

Lake Management Report Review & Priority Recommendations
Pigeon Lake Protection & Rehabilitation
District

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**Pigeon Lake Protection and Rehabilitation District
Lake Management Report Review and Priority Recommendations
July 2009**

A. Study Objectives

The Pigeon Lake Protection and Rehabilitation District (PLPRD) recently contracted with Vierbicher to review previous lake management reports and to prepare a summary report that would prioritize recommendations to protect the lake from future degradation. PLPRD will use this summary report to identify projects that can be included in their future management plans and district budgets.

B. Previous Reports

An August 2007 report from Tetra Tech Inc., "Report of Exploration Pigeon Lake Drawdown Potential", a November 2006 report from Tetra Tech, Inc. "Aquatic Plant Survey and Comprehensive Lake Management Plan", and an October 1997 report from Nordin-Pedersen Associates, LTD, "Pigeon Lake Management Study" were obtained from PLPRD and reviewed by Joseph M. Dorava, PE, a professional engineer and hydrologist with Vierbicher who has more than 20 years of experience with water resource management issues.

The reports that were reviewed each contain recommendations specific to their content. For example, the 2007 drawdown study recommended that a draw down would not substantially alter bed sediment depths in Pigeon Lake. The 2006 management plan offered numerous recommendations including benefits from dredging the lake, controlling sediment and nutrient inflow from the watershed and monitoring lake water quality. The 1997 report references another 1977 study and computed sediment delivery rates to Pigeon Lake that average about 0.75 inches per year. Furthermore the 1997 study identified sediment accumulation of 4.5 feet in a northeastern bay (Fairway Lake).

C. Summary of Results

After reviewing the previous study reports and their recommendations a list of priority projects was developed and an opinion of the probable costs to implement these projects was estimated. In addition, supplemental recommendations are also made for management activities that would benefit the lake but no costs to implement these recommendations were estimated because the activity was minor, scheduled far into the future or it had no specific cost associated with its implementation. The specific projects listed below are in the priority order and have implementation costs assigned to each project. The general recommendations that follow later in this report are listed in no specific order and do not have cost estimates prepared.

D. Priority Projects

1. Mechanical Dredging Pilot Project and Sediment Trap

A lake rehabilitation pilot project is proposed in the Fairway Lake area where the embayment has accumulated substantial sediment (see Exhibit A). The dredging is proposed to be done by draining the bay (or lake) and mechanically removing the sediment when it has frozen in the winter. The dredged material will stockpiled in a confined area upstream where the inlet stream crosses the first roadway. After drying, the dredged material will be used to construct a berm to create a sediment retention facility. This facility will have the capacity to hold about 20-30 years of sediment given an accumulation rate of 4.5 feet over 20 years.



The cost to dredge the bay and construct this sediment retention facility is estimated as follows:

Prepare Dredging Plans	\$6,000
Prepare Sediment Retention Facility Plans	\$5,500
Prepare Grant Funding Application	\$2,000
Prepare Permit Applications	\$4,000
Prepare Specifications and Bidding Documents	\$5,500
Bid & Award Construction Contract	\$3,000
Mobilize and Install Erosion Control Practices	\$3,000
Remove Lake Bed Material 15,000 at \$5.00	\$75,000
Construct Berms	\$25,000
Construct Outlet/Embankment	\$20,000
Construction Oversight	\$15,000
Restore Site and Remove Erosion Control Practices	\$15,000
Construction Contingency	<u>\$20,000</u>
TOTAL	\$199,000

In 2001, Pigeon Lake was identified as a priority watershed for the Federal EQUIP Funding Program. Since this project has many water quality improvement aspects, it is likely that either the EQUIP program or the WDNR Lake Management program could assist with funding. With that in mind perhaps 50 to 75 percent of the project costs would come from outside the district. The result is an anticipated project cost of about \$48,250 to \$96,500 for the PLPRD.

2. **Hydraulic Dredging Pilot Project**

Another high priority lake rehabilitation project is restoring water depth in the southern embayment by Bradley Lake (see Exhibit A). This bay is larger than the Fairway Lake bay described earlier and too deep to draw down and therefore would require hydraulic dredging techniques. As a result costs for rehabilitation will be higher and permitting more difficult. However, there are substantial benefits results from increasing water depth and removing soft sediment, so the project is worth investigating. The cost for completing this project was estimated as follows:

Prepare Dredging Plans	\$18,000
Prepare Sediment Disposal Plans	\$7,500
Prepare Grant Funding Application	\$2,000
Prepare Permit Applications	\$6,000
Prepare Specifications and Bidding Documents	\$5,500
Bid & Award Construction Contracts	\$3,000
Mobilize and Install Erosion Control Practices	\$25,000
Remove Lake Bed Material 41,100 yards at \$9	\$369,900
Install Bags and Construct Spoil Sites	\$165,000
Truck Material Off Park 20,000 yards at \$5	\$100,000
Construction Oversight	\$45,000
Restore Site and Remove Erosion Control Practices	\$45,000
Construction Contingency	<u>\$80,000</u>
TOTAL	\$871,900

Because there are few water quality aspects of this hydraulic dredging project, no sediment retention facility for example, there will be fewer funding opportunities. As a result the district should likely expect to pay for this total project.



3. **Agricultural Land Protection Measures**

Since a majority of the watershed draining to Pigeon Lake is used for agricultural activities, some benefits can be gained from helping reduce the inflow of sediment and nutrients from these areas. For example, providing cost share to farmers to implement Best Management Practices (BMPs) would reduce the amount of sediment and nutrients entering the lake. Example of BMPs may include:

- Install gutters on their barns to divert clean water away from manure contaminated areas
- Construction of drainage swales to divert runoff around animal feeding areas
- Constructing fences and fords to prevent cattle from damaging stream banks
- Compensating farmers for crop loss when they dedicate land as a buffer along streams tributary to the lake

These activities all provide water quality protection and thus would likely be supported by EQUIP or WDNR funding programs. The costs share programs for gutters, swales, fences and buffers would be reasonably funded at about \$50,000 per year with 50% of the funding coming from outside the district. As a result there would be an annual expense of about \$25,000 by the district.

4. **Long-Term Water Quality Monitoring**

Although previous reports indicate the water quality of Pigeon Lake is poor and has not improved since 1977, monitoring water quality is still very important. Especially if the district wants to understand if water quality benefits are obtained from implementing the programs such as dredging or agricultural land protection described earlier. Therefore a long term water quality monitoring program is recommended for the lake and its major tributaries. This monitoring is commonly supported by EQUIP and WDNR funding programs and as a result would likely be cost shared with them. An annual monitoring program of about \$10,000 would be beneficial and if cost shared, would result in an anticipated annual expense of \$5,000 for the district.

5. **Educational Workshops. Governmental Coordination and Public Involvement**

Informing and involving the public and adjoining governmental agencies of Lake District activities and concerns is very important and very beneficial to the lake. The district can prepare informational articles for its newsletter, for the local news papers, and for distribution by agencies. In addition, workshops or meetings can be held to address specific issues such as buffer area benefits or no-mow lawn care. Finally involving the public in lake issues is important and can be accomplished with lake or stream clean-up days, pontoon parades, fishing tournaments, or picnics. The costs for a public educational and involvement program would likely be eligible for cost sharing and substantial benefits could be gained from a small program of about \$5,000. As a result the district would anticipate a \$2,500 annual expense for public education and involvement.

E. **Other Recommendations**

1. **Weed Harvesting**

Continue to harvest excessive aquatic vegetation and investigate the benefits from obtaining grants from the WDNR Aquatic Invasive Species Program to assist with eradication of problematic invasive species or to prevent invasive species from entering the lake from public boat landings.



2. **Septic System Inventory**

Investigate the number of septic systems draining into Pigeon Lake using County or City records. Provide incentive funding to owners who are willing to relocate their system farther from the lake or to connect them to a public sanitary sewer system.

3. **Monitor and Police Construction Activities**

Since construction site erosion is a major source of sediment to lakes, the district should monitor all construction activity in the watershed and report any undesirable activity to regulatory agencies. This would include private and public construction projects such as home building, culvert replacements and highway maintenance and construction.

4. **Water Level Control**

The operation of the dam at Clintonville has a significant influence on water quality. Especially if insufficient water is available to completely and continuously fill the lake. Also the manipulation of water levels can benefit the lake by controlling undesirable vegetation. The district should closely monitor dam operations and when water is available water levels can be adjusted to help improve water quality. For example, blue green algae grows most effectively when it has a 7 to 10 day period of still steady water levels with high water temperatures. If the dam operation can be used to adjust water levels during a 7 to 10 day period so that water temperature and water levels decrease algae growth the lake will benefit.

5. **Increase PLPRD Membership and Outreach**

Contacting the public and educating them of lake ecology and watershed issues is very important. The district should consider increasing its membership by expanding its boundary to include the entire watershed. If that is impractical then your educational and outreach efforts should extend beyond your membership and involve all the counties, townships and municipalities within the watershed. Influencing the activities of everyone in the watershed will help improve lake water quality.

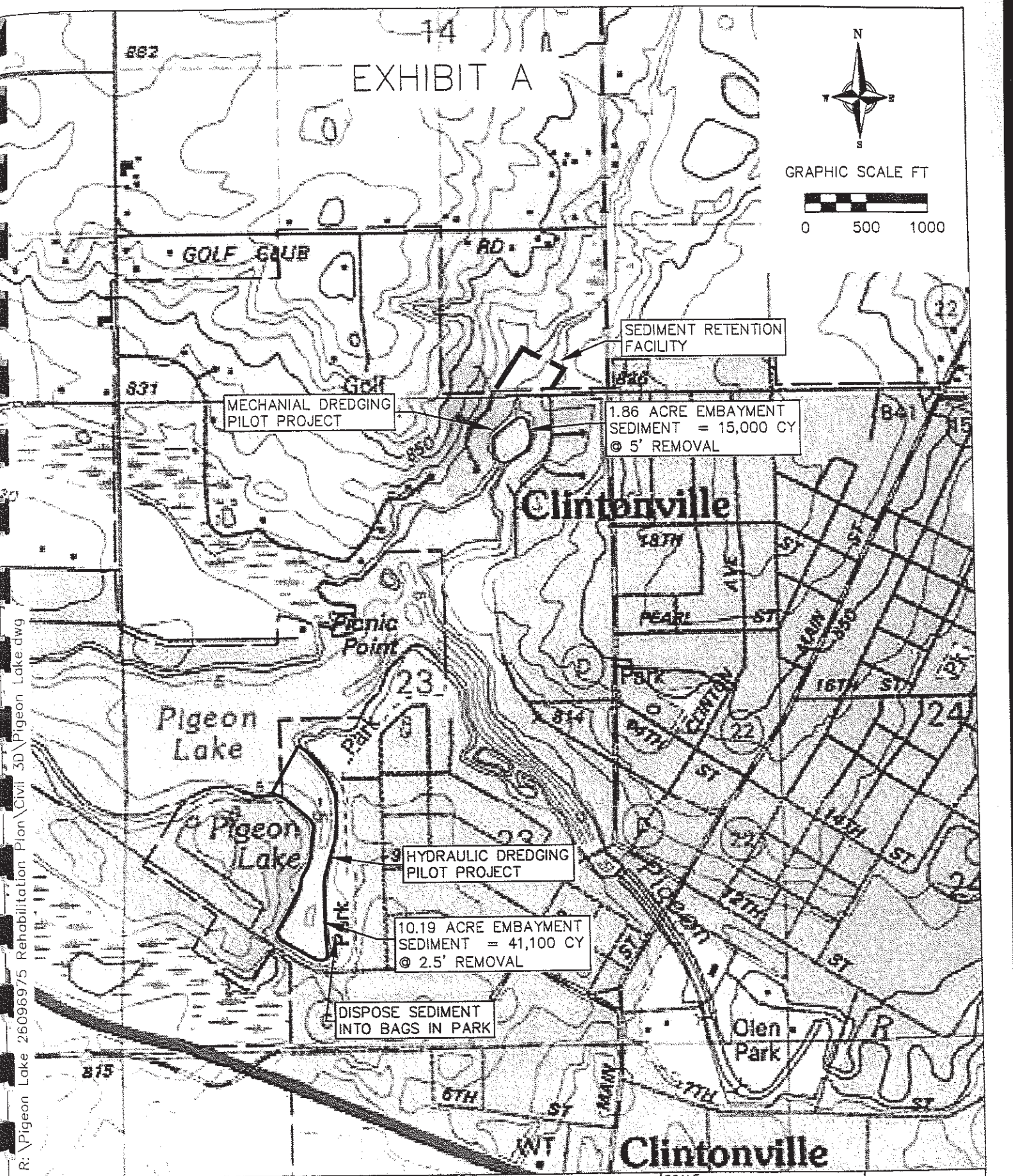


Exhibit A

EXHIBIT A



GRAPHIC SCALE FT



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REVISIONS	SCALE	AS SHOWN	SHEET
REVISION 1	CHECKED	MMUC	1 OF 1
REVISION 2	DRAFTER	JDOR	
REVISION 3	FILE		
JOB NO.	DATE	7/16/09	