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Lake LeAnn Shoreline Management Plan

Lake LeAnn Property Owners Association
Hillsdale County, MI

December 2, 2020



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Association

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Executive Summary

Lake LeAnn is a man-made residential impoundment located in Hillsdale County, Michigan (Figure 1). It is comprised of two major basins (South and North) totaling approximately 470 acres and is part of the Grand River Watershed. The lake is primarily surrounded by seasonal cottages and permanent residencies on septic systems with minor portions of forest and wetland complexes. In 2019 the Lake LeAnn Property Owners Association (LLPOA) hired Restorative Lake Sciences (RLS) to conduct multiple studies, assess water quality issues and propose management strategies to address water quality issues (Appendix A).

A major outcome of this study was the proposal of a large-scale laminar flow aeration system designed to increase dissolved oxygen, reduce cyanobacteria blooms, and improve water clarity and quality. This proposed system consists of seven shore-based compressor stations, 102 micro-porous ceramic diffusers, and approximately 135,500 feet of self-sinking airline. Plans for the aeration system were submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) and on September 9th, 2020 a permit (#WRP024641 v.1) was issued under part 301(Inland Lakes and Streams) of the provisions of the Natural Resources and Environmental Protection Act (NREPA). This permit approved the plans of the proposed aeration system, but also included additional requirements promoting naturalized shoreline management practices to address water quality issues.

One requirement of the permit was the creation of a Lake LeAnn Shoreline Management Plan that defines how LLPOA will reduce external nutrient loading and holistically manage the lake environment. This plan is intended to support previous efforts and studies, meet permit conditions identified in the EGLE permit, and outline both specific and broad actions that LLPOA plans to take to increase the overall health of Lake LeAnn.

1. Introduction

The Lake LeAnn Property Owners Association (LLPOA) was formed as a Michigan nonprofit corporation and successor to the Lake LeAnn Development company as an organized body responsible for the management of Lake LeAnn. The LLPOA owns the lake, lake bed, and several parcels of land located around Lake LeAnn. Written into the organization's bylaws is the stated duty:



Shoreline of Lake LeAnn at the North Boat Launch

To develop a comprehensive lake and watershed management plan to be implemented for the short-term improvements and long-term improvements and sustainability of the Lake LeAnn ecosystem and its community.

As such, the LLPOA has undertaken numerous efforts to gather and analyze data, engage the local community, and hire consultants to assist with the assessment of Lake LeAnn and its watershed. Most recently, LLPOA hired Restorative Lake Sciences (RLS) to develop the Lake LeAnn Improvement Study and Management Plan (Appendix A). Data gathered in support of this plan indicated that the lake has progressed toward a eutrophic state due to elevated levels of phosphorus, low Secchi disc transparency, and low dissolved oxygen. These conditions have in turn led to increased algal blooms and a degradation of the habitat within the lake, which negatively affects the ecosystem and the landowners who live and recreate in and around the lake.

The report made several recommendations to increase the water quality within Lake LeAnn, most notably the installation of a laminar flow aeration system. While this system will assist with the improvement of water quality within Lake LeAnn, additional measures are needed to address external sources of nutrient loading to the lake. Specifically, phosphorus has been identified as a limiting nutrient in the lake and a likely significant factor that has led to excessive algal growth, turbidity, and low dissolved oxygen levels.

Determining the exact location of nonpoint source pollution such as phosphorus can be difficult and costly. Previous studies, such as those referenced, have indicated that external phosphorus loading to the lake is likely coming from some combination

of the following primary sources, although the exact quantity and proportion of loading from each source is undefined at this time.

- External loading from Critical Source Area 2
- External loading from Critical Source Area 4
- Runoff from properties adjacent to the lake
- Septic systems



Outlet culvert at Critical Source Area 2

Each of these factors are discussed in more detail below. Rather than expend additional resources toward further study and sampling of these factors, LLPOA is prepared to use the results of the previous studies to begin implementation of a program to reduce external loading to the degree that it is able. Therefore, this Shoreline Management Plan is intended to build upon these previous studies to identify short- and long-term actions that can be implemented by LLPOA to help improve the water

quality of the lake. The plan has been developed with an understanding of resources available to LLPOA as well as an understanding of its commitment to the long-term health of the lake ecosystem.

There are three main components to this plan, which address the biotic, abiotic, and anthropogenic influences on the lake that LLPOA believes it can positively impact for the good of the lake:

- 1) Education and Cultural Change
- 2) Lake and Watershed Best Management Practices
- 3) Site-Specific Shoreland Management Recommendations

These components are intended to create change in lake management through demonstration and education to benefit the water quality, ecosystem, and residents of Lake LeAnn.

2. Education and Cultural Change

This plan is intended to establish a series of actions that will act as catalysts to influence changes in land and shoreland management for the benefit of Lake LeAnn. The plan acknowledges that no single project or effort can have a significant benefit to the lake in and of itself. However, when actions, education and outreach are combined, these efforts can create a cultural change that can lead to a long term and sustainable improvement in the overall health of the lake ecosystem and water quality, to the benefit of the natural communities and lake residents alike.

2.1 Education and Collaboration

While the Lake LeAnn Property Owner's Association (LLPOA) owns the lake bed, lake, and several parcels surrounding the lake, the vast majority of the adjacent land and properties within the watershed are privately owned. As such, LLPOA has limited ability to exert direct control over land management around the lake. However, LLPOA understands that its greatest ability to exert a positive influence on the lake is through education and collaboration with its constituency and landowners around the lake and in the watershed. Therefore, a core tenet of this plan lies in the belief that no specific action proposed will stand alone, and each will be used as an example to the lake community of practical changes they can make with their properties to benefit Lake LeAnn.

During the development of lake management strategies, LLPOA has developed relationships with several members of the Michigan Natural Shoreline Partnership (MNSP). It is LLPOAs intent to leverage these relationships to provide practical and actionable educational information to its constituency to encourage shoreland landowners to adopt lake friendly management practices. Specific steps LLPOA will conduct include:

- 1) Hold one public informational session for the residents of Lake LeAnn (may be virtual and/or recorded), conducted by members of MNSP, to teach homeowners the value of natural shorelines and lake friendly shoreline management
- 2) Install shoreline demonstration projects and native plantings (as described in detail below) using volunteers from the lake community to install coir logs and native plants. GEI staff will lead the installation efforts and will teach volunteers about the benefits of natural shorelines and native plants, while also teaching natural shoreline stabilization techniques.
- 3) Demonstration projects will primarily be in public areas, and LLPOA will provide information on the demonstration sites to its constituents, while also

- inviting them to visit the sites so they can observe natural shoreline alternatives
- 4) LLPOA will provide information to its constituents on the MNSP Shoreland Stewards program and encourage landowners to participate in this voluntary program that provides recommendations for lake friendly shoreland management.
 - 5) Identify, connect, and collaborate with landowners throughout the watershed that may be contributing phosphorus to Lake LeAnn, and work with these landowners to establish land management practices that will reduce phosphorus loading to the lake
 - 6) MNSP is a resource that provides training and technical guidance for many of the components discussed in this plan, including recommended native plant lists and strategies for creating natural shorelines along lakeshores. LLPOA should consider providing a link to the MNSP website on its own website, to encourage landowners to learn more about lake friendly management practices. <https://www.mishorelinepartnership.org/>



MNSP Shoreland Stewards Program

2.2 Restrictions on Shoreline Protection

During permit negotiations with EGLE related to the laminar flow aeration system, LLPOA agreed to restrict shoreline protection on the lake to more lake-friendly practices. As a result, LLPOA wrote a letter to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on August 20, 2020 requesting that LLPOA provide approval of any permit application pertaining to shoreline stabilization or management activities on Lake LeAnn (Appendix B). The intent of this letter, which has been accepted by EGLE, requires LLPOA members to use natural shorelines and/or sloped rock riprap, in lieu of seawalls. This letter will allow LLPOA to minimize or eliminate any new seawalls on the lake, while promoting the use of natural shorelines.

3. Best Management Practices

Best management practices, or BMP's, are short-term and long-term actions LLPOA can implement to improve water quality throughout Lake LeAnn. One of the primary issues identified in the Lake LeAnn Improvement study was high external loading of phosphorous (Appendix A). The BMP's discussed in this report relate directly to reducing external nutrient loading in Lake LeAnn.

External nutrient loading is primarily attributed to surface and subsurface water flow from the surrounding landscape. Several variables including soil type, topography, land use, cultivation practices, surface material, septic system management, and weather events affect external nutrient loading, and sources of nutrient loading can occur at multiple scales ranging from localized to landscape levels. As previously discussed LLPOA only owns land around the immediate lakeshore and does not control land throughout the larger watershed. While this is limiting, LLPOA has committed to continuing discussions with surrounding landowners and influencing management through education and collaboration.

The RLS Lake LeAnn Improvement Study and Management Plan provides extensive detail on various BMP's that may be implemented to benefit the water quality of Lake LeAnn. In support of this existing information, more specific recommendations are provided below based on a review of previous lake studies and an assessment of existing conditions at Lake LeAnn. Site-specific designs that incorporate some of these BMP's are included in the attached design set and are described in more detail in Section 4.

3.1 Localized BMP's

BMP's that LLPOA has the most control over include management practices that can be implemented at a localized scale with landowners of the Lake LeAnn community. The LLPOA board interacts with members of the association and has authority to adopt reasonable rules and regulations designed to facilitate the health and enjoyment of Lake LeAnn. Below are actions that can be undertaken by LLPOA and the local community to help improve the water quality in Lake LeAnn.

3.1.1 Protect existing wetlands

A simple yet important action for addressing nutrient loading is protecting the existing wetlands surrounding Lake LeAnn. Several wetland complexes exist around the lake and provide important functions including flood mitigation, pollution mitigation, and shoreline erosion protection. LLPOA is committed to continually monitoring these intact wetlands and ensuring that association members with property adjacent to existing wetlands understand their importance and value. LLPOA will:

- Monitor existing wetlands annually
- Encourage the expansion of existing wetlands where possible



Existing wetlands in Lake LeAnn

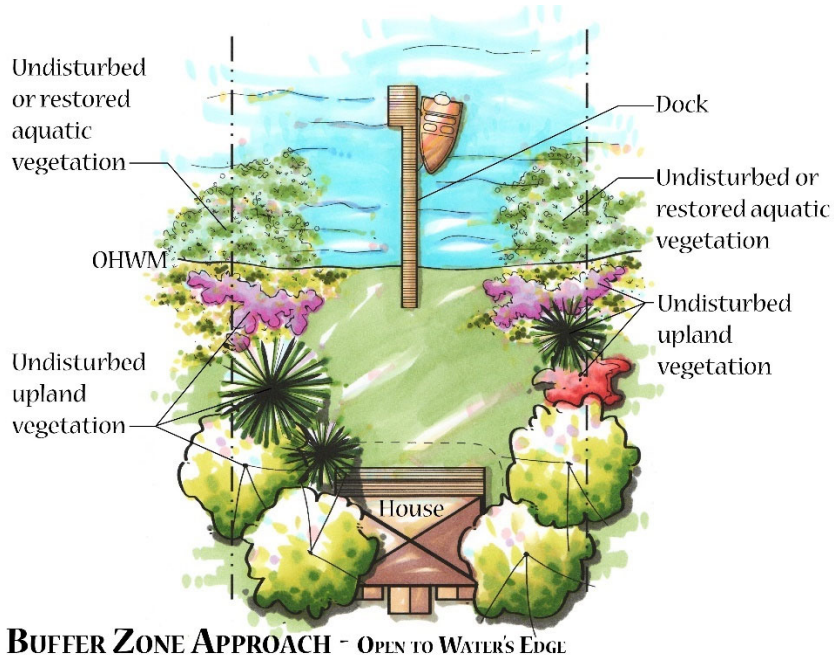
3.1.2 Increase native vegetation at the water's edge



Naturalized Shoreline with native plant buffer

The majority of Lake LeAnn landowners currently mow their laws up to the water's edge. This practice can often result in increased erosion, increased runoff, decreased water filtration, and decreased wildlife habitat. LLPOA will use the proposed NSDA's as a model to encourage association members to increase native vegetation at the water's edge on their own property. LLPOA should:

- Use demonstration sites on LLPOA property to provide examples of native plant buffers
- Provide educational material to residents on the benefits and installation of native plant buffers
- Encourage association members to reduce mowing areas with existing wetland vegetation
- Encourage association members to install native plant buffers at the water's edge



Sample natural shoreline layout. Source: MNSP

3.1.3. Fertilizer

Phosphorus-based fertilizers can cause a direct input of phosphorus into the lake, especially when applied before runoff-inducing storm events. Additionally, studies have shown that most turf grass in Michigan does not benefit from added phosphorus in the form of fertilizer. As a result of these two concerns, numerous public and private entities throughout the state have moved to reduce or eliminate the use of phosphorus-based fertilizers for lawns and golf courses. To help reduce direct loading, LLPOA should:

- Discourage members from applying any fertilizer within a 10 ft buffer from the water's edge
- Discourage members from applying fertilizer in spring
- Keep fertilizers off impervious surfaces

- Work with landowners within the watershed, such as golf courses and farms, to limit fertilizer use to a minimum amount required to maintain productivity

When fertilizers are used, they should practice the “4R’s of nutrient management” (Michigan State University). These are:

1. Right Source—careful consideration should be made in weighing chemical versus manure-based fertilizers, depending on the specific nutrient needs of the soil
2. Right Rate—fertilizer rates should be matched based on actual plant needs
3. Right Time—fertilizer should be applied to coincide with the actual plant demand, typically close to planting time for agricultural areas
4. Right Place—fertilizers should be matched to the actual nutrient demand

3.1.4. Septic System Maintenance

Failed or unmaintained septic systems may directly leach phosphorus into the lake through human waste. Although previous studies have indicated that most septic systems around the lake appear to be maintained, continued vigilance and maintenance is important to ensure septic systems do not become a source of phosphorus loading to the lake. LLPOA should develop a collaborative system to work with its constituents to monitor the maintenance of septic systems for the greater good of the lake.

3.2 Watershed BMP’s

A common and primary source of nitrogen and phosphorous pollution is agricultural run-off and leaching. Farmers often apply nutrients to their crops in the form of chemical fertilizers or manure, however excess nutrients not utilized by crops can wash away and negatively impact the surrounding landscape and waterbodies. This section discusses alternative management techniques farmers can use to protect the health of their soil and reduce nutrient loading to their neighbors. LLPOA is committed to promoting these techniques and collaborating with the farmers in the surrounding watershed.

3.2.1. Buffer Strips

Landowners, including farmers and golf courses, can plant native trees, shrubs, grasses, and forbs around their property to create buffer strips of permanent vegetation between their fields and surrounding land. Buffer strips have the benefit of trapping sediment and increasing filtration of nutrients and pesticides by reducing run-off.

3.2.2. Conservation tillage

Conservation tillage is an agricultural management approach that minimizes the frequency and intensity of ground disturbance to conserve soil and promote a variety of economic and environmental benefits. Typically, fields practicing conservation tillage will either use no-till farming practices, or will only till in the spring immediately prior to planting. Leaving thatch on agricultural fields in this manner has proven to have very little impact on productivity, but a significant positive impact on the retention of topsoil and the reduction of runoff from fields.

4. Shoreline Management and Site-Specific Recommendations

In addition to the previously discussed best management practices, site-specific plans have been developed that can create direct water quality and ecosystem benefits while also demonstrating lake-friendly management practices to the residents of Lake LeAnn (Appendix C).

4.1 Critical Source Areas

Critical Source Areas (CSA's) are drainage areas, or sub-basins, that drain the surrounding land into Lake LeAnn. These CSA's have been prioritized as potential, near-shore sources of nutrient, pollutant, and sediment to Lake LeAnn and represent the primary sources of lakeshore nutrient loading into the lake. CSA's at Lake LeAnn

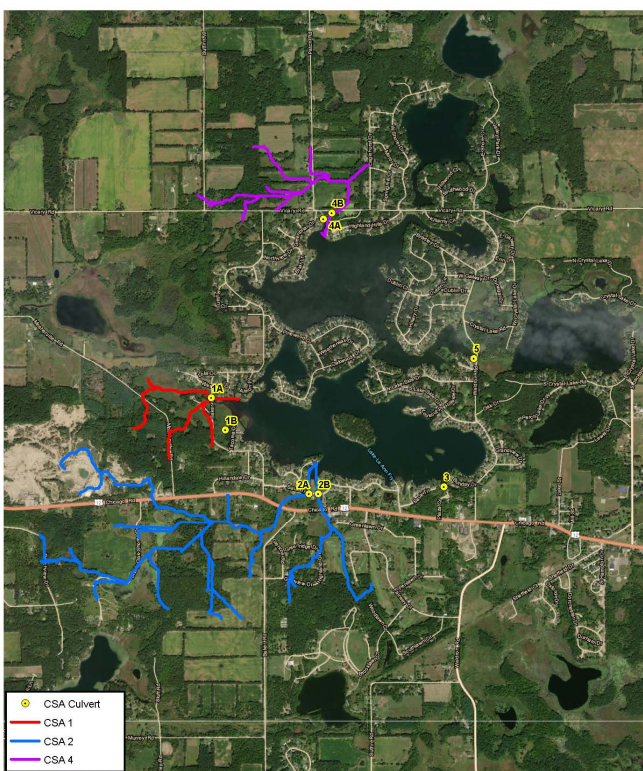


Figure 1. CSAs and CSA culverts at Lake LeAnn

include culverts of varying sizes that allow water flow from various streams, ponds, and agricultural fields under roads, private property, or other similar obstructions. LLPOA have identified five priority CSAs throughout Lake LeAnn (Figure 1).

During 2020, nutrients, suspended solids, and flows were sampled at each CSA to determine the relative impact of each CSA, as well as to help LLPOA better prioritize efforts to reduce nutrient and sediment loading to the lake. This data is reported in the RLS Lake LeAnn Improvement Study and Management Plan included in Appendix A.

CSA data was collected to inform future management decisions however, it is important to note the high variability and potential implications of variability in the

dataset. External loading is a product of water flow and nutrient concentration, however several sites had missing data (CSA 3-5) indicating the absence of visible

discharge (non-existent flow). CSA's with seasonal flow were considered a lower priority for restoration efforts.

Below is a description of each CSA, as well as a description of recommended management actions. It is important to note that, at this time, LLPOA does not own land outside of the immediate lakeshore and does not maintain control of land use in the surrounding watershed, including most of the land included in the CSA's. Additionally, LLPOA has limited resources to implement structural BMPs within the watershed or at the CSA inlets. However, LLPOA is committed to reaching out to landowners in the watershed to influence management through education and collaboration, and to monitor and maintain the CSA inlets to the extent possible to have the greatest possible benefit to the lake.

4.1.1 CSA 1

Site Description

CSA 1, subdivided into CSA 1a to the north and 1b to the south where two separate culverts enter the lake, is located on the east side of Baker Road and originates in a large wetland complex (approximately 31 acres) that drains into a pond prior to entering the culvert system. The areas around both culvert outlets in CSA 1 are well-vegetated with native wetland species, and the wetlands at the outlet of CSA 1a and 1b represent the largest wetland complex in the lake. Data gathered during previous site investigations has indicated that there are comparatively low levels of phosphorus entering the lake through CSA 1 (Figure 2).



Outlet culvert of CSA 1a (left) and area around CSA 1b (right) with tiered vegetation.

Proposed Action

Due to an already established wetland complex and low levels of reported phosphorous (Figures 2 and 3), no further actions at CSA 1 are recommended at this time. However, LLPOA will annually monitor the wetlands at the outlet of CSA

1a and 1b to assess the vegetation and verify that landowners have not impacted the wetlands. LLPOA will also work with adjacent landowners to educate them about the value of the wetlands for sediment and nutrient reduction in Lake LeAnn and will encourage the adjacent landowners to allow the natural expansion of the existing wetlands wherever possible.

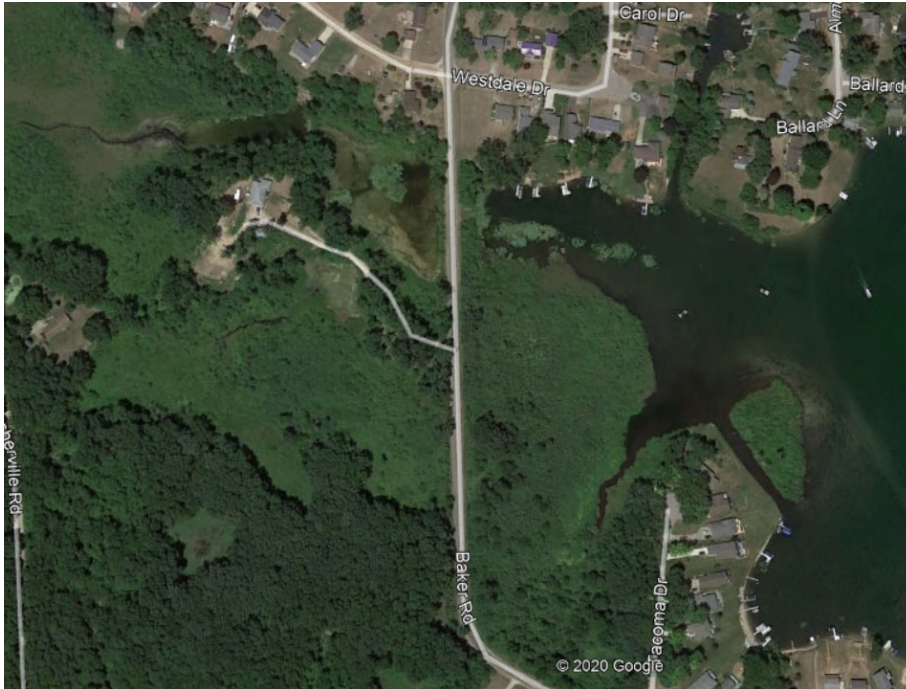


Figure 2. Wetland complexes on the west and east side of CSA1

4.1.2 CSA 2

Site Description

CSA 2 is located on the north side of Sauk Trail and includes two culverts; CSA 2a to the west and CSA 2b to the east. CSA 2a is framed by private property with an artificial beach to the west and mooring sites to the east. The shoreline is armored by cobbles and has cattails (*Typha spp.*) growing near the 16-inch corrugated metal culvert outlet. Sediment at CSA 2a is 100% muck and reaches a depth of approximately 3 ft. at the center of the inlet. CSA 2b is a wooded corridor to the west of CSA 2a with an elevated outlet culvert that empties into a stream. The streambanks immediately downstream of the culvert are experiencing significant erosion, particularly the right bank.

The subwatershed of CSA 2a includes several farms, and CSA2b includes the Lake LeAnn Golf Course. Although localized testing in the subwatershed has not been

completed to more precisely define the sources of phosphorus, golf courses and agriculture have historically been known to be significant contributors of phosphorus in other watersheds.



Outlet culvert of CSA 2a (left) and eroding stream bank of CSA 2b (right).

Proposed Action

Proposed actions for CSA 2b are to stabilize the eroding streambanks with bioengineering by incorporating large woody material along the streambank (Appendix C). Proposed actions for CSA 2a include the installation of an approximately 6,200 s.f. native plant buffer along the east shoreline. This area includes the culvert outlet and extends northward to the mooring sites. Restoration activities include turf removal through the application of an aquatic approved herbicide followed by installation of erosion control blanket (100% biodegradable), and 2,708 native plugs planted at a spacing of 1-1.5 ft. on center (detailed plans provided in Appendix C).

In 2020, LLPOA engaged in discussions with the owner of the Lake LeAnn Golf Course. The owner is a resident of Lake LeAnn and verbally indicated that he is open to working with LLPOA to manage the golf course in a manner that is beneficial to the lake. He is already using minimal fertilizer, and the golf course drains into a wetland prior to entering the drain that leads into the lake. In 2021, LLPOA should continue these discussions and complete a more thorough review of the course layout to determine additional ways that management may be altered to reduce runoff into the lake.

Additionally, LLPOA should invite additional landowners in the watershed, especially farmers, to the public workshop and if necessary, engage in personal discussions to determine the openness of landowners to changing management practices that reduce runoff into the lake.

4.1.3 CSA 3

Site Description

CSA 3 is located on private property at the end of Plaza Ct. connecting a wetland complex into a small inlet of lake LeAnn. The CSA 3 outlet culvert is located on the south side of the inlet which is dominated by forest and well vegetated with native wetland species.

Proposed Action

Due to minimal to nonexistent flow and CSA 3's location on private property, no actions are proposed at this time. 2020 sampling results show that CSA 3 has high levels of phosphorous discharge, however, also show that results were highly variable across all four sampling timeframes. These results along with observations from a site visit in October 2020 indicate that CSA 3 has seasonal flow and only acts as a source of phosphorous during heavy rain events. CSA 3 had a flow rate in 2019 that ranged from 0.1 - 0.2 cfs, and drains a wetland complex that may contribute nutrients because wetlands can act as a nutrient source when fully saturated. The CSA 3 outlet is already well vegetated so implementing natural shoreline restoration techniques (native planting, bioengineering, etc.) would not help external loading. However, LLPOA commits to continued discussions concerning lake health with the landowner, and monitoring CSA 3 to ensure that the existing vegetation is not degraded.

4.1.4 CSA 4

Site Description

CSA 4 enters Lake LeAnn on the south side of Vicary Road with access off Greenbriar Drive. CSA 4 has two culverts; CSA 4a to the southwest and CSA 4b to the northeast. The outlet for CSA 4a is located on private property and heavily armored by riprap and cobblestone, for these reasons no actions are proposed at CSA 4a. On the north side of Vicary Road, CSA 4b travels along the east and south sides of a 10-acre cornfield before entering a 24-inch culvert under Vicary Road. Discharge from the culvert outlets through a wooded corridor into a wetland before reaching Lake LeAnn.



Outlet culvert of CSA 4a (left) and CSA 4b (right)

Proposed Actions

LLPOA has coordinated with the landowners that own the areas immediately downstream of the CSA 4b culvert. These landowners have agreed to supplemental native plantings at the outlet, to help minimize erosion, filter nutrients and sediment, and provide habitat. Detailed plans for these plantings are provided in Appendix C.

Water sampling near the outlet of CSA 4b has indicated it may be a significant contributor of phosphorus to Lake LeAnn (Figure 4). While more refined sampling within this sub-basin has not been completed to more narrowly define and rank the nutrient sources, the majority of the subwatershed is currently in agriculture and farmed by one landowner. Additionally, there are approximately 70 acres of soil in this sub-watershed/farm that are classified as ‘highly erodible’ by the Natural Resources Conservation Service (NRCS) (Appendix D). Understanding the importance of this subwatershed to the water quality of Lake LeAnn, the LLPOA has reached out to the farmer to engage in preliminary discussions.

These preliminary discussions with the farmer have been favorable and provide LLPOA optimism that nutrient loading in CSA4 can be reduced through altered land management practices. The farmer has verbally indicated that she is amenable to working with LLPOA. To help demonstrate her already existing commitment to water quality, she has already coordinated with the NRCS to develop better land management practices for the agriculture and forests on her land. This includes an NRCS-developed Forest Management Plan, which includes specific recommendations to benefit water quality, as well as development of an NRCS Conservation Plan for the farm (Appendix D). Although LLPOA does not assert control over the adjacent land and cannot require a change in land practices, they will continue to work with this farmer to discuss and potentially implement practices that may further benefit Lake LeAnn, including buffer strips, conservation tillage, and prescriptive fertilization that may reduce the total nutrient load that enters the lake.

4.1.5 CSA 5

Site Description

CSA 5 connects Crystal Lake to the east with Lake LeAnn to the west via a culvert under Waldron Road. Thus, CSA 5 has considerably less overland drainage area compared to CSAs 1 through 4. This culvert is controlled by the county and had no flow at the time of survey.

Proposed Action

Due to limited area and private property on the west side of the culvert and a large wetland complex on the east side of the culvert in Crystal Lake, no actions are proposed for CSA 5.

4.2 Natural Shoreline Demonstration Areas

A Natural Shoreline Demonstration Area (NSDA) is an area that can benefit from shoreline stability, reduce external nutrient loading, reduce erosion, and serve as a model for broader natural shoreline restoration throughout the Lake LeAnn community. LLPOA have identified three potential NSDA sites as ideal candidates for restoration (detailed plans provided in Appendix C).

4.2.1 NSDA 1 - South Boat Launch

Site Description

This proposed NSDA is located on Look Out Point just west of the intersection of South Lake Side Dr. and Hillside drive. This area serves as a boat launch for the community and consists of a parking lot, several moorings, temporary docking structures, park benches, and open mowed turf. The north side of Look Out Point is a soft shoreline with turf mowed to the water's edge and sparse amounts of submerged aquatic vegetation. The south side is a hard shoreline consisting of rip rap, temporary docking structures, and a steel sea wall.



South boat launch looking west towards mooring posts (left) and east towards private property (right)

Proposed Action

Due to high public utilization and visibility, the south boat launch would be an ideal location for an NSDA. GEI proposes installing a 675 s.f. native plant buffer at Look Out Point between the parking lot, boat moorings, and the private property at the northeast corner (see Appendix C, DWG. NO. 3). Restoration activities include turf removal through the application of an aquatic approved herbicide followed by installation of 684 native plugs planted at a spacing of 1 ft. on center.

4.2.2 NSDA 2 - North Boat Launch

Site Description

This proposed NSDA is located at the end of Dublin Court just west of the intersection of Bradley Dr. and Dublin Circle. There is a small inlet at the end of Dublin court that serves as a boat launch for the community and consists of a parking lot, mowed turf, park benches, and temporary docking structures. The eastern shore of the inlet is predominately riprap and is used as docking locations for lake residents. The western shore of the inlet is a soft shoreline with mowed turf to the water's edge under a canopy of mature oak (*Quercus spp.*). This area is primarily used as a public park.



Western shoreline of the North Boat Launch inlet (left) and eroding bank (right)

Proposed Action

The north boat launch is a highly utilized public space and would be an ideal location for an NSDA. The western shore of the inlet is a soft shoreline and is already in a naturalized setting providing ideal conditions for ecological restoration. GEI proposes installing a 100 x 10 ft. native plant buffer beginning west of the boat launch and continuing north towards the tip of the peninsula where riprap begins (see Appendix C, DWG. NO. 4). Restoration activities include turf removal through the application of an aquatic approved herbicide followed by installation of 12 in. coir log at the shoreline and 1,000 native plugs planted at a spacing of 1 ft. on center. Upon completion of planting GEI will install a temporary wildlife barrier using hardwood stakes, biodegradable rope, and mylar flagging to reduce plant herbivory.

4.2.3 NSDA 3 - Cedar Court

Site Description

This proposed NSDA is located at the end of Cedar Court south of the intersection of Northview Dr. and Baker Rd. This plot of land is used as a park and includes mowed turf, picnic tables, a swing set, and a public beach with a roped off swimming area. The shoreline on this property is soft consisting of sand and mowed turf to the water's edge, however it is sandwiched between two private properties with steel sea walls.



Cedar Court looking north (left) and south (right)

Proposed Action

Cedar Court is a highly utilized public space and would be an ideal location for an NSDA. Additionally, restoring this area would demonstrate that it is possible to make naturalized shoreline improvements even if a property is sandwiched between two existing seawalls. GEI proposes installing a total of 50' of native buffer at this site, placed around the existing beach and the manifold for the laminar flow aeration system (see Appendix C, DWG. NO. 5). Additionally, a break will be created in the buffer to allow for boat mooring. Restoration activities include turf removal through the application of an aquatic approved herbicide followed by installation of 12 in. coir log at the shoreline and planting of 418 native plugs installed at a spacing of 1 ft. on center. Upon completion of planting GEI will install a temporary wildlife barrier using hardwood stakes, biodegradable rope, and mylar flagging to reduce plant herbivory.

4.3 CSA and NSDA Monitoring Plan

All CSAs and NSDAs will be monitored annually through the permit period (2020-2025). Monitoring will evaluate the success of restoration efforts and include data on site conditions, native vegetation establishment including a plant list and percent ground cover, invasive species establishment, identification of any areas that require corrective action, and geo referenced site photographs showing change over time. Monitoring reports will cover the period of January 1 through December 31 and will be submitted to EGLE prior to January 31 of the following year. The Michigan Natural Shoreline Partnership has developed a checklist for monitoring shoreline buffers that can be used for monitoring the natural shorelines. This checklist can be found in Appendix E.

5. Schedule of Activities

Year	Month (s)	Location	Activity
2021	June	Virtual/Conference Room	Hold public informational workshop on the benefits of lake friendly management practices
2021	May - August	CSA 2a/2b	Treat existing vegetation with herbicide, Install erosion control blanket, and plant 2,708 native plugs. Install log structure at CSA 2b. Continue conversation with golf course, begin discussions with farmers to encourage conservation practices
2021	May - August	CSA 4a/4b	Plant 300 native shrubs. Continue ongoing conversations with farmer
2021	May - August	NSDA 1 - South Boat Launch	Treat existing vegetation with herbicide and install 684 native plugs.
2021	May - August	NSDA 2 - North Boat Launch	Treat existing vegetation with herbicide, Install 100' of coir logs, and plant 1,000 native plugs.
2021	May - August	NSDA 3 - Cedar Court	Treat existing vegetation with herbicide, Install 50' of coir logs, and plant 418 native plugs.
2022	July - August	All CSAs and NSDAs	Monitoring and reporting
2023	July - August	All CSAs and NSDAs	Monitoring and reporting
2024	July - August	All CSAs and NSDAs	Monitoring and reporting
2025	July - August	All CSAs and NSDAs	Monitoring and reporting

Appendix A: Lake LeAnn Improvement Study and Management Plan

Appendix B: Letter to EGLE from LLPOA Regarding the Use of Natural Shorelines



Lake LeAnn Property Owners Association

P.O. Box 308 • Somerset Center • MI 49282 ~ Phone: 517-688-9704 • Fax: 517-688-4245

August 20, 2020

To Whom It May Concern,

The Lake LeAnn Property Owner's Association (LLPOA) is the owner of the lake bed and the lake known as Lake LeAnn, by virtue of the 1971 Quit Claim Deed between American Central Corporation and the Lake LeAnn Property Owners Association (recorded with the Hillsdale County Register of Deeds Records beginning at Liber 437 Page 67). As the successor to the Lake LeAnn Development Company regarding such properties, the American Central Corporation had full authority and power to execute and deliver such quit claim deed to the Lake LeAnn Property Owners Association. The ownership was also reinforced with the affidavit of Kenneth J. Foote (recorded with the Hillsdale County Register of Deeds Records beginning at Liber 1715 Page 0336) which stated that the current successor to the Lake LeAnn Development Company, the Lake LeAnn Maintenance Company and American Central as to Lake LeAnn, the deed restrictions/restrictive covenants for the Lake LeAnn development and plats, the Building Control Committee and similar matters is the current Lake LeAnn Property Owners Association, a Michigan nonprofit corporation.

As owners of the bottomlands of Lake LeAnn, the LLPOA requests that any application to EGLE pertaining to bank stabilization activities on Lake LeAnn receive prior approval from the LLPOA. It is the intent of LLPOA that members utilize natural shorelines. Natural shorelines are buffers that may include erosion-control fabrics, native vegetation and rocks.

Mike Leonard, President
LLPOA

Appendix C: Lake LeAnn Shoreline Management Plan Design Figures

LAKE LEANN SHORELINE MANAGEMENT PLAN

SHORELINE MANAGEMENT PLAN

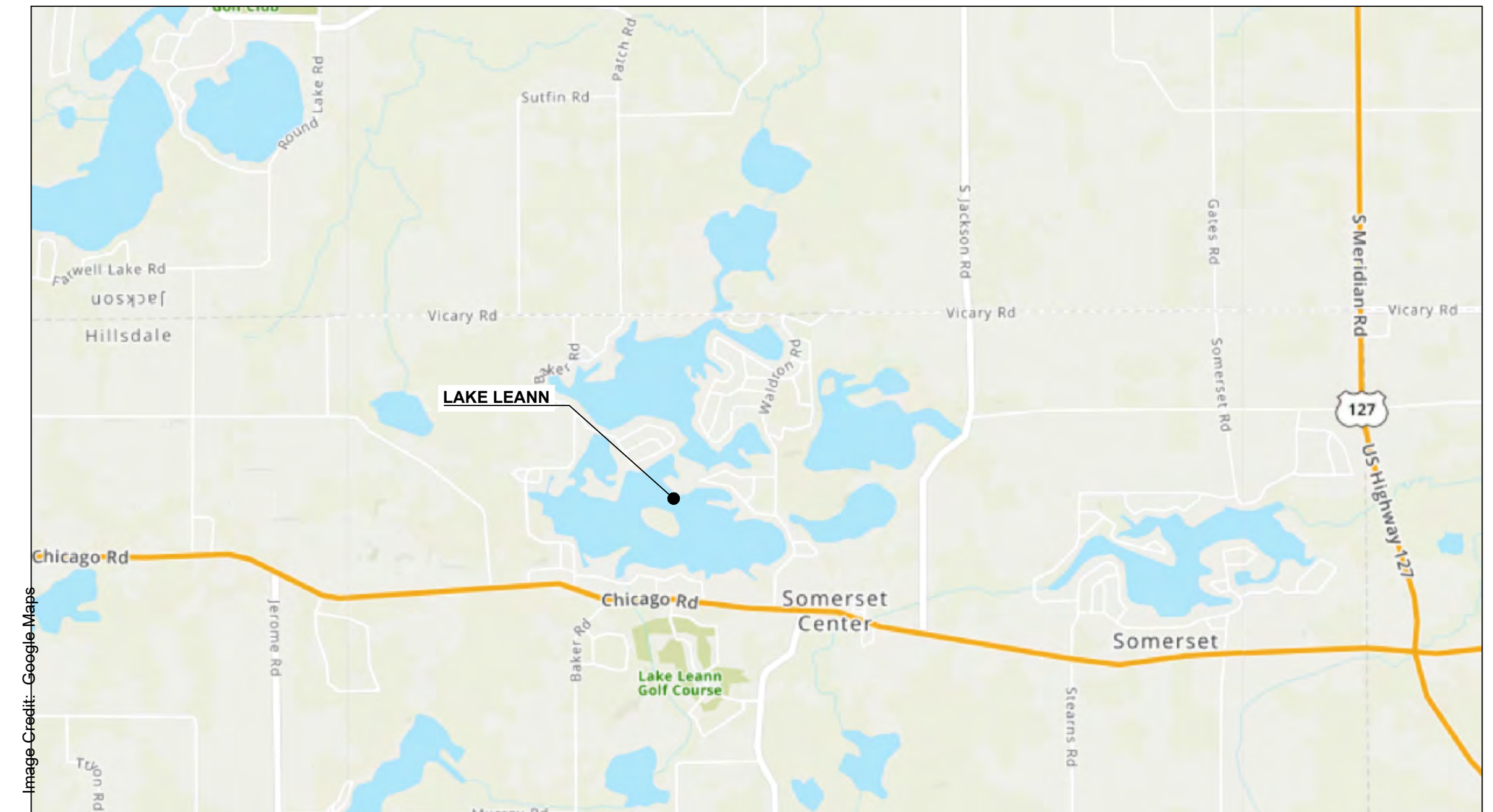
December 2, 2020

PREPARED FOR:

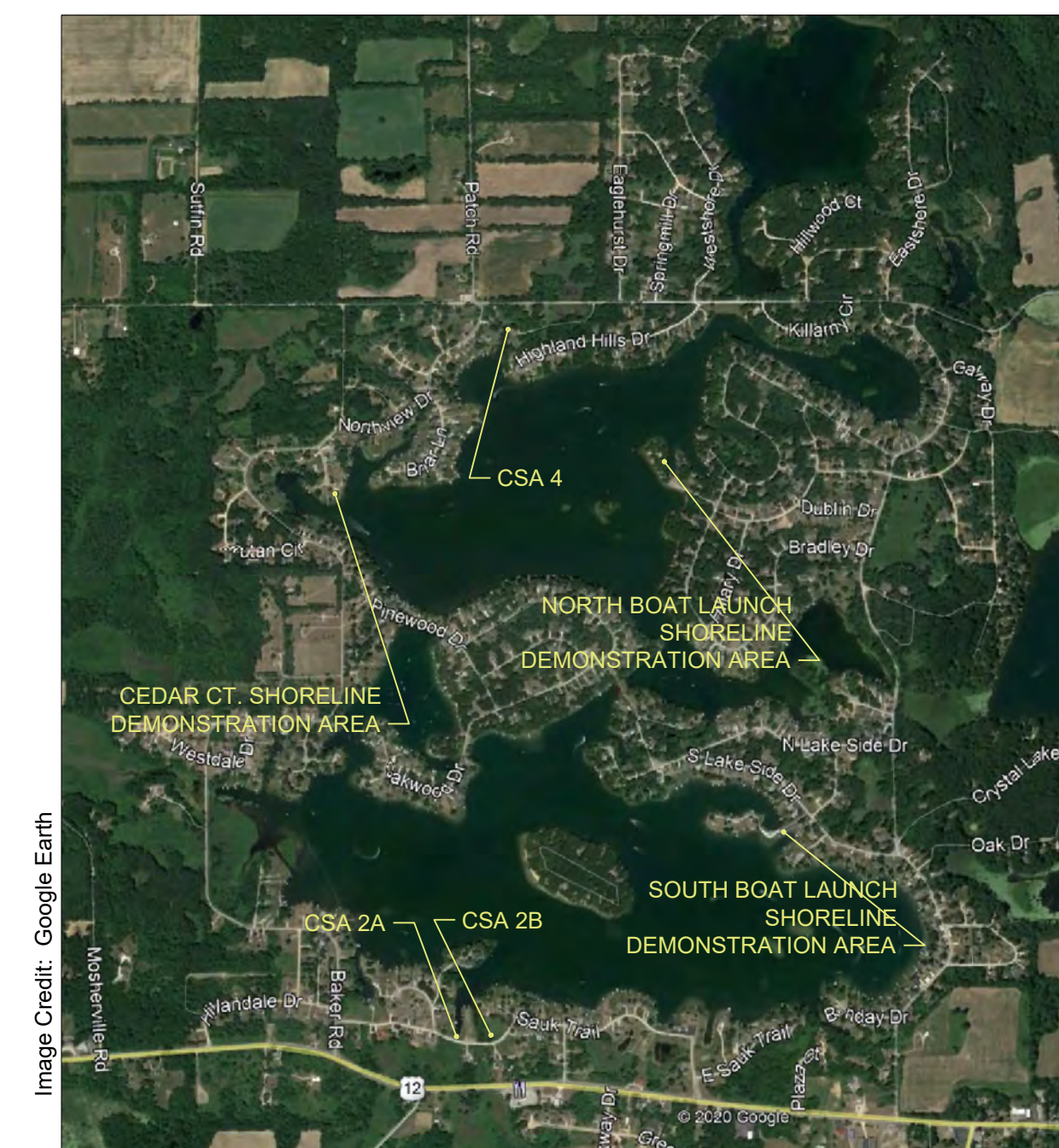
LAKE LEANN PROPERTY OWNER'S
ASSOCIATION
11701 E. CHICAGO ROAD
JEROME, MI 49249

PREPARED BY:

GEI CONSULTANTS OF MICHIGAN, P.C.
5225 EDGEWATER DRIVE
ALLENDALE, MI 49401
616-384-2710



LOCATION MAP
NOT TO SCALE



PROJECT AREA
NOT TO SCALE



MICHIGAN STATE MAP

NOT TO SCALE



Attention:				
0 1"				
If this scale bar does not measure 1" then drawing is not original scale.				
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Drawn:	- BM
Submitted By:	- BM
P.E. Number:	- 44371
Submittal Date:	-



LLPOA

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Jerome, Michigan 49249

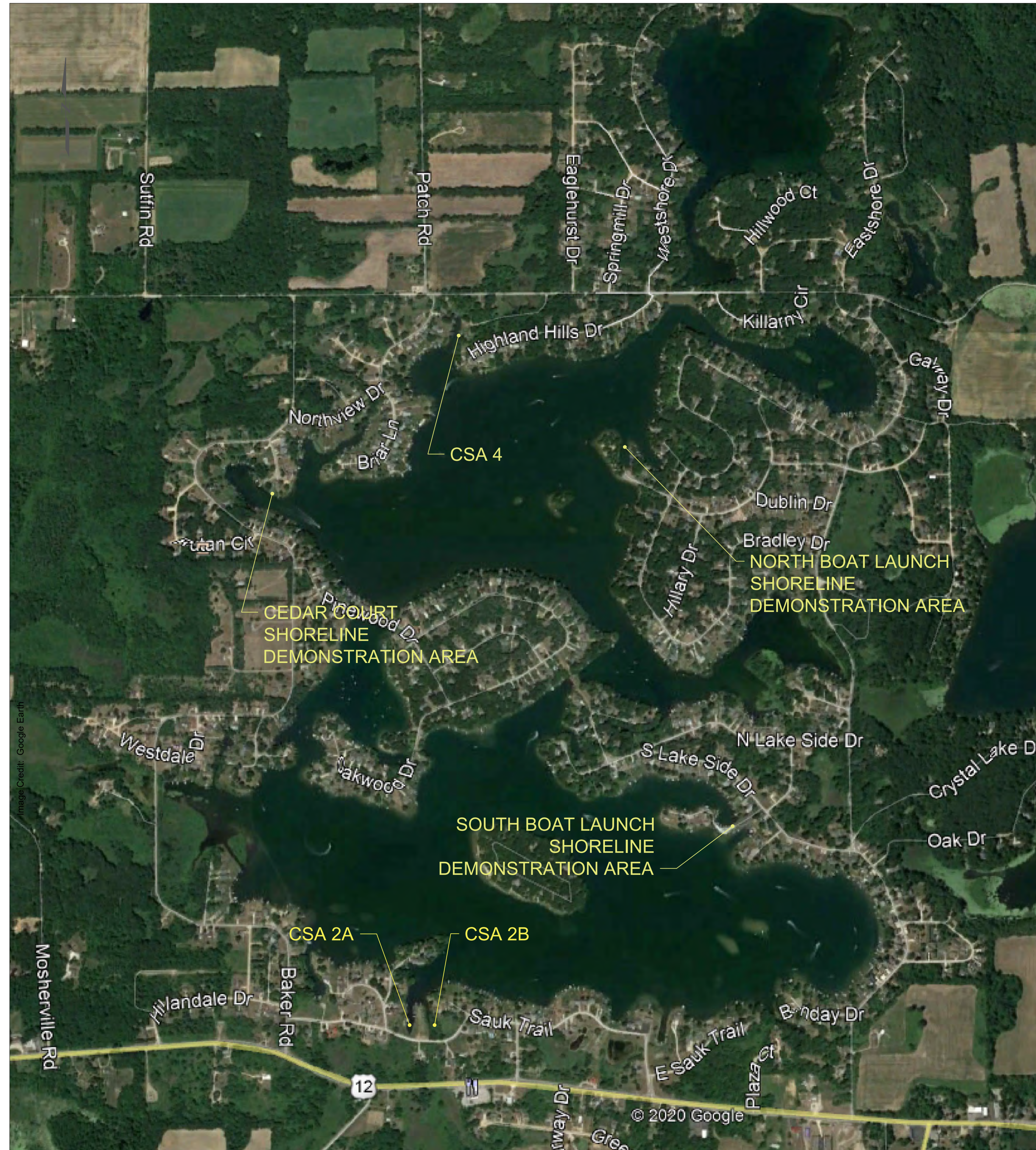
Lake LeAnn
Shoreline Management Plan

COVER SHEET

DWG. NO.

1

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LLPOA

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Jerome, Michigan 49249

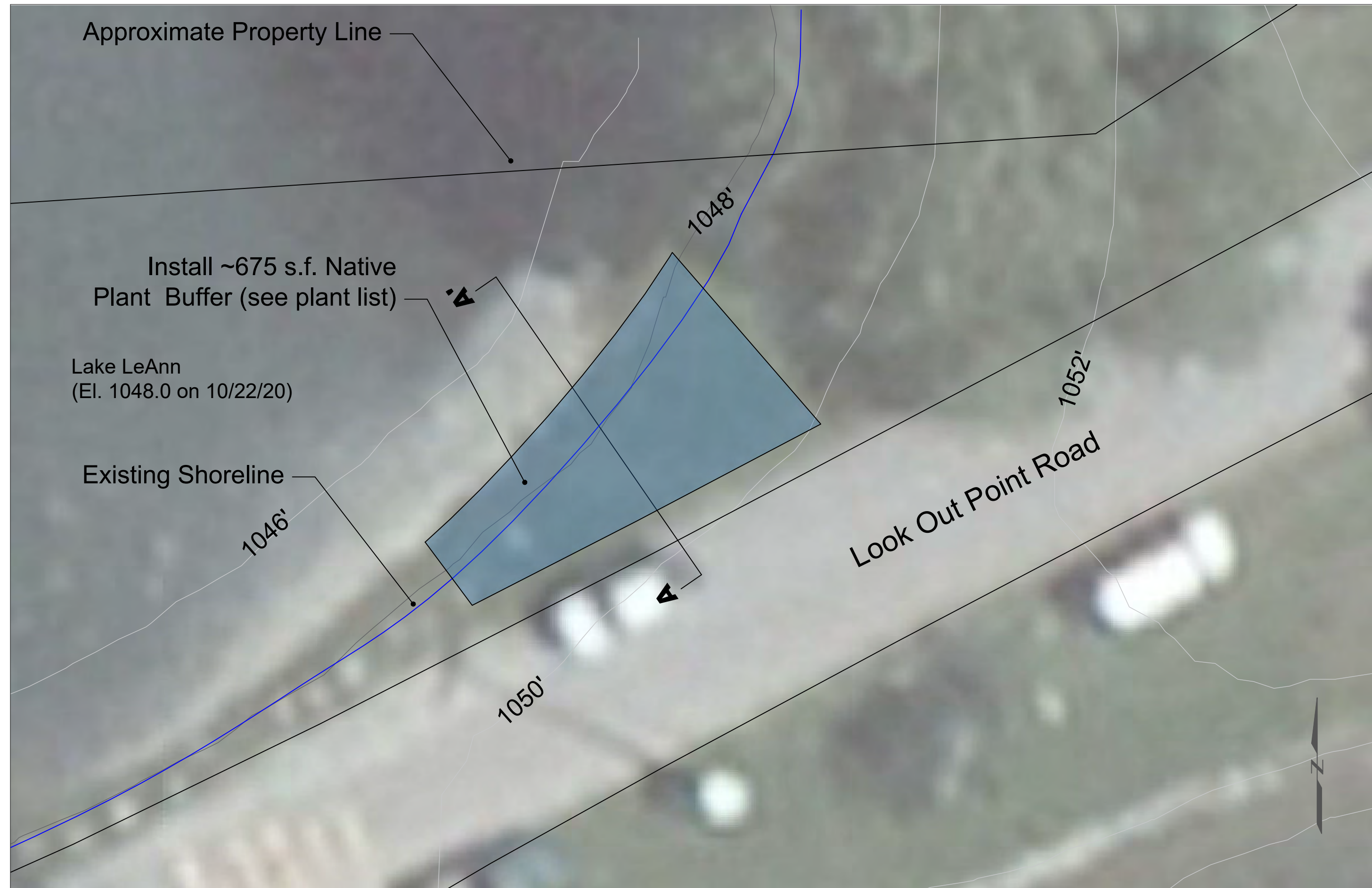
Lake LeAnn
Shoreline Management Plan

PROPOSED PROJECT
LOCATIONS

DWG. NO.

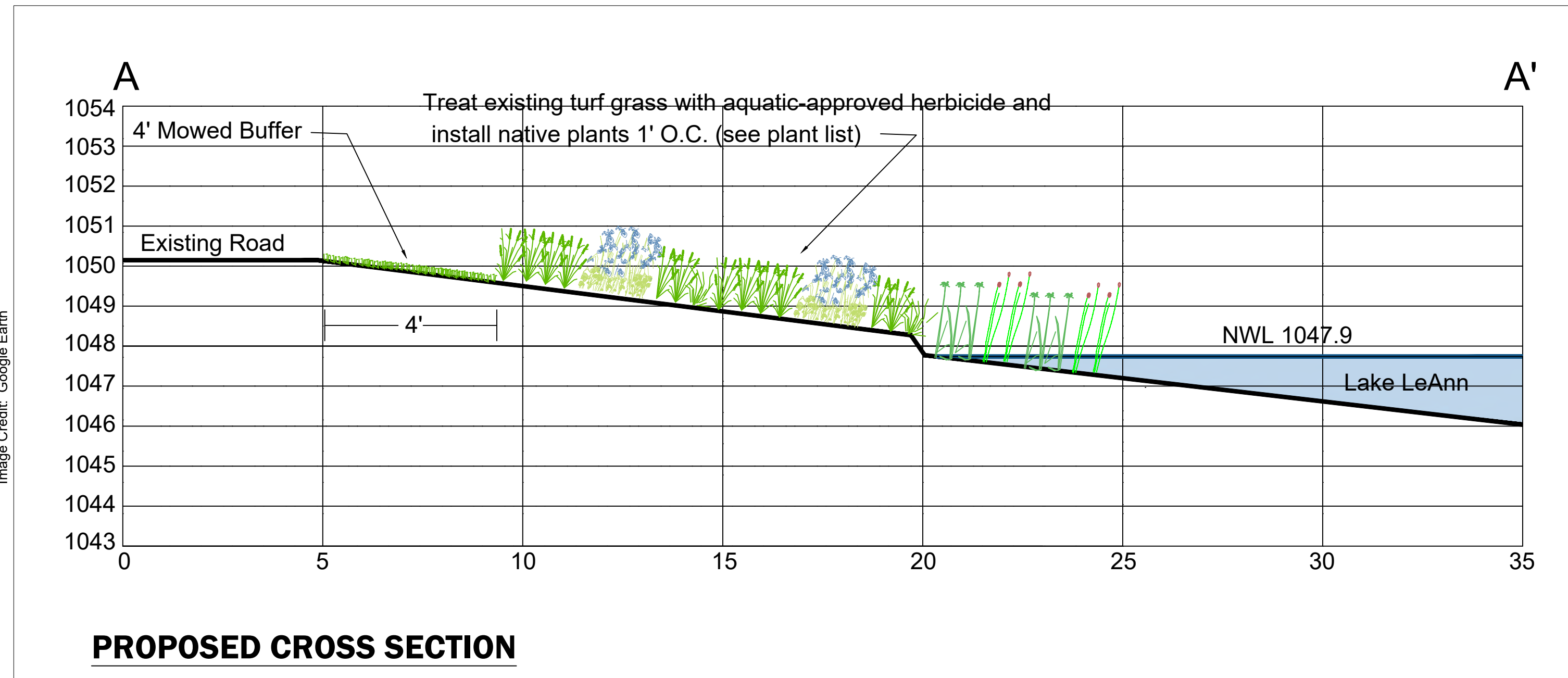
2

ISSUE



PLAN VIEW

1"=10'



PROPOSED CROSS SECTION



REPRESENTATIVE SITE PHOTO

Latin Name	Common Name	QTY
FORBS		
<i>Asclepias incarnata</i>	Swamp milkweed	76
<i>Asclepias tuberosa</i>	Butterfly weed	38
<i>Echinacea pallida</i>	Pale purple coneflower	38
<i>Iris virginica shrevei</i>	Blue flag iris	76
<i>Liatris spicata</i>	Marsh blazing star	38
<i>Lobelia cardinalis</i>	Cardinal flower	38
<i>Monarda fistulosa</i>	Wild bergamot	38
<i>Pontedaria cordata</i>	Pickernel weed	38
<i>Symphotrichum novae-angliae</i>	New England aster	38
GRASSES/SEDGES/RUSHES		
<i>Carex muskingumensis</i>	Palm sedge	38
<i>Carex vulpinoidea</i>	Brown fox sedge	38
<i>Juncus effusus</i>	Soft rush	38
<i>Schizachyrium scoparium</i>	Little bluestem	76
<i>Schoenoplectus americanus</i>	Threesquare bulrush	38
<i>Schoenoplectus validus</i>	Soft stem bulrush	38
	Total	684

PROPOSED PLANT LIST

Image Credit: Google Earth



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GEI Consultants
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 Allendale, MI 49401

LLPOA

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 Jerome, Michigan 49249

Lake LeAnn
 Shoreline Management Plan

SOUTH BOAT LAUNCH
 SHORELINE DEMONSTRATION SITE

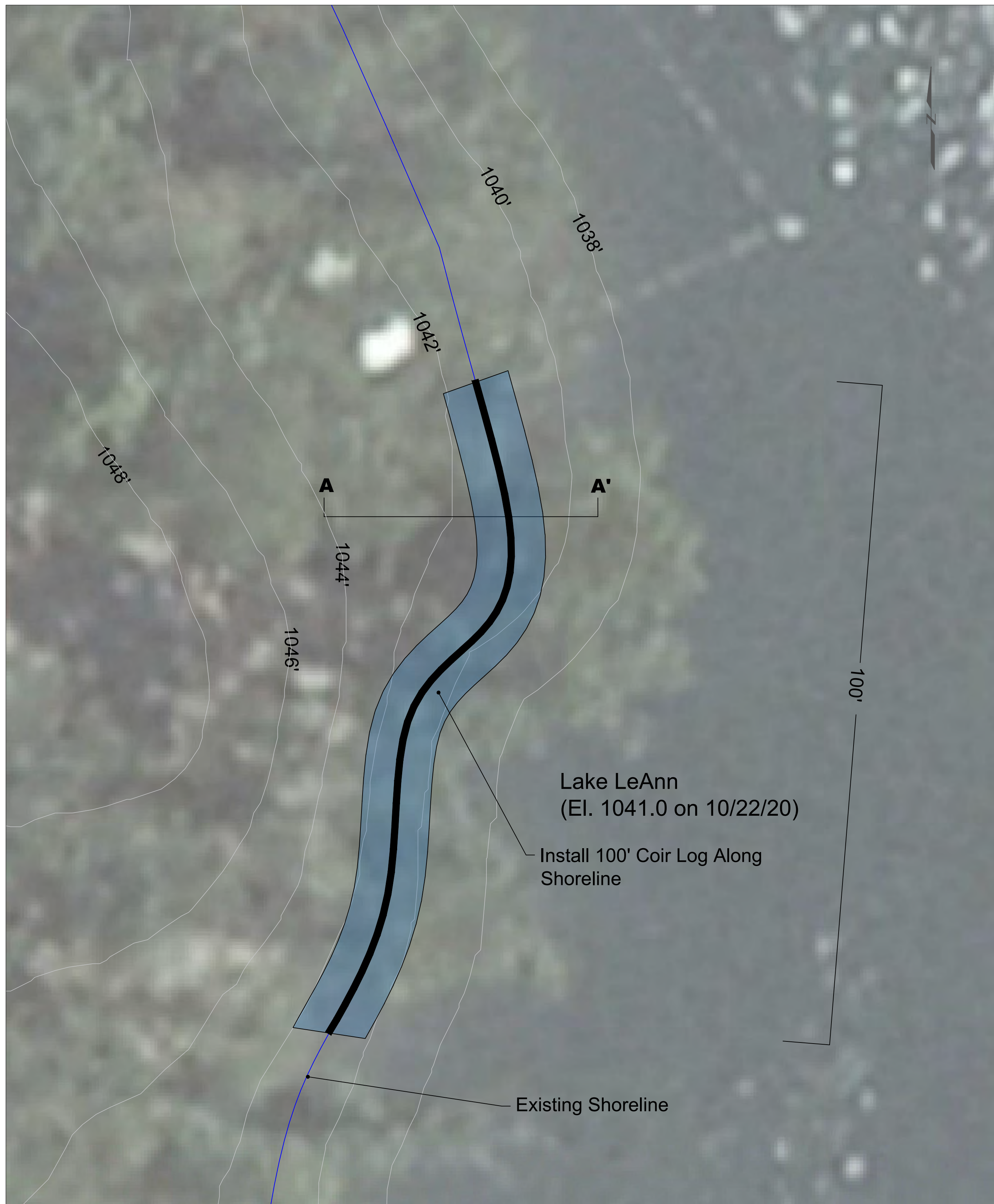
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3

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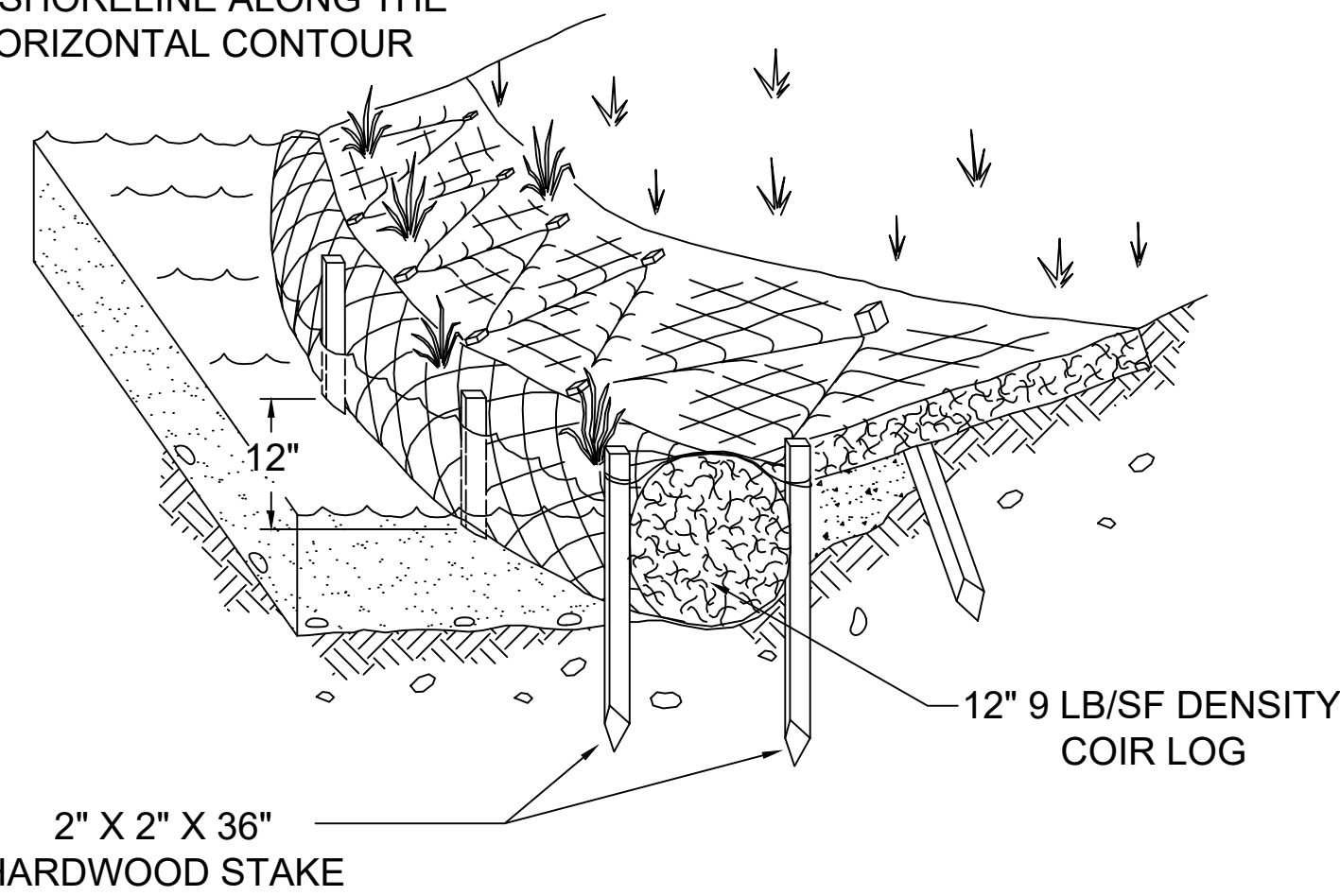
APP

GEI PN 2004639



REPRESENTATIVE SITE PHOTO

PLACE COIR LOGS PARALLEL TO SHORELINE ALONG THE HORIZONTAL CONTOUR



TYPICAL COIR LOG DETAIL
NOT TO SCALE

Latin Name	Common Name	QTY
FORBS		
<i>Asclepias incarnata</i>	Swamp milkweed	76
<i>Asclepias tuberosa</i>	Butterfly weed	38
<i>Echinacea pallida</i>	Pale purple coneflower	38
<i>Iris virginica shrevei</i>	Blue flag iris	114
<i>Liatris spicata</i>	Marsh blazing star	38
<i>Lobelia cardinalis</i>	Cardinal flower	38
<i>Monarda fistulosa</i>	Wild bergamot	38
<i>Pontederia cordata</i>	Pickerel weed	50
<i>Symphotrichum novae-angliae</i>	New England aster	38
GRASSES/SEDGES/RUSHES		
<i>Carex muskingumensis</i>	Palm sedge	38
<i>Carex vulpinoidea</i>	Brown fox sedge	38
<i>Juncus effusus</i>	Soft rush	76
<i>Schizachyrium scoparium</i>	Little bluestem	76
<i>Schoenoplectus americanus</i>	Threesquare bulrush	152
<i>Schoenoplectus validus</i>	Soft stem bulrush	152
	Total	1000

PROPOSED PLANT LIST

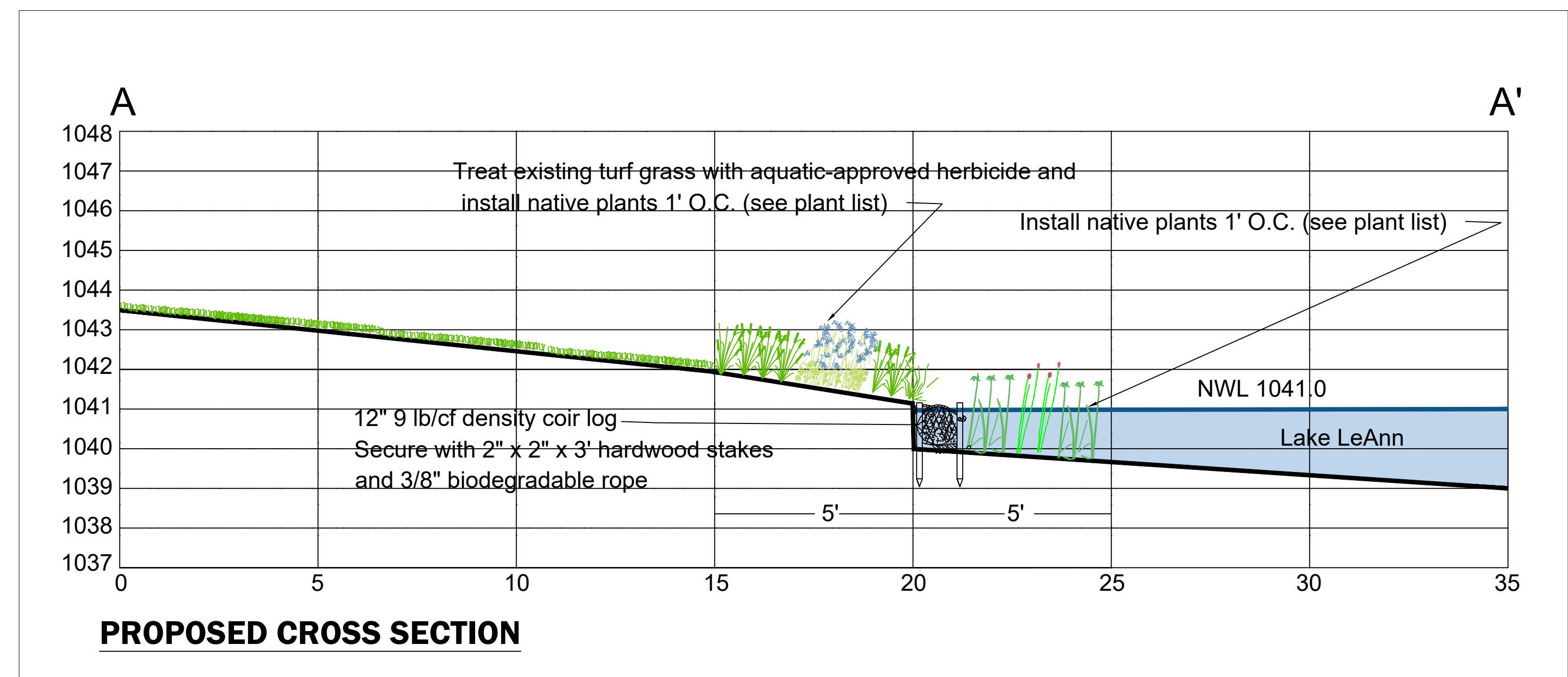


Image Credit: Google Earth

PLAN VIEW
1"=10'



Attention:	NO.	DATE

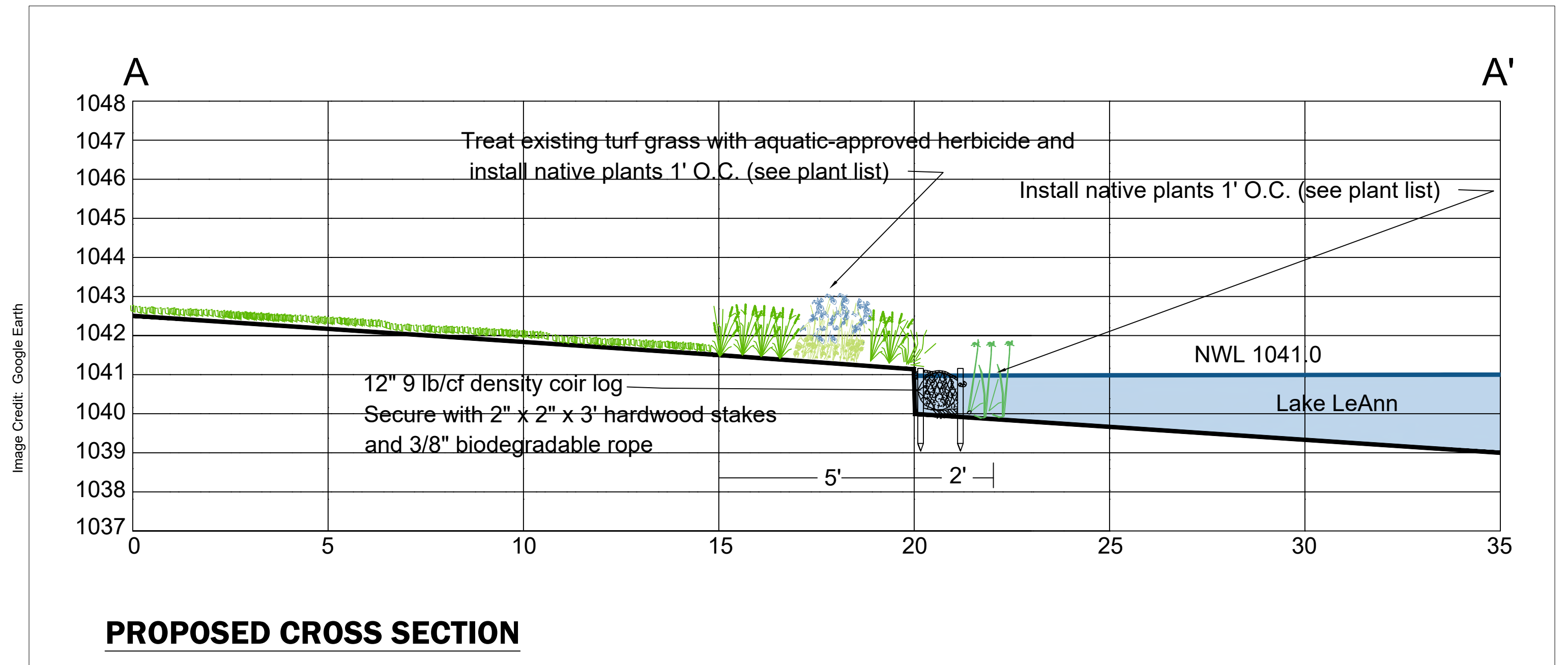
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Submittal Date:	-	

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5525 Edgewater Drive
Allendale, MI 49401

LLPOA
11701 E. Chicago Road
Jerome, Michigan 49249

Lake LeAnn
Shoreline Management Plan
NORTH BOAT LAUNCH
SHORELINE DEMONSTRATION
SITE

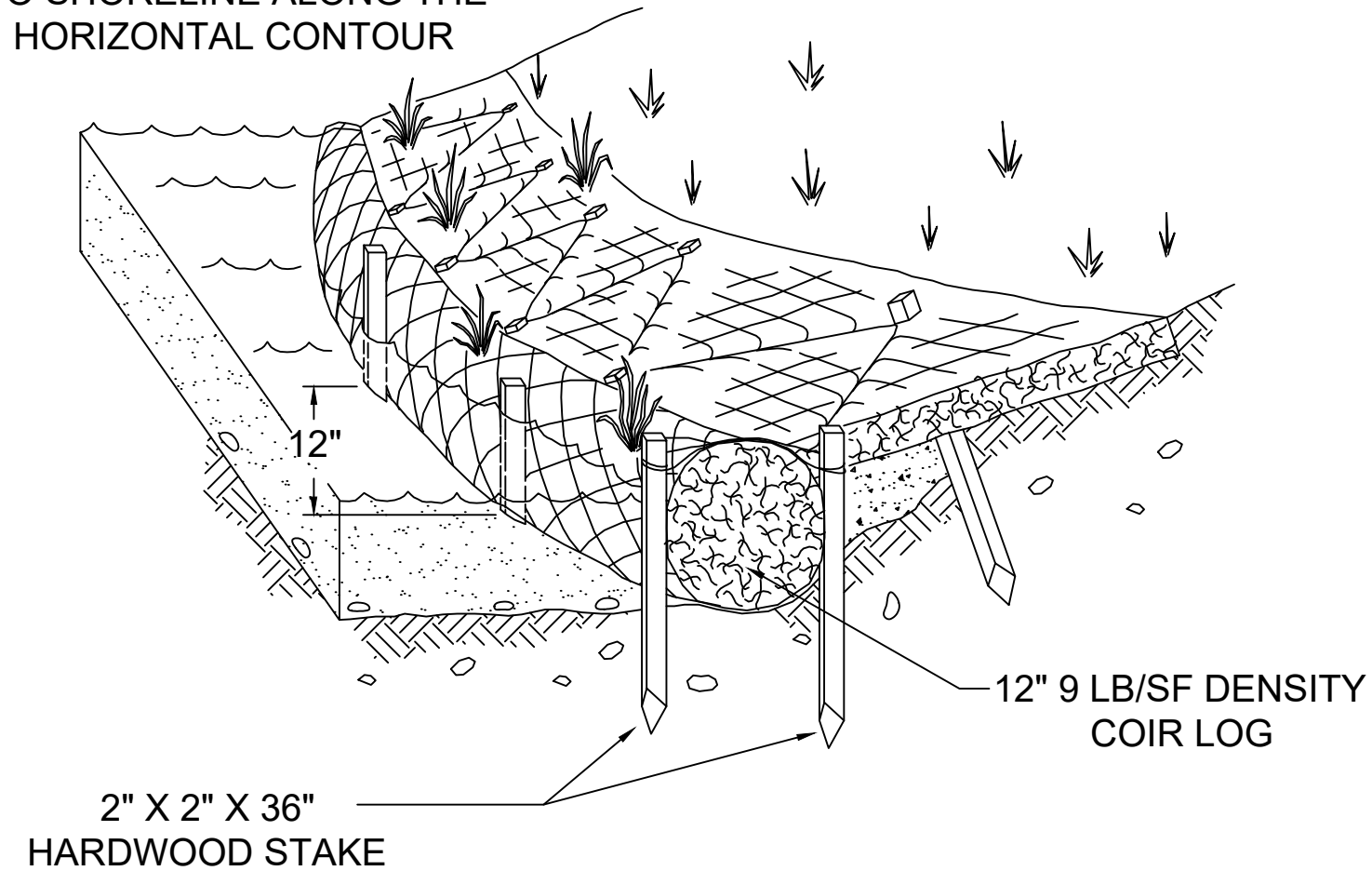
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4
ISSUE



PLAN VIEW

1"=10'

PLACE COIR LOGS PARALLEL TO SHORELINE ALONG THE HORIZONTAL CONTOUR



TYPICAL COIR LOG DETAIL

NOT TO SCALE



REPRESENTATIVE SITE PHOTO

Latin Name	Common Name	QTY
FORBS		
<i>Asclepias incarnata</i>	Swamp milkweed	38
<i>Echinacea pallida</i>	Pale purple coneflower	38
<i>Iris virginica shrevei</i>	Blue flag iris	114
<i>Liatris spicata</i>	Marsh blazing star	38
<i>Lobelia cardinalis</i>	Cardinal flower	38
<i>Monarda fistulosa</i>	Wild bergamot	38
GRASSES/SEDGES/RUSHES		
<i>Carex vulpinoidea</i>	Brown fox sedge	38
<i>Schizachyrium scoparium</i>	Little bluestem	38
<i>Schoenoplectus validus</i>	Soft stem bulrush	38
	Total	418

PROPOSED PLANT LIST



Attention:				
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LLPOA

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 Jerome, Michigan 49249

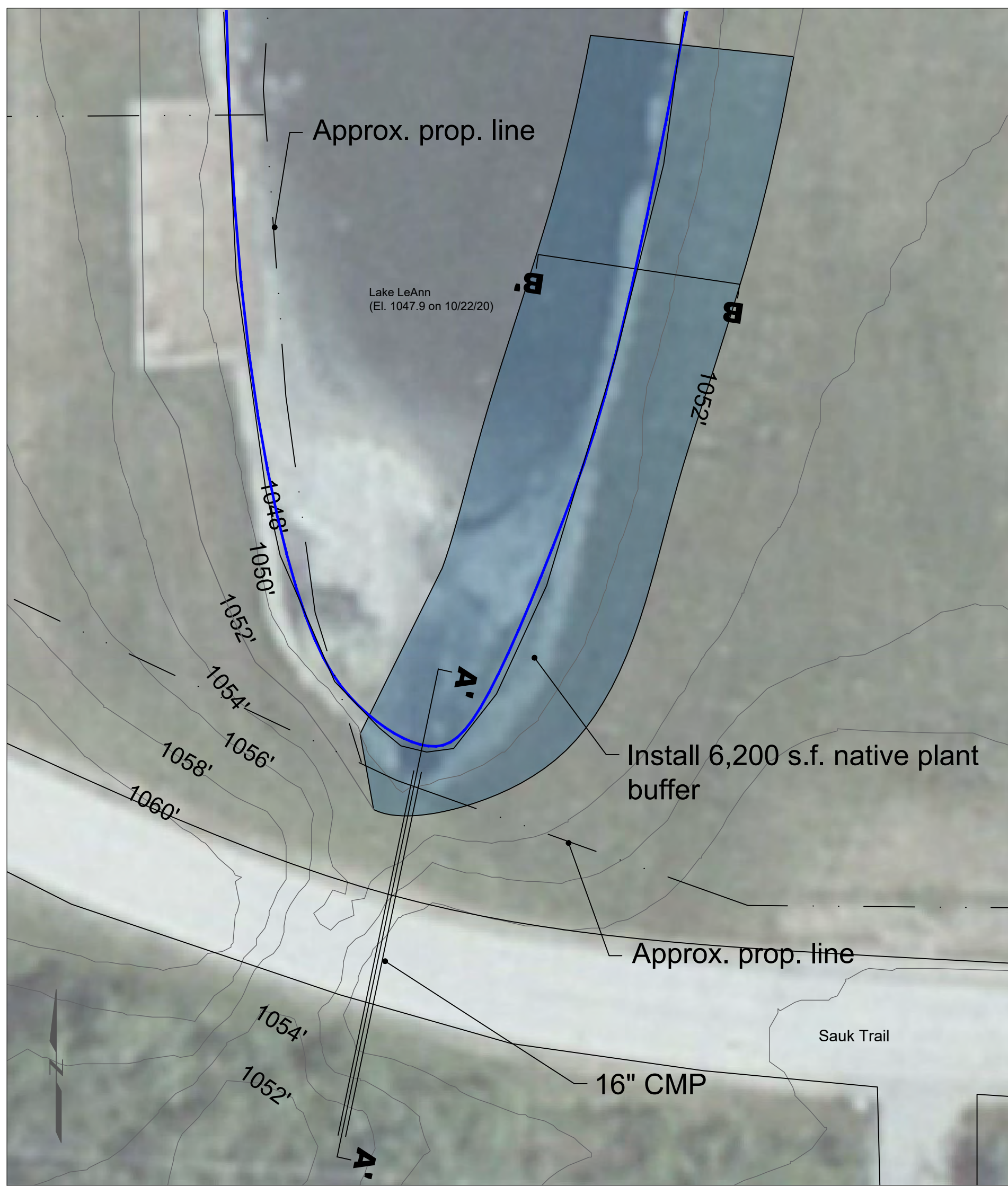
Lake LeAnn
 Shoreline Management Plan

CEDAR COURT

DWG. NO.

5

ISSUE

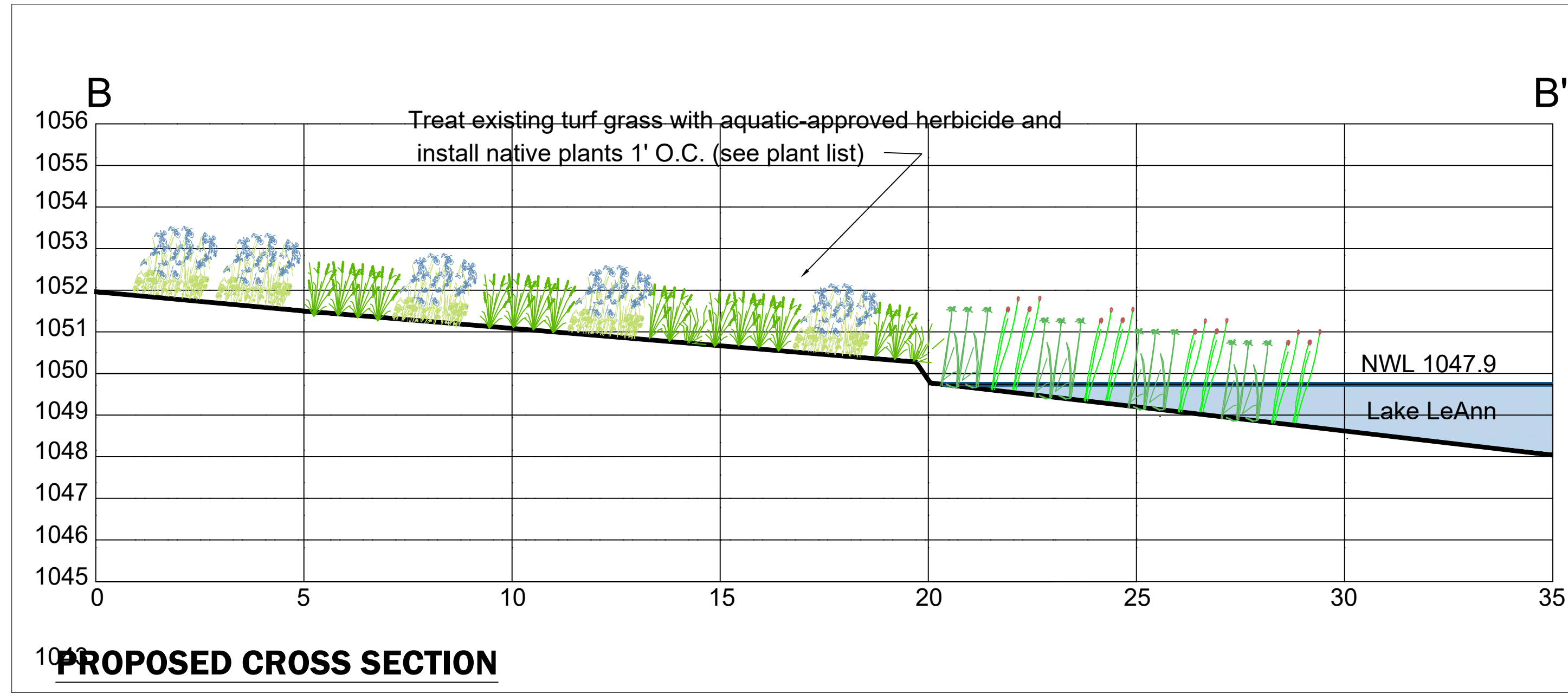


PLAN VIEW

1"=20'



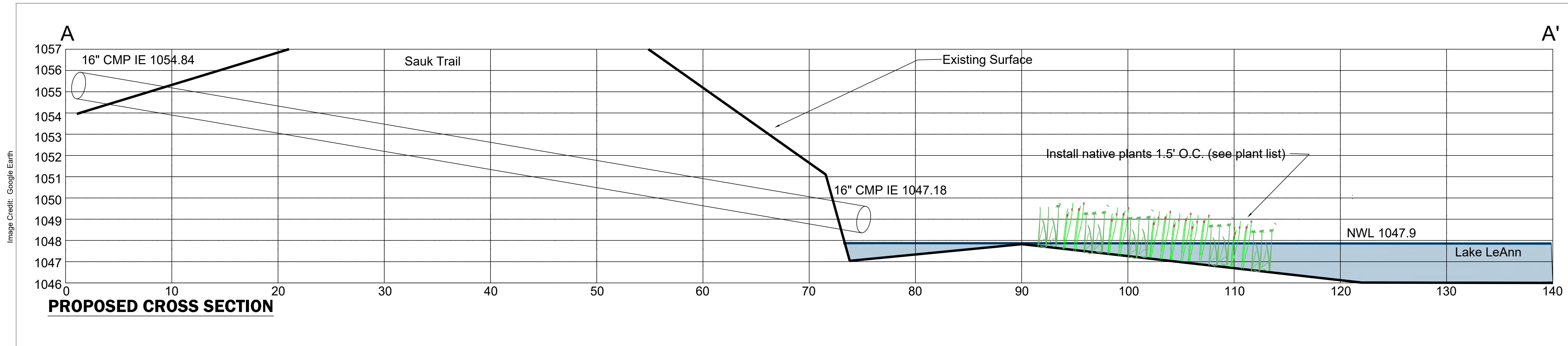
REPRESENTATIVE SITE PHOTOS



PROPOSED CROSS SECTION

Latin Name	Common Name	QTY
FORBS		
<i>Asclepias incarnata</i>	Swamp milkweed	304
<i>Asclepias tuberosa</i>	Butterfly weed	114
<i>Echinacea pallida</i>	Pale purple coneflower	114
<i>Iris virginica shrevei</i>	Blue flag iris	304
<i>Liatris spicata</i>	Marsh blazing star	114
<i>Lobelia cardinalis</i>	Cardinal flower	76
<i>Monarda fistulosa</i>	Wild bergamot	76
<i>Pontedaria cordata</i>	Pickerel weed	200
<i>Symphotrichum novae-angliae</i>	New England aster	76
GRASSES/SEDGES/RUSHES		
<i>Carex muskingumensis</i>	Palm sedge	152
<i>Carex vulpinoidea</i>	Brown fox sedge	152
<i>Juncus effusus</i>	Soft rush	114
<i>Schizachyrium scoparium</i>	Little bluestem	304
<i>Schoenoplectus americanus</i>	Threesquare bulrush	304
<i>Schoenoplectus validus</i>	Soft stem bulrush	304
	Total	2708

PROPOSED PLANT LIST



PROPOSED CROSS SECTION



Attention:



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Allendale, MI 49401

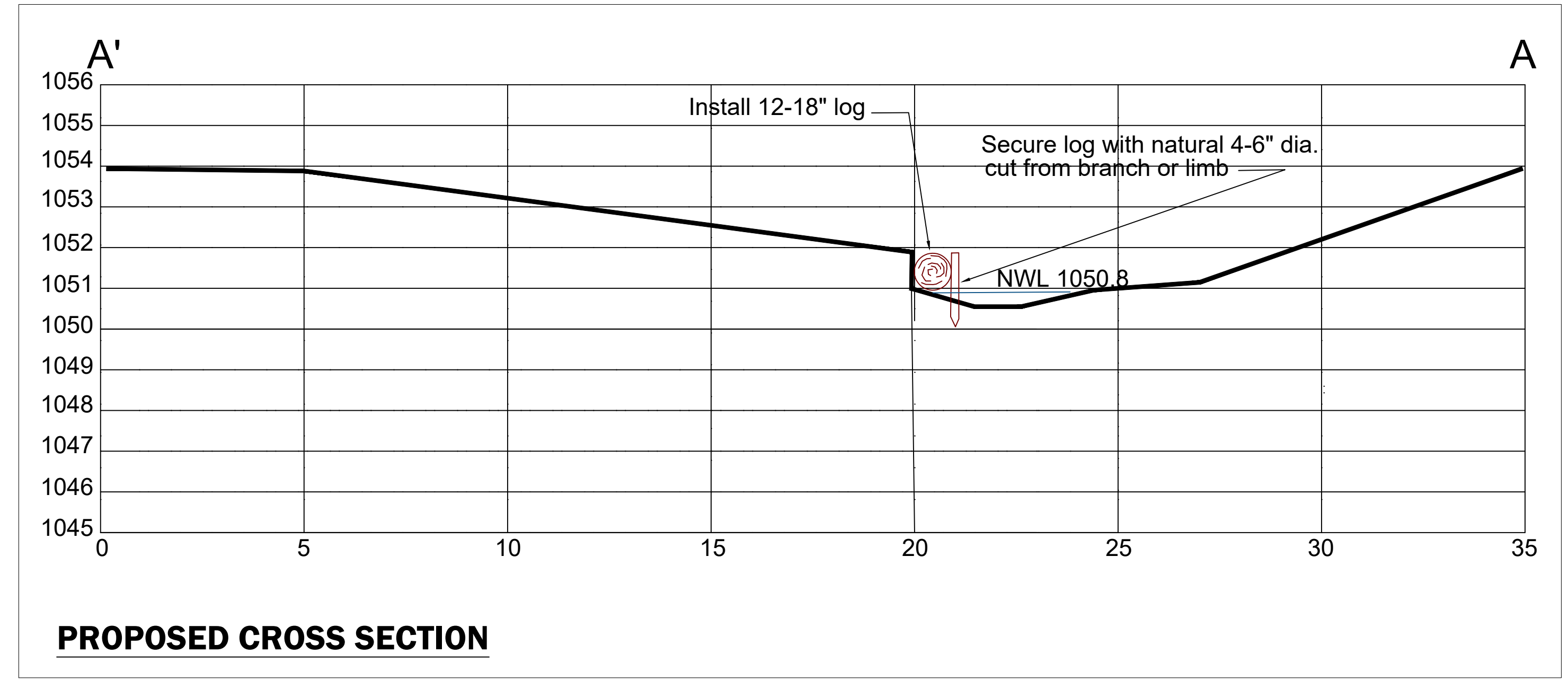
LLPOA
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Jerome, Michigan 49249

Lake LeAnn
Shoreline Management Plan
CSA 2A

DWG. NO. **6**
ISSUE



PLAN VIEW
1"=40'



REPRESENTATIVE SITE PHOTO

Image Credit: Google Earth

Image Credit: Google Earth



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Lake LeAnn Shoreline Management Plan	DWG. NO. 7
CSA 2B	ISSUE



PLAN VIEW

1"=10'



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 Jerome, Michigan 49249

Lake LeAnn
 Shoreline Management Plan
 CSA 4

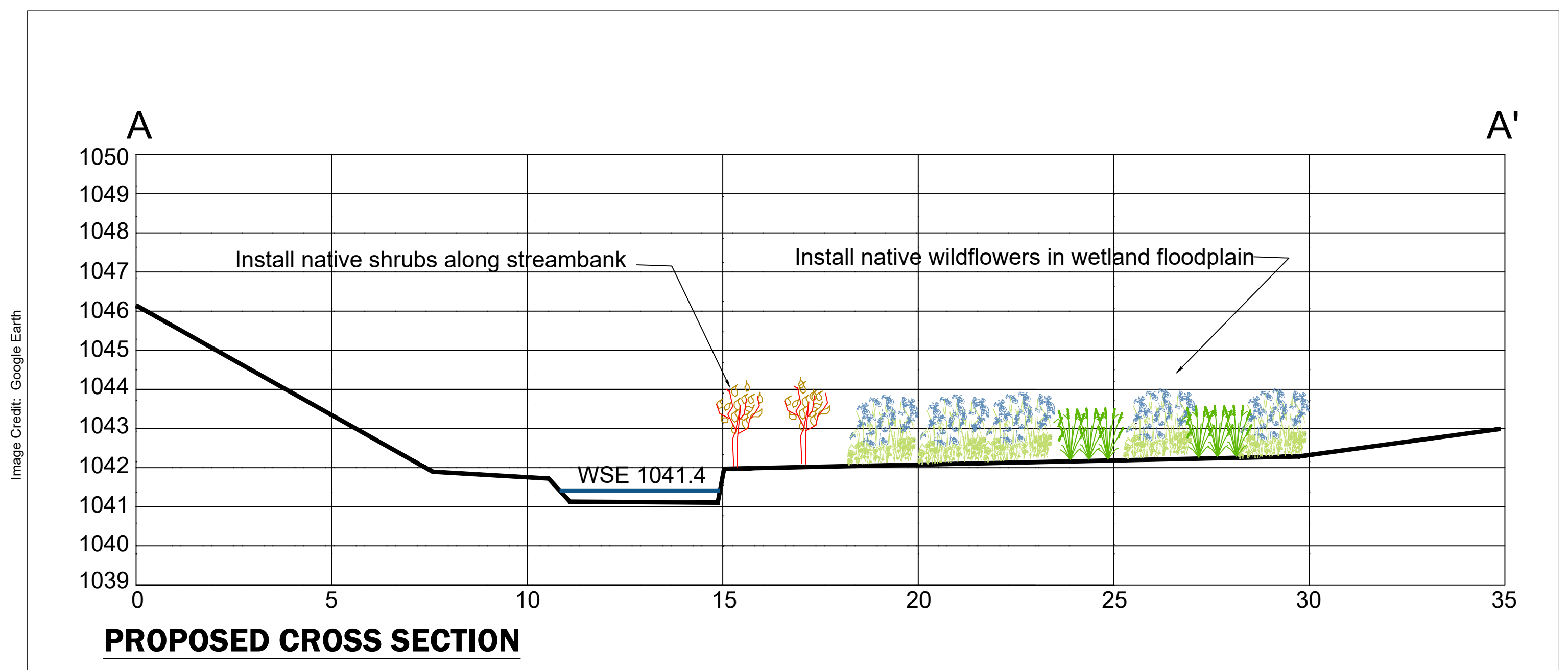
DWG. NO. **8**
 ISSUE



REPRESENTATIVE SITE PHOTO

Latin Name	Common Name	QTY
FORBS		
<i>Asclepias incarnata</i>	Swamp milkweed	38
<i>Hibiscus moscheutos</i>	Swamp rose mallow	38
<i>Iris virginica shrevei</i>	Blue flag iris	76
<i>Lobelia cardinalis</i>	Cardinal flower	38
SHRUBS		
<i>Cornus amomum</i>	Silky dogwood	50
<i>Cornus serecea</i>	Red-osier dogwood	50
	Total	290

PROPOSED PLANT LIST



PROPOSED CROSS SECTION