Environmental Assessment

A. Project Identification

Name: Ohio Department of Natural Resources
Grand Lake St. Marys Alum Treatment Project

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WPCLF No.: CS391515-0008

B. Proposed Project

1. Summary

The Ohio Department of Natural Resources (ODNR) has applied to Ohio EPA for $5,000,000 in financial assistance from the Water Pollution Control Loan Fund (WPCLF) for the Grand Lake St. Marys (GLSM) Alum Treatment Project. The alum will be applied to the lake to reduce the excessive concentration of phosphorus in the water, which has led to dense blooms of cyanobacteria (blue-green algae). The blooms result in low dissolved oxygen and production of algal toxins. High levels of algal toxins have led to state advisories to avoid contact with the water.

Ohio EPA included a provision for emergency assistance in the draft 2011 WPCLF Program Management Plan. Under that provision, ODNR is eligible to receive up to $5 million in principal forgiveness funds for the project. By federal law, the amount of principal forgiven is not required to be repaid to the WPCLF by the borrower.

The purpose of the alum dosing project is to reduce the concentration of reactive phosphorus and the quantity of blue-green algae presently in the lake, with the goal of helping to improve water quality to restore the recreational uses of this surface water resource.

The WPCLF program requires that a comprehensive environmental review be performed prior to the award of financial assistance. This Environmental Assessment describes the proposed alum treatment project, the planning and analysis that were performed prior to project bidding and the potential for adverse environmental impacts during implementation. Ohio EPA's environmental review

has concluded that the proposed project will not result in significant adverse environmental impacts.

2. Existing/Future Conditions

GLSM drains a 112 square-mile watershed in west-central Ohio. The region is characterized by low relief plains, variable thickness of ground moraine, and extensive corn, soybean and livestock production. Most of the watershed is in southeastern Mercer County and a smaller portion is in southwest Auglaize County. The lake is primarily fed by tributaries flowing from the south. It has a surface area of 12,700 acres and is approximately 9 miles long (east to west) and 3 miles wide (north to south). The lake has a maximum depth of 7 feet and a spillway at the western end, which flows into Beaver Creek just south of the city of Celina. Beaver Creek flows west and eventually reaches the Wabash River.

The tributaries of the lake include Barnes Creek, Little Chickasaw and Chickasaw creeks, Prairie Creek, Burntwood Creek, Coldwater Creek, Monroe Creek and the headwaters of Beaver Creek (see attached Figure).

GLSM, completed in 1845, was dug by hand to store water for the Miami-Erie Canal. It is formed by earthen dams on Beaver Creek at the west end and the St. Marys River at the east end. The Ohio Department of Natural Resources, Division of Parks and Recreation operates a state park, campground, three swimming beaches and several picnic areas on the lake. The Division of Wildlife has responsibility for fish and game management. There are several boat ramps and unlimited horsepower is allowed. The lake is an important recreational resource, and supplies water to the City of Celina water treatment plant and water for the St. Marys State Fish Hatchery.

GLSM currently has very high levels of phosphorus in its waters and sediments. Farming and animal feeding operations have been identified as the most significant sources of this phosphorus. Other notable sources are failing home sewage treatment systems and wastewater treatment plant discharges. Data from Ohio EPA sampling in 1999 and 2006 was used to develop the Total Maximum Daily Loads (TMDLs) for the Beaver Creek and Grand Lake St. Marys Watershed report (Ohio EPA 2007). The TMDL report recommends large reductions of phosphorus (at least 85% for many streams) to meet the in-stream nutrient targets.

GLSM is currently in a hypereutrophic state. Eutrophication means a body of water is in a nutrient enriched state. These nutrients, especially phosphorus, allow algae to reproduce so abundantly at the surface that a large proportion of them die due to lack of light. The death of blue-green and other algae releases toxins into the water. Their decomposition depletes the water of its dissolved oxygen, thus causing the death of fish and other aquatic life.

The quality of the lake as an environmental and recreational resource has declined precipitously in recent years due to the cumulative effects of gradual land use changes related to the ongoing agricultural industry, growth in animal feeding operations, and development within the watershed. Numerous plans to reduce the levels of pollution entering the lake have been developed over the years. However, the lake's water quality continues to suffer from high nutrient input, leading to dangerous levels of algal microsystin toxin that endanger public health and welfare. Algal blooms in the summer of 2010 were of such a magnitude that the Ohio EPA, ODNR, and Ohio Department of Health issued a joint advisory strongly recommending no contact with the water to ensure public health. The resulting impact was to curtail all recreational activity on the lake. The algal blooms are a clear indication of the lake ecosystem's inability to process and utilize the ongoing input and accumulation of nutrients.

In response to the adverse impacts to the ecology and economy of the area, the Grand Lake St. Marys Restoration Commission (GLSMRC) was created in December 2009 to improve the local economies surrounding the lake by supporting the environmental restoration of the lake.

The solution to the problem of nutrient overabundance and algae proliferation in the lake will require a long-term effort to implement a number of project types, both in the lake and in the surrounding watershed.

As the concern about the health of GLSM continues to rise, Ohio EPA has awarded more than $1.5 million in grants toward the restoration of the lake thus far. Grants have been awarded to:

- ODNR to conduct pilot projects in late summer of 2010 involving the application of alum in selected areas of the lake;
- Mercer County Commissioners (to develop a wetland and treatment train approach to reducing nutrient loading into the lake in the Prairie Creek watershed;
- Mercer County Commissioners to install and evaluate a water aeration and circulation device in the Park Grand and Southmore Shores embayments;
- ODNR to install bedload sediment collectors in Barnes Creek, Beaver Creek and Big Chickasaw Creek;
- US Dept. of Agriculture – Natural Resources Conservation Service (under contract) to provide targeted conservation planning in several subwatersheds, complete farm-scale conservation plans on 35% of the acres in 2010 and 2011, install targeted stream buffers on critical areas in 2012, restore wetlands and manage drainage water; and
- Mercer County Soil and Water Conservation District to implement agricultural best management practices and home sewage treatment system improvements in the lake watershed.

In addition (in April 2011), ODNR will be conducting another demonstration project for alum treatment. The results of that demonstration project will be used in future treatment of the lake.

3. Alternatives Analysis

In early 2010, USEPA contracted a consultant, Tetra Tech, Inc. to identify and develop short- and long-term solutions to address the problem of toxic algal outbreaks in the lake due to nutrient loading. The result was the report titled Recommended Actions for Grand Lake St. Marys, Ohio (July 2010). Based on this report, GLSMRC in consultation with KCI Associates of Ohio prepared The Strategic Plan for the Grand Lake St. Marys Restoration Commission (January 2011). The full reports and other GLSMRC information can be found on the Lake Improvement Association website at http://www.lakeimprovement.com. Additional information can also be found on Ohio EPA's website at: http://www.epa.state.oh.us/pic/glsm_algae.aspx.

The efforts to reduce nutrient loading can be divided into watershed actions and in-lake actions. Examples of watershed type actions are: the construction of treatment trains and alum dosing structures on the tributaries that flow into the lake as a means of inactivating phosphorus before it reaches the lake; ongoing construction of manure storage structures; promulgation of new state regulations that prohibit land application of manure on frozen ground; and implementation of requirements for comprehensive nutrient management plans for farmland in the watershed. All of these activities are focused on reducing the amount of nutrients that reach the lake.

The above watershed actions will take time to implement and to show results. While critical to accomplish, they do not address the exceptionally high nutrient levels currently found in the lake from decades of sediment inflow.

In-lake actions to address existing nutrient levels can include aeration, dredging, and alum treatment. In-lake actions have the advantage of not requiring construction and of being easy to modify to achieve maximum effectiveness. In-lake actions generally have shorter lead times, and quicker results.

The in-lake and watershed actions evaluated in the reports fall into four categories:

- Chemical treatments
- Sediment management
- Biological treatments
- Best management practices.

The chemical treatments may involve alum and/or peroxide to precipitate phosphorus that feeds the algal blooms. The chemicals are applied to the lake

from boats and quickly react to inactivate phosphorus. Project types include lake-wide alum dosing and in-stream flocculation and collection of sediment.

Projects in the sediment management category focus on the removal of sediment from the stream-lake system, since sediment is the main vehicle by which phosphorus migrates to the lake. Management ranges from preventing sediment from entering waterways through agricultural best management practices, stream restoration, and shoreline stabilization, to removing sediment in the lake by dredging. In-lake project types include dredging, spoil island development, shoreline protection and upland disposal of spoil.

Biological treatment would be used to alter the ecology of the lake. This strategy would target components of the biological system based on specific conditions. Project types include altering fish stocks, promoting beneficial algae growth, improving aeration/water circulation patterns, and water level management activities.

Best management practices can target non-point sources of nutrients before they enter the lake. These actions can maintain long-term protection of the lake. Project types include in-stream treatment trains, riparian buffer and stream restoration, wetland creation, low-impact development within the watershed, improved manure/fertilizer management, and more use of waste-to-energy technologies.

The Tetra Tech report (July 2010) discussed the use of alum in detail. Alum has been used and documented to inactivate phosphorus in about 140 lakes in the U.S. Most of the lakes were small (less than 100 acres), with the largest being 5,240 acres. Alum is the most common chemical coagulant and has been used for water treatment for centuries. It will not require water use restrictions for GLSM during or after application. Alum application is listed as a best management practice in the state's Nonpoint Source Management Plan approved by U.S. EPA. Demonstrations of phosphorus immobilization were conducted in separate embayments of the lake in late summer of 2010. The two techniques tested were: (1) alum treatment and (2) pretreatment with peroxide followed by alum treatment.

An approach was formulated in the 2011 Strategic Plan to score the inherent value of specific lake improvement project types. This process represents a prioritization of the actions that yield the greatest return for the efforts put forth. Project types that score the highest have the greatest potential for effectiveness to reestablish a healthy lake and contribute to the overall economic well being of the region in the shortest amount of time.

The 2011 Strategic Plan identified sequestration of soluble reactive phosphorus through the direct application of alum and peroxide as the highest priority project to provide the most immediate relief from the affects of toxic algal blooms.

The currently proposed project is only one part of the overall solution for restoration of GLSM. Improving the water quality in GLSM will need to be a long-term, ongoing effort that will also require a commitment to reducing pollutant loading to the lake. While an important first step, improvements in water quality from implementing actions such as alum treatment will not be enough to ensure the long-term sustainability of the lake. A long-term comprehensive effort is needed that will include a strategic series of management actions to most efficiently improve water quality. This effort must be based on a combination of in-lake measures supported by sufficient, watershed-wide nutrient management.

4. Project Description

Alum buffered with sodium aluminate was the treatment method identified as the most reasonable cost alternative, considering monetary and nonmonetary factors, to address the high levels of phosphorus in GLSM. A large-scale application of alum to the waters of the lake is planned for early 2011 to inactivate phosphorus in the water and sediments of the lake. It is imperative that alum application begin no later than the middle of May prior to the growth of harmful algae.

The project plan includes a light dose of alum across 12,500 acres of GLSM and a heavier dose over 4,900 acres in the mid-lake area. The intent of applying the alum in this manner is to strip the soluble phosphorus from the water column over the majority of the lake with the light dose. By inactivating the phosphorus with a light dose over a wide area, it is believed that the frequency and severity of algal blooms will be significantly reduced. The mid-lake area will be treated at a higher rate to begin inactivating phosphorus in the sediments.

A granular hydrogen peroxide compound will be applied prior to the alum in 1,200 acres of the mid-lake area to oxidize any algal bloom that may occur during the treatment window. This will also oxidize the sediments to help release phosphorus there so it can be more easily inactivated by alum.

Problems with aluminum toxicity are not expected because the concentration of applied alum will be very low and will be buffered to prevent aluminum from going into solution and becoming biologically available. Therefore, aluminum toxicity problems for fish and bottom fauna are extremely unlikely.

From case studies of alum application, a reasonable expectation for a treatment effectiveness lifespan is ten years. However, there is not a thorough enough understanding of phosphorus-loading dynamics to confidently predict long-term effectiveness of any whole lake treatment at GLSM.

To apply the alum treatment, the liquid alum will be transported on existing roads to lake access points by 5,000 gallon tank trucks and transferred to a boat or

barge for metered application to the lake. It is estimated that ten to twelve truck loads per day will be needed. This will be only a transient activity, with no disturbance of ground or clearing of vegetation expected to be necessary in carrying out the project.

5. Implementation

The total project cost of the currently proposed Alum Treatment project is $5,000,000. Ohio Department of Natural Resources has applied to the State of Ohio's Water Pollution Control Loan Fund, administered by the Ohio EPA for financing of this project. Ohio EPA accepted the project nomination under its proposed provision for emergency assistance in the draft 2011 WPCLF Program Management Plan. Due to the urgent nature of the public health threat presented by the condition of the lake, and to the lack of an available source of repayment to finance the lake's remediation, the project is proposed for principal forgiveness funding.

Implementation of the project will commence shortly after the WPCLF loan award, and take approximately two months to complete.

C. Environmental Impact of the Proposed Project

The WPCLF program requires that a comprehensive environmental review be performed prior to the award of financial assistance. The environmental review requirements are specified by ORC 6111.036 (L) and OAC 3745-150. This document provides the findings of the environmental review completed for the proposed Alum Treatment project. The purpose of the project is to reduce the availability of reactive phosphorus in the lake waters and thus improve water quality in the lake.

Mitigation measures and practices have been included in the detailed plans and specifications for the alum treatment project to prevent adverse environmental impacts during implementation. These include a requirement that the contractor develop a Spill Prevention Control and Contingency Plan, and contacting the appropriate local authorities concerning load limits and use of public streets. More detailed information follows.

1. Major Land Forms

The shoreline of the lake has been highly modified by water control structures and boat channels. Access to the lake by the contractor will be limited to boat ramps and other existing ODNR facilities. No disturbance of ground is expected to be necessary in carrying out the project. The project does not involve any construction, so there will be no new structures. Based on the above, the

proposed project will not result in a significant adverse environmental impact to major land forms.

2. Surface and Ground Water

Depending on mainly seasonal weather conditions, surface water entering the lake from streams carries a high concentration of dissolved and sediment load phosphorus. Water in the lake is enriched with excessive dissolved phosphorus, which has led to dense blooms of cyanobacteria (blue-green algae). The blooms result in low dissolved oxygen and production of algal toxins. Alum is a widely utilized coagulant whose uses include food processing and water treatment. Alum treatment will not require water use restrictions during or after application. Once alum is delivered to the lake water, it instantaneously dilutes and forms a floc that settles out of the water column within 10 minutes to 2 hours. The pH of the alum liquid is buffered so direct water contact with the floc is not a safety or environmental concern.

The proposed project will require approval by Ohio EPA of a general permit under the National Pollutant Discharge Elimination System. It will not require Clean Water Act Section 401 or 404 permits because no excavation or placement of fill in a water way will occur as a result of the project.

Given the above conditions, the proposed project will not result in any significant adverse environmental impact to surface water resources. Additionally, the proposed project will not result in a significant adverse environmental impact to drinking water supplies using lake water.

Shallow aquifers in the vicinity of the lake are usually thin and discontinuous and are not likely to be in direct communication with the lake. In addition, the ground water movement is toward the lake. Furthermore, It is unlikely that water wells would be affected by the project because the alum will be immobilized by a flocculation reaction in the lake water.

Alum application operations will not require utilization of ground water in the area surrounding the lake. If any make-up water is needed, it would be available from the lake or Celina WTP, which uses surface water from the lake.

Based on the above, the proposed project will not result in a significant adverse environmental impact to ground water quality or quantity.

3. Terrestrial and Aquatic Habitat

Access to the lake will be from ODNR boat ramps and their properties developed for public use. Therefore, no clearing of vegetation is expected to be necessary in carrying out the project. Equipment will be parked only in areas controlled and

designated by ODNR. The alum treatment will be applied to open water parts of the lake, so no terrestrial habitat will be affected.

Harm to aquatic habitat from alum treatment is extremely rare. The reduction in algal blooms will actually improve aquatic habitat by reducing water turbidity, and allow higher concentrations of oxygen in the water.

Considering the above, the proposed project will not result in a significant adverse environmental impact to terrestrial or aquatic habitat, or to any threatened or endangered species.

4. Land Use and Agriculture

As previously stated, access to the lake will be from developed ODNR property and will require no disturbance of ground or clearing of vegetation to carry out the project. The application of alum is a non-structural best management practice for nonpoint source pollution control. Based on the above, the proposed project will not result in any significant adverse environmental impact to land use or agriculture.

5. Floodplains and Wetlands

The lake is not a flood control reservoir so the water level does not vary significantly. The alum treatment will only be applied on open water parts of the lake so no floodplain or wetlands will be affected. Therefore, the proposed project will not result in any adverse environmental impact to floodplains or wetlands.

6. Archaeological and Historical Resources

Alum delivery will only be to developed access points and application will occur only on open water. Therefore, no disturbance of ground or clearing of vegetation that could adversely affect historic or potentially historic properties are expected to be necessary in conducting operations for the proposed project. Additionally, the project does not involve any construction, so there will be no new structures, either above or below ground.

Given the above project description, the limited scope of the project, and the nature of the project itself, the project will have no effect on properties listed on or eligible for listing in the National Register of Historic Places.

7. Air Quality

Air quality near the lake has been degraded directly and indirectly by algal blooms. Alum will be applied to the lake in liquid form so no release to the atmosphere will result. Based on the above, the proposed project will not result

in a significant adverse environmental impact to air quality and should actually improve air quality.

8. Noise, Traffic, and Aesthetics

Much of the land near the lake has been developed by subdividing where not owned by ODNR. Alum will be delivered to existing ODNR-owned access points on the lake, which will be temporarily closed to the public during operations and vary as the areas to be treated change. Thus, the effects of increased noise and traffic will be intermittent and transient. Aesthetics of the lake will not be adversely affected, as no construction activity or disturbance of vegetation will occur. Instead, the proposed project should improve the aesthetics of the lake by reducing water turbidity, scum on shorelines, odors, and fish kills. Based on the foregoing, the proposed project will not result in a significant adverse environmental impact from noise or traffic, and there will be no degradation of aesthetics.

9. Local Economy

According to a report titled Tourism Economics – The Economic Impact of Tourism in Auglaize and Mercer Counties, Ohio (2009), economic activity associated with the lake generated sales, wages and taxes totaling approximately $193M annually and accounted for 2,487 jobs in the Auglaize-Mercer County area. However, the recent algal blooms, high concentrations of microcystin, and subsequent public health advisories on the lake have caused significant adverse economic effects. Based on surveys of area businesses in the latter half of 2010, business was down an average of 35% to 40%. This percentage extrapolated across the region results in recreational related revenues decreasing by approximately $77M. Property values have fallen an estimated 14%, of which 6% is attributable to the lake conditions. The market for any properties in the area has dropped drastically. In addition, financing through Freddie Mac/Fannie Mae for homes in proximity to the lake has been denied.

The agricultural industry has also begun to feel the effects of the lake problems. Indiana is considering whether to allow application of Ohio animal waste in that state due to possible adverse effects. In addition, several livestock operations have decided to locate in Indiana due to the perceived future problems with locating in the GLSM region.

A scoring/prioritization process formulated for the Strategic Plan identified alum treatment as the project that would initially yield the greatest economic return for the efforts put forth to restore the health of the lake. There will be no cost to residents in the lake area for alum treatment or other lake restoration activities. Restoration of the lake should improve economic conditions as recreational activity returns to the lake.

Given the above conditions, the proposed project will not result in a significant adverse environmental impact to the local economy, but rather should prove beneficial.

D. Public Participation

The Grand Lake St. Marys Restoration Commission was established in January 2010 in response to the decline of the economic and ecological health of the lake. Commission members include:

Auglaize and Mercer Counties Convention and Visitors Bureau
Boards of Commissioners of Auglaize and Mercer Counties
Cities of Celina and St. Marys
Grand Lake/Wabash Watershed Alliance
Lake Development Corporation
Lake Improvement Association
St. Marys Community Foundation
Wright State University - Lake Campus.

One of the objectives of the GLSMRC is public outreach to establish open lines of communication to inform, educate and understand the needs and objectives of those who live within the ecological context of the lake system, and carry the message of the plan to the overall population.

Most recently, in accordance with this objective, Ohio EPA, ODNR and GLSMRC published notice of a public meeting, which was held on March 21, 2011 at the Wright State University - Lake Campus. The purpose of the meeting was to provide information and take comments concerning the proposed large-scale Alum Treatment project.

Other public participation opportunities occurred previously during 2010, including a public meeting in October 2010, a multi-agency community update meeting (September 2010), four citizen advisory mailings from August 2010 through February 2011, and a senior citizens community luncheon (September 2010).

Besides the above activities, Ohio EPA has also participated in meetings (February, May and September 2010) of the GLSM Restoration Commission. Ohio EPA is not aware of any major controversy involving the proposed Alum Treatment project.

The following agencies have been provided an opportunity to review and comment on the planning information for the proposed Alum Treatment project:

Ohio Environmental Protection Agency

Ohio Historic Preservation Office
Ohio Department of Natural Resources
Department of the Interior, U.S. Fish and Wildlife Service

E. Reasons for Concluding That There Will Be No Significant Adverse Impacts from the Proposed Improvements

Based upon Ohio EPA's review of the planning information and the materials presented in this Environmental Assessment, it is concluded that there will be no significant adverse impacts from the proposed alum treatment project as it relates to the environmental features discussed above.

The environment should benefit from implementation of the project by immediately reducing levels of available phosphorus in the lake, which should help prevent outbreaks of toxic algae and improve aesthetics in the lake. In turn, the economy should benefit as associated recreational activity returns.

F. Question or Comments

For further information, contact:

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