

Task #	Task Description	Milestone Start Date	Milestone Completion Date	Percent Complete	Budget Spent 5/22/26
1.0	Identification of Slope Failure Sources	Sep-25	Oct-25	100	\$4,412
2.0	BMP Options and Summary Report	Oct-25	Jun-26	95	\$5,480
3.0	Lot Recommendations and Bluff Impacts	Oct-25	Jun-26	95	\$6,149
4.0	Designed Stormwater Conveyance Swale Evaluation	Nov-25	Jun-26	95	\$7,802
5.0	BMP Identification, Survey, Design, Construction	Dec-25	Dec-26	20	\$17,548
5.1	BMP Identification, Survey, Design	15-May-26	31-Aug-26	30	
	<b>Project Administration</b>				
	Technical Design Review Meetings (4 Virtual and 1 Onsite Meeting)				
	BMP Assessment and Locations			90	
	Engineers Range of Cost per BMP (30% Design)			100	
	Topographic Survey at BMP Locations (one day)			100	
	Geotechnical Borings and Summary Report			100	\$13,191
	Permits (USACE, MNWCA, MNDNR)				
	Hydraulic Modeling and Summary Report			50	\$4,357
	60% Design Plans				
	60% Design Specifications				
	60% Engineers Construction Cost Estimate				
	Finalize 100% Design Plans				
	Finalize 100% Specifications				
	Finalize SWPPP				
	100% Engineers Construction Cost Estimate				
	Final Plan and Specification Submittal				
5.2	2025 Bid Administration and Contract Award	1-Sep-26	30-Sep-26	0	\$0.00
	Coordinate Project Advertisement				
	Issue Bidding Documents				
	Answer Bidder's Questions				
	Attend Public Bid Opening				
	Prepare Tabulation of Bids				
	Provide Recommendation of Award				
5.3	2025 Construction Management	15-Oct-26	31-Dec-26	0	\$0.00
	Prepare Contract Documents				
	Coordinate and Attend the Pre-Construction Meeting				
	Review and Process Shop Drawings and Submittals				
	Address Contractor Questions				
	Process Partial Pay Estimates				
	Prepare Record Drawing				
	Construction Observations (Total Estimated Hours Based on 2025 Construction Season)				
	Construction Staking (2 days)				
	Post Construction Survey (As-built Survey)				
	Final Project Closeout				
6.0	2025 Landowner Coordination	Sep-25	31-Dec-26	50	\$1,368
	Communication (SWCD and Landowners)				
<b>TOTAL AMOUNT</b>					<b>\$42,759</b>

## Memorandum

To: Stonegate on the Lake HOA

From: Amy Anderson, PE, CFM, WSB  
 Luke Lunde, PSS, CPSS, CPSC, WSB

Date: November 25, 2025

Re: Lot Assessment Summary and Recommendations  
 WSB Project No. 031723-000

### Project Background

Stonegate on the Lake HOA selected WSB to provide a proposal for the assessment, design, and stabilization of unstable shoreline and bluff slopes within Stonegate on the Lake subdivision. The HOA has requested that WSB prepare a summary and recommendation report assessing existing conditions and solutions for the remaining lots on Stonegate on the Lake Subdivision. This memo serves as the deliverable for this task.

### History of Bluff Impacts

There are currently two houses above the eroding bluff, located on Lot 5 and Lot 7. The bluff within the subdivision is approximately 30 feet tall and 300 feet long. There are two actively eroding sections of the bluff. The first section is behind Lot 5 and is approximately 100 feet long. Residents say that a large section of this bluff sloughed away in June 2024. The second section is behind Lot 7 and is approximately 75 feet long. Residents say that the sloughing on this section occurred in August 2024. Conveyance of surface water runoff and subsurface infiltration within adjacent lots potentially attributed to bluff sloughing (Figure 3). Surface water runoff directions per WSB's topographic survey are included in Figure 1 and 3 of the report. In 2024, existing BMPs were constructed in cooperation with Stearns County SWCD which included a drainage swale and an existing berm at the top of the bluff to prevent future surface water runoff from adjacent residential lots flowing over the bluff.

In order to understand the effects of precipitation on the bluff erosion, WSB downloaded the daily rainfall data from the CoCoRaHS station #MN-SR-24, a rain gage near Paynesville MN that would represent daily rainfall at the site. WSB downloaded the rainfall data for the growing season (April to October) for 2024 and 2025 and summed the daily rainfall data to create monthly totals. Table 1 shows a summary of the monthly precipitation data. Figure 2 shows a plot of the monthly precipitation data.

Table 1 - Monthly Precipitation Data (Station #MN-SR-42)		
Month	2024 Rainfall (in)	2025 Rainfall (in)
April	4.74	2.19
May	5.08	3.69
June	5.69	9.00

July	5.6	7.13
August	6.98	3.30
September	0.22	3.54
October	0.52	1.54
<b>Total Rainfall (in)</b>	<b>28.83</b>	<b>30.39</b>

Stonegate on the Lake residents told WSB staff that the first slough happened in June 2024. The month of June 2024 had 5.69 inches of rainfall, of which 2.52 inches fell on June 3 and 2.03 inches fell between June 16 - 23. The second slough happened in August of 2024. The month of August 2024 had 6.98 inches of total rainfall, of which 2.9 inches fell between August 4 – 6.

In response to the bluff erosion, in September 2024 the HOA hired a contractor to regrade the existing swale and raise the berm. The existing swale and berm are currently seeded with native vegetation, and the HOA is reducing mowing of the swale to encourage native vegetation to establish. There were no additional sloughing or bluff erosion events recorded by residents in 2025, despite the fact that 2025 was overall a higher precipitation year than 2024 (30.39 inches total rainfall in 2025 versus 28.83 inches in 2024). 2025 also had several events that were larger than the rainfall events in the months where sloughing occurred; June 12 – 15, 2025 recorded 3.05 inches of rainfall, June 26 – 27 recorded 3.52 inches of rainfall and July 28 – 29 recorded 2.91 inches of rainfall. None of these events lead to significant erosion on the bluff, suggesting that the regraded swale and berm may be helping to prevent surface runoff from traveling over the bluff and causing erosion.

WSB also evaluated current impervious surface and proposed impervious surface with Block 1 and Block 2. WSB's review of existing conditions and proposed per the original design plans resulted in specified limit for impervious surfaces on each lot of 3,600 square feet. WSB's initial estimates suggest that the combinations of homes and driveways on lots 3, 5 and 7 in Block 1 and Lots 1 and 3 in Block 2 are in exceedance of this limit. If these exceedances have all been approved by the developer, and county, it will be imperative to maintain this limit for future lot construction.

Block 1 Lot #	Estimated Impervious (sq ft)	Planned Impervious (sq ft)
1	--	3600
2	--	3600
3	5000	3600
4	--	3600
5	4800	3600
6	--	3600
7	4800	3600

## Summary and Recommendations

As a result of WSB's lot assessment we have included recommendations in this report to help prevent future drainage issues and concerns. WSB recommends Stonegate Lake HOA work with the developer and Stearns County SWCD staff to implement the following items which will improve surface water drainage within the subdivision.

1. Install a roadway drainage ditch per the original project design. This will move runoff from Stonegate Road and Block 1 Lots 1, 2, and 3 towards Pond IB1 and reduce runoff moving toward Block 1 Lots 4 – 7. Lots 4 – 7 will likely require driveway culverts to facilitate flow underneath existing driveways.
2. Install a drainage swale to Pond IB1 per the original project design or replace it with a catch basin and pipe to IB 1. This will collect water from the roadway drainage ditch mentioned in recommendation 1 and route it to Pond IB1.
3. Homeowners should consult with Stearns County SWCD on individual drainage solutions. This can include native plantings, rain gardens, rain barrels, rerouting downspouts, pervious pavements for driveways and patios, and other methods which will promote proper drainage on individual lots.
4. The Stonegate Lake HOA can also consider drainage requirements for new construction on remaining lots in Block 1 on Lots 1, 2, 4 and 6. For example, new builds can plan for permeable driveways or patios in order to reduce their impervious surfaces and minimize runoff generated.
5. The developer can enforce planned limits on impervious surfaces on undeveloped lots. Table 2 shows a breakdown of estimated impervious surfaces on lots in Block 1 versus the plan. This may also result in reduced size of building envelopes on these lots in comparison to those determined in the approved grading plan.
6. Selection and implementation of Best Management Plan option included in WSB's October 31, 2025, Submittal to Stonegate on the Lake HOA.

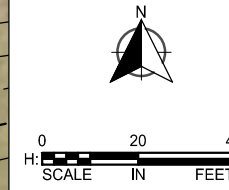
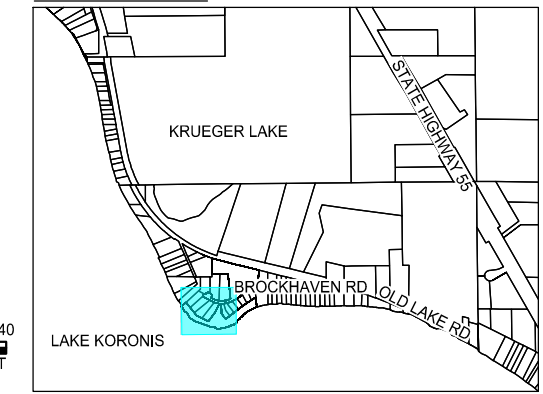
## Attachments

- Figure 1 – WSB Existing Conditions Survey
- Figure 2 – WSB 2024-2025 Precipitation Summary
- Figure 3 – WSB Topographic Survey

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LOCATION MAP



LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (MAJOR)
- EXISTING CONTOUR (MINOR)
- ERODING BLUFF AREA
- NORMAL WATER LEVEL
- EXISTING BERM CENTERLINE
- EXISTING SWALE CENTERLINE
- EXISTING DRAINAGE PIPE
- SURVEY SHOTS

wsb

SCALE: AS SHOWN  
 PLAN BY: AMN

DESIGN BY: ARA  
 CHECK BY: ARA

REVISIONS	
NO.	DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

**Preliminary**  
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 AMY ANDERSON, P.E.  
 DATE: 10/31/2025 LIC. NO.: 50820

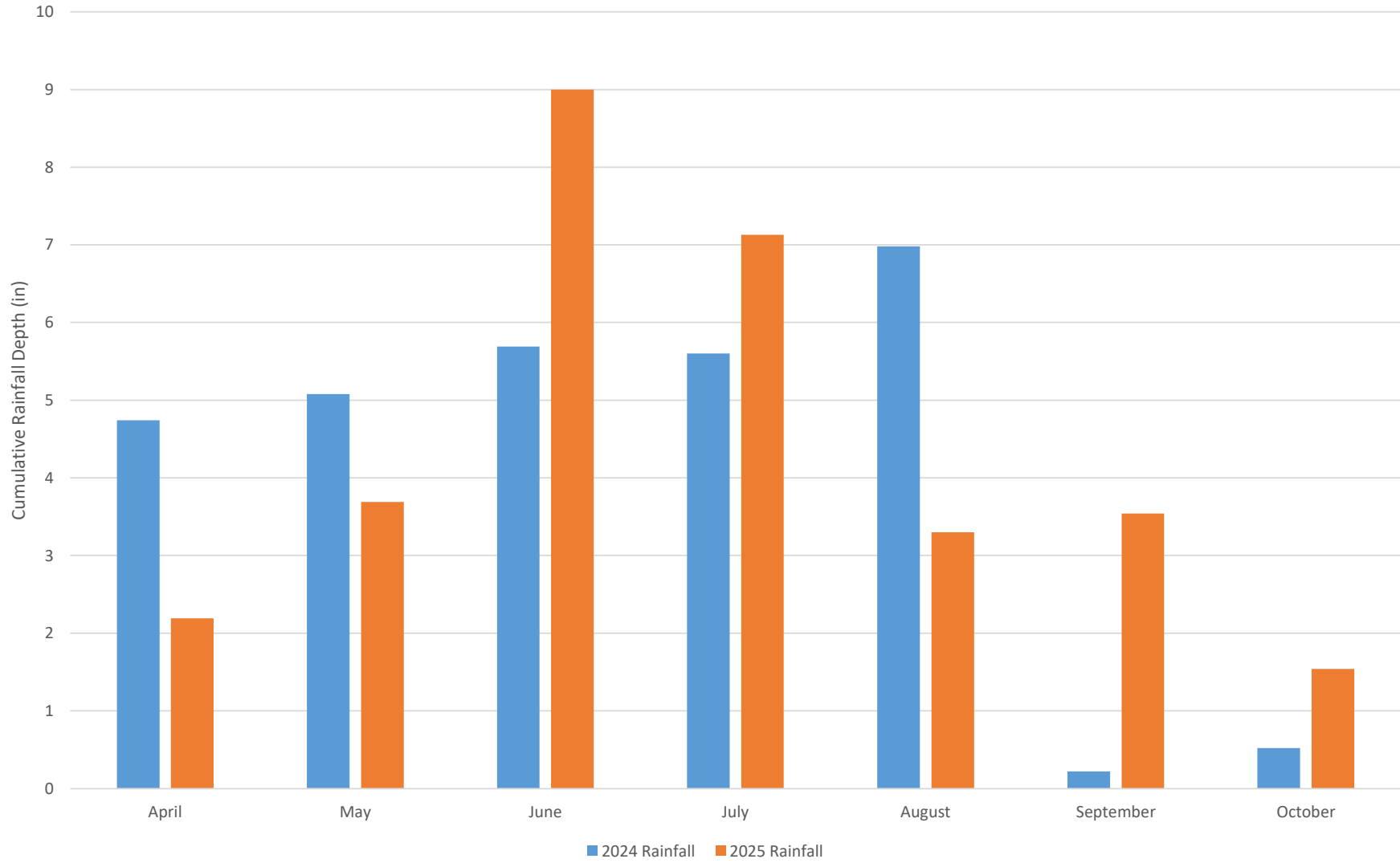
FIGURE 1  
 EXISTING  
 CONDITIONS

STALOCH PROPERTIES - LAKE KORONIS  
 STONEGATE ON THE LAKE  
 HOMEOWNER'S ASSOCIATION

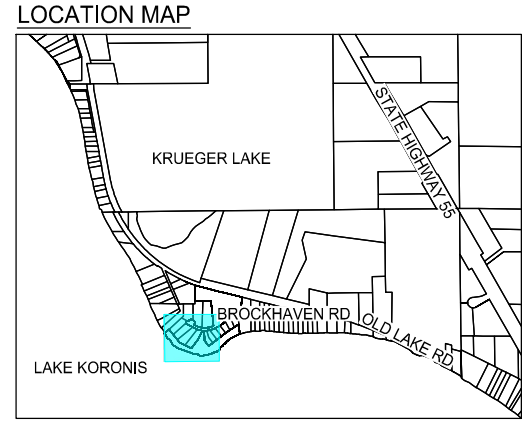
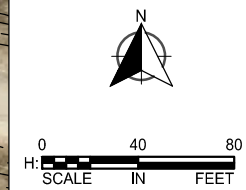
WSB PROJECT NO.  
 031723-000

SHEET  
 1 OF 4

Figure 2 - 2024 and 2025 Total Precipitation by Month CoCoRAS Station #MN-SR-42



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- LEGEND**
- PROPERTY LINE
  - - - 1015 - - - EXISTING CONTOUR (MAJOR)
  - - - EXISTING CONTOUR (MINOR)
  - ▭ ERODING BLUFF AREA
  - NORMAL WATER LEVEL
  - EXISTING BERM CENTERLINE
  - EXISTING SWALE CENTERLINE
  - EXISTING DRAINAGE PIPE
  - ▭ SURVEY EXTENTS
  - ➔ FLOW DIRECTION



SCALE: AS SHOWN  
 PLAN BY: AMN  
 DESIGN BY: ARA  
 CHECK BY: ARA

REVISIONS	
NO.	DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

AMY ANDERSON, P.E.  
 DATE: 11/25/2025 LIC. NO.: 50920

FIGURE 2

STALOCH PROPERTIES - LAKE KORONIS  
 STONEGATE ON THE LAKE  
 HOMEOWNER'S ASSOCIATION

## Memorandum

To: Stonegate on the Lake HOA

From: Amy Anderson, PE, CFM, WSB  
Luke Lunde, PSS, CPSS, CPSC, WSB

Date: April 1, 2026

Re: Best Management Practices Options Summary  
WSB Project No. 031723-000

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### Project Background

Stonegate on the Lake HOA selected WSB to provide a proposal for the assessment, design, and stabilization of unstable shoreline and bluff slopes within Stonegate on the Lake subdivision. The HOA has requested that WSB prepare a summary report documenting best management plan (BMP) options for bluff stabilization for the Stonegate on the Lake subdivision. This memo serves as the deliverable for this task.

### Site Survey and Existing Conditions

WSB completed an on-site evaluation of existing conditions on October 3<sup>rd</sup>, 2025. WSB documented the existing conditions using photos and survey equipment and also discussed drainage issues and concerns with existing residents. Selected photos from the site visit are shown in Appendix B. WSB also surveyed the top and bottom of the existing bluff. The existing conditions are shown in Figure 1. The grading plan for the entire subdivision is shown in Appendix C.

There are currently two houses above the eroding bluff, adjacent to Block 1 Lots 5 and 7. The bluff within the subdivision is approximately 30 feet tall and 300 feet long. There is an actively eroding section of the bluff adjacent to Block 1 Lots 4, 5, and 6 and is approximately 170 feet long. Residents say that a large section of this bluff sloughed away in June 2024, and another section sloughed away in August 2024.

There is an existing drainage swale and an existing berm at the top of the bluff which are meant to prevent runoff from residential lots from reaching the bluff. In September 2024 the HOA hired a contractor to regrade the existing swale and raise the berm following the bluff erosion. The existing swale and berm are currently seeded with native vegetation and the HOA is reducing mowing of the swale to encourage native vegetation to establish.

During the site visit WSB staff looked for evidence of seepage on the bluff face and did not observe any, indicating that groundwater is not likely to be the cause of the erosion issues. WSB also observed that the existing bluff toe is generally stable with both existing rock and mature vegetation. Finally, the sections of the existing bluff that did not experience sloughing are generally well vegetated with a mix of trees and perennial vegetation. This suggests that the soils, aspect, and grade of the slope are not incompatible with vegetative establishment. Homeowners also expressed a desire to preserve existing trees. Because of these reasons WSB does not recommend regrading the entire bluff to a more traditional slope angle; this would involve major

disturbance of both the bluff and private property as well as the loss of all existing vegetation, including mature trees. Instead of regrading, WSB developed design concepts for three potential stabilization options which focus on addressing drainage around the bluff and installing stabilization measures rather than regrading it.

### **Stabilization Option 1 – Vegetated Stabilization of Existing Slope, Earthen Berm and Drainage Swale Enhancement, Interceptor Drain, Drainage Ditches, and Stormwater Pipes and Culverts**

The first option for stabilization of the bluff includes encouraging vegetated stabilization of the existing slope, enhancing the earthen berm and drainage swale, installing an interceptor drain, grading a drainage ditch along Stonegate Road, and installing driveway culverts and a stormwater pipe to direct runoff to the existing stormwater pond per the approved grading plan. This option is shown in Figure 2.

Photos in Appendix B indicate that the sections of the bluff that did not experience sloughing are generally well vegetated with a mix of trees and perennial vegetation, and there is even some vegetation growing on the exposed faces of the bluff after only a single growing season. This suggests that the soils, aspect, and grade of the slope are not incompatible with vegetative establishment. However, planting on a steep and sandy slope would be difficult and expensive.

In order to assist with increasing vegetative cover on the bluff face and decreasing erosion, WSB recommends applying Proganics DUAL, a biotic erosion control matrix, along with native seed mixes suitable for site conditions. Proganics DUAL can be applied from the top of the bluff with a hydroseeder and includes both a topsoil builder and a bonded fiber matrix (BFM) for stabilizing the existing soils in place while the seed mixes take root and begin to grow.

The recommended seed mixes are Pollinator SW and Dry Prairie SW. Both are mixes designed by State of Minnesota agencies for use on a variety of sites. Pollinator SW is recommended for the top of the bluff to encourage flowering, deep-rooted vegetation at the top of the bluff along the existing berm and adjacent to private property. Dry Prairie SW is recommended for the bare soils on the face of the berm. Since no seepage was observed on the front of the bluff, soils are sandy and the bluff has moderate sun exposure (south facing aspect), prairie species should establish well.

WSB proposes increasing the height of the existing berm by one foot and grading the side slopes at 2H:1V. Material for this would come from making the existing swale approximately one foot deeper in order to facilitate drainage away from the bluff face and down the hill toward the existing stormwater pond. The enhanced swale would utilize the existing drainage pipe adjacent to Block 1 Lot 7 in order to move water to the existing stormwater pond.

Installation of an interceptor drain will prevent both subsurface flow and surface runoff from reaching the bluff. This would directly route all flows from roof drains on houses to a perforated pipe which would empty directly into the existing stormwater pond. A perforated pipe would also allow for interception of subsurface flows. Because of the narrow space between the top of the bluff and the edge of private property, the interceptor pipe will need to be placed either beneath the swale or beneath the berm.

WSB recommends grading drainage ditches along both sides of Stonegate Road to match the developer's grading plan. This would route drainage from the development to the existing stormwater pond. Since houses have been constructed in the development, culverts would need to be installed under all driveways that lie within the drainage ditches. A stormwater pipe will be required to be installed to direct drainage from the ditches to the existing stormwater pond.

Both the lake side and road side of properties will be impacted by earthwork and installing stormwater pipes. Every effort would be made to keep the berm footprint off private residential properties during design. More engineering will be required to determine pipe sizes and slopes, as well as make sure that the existing stormwater pond and the existing drainage pipe draining the swale have the capacity to absorb peak runoff rates during storm events. The anticipated construction time for this option is four to six weeks in the spring or early summer after ground thaw so seed can establish during the growing season.

### **Stabilization Option 2 – Option 1 – Vegetated Stabilization + Engineered Mechanical Stabilization**

The second option for bluff stabilization is all the activities for Option 1, minus the vegetation stabilization, and instead adding a mechanical stabilization method. This mechanical stabilization could be a geogrid, a vegetated reinforced soil system, or a mechanically stabilized earth (MSE) system. These systems consist of geosynthetic fibers or wire meshes which serve as soil reinforcements, allowing the soil to have a surface angle steeper than that of unreinforced soils of the same soil type. Generally these soil reinforcements extend back into the soil material and hold the front surface at a desired slope or angle.

MSE systems have the option of installing vegetation on the front face which would mimic the look of the existing vegetated bluff. Specific vegetation types will depend on the final design of the system and the specifications of the engineered system. An MSE system would likely also consist of a rock toe at the base extending 1-2 feet above the lake high water elevation, since MSE systems are typically not designed to resist wave action, ice heave, or prolonged inundation.

The combination of a MSE system and a rock toe would require large equipment for installation and would cause significant disturbance to the existing bluff face. The anticipated construction time for this option is three to six months and it would have to be completed between spring and fall while the ground is not frozen. If the selected MSE system includes a vegetation component, the project would require 1-2 growing seasons of monitoring to make sure that the vegetation is properly established before project closeout.

### **Stabilization Option 3 – Option 1 – Vegetated Stabilization + Sheet Pile Toe Stabilization**

The third option for bluff stabilization is all the activities for Option 1, minus the vegetated stabilization, and adding sheet pile at the toe of the slope. Sheet pile consists of interlocking sheets of metal which are driven into the ground and fastened together. Sheet pile is often used for shoreline protection or construction of maritime wall systems.

Sheet pile provides toe protection and would reduce the likelihood of bluff failure at the toe of the slope. Preliminary design assumes that the sheet pile would extend approximately 5 feet above the normal water surface elevation of the lake. Installing sheet pile would not stabilize the bluff face itself but it could be combined with vegetated stabilization or MSE to stabilize the bluff face. Cost estimates presented below do not include that combination and assume that sheet pile would be installed alone.

Installation of a sheet pile toe would require large equipment for installation, but it would not change the slope of the existing bluff face. Due to the steep bluff face the sheet pile would likely have to be installed from the water side. Installation of sheet piles would be expected to take 2-4 weeks during non-frozen ground conditions. Sizing of sheet piles, pile connections, depth that the piles would have to be installed, and detailed cost estimates would come from further design and be completed by a geotechnical engineer.

### **Cost Estimate Ranges**

To aid Stonegate on the Lake HOA with decision-making, WSB has provided a preliminary cost range for each of the options discussed above. These cost estimates are for construction alone and do not include engineering or permitting costs, and they assume that no temporary or permanent easements will have to be purchased for maintenance of any installed drainage system. More detailed cost estimates will be available once designs are at a feasibility level.

**Table 1** shows a preliminary range of construction costs for each option.

<b>Table 1 - Cost Ranges for Bluff Stabilization Options</b>	
Option 1	\$65,000 - \$85,000
Option 2	\$250,000 - \$300,000
Option 3	\$350,000 - \$400,000

### **Attachments**

#### **Appendix A - Figures**

**Figure 1 – Existing Conditions**

**Figure 2 – Option 1**

**Figure 3 – Option 2**

**Figure 4 – Option 3**

#### **Appendix B – Site Photos**

#### **Appendix C – Construction Site Plan for Stonegate on the Lake**

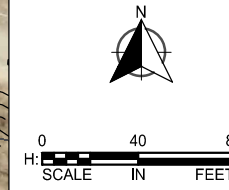
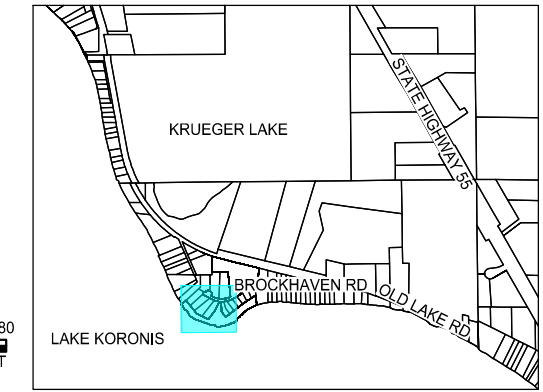
## **Appendix A - Figures**



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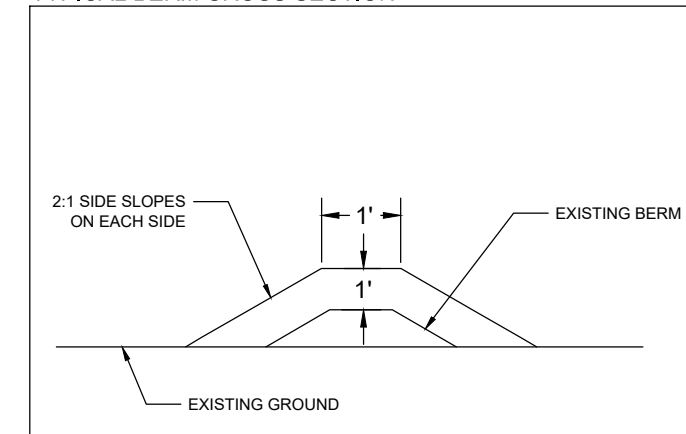
LOCATION MAP



LEGEND

- PROPERTY LINE
- - - 1015 - - - EXISTING CONTOUR (MAJOR)
- - - EXISTING CONTOUR (MINOR)
- ▭ ERODING BLUFF AREA
- NORMAL WATER LEVEL
- > EXISTING DRAINAGE PIPE
- ▭ SURVEY EXTENTS
- > INTERCEPTOR DRAIN
- - - ROOF DRAIN
- · - · - POTENTIAL INTERCEPTOR DRAIN
- DRY PRAIRIE SOUTHWEST SEED MIX 35-522 @ 33 LBS/AC AND PROGANICS DUEL @ 5,000 LBS/AC (0.215 AC)
- POLLINATOR SOUTHWEST SEED MIX 38-541 @ 20 LBS/AC (0.143 AC)
- BERM REALIGNMENT (5' WIDTH)
- PLANNED ROADWAY DRAINAGE DITCH
- > STORMWATER PIPE
- > DRIVEWAY CULVERT

TYPICAL BERM CROSS SECTION



SCALE: AS SHOWN  
 DESIGN BY: ARA  
 PLAN BY: AMN  
 CHECK BY: ARA

REVISIONS	
NO.	DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

AMY ANDERSON, P.E.  
 DATE: 2/2/2026 LIC. NO.: 50820

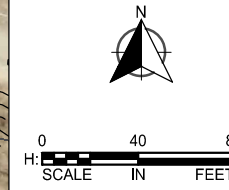
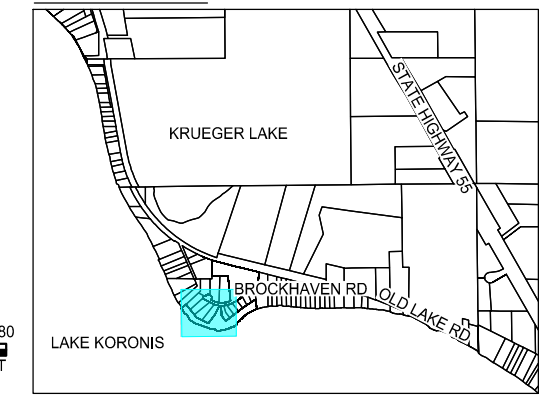
FIGURE 2  
 OPTION 1

STALOCH PROPERTIES - LAKE KORONIS  
 STONEGATE ON THE LAKE  
 HOMEOWNER'S ASSOCIATION

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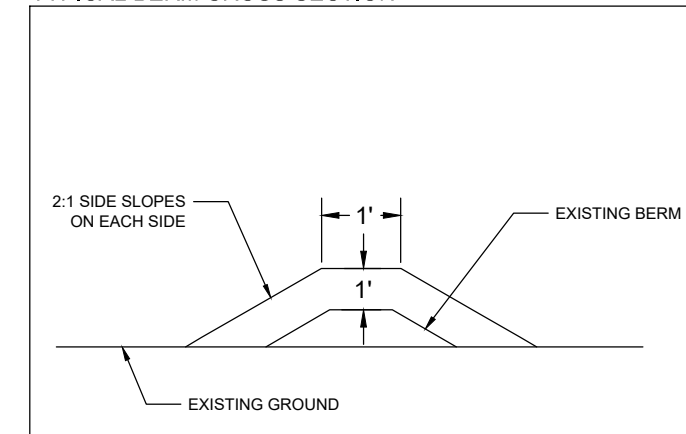
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- ▭ SURVEY EXTENTS
- > INTERCEPTOR DRAIN
- - - ROOF DRAIN
- · - · - POTENTIAL INTERCEPTOR DRAIN
- MECHANICALLY STABILIZED EARTH SYSTEM WITH ROCK TOE (0.372 AC)
- POLLINATOR SOUTHWEST SEED MIX 38-541 @ 20 LBS/AC (0.143 AC)
- BERM REALIGNMENT (5' WIDTH)
- PLANNED ROADWAY DRAINAGE DITCH
- > STORMWATER PIPE
- > DRIVEWAY CULVERT

TYPICAL BERM CROSS SECTION



SCALE: AS SHOWN  
DESIGN BY: ARA  
PLAN BY: AMN  
CHECK BY: ARA

REVISIONS	
NO.	DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

AMY ANDERSON, P.E.  
DATE: 2/2/2026 LIC. NO.: 50820

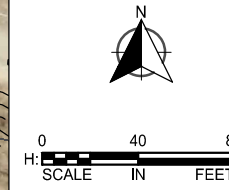
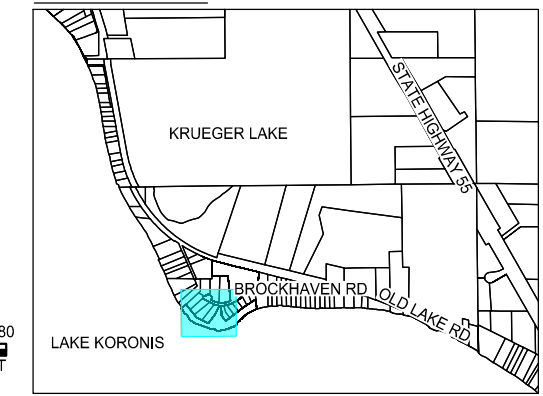
FIGURE 3  
OPTION 2

STALOCH PROPERTIES - LAKE KORONIS  
STONEGATE ON THE LAKE  
HOMEOWNER'S ASSOCIATION

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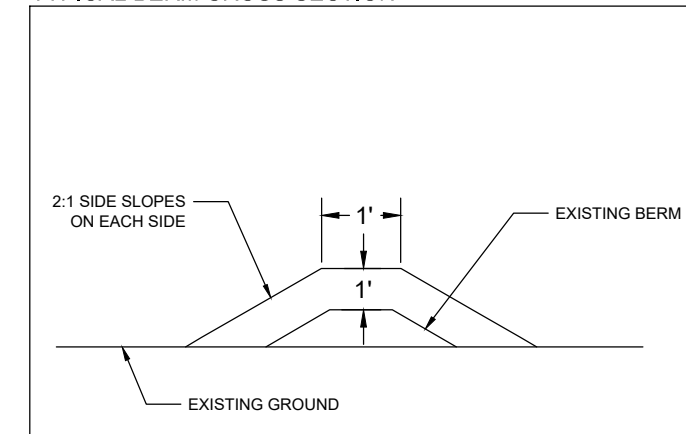
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- POLLINATOR SOUTHWEST SEED MIX 38-541 @ 20 LBS/AC (0.143 AC)
- BERM REALIGNMENT (5' WIDTH)
- PLANNED ROADWAY DRAINAGE DITCH
- >> STORMWATER PIPE
- >> DRIVEWAY CULVERT
- SHEET PILE TOE (330 LF)

TYPICAL BERM CROSS SECTION



SCALE: AS SHOWN  
 DESIGN BY: ARA  
 PLAN BY: AMN  
 CHECK BY: ARA

REVISIONS	
NO.	DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

AMY ANDERSON, P.E.  
 DATE: 2/2/2026 LIC. NO.: 50820

FIGURE 4  
 OPTION 3

STALOCH PROPERTIES - LAKE KORONIS  
 STONEGATE ON THE LAKE  
 HOMEOWNER'S ASSOCIATION

## Appendix B – Site Photos

From site visit on October 3, 2025

Bluff sloughing behind Lot 5 from top of bluff



Bluff sloughing behind Lot 7 from top of bluff



Bluff sloughing behind Lot 5 from Lake Koronis



Bluff sloughing behind Lot 7 from Lake Koronis



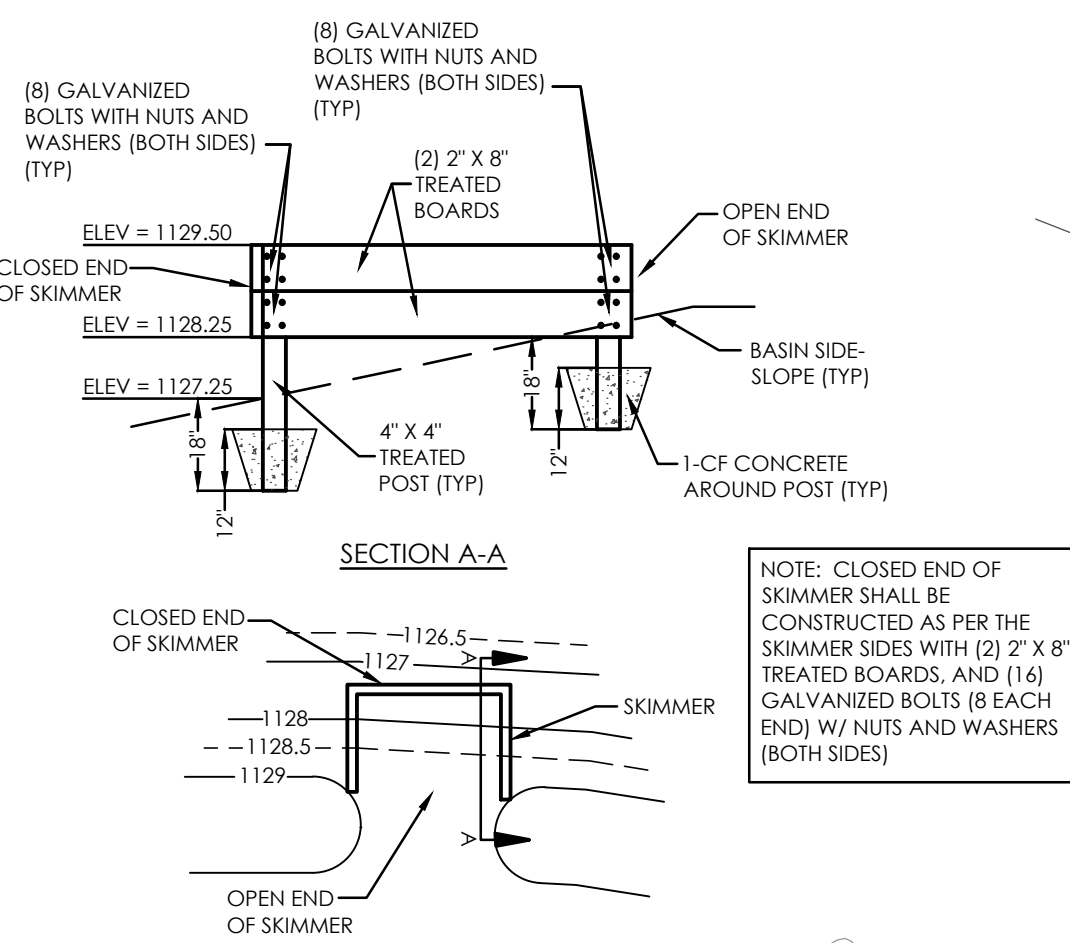
Typical stable bluff toe along Lake Koronis. Note mature vegetation and rock toe.



Existing stormwater pond



## **Appendix C - Construction Site Plan**



1 INFILTRATION BASIN SKIMMER NTS

NOTE: EXISTING VEGETATED AREAS NOT INDICATED AS WOODED CONSIST OF OPEN LAWN SPACE WITH A FEW TO SEVERAL EXISTING MATURE TREES.

NOTE: LOCATIONS AND ELEVATIONS OF PROPOSED HOME FOOTPRINTS AND DRIVEWAYS SHOWN ON THIS PLAN ARE CONCEPTUAL. ACTUAL LOCATIONS AND ELEVATIONS OF THE HOMES AND DRIVEWAYS WILL BE DETERMINED BY THE INDIVIDUAL LOT OWNERS AT THE TIME OF HOME CONSTRUCTION.

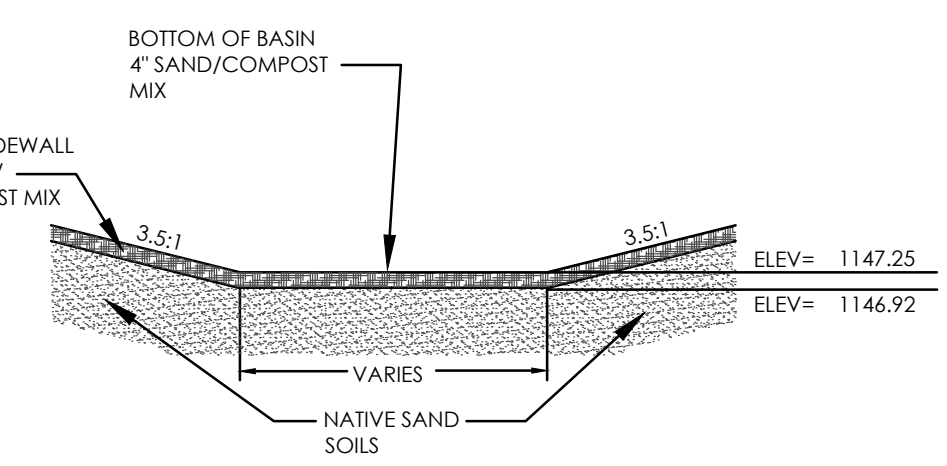
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**GRADING NOTES:**

- CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS INCLUDING LOCATIONS, AND RIM AND INVERT ELEVATIONS, OF EXISTING DRAINAGE AND SANITARY STRUCTURES. LOCATION AND SIZE OF EXISTING SANITARY, WATER, AND STORM SEWER STUBS, AND EXISTING GRADES SHALL ALSO BE VERIFIED.
- EXISTING TOPOGRAPHICAL INFORMATION WAS OBTAINED FROM A TOPOGRAPHICAL SURVEY PROVIDED BY O'MALLEY & KRON LAND SURVEYORS, COLD SPRING, MN (320) 685-5905.
- BENCHMARK: NAIL IN 1" OAK TREE LOCATED NEAR TOP OF BLUFF IN WESTERN PORTION OF SITE (SEE PLAN) - ELEV = 1161.96
- NOTIFY ENGINEER IMMEDIATELY IF ANY INCONSISTENCIES ARE DISCOVERED BETWEEN ACTUAL SITE CONDITIONS AND WHAT IS SHOWN ON THE PLANS, WHICH ARE SCARIFIED ENOUGH TO ALTER THE INTENT OF THE DRAWINGS.
- THE CONTRACTOR SHALL CONTACT GOPHER ONE CALL AT (800) 252-1166 FOR A UTILITY LOCATE PRIOR TO THE START OF CONSTRUCTION AND VERIFY LOCATIONS OF UTILITIES BEFORE BEGINNING WORK.
- ALL LENGTHS OF STORM SEWER OR CULVERT PIPE SPECIFIED ON THIS PLAN INCLUDE THE LENGTHS OF ANY ASSOCIATED FLARED END SECTIONS.
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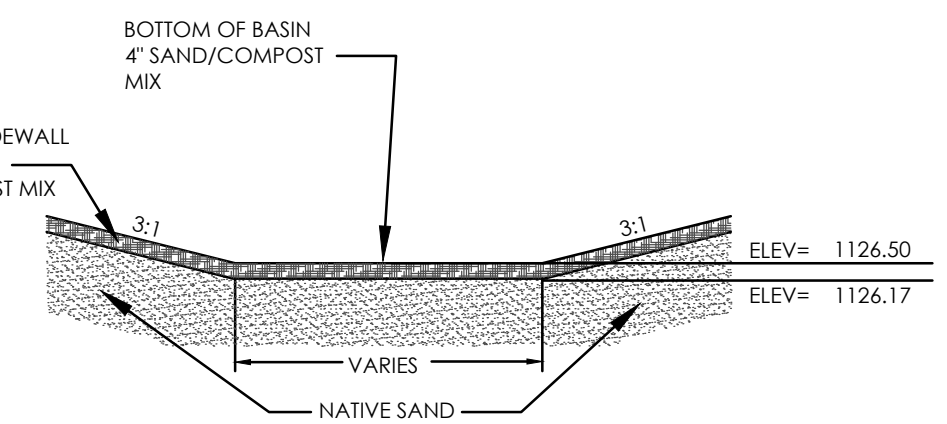
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- DURING CONSTRUCTION OF THE ADJACENT STREET AND HOMES, THE INFILTRATION BASIN AREAS SHALL BE PROTECTED FROM TRAFFIC AND SEDIMENT WITH SILT FENCE.
- THE BOTTOM OF THE INFILTRATION BASINS SHALL BE SCARIFIED TO A MINIMUM DEPTH OF 24 INCHES WITH THE USE OF APPROPRIATE EQUIPMENT (TILLER, RIPPER, ETC.). AFTER SCARIFICATION, THE BASIN SHALL BE LINED WITH A MINIMUM OF 4-INCHES OF A 70% CLEAN SAND / 30% COMPOST MIX, WHICH SHALL BE PLACED AS LOOSELY AS POSSIBLE.
- ONCE THE INFILTRATION BASINS HAVE BEEN COMPLETED AND THE SITE HAS BEEN STABILIZED, THE CONTRACTOR SHALL ARRANGE AND PAY FOR TESTING THE INFILTRATION RATES OF THE BOTTOMS OF THE BASINS. THE TEST RESULTS SHALL BE SUBMITTED TO THE CITY AND THE ENGINEER.
- FINAL STABILIZATION OF THE INFILTRATION BASINS SHALL NOT BE COMPLETED UNTIL THE UPSTREAM DRAINAGE AREAS HAVE BEEN STABILIZED.



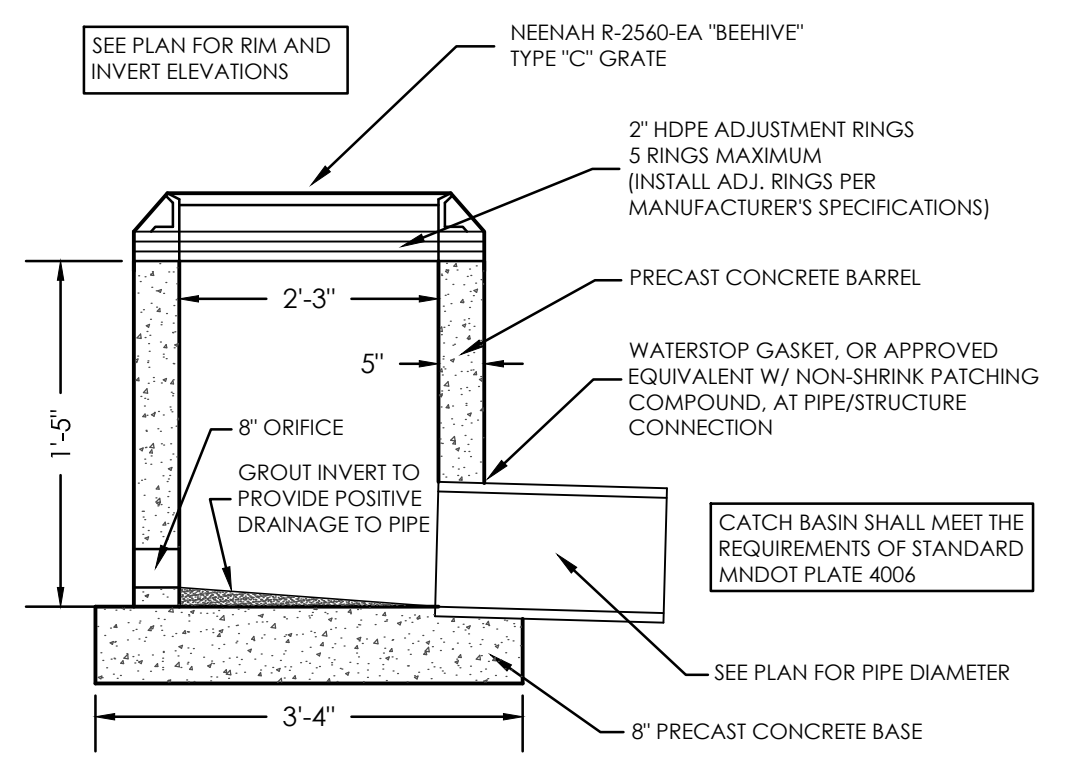
NOTES: 1. BASIN BOTTOM SHALL BE SEED W/ MNDOT NATIVE SEED MIX 2. SAND/COMPOST MIX SHALL CONSIST OF 70% CLEAN SAND & 30% COMPOST

2 INFILTRATION BASIN #1 NTS



NOTES: 1. BASIN BOTTOM SHALL BE SEED W/ MNDOT NATIVE SEED MIX 2. SAND/COMPOST MIX SHALL CONSIST OF 70% CLEAN SAND & 30% COMPOST

3 INFILTRATION BASIN #2 NTS



4 BASIN OUTLET (MNDOT DESIGN \"H\") NTS

**IMPLEMENTATION SEQUENCE: PRIVATE ROAD CONSTRUCTION**

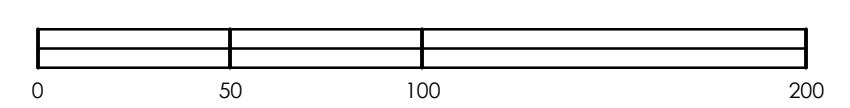
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- CLEAR AND GRUB AREAS DESIGNATED FOR DISTURBANCE WHILE MINIMIZING DISTURBANCE AS MUCH AS POSSIBLE
- EXCAVATION AND ROUGH GRADING OF CONSTRUCTION AREA INCLUDING INFILTRATION BASINS #1 AND #2
- UPON COMPLETION OF ROUGH GRADING, IMMEDIATELY INSTALL SILT FENCE AROUND INFILTRATION BASIN AREAS
- ARRANGE FOR INSTALLATION OF UTILITIES (GAS, ELECTRIC, TELEPHONE, ETC.)
- COMPLETE ROAD SUBGRADE PREPARATION
- IMMEDIATELY UPON COMPLETION OF UTILITY INSTALLATION AND SUBGRADE PREPARATION, FINISH GRADE, PLACE TOPSOIL, SEED, AND PLACE ANY EROSION CONTROL BLANKET OVER AREAS DESIGNATED FOR TURF
- PLACE CLASS 3 GRAVEL BASE (REMOVE TEMPORARY ROCK CONSTRUCTION ENTRANCE)
- PLACE PAVEMENT
- INSPECT FINISHED PROJECT AND RE-SEED AND/OR RE-BLANKET ANY DAMAGED AREAS
- ONCE TURF ESTABLISHMENT REACHES 70%, REMOVE SILT FENCE

**IMPLEMENTATION SEQUENCE: HOME CONSTRUCTION**

- INSTALL PERIMETER SILT FENCE AND TEMPORARY ROCK CONSTRUCTION ENTRANCE
- CLEAR AND GRUB AREAS DESIGNATED FOR DISTURBANCE WHILE MINIMIZING DISTURBANCE AS MUCH AS POSSIBLE
- EXCAVATION AND ROUGH GRADING OF CONSTRUCTION AREA
- CONSTRUCT HOME, DRIVEWAY, AND ANY ALLOWED ACCESSORY STRUCTURE
- IMMEDIATELY UPON COMPLETION OF CONSTRUCTION OF #4 ITEMS, FINISH GRADE, PLACE TOPSOIL, SEED, AND PLACE EROSION CONTROL BLANKET, OR PLACE SOD, OVER SLOPES STEEPER THAN 4:1
- INSPECT FINISHED PROJECT AND RE-SEED AND/OR RE-BLANKET, OR RE-SOD ANY DAMAGED AREAS
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HIGHEST RECORDED -1127.28  
O.H.W. = 1123.32  
WATER ELEVATION ON 4-21-2016- 1123.0

**GRADING PLAN**



CONSTRUCTION DRAWINGS -03/17/2017

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly licensed engineer under the laws of the state of Minnesota.

Brian C. Schultz, PE  
Date: 03/17/2017  
License No.: 43129

**SCHULTZ ENGINEERING & SITE DESIGN**  
18 South Riverside Avenue  
Suite 230  
Sartell, MN 56377  
Ph: (320) 339-0669  
Fx: (866) 633-1830  
www.schultzengineeringdesign.com

NO.	DATE	DESCRIPTION	COUNTY COMMENTS
1	06/29/2017	REVISED GRADING PER 03/27/17	
2			
3			

**STONEGATE ON THE LAKE**  
PAYNESVILLE TOWNSHIP,  
STEARNS COUNTY, MN

PROJECT NUMBER:  
16032

SCALE:  
1"=50'

C2 OF 5

## Memorandum

To: Stonegate on the Lake HOA and Stearns County SWCD

From: Amy Anderson, PE, CFM, WSB  
Luke Lunde, PSS, CPSS, CPSC, WSB

Date: November 25, 2025

Re: Stormwater Conveyance Memo  
WSB Project No. 031723-000

---

### Project Background

Stonegate on the Lake HOA selected WSB to provide a proposal for the assessment, design, and stabilization of unstable shoreline and bluff slopes within Stonegate on the Lake subdivision. The HOA has requested that WSB evaluate the existing stormwater conveyance swale. This memo includes assessment of the entire stormwater management system for Stonegate on the Lake Subdivision and summary response of the existing stormwater conveyance swale.

### Planned Stormwater Management

Figure 1 shows the approved grading plan for the Stonegate on the Lake subdivision. The planned stormwater management included a stormwater pond (IB1) that was designed to accept runoff from Block 1 Lots 1 – 7, Stonegate Road, and Block 2 Lots 1 - 5 via a drainage swale running north to south. Block 2 Lots 6 and 7 drain to a smaller stormwater pond (IB2). IB1 is connected to IB2 via a drainage swale. The grading plans also include a drainage swale running from northwest to southeast to intercept surface flow from the back half of Lots 4 – 7 and prevent surface water runoff flowing over the lake bluff face. The drainage swale also drains into IB1 via a catch basin located on the property of Block 1 Lot 7.

In addition to the grading plan WSB was provided an as-built plan set dated July 17, 2018, by Stearns County SWCD which included changes to the original approved grading plan. Results of WSB plan review include project engineer and developer revised the grading plan to include an earthen berm along the back of Block 1 Lots 4 – 7 instead of a drainage swale. The connection from IB1 to IB2 was also revised to be a piped connection rather than a surface drainage swale.

### Existing Stormwater Management

Existing stormwater management assessment includes review of existing topography and stormwater management vs what approved in the final grading plan and as-built plans. Figures 2 and 3 include the grading plans for the Stonegate on the Lake subdivision overlain with the results from WSB's 2025 topographic survey. Figures 4 and 5 show the revised grading plans for Stonegate on the Lake dated July 17, 2018, overlain with the existing topography survey. There are a number of significant differences between the planned and existing stormwater management which include the following.

- The drainage swale running north to south is not graded according to the plans. According to Figure 1, the top of the proposed swale adjacent to the road is supposed to be at approximately elevation 1157 and graded at approximately 20H:1V or 5% slope to

the pond. The actual adjacent roadway elevation is 1161 and the estimated slope is 40H:3V or 7.5% slope to the pond. There is also a utility box placed within the drainage swale footprint which may be impeding flows to the pond. Discussions with residents indicated that the home on Lot 1 Block 2 often has standing water in the driveway and garage after a rainfall and that it runs off Stonegate Road into the driveway.

- Figure 2 shows that there is no drainage ditch along the south side of Stonegate Road to facilitate roadway drainage and lot drainage. If there was a drainage ditch alongside Stonegate Road, Lots 5 and 7 in Block 1 would likely require driveway culverts and water would move more efficiently to Pond IB1. A drainage ditch south of Stonegate Road would also prevent runoff from Block 1 Lots 1 – 3 from running across the road and into Block 2 Lots 1- 5.
- Stonegate Road is graded differently than originally planned. Black flow arrows from the plan sets on Figures 3 through 6 indicate that most of Stonegate Road should drain to pond IB1 via the drainage swale. Red flow arrows drawn based on both LiDAR and survey data indicate that the road was built sloping away from IB1 and Stonegate Road east of IB1 is not draining towards the pond.
- The drainage swale across the back of Block 1 Lots 4 – 7 was not constructed in the proposed location, nor was the revised earthen berm. Figure 3 shows the proposed location of the drainage swale. The later grading plan shown in Figure 5 shows that the swale has been converted to a berm, but both Figures 3 and 5 show that homes have been built within the berm or swale footprint. In 2024 the HOA constructed a small swale as well as an earthen berm to address surface runoff running over the bluff which is visible in Figure 2.
- Block 1 Lots 4 – 7 do not drain towards Stonegate Road. Red flow arrows in Figure 3 shows that currently Lots 4 – 6 drain onto Lot 7.

## Summary

Several stormwater management items shown in the plans are either not present or were constructed significantly differently from what was shown in the plans. The existing stormwater conveyance swale was not built according to the approved grading plan. Results of WSB's assessment include stormwater management and surface water runoff do not convey surface water runoff as defined in the approved grading plan (Figure 1) nor the 2018 as-built survey in accordance to 2025 WSB topography survey. A number of constructed stormwater management features per the 2018 As-built survey were either not constructed or are significantly different from the approved grading plan.

Figure 1 – Original Grading Plan

Figure 2 – WSB 2025 Topographic Survey

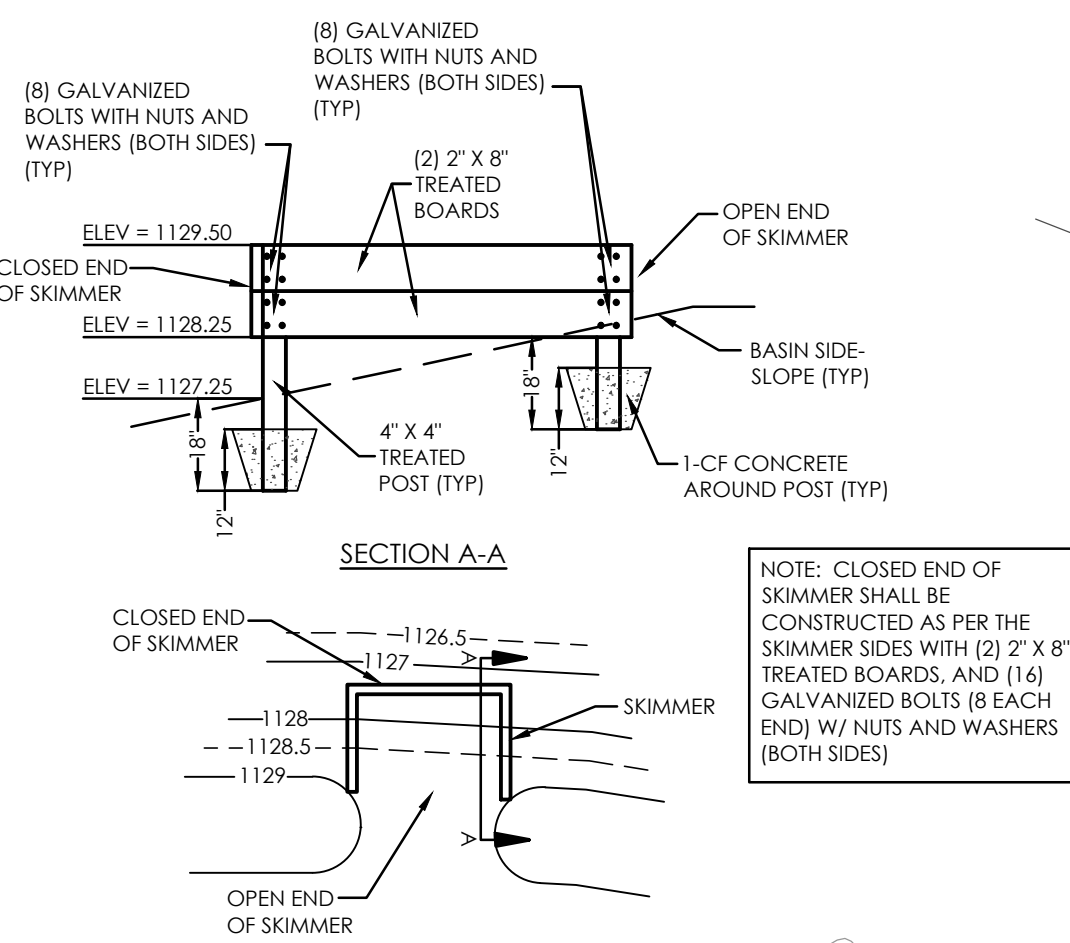
Figure 3 – Original Grading Plan Over 2025 Topographic Survey Sheet 1

Figure 4 – Original Grading Plan Over 2025 Topographic Survey Sheet 2

Figure 5 – 2018 As-Built Survey Over 2025 Topographic Survey Sheet 1

Figure 6 – 2018 As-Built Survey Over 2025 Topographic Survey Sheet 2

Appendix A – 2025 Site Photos



1 INFILTRATION BASIN SKIMMER NTS

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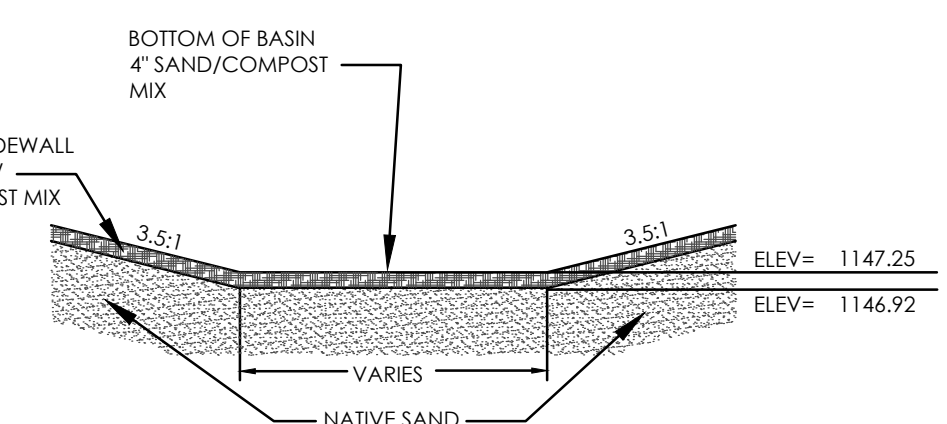
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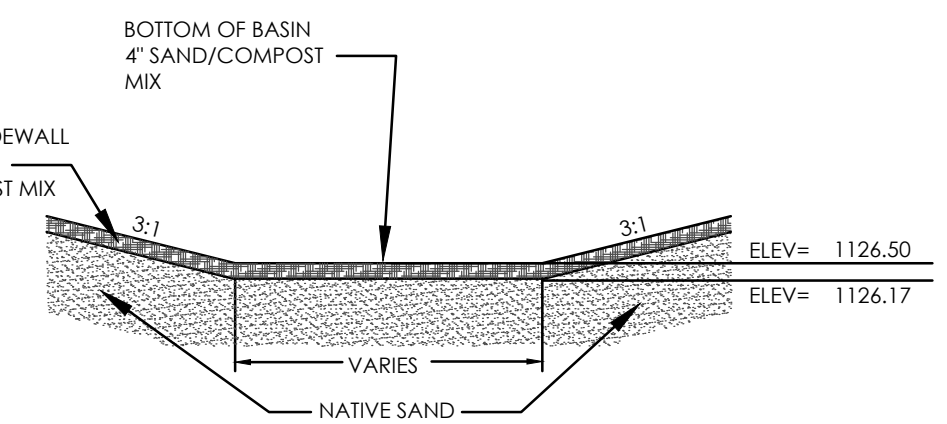
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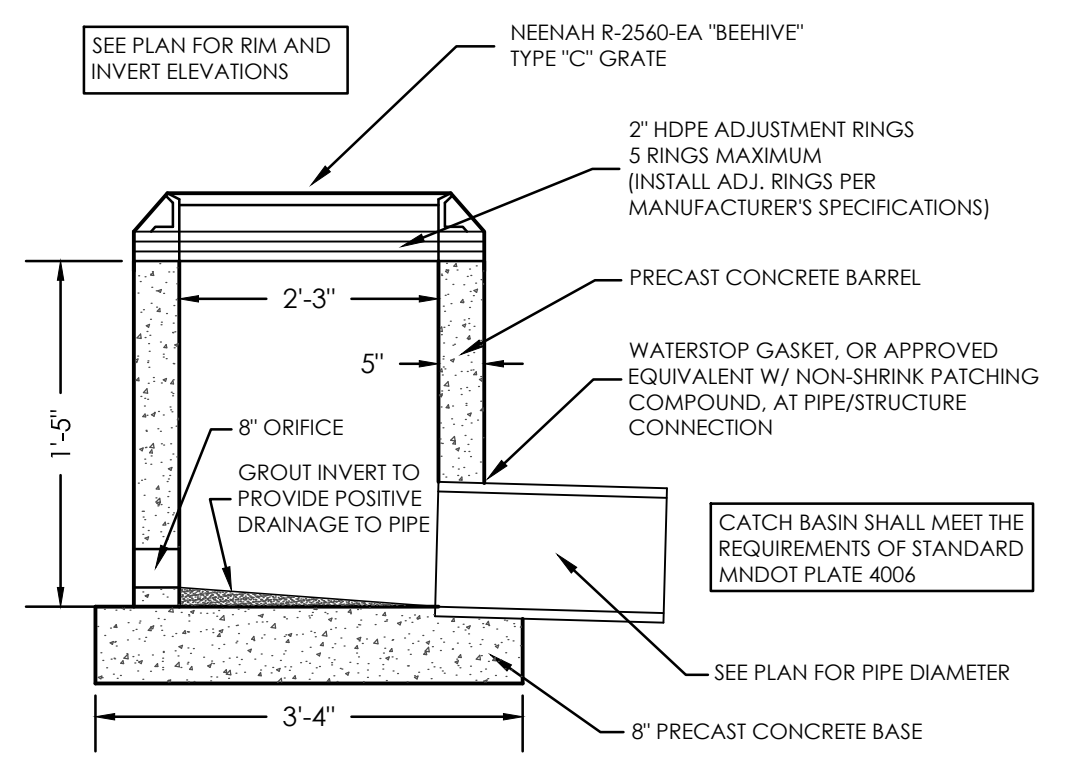
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2 INFILTRATION BASIN #1 NTS



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3 INFILTRATION BASIN #2 NTS



4 BASIN OUTLET (MNDOT DESIGN "H") NTS

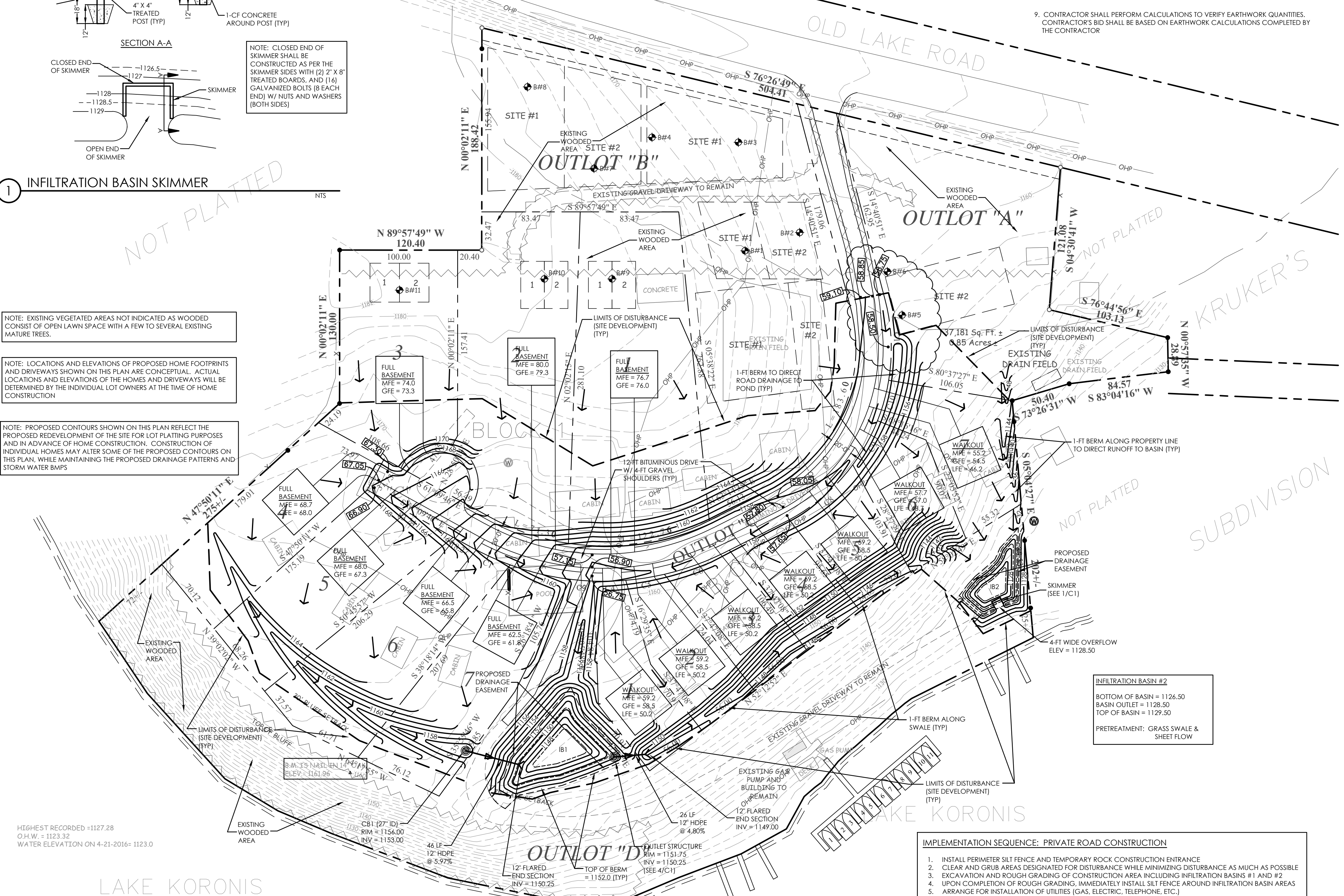
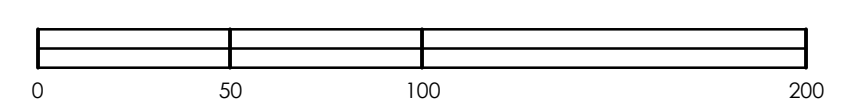
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- ONCE TURF ESTABLISHMENT REACHES 70%, REMOVE SILT FENCE

**GRADING PLAN**



CONSTRUCTION DRAWINGS -03/17/2017

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly licensed engineer under the laws of the state of Minnesota.

Brian C. Schultz, PE  
Date: 03/17/2017  
License No.: 43129

**SCHULTZ ENGINEERING & SITE DESIGN**

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Suite 230  
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schultzeng@live.com



NO.	DATE	DESCRIPTION	COUNTY COMMENTS
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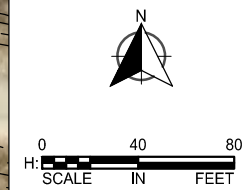
STONEGATE ON THE LAKE

PAYNESVILLE TOWNSHIP,  
STEARNS COUNTY, MN

PROJECT NUMBER: 16032  
SCALE: 1"=50'  
C2 OF 5

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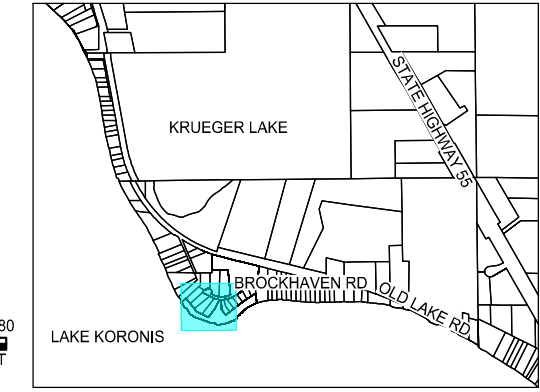
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**LEGEND**

- PROPERTY LINE
- EXISTING CONTOUR (MAJOR)
- EXISTING CONTOUR (MINOR)
- ERODING BLUFF AREA
- NORMAL WATER LEVEL
- EXISTING BERM CENTERLINE
- EXISTING SWALE CENTERLINE
- EXISTING DRAINAGE PIPE
- SURVEY EXTENTS
- FLOW DIRECTION

**LOCATION MAP**



SCALE: AS SHOWN  
 PLAN BY: AMN  
 DESIGN BY: ARA  
 CHECK BY: ARA

REVISIONS	
NO.	DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

AMY ANDERSON, P.E.  
 DATE: 11/25/2025 LIC. NO.: 50920

**FIGURE 2**

**STALOCH PROPERTIES - LAKE KORONIS  
 STONEGATE ON THE LAKE  
 HOMEOWNER'S ASSOCIATION**

C:\ACC\CDocs\WSB\031723-000\Project Files\05\_Discipline\Drainage\03\_Sheets\031723-000-C-FGR-BASE.dwg 11/25/2025 9:11:57 AM



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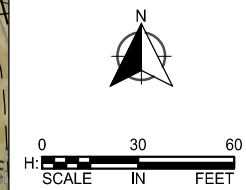
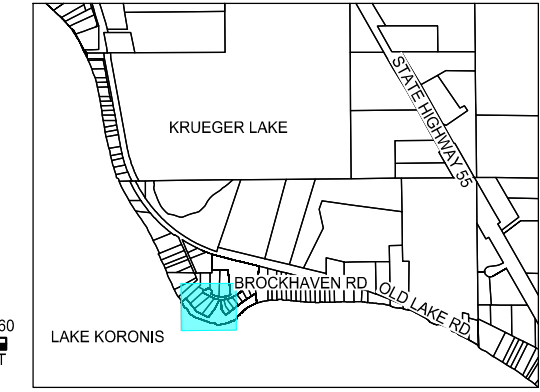
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HIGHEST RECORDED = 1127.28  
 O.H.W. = 1123.32  
 WATER ELEVATION ON 4-21-2016 = 1123.0

LAKE KORONIS

INFILTRATION BASIN #1  
 BOTTOM OF BASIN = 1147.25  
 BASIN OUTLET = 1150.25

LOCATION MAP



LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (MAJOR)
- EXISTING CONTOUR (MINOR)
- ERODING BLUFF AREA
- NORMAL WATER LEVEL
- EXISTING BERM CENTERLINE
- EXISTING SWALE CENTERLINE
- EXISTING DRAINAGE PIPE
- SURVEY EXTENTS
- FLOW DIRECTION

**wsb**

SCALE: AS SHOWN      DESIGN BY: ARA  
 PLAN BY: AMN      CHECK BY: ARA

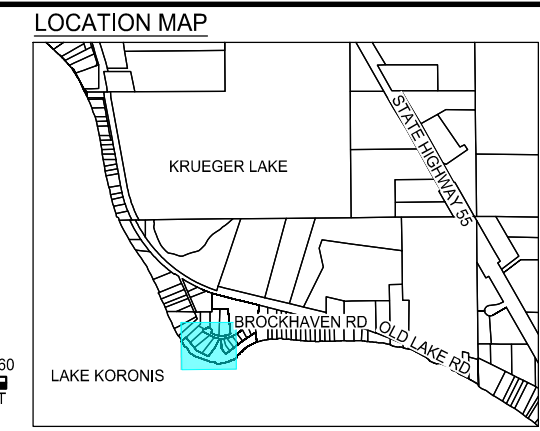
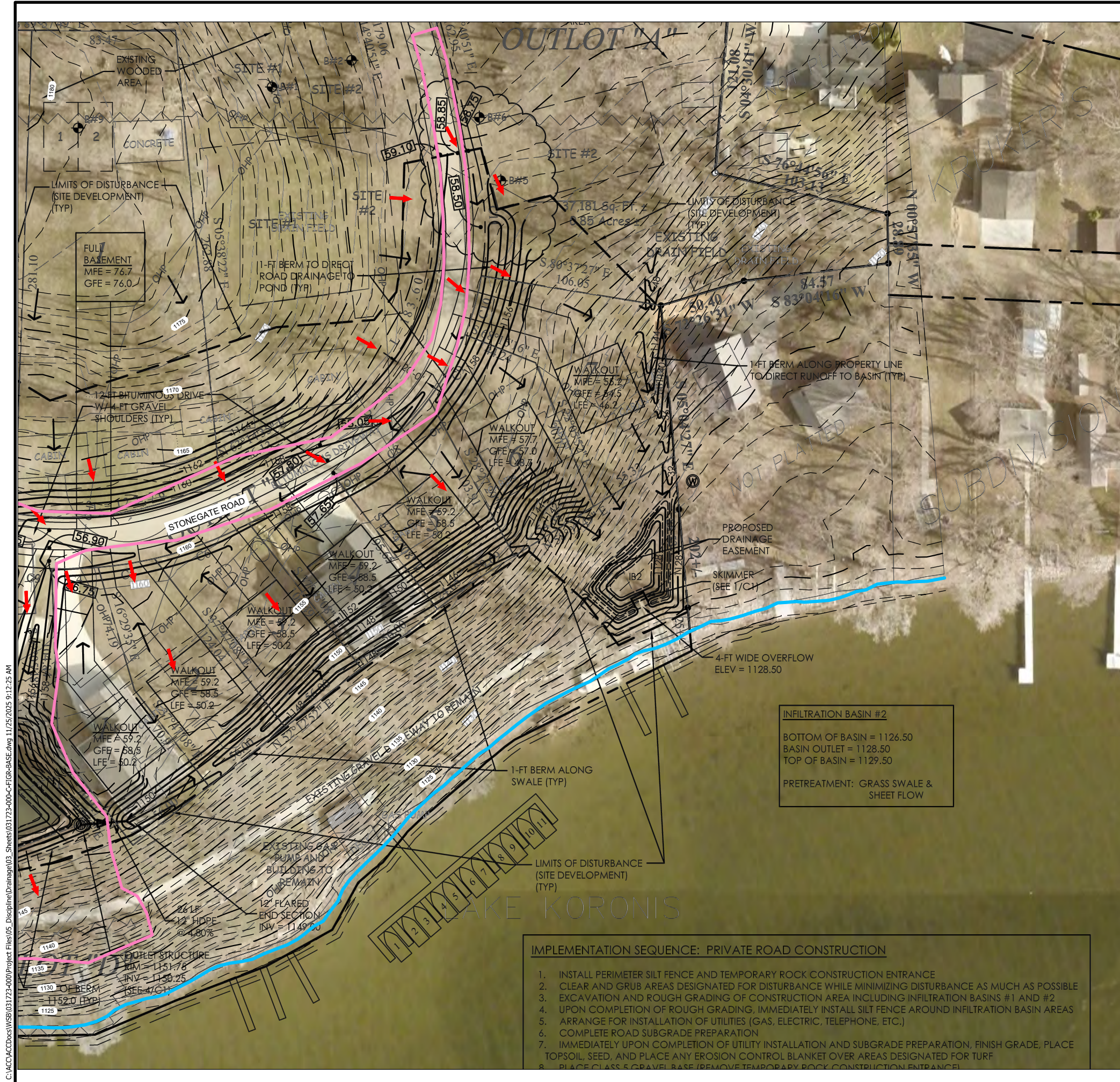
NO.	DATE	DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

AMY ANDERSON, P.E.      LIC. NO.: 50920  
 DATE: 11/25/2025

FIGURE 3

STALOCH PROPERTIES - LAKE KORONIS  
 STONEGATE ON THE LAKE  
 HOMEOWNER'S ASSOCIATION



**LEGEND**

- PROPERTY LINE
- - - 1015 - - - EXISTING CONTOUR (MAJOR)
- - - EXISTING CONTOUR (MINOR)
- ▭ ERODING BLUFF AREA
- NORMAL WATER LEVEL
- EXISTING BERM CENTERLINE
- EXISTING SWALE CENTERLINE
- EXISTING DRAINAGE PIPE
- ▭ SURVEY EXTENTS
- ➔ FLOW DIRECTION

**wsb**

SCALE: AS SHOWN      DESIGN BY: ARA  
 PLAN BY: AMN      CHECK BY: ARA

NO.	DATE	DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

AMY ANDERSON, P.E.      LIC. NO.: 50820  
 DATE: 11/25/2025

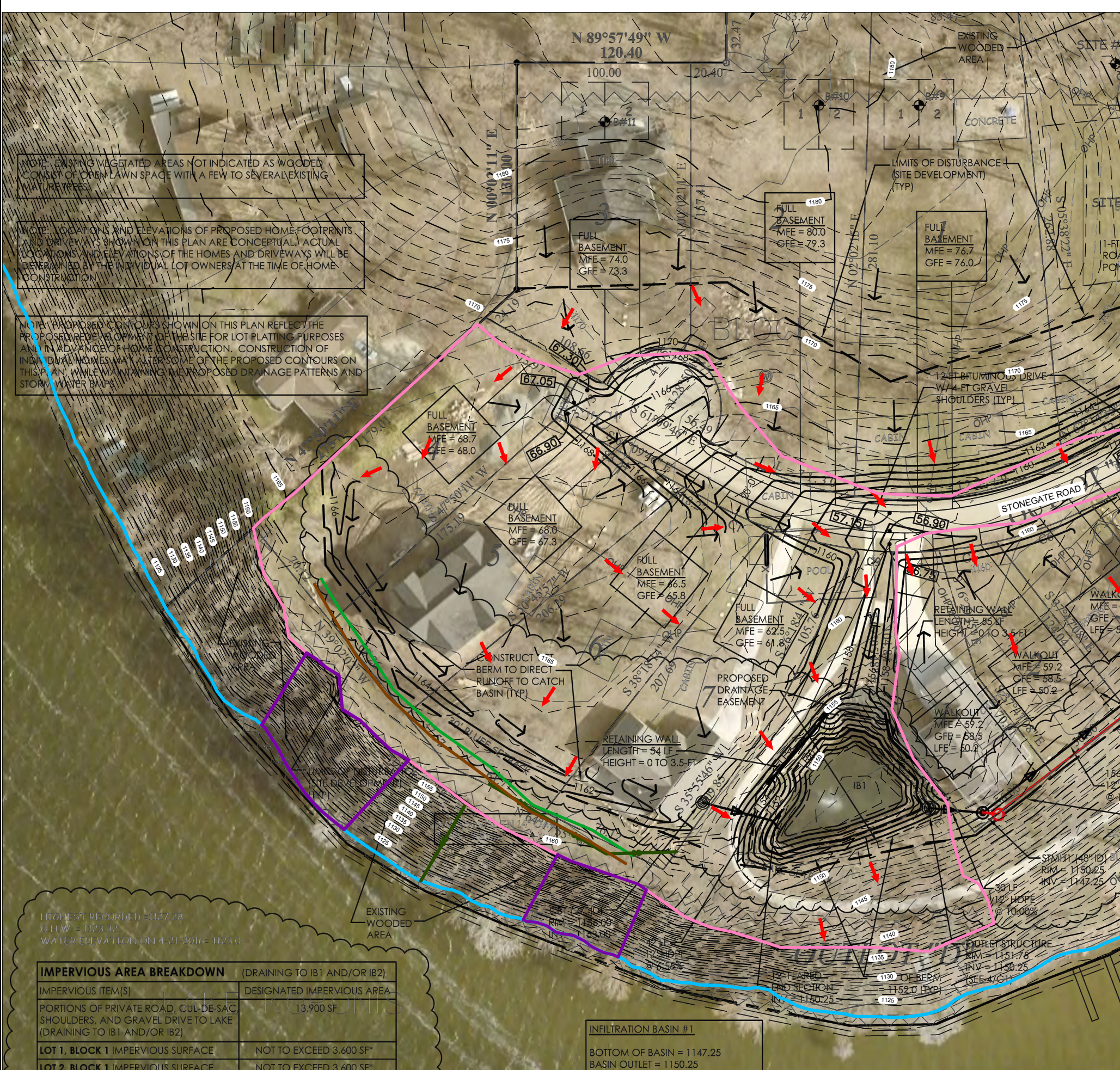
FIGURE 4

STALOCH PROPERTIES - LAKE KORONIS  
 STONEGATE ON THE LAKE  
 HOMEOWNER'S ASSOCIATION

- IMPLEMENTATION SEQUENCE: PRIVATE ROAD CONSTRUCTION**
1. INSTALL PERIMETER SILT FENCE AND TEMPORARY ROCK CONSTRUCTION ENTRANCE
  2. CLEAR AND GRUB AREAS DESIGNATED FOR DISTURBANCE WHILE MINIMIZING DISTURBANCE AS MUCH AS POSSIBLE
  3. EXCAVATION AND ROUGH GRADING OF CONSTRUCTION AREA INCLUDING INFILTRATION BASINS #1 AND #2
  4. UPON COMPLETION OF ROUGH GRADING, IMMEDIATELY INSTALL SILT FENCE AROUND INFILTRATION BASIN AREAS
  5. ARRANGE FOR INSTALLATION OF UTILITIES (GAS, ELECTRIC, TELEPHONE, ETC.)
  6. COMPLETE ROAD SUBGRADE PREPARATION
  7. IMMEDIATELY UPON COMPLETION OF UTILITY INSTALLATION AND SUBGRADE PREPARATION, FINISH GRADE, PLACE TOPSOIL, SEED, AND PLACE ANY EROSION CONTROL BLANKET OVER AREAS DESIGNATED FOR TURF
  8. PLACE CLASS 5 GRAVEL BASE (REMOVE TEMPORARY ROCK CONSTRUCTION ENTRANCE)

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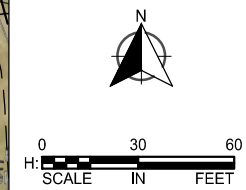
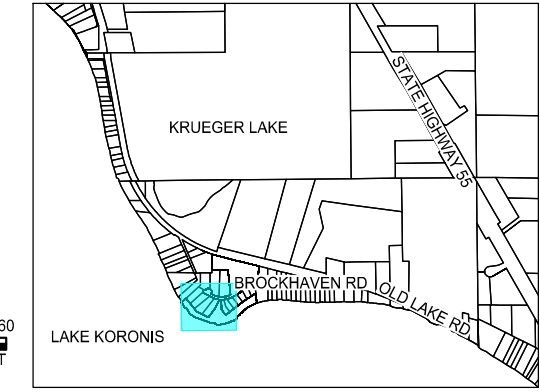


HIGHEST RECORDED = 1127.28  
 O.H.W. = 1123.32  
 WATER ELEVATION ON 4-21-2016 = 1123.0

IMPERVIOUS AREA BREAKDOWN (DRAINING TO IB1 AND/OR IB2)	
IMPERVIOUS ITEM(S)	DESIGNATED IMPERVIOUS AREA
PORTIONS OF PRIVATE ROAD, CUL-DE-SAC SHOULDERS, AND GRAVEL DRIVE TO LAKE (DRAINING TO IB1 AND/OR IB2)	13,900 SF
LOT 1, BLOCK 1 IMPERVIOUS SURFACE	NOT TO EXCEED 3,600 SF*
LOT 2, BLOCK 1 IMPERVIOUS SURFACE	NOT TO EXCEED 3,600 SF*

**INFILTRATION BASIN #1**  
 BOTTOM OF BASIN = 1147.25  
 BASIN OUTLET = 1150.25

**LOCATION MAP**



**LEGEND**

- PROPERTY LINE
- EXISTING CONTOUR (MAJOR)
- EXISTING CONTOUR (MINOR)
- ERODING BLUFF AREA
- NORMAL WATER LEVEL
- EXISTING BERM CENTERLINE
- EXISTING SWALE CENTERLINE
- EXISTING DRAINAGE PIPE
- SURVEY EXTENTS
- FLOW DIRECTION

SCALE: AS SHOWN  
 PLAN BY: AMN  
 DESIGN BY: ARA  
 CHECK BY: ARA

REVISIONS	
NO.	DESCRIPTION

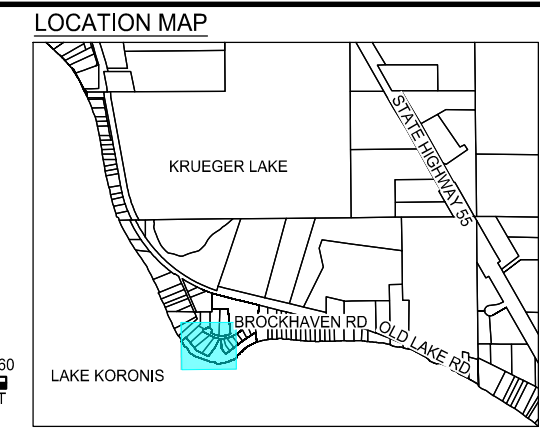
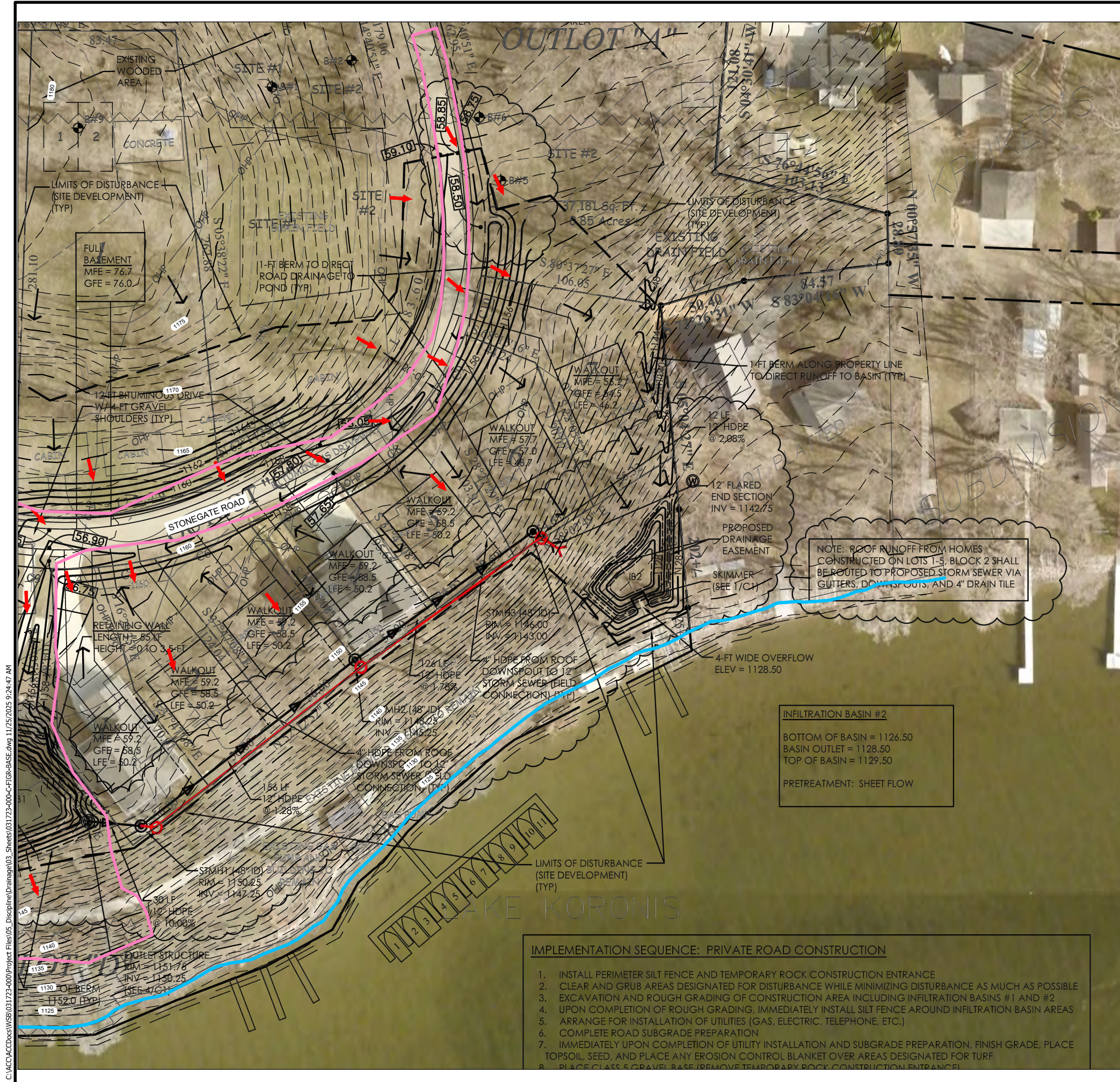
I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

AMY ANDERSON, P.E.  
 LIC. NO.: 50920  
 DATE: 11/25/2025

**FIGURE 5**

**STALOCH PROPERTIES - LAKE KORONIS  
 STONEGATE ON THE LAKE  
 HOMEOWNER'S ASSOCIATION**

WSB PROJECT NO.  
 031723-000



**LEGEND**

	PROPERTY LINE
	EXISTING CONTOUR (MAJOR)
	EXISTING CONTOUR (MINOR)
	ERODING BLUFF AREA
	NORMAL WATER LEVEL
	EXISTING BERM CENTERLINE
	EXISTING SWALE CENTERLINE
	EXISTING DRAINAGE PIPE
	SURVEY EXTENTS
	FLOW DIRECTION

SCALE: AS SHOWN  
 PLAN BY: AMN  
 DESIGN BY: ARA  
 CHECK BY: ARA

**REVISIONS**

NO.	DATE	DESCRIPTION

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AMY ANDERSON, P.E.  
 LIC. NO.: 50920  
 DATE: 11/25/2025

FIGURE 6

STALOCH PROPERTIES - LAKE KORONIS  
 STONEGATE ON THE LAKE  
 HOMEOWNER'S ASSOCIATION

- IMPLEMENTATION SEQUENCE: PRIVATE ROAD CONSTRUCTION**
1. INSTALL PERIMETER SILT FENCE AND TEMPORARY ROCK CONSTRUCTION ENTRANCE
  2. CLEAR AND GRUB AREAS DESIGNATED FOR DISTURBANCE WHILE MINIMIZING DISTURBANCE AS MUCH AS POSSIBLE
  3. EXCAVATION AND ROUGH GRADING OF CONSTRUCTION AREA INCLUDING INFILTRATION BASINS #1 AND #2
  4. UPON COMPLETION OF ROUGH GRADING, IMMEDIATELY INSTALL SILT FENCE AROUND INFILTRATION BASIN AREAS
  5. ARRANGE FOR INSTALLATION OF UTILITIES (GAS, ELECTRIC, TELEPHONE, ETC.)
  6. COMPLETE ROAD SUBGRADE PREPARATION
  7. IMMEDIATELY UPON COMPLETION OF UTILITY INSTALLATION AND SUBGRADE PREPARATION, FINISH GRADE, PLACE TOPSOIL, SEED, AND PLACE ANY EROSION CONTROL BLANKET OVER AREAS DESIGNATED FOR TURF
  8. PLACE CLASS 5 GRAVEL BASE (REMOVE TEMPORARY ROCK CONSTRUCTION ENTRANCE)

## **APPENDIX A**

### 2025 Site Photos



Photo-1

Photo Coordinates: 188,040.30E  
36,911.04N



Photo-2

Photo Coordinates: 188,229.15E  
36,609.66N



Photo-3

Photo Coordinates: 188,215.12E  
36,590.44N



Photo-4

Photo Coordinates: 188,215.12E  
36,590.44N

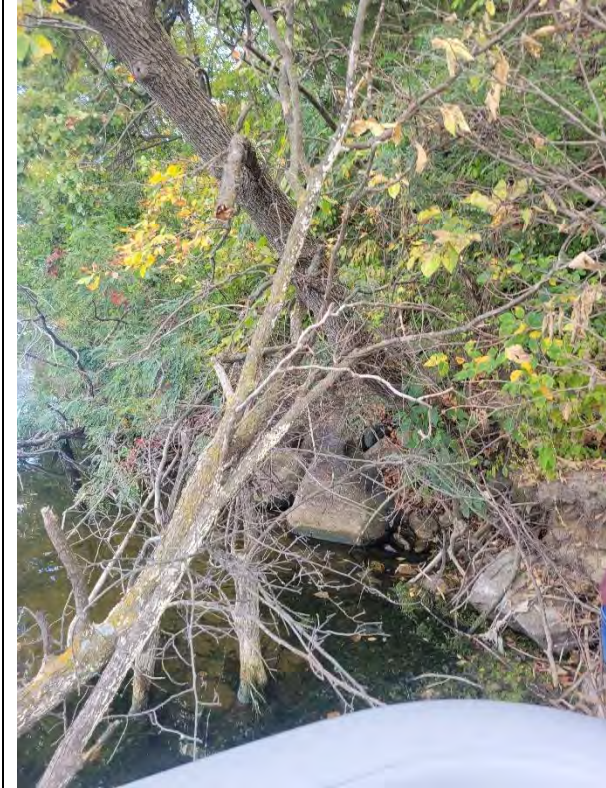


Photo-5

Photo Coordinates: 188,215.12E  
36,590.44N



Photo-6

Photo Coordinates: 188,215.12E  
36,586.50N



Photo-7

Photo Coordinates: 188,211.30E  
36,570.03N



Photo-8

Photo Coordinates: 188,230.93E  
36,556.78N



Photo-9

Photo Coordinates: 188,238.34E  
36,546.72N



Photo-10

Photo Coordinates: 188,248.21E  
36,577.09N



Photo-11

Photo Coordinates: 188,252.38E  
36,596.26N



Photo-12

Photo Coordinates: 188,260.17E  
36,577.47N



Photo-13

Photo Coordinates: 188,260.17E  
36,577.47N



Photo-14

Photo Coordinates: 188,262.63E  
36,560.95N



Photo-15

Photo Coordinates: 188,262.82E  
36,551.08N



Photo-16

Photo Coordinates: 188,283.32E  
36,541.59N



Photo-17

Photo Coordinates: 188,312.37E  
36,626.63N



Photo-18

Photo Coordinates: 188,318.82E  
36,625.12N



Photo-19  
Photo Coordinates: 188,300.98E  
36,577.66N



Photo-20  
Photo Coordinates: 188,300.98E  
36,577.66N



Photo-21  
Photo Coordinates: 188,300.98E  
36,577.66N



Photo-22

Photo Coordinates: 188,300.98E  
36,577.66N



Photo-23

Photo Coordinates: 188,300.98E  
36,577.66N



Photo-24

Photo Coordinates: 188,299.84E  
36,563.23N



Photo-25

Photo Coordinates: 188,299.84E  
36,563.23N



Photo-26

Photo Coordinates: 188,315.97E  
36,552.79N



Photo-27

Photo Coordinates: 188,341.41E  
36,599.30N



Photo-28

Photo Coordinates: 188,341.41E  
36,599.30N



Photo-29

Photo Coordinates: 188,343.50E  
36,525.27N



Photo-30

Photo Coordinates: 188,343.50E  
36,525.27N



Photo-31

Photo Coordinates: 188,343.50E  
36,525.27N



Photo-32

Photo Coordinates: 188,343.50E  
36,525.27N



Photo-33

Photo Coordinates: 188,375.58E  
36,588.86N



Photo-34

Photo Coordinates: 188,412.60E  
36,618.28N



Photo-35

Photo Coordinates: 188,412.60E  
36,618.28N



Photo-36

Photo Coordinates: 188,429.49E  
36,614.11N

## Memorandum

To: Stonegate on the Lake HOA

From: Amy Anderson, PE, CFM, WSB  
Luke Lunde, PSS, CPSS, CPSC, WSB

Date: April 1, 2026

Re: Lot Assessment Summary and Recommendations  
WSB Project No. 031723-000

---

### Project Background

Stonegate on the Lake HOA selected WSB to provide a proposal for the assessment, design, and stabilization of unstable shoreline and bluff slopes within Stonegate on the Lake subdivision. The HOA has requested that WSB prepare a summary and recommendation report assessing existing conditions and solutions for the remaining lots on Stonegate on the Lake Subdivision. This memo serves as the deliverable for this task.

### History of Bluff Impacts

There are currently two houses above the eroding bluff, adjacent to Block 1 Lots 5 and 7. The bluff within the subdivision is approximately 30 feet tall and 300 feet long. There is an actively eroding section of the bluff adjacent to Block 1 Lots 4, 5, and 6 and is approximately 170 feet long. Residents say that a large section of this bluff sloughed away in June 2024, and another section sloughed away in August 2024. Conveyance of surface water runoff and subsurface infiltration within adjacent lots potentially attributed to bluff sloughing (Figure 3). Surface water runoff directions per WSB's topographic survey are included in Figure 1 and 3 of the report. In 2024, existing BMPs were constructed in cooperation with Stearns County SWCD which included a drainage swale and an existing berm at the top of the bluff to prevent future surface water runoff from adjacent residential lots flowing over the bluff.

In order to understand the effects of precipitation on the bluff erosion, WSB downloaded the daily rainfall data from the CoCoRaHS station #MN-SR-24, a rain gage 2.2 miles away from the site near Paynesville MN that would represent daily rainfall at the site. WSB downloaded the rainfall data for the growing season (April to October) for 2024 and 2025 and summed the daily rainfall data to create monthly totals. Table 1 shows a summary of the monthly precipitation data. Figure 2 shows a plot of the monthly precipitation data.

<b>Table 1 - Monthly Precipitation Data (Station #MN-SR-42)</b>		
<b>Month</b>	<b>2024 Rainfall (in)</b>	<b>2025 Rainfall (in)</b>
April	4.74	2.19
May	5.08	3.69
June	5.69	9.00
July	5.6	7.13
August	6.98	3.30
September	0.22	3.54
October	0.52	1.54
<b>Total Rainfall (in)</b>	<b>28.83</b>	<b>30.39</b>

Stonegate on the Lake residents told WSB staff that the first slough happened in June 2024. The month of June 2024 had 5.69 inches of rainfall, of which 2.52 inches fell on June 3 and 2.03 inches fell between June 16 - 23. The second slough happened in August of 2024. The month of August 2024 had 6.98 inches of total rainfall, of which 2.9 inches fell between August 4 – 6.

In response to the bluff erosion, in September 2024 the HOA hired a contractor to regrade the existing swale and raise the berm. The HOA is reducing mowing of the swale to encourage native vegetation to establish. There were no additional sloughing or bluff erosion events recorded by residents in 2025, despite the fact that 2025 was overall a higher precipitation year than 2024 (30.39 inches total rainfall in 2025 versus 28.83 inches in 2024). 2025 also had several events that were larger than the rainfall events in the months where sloughing occurred; June 12 – 15, 2025 recorded 3.05 inches of rainfall, June 26 – 27 recorded 3.52 inches of rainfall and July 28 – 29 recorded 2.91 inches of rainfall. None of these events lead to significant erosion on the bluff, suggesting that the regraded swale and berm may be helping to prevent surface runoff from traveling over the bluff and causing erosion.

WSB also evaluated current impervious surface and proposed impervious surface with Block 1 and Block 2. WSB's review of existing conditions and proposed per the original design plans resulted in specified limit for impervious surfaces on each lot of 3,600 square feet. WSB was provided building permits by Stearns County for Lots 3, 5, and 7 of Block 1 and Lots 1 and 4 of Block 2, which included the submitted impervious coverage for each lot. The building permits showed that the developed parcels have proposed impervious less than the specified limit of 3,600 square feet. It is imperative to maintain this limit for future lot construction.

Block #	Lot #	Submitted Impervious (sq ft)	Planned Impervious (sq ft)
1	1	--	3600
	2	--	3600
	3	3420	3600
	4	--	3600
	5	3460	3600
	6	--	3600
	7	3481	3600
2	1	3585	3600
	2	--	3600
	3	--	3600
	4	3155	3600
	5	--	3600
	6	--	3600
	7	--	3600

**Geotechnical Investigation**

Soil borings were taken by WSB on February 12<sup>th</sup>. Five borings were taken, as shown on the map in the attached geotechnical report. Table 3 shows a summary of the soil boring results.

All borings encountered around 1' of clayey topsoils. Two borings, B-1 and B-5, had constructed fill present beneath the topsoils which were mostly clayey sands and lean clays. Beneath the topsoils and fill material, all borings encountered and terminated in glacial soils. The glacial soils consisted of clayey sands, silty sands, sands, and silts. Planned soil boring depths were 30', however, all borings encountered obstructions prior to reaching the planned boring depth. Boring B-3 had a refusal depth of 12', while all other borings were refused at a 25' depth. It is believed that the boring obstructions were gravel, cobbles, or boulders. Groundwater was not encountered in any of the soil borings, though most soils were classified as moist to wet. Given the proximity to Lake Koronis, the groundwater elevation is likely similar to the normal water level of the lake. Borings B-1 and B-5 are the only two that yielded constructed fill material, the remaining borings appear to be parent material.

Boring Number	Planned Boring Depth (ft)	Depth to refusal (ft)	Approximate Depth of Fill (ft)
B-1	30	25	4

B-2	30	25	N/A
B-3	30	12	N/A
B-4	30	25	N/A
B-5	30	25	6.5

## Summary and Recommendations

As a result of WSB's lot assessment we have included recommendations in this report to help prevent future drainage issues and concerns. WSB will work with Stonegate Lake HOA, the developer and Stearns County SWCD staff to implement the following items which will improve surface water drainage within the subdivision.

1. Install a roadway drainage ditch per the original project design. This will move runoff from Stonegate Road and Block 1 Lots 1, 2, and 3 towards Pond IB1 and reduce runoff moving toward Block 1 Lots 4 – 7. Lots 4 – 7 will likely require driveway culverts to facilitate flow underneath existing driveways.
2. Install a drainage swale to Pond IB1 per the original project design or replace it with a catch basin and pipe to IB 1. This will collect water from the roadway drainage ditch mentioned in recommendation 1 and route it to Pond IB1.
3. Homeowners should consult with Stearns County SWCD on additional drainage solutions. This can include native plantings, rain gardens, rain barrels, rerouting downspouts, pervious pavements for driveways and patios, and other methods which will promote proper drainage on individual lots.
4. The Stonegate Lake HOA can also consider drainage requirements for new construction on remaining lots in Block 1 on Lots 1, 2, 4 and 6. For example, new builds can plan for permeable driveways or patios in order to reduce their impervious surfaces and minimize runoff generated.
5. The developer can continue to enforce planned limits on impervious surfaces on undeveloped lots. Table 2 shows a breakdown of estimated impervious surfaces on lots in Block 1 versus the plan.
6. Selection and implementation of Best Management Plan option included in WSB's October 31, 2025, Submittal to Stonegate on the Lake HOA.
7. The HOA can hire a contractor to manage native vegetation on the berm and monitor for invasive species. The contractor can also perform maintenance activities such as mowing, spot spraying of invasives, and inspections.

## Attachments

### Appendix A - Figures

Figure 1 – WSB Existing Conditions Survey

Figure 2 – WSB 2024-2025 Precipitation Summary

Figure 3 – WSB Topographic Survey

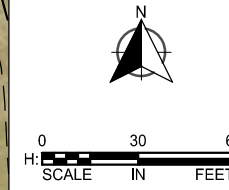
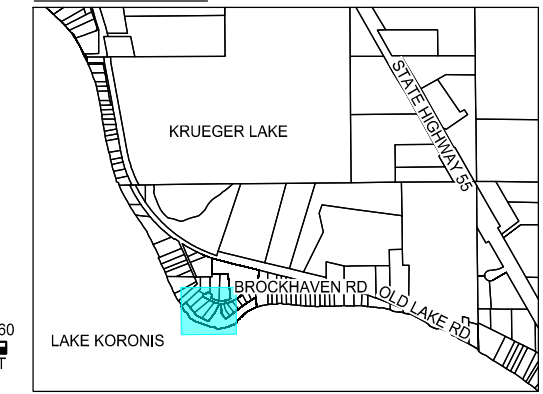
### Appendix B – Geotechnical Report

## **Appendix A - Figures**

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LOCATION MAP



LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (MAJOR)
- EXISTING CONTOUR (MINOR)
- ERODING BLUFF AREA
- NORMAL WATER LEVEL
- EXISTING BERM CENTERLINE
- EXISTING SWALE CENTERLINE
- EXISTING DRAINAGE PIPE
- SURVEY EXTENTS
- SURVEY SHOTS

SCALE: AS SHOWN  
 PLAN BY: AMN  
 DESIGN BY: ARA  
 CHECK BY: ARA

REVISIONS

NO.	DATE	DESCRIPTION

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AMY ANDERSON, P.E.

DATE: 2/2/2026 LIC. NO.: 50820

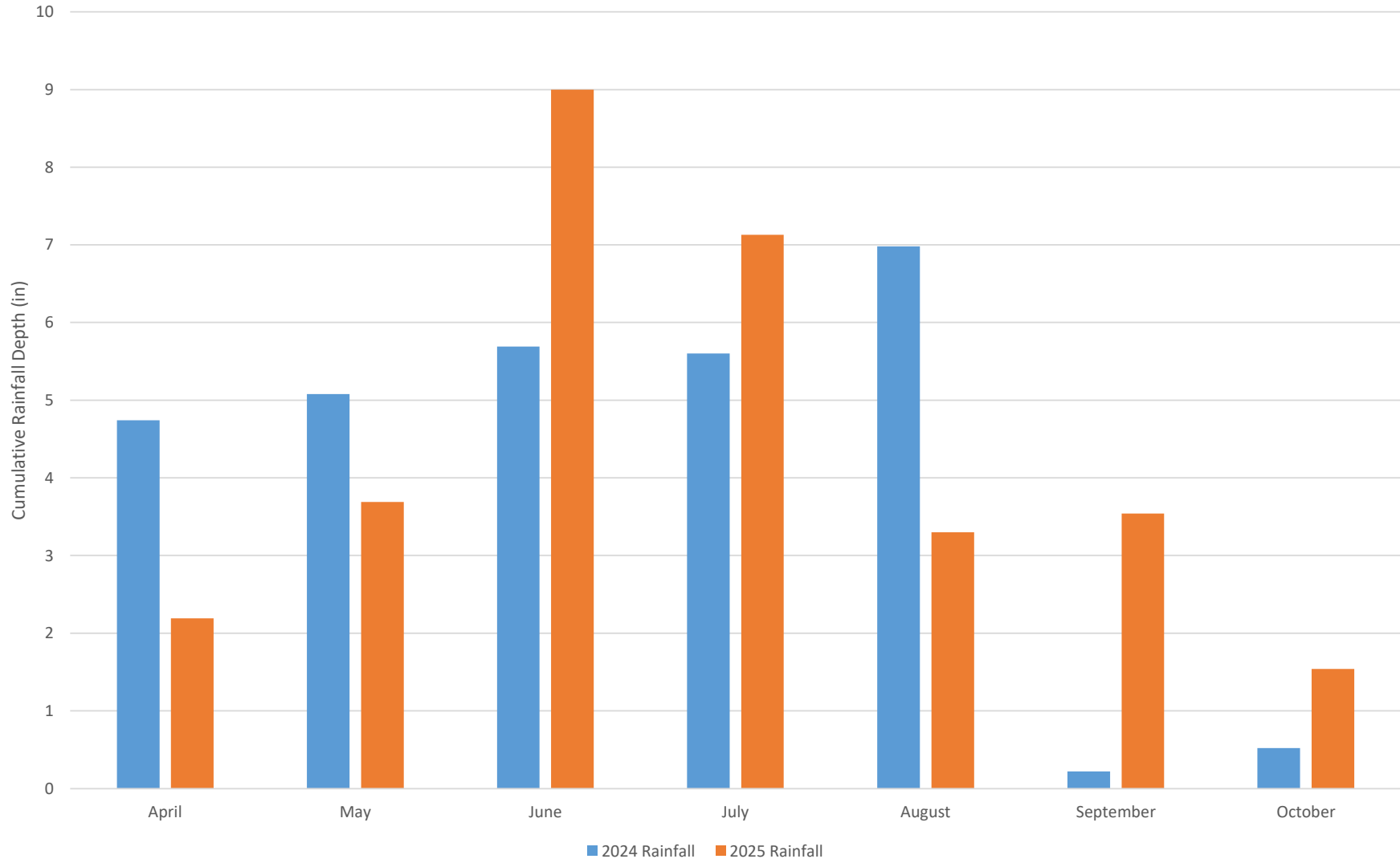
FIGURE 1

STALOCH PROPERTIES - LAKE KORONIS  
 STONEGATE ON THE LAKE  
 HOMEOWNER'S ASSOCIATION

WSB PROJECT NO.  
 031723-000

SHEET  
 1 OF

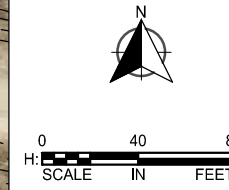
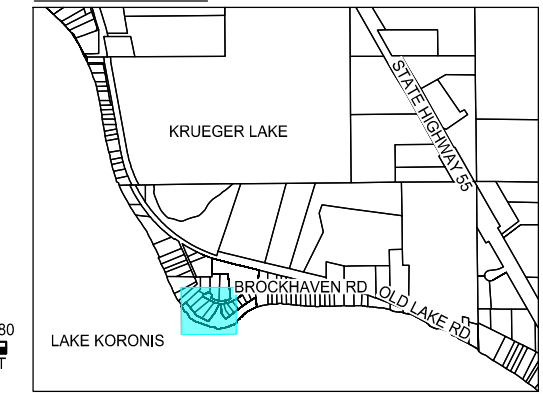
Figure 2 - 2024 and 2025 Total Precipitation by Month CoCoRAS Station #MN-SR-42



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LOCATION MAP



LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (MAJOR)
- EXISTING CONTOUR (MINOR)
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AMY ANDERSON, P.E.

DATE: 2/2/2026 LIC. NO.: 50820

FIGURE 3

STALOCH PROPERTIES - LAKE KORONIS  
 STONEGATE ON THE LAKE  
 HOMEOWNER'S ASSOCIATION

WSB PROJECT NO.  
 031723-000

SHEET  
 2 OF

## **Appendix B - Geotechnical Report**

## Technical Memorandum

To: Amy Anderson, PE  
Project Manager  
WSB

From: Mark Osborn, PE  
Director of Geotechnical Engineering  
WSB

Date: March 26, 2026

Re: Lake Koronis Slope Erosion  
14835 Old Lake Road  
Paynesville, MN 56362  
WSB Project No. 031723-000

---

### **1. Background**

The geotechnical department at WSB was contacted to perform a subsurface soil investigation utilizing Standard Penetration Test (SPT) borings at the address listed above. It was recommended for WSB to drill 5 SPT borings to depths of about 30 feet each.

### **2. Soil Boring Results**

All of our borings initially encountered about 11 to 12 inches of topsoil consisting of dark brown clayey soils (clayey sand, lean clay and sandy lean clay).

Borings B-1 and B-5 encountered fill beneath the topsoil. The fill materials consisted of dark brown, moist clayey sands and lean clays that were 4 – 6 ½ feet in thickness.

Beneath the topsoil or fill materials, the borings encountered and terminated in glacial soils. The glacial deposits consisted of clayey sands, silty sands, sands, and silts. The clayey sands were light brown, brown, and grayish brown in color and were moist to wet. The silty sands were light brown in color and were moist. The sands were brown in color and were moist. The silts were light brown in color and were moist. The SPT tests (N-values) performed in the glacial soils generally indicate increasing soil strength characteristics with depth.

Borings B-1, B-2, B-4, and B-5 encountered an obstruction at a depth of about 25 feet, and Boring B-3 encountered an obstruction at a depth of about 12 feet. These depths ranged from elevations of about 1152 feet to 1137 feet. These borings were terminated at these respective depths due to auger refusal. Auger refusal occurs when the auger can no longer advance with the soil drilling technique being used, primarily due to boulders, bedrock, or other foreign debris. The Minnesota Well Index noted gravels and boulders within the subgrade soils. Based on review of the online application of Minnesota Geological Survey – Open Data Site and the Minnesota Well Index, the top of bedrock in this area is well over 100 feet below the ground surface, as such it is our opinion that auger refusal occurred because of the presence of gravel, cobbles or boulders.

A static ground water was not observed in our borings. Based on the observed and tested moisture contents of the soils, it our opinion that a static ground water table is below the depths explored by our borings. At this site we anticipate the ground water level will be near that of Lake Koronis.

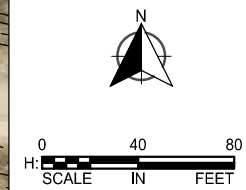
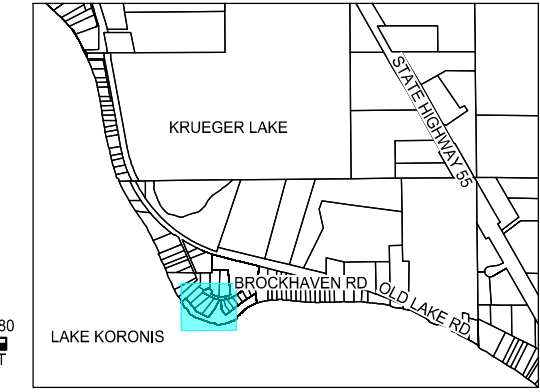
Based on information provided by our water resources group the normal water level for Lake Koronis is near an elevation 1124 feet.

The WSB Laboratory performed moisture content, percentage of fines (200 Wash), dry density, and Atterberg Limit testing on several samples that were recovered from drilling operations. The results from these tests are noted on the boring logs.

**3. Standard of Care**

The soil sampling and testing performed for this project have been performed with the level of skill and diligence ordinarily exercised by reputable members of the same profession under similar circumstances, at the same time and in the same or a similar locale. No warranty, either expressed or implied, is made.

LOCATION MAP



LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (MAJOR)
- EXISTING CONTOUR (MINOR)
- ERODING BLUFF AREA
- NORMAL WATER LEVEL
- EXISTING BERM CENTERLINE
- EXISTING SWALE CENTERLINE
- EXISTING DRAINAGE PIPE
- SURVEY EXTENTS
- FLOW DIRECTION
- Proposed boring location

NO.	DATE	DESCRIPTION

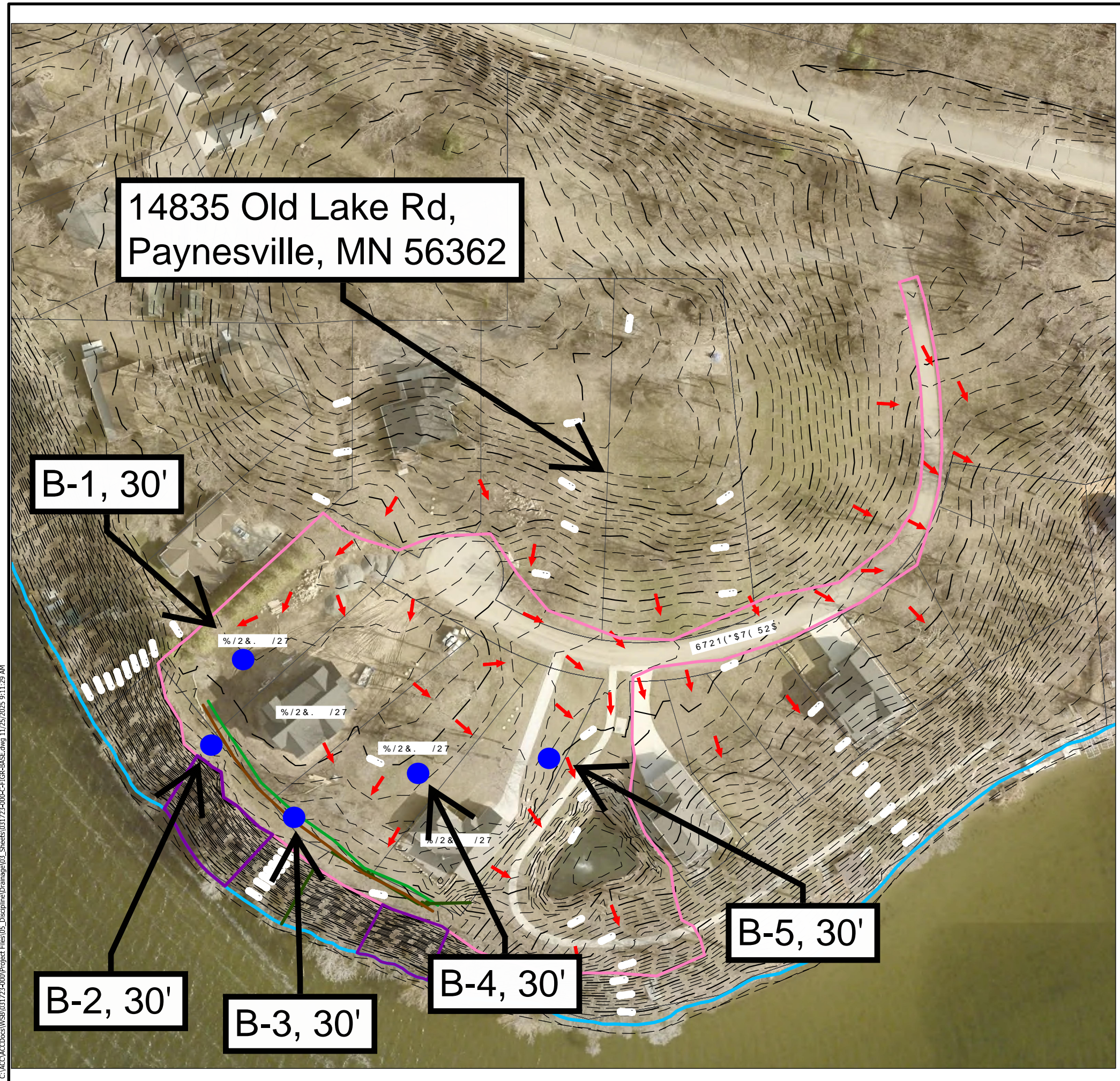
I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

AMY ANDERSON, P.E.  
 LIC. NO.: 50920  
 DATE: 11/25/2025

FIGURE 2

STALOCH PROPERTIES - LAKE KORONIS  
 STONEGATE ON THE LAKE  
 HOMEOWNER'S ASSOCIATION

C:\ACCDocs\WSB\031723-000\Project Files\05\_Discipline\Drainage\03\_Sheets\031723-000-C-FIGR-BASE.dwg 11/25/2025 9:11:29 AM



# LOG OF TEST BORING

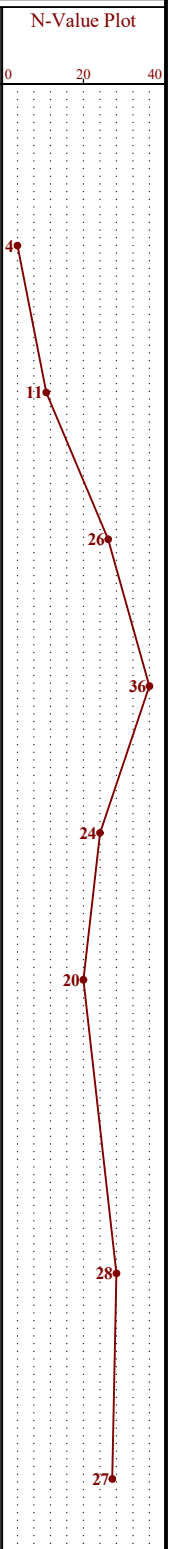


PROJECT NAME: Staloch Properties - Lake Koronis    PROJECT LOCATION: Paynesville, MN  
 CLIENT/WSB #: 031723-000    SURFACE ELEVATION: 1166 ft

**BORING NUMBER B-1**  
 PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	WL	Drilling Operation	SAMPLE		N	MC %	%Fines	N-Value Plot	
							TYPE	No.					
1	1165	12"+ TOPSOIL: Clayey Sand, slightly organic, dark brown, moist	OL	Topsoil			AU	1					
2	1164	CLAYEY SAND WITH LITTLE GRAVEL, brown and dark brown, moist	Fill	Fill			SB	2	4				
3	1163												
4	1162	CLAYEY SAND, fine to medium grained, brown, moist, medium dense	SC	Glacial Till			HSA						
5	1161												
6	1160												
7	1159												
8	1158	CLAYEY SAND WITH LITTLE GRAVEL, fine to medium grained, brown, moist, medium dense to dense	SC				SB	4	26				
9	1157												
10	1156												
11	1155	- [LL = 20, PI = 10]					SB	5	36	9			
12	1154	SILTY SAND WITH CLAY, fine to medium grained, light brown, moist, medium dense	SM				HSA						
13	1153												
14	1152	SILTY SAND, fine grained, light brown, moist, medium dense	SM				HSA						
15	1151												
16	1150												
17	1149	CLAYEY SAND, fine to coarse grained, brown with reddish brown, moist, medium dense	SC				HSA						
18	1148												
19	1147												
20	1146												
21	1145	- [Lens of Sand between 19.5 and 21 feet]					SB	8	28	8			
22	1144	CLAYEY SAND WITH GRAVEL, fine to coarse grained, grayish brown with reddish brown, moist, medium dense	SC				HSA						
23	1143												
24	1142									SB	9	27	8
25	1141	- [Auger refusal at 25 feet]					HSA						

End of Boring 25.0 ft.



**WATER LEVEL MEASUREMENTS**

START: 2/12/2026

END: 2/12/2026

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:		Logged By:	
								J. Alme		A. Wacek	
2/12/2026	12:30 pm	24.5	25	14	None		3.25" HSA 0' - 25'	Notes:			

GEO-TECHNICAL-N-PL-01 - WSB-GDT - 3/13/26 11:09 - M:\031723-000\GEO\TECH-CM\T\GEO\TECH-LAKE KORONIS - BORING LOG.GPJ

# LOG OF TEST BORING



PROJECT NAME: Staloch Properties - Lake Koronis    PROJECT LOCATION: Paynesville, MN  
 CLIENT/WSB #: 031723-000    SURFACE ELEVATION: 1164.5 ft

**BORING NUMBER B-2**  
 PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	WL	Drilling Operation	SAMPLE		N	MC %	%Fines	N-Value Plot				
							TYPE	No.				0	21.5	43		
1	1164	11" TOPSOIL: Sandy Lean Clay, slightly organic, dark brown, moist	OL	Topsoil			AU	1								
2	1163	CLAYEY SAND, fine to medium grained, brown, wet, very loose	SC	Glacial Till			SB	2	4							
3	1162															
4	1161	CLAYEY SAND WITH LITTLE GRAVEL, fine to medium grained, brown with light brown, moist, loose [Wet Density = 108.3 pcf]	SC				HSA									
5	1160															
6	1159	CLAYEY SAND WITH LITTLE GRAVEL, fine to medium grained, brown, moist, medium dense [LL = 23, PI = 14]	SC				SB	3	7	14	42					
7	1158															
8	1157	CLAYEY SAND WITH LITTLE GRAVEL, fine to medium grained, brown, moist, medium dense [LL = 23, PI = 14]	SC				SB	4	17	11						
9	1156															
10	1155	SANDY SILT WITH GRAVEL, light brown with reddish brown, moist, dense - [Lens of Clayey Sand between 12.5 and 13.5 feet]	ML				SB	5	16							
11	1154															
12	1153	CLAYEY SAND, fine to medium grained, brown with light brown, moist, medium dense - [Lens of Sand between 14.5 and 16 feet]	SC				HSA									
13	1152															
14	1151	CLAYEY SAND, fine to medium grained, brown with light brown, moist, medium dense - [Lens of Sand between 14.5 and 16 feet]	SC				SB	6	35	7	64					
15	1150															
16	1149	CLAYEY SAND WITH LITTLE GRAVEL, fine to coarse grained, grayish brown with reddish brown, moist, medium dense	SC				HSA									
17	1148															
18	1147	CLAYEY SAND WITH LITTLE GRAVEL, fine to coarse grained, grayish brown with reddish brown, moist, medium dense	SC				SB	7	29	7						
19	1146															
20	1145	CLAYEY SAND WITH GRAVEL, fine to coarse grained, grayish brown with reddish brown, moist, dense	SC				HSA									
21	1144															
22	1143	CLAYEY SAND WITH GRAVEL, fine to coarse grained, grayish brown with reddish brown, moist, dense	SC				SB	8	26	8						
23	1142															
24	1141	- [Auger refusal at 25 feet]					HSA									
25	1140															

GEO-TECHNICAL-N-PL-0T - WSB-GDT - 3/13/26 11:09 - M:\031723-000\GEO\TECH-CM\T\GEO\TECH\LAKE KORONIS - BORING LOG.GPJ

**WATER LEVEL MEASUREMENTS**

START: 2/12/2026							END: 2/12/2026			
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:	
2/12/2026	10:00 am	24.5	25	15	None		3.25" HSA 0' - 25'	J. Alme	A. Wacek	
							Notes:			

# LOG OF TEST BORING



PROJECT NAME: Staloch Properties - Lake Koronis    PROJECT LOCATION: Paynesville, MN  
 CLIENT/WSB #: 031723-000    SURFACE ELEVATION: 1163.5 ft

**BORING NUMBER B-3**  
 PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	WL	Drilling Operation	SAMPLE		N	MC %	%Fines	N-Value Plot		
							TYPE	No.				0	26.5	53
		11" TOPSOIL: Lean Clay, slightly organic, dark brown, wet	OL	Topsoil										
1	1163	CLAYEY SAND, fine to coarse grained, brown, moist, medium dense	SC	Glacial Till			AU	1						
2	1162													
3	1161	CLAYEY SAND WITH LITTLE GRAVEL, fine to coarse grained, brown, moist, medium dense	SC				SB	2	11	9				
4	1160													
5	1159	CLAYEY SAND WITH GRAVEL, fine to medium grained, brown with reddish brown, moist, dense	SC				SB	3	12	11	32			
6	1158													
7	1157	CLAYEY SAND WITH GRAVEL, fine to medium grained, brown with reddish brown, moist, dense	SC				SB	4	49	13				
8	1156													
9	1155	CLAYEY SAND WITH GRAVEL, fine to medium grained, brown with reddish brown, moist, medium dense	SC				SB	5	24	10				
10	1154													
11	1153	- [Auger refusal at 12 feet]					HSA							
12	1152													

End of Boring 12.0 ft.

**WATER LEVEL MEASUREMENTS**

START: 2/13/2026

END: 2/13/2026

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
2/13/2026	11:30 am	11	12	10	None		3.25" HSA 0' - 12'	J. Alme	A. Wacek
								Notes:	

GEO TECHNICAL N- PLOT - WSB.GDT - 3/13/26 11:09 - M:\031723-000\GEO TECH-CM\T\GEO TECH LAKE KORONIS - BORING LOG.GPJ

# LOG OF TEST BORING



PROJECT NAME: Staloch Properties - Lake Koronis    PROJECT LOCATION: Paynesville, MN  
 CLIENT/WSB #: 031723-000    SURFACE ELEVATION: 1164.5 ft

**BORING NUMBER B-4**  
 PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	WL	Drilling Operation	SAMPLE		N	MC %	%Fines	N-Value Plot						
							TYPE	No.				0	19	38				
1	1164	12"+ TOPSOIL: Clayey Sand, slightly organic, dark brown, moist	OL	Topsoil			AU	1										
2	1163	CLAYEY SAND WITH LITTLE GRAVEL, fine to coarse grained, brown, wet, loose	SC	Glacial Till			SB	2	7	20								
3	1162						HSA											
4	1161																	
5	1160						SAND WITH GRAVEL, fine to coarse grained, brown, moist, loose	SP				SB	3	9	4			
6	1159	CLAYEY SAND, fine to coarse grained, brown, moist, medium dense [Wet Density = 130.7 pcf]	SC				HSA											
7	1158						SB	4	11	9	37							
8	1157						HSA											
9	1156																	
10	1155						SB	5	11									
11	1154						HSA											
12	1153	CLAYEY SAND, fine to medium grained, brown, moist, medium dense	SC				SB	6	13	13								
13	1152	CLAYEY SAND, fine to coarse grained, light brown, moist, medium dense [LL = 17, PI = 7]	SC				HSA											
14	1151																	
15	1150						SB	7	18	9								
16	1149						HSA											
17	1148	CLAYEY SAND WITH LITTLE GRAVEL, fine to coarse grained, brown with reddish brown, moist, medium dense	SC															
18	1147						HSA											
19	1146																	
20	1145						SB	8	15									
21	1144	CLAYEY SAND WITH GRAVEL, fine to coarse grained, grayish brown, moist, dense	SC															
22	1143						HSA											
23	1142																	
24	1141	- [Auger refusal at 25 feet]					SB	9	34									
25	1140	End of Boring 25.0 ft.					HSA											

GEO-TECHNICAL-N-PL0T - WSB.GDT - 3/13/26 11:09 - M:\031723-000\GEO\TECH-CM\T\GEO\TECH\LAKE KORONIS - BORING LOG.GPJ

**WATER LEVEL MEASUREMENTS**

START: 2/13/2026							END: 2/13/2026			
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:	
2/13/2026	9:15 am	24.5	25	14	None		3.25" HSA 0' - 25'	J. Alme	A. Wacek	
							Notes:			

# LOG OF TEST BORING



PROJECT NAME: Staloch Properties - Lake Koronis    PROJECT LOCATION: Paynesville, MN  
 CLIENT/WSB #: 031723-000    SURFACE ELEVATION: 1162 ft

**BORING NUMBER B-5**  
 PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	WL	Drilling Operation	SAMPLE		N	MC %	%Fines	N-Value Plot			
							TYPE	No.				0	13.5	27	
1	1161	12" TOPSOIL: Clayey Sand, slightly organic, dark brown, moist	OL	Topsoil			AU	1							
2	1160	SLIGHTLY ORGANIC SANDY LEAN CLAY, dark brown, moist [Organic Content = 3.7%]	Fill	Fill			SB	2	5	22					
3	1159								HSA						
4	1158						SB	3	18						
5	1157						HSA								
6	1156	CLAYEY SAND, brown and dark brown, moist	Fill				SB	4	10	13					
7	1155	CLAYEY SAND, fine to coarse grained, light brown, moist, loose to medium dense [Wet Density = 139.0 pcf]	SC	Glacial Till			HSA								
8	1154								SB	5	14		41		
9	1153						HSA								
10	1152						SB	6	11						
11	1151						HSA								
12	1150	CLAYEY SAND, fine to coarse grained, grayish brown with reddish brown, moist, medium dense	SC				SB	7	13	15					
13	1149								HSA						
14	1148						SB	8	13						
15	1147	CLAYEY SAND, fine to coarse grained, brown with reddish brown, moist, medium dense	SC				HSA								
16	1146								SB	9	23	15			
17	1145						HSA								
18	1144	CLAYEY SAND WITH LITTLE GRAVEL, fine to coarse grained, grayish brown, moist, medium dense	SC				SB	8	13						
19	1143								HSA						
20	1142						SB	9	23						
21	1141						HSA								
22	1140						SB	9	23						
23	1139						HSA								
24	1138						SB	9	23						
25	1137	- [Auger refusal at 25 feet]					HSA								

GEO-TECHNICAL-N-PL-0T - WSB-GDT - 3/13/26 11:09 - M:\031723-000\GEO\TECH-CM\T\GEO\TECH\LAKE KORONIS - BORING LOG.GPJ

**WATER LEVEL MEASUREMENTS**      START: 2/12/2026      END: 2/12/2026

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
2/12/2026	3:30 pm	24.5	25	15	None		3.25" HSA 0' - 25'	J. Alme	A. Wacek
								Notes:	

## SYMBOLS AND TERMINOLOGY ON TEST BORING LOG

SYMBOLS			
Drilling and Sampling		Laboratory Testing	
<u>Symbol</u>	<u>Description</u>	<u>Symbol</u>	<u>Description</u>
HSA	3 1/4" LD. Hollow Stem Auger	MC	Moisture content, % (ASTM D2216)
FA	Flight Auger	DD	Dry Density, pcf
HA	Hand Auger	LL	Liquid Limit (ASTM D4318)
RC	Size A, B, or N rotary casing	PL	Plastic Limit (ASTM D4318)
CS	Continuous split barrel sampling		
DM	Drilling Mud		- Inserts in last column
JW	Jetting Water		
SB	2" O.D. split barrel sampling	Qu	Unconfined compressive strength, psf (ASTM D2166)
_L	2 1/2" or 3 1/2" OD split barrel liner sampler	Pq	Penetrometer Reading, tsf (ASTM D1558)
_T	2" or 3" thin walled tube sample	Ts	Torvane Reading, ts
W	Wash sample	G	Specific Gravity (ASTM D854)
B	Bag sample	SL	Shrinkage limits (ASTM D427)
P	Test Pit sample	OC	Organic Content (ASTM D2974)
_Q	BQ, NQ, or PQ wire line system	SP	Swell Pressure, tsf (ASTM D4546)
_X	AX, BX, or NX double tube barrel	PS	Percent swell under pressure (ASTM D4546)
N	Standard penetration test, blow per foot	FS	Free swell, % (ASTM D4546)
CR	Core recovery, percent	SS	Shrink swell, % (ASTM D4546)
WL	Water level	pH	
n/a	no measurement recorded	SC	Sulfate content, parts/million or mg/l
		CC	Chloride content, parts/million or mg/l
		C	One dimensional consolidation (ASTM D2435)
		Qc	Triaxial compression (ASTM D2850 and D4767)
		DS	Direct Shear (ASTM D3080)
		K	Coefficient of permeability, cm/sec (ASTM D2434)
		P	Pinhole Test (ASTM D4647)
		DH	Double hydrometer (ASTM D4221)
		MA	Particle size analysis (ASTM D422)
		R	Laboratory electrical resistivity, ohm-cm (ASTM G57)
		VS	Field vane shear (ASTM D2573)
		RQD	Rock quality designation, percent
		IR	Infiltration Test (ASTM D3385)

TERMINOLOGY							
Particle Sizes				Soil Layering and Moisture			
<u>Type</u>	<u>Size Range</u>	<u>Term</u>	<u>Visual Observation</u>				
Boulders	> 12"	Lenses	Small pockets of different soils				
Cobbles	3" - 12"	Lamination	< 1/4" thick stratum				
Coarse gravel	3/4" - 3"	Layer	1/4" - 12" thick stratum				
Fine gravel	#4 sieve - 3/4"	Stratified	Altering lenses of varying materials or colors				
Coarse sand	#4 sieve - #10 sieve	Varved	Altering laminations of clay, silt, fine sand, or colors				
Medium sand	#10 sieve - #40 sieve	Dry	Powdery, no noticeable water				
Fine sand	#40 sieve - #200 sieve	Moist	Damp, below saturation				
Silt	100% passing #200 sieve, and > 0.002mm	Wet	MC above plastic limit				
Clay	100% passing #200 sieve, and < 0.002mm	Waterbearing	Pervious soil below water table				
		Saturated	Cohesive soil with MC above liquid limit				
Gravel Content				Standard Penetration Resistance (N-value)			
Coarse-Grained Soils		Fine-Grained Soils		Cohesionless Soils		Cohesive Soils	
<u>% Gravel</u>	<u>Description</u>	<u>% Gravel</u>	<u>Description</u>	<u>N-Value</u>	<u>Relative Density</u>	<u>N-Value</u>	<u>Consistency</u>
2 - 15	A little gravel	2-5	Trace of gravel	0 - 4	Very loose	0 - 4	Very soft
16 - 30	With gravel	5 -15	a little gravel	5 - 10	Loose	5 - 8	Soft
31 - 49	Gravelly	16 - 30	with gravel	11 - 30	Medium dense	9 - 15	Firm
		31 - 49	Gravelly	31 - 50	Dense	16 - 30	Hard
				>50	Very dense	>30	Very hard

## NOTICE TO REPORT USERS BORING LOG INFORMATION

### Subsurface Profiles

The subsurface stratification lines on the graphic representation of the test borings show an approximate boundary between soil types or rock. The transition between materials is approximate and is usually far more gradual than shown. Estimating excavation depths, soil volumes, and other computations relying on the subsurface strata may not be possible to any degree of accuracy.

### Water Level

WSB & Associates, Inc. took groundwater level readings in the exploratory borings, reviewed the data obtained, and discussed its interpretation of the data in the text of this report. The groundwater level may fluctuate due to seasonal variations caused by precipitation, snowmelt, rainfalls, construction or remediation activities, and/or other factors not evident at the time of measurement.

The actual determination of the subsurface water level is an interpretive process. Subsurface water level may not be accurately depicted by the levels indicated on the boring logs. Normally, a subsurface exploration obtains general information regarding subsurface features for design purposes. An accurate determination of subsurface water levels is not possible with a typical scope of work. The use of the subsurface water level information provided for estimating purposes or other site review can present a moderate to high risk of error.

The following information is obtained in the field and noted under "Water Level Measurements" at the bottom of the log.

Sample Depth:	The lowest depth of soil sampling at the time a water level measurement is taken.
Casing Depth:	The depth to the bottom of the casing or hollow stem auger at the time of water level measurement.
Cave-in Depth:	The depth at which a measuring tape stops in the bore hole.
Water Level:	The point in the bore hole at which free-standing water is encountered by a measure device from the surface.

### Obstruction Depths

Obstructions and/or obstruction depths may be noted on the boring logs. Obstruction indicates the sampling equipment encountered resistance to penetration. It must be realized that continuation of drilling, the use of other drilling equipment or further exploration may provide information other than that depicted on the logs. The correlation of obstruction depths on the log with construction features such as rock excavation, foundation depths, or buried debris cannot normally be determined with any degree of accuracy. For example, penetration of weathered rock by soil sampling equipment may not correlate with removal by certain types of construction equipment. Using this information for estimating purposes often results in a high degree of misinterpretation.

Accurately identifying the obstruction or estimating depths where hard rock is present over the site requires a scope of service beyond the normal geotechnical exploration program. The risk of using the information noted on the boring logs for estimating purposes must be understood.

# UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART		
<b>COARSE-GRAINED SOILS</b> (more than 50% of material is larger than No. 200 sieve size.)		
<b>GRAVELS</b> More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	
	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
	GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	
	GM	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
<b>SANDS</b> 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	
	SW	Well-graded sands, gravelly sands, little or no fines
	SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures
<b>FINE-GRAINED SOILS</b> (50% or more of material is smaller than No. 200 sieve size.)		
<b>SILTS AND CLAYS</b> Liquid limit less than 50%	ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
<b>SILTS AND CLAYS</b> Liquid limit 50% or greater	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
<b>HIGHLY ORGANIC SOILS</b>	PT	Peat and other highly organic soils

LABORATORY CLASSIFICATION CRITERIA		
GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent ..... GW, GP, SW, SP  
 More than 12 percent ..... GM, GC, SM, SC  
 5 to 12 percent ..... Borderline cases requiring dual symbols

