GREENFIELD COMMUNITY PRESERVATION ACT APPLICATION FORM

Submit this application **by November 30, 2022** to:

Greenfield Community Preservation Committee

% Christian LaPlante

14 Court Square

Greenfield, MA 01301

Or by email: cpc@greenfield-ma.gov

Date submitted: by U.S. mail__________, email__________, or in person___✓_______

Project Title: Restore Highland Pond Step 1: Aerating fountain
Applicant: Philip Elmer
Are you an incorporated organization? ___Y _x___N   If not, who is your fiscal sponsor? Marlo Warner, DPW director and Alan Twarog, Engineering Superintendent
Contact Name: Philip Elmer
Mailing Address: 28 Chestnut HL, Greenfield, MA 01301
Daytime Phone #: 347 404 0090
Email Address: ped@mac.com

Date of Submission:
11/29/22

Total Project Cost	CPA Funds Requested
$10,000	$8,000

CPA Category (Please check a minimum of one category below. Your project may involve more than one category (see CPA chart in application instructions). Please check as many as are appropriate. For instance, your project could be community housing that renovates a historic building. In that case, you would check Historic Preservation and Community Housing.

Open Space _x____

Historic Preservation ______

Recreation __x___

Community Housing ______

PROJECT DESCRIPTION:

- All of the following must be answered in the space provided
- Include supporting materials as requested or as you believe necessary as attachments

1. Describe the Project

As a first step toward restoring Highland Pond for summer and winter recreational use, purchase and install a solar-powered aerator or aerating fountain (after obtaining a permit from the Conservation Commission).

2. What are the goals of the proposed project?

Short term, to re-oxygenate the pond's water, begin to reverse its eutrophication, and support the pond's native fish population. Medium term, signal to the users of the park that the city of Greenfield cares about the health of the pond. Long term, involve the municipality in the larger project of restoring and maintaining the pond. Among future steps: clearing the duckweed when it's choking the pond; install commercially available floating islands to absorb excess nutrients; do some shore-based clearing and dredging to clear fishing lanes in summer and make pathways to the deep ice in winter; finally full-scale draining dredging done in two stages, first one side, then after giving the aquatic life some time to recover, the other. (See attached plan.)

3. Who will benefit from this project and why/how?

Fishermen, frog catchers, turtle lovers, skaters, skiers, snowshoers, and anybody who enjoys the park – especially those who remember skating and playing hockey on the pond when it was a popular town-maintained recreational area.

4. How will you measure your success?

Less vegetation visible on surface, better fishing, increased interest in the community and the city government for taking the next steps.

5. How does this project fit with the requirements of the Community Preservation Act? (See attached chart)

Restoration of a popular recreational resource that is at a turning point. Before many more years it will revert to swamp.

6. If appropriate, how does this project fit with existing City plans? (See GCPC Plan [hyperlink])

This project supports several goals of the Sustainable Greenfield master plan, including preserving and maintaining public access to the city's water ways. Highland Pond is singled out on p. 151: "Highland Pond, located in Highland Park, is being actively used for various educational and recreational purposes."

7. Who is encouraging you with this project? If you have letters from organizations or City boards, please attach them.

There is a long history of support for pond restoration. There have been studies, proposals, articles, and even a request for a half-million-dollar bond earmark that's still alive in Boston. (See attachments.)

8. Budget:

Budget Summary

Total Budget.	CPA Funds Requested	Funds from Other Sources
$10,000	$8,000	$2,000 fundraising

Complete Budget

Some definitions:

Personnel: Any paid staffing

Equipment: items with a useful life expectancy of more than one year.

Supplies: items with a useful life of less than one year.

Contractual: any work that is done for a limited period of time by a person/organization with specialized skills, e.g. lawyer, surveyor, etc.

Construction: all work done on a particular property or building including erecting, altering or remodeling.

Please leave any category blank that does not apply to your project.

Category	**CPA Funds**	**Other Funds/In kind value (see below)**	**Total**
Personnel			
Equipment	$8,000	$2,000	$10,000
Supplies			
Contractual			
Construction			
Other			
TOTAL	$8,000	$2,000	$10,000

Other Funds:

- Please identify the other sources of funding including federal, state, or local government or any other sources.
- Cash means that the source is providing funds.
- In kind means that the source is going to give labor or goods, but no cash. In kind support still has value. How much would it cost if you were to pay for the labor or goods?
- Confirmed means that the organization or business has made a commitment to supply the items, labor or funds

Organization	Item	Amount or value	Cash (Please check)	In kind (Please check	Confirmed (Y or N)
DPW				X	Y
Town Engineer				X	Y

9. Timeline:

Please provide a schedule for project implementation. Please include major tasks, e.g. survey, acquisition of historic documents, etc.

Task	Estimated Start	Estimated completion
Getting Conservation Commission permit	1/23	2/23
Purchase equipment	3/23	3/23
Install equipment	4/23	5/23

10. Implementation:

If you have a project manager already in place, please provide the following information. If you do not yet, have that information, please discuss the process to move forward on that task.

Project Manager (Paid or volunteer)	Phone	Email
Philip Elmer	347 404 0090	ped@mac.com

Plans for hiring a paid or volunteer project manager:

Applicant, working with DPW and engineer, will act as volunteer project manager.

11. Maintenance (Leave blank if not applicable to your project)

If your project requires ongoing maintenance, who will be responsible for that for the 5 years after completion? How will that maintenance be funded?

Greenfield DPW's budget

Maintenance Budget

Year 1	Year 2	Year 3	Year 4	Year 5
In kind	In kind	In kind	In kind	In kind

To the best of my knowledge and belief, all data in this application are true and correct. This document has been duly authorized by the individual or governing body of the applicant.
Name of authorized representative: Philip Elmer
Title, if appropriate City Councilor
Email ped@mac.com
Phone number 347 404 0090
Signature of Authorized Representative [signature]
Date Signed 1/29/22

Maps

2022

From Wikipedia entry for Water Aeration

Water quality[edit]

Water aeration is often required in water bodies that suffer from hypoxic or anoxic conditions, often caused by upstream human activities such as sewage discharges, agricultural run-off, or over-baiting a fishing lake. Aeration can be achieved through the infusion of air into the bottom of the lake, lagoon or pond or by surface agitation from a fountain or spray-like device to allow for oxygen exchange at the surface and the release of gasses such as carbon dioxide, methane or hydrogen sulfide.[2]

Decreased levels of dissolved oxygen (DO) is a major contributor to poor water quality. Not only do fish and most other aquatic animals need oxygen, aerobic bacteria help decompose organic matter. When oxygen concentrations become low, anoxic conditions may develop which can decrease the ability of the water body to support life.

Aeration methods[edit]

Any procedure by which oxygen is added to water can be considered a type of water aeration. There are many ways to aerate water, but these all fall into two broad areas – **surface aeration** and **subsurface aeration**. A variety of techniques and technologies are available for both approaches.

Natural aeration[edit]

Natural aeration is a type of both sub-surface and surface aeration. It can occur through sub-surface aquatic plants. Through the natural process of photosynthesis, water plants release oxygen into the water providing it with the oxygen necessary for fish to live and aerobic bacteria to break down excess nutrients.[3]

Oxygen can be driven into the water when the wind disturbs the surface of the water body and natural aeration can occur through a movement of water caused by an incoming stream, waterfall, or even a strong flood.

In large water bodies in temperate climates, autumn turn-over can introduce oxygen rich water into the oxygen poor hypolimnion.

Surface aeration[edit]

Low speed surface aerator[edit]

The low speed surface aerator is a device for biology aeration with high efficiency. Those devices are often in steel protected by epoxy coating and generate high torque. The mixing of water volume is excellent. The common power is going from 1 up to 250kw per unit with an efficiency (SOE) around 2 kgO2/kw. Low speed aerator are used mostly for biology plant aeration for water purification. The higher the diameter, the higher the SOE and mixing.

Fountains[edit]

A fountain consists of a motor that powers a rotating impeller. The impeller pumps water from the first few feet of the water and expels it into the air.[4] This process utilizes air-water contact to transfer oxygen. As the water is propelled into the air, it breaks into small droplets. Collectively, these small droplets have a large surface area through which oxygen can be transferred. Upon return, these droplets mix with the rest of the water and thus transfer their oxygen back to the ecosystem. Fountains are a popular method of surface aerators because of the aesthetic appearance that they offer. However, most fountains are unable to produce a large area of oxygenated water.[4] Also, running electricity through the water to the fountain can be a safety hazard.

Floating surface aerators[edit]

Typical mechanical surface aerator at work. It is often difficult for this type of machine to aerate the entire water column.

A one-horsepower paddlewheel aerator. The splashing may increase the evaporation rate of the water and thus increase the salinity of the water body.

Floating surface aerators work in a similar manner to fountains, but they do not offer the same aesthetic appearance. They extract water from the first 1–2 feet of the water body and utilize air-water contact to transfer oxygen. Instead of propelling water into the air, they disrupt the water at the water surface. Floating surface aerators are also powered by on-shore electricity.[4] Surface aerators are limited to a small area as they are unable to add circulation or oxygen to much more than a 3-metre radius. This circulation and oxygenating is then limited to the first portion of the water column, often leaving the bottom portions unaffected. Low speed surface aerator can also be installed on floats.

Paddlewheel aerators[edit]

Paddlewheel aerators also utilize air-to-water contact to transfer oxygen from the air in the atmosphere to the water body. They are most often used in the aquaculture (rearing aquatic animals or cultivating aquatic plants for food) field. Constructed of a hub with attached paddles, these aerators are usually powered by a tractor power take-off (PTO), a gas engine, or an electric motor. They tend to be mounted on floats. Electricity forces the paddles to turn, churning the water and allowing oxygen transfer through air-water contact.[4] As each new section of water is churned, it absorbs oxygen from the air and then upon its return to the water, restores it to the water. In this regard paddlewheel aeration works very similarly to floating surface aerators.

Subsurface aeration[edit]

Subsurface aeration seeks to release bubbles at the bottom of the water body and allow them to rise by the force of buoyancy. *Diffused aeration systems* utilize bubbles to aerate as well as mix the water. Water displacement from the expulsion of bubbles will cause a mixing action to occur, and the contact between the water and the bubble will result in an oxygen transfer.[5]

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LIVING WATER AERATION
(/)

1.877.799.7572
(tel:18777997572)

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Home (/) ›Aeration Systems (/collections/aeration-systems)› Solar Aerators (/collections/solar-powered-pond-aerators)

FILTER BY

Pond Size:

- 1 Acre (3)
- 2 Acres (3)
- 4 Acres (1)
- 3 Acres (2)

Price:

$3,595.00 - $15,926.78

Reviews:

- (2)
- (1)
- (1)

Category:

- Pond Aerator (9)

Type:

Solar Powered Pond Aerators & Systems

Showing 1 - 15 of 15 items

Items per page: 96

Sort by: Relevancy

(https://www.livingwater naster-dd-solar-2-pond-

AerMaster DD Solar 2 Pond Aerator (Https://Www.livingwateraeration.com/Products/Aermaster-Dd-Solar-2-Pond-Aerator-System)

8 Reviews

$3,595.00

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Solar Powered

(9)

Solar Pond Aerator 7 AerMaster Direct Drive Electric Combo (Https://Www.livingwateraeration.com/Products/Solar-Pond-Aerator-Aermaster-Direct-Drive)

$3,695.00

(https://www.livingwater naster-dd-solar-3-pond-

AerMaster DD Solar 3 Pond Aerator System (Https://Www.livingwateraeration.com/Products/Aermaster-Dd-Solar-3-Pond-Aerator-System)

4 Reviews

$3,795.00

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Solar Pond Aerator 8 AerMaster Direct Drive Electric Combo (Https://Www.livingwateraeration.com/Products/Solar-Pond-Aerator-8-Aermaster-Direct-Drive-Electric-Combo)

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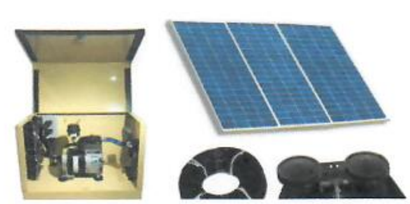

OWS Deep Water Classic 2 Solar Aerator (Https://Www.livingwateraeration.com/Products/Ows-Deep-Water-Classic-2-Solar-Aerator)

$5,595.00

(https://www.livingv ep-water-classic-3-

OWS Deep Water Classic 3 Solar Aerator (Https://Www.livingwateraeration.com/Products/Ows-Deep-Water-Classic-3-Solar-Aerator)

$5,795.00

(https://www.livingwa olar-pond-aerator-5-
ae n)

Solar Pond Aerator 5 AerMaster DD Aeration System (Https://Www.livingwateraeration.com/Products/Solar-Pond-Aerator-5-Aermaster-Dd-Aeration-System)

1 Reviews

$5,895.00

(https://www.livingv ep-water-classic-5-

OWS Deep Water Classic 5 Solar Aerator (Https://Www.livingwateraeration.com/Products/Ows-Deep-Water-Classic-5-Solar-Aerator)

$6,695.00

(https://www.livingv ep-water-classic-6-

OWS Deep Water Classic 6 Solar Aerator (Https://Www.livingwateraeration.com/Products/Ows-Deep-Water-Classic-6-Solar-Aerator)

$6,795.00

(https://www.livingwateraeration ıcts/solaer-solar-powered-pond-

Solaer Solar Powered Pond Aerator - Up To 1 Acre (Https://Www.livingwateraeration.com/Products/Solaer-Solar-Powered-Pond-Aerator)

1 Reviews

$7,882.70

(https://www.livingwateraeration ıcts/solaer-solar-powered-pond-
ae ɜs)

Solaer Solar Powered Pond Aerator - Up To 2 Acres

(Https://Www.livingwateraeration.com/Products/Solaer-Solar-Powered-Pond-Aerator-2-Acres)

$7,893.22

(https://www.livingw ep-water-classic-8-

OWS Deep Water Classic 8 Solar Aerator (Https://Www.livingwateraeration.com/Products/Ows-Deep-Water-Classic-8-Solar-Aerator)

$8,495.00

(https://www.livingw ep-water-classic-9-

OWS Deep Water Classic 9 Solar Aerator (Https://Www.livingwateraeration.com/Products/Ows-Deep-Water-Classic-9-Solar-Aerator)

$8,995.00

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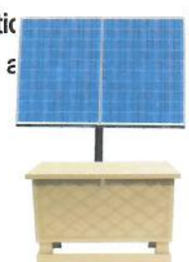

Solaer Solar Powered Pond Aerator - Up To 3 Acres

2017-2020

The Recorder - Jaywalking: **Highland Pond** skating dilemma

Greenfield Recorder › Jaywalking-16602892

Apr 2, 2018 **...** To dredge or not to dredge? That's again the question at **Highland Pond** these days, and I must confess, I'm caught up in the debate.

The Recorder - City considering **Highland Pond** for outdoor ice rink

Greenfield Recorder › Like-outdoor-ice-skating-Highland-Pond-to-be-discu...

Mar 20, 2018 **...** GREENFIELD — Though winter is technically over, the possibility of making **Highland Pond** a winter ice skating location will be discussed next ...

The Recorder - Bring back **Highland Pond** - Greenfield

Greenfield Recorder › Letters-7850588

Aug 2, 2017 **...** We wish Greenfield Mayor william Martin would lep bring back **Highland Pond**.We're quite sure he saw the supplement in the Recorder Jan.

The Recorder - Greenfield's **Pond** Hockey Team ... - Greenfield

Greenfield Recorder › Greenfield-High-School-outdoor-hockey-history-afte...

Apr 20, 2020 **...** "And it was in the shade of the white pines, so the ice wasn't in direct sun. **Highland** was still a great place to skate in those days." Of ...

The Recorder - PHOTO: A blue heron takes off - Greenfield

Greenfield Recorder › rop-HighlandParkHeron-11489938

Jul 26, 2017 **...** A blue heron spreads its wings while standing in **Highland Pond** in Greenfield Tuesday, July 25, 2017. Photo by Matt Burkhartt.

The Recorder - Greenfield Recreation Department Notebook: Oct ...

Greenfield Recorder › Greenfield-Recreation-Notebook-Oct-10-2019-29167...

Sep 10, 2019 **...** Located by **Highland Pond** and Parkway Street, this 29-acre park is a great place to explore on a fall day. Three formal trails exist. They can be ...

The Recorder - Greenfield 2018 Winter Carnival schedule

Greenfield Recorder › Greenfield-Winter-Carnival-2018-schedule-15214892

Jan 31, 2018 **...** Noon — Snowshoeing Trek: Meet at **Highland Pond** parking lot. Noon — Cookie Bake-off: Beacon Field. Noon — Chili Cook-off: Beacon Field.

2017

William F. Martin
Mayor

City known as the Town of
GREENFIELD, MASSACHUSETTS

PLANNING & DEVELOPMENT DEPARTMENT

Town Hall • 14 Court Square • Greenfield, MA 01301
Phone 413-772-1549 • Fax 413-772-1309
EricT@greenfield-ma.org • www.greenfield-ma.gov

MEMO

TO: Mayor William Martin

FROM: Eric Twarog, Director, Department of Planning & Development

DATE: July 7, 2017

RE: Funding Opportunities for Dredging of Highland Pond

I researched funding opportunities for the dredging of Highland Pond to re-establish a community ice-skating area for Greenfield residents and the region. The following agencies were contacted about such funding opportunities:

- US Army Corps of Engineers Aquatic Ecosystem Restoration Program (Section 206);
- US EPA 319 Nonpoint Source Competitive Grants Program;
- USDA's Rural Development Office in Hadley, MA;
- MA EOEEA's Department of Conservation and Recreation; and
- MassWorks Infrastructure Program.

In a 2002 memo from the DPW, Larry Petrin estimated $440,000 for dredging and later estimated $580,000 in 2009. Undoubtedly, this cost has risen since 2009. Therefore, estimated costs should be updated.

The grant programs listed above do not fund dredging activities. Based upon the responses from staff of these agencies, I believe that the first step is to reach out to our state legislative members and begin the conversation of re-establishing Highland Pond as a community ice-skating resource. Earmarked funds could then leverage state and federal grant programs. Below is a summary of the responses from the agencies listed above.

Larry Oliver of the Project Planning Section of the New England Division of the US Army Corps of Engineers stated that it is not possible to fund such projects as they have in the past. Only projects that have a national benefit can be funded by the US Army Corp of Engineers. He gave the City of Easthampton's Nashawannuck Pond Restoration Project as an example of such a project that could no longer be funded. Staff from MA DEP stated that the EPA's 319 Nonpoint

The Town of Greenfield is an Affirmative Action/Equal Opportunity Employer,
a designated Green Community and a recipient of the "Leading by Example" Award

William F. Martin
Mayor

Town Hall • 14 Court Square • Greenfield, MA 01301
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EricT@greenfield-ma.org • www.greenfield-ma.gov

Source Competitive Grants Program cannot fund dredging projects. Staff from the USDA's Rural Development Office stated that their grant and loan programs do not provide funding for dredging. Melissa Cryan, coordinator for the state's Parkland Acquisitions and Renovations for Communities (PARC) Program, stated that the PARC program does not provide funding for dredging but that the grant program could fund proposed park improvements other than the dredging. Staff from the MassWorks Infrastructure Program stated that this grant program does not fund dredging. The priorities for this round of MassWorks funding are multi-family housing development, economic development in weak or distressed areas, community revitalization to promote mixed-use development, and transportation improvements to enhance safety in small, rural communities.

I also researched the City of Easthampton's Nashawannuck Pond Restoration Project and learned the following. The City of Easthampton was able to accomplish the restoration project, which included significant dredging of the pond, with a combination of earmarked funds from the state, MassWorks Infrastructure funding, PARC grant funding, funds from the City's Community Preservation Act funds, and the US Army Corps of Engineers Aquatic Ecosystem Restoration Projects - Section 206 funding. In 2011, after more than twenty years of planning, consultations, meetings, site visits, permitting reviews, and funding delays, the pond underwent a major reconstruction.

HIGHLAND POND & PARK REVITIALIZATION PROJECT: Report to Mayor Martin 2015

The Highland Pond & Park Task Force commissioned by the Planning & Construction Committee has been charged to determine the next steps for the revitalization of Highland Pond & Park. The Task Force has met on January 22, 2015, February 18, 2015 and March 18, 2015. During these meetings, the Task Force discussed the park and pond's past and present uses, current site conditions, and what improvements should be pursued. The Task Force reviewed two previous reports which are very beneficial for evaluating the site conditions and proposing specific site improvements. Additionally, brief discussions with the people who prepared both reports were conducted for further insight and clarifications. These reports include:

- "Ecological Report and Management Plan for Highland Pond" by William Lattrell of Valley Environmental Services (1997); and
- "Preliminary Dredging Plan for Highland Pond: Methodology, Environmental Benefits, Costs and Potential Impacts" by Baystate Environmental Consultants (1999).

After careful consideration, the Task Force advises the Town to pursue the recommendations that were presented in the "Ecological Report and Management Plan for Highland Pond", which includes both dredging and watershed management as the best long-term solution for the revitalization efforts at Highland Pond & Park. Key components the Town should focus its implementation measures include: reduction of sediment entering Highland Pond from the adjacent gravel roads and parking lot; reduction or elimination of fecal coliform bacteria; reduction of nutrient contribution; increased maintenance of the trails; providing public outreach regarding best practices for using fertilizers near wetlands and the importance of pet owners properly disposing dog feces; and bringing the pond's depth to a sustainable habitat depth (dredging).

It should be noted that the Board of Health files has been recently reviewed and no nearby septic systems were found to be out of compliance. This suggests that either the fecal coliform bacteria is no longer a problem or the high bacteria levels are coming from another source, e.g. dog waste.

In order to implement such measures, the Town needs to seek funding sources to help reduce costs for pond dredging and watershed management. According to the "Preliminary Dredging Plan for Highland Pond: Methodology, Environmental Benefits, Costs and Potential Impacts" by Baystate Environmental Consultants (1999), the estimated cost of construction and permitting for dredging alone would be approximately $350,000. In a 2002 memo from DPW, Larry Petrin estimated $440,000 for dredging and later estimated $580,000 in 2009. Undoubtedly, this cost has risen since 2009. Therefore, estimated costs should be updated.

The Task Force explored funding options for both dredging and watershed management. Below is a listing of potential funding sources:

1. 604(b) Water Quality Management Grant Program (MassDEP) – for assessments of watershed/subwatershed based nonpoint source activities.
    - Funding: About $200,000 is available each year. Four to six projects are typically selected. Matching funds are not required, but offering additional cash or in-kind cost sharing as demonstration of local support may enhance proposals.

2. 319 Nonpoint Source Competitive Grants Programs (EPA) – for implementation projects that address nonpoint sources of pollution in a watershed with a goal to meet water quality standards or restore beneficial uses; Protection of healthy watersheds and unimpaired/high quality waters; TMDL development; and Outreach and education projects of statewide value

  - Funding: about $1.2 million is available to be awarded each year. Grantees are required to provide a 40% non-federal match. Projects run about three years, paid on a reimbursement basis. 10% retainage is withheld. Quarterly reports are required.

3. Aquatic Ecosystem Restoration Projects - Section 206 (ACOE) - Corps may plan, design and build projects to restore aquatic ecosystems for fish and wildlife. Projects conducted in New England under this program have included eelgrass restoration, salt marsh and salt pond restoration, freshwater wetland restoration, anadromous fish passage and dam removal, river restoration, and nesting bird island restoration. Projects must be in the public interest and cost effective and are limited to $5 million in Federal cost.
   - Cost Sharing: The Corps of Engineers provides the first $100,000 of study costs. A non-Federal sponsor must contribute 50 percent of the cost of the feasibility study after the first $100,000 of expenditures, 35 percent of the cost of design and construction, and 100 percent of the cost of operation and maintenance. The sponsor receives a credit for the value of real estate necessary to implement the project. The entire non-Federal share of the project cost may be credited as work in kind, but, to receive credit, the services must be provided after a formal Feasibility Study Cost Sharing Agreement or Project Cooperation Agreement is signed.

4. MA Recreational Trails Program (DCR)
   - Trails Grants: DCR accepts applications for Recreational Trails Grants on an annual basis
   - Education Grants: The Recreational Trails Program will award 2-3 new grants focused on statewide trail education initiatives.
   - Funding: grants ranging from $2,000 to $50,000, however, grant proposals will be accepted, considered and awarded for larger amounts up to $100,000, based on need, breadth and reach of the trail project. reimbursement grant, and need 20% match from town

5. MA Parkland Acquisitions and Renovations for Communities (PARC) Program
   - Eligible Projects: Eligible projects are those for the purchase of parkland, development of a new park, or renovation of an existing park by any municipality with an approved Open Space and Recreation Plan.
   - Funding: All awarded grants will be made as reimbursement for work completed by the municipality. The maximum reimbursement available is $400,000

6. Additional Grant Search via Congressman Jim McGovern: Bill Childs reached out to the Congressman Jim McGovern's office. The office will see if they can find already established grants, but need more information first.

After careful review of previous reports and lengthy discussions, the Highland Pond & Park Task Force advises the Town to pursue the recommendations that were presented in the Ecological Report and Management Plan, which includes both dredging and watershed management as the best long-term solution for the revitalization efforts at Highland Pond & Park. Key components the Town should focus its implementation measures include: reduction of sediment entering Highland Pond from the adjacent gravel roads and parking lot; reduction or elimination of fecal coliform bacteria; reduction of nutrient contribution; increased maintenance of the trails; providing public outreach regarding best practices for using fertilizers near wetlands and the importance of pet owners properly disposing dog feces; and bringing the pond's depth to a sustainable habitat depth (dredging). It is quite possible that grant money could be used to greatly offset the cost of this approach. The Town of Greenfield has a unique and valuable resource in Highland Pond. With sound management, the pond and surrounding parking can be enjoyed by the public for generations to come.

Enclosures:

- Meeting minutes from:
  - January 22, 2015, February 18, 2015 and March 18, 2015
- Reports:
  - "Ecological Report and Management Plan for Highland Pond" by William Lattrell of Valley Environmental Services (1997); and
  - "Preliminary Dredging Plan for Highland Pond: Methodology, Environmental Benefits, Costs and Potential Impacts" by Baystate Environmental Consultants (1999).
- DPW memos by Larry Petrin estimating $440,000 for dredging in 2002 and $580,000 in 2009

App. 20% increase
from 1999 ($350,000)
to 2002
App. 25% increase
from 2002 ($440,000)
to 2009
2021 Estimate - $650,000
to $750,000

2012

Open Space & Recreation Plan 2012

Highland Park

Location
Bear's Den Rd.
Acreage
29.00
Owner/Manager
Mayor

Description: This heavily used recreation area is located south of Rocky Mountain Park and adjacent to the steep western slope of Rocky Mountain. The tract includes the spring-fed Highland Pond and the Bear's Den/Sachem Head area where the Rocky Mountain Ridge line terminates and at which point a view of the western hills and the Deerfield meadows is afforded. Facilities for active recreational pursuits are provided and this scenic forested area allows for passive activities. There are four clay tennis courts and a hiking trail network. The park is only one half of a mile from the center of Town and one-quarter mile from two senior citizens' apartment complexes, and therefore has the potential to be enjoyed by many persons of different age groups. Both joggers and dog walkers use the trail system extensively. The pond was formerly a primary site for pond skating for over 75 years, with a warming hut staffed by volunteers on winter weekends.

Planned Actions and/or Recognized Need: It is recommended that this property be consolidated with the Rocky Mountain Park area to the north and the Old Municipal Golf Course to the south. It is hoped that more hiking trails, bikeways and cross-country ski trails can be established. Although the pond was previously cleared in the winter for ice skating, the difficulty in maintaining the surface and the inability to dredge the pond to maintain a healthy depth has taken this pond off the list of skating sites.

Task Completed?	Action Items	Year
A1e Make needed improvements to Highland Park		
Not Completed	Install new signs	2014
Not Completed	Dredge Highland Pond	2019
Not Completed	Install new playground equipment	2017
Not Completed	Install picnic tables and benches	2017
Not Completed	Maintain trail system	Ongoing

504-01
2002

Greenfield Board of Public Works

Highland Pond / Sachem's Head Management Plan

Original Draft: March 3, 2002 Last Update: September 4, 2002

Purpose The purpose for this plan is to define what the planned management activities are for the Highland Pond / Sachem's Head recreation area. This will allow the Board of Public Works, the Conservation Commission, the Recreation Commission and concerned citizens a chance to review the scope of the planned work and to comment and reshape the plan. This plan may only be amended, added to, and changed by voted of the Board of Selectmen. Any work in the Highland Pond Sachem's Head Parks which is beyond the scope of the work described herein, shall receive the approval of the Board of Selectmen before commencement of the work.

Highland Pond / Sachem's Head Description Highland Pond / Sachem's Head comprises roughly 195 acres of primarily sloped and wooded land bounded by the Mountain Road to the north, private land and Peabody Lane to the west, private land to the south (but close to Montague City Road), and private land and Mountain Road to the east. This park is designated for the following recreational uses: 1) skating, fishing and non-motorized boating on the 2.1 acre pond, 2) a cluster of 4 red clay tennis courts, and 3) hiking, cross country running and cross country skiing on the 4.1 miles of woodland paths and on a one mile long, 12' wide gravel hiking trail.

Planned Maintenance Areas:

1) **The Highland Pond water body** has an average depth of 2.5 feet and has cat-nine tails slowly spreading in the northwest corner of the pond. The pond has been studied both from an ecological and recreational point of view. The resulting report has recommended a dredging project to enhance the skating and fishing aspects of the pond if the Town wishes to keep it viable for these purposes. Dredging would require a $350,000 appropriation but up to half of that cost might be grant eligible. Dredging would not be with in the scope of this maintenance plan and would require rigorous environmental reviews.

This plan would only allow entering the pond to a) remove tires, shopping carts and other un-natural debris that vandals throw into the pond and b) to place safety fence around the spring area where the ice doesn't freeze well for skating. Individuals wearing waders and carrying hand tools only do both of these tasks.

In winter, snow blowers and small tractors are driven onto the ice for the purpose of clearing snow and scraping the ice. Once or twice during a winter, water is sprayed from fire hoses to restore the smooth surface of the ice.

2) **The banks of the pond** are mowed two or three times annually on the north end. This area extends from the warming hut northerly and around to the spring area on the west side of the pond. A tractor does this mowing with a side arm mowing attachment so that the wheels of the tractor are 6 to 8 feet from the pond at all times. This mowing averages about 15 feet wide and is to be done in November or December. There is a wooden ramp that helps skaters walk from the parking lot / warming hut to the pond edge. Occasionally boards need to be replaced on this ramp; and every 5 to 8 years the entire structure is replaced.

3) **The Warming Hut** is a small, cinder block building used almost exclusively for skaters to warm up and as a concession booth. Normal building maintenance (i.e. roofing, painting, cement work) is conducted periodically on this building and the electric lines that serve it.

4) There are **two gravel roads** in the park a) the access road which is one way from Peabody Lane around the south and east sides of the pond and b) a hiking road from Peabody Lane through the park to Mountain Road. There are **three gravel parking areas**: a) just south of the tennis courts (4 car capacity), b) on the east side of the pond (35 car capacity) and c) on the east sloping side of the Mountain Road (2 cars).

Gravel road a) and the parking lots require annual regrading in the late spring to maintain an adequate grading for car travel. Grading involves filling the low areas with new gravel as needed and scraping the surface smooth with a large tractor-grader. Typically, compacting the gravel surface with a heavy steel wheeled roller follows this.

There are several area lights on utility poles that illuminate the skating area and parking lots. These require routine bulb changing and fixture replacement as needed.

Brush growth within six feet of the gravel edges, is cut down once per year in November or December using a side arm mower. Dead and dying branches and trees that could fall in these graveled areas are removed for safety of park users.

The gravel walkway through the park occasionally has isolated areas that need gravel raked in by hand and rolled with a steel wheeled roller. Catch Basins and drainage pipes crossing these graveled areas need to be flushed of soil and debris, in some cases once a year. Our large truck equipped with a large nozzle to suck out the catch basins and a smaller nozzle to flush through the drainage pipes accomplishes this.

5) There are nearly 4 miles of **woodland trails** through the park that are used for hiking and in winter, serve as cross-country ski trails. Dead and dying branches and trees are removed from along these walkways if they could potentially fall on the pathway and injure a hiker. Also any brush that obstructs the narrow path might be removed. It is possible that a washout on one of the paths might require repair with hand tools and gravel but this is very rarely needed. Trail markers are repaired or replaced as needed.

6) **The tennis courts** are accessible from the public road. The lawn area (approximately 1.6 acres) around the four courts is mowed weekly throughout the growing season. Red clay and stone dust are stored in the early spring in the parking area south of the courts. This clay is hand spread and rolled with a small steel wheeled roller and then topped off with stone dust. Plastic edge lines are set by hand with long roofing nails. The court is surrounded by tall chain link fence which is repaired as needed with hand tools. In very dry weather, calcium chloride crystals are added to the tennis court surface to cut down on blowing dust.

7) **There is a flat area of roughly 2.5 acres**, which is directly south of Highland Pond and bounded by the gravel access road on the south and east, by the tennis court land to the west and by the 100 foot buffer zone of the pond to the north. This area was once a mowed lawn with picnic tables. The Recreation Commission has expressed interest in placing several new picnic tables in this area in the future, but until there is an amending vote by the Board of Selectmen, maintenance shall be restricted to clearing of brush from above the five foot paths that pass through this area. This cutting shall be done in November or December.

file 5U1-01
1999

Preliminary Dredging Plan for Highland Pond

Methodology, Environmental Benefits,

Costs and Potential Impacts

Prepared for: John F. Bean, P.E.
Superintendent
Department of Public Works
14 Court Square
Greenfield, MA 01301

Prepared by: Baystate Environmental Consultants, Inc.
296 North Main Street
East Longmeadow, MA 01028

December 10, 1999

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INTRODUCTION

Highland Pond is a small 2.2± acre pond situated in the southeast corner of Greenfield along the western base of Temple Woods Ridge. As documented in the "Ecological Report and Management Plan for Highland Pond" (Valley Environmental Services, 1998), the lake has seen changes in recent years including:

- The shallow infilling of the pond with sediments and organic accumulations,
- the proliferation of aquatic weeds and emergent wetland vegetation along the pond margins, and
- a simultaneous reduction in recreational use of the pond by the citizens of Greenfield.

Part of the recommendations of the Management Plan was to investigate a dredging program for Highland Pond. Baystate Environmental Consultants, Inc. (BEC) was contracted by the Town of Greenfield to conduct a preliminary investigation of the potential benefits risks and costs associated with the dredging program as well as to identify the best methodology for such a program. As per our contractual arrangement with the Town of Greenfield the specific elements of this report include the following:

1. A description of the environmentally best practice and construction methodology for dredging the pond.
2. An estimated time line for the dredging program and the recovery of the ecosystem.
3. A description of the expected ecosystem improvements and short term disruptions.
4. A description of the mitigation measures that will be employed to protect wetland resources.
5. A preliminary estimate of the expected construction costs including the implementation of mitigation measures.

This following report presents a detailed discussion of each of these issue areas and presents a addition information that is relevant to the Town of Greenfield in consideration of the dredging of Highland Pond.

DREDGING METHODOLOGY

Overview

The dredging of Highland Pond will involve the removal of significant amounts of soft sandy silt and organic sediments. The expected result of the dredging is a deeper, aesthetically pleasing open waterbody. With the increased water depths and without the soft sediments, the pond should be more conducive to both summer and winter recreational usage.

The depth of pond dredging was assumed to be as proposed in the 1998 "Ecological Report and Management Plan for Highland Pond" (Valley Environmental Services, Inc.). The dredging program as identified in this report recommended the removal of 16,000 cubic yards (CY) of dredged materials, deepening the pond about 4 feet (to a maximum depth of 8 feet, with a 1 ft. vertical to 4 ft. horizontal side slope). The recommended depth was based upon potential improvements to water quality and improving the potential for winter ice formation and recreational skating. The deepening of the pond would remove nutrient rich sediments and light penetration to the bottom, both of which support aquatic weed growth. Further, the deeper water column would limit the effect of groundwater influence on pond temperature, which can inhibit winter ice formation.

Three excavation methodologies are generally considered feasible for lake dredging; namely:

1. Conventional excavation under dry conditions (i.e., pond drawdown);
2. Hydraulic dredging under pond full conditions, and
3. Bucket dredging under pond full conditions.

1. Conventional Excavation with Pond Drawdown: Conventional excavation under conditions of Pond Drawdown is often recognized as the least expensive alternative for small waterbodies. The waterbody is drained to the maximum extent feasible, and the bottom sediments are removed with an excavator or backhoe and are either loaded directly into trucks or stockpiled and subsequently loaded for removal. Inflow streams must be temporarily re-routed or channelized during the work period. Under the best of scenarios, the lake is drawn down below the depth to be excavated and is kept dry while the construction equipment is operated on the consolidated parent soil materials beneath the accumulated sediments.

2. Hydraulic Dredging: With hydraulic dredging, sediment withdrawal and pumping equipment are mounted on a floating barge, which operates within the pond under normal water surface conditions. A suction pipe and cutterhead are controlled from the dredge and lowered through the water and into the accumulated sediments. The dredge's centrifugal pump creates a strong suction, which then transports a water and sediment slurry through a pressure pipeline laid across the pond and to a disposal/containment area. The dredging limit is controlled hydraulically or by cables, which raise or lower the cutterhead to attain the desired depth of excavation. The dredging barge itself may be moved across the water surface by a winch and cable arrangement, by self-power, or by a workboat. Various hydraulic dredge manufacturers have differing methodologies and sizes to essentially effect the same process.

Field studies by BEC and others have shown that cutterhead dredges create little ambient turbidity when properly operated. The cutterhead may re-suspend a small fraction of very fine sediments, but this is discernable only in the immediate vicinity of the cutterhead, since the suction line creates an inward flow to the work area. Some dredges may also be outfitted with a turbidity hood, which helps contain the suspended sediments until they are drawn into the pipeline. BEC's past monitoring has reported no significant increase in turbidity in the water column as close as fifty feet from active dredging.

3. Bucket Excavation/Dredging: Bucket dredging in the wet involves the use of a clamshell or dragline working from the shore or from a floating barge. Excavation takes place through the water column and, historically, has been the methodology of choice in shallow salt-water settings for the removal of sand and gravel or in settings where the creation of turbidity and excessive sedimentation is not an issue. However, in a lake setting such as at Highland Pond, this methodology poses several problems. From a permitting perspective, this method is quite problematic due to the high turbidity levels typically created by the re-suspension of sediments. In consideration of the high percentage of fine materials in the sediments, suspension of materials would be extensive within the pond and would likely impact downstream waters.

Highland Pond cannot be dredged solely from its shoreline due to its size and access restraints; therefore, materials would need to be barge-loaded and then transported to shore for off-loading. Re-handling of dredged materials is costly. Finally, this process does little to de-water the sediments, which would probably necessitate temporary on-shore stockpiling. As such, this is an expensive and environmentally unsound alternative that will not be further considered for this project.

Each of the above dredging methodologies was reviewed for applicability to a dredging program at Highland Pond. Based upon our evaluation, conventional excavation was determined to be the most feasible for Highland Pond for economic, engineering and environmental reasons. Bucket excavation/dredging was clearly infeasible for the reasons cited above and is not discussed further. However, both conventional excavation and hydraulic dredging would have applicability to Highland Pond, Therefore, both of these techniques and their potential applicability to the dredging program Highland Pond are described below in greater detail.

Conventional Excavation

Conventional excavation utilizes standard earthmoving equipment such as excavators, front-end loaders, backhoes, and/or bulldozers to excavate the accumulated sediments and load them directly onto dump trucks or stockpile for subsequent loading.

Two key elements must be analyzed, namely control of water during construction, and the depth to a hard substrate on which equipment may operate. The firm bottom at Highland Pond is present at a shallow depth and should support equipment, with limited requirements for supplemental support (e.g.- timber mats) anticipated. Equipment could enter the pond after drawdown from a staging area located within the open areas east of the pond; the point of entry would most likely be north of the warming hut, near the center of the pond. Historic and physical evidence indicates that equipment may operate and maneuver on the granular, original pond bottom. The soils in the Highland Pond watershed are predominately formed in glacial till, which indicates a strong likelihood that dewatering of the pond will not uncover or expose significant springs or "quick" areas. If soft or "spongy" pockets are discovered, construction mats or low-ground-pressure equipment may be required in minor areas of the pond.

The water level in Highland Pond is established by the primary (uncontrolled) spillway, which consists of a 12" cast iron pipe set at almost the top of the low embankment dam. The dam which forms Highland Pond is of unknown construction, but it is believed that a low level pond outlet does not exist.* In fact, the downstream wetland area is relatively high as compared to the pond's normal water surface elevation; thus, it is doubtful that a low-level outlet would be of much use in dewatering the pond. This is a significant consideration, as the recommended dredging plan requires excavation of sediments several feet below the normal pond elevation. Experience has shown that attempting to handle loose, silty sediments in a wet condition (i.e. – under water) results in inefficient and incomplete removal and a general deterioration of the conduct of the work. If conventional excavation is the chosen dredging methodology, alternative methods will be required in order to allow the sediments to sufficiently dewater so that they may be readily handled, loaded, and hauled to the disposal site. * GATE VALVE EXISTS 10/22/02 LFP

The use of a temporary siphon at the dam to further lower water levels is obviated, as the stream channel below the dam is not lower than the anticipated depth of dredging. Therefore, pumping is the most evident method available to further dewater the pond during conventional excavation. By digging a sump to an elevation below the final dredging depth and constantly pumping the collected waters, the active work area could remain relatively dry and workable. Pumping would add considerable expense to the excavation process, which will be factored into the comparative cost estimates. The glacial till soils within the Highland Pond watershed will actually facilitate pumping of the residual waters from the pond, as these soil types are not prone to excessive weeping or underground springs. These soils are characterized as having low moisture capacity and generate relatively large amounts of runoff during precipitation events. In other words, when it rains, the Highland Pond watershed is prone to generate considerable amounts of runoff. When it is not raining, the watershed is relatively dry and the streams which feed Mill Pond diminish significantly in flow and may even altogether stop flowing during the summer months when evaporation and vegetative transpiration are high. By timing the excavation work to occur during the period in which the watershed is most likely to be dry, pumping requirements can be held to a probable minimum. While the summer of 1999 was unusually dry, it can be expected that during a normal year the flow of water into Highland Pond is generally very low during the mid- to late-summer period.

To initiate the dredging process, the pond should be first pumped of its free water content, to the maximum extent practical. Discharge of clear water could be made through the existing spillway pipe. After this initial dewatering has taken place, a sump should be excavated within the pond near its northeasterly or northwesterly corner, in an area easily accessible by the contractor for maintenance during the project. This sump should be established as the point of continued dewatering of the pond by pumping.

During the period of excavation, the flow of water into the pond should be directed to the sump. To avoid rising water levels within the drawn down pond, water collecting in the sump must be lifted high enough to flow downstream of the dam. Ideally, a small stilling pool should be created at the point of pump discharge to allow for the settlement of any sediments picked up by the pumping process. At Highland Pond, a small stilling pool could be created from sandbags placed to form a semi-circular cofferdam at the upstream end of the pond spillway pipe. After being discharged into the pool thus formed, the collected flows would utilize the existing discharge pipe and downstream channel. Similar procedures have been found to be very effective at conveying normal base flows through the work area with a minimum of downstream sedimentation.

To summarize, conventional excavation of the sediments will require lowering of the water level within the pond by pumping. By taking advantage of the normal hydrology of the pond and its watershed, pumping requirements can be kept to a minimum. The establishment of a deep sump area and the existing pond outlet can be utilized in order to protect downstream areas from significant sedimentation.

Hydraulic Dredging

As previously noted, hydraulic dredging is performed with the pond water level in its natural state. From the perspective of the pond, this feature minimizes impacts and disruption. Although the dredge equipment utilized for this project would depend upon the particular contractor selected by a bid process, economics dictate that the equipment be sized appropriately to match the sediment quantity and character of the pond setting. Based upon prior experience with dredge projects of similar size and type, BEC has concluded that an Ellicott MudCat® hydraulic dredge, or its equivalent, would probably be the most suitable type dredge for use on Highland Pond (see Appendix).

The dredge is usually delivered to the waterbody on a flatbed truck and could be launched from Town-owned property onto the pond. Usually the dredge is accompanied by a workboat that ferries supplies and personnel to and from the dredge with a two-person crew—the dredge operator and an assistant boat hand to man the workboat and carry out miscellaneous tasks such as cable tie-off and repositioning.

During the actual dredging, the pond would be closed to any recreational use. The production rate of the dredge is dependent upon the work crew's experience and efficiency, the particular nature of the sediments, and the dredge size. For this pond and the proposed volume to be hydraulically dredged, a four- to eight-week dredging timeline would be anticipated.

The MudCat® traverses across the pond by winching itself along a fixed, taut cable. A calibrated depth gauge gives the operator control of the auger position (relative to the pond surface) and, knowing the depth of the bottom materials to be removed, permits the operator to cut and remove a swath of sediment approximately twelve- to eighteen-inches deep by eight- or nine-feet wide. During the operation, the variably pitched turbidity head extends beyond the auger and entraps the material, while the auger delivers the sediment to the suction intake located directly behind the auger. The appearance and function of this auger-type cutterhead design resembles a very wide snow blower.

Upon reaching the end of a cutting path, the operator reverses direction and makes a second cut and continues back and forth in this manner until the desired depth is reached. Since a MudCat® may dredge to a maximum depth of about fifteen feet, dredge reach is not a problem at Highland Pond. Upon completion of the cut, both ends of the traversing cable are laterally and equidistantly repositioned, often by employing pullover cables and tensioning devices ("come-alongs"). By creating an overlap cut (typically 1± ft), the second traversing path of the dredge results in a parallel, and overlapping trench.

The dredge cannot remove large debris, rocks, and stumps. Usually these items are removed individually with chain and winches after sediments have been removed around them. This is not anticipated to be a significant issue within the accumulated sediments at Highland Pond.

It is not unusual for residents living in and around a waterbody like Highland Pond to express concern about potential noise pollution from the dredge. On a prior active dredge project, BEC personnel monitored noise levels and recorded sound pressures of 70 dBA (decibels- "A" scale) at one hundred feet from a MudCat® and 56 dBA at five hundred feet. For comparative purposes, automobile traffic produces readings of about 60 dBA at one hundred feet. A chain saw at five hundred feet has a reading of 64 dBA. Considering the close proximity of several of the houses surrounding Highland Pond, noise could cause perceived impacts to the surrounding neighbors. Work hours could be controlled by appropriate project specifications.

A combination of bottom materials and pond water is pumped from the dredge through a pipeline to a previously prepared containment basin. Commonly, the discharge slurry is up to 20 percent solids by weight (or up to 7 percent solids by volume), and the remainder is pond water. The discharge pipeline for a MudCat® is usually an 8" (eight-inch) diameter polyethylene pipe that is floated across the pond, onto land, and thence to a containment basin.

Typically, the containment basin is an excavated or bermed holding area in which the slurry is allowed to separate by gravity into sediment and water. As noted, more than 80 percent of the slurry is water, which must be discharged either back to the pond or to adjacent watercourses, pending the siting of the containment basin relative to the pond. Thus, the containment basin must be sized to provide an adequate quiescent time to allow the solids to settle, plus provide storage volume for the soft sediments removed. The required volume for the Highland Pond project is approximately 30,000 cubic yards, which is equivalent to 18.5 acre-feet (the acre-foot is a convenient volumetric measurement equivalent to a height of one foot over an area of one acre).

Ideally, the containment basin should be located in close proximity to the pond and not have wetlands on-site. Also, the containment site should be located upstream of the pond, such that the discharges from the containment site can return to the pond via gravity flow. A twenty-four hour detention time is usually sufficient to settle virtually all sediments, including the silt fraction. However, a very small volume of the smallest particles often will remain in suspension or in a colloidal state. Although the percent of material may be very small, the turbidity associated with this fraction is often unacceptable. Based upon BEC's experience with hydraulic dredging programs, the need for flocculating agents is anticipated. Flocculents are electrically charged chemical compounds (i.e., polyelectrolytes) that attract and coagulate very fine particles in a water column until they are heavy enough to settle out of suspension by gravity. Generally, the flocculating agents are dispersed into the discharge supernatant from the containment basin and are then allowed to settle out in a second smaller basin (i.e., a flocculation basin). The discharge from that basin is then sufficiently clear to meet permit discharge standards and may be returned directly to the pond or watercourse.

In addition, as part of a very large hydraulic dredging program in Connecticut, the Connecticut Department of Health laboratory conducted a series of aquatic toxicity tests on flocculents. The additives were judged environmentally benign to aquatic life as well, and that project was successfully implemented without incident, with a second phase in process at this time.

Such a process has been utilized many times in the northeast, including Massachusetts, and although it may appear somewhat complex, it is in practice fairly straightforward and successful when appropriately designed, permitted, and implemented. From an environmental perspective, the hydraulic dredging option can often be more benign than conventional excavation. A drawdown of the pond water level is not required, the possibility of downstream impacts is significantly reduced, and the pond is available throughout the dredging process for aesthetic enjoyment.

The costs for hydraulic dredging can be competitive with those of conventional excavation in large projects where the cost of constructing the containment basin facilities and the mobilization of the specialized equipment can be distributed over a large volume of materials to be dredged. For instance, a containment basin recently constructed in Connecticut at a suitable site had a total capacity of 190,000 cubic yards (cy) and cost $580,000 (1994) to construct. This represented a "surcharge" of approximately $3 per cubic yard, prior to any sediment removal actually taking place. An informed selection of dredging methodology can be made only after considering the financial and operational attributes of each alternative. While hydraulic dredging is technically feasible at Highland Pond, the operational and financial difficulties associated with the siting and construction of the required containment basins may render this alternative economically unattractive in this setting.

Sediment Disposal

Since Highland Pond is within town-owned property, all removed sediments are the property of the Town of Greenfield and, as such, the ultimate disposal of these materials must be a component of the project. Ideally, the material will be excavated and transported directly to the site of its final disposition, regardless of the dredging methodology used. Thus, by handling the materials only once, the total project costs can be minimized.

With the conventional excavation methodology, the sediments would primarily be loaded directly onto trucks for immediate transport. Since transportation costs are a direct function of distance, the closer the disposal site is to the pond, the less the total cost. The materials to be excavated would be de-watered essentially in place at the pond, rather than in a containment basin as with hydraulic dredging. Disposal could be made by creating a permanent embankment at some area in the general vicinity of the pond. Agricultural areas can often be made suitable for this use; after an available field is stripped of topsoil, trucks could dump the excavated sediment directly onto the prepared area. A final grading plan would follow which assured appropriate drainage of the field without adverse impact to abutting lands. The topsoil would be replaced over the deposited materials, thereby returning the property to its original agricultural use. If spread in a layer three feet thick, the volume of material to be removed, 16,000 cubic yards, would blanket an area slightly over three acres. The construction phase disturbance to such a parcel would probably persist for three to five weeks under such a scenario, with a longer period required to re-establish any previous ground cover.

If hydraulic dredging were the methodology of choice, containment basins would be required to separate and store the solids, and a flocculation basin would be required to treat the excess waters prior to their release back to the pond. Due mainly to excessive steepness and lack of open upland areas, the vicinity of Highland Pond does not lend itself to hydraulic dredging and is thus judged impractical from a logistics standpoint and will be considered only as an economic comparison to conventional excavation.

If a Town-supplied disposal site is judged to not be a desirable option, the dredging contract specifications could require the contractor to dispose of the material at an unspecified location. Disposal of the sediments would then become the contractor's responsibility. Since this project will be awarded to the lowest qualified bidder, competing contractors would attempt to turn this into a "profitable" option, which could then result in a lower bid. BEC's past experience, however, has shown that this somewhat speculative approach can yield unanticipated costs, as the success of such a program is based purely on the assumption that at least one of the contractors bidding the project will have a use for the materials or an available disposal site. For financial planning purposes, it is best to provide a suitable disposal site for the contractor's use and provide an alternate in the bid documents which allows the contractor to provide their own disposal options at a lesser price. By allowing the bidders to offer a price deduction (or addition) for off-site disposal, the Town of Greenfield could select this option at bid time if in its best interest. The final bid documents should make provisions for this off-site disposal option in order to take advantage of such a possibility.

Another alternative disposal option would utilize the material at another Greenfield park site or construction project. The material is suitable for non-structural fill or as a topsoil substitute, but could contain debris and refuse which could be undesirable if the materials are to be used in a lawn or ballfield setting. The materials would be ideal for blending with composted materials to create a quality growth medium for general construction use and at area landfills.

ESTIMATED DREDGING PROGRAM TIMELINE

The dredging of Highland Pond using conventional excavation equipment and techniques is a fairly simple operation and should require a six- to ten-week period to remove the desired 16,000 cubic yards of accumulated sediments and bottom materials. The actual time required is a function of the size and resources of the contractor, the weather, the location of the disposal area, and the time of year in which the dredging takes place.

BEC has had good past results with conventional pond excavations in both the winter and summer seasons. In the cold of winter, icing conditions can result in a frozen base upon which to operate, and the frozen sediments can be easily excavated and handled. Due to their high organic content and generally loose nature, frozen sediments are not as solid and tough as frozen soils can be. Additionally, homes during the winter are generally closed tight to the weather and are thus less sensitive to any dust, noise, or truck traffic resulting from the work. Snowfall is generally not a problem as long as the weather stays cold and the snow sublimates rather than melts. Accumulations can easily be pushed away from the work area as required.

Early- to mid-summer is also an excellent time to accomplish a dredging project of this size and complexity. The summer months bring our periods of lowest precipitation, with most runoff occurring in relatively short bursts. On average, the precipitation events producing runoff are rather brief, with work able to quickly resume following the end of rainfall. Drying of sediments by evaporation is at a peak in the summer months, and the long daylight hours provide a larger window of opportunity in which to accomplish the work.

Extreme precipitation events can occur at any time of the year and the potential always exists for the work area to be flooded. The late summer/early fall is generally a poor choice of seasons due to the possibility of hurricanes, which can spawn extreme and extended rainfall events. Similarly, the spring is generally the time of maximum streamflow, leading to difficulties in the control and diversion of water through the work area.

At the end of dredging, the site must be returned to its original condition and the sediment disposal area must be stabilized. Since these operations involve turf establishment, they are best accomplished in the normal seeding seasons—spring and fall. These periods are complimentary to the aforementioned preferred dredging times.

Either summer or winter dredging would be appropriate for Highland Pond from a technical standpoint. Permitting concerns may favor one season or the other. Considering the watershed's limited potential to refill the excavated pond, a summer dredging may result in a partially-filled pond for several weeks at the completion of dredging. Dredging over the winter could take advantage of spring runoff to avoid such an occurrence.

Regardless of season, the following timeframe should be anticipated for the dredging of Highland Pond.

Task	**Time to Complete**
Bid Advertisement	-
Bid Opening	1 month
Bid Award	1 month
Contractor Mobilization	1 month
Dredging of Pond	1.5 – 2.5 months
Restoration of Disturbed Areas	1 – 2 months
Total Time from Bid Advertisement	**5.5 – 7.5 months**

PRELIMINARY ESTIMATE OF CONSTRUCTION COSTS FOR RECOMMENDED DREDGING PROGRAM

In order to assist in selecting the best methodology to remove the previously identified 16,000 cubic yards of sediments from Highland Pond, preliminary cost estimates were prepared for hydraulic dredging and for conventional excavation.

The cost estimate for conventional excavation was also computed. Table 1 itemizes the estimate to excavate the 16,000 cubic yards and dispose of the material at a Town-supplied disposal site within one mile of the. This cost estimate totals $284,000, which also includes a ten-percent contingency. The corresponding per cubic yard price is $17.75 per cubic yard.

The hydraulic dredging cost estimate (Table 2) includes construction of containment basins on an unspecified parcel located within one-half mile of the pond, dredging of the pond with a barge-mounted hydraulic dredge, and restoration of the containment site to a lawn area by regrading and seeding. The cost estimate totals $480,000, which includes a 10 percent contingency for minor construction items. This estimate equates to $30.00 per cubic yard of sediment removed. Note that the construction of the containment basins, including restoration of the utilized field, accounts for $22.55 of this per yard amount.

From a cost perspective, the conventional alternative is clearly the most achievable dredging methodology. For fiscal planning purposes, the Town of Greenfield should anticipate a $350,000 construction budget which includes final design and permitting, including an Environmental Notification Form (ENF) as per MEPA). Table 3 recaps the total costs associated with the recommended project.

Other than cost, several factors favor the conventional excavation alternative. The number of bidders interested in a conventional dredging project will be greater than for the more specialized hydraulic dredging option. Not only will the competition thus be more competitive, local contractors will be more apt to show interest in a conventional excavation project. The overall timeframe of the project would likely be shorter with the conventional alternative, as the drying period for sediments within the containment basins will not be required.

By providing the bidders with the opportunity to provide their own disposal options, the final low bid price may even be less than the estimated removal costs. The Town of Greenfield should identify potential disposal sites prior to proceeding with final design and permitting of this project. Also, BEC recommends a mid- to late-summer construction schedule, which increases the likelihood that low flow conditions will be experienced.

Potentially reducing the price for any of the methodologies would be the beneficial reuse of the dredged material. If the Town could provide a local and convenient disposal or stockpiling area for the soils, this could significantly reduce contractor costs for transport or disposal. Additionally, the Town could potentially screen the material, combining it with other soils and

ECOLOGICAL REPORT

and

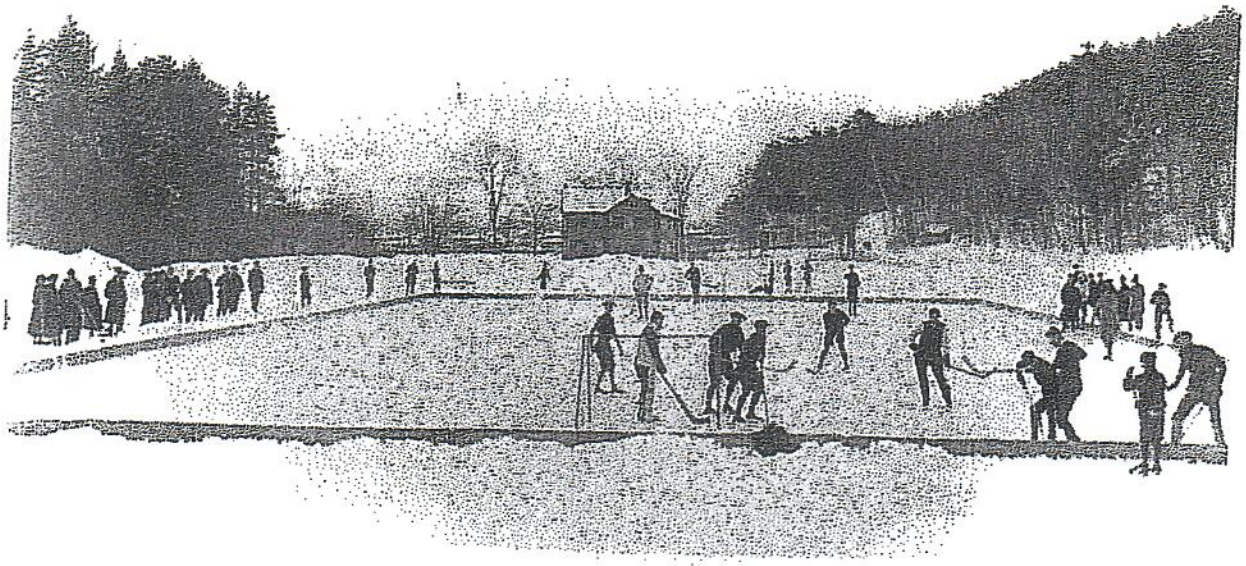
MANAGEMENT PLAN

for

HIGHLAND POND

in

GREENFIELD MASSACHUSETTS



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Addendum to Highland Pond Restoration

'Philip Elmer' via Community Preservation Committee <cpc@greenfield-ma.gov> Wed, Nov 30, 2022 at 4:26 PM
Reply-To: Philip Elmer <ped@me.com>
To: cpc@greenfield-ma.gov
Cc: Marlo Warner <marlo.warner@greenfield-ma.gov>, "alan.twarog@greenfield-ma.gov" <alan.twarog@greenfield-ma.gov>

Christian, Just learned about hydro-raking, a less disruptive alternative to traditional dredging. Could you add the first few pages as an addendum to my submission? Thanks.

https://www.solitudelakemanagement.com/blog/remove-nuisance-aquatic-plants-and-accumulated-muck-with-hydro-raking/

Hydro-Raking for Aquatic Plant and Muck Control

Remove Nuisance Aquatic Plants and Accumulated Muck with Hydro-raking

Whether you enjoy fishing, boating, or swimming, nearly everyone has a lasting memory that centers around a great experience at a lake or pond. Unfortunately, the effects of time can slowly alter the appearance of a waterbody until it no longer resembles the place you fondly remember. Just as you age, lakes and ponds have a lifespan that is dependent on many factors, including vegetation growth, muck buildup, and more. If it is not properly managed, a body of water will eventually fill in with organic materials until it is no more than a small puddle. Luckily, there are strategies available to help restore the longevity of your favorite lake or pond.

Hydro-raking is a tried and true solution to help restore mature waterbodies.

Hydro-rakes can operate in most bodies of water, including those as shallow as 18 inches, and up to depths of 10 feet. A hydro-rake is best described as a floating barge containing a mounted backhoe arm (boom and dipper) with a York rake attachment. These attachments are used to scoop organic materials out of the waterbody, with the ultimate goal of improving water quality, increasing water volume, reducing bad odors, and creating a healthier, more balanced aquatic ecosystem. Most often, this entails the removal of decaying organic matter, leaf litter, tree branches, nuisance or invasive plant species, and other debris from the waterbody.

Invasive Plant Removal

While native aquatic plants are often beneficial for lakes and ponds, the presence of certain nuisance and invasive species can cause the balance of an ecosystem to spiral out of control. Invasive milfoil, fanwort, and water chestnut, for instance, create dense mats in the water that block sunlight and exhaust dissolved oxygen. These invasive plants reproduce rapidly through both seed propagation and fragmentation. Native plants like cattails and water lilies can also be considered undesirable, depending on the extent of growth and the management goals for the waterbody. Lake and pond owners may utilize hydro-raking to physically remove nuisance and invasive plants. Depending on the undesirable plants present, a professional lake manager may recommend time frames throughout the year most conducive to plant removal via hydro-rake. An effective hydro-raking project will be completed at times when plant fragmentation is least likely in order to ensure lasting results.

Seasonal Control of Aquatic Weeds

to ensure thorough management of the problematic plant. While hydro-raking serves as an effective management tool for the removal of rooted and submersed nuisance plant species, other species can be best managed with additional strategies, like mechanical harvesting, which targets algae and floating leaf plant species such as water hyacinth and giant salvinia.

Utilizing Hydro-raking to Restore Eroded Shorelines

Your waterbody does not need to be overrun with undesirable plants to experience the positive results of a hydro-raking project. Often, it is the best management solution for lakes and ponds containing thick bottom sludge or years of accumulated muck. A hydro-rake can collect up to 500 pounds of muck in each scoop and deposit it on the shore for off-site disposal. Or, the muck can be used to reshape crumbling shorelines using a patented bio-engineered shoreline system called SOX Solutions.

Removing Nutrient-Rich Organic Muck

The removal of this muck can be a critical turning point for a lake or pond suffering from poor water quality, bad odors, flooding issues, or nutrient pollution. As leaves, grass clippings, trash, and other debris are swept into a waterbody by runoff during rainstorms, they begin to decompose. This causes them to release unnaturally high levels of nutrients that fuel invasive plant infestations as well as Harmful Algal Blooms, which can produce dangerous toxins with suspected links to degenerative diseases like Parkinson's, Alzheimer's, and ALS.

The removal of this nutrient-rich organic material can prevent undesirable plant and algae growth while improving water quality and volume. Ultimately, the best method to ensure your lake or pond maintains its health is preventative management. Biological dredging, for instance, utilizes beneficial bacteria to naturally eliminate excess muck at the bottom of a waterbody. This management tool is excellent for lakes and ponds in need of minor spot dredging or upkeep. Other proactive strategies aimed at reducing muck build-up and nutrient loading include buffer management, nutrient remediation, and aeration tools.

Hydro-raking can be extremely effective at removing plant matter, organic material, and debris, but mechanical dredging or hydraulic dredging can serve as transformative solutions that will increase depths and remove plant fragments, sediment, and other debris from the site. Though typically thought of as costly and more disruptive, dredging is often the best approach for lakes and ponds that have been neglected or misused for long periods of time. And with the help of bathymetric mapping technology, your lake management professional can help you quantify the rate of sedimentation and predict when dredging will eventually need to take place. With this information, you can better budget for and strategize your future dredging project. It's never too early—or late—to begin implementing strategies that restore your waterbody for lasting beauty and enjoyment for years to come!

Invasive Weeds Are Under Contr

We have been using SOLitude's services for the past three years for managing the neighborhood lake. Their serv
water hyacinth is now under control without harming the marine ecosystem. The technician who services th
complaints of the resident are taken care of. Will definitely recommend their service, especially

Paromita Ganguly

Palm Harbor, FL

What Is Hydro-raking?