Memorandum

To: Steve Scherer, Public Works Director
Dusty Finke, Planning Director

From: Joey Abramson, PE
Earth Evans, PE
Jim Stremel, PE, City Engineer

Date: June 16, 2021

Re: Wild Meadows Drainage Assessment – Medina, MN
WSB Project No. 017741-000

The Wild Meadows development was constructed in the early 2000's. At that time, the governing agency stormwater management requirements allowed the stormwater management design to incorporate sequences ("Treatment Train") of Best Management Practices (BMPs) to provide Total Phosphorus (TP) and Total Suspended Solids (TSS) removal to meet the water quality volume. With that in mind, a NURP level treatment criterion (60% TP and 90% TSS removal) was likely required. The general sequence of BMPs for the development routed runoff from disconnected impervious that included rural section roads and house/driveway areas to sedimentation ponds. Conveyance to and from these ponds was provided using vegetated regional drainage swales.

There are conservation easements located within the Wild Meadows development. These easements are granted to the Minnesota (MN) Land Trust. We recommend that the Homeowners Association coordinates with the MN Land Trust on all further considerations of changes to the site as well as any proposed maintenance activity.

The City and Land Trust were notified that modifications to the treatment system swales were made without proper City review and permitting. Generally, the modifications that were made included removing vegetation and sediment from two drainage swales and replacing the swale bottoms with river rock to provide more consistent flow conveyance in response to flooding issues observed in the swales. Additionally, to address overtopping and erosion issues over a stretch of gravel trail, portions of a trail section were modified and culverts either added or replaced to improve flow conveyance.

The City of Medina authorized WSB to perform a high-level drainage analysis of the existing conditions for the three primary areas of concern and how the constructed modifications may have affected the overall treatment ability or capacity of the stormwater management systems. As a part of the analysis, WSB was asked to perform the following tasks:

1. Collect background information including storm sewer sizes/elevations, grading plans, soils information, groundwater information, watershed district submittals/permit information, and other relevant information readily available.
2. Attend an onsite meeting with City staff, HOA representatives, and a representative from the land trust that oversees the conservation areas.
3. Provide an analysis of the three primary areas of concern.

WSB visited the Wild Meadows development on Friday, April 16, 2021 to assess drainage concerns and modifications made by the development's Homeowners Association (HOA). In

701 XENIA AVENUE S | SUITE 300 | MINNEAPOLIS, MN | 55416 | 763.541.4800 | WSBENG.COM

attendance at this meeting were representatives from the HOA, MN Land Trust, City of Medina staff, and WSB staff. In this memo, the observations and findings at each of the three primary locations is summarized, the drainage issues observed, field modifications made to address them, how these modifications may have affected the stormwater treatment, and recommendations on next steps to address potential future issues.

See the attached Exhibits A-C for the location of the three primary areas of concern.

Northerly Area (Exhibit A)

Existing Conditions and Background Information

The Northerly Area shown in **Exhibit A** generally consists of the gravel trail located east and north of Sunrise Ct. This trail is comprised of crushed limestone and provides resident access to nature areas north and east of the Wild Meadows development. The original (as-built) condition was a woodchip trail with periodic CMP culverts conveying offsite runoff under the trail. Over the course of several years, and particularly over the last few years, runoff from the west would flow over the trail which lead to multiple culvert washouts and trail erosion.

The primary contributing drainage to the trail area is the upstream outlet/culvert from the pond. This outlet pipe is perched above the downstream grade (appears to stick out of the ground) and currently causing erosion in and around the outfall.

Observed System Modifications & Impacts

WSB observed and learned of the following modifications/repairs made to the system. The HOA dug small, approximately six-inch wide ditches along the upstream sides of the trail to reduce offsite runoff from flowing over trail and conveyed this runoff to existing culverts. The HOA also replaced and added several new culverts.

These repairs have appeared to reduce the occurrence and amount of runoff flowing onto and over the trail, but increased ditch erosion has also occurred. The added culverts have appeared to reduce occurrence of overtopping, though some of the new and/or existing culverts appear to be undermined; some culverts may also have seepage issues.

Given the elevation difference of approximately 20 feet from the wetland area up to the pond, it is not reasonable to consider the trail work has had any impact on the flow conveyance from the perched pond or nearby yards.

The modifications in this area are not considered to have had a consequential effect on the stormwater treatment train for this area. The changes primarily affected flow conveyance and not water quality.

Recommendations & Next Steps

Based on our observations during the site visit and engineering judgement given the readily available information, we recommend the HOA or its consultant consider these corrections/next-steps:

- Reinstall culverts with the undermining issues utilizing using proper bedding and water-tight seepage prevention measures.
- At the perched outlet pipe location, survey this area and evaluate alternatives for addressing the perched outlet pipe (adding fill, lowering pipe, adding a structure,

extending the pipe etc.) and install stabilization measures (i.e. rip-rap, permanent turf reinforcing mat, etc.) in and around the outlet area.
- As a long term improvement, consider relocating the trail closer to the outlet pipe area (upstream side of the meadow) to avoid the runoff traveling over the trail. This would require a more significant improvement in design and permitting if pursued; however, it would be a better long term solution.

Southeasterly Area (Exhibit B)

Existing Conditions and Background Information

The Southeasterly Area shown in **Exhibit B** generally consists of a drainage swale between 125 and 135 Prairie Creek Rd and flowing behind lots 135 and 145 Prairie Creek Rd. This drainage swale conveys direct runoff from approximately three lots as well as inflow from an upstream pond that receives runoff from approximately 17 lots and associated roads. The original (as-built) condition was a vegetated drainage swale.

Over the last few years, vegetation, including dense cattails, established themselves within the swale causing standing water and restricting flow within the swale. Runoff had encroached into backyards and caused saturated conditions. During previous large storm events, rear yard flooding occurred and extended up to and above the low floor elevation of one home threatening to encroach into the home.

Observed System Modifications & Impacts

WSB observed and learned of the following modifications/repairs made to the system. To address these issues, the HOA removed vegetation in the swale, widened and regraded, and added 1-2" diameter river rock along swale bottom to reduce vegetation growth and promote flow. Based on HOA knowledge, this repair has reduced the occurrence of standing water and back-ups in the swale.

With respect to water quality treatment, the removal of vegetation slightly reduces the phosphorus removal but given the length and geometry of the swale, it is not expected that the removal of the vegetation will have a significant direct impact on water quality. This conclusion is supported by a very high level assessment of removal efficiencies of swale using the MIDS Calculator. Changing the Manning's roughness value of the swale from vegetation (0.035) to the equivalent of small rocks (~0.02) does not have a sizeable impact on TP or TSS removals. Additionally, most of the flow through this swale comes from the upstream sedimentation pond, which provides the majority of TP and TSS removal.

The changes to the swale did however appear to have resulted in faster velocities in the channel and may have contributed to erosion along downstream side slopes. In some locations the river rock has been bypassed by the flow channel and has further contributed to erosion and sediment loading downstream.

Recommendations & Next Steps

Based on our observations during the site visit and engineering judgement given the readily available information, we recommend the HOA or its consultant consider these corrections/next-steps:
- Repair the downstream portion of the rock swale, where the flow has bypassed the rocks to the side and begun to erode the side slopes. The repair effort should include

regrading to achieve a concave shape with the centerline being at least six inches below the sides.
- Stabilize the eroded side-slopes beyond the end of the rock swale (approximately 30 feet) down the ravine where the slope steepens. Options for protecting the side slopes should consider the lack of sunlight and vegetated understory. Some grading may be required to ensure the flow area is not restricted due to the addition of rip rap or other energy dissipation methods. A few trees may also need to be removed to allow for proper grading of the side slopes.

Southwesterly Area (Exhibit C)

Existing Conditions and Background Information

The Southwesterly Area shown in **Exhibit C** generally consists of a drainage swale located behind lots 340-370 Lythrum Ln, conveying runoff from Lythrum Ln and approximately 6 lots. The original (as-built) condition was a vegetated drainage swale.

Over the last few years, vegetation, including dense cattails, established within the swale causing standing water within the swale. Runoff encroached into backyards and caused saturated conditions.

Observed System Modifications & Impacts

WSB observed and learned of the following modifications/repairs made to the system. To address these issues, the HOA removed vegetation in the swale, widened and regraded, and added 1-2" diameter river rock along swale bottom to reduce vegetation growth and promote flow. Based on HOA knowledge, this repair has reduced the occurrence of standing and back-ups within the swale.

Spoils from the HOA's maintenance operations were placed in a berm on the east side of the swale area. It appeared in some locations that the berm was trapping runoff, potentially concentrating the runoff, and causing some minor erosion and/or limiting plant growth. It also appeared that some of the sediment that was removed from the swale was deposited on the north bank; the ground surface appeared to be saturated in some of these areas.

With respect to water quality treatment, the removal of vegetation slightly reduces the phosphorus removal. Given the length and geometry of the swale, it is not expected that the removal of the vegetation will have a significant direct impact on water quality. This conclusion is supported by a very high level assessment of removal efficiencies of swale using the MIDS Calculator. Changing the Manning's roughness value of the swale from vegetation (0.035) to the equivalent of small rocks (~0.02) does not have a sizeable impact on TP or TSS removals.

Given the geometry and slope of the swale, erosion issues are not anticipated due to slow velocities. Additionally, the downstream waterbody appears to provide sufficient deadpool sedimentation treatment, and the long swale and high amount of disconnected impervious still provide pretreatment.

Recommendations & Next Steps

Based on our observations during the site visit and engineering judgement given the readily available information, we recommend the HOA or its consultant consider these corrections/next-steps:

- Remove the spoil piles/berms created when the rock swale was constructed and return slope to what was likely more of a “sheet flow” condition.
- Vegetate disturbed or other existing bare areas with approved seed mixtures.

Conclusion

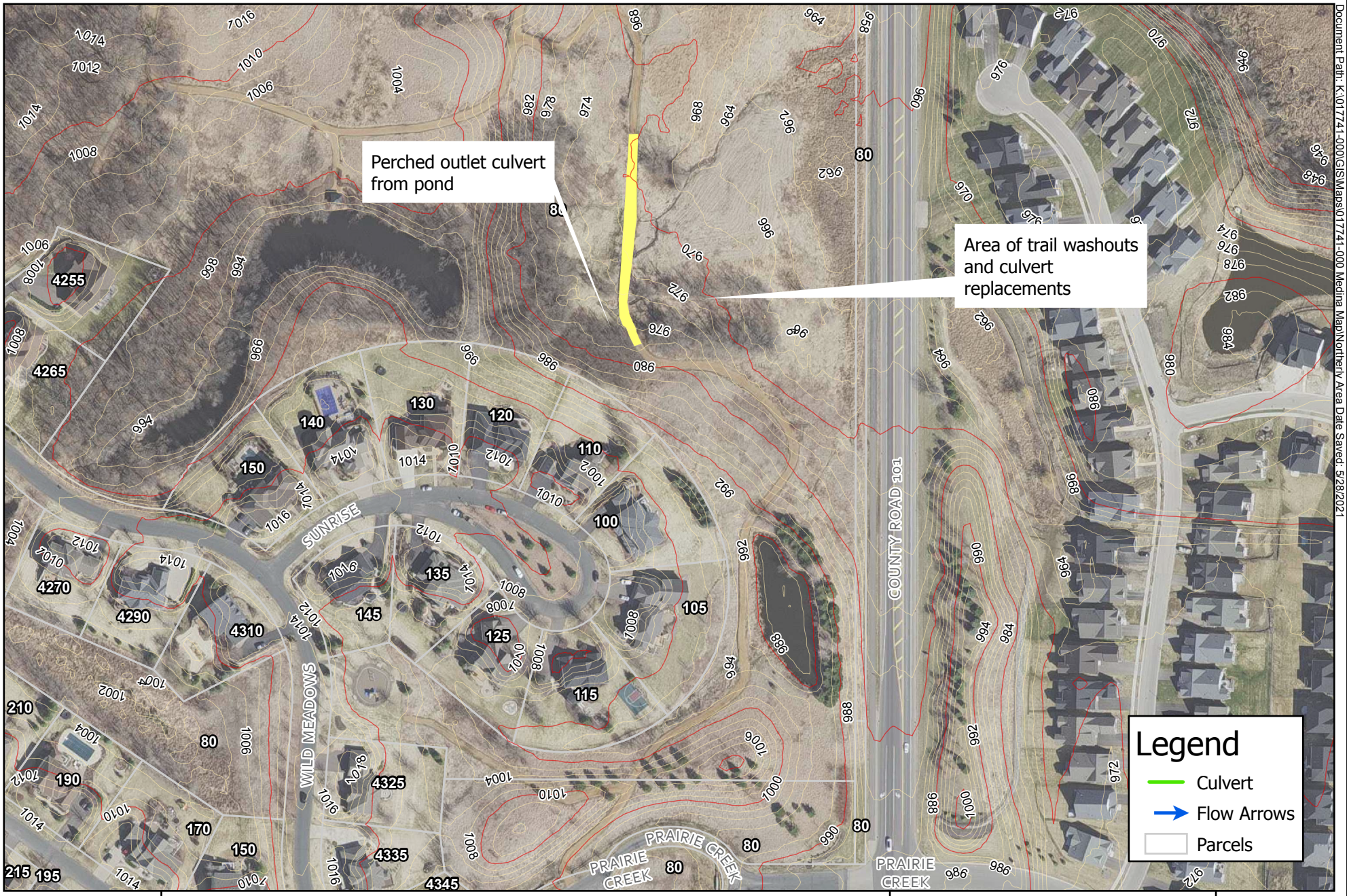
This memo constitutes a summary of our high-level observations, analysis, and review of the stormwater management modifications in the three primary areas of the Wild Meadows development described in this report.

We recommend that the HOA hires an engineering consultant to review in more detail the contents of this memo and the overall development to implement corrections, create a long-term maintenance plan, and monitor the drainage areas. Included in the maintenance plan should be recommendations regarding the use of herbicides in and around the drainage areas and their potential impacts to water quality.

We recommend that the Homeowners Association coordinates with the MN Land Trust on all further considerations of changes to the site as well as any proposed maintenance activity. As a general rule, all swales should remain vegetated unless otherwise approved by the City.

The HOA or its consultant should contact the applicable permitting agencies and easement owners, including MCWD, MN DNR, MN Army Corps of Engineers, MN Land Trust, and the City of Medina to coordinate and review the proposed project elements and maintenance plan.

We appreciate that opportunity to provide this assessment and recommendations. Please contact Joey Abramson at 763-270-3469 or jabramson@wsbeng.com with any questions. We would be happy to discuss a time to review our findings in more detail.



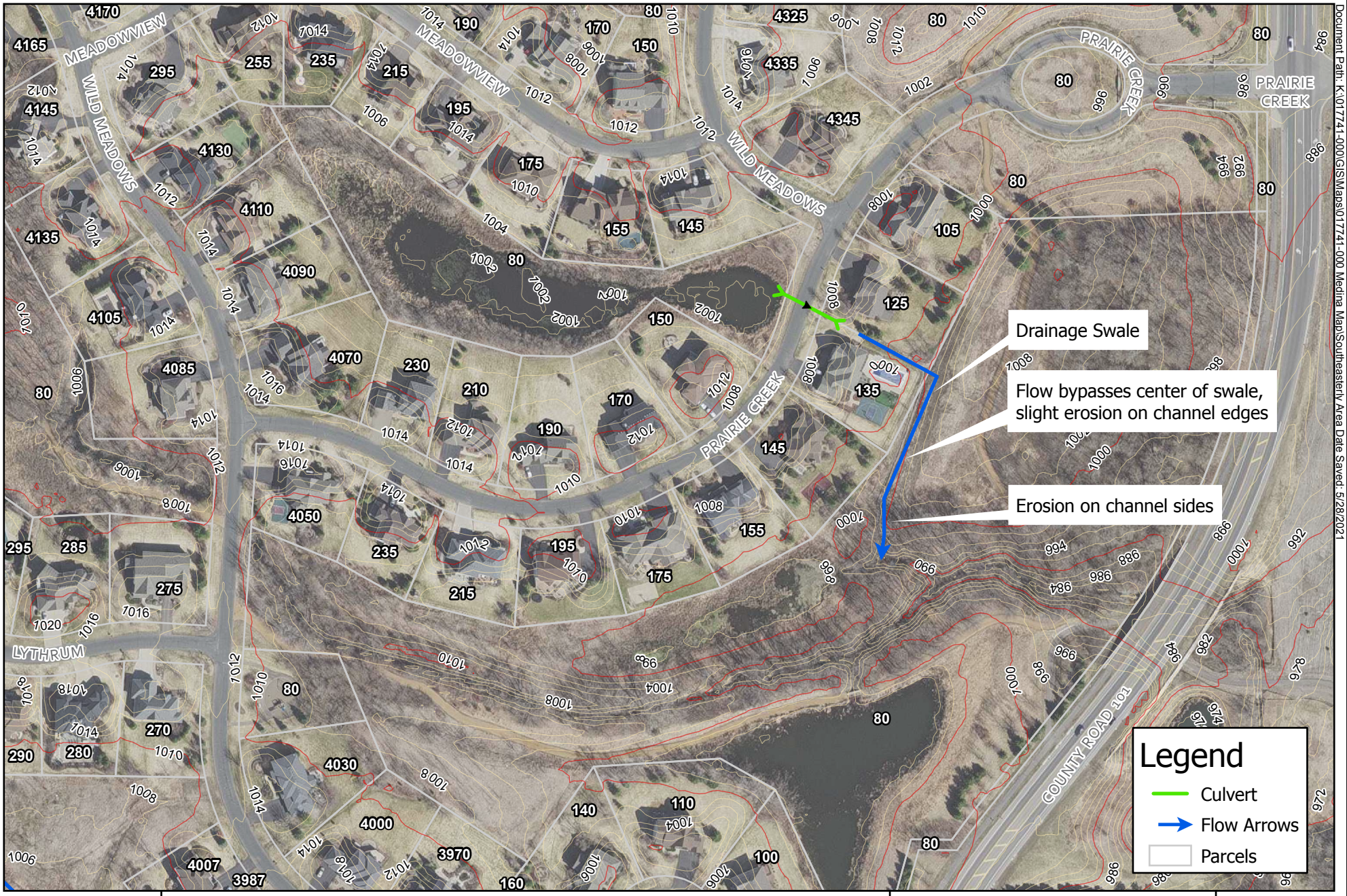
Document Path: K:\017741-000\GIS\Maps\017741-000 Medina MapNorthern Area Date Saved: 5/28/2021

CITY OF MEDINA

Exhibit A - Northerly Area

Wild Meadows Drainage Review
City of Medina, MN

wsb



CITY OF MEDINA

Exhibit B - Southeasterly Area

Wild Meadows Drainage Review
City of Medina, MN

N

0 200 Feet

1 inch = 200 feet

wsb

Document Path: K:\017741-000\GIS\Maps\017741-000 Medina MapSoutheasterly Area Date Saved: 5/28/2021

Document Path: K:\017741-000\GIS\Maps\017741-000 Medina MapSouthwesterly Area Date Saved: 5/28/2021

CITY OF MEDINA

Exhibit C - Southwesterly Area

Wild Meadows Drainage Review
City of Medina, MN

N

0 200 Feet

1 inch = 200 feet

wsb