

AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
1 NATIONAL LIFE DRIVE, MAIN 2
MONTPELIER, VT 05620-3522

Permit Number: 2014-O01

AQUATIC NUISANCE CONTROL PERMIT

In compliance with provisions of the Aquatic Nuisance Control statute, 10 V.S.A. Chapter 50, §1455 and in accordance with terms and conditions hereinafter specified, the following permittees:

Decision-maker:

**Town of Ryegate &
Ticklenaked Pond Association
PO Box 332
East Ryegate, VT 05042**

Operator:

**Aquatic Control Technology
11 John Road
Sutton, MA 01590-2509**

are hereby authorized by the Secretary of the Agency of Natural Resources (ANR) with authority delegated to the Department of Environmental Conservation (Department), to use **chemicals other than pesticides** to control aquatic nuisance plants (algae) in accordance with the application, monitoring, reporting, and other requirements set forth hereof.

This permit shall become effective on May 12, 2014, and shall expire 3 years thereafter.

David K. Mears, Commissioner
Department of Environmental Conservation

By: _____
Susan Warren, Program Manager
Lakes and Ponds Protection and Management Program

Part I. Coverage Under this Permit

A. Aquatic Nuisance Control activity covered by this Permit

1. Based on the Appendix C – Jurisdiction & Findings of this permit, the permit application and other supporting documents, the Department finds that the requested use of chemicals other than pesticides for the purposes of nuisance plant (algae) control in Ticklenaked Pond is in conformance with 10 V.S.A. §1455(f) if performed in accordance with this permit.
2. The Permittee shall conduct all aquatic nuisance control activities only in locations authorized in writing by the Lakes & Ponds Program.

B. Decision-makers & Operators as Permittees

1. For the purpose of this permit, a “Permittee” is defined to mean any person associated with aquatic nuisance control management activities (activity) that meets either of the following two criteria:
 - a. Any person who performs the activity or who has day-to-day control of the activity (i.e. they are authorized to direct workers to carry out the activity); or
 - b. Any person with control over the decision to perform the activity including the ability to modify those decisions.

Permittees identified in (1a) above are referred to in this permit as Operators while Permittees identified in (1b) are referred to in this permit as Decision-makers. As defined, more than one Operator may be responsible for complying with this permit for any single aquatic nuisance control management activity.

2. For purposes of this permit, all Permittees are defined as a Decision-maker, as an Operator, or as both.
3. When a Permittee is both a Decision-maker and an Operator, the Permittee must comply with all applicable requirements imposed on both Decision-makers and Operators. When the permit refers to all Permittees, both Decision-makers and Operators must also comply.
4. In accordance with 10 V.S.A. §1455(f), the Permittees, the Town of Ryegate and the Ticklenaked Pond Association (Decision-makers) and Aquatic Control Technology (Operator) is authorized to use chemicals other than pesticides in Ticklenaked Pond in compliance with the conditions of this permit.

Part II. Chemical other than Pesticide Application Conditions

A. Chemicals other than Pesticide Use Conditions

1. The Permittee is authorized to use the chemical other than a pesticide, liquid aluminum sulfate and liquid sodium aluminate, manufactured by Holland Company, Inc., or an approved equivalent.
2. All liquid aluminum sulfate and sodium aluminate shall be handled, applied, and disposed of in full conformance with all label requirements as well as all state and federal regulations in effect at the time of the treatment.

B. Date, Location and Environmental Conditions

1. The Permittee is authorized to conduct one treatment during the effective period of this permit in accordance with the following:
 - a. To the maximum extent possible these products shall be applied in spring or fall to avoid peak recreational use and potential pH interference from algal blooms;
 - b. Water temperature shall be at or above 45 degrees Fahrenheit at the time of treatment; and,
 - c. For both products, the lowest effective application rate shall be followed as conditions warrant.

2. The Permittee shall conduct the treatment only in the authorized areas per Appendix D – Alum Treatment & Evaluation Area Map.

C. Chemical Application Conditions

1. The Permittee shall conduct a pilot treatment within the designated “5 acre Evaluation Area” (per Appendix D) at least 24-hours prior to conducting the full scale treatment to evaluate the following:
 - a. Chemical dosage;
 - b. Flocculent characteristics and drift;
 - c. Equipment calibration;
 - d. Navigability (to ensure even chemical distribution);
 - e. Flocculent formation; and,
 - f. Observations of potential adverse effects.

2. The Permittee shall apply the approved chemicals in accordance with the following table:

Area	Acreage	Target Dose (grams of Aluminum per meter squared)	Aluminum Sulfate (gallons/acre)	Sodium Aluminate (gallons/acre)	Minimum water depth (feet)	Max predicted total Al concentration per water volume treated (ppm)
C	2.64	105	834	417	47.5	7.2
ABD	21	60	477	238	13	15

3. The Permittee shall monitor, evaluate, and adjust application rates to attain the target chemical doses above.
4. The Permittee shall apply all treatments in two distinct doses as follows (see Appendix D):
 - a. The first half dose applied over the entire area (Areas: A, B, C, & D); and
 - b. The second half dose applied in traverse of the first treatment area (in a perpendicular direction, as feasible) at least 24 hours after the first dose.
5. The Permittee shall notify the Aquatic Nuisance Control Program Coordinator, Matthew Probasco, by phone 802-490-6133 or via email at matthew.probasco@state.vt.us at least five (5) days in advance of the scheduled chemical other than pesticide application taking place. In the event that any significant treatment schedule changes are made within this 5-day period, the Permittee shall notify the Lakes & Ponds Program immediately.

Part III. Public Use Advisories & Restriction Notifications

A. Use Advisories and Restrictions

1. Use of water from Ticklenaked Pond and within one quarter mile downstream of the outlet for any purpose during the day of and the day after final treatment is restricted. This includes, but is not limited to, the following: swimming, boating, fishing, irrigation, and all domestic uses, except toilet flushing.
2. Recreational use (e.g. swimming/wading, boating and fishing) of Ticklenaked Pond as well as domestic purposes other than drinking and/or food preparation shall resume on the second day following the final treatment.
3. Use of water from Ticklenaked Pond for consumption and/or food preparation shall resume when the dissolved aluminum concentration is measured at or below 100 micrograms per liter.

B. Public Notifications – Informational Notices and Signs

1. To minimize unnecessary exposure, the Permittee shall notify the public that Ticklenaked Pond, and within one quarter mile downstream of the effluent, of the water use advisories and restrictions outlined in Subpart III.A above.
2. For each treatment the Permittee shall provide all abutting property owners (including commercial camps) to Ticklenaked Pond and within one quarter mile downstream of the effluent an informational notice at least 15 days prior to the scheduled treatment date.
 - a. The above informational shall be provided by one of the following means:
 - 1) Hand-delivery;
 - 2) Sent via confirmation receipt electronic mail;
 - 3) Sent with a stamped, return postcard;
 - 4) Sent Certified Mail-Return Receipt; or
 - 5) By other method that provides proof of receipt.
 - b. The above informational notice shall include:
 - 1) The date of the treatment;
 - 2) The chemicals to be used;
 - 3) A summary of the use advisories and restrictions, per Subpart III.A;
 - 4) A map of the treated and restricted-use areas;
 - 5) A statement that posted signs per Subpart III.B.3 along shoreline properties and roadways will provide the exact treatment date/time and applicable use restrictions;
 - 6) A statement that bottled water may be provided upon request by the Permittee to any person restricted from using their domestic water supply (taken directly from Ticklenaked Pond) for drinking or to prepare food or drink;
 - 7) The contact name(s), address(es), and telephone number(s) for the all Permittees; and,
 - 8) A statement warning all property owners that if their property is leased, rented or used at any time during treatment and/or while the use advisories are in effect, the property owner is responsible for properly informing all transient users.
3. For each treatment the Permittee shall post informational signs at least 2 days prior to the scheduled treatment date:
 - a. The informational sign shall be posted:
 - 1) Along the all public roadways approximately every 1,000 feet in the vicinity of the shoreline of Ticklenaked Pond;
 - 2) At all public and private campgrounds, hotels, inns, beaches and access points; and
 - 3) At the town office(s).
 - b. Informational signs shall be at least 11 inches in height by 8.5 inches in width mounted on wood or similar material and staked into the ground in locations where they will be most visible to vehicle traffic, shoreline property owners and potential lake users.
 - c. All signs shall be weather resistant.
 - d. When water use restrictions change, all informational signs shall be updated to indicate as such.
4. Copies of the aforementioned notice and signs shall be provided to the Aquatic Nuisance Control Program Coordinator, Matthew Probasco via email at matthew.probasco@state.vt.us at the same time as they are made available to the public.

Part IV. Chemical Application Records, Water Sampling & Reporting

A. Chemical Application Records

1. The Permittee shall submit a treatment report to the Aquatic Nuisance Control Program Coordinator, Matthew Probasco via email at matthew.probasco@state.vt.us treatment within 30 calendar days following the date of the treatment.
2. The Permittee shall maintain all data and records relating to the activities authorized under this permit until its expiration.

B. Water Sampling

1. The Permittee shall collect water samples, or arrange for samples to be collected, for the pertinent treatment for the analysis of aluminum concentrations.
2. At least two days prior to treatment, the Permittee shall submit to the Aquatic Nuisance Control Program Coordinator, Matthew Probasco or via email at matthew.probasco@state.vt.us a map of sample locations for approval.
3. All samples shall be analyzed at an appropriately qualified laboratory.
4. The Permittee shall either submit, or arrange for the laboratory performing the analyses to submit, the laboratory results directly to the Aquatic Nuisance Control Program within 24 hours of completion.
5. Additional samples and sampling locations may be required as determined by the Aquatic Nuisance Control Program.

C. Reporting

All aforementioned, required reports, notifications, or other requisite correspondence shall be submitted via email to the Aquatic Nuisance Control Program at matthew.probasco@state.vt.us, or they may be mailed to the following address:

**Matthew Probasco
Aquatic Nuisance Control Program
Watershed Management Division
One National Life Drive, 2 Main
Montpelier, VT 05620-3522**

Part V. General Conditions

1. This permit may be modified or amended upon request by the Permittee or by the Department. Any modification under this condition shall be performed in accordance with the public notice requirements of the [*Public Review and Comment Procedures for Aquatic Nuisance Control Permit Applications and General Permits*](#), dated January 30, 2003, or its replacement.
2. Prior to any treatment occurring with equipment (e.g. boat, trailer, vehicle, gear) that has been in or on any other waterbody, the Permittee shall comply with 10 V.S.A. §1454. All equipment shall be decontaminated in accordance with the [*Draft Voluntary Guidelines to Prevent the Spread of Aquatic Invasive Species through Recreational Activities*](#), Aquatic Nuisance Species Task Force, November 2012, or its replacement.

3. Cause for permit suspension or revocation includes, but not limited to, the following:
 - a. violation of any of the terms or conditions by the Permittee;
 - b. failure to disclose relevant facts, new research, findings, or other information not previously made available by the Permittee;
 - c. any misrepresentation of fact or the provision of false information by the Permittee;
 - d. a determination that the risk to the non-target environment resulting from the activities authorized under this permit is unacceptable;
 - e. a determination that the risk to public health resulting from the activities authorized under this permit is more than negligible; and/or
 - f. a determination that there is an undue adverse effect upon the public good resulting from the activities authorized under this permit.

Part VI. Compliance; Enforcement

The Permittee shall comply with all terms and conditions of this permit. Any permit noncompliance constitutes a violation of 10 V.S.A. Chapter 50, and is grounds for enforcement action; permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

Part VII. Appeals

Right to Appeal – Pursuant to 10 V.S.A. Chapter 220, any appeal of this decision must be filed with the clerk of the Environmental Court within 30 days of the date of the final decision. The appellant must attach to the appropriate Notice of Appeal entry fee, payable to the State of Vermont. The Notice of Appeal must specify the parties taking the appeal and the statutory provision under which each party claims party status; must designate the act or decision appealed from; must name the Environmental Court; and must be signed by the appellant or their attorney. The appeal must give the address or location and a description of the property, project or facility with which the appeal is concerned and the name(s) of the applicant(s) or the permit involved in the appeal. The appellant must also serve a copy of the Notice of Appeal in accordance with Rule 5(b)(4)(B) of the Vermont Rules for Environmental Court Proceedings. For further information, see the Vermont Rules for Environmental Court Proceedings, available on line at www.vermontjudiciary.org. The address for the Environmental Court is: 2418 Airport Road, Suite 1, Barre, VT 05641 (Telephone: 802-828-1660).

Part VIII. Appendices

Appendix A – Definitions

Appendix B – Standard Permit Conditions

Appendix C – Jurisdiction & Findings

Appendix D – Treatment & Evaluation Area Map

Appendix A – DEFINITIONS

For the purposes of this permit, the following definitions apply:

“Activity” means any activity subject to regulation under 10 VSA 1455.

“Agency” means the Vermont Agency of Natural Resources.

“Applicant” means a person applying for permit coverage.

“Aquatic nuisance” means undesirable or excessive substances or populations that interfere with the recreational potential or aquatic habitat of a body of water. Aquatic nuisances include rooted aquatic plants and animal and algal populations.

“Aquatic plant” means a plant that naturally grows in water, saturated soils, or seasonally saturated soils, including algae and submerged, floating-leafed, floating, or emergent plants.

“Biological controls” mean multi-cellular organisms.

“Corporation” means an association of individuals, created by law or under authority of law, having a continuous existence independent of the existences of its members, and powers and liabilities distinct from those of its members.

“DEC” means the Vermont Department of Environmental Conservation.

“Decision-maker” means any entity with control over the decision to perform pesticide applications including the ability to modify those decisions that result in a discharge to Waters of the State.

“Eligible” means qualified for authorization to under this individual permit. “Nontarget” includes the plant and animal hosts of the target species, the natural enemies of the target species living in the community, and other plants and animals, including vertebrates, living in or near the community that are not the target of the activity.

“Lessee” means a person who acquires the right to occupancy or use of property under a lease or rental agreement.

“New aquatic species” means an aquatic species that was not known to occur in a surface water of Vermont or in a segment of Lake Champlain as of January 1, 2007.

“Operator” for the purpose of this permit, means any entity associated with the aquatic nuisance control activity in a Waters of the State that meets either of the following two criteria:

- (1) Any entity who performs aquatic nuisance control activity or who has day-to-day control of the activity (i.e. they are authorized to direct workers to carry out those activities); or
- (2) Any entity with control over the decision to perform aquatic nuisance control activity including the ability to modify those decisions.

“Outstanding Resource Water” means waters designated as Outstanding Resource Waters by the Vermont Natural Resources Board pursuant to 10 V.S.A. §1424a.

“Person” means any individual, partnership, company, corporation, association, joint venture, trust, municipality, the State of Vermont or any agency, department or subdivision of the state, any federal agency, or any other legal or commercial entity.

“Pesticide” means any substance produced, distributed, or used for preventing, destroying, or repelling nuisance aquatic plants, insects, or other aquatic life, including lamprey. Pesticide includes unicellular organisms or extracts from unicellular organisms and does not include biological controls.

“Project” means aquatic nuisance control activity that the Secretary considers for coverage under or has received coverage under an individual aquatic nuisance control permit.

“Secretary” means the Secretary of the Agency of Natural Resources or the Secretary’s duly authorized representative.

“Waters of the State” means all rivers, streams, creeks, brooks, reservoirs, ponds, lakes, springs, and all bodies of surface waters, artificial or natural, which are contained within, flow through or border upon the state of Vermont or any portion of it. Waters of the State include Waters of the United States.

“Water Quality Standards” means the Vermont Water Quality Standards.

“Water resources” means the waters and the values inherent or potential in waters and their uses.

“Wetlands” means those areas of the state that are inundated by surface or groundwater with a frequency sufficient to support significant vegetation or aquatic life that depend on saturated or seasonally saturated soil conditions for growth and reproduction. Such areas include but are not limited to marshes, swamps, sloughs, potholes, fens, river and lake overflows, mud flats, bogs and ponds, but excluding such areas as grow food or crops in connection with farming activities.

Appendix B – STANDARD PERMIT CONDITIONS

A. *Permit Actions*

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

B. *Limitations*

1. This permit conveys no vested rights or exclusive privileges. The permit conveys no title to land nor authorizes any injury to public or private property. The permit does not authorize infringement of any applicable federal, state or local laws or regulations nor obviate the necessity of obtaining such additional permits as may be required.
2. Nothing in this permit shall be construed as having relieved, modified, or in any manner affected the Permittee's ongoing obligation to comply with all other federal, state or local statutes, regulations or directives applicable to the Permittee in the operation of its business, nor does it relieve the Permittee of the obligation to obtain all necessary federal, state and local permits.

C. *Right of Entry*

The Permittee shall allow the Lakes and Ponds Protection and Management (Lakes & Ponds) Program, and authorized representatives of the Secretary, at reasonable times, and upon presentation of credentials, to enter upon and inspect the authorized activity and to have access to and copy any records required to be kept pursuant to this permit.

D. *Historic Properties*

Each Permittee shall comply with any applicable state and local laws concerning the protection of historic properties and places.

E. *Retention of Records*

Copies of this permit, all amendments thereto, and all documentation required by this permit, including records of all data used to complete the application to be covered by this permit, shall be retained for at least three years from the date that permit coverage expires or is terminated. This period may be extended by request of the Lakes & Ponds Program at any time.

F. *Need to Halt or Reduce Activity Not a Defense*

It shall not be a defense in an enforcement action that it would have been necessary to halt or reduce the authorized activity in order to maintain compliance with the conditions of this permit.

G. *Duty to Mitigate*

A Permittee shall take all reasonable steps to minimize or prevent any violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

H. *Signatory Requirements*

1. All applications shall be signed as follows:
 - a. For a corporation: by a responsible corporate officer. For the purposes of this section, a responsible corporate officer means:
 - i. A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation;

- ii. The manager, provided he or she is authorized to make management decisions which govern the operation of the regulated activity including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
 - b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or
 - c. For a municipality, State, Federal or other public agency: by either a principal executive officer or a ranking elected official. For purposes of this section, a principal executive officer of a Federal Agency includes: the chief executive officer of the agency or a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.
2. All reports required by this permit, including but not limited to inspections, shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if the authorization is made in writing by a person described above. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated activity such as an individual or position having overall responsibility for environmental matters for the company. A duly authorized representative may thus be either a named individual or any individual occupying a named position.
3. Any person signing documents required by the terms of this permit shall do so under the following certification: "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

I. Duty to Reapply

If the authorized activity is anticipated to continue after the expiration date of this permit, the Permittee shall reapply for coverage under a new permit sixty (60) days prior to the expiration date of this permit.

J. Notice of Planned Changes

The Permittee shall give notice to the Lakes & Ponds Program as soon as possible of any planned changes to the authorized activity.

K. Notice of Anticipated Noncompliance

The Permittee shall give advance notice to the Lakes & Ponds Program of any planned changes to the authorized activity that may result in noncompliance with the permit conditions.

L. Duty to Provide Information

The Permittee shall furnish to the Lakes & Ponds Program, within a reasonable time, any information which the Lakes & Ponds Program may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine noncompliance with this permit. The Permittee shall also furnish to the Lakes & Ponds Program upon request, copies of records to be kept pursuant to this permit.

Where the Permittee becomes aware that it failed that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in a report to the Lakes & Ponds Program, it shall promptly submit such facts or information.

M. *Civil and Criminal Liability*

Nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance. Civil and Criminal penalties for non-compliance are provided for in 10 V.S.A. Chapter 47, Sections 201 and 211.

N. *Penalty for Permit Violation*

10 V.S.A. Section 8010(c)(1) provides that: “A penalty of not more than \$42,500.00 may be assessed for each determination of a separate violation. In addition, if the Secretary determines that a violation is continuing the Secretary may assess a penalty of not more than \$17,000.00 for each day the violation continues. The maximum amount of penalty assessed under this subsection shall not exceed \$170,000.00.”

O. *Severability*

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

P. *Twenty-four hour reporting*

Unless provided otherwise by this permit, the Permittee shall report any noncompliance which may endanger public health or the environment. Any information shall be provided orally within 24 hours from the time the Permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the Permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

Appendix C – JURISDICTION & FINDINGS

For the purposes of complying with 10 V.S.A. §1455(f), & (i) the Department of Environmental Conservation (DEC), Lakes & Ponds Management and Protection Program (Lakes & Ponds Program) has made the following findings:

1. Jurisdiction

Pursuant to 10 V.S.A. §1455(f) the Secretary shall issue a permit for aquatic nuisance control if the Secretary finds:

- a. There is acceptable risk to the nontarget environment;
- b. There is negligible risk to public health; and,
- c. There is either a public benefit to or no undue adverse effect upon the public good.

The Secretary of the Agency of Natural Resources (ANR) has delegated this authority to the Lakes & Ponds Program. The Lakes & Ponds Program has found the proposed aquatic nuisance control project complies with 10 V.S.A. §1455(f) if conducted in accordance with all terms and conditions within this Aquatic Nuisance Control (ANC) Permit (#2014-O01).

2. Project Background and General Description

Aquatic Control Technologies (ACT) submitted a permit application to apply a chemical other than pesticides to Ticklenaked Pond on behalf of Town of Ryegate and the Ticklenaked Pond Association, which was received by the Lakes & Ponds Program on February 14, 2014.

Ticklenaked Pond is a 57-acre waterbody located in the Town of Ryegate, providing valuable lake and wetland habitat and recreational opportunities for area residents. It has a long history of algae blooms due to excessive phosphorus loading. Blooms occurring now are, in part, the result of significant internal phosphorus recycling from pond sediments. An assessment and characterization of the external and internal phosphorus loading was completed as part of a Total Maximum Daily Load (TMDL) prepared by DEC's Monitoring, Assessment and Planning Program (October 2009) and approved by the US Environmental Protection Agency (November 30, 2009). In addition to conducting watershed improvements, many of which have been implemented, the TMDL recommended controlling the internal phosphorus load pond through an inactivation treatment. This recommendation was further refined in the September 2011 "Ticklenaked Pond Loading and Management Analysis" performed by AECOM and Water Resource Services (WRS).

The goal of the proposed treatment is to strip the water column of phosphorus and inactivate the phosphorus within the bottom sediments, by applying aluminum sulfate – otherwise referred to alum. It reacts with water to form an insoluble aluminum hydroxide solid flocculent (floc). This floc falls through the water column, chemically and physically removing phosphorus. Eventually, it binds to the bottom forming a "blanket," effectively inactivating the phosphorus trapped within the bottom sediments. Once applied however, the reaction of alum and water causes the water to become acidic. To counter this acidification, a buffer solution of sodium aluminate is applied simultaneously at a volumetric ratio of typically 2 parts alum to 1 part sodium aluminate. As a result, the pH is expected to remain near background throughout the treatment process.

Commercial grade liquid aluminum sulfate and sodium aluminate will be used, both of which are manufactured by the Holland Company, Inc. in North Adams, Massachusetts. According to the manufacturer, both products comply with the American Water Works Association Standards for potable water and the National Academy of Science Water Chemicals Codex, and are certified for potable water treatment under National Science Foundation, Standard 60.

A 23.65 acres portion of Ticklenaked Pond will be subject to this treatment. This roughly corresponds to area of the lake where water depths are greater than 13 feet and where anoxic conditions near the lake bottom promote the release of phosphorus. The entire treatment has been divided into four areas labeled A, B, C, & D, as indicated in Appendix D – Alum Treatment & Evaluation Area Map. The dose in Area ABD was set at 60 g/m² and Area C, which has been determined to have higher available phosphorus levels, was set at 105 g/m². In Area ABD, the application rate is 477 and 238 gallons per acre of alum and sodium aluminate, respectively. In Area C, the application rate is 834 gallons and 417 gallons per acre of alum and sodium aluminate, respectively. The total quantity to be applied is 12,264 gallons of alum and 6,132 gallons of sodium aluminate.

These specified treatment areas will split into discrete treatment sectors. Treatment will be guided electronically with on-board global position system that will log the path of the treatment vessel with an accuracy of 1 meter. The treatment vessel is also equipped with a fathometer and speedometer. A calibration table for chemical delivery versus vessel speed insures even distribution of both products. Chemical volumes applied to each sector are pre-determined and checked for accuracy daily. As an additional safeguard and to evaluate the proposed treatment protocol, an approximately 5-acre portion of the pond will be treated on the first day of application, to evaluate chemical dosage; floc characteristics and drift; equipment calibration; navigability to ensure even chemical distribution; to allow for underwater camera inspections to assess floc formation; and, allow observations of any unexpected effects. This pilot treatment is tentatively scheduled to occur on a Thursday, with results to be collected on Friday, and evaluated by Sunday before making a final decision on whether or not to continue the full scale treatment on the following Monday.

The final treatment dose will be “split” with the first half dose applied over the entire area followed by a second transect traverse of the treatment area to apply the second half. There will be at least 24 hours allowed for floc settling before any area is treated with the second half of the dose. This process requires more time, but reduces the “effective” dose applied at any one time to the pond in half and provides a further safeguard against adverse impacts to non-target organisms, especially to fish.

In total, the actual application will require approximately 3-4 extended (10-12 hour) workdays to fully complete, in addition to the time involved to mobilize. From start to finish, the entire treatment will take about a week to complete. Generally, alum treatments are best conducted in the spring or fall in order to avoid peak recreational use periods and potential interference from algal blooms. Water temperature should be at or above 45°F for optimal chemical reaction rates and flow formation/settling times. Past monitoring data from Ticklenaked Pond has shown that high algal density could elevate pH values into the 8-9 S.U. range. This has typically occurred between the beginning of May and the end of September, but varies from year to year. Since the alum treatment process is highly sensitive to pH, it will be necessary to avoid treatment while algae growth is elevating pH.

The chemical products for this treatment will be provided directly from the manufacturer. The tanker truck(s) will remain on site for the entire day and will be operated by an experienced driver. Chemical from the trucks is conveyed to the treatment vessel tanks by lengths of 3” diameter reinforced hose, specifically designed to handle these types of materials. There are shutoff valves at each hose connection and there is an emergency shutoff valve at the tanker, reducing the likelihood of an accidental spill. Hoses for each chemical are clearly marked to avoid confusion and misconnection. Since the treatment vessel cannot move all the way to shore given its increased draft after filling, a 10-15 foot temporary aluminum dock will be placed into the pond for accessing and loading the treatment vessel. The Vermont Department of Fish and Wildlife (DFW) Access Area is located in the northeast corner of the pond will be used to launch the barge into the pond. The Town of Ryegate’s Ticklenaked

Pond Beach located just west of the boat launch will serve as the base of operations for chemical transfer where tanker trucks can be located near 100 feet of the water's edge.

4. Acceptable Risk to the Nontarget Environment

While alum treatments are an effective phosphorus management technique when proper planning and application methodologies are employed some detrimental impacts are anticipated. Monitoring is a key when conducting alum treatments to maintain stable water quality and to evaluate its effectiveness. During the treatment, pH and alkalinity will be monitored to ensure both parameters remain stable throughout the day at stations both within and outside the treatment areas and at multiple depths. Flocculent settling will be monitored periodically with the use of an underwater camera system. While on the water, all staff will continuously monitor for dead or distressed non-target organisms, particularly fish. Sampling of phosphorus and aluminum (total and dissolved forms) will be conducted approximately two weeks prior to treatment, within 24-hours following the completion of treatment and at least one week post-treatment. Additional sampling may occur a quarter mile downstream of the outlet, if alum appears to have migrated far enough to warrant additional monitoring. Total and dissolved aluminum will be tested following the pilot treatment and those results will be reviewed prior to proceeding with the full-scale treatment. Specific monitoring locations and depths will be determined from the results of the pilot treatment as well.

Amphibians, Reptiles & Mammals

There are no known adverse effects or mortalities attributable to alum treatment concerning amphibians, reptiles or mammals.

Aquatic Macro-invertebrates

The potential exists for impacts on some non-target organisms. Certain species of invertebrates such as Chironomidae (midge flies) and Oligochaetes (worms), which inhabit the targeted areas of benthic sediments may be impacted by the treatment. As the floc settles and interacts with bottom sediment, these species can be smothered and some mortality may occur. However, recovery within these communities has been documented within one year post-treatment.

Other impacts to the aquatic biota arise when the products are initially applied to the water. In general, if the pond has a low acid neutralizing capacity or poorly buffered, the pH will fall and the ionic form of aluminum will be present, which can be toxic to the aquatic biota, including macroinvertebrates and fish. The use of a mixture of aluminum sulfate and sodium aluminate will increase the acid neutralizing capacity of the pond water, maintain a stable pH, and minimize soluble aluminum to avoid this situation. Ticklenaked Pond also has naturally high ambient alkalinity, which will naturally help to buffer the treatment reaction.

The possibility exists for toxic concentrations of alum to come in contact with freshwater mussels. However, based on a report entitled "2011 Freshwater Mussel Survey in Mystic Lake" (Barnstable, Massachusetts), mussel response to alum treatment showed no observable adverse effect. Another study conducted 2005-2006, entitled "Pre- and Post-Alum Treatment Survey of Honeoye Lake Macroinvertebrates" describes the response of freshwater mussels to alum treatment of the Honeoye Lake in the Finger Lakes Region of New York reports that, "Despite changes in species richness and total abundance, a comparison of the relative dominance of species before and after alum treatment suggests little change in macroinvertebrate community structure and no apparent negative impact from the chemical [alum]." Based on these studies, negligible impact to the freshwater mussel community is anticipated.

Fishes

The DFW Fisheries Program did not comment on this application. Fish mortality from incidental exposure during application is possible if they were to pass through the immediate injection area. Some laboratory experiments have documented mortality at approximately 30% within an hour after exposure to neonatal (juvenile) fish. Monitoring will be conducted to evaluate any fish mortality, though the likelihood of such from direct exposure is anticipated to be minor. The split application method will also reduce the instantaneous alum concentration to which fish may be exposed. While wind and wave activity could move the floc beyond the target area and into outlying areas, no impacts are anticipated if such an event were to occur. Monitoring and subsurface injection will be maintained so as to minimize floc migration outside of the target area.

The DFW Wildlife Diversity Program/Natural Heritage Inventory expressed concerns about the proposed treatment, but concurred that there would appear to be no impact to plants from the alum treatment based upon the information contained within the application. The Natural Heritage Inventory has one record of a rare plant in Ticklenaked Pond – a species of arrowleaf (*Peltandra virginica*). This an emergent plant species found around the shoreline margins in water's less than ~3 feet deep. No direct application of alum will occur near shore (less than 12 feet). Alum floc does not impact emergent plant species.

The DFW Wildlife Program did not comment.

The DEC Wetlands Program did not comment.

The DEC Monitoring, Assessment and Planning Program did not comment.

The Lakes & Ponds Program recognizes that additional risk to the non-target environment is the potential introduction into Ticklenaked Pond of non-native aquatic species from the vessel and other equipment, if used on other lakes. There are a number of non-native, invasive aquatic species (both plants and animals) of concern that exist both inside and outside of Vermont. These non-native species could be transported into Ticklenaked Pond on the project equipment unless proper spread prevention measures are taken. However, if proper spread prevention measures are implemented, this risk to the non-target environment can be significantly minimized. Hence, the applicant will be required to adhere to comply with 10 V.S.A. §1454 and the Draft Voluntary Guidelines to Prevent the Spread of Aquatic Invasive Species through Recreational Activities.

Having reviewed all of the potential negative impacts of the proposed treatment on the non-target environment, especially relative to the ongoing negative impacts of algae blooms, the proposed alum treatment to control algae poses, the Lakes & Ponds Program has determined that there is acceptable risk to the non-target environment.

5. Negligible Risk to Public Health

At the request of the Lakes & Ponds Program, the Vermont Department of Health (VDH), Environmental Health and Toxicology Program has reviewed and provided comments pertaining to the risk of the proposed aquatic nuisance control activity to public health regarding the proposed alum treatment via memorandum (dated April 1, 2014).

The Lakes & Ponds Program largely concurs with VDH's findings; a summary of which follows. While under the influence of many factors the maximum predicted total aluminum concentration has been estimated as accurately as possible, the concentration of aluminum may not be known exactly at any

location at any point in time after, especially during treatment. Based upon VDH's review of the most current scientific information available for aluminum including potential health effects; consideration of who is likely to come into contact with treated waters and in what manner; several very health protective assumptions and standard risk assessment procedures, the VDH recommends the following conditions, as described by the Lakes & Ponds Program (M. Probasco, personal communication March 25, 2014 and March 31, 2014), will result in negligible risk to public health:

- No use of the treated water body (and possibly its associated outlet stream within one-quarter mile downstream of the effluent) for any purpose including recreational uses such as boating, fishing and swimming and all domestic uses, except for toilet flushing, beginning with the pilot application through 3 days post last treatment;
- Full recreational and domestic use, including swimming and use as drinking water and in food/beverage preparation, may resume 3 days post last treatment providing chemical analysis of representative samples of the treated water body (and possibly its outlet stream within one-quarter mile of the effluent) confirm dissolved aluminum is at or below 100 micrograms per liter. Analysis of multiple samples may be necessary in order to account for the influence of many chemical, media and site specific factors; and,
- Until full use can be resumed, bottled water should be supplied by the applicant to those who may depend up on the treated water body and/or its outlet stream (within one-quarter mile downstream of the effluent) for their domestic drinking water or food and drink preparation water supply.

VDH also recommends that public notification of property owners and residents of the treated water body areas as well as commercial camps (and parents whose children are attending camps) which use the water body of concern and/or waters within a one-quarter contiguous water mile of this water body should occur 30 days prior to application. Water body access areas as well as any nearby campgrounds should be posted. To date, as determined by a lake-wide survey, there is believed to be one lakeside residence that uses lake water for potable purposes. While several residences reported use of lake water for gray water purposes, it is not used for consumption.

The Lakes & Ponds Program has determined that 15 days public notification (rather than the VDH recommended 30 days public notification) of property owners and residents adjacent to the lake and its outlet, including commercial seasonal camps, will provide adequate notice to protect public health. 15 days, as opposed to 30, provides more intimate relevancy to those who should be notified. By way of prior authorizations, these comments have been incorporated into typical permit conditions. It's worth noting that ACT supports the aforementioned public use restrictions during the application period so as to minimize unnecessary exposure with treated water.

The addition of sulfate has been theoretically believed to stimulate the biochemical activity of sulfate reducing bacteria and, consequently, enhance the potential for mercury present in the pond to undergo methylation. Mercury methylation requires three conditions: mercury, sulfate, and anoxic sediments rich in organic carbon. Generally, literature and expert testimony does not support this theory. The proposed alum treatment is unlikely to proliferate mercury methylation, thus increase mercury.

It is important to note that the in-water aluminum concentration is expected to be much lower than the application maximum total values. First, the dose will be split in two equal parts – half will be applied and the floc will be allowed to settle for at least one entire day before the remaining half is applied. Also, the total water volume being treated is greater than the calculations that are shown, which are

based on the minimum depth of the two treatment areas. Prior treatments in other states support this conclusion.

Since treatment is proposed outside the typical recreational season, adverse incidents are not anticipated. Moreover, even if such restricted use activities be conducted during treatment, it is unlikely that any adverse effects would occur. To date, no human illness from contact with alum treated waters has ever been documented. Additionally, minimal adverse impacts, if any, are expected to either surface or groundwater supplies. Aluminum, iron and calcium are commonly added in water and wastewater treatment facilities with no significant adverse effects.

The application will be conducted by ACT, who will be on-site at all times during the chemical application. Highly qualified biologists/technicians will be conducting all testing and monitoring during the project and have been properly trained regarding safe handling of the chemicals. Personal Protective Equipment (PPE) will be provided for all employees. A spill containment kit is maintained on shore in the unlikely event of leakage during chemical transfer from the tank-truck to the barge.

The Lakes & Ponds Program has determined that there is negligible risk to public health.

7. A Public Benefit to or No Undue Adverse Effect upon the Public Good

The Lakes & Ponds Program has determined that the proposed alum treatment in Ticklenaked Pond will significantly improve water quality and recreational use by preventing continued algae blooms. At present, this pond does not meet Vermont's Water Quality Standards due to high phosphorus and resultant algae blooms. By not addressing the excessive phosphorus loading from internal recycling, nuisance algae will continue to grow unabated adversely impacting water quality, fish and wildlife habitat, and an array of recreational uses as well as continue a public health risk from exposure to potentially toxic algae. Ongoing, overabundant algae growth will increase the rate of deposition of phosphorus on the lake bottom, increasing oxygen demand and promoting the release of more phosphorus in the summer. Conditions will be expected to worsen over time unless this cycle is stopped.

Alternatives to an alum treatment have been considered. While dredging is an alternative, this involves physically removing the phosphorus laden sediments with conventional or hydraulic dredging operations. Although dredging if properly designed would likely accomplish the same goal as an alum treatment, the cost of such a project is far more expensive and permitting of such an activity is uncertain given the disruption to the resource and impact to nontarget organisms would be too extensive. Because of the chemical mechanisms allowing phosphorus to be released from the sediment are dependent on low oxygen levels, increasing oxygen levels through improved circulation and/or aeration may reduce internal recycling. However, improving circulation or aerating the water column would be more difficult and expensive, both to install and operate than an alum. Any improvements from this method would also be temporary; if aeration ceased anoxic conditions would return. Undoubtedly, reduction of watershed loading is an important part of the restoration and management plan for Ticklenaked Pond and improvements have already been made within the watershed, largely in accordance with the approved TMDL. While some additional small improvements may still be evaluated, it has been determined that the reduction in internal phosphorus recycling from the bottom sediments is necessary to meet the outlined water quality criteria and goals.

The Lakes & Ponds Program has determined that there is a public benefit to the proposed alum treatment.

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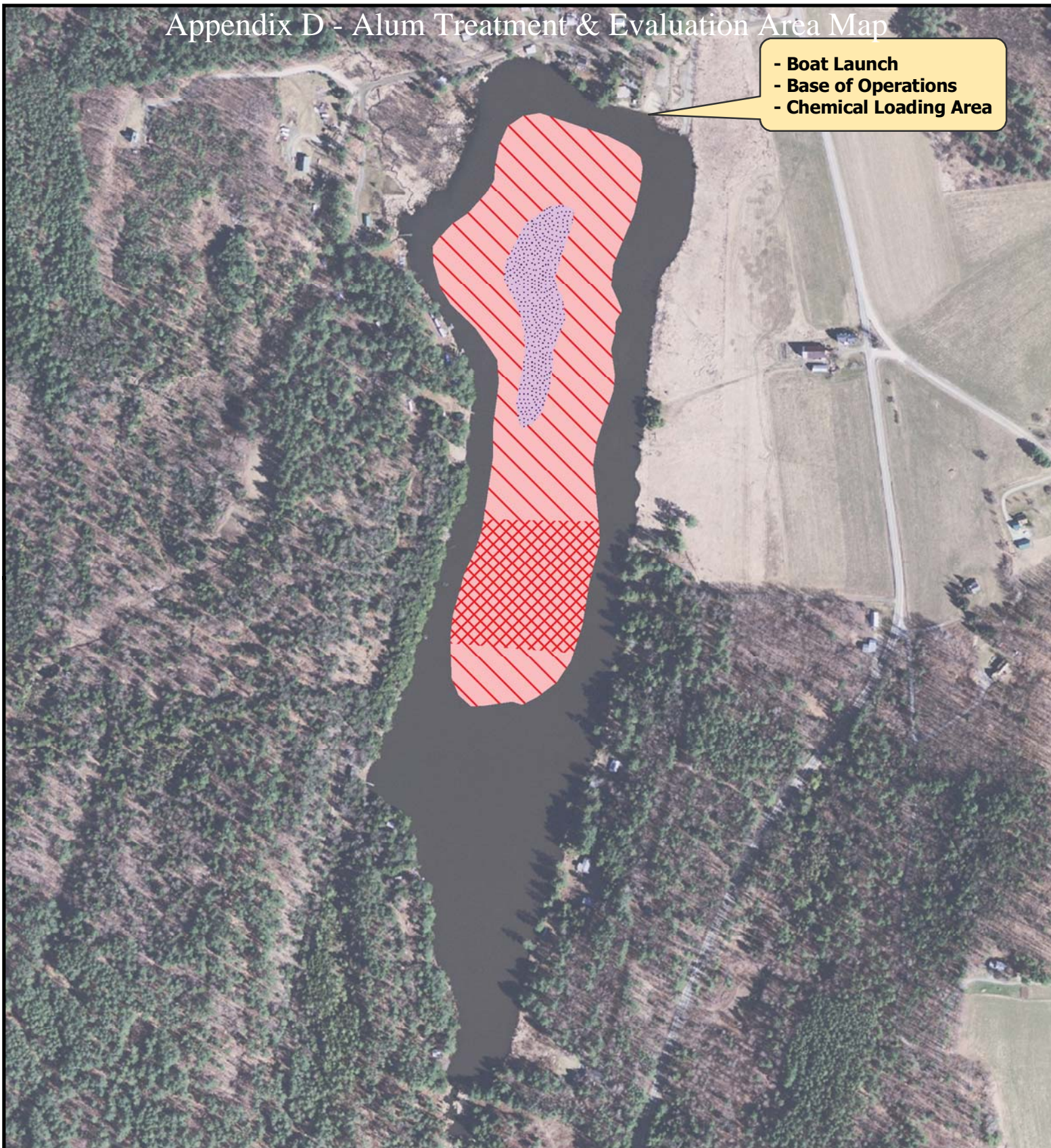
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Appendix D - Alum Treatment & Evaluation Area Map

- Boat Launch
- Base of Operations
- Chemical Loading Area



Ticklenaked Pond

East Ryegate, VT

Potential Treatment Zones

Legend:

Appendix D - Treatment & Evaluation Area

- Area C - 834 gal/ac @ 105 g/m²
- Area ABD - 477 gal/ac @ 60g/m²
- 5 acre Evaluation Area

0 250 500 750 1,000
Feet



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FIGURE:	SURVEY DATE:	MAP DATE:
2	03/2013	12/6/13