Young Environmental Consulting Group, LLC

# Technical Memorandum

To: Linda Loomis, Administrator
Lower Minnesota River Watershed District

From: Katy Thompson, PE, CFM
Della Schall Young, PMP, CPESC

Date: July 14, 2021

Re: University of Minnesota Partnership for the Gully Assessment and Condition Project

---

Dr. Joe Magner, with the University of Minnesota's Department of Bioproducts and Biosystems Engineering, reached out to the Lower Minnesota River Watershed District (LMRWD or District) through Young Environmental Consulting Group (Young Environmental) in December 2020 to discuss field data collection opportunities for his students taking the Spring Semester 2021 class, Hydrology and Water Quality Field Methods (Environmental Sciences, Policy and Management [ESPM] 3111 and ESPM 5111). The District has enjoyed the benefits of collaborating with Dr. Magner's students because his students helped the District conduct geomorphic assessments of the District's trout streams in 2019. One student, Phil Margarit, who worked for Young Environmental as an intern, also collected gully condition surveys in 2020.

Because of this strong partnership, Young Environmental staff met with Dr. Magner and Phil to discuss opportunities for the ESPM students and developed a workplan for them to help further the identification of gullies in Dakota and Scott Counties during Spring Semester 2021.

Katy Thompson from Young Environmental presented the LMRWD gully project to the ESPM students on January 21, 2021, to provide them with background on the project and the need for additional data collection. The ESPM students were split into two groups to first identify potential sites for field inspections, collect data in the field to determine if the desktop assessment was accurately predicting the location of gullies, and then draft a summary report on their methods and results. Following this initial

meeting, Katy met with Phil and the ESPM students every two weeks for the remainder of the semester in an advisor role to provide feedback on their approach and plan.

## Desktop Assessment

As part of the class assignment, the ESPM students were tasked with identifying potential gully locations using GIS software and publicly available data before entering the field. The goal of this desktop assessment was to determine if there is a correlation between these data and the likelihood that gullies may develop within the LMRWD. Between the two groups, the ESPM students utilized publicly available information, including the 2020 Gully Inventory and Conditions Assessment report and GIS data:

- LMRWD Steep Slopes Overlay District (SSOD)
- Minnesota Department of Natural Resources (MnDNR) LiDAR data
- Historic and current landcover information
- Minnesota Department of Health groundwater and well index
- MnDNR spring data
- Natural Resources Conservation Service soils data
- Minnesota Geological Survey surficial geology data

Each team assessed the data differently; however, both teams placed priority on utilizing the SSOD, topography, soil drainage types (with emphasis on poorly drained soils), depth to water table, and proximity to springs.

## Field Data Collection

The ESPM students reviewed the available information and discussed internally how to apply the data to assess if an area within LRMWD had potential for gully development. The two groups provided a comprehensive list of 31 potential areas to assess in the field.

The ESPM students went into the field from April 18 to April 25, 2021, to assess the potential gully areas and the conditions of any found gullies using the same format as the *2020 Gully Inventory and Condition Assessment*. Katy provided the students with public access maps and information to avoid trespassing on private property, which removed four locations from the field collection activities.

Of the remaining twenty-seven sites, thirteen were identified in the field as being gullies, whereas six were determined to not be gullies. Several of the potential gully areas were not visited because of difficulties accessing the sites, time limitations, or user error with the survey equipment.

## Results

The two ESPM student groups reviewed the data they collected and summarized their findings in independent reports. These reports indicated that some of the criteria used to identify gully locations did not have a noticeable correlation to gully development, in particular the springs and groundwater data. Although groundwater and seeps are known to destabilize soils, the depth to water table and historic springs data did not seem to accurately predict gully development. The factors that did have a more direct correlation to gully development appeared to be steep slopes and stormwater outfalls. Additionally, the ESPM students recommended incorporating land cover, placing more emphasis on the steep slopes, and developing a more objective survey to reduce judgment and estimation for future phases of the gully project.

## 2021 Gully Inventory and Condition Assessment

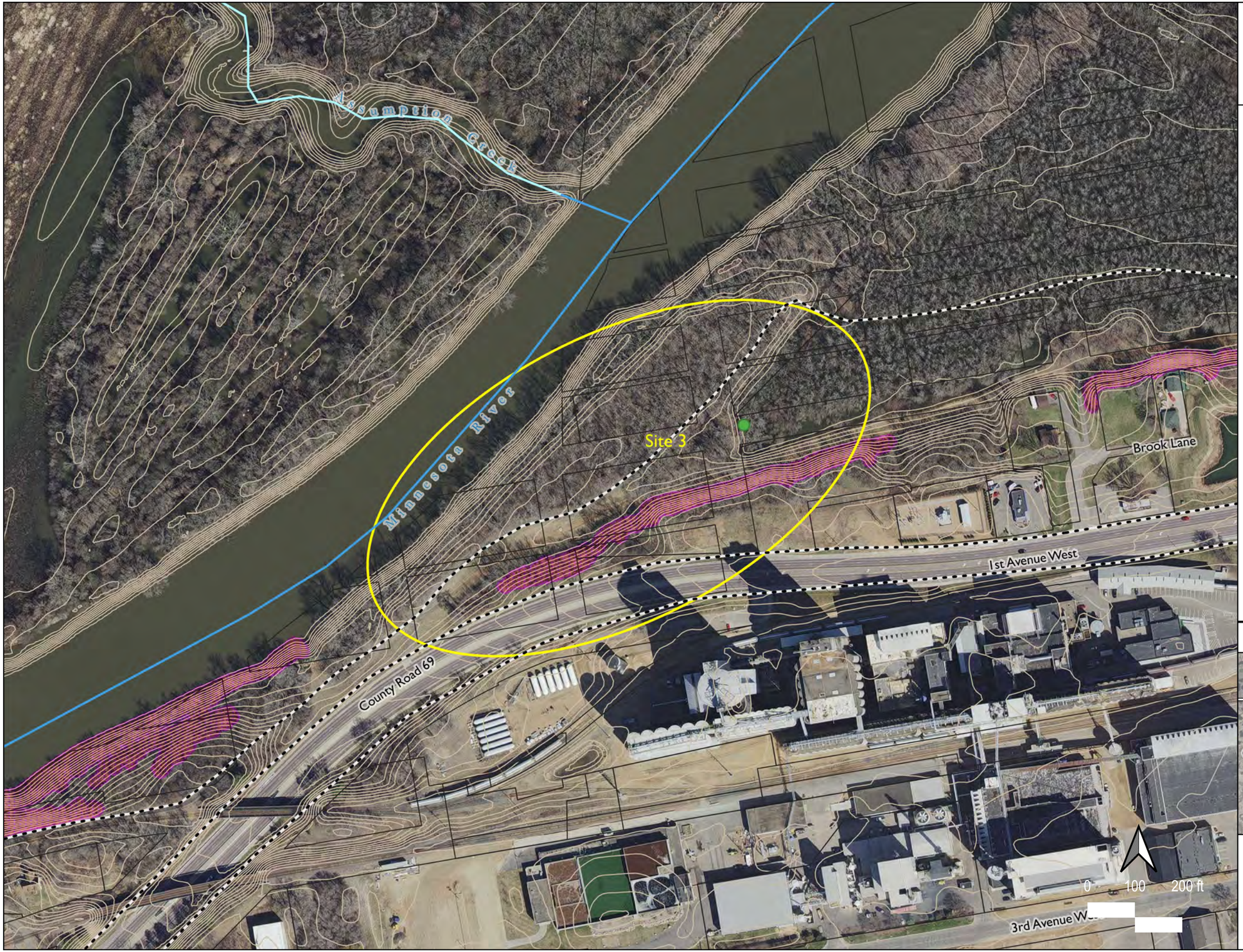
The 2021 gully project is currently underway and is utilizing the information the ESPM students vetted. The desktop analysis completed for the 2021 gully inventory work placed the most importance on identifying steep slopes outside of the SSOD, reviewing upstream land use data, and incorporating city-identified erosion hazards into the 2021 field locations. In addition, the survey forms used in 2020 have been revised to incorporate impartial scoring criteria to objectively evaluate gully erosion risk, which can also be applied to the 2020 sites. The interns have surveyed 187 sites to date and will be presenting their findings to the LMRWD managers at the August 18, 2021, board meeting.

Attachments

- Attachment 1—ESPM Survey Locations
- Attachment 2—ESPM Gully Survey Sheets

# ATTACHMENT 1 - ESPM CLASS SURVEY LOCATIONS

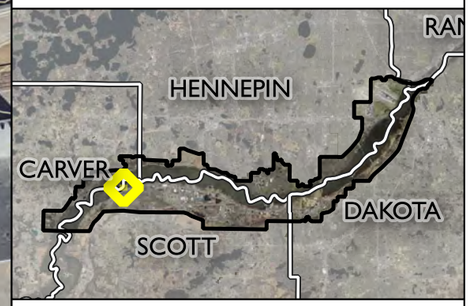
# Figure 1:
# Site 3




## LEGEND

April 2021 Gully Locations
- High Erosion Potential
- Moderate Erosion Potential
- Low Erosion Potential
- No Gullies Found
- Potential Gully Areas
- Scott Co. Trails
- State Trails
- MnDNR Spring Inventory
- LMRWD Trout Streams
- Public Waters
- Dakota Co. Parcel Data
- Scott Co. Parcel Data
- MnDNR LiDAR 2-ft Contours
- Public Waterbodies
- Steep Slopes Overlay District
- US Fish & Wildlife Service Property
- LMRWD Boundary

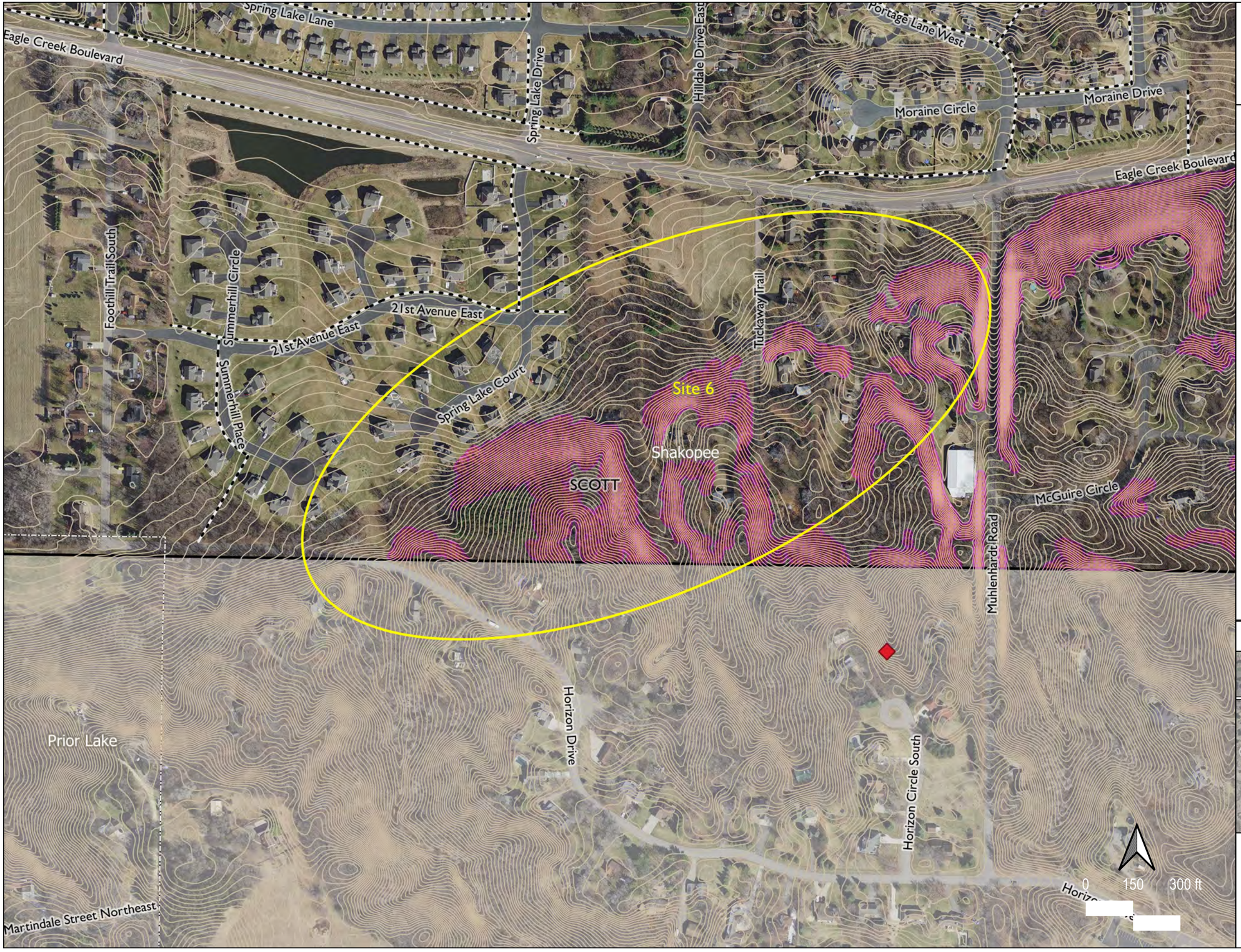
## LMRWD Watershed Location Map




Young Environmental Consulting Group, LLC

LOWER MINNESOTA RIVER WATERSHED DISTRICT

# Figure 2:
# Site 6

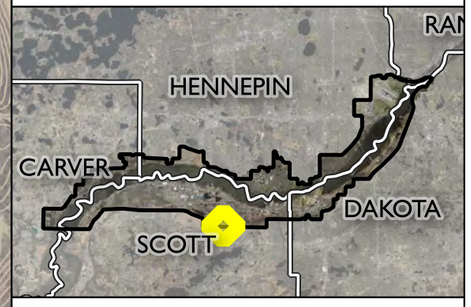



## LEGEND

April 2021 Gully Locations
- High Erosion Potential
- Moderate Erosion Potential
- Low Erosion Potential
- No Gullies Found

- Potential Gully Areas
- Scott Co. Trails
- State Trails
- MnDNR Spring Inventory
- LMRWD Trout Streams
- Public Waters
- Dakota Co. Parcel Data
- Scott Co. Parcel Data
- MnDNR LiDAR 2-ft Contours
- Public Waterbodies
- Steep Slopes Overlay District
- US Fish & Wildlife Service Property
- LMRWD Boundary

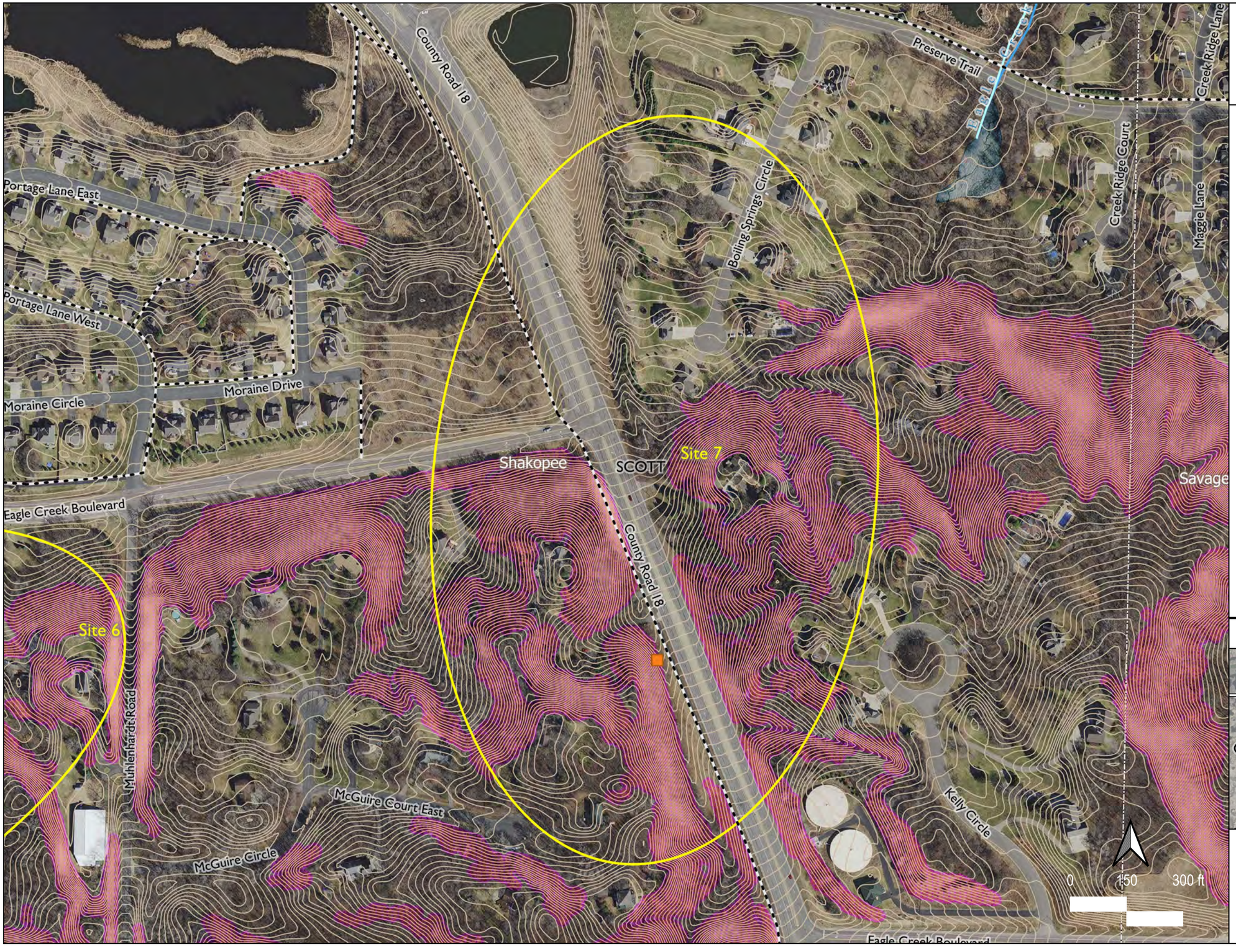
LMRWD Watershed Location Map




Young Environmental Consulting Group, LLC

LOWER MINNESOTA RIVER WATERSHED DISTRICT

# Figure 3:
# Site 7

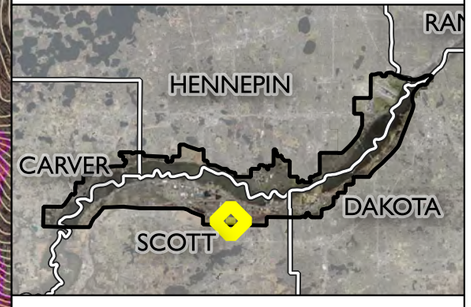



## LEGEND

April 2021 Gully Locations
- High Erosion Potential
- Moderate Erosion Potential
- Low Erosion Potential
- No Gullies Found

Potential Gully Areas
Scott Co. Trails
State Trails
MnDNR Spring Inventory
LMRWD Trout Streams
Public Waters
Dakota Co. Parcel Data
Scott Co. Parcel Data
MnDNR LiDAR 2-ft Contours
Public Waterbodies
Steep Slopes Overlay District
US Fish & Wildlife Service Property
LMRWD Boundary

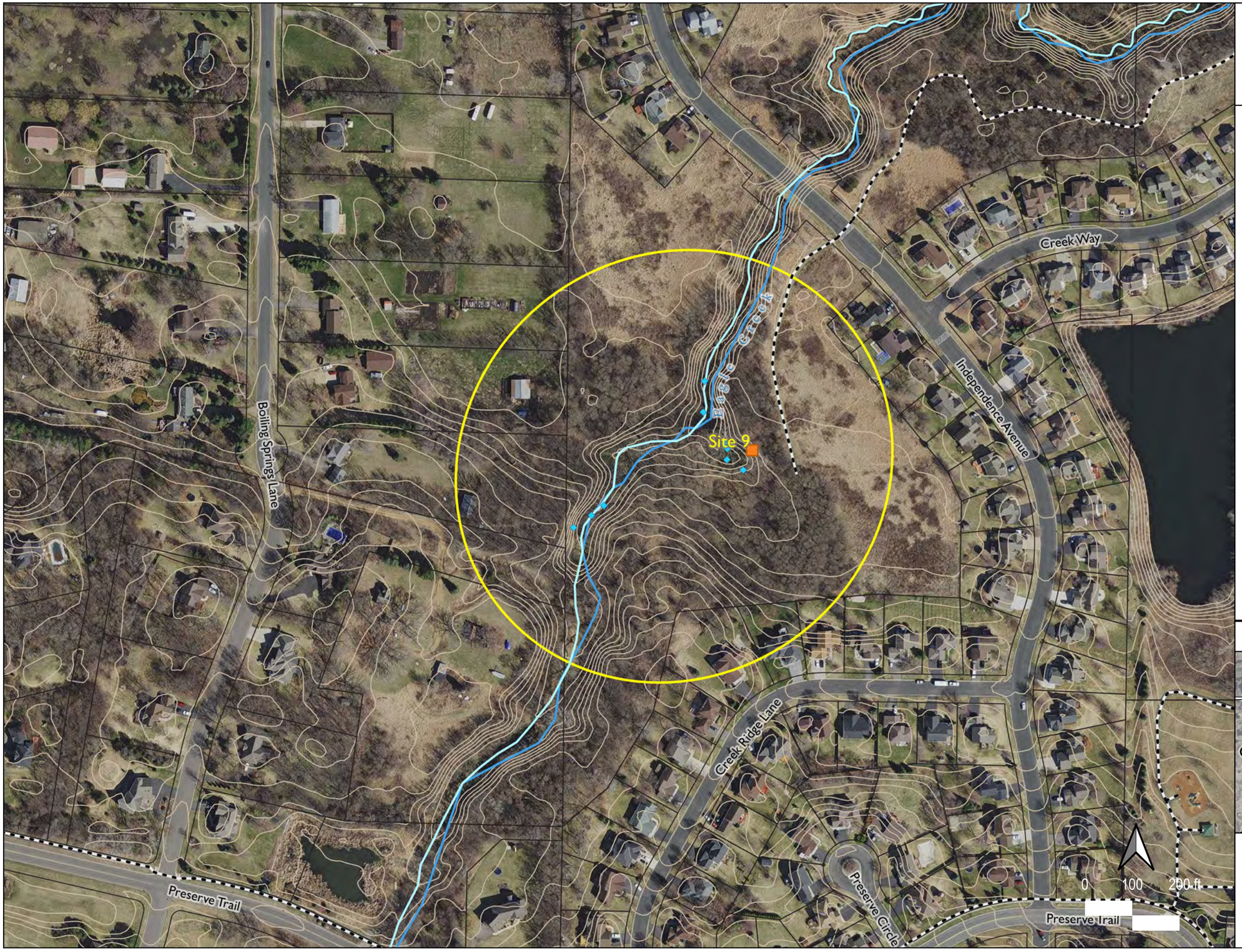
## LMRWD Watershed Location Map




Young Environmental Consulting Group, LLC

LOWER MINNESOTA RIVER WATERSHED DISTRICT

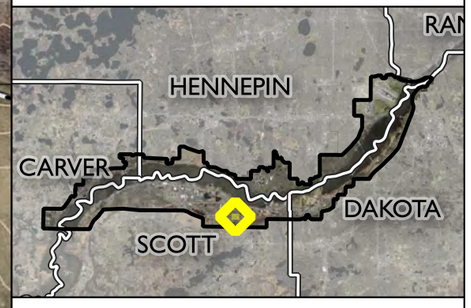
# Figure 4:
# Site 9




## LEGEND

- April 2021 Gully Locations
- High Erosion Potential
- Moderate Erosion Potential
- Low Erosion Potential
- No Gullies Found
- Potential Gully Areas
- Scott Co. Trails
- State Trails
- MnDNR Spring Inventory
- LMRWD Trout Streams
- Public Waters
- Dakota Co. Parcel Data
- Scott Co. Parcel Data
- MnDNR LiDAR 2-ft Contours
- Public Waterbodies
- Steep Slopes Overlay District
- US Fish & Wildlife Service Property
- LMRWD Boundary

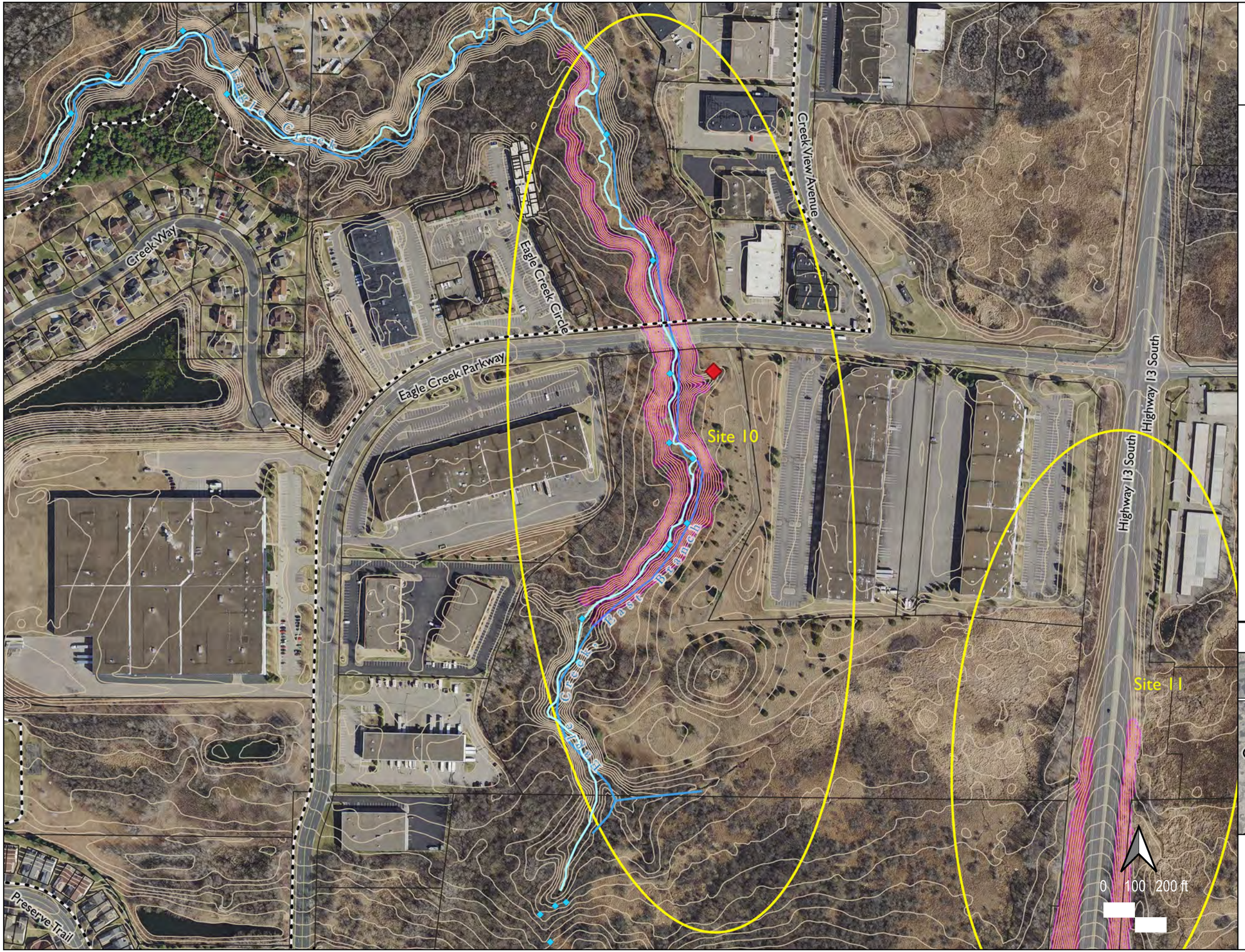
LMRWD Watershed Location Map




Young Environmental Consulting Group, LLC

LOWER MINNESOTA RIVER WATERSHED DISTRICT

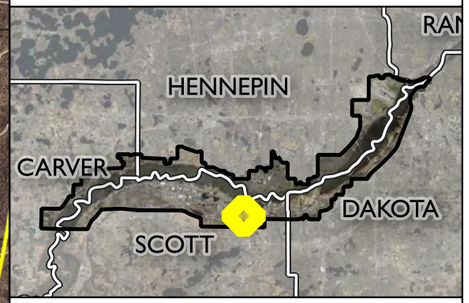
# Figure 5:
# Site 10




## LEGEND

April 2021 Gully Locations
- High Erosion Potential
- Moderate Erosion Potential
- Low Erosion Potential
- No Gullies Found
- Potential Gully Areas
- Scott Co. Trails
- State Trails
- MnDNR Spring Inventory
- LMRWD Trout Streams
- Public Waters
- Dakota Co. Parcel Data
- Scott Co. Parcel Data
- MnDNR LiDAR 2-ft Contours
- Public Waterbodies
- Steep Slopes Overlay District
- US Fish & Wildlife Service Property
- LMRWD Boundary

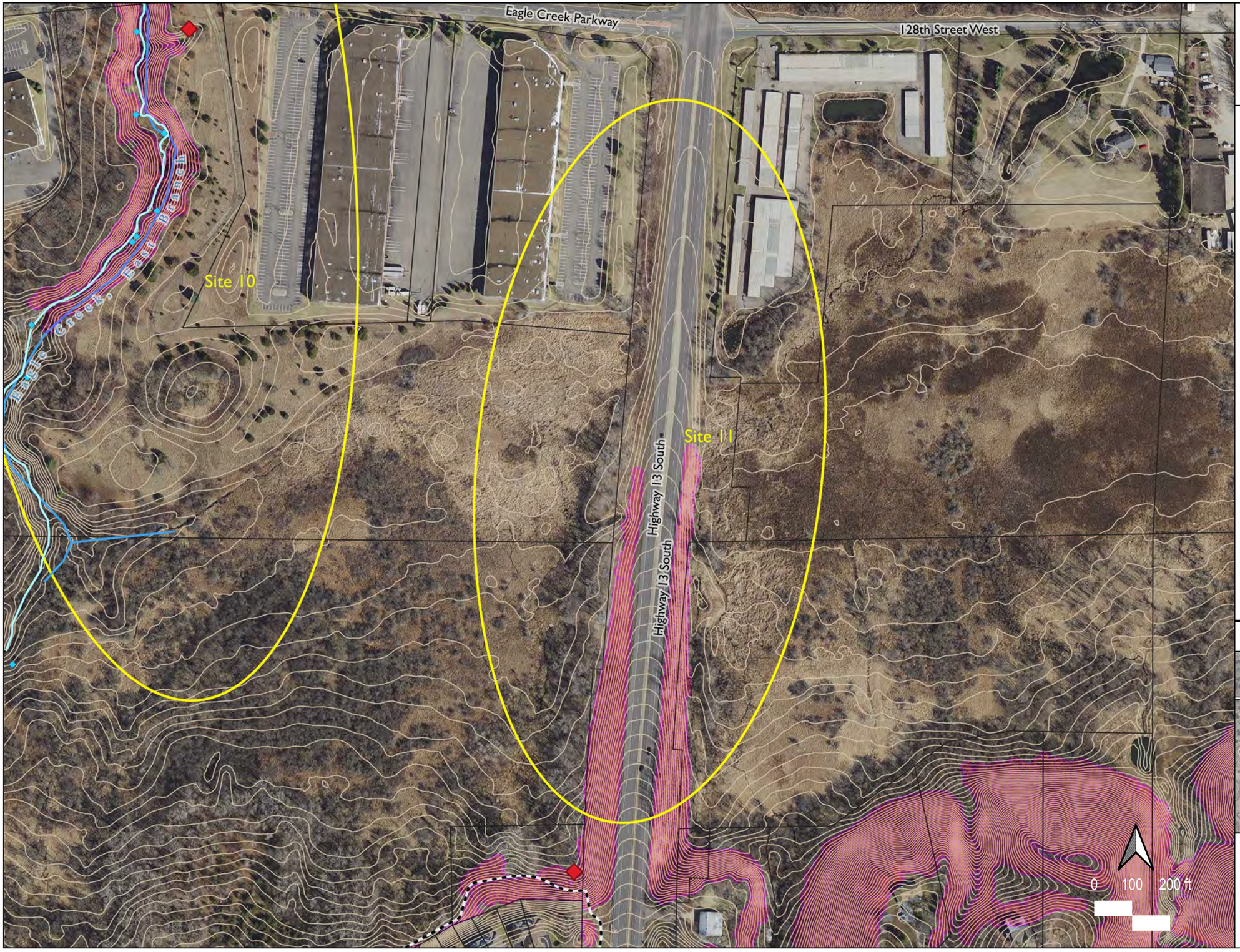
LMRWD Watershed Location Map




Young Environmental Consulting Group, LLC

LOWER MINNESOTA RIVER WATERSHED DISTRICT

# Figure 6:
# Site 11

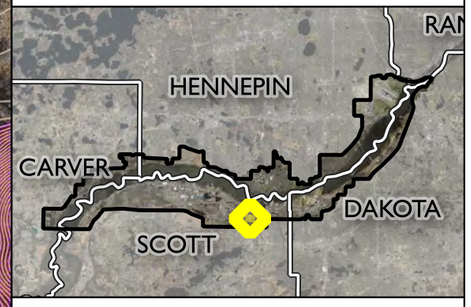



## LEGEND

April 2021 Gully Locations
- High Erosion Potential
- Moderate Erosion Potential
- Low Erosion Potential
- No Gullies Found

Potential Gully Areas
Scott Co. Trails
State Trails
MnDNR Spring Inventory
LMRWD Trout Streams
Public Waters
Dakota Co. Parcel Data
Scott Co. Parcel Data
MnDNR LiDAR 2-ft Contours
Public Waterbodies
Steep Slopes Overlay District
US Fish & Wildlife Service Property
LMRWD Boundary

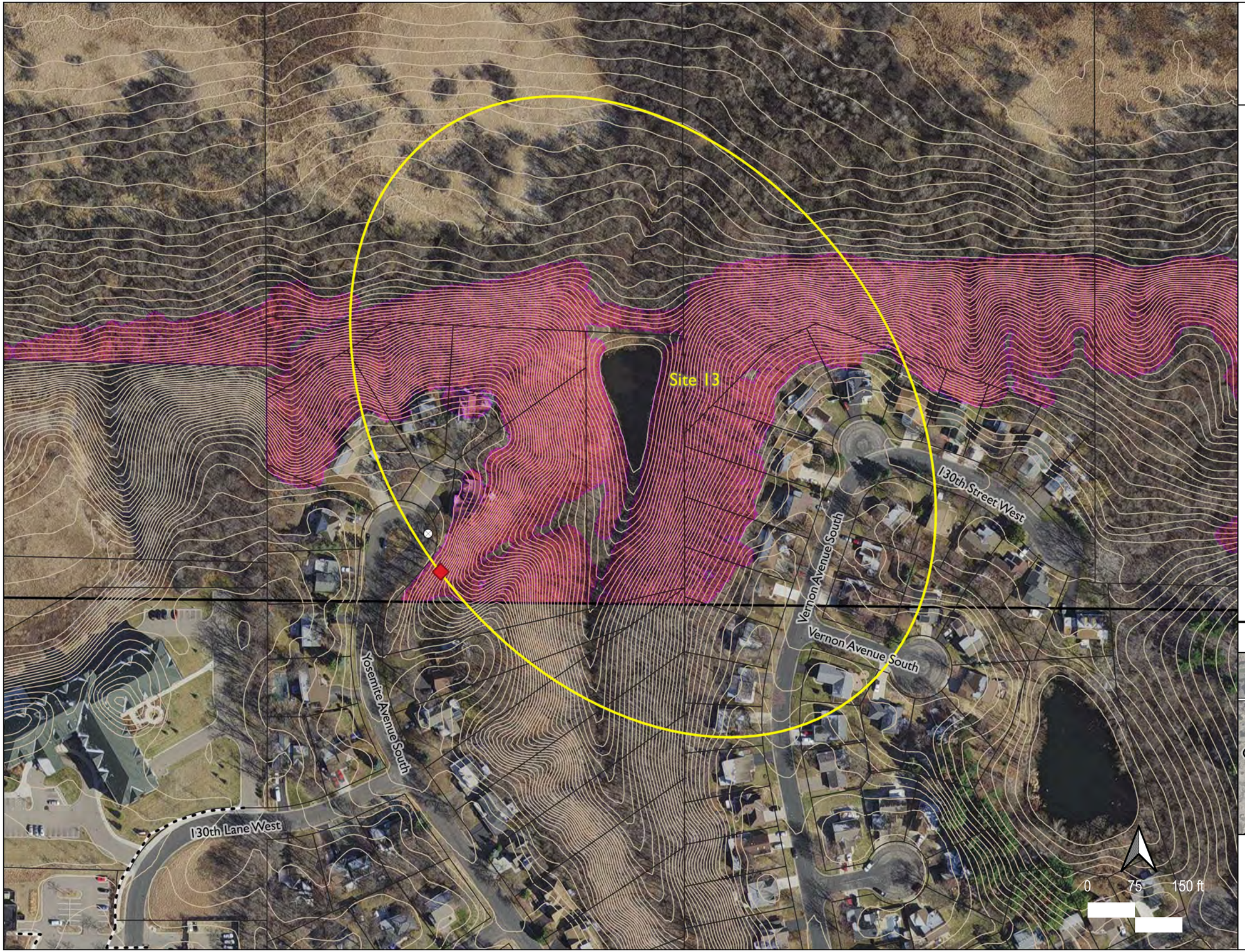
## LMRWD Watershed Location Map




Young Environmental Consulting Group, LLC

LOWER MINNESOTA RIVER WATERSHED DISTRICT

# Figure 7:
# Site 13

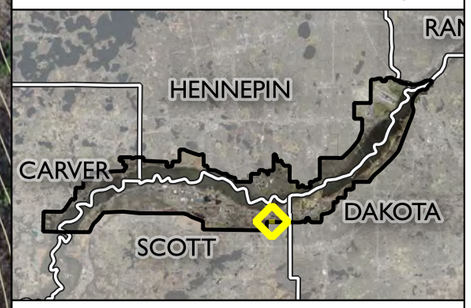



## LEGEND

April 2021 Gully Locations
- High Erosion Potential
- Moderate Erosion Potential
- Low Erosion Potential
- No Gullies Found

Potential Gully Areas
Scott Co. Trails
State Trails
MnDNR Spring Inventory
LMRWD Trout Streams
Public Waters
Dakota Co. Parcel Data
Scott Co. Parcel Data
MnDNR LiDAR 2-ft Contours
Public Waterbodies
Steep Slopes Overlay District
US Fish & Wildlife Service Property
LMRWD Boundary

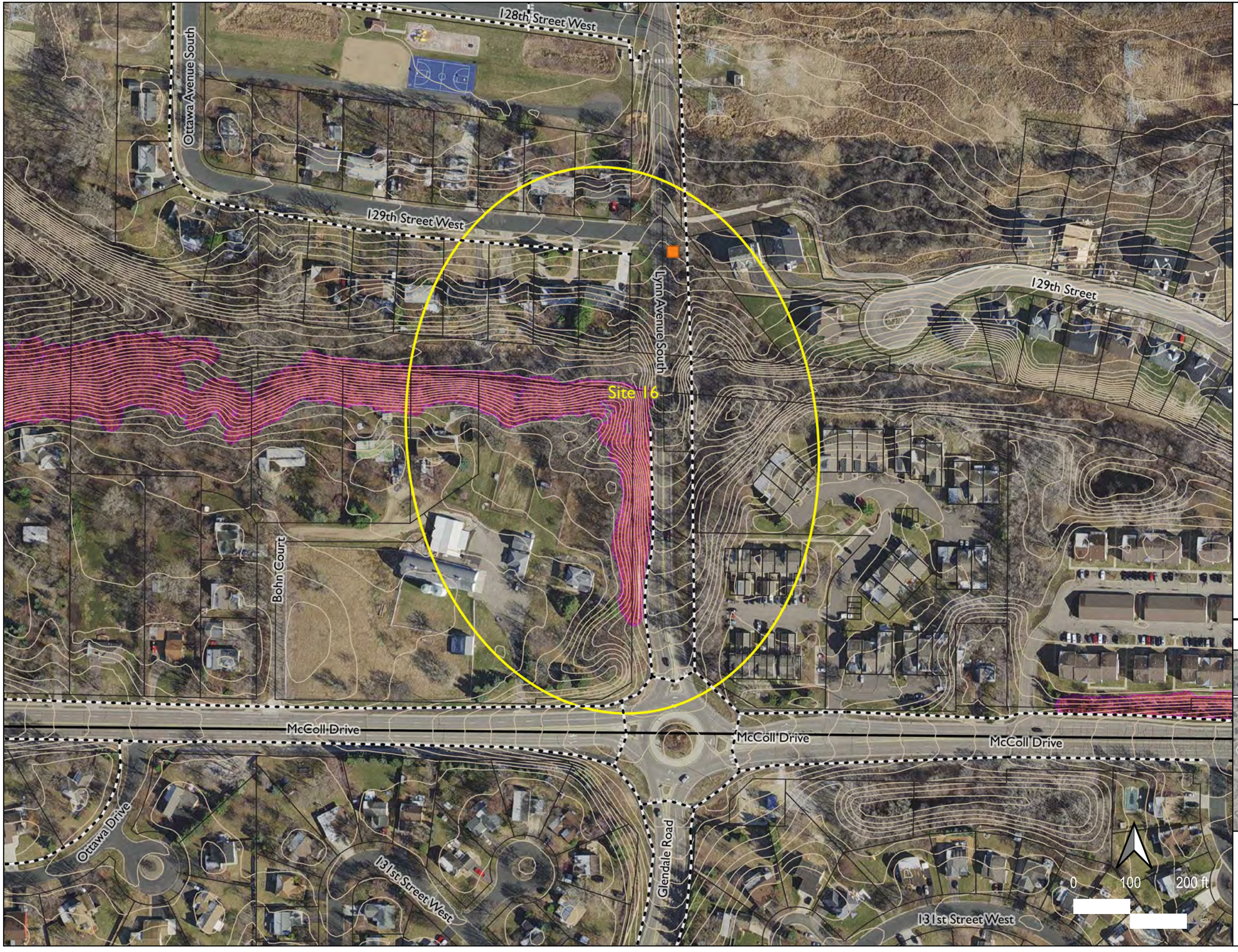
## LMRWD Watershed Location Map




Young Environmental Consulting Group, LLC

LOWER MINNESOTA RIVER WATERSHED DISTRICT

# Figure 8:
# Site 16

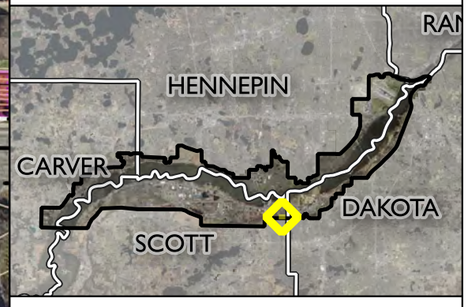



## LEGEND

April 2021 Gully Locations
- High Erosion Potential
- Moderate Erosion Potential
- Low Erosion Potential
- No Gullies Found

Potential Gully Areas
Scott Co. Trails
State Trails
MnDNR Spring Inventory
LMRWD Trout Streams
Public Waters
Dakota Co. Parcel Data
Scott Co. Parcel Data
MnDNR LiDAR 2-ft Contours
Public Waterbodies
Steep Slopes Overlay District
US Fish & Wildlife Service Property
LMRWD Boundary

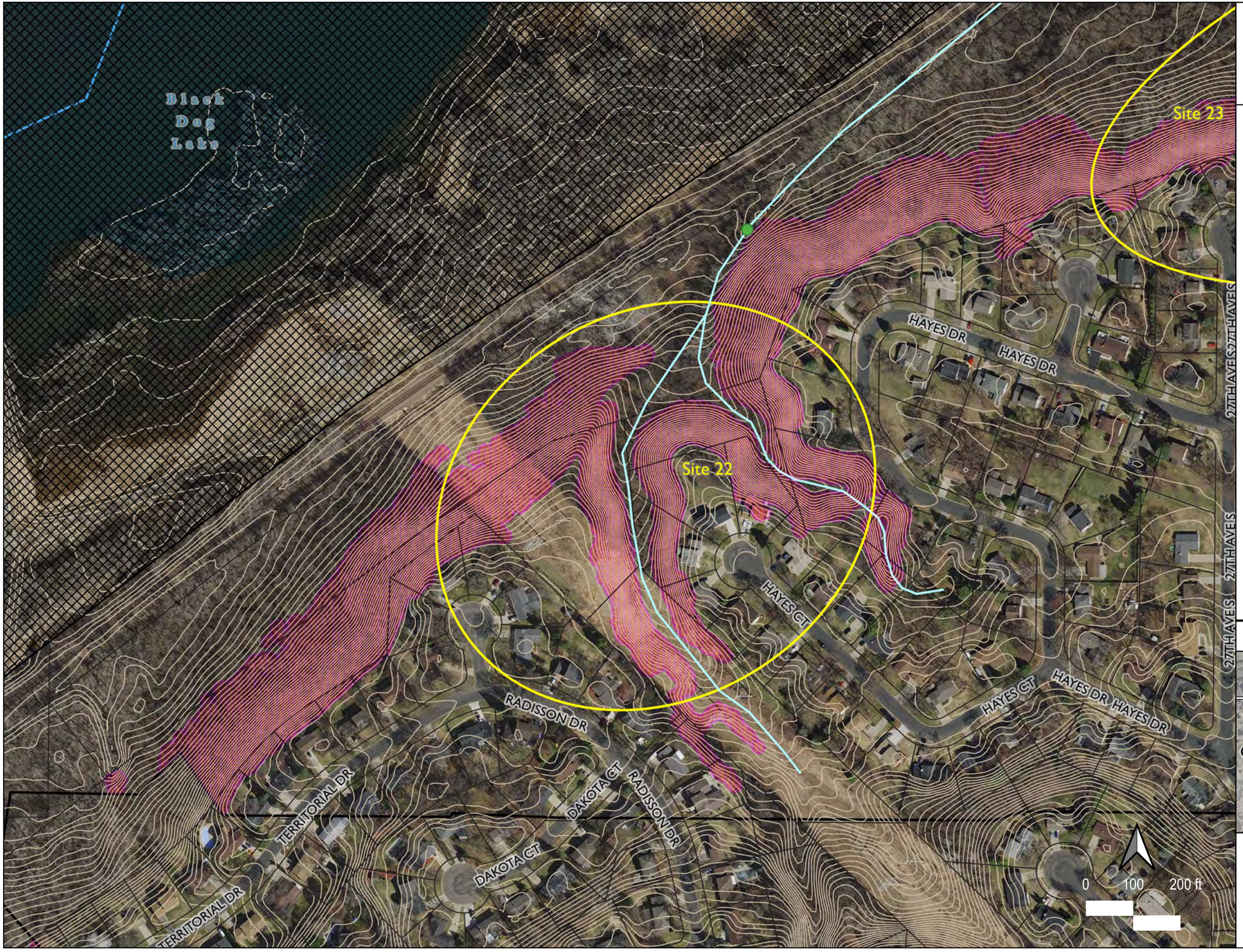
## LMRWD Watershed Location Map




Young Environmental Consulting Group, LLC

LOWER MINNESOTA RIVER WATERSHED DISTRICT

# Figure 9:
# Site 22

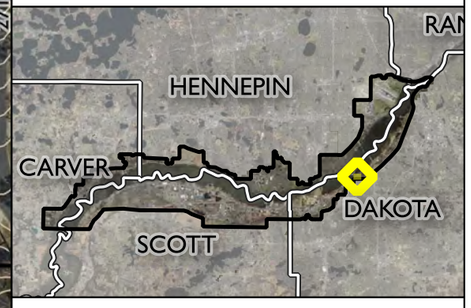



## LEGEND

April 2021 Gully Locations
- High Erosion Potential
- Moderate Erosion Potential
- Low Erosion Potential
- No Gullies Found

- Potential Gully Areas
- Scott Co. Trails
- State Trails
- MnDNR Spring Inventory
- LMRWD Trout Streams
- Public Waters
- Dakota Co. Parcel Data
- Scott Co. Parcel Data
- MnDNR LiDAR 2-ft Contours
- Public Waterbodies
- Steep Slopes Overlay District
- US Fish & Wildlife Service Property
- LMRWD Boundary

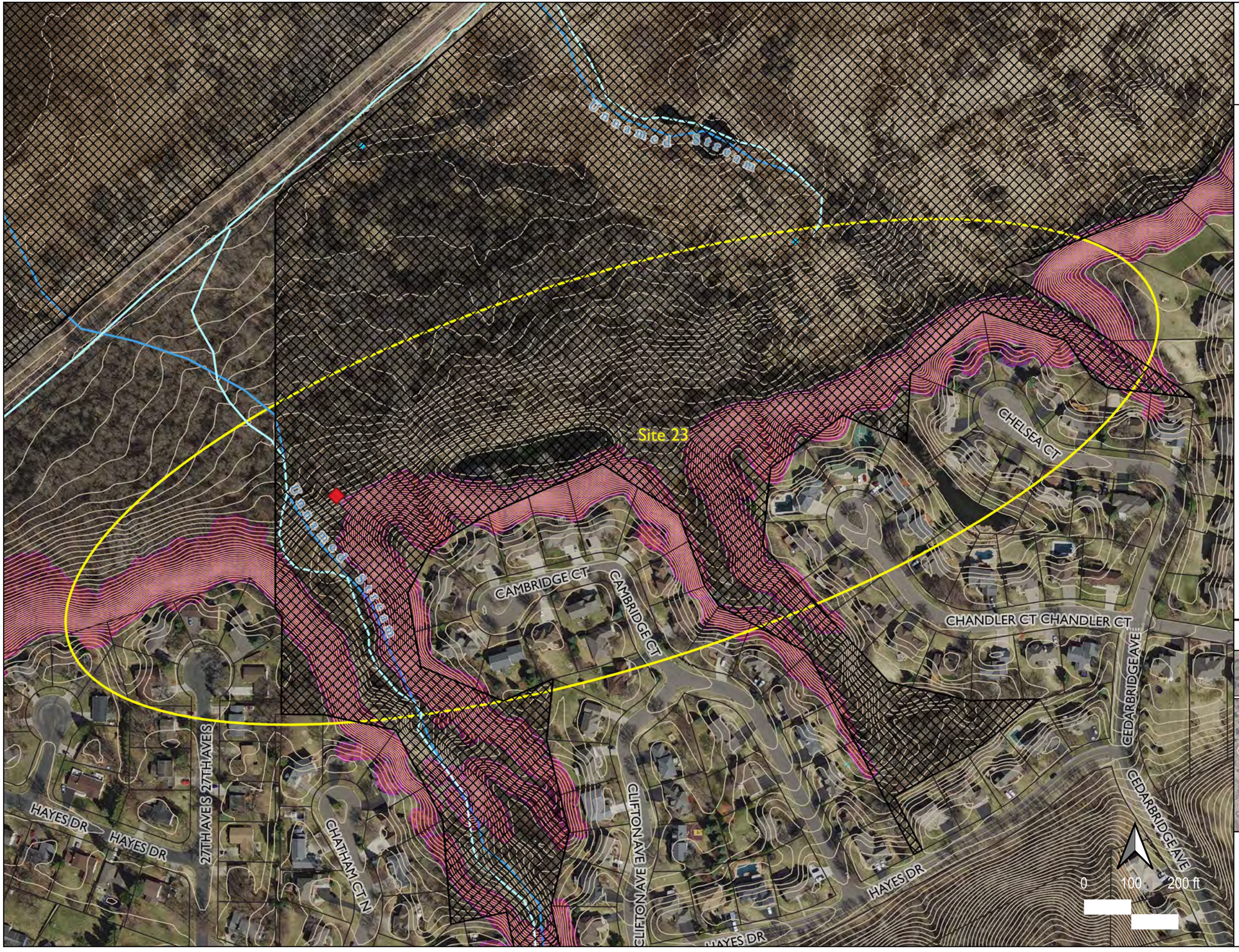
## LMRWD Watershed Location Map




Young Environmental Consulting Group, LLC

LOWER MINNESOTA RIVER WATERSHED DISTRICT

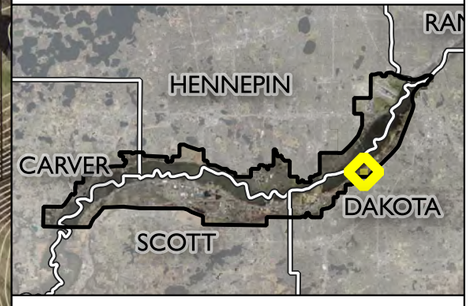
# Figure 10:
# Site 23




## LEGEND

April 2021 Gully Locations
- High Erosion Potential
- Moderate Erosion Potential
- Low Erosion Potential
- No Gullies Found
- Potential Gully Areas
- Scott Co. Trails
- State Trails
- MnDNR Spring Inventory
- LMRWD Trout Streams
- Public Waters
- Dakota Co. Parcel Data
- Scott Co. Parcel Data
- MnDNR LiDAR 2-ft Contours
- Public Waterbodies
- Steep Slopes Overlay District
- US Fish & Wildlife Service Property
- LMRWD Boundary

LMRWD Watershed Location Map




Young Environmental Consulting Group, LLC

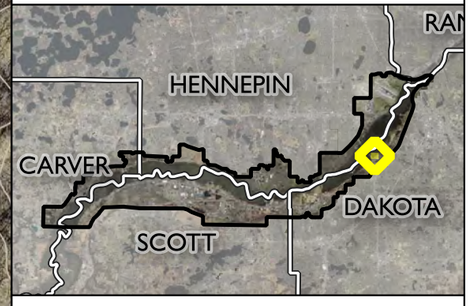
LOWER MINNESOTA RIVER WATERSHED DISTRICT

# Figure 11:
# Site 26


## LEGEND

April 2021 Gully Locations
- High Erosion Potential
- Moderate Erosion Potential
- Low Erosion Potential
- No Gullies Found
- Potential Gully Areas
- Scott Co. Trails
- State Trails
- MnDNR Spring Inventory
- LMRWD Trout Streams
- Public Waters
- Dakota Co. Parcel Data
- Scott Co. Parcel Data
- MnDNR LiDAR 2-ft Contours
- Public Waterbodies
- Steep Slopes Overlay District
- US Fish & Wildlife Service Property
- LMRWD Boundary

LMRWD Watershed Location Map




Young Environmental Consulting Group, LLC

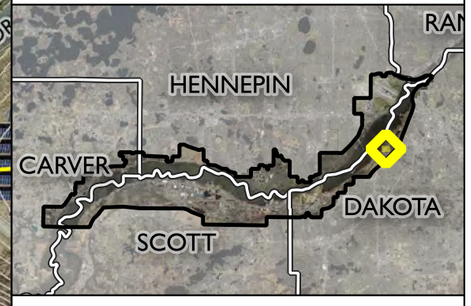
LOWER MINNESOTA RIVER WATERSHED DISTRICT

# Figure 12:
# Site 28


## LEGEND

April 2021 Gully Locations
- High Erosion Potential
- Moderate Erosion Potential
- Low Erosion Potential
- No Gullies Found
- Potential Gully Areas
- Scott Co. Trails
- State Trails
- MnDNR Spring Inventory
- LMRWD Trout Streams
- Public Waters
- Dakota Co. Parcel Data
- Scott Co. Parcel Data
- MnDNR LiDAR 2-ft Contours
- Public Waterbodies
- Steep Slopes Overlay District
- US Fish & Wildlife Service Property
- LMRWD Boundary

LMRWD Watershed Location Map




Young Environmental Consulting Group, LLC

LOWER MINNESOTA RIVER WATERSHED DISTRICT

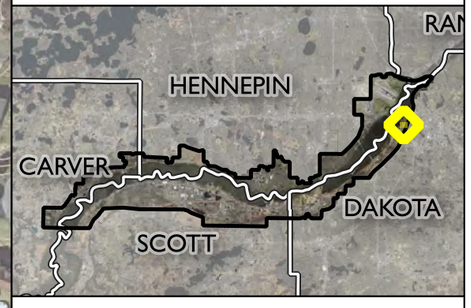
# Figure 13:
# Site 29


## LEGEND

April 2021 Gully Locations
- High Erosion Potential
- Moderate Erosion Potential
- Low Erosion Potential
- No Gullies Found

Potential Gully Areas
Scott Co. Trails
State Trails
MnDNR Spring Inventory
LMRWD Trout Streams
Public Waters
Dakota Co. Parcel Data
Scott Co. Parcel Data
MnDNR LiDAR 2-ft Contours
Public Waterbodies
Steep Slopes Overlay District
US Fish & Wildlife Service Property
LMRWD Boundary

## LMRWD Watershed Location Map




Young Environmental Consulting Group, LLC

LOWER MINNESOTA RIVER WATERSHED DISTRICT

# ATTACHMENT 2 - ESPM CLASS GULLY DATA SHEETS

| | |
|---|---|
| **GULLY ID:**<br>ESPM Site 3 |  |
| **PREVIOUS WAYPOINT ID:**<br>3 | Gully Head UTM Estimation: 30’, |
| **SURVEY DATE:**<br>April 18, 2021 1:33 PM | Observation Point correction, if applicable: |
| **LOCATION:**<br>Shakopee | Connections to other points, if applicable: |
| **TYPE OF SITE:**<br>Gully | |
| **SITE SUMMARY:**<br>Partly Cloudy<br>Rain in previous 24 hours: No<br><br>Off bike trail<br><br>Long: >100' gully.<br><br>The problem indicators were:<br>pistol-butted or leaning trees | |

| **GULLY INFORMATION** | |
|---|---|
| EROSION POTENTIAL: | Low |
| GULLY DEPTH: | Medium: 3'-15' |
| BOTTOM WIDTH: | Wide: >5' |
| TOP WIDTH: | Wide: >10' |
| BANK CONDITION: | Some Vegetation |
| BOTTOM CONDITION: | Some Vegetation |
| CHANNEL SLOPE: | Flat |
| GULLY SHAPE: | Trapezoid |
| GULLY MATERIAL: | Fine-grained cohesive |
| WATER LEVELS | None, N/A |
| SEEP | No |
| APPARENT CAUSES: | Slope, Unstable drainage feature entering system |

**ADDITIONAL NOTES:**

Invasive Species? Unkown
Type: Unkown

Debris? Some debris and trash

Existing Stabilization? Riprap/large stones
Success: Yes



Young Environmental Consulting Group, LLC

**PICTURES:**

Bank reinforcing stones

Edge of gully opposite reinforcing edge

Drainage feature blocked by sticks

| | |
|---|---|
| **GULLY ID:**<br>ESPM Site 6 |  |
| **PREVIOUS WAYPOINT ID:**<br>Site 6 | |
| **SURVEY DATE:**<br>April 22, 2021 12:04 PM | |
| **LOCATION:** | Gully Head UTM Estimation: 30 ft,<br><br>Observation Point correction, if applicable:<br>15T4674994956382<br><br>Connections to other points, if applicable: |
| **TYPE OF SITE:**<br>Gully | |
| **SITE SUMMARY:**<br>Sunny<br>Rain in previous 24 hours: Yes: Low Intensity, No<br><br>Along a Road<br><br>Long: >100' gully.<br><br>The problem indicators were: Degradation, Aggradation, Flattened and/or slumping banks (widening), undercut or overhanging banks (lateral scouring), pistol-butted or leaning trees | |

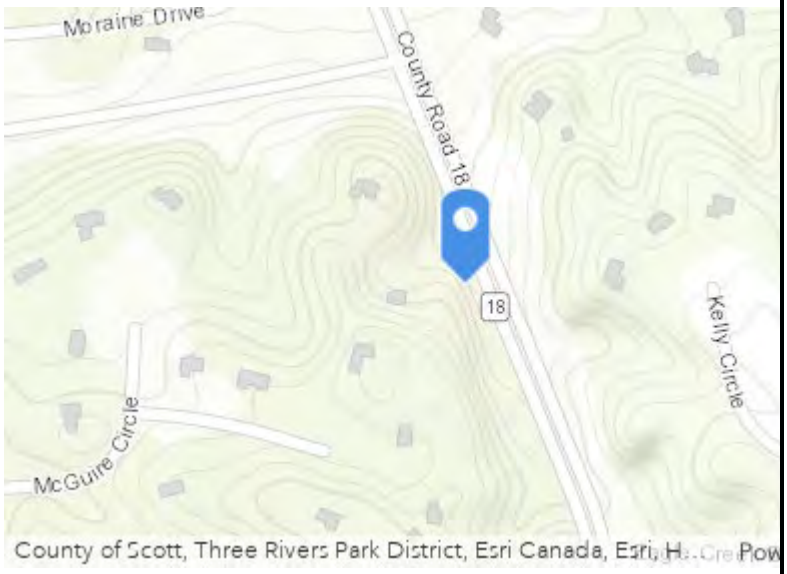
| **GULLY INFORMATION** | |
|---|---|
| EROSION POTENTIAL: | High |
| GULLY DEPTH: | Shallow: <3' |
| BOTTOM WIDTH: | Narrow/V Ditch, Medium: 1'-5' |
| TOP WIDTH: | Medium: 5'-10', Narrow: 1'-5' |
| BANK CONDITION: | Some Vegetation |
| BOTTOM CONDITION: | Some Vegetation |
| CHANNEL SLOPE: | Steep |
| GULLY SHAPE: | U-shaped |
| GULLY MATERIAL: | Gravel/cobble/ boulders , Sand, Fine-grained cohesive |
| WATER LEVELS | None, N/A |
| SEEP | No |
| APPARENT CAUSES: | Slope, Unstable drainage feature entering system |

**ADDITIONAL NOTES:**
Near site 6
Invasive Species? None
Type: Burdock, None
Debris? Little trash
Existing Stabilization? Rip rap or burlap under rocks at top of gully
Success: No



Young Environmental Consulting Group, LLC

**PICTURES:**

| | |
|---|---|
| **GULLY ID:**<br>ESPM Site 7 |  |
| **PREVIOUS WAYPOINT ID:**<br>Site 7 | |
| **SURVEY DATE:**<br>April 22, 2021 12:51 PM | |
| **LOCATION:**<br>Shakopee | |
| **TYPE OF SITE:**<br>Gully | |
| **SITE SUMMARY:**<br>Sunny<br>Rain in previous 24 hours: No<br><br>Off of Walking Trail<br><br>Long: >100' gully.<br><br>The problem indicators were: Degradation, Loss of Bank Vegetation, Flattened and/or slumping banks (widening), pistol-butted or leaning trees | Gully Head UTM Estimation: 5 ft,<br><br>Observation Point correction, if applicable:<br><br>Connections to other points, if applicable: |

| **GULLY INFORMATION** | |
|---|---|
| EROSION POTENTIAL: | Moderate |
| GULLY DEPTH: | Shallow: <3' |
| BOTTOM WIDTH: | Medium: 1'-5' |
| TOP WIDTH: | Medium: 5'-10' |
| BANK CONDITION: | Some Vegetation |
| BOTTOM CONDITION: | Some Vegetation |
| CHANNEL SLOPE: | Steep |
| GULLY SHAPE: | U-shaped |
| GULLY MATERIAL: | Fine-grained cohesive |
| WATER LEVELS | None, N/A |
| SEEP | No |
| APPARENT CAUSES: | Slope |

**ADDITIONAL NOTES:**
Slight slope drains into storm sewer at end of gully

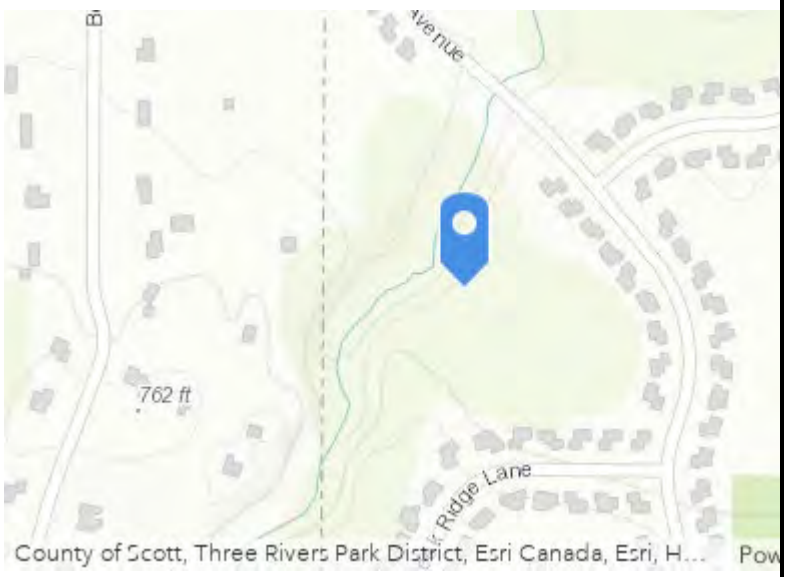
Invasive Species?
Type:

Debris? Lots of trash
Existing Stabilization? None
Success: N/A



Young Environmental Consulting Group, LLC

**PICTURES:**

| | |
|---|---|
| **GULLY ID:**<br>ESPM Site 9 |  |
| **PREVIOUS WAYPOINT ID:**<br>Site 9 | |
| **SURVEY DATE:**<br>April 22, 2021 1:58 PM | |
| **LOCATION:**<br>Savage | |
| **TYPE OF SITE:**<br>Gully | |
| **SITE SUMMARY:**<br>Sunny<br>Rain in previous 24 hours: No<br><br>Heavily Forested<br><br>Medium: 50'-100' gully.<br><br>The problem indicators were: Degradation, Aggradation, Loss of Bank Vegetation, Vertical and/or bare banks (incision), pistol-butted or leaning trees | Gully Head UTM Estimation: 5 feet,<br><br>Observation Point correction, if applicable:<br><br>Connections to other points, if applicable: |

| **GULLY INFORMATION** | |
|---|---|
| EROSION POTENTIAL: | Moderate |
| GULLY DEPTH: | Shallow: <3' |
| BOTTOM WIDTH: | Wide: >5' |
| TOP WIDTH: | Medium: 5'-10' |
| BANK CONDITION: | Some Vegetation |
| BOTTOM CONDITION: | Some Vegetation |
| CHANNEL SLOPE: | Flat |
| GULLY SHAPE: | Trapezoid |
| GULLY MATERIAL: | Fine-grained cohesive |
| WATER LEVELS | Moderate, Slow |
| SEEP | Yes |
| APPARENT CAUSES: | Seep/groundwater, Slope |

**ADDITIONAL NOTES:**

Invasive Species? None
Type: None

Debris? No trash some debris

Existing Stabilization? None
Success: No, N/A



Young Environmental Consulting Group, LLC

**PICTURES:**

| | |
|---|---|
| **GULLY ID:**<br>ESPM Site 10 |  |
| **PREVIOUS WAYPOINT ID:**<br>Site 10 | |
| **SURVEY DATE:**<br>April 22, 2021 1:11 PM | |
| **LOCATION:** | Gully Head UTM Estimation: 15 ft, |
| **TYPE OF SITE:**<br>Gully | Observation Point correction, if applicable: |
| **SITE SUMMARY:**<br>Sunny<br>Rain in previous 24 hours: No<br><br>Along a Road<br><br>Medium: 50'-100' gully.<br><br>The problem indicators were: Aggradation, Loss of Bank Vegetation, Flattened and/or slumping banks (widening), pistol-butted or leaning trees | Connections to other points, if applicable: |

| **GULLY INFORMATION** | |
|---|---|
| EROSION POTENTIAL: | High |
| GULLY DEPTH: | Deep: >15' |
| BOTTOM WIDTH: | Medium: 1'-5', Wide: >5' |
| TOP WIDTH: | Wide: >10' |
| BANK CONDITION: | Some Vegetation |
| BOTTOM CONDITION: | Some Vegetation |
| CHANNEL SLOPE: | Steep |
| GULLY SHAPE: | V-shaped |
| GULLY MATERIAL: | Fine-grained cohesive |
| WATER LEVELS | None, N/A |
| SEEP | No |
| APPARENT CAUSES: | Slope, Unstable drainage feature entering system |

**ADDITIONAL NOTES:**
In state aquatic management site

Invasive Species?
Type:

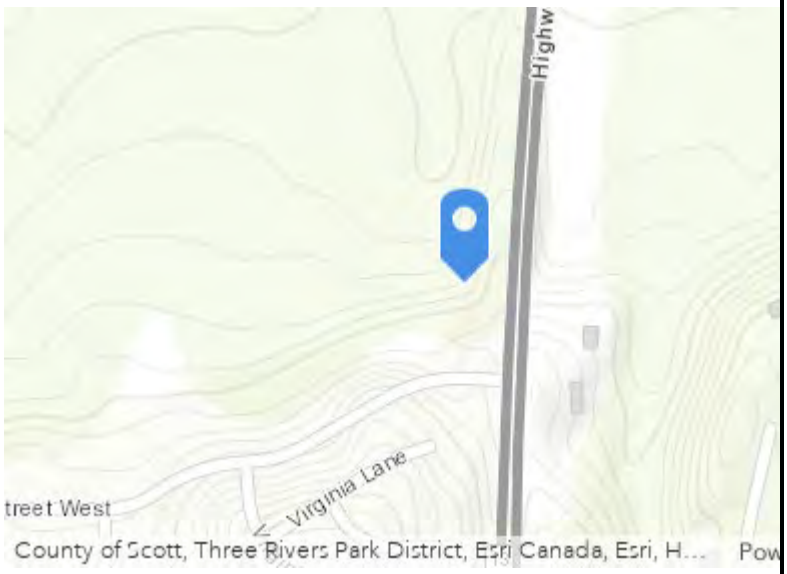
Debris? Some trash
Existing Stabilization? None
Success: N/A



Young Environmental Consulting Group, LLC

**PICTURES:**

Start of gully

| | |
|---|---|
| **GULLY ID:**<br>ESPM Site 11 |  |
| **PREVIOUS WAYPOINT ID:**<br>Site 11 | |
| **SURVEY DATE:**<br>April 22, 2021 1:29 PM | |
| **LOCATION:**<br>Savage | |
| **TYPE OF SITE:**<br>Gully | |
| **SITE SUMMARY:**<br>Sunny<br>Rain in previous 24 hours: No<br><br>Along a Road<br><br>Medium: 50'-100' gully.<br><br>The problem indicators were: Degradation, Aggradation, Loss of Bank Vegetation, Vertical and/or bare banks (incision), Flattened and/or slumping banks (widening) | Gully Head UTM Estimation: 20 feet,<br><br>Observation Point correction, if applicable:<br><br>Connections to other points, if applicable: |

| **GULLY INFORMATION** | |
|---|---|
| EROSION POTENTIAL: | High |
| GULLY DEPTH: | Shallow: <3' |
| BOTTOM WIDTH: | Medium: 1'-5' |
| TOP WIDTH: | Narrow: 1'-5' |
| BANK CONDITION: | Some Vegetation |
| BOTTOM CONDITION: | Bare Soil |
| CHANNEL SLOPE: | Steep |
| GULLY SHAPE: | V-shaped |
| GULLY MATERIAL: | Sand, Fine-grained cohesive |
| WATER LEVELS | None, N/A |
| SEEP | No |
| APPARENT CAUSES: | Slope, Unstable drainage feature entering system , Channel Incision |

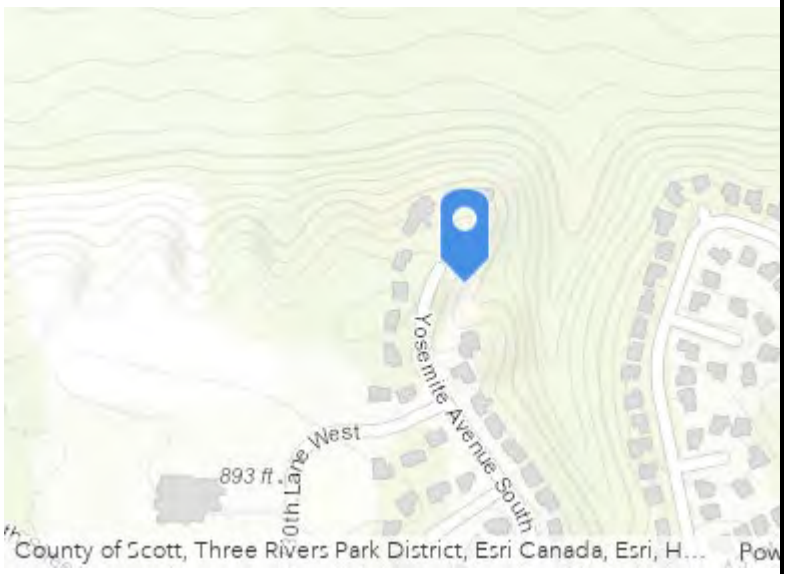
**ADDITIONAL NOTES:**

Invasive Species? None
Type: None
Debris? Some debris but no trash
Existing Stabilization? None
Success: No, N/A



Young Environmental Consulting Group, LLC

**PICTURES:**

| | |
|---|---|
| **GULLY ID:**<br>ESPM Site 13 |  |
| **PREVIOUS WAYPOINT ID:**<br>Site 13 | |
| **SURVEY DATE:**<br>April 22, 2021 2:44 PM | |
| **LOCATION:**<br>Savage | |
| **TYPE OF SITE:**<br>Gully | |
| **SITE SUMMARY:**<br>Sunny<br>Rain in previous 24 hours: No<br><br>Along a Road<br><br>Long: >100' gully.<br><br>The problem indicators were: Degradation, Flattened and/or slumping banks (widening), pistol-butted or leaning trees | Gully Head UTM Estimation: 50 ft,<br><br>Observation Point correction, if applicable:<br><br>Connections to other points, if applicable: |

| **GULLY INFORMATION** | |
|---|---|
| EROSION POTENTIAL: | High |
| GULLY DEPTH: | Deep: >15' |
| BOTTOM WIDTH: | Wide: >5' |
| TOP WIDTH: | Wide: >10', Medium: 5'-10', Narrow: 1'-5' |
| BANK CONDITION: | Some Vegetation |
| BOTTOM CONDITION: | Some Vegetation |
| CHANNEL SLOPE: | Steep |
| GULLY SHAPE: | V-shaped |
| GULLY MATERIAL: | Fine-grained cohesive |
| WATER LEVELS | None, N/A |
| SEEP | No |
| APPARENT CAUSES: | Slope, Unstable drainage feature entering system |

**ADDITIONAL NOTES:**

Invasive Species?
Type:

Debris? Some trash and debris

Existing Stabilization? None
Success: N/A



Young Environmental Consulting Group, LLC

**PICTURES:**

| | |
|---|---|
| **GULLY ID:**<br>ESPM Site 16 |  |
| **PREVIOUS WAYPOINT ID:**<br>Site 16 | |
| **SURVEY DATE:**<br>April 22, 2021 3:10 PM | |
| **LOCATION:**<br>Savage | |
| **TYPE OF SITE:**<br>Gully | |
| **SITE SUMMARY:**<br>Partly Cloudy<br>Rain in previous 24 hours: Yes: Low Intensity<br><br>Off of Walking Trail<br><br>Medium: 50'-100' gully.<br><br>The problem indicators were: Loss of Bank Vegetation, Vertical and/or bare banks (incision), pistol-butted or leaning trees | Gully Head UTM Estimation: 2',<br><br>Observation Point correction, if applicable:<br><br>Connections to other points, if applicable: |

| **GULLY INFORMATION** | |
|---|---|
| EROSION POTENTIAL: | Moderate |
| GULLY DEPTH: | Shallow: <3' |
| BOTTOM WIDTH: | Medium: 1'-5' |
| TOP WIDTH: | Narrow: 1'-5' |
| BANK CONDITION: | Bare Soil, Some Vegetation |
| BOTTOM CONDITION: | Some Vegetation |
| CHANNEL SLOPE: | Flat |
| GULLY SHAPE: | Trapezoid |
| GULLY MATERIAL: | Gravel/cobble/ boulders |
| WATER LEVELS | Low, Slow |
| SEEP | No |
| APPARENT CAUSES: | Unstable drainage feature entering system , Channel Incision |

**ADDITIONAL NOTES:**

Invasive Species?
Type:

Debris? Some trash

Existing Stabilization? Riprap
Success: Yes



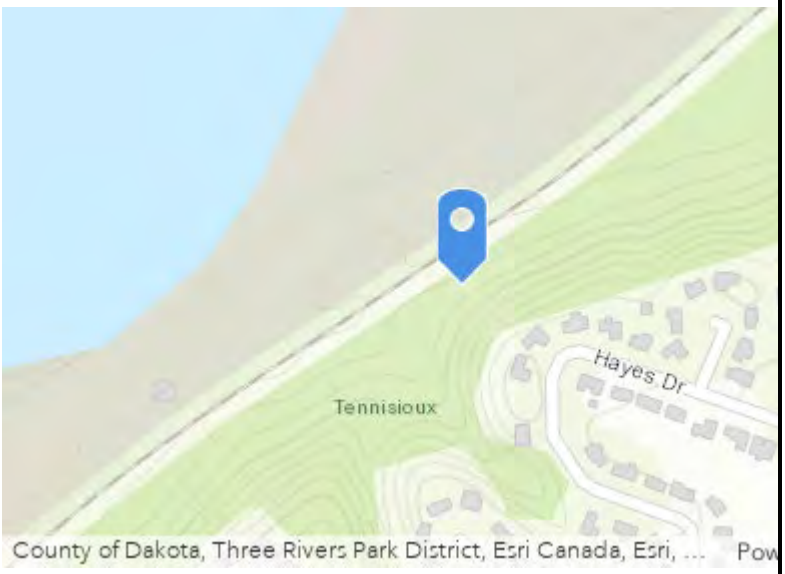
Young Environmental Consulting Group, LLC

**PICTURES:**

Riprap surrounding outlet feature

Debris and trash

Aproned outlet

| | |
|---|---|
| **GULLY ID:**<br>ESPM Site 22 |  |
| **PREVIOUS WAYPOINT ID:** | Gully Head UTM Estimation: 20, |
| **SURVEY DATE:**<br>April 17, 2021 2:26 PM | Observation Point correction, if applicable: |
| **LOCATION:** | Connections to other points, if applicable: |
| **TYPE OF SITE:**<br>Gully | |
| **SITE SUMMARY:**<br>Sunny<br>Rain in previous 24 hours: No<br><br>Heavily Forested<br><br>Long: >100' gully.<br><br>The problem indicators were:<br>Loss of Bank Vegetation, undercut or overhanging banks (lateral scouring) | |

| **GULLY INFORMATION** | |
|---|---|
| EROSION POTENTIAL: | Low |
| GULLY DEPTH: | Shallow: <3' |
| BOTTOM WIDTH: | Wide: >5' |
| TOP WIDTH: | Wide: >10' |
| BANK CONDITION: | Some Vegetation |
| BOTTOM CONDITION: | Armored |
| CHANNEL SLOPE: | Steep |
| GULLY SHAPE: | U-shaped |
| GULLY MATERIAL: | Gravel/cobble/ boulders |
| WATER LEVELS | Low, Slow |
| SEEP | No |
| APPARENT CAUSES: | None/Unknown |

**ADDITIONAL NOTES:**
8ft storm drain outlet creates stream

Invasive Species? Medium
Type: Common Buckthorn

Debris? Some
Existing Stabilization? N/a
Success: N/A



Young Environmental Consulting Group, LLC

**PICTURES:**

Stormwater outlet

| | |
|---|---|
| **GULLY ID:**<br>ESPM Site 23 |  |
| **PREVIOUS WAYPOINT ID:** | Gully Head UTM Estimation: 100ft, |
| **SURVEY DATE:**<br>April 17, 2021 2:12 PM | Observation Point correction, if applicable: |
| **LOCATION:** | Connections to other points, if applicable: |
| **TYPE OF SITE:**<br>Gully | |
| **SITE SUMMARY:**<br>Sunny<br>Rain in previous 24 hours: No<br><br>Off of Walking Trail<br><br>Long: >100' gully.<br><br>The problem indicators were: Degradation, Loss of Bank Vegetation, Vertical and/or bare banks (incision), pistol-butted or leaning trees | |

| **GULLY INFORMATION** | |
|---|---|
| EROSION POTENTIAL: | High |
| GULLY DEPTH: | Shallow: <3' |
| BOTTOM WIDTH: | Wide: >5' |
| TOP WIDTH: | Wide: >10' |
| BANK CONDITION: | Bare Soil |
| BOTTOM CONDITION: | Some Vegetation |
| CHANNEL SLOPE: | Flat |
| GULLY SHAPE: | U-shaped |
| GULLY MATERIAL: | Gravel/cobble/ boulders |
| WATER LEVELS | Low, Slow |
| SEEP | Yes |
| APPARENT CAUSES: | Slope, Scour from debris jam or other channel obstruction, Channel Incision, Dense Canopy |

**ADDITIONAL NOTES:**
In wildlife refuge and disappears after entering hidden pipe, couldn't find outlet

Invasive Species? Medium
Type: Common Buckthorn
Debris? No
Existing Stabilization? Boulders on slopes (pictured)
Success: Yes



Young Environmental Consulting Group, LLC

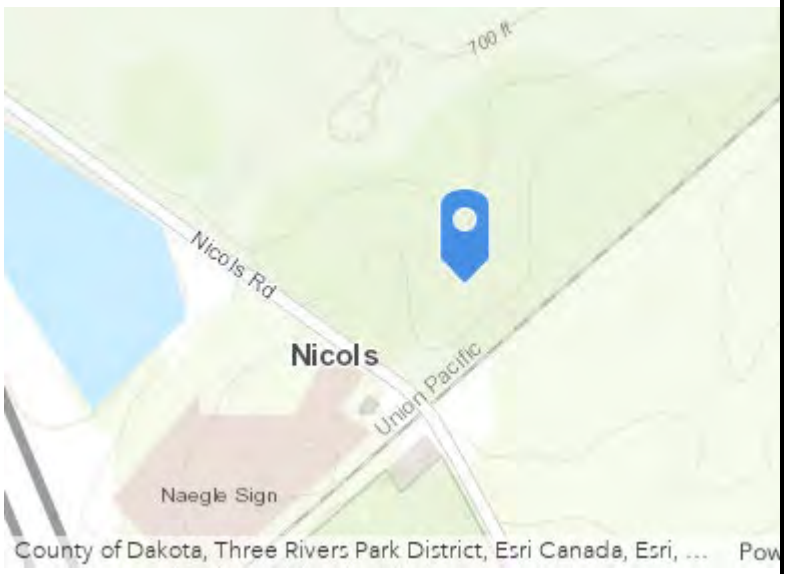
**PICTURES:**

Right off road access

150ft down trail

Erosion control structures

Turns into meandering stream

| | |
|---|---|
| **GULLY ID:**<br>ESPM Site 26 |  |
| **PREVIOUS WAYPOINT ID:** | Gully Head UTM Estimation: 100ftish, |
| **SURVEY DATE:**<br>April 17, 2021 12:47 PM | Observation Point correction, if applicable: |
| **LOCATION:** | Connections to other points, if applicable: No |
| **TYPE OF SITE:**<br>Gully | |
| **SITE SUMMARY:**<br>Sunny<br>Rain in previous 24 hours: No<br><br>Along a Road<br><br>Long: >100' gully.<br><br>The problem indicators were:<br>None | |

| **GULLY INFORMATION** | |
|---|---|
| EROSION POTENTIAL: | Low |
| GULLY DEPTH: | Shallow: <3' |
| BOTTOM WIDTH: | Medium: 1'-5' |
| TOP WIDTH: | Narrow: 1'-5' |
| BANK CONDITION: | Heavy Vegetation |
| BOTTOM CONDITION: | Bare Soil, Heavy Vegetation |
| CHANNEL SLOPE: | Flat |
| GULLY SHAPE: | U-shaped |
| GULLY MATERIAL: | Sand |
| WATER LEVELS | Low, Slow |
| SEEP | No |
| APPARENT CAUSES: | None/Unknown |

**ADDITIONAL NOTES:**

Invasive Species? None
Type: None

Debris? No

Existing Stabilization? NONE
Success: N/A

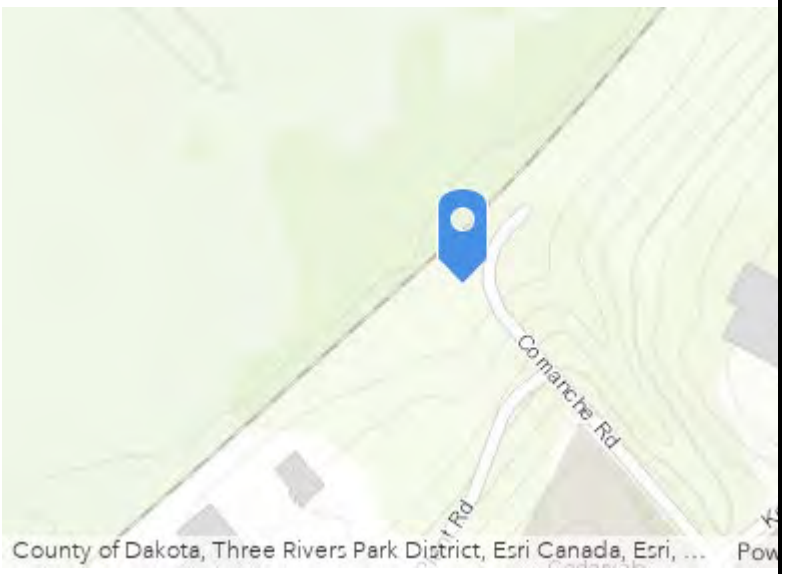


Young Environmental Consulting Group, LLC

**PICTURES:**

Top

What rest of stream looks like

| | |
|---|---|
| **GULLY ID:**<br>ESPM Site 28 | |
| **PREVIOUS WAYPOINT ID:** | |
| **SURVEY DATE:**<br>April 17, 2021 12:18 PM | |
| **LOCATION:** | |
| **TYPE OF SITE:**<br>Gully | |
| **SITE SUMMARY:**<br>Sunny<br>Rain in previous 24 hours: No<br><br>Along a Road<br><br>Long: >100' gully.<br><br>The problem indicators were:<br>None |  <br>Gully Head UTM Estimation: 100ft,<br><br>Observation Point correction, if applicable:<br><br>Connections to other points, if applicable: We had two locations which are the same gully |

| **GULLY INFORMATION** | |
|---|---|
| EROSION POTENTIAL: | Low |
| GULLY DEPTH: | Shallow: <3' |
| BOTTOM WIDTH: | Medium: 1'-5' |
| TOP WIDTH: | Wide: >10' |
| BANK CONDITION: | Heavy Vegetation |
| BOTTOM CONDITION: | Armored |
| CHANNEL SLOPE: | Flat |
| GULLY SHAPE: | U-shaped |
| GULLY MATERIAL: | Gravel/cobble/ boulders |
| WATER LEVELS | None, N/A |
| SEEP | No |
| APPARENT CAUSES: | None/Unknown |

**ADDITIONAL NOTES:**
Part of the stormwater drainage system, looks like it receives heavy flow during storm events but it's in great shape. Gully empties into wetland where it joins wastewater treatment outflow.
Invasive Species? Low
Type: Common Buckthorn
Debris? Not much trash, some
Existing Stabilization? Rip rap with energy dissipation Boulder piles (pictured) also one erosion control log
Success: Yes

**PICTURES:**

Near the entre to the wetland

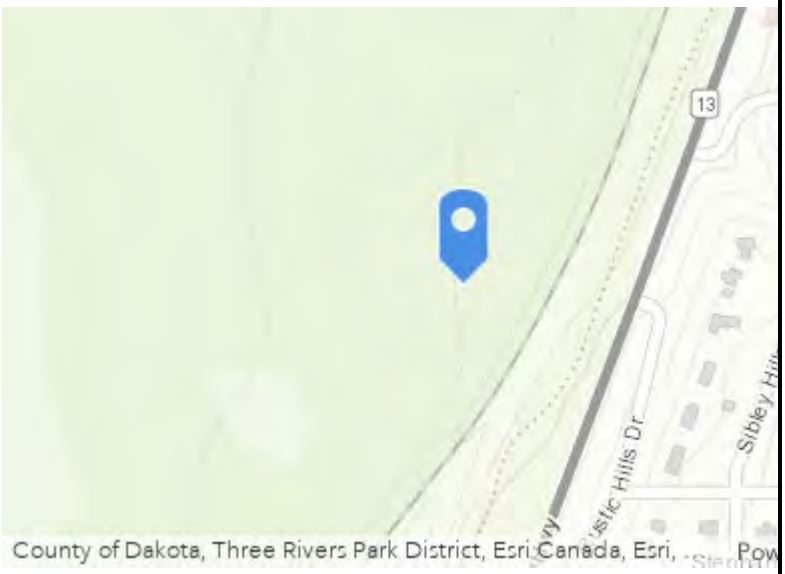
100ft further uphill

At wetland entrance

About 1/3 to top of gully

Other side of the last pictures outlet

Top of gully

| | |
|---|---|
| **GULLY ID:**<br>ESPM Site 29 |  |
| **PREVIOUS WAYPOINT ID:** | |
| **SURVEY DATE:**<br>April 17, 2021 11:06 AM | |
| **LOCATION:** | |
| **TYPE OF SITE:**<br>Gully | |
| **SITE SUMMARY:**<br>Sunny<br>Rain in previous 24 hours: No<br><br>Off of Walking Trail<br><br>Short: <50' gully.<br><br>The problem indicators were:<br>None | Gully Head UTM Estimation: N/a,<br><br>Observation Point correction, if applicable:<br><br>Connections to other points, if applicable: |

| **GULLY INFORMATION** | |
|---|---|
| EROSION POTENTIAL: | Low |
| GULLY DEPTH: | Shallow: <3' |
| BOTTOM WIDTH: | N/A - Not Visible |
| TOP WIDTH: | Narrow: 1'-5' |
| BANK CONDITION: | Heavy Vegetation |
| BOTTOM CONDITION: | Heavy Vegetation |
| CHANNEL SLOPE: | Flat |
| GULLY SHAPE: | |
| GULLY MATERIAL: | Sand |
| WATER LEVELS | None, N/A |
| SEEP | No |
| APPARENT CAUSES: | None/Unknown |

**ADDITIONAL NOTES:**
No gully present

Invasive Species? Low
Type: Common Buckthorn

Debris? None
Existing Stabilization? Heavy vegetation, no gully presents
Success: N/A, Unknown



Young Environmental Consulting Group, LLC

**PICTURES:**