EAST POND WATERSHED PLAN UPDATE – FREQUENTLY ASKED QUESTIONS (FAQs)

The following document contains a list of questions and answers related to the East Pond Watershed Management Plan update and proposed alum treatment. Questions were received at the June 26, 2017 Steering Committee Meeting, at the July 19, 2017 East Pond Association Annual Meeting, and by email. The purpose of this document is to provide a list of FAQs that the public can refer to. (Note: This is intended to be a working document and will be periodically updated to include additional questions that come up during the remainder of the watershed planning process.)

Questions	Answers
Longevity of Treatment. How long will the alum treatment last?	It is expected to result in improved water quality for a period of 10-20 years. The success of the treatment is dependent on using the correct dose and ensuring that new phosphorus from the watershed is managed. Ongoing watershed erosion control projects reduce external phosphorus loading and will extend the longevity of an alum treatment.
Success of Alum. Why might the alum treatment on East Pond be more successful than on some other lakes?	The depth of water in East Pond is important to the success of an alum treatment. East Pond is deep enough to stratify and release phosphorus from sediments each summer. Alum binds phosphorus as it is released resulting in less food for algae. In shallower lakes, alum treatments have been less successful, or have lasted for a shorter duration. To calibrate the correct dose of aluminum needed to get the desired results, additional sediment tests will be conducted in Colby College labs fall 2017, in consultation with Maine DEP and outside consultants.
Alum Timeline. Is the 2018/2019 alum treatment timeline realistic to account for the fundraising and public outreach needed?	The Steering Committee is working on developing a project calendar that outlines the timing of public meetings, permitting, and application. Permitting takes 90 days once submitted to Maine DEP. The current plan is to apply for a permit in fall 2017 for approval in early 2018 to get contractors and consultants lined up for a spring 2018 application. Monitoring will take place over the following 5-10 years. The goal is to treat in 2018, but if the funds haven't been raised, or if public support has not been built, then treatment could be delayed until spring 2019.
Alternatives to Alum. Has an alternatives analysis been completed to ensure the public that this is the best course of action?	Watershed erosion control projects have been implemented since 2001 and are important but not sufficient to prevent algal blooms – they reduce external phosphorus loading but do not prevent internal loading. The 2007 East Pond Watershed Plan suggested three treatment options to address internal loading which accounts for 50% of the phosphorus in the lake: aeration, biomanipulation (fish removal), and alum. Aeration was not recommended because of high costs, the number of aerators that would need to be deployed on the lake surface, and ongoing management and equipment maintenance. Biomanipulation was tried from 2007-2012 and was not successful.

Questions	Answers
	Alum treatment is the most promising treatment for addressing the internal load and has been recommended by Maine DEP and outside consultants. Alum treatments have been conducted on over 250 lakes worldwide and on four lakes in Maine. All Maine lakes were treated over 20 years ago, and 3 of 4 were successful – the one that was not successful was under-dosed. Alum treatments are at a similar cost to aeration/oxygenation but are applied once and do not require ongoing equipment maintenance and management.
Downstream Lakes. What does treating the internal load in East Pond do to downstream lakes such as North Pond and Great Pond?	Because East Pond is the first lake in the chain of lakes, treating East Pond will help downstream lakes. Less P upstream results in less P downstream.
Sediment Aluminum. Is it true that East Pond doesn't have a natural supply of Aluminum in the sediments?	No, the sediments in East Pond naturally contain aluminum, but the aluminum-to-iron ratio is not great enough to prevent internal loading. Iron-bound phosphorus is released under conditions of low dissolved oxygen. Increasing the amount of aluminum, which holds onto P under low oxygen conditions, will prevent the release of phosphorus into the water column, and will reduce algal blooms.
Alum Process. What is the process for the alum treatment?	Following approval of permits and selection of contractors, alum will be applied in the lake in early spring (following ice out) at a currently estimated rate of 30g/m2 with approximately 20-50 acres treated per day. Buoys will be placed around the treatment area each day to discourage boating in the treatment area. Application will not occur during high wind or rain events to prevent drift outside of the treatment area. Only the deepest area of the lake will be treated.
Motor Boats. Will motor boats affect the alum treatment?	No. In this application, only the deepest part of East Pond will be treated, the areas below 20'. Boats can stir up water up to 15', so it is unlikely it will have any affect.
Aluminum Side Effects. Are there side effects from the Alum Treatment?	There are no known side effects to people or fish when proper dosing rates, application and monitoring are used. The pH of the water is monitored closely during application to protect fish and other aquatic life. Alum is used extensively by municipal water treatment plants to remove phosphorus and sediments to create potable water.
Springs. Is it true that East Pond is fed by underwater springs? How will this be affected by the alum treatment?	Yes, East Pond is fed by groundwater via springs and has no permanent flowing streams into the lake. This results in a low flushing rate (0.4/year). Groundwater seepage in lakes is greatest at the edge of the lake and diminishes as it gets deeper, disappearing after a few feet of muck accumulation. A significant amount of water actually coming into a lake from a "spring" is rare and should not be affected by the alum treatment. Springs will not affect the effectiveness of an alum treatment.

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Alum & Plants. Can the alum treatment be affected by plants releasing phosphorus into the water column when they die?	Macrophytes (large plants) are not significant at the depths that the treatment will be applied (<20') due to lack of available sunlight. However, plants do take up phosphorus and release P into the water column when they die. This was not factored into the dosing estimate but does not appear to be a large component of the estimated P load to the lake.
Dam Management. Will lowering the water in the lake by adjusting the dam help with flushing phosphorus out of the lake?	This option will be considered, but would take decades to flush the lake given the current configuration of the dam. Based on the low flushing rate, and lack of tributaries flowing into the lake, the residence time would not support a significant draw down because it would take a long time for the lake to refill. Dam management may help extend the longevity of an alum treatment by several years.
Backflushing. What is being done to understand the role of the Serpentine in the delivery of phosphorus ("backflushing")? Why isn't this factored into the model?	Colby is in the second year of collecting flow data in the Serpentine Stream. 2016 was a dry year and did not show much backflushing from the Serpentine to East Pond, which may be the result of little rainfall. Heavier rainfall in the spring of 2017 should benefit this study to help understand the significance of backflushing. The Steering Committee has agreed that looking into dam management, and specifically draw down as a management action, should be listed as an action item in the watershed plan. Backflushing is not factored into the watershed loading model because there is not currently enough data. The model can be updated later to account for the Serpentine following additional study.
Water Quality Changes. What are the driving factors for the changes in water quality in East Pond over the past 20+ years?	Weather and climate are important drivers of the changes in lakes in Maine, New England and beyond. The data show warmer summer conditions. Warmer temperatures favor blue/green algae. An increase in temperature of 10 degrees C will double the metabolic processes in lakes resulting in more algae. Addition of phosphorus from developed land (roads, buildings, driveways, septic systems) all contribute to increased phosphorus load that feeds algae in the lake.
Health Effects of Algae. We pull water out of the lake for showering and have to leave our camp when the blooms occur. Is the algae problem (cyanobacteria) in East Pond getting worse?	The occurrence of algal blooms in East Pond will not improve without addressing the internal load. The problem of internal recycling is a self-sustaining cycle that cannot be broken without significant management measures such as an alum treatment. The effects of toxins produced by cyanobacteria (blue-green algae), to humans, domestic animals and wildlife, known as Harmful Algal Blooms (HABs), are well documented. However, not all blue-green algae blooms are toxic. Both Maine DEP and US EPA are monitoring HABs in Maine lakes. Data collected on 24 Maine lakes between 2008-2009 documented HABs in 50% of all samples, but only three samples exceeded drinking water guidelines. Warmer air temperatures result in warmer lake water that favors the growth of cyanobacteria. For more information on HABs in Maine lakes see: http://www.maine.gov/dep/water/lakes/cyanobacteria.htm

Questions	Answers
Dissolved Oxygen. What lowers the oxygen level near the sediment?	Oxygen (O2) depletion typically is most prevalent in the summer, but can also happen in the winter. In summer, stratification sets up in the lake by which the surface water gets warmer than the water at the bottom of the lake. Stratification prevents atmospheric O2 (wind, wave mixing) from reaching the deep areas, cutting off the supply. In addition, microbial respiration (microbes breaking down decaying plant and animal matter) at the bottom of the lake consumes oxygen, the combination of which results in low DO.
Treatment Area. How can we be so sure that the model is correct and doing just the deep parts of the lake will be sufficient?	Loading estimates for external and internal phosphorus loading are supported by the water quality monitoring data. Treatment of the deep area is designed to be ~80% effective in treating the internal load. Alum treatment is cumulative, meaning that additional benefit can be gained by treating additional areas beyond the deepest part of the lake; however, shallow areas are prone to mixing by wind, waves and boats that can affect the efficacy of the alum application by resuspending sediments. Resuspension is unlikely to occur in depths >15 feet.
Fundraising. To put the treatment cost in perspective for homeowners, what is the total annual tax on lake properties? What fraction of the town's funding comes from lake properties?	Lake front properties account for 26% of the property tax base in Oakland (2016: $133 million) and for about 45% of the property tax base in Smithfield (2017: $47 million).
Urgency. Why is it imperative to do this now?	The alum treatment was a management recommendation in the 2007 East Pond Watershed Plan. The 2017 Watershed Plan update has prioritized the alum treatment for the next 10-year planning cycle. A significant source of funding from Maine DEP may be available in 2018-2019 to support this effort and may not be available in the future. Not doing anything to address the internal loading problem in East Pond will result in ongoing and persistent algal blooms for the foreseeable future.
Alum Removal. Does the Aluminum have to be removed in the future?	No. Alum binds phosphorus in the sediments at the bottom of the lake where it will stay indefinitely or until it is covered with new sediment.
Climate Change. Do the studies your plan is based upon take into account the estimates of increased temperatures, particularly in the Northeast?	No. During the next 15-20 years – the estimated effective life of an East Pond alum treatment – current climate change estimates for temperature (+1-2 F) and rainfall (+10%) are not enough to be of concern (both are within natural variability). That said, many believe we are already seeing the effects of climate change in Maine; eg, earlier ice-out dates over the last 100 years add to summer algae and plant growth. Long-term, climate change is likely to be a significant factor in lake management.

Questions	Answers
How much, if at all, will temperature change increase the cost of alum treatment, reduce the estimated longevity, and increase the amount of external loading reduction we should achieve?	The loading models we are using for the Management Plan do not factor in climate change. The Management Plan is a 10-year planning document.
Harmful Algal Blooms. In September 2014, an algae test at East Pond found a Microcystin-LR level that exceeds EPA and WHO drinking water and recreational standards for small children and pets. Is the hazard as serious as that testing indicated? Does that level of hazard continue? Shouldn't the lake be tested further? Will the alum treatment diminish that problem, and to what extent?	Yes, the hazard is serious. That said, the test referenced in the question was among several conducted at East Pond in 2014 and was the only result that exceeded standards. The sample was taken from the deep hole in the lake. A second 2014 sample from another location at the lake – surface scum that accumulated at a shoreline – tested at the standards threshold. To be cautious, it is important to avoid physical contact with algae scums, and to keep children and pets away from them. No toxicity tests have been conducted on East Pond algae by Maine DEP since 2014, so we do not know what level of hazard remains. Yes, toxicity tests should be conducted when cyanobacteria algal blooms occur. In these circumstances, we are recommending toxicity testing in the updated Management Plan. The alum treatment will diminish or eliminate toxic algal blooms. If there are algal blooms after the alum treatment, they are likely to be fewer, to last for shorter periods of time, and to occur later in the year. Importantly, algae species are likely to shift from toxic cyanobacteria (blue-green algae) to nontoxic green algae.