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# **Le Sueur County, MN**

**Friday, March 29, 2019**

**Board Meeting**

## **Item 1**

**10:00 a.m. Le Sueur-Rice Joint Ditch 63 Public Hearing**

**Staff Contact:**

STATE OF MINNESOTA  
LE SUEUR AND RICE COUNTY BOARDS OF COMMISSIONERS  
SEATED AS JOINT DRAINAGE AUTHORITY UNDER STATUTES CHAPTER 103E  
FOR LE SUEUR/RICE JUDICIAL DITCH 63

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The matter of the Petition of the Minnesota Commissioner of Transportation to modify a portion of Judicial Ditch 63 pursuant to Minnesota Statutes Section 161.28

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**Hearing Agenda**

1. Opening of Hearing and Introductions – *Board Chairperson*
2. Purpose of the Hearing, Procedural Summary and Standard of Decision – *John Kolb*
3. Petitioner’s Presentation of Requested Action – MnDOT Representative
4. Drainage Authority Engineer’s Report – Chuck Brandel
5. Review of Issues Presented and Recommendations – *John Kolb*
6. Public Comment and Questions – *Board Chairperson*
7. Board Deliberations and Directions to Staff – *Board Chairperson*

Minnesota Statutes (Minn. Stat.) section 161.28 allows the Commissioner of Transportation to petition the drainage authority to make a minor alteration or change in a public drainage system directly affecting a trunk highway. At hearing, after considering all of the evidence presented, including public comment, the drainage authority board must determine whether the requested change will affect or impair the functioning or efficiency of the public drainage system. If upon the hearing the drainage authority determines that the alteration or change in the public drainage system will not affect or impair the efficiency of the drainage system, the drainage authority shall allow the alteration or change as petitioned. If granted, the commissioner may proceed as allowed in the order only after first paying damages or securing the rights necessary to implement the alteration.

Landowners affected by the alteration may bring a claim for damages within six years of the alteration.

[26666-0005/3340386/1]

# MEMORANDUM

**DATE:** January 7, 2019  
**TO:** Darrell Pettis  
**FROM:** Chuck Brandel  
**CC:** MnDOT, John Kolb  
**SUBJECT:** Review of MnDOT 4010-10 TH 99 Water Resource Model & Minor Alternations

ISG was contacted by Le Sueur County and asked to evaluate the water resources model built for the re-construct and widening of Trunk Highway 99 (TH 99) located in east central Le Sueur County in Montgomery Township, specifically looking at two culverts planned to be replaced under the highway that conveys water through county ditch systems. The two culverts to be replaced are located through County Ditch No. 40 (CD 40) and Judicial Ditch No. 63 (JD 63). With ISG's expertise and familiarity with Le Sueur County Drainage network, the review will ensure water resource design with public safety and rural drainage concerns in mind. ISG will also consider if the changes to the drainage systems follow the Minnesota Statue 161.28, considering the alternation and their effect and impact on the efficiency on the drainage system. The following summarizes ISG's findings in the model provided to ISG by MnDOT and conclusion on any design suggestion.

## **County Ditch No. 40**

County Ditch No. 40 (CD 40) crosses TH 99 at station 1271+43. The existing culvert consists of 84-inch corrugated metal pipe and is planned to be replaced with a 90-inch reinforced concrete pipe. The following design characteristics were determined from culvert replacement plan sheets provided by MnDOT.

Material	Size (in)	US Invert (MSL)	DS Invert (MSL)	Slope
EXISTING				
CMP	84	1035.71	1035.04	1.00%
PROPOSED				
RCP	90	1035.92	1034.83	1.01%

*Figure 1: Existing and Proposed Design Parameters: CD 40 TH 99 Crossing*

After reviewing the model it was determined that the upstream invert of the proposed culvert did not correspond to the invert noted in the culvert replacement plans. In the hydroCAD model provided by MnDOT, the upstream invert was modeled as 1035.71 and the culvert replacement plans indicate the proposed upstream invert to be 1035.92. Changing the upstream invert to the correct elevation from the culvert replacement plan sheets did not change the headwater elevation.



Figure 2: CD 40 Crossing at TH 99 (upstream - left, downstream - right)

### **Judicial Ditch No. 63**

Judicial Ditch No. 63 (JD 63) crosses TH 99 at station 1380+97. Currently, there are two 48-inch pipe culverts that cross TH 99 at this location, one corrugated metal and one reinforced concrete pipe. It is planned to be replaced with one 60-inch reinforced concrete pipe. The following design characteristics were determined from culvert replacement plan sheets provided by MnDOT.

Material	Size (in)	US Invert (MSL)	DS Invert (MSL)	Slope
EXISTING				
CMP	48	1058.78	1058.04	0.93%
RCP	48	1063.18	1062.93	0.40%
PROPOSED				
RCP	60	1057.52	1057.47	0.05%

Figure 3: Existing and Proposed Design Parameters: JD 63 TH 99 Crossing





*Figure 4: JD 63 Crossing at TH 99, Primary Culvert (upstream- left, downstream- right)*



*Figure 5: JD 63 Crossing at TH 99, Secondary Culvert (upstream - left, downstream - right)*

It was brought to the attention that the culvert downstream of the TH 99 crossing on JD 63, a private driveway, overtops regularly and to ensure the proposed changes do not increase pressures on private property ISG has extended the model to include the private driveway downstream of the proposed project on TH 99. Currently, the private driveway consists of a 60-inch corrugated metal culvert with design characteristics noted below.



Material	Size (in)	US Invert (MSL)	DS Invert (MSL)	Slope
EXISTING				
CMP	60	1056.55	1056.35	0.44%

Figure 6: Existing Design Parameters: JD 63 Downstream Driveway Crossing



Figure 7: JD 63 Driveway Crossing (upstream - left, downstream - right)

The extension of the model did not change the proposed headwater elevations at the highway. ISG then compared the existing conditions to the proposed conditions of the driveway to ensure the proposed changes on the highway would not increase pressures on the driveway downstream. The table below notes the elevations at the driveway for existing and proposed conditions.

Event	Existing Peak Elevation	Proposed Peak Elevation	Difference
2-yr	1062.48	1062.53	0.05
5-yr	1065.05	1065.15	0.10
10-yr	1067.16	1067.52	0.36
25-yr	1067.75	1067.81	0.06
50-yr	1067.88	1067.91	0.03
100-yr	1068.01	1068.02	0.01

Road Top Elevation = 1067.45

Figure 8: Peak Flood Elevations at JD 63 Downstream Driveway Crossing

As noted in the table, there is an increase in peak water elevation at the driveway on all storm events due to the proposed changes on the culvert under TH 99. From LiDAR, the elevation for the top of the driveway was noted to be 1067.45. Therefore, the driveway according to the developed model indicates that the driveway overtops on the 10-, 25-, 50-, and 100-year storm events for the proposed and existing models.

## Alternative Designs

### Option 1 – Change Nothing

The design as proposed in the culvert replacement plan sheets produce increased pressures on the driveway on JD 63 downstream of TH 99. Although, the increase is relatively small with a maximum increase in flood elevation of 0.36-feet (4.3 inches). It could be argued that this design is sufficient for the JD 63 crossing under Highway 99 and does not produce significant impacts of the driveway downstream of TH 99.

### Option 2 – Change Size to 54" Culvert at JD 63 TH 99 Crossing

The culvert under the TH 99 would be replaced with a 54-inch culvert instead of a 60-inch culvert. An analysis was completed to ensure that replacing the culvert with a 54-inch pipe would not increase flood elevations at the highway or at the driveway downstream of the highway. The tables noted below indicated the changes that have

Event	Existing Peak Elevation	Proposed Peak Elevation	Difference
2-yr	1064.21	1062.36	-1.85
5-yr	1065.72	1064.43	-1.29
10-yr	1066.82	1066.28	-0.54
25-yr	1068.13	1068.13	0
50-yr	1069.17	1069.41	0.24
100-yr	1070.22	1070.69	0.47

Road Top Elevation = 1071.50

Figure 9: JD 63 TH 99 Crossing Peak Elevations

Event	Existing Peak Elevation	Proposed Peak Elevation	Difference
2-yr	1062.48	1062.53	0.05
5-yr	1065.05	1065.13	0.08
10-yr	1067.16	1067.41	0.25
25-yr	1067.75	1067.73	-0.02
50-yr	1067.88	1067.84	-0.04
100-yr	1068.01	1067.94	-0.07

Road Top Elevation = 1067.45

Figure 10: JD 63 Driveway Crossing Peak Elevations

### Option 3 – Add Floodplain Culvert at Driveway

Placing an additional smaller culvert at a higher elevation in the floodplain at the driveway crossing is a viable option to more effectively drain area and have less likelihood of overtopping during larger storm events. Placing a 24-inch concrete culvert at the elevation 1061.00 would reduce pressures on driveway crossings. Below indicate the peak flood elevations with the proposed addition.

Event	Existing Peak Elevation	Proposed Peak Elevation	Difference
2-yr	1064.21	1062.03	-2.18
5-yr	1065.72	1063.79	-1.93
10-yr	1066.82	1065.45	-1.37
25-yr	1068.13	1067.39	-0.74
50-yr	1069.17	1068.67	-0.50
100-yr	1070.22	1069.94	-0.28

Road Top Elevation = 1071.50

Figure 11: JD 63 TH 99 Peak Flood Elevations

Event	Existing Peak Elevation	Proposed Peak Elevation	Difference
2-yr	1062.48	1062.32	-0.16
5-yr	1065.05	1064.53	-0.52
10-yr	1067.16	1066.63	-0.53
25-yr	1067.75	1067.73	-0.02
50-yr	1067.88	1067.85	-0.03
100-yr	1068.01	1067.95	-0.06

Road Top Elevation = 1067.45

Figure 12: JD 63 Driveway Crossing Peak Flood Elevation

### Option 4 – Raise Driveway

The existing driveway downstream of the Highway 99 crossing is low. The driveway could be raised to help to reduce the frequency of the driveway overtopping. The elevation of the top of the driveway determined from LiDAR is 1067.45. To ensure that the driveway will not overtop on the 10-year event with 1-foot of freeboard to the top of the driveway, the road would need to be raised to 1068.60 with the current design for the culvert crossing for JD 63 under Highway 99. Tables below indicate the peak flood elevations when raising the driveway.

Event	Existing Peak Elevation	Proposed Peak Elevation	Difference
2-yr	1064.21	1062.03	-2.18
5-yr	1065.72	1063.79	-1.93
10-yr	1066.82	1065.45	-1.37
25-yr	1068.13	1067.39	-0.74
50-yr	1069.17	1068.67	-0.50
100-yr	1070.22	1069.94	-0.28

Road Top Elevation = 1071.50

Figure 13: JD 63 TH 99 Crossing Peak Elevations

Event	Existing Peak Elevation	Proposed Peak Elevation	Difference
2-yr	1062.48	1062.53	0.05
5-yr	1065.05	1065.15	0.10
10-yr	1067.16	1067.61	0.45
25-yr	1067.75	1068.91	1.16
50-yr	1067.88	1069.02	1.14
100-yr	1068.01	1069.13	1.12

Road Top Elevation = 1068.60

Figure 14: JD 63 Driveway Crossing Peak Elevations

## Conclusion

ISG has evaluated the water resources model built for the re-construct and widening of TH 99 in east central Le Sueur County, specifically looking into two culverts planned to be replaced under the highway that convey water through county ditch systems, CD 40 and JD 63.

### CD 40

The model was reviewed for the CD 40 crossing under TH 99, and a small error was noticed in the crossing for CD 40 with placing the wrong upstream invert elevation. This did not produce any differences in results. From the reviewed model from MnDOT and the models developed by ISG for CD 40, it was determined that the alterations made to the CD 40 crossing of TH 99 did not affect or impair the efficiency of the drainage system. The proposed change will decrease the 100-year rainfall events headwater by 0.62-feet (7.4-inches). This does not negatively affect landowners associated with the drainage system and does not affect the efficiency of the drainage ditch or crossing. In the opinion of the engineer, it is recommended that the drainage authority grant approval to make minor alternations during the reconstruct and maintenance of Trunk Highway 99.

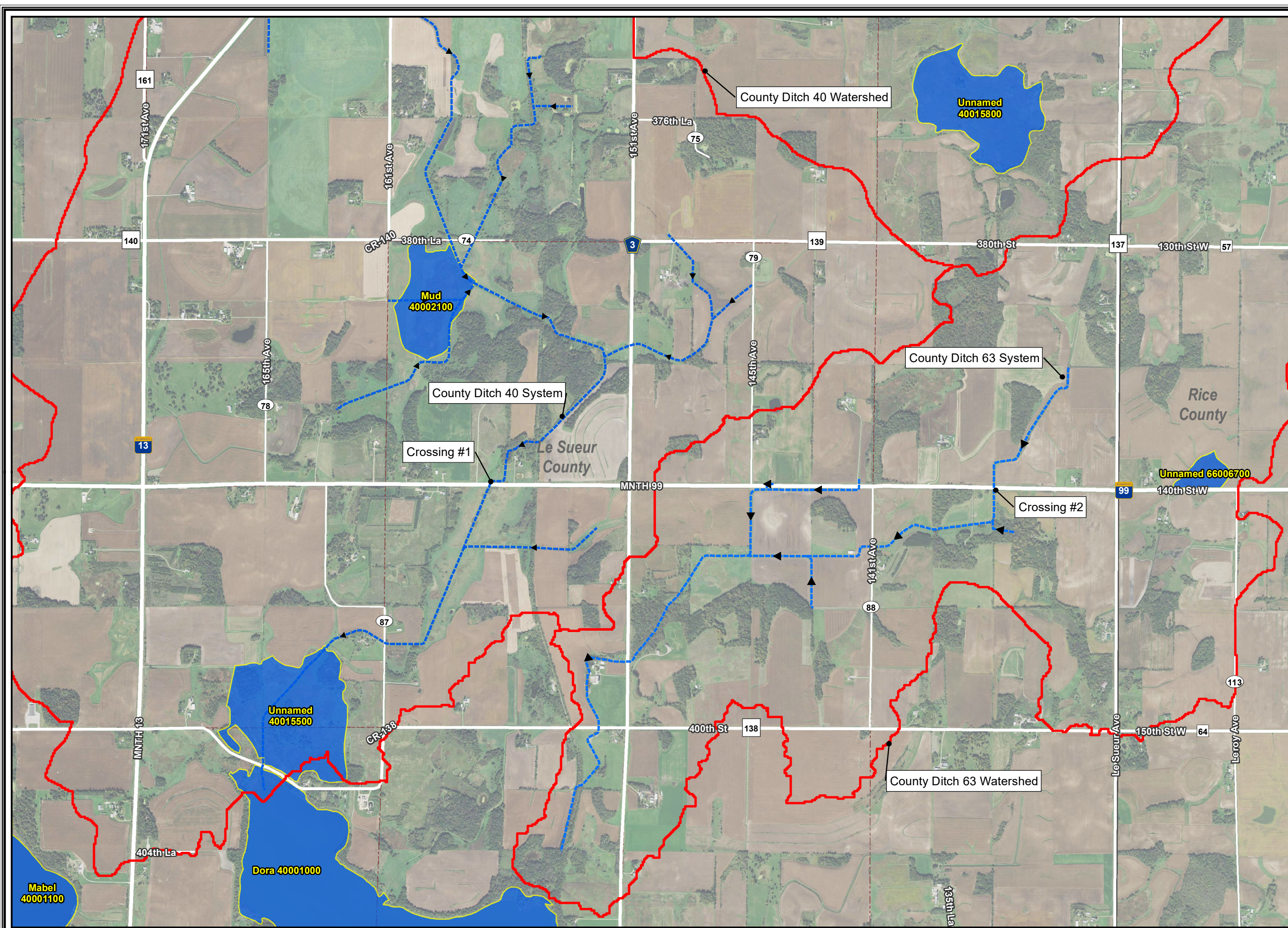
### JD 63

The model produced by MnDOT was reviewed for the JD 63 crossing under TH 99. The model was extended to include the analysis of the downstream crossing at a private driveway. Although the proposed conditions as compared to the existing conditions does produce changes to the driveway crossing, the modifications do affect the drainage system of TH 99. The driveway currently overtops frequently and the modifications will increase pressures and additional measures should be considered. Options are considered to help elevate the pressures on the driveway crossing. Options include reducing the JD 63 TH 99 crossing from a 60-inch to 54-inch culvert, adding floodplain culvert on driveway crossing, and raising the road on the driveway. All options would reduce pressures on driveway and help to have less frequent and less duration of overtopping.

Based on ISG's review of the model from MnDOT and the models developed by ISG for JD 63, it was determined that the alterations made to the JD 63 crossing of TH 99 affect and impair the efficiency of the drainage system by increasing flood waters downstream of the TH 99 crossing. From developed models, the downstream peak flood elevations are increase by 0.36-feet (4.3-inches) on the 10-year rainfall event producing increased pressures on the downstream crossing. Option 3 is recommended to be implemented into MnDOT plans as a precondition as it is potentially the least expensive option. MnDOT should modify their request to ensure plans for TH 99 will not affect or impair the efficiency of the drainage system

ISG recommends that MnDOT modify their application for minor alterations to include Option 3. If MnDOT modifies their request to include an option where the modification no longer effects or impairs the drainage system, such as Option 3, the drainage authority should grant approval for the modifications. If no modifications are made the drainage authority should deny the request for minor alternations.



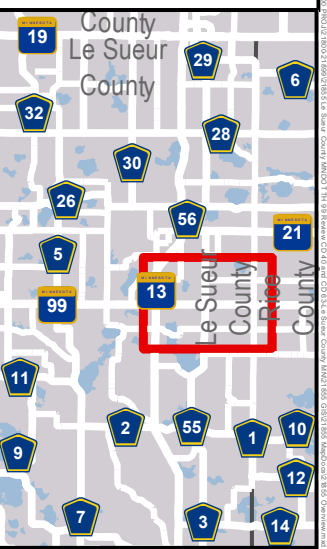


# **TH 99 Culvert Crossings** CD 40 and CD 63 Le Sueur County, Minnesota Thursday, July 12, 2018

- Legend**
- CD 63
  - CD 40
  - CD 63 Watershed
  - CD 40 Watershed

PN: 16-21855  
**Source:**  
 Orthophotograph (MnGeo WMS, 2015)  
 Tile/Ditch (Le Sueur County, 12/16/2016)  
 Parcels (Le Sueur County, 12/16/2016)  
 Lakes (MN DNR, July, 2008)  
 Major Stream (MN DNR, July 2008)  
 Counties (MN DNR, July 2013)  
 PLSS (MnGeo/USGS)

1 inch = 1,901 feet





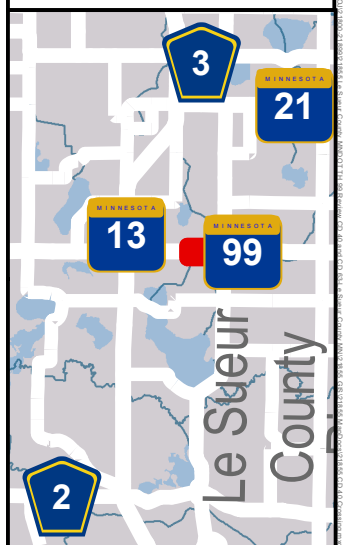


**TH 99**  
**Crossing #1**  
CD 40  
Le Sueur County,  
Minnesota  
Monday, January 07, 2019

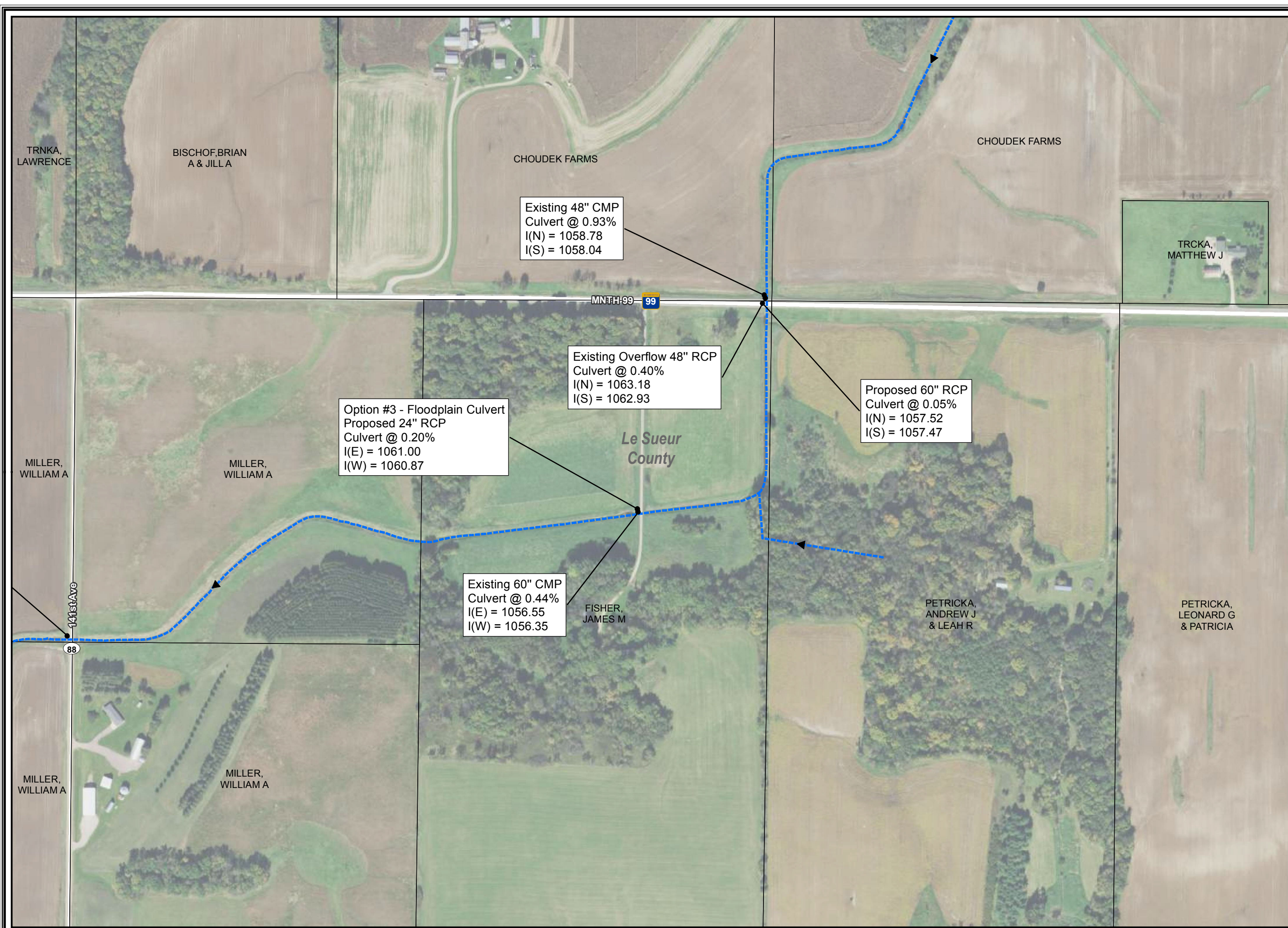
- Legend**
- CD 63
  - CD 40
  - Parcels

PN: 16-21855  
**Source:**  
Orthophotograph (MnGeo WMS, 2015)  
Tile/Ditch (Le Sueur County, 12/16/2016)  
Parcels (Le Sueur County, 12/16/2016)  
Lakes (MN DNR, July, 2008)  
Major Stream (MN DNR, July 2008)  
Counties (MN DNR, July 2013)  
PLSS (MnGeo/USGS)

0 30 60 120 Feet  
1 inch = 127 feet







**Driveway Crossing**  
**CD 63**  
Le Sueur County,  
Minnesota  
Monday, January 07, 2019

**Legend**  
 CD 63  
 Parcels

PN: 16-21855  
**Source:**  
 Orthophotograph (MnGeo WMS, 2015)  
 Tile/Ditch (Le Sueur County, 12/16/2016)  
 Parcels (Le Sueur County, 12/16/2016)  
 Lakes (MN DNR, July, 2008)  
 Major Stream (MN DNR, July 2008)  
 Counties (MN DNR, July 2013)  
 PLSS (MnGeo/USGS)

0 75 150 300 Feet  
1 inch = 333 feet

