

Item #8B:
Village Trustee Marshall
Three Lakes Subdivision Drainage & Lakes Management



Watershed Management Board Grant Application

Three Lakes Drive Drainage Improvements
Village of Long Grove

October 7, 2016

Mr. Mike Warner, Executive Director
Lake County Stormwater Management Commission
500 W. Winchester Road, Suite 201
Libertyville, IL 60048

Re: WMB Projects FY2017
Three Lakes Drive Drainage
Village of Long Grove

Dear Mr. Warner:

On behalf of The Village of Long Grove, we are pleased to submit the enclosed project proposal for consideration of grant funding from the Lake County Watershed Management Board. The project is located within the Des Plaines River Watershed. The following items are included for your review:

- Completed & Signed Watershed Resource Request Form
- Statement of Compliance
- Location Map
- Preliminary Engineer's Opinion of Probable Cost
- Three Lakes Drive Drainage Schematic Exhibit

Project Description

In the Three Lakes Subdivision, located north of Robert Parker Coffin Road and west of Illinois Route 83 in the Village of Long Grove, runoff is collected in a series of detention basins. The two large basins (referred to herein as "East Basin" and "West Basin"), approximately 400-feet north of Robert Parker Coffin Road are interconnected by a 36" diameter equalizer pipe that crosses under Three Lakes Drive. During the recent flooding of April 2013, flood waters had risen high enough to reach the homes surrounding these basins, causing property damage. The damage was limited to yard flooding and flooding of outdoor gazebos, patios, pools, etc. This was not the first time of flooding in the area. Three Lakes Drive has occasionally overtopped, resulting in road closures and safety concerns.

In June 2016, the Village (through Ela Township) pumped water from the West Basin to the East Basin via a 6" pump for three days. This effort was completed due to a high water in the West Basin that could not drain due to the condition of the equalizer pipe; see below for more information. As a result of the pumping, the water level in the West Basin was lowered 1.5,' while the water level in the East Basin remained the same. The East Basin is at capacity and is draining over the berm at the northeast corner of the basin; see below for more information. The Village had to complete a similar operation eight years ago.

The Village contracted Integrated Lakes Management (ILM) to conduct a sediment probing study of the basin in April 2014 to better understand the cause of the flooding. These basins flow west to east and outlet at the northeast corner of the subdivision. From there, discharge is carried under Illinois Route 83. ILM found that sediment has accumulated throughout the basins and was prohibiting flow in the equalizer pipe. In addition, the current water level was determined to be approximately 4.5 feet higher than the designed normal water level. The sediment in the basins and equalizer pipe explained the poor drainage under Three Lakes Drive; however, additional analysis was sought to explain the higher water level in both basins.

In efforts to identify the cause of the elevated water levels, ILM inspected the outlet of the East Basin. ILM found that sediment had blocked the outlet pipes and the berm at the outlet to be in very poor condition. Due to the outlet blockage, seepage was observed through the base of the berm, erosion is also occurring at the outlet as a result of overtopping. Further downstream, the drainage outlet across Illinois Route 83 was found to be in poor condition, due to debris blockages and a significant amount of erosion.

These basins are privately owned, so the repairs to the outlet are not included in this grant application. Likewise, the drainage under Illinois Route 83 is in the state right-of-way and not included in this application. The Village is responsible for Three Lakes Drive and is seeking improvements to maintain safe passage of this roadway during and after storm events.

In order to alleviate flooding of Three Lakes Drive, the Village of Long Grove is proposing to expose and clean the existing 36" equalizer pipe under Three Lakes Drive to promote flows. The Village is also proposing to install risers on the ends of the equalizer pipe to prevent sediment from entering the culvert pipe.

Project Benefits

Below is a summary of the project benefits based on the project prioritization criteria included in the WMB Project Proposal packet.

1. **Interjurisdictional Benefits** – Through implementation of the proposed Three Lakes Drive drainage improvements, the following jurisdictions will benefit:
 - a. The Village of Long Grove, by re-establishing flows from the West Basin to the East Basin to alleviate road overtopping.
 - b. Owners of properties surrounding the west basin in The Three Lakes Subdivision by controlling the water levels.
2. **Flood Hazard Reduction Benefits** – The drainage improvements will alleviate chronic flooding of Three Lakes Drive and properties surrounding the West Basin. The chronic flooding of Three Lakes Drive results in a road closure, which is a safety concern if emergency response vehicles cannot access the area; this subdivision has one access.
3. **Structural Damage Reduction** – Owners surrounding the West Basin have reported occurrences of flooded basements and property damage over the years. By restoring flows from the West Basin to the East Basin, water levels will not raise to damage levels. The roadway overtopping will be alleviated by this project. Although not evident at this time, the flooding of roadways has a negative impact on the structural integrity of the entire pavement section (asphalt, stone base and subgrade) resulting in premature failure.
4. **Water Quality Benefits** – The current situation results in stagnant water on properties for several days after a larger rainfall events. The proposed project will alleviate stagnant water in the area.
5. **Natural Resources Benefits** – This project will maintain a water level in the West Basin, which will allow the shoreline to be revegetated and stabilized. The revegetation and stabilization will need to be completed by the residents. The reduction in water level of the West Basin will also restore the flood capacity of this basin.
6. **Nuisance Flood Reduction** – Nuisance flooding will also be reduced by this project, not only in the private property but also in the Three Lakes Drive right-of-way. There is also a health, welfare and safety benefit to this project. Stagnant water can lead to nuisance pests and unusable areas of land.
7. **Multiple Use Benefits** – The proposed storm sewer pipe will benefit the Three Lakes subdivision and also the Village of Long Grove.
8. **Outside Funding Utilization** – The Village of Long Grove will be funding 50% of the overall cost.
9. **Public Education Component** – As part of regular outreach efforts with various Homeowner's Associations and Village-wide newsletters, the Village regularly discusses the importance of maintaining

existing drain tiles, storm sewer lines, shorelines, refraining from planting trees over storm sewers and asking homeowners to assist in clean-up of leaves and debris that can clog storm sewer structures and ditches.

If you have any questions regarding this application, please call me at 847-478-9700 or email me at: gperry@gha-engineers.com.

Sincerely,
Village of Long Grove

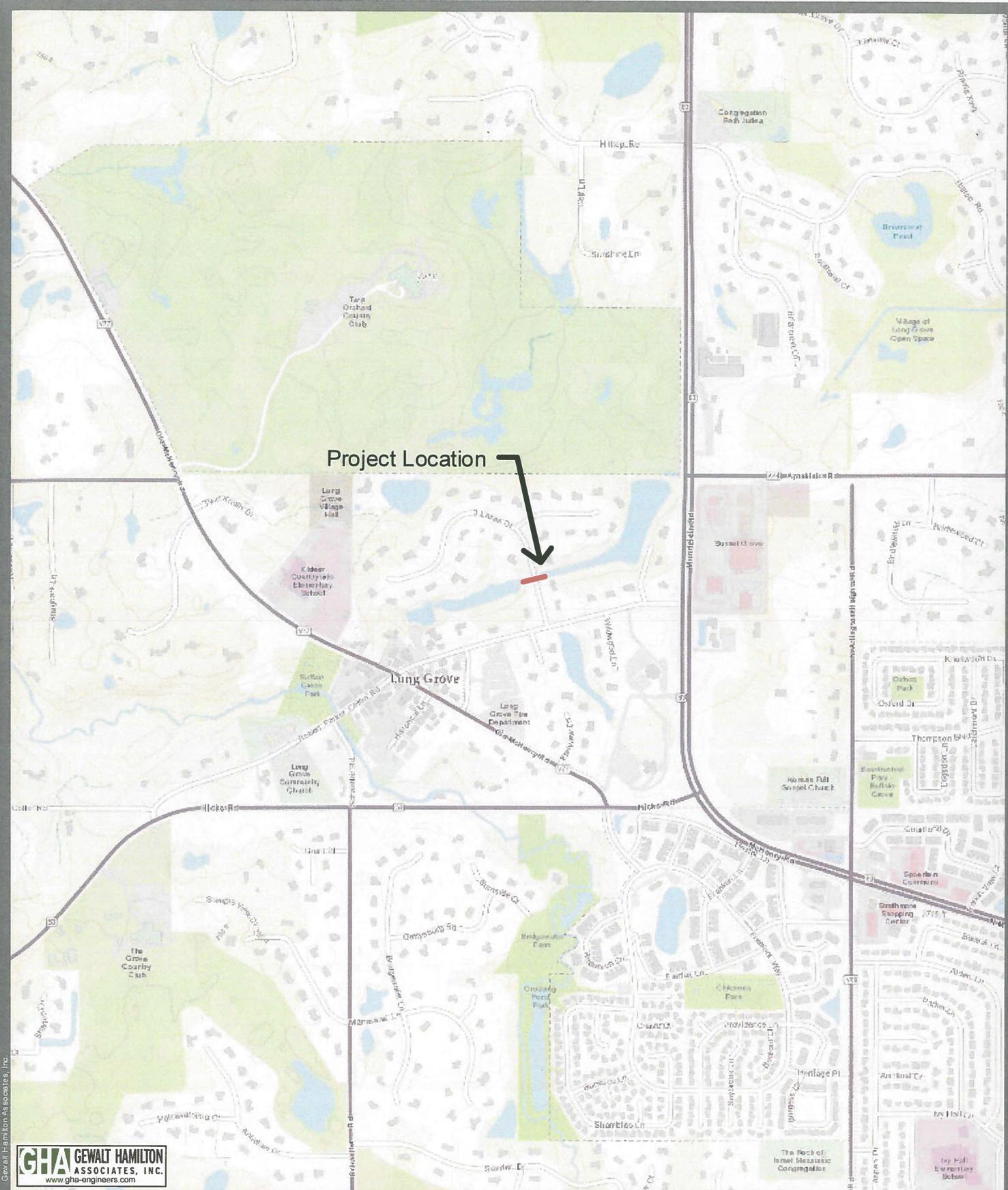
Geoffrey L. Perry, P.E.
Assistant Village Engineer

cc: Mr. Neil Schindelar – Lake County Stormwater Management Commission
Ms. Angie Underwood, Village President – Village of Long Grove
Mr. David Lothspeich, Village Manager – Village of Long Grove
Mr. Michael Shrake, P.E., Village Engineer – GHA

Statement of Compliance with SMC Policies, Local Plans and Ordinance

The Village of Long Grove, as Project Sponsor, will comply with all policies of the Lake County Stormwater Management Commission, local plans, and applicable ordinances in the development and execution of this project.

Angela Underwood
Signature of WMB Member



Project Location

Gewalt Hamilton Associates, Inc.
GHA GEWALT HAMILTON ASSOCIATES, INC.
 www.gha-engineers.com



1 inch = 1,000
 Feet

Location Map

Three Lakes Drive Drainage Improvements

RECEIVED: _____

REVIEWED: _____

WATERSHED RESOURCE REQUEST FORM

To: Des Plaines River Watershed Management Board
(Name of watershed, e.g., Fox River, Des Plaines River, Chicago River, or Lake Michigan)

Applicant Jurisdiction(s): Village of Long Grove
(e.g., name of Village, Township, Homeowners Association, etc.)

Brief Project Title: Three Lakes Drive Drainage Improvements

General Location: Three Lakes Drive, north of Robert Parker Coffin Road, between East and West lakes

North end of East lake near Route 83

Contact Person: David Lothspeich, Village Manager dlothspeich@longgrove.net
Name Email

Address: Village of Long Grove, 3110 Old McHenry Road, Long Grove, IL 60047

Phone: 847-478-9440

Grant Project Manager: Geoffrey Perry 847-478-9700 gperry@gha-engineers.com
Name Phone E-mail

Project Type: Planning Design Issue Resolution
(check all that apply) Capital Improvement Other

Is this a request for a Watershed Management Assistance Grant? Y/N N
(This is a specific type of planning grant described on page 5 of this request for proposals packet)

Resource Request: Watershed Account Funds SMC Staff Assistance
(check one) Combination Funds and Staff

Project Description (use additional sheets if necessary): See attached.

Cost Estimate: \$ 78,718.86 Applicant Share \$ 39,359.43 WMB Share \$ 39,359.43

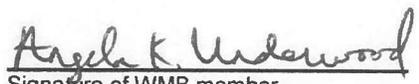
In-Kind Service Person-Hours: Applicant N/A SMC N/A

In-Kind Service Description (Applicant/SMC Service Scope): N/A

Project Timing: Start Date June 2017 Completion Date August 2017

Summary of Project Benefits (relating to flood damage reduction, water quality improvement, and natural resource enhancement): See attached.

Statement of Local Commitment (assurance that applicant has sufficient matching funds and staff capacity):
 The Village of Long Grove is budgeting sufficient funds for their share of the construction costs associated with the Three Lakes Drive Drainage Improvement Project as outlined in this application. The project is to be completed in 2017 to alleviate existing chronic flooding (roadway and structural) and standing water.



Signature of WMB member
(This must be a WMB member who supports the project. It is not necessarily the applicant.) See Page 1 for WMB member guidelines.

 Village President
Title

- Requested Attachments:**
1. Location map & project site photos
 2. Detailed project description
 3. Detailed (per criteria) statement on benefits, including quantifiable benefits
 4. Statement of compliance with SMC policies, local plans and ordinance
 5. Other comments or supporting documents



Proposed 36"
Culvert Riser

Gewalt Hamilton Associates, Inc.

GHA GEWALT HAMILTON
ASSOCIATES, INC.
www.gha-engineers.com



1 inch = 200
Feet

Proposed Improvements
Three Lakes Drive Drainage Improvements

PRELIMINARY ENGINEER'S OPINION OF PROBABLE COST

Three Lakes Drive Drainage Improvements
 4111 Three Lakes Drive
 Long Grove, Illinois
 GHA #5000.023

Date: October 5, 2016
 Prepared by: Geoffrey Perry, P.E.



CONSULTING ENGINEERS

625 Forest Edge Drive, Vernon Hills, IL 60061
 TEL 847.478.9700 ■ FAX 847.478.9701

www.gha-engineers.com

EQUALIZER PIPE IMPROVEMENTS

Pay Item	Description	Quantity	Unit	Unit Price	Value
20100110	Tree Removal (6 to 15 Units Diameter)	12.0	UNIT	\$50.00	\$600.00
21101600	Topsoil Furnish and Place, Variable Depth	150.0	SY	\$10.00	\$1,500.00
25000110	Seeding, Class 1A	0.03	AC	\$6,500.00	\$201.45
25000400	Nitrogen Fertilizer Nutrient	2.8	LB	\$2.00	\$5.58
25000600	Potassium Fertilizer Nutrient	2.8	LB	\$2.00	\$5.58
25100127	Mulch, Method 3A	150.0	SY	\$5.00	\$750.00
28000400	Perimeter Erosion Barrier	100.0	FT	\$4.00	\$400.00
50201101	Non-Erodible Cofferdam	2.0	EA	\$20,000.00	\$40,000.00
542C1081	Pipe Culverts, Class C, Type 1 36"	20.0	FT	\$75.00	\$1,500.00
X0426200	Dewatering	1.0	LS	\$3,000.00	\$3,000.00
X1200068	Bypass Pumping	5.0	DAY	\$300.00	\$1,500.00
X2010510	Clearing & Grubbing	1.0	LS	\$1,000.00	\$1,000.00
	Culvert Risers with Frame & Grate	2.0	EA	\$3,000.00	\$6,000.00
	Replacement Trees, 3" cal.	4.0	EA	\$650.00	\$2,600.00
	Cleaning and Sediment Removal of 36" Culvert	100.0	LF	\$50.00	\$5,000.00
	Traffic Control & Protection	1.0	LS	\$2,500.00	\$2,500.00

Sub-Total Construction Costs: \$66,562.60
 Contingency (10%): \$6,656.26

Total Construction Costs: \$73,218.86

Topographic Survey: \$750.00
 Phase II Engineering: \$1,500.00
 Phase III Engineering: \$2,500.00
 Record Drawings: \$750.00

Total Soft Costs: \$5,500.00

Grand Total Project Costs: \$78,718.86

Detailed Description:

This is a preliminary Engineer's Opinion of Probable Cost for submission with the Lake County Watershed Management Board Grant Application (2016). The scope of work is generally depicted on the aerial exhibit, prepared by Gewalt Hamilton Associates, Inc. dated October 7, 2016 and more fully described in the grant application.

*Since Gewalt-Hamilton Associates Inc. Has No Control Over the Cost of Labor, Materials, or Equipment, or Over the Contractor's Methods of Determining Prices, or Over Competitive Bidding of Market Conditions, Opinions of Probable Costs, as Provided for Herein, Are to be Made on the Basis of Experience and Qualifications and Represent the Best Judgment as a Design Professional Familiar with the Construction Industry. Gewalt-Hamilton Associates, Inc., Cannot and Does Not Guarantee That Proposals, Bids, or The Construction Costs Will Not Vary From Opinions of Probable Cost Prepared for the Owner.



April 1, 2014

Prabir Sen-Gupta
The Lakes of Long Grove
4148 Three Lakes Court
Long Grove, IL 60047

Re: The Lakes of Long Grove Outlet Structure Investigation

Dear Mr. Sen-Gupta,

Thank you for meeting with me and our partner, Biedyboys Construction and Excavating (BCE) on March 31, 2013. A brief summary of the project to date, and the findings of our site visit are described below, along with recommended next steps.

During the flooding of April, 2013, residents living along the South Basin indicated that flood waters from the lake backed up into their homes, causing property damage. Integrated Lakes Management (ILM) was asked to conduct a sediment probing study of the lakes to determine if sediment accumulation had caused the flooding. ILM presented the findings to the residents of The Lakes of Long Grove, indicating that sediment had accumulated throughout the lakes, and was potentially restricting flow in the culvert beneath Three Lakes Drive.

It was initially presented to ILM that the current water level in the lakes was the designed normal water level (NWL). Conversations with the Village of Long Grove, and property owners indicated that the culvert beneath Three Lakes Drive has been submerged below the water surface as long as all residents and Village personnel can recall.

The residents asked ILM to present cost estimates to remove sediment and clean out this culvert to improve flow through this culvert, with the goal of reducing future flooding. Cost estimates were developed and presented on July 24, 2013, September 24, 2013, and March 4, 2014 that included varying degrees of sediment removal, and installation of a concrete drop structure at the NWL at the "up-stream" end of the culvert to reduce further sedimentation within the culvert.

During a meeting with Village of Long Grove personnel and interested residents on March 17, 2014, ILM received the Record Drawings of the Lakes of Long Grove development from the Village of Long Grove. Upon review of the Record Drawings, it was observed that installation of a concrete drop structure on the west side of Three Lakes Drive would not be feasible, as the original designed NWL was at the invert (base) of the culvert beneath Three Lakes Drive, rather than above the culvert as had been indicated to ILM. The Record Drawing is attached as Exhibit A.

Discovering that the current water level in the lakes was above the designed NWL, ILM looked to the outlet of the East Basin to determine what was causing the current water level to be approximately 4.5-feet higher than NWL.

On March 31, the outlet on the north end of the East Basin was inspected. It should be noted that ILM and BCE are not Professional Engineers that can certify the integrity of structures such as levees and dams. However, we offer the following assessments based on our professional experience and understanding. Plan and profile drawings of the observed conditions are included with this letter.

Levee/Berm Condition – The levee, or berm on the north end of the East Basin is in poor to very poor condition. Seepage was evident along the entire base of the berm. Woody vegetation and trees were observed to be growing on top of and on the embankments. Numerous animal burrows were observed in the berm. Approximately halfway along the top of the berm, an eroded spillway was observed. The spillway did not appear to be a designed structure; rather, it appeared to have formed over time as a result of erosion along the top of the berm. A photo of the eroded spillway is included as Exhibit B. The water level on March 31, 2014 was very near the top of the berm. The eroded spillway was serving as the primary water control structure.

High Water Level Drainage – The Record Drawings show a concrete weir detail as the proposed high water overflow structure. During our site visit, a weir structure was not observed. Instead, an approximately 12-inch reinforced concrete pipe at the estimated high water level was identified. The inlet of the pipe was not protected with a grate, and was plugged with woody debris and leaves. A photograph of the high water level drainage inlet is included as Exhibit C. The outlet of the high water level drainage pipe did not have an outfall apron. While inspecting the outlet of the pipe it was observed that water was seeping around the outside of the pipe, and was not flowing through the inside of the pipe. When debris was manually cleared from the pipe inlet, water began draining freely through the high water level drainage pipe, indicating that this pipe is not plugged internally.

Normal Water Level Drainage – A second, approximately 12-inch reinforced concrete pipe that appeared to the primary NWL outlet structure was observed approximately 50-feet east of the high water level drainage pipe. There was no drainage present inside, or along the outside of this pipe. The spillway apron at the base of the pipe had been pulled away from the rest of the pipe by approximately 3-inches. A photograph of the outlet of the NWL pipe is included as Exhibit D. Based on the notes on the Record Drawing, the inlet of the NWL outlet pipe is approximately 4.5-feet below the current water surface.

State Route 83 Drainage - The drainage inlet beneath St. Rt. 83 was observed to be in poor to very poor condition. Woody debris from fallen trees was scattered around the inlet. A significant area of erosion, potentially caused by a broken drainage culvert was observed in the St. Rt. 83 embankment. This erosion may affect the integrity of the roadway if not addressed soon. The woody debris and poor condition of the inlet structure appeared to be backing up water at the base of the East Basin berm, and had created a wetland with standing water at the time of our visit. Wetland delineation flags were observed around the area at the base of the berm. Photographs of the St. Rt. 83 inlet pipe are included in Exhibit E.

Conclusions

The berm on the north end of the East Basin was not designed to retain water at the current water level for extended periods of time. Based on discussions with residents, it is thought that the water has been at the current level for over 10-years. The current water level is approximately 4.5-feet above the NWL.

The berm is showing signs of failure, evidenced by the seepage at the base, animal burrows, woody vegetation growth, and eroded spillway. If this berm is compromised, either during a high flow flood event, or by loss of structural integrity of the berm, all water currently in the lakes will be lost, and a costly repair will be necessary to restore the berm and lake level.

Flooding in the South Basin during April 2013 was likely due to the lack of flood retention capacity within the drainage system, and the submerged, and likely restricted flow beneath Three Lakes Drive.

Recommended Next Steps

Residents need to mobilize to address the high water level situation as soon as possible. The high water level has caused the lakes to lose their flood retention capacity, and is compromising the integrity of the retention berm. If the berm is compromised, the cost to repair and replace the berm will greatly exceed any maintenance or drainage pipe repair costs.

The first step for in addressing the drainage pipe repairs is to identify the source and location of the blockage in the NWL drainage pipe which drains toward St. Rt. 83. The source of the blockage can be determined by sending a camera up the drainage pipe. The camera will allow us to determine the condition of the pipe, the location of the lower end of the blockage in the pipe, and potentially the cause of the blockage. Having this information will allow us to determine if the blockage is located within the berm, or beyond the berm, beneath the water. The cost to send a camera up the pipe is \$550.

Once the location of the NWL drain blockage is known, repair work can begin. If the blockage is determined to be beneath the water, and the pipe is in good condition, ILM proposes that an excavator be brought in to try breaking off the plugged area of the pipe in the water, allowing water to gain entry into the pipe. The excavator would work to clear debris from the pipe until the water level reaches the NWL. Once the NWL is achieved, the broken pipe would be repaired, and a grated inlet structure would be installed. The existing eroded spillway would be repaired with gravel, clay, and geotextile, to prevent further erosion.

If the camera investigation indicates that the pipe is in poor condition, or the plug is within the berm, the effort to repair the drainage outlet is significantly increased. Pumps will be necessary to drain the lake down to, or below the NWL. Once the water level is at or below the NWL, the existing drain pipe can be excavated out of the berm, and a new drain pipe, inlet, and outfall apron can be installed. The existing eroded spillway would be repaired with gravel, clay, and geotextile, to prevent further erosion. The cost of this repair work is not known at this time due to the potential permitting, design, and construction uncertainties.

All woody vegetation that is currently growing on the berm should be cut and removed, to reduce the risk of berm failure. The roots of woody vegetation create flow pathways for water to pass through the berm, causing seepage and loss of structural integrity.

The storm water inlet under St. Rt. 83 should be repaired as soon as possible. BCE has contacts with the Lake County Department of Transportation (DOT), and will notify them of the

conditions we observed. ILM encourages the Village of Long Grove to also make the Lake County DOT aware of this condition so that repair work can begin as soon as possible, so the St. Rt. 83 road embankment is not compromised, and water can flow away from the base of the berm when discharged.

The recommendations above may only reduce the risk of the berm being compromised, not eliminate the risk. If the landowners wish to engage an engineer who is certified to certify the integrity of these types of structures, ILM can reach out to our Engineering partners to expedite the project.

Once the water level is returned to the NWL, the lake is likely to look very different than it currently does, and it is likely to be smaller in surface area, and shallower. The elevated water level has caused significant erosion along the banks, as areas that were graded and designed to be above water during normal conditions have been submerged for more than 10 years. These areas and the current lake shoreline have eroded, leading to the heavy sediment deposits noted by ILM. The exposed banks should be stabilized with vegetation to reduce further erosion and sedimentation into the lake.

Based on the Record Drawings, the invert (base) of the culvert beneath Three Lakes Drive is at the NWL, as described above. When the water level returns to the NWL, The culvert should be self-cleaning when water flows through it, and should not accumulate additional sediment that would restrict flows between the South Basin and the East Basin.

The changes in the lake appearance and repair costs must be weighed against the risk of additional flooding damages, and the potential cost associated with repairing the berm should it experience a total failure, draining the entire lake system. If the berm were to fail, the landowners would be responsible for any downstream property damages, as well as repair of the structure to restore the area to approved storm water discharge volumes.

At this time, our role has changed from that of a contractor providing pricing for proposed work to serving as a technical advisor/consultant. ILM is providing the information included in this letter to the residents of the Lakes of Long Grove as a courtesy based on our prior relationship. Any future technical advisor or consultant work will need to be billed to the client on a time and materials basis at our standard hourly rate of \$120.

If you have any questions, please contact me at 847-244-6662. We look forward to continuing to work with you to resolve the issues related to your lakes and their maintenance.

Sincerely,



Bill Santelik, PWS
Integrated Lakes Management

cc: Bill Biedermann, Biedyboys Construction and Excavation
David Lothspeich, Village of Long Grove



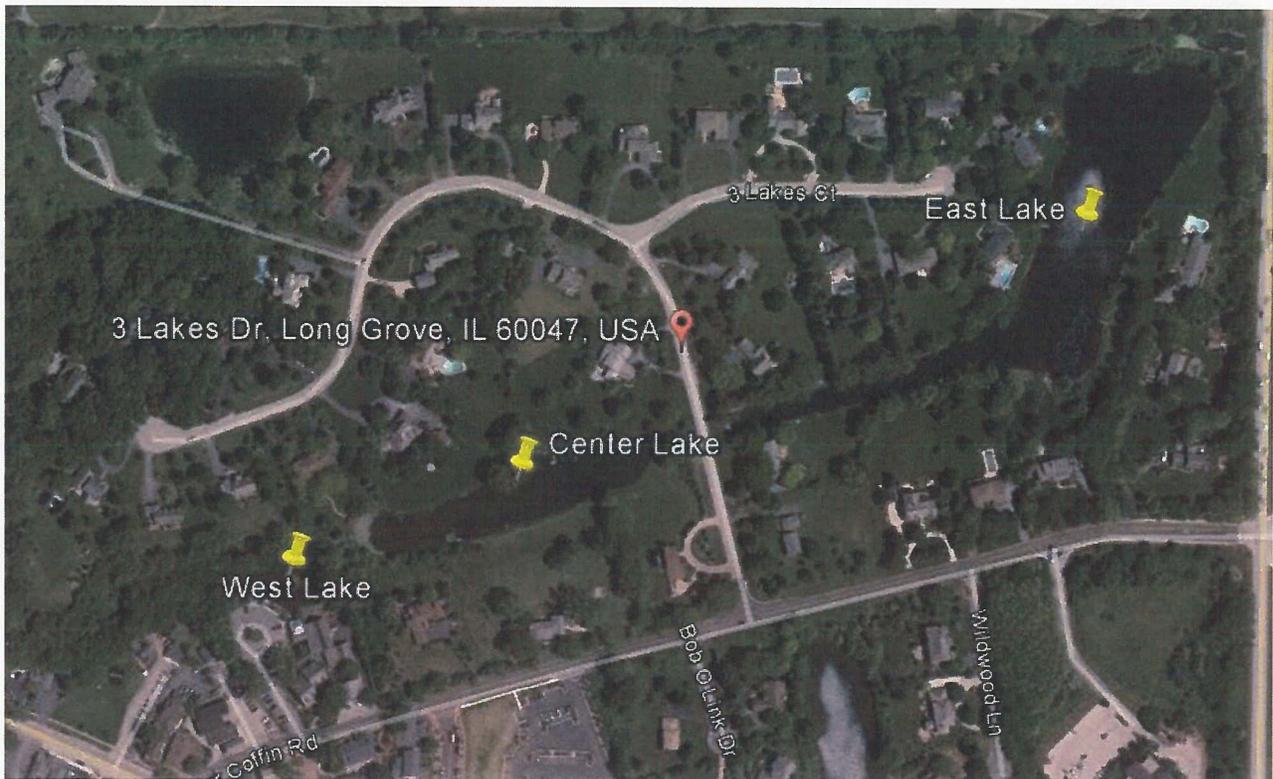
**Integrated Lakes
Management, Inc.**

Lake and Pond Management
Restoration ■ Consulting

**3 Lakes Drive
Long Grove, IL**

SEDIMENT PROBING REPORT

May 2, 2013



Prepared For: Dave Lothspeich
Village of Long Grove
3110 RFD
Long Grove, IL 60047

Prepared By: Sandy Kubillus, Certified Lake Manager
Senior Environmental Consultant
Integrated Lakes Management
120 Le Baron St.
Waukegan, IL 60085
(847) 244-6662



3 Lakes Drive
Long Grove, IL

SEDIMENT PROBING REPORT

May 2, 2013

INTRODUCTION

Ponds typically accumulate sediment and nutrients, and often support nuisance aquatic weed and algae growth, especially as they age. This report includes mapping of three small lakes for sediment thickness, water depth, and total depths, physical characterization of the type of sediment and a brief investigation as to the source of sediment.

The three areas investigated are shown on the cover page as East Lake, Center Lake and West Lake.

RESULTS

Table 1: Bathymetric and Sediment Probing Results:

	East Lake	Center Lake	West Lake
Size of Lake(acres)	4.7	1.7	0.5
Average water depth (ft.)*	4.9	3.4	6.2
Maximum water depth:	7.6	5.9	9.5
Average sediment thickness (ft.)**	0.9	2.4	2.2
Maximum sediment thickness (ft.)	3.7	5.0	5.2
Sediment volume (cubic yards)***	6,950	6,500	1,775
Recommended sediment removal volume****	4,500	6,200	1,675

*Based on average of points probed.

** Based on average depth multiplied by area.

***Wet sediment volume, which is ~ 50% water. Once this material is removed and dried it should a smaller volume.

****Recommended sediment removal volumes are based on areas with one foot of sediment accumulation or more.

The results from each probe are listed at the end of this report.

OBSERVATIONS

- A major flood occurred two weeks prior to the site visit and one of the residents identified the debris line between the West and Center Lakes (Figure 11). Apparently the problem was that the outlet to the Center Lake was blocked. The water in all three lakes was slightly flowing at 0.1 – 0.3 feet of depth at the time of the site visit.
- Both the West and East Lakes do not have outlet culverts but have swales lined with plants and soil. These areas may be one source of sediment to the downstream areas.
- The West Lake shoreline was surrounded by rock. Two of the neighbors had major shoreline restoration projects completed using decorative rock a few weeks prior to the flood.
- Portions of the West Lake have natural shoreline. The remaining sections consist of mowed lawn and the restaurant parking lot. Shorelines for the Center and East Lake consist primarily of mowed lawn to the shoreline with no native plant buffer zone. Sections of these shorelines are eroded and contributing sediment to the lakes.
- No aquatic plants or algae were visible at the time of the site visit.
- The sediment in all three lakes consisted of organic rich muck.
- The Floodplain map (Figure 14) for these lakes does not show a major inflow, so most of the sediment within these ponds appears to be due to shoreline erosion and soil washing into the ponds from nearby properties.



Figure 1: View of East Lake from 3 Lakes Dr.



Figure 2: Shoreline erosion at East Lake.



Figure 3: View of main portion of East Lake.



Figure 4: Outlet channel for East Lake, near Rt. 83.



Figure 5: Inlet for East Lake on 3 Lakes Dr.



Figure 6: Center Lake facing west.



Figure 7: Shoreline erosion of Center Lake.



Figure 8: Shoreline erosion of Center Lake



Figure 9: Inlet for Center Lake.



Figure 10: Outlet for Center Lake. This outlet was plugged during the April flood event.



Figure 11: Debris line from recent flood between the West and Center Lakes.



Figure 12: West lake facing west.



Figure 13: West Lake facing south to the restaurant.

Lake County, Illinois



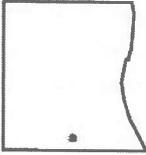
	<p>Lake County Geographic Information System</p> <p>Lake County Department of Information Technology 18 N County St Waukegan IL 60085 (847) 377-2373</p> <p>Map Printed on 05/14/2013</p>		<ul style="list-style-type: none">  100 Year Floodplain  500 Year Floodplain  Lake County Border  Streams  2010 Aerial Photography
	<p>Disclaimer The selected soil feature layer may not occur anywhere in the current map extent. A Registered Land Surveyor should be consulted to determine the precise location of property boundaries on the ground. This map does not constitute a regulatory determination and is not a base for engineering design. This map is intended to be viewed and printed in color.</p>		

Figure 14: Floodplain map for the 3 Lakes area.

RECOMMENDATIONS

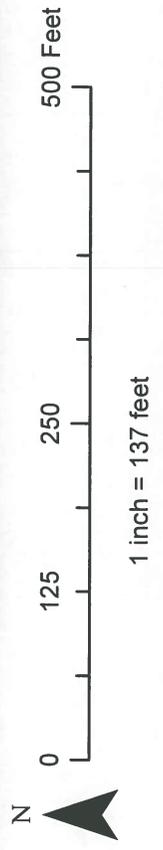
- The Center and West Lakes contain a significant amount of sediment that should be removed. Many of these areas have over two feet of sediment. The narrow channel of the East Lake also contains significant sediment deposits.
 - Estimated cost to remove sediment in the Center Lake is \$124K (\$20/cubic yards (CY)) - \$279K (\$45/CY) for 6,200 CY.
 - Estimated cost to remove sediment in the West Lake is \$33.5K - \$75K for 1,675 CY.
 - Estimated cost to remove sediment in the East Lake is \$90K - \$202K for 4,500 CY. This can be reduced if only the narrow portion is dredged.
 - These cost estimates include dredging and the sediment bags; they do not include moving the sediment to the final storage location. Permitting costs should be minimal if sediment disposal and muddy water can be kept onsite. This can be accomplished if the lake is lowered so that it is not flowing offsite at the time of dredging.
- The main source of sediment to the lakes appears to be shoreline erosion. Mowed lawn has very shallow root systems and provides little protection to the shoreline soils. It is recommended that a native plant buffer of at least 15 – 20 feet be installed around the shoreline of all of the lakes wherever possible.
- The outlets to the West Lake and the East Lake consist of swales that are cut channels. Typically pond outlets consist of culverts with grates that catch debris, or rock lined channels. The existing dirt channels may also be a source of sediment to downstream areas.
- This report is a good first step in determining which areas to dredge. The next step is for the community to determine their budget and priorities. Often a long-term fund is established for major projects such as dredging.
 - If dredging is to begin in the next two years then disposal areas should be determined and the permitting process should be started. Depending on the method utilized for dredging and the disposal location, permitting can be quite variable and early investigation into the requirements is recommended.

East Lake			
	Sediment feet	Water Depth feet	Total Depth feet
1	0.2	0.0	0.2
2	0.8	5.4	6.2
3	0.5	5.8	6.3
4	0.6	4.8	5.4
5	1.2	7.4	8.6
6	1.3	3.5	4.8
7	0.6	4.1	4.7
8	1.5	7.0	8.5
9	1.0	6.0	7.0
10	3.0	5.5	8.5
11	1.3	6.8	8.1
12	1.7	4.8	6.5
13	0.9	5.6	6.5
14	1.1	7.6	8.7
15	0.9	5.8	6.7
16	1.5	5.4	6.9
17	0.5	6.0	6.5
19	1.5	4.7	6.2
20	2.1	4.7	6.8
21	1.9	4.8	6.7
22	2.1	4.5	6.6
23	2.2	4.3	6.5
24	3.7	2.7	6.4
25	3.2	2.6	5.8
26	0.6	2.9	3.5
Average	1.4	4.9	6.3
Maximum	3.7	7.6	8.7

Center Lake				
	Sediment	Water Depth	Total Depth	
	feet	feet	feet	
1	2.3	2.9	5.2	
2	4.1	1.2	5.3	
3	2.1	1.6	3.7	
4	4.4	2.9	7.3	
5	4.1	5.9	10.0	
6	5.0	4.2	9.2	
7	2.8	3.5	6.3	
8	2.3	2.7	5.0	
9	4.4	4.5	8.9	
10	2.8	2.7	5.5	
11	4.4	4.5	8.9	
12	3.7	2.8	6.5	
13	3.9	5.6	9.5	
14	3.3	2.2	5.5	
15	1.4	2.1	3.5	
16	3.1	4.4	7.5	
17	2.8	5.4	8.2	
18	3.0	2.6	5.6	
Average	3.3	3.4	6.8	
Maximum	5.0	5.9	10.0	

West Lake				
	Sediment	Water Depth	Total Depth	
	feet	feet	feet	
1	2.8	5.5	8.3	
2	3.3	4.8	8.1	
3	5.2	4.8	10.0	
4	4.4	5.2	9.6	
5	2.9	7.9	10.8	
6	1.5	9.5	11.0	
7	2.6	6.2	8.8	
8	2.8	5.7	8.5	
9	3.8	6.2	10.0	
Average	3.3	6.2	9.5	
Maximum	5.2	9.5	11.0	

3 Lakes Dr., Long Grove East Lake, Sediment Thickness, 5/2/13



Legend

	1 ft sediment		East lake shoreline
	2 ft sediment		EastLake
	3 ft sediment		

3 Lakes Dr., Long Grove East Lake, Bathymetric Map, 5/2/13



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Legend

- 1 ft
- 3 ft
- 5 ft
- 7 ft
- East lake shoreline
- EastLake

3 Lakes Dr., Long Grove East Lake, Total Depth (Water + Sediment), 5/2/13



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500 Feet

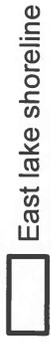
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125

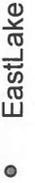
0

1 inch = 137 feet

Legend



East lake shoreline



EastLake

3 Lakes Dr., Long Grove Center Lake, Sediment Thickness, 5/2/13



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 Restoration ■ Consulting



300 Feet Legend

- 1 ft sediment
- 2 ft sediment
- 3 ft sediment
- 4 ft sediment
- 5 ft sediment
- Center lake shoreline
- CenterLake

3 Lakes Dr., Long Grove Center Lake, Bathymetric Map, 5/2/13



1 inch = 83 feet

Legend

-  1 ft Center lake shoreline
-  3 ft CenterLake
-  5 ft

3 Lakes Dr., Long Grove Center Lake, Total Depth (Water + Sediment), 5/2/13



1 inch = 83 feet

Legend

-  Center lake shoreline
-  CenterLake

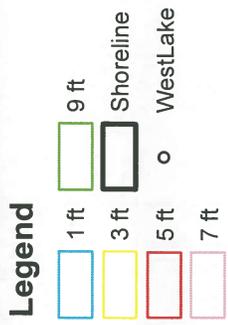
3 Lakes Dr., Long Grove West Lake, Sediment Thickness, 5/2/13



Legend

- 1 ft sediment
- 2 ft sediment
- 3 ft sediment
- 4 ft sediment
- 5 ft sediment
- Shoreline
- WestLake

3 Lakes Dr., Long Grove West Lake, Bathymetric Map, 5/2/13



1 inch = 40 feet



3 Lakes Dr., Long Grove West Lake, Total Depth (Sediment + Water), 5/2/13

