

WARNER'S POND ALTERNATIVES ANALYSIS REPORT

Concord, Massachusetts



Prepared for:



TOWN OF CONCORD
Division of Natural Resources
141 Keyes Road
Concord, Massachusetts 01742

Prepared by:



EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC., PBC
301 Metro Center Boulevard, Suite 102
Warwick, Rhode Island 02886

May 2023

CONTENTS

EXECUTIVE SUMMARY	1-1
1. INTRODUCTION.....	1-2
1.1 SITE BACKGROUND	1-2
1.2 PROJECT BACKGROUND.....	1-4
1.3 RESTORATION GOALS.....	1-6
1.4 ALTERNATIVES ANALYSIS PURPOSE AND SCOPE.....	1-6
2. EXISTING ENVIRONMENT	2-1
2.1 WATERSHED CHARACTERISTICS AND NUTRIENT LOADING.....	2-1
2.1.1 WATERSHED CHARACTERISTICS	2-1
2.1.2 HYDROLOGIC BUDGET AND NUTRIENT LOADING	2-1
2.2 NATURAL RESOURCES.....	2-3
2.2.1 WATER QUALITY	2-3
2.2.2 SEDIMENT CHARACTERISTICS	2-3
2.2.3 AQUATIC PLANT COMMUNITY	2-4
2.2.4 NATURAL COMMUNITIES	2-4
2.2.5 FISH AND SHELLFISH	2-4
2.2.6 WILDLIFE.....	2-5
2.2.7 STATE-LISTED SPECIES.....	2-6
2.2.8 SPECIAL DESIGNATIONS	2-6
2.3 RECREATIONAL RESOURCES.....	2-7
2.4 COMMUNITY RESOURCES	2-8
2.4.1 DRINKING WATER SOURCES	2-8
2.4.2 FLOOD RISK	2-8
2.4.3 AGRICULTURAL RESOURCES	2-8
2.4.4 HISTORICAL AND CULTURAL RESOURCES	2-10
2.4.5 AESTHETICS.....	2-10
2.5 PROPERTY OWNERS AND STAKEHOLDERS	2-11
3. DATA COLLECTION AND ANALYSIS	3-1
3.1 REVIEW OF EXISTING INFORMATION	3-1
3.2 BATHYMETRY AND SEDIMENT DEPTH SURVEY	3-1
3.3 INFRASTRUCTURE AND UTILITIES	3-4
3.4 ECOLOGICAL COMMUNITY AND HABITAT ASSESSMENT	3-5
3.4.1 OPEN WATER	3-6
3.4.2 DEEP MARSH.....	3-6
3.4.3 SHRUB SWAMP	3-8

	3.4.4 DECIDUOUS FORESTED WETLAND	3-8
4.	ALTERNATIVES ANALYSIS	4-1
	4.1 DREDGING AND FILLING ALTERNATIVE.....	4-3
	4.1.1 DESCRIPTION OF THE ALTERNATIVE.....	4-3
	4.1.2 ANTICIPATED EFFECTS	4-6
	4.1.3 REGULATORY FEASIBILITY.....	4-9
	4.1.4 CONSTRUCTION CONSIDERATIONS.....	4-10
	4.1.5 PROJECT COSTS	4-10
	4.1.6 PROJECT TIMELINE	4-12
	4.2 DAM REMOVAL ALTERNATIVE	4-12
	4.2.1 DESCRIPTION OF THE ALTERNATIVE.....	4-12
	4.2.2 ANTICIPATED EFFECTS	4-16
	4.2.3 REGULATORY FEASIBILITY.....	4-24
	4.2.4 CONSTRUCTION CONSIDERATIONS.....	4-24
	4.2.5 PROJECT COSTS	4-25
	4.2.6 ANTICIPATED TIMELINE	4-26
	4.3 NO-ACTION ALTERNATIVE	4-27
	4.3.1 DESCRIPTION OF THE ALTERNATIVE.....	4-27
	4.3.2 ANTICIPATED EFFECTS	4-27
	4.3.3 REGULATORY FEASIBILITY.....	4-28
	4.3.4 CONSTRUCTION CONSIDERATIONS.....	4-28
	4.3.5 PROJECT COSTS	4-28
	4.3.6 PROJECT TIMELINE	4-28
	4.4 OPTIONS NOT CONSIDERED FOR DETAILED EVALUATION.....	4-28
	4.4.1 AQUATIC PLANT MANAGEMENT.....	4-29
	4.4.2 DREDGING WITHOUT RELOCATION	4-33
	4.4.3 WATERSHED-BASED APPROACHES.....	4-33
	4.4.4 FISH PASSAGE FACILITY INSTALLATION	4-34
	4.5 ALTERNATIVES ANALYSIS SUMMARY.....	4-35
5.	COMMUNITY ENGAGEMENT	5-1
	5.1 COMMUNITY SURVEY	5-1
	5.1.1 SURVEY METHODOLOGY.....	5-1
	5.1.2 SURVEY RESULTS	5-2
	5.2 COMMUNITY MEETING.....	5-3
6.	PROJECT PHASING.....	6-1
	6.1 DETAILED DATA COLLECTION AND ANALYSIS.....	6-2

6.2	PRELIMINARY ENGINEERING DESIGN	6-2
6.3	FEDERAL, STATE, AND LOCAL PERMITTING	6-2
6.4	FINAL ENGINEERING DESIGN AND CONTRACT PREPARATION	6-4
6.5	PROJECT IMPLEMENTATION.....	6-5
6.6	POST-CONSTRUCTION MONITORING AND ADAPATIVE MANAGEMENT ..	6-5
7.	RECOMMENDATIONS	7-1
8.	REFERENCES.....	8-1

APPENDIX A: CONCEPTUAL DESIGN DRAWINGS

APPENDIX B: VISUAL RENDERINGS

APPENDIX C: CONCEPTUAL COST ESTIMATES

APPENDIX D: COMMUNITY COMMENTS

APPENDIX E: NHESP CORRESPONDENCE

LIST OF FIGURES

FIGURE 1-1: Site Locus

FIGURE 2-1: Warner's Pond Watershed

FIGURE 2-2: Flood Hazard Areas

FIGURE 2-3: Property Ownership

FIGURE 3-1: Water Depths

FIGURE 3-2: Sediment Depths

FIGURE 3-3: Ecological Communities

FIGURE 5-1: Respondents' Degree of Support for Each Alternative (Number)

FIGURE 5-2: Respondents' Degree of Support for Each Alternative (Percent)

FIGURE 6-1: Conceptual Restoration Process for Warner's Pond

LIST OF TABLES

- TABLE 1-1:** Project Goals
- TABLE 4-1:** Wetland Functions and Values
- TABLE 4-2:** Anticipated Effects of the Dredging and Filling Alternative
- TABLE 4-3:** Conceptual Cost Estimate Summary for the Dredging and Filling Alternative
- TABLE 4-4:** Conceptual Timeline for the Dredging and Filling Alternative
- TABLE 4-5:** Anticipated Effects of the Dam Removal Alternative
- TABLE 4-6:** Existing Dams between Warner's Pond and the Gulf of Maine
- TABLE 4-7:** Conceptual Cost Estimate Summary for the Dam Removal Alternative
- TABLE 4-8:** Conceptual Timeline for the Dam Removal Alternative
- TABLE 4-9:** Alternatives Analysis Summary
- TABLE 4-10:** Summary of Anticipated Goal Achievement under Each Alternative
- TABLE 6-1:** Additional Data Collection and Analysis Tasks
- TABLE 6-2:** Permits and Approvals Required for the Restoration Alternatives

LIST OF ACRONYMS AND ABBREVIATIONS

BFRT	Bruce Freeman Rail Trail
CMR	Code of Massachusetts Regulations
CWA	Clean Water Act
cy	Cubic yard(s)
DAR	Division of Agricultural Resources
DEP	Department of Environmental Protection
DER	Division of Ecological Restoration
DOC	Department of Correction
EA	EA Engineering, Science, and Technology, Inc., PBC
EIR	Environmental Impact Report
EJ	Environmental Justice
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
IP	Individual Permit
kg	Kilogram
LOMR	Letter of Map Revision
MA GP	Massachusetts General Permit
MEPA	Massachusetts Environmental Policy Act
mg/L	Milligrams per liter
MHC	Massachusetts Historical Commission
NHESP	Natural Heritage and Endangered Species Program
NRC	Natural Resources Commission
NRHP	National Register of Historic Places
ODS	Office of Dam Safety
PCN	Pre-Construction Notification
SCUBA	Self-Contained Underwater Breathing Apparatus
USACE	United States Army Corps of Engineers
WPA	Wetlands Protection Act
WQC	Water Quality Certification

EXECUTIVE SUMMARY

Warner's Pond is an approximately 54-acre impoundment of Nashoba Brook – a perennial tributary to the Assabet River – located in the Town of Concord, Massachusetts. The pond was created in 1857 following the construction of a dam approximately 1,300 feet upstream of Nashoba Brook's confluence with the Assabet River in West Concord. The Town of Concord now owns the pond, its dam, and three public access locations along the pond's shoreline. Water depths throughout most of the pond are five feet or less, and the maximum water depth is approximately 12 feet.

Observations of the adverse effects of eutrophication in Warner's Pond date back to at least the early 1980s. Today, dense growths of aquatic invasive plants occur throughout the pond with the exception of the deep northern cove near Gerow Park. Shallow water depths, paired with dense growths of multiple aquatic invasive plant species, significantly impair recreational opportunities and aesthetics. The pond is listed as an impaired waterbody by the Massachusetts Department of Environmental Protection, and habitat for native fish and wildlife is also degraded by the effects of eutrophication and the presence of the dam.

Following several years of unsuccessful efforts to reduce aquatic plant densities through management approaches including herbicides, mechanical harvesting, and hydroraking, the Town commissioned a Watershed Management Plan in 2012 to examine the nature and cause of the issues at Warner's Pond. The Watershed Management Plan predicted that the average phosphorus load to Warner's Pond was over six times higher than the critical load (i.e., the level above which adverse effects of eutrophication were nearly certain to persist) and determined through nutrient load modeling that even if an 80% reduction in phosphorus loading to Warner's Pond could be achieved, in-pond levels would remain well above the critical load.

The Town of Concord contracted EA Engineering, Science, and Technology, Inc., PBC (EA) in December 2022 to evaluate three alternatives for the future restoration of Warner's Pond: (1) the Dredging and Filling Alternative, in which approximately 14,000 cubic yards of sediment would be dredged from an approximately 4-acre area and relocated to the pond's northwestern shoreline and southwestern cove, (2) the Dam Removal Alternative, in which Nashoba Brook would be restored to a free-flowing riverine system and approximately 35 acres of native habitat would be re-established within the footprint of the existing impoundment, and (3) the No Action Alternative, in which no action would be taken and the functions and values of Warner's Pond would continue to degrade.

To inform this evaluation, EA completed a comprehensive review of previous studies and existing documentation related to Warner's Pond; collected new site-specific data and solicited information from the Town's Natural Resources, Recreation, and Engineering Divisions; and supported the Town's public engagement efforts by participating in a public meeting to present and discuss the alternatives and by developing and analyzing the results of a community survey.

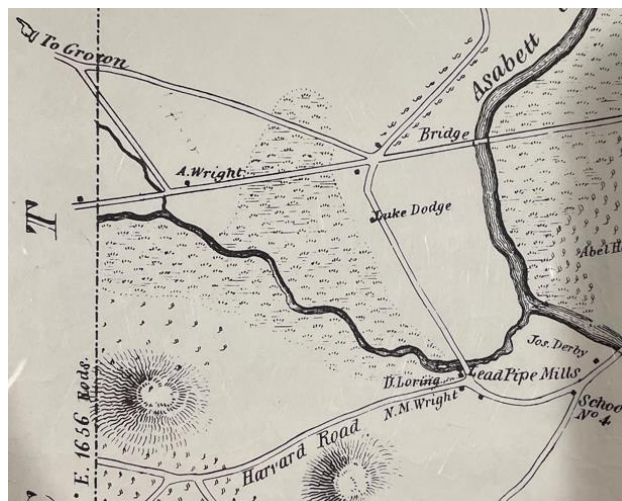
For each of the three alternatives, EA prepared a conceptual project description and evaluated their anticipated positive and negative effects, regulatory feasibility, construction considerations, project costs, and anticipated timeline. To support this evaluation, EA also prepared conceptual design drawings, cost estimates, and visual renderings for the Dredging and Filling and Dam Removal Alternatives. Based on the comprehensive evaluation completed under this alternatives analysis, it is EA's opinion that the Dam Removal Alternative is the most technically and economically feasible restoration alternative that would provide the greatest degree of ecological, recreational, and community benefits with the least potential for adverse impacts.

1. INTRODUCTION

1.1 SITE BACKGROUND

Warner's Pond is an impoundment of Nashoba Brook – a perennial tributary to the Assabet River – located in the Town of Concord (the Town), Massachusetts (Figure 1-1). The pond is approximately 54 acres in size, including its three islands which together total approximately 7.5 acres. Water flows into the pond through a broad delta of emergent and scrub-shrub wetlands on the western shore and outflow from the pond occurs at the dam spillway located at the pond's southeast corner near the intersection of Commonwealth Avenue and Laws Brook Road. The pond's watershed is approximately 47 square miles in size (resulting in a watershed-to-pond ratio of 612:1) and is located primarily outside of Concord.

Warner's Pond was created in 1857 following the construction of a dam on Nashoba Brook approximately 1,300 feet upstream of the brook's confluence with the Assabet River. The dam was constructed by Ralph Warner to power a pail factory located at the intersection of Commonwealth Avenue and Laws Brook Road. A smaller dam had previously been constructed at the same site in 1819 to power a lead pipe factory. Today, Warner's Pond and its dam are owned and managed by the Town which also owns three properties along the Warner's Pond shoreline: (1) the Gerow Recreation Area on the pond's northern shoreline, (2) a boat and fishing access off Commonwealth Avenue on the pond's eastern shoreline, and (3) an informal trail access off Pond Street on the pond's southern shoreline. Scout Island (historically known as Isle of Pines), the largest of the pond's three islands, is owned by the Boy Scouts of America. Approximately 35 residential properties abut the eastern and southern shorelines of the pond, and approximately 20 additional residential properties abut the extensive wetland system west of the pond. The Massachusetts Department of Correction (DOC) owns a large parcel of land on the pond's northwestern shoreline used for agricultural production. Warner's Pond is also very close to the Bruce Freeman Rail Trail (BFRT), a pedestrian and cycling trail which follows the 25-mile route of the former Lowell and Framingham line of the New Haven Railroad.



Nashoba Brook's reach through Concord, following construction of the 1819 dam but prior to construction of the 1857 dam.

Source: Plan of Concord made by John G. Hales, dated 1830. Accessed at the Concord Free Public Library Special Collections, December 21, 2022.

Prior to the construction of the Warner's Pond dam, sediment and nutrients flowed downstream through Nashoba Brook, into the Assabet River, and beyond. Periods of high flow due to increased rainfall or snowmelt would have mobilized areas of sediment that had accumulated within the channel, helping to maintain the brook as a self-sustaining riverine system. The construction of the Warner's Pond dam formed a barrier preventing sediment from continuing downstream, which over several decades has resulted in significant accumulation of nutrient laden sediments in the pond. As a result, Warner's Pond is now in an advanced state of eutrophication, a process characterized by increased nutrient inputs to lakes and ponds that



I:\Warwick\Warwick\GIS_Warwick\StateandLocal\Northwest\Massachusetts\6373001_TownofConcord\Warner'sPond\PROJECTS\Access\Warner'sPond_AltAlternativesAnalysis.aprx qmibm

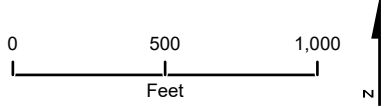


Figure 1-1
Site Locus
 Warner's Pond Alternatives Analysis
 Concord, MA

Map Date: 5/4/2023
 Source: Census 2020
 Projection: NAD 1983 UTM Zone 19N



results in reduced water depths and excessive growth of aquatic plants.

Over time, sediment accumulation and dense plant growth reduce a system's ecological and recreation value as an open waterbody. While eutrophication is a natural process in lacustrine systems, human development within the Warner's Pond watershed has significantly increased the rate at which this process occurs. Furthermore, as Warner's Pond is a human-created feature owned and managed by the Town, there is a need and responsibility on the part of the Town to manage the system to ensure that it provides ecological, recreational, and community functions and benefits.

The construction of the Warner's Pond dam and subsequent in-filling of the pond with nutrient-rich sediments has resulted in a number of impairments to the ecological, recreational, and community functions and values provided by the system, including:

- Reduced water depths, which degrades habitat for certain species of fish and wildlife and impairs recreational opportunities.
- Extensive growths of the aquatic invasive plant species fanwort (*Cabomba caroliniana*), variable-leaf milfoil (*Myriophyllum heterophyllum*), and water chestnut (*Trapa natans*), which degrade habitat for native fish and wildlife and impair recreational opportunities.
- Restriction of movement of aquatic organisms, including loss of habitat for diadromous fish species.
- Risks to public safety and property associated with the potential for dam failure.
- On-going costs associated with inspection, maintenance, and repair of the dam.

1.2 PROJECT BACKGROUND

Observations of the adverse effects of eutrophication in Warner's Pond date back to at least the early 1980s. A survey of the pond in 1999 documented high aquatic plant cover and biovolume and multiple aquatic invasive species. A management plan for Warner's Pond was prepared in 1999 with the goals of increasing open water habitat, controlling non-native vegetation, and preserving diverse habitat types. The recommendations provided in the management plan focused on managing growths of invasive or otherwise undesirable aquatic plants and included hand pulling, biological controls, hydroraking, mechanical harvesting, and chemical treatment. Based on these recommendations, the Town initiated a volunteer effort to hand-pull water chestnut at Warner's Pond and also contracted with a lake management firm to conduct mechanical harvesting of water chestnut in Warner's Pond.

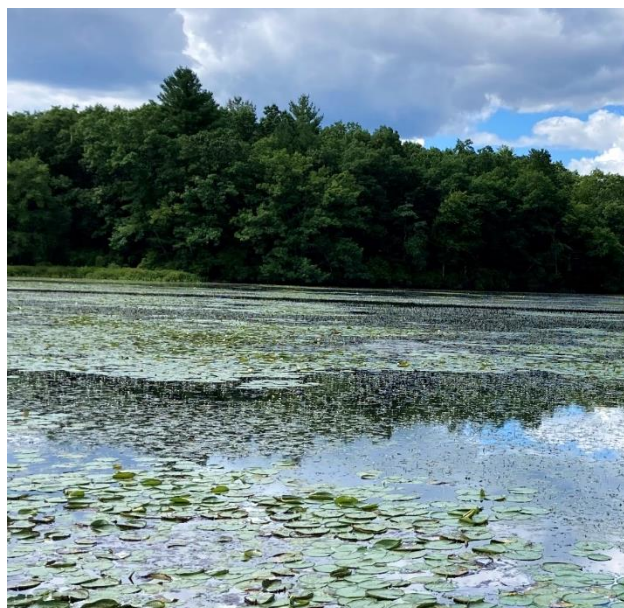


Widespread growths of aquatic plants visible on an aerial image of Warner's Pond.

Source: Google Earth. Imagery Date: September 2014

A follow-up aquatic plant survey in 2003 found that while hand-pulling efforts had successfully reduced water chestnut growths, fanwort had significantly expanded throughout the pond. The 2003 survey report indicates that chemical treatment was determined to be infeasible due to the inability to lower the water levels and control outflow, and again recommended mechanical harvesting (now targeting fanwort) as well as hydroraking of purple loosestrife (*Lythrum salicaria*), a non-native, invasive emergent wetland plant) and water willow (*Decodon verticillatus*), a native wetland plant which often grows along the margins of lakes and ponds), along the pond's shoreline. Mechanical harvesting was conducted across approximately 21 acres of Warner's Pond in July 2004. Hydroraking of targeted shoreline locations was also conducted in the summer of 2004. Unfortunately, mechanical harvesting carries the risk of spreading aquatic plants which can reproduce by fragmentation, including fanwort and variable-leaf milfoil. A subsequent aquatic plant survey of the pond completed in 2011 documented an aquatic plant community dominated by fanwort and coontail (*Ceratophyllum demersum*), a native plant which can grow to nuisance levels in some waterbodies) and extensive aquatic plant growths in most areas of the pond.

In an effort to adopt a more holistic approach to management of the pond, the Town prepared a Watershed Management Plan for Warner's Pond in 2012 to develop a framework to guide future management decisions for the pond. The Watershed Management Plan recommended a range of options for improving the ecological and recreational value of the pond, including short-term options such as herbicides and biological controls as well as long-term options. Long-term options included (1) controlling nutrient and sediment loading through an educational program for watershed residents and low impact development techniques and (2) sediment removal through dredging. The Watershed Management Plan recommended dredging as the primary focus for management because the vast majority of the pond's watershed lies outside Concord's borders, which limits the ability of the Town to achieve meaningful reductions in nutrient and sediment loading to Warner's Pond.



Dense aquatic plant growth on Warner's Pond (August 2022).

Source: Town of Concord

Based on the recommendations of the Watershed Management Plan that identified limited dredging as a suitable long-term management option, the Town prepared a Dredging Feasibility Study for Warner's Pond in 2018. The Dredging Feasibility Study provided a description of the proposed dredging project and associated conceptual-level design plans. Sediment sampling to support future dredge permitting was also completed as part of the development of the Dredging Feasibility Study. The Dredging Feasibility Study identified two targeted locations for dredging within the pond: (1) an area between Scout Island, Pond Street, and the Town-owned Commonwealth Avenue public access location, and (2) a small area in the northeastern corner of the pond adjacent to the then-future location of the Town-owned Gerow Recreation Area. Targeted dredging of these two high-priority areas was determined to be a more economically feasible option than dredging the entire pond.

In 2021, the Town began the process of securing permits for the proposed dredging project and preparing the final dredging designs and permits were received in 2022. The Town solicited bids from contractors for the dredging project in August 2022; the outcome of the public bidding process indicated that the dredging project originally conceived in the Dredging Feasibility Study would be economically infeasible for the Town to undertake. As a result, the Town began exploring alternative approaches to dredging Warner's Pond as well as the possibility of removing the Warner's Pond dam as a technically and economically feasible alternative to restore the system and remove the economic and public safety liability associated with maintaining the dam.

1.3 RESTORATION GOALS

The Town's ecological, recreational, and community goals for restoration of Warner's Pond were developed through a collaboration between the Town's Natural Resources Division, Recreation Department, and Engineering Division and are summarized in Table 1-1.

Table 1-1. Project Goals

Ecological	Goal 1	Enhance habitat for native fish and wildlife
	Goal 2	Manage aquatic invasive species
	Goal 3	Improve water quality
Recreational	Goal 4	Enhance recreational infrastructure and accessibility
	Goal 5	Increase opportunities for paddle craft use and recreational fishing
	Goal 6	Provide water-based recreational opportunities at Gerow Park
Community	Goal 7	Enhance climate resilience
	Goal 8	Protect public safety
	Goal 9	Minimize long-term operation and maintenance costs

1.4 ALTERNATIVES ANALYSIS PURPOSE AND SCOPE

The purpose of this alternatives analysis is to identify, describe, and compare/contrast two conceptual-level alternatives to meet the Town's project goals. This alternatives analysis has been developed to provide information to the Town, its residents, and other stakeholders regarding the conceptual restoration alternatives under consideration, and to reflect community feedback received during the alternatives analysis process.

The scope of this alternatives analysis was developed through preliminary discussions between the Town of Concord Natural Resources Division and EA. Based on these discussions, two restoration action alternatives were identified for evaluation, in addition to a no-action alternative. The two restoration action alternatives evaluated in this report are described below.

- **Dredging and Filling Alternative:** This alternative would entail dredging sediment from the eastern portion of Warner's Pond and placing the material in the pond's northwestern or southwestern coves. This alternative would increase water depths throughout several acres of Warner's Pond and serve to decrease the overall cover and biovolume of aquatic invasive plants in dredged areas. This alternative would also convert several acres of existing open water to a shallow vegetated wetland community through the placement of dredged material.
- **Dam Removal Alternative:** This alternative would fully restore the Warner's Pond/Nashoba Brook system to its pre-alteration state as a free-flowing river and wetland complex by removing the impounding effects of the Warner's Pond dam. The pre-alteration alignment of Nashoba Brook would be restored through the existing impounded area, and existing areas of open water would be converted to one or more vegetated community types.

The remainder of this report is organized into the following sections:

- **Section 2** provides an overview of existing conditions at Warner's Pond and discusses watershed characteristics; summarizes natural, recreational, and community resources; and identifies property owners and stakeholders.
- **Section 3** summarizes the data collection and analysis completed by EA to inform this Alternatives Analysis Report.
- **Section 4** provides a more detailed description of the two restoration alternatives, their anticipated effects, regulatory and logistics considerations, and anticipated project costs and timelines.
- **Section 5** discusses the community input received during this phase of the project.
- **Section 6** provides an overview of future phases of the project based on which alternative is selected.
- **Section 7** provides EA's recommendations to the Town.
- **Section 8** lists the documents reviewed by EA to inform this alternatives analysis.

This alternatives analysis builds on and has been informed by a number of previous studies of Warner's Pond (identified in Section 3.1), a review of publicly-available information, new site-specific data collection and analysis completed by EA, and the results of the community engagement process and survey.

2. EXISTING ENVIRONMENT

The following section provides a brief overview of the Warner's Pond watershed; the natural, recreational, and community resources in and around the pond system; and the property owners and stakeholders associated with the pond. The information provided in this section is not intended to be exhaustive, as detailed descriptions of these resources have been developed as part of past documents and reports (see Section 3.1).

2.1 WATERSHED CHARACTERISTICS AND NUTRIENT LOADING

2.1.1 WATERSHED CHARACTERISTICS

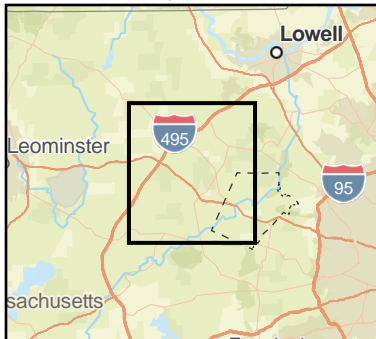
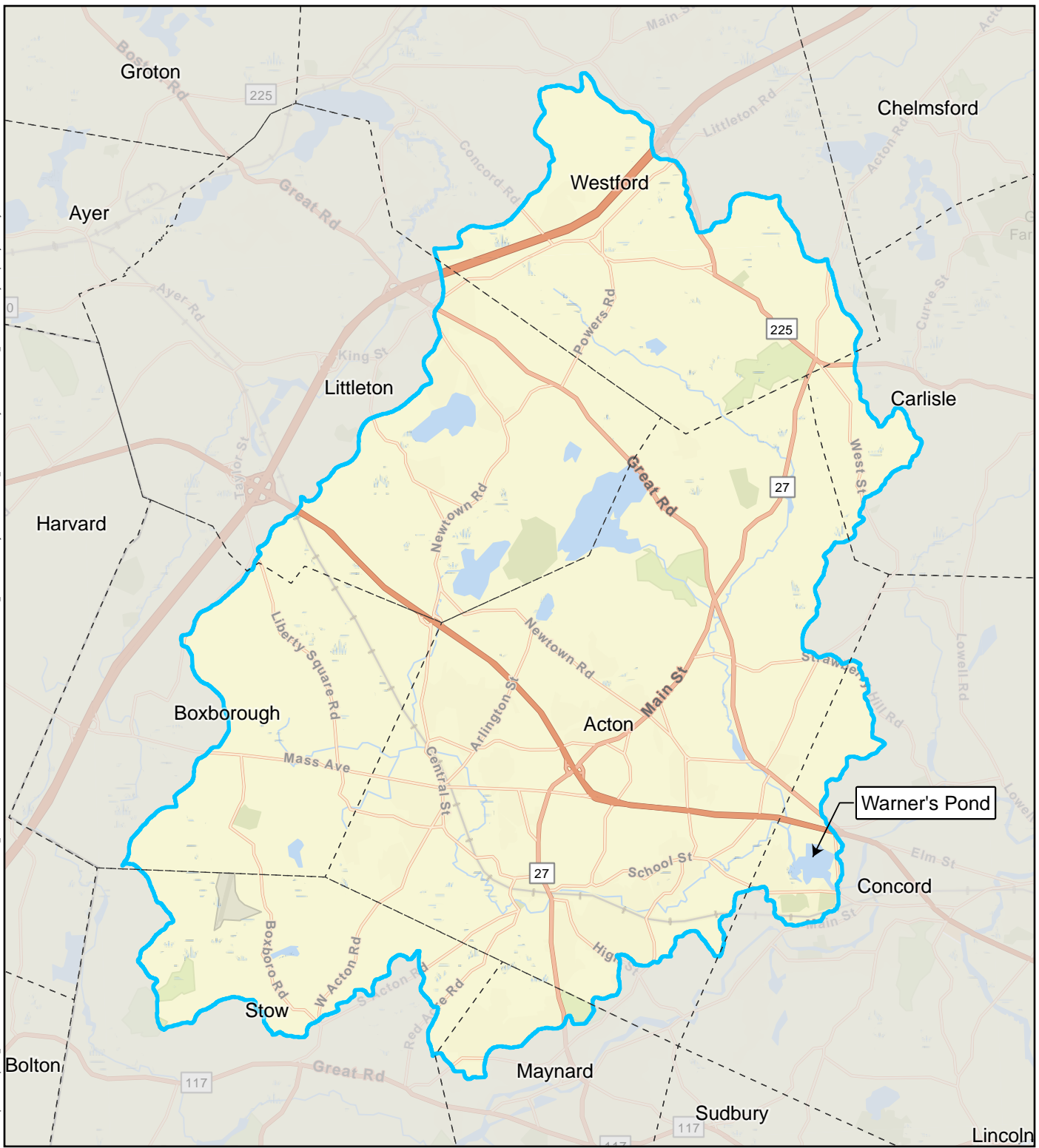
The watershed of Warner's Pond is approximately 46.6 square miles in size¹ and includes portions of the towns of Concord, Acton, Carlisle, Westford, Littleton, Boxborough, Stow, and Maynard; approximately 97% of the watershed is located outside of Concord (Figure 2-1). Based on an analysis of geospatial data available from the United States Geological Survey (USGS), the total linear distance of streams and tributaries that ultimately flow into Warner's Pond is approximately 120 miles. An analysis of 2016 land use/land cover data available from MassGIS indicates that approximately 66% of the watershed of Warner's Pond is forested, 10% is impervious surfaces (roads, buildings, etc.), and the remaining 24% is comprised of other land cover types.

2.1.2 HYDROLOGIC BUDGET AND NUTRIENT LOADING

The 2012 Watershed Management Plan modeled the pond's hydrologic budget and nutrient loading based on the results of desktop- and field-based data collection and analysis. The results of these analysis indicated that the average detention time of water in the pond is 0.949 days; that is, the volume of water contained within the pond is exchanged on average approximately once per day. The pond's flushing rate, which equates to the number of times per year that the volume of water contained within the pond is exchanged, was calculated in the Watershed Management Plan as 379 times per year. The Watershed Management Plan indicates that this rate is very high, but not unexpected given the relatively large size of the pond's watershed.

The Watershed Management Plan predicted that average phosphorus loading to Warner's Pond was 4,930 kg/year (5.4 tons/year) and that average nitrogen loading was 104,434 kg/year (115 tons/year). The Watershed Management Plan further indicates that the pond's estimated permissible load (the level below which the adverse effects of eutrophication are not expected to occur) for phosphorus as 393 kg/year (0.4 tons/year) and that the pond's estimated critical load (the level above which the adverse effects of eutrophication were nearly certain to persist) for phosphorus as 785 kg/year (0.9 tons/year). Thus, the predicted average phosphorus load to Warner's Pond was determined to be over six times higher than the critical load based on the analyses completed as part of the Watershed Management Plan. According to the Watershed Management Plan, *"the modeling results demonstrate that even an 80% reduction in the phosphorus load to Warner's Pond will still mean in-pond levels will be well above the critical load and [that] water quality issues associated with these high levels [would persist]"* (ESS 2012).

¹ Based on a watershed boundary generated from StreamStats: <https://streamstats.usgs.gov/ss/>





- Legend**
-  Town Line
 -  Warner's Pond Watershed



Figure 2-1
 Warner's Pond Watershed
 Warner's Pond Alternatives Analysis
 Concord, MA

Map Date: 1/30/2023
 Source: ESRI 2022, MassGIS 2022; StreamStats 2023
 Projection: NAD 1983 UTM Zone 18N



2.2 NATURAL RESOURCES

The summary of natural resources in the Warner's Pond system is based on information developed in previous studies of the pond, publicly-available data, and observations made by EA as part of this project.

2.2.1 WATER QUALITY

Water quality monitoring in Warner's Pond was conducted as part of the 1999 Warner's Pond Management Plan. The 1999 study collected water temperature, dissolved oxygen, and water transparency data in the field and analyzed water samples for nutrient (phosphorus and nitrogen) concentrations. The 1999 study results indicate that dissolved oxygen concentrations were relatively high at the surface (likely due to excessive plant growth) but declined significantly near the pond bottom. The 1999 study also indicates that water temperatures were too warm to support native trout, which require cool, oxygen-rich waters to survive. Total phosphorus concentrations in the water column ranged from 0.03 mg/L to 0.14 mg/L, with an average value of 0.07 mg/L. According to the 1999 study report, total phosphorus concentrations of 0.02 mg/L or lower are considered optimal for high water clarity and low algal biomass, while concentrations above 0.05 mg/L are considered excessive.



Warner's Pond is classified as a Class 4A water (impaired; Total Maximum Daily Load completed). Nashoba Brook upstream and downstream of the pond is classified as a Class 2 water (attaining some uses, other uses not assessed).

Source: MassGIS; DEP 2018 Integrated List of Waters

The 2012 Watershed Management Plan included water quality sampling in Warner's Pond and at several outfall and tributary locations in the vicinity of the pond. The results of dry-weather sampling completed for the Watershed Management Plan indicate that total phosphorus concentrations were elevated (greater than 0.02 mg/L) at all sampling locations other than the in-pond location.

Warner's Pond is listed on the *Final Massachusetts Integrated List of Waters for the Clean Water Act 2018/20 Reporting Cycle* (DEP 2021) as impaired due to the presence of water chestnut and mercury in fish tissue.

2.2.2 SEDIMENT CHARACTERISTICS

Evaluations of sediment quantity and quality have been conducted as part of multiple studies of Warner's Pond, including this alternatives analysis (see Section 3.2 for discussion of sediment quantity). The most recent assessment of sediment quality was completed as part of the 2018 Dredging Feasibility Study. Composite sediment samples collected from sediment cores throughout targeted areas of the pond indicated that concentrations of metals, polychlorinated biphenyls, and hydrocarbon compounds were below applicable Massachusetts Contingency Plan standards for surface water and groundwater, with the exception of one sample collected south of Scout Island which exceeded Massachusetts Contingency Plan standards for arsenic.

2.2.3 AQUATIC PLANT COMMUNITY

The aquatic plant community within Warner's Pond has been surveyed on multiple occasions, most recently in 2011. The 2011 survey indicated that aquatic plant cover (equivalent to the areal extent of plant growth throughout the pond) was greater than 75% throughout much of the pond, including areas surrounding both Scout and Myrica Islands. Aquatic plant cover was observed to be less than 25% only in the pond's deep northern cove and southeastern outlet channel. Aquatic plant biovolume (equivalent to the three-dimensional space of the water column occupied by plants) was observed to be above 75% throughout the western portion of the pond and around Scout Island, but was below 25% in the northern cove, southeastern outlet channel, and in the area around Myrica Island. The 2011 survey documented 19 aquatic plant species in Warner's Pond including four aquatic invasive species – fanwort, variable-leaf milfoil, water chestnut, and purple loosestrife. The aquatic plant community at the time of the 2011 survey was dominated by fanwort and coontail.



Aquatic plants growing to the surface of the pond southeast of Scout Island.

EA. September 22, 2021.

2.2.4 NATURAL COMMUNITIES

An assessment of natural communities at Warner's Pond in 1999 identified the presence of four habitat types in the system: shallow marsh, water willow-dominated marsh, open water, and mixed upland forest. A subsequent ecological community and habitat assessment of the Warner's Pond system was completed in 2023 as part of this project and is summarized in Section 3.4.

2.2.5 FISH AND SHELLFISH

The most recent and only available survey of the fish community in Warner's Pond was conducted by the Massachusetts Division of Fisheries and Wildlife (MassWildlife) in July 1983. Though now 40 years old, the MassWildlife report provides evidence of a pond in an advanced state of eutrophication. The report refers to Warner's Pond as a "fertile, 54-acre warmwater pond" with "aquatic vegetation cover[ing] approximately 50 percent of the surface area."

The 1983 fish population survey detected 20 species including golden shiner (*Notemigonus crysoleucas*), white sucker (*Catostomus commersonii*), bluegill (*Lepomis macrochirus*), pumpkinseed (*Lepomis gibbonsus*), largemouth bass (*Micropterus salmoides*), yellow perch (*Perca flavescens*), white perch (*Morone americana*), yellow bullhead (*Ameiurus natalis*), and brown bullhead (*Ameiurus nebulosus*). One rainbow trout (*Oncorhynchus mykiss*, a stocked fish in Massachusetts) and one American eel (*Anguilla rostrata*) were also observed in the pond. The survey results are indicative of a warmwater fish community typical of shallow lakes and ponds in eastern Massachusetts.

A review of the MassWildlife Coldwater Fisheries Resource data layer available on MassGIS indicates that an unnamed tributary which flows into Nashoba Brook approximately 1,300 feet upstream of Route 2 is mapped as a coldwater stream. This designation indicates that the stream provides suitable habitat for native trout, which require high dissolved oxygen concentrations found in colder water environments.

Data on the existing shellfish community within Warner's Pond is very limited, and no formal surveys have been conducted. The Watershed Management Plan indicates that native eastern elliptio (*Elliptio complanata*) are present within Warner's Pond. EA observed approximately eight eastern elliptio shells on the Warner's Pond dam on January 14, 2023. Eastern elliptios are the most widespread and abundant freshwater mussel species in the northeastern United States, inhabiting a wide range of freshwater habitats including lakes, ponds, rivers, and streams.



Eastern elliptio (*Elliptio complanata*) shell observed on the Warner's Pond dam on January 14, 2023.

EA. January 14, 2023.

2.2.6 WILDLIFE

While dedicated surveys of the wildlife community within Warner's Pond and its associated wetland system have not occurred, incidental observations of wildlife use have been made throughout the course of multiple studies of the pond over the past 25 years. The 1999 Biological Survey Report indicates that Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), wood duck (*Aix sponsa*), great blue heron (*Ardea herodias*), green heron (*Butorides virescens*), spotted sandpiper (*Actitis macularius*), belted kingfisher (*Megaceryle alcyon*), painted turtle (*Chrysemys picta*), and green frog (*Lithobates clamitans*) were observed using the shallow emergent marsh areas west of Warner's Pond, and Canada goose, mallard, belted kingfisher, and double-crested cormorant (*Phalacrocorax auritus*) were also observed using the open water portion of the pond. Canada goose, great blue heron, and invasive mute swans (*Cygnus olor*) were also observed during studies as part of the 2012 Watershed Management Plan. Wildlife observations between December 2022 and January 2023 included mute swans, Canada goose, and hooded merganser (*Lophodytes cucullatus*). EA also observed two beaver (*Castor canadensis*) lodges (both in the southern portion of the pond) and widespread evidence of beaver activity along the pond's shoreline, including chewed and felled trees. Mussel shells and a fish carcass observed on the Warner's Pond dam likely indicate the presence of muskrat (*Ondatra zibethicus*), river otter (*Lontra canadensis*), and/or northern raccoon (*Procyon lotor*).

2.2.7 STATE-LISTED SPECIES

Areas known to provide habitat for state-listed species are mapped by the Massachusetts Natural Heritage and Endangered Species Program (NHESP) and classified as Priority Habitats of Rare Species and/or Estimated Habitats of Rare Wildlife. Warner's Pond itself is not classified as Priority or Estimated Habitats, but Priority Habitats (PH 1495) and Estimated Habitats (EH 1043) are located along Nashoba Brook and Fort Pond Brook upstream of the pond. EA requested a list of the state-listed species associated with the Priority and Estimated Habitats upstream of Warner's Pond from NHESP on January 11, 2023. The response received from NHESP on January 20, 2023 (Appendix E) indicates that one state-listed species is associated with these habitat areas: wood turtle (*Glyptemys insculpta*), a Special Concern species in Massachusetts.



Nashoba Brook and Fort Pond Brook immediately upstream of Warner's Pond are mapped as Priority and Estimated Habitat for wood turtle (*Glyptemys insculpta*).

Source: MassGIS; NHESP Priority and Estimated Habitats

According to NHESP, wood turtles inhabit riparian areas and prefer slower-moving, mid-sized streams with sandy bottoms and heavily vegetated stream banks. During the winter, wood turtles hibernate in the stream bottom or bank, and spend most of the spring and summer in upland or wetland areas adjacent to streams. Nesting occurs in open sandy or gravelly areas in the riparian zone, and individuals return to their preferred overwintering locations within the stream channel in late summer to early fall.

2.2.8 SPECIAL DESIGNATIONS

Warner's Pond is not located in an Area of Critical Environmental Concern or in an Outstanding Resource Water. The pond is not a Great Pond as defined in the Massachusetts Public Waterfront Act (Chapter 91) regulations (310 Code of Massachusetts Regulations [CMR] 9.00).

A more lovely stream than this, for a mile above its junction with the Concord, has never flowed on earth.

Excerpt from *Mosses from an Old Manse* by Nathaniel Hawthorne, 1846 (referring to the Assabet River)

In 1999, 29 miles of the Sudbury, Assabet, and Concord Rivers were designated by Congress as Wild and Scenic Rivers under the National Wild and Scenic Rivers System, a program managed by the US National Park Service. This designation includes the 4.4 mile segment of the Assabet River beginning 1,000 feet downstream of the Damonmill Dam in West Concord to its confluence with the Sudbury River in Concord. Nashoba Brook meets the Assabet River at approximately the mid-point of this reach.

2.3 RECREATIONAL RESOURCES

Although Warner's Pond was originally created as a source of power for manufacturing, the pond historically provided diverse recreational opportunities to residents of Concord. A picnic area, swimming beach, and playground were once located on the pond, and boat rides and swimming lessons were offered. Wintertime recreational uses of the pond included ice skating, ice hockey games, and Christmas tree bonfires.

As the effects of eutrophication (decreased water depths and extensive growths of aquatic invasive plant species) have increased over time, recreational use of Warner's Pond has declined. Information provided by the Town indicates that recreational boating use of the pond occurs from late spring into early summer, then becomes less frequent due to navigational challenges posed by dense growths of aquatic plants and shallow water depths. Fishing is not known to be a significant recreational use of the pond, potentially due to dense weed growths, though fishing from a boat would likely be possible near the pond's deep hole. Swimming is no longer a known recreational use of Warner's Pond due to shallow water depths, accumulation of mucky sediments, and dense weed growth. Public swimming beaches operated by the Town and the Massachusetts Department of Conservation and Recreation are located at White Pond and Walden Pond, respectively, and may reduce the relevance of swimming as a potential recreation use of Warner's Pond. Informal ice skating still occurs when the pond is sufficiently frozen during the winter.

The results of the community survey (Section 5) indicate that the most common recreational activities undertaken at Warner's Pond are: enjoying nature/wildlife viewing (174 responses), boating/canoeing/kayaking (95 responses), ice skating (74 responses), and fishing (30 responses) (38 survey respondents indicated that they do not engage in recreational pursuits at Warner's Pond). Public access to Warner's Pond and its shoreline is currently possible from three locations, all of which are owned and operated by the Town:

- The Gerow Recreation Area, a 7-acre municipal park on the northern shoreline of Warner's Pond, between the pond and the BFRT. Construction of the park began in May 2021 and is ongoing. The Gerow Recreation Area currently does not provide access to Warner's Pond but does provide viewing opportunities. The Gerow Recreation Area also provides access to the BFRT for cyclists and visitors.
- The Commonwealth Avenue access location, a car-top boat access point. This is the primary location where the public can access Warner's Pond and provides unmarked parking for approximately 6 vehicles.
- The Pond Street access location, an informal path from the end of Pond Street to the southern shoreline of Warner's Pond. Access with car-top boats is possible but requires parking on Pond Street and hand-carrying a distance of at least 250 feet to the water.



Warner's Pond viewed from the Gerow Recreation Area.

EA. December 21, 2022.

Approximately 22 residential properties abut Warner's Pond, and very few (less than 5) residential docks are currently present on the pond's shoreline. Evidence of recreational use by shoreline residents includes observations of kayaks and canoes stored along the pond's shoreline.

2.4 COMMUNITY RESOURCES

Community resources (other than the natural and recreation resources discussed above) include assets such as drinking water sources, flood and storm damage protection, historical and cultural resources, agricultural resources, and aesthetics. A brief summary of each of these resources in the context of Warner's Pond is provided below.

2.4.1 DRINKING WATER SOURCES

Warner's Pond is not a public or private drinking water supply reservoir, and there are no Surface Water Protection Areas in the vicinity of the pond. Zone I Wellhead Protection Areas are located approximately 2,000 feet west of the pond, and Zone II Wellhead Protection Areas are located approximately 1,200 feet west of the pond.

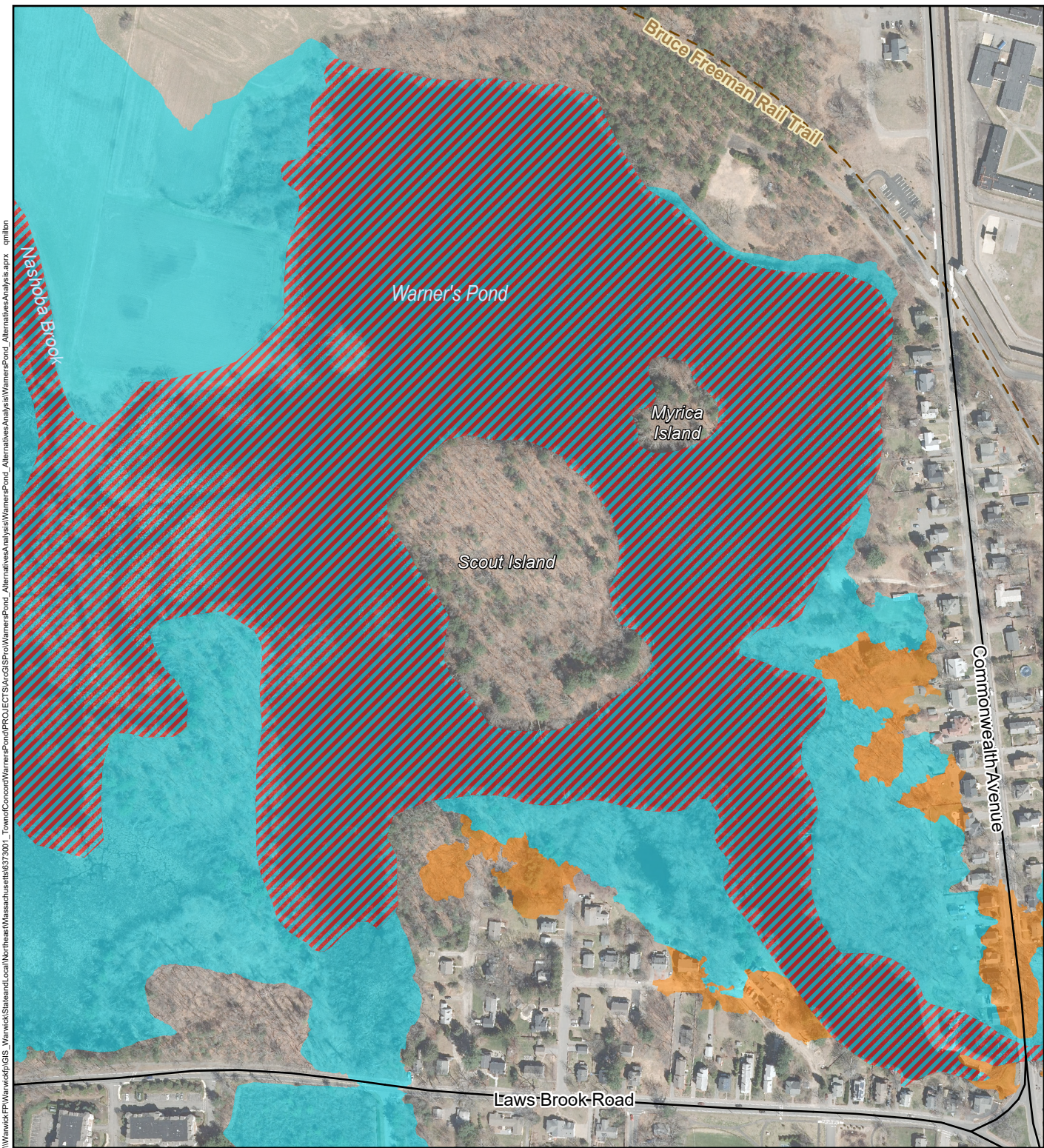
2.4.2 FLOOD RISK

Warner's Pond and immediately-surrounding lands are located within flood hazard area (FHA) AE, which is defined by the Federal Emergency Management Agency (FEMA) as the area with a 1% annual chance of flooding – also known as the 100-year floodplain – with base flood elevations defined. According to the Flood Insurance Rate Map which covers the site (Map Number 25017C0359F, Effective Date: July 7, 2014 and Map Number 25017C0357F, Effective Date: July 7, 2014), the base flood elevation associated with Warner's Pond is 124 feet. Warner's Pond and Nashoba Brook are also located within a Regulatory Floodway. FEMA defines the Regulatory Floodway as *"the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height"* (Figure 2-2).

The Warner's Pond dam is regulated by the Massachusetts Office of Dam Safety (ODS), which maintains a three-tiered hazard classification rating system for regulated dams. The Warner's Pond dam is currently classified as a Significant Hazard Potential (Class II) dam, which is defined by ODS 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."*

2.4.3 AGRICULTURAL RESOURCES

The DOC owns a 67-acre parcel of land with approximately 1,200 feet of frontage on the northwestern shoreline of Warner's Pond. Approximately 25 acres of this parcel located east of Nashoba Brook is used for production of corn, which is grown as livestock feed for cattle at the DOC's Northeast Correction Center, located to the north of Warner's Pond.



I:\Warwick\Warwick\GIS\Warwick\StateandLocal\Northwest\Missachusetts\6373001_TownofConcord\Warner'sPond\PROJECTS\AcGIS\Warner'sPond\AlternativesAnalysis\Warner'sPond_AlternativesAnalysis.aprx qm1bn



Legend

- Roads

Flood Zone Designations

- AE: 1% Annual Chance of Flooding, with BFE
- AE: Regulatory Floodway
- X: 0.2% Annual Chance of Flooding

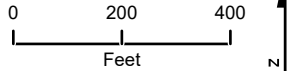


Figure 2-2
FEMA Flood Zones
 Warner's Pond Alternatives Analysis
 Concord, MA

Map Date: 2/16/2023
 Source: FEMA 2023
 Projection: NAD 1983 UTM Zone 19N



2.4.4 HISTORICAL AND CULTURAL RESOURCES

Warner's Pond is located within Concord Junction, a Massachusetts Historical Commission (MHC)-inventoried area (MACRIS #CON.E). The Concord Junction area is approximately 270 acres in size and includes Warner's Pond and much of West Concord. According to MHC, the historical significance of the Concord Junction includes architecture, commerce, industry, and transportation. Warner's Pond itself is also an MHC-inventoried property (MACRIS #CON.910). Warner's Pond is not located within or immediately adjacent to a Local Historic District, Massachusetts Historic Landmark, or an area listed on the National Register of Historic Places (NRHP). One NRHP-listed property (Union Station) and a Local Historic District (Church Street) are located approximately 1,000 feet southeast of the pond. The original Warner's Pond dam has been removed and reconstructed multiple times, most recently in 2008.

December 16: Last Sunday...I walked on Loring's Pond [Warner's Pond] to three or four islands there which I had never visited, not having a boat in the summer. On one containing an acre or two, I found a low, branching shrub frozen into the edge of the ice, with a fine spicy scent somewhat like sweet fern and a handsome imbricate bud. When I rubbed the dry-looking fruit in my hands, it felt greasy and stained them a permanent yellow, which I could not wash out...I conclude that it is sweet-gale and we named the island Myrica Island.

Excerpt from Henry David Thoreau's Journal, 1850

2.4.5 AESTHETICS

While the aesthetic qualities of an area can be subjective, several factors influence whether a natural area is generally understood to provide high aesthetic value (USACE 2019). These include:

- Multiple habitat types visible from primary viewing locations
- Expansive views and relatively unobstructed sight lines available from primary viewing locations
- Diversity of vegetative species visible from primary viewing locations
- Abundance of flowering plants and/or vibrantly-colored plants that change with seasons
- Surrounding land use is undeveloped as seen from primary viewing locations
- Contrasting landforms
- Absence of visible trash, debris, or signs of disturbance
- Low levels of noise and unpleasant odors at primary viewing locations
- Ease of access



Warner's Pond and Myrica Island viewed from the Commonwealth Avenue access location.

EA. November 1, 2021.

Based on a consideration of these factors, the aesthetic value of Warner's Pond and its associated expansive wetland system is considered relatively high. Dense and widespread growths of aquatic invasive plants likely decrease the aesthetic value of the pond, especially later in the growing season.

2.5 PROPERTY OWNERS AND STAKEHOLDERS

In the context of the future restoration of Warner's Pond, property owners and stakeholders are understood to include the following:

- The Town of Concord, which owns Warner's Pond; its dam; and the Gerow Recreation Area, Commonwealth Avenue access location, and Pond Street access location along the pond's shoreline
- Private homeowners along the shoreline of the pond
- The Boy Scouts of America, which owns Scout Island
- MA Department of Corrections
- Residents of Concord



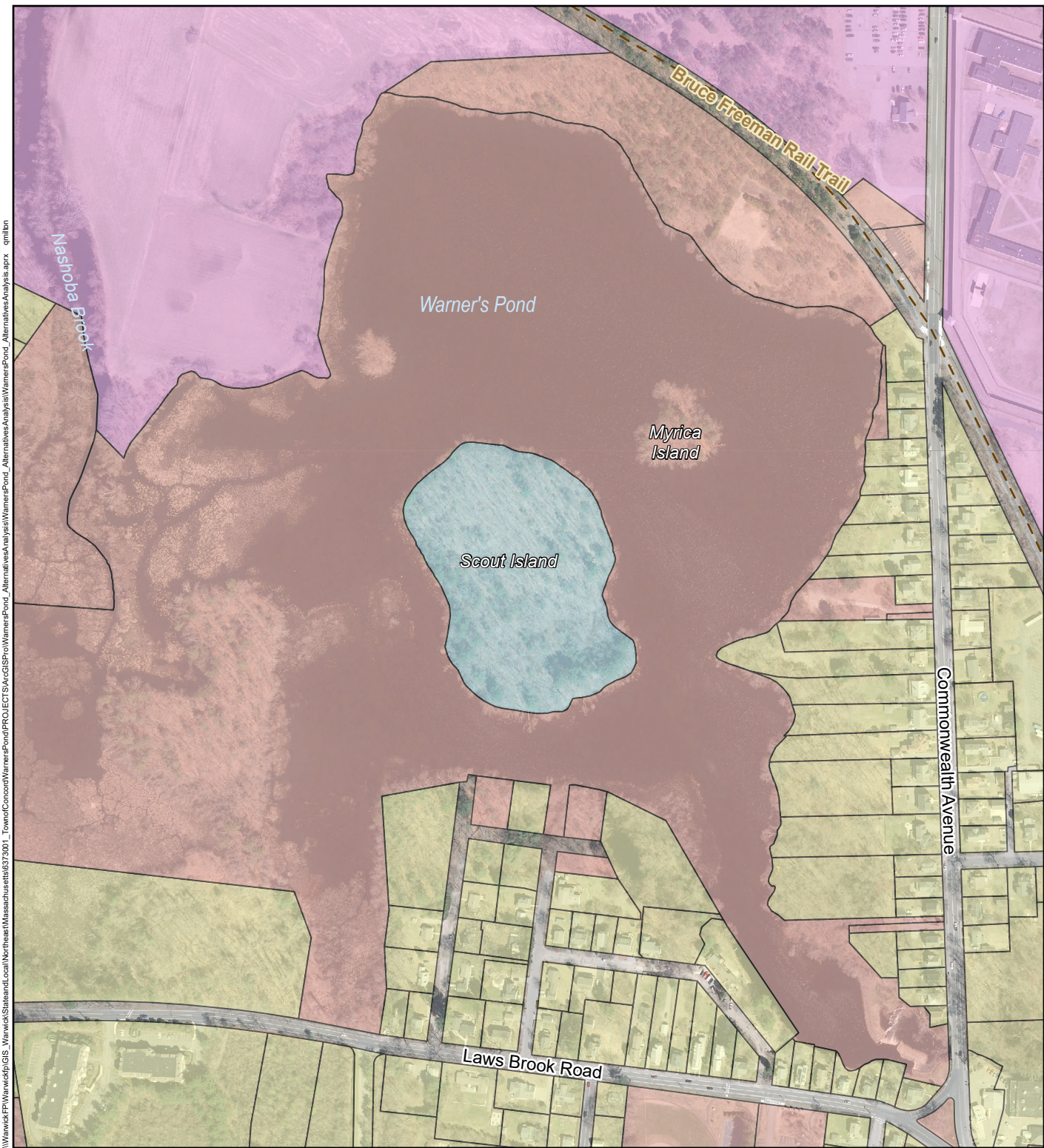
A row of single-family residential properties on the west side of Commonwealth Avenue abut Warner's Pond.

EA. December 20, 2022.

Property ownership in and around Warner's Pond is displayed on Figure 2-3. Additional stakeholders or interested parties may include:

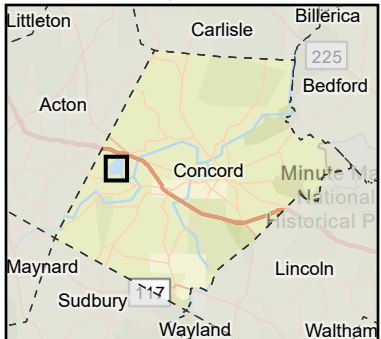
- Nipmuc Nation
- OARS, the watershed organization for the Sudbury-Assabet-Concord Rivers Watershed
- Sudbury, Assabet & Concord Wild & Scenic River Stewardship Council
- Massachusetts Division of Ecological Restoration (DER)

A robust outreach effort to property owners, stakeholders, and the community at large is critical to the Town's ability to achieve the goals identified in Section 1.3. Section 5 provides a summary of the community outreach efforts undertaken by the Town as part of this analysis.



\\Warwick\FPI\Warwick\GIS_Warwick\StateandLocal\Northwest\Massachusetts\6373001_TownofConcord\Warner'sPond\PROJECTS\AcGIS\Pro\Warner'sPond_AlternativesAnalysis\Warner'sPond_AlternativesAnalysis.aprx qm1bn

VICINITY MAP



Legend

Ownership

- Town of Concord
- Private Owner
- Commonwealth of Massachusetts
- Boy Scouts of America

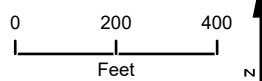


Figure 2-3
Property Ownership
 Warner's Pond Alternatives Analysis
 Concord, MA

Map Date: 2/21/2023
 Source: MA Tax Parcels 2023
 Projection: NAD 1983 UTM Zone 19N



3. DATA COLLECTION AND ANALYSIS

The following section describes the new data collection and analysis completed by EA to support this alternatives analysis.

3.1 REVIEW OF EXISTING INFORMATION

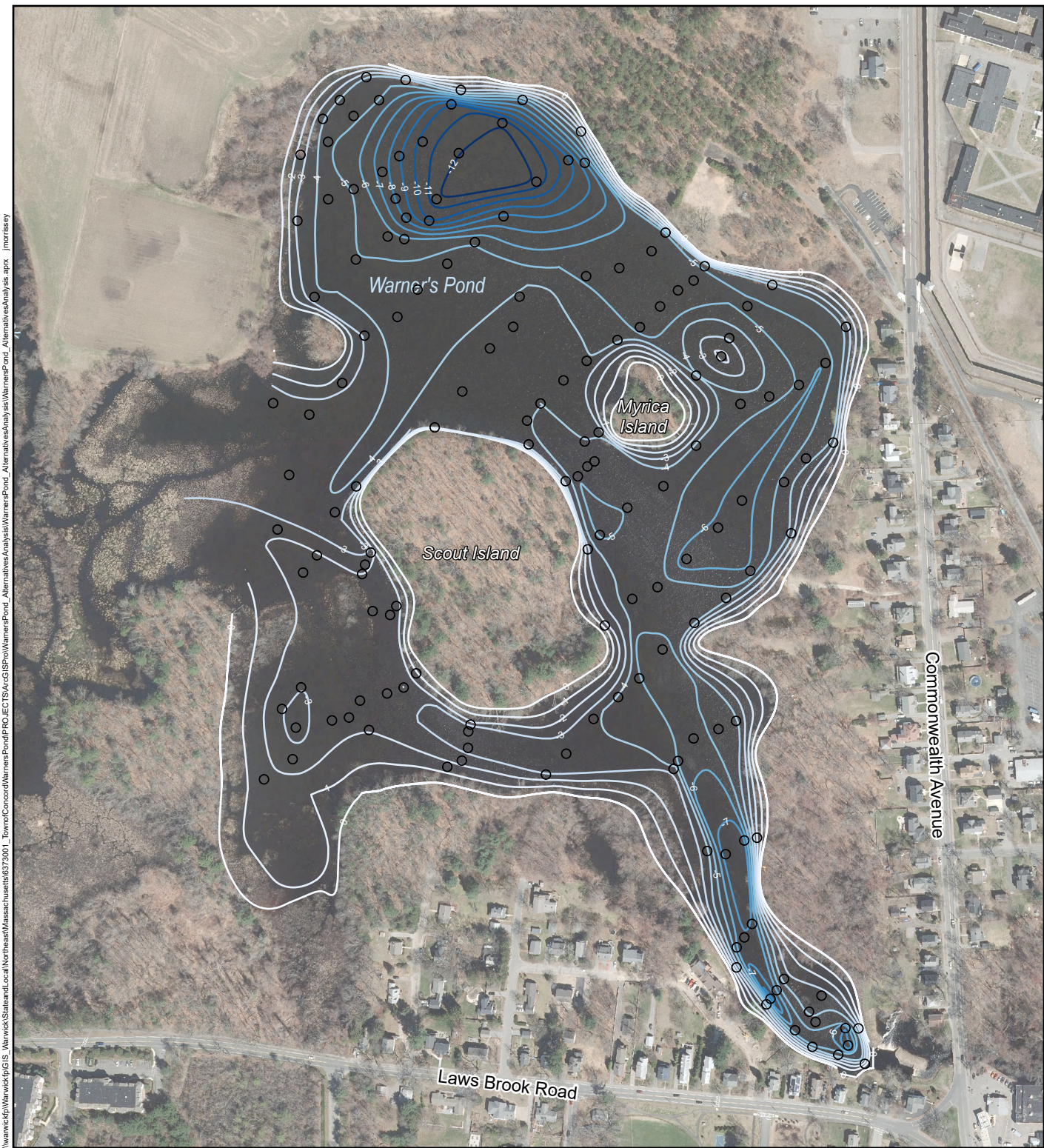
EA reviewed the following documents, reports, and data sources to assist in developing this Alternatives Analysis Report:

- Warner's Pond Dredge Feasibility Study (ESS 2018)
- Warner's Pond Dam Phase I Inspection/Evaluation Report (Pare 2018)
- Concord River Diadromous Fish Restoration Feasibility Study (Gomez and Sullivan Engineers 2016)
- Concord Open Space and Recreation Plan (Town of Concord 2015)
- Warner's Pond Watershed Management Plan (ESS 2012)
- Project Completion Report for Nuisance Aquatic Plant Management Program at Warner's Pond (ACT 2004)
- *Classification of the Natural Communities of Massachusetts* (Swain 2020)
- Warner's Pond Management Plan (ACT/NEE 1999)
- Fisheries Survey of Warner's Pond (MassWildlife 1983)
- Geospatial data layers available from MassGIS²
- Historical maps of West Concord available from the Concord Free Public Library Special Collections

3.2 BATHYMETRY AND SEDIMENT DEPTH SURVEY

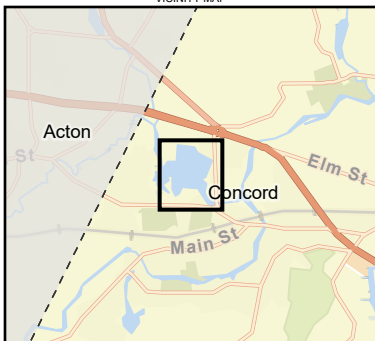
Pond-wide water and sediment depths were last assessed in Warner's Pond in 2011. This information is considered critical to developing and evaluating both restoration action alternatives, and was therefore updated to support this alternatives analysis. EA collected bathymetry and sediment depth data in Warner's Pond on December 20, 2022 and January 14, 2023 (data collection occurred on non-consecutive days because a portion of the pond was covered in ice during the first day of data collection). Water and sediment depth data was collected at a total of 156 stations throughout the pond. At each station, a 16-foot graduated steel rod was lowered from a small boat to the water-sediment interface (to assess water depth), and then manually advanced into pond sediments to first refusal (interpreted as the bottom of soft sediments; areas where depth exceeded the length of the rod were estimated). The data were then processed using geospatial software to generate one-foot contours for both water depth (Figure 3-1) and sediment depth (Figure 3-2).

² <https://maps.massgis.digital.mass.gov/MassMapper/MassMapper.html>



I:\warwick\Warwick\GIS - Warwick\StateandLocal\NorthEast\Massachusetts\6373001 - Town\Concord\Warner's Pond\PROJECT\BIA\cGIS\Photo\Warner's Pond - AlternativesAnalysis\Warner's Pond - AlternativesAnalysis.aprx - jmorrissey

VICINITY MAP



Legend

○ Water Depth Sampling Location

Water Depth Contour (feet)

— -12	— -7	— -2
— -11	— -6	— -1
— -10	— -5	— 0
— -9	— -4	
— -8	— -3	

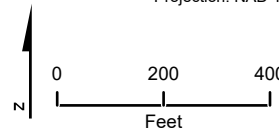
Figure 3-1
Water Depth

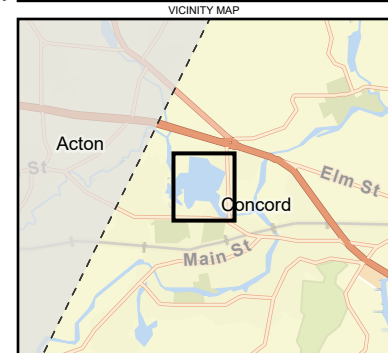
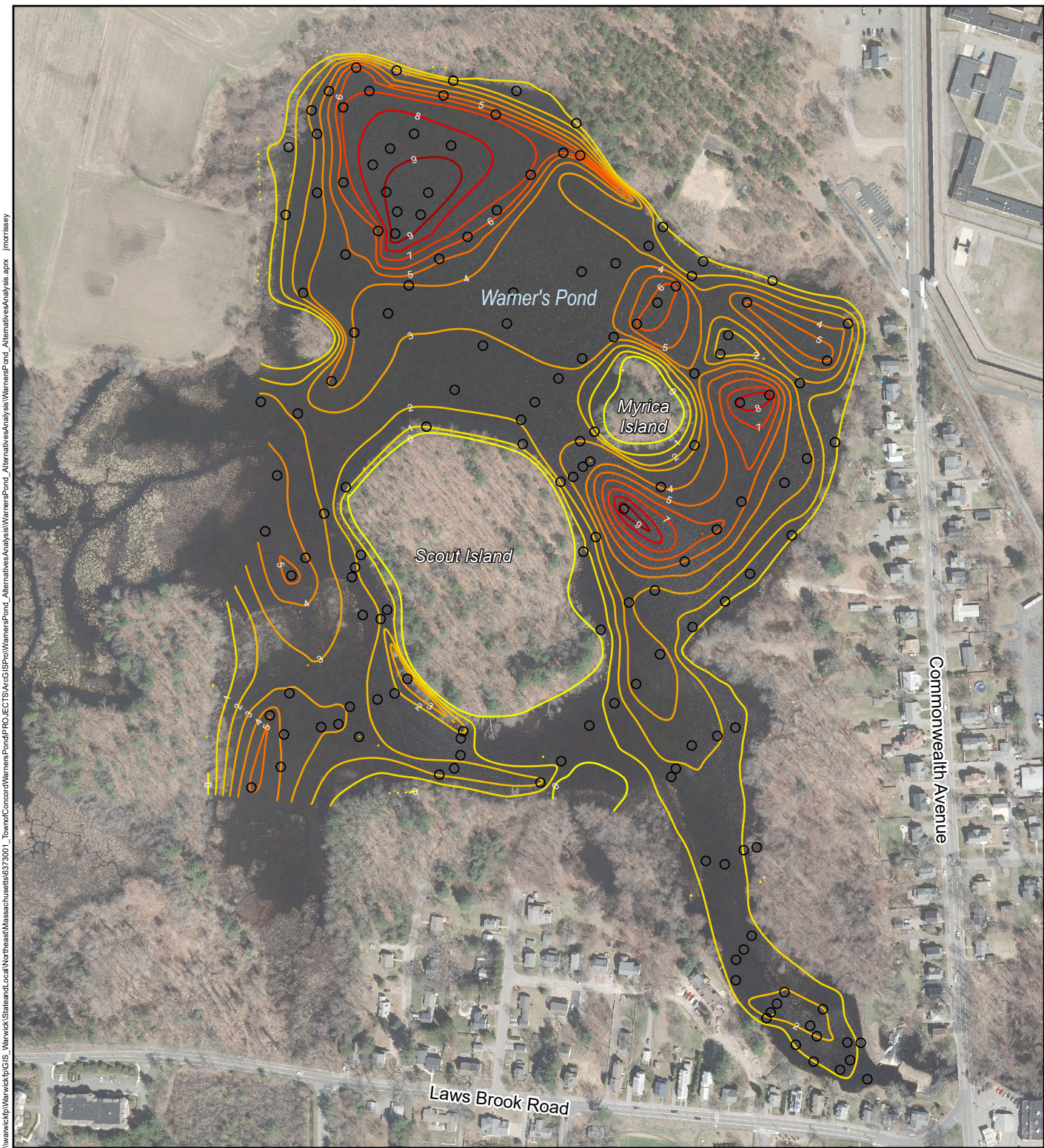
Warner's Pond Alternatives Analysis
Concord, MA

Map Date: 4/24/2023

Source: MassGIS 2022

Projection: NAD 1983 UTM Zone 19N





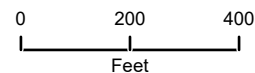
Legend
 ○ Sediment Depth Sampling Location

Sediment Depth Contour (feet)

0	5
1	6
2	7
3	8
4	9

Figure 3-2
Sediment Depth
 Warner's Pond Alternatives Analysis
 Concord, MA

Map Date: 4/24/2023
 Source: MassGIS 2022
 Projection: NAD 1983 UTM Zone 19N



I:\warwick\GIS\Warwick\StateandLocal\NorthEast\Massachusetts\6373001_Town\Concord\Warner's Pond\PROJECT\BIA\GIS\Photo\Warner's Pond_AlternativesAnalysis\Warner's Pond_AlternativesAnalysis.aprx_jmorrissey

Based on the results of this survey, water depths throughout most of Warner's Pond are 5 feet or less, with the exception of two deeper basins. The pond's deep hole is located in the northern cove, where water depths reach a maximum of approximately 12 feet. A second basin is located in the pond's southeastern cove near the outlet, where water depths reach approximately 8 feet. Accumulated sediment depths in Warner's Pond range from 0 to 9 feet and are deepest in the pond's northern cove and to the east and south of Myrica Island. Accumulated sediment depths were lowest in the pond's southeastern cove upstream of the dam.

3.3 INFRASTRUCTURE AND UTILITIES

EA completed a high-level field and desktop review of infrastructure in and around Warner's Pond and solicited utilities information for the area around the Warner's Pond dam from Concord Public Works.

The Warner's Pond dam is the most significant infrastructure element associated with Warner's Pond. According to the Warner's Pond Dam Phase I Inspection/Evaluation Report, the dam *"is a roughly 320-foot long earthen embankment with a 40.2-foot long stone masonry weir located near the center of the structure that serves as the primary spillway, an 18-foot long concrete weir located at the right end of the dam that serves as the auxiliary/secondary spillway, a 5-foot wide stop log controlled rectangular sluiceway channel left of the spillway, and a gate valve controlled 24-inch diameter low level outlet pipe."* The Warner's Pond dam has been rebuilt several times, most recently in 2008.



Warner's Pond primary spillway.

EA, January 14, 2023.

The 2018 dam inspection determined that the overall condition of the dam was satisfactory but made note of several deficiencies and provided recommendations for additional studies, inspections, maintenance, and repairs. The dam inspection report estimates the cost of recommended additional studies and analyses, minor repairs, and remedial modifications as between \$37,000 and \$106,000, or higher if additional modifications are found to be necessary. According to the dam inspection report, costs for recommended yearly monitoring, inspection, and maintenance of the Warner's Pond dam are between \$5,000 and \$11,000.

There are no other significant infrastructure elements located on Warner's Pond (e.g., docks, boat ramps, retaining walls, bulkheads, etc.). Key infrastructure along Nashoba Brook downstream of Warner's Pond includes:

- The Pail Factory (Commonwealth Avenue) bridge, located approximately 150 feet downstream of the dam.
- An approximately 340-foot stone retaining wall along the south bank of Nashoba Brook located between the Commonwealth Avenue bridge and the timber pedestrian bridge.
- An arched timber pedestrian bridge across Nashoba Brook, located approximately 540 feet downstream of the dam.

- The BFRT bridge, located approximately 980 feet downstream of the dam.



Clockwise from top left: (1) Commonwealth Avenue bridge over Nashoba Brook, looking upstream, (2) Nashoba Brook downstream of Commonwealth Avenue, looking downstream, (3) Pedestrian bridge over Nashoba Brook, looking downstream, (4) Bruce Freeman Rail Trail bridge over Nashoba Brook, looking downstream.

EA. December 21, 2022.

Based on a review of the as-built drawings for the Warner's Pond dam and information provided by the Concord Engineering Division, there are no known underground utilities located in the immediate vicinity of the Warner's Pond dam. A buried water and sewer line crosses under Nashoba Brook immediately downstream of Commonwealth Avenue, aerial electric and telecommunication lines are present over the Commonwealth Avenue bridge, and a water main is located in or attached to the bridge.

3.4 ECOLOGICAL COMMUNITY AND HABITAT ASSESSMENT

The types and configurations of the ecological communities in and around Warner's Pond have been shaped by the impounding effects of the Warner's Pond dam as well as human development and use of shoreline areas. EA reviewed the existing ecological communities associated with the Nashoba Brook/Warner's Pond system to support a future assessment of the expected changes to ecological communities and the fish and wildlife habitat they provide under both restoration action alternatives. This evaluation was informed by a review of previous

studies (see Section 3.1) and DEP wetlands mapping data available from MassGIS.

This review indicates that four ecological community types are associated with the Warner's Pond system: open water, deep marsh, shrub swamp, and deciduous forested wetland. Brief descriptions of each of these ecological communities are provided below. The approximate extents of the ecological communities associated with the Nashoba Brook/Warner's Pond system are displayed on Figure 3-3.

3.4.1 OPEN WATER

Open water is the single largest ecological community associated with the Warner's Pond system. As described in Section 3.2, water depths throughout most of Warner's Pond are 5 feet or less, and the pond has a maximum water depth of approximately 12 feet. With the exception of the pond's deep northern cove and southeastern outlet channel, the pond bottom is heavily vegetated with aquatic plants (predominantly fanwort and coontail) which grow to the surface in most areas. Floating-leaved aquatic plants (predominantly water chestnut) are also present throughout the open water area of the system. Pond sediments are highly organic, nutrient-rich muck above sand.

As documented in the 1983 MassWildlife fisheries survey, the open water portion of the system supports a warmwater fish community typical of shallow impoundments in eastern Massachusetts. Native wildlife including beavers, waterfowl (Canada goose, mallard, and hooded merganser), belted kingfisher, and double-crested cormorant use the open water portion of the system. The open water area of the system may also provide habitat for other native wildlife including painted turtle (*Chrysemys picta*) and common snapping turtle (*Chelydra serpentina*). Extensive growths of aquatic plants also provide an abundant food source for invasive mute swans, which have been consistently documented on the pond.

3.4.2 DEEP MARSH

This ecological community is west of the open water area, where Nashoba Brook transitions from a riverine to an impounded system. According to the *Classification of the Natural Communities of Massachusetts*, deep marshes occur along rivers and streams, lakes, artificial impoundments, and other waterbodies. This ecological community is typically flooded with between 0.5 to 3 feet of water, but water depth may vary within the growing season and from year to year.



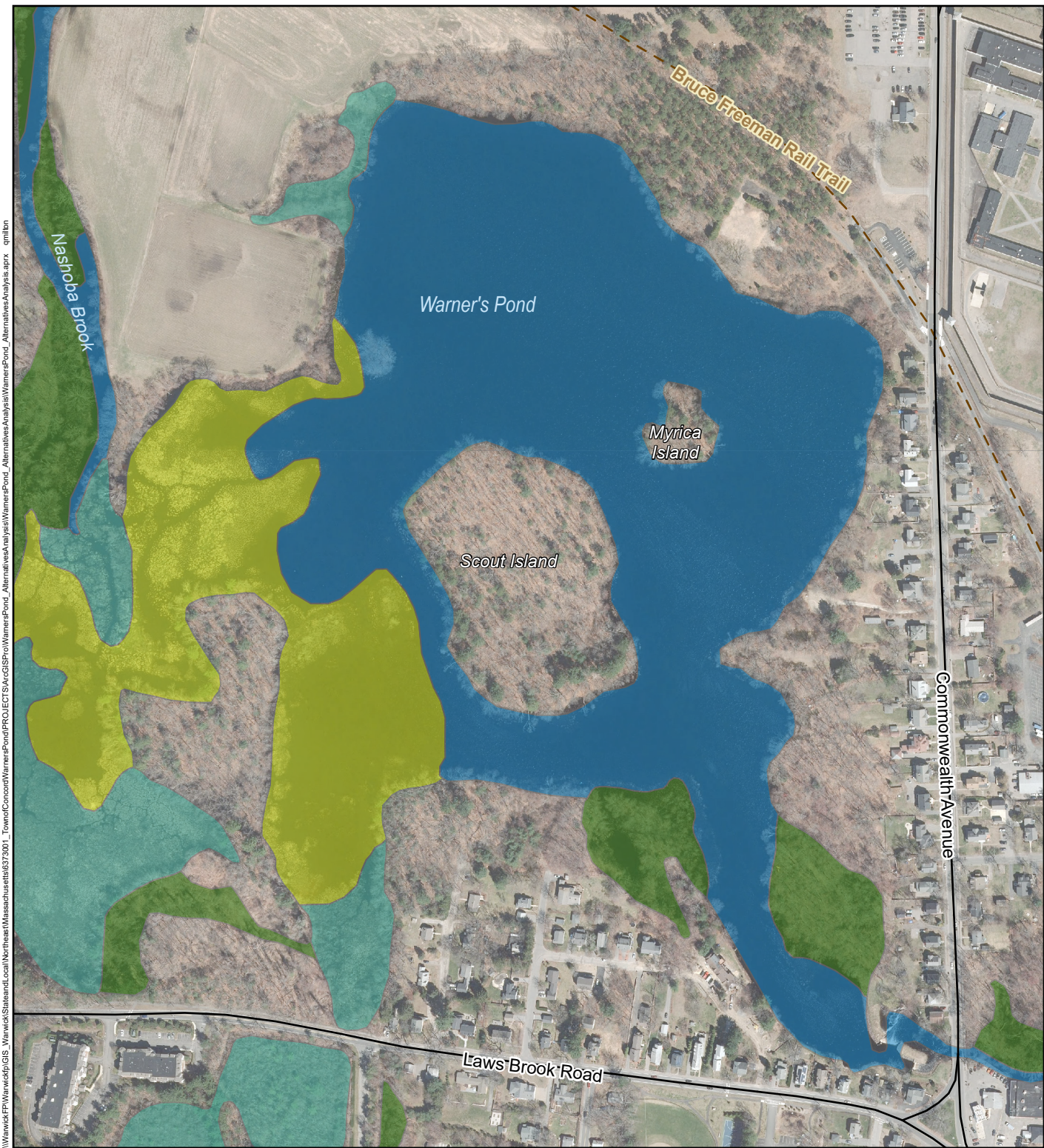
Open water is the largest ecological community associated with the Warner's Pond system.

EA, December 20, 2022.

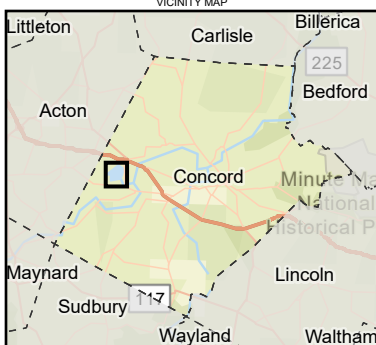


An extensive emergent marsh is located to the west of Warner's Pond.

EA, December 20, 2022.



I:\Warwick\FPI\Warwick\GIS_Warwick\StateandLocal\Northwest\Massachusetts\6373001_TownofConcord\Warner'sPond\PROJECTS\AcGISPro\Warner'sPond_AlternativesAnalysis\Warner'sPond_AlternativesAnalysis.aprx qm1bn



- Legend**
- Roads
 - Wetland Type**
 - Deep Marsh
 - Open Water
 - Shrub Swamp
 - Wooded Swamp Deciduous

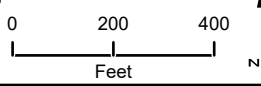


Figure 3-3
Ecological Communities
 Warner's Pond Alternatives Analysis
 Concord, MA

Map Date: 2/21/2023
 Source: MA DEP 2005
 Projection: NAD 1983 UTM Zone 19N



The specific vegetative community composition is dependent upon water depths but is typically dominated by herbaceous and graminoid species.

The deep marsh community at Warner's Pond is dominated primarily by native species including water willow, broad-leaf cattail (*Typha latifolia*), and sedges (*Carex* sp.), as well as non-native species such as purple loosestrife. Deeper water areas are vegetated with the submergent and floating-leaf aquatic plants found in the open water community associated with the pond. Deep marsh communities provide important habitat for a variety of wetland wildlife species.

3.4.3 SHRUB SWAMP

Shrub swamps are typically found in areas where hydrology is insufficient to support an emergent marsh community, but still too wet to support a forested community. In the Nashoba Brook/Warner's Pond system, this ecological community is located in the transitional areas between open water/deep marsh and forested wetlands/uplands. According to data provided by MassGIS, patches of shrub swamp occur near Nashoba Brook's inlet at Warner's Pond, in the pond's southwestern cove, and along the northwestern shoreline of the pond.

Little site-specific data is available on the shrub swamp community associated with the Nashoba Brook/Warner's Pond system. According to the *Classification of the Natural Communities of Massachusetts*, dominant plant species in shrub swamps often include alders (*Alnus* sp.), buttonbush (*Cephalanthus occidentalis*), silky dogwood (*Swida amomum*), willows (*Salix* sp.), and arrowwood (*Viburnum dentatum*). Shrub swamps provide high-quality habitat for native wildlife, especially migratory bird species, amphibians, and small mammals, which take advantage of the dense cover and abundant food sources provided by this ecological community.

3.4.4 DECIDUOUS FORESTED WETLAND

This ecological community occurs in a handful of relatively small, discrete patches along the western and southern perimeter of the Nashoba Brook/Warner's Pond system. Deciduous forested wetlands are dominated by broad-leaved tree species which drop their leaves each winter and regrow them the following spring. A number of variants of this ecological community are found in Massachusetts, many of which feature red maple (*Acer rubrum*) as a dominant or co-dominant species (Swain 2020).

The deciduous forested wetland communities associated with the Nashoba Brook/Warner's Pond system appear to be dominated by red maple and pin oak (*Quercus palustris*). Shrub and herbaceous vegetation are also present in the understory. Deciduous forested wetlands provide important feeding, breeding, and resting habitat for a wide variety of native mammals, birds, reptiles, amphibians, and insects.



A deciduous forested wetland at Nashoba Brook's confluence with Warner's Pond, with shrubs and herbaceous species in the understory.

EA. December 21, 2022.

4. ALTERNATIVES ANALYSIS

This section provides a description and analysis of the Dredging and Filling Alternative, Dam Removal Alternative, and No-Action Alternative with respect to the following six topics:

- Description of the alternative
- Anticipated effects
- Regulatory feasibility
- Construction considerations
- Project costs
- Project timeline

This section also provides a brief discussion of additional management options which were not considered for detailed analysis because they would fail to fully achieve the goals identified in Section 1.3 and/or would be logistically and/or economically infeasible. These are:

- Short-term aquatic plant management
- Dredging without fill
- Watershed-based approaches
- Fish passage facility installation

The anticipated effects of the two restoration alternatives are described in the context of 15 wetland resource area functions and values, including flood control, water quality/pollution prevention, wildlife habitat, and recreation (see Tables 4-2 and 4-5). These 15 functions and values are derived from the following three sources, as displayed in Table 4-1:

- The 13 wetland functions and values identified in the United States Army Corps of Engineers (USACE) Highway Methodology (USACE 2019),
- The 8 interests of the Massachusetts Wetlands Protection Act (WPA, M.G.L. c. 131, §40)³, and
- The 11 resource area values identified in the Concord Wetlands Bylaw⁴.

The anticipated effects of each restoration alternative on property owners and stakeholders are also discussed in this section.

³ <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXIX/Chapter131/Section40>

⁴ <https://concordma.gov/DocumentCenter/View/2233/Concord-Wetlands-Bylaw?bidId=>

Table 4-1. Wetland Functions and Values

USACE Highway Methodology Wetland Functions and Values	Interests of the Massachusetts Wetlands Protection Act	Concord Wetlands Bylaw Resource Area Values	Blended Term
-	Protection of Public and Private Water Supply	Public or Private Water Supply	Public or Private Water Supply
Groundwater Recharge/Discharge	Protection of Groundwater Supply	Groundwater	Groundwater
Floodflow Alteration	Flood Control	Flood Control	Flood Control
-	Storm Damage Prevention	Storm Damage Prevention	Storm Damage Prevention
Sediment/Toxicant/Pathogen Retention Nutrient Removal/Retention/Transformation	Prevention of Pollution	Prevention and Control of Pollution Water Quality	Water Quality/Pollution Prevention
Fish and Shellfish Habitat	Protection of Land Containing Shellfish Protection of Fisheries	Fisheries	Fish and Shellfish Habitat
Production Export*	-	-	Production Export
Sediment/ Shoreline Stabilization	-	Erosion and Sedimentation Control	Sediment/ Shoreline Stabilization
Wildlife Habitat	Protection of Wildlife Habitat	Wildlife Habitat	Wildlife Habitat
Recreation	-	-	Recreation
Educational/Scientific Value	-	-	Educational/Scientific Value
Uniqueness/Heritage	-	-	Uniqueness/Heritage
Visual Quality/Aesthetics	-	-	Visual Quality/Aesthetics
Threatened or Endangered Species Habitat	-	Rare Species Habitat	Rare Species Habitat
-	-	Agriculture	Agriculture

*This function relates to the effectiveness of the wetland to produce food or usable products for humans or other living organisms (USACE 1999).

4.1 DREDGING AND FILLING ALTERNATIVE

4.1.1 DESCRIPTION OF THE ALTERNATIVE

The Dredging and Filling Alternative would entail dredging sediment from the eastern portion of Warner's Pond and placing the material along the pond's northwestern shoreline and in the pond's southwestern cove. Dredging would increase water depths and decrease the overall cover and biovolume of aquatic invasive plants in the dredged area. The new deeper-water area would link the Gerow Recreation Area with the Commonwealth Avenue access location, enhancing recreational opportunities for paddling and fishing. This alternative would also decrease water depths within the two fill areas and convert the pond's southwestern cove from a shallow open water area to a shallow emergent marsh.

Similar to the previously-permitted dredging project at Warner's Pond, the Dredging and Filling Alternative would likely be completed using hydraulic dredging, as mechanical dredging requires a higher level of effort, cost, logistical challenges, and overall construction schedule. A dredge barge outfitted with a cutter head arm attached to a flexible discharge pipeline would be used to remove approximately 14,000 cubic yards (cy) of sediment from the approximately 4.1-acre dredge area to a maximum total depth of approximately 10 feet. The total dredge volume is constrained by two factors: project budget (an assumed total project budget of up to \$3,000,000 for the purposes of this conceptual design) and available storage capacity within the pond basin for re-location of dredged material. Turbidity curtains placed around the dredge and placement areas would be used to manage migration of suspended solids to other areas of the pond. Dredged material would be amended with a polymer flocculant to increase particle size and decrease time for particles to settle out of solution. Amended material would be pumped via the discharge pipeline directly to the two fill areas along the pond's northwestern shoreline and southwestern cove. Approximately 9,000 cy of dredge material would be placed within an approximately 3.2-acre area along the pond's northwestern shoreline, filling the area at a 60:1 slope to within 1 foot of the water surface. The remaining approximately 5,000 cy of dredged material would be placed within an approximately 3-acre area in the pond's southwestern cove within 1 foot of the water surface to create a shallow emergent wetland. Coir logs would be placed on the bottom of the pond along the perimeter of fill areas to retain placed material. Additionally, multiple layers of turbidity curtains would encircle the placement areas to manage migration of suspended solids out of the designated fill areas.

A conceptual site plan depicting the Dredging and Filling Alternative is provided in Appendix A. Appendix B provides visual renderings depicting the Dredging and Filling Alternative from both oblique aerial and ground-level perspectives.

The Dredging and Filling Alternative would include the following construction-phase activities:

- Mobilization and site preparation
- Installation of temporary turbidity curtains around dredge areas
- Installation of temporary turbidity curtains and coir log containment structures around fill areas.
- Dredging, material amendment, and sediment placement
- Recreational improvements
- Site clean-up and demobilization

To reduce project implementation costs, planting/seeding of the new wetland area established in the pond's southwestern cove has not been included; however, this could be included in subsequent design phases if additional funding is available.

The following sections provide a discussion of the Dredging and Filling Alternative's project objectives, design criteria, and performance metrics. These factors have been developed on a conceptual basis and will be refined during future phases of project design if the Town elects to proceed with this alternative.

4.1.1.1 Project Objectives

The Dredging and Filling Alternative project objectives are the specific outcomes that the Town wishes to achieve by undertaking the project and relate to the Town's overall restoration goals identified in Section 1.3. Similar to the restoration goals, the project objectives are framed in the context of ecological, recreational, and community factors.

Ecological Objectives

- Reduce cover and biovolume of invasive plant species in Warner's Pond.
- Decrease average water temperature and increase average dissolved oxygen concentrations in Warner's Pond.
- Increase diversity and abundance of native fish species in Warner's Pond.
- Increase diversity and abundance of wetland wildlife species in wetland communities bordering Warner's Pond.

Recreational Objectives

- Increase size of open water areas to allow recreational boating and fishing, and to minimize invasive species growth.
- Provide open water connection between the Commonwealth Avenue access location and the Gerow Recreation Area, as well as Scout Island.

Community Objectives

- Enhance aesthetic value of Warner's Pond by managing aquatic invasive plants.
- Demonstrate no net rise in the base flood elevation due to relocation of dredge material within the pond.

4.1.1.2 Design Criteria

The Dredging and Filling Alternative design criteria provide the framework upon which the project's engineering design is based. The design criteria represent the technical factors considered critical for the project's ability to successfully achieve the project objectives.

- **Method of dredging:** As discussed above, the Dredging and Filling Alternative could be completed using either hydraulic or mechanical dredging methods, however, it is anticipated that hydraulic dredging methods will be the most cost-effective and practical alternative.

- **Location of dredging footprint:** Dredging will focus on the eastern portion of the pond, generally in the area between the Gerow Recreation Area and the Commonwealth Avenue access location (Appendix A). Dredging this area will enhance recreational opportunities by increasing water depths and reducing aquatic invasive plant growth in the area between the pond's two primary access locations.
- **Volume of material to be dredged:** The target dredge volume is based on the availability of funding for the project and the total volume of space available within the pond basin for relocating dredged material, with the goal of maximizing the volume of material that can be dredged within these constraints. Based on our discussions with the Town, EA has assumed that the total available budget for future phases of the project will be \$3,000,000.
- **Maximum target depth for dredging:** A key objective of the Dredging and Filling Alternative is to limit the growth of aquatic invasive plant species within the dredge area by reducing light penetration to the bottom. Previous aquatic plant surveys and a review of growing season aerial photographs indicate that the northern cove of the pond is relatively free of aquatic plant growth. Bathymetric surveys of the pond further indicate that water depths in this area range from 8 to 12 feet. Therefore, the Dredging and Filling Alternative seeks to achieve a maximum target water depth in the dredging area of approximately 10 feet, which is expected to effectively manage aquatic invasive plant growth within this area.
- **Dredge area side slope angle:** Selection of an appropriate side slope angle is important to ensure the dredge area will remain relatively stable in the long-term and limit in-filling due to material collapse. Typical side slopes for coarse sandy material in still water generally range from 15-20 degrees (4H:1V to 3H:1V). Slopes for finer material generally range from 30H:1V to 10H:1V. The proposed dredge prism conservatively estimates slide slope at 25H:1V.
- **Size of dredging footprint:** The size of the dredging footprint is based on three factors: the volume of material to be dredged (which in turn is based on the project budget and the availability of areas to relocate dredged material within the pond), the maximum dredging depth, and the dredge area side slope angle to maintain long-term stability of the dredge area. The dredging project was designed to maximize the size of the dredging footprint given these constraints.
- **Fill area location:** The need to place dredged material within the pond basin represents a key engineering and logistical consideration for this alternative. Factors influencing the potential placement locations for dredged material include (1) avoiding placement in the flow paths of water through the pond, (2) avoiding placement adjacent to developed shorelines, (3) avoiding placement in areas that are currently identified as vegetated wetlands, and (4) avoiding placement in areas with steep bottom contours to minimize migration of material outside the designated fill area. Taking into account these constraints, the pond's northwestern shoreline and/or southwestern cove are expected to represent the most feasible locations for placement of dredged material.
- **Maximum target depth for filling:** Where feasible, the fill area will generally be designed to provide up to one foot of water over the top of the fill area to encourage the establishment of a shallow emergent marsh community.

- **Turbidity controls:** Dredging and filling operations will result in significant suspension of sediments in the water column, especially if hydraulic dredging is used. Turbidity controls will be implemented around dredging and filling areas to manage this effect.
- **Avoid areas of known sediment contamination:** Previous sediment sampling at Warner's Pond revealed that sediments in an area southeast of Scout Island exceeded state standards for arsenic concentrations. The Dredging and Filling Alternative will be designed to avoid dredging or filling in this area to avoid potential water quality, ecological and human health, and regulatory concerns. Additional sediment sampling will be required to support the Dredging and Filling Alternative as part of the next phase of the project.
- **Provide recreational improvements:** Recreational access improvements will be provided at the Commonwealth Avenue access location (included in the prior dredging project design) and potentially also at the Gerow Recreation Area. Improvements to the Commonwealth Avenue access location will include widening the access road, resurfacing the access road and parking area, installation of a timber and crushed stone car-top boat launching area, and management of terrestrial invasive species. Potential recreational improvements at the Gerow Recreation Area may include installation of a floating or pile-supported dock to support community paddling events and fishing.

4.1.1.3 Performance Metrics

Performance metrics are evaluation criteria developed to assess project outcomes. Performance metrics identify specific physical, biological, and chemical criteria that will be assessed before and after project implementation to determine the extent to which the project objectives have been achieved.

Physical Criteria

- Volume of sediment dredged and relocated.
- Water depths in dredge and fill areas.
- Water temperature.

Chemical Criteria

- Dissolved oxygen concentrations throughout the water column.

Biological Criteria

- Cover and biovolume of aquatic plants in the dredged area, including aquatic invasive species.
- Vegetative community in the fill area, including presence of invasive plants.
- Fish community composition in the pond.
- Wildlife community composition in the wetlands bordering the pond.

4.1.2 ANTICIPATED EFFECTS

The anticipated positive and negative effects of the Dredging and Filling Alternative to resource area functions and values are summarized in Table 4-2.

Table 4-2. Anticipated Effects of the Dredging and Filling Alternative

Resource Area Functions and Values	Anticipated Positive Effects	Anticipated Negative Effects
Public or Private Water Supply	No positive or negative effects.	
Groundwater	Likely no positive or negative effects.	
Flood Control	Likely no positive or negative effects. Since Warner's Pond is located within a Regulatory Floodway, a hydrologic and hydraulic modeling study would be required to demonstrate that the Dredging and Filling Alternative will not raise the base flood elevation.	
Storm Damage Prevention	No positive or negative effects.	
Water Quality/Pollution Prevention	Likely no significant positive effects. Dredging is anticipated to decrease water temperatures and increase dissolved oxygen concentrations within the dredge footprint; however, these benefits are likely to be offset by increased water temperatures and decreased dissolved oxygen concentrations within the fill footprints. Additionally, the reuse of dredged material within the pond basin will not result in a net removal of nutrients from the system, which would preclude any benefits that could be realized by removing and disposing sediment at an off-site location.	Short-term negative effect due to temporary increase in suspended solids in Warner's Pond, which may be significant. Turbidity barriers would be used during construction to manage this effect. Likely no long-term negative effects.

Resource Area Functions and Values	Anticipated Positive Effects	Anticipated Negative Effects
Fish and Shellfish Habitat	Possible long-term positive effects due to increase in water depths within the dredge footprint which in turn would be expected in increase dissolved oxygen concentrations. Positive effect is likely to be limited due to the reduction in water depths within fill areas, the relatively limited scale of dredging, and the presence of deep water habitat elsewhere in Warner's Pond.	Short- to medium-term negative effects. Short-term increases in suspended solids during dredging and filling operations may impair water quality and temporarily degrade habitat for fish and shellfish. Both dredging and filling are likely to result in direct mortality of shellfish, and area of filling in the southwest cove may become unsuitable for shellfish habitat due to significantly decreased water depths.
Production Export	Potential long-term positive effect through increased complexity of vegetative structure.	Likely no negative effects.
Sediment/Shoreline Stabilization	No positive effects.	Potential medium- to long-term negative effects through destabilization of subaqueous sediment which may result in unanticipated changes to pond bottom conditions.
Wildlife Habitat	Long-term positive effect by creation of 3 acres of new emergent wetland habitat in the pond's southwestern cove and reduction in aquatic invasive plant growth within the dredge footprint.	Short-term negative effects due to displacement during construction activities and increase in turbidity during dredging and filling operations.
Recreation	Long-term positive effect by improving navigability within the dredge footprint (through increased water depths and decreased cover/biovolume of aquatic plants) and installation of new recreational infrastructure.	Long-term negative effect by decreasing navigability within the fill footprints. The southwestern cove would cease to be passible by small paddle craft, while water depths in the north fill area would decrease, which may increase aquatic plant growth and in turn impair recreational use in this area.
Educational/Scientific Value	Potential long-term positive effects by providing opportunity to study the impacts of the project to the environment and community.	No negative effects.

Resource Area Functions and Values	Anticipated Positive Effects	Anticipated Negative Effects
Uniqueness/Heritage	No positive or negative effects	
Visual Quality/Aesthetics	Long-term positive effect through expansion of emergent marsh community and reduction in invasive species growths at surface.	No negative effects.
Rare Species Habitat	No positive or negative effects. Warner's Pond is not currently mapped as habitat for rare species by NHESP, and the Dredging and Filling Alternative would not impact the Priority and Estimated Habitat located along Nashoba Brook and Fort Pond Brook upstream of the pond.	
Agriculture	No positive or negative effects. Agricultural fields are located to the northwest of Warner's Pond but would not be affected by the Dredging and Filling Alternative.	
Property Owners and Stakeholders	Moderate long-term positive effect to landowners along the northeastern shoreline of Warner's Pond by improving aesthetics through a reduction in aquatic plant growth within the dredge footprint.	Short-term negative effects to property owners around Warner's Pond due to construction-related noise and visual impacts.
	Long-term effects to property owners near the southwestern fill area due to the permanent conversion of shallow open water to an emergent marsh community. This effect may be positive, negative, or neutral, depending upon individual preferences.	

4.1.3 REGULATORY FEASIBILITY

The Town previously received permits to hydraulically dredge approximately 35,000 cy of sediment from a 6.3-acre area of Warner's Pond, of which approximately 4,500 cy would be relocated to another area within the pond basin to form an approximately 1-acre emergent wetland shelf and the remaining 30,500 cy would be removed, dewatered, and transported to an off-site location. It is anticipated that the Dredging and Filling Alternative evaluated herein will be viewed as a significant change to the previously-permitted dredging project, and therefore will likely require a new set of permits and approvals.

Assuming that no new issues related to contamination of dredged sediments are discovered, the primary concern of regulatory agencies for the Dredging and Filling Alternative is likely to be related to the filling of a relatively large portion of the pond with dredged sediment. Specific concerns may include the impact of filling on mussels and other benthic organisms, the physical stability of the fill area side slopes, the potential challenges with establishing a native emergent marsh community in the southwestern fill area, and significant temporary increases in suspended solids during construction. Additionally, unlike the previously-permitted dredging project, the Dredging and Filling Alternative would not result in a net removal of nutrient-rich sediments from the system. This may cause increased regulatory agency scrutiny of the

ecological benefits of the project compared to the No Action Alternative, especially because a relatively deep, weed-free area already exists in the pond's northern cove.

Additional information on the permitting process for this alternative is provided in Section 6.3.

4.1.4 CONSTRUCTION CONSIDERATIONS

The following construction considerations are expected to be applicable to the Dredging and Filling Alternative:

- Potential for contaminated sediment in dredge area that requires management and/or off-site disposal.
- Potential for large debris in dredge area which may require additional management.
- Sediment stability in the dredge prism and ability to maintain designed side slopes.
- Stability of material in placement areas and dosage of polymer amendment prior to placement.
- Movement of dredge pipes within the relocation area
- Settling times of amended material in placement area.
- Installation of underwater retaining structures (i.e., coir log placement).
- Feasibility of emergent wetland creation using existing submerged seed bed.
- Potential need for further invasive species management in fill areas.
- Potential access constraints to dredge and placement areas.
 - Feasibility of access with dredge barge and support equipment in shallow water areas.
 - Access will be required in the vicinity of property owners near the southern placement area.
- Coordination with neighboring property owners including construction scheduling, disturbances to property, and management of homeowner's expectations.

4.1.5 PROJECT COSTS

4.1.5.1 Costs Incurred by Undertaking the Project

A summary of conceptual-level project costs is provided in Table 4-3; additional detail is provided in Appendix C.

Table 4-3. Conceptual Cost Estimate Summary for the Dredging and Filling Alternative

Project Phase	Cost Estimate	Low Range (-15%)	High Range (+30%)
Detailed Data Collection and Analysis	\$40,000	\$34,000	\$52,000
Preliminary Engineering Design	\$35,000	\$29,750	\$45,500
Federal, State, and Local Permitting	\$75,000	\$63,750	\$97,500
Final Engineering Design and Contract Preparation	\$45,000	\$38,250	\$58,500
Project Implementation*	\$2,905,000	\$2,469,250	\$3,776,500
Post-Construction Monitoring and Adaptive Management	\$40,000	\$34,000	\$52,000
Project Total	\$3,140,000	\$2,669,000	\$4,082,000

*Includes 20% construction contingency.

The following considerations are applicable to this cost estimate:

- This cost is presented on a conceptual basis for informational purposes only and is based on the conceptual-level project design presented in this report.
- Costs are presented in 2023 dollars.
- Project implementation costs have been informed by discussions with local environmental construction firms with experience completing similar projects.
- As part of the project implementation cost, EA has assumed a price of \$60 per cubic yard of dredged material based on discussions with local environmental contractors.
- As part of the project implementation cost, EA has assumed a cost for mobilization/demobilization of \$600,000. This cost is higher than the assumed mobilization/demobilization cost for the Dam Removal Alternative (\$158,000) due to the comparatively limited availability of the specialized construction equipment needed for the Dredging and Filling Alternative. This cost represents a low-range estimate based on EA's recent professional experience with recent similar projects involving hydraulic dredging. Actual mobilization/demobilization costs may be significantly higher or lower than the conceptual cost estimate included herein.
- As part of the project implementation cost, EA has assumed construction observation to include two site visits per week over the course of a 4.5-month construction period or one site visit per week over the course of a 9-month construction period.
- Additional iterations of the project cost estimate should be completed as the project design is progressed and additional detail developed, specifically as part of the Preliminary Engineering Design and the Final Engineering Design and Contract Preparation phases.

4.1.5.2 Costs Avoided by Undertaking the Project

Undertaking the Dredging and Filling Alternative would not allow the Town to avoid any costs that it would otherwise incur, but would likely reduce the need for future invasive species removal within the dredge footprint.

4.1.6 PROJECT TIMELINE

A summary of the conceptual timeline for the Dredging and Filling Alternative is presented in Table 4-4. If the Detailed Data Collection and Analysis phase of the project were initiated in the summer of 2023, it is anticipated that the project could be ready for construction by the winter of 2024-2025 and that construction may be substantially complete in 1.75 to 3.1 years, assuming minimal “downtime” between project phases and no significant project delays.

Table 4-4. Conceptual Timeline for the Dredging and Filling Alternative

Project Phase	Low Range	High Range
Detailed Data Collection and Analysis	3 months	6 months
Preliminary Engineering Design	3 months	6 months
Federal, State, and Local Permitting	9 months	12 months
Final Engineering Design and Contract Preparation	2 months	4 months
Project Implementation	4 months	9 months
Time to Construction Completion	21 months (1.75 years)	37 months (3.1 years)
Post-Construction Monitoring and Adaptive Management	Five-year post-construction monitoring period	

4.2 DAM REMOVAL ALTERNATIVE

4.2.1 DESCRIPTION OF THE ALTERNATIVE

The Dam Removal Alternative would restore the Nashoba Brook system to its pre-alteration state as a free-flowing river and bordering vegetated wetland complex by removing the impounding effects of the Warner’s Pond dam. The pre-alteration alignment of Nashoba Brook would naturally be restored through the existing impounded area, and the majority of existing open water areas would be converted to one or more vegetated community types. Removal of the Warner’s Pond dam is expected to restore approximately 4,750 linear feet (0.9 miles) of stream channel and re-establish approximately 35 acres of new vegetated wetlands. An approximately 4.5-acre open water area which corresponds with the existing pond’s deep hole is anticipated to remain in the northern portion of the current impoundment limits. Limits of this open water area are estimated and can be further refined through modeling completed during subsequent design phases.

A conceptual site plan depicting the Dam Removal Alternative is provided in Appendix A. Appendix B provides visual renderings depicting the Dam Removal Alternative from both oblique aerial and ground-level perspectives.

The Dam Removal Alternative will include the following construction-phase activities:

- Mobilization
- Installation of temporary erosion and sedimentation controls
- Control of water
- Spillway removal
- Earthwork
- Transportation and disposal of materials
- Stream bank restoration
- Recreational improvements
- Site clean-up and demobilization

Dam removal would require the establishment of a dewatered area behind the two spillways constructed from temporary cofferdams with bypass options to route impounded water downstream in Nashoba Brook. The spillways and earthen embankments would be removed using traditional construction equipment and disposed offsite. Sediment immediately behind the spillways in dewatered areas would be excavated, dewatered and disposed offsite. Sediment accumulated throughout Warner's Pond would be partially mobilized and transported downstream after the spillways are breached. The extent of sediment transport downstream will be determined by a sediment transport analysis completed in a subsequent project phase. Any necessary grading of the stream bed upstream of the dam would be performed in the dry once impounded water was released; however, this is typically not required. Wetland and riparian plants, live fascines, and/or large wood may be placed along the restored stream bank to stabilize soils, promote establishment of native vegetation, and enhance habitat for fish and wildlife. The native seed bank would be expected to germinate and naturally revegetate newly-exposed areas following dam removal. New recreational infrastructure would be necessary to provide access to the restored stream channel for paddling and fishing. Options for recreational improvements include a pile-supported boardwalk with stream access at the Gerow Recreation Area and observation platforms or boardwalks at the Commonwealth Avenue and Pond Street access locations.

The following sections provide a discussion of the Dam Removal Alternative's project objectives, design criteria, and performance metrics. These factors have been developed on a conceptual basis and will be refined during future phases of project design if the Town elects to proceed with this alternative.

4.2.1.1 Project Objectives

The Dam Removal Alternative project objectives are the specific outcomes that the Town wishes to achieve by undertaking the project and relate to the Town's overall restoration goals identified in Section 1.3. Similar to the restoration goals, the project objectives are framed in the context of ecological, recreational, and community factors.

Ecological Objectives

- Re-establish aquatic connectivity and aquatic organism passage in Nashoba Brook.
- Restore diadromous fish access to Nashoba Brook and upstream spawning areas.
- Achieve widespread elimination of aquatic invasive species by removing impounding effects of Warner's Pond dam, increasing water velocities, and increasing channel bottom roughness.
- Enhance habitat for wood turtle, a state-listed species.
- Enhance downstream flow of sediment and nutrients.

Recreational Objectives

- Maintain recreational access and viewpoints to the restored stream and wetland system from the Gerow Recreation Area, Commonwealth Avenue, and Pond Street.
- Educate the public regarding new paddling opportunities provided through dam removal.
- Maintain water access to Scout Island

Community Objectives

- Eliminate public safety risk and liability associated with potential for dam failure.
- Eliminate costs associated with future inspection, maintenance, repair, and replacement of the dam.
- Improve climate resilience by removing vulnerable infrastructure.
- Secure state or federal grant funding to offset project costs.

4.2.1.2 Design Criteria

The Dam Removal Alternative design criteria provide the framework upon which the project's engineering design is based. The design criteria represent the technical factors considered critical for the project's ability to successfully achieve the project objectives.

- **Extent of spillway removal:** In order to be eligible for a Restoration Order of Conditions under the Massachusetts Wetlands Protection Act, the project must provide for (1) the removal of the full vertical extent of the dam such as no remnant of the dam will remain at or below the streambed and (2) the removal of enough of the horizontal extent of the dam such that after removal, no water will be impounded during the 500 year flood event. The feasibility of designing the project in accordance with these conditions will be evaluated during future phases of the project.
- **Material reuse and disposal:** Removal of the dam and spillways will generate a volume of earth, stone, and other materials which will need to either be reused on site or disposed offsite. To help offset project costs, options for onsite reuse should be explored as part of a subsequent phase of the project.
- **Protection of infrastructure and utilities:** Dewatering and construction methods will be selected in future phases of the project to ensure no adverse impacts to downstream

infrastructure (including the Commonwealth Avenue Bridge, Bruce Freeman Rail Trail bridge, pedestrian footbridge, stone retaining wall, and private properties) and utilities.

- **Water management:** Hydrologic and hydraulic modeling will be required during a future phase of the project to determine required water management methods during construction and restoration specifications including planting and channel stone needs.
- **Channel location:** Based on the results of the bathymetric survey and a review of publicly-available aerial photographs of the pond, EA believes that the restored stream channel is likely to pass between the Gerow Recreation Area and Myrica Island. In this case, the bank of the restored channel is anticipated to be within 100 feet of the shoreline of the Gerow Recreation Area. The WMP indicates that the primary flow path of water through Warner's Pond is between Scout Island and Myrica Island based on field observations made in 2011/2012. This difference may be due to the time of year and/or flow conditions that existed at the time that field observations were made. It is also likely that the dominant flow path through the pond has shifted over time as sediment has accumulated within the channels. Nevertheless, a preferential pathway for flow could be established within the pond through sediment management techniques as part of a dam removal project.
- **Channel dimensions:** The restored channel width and depth are anticipated to be similar to the width and depth of the non-channelized portions of Nashoba Brook downstream of the dam. Channel widths in the non-channelized downstream portion of Nashoba Brook were measured at 7 locations using publicly-available aerial photographs and the average channel width was calculated at 45.9 feet (range 41 to 59 feet). The depth of the channel will be based on existing channel depths and the slope of the new channel following dam removal. Dam removal typically does not significantly alter downstream water surface elevations; therefore, the water surface elevation of Nashoba Brook downstream of the existing dam is not anticipated to change significantly following dam removal. Sediment mobilization following dam removal may alter water depths within the channel; a sediment transport analysis would be needed to determine the extent of this effect.
- **Sediment management:** A sediment transport analysis will be needed to determine the extent of sediment removal necessary following pond drawdown and before dam removal. Following dam removal, the restored channel will be evaluated to determine the potential need for adaptive management of channel shape and location as well as additional sediment management needs.
- **Vegetative community transitions:** Given the anticipated new surface water elevation (e.g., the elevation of the restored channel banks), an analysis of vegetative communities and elevations around the pond will be needed to determine how these communities may change following dam removal. In general, dam removal typically causes vegetative communities formerly impacted by the impounding effects of the dam to become "drier" (e.g., existing open water areas may transition to emergent marsh or shrub swamp, existing emergent marsh may transition to shrub swamp, existing shrub swamp may transition to forested wetland, etc.).
- **Recreational improvements:** New recreational infrastructure will be necessary to maintain public access to the water following dam removal. New recreational infrastructure may include a new pile-supported boardwalk/dock at the Gerow Recreation Area and new viewing platforms at the Commonwealth Avenue and Pond

Street access locations. Informational signage related to new paddling opportunities and the network of river access locations throughout Concord would also enhance the recreational value of the project.

4.2.1.3 Performance Metrics

Performance metrics are evaluation criteria developed to assess project outcomes. Performance metrics identify specific physical, biological, and chemical criteria that will be assessed before and after project implementation to determine the extent to which the project objectives have been achieved.

Physical Criteria

- Elimination of existing impoundment and restoration of a natural river channel.
- Stabilized channel banks demonstrating minimal erosion during normal flow conditions.
- Restoration of pre-dam flow rates in Nashoba Brook.
- Decreased water temperatures.

Chemical Criteria

- Increased dissolved oxygen concentrations.

Biological Criteria

- Diadromous fish use of Nashoba Brook and connected waters upstream of the existing dam location.
- Establishment of native wetland communities within the existing impounded area.
- Increased diversity and abundance of wetland wildlife at the site.

4.2.2 ANTICIPATED EFFECTS

The anticipated positive and negative effects of the Dam Removal Alternative to resource area functions and values are summarized in Table 4-5. Additional detail for the primary resource area functions and values anticipated to be affected (positively or negatively) by the Dam Removal Alternative are provided following Table 4-5.

Table 4-5. Anticipated Effects of the Dam Removal Alternative

Resource Area Functions and Values	Anticipated Positive Effects	Anticipated Negative Effects
Public or Private Water Supply	No positive or negative effects.	
Groundwater	Removal of the Warner's Pond dam would result in a decrease in groundwater elevation in the area immediately surrounding the pond. As there are no known active drinking water wells in the vicinity, this change is not expected to impact the quality or quantity of drinking water sources. In general, the effect will be to return groundwater elevations to their pre-alteration state, and thus is considered to be neither positive nor negative.	

Resource Area Functions and Values	Anticipated Positive Effects	Anticipated Negative Effects
Flood Control	Potential long-term positive effect due to lowering water surface elevation and reducing the lateral extent of the 100-year floodplain upstream of the former dam location. Future modeling would confirm the scale of this benefit.	Likely no negative effects.
Storm Damage Prevention	Potential long-term positive effect due to lowering water surface elevation and reducing the lateral extent of the 100-year floodplain upstream of the former dam location. Future modeling would confirm the scale of this benefit.	Likely no negative effects.
Water Quality/Pollution Prevention	Potential significant long-term positive effect due to restoration of natural stream flow patterns which are expected to reduce water temperature and increase dissolved oxygen concentrations.	Potential for short-term negative effects due to increased turbidity downstream of the dam. Future sediment transport modeling should confirm the potential for mobilizing arsenic-contaminated sediment.
Fish and Shellfish Habitat	Significant long-term positive effect on fish habitat through reconnection of aquatic habitat and restoration of fish passage in Nashoba Brook.	Significant short- to medium-term negative effect on shellfish habitat through removal of impoundment. This effect may be moderated in the long-term as mussels recolonize the restored stream channel. No state-listed mussel species are known to occur in Warner’s Pond, and a salvage and relocation effort could be undertaken immediately following dam removal to mitigate mortality rates of mussels.

Resource Area Functions and Values	Anticipated Positive Effects	Anticipated Negative Effects
Production Export	Significant, long-term positive effects through enhancement to fish and wildlife habitat, re-establishment of complex vegetative structure, and removal of impediment to natural flow of sediment and nutrients downstream of the pond.	Likely no negative effects.
Sediment/Shoreline Stabilization	Dam removal will result in downstream migration of sediment stored within the impoundment and re-formation of the natural stream channel. These processes will result in a temporary destabilization of sediment within the system. Hydraulic dynamics will eventually stabilize the stream bed and banks, and re-growth of vegetation will anchor soil along the stream corridor, further stabilizing conditions in the system.	
Wildlife Habitat	Very significant, long-term positive effects due to the removal of the impounding effects of the Warner's Pond dam and the re-establishment of approximately 35 acres of wildlife habitat.	Short-term negative effects due to displacement during construction.
Recreation	Long-term positive impacts through enhanced connectivity between Nashoba Brook and the Assabet River, which is expected to improve paddling and fishing opportunities. New recreational infrastructure will provide water access for active (e.g., paddling, fishing, etc.) and passive (e.g., wildlife viewing) recreation.	Long-term negative effect on skating due to the reduction in the size of the open water area; however, a smaller pond is expected to remain following dam removal which could continue to support these uses. Most private property owners along the pond's shoreline would lose direct access to the water.
Educational/Scientific Value	Significant long-term positive effect through opportunities to study the response of the system to dam removal.	No negative effects.

Resource Area Functions and Values	Anticipated Positive Effects	Anticipated Negative Effects
Uniqueness/Heritage	Long-term positive effects due to multiple benefits of dam removal, including but not limited to: re-establishing connection with Wild and Scenic River downstream of pond; enhancing habitat for rare species; re-establishing natural complex vegetative structure; providing rare scientific and educational opportunity to study the response of the system to dam removal; and improving water quality.	Likely few if any negative effects based on a review of the considerations and qualifiers related to this function (USACE 1999). This alternative would change the nature of the Warner’s Pond system, which has existed in its current state for approximately 160 years – and by extension, to a certain extent, the nature of West Concord. Whether this change is positive or negative is likely a matter of personal opinion and perspective.
Visual Quality/Aesthetics	This alternative would result in significant, long-term changes in the visual quality of the system. These changes may be positive, negative, or neutral, depending upon personal preference. To the extent that the aesthetic quality of Warner’s Pond is currently degraded by dense growths of aquatic invasive species to the water surface during the growing season, this alternative would benefit the visual quality of the system by re-establishing a native vegetative community within the existing impounded area. Based on the indicators of visual quality described in Section 2.4.5, the aesthetic value of the system following dam removal is expected to be high.	
Rare Species Habitat	Significant, long-term positive effects through restoration of wood turtle habitat in Nashoba Brook and establishment of a habitat corridor linking the existing wood turtle habitat upstream of Warner’s Pond with potential habitat along the Assabet River.	No negative effects.
Agriculture	No positive or negative effects.	
Property Owners/ Stakeholders	The project would result in short-term negative effects to property owners in the immediate vicinity of the dam due to construction-related noise and visual impacts. Long-term effects on property owners and stakeholders may be positive, negative, and/or neutral; will vary between property owner/stakeholder; and will be based in part on individual perspectives and preferences. Additional detail is provided in the discussion following this table.	

Water Quality/Pollution Prevention

The Dam Removal Alternative is expected to result in long-term water quality improvements in Nashoba Brook. Water quality improvements would occur due to increased flow velocities, which would reduce water temperature and increase dissolved oxygen concentrations. These outcomes would provide several ecological and community benefits, including improving habitat for fish and other aquatic life, reducing algal growth, and improving the value of the resource for contact recreation. As discussed in Section 2.2.1, the *Final Massachusetts Integrated List of Waters for the Clean Water Act 2018/20 Reporting Cycle* (DEP 2021) classifies Nashoba Brook upstream and downstream of Warner's Pond as a Class 2 water (attaining some uses, others uses not assessed) while Warner's Pond is classified as a Class 4A water (impaired, TMDL completed). Thus, the impounding effect of the Warner's Pond dam has resulted in water quality impairments to the system which would be expected to be ameliorated through dam removal.

Dam removal may also result in temporary negative impacts to water quality downstream of the dam, primarily due to the downstream migration of sediment which is likely to increase turbidity and water temperature and decrease dissolved oxygen concentrations. These effects may temporarily impair habitat for fish and benthic organisms downstream of the dam. Regular stream flow dynamics would help to flush accumulated sediment downstream, thus restoring downstream water quality. The length of time needed for this process would be determined through future sediment transport modeling. Overall, the long-term benefits to water quality from dam removal are expected to outweigh potential short-term adverse effects.

Fish and Shellfish Habitat

According to DER's Dam Removal and Ecological Benefit Estimation Tool⁵, removal of the Warner's Pond dam would reconnect a total of 17.31 river miles of aquatic habitat upstream of the dam. DER currently ranks the Warner's Pond dam in the 60% percentile for ecological benefit of removal; following the removal of the Talbot Mills dam in Billerica, the potential ecological benefit of removing the Warner's Pond dam may increase further.

Nashoba Brook flows downstream from the Warner's Pond dam for approximately 0.2 miles before meeting the Assabet River, which in turn flows for approximately 2.8 miles before meeting the Sudbury River at Old Calf Pasture and forming the Concord River. From there, the Concord River flows generally north for approximately 16.5 miles before discharging to the Merrimack River in Lowell. The Merrimack River then flows generally northeast for approximately 38 miles before emptying into the Gulf of Maine. Four dams are currently present along the 57.5 river miles between the Warner's Pond dam and the Gulf of Maine, as summarized in Table 4-6 and displayed on Figure 4-1.

⁵ <https://mass-eoeea.maps.arcgis.com/apps/MapTools/index.html?appid=f573dc437265480f87e31f413e527a3c>

Table 4-6. Existing Dams between Warner’s Pond and the Gulf of Maine

Name	River	Municipality	Jurisdiction	Status
Essex Dam	Merrimack River	Lawrence	FERC	Fish passage provided by fish lift.
Middlesex Dam	Concord River	Lowell	ODS	Dam was breached in early 1980s.
Wamesit Power Co. Dam	Concord River	Lowell	FERC	Fish passage provided by fish ladder.
Talbot Mills Dam	Concord River	Billerica	ODS	Dam is slated for removal. The project was awarded a \$385,000 grant from DER in November 2022 to support design, permitting, and construction administration.

FERC = Federal Energy Regulatory Commission

As shown in Table 4-6, following the removal of the Talbot Mills dam in Billerica, there will be no remaining obstacles to diadromous fish migration between the Gulf of Maine and the Warner’s Pond dam.

Wildlife Habitat

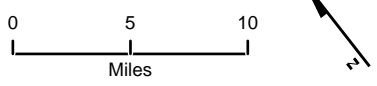
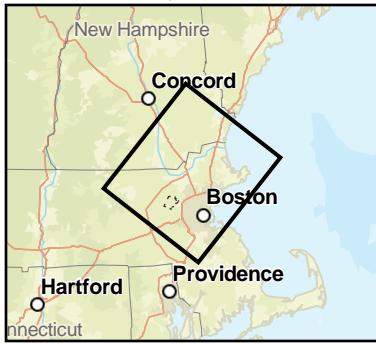
As with any project that fundamentally changes the physical and ecological character of a landscape, the changes to the wildlife habitat functions provided by the system under the Dam Removal Alternative would be beneficial to some wildlife species and detrimental to others. In general, as the impoundment is an artificial system dominated by dense growths of invasive plant species, the wildlife habitat value provided by Warner’s Pond under current conditions is relatively poor. Relatively few native wildlife species are adapted to these conditions compared to the higher number of species adapted to the native plant communities which would become re-established following dam removal. Habitat for invasive mute swans, a large, highly aggressive species commonly found on the pond, would largely be eliminated, which would benefit native waterfowl through reduced competition. Other wildlife species that could benefit from dam removal include a variety of migratory songbirds, wading birds (e.g., herons), reptiles and amphibians (including species of conservation concern such as wood turtle and spotted turtle [*Clemmys guttata*]), and small- to medium-sized mammals. Habitat for odonates (dragonflies and damselflies) may be improved by restoring riverine and wetland communities used for egg-laying and larval life stages, while habitat for lepidopterans (butterflies, moths, and skippers) may be improved by restoring host plants.

Recreation

Dam removal would convert the Warner’s Pond/Nashoba Brook system from a shallow open waterbody to a flowing riverine system, which would change the nature of recreational opportunities provided by the resource. Under current conditions, the value of Warner’s Pond for most recreational uses – including boating, fishing, and swimming – is significantly impaired by shallow water depths and dense growths of aquatic invasive species. The pond is also used for skating during the winter, which has not yet been adversely impacted by the effects of eutrophication in the pond.



Figure 4-1
 Dam and Fish Passage Locations
 Warner's Pond Alternatives Analysis
 Concord, MA



Map Date: 1/30/2023
 Source: Census 2020, USGS 2022, ESRI 2022
 Projection: NAD 1983 UTM Zone 18N



I:\warwick\Warwick\GIS - Warwick\StateandLocal\NorthEast\Massachusetts\6372001 - TownofConcord\Warner'sPond\FP\PROJECT\GIS\Photo\Warner'sPond - AlternativesAnalysis\Warner'sPond - AlternativesAnalysis.aprx - jmorrissey

With regard to summertime active recreational uses (e.g., boating, fishing, and swimming), dam removal and the subsequent enhanced connectivity throughout Nashoba Brook and the Assabet River would be expected to improve the value of the resource for these recreational uses. Dam removal would provide new opportunities for paddling and the potential to create a new paddling trail linking access locations upstream and downstream of the former dam. Enhanced connectivity would also improve habitat for local and migratory fish populations, thereby improving recreational fishing opportunities. While swimming is not a known recreational use of Warner's Pond now, water quality improvements following dam removal would improve opportunities for contact recreation in Nashoba Brook. The installation of a recreational dock at the Gerow Recreation Area would provide access to the water for recreational activities, and new observation platforms at the Commonwealth Avenue and Pond Street access locations would provide enhanced opportunities for wildlife observation and meditation/reflection while viewing the restored native ecological communities.

It should also be noted that there is considerable flexibility in the type and location of proposed recreational infrastructure improvements that could be implemented as part of the Dam Removal Alternative. The proposed improvements included in the conceptual designs prepared as part of this alternatives analysis (a new recreation dock at Gerow, and new observation platforms at the Commonwealth Avenue and Pond Street access locations) represent a starting point that can be freely modified during future design iterations of the project. For example, the Town could elect to construct a second recreational dock instead of an observation platform at the Commonwealth Avenue access location, and/or elect not to construct any recreational improvements at the Pond Street access location. Additionally, a small dock structure could be constructed on the northwestern shoreline of Scout Island to facilitate access to the island from the restored Nashoba Brook.

The significant reduction in the size of the impoundment would entail a decrease in the size of the area available to support wintertime recreational uses (e.g., ice skating and hockey), which may negatively affect the ability of the resource to support these uses. As discussed previously, an approximately 4.5-acre open waterbody is expected to remain in the vicinity of the Gerow Recreation Area following dam removal, which could support wintertime recreational activities. Additionally, most private property owners along the perimeter of the existing impoundment would no longer have direct water access from their properties without the installation of new docks/boardwalks.

Property Owners and Stakeholders

As discussed in Section 2.5, primary property owners and stakeholders in the context of the restoration of Warner's Pond are understood to be: the Town of Concord, residential property owners along the shoreline of the pond, the Boy Scouts of America, DOC, and residents of Concord. The Dam Removal Alternative would likely result in a net positive long-term effect on the Town of Concord by (1) eliminating the long-term financial burden associated with inspecting, maintaining, and repairing the dam, (2) eliminating the public safety liability associated with the dam, and (3) eliminating the long-term financial burden associated with management of the pond (e.g., aquatic plant management).

Effects on property owners along the pond shoreline would be based on individual preferences and perspectives on the concept of dam removal as well as the degree to which property owners access the pond directly from their properties. The Dam Removal Alternative would result in a long-term adverse effect on shoreline residents who wish to maintain the system as an impoundment, primarily due to changes in the visual character and recreational opportunities that would occur as a result of dam removal. For residents who wish to restore the system to its

natural state as a riverine community, dam removal would provide long-term positive effects. Other shoreline residents may be ambivalent toward the changes to the system that would result from dam removal, and the effects of this alternative would be neutral to those residents.

Effects of the Dam Removal Alternative on the Boy Scouts of America would be primarily related to access to Scout Island. Boat access to the restored Nashoba Brook channel from the Commonwealth Avenue access location would require the installation of an approximately 150-foot dock; a new dock at the Commonwealth Avenue access location is not part of the conceptual design prepared as part of this alternatives analysis, but could be constructed if sufficient funding is available. In the conceptual design prepared for this alternatives analysis, the primary boat access to Nashoba Brook would be via a new dock at the Gerow Recreation Area. From there, Scout Island could be accessed by paddling approximately 1,200 feet upstream to the northwestern shoreline of the island (for comparison, the shortest distance to paddle from the Commonwealth Avenue access location to Scout Island under current conditions is approximately 510 feet). Therefore, access to Scout Island would be expected to be maintained under the Dam Removal Alternative, albeit in a somewhat different form than is currently possible.

Similar to the effects on shoreline property owners, the effects of the Dam Removal Alternative on residents of Concord would be largely based on individual preferences and priorities. For residents who wish to maintain the visual characteristics and recreational opportunities associated with the impoundment, dam removal would represent a long-term adverse impact. For residents who wish to restore the system to its natural state as a riverine community, dam removal would represent a long-term benefit. For residents who are ambivalent toward the concept of dam removal, the effects of this alternative would be neutral.

4.2.3 REGULATORY FEASIBILITY

Dam removal is one of the primary methods of restoring degraded riverine ecosystems in the Northeastern United States and is generally viewed very favorably by regulatory agencies. Dam removal is one of the key priorities of DER, which has supported the removal of over 40 dams in Massachusetts since 2005. The 2014 revision of the WPA regulations (310 CMR 10.00) provides a streamlined permitting pathway for dam removal projects under the regulation's ecological restoration provisions.

Additional data collection, analysis, and modeling would be required to demonstrate compliance with regulatory programs, especially with respect to downstream flooding, sediment mobilization, and sediment quality. However, it is anticipated that the regulatory process for approving the Dam Removal Alternative would be relatively straightforward compared to the Dredging and Filling Alternative and that regulatory agencies would be supportive of the project.

Additional information on the permitting process for this alternative is provided in Section 5.3.

4.2.4 CONSTRUCTION CONSIDERATIONS

The following construction considerations are expected to be applicable to the Dam Removal Alternative:

- Flood contingency / severe storm event planning for construction phases of project to ensure adequate capacity to route flows downstream of work area.
- Sediment management during and following dam removal.

- Potential for contaminated sediment upstream of dam that requires management and/or offsite disposal.
- Trucking of excess material from existing dam.
- Potential constraints to access main and auxiliary spillways and size of areas available for access and staging. It is likely that access areas will also require clearing of vegetation and mature trees.
- Coordination with neighboring property owners including construction scheduling, disturbances to property, landscaping replacement and management of homeowners expectations.

4.2.5 PROJECT COSTS

4.2.5.1 Costs Incurred by Undertaking the Project

A summary of conceptual-level project costs is provided in Table 4-7; additional detail is provided in Appendix C.

Table 4-7. Conceptual Cost Estimate Summary for the Dam Removal Alternative

Project Phase	Cost Estimate	Low Range (-15%)	High Range (+30%)
Detailed Data Collection and Analysis	\$50,000	\$42,500	\$65,000
Preliminary Engineering Design	\$65,000	\$55,250	\$84,500
Federal, State, and Local Permitting	\$75,000	\$63,750	\$97,500
Final Engineering Design and Contract Preparation	\$50,000	\$42,500	\$65,000
Project Implementation*	\$2,201,000	\$1,870,850	\$2,861,300
Post-Construction Monitoring and Adaptive Management	\$90,000	\$76,500	\$117,000
Project Total	\$2,531,000	\$2,151,350	\$3,290,300

*Includes 20% construction contingency.

The following consideration are applicable to this cost estimate:

- This cost is presented on a conceptual basis for informational purposes only and is based on the conceptual-level project design presented in this report.
- Costs are presented in 2023 dollars.
- Project implementation costs have been informed by discussions with local environmental construction firms with experience completing similar projects.

- Costs do not include removal of sediment other than what is typically required of regulatory agencies (i.e., immediately upstream of the dam) and does not include removal of any arsenic-contaminated material.
- As part of the project implementation cost, EA has assumed construction oversight to include two site visits per week over the course of a 4.5-month construction period or one site visit per week over the course of a 9-month construction period.
- Additional iterations of the project cost estimate should be completed as the project design is progressed and additional detail developed, specifically as part of the Preliminary Engineering Design and the Final Engineering Design and Contract Preparation phases.

Another important consideration is that significant sources of federal and state grant funding are available to offset the costs of dam removal projects. Funding is available to support all project phases, including data collection, design, permitting, and construction. Grant funding is awarded on a competitive basis and the ability to successfully obtain grant funding is by no means a guarantee; however, it is expected that the Dam Removal Alternative would score relatively highly given its potentially significant ecological benefits. Funding agencies include the United States Fish and Wildlife Service, National Oceanic and Atmospheric Administration, National Fish and Wildlife Foundation, Massachusetts Executive Office of Energy and Environmental Affairs, and DER, among others.

4.2.5.2 Costs Avoided by Undertaking the Project

Undertaking the Dam Removal Alternative would allow the Town to avoid future costs associated with dam inspection, maintenance, repair, and eventual rehabilitation or replacement that would otherwise be incurred. According to the 2018 dam inspection report, costs for recommended yearly monitoring, inspection, and maintenance of the Warner's Pond dam are between \$5,000 and \$11,000. Assuming that annual monitoring, inspection, and maintenance needs remain consistent and an annual inflation rate of 2%, this would equate to a total cost to the Town of between approximately \$500,000 and \$1,000,000 over the next 50 years. If repairs, modifications, or additional studies or analyses are required during this time period, these costs could increase significantly. This also does not include the costs of the formal dam inspection/evaluation required by ODS which occurs every 5 years for Significant Hazard Potential dams.

4.2.6 ANTICIPATED TIMELINE

A summary of the conceptual timeline for the Dam Removal Alternative is presented in Table 4-8. If the Detailed Data Collection and Analysis phase of the project were initiated in the summer of 2023, it is anticipated that the project may be ready for construction by the winter of 2024-2025 and that construction may be substantially complete in 1.8 to 3.25 years, assuming minimal "downtime" between project phases and no significant project delays.

Table 4-8. Conceptual Timeline for the Dam Removal Alternative

Project Phase	Low Range	High Range
Detailed Data Collection and Analysis	3 months	6 months
Preliminary Engineering Design	4 months	8 months
Federal, State, and Local Permitting	9 months	12 months
Final Engineering Design and Contract Preparation	2 months	4 months
Project Implementation	4 months	9 months
Time to Construction Completion	22 months (1.8 years)	39 months (3.25 years)
Post-Construction Monitoring and Adaptive Management	Five-year post-construction monitoring period	

4.3 NO-ACTION ALTERNATIVE

4.3.1 DESCRIPTION OF THE ALTERNATIVE

Under the No-Action Alternative, neither of the two restoration action alternatives would be implemented at Warner's Pond. Under this alternative, the process of eutrophication in Warner's Pond would be allowed to continue unabated. Eutrophication is a natural process by which waterbodies are gradually filled with sediment from watershed sources over long periods of time. Through the process of eutrophication, aquatic systems slowly transition from open waterbodies to emergent marshes, shrub swamps, forested wetlands, and finally to forested upland environments. While eutrophication is a natural process, watershed development significantly increases the rate at which eutrophication occurs. Additionally, artificial impoundments such as Warner's Pond were created by humans and are typically managed for one or more specific purposes, such as habitat for fish and aquatic wildlife, recreation, aesthetics, flood control, and energy generation. To ensure that these waterbodies continue to serve these purposes, the negative impacts of eutrophication must be managed in human-created impoundments. The No-Action Alternative would fail to manage the negative in-pond effects of eutrophication while also failing to restore the pond to its pre-alteration state as a free-flowing riverine system through removal of the Warner's Pond dam.

4.3.2 ANTICIPATED EFFECTS

In general, since the No-Action Alternative represents the absence of any new action, this alternative would not result in any new positive or negative impacts to natural, recreational, or community resources. Rather, selection of this alternative would mean that the existing impairments to these resources would persist into the future, and the potential benefits associated with the two action alternatives would fail to be achieved. Additionally, since eutrophication is an on-going process, the negative effects of existing impairments in the pond would be anticipated to increase in the future in the absence of any restoration measures.

Selection of this alternative would also mean that any potential negative impacts associated with either of the two restoration alternatives would be avoided. The primary positive impact of this alternative would be the absence of the economic cost associated with implementing either of the restoration alternatives; however, selection of the No-Action Alternative would entail an economic burden, as discussed in Section 4.3.5.

4.3.3 REGULATORY FEASIBILITY

As the No-Action Alternative represents the absence of any new action, selection of this alternative would avoid the need to seek permits or approvals and the economic costs associated with the regulatory process.

4.3.4 CONSTRUCTION CONSIDERATIONS

As the No-Action Alternative represents the absence of any new action, there are no construction consideration associated with this alternative.

4.3.5 PROJECT COSTS

Although the No-Action Alternative represents the absence of any new action, this alternative would be expected to represent a cost to the Town in the long-term due to the need to maintain the Warner's Pond dam. As discussed in Section 4.2.5.2, costs for routine dam inspection and maintenance may be approximately \$500,000 and \$1,000,000 over the next 50 years.

4.3.6 PROJECT TIMELINE

As the No-Action Alternative represents the absence of any new action, there is no timeline associated with this alternative.

4.4 OPTIONS NOT CONSIDERED FOR DETAILED EVALUATION

In addition to the alternatives described in Sections 4.1 through 4.3, the feasibility of implementing several other aquatic resource management strategies at Warner's Pond was assessed as part of this alternatives analysis. These additional options can generally be categorized as short-term and long-term measures, as described below.

As a short-term measure, aquatic invasive plant management through herbicide application or other means could be implemented at Warner's Pond, as discussed in Section 4.4.1. While these measures may provide some benefits in reducing aquatic invasive plant densities, several constraints may limit their effectiveness. Also, as aquatic invasive plant management only addresses a symptom of the problem rather than its cause, it does not represent a holistic restoration approach for the pond. If the Dredging and Filling Alternative were implemented, short-term aquatic plant management could be used to supplement this alternative; implementation of the Dam Removal Alternative would largely obviate the need for short-term aquatic plant management.

Longer-term measures could include a dredging alternative that does not entail filling a portion of the pond, implementation of watershed-based approaches to address nutrient inputs to the pond, and construction of a fish passage facility at the Warner's Pond dam. These additional long-term options are discussed in Sections 4.4.2 through 4.4.4. The 2012 Watershed Management Plan provides additional detail on these and other management options.

4.4.1 AQUATIC PLANT MANAGEMENT

Several commonly-used management options are available for the control of aquatic plants in waterbodies, including benthic barriers, hand and diver harvesting, mechanical harvesting and hydroskiing, herbicide treatment, and drawdown. Hand harvesting, mechanical harvesting, hydroskiing, and herbicide treatment have been used as part of efforts to control aquatic invasive species in Warner's Pond in the past. These techniques generally provide control of aquatic plant growths in the short- to medium-term and therefore must often be repeated for multiple growing seasons to achieve noticeable reductions in aquatic invasive species growths. This is especially the case in waterbodies with dense, widespread infestations; ample light penetration to the bottom; and soft, nutrient-rich sediments, such as Warner's Pond. Therefore, the use of these techniques requires a sustained annual commitment of both effort and funding to provide long-term benefits and prevent re-growth if a level of control is achieved. Aquatic plant management approaches would not address the fundamental issues facing the pond, increase water depths, or mitigate sediment and nutrient loading; therefore, this suite of management techniques can be viewed more as an annual maintenance program, rather than as a holistic restoration approach. This is a key difference compared to the alternatives described in Sections 4.1 and 4.2.

As each aquatic plant management technique has specific limitations, multiple techniques are often combined as part of an aquatic plant management program. Effective control of aquatic invasive species growths in Warner's Pond under this alternative would almost certainly require pond-wide application of herbicides over several growing seasons. Mechanical harvesting or hydroskiing can also provide control over large areas, but these approaches are not suitable for control of species that reproduce vegetatively such as fanwort and milfoil, which are present in Warner's Pond. Benthic barriers, hand and diver harvesting, and drawdown have limitations that make these techniques unsuitable as the primary management approach at Warner's Pond, but could be used to supplement a pond-wide herbicide treatment program.

In addition to the information presented below, more information related to potential aquatic plant management techniques and considerations for their use at Warner's Pond is provided in the Warner's Pond Watershed Management Plan.

4.4.1.1 Benthic Barriers

Benthic barriers are typically used to control the growth of aquatic plants across very limited areas, such as around docks, swimming beaches, or boat launches. This technique provides effective control of aquatic plants by preventing sunlight from reaching the pond bottom. Benthic barriers are a sheet-like material which is placed in the targeted area and anchored to the bottom to prevent the barrier from floating or drifting.

While benthic barriers are effective at controlling aquatic plants within the area in which they are used, several limitations make them infeasible and undesirable for widespread use at Warner's Pond. Benthic barriers inherently provide control of aquatic plant growths only in very limited areas of a waterbody, and therefore are not a feasible solution for pond-wide management of aquatic invasive species. Once benthic barriers are removed, aquatic plants would be expected to recolonize the area relatively quickly, requiring the barriers to be used indefinitely. Benthic barriers must also be removed from the pond over the winter to prevent damage to the barrier and for cleaning, and therefore would represent an annual cost for deployment, maintenance, and removal. Benthic barriers are also non-selective and would kill native plants and benthic organisms within the barrier footprint. Given these limitations, benthic barriers could potentially be used as a minor component of pond-wide invasive species management program at

Warner’s Pond, but the costs and potential negative impacts associated with their use may outweigh any positive effects.

4.4.1.2 Hand and Diver Harvesting

Hand harvesting entails the manual removal of plants from a waterbody and can be completed by professionals or trained volunteers working from a vessel or by wading in shallow waters. Hand harvesting is most often used to manage growths of floating-leaf plants such as water chestnut which can be easily observed and pulled from the water’s surface. Hand harvesting using trained volunteers from the community is a commonly-used management technique for the control of water chestnut and has been implemented at Warner’s Pond in the past. Information provided by the Town indicates that in recent years, increasingly shallow water depths and dense plant growths have hindered water chestnut hand harvesting efforts at Warner’s Pond. Assuming that volunteers are adequately trained in the proper identification of target species, hand harvesting is a very low-impact management technique which can also provide effective control if a sufficient effort is made on an annual basis. Hand harvesting of water chestnut can begin once rosettes begin to occur in late June to mid-July, and must be completed prior to the plants dropping seed, which typically occurs in late summer to early fall. In addition to the positive ecological effects of controlling water chestnut, a volunteer harvesting program can also provide an opportunity to engage and educate the public on invasive species and their impacts on water resources. One potential negative impact is that reduced density of water chestnut on the pond surface may increase sunlight penetration into the water column and in turn spur the growth of submergent aquatic invasive plant species.



Hand-harvesting of water chestnut has been implemented at Warner’s Pond for several years.

Source: Town of Concord

Diver harvesting involves the use of trained divers outfitted with SCUBA gear and is typically used to remove rooted submergent aquatic vegetation, such as fanwort and milfoil. Diver-assisted suction harvesting is a variation of diver harvesting which makes use of a suctioning device to remove plants more efficiently than hand pulling. In all cases, plants removed by hand or diver harvesting are collected and disposed of to prevent them from re-entering waterbodies. Similar to benthic barriers, diver harvesting is typically used to control growths of submergent aquatic vegetation over very limited areas. As this technique is very labor-intensive and requires specialized training and equipment, it is typically cost-prohibitive to employ over an entire waterbody. Unlike benthic barriers, diver harvesting is selective, meaning that only targeted plant species are removed from a given area. While the potential for negative impacts from diver harvesting is low, this technique is not feasible to implement over large areas, and therefore is not expected to significantly contribute to the management of invasive species in Warner’s Pond. Diver harvesting, with or without diver-assisted suction harvesting, could be used to control invasive plant growths within limited areas at Warner’s Pond.

4.4.1.3 Mechanical Harvesting and Hydroraking

Mechanical harvesting involves the use of a specialized vessel which cuts and removes aquatic plants below the water's surface. Similar to mowing a lawn, mechanical harvesting does not kill plants, it simply reduces aquatic plant biovolume within one growing season. As mechanical harvesting does not provide systemic control, it is not an effective long-term management solution. Mechanical harvesting is also relatively expensive to implement given the need for specialized equipment. The primary benefit of mechanical harvesting is that it can be implemented over a relatively large area over a short period of time, and thus can provide rapid management across an entire waterbody. Since mechanical harvesting can result in extensive fragmentation of plants, it is not recommended for management of species which can reproduce by fragmentation, including fanwort and milfoil. As these are two of the primary invasive species present in Warner's Pond, mechanical harvesting would not be suitable for use at this site.

Hydroraking also involves the use of a specialized vessel comprised of a small excavator-like mechanism mounted on a barge. The excavator can be outfitted with different attachments that rake, scrape, or scoop plants and their roots from the pond bottom. Unlike mechanical harvesting, hydroraking can provide long-term control since roots are removed. Since hydroraking works by removing plants by their roots, it is primarily used to control aquatic plants with large root or rhizome systems, including lilies and common reed. Hydroraking is relatively ineffective at managing species with finer root systems such as fanwort, milfoil, and water chestnut, and therefore is not likely to be an effective management strategy in Warner's Pond. Similar to mechanical harvesting, hydroraking can also result in fragmentation and thus has a similar limitation in use for areas with species that can reproduce by fragmentation.

4.4.1.4 Herbicide Treatment

This technique entails the application of specific chemical formulations to a waterbody to limit aquatic plant growth through direct destruction of plant tissue (contact herbicides) or interruption of biochemical processes which result in mortality (systemic herbicides). The application of herbicides to aquatic habitats is regulated by the United States Environmental Protection Agency, DEP, and Division of Agricultural Resources, and a number of herbicide products have been approved for use in Massachusetts waters by those agencies. As each herbicide has specific limitations for use, the selection of a particular herbicide at a given waterbody is typically based on the target plant species, the size of the targeted management area, regulatory restrictions, and other factors.

In Massachusetts, options for effective control of fanwort (the dominant invasive species of concern in Warner's Pond) are limited to two products: fluridone (trade name Sonar) and flumioxazin (trade name Clipper). Fluridone is a systemic herbicide which works slowly over the course of several weeks to months, during which time a minimum concentration of herbicide must be maintained within the waterbody. Booster treatments are often required in the same season following the initial treatment of a waterbody with fluridone in order to maintain this minimum concentration. The 2003 survey report suggests that maintaining the required minimum concentration of fluridone in Warner's Pond may be infeasible due to the pond's high flushing rate; the use of granular (as opposed to liquid) formulations of fluridone (trade name Sonar One and Sonar Q) may be an option to mitigate this effect. In 2011, treatment of the northern and eastern portions of the pond using the herbicides Sonar and Sonar One was completed on three occasions to control fanwort and variable-leaf milfoil. According to the 2012 Watershed Management Plan, the results of a post-treatment survey conducted in late summer

of 2011 suggested that treatment was effective at reducing aquatic plant biomass throughout most treated areas.

Current Massachusetts regulations limit applications of flumioxazin to no more than 25% of a waterbody in any given year, with a minimum four-year interval before an area can be re-treated. Flumioxazin is a contact herbicide and works more rapidly than fluridone; therefore, the efficacy of this herbicide may be less impacted by the pond's high flushing rate compared to fluridone. However, the overall efficacy of a flumioxazin treatment may still be reduced by the pond's high flushing rate compared to other waterbodies. As flumioxazin can only be used in a given area of pond once every four years, there is a potential for re-growth of target species during the required treatment interval.

Of the available aquatic plant management techniques, herbicide treatment is anticipated to be the most effective and logistically feasible approach to pond-wide management of aquatic plant growths. Nevertheless, gaining meaningful and long-term control of aquatic invasive species growths within Warner's Pond would almost certainly require multiple treatments per year over the course of multiple years due to the extent and density of growths, high concentration of nutrients in pond sediments, ample light penetration, and the high flushing rate of the pond. These same factors mean that if treatment were suspended, the potential for re-growth of target species would be high. Therefore, this approach would require a long-term plan and commitment of resources to avoid ceding any progress that may ultimately be achieved. Like the other aquatic plant management approaches discussed in Section 4.4.1, herbicide treatments would not address the fundamental issues facing the pond, increase water depths, or mitigate sediment and nutrient loading. Finally, the use of herbicides in waterbodies remains controversial in some communities due to concerns about impacts to non-target organisms and human health.

4.4.1.5 Drawdown

Provided the pond's dam has a functioning low-level outlet, drawdown can be a relatively simple and low-cost technique to implement. Drawdown is typically used during the winter to control the growth of aquatic plants along shorelines and to prevent ice damage to shoreline structures such as docks and retaining walls. Since there are very few docks or other shoreline structures on Warner's Pond, a drawdown program at Warner's Pond would likely be implemented for the purposes of aquatic plant control, rather than shoreline protection. Drawdown is effective at controlling plants that reproduce vegetatively such as fanwort and milfoil, which are present in Warner's Pond, but is ineffective at controlling plants that reproduce by seed, such as water chestnut, which is also present in the pond.

Despite the relative simplicity of conducting a drawdown, a number of factors influence whether or not drawdown would be effective for plant control in a given waterbody. An overarching consideration is that the benefits of drawdown are limited to the drawdown zone – the area between the normal pool elevation of the waterbody and the drawdown depth, and thus drawdown is not an effective tool for pond-wide control of aquatic plant growth. Drawdowns deeper than three feet are generally no longer allowed by DEP, which limits the effectiveness of drawdown as a plant control technique. This is especially true for waterbodies such as Warner's Pond in which much of the pond is within the photic zone (i.e., the portion of the water column within which sunlight penetration occurs), and thus a ready source population of plants will be present to recolonize the adjacent drawdown zone. The effectiveness of drawdown is also highly dependent upon annual weather conditions during the winter, making it difficult to predict or control how successful drawdown will be year-to-year. Drawdown is typically less effective in waterbodies with mucky shorelines such as Warner's Pond, as these areas can retain water

during drawdown and prevent the drying and freezing of plants necessary to achieve control. For these reasons, conditions in Warner's Pond are not considered conducive to the use of drawdown as an effective plant management tool, and any benefits realized by implementing drawdown would likely be marginal.

4.4.2 DREDGING WITHOUT RELOCATION

A dredging program could be implemented at Warner's Pond in which the dredged material is removed from the pond, rather than relocated to another area of the pond as is considered in the Dredging and Filling Alternative (Section 4.1). This alternative would provide the benefits of the Dredging and Filling Alternative (increased water depths, decreased aquatic invasive plant growth, and improved recreational opportunities) but would not result in a decrease in the overall size of the open water area of the pond, and unlike the Dredging and Filling Alternative, would provide a net removal of nutrient-rich sediments that fuel aquatic plant growth. Additionally, since this alternative would not involve filling a portion of the pond, the regulatory approval process would be expected to be more straightforward compared to the Dredging and Filling Alternative.

The primary drawback of this alternative is the high cost associated with its implementation. The Town solicited bids from contractors in August 2022 to hydraulically dredge approximately 35,000 cy of sediment from a 6.3-acre area of Warner's Pond, of which approximately 4,500 cy would be relocated to another area within the pond basin and the remaining 30,500 cy would be removed, dewatered, and transported to an off-site location. Based on information provided by two contractors, the cost of such a dredging project would be on the order of \$8,000,000 to \$9,000,000, which is significantly greater than the Town's available funding. This alternative is therefore considered to be economically infeasible. Additionally, this alternative would fail to restore aquatic connectivity in Nashoba Brook.

4.4.3 WATERSHED-BASED APPROACHES

A watershed-based approach to addressing the effects of eutrophication in Warner's Pond would entail implementing both engineered and non-engineered measures to reduce or eliminate sources of sediment and nutrients within the pond's watershed, with the goal of significantly reducing sediment and nutrient loading to the pond. Engineered measures may include low-impact development stormwater management systems, septic system upgrades, and other watershed best management practices. Non-engineered measures may include reduction in use of phosphorus-based fertilizer (Massachusetts law now restricts the use of phosphorus-based fertilizer in most instances), appropriate management of pet waste, maintaining vegetated buffers in shoreline areas, and similar approaches.



A small stormwater management system located along the Bruce Freeman Rail Trail at its crossing of Nashoba Brook north of Warner's Pond.

EA, December 21, 2022.

There are few, if any, negative effects that would be associated with implementing the suite of watershed-based approaches identified above. However, the potential for achieving meaningful

benefits to Warner's Pond through implementation of watershed-based approaches is limited. This is due to a number of factors, primarily:

- The very large size of the pond's watershed compared to the size of the pond itself.
- The fact that 97% of the pond's watershed is located outside of Concord, which significantly limits the ability of the Town to make changes within the watershed.
- The high volume of sediment and nutrients which are deposited into the pond each year. The 2012 Watershed Management Plan estimates that the average annual phosphorus load to the pond is over six times higher than the critical load.
- The high volume of sediment and nutrients which have already been deposited into the pond. According to the 2012 Watershed Management Plan, even if an 80% reduction in the annual phosphorus load to Warner's Pond could be achieved (which is likely to be logistically and economically infeasible), in-pond phosphorus concentrations would remain well above the critical load and that negative water quality issues would persist.

Watershed-based approaches can provide demonstrable benefits to water quality and should be encouraged wherever possible; however, such measures are unlikely to significantly improve conditions in Warner's Pond.

4.4.4 FISH PASSAGE FACILITY INSTALLATION

As an alternative to dam removal, a fish passage facility could be constructed at the Warner's Pond dam. Fish passage facilities are typically constructed when there is a desire to restore the ability of diadromous fish species to migrate past an existing in-stream barrier (typically a dam), but when removal of the dam is too costly, is not desired by the dam owner, or is infeasible for other reasons. A fish passage facility at the Warner's Pond dam, while not nearly as effective as dam removal, would allow diadromous fish species to migrate up Nashoba Brook past the Warner's Pond dam while still maintaining the existing impoundment.



A typical Denil fish ladder.

Source: USFWS

This alternative would provide some of the benefits of the Dam Removal Alternative (Section 4.2) while maintaining Warner's Pond in its current state as an open waterbody. This alternative would not address existing in-pond impairments and therefore would not provide any benefits associated with water quality, in-pond habitat, or recreational opportunities. Additionally, unlike the Dam Removal Alternative, this alternative would not relieve the Town from the economic and public safety burden of the Warner's Pond dam, but would rather increase the maintenance burden associated with the dam by adding new infrastructure.

For the reasons described above, this alternative is considered sub-optimal compared to the Dam Removal Alternative. However, installation of a fish passage facility at the Warner's Pond dam should be evaluated in more detail if the Town elects not to proceed with the Dam Removal

Alternative. The fish passage facility installation alternative could be implemented along with in-pond management alternatives including dredging and/or aquatic plant management.

4.5 ALTERNATIVES ANALYSIS SUMMARY

To provide a side-by-side comparison of the two restoration alternatives, the anticipated effects, regulatory feasibility, construction considerations, project costs, and project timelines of each alternative were each scored on a scale of 0 to 4 based on their degree of advantageousness; these scores were then summed to determine the overall score for each alternative. As shown in Table 4-9, this process resulted in the Dredging and Filling Alternative receiving a total score of 8.25 and the Dam Removal Alternative receiving a total score of 14.06 (on a scale of 0 to 20).

Table 4-9. Alternatives Analysis Summary

Evaluation Factor	Dredging and Filling Alternative	Dam Removal Alternative
ANTICIPATED EFFECTS¹	2.25	3.06
Public or Private Water Supply	2	2
Groundwater	2	2
Flood Control	2	3
Storm Damage Prevention	2	3
Water Quality/Pollution Prevention	2	4
Fish and Shellfish Habitat	2	4
Production Export	3	3
Sediment/Shoreline Stabilization	1	2
Wildlife Habitat	3	4
Recreation	3	3
Educational/Scientific Value	3	4
Uniqueness/Heritage	2	4
Visual Quality/Aesthetics	3	3
Rare Species Habitat	2	4
Agriculture	2	2
Property Owners and Stakeholders	2	2
REGULATORY FEASIBILITY	1	3
CONSTRUCTION CONSIDERATIONS	1	3
PROJECT COSTS	2	3
PROJECT TIMELINE	2	2
TOTAL SCORE	8.25	14.06

¹Average of scores for 16 resource area functions and values
 Score descriptions: 4=Very Advantageous, 3=Advantageous, 2=Neutral, 1=Disadvantageous, 0=Very Disadvantageous
 Total score range: 20 (highest possible) to 0 (lowest possible)

Ultimately, the fundamental cause of the degradation of Warner’s Pond is that the pond is located at the end of an extensive network of streams and tributaries which carry a large sediment and nutrient load from a watershed over 600 times the size of the pond itself. The impoundment of Nashoba Brook through construction of the Warner’s Pond dam – in addition to

creating the pond itself – also created what is in essence a large settling pool for sediments and nutrients which would otherwise have continued to flow through Nashoba Brook, downstream into the Assabet River and beyond. Reduced flow velocities in the pond (i.e., compared to a free-flowing stream) allow nutrient-rich sediments to drop out of the water column and settle in the basin, and the dam physically blocks these large volumes of sediment from flowing downstream.

Given the size of the watershed and the large volume of sediment and nutrients deposited into the pond each year, options for large-scale reductions in sediment and nutrient loading to the pond through watershed-based approaches are logistically and economically infeasible. Even if meaningful reductions could be achieved, in-pond conditions would be unlikely to improve significantly given the extent of sediment and nutrient deposition which has already occurred. A dredging program in which a relatively large volume of sediment was removed from the pond would provide considerable benefits but has been determined to be economically infeasible to undertake.

The cost of the Dredging and Filling Alternative assessed in this study is several times lower than a large-scale dredging project without fill (i.e., in which sediments are removed from the pond and relocated elsewhere); however, the benefits associated with such an approach would also be less significant. This is because the Dredging and Filling Alternative would not change the overall volume of sediment and nutrients within the system, but rather would simply relocate accumulated sediment from one area of the pond to another. The primary benefit of this alternative is improved recreational opportunities through increased water depths and decreased aquatic plant densities within the dredging footprint. Benefits to other functions and values – including water quality and habitat for fish and wildlife – would either be offset by sediment relocation within the basin or would be provided at a much smaller scale than under the Dam Removal Alternative. The Dredging and Filling Alternative also entails potentially significant regulatory and logistical challenges which could impact the ability of the Town to obtain permits for the project and the overall success of project implementation, respectively.

The Town could undertake an aquatic plant management program at Warner's Pond which would rely on herbicide treatments, supplemented with hand harvesting of water chestnut. The cost of this option would not be small, but would be significantly less than either of the two restoration action alternatives, at least for the foreseeable future. The pond's very high flushing rate would be expected to limit the effectiveness of systemic herbicide treatments and likely require multiple booster treatments within each season to maintain the minimum required concentration of chemical in the water. Multiple years of treatment would likely be necessary to achieve some level of control, and re-growth after treatment is stopped would be a significant concern due to the abundance of invasive species within the pond, high concentrations of nutrients available to fuel plant growth, and ample light penetration due to shallow water depths. The use of herbicides in the pond may also raise concerns among Town residents about potential non-target impacts, and limited staff resources would pose an additional challenge to annual implementation.

The No-Action Alternative would maintain the status quo in the short term; in the medium- to long-term, conditions in the pond would continue to deteriorate and the ability of the pond to provide ecological, recreational, and community benefits would continue to decline. As sediment deposition into the pond continues, areas that are now shallow open water would be converted to marsh, and deeper water areas would become shallower. This effect would likely first be observed to the west and south of Scout Island, where an extensive marsh system already exists and where water depths are generally three feet or less.

Dam removal is the only logistically and economically feasible alternative that would provide significant, long-term benefits to several resource area functions and values. The scale and scope of the positive effects of the Dam Removal Alternative would be significantly greater than the Dredging and Filling Alternative and other management options, and the negative effects would be fewer. The primary long-term negative effects associated with the Dam Removal Alternative are likely to be the perceived reduction in the recreational potential of the resource as well as aesthetic concerns; however, the latter is highly specific to the individual and the restored stream and wetland complex are anticipated to provide high aesthetic value. It is expected that these potential negative effects can be managed and mitigated by undertaking recreational improvements as part of the dam removal project and a public outreach and education campaign. In addition, the Dam Removal Alternative is likely to have a higher degree of regulatory feasibility and fewer logistical constraints compared to the Dredging and Filling Alternative. While the costs of the two restoration action alternatives are comparable, the actual cost to the Town of implementing the Dam Removal Alternative could be significantly reduced by securing state and/or federal funding for future design, permitting, and construction-related costs.

In the context of the Town's goals for the restoration of Warner's Pond, the Dam Removal Alternative would fully achieve all nine goals while the Dredging and Filling Alternative would fully achieve three goals, partially achieve two goals, and fail to achieve four goals. The No Action Alternative would fail to achieve all nine goals (Table 4-10).

Table 4-10. Summary of Anticipated Goal Achievement under Each Alternative

Number	Description	Dredging and Filling Alternative	Dam Removal Alternative	No Action Alternative
Ecological				
Goal 1	Enhance habitat for native fish and wildlife	Partially Achieved	Achieved	No Change
Goal 2	Manage aquatic invasive species	Partially Achieved	Achieved	No Change
Goal 3	Improve water quality	No Change	Achieved	No Change
Recreational				
Goal 4	Enhance recreational infrastructure and accessibility	Achieved	Achieved	No Change
Goal 5	Increase opportunities for paddle craft use and recreational fishing	Achieved	Achieved	No Change
Goal 6	Provide water-based recreational opportunities at Gerow Park	Achieved	Achieved	No Change
Community				
Goal 7	Enhance climate resilience	No Change	Achieved	No Change
Goal 8	Protect public safety	No Change	Achieved	No Change
Goal 9	Minimize long-term operation & maintenance costs	No Change	Achieved	No Change

The Dam Removal Alternative is fundamentally different from all other possible restoration or management alternatives in that most of the open water area of the pond would be replaced by

vegetated wetlands. For residents who wish to maintain the pond as an open waterbody, this may be a decidedly negative outcome. However, it is important to keep in mind that Warner's Pond is already in the process of transitioning from an open waterbody to a vegetated wetland system – a process which has been on-going for as long as the dam has existed. For as long as the dam remains in place (and assuming dredging with sediment removal remains economically infeasible), the open water volume of the pond will continue to slowly be lost to sediment in-filling, until water depths are eventually shallow enough to support emergent vegetation throughout much of the basin. In this context, it is not a question of *whether* Warner's Pond will transition from an open waterbody to a vegetated wetland, but of *when* and *how*. Under the No-Action Alternative, the recreational and aesthetic values of Warner's Pond would continue to slowly degrade while impairments to water quality and habitat for fish and wildlife are also exacerbated. Under the Dam Removal Alternative, the Town would embrace the opportunity to restore Nashoba Brook to a free-flowing river and wetland system through a carefully planned and executed restoration project that would provide significant ecological, recreational, and community benefits at a scale that far exceeds any other feasible alternative.

5. COMMUNITY ENGAGEMENT

A robust community engagement process is key to the success of any project which will impact the community. This is especially true of projects undertaken by public entities which are accountable to the residents within their jurisdiction. With this in mind, this alternatives analysis was designed to provide multiple opportunities for community engagement and to reflect community input. A summary of the community engagement efforts undertaken as part of this alternatives analysis is provided below:

- An online community survey was developed to seek feedback from residents of Concord regarding their current use of Warner's Pond and their initial opinions regarding the two restoration action alternatives and the No-Action Alternative.
- A virtual and in-person community meeting was held on March 2, 2023 to discuss the alternatives, solicit feedback, and answer questions. The meeting was held in a hybrid in-person/virtual format.
- A second community meeting is planned for May 23, 2023 following the submittal of this Alternatives Analysis Report.

5.1 COMMUNITY SURVEY

5.1.1 SURVEY METHODOLOGY

The online community survey included four sections, as summarized below.

- The first section of the survey asked respondents about their recreational use of Warner's Pond and the degree to which they value several resource area functions and benefits associated with Warner's Pond.
- The second and third sections of the survey introduced respondents to the Dam Removal Alternative and the Dredging and Filling Alternative, respectively, and asked respondents to indicate their initial level of support for each alternative. These sections of the survey also asked respondents to rank the importance of potential benefits of these alternatives and identify their concerns related to these alternatives.
- The fourth section of the survey introduced respondents to the No-Action Alternative and asked respondents to indicate their initial level of support for this alternative. This section of the survey also asked respondents to rank the importance of potential benefits of this alternative and identify their concerns related to this alternative. This section of the survey also included open-ended concluding questions.

The survey was developed using the online platform SurveyLegend® and was distributed by the Town via a town-wide postcard mailing on February 17, 2023. Postcards included a QR code which linked to the online survey and also provided information for the first community meeting. Information on the survey and meeting was also published in the Concord Bridge and on the Town's website; posted at Town Offices and both branches of the Concord Free Public Library; and distributed directly to organizations including the League of Women Voters (LWV), Concord Scout House representatives, and DOC. All survey results received by 5:00 pm on March 15, 2023 were included in the summary provided in this report (note that this includes results received both before and after the first community meeting held on March 2, 2023).

5.1.2 SURVEY RESULTS

Survey responses received by March 15, 2023 at 5:00 pm were included in the summary provided in this report; a total of 251 responses were received by this deadline and 96.3% of respondents indicated that they were residents of Concord. The responses to three key survey questions were considered the primary results of the community survey for the purposes of the summary included in this report (the survey responses provided a significant amount of additional data; however, providing a full summary of all survey results is beyond the scope of this report). These questions asked respondents to indicate their level of support for the Dredging and Filling, Dam Removal, and No-Action Alternatives, respectively. A summary of the responses to these three questions is provided in Figures 5-1 and 5-2.

Figure 5-1: Respondents’ Degree of Support for Each Alternative (Number)

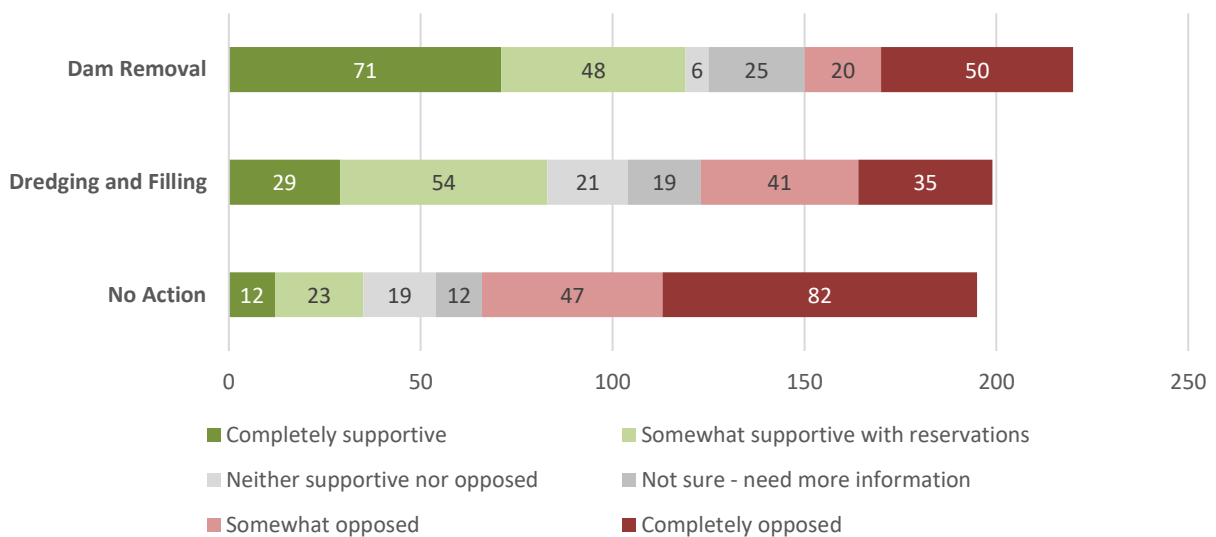
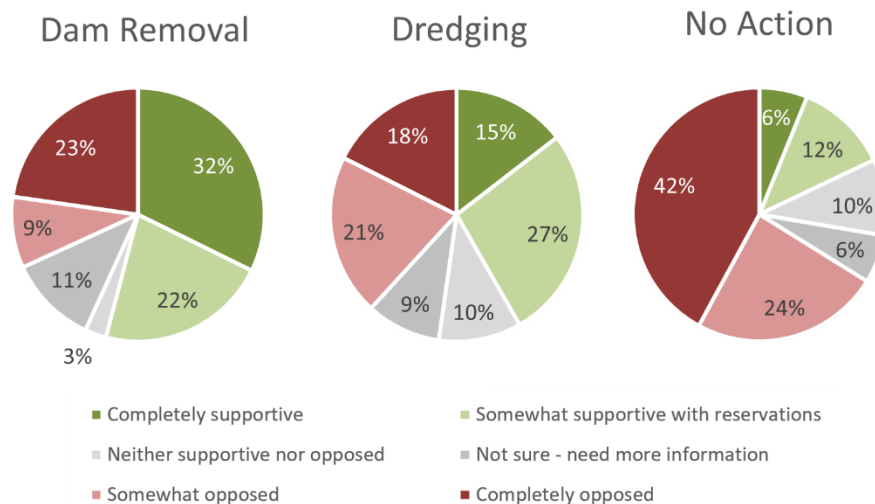


Figure 5-2: Respondents’ Degree of Support for Each Alternative (Percent)



Public comments received as of March 15, 2023 at 5:00 pm are provided in Appendix D.

5.2 COMMUNITY MEETING

The first of two planned community meetings to discuss this alternatives analysis was held on March 2, 2023 at 7:00 pm at the Concord Town House at 22 Monument Square; an option to join the meeting via Zoom was also available. During this meeting, EA provided a presentation to attendees which reviewed the background of Warner's Pond and summarized the three alternatives being evaluated as part of this alternatives analysis. Public comments received by in-person and virtual attendees are provided in Appendix D.

Several community comments were related to whether the two action alternatives could be combined; that is, whether the Warner's Pond dam could be removed while also removing sediment from one or more areas within the pond basin in order to expand the area of open water that would remain following dam removal. While a formal analysis of this approach is outside the scope of this alternatives analysis, future phases of the project could consider the feasibility of a project that includes both dam removal as well as expanded dredging. Depending upon the volume of material to be removed, dredging methods, and disposal options, the cost for such a project could be significantly higher than either of the two action alternatives evaluated in this alternatives analysis. Another key consideration of this approach would be the stability and longevity of the newly dredged areas, as dam removal would significantly alter the sediment dynamics of the system.

Another common theme of community comments was related to the specific types and locations of new recreational infrastructure. As discussed in Section 4.2.2, the proposed recreation improvements included in the conceptual designs prepared for this alternatives analysis represent an initial, conceptual-level approach to how recreational improvements could be implemented under both action alternatives. There is a significant degree of flexibility in whether, where, and what types of recreational improvements are ultimately constructed at Warner's Pond, and it is expected that the concepts developed for this alternatives analysis will be modified during future design iterations based on community and stakeholder feedback as well as available funding. Several other feasible options have been proposed by members of the community, and the Town expects to evaluate these options and ultimately select an approach to recreational improvements as part of the detailed design of a preferred alternative.

A second community meeting is planned for May 23, 2023 following the submittal of this report.

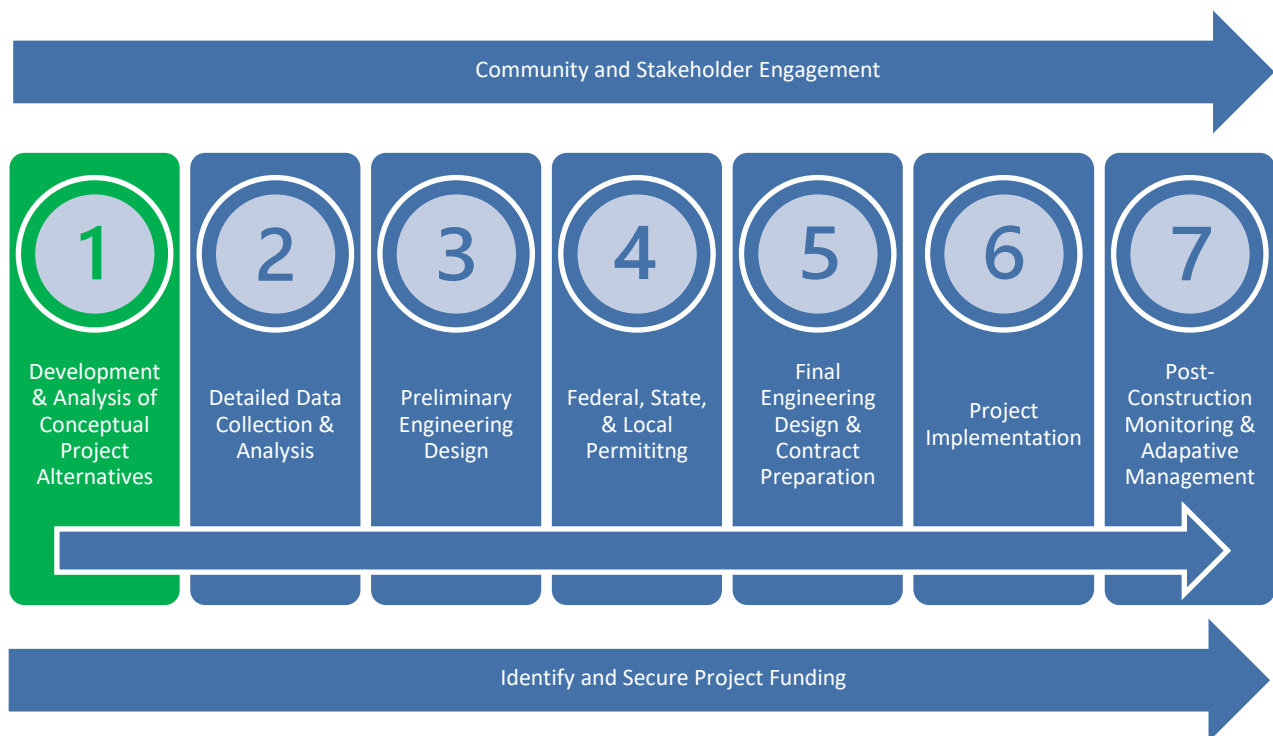
6. PROJECT PHASING

Both restoration project alternatives will entail the following project phases:

1. **Development and Analysis of Conceptual Project Alternatives – Complete**
2. Detailed Data Collection and Analysis
3. Preliminary Engineering Design
4. Federal, State, and Local Permitting
5. Final Engineering Design and Contract Preparation
6. Project Implementation
7. Post-Construction Monitoring and Adaptive Management

This alternatives analysis report represents the completion of Phase 1 in the restoration process. Following the selection of a preferred alternative, the project would progress to Phases 2 through 7; a brief description of these phases is provided in the following sections. Figure 6-1 illustrates the conceptual restoration process for Warner's Pond.

Figure 6-1: Conceptual Restoration Process for Warner's Pond



6.1 DETAILED DATA COLLECTION AND ANALYSIS

Additional data collection and analysis will be required to support design and permitting of either restoration action alternative. Table 6-1 provides a summary of the data collection and analysis needs applicable to each restoration action alternative.

Table 6-1. Additional Data Collection and Analysis Tasks

Task	Dredging and Filling Alternative	Dam Removal Alternative
Sediment sampling and analysis	Required	Required
Wetland resource area delineation	Required	Required
Topographic and bathymetric survey	Not required	Required
Wildlife habitat assessment	Discretionary	Discretionary
Aquatic plant mapping	Discretionary	Discretionary
Water quality monitoring	Discretionary	Discretionary
Benthic macroinvertebrate survey	Discretionary	Discretionary

Note: regulatory agencies may require that discretionary tasks be completed to support project permitting.

Pre-application discussions with regulatory agency representatives will inform the scope of data collection and analysis tasks listed in Table 6-1, identify whether any additional data collection may be necessary, and determine whether tasks listed as “discretionary” will be required to support project permitting.

6.2 PRELIMINARY ENGINEERING DESIGN

Under this phase of the project, the conceptual restoration design prepared under the current phase of the project will be advanced and refined to support project permitting. This process will include a series of discussions with the Town and other stakeholders, taking into account community and regulatory agency input and the results of data collection and analysis efforts. This phase of the project will also include modeling to support and help refine the project’s engineering design. Hydrologic and hydraulic modeling would be required for both restoration action alternatives to demonstrate that the work will not result in an increase in the base flood elevation. Sediment mobility modeling would also be required for the Dam Removal Alternative to help predict the downstream movement of sediment following dam removal. This phase of the project will produce preliminary engineering design drawings, a basis of design report, a revised cost estimate for the project, and supporting data and documentation. These documents will provide the basis for completing permitting under the next phase of the project.

6.3 FEDERAL, STATE, AND LOCAL PERMITTING

Both restoration alternatives will require multiple regulatory permits and approvals from federal, state, and local agencies, as summarized in Table 6-2. While the Town has previously received full regulatory approval for a dredging project at Warner’s Pond, it is anticipated that the

Dredging and Filling Alternative evaluated herein will be viewed as a significant change to the previously-permitted dredging project, and therefore will likely require a new set of permits and approvals.

Table 6-2. Permits and Approvals Required for the Restoration Alternatives

Regulatory Program	Dredging and Filling Alternative	Dam Removal Alternative
Federal Clean Water Act (CWA)	The project will entail a discharge of dredged or fill material to a jurisdictional Water of the United States and therefore will require authorization by the USACE under Section 404 of the federal CWA.	
	Given the significant volume and area of proposed fill within the pond basin, the project is expected to require an Individual Permit (IP).	The project is expected to be eligible for coverage under Massachusetts General Permit (MA GP) 23: Aquatic Habitat Restoration, Enhancement, and Establishment Activities. A Pre-Construction Notification (PCN) would be required to seek coverage under the MA GP.
National Flood Insurance Program	Warner's Pond is located in a Regulatory Floodway; therefore, FEMA regulations will require the Town to demonstrate that the project will not change the base flood elevation of the area around the pond. If the project will alter the base flood elevation, a Letter of Map Revision (LOMR) issued by FEMA will be required.	The project will require a Letter of Map Revision (LOMR) issued by FEMA because dam removal will alter the base flood elevation in the area around Nashoba Brook.
Massachusetts Environmental Policy Act (MEPA)	The project will be subject to MEPA jurisdiction because it will require one or more permits from a state agency and will require MEPA review because it will trigger one or more MEPA review thresholds as listed in 301 CMR 11.03.	
	The project will require the filing of an Environmental Impact Report (EIR) because the project will exceed at least one mandatory EIR review threshold under MEPA (301 CMR 11.03(3)(a)(1)(b), alteration of ten or more acres of any other wetlands). Additionally, pursuant to 301 CMR 11.06(7)(b), the recently revised MEPA regulations require the submittal of an EIR	The project is expected to be eligible for a Restoration Order of Conditions and therefore may be eligible for streamlined MEPA review under newly revised regulations. Submittal of an ENF or EENF may be required based on the discretion of the EEA Secretary. A flowchart describing this process may be found here: https://www.mass.gov/doc/streamlined-process-for-ecological-restoration-projects-flow-chart/download

Regulatory Program	Dredging and Filling Alternative	Dam Removal Alternative
	for any project requiring MEPA review located within one mile of an Environmental Justice (EJ) population. Warner's Pond is located within one mile of an EJ population (Block Group 3, Census Tract 3612).	
Massachusetts Clean Waters Act	The project will require a 401 Water Quality Certification (WQC) issued by MassDEP pursuant to the Massachusetts Clean Waters Act and the federal CWA because the project will result in more than 100 cy of dredging and dredged material re-use or disposal (314 CMR 9.04(12)).	
Massachusetts Public Waterfront Act (Chapter 91)	The project is located within a geographic area subject to jurisdiction under Chapter 91 (310 CMR 9.04(1)(e)) and will involve an activity requiring a Chapter 91 license (310 CMR 9.05(1)(a)) and permit (310 CMR 9.05(2)(b) and (c)) issued by MassDEP.	
Massachusetts Dam Safety statutes	Not required.	The project will result in the removal of a dam which is regulated by ODS and will therefore require a permit from ODS pursuant to Chapter 253 of the Massachusetts General Laws and 302 CMR 10.00.
Massachusetts Wetlands Protection Act (WPA)	The project will alter one or more areas subject to protection under the WPA (310 CMR 10.02) and will therefore require an Order of Conditions issued by the Concord Natural Resources Commission (NRC).	
	The project may be eligible for review as an Ecological Restoration Limited Project pursuant to 310 CMR 10.53(4)(e)(5).	The project is expected to be eligible for a Restoration Order of Conditions pursuant to 310 CMR 10.13.

6.4 FINAL ENGINEERING DESIGN AND CONTRACT PREPARATION

This project phase entails development of final engineering designs, technical specifications, and the final engineer's opinion of cost. The development of these documents will begin when the regulatory permitting process is substantially complete. The final design package will incorporate any revisions to the project design made during the permitting process and reflect any permit conditions, providing the contractor with the information necessary to complete the work in accordance with all project requirements. The final design package will be incorporated into the Town's bid documents to support the public bidding process for project implementation.

6.5 PROJECT IMPLEMENTATION

Following the selection of a contractor by the Town, construction of the restoration project will begin. Prior to the start of work, a pre-construction site meeting and submittal of notifications to regulatory agencies will be required. Depending on which alternative is selected, construction tasks will generally proceed in the order outlined in Sections 4.1.1 or 4.2.1. An experienced environmental monitor would provide oversight of construction activities, ensure compliance with permit conditions, and provide regular updates to the Town regarding construction progress.

6.6 POST-CONSTRUCTION MONITORING AND ADAPATIVE MANAGEMENT

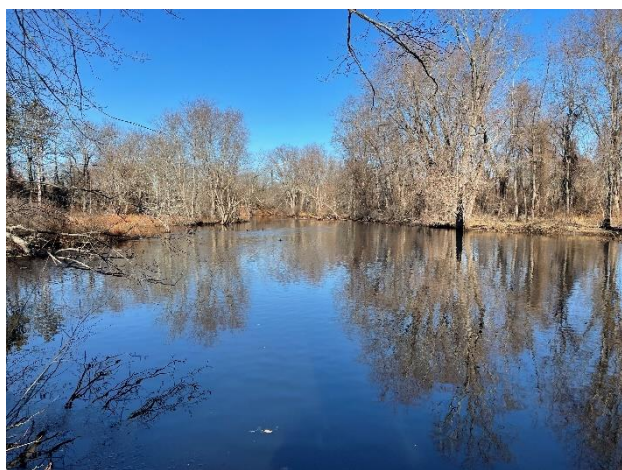
Post-construction monitoring is a critical aspect of any restoration project and is likely to be a requirement of one or more permits issued for the work. Post-construction monitoring confirms whether the project objectives have been achieved, identifies the need for adaptive management, and ensures that the site continues on a restoration trajectory. Monitoring would assess the physical, chemical, and biological condition of the areas affected by the project and would focus on documenting the response of the system to the work performed under the project implementation phase, including any positive or negative ecological outcomes. The exact timing and duration of post-construction monitoring varies across projects, but a typical schedule is two rounds of monitoring per year for five years following the completion of construction. A year-end report would be prepared during each monitoring year that provides a summary of the monitoring results, identifies whether project objectives are being met, and provides recommendations for adaptive management measures to remedy any deficiencies.

Adaptive management involves developing a series of measures to address unforeseen problems which may arise following the completion of construction in order to ensure the long-term success of the project. Adaptive management measures would be specific to the proposed project and would likely be developed during the preliminary engineering design phase of the project. Adaptive management measures may be implemented following construction if project objectives or performance metrics are not met based on the results of post-construction monitoring.

7. RECOMMENDATIONS

Based on a comprehensive evaluation of the information provided in this report, **EA recommends that the Town of Concord pursue the Dam Removal Alternative for Warner's Pond**. This recommendation is based on the following consideration:

- Dam removal is the only alternative that would provide **full ecological restoration** of the Warner's Pond/Nashoba Brook system, returning the resource to the condition which existed prior to the construction of the Warner's Pond dam. The ecological benefits associated with this alternative include the full restoration of diadromous fish migration and aquatic organism passage in Nashoba Brook, restoration of natural downstream flow of sediment and nutrients, widespread elimination of the aquatic invasive species currently found in Warner's Pond, and restoration of 35 acres of habitat for native wildlife.
- Dam removal would provide **transformational improvements to recreational opportunities** in Concord, including the opportunity to create a paddling trail linking Town-owned recreational access points upstream of the existing dam with those along the Assabet River.
- Dam removal is the only alternative that would **relieve the Town of the on-going economic burden and public safety liability** associated with the Warner's Pond dam. As inland flooding is exacerbated by climate change, the need to maintain and repair the dam and the risks associated with a potential dam failure are expected to increase.
- Dam removal would **preclude the need for the long-term financial commitment associated with management of invasive species** in Warner's Pond and would **preclude the need to apply herbicides** to the pond to effectively manage invasive species. While dam removal could result in conditions conducive to the spread of purple loosestrife, this species has been effectively controlled in Concord through the use of *Galerucella* beetles, which is a highly effective and low-cost management strategy with no known adverse environmental impacts.
- **Significant sources of state and federal grant funding are available** to support all phases of dam removal projects, including planning, design, permitting, and construction. Conversely, funding for other potential alternatives such as dredging or routine invasive species management would likely need to be secured through the Town's capital budget and/or Community Preservation Act funding, as no dedicated grant programs related to these types of activities exist. Leveraging state or federal grant funding for a dam removal project would allow the Town to use existing CPA/capital



Assabet River at the Nashoba Brook confluence (view downstream).

EA, December 21, 2022.

budget appropriations to fund significant recreational improvements associated with dam removal or divert these resources to other priority projects.

- Dam removal is generally **viewed very favorably by regulatory agencies**, and the permitting pathway for this alternative is straightforward. Conversely, regulatory agencies may raise significant concerns about the degree of fill proposed as part of the dredging and filling alternative, despite the fact that this is likely the only economically feasible approach to completing a dredging project at Warner's Pond.
- Compared to the Dredging and Filling Alternative, the Dam Removal Alternative entails **significantly fewer logistical challenges** that could adversely impact the success of the project.
- While the positive effects of the Dredging and Filling Alternative may last for several decades, the downstream movement of sediment into Warner's Pond from its watershed will continue indefinitely. As sediment slowly refills the pond, the benefits of dredging will gradually be reduced until the pond is eventually refilled to its current volume. If the Dredging and Filling Alternative were implemented, subsequent dredging projects at Warner's Pond would need to include the removal and relocation of sediment to an offsite location, since there would be no further capacity for filling other areas of the pond. Therefore, the costs of a subsequent dredging project of similar scale would likely be many times higher than the Dredging and Filling Alternative evaluated in this study. Conversely, **the benefits of the Dam Removal Alternative would continue into the future indefinitely**. While some degree of adaptive management may be required in the few years following dam removal, the system is expected to be self-managing with minimal future intervention required.
- Lastly and perhaps most importantly, of the three alternatives evaluated as part of this alternatives analysis, **community survey respondents indicated the highest degree of support and lowest degree of opposition to the Dam Removal Alternative**. Based on survey results received as of March 15, 2023 at 5:00 pm, 54% of survey respondents were completely or somewhat supportive of the Dam Removal Alternative, while 42% were completely or somewhat supportive of the Dredging and Filling Alternative, and 18% were completely or somewhat supportive of the No-Action Alternative. Conversely, 32% of respondents were completely or somewhat opposed to the Dam Removal Alternative, while 39% were completely or somewhat opposed to the Dredging and Filling Alternative, and 66% were completely or somewhat opposed to the No-Action Alternative.

Given these considerations, it is EA's opinion that the Dam Removal Alternative is the most technically and economically feasible restoration alternative that would provide the greatest degree of ecological, recreational, and community benefits with the least potential for adverse impacts.

Who looks upon a river in a meditative hour, and is not reminded of the flux of all things? Throw a stone into the stream, and the circles that propagate themselves are the beautiful type of all influence.

Excerpt from *Nature* by
Ralph Waldo Emerson, 1836

8. REFERENCES

- [ACT 2005] Aquatic Control Technology, Inc. 2005. Project Completion Report for Nuisance Aquatic Plant Management Program at Warner's Pond – 2004.
- [ACT 1999] Aquatic Control Technology, Inc. 1999. Warner's Pond Management Plan.
- American Rivers. 2002. The Ecology of Dam Removal: A Summary of Benefits and Impacts.
- Bellmore, J. R., G. R. Pess, J. J. Duda, J. E. O'Connor, A. E. East, M. M. Foley, A. C. Wilcox, J. J. Major, P. B. Shafroth, S. A. Morely, C. S. Magirl, C. W. Anderson, J. E. Evans, C. E. Torgersen, and L. A. Craig. 2019. Conceptualizing Ecological Responses to Dam Removal: If You Remove It, What's To Come? *Bioscience* 69(1): 26-39.
- [DEP 2021] Massachusetts Department of Environmental Protection. 2021. Final Massachusetts Integrated List of Waters for the Clean Water Act 2018/20 Reporting Cycle. Accessed online at: <https://www.mass.gov/doc/final-massachusetts-integrated-list-of-waters-for-the-clean-water-act-20182020-reporting-cycle/download>
- [DEP 2007] Massachusetts Department of Environmental Protection. 2007. Dam Removal and the Wetlands Regulations.
- [EEA 2004] Massachusetts Executive Office of Energy and Environmental Affairs. 2004. The Practical Guide to Lake Management in Massachusetts: A Companion to the Final Generic Environmental Impact Report on Eutrophication and Aquatic Plant Management in Massachusetts.
- ESS Group, Inc. 2018. Dredging Feasibility Assessment and Conceptual Engineering Design for Warner's Pond. Accessed online at: <https://www.concordma.gov/DocumentCenter/View/21665/Warners-Pond-Dredging-Feasibility-Study---Nov-2018>
- ESS Group, Inc. 2012. Warner's Pond Watershed Management Plan. Accessed online at: <https://www.concordma.gov/DocumentCenter/View/16613/Warners-Pond-Watershed-Management-Plan>
- Gomez and Sullivan Engineers. 2016. Concord River Diadromous Fish Restoration Feasibility Study. Accessed online at: <https://www.mass.gov/doc/concord-river-diadromous-fish-restoration-feasibility-study/download>
- [GPI, Inc. 2021] Greenman-Pedersen, Inc. 2021. Phase 1 Park Improvements for Gerow Recreation Area.
- GZA GeoEnvironmental, Inc. Warner's Pond Dam Rehabilitation – Spillway and Embankment Improvements.
- Lisius, G. L., N. P. Snyder, M. J. Collins. 2018. Vegetation community response to hydrologic and geomorphic changes following dam removal. *River Research and Applications* 34(4): 317-327.
- [MassWildlife undated] Massachusetts Division of Fisheries and Wildlife. Undated. Summary of fish population data collected at Warner's Pond on July 6, 1983.
- [NHESP 2015] Massachusetts Natural Heritage and Endangered Species Program. 2015. Wood Turtle (*Glyptemys insculpta*) Fact Sheet. Accessed online at:

<https://www.mass.gov/doc/wood-turtle/download#:~:text=DESCRIPTION%3A%20The%20Wood%20Turtle%20is,pyramid%20of%20grooves%20and%20ridges.>

Oliver, L., W. Gendron, D. Olson, and M. Simmons. Low-head Dam Removal for Aquatic Ecosystem Restoration in the Corps. *Lakeline* Spring 2018.

Pare Corporation. 2020. Warner's Pond Dam Emergency Action Plan.

Pare Corporation. 2018. Warner's Pond Dam Phase I Inspection/Evaluation Report.

Swain, P. C. 2020. Classification of the Natural Communities of Massachusetts. Massachusetts Division of Fisheries and Wildlife, Westborough, MA. Accessed online at:

<https://www.mass.gov/service-details/classification-of-natural-communities>

Town of Concord. 2015. 2015 Open Space and Recreation Plan. Accessed online at:

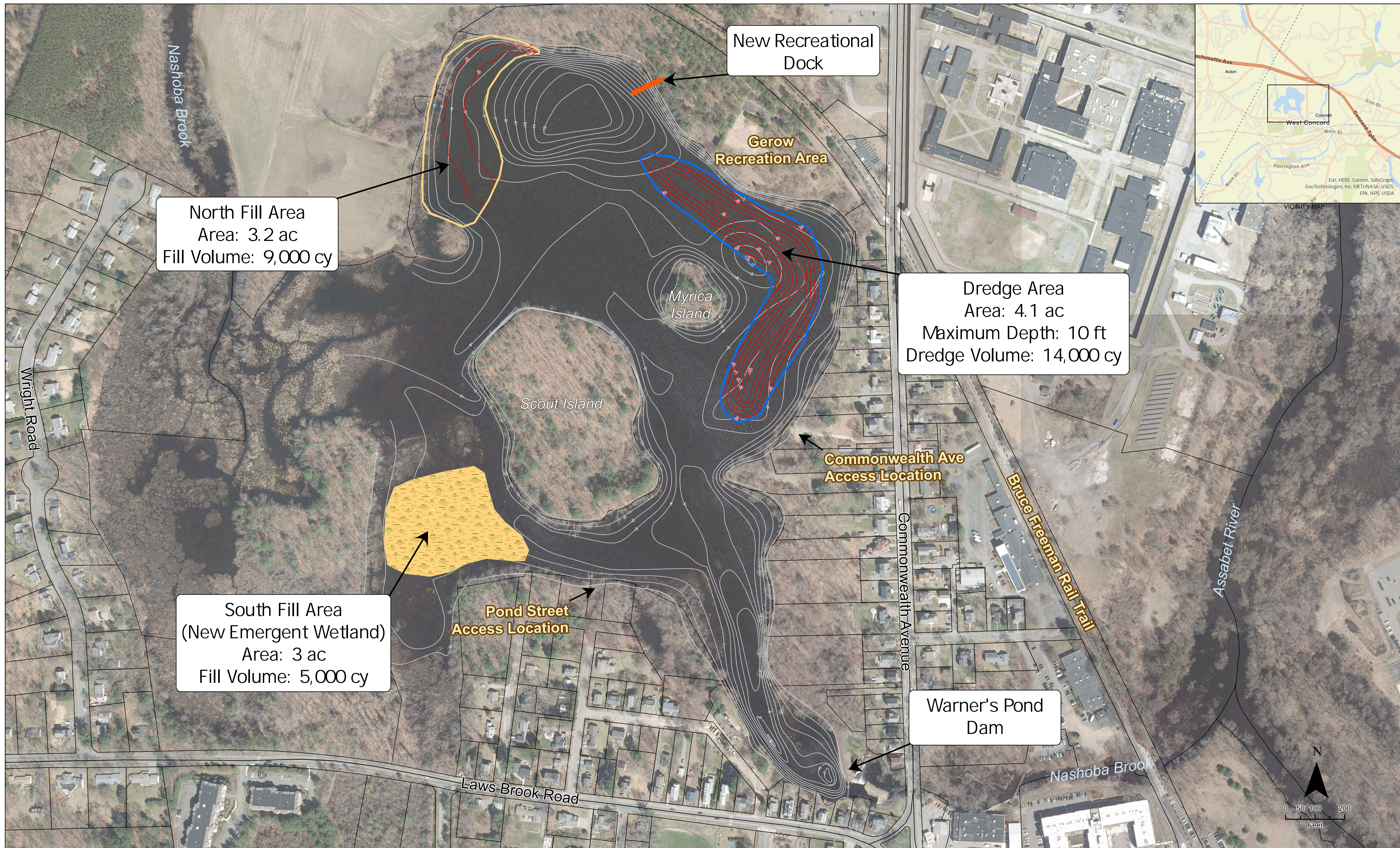
<https://www.concordma.gov/DocumentCenter/View/27974/2015-Open-Space-and-Recreation-Plan>

[USACE 1999] United States Army Corps of Engineers, New England District. 1999. The Highway Methodology Workbook Supplement: Wetland Functions and Values: A Descriptive Approach. Accessed online at:

<https://www.nae.usace.army.mil/Portals/74/docs/regulatory/Forms/HighwaySupplement6Apr2015.pdf>

APPENDIX A

CONCEPTUAL DESIGN DRAWINGS



North Fill Area
Area: 3.2 ac
Fill Volume: 9,000 cy

New Recreational Dock

Gerow Recreation Area

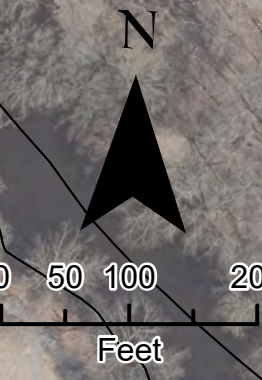
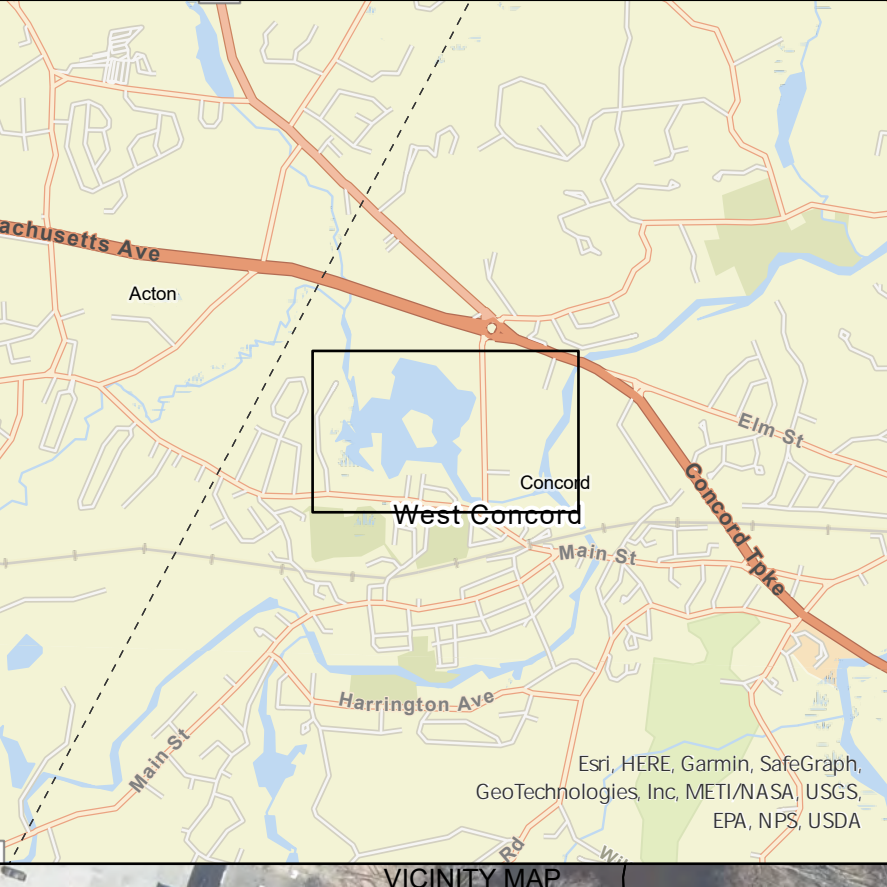
Dredge Area
Area: 4.1 ac
Maximum Depth: 10 ft
Dredge Volume: 14,000 cy

South Fill Area
(New Emergent Wetland)
Area: 3 ac
Fill Volume: 5,000 cy

Pond Street Access Location

Commonwealth Ave Access Location

Warner's Pond Dam



EA Engineering, Science, and Technology, Inc., PBC
301 Metro Center Blvd, Ste 102
Warwick, RI 02886

PROJECT NUMBER:
6392901
DATE:
FEBRUARY 2023

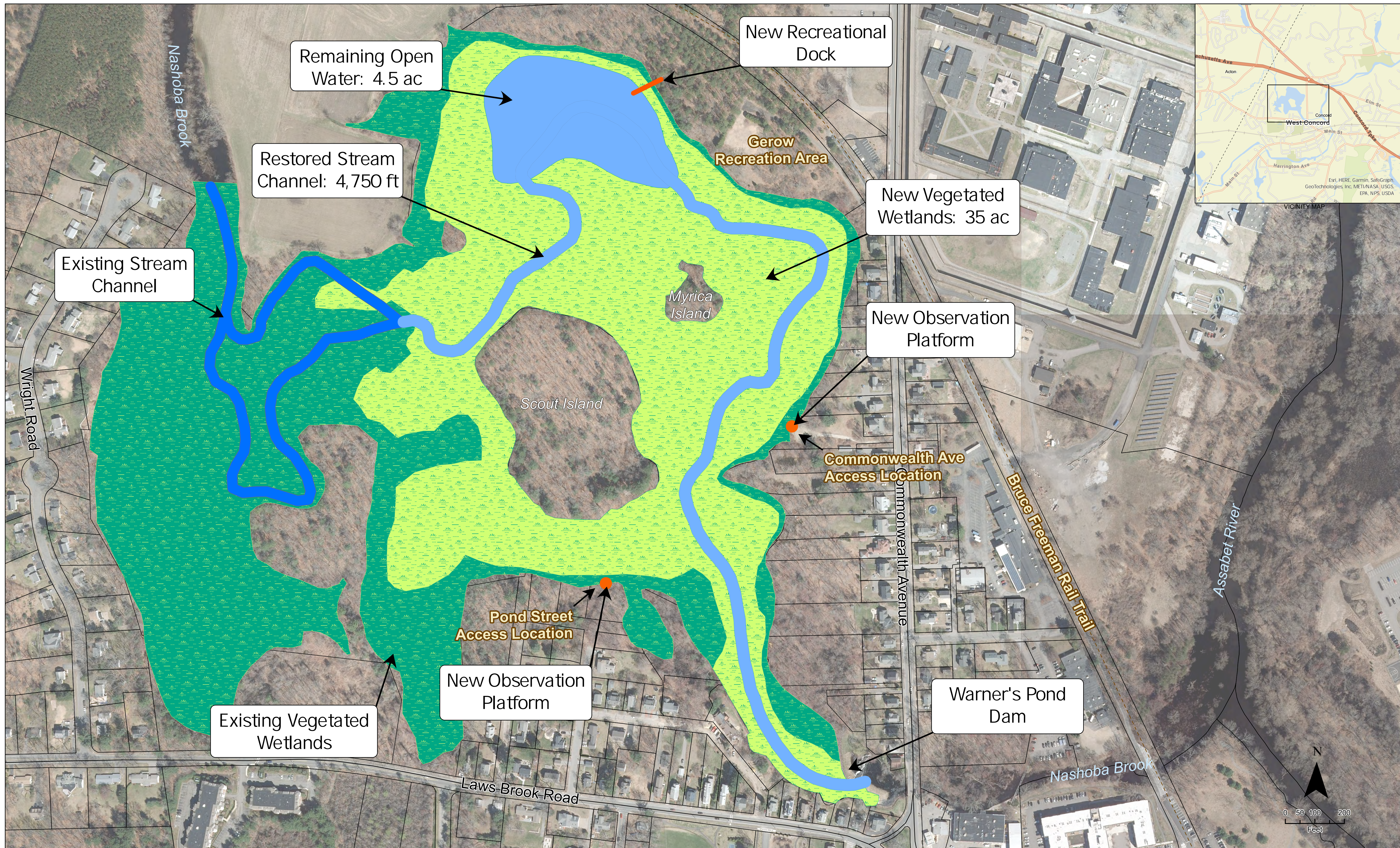
DESIGNED BY:
AH
CHECKED BY:
AP


DRAWN BY:
QM
PROJECT MGR:
AP

FIGURE:
2
SHEET NUMBER:
1

WARNER'S POND RESTORATION ALTERNATIVES ANALYSIS
CONCORD, MASSACHUSETTS, 01742

DREDGING AND FILLING ALTERNATIVE



 <p>EA Engineering, Science, and Technology, Inc., PBC 301 Metro Center Blvd, Ste 102 Warwick, RI 02886</p>	PROJECT NUMBER: 6392901	DESIGNED BY: AH	DRAWN BY: QM	FIGURE: 1	WARNER'S POND RESTORATION ALTERNATIVES ANALYSIS CONCORD, MASSACHUSETTS, 01742	DAM REMOVAL ALTERNATIVE
	DATE: FEBRUARY 2023	CHECKED BY: AP	PROJECT MGR: AP	SHEET NUMBER: 1		

APPENDIX B

VISUAL RENDERINGS



Dam Removal Alternative - Aerial view of Warner's Pond facing South

Warner's Pond Alternatives Analysis | Concord, Massachusetts | April, 2023



Dredging and Filling Alternative - Aerial view of Warner's Pond facing South

Warner's Pond Alternatives Analysis | Concord, Massachusetts | April, 2023



Dam Removal Alternative - Warner's Pond from Gerow Park facing Southwest

Warner's Pond Alternatives Analysis | Concord, Massachusetts | April, 2023



Dredging and Filling Alternative - Warner's Pond from Gerow Park facing Southwest

Warner's Pond Alternatives Analysis | Concord, Massachusetts | April, 2023



Dam Removal Alternative - Warner's Pond from Commonwealth St. facing West

Warner's Pond Alternatives Analysis | Concord, Massachusetts | April, 2023



Dredging and Filling Alternative - Warner's Pond from Commonwealth St. facing West

Warner's Pond Alternatives Analysis | Concord, Massachusetts | April, 2023



Dam Removal Alternative - Warner's Pond from Commonwealth St. facing Northwest

Warner's Pond Alternatives Analysis | Concord, Massachusetts | April, 2023

APPENDIX C

CONCEPTUAL COST ESTIMATES

**Dredging and Filling Alternative
Conceptual Cost Estimate by
Project Phase and Task**

Phase 2: Detailed Data Collection and Analysis	\$ 40,000
Task 2.1. Sediment Sampling	\$ 15,000
Task 2.2. Water Quality Sampling	\$ 4,500
Task 2.3. Aquatic Plant Mapping	\$ 4,500
Task 2.4. Wildlife Habitat Evaluation	\$ 1,500
Task 2.5. Mussel/Benthos Survey	\$ 4,000
Task 2.6. Wetland Delineation	\$ 3,000
Task 2.7. Technical Memorandum	\$ 7,500
Phase 3: Preliminary Engineering Design	\$ 35,000
Task 3.1. Hydrologic and Hydraulic Modeling	\$ 8,000
Task 3.2. Draft 60% Design	\$ 16,000
Task 3.3. Final 60% Design	\$ 7,000
Task 3.4. Opinion of Cost	\$ 4,000
Phase 4: Federal, State, and Local Permitting	\$ 75,000
Task 4.1. Massachusetts Environmental Policy Act	\$ 16,500
Task 4.2. United States Army Corps of Engineers	\$ 15,000
Task 4.3. Federal Emergency Management Agency	\$ 6,000
Task 4.4. Section 401 Water Quality Certification	\$ 12,500
Task 4.5. Chapter 91	\$ 12,500
Task 4.6. Massachusetts Wetlands Protection Act/Concord Wetlands Bylaw	\$ 12,500
Phase 5: Final Engineering Design and Contract Preparation	\$ 45,000
Task 5.1. 90% Design Drawings	\$ 9,000
Task 5.2. 100% Design Drawings	\$ 5,500
Task 5.3. 90% Bid Documents	\$ 8,000
Task 5.4. 100% Bid Documents	\$ 5,000
Task 5.5. Updated Opinion of Cost	\$ 2,500
Task 5.6. Bid Administration	\$ 15,000
Phase 6: Project Implementation	\$ 2,905,200
Site Preparation	\$ 120,000
Commonwealth Avenue Access Improvements	\$ 52,000
Staging Area	\$ 9,000
Dredging, Filling, and Wetland Area Creation	\$ 1,325,000
Restoration	\$ 187,000
Mobilization/Demobilization	\$ 600,000
Construction Oversight	\$ 72,000
Insurance	\$ 14,000
Performance Bond	\$ 42,000
Contingency (20%)	\$ 484,200
Phase 7: Post-Construction Monitoring and Adaptive Management	\$ 40,000
Task 7.1. Annual Monitoring and Reporting (5 Years)	\$ 40,000
Task 7.2. Adaptive Management	\$ -
PROJECT TOTAL	\$ 3,140,200

**Dam Removal Alternative
Conceptual Cost Estimate by
Project Phase and Task**

Phase 2: Detailed Data Collection and Analysis	\$ 50,000
Task 2.1. Sediment Sampling	\$ 10,000
Task 2.2. Water Quality Sampling	\$ 4,000
Task 2.3. Aquatic Plant Mapping	\$ 4,000
Task 2.4. Wildlife Habitat Evaluation	\$ 1,500
Task 2.5. Mussel/Benthos Survey	\$ 4,000
Task 2.6. Wetland Delineation	\$ 3,000
Task 2.7. Topographic Survey	\$ 16,000
Task 2.8. Technical Memorandum	\$ 7,500
Phase 3: Preliminary Engineering Design	\$ 65,000
Task 3.1. Feasibility Study	\$ 19,000
Task 3.2. Draft 60% Design	\$ 12,000
Task 3.3. Final 60% Design	\$ 7,500
Task 3.4. Opinion of Cost	\$ 5,500
Task 3.5. Hydrologic Modeling	\$ 3,000
Task 3.6. Existing Conditions HEC-RAS Model	\$ 5,500
Task 3.7. Proposed Conditions HEC-RAS Model	\$ 5,000
Task 3.8. Sediment Transport Modeling	\$ 7,500
Phase 4: Federal, State, and Local Permitting	\$ 75,000
Task 4.1. Massachusetts Environmental Policy Act	\$ 16,500
Task 4.2. United States Army Corps of Engineers	\$ 13,500
Task 4.3. Federal Emergency Management Agency	\$ 6,000
Task 4.4. Section 401 Water Quality Certification	\$ 10,000
Task 4.5. Chapter 91	\$ 10,000
Task 4.6. Office of Dam Safety	\$ 8,000
Task 4.7. Massachusetts Wetlands Protection Act/Concord Wetlands Bylaw	\$ 11,000
Phase 5: Final Engineering Design and Contract Preparation	\$ 50,000
Task 5.1. 90% Design Drawings	\$ 9,000
Task 5.2. 100% Design Drawings	\$ 5,500
Task 5.3. 90% Bid Documents	\$ 13,000
Task 5.4. 100% Bid Documents	\$ 5,000
Task 5.5. Updated Opinion of Cost	\$ 2,500
Task 5.6. Bid Administration	\$ 15,000
Phase 6: Project Implementation	\$ 2,200,800
Site Preparation	\$ 78,000
Control of Water	\$ 498,000
Spillway Removal	\$ 254,000
Earthwork	\$ 154,000
Erosion and Sedimentation Control	\$ 7,000
Transportation and Disposal	\$ 142,000
Restoration	\$ 45,000
Commonwealth Avenue Access Improvements	\$ 48,000
Additional Recreational Improvements	\$ 309,000
Mobilization/Demobilization	\$ 158,000
Construction Oversight	\$ 72,000
Insurance	\$ 13,000
Performance Bond	\$ 40,000
Access Agreements/Easements	\$ 16,000
Contingency (20%)	\$ 366,800
Phase 7: Post-Construction Monitoring and Adaptive Management	\$ 90,000
Task 7.1. Annual Monitoring and Reporting (5 Years)	\$ 40,000
Task 7.2. Adaptive Management	\$ 50,000
PROJECT TOTAL	\$ 2,530,800

APPENDIX D
COMMUNITY COMMENTS

PUBLIC COMMENTS AND QUESTIONS RECEIVED ON THE ALTERNATIVES ANALYSIS FOR WARNER'S POND

Comments and Questions Received During the First Community Meeting

- Of the 5.4 tons/year of phosphorus estimated to enter the pond, what percentage of the loading would be addressed by dredging? Does the 5.4 not include sediment already in the pond?
- Given the issues of nutrient loading from the watershed, can you forecast the success of the wetlands that will be created by removing the dam?
- Will there be any hydraulics issues with unstable walls downstream of the dam?
- How long will the benefits of the dredging alternative last?
- How much of a concern is dam failure considering the dam was recently rebuilt?
- Was surprised by how much use pond gets. How many ponds are in Concord that can be used like this (ice skating, hockey, etc)? White Pond is polluted and Walden Pond is crowded.
- Seems that obvious solution is to remove the dam and maintain Nashoba Brook instead of maintaining a pond which was artificially created. Why are we so slow to come to this conclusion?
- Why can't we get to the water via Commonwealth Ave?
- Dam was repaired recently, however it was under duress, since Taunton Dam buckled. There was no time to consider other alternatives or think about it. It was a state requirement. Fish passage refers to feeder fish. Fish migrate up and spawn, then return to the ocean. All the fish we eat are being supplied by these fish. Talbot Dam is the only dam between this dam and the ocean. Now Talbot Dam is being removed. The state can demand fish passage the same way it can demand dam repair. In that case, the removal will have to be done under duress instead of on our own terms. Cost of dam removal is not accurate since the dam removal option would be funded. If going with dredging, will have to pay for it now, and pay for dam removal later once Taunton Dam is removed.
- We should be proactive and remove dam to be safer, for water supply, fish, and whole ecosystem.
- Personal preference is dredging. West Concord is gaining from the completed rail trail and recreational area, and is now economically growing. Would like it to also gain from the presence of a pond.
- With dam removal, will there be any problem with downstream distribution of phosphorus that is now roadblocked by the dam?
- Seems like there is currently allocated funding for pond restoration and funding for dam removal is out there. Is there any way to take advantage of both? Dredge first to have a deeper pond, then remove dam – would that allow a larger pond footprint? Envisioning maintaining a recreational corridor between Commonwealth Avenue and Gerow while going with dam removal. Seems like there is a financial means to do both since funding will be available for dam removal.
- How much water level would be reduced at the removal of the pond?
- Seems like with both scenarios, sediment is still entering the pond. Is there some way to protect the pond with dredging spoils to prevent sediment from entering?
- Has been done in other towns. Will provide reference to other places where it was done.
- White Pond was sold to the Town first, before Gerow was finalized. Gerow was proposed to be a big swimming and recreational area, but after White Pond the whole plan changed.
- What is the goal with a tiny 4-acre pond for those who are used to going to West Concord and used to two access points? It is such a community area.
- What is the plan for Gerow in terms of recreation?
- Coming back to skating, seems like West Concord is losing their skating option. Is a dock going to be the only access point?

- Free flowing rivers are healthier, especially with climate change increasing water temperature. Benefits migratory species as well as local fish.
- Cost of fish passage should be included in the costing of the dredging alternative since it will need to be considered.
- Are there any grant funding sources for dredging?
- A lot of sediment from the Big Dig project in Boston was put on Harbor Island. Can you place the dredge material from the pond on the smaller islands?
- Would somebody buy the sediment?
- What about the waterfowl on the pond, as well as snakes, turtles? What would happen to other wildlife if the pond is taken away?
- Can you give a sense of what the remaining pond area will be like? Will the depths be about 6 feet of water? Will there be a struggle with aquatic plant growth at that depth or will flow keep that at bay?
- What is the current and annual dam maintenance cost?
- Dredging project should be proposed to funding agencies since if you don't ask it will never happen.
- How effective were herbicide, drawdown, hydroraking options? Have they considered multiple treatments? Consider efficacy compared to cost.
- Strong grassroots organization cleaned the rivers in the past. Need to reinvigorate that effort for the pond.
- Do we know the source of pollutant loading? Can we look to the state for funding for reducing sources of pollutants coming into Concord?
- Why would DEP support dam removal but not drawdown when they have basically the same effects?
- Scout Island is deeded property to the Boy Scouts. Wouldn't they be denied access to deeded property with dam removal?
- Why not consider no action and maintain the status quo?
- What is causing all the urgency to act now instead of next year?
- Associated with pond for 30 years or more
- Dam is a very stable structure with earth embankment and overflow structure. Removal is inconsequential and would be completed easily. Fish passage is not feasible for such a strong structure.
- Currently the pond is impenetrable when boating
- Would like to see the pond dredged with a way to utilize the spoil in way to benefit both parties.
- Pollutant loading seems like it is caused by neighbors of Concord, so there should be a joint effort to reduce the burden on Concord.
- Suggest placing small check dams with contamination filters in streams to remove the problem.
- Will recording of meeting be available?
- Received a postcard but couldn't click on the URL.
- Have you explored the source of the phosphorus being surrounding farmland?
- Has the impact of beaver activity on the designs been explored? Currently there is beaver activity in the northwest and that may change with any changes in the pond.
- Are there any natural ways to reduce invasives using wetland plants?
- Wasn't active boating the initial intent of Gerow?
- How will the changes to the pond affect property lines? Does the town currently own up to the water line?
- Fish ladders are not that great. They must be maintained and are not great for fish.
- Acton installed sewer system and wastewater treatment plant to reduce septic fields and help with pollutant loading issue. They already feel like they have done a lot.

- Outdoors person but can't envision what the brook will look like with the connection to downstream being claimed by dam removal.
- The brook downstream of the dam next to the bakery is tiny. Right now any boating there would be crashing into rocks. Understands that water rises during storms.
- People could not ice skate once this winter, and that will continue with warmer winters. Protecting the pond for a winter reason that won't exist in the future doesn't make sense. And protecting the pond for the summer doesn't make sense because the pond is disgusting in the summer. If the benefit is flowing water, he is in support.
- Likes the potential presented by the options. Could we see boardwalks to increase access? Easier to accept the change if they could see benefits to recreation.
- What is the plan for the erosion controls currently at Gerow?
- When is the goal for Gerow completion?

Comments and Questions Received After the First Community Meeting

- 1
 - I think the dam removal option leaves Gerow as the centerpiece of the recreational access/benefit. Therefore I suggest, based on comments last night, that several items be further clarified as part of this option:
 - A) the remaining size and depth of the open water area adjacent to Gerow
 - B) for reference, comparisons of the size of that area with other open water/ponds on Concord and possibly the pond at Nara Park.
 - C) clarification that access to the remaining open water will be via a dock at Gerow reaching the open water. Gerow was described as providing passive recreation when the concern seemed to center on ice skating and boating. The fate of the dock in the Gerow Plan was ambiguous in the discussion.
 - Finally, since I think the dam removal plan will be eligible for grant money, you might also consider adding a floating walkway/platform (if remaining funds are available after grants are obtained) that connects the Commonwealth access point to the stream so that the Comm. Ave. part of your plan survives. Maybe not as elaborate as in the photo, but something that keeps that access "alive". Just a thought.
- 2
 - Whatever does happen (and I hope we don't lose the Pond) I think it is imperative that Gerow NOT be the only access point, physically or visually (active and passive recreation). I hope we keep the conservation land access points---Commonwealth Ave. and Pond St. and if it's going to become wetlands, vs. pond, we must build on those access points, not just have "observation" points. I would also suggest we build out the "right of way" given to the town off Warners Street, (just off Lawsbrook Road) and I believe the area by the dam on Comm Ave, with the seat, is also Town land and could create another access point to "get in or on the water or wetlands". The notion of "observation" suggested by EA at the current Comm. Ave and Pond St. conservation access point feels very limited. One of the BEST THINGS about Warners Pond is its variety and vastness.....and it's not just the folks who are lucky enough to live within eye-shot of the water. Skating and floating around the pond allows lots of different experiences from intimate to vast vistas. Skating all the way over and around the islands is nothing short of magical. (and again, provides community--often with 'strangers', visiting and chatting, all out enjoying the pond.) If we get rid of the dam, and much of the pond resorts back to wetlands, I HOPE WITH MY WHOLE BEING that we build boardwalks or mounded trails through the area, to the small 4-5 acres that EA indicated would remain a deeper pond and to gain access to the islands, for the community to enjoy. Let's begin to think about language that includes "nature preserve", and "conservation land" as it pertains to Warner's Pond. Great Meadow, in Concord, and Sudbury offer a good example of what's possible.

- Warner's Pond and how it is used is a true **local** treasure, something that is WELL USED for both active and passive recreational enjoyment. Many of us walk to and around the pond, so it is the body of water used mostly by West Concordians who live near "the Junction". Preserving and allowing West Concord to have a resource like that can't be underestimated
 - I also want to understand more about Scout Island, which many of us enjoy walking on, skating around, paddling around, and which is an island owned and deeded to The Scouts. How will that be able to be accessed?
 - Thanks for your work on Warner's Pond.
- 3
 - I have several concerns about the Warner's Pond presentation that was delivered on March 2nd and the timeline of decisions regarding the fate of the pond. They are the following:
 - The presentation left one with the impression that the problems with Warner's Pond could not be fixed and so the obvious solution for anyone with a conscience or any sense of environmental stewardship was to remove the dam and undo the crime that had been committed 350 years ago. I personally felt extremely uncomfortable standing up to voice my dissent, and I spoke to several people afterwards who also want to preserve the pond but felt that the tone of the presentation was "this is the right thing to do, obviously" and were not comfortable speaking up because of that.
 - For the option of partial dredging, the presentation and slides on the website omitted the critical fact that the benefits of that dredging could last for decades – I believe the consultant said up to 100-200 years?! I'm still not sure I heard that correctly. Anyone listening to the presentation would have assumed the effects were going to be very temporary at best – maybe a few years. If the estimate is far greater – even 20 years, that alone completely changes the equation and that should have been clearly stated in the presentation and slides. But now that the slides have been posted, people will not know this and will make up their minds based on the information there.
 - The photos that compare the pond as it is now and how it would appear if drained are misleading, because they minimize the differences between the two states. The "now" photo was taken at peak vegetation, but that is not the entire spring or summer. In other words, the "now" photo was a worst-case scenario, and as a result, it doesn't look that different from the drained photo. Also, aerial photos make the vegetation growth look more dramatic than it is at water level. Much of the pond that looks green in the "now" photo is actually navigable. My favorite activity is silently gliding through the weeds in a kayak and seeing what I can surprise – herons and sunbathing turtles and all sorts of creatures in the shallows. If drained, those areas will be truly inaccessible.
 - The survey asked people to choose between dam removal, limited dredging, and no action. Posing the question that way splits the vote of the group who would like to preserve the pond. A more balanced way of asking the question would have been, "Do you want to preserve the pond if there is a reasonable way to do so – yes or no?" That would have provided a clearer picture of whether people valued the pond at baseline. Then, there could have been a second set of questions for those who answered yes and those who answered no. But since the question was worded as it was, votes for dredging and doing nothing should be combined and counted together.
 - My understanding of the history of this issue is that people were asking the town if something could be done about the eutrophication to make the pond more usable. If that is correct, how did we get from there to the solution of getting rid of the pond altogether? That's analogous to telling a doctor that you have a pain in your leg and being told that

you can either do nothing or amputate. I don't think that was the intent of seeking care in the first place. Is there really no other set of compromises to be found?

- I think there is a real risk that the committee overseeing this project is not communicating adequately with the townspeople about it, and that there will be shock and anger if the pond is drained without more buy-in. As someone who lives on the pond, I see how many people use it. Please see the link at the end of this point about Bow, NH, where a much smaller beaver dam was taken down. Removing a dam is a dramatic event and the water will drop precipitously, leaving flopping, gasping fish and scrambling turtles. I first heard about the Bow event on the radio, where people described it as a collective trauma for the community. Warner's Pond is huge, and the event will be dramatic and unpleasant. People need to know and be comfortable that this is the right thing to do, because it's going to feel bad at the time, and the stinking, rotting debris will take a while to become covered. Also, is there a plan to clear old tires and assorted trash that will inevitably be uncovered? [Bow, NH residents hope to restore drained beaver pond | New Hampshire Public Radio \(nhpr.org\)](https://www.nhpr.org/news/bow-nh-residents-hope-to-restore-drained-beaver-pond)
- The timing of this discussion relative to the creation of Gerow Park seems wrong. If the park is going to be a feature of West Concord, why would we dramatically alter the pond that it overlooks just as the park is opening? Wouldn't it be better to do nothing for several years and see how much and in what ways people use the park? Why not explain the options on a board at the park and invite people to answer the survey on their phones as they pass through? There may be a clear preference of people to preserve the pond once they get easy access to it. You may even be able to raise funds from people outside of Concord who use the rail trail if signage were placed at the park explaining that the pond needs to be maintained to stay usable. A wetland and small pond with limited access is simply not going to be as appealing for recreational purposes or aesthetics along the trail, and I think you will hear that from people if you ask in a different way.
- I am not making an ecological argument for keeping Warner's Pond, because it doesn't seem there is one to be made, other than the fact that the pond is a resource that can teach children to love the outdoors and protect it, as it did for my children growing up skating and kayaking here. Also, we use the land to our own benefit all the time. We have highways and farms and travel in jets. Everything is balance and compromise. I understand that the pond prevents feeder fish from swimming upstream, but we have an abundance of other rivers and streams, and we are not talking about endangered species directly. Perhaps some type of fish ladder or other circumvention could partially help with fish passage.
- This issue feels like it has already been settled, the dam is coming down, and the decision is being pushed through too quickly. When I ask other people in Concord, they are barely aware of this and yet there are only two weeks allowed for people to respond to the survey? The slides say that we are going to decide in the Spring of 2023. As one woman asked at the meeting – "Why now?" Your answer was that we didn't have to deal with this now or on any specific timeline, but that is not the impression one got from the presentation or the posted slides. It is unclear what the timeline actually is.
- When this project started, were people in the town given the opportunity to be part of the committee looking for solutions? I imagine they were invited because we value that in Concord, but I do not recall hearing about the issues with Warner's pond until I moved to Commonwealth Ave from the center of town this spring, and I have consistently attended town meetings since moving here 14 years ago. Are there any abutters involved? I imagine you would have had abutters volunteer if they had known that permanent drainage was being considered. **I would very much like to be involved if possible.** Those of us who live by the pond live here solely *because* of the pond. Otherwise, Comm Ave is just a busy road by the prison. We are highly motivated to look for

compromise solutions and try to find paths forward that preserve this amazing town resource.

- 4

- I wanted to reach out directly after last week's meeting to share some thoughts and questions. As you know, I am very invested in Warner's Pond and in being a good steward of the habitat adjacent to the pond. While the engineer at the meeting seemed to be pushing the dam removal alternative, it did seem that the Town is committed to obtaining community input and considering all feasible alternatives to restore the health of the pond while maintaining recreational activities. I very much appreciate that and feel hopeful that a creative solution that preserves recreational opportunities and restores the health of the pond will result from this process. The three black and white options presented at the meeting hopefully served to get people thinking more creatively about this problem so that a creative solution can emerge. It seems likely that at the end of the day we are going to have a much reduced Warner's Pond and at least a partial return to Nashoba Brook. And it also seems that there are ways to preserve recreational opportunities and restore the health of the pond/brook and the surrounding habitat and intentionally and gradually move toward a thoughtful solution. I have copied some neighbors on this email, neighbors who are related to Joanne Loynd and have a long history with and relationship to Warner's Pond. We met after the meeting and I filled them in on the phosphorus problem and the resulting eutrophication of the pond, the likelihood of needing to remove or rebuild the dam in the future, and the alternatives put forth. Here are thoughts/questions/research on the following: Filtering, Upstream Funding and Phoslock; Proactive Dredging and using sediment placement well; Mitigation Alternatives for Dam removal; Private Funding.
- **Filtering, Upstream Funding for Downstream Problems and Phoslock.** Someone had the idea of filtering the water as it comes into the pond. I don't know if that could be feasible and I am sure it would be costly, but it seems that if the agricultural and other operations within the watershed that are contributing so much phosphorus to the pond won't reduce or manage their runoff, then they should be required to financially contribute to the Warner Pond Restoration. I wonder if there is precedent where upstream polluting communities have been required to fund downstream affected communities. It seems irresponsible not to pursue that angle of funding and just take it all on ourselves or, worse, throw our hands up and say we can't afford to adequately address the problem that's caused by others. There is apparently a "sustainable" treatment, called Phoslock, being used in ponds and lakes for exactly this problem, and I wondered whether this has been considered as it seems inexpensive and on point. Here is one link I found that details it's use [Phoslock – A Proven Strategy for Water Quality Improvement](#).

Perhaps Phoslock could eliminate or substantially mitigate the phosphorus problem. And perhaps the costs of it's application could be recovered in whole or in part from the upstream producers of the run off. It seems possible that Phoslock could affect the costs of removing the sediment or could render the sediment more or less useful in filling in areas of the pond that are eutrophying already.

- **Dredging.** It seems that dredging in the places where Nashoba Brook would naturally flow if and when the dam is ultimately removed could maintain more useable recreation opportunities in the shorter term in the dredged parts. It also seems like the dredging could create a useable channel (wider and deeper in parts) to accommodate a future return to Nashoba Brook if and when the dam is removed or reconstructed. The materials envisioned a natural 4 acre pond in the northwest portion. Perhaps a second smaller pond could be dredged near the boat launch, which is the area that people most frequently use to boat, skate, fish. I believe the engineer said it might take many decades for the dredging to fill in. The dredging alternative was already considering relocating the

sediment within the pond. It seems that the sediment could be used to build up areas to start directing the water toward the dredged areas and the ultimate path of Nashoba Brook.

- **Dam Removal.** There are apparently many considerations and mitigation alternatives to consider within the scope of dam removal. I found this document by the Iowa Department of Natural Resources to be extremely helpful and heartening. It describes ways to be very intentional when considering dam removal and to take steps to ensure the stabilization of the channel bed and creating deep water habitats within the channel. Given that the Engineering firm seems to be pushing for this alternative, it would be reassuring to know that they are intending to be thoughtful and intentional with respect to the end result. That did not come across at the meeting.
https://www.iowadnr.gov/portals/idnr/uploads/riverprograms/dam_chap4.pdf
- **Funding.** I was heartened by your agreement that we don't need to do this now and can take time to be thoughtful and plan. I also wonder whether there could be an opportunity here to raise private monies to fund a plan, especially a plan that preserves recreational opportunities AND restores the health of the pond/brook and the surrounding habitat. I have noticed over my years in Concord that private money can often be found for projects that benefit the community.

Comments and Questions Received through the Community Survey

In response to the importance of the functions and values of Warner's Pond

- "I am concerned that the dam removal alone would help with possible navigation thru to the Assabet. Anyway to include broadening the Nashoba Brook within the pond or deeping or clearing the brook behind the bakery out of the Assabet."
- A community place to skate and gather.
- A community place to skate and gather. Very unique.
- Accessibility for all attracting cyclists and walkers from freeman trail to reduce car traffic. (Keep parking spots to a minimum)
- An opportunity for loocal outdoor activity
- Beauty it brings. The many fish and wildlife it has
- Biking and Gerow property boating access
- Camping on Scout Island
- Clean and natural
- Does the dam have any flood control value?
- Green space and nature habitat
- Having a resource which is clean and natural in which it cleanses and maintains itself through nature's natural ways and which makes new or existing activities more enjoyable.
- Hearing spring peepers, watching herons and hawks hunting, hearing owls call to each other, turtles coming out of pond to lay eggs, daily bird song, rich wetland habitat
- Hearing the spring peepers; seeing the herons and hawks hunting, turtles coming out to lay eggs, owls calling to each other, bird song, rich wetland habitat, Oasis in West Concord
- I believe we should follow nature and climate change to address issues related to Warners Pond. I don't think the town should spend money on keeping it a pond if the long term picture does not sustain that goal. I think we should transition warners pond into an ecological area for nature and wildlife. I don't think residents are entitled to kayaking and fishing if it is not a long term viable option and will cost the town a lot of money to maintain. There is plenty of walking and viewing areas which is visually pleasing and a positive open space environment for residents.
- I do prioritize the ambient value of the natural landscape to the general quality of life in Concord.
- I enjoy the peace and tranquility of the pond. Beautiful spot for sunsets. Skate whenever the ice is safe. Canoe from ice out to ice ind the most when weather is best.

- I enjoy the peace and tranquility. Sunsets every evening from shore, the canoe or from a chair ashore or from the ice.
- I grew up in Concord near Fairhaven Bay and value maintaining healthy areas of Nature that are a benefit to all, including recreational opportunities for those who live in Concord and those who benefit from the beauty of a healthy Warner's Pond and who also ride the Bruce Freeman Rail Trail that is shared among multiple area towns between Lowell and Sudbury+.
- I keep a canoe in my yard and can wheel it down to the pond at will. In the winter when the pond freezes I can ski out my back door and out to the farmland beyond. I go to Scout Island often, both by skis and canoe. It was the place I went to most often for the solace of nature when my wife passed away.
- I view Warner's Pond from Commonwealth Ave or the Bruce Freeman Rail Trail while traveling by car or bicycle respectively. I enjoy the look of clear water.
- I want as much preserved healthy undeveloped space as possible
- I wish to enjoy biking near it, kayaking on it, skating and nature photography
- I would like to be able to sail on the pond, but the invasive aquatic plants get caught in the center board and rudder.
- I would strongly prefer to see the pond, stream/brook returned to its original natural state with the dam removed allowing natural wetlands for wildlife and for greater passage of native fish species to move throughout the watershed. The dam is unnatural and many, many years ago was created to serve a purpose. It no longer serves any positive purpose and has only created multiple issues as a holding tank for sediment load, chemical contaminants, warming water temps and eutrophication.
- I'd be interested canoeing Nashoba Brook if the dam was removed
- I'd like to be able to swim there at some point in the future
- Is there any way to have swimming there?
- It is a Community gathering place for ice skating. There is a West Concord identification with the pond that is hard to measure. We supported the Gerow property as a wonderful way to share this resource more broadly, but it has felt like a bait and switch to have the Gerow property become the focal point for recreational activity when most residents access it from other points.
- It is part of my quality of life in Concord
- It's value as a natural resource in its natural state
- It's very important that Warner's pond is maintained as a part of our West Concord community including our wildlife.
- Keep it natural. The value is nature and with too many people it will destroy the beauty.
- Local flooding
- My house abuts Warner's Pond -- we've lived here over 20 years and 10 years before that in W. Concord as well. Warner's Pond is the gem of West Concord. Its history, beauty, size and access to West Concordians is an important part of our experience as community members and tax payers.
- Never really thought about it. My husband has been a Concordian for 88 years and we just never think about Warner's Pond
- Not waste money
- "Other- I think Boy Scout Island access is important and I think everyone was very excited with the development of Gerow Area to have a boat dock and canoe/kayak around the pond.
- If the dam is let go, the brook may not be easy to navigate due to tree fall blocking passage."
- Photography!
- Proximity to and access from Gerow in the future
- Quiet walking trails and spaces
- Recreational opportunities needed for all ages that we can get to without a car
- Return the brook to its original course.

- River restoration
- Having a body of fresh water
- Seeing others on the community enjoying the pond as a community resource
- Stop wasting taxpayer money on this boondoggle!
- Sunsets, peaceful surroundings, views, wildlife viewing, particularly the deer on the islands and the swan families that raise their offspring on the waters
- sunsets, Swans, wild-life, the changes of landscape thru-out the year.
- The ability of the wetland associated with Nashoba Brook, to absorb big rain events and reduce flooding
- The Pond is a valued and enjoyed extension of the Rail Trail and adds a natural and beautiful space for a walk.
- The pond is not in useable condition. Once the issue has been adjudicated--to try to repair or allow to slowly return to marsh and then a field--I will be able to determine whether I use it.
- The pond provides year-round recreational activities including paddling and ice skating
- The value of cleaning up something in the most enlightened way feasible. The phrase "reduce, re-use, recycle" comes to mind because it appears that reducing Warners Pond's size, re-using some accumulated sediments for land-recycling, recycling other materials by allowing greater flows down stream can all be part of the mix to fix. While much can be learned and applied from other, similar renovation projects, Warners Pond could provide a great educational opportunity for our students, UMass/State college students, and others. This could be a great laboratory that we can share with other in Massachusetts and other in N.E. England having to deal with what our predecessors created for us. I apologize for the somewhat lame reference, but so much "mucking around" the Warners Pond watershed would provide real hope that we are capable of cleaning up some messes and leaving our environment somewhat better for posterity. Sure, messy, challenging, costly it will be, but it all can be made reasonably worth the efforts. The Town and the Commonwealth have lots of very smart, very creative minds who could get involved.
- The watershed dumps too much chemicals and we need both a vegetation buffer at pond and education of residents around pond re: stewardship
- There is absolutely ZERO reason to make this pond more accessible to the masses. No beach! It will inevitably ruin the
- This pond could be such a great source of recreation for Concord residents, especially now that the Gerow property has been created. It is such a waste to let it continue to degrade
- To be clear: passive recreational activities are very important to me; active activities such as boating, kayaking, skating are not important at all.
- View and tranquility
- Walking, sitting and looking, meeting and talking with friends, enjoying being outside in a lovely place
- Warner's pond is in the back of my property. It is very important for activities all year long.
- Warner's Pond is a beautiful resource in West Concord. There is so much nature located around the dam. We see a blue heron catching fish below the dam on a daily basis during the season. On occasion we see three otters swimming around and catching fish. On occasion we have also seen a beaver below the dam and travel up the banking into the pond. There are also muskrats and mink that swim around the dam as well as snapping turtles and sun turtles. There are also various snakes in and around the pond. The dam is a beautiful site with water freely flowing down, especially in the spring time. Often times we can hear and see the kingfisher fishing below the dam.
- Warner's Pond is THE wild/community space in this part of West Concord. I supported the Gerow development as a wonderful way to allow others to enjoy the pond, but West Concordians already have their ways of enjoying and accessing the pond. It feels like a huge bait and switch to have the Gerow property become the focal point for recreational activities and to abandon the

Commonwealth boat launch and the sections of the pond that are accessed from there and from Pond Street, that's where a lot of the skating and boating and fishing happens.

- Water contamination will never be rectified. The plan presented to the Town was greatly overstated and unachievable within a "reasonable" cost.
- Water quality to support human use and wildlife habitat (primarily fin-fish).
- We would love to fish and kayak if it weren't so overgrown and difficult to navigate.

In response to the importance of the potential benefits of the Dam Removal Alternative

- All the 'possibles' listed above are good. If they are realized that would really benefit Concord. No downsides or possible problems were listed. What are they?
- Another reasonable alternative is to do nothing. That would cost nothing.
- Becoming an example and model for wetland restoration
- Connecting the water and the fish back to the ocean to which they were originally connected.
- Dam have been removed nationwide because before we knew better there was overuse of dams to curtail nature
- Don't want dam removed
- I am not in favor of removal of the dam. I am in favor of making it possible to periodically drain the pond to manage the growth of invasive species. I believe the periodic draining of the pond is the best option in the long run.
- I didn't answer these questions. Possible benefit implies there also may be no benefit.
- I don't want the pond to go away. We purchased our home on Warners pond for the scenic views as well as we love to canoe and ice skate in the winter.
- I favor changing the dam to allow periodic draining of Warner's Pond, so that at appropriate intervals, the pond can be allowed to dry out and be cleared of "dried muck" on the bottom (e.g. this muck might be sold as nutrient rich soil for landscaping). This system would allow the pond to be restored to active recreation that has historically been enjoyed by many.
- I have property on the pond which is currently considered waterfront. Dam removal will make my property wetland-adjacent. I've paid property taxes in W. Concord for over 30 years. I'd like my tax dollars to protect my property value.
- "I notice all the benefits are listed as "" possible"" which does not build confidence.
- The pond could be improved by reducing point source pollution along the pond itself. The abutting farm fields add manure to the fields beginning in March and continue to do so during the Spring, Summer and Fall which leads to nutrient load in the ponds. They should have buffer plantings that do not get fertilized. Homes should be educated to reduce fertilizing their lawns,"
- I see the possibility of dam removal to restore or enable Kayak/paddling access from the Gerow dock down to the Assabet river IF some work is also done to create a stable safe channel. Which should also ensure fish have a year-round or nearly year-round access to the pond and further upstream. Also important is to be sure that this area remains viable to mitigate future flooding in West Concord. Can Warner's be effective slowing a reducing the impact of major weather events like excess rain from impacting the area?
- I would like the pond to be able to continue to be a canoe and island camp out facility for scouts and become navigable by a small sail boat.
- ICE SKATING would not be safe with moving water
- If the Town could dredge a second smaller pond space near the Commonwealth Ave boat launch to allow for skating boating and fishing in that area as well and there would be constructed pathways through the new vegetated wetlands, thus maintaining recreational opportunities in the areas of the pond that residents frequent, I would be hugely in favor of the dam removal. I would like the Town to come up with a "both/and solution"
- If, prior to dam removal, you could dredge a second pond space in front of the Commonwealth Ave boat launch so that recreational opportunities could be maintained in that area and have a plan for eventual construction of pathways through the new vegetated wetlands after dam

removal, I would support this option. I believe there is a both/and solution that can be found, both dredging and establishing a stable channel, and full or partial dam removal.

- Improvement of habitat may allow the return of wildlife such as eagles, osprey, etc.
- Improving recreation on a stream system (kayaking)
- Improving recreational opportunities, specifically the ability to paddle through without the obstruction of the dam
- "It really is a survey asking questions and I'm not aware of any of this and have no information to base my answers. I will be on the zoom March 2nd to understand what and why's of this project.
- Send out another survey at that time and get a more accurate elevation."
- Just knowing we have restored and improved biodiversity.
- Keeping this fresh water stream/pond untouched by humans.
- My property abuts the pond. I delight in viewing the pond but am too old to use it in any other way. I'd feel bad for young people, losing access to the pond, but for me it would be a visual change, not a change for recreation unless you're counting Gerow Park where I might picnic and walk around. If the dam was removed, would the portion of the pond abutting my property be available for development? Either private development or development by the Town, including housing, playing fields, or any other development? I would be extremely sad to lose the last undeveloped land abutting my property. I see that the plan shows the former pond land as vegetated wetlands, but what if these wetlands dried out?
- Opportunity to restore the wetlands
- Potential for trails/connectivity along the perimeter of the new wetlands
- Recreational access from Gerow and paddling in a natural stream
- Removal of the dam would significantly reduce the recreational value of Pond. Some of the benefits may be achieved may be achieved through alternative actions. The benefits do not outweigh the reduced use value of the pond for recreation.
- Removing the dam may make it possible to canoe a longer stretch of Nashoba Brook
- Return the brook to its natural course.
- That would greatly reduce the ability to actually use the pond for recreational activities.
- The above options all include possible benefits. Possible implies there may be no benefit, therefore, I didn't answer.
- The dam should stay and another method of enhancing the Warner Pond area should be enacted.
- The dam was just rebuild in 2008 at a large expense to the town. Therefore the dam should be very sturdy. At the meeting, recreational activities were discussed at the Gerow property. There was no mention of the recreational activities that occur at the location of the dam. Many children spend a great deal of time fishing at the dam. We often see children there on a daily basis, especially once school ends. If the dam is destroyed, none of these activities will exist.
- The options above are just excuses to waste more money on a bad project. The problems with this pond go way beyond the damage. These problems include a large drainage pipe under Route 2 that empties into the pond. The Town was aware if this before this while process started. Stop throwing good money after bad. Do not waste more time, energy, resources, or money on this project.
- This is a man-made problem. We can remove it.
- This survey is rigged to support removal of the dam and I am deeply disturbed.
- Upstream flooding and cleaning are as important as downstream flooding. Is total dam removal necessary? For example, could some dam capabilities be retained, in event too much water were to flow downstream? Maybe that would not be a concern because smart civil engineers have factored dam removal and its effects all the way to the Merrimac?
- Use of grants to mitigate cost to the town

- We purchased our home as a pond front property and would be extremely disappointed to have our pond disappear! I do not believe there will be any costs to maintaining the pond if the dam is to remain. The dam could require maintenance but I do not see that as a major cost to the town. I would be in favor of adding to the dam and increasing the depth of the pond in that method.
- What are the implications for property values of houses overlooking the current pond? If it takes a long time for the wetlands to grow, would those houses be overlooking a muddy and unattractive landscape for several years?
- Would like swimming opportunity.

In response to respondents' concerns related to the Dam Removal Alternative

- After listening to the presentation regarding the dredging of the pond and the dam status, it was clear to us that the presentation was strongly skewed towards removal of the dam. Little, if no consideration was given to leaving the dam alone. Also, if the dam is removed, how will that affect the activity on Boy Scout Island. They canoe from the Concord River, up Nashoba Brook, portage up over the banking into the pond and continue to the island. We wonder if anyone has consulted with the Boy Scout organization regarding their thoughts about removal of the dam and the consequences to their activities.
- As a fisherman, I would suspect that this would not significantly improve the opportunity. Even so, I support this solution.
- Clearly this questionnaire is biased towards dam removal. No other alternatives are being offered to weigh in on. Sounds like you have made your decision.
- Costs too much.
- Could do a lowering of the dam but with a decent fish ladder and a dike to keep water depth in the north section
- Ensuring that individuals properties will not be meaningfully effected by this change -
- From the presentation, it looks as though we would lose "Warner Pond" as we know it and there is not any good reason as to why the town is suddenly pushing this through. Our home abuts the Pond and, once the dam was fixed a few years ago, we no longer have flooding issues in our home. The Pond is a great resource and is loved by all the neighbors surrounding it. It feels as if the town has an agenda to get rid of it and this agenda is not being presented to us.
- "Having camped on Scout island in the past with my son, I'd be sorry to lose the ability to paddle the pond. Also the slides left several questions in my mind:
- -Presumably the falling water level will leave behind a messy landscape of mud, rotting vegetation and trash from the bottom of the current pond. Will any of this need to be relocated? If so, is this included in the cost estimate? How many years before the newly created wetland looks like what's shown in the pictures?
- -Presumably the accumulated debris, if it is not removed, will be washed downstream – would it block the brook further downstream, and/or the Assabet River if it flows that far? What would be the impact and cost of mitigation? Is that included in the project budget estimate?
- -After dam removal would the brook be deep enough to paddle downstream to the Assabet River?
- -The slide presentation mentions federal and state funding sources that might help offset the cost of dam removal. How much funding is available and what is the probability that an application from Concord would be successful?"
- how do I send this survey to you?
- How much would this choice reduce maintenance and management costs?
- I am concerned that this alternative will still result in the flow of nutrient dense water and sediments through the stream as a result of nutrients coming in from the upstream watershed, presumably delivering these to the Assabet and then the Concord Rivers.
- I believe the dam should be modified to allow periodic draining of the pond for maintenance. Such as every five years or so. Concord has the Assabet, Sudbury and Concord rivers as well as two

kettle hole ponds the addition of Warners as a mill pond capable of being cleaned every so often is a true asset to the community as well as an historical treasure.

- I do know one of the nearby residents a little. I may check in with her about the effects it would have on the neighborhood.
- I don't want to lose access to the island by canoes lanced from the Commonwealth Ave access point.
- I just purchased a home on the pond, dam removal would be a disaster to me
- I would like to see this project result in improved access to the rivers for recreation as well as contribute to climate resilience with designed passive (mostly) flood control.
- I'm opposed to reducing the current amount of open water for both recreational and aesthetic reasons. I think property values will decrease on comm ave.
- It can be shown historically, that in the past 50 years the MAIN use of the Pond has been for skating. All possible efforts should be made to continue to provide this important family sport! This clearly means having at least one area of the pond where there will be water depth. That should be in the area where most neighbors of the pond live--and that is in the OPPOSITE direction from Route 2 and the Gerow land. NOTHING should be done in that area because when the Town purchased that land voters were told clearly that Swimming would NOT be provided..
- Loss of open water is severe
- Note about Dam maintenance, I have not noticed that the Town is actively maintaining the dam evidenced by the vegetation (woody vegetation and bushes) growing on the earth banks of the dam. If the maintenance element is being considered a factor in the evaluation of this alternative, then there should be acknowledgement of current costs to date regarding the maintenance of the dam.
- Please see answer to #22.
- Reducing area of the pond is unfortunate
- Removal of the dam is a terrible idea. It would transform the "jewel of West Concord" into a swamp. I am reminded of the saying from the Vietnam war: "We had to destroy the village to save it." The water level of the deep part would reduce from 12 to six feet, which would become overgrown and fill in within a few years, making a joke of Gerow Park and useless for boating, fishing, and ice skating. All of the listed "possible benefits" are both also not possible and not necessarily benefits. Many of them are canards, for instance, fish passage. Fish swim upstream to spawn where they were born, but no migratory fish have spawned in Warner Pond since it was created 165 years ago. Future maintenance costs is another example as dam maintenance is not a huge cost and future maintenance costs of the proposed Warner Swamp cannot be accurately known.
- "Removing the dam would reduce the amount of open water habitat but increase the amount of dry habitat or wetlands (if not developed), so I see that as kind of a wash as far as habitat is concerned.
- If the pond gets smaller, then the new ""vegetated wetland"" wouldn't support aquatic invasive species but instead it would get overgrown wetland and land-based invasive species such as bittersweet, buckthorn, multiflora rose, knotweed, etc. I couldn't say whether that's better or worse for plants and animals but it doesn't seem like an improvement in terms of aesthetic value.
- If we remove the dam, can we build a boardwalk along Gerow Park to compensate for having less pond shoreline and to give more access (sort of) than just the dock? It could start kind of near the dock and end as close as possible to Commonwealth Ave. Given that dam removal is a one-time thing, it doesn't seem like too big of a money ask.
- What about the large island? Would it be completely cut off to people, or would it still be accessible by boat from the stream? Or would it be the other way around -- would people be able to walk to it from Pond Street, either safely or unsafely?

- If we remove the dam, can we rebuild the Pail Bridge while we're at it? With lower walls so that drivers can see around the curve even if they're in small cars. Could we get state/outside funding help on the grounds that removing the dam would endanger the bridge?"
- Removing the dam would significantly change the appearance and provide fewer active recreational opportunities
- The dam removal appears to significantly reduces Warner's Pond open water square footage WITHOUT getting to the root cause of the problem. There did not appear (during the presentation) to be any thoughts on how to neutralize the effect of the fertilizer impact from the watershed.
- The pond needs to be dredged properly. Nothing has been done for too long. 40 years ago it was a beautiful flourishing pond.
- The pond will be too small and there are too many unknown variables
- "We live in Warner's Pond and have a family of beavers that lives behind our house. Removing the dam would displace them.
- I also worry about the proliferation of Japanese knotweed, which is a huge problem in the wetland already behind our property."
- We purchased our home as a pond, front property. If the dam was to be removed, the majority of the pond with disappear.
- While I would be disappointed if there is less opportunity for say kayaking, canoeing and ice skating, I believe that the health of the ecology is more important.
- Would increased "native wetland communities and biodiversity" happen automatically? Or, would intervention/seeding/other management be necessary for this to happen, and at what costs to the Town?
- Would like swamp area to be accessible to people using some boardwalks

In response to the importance of the potential benefits of the Dredging and Filling Alternative

- Cost. The cost of the dredging is millions of dollars more than what was originally communicated to residents. Dredging won't even address all the problems with the pond. Stop wasting money.
- Costs too much.
- Dredge most of pond
- Dredging has been successful in other projects. Great Meadows has on going work being done to remove invasive. Warner's Pond would benefit from similar practices.
- Dredging the pond would be extremely costly and serve as only a short term fix as the nutrient and sediment load would continue to come back day by day, week by week, month by month, year by year. It would also do little for native fish in the pond and still not allow any fish passage from below the dam.
- Find the money to dredge and remove the fill
- How effective will this be? Seems like we will face the same problems indefinitely
- I am concerned with where the dredged material will be placed as it will inhibit passage in canoes where it is placed. My other concern is if dredging is to take place in the area specified above or if to be dredged where it was said to be done in earlier reports.
- I am very concerned that canoeing egress, where dredged material will be placed will be decreased substantially. I do not believe the dredging will improve any aesthetics of the pond. From looking at earlier maps, I was under the belief that the dredging was to take place in slightly different places, than just mentioned. Although invasive species will be reduced in areas of dredging, I believe they will be increased where the dredging material is placed. I am not sure that native wetland communities will be expanded.
- I believe that the dredging could be done prior to an eventual dam removal to create a more stable channel for Nashoba Brook if and when the dam is removed and to create a second pond space near the boat launch that will remain once and the dam is removed.

- I think this alternative becomes more attractive if it is part of a holistic plan involving Gerow and BFRT. The projects costs become more justifiable if part of a larger picture that includes access from Gerow
- I would like the town to remove the dredged material.
- I would like the town to remove the dredged materials.
- Ice skating would be better with this plan
- Improved recreational facilities. Eliminating invasive growth and water quality while allowing remainder of pond to go back to nature.
- Increase in the associated recreational value of the adjacent upland areas. Stand alone value with no improvement to the open water of the pond would be significantly reduced.
- Keeping access to the pond open. No one can find access now
- Not interested in mainly improving depth for boating.
- Return brook to its original state.
- See answer to #22. Plus, future control of invasives should be a top priority.
- Surely there is some option for modest maintenance (rather than just the extremes of full dredging or no action)
- Swimming opportunities?
- Warner's pond is a large pond with many recreational activities available to the community. The new beach will introduce more townspeople to the possibilities. We need to retain the pond.
- Where is the money coming from for all these projects? I pay so much taxes for the increase school buildings I can't afford any more or will have to move away!!!! How important is that to you?
- You should also consider doing nothing.

In response to respondents' concerns related to the Dredging and Filling Alternative

- As with removing the dam, I wonder if dredging would eventually make it possible to develop the land where sediment was deposited, and if the "emergent wetland" would be just as overrun only with different invasives. It seems like just a short-term solution that would have to be repeated in a few years. And do we really know what's in the pond? Are we sure we wouldn't dredge up toxic materials?
- Can you please publish how long the construction for each option would take?
- Cannot understand phrasing of the question
- Doesn't seem worth it - we effectively lose a lot of the pond, but the dam's still blocking the natural flow of the brook.
- I am very concerned that this costly approach will be a temporary fix - not worth the \$
- I believe that the health of native species of animals, insects and plants should be paramount. I am skeptical that this is a good alternative in that regard. I also doubt that the benefit aesthetically and recreationally would be worth the cost and maintenance.
- I don't think dredging solves the longer term problems.
- I don't understand what the new marsh will be like
- I really prefer dam removal if improvements can be had along the brook and still have access from Commonwealth Ave./pond access. I worry this dredging solution won't work as expected and we will need to do something else in the future.
- I see this alternative as a temporary fix. I would be support of some dredging in advance of dam removal in order to secure a even better long term prognosis for the health of the ecosystem and availability of recreational activities involving access to the broader river system for boating and fishing while retaining the area for some ice skating.
- I think that we should consider upstream management of source contamination or bio- treatment of the nutrients (bacteria that eat the phosphorus or sth). I am in favor of dredging and treatment to maintain the current aesthetic while controlling the source of the nutrients

- I think we should go after upstream contribution to solve this problem and I think private donors should be explored.
- "I would like to see removal of the dredged material from the pond's footprint offered as an alternative. It seems with the Middle School there are no costs that concern the town. Why are key options deemed too costly here? This is a project that benefits the town as much as a fancy Middle School building (which doesn't at all impact the quality of teaching, let's not forget). I say this as the parent of children who will in the future attend the new Middle School.
- Here's an idea: Stop wasting money on tax-consumptive housing projects meant to lure in people ""not like today's Concordians"" (per the December 2022 Housing Production Plan) and put it instead toward projects that benefit everyone in the community."
- I would want to know what the real enviro cost and benefit is if dredging. Seems like an invasive approach but need to learn more.
- if the consensus is to dredge and retain sediment on site, I would want to see an associated landscape architectural plan particularly regarding foot access to Scout Island, i.e., boardwalks for recreation and viewing of wildlife.
- If we do nothing, invasives will take over. I hope we won't lose the pond and all it provides to West Concord. I don't think anyone wants swimming in Warner's Pond. White Pond is better option (as long as that stays clean).
- It is important to look at the farm land that abuts Warner Pond. The use of pesticides and fertilizers results in these products ending up in the pond. This has hastened the growth of aquatic vegetation. Finding a way to keep these products out off the pond would reduce the overgrowth.
- Let nature take its' course. We don't need the pond anything now.
- Messing with the natural order of the land and water tables creates long term problems. Working with nature is a better option for sustainability.
- Need to be realistic in spending
- Our concern is that dredging of the pond is concentrated around a small area near the Gerow Property. What effect will it have on the rest of the pond closer to the dam. Will the alternative of dredging the pond leave the dam in place? If so, we are much more supportive of this alternative.
- See #32. In addition, without a future companion plan for source controls, the dredging may have only short term benefits. It is not clear that limited dredging will have a long term benefit given the nutrient addition from upstream and storm water runoff from adjacent roadways will continue.
- "Several potential funding sources are mentioned for dam removal - would any of these also cover the cost of dredging & relocation?"
- If the dam remains in place, how long before it becomes necessary to dredge again to move more material?
- -The slide presentation notes that the benefit may be marginal relative to cost, but I did not clearly understand what that means. Will the part of the pond that is outside the dredged channel continue to accumulate plant debris and invasive species?"
- Since the majority of the Warners Pond watershed is outside of the Town of Concord, where is the public outreach to the watershed communities outside of Concord to try to reduce/control future sediment loading into the pond. This should be a element of each alternative.
- The entire pond should be dredged and the material removed. "Economically unfeasible" is not definitive. Do you mean within the current budget of the NRC?
- The storing of the dredged material within the proposed areas is the most viable approach. I suggest an additional pond water quality measurement system be put in place to continuously monitor the pollutants within the pond. I also suggest additional effort be put in place to figure out how to neutralize and/or filter the pollutants impact.
- This alternative does not allow for fish and other wildlife to have access to a freely flowing stream. I am also concerned that it will still result in capture of nutrient dense water and sediments in the pond as a result of nutrients coming in from the upstream watershed.

- Warner's pond was created for a utilitarian purpose. It has served as a pond for recreation and scenic values for many years. But, like many artificial ponds, it has filled in. Moreover, we are now recognizing the how dams damage free-flowing streams and rivers. It is time to let rivers and streams flow free again. Take out the dam!
- Work with the legislature to secure funding.
- Yes
- You could combine opt 1 & 2. Dike off the river in the south from the dredged north pond.

In response to the importance of the potential benefits of the No Action

- "No action" is of no value to the stewardship of the asset other than saving money. The costs need to be valued in comparison with other recreation costs to the Town such as sports fields, tennis courts, Beede Center, and nature trails.on
- Allows time for further analysis
- Allows time for residents to think some more about the different plans after visiting the pond in the spring, summer and fall. If there is little boating access, I think plans B then A make sense.
- As mentioned previously, the proximity to farm land and the use of products has hastened the growth of invasive plants. Doing nothing does not mitigate this issue.
- As we stated before, the dam was rebuild in 2008. Why would we pay more to destroy it? What would be gained by destroying the dam vs doing nothing? Effectively the results will be the same over time. So, let's enjoy the beauty, the wildlife and the recreation that comes with the dam and let nature take its course with no additional expense.
- Consider other suggestions in the management plan
- I am in favor of either dredging or leaving pod as is.
- I am not convinced that the no action option would definitely be worse than removing the dam. In both cases the inflow of extra nutrients is still happening, nutrient dense sediment is still present (although perhaps the problem does not get worse but rather is sent downstream). How is the presence of the main made dam any different than the presence of a beaver dam, which presumably is one way the system could work naturally. It is really the nutrient pollution that is the primary problem, although it would be very nice to let the fish go upstream again!
- Ice skating would probably still be feasible. It also does keep open the possibility that some other solution may arise in the future, but I doubt that one will
- If it were in Concord center, would the Town be considering the same thing?
- If no better plan then I prefer this option over draining (effectively eliminating the pond)
- If we took no action now to allow us time to very intentionally plan a more creative and constructive solution than the three presented, I would be very much in favor.
- Marshland is not acceptable alternative
- No action with exacerbation of the problem is irresponsible
- No more cost to the taxpayers in this town especially the seniors that really should have their taxes frozen when they turn 70! Good grief. And use tax dollars for trash and recyables like other towns can do with their tax dollers.
- Preserving skating near to neighbors on Commonwealth and off Lawsbrook Road area is my number 1 interest
- Save the taxpayers some money. Do nothing.
- seems like if ignored for now will be more expensive eventually; environmentally, it seems dam removal is the best option
- The ability to plan a good project is enabledy the fact that this is not an emergency.
- the only reason Concord would choose this alternative is to save cost. I'd like my tax dollars to go to pond preservation.
- The other alternatives represent a lack of imagination to solve the actual problem
- This option avoids wasting everyone's time, energy, resources, and money. Do the responsible thing, STOP WASTING TAXPAYER'S MONEY! People can use Whites Pond for the activities

discussed here. There is no reason to spend 1 second, cent, breath, or sentence on this ill conceived project.

In response to respondents' concerns related to the No Action Alternative

- "Going back to nature" approach removes valuable recreation area for West Concord That unlike White's Pond, is open to everyone. I also appreciate historical significance of Warner's Pond.
- A do nothing alternative would significantly reduce the recreational value of the Town's acquisition of the property. The land's reduced recreational value would be better served as an affordable housing site.
- Cost is always a concern, but doing nothing is a wasted opportunity to improve this part of Concord.
- Does the dam provide any benefit at all? Hydropower? If not it should be removed.
- Doing nothing is not a solution. It basically ignores the issue at hand ultimately causing the pond to fill in with sediment and invasive species and killing all fish life.
- How fast will the situation deteriorate? For example, if we were to visit the pond 10 years from now and nothing has been done, what differences might we notice? Assuming something must be done eventually, how would the cost change (other than general inflation)? Is there any critical inflection point or other nonlinear effect that would make it much more expensive to fix in the future if the problem is deferred?
- I did not vote against the middle school in spite of the fact that it is raising my taxes. My neighborhood is changing from the small town feel that appealed to me so much when I moved in 33 years ago to something more akin to a subdivision. Losing the pond would probably be enough to get me to move away..
- I notice that the phrasing in the options is that the various choices would have "possible" effects. This gives me pause. Do we or don't we know which option is best for wildlife?
- I wonder about health effects to neighborhood residents as work is done. For example, does work work
- If nothing is done (status quo), the Pond will continue to infill with sediment and invasive species eventually no longer be a pond but a wet meadow with maybe stream meandering through it.
- If we don't act now, we never will, and that would mean letting the pond self-destruct in a way that is very bad for the future of wildlife in the area.
- If we're going to let the pond fill in anyway, we should remove the dam. Or we should dredge for short term benefit. I don't see any real benefit to the "no action" alternative -- the pond fills in anyway, there's no benefit for passage of fish or water, it leaves us vulnerable to catastrophic dam failure, and it doesn't reduce flood risk. And any avoidance of expense, noise, or mess we gain will get dumped onto the people of the future, right?
- Invasive plants taking hold as the pond becomes unhealthy and is less able to support native pond life
- It'd be great if a combination of options could be found to dredge & then prevent further sediment buildup.
- It's important to reduce sources of pollution all throughout the watershed. Removing the dam and flushing pollutants into the ocean does not sound like good stewardship.
- Long range planning for climate resilience, ecosystem recovery and lower maintenance expenses are important and worth investing in.
- Need to dredge to get the beach going I guess.
- No action alternative is not viable as the conditions will worsen until the system is dead and reverts to poor quality wet meadows.
- The pond would become unnavigable by canoe or sailboat.
- They have been stated
- This is kicking the can down the road.
- Unrelated, but I would like to see a playground adjacent to the pond


- Warner Pond will fill in and return to nature eventually. But since it has a newly rebuilt dam and has some recreational features now and there is money to dredge part of the pond I would like to see the recreational features available for as many years as is easily made possible. In other words, knowing it will fill in someday I would not create the pond but now that it is here let's enjoy it for as long as possible and then let it return to nature.
- We need more active recreational activities
- We strongly support keeping the dam. There is currently a lot of recreation that is happening at the dam that has not been mentioned. This would be a huge loss to West Concord if the dam were to be destroyed.

Open-ended comments

- A continuous path for fish (and ideally a kayak) is my primary thought, which seems preferable to a solution (or no action) that seems to eventually lead to mostly mud.
- A long term (30 years) plan to maintain the health of the pond various ecosystems. Included with the plan is a Structure for how it will be paid for
- A more comprehensive approach to reduce sediment and nutrient loading and larger scale dredging/invasives management
- Again, see #22: periodically drain the pond, allow it to dry out and harvest the dried "muck" to be used in landscaping e.g. sold as nutrient rich soil. Ongoing thoughtful management of invasive plants as part of the preservation of desired plants.
- Aquatic invasive species removed and a method of maintaining their absence instituted. Banning of use of fertilizers and other harmful things that run-off into our rivers. Education and incentives for Concord inhabitants to choose alternatives to green grass lawns.
- As a regular kayaker, I would like to see abutters to the Nashoba Brook & Warner clean up thier properties & limit the fertilizer that flows in.
- Back to original configuration, before a dam was added
- Based on the information I've seen, I'd like to see the dam removed.
- Clean out the area across from Nashoba Brook Bakery.
- Clean up the pond for swimming.
- Come up w a cost effective solution to the invasive plant growth, restore to more of what it was naturally
- Complete dredging and continues ongoing maintenance
- Complete the proposed dredging project as proposed. Develop a longer term Warner's Pond water quality measurement system to guide future neutralization and filtering efforts.
- Continue to work with neighboring towns as to limiting pollutants entering the water shed area.
- Dam modification/removal, combined with other steps as the Pond's "footprint" changes, to reduce risks from dirty muck.
- Dam removal
- Dam removal and a smaller pond used for recreation and pond habitat for wildlife.
- Dam removal.
- Dam removal. Continued invasives management including newly revegetated areas (phragmites, purple loosestrife), pier or other stricture to access pond for skating and for launching to Scout Island.
- Develop an on-going environmental monitoring and improvements plan, managed by the Town with a dedicated manager, with clearly defined duties and responsibilities. Provide for a public utilization strategy similar to the White Pond area whereby public access and usage is fostered to support the environment in and around the pond. Create an educational program with the public schools to utilize the pond as a teaching tool with practical applications in support of native species & habitats. Apply for state grants to mitigate and eliminate hazardous inputs to the pond from drainage inputs and agricultural runoff from the neighboring farms , lawns and highways. Create habitats for migrating and native birds, insects pollinators.

- Divert the nitrogen flow from the NEEC cattle through a swale to soak up some of the nutrients that currently feed the vegetation in Warner's Pond.
- Do nothing. Leave it alone.
- Dredge most of the pond, make it a pond with wetlands around it.
- Dredge the entire pond and remove the material.
- Dredge the whole pond and keep as a pond
- Dredging
- Dredging plus maintenance of pond with organic invasive plant products.
- Evaluation of the impact of RT2 and the nearby agricultural land on the P level and sediment flowing into the pond.
- Every effort should be made to maintain Warner's Pond in the best condition possible for now and for future generations. Many years ago I was on the Warner Pond Committee which was a town sponsored committee. A mention was made at last night's meeting about Joanne Loynd who was one of our members. At that time we had found an herbicide that would kill the invasives but not the fish. In order for this option to work a drawdown of the pond would have been necessary but the old dam's mechanism was rusted out. By the time we got a new dam, making this option possible, the committee no longer existed. I would like to see this option reviewed now. Dredging is the most likely scenario and according to the rep from EA this would give us about another 100 years before the pond silted up again. That certainly seems worthwhile to me. When we first moved here in 1983, the pond was in very good condition. It has taken 40 years for it to get to in the current condition. BTW, it seems more likely that most of the phosphorus could be coming from the farm and lawns abutting the pond and not just the watershed. Something could be done about that.
- "First, the cost for dredging/removal was not presented in the material to the town...it seems that all options and their costs should be included. The cost of dredging/relocation is pretty close to the cost of removing the dam, thus eliminating Warner Pond and creating Warner Marsh.
- Personally, I think this survey is also a bit biased..."
- Full restoration. Make Warner's Pond boatable, fishable, swimmable and skateable - a true resource to the community.
- Further analysis
- Get fish passage done. Do a board walk through the wetland.
- Greater integration of planning and justifying/leveraging project costs with some integration of adjacent assets - Gerow and BFRT
- "I am in favor of any means to improve the quality of the pond. We moved here in 1983 and at that time the pond was in good condition. It has taken 40 years for the pond to get this bad. The engineer from EA when asked how long it would take for the pond to silt up again if we do the dredging and I believe he said somewhere around 100 years. That certainly seems like a good return on investment.
- Many years ago I was on the Warner Pond Committee along with Joanne Loynd. At that time we found an herbicide that could kill the invasives but not the fish or other wildlife. In order to make this work we would have needed to do a drawdown but that wasn't possible with the old dam since the mechanism had rusted out. By the time the new dam was built the committee no longer existed. I would like to see this option revisited. Hand pulling of the water lilies is another option but dredging is the most important."
- I am in support of the dredging and relocation of dredged sediment within other areas of the pond.
- I am not interested in the Brook System--only in what Warners Pond provides for taxpayers of Concord
- I am not knowledgeable enough to know what would make the pond healthier and more attractive to wildlife but I would support whatever would do that

- I believe that the natural habitat and its inhabitants is of greatest importance. I am not an expert in the field and am inclined to go along with the advice of those who are.
- I don't know enough right now to answer this question, but finding some balance between making the water available for recreation & improving it as a wildlife/aquatic life habitat is what I prefer.
- I think a robust educational campaign to residents about the high phosphate load that Warner's is suffering from. I also think the state farmland properties need to be part of this effort- they add fertilizers that run-off into the pond and could buffer their area with native plants that do not need water nor fertilizer. The farm also pumps water from the pond that contributes even more to the problem.
- I think alternative #2 would probably be the best in the long run.
- I think dam removal is the best alternative. Not only does it restore natural habitat in a lasting way, it increases the safety to the downstream neighborhoods, improves native habitat, and eliminates future costs of re-dredging and dam maintenance.
- I would like accessible paths, possibly a loop for people to hike and experience the area. It would be great to grow native edible plants in the area as well.
- I would like the Town to explore Phoslock as a way to manage the phosphorus problem. I would like the Town to dredge and create a second smaller pond area near the Commonwealth boat launch that would remain after the dam is removed and also create a stable channel pathway (using the sediment to speed the eutrophication of the new vegetated wetlands. I would like the dam to be reconstructed to allow fish passage and the flow of sediment but to keep a higher level to the two smaller ponds and the brook. I would like there to be constructed walking paths and benches within the new vegetated wetlands.
- I would like to explore options to reduce the upstream contamination and treat the water quality by alternative means, like bio-treatment. Explore other options of maintaining open water.
- I would like to have the dam removed.
- I would like to see better care for the pond that improves water quality and wildlife habitat. I'm not as concerned about recreational opportunities. There's plenty of other boating and swimming opportunities in Concord.
- I would like to see improving recreation facilities at Warners either removing dam and improving Nashoba Brook - maybe widening the Warner's Pond environment or partially dredging.
- I would like to see it become a low maintenance, environmentally friendly & supportive space for residents and visitors to spend time. I would LOVE to have a full & complete walking path around the pond/wetland area.
- I would like to see it integrated so that the pond is an access point to the upstream and downstream areas.
- I would like to see it restored to its natural state: no dam, no dredging, so that Nashoba Brook runs free and fish can access the entire waterway
- I would like to see the dam removed, and a free flowing riverway replace the overgrown, stagnant pond.
- I would like to see the town come up with the funds to finally do something about this pond. We have been talking about this for years
- I think I am primarily interested in the idea of dam removal though the decrease in ice skating would be a bummer - it's such a great way that the community connects over the winter.
- I'd like to see the adoption of Conceptual Alternative 2: keep the pond's acreage and dredge it.
- I'd like to see the phosphorous loading from upstream be reduced! But if that's not feasible, dam removal seems like the most logical option- though I don't fully understand the downstream impacts.
- Ideally improve the water quality and wildlife habitat and avoid the accumulation of debris while preserving the appearance of the pond and the ability to paddle on it.
- Ideally, clean up the pond and restore it back to how it used to be 30+ years ago when people could swim in it. It's such a beautiful pond.

- "Ideally, I would like to see the pond dredged and for there to be collective action among municipalities within the watershed that feeds the pond to reduce the flow of nutrients into the waterway that drives eutrophication. I would like to hear the best current estimate of what the cost of dredging with retention of sediment on site would be. In this regard, I would like a presentation on the current balance of funds in the CPA Fund is that is available for recreational use and a projection of future CPA revenues that would be available for recreation use. I would then like to see a projection of what the annual debt service would be on bonds issued to finance the estimated cost of dredging and match that with the availability of CPA funds to pay for annual debt service. Also, regarding dredging, I would like to hear a presentation of the results of testing of the materials being dredged for hazardous contaminants.
- Regarding the alternative of removing the dam, I would like to hear more about the magnitude of the impact of its removal downstream; that is, the washing of sediment downstream and, in the absence of the control of nutrient flows out of the upstream watershed, the impact of those nutrients downstream."
- Increase wildlife benefits
- Integration with other recreation facilities.
- It appears that dredging the pond is the only way to improve the pond. Since this is fairly expensive, the best alternative is to leave the dam as is. It truly is a beautiful sight with so much wildlife prospering there and a great recreational spot for many local residents, which has not been mentioned in any aspects of the presentation.
- "Keep people away from it.
- If bordering septic tanks are leaking/leaching nutrients into the pond, get them fixed."
- Leave it alone and return to nature.
- Leave it alone.
- Let the pond fill in.
- Low cost options! Improved ice skating 
- Mitigate discharge into the pond esp from rts 495 & 2
- "Mitigate flow of pesticides and fertilizers from abutting farm land
- Dredge invasive that have grown due to farming practices"
- Modest ongoing maintenance of this valuable community resource. (Recreational and aesthetic)
- Periodic draining to control invasive vegetation if financially feasible in the long run. This would create the need for an openable dam rather than the fixed one that currently exists.
- Pond restoration
- Prevention of building, particularly industrial and road construction in and around the watershed. Keep the pond free of associated contaminants and encourage wildlife habitats.
- Proactive, creative, professionally planned, designed, constructed and monitored model ecosystem restoration, utilizing local school classes and students for study, input, education and promotion, and seeking funding in part from the EOEEA wetland restoration program.
- Reduce the nutrient load throughout the watershed - maybe throughout the SuAsCo area in general.
- Regular maintenance plan based of studies since 2004; seeking available funding in a systematic, committed effort
- Removal of dam
- Removal of the dam
- Removal of the damn
- Remove all dams in the system. Let beavers take care of water management.
- Remove dam
- Remove dam
- Remove half of the dam. Dredge what can be done.
- Remove invasive species

- Remove the dam
- Remove the dam
- Remove the dam
- remove the dam
- Remove the dam
- remove the dam
- Remove the dam and return the water flow with surge capacity in the area.
- remove the dam and work on further brook restoration programs, which I would be happy to volunteer participate in.
- Remove the dam!!
- Remove the dam, enough said.
- Remove the dam.
- Return it to nature and let us steward and enjoy it that way
- Return it to pre-dam state.
- Sam removal seems like the right way to go to restore nature
- Seasonal adjustment to the water level to mitigate and manage the aquatic growth at the water's edge.
- Secure funding to support the removal of the dam.
- Start investing long term rather than punting. This could have been solved if the pond was dredged when the dam was rebuilt and dammed upstream
- Stop giving building permits so close to the pond such as the new houses on Sunnyside Lane and Pond Street. Also, do not allow properties that border the pond to use lawn fertilizer.
- That's a tough one. I love the pond the way it was and I don't want to lose it, but things change, it's not a natural pond in the first place, and we can't control the watershed which is destroying the pond with runoff. I'm kind of leaning toward dam removal even though I don't like that option, just because the other options seem even worse.
- The pond needs to be dredged properly, not partially
- The primary problem seems to be the nutrient pollution coming in from upstream. I would like to see a (separate) effort trying to address this (very difficult) problem. In general, I would prefer the dam removal option as the closest thing to restoring the natural ecosystem as possible, but still have many questions: 1. How do we know that removing the dam will result in invasive species decline? Do other communities have experience? 2. What do the surrounding homeowners thing? 3. Under each of the scenarios, what will happen to the P load in the water and sediment? 4. The presentation seems very uninformed about the invasive species at Warner's Pond. The only one they cite is Purple Loosestrife, which actually can be controlled now.
- "Walking trails around some or all of it.
- A beach area for gathering in West Concord.
- It is a great asset to have and could be much better utilized than it is."
- Warners pond is a wonderful open space that is changing and needs a practical plan that reduces invasives and doesn't fight what is going to happen over time anyway. I hope local residents will be open to a changing landscape.
- Whatever best achieves the goal of improved water quality, decreased invasives, better fish habitat.

APPENDIX E

NHESP CORRESPONDENCE



MASSWILDLIFE

DIVISION OF FISHERIES & WILDLIFE

1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6300 | f: (508) 389-7890
MASS.GOV/MASSWILDLIFE

January 20, 2023

Delia Kaye
Concord Natural Resources Commission
141 Keyes Road
Concord MA 01742

RE: Project Location: Warner's Pond
Town: CONCORD
NHESP Tracking No.: 23-41604

To Whom It May Concern:

Thank you for contacting the Natural Heritage and Endangered Species Program of the MA Division of Fisheries & Wildlife (the "Division") for information regarding state-listed rare species in the vicinity of the above referenced site. Based on the information provided, this project site, or a portion thereof, is located **within** *Priority Habitat 1495* (PH 1495) and *Estimated Habitat 1043* (EH 1043) as indicated in the *Massachusetts Natural Heritage Atlas* (15th Edition) for the following state-listed rare species:

<u>Scientific name</u>	<u>Common Name</u>	<u>Taxonomic Group</u>	<u>State Status</u>
<i>Glyptemys insculpta</i>	Wood Turtle	Reptile	Special Concern

The species listed above is protected under the Massachusetts Endangered Species Act (MESA) (M.G.L. c. 131A) and its implementing regulations (321 CMR 10.00). State-listed wildlife are also protected under the state's Wetlands Protection Act (WPA) (M.G.L. c. 131, s. 40) and its implementing regulations (310 CMR 10.00). Fact sheets for most state-listed rare species can be found on our website (www.mass.gov/nhesp).

Please note that projects and activities located within Priority and/or Estimated Habitat must be reviewed by the Division for compliance with the state-listed rare species protection provisions of MESA (321 CMR 10.00) and/or the WPA (310 CMR 10.00).

Wetlands Protection Act (WPA)

If the project site is within Estimated Habitat and a Notice of Intent (NOI) is required, then a copy of the NOI must be submitted to the Division so that it is received at the same time as the local conservation commission. If the Division determines that the proposed project will adversely affect the actual Resource Area habitat of state-protected wildlife, then the proposed project may not be permitted (310 CMR 10.37, 10.58(4)(b) & 10.59). In such a case, the project proponent may request a consultation with the Division to discuss potential project design modifications that would avoid adverse effects to rare wildlife habitat.

A streamlined joint MESA/WPA review process is available. When filing a Notice of Intent (NOI), the applicant may file concurrently under the MESA on the same NOI form and qualify for a 30-day

MASSWILDLIFE