Carol Stream Park District

Evergreen Lakes Bank Assessment Summary Report

849 W Lies Rd
Carol Stream, IL 60188
Bodwé Project No. 24-2055
Issued for Carol Stream Park District – October 2024

WBK ENGINEERING
Part of Bodwé Group

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1.0 INTRODUCTION

WBK Engineering, LLC has been tasked to analyze the existing lake banks for erosion and stability concerns at the Evergreen Lakes in Evergreen Lakes Park, Carol Stream, IL. Due to natural conditions as well as other circumstances, erosion has been developing on certain sections of the lake banks. Thus, the Carol Stream Park District, owners and operators of the park, have commissioned this report to identify cost-effective solutions to ongoing erosion and identify the priority areas experiencing the most significant erosion. The objectives of the memorandum are as described below:

- To rank the severity of erosion for bank sections and prioritize areas of concern with accelerated erosion.
- To identify specific treatments that can be applied to targeted locations at the lake banks which should be prioritized for stabilization and/or restoration.
- To identify general treatments that can be applied to the lake banks throughout the entire study corridor to prevent additional erosion and loss of property while also providing aesthetic and ecological benefits.
- To establish an estimate of probable construction costs for various treatments described and prioritize based upon their cost-effectiveness and level of urgency.

2.0 EXISTING CONDITIONS AND FIELD ASSESSMENT

WBK performed a field assessment and captured photographs, which are included in the sections to follow. The Evergreen Lakes Park contains two lakes connected via culvert. These were identified as “North Lake” and “South Lake” for clarity in the assessment. A location map of the site can be found in Appendix A. Maps of the lakes are provided in Appendix B and provide bank section numbers that are cross-referenced in the site photo figures.

Bank sections were labeled as Category A, B, or C based on their severity of erosion. This ranking system is as defined below:

- **Category A:** sections with slight erosion along the bank that was not significantly steep, sections are well covered in vegetation, and/or there is significant distance between the shoreline and private property line. These areas are low priority for treatment.
- **Category B:** sections containing erosion along the bank that is moderate and/or partially sloped, sections are moderately covered in vegetation, and/or there is moderate distance between the shoreline and private property line. These areas are moderate priority for treatment.
- **Category C:** sections with significant erosion along the bank that was significantly steep, lack of vegetative cover, and/or increased threat to private property. These areas are top priority for treatment.

The bridge section between the North and South Lakes is in good condition. There is existing structural reinforcement surrounding the culverts and vegetation buffer, pictured in Figure 2.1.

Figure 2.1 Category A – Culverts Between North and South Lakes, 1-S

2.1 North Lake

The North Lake is generally in better condition than the South Lake; there is less erosion comparatively and no instances of category C erosion. There is adequate vegetative cover throughout including a wetland portion of the North Lake in the northeast corner, shown in Figure 2.2 and Appendix B - Figure 1.

Figure 2.2 Category A – Wetland Area, 10-N

There is also existing structural enforcement present in the form of A-Jacks along the northern-most portion of the bank. These are generally in good condition and providing some bank protection, as seen in Figure 2.3. However, the A-Jacks in some places are sitting in front of the shoreline, indicating that some erosion has still occurred with them in place, seen in Figure 2.4.

Figure 2.3 Category A – Existing A-Jacks Enforcement, 5-N

Figure 2.4 Category B – Existing A-Jacks Enforcement, 6-N

There is also an existing boat launch for non-motorized boats at the northwest corner of the lake, pictured in Figure 2.5. This launch was graded Category B because of the observed damage at the shoreline.

Figure 2.5 Category B – Existing Boat Launch, 4-N

2.2 South Lake

The South Lake generally has more erosion than the North Lake and has been a specific area of concern for the park district. The banks are generally steeper and there is a lack of native plant growth in the southwest portion. Erosion is present at the northeast portion and near the outlet culvert at the southernmost portion of the lake. There is a small section of adequate bank at the southeast corner where the shoreline is a significant distance from the surrounding properties, shown in Figure 2.6.

Figure 2.6 Category A – Gradual Slope, 4-S

The outlet culvert is rated Category C because of the observed steep slope, lack of vegetation and distance to property line, seen on the right side of the image in Figure 2.7.

Figure 2.7 Category C – Outlet Culvert, 6-S

There is a significant amount of downcutting (downward or vertical erosion) along banks in the South Lake, shown in Figure 2.8 and Figure 2.9.

Figure 2.8 Category B – Downcutting, 3-S

Figure 2.9 Category B – Downcutting, 5-S

Figure 2.10 shows steep downcutting at a Category B location but based on historical aerial imagery, the bank has not receded appreciably. Tree root structure at this location appears to help maintain a fairly stable bank. Figure 2.11 shows Category C downcutting and limited distance to the property lines and more sparse vegetative growth compared to other portions of the bank.

Figure 2.10 Category B – Downcutting, 9-S

Figure 2.11 Category C – Downcutting, 2-S

Additionally, there is existing riprap at the southwest portion of the South Lake, shown in Figure 2.12 and Figure 2.13. However, this stabilization is not accompanied by native plant growth and is at a steep grade, so it is still an area of concern.

Figure 2.12 Category C – Existing Riprap, 8-S

Figure 2.13 Category C – Existing Riprap, 8-S

There is another existing boat launch on the South Lake at the northwest corner which is in good condition, pictured in Figure 2.14. The launch is generally stable and surrounded by vegetation on either side.

Figure 2.14 Category A – Boat Launch, 1-S

3.0 STABILIZATION AND RESTORATION TREATMENT ALTERNATIVES

Various erosion control methods were considered with the following goals in mind:

- Reduce and/or eliminate erosion and downcutting of the lake banks.
- Increase stability for the lake banks.
- Cost effectiveness.
- Accessibility for fishing and non-motorized boating.
- Aesthetic value for residents living on the lakes and visitors to the park.

The following methods of stabilization were considered for the bank areas of concern:

3.1 Riprap Stabilization

Riprap stabilization consists of armoring the upper bank with an angular stone, possibly combined with regrading the banks to a stable slope (3(H):1(V) – 4:1). Riprap is typically placed above the water but can extend down into the water as well. A hard armor solution such as rock riprap provides a solution for extreme slopes that cannot be regraded to desired slopes or experience significant wave action or water velocities. However, riprap is not easily walked on and limits accessibility to the lake and is often considered less aesthetically pleasing compared to vegetative or natural solutions. Riprap stabilization can be combined with vegetative erosion control methods for increased effectiveness and aesthetic value. Limits of riprap stabilization also include the bank width, as a wide enough strip of land is needed to cut back the slope (often 20 feet). Cost for this method includes the placement of materials to armor the slope, earth excavation, and grading needed to reshape the bank slope. A typical riprap application without any vegetation is represented in Figure 3.1 [1].

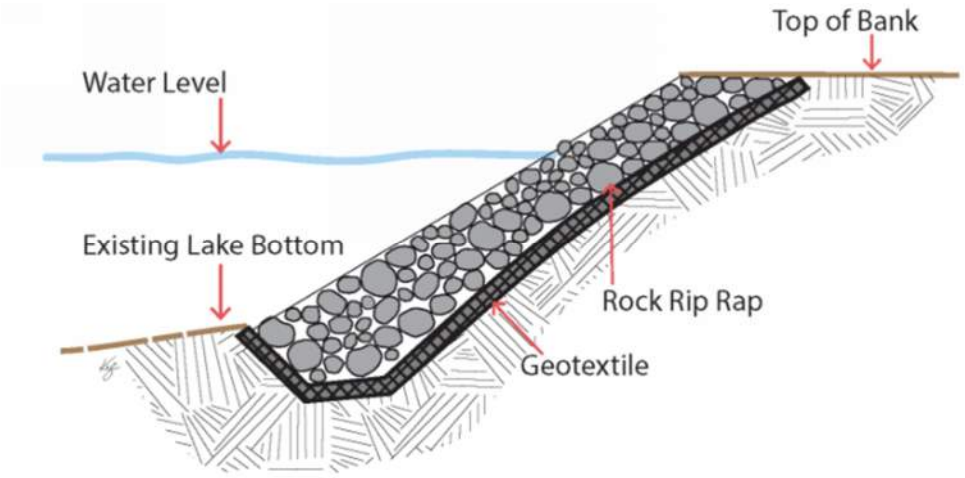

Figure 3.1 Riprap Typical Application

3.2 Stone Toe Stabilization

Stone toe stabilization is the addition of riprap stabilization at only the lower portion (toe) of the bank. Stone toe is placed below the water surface along the bank to stabilize and protect the bank from downcutting. An armored toe dissipates energy along the lower bank and provides a physical barrier between water and soil. This tends to help prevent the upper bank soil from sloughing off and allows for root establishment which is key for long-term stability. Stone toe can extend above the water surface to expected high water elevations and be combined with regrading and vegetation to introduce native species and deep-root structure. Construction typically requires working in dry conditions to install a filter fabric underlayment for the stone to rest on. Costs for this treatment include a cofferdam or low water conditions to work in the dry, preparation of the toe to receive the stone, and placement of materials. Stone toes are visually represented in typical details several of the following erosion control methods as they are often used alongside other methods. See Figure 3.5, Figure 3.6, and Figure 3.7.

3.3 Bio-logs

Bio-logs, also known as geotextile rolls, can be made of various natural materials including wood, coconut fiber, and straw, wrapped in a biodegradable netting and create an immediate barrier to protect the bank. They help to reduce erosion, stabilize the shoreline, and reduce sediment and pollutant runoff. Bio-logs are applicable for banks with lower flow velocities. Bio-logs can be put in place without drastic modification to bank grading as they are flexible and can bend to existing curvature. Bio-logs are held in place on both sides by wooden stakes. Bio-logs can be used in conjunction with live stakes or other vegetative erosion control methods, as plantings can be installed directly into the logs or behind them. Bio-logs should be inspected periodically after installation, and particularly after high-flow events and ice melts. Lifespans often range from 2 to 5 years. Costs for this treatment include material and installation and can vary greatly depending on sourcing of material and complexity of the design. A typical bio-log treatment is shown in Figure 3.2 [1].

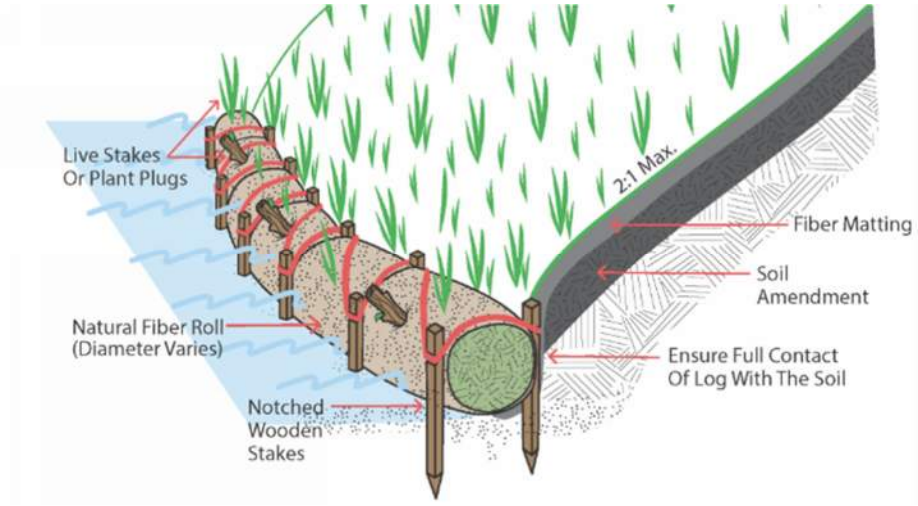

Figure 3.2 Bio-logs Typical Application

3.4 Log Revetments and Rootwads

Rootwads are lower trunks of trees with the root ball attached that are placed along a bank to dissipate wave energy. The rootwad revetment structure provides a barrier between bank soils and the flow. They provide habitat diversity and stabilization. They provide aesthetic value by appearing more natural but can limit access to the water. These typically last 7 to 10 years but require annual monitoring to ensure effectiveness. Construction includes keying a portion of the trunk into the bank and possibly anchoring the trunk into sediment. Costs for this treatment include material and installation. Material for this method may be sourced locally, but adequate sizing of components is necessary. A typical log revetment and rootwad application is shown in Figure 3.3 [1].

Figure 3.3 Log Revetments Typical Application

3.5 Vegetative Buffers

A vegetative buffer is a strip of vegetation made up of native plants which provides erosion prevention, water quality improvement, aesthetic value, and privacy from boaters and neighbors. Generally, vegetative solutions stabilize the bank soils by providing a deep interconnected root system. However, it does not provide access areas to water from properties. Additionally, weed control and maintenance by the park district will be required on a regular basis, and vegetation will need to be fenced off as it grows. Vegetation is often used in conjunction with other erosion control methods as by itself will take years to establish and is best suited for lower flows. Vegetation, especially beginning as seeding, is inexpensive. However, more advanced and effective methods of vegetative erosion control, including those in the sections to follow, can have more significant costs. For cost estimate purposes, the cost for vegetative buffer is provided in terms of seeding cost. Figure 3.4 provides a visual representation of buffer zones [1].

Figure 3.4 Vegetative Buffer Zones

3.6 Live Staking

Live staking involves establishing plant growth by placing live vegetative cuttings of woody species into the ground. The live stakes will root and grow to provide a root system faster than what could be accomplished by seeding. Established live stakes generate root systems strengthen the bank, provide habitat, and promote conditions for continued growth. Live staking is appropriate for areas with minor erosion on slopes less than 3:1. However, they may be used in conjunction with other streambank protection techniques including live fascines and hard armoring to further enhance stabilization. Live stakes should be inspected shortly after installation to verify they are properly seated. They should be inspected again after the first growing season for survival, and invasive species may need to be removed. They also should be monitored after high flow events and icing. After full establishment around 1 to 3 years, they will require limited maintenance. Costs for live stakes depend on the size of the area planted and slope of the bank. A typical cross section of a live staking application is provided in Figure 3.5 [2].

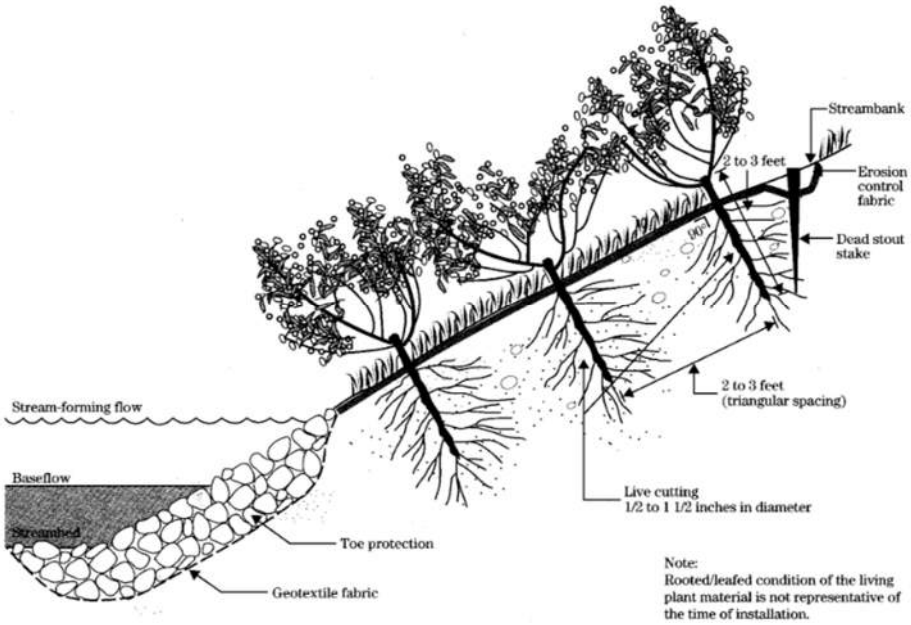

Figure 3.5 Live Stakes Typical Cross Section

3.7 Live Fascines

Fascines, also known as wattles, are bundles of live cuttings held together with rope or twine. They protect against runoff and erosion and are often combined with live staking. They provide immediate protection, which is enhanced as plant growth continues. Live fascines have similar benefits and setbacks to live staking. Fascines should be inspected periodically during their first year. Minimal maintenance is required once growth is established. The majority of the cost is due to cutting and bundling the fascines. Figure 3.6 shows a cross section of a typical live fascine application. This features stone toe protection and live staking similar to Figure 3.5, but with the added protection of live fascine bundles [2].

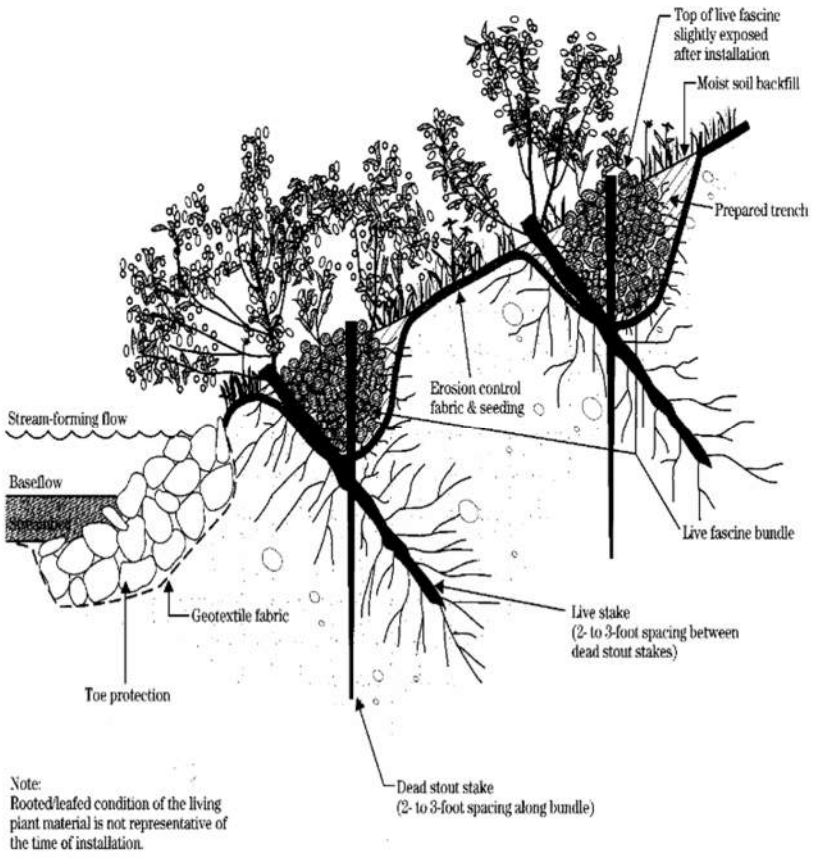

Figure 3.6 Live Fascines Typical Cross Section

3.8 Encapsulated Soil Lift

Encapsulated soil lifts are made up of layers of compacted soil wrapped in a geotextile fabric. Live cuttings are placed between each soil lift, and the top-most lift typically has live stakes installed through it. Encapsulated soil lifts must be installed on a stable bank, so they are often used in conjunction with a toe stabilization method. Encapsulated soil lifts provide immediate bank protection, promote rapid vegetative growth, and enhances toe stability. Encapsulated soil lifts have been successful on banks with 1:1 or steeper slope and can tolerate higher flows. Required maintenance of encapsulated soil lifts are similar to the requirements of live stakes, and need for maintenance will decrease as plant growth increases over time. The cost per linear foot depends on the height and width required, and also includes labor. Typical details for this method are provided in Figure 3.7, which includes a stone toe.

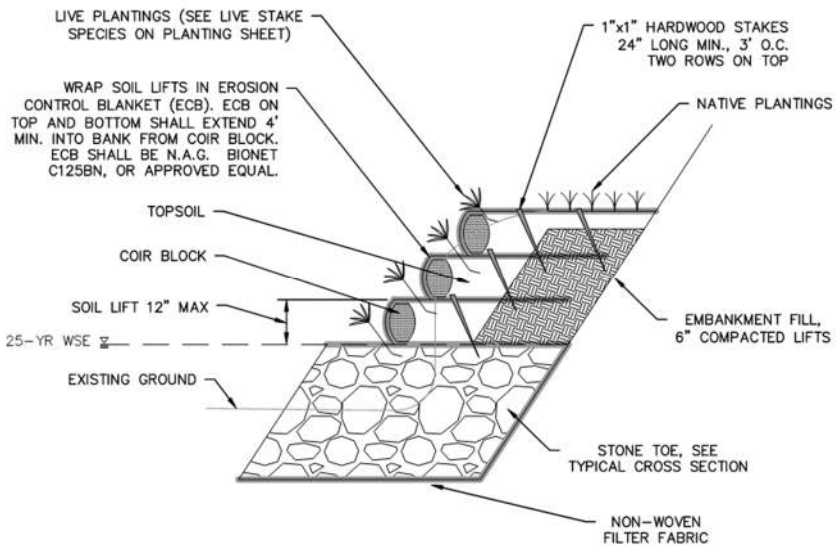

Figure 3.7 Encapsulated Soil Lift Detail

3.9 Brush Mattress

Brush mattresses consist of engineered matting with tightly packed cuttings that are placed directly on exposed bank soils to establish ground cover. They are typically used alongside a toe stabilization method such as riprap. Brush mattresses immediately begin to slow velocities, accumulate sediment, create habitat, and reduce non-point source pollution. A brush mattress can include the erosion control methods of live fascines, live stakes, and cuttings. These are best suited for slopes no steeper than 2.5:1, and their maintenance requirements are similar to that of live stakes. Maintenance after growth establishment is minimal. The majority of costs for brush mattresses are associated with construction of the mattress. A typical brush mattress setup is shown in Figure 3.8 [3].

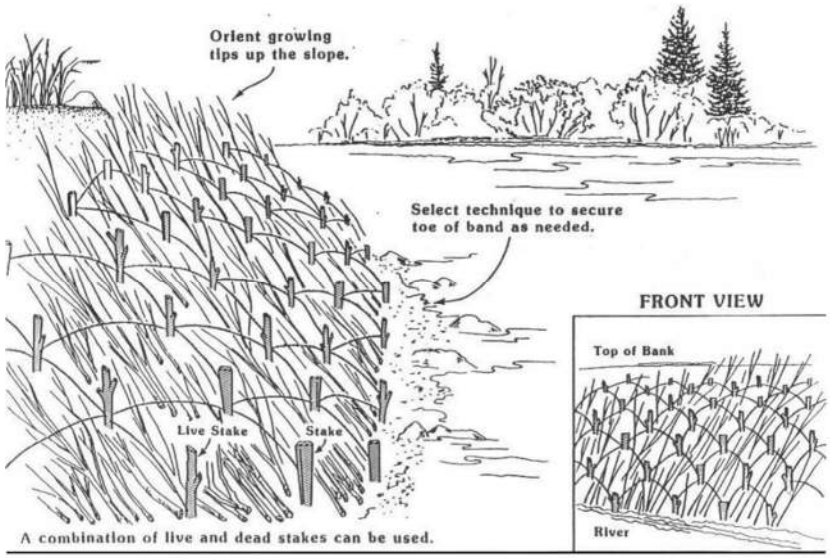

Figure 3.8 Brush Mattress Typical Application

3.10 Limestone Outcropping

Limestone outcropping is an erosion control method that could be implemented in addition to other methods at specific locations along the lake banks to allow residents access. This method combines toe stabilization with flat stone pieces on aggregate wrapped in geotextile fabric, to provide a suitable path for walking. This method provides minor benefits of toe stabilization, but its main purpose is for aesthetics and resident access. A typical detail of this method is shown in Figure 3.9.

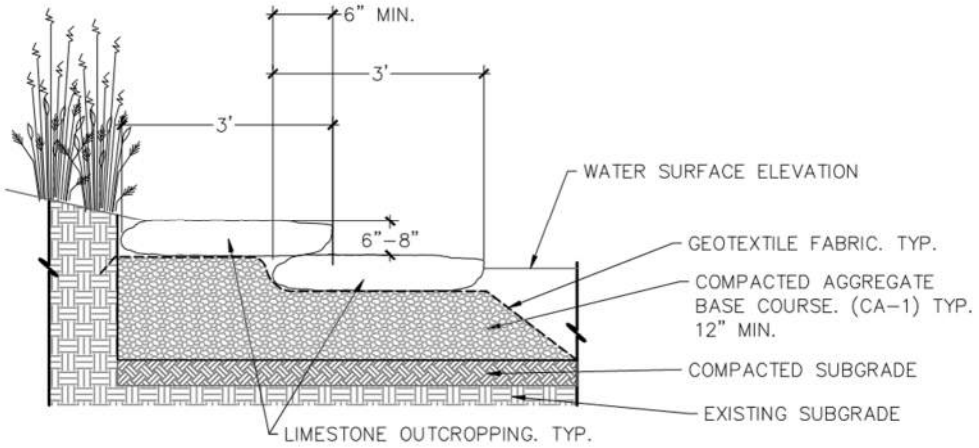

Figure 3.9 Limestone Outcropping

4.0 COSTS AND RECOMMENDATIONS

Construction costs for each section of bank are presented in the Preliminary Cost Estimate in Appendix C. In general, the range of estimated costs for the bank sections evaluated range from $52,000 to $273,000 for area along the North Lake and from $35,000 to $208,000 along the South Lake, depending upon the length and severity of the existing bank erosion. This estimate was made in 2024, and construction costs are based on current pricing. As this plan is ongoing and the work will span multiple budget years, construction costs will need to be adjusted to reflect the most current economic conditions. Note that erosion control treatment methods were divided into two general categories: structural/hard treatments and bio-engineered/soft treatments. The best approach for a specific bank section often combines one or more methods for optimal erosion control based on site-specific factors. The estimate provided includes high level material and labor costs that may vary depending on supplier or contractor, permit fees, etc. Costs presented are based on installation only, and do not necessarily include potential removal costs of existing treatments or on-going maintenance.

Due to the erosion of the Category C bank areas on Evergreen Lakes, these sections may best be treated with a structural/hard armor treatment. This includes a combination of stone toe stabilization and a form of vegetative erosion control (live stakes, live fascines, and/or encapsulated soil lift), such as what was shown in Figure 3.5, Figure 3.6, and Figure 3.7. This provides an armored bank toe that can manage significant erosion long-term. When armored toe is combined with vegetation, erosion is additionally minimized, and aesthetic and environmental benefits are provided.

At Category B sections of the bank, bio-engineered/soft treatment methods such as bio-logs, live staking, and/or seeding with erosion control blankets would be adequate. These methods are applicable for areas with less threat of erosion and require less engineering effort.

Category A sections of the bank appear to be in good condition and do not require additional erosion control methods at this time. However, vegetation in these areas should be regularly maintained to ensure this good standing.

5.0 REFERENCES

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[2] Lake County Stormwater Management Commission, "Streambank and Shoreline Protection," Lake County, IL, 2002.

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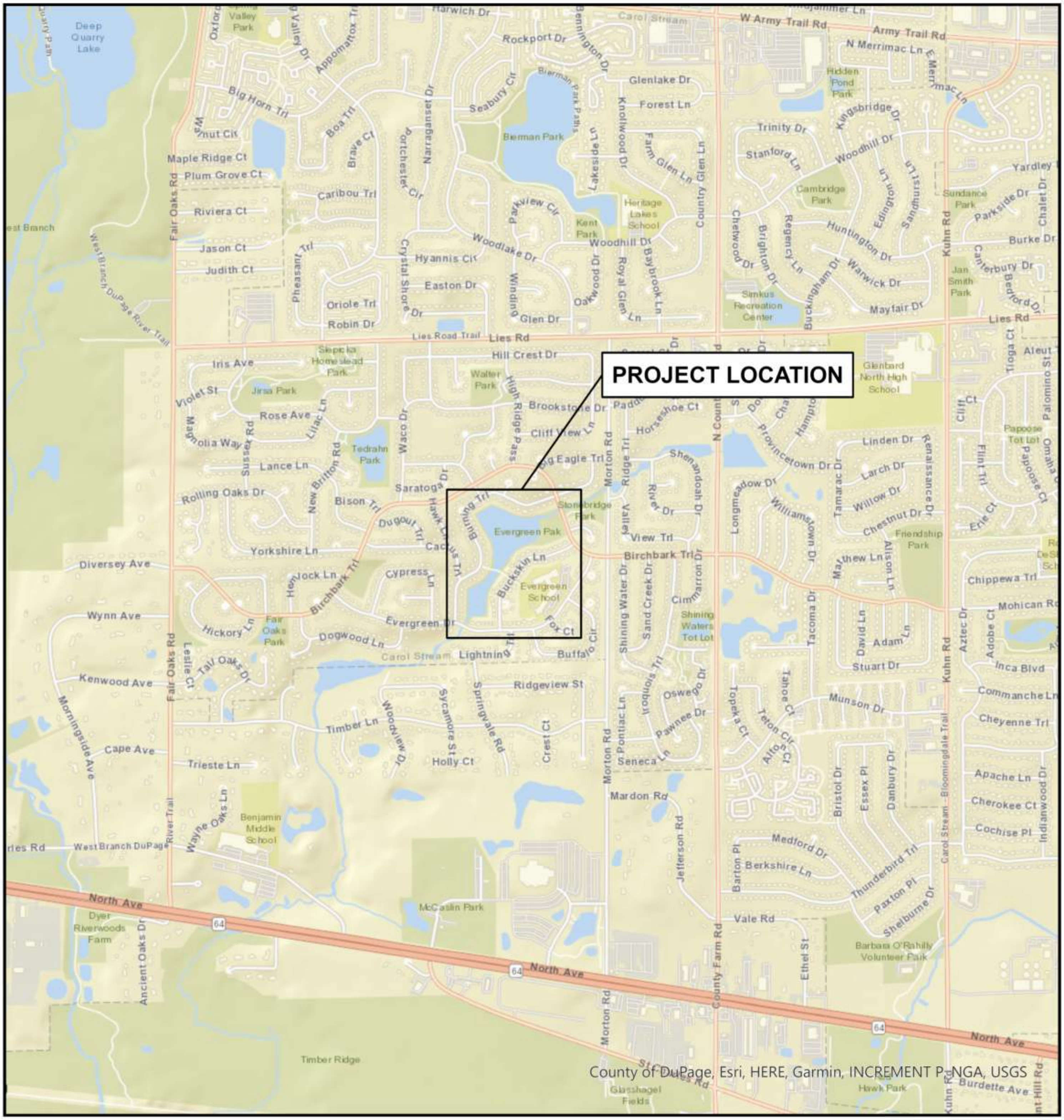
APPENDIX A

LOCATION MAP

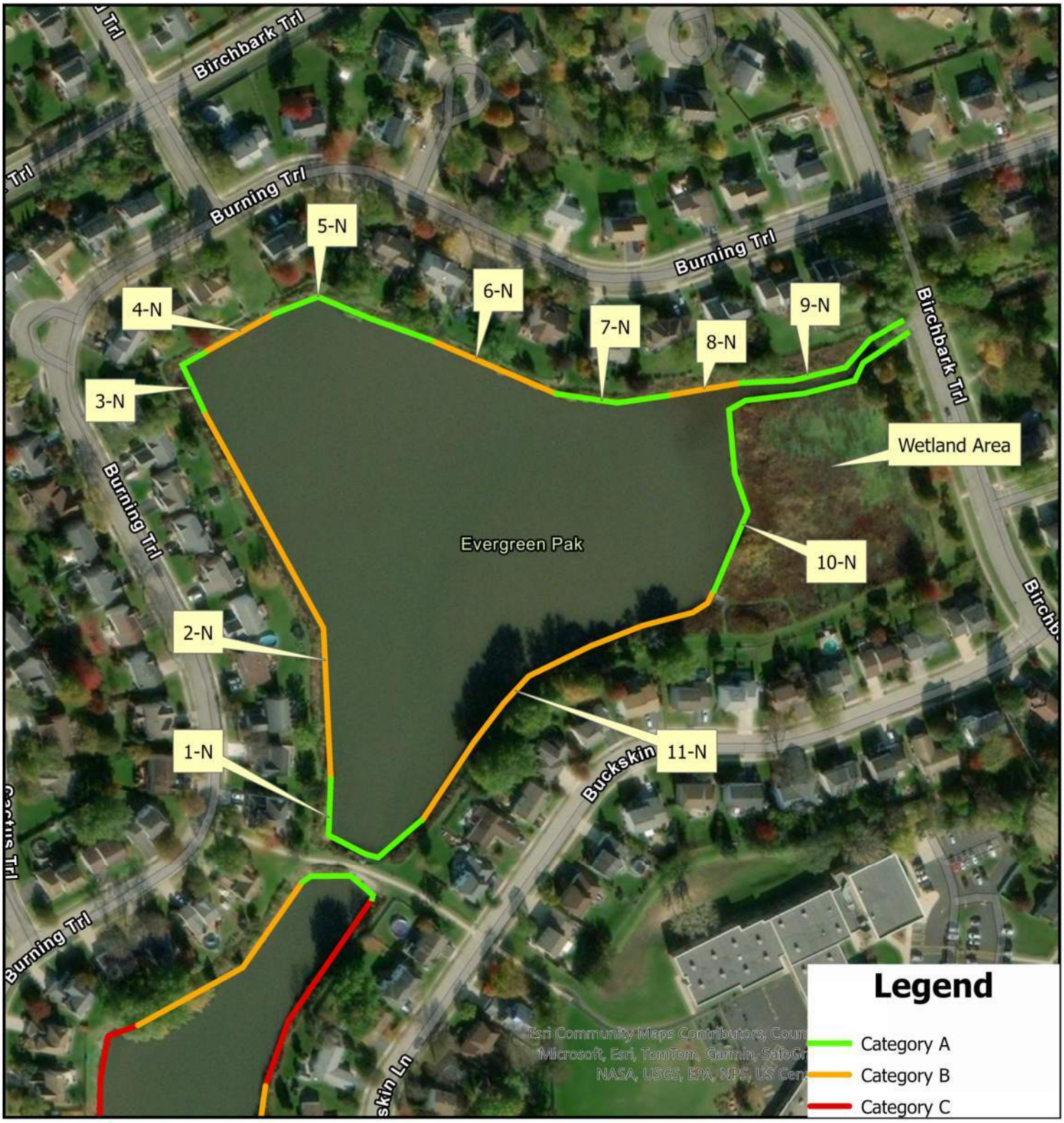


0 500 1,000 2,000 3,000 4,000 US Feet

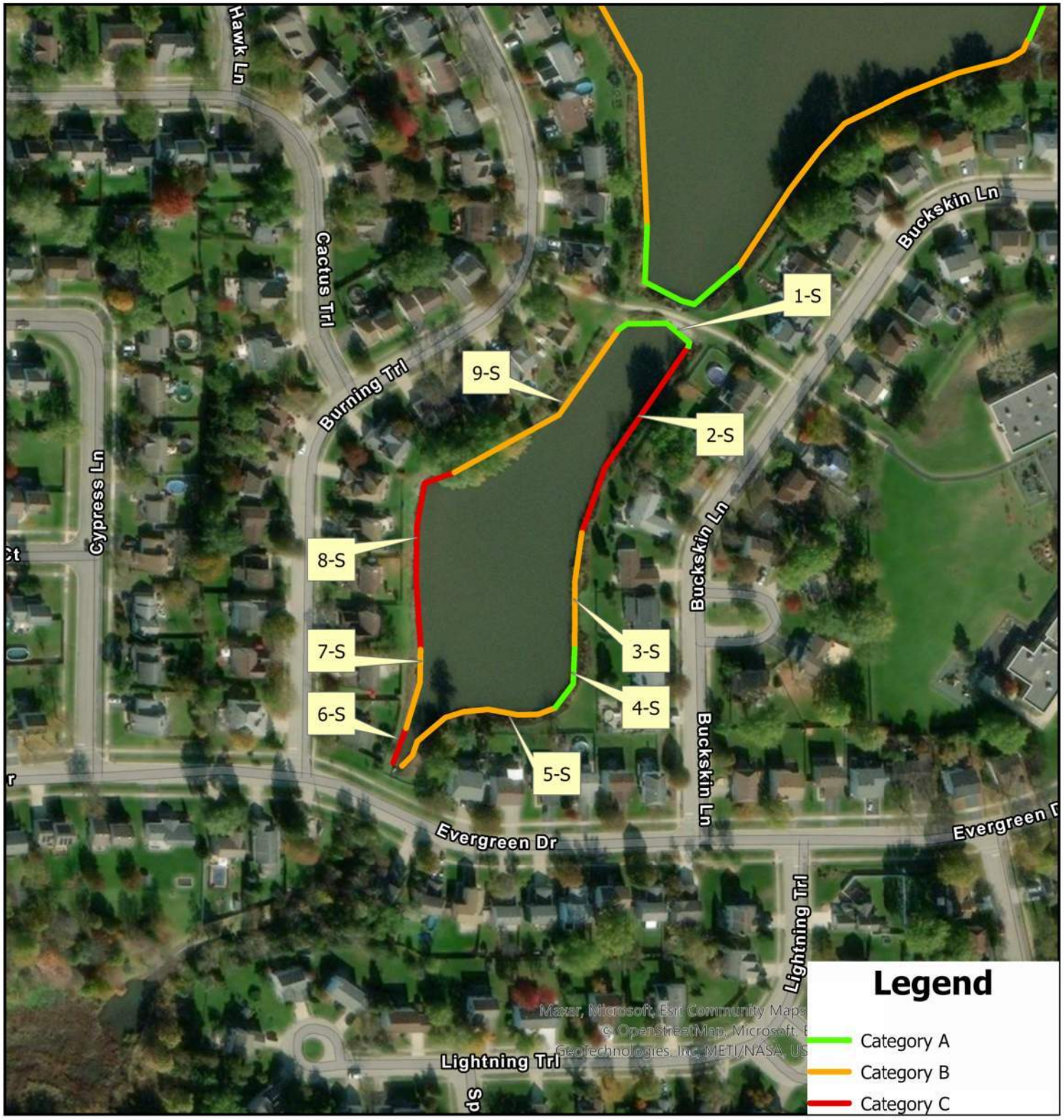
CLIENT	TITLE	DWN.	FMK	CHKD.	SFR
CAROL STREAM PARK DISTRICT 2250 Waukegan Rd, Suite 220 Glenview, IL 60025 (847) 724-8200	**EVERGREEN LAKES BANK ASSESSMENT**	JOB# 24-2055			N
WBK ENGINEERING Part of Bodwé Group **WBK ENGINEERING, LLC** **116 W MAIN STREET, #201** **ST. CHARLES IL, 60174**	**LOCATION MAP**				DATE 08/05/2024 **LOC MAP**

APPENDIX B

NORTH AND SOUTH LAKE EXHIBITS



CLIENT **CAROL STREAM PARK DISTRICT** 2250 Waukegan Rd, Suite 220 Glenview, IL 60025 (847) 724-8200	TITLE **EVERGREEN LAKES BANK ASSESSMENT**	DWN. FMK	CHKD. SFR	
		JOB# 24-2055		N
WBK ENGINEERING Part of Bodwé Group **WBK ENGINEERING, LLC** **116 W MAIN STREET, #201** **ST. CHARLES IL, 60174**	**FIGURE 1 - NORTH LAKE EXISTING EROSION SEVERITY**			DATE 09/24/2024 **1 OF 2**



CLIENT **CAROL STREAM PARK DISTRICT** 2250 Waukegan Rd, Suite 220 Glenview, IL 60025 (847) 724-8200	TITLE **EVERGREEN LAKES BANK ASSESSMENT**	DWN. FMK	CHKD. SFR	
		JOB# 24-2055		N
WBK ENGINEERING Part of Bodwé Group **WBK ENGINEERING, LLC** **116 W MAIN STREET, #201** **ST. CHARLES IL, 60174**	**FIGURE 2 - SOUTH LAKE EXISTING EROSION SEVERITY**			DATE 09/24/2024 **2 OF 2**

APPENDIX C

PRELIMINARY COST ESTIMATE

Erosion Control Summary Table
Evergreen Lakes Bank Assessment
Preliminary Cost Estimate

9/18/2024

WBK ENGINEERING
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Bank Section Number	Erosion Severity Category	Recommended Erosion Control Treatment	Unit of Measure	Approximate Length	Unit Cost	Cost
North Lake						
1-N	A	N/A	LF	226.0	$ -	$ -
2-N	B	BIO-ENGINEERED (SOFT)	LF	546.0	$ 500.00	$ 273,000.00
3-N	A	N/A	LF	101.0	$ -	$ -
4-N	B	BIO-ENGINEERED (SOFT)	LF	108.0	$ 500.00	$ 54,000.00
5-N	A	N/A	LF	230.0	$ -	$ -
6-N	B	BIO-ENGINEERED (SOFT)	LF	186.0	$ 500.00	$ 93,000.00
7-N	A	N/A	LF	152.0	$ -	$ -
8-N	B	BIO-ENGINEERED (SOFT)	LF	104.0	$ 500.00	$ 52,000.00
9-N	A	N/A	LF	245.0	$ -	$ -
10-N	A	N/A	LF	537.0	$ -	$ -
11-N	B	BIO-ENGINEERED (SOFT)	LF	527.0	$ 500.00	$ 263,500.00
					NORTH LAKE TOTAL	**$ 735,500.00**
South Lake						
1-S	A	N/A	LF	113.0	$ -	$ -
2-S	C	STRUCTURAL (HARD)	LF	297.0	$ 700.00	$ 207,900.00
3-S	B	BIO-ENGINEERED (SOFT)	LF	157.0	$ 500.00	$ 78,500.00
4-S	A	N/A	LF	87.0	$ -	$ -
5-S	B	BIO-ENGINEERED (SOFT)	LF	243.0	$ 500.00	$ 121,500.00
6-S	C	STRUCTURAL (HARD)	LF	51.0	$ 700.00	$ 35,700.00
7-S	B	BIO-ENGINEERED (SOFT)	LF	111.0	$ 500.00	$ 55,500.00
8-S	C	STRUCTURAL (HARD)	LF	271.0	$ 700.00	$ 189,700.00
9-S	B	BIO-ENGINEERED (SOFT)	LF	307.0	$ 500.00	$ 153,500.00
					SOUTH LAKE TOTAL	**$ 842,300.00**
					NORTH AND SOUTH LAKE TOTAL	**$ 1,577,800.00**

NOTES:

1. This estimate is prepared by WBK Engineering, LLC dated 09/18/24.
2. This estimate is prepared as a guide only. WBK makes no warranty that actual costs will not vary from the amounts indicated and assumes no liability for such variance.
3. This estimate DOES NOT include: Permit fees, review fees, easement/land right costs, or relocation of conflicting utilities.
4. BIO-ENGINEEED (SOFT) treatments is a general description for treatments including bio-logs, live staking, and seeding with erosion control blankets, or some combination of those or similar treatments. STRUCTURAL (HARD) treatments includes stone toe stabilization with vegetative erosion control (live stakes, live fascines, and/or encapsulated soil lift). Specific treatments for each section of bank and detailed cost estimates would be defined following survey of the area and a detailed design process.