APPENDIX A

PROJECT DESCRIPTION

1.0 Introduction

The "Applicant", the Massachusetts Department of Conservation and Recreation - Lakes and Pond Program (DCR), is seeking approval to initiate an Aquatic Management Program in the Lower Basin of the Charles River.

The objective of the management program is to provide site specific control of growth of submersed non-native and invasive aquatic plant species, specifically Eurasian watermilfoil (*Myriophyllum spicatum,* EWM), variable watermilfoil (*Myriophyllum heterophyllum*), curlyleaf pondweed (*Potamogeton crispus*), fanwort (*Cabomba caroliniana*), water chestnut (*Trapa natans*), spiny/brittle naiad (*Najas minor*) and algae to restore and improve the natural capacity of the Charles River by maintaining open water habitat, fish habitat and water quality, promoting the growth of less pervasive native plant species, and providing safe recreational access/appreciation of the River. Based on the type, distribution, and density of vegetation within the Lower Basin of the Charles River, it has been concluded that the restoration goals of the Applicant can best be achieved through an integrated management plan utilizing monitoring, mechanical harvesting, and the prudent use of USEPA/MA Department of Agricultural Resources (MDAR) registered herbicides and algaecides.

The proposed project has been filed as an Ecological Restoration Limited Project under 310 CMR 10.53(4) and will sustain the interest identified in the Wetland Protection Act (MGL c.131 s.40) by controlling a nuisance species, improving fish habitat, improving water quality and slowing waterbody eutrophication.[1] The presence of invasive species within the Lower Basin of the Charles River likely result from direct anthropogenic influences including the River's high recreational use via boats which spread invasive aquatic plant species, unintended but increased nutrient input from surrounding developed land and roadways, and the possible innocent dumping of aquarium trade plant species. It is important to remember that "no amount of watershed management will control an existing infestation

- Rooted aquatic plant growths are not controlled by clean water
- Increased water clarity may extend plant growth
- Watershed management complements in-lake management."[2]

2.0 Site Description

The Charles River begins in Hopkinton and flows generally eastward through 23 cities and towns, over approximately 80 miles in total, before reaching the Atlantic Ocean in Boston Harbor.

Lower Basin of the Charles River[3]	
Surface Area (acres)	Approximately 705
Estimated Mean Depth (feet)	6
Estimated Volume	4,230 ac-ft 1.38 billion gallons
Dominant Plant Species	Eurasian watermilfoil Southern naiad Spiny/brittle naiad Filamentous algae

For purposes of this Notice of Intent, focus will only be on what is referred to as the Lower Basin of the Charles River. The Lower Basin begins at the Watertown Dam in Watertown and ends at the New Charles River Dam. The shoreline along the Lower Basin supports extensive urban development beyond the parks systems and vegetated buffer along the river's edge. The Lower Basin is frequently used for boating, fishing, research efforts and

[1] Department of Environmental Protection. Guidance for Aquatic Plant Management in Lake and Ponds as it Relates to the Wetlands Protection Act: April 2004, 1p.
[2] Practical Guide to Lake Management in Massachusetts, Commonwealth of Massachusetts, Executive Office of Environmental Affairs, 2004, p. 22.
[3] Estimates based on observed and reported conditions

passive wildlife viewing; swimming in the Charles River is currently only allowed if a permit is obtained due to safety issues.

Additionally, there is currently a floating wetland island pilot project in the Cambridge portion of the Lower Basin, between the Longfellow Bridge and Museum of Science. That project has been taken into consideration for the management approaches included in this filing so that any potential negative impacts can be avoided to the best of our ability. Information as it relates to potential impacts is included in later sections.

3.0 Problem Statement

The Lower Basin of the Charles River is an urban waterway with varying densities of submersed and floating leaf aquatic vegetation growing along the sides of the main channel and in the shallower eddies created after constriction points. Although the River flows slowly overall, these shallow littoral areas are areas of slower moving water, composed of nutrient rich sediment deposited over years, and support sparse to dense growth of non-native and native submersed vegetation.

This management program is being implemented as the local boating community has voiced escalating concerns in recent years about the impacts and safety hazards the aquatic plant growth within the Lower Basin of the Charles River poses to their recreation. This project has been undertaken in coordination with the boating community, the Charles River Watershed Association (CRWA) and the Charles River Conservancy (CRC) to ensure the management strategies can achieve the overall recreational goals for the Lower Basin of the Charles River, as well as protecting the native aquatic plant species and habitat.

During the summer of 2019, a comprehensive point-intercept survey was undertaken throughout the littoral zone of the Lower Basin. Using the data collected during this effort, the management approaches and strategies within this Notice of Intent application were developed. Based on the management goals of the Applicant, an integrated management program focusing on monitoring, with mechanical harvesting and treatment with US EPA/MDAR approved herbicides, and contingent treatment with US EPA/MDAR approved algaecides, is proposed to control the non-native plants, and potentially harmful algae growth, respectively to maintain open water conditions and desirable water quality.

DCR is aware that the Lakes District portion of the Charles River is the upstream source of many of the invasive aquatic plant species present in the Lower Basin. A comparable comprehensive point-intercept survey effort is planned for this (2021) growing season to collect the same types of data for that portion of the river. The overall goal will be to file Notices of Intent for management approval within the respective municipalities of the Lakes District, which will include the same and similar management approaches to those included in this application, as applicable.

As sea level is projected to rise, with changes in storm intensity and frequency, along with other consequences of climate change, the resource area that is the Lower Basin will only continue to expand as the water rises. Unfortunately, this also means that the potential habitat for aquatic invasive species growth will expand and have a greater potential to spread within the Lower Basin and/or elsewhere if transported away. Even if climate change consequences were to increase the flow of the river, the invasive growth would still exist as other rivers throughout the northeast with greater flow rates than the Charles are also plagued by invasive aquatic plant growth.

A very similarly designed management program has been implemented previously at the Mystic River in Medford and Somerville and the Malden River in Everett and has been successful over the last decade of management. That program originated as solely water chestnut management via mechanical harvesting and hand-pulling efforts. As a result of a significant decrease in water chestnut growth, Eurasian watermilfoil quickly continued establishing itself in the newly available growing habitat. Waterbody systems are dynamic, so the need for any aquatic plant management program to be adjusted over time to address changing issues is crucial. Today at the Mystic River, water chestnut management continues but on a much-reduced level when compared to when the program was initiated. Eurasian watermilfoil management has varied through the years, but since the back-to-back years of a "whole-river" low-dose Sonar (fluridone) treatment program in 2017 and 2018, only spot-treatments utilizing ProcellaCOR EC (florpyrauxifen-benzyl) have been necessary to target areas of regrowth.

4.0 Existing Conditions:

As previously noted, the Lower Basin of the Charles River was surveyed extensively in 2019 in two parts, a biovolume survey and a point-intercept vegetation survey.

Biovolume Survey

In early August 2019, the Lower Basin was surveyed to collect biovolume data in order to determine the extent of the littoral zone, or where aquatic plant growth is able to get enough sunlight to grow, to later be surveyed. For the biovolume data collection, the entirety of the Lower Basin was toured via boat equipped with a Lowrance HDS5 unit, which has a 200 KHz echosounder frequency and a ping rate of 20 pulses (dynamic and optimized to water depth) per second. The boat was piloted at 5mph or less, and data collection was conducted in hour-interval mapping runs. Following field collection, the data was uploaded to CI Biobase for quality control verification and interpolation and processed to display aquatic plant percent biovolume and bathymetry. The processed data was then downloaded and reprocessed using Spatial Analyst in ArcMap 10.2. The methodology was performed according to the CI Biobase Use Reference Guide.

Aquatic percent biovolume is the percentage of the water column inhabited by aquatic plants. For example, aquatic plants at the surface would have a biovolume of 100%, whereas 5-foot-tall plants in 10 feet of water would have a biovolume of 50%.

Point-intercept Vegetation Survey

Based on the extent of biovolume measured during the August site visit, the macrophyte survey was performed on September 9-12th, 2019 using the Point-Intercept Method (PIM). The PIM is designed to determine the extent of submersed aquatic plant growth within an area of concern. The total number of survey points is typically based on the total acreage of a waterbody, where one sample location per acre is surveyed at a given site. According to the initial biovolume mapping, the littoral zone is restricted to the shoreline and areas less than 6 feet deep presumably due to water clarity and flow. Point-intercept locations within the river were determined by a 60-meter grid data layer placed over an orthophoto of the river.

During the survey, each predetermined georeferenced point was accessed by boat. At each point, the real-time GPS coordinates of the sample location were recorded using a Trimble Geo 7X, a handheld GNSS system. One rake toss was executed at each site for enhanced detection of target species and other species occurring infrequently.

The Rake Toss Methodology, developed by the US Army Corps of Engineers and modified by Cornell University was used for this survey (Lord and Johnson 2006). The following data was collected for each rake toss: overall abundance of macrophyte growth, relative abundance of each species, and any other pertinent field notes regarding the sample location. The abundance scale defined by this methodology was used to categorize the observed macrophyte growth:

Z Zero: No plants on rake
T Trace: Fingerful on rake
S Sparse: Handful on rake
M Medium: Rakeful of plants
D Dense: Difficult to bring into boat

During the biovolume survey, any observed non-native growth within the survey area was marked with a handheld GPS unit. A throw-rake was used to identify invasive aquatic plant growth areas within deeper water, when observed and/or when necessary.

A total of 18 aquatic plant species were observed during the survey. Overall, vegetation was only present within 64% (355 of 555) of the sites within the calculated littoral zone. Of the eighteen species, six invasive species were observed within that area. Eurasian watermilfoil, southern naiad, and brittle naiad were the three most dominant species within the system. Trace amounts of water chestnut were observed only during the August biovolume survey; no water chestnut was observed during the September survey, likely due to CRWA's dedicated volunteer hand-pulling effort in place. As a result, the total growth of water chestnut within the bounds of the survey area is unknown. Fanwort, curly-leaf pondweed, and variable watermilfoil were observed at a low frequency of sites – this could be a factor of competition with other non-native vegetation within the river, or early-stage infestation. Curly-leaf pondweed is also a cold-water species and usually dies back by late June or early July in this area. A wider distribution of curly-leaf pondweed likely occurs earlier in the season across the river based on anecdotal data.

The full survey report, including maps, is attached to this Notice of Intent application for reference.

5.0 In-Lake Management Recommendations:

5.1 Program Overview:

Five-year approval is requested for the implementation of an Aquatic Management Program at the Lower Basin of the Charles River. The goal of the management program is to control growth of invasive, non-native plant species to improve and maintain open water habitat, promote the growth of less pervasive plant species, and provide safe recreational access throughout the river through an integrated management program. This management program has been developed to be compatible with the resource protection and recreational management goals of the Applicant keeping in mind the regulatory responsibilities of the Newton, Watertown, Cambridge and Boston Conservation Commissions and MA DEP as they relate to the WPA. All the proposed management strategies presented in this filing are approved methodologies in the Commonwealth and are included within the *Massachusetts Final Generic Environmental Impact Review*.

As the jurisdiction of this project spans four municipalities, the following management options sought for approval are applicable for all towns based on the species present through the entire Lower Basin. However, municipality specific information is provided to illustrate the anticipated management techniques based on the 2019 survey data. As with any dynamic system, the ability

to change and modify the management program is paramount to its success; as such we are seeking approval for a variety of aquatic plant management "tools" with the understanding that not all of them may be utilized over the course of a single year or the life of the Order of Conditions. However, proactive management strategies and the ability to respond as needed can be crucial in reducing future environmental or financial impacts.

Control of aquatic invasive species growth between the Watertown Dam and the New Charles River Dam is the top priority of the management program (Appendix B – Figure 1). By controlling invasive species growth within the Lower Basin, the hope and anticipation is that native aquatic plant species will re-establish into the available space left by the invasives once they are managed. The other objectives of improving water quality and maintaining open water habitat can also be achieved through the proposed management strategies.

Each management season, at least one pre-management survey of the Lower Basin will be conducted towards the beginning of the growing season to assess the overall aquatic invasive species growth to understand the distribution and abundance of the target species. Using the data collected during the survey(s), the management approach for that calendar year will be selected accordingly.

Depending on the timing of the management approach(es), interim surveys during the summer months will be conducted as needed for the respective management approach.

Toward the end of each growing season, a post-management survey of the Lower Basin will be conducted. This survey will collect the same data on an annual basis to allow for comparisons year-over-year. The distribution and abundances of the invasive and native aquatic plant species will be documented to understand the management successes, any potential impacts, and to guide the following calendar year's management approach(es). A year-end report will be prepared at the end of each year of management and will be inclusive of all survey data, management activities, future management recommendations, and any other pertinent information as it applies to this project.

Specifically, we are requesting approval for use of mechanical harvesting, hand-pulling, Sonar herbicide (active ingredient: fluridone), ProcellaCOR EC herbicide (florpyrauxifen-benzyl), Tribune herbicide (diquat), Clearcast herbicide (imazamox), and Red Eagle/Clipper herbicide (flumioxazin). Additionally, we are seeking conditional approval for use of algaecides for management of algae blooms, if necessary, in the event of a health hazard. Supplemental information for all proposed management options is provided below in section 5.2.

The proposed herbicides and algaecides specifically affect the target species to be controlled and have a negligible effect on the non-target species and wildlife when applied in accordance with the label directions. All products are applied at or below suggested doses according to the product label. All doses are based on plant types and densities, so that a minimum amount of the chemicals is introduced into the waterbody. Prior to any given year's initial application, a License to Apply Chemicals permit will be obtained from MA Department of Environmental Protection.

The initial year of management is anticipated to be a spot-treatment approach utilizing ProcellaCOR EC (florpyrauxifen-benzyl) herbicide to target Eurasian watermilfoil growth, which is the most prevalent aquatic invasive species in the Lower Basin. The areas of treatment would focus on milfoil growth observed during the pre-management survey effort as well as the 2019 survey. Additionally, hand-pulling of water chestnut plants will be utilized as necessary based on growth observed. This overall approach allows for control of Eurasian watermilfoil growth in the

near term, with the anticipation of a "whole-river" low-dose Sonar (fluridone) herbicide treatment program once the Lake District portion of the river has obtained permits to proceed with management.

No significant alteration to the wetland resource areas will occur as a result of the proposed aquatic plant management program; instead, the resource areas will be enhanced by controlling non-native, invasive aquatic plant species, improving water quality, and improving wildlife habitat.

As previously mentioned, there is a floating wetland island in the Cambridge portion of the River. With our proposed management strategies (primarily herbicides), even those not anticipated for immediate use, there should be negligible, if any, impacts to the plant species currently on the island at the applicable application rates for control of the target species within the River.

The Lower Basin of the Charles River is also under the jurisdiction of the Massachusetts Division of Marine Fisheries (DMF). During each calendar year in which an herbicide treatment takes place, a basic water quality monitoring program will be implemented. The monitoring program will coordinate with DMF's requirements and/or recommendations to ensure the fish species within the Lower Basin are protected. It is also understood there will be a DMF time of year restriction on management activities to protect the running and spawning of the fish; for other similar projects, this has been from April 1 to June 15 or 30. Prior to filing this Notice of Intent application, a meeting was held with various DMF and Division of Fish and Wildlife staff to present the project to them for feedback.

5.1.1 Anticipated Newton Management

The Newton portion of the Lower Basin of the Charles River is the smallest municipal section within this Notice of Intent filing, contributing approximately 11 acres of the roughly 705 acres. Approximately 21 of the total survey points were located within the Newton boundaries of the River. Approximately 18 of those 21 points supported Eurasian watermilfoil growth; 4 points supported fanwort growth; 3 points supported curlyleaf pondweed; and 1 point supported spiny/brittle naiad.

Based on the species and growth observed, management within the Newton portion of the Lower Basin is anticipated to include the following approaches:

- Hand-pulling of water chestnut plants, as needed
- Sonar (fluridone) herbicide for control of Eurasian watermilfoil, fanwort, curlyleaf pondweed, spiny/brittle naiad
- ProcellaCOR (florpyrauxifen benzyl) herbicide for control of Eurasian watermilfoil
- Tribune (diquat) herbicide for control of Eurasian watermilfoil, curlyleaf pondweed, spiny/brittle naiad
- Red Eagle/Clipper (flumioxazin) herbicide for control of Eurasian watermilfoil, fanwort, curlyleaf pondweed, spiny/brittle naiad

As almost all of the survey points within Newton contained Eurasian watermilfoil growth, spot-treatments utilizing ProcellaCOR EC in 2021 are anticipated. The final treatment areas will be determined following the pre-management survey so they can be coordinated appropriately based on Watertown's milfoil distribution.

5.1.2 Anticipated Watertown Management

The Watertown portion of the Lower Basin of the Charles River contributes approximately 67 acres of the roughly 705 acres. Approximately 91 of the total survey points were located within the

Watertown boundaries of the River. Approximately 64 of those 91 points supported Eurasian watermilfoil growth; 16 points supported fanwort growth; 4 points supported curlyleaf pondweed; and 9 points supported spiny/brittle naiad growth.

Based on the species and growth observed, management within the Watertown portion of the Lower Basin is anticipated to include the following approaches:

- Hand-pulling of water chestnut plants, as needed
- Sonar (fluridone) herbicide for control of Eurasian watermilfoil, fanwort, curlyleaf pondweed, spiny/brittle naiad
- ProcellaCOR (florpyrauxifen benzyl) herbicide for control of Eurasian watermilfoil
- Tribune (diquat) herbicide for control of Eurasian watermilfoil, curlyleaf pondweed, spiny/brittle naiad
- Red Eagle/Clipper (flumioxazin) herbicide for control of Eurasian watermilfoil, fanwort, curlyleaf pondweed, spiny/brittle naiad

Watertown's Eurasian watermilfoil distribution from 2019 was more scattered, so based on the pre-management survey results, the treatment areas are anticipated to correspond to the scattered distribution. Areas with few milfoil plants that are localized to smaller areas may not yet be selected for treatment in order to prioritize other areas. Depending on the pre-management survey results, treatment areas will be coordinated as needed with those in the adjacent municipalities' waters.

5.1.3 Anticipated Cambridge Management

The Cambridge portion of the Lower Basin of the Charles River contributes approximately 295 acres of the roughly 705 acres. There were approximately 171 of the total survey points located within the Cambridge boundaries of the River. Approximately 60 of those 171 points supported Eurasian watermilfoil growth; 4 points supported fanwort growth; no points supported curlyleaf pondweed; and 45 points supported spiny/brittle naiad growth.

Based on the species and growth observed, management within the Cambridge portion of the Lower Basin is anticipated to include the following approaches:

- Hand-pulling of water chestnut plants, as needed
- Sonar (fluridone) herbicide for control of Eurasian watermilfoil, fanwort, curlyleaf pondweed, spiny/brittle naiad
- ProcellaCOR (florpyrauxifen benzyl) herbicide for control of Eurasian watermilfoil
- Tribune (diquat) herbicide for control of Eurasian watermilfoil, curlyleaf pondweed, spiny/brittle naiad
- Red Eagle/Clipper (flumioxazin) herbicide for control of Eurasian watermilfoil, fanwort, curlyleaf pondweed, spiny/brittle naiad

Cambridge's Eurasian watermilfoil distribution becomes more scattered going east on the river; there are only few occurrences downstream of the Boston University Bridge. As a result, the areas with greater frequencies of milfoil plants will be focused on as well as higher use recreational areas, such as the portion of the river used for Head of the Charles. The areas selected will be coordinated with those within the Watertown and Boston portion of the river.

5.1.4 Anticipated Boston Management

The Boston portion of the Lower Basin of the Charles River contributes approximately 332 acres of the roughly 705 acres. There were approximately 222 of the total survey points located within the Boston boundaries of the River. Approximately 67 of those 222 points supported Eurasian watermilfoil growth; 8 points supported fanwort growth; no points supported curlyleaf pondweed; and 51 points supported spiny/brittle naiad growth.

Based on the species and growth observed, management within the Boston portion of the Lower Basin is anticipated to include the following approaches:

- Hand-pulling of water chestnut plants, as needed
- Sonar (fluridone) herbicide for control of Eurasian watermilfoil, fanwort, curlyleaf pondweed, spiny/brittle naiad
- ProcellaCOR (florpyrauxifen benzyl) herbicide for control of Eurasian watermilfoil
- Tribune (diquat) herbicide for control of Eurasian watermilfoil, curlyleaf pondweed, spiny/brittle naiad
- Red Eagle/Clipper (flumioxazin) herbicide for control of Eurasian watermilfoil, fanwort, curlyleaf pondweed, spiny/brittle naiad

Boston's Eurasian watermilfoil distribution is very similar to Cambridge's, in that it decreases going down stream. Some higher density points were present near the Esplanade and depending on their proximity to recreational areas, can be targeted for a very localized spot-treatment if necessary based on the pre-management survey results. As previously mentioned, the treatment areas will coordinate with those in the adjacent municipalities' waters.

5.1.5 Potential Future Management

Mechanical harvesting, Clearcast (imazamox) herbicide and algaecides are not anticipated for immediate use in the Lower Basin. Mechanical harvesting will be utilized if water chestnut growth expands to greater distribution/density than is feasibly managed with hand-pulling efforts. At this time, there is minimal water chestnut growth within the Lower Basin of the Charles River.

Clearcast has been included as it is an effective herbicide for foliar spot-treatments of water chestnut growth. As there is minimal water chestnut growth in the Lower Basin at this time, this management approach is a contingency in the event that growth expands rapidly or is within locations that are not suited for hand-pulling or mechanical harvesting.

Algaecides have been included as a management tool in the event of a cyanobacteria (blue-green algae) bloom that may be hazardous to human health. Cyanobacteria blooms are occurring more frequently as climate change progresses and have previously been documented in the Lower Basin of the Charles River. Although treatment of a cyanobacteria bloom is only a short-term solution, the ability to react accordingly when public health may be at stake is crucial (i.e., Head of the Charles Regatta or similar).

Proper herbicide application allows for targeted plant control without posing an unreasonable adverse risk to non-target species and wildlife. Written approval from the Commission will be sought should alternate products be considered in future years. All products proposed for use will be registered for aquatic use in Massachusetts.

5.2 Proposed Products and Management Techniques

The use of chemicals to control nuisance aquatic plant and algae growth is probably the most widely used management strategy for waterbodies with submersed aquatic plant infestations that are beyond effective control with non-chemical techniques like hand-pulling, suction harvesting or bottom barriers. In the case of the Lower Basin, those three non-chemical techniques are not applicable due to safety concerns for those physically involved in the undertaking of each activity. Herbicides that are registered for aquatic use must meet strict federal guidelines and demonstrate that there is not an "unreasonable risk" to humans and the environment when applied in accordance with their product label. According to Madsen (Madsen 2000), "currently

no product can be labeled for aquatic use if it poses more than a one in a million chance of causing significant damage to human health, the environment, or wildlife resources. In addition, it may not show evidence of biomagnification, bioavailability or persistence in the environment".

For Eurasian watermilfoil, curlyleaf pondweed, fanwort and/or spiny naiad control, the areas chosen for herbicide treatment will depend upon the target species' density, distribution, potential for spread based on its location, potential for an effective treatment (i.e., size configuration, potential for dilution, etc.), and overall benefit of control with respect to the river and its users. It is anticipated that most treatment areas will have more dense or more widely distributed infestations; however, it is possible that a smaller, less dense area that is subject to more fragmentation (i.e., a marina or boat club) will also be selected for treatment to prevent further infestation of the target species.

Florpyrauxifen-benzyl (ProcellaCOR EC - EPA # 67690-80 or equivalent)

ProcellaCOR (florpyrauxifen-benzyl) is a recently registered herbicide in Massachusetts and is an effective, milfoil selective, systemic herbicide. After receiving its full aquatic registration from the EPA in February 2018, ProcellaCOR was used in numerous locations throughout the country for control of milfoil and other susceptible invasive aquatic plants. In 2018 in New England, SŌLitude applied ProcellaCOR at approximately a dozen locations in New Hampshire and Connecticut for the control of variable milfoil and Eurasian watermilfoil. In 2019, ProcellaCOR was registered for use in Massachusetts and SŌLitude applied ProcellaCOR at many waterbodies in Vermont, New York, New Hampshire, Massachusetts, Maine, and Connecticut. Results of all treatments performed in the Northeast to date by SŌLitude (approximately 100) have been extremely positive, achieving nearly complete control of targeted milfoil growth with little or no impact to non-target native plants.

ProcellaCOR will be applied to the area at or below the permissible label dose (anticipated to be up to 4 PDU/ac-ft; maximum label rate is 25 PDU/ac-ft). A PDU is a prescription dose unit, which is a unit of measurement that SePRO Corp. (manufacturer of ProcellaCOR EC) developed for ease of calculations in the field. One PDU is equal to 3.17 ounces. Due to the limited contact-exposure time required for control of the target species, concentrations only need to be maintained for hours to several days to achieve management. The anticipated application rates for ProcellaCOR in the Lower Basin of the Charles range from 2 to 4 PDU/ac-ft. Each treatment area will be dosed accordingly based on its density of milfoil plants, density of native plants, configuration, amount of surface area, potential for dilution, average depth and any other influencing factors. The ProcellaCOR label indicates that the rate is also determined based on the acreage of the entire "waterbody" as well as area of influence – each of those will be factored into the decision on application rate for each treatment area. Understanding that MA DMF will place a time-of-year restriction on management activities, the treatment program is not anticipated to be initiated until after the end of the restricted period. Additionally, the slow staggered rate of mortality associated with ProcellaCOR treatment (explained further below) eliminates the potential for low dissolved oxygen related stress to fish and other aquatic wildlife.

The only water use restrictions listed on the current ProcellaCOR™ EC label are all centered around the use of ProcellaCOR treated water for irrigation purposes. There are no restrictions on using ProcellaCOR treated water for drinking water, swimming or fishing. Irrigation restrictions vary depending on what is being irrigated. Turf may be irrigated immediately after treatment without restriction. Irrigation of landscape vegetation and other non-agricultural plants can occur once ProcellaCOR concentrations are determined to be less than 2 ppb or by following a waiting period that is 7 days for the use rates being proposed. The shoreline of the waterbody will be posted with signs warning of these temporary water-use restrictions, prior to treatment. Based on ProcellaCOR's Reduced Risk classification profile issued by the US EPA and its overall brief

presence within the water (24-48 hours maximum; reported photolytic half-life is 0.07 days or 1.68 hours), there are no cumulative adverse impacts anticipated to affect the river as a resource for its users.

Based on the ecotoxicological testing completed for ProcellaCOR, there was no toxicity observed for avian, fish, or other species exposed to the product during both short and long-term studies. It should be noted that these testing efforts included higher concentrations than even those available at the maximum label rate.

The herbicide is quickly absorbed by the target vegetation and translocated within the plant. The mode of action of the herbicide causes impacted vegetation to lose structural integrity at growth nodes. Residual levels of the herbicide in treated water decline rapidly and reduction is due to the uptake by the targeted vegetation and degradation.

Following treatment efforts, the plants within the treatment areas would be anticipated to follow a similar decomposition timeline as follows: within a week of treatment – EWM plants are anticipated to be leaning over within the water column; within two weeks of treatment – EWM plants are anticipated to be leaning and more fallen over within the water column, beginning to brown and get discolored, and if touched, the plants would be anticipated to easily break apart, however fragments of these plants are no longer viable; within three weeks of treatment – EWM plants are anticipated to be completely fallen within the water column and be difficult to find even along the bottom sediment. As a result of the timeframe of decomposition, and minimal amount of area to be managed utilizing ProcellaCOR relative to the overall waterbody acreage, there is no additional concern for an algal bloom beyond what may be present in any one given year at a waterbody of the Lower Basin's nature.

Excellent selectivity and minimal impact to non-target species has been demonstrated with ProcellaCOR treatments that have been performed in the Northeast to date. Of the species reported in the Lower Basin of the Charles River in 2019, the only plants that may show some impact following treatment are coontail (*Ceratophyllum demersum*), and white waterlilies (*Nymphaea odorata*). Coontail is typically not impacted by ProcellaCOR treatments except when using rates of 4+ PDUs/ac-ft, while the white waterlilies may show some discoloration (yellowing) and twisting, depending on their proximity to the treatment area(s), before outgrowing the symptoms. Waterlilies are a hardy and resilient species, with significant root systems, and can easily rebound from the typical impacts of a ProcellaCOR herbicide treatment.

It is anticipated that treatment areas would experience multiple years of control following one treatment effort. However, it is understood that any fragments entering the treated area(s) from unmanaged areas elsewhere in the Lower Basin or upstream in the River may allow for the population to be reestablished within that area.

Impacts Specific to the Wetlands Protection Act using Florpyrauxifen-benzyl

- Protection of public and private water supply – Neutral (no significant interaction)
- Protection of groundwater supply – Generally neutral (no interaction)
- Flood control - Neutral (no significant interaction)
- Storm damage prevention – Neutral (no significant interaction)
- Prevention of pollution – Generally neutral (no significant interaction), but could be a detriment if plant die-off causes low oxygen at the bottom of the river
- Protection of land containing shellfish - Generally neutral (no significant interaction), but reduced algae might reduce food resources for shellfish, and direct toxicity is possible under unusual circumstances

- Protection of fisheries - Possible benefit (habitat enhancement) and possible detriment (food source alteration, loss of cover)
- Protection of wildlife habitat – Possible benefit (habitat enhancement) and possible detriment (food source alteration, loss of cover)

Fluridone (Sonar – EPA # 67690-4 or equivalent)

Fluridone is a systemic herbicide that offers long-term control on invasive (Eurasian watermilfoil, fanwort) and nuisance aquatic vegetation. Fluridone also provides annual control of curlyleaf pondweed and spiny/brittle naiad, but as these species germinate from seed each season, it is not considered systemic control. Fluridone has also been observed to regulate the growth of water chestnut if the fluridone treatment program is initiated prior to the water chestnut rosettes reaching the water surface.

This herbicide hinders the ability of susceptible plants to produce carotene which protects chlorophyll from photodegradation, which results in mortality and subsequent long-term control of the targeted species (i.e., directly impacts the standing population and prevents future spread). This process is known as chlorosis and may be observed visually as the plant begins to lose its green color and take on a white or pink shade. Fluridone requires an extended contact time (45-90 days), so it has historically been used for low-dose, whole-pond treatments where dilution and contact time are more predictable, however, new granular formulations do allow for more effective spot-treatment as well. A series of low-dose applications (booster treatments) would be required to provide the effective contact time within the Lower Basin, likely 3-4 depending on water flow and timing.

Fluridone, when applied at recommended dosages, is generally viewed as having one of the most environmentally friendly toxicology profiles of all products currently on the market. The US EPA has approved a limit of 150 ppb to be allowed in water used for drinking. Ideally, fluridone treatments are initiated early in the growing season when target vegetation is low or starting emergence. Understanding that MA DMF will place a time-of-year restriction on management activities, the treatment program is not anticipated to be initiated until after the end of the restricted period. Additionally, the slow staggered rate of mortality associated with Sonar treatment eliminates the potential for low dissolved oxygen related stress to fish and other aquatic wildlife.

Presently, liquid and slow-release granular formations of this herbicide are available and included under this management plan. For granular applications, the herbicide will be placed into a circular spreader mounted to the bow of the treatment vessel and evenly distributed over the surface of the treatment area. Using the pellet formulations, the active ingredient is gradually released off the clay carrier pellet over a period of several weeks. This allows for a controlled and extended exposure to fluridone concentrations. For aqueous applications to smaller acreage amounts, the herbicide will be placed into an onboard mixing tank, mixed with river water and evenly distributed throughout the surface of the treatment area via boat. This herbicide will be applied under the water surface through trailing hoses, minimizing the chance of herbicide drift and assuring accurate placement over the target species.

For larger aqueous fluridone applications, an onshore, temporarily placed injection unit may be utilized. This unit would allow for more frequent, but lower dose applications to be automatically conducted over the course of many days to months. The injections are calibrated based on the formulation of product to be used, can be remotely operated via mobile device, and can be stopped or postponed as needed based on storm or higher water flow events that could otherwise impact the treatment program. The setup and configuration of the unit would be

coordinated in advance with SePRO (manufacturer of Sonar) staff to ensure the more effective application to the Lower Basin. Injection units like this have been utilized by SOLitude staff for various fluridone treatments to the Croton River (New York City drinking water supply for New York State Department of Environment Conservation) and Delaware & Raritan Canal (New Jersey drinking water supply for New Jersey Department of Environmental Protection).

Where this would be a long-duration, low-concentration treatment program, adjustments in the planned treatment protocol may be needed to accommodate changes in plant response or varying water flow and water volume turnover.

Fluridone water use restrictions include no application within one-quarter mile of a potable water intake and no use of treated water for irrigation purposes within 30 days of application. Although there are no restrictions on swimming, boating or fishing, prudent use suggests that we recommend minimal recreational use for the day of treatment. The shoreline of the river will be posted with signs warning of these temporary water use restrictions, prior to treatment.

Water samples will be collected from multiple locations within the treatment area throughout the treatment program to test for fluridone residues using the manufacturer's FasTEST procedure. Results of these analyses will help guide subsequent booster applications. The sampling protocol is anticipated to correspond to DMF's recommendations.

Impacts Specific to the Wetlands Protection Act using Fluridone[4]

- Protection of public and private water supply – Generally neutral, but may have detriment at high doses (prohibition within ¼ -mi. of drinking water intakes at doses >20 ppb)
- Protection of groundwater supply – Generally neutral (no significant interaction)
- Storm damage prevention – Neutral (no significant interaction)
- Prevention of pollution – Generally neutral (no significant interaction)
- Protection of land containing shellfish - Generally neutral (no significant interaction)
- Protection of fisheries - Possible benefit (habitat enhancement) and possible detriment (food source alteration, loss of cover)
- Protection of wildlife habitat – Possible benefit (habitat enhancement) and possible detriment (food source alteration, loss of cover)

Diquat (Tribune - EPA # 100-1390 or equivalent)

Tribune (diquat) is an effective herbicide for spot-application treatments due to its rapid mode of action and short herbicide concentration-exposure-time requirements. Even though diquat is classified as a contact herbicide, longer term control may be seen as plants' root crowns will not be allowed to develop.

The USEPA/MA registered herbicide diquat dibromide will be applied to the area at or below the permissible label dose. Tribune is a widely used herbicide, applied to greater than 500 lakes and ponds annually, throughout the northeast, to control nuisance submersed aquatic plants. At this time, there are no immediate plans to utilize diquat within the Lower Basin of the Charles River. However, as diquat is a valuable tool in the aquatic plant management toolbox, we are including it in the event an appropriate and justified need arises. Diquat is able to control milfoil, curly-leaf pondweed, or spiny/brittle naiad and other nuisance submersed plants at the application rate of 1.0-2.0 gal/acre, if necessary. Ultimately, diquat would likely only be used to control curly-leaf pondweed and/or spiny/brittle naiad, if necessary, during non-fluridone treatment years (as

[4] Commonwealth of Massachusetts Executive Office of Environmental Affairs. *Practical Guide to Lake Management*: 2004. 133 p.

fluridone is also able to control these species on an annual basis). Milfoil spot-treatments will be conducted using ProcellaCOR.

Temporary water use restrictions for diquat are: 1) No drinking or cooking for 3 days, 2) No irrigation of turf for 3 days and of food crops for 5 days, and 3) No livestock watering for 1 day. There are no restrictions on swimming, boating, or fishing, but prudent herbicide/algaecide management suggests that we recommend avoiding use of the treatment area(s) on the day of treatment. The shoreline will be posted with signs warning of these temporary water use restrictions, prior to treatment.

Diquat is translocated to some extent within the plant. Its rapid action tends to disrupt the leaf cuticle of plants and acts by interfering with photosynthesis. Upon contact with the soil, it is adsorbed immediately and thereby biologically inactivated. Residual levels of diquat in treated water decline rapidly and their reduction is due to the uptake by the targeted vegetation and adsorption to suspended soil particles in the water or on the bottom mud. Photochemical degradation accounts for some loss under conditions of high sunlight and clear waters.

Impacts Specific to the Wetlands Protection Act using Diquat[5]

- Protection of public and private water supply – Benefit (water quality improvement)
- Protection of groundwater supply – Neutral (no interaction as diquat is adsorbed to soil particles)
- Flood control - Neutral (no significant interaction)
- Storm damage prevention – Neutral (no significant interaction)
- Prevention of pollution – Generally neutral (no significant interaction), but could be a detriment if plant die-off causes low oxygen at the bottom of the lake
- Protection of land containing shellfish - Generally neutral (no significant interaction), but reduced algae might reduce food resources for shellfish, and direct toxicity is possible under unusual circumstances
- Protection of fisheries - Possible benefit (habitat enhancement) and possible detriment (food source alteration, loss of cover)
- Protection of wildlife habitat – Possible benefit (habitat enhancement) and possible detriment (food source alteration, loss of cover)

Imazamox (Clearcast – EPA # 241-437-67690)

The USEPA/MA registered systemic herbicide Imazamox will be applied to the area at or below the permissible label dose. Imazamox would be applied to control invasive water chestnut growth at the application rate of 1.5 lbs ae/acre (approximately 1 gal/ac.), if necessary. At this time, there is no immediate plan to utilize Clearcast in the Lower Basin as water chestnut growth is anticipated to be managed via hand-pulling efforts. If and/or when water chestnut growth expands significantly, Clearcast may be utilized for control. Clearcast can be a more financially feasible option to managing large areas of growth as opposed to mechanical harvesting. Additionally, Clearcast is a great option for managing water chestnut growth that may be inaccessible to a mechanical harvester and/or hand-pulling.

As Clearcast would be applied as a foliar application that is conducted using a hand-held gun sprayer from a low-volume pump system, the herbicide would be diluted onboard the treatment boat with river water and a spray adjuvant would be added to ensure the product adheres to

[5] Commonwealth of Massachusetts Executive Office of Environmental Affairs. *Practical Guide to Lake Management*: 2004. 124 p.

and remains on the water chestnut rosettes for maximum uptake. Treatment is usually conducted between the end of June and the end of August – once the rosettes have surfaced, but prior to the nutlets dropping from the plants into the River. By conducting a foliar application this way, the water chestnut plants can be easily targeted with little to no non-target impacts. Clearcast is quickly absorbed by the water chestnut foliage and rapidly translocated to the growing points within the plant, stopping growth. Treatment would not be conducted when there is any rain forecasted within the day to ensure maximum uptake by the plants. Additionally, if the wind speeds exceed 10 mph, treatment would be rescheduled accordingly to prevent any drift to non-target species.

Temporary water use restrictions for Imazamox are: 1) No drinking or cooking until residue testing results are below 50 ppb, 2) No irrigation until concentrations are below 50 ppb. There are no restrictions on swimming, boating, fishing, watering of livestock, or domestic use, but prudent herbicide management suggests that we close the treatment area on the day of treatment. The shoreline will be posted with signs warning of these temporary water use restrictions prior to treatment.

Impacts Specific to the Wetlands Protection Act using Imazamox

- Protection of public and private water supply – Generally neutral, but may have detriment at high doses (setback of treatment required, with distance based on dose and area treated)
- Protection of groundwater supply – Neutral (no interaction)
- Flood control - Neutral (no significant interaction)
- Storm damage prevention – Neutral (no significant interaction)
- Prevention of pollution – Generally neutral (no significant interaction), but could be a detriment if plant die-off causes low oxygen at the bottom of the lake
- Protection of land containing shellfish - Generally neutral (no significant interaction)
- Protection of fisheries - Possible benefit (habitat enhancement) and possible detriment (food source alteration, loss of cover)
- Protection of wildlife habitat – Possible benefit (habitat enhancement) and possible detriment (food source alteration, loss of cover)

Flumioxazin (Clipper - EPA # 59639-161 or equivalent)

The USEPA/MA registered herbicide flumioxazin (Clipper) is the only contact herbicide currently approved for use in Massachusetts that can provide effective control of fanwort. Flumioxazin use carries a number of state specific restrictions which limit its use potential. Until flumioxazin is more widely used in the State and more data is collected (which is in process at another waterbody SOLitude currently manages) it is unlikely that these restrictions will change, so its use would be reserved for small spot-treatments in high-use areas of the river. If greater acreages require control, fluridone herbicide would be a better fit.

Currently in the Lower Basin of the Charles River, there is minimal fanwort growth. As such, at this time there are no immediate plans to utilize flumioxazin. In the event of small, localized areas of fanwort growth when Sonar (fluridone) herbicide use is not feasible, then flumioxazin would be used.

Flumioxazin herbicide is classified as a PPO (Protoporphyrinogen oxidase) inhibitor that initiates cell membrane disruption providing control of a broad range of susceptible plants. Flumioxazin is a true contact herbicide that provides quick and effective control of target plant species. Although

Flumioxazin is not shown to have systemic activity, one or more years of reasonable control have been observed at other projects in New England where it has been applied. Flumioxazin is extremely fast-acting and has a very short half-life so it is well suited for spot/site specific treatments.

Impacts Specific to the Wetlands Protection Act using Flumioxazin

- Protection of public and private water supply – Benefit (water quality improvement)
- Protection of groundwater supply – Neutral (no interaction as flumioxazin has a low leaching potential)
- Flood control - Neutral (no significant interaction)
- Storm damage prevention – Neutral (no significant interaction)
- Prevention of pollution – Generally neutral (no significant interaction), but could be a detriment if plant die-off causes low oxygen at the bottom of the lake
- Protection of land containing shellfish - Generally neutral (no significant interaction), but reduced algae might reduce food resources for shellfish, and direct toxicity is possible under unusual circumstances
- Protection of fisheries - Possible benefit (habitat enhancement) and possible detriment (food source alteration, loss of cover)
- Protection of wildlife habitat – Possible benefit (habitat enhancement) and possible detriment (food source alteration, loss of cover)

Algaecides (Captain XTR – EPA # 67690-9, SeClear – EPA # 67690-55, GreenClean PRO – EPA #70299-15, or equivalent)

Approval for the use of a copper or peroxide-based algaecide is requested in the event that hazardous or nuisance algae conditions develop that jeopardize human health or recreation, warranting treatment. Although the Charles River has previously had multiple documented cyanobacteria (blue-green algae) blooms, there is no immediate plan to conduct an algaecide treatment in the Lower Basin. Algaecides have been included for approval so that if a cyanobacteria bloom is documented around the time of a large recreational event on the Charles River (i.e., Head of the Charles Regatta, or similar), in which human health may be negatively impacted by the bloom, a treatment can be conducted to alleviate the conditions. Although treatment of a cyanobacteria bloom is only a short-term solution, the ability to react accordingly when public health may be at stake is crucial.

Copper based algaecides (i.e., Captain XTR, $CuSO_4$, SeClear) are widely used and are applied to lakes and ponds throughout North America to control nuisance filamentous and microscopic algae – inclusive of cyanobacteria (blue-green algae) blooms. There are no water use restrictions associated with copper-based algaecides; SŌLitude treats several direct, potable (drinking) water reservoirs and a number of recreational waterbodies in the Commonwealth with these algaecides, on a yearly basis. The concentrated liquid algaecides are first diluted with river water and are then applied subsurface (in the same process as the liquid herbicides mentioned previously) throughout the treatment area. The application rate is generally 0.2 ppm of copper or less for algae control. If applied, treatment will not exceed 50% of the waterbody volume so that dissolved oxygen levels can be preserved as to not impact any aquatic wildlife.

Peroxide based algaecides (i.e., GreenClean PRO, GreenClean Liquid) are a recent addition to algae management. Similar to copper algaecides, there are no water use restrictions. The concentrated products are diluted with river water and then sprayed evenly throughout the treatment area. The application rate is 0.5 – 1.5 gallons per acre-foot for algae control. If applied, treatment will not exceed 50% of the waterbody volume.

Impacts Specific to the Wetlands Protection Act using Copper[6] and Peroxide Algaecides

- Protection of public and private water supply – Benefit (used to control algae)
- Protection of groundwater supply – Neutral (no significant interaction)
- Flood control - Neutral (no significant interaction)
- Storm damage prevention – Neutral (no significant interaction)
- Prevention of pollution - Generally neutral (no significant interaction), but could be a detriment if algae/plant die-off causes low oxygen at the bottom of the lake or causes release of taste and odor compounds or toxins
- Protection of land containing shellfish - Generally neutral (no significant interaction), but reduced algae might reduce food resources for shellfish, and direct toxicity is possible under unusual circumstances.
- Protection of fisheries - Possible benefit (habitat enhancement) and possible detriment (food source alteration, direct toxicity)
- Protection of wildlife habitat – Possible benefit (habitat enhancement) and possible detriment (food source alteration, direct toxicity)

Mechanical Harvesting

Mechanical harvesters are paddle-wheel driven barges that cut and collect aquatic vegetation. The front table can be adjusted to a maximum cutting depth of usually 5-7 feet. Hydraulically driven conveyors on these machines facilitate stockpiling and off-loading of the harvested material. Harvesters run on a vegetable-based hydraulic oil that is biodegradable. The machines carry oil containment "booms" and absorbent pads in the unlikely and unforeseen event of a hydraulic or fuel leak. All other necessary precautions are taken while fueling and maintaining the machine.

For the Lower Basin of the Charles River, mechanical harvesting would be utilized in areas of dense water chestnut growth. This technique would predominately apply to larger, widespread areas of growth, if they are to ever exist. Under those conditions, harvesting would be employed annually, and potentially on multiple occasions annually, as often when harvesting water chestnut growth, the newly available space within the water column allows for more plants to germinate.

The harvester would be launched in the river via an existing boat ramp location, depending on the proximity to the area to be harvested, and offloading of harvested materials will occur at similar pre-determined, easily accessible locations adjacent (or as close as possible) to harvested areas. Offloaded material would be allowed to dry for a short time before being transported to an upland location for composting and/or disposal as necessary.

Impacts Specific to the Wetlands Protection Act[7] using Mechanical Harvesting

- Protection of public and private water supply – Generally neutral (no significant interaction), although reduced plant density may benefit taste and odor control and minimize clogging of intakes
- Protection of groundwater supply – Generally neutral (no significant interaction)

[6] Commonwealth of Massachusetts Executive Office of Environmental Affairs. *Practical Guide to Lake Management*: 2004. 122 p.

[7] Commonwealth of Massachusetts Executive Office of Environmental Affairs. *Practical Guide to Lake Management*: 2004. 106 p.

- Flood control – Generally neutral (no significant interaction)
- Storm damage prevention – Generally neutral (no significant interaction)
- Prevention of pollution – Generally neutral (no significant interaction), but could be a detriment if sediment disruption and resultant turbidity are high, or if cut vegetation is left in the water to decay
- Protection of land containing shellfish – Generally neutral (no significant interaction)
- Protection of fisheries – Detriment from mechanical harvesting (direct fish removal), but with potential benefit by habitat improvement (may have benefit and detriment to different species in same lake from same effort)
- Protection of wildlife habitat - Potential benefit by habitat improvement, but may have benefit and detriment to different species in same lake from same effort

Hand-Pulling for Water Chestnut Removal

Similar to mechanical harvesting, as water chestnut plants develop and drop a nutlet (seed) structure on an annual basis, hand-pulling of plants via boat from the water's surface can be an effective means of control. Typically, water chestnut plants surface towards the end of June. Once the plants reach the surface, they can be effectively hand-pulled. The floating rosette of leaves and much of the roots can be easily lifted from the water and placed into an onboard storage container within the collection boat. Once the onboard storage is at capacity, it can be brought to shore for deposition and allowed to dry for a short time before being transported to an upland location for composting and/or disposal as necessary.

For the Lower Basin of the Charles River, hand-pulling may be conducted on an as-needed basis based on the abundance and distribution of water chestnut plants observed. Hand-pulling is effective when the distribution and abundances are relatively low, as it is a labor-intensive method that loses efficacy once the amount of growth expands significantly. Additionally, hand-pulling is a good strategy to be utilized for areas that a mechanical harvester may not be able to access (i.e., immediate shoreline areas, shallower waters, etc.).

If water chestnut growth is scattered and at trace or sparse density, a maximum of approximately an acre of area is able to be covered by a two-person hand-pulling crew per day. If the growth is moderate, a maximum of approximately one quarter to one half of an acre can be covered by a two-person crew per day. If the growth is dense, a maximum of approximately one tenth of an acre can be covered by a two-person crew per day.

Impacts Specific to the Wetlands Protection Act using Hand-Pulling

- Protection of public and private water supply – Generally neutral (no significant interaction), although reduced plant density may benefit taste and odor control and minimize clogging of intakes
- Protection of groundwater supply – Generally neutral (no significant interaction)
- Flood control – Generally neutral (no significant interaction)
- Storm damage prevention – Generally neutral (no significant interaction)
- Prevention of pollution – Generally neutral (no significant interaction)
- Protection of land containing shellfish – Generally neutral (no significant interaction)
- Protection of fisheries – Potential benefit by habitat improvement (may have benefit and detriment to different species in same waterbody from same effort)

- Protection of wildlife habitat - Potential benefit by habitat improvement, but may have benefit and detriment to different species in same waterbody from same effort

Management Technique Descriptions
Detailed information on all the approaches proposed in this NOI can be found at the **Massachusetts Department of Conservation and Recreation, Lakes and Ponds Program website**. There are links under the Publications tab to the "Generic Environmental Impact Report for Eutrophication and Lake Management in Massachusetts" and the "Practical Guide to Lake Management in Massachusetts."
<http://www.mass.gov/eea/agencies/dcr/water-res-protection/lakes-and-ponds/eutrophication-and-aquatic-plant-management.html>

Additional information on the herbicides and algaecides can be found at the **Massachusetts Department of Agricultural Resources website**:

<http://www.mass.gov/eea/agencies/agr/pesticides/aquatic-vegetation-management.html>

5.3 Monitoring:

Each management season, at least one pre-management survey of the Lower Basin will be conducted towards the beginning of the growing season to assess the overall aquatic invasive species growth to understand the distribution and abundance of the target species. Using the data collected during the survey(s), the management approach for that calendar year will be selected accordingly.

Depending on the timing of the management approach(es), interim surveys during the summer months will be conducted as needed for the respective management approach.

Toward the end of the growing season, a post-management survey of the Lower Basin will be conducted. This survey will collect the same data on an annual basis to allow for comparisons year-over-year. The distribution and abundances of the invasive and native aquatic plant species will be documented to understand the management successes, any potential impacts, and to guide the following calendar year's management approach(es).

The water quality monitoring portion of this program will follow the recommendations and/or requirements of MA DMF. It is anticipated, based on similar programs in DMF jurisdiction, that this will include pre- and post-treatment monitoring of dissolved oxygen (DO) levels, pH, temperature, and turbidity via secchi disk measurement. Additionally, multiple sites as appropriate throughout the management areas will be monitored.

6.0 Alternatives Analysis:

Alternatives to the proposed Aquatic Plant Management Plan were considered. SŌLitude evaluated all available strategies for management of the Lower Basin of the Charles River. Findings and recommendations are based on direct experience and discussions found in the *Eutrophication and Aquatic Plant Management in Massachusetts Final Generic Environmental Impact Review* (FGEIR, EOEA 2004).

Bottom/Benthic Weed Barriers: Not Recommended

Physical controls, such as the use of bottom weed barriers (i.e. Aquatic Weed Net or Palco) can be effective for small dense patches of nuisance vegetation, but are not cost effective or feasible for large areas. Weed barriers are expensive to install and maintain at ~$2.00+/ft^2 (material & installation). Semi-annual maintenance to retrieve, clean and re-deploy the barriers would be expensive and time consuming. Additionally, covering expansive areas of the river bottom may also have detrimental impacts on invertebrates or other types of wildlife. Based on the configuration of the Lower Basin, the relatively large distribution of various invasive aquatic plants within the Basin, and the known presence of contaminated sediment which would be disturbed with the installation/removal, we are not recommending this management strategy.

Diver Hand-Pulling or Diver-Assisted Suction Harvesting (DASH): Not Recommended

Diver hand-pulling and/or diver-assisted suction harvesting (DASH) can be a potential management tool for small, scattered growth of species such as milfoil, fanwort, and curlyleaf pondweed. The plants are individually pulled by the stem to gently lift the root from the sediment and placed into a mesh bag (with the diver hand-pulling) or suctioned up to a boat on the surface (with DASH). Unfortunately, due to the presence of contaminated sediment in the Charles River, the high frequency and use of recreational boats, and prohibited swimming, we are not recommending these management strategies for use in the Lower Basin in order to protect the safety of the divers.

Mechanical Harvesting: Recommended

Harvesting of water chestnut plants only is recommended if distribution and abundance within the Lower Basin of the Charles expands significantly. Further information about the proposed mechanical harvesting strategy is provided in section 5.2.

It should be noted that harvesting Eurasian watermilfoil is not recommended because of its ability to reproduce through vegetative fragmentation, leading to increased spread into previously un-infested areas or further intensifying growth rates. Additionally, harvesting would be costly and at best would only provide a season of relief from the milfoil, fanwort and/or spiny/brittle naiad with no guarantee of success. The overall ecological disruption and non-target impacts would be more significant than with spot-treatments using aquatic herbicides.

Biological: Not Recommended

There are no proven biological controls available or approved by the State for the control of the invasive aquatic plant species present in the Lower Basin of the Charles River.

Sediment Excavation/Dredging: Not Recommended

Dredging nutrient rich bottom sediment is sometimes used as a strategy to control excessive weed growth. Conventional (dry) or hydraulic dredging would require the expenditure of hundreds of thousands of dollars in design and permitting fees alone. Dredging may also have severe impacts to aquatic organisms (i.e., fish and macroinvertebrates) in the river with no guarantees of elimination of invasive vegetation.

Do Nothing: Not Recommended

If the non-native and nuisance plant and algae growth is allowed to continue unabated, eutrophication and inevitable filling-in at the Lower Basin will continue to occur at an accelerated rate due to the annual decomposition of extra plant material. Stagnant conditions will also increase water temperatures promoting both algae and bacterial growth as well as

providing extensive mosquito breeding habitat. The river's recreational and aesthetic value would be significantly degraded.

7.0 Compliance

Massachusetts Wetlands Protection Act:

The objective of this project is to control invasive species. Managing densities of non-native species will typically not adversely affect wildlife habitat and will not negatively impact other interests of the Massachusetts Wetlands Protection Act. No significant alteration to wetland resources areas will occur as a result of the proposed management program; instead the resource areas will be enhanced by controlling the nuisance plant and algae growth. The proposed management activities are consistent with the guidelines in the following documents:

- Final Generic Environmental Impact Report: Eutrophication and Aquatic Plant Management in Massachusetts (June 2004)
- Guidance for Aquatic Plant Management in Lakes and Ponds: As it Relates to the Wetlands Protection Act (April 2004 – DEP Policy/SOP/Guideline # BRP/DWM/WW/G04-1)
- The Practical Guide to Lake Management in Massachusetts (2004)

DEP License to Apply Chemicals:

All herbicide applications will be performed by Certified Applicators. A site specific "License to Apply Chemicals" for the proposed treatment will be filed with Massachusetts DEP, Office of Watershed Management. The USEPA/MA registered aquatic herbicides will be applied at recommended label rates, in accordance with the "Order of Conditions" and DEP "License to Apply Chemicals" permits (BRP WM04). Prior to treatment, the shoreline will be posted with signs warning of all temporary water use restrictions.

Massachusetts Environmental Policy Act:

The strategies proposed in this NOI are options approved under the Massachusetts Environmental Protection Act (MEPA) process that was approved in 2004 with the issuance of the FGEIR and the *Practical Guide to Lake and Pond Management in Massachusetts*. These approaches do not require individual MEPA review.

Massachusetts Endangered Species Act:

According to the most recent Natural Heritage maps provided by MA GIS (Appendix B - Figure 8), the Lower Basin of the Charles River is not located within area designated as Priority Habitats of Rare Species as determined by the Massachusetts Natural Heritage & Endangered Species Program (NHESP). A formal review by NHESP is not required.

Chapter 91:

Based on the types of activities that are subject to Chapter 91 authorization (structures, filing, dredging, change in use, and structural alteration), the work proposed in this Notice of Intent application is not classified as any of those activities. These approaches do not require a Chapter 91 authorization.

US Army Corps of Engineers:

The Lower Basin of the Charles River falls into the US Army Corps of Engineers jurisdiction. Based on the types of activities that are subject to their approval, we believe filing a Self-Verification will fulfil this regulatory requirement.

8.0 Impacts of the Proposed Management Plan Specific to the Wetlands Protection Act:

Protection of public and private water supply – The Lower Basin of the Charles River is not used directly as a drinking water supply. Aquatic herbicide treatment at the river will not have any adverse impacts on the public or private water supply, when used in accordance with the project label and conditions of the MA DEP License to Apply Chemicals.

Protection of groundwater supply – According to available studies, there is no reason to believe that the groundwater supply will be adversely impacted by the proposed management strategies, specifically the application of the herbicides at the proposed rates to the Lower Basin of the Charles River, when used in accordance with the product labels. Contamination of groundwater by aquatic herbicides is limited by their low rate(s) of application, rapid rate of degradation, and uptake by target plants. SŌLitude's State licensed applicators take all necessary precautions when mixing and disposing/recycling of all chemical containers.

Flood control and storm damage prevention – No construction, dredging or alterations of the existing floodplain and storm damage prevention characteristics of the river are proposed. However, in some instances, abundant and excessive aquatic plant growth can contribute to high water and flooding. Most commonly this occurs in the vicinity of waterbody outlets or water conveyance channels and structures. The unmanaged annual growth and decomposition of abundant plant growth is also known to increase sediment deposition at an accelerated rate. Therefore, the proposed management approaches may increase the capacity of the resource area over the long-term to provide flood protection.

Prevention of pollution – No degradation of water quality or increased pollution is expected by the proposed management approaches. The proposed herbicides are relatively slow acting in controlling the nuisance vegetation. This results in a slow release of nutrients from the decaying plants, reducing the potential for increases in nutrients that can cause algae blooms. Removal of the excessive growth of aquatic vegetation will contribute to improved water circulation and a reduction in the potential for anoxic conditions. The post-management decrease in plant biomass will help to decrease the rate of eutrophication currently caused by the decomposing of excessive plant material.

Protection of fisheries and shellfisheries – Contiguous, dense beds of aquatic vegetation provide poor habitat for most species of fish. Dense plant cover frequently results in significant diurnal fluctuations in dissolved oxygen as well as oxygen depletion during certain times of the year. While temporary effects on some desirable submersed and floating-leafed species may occur following the application of an aquatic herbicide, non-target plants typically rebound quickly. Shoreline emergent plants will not be impacted following the use of aquatic herbicides.

Protection of wildlife and wildlife habitat – In general, excessive and abundant plant growth, especially non-native plants, provides poor wildlife habitat for fish and other wildlife. The proposed management plan is expected to help prevent further degradation of the waterbody through excessive weed growth and improve the wildlife habitat value of the pond in the long-term. Maintaining a balance of open water and vegetated areas is intended.