**

A compensatory storage table has been prepared, please see below.

COMPENSATORY STORAGE CALCULATIONS		
ELEVATION	CUT (CY)	FILL (CY)
143-144	0.92	0.75
144-145	0.37	0.28

(3) **protect and preserve the water table and groundwater recharge areas within the city; and**

The water table and groundwater recharge areas throughout the City will be preserved

(4) **allow the city to maintain compliance with the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973, and the regulations promulgated pursuant thereto.**

Compliance with the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973 will be preserved. Proper compensatory storage will be utilized to ensure that compliance is maintained throughout the project.

P:\MA\Newton\Crystal Lake Levingston Cove\Permitting\Notice of Intent\Appendix A - Project Description\PROJECT DESCRIPTION.doc

Stormwater Report

Newton, Massachusetts

City of Newton Parks and Recreation

August 10, 2021

JOB NO: ENG21-0021

Weston & Sampson
55 Walkers Brook Drive
Reading, MA 01867

www.westonandsampson.com
Tel: 978-532-1900 Fax: 978-977-0100

Table of Contents

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

COMMONWEALTH OF MASSACHUSETTS
JAMES I. PEARSON
CIVIL
No. 50675
REGISTERED PROFESSIONAL ENGINEER
08/09/2021

8/9/2021

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 (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): ______________________

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.

Stormwater Report
August 10, 2021
To Be Submitted with the Notice of Intent

Applicant/Project Name: City of Newton – Levingston Cove

Project Address: Intersection of Lakeview and Lake Avenue, Newton, MA, 02459

Application Prepared by:
Firm: Weston & Sampson, Inc.
Registered PE: James I. Pearson, PE

General:

The Town of Newton proposes to redevelop Levingston Cove on Crystal Lake. Site improvements will include ADA accessible pedestrian walkways and upgrades, seating areas, new site plantings, handrails, a cantilevered deck overlooking the lake, and associated stormwater improvements to encourage increased public usage of the cove. This project will allow the City of Newton to utilize the public beach area that meets current and future needs while also providing new park improvements and increased access to Crystal Lake. Work associated with this project will include but not be limited to paving, grading and installation of drainage infrastructure.

The site is adjacent to three wetland resource areas: The Crystal Lake Bank, bordering vegetated wetlands, and land under water. All work will occur within the 100-foot buffer zone, protected under the Wetlands Protection Act. NRCS soil mapping describes the area as being Merrimac-Urban land complex (626B) with HSG rating A. Geotechnical exploration on site has generally confirmed the soil survey data, boring and test pit logs are included with this report in Attachment C.

Design Standards

The proposed project is subject to the standards of the Massachusetts Stormwater Handbook. Below is an explanation concerning Standards 1-10 as they apply to the City of Newton, Levingston Cove, located at the intersection of intersection of Lakeview and Lake Avenue:

Standard 1: No New Untreated Discharges

The proposed project will create no new untreated discharges. Impervious area will be increased in comparison with existing conditions. Stormwater runoff generated from the new paved walkway, walls, and other impervious park areas will be treated prior to discharge to Crystal Lake. HydroCAD modeling of the site is provided in Attachment D.

Standard 2: Peak Rate Attenuation

Existing and proposed conditions were modeled using HydroCAD software. The proposed design mitigates peak flows for the 2-year, 10-year, 25-year, and 100-year 24-hour storm events. Infiltration rates used for the site were based on site soils that have been characterized as belonging to Hydrologic Soil Group A, verified by NRCS Soil Mapping and onsite test pits (Attachment B). The infiltration rates were obtained from the Rawls Rate table in the Stormwater Handbook. A table summarizing peak discharges can be found in Attachment D.

To ensure that the work incorporates the performance standards recommended in the DEP's Stormwater Management Policy, necessary erosion and sedimentation control measures will be utilized during construction. These measures will include compost filter tubes, catch basin protection, and a stabilized construction entrance, as depicted on the site plans.

Standard 3: Recharge

Due to the slight increase in impervious area, the Required Recharge Volume for the site is 3 cubic feet. The available volume from the bioretention areas and the subsurface infiltration systems site-wide is over 78 cubic feet. This reflects the amount of volume available in bioretention areas below the elevation of any outlet device. See Attachment E for all recharge calculations. Infiltration areas are required to have a maximum drawdown time of 72 hours. The infiltration area hydrographs in the HydroCAD model in Attachment D show that this requirement is achieved.

Standard 4: Water Quality

This is a redevelopment project, and standard 4 will be met to the maximum extent practicable. All of the stormwater from impervious pedestrian areas on the site will undergo treatment to bring TSS levels within regulated limits (>80% removal). All of the stormwater from each drainage area will undergo treatment from vegetated filter strips and grassed swales. During the project, appropriate BMPs will be used to minimize sedimentation and soil erosion. All impervious areas on site for pedestrian/non-vehicular use will not generate a significant TSS load. The structural best management practice requirement of Standard 4, water quality volume, has been provided to the maximum extent practicable. Water quality volume provided is equal to 0.2 inches times the total impervious area of the post-development project site; see the calculation in Attachment E.

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

The Levingston Cove improvements are not a land use with higher potential pollutant load.

Standard 6: Critical Areas

There will be no new discharge to critical areas.

Standard 7: Redevelopments and Other Projects Subject to the Standards Only to the Maximum Extent Practicable

The project is a redevelopment.

Standard 8: Construction Period Pollution Prevention and Erosion and Sediment Control

A detailed Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan is included in Attachment G. To ensure that the work incorporates the performance standards recommended in the DEP's Stormwater Management Policy, necessary erosion and sedimentation control measures will be utilized during construction. These measures will include compost filter tubes, and catch basin protection, as depicted on the site plans.

Standard 9: Operation and Maintenance Plan

An operations and maintenance plan is included in Attachment H.

Standard 10: Prohibition of Illicit Discharges

An illicit discharge compliance statement has been included in Attachment I.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including any relevant soil evaluations, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan, the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement 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.

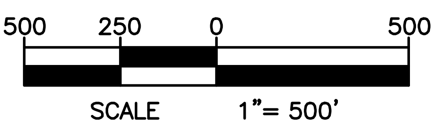
Registered Professional Engineer Block and Signature

COMMONWEALTH OF MASSACHUSETTS
JAMES I.
PEARSON
CIVIL
No. 50675
REGISTERED
PROFESSIONAL ENGINEER
08/09/2021

8/9/2021

Signature and Date

Attachment A - Locus Map



LOCUS MAP

Weston & Sampson

Weston & Sampson Engineers, Inc.

55 Walkers Brook Drive, Suite 100, Reading MA 01867

Attachment B - NRCS Soils Map, Soils Report, and HSG Classifications

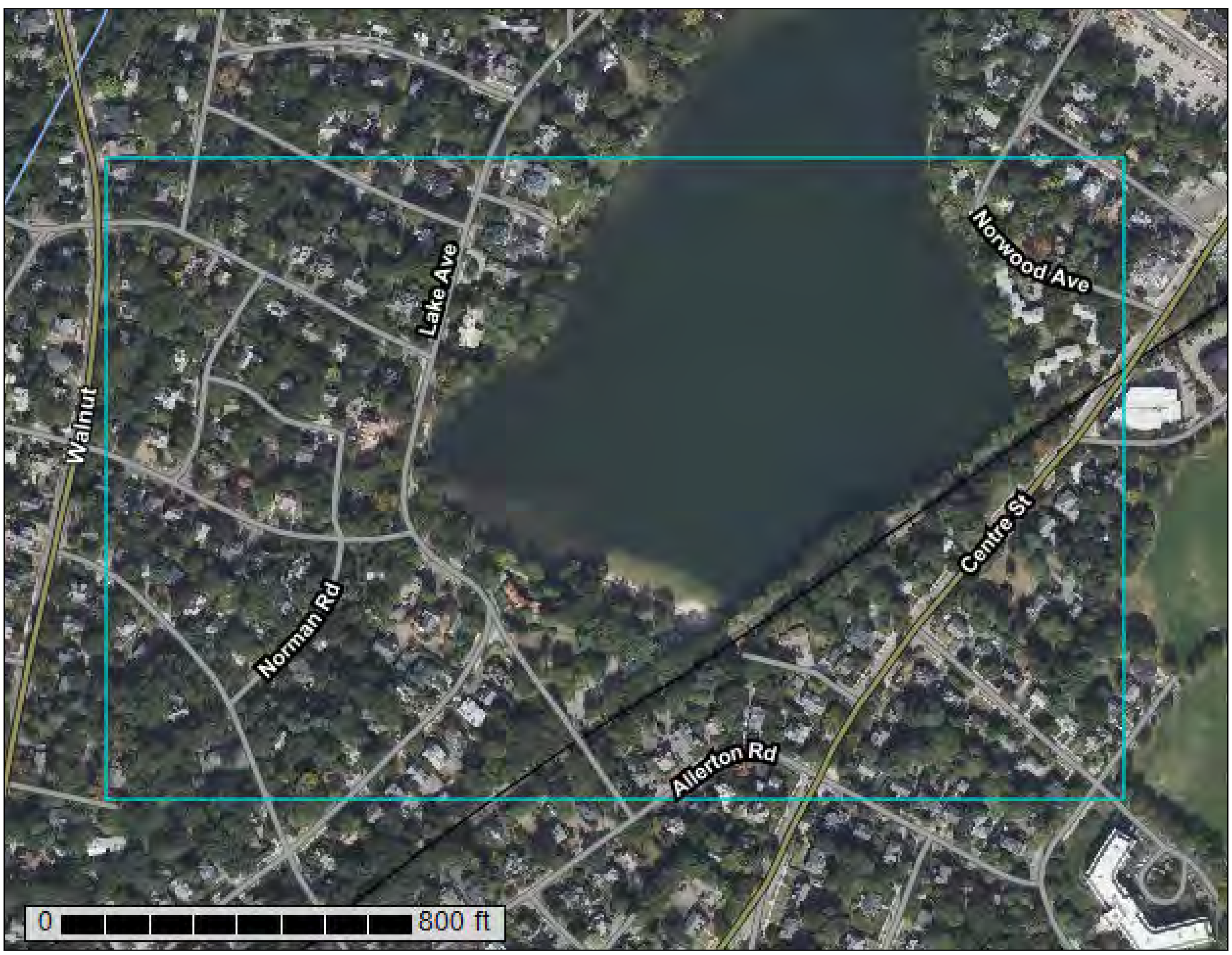
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for
Middlesex County, Massachusetts



July 23, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

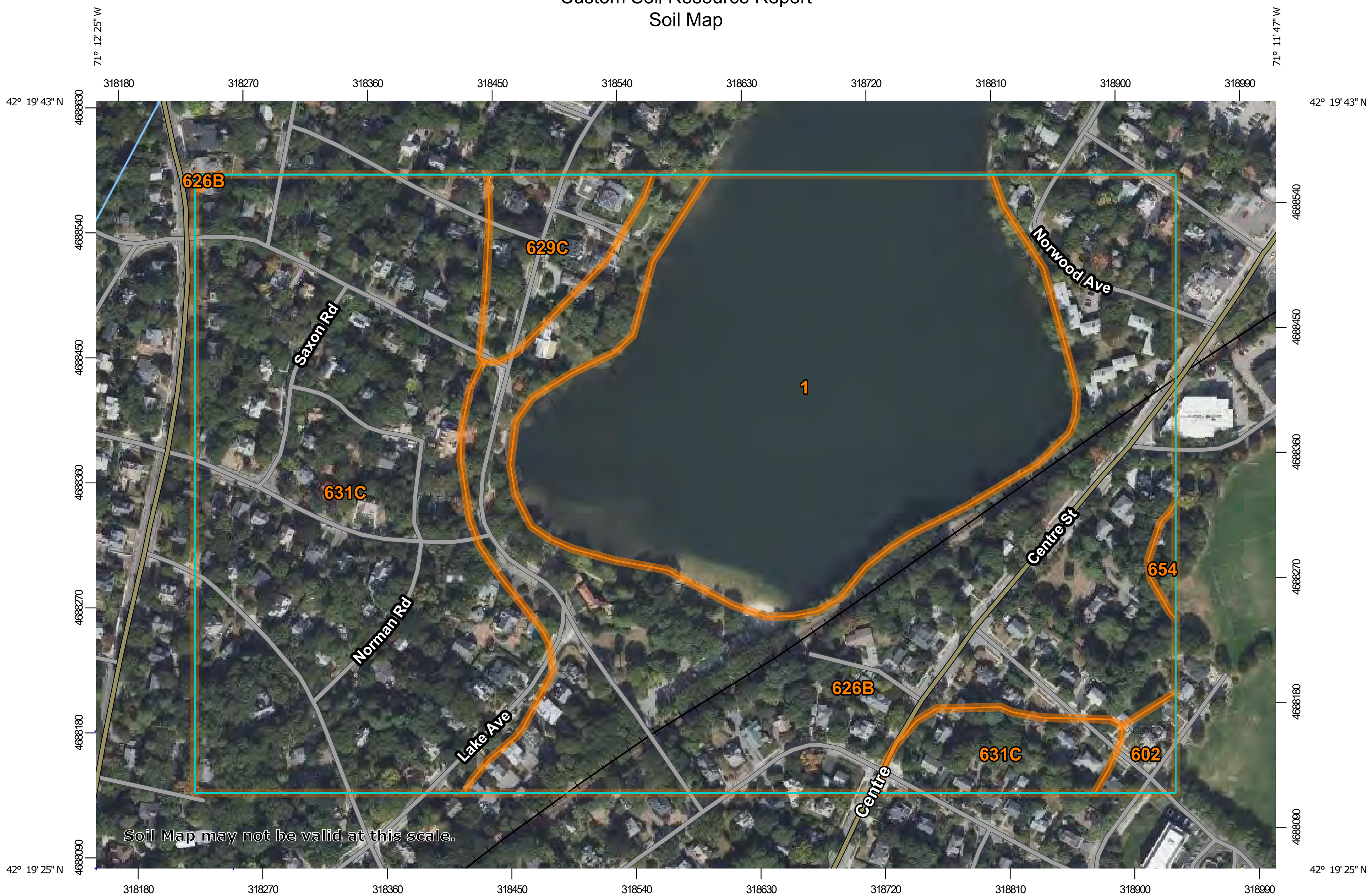
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,900 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 150, 300, 600, 900

N

Map projection: Web Mercator   Corner coordinates: WGS84   Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Sep 25, 2020—Oct 4, 2020

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	22.5	28.7%
602	Urban land	0.7	0.9%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	26.3	33.6%
629C	Canton-Charlton-Urban land complex, 3 to 15 percent slopes	2.5	3.2%
631C	Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky	26.0	33.2%
654	Udorthents, loamy	0.3	0.3%
Totals for Area of Interest		**78.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Middlesex County, Massachusetts

1—Water

Map Unit Setting

National map unit symbol: 996p
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Setting

Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear

602—Urban land

Map Unit Setting

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

Map Unit Composition

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

Description of Urban Land

Setting

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

Minor Components

Rock outcrop

Percent of map unit: 5 percent
Landform: Ledges
Landform position (two-dimensional): Summit

Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

Udorthents, wet substratum
Percent of map unit: 5 percent
Hydric soil rating: No

Udorthents, loamy
Percent of map unit: 5 percent
Hydric soil rating: No

626B—Merrimac-Urban land complex, 0 to 8 percent slopes

Map Unit Setting
National map unit symbol: 2tyr9
Elevation: 0 to 820 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition
Merrimac and similar soils: 45 percent
Urban land: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting
Landform: Eskers, moraines, outwash terraces, outwash plains, kames
Landform position (two-dimensional): Backslope, footslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile
Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities
Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water capacity: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Description of Urban Land

Typical profile

M - 0 to 10 inches: cemented material

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water capacity: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Windsor

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

Sudbury

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

Hinckley

Percent of map unit: 5 percent
Landform: Eskers, kames, deltas, outwash plains

Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

629C—Canton-Charlton-Urban land complex, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9959
Elevation: 0 to 1,000 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton and similar soils: 40 percent
Charlton and similar soils: 30 percent
Urban land: 25 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable sandy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 8 inches: fine sandy loam
H2 - 8 to 21 inches: fine sandy loam
H3 - 21 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 18 to 30 inches to strongly contrasting textural stratification
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Available water capacity: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Charlton

Setting

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

Typical profile

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

Properties and qualities

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

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Urban Land

Setting

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

Minor Components

Montauk

Percent of map unit: 2 percent
Landform: Hillslopes

Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Nose slope, head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Scituate

Percent of map unit: 2 percent
Landform: Depressions, hillslopes
Landform position (two-dimensional): Toeslope, summit
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Udorthents, loamy

Percent of map unit: 1 percent
Hydric soil rating: No

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

Map Unit Setting

National map unit symbol: vr1g
Elevation: 0 to 1,000 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton and similar soils: 45 percent
Urban land: 35 percent
Hollis and similar soils: 10 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

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

Typical profile

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

Properties and qualities

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

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Urban Land

Setting

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

Description of Hollis

Setting

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

Typical profile

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

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water capacity: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Minor Components

Canton

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

Udorthents, loamy

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

Rock outcrop

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

Scituate

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

Montauk

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

654—Udorthents, loamy

Map Unit Setting

National map unit symbol: vr1l
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Udorthents, Loamy

Setting

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Properties and qualities

Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Minor Components

Udorthents, sandy

Percent of map unit: 10 percent
Hydric soil rating: No

Udorthents, wet substratum

Percent of map unit: 5 percent
Hydric soil rating: Yes

Urban land

Percent of map unit: 5 percent
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

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

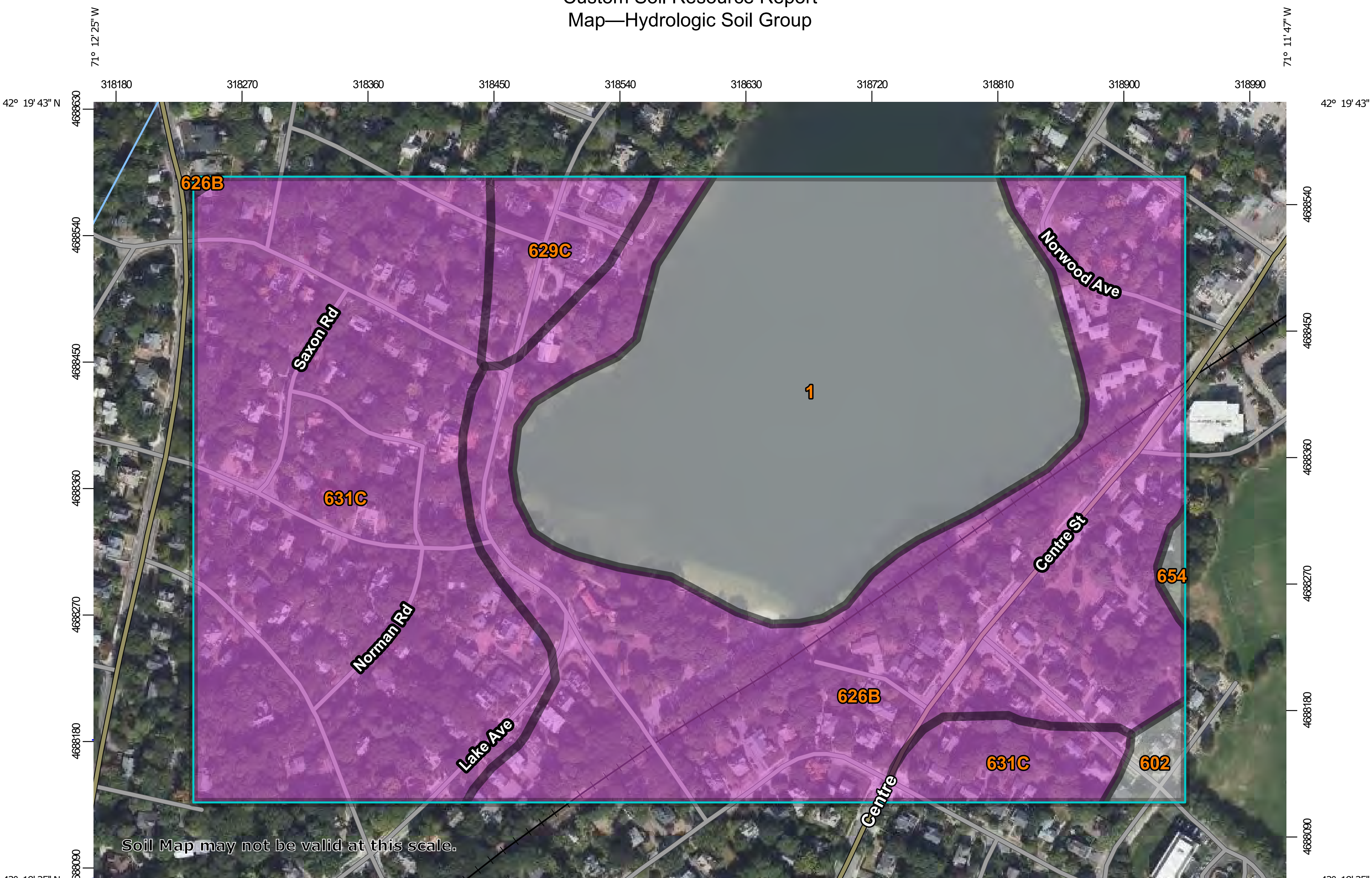
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Map—Hydrologic Soil Group



Map Scale: 1:3,900 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 150, 300, 600, 900

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 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Sep 25, 2020—Oct 4, 2020

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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		22.5	28.7%
602	Urban land		0.7	0.9%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	A	26.3	33.6%
629C	Canton-Charlton-Urban land complex, 3 to 15 percent slopes	A	2.5	3.2%
631C	Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky	A	26.0	33.2%
654	Udorthents, loamy		0.3	0.3%
Totals for Area of Interest			**78.3**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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Attachment C - Test Pit Summary and Logs

85 Devonshire Street, 3rd Floor, Boston, MA 02109
Tel: 617.412.4480

MEMORANDUM

TO: Cassie Bethoney, RLA

FROM: Kyle Elmy, MA Licensed Soil Evaluator SE14274

DATE: June 18, 2021

SUBJECT: Levingston Cove, Newton, MA – Test Pit Results

Test pits were conducted on June 16, 2021 at Levingston Cove Park, which is located along Crystal Lake between Berwick Road and Lakewood Road in Newton, Massachusetts. Three (3) test pits were dug by City staff and evaluated by Kyle Elmy of Weston & Sampson to better understand the subsurface soil and drainage conditions present at the park, which will be incorporated into the park's improvement program. Test pits were witnessed by Luis Perez Demorizi, Open Space Coordinator with the City of Newton's Parks, Recreation, and Culture Department. The test pits were excavated to a depth of 7.33-ft to 8.20-ft below ground surface (b.g.s.). Test pits were stopped when required depths were reached, and groundwater was encountered. All three test pits were fairly consistent and contained mostly loamy sand and sand with some fill. A site plan showing the test pit locations, detailed test pit logs, and photos are attached to this memorandum. The following is a summary of these explorations:

Test Pit #1: Sited on the slope between Lake Avenue and the water access area, Test Pit #1 ranged from fill to loamy sand to sand, with a loose structure. The test pit was stopped at a depth of 88-in b.g.s., as required depths were achieved and groundwater was encountered. Redox features were encountered at 78-in b.g.s., weeping was noted at 80-in b.g.s. and standing water was measured at 85-in b.g.s. No sample was taken.

Test Pit #2: This test pit was located to the southeast of Test Pit #1 along the walking trail, slightly up on the hill. Test Pit #2 ranged from loamy sand to sand, with a loose structure. The test pit was stopped at a depth of 98-in b.g.s., as required depths were achieved and groundwater was encountered. Redox features were encountered at 80-in b.g.s., weeping was noted at 85-in b.g.s. and standing water was measured at 85-in b.g.s. No sample was taken.

Test Pit #3: Located southeast of tTst Pit #2 along the walking trail, slightly up on the hill, Test Pit #3 ranged from fill to loam to loamy sand to sand, with a loose structure. The test pit was stopped at a depth of 90-in b.g.s., as required depths were achieved and groundwater was encountered. Redox features were encountered at 78-in b.g.s., weeping was noted at 80-in b.g.s. and standing water was measured at 88-in b.g.s. No sample was taken.

USDA and USGS Mapping Data: The USDA web soil survey indicates that the following soils are present at this site: map unit 626B Merrimac-Urban land Complex. The USGS surficial geologic map indicates that coarse deposits consisting of gravel and sand are present. The test pit data gathered at the Levingston Cove Park is consistent with the data recorded on both the USDA and USGS websites. Please refer to the attached maps and test pit results for more information and soil layer ranges.

TEST PIT LOG

PROJECT NAME/NO.	Levingston Cove Park - ENG21-0021			TEST PIT NUMBER	
LOCATION	Newton, MA			TP 1	
CLIENT	Newton, MA			GROUND SURFACE	
CONTRACTOR	Newton DPW	FOREMAN:		ELEVATION	see plan
OBSERVED BY	K. Elmy	DATE	6/16/21	DEPTH TO GROUNDWATER BELOW	
CHECKED BY		DATE		SURFACE	78-in

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
18"	Fill Stirred up material, Sand, Loamy Sand, Gravel, Cobbles
22"	Bw - Yellowish Brown Loamy Sand (10YR 5/6) 15% Gravel and 10% Cobbles
64"	C1 - Yellowish Brown Loamy Sand (10YR 5/8) 5% Gravel and 5% Cobbles
88"	C2 - Pale Brown Medium Sand (10YR 6/3)
	- End of Exploration -

NOTES:

1. SHGW observed at 78-in
2. Weeping at 80-in
3. Standing water at 85-in

TEST PIT NUMBER

TP 1

Weston & Sampson

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TEST PIT LOG

PROJECT NAME/NO.	Levingston Cove Park - ENG21-0021			**TEST PIT NUMBER**	
LOCATION	Newton, MA			TP 1	
CLIENT	Newton, MA			GROUND SURFACE	
CONTRACTOR	Newton DPW	FOREMAN:		ELEVATION	see plan
OBSERVED BY	K. Elmy	DATE	6/16/21	DEPTH TO GROUNDWATER BELOW	
CHECKED BY		DATE		SURFACE	78-in

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
	

NOTES:

1. SHGW observed at 78-in
2. Weeping at 80-in
3. Standing water at 85-in

TEST PIT NUMBER
TP 1

Weston & Sampson

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TEST PIT LOG

PROJECT NAME/NO.	Levingston Cove Park - ENG21-0021			**TEST PIT NUMBER**
LOCATION	Newton, MA			TP 2
CLIENT	Newton, MA			GROUND SURFACE
CONTRACTOR	Newton DPW	FOREMAN:		ELEVATION see plan
OBSERVED BY	K. Elmy	DATE	6/16/21	DEPTH TO GROUNDWATER BELOW
CHECKED BY		DATE		SURFACE 80-in

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
8"	A - Dark Brown Loamy Sand (10YR3/3)
19"	Bw - Yellowish Brown Loamy Sand (10YR 5/8) 5% Gravel and 5% Cobbles
32"	C1 - Yellowish Brown Sand (10YR 5/4) 5% Gravel
98"	C2 - Grayish Brown Medium Sand (10YR 5/2) 5% Gravel & 5% Cobbles
	- End of Exploration -

NOTES:

1. SHGW observed at 80-in
2. Weeping at 85-in
3. Standing water at 85-in

TEST PIT NUMBER
TP 2

Weston & Sampson

TEST PIT LOG

PROJECT NAME/NO.	Levingston Cove Park - ENG21-0021			**TEST PIT NUMBER**	
LOCATION	Newton, MA			TP 2	
CLIENT	Newton, MA			GROUND SURFACE	
CONTRACTOR	Newton DPW	FOREMAN:		ELEVATION	see plan
OBSERVED BY	K. Elmy	DATE	6/16/21	DEPTH TO GROUNDWATER BELOW	
CHECKED BY		DATE		SURFACE	80-in

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
	

NOTES:

1. SHGW observed at 80-in
2. Weeping at 85-in
3. Standing water at 85-in

TEST PIT NUMBER
TP 2

Weston & Sampson

\\wse03.local\WSE\Projects\MA\Newton\Crystal Lake Levingston Cove\Soil Evaluation\[2021.06.15-Levingston Cove TP Logs.xlsx]TP 3 pic

TEST PIT LOG

PROJECT NAME/NO.	Levingston Cove Park - ENG21-0021			**TEST PIT NUMBER**	
LOCATION	Newton, MA			TP 3	
CLIENT	Newton, MA			GROUND SURFACE	
CONTRACTOR	Newton DPW	FOREMAN:		ELEVATION	see plan
OBSERVED BY	K. Elmy	DATE	6/16/21	DEPTH TO GROUNDWATER BELOW	
CHECKED BY		DATE		SURFACE	78-in

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
40"	Fill Stirred up material, Sand, Loamy Sand, Gravel, Cobbles
44"	Ab - Dark Brown Loam (10YR3/3) 15% Gravel and 10% Cobbles
50"	Bw - Yellowish Brown Loamy Sand (10YR 5/6) 5% Gravel and 5% Cobbles
90"	C1 - Brown Medium Sand (10YR 5/3)
	- End of Exploration -

NOTES:

1. SHGW observed at 78-in
2. Weeping at 80-in
3. Standing water at 88-in

TEST PIT NUMBER
TP 3

Weston & Sampson

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TEST PIT LOG

PROJECT NAME/NO.	Levingston Cove Park - ENG21-0021			**TEST PIT NUMBER**	
LOCATION	Newton, MA			TP 3	
CLIENT	Newton, MA			GROUND SURFACE	
CONTRACTOR	Newton DPW	FOREMAN:		ELEVATION	see plan
OBSERVED BY	K. Elmy	DATE	6/16/21	DEPTH TO GROUNDWATER BELOW	
CHECKED BY		DATE		SURFACE	78-in

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
	

NOTES:

1. SHGW observed at 78-in
2. Weeping at 80-in
3. Standing water at 88-in

TEST PIT NUMBER
TP 3

Weston & Sampson

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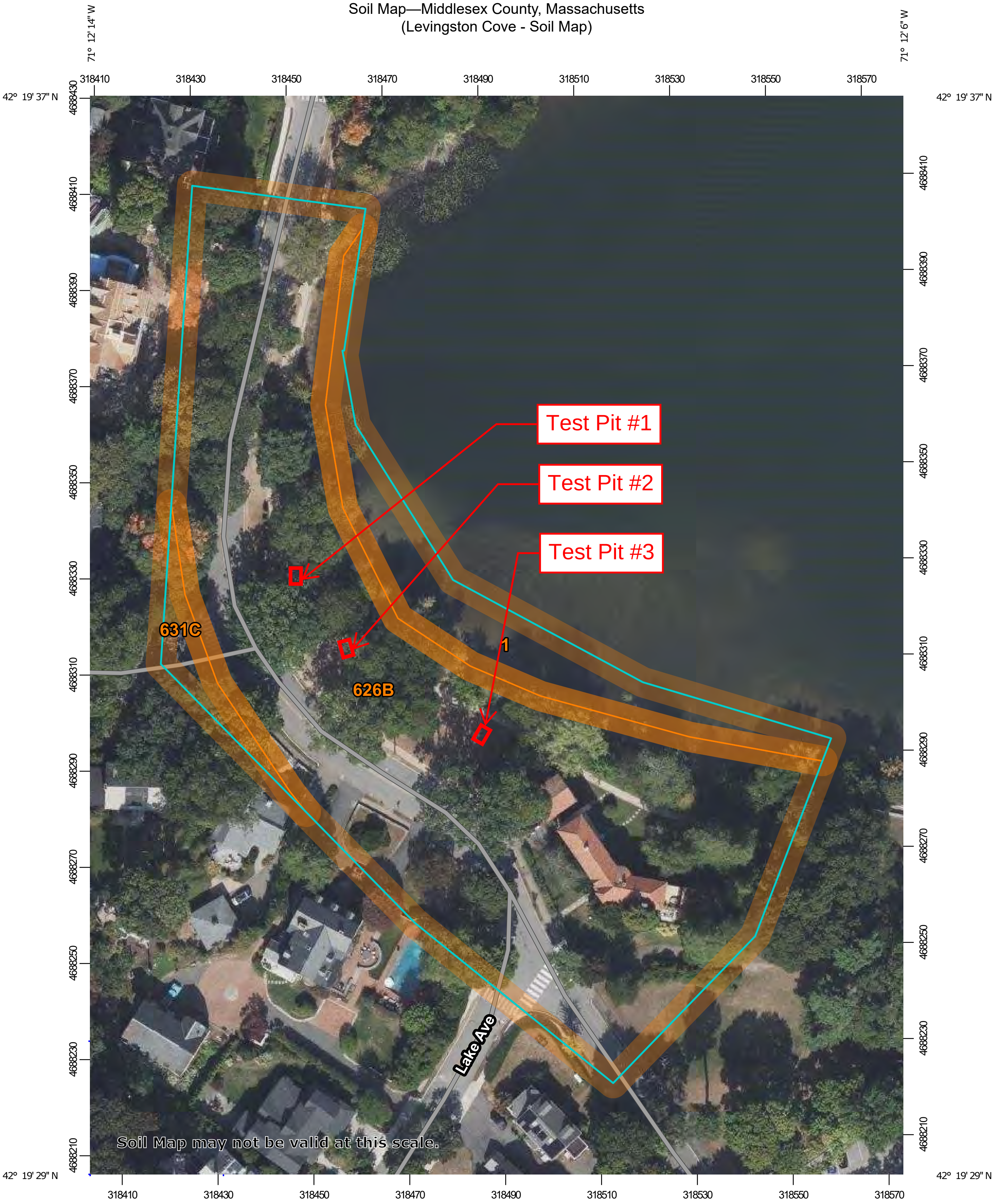
Soil Map—Middlesex County, Massachusetts
(Levingston Cove - Soil Map)



Map Scale: 1:1,090 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 15, 30, 60, 90

Feet: 0, 50, 100, 200, 300

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Sep 25, 2020—Oct 4, 2020

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	0.4	13.1%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	2.4	84.5%
631C	Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky	0.1	2.5%
Totals for Area of Interest		**2.8**	**100.0%**

Description of Map Units

Postglacial Deposits

Artificial fill

coastal wetlands

Cranberry bog deposits
sand o ,
cranberry bogs also are created by excavation into sand and gravel deposits that form the bed; peat and other organi

Flood-plain alluvium—Sand, gravel, silt, and some or
The texture of alluvium commonly varies over short distances both laterally and vertically, and generally is similar to the texture of adjacent glacial deposits. Along smaller streams, alluvium is commonly less than 5 feet (ft) thick. The most extensive deposits of alluvium in Massachusetts are
W Alluvium

Swamp deposits—Organic muck and peat that contain minor amounts of sand, silt, and clay
poorly sorted, and occur in swamps and freshwater marshes, in kettle depressions, or in poorly drained areas. Unit is shown only where deposits are estimated to be at least 3 ft thick; most deposits are less than 10 ft thick. Swamp deposits overlie glacial deposits or bedrock. They locally overlie glacial till even where they occur within thin glacial meltwater deposits

Salt-marsh and estuarine deposits—Peat and organic muck interbedded with sand and silt, deposited in saltwater or brackish-water environments of low wave energy along the coast and in river estuaries. Salt-marsh deposits are dominantly peat and muck, generally a few feet to 25 ft thick. In the major estuaries, these deposits locally overlie estuarine deposits (not mapped), which are sand and silt with minor organic material and are as much as 30 to 80 ft thick. Salt-marsh and estuarine deposits generally are underlain by adjacent glacial material,

Beach and dune deposits
wind action. The texture of beach deposits varies over short distances and is generally controlled by the texture of nearby glacial materials exposed to wave action. Sand beach deposits are composed of moderately sorted, very

clasts in moderately sorted thin beds; deposits contain minor amounts of sand within gravel beds, and thin beds of sand as alternating layers. Beach deposits are rarely more than a few feet thick. Dune deposits are composed

Early Postglacial Deposits

Alluvial-fan deposits—Generally coarse gravel and sand deposits on steep slopes where high-gradient streams entered lower gradient valleys. Alluvial fans in some places were graded to lowering levels of glacial lakes. Fans continue to form today at some locations in Massachusetts

Valley-floor fluvial deposits

The

, and generally is similar to the texture of adjacent glacial deposits.

the upper, dry reaches of the furrow valleys and probably are less than 20 ft thick. Swamp deposits and deforma-

The deposits probably extend beneath salt-marsh and estuarine deposits in coastal valley reaches.

and on Martha's Vineyard in Quampache Bottom

Stream-terrace deposits—Sand, gravel, and silt deposited by meteoric water (locally distal meltwater) on terraces cut into glacial meltwater sediments along rivers and streams. These deposits are shown where they

terrace deposits are included in the coarse deposits map unit. Most stream-terrace deposits are less than 10 ft thick and overlie thicker glacial deposits; textures are commonly similar to those of underlying glacial meltwater

lake-bottom silt and clay

Marine regressive deposits—Sand and minor gravel deposited along former, higher shorelines in northeastern Massachusetts by waves and currents, and by wind action on beaches and spits. These deposits are shown where

than a few feet thick. Regressive spit deposits are 10 to 30 ft thick

Inland-dune deposits—Fine to medium, well-sorted sand in transverse, parabolic, and hummocky dunes as much as 60 ft thick. Deposits occur mostly in the glacial Lake Hitchcock basin (in the Connecticut Valley lowland), where sand derived from extensive glacial-lake deltas that were not yet vegetated was deposited in dune forms

Talus deposits—Angular, loose blocks of basalt and diabase accumulated by rockfall and creep at the base of

Valley lowland). Talus deposits form steep, unstable slopes. Generally less than 20 ft thick

Glacial Stratified Deposits

below), deposited in layers by glacial meltwater. These sediments occur as four basic textural units: gravel deposits, sand and

Coarse Deposits where they occur at the land surface. *Fine Deposits* also are shown where they occur at the land surface. T

, subsurface textural variations are not shown on this map.

PARTICLE DIAMETER											
10 / 256	2.5 / 64	.16 / 4	.08 / 2	.04 / 1	.02 / .5	.01 / .25	.005 / .125	.0025 / .063	.00015 / .004	inches / mm	
Boulders	Cobbles	Pebbles	Granules	Very coarse sand	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay	
GRAVEL PARTICLES				SAND PARTICLES				FINE PARTICLES			

Figure 12. Grain-size classification used in this report, modified from Wentworth (1922). Abbreviation: mm, millimeter.

Coarse deposits consist of *gravel deposits*, *sand and gravel deposits*, and *sand deposits*
report. *Gravel deposits* are composed of at least 50 percent gravel-size clasts; cobbles and boulders predominate; minor amounts of sand occur within gravel beds, and sand comprises a few separate layers. Gravel layers generally are poorly sorted, and bedding commonly is distorted and faulted due to postdepositional collapse related to melting of ice. *Sand and gravel deposits* occur as mixtures of gravel and sand within individual layers and as layers of sand alternating with layers of gravel. Sand and gravel layers generally range between 25 and 50 percent gravel particles and between 50 and 75 percent sand particles. Layers are well sorted to poorly sorted; bedding may be distorted and faulted due to postdepositional collapse. *Sand deposits* are composed mainly of

Fine deposits

V

of these lake-bottom deposits and grades downward into rhythmically bedded silt and clay varves. In some places on the lake-bottom surface of glacial Lake Hitchcock (in the Connecticut Valley lowland) and glacial Lake

sand, deposited as the lake level lowered or the lake shallowed; this sand has not been mapped separately. Locally

Glaciomarine fine deposits include clay, silty clay -level sea in environments of low wave ener

clay, and clay. The lower silty clay and clay is massive and thinly laminated. Total thickness is generally a few feet to 75 ft

Stagnant-ice deposits—Surface coarse sediments include scattered large surface boulders, gravel deposits, and sand and gravel deposits, totaling 5 to 30 ft thick, that overlie predominantly sand deposits. Sand deposits . Sand and silty sand deposits extend downward to basal till and bedrock. Flowtill sediments are interlayered under ice-contact slopes. -

by ice-contact slopes, present on tops of till hills or extending more than 30 ft above the altitudes of adjacent meltwater morphosequences in lowlands. Deposits are aligned in belts parallel to the retreating ice margin

Glacial Till and Moraine Deposits

End moraine deposits—Composed predominantly of boulders and ablation-facies sandy upper till; lenses of ger deposits on Cape Cod and Martha's Vineyard, the surface ablation till is as much as 30 ft thick and overlies sand, gravel, and silty sand meltwater deposits. Some end moraine deposits include thrusted sheets of glacial meltwater deposits resulting from readvance of the ice mar
result of postdepositional collapse caused by melting of buried ice. Surface boulders on end moraine deposits are generally more numerous than on adjacent till surfaces; dense concentrations of boulders are present in some places. Deposits occur as freestanding hummocky landforms, commonly in ridges that trend east-northeast to west-southwest, and range in height from 10 to 100 ft

Thrust moraine deposits—In western Martha's Vineyard, thrusted moraine deposits stand as high as 300 ft in altitude and are composed of allochthonous, ice-thrusted Cretaceous, Tertiary, and older Quaternary sediments, locally overlain by thin surface till and boulders. These coastal-plain beds are fossiliferous, semi-consolidated sand, gravel, and silty clay in tilted strata that were thrust up by glacial ice into positions well above the autochthonous coastal-plain surface, which lies below sea level. Numerous northeast-southwest-trending ridges within the thrust moraine unit mark the edges of these tilted and thrusted strata

Thin till
and boulder clasts; large surface boulders are common; unit was mapped where till is generally less than 10 to 15 ft thick including areas of shallow bedrock. Predominantly consists of upper till of the last glaciation; loose to moderately compact, generally sandy, commonly stony. Two facies are present in some places: a looser, coarser

lodgement facies deposited subglacially. In general, both ablation and lodgement facies of upper till derived from

till derived from coarse-grained crystalline rocks.
the red Mesozoic sedimentary rocks of the Connecticut Valley lowland, marble in the western river valleys, and

Thick till
cobbles, and boulders in the shallow subsurface; at greater depths consists of compact, nonsorted matrix of silt,

than 10 to 15 ft thick, mostly in drumlin landforms in which till thickness commonly exceeds 100 ft (maximum recorded thickness is 230 ft). Although upper till of late Wisconsinan age is the surface deposit, lower till of probable Illinoian age constitutes the bulk of the material in thick-till areas. Lower till is moderately to very
An oxidized zone, the lower part of a soil
glacial weathering, is generally present in the upper part of the lower till. This zone commonly shows closely spaced joints that are stained with iron and manganese oxides

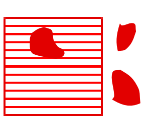
Glacially modified coastal-plain hill deposits , and Duxbury quadrangles) and in the Pine Hills area (Manomet quadrangle), very compact till and older glacial
Tertiary coastal-plain strata that are semi-consolidated dark clay layers. Miocene-age green sand deposits have also been reported at depth. These hills in many places were sculpted by the last ice sheet, but they are generally larger (3–4 miles [mi] long and 1–2 mi wide) than typical drumlins

Thick valley till and fine deposits—Composed of sandy surface till with boulders, 3 to 20 ft thick, overlying
, local boulders, and local weathered limestone and dolostone bedrock; total thickness of all sediments is 6 to 135 ft, averaging 50 ft. Materials reported in drillers' records include four descriptions usually synonymous with till: hardpan with no boulders; boulders and clay; gravelly hardpan; and

weathered carbonate bedrock materials, listed as follows: gray clay, gray and yellow clay, black soft rock, and weathered bedrock.

(1) a glacially smoothed surface without bedrock outcrops or any relief related to bedrock structure; (2) locally a streamlined shape similar to small drumlins composed of thick till in other parts of Massachusetts; (3) landslide scarps and stream-cut banks commonly having 5 to 10 ft of relief, locally as much as 50 ft; and (4) dry, meltwater-carved channels 3 to 10 ft deep. These deposits extend almost continuously along lower valley slopes in the Housatonic and Hoosic River valleys, and their tributary valleys, that are underlain by marble, dolostone, or limestone and shale bedrock (Zen and others, 1983). The deposits appear to extend beneath the edges of glacial meltwater deposits in the valley bottoms, but their extent beneath thick glacial deposits in the centers of the valleys is not known. Some of these deposits are present in north-draining upland valleys in areas that also contain thick till deposits in drumlins

Bedrock Areas



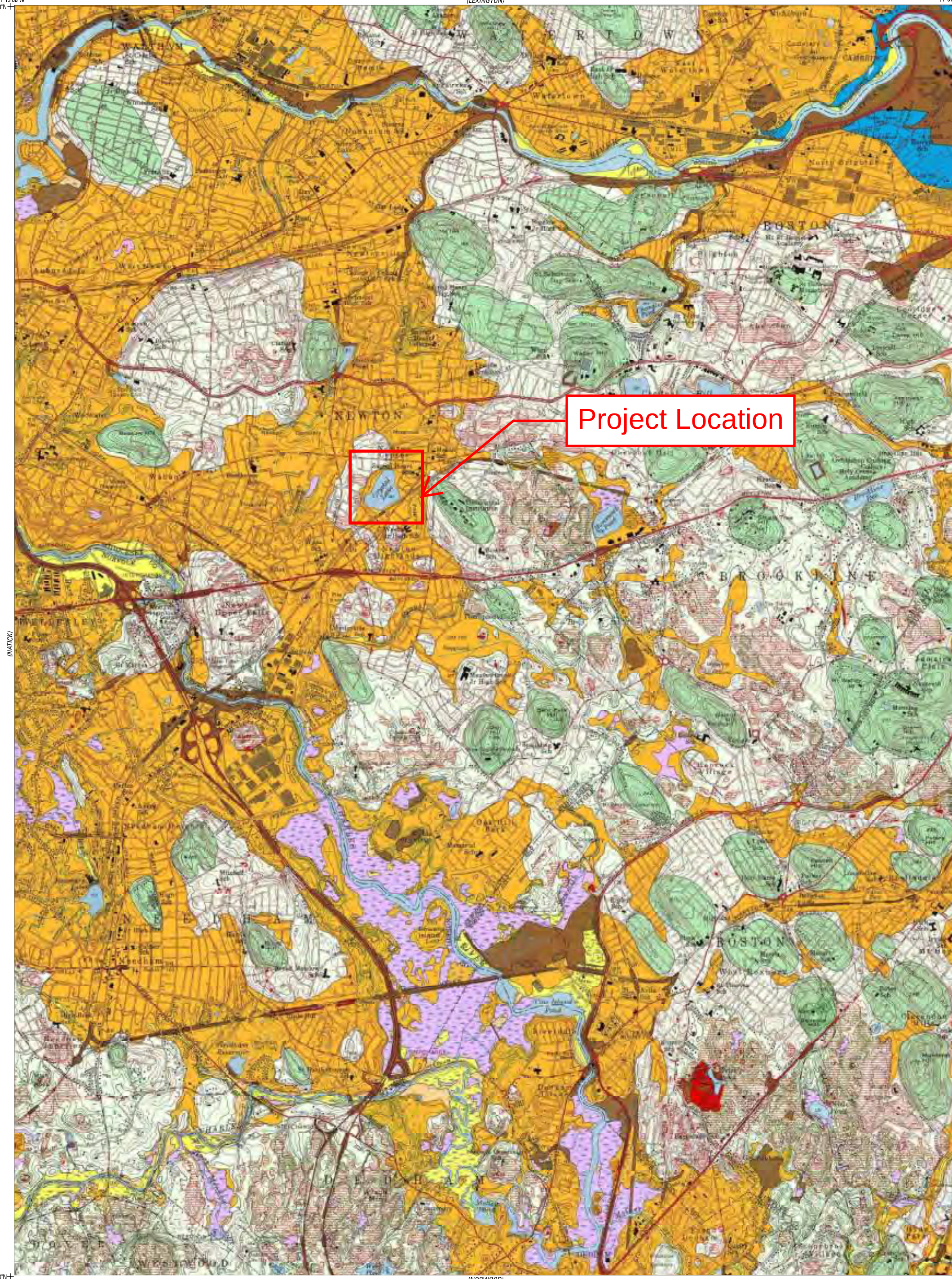
Bedrock outcrops and areas of abundant outcrop or shallow bedrock—Solid color shows extent of individual bedrock outcrops; horizontal-line pattern indicates areas of shallow bedrock or areas where small outcrops

thick. These units were not mapped consistently among all quadrangles; see note at beginning of appendix 1 for information on bedrock outcrop mapping by quadrangle

U.S. Department of the Interior
U.S. Geological Survey

Prepared in cooperation with the
Commonwealth of Massachusetts
Massachusetts Geological Survey
and Executive Office for Administration and Finance

Scientific Investigations Map 3402
Quadrangle 115—Newton
Discussion of surficial materials and description of map units available at https://doi.org/10.3133/sim3402



Base from U.S. Geological Survey, 1956

Map was scanned, processed, georeferenced, rectified, and cropped by the Massachusetts Geological Survey

Lambert Conformal Conic projection. North American Datum of 1983

Massachusetts state plane coordinate system, mainland zone

SCALE 1:24 000

1 0.5 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0.5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

MAP LOCATION

Map units were modified from LaForge (1932) and Chute (1949, northeastern part of map), and from Stone, B.D., 1982, unpublished field map. Bedrock outcrops and areas of shallow bedrock were reproduced from Kaye (1980); some additional outcrops are from Thompson (2015). Some units were mapped or revised from recent field studies and from analysis of topographic (lidar) data and 2005 orthophoto images.

Surficial Materials Map of the Newton Quadrangle, Massachusetts

Compiled by
Byron D. Stone and Mary L. DiGiacomo-Cohen
2018

For sale by U.S. Geological Survey, Box 25286, Denver Federal Center, Denver, CO 80225; https://store.usgs.gov; 1–888–ASK–USGS (1–888–275–8747)

Suggested citation: Stone, B.D., and DiGiacomo-Cohen, M.L., comps., 2018, Surficial materials map of the Newton quadrangle, Massachusetts, quadrangle 115 *in* Stone, J.R., Stone, B.D., DiGiacomo-Cohen, M.L., and Mabee, S.B., comps., Surficial materials of Massachusetts—A 1:24,000-scale geologic map database: U.S. Geological Survey Scientific Investigations Map 3402, 1 sheet, scale 1:24,000, https://doi.org/10.3133/sim3402.

ISSN 2329-132X (online)
https://doi.org/10.3133/sim3402

Attachment D - HydroCAD Reports

NOAA Atlas 14, Volume 10, Version 3
Location name: ???*
Latitude: 42.3257°, Longitude: -71.2031°
Elevation: 158.14 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	0.302 (0.240-0.380)	0.373 (0.296-0.470)	0.489 (0.387-0.619)	0.585 (0.460-0.745)	0.717 (0.545-0.965)	0.816 (0.607-1.13)	0.921 (0.665-1.33)	1.04 (0.707-1.54)	1.23 (0.796-1.88)	1.38 (0.874-2.17)
10-min	0.428 (0.340-0.539)	0.528 (0.420-0.666)	0.692 (0.548-0.877)	0.829 (0.651-1.06)	1.02 (0.772-1.37)	1.16 (0.859-1.60)	1.30 (0.942-1.88)	1.48 (1.00-2.18)	1.74 (1.13-2.67)	1.96 (1.24-3.07)
15-min	0.503 (0.400-0.634)	0.621 (0.494-0.784)	0.814 (0.644-1.03)	0.974 (0.766-1.24)	1.20 (0.908-1.61)	1.36 (1.01-1.88)	1.54 (1.11-2.22)	1.74 (1.18-2.57)	2.05 (1.33-3.14)	2.30 (1.46-3.61)
30-min	0.687 (0.546-0.866)	0.849 (0.674-1.07)	1.11 (0.881-1.41)	1.33 (1.05-1.70)	1.63 (1.24-2.20)	1.86 (1.38-2.57)	2.10 (1.52-3.04)	2.39 (1.62-3.52)	2.82 (1.83-4.32)	3.18 (2.01-4.99)
60-min	0.871 (0.692-1.10)	1.08 (0.855-1.36)	1.41 (1.12-1.79)	1.69 (1.33-2.15)	2.07 (1.58-2.79)	2.36 (1.76-3.26)	2.66 (1.93-3.86)	3.03 (2.05-4.47)	3.59 (2.33-5.51)	4.06 (2.57-6.37)
2-hr	1.13 (0.903-1.41)	1.40 (1.12-1.75)	1.84 (1.47-2.32)	2.21 (1.75-2.80)	2.71 (2.08-3.64)	3.09 (2.32-4.25)	3.49 (2.55-5.05)	4.00 (2.71-5.85)	4.79 (3.11-7.28)	5.47 (3.47-8.49)
3-hr	1.31 (1.06-1.64)	1.63 (1.31-2.03)	2.14 (1.71-2.69)	2.57 (2.04-3.24)	3.16 (2.43-4.22)	3.59 (2.70-4.93)	4.06 (2.98-5.86)	4.66 (3.17-6.78)	5.59 (3.64-8.45)	6.40 (4.07-9.88)
6-hr	1.71 (1.38-2.11)	2.11 (1.70-2.61)	2.76 (2.22-3.43)	3.30 (2.63-4.13)	4.04 (3.12-5.35)	4.58 (3.47-6.24)	5.18 (3.82-7.40)	5.93 (4.05-8.56)	7.10 (4.64-10.6)	8.12 (5.18-12.4)
12-hr	2.19 (1.78-2.69)	2.68 (2.18-3.30)	3.49 (2.83-4.32)	4.16 (3.35-5.18)	5.09 (3.95-6.68)	5.77 (4.39-7.78)	6.51 (4.81-9.19)	7.42 (5.09-10.6)	8.83 (5.80-13.1)	10.0 (6.42-15.2)
24-hr	2.64 (2.16-3.23)	3.27 (2.67-4.00)	4.30 (3.50-5.28)	5.15 (4.16-6.36)	6.32 (4.94-8.25)	7.18 (5.49-9.62)	8.13 (6.04-11.4)	9.30 (6.40-13.2)	11.1 (7.32-16.3)	12.7 (8.15-19.0)
2-day	3.03 (2.49-3.67)	3.82 (3.14-4.64)	5.11 (4.18-6.23)	6.18 (5.03-7.58)	7.65 (6.03-9.95)	8.73 (6.73-11.7)	9.92 (7.46-13.9)	11.5 (7.91-16.1)	13.9 (9.20-20.3)	16.1 (10.4-23.9)
3-day	3.33 (2.75-4.02)	4.18 (3.45-5.06)	5.58 (4.59-6.78)	6.74 (5.50-8.24)	8.33 (6.59-10.8)	9.49 (7.35-12.6)	10.8 (8.14-15.1)	12.5 (8.63-17.4)	15.2 (10.1-22.0)	17.6 (11.4-26.0)
4-day	3.61 (2.99-4.35)	4.49 (3.72-5.42)	5.94 (4.90-7.19)	7.14 (5.85-8.70)	8.79 (6.97-11.3)	9.99 (7.76-13.2)	11.3 (8.57-15.8)	13.1 (9.07-18.2)	15.9 (10.5-22.9)	18.4 (11.9-27.1)
7-day	4.37 (3.64-5.24)	5.29 (4.40-6.35)	6.80 (5.63-8.19)	8.05 (6.62-9.75)	9.77 (7.77-12.5)	11.0 (8.58-14.5)	12.4 (9.40-17.1)	14.2 (9.90-19.6)	17.1 (11.4-24.5)	19.7 (12.8-28.7)
10-day	5.07 (4.24-6.06)	6.02 (5.03-7.20)	7.56 (6.29-9.08)	8.84 (7.30-10.7)	10.6 (8.46-13.5)	11.9 (9.27-15.5)	13.3 (10.1-18.2)	15.1 (10.6-20.8)	18.0 (12.0-25.6)	20.5 (13.3-29.7)
20-day	7.11 (5.99-8.44)	8.13 (6.84-9.66)	9.80 (8.20-11.7)	11.2 (9.29-13.4)	13.1 (10.5-16.4)	14.5 (11.3-18.5)	16.0 (12.0-21.3)	17.7 (12.5-24.1)	20.2 (13.6-28.4)	22.3 (14.5-32.0)
30-day	8.79 (7.43-10.4)	9.87 (8.33-11.7)	11.6 (9.77-13.8)	13.1 (10.9-15.6)	15.1 (12.1-18.7)	16.6 (12.9-21.0)	18.2 (13.6-23.8)	19.8 (14.0-26.7)	22.1 (14.8-30.8)	23.8 (15.5-34.0)
45-day	10.9 (9.23-12.8)	12.0 (10.2-14.2)	13.9 (11.7-16.4)	15.4 (12.9-18.3)	17.5 (14.1-21.6)	19.2 (14.9-24.0)	20.8 (15.5-26.8)	22.4 (15.8-29.9)	24.3 (16.4-33.8)	25.8 (16.8-36.5)
60-day	12.6 (10.8-14.8)	13.8 (11.7-16.2)	15.7 (13.3-18.6)	17.3 (14.6-20.5)	19.5 (15.7-23.9)	21.3 (16.6-26.5)	22.9 (17.0-29.3)	24.4 (17.4-32.6)	26.3 (17.8-36.3)	27.6 (18.0-38.9)

[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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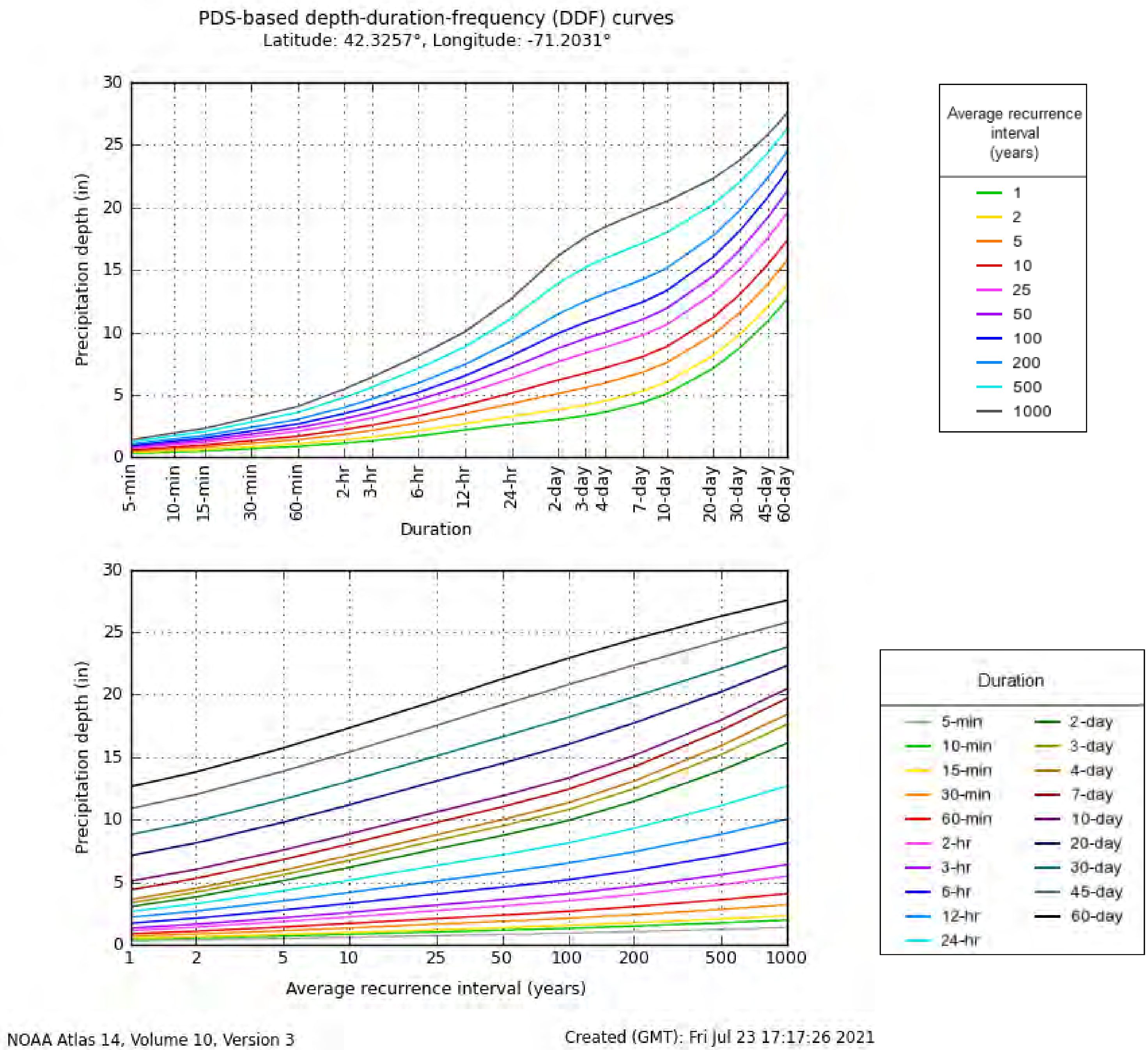
PF graphical



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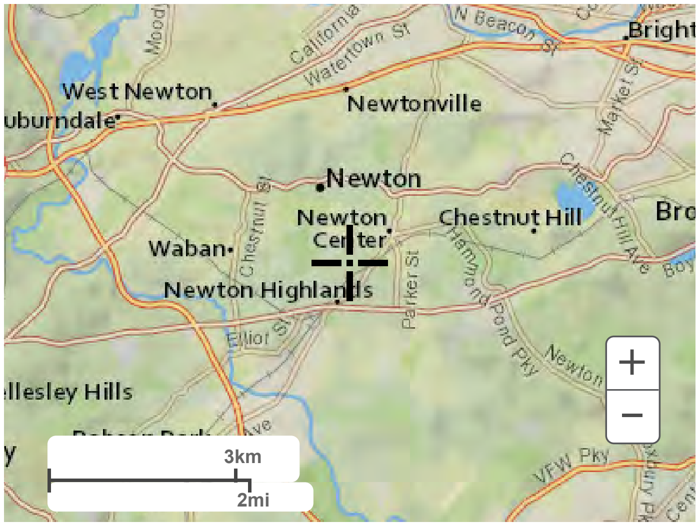
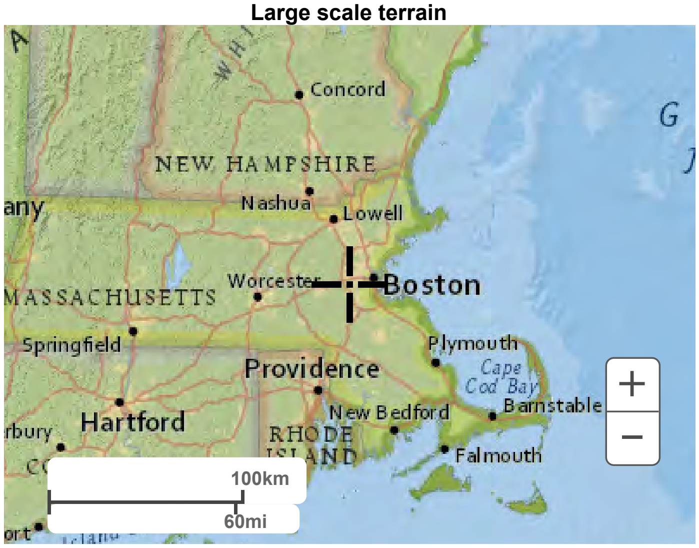
Maps & aerials

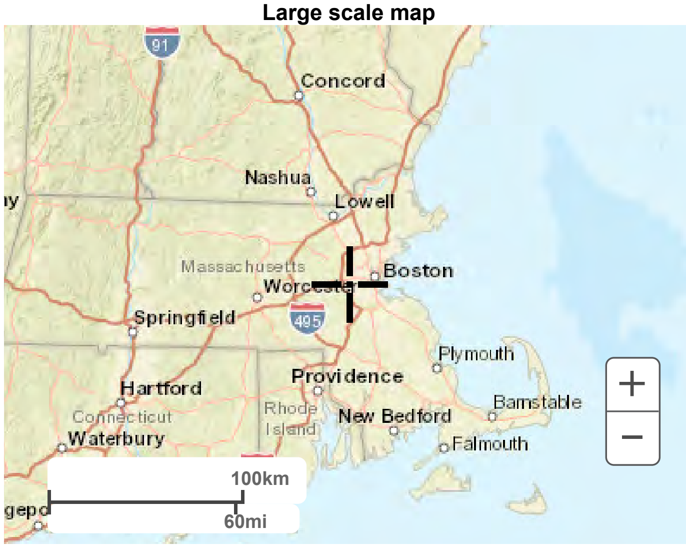
Small scale terrain



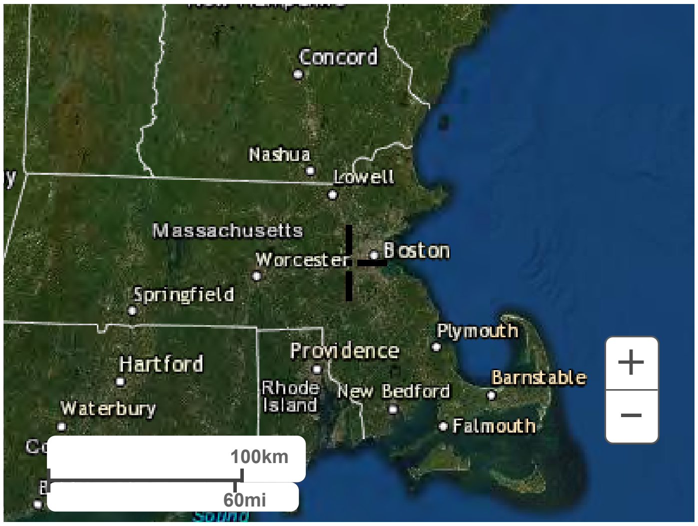
Large scale terrain



Large scale map



Large scale aerial



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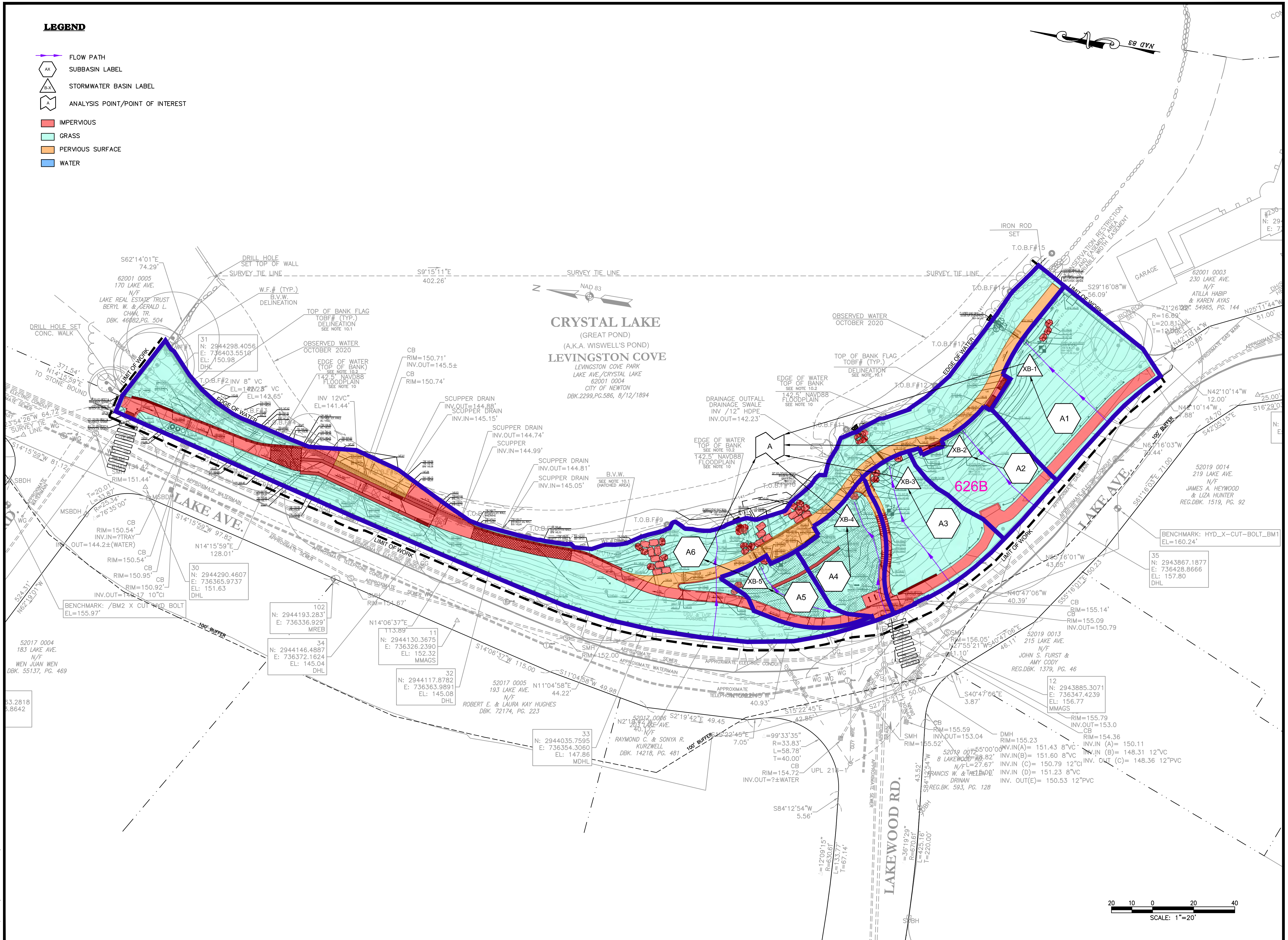
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov



Project:

IMPROVEMENTS TO LOUISE LEVINGSTON COVE, CRYSTAL LAKE

NEWTON Parks & Recreation

INTERSECTION OF LAKEVIEW AND LAKE AVENUE, NEWTON CENTRE, MA, 02459

Weston & Sampson

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Reading, MA 01867
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description

Seal:

Issued For:

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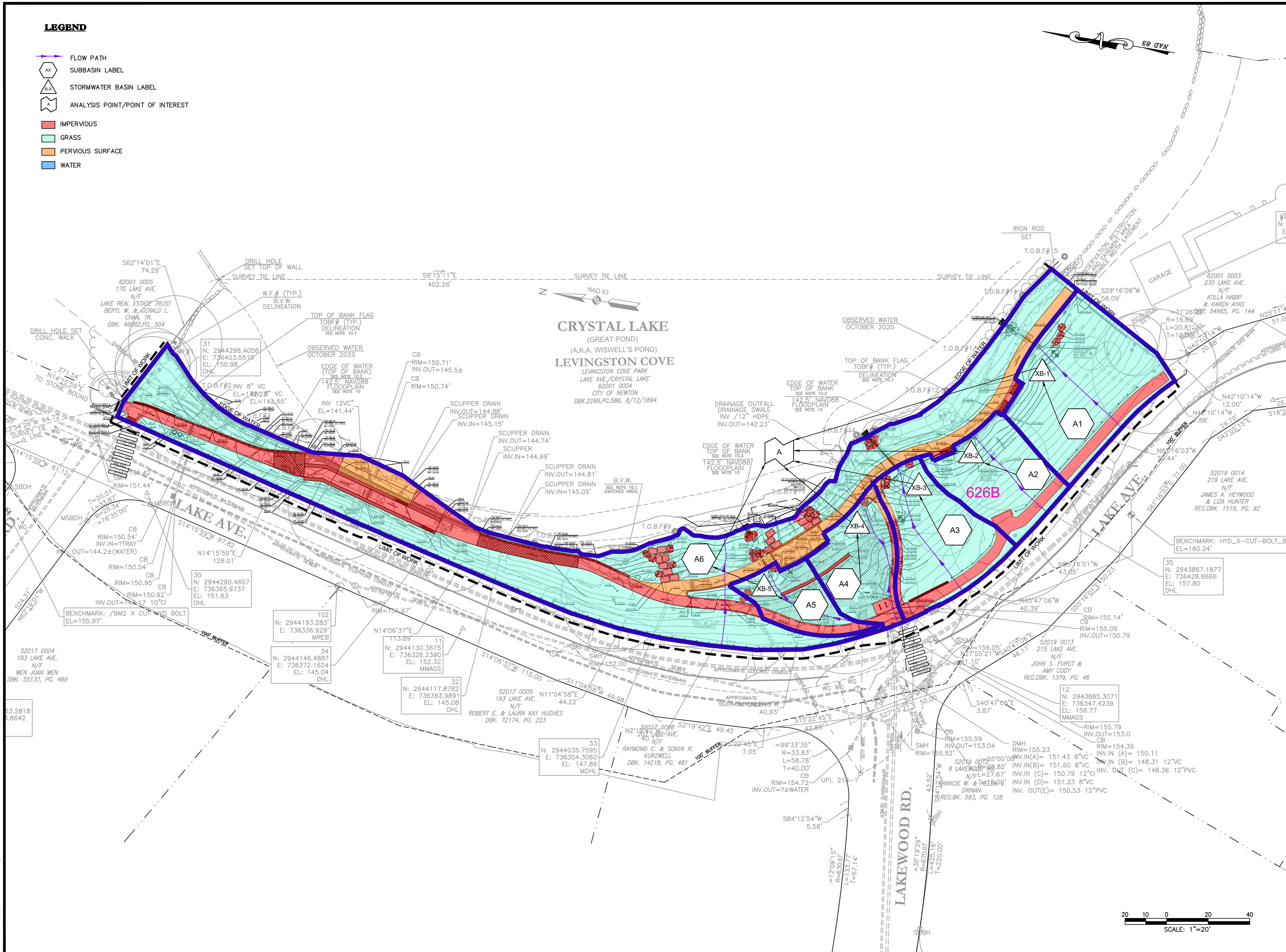
Scale:	AS SHOWN
Date:	08/10/21
Drawn By:	REB
Reviewed By:	JIP
Approved By:	JIP
W&S Project No.:	ENG21-0021
W&S File No.:	

Drawing Title:

EXISTING HYDROLOGIC MAP

Sheet Number:

FIG-1



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W&S Project No.:	ENG21-0021
W&S File No.:	

Drawing Title:

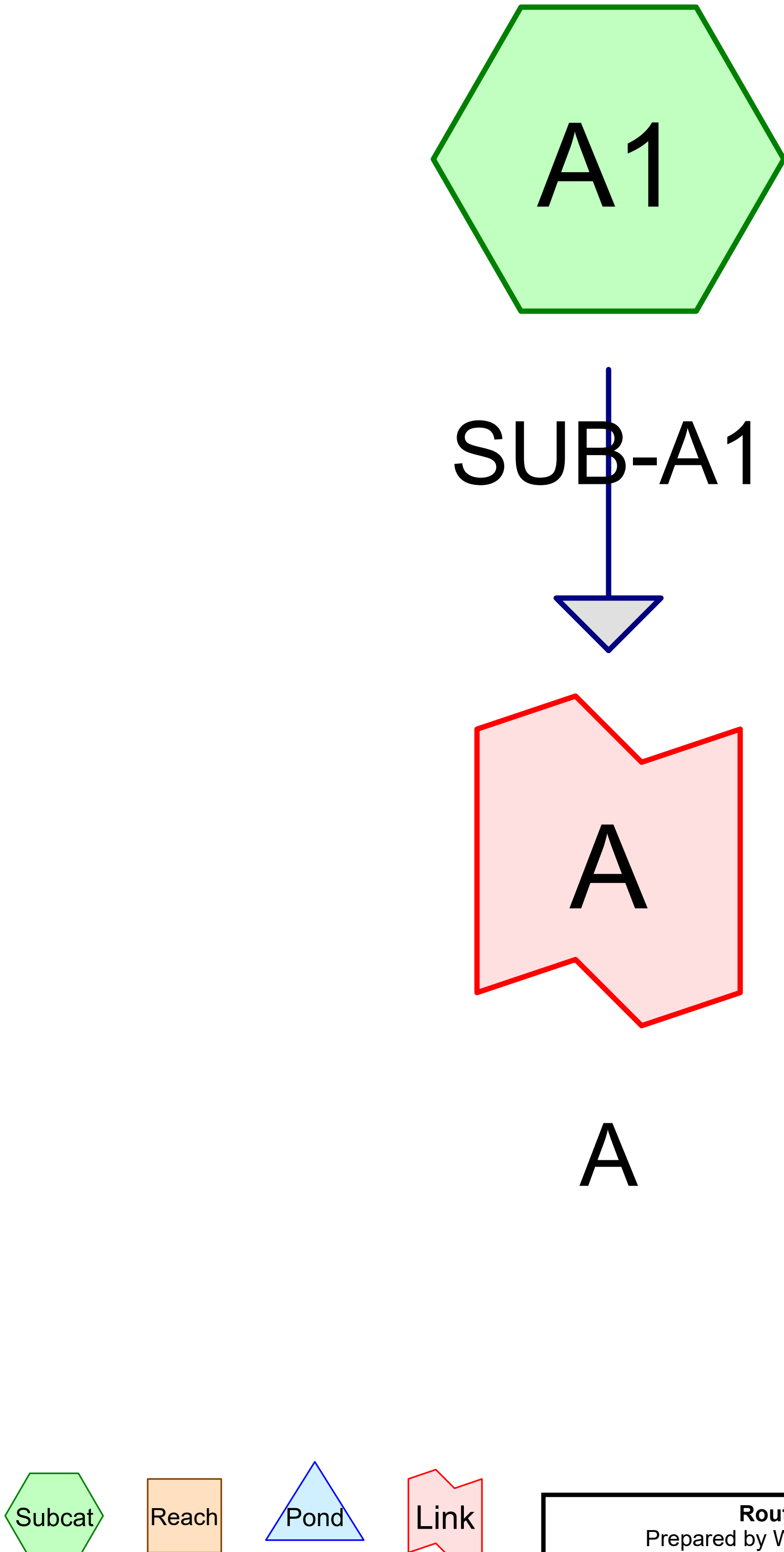
EXISTING HYDROLOGIC MAP

Sheet Number:

FIG-1

Levingston Cove
Newton, MA
Stormwater Discharge Summary Table
10-Aug-21

		Peak Discharge (cfs)	
Analysis Point	**24 Hr Storm**	**Pre-Development**	**Post-Development**
A	2yr	0.01	0.01
	10yr	0.31	0.26
	25yr	0.70	0.60
	100yr	1.45	1.45



Routing Diagram for HYDRO-EX
Prepared by Weston & Sampson, Printed 7/29/2021
HydroCAD® 10.10-3a s/n 00455 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	Type III 24-hr		Default	24.00	1	3.27	2
2	10-year	Type III 24-hr		Default	24.00	1	5.15	2
3	25-year	Type III 24-hr		Default	24.00	1	6.32	2
4	100-year	Type III 24-hr		Default	24.00	1	8.13	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
20,418	39	>75% Grass cover, Good, HSG A (A1)
4,183	98	Paved parking, HSG A (A1)
1,500	39	Pervious Surface, Good, HSG A (A1)
483	98	Water Surface, HSG A (A1)
26,584	**49**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
26,584	HSG A	A1
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
26,584		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
20,418	0	0	0	0	20,418	>75% Grass cover, Good	
4,183	0	0	0	0	4,183	Paved parking	
1,500	0	0	0	0	1,500	Pervious Surface, Good	
483	0	0	0	0	483	Water Surface	
26,584	**0**	**0**	**0**	**0**	**26,584**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=26,584 sf 17.55% Impervious Runoff Depth=0.12"
Tc=6.0 min CN=49 Runoff=0.01 cfs 270 cf

Link A: A Inflow=0.01 cfs 270 cf
Primary=0.01 cfs 270 cf

Total Runoff Area = 26,584 sf Runoff Volume = 270 cf Average Runoff Depth = 0.12"
82.45% Pervious = 21,918 sf 17.55% Impervious = 4,666 sf

Summary for Subcatchment A1: SUB-A1

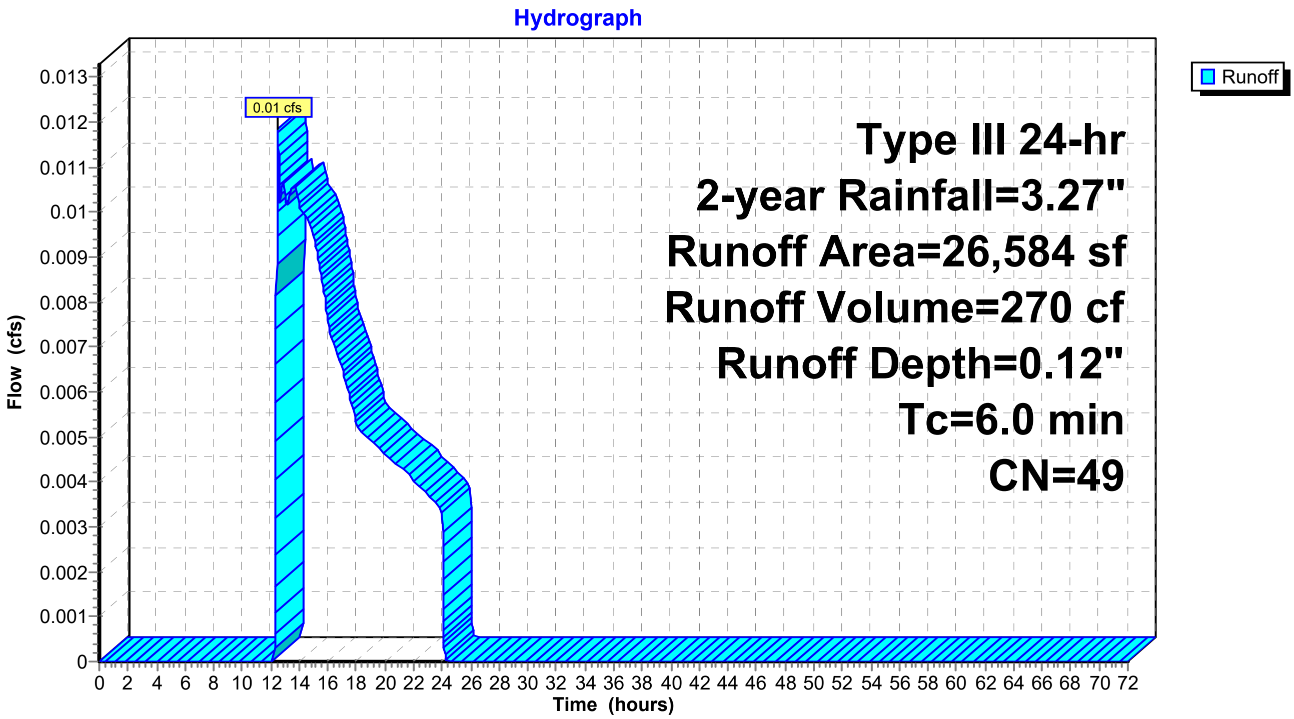
Runoff = 0.01 cfs @ 12.49 hrs, Volume= 270 cf, Depth= 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.27"

	Area (sf)	CN	Description
	4,183	98	Paved parking, HSG A
*	1,500	39	Pervious Surface, Good, HSG A
	483	98	Water Surface, HSG A
	20,418	39	>75% Grass cover, Good, HSG A
	26,584	49	Weighted Average
	21,918		82.45% Pervious Area
	4,666		17.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A1: SUB-A1

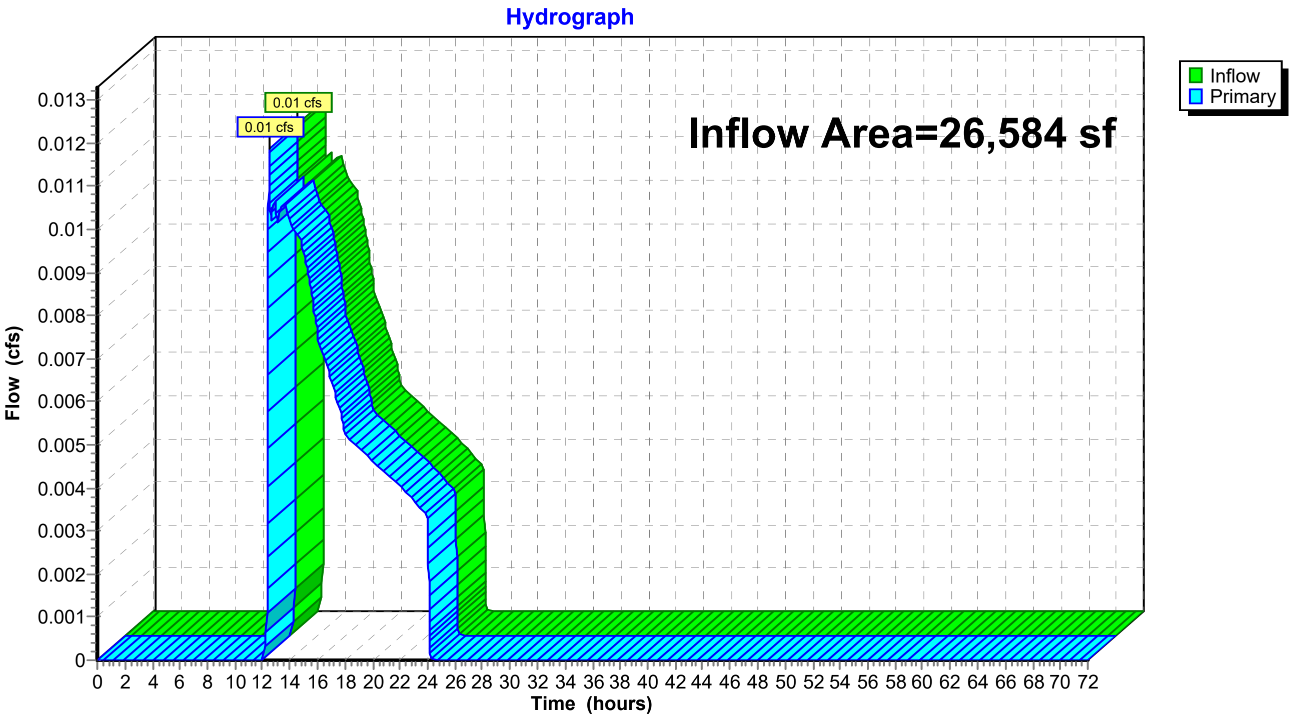


Summary for Link A: A

Inflow Area = 26,584 sf, 17.55% Impervious, Inflow Depth = 0.12" for 2-year event
Inflow = 0.01 cfs @ 12.49 hrs, Volume= 270 cf
Primary = 0.01 cfs @ 12.49 hrs, Volume= 270 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: A



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=26,584 sf 17.55% Impervious Runoff Depth=0.70"
Tc=6.0 min CN=49 Runoff=0.31 cfs 1,548 cf

Link A: A Inflow=0.31 cfs 1,548 cf
Primary=0.31 cfs 1,548 cf

Total Runoff Area = 26,584 sf Runoff Volume = 1,548 cf Average Runoff Depth = 0.70"
82.45% Pervious = 21,918 sf 17.55% Impervious = 4,666 sf

Summary for Subcatchment A1: SUB-A1

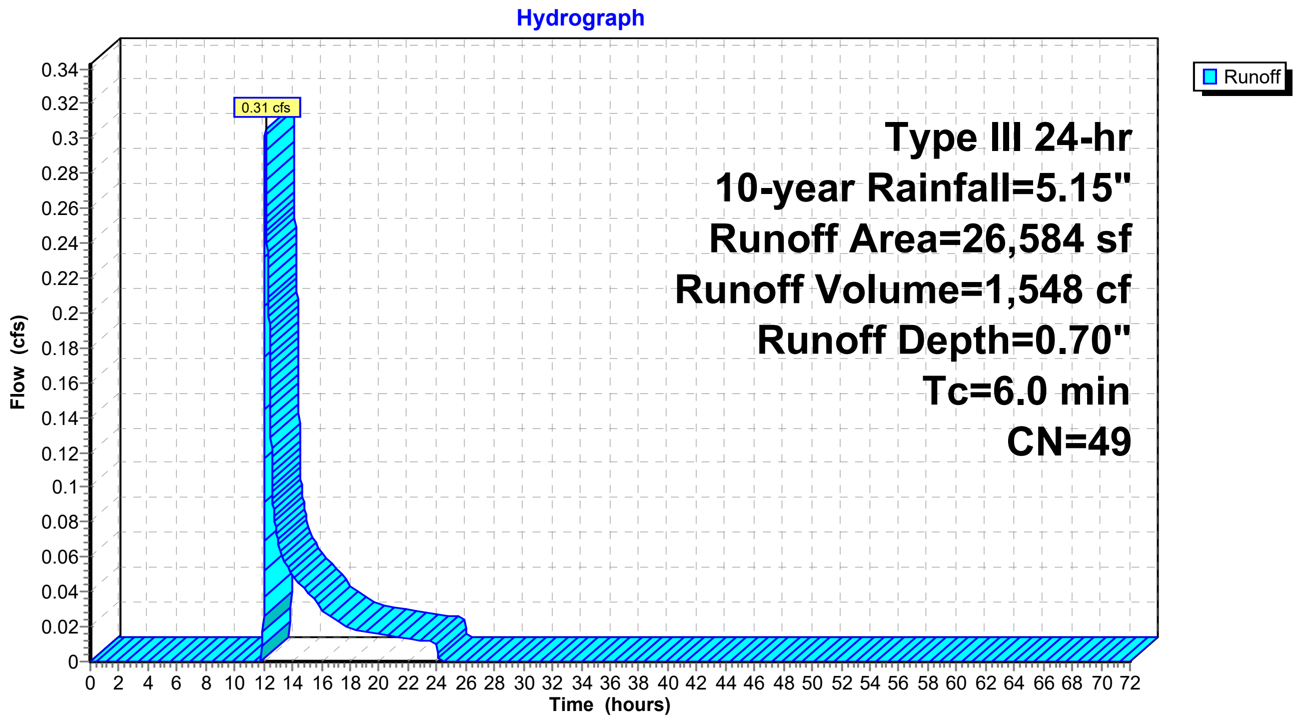
Runoff = 0.31 cfs @ 12.12 hrs, Volume= 1,548 cf, Depth= 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.15"

	Area (sf)	CN	Description
	4,183	98	Paved parking, HSG A
*	1,500	39	Pervious Surface, Good, HSG A
	483	98	Water Surface, HSG A
	20,418	39	>75% Grass cover, Good, HSG A
	26,584	49	Weighted Average
	21,918		82.45% Pervious Area
	4,666		17.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

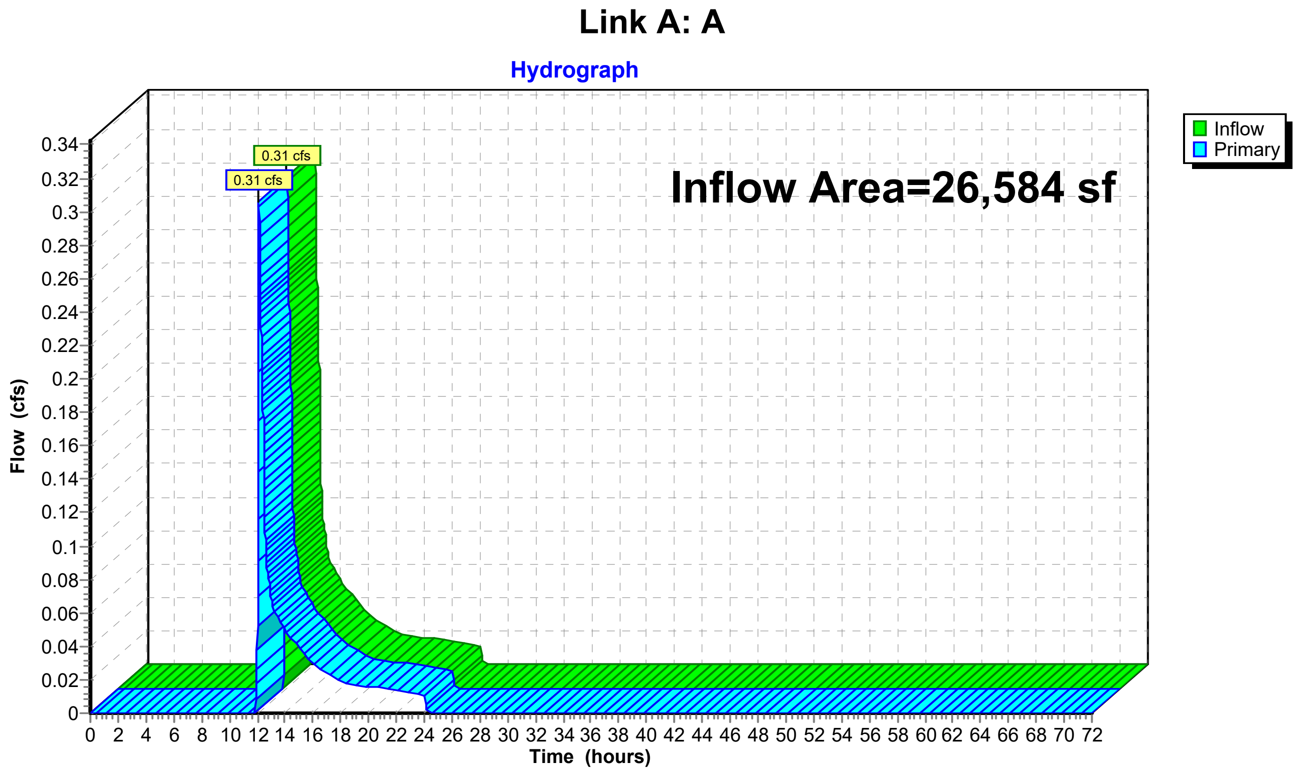
Subcatchment A1: SUB-A1



Summary for Link A: A

Inflow Area = 26,584 sf, 17.55% Impervious, Inflow Depth = 0.70" for 10-year event
Inflow = 0.31 cfs @ 12.12 hrs, Volume= 1,548 cf
Primary = 0.31 cfs @ 12.12 hrs, Volume= 1,548 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=26,584 sf 17.55% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=49 Runoff=0.70 cfs 2,717 cf

Link A: A Inflow=0.70 cfs 2,717 cf
Primary=0.70 cfs 2,717 cf

Total Runoff Area = 26,584 sf Runoff Volume = 2,717 cf Average Runoff Depth = 1.23"
82.45% Pervious = 21,918 sf 17.55% Impervious = 4,666 sf

Summary for Subcatchment A1: SUB-A1

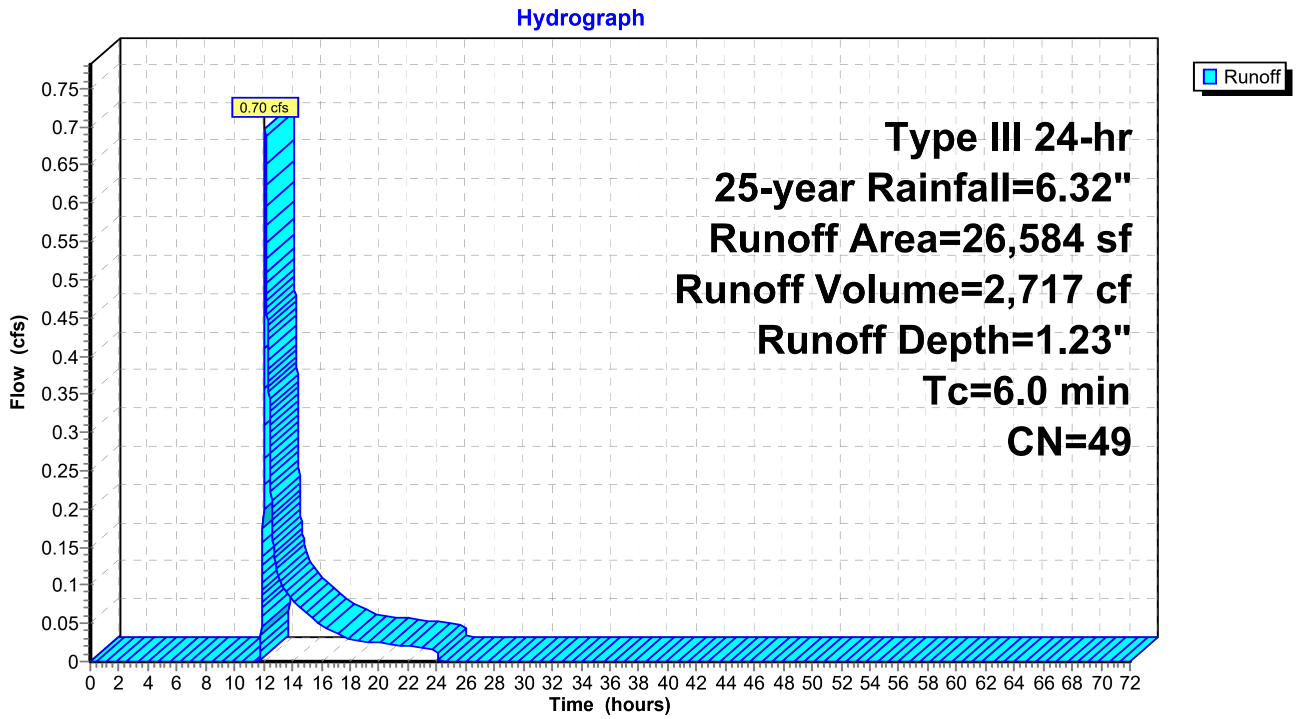
Runoff = 0.70 cfs @ 12.11 hrs, Volume= 2,717 cf, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.32"

	Area (sf)	CN	Description
	4,183	98	Paved parking, HSG A
*	1,500	39	Pervious Surface, Good, HSG A
	483	98	Water Surface, HSG A
	20,418	39	>75% Grass cover, Good, HSG A
	26,584	49	Weighted Average
	21,918		82.45% Pervious Area
	4,666		17.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A1: SUB-A1

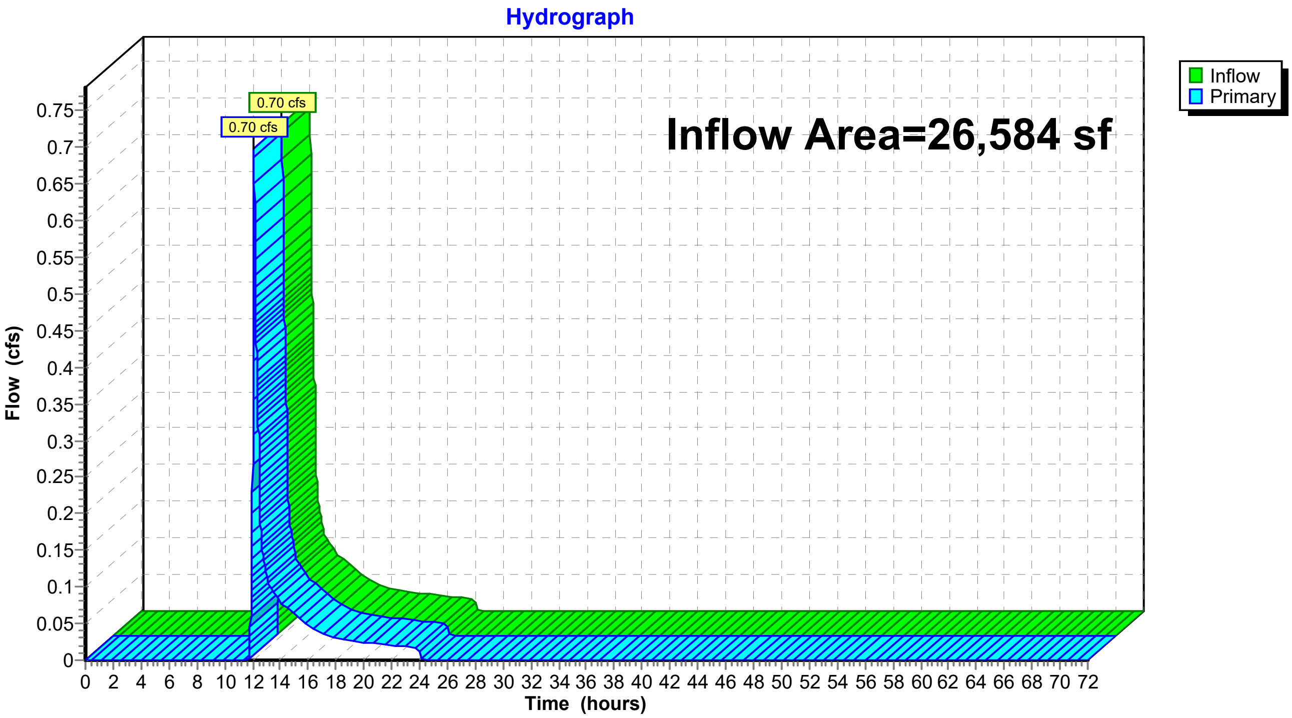


Summary for Link A: A

Inflow Area = 26,584 sf, 17.55% Impervious, Inflow Depth = 1.23" for 25-year event
Inflow = 0.70 cfs @ 12.11 hrs, Volume= 2,717 cf
Primary = 0.70 cfs @ 12.11 hrs, Volume= 2,717 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: A



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=26,584 sf 17.55% Impervious Runoff Depth=2.22"
Tc=6.0 min CN=49 Runoff=1.45 cfs 4,925 cf

Link A: A Inflow=1.45 cfs 4,925 cf
Primary=1.45 cfs 4,925 cf

Total Runoff Area = 26,584 sf Runoff Volume = 4,925 cf Average Runoff Depth = 2.22"
82.45% Pervious = 21,918 sf 17.55% Impervious = 4,666 sf

Summary for Subcatchment A1: SUB-A1

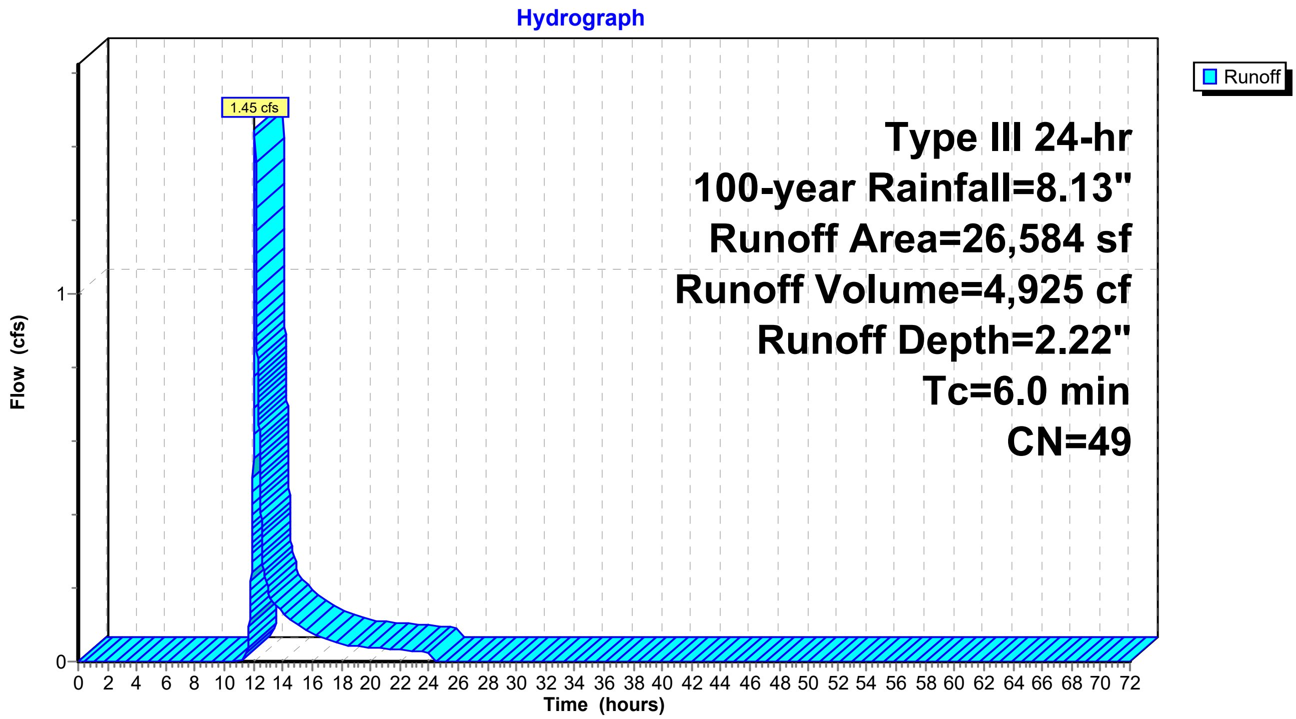
Runoff = 1.45 cfs @ 12.10 hrs, Volume= 4,925 cf, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.13"

	Area (sf)	CN	Description
	4,183	98	Paved parking, HSG A
*	1,500	39	Pervious Surface, Good, HSG A
	483	98	Water Surface, HSG A
	20,418	39	>75% Grass cover, Good, HSG A
	26,584	49	Weighted Average
	21,918		82.45% Pervious Area
	4,666		17.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A1: SUB-A1

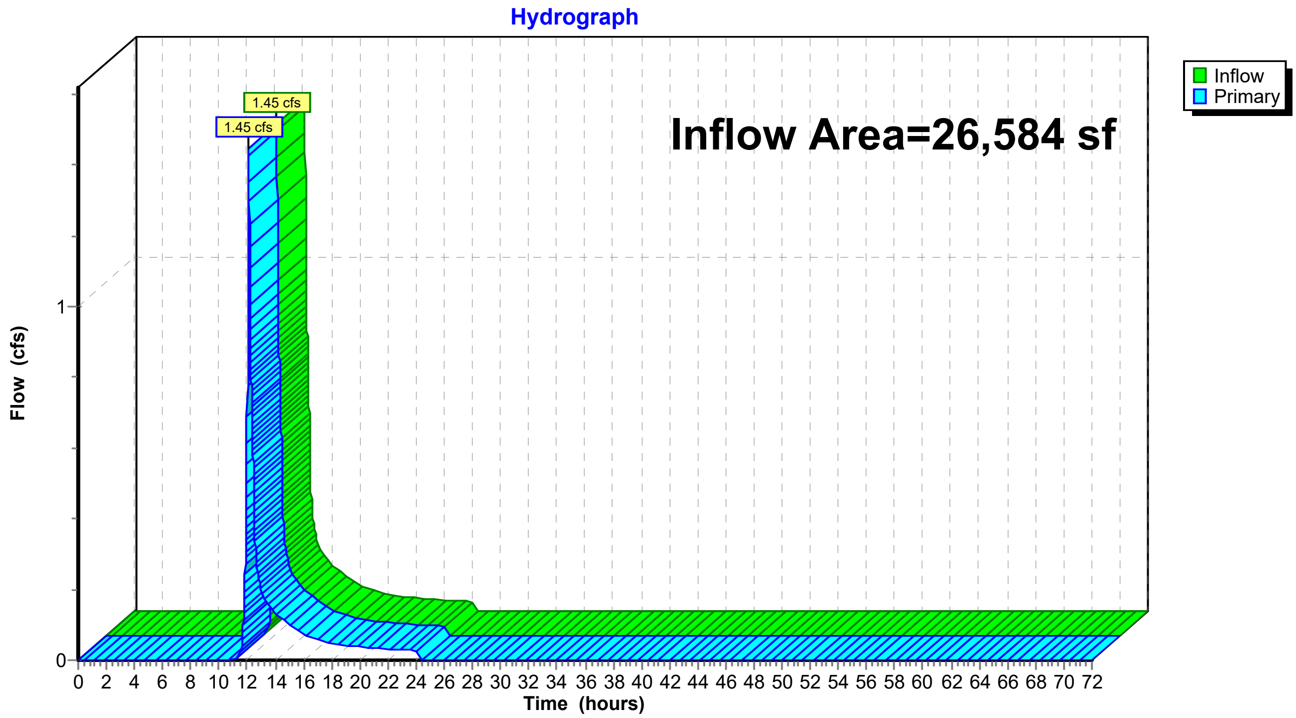


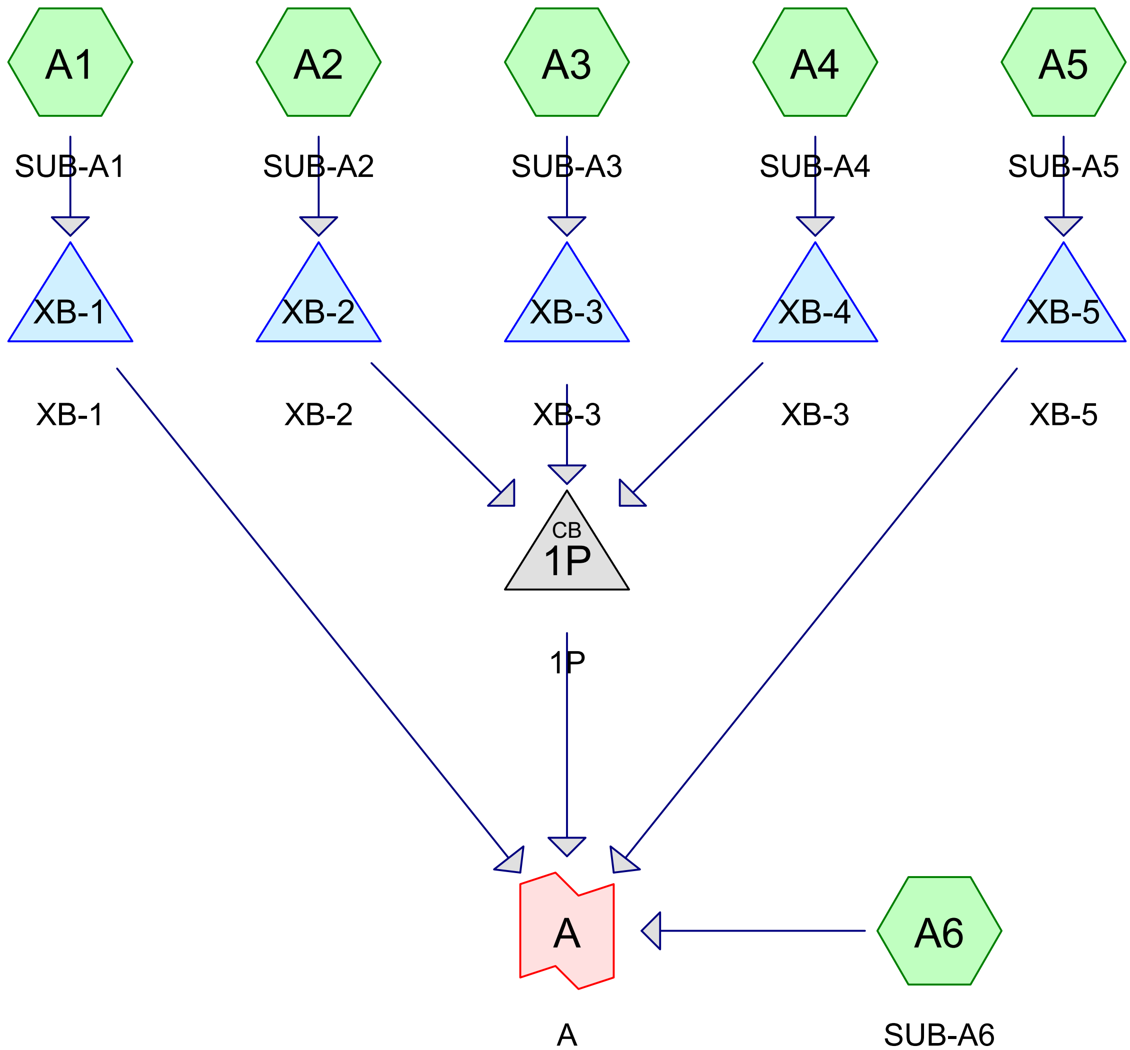
Summary for Link A: A

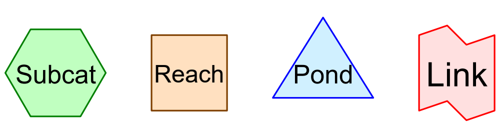
Inflow Area =	26,584 sf,	17.55% Impervious,	Inflow Depth = 2.22"	for 100-year event
Inflow =	1.45 cfs @	12.10 hrs, Volume=	4,925 cf	
Primary =	1.45 cfs @	12.10 hrs, Volume=	4,925 cf, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: A







Routing Diagram for HYDRO-PR
Prepared by Weston & Sampson, Printed 8/4/2021
HydroCAD® 10.10-3a s/n 00455 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	Type III 24-hr		Default	24.00	1	3.27	2
2	10-year	Type III 24-hr		Default	24.00	1	5.15	2
3	25-year	Type III 24-hr		Default	24.00	1	6.32	2
4	100-year	Type III 24-hr		Default	24.00	1	8.13	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
19,773	39	>75% Grass cover, Good, HSG A (A1, A2, A3, A4, A5, A6)
4,734	98	Paved parking, HSG A (A1, A2, A3, A4, A5, A6)
67	39	Pervious Surface, Good, HSG A (A4)
2,010	39	Pervious Surface, HSG A (A3, A6)
26,584	**50**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
26,584	HSG A	A1, A2, A3, A4, A5, A6
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
26,584		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
19,773	0	0	0	0	19,773	>75% Grass cover, Good	
4,734	0	0	0	0	4,734	Paved parking	
2,010	0	0	0	0	2,010	Pervious Surface	
67	0	0	0	0	67	Pervious Surface, Good	
26,584	**0**	**0**	**0**	**0**	**26,584**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1P	143.20	143.00	20.0	0.0100	0.012	12.0	0.0	0.0
2	XB-1	143.16	143.00	16.0	0.0100	0.012	6.0	0.0	0.0
3	XB-2	143.68	143.30	38.0	0.0100	0.012	6.0	0.0	0.0
4	XB-4	143.52	143.30	22.0	0.0100	0.012	6.0	0.0	0.0
5	XB-5	143.23	143.00	21.0	0.0110	0.012	6.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=4,054 sf 9.69% Impervious Runoff Depth=0.05"
Tc=6.0 min CN=45 Runoff=0.00 cfs 18 cf

SubcatchmentA2: SUB-A2 Runoff Area=2,276 sf 12.26% Impervious Runoff Depth=0.07"
Tc=6.0 min CN=46 Runoff=0.00 cfs 13 cf

SubcatchmentA3: SUB-A3 Runoff Area=2,771 sf 14.62% Impervious Runoff Depth=0.10"
Tc=6.0 min CN=48 Runoff=0.00 cfs 24 cf

SubcatchmentA4: SUB-A4 Runoff Area=1,891 sf 16.23% Impervious Runoff Depth=0.12"
Tc=6.0 min CN=49 Runoff=0.00 cfs 19 cf

SubcatchmentA5: SUB-A5 Runoff Area=1,258 sf 25.83% Impervious Runoff Depth=0.24"
Tc=6.0 min CN=54 Runoff=0.00 cfs 26 cf

SubcatchmentA6: SUB-A6 Runoff Area=14,334 sf 21.10% Impervious Runoff Depth=0.17"
Tc=6.0 min CN=51 Runoff=0.01 cfs 198 cf

Pond 1P: 1P Peak Elev=143.20' Inflow=0.00 cfs 0 cf
12.0" Round Culvert n=0.012 L=20.0' S=0.0100 '/' Outflow=0.00 cfs 0 cf

Pond XB-1: XB-1 Peak Elev=144.76' Storage=0 cf Inflow=0.00 cfs 18 cf
Discarded=0.00 cfs 18 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 18 cf

Pond XB-2: XB-2 Peak Elev=145.81' Storage=0 cf Inflow=0.00 cfs 13 cf
Discarded=0.00 cfs 13 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 13 cf

Pond XB-3: XB-3 Peak Elev=145.15' Storage=1 cf Inflow=0.00 cfs 24 cf
Discarded=0.00 cfs 24 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 24 cf

Pond XB-4: XB-3 Peak Elev=146.56' Storage=1 cf Inflow=0.00 cfs 19 cf
Discarded=0.00 cfs 19 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 19 cf

Pond XB-5: XB-5 Peak Elev=146.85' Storage=2 cf Inflow=0.00 cfs 26 cf
Discarded=0.00 cfs 26 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 26 cf

Link A: A Inflow=0.01 cfs 198 cf
Primary=0.01 cfs 198 cf

Total Runoff Area = 26,584 sf Runoff Volume = 297 cf Average Runoff Depth = 0.13"
82.19% Pervious = 21,850 sf 17.81% Impervious = 4,734 sf

Summary for Subcatchment A1: SUB-A1

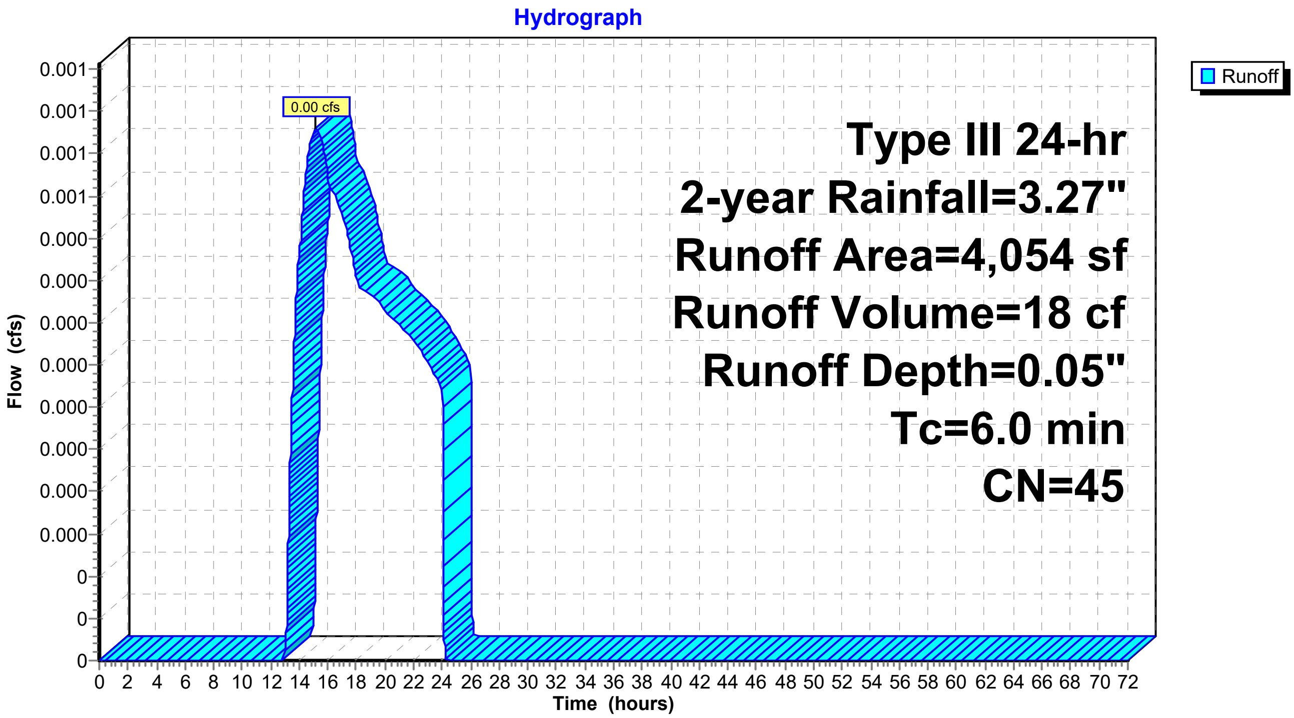
Runoff = 0.00 cfs @ 15.18 hrs, Volume= 18 cf, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
393	98	Paved parking, HSG A
3,661	39	>75% Grass cover, Good, HSG A
4,054	45	Weighted Average
3,661		90.31% Pervious Area
393		9.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

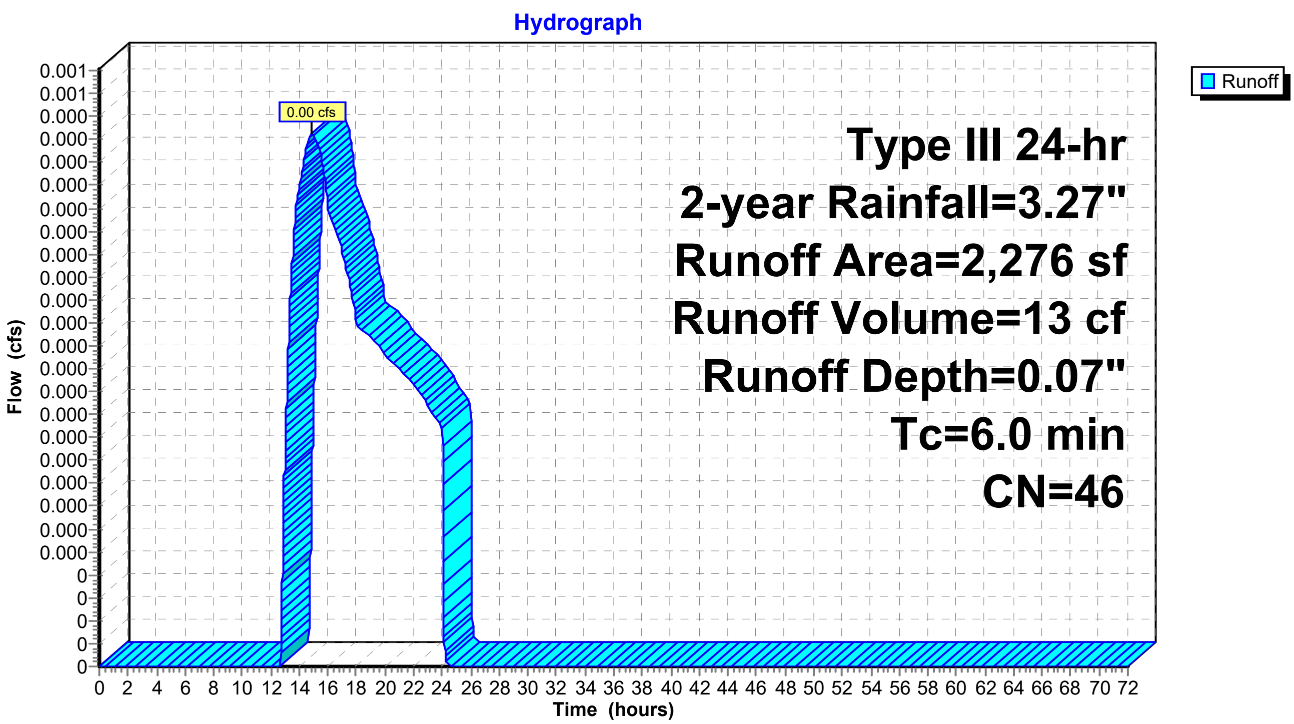
Runoff = 0.00 cfs @ 14.90 hrs, Volume= 13 cf, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
279	98	Paved parking, HSG A
1,997	39	>75% Grass cover, Good, HSG A
2,276	46	Weighted Average
1,997		87.74% Pervious Area
279		12.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

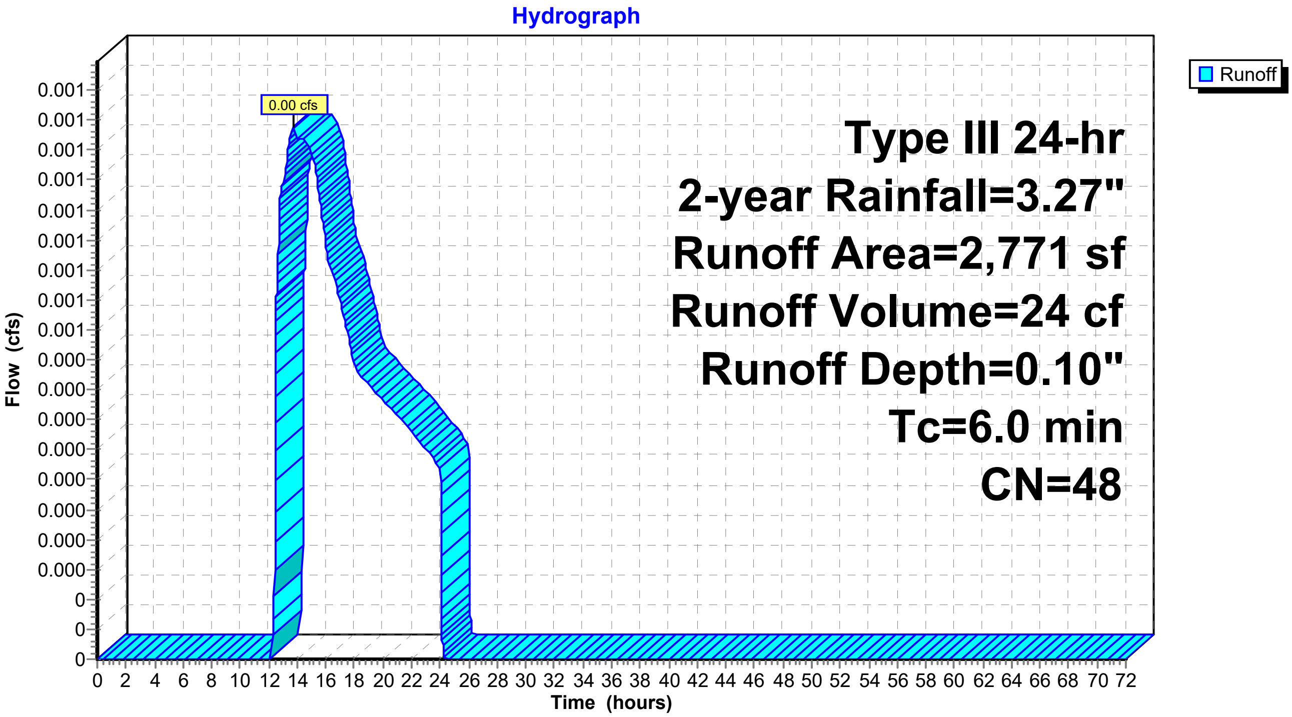
Runoff = 0.00 cfs @ 13.74 hrs, Volume= 24 cf, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.27"

	Area (sf)	CN	Description
	405	98	Paved parking, HSG A
	2,314	39	>75% Grass cover, Good, HSG A
*	52	39	Pervious Surface, HSG A
	2,771	48	Weighted Average
	2,366		85.38% Pervious Area
	405		14.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

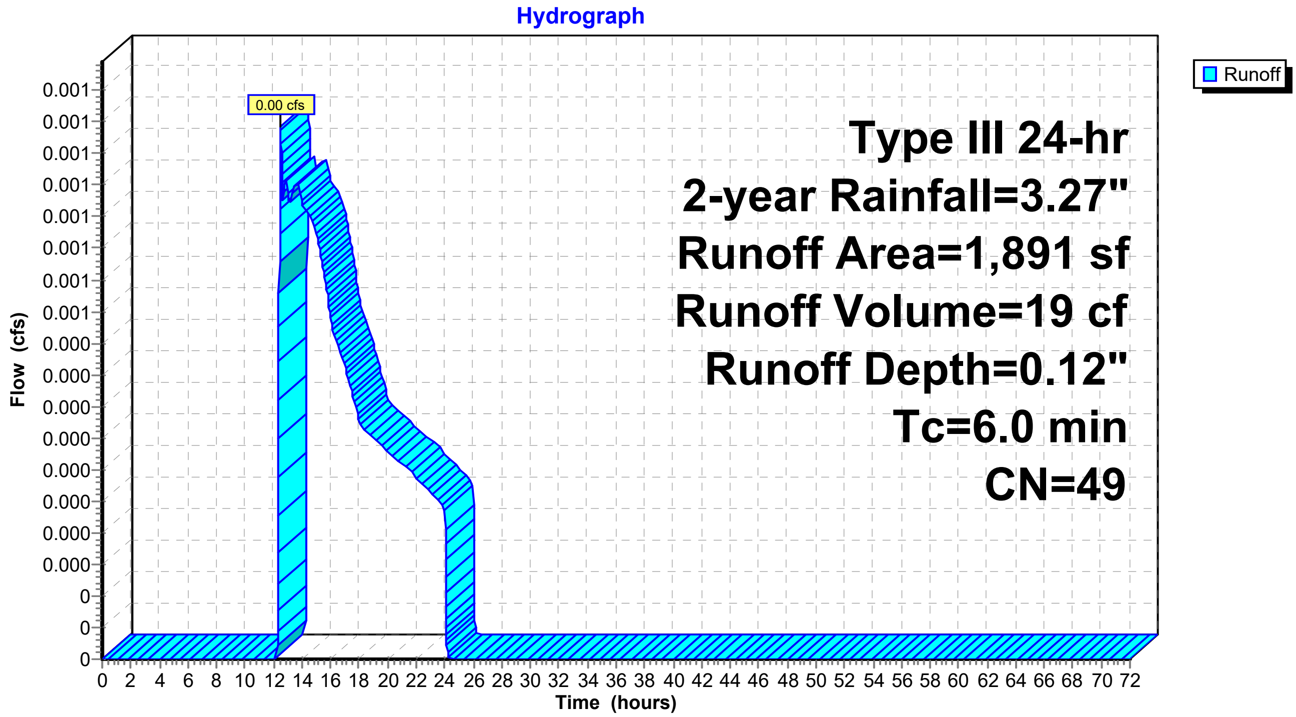
Runoff = 0.00 cfs @ 12.49 hrs, Volume= 19 cf, Depth= 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.27"

	Area (sf)	CN	Description
	307	98	Paved parking, HSG A
	1,517	39	>75% Grass cover, Good, HSG A
*	67	39	Pervious Surface, Good, HSG A
	1,891	49	Weighted Average
	1,584		83.77% Pervious Area
	307		16.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A4: SUB-A4



Summary for Subcatchment A5: SUB-A5

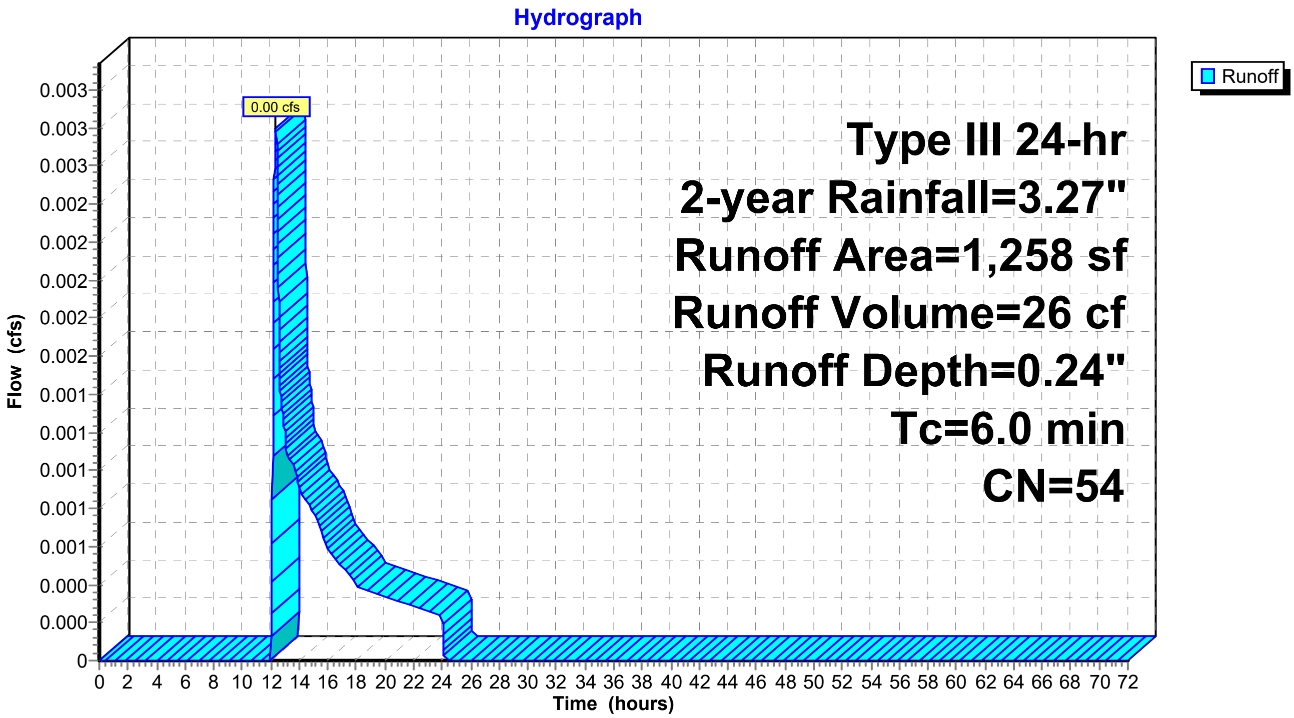
Runoff = 0.00 cfs @ 12.34 hrs, Volume= 26 cf, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
325	98	Paved parking, HSG A
933	39	>75% Grass cover, Good, HSG A
1,258	54	Weighted Average
933		74.17% Pervious Area
325		25.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A5: SUB-A5



Summary for Subcatchment A6: SUB-A6

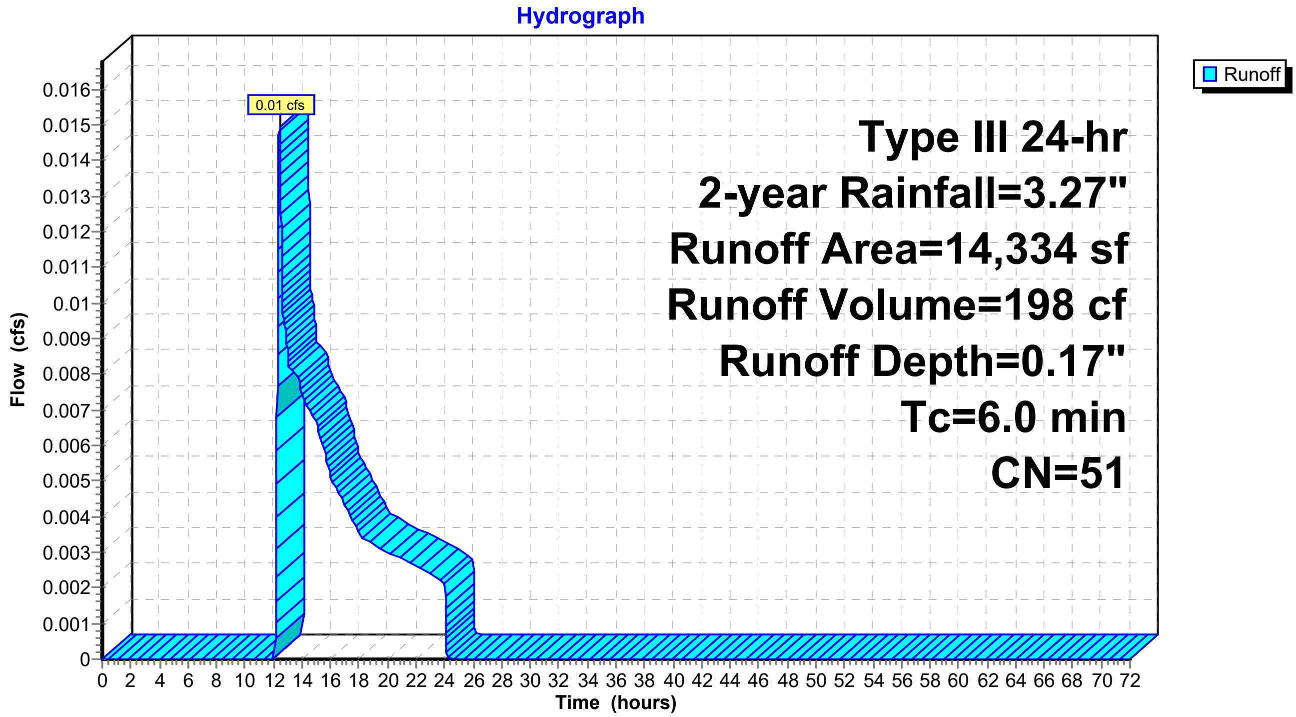
Runoff = 0.01 cfs @ 12.42 hrs, Volume= 198 cf, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.27"

	Area (sf)	CN	Description
	3,025	98	Paved parking, HSG A
	9,351	39	>75% Grass cover, Good, HSG A
*	1,958	39	Pervious Surface, HSG A
	14,334	51	Weighted Average
	11,309		78.90% Pervious Area
	3,025		21.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A6: SUB-A6



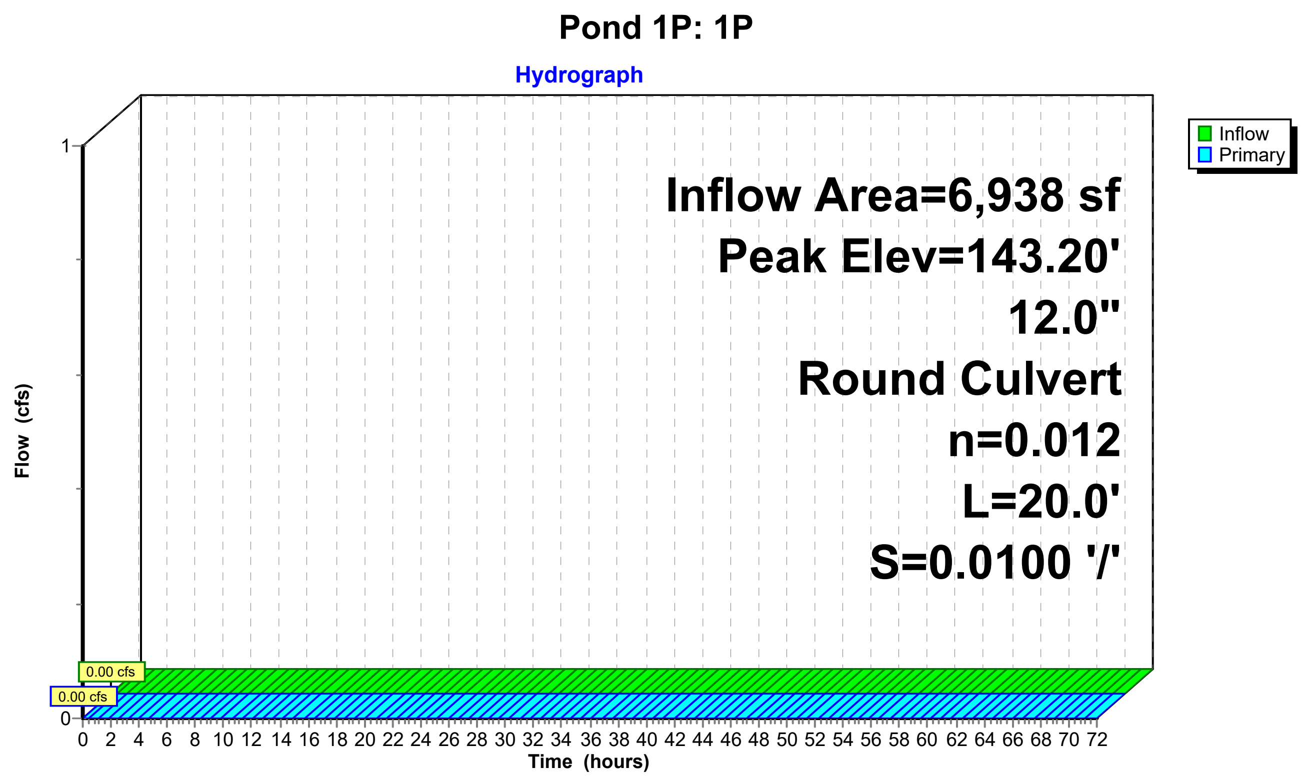
Summary for Pond 1P: 1P

Inflow Area =	6,938 sf,	14.28% Impervious,	Inflow Depth = 0.00"	for 2-year event	
Inflow =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	
Outflow =	0.00 cfs @	0.00 hrs,	Volume=	0 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 143.20' @ 0.00 hrs
Flood Elev= 145.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	143.20'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.20' / 143.00' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=143.20' TW=0.00' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)



Summary for Pond XB-1: XB-1

Inflow Area = 4,054 sf, 9.69% Impervious, Inflow Depth = 0.05" for 2-year event
Inflow = 0.00 cfs @ 15.18 hrs, Volume= 18 cf
Outflow = 0.00 cfs @ 15.49 hrs, Volume= 18 cf, Atten= 1%, Lag= 18.6 min
Discarded = 0.00 cfs @ 15.49 hrs, Volume= 18 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 144.76' @ 15.49 hrs Surf.Area= 11 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.3 min (1,093.6 - 1,093.3)

Volume	Invert	Avail.Storage	Storage Description
#1	144.75'	173 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

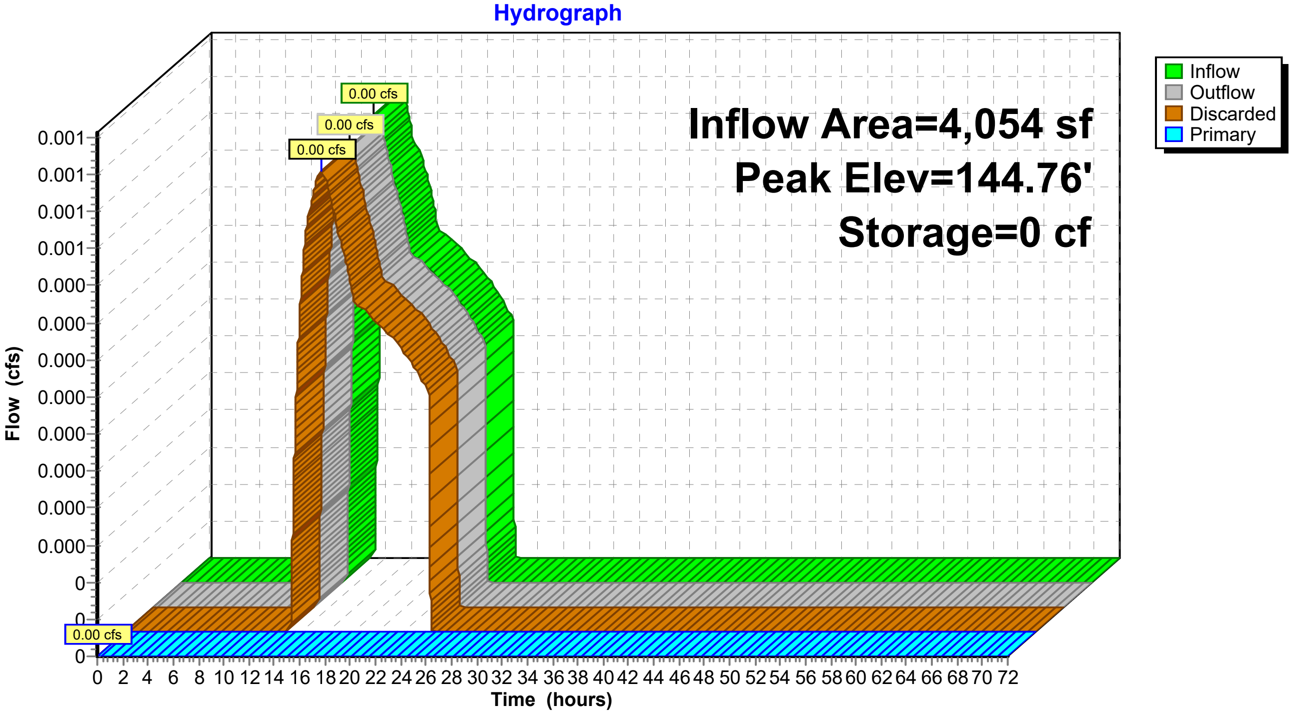
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
144.75	10	0	0
145.00	50	8	8
146.00	280	165	173

Device	Routing	Invert	Outlet Devices
#1	Primary	143.16'	**6.0" Round Culvert** L= 16.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.16' / 143.00' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Device 1	145.30'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	144.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 15.49 hrs HW=144.76' (Free Discharge)
└─**3=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=144.75' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.00 cfs of 0.86 cfs potential flow)
  └─**2=Orifice/Grate** (Controls 0.00 cfs)

Pond XB-1: XB-1


Hydrograph
Inflow Area=4,054 sf
Peak Elev=144.76'
Storage=0 cf
Inflow
Outflow
Discarded
Primary
0.00 cfs
0.00 cfs
0.00 cfs
0.00 cfs
Flow (cfs)
0.001
0.001
0.001
0.001
0.000
0.000
0.000
0.000
0.000
0.000
0.000
0.000
0
0
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Pond XB-2: XB-2

Inflow Area = 2,276 sf, 12.26% Impervious, Inflow Depth = 0.07" for 2-year event
Inflow = 0.00 cfs @ 14.90 hrs, Volume= 13 cf
Outflow = 0.00 cfs @ 15.51 hrs, Volume= 13 cf, Atten= 4%, Lag= 36.5 min
Discarded = 0.00 cfs @ 15.51 hrs, Volume= 13 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 145.81' @ 15.51 hrs Surf.Area= 8 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 5.4 min (1,075.7 - 1,070.2)

Volume	Invert	Avail.Storage	Storage Description
#1	145.75'	107 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

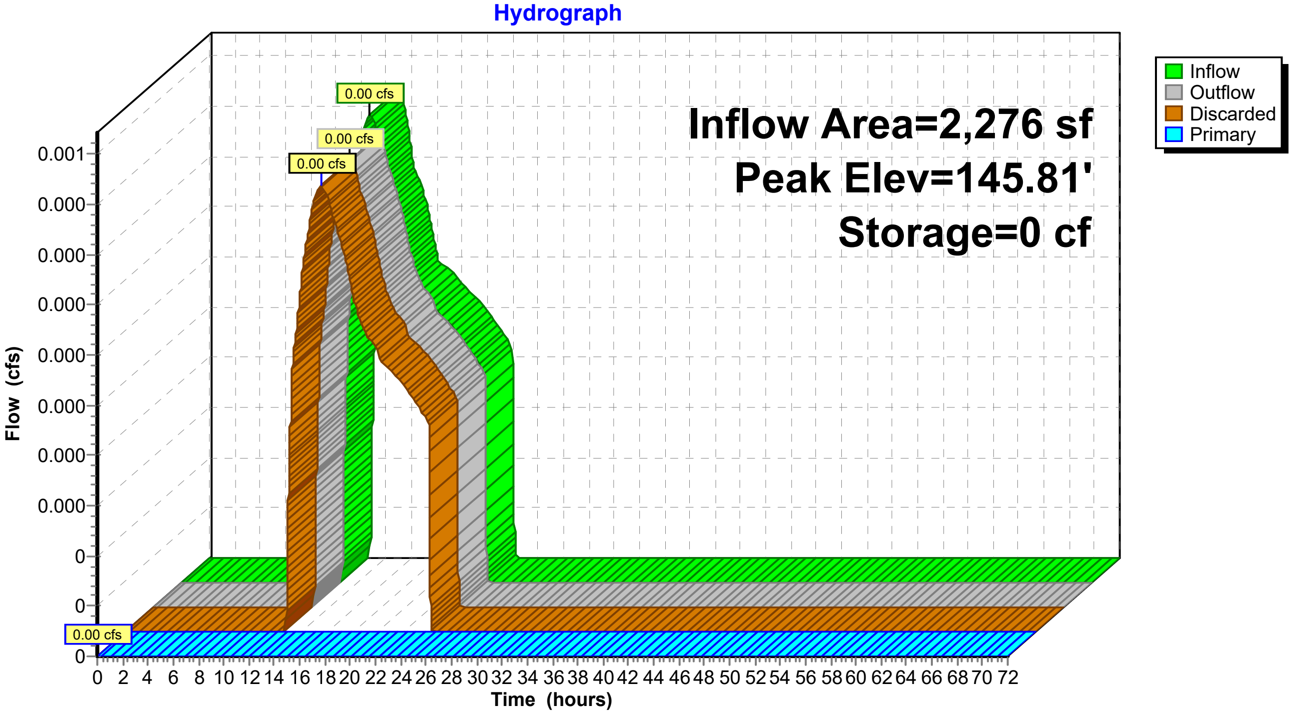
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
145.75	5	0	0
146.00	18	3	3
147.00	190	104	107

Device	Routing	Invert	Outlet Devices
#1	Primary	143.68'	**6.0" Round Culvert** L= 38.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.68' / 143.30' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Device 1	146.25'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	145.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 15.51 hrs HW=145.81' (Free Discharge)
└─**3=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=145.75' TW=143.20' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.00 cfs of 1.01 cfs potential flow)
  └─**2=Orifice/Grate** (Controls 0.00 cfs)

Pond XB-2: XB-2


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=2,276 sf
Peak Elev=145.81'
Storage=0 cf
0.00 cfs
0.00 cfs
0.00 cfs
0.00 cfs
Flow (cfs)
0.001
0.000
0.000
0.000
0.000
0.000
0.000
0.000
0
0
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Pond XB-3: XB-3

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	2,771 sf,	14.62% Impervious,	Inflow Depth = 0.10"	for 2-year event
Inflow =	0.00 cfs @	13.74 hrs, Volume=	24 cf	
Outflow =	0.00 cfs @	15.19 hrs, Volume=	24 cf,	Atten= 7%, Lag= 87.1 min
Discarded =	0.00 cfs @	15.19 hrs, Volume=	24 cf	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 145.15' @ 15.19 hrs Surf.Area= 14 sf Storage= 1 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 19.5 min (1,051.8 - 1,032.3)

Volume	Invert	Avail.Storage	Storage Description
#1	145.00'	143 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

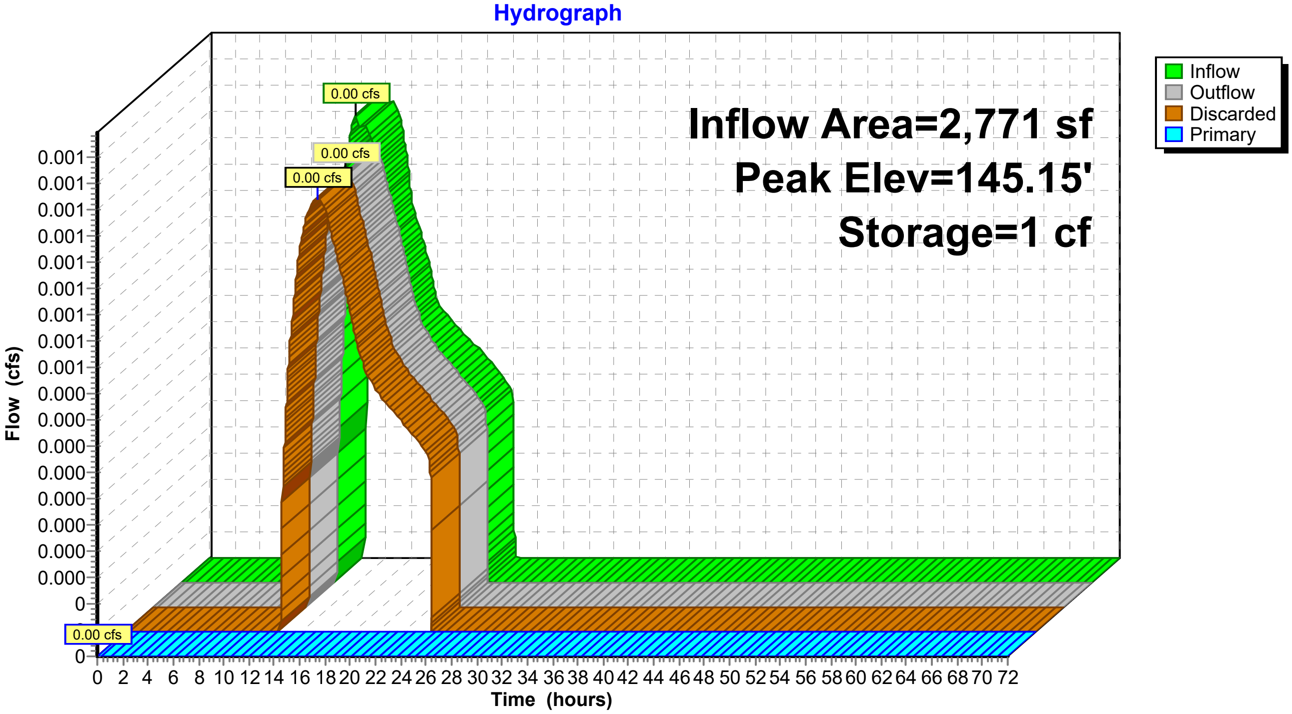
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
145.00	5	0	0
146.00	65	35	35
147.00	150	108	143

Device	Routing	Invert	Outlet Devices
#1	Primary	145.25'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	145.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 15.19 hrs HW=145.15' (Free Discharge)
└─**2=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=145.00' TW=143.20' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Controls 0.00 cfs)

Pond XB-3: XB-3


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=2,771 sf
Peak Elev=145.15'
Storage=1 cf
0.00 cfs
0.00 cfs
0.00 cfs
0.00 cfs
Flow (cfs)
0.001
0.000
0
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72

Summary for Pond XB-4: XB-3

Inflow Area = 1,891 sf, 16.23% Impervious, Inflow Depth = 0.12" for 2-year event
Inflow = 0.00 cfs @ 12.49 hrs, Volume= 19 cf
Outflow = 0.00 cfs @ 13.90 hrs, Volume= 19 cf, Atten= 13%, Lag= 84.4 min
Discarded = 0.00 cfs @ 13.90 hrs, Volume= 19 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 146.56' @ 13.90 hrs Surf.Area= 13 sf Storage= 1 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 6.5 min (1,023.1 - 1,016.6)

Volume	Invert	Avail.Storage	Storage Description
#1	146.50'	73 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

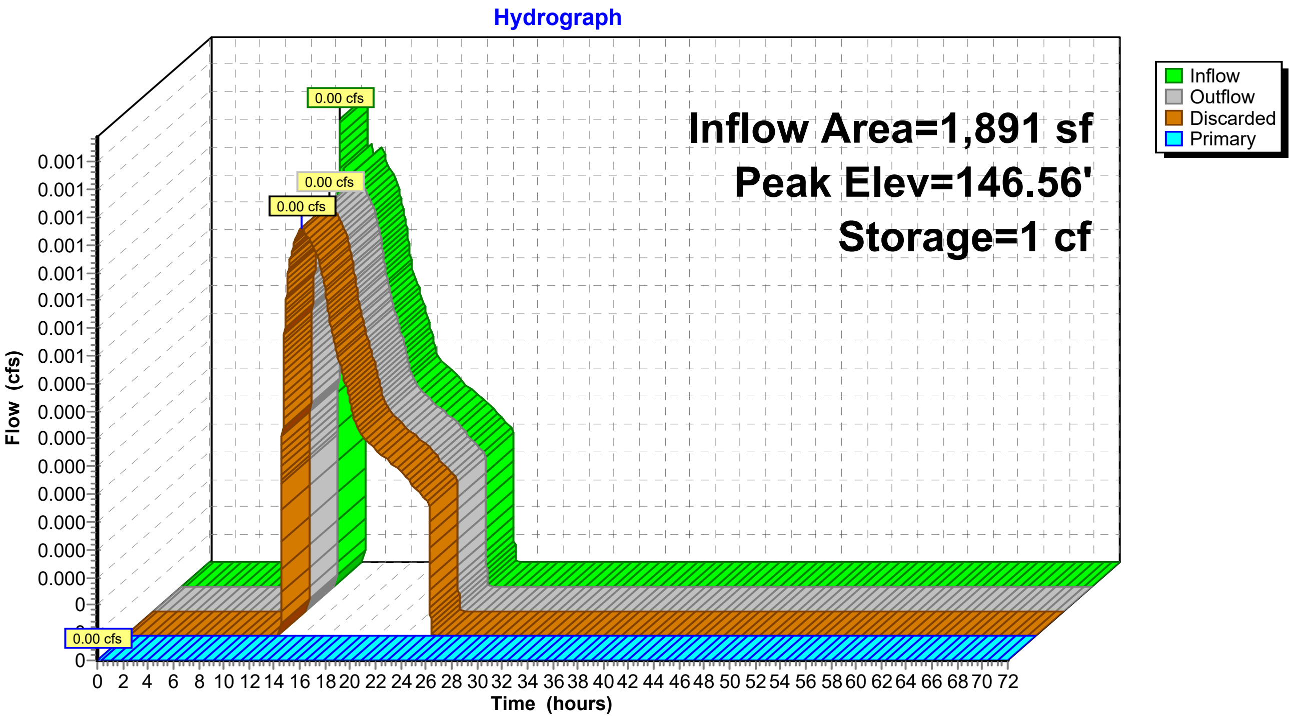
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
146.50	5	0	0
147.00	75	20	20
147.50	135	53	73

Device	Routing	Invert	Outlet Devices
#1	Primary	143.52'	**6.0" Round Culvert** L= 22.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.52' / 143.30' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Device 1	147.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	146.50'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 13.90 hrs HW=146.56' (Free Discharge)
└─**3=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=146.50' TW=143.20' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.00 cfs of 1.23 cfs potential flow)
  └─**2=Orifice/Grate** (Controls 0.00 cfs)

Pond XB-4: XB-3


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=1,891 sf
Peak Elev=146.56'
Storage=1 cf
0.00 cfs
0.00 cfs
0.00 cfs
0.00 cfs
Flow (cfs)
0.001
0.000
0
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72

Summary for Pond XB-5: XB-5

Inflow Area = 1,258 sf, 25.83% Impervious, Inflow Depth = 0.24" for 2-year event
Inflow = 0.00 cfs @ 12.34 hrs, Volume= 26 cf
Outflow = 0.00 cfs @ 12.57 hrs, Volume= 26 cf, Atten= 40%, Lag= 13.6 min
Discarded = 0.00 cfs @ 12.57 hrs, Volume= 26 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 146.85' @ 12.57 hrs Surf.Area= 30 sf Storage= 2 cf

Plug-Flow detention time= 7.8 min calculated for 26 cf (100% of inflow)
Center-of-Mass det. time= 7.8 min (967.2 - 959.4)

Volume	Invert	Avail.Storage	Storage Description
#1	146.75'	56 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

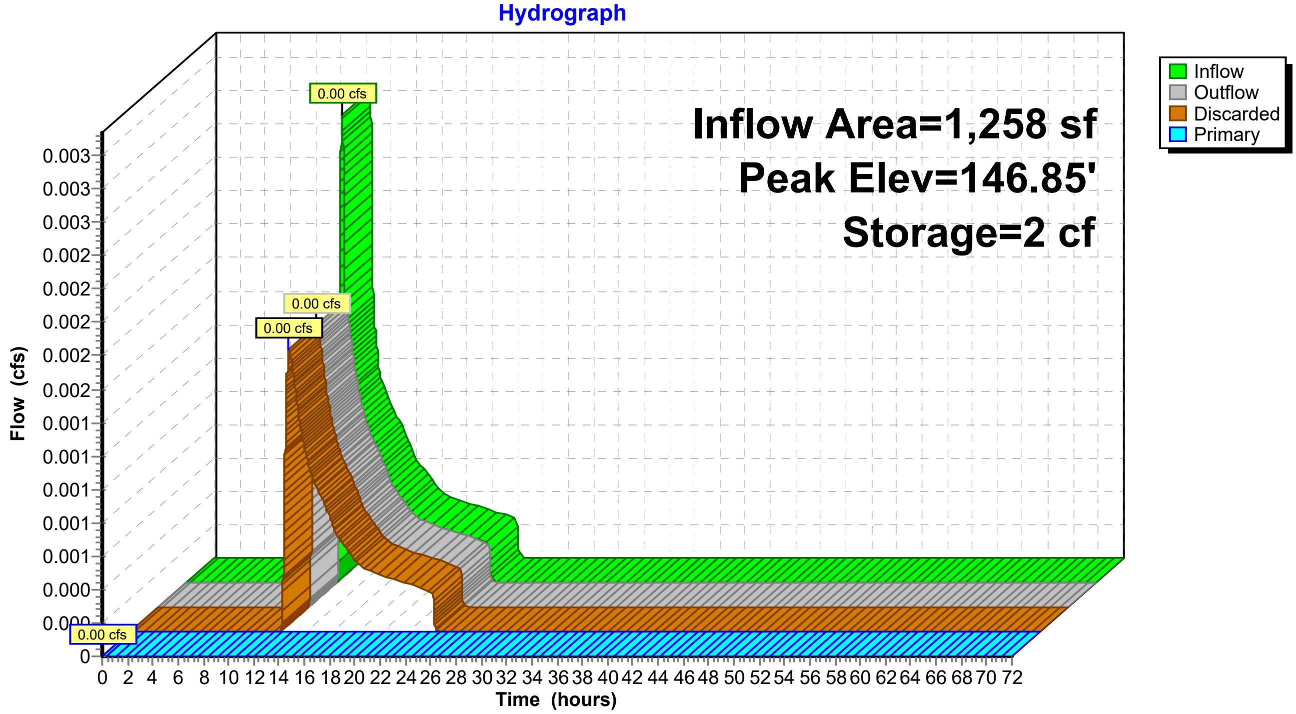
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
146.75	5	0	0
147.00	65	9	9
147.50	125	48	56

Device	Routing	Invert	Outlet Devices
#1	Primary	143.23'	**6.0" Round Culvert** L= 21.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.23' / 143.00' S= 0.0110 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Device 1	147.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	146.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 12.57 hrs HW=146.85' (Free Discharge)
└─**3=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=146.75' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.00 cfs of 1.35 cfs potential flow)
  └─**2=Orifice/Grate** (Controls 0.00 cfs)

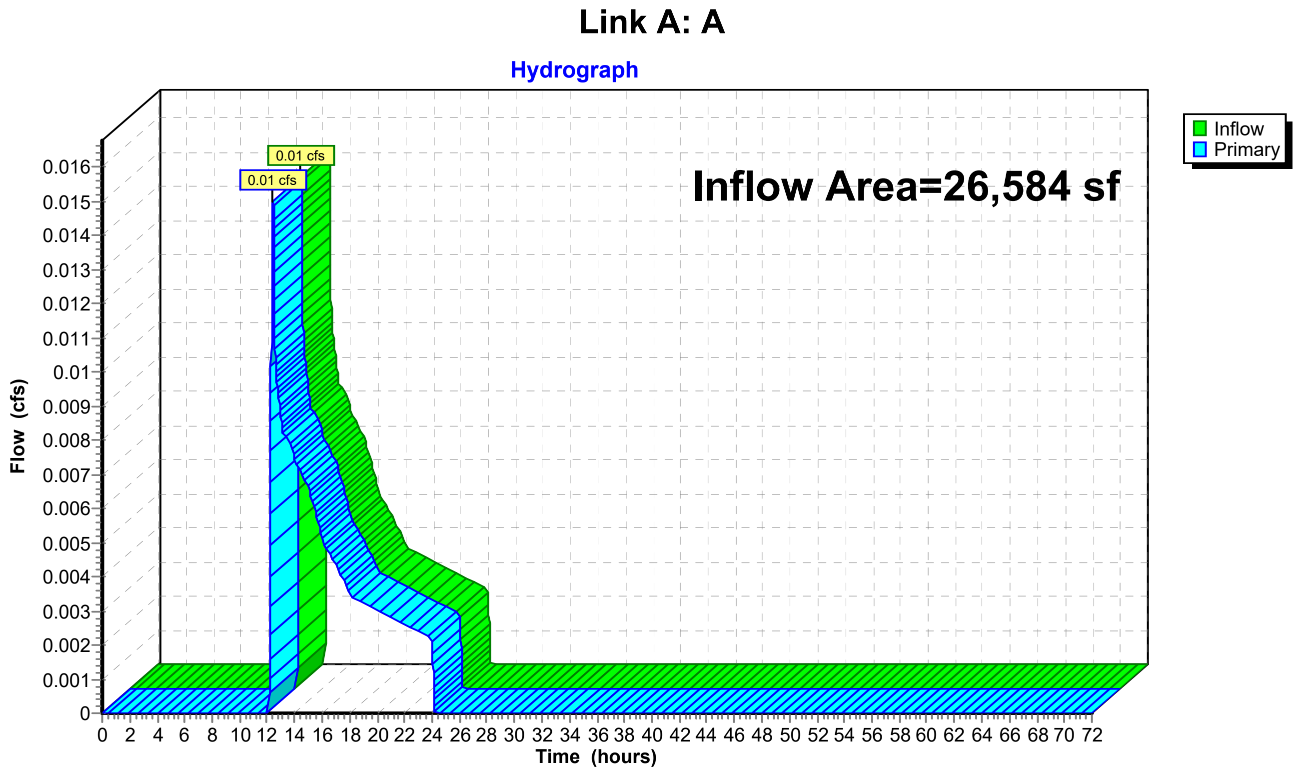
Pond XB-5: XB-5


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=1,258 sf
Peak Elev=146.85'
Storage=2 cf
0.00 cfs
0.00 cfs
0.00 cfs
0.00 cfs
Flow (cfs)
0.003
0.003
0.003
0.002
0.002
0.002
0.002
0.002
0.001
0.001
0.001
0.001
0.001
0.000
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Link A: A

Inflow Area = 26,584 sf, 17.81% Impervious, Inflow Depth = 0.09" for 2-year event
Inflow = 0.01 cfs @ 12.42 hrs, Volume= 198 cf
Primary = 0.01 cfs @ 12.42 hrs, Volume= 198 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1	Runoff Area=4,054 sf 9.69% Impervious Runoff Depth=0.49" Tc=6.0 min CN=45 Runoff=0.02 cfs 166 cf
SubcatchmentA2: SUB-A2	Runoff Area=2,276 sf 12.26% Impervious Runoff Depth=0.54" Tc=6.0 min CN=46 Runoff=0.01 cfs 102 cf
SubcatchmentA3: SUB-A3	Runoff Area=2,771 sf 14.62% Impervious Runoff Depth=0.64" Tc=6.0 min CN=48 Runoff=0.03 cfs 149 cf
SubcatchmentA4: SUB-A4	Runoff Area=1,891 sf 16.23% Impervious Runoff Depth=0.70" Tc=6.0 min CN=49 Runoff=0.02 cfs 110 cf
SubcatchmentA5: SUB-A5	Runoff Area=1,258 sf 25.83% Impervious Runoff Depth=0.99" Tc=6.0 min CN=54 Runoff=0.03 cfs 104 cf
SubcatchmentA6: SUB-A6	Runoff Area=14,334 sf 21.10% Impervious Runoff Depth=0.81" Tc=6.0 min CN=51 Runoff=0.22 cfs 970 cf
Pond 1P: 1P	Peak Elev=143.29' Inflow=0.03 cfs 109 cf 12.0" Round Culvert n=0.012 L=20.0' S=0.0100 '/' Outflow=0.03 cfs 109 cf
Pond XB-1: XB-1	Peak Elev=145.27' Storage=29 cf Inflow=0.02 cfs 166 cf Discarded=0.01 cfs 166 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 166 cf
Pond XB-2: XB-2	Peak Elev=146.25' Storage=13 cf Inflow=0.01 cfs 102 cf Discarded=0.00 cfs 93 cf Primary=0.01 cfs 9 cf Outflow=0.01 cfs 102 cf
Pond XB-3: XB-3	Peak Elev=145.26' Storage=3 cf Inflow=0.03 cfs 149 cf Discarded=0.00 cfs 54 cf Primary=0.03 cfs 94 cf Outflow=0.03 cfs 149 cf
Pond XB-4: XB-3	Peak Elev=147.00' Storage=20 cf Inflow=0.02 cfs 110 cf Discarded=0.00 cfs 104 cf Primary=0.01 cfs 6 cf Outflow=0.01 cfs 110 cf
Pond XB-5: XB-5	Peak Elev=147.01' Storage=9 cf Inflow=0.03 cfs 104 cf Discarded=0.00 cfs 82 cf Primary=0.02 cfs 22 cf Outflow=0.03 cfs 104 cf
Link A: A	Inflow=0.26 cfs 1,101 cf Primary=0.26 cfs 1,101 cf

Total Runoff Area = 26,584 sf Runoff Volume = 1,601 cf Average Runoff Depth = 0.72"
82.19% Pervious = 21,850 sf 17.81% Impervious = 4,734 sf

Summary for Subcatchment A1: SUB-A1

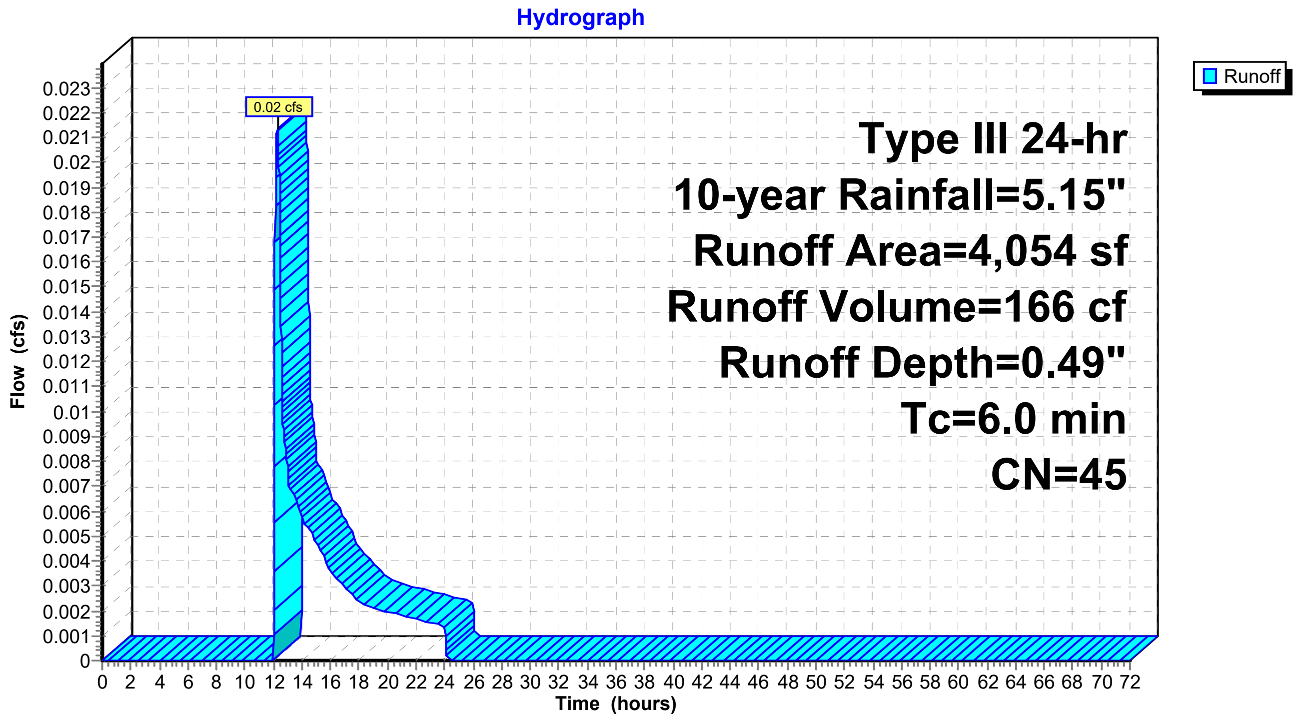
Runoff = 0.02 cfs @ 12.29 hrs, Volume= 166 cf, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.15"

Area (sf)	CN	Description
393	98	Paved parking, HSG A
3,661	39	>75% Grass cover, Good, HSG A
4,054	45	Weighted Average
3,661		90.31% Pervious Area
393		9.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

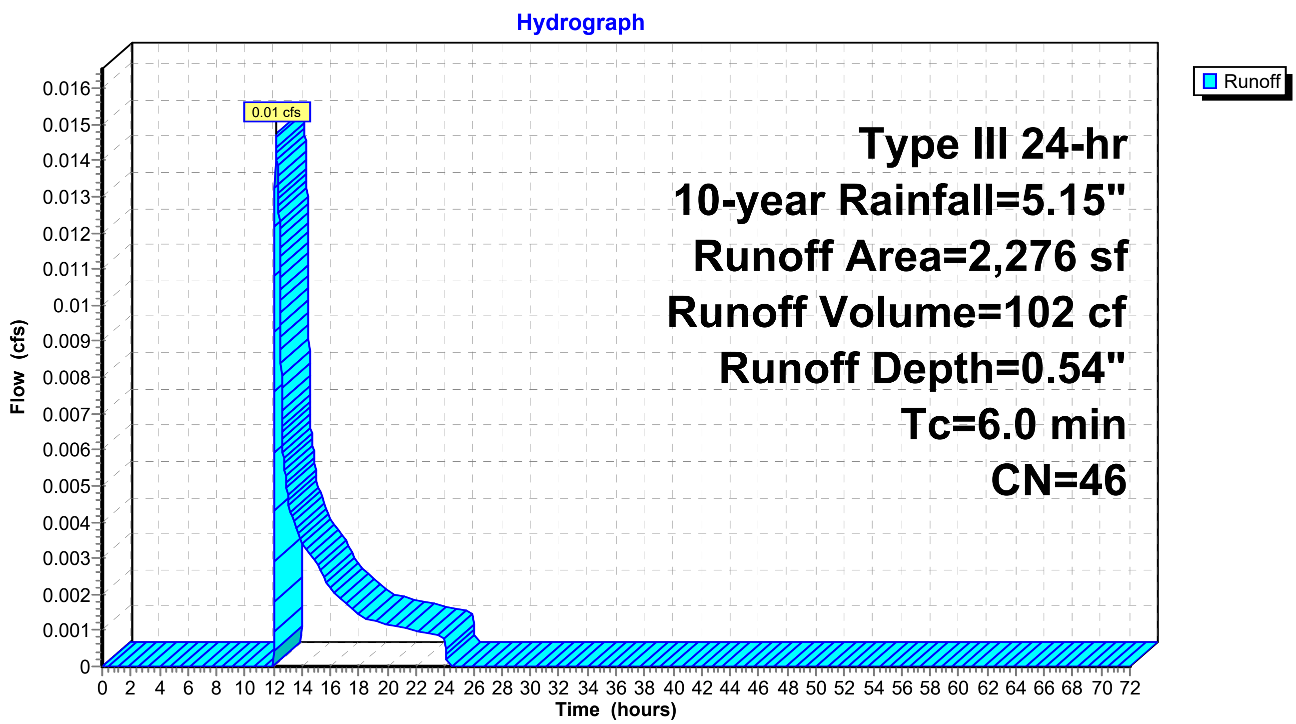
Runoff = 0.01 cfs @ 12.15 hrs, Volume= 102 cf, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.15"

Area (sf)	CN	Description
279	98	Paved parking, HSG A
1,997	39	>75% Grass cover, Good, HSG A
2,276	46	Weighted Average
1,997		87.74% Pervious Area
279		12.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

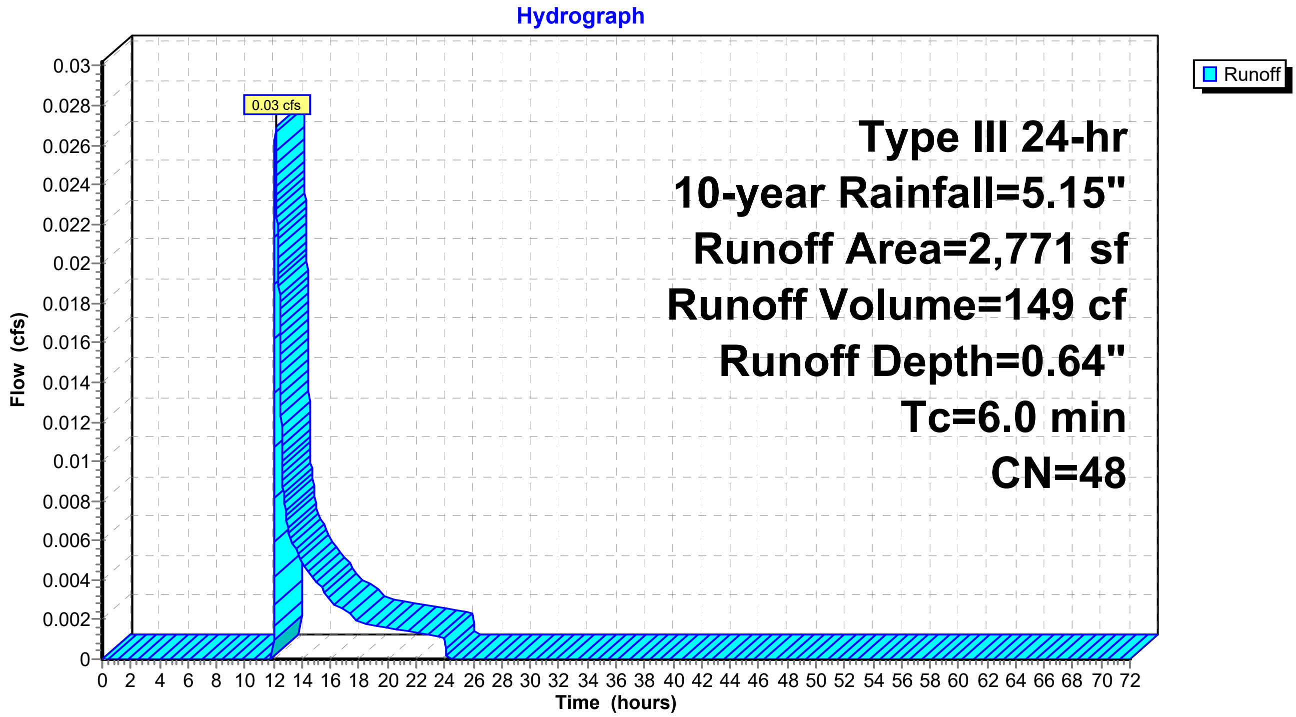
Runoff = 0.03 cfs @ 12.13 hrs, Volume= 149 cf, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.15"

	Area (sf)	CN	Description
	405	98	Paved parking, HSG A
	2,314	39	>75% Grass cover, Good, HSG A
*	52	39	Pervious Surface, HSG A
	2,771	48	Weighted Average
	2,366		85.38% Pervious Area
	405		14.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

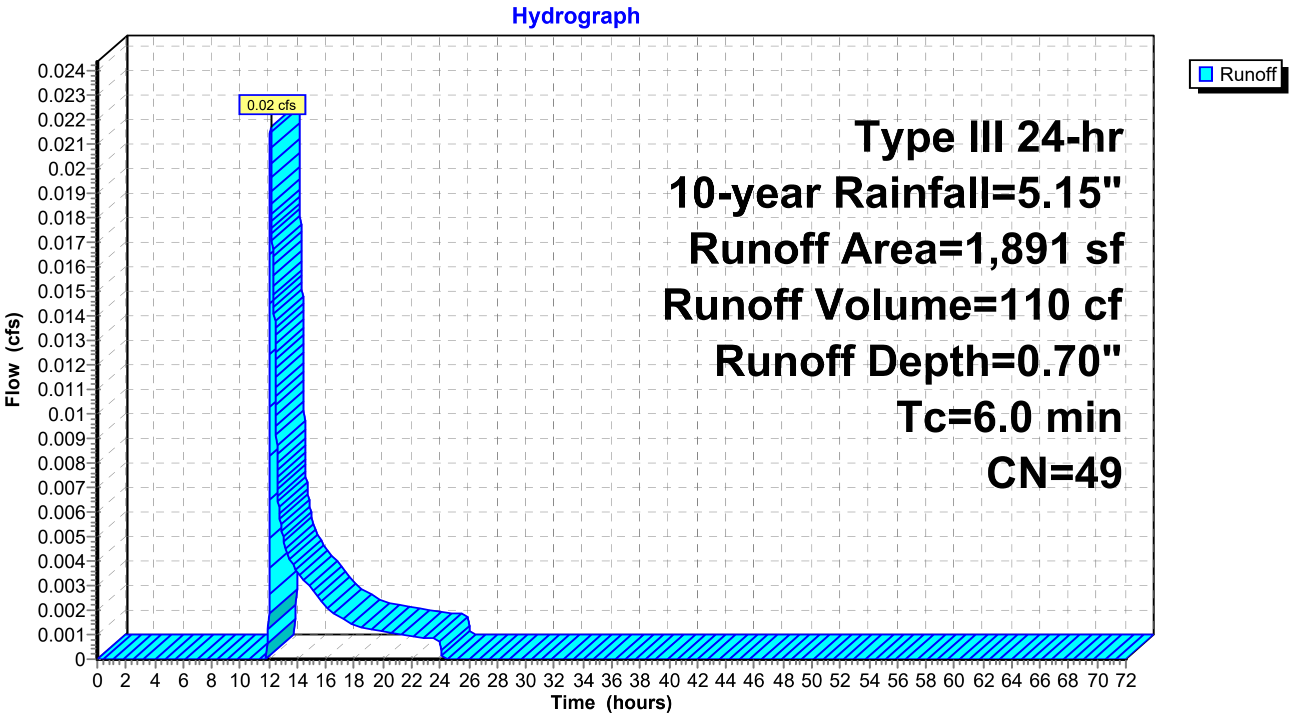
Runoff = 0.02 cfs @ 12.12 hrs, Volume= 110 cf, Depth= 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.15"

	Area (sf)	CN	Description
	307	98	Paved parking, HSG A
	1,517	39	>75% Grass cover, Good, HSG A
*	67	39	Pervious Surface, Good, HSG A
	1,891	49	Weighted Average
	1,584		83.77% Pervious Area
	307		16.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A4: SUB-A4



Summary for Subcatchment A5: SUB-A5

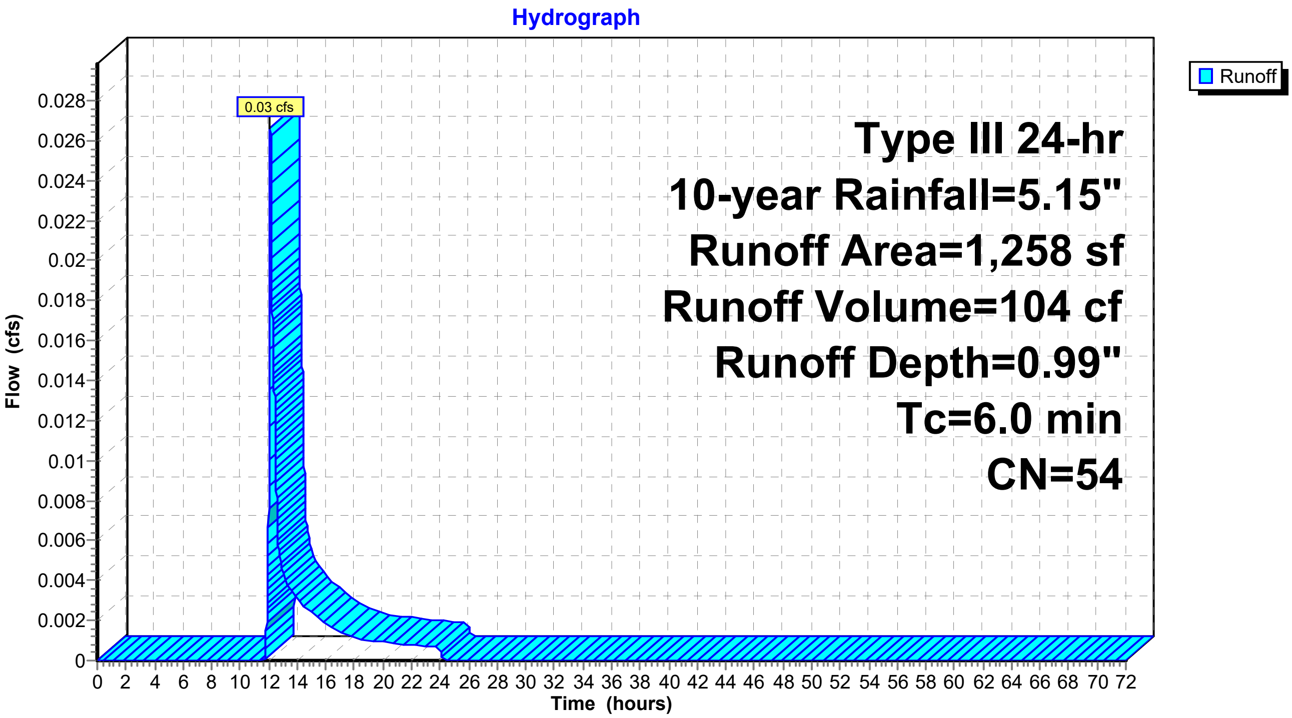
Runoff = 0.03 cfs @ 12.11 hrs, Volume= 104 cf, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.15"

Area (sf)	CN	Description
325	98	Paved parking, HSG A
933	39	>75% Grass cover, Good, HSG A
1,258	54	Weighted Average
933		74.17% Pervious Area
325		25.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A5: SUB-A5



Summary for Subcatchment A6: SUB-A6

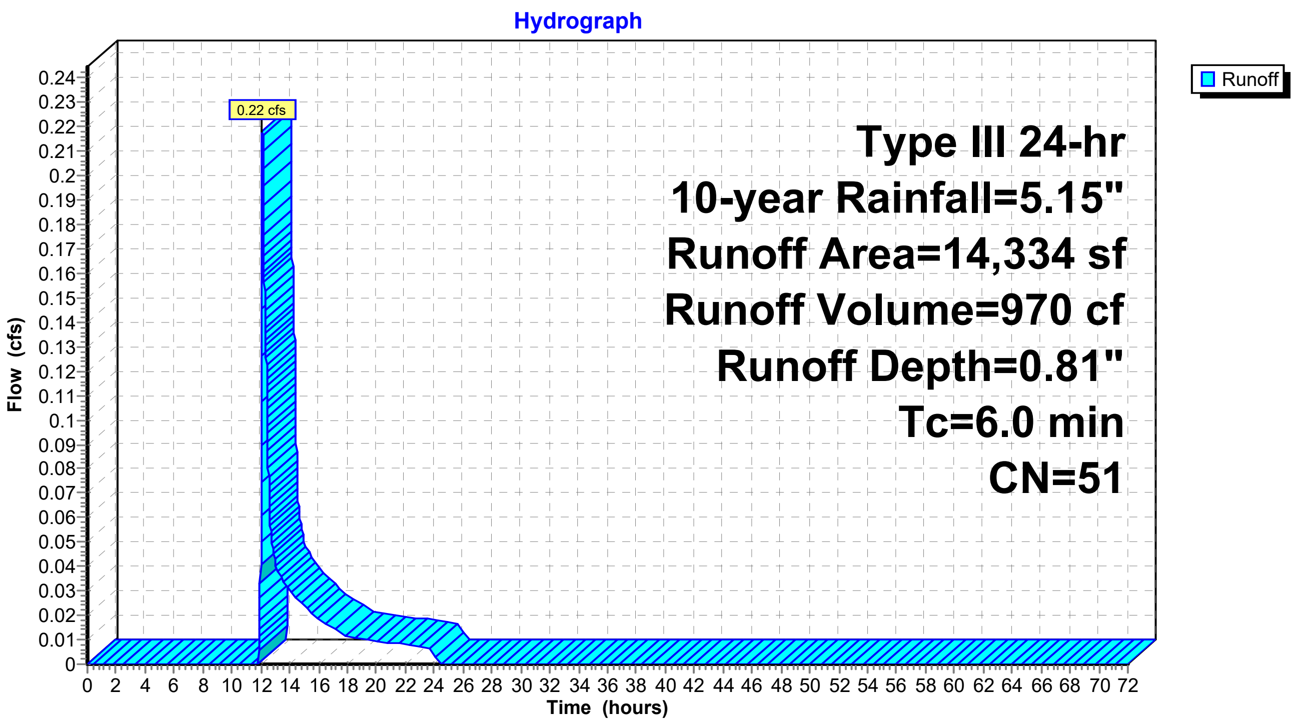
Runoff = 0.22 cfs @ 12.11 hrs, Volume= 970 cf, Depth= 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.15"

	Area (sf)	CN	Description
	3,025	98	Paved parking, HSG A
	9,351	39	>75% Grass cover, Good, HSG A
*	1,958	39	Pervious Surface, HSG A
	14,334	51	Weighted Average
	11,309		78.90% Pervious Area
	3,025		21.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A6: SUB-A6



Summary for Pond 1P: 1P

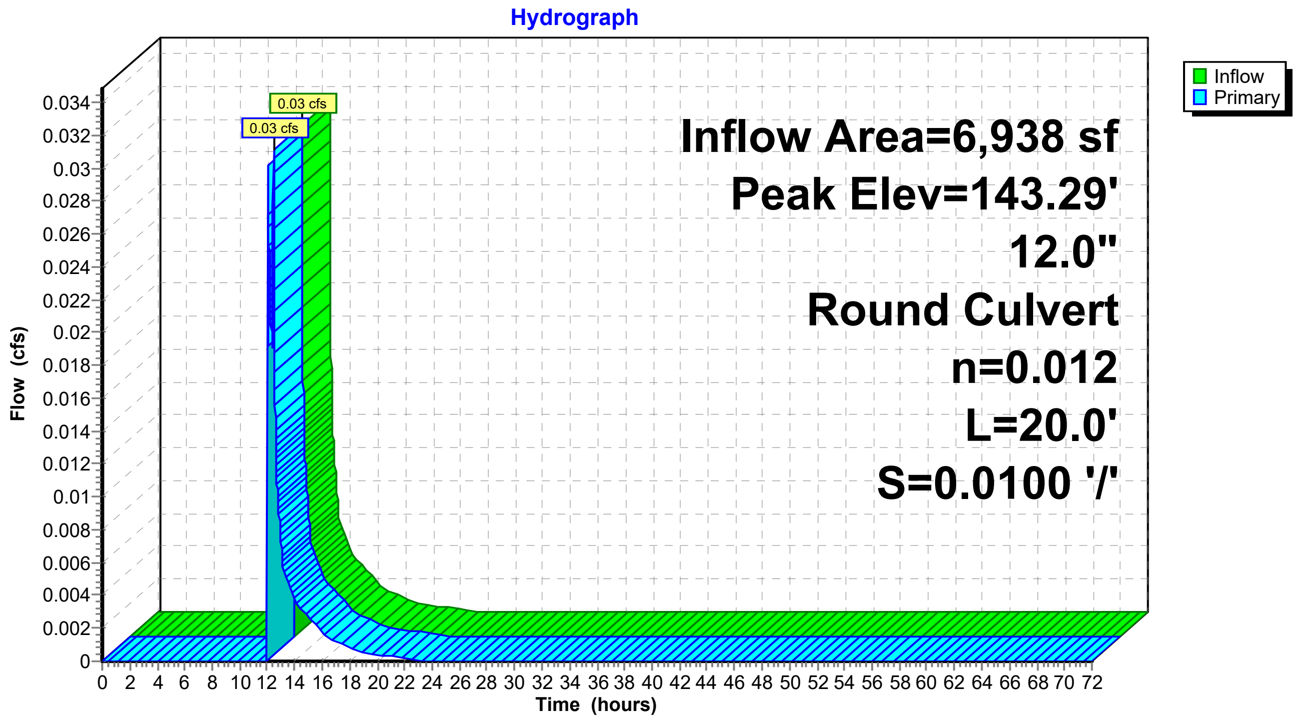
Inflow Area = 6,938 sf, 14.28% Impervious, Inflow Depth = 0.19" for 10-year event
Inflow = 0.03 cfs @ 12.44 hrs, Volume= 109 cf
Outflow = 0.03 cfs @ 12.44 hrs, Volume= 109 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.03 cfs @ 12.44 hrs, Volume= 109 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 143.29' @ 12.44 hrs
Flood Elev= 145.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	143.20'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.20' / 143.00' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.03 cfs @ 12.44 hrs HW=143.29' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.03 cfs @ 0.83 fps)

Pond 1P: 1P



Summary for Pond XB-1: XB-1

Inflow Area = 4,054 sf, 9.69% Impervious, Inflow Depth = 0.49" for 10-year event
Inflow = 0.02 cfs @ 12.29 hrs, Volume= 166 cf
Outflow = 0.01 cfs @ 13.20 hrs, Volume= 166 cf, Atten= 68%, Lag= 54.9 min
Discarded = 0.01 cfs @ 13.20 hrs, Volume= 166 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 145.27' @ 13.20 hrs Surf.Area= 112 sf Storage= 29 cf

Plug-Flow detention time= 53.3 min calculated for 166 cf (100% of inflow)
Center-of-Mass det. time= 53.3 min (994.2 - 940.9)

Volume	Invert	Avail.Storage	Storage Description
#1	144.75'	173 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

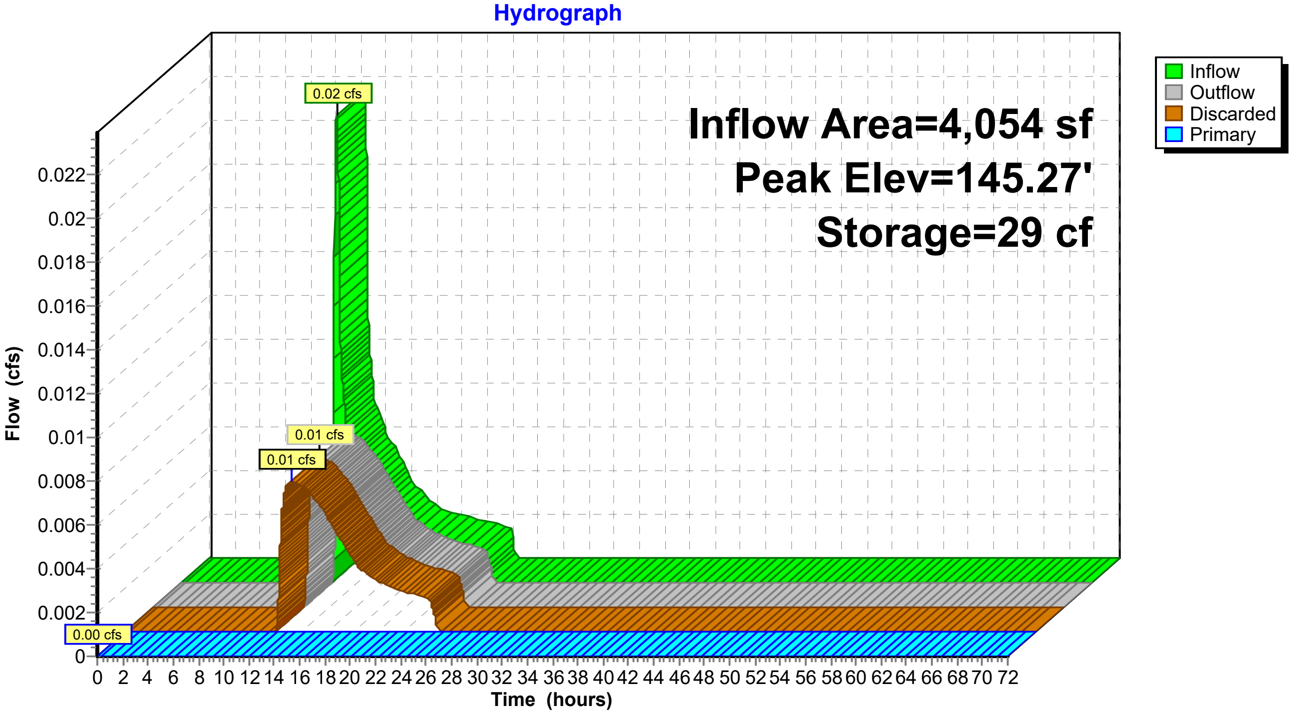
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
144.75	10	0	0
145.00	50	8	8
146.00	280	165	173

Device	Routing	Invert	Outlet Devices
#1	Primary	143.16'	**6.0" Round Culvert** L= 16.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.16' / 143.00' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Device 1	145.30'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	144.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.01 cfs @ 13.20 hrs HW=145.27' (Free Discharge)
└─**3=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=144.75' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.00 cfs of 0.86 cfs potential flow)
  └─**2=Orifice/Grate** (Controls 0.00 cfs)

Pond XB-1: XB-1


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=4,054 sf
Peak Elev=145.27'
Storage=29 cf
0.02 cfs
0.01 cfs
0.01 cfs
0.00 cfs
Flow (cfs)
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Pond XB-2: XB-2

Inflow Area = 2,276 sf, 12.26% Impervious, Inflow Depth = 0.54" for 10-year event
Inflow = 0.01 cfs @ 12.15 hrs, Volume= 102 cf
Outflow = 0.01 cfs @ 12.40 hrs, Volume= 102 cf, Atten= 16%, Lag= 15.0 min
Discarded = 0.00 cfs @ 12.40 hrs, Volume= 93 cf
Primary = 0.01 cfs @ 12.40 hrs, Volume= 9 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 146.25' @ 12.40 hrs Surf.Area= 62 sf Storage= 13 cf

Plug-Flow detention time= 46.4 min calculated for 102 cf (100% of inflow)
Center-of-Mass det. time= 46.4 min (980.4 - 934.0)

Volume	Invert	Avail.Storage	Storage Description
#1	145.75'	107 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

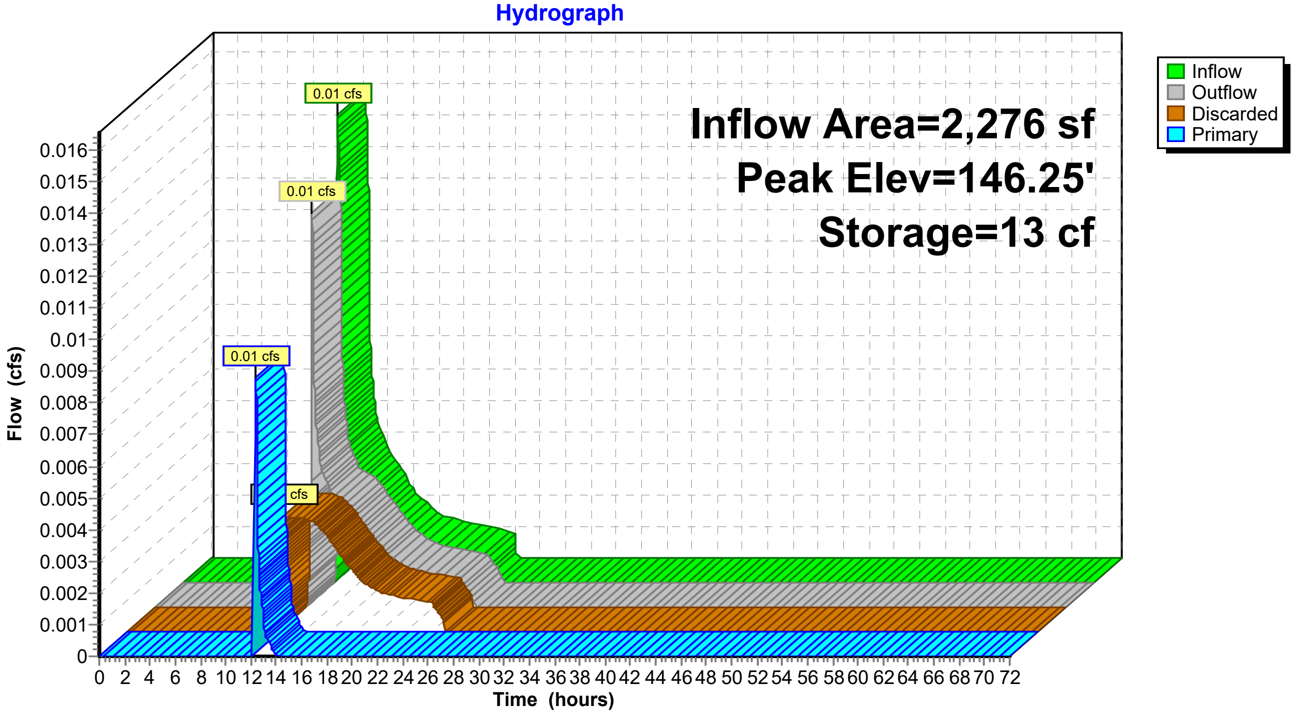
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
145.75	5	0	0
146.00	18	3	3
147.00	190	104	107

Device	Routing	Invert	Outlet Devices
#1	Primary	143.68'	**6.0" Round Culvert** L= 38.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.68' / 143.30' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Device 1	146.25'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	145.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 12.40 hrs HW=146.25' (Free Discharge)
└─**3=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.01 cfs @ 12.40 hrs HW=146.25' TW=143.29' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.01 cfs of 1.14 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 0.01 cfs @ 0.23 fps)

Pond XB-2: XB-2


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=2,276 sf
Peak Elev=146.25'
Storage=13 cf
0.01 cfs
0.01 cfs
0.01 cfs
cfs
Flow (cfs)
0.016
0.015
0.014
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Pond XB-3: XB-3

[90] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area =	2,771 sf,	14.62% Impervious,	Inflow Depth = 0.64"	for 10-year event
Inflow =	0.03 cfs @	12.13 hrs, Volume=	149 cf	
Outflow =	0.03 cfs @	12.09 hrs, Volume=	149 cf,	Atten= 0%, Lag= 0.0 min
Discarded =	0.00 cfs @	12.09 hrs, Volume=	54 cf	
Primary =	0.03 cfs @	12.09 hrs, Volume=	94 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 145.26' @ 12.09 hrs Surf.Area= 21 sf Storage= 3 cf

Plug-Flow detention time= 15.9 min calculated for 149 cf (100% of inflow)
Center-of-Mass det. time= 15.9 min (937.6 - 921.7)

Volume	Invert	Avail.Storage	Storage Description
#1	145.00'	143 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

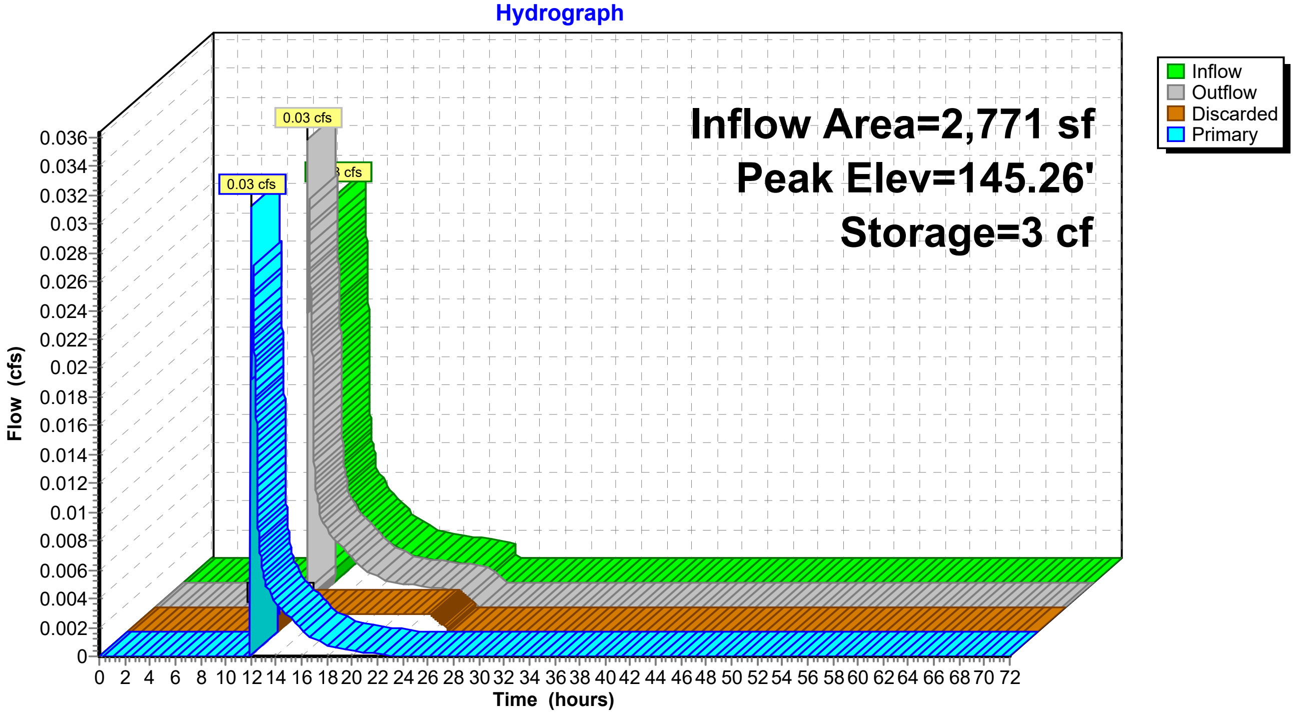
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
145.00	5	0	0
146.00	65	35	35
147.00	150	108	143

Device	Routing	Invert	Outlet Devices
#1	Primary	145.25'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	145.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 12.09 hrs HW=145.26' (Free Discharge)
└─**2=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.03 cfs @ 12.09 hrs HW=145.26' TW=143.29' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Weir Controls 0.03 cfs @ 0.33 fps)

Pond XB-3: XB-3


Hydrograph
Inflow Area=2,771 sf
Peak Elev=145.26'
Storage=3 cf
0.03 cfs
0.03 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)

Summary for Pond XB-4: XB-3

Inflow Area = 1,891 sf, 16.23% Impervious, Inflow Depth = 0.70" for 10-year event
Inflow = 0.02 cfs @ 12.12 hrs, Volume= 110 cf
Outflow = 0.01 cfs @ 12.45 hrs, Volume= 110 cf, Atten= 44%, Lag= 19.6 min
Discarded = 0.00 cfs @ 12.45 hrs, Volume= 104 cf
Primary = 0.01 cfs @ 12.45 hrs, Volume= 6 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 147.00' @ 12.45 hrs Surf.Area= 76 sf Storage= 20 cf

Plug-Flow detention time= 50.3 min calculated for 110 cf (100% of inflow)
Center-of-Mass det. time= 50.3 min (966.6 - 916.3)

Volume	Invert	Avail.Storage	Storage Description
#1	146.50'	73 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

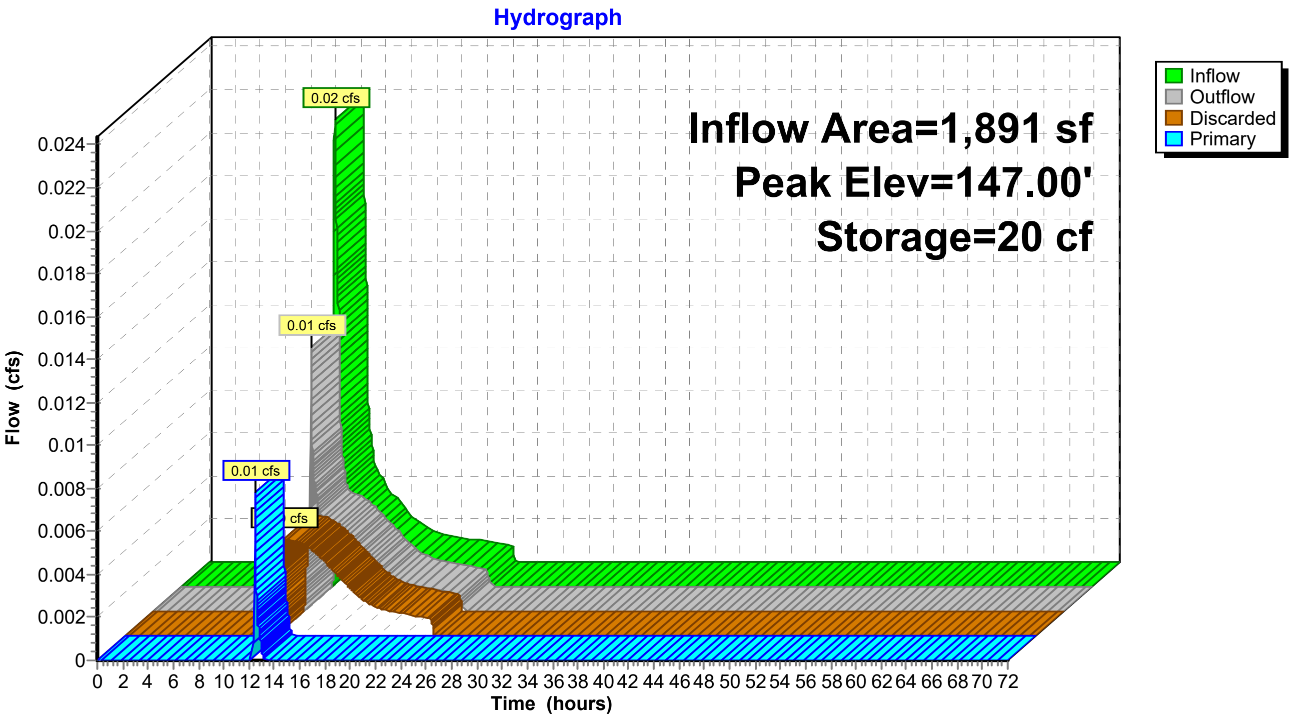
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
146.50	5	0	0
147.00	75	20	20
147.50	135	53	73

Device	Routing	Invert	Outlet Devices
#1	Primary	143.52'	**6.0" Round Culvert** L= 22.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.52' / 143.30' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Device 1	147.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	146.50'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 12.45 hrs HW=147.00' (Free Discharge)
└─**3=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.01 cfs @ 12.45 hrs HW=147.00' TW=143.29' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.01 cfs of 1.34 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 0.01 cfs @ 0.22 fps)

Pond XB-4: XB-3


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=1,891 sf
Peak Elev=147.00'
Storage=20 cf
0.02 cfs
0.01 cfs
0.01 cfs
cfs
Flow (cfs)
0
0.002
0.004
0.006
0.008
0.01
0.012
0.014
0.016
0.018
0.02
0.022
0.024
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Pond XB-5: XB-5

Inflow Area = 1,258 sf, 25.83% Impervious, Inflow Depth = 0.99" for 10-year event
Inflow = 0.03 cfs @ 12.11 hrs, Volume= 104 cf
Outflow = 0.03 cfs @ 12.13 hrs, Volume= 104 cf, Atten= 2%, Lag= 1.5 min
Discarded = 0.00 cfs @ 12.13 hrs, Volume= 82 cf
Primary = 0.02 cfs @ 12.13 hrs, Volume= 22 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 147.01' @ 12.13 hrs Surf.Area= 66 sf Storage= 9 cf

Plug-Flow detention time= 21.0 min calculated for 104 cf (100% of inflow)
Center-of-Mass det. time= 21.0 min (914.7 - 893.7)

Volume	Invert	Avail.Storage	Storage Description
#1	146.75'	56 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

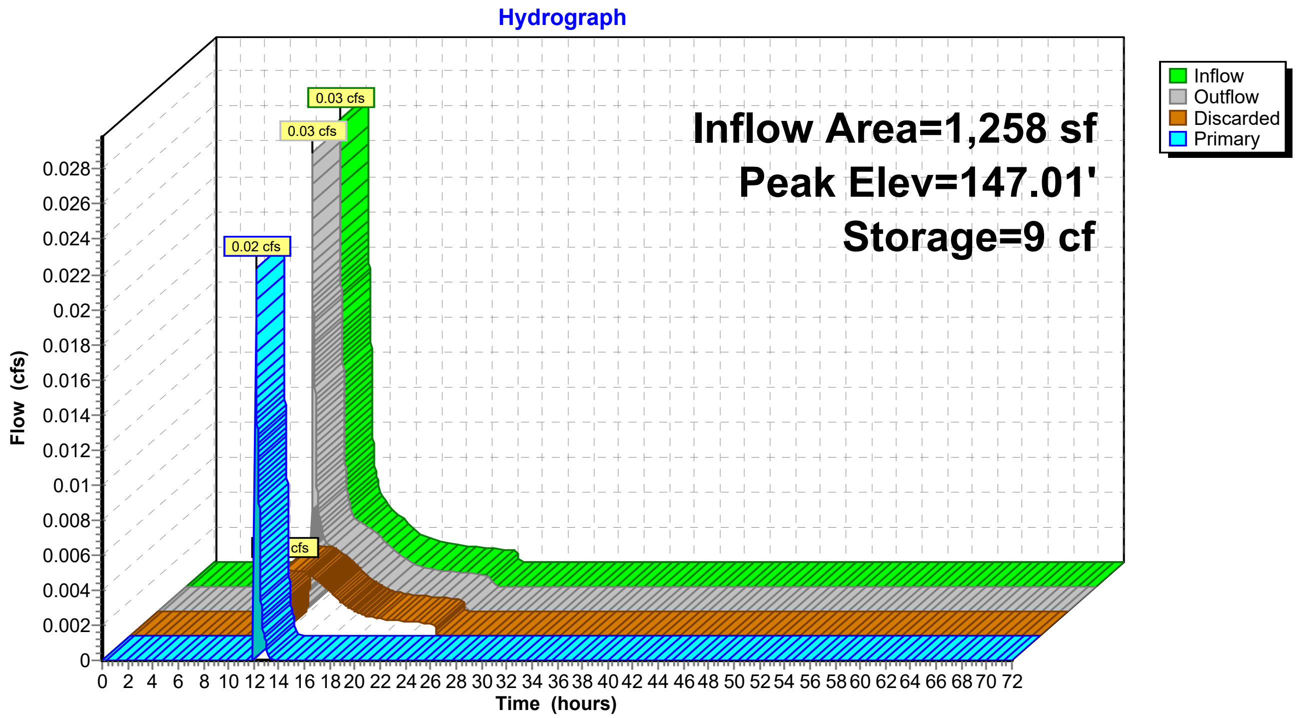
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
146.75	5	0	0
147.00	65	9	9
147.50	125	48	56

Device	Routing	Invert	Outlet Devices
#1	Primary	143.23'	**6.0" Round Culvert** L= 21.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.23' / 143.00' S= 0.0110 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Device 1	147.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	146.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 12.13 hrs HW=147.01' (Free Discharge)
└─**3=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.02 cfs @ 12.13 hrs HW=147.01' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.02 cfs of 1.40 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 0.02 cfs @ 0.31 fps)

Pond XB-5: XB-5

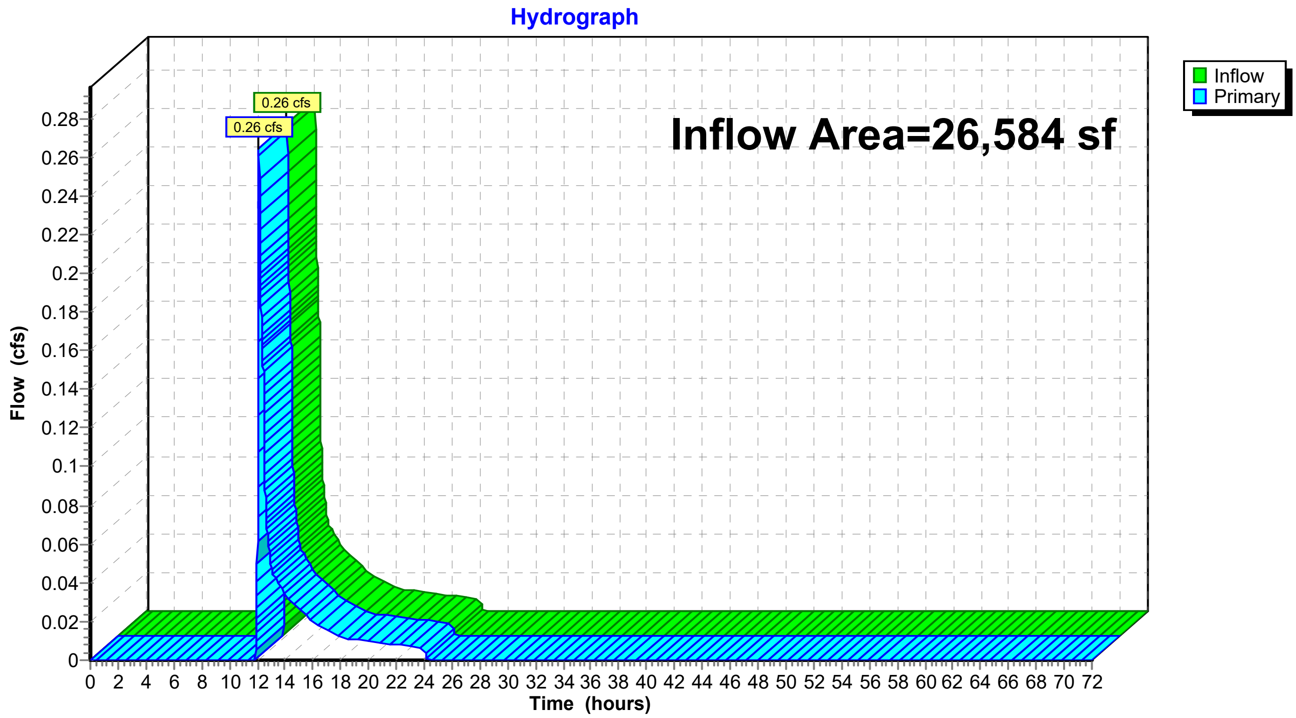

Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=1,258 sf
Peak Elev=147.01'
Storage=9 cf
0.03 cfs
0.03 cfs
0.02 cfs
cfs
Flow (cfs)
0.028
0.026
0.024
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Link A: A

Inflow Area = 26,584 sf, 17.81% Impervious, Inflow Depth = 0.50" for 10-year event
Inflow = 0.26 cfs @ 12.13 hrs, Volume= 1,101 cf
Primary = 0.26 cfs @ 12.13 hrs, Volume= 1,101 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: A



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=4,054 sf 9.69% Impervious Runoff Depth=0.93"
Tc=6.0 min CN=45 Runoff=0.07 cfs 315 cf

SubcatchmentA2: SUB-A2 Runoff Area=2,276 sf 12.26% Impervious Runoff Depth=1.00"
Tc=6.0 min CN=46 Runoff=0.04 cfs 190 cf

SubcatchmentA3: SUB-A3 Runoff Area=2,771 sf 14.62% Impervious Runoff Depth=1.15"
Tc=6.0 min CN=48 Runoff=0.07 cfs 266 cf

SubcatchmentA4: SUB-A4 Runoff Area=1,891 sf 16.23% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=49 Runoff=0.05 cfs 193 cf

SubcatchmentA5: SUB-A5 Runoff Area=1,258 sf 25.83% Impervious Runoff Depth=1.62"
Tc=6.0 min CN=54 Runoff=0.05 cfs 170 cf

SubcatchmentA6: SUB-A6 Runoff Area=14,334 sf 21.10% Impervious Runoff Depth=1.38"
Tc=6.0 min CN=51 Runoff=0.45 cfs 1,650 cf

Pond 1P: 1P Peak Elev=143.41' Inflow=0.14 cfs 335 cf
12.0" Round Culvert n=0.012 L=20.0' S=0.0100 '/' Outflow=0.14 cfs 335 cf

Pond XB-1: XB-1 Peak Elev=145.31' Storage=35 cf Inflow=0.07 cfs 315 cf
Discarded=0.01 cfs 234 cf Primary=0.04 cfs 81 cf Outflow=0.05 cfs 315 cf

Pond XB-2: XB-2 Peak Elev=146.26' Storage=14 cf Inflow=0.04 cfs 190 cf
Discarded=0.00 cfs 122 cf Primary=0.04 cfs 68 cf Outflow=0.04 cfs 190 cf

Pond XB-3: XB-3 Peak Elev=145.27' Storage=4 cf Inflow=0.07 cfs 266 cf
Discarded=0.00 cfs 55 cf Primary=0.06 cfs 210 cf Outflow=0.07 cfs 266 cf

Pond XB-4: XB-3 Peak Elev=147.01' Storage=21 cf Inflow=0.05 cfs 193 cf
Discarded=0.00 cfs 137 cf Primary=0.04 cfs 56 cf Outflow=0.05 cfs 193 cf

Pond XB-5: XB-5 Peak Elev=147.01' Storage=10 cf Inflow=0.05 cfs 170 cf
Discarded=0.00 cfs 106 cf Primary=0.05 cfs 64 cf Outflow=0.05 cfs 170 cf

Link A: A Inflow=0.60 cfs 2,130 cf
Primary=0.60 cfs 2,130 cf

Total Runoff Area = 26,584 sf Runoff Volume = 2,785 cf Average Runoff Depth = 1.26"
82.19% Pervious = 21,850 sf 17.81% Impervious = 4,734 sf

Summary for Subcatchment A1: SUB-A1

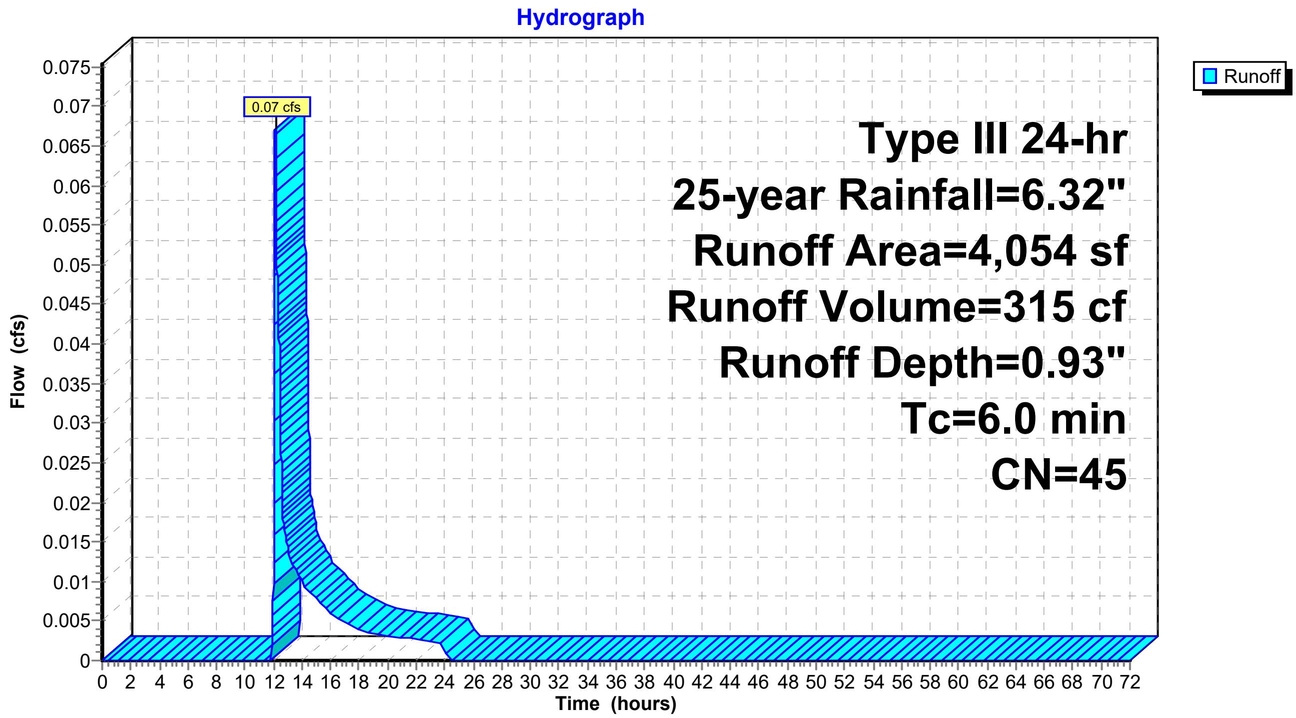
Runoff = 0.07 cfs @ 12.12 hrs, Volume= 315 cf, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.32"

Area (sf)	CN	Description
393	98	Paved parking, HSG A
3,661	39	>75% Grass cover, Good, HSG A
4,054	45	Weighted Average
3,661		90.31% Pervious Area
393		9.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

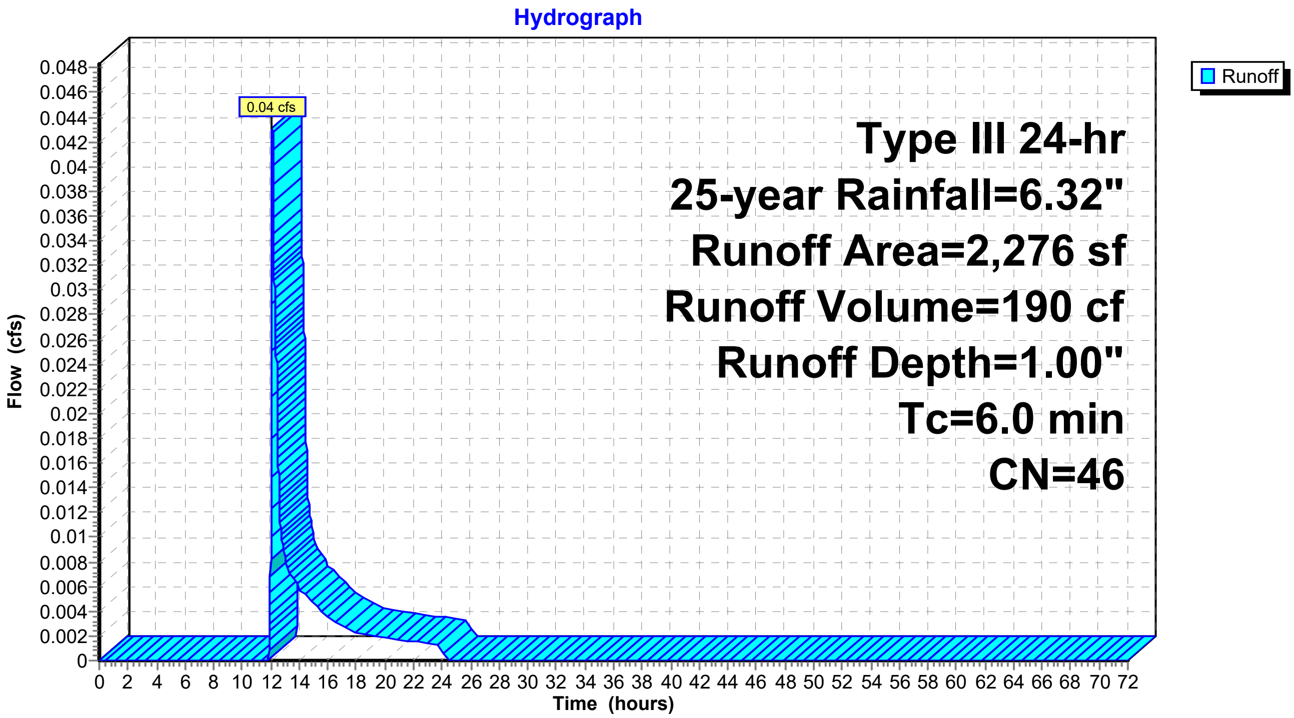
Runoff = 0.04 cfs @ 12.11 hrs, Volume= 190 cf, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.32"

Area (sf)	CN	Description
279	98	Paved parking, HSG A
1,997	39	>75% Grass cover, Good, HSG A
2,276	46	Weighted Average
1,997		87.74% Pervious Area
279		12.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

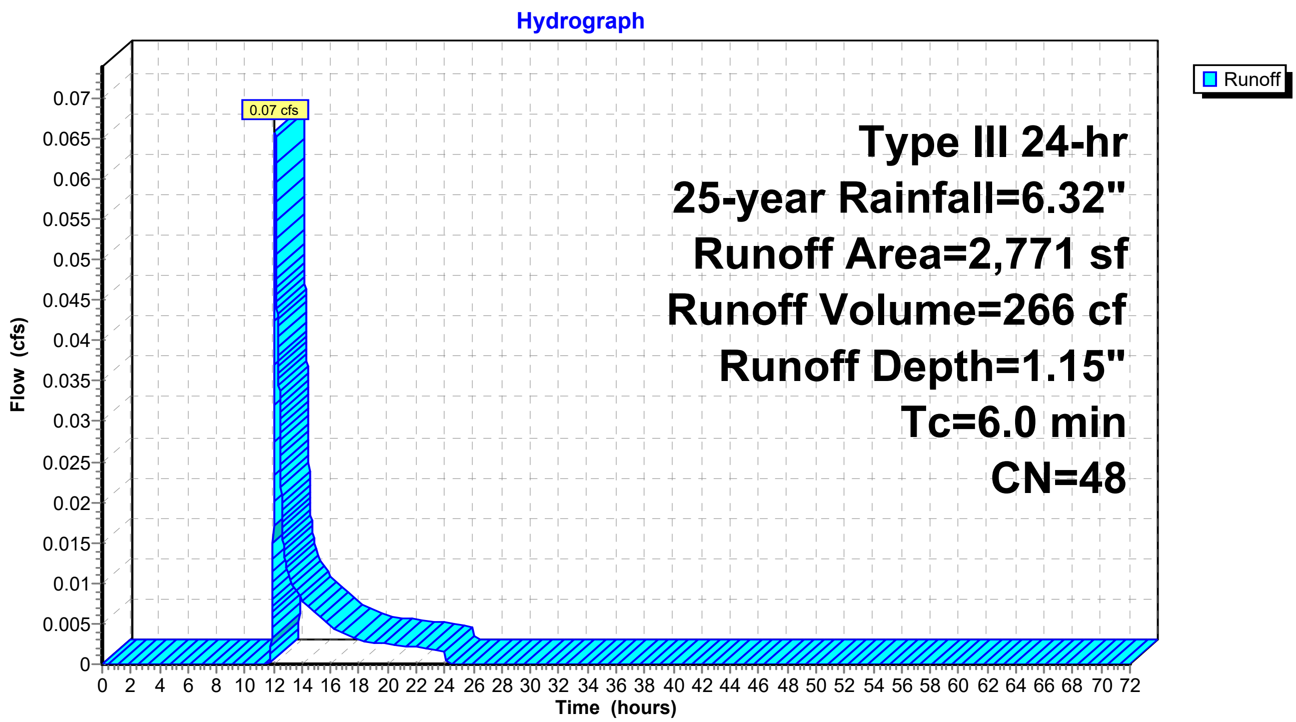
Runoff = 0.07 cfs @ 12.11 hrs, Volume= 266 cf, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.32"

	Area (sf)	CN	Description
	405	98	Paved parking, HSG A
	2,314	39	>75% Grass cover, Good, HSG A
*	52	39	Pervious Surface, HSG A
	2,771	48	Weighted Average
	2,366		85.38% Pervious Area
	405		14.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

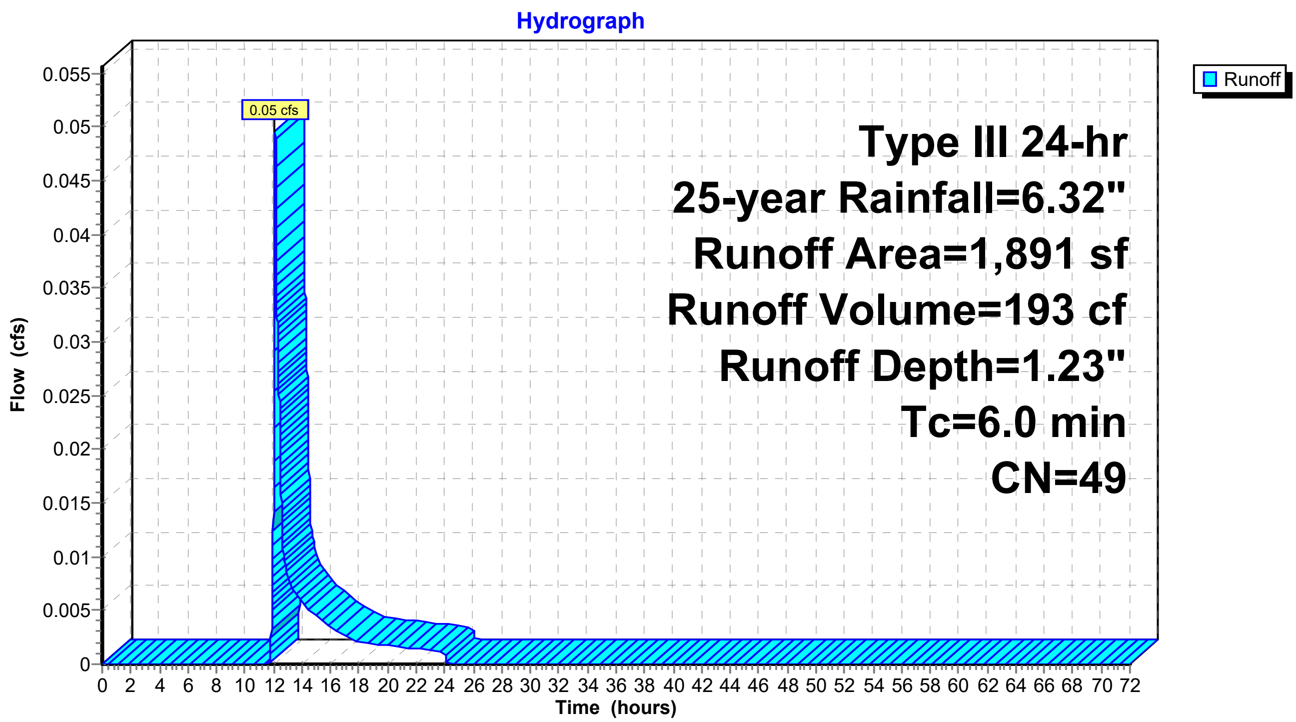
Runoff = 0.05 cfs @ 12.11 hrs, Volume= 193 cf, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.32"

	Area (sf)	CN	Description
	307	98	Paved parking, HSG A
	1,517	39	>75% Grass cover, Good, HSG A
*	67	39	Pervious Surface, Good, HSG A
	1,891	49	Weighted Average
	1,584		83.77% Pervious Area
	307		16.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A4: SUB-A4



Summary for Subcatchment A5: SUB-A5

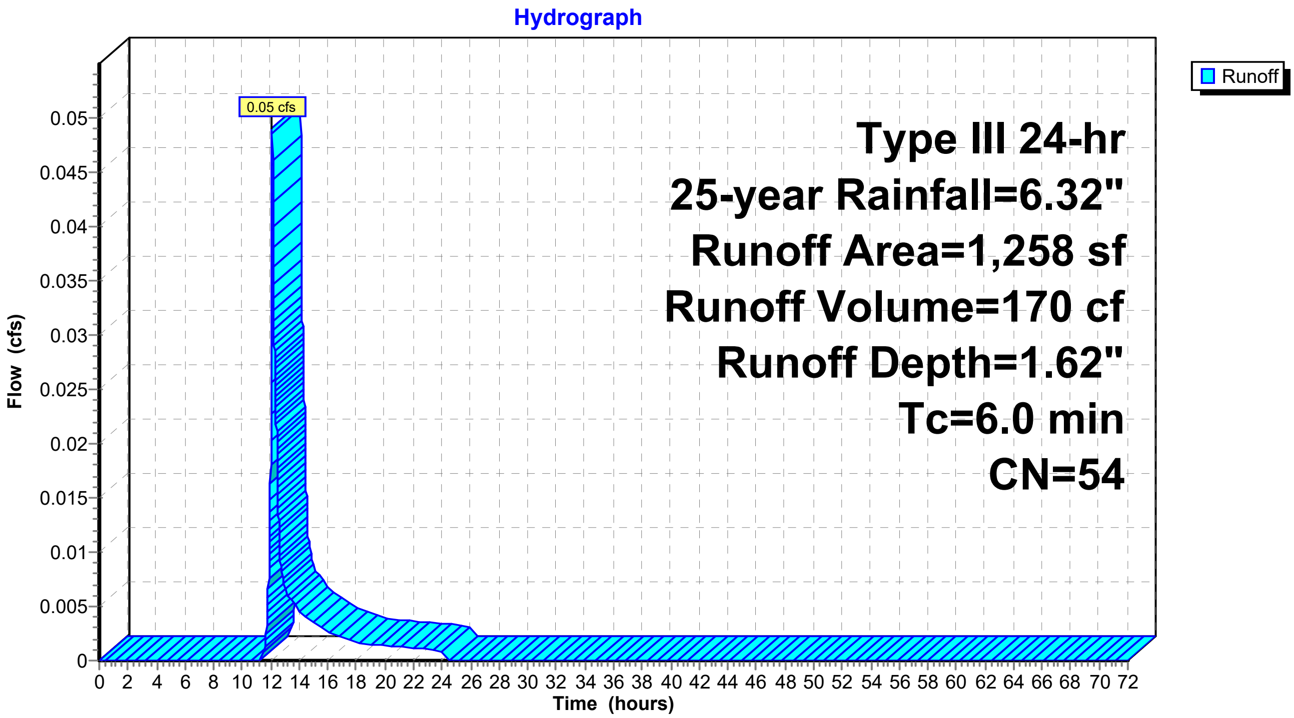
Runoff = 0.05 cfs @ 12.10 hrs, Volume= 170 cf, Depth= 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.32"

Area (sf)	CN	Description
325	98	Paved parking, HSG A
933	39	>75% Grass cover, Good, HSG A
1,258	54	Weighted Average
933		74.17% Pervious Area
325		25.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A5: SUB-A5



Summary for Subcatchment A6: SUB-A6

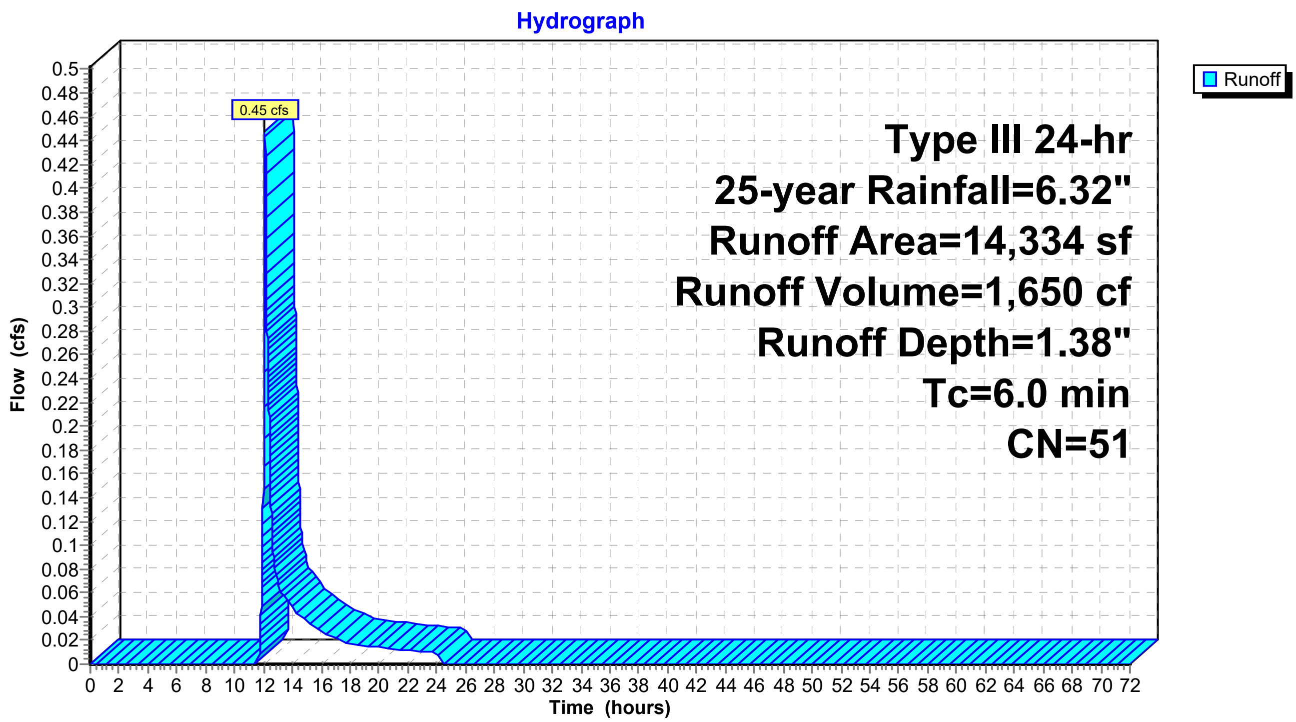
Runoff = 0.45 cfs @ 12.10 hrs, Volume= 1,650 cf, Depth= 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.32"

	Area (sf)	CN	Description
	3,025	98	Paved parking, HSG A
	9,351	39	>75% Grass cover, Good, HSG A
*	1,958	39	Pervious Surface, HSG A
	14,334	51	Weighted Average
	11,309		78.90% Pervious Area
	3,025		21.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A6: SUB-A6



Summary for Pond 1P: 1P

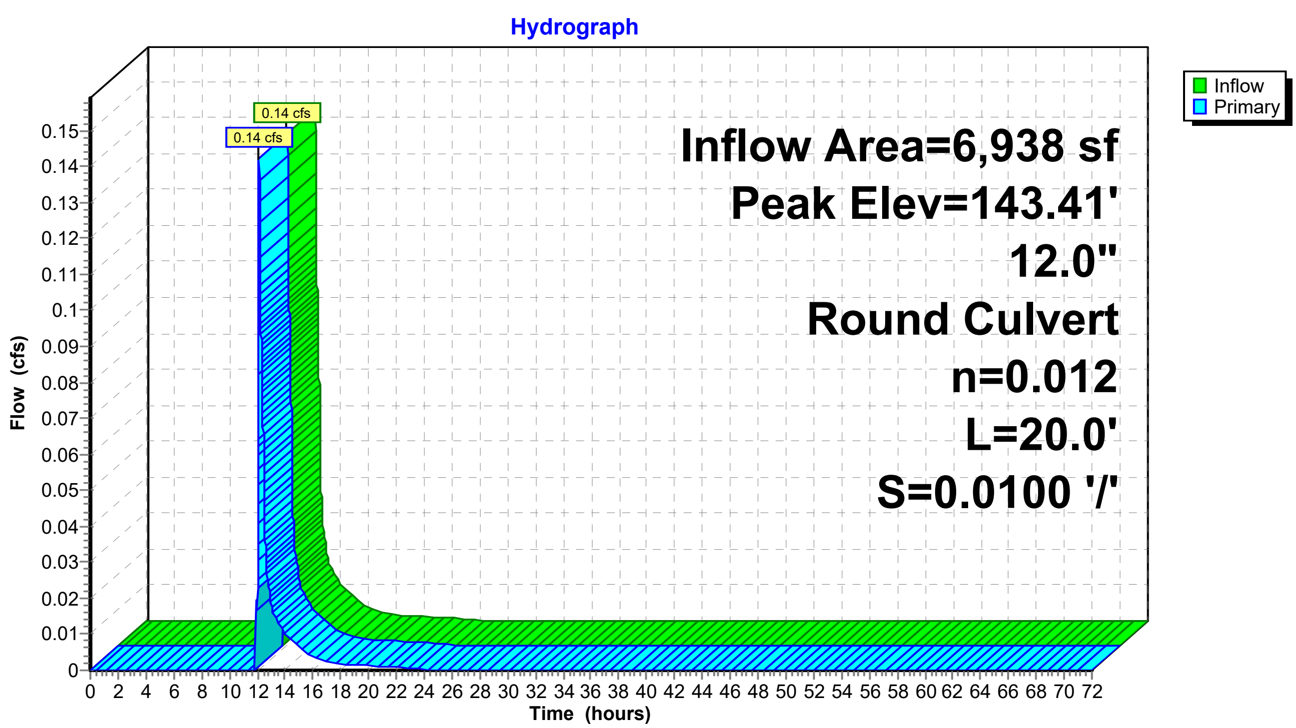
Inflow Area =	6,938 sf,	14.28% Impervious,	Inflow Depth = 0.58"	for 25-year event	
Inflow =	0.14 cfs @	12.14 hrs,	Volume=	335 cf	
Outflow =	0.14 cfs @	12.14 hrs,	Volume=	335 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.14 cfs @	12.14 hrs,	Volume=	335 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 143.41' @ 12.14 hrs
Flood Elev= 145.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	143.20'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.20' / 143.00' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.14 cfs @ 12.14 hrs HW=143.40' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.14 cfs @ 1.22 fps)

Pond 1P: 1P



Summary for Pond XB-1: XB-1

Inflow Area = 4,054 sf, 9.69% Impervious, Inflow Depth = 0.93" for 25-year event
Inflow = 0.07 cfs @ 12.12 hrs, Volume= 315 cf
Outflow = 0.05 cfs @ 12.22 hrs, Volume= 315 cf, Atten= 22%, Lag= 5.9 min
Discarded = 0.01 cfs @ 12.22 hrs, Volume= 234 cf
Primary = 0.04 cfs @ 12.22 hrs, Volume= 81 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 145.31' @ 12.22 hrs Surf.Area= 122 sf Storage= 35 cf

Plug-Flow detention time= 46.7 min calculated for 315 cf (100% of inflow)
Center-of-Mass det. time= 46.7 min (957.4 - 910.7)

Volume	Invert	Avail.Storage	Storage Description
#1	144.75'	173 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

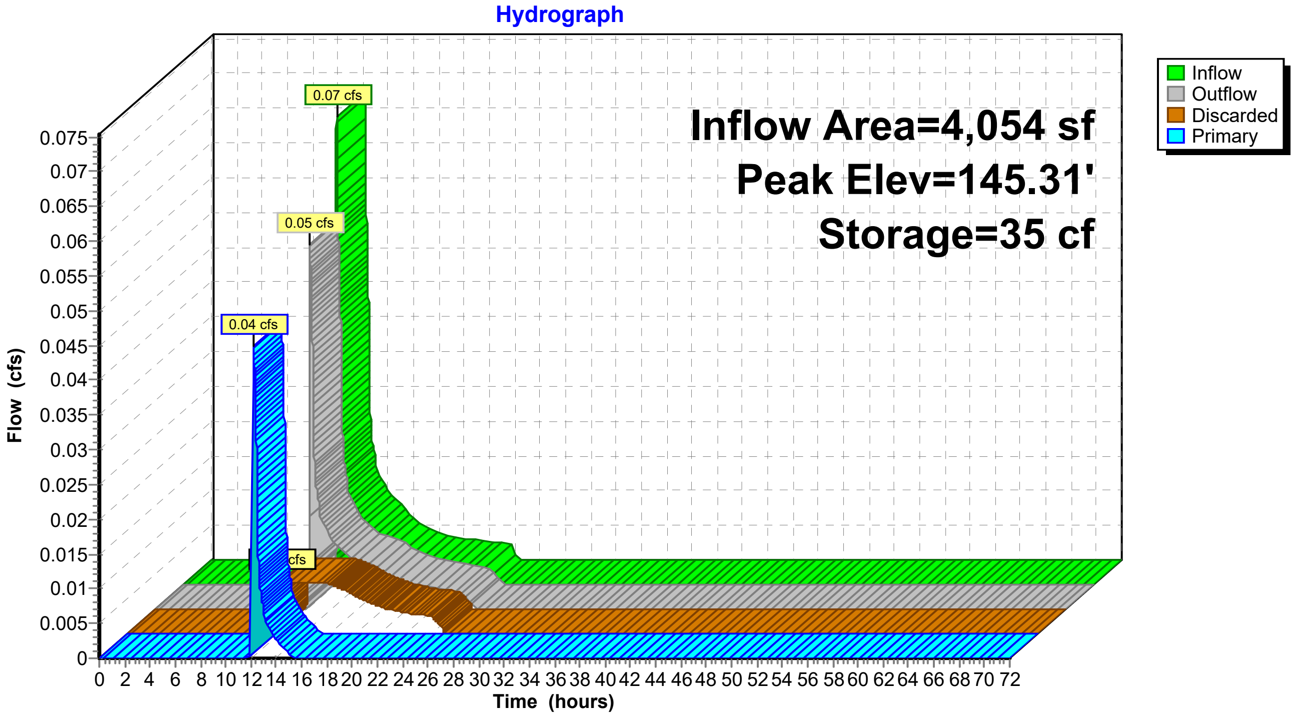
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
144.75	10	0	0
145.00	50	8	8
146.00	280	165	173

Device	Routing	Invert	Outlet Devices
#1	Primary	143.16'	**6.0" Round Culvert** L= 16.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.16' / 143.00' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Device 1	145.30'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	144.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.01 cfs @ 12.22 hrs HW=145.31' (Free Discharge)
└─**3=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.04 cfs @ 12.22 hrs HW=145.31' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.04 cfs of 1.03 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 0.04 cfs @ 0.39 fps)

Pond XB-1: XB-1


Hydrograph
0.07 cfs
0.05 cfs
0.04 cfs
cfs
Inflow Area=4,054 sf
Peak Elev=145.31'
Storage=35 cf
Inflow
Outflow
Discarded
Primary
Flow (cfs)
0.075
0.07
0.065
0.06
0.055
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Pond XB-2: XB-2

Inflow Area = 2,276 sf, 12.26% Impervious, Inflow Depth = 1.00" for 25-year event
Inflow = 0.04 cfs @ 12.11 hrs, Volume= 190 cf
Outflow = 0.04 cfs @ 12.13 hrs, Volume= 190 cf, Atten= 0%, Lag= 1.1 min
Discarded = 0.00 cfs @ 12.13 hrs, Volume= 122 cf
Primary = 0.04 cfs @ 12.13 hrs, Volume= 68 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 146.26' @ 12.13 hrs Surf.Area= 63 sf Storage= 14 cf

Plug-Flow detention time= 34.1 min calculated for 190 cf (100% of inflow)
Center-of-Mass det. time= 34.1 min (940.0 - 905.9)

Volume	Invert	Avail.Storage	Storage Description
#1	145.75'	107 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

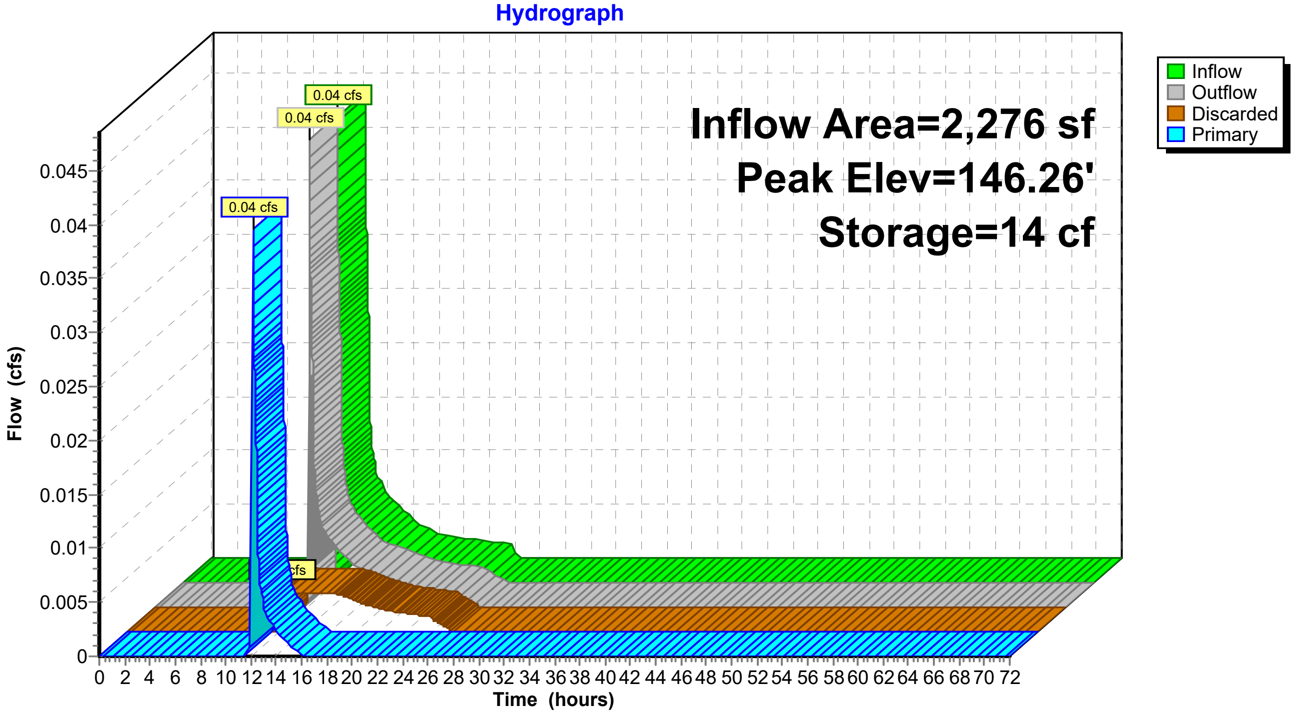
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
145.75	5	0	0
146.00	18	3	3
147.00	190	104	107

Device	Routing	Invert	Outlet Devices
#1	Primary	143.68'	**6.0" Round Culvert** L= 38.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.68' / 143.30' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Device 1	146.25'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	145.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 12.13 hrs HW=146.26' (Free Discharge)
└─**3=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.04 cfs @ 12.13 hrs HW=146.26' TW=143.40' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.04 cfs of 1.14 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 0.04 cfs @ 0.38 fps)

Pond XB-2: XB-2


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=2,276 sf
Peak Elev=146.26'
Storage=14 cf
0.04 cfs
0.04 cfs
0.04 cfs
Flow (cfs)
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Pond XB-3: XB-3

Inflow Area = 2,771 sf, 14.62% Impervious, Inflow Depth = 1.15" for 25-year event
Inflow = 0.07 cfs @ 12.11 hrs, Volume= 266 cf
Outflow = 0.07 cfs @ 12.11 hrs, Volume= 266 cf, Atten= 0%, Lag= 0.1 min
Discarded = 0.00 cfs @ 12.11 hrs, Volume= 55 cf
Primary = 0.06 cfs @ 12.11 hrs, Volume= 210 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 145.27' @ 12.11 hrs Surf.Area= 21 sf Storage= 4 cf

Plug-Flow detention time= 9.1 min calculated for 266 cf (100% of inflow)
Center-of-Mass det. time= 9.1 min (906.3 - 897.2)

Volume	Invert	Avail.Storage	Storage Description
#1	145.00'	143 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

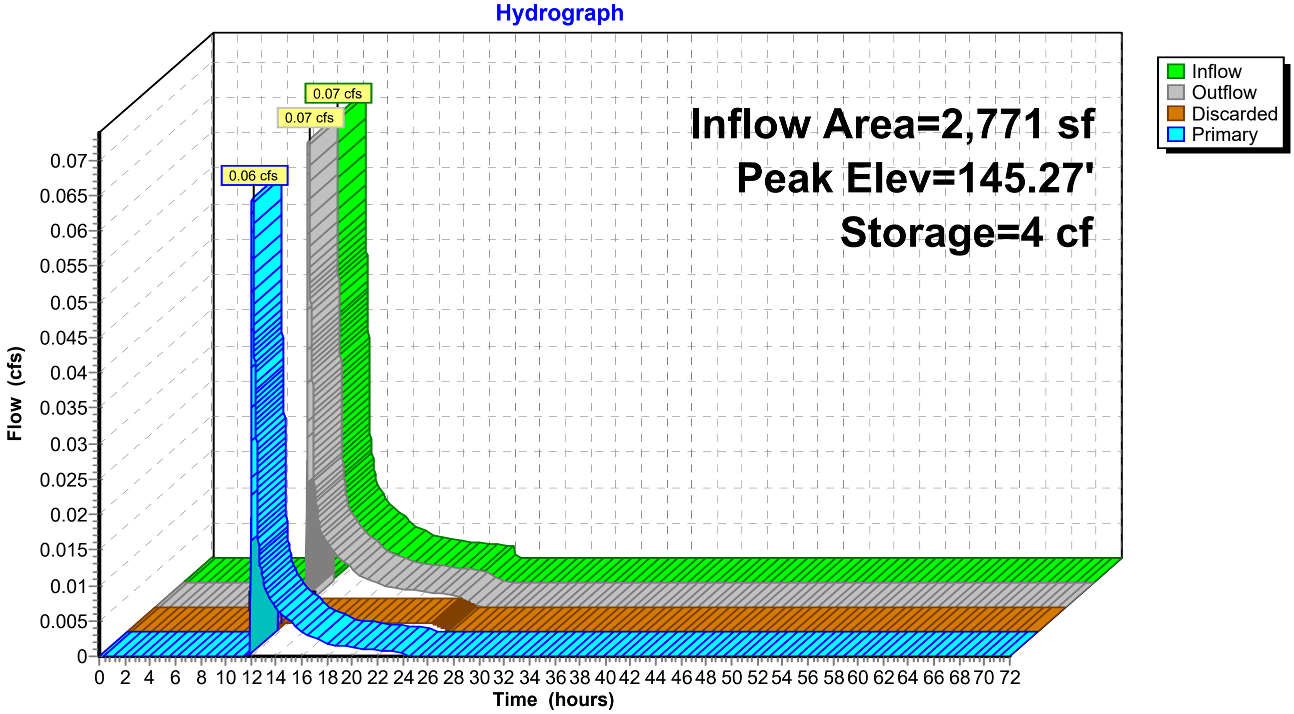
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
145.00	5	0	0
146.00	65	35	35
147.00	150	108	143

Device	Routing	Invert	Outlet Devices
#1	Primary	145.25'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	145.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 12.11 hrs HW=145.27' (Free Discharge)
↑—**2=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.06 cfs @ 12.11 hrs HW=145.27' TW=143.34' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Weir Controls 0.06 cfs @ 0.44 fps)

Pond XB-3: XB-3


Hydrograph
Inflow
Outflow
Discarded
Primary
0.07 cfs
0.07 cfs
0.06 cfs
Inflow Area=2,771 sf
Peak Elev=145.27'
Storage=4 cf
Flow (cfs)
0.07
0.065
0.06
0.055
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Pond XB-4: XB-3

Inflow Area = 1,891 sf, 16.23% Impervious, Inflow Depth = 1.23" for 25-year event
Inflow = 0.05 cfs @ 12.11 hrs, Volume= 193 cf
Outflow = 0.05 cfs @ 12.14 hrs, Volume= 193 cf, Atten= 2%, Lag= 2.2 min
Discarded = 0.00 cfs @ 12.14 hrs, Volume= 137 cf
Primary = 0.04 cfs @ 12.14 hrs, Volume= 56 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 147.01' @ 12.14 hrs Surf.Area= 77 sf Storage= 21 cf

Plug-Flow detention time= 42.4 min calculated for 193 cf (100% of inflow)
Center-of-Mass det. time= 42.4 min (935.7 - 893.3)

Volume	Invert	Avail.Storage	Storage Description
#1	146.50'	73 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

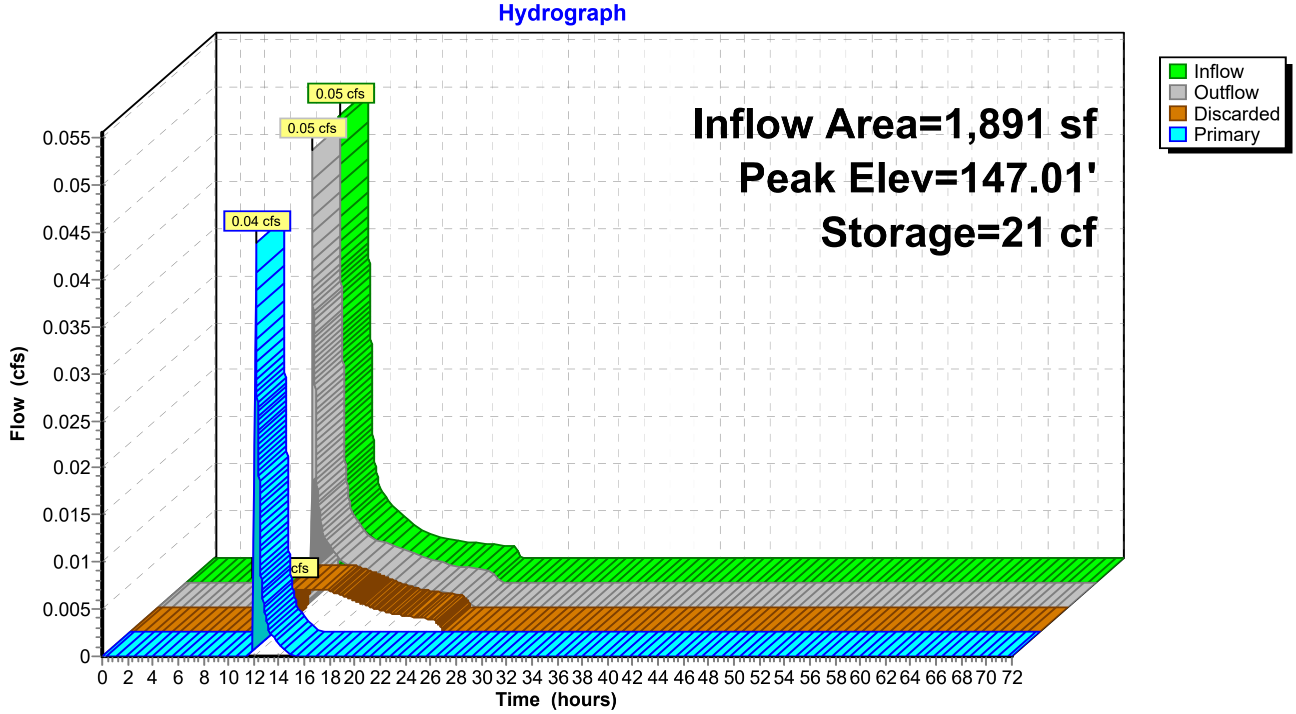
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
146.50	5	0	0
147.00	75	20	20
147.50	135	53	73

Device	Routing	Invert	Outlet Devices
#1	Primary	143.52'	**6.0" Round Culvert** L= 22.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.52' / 143.30' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Device 1	147.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	146.50'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 12.14 hrs HW=147.01' (Free Discharge)
└─**3=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.04 cfs @ 12.14 hrs HW=147.01' TW=143.40' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.04 cfs of 1.34 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 0.04 cfs @ 0.38 fps)

Pond XB-4: XB-3


Hydrograph
Inflow
Outflow
Discarded
Primary
0.05 cfs
0.05 cfs
0.04 cfs
cfs
Inflow Area=1,891 sf
Peak Elev=147.01'
Storage=21 cf
Flow (cfs)
0.055
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Pond XB-5: XB-5

Inflow Area = 1,258 sf, 25.83% Impervious, Inflow Depth = 1.62" for 25-year event
Inflow = 0.05 cfs @ 12.10 hrs, Volume= 170 cf
Outflow = 0.05 cfs @ 12.10 hrs, Volume= 170 cf, Atten= 0%, Lag= 0.2 min
Discarded = 0.00 cfs @ 12.10 hrs, Volume= 106 cf
Primary = 0.05 cfs @ 12.10 hrs, Volume= 64 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 147.01' @ 12.10 hrs Surf.Area= 67 sf Storage= 10 cf

Plug-Flow detention time= 18.6 min calculated for 170 cf (100% of inflow)
Center-of-Mass det. time= 18.7 min (894.9 - 876.2)

Volume	Invert	Avail.Storage	Storage Description
#1	146.75'	56 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

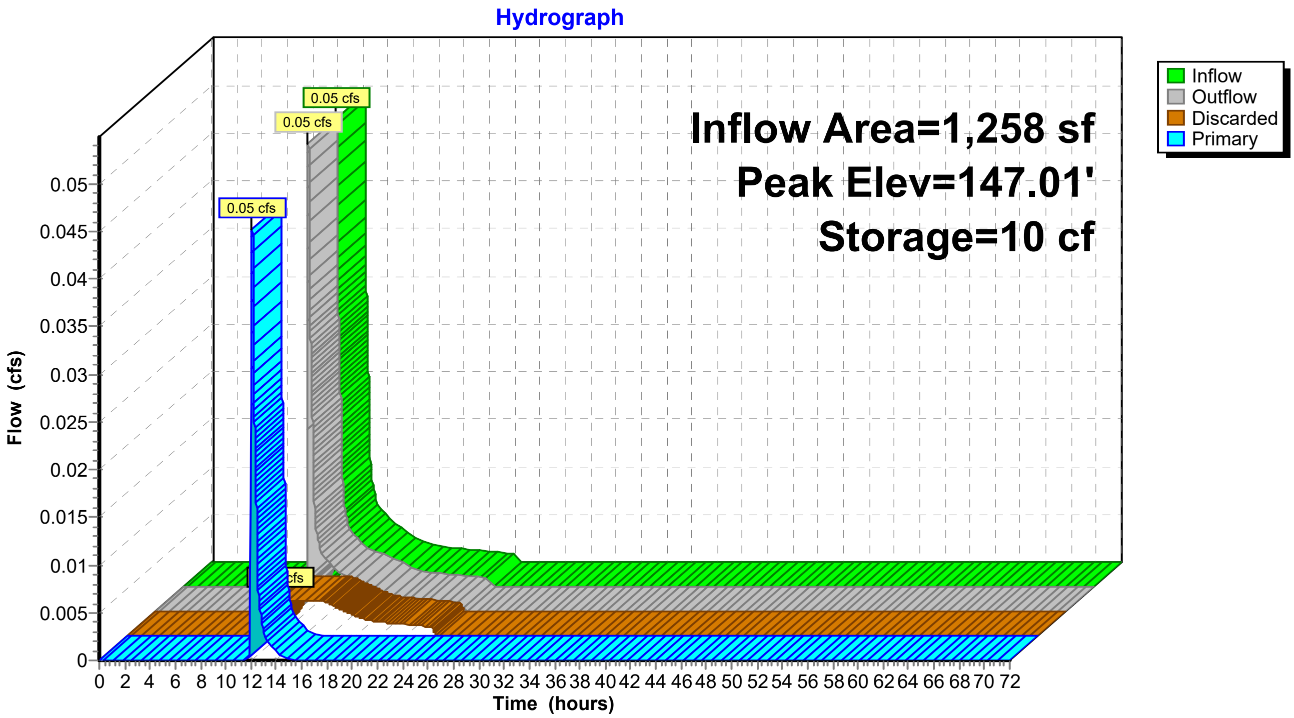
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
146.75	5	0	0
147.00	65	9	9
147.50	125	48	56

Device	Routing	Invert	Outlet Devices
#1	Primary	143.23'	**6.0" Round Culvert** L= 21.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.23' / 143.00' S= 0.0110 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Device 1	147.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	146.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 12.10 hrs HW=147.01' (Free Discharge)
└─**3=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.05 cfs @ 12.10 hrs HW=147.01' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.05 cfs of 1.40 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 0.05 cfs @ 0.39 fps)

Pond XB-5: XB-5

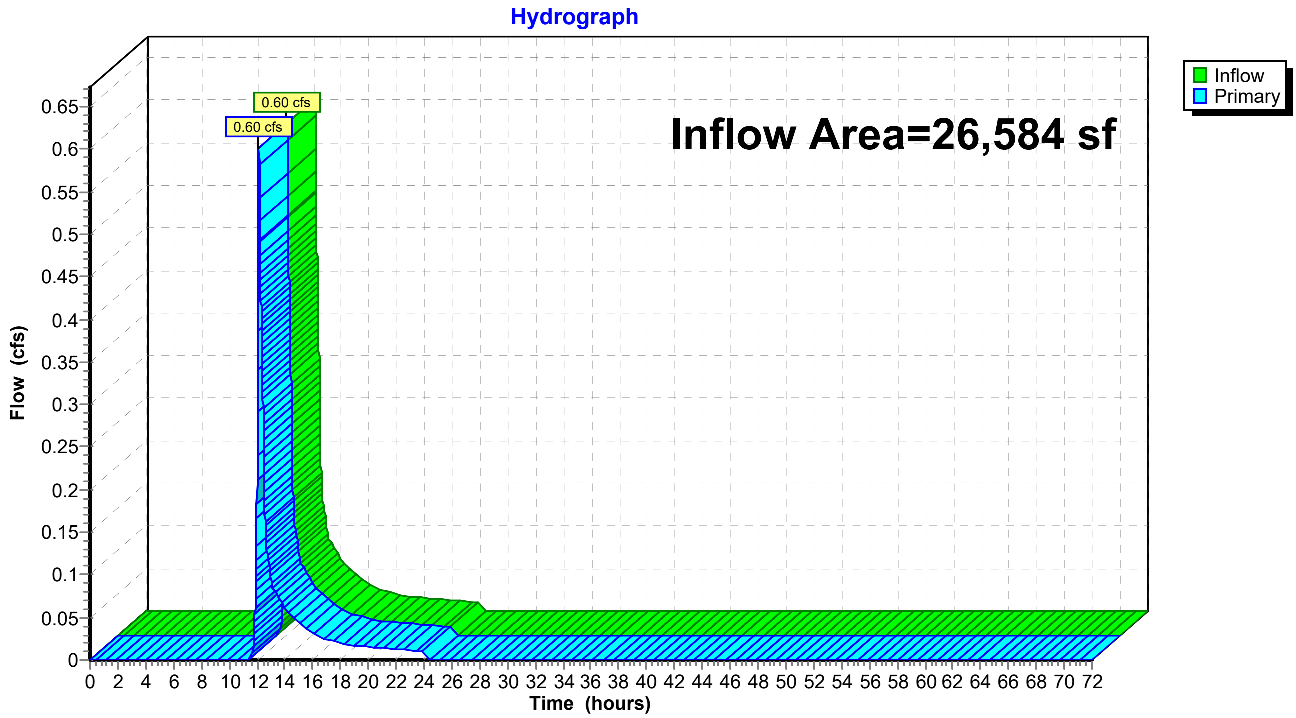

Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=1,258 sf
Peak Elev=147.01'
Storage=10 cf
0.05 cfs
0.05 cfs
0.05 cfs
Flow (cfs)
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035
0.04
0.045
0.05
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Link A: A

Inflow Area = 26,584 sf, 17.81% Impervious, Inflow Depth = 0.96" for 25-year event
Inflow = 0.60 cfs @ 12.13 hrs, Volume= 2,130 cf
Primary = 0.60 cfs @ 12.13 hrs, Volume= 2,130 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: A



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=4,054 sf 9.69% Impervious Runoff Depth=1.81"
Tc=6.0 min CN=45 Runoff=0.17 cfs 610 cf

SubcatchmentA2: SUB-A2 Runoff Area=2,276 sf 12.26% Impervious Runoff Depth=1.91"
Tc=6.0 min CN=46 Runoff=0.10 cfs 362 cf

SubcatchmentA3: SUB-A3 Runoff Area=2,771 sf 14.62% Impervious Runoff Depth=2.12"
Tc=6.0 min CN=48 Runoff=0.14 cfs 489 cf

SubcatchmentA4: SUB-A4 Runoff Area=1,891 sf 16.23% Impervious Runoff Depth=2.22"
Tc=6.0 min CN=49 Runoff=0.10 cfs 350 cf

SubcatchmentA5: SUB-A5 Runoff Area=1,258 sf 25.83% Impervious Runoff Depth=2.76"
Tc=6.0 min CN=54 Runoff=0.09 cfs 290 cf

SubcatchmentA6: SUB-A6 Runoff Area=14,334 sf 21.10% Impervious Runoff Depth=2.44"
Tc=6.0 min CN=51 Runoff=0.88 cfs 2,911 cf

Pond 1P: 1P Peak Elev=143.52' Inflow=0.34 cfs 816 cf
12.0" Round Culvert n=0.012 L=20.0' S=0.0100 '/' Outflow=0.34 cfs 816 cf

Pond XB-1: XB-1 Peak Elev=145.33' Storage=37 cf Inflow=0.17 cfs 610 cf
Discarded=0.01 cfs 300 cf Primary=0.16 cfs 310 cf Outflow=0.17 cfs 610 cf

Pond XB-2: XB-2 Peak Elev=146.27' Storage=14 cf Inflow=0.10 cfs 362 cf
Discarded=0.00 cfs 154 cf Primary=0.10 cfs 208 cf Outflow=0.10 cfs 362 cf

Pond XB-3: XB-3 Peak Elev=145.28' Storage=4 cf Inflow=0.14 cfs 489 cf
Discarded=0.00 cfs 57 cf Primary=0.14 cfs 432 cf Outflow=0.14 cfs 489 cf

Pond XB-4: XB-3 Peak Elev=147.02' Storage=22 cf Inflow=0.10 cfs 350 cf
Discarded=0.00 cfs 173 cf Primary=0.10 cfs 177 cf Outflow=0.10 cfs 350 cf

Pond XB-5: XB-5 Peak Elev=147.02' Storage=10 cf Inflow=0.09 cfs 290 cf
Discarded=0.00 cfs 136 cf Primary=0.09 cfs 154 cf Outflow=0.09 cfs 290 cf

Link A: A Inflow=1.45 cfs 4,191 cf
Primary=1.45 cfs 4,191 cf

Total Runoff Area = 26,584 sf Runoff Volume = 5,012 cf Average Runoff Depth = 2.26"
82.19% Pervious = 21,850 sf 17.81% Impervious = 4,734 sf

Summary for Subcatchment A1: SUB-A1

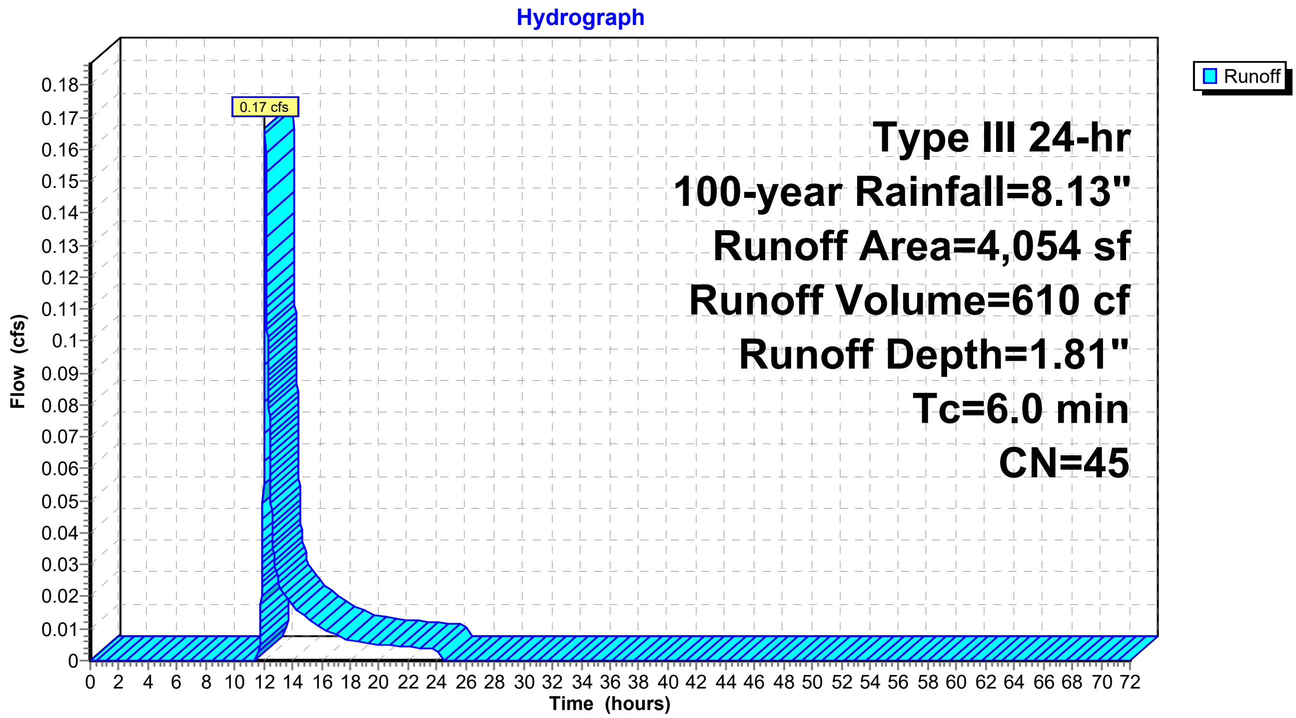
Runoff = 0.17 cfs @ 12.10 hrs, Volume= 610 cf, Depth= 1.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.13"

Area (sf)	CN	Description
393	98	Paved parking, HSG A
3,661	39	>75% Grass cover, Good, HSG A
4,054	45	Weighted Average
3,661		90.31% Pervious Area
393		9.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

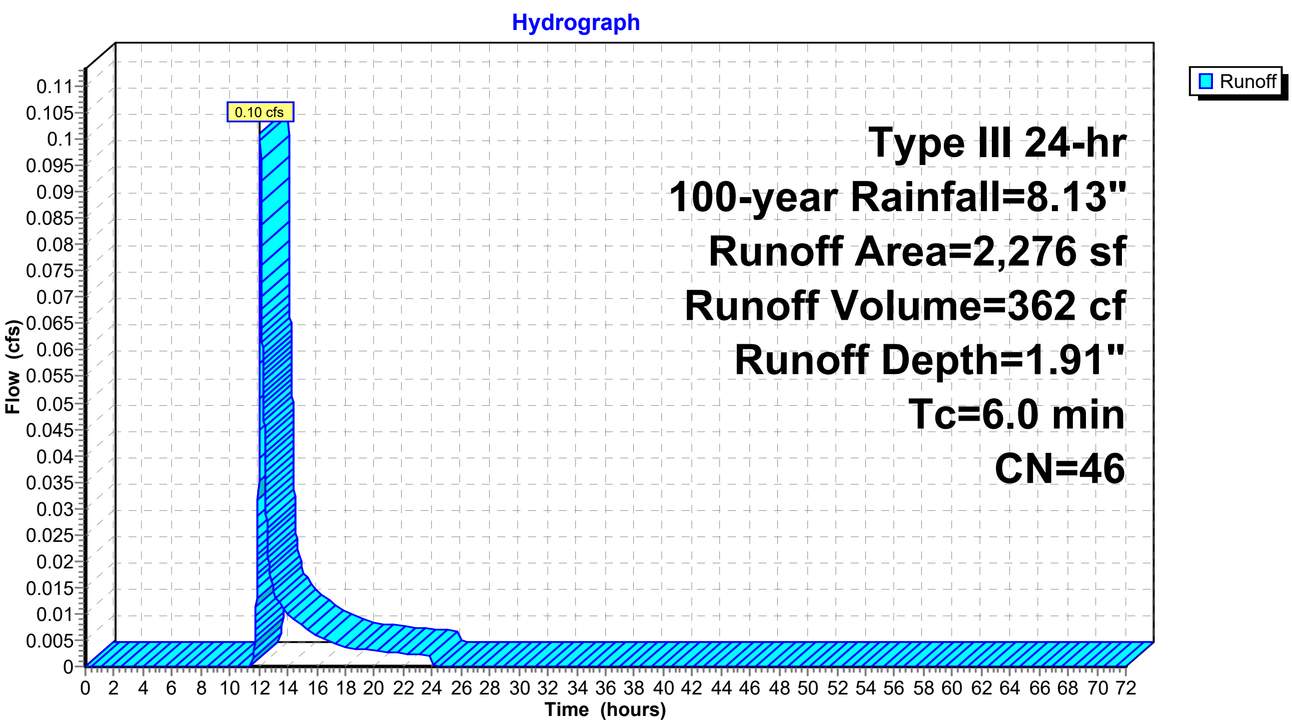
Runoff = 0.10 cfs @ 12.10 hrs, Volume= 362 cf, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.13"

Area (sf)	CN	Description
279	98	Paved parking, HSG A
1,997	39	>75% Grass cover, Good, HSG A
2,276	46	Weighted Average
1,997		87.74% Pervious Area
279		12.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

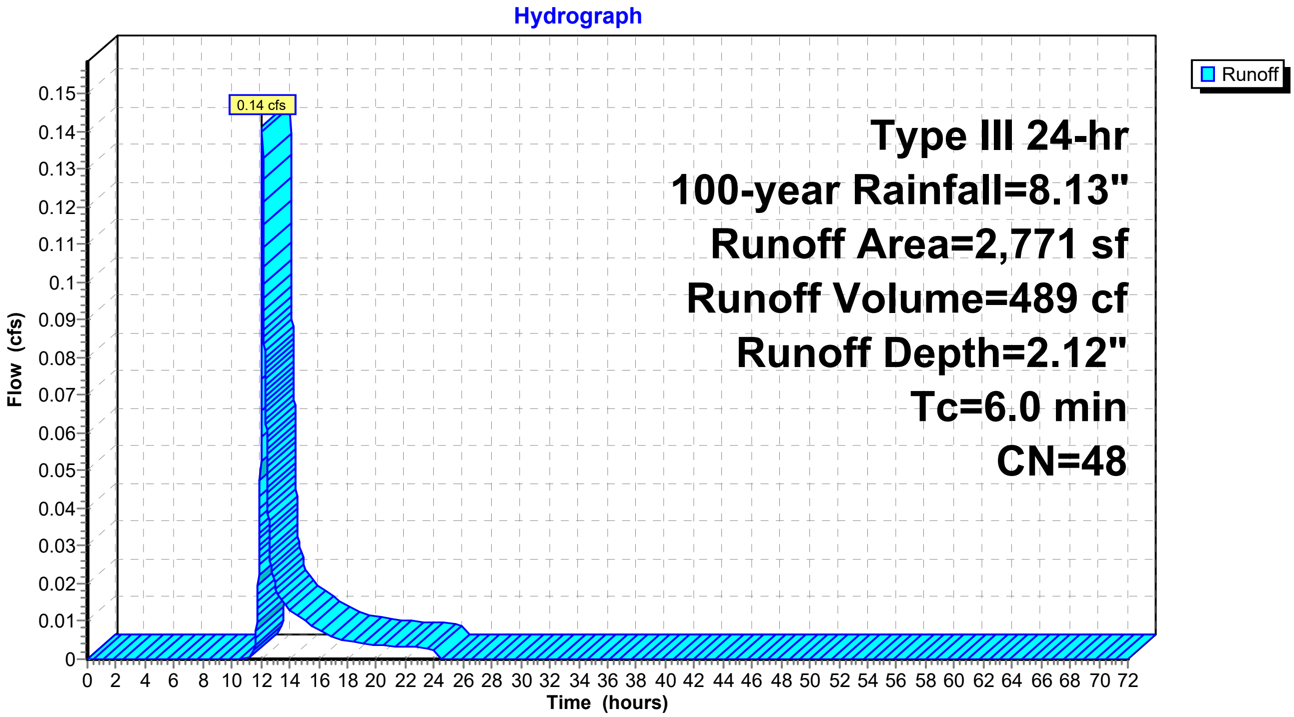
Runoff = 0.14 cfs @ 12.10 hrs, Volume= 489 cf, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.13"

	Area (sf)	CN	Description
	405	98	Paved parking, HSG A
	2,314	39	>75% Grass cover, Good, HSG A
*	52	39	Pervious Surface, HSG A
	2,771	48	Weighted Average
	2,366		85.38% Pervious Area
	405		14.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

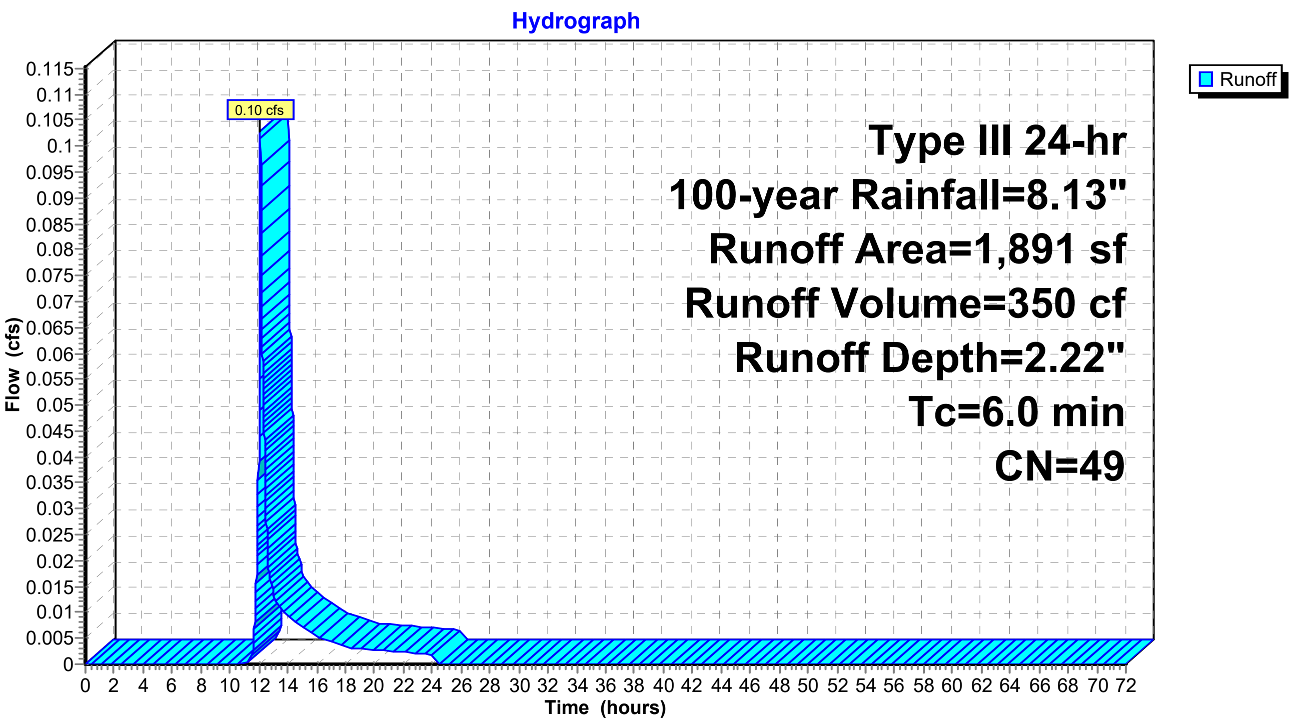
Runoff = 0.10 cfs @ 12.10 hrs, Volume= 350 cf, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.13"

	Area (sf)	CN	Description
	307	98	Paved parking, HSG A
	1,517	39	>75% Grass cover, Good, HSG A
*	67	39	Pervious Surface, Good, HSG A
	1,891	49	Weighted Average
	1,584		83.77% Pervious Area
	307		16.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A4: SUB-A4



Summary for Subcatchment A5: SUB-A5

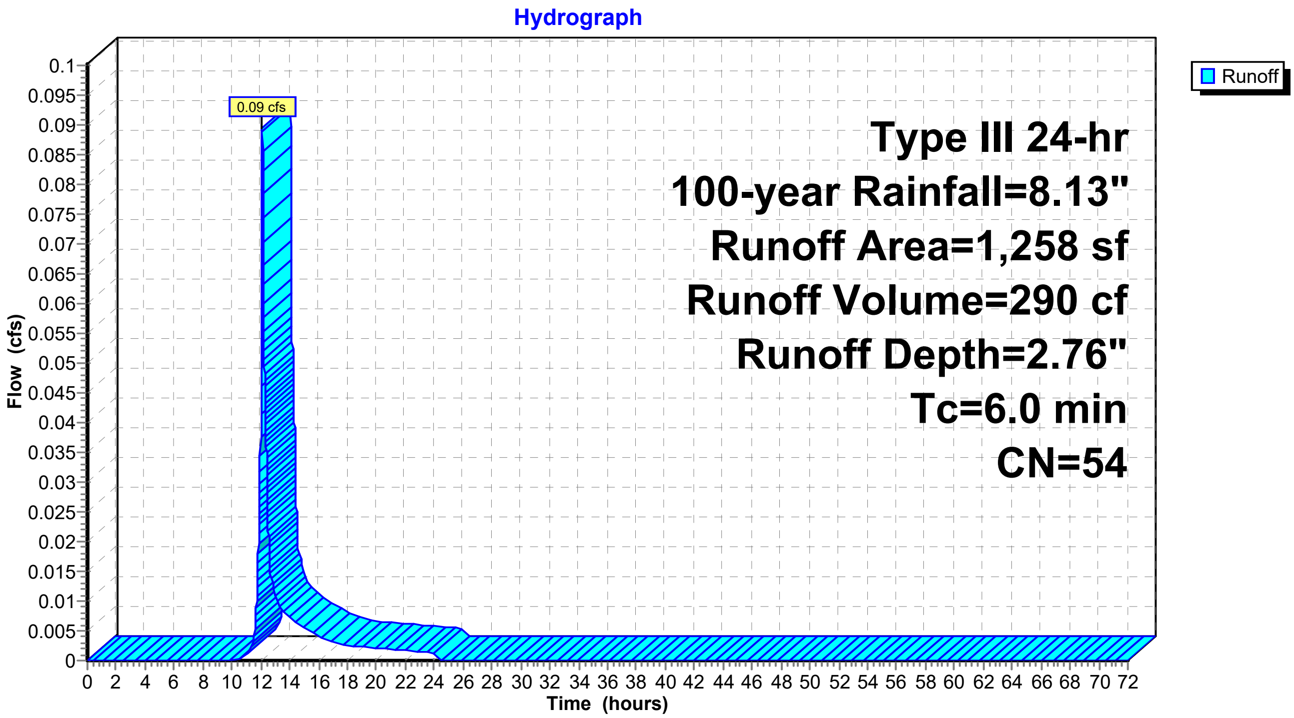
Runoff = 0.09 cfs @ 12.10 hrs, Volume= 290 cf, Depth= 2.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.13"

Area (sf)	CN	Description
325	98	Paved parking, HSG A
933	39	>75% Grass cover, Good, HSG A
1,258	54	Weighted Average
933		74.17% Pervious Area
325		25.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A5: SUB-A5



Summary for Subcatchment A6: SUB-A6

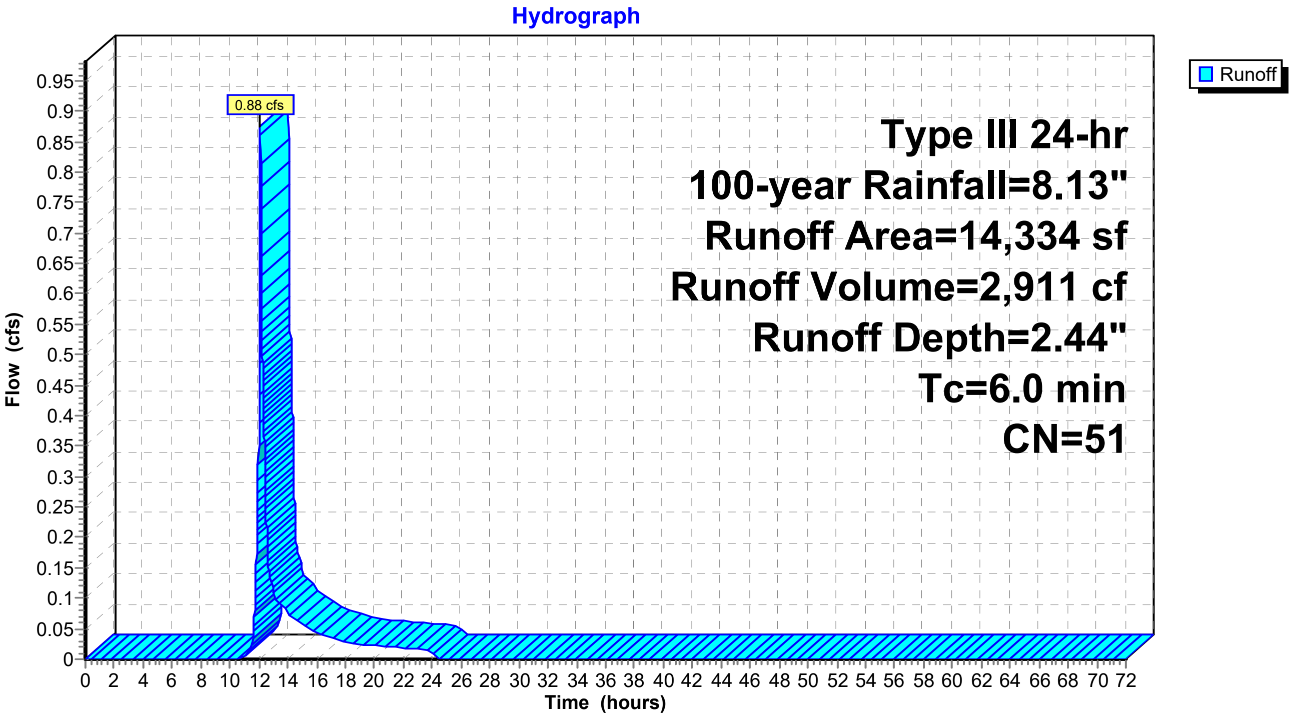
Runoff = 0.88 cfs @ 12.10 hrs, Volume= 2,911 cf, Depth= 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.13"

	Area (sf)	CN	Description
	3,025	98	Paved parking, HSG A
	9,351	39	>75% Grass cover, Good, HSG A
*	1,958	39	Pervious Surface, HSG A
	14,334	51	Weighted Average
	11,309		78.90% Pervious Area
	3,025		21.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min Tc=0.1 hrs**

Subcatchment A6: SUB-A6



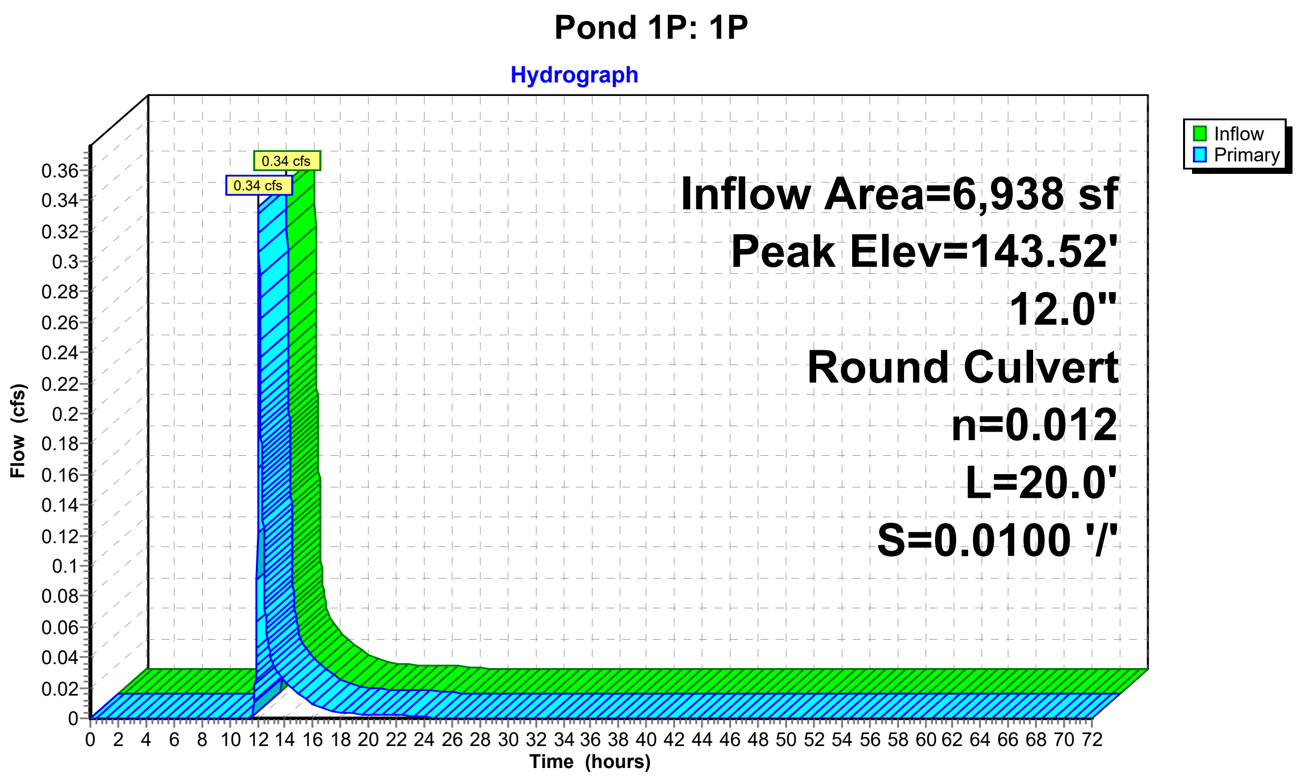
Summary for Pond 1P: 1P

Inflow Area =	6,938 sf,	14.28% Impervious,	Inflow Depth = 1.41"	for 100-year event	
Inflow =	0.34 cfs @	12.10 hrs,	Volume=	816 cf	
Outflow =	0.34 cfs @	12.10 hrs,	Volume=	816 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.34 cfs @	12.10 hrs,	Volume=	816 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 143.52' @ 12.10 hrs
Flood Elev= 145.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	143.20'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.20' / 143.00' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.34 cfs @ 12.10 hrs HW=143.52' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.34 cfs @ 1.53 fps)



Summary for Pond XB-1: XB-1

Inflow Area =	4,054 sf,	9.69% Impervious,	Inflow Depth = 1.81"	for 100-year event
Inflow =	0.17 cfs @	12.10 hrs, Volume=	610 cf	
Outflow =	0.17 cfs @	12.11 hrs, Volume=	610 cf,	Atten= 0%, Lag= 0.3 min
Discarded =	0.01 cfs @	12.11 hrs, Volume=	300 cf	
Primary =	0.16 cfs @	12.11 hrs, Volume=	310 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 145.33' @ 12.11 hrs Surf.Area= 127 sf Storage= 37 cf

Plug-Flow detention time= 33.5 min calculated for 610 cf (100% of inflow)
Center-of-Mass det. time= 33.5 min (918.5 - 885.0)

Volume	Invert	Avail.Storage	Storage Description
#1	144.75'	173 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

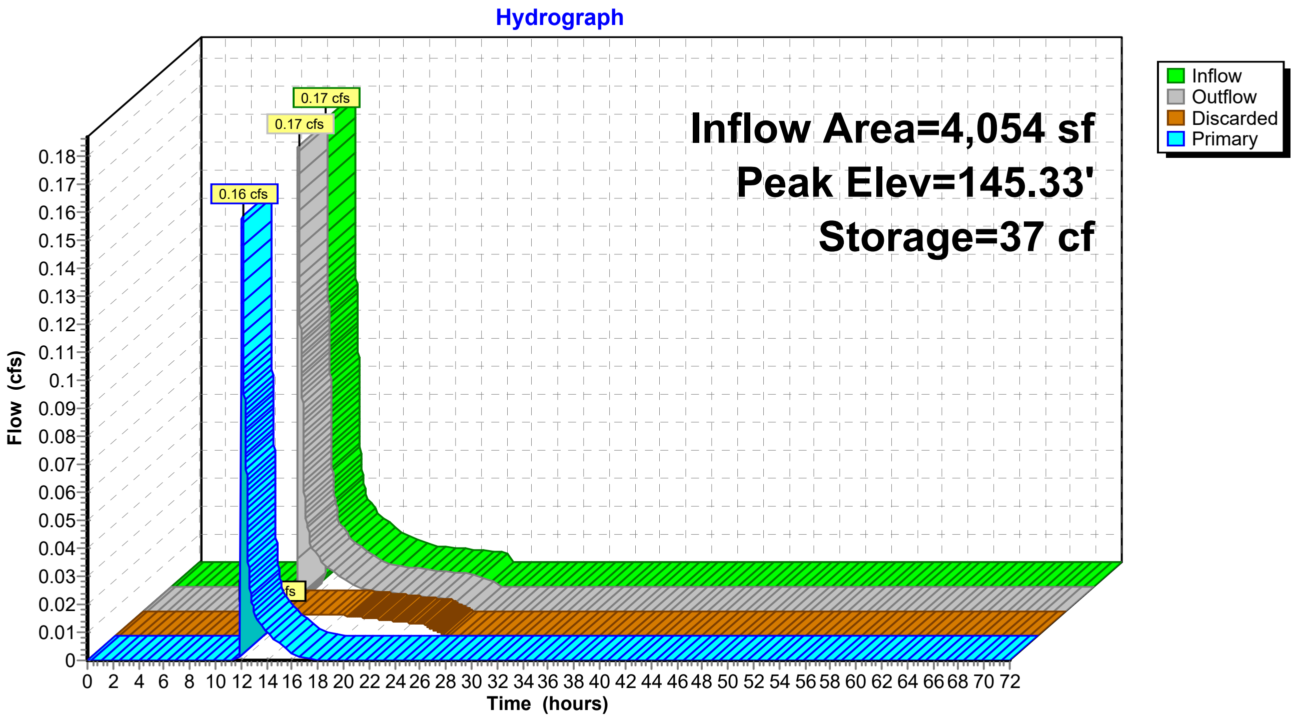
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
144.75	10	0	0
145.00	50	8	8
146.00	280	165	173

Device	Routing	Invert	Outlet Devices
#1	Primary	143.16'	**6.0" Round Culvert** L= 16.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.16' / 143.00' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Device 1	145.30'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	144.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.01 cfs @ 12.11 hrs HW=145.33' (Free Discharge)
└─**3=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.16 cfs @ 12.11 hrs HW=145.33' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.16 cfs of 1.04 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 0.16 cfs @ 0.60 fps)

Pond XB-1: XB-1


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=4,054 sf
Peak Elev=145.33'
Storage=37 cf
0.17 cfs
0.17 cfs
0.16 cfs
Flow (cfs)
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Pond XB-2: XB-2

Inflow Area = 2,276 sf, 12.26% Impervious, Inflow Depth = 1.91" for 100-year event
Inflow = 0.10 cfs @ 12.10 hrs, Volume= 362 cf
Outflow = 0.10 cfs @ 12.10 hrs, Volume= 362 cf, Atten= 0%, Lag= 0.2 min
Discarded = 0.00 cfs @ 12.10 hrs, Volume= 154 cf
Primary = 0.10 cfs @ 12.10 hrs, Volume= 208 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 146.27' @ 12.10 hrs Surf.Area= 65 sf Storage= 14 cf

Plug-Flow detention time= 23.9 min calculated for 362 cf (100% of inflow)
Center-of-Mass det. time= 23.9 min (905.6 - 881.6)

Volume	Invert	Avail.Storage	Storage Description
#1	145.75'	107 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

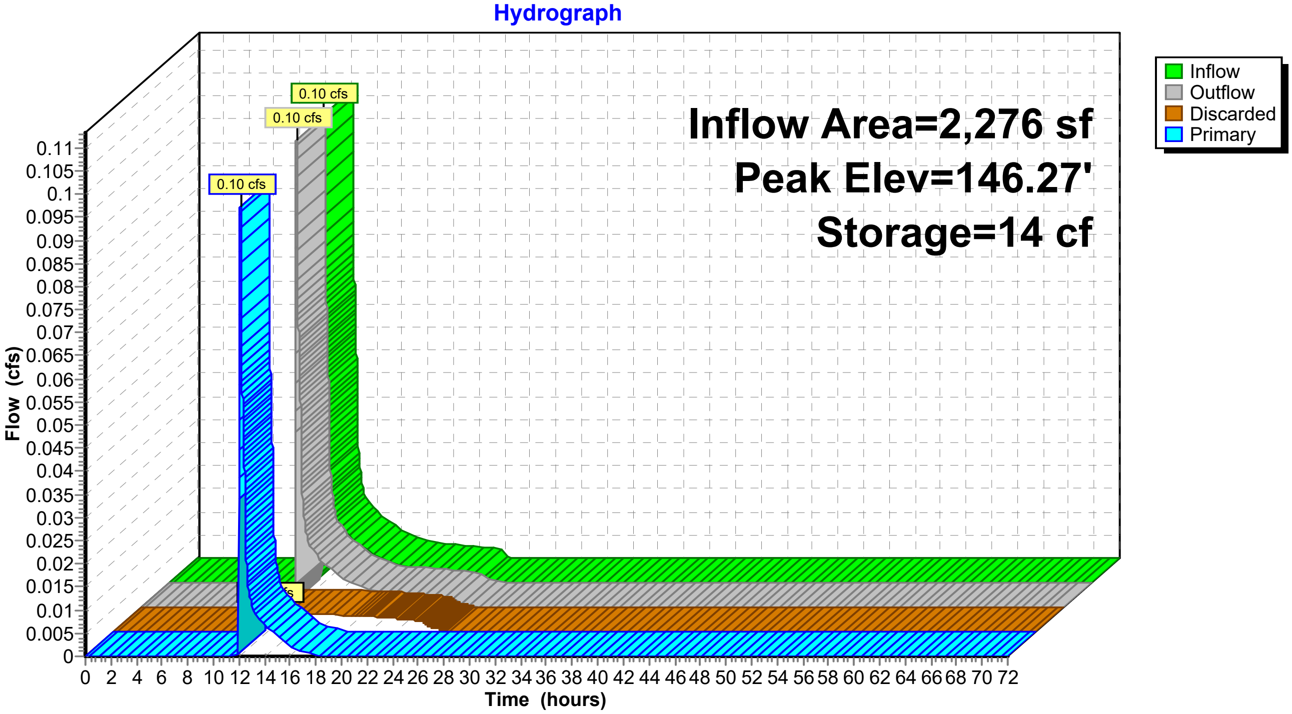
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
145.75	5	0	0
146.00	18	3	3
147.00	190	104	107

Device	Routing	Invert	Outlet Devices
#1	Primary	143.68'	**6.0" Round Culvert** L= 38.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.68' / 143.30' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Device 1	146.25'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	145.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 12.10 hrs HW=146.27' (Free Discharge)
└─**3=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.10 cfs @ 12.10 hrs HW=146.27' TW=143.52' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.10 cfs of 1.14 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 0.10 cfs @ 0.51 fps)

Pond XB-2: XB-2


Hydrograph
0.10 cfs
0.10 cfs
0.10 cfs
Inflow Area=2,276 sf
Peak Elev=146.27'
Storage=14 cf
Inflow
Outflow
Discarded
Primary
Flow (cfs)
0.11
0.105
0.1
0.095
0.09
0.085
0.08
0.075
0.07
0.065
0.06
0.055
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Pond XB-3: XB-3

Inflow Area = 2,771 sf, 14.62% Impervious, Inflow Depth = 2.12" for 100-year event
Inflow = 0.14 cfs @ 12.10 hrs, Volume= 489 cf
Outflow = 0.14 cfs @ 12.10 hrs, Volume= 489 cf, Atten= 0%, Lag= 0.1 min
Discarded = 0.00 cfs @ 12.10 hrs, Volume= 57 cf
Primary = 0.14 cfs @ 12.10 hrs, Volume= 432 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 145.28' @ 12.10 hrs Surf.Area= 22 sf Storage= 4 cf

Plug-Flow detention time= 5.1 min calculated for 489 cf (100% of inflow)
Center-of-Mass det. time= 5.1 min (880.5 - 875.4)

Volume	Invert	Avail.Storage	Storage Description
#1	145.00'	143 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

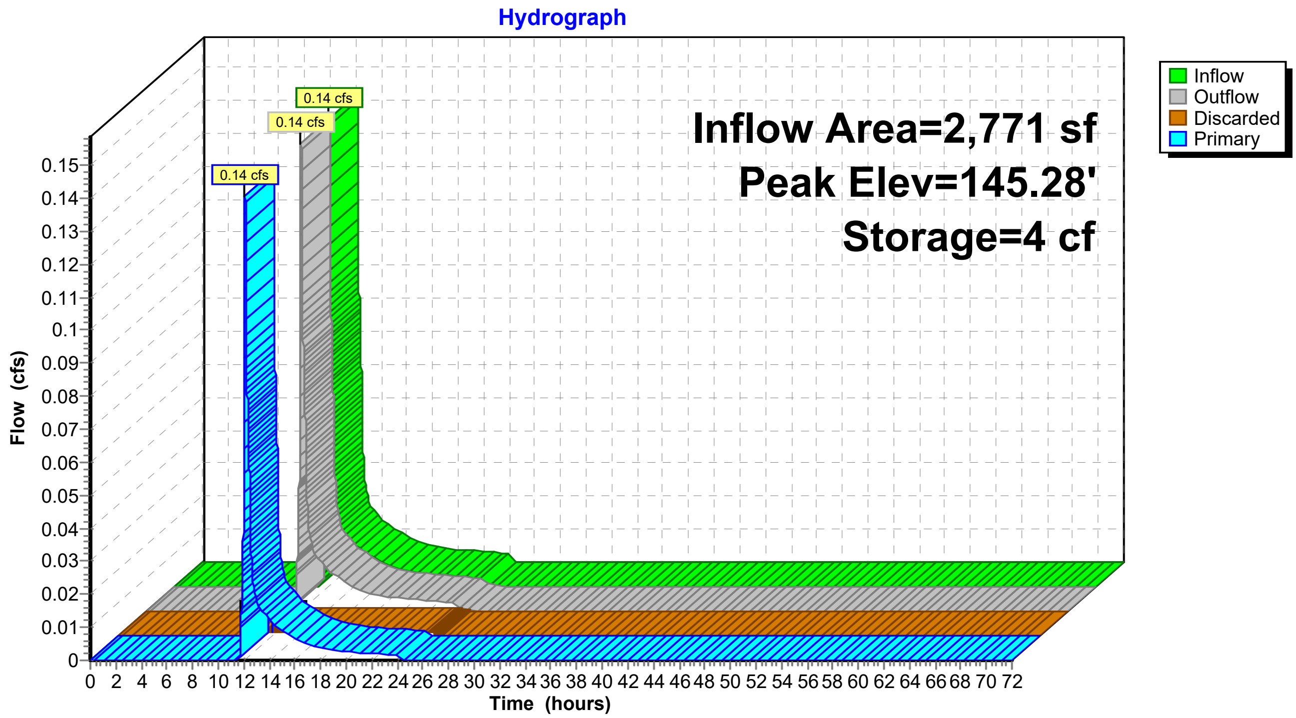
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
145.00	5	0	0
146.00	65	35	35
147.00	150	108	143

Device	Routing	Invert	Outlet Devices
#1	Primary	145.25'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	145.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 12.10 hrs HW=145.28' (Free Discharge)
└─**2=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.14 cfs @ 12.10 hrs HW=145.28' TW=143.52' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Weir Controls 0.14 cfs @ 0.58 fps)

Pond XB-3: XB-3


Hydrograph
Inflow
Outflow
Discarded
Primary
0.14 cfs
0.14 cfs
0.14 cfs
Inflow Area=2,771 sf
Peak Elev=145.28'
Storage=4 cf
Flow (cfs)
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Pond XB-4: XB-3

Inflow Area = 1,891 sf, 16.23% Impervious, Inflow Depth = 2.22" for 100-year event
Inflow = 0.10 cfs @ 12.10 hrs, Volume= 350 cf
Outflow = 0.10 cfs @ 12.10 hrs, Volume= 350 cf, Atten= 0%, Lag= 0.2 min
Discarded = 0.00 cfs @ 12.10 hrs, Volume= 173 cf
Primary = 0.10 cfs @ 12.10 hrs, Volume= 177 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 147.02' @ 12.10 hrs Surf.Area= 78 sf Storage= 22 cf

Plug-Flow detention time= 32.4 min calculated for 350 cf (100% of inflow)
Center-of-Mass det. time= 32.4 min (904.8 - 872.4)

Volume	Invert	Avail.Storage	Storage Description
#1	146.50'	73 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

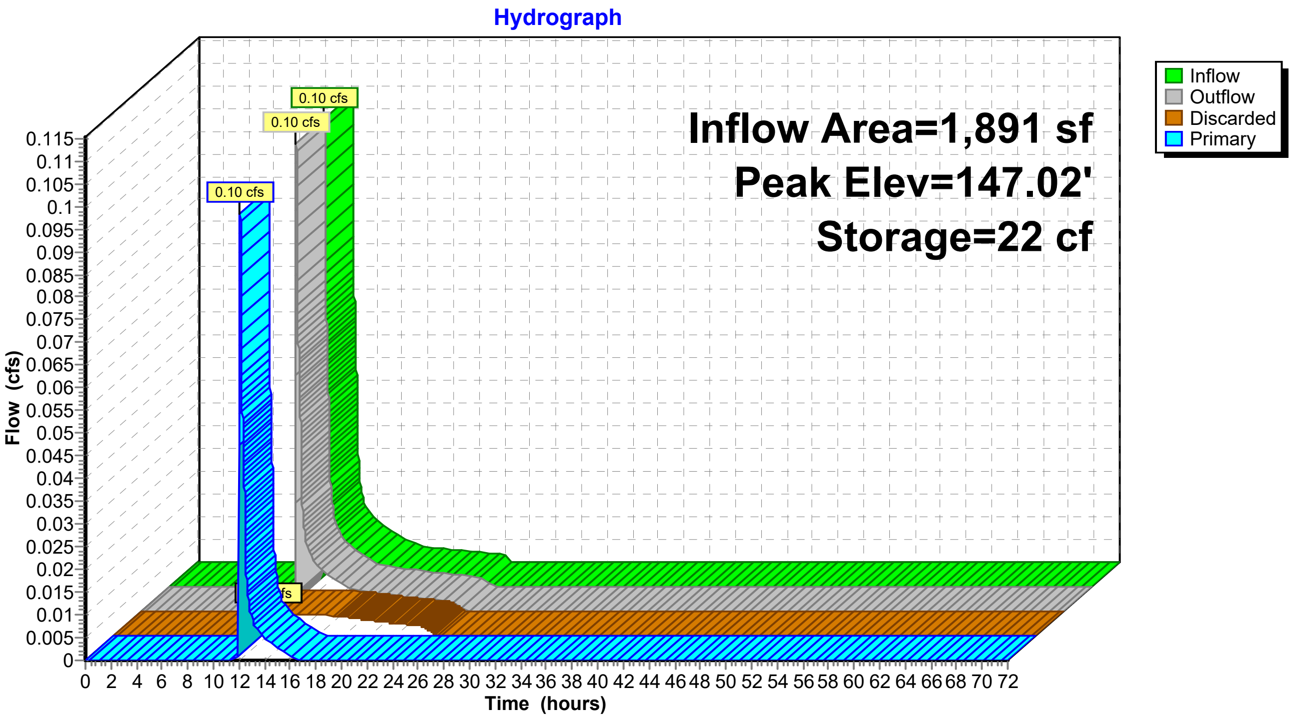
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
146.50	5	0	0
147.00	75	20	20
147.50	135	53	73

Device	Routing	Invert	Outlet Devices
#1	Primary	143.52'	**6.0" Round Culvert** L= 22.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.52' / 143.30' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Device 1	147.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	146.50'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 12.10 hrs HW=147.02' (Free Discharge)
└─**3=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.10 cfs @ 12.10 hrs HW=147.02' TW=143.52' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.10 cfs of 1.35 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 0.10 cfs @ 0.51 fps)

Pond XB-4: XB-3


Hydrograph
Inflow
Outflow
Discarded
Primary
0.10 cfs
0.10 cfs
0.10 cfs
Inflow Area=1,891 sf
Peak Elev=147.02'
Storage=22 cf
Flow (cfs)
Time (hours)

Summary for Pond XB-5: XB-5

Inflow Area = 1,258 sf, 25.83% Impervious, Inflow Depth = 2.76" for 100-year event
Inflow = 0.09 cfs @ 12.10 hrs, Volume= 290 cf
Outflow = 0.09 cfs @ 12.10 hrs, Volume= 290 cf, Atten= 0%, Lag= 0.2 min
Discarded = 0.00 cfs @ 12.10 hrs, Volume= 136 cf
Primary = 0.09 cfs @ 12.10 hrs, Volume= 154 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 147.02' @ 12.10 hrs Surf.Area= 68 sf Storage= 10 cf

Plug-Flow detention time= 15.3 min calculated for 290 cf (100% of inflow)
Center-of-Mass det. time= 15.3 min (874.5 - 859.2)

Volume	Invert	Avail.Storage	Storage Description
#1	146.75'	56 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

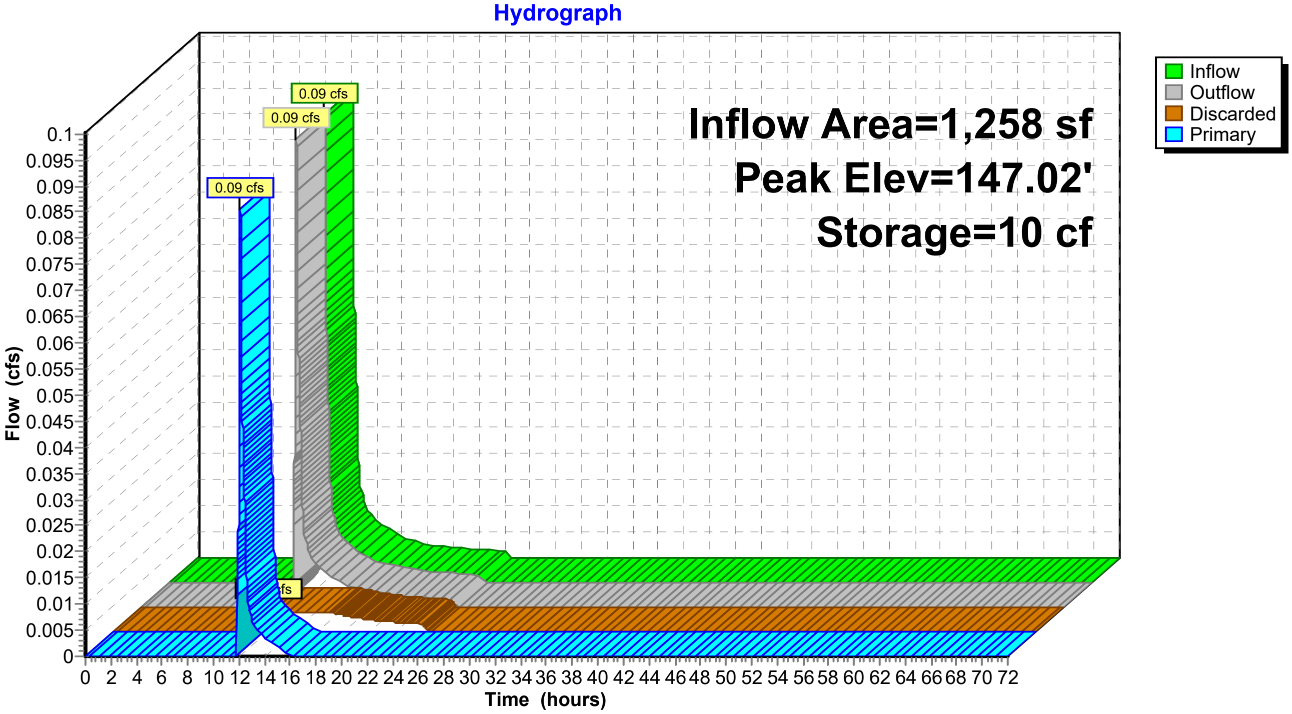
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
146.75	5	0	0
147.00	65	9	9
147.50	125	48	56

Device	Routing	Invert	Outlet Devices
#1	Primary	143.23'	**6.0" Round Culvert** L= 21.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 143.23' / 143.00' S= 0.0110 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Device 1	147.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	146.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 142.33'

Discarded OutFlow Max=0.00 cfs @ 12.10 hrs HW=147.02' (Free Discharge)
└─**3=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.09 cfs @ 12.10 hrs HW=147.02' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.09 cfs of 1.40 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 0.09 cfs @ 0.49 fps)

Pond XB-5: XB-5

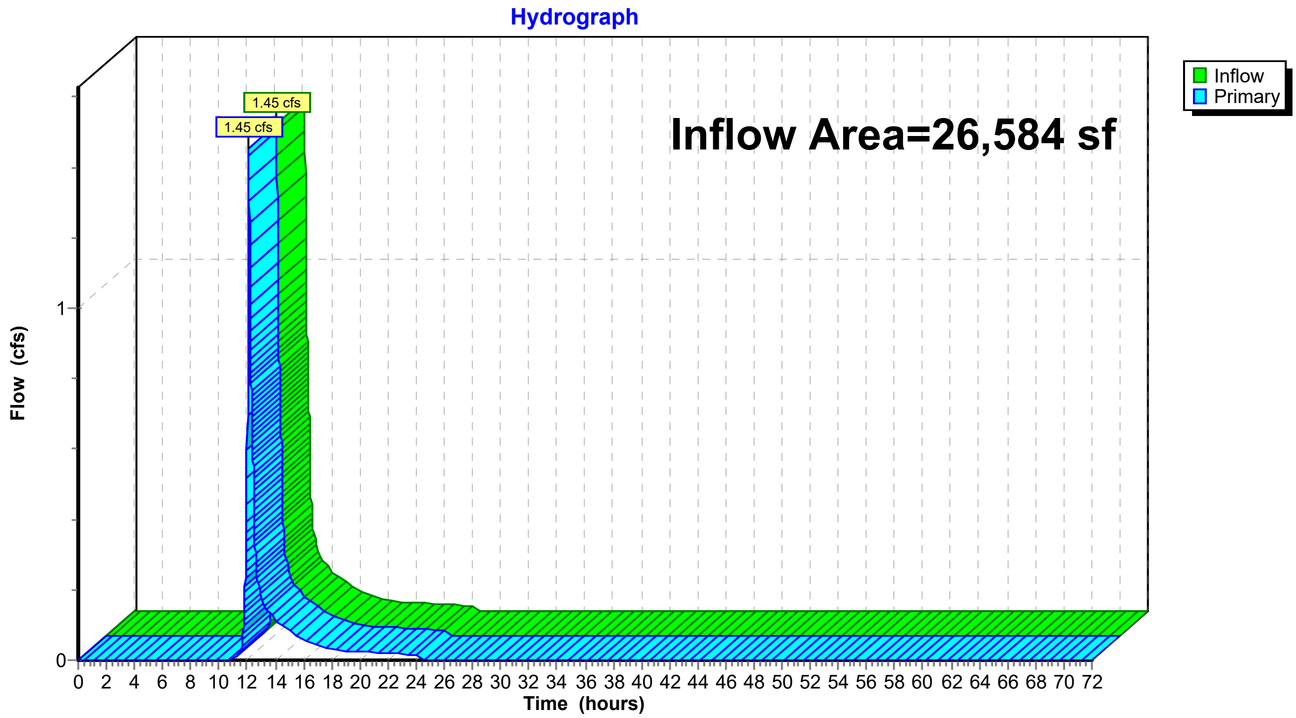

Hydrograph
Inflow
Outflow
Discarded
Primary
0.09 cfs
0.09 cfs
0.09 cfs
Inflow Area=1,258 sf
Peak Elev=147.02'
Storage=10 cf
Flow (cfs)
0.1
0.095
0.09
0.085
0.08
0.075
0.07
0.065
0.06
0.055
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Link A: A

Inflow Area =	26,584 sf,	17.81% Impervious,	Inflow Depth = 1.89"	for 100-year event	
Inflow =	1.45 cfs @	12.10 hrs,	Volume=	4,191 cf	
Primary =	1.45 cfs @	12.10 hrs,	Volume=	4,191 cf,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: A



Attachment E - Calculations

Levingston Cove
Recharge Calculation

Required Recharge

Area Summary	
	Area (SF)*
Existing Impervious	4,666
Proposed Impervious	4,734
Required Recharge Area *(Proposed - Existing)*	68

* Areas calculated in HydroCAD

Note: Site consists of HSG A soils.

Hydrologic Soil Group Summary		
Group	Target Depth Factor (in)	Area (SF)
A	0.6	68
B	0.35	0
C	0.25	0
D	0.1	0

Required Recharge (*Rv*) Calculation:

Rv = Target Depth Factor x Δ Impervious Area
Rv = 0.6 x (1/12) x 68
Rv = 3 CF

Proposed Recharge Summary

Location	Volume (CF)*	Description
Bioretention Area 1	33	XB-1
Bioretention Area 2	13	XB-2
Bioretention Area 3	3	XB-3
Bioretention Area 4	20	XB-4
Bioretention Area 5	9	XB-5
Total	78	

Rv = 3 CF
Provided recharge = 78 CF

Recharge Requirement is met.

*Note: Volume numbers listed above reflect static volume available in recharge systems. Actual volume of recharged water will be much higher due to dynamic action reflected in the HydroCAD analysis.

Levingston Cove
Water Quality Volume Calculation
Aug-21

Required Water Quality Storage
Proposed Paved Area sf x 1" x 1'/12"= Required WQ Storage CF

Location	Proposed Impervious Area (sqft)	Required WQ Storage (cf)	Provided WQ Storage (cf)	Description
Bioretention Areas 1-5	4,734	395	78	XB-1, XB-2, XB-3, XB-4, XB-5

Water Quality Event Provided for = (78 cf * 12"/1') / 4,734 sf = 0.2"

Stage-Area-Storage for Pond XB-1: XB-1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
144.75	10	0	145.27	112	29
144.76	12	0	145.28	114	31
144.77	13	0	145.29	117	32
144.78	15	0	145.30	119	33
144.79	16	1	145.31	121	34
144.80	18	1	145.32	124	35
144.81	20	1	145.33	126	37
144.82	21	1	145.34	128	38
144.83	23	1	145.35	130	39
144.84	24	2	145.36	133	40
144.85	26	2	145.37	135	42
144.86	28	2	145.38	137	43
144.87	29	2	145.39	140	44
144.88	31	3	145.40	142	46
144.89	32	3	145.41	144	47
144.90	34	3	145.42	147	49
144.91	36	4	145.43	149	50
144.92	37	4	145.44	151	52
144.93	39	4	145.45	153	53
144.94	40	5	145.46	156	55
144.95	42	5	145.47	158	56
144.96	44	6	145.48	160	58
144.97	45	6	145.49	163	60
144.98	47	7	145.50	165	61
144.99	48	7	145.51	167	63
145.00	50	8	145.52	170	65
145.01	52	8	145.53	172	66
145.02	55	9	145.54	174	68
145.03	57	9	145.55	177	70
145.04	59	10	145.56	179	72
145.05	62	10	145.57	181	73
145.06	64	11	145.58	183	75
145.07	66	12	145.59	186	77
145.08	68	12	145.60	188	79
145.09	71	13	145.61	190	81
145.10	73	14	145.62	193	83
145.11	75	14	145.63	195	85
145.12	78	15	145.64	197	87
145.13	80	16	145.65	200	89
145.14	82	17	145.66	202	91
145.15	85	18	145.67	204	93
145.16	87	18	145.68	206	95
145.17	89	19	145.69	209	97
145.18	91	20	145.70	211	99
145.19	94	21	145.71	213	101
145.20	96	22	145.72	216	103
145.21	98	23	145.73	218	105
145.22	101	24	145.74	220	107
145.23	103	25	145.75	223	110
145.24	105	26	145.76	225	112
145.25	108	27	145.77	227	114
145.26	110	28	145.78	229	116

Storage volume below lowest outlet

Stage-Area-Storage for Pond XB-1: XB-1 (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
145.79	232	119
145.80	234	121
145.81	236	123
145.82	239	126
145.83	241	128
145.84	243	131
145.85	245	133
145.86	248	136
145.87	250	138
145.88	252	141
145.89	255	143
145.90	257	146
145.91	259	148
145.92	262	151
145.93	264	153
145.94	266	156
145.95	268	159
145.96	271	161
145.97	273	164
145.98	275	167
145.99	278	170
146.00	**280**	**173**

Stage-Area-Storage for Pond XB-2: XB-2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
145.75	5	0
145.77	6	0
145.79	7	0
145.81	8	0
145.83	9	1
145.85	10	1
145.87	11	1
145.89	12	1
145.91	13	1
145.93	14	2
145.95	15	2
145.97	16	2
145.99	17	3
146.01	20	3
146.03	23	3
146.05	27	4
146.07	30	5
146.09	33	5
146.11	37	6
146.13	40	7
146.15	44	8
146.17	47	8
146.19	51	9
146.21	54	10
146.23	58	12
146.25	61	13
146.27	64	14
146.29	68	15
146.31	71	17
146.33	75	18
146.35	78	20
146.37	82	21
146.39	85	23
146.41	89	25
146.43	92	27
146.45	95	28
146.47	99	30
146.49	102	32
146.51	106	34
146.53	109	37
146.55	113	39
146.57	116	41
146.59	119	43
146.61	123	46
146.63	126	48
146.65	130	51
146.67	133	54
146.69	137	56
146.71	140	59
146.73	144	62
146.75	147	65
146.77	150	68
146.79	154	71
146.81	157	74
146.83	161	77
146.85	164	80
146.87	168	84
146.89	171	87
146.91	175	90
146.93	178	94
146.95	181	98
146.97	185	101
146.99	**188**	**105**

Storage volume
below lowest outlet

Stage-Area-Storage for Pond XB-3: XB-3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
145.00	5	0	145.52	36	11
145.01	6	0	145.53	37	11
145.02	6	0	145.54	37	11
145.03	7	0	145.55	38	12
145.04	7	0	145.56	39	12
145.05	8	0	145.57	39	13
145.06	9	0	145.58	40	13
145.07	9	0	145.59	40	13
145.08	10	1	145.60	41	14
145.09	10	1	145.61	42	14
145.10	11	1	145.62	42	15
145.11	12	1	145.63	43	15
145.12	12	1	145.64	43	15
145.13	13	1	145.65	44	16
145.14	13	1	145.66	45	16
145.15	14	1	145.67	45	17
145.16	15	2	145.68	46	17
145.17	15	2	145.69	46	18
145.18	16	2	145.70	47	18
145.19	16	2	145.71	48	19
145.20	17	2	145.72	48	19
145.21	18	2	145.73	49	20
145.22	18	3	145.74	49	20
145.23	19	3	145.75	50	21
145.24	19	3	145.76	51	21
145.25	20	3	145.77	51	22
145.26	21	3	145.78	52	22
145.27	21	4	145.79	52	23
145.28	22	4	145.80	53	23
145.29	22	4	145.81	54	24
145.30	23	4	145.82	54	24
145.31	24	4	145.83	55	25
145.32	24	5	145.84	55	25
145.33	25	5	145.85	56	26
145.34	25	5	145.86	57	26
145.35	26	5	145.87	57	27
145.36	27	6	145.88	58	28
145.37	27	6	145.89	58	28
145.38	28	6	145.90	59	29
145.39	28	7	145.91	60	29
145.40	29	7	145.92	60	30
145.41	30	7	145.93	61	31
145.42	30	7	145.94	61	31
145.43	31	8	145.95	62	32
145.44	31	8	145.96	63	32
145.45	32	8	145.97	63	33
145.46	33	9	145.98	64	34
145.47	33	9	145.99	64	34
145.48	34	9	146.00	65	35
145.49	34	10	146.01	66	36
145.50	35	10	146.02	67	36
145.51	36	10	146.03	68	37

Storage volume
below lowest outlet

Stage-Area-Storage for Pond XB-3: XB-3 (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
146.04	68	38
146.05	69	38
146.06	70	39
146.07	71	40
146.08	72	40
146.09	73	41
146.10	73	42
146.11	74	43
146.12	75	43
146.13	76	44
146.14	77	45
146.15	78	46
146.16	79	46
146.17	79	47
146.18	80	48
146.19	81	49
146.20	82	50
146.21	83	51
146.22	84	51
146.23	85	52
146.24	85	53
146.25	86	54
146.26	87	55
146.27	88	56
146.28	89	57
146.29	90	57
146.30	91	58
146.31	91	59
146.32	92	60
146.33	93	61
146.34	94	62
146.35	95	63
146.36	96	64
146.37	96	65
146.38	97	66
146.39	98	67
146.40	99	68
146.41	100	69
146.42	101	70
146.43	102	71
146.44	102	72
146.45	103	73
146.46	104	74
146.47	105	75
146.48	106	76
146.49	107	77
146.50	108	78
146.51	108	79
146.52	109	80
146.53	110	81
146.54	111	82
146.55	112	84
146.56	113	85
146.57	113	86
146.58	114	87
146.59	115	88
146.60	116	89
146.61	117	90
146.62	118	92
146.63	119	93
146.64	119	94
146.65	120	95
146.66	121	96
146.67	122	98
146.68	123	99
146.69	124	100
146.70	124	101
146.71	125	103
146.72	126	104
146.73	127	105
146.74	128	106
146.75	129	108
146.76	130	109
146.77	130	110
146.78	131	112
146.79	132	113
146.80	133	114
146.81	134	116
146.82	135	117
146.83	136	118
146.84	136	120
146.85	137	121
146.86	138	122
146.87	139	124
146.88	140	125
146.89	141	127
146.90	142	128
146.91	142	129
146.92	143	131
146.93	144	132
146.94	145	134
146.95	146	135
146.96	147	137
146.97	147	138
146.98	148	140
146.99	149	141
147.00	**150**	**143**

Stage-Area-Storage for Pond XB-4: XB-3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
146.50	5	0
146.51	6	0
146.52	8	0
146.53	9	0
146.54	11	0
146.55	12	0
146.56	13	1
146.57	15	1
146.58	16	1
146.59	18	1
146.60	19	1
146.61	20	1
146.62	22	2
146.63	23	2
146.64	25	2
146.65	26	2
146.66	27	3
146.67	29	3
146.68	30	3
146.69	32	3
146.70	33	4
146.71	34	4
146.72	36	4
146.73	37	5
146.74	39	5
146.75	40	6
146.76	41	6
146.77	43	6
146.78	44	7
146.79	46	7
146.80	47	8
146.81	48	8
146.82	50	9
146.83	51	9
146.84	53	10
146.85	54	10
146.86	55	11
146.87	57	11
146.88	58	12
146.89	60	13
146.90	61	13
146.91	62	14
146.92	64	14
146.93	65	15
146.94	67	16
146.95	68	16
146.96	69	17
146.97	71	18
146.98	72	19
146.99	74	19
147.00	75	20
147.01	76	21
147.02	77	22
147.03	79	22
147.04	80	23
147.05	81	24
147.06	82	25
147.07	83	26
147.08	85	26
147.09	86	27
147.10	87	28
147.11	88	29
147.12	89	30
147.13	91	31
147.14	92	32
147.15	93	33
147.16	94	34
147.17	95	34
147.18	97	35
147.19	98	36
147.20	99	37
147.21	100	38
147.22	101	39
147.23	103	40
147.24	104	41
147.25	105	43
147.26	106	44
147.27	107	45
147.28	109	46
147.29	110	47
147.30	111	48
147.31	112	49
147.32	113	50
147.33	115	51
147.34	116	52
147.35	117	54
147.36	118	55
147.37	119	56
147.38	121	57
147.39	122	58
147.40	123	60
147.41	124	61
147.42	125	62
147.43	127	63
147.44	128	65
147.45	129	66
147.46	130	67
147.47	131	69
147.48	133	70
147.49	134	71
147.50	**135**	**73**

Storage volume below lowest outlet

Stage-Area-Storage for Pond XB-5: XB-5

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
146.75	5	0
146.76	7	0
146.77	10	0
146.78	12	0
146.79	15	0
146.80	17	1
146.81	19	1
146.82	22	1
146.83	24	1
146.84	27	1
146.85	29	2
146.86	31	2
146.87	34	2
146.88	36	3
146.89	39	3
146.90	41	3
146.91	43	4
146.92	46	4
146.93	48	5
146.94	51	5
146.95	53	6
146.96	55	6
146.97	58	7
146.98	60	7
146.99	63	8
147.00	65	9
147.01	66	9
147.02	67	10
147.03	69	11
147.04	70	11
147.05	71	12
147.06	72	13
147.07	73	14
147.08	75	14
147.09	76	15
147.10	77	16
147.11	78	17
147.12	79	17
147.13	81	18
147.14	82	19
147.15	83	20
147.16	84	21
147.17	85	22
147.18	87	22
147.19	88	23
147.20	89	24
147.21	90	25
147.22	91	26
147.23	93	27
147.24	94	28
147.25	95	29
147.26	96	30
147.27	97	31
147.28	99	32
147.29	100	33
147.30	101	34
147.31	102	35
147.32	103	36
147.33	105	37
147.34	106	38
147.35	107	39
147.36	108	40
147.37	109	41
147.38	111	42
147.39	112	43
147.40	113	44
147.41	114	45
147.42	115	47
147.43	117	48
147.44	118	49
147.45	119	50
147.46	120	51
147.47	121	53
147.48	123	54
147.49	124	55
147.50	**125**	**56**

Storage volume
below lowest outlet

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

Version 1, Automated: Mar. 4, 2008

Location: Proposed Site to XB-1-XB-5: Total Treatment

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Vegetated Filter Strip >50 feet	**0.45**	**1.00**	**0.45**	**0.55**
Bioretention Area	**0.90**	**0.55**	**0.50**	**0.06**
	0.00	**0.06**	**0.00**	**0.06**
	0.00	**0.06**	**0.00**	**0.06**
	0.00	**0.06**	**0.00**	**0.06**

Total TSS Removal = 95%

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

Project: **Levingston Cove - Newton, MA**
Prepared By: **James Pearson**
Date: **8/10/2021**

*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

Mass. Dept. of Environmental Protection

Levingston Cove, Newton MA

Phosphorous Load Reduction Calculations

(Calculations are based on NPDES MS4 Permit, Appendix F, Attachment 3)

Key: IA = impervious area

PA = pervious area

Existing Phosphorous Load:

Open Land Use, HSG A

1.52 lbs/acre/yr * 0.13 acres (IA) + 0.03 lbs/acre/yr * 0.50 acres (PA) = **0.213 lbs/yr**

Proposed Phosphorous Load Reduction:

Open Land Use, HSG A

1) IA = 0.039 acres

   PA = 0.24 acres

2) Total BMP volume (total on site): 552 ft^3

3) To determine what the BMP design storage volume is in terms of runoff depth (in) from IA, an iterative process is undertaken:

4) BMP Volume = (552 ft^3 * 0.039 acres) * (12 in/ft * 43,560 ft^2/acre) = 0.01 in
   0.24 acre (PA) * 0.0 in (runoff depth from table 3-4) = 0.0 ft^3
   552 ft^3 – 0.0 ft^3 = 552 ft^3

5) BMP Volume = (552 ft^3 * 0.039 acres) * (12* in/ft * 1 acre / 43,560 ft^2) = 0.01 in

6) % Difference = ((0.01 in – 0.01 in) / (0.01 in) x 100 = 0% difference is acceptable

7) The percent phosphorus load reduction for the infiltrating bioretention basin is determined by using the infiltration basin performance curve for an infiltration rate of 2.41 in/hr and the treatment volume (BMP-Volume = 0.01 in) calculated in step 5)

   The percent phosphorus load reduction for all the infiltrating bioretention basins site wide based on Figure 3-11: BMP Performance Curve: Infiltration Basin (infiltration rate = 2.41 in/hr)

   = 46% phosphorous load reduction

8) The cumulative phosphorus load reduction in pounds of phosphorus for the proposed infiltrating bioretention basins is calculated by using equation 3-2 with the BMP Load and the calculated Phosphorus load reduction of 46%.

BMP phosphorous load reduction (lbs phosphorus)
= BMP Load x (phosphorus load reduction /100) (Equation 3-2)

Using Table 3-1, the BMP load is calculated:
BMP Load = (IA x loading rate) + (PA HSG A x loading rate)
BMP Load = 1.52 lbs/acre/yr * 0.039 acres (IA) + 0.03 lbs/acre/yr * 0.24 acres (PA)
= 0.066 lbs/yr

BMP load reduction (lbs phosphorous) = 0.066 lbs/yr * 47/100 = 0.031 lbs/yr

Phosphorous load direct to Crystal Lake (Load from area not captured by BMPs)
= 1.52 lbs/acre/yr * 0.069 acres (IA) + 0.03 lbs/acre/yr * 0.26 acres (PA
= 0.113 lbs/yr

Proposed phosphorous load
= BMP Load – BMP load reduction + phosphorus Load direct to Crystal Lake
= 0.066 lbs/yr – 0.031 lbs/yr + 0.113 lbs/yr = **0.148 lbs/yr**

Percent phosphorous load reduction from existing conditions to proposed conditions site-wide:

$$= \frac{\text{Existing phosphorous load} - \text{Proposed phosphorous load}}{\text{Existing phosphorus load}} x\ 100$$

$$= \frac{0.213\ \text{lbs/yr} - 0.148\ \text{lbs/yr}}{0.213\ \text{lbs/yr}} x\ 100 = \mathbf{30.5}\%$$

Attachment F - Long Term Pollution Prevention Plan

Levingston Cove
Newton, MA

To meet the requirements of Standard 4 of the Massachusetts Stormwater Handbook, this Long Term Pollution Prevention Plan is provided to identify the proper procedures of practices for source control and pollution prevention.

Storage and Handling of Oil and other Hazardous Materials

No oil or other hazardous materials will be stored at this site.

Operation and Maintenance of Stormwater Control Structures

Included in Attachment H of this appendix is the Operation and Maintenance plan for this site, which include maintenance of the stormwater BMP's. The Newton Parks and Recreation Department will be responsible for the implementation of the plan.

Landscaping

The landscaped areas will be maintained by the owner.

Septic System

There will be no onsite septic wastewater disposal system.

Non-Hazardous Waste Management/Good Housekeeping Practices

All non-hazardous waste shall be stored in designated trash or recycling containers onsite for periodic collection by the local trash collector. The Newton Parks and Recreation Department shall have maintenance staff who monitor the site for the accumulation of trash. Any trash that is seen onsite shall immediately be collected and placed into designated trash or recycling containers. The Newton Parks and Recreation Department maintenance staff shall inspect the site once per week at minimum.

Prohibition of Illicit Discharges

Illicit discharges to the onsite stormwater management system shall be strictly prohibited. Illicit discharges are defined as any direct or indirect non-stormwater discharge to the onsite stormwater system. Requirements related to Illicit Discharges are further detailed in the attached Illicit Discharge Compliance Statement.

Attachment G - Construction Period Pollution and Erosion and Sedimentation Control Plan

Construction Period Pollution Prevention and
Erosion and Sedimentation Control Plan

SECTION 1: Introduction

The Town of Newton proposes to redevelop Levingston Cove on Crystal Lake. Site improvements will include ADA accessible pedestrian walkways and upgrades, seating areas, new site plantings, handrails, a cantilevered deck overlooking the lake, and associated stormwater improvements to encourage increased public usage of the cove. This project will allow the City of Newton to utilize the public beach area that meets current and future needs while also providing new park improvements and increased access to Crystal Lake. Work associated with this project will include but not be limited to paving, grading and installation of drainage infrastructure.

As part of this project, this “Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan” has been created to ensure that no further disturbance to the wetland resource is created during the project.

SECTION 2: Construction Period Pollution Prevention Measures

Best Management Practices (BMPs) will be utilized as Construction Period Pollution Prevention Measures to reduce potential pollutants and prevent any off-site discharge. The objectives of the BMPs for construction activity are to minimize the disturbed areas, stabilize any disturbed areas, control the site perimeter and retain sediment. Both erosion and sedimentation controls and non-stormwater best management measures will be used to minimize site disturbance and ensure compliance with the performance standards of the WPA and Stormwater Standards. Measures will be taken to minimize the area disturbed by construction activities to reduce the potential for soil erosion and stormwater pollution problems. In addition, good housekeeping measures will be followed for the day-to-day operation of the construction site under the control of the contractor to minimize the impact of construction. This section describes the control practices that will be in place during construction activities. Recommended control practices will comply with the standards set in the MA DEP Stormwater Policy Handbook.

2.1 Minimize Disturbed Area and Protect Natural Features and Soil
In order to minimize disturbed areas, work will be completed within well-defined work limits. These work limits are shown on the construction plans. The Contractor shall not disturb native vegetation in the undisturbed wetland area without prior approval from the Engineer. The Contractor will be responsible to make sure that all their workers and any subcontractors know the proper work limits and do not extend their work into the undisturbed areas. The protective measures are described in more detail in the following sections.

2.2 Control Stormwater Flowing onto and through the project

Construction areas adjacent to wetland resources will be lined with compost filter tubes. The tubes will be inspected daily, and accumulated silt will be removed as needed.

2.3 Stabilize Soils

The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, mulching, the use of erosion control mats, or other protective measures shall be provided as specified.

The Contractor shall take account of the conditions of the soil where erosion control seeding will take place to ensure that materials used for re-vegetation are adaptive to the sediment control.

2.4 Proper Storage and Cover of Any Stockpiles

The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project and shall require written approval of the Engineer.

Adequate measures for erosion and sediment control such as the placement of compost filter tubes around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

There shall be no storage of equipment or materials in areas designated as wetlands.

The Engineer may designate one or more areas where the Contractor may store materials used in operations.

2.5 Perimeter Controls and Sediment Barriers

Erosion control lines as described in Section 5 will be utilized to ensure that no sedimentation occurs outside the perimeter of the work area.

2.6 Storm Drain Inlet Protection

Catch basin protection in the form of filtration sac is to be installed prior to start of work on-site on three existing catch basins on the existing access drive and parking area as noted on the site preparation and erosion and sedimentation control plan.

2.7 Retain Sediment On-Site

The Contractor will be responsible to monitor erosion control measures. Whenever necessary the Contractor will clear sediment from the compost filter tube that have been silted up during construction. Daily monitoring should be conducted using the attached Monitoring Form.

The following good housekeeping practices will be followed on-site during the construction project:

2.8 Material Handling and Waste Management
Materials stored on-site will be stored in a neat, orderly manner in appropriate containers. Materials will be kept in their original containers with the original manufacturer's label. Substances will not be mixed with one another unless recommended by the manufacturer.

Waste materials will be collected and stored in a securely lidded metal container from a licensed management company. The waste and any construction debris from the site will be hauled off-site daily and disposed of properly. The contractor will be responsible for waste removal. Manufacturer's recommendations for proper use and disposal will be followed for materials. Sanitary waste will be collected from the portable units a minimum of once a week, by a licensed sanitary waste management contractor.

2.9 Designated Washout Areas
The Contractor shall use washout facilities at their own facilities, unless otherwise directed by the Engineer.

2.10 Proper Equipment/Vehicle Fueling and Maintenance Practices
On-site vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the risk of leakage. To ensure that leaks on stored equipment do not contaminate the site, oil-absorbing mats will be placed under oil-containing equipment during storage. Regular fueling and service of the equipment may be performed using approved methods and with care taken to minimize chance of spills. Repair of equipment or machinery within the 100' water resources area shall not be allowed without the prior approval of the Engineer. Any petroleum products will be stored in tightly sealed containers that are clearly labeled with spill control pads/socks placed under/around their perimeters.

2.11 Equipment/Vehicle Washing
The Contractor will be responsible to ensure that no equipment is washed on-site.

<u>SECTION 3: Spill Prevention and Control Plan</u>
The Contractor will be responsible for preventing spills in accordance with the project specifications and applicable federal, state and local regulations. The Contractor will identify a properly trained site employee, involved with the day-to-day site operations to be the spill prevention and cleanup coordinator. The name(s) of the responsible spill personnel will be posted on-site. Each employee will be instructed that all spills are to be reported to the spill prevention and cleanup coordinator.

3.1 Spill Control Equipment

Spill control/containment equipment will be kept in the Work Area. Materials and equipment necessary for spill cleanup will be kept either in the Work Area or in an otherwise accessible on-site location. Equipment and materials will include, but not be limited to, absorbent booms/mats, brooms, dust pans, mops, rags, gloves, goggles, sand, plastic and metal containers specifically for this purpose. It is the responsibility of the Contractor to ensure the inventory will be readily accessible and maintained.

3.2 Notification

Workers will be directed to inform the on-site supervisor of a spill event. The supervisor will assess the incident and initiate proper containment and response procedures immediately upon notification. Workers should avoid direct contact with spilled materials during the containment procedures. Primary notification of a spill should be made to the local Fire Department and Police Departments. Secondary Notification will be to the certified cleanup contractor if deemed necessary by Fire and/or Police personnel. The third level of notification (within 1 hour) is to the DEP or municipality's Licensed Site Professional (LSP). The specific cleanup contractor to be used will be identified by the Contractor prior to commencement of construction activities.

3.3 Spill Containment and Clean-Up Measures

Spills will be contained with granular sorbent material, sand, sorbent pads, booms or all the above to prevent spreading. Certified cleanup contractors should complete spill cleanup. The material manufacturer's recommended methods for spill cleanup will be clearly posted and on-site personnel will be made aware of the procedures and the location of the information and cleanup supplies.

3.4 Hazardous Materials Spill Report

The Contractor will report and record any spill. The spill report will present a description of the release, including the quantity and type of material, date of the spill, circumstances leading to the release, location of spill, response actions and personnel, documentation of notifications and corrective measures implemented to prevent reoccurrence.

This document does not relieve the Contractor of the Federal reporting requirements of 40 CFR Part 110, 40 CFR Part 117, 40 CFR Part 302 and the State requirements specified under the Massachusetts Contingency Plan (M.C.P) relating to spills or other releases of oils or hazardous substances. Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117 or 40 CFR Part 302, occurs during a twenty-four (24) hour period, the Contractor is required to comply with the response requirements of the above mentioned regulations. Spills of oil or hazardous material in excess of the *reportable quantity will be reported to the National Response Center (NRC).*

SECTION 4: Contact Information/Responsible Parties

Owner/Operator:
City of Newton
Department of Parks and Recreation
Nicole Banks, Commissioner
1000 Commonwealth Ave.
Newton Centre, MA 02459
617-796-1000

Engineer:
James Pearson, PE
Weston & Sampson Engineers, Inc.
55 Walkers Brook Dr #100
Reading, MA 01867
978-532-1900

Site Inspector:
TBD

Contractor:
TBD

SECTION 5: Erosion and Sedimentation Control
The erosion and sedimentation control can be found on the plan drawings and consists of compost filter tubes with siltation sacks on the catch basins located on the access drive. Additional measures may be implemented by the contractor at any time during work with the approval of the Engineer.

SECTION 6: Site Development Plan
The Site Development Plan is included in the attached plans.

SECTION 7: Operation and Maintenance of Erosion Control
The erosion control measures will be installed as detailed in the technical specification ***01 57 19 Environmental Protection***. If there is a failure to the controls, the Contractor, under the supervision of the Engineer, will be required to stop work until the failure is repaired.

Periodically throughout the work, whenever the Engineer deems it necessary, the sediment that has been deposited against the controls will be removed to ensure that the controls are working properly.

SECTION 8: Inspection Schedule
During construction, the erosion and sedimentation controls will be inspected daily. Once the Contractor is selected, an onsite inspector will be selected to

work closely with the Engineer to ensure that erosion and sedimentation controls are in place and working properly. An Inspection Form is included.

Inspection Form

Inspected By:______________________________ Date: ________Time:________

YES	NO	DOES NOT APPLY	ITEM
			Do any erosion/siltation control measures require repair or clean out to maintain adequate function?
			Is there any evidence that sediment is leaving the site and entering the wetlands?
			Are any temporary soil stockpiles or construction materials located in non-approved areas?
			Are on-site construction traffic routes, parking, and storage of equipment and supplies located in areas not specifically designed for them?
			Is there any evidence that sediment is accumulating in stormwater infiltration basins?

Specific location, current weather conditions, and action to be taken:

____

____

____

____

____

____

Other Comments:

____

____

____

Pending the actions noted above I certify that the site is in compliance with the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan.

Signature:________________________________Date: ______________________

SECTION 01 57 19

ENVIRONMENTAL PROTECTION

PART 1 – GENERAL

1.01 DESCRIPTION:

A. The work covered by this section of the specifications consists of furnishing all labor, materials, tools and equipment and performing all work required for the prevention environmental pollution during and as a result of construction operations under this contract.

B. The requirements set forth in this section of the specifications apply to cross-country areas, river and stream crossings, and construction in and adjacent to wetlands, unless otherwise specifically stated.

C. All work under this Contract shall be in accordance with the Conservation Commissions' Orders of Conditions as well as any conditional requirements applied, all of which are attached to Section 00 31 43, PERMITS.

D. Prior to commencement of work, the Contractor shall meet with representatives of the Engineer to develop mutual understandings relative to compliance of the environmental protection program.

1.02 RELATED WORK:

A. Section 00 31 43, PERMITS

B. Section 01 14 19.16, DUST CONTROL

C. Section 01 33 23, SUBMITTALS

D. Section 31 00 00, EARTHWORK

E. Section 31 05 13.33, BENTONITE DAMS

F. Section 31 11 00, CLEARING AND GRUBBING

G. Section 31 23 19, DEWATERING

H. Section 31 50 00, SUPPORT OF EXCAVATION

I. Section 32 92 00, SURFACE RESTORATION OF CROSS COUNTRY AREAS

1.03 SUBMITTALS:

A. The Contractor shall submit details and literature fully describing environmental protection methods to be employed in carrying out construction activities within 100 feet of wetlands or across areas designated as wetlands.

PART 2 - PRODUCTS

2.01 SILT FENCE:

A. The silt fence shall consist of a 3-foot wide continuous length sediment control fabric, stitched to a mesh backing, and stapled to preweathered oak posts installed as shown on the drawings. The oak posts shall be 1-1/4-inches by 1-1/4-inches (Minimum Dimension) by 48-inches and shall be tapered. The bottom edge of the silt fence shall be buried as shown on the drawings.

B. The silt fence shall be DOT Silt Fence PPDM3611, as manufactured by U.S. Silt & Site Supply/Getsco, Concord, NH, or approved equal.

C. Silt fence properties:

Physical Properties	Test Method	Minimum Value
Grab Strength, lbs.	ASTM-D-4632	124
Grab Elongation, %	ASTM-D-4632	15
Mullen burst, psi	ASTM-D-3786	300
Puncture, lbs.	ASTM-D-4833	65
Trapezoidal Tear, lbs.	ASTM-D-4533	65
UV Resistance2, %3	ASTM-D-4355	80@500 hrs.
AOS, US Sieve No.	ASTM-D-4751	30
Flow Rate, gal/min/sq ft	ASTM-D-4491	10
Permittivity,(1/sec)gal/min/sq ft	ASTM-D-4491	0.05 sec^{-1}

2.02 STRAW BALES:

A. Straw bales shall consist of certified seed free stems of agricultural grain and cereal crops and shall be free of grasses and legumes. Standard bales shall be 14-inches high, 18- inches wide and 36- to 40-inches long tied with polypropylene twine and weigh within 5 percent of 7 lbs. per cubic ft.

2.03 STRAW WATTLES:

A. Straw Wattles shall consist of a 100% biodegradable exterior jute or coir netting with 100% wheat straw interior filling as manufactured by GEI Works, Sebastian, Florida (Phone: 772-646-0597; website: www.erosionpollution.com), or approved equal.

2.04 SILT CURTAIN:

A. The silt curtain shall be a Type-1-Silt-Barrier consisting of 18-ounce vinyl fabric skirt with a 6-inch marine quality floatation device. The skirt shall be ballasted to hang vertical in the water column by a minimum 3/16-inch galvanized chain. The silt curtain shall extend into the water as shown on the drawings. If necessary, join adjacent ends of the silt curtain by connecting the reinforcing grommets and shackling ballast lines.

2.05 CATCH BASIN PROTECTION:

A. To trap sediment and to prevent sediment from clogging drainage systems, catch basin protection in the form of a siltation sack (Siltsack as manufactured by ACF Environmental, Inc. or approved equal) shall be provided as approved by the Engineer.

PART 3- EXECUTION

3.01 NOTIFICATION AND STOPPAGE OF WORK:

A. The Engineer will notify the Contractor in writing of any non-compliance with the provisions of the Order of Conditions. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Owner may order stoppage of all or part of the work through the Engineer until satisfactory corrective action has been taken. No claim for an extension of time or for excess costs or damage incurred by the Contractor as a result of time lost due to any stop work orders shall be made unless it was later determined that the Contractor was in compliance.

3.02 AREA OF CONSTRUCTION ACTIVITY:

A. Insofar as possible, the Contractor shall confine his construction activities to those areas defined by the plans and specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction at least equal to that which existed prior to work under this contract.

3.03 PROTECTION OF WATER RESOURCES:

A. The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids or other harmful materials. It is the Contractor's responsibility to comply with all applicable Federal, State, County and Municipal laws regarding pollution of rivers and streams.

B. Special measures should be taken to insure against spillage of any pollutants into public waters.

3.04 CONSTRUCTION IN AREAS DESIGNATED AS WETLANDS ON THE DRAWINGS:

A. Insofar as possible, the Contractor shall make every effort to minimize disturbance within areas designated as wetlands or within 100-feet of wetland resource areas. Total easement widths shall be limited to the widths shown.

B. The Contractor shall perform his work in such a way that these areas are left in the condition existing prior to construction.

C. The elevations of areas designated as wetlands shall not be unduly disturbed by the Contractor's operations outside of the trench limits. If such disturbance does occur, the Contractor shall take all measures necessary to return these areas to the elevations which existed prior to construction.

D. In areas designated as wetlands, the Contractor shall carefully remove and stockpile the top 24 inches of soil. This topsoil material shall be used as backfill for the trench excavation top layer. The elevation of the trench shall be restored to the preconstruction elevations wherever disturbed by the Contractor's operation.

E. The Contractor shall use a trench box, sheeting or bracing to support the excavation in areas designated as wetlands.

F. Excavated materials shall not be permanently placed or temporarily stored in areas designated as wetlands. Temporary storage areas for excavated material shall be as required by the Engineer.

G. The use of a temporary gravel roadway to construct the pipeline in the wetlands area is not acceptable. The Contractor will be required to utilize timber or rubber matting to support his equipment in these areas. The timber or rubber matting shall be constructed in such a way that it is capable of supporting all equipment necessary to install the pipeline. The timber or rubber matting shall be constructed of materials and placed in such a way that when removed the material below the matting will not be unduly disturbed, mixed or compacted so as to adversely affect recovery of the existing plant life.

H. Bentonite dams shall be placed in wetlands to prevent drainage. Locations for dams are as indicated on the drawings or as required by the Engineer.

I. During construction, easements within wetlands shall be lined with a continuous straw bale/siltation fence barrier or line of straw wattles (aka compost filter tube, silt/filter sock).

3.05 PROTECTING AND MINIMIZING EXPOSED AREAS:

A. The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, temporary vegetation, mulching or other protective measures shall be provided as specified.

B. The Contractor shall take account of the conditions of the soil where temporary cover crop will be used to insure that materials used for temporary vegetation are adaptive to the sediment control. Materials to be used for temporary vegetation shall be approved by the Engineer.

3.06 LOCATION OF STORAGE AREAS:

A. The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project, and shall require written approval of the Engineer. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Engineer.

B. No excavated materials or materials used in backfill operations shall be deposited within a minimum distance of one hundred (100) feet of any watercourse or any drainage facility. Adequate measures for erosion and sediment control such as the placement of baled straw around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

C. There shall be no storage of equipment or materials in areas designated as wetlands.

D. The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.

E. Storage areas in cross-country locations shall be restored to pre-construction conditions with the planting of native species of trees and shrubs.

3.07 PROTECTION OF LANDSCAPE:

A. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without written authority from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized by the Engineer. Excavating machinery and cranes shall be of suitable type and be operated with care to prevent injury to trees which are not to be removed, particularly overhanging branches and limbs. The Contractor shall, in any event, be responsible for any damage resulting from such use.

B. Branches, limbs, and roots shall not be cut except by permission of the Engineer. All cutting shall be smoothly and neatly done without splitting or crushing. When there is unavoidable injury to branches, limbs and trunks of trees, the injured portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed.

C. Where, in the opinion of the Engineer, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by his blasting or other operations, the Engineer may require the Contractor to adequately protect such trees by placing boards, planks, poles or fencing around them. Any trees or landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the expense of the Contractor. The Engineer will decide what method of restoration shall be used, and whether damaged trees shall be treated and healed or removed and disposed of under the provisions of Section 31 11 00, CLEARING AND GRUBBING.

D. Cultivated hedges, shrubs, and plants which could be injured by the Contractor's operations shall be protected by suitable means or shall be dug up, balled and temporarily replanted and maintained. After construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of a kind and quality at least equal to that existing at the start of the work.

3.08 CLEARING AND GRUBBING:

A. The Contractor shall clear and grub only on the Owner's land or the Owner's easements, and only the area required for construction operations, as approved by the Engineer.

Removal of mature trees (4-inches or greater DBH) will not be allowed on temporary easements.

B. The Contractor shall not remove trees in the Owner's temporary easements without permission of the Engineer.

3.09 DISCHARGE OF DEWATERING OPERATIONS:

A. Any water that is pumped and discharged from the trench and/or excavation as part of the Contractor's water handling shall be filtered by an approved method prior to its discharge into a receiving water or drainage system.

B. Under no circumstances shall the Contractor discharge water to the areas designated as wetlands. When constructing in a wetlands area, the Contractor shall discharge water from dewatering operations directly to the nearest drainage system, stream, or waterway after filtering by an approved method.

C. The pumped water shall be filtered through filter fabric and baled straw, a vegetative filter strip or a vegetated channel to trap sediment occurring as a result of the construction operations. The vegetated channel shall be constructed such that the discharge flow rate shall not exceed a velocity of more than 1 foot per second. Accumulated sediment shall be cleared from the channel periodically.

3.10 DUST CONTROL:

A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust. If the Engineer decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed. Calcium chloride shall be as specified under Section 01 14 19.16, DUST CONTROL.

B. Calcium Chloride shall not be used for dust control within a drainage basin or in the vicinity of any source of potable water.

3.11 SEPARATION AND REPLACEMENT OF TOPSOIL:

A. Topsoil shall be carefully removed from cross-country areas where excavations are to be made, and separately stored to be used again as required. The topsoil shall be stored in an area acceptable to the Engineer and adequate measures shall be employed to prevent erosion of said material.

3.12 BALED STRAW:

A. To trap sediment and to prevent sediment from clogging drainage systems, baled straw shall be used where shown on the drawings. Care shall be taken to keep the bales from breaking apart. The bales should be securely staked to prevent overturning, flotation, or displacement. All deposited sediment shall be removed periodically. Straw bales shall not be placed within a waterway during construction of the pipeline crossing.

3.13 ERECTION AND MAINTENANCE OF SILT FENCE:

A. Where indicated on the drawings or where required by the Engineer, the Contractor shall erect and maintain a temporary silt fence. In areas designated as wetlands, the Contractor shall line the limits of the construction easement with a silt fence. The silt fence shall be used specifically to contain sediment from runoff water and to minimize environmental damage caused by construction.

3.14 SURFACE RESTORATION OF CROSS COUNTRY AREAS:

A. Plantings detailed in Section 32 92 00 shall be conducted when construction of the pipeline has been completed within the areas designated. A one-year guarantee of maintenance will be required on these plantings to ensure that they establish in the area.

3.15 CATCH BASIN PROTECTION:

A. Catch basin protection shall be used for every catch basin, shown on the plans or as required by the Engineer, to trap sediment and prevent it from clogging drainage systems and entering wetlands. Siltation sack shall be securely installed under the catch basin grate. Care shall be taken to keep the siltation sack from breaking apart or clogging. All deposited sediment shall be removed periodically and at times prior to predicted precipitation to allow free drainage flow. Prior to working in areas where catch basins are to be protected, each catch basin sump shall be cleaned of all debris and protected. The Contractor shall properly dispose of all debris at no additional cost to the Owner.

B. All catch basin protection shall be removed by the Contractor after construction is complete.

3.16 STRAW WATTLES:

A. The wattles will be placed in a shallow trench (2-3 inches deep) and staked in the ground using wooden stakes driven at 4-foot intervals. The wooden stakes will be placed at a minimum depth of 24-inches into the ground.

B. The wattles shall be regularly inspected and before and after every forecasted major weather event. All deposited sediment shall be removed and not allowed to accumulate to the top of the wattles. Wattles damaged during construction shall be repaired or replaced as required by the Engineer at no additional cost to the Owner.

C. The Contractor shall remove all wattles after construction is completed.

END OF SECTION

Document2

Attachment H - Long Term Operations & Maintenance Plan

1.0 Introduction

The following document has been written to comply with the stormwater guidelines set forth by the Massachusetts Department of Environmental Protection (MassDEP). The intent of these guidelines is to encourage Low Impact Development techniques to improve the quality of the stormwater runoff. These techniques, also known as Best Management Practices (BMPs) collect, store, and treat the runoff before discharging to adjacent environmental resources.

2.0 Purpose

This Operation and Maintenance Plan (O&M Plan) is intended to provide a mechanism for the consistent inspection and maintenance of each BMP installed on the project site. Included in this O&M Plan is a description of each BMP type and an inspection form for each BMP. The City of Newton is the owner and operator of the system and is responsible for its upkeep and maintenance. This work will be funded on an annual basis through the owner's operating budget.

In the event the Owner sells the property, it is the Owner's responsibility to transfer this plan as well as the past three years of operation and maintenance records to the new property owner.

3.0 BMP Description and Locations

3.1 Grassed Areas and Grassed Swales

There are several grassed areas and swales throughout the site, particularly adjacent to the proposed bioretention areas that will receive stormwater runoff. These grassed areas are intended to slow runoff velocities and promote infiltration of stormwater.

3.2 Area Drains

Area drains will be located throughout the site and used as pre-treatment before entering the infiltration basin. The area drains with dome grates are designed to remove trash, debris, and coarse sediment from the stormwater runoff.

3.3 Bio-Retention Areas

The bio-retention areas mitigate peak runoff rates and filters the stormwater to provide treatment, significantly reducing TSS as well as phosphorus, nitrogen and heavy metals.

4.0 <u>Inspection, Maintenance Checklist and Schedule</u>

4.1 Grassed Areas and Grassed Swales

All sediment and debris should be removed and disposed of according to local, state, and federal regulations. During the growing season, vegetation should not exceed six inches in height, and should be mowed as necessary. Any grassed areas in close proximity to any areas that use salt in deicing applications should be re-seeded in the spring. Bare spots should be re-seeded as needed.

4.2 Area Drains

Inspect and/or clean area drains at least four times per year and at the end of foliage and snow removal seasons. Sediments must be removed whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin. The area drains should be cleaned a minimum of four times per year regardless of the amount of sediment in the basin. Area drains shall be cleaned with clamshell buckets.

In the event of contamination by a spill or other means, all cleanings must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.000 and handled as hazardous waste.

In the absence of evidence of contamination, area drain cleanings may be taken to a landfill or other facility permitted by MassDEP to accept Solid Waste without any prior approval by MassDEP. Please note that current MassDEP regulations prevent landfills from accepting materials that contain free-draining liquids.

4.3 Bio-Retention Basin

Premature failure of bioretention areas is a significant problem caused by lack of regular maintenance. Careful attention must be paid while plantings are being established and seasonal landscaping maintenance is required thereafter. Maintenance shall be conducted in accordance with the following schedule:

Activity	Time of Year	Frequency
Inspect & remove trash	Year round	Monthly
Mulch	Spring	Annually
Remove dead vegetation	Fall or Spring	Annually
Replace dead vegetation	Spring	Annually
Prune	Spring or Fall	Annually

Replace entire media & all vegetation	Late Spring/early Summer	As needed*

*Paying careful attention to pretreatment and operation & maintenance can extend the life of the soil media

Basin inspection should include checking for rilling and other signs of erosion. When encountered, repairs shall be made immediately. Debris and litter should be removed while inspecting for erosion.

Care must be taken to maintain the plants in the basin. Salt use must be restricted where runoff flows to the bioretention areas to maintain the plantings.

4.4 Inspections and Record Keeping

- An inspection form should be filled out each and every time maintenance work is performed.
- A binder should be kept at the facility that contains all of the completed inspection forms and any other related materials.
- A review of all Operation & Maintenance actions should take place annually to ensure that these Stormwater BMPs are being taken care of in the manner illustrated in this Operation & Maintenance Plan.
- All operation and maintenance log forms for the last three years, at a minimum, shall be kept on site at the facility.
- The inspection and maintenance schedule may be refined in the future based on the findings and results of this operation and maintenance program or policy.

5.0 Public Safety Features

The only stormwater basins on site have been designed to be very shallow in depth, thereby not presenting any harm to the public.

6.0 Stormwater Management System Owner/Responsible Party

The stormwater management system shall be owned and maintained by the following party or its future designee/assigns:

City of Newton
Department of Parks and Recreation
Nicole Banks, Commissioner
1000 Commonwealth Ave.
Newton Centre, MA 02459
617-796-1000

This operation and Maintenance Plan will be recorded with the registry of deeds so that current and future owners are aware of the requirement for proper operation and maintenance of the onsite stormwater system.

7.0 General Good Housekeeping Practices

All non-hazardous waste shall be stored in designated trash or recycling containers onsite for periodic collection by the local trash collector. The City of Newton Department of Parks and Recreation shall have maintenance staff who monitor the site for the accumulation of trash. Any trash that is seen onsite shall immediately be collected and placed into designated trash or recycling containers. The City of Newton Department of Parks and Recreation maintenance staff shall make an inspection of the site once per week at minimum.

8.0 Estimated Operations and Maintenance Budget

The estimated budget for annual operations and maintenance of this stormwater system is $2,000 per year.

Levingston Cove
Permanent BMP Inspection Checklist

Grassed Areas and Grassed Swales

Frequency: Grassed areas and swales acting as vegetated filter strips should be inspected every six months during the first year and annually thereafter.

Location: ______________________________

Inspected By: _______________ Date: ___________

Observations: ______________________________
____
____

Actions Taken: ______________________________
____
____

Instructions: Inspect grassed area. Mow grass as needed. Remove accumulated trash and debris. Remove sediment and re-seed bare spots as needed. All trash, debris, and sediments should be disposed of in accordance with local, state, and federal regulations.

Area Drains

Frequency: Inspect and clean Area Drains in March, June, September and December.

Structure Number: ________________________________

Inspected By: ________________ Date: ___________

Observations: ________________________________
____
____

Actions Taken: ________________________________
____
____

Instructions: Clean units four times per year or whenever the depth of the deposits is greater than or equal to one half the depth from the bottom of the invert to the lowest pipe in the structure.

Bio-Retention Area

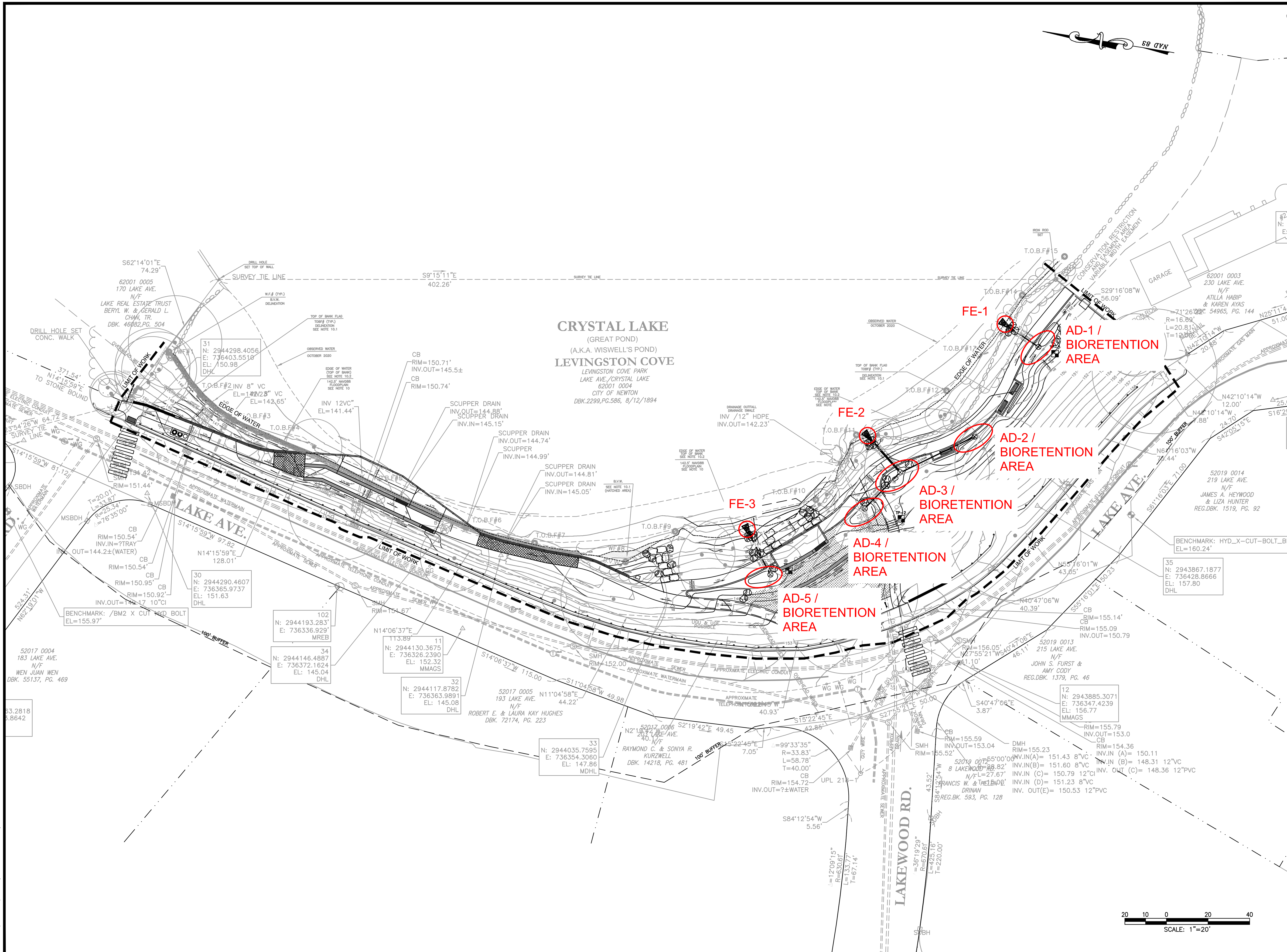
Frequency: The bio-retention area should be inspected monthly.

Inspected By: ___________________ Date: _____________

Observations: _______________________________________
____
____

Actions Taken: _______________________________________
____
____

Instructions: Inspect grassed area. Mow grass as needed on basin side slopes and embankment. Remove accumulated trash and debris. Remove sediment and re-mulch bare spots as needed in basin bottom. Inspect pipe inlets/outfalls for damage, erosion or blockage, remove blockage as needed, repair erosion with riprap. Inspect embankments, spillways and swales for erosion or blockage. Repair erosion with riprap, remove blockage as needed. Check sediment accumulation in forebays and remove as necessary. All trash, debris, and sediments should be disposed of in accordance with local, state, and federal regulations.



Project:
IMPROVEMENTS TO LOUISE LEVINGSTON COVE, CRYSTAL LAKE

NEWTON Parks & Recreation

INTERSECTION OF LAKEVIEW AND LAKE AVENUE, NEWTON CENTRE, MA, 02459

Weston & Sampson

Weston & Sampson Engineers, Inc.
55 Walkers Brook Drive, Suite 100
Reading, MA 01867
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description

Seal:

COA:

THIS DOCUMENT AND ALL ASSOCIATED DOCUMENTS ARE PREPARED FOR THE EXCLUSIVE USE OF THE CLIENT SOLELY FOR THE SPECIFIC PROJECT LISTED ON THE FACE OF THIS DOCUMENT AND INCORPORATES CALCULATIONS AND MEASUREMENTS AVAILABLE FROM THE CLIENT AT THE TIME OF DRAFTING. THE RECIPIENT OF THIS DOCUMENT SHALL NOT DISTRIBUTE, DISSEMINATE, REPRODUCE OR COPY, IN WHOLE OR IN PART, WITHOUT THE WRITTEN PERMISSION OF WESTON & SAMPSON, INC.

Issued For:

PERMITTING

Scale:	AS SHOWN
Date:	08/10/21
Drawn By:	REB
Reviewed By:	JIP
Approved By:	JIP
W&S Project No.:	ENG21-0021
W&S File No.:	

Drawing Title:

O&M KEY PLAN

Sheet Number:

FIG-3

Attachment I - Illicit Discharge Compliance Statement

Illicit Discharge Compliance Statement

Section I – Purpose/Intent

The purpose of this document is to provide for the health, safety, and general welfare of the citizens of Newton, Massachusetts through the regulation of non-stormwater discharges into existing outstanding resource areas near the site to the maximum extent practicable, as required by federal and state law. This document establishes methods for controlling the introduction of pollutants into existing outstanding resource areas to comply with requirements of the National Pollutant Discharge Elimination System (NPDES) permit process.

Section II - Definitions

For the purposes of this statement, the following shall mean:

Best Management Practices (BMPs): Schedules of activities, prohibitions of practices, general good housekeeping practices, pollution prevention and educational practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants directly or indirectly to stormwater, receiving waters, or stormwater conveyance systems. BMPs also include treatment practices, operating procedures, and practices to control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw materials storage.

Clean Water Act: The federal Water Pollution Control Act (33 U.S.C § 1251 et seq.), and any subsequent amendments thereto.

Construction Activity: Activities subject to the Massachusetts Erosion and Sedimentation Control Act or NPDES Construction Permits. Such activities include but are not limited to clearing and grubbing, grading, excavating, and demolition.

Hazardous Materials: Any material, including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Illegal Connection: An illegal connection is defined as either of the following:

a. Any pipe, open channel, drain or conveyance, whether on the surface or subsurface, which allows an illicit discharge to enter the outstanding resource area including but not limited to any conveyances which allow any non-stormwater discharge including sewage, process wastewater, and wash water, regardless of whether said drain or connection has been previously allowed, permitted, or approved by an authorized enforcement agency; or

b. Any pipe, open channel, drain or conveyance connected to the Town of Newton storm water treatment system which has not been documented in plans, maps, or equivalent records and approved by an authorized enforcement agency.

Illicit Discharge: Any direct or indirect non-stormwater discharge to the Town of Newton stormwater treatment system, except as exempted in Section III of this ordinance.

Industrial Activity: Activities subject to NPDES Industrial Permits as defined in 40CFR, Section 122.26 (b) (14).

National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit: A permit issued by MassDEP under authority delegated pursuant to 33 USC § 1342 (b) that authorizes the discharge of pollutants to waters of the United States, whether the permit is applicable on an individual, group, or general area-wide basis.

Town of Newton Stormwater Treatment System: Any facility, owned or maintained by the Town, designed or used for collecting and/or conveying stormwater, including but not limited to roads with drainage systems, Town of Newton streets, curbs, gutters, inlets, catch basins, piped storm drains, pumping facilities, infiltration, retention and detention basins, natural and man-made or altered drainage channels, reservoirs, and other drainage structures.

Non-Stormwater Discharge: Any discharge to the storm drain system that is not composed entirely of stormwater.

Person: Any individual, association, organization, partnership, firm, joint venture, public or private corporation, trust, estate, commission, board, public or private institution, utility, cooperative, Town, county or other political subdivision of the State, interstate body, or any other legal entity.

Pollutant: Anything which causes or contributes to pollution. Pollutants may include, but are not limited to: paints, varnishes, and solvents; petroleum hydrocarbons; automotive fluids; cooking grease; detergents (biodegradable or otherwise); degreasers; cleaning chemicals; non-hazardous liquid and solid wastes; refuse, rubbish, garbage, litter, or other discarded or abandoned objects and accumulations, so that same may cause or contribute to pollution; floatables; pesticides, herbicides, and fertilizers; liquid and solid wastes; sewage, fecal coliform and pathogens; dissolved and particulate metals; animal wastes; wastes and residues that result from constructing a building or structure; concrete and cement; and noxious or offensive matter of any kind.

Pollution: Contamination or other alteration of any water's physical, chemical, or biological properties by addition of any constituent including but not limited to a change in temperature, taste, color, turbidity, or odor of such waters, or the discharge of any liquid, gaseous, solid, radioactive, or other substance into any such waters as will or is likely to create a nuisance or render such waters harmful, detrimental, or injurious to the public health, safety, welfare, or environment, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life.

Premises: Any building, lot, parcel of land, or portion of land whether improved or unimproved including adjacent sidewalks and parking strips.

Stormwater: Any surface flow, runoff, and drainage consisting entirely of water from any form of natural precipitation and resulting from such precipitation.

Wastewater: Any water or other liquid discharged from a facility, that has been used, as for washing, flushing, or in a manufacturing process, and so contains waste products.

Section III - Prohibitions

Prohibition of Illicit Discharges:

No person shall throw, drain, or otherwise discharge, cause or allow others under its control to throw, drain, or otherwise discharge into the Town of Newton stormwater treatment system or watercourses any materials, including but not limited to, any pollutants or waters containing any pollutants, other than stormwater. The commencement, conduct or continuance of any illicit discharge to the storm drain system is prohibited except as described as follows:

1. Water line flushing performed by a government agency, other potable water sources, landscape irrigation or lawn watering, diverted stream flows, rising ground water, ground water infiltration to storm drains, uncontaminated pumped ground water, foundation or footing drains (not including active groundwater dewatering systems), crawl space pumps, air conditioning condensation, springs, natural riparian habitat or wetland flows, and any other water source not containing pollutants;

2. Discharges or flows from fire fighting, and other discharges specified in writing by the Town of Newton as being necessary to protect public health and safety;

3. Dye testing is an allowable discharge, but requires a verbal notification to the Town of Newton prior to the time of the test;

4. Any non-stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the Federal Environmental Protection Agency, provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for a discharge to the Town of Newton stormwater treatment system.

Section IV - Industrial or Construction Activity Discharges

Any person subject to an industrial or construction activity NPDES stormwater discharge permit shall comply with all provisions of such permit. Proof of compliance with said permit may be required in a form acceptable to the Town of Newton Department of Public Works prior to allowing discharges to the Town of Newton stormwater treatment system.

Section V - Notification of Spills and Accidental Discharges

Notwithstanding other requirements of law, as soon as any person responsible for a facility, activity or operation, or responsible for emergency response for a facility, activity or operation has information of any known or suspected release of pollutants or non-stormwater discharges from that facility, activity, or operation which are resulting or may result in illicit discharges or pollutants discharging into stormwater, the Town of Newton stormwater treatment system, State Waters, or Waters of the U.S., said person shall take all necessary steps to ensure the discovery, containment, and cleanup of such release so as to minimize the effects of the discharge. In the event of such a release of hazardous materials, said person shall immediately notify emergency response agencies of the occurrence via emergency dispatch services. In the event of a release of non-hazardous materials, said person shall notify the Town of Newton Department Public Works in person or by phone no later than the next business day, including the nature, quantity and time of occurrence of the discharge. Notifications in person or by phone shall be confirmed by written notice, via certified mail return receipt requested addressed to the Town of Newton Department of Public Works within three (3) business days of the initial notice. If the discharge of prohibited materials emanates from a commercial or industrial establishment, the owner or operator of such establishment shall also retain an on-site written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least three years.

IN WITNESS WHEREOF the parties hereto have executed copies of this Agreement on the ______ day of ____________________, ______.

____

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Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

Work Area

FIGURE 1

Levingston Cove
Newton, MA

Locus Map

Weston & Sampson

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Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Work Area
- Hydrologic Connection
- Perennial Stream
- Intermittent Stream
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune

ACECs

- ACECs

NHESP Habitats

- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools

FEMA National Flood Hazard Layer

Flood Zone Designations

- A: 1% Annual Chance of Flooding, no BFE
- AE: 1% Annual Chance of Flooding, with BFE
- AE: Regulatory Floodway
- AH: 1% Annual Chance of 1-3ft Ponding, with BFE
- AO: 1% Annual Chance of 1-3ft Sheet Flow Flooding, with Depth
- VE: High Risk Coastal Area
- D: Possible But Undetermined Hazard
- X: 0.2% Annual Chance of Flooding
- X: Reduced Flood Risk due to Levee
- Area Not Included
- Area with no DFIRM - Paper FIRMs in Effect

Outstanding Resource Waters

- Public Water Supply Contributor
- ORW for ACEC
- ORW for both Water Supply and Other

FIGURE 2

Levingston Cove
Newton, MA

Environmental
Resource Map

Weston & Sampson

SECTION 01562

DUST CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION:

This section of the specification covers the control of dust via water, complete.

PART 2 - PRODUCTS

2.01 WATER:

A. Water shall not be brackish and shall be free from oil, acid, and injurious alkali or vegetable matter.

PART 3 - EXECUTION

3.01 APPLICATION:

A. Water may be sprinkler applied with equipment including a tank with gauge-equipped pressure pump and a nozzle-equipped spray bar.

B. Water shall be dispersed through the nozzle under a minimum pressure of 20 pounds per square inch, gauge pressure.

END OF SECTION

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SECTION 01570

ENVIRONMENTAL PROTECTION

PART 1 – GENERAL

1.01 DESCRIPTION:

A. The work covered by this section of the specifications consists of furnishing all labor, materials, tools and equipment and performing all work required for the prevention of environmental pollution during and as a result of construction operations under this contract.

B. The requirements set forth in this section of the specifications apply to construction in and adjacent to wetlands, unless otherwise specifically stated.

C. All work under this Contract shall be in accordance with the Conservation Commissions' Orders of Conditions as well as any conditional requirements applied

D. Prior to commencement of work, the Contractor shall meet with representatives of the Engineer to develop mutual understandings relative to compliance of the environmental protection program.

1.02 SUBMITTALS:

A. The Contractor shall submit for approval six sets of details and literature fully describing environmental protection methods to be employed in carrying out construction activities within 100 feet of wetlands or across areas designated as wetlands.

PART 2 - PRODUCTS

2.01 SILT FENCE:

A. The silt fence shall consist of a 3-foot wide continuous length sediment control fabric, stitched to a mesh backing, and stapled to preweathered oak posts installed as shown on the drawings. The oak posts shall be 1-1/4-inches by 1-1/4-inches (Minimum Dimension) by 48-inches and shall be tapered. The bottom edge of the silt fence shall be buried as shown on the drawings.

B. The silt fence shall be DOT Silt Fence PPDM3611, as manufactured by U.S. Silt & Site Supply/Getsco, Concord, NH, or approved equal.

C. Silt fence properties:

Physical Properties	Test Method	Minimum Value
Grab Strength, lbs.	ASTM-D-4632	124
Grab Elongation, %	ASTM-D-4632	15
Mullen burst, psi	ASTM-D-3786	300

Puncture, lbs.	ASTM-D-4833	65
Trapezoidal Tear, lbs.	ASTM-D-4833	65
UV Resistance2, %3	ASTM-D-4355	80@500 hrs.
AOS, US Sieve No.	ASTM-D-4751	30
Flow Rate, gal/min/sq ft	ASTM-D-4491	10
Permittivity, (1/sec) gal/min/sq ft	ASTM-D-4491	0.05 sec^{-1}

2.02 STRAW WATTLES:

A. Straw Wattles shall consist of a 100% biodegradable exterior jute or coir netting with 100% wheat straw interior filling as manufactured by Granite Environmental, Inc., Sebastian, Florida (Phone: 888-703-9889; website: www.GraniteEnvironmental.com), or approved equal.

2.03 SILT CURTAIN:

A. The silt curtain shall be a Type-1-Silt-Barrier consisting of 18-ounce vinyl fabric skirt with a 6-inch marine quality floatation device. The skirt shall be ballasted to hang vertical in the water column by a minimum 3/16-inch galvanized chain. The silt curtain shall extend into the water as shown on the drawings. If necessary, join adjacent ends of the silt curtain by connecting the reinforcing grommets and shackling ballast lines.

2.04 CATCH BASIN PROTECTION:

A. To trap sediment and to prevent sediment from clogging drainage systems, catch basin protection in the form of a siltation sack (Siltsack as manufactured by ACF Environmental, Inc. or approved equal) shall be provided as approved by the Engineer.

2.05 COMPOST FILTER TUBES:

A. Silt socks shall be a tubular filter sock of mesh fabric. The fabric will have openings of between 1/8” to ¼” diameter. The mesh material will either photo degrade within one year or be made of nylon with a life expectancy of 24 months. The sock shall be filled with a mix of composted leaf mulch, bark mulch and wood chips that have been composted for at least one year. The sock will have a minimum diameter of 12-inches.

PART 3- EXECUTION

3.01 NOTIFICATION AND STOPPAGE OF WORK:

A. The Engineer will notify the Contractor in writing of any non-compliance with the provisions of the Order of Conditions. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Owner may order stoppage of all or part of the work through the Engineer until satisfactory corrective action has been taken.

No claim for an extension of time or for excess costs or damage incurred by the Contractor as a result of time lost due to any stop work orders shall be made unless it was later determined that the Contractor was in compliance.

3.02 AREA OF CONSTRUCTION ACTIVITY:

A. Insofar as possible, the Contractor shall confine his construction activities to those areas defined by the plans and specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction at least equal to that which existed prior to work under this contract.

3.03 PROTECTION OF WATER RESOURCES:

A. The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids or other harmful materials. It is the Contractor's responsibility to comply with all applicable Federal, State, County and Municipal laws regarding pollution of rivers and streams.

B. Special measures should be taken to insure against spillage of any pollutants into public waters.

3.04 CONSTRUCTION IN AREAS DESIGNATED AS WETLANDS ON THE DRAWINGS:

A. Insofar as possible, the Contractor shall make every effort to minimize disturbance within areas designated as wetlands or within 100-feet of wetland resource areas.

B. The Contractor shall perform his work in such a way that these areas are left in the condition existing prior to construction.

C. The elevations of areas designated as wetlands shall not be unduly disturbed by the Contractor's operations.

3.05 PROTECTING AND MINIMIZING EXPOSED AREAS:

A. The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, temporary vegetation, mulching or other protective measures shall be provided as specified.

B. The Contractor shall take account of the conditions of the soil where temporary cover crop will be used to insure that materials used for temporary vegetation are adaptive to the sediment control. Materials to be used for temporary vegetation shall be approved by the Engineer.

3.06 LOCATION OF STORAGE AREAS:

A. The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project, and shall require written approval of the Engineer. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Engineer.

B. No excavated materials or materials used in backfill operations shall be deposited within a minimum distance of one hundred (100) feet of any watercourse or any drainage facility. Adequate measures for erosion and sediment control such as the placement of baled straw or line of straw wattles or compost filter tubes around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

C. There shall be no storage of equipment or materials in areas designated as wetlands.

D. The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.

3.07 PROTECTION OF LANDSCAPE:

A. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without written authority from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized by the Engineer. Excavating machinery and cranes shall be of suitable type and be operated with care to prevent injury to trees which are not to be removed, particularly overhanging branches and limbs. The Contractor shall, in any event, be responsible for any damage resulting from such use.

B. Branches, limbs, and roots shall not be cut except by permission of the Engineer. All cutting shall be smoothly and neatly done without splitting or crushing. When there is unavoidable injury to branches, limbs and trunks of trees, the injured portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed.

C. Where, in the opinion of the Engineer, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by his blasting or other operations, the Engineer may require the Contractor to adequately protect such trees by placing boards, planks, poles or fencing around them. Any trees or landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the expense of the Contractor. The Engineer will decide what method of restoration shall be used, and whether damaged trees shall be treated and healed or removed and disposed of under the provisions of Section 02230, CLEARING AND GRUBBING.

D. Cultivated hedges, shrubs, and plants which could be injured by the Contractor's operations shall be protected by suitable means or shall be dug up, balled and temporarily replanted and maintained. After construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of a kind and quality at least equal to that existing at the start of the work.

3.08 CLEARING AND GRUBBING:

A. The Contractor shall clear and grub only on the Owner's land or the Owner's easements, and only the area required for construction operations, as approved by the Engineer. Removal of mature trees (4 inches or greater DBH) will not be allowed on temporary easements.

B. The Contractor shall not remove trees in the Owner's temporary easements without permission of the Engineer.

3.09 DISCHARGE OF DEWATERING OPERATIONS:

B. Under no circumstances shall the Contractor discharge water to the areas designated as wetlands. When constructing in a wetlands area, the Contractor shall discharge water from dewatering operations directly to the nearest drainage system, stream, or waterway after filtering by an approved method.

C. The pumped water shall be filtered through filter fabric and baled straw, a vegetative filter strip or a vegetated channel to trap sediment occurring as a result of the construction operations. The vegetated channel shall be constructed such that the discharge flow rate shall not exceed a velocity of more than 1 foot per second. Accumulated sediment shall be cleared from the channel periodically.

3.10 DUST CONTROL:

A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust. If the Engineer decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed. Calcium chloride shall be as specified under Section 01562, DUST CONTROL.

B. Calcium Chloride shall not be used for dust control within a drainage basin or in the vicinity of any source of potable water.

3.11 BALED STRAW:

A. To trap sediment and to prevent sediment from clogging drainage systems, baled straw shall be used where shown on the drawings. Care shall be taken to keep the bales from breaking apart. The bales should be securely staked to prevent overturning, flotation, or displacement. All deposited sediment shall be removed periodically. Straw bales shall not be placed within a waterway during construction of the pipeline crossing.

3.12 ERECTION AND MAINTENANCE OF SILT FENCE:

A. Where indicated on the drawings or where required by the Engineer, the Contractor shall erect and maintain a temporary silt fence. In areas designated as wetlands, the Contractor shall line the limits of the construction easement with a silt fence. The silt fence shall be used specifically to contain sediment from runoff water and to minimize environmental damage caused by construction.

3.13 CATCH BASIN PROTECTION:

A. Catch basin protection shall be used for every catch basin, shown on the plans or as required by the Engineer, to trap sediment and prevent it from clogging drainage systems and entering wetlands. Siltation sacks shall be securely installed under the catch basin grate. Care shall be taken to keep the siltation sacks from breaking apart or clogging. All deposited sediment shall be removed periodically and at times prior to predicted precipitation to allow free drainage flow. Prior to working in areas where catch basins are to be protected, each catch basin sump shall be cleaned of all debris and protected. The Contractor shall properly dispose of all debris at no additional cost to the Owner.

3.14 STRAW WATTLES:

A. The wattles will be placed in a shallow trench (2-3 inches deep) and staked in the ground using wooden stakes driven at 4-foot intervals. The wooden stakes will be placed at a minimum depth of 24-inches into the ground.

3.15 COMPOST FILTER TUBES:

A. The filter tubes will be staked in the ground using wooden stakes driven at 4-foot intervals. The wooden stakes will be placed at a minimum depth of 24-inches into the ground.

END OF SECTION

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SECTION 01740

CLEANING UP

PART 1 - GENERAL

1.01 DESCRIPTION:

The Contractor must employ at all times during the progress of its work adequate cleanup measures and safety precautions to prevent injuries to persons or damage to property. The Contractor shall immediately, upon request by the Engineer provide adequate material, equipment and labor to cleanup and make safe any and all areas deemed necessary by the Engineer.

PART 2 - PRODUCTS

Not applicable

PART 3 - EXECUTION

3.01 DAILY CLEANUP:

A. The Contractor shall clean up, at least daily, all refuse, rubbish, scrap and surplus material, debris and unneeded construction equipment resulting from the construction operations and sweep the area. The site of the work and the adjacent areas affected thereby shall at all times present a neat, orderly and workmanlike appearance.

B. Upon written notification by the Engineer, the Contractor shall within 24 hours clean up those areas, which in the Engineer's opinion are in violation of this section and the above referenced sections of the specifications.

C. If in the opinion of the Engineer, the referenced areas are not satisfactorily cleaned up, all other work on the project shall stop until the cleanup is satisfactory.

3.02 MATERIAL OR DEBRIS IN DRAINAGE FACILITIES:

A. Where material or debris has washed or flowed into or has been placed in existing watercourses, ditches, gutters, drains, pipes, structures, such material or debris shall be entirely removed and satisfactorily disposed of during progress of the work, and the ditches, channels, drains, pipes, structures, and work shall, upon completion of the work, be left in a clean and neat condition.

3.03 REMOVAL OF TEMPORARY BUILDINGS, STRUCTURES AND EQUIPMENT:

A. On or before completion of the work, the Contractor shall, unless otherwise specifically required or permitted in writing, tear down and remove all temporary buildings and structures it built; shall remove all temporary works, tools and machinery or other construction equipment it furnished; shall remove all rubbish from any grounds which it has occupied; shall remove silt fences and hay bales used for trapping sediment; and shall leave the roads and all parts of the property and adjacent property affected by its operations in a neat and satisfactory condition.

3.04 RESTORATION OF DAMAGED PROPERTY:

A. The Contractor shall restore or replace, when and as required, any property damaged by its work, equipment or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk and landscaping work. Materials, equipment, and methods for such restoration shall be as approved by the Engineer.

3.05 FINAL CLEANUP:

A. Before acceptance by the Owner, the Contractor shall perform a final cleanup to bring the construction site to its original or specified condition. This cleanup shall include removing all trash and debris off of the premises. Before acceptance, the Engineer shall approve the condition of the site.

END OF SECTION

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SECTION 04050

STONE VENEER WALLS

PART 1 – GENERAL

1.01 SCOPE OF WORK

a. Under this Section, the Contractor shall furnish all labor, materials, equipment and transportation required to construct the required stone veneer walls. The walls are as detailed and specified elsewhere in the Contract Documents.

b. The Contract shall take note that the stone veneer that is called for in the Contract Drawings to clad the lake-side face of the existing retaining wall to remain and a new concrete cheekwall pinned on top of the existing wall shall be considered Add Alternate #2.

1.02 REFERENCE STANDARDS AND SPECIFICATIONS

a. Reference to the standards, specifications and tests of technical societies, organizations, and governmental bodies is made in the Contract Documents.

1. AASHTO - American Association of State Highway and Transportation Officials (tests or specifications).

2. ASTM - American Society for Testing and Materials.

3. Mass. Standard Specs. - Latest edition of the Standard Specifications for Highways, Bridges and Waterways, 1988 Edition, the Commonwealth of Massachusetts, Department of Public Works, (MassDOT) hereinafter referred to as "the MDPW Standard Specifications, "Section 685, as modified herein.

1.03 SHOP DRAWINGS AND SAMPLES

a. Samples of the stone are to show color, grain, and surface finishing and shall be submitted to the Owner's Representative for approval. Complete erection drawings shall be prepared and furnished to the Owner's Representative for approval prior to ordering, delivering, and construction of furnished materials for the walls.

PART 2 – MATERIALS

2.01 VENEER STONE

A. All veneer stone shall be of granite, hard and durable, free from seams, which impairs structural integrity, and of smooth splitting character obtained from an approved quarry. Natural variations characteristic of the deposit will be permitted.

B. Veneer stones shall be generally flat with dimensions that range from 4 inches to 12 inches in length and 8 inches to 16 inch in height. Stone shall be 0.75 inches to 1.25 inches thick. All surfaces to be sawn (as applicable) shall have a maximum variation in their thickness of ± 1/4 inch. Corner veneer stones shall be provided as required. All other dimensions and surface finishes shall be as shown on the Drawings. An image below represents the basic finished appearance of the walls. Veneer stones shall be 'Portsmouth Granite-Mosaic' as manufactured by Stoneyard, Littleton, MA, 978-742-9800, or approved equal.

C. The front face of all stones shall have no projections or depressions greater than 1/2 inch for the full length of the stone. Front faces of all stones shall have no visible split marks.

D. The stone shall be set with full mortar bedding of l/2-inch to l-inch on all horizontal and vertical joints.

E. Mortar joints shall be recess grooved joints approximately 3/4-inch deep. The exposed face of the wall shall be set vertical with ± l/2-inch tolerance.

F. Mortar shall conform to MDPW Standard Specification M4.02.15, and shall be composed of one (1) part Portland cement conforming to ASTM C150 and two (2) parts sand for cement mortar with sufficient water for forming a workable mixture. Adjust color with light and dark cement to the satisfaction of the Owner’s Representative.

2.02 CMU BLOCK

A. Concrete masonry units shall be moisture-controlled units designated as Grade N, Type 1, (N-1) conforming to ASTM C90. The minimum compressive strength of any individual Grade N-1 unit shall be 800 psi and for any three Grade N-1 units 1,000 psi as tested on average gross area. All special shapes shall be included.

B. Wall anchors, ties, joint reinforcing and other bonding devices shall be hot-dip galvanized.

C. Horizontal masonry joint reinforcing for walls and partitions shall be "Dur-O-Wall," "Bet-R-Wall," "Trus-Mesh," or approved equal, galvanized ladder-type reinforcing. Longitudinal wires shall be a minimum of number 9 gage.

D. Weep holes shall be l-inch PVC pipe spaced 3 feet on center.

E. Mortar for all concrete masonry units shall consist of l part portland cement, l/2 part hydrated lime, and 4 parts sand and a waterproofing admixture, or a premixed blend meeting ASTM C270 Type "S" and approved by the Owner’s Representative. Color to be approved by Owner’s Representative on approval of brick samples.

F. Grout shall consist of 1 part portland cement and 3 parts maximum of sand, conforming to ASTM C476, with a slump of 8- to11-inches.

G. Portland cement shall be any American Brand conforming to ASTM Cl50, Type II.

H. Sand shall conform to ASTM Cl44. Sand shall be natural sand, washed and cleaned, free from organic or other deleterious matter. When dry, l00 percent shall pass a No. 8 sieve, not more than 34 percent shall pass a No. 50 sieve, and not more than l0 percent shall pass a No. l00 sieve.

I. Water shall be potable.

J. Lime shall be an approved brand of Type A mason's hydrated lime conforming to the requirements of ASTM C207.

K. Waterproofing admixture for mortar shall be equal to one of the following: Hydratite Plus, W.R. Grace Company; Medusa Waterproofing, Medusa Portland Cement Company; or Omicron Mortarproofing, Master Builders Company.

L. Reinforcing steel bars shall conform to ASTM A615, Grade 60.

2.04 FOOTINGS

A. The cement concrete for the footings shall be in conformance with Section 03301 of these Specifications and all relevant details.

2.05 GRANITE CAP

A. Granite cap shall be 12” wide 4” high, length shall vary as required. Finishes shall be as shown on the drawings. Granite cap material shall match granite curbing, refer to section32 16 00, Curbing.

<u>PART 3 - EXECUTION</u>

3.01 SAMPLE WALL:

A. Before masonry work has commenced, the Contractor shall build a sample wall for the approval of the Owner’s Representative. The wall shall be 4 feet long, and 2.5 feet high, and shall be constructed of concrete masonry units and stone veneer, which are selected for the work. The wall shall be constructed before masonry materials for the project are delivered to the job site. The panel shall show the stone veneer and CMU back-up work for the Owner’s Representative's approval of bond, spacing, color and jointing. The Contractor shall make any changes requested until the panel is approved by the Owner’s Representative. The panel shall remain until removal is ordered by the Owner’s Representative.

3.02 MORTAR MIXING REQUIREMENTS:

A. Mortar color for exposed masonry work will be selected by the Owner’s Representative from fully-cured mortar samples submitted for this purpose by the masonry subcontractor. For other masonry work, only one brand and color of cement and one color of sand, all from the same source, shall be used on the work.

B. For all exterior masonry, mortar waterproofing shall be added to the mortar in accordance with the manufacturer's directions.

C. Plasticity of mortar shall be maintained by retempering as required up to 2-1/2 hours after original mixing of mortar. Mortar requiring retempering to maintain proper workability after this period shall be discarded.

D. Mixers, mortar boxes, and all tools used with mortar shall be clean, and free from rust and any foreign material, particularly salt. No salt shall be permitted on the work.

E. Except as otherwise approved for small batches, all mortar shall be mixed in a mechanically operated batch mixer of the drum type in which the water can be accurately and uniformly controlled. The mortar shall be thoroughly mixed for at least five minutes after all materials are in the mixer.

F. For exposed concrete masonry the cement used in the mortar shall show no signs of efflorescence when tested in accordance with provisions of ASTM C67.

3.03 MASONRY CONSTRUCTION:

A. Vertical joints in each course shall break halfway over the units of the course below. All joints shall be 3/8-inch. CMU block shall be laid with all contact surfaces fully embedded in mortar.

B. CMU masonry shall be laid to lines, built plumb, true, and square. Joints shall be of uniform thickness. Units shall be laid with common running bond, except where otherwise noted with vertical joints accurately centered relative to units above and below. Walls shall be laid to obtain the smoothest surface that the variation in thickness or the units will permit.

C. Masonry shall be protected from entrance of water and from other damage during construction. Any masonry built of cracked, pitted, chipped, stained, or otherwise injured or defaced units shall be taken down as far as the Owner's Representative requires and be rebuilt. Poorly tooled joints, and joints not uniform in color and texture, will be adequate grounds for rejection of the work. All masonry shall be covered at night and during bad weather with non-staining waterproof coverings.

D. Temporary bracing and shoring shall be introduced wherever necessary to support loads to which the masonry may be subjected. The supports shall be left in place as long as required for safety.

E. As work progresses, and before staging is raised or removed, all exposed masonry shall be pointed up, all holes and joints filled, loose mortar removed, and defective joints cut out and repointed if necessary. Completed joints shall be neat, true, uniform, and free of voids, mortar crumbs, and other defects. Only first class jointing will be acceptable on joints which will be exposed to view, in the completed work.

F. All masonry walls shall start on concrete footings except where otherwise noted on the drawings or specified herein.

G. Masonry shall be laid in courses as indicated on the drawings with joints of uniform thickness. All joints, both horizontal and vertical, shall be in proper alignment. When mortar becomes "thumb-print" hard, exterior and interior joints shall be thoroughly tooled so as to be slightly concave, and to have a glassy-hard, polished surface, free from drying cracks.

H. Masonry units shall be dry when laid. Masonry saws shall be used for cutting and fitting masonry units, to produce straight, true edges and joints of the same width as the remainder of the work. Power masonry saws shall be used to facilitate close tolerance work.

I. All reinforced hollow vertical cells shall be filled with grout (not mortar). The grout shall be rodded and vibrated until well consolidated and all voids are filled.

J. Masonry shall not be laid overhand. Where necessary to avoid laying masonry overhand, staging shall be constructed on both sides of the wall.

K. Masonry at intersections of walls or corners shall be bonded with masonry or approved metal ties. Ties shall be spaced at not more than 16-inches o.c. unless otherwise noted on the Drawings.

L. No masonry work shall be done when the mean daily temperature is below 40 degrees F., or is expected to fall below 40 degrees within 72 hours, except with the permission of, and in accordance with the requirements of subsection entitled <u>Masonry Work at Temperatures Below 40 degrees F.</u> No salt or other anti-freeze or accelerator ingredients shall be used in the mortar.

M. All necessary weep holes and openings shall be cut and patched in accordance with the drawings and these specifications.

3.04 MASONRY WORK AT TEMPERATURES BELOW 40 DEGREES F.:

A. All materials shall be covered to prevent wetting, and shall be stored off the ground. At temperatures below 20 degrees F, all materials shall be stored in covered enclosures and kept at a temperature above 32 degrees F. Mortar shall be between 70 degrees F. and 120 degrees F. when used.

B. When temperature in the air is between 30 and 40 degrees F., either the water or the sand shall be heated to between 70 degrees F. and 160 degrees F. (Heating the sand is preferable, as it makes the mortar more workable and maintains workability longer than heating the water). When temperature of the air is between 10 degrees F. and 30 degrees F., both the sand and the water shall be heated to between 70 degrees F. and 160 degrees F. When the temperature of the air is or is expected to fall below 10 degrees F. within 24 hours, no masonry shall be erected.

C. Masonry work under construction shall be protected with canvas or other windbreak material. All such material shall be flame-proofed. Canvas shall completely enclose that portion of work requiring protection, but shall be held off to allow air circulation between canvas and masonry. Canvas shall be securely held, and lapped at edges to prevent heat loss.

D. Temperatures shall be recorded frequently, at least every hour, and artificial heat supplied as required to maintain 40 degrees F. under the canvas. Points at which temperature is measured shall be those designated by the Owner's Representative. Care shall be taken that one side of masonry is not heated more rapidly than the other side; air circulation shall be provided as required to maintain even temperatures.

E. Covering shall be used on both completed and unfinished work. The warmed enclosure shall be kept on masonry for 72 hours after laying. Following the 72 hour period, the masonry shall be brought gradually to ambient temperature but shall not be allowed to drop faster than one degree F. per hour. The Contractor shall furnish and install maximum/minimum thermometers in an enclosure which contains a hasp and staple.

F. The Owner's Representative shall designate the number and location of the thermometers.

3.05 CLEAN-UP:

A. Mortar droppings on face of wall shall be allowed to set up and shall then be promptly removed with a trowel and by rubbing with a piece of block. Droppings shall not be allowed to remain on the wall until completion of the masonry. Walls shall be cleaned by brushing with a stiff brush. No acid cleaners shall be used.

B. Masonry surfaces to be left exposed, either painted or unpainted, shall be thoroughly cleaned. Spattering and staining of floors, finished surfaces, pipe, equipment, etc., shall be avoided, and all finished surfaces shall be left in clean and perfect condition. Suitable drop cloths or other adequate means of protection shall be provided as necessary.

PART 4 - GUARANTEE

4.01 Guarantee all materials and workmanship for a period of one (1) year from date of final acceptance.

END OF SECTION

AFFIDAVIT OF SERVICE

Under the Massachusetts Wetlands Protection Act

I, Alexandra Gaspar hereby certify under the pains and
name
penalties of perjury that on 8/10/2021 I gave notification to abutters in
date
compliance with the second paragraph of the Massachusetts General Laws, Chapter 131, Section 40 and the DEP Guide to Abutter Notification in connection with the following matter:

A(n) NOI application was filed under the Massachusetts Wetlands Protection Act by the City of Newton with the Newton Conservation Commission on
name
8/10/2021 for a property located at Levingston Cove.
Date ***address***

The form of notification and the list of abutters to whom it was given and their addresses are attached to this Affidavit of Service.

8/10/2021

signature ***date***

Notification to Abutters under the Massachusetts Wetlands Protection Act and Newton Wetlands Protection Ordinance

In accordance with the second paragraph of Massachusetts Wetlands Protection Act (Massachusetts General Laws Chapter 131, Section 40) and the Newton Floodplain Protection Ordinance, you are hereby notified of the following.

The applicant filed a **Notice of Intent** with the Conservation Commission for the municipality of Newton, MA seeking permission to **remove, fill, dredge or alter an area subject to protection under the Wetlands Protection Act** (General Laws Chapter 131, Section 40) and **Newton Floodplain Protection Ordinance** (City Ordinance Section 22-22. Floodplain/Watershed Protection Provisions).

Applicant: the City of Newton

Project Location: Levingston Cove/Crystal Lake

Project Section-Block-Lot: 62001 0004

Project Description: Improvements to Levingston Cove

A Public Hearing will be held remotely via Zoom.

☒ **The Public Hearing will be held remotely on:**

(date) (time)

☒ **The Public Hearing can be accessed remotely:**

- From your computer or tablet: (weblink)
- Meeting ID: [XXXXXXXXX]
- From your phone: Dial +1 646 558 8656, followed by (meeting ID#) XXXXXXXXXX#

☒ **Information regarding the date, time, and Zoom ID for the public hearing**: will be published at least five (5) days in advance in the TAB or may be obtained from the Newton Conservation Commission by calling 617-796-1134.

Public Participation via Virtual Means

In light of the ongoing COVID-19 coronavirus outbreak, Gov. Baker issued an Emergency Order on March 12, 2020, allowing public bodies greater flexibility utilizing technology in the conduct of meetings under the Open Meeting Law. The City of Newton has decided to implement the "remote participation" procedures allowed under Gov. Baker's Emergency Order for all boards, committees, and commissions.

Copies of the Notice of Intent can be requested by email from jsteel@newtonma.gov and crundelli@newtonma.gov. You may also contact the Northeast Regional Office of the Department of Environmental Protection at 978-694-3200 for more information about this application or the Wetlands Protection Act.

Abutters List
Date: July 30, 2021

print this list

Search Distance: 100 Feet

Prop ID: 52-017-0004
Prop Location: 183 LAKE AVE CTR Newton, MA
Owner: JUAN YANG WEN
Mailing Address:

17 ORRIS ST
AUBURNDALE, MA 02466

Prop ID: 52-017-0005
Prop Location: 193 LAKE AVE CTR Newton, MA
Owner: HUGHES ROBERT E JR
Co-Owner: HUGHES LAURA KAY
Mailing Address:
193 LAKE AVE CTR
NEWTON, MA 02461

Prop ID: 52-017-0006
Prop Location: 203 LAKE AVE CTR Newton, MA
Owner: KURZWELL RAYMOND C & SONYA R
Mailing Address:
203 LAKE AVE
NEWTON HGLDS, MA 02461

Prop ID: 52-019-0012
Prop Location: 8 LAKEWOOD RD Newton, MA
Owner: DRINAN FRANCIS W & HELEN L
Mailing Address:
8 LAKEWOOD RD
NEWTON HGLDS, MA 02461

Prop ID: 52-019-0013
Prop Location: 215 LAKE AVE CTR Newton, MA
Owner: FURST JOHN S

Co-Owner: CODY AMY
Mailing Address:
215 LAKE AVE CTR
NEWTON, MA 02459

Prop ID: 52-019-0014
Prop Location: 219 LAKE AVE CTR Newton, MA
Owner: HEYWOOD JAMES A
Co-Owner: HUNTER LIZA
Mailing Address:
219 LAKE AVE CTR
NEWTON, MA 02461

Prop ID: 52-023-0011
Prop Location: 15 ROGERS ST HGH Newton, MA
Owner: AXELROD SCOTT E
Co-Owner: FREED DENISE E
Mailing Address:
15 ROGERS ST HGH
NEWTON, MA 02461

Prop ID: 62-001-0002
Prop Location: 20 ROGERS ST HGH Newton, MA
Owner: CITY OF NEWTON
Mailing Address:
1000 COMMONWEALTH AVE
NEWTON, MA 02459

Prop ID: 62-001-0003
Prop Location: 230 LAKE AVE CTR Newton, MA
Owner: HABIP ATILLA
Co-Owner: AYAS KAREN
Mailing Address:
230 LAKE AVE CTR
NEWTON, MA 02461

Prop ID: 62-001-0003-A
Prop Location: LAKE AVE CTR Newton, MA

Owner: CITY OF NEWTON
Mailing Address:
1000 COMMONWEALTH AVE
NEWTON, MA 02459

Prop ID: 62-001-0005
Prop Location: 170 LAKE AVE CTR Newton, MA
Owner: CHAN GERALD L & BERYL W TRS
Co-Owner: LAKE REAL ESTATE TRUST
Mailing Address:
PO BOX 590179
NEWTON, MA 02459

Prop ID: 62-001-0006
Prop Location: 160 LAKE AVE CTR Newton, MA
Owner: ROONEY DEBORAH K
Co-Owner: ARONSON RICHARD B TRS SEALEX TRST
Mailing Address:
82 FAIR OAKS AVE
NEWTON, MA 02460

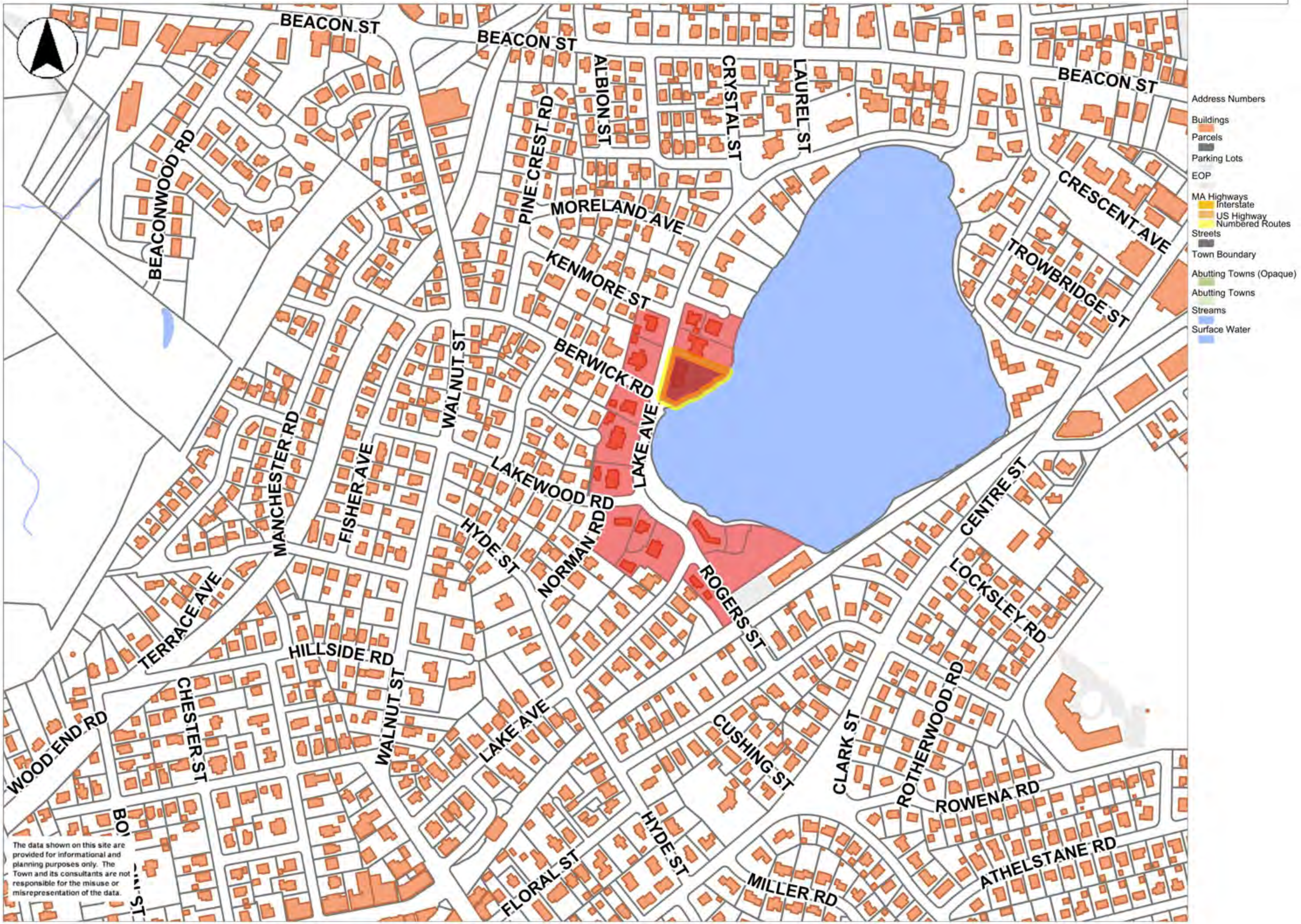
Prop ID: 62-001-0007
Prop Location: 152 LAKE AVE CTR Newton, MA
Owner: HOLLEY ONI C & MICHAEL S
Mailing Address:
152 LAKE AVE CTR
NEWTON, MA 02459

Prop ID: 62-001-0008
Prop Location: 12 LAKE TER Newton, MA
Owner: MAHONEY AMANDA J TR
Co-Owner: ANGEL TRUST
Mailing Address:
12 LAKE TER
NEWTON, MA 02459

Prop ID: 62-002-0001
Prop Location: 167 LAKE AVE CTR Newton, MA
Owner: ROSSI DERRICK

Co-Owner: KORSISAARI NINA
Mailing Address:
167 LAKE AVE CTR
NEWTON, MA 02459

Prop ID: 62-002-0014
Prop Location: 155 LAKE AVE CTR Newton, MA
Owner: IEZZONI LISA I
Co-Owner: DREWS REED E TRS
Mailing Address:
155 LAKE AVE
NEWTON, MA 02459



0 650 1300 ft

Printed on 07/30/2021 at 02:58 PM

Newton, MA DPW - MapsOnline

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

MEMORANDUM

TO: The City of Newton Conservation Commission

FROM: Alexandra Gaspar, Weston & Sampson Engineers

DATE: 8/10/2021

SUBJECT: Louise Levingston Cove – Wetland Delineation

On October 8, 2020 the City of Newton Chief Environmental Planner performed a wetland delineation at Louise Levingston Cove near Crystal Lake in Newton, MA. Resource areas flagged in the field included Bordering Vegetated Wetlands and Top of Bank of a lake.

<u>Bordering Vegetated Wetlands</u>

Two areas identified as Bordering Vegetated Wetlands were identified and flagged in the field. Flags labeled as "WF" were used to mark these areas. One area was located in the northwest corner of the site, and the other was located between TOB flags 7 and 9

<u>Top of Bank of a Pond</u>

It was noted that due to the existing drought, the edge of water (top of bank) location for Crystal Lake was identified in the field at an elevation=142.5 (in feet, NAVD,88) based on existing staining and erosion evidence on the retaining wall face directly below the sidewalk middle scupper drain. One top of bank series was flagged in the field and was flagged as T.O.B F#2 beginning at approximately 170 Lake Ave. through T.O.B F#15 ending at approximately 230 Lake Ave.

There is a 100' buffer zone associated with both the Top of Bank and Bordering Vegetated Wetland resource areas.

Photo 1

Photo 2

Photo 3

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

MEMORANDUM

TO: Cassie Bethoney, RLA, Weston & Sampson Engineers Inc.

FROM: Devin Batchelder, CWS, Weston & Sampson Engineers Inc.

DATE: July 12, 2021

SUBJECT: Invasive Species Survey - Levingston Cove, Newton

On June 11. 2021 the presence of invasive vegetation was investigated at Levingston Cove along Crystal Lake in Newton, MA by a Devin Batchelder, a Certified Wetland Scientist (CWS). The approximate number and location of individual plants for each species was recorded using a GPS unit. The locations of these species can be seen in Figure 1 below.

These species were identified as invasive based on the Massachusetts Invasive Plant Advisory Group (MIPAG) which is a collaborative group which evaluates plant species that are suspected to be invasive in the state. These species are given designations based on historical and field data. Lists of species have been developed for Massachusetts based on the level of "invasiveness" shown by the species in question. MIPAG defines "invasive plants" as "non-native species that have spread into native or minimally managed plant systems in Massachusetts. These plants cause economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems." Other designations include "likely invasive" meaning "non-native species that are naturalized in Massachusetts but do not meet the full criteria that would trigger an 'invasive plant' designation" as well as "potentially invasive" which are "non-native species not currently known to be naturalized in Massachusetts, but that can be expected to become invasive within minimally managed habitats within the Commonwealth." The final designation that MIPAG offers is "not currently meeting criteria" which means the species was "evaluated for invasiveness by MIPAG. They did not meet the necessary criteria to list them as invasive, likely invasive or potentially invasive at the time of evaluation." These MIPAG designations will be referenced below in the description of each species identified at Levingston Cove.

Table 1: Summary if Invasive Species Identified at Levingston Cove

Common Name	Scientific Name	MIPAG Designation	Approximate # of Individual Plants Identified
Asiatic bittersweet	*Celastrus orbiculatus*	Invasive	8
glossy buckthorn	*Frangula alnus*	Invasive	22
purple loosestrife	*Lythrum salicaria*	Invasive	28
multiflora rose	*Rosa multiflora*	Invasive	5

Celastrus orbiculatus - Asiatic Bittersweet (MIPAG – Invasive): Per the United Stated Department of Agriculture (USDA) National Invasive Species Information Center, Asiatic (Oriental) bittersweet is a vine native to Eastern Asia that was introduced to the US in the 1860's as an ornamental and for erosion control. The Natural Resources Conservation Service (NRCS) indicates that the two methods for control of this species are mechanical control and chemical control. Mechanical control (hand removal/pulling) is appropriate for small infestations which can be removed by hand. This method will likely require ongoing treatment because re-sprouting will occur if the entire root is not removed. Chemical control (herbicides) can be applied utilizing foliar treatment, cut stem treatment and basal bark method. Effective systematic herbicides for treatment of Asiatic bittersweet include triclopyr (i.e., Garlon 3A, Garlon 4, Pathfinder, and others) and glyphosate (i.e., Accord, Glypro, Rodeo, Roundup and others). Glyphosate is a nonselective herbicide which kills both grasses and broad-leaved plants. Triclopyr is a selective herbicide that kills broad-leaved plants but does little or no harm to grasses. Care should be utilized when applying herbicides near wetland resources. Rodeo contains a nonionic surfactant and has been approved for use over water. Utilizing herbicides requires caution as application can also kill surrounding non-target vegetation. Herbicide applications should only be undertaken by a qualified professional.

Information Sources:

https://www.invasivespeciesinfo.gov/terrestrial/plants/oriental-bittersweet

https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_015111.pdf

Frangula alnus - Glossy Buckthorn (MIPAG – Invasive): Per the National Park Service, glossy buckthorn is a shrub native to Eurasia that was introduced to the US in the 18th century as an ornamental and as a living fence. The Natural Resources Conservation Service (NRCS) indicates that the two methods for control of this species are mechanical control and chemical control. Mechanical control (hand removal/pulling) is appropriate for small infestations which can be removed by hand. This method will likely require ongoing treatment because re-sprouting will occur if the entire root is not removed. Chemical control (herbicides) can be applied utilizing foliar treatment, cut stem treatment and basal bark method. Effective systematic herbicides for treatment of glossy buckthorn include triclopyr (i.e., Garlon 3A, Garlon 4, Pathfinder, and others) and glyphosate (i.e., Accord, Glypro, Rodeo, Roundup and others). Glyphosate is a nonselective herbicide which kills both grasses and broad-leaved plants. Triclopyr is a selective herbicide that kills broad-leaved plants but does little or no harm to grasses. Care should be utilized when applying herbicides near wetland resources. Rodeo contains a nonionic surfactant and has been approved for use over water. Utilizing herbicides requires caution as application can also kill surrounding non-target vegetation. Herbicide applications should only be undertaken by a qualified professional.

Information Sources:

https://www.nps.gov/articles/000/glossy-buckthorn-acadia.htm

https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1081644.pdf

Lythrum salicaria - Purple Loosestrife (MIPAG – Invasive): Per the United Stated Department of Agriculture (USDA) National Invasive Species Information Center, purple loosetrife is an herbaceous perennial native to Eurasia that was introduced to the US by the 1830's likely through ships' ballast and as an ornamental. The Natural Resources Conservation Service (NRCS) indicates that the three methods for control of this species are biological control, mechanical control and chemical control. Biological control is seen as the most likely candidate for effective long-term control of large infestations. Insects utilized for biological control include a root-mining weevil (*Hylobius transversovittatus*), and two leaf-feeding beetles (*Galerucella calmariensis* and *Galerucella pusilla*). Mechanical control (hand removal/pulling) is appropriate for small infestations which can be removed by hand. This method will likely require ongoing treatment because re-sprouting will occur if the entire root is not removed. Chemical control (herbicides) can be applied utilizing foliar treatment and cut stem treatment. The most effective systematic herbicide for treatment of purple loosetrife is glyphosate (i.e., Accord, Glypro, Rodeo, Roundup and others). Glyphosate is a nonselective herbicide which kills both grasses and broad-leaved plants. Care should be utilized when applying herbicides near wetland resources. Rodeo contains a nonionic surfactant and has been approved for use over water. Utilizing herbicides requires caution as application can also kill surrounding non-target vegetation. Herbicide applications should only be undertaken by a qualified professional.

Information Sources:

https://www.invasivespeciesinfo.gov/aquatic/plants/purple-loosestrife

https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1081652.pdf

Rosa multiflora - Multiflora Rose (MIPAG – Invasive): Per the United Stated Department of Agriculture (USDA) National Invasive Species Information Center, multiflora rose is a shrub native to Eastern Asia that was introduced to the US by the 1700's likely as an ornamental, for erosion control, and as a living fence. The Natural Resources Conservation Service (NRCS) indicates that the two methods for control of this species are mechanical control and chemical control. Mechanical control (hand removal/pulling) is appropriate for small plants which can be removed by hand. This method will likely require ongoing treatment because re-sprouting will occur if the entire root is not removed. Chemical control (herbicides) can be applied utilizing foliar treatment. Effective systematic herbicides for treatment of multiflora rose include triclopyr (i.e., Garlon 3A, Garlon 4, Pathfinder, and others) and glyphosate (i.e., Accord, Glypro, Rodeo, Roundup and others). Glyphosate is a nonselective herbicide which kills both grasses and broad-leaved plants. Triclopyr is a selective herbicide that kills broad-leaved plants but does little or no harm to grasses. Care should be utilized when applying herbicides near wetland resources. Rodeo contains a nonionic surfactant and has been approved for use over water. Utilizing herbicides requires caution as application can also kill surrounding non-target vegetation. Herbicide applications should only be undertaken by a qualified professional.

Information Sources:

https://www.invasivespeciesinfo.gov/terrestrial/plants/multiflora-rose

https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1081650.pdf

<BOL>Path:</BOL> C:\Users\batchelder.devin\OneDrive - WESTON & SAMPSON ENGINEERS, Inc\Desktop\Livingston Cove Newton MA\GIS\Maps\Invasive Species Survey Levingston Cove.mxd <BOL>User:</BOL> Batchelder.Devin <BOL>Saved:</BOL> 7/12/2021 10:45:41 AM <BOL>Opened:</BOL> 7/12/2021 10:45:49 AM

Legend

- Asiatic Bittersweet Individual
- Glossy Buckthorn Individual
- Multiflora Rose Individual
- Purple Loosestrife Individual

FIGURE 1

Levingston Cove
Newton MA
Invasive Species Locations

Weston & Sampson

Ruthanne Fuller
Mayor

City of Newton, Massachusetts
Department of Planning and Development
1000 Commonwealth Avenue Newton, Massachusetts 02459

Telephone
(617) 796-1120
Telefax
(617) 796-1142
TDD/TTY
(617) 796-1089
www.newtonma.gov

Barney S. Heath
Director

MEMORANDUM

DATE: April 1, 2022

TO: Peter Doeringer, Chair, Planning and Development Board
Members of the Planning and Development Board

FROM: Barney Heath, Director, Department of Planning and Development
Jennifer Caira, Deputy Director Department of Planning and Development
Zachery LeMel, Chief of Long Range Planning

RE: **#127-22 Request for amendment to the Zoning Code to regulate "last mile" delivery services**
COUNCILORS LAREDO, DOWNS, CROSSLEY, RYAN, KALIS, DANBERG, KRINTZMAN AND ALBRIGHT requesting an amendment to the Zoning Code to regulate "last mile" delivery services in the City of Newton.

MEETING: April 4, 2022

Over the last few years, spurred largely by the pandemic, cities across the United States have seen a rapid rise in the number of last mile delivery services, also known as dark stores or mini-warehouses. These storefronts, not open to the public, are stocked with groceries and other home goods that are marketed as deliverable within 15- to 30-minutes. Based on our existing Use Regulations (Article 6), the Inspectional Service Department (ISD) determined that this type of business would be categorized as a Retail Sales use (Sec. 6.4.30), which is allowed by-right in Newton's business zones (BU). Newton's village centers are primarily zoned BU1 and BU2. Working closely with an advisory group made up of members from the Planning Board, Economic Development Commission (EDC), and the Regional Chamber, City staff are recommending a new zoning use definition, Microfulfillment Center, to properly regulate this emerging business model. ZAP has scheduled a public hearing for their April 25, 2022 meeting, where the following alternatives will be discussed:

	Alternative 1	Alternative 1a	Alternative 2
Allowed in village centers	Yes, subject to standards	Yes, by Special Permit	No
Located on the street	No, only allowed in the rear away from the street	No, unless allowed by Special Permit	No
Reasoning	Not allowing at the street mitigates the negative impacts on the public realm	The Special Permit process allows each site to be reviewed individually	The use is not compatible with village centers

In advance of the public hearing at ZAP, which will be a joint public hearing with the Planning Board, Planning staff requests that the Planning Board discuss this item at their April meeting. If desired, the Planning Board may submit their recommendation to ZAP in advance of the public hearing. Additional background information can be found through the links below.

Links

March 28, 2022 ZAP Meeting Recording (00:29:15-01:29:55)

https://newtv.org/recent-video/107-committee-meetings-and-public-hearings/7434-zoning-and-planning-committee-march-28-2022

March 14, 2022 ZAP Presentation and Report

https://www.newtonma.gov/home/showpublisheddocument/82266/637832168861730000

January 24, 2022 ZAP Presentation and Report

https://www.newtonma.gov/home/showpublisheddocument/80556/637798217238470000

PLANNING & DEVELOPMENT BOARD MEETING MINUTES
March 7, 2022

1000 Commonwealth Ave.
Newton, MA 02459
T 617-796-1120
F 617-796-1142
www.newtonma.gov

Members Present:
Peter Doeringer, Chair
Kelley Brown, Vice-Chair
Jennifer Molinsky, Member
Chris Steele, Member
Kevin McCormick, Member
Barney Heath, *ex officio*
Lee Breckenridge, Alternate

Staff Present:
Zachery LeMel - Chief of Long Range Planning
Cat Kemmett, Planning Associate

Meeting held virtually by Zoom Meeting

1. Presentation/Vote—303 Walnut Street Lighting Waiver

Chair Doeringer opened the meeting at 8:02 p.m. Ms. Molinsky recused herself from the first item before the Board due to a personal connection to one of the properties impacted by the proposed project.

Ms. Gensler, the architect for the project, gave a presentation on behalf of the Bank of America, located at 303 Walnut Street. She showed photometric plans and elevations for the proposed lighting changes at the site and explained that the lighting levels shown were what the state suggested the bank use to keep their patrons safe at night.

She explained that according to the plans, on much of the site the petitioner does comply with the Light Trespass Ordinance. However, on the facades facing the back portion of the site at the alleyway, the proposed lighting plan would violate that light trespass ordinance because the light would fall on abutting property.

Chair Doeringer asked if the referenced state recommendations regarding lighting standards are mandatory, and whether they were new. Ms. Gensler said that the standards are not new, these suggestions have been around for a while. They are not mandated y the state. These suggested lighting levels are sometimes brighter than local governments allow.

Chair Doeringer asked if the petitioner had prepared simulations or rendering showing what the proposed light levels would look like at night if implemented. Ms. Gensler said that they did not have those available to share at this time.

Ms. Breckenridge said that the state level guidance the petitioner referred to exempts many electronic banking locations, including this one in all likelihood, so she wasn't sure why that guidance would need to apply to this site. She also said that as someone familiar with the site, she didn't see a great need for additional light in excess of 50 feet here, and that 50 feet is a pretty wide umbrella to cover. Mr. Sharkey, project manager for the Bank of America lighting changes, said that banks are required by the state to provide certain safety measures at their facilities, including adequate lighting. However, the state does not give concrete rules regarding foot candles for the bank locations to use. Some states do dictate specific lighting levels very clearly, but Massachusetts does not. The Bank of America prefers to use the same general lighting scheme nationally when possible at all of their locations to maintain a consistent standard.

Ms. Breckenridge noted that none of the plans provided give a clear sense of what kind of impact the proposed lighting scheme would have on the abutting buildings. There were no visuals provided to give a sense of scale for the lighting levels. This makes it difficult to assess how impactful the changes might be.

Chair Doeringer asked if the project team had consulted with the abutters to the site. Bill Sharkey from the Bank of America said that they had not consulted with the abutters.

Mr. McCormick said that if the abutters do not mind the lighting levels proposed, he did not see the issue in allowing a waiver. According to the ordinance, as long as a petitioner has permission from the abutters, lighting in excess of what is allowed in the light trespass ordinance may be permitted. Ms. Breckenridge said that the lighting does also have an impact on pedestrians and visitors to the site, not just the abutters.

Mr. Brown asked for clarification about the scope of the violation of the ordinance as proposed in the plan. It's clear that the amount of light depicted in the plan is more than what the ordinance allows for, but is it just a little more light than allowed by-right, or is it order of magnitude more than what is allowed by-right? The materials submitted do not make that clear, and that information seems important to have if the Board is to grant a waiver. He would like to see some material to show why additional lighting is needed here, and what the proposed site plan would look like if illuminated at night.

Ms. Breckenridge said that it's clear from the ordinance that there are a series of findings the Board must make in evaluating these waiver requests, and to her understanding, the Board did not have all of the information needed to make those findings with the material provided by the petitioner.

Chair Doeringer said that the Board has in the past reviewed another lighting waiver request where the petitioner explained that counterintuitively, some lights that point downwards but reflect back up actually created more of an adverse lighting impact than if they had been pointing upwards. Some sites have unique conditions that should factor into these evaluations, which is part of why it is important to show what the lighting plan would actually look like if implemented. He asked if the petitioner had tested potential light reflection on the site, and Mr. Sharkey said that they had not done so.

Mr. Sharkey asked if the project team needed to get permission for the light trespass from the abutters and then return to the Planning Board. Ms. Kemmett said that the Law Department has confirmed that if the applicant has proof that they got permission from all abutting parties who would be affected by the lighting plan, then they would not need a waiver from the Board.

Upon a motion by Mr. Steele and approved 6-0-1, with Director Heath abstaining, the Board voted to hold the item pending discussion with abutters to the property.

2. Zoning Matters Discussion

MBTA Communities
Director Heath explained that there was a briefing session with City Council recently. Because the guidelines from DHCD are still in flux, many questions about the path forward from here remain. Staff are in the process of analyzing what we have on the ground already and comparing that to the draft guidance and thinking about how we might meet these requirements. There is still a lot we need to better understand to get us closer to any sort of zoning recommendation. The city will be submitting feedback to state before the comment period ends at the end of the month.

Village Centers
Mr. Lemel said that at the last ZAP meeting, staff shared an initial analysis of hypothetical scenarios for Village Center zoning with a focus on what is allowed under current zoning and what the economics of development are under current conditions. Staff and the consultants from Utile gathered data from recent projects in Newton and nearby regions to test whether projects allowed by right or by special permit would pencil out financially. The next step is to look at possible options if zoning were to be tweaked with slightly different standards and use those same financial models to see what could be done in terms of development. Staff will be testing that to see if the results get us closer to what people said they wanted to see that we heard in our engagement from last year.

Last Mile Delivery
Mr. LeMel gave a presentation on this item. He described last mile delivery businesses as “dark” storefronts or warehouses, many of which are not open to the public at all or only in a fairly limited capacity, stocked with groceries or home goods that are marked for delivery within short time frames. The rise of last mile delivery business models has been growing over several years, but the pandemic has significantly increased these types of uses throughout the country.

He said in evaluating these uses, we need to weigh the pros and cons. Although we want active storefronts in village centers, our residents use and want this service. This use, properly regulated, could fill vacant storefronts and may reduce traffic congestion. It will be important to craft policy to minimize negative unintended consequences and not make locating anywhere in Newton infeasible.

He explained that historically, we have many deep, difficult to lease retail spaces. This is a use that can fill those spaces, and if they are centrally located, deliveries could happen by scooter or ebike, which we are seeing a lot of in bigger cities. The changes being considered here are not meant to impact stores and restaurants that use delivery to supplement their work.

Mr. Lemel explained that under this recommendation, design standards would apply in Business 1 and 2 and Mixed Use 1 and 2 Districts when the Microfullfilment Center use is located at street-level, and any gross floor area is located less than 16 feet from the street-facing building facade, and any point of the building containing the use is located less than 30 from a street. Those design standards include a requirement that a minimum percent of the gross floor area of the use must be devoted to on-site display of goods for sale, and a minimum of 50 percent of the street-facing building facade at ground level must consist of clear windows that allow views of the indoor space used for the on-site personal services and display of goods

Mr. Lemel said that ISD has already determined that this is an allowed use by-right under current zoning, so there is a sense of urgency from some members of ZAP to move quickly on this item.

Mr. Steele shared his observations of a microfullfilment center in Boston near Park Street. He said that it felt very much like being near a warehouse with heavy traffic going in and out, and often causing conflict with pedestrians. From an economic development perspective, these stores also can pose significant competition to local retailers without adding vibrance to village centers - they are a net negative for village centers. He was also concerned that allowing this use to proliferate in village centers could cause an increase in market rents, which could compound the problems traditional retailers already face in village centers.

Chair Doeringer asked whether Mr. Steele felt the same way about microfullfilment centers that are not centrally located at the street level- for instance, those off the beaten path, located in the back of buildings on a main street, etc. Mr. Steele said that if regulated appropriately there is a place for microfulfillment centers in locations that are not central, but he has serious concerns about allowing them in BU1 and BU2.

Ms. Molinsky expressed support for the transparency requirements and in-store retail component. She asked Mr. Lemel if staff have given any thought to whether these design standards could or should be used in the future as a way to improve the streetscape for other common uses that are not very active in village centers, such as banks. Mr, Lemel responded that members of ZAP have also had questions in this vein, which shows that there is a mismatch in our ordinance between what exists on the ground in village centers, and what people wish to see there. He hopes work the department is doing on village center zoning will lead to revisions of the use table to better facilitate an active village center and reduce barriers to including active uses.

Mr. McCormick asked whether other municipalities have allowed a retail component in front and microfullfilment use in the back successfully. Mr. Lemel said that staff has looked at other cities that have similar requirements, but there isn’t a lot of data to draw from yet.

Ms. Breckenridge noted the challenges facing many retail spaces that are tucked away and not visible and voiced enthusiasm for finding ways to reduce barriers to more active and varied uses in village centers, like considering lowering parking minimums. Mr. Lemel agreed that parking can be a significant barrier for many desirable uses in village centers, and hopefully through the village center rezoning process we can better enable uses and outcomes we want, and appropriately regulate uses that need a higher level of scrutiny.

Chair Doeringer said that this is an interesting time for this use, and there is a lot of experimentation happening. We do not yet know the full scope of the impact of these experiments, but it’s something for the city to keep an eye on going forward. He observed that in different pockets of the city there are retail vacancies that have remained vacant for years, despite many changes in the economic landscape, and it may take some experimentation to find a way to activate those spaces that have been persistently vacant. There are still many unanswered questions: how aware and respectful will the traffic in and out of these facilities be towards pedestrians? How can we ensure that this traffic doesn’t pose a danger and nuisance to the neighborhood where the facility is located? It may be difficult to try to create a way to allow these facilities but only away from the street level in village centers, because many of these facilities have the desire to locate centrally in cities, not on the periphery or out of the way, and they have the money to rent prime real estate.

Mr. McCormick suggested having the facilities load and unload in the rear of the building, not on the front of the street.

<u>Sustainability Measures</u>
Mr. Lemel explained that the climate & sustainability team at the city is pursuing a new ordinance targeting a reduction in emissions for large buildings. This will be based on the Building Energy Reporting and Disclosure Ordinance (BERDO) energy reporting ordinance that Boston has already adopted, but crafted to fit Newton. There

will be a presentation outlining the initial plan and information about this ordinance at a Committee of the Whole meeting on March 21.

Mr. Brown said that as the city considers measures that may put more strain on the electrical grid, it might be worth reaching out to Eversource to better understand their capacity. He also noted that based on his understanding of some of the ambitious sustainability measures in place in other cities, some are very reasonable, and some (like some of the more strict rules in Cambridge) are proving to be difficult for businesses to navigate. Newton can learn from what Boston and Cambridge are doing and what has worked well for them. Mr. Lemel agreed and said that local businesses will be an important partner in figuring out what will be impactful and doable in Newton.

3. Board Updates

Director Heath gave a few brief updates.

- There will be a joint meeting with Community Preservation Committee on funding for the West Newton Armory on April 12.
- CDBG/ESG reviews are ongoing.
- The public hearing for the senior center historic nomination will be on March 24. The building has been nominated as a landmark, and the NHC will determine whether to proceed with more extensive study or not. If they vote to pursue the nomination, the Board will be involved in the process and provide a recommendation on that nomination
- 206-208 Concord Street was approved as a local landmark by the NHC.

4. Minutes

Chair Doeringer noted a minor grammatical error in the February 7, 2022 minutes. Upon a motion by Mr. Steele and approved 6-0-1 the minutes were approved as amended.

5. Adjournment

Upon a motion by Mr. Brown and approved unanimously, the meeting was adjourned at 9:35 PM.