Weston & Sampson SM

westonandsampson.com

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

Environmental Notification Form

April 2024

Lake Boon Dam Repairs and Improvements Project

PREPARED FOR:
Town of Stow, Massachusetts
380 Great Road
Stow, MA 01775

SUBMITTED TO:
Massachusetts Executive Office of Energy and Environmental Affairs

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

Project: Lake Boon Dam Repairs and Improvements Project
WSE Project No. ENG23-2847

April 1, 2024

Secretary Rebecca Tepper
Executive Office of Energy and Environmental Affairs
Attention: MEPA Office
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Re: Environmental Notification Form
Lake Boon Dam Repairs and Improvements Project
Barton Road in Stow, Massachusetts

Dear Secretary Tepper:

On behalf of the Town of Stow, we are pleased to submit the attached Environmental Notification Form (ENF) for review under the provisions of the Massachusetts Environmental Policy Act (MEPA).

The proposed project includes a dam improvements project to bring Lake Boon Dam into compliance with the Massachusetts Department of Conservation and Recreation (DCR) Office of Dam Safety requirements. This ENF is being submitted because the project will impact more than ½ acre of other wetland resource area (bordering land subject to flooding, land under water, & riverfront area), more than 5,000 square feet of bordering vegetated wetlands, and greater than 500 linear feet of bank. Additionally, the project involves work on a historic structure listed in the State Register of Historic Places (the Lake Boon Dam).

Copies of the ENF have been provided to all required recipients, as listed in the attached Circulation List (Appendix G). Please contact Hailey Page, of Weston & Sampson, with any questions, or if you request additional copies of the ENF, at 978-532-1900 or by e-mail at page.hailey@wseinc.com

Very truly yours,

WESTON & SAMPSON ENGINEERS, INC.

Hailey Page
Environmental Scientist

cc: ENF Circulation List

Commonwealth of Massachusetts

Executive Office of Energy and Environmental Affairs
Massachusetts Environmental Policy Act (MEPA) Office

Environmental Notification Form

For Office Use Only

EEA#: _____

MEPA Analyst: _____

The information requested on this form must be completed in order to submit a document electronically for review under the Massachusetts Environmental Policy Act, 301 CMR 11.00.

Project Name: Lake Boon Dam Repairs and Improvements Project		
Street Address: 0 Barton Road		
Municipality: Stow	Watershed: Concord	
Universal Transverse Mercator Coordinates: 19T-293739-4697853	Latitude: 42.40552 Longitude: -71.50650	
Estimated commencement date: May 2025	Estimated completion date: November 2025	
Project Type: Dam Improvements Project	Status of project design: 60 %complete	
Proponent: Town of Stow – Denise Dembokoski		
Street Address: 380 Great Road		
Municipality: Stow	State: MA	Zip Code: 01775
Name of Contact Person: Hailey Page		
Firm/Agency: Weston & Sampson Engineers	Street Address: 55 Walkers Brook Drive, Suite 100	
Municipality: Reading	State: MA	Zip Code: 01867
Phone: 978-532-1900	Fax: N/A	E-mail: page.hailey@wseinc.com

Does this project meet or exceed a mandatory EIR threshold (see 301 CMR 11.03)?
☐Yes ☒No

If this is an Expanded Environmental Notification Form (ENF) (see 301 CMR 11.05(7)) or a Notice of Project Change (NPC), are you requesting:

a Single EIR? (see 301 CMR 11.06(8)) ☐Yes ☒No
a Rollover EIR? (see 301 CMR 11.06(13)) ☐Yes ☒No
a Special Review Procedure? (see 301CMR 11.09) ☐Yes ☒No
a Waiver of mandatory EIR? (see 301 CMR 11.11) ☐Yes ☒No
a Phase I Waiver? (see 301 CMR 11.11) ☐Yes ☒No
(Note: Greenhouse Gas Emissions analysis must be included in the Expanded ENF.)

Which MEPA review threshold(s) does the project meet or exceed (see 301 CMR 11.03)?
(3)(b)(1)(b) alteration of 500 or more linear feet of bank along an inland bank
(3)(b)(1)(d) alteration of 5,000 or more sf of bordering vegetated wetlands
(3)(b)(1)(f) alteration of ½ or more acres of any other wetlands (Land Under Water, Bordering Land Subject to Flooding, and Riverfront Area)
(10)(b)(1) demolition of all or any exterior part of any Historic Structure listed in or located in any Historic District listed in the State Register of Historic Places or the

Inventory of Historic and Archaeological Assets of the Commonwealth

Which State Agency Permits will the project require?

Massachusetts DCR, Chapter 253 Dam Safety Permit
Order of Conditions from the Stow Conservation Commission
MassDEP 401 Water Quality Certification
Chapter 91 License
Massachusetts Historic Commission Project Notification Form

Identify any financial assistance or land transfer from an Agency of the Commonwealth, including the Agency name and the amount of funding or land area in acres:

Massachusetts EEA, FY2023 Dam and Seawall Construction Grant funded $1,000,000 to go toward construction funding for this project that needs to be committed as soon as possible or be forfeited.

Summary of Project Size & Environmental Impacts	Existing	Change	Total
LAND			
Total site acreage	1.31 ac		
New acres of land altered		0.05 ac	
Acres of impervious area	0.20 ac	0 ac	0.20 ac
Square feet of new bordering vegetated wetlands alteration		10,314 SF (Temporary: 678 SF Permanent: 9,456 SF)	
Square feet of new other wetland alteration		**Bank** 901 LF (Temporary: 134 LF Permanent: 767 LF) **Land Under Water** 24,437 SF (Temporary: 22,701 SF Permanent:1,776 SF) **Bordering Land Subject to Flooding** 313 SF (Permanent) **Riverfront Area** 24,147 (Temporary: 678 SF Permanent: 23,469 SF)	
Acres of new non-water dependent use of tidelands or waterways		0 ac	
STRUCTURES			
Gross square footage (Lake Boon Dam)	28,690 SF	+1,160 SF	29,850 SF
Number of housing units	N/A	N/A	N/A
Maximum height (feet)	N/A	N/A	N/A
TRANSPORTATION			
Vehicle trips per day	0	0	0
Parking spaces	N/A	N/A	N/A
WASTEWATER			
Water Use (Gallons per day)	N/A	N/A	N/A
Water withdrawal (GPD)	N/A	N/A	N/A

Wastewater generation/treatment (GPD)	N/A	N/A	N/A
Length of water mains (miles)	N/A	N/A	N/A
Length of sewer mains (miles)	N/A	N/A	N/A

Has this project been filed with MEPA before?
☐ Yes (EEA #_____) ☒No

Has any project on this site been filed with MEPA before?
☐ Yes (EEA #_____) ☒No

GENERAL PROJECT INFORMATION – all proponents must fill out this section

PROJECT DESCRIPTION:

Describe the existing conditions and land uses on the project site:

The site consists of Lake Boon Dam, an earthfill embankment dam constructed across Bailey Brook, a perennial stream, between natural earthen abutments located off Barton Road in Stow, Massachusetts. The dam impounds Lake Boon, a Great Pond with two large open-water basins and several shallower vegetated basins straddling the Towns of Stow and Hudson. Refer to the Project Description in Appendix A for additional information.

Describe the proposed project and its programmatic and physical elements:

This project is a dam repair/improvements project. See Appendix A for additional information.

NOTE: The project description should summarize both the project's direct and indirect impacts (including construction period impacts) in terms of their magnitude, geographic extent, duration and frequency, and reversibility, as applicable. It should also discuss the infrastructure requirements of the project and the capacity of the municipal and/or regional infrastructure to sustain these requirements into the future.

Describe the on-site project alternatives (and alternative off-site locations, if applicable), considered by the proponent, including at least one feasible alternative that is allowed under current zoning, and the reasons(s) that they were not selected as the preferred alternative:

Please refer to the Alternatives Analysis provided in Appendix C for a discussion of project alternatives.

NOTE*: The purpose of the alternatives analysis is to consider what effect changing the parameters and/or siting of a project, or components thereof, will have on the environment, keeping in mind that the objective of the MEPA review process is to avoid or minimize damage to the environment to the greatest extent feasible. Examples of alternative projects include alternative site locations, alternative site uses, and alternative site configurations.*

Summarize the mitigation measures proposed to offset the impacts of the preferred alternative:

The dam improvements are necessary to bring the Lake Boon Dam into compliance with DCR Office of Dam Safety (ODS) standards. The proposed new spillway will offer improved water quality, temperature sensing, and improved ability to control lake level including ability to lower the lake below the current annual drawdown level, which is constrained by the current spillway configuration. The ability to lower the lake further will aid in the community's endeavor to improve and preserve the water quality in Lake Boon, which has been degrading with changes in climate.

Impacts to wetland resource areas will be avoided and minimized to the maximum extent practicable. Proposed temporary impacts to wetland resource areas will be restored in situ. The permanent impacts to resource areas are considered unavoidable. Alternatives were assessed for potential on site wetland replication and compensatory storage replication, and it was deemed there is no feasible option (see Appendix C for alternatives analysis). Through the permitting process with the local Stow Conservation Commission (seeking Order of Conditions) it will be discussed what opportunity may be available for alternative mitigation measures such as invasive species management and/or native tree plantings throughout the Town of Stow.

If the project is proposed to be constructed in phases, please describe each phase:

N/A - no phasing is proposed for this project.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN:

Is the project within or adjacent to an Area of Critical Environmental Concern?

☐Yes (Specify_____)

☒No

if yes, does the ACEC have an approved Resource Management Plan? ___ Yes ___ No;
If yes, describe how the project complies with this plan.

_____

Will there be stormwater runoff or discharge to the designated ACEC? ___ Yes ___ No;
If yes, describe and assess the potential impacts of such stormwater runoff/discharge to the designated ACEC.

_____

RARE SPECIES:

Does the project site include Estimated and/or Priority Habitat of State-Listed Rare Species? (see http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/priority_habitat/priority_habitat_home.htm)

☐Yes (Specify_____) ☒No

HISTORICAL /ARCHAEOLOGICAL RESOURCES:

Does the project site include any structure, site or district listed in the State Register of Historic Place or the inventory of Historic and Archaeological Assets of the Commonwealth?

☒Yes ☐No

Specify: Lake Boon (STW.G), Lake Boon Earthen Dam (STW.916), & a portion of the Barton Road Stone Wall (STW.912) are located within the limit of work. Alteration to Lake Boon Earthen Dam is required to bring the dam into compliance with DCR ODS safety requirements. The applicant will coordinate with the Massachusetts Historic Commission (MHC) for the proposed project throughout the remaining permitting process. A Project Notification Form will be submitted to MHC prior to closing out the permitting process.

In close proximity to the limit of work includes 105 Barton Road (STW.185), 81 Barton Road (STW.184). There will be no alteration to these historic structures.

If yes, does the project involve any demolition or destruction of any listed or inventoried historic or archaeological resources? ☒Yes ☐No

Lake Boon earthen dam (STW.916) is located within the Lake Boon Historic District (STW.G). Lake Boon Dam will be demolished to be brought into compliance with the Department of Conservation and Recreation Office of Dam Safety (DCR ODS) requirements. Upon completion of construction the dam structure will be slightly enlarged however, the overall appearance of Lake Boon Dam will not appreciably change. As a result of the proposed project the overall safety and condition of the structure will be greatly enhanced.

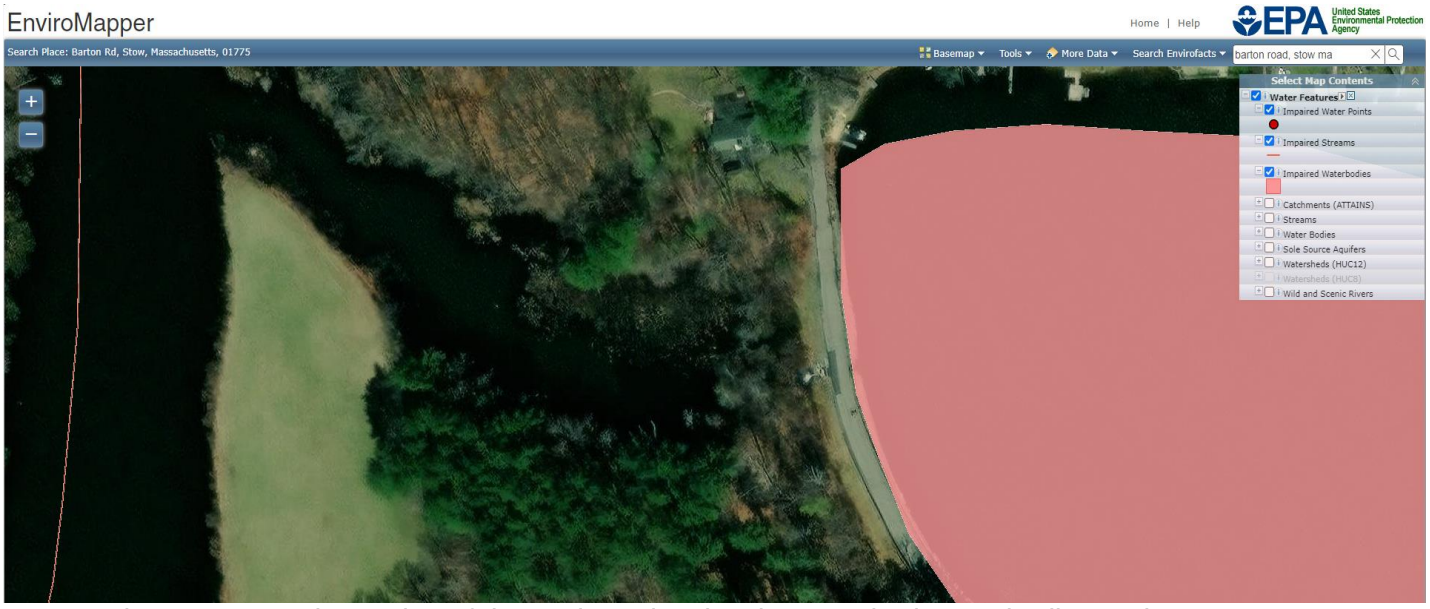
Please refer to Appendix D, Figure 4 for a Massachusetts Historic Resources Map. Additionally, see Historical and Archaeological Resources Section below (page 31 of ENF Form) for more details.

WATER RESOURCES:

Is there Outstanding Resource Water (ORW) on or within a half-mile radius of the project site? ___Yes_**X**__No; if yes, identify the ORW and its location.

(NOTE: Outstanding Resource Waters include Class A public water supplies, their tributaries, and bordering wetlands; active and inactive reservoirs approved by MassDEP; certain waters within Areas of Critical Environmental Concern, and certified vernal pools. Outstanding resource waters are listed in the Surface Water Quality Standards, 314 CMR 4.00.)

Are there any impaired water bodies on or within a half-mile radius of the project site? _**X**_Yes _ __No; if yes,identify the water body and pollutant(s) causing the impairment: **Lake Boon (algal growth, exotic species, noxious aquatic plants, mercury in fish tissue), Assabet River (algal growth, noxious aquatic plants, nuisance exotic species, nutrient eutrophication, biological indicators, total phosphorus, dissolved oxygen, debris, odor). The project does not propose any alterations to the Assabet River. Limited alterations will take place within Lake Boon to bring the dam into compliance with ODS requirements.**



EPA EnviroMapper Tool Mapping of the Project Site showing Impaired Waterbodies and Waterways

Is the project within a medium or high stress basin, as established by the Massachusetts Water Resources Commission? _**X**__Yes __No

STORMWATER MANAGEMENT:

Generally describe the project's stormwater impacts and measures that the project will take to comply with the standards found in MassDEP's Stormwater Management Regulations:

Sediment and erosion control measures will be installed to protect adjacent resource areas. See Appendix L for the stormwater report which explains how the project will meet MassDEP's Stormwater Management Regulations.

MASSACHUSETTS CONTINGENCY PLAN:

Has the project site been, or is it currently being, regulated under M.G.L.c.21E or the Massachusetts Contingency Plan?

Yes ___ No _**X**_ ; if yes, please describe the current status of the site (including Release Tracking Number (RTN),
cleanup phase, and Response Action Outcome classification):_____

Is there an Activity and Use Limitation (AUL) on any portion of the project site? Yes ___ No _**X**__;
if yes, describe which portion of the site and how the project will be consistent with the AUL:
_____.

Are you aware of any Reportable Conditions at the property that have not yet been assigned an RTN?
Yes ___ No _**X**__ ; if yes, please describe:_____

SOLID AND HAZARDOUS WASTE:

If the project will generate solid waste during demolition or construction, describe alternatives considered for re-use, recycling, and disposal of, e.g., asphalt, brick, concrete, gypsum, metal, wood:

The project will generate asphalt pavement and concrete rubble waste associated with demolition of the existing road surface on top of the dam and demolition of the existing spillway/culvert structure, respectively.

Integration of these materials into the proposed construction is not considered to be a practicable option given the limited space available to stage a reprocessing and recycling operation and the generally limited quantities that such an operation would yield. Additionally, the engineering properties and behavior of recycled demolition rubble are challenging to control and are not as comprehensively understood; in the case of a structure that poses inherent risks to downstream public safety, use of subpar or underperforming materials could have unacceptable consequences.

(NOTE: Asphalt pavement, brick, concrete and metal are banned from disposal at Massachusetts landfills and waste combustion facilities and wood is banned from disposal at Massachusetts landfills. See 310 CMR 19.017 for the complete list of banned materials.)

Will your project disturb asbestos containing materials? Yes ___ No _**X**__ ;
if yes, please consult state asbestos requirements at http://mass.gov/MassDEP/air/asbhom01.htm

Describe anti-idling and other measures to limit emissions from construction equipment:

Any emissions on site will be consistent with local, state, and federal standards. Construction vehicles will minimize idling during construction.

DESIGNATED WILD AND SCENIC RIVER:

Is this project site located wholly or partially within a defined river corridor of a federally designated Wild and Scenic River or a state designated Scenic River? Yes ___ No _**X**__ ;
if yes, specify name of river and designation: **NOTE: The Assabet River, a Wild and Scenic River, is located downgradient of the dam. However, no impacts to the Assabet River are proposed as a result of the project.**

If yes, does the project have the potential to impact any of the "outstandingly remarkable" resources of a federally Wild and Scenic River or the stated purpose of a state designated Scenic River?
Yes ___ No ___ ; if yes, specify name of river and designation: _____;
if yes, will the project will result in any impacts to any of the designated "outstandingly remarkable" resources of the Wild and Scenic River or the stated purposes of a Scenic River.

Yes ___ No ___ ;
if yes, describe the potential impacts to one or more of the "outstandingly remarkable" resources or stated purposes and mitigation measures proposed.

ATTACHMENTS:

1. List of all attachments to this document.
    - **Appendix A – Project Description**
    - **Appendix B – MEPA Triggers**
    - **Appendix C – Alternatives Analysis**
    - **Appendix D – Maps**
    - **Appendix E – Environmental Justice Maps**
    - **Appendix F – Wetland Delineation Report**
    - **Appendix G – Distribution List**
    - **Appendix H – RMAT Climate Resilience Report**
    - **Appendix I – Specifications**
    - **Appendix J – ODS Certificate**
    - **Appendix K – Agency Correspondence**
    - **Appendix L – Stormwater Report**
    - **Appendix M – Property Access Agreements**
    - **Appendix N – Project Plans**

2. U.S.G.S. map (good quality color copy, 8-½ x 11 inches or larger, at a scale of 1:24,000) indicating the project location and boundaries. **Appendix D Figure 1.**
3. Plan, at an appropriate scale, of existing conditions on the project site and its immediate environs, showing all known structures, roadways and parking lots, railroad rights-of-way, wetlands and water bodies, wooded areas, farmland, steep slopes, public open spaces, and major utilities. **Appendix N**
4. Plan, at an appropriate scale, depicting environmental constraints on or adjacent to the project site such as Priority and/or Estimated Habitat of state-listed rare species, Areas of Critical Environmental Concern, Chapter 91 jurisdictional areas, Article 97 lands, wetland resource area delineations, water supply protection areas, and historic resources and/or districts. **Appendix D Figure 2.**
5. Plan, at an appropriate scale, of proposed conditions upon completion of project (if construction of the project is proposed to be phased, there should be a site plan showing conditions upon the completion of each phase). **Appendix N**
6. List of all agencies and persons to whom the proponent circulated the ENF, in accordance with 301 CMR 11.16(2). **Appendix G**
7. List of municipal and federal permits and reviews required by the project, as applicable. **Appendix A**
8. Printout of output report from RMAT Climate Resilience Design Standards Tool, available here. **Appendix H**
9. Printout from the EEA EJ Maps Viewer showing the project location relative to Environmental Justice (EJ) Populations located in whole or in part within a 1-mile and 5-mile radius of the project site. **Appendix E**

LAND SECTION – all proponents must fill out this section

I. Thresholds / Permits

A. Does the project meet or exceed any review thresholds related to **land** (see 301 CMR 11.03(1) ___ Yes __**X**__ No; if yes, specify each threshold:

II. Impacts and Permits

A. Describe, in acres, the current and proposed character of the project site, as follows:

Land	Existing	Change	Total
Footprint of Buildings	0.00 AC	0 AC	0.00 AC
Internal Roadways (Barton Road)	0.20 AC	0 AC	0.20 AC
Parking and other Paved Areas	0.00 AC	0 AC	0.00 AC
Other Altered Areas (Dam structure+ Lake Boon)	0.81 AC	+0.05 AC	0.86 AC
Undeveloped Areas (Un-altered toe of dam + Bailey Brook)	0.30 AC	-0.05 AC	0.25 AC
Total: Project Site Acreage	1.31 AC	0 AC	1.31 AC

B. Has any part of the project site been in active agricultural use in the last five years? ___ Yes __**X**__ No; if yes, how many acres of land in agricultural use (with prime state or locally important agricultural soils) will be converted to nonagricultural use?

C. Is any part of the project site currently or proposed to be in active forestry use? ___ Yes __**X**__ No; if yes, please describe current and proposed forestry activities and indicate whether any part of the site is the subject of a forest management plan approved by the Department of Conservation and Recreation:

D. Does any part of the project involve conversion of land held for natural resources purposes in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth to any purpose not in accordance with Article 97? ___ Yes __**X**__ No; if yes, describe:

E. Is any part of the project site currently subject to a conservation restriction, preservation restriction, agricultural preservation restriction or watershed preservation restriction? ___ Yes __**X**__ No; if yes, does the project involve the release or modification of such restriction? ___ Yes ___ No; if yes, describe:

F. Does the project require approval of a new urban redevelopment project or a fundamental change in an existing urban redevelopment project under M.G.L.c.121A? ___ Yes __**X**__ No; if yes, describe:

G. Does the project require approval of a new urban renewal plan or a major modification of an existing urban renewal plan under M.G.L.c.121B? Yes ___ No __**X**__; if yes, describe:

III. Consistency

A. Identify the current municipal comprehensive land use plan
   Title: **Stow Master Plan**
   Date: **November 7, 2010**

B. Describe the project's consistency with that plan with regard to:
   1) economic development

      The project will rehabilitate and improve a failing dam. By updating the local infrastructure, the project will prevent potential economic losses associated with dam failure, including damage to properties, infrastructure, and potential road closure.

      The project will also allow for a safer dam crossing over this section of Barton Road, and thus will protect the value of the residential properties that rely on this crossing for access.

   2) adequacy of infrastructure

      The project proposes to improve and replace existing infrastructure. The proposed improvements will ensure that the dam operates efficiently and effectively for years to come. Also, the lake serves as a shallow well-water supply, a critical resource for the community. The dam's rehabilitation will ensure the continued availability and quality of this water supply, essential for residential use.

   3) open space impacts

      The project is not located in existing Article 97 open space land, and will not have an impact on open space.

   4) compatibility with adjacent land uses

      By addressing the dam's structural deficiencies, the project will directly enhance the safety of adjacent residential areas, mitigating risks associated with potential dam failure, such as downstream flooding. This will not only protect lives and property but also contribute to a sense of security for residents living near the dam.

C. Identify the current Regional Policy Plan of the applicable Regional Planning Agency (RPA)

   RPA: **Metropolitan Area Planning Council (MAPC)**
   Title: **MetroFuture: Making a Greater Boston Region Regional Plan**
   Date: **May 2008**

D. Describe the project's consistency with that plan with regard to:

1) economic development

The project will rehabilitate and improve a failing dam. By updating the local infrastructure, the project will prevent potential economic losses associated with dam failure, including damage to properties, infrastructure, and potential road closure.

2) adequacy of infrastructure

The project proposes to improve and replace existing infrastructure. The proposed improvements will ensure that the dam operates efficiently and effectively for years to come.

The MAPC Regional Plan emphasizes reliability on transportation and the importance of maintaining roads, bridges, and railways so that they are safe. The dam's rehabilitation will also enhance emergency response capabilities by maintaining essential transportation links and providing a reliable water source for firefighting efforts in an area without a municipal water system.

3) open space impacts

The project is not located in existing Article 97 open space land, and will not have an impact on the MAPC regional plan goal of enhancing bicycle and pedestrian access to regional open spaces.

RARE SPECIES SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **rare species or habitat** (see 301 CMR 11.03(2))? ___ Yes __**X**_ No; if yes, specify, in quantitative terms: **See Appendix K for correspondence with Natural Heritage and Endangered Species Program that deemed no rare species or habitat is located within the limit of work.**

(NOTE: If you are uncertain, it is recommended that you consult with the Natural Heritage and Endangered Species Program (NHESP) prior to submitting the ENF.)

B. Does the project require any state permits related to **rare species or habitat**? ___ Yes _**X**_ No

C. Does the project site fall within mapped rare species habitat (Priority or Estimated Habitat?) in the current Massachusetts Natural Heritage Atlas (attach relevant page)? ___ Yes _**X**__ No.

D. If you answered "No" to all questions A, B and C, proceed to the **Wetlands, Waterways, and Tidelands Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Rare Species section below.

II. Impacts and Permits

A. Does the project site fall within Priority or Estimated Habitat in the current Massachusetts Natural Heritage Atlas (attach relevant page)? ___ Yes ___ No. If yes,

1. Have you consulted with the Division of Fisheries and Wildlife Natural Heritage and Endangered Species Program (NHESP)? ___Yes ___No; if yes, have you received a determination as to whether the project will result in the "take" of a rare species? ___ Yes ___ No; if yes, attach the letter of determination to this submission.

2. Will the project "take" an endangered, threatened, and/or species of special concern in accordance with M.G.L. c.131A (see also 321 CMR 10.04)? ___ Yes ___ No; if yes, provide a summary of proposed measures to minimize and mitigate rare species impacts

3. Which rare species are known to occur within the Priority or Estimated Habitat?

4. Has the site been surveyed for rare species in accordance with the Massachusetts Endangered Species Act? ___ Yes ___ No

4. If your project is within Estimated Habitat, have you filed a Notice of Intent or received an Order of Conditions for this project? ___ Yes ___ No; if yes, did you send a copy of the Notice of Intent to the Natural Heritage and Endangered Species Program, in accordance with the Wetlands Protection Act regulations? ___ Yes ___ No

B. Will the project "take" an endangered, threatened, and/or species of special concern in accordance with M.G.L. c.131A (see also 321 CMR 10.04)? ___ Yes ___ No; if yes, provide a summary of proposed measures to minimize and mitigate impacts to significant habitat:

WETLANDS, WATERWAYS, AND TIDELANDS SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wetlands, waterways, and tidelands** (see 301 CMR 11.03(3))? _**X**_ Yes ___ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits (or a local Order of Conditions) related to **wetlands, waterways, or tidelands**? _**X**_ Yes ___ No; if yes, specify which permit:

The project requires filing a joint Chapter 91 Waterways License & 401 Water Quality Certificate, a Notice of Intent with the Stow Conservation Commission, and an ACOE PCN. These permit applications will be submitted following receipt of the final MEPA Certificate.

C. If you answered "No" to both questions A and B, proceed to the **Water Supply Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wetlands, Waterways, and Tidelands Section below.

II. Wetlands Impacts and Permits

A. Does the project require a new or amended Order of Conditions under the Wetlands Protection Act (M.G.L. c.131A)? _**X**_ Yes ___ No; if yes, has a Notice of Intent been filed? ___ Yes _**X**_ No; if yes, list the date and MassDEP file number: _____; if yes, has a local Order of Conditions been issued? ___ Yes ___ No; Was the Order of Conditions appealed? ___ Yes ___ No. Will the project require a Variance from the Wetlands regulations? ___ Yes ___ No.

B. Describe any proposed permanent or temporary impacts to wetland resource areas located on the project site:

Bank

A total of 901 linear feet (LF) of bank impacts are proposed to inland bank to bring the Lake Boon Dam into compliance with ODS safety standards.

Temporary Impacts:

134 LF of temporary impacts are associated with dewatering operations of the Bailey Brook. Upon completion of construction these portions of temporarily impacted bank will be restored to pre-construction conditions.

Permanent Impacts:

767 LF of permanent bank impact is proposed. Along Lake Boon's bank (upstream of dam) 490 LF of permanent impact is associated with the installation of an embedded interlocking steel sheet pile wall parallel to the existing dam. Downstream of the dam 119 LF of permanent bank impact will take place to the un-named intermittent stream channel due to the realignment of the channel (both banks). 158 LF of permanent impact is associated with Bailey Brook located downstream of the dam due to the construction of the new headwall and the regrading to the downstream embankment slope.

Bordering Vegetated Wetlands

A total of 10,134 square feet (SF) of impact is proposed to bordering vegetated wetlands to bring the Lake Boon Dam into compliance with ODS safety standards.

Temporary Impacts:

678 SF of temporary impact is proposed downstream of the dam. These temporary impacts are associated with erosion and sediment controls and temporary access to the tailwater cofferdam. Post construction, a New England wetland seed mix will be spread to restore temporarily impacted wetlands to preconstruction conditions.

Permanent Impacts:

9,456 SF of impact will take place downstream of the dam. 4,954 SF of permanent impact is proposed for the regrading of the downstream embankment slope and seepage control improvements on the bordering vegetated wetland directly to the downstream toe of dam. 4,110 SF of permanent impact is due to the proposed vegetation clearing (proposed vegetation removals necessary to provide the vegetative buffer off the dam required by ODS safety standards), soft ground stabilization, and seepage control improvements. 392 SF of permanent bordering vegetated wetland is assumed for the realignment of the intermittent stream channel.

Land Under Water

24,477 square feet (SF) of land under water impact is proposed to bring the Lake Boon Dam into compliance with ODS safety standards.

Temporary Impacts:

22,701 SF of temporary impact is proposed. 19,413 SF of land under water temporary impacts is associated with the upstream portion of the dam, located within Lake Boon. Impacts are due to the installation and dewatering associated with the installation of the sheet pile cofferdam enclosure and silt curtain. 3,288 SF of temporary impact will take place downstream of the dam within the Bailey Brook due to the installation and associated dewatering of the tailwater cofferdam. All sediment and erosion controls will be removed post construction and restored to pre-construction conditions.

Permanent Impacts:

A total of 1,776 SF of permanent impact is proposed. Permeant impacts upstream of the dam (Lake Boon) includes a total of 1,345 SF associated with 202 SF of impact to construct the new spillway intake/control structure and 1,143 SF of impact due to the installation of an embedded interlocking steel sheet pile wall and the roadway reconstruction. 431 SF of impact is associated with the downstream portion of the dam within the Bailey Brook and the un-named intermittent stream. 188 SF of permanent impacts is due to the construction of the spillway headwall and embankment slope regrading. 243 SF of downstream permanent impact is associated with the realignment of the un-named intermittent stream.

Dredging is proposed for the required improvements to the Lake Boon Dam. Dredging will take place below the ordinary high-water line of Bailey Brook and Lake Boon. The project proposes 240 cubic yards (CY) total of dredging (120 CY below the high-water line of Lake Boon and 120 CY below the high-water line of Baily Brook).

Bordering Land Subject to Flooding (BLSF)

This project proposes a total of 313 SF of impact to bordering land subject to flooding to bring the Lake Boon Dam into compliance with ODS safety standards.

Permanent Impacts:

All proposed impacts will take place downstream of the dam within the flood plain associated with the Bailey Brook. The impacts are associated with the downstream dam embankment slope regrading.

Approximately 37.6 CY of flood storage will be lost with the required alterations to bring the dam into compliance with ODS requirements. Due to site constraints, compensatory storage replication was not possible at the site. See Appendix A and Appendix C for additional information.

Riverfront Area

This project proposes a total of 24,147 SF of impact to riverfront area to bring the Lake Boon Dam into compliance with ODS safety standards.

Temporary Impacts:

678 SF of temporary impact is associated with the sediment and erosion control installation. Upon completion of construction these portions of temporarily impacted riverfront area will be re-seeded and restored to pre-construction conditions.

Permanent Impacts:

23,459 SF of impact is permanent associated with the realignment of the roadway, regrading of the downstream dam embankment, vegetation clearing, soft ground stabilization, seepage control improvements, and realignment of the un-named intermittent channel.

For additional details on wetland resource area impacts please see Appendix A (Project Description) and Appendix N(Plans) Sheet 2.0.

B. Estimate the extent and type of impact that the project will have on wetland resources, and indicate whether the impacts are temporary or permanent:

Coastal Wetlands	Permeant Impacts	Temporary Impacts
Land Under the Ocean	N/A	N/A
Designated Port Areas	N/A	N/A
Coastal Beaches	N/A	N/A
Coastal Dunes	N/A	N/A

Barrier Beaches	N/A	N/A
Coastal Banks	N/A	N/A
Rocky Intertidal Shores	N/A	N/A
Salt Marshes	N/A	N/A
Land Under Salt Ponds	N/A	N/A
Land Containing Shellfish	N/A	N/A
Fish Runs	N/A	N/A
Land Subject to Coastal Storm Flowage	N/A	N/A

Inland Wetlands	Permanent Impacts	Temporary Impacts
Bank	767 LF	134 LF
Bordering Vegetated Wetlands	9,456 SF	678 SF
Isolated Vegetated Wetlands	0 SF	0 SF
Land Under Water	1,776 SF	22,701 SF
Isolated Land Subject to Flooding	0 SF	0 SF
Bordering Land Subject to Flooding	313 SF	0 SF
Riverfront Area	23,469 SF	678 SF

D. Is any part of the project:

1. proposed as a **limited project**? **_X__** Yes ___ No; if yes, what is the area (in sf)? **57,063 SF. The entire limits of the proposed project will be filed as a dam maintenance limited project in compliance with 310 CMR 10.53(i):**

The maintenance, repair and improvement (but not substantial enlargement except when necessary to meet the Massachusetts Stream Crossing Standards) of structures, including dams and reservoirs and appurtenant works to such dams and reservoirs, buildings, piers, towers, headwalls, bridges, and culverts which existed on the effective date of 310 CMR10.51 through 10.60 (April 1, 1983).

2. the construction or alteration of a **dam**? **__X_** Yes ___ No; if yes, describe

The project proposes to rehabilitate and improve the existing dam to bring the dam into compliance with safety standards determined by the Office of Dam Safety (ODS). See Appendix A for additional details.

3. fill or structure in a **velocity zone** or **regulatory floodway**? **_X_** Yes ___ No

The existing spillway of the dam is located within a regulatory floodway associated with Bailey Brook. The new spillway will be constructed to be a within a similar footprint. See Appendix N for plans.

4. dredging or disposal of dredged material? _**X**__ Yes ___ No; if yes, describe the volume of dredged material and the proposed disposal site:

Dredging is proposed for the required improvements to the Dam. Dredging will take place below the ordinary high-water line of Bailey Brook and Lake Boon. The project proposes 240 cubic yards (CY) total of dredging (120 CY below the high-water line of Lake Boon and 120 CY below the high-water line of Baily Brook).The project proposes to dewater the soil in-place sufficiently so that it can be excavated and live-loaded into trucks departing from the site to minimize handling and stockpiling. The sediment will be disposed of off-site at a regulated receiving facility.

5. a discharge to an **Outstanding Resource Water (ORW)** or an **Area of Critical Environmental Concern (ACEC)**? ___ Yes _**X**__ No
6. subject to a wetlands restriction order? ___ Yes _**X**__ No; if yes, identify the area (in sf):
7. located in buffer zones? _**X**__Yes ___No; if yes, how much (in sf) **_23,457 SF**

E. Will the project:
1. be subject to a local wetlands ordinance or bylaw? _**X**__ Yes ___ No
2. alter any federally-protected wetlands not regulated under state law? ___ Yes _**X**_ No; if yes, what is the area (sf)?

III. Waterways and Tidelands Impacts and Permits

A. Does the project site contain waterways or tidelands (including filled former tidelands) that are subject to the Waterways Act, M.G.L.c.91? _**X**__ Yes _ _ No; if yes, is there a current Chapter 91 License or Permit affecting the project site? ___ Yes _X__ No; if yes, list the date and license or permit number and provide a copy of the historic map used to determine extent of filled tidelands:

C. Does the project require a new or modified license or permit under M.G.L.c.91? _**X**__ Yes ___ No;

A Chapter 91 License will be filed for the proposed project following MEPA approval.

D. if yes, how many acres of the project site subject to M.G.L.c.91 will be for non-water-dependent use?

None. The project is expected to be considered water dependent.

Current ___ Change ___ Total ___
If yes, how many square feet of solid fill or pile-supported structures (in sf)?

C. For non-water-dependent use projects, indicate the following:
Area of filled tidelands on the site:_____**N/A**_____
Area of filled tidelands covered by buildings:___**N/A**_____
For portions of site on filled tidelands, list ground floor uses and area of each use: ____**N/A**_____
Does the project include new non-water-dependent uses located over flowed tidelands? Yes ___ No __**X**_

Height of building on filled tidelands_____**N/A**_____

Also show the following on a site plan: Mean High Water, Mean Low Water, Water-dependent Use Zone, location of uses within buildings on tidelands, and interior and exterior areas and facilities dedicated for public use, and historic high and historic low water marks.

D. Is the project located on landlocked tidelands? ___ Yes _**X**_ No; if yes, describe the project's impact on the public's right to access, use and enjoy jurisdictional tidelands and describe measures the project will implement to avoid, minimize or mitigate any adverse impact:

E. Is the project located in an area where low groundwater levels have been identified by a municipality or by a state or federal agency as a threat to building foundations? ___Yes _**X**_ No; if yes, describe the project's impact on groundwater levels and describe measures the project will implement to avoid, minimize or mitigate any adverse impact:

F. Is the project non-water-dependent **and** located on landlocked tidelands **or** waterways or tidelands subject to the Waterways Act **and** subject to a mandatory EIR? ___ Yes **X** No; *(NOTE: If yes, then the project will be subject to Public Benefit Review and Determination.)*

G. Does the project include dredging? __**X**_ Yes ___ No; if yes, answer the following questions:

What type of dredging? Improvement _X__ Maintenance ___ Both ___
What is the proposed dredge volume, in cubic yards (cys) ___**240 CY**_____
What is the proposed dredge footprint:
Lake Boon: 25 length (ft) 20 width (ft) Shallowest: 7' Maximum Depth: 11' depth (ft);

Downstream Area (Bailey Brook): 100 length (ft) 14 width (ft) Shallowest: 4' Maximum Depth: 7' depth (ft);

Will dredging impact the following resource areas?

Intertidal Yes__ No_**X**_; if yes, ___ sq ft
Outstanding Resource Waters Yes__ No_**X**_; if yes, ___ sq ft
Other resource area (i.e. shellfish beds, eel grass beds) Yes__ No_**X**_; if yes __ sq ft

If yes to any of the above, have you evaluated appropriate and practicable steps to: 1) avoidance; 2) if avoidance is not possible, minimization; 3) if either avoidance or minimize is not possible, mitigation?
If no to any of the above, what information or documentation was used to support this determination?

Limited dredging of sediment for the proposed dam rehabilitation is necessary in two localized areas. The first area is on the upstream/easterly side of the dam below the waters of Lake Boon, and the second area is along the downstream/westerly side of the dam below the waters of Bailey's Brook. Alternatives were assessed to determine the least impactful

scope of work in order to bring the dam into compliance with ODS safety requirements.

Please refer to Appendix C – Alternatives Analysis for additional information regarding the alternatives that were evaluated for the project.

Provide a comprehensive analysis of practicable alternatives for improvement dredging in accordance with 314 CMR 9.07(1)(b). Physical and chemical data of the sediment shall be included in the comprehensive analysis.

Please refer to Appendix C – Alternatives Analysis for additional information regarding the alternatives that were evaluated for the project.

Given the dam's existing construction and poor structural stability, the performance of pre-construction sampling at this particular site, specifically in the proposed dredge areas, would pose safety risks that could further endanger the stability of the dam. Correspondence has taken place with the Massachusetts Department of Environmental Protection (MassDEP) to express safety concerns with sampling within 401 Water Quality Certification (401 WQC) jurisdiction (See Appendix K). Through consultation with MassDEP, it was determined that a sediment analysis plan (SAP)/due diligence review could be submitted for approval to conduct sediment sampling during construction, but before dredging activities physically occur.

An SAP/due diligence review was submitted to Massachusetts Department of Environmental Protection (MassDEP) on March 14, 2024, to propose an alternate sampling schedule whereby sediment sampling activities would be delayed until the beginning of the proposed construction. The SAP was approved on March 26, 2024 (See Appendix K).

<u>Existing Soil Data</u>

Available geologic reconnaissance reports including "Geology and Mineral Resources of the Hudson and Maynard Quadrangles Massachusetts" by Wallace R. Hansen and geologic maps published by the United States Geological Survey (USGS) indicate that the project site and surrounding area have been highly influenced by historic glacier activity. The dominant surficial deposit underlying Lake Boon and the Site is characterized as a glacial outwash plain comprised predominantly of highly pervious sand deposits.

In 2023, a geotechnical investigation boring was performed and associated laboratory sieve analysis testing conducted on recovered samples agree with the regional geologic mapping and geologic site characterization described above. The borings were performed through the top of the dam embankment in the roadway, outside of the limits of the geomembrane liner. The borings were advanced through the existing embankment fill material (which was generally 4 to 6 feet thick) and taken up to 50 feet into the underlying glacial outwash deposit. Sieve analysis testing performed on select samples for geotechnical purposes indicate that the existing dam

embankment is comprised of mostly sand with potentially up 15 percent of particles (by weight) being finer than the U.S. Standard No. 200 mesh sieve. Sieve analysis testing performed on a sample of the glacial outwash layer beneath the dam embankment indicate that the glacial outwash also contains a relatively low percentage of particles finer than the No. 200 sieve, which is a typical characteristic of this type of deposit.

Sediment Characterization

Existing gradation analysis results? __Yes _**X**__No: if yes, provide results.

Existing chemical results for parameters listed in 314 CMR 9.07(2)(b)6? ___Yes __**X**__No; if yes, provide results.

Do you have sufficient information to evaluate feasibility of the following management options for dredged sediment? If yes, check the appropriate option.

Beach Nourishment ___
Unconfined Ocean Disposal ___
Confined Disposal:
Confined Aquatic Disposal (CAD) ___
Confined Disposal Facility (CDF) ___
Landfill Reuse in accordance with COMM-97-001 ___
Shoreline Placement ___
Upland Material Reuse____
In-State landfill disposal _X_ -
In state landfill disposal is proposed but to be confirmed upon completion of sediment sampling.
Out-of-state landfill disposal ____
(NOTE: This information is required for a 401 Water Quality Certification.)

IV. Consistency:

A. Does the project have effects on the coastal resources or uses, and/or is the project located within the Coastal Zone? ___ Yes _**X**__ No; if yes, describe these effects and the projects consistency with the policies of the Office of Coastal Zone Management:

B. Is the project located within an area subject to a Municipal Harbor Plan? ___ Yes _**X**__ No; if yes, identify the Municipal Harbor Plan and describe the project's consistency with that plan:

WATER SUPPLY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **water supply** (see 301 CMR 11.03(4))? ___ Yes _**X**__ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **water supply**? ___ Yes _**X**__ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Wastewater Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Water Supply Section below.

II. Impacts and Permits

A. Describe, in gallons per day (gpd), the volume and source of water use for existing and proposed activities at the project site:

	Existing	Change	Total
Municipal or regional water supply	_____	_____	_____
Withdrawal from groundwater	_____	_____	_____
Withdrawal from surface water	_____	_____	_____
Interbasin transfer	_____	_____	_____

(NOTE: Interbasin Transfer approval will be required if the basin and community where the proposed water supply source is located is different from the basin and community where the wastewater from the source will be discharged.)

B. If the source is a municipal or regional supply, has the municipality or region indicated that there is adequate capacity in the system to accommodate the project? ___ Yes ___ No

C. If the project involves a new or expanded withdrawal from a groundwater or surface water source, has a pumping test been conducted? ___ Yes ___ No; if yes, attach a map of the drilling sites and a summary of the alternatives considered and the results.

D. What is the currently permitted withdrawal at the proposed water supply source (in gallons per day)? _____Will the project require an increase in that withdrawal? ___Yes ___No; if yes, then how much of an increase (gpd)? _____

E. Does the project site currently contain a water supply well, a drinking water treatment facility, water main, or other water supply facility, or will the project involve construction of a new facility? ___ Yes ___No. If yes, describe existing and proposed water supply facilities at the project site:

	Permitted Flow	Existing Avg Daily Flow	Project Flow	Total
Capacity of water supply well(s) (gpd)	_____	_____	_____	_____
Capacity of water treatment plant (gpd)	_____	_____	_____	

F. If the project involves a new interbasin transfer of water, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or proposed?

G. Does the project involve:

1. new water service by the Massachusetts Water Resources Authority or other agency of the Commonwealth to a municipality or water district? _ Yes __ No
2. a Watershed Protection Act variance? ___ Yes ___ No; if yes, how many acres of alteration?
3. a non-bridged stream crossing 1,000 or less feet upstream of a public surface drinking water supply for purpose of forest harvesting activities? ___ Yes ___ No

III. Consistency

Describe the project's consistency with water conservation plans or other plans to enhance water resources, quality, facilities and services:

WASTEWATER SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wastewater** (see 301 CMR 11.03(5))? ___ Yes _**X**__ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **wastewater**? ___ Yes _**X**__ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Transportation -- Traffic Generation Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wastewater Section below.

II. Impacts and Permits

A. Describe the volume (in gallons per day) and type of disposal of wastewater generation for existing and proposed activities at the project site (calculate according to 310 CMR 15.00 for septic systems or 314 CMR 7.00 for sewer systems):

	Existing	Change	Total
Discharge of sanitary wastewater	_____	_____	_____
Discharge of industrial wastewater	_____	_____	_____
TOTAL	_____	_____	_____

	Existing	Change	Total
Discharge to groundwater	_____	_____	_____
Discharge to outstanding resource water	_____	_____	_____
Discharge to surface water	_____	_____	_____
Discharge to municipal or regional wastewater facility	_____	_____	_____
TOTAL	_____	_____	_____

B. Is the existing collection system at or near its capacity? ___ Yes ___ No; if yes, then describe the measures to be undertaken to accommodate the project's wastewater flows:

C. Is the existing wastewater disposal facility at or near its permitted capacity? ___ Yes___ No; if yes, then describe the measures to be undertaken to accommodate the project's wastewater flows:

D. Does the project site currently contain a wastewater treatment facility, sewer main, or other wastewater disposal facility, or will the project involve construction of a new facility?
___ Yes
___ No; if yes, describe as follows:

	Permitted	Existing	Avg	Project Flow Total
		Daily Flow		
Wastewater treatment plant capacity (in gallons per day)	_____	_____	_____	_____

E. If the project requires an interbasin transfer of wastewater, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or new?

(NOTE: Interbasin Transfer approval may be needed if the basin and community where wastewater will be discharged is different from the basin and community where the source of water supply is located.)

F. Does the project involve new sewer service by the Massachusetts Water Resources Authority (MWRA) or other Agency of the Commonwealth to a municipality or sewer district? ___ Yes ___ No

G. Is there an existing facility, or is a new facility proposed at the project site for the storage, treatment, processing, combustion or disposal of sewage sludge, sludge ash, grit, screenings, wastewater reuse (gray water) or other sewage residual materials? ___ Yes ___ No; if yes, what is the capacity (tons per day):

	Existing	Change	Total
Storage	_____	_____	_____
Treatment	_____	_____	_____
Processing	_____	_____	_____
Combustion	_____	_____	_____
Disposal	_____	_____	_____

H. Describe the water conservation measures to be undertaken by the project, and other wastewater mitigation, such as infiltration and inflow removal.

III. Consistency

A. Describe measures that the proponent will take to comply with applicable state, regional, and local plans and policies related to wastewater management:

B. If the project requires a sewer extension permit, is that extension included in a comprehensive wastewater management plan? ___ Yes ___ No; if yes, indicate the EEA number for the plan and whether the project site is within a sewer service area recommended or approved in that plan:

TRANSPORTATION SECTION (TRAFFIC GENERATION)

I. Thresholds / Permit

A. Will the project meet or exceed any review thresholds related to **traffic generation** (see 301 CMR 11.03(6))? ___ Yes _**X**__ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **state-controlled roadways**? ___ Yes _**X**__No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Roadways and Other Transportation Facilities Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Traffic Generation Section below.

II. Traffic Impacts and Permits

A. Describe existing and proposed vehicular traffic generated by activities at the project site:

	Existing	Change	Total
Number of parking spaces	_____	_____	_____
Number of vehicle trips per day	_____	_____	_____
ITE Land Use Code(s):	_____	_____	_____

B. What is the estimated average daily traffic on roadways serving the site?

Roadway	Existing	Change	Total
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____

C. If applicable, describe proposed mitigation measures on state-controlled roadways that the project proponent will implement:

D. How will the project implement and/or promote the use of transit, pedestrian and bicycle facilities and services to provide access to and from the project site?

E. Is there a Transportation Management Association (TMA) that provides transportation demand management (TDM) services in the area of the project site? ____ Yes ____ No; if yes, describe if and how will the project will participate in the TMA:

F. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation facilities? ____ Yes ____ No; if yes, generally describe:

G. If the project will penetrate approach airspace of a nearby airport, has the proponent filed a Massachusetts Aeronautics Commission Airspace Review Form (780 CMR 111.7) and a Notice of Proposed Construction or Alteration with the Federal Aviation Administration (FAA) (CFR Title 14 Part 77.13, forms 7460-1 and 7460-2)?

III. Consistency

Describe measures that the proponent will take to comply with municipal, regional, state, and federal plans and policies related to traffic, transit, pedestrian and bicycle transportation

facilities and services:

TRANSPORTATION SECTION (ROADWAYS AND OTHER TRANSPORTATION FACILITIES)

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **roadways or other transportation facilities** (see 301 CMR 11.03(6))? ___ Yes **X** No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **roadways or other transportation facilities**? ___ Yes _**X**__ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Energy Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Roadways Section below.

II. Transportation Facility Impacts

A. Describe existing and proposed transportation facilities in the immediate vicinity of the project site:

B. Will the project involve any

1. Alteration of bank or terrain (in linear feet)? _____
2. Cutting of living public shade trees (number)? _____
3. Elimination of stone wall (in linear feet)? _____

III. Consistency -- Describe the project's consistency with other federal, state, regional, and local plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services, including consistency with the applicable regional transportation plan and the Transportation Improvements Plan (TIP), the State Bicycle Plan, and the State Pedestrian Plan:

ENERGY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **energy** (see 301 CMR 11.03(7))? ___ Yes _**X**__ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **energy**? ___ Yes _**X**__ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Air Quality Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Energy Section below.

II. Impacts and Permits

A. Describe existing and proposed energy generation and transmission facilities at the project site:

	Existing	Change	Total
Capacity of electric generating facility (megawatts)	_____	_____	_____
Length of fuel line (in miles)	_____	_____	_____
Length of transmission lines (in miles)	_____	_____	_____
Capacity of transmission lines (in kilovolts)	_____	_____	_____

B. If the project involves construction or expansion of an electric generating facility, what are:

1. the facility's current and proposed fuel source(s)?
2. the facility's current and proposed cooling source(s)?

C. If the project involves construction of an electrical transmission line, will it be located on a new, unused, or abandoned right of way? ___Yes ___No; if yes, please describe:

D. Describe the project's other impacts on energy facilities and services:

III. Consistency

Describe the project's consistency with state, municipal, regional, and federal plans and policies for enhancing energy facilities and services:

AIR QUALITY SECTION

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **air quality** (see 301 CMR 11.03(8))? ___ Yes _**X**__ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **air quality**? ___ Yes _**X**__ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Solid and Hazardous Waste Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Air Quality Section below.

II. Impacts and Permits

A. Does the project involve construction or modification of a major stationary source (see 310 CMR 7.00, Appendix A)? ___ Yes ___ No; if yes, describe existing and proposed emissions (in tons per day) of:

Total	Existing	Change	
Particulate matter	_____	_____	_____
Carbon monoxide	_____	_____	_____
Sulfur dioxide	_____	_____	_____
Volatile organic compounds	_____	_____	_____
Oxides of nitrogen	_____	_____	_____
Lead	_____	_____	_____
Any hazardous air pollutant	_____	_____	_____
Carbon dioxide	_____	_____	_____

B. Describe the project's other impacts on air resources and air quality, including noise impacts:

III. Consistency

A. Describe the project's consistency with the State Implementation Plan:

B. Describe measures that the proponent will take to comply with other federal, state, regional, and local plans and policies related to air resources and air quality:

SOLID AND HAZARDOUS WASTE SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **solid or hazardous waste** (see 301 CMR 11.03(9))? ___ Yes _**X**__ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **solid and hazardous waste**? ___ Yes, **X** No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Historical and Archaeological Resources Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Solid and Hazardous Waste Section below.

II. Impacts and Permits

A. Is there any current or proposed facility at the project site for the storage, treatment, processing, combustion or disposal of solid waste? ___ Yes ___ No; if yes, what is the volume (in tons per day) of the capacity:

	Existing	Change	Total
Storage	_____	_____	_____
Treatment, processing	_____	_____	_____
Combustion	_____	_____	_____
Disposal	_____	_____	_____

B. Is there any current or proposed facility at the project site for the storage, recycling, treatment or disposal of hazardous waste? ___ Yes ___ No; if yes, what is the volume (in tons or gallons per day) of the capacity:

	Existing	Change	Total
Storage	_____	_____	_____
Recycling	_____	_____	_____
Treatment	_____	_____	_____
Disposal	_____	_____	_____

C. If the project will generate solid waste (for example, during demolition or construction), describe alternatives considered for re-use, recycling, and disposal:

D. If the project involves demolition, do any buildings to be demolished contain asbestos? ___ Yes ___ No

E. Describe the project's other solid and hazardous waste impacts (including indirect impacts):

III. Consistency

Describe measures that the proponent will take to comply with the State Solid Waste Master Plan:

HISTORICAL AND ARCHAEOLOGICAL RESOURCES SECTION

I. Thresholds / Impacts

A. Have you consulted with the Massachusetts Historical Commission? ___ Yes __**X**_ No; if yes, attach correspondence. For project sites involving lands under water, have you consulted with the Massachusetts Board of Underwater Archaeological Resources? ____Yes __**X**__ No; if yes, attach correspondence

A Massachusetts Historical Commission (MHC) project notification form will be submitted prior to completion of environmental permitting for this project.

Per the Massachusetts Cultural Resource Information System (MACRIS) the following have been identified as Massachusetts Historical Commission inventoried properties within the limit of work: Lake Boon (STW.G), Lake Boon Earthen Dam (STW.916), & a portion of the Barton Road Stone Wall (STW.912).

In close proximity to the limit of work includes 105 Barton Road (STW.185), 81 Barton Road (STW.184). There will be no alteration of these historic structures.

Please see below for a summary of impacts proposed to these inventoried properties:

Lake Boon earthen dam (STW.916) is located within the Lake Boon Historic District (STW.G). The existing Lake Boon Dam will be demolished to be brought into compliance with the Department of Conservation and Recreation Office of Dam Safety (DCR ODS) requirements. Upon completion of construction the dam structure will be slightly enlarged however, the overall appearance of Lake Boon Dam will not appreciably change. As a result of the proposed project the overall safety and condition of the structure will be greatly enhanced. The project design team has taken steps to preserve the overall aesthetic of the dam such as specifying steel-backed timber guardrails as opposed to steel-only guardrails. The design team has received feedback from the Lake Boon community regarding preservation of the dam's appearance and has incorporated this feedback into the proposed work.

Additionally, a portion of the 105 Barton Road (STW.185) property will be used for staging during construction of the project. However, the project will not result in the demolition of the historic structure (house) on the property.

Within the northern portion of the limits of work a historic stone wall has been identified (STW.912). This wall is located along the property of 81 Barton Road (STW.184 (house). The project will not result in demolition or alteration to either of these historic structures (wall or house).

Please refer to Appendix D, Figure 4 for a Massachusetts Historic Resources Map.

B. Is any part of the project site a historic structure, or a structure within a historic district, in either case listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? _**X**__ Yes ___ No; if yes, does the project involve the demolition of all or any exterior part of such historic structure? _**X**__ Yes ___ No; if yes, please describe:

Lake Boon Dam will be demolished to be brought into compliance with the Department of Conservation and Recreation Office of Dam Safety (DCR ODS) requirements. Lake Boon earthen dam (STW.916) is located within the Lake Boon Historic District (STW.G). Upon completion of construction the dam structure will be slightly enlarged however, the overall appearance of Lake Boon Dam will not appreciably change. As a result of the proposed project the overall safety and condition of the structure will be greatly enhanced. The applicant will coordinate with MHC throughout the permitting process.

C. Is any part of the project site an archaeological site listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? ___ Yes __X_ No; if yes, does the project involve the destruction of all or any part of such archaeological site? ___ Yes ___ No; if yes, please describe:

D. If you answered "No" to all parts of both questions A, B and C, proceed to the **Attachments and Certifications** Sections. If you answered "Yes" to any part of either question A or question B, fill out the remainder of the Historical and Archaeological Resources Section below.

II. Impacts

Describe and assess the project's impacts, direct and indirect, on listed or inventoried historical and archaeological resources:

The project has been designed to minimize impacts to the maximum extent practicable. All impacts are associated with the rehabilitation of the dam. The proposed project is necessary to bring the dam into compliance with the Office of Dam Safety requirements.

The dam structure will be slightly enlarged however, the overall appearance of Lake Boon Dam will not appreciably change. As a result of the proposed project the overall safety and condition of the structure will be greatly enhanced.

Additional information is provided in Appendix A.

III. Consistency

Describe measures that the proponent will take to comply with federal, state, regional, and local plans and policies related to preserving historical and archaeological resources:

The proposed project will undergo review by the Massachusetts Historic Commission (MHC) under 950 CMR 71. A project notification form will be submitted before completion of permitting. Additionally, review will take place through this ENF submission. Potential effects, if any, to listed eligible historic and archaeological resources will be avoided or mitigated to the maximum extent practicable in compliance with MHC regulations and policies.

CLIMATE CHANGE ADAPTATION AND RESILIENCY SECTION

This section of the Environmental Notification Form (ENF) solicits information and disclosures related to climate change adaptation and resiliency, in accordance with the MEPA Interim Protocol on Climate Change Adaptation and Resiliency (the "MEPA Interim Protocol"), effective October 1, 2021. The Interim Protocol builds on the analysis and recommendations of the 2018 Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan (SHMCAP), and incorporates the efforts of the Resilient Massachusetts Action Team (RMAT), the inter-agency steering committee responsible for implementation, monitoring, and maintenance of the SHMCAP, including the "Climate Resilience Design Standards and Guidelines" project. The RMAT team recently released the RMAT Climate Resilience Design Standards Tool, which is available here.

The MEPA Interim Protocol is intended to gather project-level data in a standardized manner that will both inform the MEPA review process and assist the RMAT team in evaluating the accuracy and effectiveness of the RMAT Climate Resilience Design Standards Tool. Once this testing process is completed, the MEPA Office anticipates developing a formal Climate Change Adaptation and Resiliency Policy through a public stakeholder process. Questions about the RMAT Climate Resilience Design Standards Tool can be directed to rmat@mass.gov.

All Proponents must complete the following section, referencing as appropriate the results of the output report generated by the RMAT Climate Resilience Design Standards Tool and attached to the ENF. In completing this section, Proponents are encouraged, but not required at this time, to utilize the recommended design standards and associated Tier 1/2/3 methodologies outlined in the RMAT Climate Resilience Design Standards Tool to analyze the project design. However, Proponents are requested to respond to a respond to a user feedback survey on the RMAT website or to provide feedback to rmat@mass.gov, which will be used by the RMAT team to further refine the tool. Proponents are also encouraged to consult general guidance and best practices as described in the RMAT Climate Resilience Design Guidelines.

Climate Change Adaptation and Resiliency Strategies

I. Has the project taken measures to adapt to climate change for all of the climate parameters analyzed in the RMAT Climate Resilience Design Standards Tool (sea level rise/storm surge, extreme precipitation (urban or riverine flooding), extreme heat)? ___Yes _**X**_ No

Note: Climate adaptation and resiliency strategies include actions that seek to reduce vulnerability to anticipated climate risks and improve resiliency for future climate conditions. Examples of climate adaptation and resiliency strategies include flood barriers, increased stormwater infiltration, living shorelines, elevated infrastructure, increased tree canopy, etc. Projects should address any planning priorities identified by the affected municipality through the Municipal Vulnerability Preparedness (MVP) program or other planning efforts, and should consider a flexible adaptive pathways approach, an adaptation best practice that encourages design strategies that adapt over time to respond to changing climate conditions. General guidance and best practices for designing for climate risk are described in the RMAT Climate Resilience Design Guidelines*.*

A. If no, explain why.

This work is necessary to bring the current dam structure into compliance with the ODS Safety requirements and the proposed is the least impactful alternative. The dam has been designed for the 500-year storm event.

Like many inland waters, Lake Boon is susceptible to the effects of climate change. For the dam, the greatest of these concerns is inarguably the increased threat of overtopping attributed to greater storm intensities. As summarized in the DCR-ODS *Public Safety Notice Regarding Overtopping of Dams*, overtopping of an embankment dam, even for a short period, is a serious concern and can quickly lead to failure of the dam (and uncontrolled release of the stored water) by way of external erosion. Unless a dam is intentionally designed and constructed to withstand overtopping, the combined outflow capacity of its spillway(s) and other outlets must be sufficient to keep the dam from overtopping. For dams subject to the Massachusetts Dam Safety Regulations, the adequacy of the spillways / outlets to accomplish this is based on a prescribed design flood that considers the size and hazard potential of the dam and whether or not the dam is new or existing.

For Lake Boon Dam, the prescribed design flood is the 500-year event, or in other words, the inflow resulting from a simulated precipitation event with an annual exceedance probability of 0.2 percent (1 in 500 chance). A focused hydrologic and hydraulic study performed by Weston & Sampson in 2018 concluded that the spillway at Lake Boon Dam, which is the only intended outlet for the lake, does not have the capacity necessary to safely accommodate a "baseline climate" 500-year storm. Under projected climate conditions typically used for resilient infrastructure design, it can be reasonably assumed that the probability and magnitude of the risks associated with inadequate spillway capacity would be even greater for Lake Boon Dam. While it is neither practicable (in most cases) nor required by the Massachusetts Dam Safety Regulations to upgrade existing dams to meet projected climate conditions, any increase in safe outflow capacity and/or reserve flood storage is an improvement that generally makes an existing dam safer.

B. If yes, describe the measures the project will take, including identifying the planning horizon and climate data used in designing project components. If applicable, specify the return period and design storm used (e.g., 100-year, 24-hour storm).

Not applicable.

C. Is the project contributing to regional adaptation strategies? __ Yes _**X**_ No; If yes, describe.

II. Has the Proponent considered alternative locations for the project in light of climate change risks?
___ Yes _**X**__ No

A. If no, explain why.

The project is necessary to bring the dam in this location into compliance with ODS safety requirements.

B. If yes, describe alternatives considered.

Not applicable.

III. Is the project located in Land Subject to Coastal Storm Flowage (LSCSF) or Bordering Land Subject to Flooding (BLSF) as defined in the Wetlands Protection Act? __**X**__Yes ____No

If yes, describe how/whether proposed changes to the site's topography (including the addition of fill) will result in changes to floodwater flow paths and/or velocities that could impact adjacent properties or the functioning of the floodplain. General guidance on providing this analysis can be found in the CZM/MassDEP Coastal Wetlands Manual, available here.

37.6 CY of fill in BLSF is proposed to facilitate necessary safety improvements and alterations to the downstream slope of the dam embankment. This proposed filling will not change floodwater flow paths or velocities and is not projected to impact adjacent properties or the functioning of the floodplain.

Impacts to wetland resource areas will be avoided and minimized to the maximum extent practicable. Proposed temporary impacts to wetland resource areas will be restored in situ. The permanent impacts to resource areas are considered unavoidable. Alternatives were assessed for potential on site wetland replication and compensatory storage replication, and it was deemed there is no feasible option (see Appendix C for alternatives analysis).

ENVIRONMENTAL JUSTICE SECTION

I. Identifying Characteristics of EJ Populations

A. If an Environmental Justice (EJ) population has been identified as located in whole or in part within 5 miles of the project site, describe the characteristics of each EJ populations as identified in the EJ Maps Viewer (i.e., the census block group identification number and EJ characteristics of "Minority," "Minority and Income," etc.). Provide a breakdown of those EJ populations within 1 mile of the project site, and those within 5 miles of the site.

No Environmental Justice (EJ) populations are identified within 1 mile of the project site. See Appendix E for a summary of the mapped EJ populations located within 5 miles of the project site.

B. Identify all languages identified in the "Languages Spoken in Massachusetts" tab of the EJ Maps Viewer as spoken by 5 percent or more of the EJ population who also identify as not speaking English "very well." The languages should be identified for each census tract located in whole or in part within 1 mile and 5 miles of the project site, regardless of whether such census tract contains any designated EJ populations.

No additional languages were identified within 1 mile of the project site. See Appendix E for a summary of additional languages spoken within 5 miles of the project site.

C. If the list of languages identified under Section I.B. has been modified with approval of the EEA EJ Director, provide a list of approved languages that the project will use to provide public involvement opportunities during the course of MEPA review. If the list has been expanded by the Proponent (without input from the EEA EJ Director), provide a list of the additional languages that will be used to provide public involvement opportunities during the course of MEPA review as required by Part II of the MEPA Public Involvement Protocol for Environmental Justice Populations ("MEPA EJ Public Involvement Protocol"). If the project is exempt from Part II of the protocol, please specify.

Not applicable as there are no EJ communities within 1 mile of the limit of work.

II. Potential Effects on EJ Populations

A. If an EJ population has been identified using the EJ Maps Viewer within 1 mile of the project site, describe the likely effects of the project (both adverse and beneficial) on the identified EJ population(s).

Not applicable as there are no EJ communities within 1 mile of the limit of work. Please see the attached map in Appendix E.

B. If an EJ population has been identified using the EJ Maps Viewer within 5 miles of the project site, will the project: (i) meet or exceed MEPA review thresholds under 301 CMR 11.03(8)(a)-(b) __ Yes _**X**_ No; or (ii) generate 150 or more new average daily trips (adt) of diesel vehicle traffic, excluding public transit trips, over a duration of 1 year or more. ___ Yes _**X**__ No

C. If you answered "Yes" to either question in Section II.B., describe the likely effects of the project (both adverse and beneficial) on the identified EJ population(s).

III. Public Involvement Activities

A. Provide a description of activities conducted prior to filing to promote public involvement by EJ populations, in accordance with Part II of the MEPA EJ Public Involvement Protocol. In particular:

1. If advance notification was provided under Part II.A., attach a copy of the Environmental Justice Screening Form and provide list of CBOs/tribes contacted (with dates). Copies of email correspondence can be attached in lieu of a separate list.

   Not applicable – there are no EJ communities within 1 mile of the project site.

2. State how CBOs and tribes were informed of ways to request a community meeting, and if any meeting was requested. If public meetings were held, describe any issues of concern that were raised at such meetings, and any steps taken (including modifications to the project design) to address such concerns.

   Not applicable – there are no EJ communities within 1 mile of the project site.

3. If the project is exempt from Part II of the protocol, please specify.

   There are no EJ Populations within 1 mile of the project site, so this project is exempt from Part II of the protocol.

B. Provide below (or attach) a distribution list (if different from the list in Section III.A. above) of CBOs and tribes, or other individuals or entities the Proponent intends to maintain for the notice of the MEPA Site Visit and circulation of other materials and notices during the course of MEPA review.

An EJ reference list was not requested due to the project location not being located within 1 mile of any EJ community; therefore, no additional CBOs or tribes were identified. However, the ENF will be distributed to all parties on the ENF Distribution list included in Appendix G.

C. Describe (or submit as a separate document) the Proponent's plan to maintain the same level of community engagement throughout the MEPA review process, as conducted prior to filing.

There are no EJ Populations within 1 mile of the project site, so this project is exempt from Part III of the protocol.

CERTIFICATIONS:

1. The Public Notice of Environmental Review has been/will be published in the following newspapers in accordance with 301 CMR 11.15(1):

   (Name) The Stow Independent (Date) April 3, 2024

2. This form has been circulated to Agencies and Persons in accordance with 301 CMR 11.16(2).

Signatures:

03/28/2024	3/28/2024
Date Signature of Responsible Officer or Proponent	Date Signature of person preparing ENF (if different from above)
Denise M. Dembkoski	Hailey Page
Name (print or type)	Name (print or type)
Town of Stow	Weston & Sampson Engineers
Firm/Agency	Firm/Agency
380 Great Road	55 Walkers Brook Dr Suite 100
Street	Street
Stow/MA/01775	Reading/MA/01867
Municipality/State/Zip	Municipality/State/Zip
978-897-2927	978-532-1900
Phone	Phone

Appendix A

Project Description

TABLE OF CONTENTS

Page

1.0 BACKGROUND AND PURPOSE

The proposed project, hereinafter referred to as "the project," includes the construction of necessary repairs and improvements to Lake Boon Dam. The scope of the repairs and improvements will constitute an extensive rehabilitation of the dam and will address structural deficiencies which have been recognized as posing a significant risk to downstream public safety. The Massachusetts Department of Conservation and Recreation (DCR) issued a Certificate of Non-Compliance and Dam Safety Order (CONC-DSO) on April 18, 2017 (Appendix J), notifying the Town of Stow of the dam's failure to comply with the Massachusetts Dam Safety Regulations, 302 CMR 10.00, and ordering the Town of Stow to take appropriate action, including adequately repairing, breaching, or removing the dam.

Lake Boon Dam ("the dam") is a vestige of a past industry but one that remained to become an important part of today's surrounding communities. The dam was constructed over 100 years ago to raise the level of a natural glacial kettle[1] pond, referred to then as Boon's Pond, for the benefit of downstream mills on the Assabet River. This action enlarged the original pond (located entirely within Stow) into the present-day lake by flooding a series of interconnected wetland, swamp, and meadow areas located partially in the adjacent town of Hudson. When the lake's use as a low-flow augmentation reservoir was abandoned towards the end of the 1800s, the dam was left in-place and the lake remained in its enlarged state. The stable water level provided by the remaining (but no longer operated) dam encouraged subsequent development that ultimately led to the formation of a permanent residential community on and about the lake's shoreline. Today, the lake and dam provide important functions to the local Stow and Hudson communities. These functions include residential well-water supply, emergency preparedness, and opportunities for recreation.

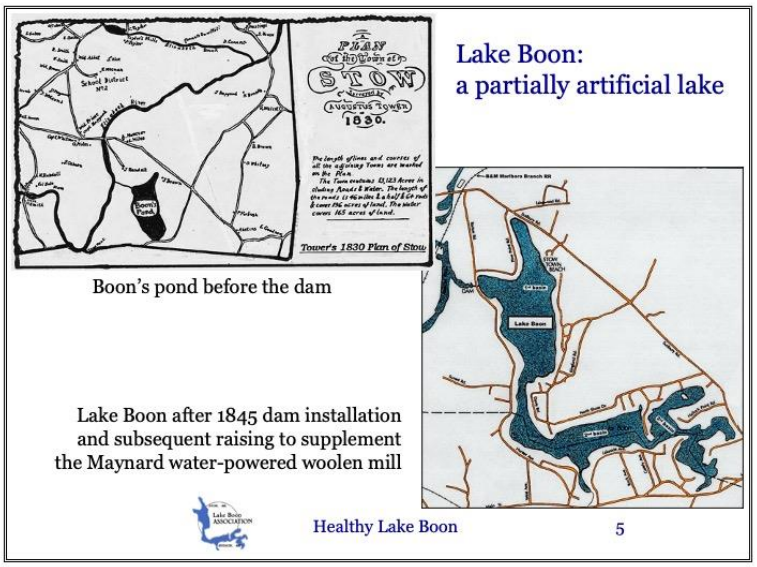


Figure 1: Illustrations of Boon's Pond / Lake Boon before (left) and after (right) construction of the dam (credit: Lake Boon Association and HealthyLakeBoon.org)

Pursuant to Massachusetts General Law (M.G.L.) c. 253, Sections 44-48, the ownership, operation, maintenance, and performance of Lake Boon Dam is subject to the Massachusetts Dam Safety Regulations, 302 CMR 10.00, as administered by DCR and enforced by the Office of Dam Safety (ODS). The dam is classified and catalogued by DCR-ODS, per the Massachusetts Dam Safety Regulations, as "Large" in size based on water storage capacity and "Significant" in hazard potential based on the

[1] Kettles are glacial landforms resembling large circular depressions in the surrounding terrain that are the result of blocks of glacial ice calving from a receding glacier. Kettles that descend below the local groundwater table often result in kettle ponds.

potential consequences associated its failure[1]. Over time, structural deficiencies of the dam have developed and currently consist of uncontrolled seepage, slope instability, spillway deterioration, inadequate spillway capacity, and excessive woody vegetation in critical areas that threaten the dam's structural integrity and overall safety.

Lake Boon Dam has been and currently remains in poor condition, meaning that it is recognized by the ODS as being "structurally deficient" and posing unacceptable risks to downstream areas. Concern over the dam's condition and safety status began in 2012. Inspections of the dam performed between 2012 and 2023, inclusive, have indicated the presence, persistence, and (in some cases) evolution of significant structural deficiencies. Similarly, technical investigations into the hydrologic and geotechnical safety of the dam have provided additional insight in the dam's original construction that are not readily apparent based on visual inspection alone.

In the Summer of 2021, one of the dam deficiencies evolved following an extended period of precipitation and resulted in an emergency response. The safety incident was initially recognized by a local resident who observed a sinkhole forming on the downstream side of the dam next to the spillway. Stow town officials, engineers and on-call contractors subsequently responded to evaluate and stabilize the sinkhole along with the assistance of members of the Lake Boon Association whose ongoing watershed modeling and monitoring efforts helped inform key decisions, including sizing of bypass pumps. It was ultimately determined that a hole had developed in the bottom of the culvert which allowed water flowing through the culvert to erode the embankment from the inside out, leading eventually to collapse of an unstable 'roof' that was being provided by a layer of grouted surface riprap. The necessary actions that were taken to stabilize the area were authorized under an emergency Order of Conditions issued by the Town of Stow Conservation Commission and accepted by the ODS as a temporary stabilization measure.

Figure 2: Photograph of sinkhole showing collapsed layer of grouted riprap and guardrail post falling into hole.

Like many inland waters, Lake Boon is susceptible to the effects of climate change. For the dam, the greatest of these concerns is the increased threat of dam overtopping attributed to greater storm intensities. As summarized in the DCR-ODS *Public Safety Notice Regarding Overtopping of Dams*,[2] overtopping of an embankment dam, even for a short period, is a serious concern and can quickly lead to failure of the dam (and uncontrolled release of the stored water) by way of external erosion. Unless a

[1] 302 CMR 10.06 defines dams categorized as having significant hazard potential as "Dams located where failure may cause loss of life and damage to home(s), industrial or commercial facilities, secondary highway(s) or railroad(s) or cause interruption of use or service of relatively important facilities."

[2] DCR-ODS public safety notices can be viewed at: https://www.mass.gov/lists/dcr-office-of-dam-safety-public-safety-notices

dam is intentionally designed and constructed to withstand overtopping, the combined outflow capacity of its spillway(s) and other outlets must be sufficient to keep the dam from overtopping. For dams subject to the Massachusetts Dam Safety Regulations, the adequacy of the spillways / outlets to accomplish this is based on a prescribed design flood that considers the size and hazard potential of the dam and whether or not the dam is new or existing. For Lake Boon Dam, the prescribed design flood is the 500-year event, or in other words, the inflow resulting from a simulated precipitation event with an annual exceedance probability of 0.2 percent (1 in 500 chance). A hydrologic and hydraulic study performed by Weston & Sampson in 2018 concluded that the spillway at Lake Boon Dam, which is the only designed outlet for the lake, does not have the capacity necessary to safely accommodate a "baseline climate" 500-year storm. Under projected climate conditions typically used for resilient infrastructure design, it can be reasonably assumed that the probability and magnitude of the risks associated with inadequate spillway capacity would be further increased for Lake Boon Dam.

Weston & Sampson was retained by the Town of Stow to develop and evaluate engineering design alternatives to mitigate the deficiencies identified at Lake Boon Dam. The alternatives development and evaluation process, as presented in Appendix C of this ENF submission, informed the selection of the proposed project scope. The formulation process of alternatives for the project necessarily required the consideration of various competing interests, including public safety, environmental protection of wetlands and waterways, economic efficiency, constructability, and historical resource preservation. Ultimately, the selected alternative (i.e., the proposed project) was determined to be the most balanced approach to satisfactorily address the identified safety deficiencies while minimizing environmental impacts to the maximum extent practicable. The following sections of this project narrative provide relevant descriptions of existing site conditions and details pertaining to the proposed scope of work as are relevant to an ENF submission.

2.0 SITE DESCRIPTION

Lake Boon Dam ("the dam") and Lake Boon ("the lake") are located in Middlesex County, Massachusetts near the municipal boundary dividing the towns of Stow and Hudson, and approximately 11 miles southeast of where the Assabet and Sudbury Rivers combine to form the Concord River. The dam is located entirely within the town of Stow and impounds the lake at its most westerly point along Barton Road. The northeasterly flowing Assabet River receives the lake's outflow from the dam through a relatively short, artificially widened, marshy perennial stream channel referred to as Bailey's Brook (or Bailey Brook).

Directional orientation terms referenced below and throughout this Project Description are used to aid in describing the site and providing relative positions of site features for context. The terms *downstream* and *upstream* apply to the opposing directions aligned generally perpendicular to the longitudinal axis of the dam, with upstream being in the direction of lake and downstream being in the direction opposite the lake. The terms *right* and *left* apply to the opposing directions along the longitudinal axis of the dam, as viewed facing downstream. Based on the orientation of the dam, upstream and downstream are generally due east and west, respectively. Right and left are generally due north and south, respectively.

2.1 Lake Boon

Lake Boon is an artificially enlarged inland waterbody and listed as a Massachusetts Great Pond[1]. As indicated above, the lake straddles the boundary between the towns of Stow and Hudson. Available historic literature indicates that the original body of water (referred to as Boon's Pond) formed naturally in a glacial depression (kettle). According to historic maps and photographs compiled by Lewis Halprin and Alan Kattelle as presented in their 1998 publication "Images of America, Lake Boon," the lake was enlarged initially around 1845 and again around 1870. Enlargement of the lake occurred by damming of the low valley through which the lake's natural outflow was channeled as a stream (Bailey's Brook), which drained westward to the Assabet River. Prior to its enlargement, the lake (Boon's Pond) existed as a single, oval-shaped basin covering approximately 70 acres.

Available historic records indicate that the lake was dammed and enlarged to provide a greater source of water that could be used to augment the flow of the Assabet River, which provided water-driven power for downstream mills in the adjacent town of Maynard. After the downstream mills converted to alternate power sources, the dam was left in place and the lake remained in its enlarged state where it supported a developing seasonal recreation area and the subsequent establishment of a year-round residential community on its banks and adjacent uplands.

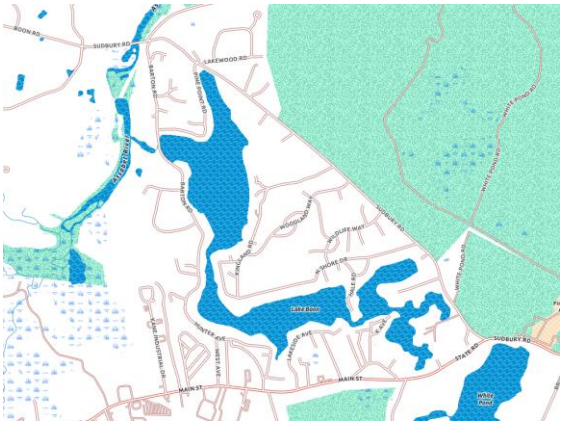


Figure 3: Map of present-day Lake Boon and surrounding area

In its current state, Lake Boon has an "L" shaped surface area of approximately 160 to 180 acres and is comprised

[1] Lake Boon is identified in the current "Massachusetts Great Ponds List" document available at www.mass.gov. 310 CMR 9.02 defines a great pond as "any pond which contained more than ten acres in its natural state, as calculated based on the surface area of lands lying below the natural high water mark."

of a series of four open-water basins connected by shallower and relatively narrow channels. Numerous properties with year-round private residences are present around the lake and utilize the lake for shallow well water supply and water-based recreational activities including swimming, boating, and fishing. Public access to the lake provided in at least three areas, including at two boat launches and a public town beach. Roadways supporting these waterfront residential properties include Barton Road, Pine Point Road, Hunter Avenue, Lakeside Avenue, North Shore Drive, Davis Road, and Kingland Road, as well as some others.

The bathymetric profile of Lake Boon (i.e., measures of water depth) was studied and mapped by the Massachusetts Division of Fisheries and Wildlife (MA DFW) in 2015 using GPS depth sounders deployed from watercraft. Based on approximately 9,680 soundings, MA DFW determined that Lake Boon has an average (mean) depth of 11 feet and a maximum depth of 23 feet. The northernmost basin, referred to as the first basin, is the location of the original Boon's Pond and is thus the deepest and largest of the three basins. The maximum depth point of 22 to 23 feet was measured near the east side of the first basin. The second, third, and fourth basins have maximum measured depths of approximately 10 feet and 7 feet, and 4 feet respectively. Prior to construction of the dam and enlargement of Boon's Pond, the second, third, and fourth basins existed as part of the Ramshorn Brook, Meadow, and Swamp complex. Construction of Lake Boon Dam provided the ability to impound underground spring and surface water inflows received naturally by the first basin to higher elevations that resulted in the creation / flooding of the second, third, and fourth basins.

2.2 Lake Boon Dam

Lake Boon Dam is located within the town on Stow, approximately 0.5 miles north of the Stow-Hudson boundary and approximately 600 feet east of the Assabet River. Geographic coordinates of the dam's approximate midpoint are 42.40555 degrees north latitude, 71.50655 degrees west longitude. The dam outlets at an integrated spillway to Bailey's Brook, which empties into the Assabet River. The dam carries a two-lane paved public way (Barton Road) on its crest across the full length of the dam, which is approximately 540 feet. The maximum height (structural height) of the dam is approximately 12 feet and provides a maximum lake volume of approximately 1,631 acre-feet (457 million gallons). The height of the dam gradually increases along its length with the maximum (tallest) section being at or in the immediate vicinity of the existing spillway. As indicated above, the dam is subject to the Massachusetts Dam Safety Regulations, 310 CMR 10.00, and is classified per those regulations as an intermediate-size, significant hazard potential structure.

Figure 4: Aerial photograph of Lake Boon Dam (MassGIS, 2019 Imagery).

Lake Boon Dam is of earthen construction and comprised predominantly of locally available, sandy fill material placed as an embankment across a low valley and stream (Bailey's Brook), which once joined the outflow from the original Boon's Pond to the Assabet River. Historic records and research into the dam's construction indicate that the dam was placed sometime around the year 1845 and

then raised or reconstructed some 25 years later to further increase the lake's surface elevation and storage volume. The dam itself predates modern geotechnical engineering and design criteria. Historic photographs included in Lewis Halprin and Alan Kattelle's "Images of America, Lake Boon" show the dam in the late 1800s with an unpaved, heavily rutted crest and a significant covering of mature tree growth on its sideslopes.

As indicated above, the crest of the present-day dam embankment is an approximately 16-foot-wide paved roadway. This roadway (Barton Road) provides a transportation link connecting Stow to the bordering town of Hudson and provides residential roadway access to the Lake Boon community. The upstream and downstream faces of the dam (east and west facing, respectively) are earthen slopes formed at variable inclinations, ranging generally from 1:1 (steepest) to 2:1 (flattest). The upstream slope is generally flatter than the downstream slope, and the slope face is protected with a layer of angular stone riprap that covers a 30-mil geomembrane liner. The geomembrane liner, which is submerged beneath the lake surface, was installed during repairs made to the dam in 1999/2000 as an impervious barrier and mitigation measure to block the flow of water seeping from the lake through the pervious embankment. The downstream slope is vegetated and includes a narrow stone-lined drainage swale at the toe, though the swale is mostly concealed by dense vegetation.

Figure 5: Photograph (March 2021) of dam embankment downstream slope and discharging spillway.

Incorporated into the earthen dam embankment near its midpoint is a culvert-style spillway constructed predominantly of concrete. The spillway feature is an assembly of three adjoined components that serve to protect the dam and surrounding areas by safely conveying excess lake inflows downstream to Bailey's Brook. These three components include the control section, conveyance section, and an extension of the conveyance section. The control section is a three-sided concrete inlet located within the upstream embankment slope. The structure contains wood stoplogs (stacked boards placed horizontally across the inlet opening) that provide lake level control and a metal debris rack for blocking the entry of large objects. The inlet contains 12 to 14 inches of removable stoplogs above additional stoplogs that were grouted in place an unknown number of years ago. The central conveyance section consists of a 5-foot-wide, four-sided concrete culvert located within the embankment beneath the roadway. The culvert receives flow passing over/through the control section. Attached to the main body of the culvert is an extension constructed as a "U" shaped concrete channel with a separate, unattached roof slab. Within this extension is a 5-foot diameter corrugated metal pipe (CMP) that receives flow from the main body of the culvert. The CMP daylights through the embankment approximately half way up the downstream slope. Flow through the corrugated metal pipe is then discharged onto a plastic chute resting on the downstream embankment slope. The plastic chute was added as a retrofit to convey outflows over the

lower part of the embankment slope and dissipate energy after it was discovered that the slope had experienced significant toe erosion.

Flows passed through the spillway collect initially in a shallow tailwater basin at the toe of the dam before navigating further downstream to the wider and more pronounced reach of Bailey's Brook. The tailwater basin is a roughly 100-foot-wide by 35-foot-long oval-shaped area that has formed between the toe of the dam and a smaller 3 to 4-foot-tall downstream embankment. The downstream embankment is separated into two sections at a narrow breachway that is approximately 15-feet-wide from bank to bank. It is understood that this downstream embankment is likely the remnants of the original dam constructed in 1845. The sideslopes of the two embankment sections remain armored with stone in some areas beneath a dense cover of brush.

Figure 6: West facing view of Lake Boon Dam, Bailey's Brook, and confluence with Assabet River (EagleView, 2019). The remnant downstream embankments sections separated by the narrow breachway are indicated by arrows.

2.2.1 Properties

The footprint of Lake Boon Dam is mostly contained on a municipal parcel (0 Barton Road, Parcel ID: 000U-1 000051) and a public way (Barton Road), both of which were identified by property survey as belonging to the Town of Stow. The dam's downstream embankment slope at its southerly limit extends onto the privately owned property identified as 137 Barton Road (Parcel ID: 00R-25 000017). The privately owned property identified as 105 Barton Road (Parcel ID: 000U-2 000062) provides the abutment for the southerly end of the dam embankment. Flowage rights for Lake Boon are shared between the towns of Stow and Hudson.

2.2.2 Lake Boon Dam Deficiencies

As indicated previously, Lake Boon Dam is considered to be structurally deficient and in overall poor condition. Deficiencies identified at the dam between August 7, 2012 and November 16, 2017, as indicated by the inspection reports that prompted issues of the CONC-DSO, can be summarized as follows (in no particular order):

- Significant seepage emerging to the surface along and below the downstream embankment slope, as well from beneath the spillway culvert in the outfall area.
- Erosion of the embankment toe due to the location of the spillway outfall, which has led to the use of an informal plastic slide as a flow deflector.
- General deterioration of the spillway structure and outlet area, including corrosion of the horizontal bar (debris) rack at the inlet, deterioration of the northerly concrete abutment, an open joint separating the top from the sides at the end of the culvert section, and inadequate riprap at the toe of the embankment in the outfall area and beneath the flow deflector.
- Corrosion of the corrugated metal pipe extension insert at the downstream end of the spillway culvert and improper fitment / connection of the pipe to the rectangular box section.
- Significant tree and heavy brush growth on and within 20 feet of the dam in some areas, including the left and right ends of the embankment and along the toe of the embankment on the downstream side.
- Cracking of the grouted stone riprap next to the spillway culvert on the downstream side of the dam, suggesting movement of possible undermining, as well as evidence of settling / movement along the alignment of the spillway culvert.
- Inadequate riprap coverage and exposed bedding in some areas along the upstream slope.
- Areas of surface erosion or slope sloughing on the downstream slope of the dam embankment.

Following the inspection conducted on November 16, 2017, the Town of Stow engaged Weston & Sampson to continue performing routine follow-up inspections as a means to monitor the condition of the dam. These inspections have been performed at approximately 6-month intervals since 2018. The following is a summary list of additional deficiencies and changes identified during the inspections.

- Evidence of ongoing settlement and deformation of the embankment as indicated by the formation of arcuate cracks in the crest / roadway pavement and apparent sagging of the crest shoulder along the downstream edge.
- Component failure of the spillway culvert at its connection to the corrugated metal pipe extension, which allowed water flowing through the culvert to escape into the backfill (embankment) and erode the embankment soil from the inside out. This mechanism led eventually to the partial collapse of the overlying slope face into the sinkhole that formed as a result. Emergency action was taken in response to this August 2021 incident to provide a temporary stabilization with the understanding the spillway would be replaced as part of the proposed project.
- Overturning and uprooting of mature coniferous trees along and below and downstream limits of the dam in areas that remain consistently saturated from excessive seepage passing beneath the dam embankment. Pullout of large lateral root masses has caused considerable ground disturbance and further exposed saturated, sensitive soils.

- In the area downstream from the dam, an intermittent stream flowing north to Bailey's Brook has diverted itself around a fallen tree and begun to contact and erode the toe of the dam embankment.

Lake Boon Dam pre-dates the current understanding of potential failure modes for embankment dams, and relatively modern construction practices that facilitated improvements in earthwork construction and soil compaction. In addition to the foregoing deficiencies identified principally by visual inspection, the following concerns pertaining to the dam's original design and construction are also recognized.

- The capacity of the dam to safely pass the minimum required design flood inflow is insufficient.
- The spillway assembly is improperly constructed and configured.
- The dam is comprised of generally homogenous, locally available sandy fill, and does not contain a central core zone comprised of a comparatively impervious material such as clay, silt, or concrete. The membrane placed on upstream slope of the dam in 1999/2000 may provide a marginal level of seepage control benefit in the upper few of the embankment but has a limited ability to reduce long-term overall seepage.
- The dam is founded on highly pervious geologic conditions (glacial outwash plain) without an appropriate seepage barrier or control system to limit the flow of surface water seepage and groundwater under the dam.
- The dam is seismically unstable. Strong, widespread ground shaking such as that which would be expected during a significant earthquake could trigger a liquefaction response during which loose, saturated zones of soil within and potentially below the embankment experience a relatively sudden loss of strength.
- Post-construction modifications have eliminated the ability to release water impounded below a depth of approximately 12 to 14 inches from the lake's normal full operating level. These modifications resulted in the grouting or cementing of the original lower stoplogs (boards) at the spillway inlet.
- Historic photographs of the dam show that the dam embankment sideslopes were once almost entirely covered in trees. When tree growth to this extent has occurred, it can be reasonably assumed that root penetrations into the dam may have caused considerable subsurface disturbance, and that it would be a significant undertaking to remove the roots. It is therefore expected that relic root structures remain in the dam and may continue to decay over time, which could provide preferential seepage pathways.

2.3 Wetland Resources

Wetland resource areas, including two bordering vegetated wetlands, land under waterbodies and waterways (perennial stream, lake, and intermittent stream), and inland bank have been identified at the site as described in the Wetland Delineation Report for the project (Appendix F). The bordering vegetated wetlands identified at the site are generally associated with Bailey's Brook, although areas of bordering vegetated wetland closest to downstream toe of the dam embankment and established higher up on the dam embankment sideslope can be at least partially attributed to excessive seepage under and through the dam, respectively.

Bordering Land Subject to Flooding (BLSF) is also present at the site throughout the downstream area along Bailey's Brook. The boundary of BLSF is referenced to the 181.3 (NAVD 88) surveyed ground

surface elevation contour based on 310 CMR 10.57 and FEMA flood profile data contained in Flood Insurance Study (FIS) No. 25017CV001C.

2.4 Historic Resources

Review of the Massachusetts Cultural Resource Information System (MACRIS) shows that the project area contains several inventoried historic resources, including Lake Boon Dam itself, an adjacent historic stone wall, and several historic residential properties. Lake Boon Dam is located within the Lake Boon Historic District (STW.G). Please refer to Appendix D, Figure 4 for a Massachusetts Historic Resources Map.

As Lake Boon Dam is proposed to be altered to be brought into compliance with the DCR ODS requirements, there will be an impact to this historic resource. Upon completion of construction the dam structure will be slightly enlarged however, overall appearance of Lake Boon Dam will not appreciably change as a result of the proposed project, and the overall safety and condition of the structure will be greatly enhanced. The project design team has taken steps to preserve the overall aesthetic of the dam such as specifying steel-backed timber guardrails as opposed to steel-only guardrails. The design team has received feedback from the Lake Boon community regarding preservation of the dam's appearance and has incorporated this feedback into the proposed work.

Additionally, a portion of the 105 Barton Road property will be used for staging during construction of the project. However, the project will not result in the demolition of the historic structure (house) on the property.

Within the northern portion of the limits of work a historic stone wall has been identified (STW.912). This wall is located along the property of 81 Barton Road (STW.184) (house). Although a portion of the stone wall is within the limit of work boundary, the project does not propose demolition of the wall or alteration of its appearance. The house at 81 Barton Road is not within the proposed limit of work. The applicant will consult with MHC during the permitting process to limit impacts to historic resources to the maximum extent practicable.

2.5 Site Geology

Available geologic reconnaissance reports including "Geology and Mineral Resources of the Hudson and Maynard Quadrangles Massachusetts" by Wallace R. Hansen and geologic maps published by the United States Geological Survey (USGS) indicate that the terrain and surficial geologic deposits at the project site and in the surrounding area is of glacial origin. The dominant surficial deposits underlying the general is characterized as a glacial outwash plain comprised predominantly of highly pervious sand deposits. Other glacially-derived deposits and landforms in the project area include kame plains and drumlins. Post-glacial alluvial deposits associated with Bailey's Brook and the Assabet River are expected to overly the glacial soils in the low-lying areas downstream from the dam. As indicated previously, Lake Boon's first basin is contained partially within a glacial kettle.

The results of several rounds of exploratory borings completed at the site, including those performed for the repairs done in 1999/2000, agree with the regional geologic mapping and geologic site characterization described above. Geotechnical investigation borings were performed most recently in 2023. The borings, identified as WSE-101 through WSE-105, were performed through the top of the dam embankment along the upstream edge of the roadway. The borings were advanced through the existing embankment fill material and extended to depths of up to 50 feet into the underlying glacial outwash

deposit. Four of the five borings penetrated the glacial outwash stratum and extended into a dense glacial till layer.

Sieve analysis testing performed on select samples recovered from the borings indicate that the existing dam embankment is comprised of mostly sand with potentially up 15 percent of particles (by weight) being finer than the U.S. Standard No. 200 mesh sieve. Sieve analysis testing performed on a sample of the glacial outwash layer beneath the dam embankment indicate that the glacial outwash also contains a relatively low percentage of particles finer than the No. 200 sieve, which is a typical characteristics of this type of deposit.

2.6 Watershed Drainage Area

The watershed area that contributes inflow and runoff to Lake Boon is approximately 1.62 square miles and includes land in both Stow and Hudson (primarily south and east of the lake). Of this area, Lake Boon normally occupies between 160 to 170 acres. The watershed is dominated by forest with dense residential development on and around the lake shore. Areas of commercial and/or industrial use are also present and occupy a small percentage of the drainage area.

The watershed can be readily broken into various sub-basins based on hydrology. Terrain within most of the watershed is mildly sloped and generally not more than 50 to 60 feet higher than the lake surface. There are four notable hills at the periphery of the watershed that are up to 100 feet higher than the lake surface. Uplands with peak elevations approximately 170 higher than the lake surface exist at the southern limit of the watershed.

The spillway at Lake Boon Dam provides the only outlet for the lake. From its origin at the base of the dam, Bailey's Brook flows west for a distance of approximately 650 feet to its confluence with the Assabet River. Bailey's Brook flows at a very low gradient and is prone to backwatering. The average bank-full width of Bailey's Brook along its relatively short path to the Assabet River is approximately 200 feet.

2.7 Dam and Lake Operations

Lake Boon Dam is operated to maintain the lake level at elevations that support various interests including well water supply, ecological health, and recreation, and to provide temporary flood storage allocations in Lake Boon ahead of precipitation / runoff events. Normal lake operations are coordinated with application environmental agencies including the Stow Conservation Commission, Hudson Conservation Commissions, and the Massachusetts Department of Environmental Protection.

A seasonal (annual) drawdown is authorized for Lake Boon, subject to special conditions imposed under the Massachusetts Wetlands Protection Act. The annual drawdown is a method employed to combat invasive aquatic vegetation, reduce ice damage to docks, and provide dock owners with an opportunity to perform maintenance of docks and shorelines. The annual drawdown typically begins between October 15 and October 31, based on lake level and weather conditions. The drawdown is performed with sequential removal of the stoplogs at the spillway inlet and is typically reached by December 1. Refill of the lake to the normal full pool is typically completed by April 1. The target lake level for the annual drawdown (approximately El. 185.0) is 12 to 14 inches below the normal full pool and represents the maximum drawdown achievable without the use of alternate methods.

Under normal operating conditions, and when the annual drawdown is not in effect, the Town of Stow maintains the water surface level in Lake Boon at approximately El. 186.0 to 186.2. This normal full pool elevation is regulated with the use of stoplogs.

Lake Boon is unique in that its water quality has been the subject of several reports and studies, including an ongoing citizen-science initiative funded by the Massachusetts Municipal Vulnerability Preparedness (MVP) grant program. This initiative is fully aimed at preserving the lake as an important resource and taking action based on informed decisions supported by scientific data collected by volunteer citizen scientists and analyzed by a team of professionals. The ongoing Healthy Lake Boon Project has led to a better understanding of the lake's underlying hydrology and therefore the response of the lake to extreme weather events.

3.0 PROPOSED SCOPE OF WORK

As indicated previously, Lake Boon Dam is considered to be structurally deficient and in overall poor condition. Among the various deficiencies identified at the dam, those most significant include uncontrolled seepage through the thick and highly pervious soils upon which the dam was constructed, spillway capacity inadequacies, significant deterioration of the spillway culvert, and an unstable downstream embankment face exacerbated by seepage.

The proposed project will mitigate these concerns, as well as the other identified deficiencies summarized in Section 2.2.2, through the completion of a comprehensive rehabilitation intended to both address existing deficiencies and upgrade the overall design of the dam. The major constituents of the proposed construction scope are summarized in Sections 3.1 through 3.4. Discussion of construction sequencing and other considerations are included in Section 3.5.

3.1 Internal Sheet Piling (Cutoff Wall)

The project includes the installation of a continuous permanent sheet pile 'cutoff wall' that will reduce the flow of seepage occurring below the dam and facilitate the remainder of the proposed construction without necessitating a large-scale lake level drawdown.

3.2 Spillway / Outlet Replacement

The project will decommission and remove the existing spillway and construct a new spillway with greater capacity for large magnitude storm events and improved operational flexibility and safety. The outlet control structure for the new spillway is proposed to include multiple overflow outlets and an additional bottom (low-level) outlet should the need arise to quickly release water from below the lowest of the overflow outlets. The conveyance conduit through the embankment for the new spillway will be a cast-in-place concrete culvert or a prefabricated large-diameter pipe supported on a cast-in-place concrete cradle. At the end of the spillway, a concrete headwall is proposed to shield the embankment toe from constant backwater and to retain the embankment slope above Bailey's Brook.

3.3 Embankment Stability and Seepage Control Improvements

The project will provide stability and seepage control improvements to the downstream slope of the embankment. The alignment of the sheet piling described above will facilitate a modest realignment of the dam crest and therefore an opportunity to flatten the existing (overly steep) downstream embankment slope to 3:1 (horizontal to vertical). Specified layers of imported sand and fine gravel will be placed below the face of the downstream slope as filter zones for residual seepage that passes through and/or beneath the sheet piles. These filter zones will permit the passage of residual seepage flows to downstream areas while reducing the potential migration of dam embankment soils associated with uncontrolled seepage. The finished slope surface will be furnished with a natural grass cover resembling the appearance of the existing slope. As part of the slope improvements, an approximately 12-foot-wide area extending downstream from the toe of the dam will be cleared and stabilized to comply generally with Office of Dam Safety's policy regarding trees (and other woody growth) established on and in the vicinity of dams and to stabilize this particular area, which is critical to the satisfactory performance and maintenance of the dam.

3.4 Embankment Crest / Roadway Improvements

The project will reconstruct and realign Barton Road within the project limits. The surface of Barton Road (i.e., the crest of the dam) will be established at a consistent elevation generally matching the average existing elevation. The shift in the alignment of the crest / roadway will be greatest near the location of the existing spillway and will follow alongside the installed sheet piling such that the exposed few feet of the sheet piling will serve as a low retaining wall for the crest of the embankment. The reconstruction section of roadway at the dam will be completed with steel-backed timber guardrails to generally match the appearance of the existing timber guardrails, but with added safety.

The overall appearance and footprint area of Lake Boon Dam will not appreciably change as a result of the proposed project, but the overall safety and condition of the structure will be greatly enhanced.

3.5 Construction Considerations

3.5.1 Construction Site Erosion and Sediment Controls

Excavation and preparation of the site for construction will expose erodible subsoils following removal of existing groundcover including asphalt pavement and established vegetation, both of which provide protection against soil erosion. Erosion and sedimentation control measures will be utilized, maintained, and inspected during construction to minimize the unwanted movement of soil particles from surface water runoff, wind, and other causes, and to prevent suspended sediment from leaving the work site. The construction contractor will be made responsible for coordinating the timing of earth-disturbing activities and the installation of erosion and sediment controls to reduce the site's erosion and sediment transport potential.

Construction site erosion and sediment controls specified for the project will include, at a minimum, compost filter tubes on the downgradient (westerly) side of work area, a silt curtain in the lake, and dewatering sediment collection and filtration devices, as needed. Erosion and sediment controls of the like will also be required at material stockpile locations and in any other areas where additional controls may be necessary. Construction vehicles entering or exiting the site from unpaved surfaces will be required to utilize a stabilized construction trafficking pad (also referred to as an anti-tracking pad or tracking control mat) to remove sediment from tires that could otherwise be tracked into areas outside of the work site. Additional erosion and sediment control practices that may be employed by the construction contractor, as necessary, include temporary diversions and level spreaders to direct runoff and reduce flow velocity, temporary grading of slopes, and dust control. Specifications for the project will further require that temporary or permanent stabilization measures be applied to any disturbed areas where work has been completed. Dust generation is not expected to be a significant issue given the relatively small area of exposure; however, should excessive dust be generated, it will be control by sprinkling with water.

3.5.2 Lake Level and Outflow Control During Construction

Dams are typically provided with low-level outlets for various purposes, one of which is so that future repair or remediation work may be conducted while the reservoir is either drained or significantly drawn down. Since a large-scale drawdown of Lake Boon would impact numerous shallow residential wells around the lake perimeter, and because Lake Boon Dam is not equipped with a low-level outlet, a substantial lowering of the lake level for the proposed project is not a practicable option. Project construction is proposed to occur while the lake level (water surface elevation) is kept within its normal operating range. As indicated previously, one of the primary reasons for proposing a permanent sheet

piling system is to facilitate the remainder of the proposed construction scope (e.g., spillway replacement and downstream slope improvements) without necessitating a large-scale drawdown of the lake, which would otherwise require the use and staging of large diesel-powered pumps and connecting bypass pipes. It would further be expected that such equipment would need to operate continuously, result in significant cumulative exhaust emissions and long-duration noise exposure.

To accomplish the proposed work safely and while limiting the use of continuously operating pumps, the proposed design utilizes an approach that will allow the existing spillway to remain operational with limited modifications until the new spillway is ready to be commissioned. As discussed further in Section 3.5.3 below, the continuous permanent sheet piling barrier installed at the beginning of construction will pass upstream of the existing spillway and will be configured vertically such that the normal flow of water into the spillway will not be obstructed at this location. Outflows from the lake may then pass through the spillway culvert as they currently do. Additional sheet pilings will also be installed in the lake at the location of the control structure for the new spillway. These additional sheet piles will provide an enclosed, rectangular cofferdam that can be dewatered to facilitate casting of the control structure in-place.

For construction activity to take place on the downstream side of the dam, a separate "tailwater" cofferdam will be required to facilitate temporary dewatering of that portion of Bailey's Brook that is within the work limits. The location of tailwater cofferdam was selected based primarily on existing site conditions, which indicate the presence of a former (breached) embankment dam which is understood to be remnants of the original dam constructed at the site in the 1800s. Because of the relatively shallow depth of Bailey's Brook combined with the narrow width of the existing breachway and the potential need to periodically remove and replace the cofferdam during the course of the project, it is expected that the cofferdam in this area will be constructed using 3-foot by 3-foot (27 cubic yard) industrial grade bulk sand bags complete with hoisting loops. When installed, the cofferdam will plug the breachway located between the two remnant embankment sections and will provide an area at the toe of the dam that can be sufficiently dewatered and remain reasonably protected from the persistent backwaters in Bailey's Brook. It is noted that placement of the cofferdam will need to be coordinated with flows being maintained through the existing spillway. The construction contractor will be required to design and construct a temporary extension of the existing spillway culvert or develop an alternate temporary diversion scheme to carry lake outflows into Bailey's Brook on the opposite side of the cofferdam when necessary to keep the downstream work area dry.

3.5.3 Probable Construction Sequencing

Sequencing of the major aspects of the proposed construction will be necessary for reasons indicated previously. Following initial site setup and placement of erosion and sediment controls, project construction will need to begin with the installation of the permanent sheet pile cutoff wall. The presence of the longitudinal cutoff wall along the upstream side of the dam is required to provide stability during construction. Either during or immediately after the cutoff wall is installed, the three-sided sheet pile cofferdam will be installed in the lake at the location of the proposed new spillway intake structure. The permanent cutoff wall will have provided the fourth side to the three-sided cofferdam, creating an enclosed area that can be dewatered as indicated above.

During the installation of the permanent cutoff wall and temporary cofferdam enclosure, additional piezometers are planned be installed through the downstream embankment. These additional instruments will be used during a monitoring period by engineering and construction personnel to

assess the performance of the cutoff wall with respect to lowering groundwater (seepage) levels, and to determine when future dependent excavation work may proceed. A piezometer is also planned to be installed at this time within the enclosed sheet pile cofferdam. It is anticipated that the duration of the monitoring period will be at least 4 weeks.

Once installed, the sheet pile cutoff wall will provide a significant reduction in seepage flows beneath and through the existing dam embankment; however, it cannot be expected that positive (complete) cutoff will be attained. Since construction of the new spillway culvert and removal of the existing spillway assembly will require significant excavation into the existing embankment, a supplemental in-situ temporary dewatering system will be installed to provide additional control, as needed, during those phases of the work. The supplemental dewatering system will utilize a series of wellpoints or similar contractor-designed installation.

Following sheet piling and dewatering system installation, work may resume during the monitoring period on aspects of the project that do not involve dredging or open excavation below surface water or groundwater. When the monitoring period has concluded, the construction contractor will proceed with excavation work required to construct the new spillway. Following excavation for the new spillway, which includes the intake structure, culvert section, and downstream headwall, work will proceed with placement of reinforced concrete to construct these components. Outflows from the lake will be maintained through the existing spillway while this work is occurring but will be routed beyond the tailwater cofferdam as indicated previously.

Upon completion of the new spillway, the sheet pile cofferdam enclosing the new intake structure will be flooded and the three temporary sides of the enclosure will be cut to a level sufficiently below the lake surface. Lake outflows will then be diverted to the new spillway and the existing spillway will be taken offline and able to be removed. The excavation resulting from removal of the existing spillway will then be closed with engineered backfill to restore the embankment.

During or after construction of the new spillway, general earthwork on the downstream slope of the dam will begin. At this point during the project, the sequencing of the remaining work will be subject to the contractor's discretion so that unnecessary sequencing requirements do not lengthen the project timeline. Project construction will conclude with surface restoration and permanent stabilization activities including, but not limited to, loaming, seeding, pavement reconstruction, guardrail installation, removal of temporary erosion and sediment controls, and general cleanup of the work site.

3.5.4 Sediment Dredging

Limited dredging of sediment for the proposed rehabilitation construction is necessary in two localized areas. The first area is on the upstream side of the dam below the waters of Lake Boon, and the second area is along the downstream side of the dam below the waters of Bailey's Brook. The required dredging in the lake is proposed to occur within the sheet pile enclosure (cofferdam), which will be dewatered as indicated previously to isolate the construction area from the lake. The required dredging in the brook is associated with construction of the proposed headwall and will also occur within a dewatered coffer-dammed area.

The total dredge volume is estimated to be approximately 240 cubic yards (CY). Approximately 120 CY of the total dredge volume will be generated from the lakeside area. The maximum depth of dredging within this area is estimated to be 11 feet from the top of the sediment surface, with an average depth

of approximately 7 feet. The remaining approximately 120 CY of dredged sediment will be generated from the western excavation area. The maximum depth of dredging within this area is estimated to be approximately 7 feet, with an average depth of approximately 4 feet.

An environmental due-diligence review and proposed sampling and analysis plan for dredging and dredged material disposal activities was submitted to the Massachusetts Department of Environmental Protection (MassDEP), Water Quality Certification (WQC) Program office for its review on March 14, 2024. MassDEP approved the proposed sampling and analysis plan on March 26, 2024 (correspondence with MassDEP is included in Appendix K).

3.5.5 Construction Access, Parking, and On-Site Staging

Access to the work site for construction vehicles is currently planned to be from the north using Barton Road via Sudbury Road in Stow. This route provides the shortest and most direct path of ingress and egress to site that does not utilize private property or the require the construction of temporary access roads through environmental resource areas and wooded uplands. Closure of Barton Road at the work site will be required during significant portions of the work. The logistical aspects of a road closure, such as anticipated detours and provisions for adequate emergency response, will be coordinated with appropriate Town Officials for both Stow and Hudson as project planning and design continues. At the time of this ENF submission, with few exceptions, it not anticipated that large construction vehicles will be allowed to access the work site from the south, via Main Street in Hudson.

An area at the project site located partly on the properties of 105 Barton Road and partly on the property of 137 Barton Road has been allocated for parking and staging of equipment and materials. This proposed staging area is shown on Sheet 4.0 of the project plans included in Appendix N. The area is approximately 3,270 square feet in size and will provide a level platform for equipment and material staging. It is noted that alternate staging areas and site access approaches were explored in detail to potentially reduce the volume of construction traffic on Barton Road over the course of construction. For various reasons, including the unnecessary impacts to environmental resource areas, these alternatives are no longer being considered.

4.0 WETLAND IMPACT SUMMARY

The following wetland resource area impacts (both temporary and permanent) are anticipated as a result of the proposed project. Proposed wetland resource area impacts are quantified in Table 1 below and are discussed in more detail below.

Table 1 – Summary of Wetland Resource Area Impacts

Wetland Resource Area	Temporary Impact	Permanent Impact	Total Impact
Bordering Vegetated Wetland (BVW)	678 SF	9,456 SF	10,134 SF
Bank	134 LF	767 LF	901 LF
Land Under Water (LUW)	22,701 SF	1,776 SF	24,477 SF
Bordering Land Subject to Flooding (BLSF)	0 SF	313 SF	313 SF
BLSF Fill (CY)	N/A	37.6 CY	37.6 CY
Riverfront Area	678 SF	23,469 SF	24,147 SF

4.1 Bordering Vegetated Wetland Impacts

Approximately 10,134 square feet (SF) of impacts are proposed to Bordering Vegetated Wetlands (BVW) to bring the Lake Boon Dam into compliance with ODS safety standards.

Of this, approximately 678 SF of these impacts will be temporary and will occur on the downstream side of the dam. These temporary impacts are associated with installation of erosion and sediment controls and temporary access to the tailwater cofferdam. Following construction, temporarily altered areas will be restored to pre-existing grades and seeded with a native wetland seed mix to restore impacted wetlands to preconstruction conditions.

Of the total 10,134 SF of impacts proposed, 9,456 SF will be permanent impacts occurring on the downstream side of the dam. Of this, 4,954 SF of permanent impacts will result from the regrading of the downstream embankment slope and seepage control improvements on the BVW directly to the downstream toe of dam. Another 4,110 SF of permanent impacts will result from the proposed vegetation clearing (proposed vegetation removals necessary to provide the 12-foot vegetation-free buffer off the dam required by ODS safety standards), soft ground stabilization, and seepage control improvements. Lastly, 392 SF of permanent BVW impacts are proposed from the realignment of the intermittent stream channel.

4.2 Inland Bank Impacts

A total of 901 linear feet (LF) of bank impacts are proposed to Inland Bank to bring the Lake Boon Dam into compliance with ODS safety standards.

Of this, approximately 134 LF of these impacts will be temporary impacts associated with dewatering operations within Bailey's Brook. Upon completion of construction these portions of temporarily impacted bank will be restored to pre-construction conditions.

Approximately 767 LF of these impacts will be permanent. Along Lake Boon's bank (upstream of dam), 490 LF of permanent impacts will result from the installation of the embedded interlocking steel sheet

pile wall. Downstream of the dam, approximately 119 LF of permanent bank impact will occur within the un-named intermittent stream channel due to the realignment of the channel (both banks). Lastly, approximately 158 LF of permanent impacts to the Bank of Bailey's Brook will result from the construction of the new headwall and the regrading to the downstream embankment slope.

4.3 Land Under Water Impacts

A total of approximately 24,477 SF of Land Under Water (LUW) impacts are proposed to bring the Lake Boon Dam into compliance with ODS safety standards.

The majority of these impacts (22,701 SF) will be temporary in nature and will result from proposed dewatering efforts during construction of the project. The majority of these temporary impacts (19,413 SF) to LUW are associated with the upstream portion of the dam, located within Lake Boon. The impacts will result from the dewatering associated with the sheet pile cofferdam enclosure and silt curtain. An additional 3,288 SF of temporary impacts will occur downstream of the dam within Bailey's Brook due to the area of LUW that is dewatered within the tailwater cofferdam. All sediment and erosion controls will be removed post construction and restored to pre-construction conditions.

A total of 1,776 SF of permanent impacts to LUW are proposed. Proposed permanent impacts upstream of the dam (Lake Boon) include 202 SF of impacts to construct the new spillway intake/control structure and 1,143 SF of impacts due to the sheet pile installation and the roadway reconstruction. Approximately 431 SF of permanent impacts are associated with the downstream portion of the dam within Bailey's Brook and the unnamed intermittent stream. Of this, approximately 188 SF of permanent impacts will result from the construction of the spillway headwall and embankment slope regrading, and approximately243 SF will result from the realignment of the unnamed intermittent stream.

Dredging is proposed for the required improvements to the Lake Boon Dam. Dredging will take place below the ordinary high-water line of both Bailey Brook and Lake Boon. Approximately 240 cubic yards (CY) total of dredge is proposed; 120 CY below the high-water line of Lake Boon and 120 CY below the high-water line of Bailey Brook.

4.4 Bordering Land Subject to Flooding Impacts

This project proposes a total of 313 SF of impact to Bordering Land Subject to Flooding (BLSF) to bring the Lake Boon Dam into compliance with ODS safety standards. All proposed impacts will take place on the downstream dam embankment. The impacts are associated with the downstream dam embankment slope regrading.

Approximately 37.6 of flood storage will be lost with the required alterations to bring the dam into compliance with ODS requirements. Due to site constraints, construction of a compensatory storage area is not possible at the site. See the sections below and Appendix C for additional information.

4.5 Riverfront Area Impacts

Due to the location of Bailey's Brook, a majority of the project site is located within Riverfront Area (RFA). This project proposes a total of 24,147 SF of impact to RFA to bring the Lake Boon Dam into compliance with ODS safety standards.

Approximately 678 SF of temporary impacts will result from the sediment and erosion control installation. Upon completion of construction these portions of temporarily impacted riverfront area will be re-seeded and restored to pre-construction conditions.

Approximately 23,459 SF of permanent impacts to RFA will occur as a result of the roadway realignment, regrading of the downstream dam embankment, vegetation clearing, soft ground stabilization, seepage control improvements, and realignment of the un-named intermittent channel.

5.0 REGULATORY REVIEW

The proposed project requires permitting at the federal, state, and local levels, as summarized in Table 2 below. Further discussion of the applicable permits, authorizations, and/or other forms of approval is provided in the subsequent sections.

Table 2 – Summary of Required Permits and Regulatory Approvals

Permit (or other Authorization)	Reviewing / Issuing Agency
Federal	
Section 404 Pre-Construction Notification (PCN)	U.S. Army Corps of Engineers (ACOE)
State	
Environmental Notification Form (ENF)	Massachusetts Environmental Policy Act (MEPA) Office
Chapter 253 Permit	Massachusetts Department of Conservation and Recreation (DCR), Office of Dam Safety (ODS)
Water Quality Certification (WQC)	Massachusetts Department of Environmental Protection (MassDEP), WQC Program
Chapter 91 (Waterways) License	Massachusetts Department of Environmental Protection (MassDEP), Waterways Program
Project Notification Form (PNF)	Massachusetts Historic Commission (MHC)
Local	
Notice of Intent (NOI) under the Massachusetts Wetlands Protection Act (WPA) and Town of Stow Wetlands Protection Bylaw	MassDEP and Town of Stow Conservation Commission (Conservation Department)

5.1 Federal

5.1.1 U.S. Army Corps of Engineers (ACOE) Section 404 Permit

Section 404 of the Clean Water Act (CWA) establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under the CWA include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports) and mining projects. The project will require a Pre-Construction Notification (PCN) under Section 404 of the Clean Water Act due to the proposed dredge and fill activities within waters of the United States.

5.2 State

5.2.1 Massachusetts Environmental Policy Act (MEPA, 301 CMR 11.0) Review

The purpose of MEPA and 301 CMR 11.00 is to provide meaningful opportunities for public review of the potential environmental impacts of a project for which a permit is required from an agency of the Commonwealth, and to assist agencies of the Commonwealth in using all feasible means to avoid damage to the environment or, to the extent damage to the environment cannot be avoided, to minimize and mitigate damage to the environment to the maximum extent practicable. MEPA's review is intended

to inform the participating agencies of the project, to maximize consistency between Agency actions, and to facilitate coordination of all environmental and development review and permitting processes of the Commonwealth. The MEPA process provides an opportunity for the project proponent to identify required Agency actions and to describe and analyze how the project will comply with applicable regulatory standards and requirements. Through review of the MEPA documents, each participating Agency can comment on aspects of the project or issues regarding its agency action that require additional description or analysis.

There are twelve MEPA review threshold categories contained in the Act covering the following topics of Land, State Listed Species, Wetlands, Waterways and Tidelands, Water, Wastewater, Transportation, Energy, Air, Solid and Hazardous Waste, Historical and Archaeological Resources, Areas of Critical Concern, and Regulations. In addition to triggering a threshold, a state action (i.e., state funding or state permitting) is necessary to trigger MEPA review.

The following MEPA thresholds are triggered for this project under the Wetlands, Waterways and Tidelands category:

- 301 CMR 11.03(3)(b)1b. alteration of 500 or more linear feet of bank along a fish run or inland bank
- 301 CMR 11.03(3)(b)1d. alteration of 5,000 or more sf of bordering or isolated vegetated wetlands
- 301 CMR 11.03(3)(b)1f. alteration of ½ or more acres of any other wetlands

The project also triggers the following MEPA threshold related to historic resources:

- 301 CMR 11.03(10)(b)1. demolition of all or any exterior part of any Historic Structure listed in or located in any Historic District listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth

These MEPA thresholds triggered for this project described above result in the submission of an Environmental Notification Form (ENF) (this submission).

Environmental Justice Communities:

Per 301 CMR 11.00, MEPA requires all Environmental Justice (EJ) communities within a mile of the project location to be identified and notified. Using the MEPA EJ community mapper, a map was generated to identify all communities within a mile. There are no environmental justice communities located within 1 mile of the project site.

Climate Change Adaptation and Resiliency:

Per 301 CMR 11.05(5) MEPA updated requirements, the ResilientMass Action Team (RMAT) climate resilience design standards tool was used to generate a report on the project to address climate risk. The project is mapped as high risk for extreme precipitation – urban flooding, extreme precipitation – riverine flooding, and extreme heat. The project site has a history of flooding and is located in a mapped FEMA floodplain. Refer to Appendix H – RMAT Climate Tool for the climate report for the site and additional information.

5.2.2 Chapter 253 Permit (Dam Safety Permit)

The Massachusetts DCR Chapter 253 Dam Safety Permit is required for this project since work includes repairing and materially altering a dam. The application for Chapter 253 Permit is required to include a technical design report (basis of design report) with a description of the proposed project, design calculations, and construction plans.

5.2.3 Water Quality Certification (WQC)

Projects in Massachusetts involving the discharge of dredged or fill material, dredging, or dredged material disposal activities in waters of the United States, which require federal licenses or permits are subject to 314 CMR 9.00 as administered by MassDEP. 314 CMR 9.00 also applies to any dredging project and the management of dredged material within the marine boundaries and at upland locations within the Commonwealth.

The purpose of the 401 Water Quality Certification is to ensure that proposed discharges of dredged or fill material, dredging and dredged material disposal in the waters of the United States within the Commonwealth comply with the Surface Water Quality Standards and other appropriate requirements of the state law.

This project will result in greater than 5,000 SF of impacts to BVW and LUW and will also involve greater than 100 cubic yards of dredging in order to facilitate construction of the new spillway and retaining wall. Therefore, the project will require both a Major Fill/Excavation Project Certification and a Minor Dredge Project Certification. The applications will include a plan and description of a wetland mitigation area for impacted wetlands. Sediment sampling and analysis will be required as part of the dredge permit application.

5.2.4 Chapter 91 (Waterways) License

The "Public Waterfront Act" or Massachusetts General Law Chapter 91 (Chapter 91) dates back to 1866 and serves to provide the public with access to tidelands and waterways and to protect public interests associated with those resources. Chapter 91 takes jurisdiction in four general areas: flowed tidelands, filled tidelands, great ponds, non-tidal navigable rivers and streams on which public funds have been expended either upstream or downstream within the river basin. For inland rivers and streams this jurisdiction extends up to the Ordinary High-Water Mark. Per [33 CFR 328.3(d)] OHW is defined as "with respect to non-tidal waters, is the line on shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed upon the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."

Lake Boon is a "Great Pond" and therefore subject to the Chapter 91 Waterways Licensing Program administered by the Massachusetts Department of Environmental Protection (MassDEP). The project will be submitting an application for authorization and licensing of the proposed rehabilitation project. Proposed activities subject to Chapter 91 jurisdiction include the proposed sheet pile installation within the lake.

5.2.5 MHC Project Notification Form (PNF)

The project will require a Project Notification Form (PNF) submission with the Massachusetts Historic Commission (MHC) as part of the ACOE Section 404 permitting process. Coordination with MHC is

required because the project will receive state funding and will also require permits from state agencies, thus the project must be reviewed by the MHC in compliance with Massachusetts General Laws Chapter 9, sections 26-27C.

The project will also require federal permits and thus must be reviewed in compliance with Section 106 of the National Historic Preservation Act of 1966. Section 106 requires federal agencies to take into account the effects of their actions on historic properties. "Section 106 review," follows a specific process, which is guided by federal regulations (36 CFR 800). These regulations have created a series of steps by which federal agencies identify and evaluate historic properties that may be affected by their undertakings, assess adverse effects to those properties, and take prudent and feasible measures to avoid, minimize, or mitigate those effects. In Massachusetts, these steps are taken in consultation with the Massachusetts State Historic Preservation Officer (SHPO). The MHC is the office of the SHPO.

5.3 Local

5.3.1 The Massachusetts Wetlands Protection Act (310 CMR 10.00)

The Massachusetts Wetlands Protection Act (MGL c.131 § 40) (WPA) and implementing regulations (310 CMR 10.00) is a state statute administered locally. This project will require the filing of a Notice of Intent (NOI) pursuant to the WPA and the local wetlands bylaw. Jurisdiction under the WPA would occur for proposed removal, fill, dredge and/or alteration of a wetland resource protected under the WPA. The WPA requires the preparation of an NOI for work within wetland resource areas or the 100-foot buffer zone. The general performance standards for work or activities occurring within each wetland resource are identified in the WPA.

Resource areas impacted by the proposed work include Inland Bank, Bordering Vegetated Wetland, Land Under Water, Bordering Land Subject to Flooding, and Riverfront Area. The project also proposes impacts to the 100-foot buffer zone as well as the Stow Conservation Commission's local 35-foot buffer zone.

The Massachusetts WPA grants relief from the performance standards under its limited project provisions, for various types of infrastructure and agricultural projects as described at 310 CMR 10.53(3) that cannot comply to all of the performance standards. Simply stated, these provisions allow the Conservation Commission to permit certain unique projects that cannot meet the applicable performance standards. The proposed project consists of the repair and improvement of an existing dam and falls under the Limited Project Status identified at 10.53(i):

> *"The maintenance, repair and improvement (but not substantial enlargement except when necessary to meet the Massachusetts Stream Crossing Standards) of structures, including dams and reservoirs and appurtenant works to such dams and reservoirs, buildings, piers, towers, headwalls, bridges and culverts which existed on the effective date of 310 CMR 10.51 through 10.60 (April 1, 1983). When water levels are drawn down for the maintenance, repair, or improvement of dams or reservoirs or appurtenant works to such dams or reservoirs under 310 CMR 10.53(3)(i), water levels that existed immediately prior to such projects being undertaken shall be restored upon completion of the work, and a new Notice of Intent need not be filed for such restoration. If the Department of Conservation and Recreation Office of Dam Safety determines that it would not be safe to restore the water level existing prior to the project being undertaken, the applicant shall submit a new Notice of Intent within ninety days of the date of the*

determination describing the measures necessary with a schedule for repairing or replacing the dam and returning water levels to the previous condition, or removing the dam and restoring the riparian habitat."

Compliance with the WPA performance standards, as well as the additional performance standards set by the Town of Stow Wetlands Protection Bylaw (Article 9) is discussed below.

WPA Performance Standards: Bordering Vegetated Wetlands

Bordering Vegetated Wetlands are regulated at 310 CMR 10.55. Bordering Vegetated Wetland is defined as "freshwater wetlands which border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants." BVWs within the work area were formed from dam failure and seepage on the downstream side.

Proposed work within BVW includes fill resulting from the re-grading of the downstream embankment to meet ODS safety standards that is necessary to prevent erosion and slope failure. BVW impacts also include proposed vegetation removals that are considered necessary as described further below.

The BVW performance standards are provided in the regulations at 310 CMR 10.55(4)(a) through (e) and are discussed below.

(a) *Where the presumption set forth in 310 CMR 10.55(3) is not overcome, any proposed work in a Bordering Vegetated Wetland shall not destroy or otherwise impair any portion of said area.*

The project proposes to impact approximately 10,134 square feet of BVW. The proposed impacts to BVW have been avoided and minimized to the maximum extent practicable. The proposed vegetation removal within BVW occurring along the downstream toe of the dam is considered unavoidable since the overgrowth of vegetation (particularly woody vegetation) in these areas is considered a dam safety deficiency. Several trees along the toe of Lake Boon Dam and within the immediate downstream area have overturned in the recent past, resulting in large voids at the ground surface and pooling of seepage water due to pull-out of the root ball and extensive lateral root systems. For these reasons, the vegetation removal in BVW is considered unavoidable.

The ODS' policy regarding trees and other forms of woody growth on an around dams is that all embankment dams be maintained free of such growth, and that this maintenance area extend downstream for a recommended distance of 20 feet to facilitate adequate inspection of these critical areas and to prevent roots from growing into the dam embankment. Based on the height of Lake Boon Dam and available technical and scientific literature compiled by FEMA on the impacts of vegetation on earthen dams, the project design is proposing a 12-foot clearing area so as to minimize impacts to BVW.

The proposed permanent fill impacts to BVW are due to regrading of the downstream slope to make it flatter and more stable. A Phase II evaluation by Weston & Sampson determined that

the slope currently does not possess the minimum factors of safety required by state regulatory requirements for embankment slope stability, and that slope failure may be imminent. The embankment will be graded to have a 3:1 slope. A retaining wall is proposed along the toe of slope in order to minimize BVW impacts along the slope.

On-site areas were investigated for possible wetland and compensatory storage replication but due to site constraints, no suitable options for replication were identified on site. Constraints associated with the project site include:

- Space constraints associated with the property (and the fact that much of the property already consists of wetland resource areas)
- Dense tree canopy adjacent to the project site
- The topography on site and the significant cut that would be required to achieve wetland hydrology
- Access issues, the need to access through private property or to temporarily cross BVW to construct the replication area

These site constraints would result in additional resource area impacts, tree removal, and extensive excavation to replicate on-site. Given the project site's constraints, including limited available space on the site and the significant cuts that would be required to construct the replication area, an extensive evaluation was conducted to explore the feasibility of constructing a wetland replication area off-site. Several sites were evaluated and ultimately were not deemed suitable due to a number of reasons, but primarily the fact that each site would require extensive tree clearing within upland habitat to construct the replication area. The off-site replication area feasibility analysis is described in more detail in the Alternatives Analysis in Appendix C.

Due to site limitations described above and in the Alternatives Analysis, it was determined there are no feasible options for wetland replication, on or off-site. The dam rehabilitation project is considered a limited project in accordance with 310 CMR 10.53(3)(i) (maintenance, repair and improvement of dams). Due to this classification, and in recognition of the need to complete the required improvements to increase public safety, exemptions and leniency are sometimes required for limited projects. The applicant will coordinate with the Stow Conservation Commission during the permitting process.

(b) Notwithstanding the provisions of 310 CMR 10.55(4)(a), the issuing authority may issue an Order of Conditions permitting work which results in the loss of up to 5,000 square feet of Bordering Vegetated Wetland when said area is replaced in accordance with the following general conditions and any additional, specific conditions the issuing authority deems necessary to ensure that the replacement area will function in a manner similar to the area that will be lost:

1. *The surface of the replacement area to be created ("the replacement area") shall be equal to that of the area that will be lost ("the lost area");*

2. *The ground water and surface elevation of the replacement area shall be approximately equal to that of the lost area;*

3. *The overall horizontal configuration and location of the replacement area with respect to the bank shall be similar to that of the lost area;*

4. *The replacement area shall have an unrestricted hydraulic connection to the same water body or waterway associated with the lost area;*

5. *The replacement area shall be located within the same general area of the water body or reach of the waterway as the lost area;*

6. *At least 75% of the surface of the replacement area shall be reestablished with indigenous wetland plant species within two growing seasons, and prior to said vegetative reestablishment any exposed soil in the replacement area shall be temporarily stabilized to prevent erosion in accordance with standard U.S. Soil Conservation Service methods; and*

7. *The replacement area shall be provided in a manner which is consistent with all other General Performance Standards for each resource area in Part III of 310 CMR 10.00. In the exercise of this discretion, the issuing authority shall consider the magnitude of the alteration and the significance of the project site to the interests identified in M.G.L. c. 131 §40, the extent to which adverse impacts can be avoided, the extent to which adverse impacts are minimized, and the extent to which mitigation measures, including replication or restoration, are provided to contribute to the protection of the interests identified in M.G.L. c. 131, §40.*

   The project will result in more than 5,000 SF of BVW impact. The applicant investigated potential wetland replication area sites for the project, but significant constraints, both on and off the site, rendered no feasible options for replication. On-site limitations included space constraints, dense tree canopy, challenging topography requiring significant excavation, and access issues necessitating crossing private properties or wetlands. Off-site, potential replication areas were dismissed due to the necessity for extensive tree clearing. These constraints, coupled with the project's classification as a "limited project" under regulatory guidelines, which allows for certain exemptions to facilitate essential public safety improvements, led to the conclusion that wetland replication, both on and off-site, was not viable, as detailed in the project's Alternatives Analysis. Therefore, the project is seeking flexibility with this requirement under the limited project provision.

(c) *Notwithstanding the provisions of 310 CMR 10.55(4)(a), the issuing authority may issue an Order of Conditions permitting work which results in the loss of a portion of Bordering Vegetated Wetland when;*
   1. *Said portion has a surface area less than 500 square feet;*
   2. *Said portion extends in a distinct linear configuration ("finger-like") into adjacent uplands; and*
   3. *In the judgement of the issuing authority it is not reasonable to scale down, redesign or otherwise change the proposed work so that it could be completed without loss of said wetland.*

The project proposes to impact approximately 10,134 square feet of BVW. The proposed impacts to BVW have been avoided and minimized to the maximum extent practicable. Work in this area is necessary for repairing and improving the dam, as described in the sections above. Regrading the downstream embankment is a critical component of the project to help make the

dam more stable. A Phase II evaluation determined that slope failure may be imminent under current conditions.

(d) Notwithstanding the provisions of 310 CMR 10.55(4)(a), (b), and (c), no project may be permitted which will have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.59.

This standard is not applicable. The proposed project is not located within NHESP-mapped Estimated Habitat of Rare Wildlife or Priority Habitat of Rare Species.

(e) Any proposed work shall not destroy or otherwise impair any portion of a Bordering Vegetated Wetland that is within an Area of Critical Environmental Concern designated by the Secretary of Energy and Environmental Affairs under M.G.L. c. 21A, §2(7) and 301 CMR 12.00: Areas of Critical Environmental Concern. 310 CMR 10.55(4)(e):

1. *Supersedes the provisions of 310 CMR 10.55(4)(b) and (c);*
2. *Shall not apply if the presumption set forth at 310 CMR 10.55(3) is overcome;*
3. *Shall not apply to work proposed under 310 CMR 10.54(3)(l); and*
4. *Shall not apply to maintenance of stormwater detention, retention, or sedimentation ponds, or to maintenance of stormwater energy dissipating structures, that have been constructed in accordance with a valid order of conditions.*

The proposed project is not located within an Area of Critical Environmental Concern; therefore, this standard is not applicable.

WPA Performance Standards: Inland Bank

Bank is regulated by the WPA per 310 CMR 10.54. Bank (WPA 10.54.2.a) is defined as "the portion of the land surface which normally abuts and confines a waterbody. It occurs between a water body and a vegetated bordering wetland and adjacent flood plain, or, in the absence of these, it occurs between a water body and an upland".

Proposed Bank impacts include the installation of the sheet pile wall on the upstream side of the dam, realignment of the intermittent stream channel on the downstream side of the dam, and construction of the new headwall and regrading on the downstream embankment slope.

Each standard for work in Bank (per 310 CMR 10.54(4)) is provided below, followed by an explanation on how the project meets that standard.

(a) 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;

The installation of the embedded interlocking steel sheet pile wall upstream of the existing dam will significantly reinforce the embankment, effectively addressing uncontrolled seepage issues that have historically compromised the bank's stability. By reducing seepage, the project directly mitigates one of

the primary causes of embankment instability, thus enhancing the bank's resilience against erosion and internal structural failure. Additionally, the replacement and redesign of the spillway structure will be an improvement over existing conditions, since the existing spillway is severely deteriorated as a result of poor overall concrete condition, corrosion of the debris rack, deteriorating wood stoplogs, concrete separation and displacement, and severe corrosion and pitting along the invert of the corrugated metal discharge pipe, among other factors.

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

The water carrying capacity of Lake Boon will not be impacted. The water carrying capacity within the channel of Bailey Brook will improve as a result of the construction of the new spillway and headwall. The existing spillway has insufficient capacity to convey lake inflows resulting from the full design flood. This hydraulic condition would allow floodwaters to overtop the dam embankment, which is not designed to withstand overtopping flows of any magnitude and could sustain significant erosional damage and potential breach. Moreover, by constructing a new spillway north of the existing location, the project will address structural deficiencies and ensure that the capacity of the spillway to manage overflow is maintained or enhanced, without reducing the waterway's carrying capacity. The new spillway will be designed to accommodate current and anticipated future flows, ensuring that water can be efficiently diverted away from the dam when necessary, without causing upstream backwater effects or downstream scouring that might impair the channel's capacity.

3. ground water and surface water quality;

The proposed dam improvements will not impact the ground water or surface water quality. The downstream slope of the dam will be regraded to prevent further erosion of the embankment, reducing the potential for sediment migration into the downgradient wetlands and waterway in the long-term. Energy dissipation (rip rap) will be provided at the culvert outlet to Bailey Brook.

The installation of the sheet pile wall upstream of the existing roadway is designed to reduce seepage and control the flow of water through the dam. This intervention will help maintain the stability of groundwater levels and prevent the uncontrolled release of sediments or pollutants trapped within the dam structure, thus protecting ground and surface water quality.

Also, during construction dewatering activities, there will be appropriate sediment controls (cofferdams and silt curtains) in place to protect water quality during construction. Work will occur in dry conditions to minimize sedimentation in the lake and stream.

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

The existing bank of Lake Boon consists of angular stone/rip rap that provides limited wildlife habitat value. Relative to the spillway and culvert replacement, the spillway does not allow for fish passage under existing conditions, so the bank associated with the inside of the culvert to be replaced does not currently provide habitat for fisheries.

There are stocked fish within Lake Boon, but because of the spillway, there is no fish passage between Lake Boon and Bailey Brook under existing conditions (nor will there be under proposed conditions due

to the new spillway). Therefore, no impact to breeding habitat or food is anticipated as a result of the project.

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.

The applicant shall conduct Wildlife Habitat Evaluations to assess important wildlife habitat functions on the site and will submit those findings with the Notice of Intent filing with the Stow Conservation Commission.

6. Work on a stream crossing shall be presumed to meet the performance standard set forth in 310 CMR 10.54(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 requirement of 310 CMR 10.54(4)(a)5., the impact on bank caused by the installation of a stream crossing is exempt from the requirement to perform a habitat evaluation in accordance with the procedures contained in 310 CMR 10.60.

The proposed project does not include a stream crossing; therefore, this standard is not applicable.

(b) Notwithstanding the provisions of 310 CMR 10.54(4)(a), structures may be permitted in or on a Bank when required to prevent flood damage to facilities, buildings and roads constructed prior to the effective date of 310 CMR 10.51 through 10.60 or constructed pursuant to a Notice of Intent filed prior to the effective date of 310 CMR 10.51 through 10.60 (April 1, 1983), including the renovation or reconstruction (but not substantial enlargement) of such facilities, buildings and roads, provided that the following requirements are met:

1. The proposed protective structure, renovation or reconstruction is designed and constructed using best practical measures so as to minimize adverse effects on the characteristics and functions of the resource area;

The project was designed to repair the dam deficiencies using the best practical measures.

2. The applicant demonstrates that there is no reasonable method of protecting, renovating or rebuilding the facility in question other than the one proposed.

The work is designed and will be constructed using best management practices to minimize adverse effects to the nearby wetland resource areas. The proposed design is intended to fix dam deficiencies, as documented in the ODS Certified of Non-Compliance (Appendix J). A discussion of alternatives is provided in Appendix C.

(c) Notwithstanding the provisions of 310 CMR 10.54(4)(a) or (b), no project may be permitted which will have any adverse effect on specified habitat sites of Rare Species, as identified by procedures established under 310 CMR 10.59.

The project is not proposed within NHESP-mapped rare species habitat.

WPA Performance Standards: Bordering Land Subject to Flooding

This project proposes a total of approximately 313 SF of permanent impacts to BLSF. All proposed impacts will take place on the downstream dam embankment. The impacts are associated with the downstream dam embankment slope regrading.

Approximately 37.6 CY of flood storage will be lost as a result of these required alterations to bring the dam into compliance with ODS requirements. See Table 3 below summarizing cut/fill within BLSF.

Table 3: Compensatory Storage Flood Analysis Table (BFE: 181.3 Feet, NAVD 88)

Elevation (Feet, NAVD88)	Incremental Cut Volume (CY)	Incremental Fill Volume (CY)	Incremental Net Impact (CY)	Cut/Fill
181.3 to 181.0	2.53	7.19	4.66	(Fill)
181.0 to 180.0	6.36	25.28	18.92	(Fill)
180.0 to 179.0	3.68	21.49	17.81	(Fill)
179.0 to 178.0	0.46	18.19	17.73	(Fill)
178.0 to 177.0	0.28	9.20	8.92	(Fill)
177.0 to 176.0	6.05	5.90	-0.15	(Cut)
176.0 to 175.0	17.07	3.89	-13.18	(Cut)
175.0 to 174.0	17.31	0.16	-17.15	(Cut)
Cumulative (181.3 to 174.0)	53.7	91.3	37.6	(Fill)

The BLSF performance standards are provided in the regulations at 310 CMR 10.57(4)(a)(1) through (3) and are discussed below.

310 CMR 10.57(4)(a)(1) – Compensatory storage shall be provided for all flood storage volume that will be lost as the result of a proposed project within Bordering Land Subject to Flooding, when in the judgment of the issuing authority said loss will cause an increase or will contribute incrementally to an increase in the horizontal extent and level of flood waters during peak flows.

As discussed above and also in the Alternatives Analysis provided in Appendix C, the investigation into potential compensatory storage areas for this project faced significant constraints, both on and off the site, rendering no feasible options for construction of a compensatory flood storage area. On-site limitations included space constraints, dense tree canopy, challenging topography requiring significant excavation, and access issues necessitating crossing private properties or wetlands.

The project is seeking flexibility in meeting the compensatory storage replication requirements under the limited project provision of the WPA, given the site constraints that make it infeasible to construct a compensatory flood storage mitigation area.

310 CMR 10.57(4)(a)(2) – Work within Bordering Land Subject to Flooding, including that work required to provide the above-specified compensatory storage, shall not restrict flows so as to cause an increase in flood stage or velocity.

The proposed project will not restrict flows or cause an increase in flood stage or velocity. The existing spillway has insufficient capacity to convey lake inflows resulting from the full design flood. This hydraulic condition would allow floodwaters to overtop the dam embankment, which is not designed to withstand overtopping flows of any magnitude and could sustain significant erosional damage and potential breach. The project will include decommissioning and removal of the existing spillway and construction of a new spillway with greater capacity for large magnitude storm events and improved operational flexibility and safety.

310 CMR 10.57(4)(a)(3) – Work in those portions of bordering land subject to flooding found to be significant to the protection of wildlife habitat shall not impair its capacity to provide important wildlife habitat functions. Except for work which would adversely affect vernal pool habitat, 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, or altering vernal pool habitat, may be permitted if they will have no adverse effects on wildlife habitat, as determined by procedures contained in 310 CMR 10.60.

Proposed impacts to BLSF are within the existing downstream dam embankment, which currently consists primarily of herbaceous vegetation that is maintained/mowed, a wooden guardrail, and portions of the existing paved road which will be shifted as part of the project. The applicant shall conduct Wildlife Habitat Evaluations to assess important wildlife habitat functions on the site and will submit those findings with the Notice of Intent filing with the Stow Conservation Commission.

WPA Performance Standards: Land Under Water

LUW is regulated by the WPA per 310 CMR 10.56. LUW (WPA 10.56.2.a) is defined as "the land beneath any creek, river, stream, pond or lake.

Permanent LUW impacts to Lake Boon proposed by this project include the installation of sheet piling on the upstream side of the dam. Most of this will occur within the existing embankment that consists of angular stone riprap. However, at the spillway location, a portion of the sheet piling will need to extend into LUW (both within Lake Boon and Bailey's Brook). There will also be permanent impacts to the LUW of Lake Boon and Bailey's Brook associated with construction of the new spillway intake structure.

On the downstream side of the dam, there will be LUW impacts to Bailey's Brook associated with installation of the new headwall. Temporary impacts proposed within LUW will also result from installation of a temporary cofferdam on the downstream side of the dam (within Bailey's Brook), and

dewatering activities on both the upstream and downstream sides of the spillway to be replaced (Bailey's Brook and Lake Boon).

Each performance standard for work in LUW (per 310 CMR 10.56(1)) is provided below, followed by an explanation on how the project meets that standard.

(a) *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:*

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

The water carrying capacity within the channel of Bailey Brook will improve as a result of the construction of the new spillway and headwall. The existing spillway has insufficient capacity to convey lake inflows resulting from the full design flood. By constructing a new spillway north of the existing location, the project will address structural deficiencies and ensure that the capacity of the spillway to manage overflow is maintained or enhanced, without reducing the waterway's carrying capacity. The new spillway will be designed to accommodate current and anticipated future flows, ensuring that water can be efficiently diverted away from the dam when necessary, without causing upstream backwater effects or downstream scouring that might impair the channel's capacity.

b. *Ground and surface water quality*

The proposed project will not negatively impact ground or surface water quality on site. During construction dewatering activities, there will be appropriate sediment controls (cofferdams) in place to protect water quality during construction. Work will be in dry conditions to minimize sedimentation in the stream.

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

Permanent impacts to LUW have been minimized to the maximum extent practicable by installing the proposed sheet piling through the existing bank of Lake Boon (the dam crest) which consists of angular stone/rip rap that provides limited wildlife habitat value. It should be noted that the sheet pile installation will enable excavation work for the spillway to safely occur without needing to lower the reservoir level, which would require exposing vast areas of LUW.

Relative to the spillway and culvert replacement, the spillway does not allow for fish passage under existing conditions, so the LUW associated with the inside of the culvert does not provide habitat for fisheries. Additionally, the replacement of the existing spillway, coupled with the construction sequence that will maintain flow through the existing spillway until the new one is operational, will ensure that there will be no disruption to the water levels and flow patterns that could adversely affect the aquatic ecosystem.

d. *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.

By using techniques like the embedded sheet pile wall, the project will avoid the need for extensive dredging or alteration of the lake bed, which could disrupt habitats. The sheet pile installation is designed to be minimally invasive.

The strategic placement of the new spillway and the realignment of Barton Road, which will result in the creation of additional LUW downslope at Bailey Brook, offers an opportunity to enhance aquatic habitat.

Wildlife habitat evaluations will be conducted as part of the NOI filing process with the Stow Conservation Commission to ensure that the project will not adversely affect the ability of LUW to provide important wildlife habitat functions.

e. *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.*

The project does not include a stream crossing; therefore, this standard is not applicable.

(b) *Notwithstanding the provisions of 310 CMR 10.56(4)(a), the issuing authority may issue an Order in accordance with M.G.L. c. 131, § 40 to maintain or improve boat channels within Land under Water Bodies and Waterways when said work is designed and carried out using the best practical measures so as to minimize adverse effects such as the suspension or transport of pollutants, increases in turbidity, the smothering of bottom organisms, the accumulation of pollutants by organisms or the destruction of fisheries habitat or nutrient source areas.*

Not applicable. The project does not propose a boat channel.

(c) *Notwithstanding the provisions of 310 CMR 10.56(4)(a) or (b), no project may be permitted which will have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.59*

The project is not proposed within NHESP-mapped rare species habitat.

WPA Performance Standards: Riverfront Area

The project proposes both permanent and temporary impacts to RFA, as a result of the roadway realignment, regrading of the downstream dam embankment, vegetation clearing, soft ground stabilization, and seepage control improvements. Each performance standard for work in RFA (per 310 CMR 10.58(4)(a) through (d) is provided below, followed by an explanation on how the project meets the standard.

(a) *Protection of Other Resource Areas. The work shall meet the performance standards for all resource areas within the riverfront area, as defined in 310 CMR 10.30 (coastal bank), 10.32 (salt marsh), 10.55 (Bordering Vegetated Wetland), and 10.57 (Land Subject to Flooding). When work in the riverfront area is also within he buffer zone to another resource area, the performance standards for the riverfront area, shall contribute to the protection of the interests of MGL c. 131, §40 in lieu of any additional requirements that might otherwise be imposed in the buffer zone within the riverfront area.*

As described above, the project has been designed to meet the performance standards for all of the affected resource areas to the maximum extent practicable, as described above. Due to the site constraints and the need to bring the dam into compliance with the ODS safety requirements, the project is seeking flexibility from this standard as a limited project.

(b) *Protection of Rare Species. No project may be permitted within riverfront area which will have an adverse effect on specified habitat sites of rare wetland or upland vertebrate or invertebrate species, as identified by the procedures established under 310 CMR 10.59 or 10.37 or which will have any adverse effect on vernal pool habitat certified prior to the filing of the Notice of Intent.*

The proposed project is not located within NHESP-mapped habitat for rare species, nor is the project located within a mapped cold-water fishery.

(c) *Practicable and substantially Equivalent Economic Alternatives. There must be no practicable and substantially equivalent economic alternative to the proposed project with less adverse effects on the interests identified in M.G.L. c. 131 §40.*

There is no practicable and substantially equivalent economic alternative to the proposed Project that satisfies the Project need with less adverse effects on the interests identified in the Act. Please refer to the Alternatives Analysis in Appendix C for a discussion of alternatives.

(d) *No Significant Adverse Impact. The work including proposed mitigation measures must have no significant adverse impact on the riverfront area to protect the interests in M.G.L. c. 131 §40. Within 200 foot Riverfront Areas, the issuing authority may allow the alteration of up to 5,000 s.f. or 10% of the Riverfront Area within the lot, whichever is greater (in part);*

The project will impact a total of 24,147 square feet of RFA, which is greater than the 5,000 square feet allowable and is greater than 10% of the RFA within the lot. Because Bailey's Brook is a perennial stream and is located immediately downstream of the dam, impacts to the RFA are unavoidable in order to improve the dam and bring it into compliance with the ODS safety

requirements. The project is seeking flexibility with meeting this performance standard as a limited project for these reasons.

The Stow Wetlands Protection Bylaw (Article 9)

The Stow Wetlands Protection Bylaw (Article 9) ("the Bylaw") and associated regulations also implement specific performance standards for work in each wetland resource area, in addition to the WPA. The performance standards are listed in Section 5 of the bylaw and are also described below.

Bylaw Performance Standards: Bank

5.1 Any activity subject to regulation by the Bylaw shall not impair:

(A) The physical stability of the bank;
(B) The water carrying capacity of the existing channel within the bank; or
(C) The groundwater and surface water quality; or
(D) The capacity of the bank to provide breeding habitat, escape cover and nutrient sources for fisheries.

These standards are also included in the WPA and compliance with each standard is described in the sections above. The project will comply with these requirements for work in Bank as described above.

Bylaw Performance Standards: Wetlands

5.2 Activities involving Wetlands

(A) Any activity within a wetland for which the presumption of significance has not been overcome shall not destroy or otherwise impair any function of the wetland identified with the interests of the Bylaw except as provided for in section 5.2.B et seq. of these regulations.

Impacts to BVW are unavoidable as a result of the functional layout of the dam, the presence of wetlands along the downstream embankment which requires necessary regrading to bring the dam into compliance with ODS safety requirements. The project has avoided and minimized impacts to BVW to the maximum extent practicable. The proposed permanent fill impacts to BVW are due to regrading of the downstream slope to make it flatter and more stable. A Phase II evaluation by Weston & Sampson determined that the slope currently does not possess the minimum factors of safety required by state regulatory requirements for embankment slope stability, and that slope failure may be imminent. The embankment will be graded to have a 3:1 slope. A retaining wall is proposed along the toe of slope in order to minimize BVW impacts along the slope.

(B) Any activity, which alters a wetland for which the presumption of significance has not been overcome, may be permitted provided that an area, which shall replace all the functions of the altered area, shall be provided.

1. *The replacement area shall have a direct free flowing hydrologic connection with the altered area.*
   The replacement area shall lie within the land owned by the applicant.
2. *The replacement area shall be not more than two hundred (200) feet from the altered area.*
3. *The replacement area shall not be less than 110% of the altered area. The additional area will compensate for the time required for the replacement area to assume all the functions of the altered area.*
4. *The replacement area shall provide not less than 110% of the flood storage area lost by alteration.*
5. *The altered area shall not be greater than five thousand (5,000) square feet except in the case of special projects as defined in section 5.2© of these regulations.*
6. *At least 10% of the original wetland shall remain and shall be contiguous with the replacement area along a line which has a length of at least 10% of the circumference of the replacement area to ensure the complete repopulating of the replacement area with the vegetation existing in the original wetland.*
7. *No replication will be permitted of previously replicated wetlands.*

On-site areas were investigated for possible wetland and compensatory storage replication but due to site constraints, no suitable options for replication were identified on site. Constraints associated with the project site include:

- Space constraints associated with the property (and the fact that much of the property already consists of wetland resource areas
- Dense tree canopy adjacent to the project site
- The topography on site and the significant cut that would be required to achieve wetland hydrology
- Access issues, the need to access through private property or to temporarily cross BVW to construct the replication area

Given the project site's constraints, including limited available space on the site and the significant cuts that would be required to construct the replication area, an extensive evaluation was conducted to explore the feasibility of constructing a wetland replication area off-site. Several sites were evaluated and ultimately were not deemed suitable due to a number of reasons, but primarily the fact that each site would require extensive tree clearing within upland habitat to construct the replication area. The off-site replication area feasibility analysis is described in more detail in the Alternatives Analysis in Appendix C.

(C) The following special projects may be permitted if in the judgment of the Commission any damage to the interests of the Bylaw is outweighed by an overriding public benefit. These projects may be subject to conditions issued by the Commission.

….6. The maintenance and repair of buildings and structures which existed as of September 15, 1987, the original effective date of these regulations.

The Lake Boon Dam was constructed over 100 years ago. The project serves an overriding public benefit by addressing the structural deficiencies of the dam mitigates the risk of dam

failure, which could result in loss of life, property damage, and environmental catastrophe. The project will protect downstream communities and ensure the safety of local residents and ecosystems. Additionally, by repairing the dam and improving its resilience, the project will secure a critical water supply for the communities of Stow and Hudson. This is particularly important in light of historic drought events that have stressed local water resources. The dam's rehabilitation will also enhance emergency response capabilities by maintaining essential transportation links and providing a reliable water source for firefighting efforts in an area without a municipal water system.

Bylaw Performance Standards: Land Subject to Flooding

5.2 Any activity subject to regulation by the Bylaw shall:

(A) Provide at least 110% compensatory storage volume for any flood storage capability lost by reason of the activity, either temporarily or permanently;

The project proposes approximately 313 SF of permanent impacts to BLSF as a result of the regrading of the downstream embankment to bring the dam into compliance with ODS safety standards. Approximately 37.6 CY of fill within BLSF is proposed. As a Limited Project, the applicant is seeking flexibility with this requirement due to the on-site space limitations that make it infeasible to construct a compensatory flood storage area. Please refer to the Alternatives Analysis in Appendix C for additional information.

(B) Maintain or increase the capacity of the area to recharge groundwater supplies;

The project will not result in an increase in impervious surface. The project will not adversely impact the capacity of the floodplain to recharge groundwater supplies.

(C) Maintain or increase the capacity of the area to prevent pollution of groundwater supplies by filtration;

The proposed dam improvements will not impact the ground water or surface water quality. The downstream slope of the dam will be regraded to prevent further erosion of the embankment, reducing the potential for sediment migration into the downgradient wetlands and waterway in the long-term. In addition, the installation of the embedded sheet pile wall upstream of the existing roadway is designed to reduce seepage and control the flow of water through the dam. This intervention will help maintain the stability of groundwater levels and prevent the uncontrolled release of sediments or pollutants trapped within the dam structure, thus protecting ground and surface water quality.

(D) At least 10% of the original flood storage area shall overlap the replacement area.

Construction of a compensatory flood storage area was not deemed feasible given the site constraints described above and in the Alternatives Analysis provided in Appendix C.

(E) Surface contours shall not be changed in such a way to divert water away from the flood area.

Surface contours will not divert water away from the flood area.

Bylaw Performance Standards: Any Area Subject to Regulation

5.4 (A) An undisturbed vegetative buffer of naturally occurring plant materials shall be left adjacent to all wetlands, water bodies and watercourses to a minimum width of thirty-five (35) feet.

Due to the layout of the existing dam and the necessity for it to be located between two wetland resource areas (Lake Boon and Bailey's Brook), maintaining an undisturbed vegetative buffer off of the resource areas impacted by the project is not feasible. The proposed tree removals along the downstream dam embankment are necessary as described previously. One of the reasons the dam is considered structurally deficient and is in non-compliance with the ODS requirements is that there is currently significant woody vegetation and tree growth along the downstream toe of the dam and throughout the downstream area, which has a detrimental impact on dam operation, performance, and safety. Thus, vegetation removal will be necessary to meet safety standards.

(B) All disturbed areas shall be seeded in accordance with Soil Conservation Service guidelines to stabilize the soil as soon as possible. If work is completed or halted after November of any year, disturbed areas shall be covered with mulch to aid in the absorption and retention of surface water and to reduce erosion. The Commission may require further measures for this purpose. This mulch and/or any other required measures shall remain in place until permanent vegetation is reestablished.

Exposed areas that are disturbed as a result of the project will be stabilized as soon as possible to reduce the potential for erosion and sedimentation.

(C) Haybales, siltation screen or other measures shall be placed between any disturbed areas and wetlands or waterbodies to prevent siltation. The Commission may require similar protection between disturbed areas and flood plains.

A sediment and erosion control program will be implemented during construction to protect downgradient resource areas. Please refer to the Project Plans in Appendix N for a depiction of the proposed controls.

6.0 DISCUSSION OF MITIGATION

6.1 Tree Removal

The project proposes to remove 28 mature trees (primarily white pine) along the downstream embankment in order to facilitate the reconstruction of the slope and to comply with the ODS's required vegetation-free buffer off the dam. The downstream slope of the dam is currently experiencing overturning and uprooting of many of the trees that remain consistently saturated from excessive seepage passing beneath the embankment. Pullout of large lateral root masses has already caused considerable ground disturbance and further exposed saturated, sensitive soils. Removing these trees, many of which are already partially uprooted, is necessary to stabilize the dam embankment. As the photos depicted below illustrate, many of these trees are already uprooted as a result of the failing embankment.

Figure 7: Photo of some of the uprooted trees proposed for removal along the downstream dam embankment.

Figure 8: Another view of uprooting of pine trees along the downstream dam embankment. The trees and their roots will be removed.

The proponent will work with the Stow Conservation Commission to develop appropriate mitigation for the project's impacts.

6.2 Wetland Replication

Impacts to wetland resource areas will be avoided and minimized to the maximum extent practicable. Proposed temporary impacts to wetland resource areas will be restored in situ. The permanent impacts to resource areas are considered unavoidable. Alternatives were assessed for potential on site wetland replication and compensatory storage replication, and it was deemed there is no feasible option (see Appendix C for alternatives analysis). Site constraints include limited space, presence of existing wetlands, and the ODS requirement that no wetland (water/seepage) should be located within 20 feet of the dam toe and steep slopes on site. We are seeking flexibility in meeting this requirement due to filing as a limited project.

Through the permitting process with the local Stow Conservation Commission (seeking Order of Conditions) it will be discussed what opportunity may be available for alternative mitigation measures such as invasive species management and/or native tree plantings throughout the Town of Stow.

6.3 Flood Storage Compensation

The dam improvements are necessary to bring the Lake Boon Dam into compliance with DCR Office of Dam Safety (ODS) standards. The proposed new spillway will offer improved water quality, temperature sensing, and improved ability to control lake level including ability to lower the lake below the current annual drawdown level, which is constrained by the current spillway configuration. The ability to lower the lake further will aid in the community's endeavor to improve and preserve the water quality in Lake Boon, which has been degrading with changes in climate.

Alternatives were assessed for potential on site wetland replication and compensatory storage replication, and it was determined that there is no feasible option (see Appendix C for alternatives analysis). Site constraints include limited space, presence of existing wetlands, and relatively steep upland slopes. We are seeking flexibility in meeting this requirement due to filing as a limited project.

Through the permitting process with the local Stow Conservation Commission (seeking Order of Conditions) it will be discussed what opportunity may be available for alternative mitigation measures such as invasive species management and/or native tree plantings throughout the Town of Stow.

Appendix B

MEPA Triggers

MEPA THRESHOLDS DISCUSSION

This project will trigger the following MEPA thresholds related to Wetlands/Waterways and Historic Resources:

- 301 CMR 11.03(3)(b)1b. alteration of 500 or more linear feet of bank along a fish run or inland bank
- 301 CMR 11.03(3)(b)1d. alteration of 5,000 or more sf of bordering or isolated vegetated wetlands
- 301 CMR 11.03(3)(b)1f. alteration of ½ or more acres of any other wetlands
- 301 CMR 11.03(10)(b)1. demolition of all or any exterior part of any Historic Structure listed in or located in any Historic District listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth

Each of the MEPA thresholds is described in more detail below.

WETLANDS, WATERWAYS, AND TIDELANDS

This project will trigger thresholds set forth in 301 CMR 11.03 (3)(b), including:

- Alteration of 5,000 or more square feet of bordering vegetated wetland
- Alteration of greater than 500 linear feet bank impacts
- Alteration of ½ or more acres of any other wetlands

The proposed impacts to land under water, bordering vegetated wetlands, bordering land subject to flooding, and bank are considered unavoidable and have been minimized to extent practicable whilst providing a project design that conforms generally to accepted dam safety standards and state regulatory requirements for the safety of significant hazard potential dams.

The project proposes necessary repairs and improvements to Lake Boon Dam to address structural deficiencies which have been recognized as posing a significant risk to downstream public safety. The Massachusetts Department of Conservation and Recreation (DCR) Office of Dam Safety (ODS) issued a Certificate of Non-Compliance (Appendix J) on April 18, 2017, notifying the Town of Stow of the dam's failure to comply with the Massachusetts Dam Safety Regulations, 310 CMR 10.00, and ordering the Town of Stow to take appropriate action. Lake Boon (and therefore Lake Boon Dam) are important municipal assets, serving a variety of public purposes including residential well water supply, emergency preparedness, transportation, and recreation for the communities of Stow and Hudson, Massachusetts. Despite its significance, outstanding deficiencies including uncontrolled seepage, slope instability, spillway deterioration, inadequate spillway capacity, and excessive woody vegetation in critical areas threaten its structural integrity and overall safety.

LAND ALTERATION

The proposed project will not directly alter 25 or more acres of land, create five or more acres of impervious area, or exceed any of the other thresholds set forth in 301 CMR 11.03 (1)(b). As such, there are no MEPA triggers concerning Land Alteration.

RARE SPECIES

The proposed project is not located within any significant rare species habitat and therefore will not alter or take an endangered or threatened species of special concern, which is listed as a threshold per 301 CMR 11.03 (2)(b). As such, there are no MEPA triggers concerning Rare Species.

WATER

This proposed project will not trigger any of the thresholds set forth in 301 CMR 11.03 (4)(b)

WASTEWATER

The proposed project will not expand upon any wastewater treatment facilities, infrastructure associated with wastewater facilities, or trigger any other thresholds listed in 301 CMR 11.03 (5)(b). As such, there are no MEPA triggers concerning Wastewater.

TRANSPORTATION

The proposed project will not construct or substantially alter any roadways or trigger any other thresholds listed in 301 CMR 11.03 (6)(b). As such, there are no MEPA triggers concerning Transportation.

ENERGY

The proposed project will not include the construction or expansion of an electric generation facility or a fuel pipeline as listed in 301 CMR 11.03 (7)(b). As such, there are no MEPA triggers concerning Energy.

AIR

The proposed project will not construct or modify a major stationary source with federal potential emissions as listed in 301 CMR 11.03 (8)(b). As such, there are no MEPA triggers concerning Air.

SOLID AND HAZARDOUS WASTE

The proposed project will not build or expand in capacity for combustion or disposal of any quantity of solid waste as listed in 301 CMR 11.03 (9)(b). As such, there are no MEPA triggers concerning Solid and Hazardous Waste.

HISTORICAL AND ARCHAEOLOGICAL RESOURCES

The proposed project will trigger 301 CMR 11.03 (10)(b)(1). The project includes alteration of a historic structure (Lake Boon Earthen Dam, STW.916) but will not appreciably change the structure's overall appearance. No archaeological sites or resources were identified therefore the project will not trigger 301 CMR 11.03 (10)(b)(2).

AREAS OF CRITICAL ENVIRONMENTAL CONCERN

The proposed project will not be conducted in any areas of critical environmental concern (ACEC) as listed in 301 CMR 11.03 (11)(b). As such, there are no MEPA triggers concerning ACEC.

ENVIRONMENTAL JUSTICE

The proposed project will not include work within an Environmental Justice Community or within an Environmental Justice Community designated geographic area (DGA) as defined in 301 CMR 11.02. Therefore, this project will not trigger an Environmental Impacts Report (EIR) Submission.

REGULATIONS

The proposed project will not reduce any standards for environmental protection, reduce opportunities for public participation in permitting or other review processes, or reduce public access to information generated or provided in accordance with the regulations whose primary purpose is to protect against damage to the environment as listed in 301 CMR 11.03 (12)(b). As such, there are no MEPA triggers concerning Regulations.

Appendix C

Alternatives Analysis

TABLE OF CONTENTS

Page

1.0 INTRODUCTION

Lake Boon Dam (referred to herein as "the dam") is a municipally-owned and state-regulated dam located in Stow, Massachusetts. Ownership, operation, maintenance, and performance of the dam is subject to the Massachusetts Dam Safety Regulations (302 CMR 10.00) as administered by the Department of Conservation and Recreation (DCR) Office of Dam Safety (ODS). The dam is classified per the Massachusetts Dam Safety Regulations, as "Large" in size based on water storage capacity and "Significant" in hazard potential based on the potential consequences associated with its failure[1].

The current status of Lake Boon Dam with respect to overall physical condition and structure safety is poor. This evaluation was based on the presence of deficiencies identified during periodic dam safety inspections, the results of technical investigations into the hydrologic and geotechnical safety of the dam, and the occurrence of a relatively recent dam safety incident. As such, the dam is not in compliance with the Massachusetts Dam Safety Regulations and presents an unacceptable risk to downstream public safety. Outstanding structural deficiencies contributing to the dam's current condition are summarized in the Project Description provided in Appendix A.

Weston & Sampson Engineers, Inc. (Weston & Sampson) was retained by the Town of Stow to develop and evaluate alternative approaches and project scopes to mitigate the deficiencies identified at Lake Boon Dam ("the project"). This evaluation identifies the various alternatives that were developed for the project, summarizes the evaluations performed, and presents the recommended project alternative. The information provided in this evaluation is presented in a manner that assumes that some readers may not be familiar with the dam/site or its deficiencies.

The formulation process of alternatives to address existing dam safety deficiencies requires the consideration of various interests. These interests include public safety, environmental protection of wetlands and waterways, economic efficiency, constructability, and historical resource preservation. While consideration must be given to all relevant interests (without compromising public safety), it is important to recognize that these differing interests can and often present circumstances in which adverse impacts are unavoidable. Where adverse impacts to a particular interest, or set of interests, are not avoidable, a balanced approach should seek to minimize those adverse impacts without unnecessary expense to competing interests. The availability of practicable ways to mitigate or compensate for the impacts that would be recognized for a particular alternative is also an important factor that must be considered during the criteria development and evaluation process.

Section 2 of this evaluation provides the basis of the alternatives analysis. Section 3 identifies the various alternatives developed for the project and excludes some of the alternatives from further analysis. Section 4 presents the results of the alternatives analysis based on the ability of an alternative to satisfactorily address the purpose and need of the project. Based on the anticipation of unavoidable impacts to wetland resource areas and various site constraints that limit the possibilities for wetland replication / compensation efforts, the results of a desktop study reviewing four off-site town-owned parcels is included as Section 5 of this evaluation.

[1] 302 CMR 10.06 defines dams categorized as having significant hazard potential as "Dams located where failure may cause loss of life and damage to home(s), industrial or commercial facilities, secondary highway(s) or railroad(s) or cause interruption of use or service of relatively important facilities."

2.0 BASIS OF ALTERNATIVES ANALYSIS

As indicated previously, Lake Boon Dam is considered to be structurally deficient and in overall poor condition. Provided below is the basis for which the current status of the dam has been assessed and the needs of the project have been determined. The information included in this section of the evaluation was used to inform and support the identification and conceptual development of reasonably practicable alternatives for consideration in the alternatives analysis.

2.1 Visual Inspection Deficiencies

Acton Survey & Engineering, Inc. performed an inspection of Lake Boon Dam on August 7, 2012. The inspection report described the dam as being in satisfactory condition but the evaluations contained within the report indicated the dam to be in poor condition. Based on this information, two subsequent follow-up inspections were completed: the first performed by ODS engineering consultant Tighe & Bond on February 27, 2017, and the second performed by Weston & Sampson (engaged by the Town of Stow) on November 16, 2017. The follow-up inspections each concluded that the dam was in poor condition. This shared conclusion was based on similar visual observations made during the inspections relative to specific evaluation criteria set by the ODS for the inspection of dams.

Deficiencies identified at the dam between August 7, 2012 and November 16, 2017, as indicated by the reports for the three aforementioned inspections, can be summarized as follows (in no particular order):

- Significant seepage emerging to the surface along and below the downstream embankment slope, as well from beneath the spillway culvert in the outfall area.
- Erosion of the embankment toe due to the location of the spillway outfall, which has led to the use of an informal plastic slide as a flow deflector.
- General deterioration of the spillway structure and outlet area, including corrosion of the horizontal bar (debris) rack at the inlet, deterioration of the northerly concrete abutment, an open joint separating the top from the sides at the end of the culvert section, and inadequate riprap at the toe of the embankment in the outfall area and beneath the flow deflector.
- Corrosion of the corrugated metal pipe extension insert at the downstream end of the spillway culvert and improper fitment / connection of the pipe to the rectangular box section.
- Significant tree and heavy brush growth on and within 20 feet of the dam in some areas, including the left and right ends of the embankment and along the toe of the embankment on the downstream side.
- Cracking of the grouted stone riprap next to the spillway culvert on the downstream side of the dam, suggesting movement of possible undermining, as well as evidence of settling / movement along the alignment of the spillway culvert.
- Inadequate riprap coverage and exposed bedding in some areas along the upstream slope.
- Areas of surface erosion or slope sloughing on the downstream slope of the dam embankment.

Following the inspection conducted on November 16, 2017, the Town of Stow engaged Weston & Sampson to continue performing routine follow-up inspections as a means to monitor the condition of the dam. These inspections have been performed at approximately 6-month intervals since 2018. The following is a summary list of additional deficiencies and changes identified during the inspections.

- Evidence of potential settlement and deformation of the embankment as indicated by the formation of arcuate cracks in the crest / roadway pavement and apparent sagging of the crest shoulder along the downstream edge.
- Component failure of the spillway culvert at its connection to the corrugated metal pipe extension, which allowed water flowing through the culvert to escape into the backfill (embankment) and erode the embankment soil from the inside out. This mechanism led eventually to the partial collapse of the overlying slope face into the sinkhole that formed as a result. Emergency action was taken in response to this August 2021 incident to provide a temporary stabilization with the understanding the spillway would be replaced as part of the proposed project.
- Overturning and uprooting of mature coniferous trees along and below and downstream limits of the dam in areas that remain consistently saturated from excessive seepage passing beneath the dam embankment. Pullout of large lateral root masses has caused considerable ground disturbance and further exposed saturated, sensitive soils.
- In the area downstream from the dam, an intermittent stream flowing north to Bailey's Brook has diverted itself around a fallen tree and begun to contact and erode the toe of the dam embankment.

2.2 Compliance with Dam Safety Regulations, 310 CMR 10.00

The Massachusetts DCR ODS issued a Certificate of Non-Compliance and Dam Safety Order (CONC-DSO) to the Town of Stow on April 18, 2017 for Lake Boon Dam. The CONC-DSO states that, based on the results of visual inspections, the dam does not meet accepted safety standards and is a potential threat to public safety. Required actions to be taken by the Town of Stow, as listed in the CONC-DSO, include: (1) perform a detailed 'Phase II' evaluation of the dam; (2) bring the dam into compliance by repairing, breaching, or removing; and (3) conduct follow-up inspections every 6-months until the dam is adequately repaired, breached, or removed.

The CONC-DSO issued for Lake Boon Dam is recorded at the Middlesex South Registry of Deeds. Issuance of a Certification of Compliance (COC) following adequate repair, breaching, or removal of the dam is required to discharge the CONC-DSO.

2.3 Design and Construction Deficiencies

Lake Boon Dam pre-dates the current understanding of potential failure modes for embankment dams, and relatively modern construction practices that facilitated improvements in earthwork construction and soil compaction. In addition to the foregoing deficiencies identified principally by visual inspection, the following concerns pertaining to the dam's original design and construction are also recognized:

- The capacity of the dam to safely pass the minimum required design flood inflow is insufficient.
- The spillway assembly is improperly constructed and configured.
- The dam is comprised of generally homogenous, locally available sandy fill, and does not contain a central core zone comprised of a comparatively impervious material such as clay, silt, or concrete. The membrane placed on upstream slope of the dam in 1999/2000 may provide a marginal level of seepage control benefit in the upper few of the embankment but has a limited ability to reduce long-term overall seepage.

- The dam is founded on highly pervious geologic conditions (glacial outwash plain) without an appropriate seepage barrier or control system to limit the flow of surface water seepage and groundwater under the dam.
- The dam is seismically unstable. Strong, widespread ground shaking such as that which would be expected during a significant earthquake could trigger a liquefaction response during which loose, saturated zones of soil within and potentially below the embankment experience a relatively sudden loss of strength.
- Post-construction modifications have eliminated the ability to release water impounded below a depth of approximately 12 to 14 inches from the lake's normal full operating level. These modifications resulted in the grouting or cementing of the original lower stoplogs (boards) at the spillway inlet.
- Historic photographs of the dam show that the dam embankment side slopes were once almost entirely covered in trees. When tree growth to this extent has occurred, it can be reasonably assumed that root penetrations into the dam may have caused considerable subsurface disturbance, and that it would be a significant undertaking to remove the roots. It is therefore expected that relic root structures remain in the dam and may continue to decay over time, which could provide preferential seepage pathways.

3.0 ALTERNATIVES IDENTIFICATION AND DEVELOPMENT

3.1 No Action Alternative

A no action alternative includes maintaining the current level of maintenance and operations at the dam. Repairs or improvements are not performed, and the dam remains non-compliant. This alternative does not meet the goals of the project.

3.2 Action Alternatives

3.2.1 A1: Repairs (Corrective Maintenance)

Repairs are generally limited to maintenance, in-kind replacement, or restoration of existing components and features associated with the dam, including embankments and appurtenant structures such as spillways. The intent of a repair is to restore a material deficiency to a previous condition, or to restore original functionality to a damaged or defective component. Upgrades to existing structures or facilities are generally beyond the scope of a repair program. While repairs are necessary in most cases, repairing a deficiency that is caused by an underlying, persisting condition is not a long-term solution and has the potential to exacerbate the issue.

The scope of repairs for Lake Boon Dam may include the clearing of overgrown and problematic woody vegetation from the dam; filling in and leveling cracked and depressed areas on the embankment crest and restoring the overlying pavement; replacing or augmenting lost or displaced riprap; resurfacing eroded concrete and patching of concrete spalls; etc. Repairs for Lake Boon Dam would be expected to have little impact on the surrounding area and could be performed alongside any of the other listed alternatives. For this reason, repairs (corrective maintenance) to Lake Boon Dam were not considered for further analysis and are omitted from Section 4.0 of this report.

3.2.2 A2: Alternatives to Reduce Embankment Overtopping Potential

Erosion and instability resulting from overtopping flow is a principal cause of embankment dam failure according to various dam failure and near-failure incident studies. Many early dams were constructed to accommodate floods based on the largest experienced local flood or a presumed probable maximum flood considered appropriate at the time. The combination of hazard creep[1], significant technological and analytical advances in hydrologic modeling capabilities, and improvements in the understanding of extreme floods have led to the reclassification of many dams as being hydrologically deficient. The following four action alternatives (A2.1 through A2.4) are intended to analyze alternatives for overtopping concerns.

3.2.2.1 A2.1: Raise the Dam Crest

If the terrain at a dam site and around the reservoir rim is favorable, raising a dam (i.e., establishing the top / crest of the dam at a higher elevation) without lowering the discharge capacity allow for

[1] Hazard creep relates to the development of an area downstream of dam that occurs after the construction of the dam and initial assessment of hazard potential, and may warrant a reclassification of a dam's hazard potential (e.g., from low to high). In such cases, these reclassified dams are then subject to additional regulatory requirements including increasingly conservative design standards.

the allocation of more impoundment area and volume for temporary flood storage and thus provides additional freeboard[1] during normal conditions and flood conditions.

Raising the crest of Lake Boon Dam sufficiently to store the volume of water that would otherwise be routed over the top of the embankment (Barton Road) during the regulatory design flood would be expected to cause flooding of residential properties and associated septic systems. Furthermore, the relatively low terrain relief at the left (southerly) end of the dam is not conducive to this alternative; the fill or parapet structure necessary to meet the minimum required flood storage gain would likely impact private properties not currently associated with the dam. For these reasons, raising the crest of Lake Boon Dam was not considered for further analysis and is omitted from Section 4.0 of this report.

3.2.2.2 A2.2: Lower the Spillway Control Level

Lowering the overflow control level or weir elevation for a spillway provides an effect that is similar to that of raising the crest of a dam. The increase in normal operating freeboard that is equal to the vertical height of the lowering of the spillway translates to some relative increase in flood freeboard that is attributed to the gain in reserve flood storage within the preexisting impoundment area. Since the gain in reserve flood storage occurs within the boundaries of the already-existing impoundment, this potential option can be a practical and cost-effective alternative when the reservoir does not serve an important purpose and when raising the dam would expose adjacent dwellings or facilities to greater flooding hazards.

Lowering the spillway control elevation at Lake Boon Dam would be impracticable for a number of reasons. The public opposition to a proposal that would permanently lower the lake level by 1 foot or more, as would be necessary, would be significant. As described previously, the lake provides residents of both Stow and Hudson, as well as a densely populated lake community, with valued recreational resources opportunities. Given the lake's bathymetric profile, a significant year-round lowering of the lake may render the shallow channels connecting the four basins of the lake unnavigable for motorized watercraft, which are very common on the lake in the summer months. Many private docks would likely require modifications to remain effective. For these reasons, lowering the spillway control level at Lake Boon Dam was not considered for further analysis and is omitted from Section 4.0 of this report.

3.2.2.3 A2.3: Increase the Spillway Capacity

Increasing spillway capacity to mitigate overtopping risks requires a sound understanding of the complex interaction between upgradient watershed hydrology, spillway hydraulics, and downstream flood hazards risks. Simply making a spillway bigger but keeping its fixed overflow level at the same elevation can reduce overtopping potential but the increased outflow released downstream during storm events could adversely impact buildings, facilities, and sensitive areas that would have otherwise been unaffected had the spillway size not been increased. The 100-year flood is the reference event to be used when evaluating these potential impacts, meaning that modifications to any part of a dam should not cause an increase in discharge released downstream in response to events with annual exceedance probability of 1% or more. Spillways and other forms

[1] Freeboard is defined in 302 CMR 10.03 as the vertical distance between a stated water level and the top of a dam. Flood freeboard, or residual freeboard, is the vertical distance between the spillway design flood water level and the top of the dam.

of reservoir outlet structures can be configured structurally and hydraulically in many ways. Upgrades to existing spillways that discharge to flood-prone areas often employ the use of spillway crest controls, such as bascule gates or tainter gates, construction of a secondary (auxiliary) overflow or siphon spillway or retrofitting the existing spillway with a multi-stage weir designed to engage its different levels coincident with specific storm inflows.

Site constraints including large expanses of downstream wetlands, abutting private properties, and a public road on the crest of the dam limit the viability of constructing a sufficiently sized, separate auxiliary overflow spillway. Additionally, the use of mechanical crest controls or reliance on siphons for making spillway releases is not recommended for this site. Therefore, increasing the spillway capacity at Lake Boon Dam without exceeding the current 100-year flood outflow would likely require the use of a multi-stage inlet configured to match the hydraulic response of the existing spillway for hydrologic events up to and including the 100-year flood. When subjected to higher magnitude, lower frequency flood events, the higher and larger stages of the inlet weirs would passively engage and combine with the lower service stage to provide a cumulative increase in the total discharge capacity. The conveyance conduit (pipe or box culvert) that carries the outflow from the staged inlets would need to be sized adequately. It is also expected that the combined weir length across all stages would need to be significantly greater than the existing weir length for the system to operate properly.

3.2.2.4 A2.4: Provide Overtopping Protection

Overtopping protection for an existing embankment dam is a design approach and retrofit measure that can be a practical and cost-effective way, in some cases, to address a hydrologic deficiency that may be realized upon reevaluation or revision of the design flood to a more conservative standard (e.g., 100-year flood vs. 500-year flood). Alternatives for overtopping protection may use a variety of different materials, though not all are feasible in every situation. Some of the more common systems utilize roller-compacted concrete, conventional concrete, precast concrete blocks, articulated concrete blocks, reinforced riprap, high performance turf reinforcement mats, gabions, and various geosynthetic materials. Once properly installed, the area of the embankment with overtopping protection is able to function as an auxiliary (secondary) spillway during extreme flood events.

An overtopping protection system for Lake Boon Dam could potentially utilize any of the aforementioned materials depending on the expected hydraulic forces that would act on the embankment surface during the design overtopping event. However, regardless of type, embankment dam overtopping protection systems should be reserved for events with relatively low annual exceedance probabilities. Some important engineering and design considerations for embankment dam overtopping protection systems that may be particularly applicable and significant to a decision to pursue overtopping protection for Lake Boon Dam include the following:

- Surface discontinuities and interruptions can produce irregular hydraulic flow patterns, negative pressure (uplift) zones, and turbulence above the protection system. These phenomena are difficult to predict and can lead to a premature failure of the protection system if their affects are not adequately understood.
- Overtopping protection can involve a significant change to the visual appearance of the structure.

- Maintenance of the protection system is essential for reliable performance. Depending on the type of overtopping protection system, maintenance costs could be a significant long-term expense.
- Overtopping flows should be directed to the existing downstream channel or receiving area and away from the toe of the dam to reduce the risk of embankment erosion.

3.2.3 A3: Alternatives to Address Spillway Condition and Construction Flaws

A spillway is a crucial dam appurtenance, and its satisfactory performance is depended on to maintain lake or reservoir levels within safe ranges. Many dams utilize more than one spillway. For dams that utilize only one spillway, and which also do not incorporate any other outlets or means to make deliberate releases, the robustness and reliability of the spillway is arguably even more important. As evidenced by the August 2021 incident that indicated accelerated deterioration of the spillway, remedial action is necessary to provide a safe and reliable spillway system. The following three alternatives (A3.1 through A3.3) are intended to mitigate these concerns.

3.2.3.1 A3.1: Improve the Existing Spillway In-Place

Portions of the existing spillway are original to the dam and likely over 150 years old. Inspection of the spillway interior and visible exterior faces indicate that in-place structural improvements should, at a minimum, include removal and replacement of the inlet control structure (portion of spillway containing the stoplogs), removal of the corrugated metal pipe extension, and replacement of pipe extension with a concrete box culvert section matching the interior dimensions of the existing culvert body remaining below Barton Road.

The decision to pursue this alternative would need to consider the level of uncertainty regarding the long-term integrity of the main culvert section that would remain. Since this alternative would not propose to replace the main culvert section below Barton Road, it is also anticipated that there would be little to no opportunity to design the replacement inlet structure to accommodate increased spillway capacity. It is therefore assumed that this alternative would not alter the hydraulic behavior of the spillway or provide any significant increase in spillway capacity. For these reasons, improving the existing spillway in-place was not considered for further analysis and is omitted from Section 4.0 of this report.

3.2.3.2 A3.2: Remove Existing Spillway and Replace in Present Location

Complete replacement of the spillway in its existing location provides for the opportunity to modify the design of the spillway to (1) better suit the hydrologic demands that the dam is subject to, (2) potentially provide enough outflow capacity increase to accommodate the prescribed 500-year design flood inflow, and (3) reduce uncertainty in the design since all components of the existing spillway assembly would be completely removed.

3.2.3.3 A3.3: Remove Existing Spillway and Replace in New Location

Complete replacement of the existing spillway with a new spillway at an alternate location would provide the same advantages, in terms of desired outcome, as the A3.2 alternative, and with the additional advantage of being able to site the new spillway at a preferred location.

3.2.4 A4: Alternatives to Reduce and Control Seepage

Seepage, in the context of water storage dams, is the subsurface flow of water through the intergranular spaces between soil particles, or the concentrated flow of water along a more direct path, such as through bedrock joints or along a buried structural contact. Seepage is understood to occur at almost all water storage dam sites to some extent, though it is the extent to which it occurs and whether or not it is adequately controlled that is usually of primary concern.

The presence of uncontrolled seepage through an embankment and/or beneath an embankment dam (underseepage) is a prerequisite for numerous potential failure modes and mechanisms categorized as "internal erosion" processes. Generally speaking, internal erosion is the subsurface removal (erosion) of soil particles by seepage action. Internal erosion can lead to the formation of voids within a soil mass, increased seepage rates over time, and instability of overlying embankments and structures.

It is well-documented in engineering literature and practice that early dams, such as Lake Boon Dam, were / are more prone to internal erosion failures. As stated in FEMA Publication P-1032: *Evaluation and Monitoring of Seepage and Internal Erosion* (2015), internal erosion through and under embankments poses one of the greatest threats to satisfactory performance of these types of dams. Early dams were often constructed on sand and did not incorporate any defensive measures for underseepage, such as cutoff walls or extended seepage paths. The following four alternatives (A4.1 through A4.4) are intended to mitigate these concerns.

3.2.4.1 A4.1: Embankment Filter Zones

Properly designed sand and fine gravel filters placed within the downstream section of an existing embankment dam are defensive measures that reduce the potential for internal erosion. These designated zones within or below an embankment dam provide controlled, filtered exits for seepage to pass through while retaining soil particles carried to the filter face. These systems also provide an engineered path for the filtered seepage to be carried out of the embankment or foundation with less resistance and less potential to contribute to slope instability. Filters are widely regarded as indispensable design elements and are often required by most agencies overseeing the construction of new embankment dams and rehabilitations of existing embankment dams.

The layout and design of filters for existing embankment dams are highly dependent on the existing site conditions. Based on the available geotechnical information, it is likely that a filter installation for Lake Boon Dam would need to consider significant seepage volumes occurring through the relatively thick, sandy glacial outwash layer below the dam, and would need to be located far enough into the dam to prevent the line of saturation (phreatic surface) from emerging through the downstream slope face (as it currently does). To accomplish this, one of the following would likely need to occur: the downstream slope of the dam is removed and replaced to accommodate the filter zones within the existing embankment footprint, or the filter zones are placed against the existing downstream slope face and covered with additional fill material. The latter would be expected to result in a substantial expansion (in the downstream direction) of the dam's footprint.

3.2.4.2 A4.2: Seepage Cutoff Wall

A seepage cutoff wall is a common mitigation measure used in embankment dams. 'Positive cutoff' is attained when seepage occurring through the embankment and its foundation is effectively minimized by penetrating the bottom of the cutoff wall into sound bedrock. The result is a vertically and horizontally continuous flow barrier that is concealed beneath the surface. Conventionally-

construced cutoff walls placed in large (tall) modern dams utilize relatively low-cost and readily available materials such a cement-bentonite and soil-cement mixtures installed using various trenching and mixing methods. These installations often require specialized equipment and expertise, and only become cost-effective when working across long alignments and to significant depths. Cutoff walls placed in smaller dams tend to utilize methods that are local to the geographic area within which the project site is located, unless specific project demands warrant the use of a different approach.

Based on the location, height, and length of Lake Boon Dam, and the depth to a relatively impervious stratum below the dam embankment, it may be possible and cost-effective to install a soil-cement or soil-cement-bentonite wall using in-situ mixing methods. Consideration would need to be given to work area constraints, existing soil conditions and composition, proximity to wetlands and water bodies, and local contractor expertise. If this approach to a cutoff wall is not feasible, an alternative approach would be to use sheet piles installed by vibrating or hydraulically pressing in-place. When working in environmentally sensitive areas, sheet piles are often preferred over methods that can result in inadvertent releases of cement and bentonite mixtures into wetlands and water bodies. Considerations for sheet piling installations include the possible presence of subsurface obstructions (e.g., boulders), thick and dense soil layers, and vibrations generated by the installation process (if vibratory installation is used). Steel sheet piles are the most common form, but sheet piles manufactured from composites and durable plastics such as vinyl are also available.

3.2.4.3 A4.3: Permeation Grouting

Permeation grouting (also referred to as chemical grouting or pressure grouting) is a procedure whereby low-viscosity, non-particulate grouts (chemical grouts) are injected into soil and/or rock masses. Permeation grouting in soil effectively transforms the original soil into a hardened mass with increased strength and reduced permeability. When applied to dams specifically, permeation grouting and similar grouting technologies are often used to treat fractures in a bedrock foundation (foundation grouting) below a dam; however, permeation grouting or similar grouting technologies are not typically used to mitigate widespread seepage occurring through an embankment dam or through a significant thickness of highly pervious soil underlying the dam. The following additional considerations and potential limitations concerning grouting in soil embankments are reported in available literature:

- Grouting in embankment dams (i.e., within the embankment itself) has the potential to hydraulically fracture the embankment soils if not carefully performed. This could further result in advertent grout releases to sensitive areas adjacent to the work site.
- Low-viscosity chemical grouts required to permeate soils can be inadvertently mobilized by seepage flows and dispersed downstream to locations outside of the target area.
- Grouting has the potential redirect seepage flows and leave 'windows' of untreated soil that could then be subjected higher seepage velocities and increased internal erosion potential.

For these reasons, permeation grouting was not considered for further analysis and is omitted from Section 4.0 of this report.

3.2.4.4 A4.4: Upstream Impervious Blanket

Upstream blankets are layers of impervious or relatively impervious materials that line the upstream face of an embankment and extend horizontally upstream across the reservoir, pond, or lake bottom.

The most common upstream blankets are constructed of soil (usually clay) or geomembrane products and require a separate cover material to protect the blanket. Upstream blankets function as defensive measures generally by lengthening the seepage pathway, or the distance that water must travel to the downstream side of the dam, thereby reducing seepage velocities, exist gradients, and internal erosion potential.

Installation of a geomembrane liner on the upstream side of Lake Boon Dam was performed in 1999/2000. Based upon available information, it appears that the liner was not extended beyond the toe of the upstream slope. While the presence of the liner likely provides some protection to the embankment, the current status of the dam with respect to seepage performance indicates that significant seepage volumes are able to bypass the liner. The profile of the lake bottom in front of the dam, which continues to descend below the base of the dam to the bottom of a glacial kettle, is generally not considered conductive to the placement of an upstream blanket. For these reasons, the use of an upstream impervious blanket was not considered for further analysis and is omitted from Section 4.0 of this report.

3.2.5 A5: Alternatives to Improve Embankment Stability

Various factors contribute to the stability, or instability, of an embankment dam. Embankment dams must demonstrate satisfactory performance for a variety of loading conditions ranging from normal static loading to design flood loading and seismic loading. The degree of stability is typically expressed in terms of a safety factor (factor of safety), which is required to comply with a minimum value prescribed for the analyzed loading condition. 302 CMR 10.14 prescribes minimum factors of safety for dams subject to the Massachusetts Dam Safety Regulations. Loading conditions to be analyzed for all dams, as applicable, include the end-of-construction condition, sudden drawdown condition, post-construction normal loading / steady-state seepage condition, steady-state seepage condition with a surcharge pool, and earthquake loading. Minimum required factor of safety values are highest for the most frequent loading conditions to lowest for the least frequent loading conditions.

The stability of Lake Boon Dam's downstream slope is inadequate based on geotechnical analysis and field observations of slope movement and overall poor slope performance. Contributing factors include loose saturated zones within the embankment that offer little resistance to shearing, an elevated phreatic surface (line of saturation) that exists the slope face, and a relatively steep slope face. Furthermore, loose, saturated soils within the embankment are susceptible to seismic-induced liquefaction. The following two alternatives (A5.1 and A5.2) are alternatives to mitigate concerns regarding the instability of Lake Boon's downstream slope.

3.2.5.1 A5.1: Downstream Slope Flattening

Flattening a soil slope (e.g., going from a 2:1 slope to a 3:1 slope) is a reliable approach to improve embankment stability and is a common technique used during the rehabilitation of embankment dams. Space constraints and the potential impacts to environmental resource areas are factors that need to be considered. Without changing the alignment of Lake Boon Dam or narrowing the crest, flattening the downstream slope by any substantial degree would require the filling of bordering vegetation wetlands, land under water, and adjacent floodplain areas.

3.2.5.2 A5.2: Downstream Stability Berm

Stability berms are constructed against the lower portion of an embankment slope when the addition of weight as a resisting mass is necessary to intercept a potential failure plane with a low factor of

safety. Stability berms are often constructed to improve the seismic response of an embankment dam or as a cover over the top of a seepage filter installation. The decision to pursue a stability berm at Lake Boon Dam would likely be subject to the same considerations as the A5.1 alternative (downstream slope flattening).

3.2.6 A6: Dam Removal Alternative

Dams are inherently hazardous structures and their presence throughout the landscape has had lasting effects on river and stream ecology. Removal of ageing dams is becoming increasingly prevalent, particularly in Massachusetts, as a means to restore ecological connectivity, remove unnecessary public safety hazards, and eliminate the economic burden and liability carried by their owners. The removal of a dam that is subject to the Massachusetts Dam Safety Regulations is defined, per 302 10.03, as the physical removal or engineered breaching of a dam to the extent that no water can be impounded by the dam. Dams that no longer serve their original purpose or provide any public benefit, including flood control, can often be considered for removal pending various studies and investigations into the particular site conditions and feasibility of a dam removal project. Lake Boon Dam, however, is not within this category. Removal of Lake Boon Dam would adversely impact numerous residential drinking water wells and effectively eliminate a recreational asset that is fundamentally integrated into the Stow and Hudson communities, and their history.

The scale of the ecological benefits often sought and realized by dam removal projects would also not be as significant in the case of Lake Boon Dam. If the dam were to be removed, the lake would return to a single-basin glacial kettle pond supplied chiefly by the underlying groundwater aquifer. Fish migration does not presently occur into or out of Lake Boon, and removal of the dam would be unlikely to change this. For these reasons, removal of Lake Boon Dam was not considered for further analysis and is omitted from Section 4.0 of this report.

4.0 ALTERNATIVES ANALYSIS

Section 3 identified a range of alternatives developed for various project components. Several of the identified alternatives were judged to be either inadequate in terms of their ability to meet the needs of the project or not practicable for the reasons stated. Alternatives combining the various project components considered for further analysis are summarized in the following table.

	Alternatives Considered for Further Analysis			
	Alternatives to Reduce Embankment Overtopping Potential	Alternatives to Address Spillway Condition and Construction Flaws	Alternatives to Reduce and Control Seepage	Alternatives to Improve Embankment Stability
Alternative 1	A2.4: Provide Overtopping Protection	A3.2: Remove Existing Spillway and Replace in Present Location	A4.1: Embankment Filter Zones	A5.1: Downstream Slope Flattening
Alternative 2	A2.3: Increase the Spillway Capacity	A3.3: Remove Existing Spillway and Replace in New Location	A4.2: Seepage Cutoff Wall	A5.2: Downstream Stability Berm
Alternative 3	A6: Dam Removal			

4.1 Scope Development

In order to meets the needs of the project, one alternative from each of the general categories presented in the table above was selected and combined into a conceptual construction scope. The following two alternative constructions scopes were developed based on this process.

4.1.1 Alternative #1

Alternative #1 is the combination of A2.4 (provide overtopping protection), A3.2 (remove existing spillway and replace in present location), A4.1 (embankment filter zones), and A5.1 (downstream slope flattening).

4.1.2 Alternative #2 (Proposed Project)

Alternative #2 is the combination of A2.3 (increase the spillway capacity), A3.3 (remove existing spillway and replace in new location), A4.2 (seepage cutoff wall), and A5.1 (downstream slope flattening).

4.1.3 Alternative #3

Alternative #3 consists of the removal of Lake Boon Dam.

4.2 Evaluation of Alternative #1

4.2.1 Construction Challenges and Potential Impediments

Alternative #1 could be constructed but would require a substantial temporary drawdown of the lake and continuous bypassing of lake inflow over the dam to facilitate replacement of the spillway and excavation on the downstream side of the dam. The temporary drawdown would be expected to impact numerous residential wells supplying members of the Lake Boon community with potable water as well

as interrupt almost all forms of recreation on the lake. The duration of impact would likely be on the order of 4 to 6 months. During this time, the Town of Stow would need to coordinate bottled water deliveries to affected residents. Significant public opposition to any long-duration temporary drawdown below the current winter drawdown level would be expected. It is also anticipated that abutting landowners would be constantly exposed to the noise of large diesel-powered pumps operating continuously to maintain the drawdown, and that staging of the pumps such that they do not create persistent construction obstacles would be challenging.

4.2.2 Impacts to Wetland Resources

It is expected that impacts to wetland resource areas would be unavoidable for Alternative #1. The temporary drawdown would expose significant expanses of land under water and would temporarily interrupt the shallow navigable channels connecting the four basins of the lake. One potential adverse effect of this, if done during warmer months, would be increased water temperatures in the second, third, and fourth basins associated with longer residence times. Warming water temperatures would be expected to further degrade the lake's already-impacted ecological health. On the downstream side of the dam, the placement of fill in bordering vegetated wetlands, bordering land subject to flooding, and land under water (Bailey's Brook) would be required to flatten the downstream slope for stability improvements. A significant length of intermittent stream in the downstream area would also be filled in, necessitating a realignment of the streambed.

4.2.3 Impacts to Historic Resources

The installation of overtopping protection would likely require the removal of a historic stone wall (STW.912) extending onto the dam crest along the edge of Barton Road from the property of 81 Barton Road. If left in-place, this wall could project into the flow path and cause a failure of the overtopping protection. Additionally, conflicts with guardrails along the edge of the crest, which are necessary for driver safety, would need to be reconciled since their presence during and overtopping event could also cause the premature failure of an overtopping protection system. Members of the community Lake Boon community have expressed an overwhelming desire to maintain wooden guardrails at the dam to preserve the historic appearance and scenic attributes of the area. Furthermore, as indicated previously, overtopping protection can involve a significant change to the visual appearance of the structure.

4.2.4 Cost

Estimated order-of-magnitude costs to construct Alternative #1 are anticipated to be within the range of approximately $3,000,000 to $4,000,000. This estimate assumes that articulate concrete blocks are selected as the overtopping protection system.

4.2.5 Overall Safety Improvement and Compliance with 302 CMR 10.00

Alternative #1 would be expected to address the identified dam safety deficiencies adequately to comply with the Massachusetts Dam Safety Regulations. However, while the use of overtopping protection can be a practicable and cost-effective option to address hydrologic deficiencies in some cases, the decision to pursue overtopping protection in lieu of other viable options, such as increased spillway capacity, must give strong consideration to the potential risk of failure of the protection system. Since their use is generally limited to flooding events with a relatively low probability of occurring, few overtopping protection systems have seen significant and repeated use in the field.

4.3 Evaluation of Alternative #2 (Proposed Project)

4.3.1 Construction Challenges and Potential Impediments

With the use of sheet piles as the seepage cutoff wall, Alternative #2 offers unique opportunities and synergies with other aspects of the proposed construction. Placement of a sheet pile cutoff wall along the upstream side of the dam could serve as both a permanent seepage reduction measure and provide temporary earth support during construction, thus enabling the necessary excavation into the downstream embankment to occur without drawing down the lake.

4.3.2 Impacts to Wetland Resources

Similar to Alternative #1, it is expected that impacts to wetland resource areas would be unavoidable for Alternative #2. However, locating the sheet piles on the upstream side of the dam would facilitate a modest upstream shift in the alignment of the dam crest (Barton Road), which in turn could accommodate the same downstream slope configuration as Alternative #1 but with reduced permanent impacts to bordering vegetated wetlands and bordering land subject to flooding. Realigning a short section of the intermittent stream in the downstream area would still be required, but the length of impact would be reduced compared to Alternative #1.

4.3.3 Impacts to Historic Resources

Alternative #2 is not expected to have significant detrimental impact to historic resources. The historic stone wall (STW.912) extending onto the dam crest from the property of 81 Barton Road should not need to be removed or modified since a larger spillway configured to match existing outflows for hydrologic events up to an including the 100-year flood will not necessitate the need for an overtopping protection system. The ability to exclude overtopping protection without compromising the hydrological performance of the dam allows for the use of guardrails without concern for their potential to cause premature failure of an overtopping protection system. Alternative #2 would not be expected to result in appreciable changes to the physical appearance of the dam with the exception of the sheet piles installed along the upstream edge, which would effectively become the new shoreline along the majority of the dam length. However, to adequately protect the tops of the sheet piles, they would need to be covered with a concrete cap section. This cap section could be designed to conceal most, if not all, of the exposed sheet pile face that may otherwise be visible from the lake.

4.3.4 Cost

Estimated order-of-magnitude costs to construct Alternative #2 are anticipated to be within the range of approximately $3,500,000 to $4,500,000. While the sheet piling would be an added expense compared to Alternative #1, this expense would at least partly offset by the combined cost of the overtopping protection and extensive pumping equipment, including fuel necessary to maintain a lake drawdown for an extended period of time. This estimate includes the use of steel sheet piles as opposed to other types of sheet piles.

4.3.5 Overall Safety Improvement and Compliance with 302 CMR 10.00

Alternative #2 would be expected to address the identified dam safety deficiencies adequately to comply with the Massachusetts Dam Safety Regulations. Inclusion of the sheet piles into the permanent construction would provide a level of safety improvement compared to Alternative #1. Additionally, the ability to convey all required spillway outflows without passing flow over the embankment is advantageous compared to Alternative #1.

4.4 Evaluation of Alternative #3

4.4.1 Construction Challenges and Potential Impediments

Removal of Lake Boon Dam would adversely impact numerous residential drinking water wells and effectively eliminate a recreational asset that is fundamentally integrated into the Stow and Hudson communities, and their history.

4.4.2 Impacts to Wetland Resources

Similar to Alternatives #1 and #2, it is expected that impacts to wetland resource areas would be unavoidable for Alternative #3. The scale of the ecological benefits often sought and realized by dam removal projects would also not be as significant in the case of Lake Boon Dam. If the dam were to be removed, the lake would return to a single-basin glacial kettle pond supplied chiefly by the underlying groundwater aquifer. The removal of the dam would result in impacts to the wetland resource areas immediately adjacent to the dam and would alter upstream wetland resource area impacts as well. Fish migration does not presently occur into or out of Lake Boon, and removal of the dam would be unlikely to change this.

4.4.3 Impacts to Historic Resources

Alternative #3 would have impacts to historic resources. The historic stone wall (STW.912) extending onto the dam crest from the property of 81 Barton Road may need to be removed or modified. The dam itself is a historic structure, and dam removal would result in the permanent loss of the historic structure.

4.4.4 Cost

Estimated order-of-magnitude costs to construct Alternative #3 are anticipated to be within the range of approximately $2,000,000 to $3,000,000, which would include studies and the need to reinstall some form of bridge or culvert so that transportation can continue in this area.

4.4.5 Overall Safety Improvement and Compliance with 302 CMR 10.00

This alternative would remove the dam; however, a bridge or culvert would still need to be installed so that transportation can continue in this area.

4.5 Recommendations

Based on the reasons outlined above, Alternative #2 is the recommended course of action for Lake Boon Dam and was selected as the preferred alternative.

5.0 WETLAND COMPENSATION / MITIGATION

The recommended course of action for Lake Boon Dam will result in unavoidable impacts to Bordering Vegetated Wetland (BVW) that can only be minimized to a reasonable extent. In an effort to compensate for the remaining impacts that are anticipated, an on-site replication design for BVW was attempted and sited in the southwestern corner of the 0 Barton Road parcel upon which much of the project site is located. This small area of upland located in the riverfront area associated with Bailey's Brook appears to be the only potentially viable location for an on-site replication effort. However, it was recognized during the preliminary design process for the replication area that the potential for causing unnecessary disturbance to forested uplands and existing wetlands to-remain (in order to access the replication area) was high, and that the site in general is not particularly conductive to replication efforts for BVW or flood storage compensation. The follow additional impediments to an on-site replication effort were also realized:

- Space constraints associated with the property (and the fact that much of the property already consists of wetland resource areas)
- Dense tree canopy adjacent to the project site
- The topography on site and the significant cut that would be required to achieve wetland hydrology
- Access issues, the need to access through private property or to temporarily cross BVW to construct a replication area

Given these project site constraints, an extensive desktop evaluation was conducted to explore the feasibility of constructing a wetland replication area off-site.

A desktop analysis of local parcels of land within the Town of Stow was performed to identify any parcels that may be suitable for off-site wetland replication area creation. Parcels within the Town of Stow that border on Bailey Brook and the Assabet River were assessed. There are only a few parcels bordering on Bailey Brook aside from the project site, and all are privately owned. Parcels along the Assabet River are generally either privately owned, owned by the Town of Hudson, the U.S. Department of the Interior (Assabet River Wildlife Refuge), Honey Pot Orchards, or the Stow Conservation Trust, a non-profit organization.

A list of parcels owned by the Town of Stow that border the Assabet River was compiled. Four town-owned parcels were identified as potential replication area sites. Each of those sites was then further screened for suitability based on the following factors, following the guidance from the Massachusetts Inland Wetland Replacement Guidelines (September 2022)[1]:

- Proximity to impact site
- Topography / steepness of terrain
- Presence of existing wetlands to tie into on the parcel
- Access to the potential wetland replication site

[1] Massachusetts Department of Environmental Protection. (September 2022). Massachusetts inland wetland replacement guidelines. Retrieved from https://www.mass.gov/doc/massachusetts-inland-wetland-replacement-guidelines/download

- Amount of tree clearing that would be required

The evaluations revealed that each parcel presented significant challenges. Concerns ranged from the significant ecological impact of tree clearing, accessibility issues that would necessitate the negotiation of easements through private land, and existing land use that renders such development inappropriate.

Each of the four sites that were assessed are described in more detail below.

5.1 0 Gleasondale Road, Stow, MA (Property ID: 000U-7 0034-2)

This forested parcel is surrounded by wetlands bordering on the Assabet River to the north and east and is bordered by private residential properties to the south and west. There is one potential access point from Gleasondale Road, where there is a gap in between the residential properties, however, a guardrail along the side of the road followed by a steep roadway embankment down into the forest would make access in this location precarious. Additionally, the whole site is forested, and access to the site would not only require removal of the guardrail and grading of the roadway embankment slope but would also require extensive tree removals. For these reasons, the site was not further evaluated.

5.2 0 Joanna Drive, Stow, MA (Property ID: 00R-13 011A-A)

Access to this site appears possible from Joanna Drive. The site is bounded to the north by residential land, to the west by additional residential areas, to the east by undeveloped forested land, and to the south by the Assabet River. Access to the site and construction of the replication area would require extensive tree removals. For this reason, the site was not further evaluated.

5.3 0 Apple Blossom Lane, Stow, MA (Property ID: 00R-14 006A-G)

This site borders on the Assabet River and contains existing MassDEP-mapped wetlands. However, the site is surrounded by private properties and the Assabet River, which make access to the site infeasible. For this reason, the site was not further evaluated.

5.4 0 Brookside Avenue, Stow, MA (Property ID: 00R-29 000105)

This site consists of the Stow Town Forest which is protected open space. There is also limited access to the site based on surrounding private residential properties, and the fact that much of the forest is already existing wetland. Thus, access to the site would likely require crossing existing wetlands to construct the replication area. Additionally, substantial tree removals would be required. For these reasons, the site was not further evaluated.

5.5 Conclusion

For these reasons, none of the off-site town-owned parcels were pursued further for potential replication area construction. The Massachusetts Inland Wetland Replacement Guidelines indicate that whenever possible, replication areas should not be located in high quality upland areas such as mature forests. Unfortunately, all of the town-owned parcels that border the Assabet River are generally dominated by mature forest cover, which in itself provides valuable habitat.

Removing trees and disturbing these established ecosystems to construct a wetland replication area would not only undermine the habitat integrity for numerous species but also negate the broader environmental benefits these forests provide. Mature forests are invaluable for carbon sequestration, playing a crucial role in mitigating the impacts of climate change by absorbing carbon dioxide from the

atmosphere. Furthermore, these forests contribute to the maintenance of air and water quality, soil stabilization, and offer recreational and aesthetic values to the community. Given these considerations, the decision to avoid using areas of mature upland forest for wetland replication aligns with a holistic approach to environmental stewardship and recognizes the counterproductive nature of sacrificing high-quality upland habitats for wetland creation, especially when such actions could result in net ecological losses. This approach is consistent with the Massachusetts Inland Wetland Replacement Guidelines, which acknowledge that "in some cases, it may not be feasible to replace wetlands, for instance, where a wetland replacement is expected to be of marginal quality, or wetland replacement would come at the expense of high-quality upland habitat (e.g., forest)."

Appendix D

Site Maps

N W E S

1,000 500 0 1,000 Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

Limit of Work

FIGURE 1

Lake Boon Dam
Stow, MA

USGS Topographic Map

Weston & Sampson

Path: \\wse03.local\WSE\Projects\MA\Stow, MA\Lake Boon Dam\11 Rehab Design and Permitting\07 - Permitting\00_Joint Appendices\Appendix C - Project Maps\LakeBoonDam\LakeBoonDam.aprx **User:** Page.Hailey **Saved:** 3/4/2024 10:45 AM **Opened:** 3/4/2024 10:46 AM

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

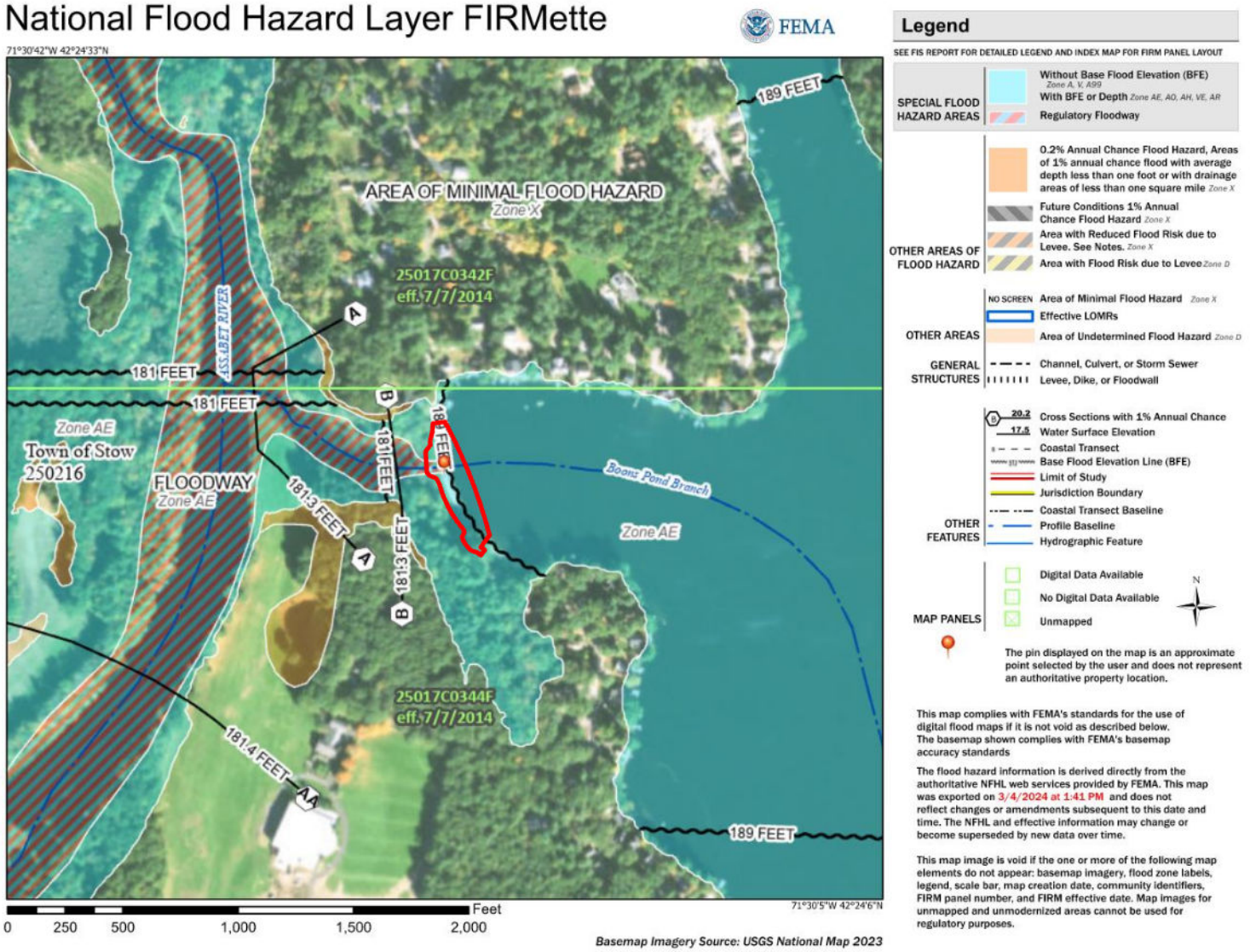
Limit of Work
Limit of Work
MassDOT Roads
MassDOT Roads
DEP Wetlands
Marsh/Bog
Wooded marsh
Cranberry Bog
Salt Marsh
Open Water
Reservoir (with PWSID)
Tidal Flats
Beach/Dune
Article 97 Land
Article 97 Land
ACECs
ACECs
NHESP Estimated Habitats of Rare Wildlife
NHESP Estimated Habitats of Rare Wildlife
NHESP Priority Habitats of Rare Species
NHESP Priority Habitats of Rare Species
NHESP Certified Vernal Pools
NHESP Certified Vernal Pools
NHESP Potential Vernal Pools
NHESP Potential Vernal Pools
Cold Water Fisheries
Cold Water Fisheries
Outstanding Resource Waters
Public Water Supply Contributor
ORW for ACEC
ORW for both Water Supply and Other

FIGURE 2

Lake Boon Dam
Stow, MA

Environmental Receptors Map

Weston & Sampson



Legend

Limit of Work

FIGURE 3

Lake Boon Dam
Stow, MA

FEMA Map

Weston & Sampson

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

Limit of Work
- Limit of Work

MassDOT Roads
- MassDOT Roads

MassHistoric Commission Inventory (Points)
- National Register of Historic Places
- Preservation Restriction
- Massachusetts Historic Landmark
- Local Historic District
- NRHP and LHD
- Inventoried Property

MassHistoric Commission Inventory (Areas)
- MHC National Register of Historic Places
- MHC Preservation Restriction
- MHC Massachusetts Historic Landmark
- MHC Local Historic District
- MHC NRHP and LHD
- MHC Inventoried Property

Assessor's Parcels
- Assessor's Parcels

FIGURE 4

Lake Boon Dam
Stow, MA

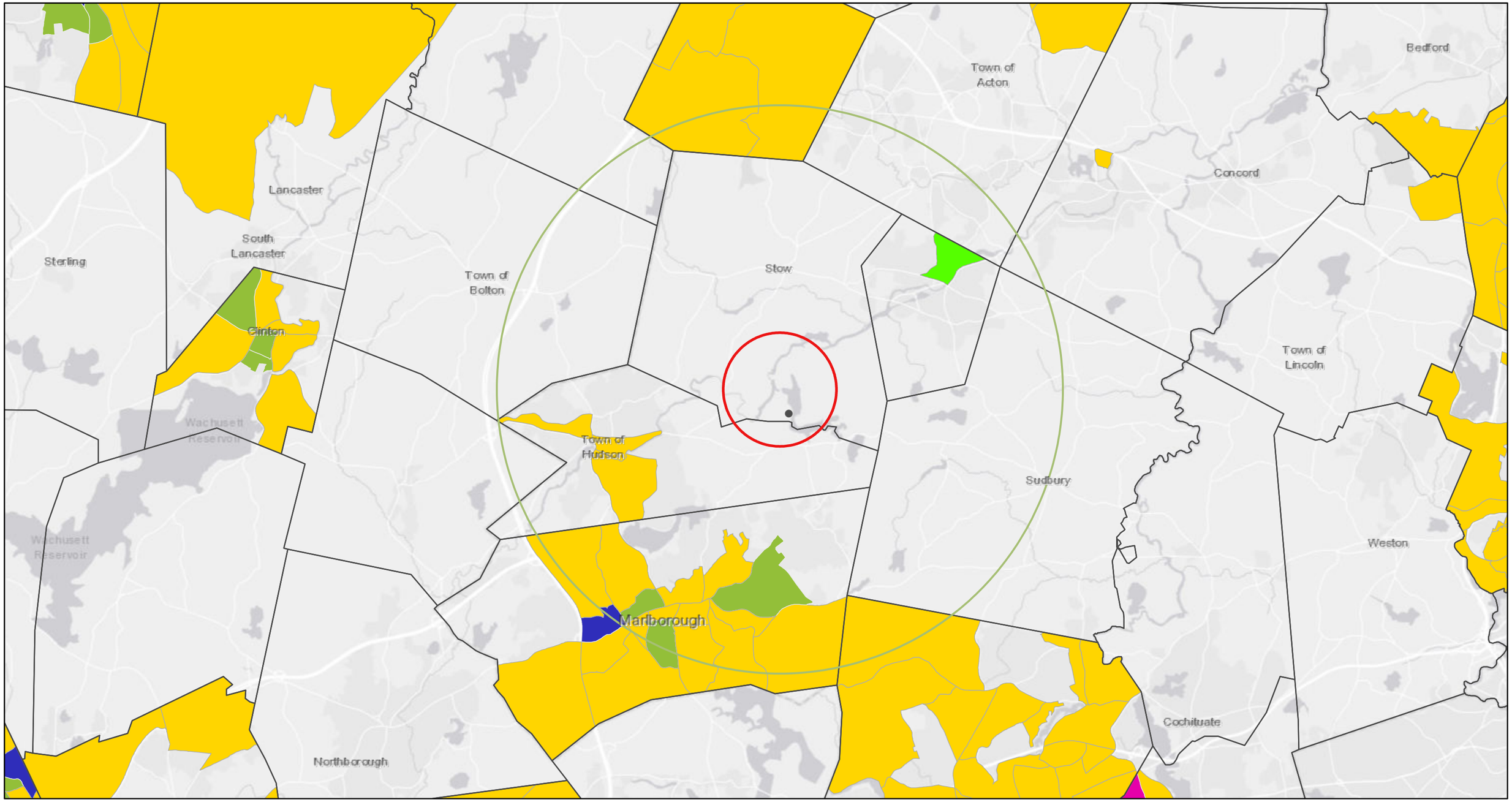
Massachusetts Historic Resources

Weston & Sampson

Appendix E

Environmental Justice

2020 Environmental Justice Neighborhoods



2/21/2024, 12:42:51 PM

1:144,448

Distance & Direction - Circle Graphics

- 1 Mile Radius
- 5 Mile Radius
- MA Municipalities

MA 2020 Environmental Justice Block Groups

- Minority: the block group minority population is >= 40%, or the block group minority population is >= 25% and the median household income of the municipality the block group is in is < 150% of the Massachusetts median household income
- Income: at least 25% of households have a median household income 65% or less than the state median household income
- Minority and Income
- Minority and English isolation
- Minority, Income and English isolation

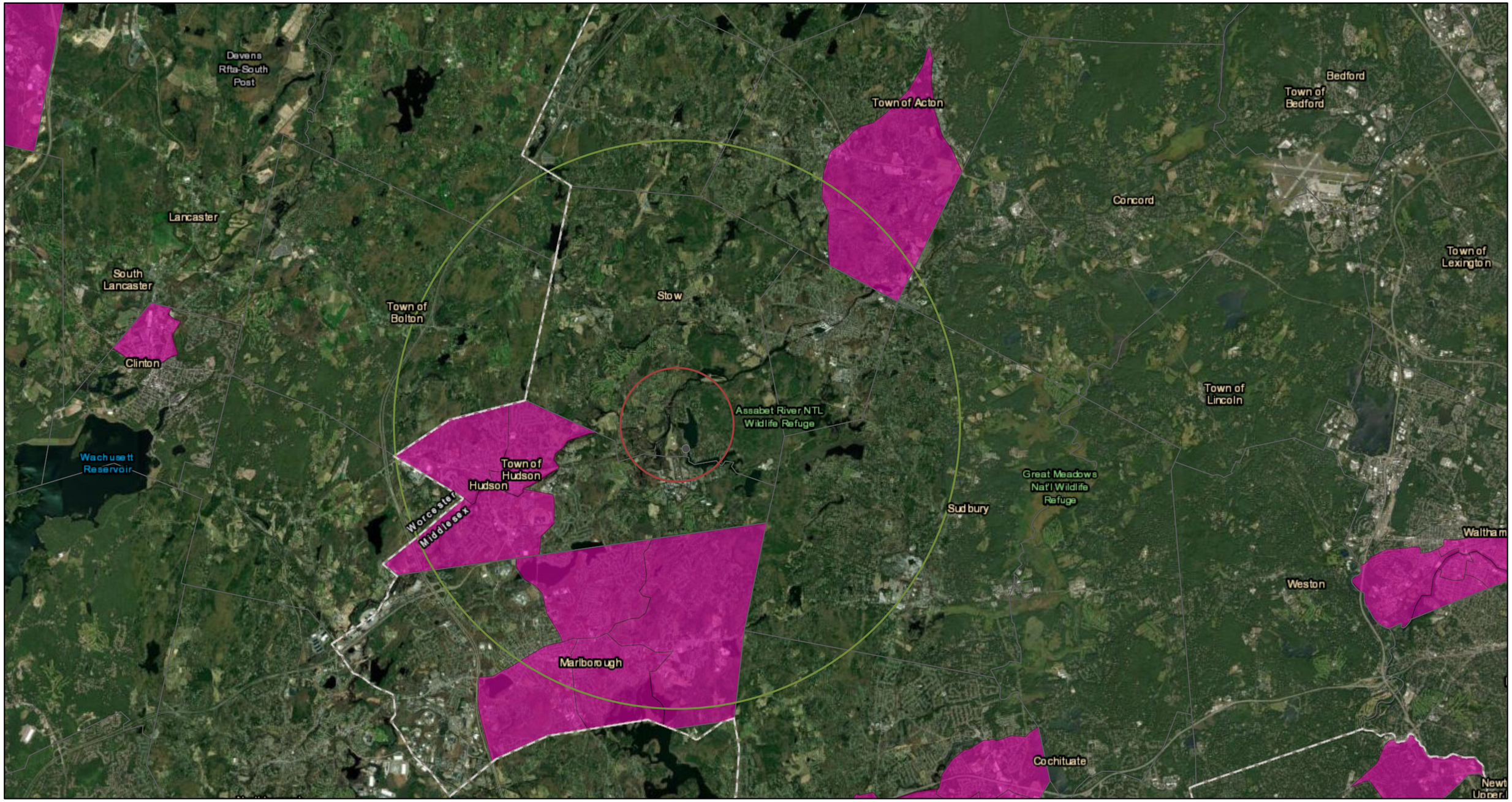
0 1.25 2.5 5 mi

0 2 4 8 km

MassGIS, Esri, HERE, Garmin, USGS, EPA, NPS, Esri, HERE, NPS

Geographic Area Name	Municipality	Total Poputation	Non-Hispanic White Alone	Percent Minority	Block Group Median 2020 Household Income	EJ Criteria Description
Block Group 2, Census Tract 3641.01, Middlesex County, Massachusetts	Maynard	1347	1139	15.44172235	55063	Income
Block Group 4, Census Tract 3839.04, Middlesex County, Massachusetts	Framingham	2143	1580	26.27158189	68005	Minority
Block Group 3, Census Tract 3223, Middlesex County, Massachusetts	Hudson	1513	1020	32.58426966	55938	Minority
Block Group 1, Census Tract 3222, Middlesex County, Massachusetts	Hudson	1872	1327	29.11324786	111667	Minority
Block Group 2, Census Tract 3224, Middlesex County, Massachusetts	Hudson	1436	932	35.09749304	68793	Minority
Block Group 3, Census Tract 3213.01, Middlesex County, Massachusetts	Marlborough	1168	569	51.28424658	64055	Minority
Block Group 2, Census Tract 3211, Middlesex County, Massachusetts	Marlborough	2400	1401	41.625	45757	Minority and income
Block Group 3, Census Tract 3212, Middlesex County, Massachusetts	Marlborough	1835	913	50.24523161	96210	Minority
Block Group 2, Census Tract 3212, Middlesex County, Massachusetts	Marlborough	2010	1284	36.11940299	95746	Minority
Block Group 4, Census Tract 3212, Middlesex County, Massachusetts	Marlborough	1073	794	26.00186393	108802	Minority
Block Group 1, Census Tract 3213.01, Middlesex County, Massachusetts	Marlborough	1306	605	53.67534456	63606	Minority
Block Group 5, Census Tract 3216, Middlesex County, Massachusetts	Marlborough	1852	872	52.91576674	107361	Minority
Block Group 2, Census Tract 3215, Middlesex County, Massachusetts	Marlborough	1641	1095	33.27239488	59028	Minority
Block Group 4, Census Tract 3215, Middlesex County, Massachusetts	Marlborough	1740	1131	35	119167	Minority
Block Group 2, Census Tract 3216, Middlesex County, Massachusetts	Marlborough	1698	802	52.76796231	110114	Minority
Block Group 1, Census Tract 3211, Middlesex County, Massachusetts	Marlborough	2536	1408	44.47949527	59306	Minority
Block Group 1, Census Tract 3212, Middlesex County, Massachusetts	Marlborough	2005	969	51.67082294	73200	Minority
Block Group 2, Census Tract 3213.01, Middlesex County, Massachusetts	Marlborough	1877	898	52.15769845	47906	Minority and income
Block Group 1, Census Tract 3213.02, Middlesex County, Massachusetts	Marlborough	1702	741	56.46298472	109757	Minority
Block Group 1, Census Tract 3215, Middlesex County, Massachusetts	Marlborough	2227	966	56.62325999	52746	Minority, income and English isolation
Block Group 3, Census Tract 3215, Middlesex County, Massachusetts	Marlborough	2183	999	54.23728814	54979	Minority and income
Block Group 1, Census Tract 3881, Middlesex County, Massachusetts	Boxborough	2917	2002	31.36784368	132276	Minority
Block Group 2, Census Tract 3881, Middlesex County, Massachusetts	Boxborough	1589	1013	36.24921334	143250	Minority

Languages spoken in Massachusetts



2/21/2024, 1:07:03 PM

1:144,448

Distance & Direction - Circle Graphics

1 Mile Radius

5 Mile Radius

MA Municipalities -- multipart

2015 ACS: Languages spoken by at least 5% of population in the census tract who do not speak English very well, by tract

0 1.25 2.5 5 mi

0 2 4 8 km

Esri, HERE, Garmin, Earthstar Geographics

Data provided to EEA by Craig Weller, Data, Assessment, and Accountability, Massachusetts Department of Elementary and Secondary Education | American Community Survey, EEA GIS | MassGIS | EEA GIS | Earthstar Geographics | Esri, HERE, Garmin |

Languages Spoken within 5 Miles of Project Site

Tract	Municipality	Language	Percent Spoken (%)
3631.04	Acton	Chinese	5.3
3224	Hudson	Portuguese or Portuguese Creole	6.5
3223	Hudson	Portuguese or Portuguese Creole	6.4
3222	Hudson	Portuguese or Portuguese Creole	8
3216	Marlborough	Portuguese or Portuguese Creole	5.7
3213	Marlborough	Portuguese or Portuguese Creole	7.5
3214	Marlborough	Spanish or Spanish Creole	12
3212	Marlborough	Spanish or Spanish Creole	7.3
3213	Marlborough	Portuguese or Portuguese Creole	6.1
3211	Marlborough	Portuguese or Portuguese Creole	5.3

Appendix F

Wetland Delineation Report

Weston & Sampson SM

westonandsampson.com

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

Wetland Delineation Report

January 2023
Updated October 16, 2023.

Stow, Massachusetts
Project # 2190883

Lake Boon Dam
Stow, MA

Wetland Delineation Conducted By:
Nathaniel Parker on 1/18/2023
Extended by Hailey Page and Jordan Foulds, WPIT on 10/16/23

Delineation Report Reviewed By:
Megan Kearns PWS

TABLE OF CONTENTS

Page

FIGURES

APPENDICES

1.0 SITE DESCRIPTION

On October 16th, 2023, the presence of wetland resources were investigated and extended from a previous delineation on January 18th, 2023 in the vicinity of Lake Boon Dam in Stow, MA. The most recent delineation extended wetland BVW A, BVW B, TOB B, TOB C, and TOB H. The investigation area currently consists of forested area and Lake Boon. Please see Figure 1 (Wetlands Field Map) and Figure 2 (USGS Topographic Map) of this report for the investigation area.

Wetland resource areas, including two bordering vegetated wetlands, perennial stream, a lake, and an intermittent stream, were identified and flagged in the field using pink flagging by a Weston & Sampson employee who is trained in the wetland delineation process using the Massachusetts Department of Environmental Protection (MassDEP) and the US Army Corps of Engineers methodology. Further descriptions of these wetland resource areas are presented in the following sections.

2.0 DELINEATION OF WETLAND RESOURCES

2.1 Site Observations

The Weston & Sampson wetland scientist, trained in the ACOE Wetland Delineation Manual and Massachusetts Department of Environmental Protection (MassDEP) Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetland Protection Act guidance document, observed the following protected wetland resources at the site:

- Bordering Vegetated Wetlands (BVW)
- Bank – Perennial Stream
- Bank – Intermittent Stream
- Bank - Lake

Field data were recorded on US Army Corps of Engineers (ACOE) Wetland Determination Data Forms. See Appendix A for completed data forms and Appendix B for site photographs.

2.2 Wetland Delineation Methodology

A wetland delineation assessment was conducted in accordance with the Massachusetts Wetland Protection Act Regulations (310 CMR 10.55(2)(c)), Massachusetts Department of Environmental Protection (MassDEP) Delineating Bordering Vegetated Wetlands Under the Massachusetts Protection Act (March 1995), and ACOE Wetland Manual (Technical Report Y-87-1).

The bordering vegetated wetlands (BVW) delineation methodology included the characterization of vegetation, soil and hydrologic conditions in both wetland and upland areas to identify the transitional area, which was used as the wetland limit. Pink flags with distinct flag numbers were left in the field to show wetland resource area limits.

Vegetation, hydrology and soils were assessed in both wetland and upland areas to accurately place the wetland limits at each site. The percentage of vegetative species was estimated by creating sample plots. Sample plot radius for trees, saplings, shrubs, groundcover and woody vine strata was 30', 15', 15', 5' and 30', respectively. After creating the sample plot areas, the percent basal area coverage of each species within the monitoring plot was recorded. Using these field observations, the percent

dominance of each species within its stratum was calculated. The 50/20 Rule was then used to determine dominance. Dominant species were considered the most abundant plant species (when ranked in descending order of abundance and cumulatively totaled) that immediately exceeds 50% of the total dominance measure (basal area) for the stratum, plus any additional species comprising 20% or more of the total dominance measure for the stratum. Once the dominant species were determined, they were treated equally to determine the presence of hydrophytic vegetation. If the number of dominant species with a Wetland Indicator Status of FAC (excluding FAC-), FACW or OBL is greater than, or equal to, the number of remaining dominant species, the area was considered a jurisdictional wetland resource area based on vegetation.

A soil sample from each wetland sample plot were also taken. Each soil sample goes to a depth of at least 12-24 inches. The soil was characterized to determine if the soil sample was considered a hydric (wetland) soil. Soil samples, including mottles, were characterized based on color using Munsell Soil-Color charts as a color reference.

The general area was then assessed for hydrologic conditions, including, but not limited to, site inundation, depth to free water, depth of soil saturation, water marks, drift lines, sediment deposits, water stained leaves.

2.3 Bordering Vegetated Wetlands (BVW)

A total of two BVW series were delineated at the site. The BVW series are associated with the Assabet River. The limit of the BVW resource areas were determined by locating the transitional area between wetland and upland vegetation, soils and hydrologic conditions. Wetland flags left in the field included:

- BVW-A1 through BVW-A56 (Bordering Vegetated Wetland “A” series)
- BVW-B1 through BVW-B10 (Bordering Vegetated Wetland “B” series)

Dominant vegetation within the wetland resource areas included red oak (*Quercus rubra*), and reed canary (*Phalaris arundinacea*) both species that thrive in wet conditions. Soils within the BVWs were considered fine sandy loam. Other indicators of wetland hydrology included standing water and a high-water table.

Dominant upland vegetation in the area included hay scented fern (*Dennstaedtia punctilobula*) and white pine (*Pinus strobus).* Soils within the upland were composed of fine sandy loam, with no evidence of mottling or hydrology within the top 12 inches.

BVWs are subject to a 100-foot buffer under the Massachusetts Wetland Protection Act per 310 CMR 10.02(2)(b). The town of Stow has a Wetlands Bylaw, no person shall remove, fill, dredge, alter, degrade, pollute, discharge into, or build upon or within one hundred feet of any bank, fresh water wetland, beach, dune, flat, marsh, meadow, bog or swamp. The town also has a thirty five foot undisturbed vegetative buffer of naturally occurring plant materials adjacent to all wetlands.

2.4 Bank

Water bodies, including perennial streams, intermittent streams, ponds and lakes, have banks which are protected by the Massachusetts Wetland Protection Act. Bank is a wetland resource area defined by 310 CMR 10.54(2)(a) as "the portion of land surface which normally abuts and confines a water body. It occurs between a waterbody and a vegetated bordering wetland and adjacent floodplain, or, in absence of these, it occurs between a waterbody and an upland." Vegetated banks provide valuable functions such as flood control, stormwater prevention, fisheries protection, and water quality protection. The limit of this resource area is identified by Top of Bank (TOB) which is located at the first observable break in slope or the Mean Annual Flood Level (MAFL), whichever is lower. TOB is easily identified in the field so that indicator was utilized for this wetland delineation.

Perennial Stream Bank

A perennial stream was identified starting at the outlet of the Lake Boon Dam and connecting to the Assabet RIver. The boundary of the perennial stream was identified in the field utilizing Top of Bank (TOB), identified by flag line TOB-A and TOB-D. The Assabet River is shown as perennial on the current United States Geographical Survey (USGS) map and has a watershed size greater than two square miles in size according to USGS Stream Stats which classifies the stream as perennial per 310 CMR 10.58 (2)(a)(1)(b-c). The boundary of the perennial stream was identified in the field by the first observable break in slope (TOB). Wetland flags left in the field included:

- TOB-A1 through TOB-A12 (Perennial Bank "A" Series)
- TOB-D1 through TOB-D3 (Perennial Bank "D" Series)

Perennial streams are subject to a 200-foot Riverfront Area under the Massachusetts Wetland Protection Act per 301 CMR 10.58(2)(a)(2)(c). The town of Stow Wetlands Bylaw has additional protections that lands within two hundred feet of any perennial stream without filing written application for a permit so to remove, fill, dredge, build upon, degrade, pollute, discharge into, or alter. The town also has a thirty five foot undisturbed vegetative buffer of naturally occurring plant materials adjacent to all watercourses.

Intermittent Stream Bank

One intermittent stream was identified on site and flagged as the TOB-B on one side and TOB-C on the opposite side. The stream was identified running through the center of the site. The unnamed stream is shown as intermittent on the current United States Geographical Survey (USGS) map and has a watershed size less than 0.5 square miles in size according to USGS Stream Stats which classifies the stream as intermittent per 310 CMR 10.58 (2)(a)(1)(b-c). The boundary of the intermittent stream was identified in the field by the first observable break in slope (TOB). Wetland flags left in the field included:

- TOB-B1 through TOB-B14 (Intermittent Bank "B" Series)
- TOB-C1 through TOB-C14 (Intermittent Bank "C" Series)

Intermittent stream banks are subject to a 100-foot buffer under the Massachusetts Wetland Protection Act per 301 CMR 10.02(2)(b). The town of Stow Wetlands Bylaw has additional protections that lands within one hundred feet of any Great Pond, estuary, creek, intermittent stream are protected without filing written application for a permit so to remove, fill, dredge, build upon, degrade, pollute, discharge into, or alter. The town also has a thirty five foot undisturbed vegetative buffer of naturally occurring plant materials adjacent to all watercourses.

Lake Bank

Lake Boon is located immediately upstream of a dam. The waterbody is 180 acres in size, based on the 2016 Mass wildlife Lake summary. Due to its size, Lake Boon is classified as a lake. According to the Massachusetts Wetland Protection Act a lake is defined as "any open body of fresh water with a surface area of ten acres or more, and shall include great ponds." (310 CMR 10.04). Great Ponds are defined in 310 CMR 9.02 as "any pond which contained more than ten acres in its natural state … prior to any

alteration by damming or other human activity". Lake Boon is called out on the Massachusetts Great Ponds List. A portion of the western bank of the lake was flagged. Wetland flags left in the field included:

- TOB-H1 through TOB-H20 (Lake Bank "H" Series)

Banks are subject to a 100-foot buffer under the Massachusetts Wetland Protection Act per 310 CMR 10.02(2)(b). The town of Stow has Lake Boon Shoreline Stabilization Guidance has a thirty five foot undisturbed buffer requirement although waivers are likely to be granted.

2.5 Other Protected Areas

Weston & Sampson created environmental resources maps (see Figure 4) of the site to determine the presence of other protected areas. The data source of these map layers was the Massachusetts Geographic Information System (MassGIS). These areas included:

- NHESP Priority Habitats of Rare Species
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Certified and Potential Vernal Pools
- Areas of Critical Environmental Concern (ACEC)
- Outstanding Resource Waters (ORW)
- Coldwater Fisheries
- Article 97 Land

Wetland resources identified in the field were also added to these maps. Based on the MassGIS data there are no additional protected areas located on site other than the wetland resource areas identified in the body of the report above (See Figure 4 for Environmental Resources Map).

FEMA Flood Insurance Rate Maps (FIRM) were created online from the FEMA website to determine if there is a 100-year flood zone at the site. See Figure 3 for FIRM map. Based on the information provided by the FIRM map a portion of the investigation area is located within Regulatory Floodway Zone AE. FEMA defines a Regulatory Floodway as "the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood" and Zone AE as "areas subject to inundation by the 1-percent-

annual-chance flood event". The 1-percent-annual-chance flood event is the same as the 100-year event. As a result, portions of the investigation area are located within the 100-year flood zone.

The Massachusetts Wetland Protection Act does not place a buffer zone on the 100-year flood zone (Bordering Land Subject to Flooding).

3.0 SUMMARY

On January 18th, 2023, and October 16th, 2023, the presence of wetland resources was investigated in the vicinity of Lake Boon Dam in Stow, MA. Two bordering vegetated wetland, perennial stream, lake bank, and intermittent stream were identified and flagged at the site.

Additional environmental mapping was conducted using MassGIS data layers and FEMA FIRM mapping. This additional mapping indicates that portions of the site are within the 100-year floodplain.

This Wetlands Delineation Report has been reviewed and approved by a Professional Wetland Scientist PWS.

4.0 REFERENCES

Jackson, Scott. 1995. "Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act." Massachusetts Department of Environmental Protection.

Massachusetts Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program. Massachusetts Natural Heritage Atlas, 13th Edition with 2017 web updates. Accessed on 10/16/2023.

Massachusetts Geographic Information System. January 2009. Outstanding Resource Waters. Massachusetts Department of Environmental Protection. Accessed on 10/16/2023.

Massachusetts Geographic Information System. December 2003. Areas of Critical Environmental Concern. Massachusetts Department of Environmental Protection. Accessed on 10/16/2023.

Newcomb, Lawrence. 1977. Newcomb's Wildflower Guide. Little, Brown and Company.

Web Soil Survey of Middlesex County, Massachusetts. United States Department of Agriculture, Soil Conservation Service, in cooperation with Massachusetts Agricultural Experiment Station

United States Department of Agriculture, Natural Resources Conservation Service. *2018. Field Indicators of Hydric Soils in the United States, Version 8.2.* L. M. Vasilas, G. W. Hurt, and J.F. Berkowitz (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.

USACOE, January 1987, Corps of Engineers Wetlands Delineation Manuel, Wetlands Research Program Technical Report Y-87-1.

FEMA Flood Map Service Center, online at msc.fema.gov/portal Assessed on 10/16/2023.
Tiner, Jr., Ralph W., 2005, Field Guide to Nontidal Wetland Identification

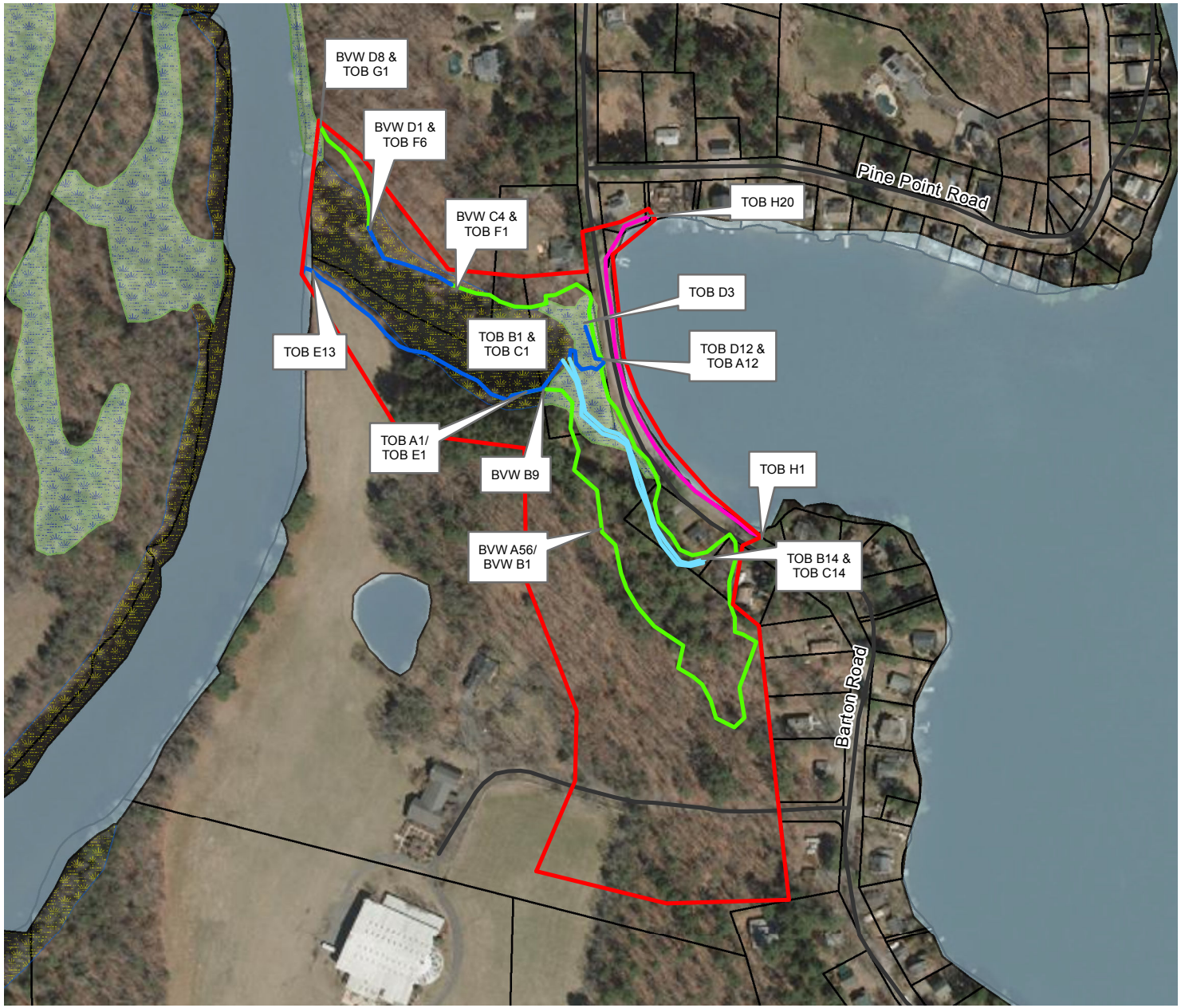
Tiner, Jr., Ralph W, 2009, Field Guide to Tidal Wetland Plants of the Northeastern United States and Neighboring Canada.

Wojtec, Michael, Bard – A field Guide to Trees of the Northeast.

New England Hydric Soils Technical Committee, 2019, Version 4, *Field Indicator of Identifying Hydric Soils in New England*. New England Interstate Water Pollution Control Commission, Lowell, MA.

.

Path: \\wse03.local\WSE\Projects\MA\Stow, MA\Lake Boon Dam\09 Wetlands Delineation\Extension 10.2023\GIS\Mapfiles\Wetland Flags.mxd **User:** Foulds.Jordan **Saved:** 10/16/2023 4:17:48 PM **Opened:** 11/28/2023 1:30:51 PM



Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

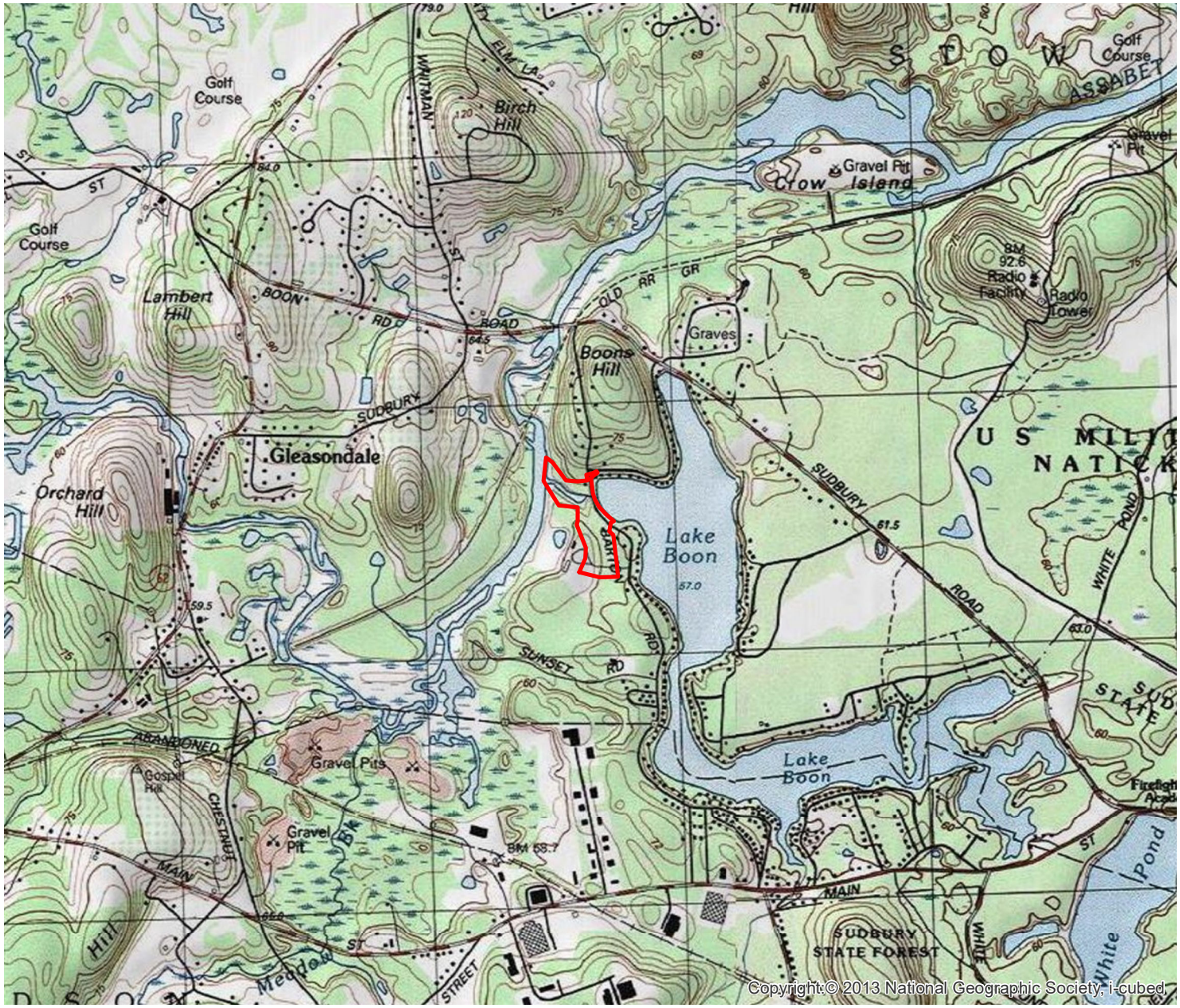
- Investigation Area
- Top of Bank - Lake
- Bordering Vegetated Wetland
- Top of Bank Intermittent
- Top of Bank Perennial
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune

FIGURE 1

Lake Boon Dam
Stow, MA

Wetlands Field Map

Weston & Sampson



Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

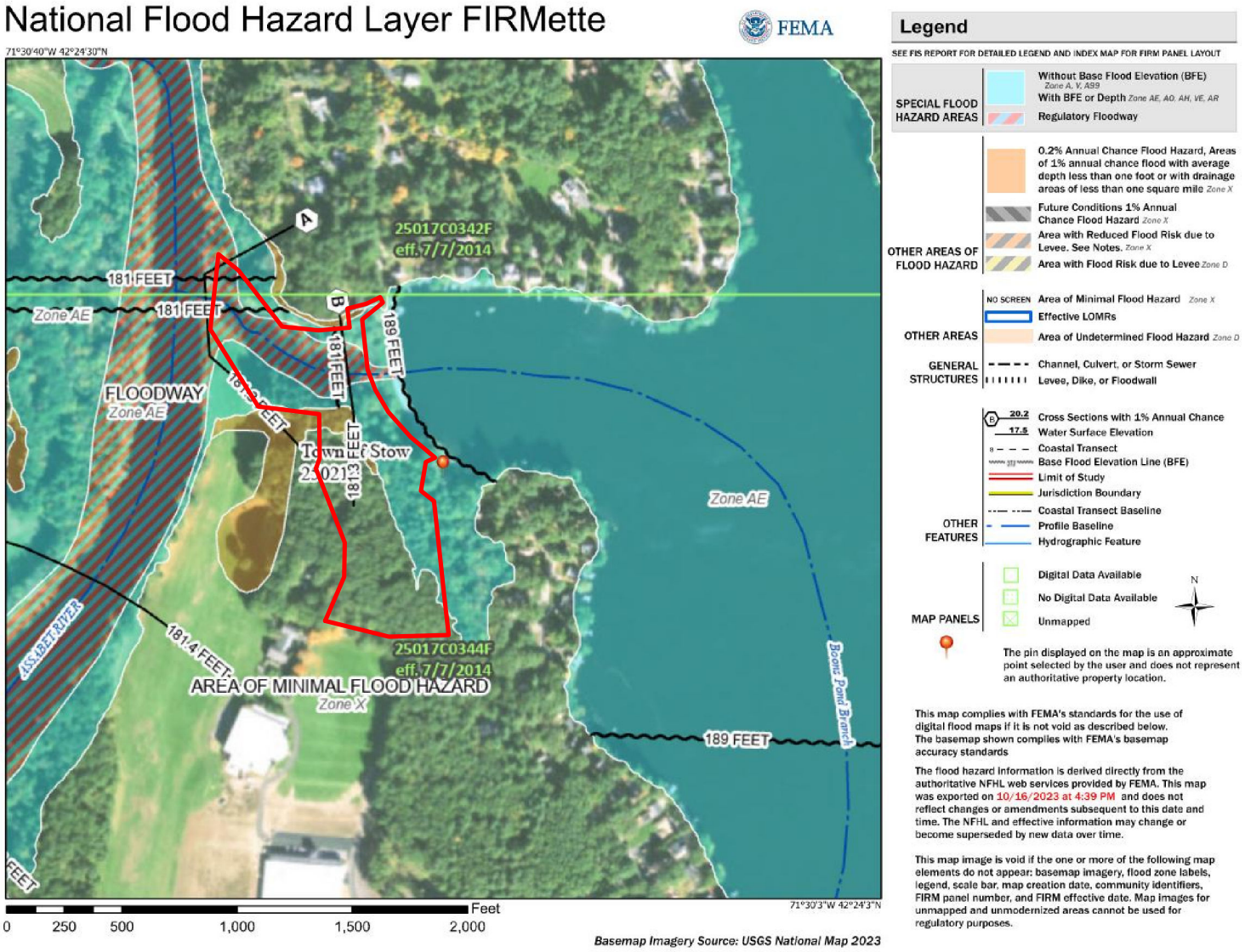
Investigation Area

FIGURE 2

Lake Boon Dam
Stow MA

USGS Topographic Map

Weston & Sampson



Legend

Investigation Area

FIGURE 3

Lake Boon Dam
Stow, MA

FEMA Map

Weston & Sampson

Path: \\wse03.local\WSE\Projects\MA\Stow, MA\Lake Boon Dam\09 Wetlands Delineation\Extension 10.2023\GIS\Mapfiles\Environmental Receptor.mxd **User:** Foulds.Jordan **Saved:** 11/28/2023 1:31:14 PM **Opened:** 11/28/2023 1:31:27 PM

N
W E
S

200 100 0 200
Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Investigation Area
- Top of Bank - Lake
- Top of Bank Intermittent
- Top of Bank Perennial
- Bordering Vegetated Wetland
- MassDOT Roads
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune
- ACECs
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools
- Cold Water Fisheries
- Public Water Supply Contributor
- ORW for ACEC
- ORW for both Water Supply and Other

FIGURE 4

Lake Boon Dam
Stow, MA

Environmental
Resources Map

Weston & Sampson

APPENDIX A

ACOE Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Boon Dam City/County: Stow Sampling Date: 1/18/23

Applicant/Owner: Town of Stow State: MA Sampling Point: A1 - WET

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____

Slope (%): 0-3% Lat: 42.405 Long: -71.507 Datum: _____

Soil Map Unit Name: Windsor loamy sand NWI classification: PEM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No _____	Depth (inches): 0"	
Water Table Present?	Yes X	No _____	Depth (inches): 0"	
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0"	**Wetland Hydrology Present?** **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: A1 - WET

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. red maple (*Acer rubrum*)	5	yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. purple loostrife (*Lythrum salicaria*)	10	no	OBL
2. beggar-tick (*Bidens vulgata*)	5	no	FAC
3. sensitive fern (*Onoclea sensibilis*)	10	no	FACW
4. reed canary (*Phalaris arundinacea*)	50	yes	FACW
5. arrow arum (*Peltandra virginica*)	1	no	OBL
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	76 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	11	x 1 =	11
FACW species	60	x 2 =	120
FAC species	10	x 3 =	30
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	81 (A)		161 (B)

Prevalence Index = B/A = 1.98

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- X Dominance Test is >50%
- X Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: A1 - WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 2/1							organic fibric
3-24+	10YR 2/1							organic fibric

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- X Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Boon Dam Stow City/County: 1/18/23 Sampling Date: _____

Applicant/Owner: Town of Stow State: MA Sampling Point: A1-UP

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____

Slope (%): 0-3% Lat: 42.405 Long: -71.507 Datum: _____

Soil Map Unit Name: Windsor loamy sand NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: A1 - UP

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. white pine (*Pinus strobus*)	25	yes	FACU
2. red maple (*Acer rubrum*)	10	yes	FAC
3. American beech (*Fagus grandifolia*)	5	no	FACU
4.			
5.			
6.			
7.			
	40	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15)			
1. multiflora rose (*Rosa multiflora*)	5	yes	FACU
2. Japanese barberry (*Berberis thunbergii*)	5	yes	FACU
3. chokecherry (*Prunus virginiana*)	10	yes	FACU
4.			
5.			
6.			
7.			
	20	= Total Cover	

Herb Stratum (Plot size: 5)			
1. hayscented fern (*Dennstaedtia Bernh.*)	50	yes	UPL
2. Canada mayflower(*Maianthemum canadense*)	1	no	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	51	= Total Cover	

Woody Vine Stratum (Plot size: 30)			
1. oriental bittersweet	5	yes	
2.			
3.			
4.			
	5	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 14% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species	10	x 3 =	30
FACU species	51	x 4 =	204
UPL species	50	x 5 =	250
Column Totals:	111 (A)		484 (B)

Prevalence Index = B/A = 4.36

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: A1 - UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 2/2							fsl
5-12	10 YR 4/4							fsl

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Boon Dam City/County: Stow Sampling Date: 1/18/23

Applicant/Owner: Town of Stow State: MA Sampling Point: B10 - WET

Investigator(s): Devin Batchelder Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____

Slope (%): 0-3% Lat: 42.405 Long: -71.507 Datum: _____

Soil Map Unit Name: Windsor loamy sand NWI classification: PFO1/4E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No _____	Depth (inches): 0"
Water Table Present?	Yes X	No _____	Depth (inches): 0"
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0"

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: B10 WET

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. white pine (*Pinus strobus*)	40	yes	FACU
2. eastern hemlock (*Tsuga candensis*)	5	no	FACU
3.			
4.			
5.			
6.			
7.			
	45	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15)			
1. winterberry (*Ilex verticillata*)	50	yes	FACW
2. highbush blueberry (*Vaccinium corymbosum*)	10	no	FACW
3.			
4.			
5.			
6.			
7.			
	60	= Total Cover	

Herb Stratum (Plot size: 5)			
1. Canada mayflower (*Maianthemum canadense*)	1	no	FACU
2. cinnamon fern (*Osmundastrum cinnamomeum*)	20	yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	21	= Total Cover	

Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species	80	x 2 =	160
FAC species		x 3 =	
FACU species	46	x 4 =	184
UPL species		x 5 =	
Column Totals:	126 (A)		344 (B)

Prevalence Index = B/A = 2.7

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- X Dominance Test is >50%
- X Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: B10 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/1							organic fibric
4-18+	10YR 2/1							organic hemic

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lake Boon Dam City/County: Stow Sampling Date: 1/18/23

Applicant/Owner: Town of Stow State: MA Sampling Point: B1-UP

Investigator(s): Nathaniel Parker Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____

Slope (%): 0-3% Lat: 42.405 Long: -71.507 Datum: _____

Soil Map Unit Name: Windsor loamy sand NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: B1 - UP

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. white pine (*Pinus strobus*)	50	yes	FACU
2. red oak (*Quercus rubr*)	20	yes	FACU
3.			
4.			
5.			
6.			
7.			
	70	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15)			
1. white pine (*Pinus strobus*)	15	yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	

Herb Stratum (Plot size: 5)			
1. hayscented fern (*Dennstaedtia Bernh.*)	60	yes	UPL
2. Canada mayflower (*Maianthemum canadense*)	5	no	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	65	= Total Cover	

Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species	90	x 4 =	360
UPL species	60	x 5 =	300
Column Totals:	150 (A)		660 (B)

Prevalence Index = B/A = 4.4

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: B1 - UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/2							fsl
4-12	2.5Y /3							fsl

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

APPENDIX B

Site Photographs

Photo 1: BVW A Series

Photo 2: BVW B Series

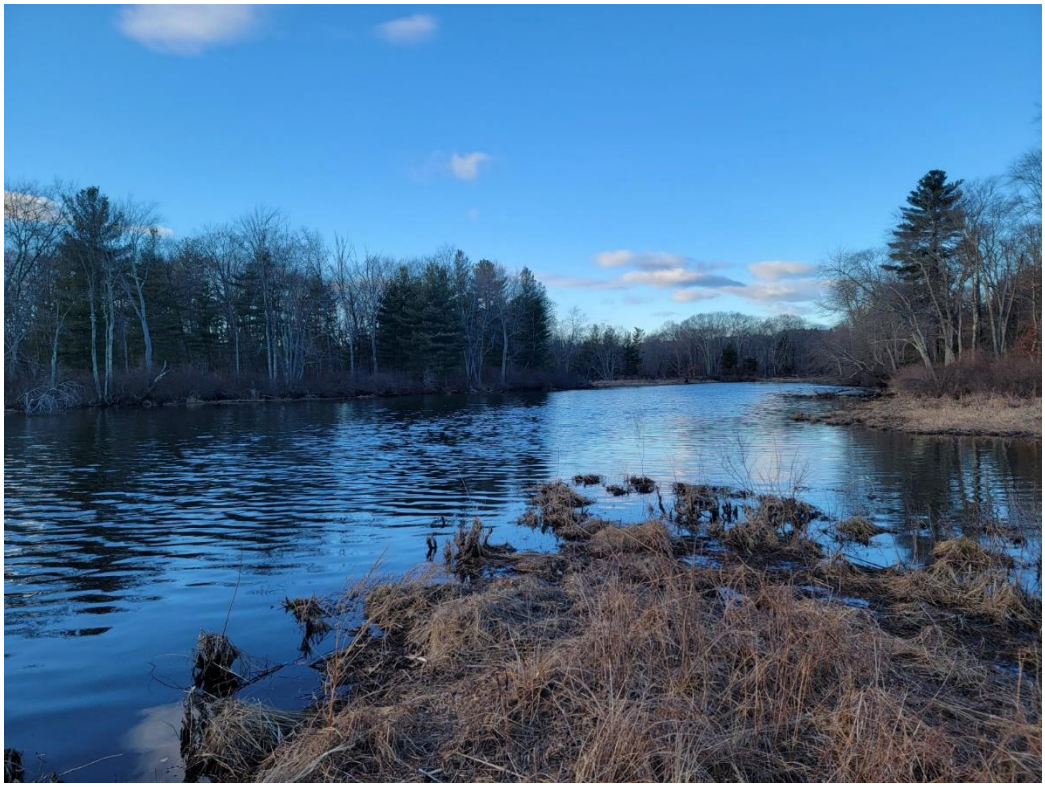


Photo 3: Perennial Stream

Photo 4: Wetland Soils Observed On Site

Appendix G

Distribution List

Distribution List

Massachusetts Environmental Policy Act (MEPA) Office
MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114
MEPA@mass.gov

Department of Environmental Protection, Boston Office
Commissioner's Office
100 Cambridge Street, 9th Floor
Boston, MA 02114
Helena.boccadoro@mass.gov

Department of Environmental Protection, Central Region
Attn: MEPA Coordinator
8 New Bond Street
Worcester, MA 01606
andrea.briggs@mass.gov

Massachusetts Department of Transportation – Boston
Public/Private Development Unit
10 Park Plaza, Suite #4150
Boston, MA 02116
MassDOTPPDU@dot.state.ma.us

Massachusetts Department of Transportation District #3
Attn: MEPA Coordinator
499 Plantation Parkway
Worcester, MA 01605
jeffrey.r.gomes@dot.state.ma.us

Massachusetts Historical Commission
The MA Archives Building
220 Morrissey Boulevard
Boston, MA 02125
Hard copy only

Metropolitan Area Planning Council
mpillsbury@mapc.org
afelix@mapc.org

Town of Stow
Select Board
Stow Town Building
380 Great Road
Stow, MA 01775-2127
selectboard@stow-ma.gov

Stow Planning Board
Stow Town Building
380 Great Road
Stow, MA 01775
planning@stow-ma.gov

Stow Conservation Commission
Stow Town Building
380 Great Road
Stow, MA 01775
conservation@stow-ma.gov

Stow Board of Health
Stow Town Building
380 Great Road
Stow, MA 01775
health@stow-ma.gov

MEPA Office
Attn: EEA EJ Director
100 Cambridge Street, Suite 900
Boston, MA 02114
MEPA-EJ@mass.gov

Massachusetts Department of Conservation and Recreation
Attn: MEPA Coordinator
251 Causeway Street, Suite 600
Boston, MA 02114
andy.backman@mass.gov

Randall Library
380 Great Road, Lower Level
Stow, MA 01775
randalllibrary@gmail.com

Appendix H

RMAT Climate Resilience Report

Climate Resilience Design Standards Tool Project Report

Lake Boon Dam Rehab Project
Date Created: 2/12/2024 2:03:02 PM
Created By: page.hailey
Date Report Generated: 2/12/2024 3:08:06 PM
Tool Version: Version 1.2
Project Contact Information: Denise Dembkoski (townadministrator@stow-ma.gov)

Project Summary

Link to Project

Estimated Capital Cost: $3000000.00
End of Useful Life Year: 2125
Project within mapped Environmental Justice neighborhood: No

Ecosystem Service Benefits	Scores
Project Score	Low
Exposure	**Scores**
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	High Exposure
Extreme Heat	High Exposure

Asset Preliminary Climate Risk Rating Summary

Number of Assets: 9

Asset Risk	Sea Level Rise/Storm Surge	Extreme Precipitation - Urban Flooding	Extreme Precipitation - Riverine Flooding	Extreme Heat
Lake Boon Dam	Low Risk	High Risk	High Risk	High Risk
Barton Road	Low Risk	High Risk	High Risk	High Risk
Bordering Vegetated Wetland	Natural Resource project assets do not receive a preliminary climate risk rating.			
Land Under Water	Natural Resource project assets do not receive a preliminary climate risk rating.			
Bank - Lake	Natural Resource project assets do not receive a preliminary climate risk rating.			
Bank - Perennial Stream	Natural Resource project assets do not receive a preliminary climate risk rating.			
Bank - Intermittent Stream	Natural Resource project assets do not receive a preliminary climate risk rating.			
Riverfront Area	Natural Resource project assets do not receive a preliminary climate risk rating.			
Bordering Land Subject to Flooding	Natural Resource project assets do not receive a preliminary climate risk rating.			

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					

Lake Boon Dam				
Barton Road				
Bordering Vegetated Wetland				
Land Under Water				
Bank - Lake				
Bank - Perennial Stream				
Bank - Intermittent Stream				
Riverfront Area				
Bordering Land Subject to Flooding				
Extreme Precipitation				
Lake Boon Dam	2070		500-yr (0.2%)	Tier 3
Barton Road	2070		50-yr (2%)	Tier 3
Bordering Vegetated Wetland	2030			Tier 1
Land Under Water	2030			Tier 1
Bank - Lake	2030			Tier 1
Bank - Perennial Stream	2030			Tier 1
Bank - Intermittent Stream	2030			Tier 1
Riverfront Area	2030			Tier 1
Bordering Land Subject to Flooding	2030			Tier 1
Extreme Heat				
Lake Boon Dam	2070	90th		Tier 3
Barton Road	2070	50th		Tier 3
Bordering Vegetated Wetland	2030	50th		Tier 1
Land Under Water	2030	50th		Tier 1
Bank - Lake	2030	50th		Tier 1
Bank - Perennial Stream	2030	50th		Tier 1
Bank - Intermittent Stream	2030	50th		Tier 1
Riverfront Area	2030	50th		Tier 1
Bordering Land Subject to Flooding	2030	50th		Tier 1

Scoring Rationale - Project Exposure Score

The purpose of the Exposure Score output is to provide a preliminary assessment of whether the overall project site and subsequent assets are exposed to impacts of natural hazard events and/or future impacts of climate change. For each climate parameter, the Tool will calculate one of the following exposure ratings: Not Exposed, Low Exposure, Moderate Exposure, or High Exposure. The rationale behind the exposure rating is provided below.

Sea Level Rise/Storm Surge

This project received a "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

This project received a "High Exposure" because of the following:

- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- No increase to impervious area
- Existing impervious area of the project site is between 10% and 50%

Extreme Precipitation - Riverine Flooding

This project received a "High Exposure" because of the following:

- Part of the project is within a mapped FEMA floodplain, outside of the Massachusetts Coast Flood Risk Model (MC-FRM)
- Part of the project is within 100ft of a waterbody
- No historic riverine flooding at project site

- Project is not likely susceptible to riverine erosion

Extreme Heat

This project received a "High Exposure" because of the following:

- 30+ days increase in days over 90 deg. F within project's useful life
- Existing trees are being removed as part of the proposed project
- Less than 10% of the existing project site has canopy cover
- Located within 100 ft of existing water body
- No increase to the impervious area of the project site

Scoring Rationale - Asset Preliminary Climate Risk Rating

A Preliminary Climate Risk Rating is determined for each infrastructure and building asset by considering the overall project Exposure Score and responses to Step 4 questions provided by the user in the Tool. Natural Resource assets do not receive a risk rating. The following factors are what influenced the risk ratings for each asset.

Asset - Lake Boon Dam
Primary asset criticality factors influencing risk ratings for this asset:

- Asset must be operable at all times, even during natural hazard event
- Loss/inoperability of the asset would have impacts limited to local area and/or municipality
- Infrastructure functions as an evacuation route during emergencies
- Inoperability may moderately impact other facilities, assets, or buildings, but is not expected to affect their ability to operate
- Impact on natural resources will require remediation/rehabilitation with the inoperability of the asset

Asset - Barton Road
Primary asset criticality factors influencing risk ratings for this asset:

- Asset may inaccessible/inoperable for more than a day but less than a week after natural hazard event
- Loss/inoperability of the asset would have impacts limited to local area and/or municipality
- Infrastructure functions as an evacuation route during emergencies
- Inoperability may moderately impact other facilities, assets, or buildings, but is not expected to affect their ability to operate
- There are no hazardous materials in the asset

Asset - Bordering Vegetated Wetland
Primary asset criticality factors influencing risk ratings for this asset:

No score available

Asset - Land Under Water
Primary asset criticality factors influencing risk ratings for this asset:

No score available

Asset - Bank - Lake
Primary asset criticality factors influencing risk ratings for this asset:

No score available

Asset - Bank - Perennial Stream
Primary asset criticality factors influencing risk ratings for this asset:

No score available

Asset - Bank - Intermittent Stream
Primary asset criticality factors influencing risk ratings for this asset:

No score available

Asset - Riverfront Area
Primary asset criticality factors influencing risk ratings for this asset:

No score available

Asset - Bordering Land Subject to Flooding
Primary asset criticality factors influencing risk ratings for this asset:

No score available

Project Climate Resilience Design Standards Output

Climate Resilience Design Standards and Guidance are recommended for each asset and climate parameter. The Design Standards for each climate parameter include the following: recommended planning horizon (target and/or intermediate), recommended return period (Sea Level Rise/Storm Surge and Precipitation) or percentile (Heat), and a list of applicable design criteria that are likely to be affected by climate change. Some design criteria have numerical values associated with the recommended return period and planning horizon, while others have tiered methodologies with step-by-step instructions on how to estimate design values given the other recommended design standards.

Asset: Lake Boon Dam — Infrastructure

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 500-yr (0.2%)

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Lake Boon Dam	2070	500-Year (0.2%)	14.4	Downloadable Methodology PDF

ATTENTION: This is a Tier 3, Dams & Flood Control Structures project. Due to the criticality and useful life of this project, it is recommended that NCHRP15-61 methodology be used to calculate total precipitation depth for 24-hour design storms, and those results be compared to the provided total storm depth output: Tier 3 methodology PDF.

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 90th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): NOT APPLICABLE

Asset: Barton Road Infrastructure

Sea Level Rise/Storm Surge Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation High Risk

Target Planning Horizon: 2070
Return Period: 50-yr (2%)

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for

construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Barton Road	2070	50-Year (2%)	9.5	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 50th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 3

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 3

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): NOT APPLICABLE

Asset: Bordering Vegetated Wetland Natural Resources

Sea Level Rise/Storm Surge

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Return Period Recommendations for natural resource assets and subsequent projected values are provided as a consideration for users, not a formal standard. Users should follow industry best practices for designing natural resource assets in coordination with the appropriate regulatory agencies.

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation

Target Planning Horizon: 2030

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 1

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Bordering Vegetated Wetland	2030	25-Year (4%)	7.1	Downloadable Methodology PDF

Return Period Recommendations for natural resource assets and subsequent projected values are provided as a consideration for users, not a formal standard. Users should follow industry best practices for designing natural resource assets in coordination with the appropriate regulatory agencies.

ATTENTION: This is a Tier 1 project. It is advised to compare the extreme precipitation output values to the NOAA+ methodology to calculate total precipitation depth for 24-hr design storms.

This methodology can be found in the following PDF. (Link).

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 1

Extreme Heat

Target Planning Horizon: 2030
Percentile: 50th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 1

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 1

Projected Heat Index: NOT APPLICABLE

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: NOT APPLICABLE

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: NOT APPLICABLE

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): NOT APPLICABLE

Asset: Land Under Water — Natural Resources

Sea Level Rise/Storm Surge

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Return Period Recommendations for natural resource assets and subsequent projected values are provided as a consideration for users, not a formal standard. Users should follow industry best practices for designing natural resource assets in coordination with the appropriate regulatory agencies.

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation

Target Planning Horizon: 2030

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 1

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Land Under Water	2030	25-Year (4%)	7.1	Downloadable Methodology PDF

Return Period Recommendations for natural resource assets and subsequent projected values are provided as a consideration for users, not a formal standard. Users should follow industry best practices for designing natural resource assets in coordination with the appropriate regulatory agencies.

ATTENTION: This is a Tier 1 project. It is advised to compare the extreme precipitation output values to the NOAA+ methodology to calculate total precipitation depth for 24-hr design storms.

This methodology can be found in the following PDF. (Link).

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 1

Extreme Heat

Target Planning Horizon: 2030
Percentile: 50th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 1

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 1

Projected Heat Index: NOT APPLICABLE

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: NOT APPLICABLE

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: NOT APPLICABLE

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): NOT APPLICABLE

Asset: Bank - Lake — Natural Resources

Sea Level Rise/Storm Surge

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Return Period Recommendations for natural resource assets and subsequent projected values are provided as a consideration for users, not a formal standard. Users should follow industry best practices for designing natural resource assets in coordination with the appropriate regulatory agencies.

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation

Target Planning Horizon: 2030

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 1

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Bank - Lake	2030	25-Year (4%)	7.1	Downloadable Methodology PDF

Return Period Recommendations for natural resource assets and subsequent projected values are provided as a consideration for users, not a formal standard. Users should follow industry best practices for designing natural resource assets in coordination with the appropriate regulatory agencies.

ATTENTION: This is a Tier 1 project. It is advised to compare the extreme precipitation output values to the NOAA+ methodology to calculate total precipitation depth for 24-hr design storms.

This methodology can be found in the following PDF. (Link).

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 1

Extreme Heat

Target Planning Horizon: 2030
Percentile: 50th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 1

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 1

Projected Heat Index: NOT APPLICABLE

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: NOT APPLICABLE

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: NOT APPLICABLE

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): NOT APPLICABLE

Asset: Bank - Perennial Stream — Natural Resources

Sea Level Rise/Storm Surge

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Return Period Recommendations for natural resource assets and subsequent projected values are provided as a consideration for users, not a formal standard. Users should follow industry best practices for designing natural resource assets in coordination with the appropriate regulatory agencies.

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation

Target Planning Horizon: 2030

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 1

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Bank - Perennial Stream	2030	25-Year (4%)	7.1	Downloadable Methodology PDF

Return Period Recommendations for natural resource assets and subsequent projected values are provided as a consideration for users, not a formal standard. Users should follow industry best practices for designing natural resource assets in coordination with the appropriate regulatory agencies.

ATTENTION: This is a Tier 1 project. It is advised to compare the extreme precipitation output values to the NOAA+ methodology to calculate total precipitation depth for 24-hr design storms.

This methodology can be found in the following PDF. (Link).

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 1

Extreme Heat

Target Planning Horizon: 2030
Percentile: 50th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 1

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 1

Projected Heat Index: NOT APPLICABLE

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: NOT APPLICABLE

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: NOT APPLICABLE

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): NOT APPLICABLE

Asset: Bank - Intermittent Stream Natural Resources

Sea Level Rise/Storm Surge

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Return Period Recommendations for natural resource assets and subsequent projected values are provided as a consideration for users, not a formal standard. Users should follow industry best practices for designing natural resource assets in coordination with the appropriate regulatory agencies.

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation

Target Planning Horizon: 2030

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 1

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Bank - Intermittent Stream	2030	25-Year (4%)	7.1	Downloadable Methodology PDF

Return Period Recommendations for natural resource assets and subsequent projected values are provided as a consideration for users, not a formal standard. Users should follow industry best practices for designing natural resource assets in coordination with the appropriate regulatory agencies.

ATTENTION: This is a Tier 1 project. It is advised to compare the extreme precipitation output values to the NOAA+ methodology to calculate total precipitation depth for 24-hr design storms.

This methodology can be found in the following PDF. (Link).

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 1

Extreme Heat

Target Planning Horizon: 2030
Percentile: 50th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 1

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 1

Projected Heat Index: NOT APPLICABLE

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: NOT APPLICABLE

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: NOT APPLICABLE

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): NOT APPLICABLE

Asset: Riverfront Area — Natural Resources

Sea Level Rise/Storm Surge

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Return Period Recommendations for natural resource assets and subsequent projected values are provided as a consideration for users, not a formal standard. Users should follow industry best practices for designing natural resource assets in coordination with the appropriate regulatory agencies.

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation

Target Planning Horizon: 2030

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 1

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Riverfront Area	2030	25-Year (4%)	7.1	Downloadable Methodology PDF

Return Period Recommendations for natural resource assets and subsequent projected values are provided as a consideration for users, not a formal standard. Users should follow industry best practices for designing natural resource assets in coordination with the appropriate regulatory agencies.

ATTENTION: This is a Tier 1 project. It is advised to compare the extreme precipitation output values to the NOAA+ methodology to calculate total precipitation depth for 24-hr design storms.

This methodology can be found in the following PDF. (Link).

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 1

Extreme Heat

Target Planning Horizon: 2030
Percentile: 50th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 1

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 1

Projected Heat Index: NOT APPLICABLE

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: NOT APPLICABLE

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: NOT APPLICABLE

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): NOT APPLICABLE

Asset: Bordering Land Subject to Flooding — Natural Resources

Sea Level Rise/Storm Surge

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Return Period Recommendations for natural resource assets and subsequent projected values are provided as a consideration for users, not a formal standard. Users should follow industry best practices for designing natural resource assets in coordination with the appropriate regulatory agencies.

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation

Target Planning Horizon: 2030

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 1

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Bordering Land Subject to Flooding	2030	25-Year (4%)	7.1	Downloadable Methodology PDF

Return Period Recommendations for natural resource assets and subsequent projected values are provided as a consideration for users, not a formal standard. Users should follow industry best practices for designing natural resource assets in coordination with the appropriate regulatory agencies.

ATTENTION: This is a Tier 1 project. It is advised to compare the extreme precipitation output values to the NOAA+ methodology to calculate total precipitation depth for 24-hr design storms.

This methodology can be found in the following PDF. (Link).

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 1

Extreme Heat

Target Planning Horizon: 2030
Percentile: 50th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 1

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 1

Projected Heat Index: NOT APPLICABLE

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: NOT APPLICABLE

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: NOT APPLICABLE

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): NOT APPLICABLE

Project Inputs

Core Project Information

Name:	Lake Boon Dam Rehab Project
Given the expected useful life of the project, through what year do you estimate the project to last (i.e. before a major reconstruction/renovation)?	2125
Location of Project:	Stow
Estimated Capital Cost:	$3,000,000
Who is the Submitting Entity?	City/Town Stow Denise Dembkoski (townadministrator@stow-ma.gov)
Is this project identified as a priority project in the Municipal Vulnerability Preparedness (MVP) plan or the local or regional Hazard Mitigation Plan (HMP)?	Yes
Is this project being submitted as part of a state grant application?	No
Which grant program?	
What stage are you in your project lifecycle?	Permitting
Is climate resiliency a core objective of this project?	No
Is this project being submitted as part of the state capital planning process?	No
Is this project being submitted as part of a regulatory review process or permitting?	Yes
Brief Project Description:	Dam Rehabilitation Project.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

- ✓ Project reduces storm damage
- ✓ Project protects public water supply
- ✓ Project improves water quality

Factors to Improve Output

- ✓ Incorporate nature-based solutions that may provide flood protection
- ✓ Incorporate strategies that reduce carbon emissions
- ✓ Incorporate green infrastructure or nature-based solutions that recharge groundwater
- ✓ Incorporate green infrastructure to filter stormwater
- ✓ Incorporate nature-based solutions that sequester carbon carbon
- ✓ Increase biodiversity, protect critical habitat for species, manage invasive populations, and/or provide connectivity to other habitats
- ✓ Preserve, enhance, and/or restore coastal shellfish habitats
- ✓ Incorporate vegetation that provides pollinator habitat
- ✓ Identify opportunities to remediate existing sources of pollution
- ✓ Provide opportunities for passive and/or active recreation through open space
- ✓ Increase plants, trees, and/or other vegetation to provide oxygen production
- ✓ Mitigate atmospheric greenhouse gas concentrations and other toxic air pollutants through nature-based solutions
- ✓ Identify opportunities to prevent pollutants from impacting ecosystems
- ✓ Incorporate education and/or protect cultural resources as part of your project

Is the primary purpose of this project ecological restoration?

No

Project Benefits

Provides flood protection through nature-based solutions	No
Reduces storm damage	Yes
Recharges groundwater	No
Protects public water supply	Yes
Filters stormwater using green infrastructure	No
Improves water quality	Yes
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
Remediates existing sources of pollution	No
Protects fisheries, wildlife, and plant habitat	No
Protects land containing shellfish	No
Provides pollinator habitat	No
Provides recreation	No
Provides cultural resources/education	No

Project Climate Exposure

Is the primary purpose of this project ecological restoration?	No
Does the project site have a history of coastal flooding?	No

Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
Does the project site have a history of riverine flooding?	No
Does the project result in a net increase in impervious area of the site?	No
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Lake Boon Dam
Asset Type: Dams and Flood Control Structures
Asset Sub-Type: Dams
Construction Type: Major Repair/Retrofit
Construction Year: 2025
Useful Life: 100

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure must be accessible/operable at all times, even during natural hazard event.

Identify the geographic area directly affected by permanent loss or significant inoperability of the infrastructure.
Impacts would be limited to local area and/or municipality

Identify the population directly served that would be affected by the permanent loss or significant inoperability of the infrastructure.
Less than 5,000 people

Identify if the infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
The infrastructure does not provide services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.

Will the infrastructure reduce the risk of flooding?
Yes

If the infrastructure became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?
Inoperability of the infrastructure would be expected to result in minor impacts to people's health, including minor injuries or minor impacts to chronic illnesses

If there are hazardous materials in your infrastructure, what are the extents of impacts related to spills/releases of these materials?
There are no hazardous materials in the infrastructure

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?
Moderate – Inoperability may impact other facilities, assets, or buildings, but cascading impacts do not affect the ability of other facilities, assets, or buildings to operate

If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Less than $10 million

Does the infrastructure function as an evacuation route during emergencies? This question only applies to roadway projects.
Yes

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?
Impact on natural resources will require remediation/rehabilitation

If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the infrastructure is not able to serve or operate its intended users or function)?
Loss of infrastructure may reduce the ability to maintain some government services, while a majority of services will still exist

What are the impacts to loss of confidence in government resulting from loss of infrastructure functionality (i.e. the infrastructure asset is not able to serve or operate its intended users or function)?
Reduced morale and public support

Asset: Barton Road
Asset Type: Transportation
Asset Sub-Type: Roads (local)
Construction Type: Maintenance (critical repair)
Construction Year: 2025
Useful Life: 50

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Infrastructure may be inaccessible/inoperable for more than a day, but less than a week after natural hazard without consequences.

Identify the geographic area directly affected by permanent loss or significant inoperability of the infrastructure.
Impacts would be limited to local area and/or municipality

Identify the population directly served that would be affected by the permanent loss or significant inoperability of the infrastructure.
Less than 5,000 people

Identify if the infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
The infrastructure does not provide services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.

Will the infrastructure reduce the risk of flooding?
No

If the infrastructure became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's

health and safety?
Inoperability of the infrastructure would be expected to result in minor impacts to people's health, including minor injuries or minor impacts to chronic illnesses
If there are hazardous materials in your infrastructure, what are the extents of impacts related to spills/releases of these materials?
There are no hazardous materials in the infrastructure
If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?
Moderate – Inoperability may impact other facilities, assets, or buildings, but cascading impacts do not affect the ability of other facilities, assets, or buildings to operate
If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?
Less than $10 million
Does the infrastructure function as an evacuation route during emergencies? This question only applies to roadway projects.
Yes
If the infrastructure became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?
No impact on surrounding natural resources is expected
If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the infrastructure is not able to serve or operate its intended users or function)?
Loss of infrastructure may reduce the ability to maintain some government services, while a majority of services will still exist
What are the impacts to loss of confidence in government resulting from loss of infrastructure functionality (i.e. the infrastructure asset is not able to serve or operate its intended users or function)?
Reduced morale and public support
Asset: Bordering Vegetated Wetland
Asset Type: Wetland Resource Area - Inland
Asset Sub-Type: Emergent wetlands
Construction Type: Maintenance (environmental)
Construction Year: 2025
Monitoring Frequency: 2
Asset: Land Under Water
Asset Type: Wetland Resource Area - Inland
Asset Sub-Type: Land under Water Bodies or Waterways
Construction Type: Maintenance (environmental)
Construction Year: 2024
Monitoring Frequency: 0
Asset: Bank - Lake
Asset Type: Wetland Resource Area - Inland
Asset Sub-Type: Banks
Construction Type: Maintenance (environmental)
Construction Year: 2025
Monitoring Frequency: 0
Asset: Bank - Perennial Stream
Asset Type: Wetland Resource Area - Inland
Asset Sub-Type: Banks
Construction Type: Maintenance (environmental)
Construction Year: 2025
Monitoring Frequency: 0
Asset: Bank - Intermittent Stream
Asset Type: Wetland Resource Area - Inland
Asset Sub-Type: Banks
Construction Type: Maintenance (environmental)
Construction Year: 2025
Monitoring Frequency: 0
Asset: Riverfront Area
Asset Type: Wetland Resource Area - Inland
Asset Sub-Type: Riverfront Area
Construction Type: Maintenance (environmental)
Construction Year: 2025
Monitoring Frequency: 0
Asset: Bordering Land Subject to Flooding
Asset Type: Wetland Resource Area - Inland
Asset Sub-Type: Lower Floodplains
Construction Type: Maintenance (environmental)
Construction Year: 2025
Monitoring Frequency: 0

Report Comments

N/A

Appendix I

Technical Specifications

DRAFT CONSTRUCTION CONTRACT SPECIFICATION FOR
SECTION 01562

DUST CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This section of the specifications 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

DRAFT CONSTRUCTION CONTRACT SPECIFICATION FOR
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, all of which are attached to Section 00890, 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 SUBMITTALS:

A. The Contractor shall submit for approval 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 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.

2.03 COMPOST FILTER TUBES:

A. Compost filter tubes or silt socks shall be a tubular filter sock of mesh fabric. The fabric will have openings of between 1/8-inch to 1/4-inch 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.

DRAFT CONSTRUCTION CONTRACT SPECIFICATION FOR
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, all of which are attached to Section 00890, 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 SUBMITTALS:

A. The Contractor shall submit for approval 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 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.

2.03 COMPOST FILTER TUBES:

A. Compost filter tubes or silt socks shall be a tubular filter sock of mesh fabric. The fabric will have openings of between 1/8-inch to 1/4-inch 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 the Contractor's 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 the 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 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.

3.05 LOCATION OF STORAGE AREAS:

A. The location of the Contractor's storage areas for equipment and/or materials shall be within area designated on the drawings as being available for construction staging operations.

B. The storage of excavated materials and materials used in backfill operations shall be confined to the designated staging areas. 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.

3.06 PROTECTION OF LANDSCAPE:

A. Unless indicated on the drawings, the Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them in areas outside the limits of work without written authority from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees to remain 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, including overhanging branches and limbs. The Contractor shall, in any event, be responsible for any damage resulting from such use.

B. Branches, limbs, and roots of trees to remain shall not be cut except by permission of the Engineer. If authorized by the Engineer, 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 construction 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 the method of restoration to 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.

3.07 CLEARING AND GRUBBING:

A. The Contractor shall clear and grub only on the Owner's land or the Owner's easements, and only within limit of work.

3.08 DISCHARGE OF DEWATERING OPERATIONS:

A. Under no circumstances shall the Contractor discharge water to the areas designated as bordering vegetated 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.

B. 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.

3.09 DUST CONTROL:

A. During the progress of the work, the Contractor shall conduct operations and maintain the area of construction activity, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust.

END OF SECTION

DRAFT CONSTRUCTION CONTRACT SPECIFICATION FOR
SECTION 01740

CLEANING UP

PART 1 - GENERAL

1.01 DESCRIPTION:

A. 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 clean up and make safe any and all areas deemed necessary by the Engineer.

1.02 RELATED WORK:

A. Section 00700 GENERAL CONDITIONS

B. Section 01110 CONTROL OF WORK AND MATERIALS

C. Section 01140 SPECIAL PROVISIONS

D. Section 01570 ENVIRONMENTAL PROTECTION

PART 2 - PRODUCTS

Not applicable to this section of the specifications.

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 shall 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 of the specifications 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, or 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 controls used for trapping sediment; and shall leave the roads and all parts of the work site 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 its operations. To this end the Contractor shall perform as required all necessary highway or driveway, walkway, 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

Appendix J

ODS Certificate of Non-Compliance and Dam Safety Order

dcr
Massachusetts

April 18, 2017
Certified Mail No. 7013 1090 0000 4863 5724
Return Receipt Requested

Town of Stow
c/o Michael Clayton, Superintendent
88 South Acton Rd
Stow, MA 01775

Subject: **CERTIFICATE OF NON-COMPLIANCE and DAM SAFETY ORDER**

Dam Name:	**Lake Boon Dam**
Location:	Stow
National ID No:	MA00137
Known Condition:	Poor
Hazard Potential:	Significant
Middlesex Registry of Deeds:	Book 10194, Page 35

Dear Mr. Clayton:

In accordance with 302 CMR 10.08, the Department of Conservation and Recreation (DCR), Office of Dam Safety (ODS) has determined that Lake Boon Dam does not meet accepted dam safety standards and is a potential threat to public safety. Therefore, DCR hereby issues a **CERTIFICATE OF NON-COMPLIANCE and DAM SAFETY ORDER**.

ODS records indicate that the Town of Stow is the Owner of the Lake Boon Dam, National Inventory of Dams No. MA00137. ODS classifies the dam as a **Large Size, Significant Hazard Potential** Structure. Significant Hazard Potential Dams are dams that may cause the loss of life and property damage in the event of dam failure.

August 7, 2012, an inspection of the Lake Boon Dam was performed by your engineering consultants Acton Survey & Engineering, Inc. As a result of this inspection, the dam was determined to be **STRUCTURALLY DEFICIENT** and in **POOR** condition. The dam has been found to be in need of repair, breaching or removal to bring the dam into compliance with dam safety regulations.

The CERTIFICATE OF NON-COMPLIANCE is based on the above-referenced inspection report results which listed the observance of many deficiencies, including but not limited to:

- Corrosion of the horizontal bar rack over the outlet structure
- Some deterioration of the northerly concrete weir abutment
- Inadequate riprap at the northerly end of the upstream slope
- Open joint between the top and bottom sections of the box culvert
- Unstable slide/deflection bucket at the primary spillway discharge
- Inadequate riprap at the dam outlet with erosion at the outfall and end of the slide/deflection bucket
- Significant seepage observed along the downstream embankment slope

ODS engineer consultant Tighe & Bond visited the site the dam site on February 27, 2017 and noted that conditions appeared to have worsened since the time of the August 7, 2012 Phase I Inspection Report, and that accordingly, the dam remains in POOR condition. The following observations were made during the February 27, 2017 inspection:

- Trees and brush were observed on and within 20 feet of the dam in some areas, including the left and right ends of the embankment and along the toe, although the majority of the downstream slope is well-maintained grass.
- A dike may be present near the dam's left abutment. This dike was not mentioned in the previous report. Trees and brush are located on and within 20 feet of the dike.
- Wet areas with signs of seepage are present along the downstream toe.
- An area of possible erosion or slope failure is present at the downstream toe near the outlet structure.
- There is evidence of settling, indicating possible subsurface defects, along the alignment of the low-level outlet pipe. This evidence includes settling of the fence posts adjacent to the outlet structure, a hole or burrow near the edge of pavement, and a hole at the center of the road. The previous inspection report references loss of soil into the outlet conduit, which was repaired with hydraulic cement and backfilled.

- The grouted riprap on the downstream slope is cracked, suggesting movement or possible undermining.

- The downstream portion of the outlet conduit is a corrugated metal pipe, which is corroded and which may not connect well to the upstream box culvert section.

- The outlet conduit discharges onto the downstream slope of the dam, resulting in erosion of riprap slope protection and the need for an information chute to reduce erosion.

- Areas of erosion and rutting are present on the downstream slope.

- A bare area was observed on the crest.

- The grouted riprap on the downstream slope is cracked, suggesting movement or possible undermining.

- The concrete of the outlet structure is deteriorating

- The upstream riprap slope protection has been displaced in areas, exposing the bedding material.

- No Operation and Maintenance Manual.

These foregoing deficiencies compromise the structural integrity of the dam and present a potential threat to public safety. ODS has determined that the dam needs to be repaired, breached or removed in order to bring the dam into compliance with dam safety regulations.

As indicated in the August 7, 2012 and the February 27, 2017 reports, Barton Road, a public roadway, sits on the crest of the dam. Failure of the dam may overtop or endanger the structural integrity of the roadway.

G.L. c. 253, Sections 44-48 and 302 CMR 10.00 set forth the jurisdiction for ODS and its authority to take action and order actions to be taken. For your information a copy of the Dam Safety Regulations, 302 CMR 10.00 Dam Safety, can be found on the ODS website.

DAM SAFETY ORDER:

In accordance with the authority of G.L. c. 253, Section 47, 302 CMR 10.07 and 10.08 you are hereby **ORDERED** to comply with the following:

1) **Conduct Follow-up Inspections:** You shall complete follow-up visual inspections at six (6)-month intervals, conducted by a registered professional civil engineer qualified to conduct dam inspections, at your cost, until adequate repairs are made or the dam is adequately breached. You shall submit the first Follow-up inspection to ODS no later than **August 28, 2017**.

   Follow-up inspections are to be summary in format and shall provide a written description, including photographs, of any changes in condition. Your engineer is to use the attached ODS Poor Condition Dam Follow-up

Inspection Form to report follow-up inspection findings. The form is also available electronically on the ODS web site. Your engineer shall include a cover letter on engineering firm letterhead that briefly summarizes the current follow-up inspection and findings.

You shall submit one (1) hard copy printed double-sided and one (1) electronic pdf copy of all completed follow-up visual inspection reports to ODS within thirty (30) days of the date of follow-up inspection field work.

2) **Conduct Phase II Inspection and Investigations**. You shall hire at your cost, a qualified registered professional engineer with dam engineering experience (engineer) to conduct a Phase II Inspection and Investigation of the dam to evaluate the structural integrity and spillway hydraulic adequacy of your dam and to develop/implement a plan to bring the dam into compliance with dam safety regulations by adequately repairing, breaching or removing the dam (see attached Phase II Investigation Outline).

   a. You shall commence the Phase II Inspection and Investigation no later than **July 18, 2017**. The Phase II Inspection and Investigation is to conform to the attached Phase II Investigation Outline. You are to, in a letter to ODS, no later than **July 5, 2017,** identify your selected engineer and inform ODS of the start date of the Phase II work.

   b. The Phase II Inspection and Investigation is to be completed, signed and stamped by your engineer and copies of the Phase II final report are to be delivered to ODS no later than **October 18, 2017**.

      You shall include a cover letter with the submitted Phase II report which describes your selected alternative to bring the dam into compliance with dam safety regulations. The owner shall submit a statement of your intent to implement inspection report recommendations to address structural and operational deficiencies to ODS upon submission of the required Phase II Inspection and Investigation completed by your engineer.

3) **Bring the dam into compliance and complete all repair, breach or removal work no later than October 18, 2018.** With your Phase II submittal, you must also provide a proposed timeline to design, permit and construct the selected alternative to repair, breach or remove the dam. The selected alternative must be completed, and the dam brought into compliance with Dam Safety regulations, by October 18, 2018.

4) **Additional Requirements:**
   a. You shall furnish copies of all required submittals listed above via certified mail.

   b. In order to maintain compliance with the Commonwealth's Wetlands Protection Laws you may have to seek requisite approval from your local Conservation Commission in accordance with G.L. c. 131, §40. You are obligated to contact and maintain communication with the Stow Conservation Commission and any other local, state or federal

permitting agency the ensure compliance with the Wetlands Protection Act and any other regulatory requirements.

c. You must inform the following parties about the condition of the dam and your developing plans to bring the dam into compliance with dam safety regulations: all abutters of the impoundment upstream; property owners within one-half mile downstream of the Lake Boon Dam; Bill Davis, District Manager, Central District, Division of Fisheries & Wildlife, 211 Temple St, West Boylston, MA 01583; Mary Jude Pigsley, Department of Environmental Protection, Central Region, 8 New Bond St, Worcester, MA 01606; Stow Board of Selectmen, 380 Great Rd, Stow, MA 01775; Kathy Sferra, Stow Conservation Coordinator, 380 Great Rd, Stow, MA 01775; Chief Landry, Stow Emergency Management Director, 511 Great Rd, Stow, MA 01775.

Please be advised that in accordance with G.L. c. 253, § 47, "any person who fails to comply with the provisions of this chapter or of any order, regulation or requirement of the department relative to dam safety, shall be fined an amount not to exceed $5,000 for each offense, to be fixed by the court." Furthermore, each violation shall be regarded as a separate and distinct offense and, in case of a continuing violation, each day's continuance thereof shall be deemed to be a separate and distinct offense.

Nothing in this order releases the owner from the requirements of any prior Dam Safety Order issued for this dam.

In accordance with 302 CMR 10.08, this CERTIFICATE OF NON-COMPLIANCE and DAM SAFETY ORDER will be recorded by the DCR at the Registry of Deeds in the county where the dam lies. Issuance of a Certificate of Compliance following adequate repair or breaching of the dam will be required to discharge the CERTIFICATE OF NON-COMPLIANCE and DAM SAFETY ORDER.

Please direct any technical questions, correspondence, or submittals to Emily Caruso, Department of Conservation and Recreation, Office of Dam Safety, 180 Beaman Street, West Boylston, MA 01583. Legal questions should be directed to the DCR Assistant General Counsel, Ariana Johnson, 251 Causeway Street, Suite 600, Boston, MA 02114. Additional dam safety information can be found at the DCR-ODS website: http://www.mass.gov/eea/agencies/dcr/conservation/dam-safety/.

Thank you for your cooperation.

Sincerely,

Leo Roy
Commissioner

CC: Senator James B. Eldridge
Representative Kate Hogan
Stow Board of Selectmen
Joseph Landry, Stow Fire Chief, Emergency Management Director
Kathy Sferra, Coordinator, Stow Conservation Commission
Barbara Newman, U.S. Army Corps
Mary Jude Pigsley, DEP
Deirdre Buckley, MEPA
Bill Davis, DFW
Rob Lowell, DCR
William Salomaa, DCR
Ariana Johnson, Esq., DCR
Tim Purinton, DER

Department of Conservation and Recreation
Office of Dam Safety
Phase II Inspection and Investigation Outline

I.	Review of existing information.....
II.	Updated Detailed Phase I surface inspection in compliance with Office of Dam Safety Phase I Inspection format.....
III.	Subsurface Investigations – borings, sampling, analysis.....
IV.	Topographic Survey, wetlands flagging/delineation, of sufficient detail to support not only the Phase II effort, but sufficient for the future implementation of design phase.....
V.	Stability and seepage analyses – Seismic and static stability evaluation of dam (upstream and downstream slopes, internal materials), seepage potential, internal erosion potential, piping potential.....
VI.	Hydrologic/Hydraulic Analysis and spillway inadequacy resolution.....
VII.	Alternatives analysis and presentation of conceptual designs and associated estimated design, permitting and construction costs to bring the dam structure into compliance with Chapter 253 Section 44-48 and 302 CMR 10.00 Dam Safety Regulations by either executing selected repair plan or breach plan.....
VIII.	Final Report Presented to the Office of Dam Safety.....

Commonwealth of Massachusetts
Department of Conservation and Recreation
Office of Dam Safety Poor Condition Dam Follow-up Inspection Form

(Complete this inspection form and provide a cover letter on consulting firm letterhead that briefly summarizes the current follow-up inspection and findings. The cover letter shall be signed and stamped by the Registered Professional Engineer in charge of the inspection)

Dam Name:
Dam Owner:
Nat. ID Number:
Hazard Potential:
Location of Dam (town):
Coordinate location (lat, long):
Date of Inspection:
Weather:

Consultant Inspector(s): **firm name and name of Registered Professional Engineer in charge of inspection.**

Others in Attendance at Field Inspection: **include list of names, affiliation and phone numbers.**

Attachments: **Updated site sketch with photo locations, Updated photos, and copy of locus map from Phase I report and other applicable attachments.**

I. **Previous Inspection date/Overall Condition:**
- Date of most recent formal Phase I Inspection Report:
- List the overall condition reported in most recent Phase I Inspection Report:

II. **Previous Inspection Deficiencies:**
- List identified deficiencies in the most recent Phase I Inspection Report:

III. **Overall Condition of Dam at the Time of the Current Follow-up Inspection:**
   a. **State the current condition**
   b. **Have conditions changed since the previous inspection? Yes or no.**

IV. **Comparison of Current Conditions to Condition Listed in Previous Phase I Inspection Report:**
   a. **Have any of the deficiencies listed in the previous Phase I Inspection Report worsened?**
   b. **If yes, list the changes.**
   c. **Are there any additional deficiencies that have been identified in the current inspection?**

d. **If yes, list the deficiencies and describe.**

V. **Dam Safety Orders:**

- **List dam safety orders that have been issued to the dam owner pertaining to this dam.**

VI. **Maintenance:**

1. Indicate if there exists an operation and maintenance plan for the dam.
2. Indicate if it appears the dam is being maintained.

VII. **Recommendations:**

VIII. **Other Comments or Observations:**

IX. **Updated Site Sketch with Photo Locations:**

X. **Updated Photos:**

XI. **Copy of Locus Map from Phase I Report:**

XII. **Other applicable attachment:**

Appendix K

Agency Correspondence

Page, Hailey

From: Stolarski, Jason (FWE) <jason.stolarski@mass.gov>
Sent: Thursday, March 7, 2024 8:34 AM
To: Page, Hailey
Cc: Sommers, Rhianna
Subject: Re: Stow MA - Lake Boon Dam Repairs and Improvements Project - TOY Restrictions 03/06/2024

Hailey,
After review, MassWildlife has no time restrictions pertaining to the proposed work on the dam in Lake Boon. Please do take care to minimize turbidity downstream in Bailey Brook and the Assabet River.

jason

Jason Stolarski Ph.D | Aquatic Biologist
Massachusetts Division of Fisheries & Wildlife
1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6334 | f: (508) 389-7890
mass.gov/masswildlife | facebook.com/masswildlife

From: Page, Hailey <Page.Hailey@wseinc.com>
Sent: Wednesday, March 6, 2024 3:40 PM
To: Stolarski, Jason (FWE) <jason.stolarski@mass.gov>
Cc: Sommers, Rhianna <Sommers.Rhianna@wseinc.com>
Subject: Stow MA - Lake Boon Dam Repairs and Improvements Project - TOY Restrictions 03/06/2024

Good afternoon,

I am reaching out to request a written determination if there are any Time of Year Restrictions for a dam rehabilitation/improvement project located at Lake Boon Dam (Near 0 Barton Road) in Stow, MA. I have attached a project description along with a few maps showing the extent of the project area.

Could you please confirm if there are any Time of Year Restrictions, we should be aware of or if there is anything else we need to do to satisfy your department for work within this area?

Please feel free to reach out for any additional information.

Thanks,
Hailey

Hailey Page (She/Her)
Environmental Scientist II

direct: 781-909-4035

Weston & Sampson
55 Walkers Brook Drive, Suite 100 | Reading, MA 01867
tel: 978-532-1900
westonandsampson.com
Follow us on Facebook | Twitter | LinkedIn

Page, Hailey

From: Cheeseman, Melany (FWE) <Melany.Cheeseman@mass.gov>
Sent: Tuesday, March 12, 2024 2:04 PM
To: Page, Hailey
Cc: Sommers, Rhianna
Subject: RE: Stow MA - Lake Boon Dam Repairs and Improvements Project - NHESP Protected Resources Determination 03/06/2024

Follow Up Flag: Follow up
Flag Status: Flagged

Hailey,

Thank you for submitting the project information for the dam repairs and improvements project at Lake Boon in Stow. Based on a review of the project description and locus map that were provided and the information that is currently contained in our database, the Division has determined that this project, as currently proposed, does not occur within Estimated Habitat of Rare Wildlife or Priority Habitat as indicated in the Massachusetts Natural Heritage Atlas (15th Edition). Therefore, the project is not required to be reviewed for compliance with the rare wildlife species section of the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.37, 10.59 & 10.58(4)(b)) or the MA Endangered Species Act Regulations (321 CMR 10.18). Any additional work beyond that shown on the submitted maps (Figure 1, Figure 2; prepared by Weston and Sampson) may require a filing with the Division. Please let me know if you have any additional questions or need any additional information. Thank you,

Melany Cheeseman
Endangered Species Review Assistant
Natural Heritage & Endangered Species Program
Massachusetts Division of Fisheries & Wildlife
1 Rabbit Hill Road, Westborough, MA 01581
melany.cheeseman@mass.gov | www.mass.gov/nhesp

From: Page, Hailey <Page.Hailey@wseinc.com>
Sent: Wednesday, March 6, 2024 3:26 PM
To: Cheeseman, Melany (FWE) <Melany.Cheeseman@mass.gov>
Cc: Sommers, Rhianna <Sommers.Rhianna@wseinc.com>
Subject: Stow MA - Lake Boon Dam Repairs and Improvements Project - NHESP Protected Resources Determination 03/06/2024

Hello Melany,

I hope all is well with you. I am submitting several wetlands permits for a project located at Lake Boon Dam in Stow MA (Near 0 Barton Road, Stow, MA). This project is a dam rehabilitation/improvement project. I have attached a project description along with a few maps showing the extent of the project area.

I am reaching out to you to ensure that no further action is required. Based on the available MassGIS mapping this project area is not located within any estimated or priority habitat. Would you be able to confirm for me if there is anything else we need to do to satisfy your department?

Please let me know if you have any questions!

Thanks,
Hailey

Hailey Page (She/Her)
Environmental Scientist II
direct: 781-909-4035

Weston & Sampson
55 Walkers Brook Drive, Suite 100 | Reading, MA 01867
tel: 978-532-1900
westonandsampson.com
Follow us on Facebook | Twitter | LinkedIn

MassDEP 401 WQC - SAP Approval 03.26.2024

From: Alepidis, Kenneth (DEP) <Kenneth.Alepidis@mass.gov>
Sent: Tuesday, March 26, 2024 11:40 AM
To: Blair, TJ <BlairT@wseinc.com>
Cc: Wong, David W (DEP) <david.w.wong@mass.gov>; Kurkjian, Daron <KurkjianD@wseinc.com>; Shanahan, Meghan <Shanahan.Meghan@wseinc.com>
Subject: RE: 401 WQC Sediment Sampling Requirements

Thank you for this additional information, TJ.

The proposed sampling, as described in the Sampling and Analysis Plan for the Lake Boon Dam Rehabilitation project, dated March 14, 2024 and further detailed in the March 21, 2024 Response to Request for Additional Information memorandum, is approved.

Prior to application submission, please be sure to reach out to David Wong to coordinate a pre-application meeting with MassDEP. Project proponents are required to request a pre-filing meeting with MassDEP at least 30 days prior to submitting a request for a WQC. A pre-filing meeting would be especially important in this case, to go over project construction and sampling sequencing and details.

Let me know if you have any questions.

Thanks,

Ken Alepidis, P.G.
401 Water Quality Certification Unit
MassDEP
Kenneth.Alepidis@Mass.gov

From: Blair, TJ <BlairT@wseinc.com>
Sent: Thursday, March 21, 2024 9:31 AM
To: Alepidis, Kenneth (DEP) <Kenneth.Alepidis@mass.gov>
Cc: Wong, David W (DEP) <david.w.wong@mass.gov>; Kurkjian, Daron <KurkjianD@wseinc.com>; Shanahan, Meghan <Shanahan.Meghan@wseinc.com>
Subject: RE: 401 WQC Sediment Sampling Requirements

Good morning, Kenneth:
Thank you for your questions. Please see the attached memo for our responses. We appreciate the comment regarding SVOC and PAH testing and will take that under consideration. We do understand that issuance of a WQC prior to dredged material characterization is not typical, and so we appreciate your consideration of this special case and your request for additional information. If there is any other information we can provide, please let us know.

Thank you,
TJ

TJ Blair, P.E.
PROJECT MANAGER
cell: 508-410-7629

Weston & Sampson
100 Foxborough Blvd, Suite 250 | Foxborough, MA 02035
westonandsampson.com
Follow us on Facebook | Twitter | LinkedIn

From: Alepidis, Kenneth (DEP) <Kenneth.Alepidis@mass.gov>
Sent: Monday, March 18, 2024 4:00 PM
To: Blair, TJ <BlairT@wseinc.com>
Cc: Wong, David W (DEP) <david.w.wong@mass.gov>; Kurkjian, Daron <KurkjianD@wseinc.com>; Shanahan, Meghan <Shanahan.Meghan@wseinc.com>
Subject: RE: 401 WQC Sediment Sampling Requirements

Hello Tj
Thank you for this Due Diligence Review and Sampling and Analysis Plan for the Lake Boon Dam Rehabilitation project in Stow.

I understand that due to dam safety concerns the sampling is proposed for after the project begins, where samples will be collected during a monitoring period after the sheetpile cutoff wall and temporary cofferdams are installed, enabling sampling to be conducted in the dry, and would mitigate the identified safety issues.

Can you help us better understand the project's proposed construction and sampling sequencing, and sediment management strategies?

- What is the construction sequencing prior to sampling?
- What type of temporary cofferdam will be installed at the Bailey Brook side of the proposed work, will that be installed prior to the sampling, and will that area be dewatered prior to sampling ?
- What is the project sequence after sampling is conducted and how long will the monitoring period be?
- What will be the protocol to provide sampling results to MassDEP?
- Following characterization, how will sediment be managed? Will dredged materials be disposed of offsite, reused onsite? Will any material be released to the pond or brook? If transported offsite, will the material be live loaded to offsite facilities or will it be staged onsite for stockpiling/dewatering?

One additional comment on the sampling details. PAHs (with the EPH) and SVOC are listed for separate analysis. If the SVOC analysis includes the PAH subset, two separate analyses for SVOCs and PAHs are not required (unless you want two separate analyses).

Let us know when you have a chance. As you may understand, issuance of a WQC prior to dredged material characterization is not typical, so we need to make sure the sampling, construction, and soil management sequence and details are understood, appropriate, and protective of the environment in this unique project situation.

Thank you,

Kenneth N. Alepidis, P.G.
Environmental Analyst
401 Water Quality Certification Unit
Division of Wetlands and Waterways
MassDEP - Bureau of Water Resources
100 Cambridge Street, Suite 900, Boston MA 02114
Kenneth.Alepidis@Mass.gov

From: Blair, TJ <BlairT@wseinc.com>
Sent: Friday, March 15, 2024 8:18 AM
To: Wong, David W (DEP) <david.w.wong@mass.gov>
Cc: Kurkjian, Daron <KurkjianD@wseinc.com>; Shanahan, Meghan <Shanahan.Meghan@wseinc.com>; Alepidis, Kenneth (DEP) <Kenneth.Alepidis@mass.gov>
Subject: RE: 401 WQC Sediment Sampling Requirements

Thank you, David and Kenneth.

TJ Blair, P.E.
PROJECT MANAGER
cell: 508-410-7629

Weston & Sampson
100 Foxborough Blvd, Suite 250 | Foxborough, MA 02035
westonandsampson.com
Follow us on Facebook | Twitter | LinkedIn

From: Wong, David W (DEP) <david.w.wong@mass.gov>
Sent: Friday, March 15, 2024 7:09 AM
To: Blair, TJ <BlairT@wseinc.com>
Cc: Kurkjian, Daron <KurkjianD@wseinc.com>; Shanahan, Meghan <Shanahan.Meghan@wseinc.com>; Alepidis, Kenneth (DEP) <Kenneth.Alepidis@mass.gov>
Subject: RE: 401 WQC Sediment Sampling Requirements

Hi TJ,

This is to confirm that MassDEP received your two files. My colleague Ken Alepidis is going to review it and please contact him accordingly if you have any questions. For your convenience, he is copied in this email.

You have a good weekend!

Sincerely,

David

From: Blair, TJ <BlairT@wseinc.com>
Sent: Thursday, March 14, 2024 4:52 PM
To: Wong, David W (DEP) <david.w.wong@mass.gov>
Cc: Kurkjian, Daron <KurkjianD@wseinc.com>; Shanahan, Meghan <Shanahan.Meghan@wseinc.com>
Subject: RE: 401 WQC Sediment Sampling Requirements

David,
Please disregard the download link in my previous email and use the one provided here/below. Apologies for any confusion.

Sincerely,
TJ

Secure Message Info

Message ID	aO2zKqxXAEfhgPzSJ7KrGS
Message Expires	Thursday, 28 March
Message URL	https://sharefile.wseinc.com/message/aO2zKqxXAEfhgPzSJ7KrGS
Permission	Only specified recipients can access the files attached to this message.

Files attached to this message

Filename	Size
401 WQC Pre-Application Form_20240207.xlsx	18.8 KB
Wetson & Sampson DD Review and Proposed SAP - Lake Boon Dam Rehabilitation.pdf	64.3 MB

Download Attached Files

Reply to this Secure Message

If you need assistance accessing or using this Secure Message System, please contact support at LiquidFilesSupport@wseinc.com.

TJ Blair, P.E.
PROJECT MANAGER
cell: 508-410-7629

Weston & Sampson
100 Foxborough Blvd, Suite 250 | Foxborough, MA 02035
westonandsampson.com
Follow us on Facebook | Twitter | LinkedIn

From: Blair, TJ <BlairT@wseinc.com>
Sent: Thursday, March 14, 2024 4:48 PM
To: Wong, David W (DEP) <david.w.wong@mass.gov>
Cc: Kurkjian, Daron <KurkjianD@wseinc.com>; Shanahan, Meghan <Shanahan.Meghan@wseinc.com>
Subject: RE: 401 WQC Sediment Sampling Requirements

Hello David,
Thank you again for your previous suggestions.
We are happy to say that our due diligence review and proposed SAP for the Lake Boon Dam Rehabilitation Project are ready for MassDEP's review. Please use the link provided below to download an electronic copy of the document as well as the pre-application form you provided me. As indicated in my previous emails, we are proposing an alternate sampling schedule and are hopeful that MassDEP will understand our reasoning for doing so. Please reach out with any questions. We look forward to hearing from you.

Sincerely,
TJ

Secure Message Info

Message ID	hfpZOLNrx3LDEnp2FsDNHt
Message Expires	Thursday, 28 March
Message URL	https://sharefile.wseinc.com/message/hfpZOLNrx3LDEnp2FsDNHt
Permission	Only specified recipients can access the files attached to this message.

Files attached to this message

Filename	Size
Wetson & Sampson DD Review and Proposed SAP - Lake Boon Dam Rehabilitation 2024-03-24.pdf	64.3 MB
401 WQC Pre-Application Form_20240207.xlsx	18.8 KB

Download Attached Files

Reply to this Secure Message

If you need assistance accessing or using this Secure Message System, please contact support at LiquidFilesSupport@wseinc.com.

TJ Blair, P.E.
PROJECT MANAGER
cell: 508-410-7629

Weston & Sampson
100 Foxborough Blvd, Suite 250 | Foxborough, MA 02035
westonandsampson.com
Follow us on Facebook | Twitter | LinkedIn

From: Wong, David W (DEP) <david.w.wong@mass.gov>
Sent: Friday, February 9, 2024 10:47 AM
To: Blair, TJ <BlairT@wseinc.com>
Cc: Spink, Stephen <SpinkS@wseinc.com>
Subject: RE: 401 WQC Sediment Sampling Requirements

Hi TJ,

Look forward to working with you on it.

Sincerely,

David

From: Blair, TJ <BlairT@wseinc.com>
Sent: Friday, February 9, 2024 10:30 AM
To: Wong, David W (DEP) <david.w.wong@mass.gov>
Cc: Spink, Stephen <SpinkS@wseinc.com>
Subject: RE: 401 WQC Sediment Sampling Requirements

Thank you, David. We will submit that information to you as soon as possible.

Thanks,
TJ

TJ Blair, P.E.
PROJECT MANAGER
cell: 508-410-7629

Weston & Sampson
100 Foxborough Blvd, Suite 250 | Foxborough, MA 02035
westonandsampson.com
Follow us on Facebook | Twitter | LinkedIn

From: Wong, David W (DEP) <david.w.wong@mass.gov>
Sent: Friday, February 9, 2024 8:28 AM
To: Blair, TJ <BlairT@wseinc.com>
Subject: RE: 401 WQC Sediment Sampling Requirements

Hi TJ,

Thanks for your information on this project. For a 401 WQC project with dredging, usually it is required for submitting all sediment chemical data. Before lab analysis, usually a due diligence and sampling review and analysis plan (SAP) are also required (attached are two examples). For your proposed sampling alternative, we have never had such a case before. Therefore, I cannot make a decision now. However, it may be possible, if you submit a due diligence review and a SAP, as well as the Pre-APPLICATION Form (attached EXCEL file) to me.

After that, I'll review them and discuss with you about it.

Thanks and you have a good weekend!

Sincerely,

David

David Wong, Ph.D.
401 Water Quality Cert. Program
Division of Wetlands and Waterways
Massachusetts Department of Environmental Protection
Email: david.w.wong@mass.gov
Cell Phone: 617-874-7155

From: Blair, TJ <BlairT@wseinc.com>
Sent: Friday, February 9, 2024 7:13 AM
To: Wong, David W (DEP) <david.w.wong@mass.gov>
Subject: 401 WQC Sediment Sampling Requirements

Hello David,

Thank you for returning my call. Sorry I couldn't get to the phone quick enough, but I did listen to your voicemail, so I am following up here as you suggested. Apologies that this is a long email.

Weston & Sampon Engineers is helping the Town of Stow, Massachusetts with a proposed project that consists of repairs and improvements to the Lake Boon Dam located in Stow, MA at the northwestern limit of Lake Boon. The dam itself is a soil / earth fill embankment that carries Barton Road on its crest and includes a concrete spillway culvert near its midpoint. We are in the process of reviewing which permits and approvals will be required for the project (we have not submitted any applications yet) and have identified that an application for a 401 WQC for dredging and dredged material disposal will be needed based on the following proposed activities:

- Near-shore dredging within Lake Boon itself will be proposed for construction of a new spillway/outlet structure, which will replace the existing structure that is undersized and in poor condition. The dredge area would be contained within a four-sided enclosed sheet pile cofferdam that abuts the dam/roadway. The footprint area of the sheet pile enclosure, which is equal to dredge area, will be approximately 500 square feet. Water would be removed from within the sheet pile cofferdam before any excavation within it can occur. Additionally, it seems important to note that the dredging operations at this location would occur entirely within the cofferdam enclosure, which would greatly minimize any opportunity for dredged sediment to inadvertently displace into the open water.
- Additionally, dredging below the waters of Bailey's Brook on the downstream side of the dam will be proposed for construction of a new headwall structure.
- Disposal of dredged material would occur at an appropriate off-site, upland disposal facility. Currently there are no intentions to re-use or relocate the material to a different location on the project site.
- Total proposed dredge volume is still being determined but there is the possibility that it could classify as a major project subject to BRP WW07 (though we intend to submit a combined application for a 401WQC and Chapter 91 license). Lake Boon is a Great Pond.

One of the challenges we are facing in developing a sampling plan for the 401 WQC application is that the proposed dredge locations are in areas that are critical to the stability and safe performance of the dam. The dam itself is in poor condition, which per the Massachusetts Dam Safety Regulations means that its condition poses a high risk to downstream public safety. Penetrating the areas of proposed dredging ahead of construction could further endanger the dam, which is already in poor condition. We are therefore hesitant to perform sampling activities that could further compromise its stability. Below is some additional information as to why sampling in these areas, in our professional opinion, should not be performed until construction.

- Materials proposed to be dredged from within Lake Boon (first bullet above) would be soil material that is currently beneath an impermeable PVC liner. The liner was installed many years ago as a protective measure for the dam itself to reduce seepage from the lake through the dam embankment. Penetrating the liner to sample the underlying soil that would be dredged would compromise the performance of the liner and could adversely affect stability of the dam. Additionally, there is approximately a 12-inch-thick layer of underwater stone riprap over the liner that cannot be safely removed to enable core samples to be taken without damaging the liner.
- Materials proposed to be dredged from within Bailey's Brook (second bullet above) are located at the downstream toe of the dam, which is an area that is arguably the most sensitive to any form of boring or core-type sampling. Holes created in this area for sampling purposes, without first lowering the lake level, could potentially initiate a dangerous condition referred to as internal erosion. Unfortunately, there are a variety of reasons why lowering the lake is not possible for this project.

In reviewing 314 CMR 9.00, we noted that Paragraph 9.07(2) indicates that alternative sampling schedules may be authorized in certain cases. In light of the considerations summarize above, we are hopeful that your office might consider authorizing the following alternative sampling approach, or some derivation of it:

- We would propose to conduct the required sediment sampling during construction, but before any dredging activity occurs, so that appropriate safety measures can be in place beforehand. Appropriate chemical testing would be performed, and the results provided to the DEP reviewer, before any dredging activity occurs. This approach would allow for the collection of soil core samples in the proposed dredge areas at a time when such activities can be performed without unnecessary risk and concern for the safety of the dam.

Please let us know if you have any questions or if we can provide any additional detail that may help.

We appreciate your time and look forward to hearing from you.

Thank you,
TJ

TJ Blair, P.E.
PROJECT MANAGER
cell: 508-410-7629

Weston & Sampson
100 Foxborough Blvd, Suite 250 | Foxborough, MA 02035
westonandsampson.com
Follow us on Facebook | Twitter | LinkedIn

The contents of this e-mail and any attachments are the property of the Weston & Sampson companies. The e-mail contents are only to be used by the intended recipient of the e-mail. If you are not the intended recipient, then use, disclosure, copying, distribution or reliance on the e-mail is prohibited. All professional advice from us should be obtained in writing (not e-mail).
The contents of this e-mail and any attachments are the property of the Weston & Sampson companies. The e-mail contents are only to be used by the intended recipient of the e-mail. If you are not the intended recipient, then use, disclosure, copying, distribution or reliance on the e-mail is prohibited. All professional advice from us should be obtained in writing (not e-mail).
The contents of this e-mail and any attachments are the property of the Weston & Sampson companies. The e-mail contents are only to be used by the intended recipient of the e-mail. If you are not the intended recipient, then use, disclosure, copying, distribution or reliance on the e-mail is prohibited. All professional advice from us should be obtained in writing (not e-mail).
The contents of this e-mail and any attachments are the property of the Weston & Sampson companies. The e-mail contents are only to be used by the intended recipient of the e-mail. If you are not the intended recipient, then use, disclosure, copying, distribution or reliance on the e-mail is prohibited. All professional advice from us should be obtained in writing (not e-mail).

Appendix L

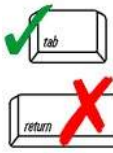
Stormwater Report

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.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

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.

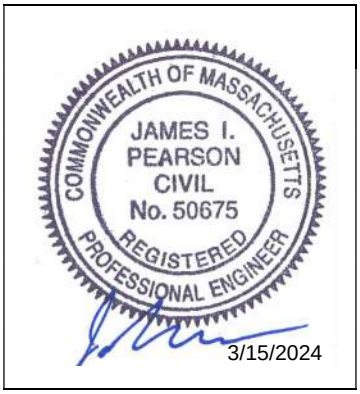
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the 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



3/15/2024
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of “country drainage” versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

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 for Stormwater Report

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 for Stormwater Report

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 for Stormwater Report

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 for 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 for 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

To Be Submitted with the Environmental Permits

Applicant/Project Name: Town of Stow

Project Address: 0 Barton Road Stow, MA

Application Prepared by:

Firm: Weston & Sampson, Inc.

Registered PE James Pearson, P.E.

Below is an explanation concerning Standards 1-10 as they apply to the Town of Stow – Lake Boon Dam Repairs & Improvements Project:

General:

The proposed Lake Boon Dam Repairs and Improvements Project (the project) is located at the Lake Boon Dam in Stow, Massachusetts. The dam is an earthfill embankment dam constructed across Bailey Brook, a perennial stream, between natural earthen abutments. The dam impounds Lake Boon, a Great Pond with two large open-water basins and several shallower vegetated basins straddling the Towns of Stow and Hudson.

The project proposes necessary repairs and improvements to the dam due to its classification as structurally deficient and in poor condition. The Massachusetts Department of Conservation and Recreation (DCR) Office of Dam Safety issued a Certificate of Non-Compliance to the Town of Stow on April 18, 2017, highlighting the dam's failure to meet safety standards and its potential threat to public safety. Lake Boon Dam is crucial, serving multiple public purposes including water supply, emergency preparedness, transportation, and recreation for the communities of Stow and Hudson, Massachusetts. Despite its significance, critical deficiencies such as uncontrolled seepage, slope instability, spillway deterioration, insufficient spillway capacity, and excessive woody vegetation threaten its structural integrity and safety.

The dam's inadequacies, particularly concerning seepage, slope stability, spillway condition, and vegetation management, pose immediate risks to public safety and the environment. Failure of the dam could lead to catastrophic downstream consequences, including loss of life, water supply, and essential emergency services, alongside the loss of a historic recreational asset. The proposed project aims to address these critical issues, enhancing the dam's physical condition and safety, thereby mitigating risks to the public and preserving the dam's multifaceted roles.

For additional information please see Appendix A for Project Description.

Standard 1: No New Untreated Discharges

The proposed project will create no new untreated discharges. No new impervious area will be created during this project.

Standard 2: Peak Rate Attenuation

Since there will be no increase in impervious areas, post-development (post-improvement) peak discharge rates will not exceed pre-development (pre-improvement) peak discharge rates.

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, a silt curtain in the reservoir, and a dewatering sediment trap as needed by the determined contractor.

Standard 3: Recharge

As noted in the Standard 2 explanation, the impervious area in the work area will not be increased at the completion of the project. Therefore, recharge rates will not change in the work area at the end of the project.

Standard 4: Water Quality

The proposed work will not change water quality at the site. There will be no increase in stormwater flow, and the design for dam improvements will not increase soil erosion. During the project, appropriate BMPs will be used to minimize sedimentation and soil erosion.

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

Not Applicable. There are no LUHPPLs in the work area.

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

This project is a re-development and limited project which will minimize disturbance to existing trees and shrubs.

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. 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 around much of the downstream limits of work, a silt boom in the reservoir, a stabilized construction entrance, and a dewatering sediment trap (as needed) as depicted on the site plans.

Standard 9: Operation and Maintenance Plan

An operations and maintenance plan is not needed since there will not be any new stormwater management systems put in place in the project work area. The Town of Stow will be responsible for maintaining the dam structure.

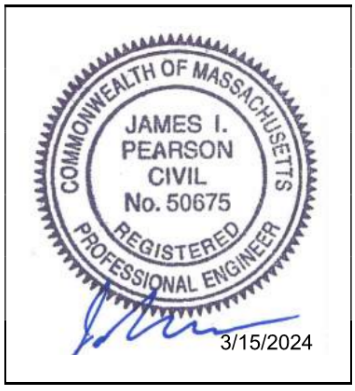
Standard 10: Prohibition of Illicit Discharges

By the nature of the proposed work, there will be no illicit discharges. There will be no opportunity for illicit discharges into the system.

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



3/15/2024

Signature and Date

Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan

SECTION 1: Introduction

Lake Boon Dam was constructed in about 1870 and is a municipally-owned and state-regulated dam located off Barton Road in Stow, Massachusetts. The dam impounds Lake Boon. Numerous properties with year-round private residents surround Lake Boon and utilize the lake for shallow well-water supply and water-based recreational activities.

The project proposes necessary repairs and improvements to the dam due to its classification as structurally deficient and in poor condition. The Massachusetts Department of Conservation and Recreation (DCR) Office of Dam Safety issued a Certificate of Non-Compliance to the Town of Stow on April 18, 2017, highlighting the dam's failure to meet safety standards and its potential threat to public safety. Lake Boon Dam is crucial, serving multiple public purposes including water supply, emergency preparedness, transportation, and recreation for the communities of Stow and Hudson, Massachusetts. Despite its significance, critical deficiencies such as uncontrolled seepage, slope instability, spillway deterioration, insufficient spillway capacity, and excessive woody vegetation threaten its structural integrity and safety.

The dam's inadequacies, particularly concerning seepage, slope stability, spillway condition, and vegetation management, pose immediate risks to public safety and the environment. Failure of the dam could lead to catastrophic downstream consequences, including loss of life, water supply, and essential emergency services, alongside the loss of a historic recreational asset. The proposed project aims to address these critical issues, enhancing the dam's physical condition and safety, thereby mitigating risks to the public and preserving the dam's multifaceted roles.

For additional information please see Appendix A for Project Description.

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 of 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 appropriate sediment and erosion control measures.

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 insure 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 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 a particular area or areas where the Contractor may store materials used in his operations.

2.5 Perimeter Controls and Sediment Barriers

Erosion control lines as described in Section 5 will be utilized to ensure that sedimentation does not occur outside the perimeter of the work area.

2.6 Storm Drain Inlet Protection

There are no storm drains in the work area.

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 and silt curtain 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.

SECTION 3: Spill Prevention and Control Plan

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 of 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:
Brian Hatch
Town of Stow Highway Department
88 South Acton Road
Stow, MA 01775
(978)897-8071

Engineer:
James Pearson, PE
Weston & Sampson Engineers, Inc.
55 Walkers Brook Dr, Suite 100
Reading, MA 01867
978-532-1900

Site Inspector:
TBD

Contractor:
TBD

SECTION 5: Erosion and Sedimentation Control

Erosion and Sedimentation Control Drawings can be found in the attached project plans. In addition a technical specification (*Section 01570 Environmental Protection*) has been included as part of Appendix E, which details all Erosion and Sedimentation controls.

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 *01570 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?

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: _____

Appendix M

Property Access Agreements

ASSENT

We, the undersigned, Robert F. Collings and Caroline J. Collings, owners of the property at 137 Barton Road, Stow, MA, being Assessors' Map R25, Parcel 17, hereby assent to allow the permit applications for proposed safety improvements to Lake Boon Dam to show re-grading of our property along the down side of the dam terminating at the edge of our property line with 105 Barton Road shown on W&S C101 and streambed realignment on our property as identified as 55 LF of stream realignment as noted on the Illustrative Preliminary Site Plan with Impacted Areas (W&S no identification) on Phase 2 construction plan sheet 2 of 4, August 2022 estimated as 68 ft.

We further acknowledge that some further construction agreements may be required before construction bidding takes place and we agree to approve them, but only as they apply directly to this agreement. That said, this agreement does not include any other rights to use our property as it has been represented that this agreement is necessary to apply for environmental permits and the Town of Stow has rejected other options regarding the use of our property.

This agreement remains in effect throughout the entire permitting process but expires one year after Phase 2 construction begins.

Robert F. Collings — 3/29/24

Robert F. Collings — Date

Caroline J. Collings — 3.29.24

Caroline J. Collings — Date

ASSENT

We, the undersigned, Calbenal Family LLC, owner of the property at 105 Barton Rd, Stow, MA, being Assessors' Map U-2, Parcel 62, hereby assent to allow the permit applications for proposed improvements to the Lake Boon Dam to show activities on our property, including but not limited to the removal of existing infrastructure and trees, earthwork and grading of slopes, as depicted on the land use plans accompanying this Assent. We acknowledge that the proposed conditions may receive alterations out of necessity prior to, or during, the application process, or as a condition of permits. We further acknowledge that a lease agreement will be required before construction bidding takes place, and we agree to cooperate in the execution of such instrument.

CALBENAL FAMILY LLC
5 Larch Road
Acton, MA 01720

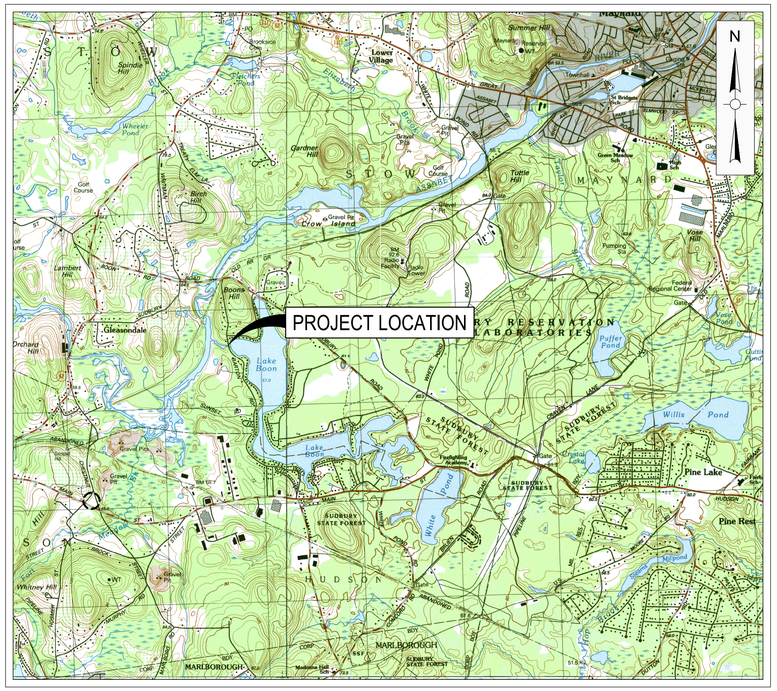
By: Nancy L. Warner Date: 3/22/24

Print name: Nancy L. Warner for Calbenal Family LLC

Title: General Partner

Appendix N

Project Plans



SITE LOCATION MAP
SCALE: 1" = 3,000'

AERIAL IMAGE
SCALE: 1" = 200'

DRAWINGS FOR:

LAKE BOON DAM

STOW, MASSACHUSETTS
MIDDLESEX COUNTY

TOWN OF STOW
380 GREAT ROAD
STOW, MA 01775

NATIONAL DAM I.D. NUMBER:
MA00137

DAM OWNER:
TOWN OF STOW, MASSACHUSETTS

DAM CARETAKER:
STOW HIGHWAY DEPARTMENT

STATE SIZE CLASSIFICATION:
LARGE

STATE HAZARD POTENTIAL CLASSIFICATION:
SIGNIFICANT

PROJECT DESIGN ENGINEER:
WESTON & SAMPSON ENGINEERS, INC.

DRAWING INDEX FOR ENF SUBMISSION

Weston & Sampson Engineers, Inc.
55 Walkers Brook Drive, Suite 100
Reading, MA 01867

PROJECT PLANS
MEPA ENF SUBMISSION

APRIL 2024

Know what's below.
Call before you dig.

SYMBOLS LEGEND:

- WETLAND FLAG
- EXPLORATORY BORING
- SURVEY TRAVERSE POINT
- BOULDER ON GROUND
- TREE > 6" DBH
- SURVEY MONUMENT (REBAR)
- SURVEY MONUMENT (IRON PIPE)
- SURVEY MONUMENT (DRILL HOLE)
- 185 — 1-FT. ELEVATION CONTOUR (NAVD 88)
- SURVEY TRAVERSE LINE
- PROPERTY LINE
- TOWN LAYOUT LINE
- UNDERGROUND STRUCTURE
- WOOD POST AND BEAM GUARDRAIL
- BVW
- TOP OF BANK (PERENNIAL OR LAKE)
- TOP OF BANK (INTERMITTENT)
- BLSF
- WETLAND BUFFER (35' AND 100')
- RIVERFRONT AREA (100' AND 200')

ABBREVIATIONS:

BVW	BORDERING VEGETATED WETLAND
BLSF	BORING LAND SUBJECT TO FLOODING
DBH	DIAMETER AT BREAST HEIGHT
DH	DRILL HOLE
TOB	TOP OF BANK
TYP.	TYPICAL
WF	WETLAND FLAG
WPZ	35' WETLAND PROTECTION ZONE

GENERAL SHEET NOTES:

1. PLAN DEVELOPED FROM THE FOLLOWING SURVEY DATA SOURCES:
   a. TOPOGRAPHIC MAPPING COMPILED BY WESTON & SAMPSON ENGINEERS, INC. IN AUGUST AND SEPTEMBER OF 2017 UTILIZING GPS AND TOTAL STATION METHODS.
   b. TOPOGRAPHIC MAPPING COMPILED BY WESTON & SAMPSON ENGINEERS, INC. IN NOVEMBER OF 2019 USING TOTAL STATION METHODS RELATIVE TO PREVIOUSLY ESTABLISHED BENCHMARKS AND TRAVERSE POINTS.
   c. TOPOGRAPHIC MAPPING COMPILED BY WESTON & SAMPSON ENGINEERS, INC. IN JULY 2021 USING TOTAL STATION METHODS RELATIVE TO PREVIOUSLY ESTABLISHED BENCHMARKS AND TRAVERSE POINTS.
   d. PROPERTY AND EASEMENT LINE MAPPING COMPILED BY CHAPPELL ENGINEERING ASSOCIATES, LLC. IN JUNE OF 2022 USING TOTAL STATION METHODS.
   e. TOPOGRAPHIC MAPPING COMPILED BY CHAPPELL ENGINEERING ASSOCIATES, LLC. IN OCTOBER OF 2023 USING GPS AND TOTAL STATION SURVEY METHODS.
   f. BATHYMETRIC DEPTH SOUNDING DATA OBTAINED AND PROVIDED BY THE MASSACHUSETTS DIVISION OF FISHERIES AND WILDLIFE.
2. ELEVATIONS ARE IN UNITS OF FEET AND REFERENCED TO NAVD 88. SURVEY AND MAP DATA REFERENCE THE NAD83 MASSACHUSETTS STATE PLANES COORDINATE SYSTEM (MAINLAND ZONE).
3. UNLESS INDICATED OTHERWISE, PROPERTY LINE INFORMATION SHOWN IS BASED ON FIELD OBSERVATIONS, TOWN OF STOW RECORDS, AND PLANS AND DEEDS RECORDED AT THE MIDDLESEX COUNTY SOUTH REGISTRY OF DEEDS.
4. LOCATIONS OF UNDERGROUND FEATURES INCLUDING EXISTING PIPES, CULVERTS, AND CONDUITS, AS SHOWN, ARE BASED ON EVIDENCE VISIBLE AT THE GROUND SURFACE. LOCATIONS OF SUCH FEATURES SHOULD BE CONSIDERED APPROXIMATE AND SUBJECT TO VERIFICATION IN THE FIELD BY THE CONTRACTOR.

LAKE BOON
BARTON ROAD
BAILEY BROOK
TO ASSABET RIVER
ASSABET RIVER
NAD 83
DH FOUND
STONE WALL
S87° 02' 34"W 150.91'
DH FOUND (HELD)
81 BARTON ROAD N/F DANIEL L. JAMES BK. 67768 PG. 97 MAP 000U-1 LOT 000052
HOUSE
DRIVEWAY
RIVERFRONT AREA BOUNDARY
WETLAND BUFFER
N82° 24' 59"E 152.00'
REBAR SET
200' RFA
100' RFA
35' WPZ
100' WETLAND BUFFER
BORDERING LAND SUBJECT TO FLOODING EL. 181.3 (FEMA)
0 BARTON ROAD N/F TOWN OF STOW BK. 10194 PG. 35 MAP 000U-1 LOT 000051
S7° 35' 01"E 330.00'
BVW BOUNDARY
SURVEY TRAVERSE LINE
LAKE BOON DAM
CONCRETE SPILLWAY AND BOX CULVERT
EMBANKMENT SLOPE COVERED WITH 12" LAYER OF RIPRAP OVER 30 MIL GEOMEMBRANE
6" PVC DRAIN OUTLET TYP. (4)
FLOW
S44° 53' 28"E 147.39
105 BARTON ROAD N/F CALBENAL FAMILY, LLC BK. 76552 PG. 251 MAP 000U-2 LOT 000062
IP FOUND (HELD)
LEACH FIELD
SEPTIC TANK
S49° 32' 53"E 180.00'
109 BARTON ROAD N/F WILLIAM P. CONLEY BK. 42331 PG. 487 MAP 000U-2 LOT 000061
S53° 36' 53"E 125.47'
S24° 14' 07"W 126.47'
153.88'
N44° 52' 33"W
187.11'
N49° 32' 53"W
N40° 07' 27"E 200.00'
N36° 23' 11"E 100.26'
0.45'
INTERMITTENT STREAM
APPROXIMATE AREA OF FALLEN TREES
137 BARTON ROAD N/F ROBERT F. COLLINGS BK. 12684 PG. 426 MAP 00R-25 LOT 000017
WOODS
CLEARED PATH
SURVEY TRAVERSE LINE
TOP OF BANK
WETLAND BUFFER
PRIVATE DOCK
SAND
STONE STAIRS AND RETAINING WALL
STONE WALLS
WSE-101
WSE-102
WSE-103
WSE-104
WSE-105
B1
B2
B3
WF TOB H20
WF TOB H19
WF TOB H1
WF BVW A5
WF BVW A1
WF BVW C1
WF TOB D3
WF TOB D1
WF TOB A12
WF TOB A6
WF TOB C1
WF TOB A5
WF TOB B1
WF TOB A4
WF BVW B7
WF BVW B9
WF TOB A3
WF BVW B4
WF TOB C8
WF TOB B8
WF BVW A31
WF BVW A29
WF BVW A24
WF TOB C14
WF TOB B14
WF BVW A35
WF BVW A40
WF BVW A56
WF BVW B1
WF BVW A54
WF BVW A50
WF BVW A47
WF BVW D3
WF BVW D2
WF BVW D1
WF TOB F6
WF TOB F5
WF TOB F4
WF TOB F1
WF BVW C4
WF TOB E1
WF TOB A1
WF TOB E11
WF TOB E10
WF TOB E12
WF TOB E13
REBAR FOUND
40 20 0 40 80
SCALE: 1"=40'

\\wse03.local\WSE\Projects\MA\Stow, MA\Lake Boon Dam\11 Rehab Design and Permitting\02 - CAD\01 Current\01 Sheet Files\Existing Conditions - Plan of Dam.dwg

Project:

LAKE BOON DAM REPAIRS AND IMPROVEMENTS

TOWN OF STOW, MASSACHUSETTS - 1683 - INCORPORATED MAY 16, 1845

STOW, MASSACHUSETTS

Weston & Sampson

Weston & Sampson Engineers, Inc.
100 Foxborough Blvd, Suite 250
Foxborough, MA 02035
978.532.1900
800.SAMPSON
www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description

Seal:

Issued For:

MEPA ENF SUBMISSION

Scale:	1" = 40'
Date:	04-01-2024
Drawn By:	TJB
Reviewed By:	---
Approved By:	---
W&S Project No.:	ENG23-2847
W&S File No.:	

Drawing Title:

SURVEY PLAN OF DAM AND PROPERTY

Sheet Number:

1.0

GENERAL SHEET NOTES:

1. THIS PLAN IS INTENDED TO IDENTIFY AND ILLUSTRATE PRIMARILY THE AREAS OF IMPACT (TEMPORARY AND PERMANENT) TO SITE RESOURCE AREAS SUBJECT TO THE WETLANDS PROTECTION ACT, AS DESCRIBED IN THE ENF SUBMISSION. THIS PLAN UTILIZES COLORED HATCHING AS INDICATED IN THE LEGEND TO HELP DIFFERENTIATE BETWEEN IMPACT AREAS. THE BACKGROUND MAPPING APPLIES TO EXISTING SITE CONDITIONS AS SHOWN ON THE "SURVEY PLAN OF DAM AND PROPERTY".

2. VALUES FOR AREAS AND LENGTHS OF RESOURCE IMPACT ARE REPORTED IN SQUARE FEET (SF) AND LINEAR FEET (LF), RESPECTIVELY, AND BASED ON QUANTITY TAKEOFF CALCULATIONS MADE USING THE AUTODESK CIVIL 3D DESIGN SOFTWARE. VALUES REPORTED ARE ROUNDED TO THE NEAREST WHOLE NUMBER.

3. THE FOLLOWING CATEGORIES / TYPES OF IMPACT WERE USED TO DEVELOP THIS PLAN:

   a. PERMANENT IMPACT: THE SUBJECT PORTION OF RESOURCE AREA WILL BE ALTERED DURING THE PROJECT AND THE ALTERATIONS WILL PERSIST INDEFINITELY FOLLOWING PROJECT COMPLETION. ALTERATIONS THAT RESULT IN THE LOSS OF A RESOURCE ARE INCLUDED IN THIS CATEGORY.

   b. TEMPORARY IMPACT: THE SUBJECT PORTION OF RESOURCE AREA IS INCLUDED IN THE LIMIT OF WORK, AND MAY EXPERIENCE SOME LIMITED FORM OF DISRUPTION DURING PERFORMANCE OF THE WORK, BUT WILL NOT BE SUBSTANTIALLY ALTERED TO THE EXTENT THAT LASTING CHANGES WILL PERSIST UPON PROJECT COMPLETION.

LEGEND AND SUMMARY OF WETLAND IMPACT VALUES PER PLAN

WETLAND RESOURCE	EXISTING WITHIN LIMIT OF WORK	PERMANENT IMPACT	TEMPORARY IMPACT
LAND UNDER WATER BODIES AND WATERWAYS (LUW)	24,437 SF [SUM OF "A" AREAS]	1,776 SF [A1+A3+A6+A7+A8]	22,701 SF [A2+A4+A5]
BORDERING VEGETATED WETLAND (BVW)	10,134 SF [SUM OF "B" AREAS]	9,456 SF [B1+B2+B3+B4+B5]	678 SF [B6+B7]
BORDERING LAND SUBJECT TO FLOODING (BLSF)	313 SF [SUM OF "C" AREAS]	313 SF [C1+C2]	0 SF
BANK	901 LF [SUM OF "L" LENGTHS]	767 LF [L1+L2+L5]	134 LF [L3+L4]
RIVERFRONT AREA*	24,147 SF	23,469 SF	678 SF

* FOR CLARITY, HATCHED OR SHADED AREAS ARE NOT SHOWN ON THE PLAN FOR RIVERFRONT AREA. THE SQUARE FOOTAGE OF RIVERFRONT AREA IMPACTS WERE DETERMINED FOLLOWING THE SAME APPROACH USED FOR LUW, BVW, BLSF, AND BANK.

BARTON ROAD STONE WALL (MASSACHUSETTS CULTURAL RESOURCE I.D. STW.912) NOT TO BE DAMAGED OR MODIFIED IN ANY WAY AS PART OF PROPOSED WORK

A4: 19,110 SF TEMPORARY IMPACT TO LUW FOR SILT CURTAIN DEPLOYMENT ONLY

A1: 202 SF PERMANENT IMPACT TO LUW ASSOCIATED WITH NEW SPILLWAY INTAKE/CONTROL STRUCTURE

A2: 303 SF TEMPORARY IMPACT TO LUW ASSOCIATED WITH INSTALLATION AND DEWATERING OF SHEET PILE COFFERDAM ENCLOSURE

B1: 4,954 SF PERMANENT IMPACT TO BVW ASSOCIATED WITH EMBANKMENT SLOPE RECONSTRUCTION AND SEEPAGE CONTROL IMPROVEMENTS

C1+C2: 313 SF PERMANENT IMPACT TO BLSF ASSOCIATED WITH EMBANKMENT SLOPE RECONSTRUCTION

L2: 158 LF PERMANENT IMPACT TO STREAM BANK ASSOCIATED WITH HEADWALL CONSTRUCTION

A3: 1,143 SF PERMANENT IMPACT TO LUW ASSOCIATED WITH SHEET PILE CUTOFF WALL AND ROADWAY RECONSTRUCTION/FILL

L1: 490 LF PERMANENT IMPACT TO LAKE BANK ASSOCIATED WITH SHEET PILE CUTOFF WALL

B2: 909 SF PERMANENT IMPACT TO BVW ASSOCIATED WITH VEGETATION CLEARING, SOFT GROUND STABILIZATION, AND SEEPAGE CONTROL IMPROVEMENTS

B6: 410 SF TEMPORARY IMPACT TO BVW FOR EROSION AND SEDIMENT CONTROLS AND ACCESS TO TAILWATER COFFERDAM AREA AS NEEDED

A6+A7: 188 SF PERMANENT IMPACT TO LUW ASSOCIATED WITH SPILLWAY HEADWALL CONSTRUCTION AND EMBANKMENT SLOPE GRADING/FILL

A5: 3,288 SF TEMPORARY IMPACT TO LUW ASSOCIATED WITH INSTALLATION AND DEWATERING OF TAILWATER COFFERDAM

L3: 70 LF TEMPORARY IMPACT TO STREAM BANK ASSOCIATED WITH DEWATERING OF A5 AREA

L4: 64 LF TEMPORARY IMPACT TO STREAM BANK ASSOCIATED WITH DEWATERING OF A5 AREA

B7: 268 SF TEMPORARY IMPACT TO BVW FOR EROSION AND SEDIMENT CONTROLS AND ACCESS TO TAILWATER COFFERDAM AS NEEDED

B3: 1,831 SF PERMANENT IMPACT TO BVW ASSOCIATED WITH VEGETATION CLEARING, SOFT GROUND STABILIZATION, AND SEEPAGE CONTROL IMPROVEMENTS

L5: 119 LF PERMANENT IMPACT TO INTERMITTENT STREAM BANK ASSOCIATED WITH STREAM CHANNEL REALIGNMENT (TOTAL BOTH BANKS)

B4: 392 SF ASSUMED PERMANENT IMPACT TO BVW ASSOCIATED WITH INTERMITTENT STREAM CHANNEL REALIGNMENT

A8: 243 SF PERMANENT IMPACT TO LUW ASSOCIATED WITH INTERMITTENT STREAM CHANNEL REALIGNMENT

B5: 1,370 SF PERMANENT IMPACT TO BVW ASSOCIATED WITH VEGETATION CLEARING, SOFT GROUND STABILIZATION, AND SEEPAGE CONTROL IMPROVEMENTS

TREE REMOVAL WITHIN LIMIT OF WORK: QUANTITY 28

LAKE BOON

BAILEY BROOK

200' RIVERFRONT AREA

LIMIT OF WORK

NAD 83

40 20 0 40 80
SCALE: 1"=40'

\\wse03.local\WSE\Projects\MA\Stow, MA\Lake Boon Dam\11 Rehab Design and Permitting\02 - CAD\01 Current\01 Sheet Files\Work Area and Resource Plan.dwg

Project:

LAKE BOON DAM REPAIRS AND IMPROVEMENTS

STOW, MASSACHUSETTS

Weston & Sampson Engineers, Inc.
100 Foxborough Blvd, Suite 250
Foxborough, MA 02035
978.532.1900
800.SAMPSON
www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description

Seal:

Issued For:

MEPA ENF SUBMISSION

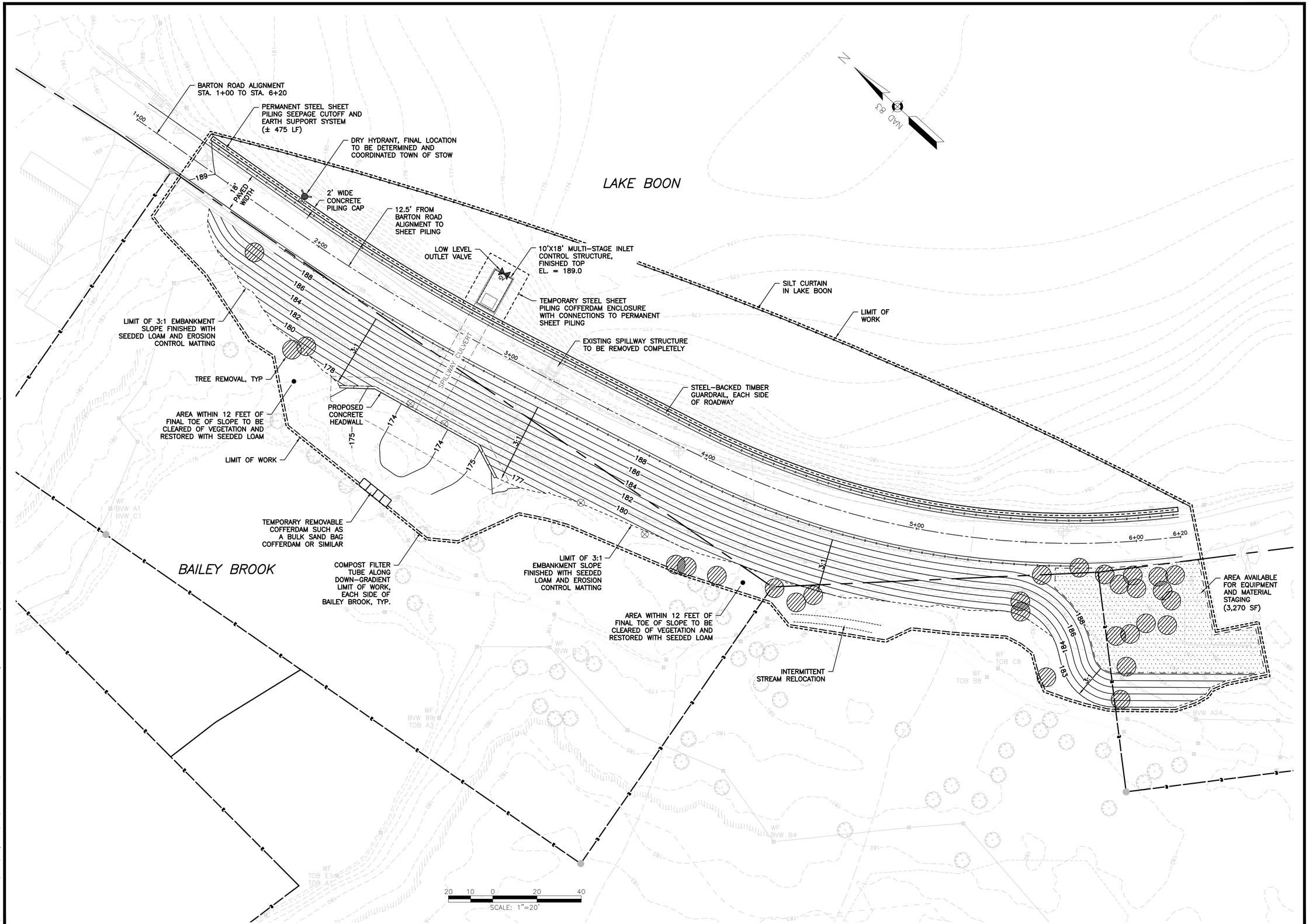
Scale:	AS NOTED
Date:	04-01-2024
Drawn By:	TJB
Reviewed By:	---
Approved By:	---
W&S Project No.:	ENG23-2847
W&S File No.:	

Drawing Title:

LIMIT OF WORK AND RESOURCE AREA IMPACT PLAN

Sheet Number:

2.0



\\wse03.local\WSE\Projects\MA\Stow, MA\Lake Boon Dam\11 Rehab Design and Permitting\02 - CAD\01 Current\01 Sheet Files\Overall Site Plan.dwg

Project:

LAKE BOON DAM REPAIRS AND IMPROVEMENTS

STOW, MASSACHUSETTS

Weston & Sampson Engineers, Inc.
100 Foxborough Blvd, Suite 250
Foxborough, MA 02035
978.532.1900
800.SAMPSON
www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description

Seal:

Issued For:

MEPA ENF SUBMISSION

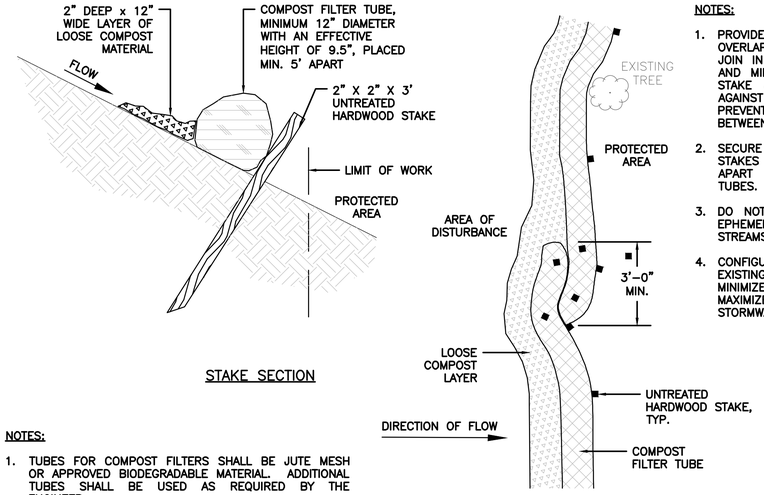
Scale:	AS NOTED
Date:	04-01-2024
Drawn By:	TJB
Reviewed By:	---
Approved By:	---
W&S Project No.:	ENG23-2847
W&S File No.:	

Drawing Title:

OVERALL PROPOSED SITE PLAN

Sheet Number:

3.0



STAKE SECTION

JOINING PLAN

NOTES:

1. PROVIDE A 3-FOOT MINIMUM OVERLAP AT ENDS OF TUBES TO JOIN IN A CONTINUOUS BARRIER AND MINIMIZE UNIMPEDED FLOW. STAKE JOINING TUBES SNUGLY AGAINST EACH OTHER TO PREVENT UNFILTERED FLOW BETWEEN THEM.
2. SECURE ENDS OF TUBES WITH STAKES SPACED 18 INCHES APART THROUGH TOPS OF TUBES.
3. DO NOT INSTALL IN PERENNIAL, EPHEMERAL, OR INTERMITTENT STREAMS.
4. CONFIGURE TUBES AROUND EXISTING SITE FEATURES TO MINIMIZE SITE DISTURBANCE AND MAXIMIZE CAPTURE AREA OF STORMWATER RUN-OFF.

NOTES:

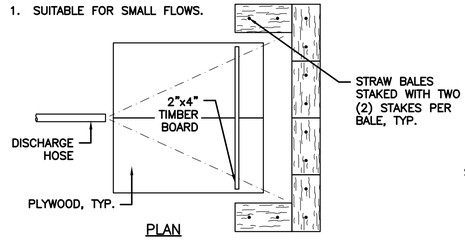
1. TUBES FOR COMPOST FILTERS SHALL BE JUTE MESH OR APPROVED BIODEGRADABLE MATERIAL. ADDITIONAL TUBES SHALL BE USED AS REQUIRED BY THE ENGINEER.
2. TAMP TUBES IN PLACE TO ENSURE GOOD CONTACT WITH SOIL SURFACE. IT IS NOT NECESSARY TO TRENCH TUBES INTO EXISTING GRADE.
3. PLACING TUBES AGAINST THE UPHILL SIDE OF WELL-ANCHORED, STATIONARY FEATURES SUCH AS EXISTING TREES CAN PROVIDE ADDITIONAL BRACING.
4. WHEN STAKING IS NOT POSSIBLE, SUCH AS WHEN TUBES MUST BE PLACED ON PAVEMENT, HEAVY CONCRETE OR CINDER BLOCKS CAN BE USED BEHIND TUBES UP TO 5' APART OR AS REQUIRED TO SECURE TUBES IN PLACE.

COMPOST FILTER TUBE

NOT TO SCALE

NOTES:

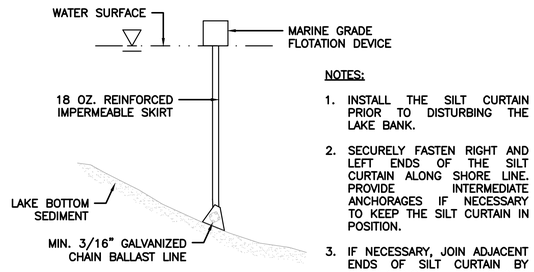
1. SUITABLE FOR SMALL FLOWS.



PLAN

SEDIMENT CATCH

NOT TO SCALE



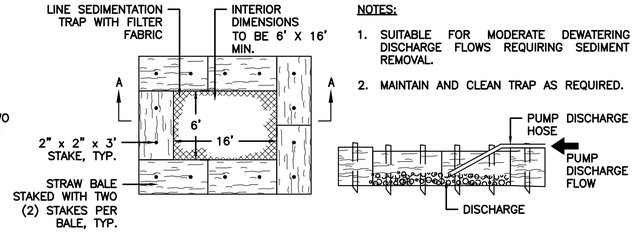
ELEVATION

NOTES:

1. INSTALL THE SILT CURTAIN PRIOR TO DISTURBING THE LAKE BANK.
2. SECURELY FASTEN RIGHT AND LEFT ENDS OF THE SILT CURTAIN ALONG SHORE LINE. PROVIDE INTERMEDIATE ANCHORAGES IF NECESSARY TO KEEP THE SILT CURTAIN IN POSITION.
3. IF NECESSARY, JOIN ADJACENT ENDS OF SILT CURTAIN BY CONNECTING REINFORCING GROMMETS AND SHACKLING BALLAST LINES.

SILT CURTAIN

NOT TO SCALE



PLAN

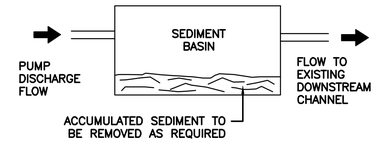
SECTION A-A

NOTES:

1. SUITABLE FOR MODERATE DEWATERING DISCHARGE FLOWS REQUIRING SEDIMENT REMOVAL.
2. MAINTAIN AND CLEAN TRAP AS REQUIRED.

DEWATERING SEDIMENT TRAP

NOT TO SCALE



ELEVATION

NOTES:

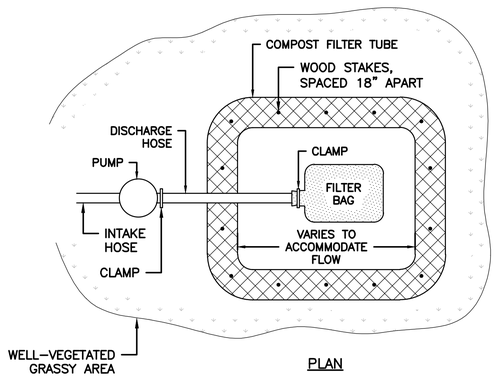
1. SUITABLE FOR LARGE DEWATERING DISCHARGE FLOW REQUIRING SEDIMENT REMOVAL.
2. SEDIMENT BASIN IS TO BE SIZED APPROPRIATELY FOR THE NEEDS OF THE PROJECT.

DEWATERING SEDIMENT BASIN

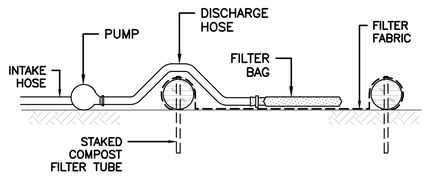
NOT TO SCALE

NOTES:

1. FILTER BAGS SHALL BE USED TO FILTER WATER PUMPED FROM DISTURBED AREAS PRIOR TO DISCHARGING. FILTER BAG LOCATIONS ARE SUBJECT TO APPROVAL BY THE ENGINEER.
2. FILTER BAGS SHALL BE MADE FROM NON-WOVEN GEOTEXTILE MATERIAL SEWN WITH HIGH-STRENGTH, DOUBLE STITCHED "J" TYPE SEAMS AND SHALL BE CAPABLE OF TRAPPING PARTICLE LARGER THAN 150 MICRONS. CONTRACTOR SHALL PROVIDE A SUITABLE MEANS OF ACCESSING THE BAG WITH MACHINERY FOR DISPOSAL PURPOSES.
3. FILTER BAGS SHALL BE REPLACED WHEN THEY BECOME HALF-FULL. SPARE FILTER BAGS SHALL BE KEPT AVAILABLE FOR REPLACEMENT.
4. FILTER BAGS SHALL BE LOCATED IN WELL-VEGETATED AREA, AND DISCHARGE ONTO STABLE, EROSION-RESISTANT AREAS. WHERE THIS IS NOT POSSIBLE, A GEOTEXTILE FLOW PATH SHALL BE PROVIDED. FILTER BAGS SHALL NOT BE PLACED ON SLOPES GREATER THAN 5%.
5. THE PUMP DISCHARGE HOSE SHALL BE INSERTED INTO THE FILTER BAGS IN THE THE MANNER SPECIFIED BY THE MANUFACTURER AND SHALL BE SECURELY CLAMPED.
6. THE PUMPING RATE SHALL BE NO GREATER THAN 100 GPM OR 1/2 THE MAXIMUM SPECIFIED BY THE MANUFACTURER, WHICHEVER IS LESS. PUMP INTAKES SHOULD BE FLOATING AND SCREENED.
7. FILTER BAGS SHALL BE INSPECTED DAILY. IF ANY PROBLEM IS DETECTED, PUMPIING SHALL CEASE IMMEDIATELY AND NOT RESUME UNTIL THE PROBLEM IS CORRECTED.



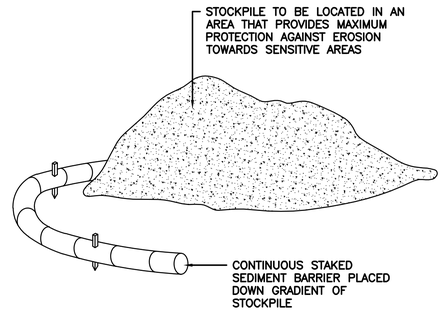
PLAN



ELEVATION

PUMPED WATER FILTER BAG

NOT TO SCALE

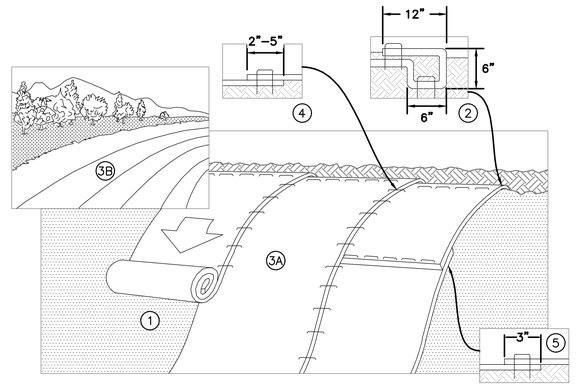


NOTES:

1. STOCKPILES SHALL BE LOCATED IN DESIGNATED MATERIAL STORAGE / STAGING AREAS AND OUTSIDE OF WETLANDS AND RESOURCE PROTECTION BUFFERS UNLESS OTHERWISE APPROVED.
2. PROTECT ALL STOCKPILES FROM WET WEATHER BY COVERING WITH SECURED PLASTIC SHEETING OR TARP.
3. ORIENT THAT LONG AXIS OF THE STOCKPILE PERPENDICULAR TO GROUND SURFACE CONTOURS WHEN SUFFICIENT SPACE IS AVAILABLE.

TEMPORARY STOCKPILE

NOT TO SCALE



NOTES:

1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6-INCH DEEP X 6-INCH WIDE TRENCH.
3. ROLL THE BLANKETS (A.) DOWN OR (B.) HORIZONTALLY ACROSS THE SLOPE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE.
4. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2-INCH TO 5-INCH OVERLAP DEPENDING ON BLANKET TYPE.
5. CONSECUTIVE BLANKETS SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3-INCH OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12 INCHES APART ACROSS ENTIRE BLANKET.

EROSION CONTROL BLANKET

NOT TO SCALE

Project:

LAKE BOON DAM REPAIRS AND IMPROVEMENTS

STOW, MASSACHUSETTS

Weston & Sampson

Weston & Sampson Engineers, Inc.
100 Foxborough Blvd, Suite 250
Foxborough, MA 02035
978.532.1900
800.SAMPSON
www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description

Seal:

Issued For:

MEPA ENF SUBMISSION

Scale:	AS NOTED
Date:	04-01-2024
Drawn By:	TJB
Reviewed By:	---
Approved By:	---
W&S Project No.:	ENG23-2847
W&S File No.:	

Drawing Title:

EROSION AND SEDIMENT CONTROL DETAILS

Sheet Number:

4.0