Drainage Study

Report Description

Prepared for:
City of Minnetonka Beach

Prepared by:
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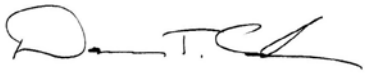
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Phillip A Elkin, P.E.

Date: 11-8-2013 License # 26856

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.



Darren T. Amundsen, P.E.

Date: 11-8-2013 License # 40924

1.0 Study Goals

The goals of the study are to provide a greater understanding of the Minnetonka Beach storm sewer system, develop preliminary cost estimates for improvements, and provide information for the city to make policy decisions.

2.0 Storm Sewer Design Strategy

Storm sewer design is based on the ability to drain certain storm events. Storm events typically are categorized by their probability of producing a statistical amount of rainfall over 24 hours. Typical design storms and their corresponding rainfall amounts over 24 hours are:

Event Frequency	Rainfall	% probability of annual occurrence
2-year	2.75 inches	50%
5-year	3.25 inches	20%
10-year	4.10 inches	10%
100-year	5.90 inches	1%
Approximately 90% of the storms produce less that 1 inch of rain		

Designing storm sewer is a balance between providing a level of drainage service and cost. Most new municipal storm sewer pipe systems are typically designed to drain a 5-year storm. Collector roads usually have the slightly higher drainage standard of a 10-year storm. New ponding areas are designed to hold a 100-year storm. These systems are designed to fail at fairly regular intervals so overland drainage routes must be designed into the system. This overland route is commonly referred to as the Emergency Overflow or EOF . When overland EOFs are not possible, special consideration is given to the downstream pipe system depending on the impacts of potential flooding.

In a typical municipal stormwater system, the collection and discharge of stormwater runoff would occur within the city right-of-way. Streets are usually designed with a “trunk system” which collects stormwater from various points and discharges at one point. In addition to pipes in the streets, drainage routes are created within city right-of-way. These routes are typically within the street right of way or drainage and utility easements.

3.0 Existing Minnetonka Beach Storm Sewer System

3.1 GENERAL SYSTEM AND STORMWATER MODEL DISCUSSION

When looking at the pipe and drainage structures in the City of Minnetonka Beach, there does not appear to be a set pattern or method of design and construction. This is not unusual in "older" communities. While a typical municipal storm sewer system will use a 12" diameter pipe as a minimum size, 86% of the existing pipe network in Minnetonka Beach is 12" or smaller with 43% of the existing pipes at 8" or smaller. This is an indication that pipes have been installed as a reaction to ponding in low spots, not as part of an overall stormwater management plan.

A stormwater model was constructed as part of this report in which drainage areas were delineated and the existing pipe and overland discharge routes that drained the areas added. Our watershed delineation is based on 2012 State of Minnesota LiDAR Elevation Data. The model was then subjected to simulated rainfall events to determine the effectiveness of the current pipe system. The result of the 5 year storm event simulation reveals that ponding and overflow occurred at all of the collection areas. In other words, the current storm sewer pipe system does not prevent short-term localized ponding, but only acts to eliminate long-term ponding conditions. Based on our study we found that there were essentially four conditions:

3.1.1 Overland Drainage (no pipes)

Most of the shoreline properties and areas which are at higher elevations will discharge directly to the lake (see orange shaded areas on Figure 1). Homes that are not on lakeshore property or directly connected to the lake will discharge to side yard swales and streets, which will eventually discharge to Lake Minnetonka.

3.1.2 Combination of Overland Drainage and Pipes

This study identified sub watersheds which had stormwater pipes as part of the drainage system in addition to overland drainage routes (yellow shaded areas on Figure 1). These areas were such that a pipe system would provide partial or all drainage needs during small rainfall events, but overland flow would not be impeded if the system was overwhelmed or blocked.

3.1.3 Pipe Drained

These areas are found mostly on the inner parts of the City where relatively small (4"-12") drainage pipes have been installed to drain low areas that are unable to drain overland (blue shaded areas on Figure 1). Based on the size of the pipe and the age of the drainage systems in the City, the areas which rely on pipe discharges to drain will experience temporary ponding after rainfall events. The length of ponding time is determined by the size, slope and condition of the outlet pipes.

Within these areas we found potential problem areas, areas in which the level of ponding could potentially reach adjacent structures before it would discharge overland in what is known as the EOF.

3.1.4 Land Locked Areas

Several locations were identified where ponding would occur due to low lying areas which were land-locked or had no drainage option (see solid blue areas in Figure 1). While excessive accumulation of stormwater will cause flooding in extreme cases, infiltration and/or evaporation would be the only method of drying these areas.

4.0 Drainage and Flooding Issue Areas

Identification of drainage issues is one of the main drivers of this study. The study presents issues brought forth by residents, the model, and historic information. Thirteen areas of concern are being presented in this report. The table below lists the area and provides a brief summary of the situation. The Map IDs are shown on Figure 2 and Appendix A provides greater detail on each area.

Map ID No	Address/Location	Summary
1	2416 Lafayette Rd	Drainage issues between homes
2	2438, 2442 Lafayette Rd	No overland EOF
3	2324 Huntington Pt Rd W	No overland EOF
4	2522 Lafayette Rd	No overland EOF
4	2528 Lafayette Rd	No overland EOF
4	2417 Woodbridge Rd	No overland EOF
5	2312, 2313 Old Beach Rd	Proximity to lake level
6	3120 Brooks Ln	Local street flooding
7	3130 Brooks Ln	No overland EOF
8	3103 Brooks Ln	Local street flooding/drainage
9	3115 Brooks Ln	Drainage issues between homes/Local street flooding
10	3034 Northview Rd	Local street flooding
11	Lafayette Park	Park acts as large storm sewer "pond"
12	3017 Brooks Lane	Local street flooding/No overland EOF
13	2950 Northview Rd	Local street flooding – EOF between homes

5.0 Cost Estimates

General cost estimates are being provided for resolving the identified issues for planning and discussion purposes. The final cost of solutions to storm water issues are driven by policy decisions, obtaining additional information, and detailed engineering design.

Map ID No	Address/Location	Preliminary Solution	Preliminary Cost Estimate	Notes
1	2416 Lafayette Rd	Residential Grading Project - already completed by owner	$0	
2	2438, 2442 Lafayette Rd	Storm sewer structure and larger pipe to lake	$60,000	
3	2324 Huntington Pt Rd W	Storm sewer structure and pipe to lake*	$30,000	
4	2522 Lafayette Rd	Overland EOF to Lake - joint project*	$80,000	
4	2528 Lafayette Rd	Overland EOF to Lake - joint project*	$0	included above
4	2417 Woodbridge Rd	Overland EOF to Lake - joint project*	$0	included above
5	2312, 2313 Old Beach Rd	Not corrected with storm sewer improvements	$0	
6	3120 Brooks Ln	Part of Brooks Lane storm sewer project	$170,000	
7	3130 Brooks Ln	Part of Brooks Lane storm sewer project, and overland EOF*	$30,000	Additional for EOF
8	3103 Brooks Ln	Part of Brooks Lane storm sewer project	$0	included above
9	3115 Brooks Ln	Part of Brooks Lane storm sewer project, does not inc. lot grading	$0	included above
10	3034 Northview Rd	Additional structure and pipe in Northview	$30,000	
11	Lafayette Park	Park acts as large storm sewer "pond"	$0	Not recommended
12	3017 Brooks Lane	Part of Brooks Lane storm sewer project	$0	included above
13	2950 Northview Rd	Storm sewer recon/EOF grading	$35,000	
	Total		$435,000	

*easement costs could be significant and are not included

Future policy decisions will dictate the replacement policy of the remaining system pipes. Noting that all storm sewer pipes likely do not handle a 5-year design storm and assuming them to all be replaced only provides a starting place for prioritizing and budgeting. A rough cost estimate to replace the remainder of the storm sewer system in Minnetonka Beach is based on an average cost of $150 per foot. The total length of storm sewer is 8,100 feet. This translates into $1,215,000. Note that this cost is for stand-alone storm sewer replacement projects, significant savings could be achieved when combined with future street, sanitary sewer, and/or watermain projects.

6.0 Recommendations

We recommend that the information in this study be used to develop a storm water policy that includes design and service standards. The policy will also need to consider funding sources for future stormwater improvement projects.

Once policies are determined, the city should consider prioritization of the individual projects presented in this report.

Appendix A – Drainage Issues Detail Sheets

Minnetonka Beach Drainage Study
Drainage Issues Detail Sheet

Property Information	
Map ID No	1
Address Number	2416
Address Street	Lafayette
Property Owner	Zinn

Drainage Issue Description

Drainage issue between 2416 and 2412 Lafayette Road. Runoff from both properties runs between a retaining wall at 2412 Lafayette Road and the home foundation of 2416 Lafayette Road. Runoff enters the finished basement.

Threat to Prop	Erosion	Minor
X		

Solution/Improvement Information	
Success Factor	Medium
Easement Required	Yes
Easement properties	2
Benefiting Easement properties	1
Additional Downstream Work Required?	No
Cost Estimate	$ -

Notes

Home owners are in the process of completing a project to improve drainage between properties. Follow with homeowners on project's success is recommended.

Figure/Photo

Minnetonka Beach Drainage Study
Drainage Issues Detail Sheet

Property Information	
Map ID No	2
Address Number	2438 and 2442
Address Street	Lafayette
Property Owner	Warren and Frecon

Drainage Issue Description		
Low area serviced by private storm sewer that is not large enough to drain large events.		
Threat to Prop	Erosion	Minor
X		

Solution/Improvement Information	
Success Factor	High
Easement Required	Yes
Easement properties	2
Benefiting Easement properties	2
Additional Downstream Work Required?	No
Cost Estimate	$ 60,000

Notes

Larger pipe is possible under Lafayette Road to the lake.

Figure/Photo

Minnetonka Beach Drainage Study
Drainage Issues Detail Sheet

Property Information	
Map ID No	3
Address Number	2535
Address Street	Huntington Pt Rd W
Property Owner	Suerken

Drainage Issue Description		
This is older information, however this is a low area appearing to be serviced by storm sewer.		
Threat to Prop	Erosion	Minor

Solution/Improvement Information	
Success Factor	High/Medium
Easement Required	3
Easement properties	1
Benefiting Easement properties	1
Additional Downstream Work Required?	yes
Cost Estimate	$ 30,000

Notes

Verify storm sewer condition and elevation relative to low basin elevation. This area is landlocked, but no structural damage has been reported in the past. Review current drainage with owners.

Figure/Photo

Minnetonka Beach Drainage Study
Drainage Issues Detail Sheet

Property Information	
Map ID No	4
Address Number	2522
Address Street	Lafayette Road
Property Owner	Rezabek

Drainage Issue Description

Flooding in backyard area of Woodbridge and Lafayette Roads.
Backyard area ponds and holds water during heavy rains.

Threat to Prop	Erosion	Minor
X		

Solution/Improvement Information	
Success Factor	High
Easement Required	Yes
Easement properties	up to 12
Benefiting Easement properties	3-10
Additional Downstream Work Required?	
Cost Estimate	$ 80,000

Notes

Significant amount of upstream runoff enter this backyard low area during larger storm events. The area is drained by small, private storm sewer to the Lafayette Road storm sewer. Several other homes that share backyards in this area are identified in this study.

Figure/Photo

Minnetonka Beach Drainage Study
Drainage Issues Detail Sheet

Property Information	
Map ID No	4
Address Number	2528
Address Street	Lafayette Road
Property Owner	Ramaker

Drainage Issue Description		
Concerns on the condition and maintenance of the storm sewer system, but also impacted by the Lafayette/Woodbridge area ponding in large storm events.		
Threat to Prop	Erosion	Minor
X		

Solution/Improvement Information	
Success Factor	High
Easement Required	Yes
Easement properties	up to 12
Benefiting Easement properties	3-10
Additional Downstream Work Required?	
Cost Estimate	$ 80,000

Notes

Significant amount of upstream runoff enter this backyard low area during larger storm events. The area is drained by small, private storm sewer to the Lafayette Road storm sewer. Several other homes that share backyards in this area are identified in this study.

Figure/Photo

Minnetonka Beach Drainage Study
Drainage Issues Detail Sheet

Property Information	
Map ID No	4
Address Number	2417
Address Street	Woodbridge Road
Property Owner	Forbes

Drainage Issue Description		
Flooding in backyard area of Woodbridge and Lafayette Roads. Backyard area ponds and holds water during heavy rains.		
Threat to Prop	Erosion	Minor
X		

Solution/Improvement Information	
Success Factor	High
Easement Required	Yes
Easement properties	up to 12
Benefiting Easement properties	3-10
Additional Downstream Work Required?	
Cost Estimate	$ 80,000

Notes

Significant amount of upstream runoff enter this backyard low area during larger storm events. The area is drained by small, private storm sewer to the Lafayette Road storm sewer. Several other homes that share backyards in this area are identified in this study.

Figure/Photo

photos supplied by homeowner

Minnetonka Beach Drainage Study
Drainage Issues Detail Sheet

Property Information	
Map ID No	5
Address Number	2312 and 2313
Address Street	Old Beach Road
Property Owner	Frangipane and Zimring

Drainage Issue Description

House elevations are close to lake level and are affected by ground water.

Threat to Prop	Erosion	Minor
X		

Solution/Improvement Information	
Success Factor	Low
Easement Required	0
Easement properties	0
Benefiting Easement properties	0
Additional Downstream Work Required?	No
Cost Estimate	$ -

Notes

This is not directly a drainage problem, but has been previously identified as having potential flooding issues.

Figure/Photo

Minnetonka Beach Drainage Study
Drainage Issues Detail Sheet

Property Information	
Map ID No	6
Address Number	3120
Address Street	Brooks Lane
Property Owner	Johnson

Drainage Issue Description		
Street flooding affects the garage.		
Threat to Prop	Erosion	Minor
X		

Solution/Improvement Information	
Success Factor	Medium
Easement Required	Temporary
Easement properties	2
Benefiting Easement properties	9
Additional Downstream Work Required?	yes
Cost Estimate	$ 170,000

Notes

This information is from 2008. Mitigation of this drainage issue would likely be part of a larger Brooks Lane storm sewer project.

Figure/Photo

Minnetonka Beach Drainage Study
Drainage Issues Detail Sheet

Property Information	
Map ID No	7
Address Number	3130
Address Street	Brooks Lane
Property Owner	Bolden

Drainage Issue Description

Landlocked basin in the backyard receive drainage from higher elevations including runoff from Brooks Lane. Ponding elevations reach levels that flood the basement and tuck under garage.

Threat to Prop	Erosion	Minor
X		

Solution/Improvement Information	
Success Factor	High/Medium
Easement Required	3
Easement properties	3
Benefiting Easement properties	1
Additional Downstream Work Required?	yes
Cost Estimate pipe	$ 170,000
Cost Estimate EOF	$ 30,000

Notes

An overland EOF could be constructed to the north along the common lot line of 3124 and 3136 Brooks Lane. Further mitigation of this drainage issue would likely be part of a larger Brooks Lane storm sewer project.

Figure/Photo

Minnetonka Beach Drainage Study
Drainage Issues Detail Sheet

Property Information	
Map ID No	8
Address Number	3103
Address Street	Brooks Lane
Property Owner	Gipson

Drainage Issue Description		
Drainage issues along Brooks Lane where private storm sewer discharges.		
Threat to Prop	Erosion	Minor
	X	

Solution/Improvement Information	
Success Factor	Medium
Easement Required	Temporary
Easement properties	2
Benefiting Easement properties	9
Additional Downstream Work Required?	yes
Cost Estimate	$ 170,000

Notes

This information is from 2008. Mitigation of this drainage issue would likely be part of a larger Brooks Lane storm sewer project.

Figure/Photo

Minnetonka Beach Drainage Study
Drainage Issues Detail Sheet

Property Information	
Map ID No	9
Address Number	3115
Address Street	Brooks Lane
Property Owner	Scott

Drainage Issue Description

Runoff from neighboring property may contribute to basement flooding. A separate street ponding issue was also noted near mailboxes.

Threat to Prop	Erosion	Minor
X		

Solution/Improvement Information	
Success Factor	Medium
Easement Required	No
Easement properties	0
Benefiting Easement properties	0
Additional Downstream Work Required?	No
Cost Estimate	$ 170,000

Notes

The first floor elevation of the home is located 8-10 feet above Brooks Lane. Drainage impacts appear to be from side lot drainage issues potentially related to grading on the neighboring property. Recommend follow up with resident to review issue.

Figure/Photo

Minnetonka Beach Drainage Study
Drainage Issues Detail Sheet

Property Information	
Map ID No	10
Address Number	3034
Address Street	Northview
Property Owner	Kozloski

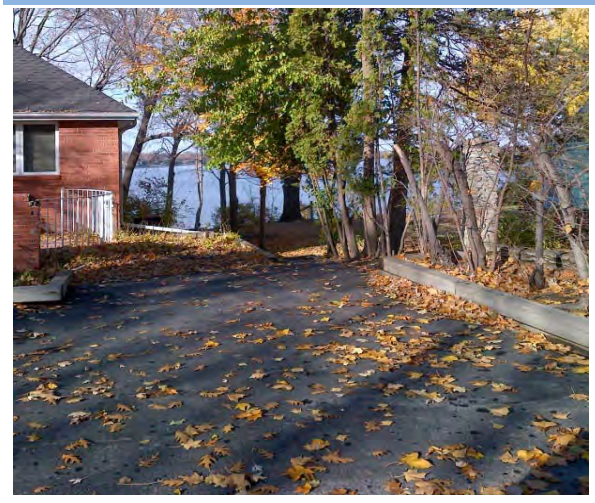
Drainage Issue Description		
Runoff from Northview Road runs down the side of the home and erodes landscaping.		
Threat to Prop	Erosion	Minor
X	X	

Solution/Improvement Information	
Success Factor	High
Easement Required	Possibly
Easement properties	2
Benefiting Easement properties	0
Additional Downstream Work Required?	
Cost Estimate	$ 30,000

Notes

There is storm sewer near this issue. Additional inlets may improve the situation or curbing on Northview may better direct the runoff to the existing storm sewer.

Figure/Photo



Minnetonka Beach Drainage Study
Drainage Issues Detail Sheet

Property Information	
Map ID No	11
Address Number	Lafayette Park
Address Street	
Property Owner	City of Minnetonka Beach

Drainage Issue Description		
Lafayette Park acts as a large shallow pond during large storm events.		
Threat to Prop	Erosion	Minor

Solution/Improvement Information	
Success Factor	Maintain?
Easement Required	Henn Co. Permit
Easement properties	
Benefiting Easement properties	0
Additional Downstream Work Required?	Yes
Cost Estimate	$ -

Notes

Flooding can make turf maintenance an issue during periods of wet weather. However, this area works well as a stormwater retention and filtration area and is beneficial to Lake Minnetonka water quality.

Figure/Photo

Minnetonka Beach Drainage Study
Drainage Issues Detail Sheet

Property Information	
Map ID No	12
Address Number	3017
Address Street	Brooks Lane
Property Owner	Mackinnon

Drainage Issue Description

This property has been connected with drainage issues related to Brooks Lane. Overland street traveling down the steep slope of Brooks Lane has the potential to impact this property.

Threat to Prop	Erosion	Minor
X		

Solution/Improvement Information	
Success Factor	Medium
Easement Required	Temporary
Easement properties	2
Benefiting Easement properties	9
Additional Downstream Work Required?	yes
Cost Estimate	$ 170,000

Notes

This information is from 2008. Mitigation of this drainage issue would likely be part of a larger Brooks Lane storm sewer project.

Figure/Photo

Minnetonka Beach Drainage Study
Drainage Issues Detail Sheet

Property Information	
Map ID No	13
Address Number	2950
Address Street	Northview
Property Owner	Boschwitz

Drainage Issue Description		
Overland drainage between 1901 Lake Road and 2950 Northview Rd. 8-12 foot wide "river" between homes. Potential to cause slope failure/erosion at lake.		
Threat to Prop	Erosion	Minor
	X	

Solution/Improvement Information	
Success Factor	Medium
Easement Required	yes
Easement properties	2
Benefiting Easement properties	2
Additional Downstream Work Required?	No
Cost Estimate	$ 35,000

Notes

Upsize existing storm sewer located in Lake Rd. Grade EOF to Lake Rd and new storm sewer structure at 2950 Northview.

Figure/Photo

Appendix B – Figures

Stantec

Stantec Consulting
2335 Highway 36 W
Saint Paul, MN 55113
tel 651.636.4600
fax 651.636.1311

November 2013

Figure 1
Subcatchments and Drainage Type

Minnetonka Beach, MN

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Design With Community In Mind

Stantec Consulting
2335 Highway 36 W
Saint Paul, MN 55113
tel 651.636.4600
fax 651.636.1311

November 2013

Figure 2
Problem Areas

Minnetonka Beach, MN

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