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Asset Management Memorandum

To: ***Darren Laesch, MnDOT***

From: ***Jack Corkle, PTP, AICP, WSB & Associates***
Rose Ryan, AICP, WSB & Associates

Date: ***September 2, 2015***

Re: ***Asset Management***
TH 11 Corridor Assessment
WSB Project No. 03063-000

The purpose of this memo is to document existing conditions for MnDOT infrastructure assets along the TH 11 corridor and to identify the amount of remaining service life of these assets. This memo includes detailed information on the different assets along the corridor, their associated ages, condition, and remaining service life. By understanding the condition of existing assets, planners can better prioritize improvements to the corridor so that existing assets are effectively maintained while meeting other objectives for the corridor.

This memo is divided into two primary sections. The first section provides some general information on TH 11 and the area in which the study is occurring. The second section provides information on the current condition of pavement, bridges, sidewalks, culverts, storm sewer, traffic signals, and lighting in the TH 11 corridor. This section also identifies needs for immediate rehabilitation or replacement of these assets as well as long-term recommendations for follow-up activities.

Study Background Information

TH 11 is the primary east-west route for communities located near the Canadian border including the incorporated cities of Greenbush, Badger, Roseau, Warroad and Roosevelt (**Figure 1**). It serves an important connection between these population centers and major employers of Roseau County, including Polaris, Marvin Windows & Doors, and the Seven Clans Casino. Additionally, it is an important connection to international border crossings with Canada, including the 24-hour a day year round crossing north of Warroad. Much of the area between the communities along the corridor is largely undeveloped, with a smattering of manufactured home communities, contractor yards, agricultural uses, isolated businesses, residential development and the Roseau Airport in between.

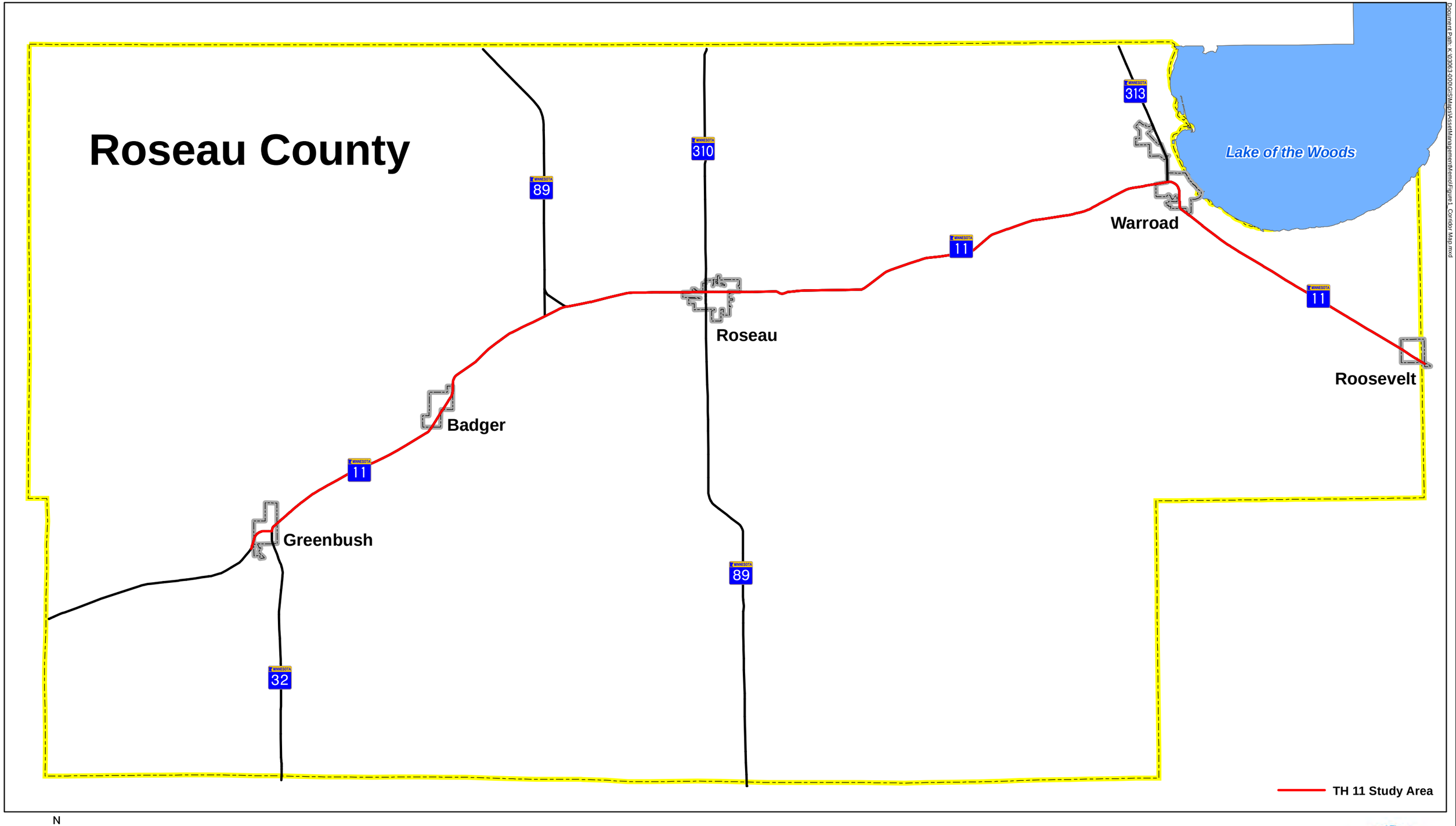

Figure 1- Corridor Study Area

The corridor study area covers the approximately 60 miles of TH 11 between Greenbush and Roosevelt. As part of the study, existing and future conditions will be evaluated and recommendations for improvements along the corridor will be identified for implementation over the next 20 years. A number of items will be studied including systems assets to better understand both short- and long-term needs of the corridor. Other topics to be studied as part of the study include: congestion, safety, infrastructure condition, future growth and development, and natural and cultural environmental constraints. Infrastructure condition is the focus of this memo.

Asset Condition

This section of the memo summarizes existing asset condition on TH 11 and near- to long-term needs for replacement or rehabilitation. Timing of replacement and/or rehabilitation will include the time period between 2020 and 2040. MnDOT's existing plans take into consideration improvements up to 2020. Assets included in this section are pavement, bridges, sidewalks, culverts, storm sewer, traffic signals, and lighting.

Pavement Condition

This section of the memo describes current pavement condition, predicted pavement condition, and areas in need of near- to mid-term rehabilitation or replacement.

Current Pavement Condition

MnDOT's pavement management Digital Inspection Vehicle drives the TH 11 corridor each year to collect pavement condition data. The primary pavement condition measure is the Ride Quality Index (RQI), a measure of pavement roughness rated on a scale from 0.0 to 5.0. Good pavement condition is indicated by an RQI of 3.1-5.0. An RQI of 2.1-3.0 indicates fair pavement condition. RQI below 2.0 indicates poor pavement condition. MnDOT uses the RQI to determine whether pavement reconditioning is required. Generally, pavement reconditioning is needed when the RQI falls below 2.5. Additional information is necessary to determine whether mill and overlay, overlay, reclamation, or reconstruction will be the most effective to improve pavement condition and extend the life of the roadway. Generally, regular pavement maintenance (mill and overlay, overlay, or reclaim when RQI drops below 2.5) will extend the life of the roadway and reduce the need for roadway reconstruction. The most recent pavement condition data available is from summer 2014. **Figures 2–4** show current pavement condition by segment. **Table 1** shows pavement maintenance history by segment and **Table 2** shows the current (2014) pavement condition.

Badger
Roseau
Greenbush
RQI: 4.2
Segment 3
RQI: 4.3
Segment 2
RQI: 3.1
Segment 1
Segment Breaks
RQI
3.1 - 5 = Good
2.1 - 3 = Fair
0 - 2 = Poor
1 inch = 6,500 feet
N
W
E
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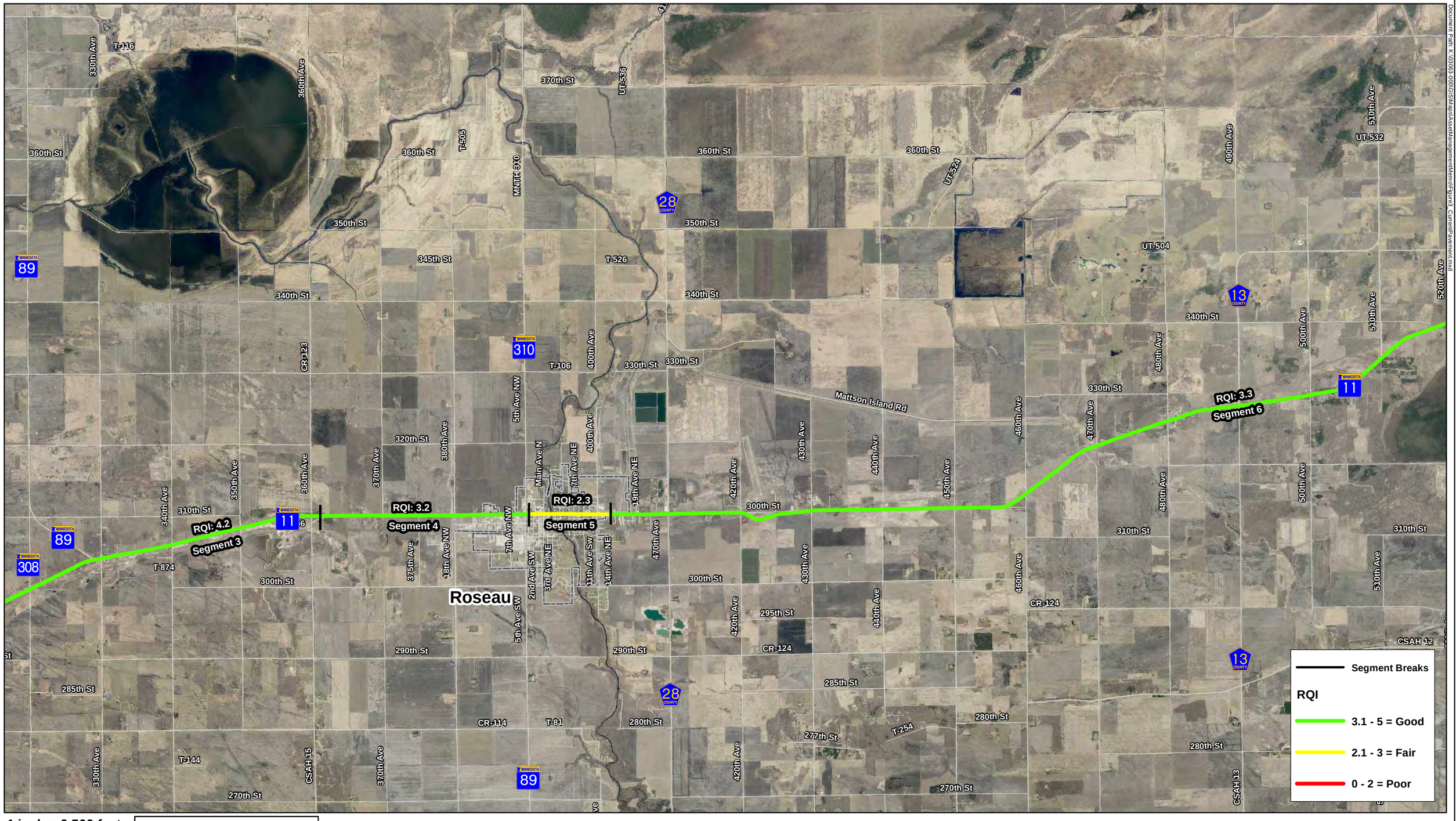
Figure 2
2014Pavement Condition
Greenbush-Badger



1 inch = 6,500 feet

Figure 3
2014Pavement Condition
Roseau

Warroad

Roosevelt

RQI: 3.6
Segment 7

RQI: 3.1
Segment 8

RQI: 3.1
Segment 9

RQI: 3
Segment 10

RQI: 3.3
Segment 6

RQI: 3.3
Segment 11

Segment Breaks

RQI

3.1 - 5 = Good

2.1 - 3 = Fair

0 - 2 = Poor

1 inch = 6,500 feet

N

W E

S

Figure 4
2014Pavement Condition
Warroad

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Table 1 – Pavement Maintenance History

Segment No.	From Milepoint	To Milepoint	Year	Maintenance Activity
1	47.2 Greenbush Forsness Rd	48.908 Greenbush TH 32	1971	Reconstruction
			1994	Thin Overlay
			2000	Chip Seal
			2006	Medium Overlay
2	48.098 Greenbush TH 32	54.972 West of Badger 260th Ave	1962	Segment Construction
			1966	Chip Seal
			1992	Thin Overlay
			1999	Chip Seal
			2005	Patching
			2012	Reclaim
3	54.972 West of Badger 260th Ave	67.760 West of Roseau 360th Ave	1962	Segment Construction
			1966	Chip Seal
			1988	Thin Overlay
			1996	Chip Seal
			2005	Patching
			2012	Reclaim
4	67.760 West of Roseau 360th Ave	70.678 Roseau TH 89/TH 310	1950	Segment Construction
			1962	Medium Overlay
			1966	Chip Seal
			1983	Thin Overlay
			1993	Thin Overlay
			2005	Patching
			2014	Patching
5	70.678 Roseau TH 89/TH310	71.840 Roseau 14th Ave	2006	Reconstruction
6	71.840 Roseau 14th Ave	90.031 West of Warroad 0.5 miles west of 580th Ave	1950	Segment Construction
			1953	Thin Overlay
			1970	Medium Overlay
			1991	Thin Overlay
			2002	Thin Overlay
			2005	Patching
7	90.031 West of Warroad 0.5 miles west of 580th Ave	91.600 Warroad Cedar Ave/TH 313	1950	Segment Construction
			1953	Thin Overlay
			1970	Medium Overlay
			1990	Thin Overlay
			2008	Thin Mill and Overlay

Segment No.	From Milepoint	To Milepoint	Year	Maintenance Activity
8	91.600 Warroad Cedar Ave/ TH 313	92.779 Warroad Riverview Dr SE	1950	Segment Construction
			1953	Thin Overlay
			1970	Medium Overlay
			1990	Reconstruction
			2008	Thin Mill and Overlay
9	92.779 Warroad Riverview Dr SE	93.019 Warroad 300 ft west of CSAH 5	1953	Segment Construction
			1953	Thin Overlay
			1970	Medium Overlay
			1990	Thin Overlay
			2005	Spot Overlay
			2008	Thin Mill and Overlay
			2012	Patching
			2014	Patching
10	93.019 Warroad 300 ft north of CSAH 5	93.170 South of Warroad 500 ft southeast of CSAH 5	1950	Segment Construction
			1953	Thin Overlay
			1970	Medium Overlay
			1990	Thin Overlay
			2005	Spot Overlay
			2007	Crack Seal
			2008	Thin Mill and Overlay
			2012	Crack Fill
11	93.170 South of Warroad 500 ft southeast of CSAH 5	105.595 Roosevelt CSAH 17	1955	Segment Construction
			1956	Chip Seal
			1957	Chip Seal
			1972	Medium Overlay
			1989	Medium Overlay
			2004	Thin Overlay
			2007	Crack Seal
			2012	Crack Fill

Table 2 – Existing (2014) Pavement Condition Based on RQI

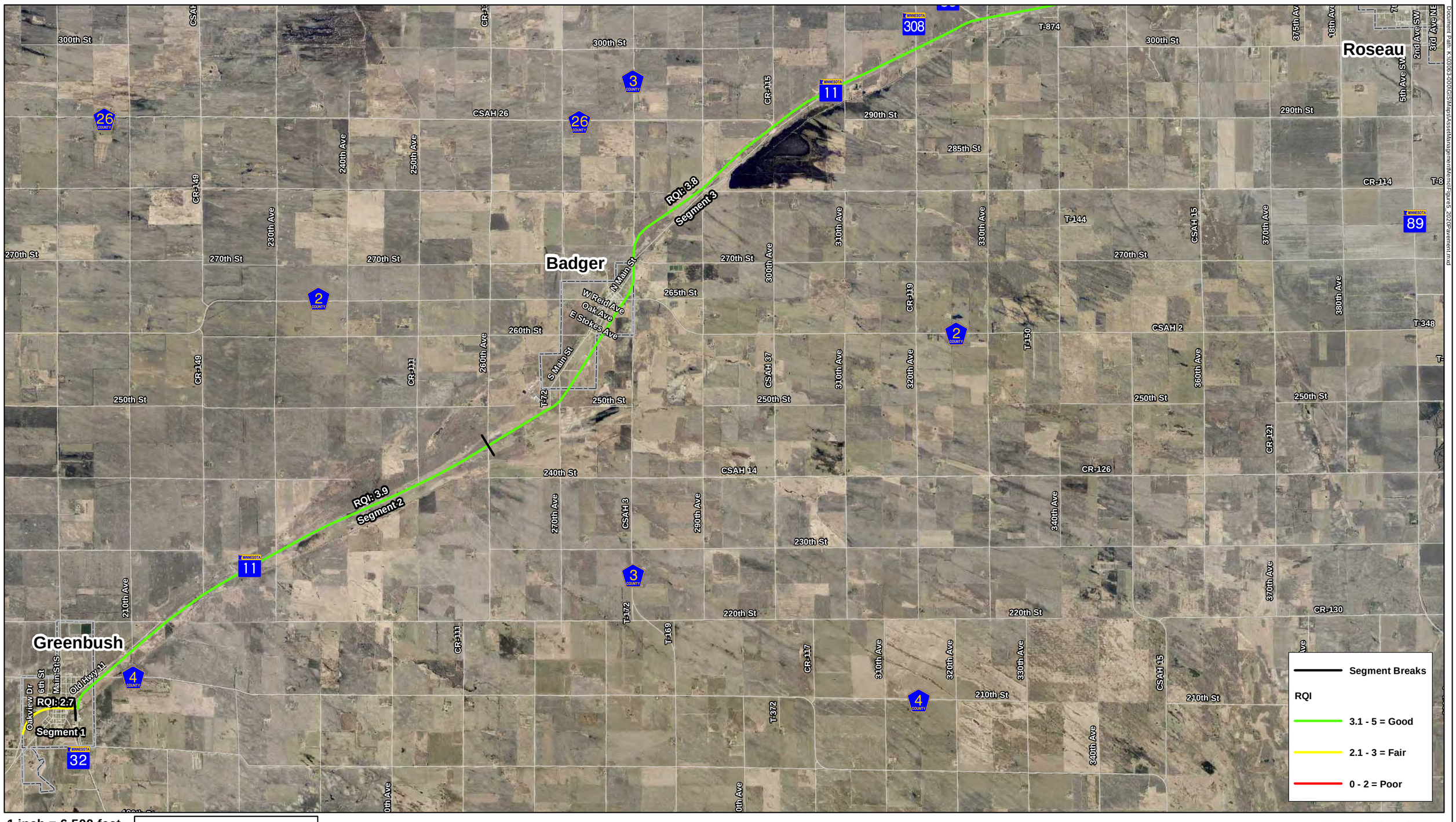
Segment No.	From	To	RQI (2014)
1	47.2	48.098	3.1
2	48.098	54.972	4.3
3	54.972	67.76	4.2
4	67.76	70.678	3.2
5	70.678	71.84	2.3
6	71.84	90.031	3.3
7	90.031	91.6	3.6
8	91.6	92.779	3.1
9	92.779	93.019	3.1
10	93.019	93.17	3.0
11	93.17	105.595	3.3

As of 2014, nearly the entire TH 11 corridor was considered to have good pavement condition. Only two segments had an RQI below 3.1. Segment 5 has an RQI of 2.3. This segment is a 1.2 mile segment of TH 11 in the center of Roseau, from TH 89/TH 310 to 14th Avenue NE. The RQI for this segment indicates an immediate need for reconditioning. No pavement reconditioning activities have occurred since 2006.

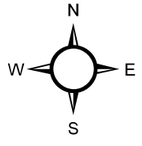
Segment 10 has an RQI of 3, at the upper limit of fair pavement condition. This is an 800-foot segment of TH 11 at the southern city limits of Warroad (300 feet north of CSAH 5 to 500 feet southeast of CSAH 5). The most recent maintenance on this segment was a thin mill and overlay in 2008. MnDOT is completing a 2 inch mill and overlay on segments 8-10 in 2015. Following the mill and overlay RQI is expected to be at 4.0 or above, which should extend the life of these segments until 2030. Pavement maintenance history on TH 11 indicates that the life of a mill and overlay is approximately 15 years. While **Table 1** shows that a thin mill and overlay was performed on segments 8-10 in 2008, the pavement seams near the wheel path have rapidly raveled between 2013 and 2014. As a result, MnDOT plans to accelerate the normal maintenance schedule for this segment.

Predicted Pavement Condition: 2020

In order to understand upcoming needs for pavement reconditioning, MnDOT prepares pavement condition predictions. MnDOT uses current and historic pavement condition data to inform pavement condition predictions. Pavement condition predictions assume no rehabilitation activities take place in the future. **Table 3** lists predicted pavement condition for 2020. **Figures 5 – 7** show predicted pavement condition in 2020 with the improvements programmed for 2015 and 2016 noted.



1 inch = 6,500 feet



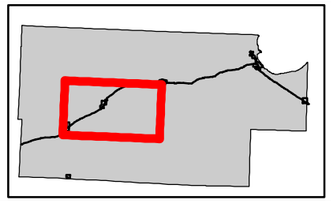
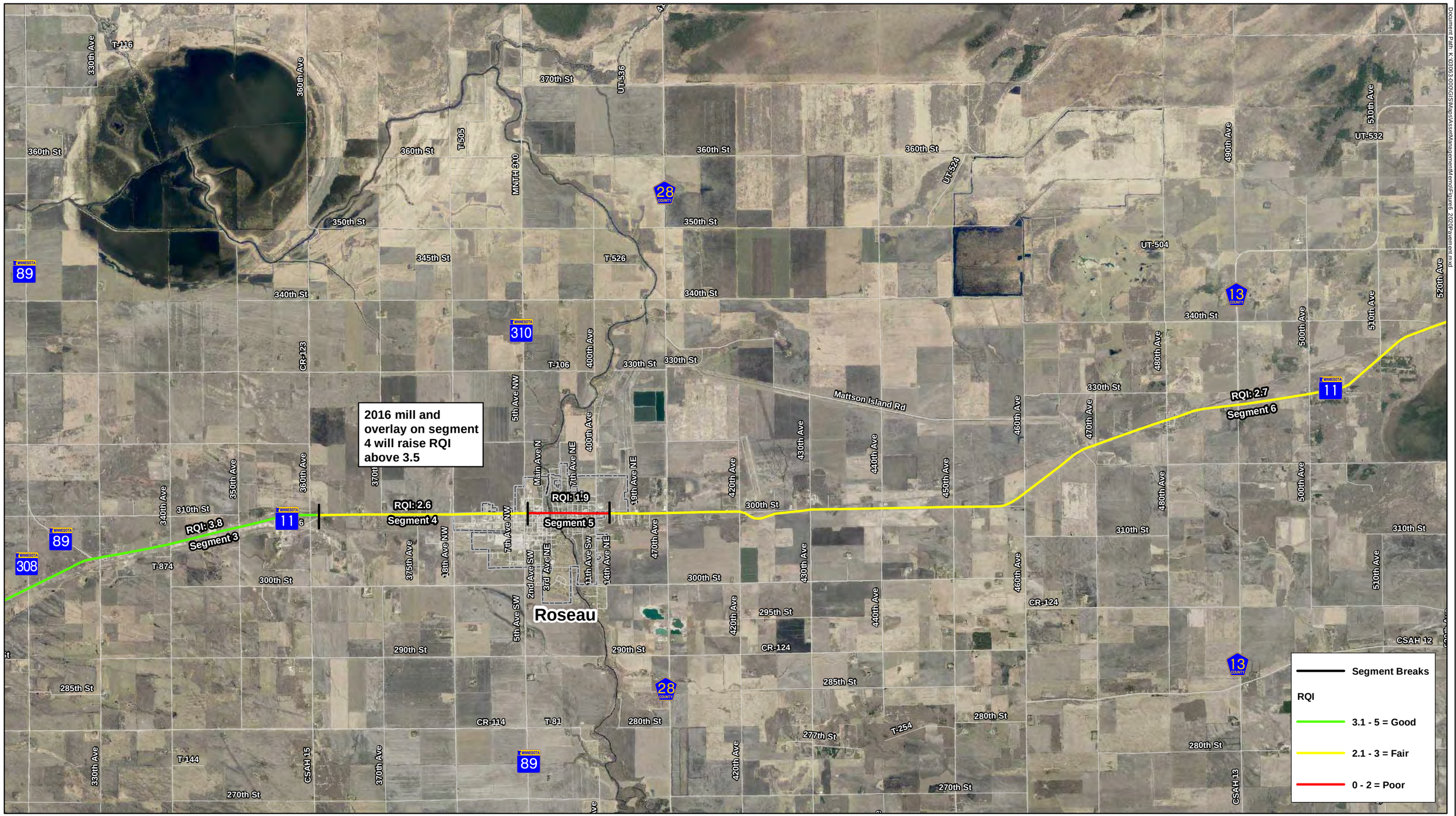
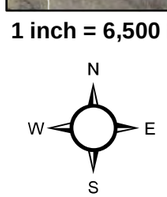


Figure 5
Predicted 2020 Pavement Condition
Greenbush-Badger



1 inch = 6,500 feet



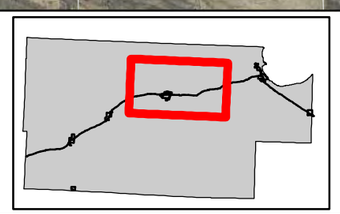


Figure 6
Predicted 2020 Pavement Condition
Roseau

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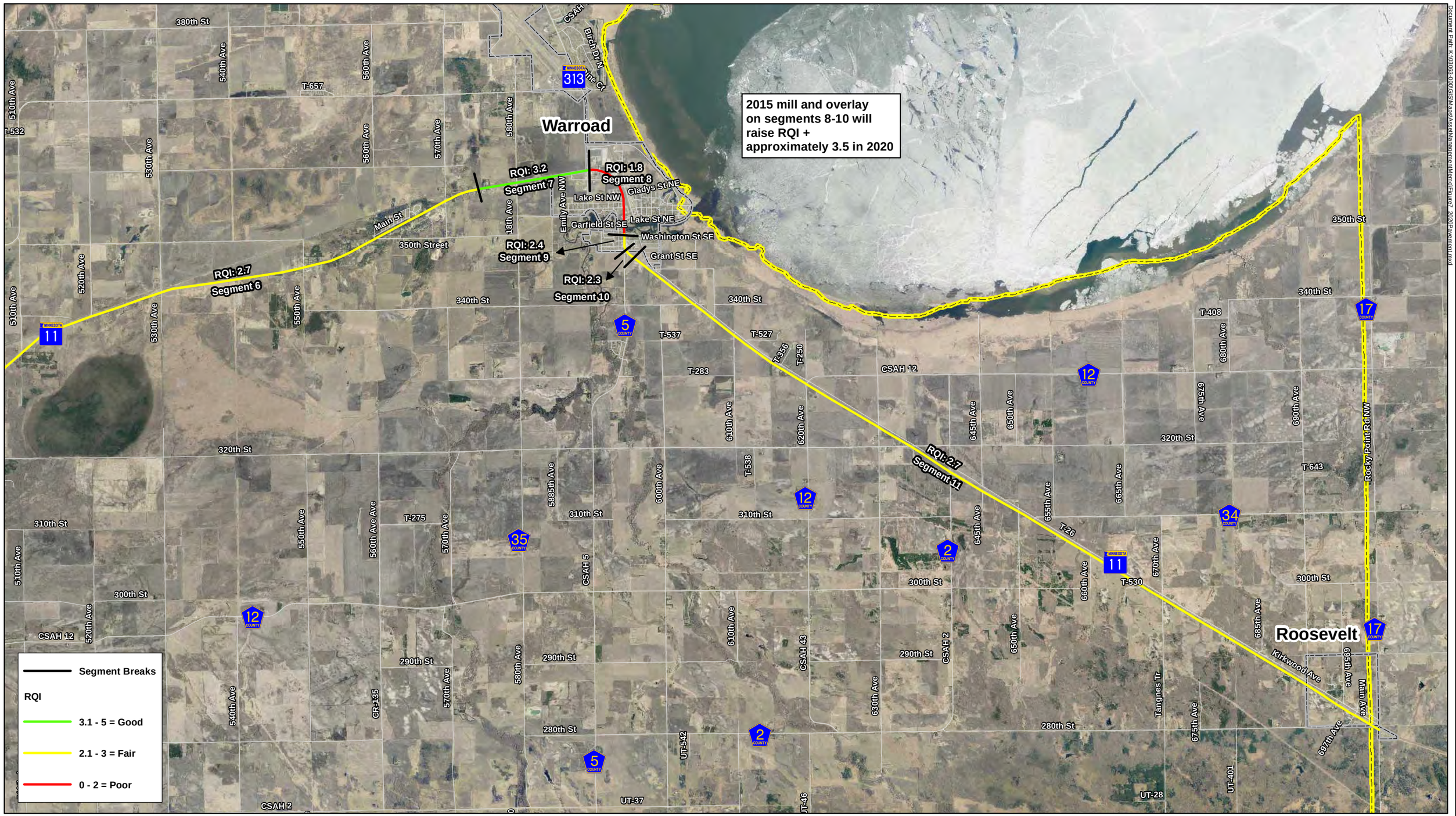

1 inch = 6,500 feet

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Figure 7
Predicted 2020 Pavement Condition
Warroad

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Table 3 – Predicted Pavement Condition – 2020

Segment No.	From	To	RQI (2020)	Next Maintenance Activity
1	47.2	48.098	2.7	
2	48.098	54.972	3.9	
3	54.972	67.76	3.8	
4	67.76	70.678	2.6	2015
5	70.678	71.84	1.9	
6	71.84	90.031	2.7	
7	90.031	91.6	3.2	
8	91.6	92.779	1.8	2015
9	92.779	93.019	2.4	2015
10	93.019	93.17	2.3	2015
11	93.17	105.595	2.7	

Based on the data presented in Table 3, MnDOT is predicting that three segments of TH 11 will have good pavement condition (RQI of 3.1 or greater). Those include Segments 2 and 3 at the western end of the corridor between TH 32 in Greenbush and 360th Avenue near Roseau and Segment 7. Segment 7 includes the area just west of the Warroad city limits to TH 313/Cedar Avenue.

Following completion of the 2014 pavement condition evaluation and prior to the start of the TH 11 Corridor Study, MnDOT identified proposed pavement projects to address the deficiencies identified in Table 3. These improvements included the sections in Warroad between TH 313 and 500 feet southeast of CSAH 5 (Segments 8-10) in 2015 and a reclaim and overlay in Roseau from CSAH 15 to just east of TH 89 (Segment 4) in 2015. The 2015 improvements should increase RQI above 4.0, with an expected RQI of approximately 3.5-3.9 in 2020.

As a result of planned maintenance activity before 2020, only one segment of TH 11 will remain below the 2.5 RQI threshold. Segment 5 in the center of Roseau (TH 89/TH 310 to 14th Avenue NE) is predicted to have an RQI of 1.9. No maintenance activities are planned for this segment prior to 2020; however, preventative maintenance is needed on this segment to extend the life of the roadway and reduce the need for roadway reconstruction. It should be noted that RQI measured in urban areas can be skewed because the measure is based on a 50 mph speed. In urban areas, there are also more manholes and utilities in the pavement that affect ride quality.

Predicted Pavement Condition: 2025 - 2040

Table 4 shows predicted pavement condition in 2025. These forecasts do not include any additional maintenance activities. As can be seen from the table, pavement conditions deteriorate substantially.

Table 4 – Future Pavement Condition – 2025

Segment No.	From	To	RQI (2025)	Next Maintenance Activity
1	47.2	48.098	2.3	
2	48.098	54.972	3.5	
3	54.972	67.76	3.4	
4	67.76	70.678	2.0	2016
5	70.678	71.84	1.5	2024
6	71.84	90.031	2.1	2024*
7	90.031	91.6	2.6	2024
8	91.6	92.779	0.1	2015
9	92.779	93.019	1.7	2015
10	93.019	93.17	1.5	2015
11	93.17	105.595	2.1	2024

*Reclaim and overlay

To extend pavement life a bit longer on some segments, MnDOT has a few additional mill and overlay projects tentatively planned for 2024. These projects include a mill and overlay/ADA improvements on segment 5, mill and overlay on segment 6 (an 18.2-mile segment from the east city limits of Roseau to 1.5 miles west of TH 313), and a mill and overlay on segment 11 (a 12.4-mile segment from CSAH 5 to the Lake of the Woods County Line). Because these projects are near the end of MnDOT's 10-year plan, they could slip a year or two in either direction. As a result, the improvements will be noted prior to 2025.

Following these maintenance projects, all but one segment of TH 11 is expected to have an RQI above 2.5 in 2030. Segment 1 in Greenbush is expected to have an RQI of 2.3 in 2025. A mill and overlay is recommended on this segment between 2020 and 2025 to address expected pavement condition issues.

Potential Timing of Pavement Projects – 2025 to 2040

In general, mill and overlay projects can expect to last 15-20 years. Based on the pavement condition and maintenance history of the TH 11 study area, the life of a mill and overlay project is expected to be 15 years in urban areas and 18 years in urban areas. The remaining life of a reclaim and overlay is estimated as 20 years. However, the remaining life may vary based upon the initial condition the roadway was in when the mill and overlay was completed, the types of soil in the area, traffic volumes and heavy commercial vehicle traffic, and freeze-thaw damage to the roadway.

Assuming regular maintenance occurs, it is not expected that any segments of TH 11 will need to be reconstructed prior to 2040. To prevent the need for reconstruction during this timeframe, mill and overlays should be completed approximately every 15-20 years. RQI should continue to be monitored to refine the need for pavement maintenance. Some segments may deteriorate more quickly than others. Based upon the information above and the improvements that were completed in 2015, 2016 and 2024, a number of additional mill and overlay projects are likely needed to address pavement condition prior to 2040. The list below and **Table 5** indicate the time period when RQI is expected to fall into the category of 2.5 or below and pavement rehabilitation will be needed.

Table 4 – Recommended Pavement Maintenance: 2025-2044

Segment No.	From	To	RQI (2025)	Next Planned Maintenance Activity	Approximate Next Recommended Maintenance: 2025-2040
1	47.2	48.098	2.3		2025 or sooner
2	48.098	54.972	3.5		2032
3	54.972	67.76	3.4		2032
4	67.76	70.678	2.0	2016	2036
5	70.678	71.84	1.5	2024	2042
6	71.84	90.031	2.1	2024	2044
7	90.031	91.6	2.6	2024	2044
8	91.6	92.779	0.1	2015	2030
9	92.779	93.019	1.7	2015	2030
10	93.019	93.17	1.5	2015	2030
11	93.17	105.595	2.1	2024	2042*

*Reclaim and overlay

2025-2029: Segments Needing Pavement Maintenance

- Segment 1: Mill and overlay (if not completed during 2020-2025 timeframe)

2030-2034: Segments Needing Pavement Maintenance

- Segment 2: Mill and overlay
- Segment 3: Mill and overlay
- Segment 8: Mill and overlay
- Segment 9: Mill and overlay
- Segment 10: Mill and overlay

2035-2039: Segments Needing Pavement Maintenance

- Segment 1: Mill and overlay (if completed during 2020-2025 timeframe)
- Segment 4: Mill and overlay
- Segment 5: Mill and overlay

2035-2039: Segments Needing Pavement Maintenance

- Segment 5: Mill and overlay
- Segment 6: Mill and overlay
- Segment 7: Mill and overlay
- Segment 11: Reclaim and overlay

Figures 8 – 10 show predicted 2025 pavement condition and date of recommended pavement maintenance between 2025 and 2040.

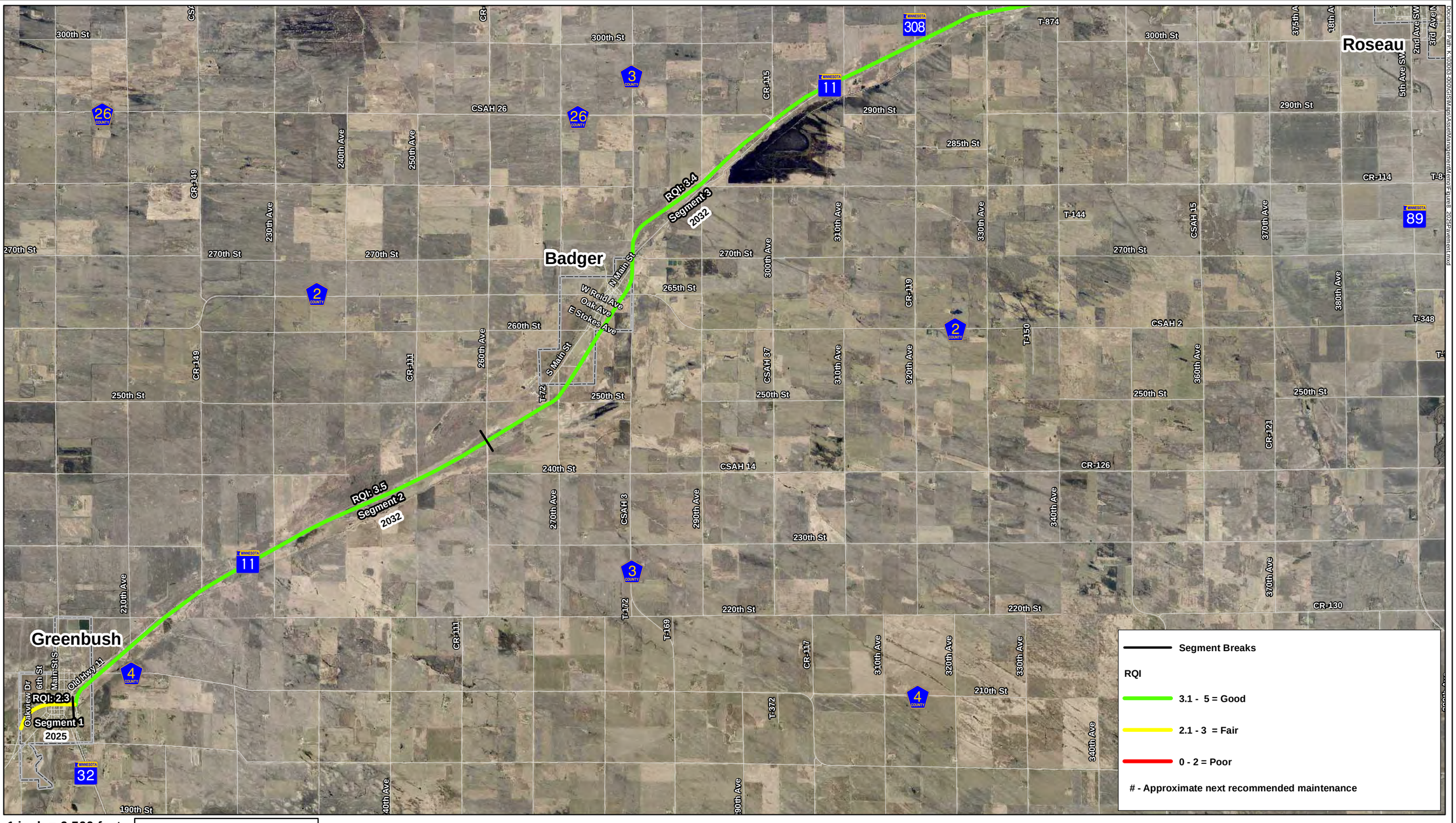
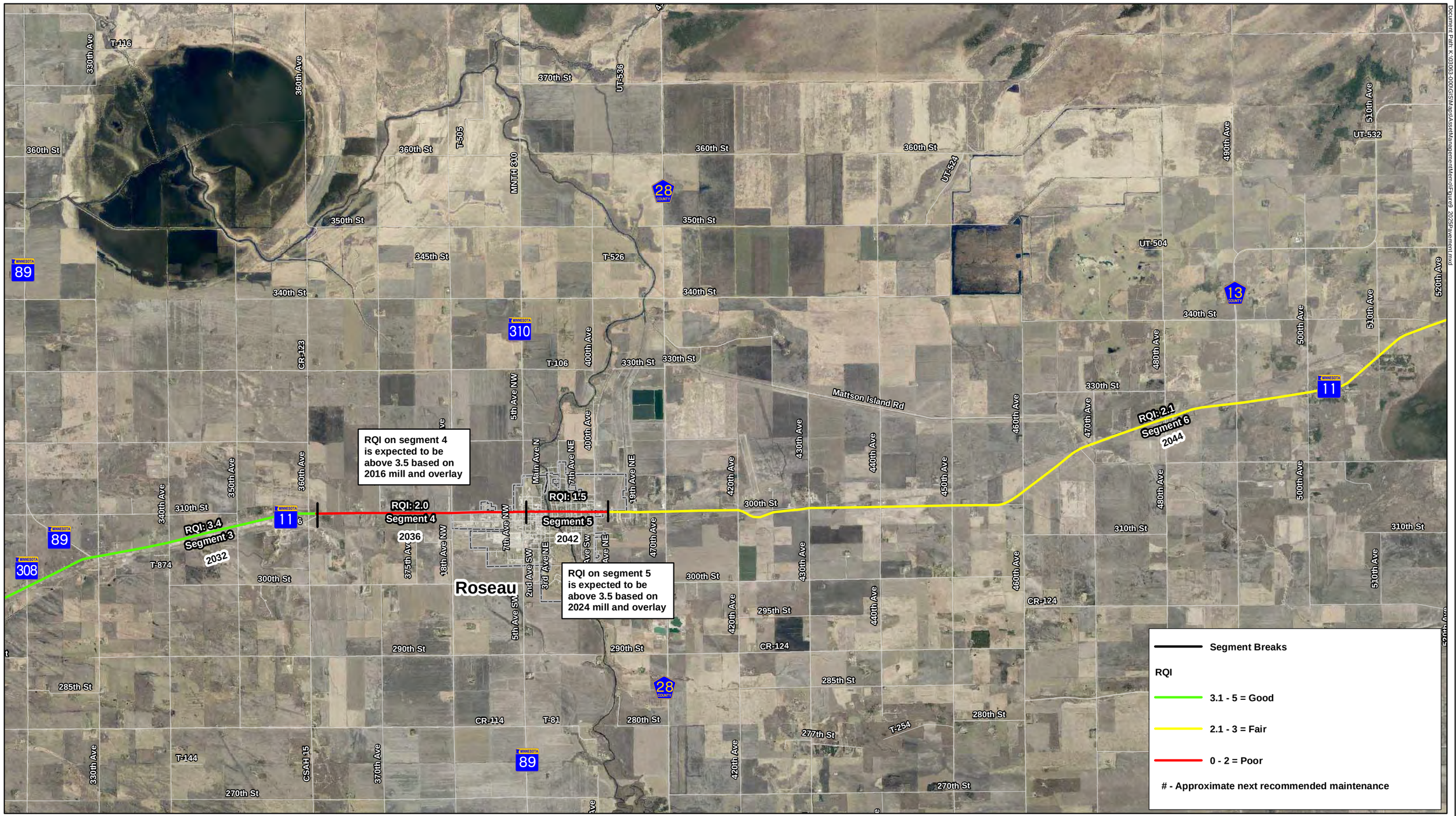


Figure 8
Predicted 2025 Pavement Condition
Greenbush & Badger



1 inch = 6,500 feet

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Figure 9
Predicted 2025 Pavement Condition
Roseau

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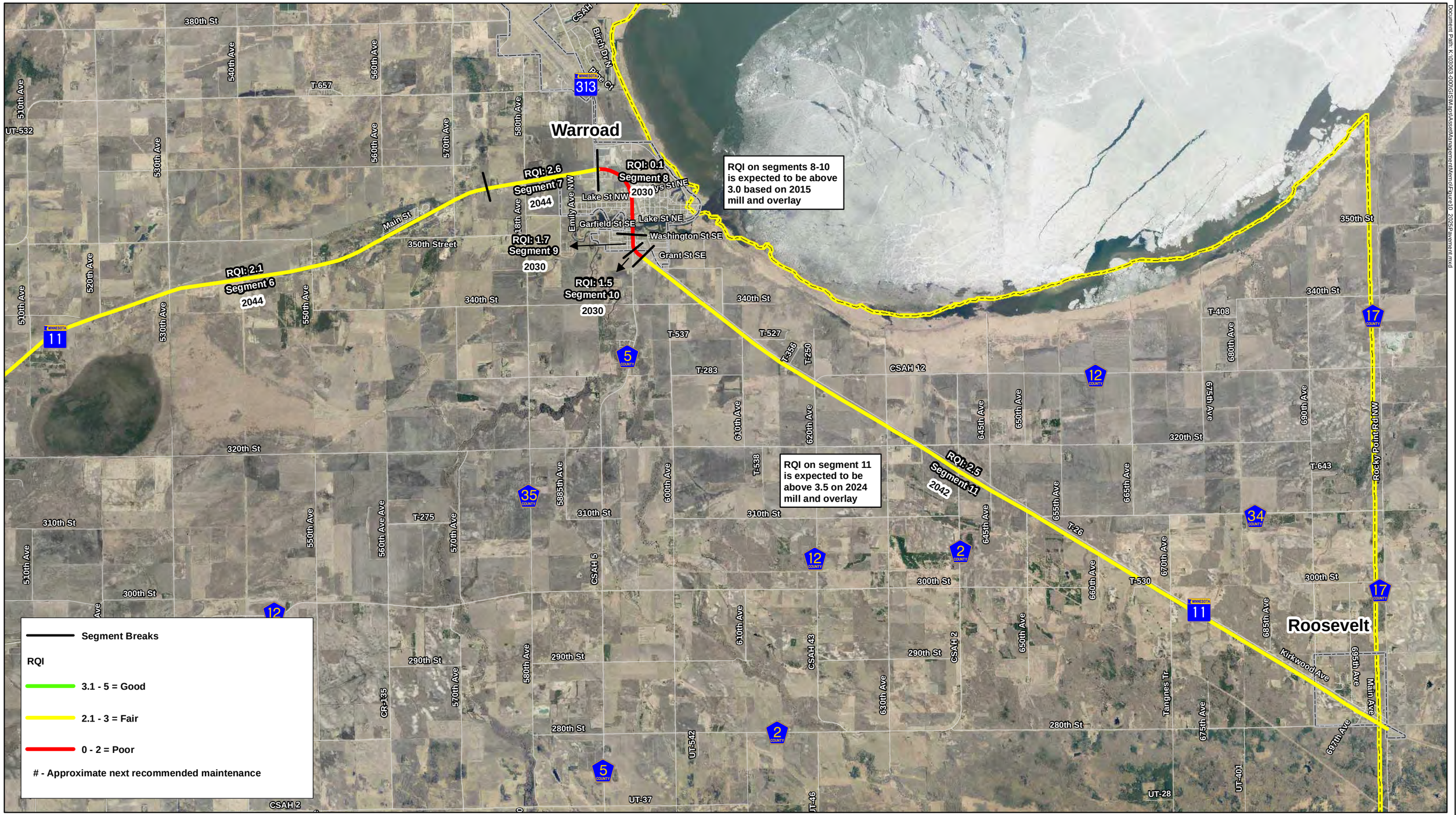

1 inch = 6,500 feet

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Figure 10
Predicted 2025 Pavement Condition
Warroad

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Bridge Condition

This section of the memo describes current bridge condition for bridges in the study area and assesses whether bridge rehabilitation or replacement should be considered.

Current Bridge Condition

There are 13 bridges on TH 11 within the study area. **Figure 11** shows the location and condition of each bridge. **Table 6** lists the bridge by number, identifies their general location and includes their most recent sufficiency rating and the date of that rating. Additionally, if the bridge is considered functionally obsolete, that is noted as well.

Table 6 – TH 11 Corridor Bridges and Sufficiency Ratings

Bridge No.	Location	Type of Bridge	Sufficiency Rating	Inspection Year	Year of Construction/ Rehabilitation	Functionally Obsolete
68X04	In Badger over Badger Creek	Precast Box Culvert	99.8	2013	2005	No
68X05	4.25 miles west of Junction with TH 89 over Co. Ditch #13	Precast Box Culvert	99.8	2013	2005	No
68X06	1.1 miles west of Junction with TH 310 over Roseau River Watershed	Precast Box Culvert	96.0	2012	2005	No
5814	In Roseau over Roseau River	Steel Beam Span	97.4	2014	1938/1988	No
68008	0.3 miles east of Junction with CSAH 24 over Roseau River Diversion Channel	Concrete Slab Span	99.8	2014	2009	No
8580	4.0 miles east of Roseau over ditch	Precast Box Culvert	87.3	2014	1927/1969	No
68001	1.3 miles west of Salol over Hay Creek	Concrete Slab Span	97.9	2014	1969/1998	No
68X07	6.2 miles west of Warroad over ditch	Precast Box Culvert	99.8	2014	2010	No
9059	In Warroad over Warroad River	Steel Beam Span	99.3	2014	1970	No
8825	6.6 miles southeast of Warroad over stream	Precast Box Culvert	97.9	2014	1954	No
8826	9.0 miles southeast of Warroad over stream	Precast Box Culvert	97.9	2014	1954	No
8827	11.2 miles southeast of Warroad over Willow Creek	Precast Box Culvert	97.9	2014	1954	No

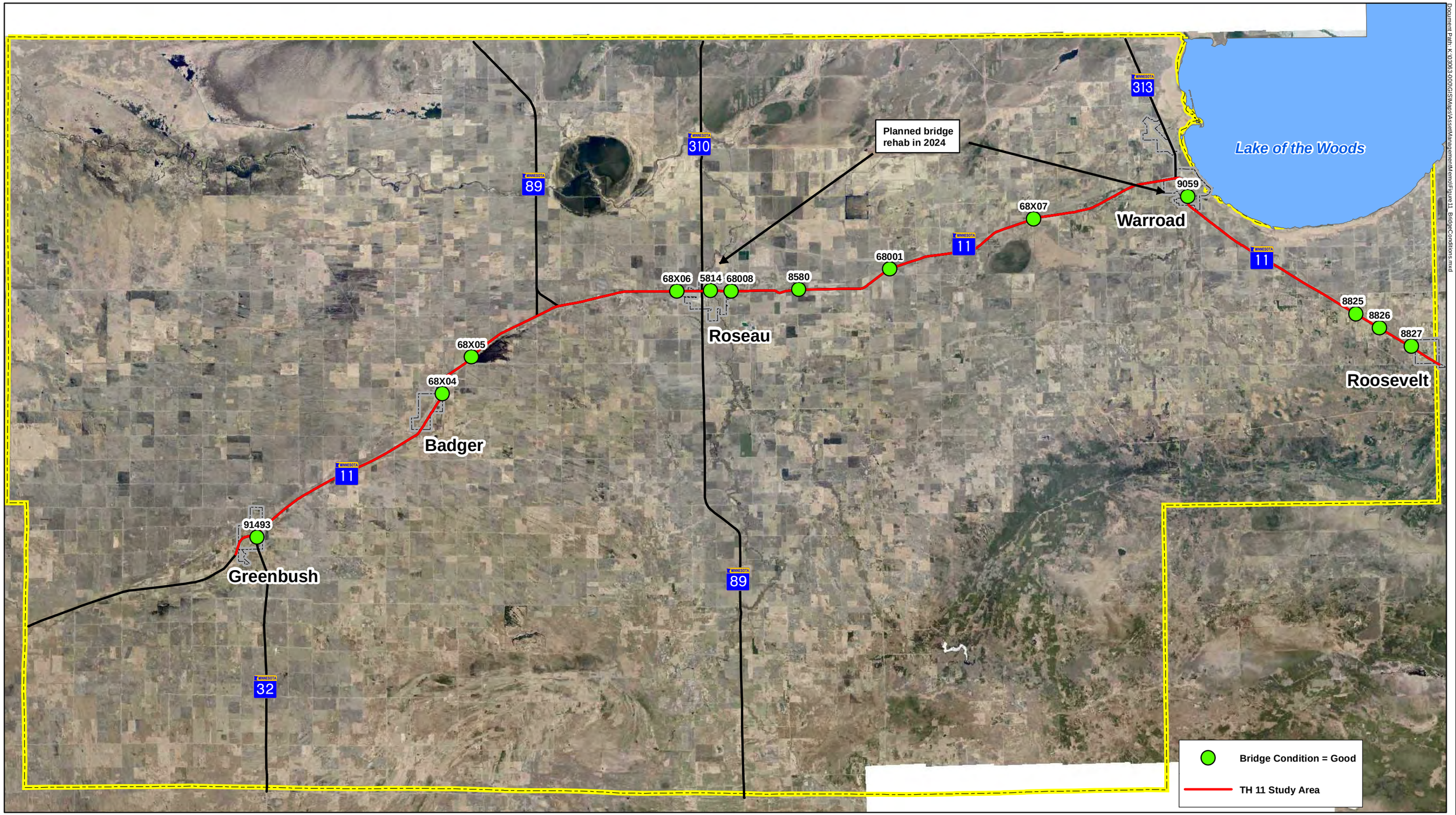


Figure 11
Current Bridge Conditions

All bridges within the study area are in good condition based on inspections in 2012-2014. No bridges within the study area are considered functionally obsolete or fracture critical. All bridges but one have sufficiency ratings above 97.4. Bridge 8580, located 4 miles east of Roseau, has a sufficiency rating of 87.3. MnDOT considers bridges with sufficiency ratings of 80 or less to be candidates for bridge rehabilitation. Ratings of 50 or less indicate a potential need for bridge replacement.

Recommendations for Bridge Inspections

Bridge inspections are generally required every two years. Box culvert inspections are generally required every four years, but can vary depending on rating, cover depth, and age. Bridges in the study must be inspected again in 2015 and 2016, depending on the year of last inspection. Most box culverts must be inspected again in 2018. Bridge 68X06 and 68X05, both precast box culverts, should be inspected again in 2016 and 2017.

Additionally, bridges with piers extending into waterways must have underwater inspections every five years. The TH 11 bridge over the Warroad River (9059) is the only bridge with piers requiring underwater inspections. The last underwater inspection occurred in 2012, with the next inspection recommended in 2017.

Bridge inspection and rehabilitation should meet the guidelines in the MnDOT Fiscal Year 2016-2020 Bridge Preservation and Improvement Guidelines.

Recommendations for Bridge Rehabilitation or Replacement – 2015-2025

Based on 2014 bridge inspections, there are no immediate needs for bridge rehabilitation or replacement within the study area. All bridges on the corridor are in good condition and will only need ongoing maintenance in the near-term. As part of its 10-year plan MnDOT is recommending two bridge rehabilitation projects for the TH 11 corridor in the study area. One project is scheduled for 2024 in Warroad (Bridge 9059). There is a 36-foot length of the bridge where the beams are in poor condition and need to be addressed. Re-decking may also be necessary. The second project is expected to occur in 2025 for Bridge 5814 in Roseau. There are no major concerns about this bridge at this time. This bridge is programmed for paint, low-slump overlay, and repair to approach panels. The deck and superstructure are in good condition and there are no strength issues. MnDOT may want to consider installing guardrails on the approaches to this bridge as there are none existing today.

As bridge rehabilitation is planned, it will be important to consider the historic potential of each bridge. Current structure inventory reports indicate that all bridges in the study area are not eligible for historic status. However, all bridges 50 years or older could potentially be considered historic. Over the next 25 years it is possible that bridges in the study area could be considered historic, which would require additional studies prior to rehabilitation. It is generally more costly to rehabilitate historic bridges. Bridge 5814 in Roseau was built in 1938 and could require historic studies prior to planned rehabilitation in 2025.

Recommendations for Bridge Rehabilitation or Replacement – 2025-2040

Based upon the information contained in the bridge inspection reports and planned improvements, it is anticipated that two additional bridges will need rehabilitation or replacement prior to 2040. Bridge 8580 is a precast box culvert constructed in 1927 located four miles east of Roseau. Recent inspections found cracks on the inside of the culvert that will need to be addressed prior to 2040. This bridge is a W-type box culvert that should not be rehabilitated by installing a concrete liner. It is anticipated that this box culvert would be replaced rather than rehabilitated.

Based on the review of bridge inspection reports, rehabilitation is also recommended on bridge 68001 over Hay Creek, located 1.3 miles west of Salol. This bridge is a concrete slab span that was constructed in 1969 and re-decked in 1998. Recent inspections indicate cracking on the bridge deck. An overlay of low-slump concrete is recommended to address cracks on the bridge deck.

Sidewalk Condition

This section describes current sidewalk condition for sidewalks within the study area, including surface condition and cross-slope consistency with ADA recommendations. This section also includes recommendations for priorities for sidewalk panel replacement to address condition issues and meet ADA cross-slope standards.

Current Sidewalk Condition

Within the project area, there is sidewalk along TH 11 in Greenbush, Roseau, and Warroad. The sections below describe sidewalk conditions in each city. The condition and cross-slope of TH 11 sidewalks were most recently assessed in 2010. Sidewalk condition and cross-slope are important considerations for MnDOT as it works to keep pedestrian facilities compliant with ADA standards. Sidewalks with poor surface condition and cross-slopes that exceed ADA recommendations of 2 percent can create challenges for all pedestrians, in particular pedestrians using wheelchairs or with visual impairments.

Sidewalk surface condition is rated on a scale of 1 to 4. Sidewalks with a condition rating of 1 are considered in good condition with minimal small cracks and no dips or heaves. A sidewalk with a condition rating of 2 is considered in fair condition, with some cracking and minimal dips or heaves. Condition of 3 or 4 is considered poor, with large cracks, dips and heaves, and obstacles. Sidewalk segments with a condition of 3 or 4 should be priority candidates for replacement.

Per MnDOT's Preferred ADA Design Criteria, the maximum cross-slope for new sidewalks should be a maximum of 2 percent, with a preferred cross-slope between 1.0-1.5 percent. For the purpose of this report, sidewalks with a cross-slope greater than 3 are considered candidates for replacement. All pedestrian ramps not meeting ADA standards need to be replaced as well.

Greenbush

Figure 12 shows sidewalk condition and recommendations for replacement within the City of Greenbush. Along both sides of TH 11, there is sidewalk from 6th Street to approximately 50 feet west of the Minnesota Northern Railroad. There is approximately 2,050 feet of existing sidewalk and 15 curb ramps in Greenbush. The majority of sidewalk within Greenbush has poor surface condition. Sidewalk cross-slope within Greenbush is generally below 3 percent, except for at the intersection with 6th Street and in some sections between 4th and Main Streets. None of the curb ramps meet current ADA standards. Additionally, there are five corners without curb ramps between Main Street and 1st Street N.

Based on existing sidewalk conditions and the criteria outlined above, 1,280 feet of sidewalk is recommended for replacement. 15 curb ramps are recommended for replacement and 5 new curb ramps will need to be constructed to be provided at corners where there are no existing curb ramps. Sidewalks and curb ramps recommended for replacement are shown on **Figure 12. Table 7** shows the length of sidewalk segments recommended for replacement.

Roseau

Figure 13 shows sidewalk condition and recommendations for replacement within the City of Roseau. There is sidewalk along both sides of TH 11 from 3rd Avenue NW to 8th Avenue NE. Additionally, there is sidewalk along the north side of TH 11 from TH 89/TH 310 to 3rd Avenue NW and between 8th and 11th Avenues NE.

Sidewalks along TH 11 within Roseau generally have fair to good surface condition. Most sidewalk segments west of 3rd Avenue NE have fair surface condition. Sidewalks east of 3rd Avenue NE vary between fair and good condition. While sidewalk surface condition is generally acceptable, the majority of sidewalk segments in Roseau have cross-slopes greater than 3 percent which is problematic for ADA requirements.

Based on existing sidewalk conditions, approximately 3,860 feet of sidewalk is recommended for replacement. Seven curb ramps are recommended for replacement. The length of sidewalk segments recommended for replacement is shown in **Table 7.**

Warroad

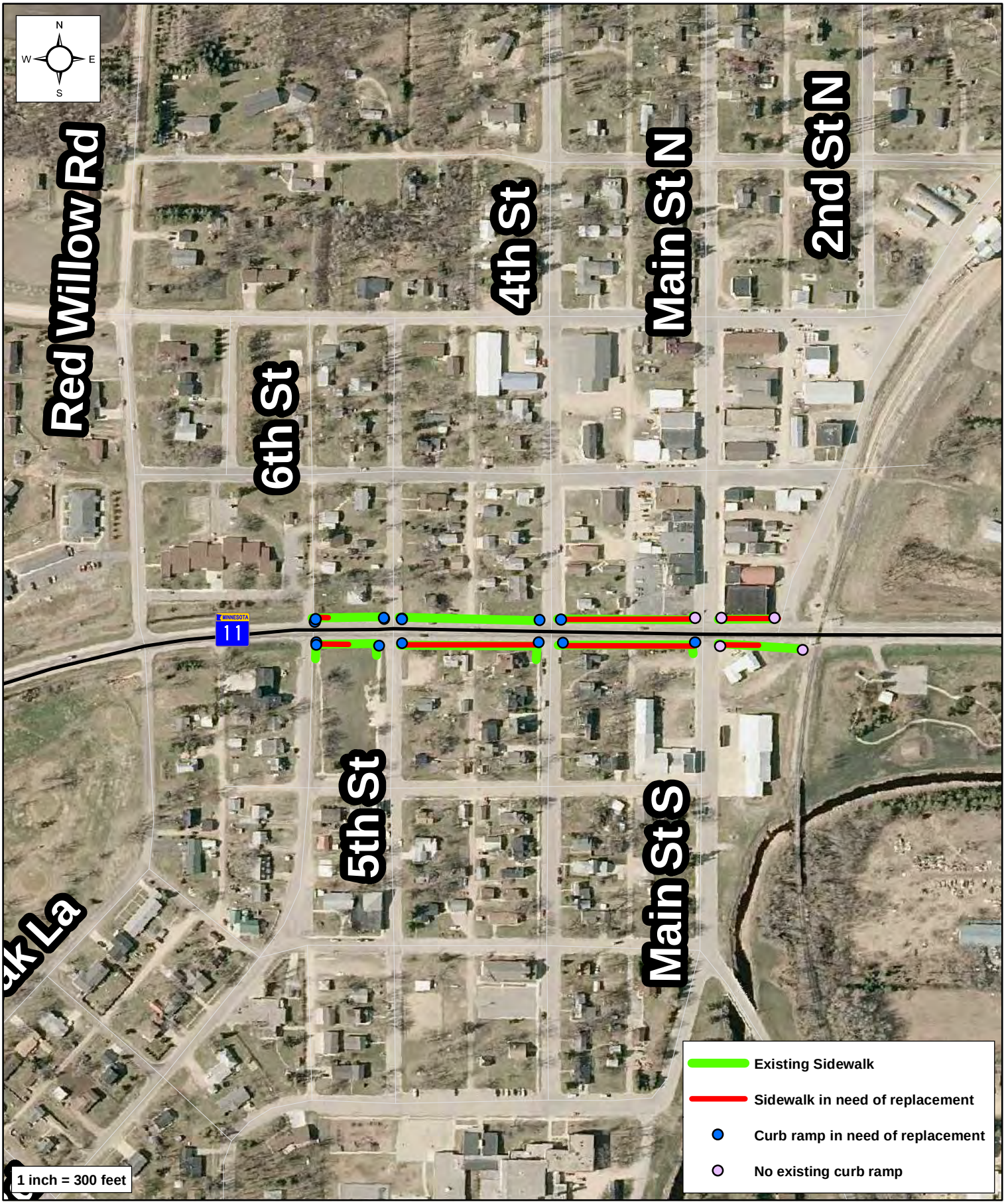
Figure 14 shows sidewalk condition and recommendations for replacement within the City of Warroad. There is continuous sidewalk along the south/west side of TH 11 from Cedar Avenue NW/TH 313 to Halberg Street SW. There is also sidewalk along the east side of TH 11 from Lake Street NE to Garfield Street SE.

Along TH 11 within the City of Warroad, sidewalk condition is generally fair. There are some short segments with sidewalk in good condition. On the east side of TH 11 south of the Warroad River, sidewalk condition is generally poor. Cross-slopes exceed 3 percent on the majority of sidewalk segments between Cedar Ave NW/TH 313 and Elk Street NW. Cross-slopes also exceed 3 percent on many segments south of Elk Street NW.

Approximately 4,960 feet of sidewalk are recommended for replacement due to condition and/or cross-slope. All 16 curb ramps in Warroad are recommended for replacement to comply with ADA standards. Additionally, two curb ramps will need to be constructed to be provided at corners where there are no existing curb ramps. **Figure 14** shows the location of sidewalks and curb ramps recommended for replacement. **Table 7** summarizes the sidewalk segments recommended for replacement.

Recommendations for Sidewalk Replacement Priorities

As described above, sidewalk segments are recommended for replacement if surface condition is poor and/or cross-slope exceeds 3 percent. Sidewalk replacement will be completed with the next scheduled pavement improvement. In Warroad, a planned MnDOT project will bring sidewalks and curb ramps into compliance with ADA. This project is scheduled for 2019 and will address many of the high priority sidewalk segments for replacement. Additionally, a planned 2024 project will address ADA and sidewalk condition issues in Roseau and should improve sidewalk condition on the high priority sidewalk segments for replacement. Following these projects, sidewalks will be rated in good condition with cross-slopes between 1.0 and 1.5 percent.



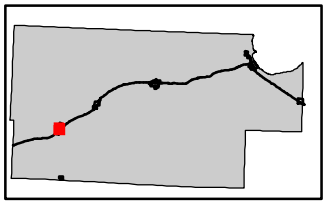


Figure 12
Existing Sidewalk and Sidewalk Replacement Needs
Greenbush

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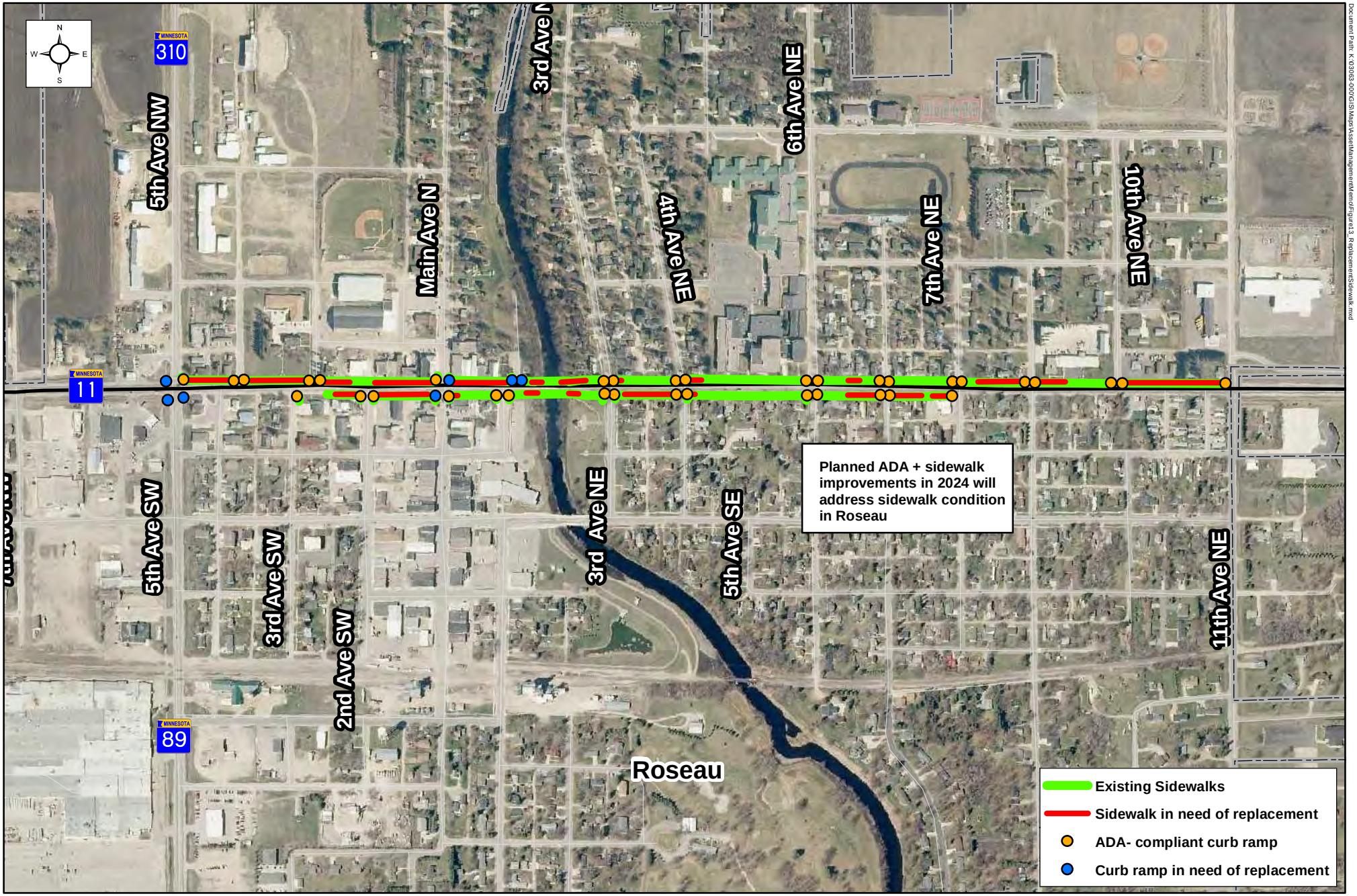
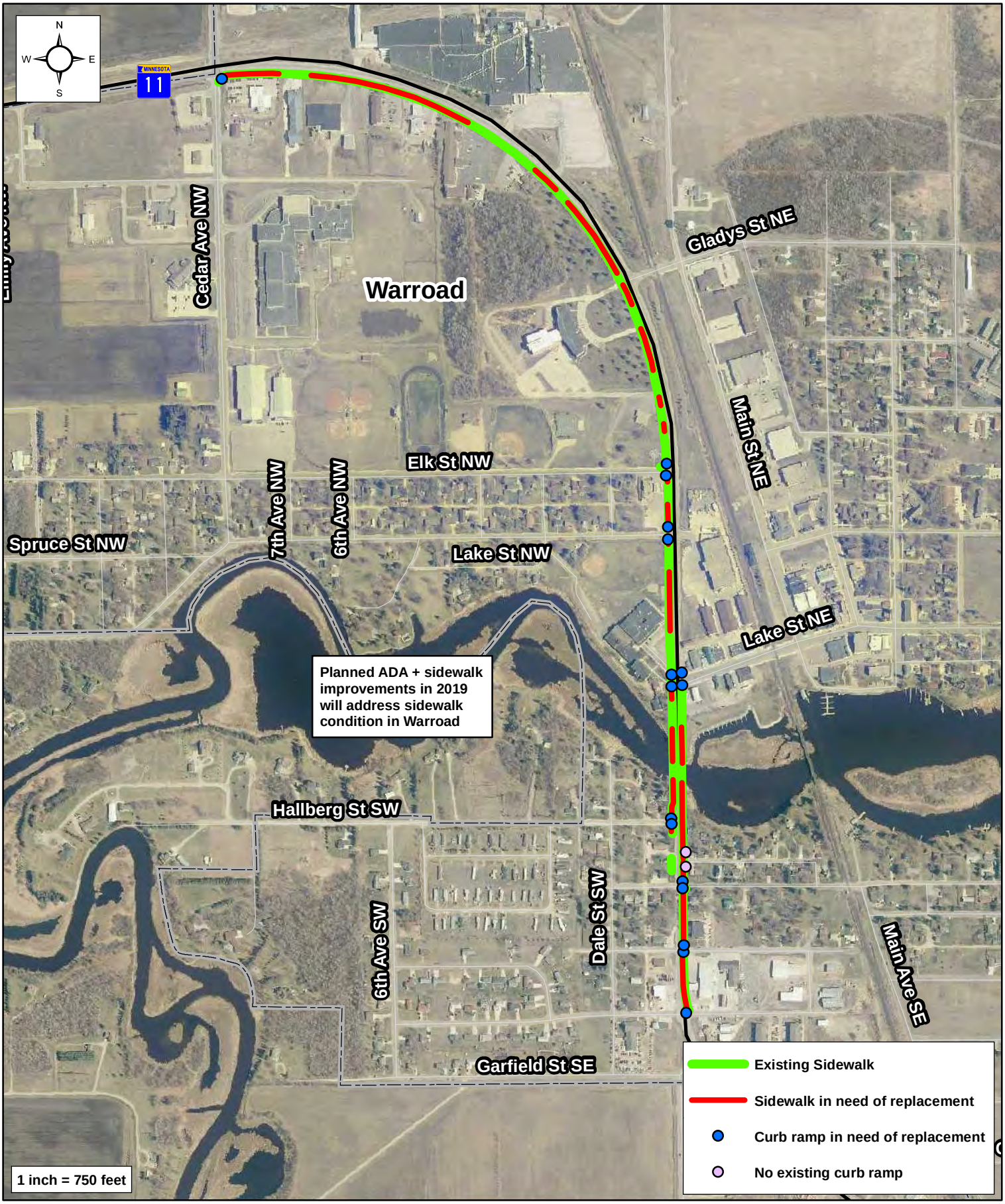


Figure 13
Existing Sidewalk and Sidewalk Replacement Needs
Roseau



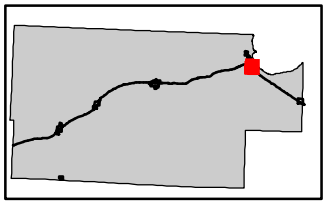


Figure 14
Existing Sidewalk and Sidewalk Replacement Needs
Warroad

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Table 7: Sidewalk Segments Recommended for Replacement

Segment Number	City	Segment Description	Segment Length (ft)
1	Greenbush	Intersection with 6th Street (east side)	118
2	Greenbush	Between 5th and 4th Streets (south side)	321
3	Greenbush	Between 4th and Main Streets	620
4	Greenbush	Between Main Street and 1st Street (Old Highway 11)	225
5	Roseau	Between 5th Avenue Northwest and 4th Avenue Northwest (north side)	257
6	Roseau	Between 4th Avenue Northwest and 3rd Avenue Northwest (north side)	305
7	Roseau	Between 3rd Avenue Northwest and 2nd Avenue Northwest	283
8	Roseau	Between 2nd Avenue Northwest and Main Avenue North	576
9	Roseau	Between Main Avenue North and 2nd Avenue Northeast (primarily north side)	319
10	Roseau	West of Roseau River Bridge	112
11	Roseau	East of Roseau River Bridge	178
12	Roseau	Intersection with 3rd Avenue Northeast (northeast corner)	37
13	Roseau	Between 3rd and 4th Avenue Northeast (south side)	276
14	Roseau	Intersection with 4th Avenue Northeast (east side)	127
15	Roseau	West of 7th Avenue Northeast (primarily south side)	227
16	Roseau	East of 7th Avenue Northeast (south side)	128
17	Roseau	Intersection with 8th Avenue Northeast (west side)	131
18	Roseau	West of 9th Avenue Northeast (north side)	246
19	Roseau	Intersection with 9th Avenue Northeast (northeast corner)	156
20	Roseau	Between 10th Avenue Northeast and 11th Avenue Northeast (north side)	505
21	Warroad	East of TH 313/Cedar Avenue Northwest (south side)	348
22	Warroad	South of Marvin Windows Factory (south side)	971
23	Warroad	South of Marvin Windows Parking Lot (southwest side)	167
24	Warroad	North of Gladys Street (west side)	506
25	Warroad	South of Gladys Street (west side)	128
26	Warroad	East of Marvin Windows Office (west side)	256
27	Warroad	East of Warroad Liquor Store (west side)	50
28	Warroad	North of Veterans Memorial (west side)	46

Segment Number	City	Segment Description	Segment Length (ft)
29	Warroad	Intersection with Elk Street Northwest (southwest corner)	39
30	Warroad	Intersection with Lake Street Northwest (west side)	182
31	Warroad	Between Lake Street Northwest and Lake Street Northeast (west side)	346
32	Warroad	South of Lake Street Northeast (west side)	44
33	Warroad	North of Warroad River	193
34	Warroad	Between Warroad River and Hallberg Street West	407
35	Warroad	Between Hallberg Street Southwest and Riverview Drive Southeast	245
36	Warroad	Between Riverview Drive Southeast and Washington Avenue Southeast (east side)	117
37	Warroad	Between Washington Avenue Southeast and Lincoln Street Southeast (east side)	327
38	Warroad	Between Lincoln Street Southeast and Garfield Street Southeast (east side)	326

Culvert Condition

This section of the memo describes current condition of culverts within the study area and includes recommendations for any necessary rehabilitation or replacement.

Current Culvert Condition

There are a total of 57 culverts located on TH 11, as shown on **Figures 15-17**. Most culverts in the study area were inspected in 2009, with a few inspected as recently as 2014. MnDOT rates culvert condition on a scale of 1 to 4. A rating of 1 indicates a culvert in excellent, like-new condition. A rating of 2 indicates fair condition, with the culvert showing some wear but still structurally sound. Ratings of 3-4 indicate a need for repair or replacement.

All culverts in the study area are rated 1 or 2 indicating fair to excellent condition. The 15 culverts in good condition are scattered throughout the study area. The remaining 42 culverts are in fair condition. However, staff at MnDOT believes that an additional inspection of the culverts is warranted since many of them were last inspected in 2009 to ensure the accuracy of the rating. MnDOT will be conducting an inspection of the culverts in late summer or early fall in 2015 to update the condition reports. The final report with this study will include the updated information from the inspection. **Table 8** includes information about the location and condition of each culvert based on most recent inspections.

Table 8: Culvert location and condition

Culvert ID	Date of Last Inspection	Reference Point	Material	Condition
174147	7/8/2009	48.269	Concrete	2
174150	7/8/2009	48.783	Concrete	2
174153	7/8/2009	49.261	Concrete	2
174156	7/8/2009	51.677	Concrete	1
174159	7/8/2009	58.731	Concrete	2
174162	7/8/2009	59.368	Concrete	1
174165	7/8/2009	64.478	Concrete	2
174168	7/8/2009	67.516	Concrete	2
174171	7/8/2009	68.500	Corg. Mtl (CMP)	2
174174	7/8/2009	69.681	Corg. Mtl (CMP)	1
174177	7/8/2009	69.704	Corg. Mtl (CMP)	1
174066	7/8/2009	71.699	Concrete	1
174069	7/1/2009	72.696	Concrete	1
174072	7/1/2009	73.301	Corg. Mtl (CMP)	2
174075	7/1/2009	73.718	Concrete	1
174078	7/1/2009	73.980	Corg. Mtl (CMP)	2
174081	7/1/2009	75.732	Corg. Mtl (CMP)	2
174084	7/1/2009	75.733	Corg. Mtl (CMP)	2
174087	7/1/2009	76.736	Concrete	1
174090	7/1/2009	77.788	Concrete	1
174093	7/1/2009	78.151	Corg. Mtl (CMP)	2
174096	7/1/2009	78.535	Corg. Mtl (CMP)	2
174099	7/1/2009	79.537	Corg. Mtl (CMP)	2
174102	7/1/2009	80.523	Corg. Mtl (CMP)	2
174105	7/1/2009	81.075	Corg. Mtl (CMP)	2
174108	7/1/2009	82.087	Corg. Mtl (CMP)	2
174111	7/1/2009	82.965	Corg. Mtl (CMP)	2
174114	7/2/2009	83.283	Corg. Mtl (CMP)	2
174117	7/2/2009	84.105	Concrete	1
174120	7/2/2009	84.815	Corg. Mtl (CMP)	2
174126	7/2/2009	85.943	Corg. Mtl (CMP)	2
174129	7/2/2009	86.421	Corg. Mtl (CMP)	2
174132	7/2/2009	86.893	Corg. Mtl (CMP)	2
174135	7/2/2009	87.366	Corg. Mtl (CMP)	2
174138	7/2/2009	89.780	Corg. Mtl (CMP)	2
778639	10/24/2014	90.664	Liner Cured in Place	1
174141	7/2/2009	91.648	Concrete	2
175957	7/2/2009	93.113	Corg. Mtl (CMP)	2
175960	10/24/2014	93.509	Liner Cured in Place	1
175963	7/2/2009	94.658	Corg. Mtl (CMP)	2
175966	7/7/2009	95.792	Concrete	2

Culvert ID	Date of Last Inspection	Reference Point	Material	Condition
175969	7/7/2009	96.226	Corg. Mtl (CMP)	2
175972	10/24/2014	97.402	Liner Cured in Place	1
175975	7/7/2009	97.412	Corg. Mtl (CMP)	2
175978	7/7/2009	97.627	Corg. Mtl (CMP)	2
175981	7/7/2009	98.538	Corg. Mtl (CMP)	2
175984	7/7/2009	99.137	Corg. Mtl (CMP)	2
175987	7/7/2009	99.356	Corg. Mtl (CMP)	2
175990	7/7/2009	99.359	Corg. Mtl (CMP)	2
175993	7/7/2009	99.485	Corg. Mtl (CMP)	2
175996	7/7/2009	99.487	Corg. Mtl (CMP)	2
175999	7/7/2009	100.687	Corg. Mtl (CMP)	2
176002	7/7/2009	102.016	Concrete	1
176005	10/24/2014	103.440	Liner Cured in Place	1
176008	7/13/2009	103.686	Concrete	2
176011	7/13/2009	103.857	Concrete	2
176014	7/13/2009	104.923	Corg. Mtl (CMP)	2

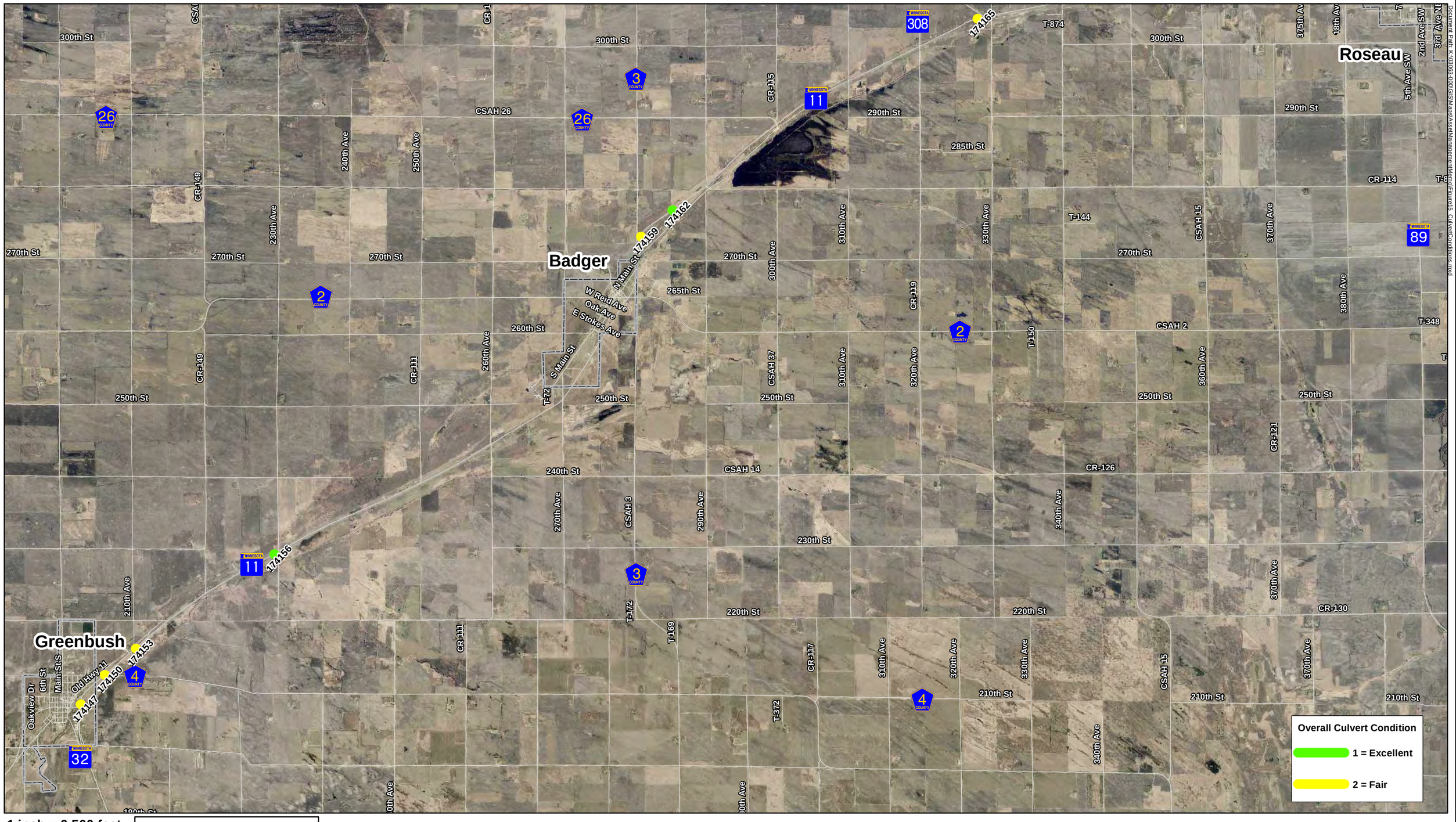
Recommendations for Culvert Inspection

Culverts in fair to excellent condition should be inspected every six years. Culverts with a rating of 3 (poor) should be inspected every 2-4 years. Culverts in very poor condition (rated 4) should be inspected every two years if the problem is not under the road, and every year if the problem requires a repair under the road. Culverts are one of the greatest risks for MnDOT because a culvert in poor condition can suddenly fail underneath a roadway. Camera inspections can help identify concerns such as rusting or erosion around galvanized steel pipes, sedimentation blocking water flow, or separating joints.

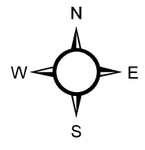
Based on the most recent inspection reports available, culverts in the corridor should be inspected every six years, with the next inspections recommended in 2015 and 2021. It is possible that 2015 inspections will identify culverts in poor condition that must be inspected more frequently.

Recommendations for Culvert Rehabilitation or Replacement

Based on MnDOT culvert inspection reports, there are no immediate needs for culvert rehabilitation or replacement within the study area. All culverts on the corridor are known to be in fair to good condition and will only need ongoing maintenance in the near-term. Culverts in fair condition may need rehabilitation in the prior to 2040 based on the results of future inspections. As noted above, MnDOT hydraulic engineers expect that there are some culverts that may be in poor condition and will require rehabilitation or replacement. These recommendations will be updated following 2015 inspections of culverts in the corridor. It is expected that some culverts will require cleaning, repair of separated joints, lining, or full replacement.



1 inch = 6,500 feet



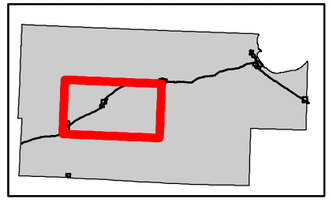
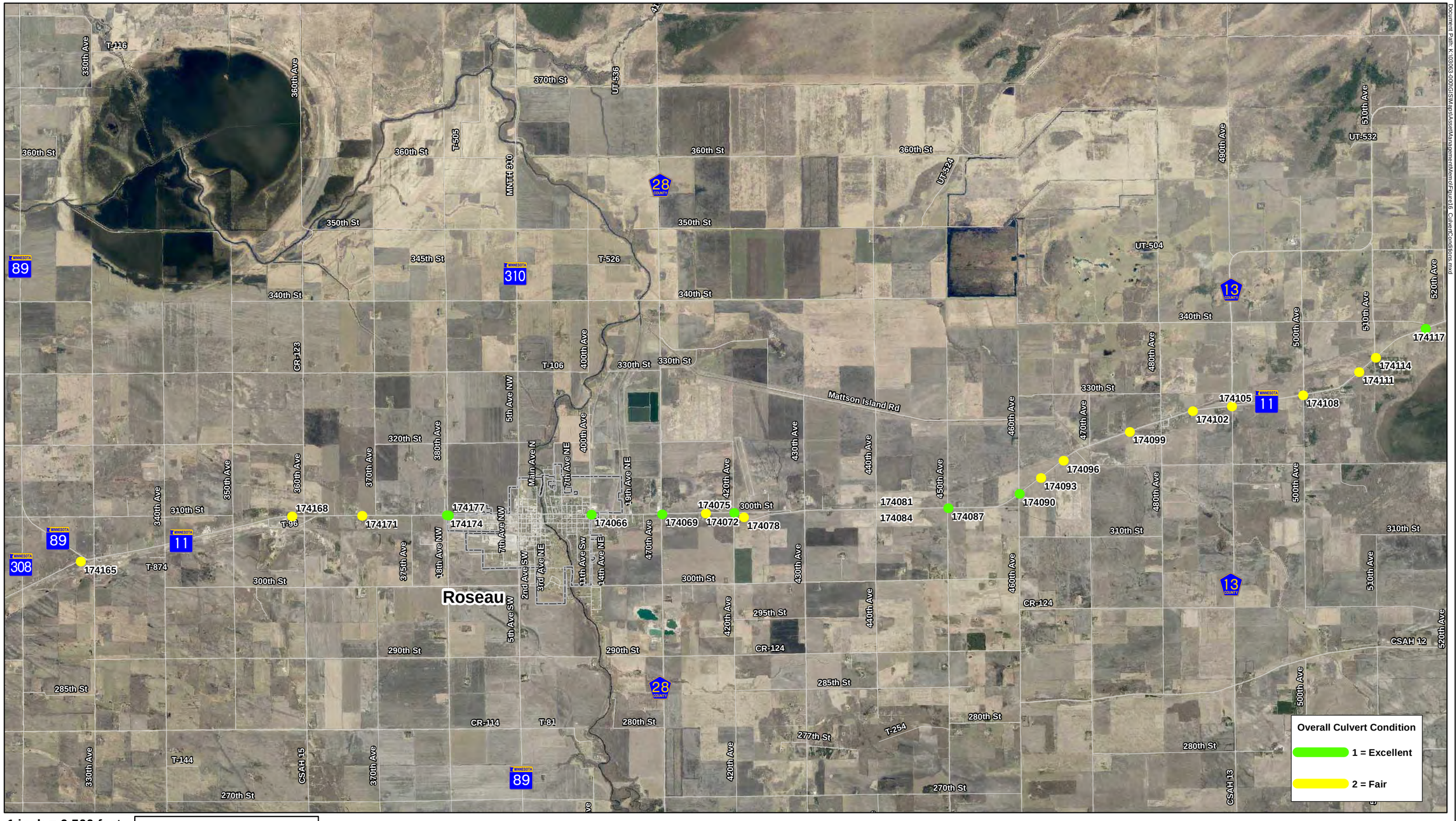


Figure 15
Current Culvert Conditions
Greenbush & Badger



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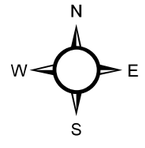

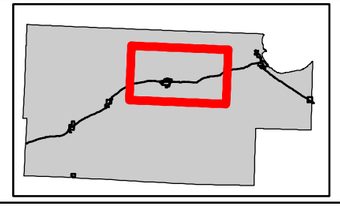

Figure 16
Current Culvert Conditions
Roseau

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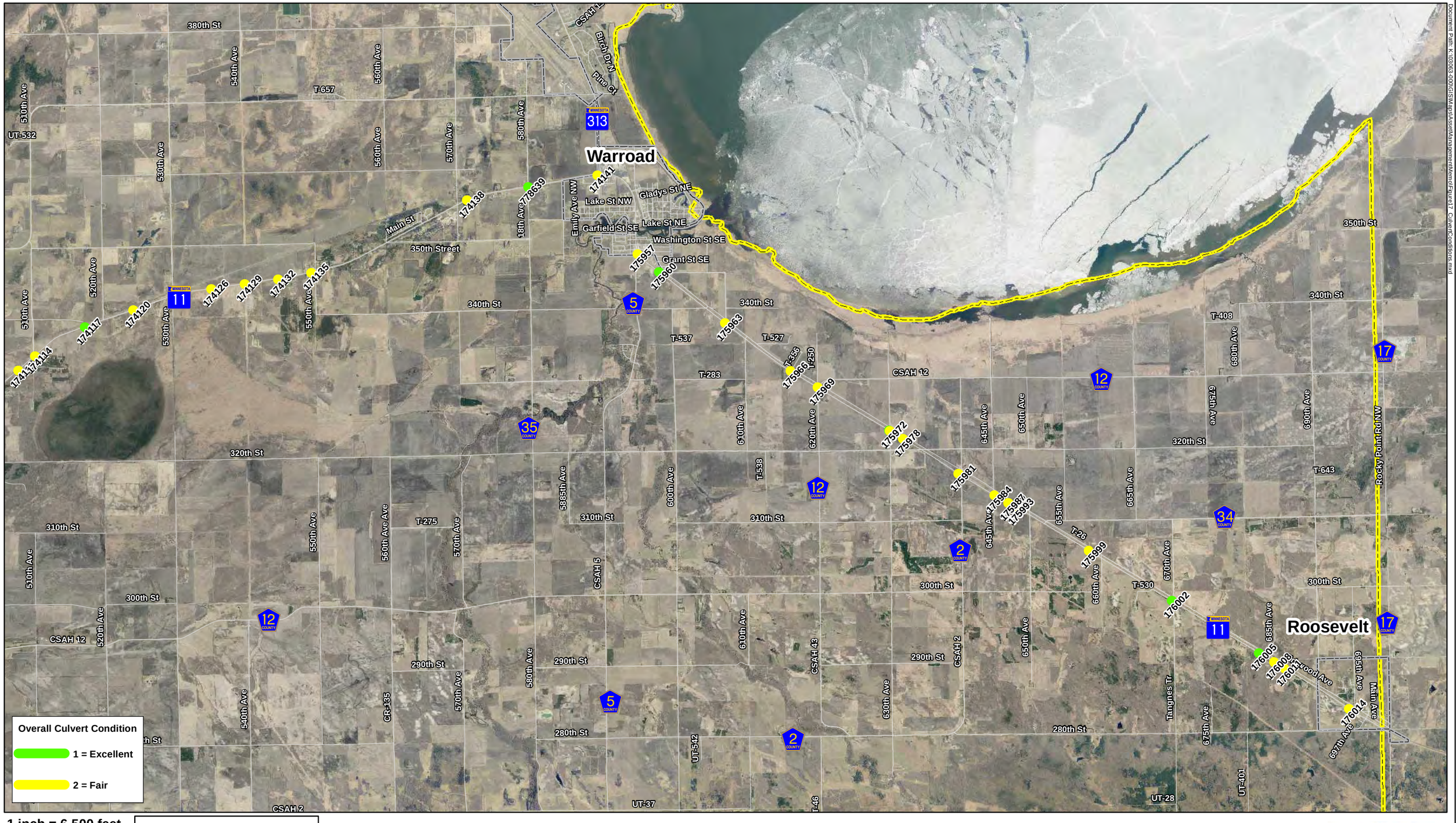

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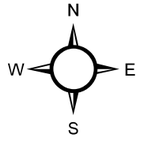


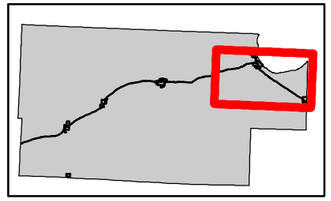


Figure 17
Current Culvert Conditions
Warroad & Roosevelt

Storm Sewer Condition

This section includes information on the current condition of storm sewer systems within the study area and includes recommendations for any necessary rehabilitation or replacement.

Current Storm Sewer Condition

Within the study area, there is only storm sewer along TH 11 in Roseau and Warroad, as shown in **Figures 18-19**. Storm sewer in Roseau was constructed in 2005 and 2006 and is in good condition. Storm sewer in Warroad was constructed in 1989 and 1990 and will be inspected in late summer 2015. At this time the condition of the Warroad storm sewer system is unknown. Information from the inspection will be incorporated as appropriate into the final report.

Recommendations for Storm Sewer Rehabilitation or Replacement

Based on the recent installation of the storm sewer along TH 11 in Roseau, there is not a need for rehabilitation or replacement in the near- to mid-term. As noted above, the current condition of the storm sewer in Warroad is unknown. It is possible that the 2015 inspection may identify needs for rehabilitation or replacement of portions of the system, based on its age. Information from the inspection will be incorporated as appropriate into the final report.

Storm sewer should generally be inspected every five years to comply with MS4 permit requirements, with the next inspection recommended in 2020. Inspections should identify needs to clean drains, clean sediment in storage ponds, and address erosion around open inlets or grates.

Traffic Signals and Lighting Condition

This section of the memo summarizes the current condition of MnDOT signals and lighting in the study area and describes any necessary rehabilitation or replacement.

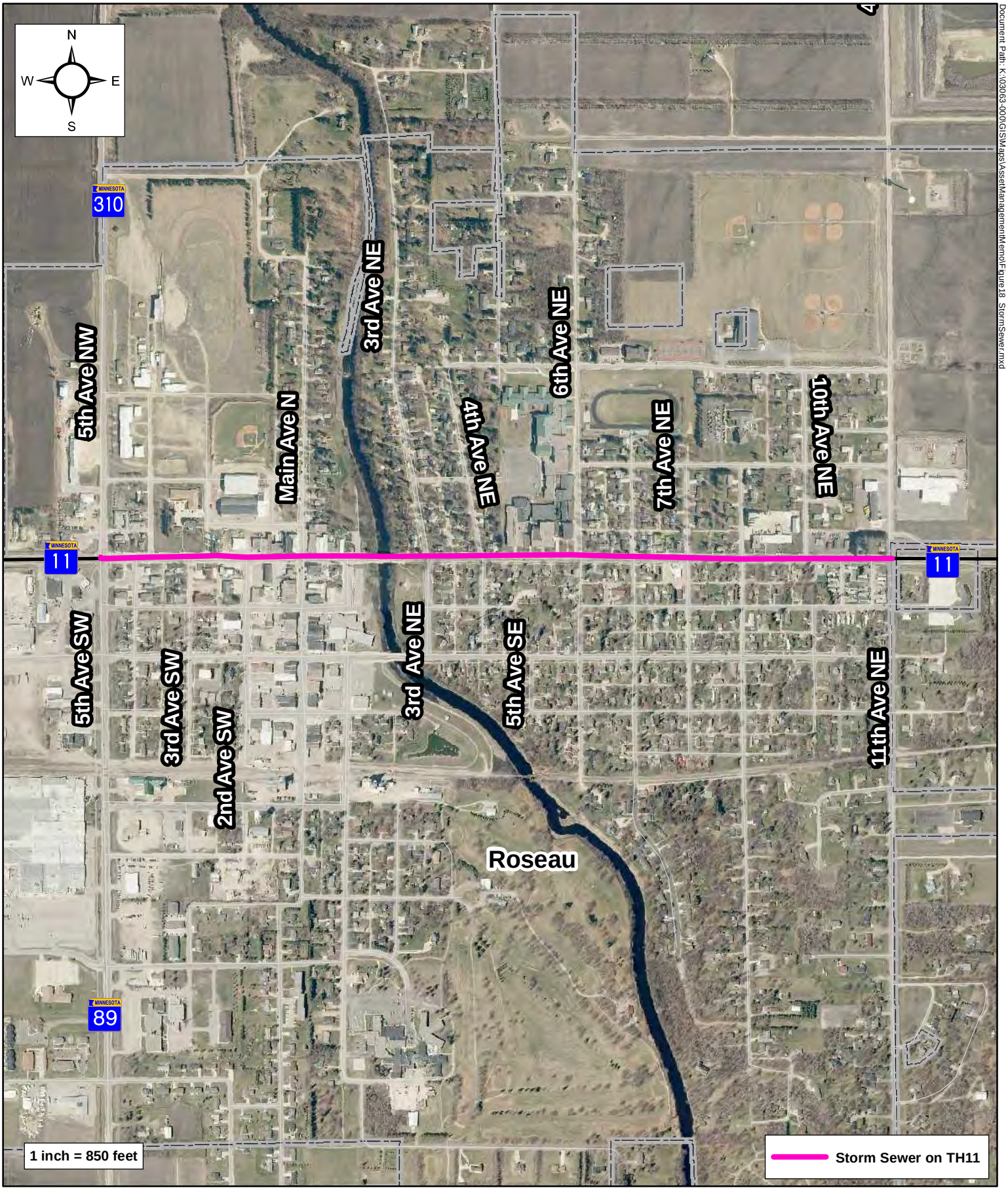
Current Traffic Signal and Lighting Condition

Within the study area, there are four traffic signals on TH 11 and two MnDOT-owned street lights. Existing signals and lighting are shown on **Figures 20** and **21.**

The signals in Roseau are located at the intersections with TH 89/TH 311 and Main Street. Both signals were originally turned on in 1992. The signal at TH 89/TH 313 is being rebuilt in summer 2015 to include accessible pedestrian signals and allow protected/permissive left turns. Both signals are in good condition.

The signals in Warroad are located at the intersections with TH 313/Cedar Street NW and Lake Street. The signal at Lake Street was originally turned on in 1986. The signal at TH 313 was originally turned on in 1992. Both signals are scheduled for replacement in 2019. MnDOT plans to bring both signals into compliance with accessible pedestrian signal requirements.

The MnDOT-owned street lights are located approximately three miles southeast of Warroad, at the intersection of TH 11 and CSAH 12. These lights were originally turned on in 2011 and are in good condition.



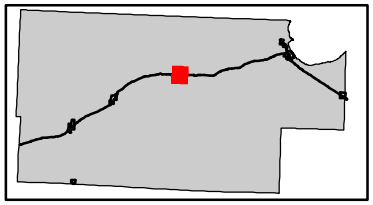
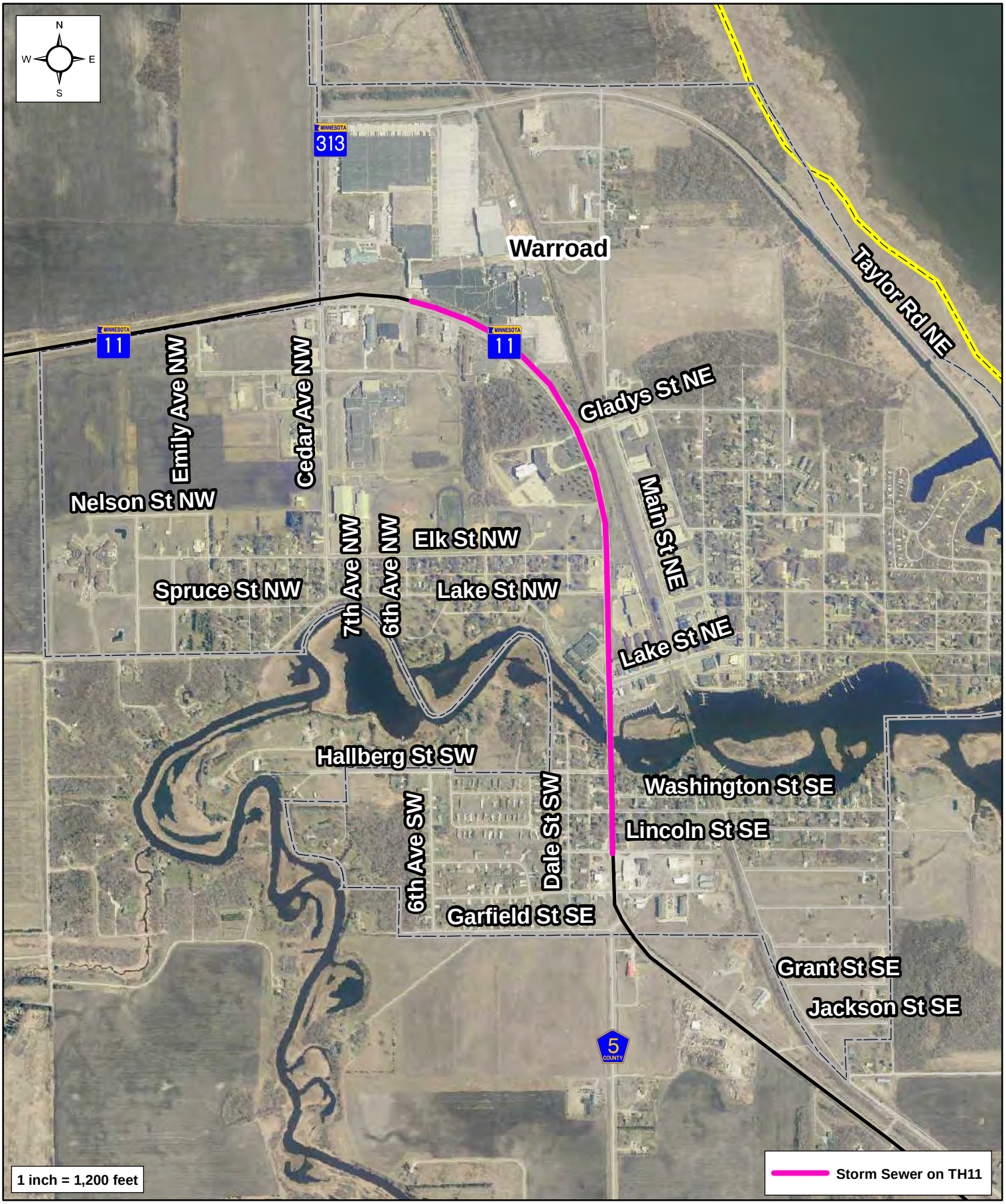


Figure 18
Existing Storm Sewer
Roseau



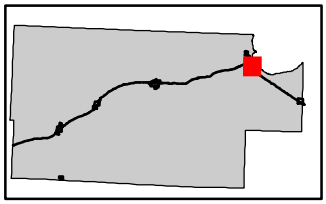


Figure 19
Existing Storm Sewer
Warroad

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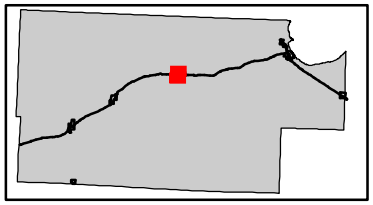

Figure 20
Traffic Signals and Lighting
Roseau

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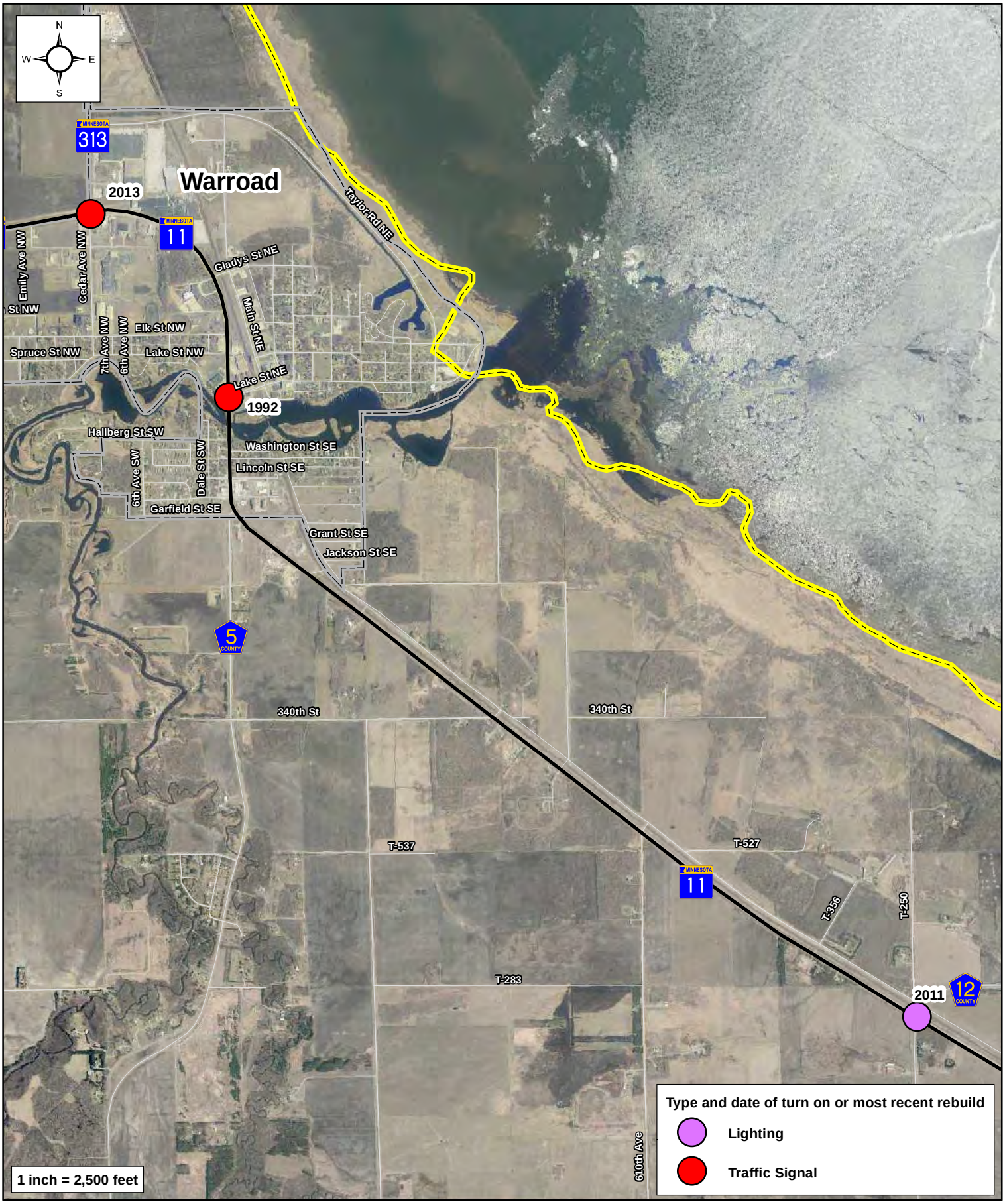

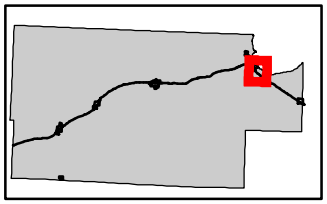

Figure 21
Traffic Signals and Lighting
Warroad

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Recommendations for Traffic Signal and Lighting Rehabilitation or Replacement

Based on the current condition of traffic signals and lighting on TH 11, there is no immediate need for replacement or rehabilitation to keep the signals and lighting in working order. Signals should be painted every 10 years. Additionally, the signal at Main Street in Roseau should also be considered for accessible pedestrian signal updates prior to 2025.

If through the course of the TH 11 study it is determined that protected/permissive left turns would improve safety and operations at TH 313, it would be necessary to change out the signal head on this signal. This could be completed in conjunction with a 2019 planned upgrade. MnDOT could also consider upgrading to the latest signal cabinets at this time.

As the street lights at CSAH 12 are maintained, MnDOT could consider replacing fixtures with LED fixtures with a longer life to reduce maintenance needs. LED fixtures typically last 5-7 years as compared to the typical two-year life of incandescent fixtures.

Asset Management Risks for TH 11

This section of the memo summarizes the primary asset management risks for the TH 11 study area. While ongoing maintenance will be necessary for all assets in the corridor, pavement condition, sidewalk condition/ADA, and culverts are the primary risks to MnDOT on TH 11.

Pavement Condition Risks

Preventive pavement condition maintenance is necessary to keep pavement in good condition on TH 11. Planned projects through 2024 should generally be adequate to maintain pavement in good condition. The one exception is Segment 4 in Roseau, between TH 89/TH 310 and 14th Avenue. This segment is planned for mill and overlay in 2024. Based on the current RQI of 2.4, it is recommended that this mill and overlay be accelerated to occur prior to 2020.

If preventive maintenance occurs at the recommended intervals, there should not be a need to reconstruct any segments within the study area. However, budget constraints might cause this schedule to slip. To manage pavement condition risks on TH 11, it is recommended that MnDOT prioritize preventive maintenance to extend the life of the roadway and prevent the need for a costly roadway reconstruction prior to 2040.

Sidewalk Condition/ADA Risks

There are many segments of sidewalk in fair to poor condition in Greenbush, Roseau, and Warroad. Cross-slopes are a concern along TH 11 as many sidewalk segments do not meet current ADA-standards. Planned sidewalk/ADA projects in Warroad and Roseau are expected to address some of these concerns. It will be important for MnDOT to continue to improve sidewalk condition to maintain access for persons with disabilities.

Culvert Risks

As noted in the Culvert Condition section, MnDOT hydraulics staff are concerned that culverts on TH 11 are in worse condition than indicated in recent inspections. Inspections in 2015 may reveal culverts in need of short- to mid-term rehabilitation or replacement. As aging culverts are prone to sudden failure underneath the roadway, it is important that camera inspections are conducted to identify concerns so they can be addressed prior to failure.