

Conceptual Design Report

Sediment Mitigation Project

Lake Lemon Conservancy District

Monroe and Brown Counties, Indiana

September 25, 2018



Lake Lemon Conservancy District
7599 North Tunnel Road
Unionville, IN 47468

Project Number: 17-0215



Shrewsberry & Associates
120 West 7th Street, Suite 310
Bloomington, Indiana

TABLE OF CONTENTS

1	Introduction and Background	1
1.1	Introduction	1
1.2	Project Location	1
1.3	Background	2
1.4	Goals and Objectives	2
1.5	Stakeholders	2
2	Data Collection and Analysis	3
2.1	Past Studies	3
2.1.1	Sedimentation in Lake Lemon, 1974	3
2.1.2	Lake Lemon Diagnostic/Feasibility Study, 1986	5
2.1.3	Lake Lemon Feasibility Study, 1992	6
2.1.4	Lake Lemon District Plan, 1996	7
2.1.5	Other Recent Reports Reviewed	8
2.2	Early Agency Coordination Meeting	8
3	Sedimentation in Lake Lemon	8
3.1	East End Delta Formation	8
3.2	Root Causes of Sedimentation in Lake Lemon	9
3.2.1	Highly Erodible Soils	9
3.2.2	Stream Bank Erosion	9
4	Project Elements	10
4.1	Summary of Approach	10
4.2	Main Dredging Areas (Elements No. 1 to 5)	10
4.3	Opening Old Channels (Elements No. 6 to 11)	10
4.4	In-Lake Disposal/Created Wetland Areas (Elements No. 12 and 13)	10
4.5	Sedimentation Basin (Elements No. 14, 22, and 23)	11
4.6	Upland Disposal Sites (Elements No. 15, 16, 19 and 20)	11
4.7	Lake Disposal Sites (Elements No. 17 and 18)	11
5	Project Implementation	12
5.1	Implementation Approach	12
5.1.1	Project Elements Eliminated	12
5.1.2	Opinion of Probably Construction Costs	12
5.1.3	Construction Methodology	12

5.2 Phase I – Open Flow Paths (Elements No. 6 to 11, 15).....13

5.3 Phase II – Main Dredging Area with In-Lake Disposal/Wetland Creation (Elements No. 1, 12)13

5.4 Phase III – Main Dredging Area (Elements No. 2, 3, 19, 20)14

5.5 Phase IV – Main Dredging Area (Elements No. 4, 5, 13, 14, 16, 18)14

5.6 Additional Implementation Steps15

6 Funding Assistance..... 16

6.1 IDNR’s in-lieu fee (ILF) Program16

6.2 Grant Funding16

6.2.1 U.S. Fish and Wildlife Service - North America Wetlands Conservation Act 2019-2 U.S. Standard Grants..... 16

6.2.2 Indiana Department of Natural Resources - Lake & River Enhancement Program (LARE) 17

6.2.3 U.S. Fish and Wildlife Service - Association of Fish and Wildlife Agencies 2019 Multistate Conservation Grant Program17

6.2.4 US EPA, Office of Water, Office of Wetlands, Oceans and Watersheds FY 2018 and 2019 National Wetland Program Development.....18

6.2.5 National Park Service - Land and Water Conservation Fund Outdoor Recreation Legacy Partnership Program18

6.2.6 Department of the Interior, Fish and Wildlife Services Sport Fish Restoration Grant Program 19

6.2.7 U.S. Fish and Wildlife Service - Great Lakes Restoration Initiative, Partners for Fish and Wildlife 2018.....20

6.2.8 Other Grants21

7 Conclusion 22

APPENDICES

Appendix AFigures

Appendix B USGS StreamStats

Appendix C Early Agency Coordination Meeting

Appendix DOpinion of Probably Construction Costs

Appendix E Grant Information

1 Introduction and Background

1.1 Introduction

The Lake Lemon Conservancy District (LLCD) hired Shrewsberry & Associates, LLC to further expand efforts to prepare a conceptual level planning document, facilitate early agency coordination, and documentation of recent work efforts to procure a sediment mitigation project. The project aims to mitigate a massive amount of sediment that has accumulated at the east end of the reservoir and drastically reduced water levels. The sedimentation created a delta reducing the lake's surface area by as much as 140 acres since the lake was constructed in the mid-1950's. Without some sort of mitigation this loss of lake area will continue.

The Lake Lemon Sediment Mitigation project will provide solutions for the sediment issues in the Lake. The project aims to dredge (or excavate) the sediment from the lake and provide increased recreation use, water quality, and natural habitat. Solutions will consider watershed stresses that have contributed to the sediment buildup and look at best management practices to limit future sedimentation.

1.2 Project Location



Figure 1-1 - Project Location Map
Lemon Watershed.

Lake Lemon is in Monroe and Brown Counties and is approximately 12 miles northeast of Bloomington, Indiana and approximately 50 miles south of Indianapolis, Indiana as shown in Figure 1. Lake Lemon is the 11th largest lake and the 7th largest public reservoir in Indiana with a size of approximately 14,400 acres (originally). The Lake Lemon watershed drains approximately 70 square miles of land of which, 58 square miles enters the east end of the reservoir through Beanblossom Creek. **Figure 1 in Appendix A**, shows a more detailed location map identifying the Lake Lemon upstream watershed. **Appendix B** includes a report from the USGS Streamstats for the Lake

1.3 Background

The Lake Lemon reservoir served the community for over 60 years as a recreational destination for the area and a backup water supply to the City of Bloomington. The LLCD was formed in 1995 and is dedicated to maintaining the reservoir's water quality and recreational use. The LLCD is an active organization with seven elected volunteer directors comprised of Lake Lemon landowners. The LLCD hosts monthly meetings to carry out business and accomplish necessary tasks.

Sedimentation is the number one threat to man-made reservoirs. "Filling in" of reservoirs with sediment is an inevitable fate unless actions are taken to remove and control sediment build-up. Lake Lemon is primarily feed by Beanblossom Creek which has a watershed upstream of Lake Lemon of about 22.7 square miles. The watershed's primary soil types are highly erodible soils which led to sedimentation from the banks of tributaries and steep slopes of Brown County. Several hundred thousand cubic yards of sedimentation have been estimated to be on the lake's bottom in past studies. Additional estimates show that the buildup of sediment is occurring at 15 to 40 thousand cubic yards per year. The current sediment removal program focuses on navigable channels and shore line sediment removal. However, to maintain the recreational uses and water quality of Lake Lemon, a larger scale project is needed. This project will likely need to be in several phases and include sediment removal in controlled areas as it accumulates in the future. **Figure 2 in Appendix A** shows the current and historic flow paths in Lake Lemon.

1.4 Goals and Objectives

Goals and objectives for this study include the following:

- Sediment Removal
- Identified the Preferred Concept and Scope
- Prepare Cost Estimate of Each Alternative
- Create Better Sedimentation Capture
- Develop Schedule
- Prepare Implementation Plan for the Project

1.5 Stakeholders

The following stakeholders have been determined in the project implementation at various stages or throughout the project:

- Lake Lemon Conservancy District
- Lake Freeholders
- City of Bloomington Utilities
- Soil and Water Conservation District
- U.S. Army Corp of Engineers
- Indiana Department of Environmental Management
- Indiana Department of Natural Resources
- Upstream Property Owners

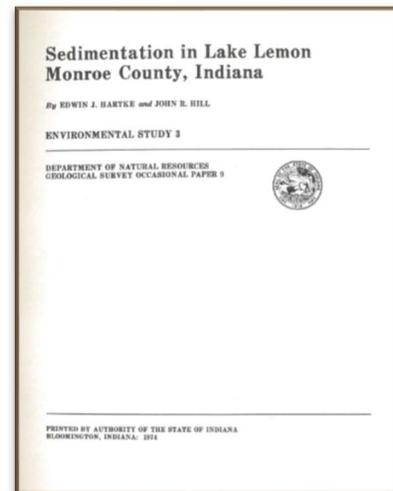
2 Data Collection and Analysis

As part of this project, Shrewsberry collected and analyzed a large amount of data and past reports. This section summarizes data used in preparation of the conceptual designs.

2.1 Past Studies

2.1.1 Sedimentation in Lake Lemon, 1974

This study was performed by the Department of Natural Resources Geological Survey in 1974. The lake surface area was noted to be 1,440 acres. The original lake volume was calculated at 14,400 acre-feet and, at the time, the volume was estimated at 13,920 acre-feet or about a 3.5 percent loss in volume since the lake's conception. It was noted that about 90% of the sediment was transported during 10% of the time. Figure 3 illustrates a cross section from point Idalawn in 1974. Interestingly, comparing the cross section to the 2014 Bathometric Study, major sedimentation has not occurred at this location until recently. Since 2014, a sand bar can now be seen above the water level. Figure 4 shows an aerial photograph of the east end of Lake Lemon in 1974.



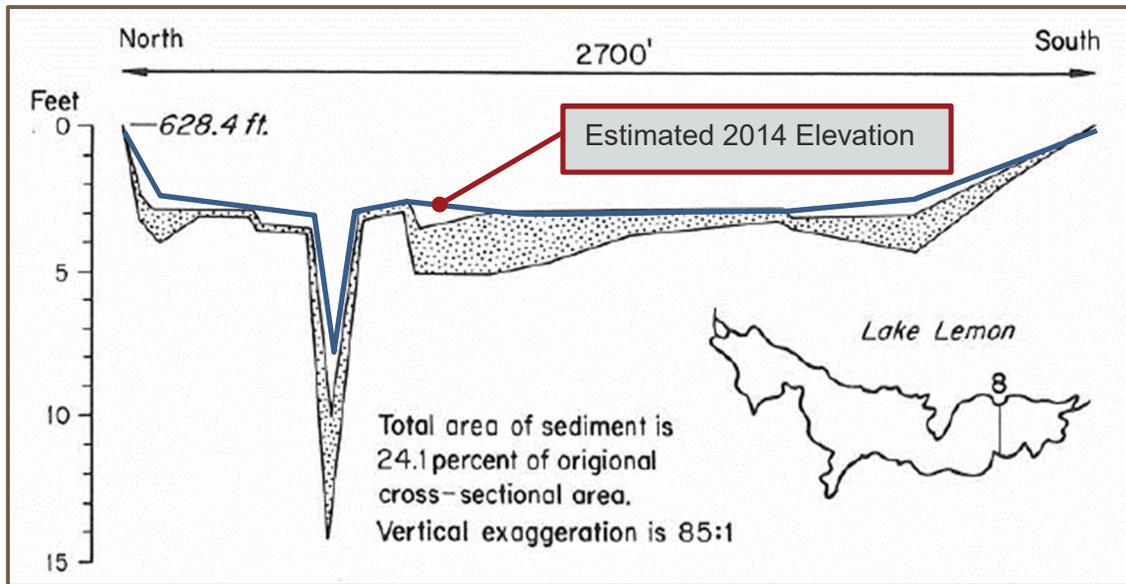


Figure 2-2 - Cross Section from 1974 Report

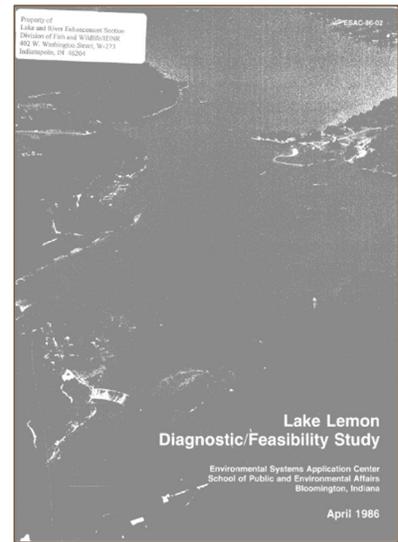


Figure 2-3 - Aerial Photograph from 1974 of East End of Lake Lemon

2.1.2 Lake Lemon Diagnostic/Feasibility Study, 1986

This study which was funded by a grant from the U.S. EPA Clean Lakes Program and finalized in 1986 looked at overall lake health. Key notes from the study pertaining to this project follow:

- Lake Lemon was constructed in 1953 for flood control, recreation, and as a drinking water supply for the City of Bloomington.
- Turbidity is high following storm events. Most of the suspended materials settle out in the eastern end of the lake where sedimentation is a problem. Little sedimentation occurs in the lake's western end.
- Runoff and streambank erosion controls are recommended where needed in Lake Lemon's drainage basin. However, a Soil Conservation Service watershed assessment concluded that erosion from agricultural lands, in general, is not excessive.
- Elevations range from 630 feet (spillway elevation) to 1033 feet at Bear Wallow Hill (east of Village of Beanblossom).
- Nearly all soils in the watershed are silty loams.
- The sediment rate is not excessive, but there is a disproportionate rate of deposition in the eastern end of the lake.
- Recommendations only included sedimentation control by bank and soil stabilization and provided some guidelines on sedimentation detention basin design criteria. Figure 5 below shows the guidance provided in this report.



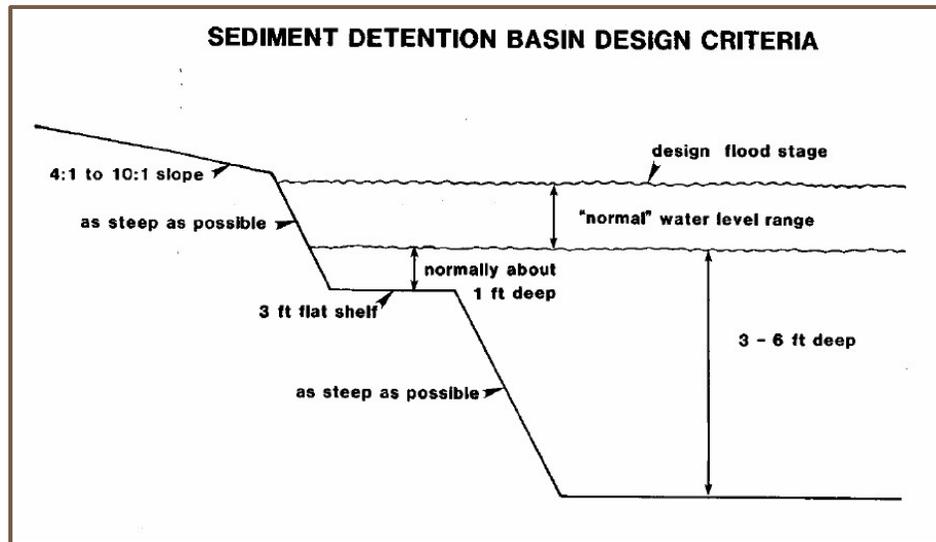


Figure 2-4 - Sediment Detention Figure from 1986

2.1.3 Lake Lemon Feasibility Study, 1992

This study's purpose was to satisfy the requirements of the EPA Clean Lakes Program and complete the feasibility study requirements of the Lake Enhancement Program.

Recommendations included stream bank stabilization, wetland enhancement, and sediment basins, among other things.

Severe streambank erosion issues were noted in the lower Plum Creek and lower Beanblossom Creek from the mouth to the junction of North Fork three miles east of Helmsburg.

Sedimentation basins were also recommended in this study to trap suspended sediments prior to their discharge into

receiving waters. The report noted a massive basin would be needed and recommended a series of smaller sedimentation basins in the upper watershed. It was the first report that suggested potentially using the delta that was forming on the east end as a sediment trap.

Figure 2-5 below shows a conceptual plan for enhancing the wetlands and creating a sedimentation basin.



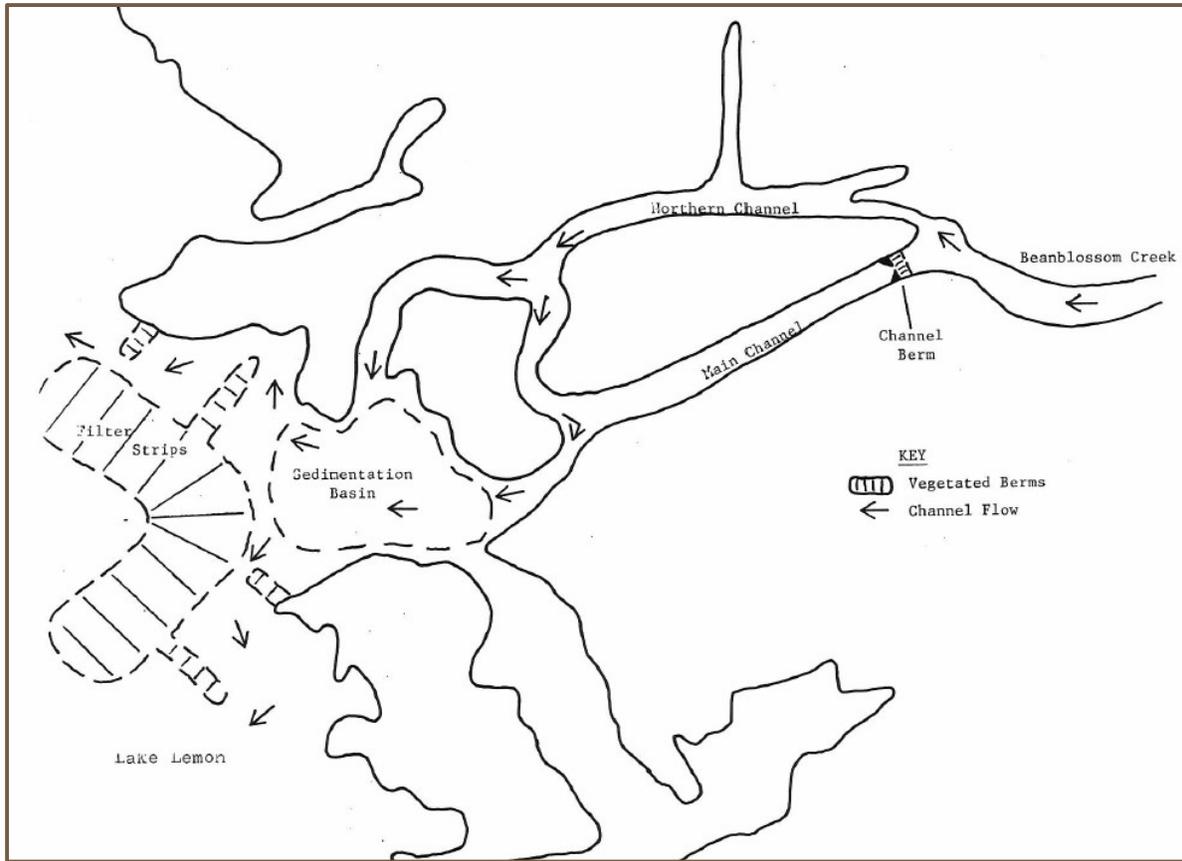
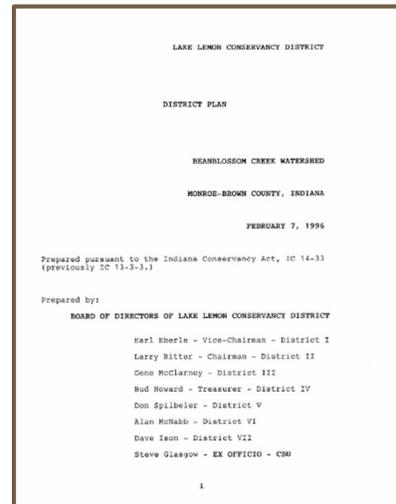


Figure 2-5 Conceptual Plan From Lake Lemon Feasibility Study, 1992

2.1.4 Lake Lemon District Plan, 1996

In 1996, the Lake Lemon Conservancy District Plan was prepared to set forth the District Plan for the Lake Lemon Conservancy District. It documented the Indiana code that allowed the development of the conservancy, provided a plan for operation and maintenance, documented the lake's current and past use, documented problems, and future plans for the lake. It documented that Lake Lemon had been used as water supply until the mid-60's, partial water supply until the mid-70's, and a back-up water supply since. Interestingly, sedimentation mitigation was not documented as being one of their issues or as improvements desired by the people at the time.



2.1.5 Other Recent Reports Reviewed

Other Recent reports reviewed included.

- Soil Boring Data and Lake Lemon Sedimentation Restoration, 2000 and 2001
- Lake Lemon Sediment Sampling and Analysis, 2005
- Beanblossom Creek Watershed Management Plan, 2008
- Sedimentation Management Alternatives Analysis, 2017

2.2 Early Agency Coordination Meeting

On June 4th, 2018 an early agency coordination meeting was conducted with the Indiana Department of Environmental Management (IDEM) and the United States Army Corp of Engineers (USACE) at the LLCD office. Shrewsberry provided a memorandum with background and questions for the agencies. The project was discussed, and feedback solicited. During and after the meeting the agencies provided feedback. The answers to memorandum with specific questions and answers along with meeting minutes can be found in **Appendix C**. Some highlights of coordination include:

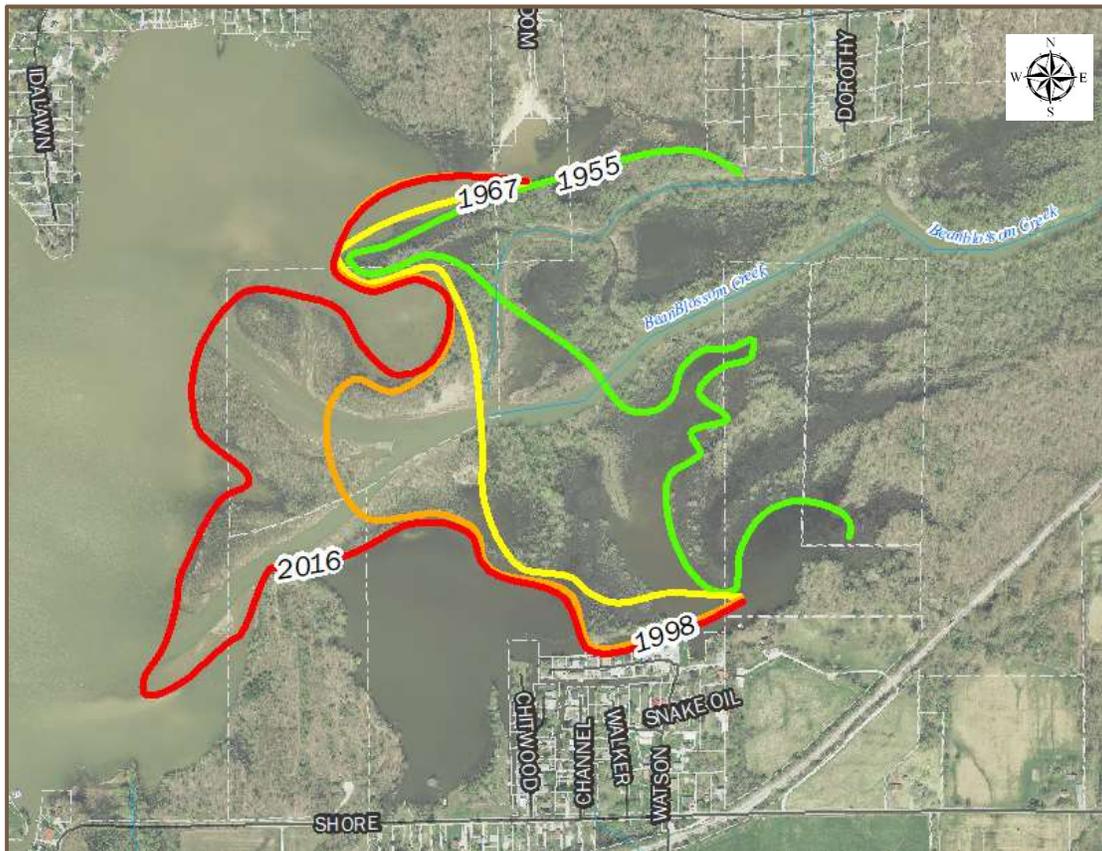
- Wetland mitigation requirements for forested wetlands will be 4:1, scrub shrub 3:1, and emergent 2:1 and open water impacts are 1:1 per IDEM.
- The USACE noted they have jurisdiction of the entire lake unless there was some sort of maintenance agreement between the agencies when the lake was formed.
- USACE would view potential impacts more favorably if the project was seen to be bring value to the environment or providing an “ecological uplift”.
- A wetland delineation will be needed.
- Any discharge of dredge material below the ordinary high-water mark will require a permit.
- Channel diversions for sediment basins would be allowed.
- All phases of construction should be rolled into one permit.
- Coordination should continue as the design of the project moves forward.

3 Sedimentation in Lake Lemon

3.1 East End Delta Formation

All rivers and streams contain sediments and therefore it is inevitable that manmade reservoirs will trap sediment over time and in the case of Lake Lemon, much of the sediment has formed as a delta at the east end of the lake. Review of historical aerial photographs showed the rate

the delta was formed, and figure below shows the timeline of the delta formation based these historical aerial photographs at the east end of Lake Lemon.



3.2 Root Causes of Sedimentation in Lake Lemon

3.2.1 Highly Erodible Soils

Much of the land within Lake Lemon's watershed has the potential to be classified as highly erodible land (HEL). The amount and location of HEL varies annually with cultivation practices and developments in the watershed. The soils also lead to more erosion from stream banks which is discussed further below. Conversion of forest land to cultivated crop or farm land would increase the amount of HEL in the watershed.

3.2.2 Stream Bank Erosion

Streambank erosion is severe problem along BeanBlossom Creek as observed in the May 2018 field visit and as noted for nearly all other stream reaches in Lake Lemon's watershed in past reports. Because most of the eroded streambanks are on private land, lack of incentive and financial ability on the landowner's part may limit implementation.

4 Project Elements

4.1 Summary of Approach

Instead of preparing several alternatives as other previous studies had already done, the LLCD and Shrewsberry agreed this preliminary design phase would focus on the implementation of the recommended and LLCD desired alternative from the 2017 Sedimentation Management Alternatives Analysis Study. The alternative for a managed delta utilized portions of the lake adjacent to the delta areas for disposal while creating a wetland habitat that would also help prevent sediment delta formation in the future and offset the offsite disposal needs. This alternative was developed further and broken into the project elements for the Lake Lemon Sediment Mitigation Project.

Figure 3 in Appendix A includes the project alternative map showing the east end of Lake Lemon with each element identified and numbered so that elements could be easily identified. The implementation plan uses this numbering scheme to group elements into phases.

4.2 Main Dredging Areas (Elements No. 1 to 5)

These areas were identified by the Lake Lemon Conservancy District (LLCD) to be primary areas that need dredged to approximately 5 feet deep. These areas will likely be dredged by traditional dredging methods such as hydraulic dredging. Wetland impacts in these areas should be minimal.

4.3 Opening Old Channels (Elements No. 6 to 11)

Opening these flow pathways would allow sediment to distribute across the existing delta area, leveraging the marsh areas to help catch sediment before reaching the Lake. These channels could be cleaned out under the existing maintenance program (with or without utilizing contractors to assist).

A diversion structure is included with these elements of the project. The diversion structures will need to be designed and can be added in later phases after the channels have been dredged. The diversion structures may be created from a variety of materials including rock, gabions, or uprooted trees.

4.4 In-Lake Disposal/Created Wetland Areas (Elements No. 12 and 13)

These areas serve two functions; 1.) Provide a disposal area for some of the dredged sediment, and 2.) Create wetland habitat that will allow for an offset of any impacts to wetlands that may

occur. A wetland delineation will need to be performed in the next phase, and impacts to existing wetland could be mitigated by these areas.

4.5 Sedimentation Basin (Elements No. 14, 22, and 23)

These areas are sedimentation basins to trap sediment. Clearing trees and scrub and dredging these areas would be required to create a deeper water sedimentation area that would trap sediment and could be maintained in the future.

4.6 Upland Disposal Sites (Elements No. 15, 16, 19 and 20)

The most cost-effective disposal sites are upland areas because these areas can allow for traditional sediment dewatering. The primary costs for disposal of these sites will be clearing (if necessary), dewatering erosion control, and restoration costs. If the site is not owned by the LLCD, the sites would need to be purchased which have been factored into the costs.

4.7 Lake Disposal Sites (Elements No. 17 and 18)

These sites include using a portion of Lake Lemon for sediment disposal. Element No. 17 would require an 8-12-foot deep rock dike or sea wall be constructed around the north perimeter to enlarge the South Shore Drive causeway. Element No. 18 is an offline overflow pond for Lake Lemon that would be more cost effective as a disposal area since containment is provided with the existing causeway and railroad. An open water area and kayaking channels could be left for the homes to the east.

5 Project Implementation

5.1 Implementation Approach

The elements were then prioritized based on the cost, effectiveness, and need. Discussions with LLCD helped prioritize dredging, disposal, and channel areas. The effectiveness, OPCC, constructability, and need were all considered. The elements were then either eliminated (based on the prioritization) or kept and grouped into phases.

5.1.1 Project Elements Eliminated

Conceptual elements No. 17, 21, 22 and 23 were eliminated from immediate consideration due to relative high costs and/or potential permitting mitigation requirements for wetland impacts. Element No. 17 was eliminated because of high cost to build a seawall or dike around the perimeter and Elements No. 21 through 23 would likely impact wetlands and require wetland mitigation.

5.1.2 Opinion of Probably Construction Costs

Utilizing the potential project elements, costs were estimated for each element. The Opinion of Probable Construction Cost (OPCC) for this magnitude of conceptual planning may range from -20% to +100% in accuracy based on guidelines created by the American Association for Cost Engineers (AACE). The OPCC for each project element can be found in **Appendix D**.

5.1.3 Construction Methodology

Dredging of the east end of Lake Lemon could be performed by a variety of dredging methods typically based around two approaches, mechanical and hydraulic. Mechanical dredging involves removing sediment with machinery usually with a bucket of some type. The most common types are an excavator such as the LLCD's current dredging operation. Another form of mechanical dredging for Lake Lemon could involve lowering the lake and using traditional excavation equipment, however permitting agencies would require the equipment work from built temporary causeways or timber mats which limit effectiveness and increase costs. Hydraulic dredging includes the use of a pump, usually barge mounted, to move material in a slurry via a pipeline. Hydraulic dredging can be very practical and efficient depending on the material type, depth, and location of its destination. Hydraulic dredging has been assumed for the preparation of costs and alternatives for this study.

5.2 Phase I – Open Flow Paths (Elements No. 6 to 11, 15)

Phase I of the Lake Lemon Mitigation Project proposes to open flow paths to the existing delta areas to decrease sedimentation reaching the main lake area. These flow paths are primarily past channels. These channels would be dredged to approximately 40 feet wide and 5 feet deep utilizing existing maintenance permits. A detailed design would not be needed for these area as these are considered routine maintenance of existing channels. Diversion structures would be incorporated later in Phase II. The diversion structures would further help push sediment-laden flow into these areas.

Table 1 - Phase I - Lake Lemon Sediment Mitigation Project

Dredged Volume Estimated =	43,000 cubic yards
OPCC (30% contingency) =	\$1,000,000
Suggested construction timeline =	2019-2020

5.3 Phase II – Main Dredging Area with In-Lake Disposal/Wetland Creation (Elements No. 1, 12)

This phase would start dredging operations in the main lake and include Element No. 1 and disposal area Element No. 12 creating the in-lake wetland and sedimentation trap. Main dredging area Element No. 1 is one of the most needed open water areas. Sediment has started to create a sediment bar in this area and would be high priority area. The in-lake disposal/wetland area could be created in a manner to allow finger type pathways that would collect sediment and act as the last defense against sediment entering the lake. A detailed design will need to be performed to further define the layout and configuration of the wetland area. Required indirect costs would include detailed design fees, permitting coordination and application, bathometric survey, a wetland delineation, and archeological survey. These fees are not included with the OPCC.

Table 2 - Phase II - Lake Lemon Sediment Mitigation Project

Dredged Volume Estimated =	84,000 cubic yards
OPCC (30% contingency) =	\$1,900,000
Suggested design timeline =	2020-2021
Suggested construction timeline =	2020-2021

5.4 Phase III – Main Dredging Area (Elements No. 2, 3, 19, 20)

This phase would continue the main lake dredging area in Element No. 2 and 3 areas and would dispose of sediment in a purchased property. The property identified as Element No. 19 and 20 has been preliminary identified as a suitable property given it is an upland area that could be used for disposal without much clearing or wetlands. If this property were unable to be acquired a substitute property would be needed or disposal areas identified as Elements 16 or 18 could be substituted.

Table 3 - Phase III - Lake Lemon Sediment Mitigation Project

Dredged Volume Estimated =	197,000 cubic yards
OPCC (30% contingency) =	\$2,400,000
Suggested design timeline =	2019-2020
Suggested construction timeline =	2021-2022

5.5 Phase IV – Main Dredging Area (Elements No. 4, 5, 13, 14, 16, 18)

This phase would continue the main lake dredging of the lake in Element No. 4 and 5 areas and would dispose of sediment in areas identified as Elements No. 16 and 18. The property identified as Element No. 18 could be used for disposal and to create wetlands either for mitigation or for the IDNR In-Lieu Fee (<https://www.in.gov/dnr/heritage/8340.htm>) program to generate revenue for the project. These disposal areas could be substituted for the Phase III disposal area, if desired.

Table 4 - Phase IV - Lake Lemon Sediment Mitigation Project

Dredged Volume Estimated =	169,000 cubic yards
OPCC (30% contingency) =	\$2,600,000
Suggested design timeline =	2019-2020
Suggested construction timeline =	2022-2023

5.6 Additional Implementation Steps

During field investigations for the conceptual level planning project it was observed that several severe bank erosion problems upstream of the Lake on Bean Blossom Creek were present. It is recommended that the LLCD initiate a study of the creek to identify high sediment load areas and bank stabilization measures that can be undertaken on upper reaches of the Bean Blossom Creek watershed. The LLCD should coordinate this work with the Brown County Soil and Water Conservation Board who may be able to assist with identifying these areas or other problems areas in the watershed.

6 Funding Assistance

6.1 IDNR's in-lieu fee (ILF) Program

The DNR's ILF program allows the DNR to sell stream and wetland mitigation credits that can be used for compensatory mitigation for unavoidable impacts to waters of the United States and isolated wetlands in the State of Indiana. Permits are required by the United States Army Corps of Engineers in accordance with Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403) for work in or affecting traditionally navigable "waters of the United States" and in accordance with Section 404 of the Clean Water Act (CWA) for the discharge of dredged and/or fill material into "waters of the U.S.," and by IDEM under Section 401 Water Quality Certification of the CWA and Indiana's Isolated Wetlands law (Indiana Code 13-18-22).

Additionally, the Indiana Natural Resources Commission (NRC) adopted new rules allowing for an ILF for permits for construction in a floodway, public freshwater lake or navigable waterway issued by the DNR Division of Water under the Flood Control Act, Lakes Preservation Act or Navigable Waterways Act. While this rule was formally adopted by the NRC, it is not yet in effect. The DNR Division of Fish & Wildlife is working on a non-rule policy document that will assist the DNR and the regulated community on how the ILF option will be carried out.

Previously, these permits required an applicant to restore aquatic resources and habitat either (1) at or near the project site, or (2) using an approved mitigation bank. The ILF program adds a mitigation option for permit applicants.

6.2 Grant Funding

6.2.1 U.S. Fish and Wildlife Service - North America Wetlands Conservation Act 2019-2 U.S. Standard Grants

The North American Wetlands Conservation Act (Act) Grants Program is a competitive grant program with a competitive and thorough application process. The Small Grants Program application process, while simpler than the Standard Grants application process, still takes time and effort, so please plan accordingly and do not hesitate to contact us for assistance. Before you write the proposal, think carefully about how you will implement your project. Grant request may not exceed \$100,000. All costs must be directly linked to eligible acquired, restored, enhanced, or established acres that are completed DURING the project period. Partners must match their grants request at no less than a 1-to-1 ratio. For example, partners requesting a \$1 million grant would need to also contribute at least \$1 million in partner funds (from nonfederal

sources) towards the project. There is no difference in grant and match for grant administration purposes. Generally, laws and requirements that apply to activities funded with NAWCA dollars also apply to items funded with match dollars or provided as in-kind match (i.e., real property interests) Each grant and match dollar, except for indirect costs, must be linked to an acre acquired, restored, enhanced, and/or established. Grantees are held accountable for both match dollars and acres, as defined in the proposal and grant agreement. Without prior approval and agreement modification, accomplishing less than 100 percent of match dollars and acres will result in a reduction of the award amount.

6.2.2 Indiana Department of Natural Resources - Lake & River Enhancement Program (LARE)

The LARE program strives to operate as a scientifically-effective program in a cost-efficient manner to protect and enhance aquatic habitat for fish and wildlife; and to insure the continued viability of Indiana's publicly accessible lakes and streams for multiple uses, including recreational opportunities. This is accomplished through grants for projects that reduce non-point sediment and nutrient pollution of surface waters to a level that meets or surpasses state water quality standards. LARE grant funds are intended for those projects demonstrating not only a need, but a local commitment to getting the task accomplished in a timely manner at a reasonable cost. Grant applications normally greatly exceed the amount of funds available. The LARE program staff work to maximize the effectiveness of the limited amount of dollars available to as many projects as possible. LARE applications are due by Jan. 31 of the year grants are awarded. Application forms are available in the LARE program manual in "Applying to the LARE Program." They can be completed and submitted electronically.

6.2.3 U.S. Fish and Wildlife Service - Association of Fish and Wildlife Agencies 2019 Multistate Conservation Grant Program

The Multistate Conservation Grant Program (MSCGP) funds projects that address regional or national level priorities of state fish and wildlife agencies. It was established in 2000 by the Wildlife and Sport Fish Restoration Programs Improvement Act, which amended the Pittman-Robertson Wildlife Restoration Act and the Dingell Johnson Sport Fish Restoration Act. The Association of Fish and Wildlife Agencies and the U.S. Fish and Wildlife Service (USFWS) cooperatively administer the Multistate Conservation Grant Program. The Association solicits grant proposals and makes its "priority list" recommendations to the USFWS, who can only fund projects from the Association's list and manages and monitors grant awards. Each year, up to \$6,000,000 is available to fund MSCGP projects. Applications due May 4, 2018.

6.2.4 US EPA, Office of Water, Office of Wetlands, Oceans and Watersheds FY 2018 and 2019 National Wetland Program Development

The U.S. Environmental Protection Agency (EPA) is soliciting proposals from eligible applicants for projects that develop or refine state/tribal/local government wetland programs as a whole, or individual components of those programs. Proposals for projects submitted under this announcement for Wetland Program Development Grants (WPDGs) must address the National Priority Area identified in Section I.B. Awards made under this announcement will support EPA's Fiscal Year FY 2018 – FY 2022 Strategic Plan, Goal 1- Core Mission: Deliver real results to provide Americans with clean air, land, and water, and ensure chemical safety; Objective 1.2 - Provide for Clean and Safe Water: Ensure waters are clean through improved water infrastructure and, in partnership with states and tribes, sustainably manage programs to support drinking water, aquatic ecosystems, and recreational, economic, and subsistence activities. Information on the EPA Strategic Plan is available at <https://www.epa.gov/planandbudget/strategicplan.html>.

Eligible applicants under this announcement are non-profit, non-governmental organizations, interstate agencies, and intertribal consortia which are capable of undertaking activities that advance wetland programs. Non-profit private universities and colleges and non-profit institutions of higher education are considered non-profit organizations and are eligible under this announcement.

All proposals must be submitted electronically through Grants.gov as explained further in Section IV. Proposals must be submitted by 11:59 P.M. EDT June 21, 2018. Written responses will be posted on EPA's website at: <https://www.epa.gov/wetlands/wetland-program-development-grants>.

6.2.5 National Park Service - Land and Water Conservation Fund Outdoor Recreation Legacy Partnership Program

The National Park Service (NPS) has announced that the application process has opened for the 2018 Outdoor Recreation Legacy Partnership Program (ORLP). The ORLP is a nationally competitive grant program funded through the Land and Water Conservation Fund (LWCF). The ORLP offers nationally competitive grants specifically to help create and improve state and locally-owned park and other outdoor recreation areas in ways that will help the public to access or re-connect with the outdoors, particularly in city neighborhoods that lack parks and recreational opportunities. A total of \$13.3 million of funding is available. Sponsors may request grants for their projects ranging from a minimum of \$250,000 up to a maximum of \$750,000. By

law, project sponsors and/or their partners must cost-share in the projects at an at least 1:1 ratio. Funding for eligible projects can be used to acquire and/or develop land to create new, or reinvigorate existing, public parks and other outdoor recreation spaces in neighborhoods that are economically disadvantaged and are underserved or lacking in such opportunities. Open to State and local government agencies (e.g., cities, counties, legal subdivisions such as park districts, etc.) and federally-recognized Indian tribes within or serving areas delineated by the Census Bureau from the 2010 census as having populations of 50,000 or more people and consisting of densely settled territory. This year NPS will allow states to submit up to three proposals. Proposals should be developed in cooperation with the lead agency for LWCF in each state. The full funding opportunity announcement and pre-application materials are available online at grants.gov. Please look for Funding Opportunity Number P18AS00153; Title: Land and Water Conservation Fund Outdoor Recreation Legacy Partnership Program. Applications are due on Friday, September 14, 2018.

6.2.6 Department of the Interior, Fish and Wildlife Services Sport Fish Restoration Grant Program

The Sport Fish Restoration Act of 1950 (Dingell-Johnson Sport Fish Restoration Act), 64 Stat. 430 as amended; 16 U.S.C. 777-777m, was passed on August 9, 1950. It was modeled after the Pittman-Robertson Wildlife Restoration Act to create a parallel program for management, conservation, and restoration of sport fishery resources. The Sport Fish Restoration Grant Program (SFR) is funded by revenues collected from excise taxes on sport fishing equipment, electric motors and sonar, import duties on fishing tackle, yachts and pleasure craft, and a portion of gasoline tax attributable to motorboats and small engines. Revenues are deposited into and appropriated from the Sport Fish Restoration and Boating Trust Fund. SFR provides funding to restore, conserve, manage, or enhance sport fish populations and the public use and benefits from these resources; to educate the public about aquatic resources; and to provide boating access to public waters. Monies are apportioned annually following a legislatively established formula to each of the eligible participants (State Fish and Wildlife Agencies). The Wildlife and Sport Fish Restoration Program's (WSFR) mission is to work through partnerships to conserve and manage fish and wildlife, and their habitats, for the use and enjoyment of current and future generations. WSFR's vision is of healthy, diverse, and accessible fish and wildlife populations that offer recreation, economic activity, and other societal benefits, in addition to sustainable ecological functions. WSFR's guiding principle is that society benefits from conservation-based management of fish and wildlife and their habitats and opportunities to use and enjoy them. Our grant programs align with WSFR's mission, vision, and guiding

principle, and support three of the Secretary of the Department of the Interior's priorities including:

- 1) Creating a conservation stewardship legacy second only to Teddy Roosevelt;
- 2) Utilizing our natural resources; and
- 3) Restoring trust with our local communities.

Federal law mandates that all entities applying for Federal financial assistance must have a valid Dun & Bradstreet Data Universal Number System (DUNS) number and have a current registration in the System for Award Management (SAM).

6.2.7 U.S. Fish and Wildlife Service - Great Lakes Restoration Initiative, Partners for Fish and Wildlife 2018

The Great Lakes Restoration Initiative targets the most significant environmental problems in the Great Lakes ecosystem by funding and implementing federal projects that address these problems. One goal is to improve habitat and wildlife protection and restoration. Using appropriations from the Great Lakes Restoration Initiative, the U.S. Fish and Wildlife Service (Service), Partners for Fish and Wildlife (PFW) Program anticipates funding wetland (both coastal and interior) and associated upland habitat restoration and enhancement projects for conservation of native Great Lakes fish and wildlife populations, particularly migratory birds and, as appropriate, federally-listed species. Restoration projects will be completed on privately owned (non-federal/non-state) lands. Emphasis will be placed on, but not limited to, completing projects within the watersheds of Great Lakes Areas of Concern and in coastal zones. The PFW Program is a voluntary, incentive-based program that provides direct technical assistance and financial assistance in the form of cooperative agreements to private landowners to restore and conserve fish and wildlife habitat for the benefit of federal trust resources. In the Great Lakes watershed, PFW biologists from eight states coordinate with project partners, stakeholders, and other Service programs to identify geographic focus areas and develop habitat conservation priorities within these focus areas. Geographic focus areas are where the PFW Program directs resources to conserve habitat for federal trust species. Project work plans are developed strategically, in coordination with partners, and with substantial involvement from Service field staff. Projects must advance our mission, promote biological diversity, and be based upon sound scientific biological principles. Program strategic plans inform the types of projects funded under this opportunity.

6.2.8 Other Grants

In addition, to the grants noted above, the following grants were discovered during the study phase:

- Region 5 Wetland Program Development Grants
- National Coastal Wetlands Conservation Grant Program
- Conservation Stewardship Program
- Clean Water Indiana 2019 Competitive Grants
- Conservation Innovation Grants (CIG)
- Emergency Watershed Protection Program
- Public Assistance (PA) Grant Program
- Wells Fargo
- Shell Foundation Grant
- Bill Gates Foundation
- Urban Nonpoint Source & Storm Water Management Grant Program
- Reservoir Fisheries Habitat Partnership and Friends of Reservoirs Grant
- Association of Fish & Wildlife Agencies
- National Fish & Wildlife Foundation
- Bass Pro Shops Grants
- AFTCO/B.A.S.S. Nation Conservation Grant

All grants in this chapter are summarized in tabular format in **Appendix E**.

7 Conclusion

This preliminary design report reviewed past reports and lake data and elaborated on the preferred alternative from the 2017 Sedimentation Management Alternatives Analysis which included utilizing portions of the east end of the Lake for disposal while creating more habitat in those areas. This study identified in-lake and upland disposal areas that are available around the dredging area and evaluated the best areas for disposal. The LLCD preferred dredging limits, past and current flow paths, were identified. The agency coordination meeting was conducted to get feedback from governing agencies. Finally, OPCC were prepared for each of the elements identified and alternatives for phases were created. Four phases spanning four years was proposed. The total proposed Lake Lemon Sediment Mitigation Project includes:

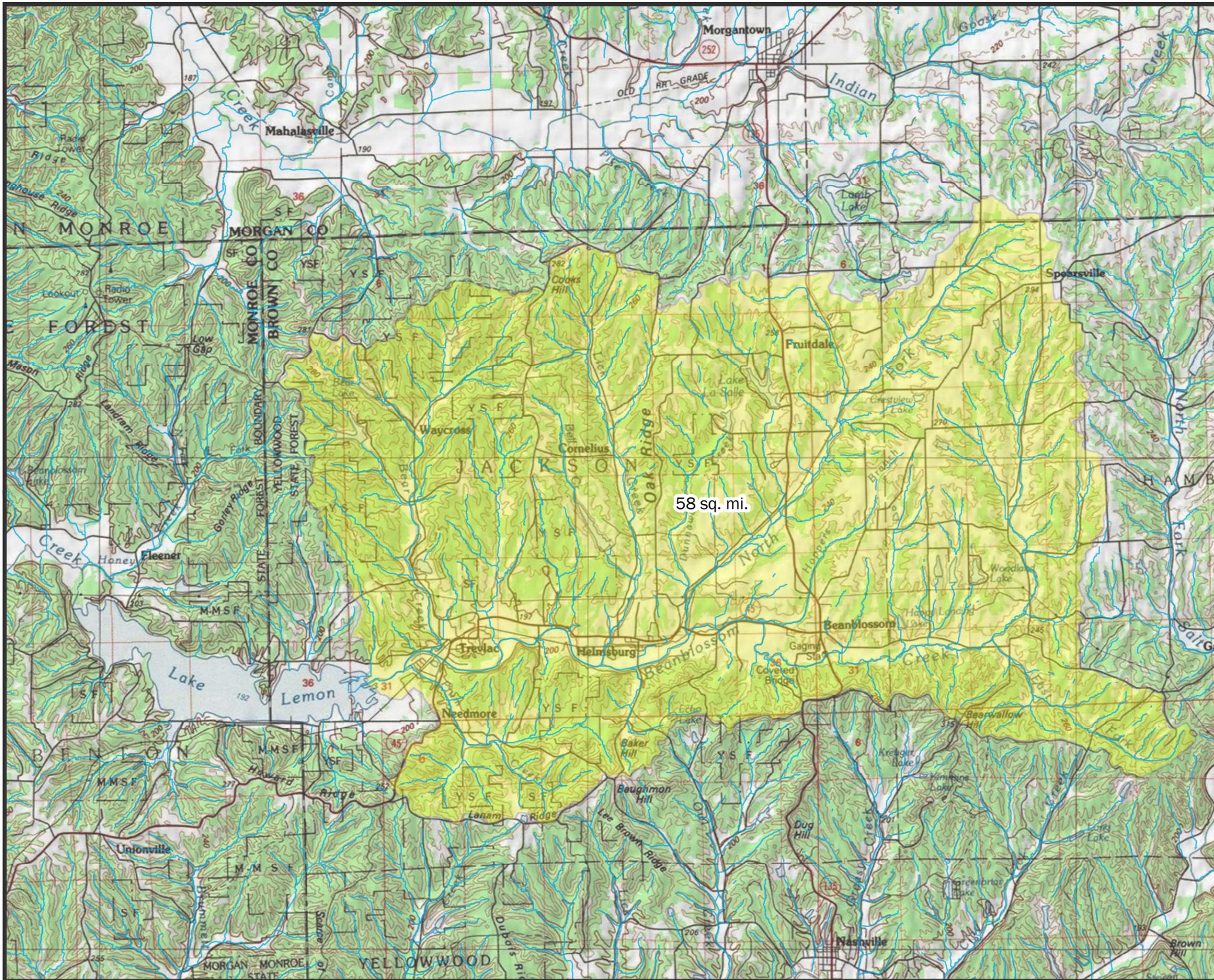
- Dredging of approximately 500,000 cubic yards
- Creation of 40-acres of wetlands
- 2 in-lake disposal areas
- 4 upland disposal areas (including the existing maintenance site disposal area).

The OPCC for all phases is \$7.8 million and included a 30% contingency (but could vary as noted previously). Phases have been broken down over 4 years but could be spread out over a longer time if needed as financial resources become available.

The LLCD should consider an additional implementation step to study the watershed upstream of Lake Lemon. This study would be to determine the sources of sediment entering the lake and propose targeted best management practices to reduce sediment in those areas.

Appendix A

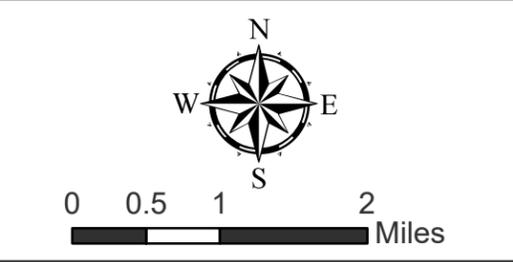
Figures

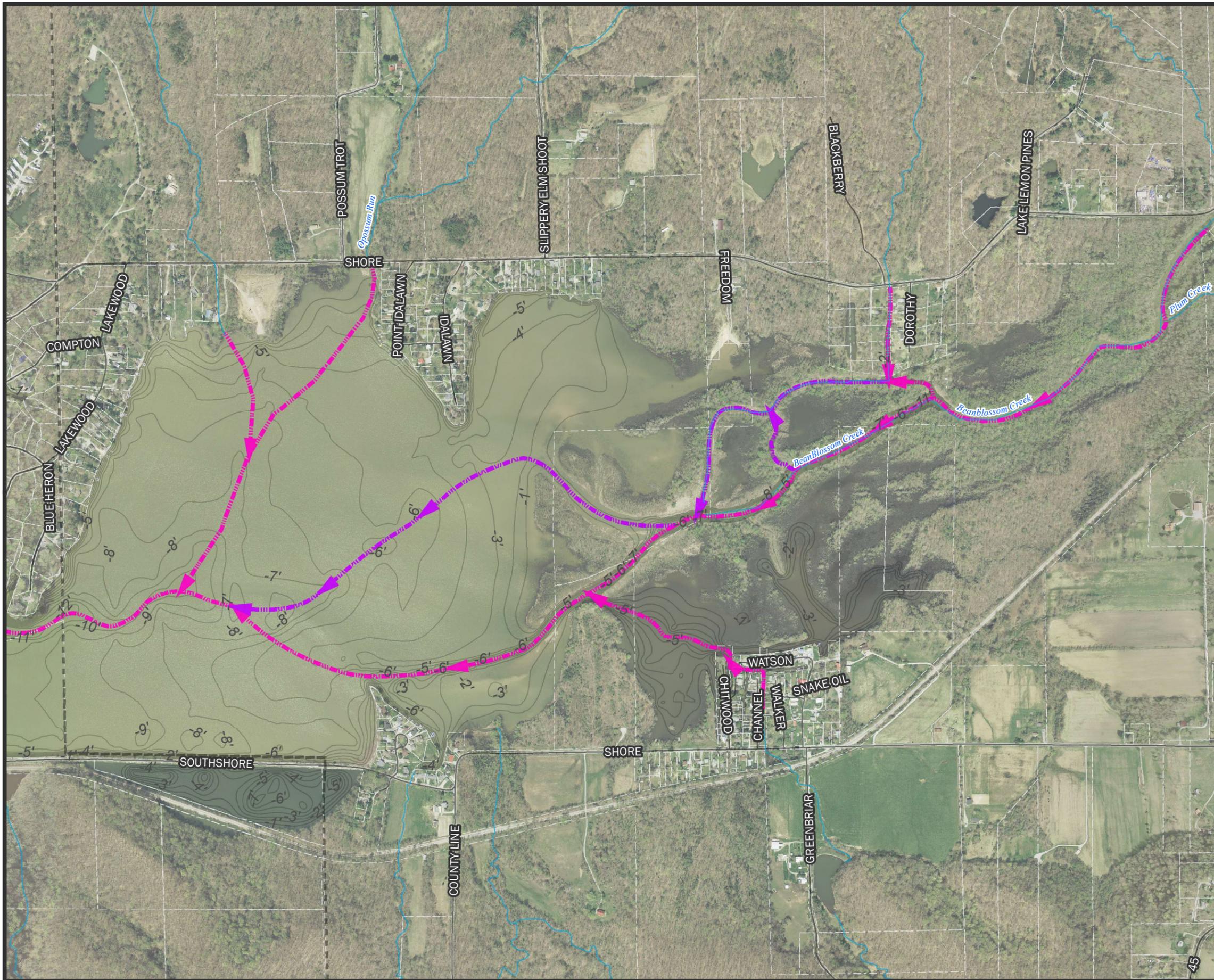


Lake Lemon Sediment Mitigation Project

Figure 2 - Location and Watershed Map

- ### Legend
- Streams or Rivers
 - Lake Lemon Watershed
 - Counties

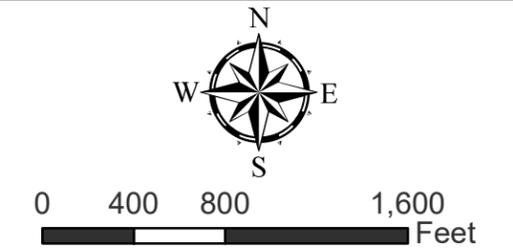


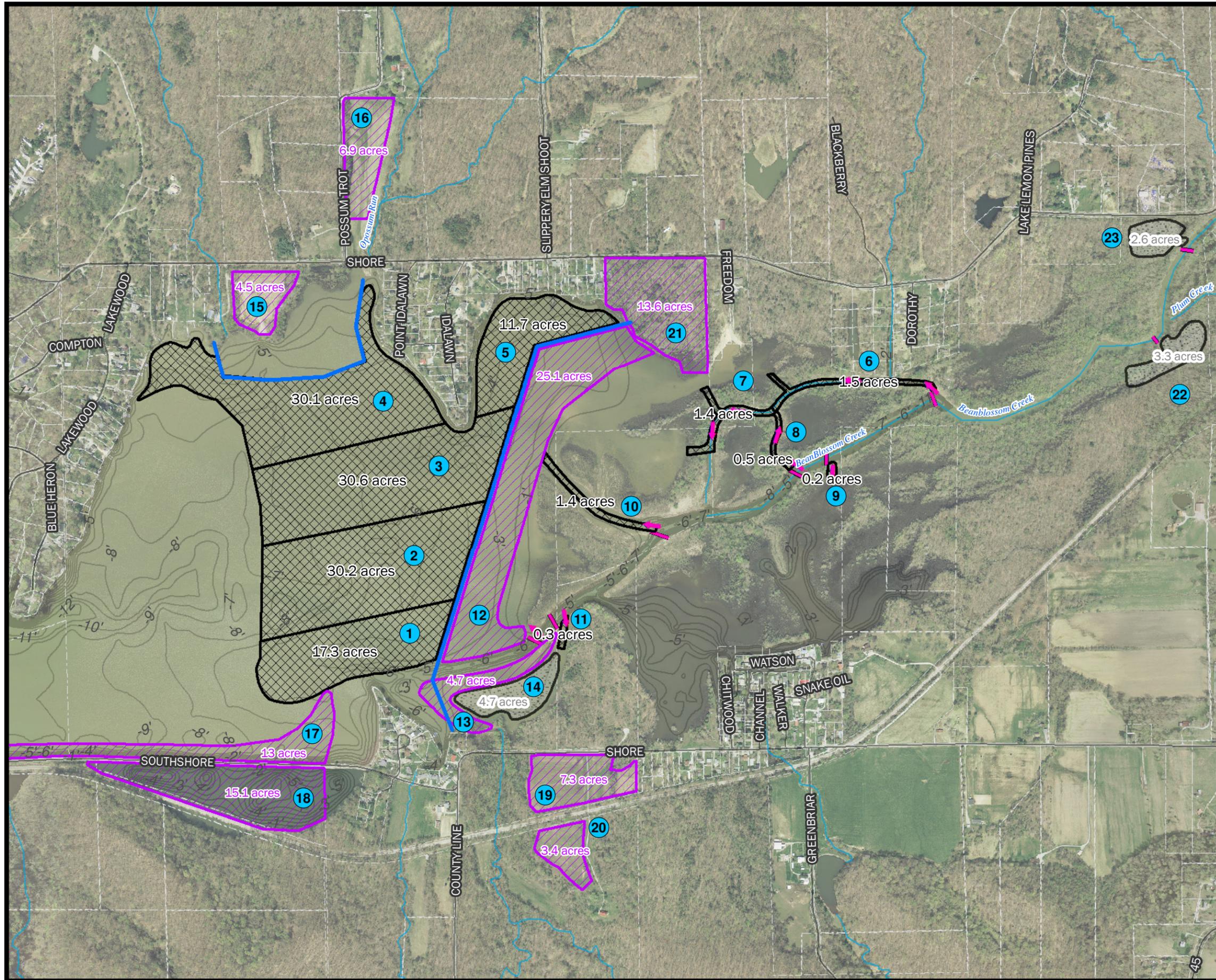


Lake Lemon Sediment Mitigation Project

Figure 2 - Current and Historical Flow Paths

- ### Legend
- Current Flow Paths
 - Historic Flow Paths
 - 2014 Bathymetric Study Contours
 - Parcels
 - Counties
 - Streams

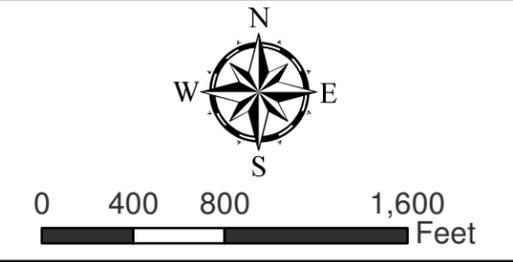




Lake Lemon Sediment Mitigation Project

Figure 3 - Project Elements

- ### Legend
- Dredge Area
 - Disposal Areas
 - Approved Maintenance Line
 - Flow Direction
 - Low Flow Berms
 - Sediment Trap
 - Streams
 - Parcels
 - 2014 Bathymetric Study Contours
 - Project Element Number



Appendix B

USGS StreamStats

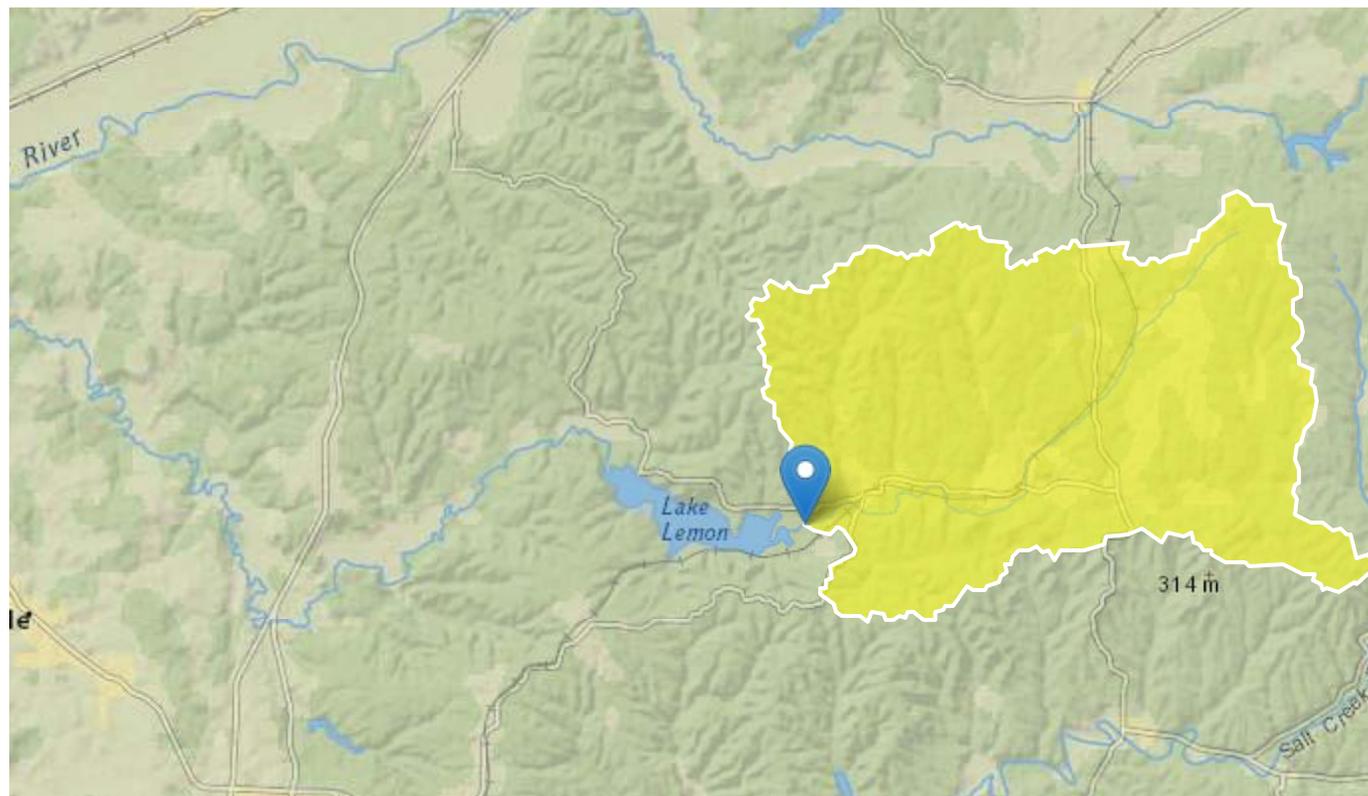
Lake Lemon Watershed

Region ID: IN

Workspace ID: IN20180607224639761000

Clicked Point (Latitude, Longitude): 39.25799, -86.35720

Time: 2018-06-07 18:46:55 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	58.189	square miles
BFREGNO	BFREGNO	1567	dimensionless
K1INDNR	Average hydraulic conductivity (ft/d) for the top 70 ft of unconsolidated deposits from InDNR well database.	11	ft per day
BSLDEM10M	Mean basin slope computed from 10 m DEM	12.73	percent
QSSPERMTHK	Index of the permeability of surficial Quaternary sediments computed as in SIR 2014-5177	11.02	dimensionless

Bankfull Statistics Parameters [100 Percent (58.2 square miles) Bankfull South Hills and Lowlands Region 2013 5078]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	58.189	square miles	0.06	186
BFREGNO	BFREGNO	1567	dimensionless		

Bankfull Statistics Flow Report [100 Percent (58.2 square miles) Bankfull South Hills and Lowlands Region 2013 5078]

Statistic	Value	Unit
Bankfull Width	87	ft
Bankfull Depth	4	ft
Bankfull Area	341	ft^2

Bankfull Statistics Citations

Robinson, B.A.,2013, Regional bankfull-channel dimensions of non-urban wadeable streams in Indiana: U.S. Geological Survey, Scientific Investigations Report 2013–5078, 33 p. (<http://pubs.usgs.gov/sir/2013/5078/>)

Low-Flow Statistics Parameters [Statewide Lowflow 2016 5102]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	58.189	square miles	6.33	856
K1INDNR	Avg_Hydraulic_Conductivity_Upper_70ft	11	ft per day	5.78	76.9
BSLDEM10M	Mean Basin Slope from 10m DEM	12.73	percent	0.916	7.8
QSSPERMTHK	Permeability_Index	11.02	dimensionless	0	30000

Low-Flow Statistics Parameters [Statewide 30day Lowflow 2016 5102]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	58.189	square miles	6.33	856
K1INDNR	Avg_Hydraulic_Conductivity_Upper_70ft	11	ft per day	5.78	76.9
BSLDEM10M	Mean Basin Slope from 10m DEM	12.73	percent	0.916	7.8
QSSPERMTHK	Permeability_Index	11.02	dimensionless	0	30000

Low-Flow Statistics Disclaimers [Statewide Lowflow 2016 5102]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report [Statewide Lowflow 2016 5102]

Statistic	Value	Unit
1 Day 10 Year Low Flow	0.91	ft ³ /s
7 Day 10 Year Low Flow	1.09	ft ³ /s

Low-Flow Statistics Disclaimers [Statewide 30day Lowflow 2016 5102]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report [Statewide 30day Lowflow 2016 5102]

Statistic	Value	Unit
30 Day 10 Year Low Flow	1.44	ft ³ /s

Low-Flow Statistics Citations

Martin, G.R., Fowler, K.K., and Arihood, L.D., 2016, Estimating selected low-flow frequency statistics and harmonic-mean flows for ungaged, unregulated streams in Indiana (ver 1.1, October 2016): U.S. Geological Survey Scientific Investigations Report 2016–5102, 45 p. (<http://dx.doi.org/10.3133/sir20165102>)

Peak-Flow Statistics Parameters [Coordinated Reach: SELECTED STREAMS IN BROWN COUNTY]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	58.189	square miles		
PK10CoeffA	PK10 CoefficientA	1117.903	dimensionless		
PK10CoeffB	PK10 CoefficientB	0.486	dimensionless		
PK25CoeffA	PK25 CoefficientA	1420.904	dimensionless		
PK25CoeffB	PK25 CoefficientB	0.492	dimensionless		
PK50CoeffA	PK50 CoefficientA	1729.475	dimensionless		
PK50CoeffB	PK50 CoefficientB	0.489	dimensionless		
PK100CoeffA	PK100 CoefficientA	2099.928	dimensionless		

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
PK100CoeffB	PK100 CoefficientB	0.486	dimensionless		

Peak-Flow Statistics Flow Report [Coordinated Reach: SELECTED STREAMS IN BROWN COUNTY]

Statistic	Value	Unit
10 year Peak Flood	8050	ft ³ /s
25 year Peak Flood	10500	ft ³ /s
50 year Peak Flood	12600	ft ³ /s
100 year Peak Flood	15100	ft ³ /s

Peak-Flow Statistics Citations

Indiana DNR, Coordinated Discharges of Selected Streams in Indiana.
(<http://www.in.gov/dnr/water/4898.htm>)

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

USGS Software Disclaimer: This software has been approved for release by the U.S. Geological Survey (USGS). Although the software has been subjected to rigorous review, the USGS reserves the right to update the software as needed pursuant to further analysis and review. No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the software and related material nor shall the fact of release constitute any such warranty. Furthermore, the software is released on condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from its authorized or unauthorized use.

USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.2.1

Appendix C

Early Agency Coordination Meeting

MEETING SUMMARY

	Date:	<i>6/04/2018</i>
	Time:	<i>12:30 pm</i>
	Client:	<i>Lake Lemon Conservancy District</i>
	Project:	<i>Lake Lemon Sediment Mitigation Project</i>
	Location:	<i>LLCD's office and on the lake</i>

The following meeting summary was prepared by Sam Robertson and represents the discussion at the above noted meeting. Items in brackets are information added outside of meeting discussion as additional information.

- **Attendees**

- Pam Dugan, LLCD Chairman
- Adam Casey, LLCD Manager
- Michael Davis, USACE
- Aileen Driscoll Farid, IDEM
- Blake Wilson, LPG, Shrewsberry
- Sam Robertson, P.E., CFM Shrewsberry
- Rachele Baker, PWS, CPESC, Little River Consultants

- **Discussion Items**

- Sam Robertson began the meeting by discussing the project background, goals and potential alternatives the LLCD is considering. These goals include removing sediment buildup occurring in the open water portion of the east end of the lake, sedimentation ponds for future sediment control, and enhancing wetlands, where feasible. Sam provided a memorandum prepared by Shrewsberry & Associates, which acted as the agenda for the meeting, provided background and listed questions the design team has for the agencies. An aerial photograph plot was also provided showing the east end of the lake. The memorandum has been attached to this meeting summary.
- Michael Davis noted that this was a good time for preliminary meeting and both representatives agreed on the need for more frequent coordination as the project develops. An additional meeting was recommended to take place after the detailed design has started and the concepts from the current study have been completed and a preferred alternative selected.
- The design team reviewed questions for the agencies, but many of questions required further consideration by IDEM and USACE due to the unique nature of this project. Questions, answers and discussion points, as well as preliminary information provided by the agencies follows:
 - Lake Lemon is a backup water supply to the City of Bloomington. Can the LLCD dredge the delta areas that has built up in the east end of the

reservoir within the original reservoir's water surface limits without mitigation?

Michael said the USACE would have jurisdiction of the entire lake unless there was some sort of agreement between the agencies that were present at the time the Lake was formed, therefore Lake Lemon has the right to be maintained in these areas. [The LLCD needs to see if they can find any historic agreements on maintenance established in the a past with any state or federal agencies.]

- Shrewsberry asked if they have a preferred methodology for removing sediment from the lake. The two options specifically asked about included draining the lake and using traditional excavation equipment to remove sediment versus having a dredge remove the sediment.

Michael responded that the USACE does not have a preference but would prefer equipment on the lake bottom be minimized.

- Michael noted the USACE would view potential impacts more favorably if the project was seen to be bring value to the environment or providing a "ecological uplift". [Protecting and creating new wetland areas will be a key factor in permitting the project.]
- The agencies stated that wetland mitigation could be done within the LLCD bounds and in the delta area. t Some credit may be given for improving existing wetland quality. Wetlands created for mitigation for either agency permit would be required to be maintained as wetlands, in perpetuity. If these wetlands silted in and wetland plants died, the LLCD may be required to dredge those areas and replant wetland plantings. IDNR has recently established an an in-lieu fee program, where the LLCD could pay in to the program rather than physically mitigating for wetland impacts. [The cost is 45-75k per acre of wetland purchased for mitigation.]
- The overflow pond on the south side of the causeway was discussed. It was noted that this would be a viable option for sediment disposal and the agencies were in agreement. This area could also be used as a wetland mitigation. [This location may be a prime location for wetland mitigation because the area would be protected from silting overtime and therefore would require minimal maintenance for the LLCD.]
- The timeline for how long permits are valid was discussed. It was noted that the USACE Section 404 dredging permit is valid for 10 years and the IDEM 401 Water Quality Certification permit is valid for 5 years.
- Michael noted that the USACE requires an alternative analysis to be considered for any impacts to jurisdictional waterways including wetlands. He advised Shrewsberry to be prepared to submit these studies, documenting the analysis, when applying for the permitting.
- Shrewsberry noted that the USACE and IDEM's input will be critical to the development of the alternatives and asked when the answers to the question in the memorandum could be provided.

IDEM noted they would try and answer the questions by the end of the week and USACE did not provide a specific date. [However, at time of finalization of these minutes on 6/14 no response has been provided. Sam contacted the agencies on 6/14 and they USACE noted they would likely have answers in a few days but Aileen's voicemail noted she was out until June 20th.]

- The desktop portion of the meeting lasted for about 30 minutes and after the meeting, the design team and Aileen went on boat ride to tour the project area.



Memo

To: Agencies at June 4th Meeting

From: Sam Robertson, P.E., CFM, Shrewsberry

cc: Adam Casey, Lake Lemon Conservancy District Manager
Blake Wilson, LPG, Shrewsberry
Rachele Baker, PWS, CPESC, Little River Consultants

Date: June 4, 2018

Re: Lake Lemon Sediment Mitigation Project
Early Coordination Meeting No. 1

Background

The Lake Lemon reservoir was originally constructed in the mid-1950's and has served the community for over 60 years as a recreational destination and backup water supply to Bloomington, Indiana. The Lake Lemon Conservancy District (LLCD) was formed in 1995 and is dedicated to maintaining the reservoir's water quality and recreational use. Sediment has accumulated over the years disproportionately at the east end of the Lake and has led to the formation of a large delta that has reduced the original Lake's water surface area and volume. The current sediment removal program focuses on maintaining navigable channels and shore line sediment removal as a one-step process. A larger scale sediment removal project is needed to maintain the recreation uses and water quality of Lake Lemon, and to preserve the Lake's availability as a backup water supply. Figure 1 is an excerpt of the original Lake Lemon Reservoir plans from 1950, with the spillway elevation (630 feet) highlighted, indicating the original water surface limits.

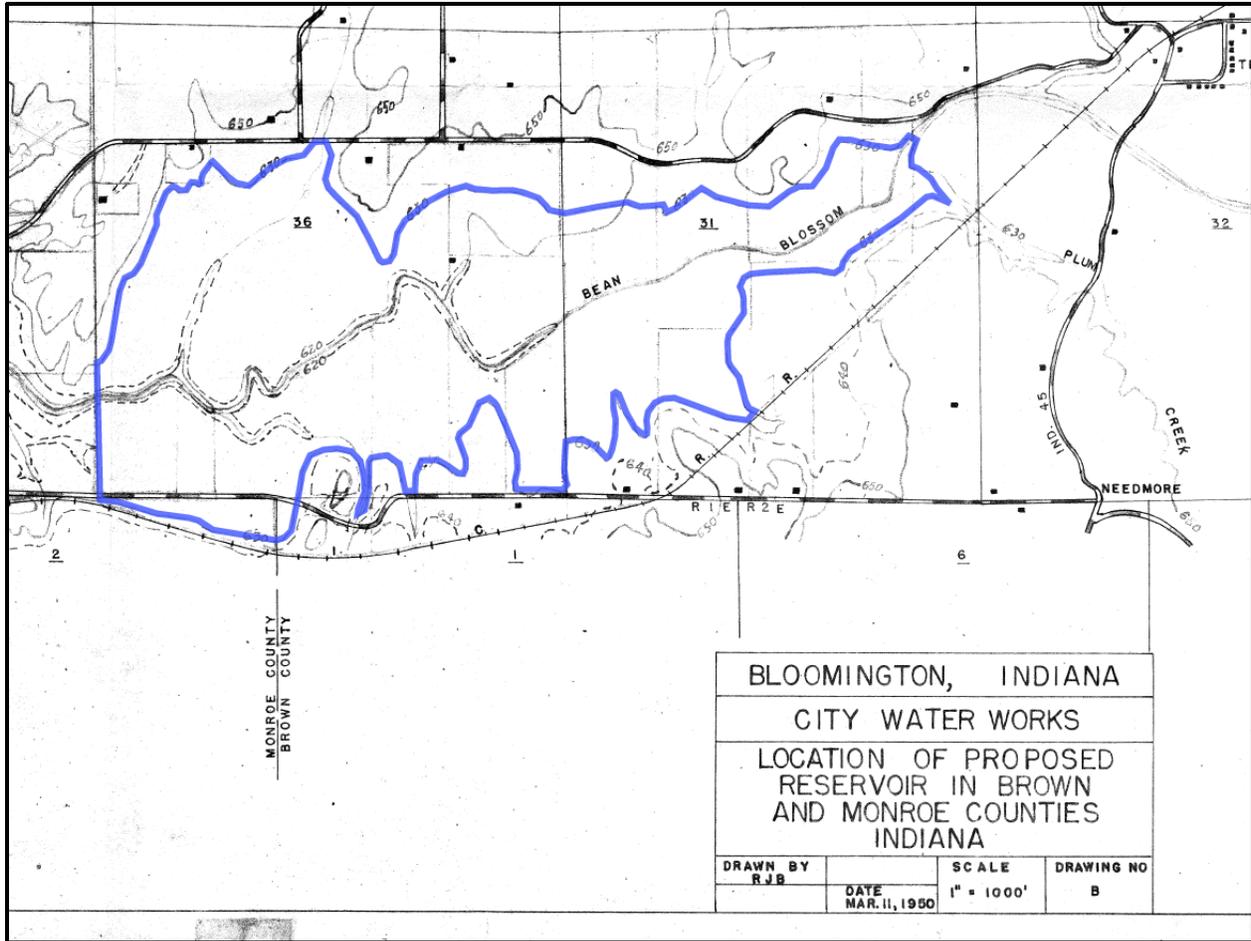


Figure 1 - Original Lake Lemon plans with the original water surface limits

Shrewsberry and Associates have been hired to review potential alternatives, perform early coordination with agencies, and prepare a 10% design to mitigate sediment. The LLC intends to start the project in 2019. The project will aim to dredge accumulated sediment from the lake, thereby improving recreation use and increasing water supply volume. Solutions will consider watershed stresses that have contributed to the sediment buildup and look at best management practice to limit future sediment. The extent of the sediment mitigation and removal will be determined by agency coordination and the feasibility of the proposed alternatives.

Figure 1 shows the original Lake Lemon water surface limits on the east end and Figures 2 and 3 show progression of sediment since the reservoir was constructed.



Figure 2 - Photograph from 1974 report showing early sediment accumulation on the east end and past water surface limits.



Figure 3 - 2015 Google Earth Aerial Photograph

Questions

The design team would like to get the agencies input on several questions that can be addressed at or after the June 4th, 2018 agency early coordination meeting.

1. Lake Lemon is a backup water supply to the City of Bloomington. Can the LLCDC dredge the delta areas that has built up in the east end of the reservoir within the original reservoir's water surface limits without mitigation?
2. If mitigation is required for wetland impacts in the delta, what mitigation type and ratio is required?
3. If mitigation is required for wetland impacts in the delta, will the following be allowed:
 - a. Enhancement and protection of existing wetlands?
 - b. Creation of new wetland areas by strategic placement of dredged material into open water?
4. Would using the delta areas that are not wetland areas to dispose of sediment and thereby increasing the topography elevation of those areas be permissible? They could then be forested upland areas when complete.
5. Sediment disposal areas are limited around the Lake and one option includes building manmade islands in the Lake or adding to the roadway causeway making it wider.
 - a. What type of dikes are allowed to create an island area in the lake?
 - i. Sheet piling or soldier pile wall systems?
 - ii. Riprap dikes?
 - iii. Sediment bags?
 - iv. Anchored trees?
 - v. Others?
6. Can below channel diversions be added in BeanBlossom Creek either in the channel upstream of the lake to direct sediment to sedimentation basins off line?
7. Can we do any erosion control within the stream channel?
8. Can we do any erosion control within the reservoir?
9. One option may be to lower the Lake level by 6-8 feet during the winter months and perform the sediment removal through traditional excavation. Is this a permissible solution?
10. Which does the Corps or IDEM prefer – Draining the reservoir or leaving the water up to dredge out the sediment?

11. Has the Corps dealt with this type of issue in other locations?
12. This project may have multiple phases and areas of need. Will multiple permit applications appropriate be appropriate or one overall application? Elements of the larger project may include:
 - a. Large scale dredging to restore lake volume.
 - b. Long term sediment management such as diversions or designated traps to prevent or slow future sedimentation.
 - c. Up channel efforts to reduce sediment load.



Memo

To: Agencies at June 4th Meeting

From: Sam Robertson, P.E., CFM, Shrewsberry

cc: Adam Casey, Lake Lemon Conservancy District Manager
Blake Wilson, LPG, Shrewsberry
Rachele Baker, PWS, CPESC, Little River Consultants

Date: June 4, 2018

Re: Lake Lemon Sediment Mitigation Project
Early Coordination Meeting No. 1

Background

The Lake Lemon reservoir was originally constructed in the mid-1950's and has served the community for over 60 years as a recreational destination and backup water supply to Bloomington, Indiana. The Lake Lemon Conservancy District (LLCD) was formed in 1995 and is dedicated to maintaining the reservoir's water quality and recreational use. Sediment has accumulated over the years disproportionately at the east end of the Lake and has led to the formation of a large delta that has reduced the original Lake's water surface area and volume. The current sediment removal program focuses on maintaining navigable channels and shore line sediment removal as a one-step process. A larger scale sediment removal project is needed to maintain the recreation uses and water quality of Lake Lemon, and to preserve the Lake's availability as a backup water supply. Figure 1 is an excerpt of the original Lake Lemon Reservoir plans from 1950, with the spillway elevation (630 feet) highlighted, indicating the original water surface limits.

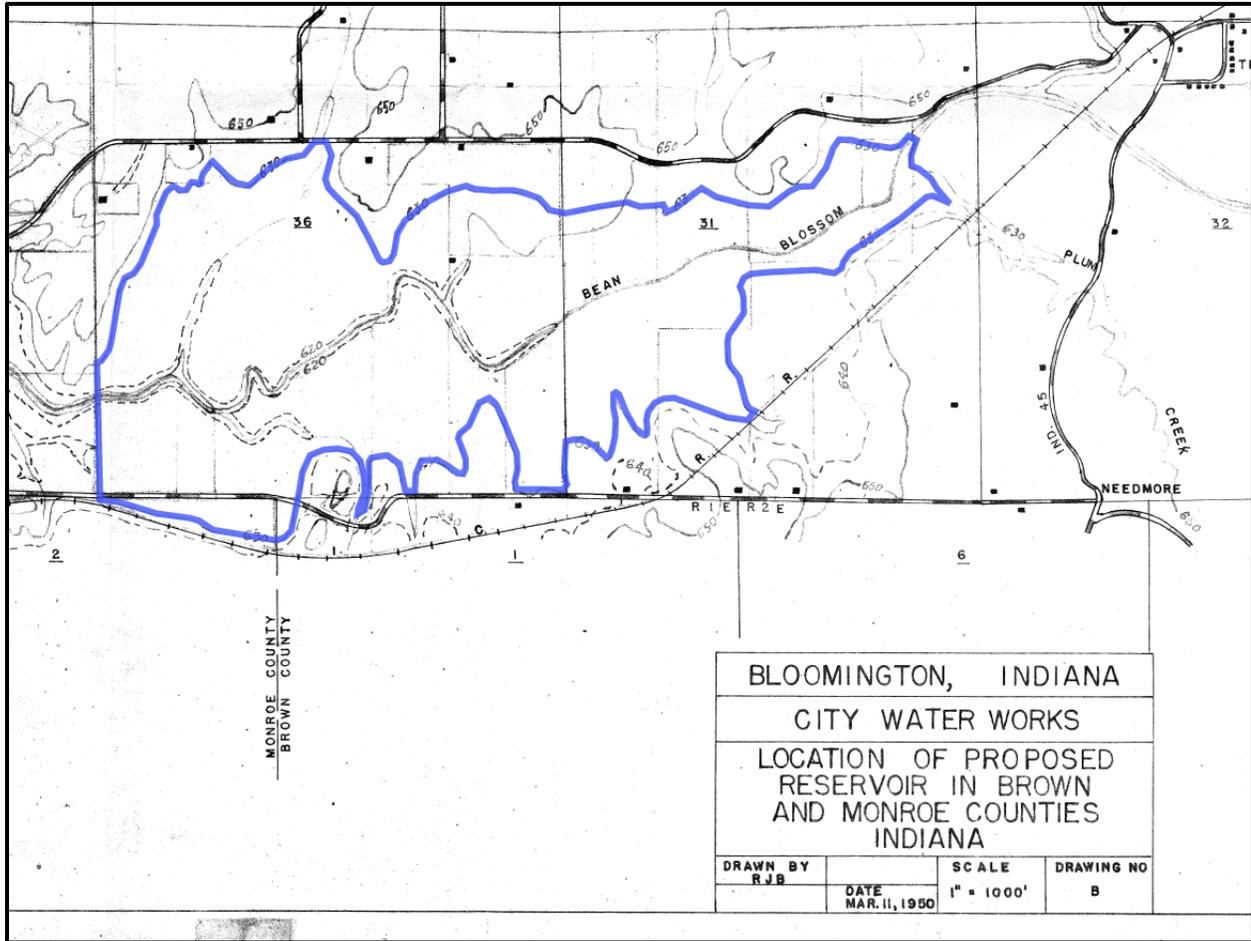


Figure 1 - Original Lake Lemon plans with the original water surface limits

Shrewsberry and Associates have been hired to review potential alternatives, perform early coordination with agencies, and prepare a 10% design to mitigate sediment. The LLC intends to start the project in 2019. The project will aim to dredge accumulated sediment from the lake, thereby improving recreation use and increasing water supply volume. Solutions will consider watershed stresses that have contributed to the sediment buildup and look at best management practice to limit future sediment. The extent of the sediment mitigation and removal will be determined by agency coordination and the feasibility of the proposed alternatives.

Figure 1 shows the original Lake Lemon water surface limits on the east end and Figures 2 and 3 show progression of sediment since the reservoir was constructed.



Figure 2 - Photograph from 1974 report showing early sediment accumulation on the east end and past water surface limits.



Figure 3 - 2015 Google Earth Aerial Photograph

Questions

The design team would like to get the agencies input on several questions that can be addressed at or after the June 4th, 2018 agency early coordination meeting.

1. Lake Lemon is a backup water supply to the City of Bloomington. Can the LLCDC dredge the delta areas that has built up in the east end of the reservoir within the original reservoir's water surface limits without mitigation?

USACE Response: If the areas to be dredged have not become wetlands, then one-step removal would allow you to do so.

IDEM Response: The original surface limits don't change anything on our end in terms of mitigation.

2. If mitigation is required for wetland impacts in the delta, what mitigation type and ratio is required?

USACE Response: It depends on the type of wetland. For forested impacts, the Corps requires a 1:3 ratio. Emergent/Scrub Shrub is 1:2. As with all mitigation projects, especially In-Lieu Fee, a 20% temporal loss will be assessed by the Corps. These ratios are our general standard for Establishment/Creation.

IDEM Response: The forested wetlands will be 4:1, scrub shrub 3:1, and emergent 2:1. Open water impacts are 1:1.

3. If mitigation is required for wetland impacts in the delta, will the following be allowed:

- a. Enhancement and protection of existing wetlands?

USACE Response: Wetland enhancement will generally result in a higher ratio for mitigation and is dependent on what type of enhancement is being done. There is one restriction on wetland enhancement for the Corps, all tree planting must be containerized, no bare root plantings. Protection (Preservation) generally has the highest ratio starting at 1:10.

IDEM Response: Yes it will be allowed, but like the Corps, the ratios are around 1:10.

- b. Creation of new wetland areas by strategic placement of dredged material into open water?

USACE Response: This could be an option; however, any discharge of fill/dredged material below the OHWM would require a permit, even for mitigation purposes.

IDEM Response: Yes, this is something we are open to. It will have to be included as an impact in your permit.

4. Would using the delta areas that are not wetland areas to dispose of sediment and thereby increasing the topography elevation of those areas be permissible?

USACE Response: They could then be forested upland areas when complete. Again, any discharge of fill/dredged material would require a permit.

IDEM Response: You can dispose of sediment in the non-wetland delta areas without having it count towards your impact. But, we would still have it be a 401 so that the permit can include a sediment and erosion control plan. Anything below OHWM would count as an impact.

5. Sediment disposal areas are limited around the Lake and one option includes building manmade islands in the Lake or adding to the roadway causeway making it wider.
 - a. What type of dikes are allowed to create an island area in the lake? Any of these options can be proposed; however, more "natural" methods are generally preferred.
 - i. Sheet piling or soldier pile wall systems?
 - ii. Riprap dikes?
 - iii. Sediment bags?
 - iv. Anchored trees?
 - v. Others?

USACE Response: Not provided

IDEM Response: This is a possibility, but it would be counted as an open water fill impact, possibly triggering mitigation, and we'd want to see an argument that it is enhancing habitat etc, something that validates it being returned into the lake. In terms of the material, we would want it to be clean, non-erodible fill. Beyond that, I don't believe we have a set requirement.

6. Can below channel diversions be added in BeanBlossom Creek either in the channel upstream of the lake to direct sediment to sedimentation basins off line?

USACE Response: This is an option; however, careful design must take place so that these diversions do not cause flooding up stream.

IDEM Response: Yes.

7. Can we do any erosion control within the stream channel?

USACE Response: Yes; if a fill/dredged material discharge is needed to complete the work, then a permit would be required.

IDEM Response: Same as above.

8. Can we do any erosion control within the reservoir?

USACE Response: Yes, same conditions as #7.

IDEM Response: Same as above.

9. One option may be to lower the Lake level by 6-8 feet during the winter months and perform the sediment removal through traditional excavation. Is this a permissible solution?

USACE Response: This is an option; however, the use of timber matting would likely be necessary to complete such action due to the lake bottom and would likely require a permit. I had a permit for a small pond/lake that had a dam failure; while the water was down, the applicant used an excavator, high lift, and off-road dump truck to remove the built-up sediment. The method used in this project was considered by the Corps as a one-step removal.

IDEM Response: Yes it is a permissible solution. IDEM considers timber mats to be temporary impact so this wouldn't count as one step removal for us.

10. Which does the Corps or IDEM prefer – Draining the reservoir or leaving the water up to dredge out the sediment?

USACE Response: Either option is available for the Corps; however, it is up to the applicant to design what fits your needs and fit as a permissible action.

IDEM Response: Typically, draining. However, DNR may have their own concerns on that one. I'm open to both options depending on that.

11. Has the Corps dealt with this type of issue in other locations?

USACE Response: On a smaller scale. I will have to get back with you on what lake it was (I have asked a few others and it occurred several years ago, so finding out which has been a little difficult). From my limited understanding, sediment traps were added to the streams feeding the lake. I do know that a few to several years later, the applicant had applied to add more sediment traps, along with other work, as the previously installed traps were not able to keep up with the amount of sediment being discharged. I am not certain of the success of this other project. Again, I will get back with you if I find out any more information.

IDEM Response: We've had dredging projects. Most of the time, they drain and dredge. I'll try to get more details as well.

12. This project may have multiple phases and areas of need. Will multiple permit applications appropriate be appropriate or one overall application? Elements of the larger project may include:

- a. Large scale dredging to restore lake volume.

- b. Long term sediment management such as diversions or designated traps to prevent or slow future sedimentation.
- c. Up channel efforts to reduce sediment load.

USACE Response: All of these elements above should be rolled into one large plan to review. It is already likely that this project will require an individual permit. It would then be the assigned project managers decision on how to proceed with permitting.

IDEM Response: IDEM would also require it to be presented as one application.

Appendix D

Opinion of Probably Construction Costs

Lake Lemon Sediment Mitigation Project Options

Conceptual Project Elements



Include (Y to include)	Project Element Number	Description	Size (acres)	Depth of Dredging or Disposal (ft)	Dredge Volume (CYS)	Disposal Volume (CYS)	Estimated Cost	Comments
y	1	Main Dredging Area	17.3	3.0	83,732	-	\$891,000	
y	2	Main Dredging Area	30.2	2.0	97,445	-	\$1,033,000	
y	3	Main Dredging Area	30.6	2.0	98,736	-	\$1,047,000	
y	4	Main Dredging Area	30.1	2.5	121,403	-	\$1,283,000	
y	5	Main Dredging Area	11.7	2.5	47,190	-	\$511,000	
y	6	Open Old Channel	1.5	5.0	12,100	-	\$126,000	5 feet deep, one step removal, try for no mitigation, spray discharge and option
y	7	Open Old Channel	1.4	5.0	11,293	-	\$118,000	5 feet deep, one step removal, try for no mitigation, spray discharge and option
y	8	Open Old Channel	0.5	5.0	4,033	-	\$58,000	5 feet deep, one step removal, try for no mitigation, spray discharge and option
y	9	Dredging, Underwater Diversion Structure	0.2	5.0	1,613	-	\$33,000	
y	10	Open Old Channel	1.4	5.0	11,293	-	\$134,000	
y	11	Dredging, Underwater Diversion Structure	0.3	5.0	2,420	-	\$41,000	
y	12	In-Lake Disposal Area/Created Wetland	25.1	2.0	-	80,989	\$933,000	
y	13	In-Lake Disposal Area/Created Wetland	4.7	1.5	-	11,374	\$49,000	
y	14	Sediment Trap	4.7	3.0	22,748	-	\$237,000	Accessible from South Shore Drive(?)
y	15	Upland Disposal Site - Current Maintenance Site	4.5	3.5	-	25,410	\$496,000	
y	16	Upland Disposal Site (Possum Trot)	6.9	10.0	-	111,320	\$149,000	
n	17	Lake Disposal Site (Northside of Southshore)	13.0	5.0	-	-	-	Needed to stabilize South Shore Drive. Also, creates parking area, dock sites, and debris trap
y	18	Lake Disposal Site (Southside of Southshore)	15.1	5.0	-	121,807	\$324,000	Good site for a permanent wetland
y	19	Upland Disposal Site (Southwest Area 1)	7.3	12.0	-	141,328	\$186,000	
y	20	Upland Disposal Site (Southwest Area 2)	3.4	12.0	-	65,824	\$87,000	
n	21	Upland Disposal Site (Northwest Area)	13.6	10.0	-	-	-	Approximately half of this site is 1-3 feet above water level and may be a wetland
n	22	Sediment Trap, Underwater Diversion Structure	3.3	6.0	-	-	-	
n	23	Sediment Trap, Underwater Diversion Structure	2.6	6.0	-	-	-	

514,008 558,052 \$7,736,000

Earth Balance = 44,044

[<Return to Summary](#)

Project Element No. = 1
 Project Element Description = s

Size (acres)	Depth of Dredging or Disposal	Dredge Volume (CYS)	Disposal Volume (CYS)	Estimated Cost
17.3	3	83,732	-	\$ 891,000

ITEM	DESCRIPTION	QTY	UNIT	PRICE	TOTAL
1	Dredging Open Water - Standard Disposal	83,732	CYS	\$ 8	\$ 669,856
2	Silt Curtain	300	LF	\$ 50	\$ 15,000
SUBTOTAL				\$	684,856
CONTINGENCY 30%				\$	205,456.80
TOTAL				\$	891,000

[<Return to Summary](#)

Project Element No. = 3
 Project Element Description = Main Dredging Area

Size (acres)	Depth of Dredging or Disposal	Dredge Volume (CYS)	Disposal Volume (CYS)	Estimated Cost
30.6	2	98,736	-	\$ 1,047,000

ITEM	DESCRIPTION	QTY	UNIT	PRICE	TOTAL
1	Dredging Open Water - Standard Disposal	98,736	CYS	\$ 8	\$ 789,888
2	Silt Curtain	300	LF	\$ 50	\$ 15,000
SUBTOTAL				\$	804,888
CONTINGENCY 30%				\$	241,466.40
TOTAL				\$	1,047,000

[<Return to Summary](#)

Project Element No. = 8
 Project Element Description = Open Old Channel

Size (acres)	Depth of Dredging or Disposal	Dredge Volume (CYS)	Disposal Volume (CYS)	Estimated Cost
0.5	5	4,033	-	\$ 58,000

ITEM	DESCRIPTION	QTY	UNIT	PRICE	TOTAL
1	Dredging Open Water - Standard Disposal	4,033	CYD	\$ 8	\$ 32,267
2	Underwater Diversion Structures	40	LF	\$ 300	\$ 12,000
				SUBTOTAL	\$ 44,267
				CONTINGENCY 30%	\$ 13,280.00
				TOTAL	\$ 58,000

[<Return to Summary](#)

Project Element No. = 10
 Project Element Description = Open Old Channel

Size (acres)	Depth of Dredging or Disposal	Dredge Volume (CYS)	Disposal Volume (CYS)	Estimated Cost
1.4	5	11,293	-	\$ 134,000

ITEM	DESCRIPTION	QTY	UNIT	PRICE	TOTAL
1	Dredging Open Water - Standard Disposal	11,293	CYD	\$ 8	\$ 90,347
2	Underwater Diversion Structures	40	LF	\$ 300	\$ 12,000
SUBTOTAL				\$	102,347
CONTINGENCY 30%				\$	30,704.00
TOTAL				\$	134,000

[<Return to Summary](#)

Project Element No. = 12
 Project Element Description = In-Lake Disposal Area/Created Wetland

Size (acres)	Depth of Dredging or Disposal	Dredge Volume (CYS)	Disposal Volume (CYS)	Estimated Cost
25.1	2	-	80,989	\$ 933,000

ITEM	DESCRIPTION	QTY	UNIT	PRICE	TOTAL
1	Geobag Disposal	80,989	CYS	\$ 7	\$ 566,925
2	Wetland Plantings	10	Acre	\$ 15,000	\$ 150,000
SUBTOTAL				\$	716,925
CONTINGENCY 30%				\$	215,077.60
TOTAL				\$	933,000

[<Return to Summary](#)

Project Element No. = 13
 Project Element Description = In-Lake Disposal Area/Created Wetland

Size (acres)	Depth of Dredging or Disposal	Dredge Volume (CYS)	Disposal Volume (CYS)	Estimated Cost
4.7	1.5	-	11,374	\$ 49,000

ITEM	DESCRIPTION	QTY	UNIT	PRICE	TOTAL
1	Rock Dike	500	LF	\$ 75	\$ 37,500
				SUBTOTAL	\$ 37,500
				CONTINGENCY 30%	\$ 11,250.00
				TOTAL	\$ 49,000

[<Return to Summary](#)

Project Element No. = 16
 Project Element Description = Upland Disposal Site (Possum Trot)

Size (acres)	Depth of Dredging or Disposal	Dredge Volume (CYS)	Disposal Volume (CYS)	Estimated Cost
6.9	10	-	111,320	\$ 149,000

ITEM	DESCRIPTION	QTY	UNIT	PRICE	TOTAL
1	Erosion and Sediment Controls	6.9	Acre	\$ 1,500	\$ 10,350
2	Land Acquisition	6.9	Acre	\$ 15,000	\$ 103,500
SUBTOTAL				\$	113,850
CONTINGENCY 30%				\$	34,155.00
TOTAL				\$	149,000

[<Return to Summary](#)

Project Element No. = 17
 Project Element Description = Lake Disposal Site (Northside of Southshore)

Size (acres)	Depth of Dredging or Disposal	Dredge Volume (CYS)	Disposal Volume (CYS)	Estimated Cost
13	5	-	-	#VALUE!

ITEM	DESCRIPTION	QTY	UNIT	PRICE	TOTAL
1	Seawall	4900	LF	\$ 700	\$ 3,430,000
2	Additional Disposal Costs	-	CYD	\$ 7	#VALUE!
				SUBTOTAL	#VALUE!
				CONTINGENCY 30%	#VALUE!
				TOTAL	#VALUE!

[<Return to Summary](#)

Project Element No. = 18
 Project Element Description = Lake Disposal Site (Southside of Southshore)

Size (acres)	Depth of Dredging or Disposal	Dredge Volume (CYS)	Disposal Volume (CYS)	Estimated Cost
15.1	5	-	121,807	\$ 324,000

ITEM	DESCRIPTION	QTY	UNIT	PRICE	TOTAL
1	Erosion and Sediment Controls	15.1	Acre	\$ 1,500	\$ 22,650
2	Wetland Plantings	15.1	Acre	\$ 15,000	\$ 226,500
SUBTOTAL				\$	249,150
CONTINGENCY 30%				\$	74,745.00
TOTAL				\$	324,000

[<Return to Summary](#)

Project Element No. = 21
 Project Element Description = Upland Disposal Site (Northwest Area)

Size (acres)	Depth of Dredging or Disposal	Dredge Volume (CYS)	Disposal Volume (CYS)	Estimated Cost
13.6	10	-	-	\$ 421,000

ITEM	DESCRIPTION	QTY	UNIT	PRICE	TOTAL
1	Erosion and Sediment Controls	13.6	Acre	\$ 1,500	\$ 20,400
2	Clearing and Grubbing	13.6	Acre	\$ 4,300	\$ 58,480
3	Land Acquisition	13.6	Acre	\$ 15,000	\$ 204,000
4	Site Restoration	13.6	Acre	\$ 3,000	\$ 40,800
SUBTOTAL				\$	323,680
CONTINGENCY 30%				\$	97,104.00
TOTAL				\$	421,000

[<Return to Summary](#)

Project Element No. = 22
 Project Element Description = Sediment Trap, Underwater Diversion Structure

Size (acres)	Depth of Dredging or Disposal	Dredge Volume (CYS)	Disposal Volume (CYS)	Estimated Cost
3.3	6	-	-	#VALUE!

ITEM	DESCRIPTION	QTY	UNIT	PRICE	TOTAL
1	Erosion Control	1	LS	\$ 20,000	\$ 20,000
2	Clearing and Grubbing	3.3	ACRE	\$ 4,300	\$ 14,190
3	Dredging pump long distance	-	CYD	\$ 10	#VALUE!
4	Silt Curtain	50	LF	\$ 50	\$ 2,500
5	Tree Removal	20	EA	\$ 700	\$ 14,000
SUBTOTAL					#VALUE!
CONTINGENCY				30%	#VALUE!
TOTAL					#VALUE!

[<Return to Summary](#)

Project Element No. = 23
Project Element Description = Sediment Trap, Underwater Diversion Structure

Size (acres)	Depth of Dredging or Disposal	Dredge Volume (CYS)	Disposal Volume (CYS)	Estimated Cost
2.6	6	-	-	#VALUE!

ITEM	DESCRIPTION	QTY	UNIT	PRICE	TOTAL
1	Erosion Control	1	LS	\$ 20,000	\$ 20,000
2	Clearing and Grubbing	2.6	Acre	\$ 4,300	\$ 11,180
3	Dredging pump long distance	-	CYD	\$ 10	#VALUE!
4	Silt Curtain	50	LF	\$ 50	\$ 2,500
5	Tree Removal	20	EA	\$ 700	\$ 14,000
SUBTOTAL					#VALUE!
CONTINGENCY				30%	#VALUE!
TOTAL					#VALUE!

SSSSSSS

Description	Unit	Cost/Unit	Sources
Dredging Open Water - Standard Disposal	CYD	8	Contractor Input
Dredging Open Water - Spray Adjacent	CYD	7	Contractor Input
Dredging pump long distance	CYD	10	Contractor Input
Disposal using Geobags (doesn't count dredging cost)	CYD	7	Contractor Input
Seawall	LF	700	RSMMeans
Underwater Diversion Structures (placed stone)	LF	300	
Wetland Plantings	Acre	15000	
Clearing and Grubbing	Acre	4300	Based on RSMMeans
Tree Removal (18" Average)	EA	700	Based on RSMMeans
Rock Dike	LF	75	
Erosion and Sediment Controls	Acre	1500	
Common Excavation	CYS	15	
Silt Curtain	LF	50	
Land Acquisition	Acre	15000	
Site Restoration	Acre	3000	
Contingency	%	30%	AACE Standard

Appendix E

Grant Information

Lake Lemon Conservancy District - Grant Research



Organization	Name of Grant	Category of Funding Activity	Min. Amount Per Grant	Max Amount Per Grant	When Application is Due	Match	Website
U.S. Fish and Wildlife Service	North America Wetlands Conservation Act 2019-2 U.S. Standard Grants	Environment Natural Resources	\$ 100,000	\$ 1,000,000	July 13	100%	https://www.fws.gov/birds/grants/north-american-wetland-conservation-act/how-to-apply-for-a-nawca-grant.php
IDNR	LARE Lake & River Enhancement Program	Environment Natural Resources			January 31	20%	https://www.in.gov/dnr/fishwild/2364.htm
U.S. Fish and Wildlife Service	2019 Multistate Conservation Grant Program	Discretionary	\$ 25,000	\$ 600,000	August 3		http://www.federalgrants.com/2019-Multistate-Conservation-Grant-Program-71172.html
US EPA	FY 2018 and FY 2019 National Wetland Program Development	Environment	\$ 75,000	\$ 200,000	July 21		https://www.epa.gov/wetlands/fy-2018-and-fy-2019-national-wetland-program-development-grant-request-proposals
Nation Park Service (NPS)	Land and Water Conservation Fund Outdoor Recreation Legacy Partnership Program (ORLP)	Environment Natural Resources Other (see text field entitled "Explanation of Other Category of Funding Activity" for clarification)	\$ 250,000	\$ 750,000	September 14	100%	https://fundingwizard.arb.ca.gov/grants/13697
Department of Interior	Sport Fish Restoration Grant Program						https://wsfrprograms.fws.gov/Subpages/GrantPrograms/SFR/SFR.htm
U.S. Fish and Wildlife Service	Great Lakes Restoration Initiative Partners for Fish & Wildlife	Environment Natural Resources	\$ 1,000	\$ 200,000	September 30		https://www.instrument1.com/grants/great-lakes-restoration-initiative-partners-for-fish-and-wildlife-2018
Association of Fish and Wildlife Agencies and U.S. Fish and Wildlife Service	Association of Fish and Wildlife Agencies 2019 Multistate Conservation Grant Program	Fish and Wildlife		\$ 6,000,000	May 4		https://www.fishwildlife.org/application/files/8215/1784/8796/Multistate_Conservation_Grant_Program_Overview.pdf
U.S. Environmental Protection Agency	FY18 Region 5 Wetland Program Development Grants	Environment	\$ 50,000	\$ 350,000	June 11		http://www.federalgrants.com/FY18-Region-5-Wetland-Program-Development-Grants-70770.html
U.S. Fish and Wildlife Service	National Coastal Wetlands Conservation Grant Program	Environment Natural Resources	\$ -	\$ 1,000,000	June 29		https://www.fws.gov/coastal/CoastalGrants/
Natural Resources Conservation Service	Conservation Stewardship Program				March 2		https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/csp/
Indiana State Department of Agriculture	Clean Water Indiana 2019 Competitive Grants				September 14		https://www.in.gov/isda/files/CWI%20Guidance%202019%20FINAL.pdf
Natural Resources Conservation Service	Conservation Innovation Grants (CIG)			\$ 75,000	June 1		https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/cig/
Natural Resources Conservation Service	Emergency Watershed Protection Program					25%	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp/
Federal Emergency Management Agency	Public Assistance (PA) Grant Program					25%	https://www.in.gov/dhs/2401.htm
	Wells Fargo	Private			anytime		https://www.wellsfargo.com/private-foundations/search-results#searchtab
Shell Oil Company	Shell Foundation Grant	Private (Environmental)	\$ 150,000	\$ 1,400,000	anytime		https://www.shell.us/sustainability/request-for-a-grant-from-shell.html
Bill and Melinda Gates Foundation	Bill Gates Foundation	Private (Environmental)			anytime		https://gch.grandchallenges.org/grant-opportunities
Department of Natural Resources	Urban Nonpoint Source & Storm Water Management Grant Program						https://dnr.wi.gov/aid/urbanonpoint.html

Lake Lemon Conservancy District - Grant Research



Organization	Name of Grant	Category of Funding Activity	Min. Amount Per Grant	Max Amount Per Grant	When Application is Due	Match	Website
Reservoir Fisheries Habitat Partnership	Reservoir Fisheries Habitat Partnership and Friends of Reservoirs Grant		\$ 10,000	\$ 30,000			http://www.reservoirpartnership.org/
Association of Fish and Wildlife Agencies	Association of Fish & Wildlife Agencies						https://www.fishwildlife.org/afwa-informs/resources
National Fish and Wildlife Foundation	National Fish & Wildlife Foundation						http://www.nfwf.org/whatwedo/grants/Pages/home.aspx
Bass Pro Shops and NFWF	Bass Pro Shops Grants						http://community.basspro.com/apply-for-support/
AFTCO/Bassmaster	AFTCO/B.A.S.S. Nation Conservation Grant		5000	5000			https://aftco.com/pages/bass-conservation-grant