



Alum treatment: Protecting the water quality of Twin Lake



With the goal of improving water quality in Twin Lake, the Bassett Creek Watershed Management Commission and City of Golden Valley plan to treat the lake with aluminum sulfate (alum) in 2015. As a lake-area resident you may have some questions about alum treatment. We hope this information sheet answers those questions. You'll also have an opportunity to learn more at a public meeting scheduled for March 19 (see information box at right).

Alum: frequently asked questions Why treat the lake with alum?

The alum treatment will provide safe, effective control of algae in Twin Lake for 20–30 years or longer. The result will be cleaner, clearer water for recreation.

What does alum do?

Alum (aluminum sulfate) is derived from aluminum. It has been used in water purification and wastewater treatment for centuries and in lake restoration for decades. The chemical reduces the growth of algae by trapping phosphorus in the lake sediments.

Where does phosphorus come from?

- From external sources such as stormwater runoff or groundwater.

- From internal sources—phosphorus that has already accumulated in lake-bottom sediments and is periodically re-suspended in the summer.

Project partners have worked to control external sources of phosphorus. But, even when external sources have been reduced, phosphorus that is recycled from the lake's sediments into the overlying waters can support explosive algal growth. This process, frequently referred to as *internal loading*, can be controlled by alum.

How does alum work?

Alum is injected into the lake, several feet below the water's surface. Upon contact with the water it becomes aluminum hydroxide, taking the form of a fluffy substance called *floc*. This floc works to improve water quality in two ways:

1. As it settles to the bottom of the lake, the floc interacts with phosphorus to form aluminum phosphate, an insoluble compound. In this state the phosphorus can no longer be used by algae for food. Other suspended particles are also collected by the floc, leaving the water noticeably clearer.

Public meeting

Alum treatments in Twin Lake

- Date: March 19, 2015
- Time: 6:30–8 p.m.
- Place: Golden Valley City Hall Council Chambers
- Address: 7800 Golden Valley Road

For additional information, please contact Tom Hoffman at 763-593-8044 (thoffman@goldenvalleymn.gov).

2. On the bottom of the lake, the floc forms a layer which binds with phosphorus as it is released from the sediment. This produces a "blanket" over the sediment, reducing internal loading.

How long does it take to complete an alum treatment project?

Alum treatments are generally made either in the late fall or early spring over a period of 7–10 days.

How quickly will results be seen?

Lake transparency will increase dramatically, even within a few hours. Reductions in algae should be noticeable within one year.

How long will the alum treatment last and how can we extend the effectiveness of the treatment?

Since Twin Lake does not receive much phosphorus from *external* sources, the alum treatment is expected to maintain the lake's water quality for 20–30 years, or longer.

We can extend the effectiveness of the treatment by limiting the phosphorus that enters the lake from surface runoff. Leaves, grass clippings, eroded soil, fertilizers, and animal droppings are examples of phosphorus-rich materials carried by surface runoff.

The effectiveness of alum can also be increased by splitting the full alum treatment into multiple applications. Two applications will be used to treat Twin Lake.

Will recreation/aesthetics be affected?

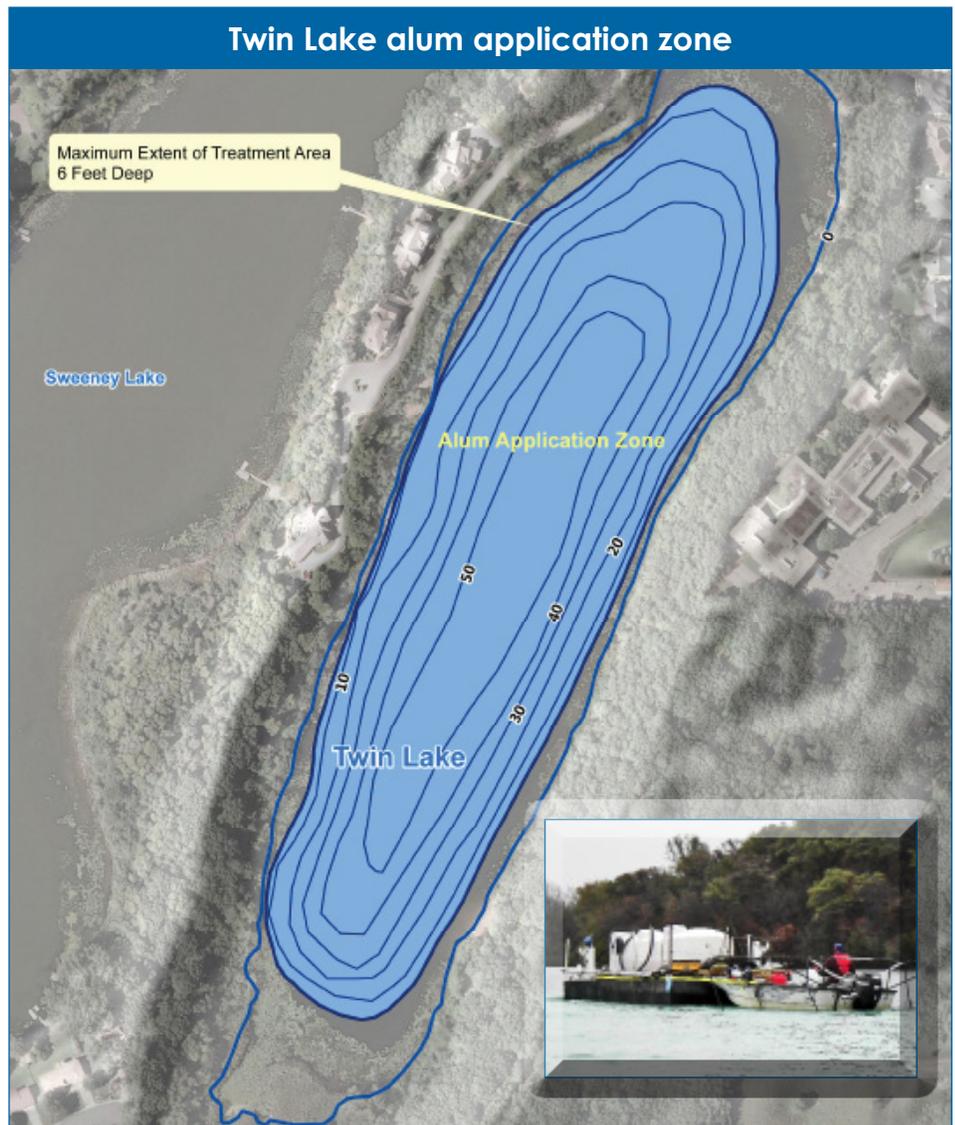
Treatment is planned during times of the year when lake water temperatures would discourage in-lake recreational activities. Swimming, canoeing and boating can continue during treatment; however, direct contact with the alum barge should be avoided.

Because application of the alum takes place in relatively deep water (6 or more feet), it is unlikely that the floc would be visible in shallow, recreational areas.

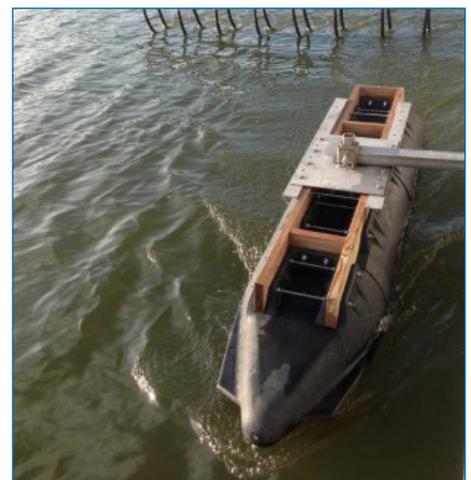
Is alum safe?

Yes. There is no evidence to suggest that aluminum ingested in water poses a health threat. Water treatment plants throughout the United States use hundreds of thousands of tons of alum annually and many municipalities use it for wastewater treatment. The floc is harmless to water creatures and aquatic plants; no adverse effects on spawning habitat have been documented.

The Food and Drug Administration, the U.S. Environmental Protection Agency, and leading medical experts all concur that **aluminum is not a risk factor** for any diseases or health conditions.



Above: The figure shows the extent of the alum treatment area; inset is a photo of an alum treatment barge. Below: Photos of Spring Lake before (left) and after alum treatment (right) by the Prior Lake-Spring Lake Watershed District.



Division 2 – Technical Specifications

SECTION 02400

CHEMICAL TREATMENT

PART 1: GENERAL

1.01 DESCRIPTION

- A. All Work included in this Section shall be performed in accordance with the following paragraphs, the General Requirements set forth in Division 1 of these Specifications, and the provisions of the other Contract Documents.
- B. Work covered by this section includes furnishing all supervision, labor, materials, and equipment required to supply, deliver, store and apply aluminum sulfate to Twin Lake, shown on Figure 1. The Contractor shall:
 - 1. Furnish, deliver, store and apply liquid aluminum sulfate to Twin Lake to mitigate the internal release of phosphorus from the lake sediment.
 - 2. Treat at appropriate weather, temperature, and flow conditions as directed by the Engineer.
 - 3. Furnish, install and remove all appropriate signage and buoys (if used) in a timely manner.
 - 4. Restore all areas directly or indirectly disturbed by the Work.
 - 5. All other Work required for a completion of the aluminum sulfate treatment as a project whole.

1.02 REFERENCES

- A. AWWA B403-88 American Water Works Association Standard for Aluminum Sulfate.

1.03 SEQUENCE OF WORK

- A. Aluminum treatment shall not begin until chemical applicator (Contractor) is approved by Owner. Treatment is to occur once in the spring of 2015 (see 3.05.E for the specifics on the aluminum sulfate application timing).
- B. The Contractor shall be responsible for all labor, aluminum sulfate, aluminum sulfate application equipment and arrangements for the timely delivery of aluminum sulfate required to complete the project.
- C. Aluminum application shall be conducted according to ARTICLE 8 – Instruction to Bidders.

1.04 SUBMITTALS

- A. The Contractor shall submit a spill prevention and contingency plan to Engineer for review prior to beginning Work on the Project.
- B. The Contractor shall submit certificate(s) indicating all materials meet requirements of these Specifications before treatment occurs. The Contractor shall submit the item, applicable reference specification, class, type, manufacturer, and distributor. The Contractor shall also submit the results of aluminum sulfate lot testing of materials delivered to the site, including an analysis of the metals content of the material, before treatment.
- C. The Contractor shall submit GPS coordinates and corresponding application rates and amounts of aluminum sulfate applied to the lake. This data shall be collected by the Contractor in real-time during the application and submitted to Engineer on a daily basis.

1.05 BASIS FOR COMPENSATION

- A. Compensation for all Work covered under this section of these Specifications shall be in accordance with the provisions set forth in Section 01010, Unit Price Measurement and Payment.

PART 2: PRODUCTS

2.01 CHEMICALS

- A Aluminum Sulfate (Alum)
 - 1. Liquid aluminum sulfate supplied shall meet the requirements of AWWA B403-88. The liquid aluminum sulfate [$\text{Al}_2(\text{SO}_4)_3 \cdot 14.3(\text{H}_2\text{O})$] shall be of commercial grade appropriate for the application with an aluminum content of **4.4%** Al^{+3} (Aluminum) by weight.

PART 3: EXECUTION

3.01 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall provide the name and location of the proposed chemical supplier with the Bid, and will be responsible for all coordination with the aluminum supplier necessary to insure timely delivery to the project site. The Contractor shall confine all storage of equipment and materials within the Project Limits and otherwise in a safe, secure and environmentally sound manner. Conformance to these requirements shall be determined by the Contractor, subject to disapproval of the Engineer, whose failure to disapprove does not, however, constitute any shift of responsibility to properly handle equipment and materials from Contractor to Engineer. Tank Truck haul routes and site access shall be as directed by Owner. If gradual off-loading is required the contractor shall be responsible for all demurrage charges.

- B. The Contractor shall provide notice to Owner of delivery of equipment and materials seven days prior to the delivery date.
- C. The Contractor shall maintain a copy of the spill prevention and spill contingency plan described in the Bid on site for the duration of the project.

3.02 UNFAVORABLE TREATMENT CONDITIONS

- A. Application of aluminum shall not occur when wind speeds 6 feet above the lake surface exceed 10 miles per hour.
- B. Application of aluminum shall not occur if it can be reasonably expected (forecast) that a significant precipitation event (greater than 1 inch in 24 hours) shall occur during treatment or begin within 24 hours after treatment completion.

3.04 LOCATION OF WORK

- A. Project Limits shall be the entire water surface area of Twin Lake and access area indicated on Figure 1 except for a 20 foot buffer zone around the shoreline of Twin Lake. The contractor shall not apply aluminum outside the indicated area on Figure 1 in the Drawings.

3.05 ALUMINUM APPLICATION

- A. The Contractor shall conduct the aluminum sulfate application utilizing a barge or similar vessel with an Engineer approved injection system that allows for uniform application of liquid aluminum sulfate at variable boat speeds. Aluminum sulfate application shall be made to the indicated area of Twin Lake shown in Figure 1.
- B. The Contractor shall ensure that the aluminum sulfate is **evenly distributed throughout the treatment area and that the appropriate dose is applied to the appropriate zone shown in Figure 1**. The Contractor shall maintain records to verify the area of coverage (also see Section 1.04).
- C. Engineer will monitor the ambient pH in **Twin Lake** during the aluminum sulfate treatment application. If at any time during treatment, the depth-averaged ambient pH in the lake falls below 6.5 or increases above 9 S.U., Contractor will stop the treatment. Treatment will not resume until authorized by the Engineer.
- D. The aluminum sulfate treatment shall be made at a sufficient rate to insure long term sediment phosphorus inactivation, as determined by the Engineer. Unless advised otherwise by the Engineer, the Contractor shall apply aluminum sulfate at a dose rate of **920** gallons per acre.
- E. The Engineer estimates that this treatment rate will require a total of **15,000** gallons of commercial grade (4.4% Al³⁺ Aluminum) liquid aluminum sulfate [Al₂(SO₄)₃•14.3(H₂O)]. It is Contractor's responsibility to ensure that enough material is available to complete the Work in accordance with the dosing requirements stated herein.

- F. The aluminum sulfate application must be complete before the surface temperature of Twin Lake has risen above 60° F. Application of aluminum sulfate shall not occur if it can be reasonably expected that the surface temperature of Twin Lake will drop below 40° F within 24 hours after treatment completion.
- G. The Contractor shall keep daily records acceptable to the Engineer and available for review as a basis for and substantiation of payment. Daily logs shall minimally state the following:
 - a. Hours of aluminum application
 - b. The quantity of aluminum applied
 - c. The approximate acreage and volume treated
 - d. Explanation of any downtime

END OF SECTION 02400

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