

Dakota Rail Trail

Preliminary Engineering Study

McLeod County, MN



June 2018

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Prepared by:



Consulting Group, Inc.

Job # 10897

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INTRODUCTION

McLeod County, in conjunction with the McLeod County Regional Railroad Authority and the City of Hutchinson, administered this feasibility study for the Dakota Rail corridor between Lester Prairie and Hutchinson to better understand the current condition of the corridor and to identify what steps will be needed to develop a paved or aggregate surfaced, multi-use trail between these two communities. A master plan has been developed for the trail and the first phase of funding has been received to pave a two-mile segment of the trail from the McLeod County/Carver County line into downtown Lester Prairie in 2018. McLeod County officials will use this feasibility study to determine surfacing approach, inventory constructability issues, identify phasing options, and to prepare future grant applications to develop the entire trail corridor.

The Dakota Rail corridor is an abandoned rail corridor that extends from Wayzata on the east to Hutchinson on the west for a total distance of 44 miles through Hennepin, Carver and McLeod Counties. In McLeod County, the corridor extends 14.94 miles between the McLeod/Carver County line to the City of Hutchinson. In Hennepin and Carver County, 26 miles of the trail are fully developed and paved between Wayzata and the McLeod/Carver County line. Completion of the McLeod County segment will create a 44-mile regional trail that will connect several communities in all three counties while connecting to the Luce Line State Trail in Hutchinson.

The McLeod County Regional Rail Authority, along with the Hennepin and Carver County Regional Railroad Authorities, purchased the corridor in 2001 to preserve it for future transportation operations. In 2008, Hennepin County began construction of the first segment of paved trail in the corridor. The final completed segment in Carver County from Mayer to the McLeod/Carver County line was completed in 2012.



PROJECT INFORMATION

The proposed Dakota Rail Trail project in McLeod County will extend 14.94 miles between County Road 1 along the west side of Lester Prairie and Ranch Avenue SE within the easterly edge of Hutchinson, utilizing abandoned railroad right-of-way owned by the McLeod County Regional Railroad Authority. The corridor contains several culvert crossings, two bridge crossings and numerous roadway crossings.

Adjacent Land Use

The proposed trail will pass through rural agricultural land across central and eastern McLeod County. In several locations along the corridor farming practices extend over the Regional Railroad Authority property line and abut the ballast and old rail way.

In anticipation of future trail development, McLeod County contacted 117 land owners with property immediately adjacent to the Dakota Rail corridor requesting information on drainage structures and other items adjacent to or within the right-of-way. The County received 17 responses and that information has been included in this report. A copy of the letter is included in Appendix F.

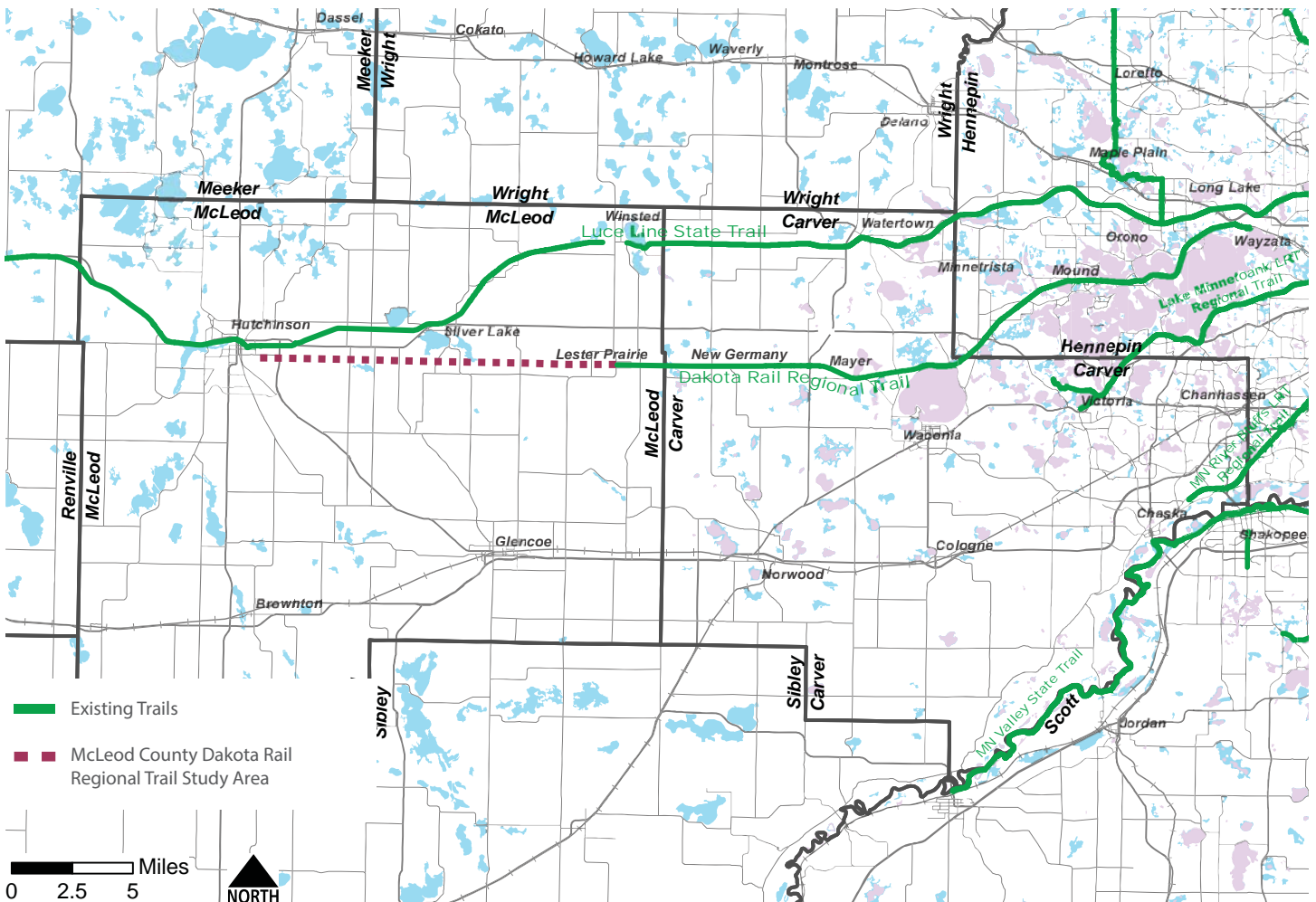


Figure 1: Trail Location

Right-Of-Way

The proposed trail will be a multi-use recreational trail similar to the existing trail segment in Carver and Hennepin Counties. The trail will be developed on the old rail bed that is generally centered in the 100-foot wide right-of-way that extends along the entire corridor.

Horizontal/Vertical Alignment

The topography of the corridor is generally level terrain. The trail route follows an abandoned railroad line and, thus the alignment is generally straight with one gradual curve as the corridor extends east out of Hutchinson. There are several locations along the corridor where the abandoned rail bed is in a cut section, generally at roadway crossings to bring the rail bed down to the same elevation as the roadway.

Bridge Crossings

The proposed trail will cross over County Ditch No. 40, also known as Bear Creek, and County Ditch No. 32. Both currently have railroad trestle bridge structures. The Department of Natural Resources (DNR) determined previously that the bridge structures are beyond repair and should be replaced. Additional information on the recommended crossing structures for these two locations is included later in the report.

Trailhead Facilities

Trailhead facilities may be developed in Lester Prairie as part of Phase One trail improvements. Trailhead facilities may include parking, portable restrooms, drinking fountain, picnic facilities, benches, bike racks, waste receptacles and wayfinding. Additionally, a trail parking facility with a rest stop may be developed near the northwest corner of Iris Road, south of Silver Lake.



Rest Stops

Rest stops may be constructed every two to three miles apart throughout the corridor. The rest stops could include a concrete pad with benches, a bike rack and a trash receptacle.

Design/Construction Alternatives

The existing rail corridor has had the ties and rails removed. Railroad ballast rock, consisting generally of 1-inch to 2-inch granite with fine organics and sediment mixed in remains throughout the corridor, though the depth of the ballast material varies greatly from several inches to over a foot deep. Minimal maintenance has been done on the corridor since the rails were removed. Mowing and clearing of downed trees on a regular basis are the extent of maintenance. As such, a layer of organic material that has grass and weedy plants has grown over the old rail bed. The geotechnical borings conducted as part of the corridor analysis provide additional detail on the depth of ballast rock and organic material. The boring reports are included in Appendix C.

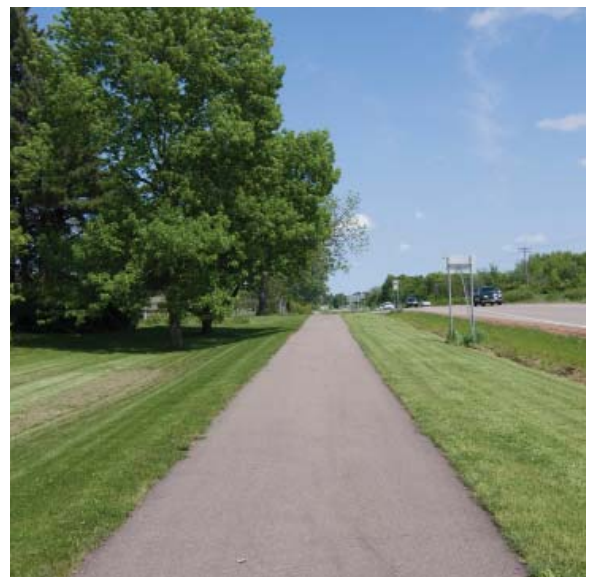
Subgrade Preparation

Subgrade preparation for trail development should include removal of the surface organic material and ballast rock to a depth of six inches. The subgrade under the removed ballast should be compacted with a sheepsfoot or similar roller to achieve consistent compaction across the entire trail width. A base of six inches of Class 5 gravel should be placed and compacted over the compacted subgrade. Three inches of the surface wear material should be placed on top of the Class 5 base material. The surface material may include one lift of bituminous asphalt or Class 2 virgin limestone.

Trail Surface

Both bituminous and aggregate surfacing were reviewed. A bituminous trail surface is recommended because this surface requires less frequent maintenance thus making it more cost effective than other treatments; it provides a stable surface for a wide variety of trail uses thus attracting more users including limited mobility users, and it can be used in a wider range of weather conditions such as spring thaw.

Paved trail surfacing may be a requirement of certain grant opportunities, and if not a requirement, may rank higher than a non-paved surface. A bituminous trail surface is also consistent with the adjoining Dakota Rail Regional Trail sections in Carver and Hennepin Counties.



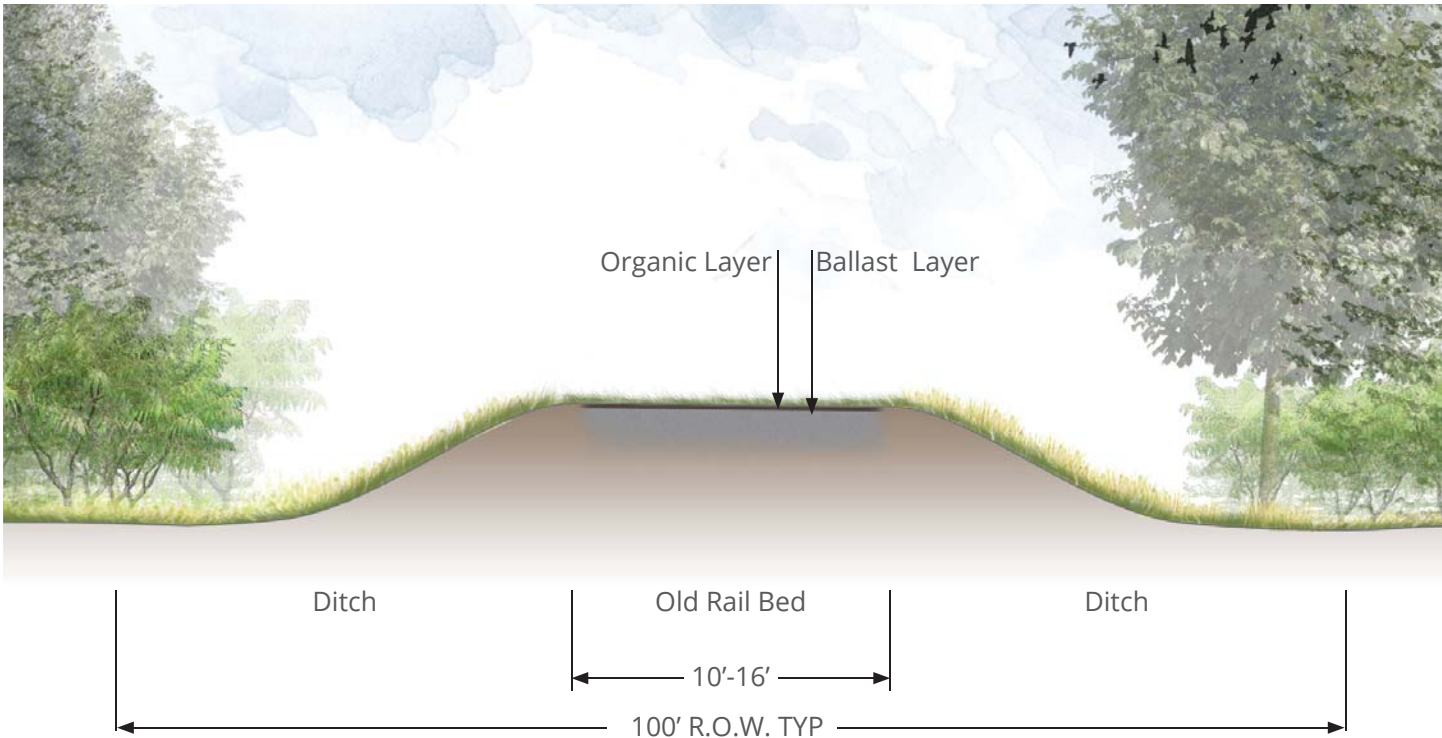


Figure 2: Typical Existing Condition Section

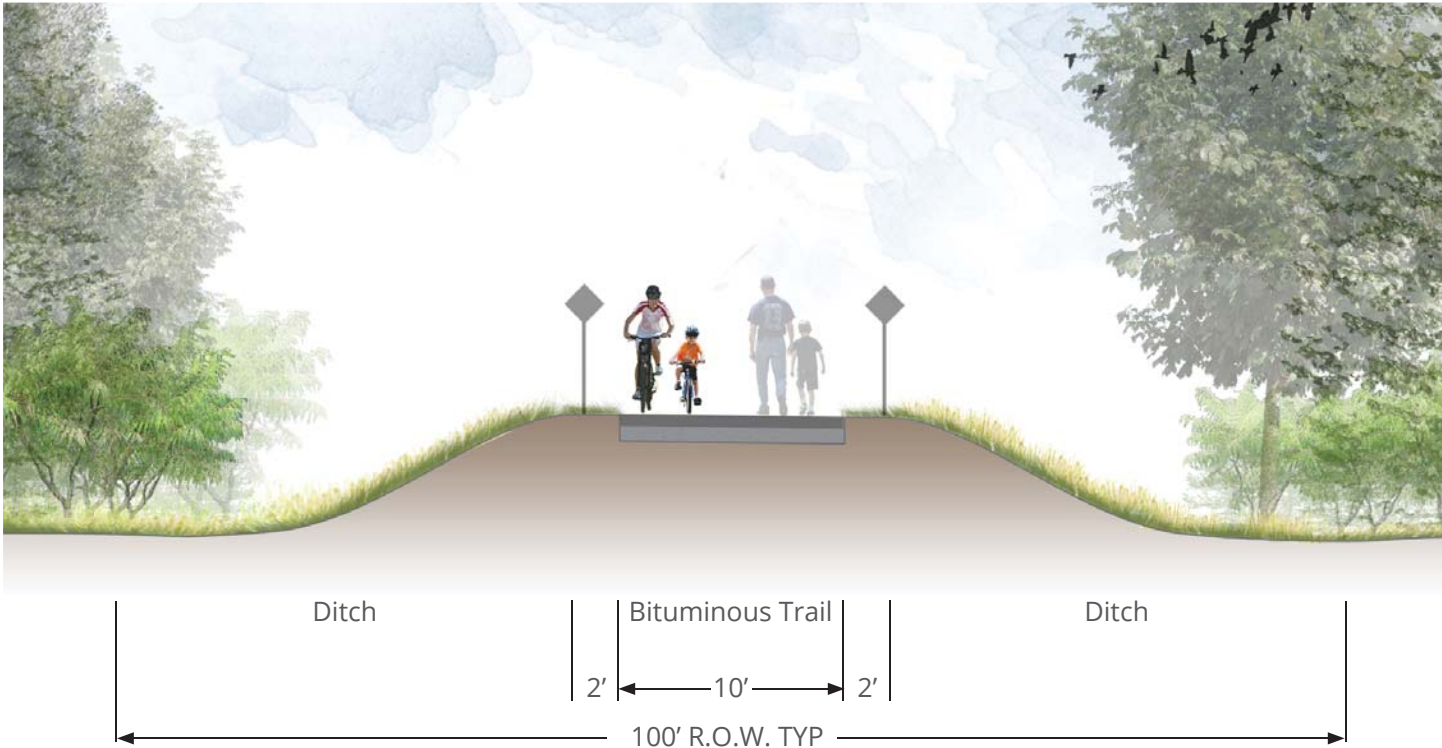


Figure 3: Typical Trail Section

Trail Maintenance

Both paved and soft-surface trails will require regular maintenance including mowing the grass shoulders, removing leaves and other debris from wind, storms or seasonal weather, tree trimming, sign maintenance, solid waste collection and visually inspecting signs, pavement surfacing and bridges for wear and damage. Winter maintenance may include either grooming for snowmobiling and cross-country skiing, depending on weather conditions and available resources.

Soft-surface trails require periodic but regular grading to smooth out ruts caused by bicycle tires and maintenance vehicles and to repair washouts caused by heavy rain events. Vegetation encroachment along the edges is another maintenance issue. Weeds and grass will encroach on the trail edges and if this is not maintained, a layer of duff material will form, reducing the width of the usable surface and creating a larger maintenance concern to maintain the trail width. Additional limestone aggregate surfacing may need to be applied periodically in areas where heavy use has compacted the trail or where washouts have occurred.

Maintenance for paved trail surfaces is less frequent because the surface holds up better during rain events and during the spring thaw season. After five to eight years, it is ideal to seal cracks in the pavement surface and to apply a fog seal to extend the life of the trail surface. If the trail has striping, refreshing the paint after fog seal application or after several years of wear may be necessary. The cost for crack sealing ranges from \$.050 to \$.075 per linear foot, in 2018 dollars. For planning purposes, assume an average of 80 linear feet per mile of crack filling, or 1,200 linear feet of cracks. The total estimated cost for crack filling is between \$750 and \$1,750. The average cost, in 2018 dollars, for fog sealing trails is \$1.25 per square yard. The total estimated cost to fog seal the entire trail, if paved, is \$70,000.

Annual Maintenance and Operations Costs

After the trail is fully developed, McLeod County will make use of existing personnel and equipment to maintain the Dakota Rail Trail corridor, surfacing and vegetation. Maintenance activities can be undertaken by partner organizations to reduce the burden on county and city staffs and budgets. Volunteer groups such as local trail, bike and snowmobile organizations may be willing to conduct regular maintenance of the trail and corridor.

Annual routine maintenance costs, including monthly mowing and blowing and weekly visual inspections for the trail with an asphalt surface is estimated to be \$7,400 in 2018 dollars.

An aggregate trail will require additional maintenance including grading. For the estimating purposes, it is assumed that the trail will be graded two times per season, once in the spring after thaw and once in the mid-summer to maintain trail edges and a smooth surface. Annual routine maintenance costs for the trail with a gravel surface is estimated to be \$8,600 in 2018 dollars.



Trail maintenance: fog seal.



Trail maintenance: Shoulder mowing.

Roadway Crossings

The trail will cross a total of 15 roadways at grade. A list of all at grade roadway crossings is shown in Figure 4.

Gravel road crossings will include a pavement apron that extends 25 feet in both directions perpendicular to the trail crossing to provide a transition between the gravel roadway surface and the paved trail crossing surface.

Roadway Crossing	Surface	Width	Jurisdiction
Ranch Avenue	Gravel	24'	Township
Arch Street	Gravel	24'	Township
Highway 22	Paved	45'	MnDOT
Nickel Avenue	Gravel	28'	Township
Major Avenue / County Road 4	Paved	26'	McLeod County
Lace Avenue / County Road 71	Gravel	28'	McLeod County
Kale Avenue / County Road 90	Gravel	28'	McLeod County
Iris Road	Paved	24'	McLeod County
County Road 2	Paved	46'	McLeod County
Garden Avenue	Gravel	24'	Township
Falcon Avenue	Paved	30'	McLeod County
Eagle Avenue	Gravel	24'	Township
Dairy Avenue	Gravel	22'	Township
Cable Avenue / County Road 63	Paved	24'	McLeod County
Babcock Avenue / County Road 1	Paved	48'	McLeod County

Figure 4: Roadway Crossing

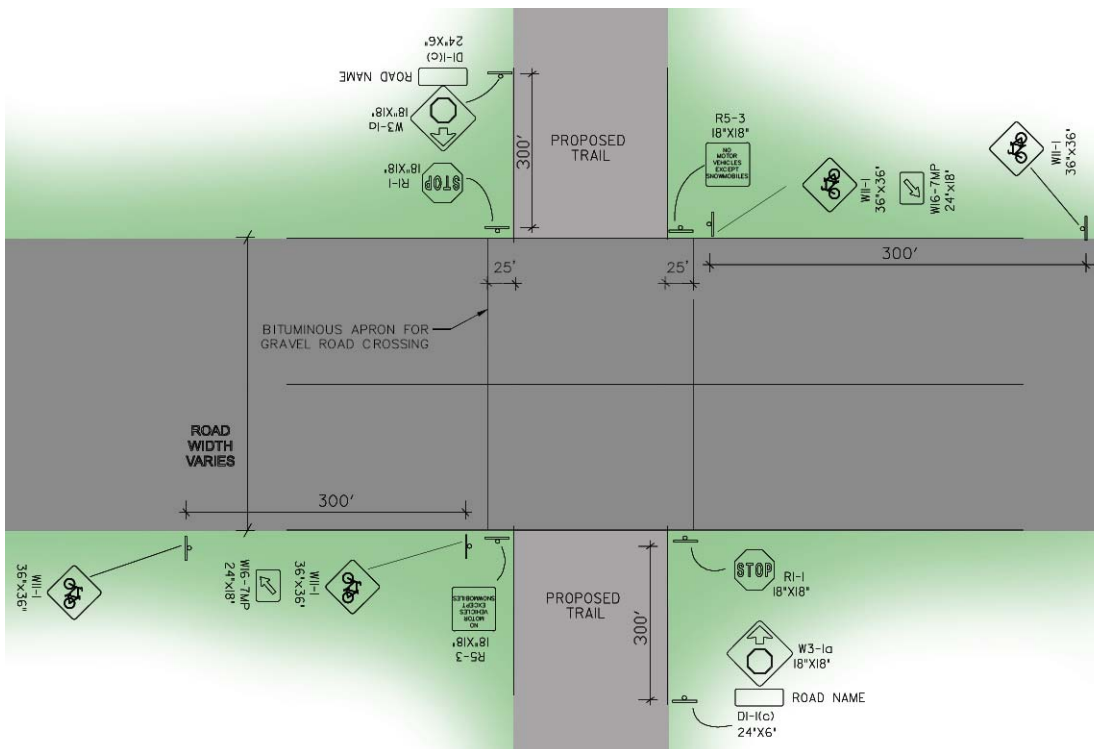


Figure 5: Typical Roadway Crossing

Bridge Crossings

There are two existing trestle bridge crossings in the corridor. These bridges will require replacement to meet safety standards for trail use. The bridge crossings are located over County Ditch Number 40 (“Bear Creek”) and County Ditch Number 32.

Field Crossings

In addition to roadway crossings, the trail extends through several field crossings. There are a total of 9 field crossings in the corridor at the following station points (note: refer to Appendix A for corridor map showing locations):

- Station 226+00
- Station 246+50
- Station 259+50
- Station 279+50
- Station 465+50
- Station 601+50
- Station 613+50
- Station 656+50
- Station 764+00

Culvert Crossings

There are 45 existing culvert crossings under the old rail bed. These culverts vary in their size and condition. Several culverts are broken or separated and will require replacement to provide sufficient drainage along the trail corridor. In addition to culvert crossings, several drain tile systems exist in the corridor. A table of all culvert crossings and drain tiles found in the corridor are listed in Figure 6. McLeod County mailed a letter to all adjacent landowners to ask inquire about drain tile outlets. Seventeen landowners responded to the letter with input about drainage along the corridor.

Agency Coordination

During design development, several agencies may require plan review and/or permits prior to construction. These agencies include:

- Minnesota Department of Transportation (MNDOT) for roadway crossings
- Minnesota Department of Natural Resources (MNDNR) for stream crossing improvements
- McLeod Highway Department for roadway crossings
- McLeod Soil & Water Conservation District for stream crossing improvements and wetland/drainage review



Drainage Structures				
Station	Material	Size	Condition	Notes
Ranch Avenue (Unpaved) - West End of Project				
101+50	ARCP	30"	Good	Culverts under road
101+50	RCP	18"	Good	Culverts under road
Hwy 22 (Paved)				
Arch Street (Unpaved)				
137+00	CSP	48"	Good	County ditch crossing culvert & utilities
173+00	Steel	24"	Good	Culvert Crossing & Draintile on South Side
189+50	CSP	Steel	Replace	Culvert Crossing & Draintile on Both Sides, Hole in Grade - Replace Culvert
192+50	Drain Tile	NA	Good	Draintile on South Side
210+00	Drain Tile	NA	Good	Draintile on South Side
218+00	Steel	18"	Good	Culvert Crossing
228+00	CPP	15"	Good	Lagoon Pipe Crossing
232+50	CPP	18"	Good	Culvert Crossing at Driveway and Trail Embankment (2 culverts)
Nickel Avenue (Unpaved) - Culvert Crossing Roadway				
233+00	CPP	18"	Good	Culvert Crossing at Nickle Ave
234+00	Steel	18"	Good	Culvert Crossing
238+00	Steel	30"	Good	Culvert Crossing (large diameter)
298+00	Steel	24"	Replace	Culvert Crossing, Hole in Grade - Replace Culvert
306+00	Steel	24"	Replace	Culvert Crossing, Hole in Grade - Replace Culvert
Major Avenue/CR 4 (Paved)				
330+00	Steel	18"	Good	Culvert Crossing
351+00-357+00	Drain Tile	NA	Good	Draintile
Lace Avenue/CR 71 (Unpaved)				
390+00-416+00	Drain Tile	NA	Good	Draintile (off corridor)
393+00	Steel	18"	Good	Culvert Crossing
Kale Avenue/CR 90 (Unpaved)				
429+00	Steel	24"	Good	Culvert Crossing
446+00	Steel	48"	Replace	Culvert Crossing (large diameter), Hole in Grade - Replace Culvert
470+00	Steel	24"	Replace	Culvert Crossing, Hole in Grade - Replace Culvert
Iris Road (Paved)				
519+00	Steel	18"	Good	Culvert Crossing
534+00	Steel	24"	Good	Culvert Crossing
CR 2 (Concrete)				
582+00	Steel	30"	Good	Culvert Crossing 3,140 LF East of CR 2
626+50	Steel	24"	Good	Culvert Crossing 265 LF west of Garden Ave
Garden Avenue (Unpaved)				
Falcon Avenue (Paved)				
692+00	Steel	12"	Replace	Culvert Crossing, fully clogged - Replace with 18" Culvert
704+50	Steel	24"	Good	Culvert Crossing
724+50	CSP	36"	Good	Culvert Crossing, 36"
Eagle Avenue (Unpaved)				
731+00	RCP	18"	Good	Culvert Under Eagle Avenue, (18" estimated)
749+00	Steel	18"	Good	Culvert Crossing
771+00	Steel	18"	Replace	Culvert Crossing - Hole in Grade - Replace Culvert
Dairy Avenue (Unpaved)				
819+00	Steel	36"	Good	Culvert Crossing - 30" being replaced with 36" CSP, 40 LF with aprons
Cable Avenue/CR 63 (Paved)				
879+00	Steel	30"	Good	Culvert Crossing
Babcock Avenue/CR 1 (Paved) - East End of Project				

MATERIAL LEGEND:

CSP = Corrugated Steel Pipe
RCP = Reinforced Concrete Pipe
ARCP = Arched Concrete Pipe
CPP = Crumpler Plastic Pipe
STEEL = Steel Casing Pipe

Figure 6: Drainage Structures

Construction Phasing Alternatives

The trail corridor extends almost 15 miles between Lester Prairie and Hutchinson. It is unlikely that the entire corridor can be developed at one time. Construction phasing that allows for segmental development will provide opportunities for trail use that will expand over time as more trail is developed, which is similar to how previous segments in Hennepin and Carver County were constructed. It is recommended that the first phase of trail development include replacing the bridge structures at Bear Creek and County Ditch 32 because this will provide better access for snowmobiles and off-road bicyclists and hikers to utilize the trail. Trail base preparation and surfacing can be undertaken in segments as funding allows. It is beneficial if trail paving emanates from Lester Prairie or from Hutchinson because there are more people and facilities in these locations. Potential phasing (funding dependent) options include:

- Bridge construction for Bear Creek and County Ditch 32 crossings
- Base Preparation and surfacing between Lester Prairie and South Silver Lake
- South Silver Lake parking lot and trailhead
- Base preparation and surfacing between South Silver Lake and Hutchinson

ESTIMATED CONSTRUCTION COSTS

Trail development in the Dakota Rail corridor between Lester Prairie and Hutchinson extends a total distance of 14.94 miles. Estimated construction costs are divided into segments and include items for site preparation, removals, earthwork, drainage structures, pavement/surfacing, bridges, rest stops, turf establishment and wayfinding/signage. Contingencies are included for design and engineering and construction. Detailed construction estimates are located in Appendix D.

Bridge Structures

County Ditch No. 40, “Bear Creek”: \$357,500

County Ditch No. 32: \$357,500

Trail Between Lester Prairie and South Silver Lake

Bituminous Surface: \$1,516,000

Aggregate Surface: \$1,029,000

Trail Between South Silver Lake and Hutchinson

Bituminous Surface: \$1,590,000

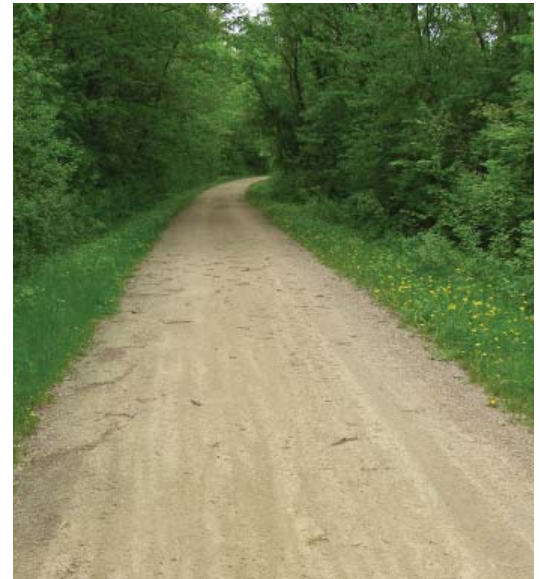
Aggregate Surface: \$1,071,000

South Silver Lake Parking Lot and Trailhead

Gravel surface lot, rest stop amenities: \$24,000



Trail paving.



Aggregate trail with limestone surfacing.

SOCIAL, ECONOMIC & ENVIRONMENTAL STUDY

Right of Way

The project will utilize McLeod County Regional Railroad Authority right-of-way for the entire 14.94 miles of the trail between County Road 1 in Lester Prairie and Ranch Avenue SE in Hutchinson.

Farmland Protection Policy Act

The project will not impact farmland that is outside the McLeod County Regional Railroad Authority right-of-way. The project will not acquire any farmland for right of way.

Section 404 (Army Corps of Engineers)

The project will not involve placement of fill into waters of the U.S. (defined in 33 CFR 328).

Water Quality

The project will disturb one or more acres of land (including clearing, grading and excavation). A Minnesota Pollution Control Agency (MPCA) National Pollution Discharge Elimination System (NPDES) permit will be required prior to project authorization.

Wetlands

The National Wetland Inventory data has been included in the trail corridor layout and the location of wetland areas along the corridor was reviewed. Figure 7 lists all locations where NWI data identifies a wetland area within the 100-foot right-of-way of the Dakota Rail corridor.

Noise

The project is not a Type I project as defined by the Federal Highway Administration. Procedures for abatement of highway traffic noise do not apply, in accordance with 23 CFR 772. Construction Noise has been considered and no substantial impact is anticipated.

Air Quality

The project will not significantly impact air quality.

State Environmental Review (MEQB)

The project has been determined to be an exemption category project in accordance with current Minnesota Rules, Part 4410.4600, Subp. 14. The project will likely not meet the mandatory (Environmental Assessment Worksheet (EAW) threshold and does not have potential for significant environmental effects.

Station	Location Related to Trail
125+00	South
180+00	North
191+00	South
238+00	South
255+00	North and South
270+00	North
295+00	North and South
306+00	North
366+00	South
390+00	South
480+00	South
495+00	South
505+00	South
531+00	South
586+00	South
622+00	North and South
675+00	South
704+00	North and South
740+00	South
755+00	South
770+00	North
785+00	North and South
819+00	North and South
846+00	South
851+00	North and South

Figure 7: Wetlands in Right-Of-Way

DESIGN STANDARDS AND SPECIFICATIONS

The project will be designed in accordance with the FHWA-MNDOT Stewardship Plan. For this project, the following design standards are applicable:

State Aid Minimum Geometric Design Standards

- MNDOT LRFD Bridge Design Manual
- MMUTCD Minnesota Manual on Uniform Traffic Control Devices
- AASHTO Standard Specifications for Highway Bridges
- 8820.9995 State Aid Minimum Bicycle Path Standards
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, July 2004
- ADA: Americans with Disabilities Act

Other

- MNDOT Bikeway Facility Design Manual
- The project will be constructed in accordance with the current edition of the MNDOT's "Standard Specifications for Construction", including all Supplemental Specifications.

DESIGN ELEMENTS

Bridge and Box Culvert Design

The two existing trestle bridge structures over County Ditch 40, also known as Bear Creek, County Ditch 32 are in damaged condition and replacement is required for trail use. Both bridges are currently closed for access.

County Ditch 40 (Bear Creek) Crossing

The goal of the proposed designs at Bear Creek was to maintain a 0.5-foot or less increase of the 100-year stage, where stage increase is defined as the difference between the natural condition stream and the proposed condition 100-year water surface elevation. Five alternatives were explored based on this goal, including four reinforced concrete box culvert (RCB) options and one truss option.

The proposed alternatives for the crossing at Bear Creek included dual 10-foot span by 8-foot rise reinforced concrete box culverts (RCB), and dual 8-foot span by 8 foot rise RCB, both 50-feet long (including apron length). Two additional alternatives analyzed the impact of a 30-degree skew to the RCB at 58 feet in length. The culverts were selected from standard RCB sizes based on the flow area in the existing creek channel. One of the RCB in each alternative was offset one foot lower than the other, which will maintain a low flow channel and create an ecologically-friendly crossing.



Dakota Rail corridor existing conditions



County Ditch 40 (Bear Creek) Crossing

A 60-foot span truss bridge alternative was also analyzed to avoid the disturbances of a RCB alternative. Minimal abutments, maintenance of the existing channel bottom, and widening of the existing channel banks for this alternative results in a greater hydraulic opening than the existing condition or what would be provided by the RCB alternatives. Given this assumption of an increased bridge opening, no hydraulic analysis was completed for this alternative. Additionally, this alternative does not impact right-of-way boundaries or necessitate channel realignment.

Based on these results, the 60-foot truss alternative is recommended as it will benefit the hydraulic conditions upstream, be contained within right-of-way boundaries, does not necessitate channel realignment, meet the goal of a 0.5-foot or less stage increase, and offers comparable value.

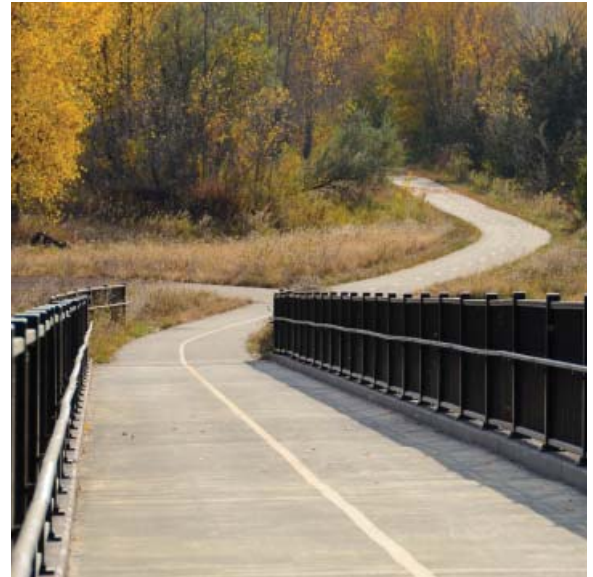
County Ditch 32 Crossing

The goal of the design alternatives for the proposed crossing at County Ditch 32 was to maintain or decrease the upstream 100-year high water level from the existing condition. Four alternatives were explored based on this goal, including three reinforced concrete box culvert (RCB) options and one truss option.

The box alternatives included dual 14-foot span by 10-foot rise RCB, dual 16-foot span RCB with one 4-foot rise and one 5-foot rise, and triple 12-foot span RCB with two 4-foot rise and one 5-foot rise, all 84 feet long (including apron length). Each configuration was analyzed hydraulically in HEC RAS. In each alternative, one of the RCBs was offset one foot lower than the other to provide a low flow channel and create an ecologically-friendly crossing.

The bridge alternative included a single-span prefabricated steel truss approximately 60 feet long. The length would be selected such that the bottom channel of Co. Ditch 32 would not be impacted, and the opening would be widened due to flattening of the embankments up to the bridge abutments.

Based on the design considerations, and a lower construction cost, the single span bridge is the recommended replacement of the in-place bridge.



Concrete deck on pre-fabricated bridge structure.



Prefabricated truss bridge for trail use.



County Ditch 32 Crossing

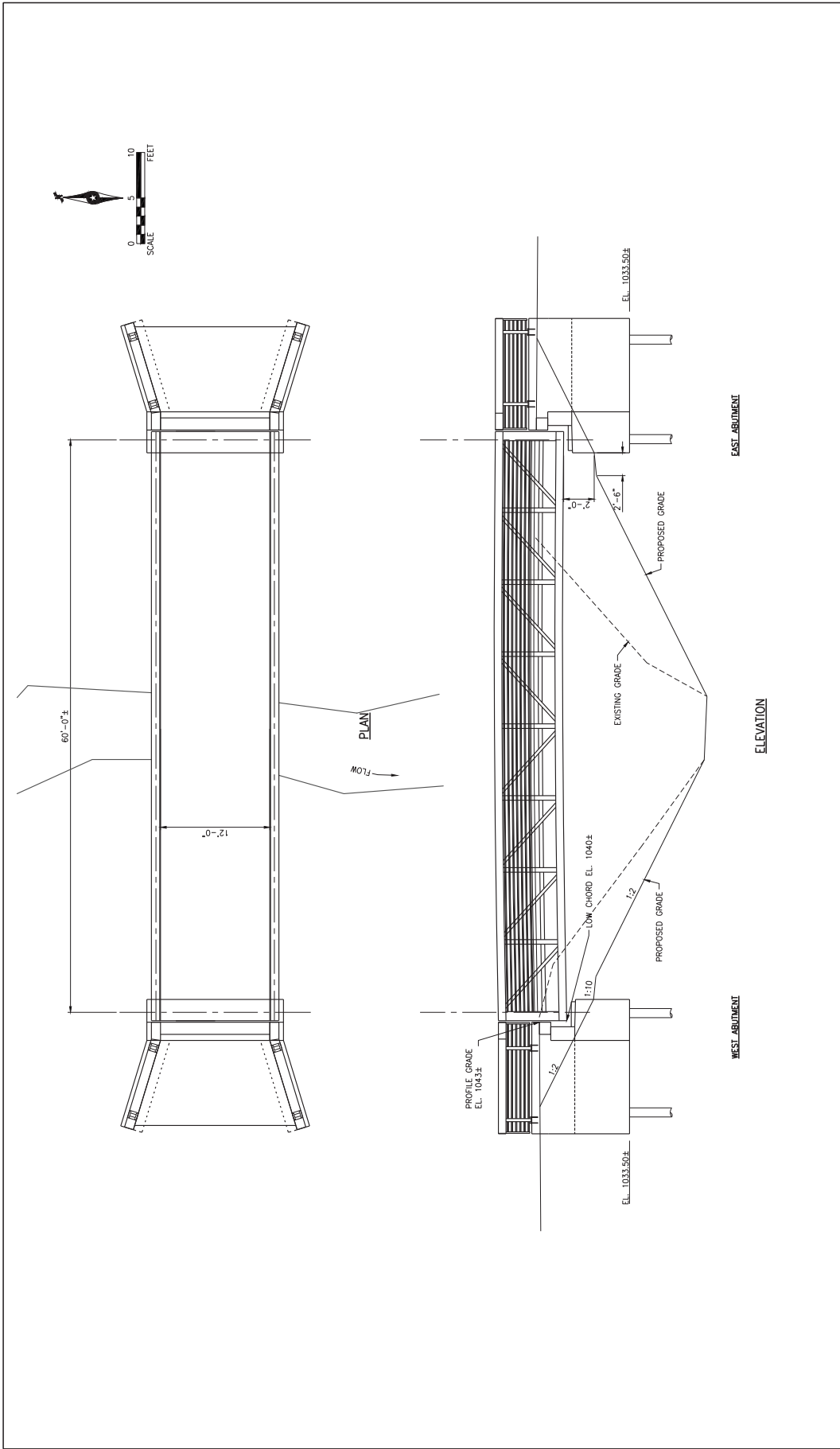


Figure 1

DAKOTA TRAIL OVER BEAR CREEK
 McLEOD COUNTY
 IN THE CITY OF GLENCOE, MINNESOTA



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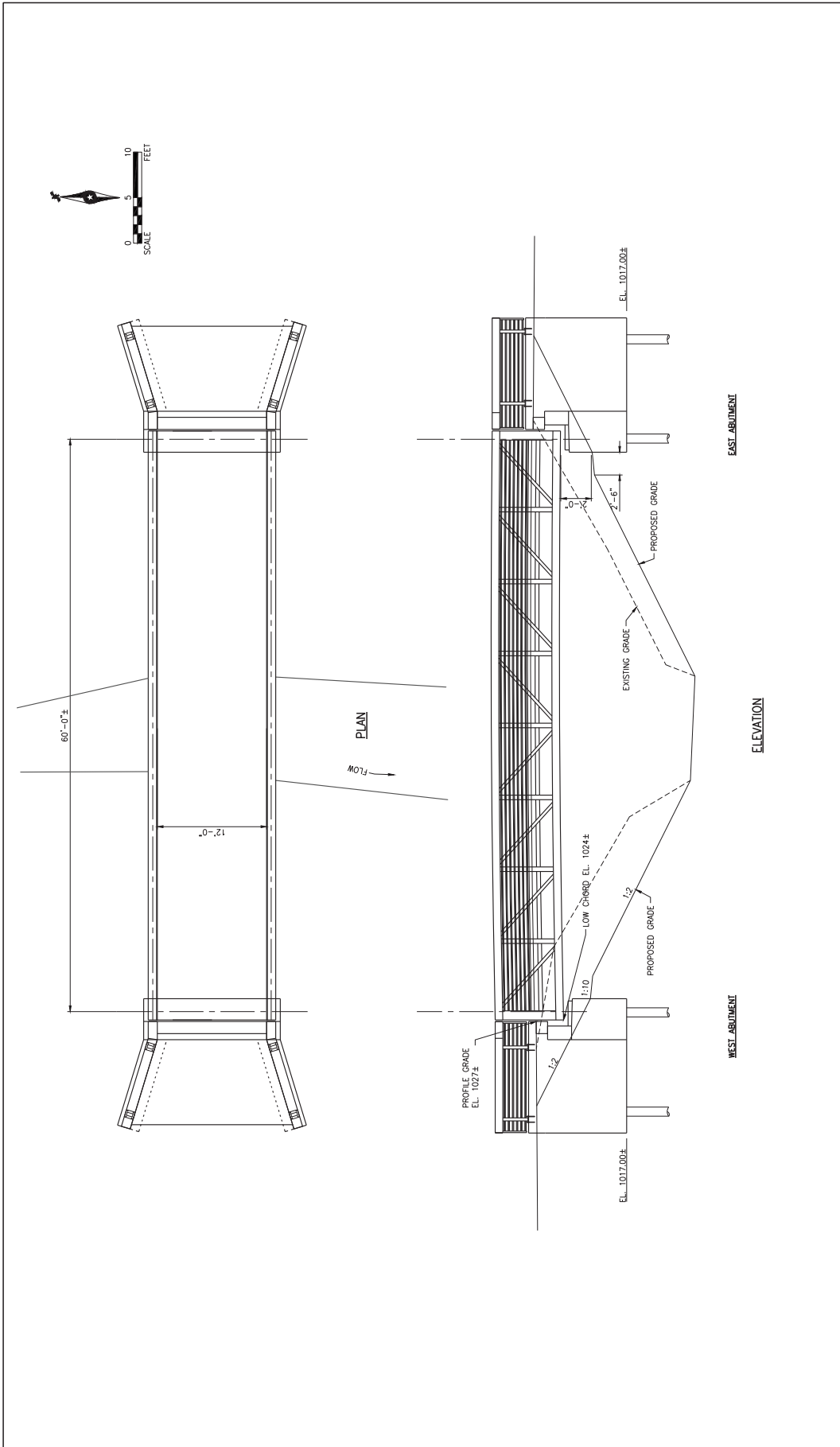
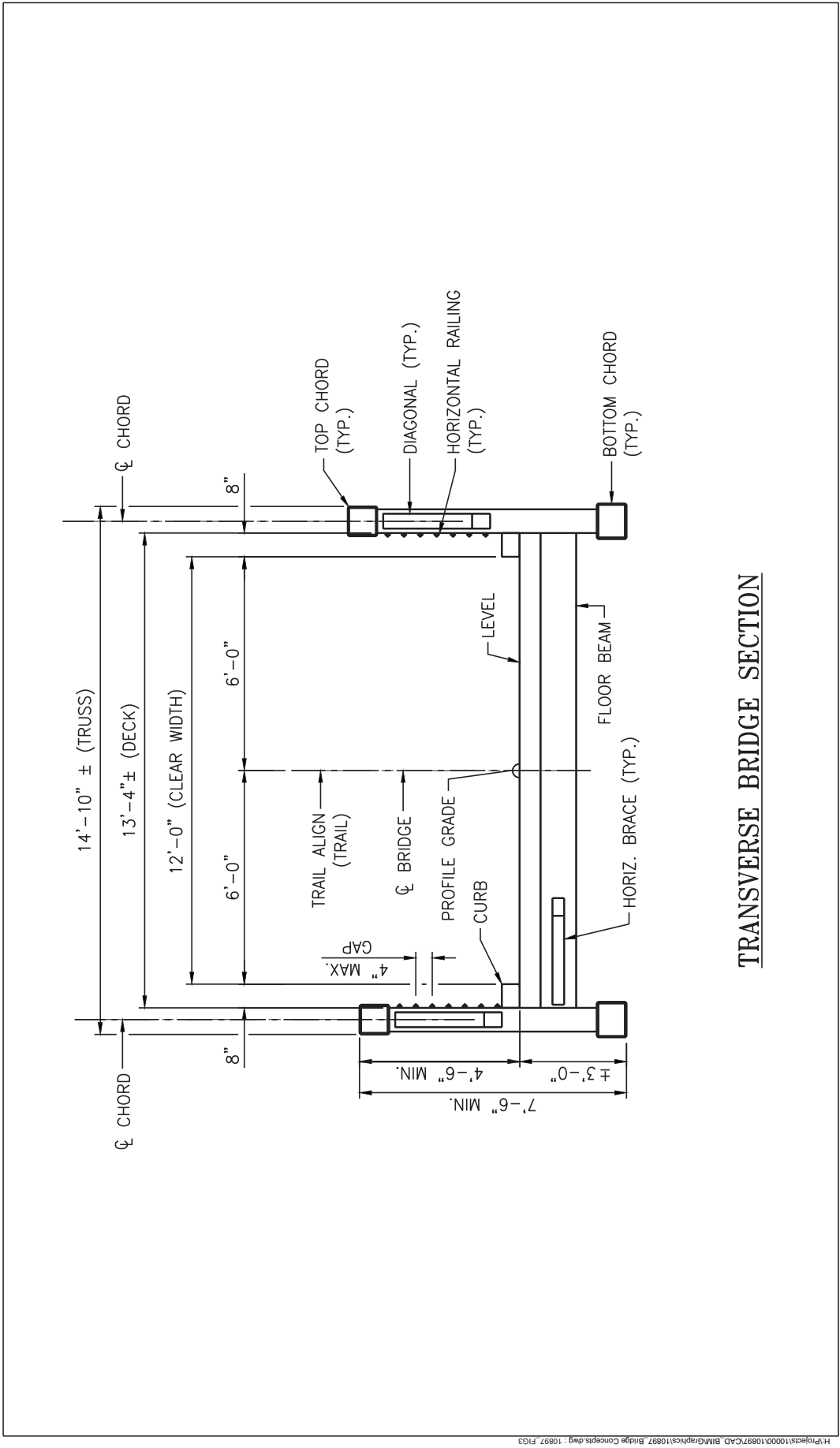


Figure 2

SRF
 DAKOTA TRAIL OVER COUNTY DITCH #32
 McLEOD COUNTY
 IN THE CITY OF GLENCOE, MINNESOTA

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TRANSVERSE BRIDGE SECTION

Figure 3

DAKOTA TRAIL OVER BEAR CREEK & COUNTY DITCH #32
 McLEOD COUNTY
 IN THE CITY OF GLENCOE, MINNESOTA



Design Exceptions

It is not anticipated that there will be any design exceptions to the bicycle facility guidelines established by the Minnesota Department of Transportation (MNDOT Bikeway Facility Design Manual).

Trail Surfacing

The recommended trail typical section is three inches of bituminous asphalt over six inches of Class 5 material over 12 inches of compacted sub-grade. Farm and field access crossings may require thickened pavement sections. There are several reasons why the recommended surface type is pavement, including the following:

- Lower future maintenance costs
- Certain funding sources require bituminous surfacing
- Paved trails appeal to a wider demographic of users
- Adjacent trail segments are paved in Carver and Hennepin Counties.

Pedestrian Ramps

If bituminous surfacing is utilized, truncated domes will be included where needed at existing street crossings using standard MNDOT curb ramp design.

Minimum Design Radius

Horizontal curves will be a minimum of 100 feet per the MNDOT Bicycle Facility Design Manual.



FUNDING OPPORTUNITIES

Funding for the development of regional trails is available through multiple sources. State bonding funds are one of the primary funding mechanisms for trails. The State of Minnesota provides funding for trail design and development through the Parks and Trails Legacy Program. Additional funding sources can be found on the Minnesota Department of Natural Resources grants website: <https://www.dnr.state.mn.us/grants/index.html>. This website contains a comprehensive list of funding options for trail design and development, including links for information about the Federal recreational trail program, local trail connections program, regional trail grant program and the outdoor recreation grant program. More funding sources exist for paved surface trails because the lifespan is longer and because the number of users is larger.

CONCLUSION

The existing McLeod County Dakota Rail corridor could become an exciting and popular regional and local multi-use trail asset. This trail is a key link in the regional trail system that will provide opportunities for commuters, families, recreational users and countless others to experience the scenic beauty of McLeod County. The enthusiasm of the neighboring communities and businesses are an indication that this trail facility could become a very attractive and functional amenity in McLeod County.



APPENDIX A: TRAIL CORRIDOR MAPS

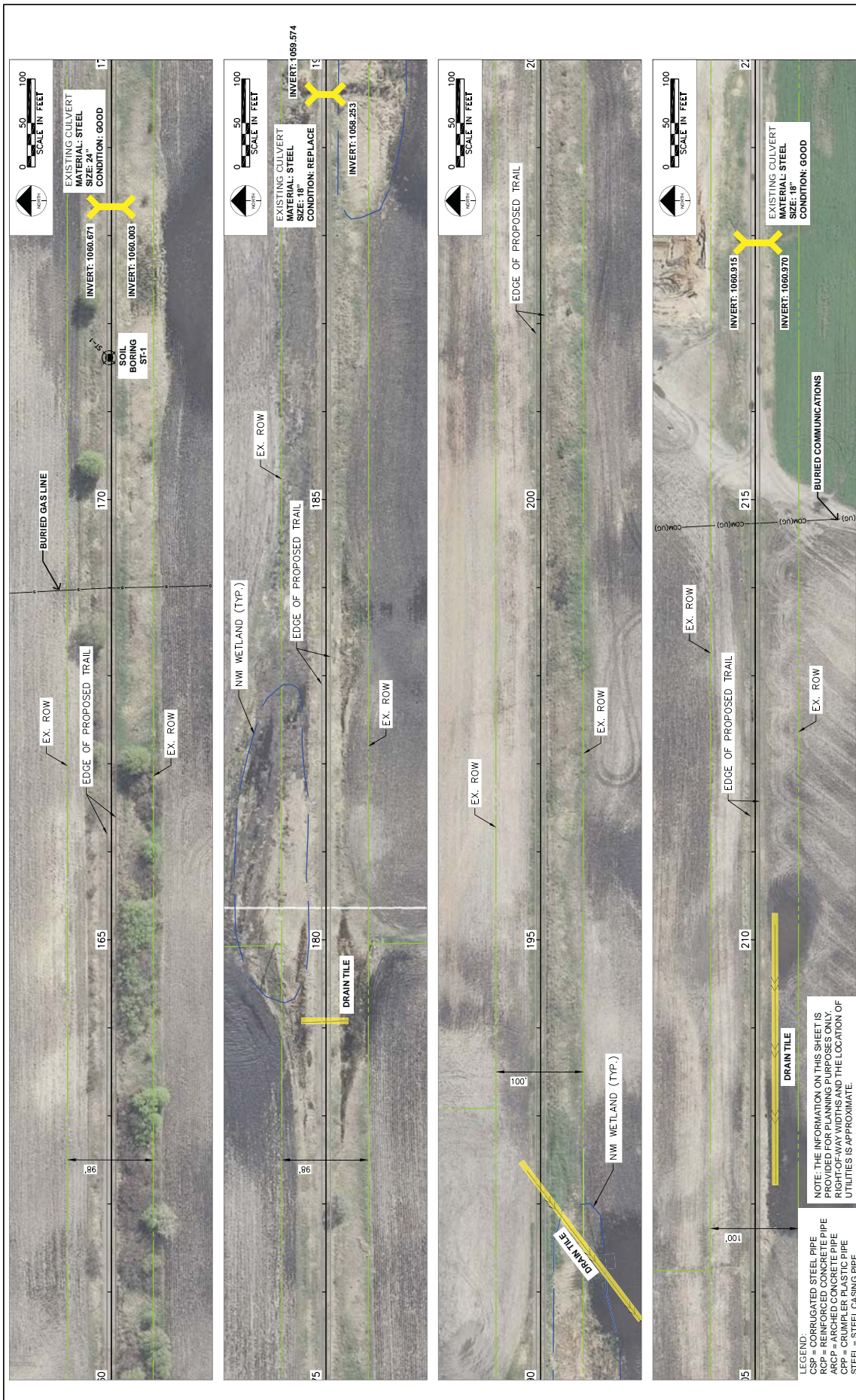


Figure 1

McLeod County Dakota Rail Trail Preliminary Engineering Study



Corridor Analysis Plans
 Hutchinson to Lester Prairie



McLeod County Dakota Rail Trail Preliminary Engineering Study



Corridor Analysis Plans
Hutchinson to Lester Prairie

Figure 2

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Figure 3

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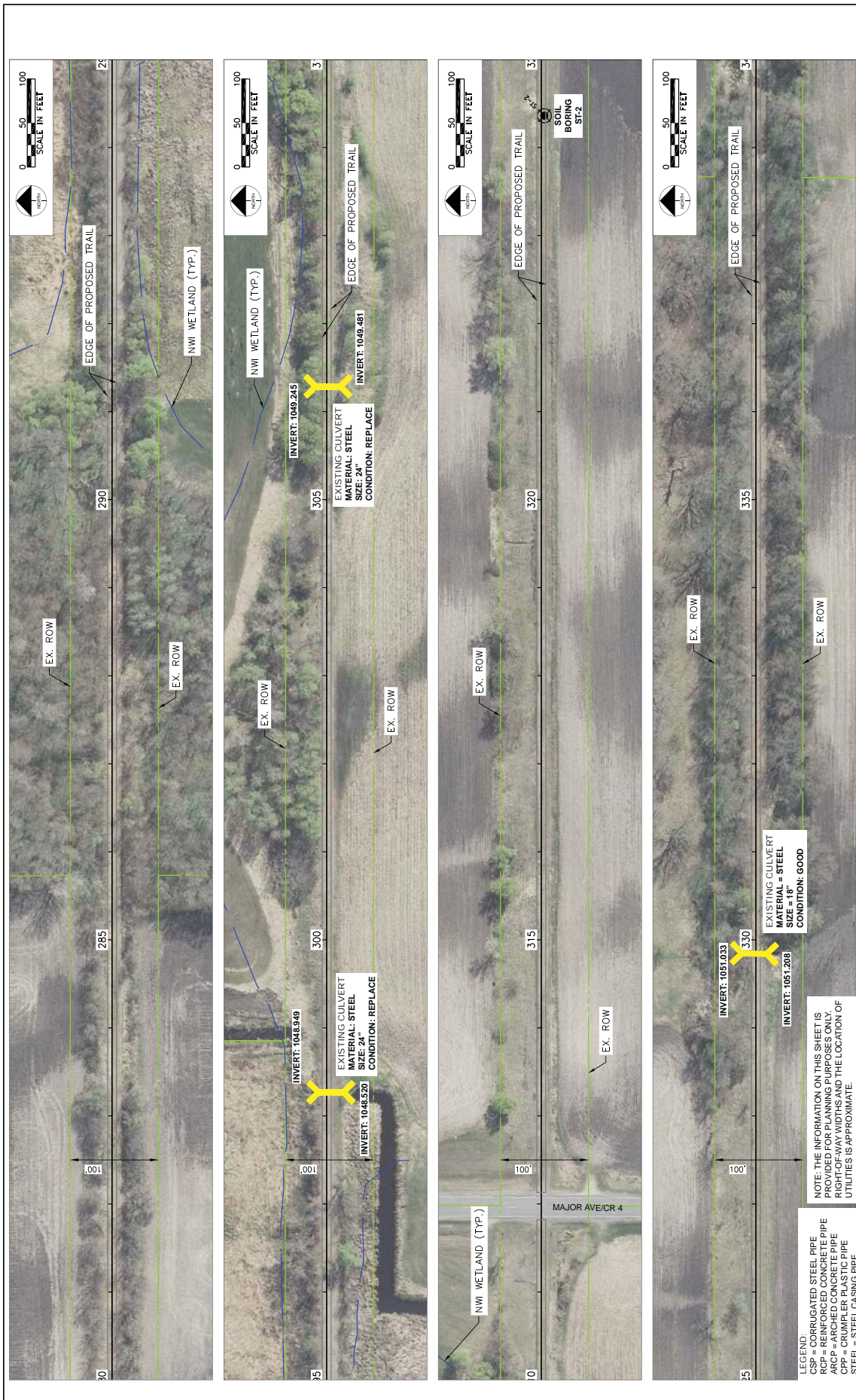
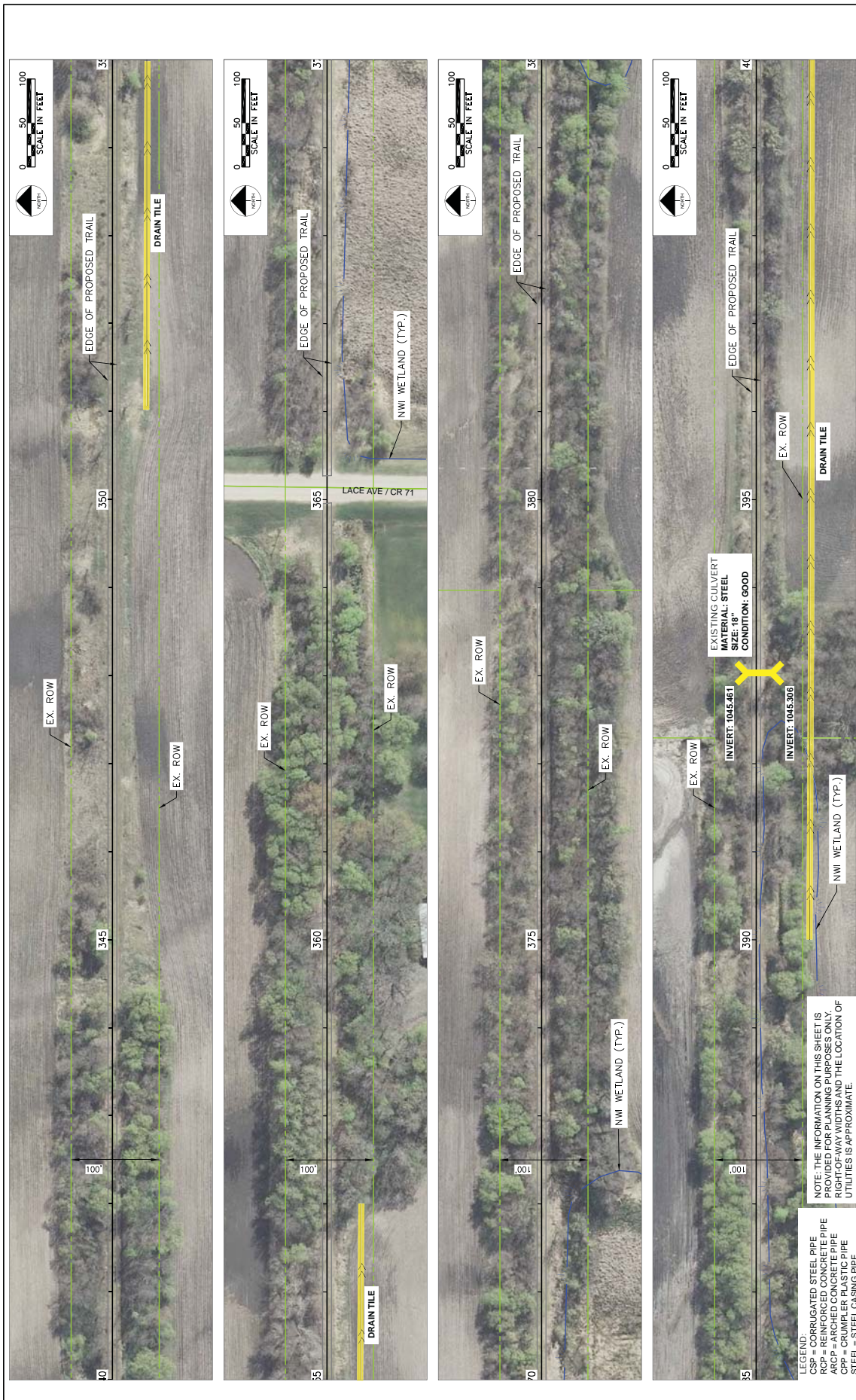


Figure 4

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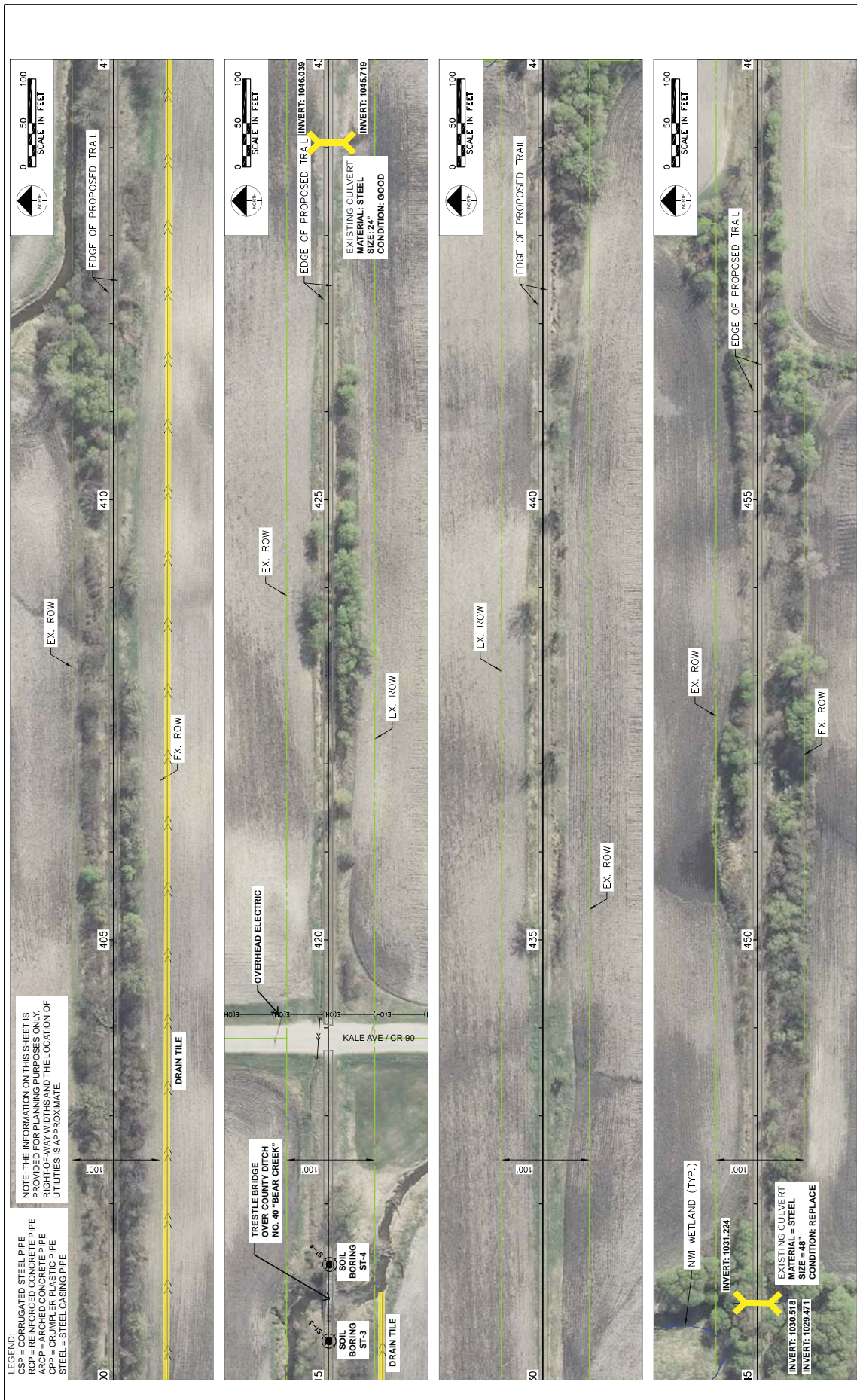
McLeod County Dakota Rail Trail Preliminary Engineering Study

Corridor Analysis Plans
Hutchinson to Lester Prairie



Figure 5

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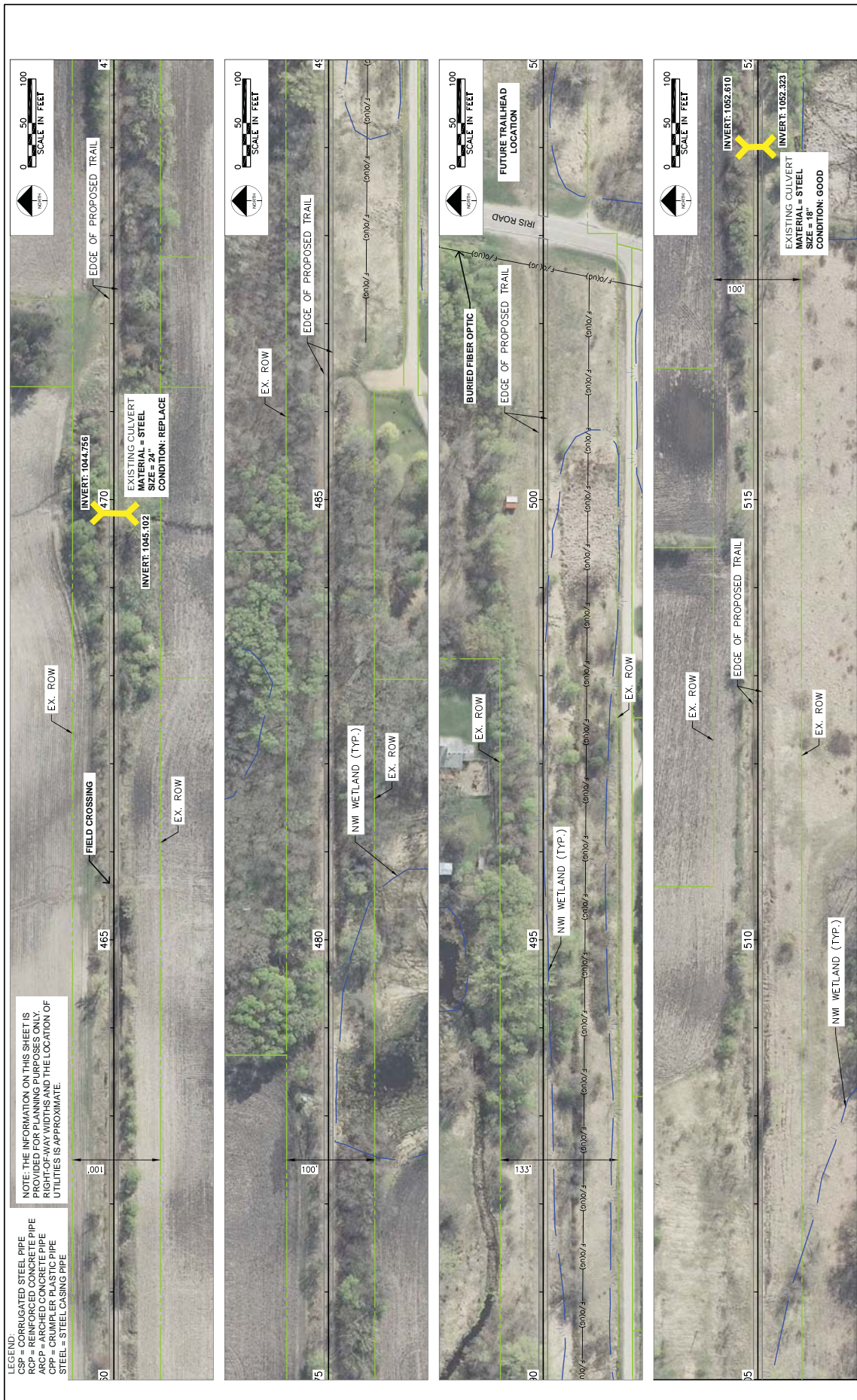
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McLeod County Dakota Rail Trail Preliminary Engineering Study

Corridor Analysis Plans
 Hutchinson to Lester Prairie

Figure 6



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McLeod County Dakota Rail Trail Preliminary Engineering Study
 Corridor Analysis Plans
 Hutchinson to Lester Prairie

Figure 7



McLeod County Dakota Rail Trail Preliminary Engineering Study



Corridor Analysis Plans
 Hutchinson to Lester Prairie

Figure 8

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McLeod County Dakota Rail Trail Preliminary Engineering Study



Corridor Analysis Plans
Hutchinson to Lester Prairie

Figure 9

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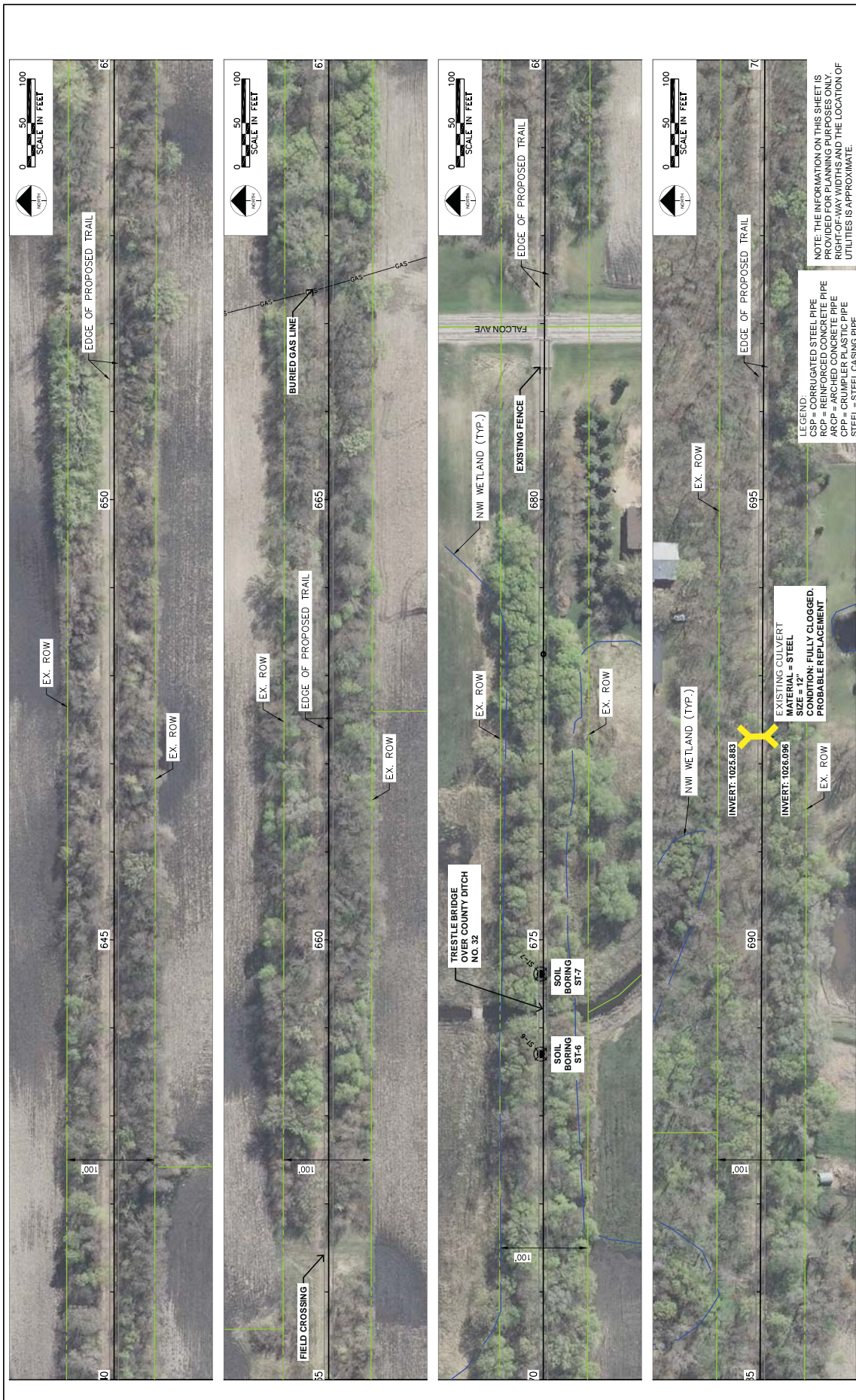


Figure 10

McLeod County Dakota Rail Trail Preliminary Engineering Study



Corridor Analysis Plans
Hutchinson to Lester Prairie

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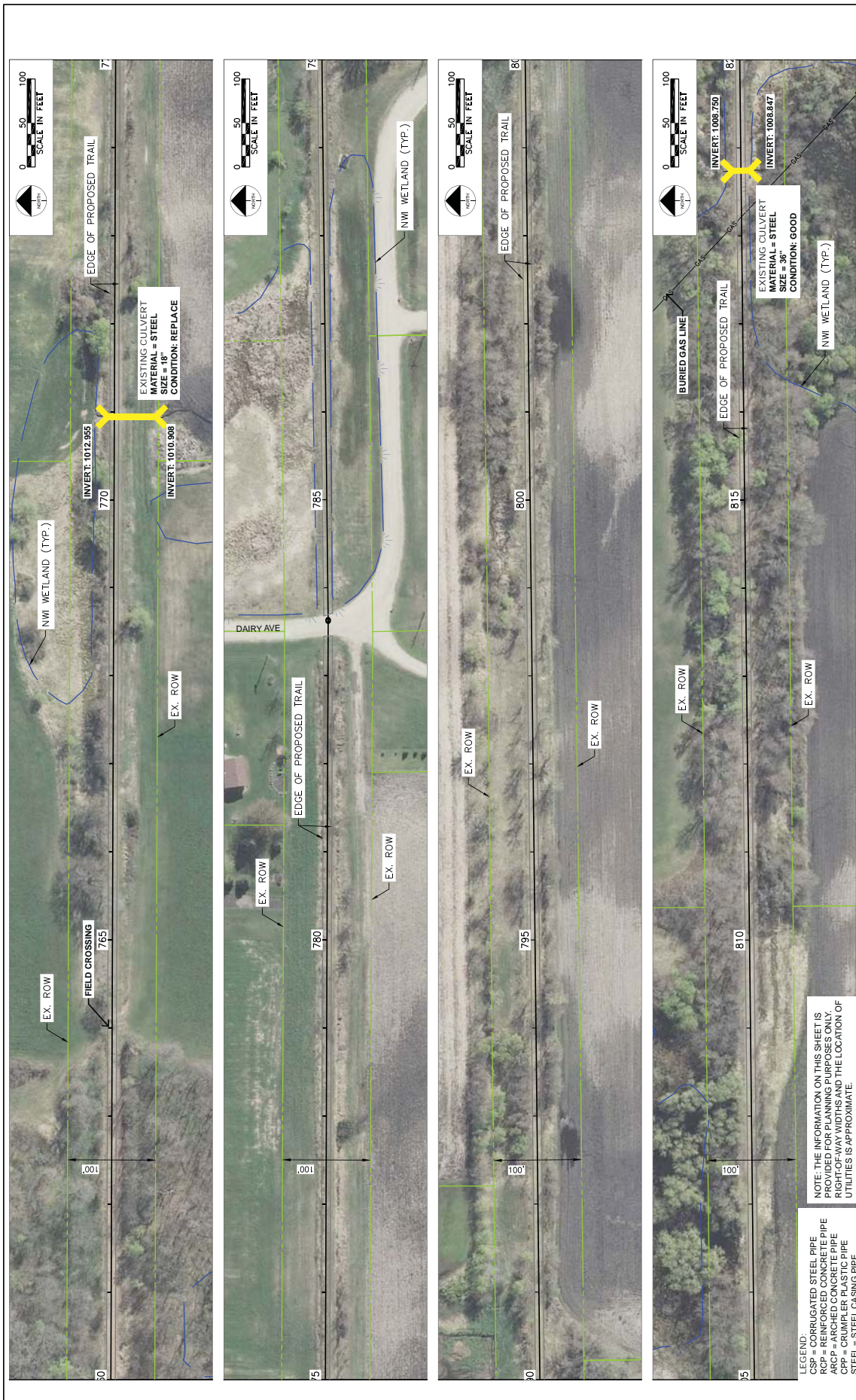


Figure 11

McLeod County Dakota Rail Trail Preliminary Engineering Study
 Corridor Analysis Plans
 Hutchinson to Lester Prairie



H:\Projects\10000\1097\CAD BIM\Plan\1097\CAD BIM\Plan\1097 CP01 Construction Plans.dwg; CP-11



McLeod County Dakota Rail Trail Preliminary Engineering Study



Corridor Analysis Plans
 Hutchinson to Lester Prairie

Figure 12

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McLeod County Dakota Rail Trail Preliminary Engineering Study



Corridor Analysis Plans
 Hutchinson to Lester Prairie

Figure 13

H:\Projects\10000\10897\CAD BIM\Plan\10897 CP01 Construction Plans.dwg - CP-13



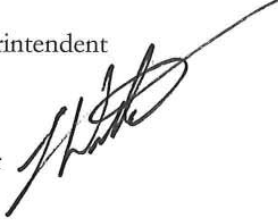
APPENDIX B: STREAM MODELING REPORT



Memorandum

SRF No. 10897

TO: Al Koglin – Parks Superintendent
McLeod County

FROM: Sam Westlund, PE
Josh Swanson, Engineer 

DATE: 3/5/2018

SUBJECT: Replacement of Bridge over County Ditch 32 Along the Dakota Rail/Trail –
Hydraulic Feasibility Analysis of Proposed Crossing

Introduction

SRF Consulting Group, Inc. (SRF) has completed a hydraulic feasibility analysis of the Dakota Rail Trail crossing over County Ditch 32. The crossing is in the NE quadrant of Section 1 of Township 116N, Range 28W. Due to the condition of the existing bridge, McLeod County intends to replace the structure. The recommended replacement structure type is a single-span prefabricated steel truss bridge. This memorandum discusses the hydraulic feasibility analyses of the replacement alternatives considered and provides the reasoning behind the recommended single-span replacement.

Existing Conditions Modeling

The existing County Ditch 32 crossing is a five-span timber trestle railroad bridge that is 69 feet long and 10 feet in width. County Ditch 32 is a tributary to the South Fork Crow River and flows north to south. The bridge is in overall poor condition with severe decay observed in the bridge deck and several pilings. The bridge is currently closed.

The upstream and downstream conditions of County Ditch 32 are straight channels with a bend 67 feet downstream of the existing bridge. It is a well-defined channel with a wide floodplain which consists primarily of grassy areas with some brush and trees near the crossing.

County Ditch 32 is shown on published Flood Insurance Rate Map (FIRM), Map Number 27085C0075E, which does not indicate a regulated floodplain zone for this crossing.

There was no existing effective model for the County Ditch 32 crossing. A model of existing conditions at the County Ditch 32 crossing was created with HEC-RAS using recently obtained survey data. Bridge deck and pier parameters used in the model were based on a bridge inspection report conducted in 2015 by the Minnesota Department of Natural Resources, survey data and photos. Aerial photographs were used to estimate Manning's roughness values. Hydrology computations were completed using the USGS Streamstats program.

Proposed Conditions Analysis Results

The goal of the design alternatives for the proposed crossing at County Ditch 32 was to maintain or decrease the upstream 100-year high water level from the existing condition. Four alternatives were

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explored based on this goal, including three reinforced concrete box culvert (RCB) options and one truss option.

The box alternatives included dual 14-foot span by 10-foot rise RCB, dual 16-foot span RCB with one 4-foot rise and one 5-foot rise, and triple 12-foot span RCB with two 4-foot rise and one 5-foot rise, all 84 feet long (including apron length). Each configuration was analyzed hydraulically in HEC-RAS. In each alternative, one of the RCBs was offset one foot lower than the other to provide a low flow channel and create an ecologically-friendly crossing. The bridge deck, piers and associated parameters in the existing model were replaced with the culvert parameters to create the proposed HEC-RAS model.

The bridge alternative included a single-span prefabricated steel truss approximately 60 feet long. The length would be selected such that the bottom channel of Co. Ditch 32 would not be impacted, and the opening would be widened due to flattening of the embankments up to the bridge abutments. Given this assumption of an increased bridge opening, no hydraulic analysis was completed for this alternative.


Headwater elevations upstream of the proposed crossing were collected from HEC-RAS Cross Section 5, which is located 42 feet upstream of the roadway embankment.

Co. Ditch 32	100-Year Water Surface Elevation (ft)				Cost
	Natural Condition HW Elevation	Existing Condition HW Elevation	Proposed Condition HW Elevation	Proposed HWL Change	
Dual 14' span RCB	1013.83	1014.54	1014.63	+0.09	\$440,000
Dual 16 span RCB	1013.83	1014.54	1014.47	-0.09	\$420,000
Triple 12' RCB	1013.83	1014.54	1014.28	-0.26	\$430,000
60' Truss Bridge	1013.83	1014.54	Not Analyzed	--	\$275,000

Based on these results, the proposed dual 14-foot span RCB is not recommended as it will increase the upstream 100-year HWL beyond project goals. The dual 16-foot span and triple 12-foot span RCB both reduce the upstream 100-year high water level, but likely have significant impacts to construction limits, right-of-way, and ditch bed impacts. Based on these considerations, and the lower construction cost, the single-span bridge is the recommended replacement of the in-place bridge.

SNW/cw

TO: Al Koglin – Parks Superintendent
McLeod County

FROM: Sam Westlund, PE
Josh Swanson, Engineer 

DATE: 3/5/2018

SUBJECT: Replacement of Bridge over Bear Creek Along the Dakota Rail/Trail – Hydraulic Feasibility Analysis of Proposed Crossing

Introduction

SRF Consulting Group, Inc. (SRF) has completed a hydraulic feasibility analysis of the Dakota Rail Trail crossing over Bear Creek. The crossing is in the NW quadrant of Section 6 of Township 116N, Range 28W. Due to the condition of the existing bridge, McLeod County intends to replace the structure. The recommended replacement structure type is a single-span prefabricated steel truss bridge. This memorandum discusses the hydraulic feasibility analyses of the replacement alternatives considered and provides the reasoning behind the recommended single-span replacement.

Existing Conditions Modeling

The effective model of Bear Creek was downloaded from the FEMA Hydraulic Model Download website on October 02, 2017. This model was used as the basis for the modeling of the Bear Creek crossing described below and in the following sections.

At the Bear Creek crossing, the creek is flowing north to south. The existing railroad bridge is a four-span timber trestle that is 57 feet long and 10 feet wide. Timber stringers that make up the superstructure are moderately decayed. The timber pilings that support the bridge are in poor or failed condition with severe decay. The bridge is currently closed.

The upstream and downstream reaches of Bear Creek are slightly sinuous with a bend 26 feet upstream and another bend 48 feet downstream of the existing bridge. It is a well-defined channel with a wide floodplain consisting mainly of agricultural fields. Overbank areas near the channel vary between wooded and grassy sections.

Bear Creek is shown on published Flood Insurance Rate Map (FIRM), Map Number 27085C0065E, which indicates that the Dakota Rail crossing is in a Zone A floodplain.

The effective model of Bear Creek was copied and modified to create the Corrected Effective model in HEC-RAS. Modifications to the effective model include updates to cross sections, bridge deck and piers, and ineffective flow areas based on recent survey data. Additionally, Manning's roughness values were confirmed or updated based on aerial imagery.

Proposed Conditions Analysis Results

The goal of the proposed designs at Bear Creek was to maintain a 0.5-foot or less increase of the 100-year stage, where stage increase is defined as the difference between the natural condition stream and the proposed condition 100-year water surface elevation. Five alternatives were explored based on this goal, including four reinforced concrete box culvert (RCB) options and one truss option.

Analyses of the proposed RCB alternatives were completed in models created by modifying the Effective and Corrected Effective HEC-RAS models. The proposed alternatives for the crossing at Bear Creek include dual 10-foot span by 8-foot rise reinforced concrete box culverts (RCB), and dual 8-foot span by 8-foot rise RCB, both 50 feet long (including apron length). Two additional alternatives analyzed the impact of a 30-degree skew to the RCB at 58 feet in length. The culverts were selected from standard RCB sizes based on the flow area in the existing creek channel. One of the RCB in each alternative was offset one foot lower than the other, which will maintain a low flow channel and create an ecologically-friendly crossing. The bridge deck, piers and associated parameters in the existing model were replaced with the culvert dimensions and parameters to create the proposed HEC-RAS model.

Headwater elevations at the location of the proposed culverts were collected from HEC-RAS cross section 20228.5, which is located about 57 feet upstream of the proposed culverts in the non-skewed configuration and 53 feet upstream in the skewed configuration (Table 1). Due to the size and length of the RCB required to maintain upstream hydraulic conditions, these alternatives resulted in encroachment on the right-of-way boundaries, high costs, and a necessary channel realignment.

A 60-foot span truss bridge alternative was also analyzed to avoid the disturbances of a RCB alternative. Minimal abutments, maintenance of the existing channel bottom, and widening of the existing channel banks for this alternative results in a greater hydraulic opening than the existing condition or what would be provided by the RCB alternatives. Given this assumption of an increased bridge opening, no hydraulic analysis was completed for this alternative. Additionally, this alternative does not impact right-of-way boundaries or necessitate channel realignment.

Headwater elevations upstream of the proposed crossing were collected from HEC-RAS Cross Section 20228.5, which is located 40 feet upstream of the roadway embankment.

Bear Creek	100-Year Water Surface Elevation (ft)				Cost
	Natural Condition HW Elevation	Corrected Effective HW Elevation	Proposed Condition HW Elevation	Proposed Stage Change	
Dual 10' span RCB	1032.88	1033.06	1033.05	+0.17	\$290,000
Dual 8' span RCB	1032.88	1033.06	1033.31	+0.43	\$250,000
Dual 10' span skewed at 30-degrees	1032.88	1033.06	1033.04	+0.16	\$310,000
Dual 8' span RCB skewed at 30-degrees	1032.88	1033.06	1033.31	+0.43	\$270,000
60' Truss Bridge	1032.88	1033.06	Not Analyzed	-	\$275,000

Based on these results, the 60-foot truss alternative is recommended as it will benefit the hydraulic conditions upstream, be contained within right-of-way boundaries, does not necessitate channel realignment, meet the goal of a 0.5-foot or less stage increase, and offers comparable value.

SNW/cw

APPENDIX C: GEOTECHNICAL REPORT

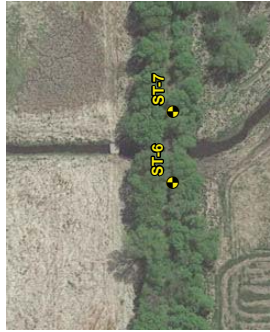
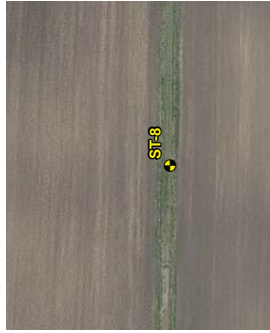
BRAUN
INTERTEC
 11001 Hennepin Avenue S
 Minneapolis, MN 55438
 Tel: (612) 995-2000
 Fax: (612) 995-2003

DAKOTA RAIL CORRIDOR FEASIBILITY STUDY
 BETWEEN LESTER PRAIRIE AND HUTCHINSON
 MCLEOD COUNTY, MINNESOTA

Project No: B7710033
 Drawing: B7710033
 Scale: B7710033 Border:
 Drawn By: CMF
 Date Drawn: 10/06/2017
 Checked By: BS
 Last Modified: 10/26/17
 Sheet: 1 of 1 Fig. 1



LEGEND
 APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING



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(See Descriptive Terminology sheet for explanation of abbreviations)

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Braun Project B1710033 PRELIMINARY GEOTECHNICAL EVALUATION McLeod County - Dakota Rail Corridor Between Lester Prairie & Hutchinson McLeod County, Minnesota					BORING: ST-1 LOCATION: N: 256523; E: 579126. See attached sketch.		
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 10/17/17		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	Tests or Notes
1066.1	0.0						
1065.7	0.4	TS SC	SILTY SAND, fine- to medium-grained, slightly organic, trace Gravel, dark brown to black, moist. (Topsoil)	6		15	
			CLAYEY SAND, trace Gravel, brown, moist, loose. (Glacial Till)	6			
				6			
1060.1	6.0		END OF BORING.				
			Water not observed while drilling.				
			Water not observed with 4 feet of hollow-stem auger in the ground.				
			Boring immediately backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project B1710033 PRELIMINARY GEOTECHNICAL EVALUATION McLeod County - Dakota Rail Corridor Between Lester Prairie & Hutchinson McLeod County, Minnesota					BORING: ST-2 LOCATION: N: 256516; E: 594401. See attached sketch.		
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 10/17/17		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	Tests or Notes
1061.4	0.0						
1059.4	2.0	FILL	FILL: Lean Clay with Sand, slightly organic, trace roots, dark brown to black, moist. (Topsoil Fill)	6		22	OC=4%
1057.4	4.0	SC	CLAYEY SAND, trace Gravel, brown, moist, loose. (Glacial Till)	6			
1055.4	6.0	CL	LEAN CLAY with SAND, trace Gravel, brown and gray, moist, medium. (Glacial Till)	6			
			END OF BORING. Water not observed while drilling. Water not observed with 4 feet of hollow-stem auger in the ground. Boring immediately backfilled.				

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Braun Project B1710033 PRELIMINARY GEOTECHNICAL EVALUATION McLeod County - Dakota Rail Corridor Between Lester Prairie & Hutchinson McLeod County, Minnesota				BORING: ST-3				
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 10/17/17				
DATE: 10/17/17		SCALE: 1" = 4'						
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	Qp tsf	Tests or Notes
1043.3	0.0							
1043.1	0.2	FILL	FILL: Clayey Sand, slightly organic, trace roots, dark brown to black, moist.					
1042.1	1.2	AGG	(Topsoil Fill)					
		FILL	Apparent Railroad Ballast.					
			FILL: Clayey Sand, trace Gravel, brown and dark brown, moist to wet.	7		16		P200=36%
				9				
				8				
				9				
1031.3	12.0							
1030.3	13.0	OL	ORGANIC SILT, trace fibers, black, wet. (Swamp Deposit)	11		33		OC=9%
		SC	CLAYEY SAND, trace Gravel, brownish gray, wet, very loose. (Glacial Till)	3		16	1/2	
1025.3	18.0							
		CL	SANDY LEAN CLAY, trace Gravel, gray, wet, rather stiff. (Glacial Till)	11		14		
				10			2 1/2	*Water not observed while drilling.
1015.3	28.0							Water not observed with 29 1/2 feet of hollow-stem auger in the ground.
		SC	CLAYEY SAND, trace Gravel, gray, wet, medium dense. (Glacial Till)					Boring immediately backfilled with bentonite grout.
1012.3	31.0			14				
			END OF BORING.*					

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(See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project B1710033 PRELIMINARY GEOTECHNICAL EVALUATION McLeod County - Dakota Rail Corridor Between Lester Prairie & Hutchinson McLeod County, Minnesota				BORING: ST-4				
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 10/17/17				
Elev. feet		Depth feet		SCALE: 1" = 4'				
		Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	Qp tsf	Tests or Notes
1043.7	0.0							
1043.4	0.3	FILL	FILL: Silty Sand, fine- to medium-grained, slightly organic, with Gravel, dark brown to black, moist.					
1042.4	1.3	AGG	(Topsoil Fill)					
		FILL	Apparent Railroad Ballast.					
		FILL	FILL: Clayey Sand, trace Gravel, with inclusions of Lean Clay, brown and dark brown, wet.	8		18		
1039.7	4.0	FILL	FILL: Sandy Lean Clay, trace Gravel, brown and gray, wet.	5				
1036.7	7.0	FILL	FILL: Clayey Sand, trace Gravel, brown, wet.	3				
				2				
1031.7	12.0	PT	PEAT, trace fibers, black, wet. (Swamp Deposit)	5		101		OC=27%
1029.7	14.0	CL	LEAN CLAY, slightly organic, trace fibers, black and dark gray, wet. (Alluvium)	2		28		OC=2%
1025.7	18.0	SC	CLAYEY SAND, trace Gravel, gray, wet, loose to medium dense. (Glacial Till)	15		15	2 1/4	
				8			1 3/4	*Water not observed while drilling. Water not observed with 29 1/2 feet of hollow-stem auger in the ground.
				13				Boring immediately backfilled with bentonite grout.
1012.7	31.0		END OF BORING.*					

(See Descriptive Terminology sheet for explanation of abbreviations)

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(See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project B1710033 PRELIMINARY GEOTECHNICAL EVALUATION McLeod County - Dakota Rail Corridor Between Lester Prairie & Hutchinson McLeod County, Minnesota					BORING: ST-5			
DRILLER: B. Kammermeier METHOD: 3 1/4" HSA, Autohammer					DATE: 10/17/17		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	Tests or Notes	
1049.0	0.0							
1047.0	2.0	FILL 	FILL: Clayey Sand, slightly organic, trace Gravel, dark brown to black, wet. (Topsoil Fill)	6		19		
1045.0	4.0	FILL 	FILL: Clayey Sand, trace Gravel, brown, wet.	6		16		
1043.0	6.0	FILL 	FILL: Clayey Sand, trace Gravel, with granite pieces, dark brown and brown, wet.	13				
END OF BORING. Water not observed while drilling. Water not observed with 4 feet of hollow-stem auger in the ground. Boring immediately backfilled.								

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Braun Project B1710033 PRELIMINARY GEOTECHNICAL EVALUATION McLeod County - Dakota Rail Corridor Between Lester Prairie & Hutchinson McLeod County, Minnesota		BORING: ST-6 LOCATION: N: 256520; E: 629335. See attached sketch.	
DRILLER: B. Kammermeier	METHOD: 3 1/4" HSA, Autohammer	DATE: 10/18/17	SCALE: 1" = 4'

(See Descriptive Terminology sheet for explanation of abbreviations)

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Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	Qp tsf	Tests or Notes
1026.6	0.0							
1026.3	0.3	FILL	FILL: Silty Sand, fine- to medium-grained, slightly organic, trace Gravel, dark brown, moist.					
1025.2	1.4	AGG	(Topsoil Fill)					
		FILL	Apparent Railroad Ballast					
			FILL: Silty Sand, fine- to medium-grained, organic, trace Gravel, dark brown, moist.	7		19		OC=16%
				17				
1019.6	7.0	FILL	FILL: Poorly Graded Sand, fine- to medium-grained, trace Gravel, brown, moist.					
1017.6	9.0	FILL	FILL: Clayey Sand, trace Gravel, brown and dark brown, moist.					
				15				
				18				
			Lenses of Peat / organics at 15 feet.	13				
1009.6	17.0	OL	ORGANIC SILT, dark gray, wet. (Swamp Deposit)					
				5		85		OC=15%
1003.6	23.0	CL	SANDY LEAN CLAY, trace Gravel, gray, wet, rather stiff to stiff. (Glacial Till)					
				9		21	1	
				11			1 3/4	

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(See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project B1710033 PRELIMINARY GEOTECHNICAL EVALUATION McLeod County - Dakota Rail Corridor Between Lester Prairie & Hutchinson McLeod County, Minnesota					BORING: ST-6 (cont.) LOCATION: N: 256520; E: 629335. See attached sketch.				
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer			DATE: 10/18/17		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	Qp tsf	Tests or Notes	
994.6	32.0		SANDY LEAN CLAY, trace Gravel, gray, wet, rather stiff to stiff. (Glacial Till) (continued)						
990.6	36.0		END OF BORING. Water not observed while drilling. Water not observed with 34 1/2 feet of hollow-stem auger in the ground. Boring immediately backfilled with bentonite grout.	13			2		

Braun Project B1710033 PRELIMINARY GEOTECHNICAL EVALUATION McLeod County - Dakota Rail Corridor Between Lester Prairie & Hutchinson McLeod County, Minnesota	BORING: ST-7 LOCATION: N: 256520; E: 629426. See attached sketch.
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DRILLER: B. Kammermeier	METHOD: 3 1/4" HSA, Autohammer	DATE: 10/18/17	SCALE: 1" = 4'
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(See Descriptive Terminology sheet for explanation of abbreviations)

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Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	Qp tsf	Tests or Notes
1026.3	0.0							
1025.9	0.4	FILL	FILL: Silty Sand, fine- to medium-grained, slightly organic, trace Gravel, dark brown, moist.					P200=32%
1024.9	1.4	AGG	(Topsoil Fill)					
		FILL	Apparent Railroad Ballast					
			FILL: Silty Sand, fine- to medium-grained, slightly organic, with Gravel and debris, dark brown to black, moist.	4		19		
				9				
1019.3	7.0							
		FILL	FILL: Poorly Graded Sand, fine- to medium-grained, trace Gravel, with layer of Clayey Sand, brown, moist.	9				
1017.3	9.0							
		FILL	FILL: Clayey Sand, trace Gravel, brown and gray, moist.	7				
			With organics at 12 feet.					
				9				
1012.3	14.0	PT	PEAT, fibrous, brown and dark gray, wet. (Swamp Deposit)	6		203		OC=72%
1008.3	18.0	OL	ORGANIC SILT, trace fibers and shells, olive, wet. (Swamp Deposit)	5		87		OC=15%
1003.3	23.0	CL	SANDY LEAN CLAY, trace Gravel, gray, wet, soft to rather stiff. (Glacial Till)	3		20	3/4	
				4			3/4	

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\10033.GPJ BRAUN_V8_CURRENT.GDT 1/26/18 11:44

Braun Project B1710033 PRELIMINARY GEOTECHNICAL EVALUATION McLeod County - Dakota Rail Corridor Between Lester Prairie & Hutchinson McLeod County, Minnesota					BORING: ST-7 (cont.) LOCATION: N: 256520; E: 629426. See attached sketch.				
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer			DATE: 10/18/17		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	Qp tsf	Tests or Notes	
994.3	32.0		SANDY LEAN CLAY, trace Gravel, gray, wet, soft to rather stiff. (Glacial Till) (continued)						
990.3	36.0		END OF BORING. Water not observed while drilling. Water not observed with 34 1/2 feet of hollow-stem auger in the ground. Boring immediately backfilled with bentonite grout.	11			1 3/4		

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\10033.GPJ | BRAUN_V8_CURRENT.GDT 1/26/18 11:44

Braun Project B1710033 PRELIMINARY GEOTECHNICAL EVALUATION McLeod County - Dakota Rail Corridor Between Lester Prairie & Hutchinson McLeod County, Minnesota					BORING: ST-8		
DRILLER: B. Kammermeier METHOD: 3 1/4" HSA, Autohammer					DATE: 10/18/17 SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	Tests or Notes
1034.7	0.0						
1033.7	1.0	FILL	FILL: Sandy Lean Clay, slightly organic, trace Gravel, dark brown to brown, moist to wet. (Topsoil Fill)	5			
1032.7	2.0	AGG					
		FILL	Apparent Railroad Ballast FILL: Lean Clay with Sand, trace Gravel, brown and dark brown, moist to wet.	7		28	
				8			
1028.7	6.0		END OF BORING. Water not observed while drilling. Water not observed with 4 feet of hollow-stem auger in the ground. Boring immediately backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\10033.GPJ | BRAUN_V8_CURRENT.GDT 1/26/18 11:44

Braun Project B1710033 PRELIMINARY GEOTECHNICAL EVALUATION McLeod County - Dakota Rail Corridor Between Lester Prairie & Hutchinson McLeod County, Minnesota					BORING: ST-9 LOCATION: N: 256570; E: 648549. See attached sketch.		
DRILLER: B. Kammermeier		METHOD: 3 1/4" HSA, Autohammer		DATE: 10/18/17		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	Tests or Notes
996.5	0.0						
995.5	1.0	FILL	FILL: Sandy Lean Clay, slightly organic, dark brown to black, moist.	4		22	OC=4%
994.5	2.0	FILL	(Topsoil Fill)				
992.5	4.0	FILL	FILL: Silty Sand, fine- to medium-grained, slightly organic, with Gravel and debris, dark brown, moist.	5		19	
990.5	6.0	FILL	FILL: Sandy Lean Clay, trace Gravel, dark brown and brown, moist.				
			FILL: Sandy Lean Clay, trace Gravel, brown and gray, moist.	11			
END OF BORING. Water not observed while drilling. Water not observed with 4 feet of hollow-stem auger in the ground. Boring immediately backfilled.							



Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^a			Soils Classification			
			Group Symbol	Group Name ^b		
Coarse-grained Soils more than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines ^e	$C_u \geq 4$ and $1 \leq C_c \leq 3^c$	GW	Well-graded gravel ^d	
		Gravels with Fines More than 12% fines ^e	$C_u < 4$ and/or $1 > C_c > 3^c$	GP	Poorly graded gravel ^d	
			Fines classify as ML or MH	GM	Silty gravel ^{d f g}	
		Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines ⁱ	$C_u \geq 6$ and $1 \leq C_c \leq 3^c$	SW	Well-graded sand ^h
	Sands with Fines More than 12% ⁱ		$C_u < 6$ and/or $1 > C_c > 3^c$	SP	Poorly graded sand ^h	
			Fines classify as ML or MH	SM	Silty sand ^{f g h}	
	Fines classify as CL or CH		SC	Clayey sand ^{f g h}		
	Fine-grained Soils 50% or more passed the No. 200 sieve	Silt and Clays Liquid limit less than 50	Inorganic	PI > 7 and plots on or above "A" line ^j	CL	Lean clay ^{k l m}
PI < 4 or plots below "A" line ^j				ML	Silt ^{k l m}	
Organic			Liquid limit - oven dried < 0.75	OL	Organic silt ^{k l m n}	
			Liquid limit - not dried	OH	Organic clay ^{k l m o}	
Silt and clays Liquid limit 50 or more		Inorganic	PI plots on or above "A" line	CH	Fat clay ^{k l m}	
			PI plots below "A" line	MH	Elastic silt ^{k l m}	
		Organic	Liquid limit - oven dried < 0.75	OH	Organic clay ^{k l m p}	
			Liquid limit - not dried	OH	Organic silt ^{k l m q}	
			Highly Organic Soils		PT	Peat
			Primarily organic matter, dark in color and organic odor			

Particle Size Identification

Boulders..... over 12"
Cobbles 3" to 12"
Gravel
Coarse 3/4" to 3"
Fine..... No. 4 to 3/4"
Sand
Coarse No. 4 to No. 10
Medium No. 10 to No. 40
Fine..... No. 40 to No. 200
Silt <No. 200, PI < 4 or below "A" line
Clay <No. 200, PI ≥ 4 and on or about "A" line

Relative Density of Cohesionless Soils

Very Loose..... 0 to 4 BPF
Loose..... 5 to 10 BPF
Medium dense 11 to 30 PPF
Dense 31 to 50 BPF
Very dense..... over 50 BPF

Consistency of Cohesive Soils

Very soft..... 0 to 1 BPF
Soft 2 to 3 BPF
Rather soft 4 to 5 BPF
Medium 6 to 8 BPF
Rather stiff 9 to 12 BPF
Stiff 13 to 16 BPF
Very stiff..... 17 to 30 BPF
Hard..... over 30 BPF

Drilling Notes

Standard penetration test borings were advanced by 3 1/4" or 6 1/4" ID hollow-stem augers, unless noted otherwise. Jetting water was used to clean out auger prior to sampling only where indicated on logs. All samples were taken with the standard 2" OD split-tube samples, except where noted.

Power auger borings were advanced by 4" or 6" diameter continuous flight, solid-stem augers. Soil classifications and strata depths were inferred from disturbed samples augered to the surface, and are therefore, somewhat approximate.

Hand auger borings were advanced manually with a 1 1/2" or 3 1/4" diameter auger and were limited to the depth from which the auger could be manually withdrawn.

BPF: Numbers indicate blows per foot recorded in standard penetration test, also known as "N" value. The sampler was set 6" into undisturbed soil below the hollow-stem auger. Driving resistances were then counted for second and third 6" increments, and added to get BPF. Where they differed significantly, they are reported in the following form: 2/12 for the second and third 6" increments, respectively.

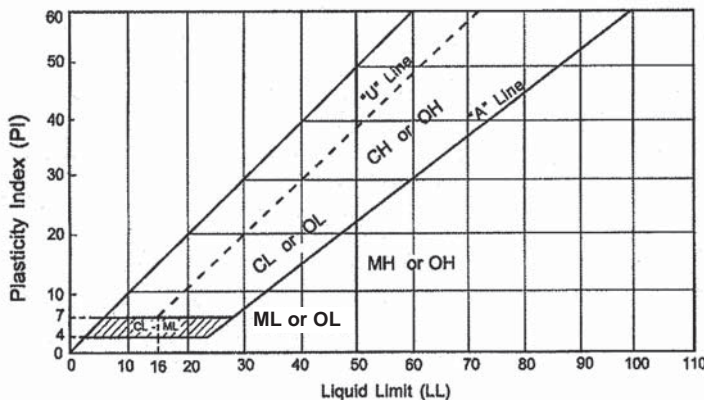
WH: WH indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WR: WR indicates the sampler penetrated soil under weight of rods alone; hammer weight, and driving not required.

TW: TW indicates thin-walled (undisturbed) tube sample.

Note: All tests were run in general accordance with applicable ASTM standards.

- a. Based on the material passing the 3-inch (75mm) sieve.
- b. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders or both" to group name.
- c. $C_u = D_{60}/D_{10}$ $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
- d. If soil contains ≥15% sand, add "with sand" to group name.
- e. Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay
- f. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
- g. If fines are organic, add "with organic fines:" to group name.
- h. If soil contains ≥15% gravel, add "with gravel" to group name.
- i. Sand with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay
- j. If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.
- k. If soil contains 10 to 29% plus No. 200, add "with sand" or "with gravel" whichever is predominant.
- l. If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.
- m. If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
- n. PI ≥ 4 and plots on or above "A" line.
- o. PI < 4 or plots below "A" line.
- p. PI plots on or above "A" lines.
- q. PI plots below "A" line.



Laboratory Tests

DD Dry density, pcf	OC Organic content, %
WD Wet density, pcf	S Percent of saturation, %
MC Natural moisture content, %	SG Specific gravity
LL Liquid limit, %	C Cohesion, psf
PL Plastic limits, %	Ø Angle of internal friction
PI Plasticity index, %	qu Unconfined compressive strength, psf
P200 % passing 200 sieve	qp Pocket penetrometer strength, tsf

APPENDIX D: PRELIMINARY ENGINEER'S ESTIMATES

Bituminous Trail

UNIT LEGEND: <u>LS</u> =Lump Sum, <u>SF</u> =Square Feet, <u>SY</u> =Square Yard, <u>EA</u> =Each, <u>LF</u> =Lineal Foot, <u>CY</u> =Cubic Yards. <u>AC</u> =Acre						
McLeod County Dakota Rail Trail Bituminous Trail Hutchinson to Lester Prairie (14.94 miles) Preliminary Engineer's Estimate						
Notes	No.	Section 1 - Mobilization, Surveying & Site Preparation	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
	1	Construction Staking	1	LS	\$30,000.00	\$30,000.00
	2	Mobilization (10%)	1	LS	\$28,800.00	\$28,800.00
	3	Construction Entrance	2	LS	\$2,500.00	\$5,000.00
1	4	Silt Fence Type Machine Sliced	19,750	LF	\$2.00	\$39,500.00
2	5	Sediment Control Log Type Straw	4,100	LF	\$2.25	\$9,225.00
Section 1 - Mobilization, Surveying & Site Preparation Total:						\$112,525.00
Notes	No.	Section 2 - Removals	Estimated Quantity	Unit	Unit Bid (in Dollars)	Total Bid (In Dollars)
	1	Remove Rails and Ties Stockpiled in Corridor	1	LS	\$8,000.00	\$8,000.00
	2	Tree and Brush Clearing and Grubbing	5	AC	\$2,000.00	\$10,000.00
Section 2 - Removals Total:						\$18,000.00
Notes	No.	Section 3 - Earthwork	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
3	1	Common Excavation	16,073	CY	\$15.00	\$241,095.00
4	2	Topsoil Borrow	2,922	CY	\$31.00	\$90,582.00
5	3	Ditch Cleaning	19,950	LF	\$10.00	\$199,500.00
Section 3 - Earthwork Total:						\$531,177.00
Notes	No.	Section 4 - Drainage Structures	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
	1	18" CSP at STA 189+50	31	LF	\$30.00	\$930.00
	2	24" CSP at STA 298+25	39	LF	\$33.00	\$1,287.00
	3	24" CSP at STA 306+25	36	LF	\$33.00	\$1,188.00
	4	48" RCP at STA 445+90	53	LF	\$80.00	\$4,240.00
	5	24" CSP at STA 469+90	39	LF	\$33.00	\$1,287.00
	6	18" CSP at STA 692+25	32	LF	\$30.00	\$960.00
	7	18" RCP at STA 771+00	75	LF	\$30.00	\$2,250.00
	10	18" CS Pipe Apron	6	EA	\$350.00	\$2,100.00
	11	24" CS Pipe Apron	6	EA	\$375.00	\$2,250.00
	12	48" CS Pipe Aron	2	EA	\$450.00	\$900.00
Section 4 - Drainage Structures Total:						\$17,392.00
Notes	No.	Section 5 - Surfacing	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
6	1	Furnish and Install 6" Aggregate Base	14,611	CY	\$32.00	\$467,552.00
6	2	Furnish and Install 3" Thick Bituminous Pavement	87,600	SY	\$12.00	\$1,051,200.00
7	3	Furnish and Install Pedestrian Ramps and Truncated Domes, Complete	30	EA	\$2,000.00	\$60,000.00
Section 5 - Pavement Total:						\$1,578,752.00

APPENDIX D: PRELIMINARY ENGINEER'S ESTIMATES

Bituminous Trail Continued

Notes	No.	Section 6 - Bridges	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
8	1	County Ditch No. 40 "Bear Creek" 60-Foot Truss Bridge	1	LS	\$275,000.00	\$275,000.00
8	2	County Ditch No. 32 60-Foot Truss Bridge	1	LS	\$275,000.00	\$275,000.00
Section 6 - Bridges Total:						\$550,000.00
Notes	No.	Section 7 - Rest Stops	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
9	1	Concrete Pad	5	EA	\$1,800.00	\$9,000.00
9	2	Furnish and Install 6' Bench	10	EA	\$1,200.00	\$12,000.00
9	3	Furnish and Install Waste Receptacle	5	EA	\$650.00	\$3,250.00
9	4	Furnish and Install Bicycle Rack	5	EA	\$550.00	\$2,750.00
Section 7 - Rest Stops Total:						\$27,000.00
Notes	No.	Section 8 - Turf Establishment	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
10	1	Erosion Control Blankets Category 3	445	SY	\$2.00	\$890.00
11	2	Turf Establishment - Seeding with Hydroseed	22	AC	\$1,500.00	\$33,000.00
Section 8 - Turf Establishment Total:						\$33,890.00
Notes	No.	Section 9 - Wayfinding/Signage	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
12	1	Traffic Control Signs	870	SF	\$75.00	\$65,250.00
	2	4" Broken Line Yellow Paint	19,725	LF	\$0.25	\$5,000.00
Section 9 - Wayfinding/Signage Total:						\$70,250.00
Notes	No.	Section 10 - Trailhead Parking Lot	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
13	1	Gravel Parking Lot for Ten Vehicles	1	LS	\$12,000.00	\$12,000.00
	2	Concrete Curb Stops	10	EA	\$80.00	\$800.00
	3	Rest Stop (Concrete Pad, 2 Benches, 1 Bike Rack, 1 Waste Receptacle)	1	LS	\$5,400.00	\$5,400.00
Section 10 - Trailhead Parking Lot Total:						\$18,200.00
SUBTOTAL						\$2,957,000.00
Design and Engineering Contingency, 20%						\$591,000.00
Construction Contingency, 10%						\$296,000.00
TOTAL						\$3,844,000.00

Notes:

1. Assumes silt fence length equal to 1/2 of one side of trail, average.
2. Assumes 10 feet of bioroll required every 50 feet of ditch cleaning and 20 feet at each culvert replacement.
3. Assumes common excavation is required for 6" depth x 11' width x trail length (78,900).
4. Assumes 3" topsoil depth x 4' width (2' on each side of trail) x trail length (78,900).
5. Assumes ditch cleaning will be needed along segments of trail corridor equal to one-quarter the total length of trail.
6. 78,900 lin. ft. of trail from Ranch Ave (STA 101) in Hutchinson to Babcock Avenue / CR 1 (STA 890) in Lester Prairie, 10 feet wide.
7. Assumes two pedestrian ramps are required for all seven paved roadway intersections.
8. Figure includes estimated cost for a 60-foot long prefabricated truss bridge with concrete abutments.
9. Assumes five rest stops along trail between Ranch Ave. and Babcock Ave.
10. Assumes erosion control blankets are required for a 20'x50' area around each bridge abutment (2 bridges, 4 abutments).
11. Assumes turf seeding is required along entire length of trail corridor at a 12 foot width (6 feet on each side of trail).
12. Assumes 58 SF signage per intersection. Includes all 15 intersections in corridor. Quantity based on typical regional trail crossing layout.
13. Assumes 64' x 50' gravel parking lot for ten vehicles with 12" deep Class 5 surface.

APPENDIX D: PRELIMINARY ENGINEER'S ESTIMATES

Aggregate Trail

UNIT LEGEND: <u>LS</u> =Lump Sum, <u>SF</u> =Square Feet, <u>SY</u> =Square Yard, <u>EA</u> =Each, TON=TON <u>LF</u> =Lineal Foot, <u>CY</u> =Cubic Yards, <u>AC</u> =Acre						
McLeod County Dakota Rail Trail Aggregate Trail Hutchinson to Lester Prairie (14.94 miles) Preliminary Engineer's Estimate						
Notes	No.	Section 1 - Mobilization, Surveying & Site Preparation	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
	1	Construction Staking	1	LS	\$30,000.00	\$30,000.00
	2	Mobilization (10%)	1	LS	\$28,800.00	\$28,800.00
	3	Construction Entrance	2	LS	\$2,500.00	\$5,000.00
1	4	Silt Fence Type Machine Sliced	19,750	LF	\$2.00	\$39,500.00
2	5	Sediment Control Log Type Straw	4,100	LF	\$2.25	\$9,225.00
Section 1 - Mobilization, Surveying & Site Preparation Total:						\$112,525.00
Notes	No.	Section 2 - Removals	Estimated Quantity	Unit	Unit Bid (in Dollars)	Total Bid (In Dollars)
	1	Remove Rails and Ties Stockpiled in Corridor	1	LS	\$8,000.00	\$8,000.00
	2	Tree and Brush Clearing and Grubbing	5	AC	\$2,000.00	\$10,000.00
Section 2 - Removals Total:						\$18,000.00
Notes	No.	Section 3 - Earthwork	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
3	1	Common Excavation	16,073	CY	\$15.00	\$241,095.00
4	2	Topsoil Borrow	2,922	CY	\$31.00	\$90,582.00
5	3	Ditch Cleaning	19,950	LF	\$10.00	\$199,500.00
Section 3 - Earthwork Total:						\$531,177.00
Notes	No.	Section 4 - Drainage Structures	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
	1	18" CSP at STA 189+50	31	LF	\$30.00	\$930.00
	2	24" CSP at STA 298+25	39	LF	\$33.00	\$1,287.00
	3	24" CSP at STA 306+25	36	LF	\$33.00	\$1,188.00
	4	48" RCP at STA 445+90	53	LF	\$80.00	\$4,240.00
	5	24" CSP at STA 469+90	39	LF	\$33.00	\$1,287.00
	6	18" CSP at STA 692+25	32	LF	\$30.00	\$960.00
	7	18" RCP at STA 771+00	75	LF	\$30.00	\$2,250.00
	8	18" CS Pipe Apron	6	EA	\$350.00	\$2,100.00
	9	24" CS Pipe Apron	6	EA	\$375.00	\$2,250.00
	10	48" CS Pipe Aron	2	EA	\$450.00	\$900.00
Section 4 - Drainage Structures Total:						\$17,392.00
Notes	No.	Section 5 - Surfacing	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
6	1	Furnish and Install 6" Aggregate Base	14,611	CY	\$32.00	\$467,552.00
6	2	Furnish and Install 3" Thick Class 2 Limestone	10,227	TON	\$30.00	\$306,810.00
7	3	Furnish and Install Pedestrian Ramps and Truncated Domes, Complete	14	EA	\$2,000.00	\$28,000.00
Section 5 - Pavement Total:						\$802,362.00

APPENDIX D: PRELIMINARY ENGINEER'S ESTIMATES

Aggregate Trail Continued

Notes	No.	Section 6 - Bridges	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
8	1	County Ditch No. 40 "Bear Creek" 60-Foot Truss Bridge	1	LS	\$275,000.00	\$275,000.00
8	2	County Ditch No. 32 60-Foot Truss Bridge	1	LS	\$275,000.00	\$275,000.00
Section 6 - Bridges Total:						\$550,000.00
Notes	No.	Section 7 - Rest Stops	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
9	1	Concrete Pad	5	EA	\$1,800.00	\$9,000.00
9	2	Furnish and Install 6' Bench	10	EA	\$1,200.00	\$12,000.00
9	3	Furnish and Install Waste Receptacle	5	EA	\$650.00	\$3,250.00
9	4	Furnish and Install Bicycle Rack	5	EA	\$550.00	\$2,750.00
Section 7 - Rest Stops Total:						\$27,000.00
Notes	No.	Section 8 - Turf Establishment	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
10	1	Erosion Control Blankets Category 3	445	SY	\$2.00	\$890.00
11	2	Turf Establishment - Seeding with Hydroseed	22	AC	\$1,500.00	\$33,000.00
Section 8 - Turf Establishment Total:						\$33,890.00
Notes	No.	Section 9 - Wayfinding/Signage	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
12	1	Traffic Control Signs	870	SF	\$75.00	\$65,250.00
Section 9 - Wayfinding/Signage Total:						\$65,000.00
Notes	No.	Section 10 - Trailhead Parking Lot	Estimated Quantity	Unit	Unit Price (in Dollars)	Total (In Dollars)
13	1	Gravel Parking Lot for Ten Vehicles	1	LS	\$12,000.00	\$12,000.00
	2	Concrete Curb Stops	10	EA	\$80.00	\$800.00
	3	Rest Stop (Concrete Pad, 2 Benches, 1 Bike Rack, 1 Waste Receptacle)	1	LS	\$5,400.00	\$5,400.00
Section 10 - Trailhead Parking Lot Total:						\$18,200.00
SUBTOTAL						\$2,176,000.00
Design and Engineering Contingency, 20%						\$435,000.00
Construction Contingency, 10%						\$218,000.00
TOTAL						\$2,829,000.00

Notes:

1. Assumes silt fence length equal to 1/2 of one side of trail, average.
2. Assumes 10 feet of bioroll required every 50 feet of ditch cleaning and 20 feet at each culvert replacement.
3. Assumes common excavation is required for 6" depth x 11' width x trail length (78,900).
4. Assumes 3" topsoil depth x 4' width (2' on each side of trail) x trail length (78,900).
5. Assumes ditch cleaning will be needed along segments of trail corridor equal to one-quarter the total length of trail.
6. 78,900 lin. Feet of trail from Ranch Ave (STA 101) in Hutchinson to Babcock Avenue / CR 1 (STA 890) in Lester Prairie, 10 feet wide.
7. Assumes two pedestrian ramps are required for all seven paved roadway intersections.
8. Figure includes estimated cost for a 60-foot long prefabricated truss bridge with concrete abutments.
9. Assumes five rest stops along trail between Ranch Ave. and Babcock Ave.
10. Assumes erosion control blankets are required for a 20'x50' area around each bridge abutment (2 bridges, 4 abutments).
11. Assumes turf seeding is required along entire length of trail corridor at a 12 foot width (6 feet on each side of trail).
12. Assumes 58 SF signage per intersection. Includes all 15 intersections in corridor. Quantity based on typical regional trail crossing layout.
13. Assumes 64' x 50' gravel parking lot for ten vehicles with 12" deep Class 5 surface.

APPENDIX E: BRIDGE ELEMENTS



PREFABRICATED STEEL BRIDGES

APPLICATIONS & LOADINGS

Prefabricated Steel Bridges are ideal for recreation and low volume vehicular bridge applications. The efficiency of the truss design maximizes material properties of the primary tubular steel members. These bridges are used for regional hiking/biking/equestrian trails, community parks, pedestrian overpasses, snowmobile routes, golf courses, single lane residential access, etc. Typical loads may include pedestrian, equestrian and maintenance vehicles. Utility dead loads are not uncommon.

PREFABRICATED

The bridges are shop manufactured with primarily welded connections then shipped to the site ready for installation. Limited field assembly is required for most projects.

SPANS 20' - 200'

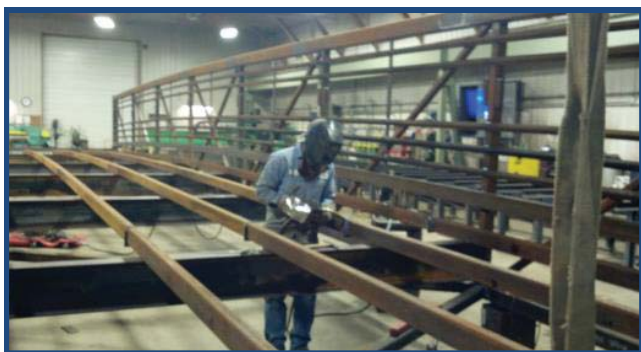
Typical designs allow for clear spans from 20 to 200 feet. Under certain conditions special designs can extend spans to 250 feet. Bridges can be in single or multiple span configurations.

Clear spans up to 100 feet can be fabricated and shipped as one piece if contractor capabilities and site considerations allow. Longer spans are built with field bolted splices and shipped as multiple sections.

WIDTHS 6' - 12'

Widths less than six feet should only be considered for shorter spans. Bridges wider than twelve feet (clear between the railing) may require a longitudinal field splice, increasing the installed cost.





ENGINEERING

Specifications are developed specific to the project to ensure the bridge meets your needs. All aspects are considered including: application, configuration, geometry, loading, materials, etc. A custom design is then created by our registered Professional Engineers. Detailed plans are generated by our staff of drafters. Wheeler can provide sealed plans for projects nationwide.

Prefabricated bridges are compatible with most foundations. Substructure design may be available if site and soil information are provided. Site information, including grade, elevations and soils report, including geotechnical engineer recommendations, will be required prior to substructure design and may effect design fee.

FACILITIES & QUALIFICATIONS

Wheeler maintains approved status as a AISC Quality Certified Intermediate Bridge Fabricator with Fracture Critical Endorsement. Our plant certification has been reviewed and approved annually by the AISC since 1998. This certification confirms that Wheeler has "...the personnel, organization, experience, capability and commitment..." to handle these types of projects.



As a member of the American Welding Society, Wheeler employs AWS Certified Welders.

Inspectors from state and independent agencies across the country have visited our facilities and confirmed our ability to produce quality bridges.

Wheeler **PREFABRICATED STEEL BRIDGES**

TYPICAL TRUSS STYLES



WARREN

The Warren truss provides an alternate appearance and offers optimum efficiency for long spans. It is a parallel chord truss with diagonals in alternating directions creating a “W” pattern. The Warren may or may not include vertical members and often uses overhead bracing.



PRATT

The most common truss style is the Pratt. This is a parallel chord truss with diagonal members slanting toward the center of the span and separated by verticals. Double diagonals can be added at additional expense. The Pratt can be built with underhung floor beams, as an H-section (floor beams connected to the verticals) or with overhead bracing.

TYPICAL TRUSS STYLES



BOWSTRING

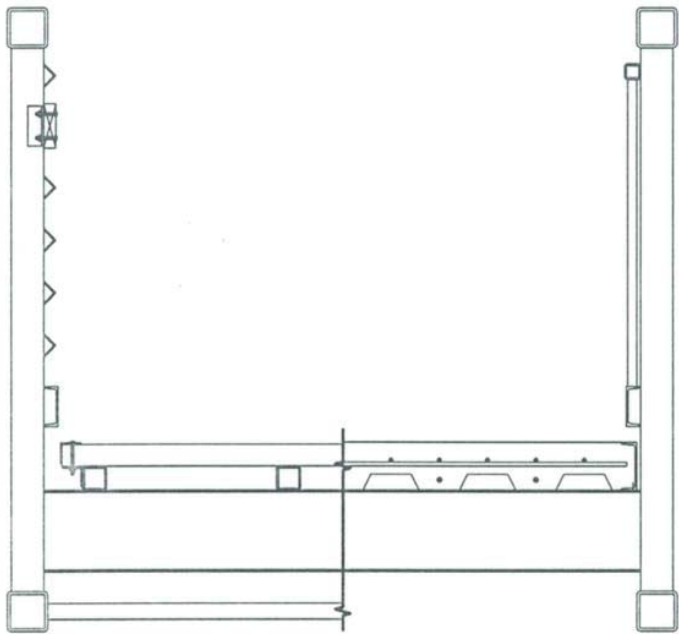
The Bowstring Truss is distinct with the top chord arched relative to the bottom chord. The top chord meets the deck at the ends of the span. It can incorporate Pratt or Warren web configurations and is used in a variety of span lengths for the distinct architecture.



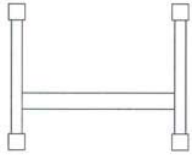
MODIFIED BOW

With a Modified Bow the top chord is arched relative to the bottom, but the chords are separated by verticals at the ends of the span. Pratt webs are typical. The Modified Bow is often used as an affordable alternative to the traditional Pratt and can be used for most span lengths.

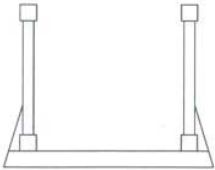
TYPICAL CROSS-SECTION



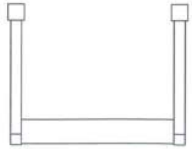
Floor Beam Configuration



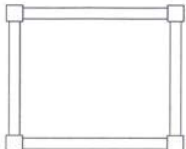
H-section



Underhung



U-section



Overhead Braced

APPROACH RAILING

Approach railing guides users onto the bridge. Custom sections can be built to match or compliment the bridge. Less expensive options utilize treated wood. Regardless of style, approach railing is encouraged.



Wheeler PREFABRICATED STEEL BRIDGES

RAILING

Railing combinations can vary by intended use and differing code requirements. Most bridges incorporate a toe plate, safety rail and rub rail. Orientation for the safety rail is typically vertical or horizontal.



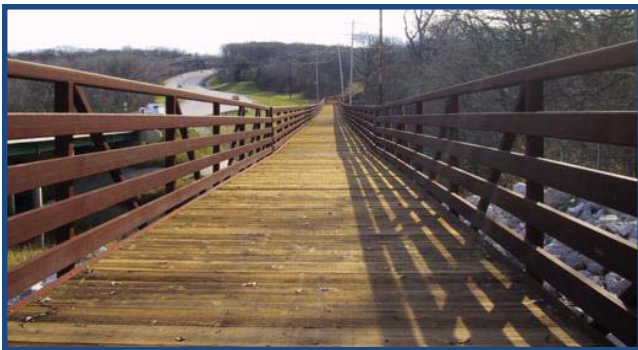
HORIZONTAL



VERTICAL PICKETS

Safety rail spacing can vary by code, but AASHTO standards are typical.

Handrails can be added if ADA requirements apply.



Wheeler recommends incorporating a vertical post at the end of the bridge. This provides easy termination of the safety rail and transition to any approach rail. If slanted ends are preferred, it is still recommended to extend the safety rail to the end of the bridge.

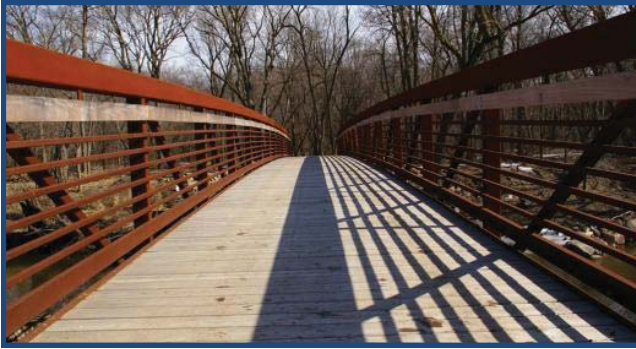


Custom safety railing is available at additional expense. Contact us to review project specific options.

Wheeler **PREFABRICATED STEEL BRIDGES**

DECK MATERIALS

All bridges are available with treated timber, tropical hardwood, asphalt or concrete decks. Composite and FRP materials may be considered under limited loading conditions. Steel grating has been used for decks requiring more drainage.



TREATED TIMBER

The most economical and easiest to maintain, wood decks are typically shop installed. If preferred, they can be shipped loose to reduce the structure lifting weight and field installed after the bridge is set.



TIMBER WEAR COURSE

Applied for added abrasion resistance, this is common for multi-use applications including equestrian and snowmobile traffic. Often the wear course is installed diagonal to the bridge centerline.



TROPICAL HARDWOOD

Premium wood providing greater dimensional stability and smoother finish. Ipe is the most common specie.



CONCRETE

Asphalt and concrete decks are installed after the bridge is set in position. An asphalt wear surface can be added to structural timber panels or steel bridge plank. Reinforced concrete decks are poured-in-place with shop installed stay-in-place steel deck pans and side forms.



STEEL GRATING

COMPOSITE

There are a wide variety of FRP, PVC, and recycled plastic/wood composite decking materials offered in the market place. The appropriate application of these products must be reviewed project specific. Some products may only be used as a wear surface.

FINISH



WEATHERING STEEL

Atmospheric Corrosion Resistant Self-Weathering Steel is a special formulation that develops a protective oxide patina. Under acceptable atmospheric conditions the steel “rusts” to a patina, eventually stabilizing and protecting the steel from further corrosion. Color of the patina will progress from reddish to dark brown.



Weathering steel provides an economical choice with a rustic appearance and relatively little maintenance. The bridge will never require recoating and can be blasted to remove graffiti. It will simply rust again in the affected area.



PAINT

Painted bridges can be considered for applications where weathering steel is undesirable. Two and three coat paint systems used for other highway applications are available in virtually any color.



Painted bridges are more expensive due to the cost of materials and application. They also require additional sealing of accessory connections and more extensive sand blasting.



Precautions with weathering steel include rust staining in runoff areas below the bridge and avoiding salt latent atmospheres (coastal areas or bridges over highways requiring winter maintenance).

Wheeler PREFABRICATED STEEL BRIDGES

OVERHEAD BRACING



Overhead bracing can be incorporated into most truss configurations. It often reduces member sizes by adding stability and may be required for the longest spans. The bridge depth of section, measured from the top of deck to the bottom of the lowest member (typically the bottom chord) can be minimized by adding overhead bracing.



For bridges requiring fencing or roofs, designs with overhead bracing are preferred.

ARCHITECTURAL FEATURES

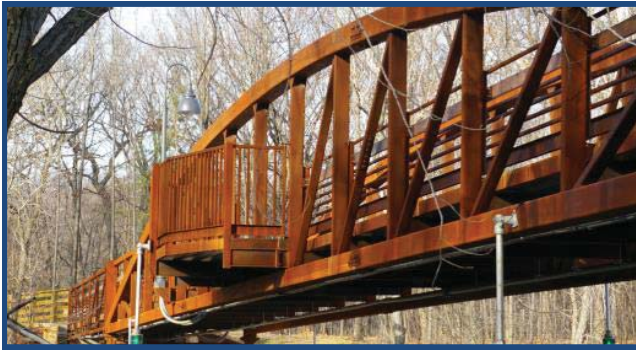
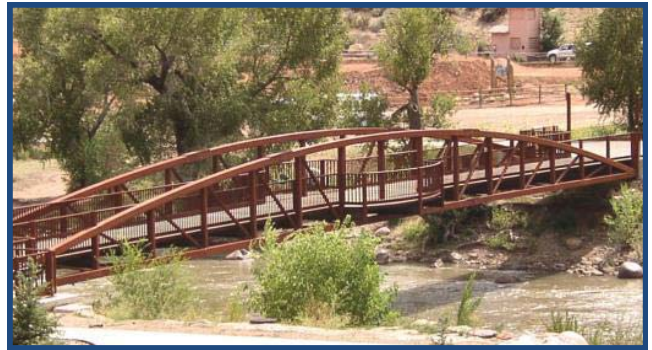
Wheeler often works with consultants and architects to incorporate specific architectural features. Please contact us to review the potential for your next bridge. We will discuss the feasibility and cost implications of the elements.



Wheeler PREFABRICATED STEEL BRIDGES

ACCESSORIES

Please review your specific requirements with a Wheeler representative prior to requesting price estimates.



OVERLOOKS

Adding a walk-through viewing area provides many opportunities to enhance the user experience. It also allows those who stop on the bridge to move out of the main traffic lanes. Overlooks can be added under certain span and loading conditions. Multiple truss configurations are compatible.



LIGHTING

Lighting design by others. Field installed by locally licensed electrician. Brackets can be shop installed.



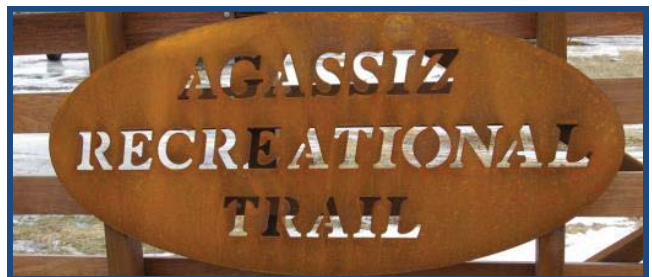
UTILITY HANGERS

All utility design and installation by others. Brackets can be provided when locations are specified.



FENCING

Available in chain-link (galvanized or vinyl coated) or welded wire panels (galvanized, painted or weathering steel)



SIGNS

State-of-the-art plasma table available for cutting images provided in CAD format.

Wheeler PREFABRICATED STEEL BRIDGES



SHIPPING

The bridges are shop manufactured and shipped to the site ready for installation.

Bridge spans less than 80 feet in length are often shipped as one piece without a field splice.

Spans between 80 and 100 feet will be reviewed to determine if they can be shipped without a splice.

Spans greater than 100 feet will be shipped in sections and require field bolted splice connections.

***Bridges are shipped via independent carrier. Delivery is made to a location nearest the site, which is easily accessible to normal over-the-road tractor/trailer equipment. Oversized loads warrant additional consideration and providing suitable access shall be the responsibility of others. All trucks delivering materials will need to be unloaded at the time of arrival.*

INSTALLATION

Prefabricated bridges install in minimal time.

Detailed, written instruction in the proper splicing (if required) and lifting procedures will be provided. The method and sequence of erection shall be the responsibility of others.

All unloading, field erection and installation is the responsibility of others.



9531 W 78th St, Ste100
Minneapolis, MN 55344

952.929.7854

info@wheeler1892.com

wheelerbridge.com

PREFABRICATED STEEL BRIDGES

STEEL RECREATION BRIDGE ESTIMATE

3/9/2018

T20378

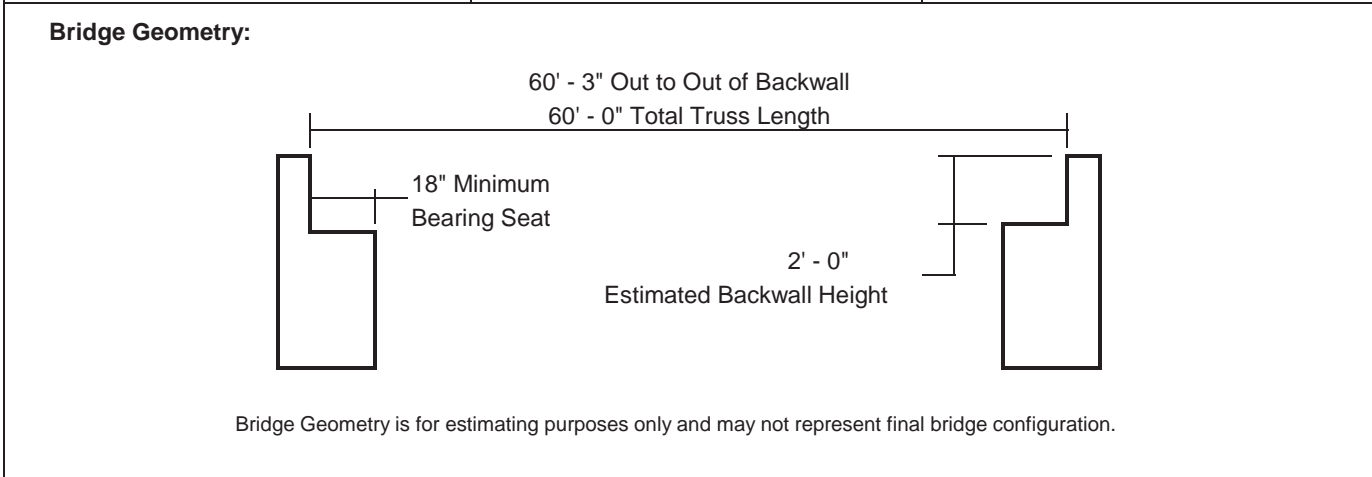
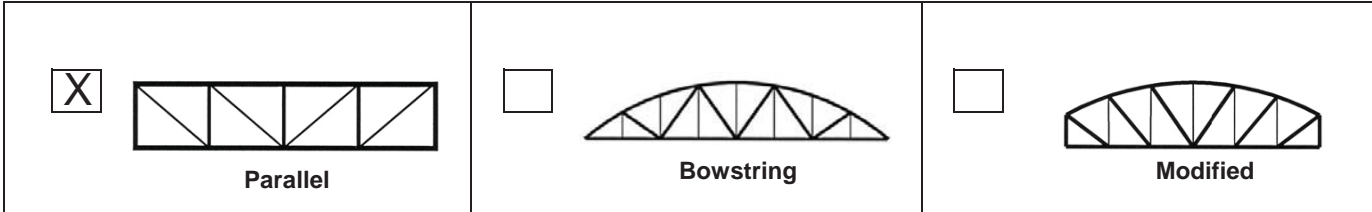
Customer: SRF Consulting Group, Inc.
One Carlson Parkway, Suite 150



Wheeler Lumber LLC | PH 952-929-7854
9531 West 78th Street | Eden Prairie, MN 55344

Project: Dakota Rail Trail Bridge

David Clemens | Sales Manager
dclemens@wheeler1892.com | 612-249-0850



Bridge Span: 60' - 0"	Live Load: 90#	Field Splices: 0
Bridge Width: 12' - 0"	Vehicle Load: AASHTO H10	Number of Pieces: 1
Truss Type: Parallel	Finish: Weathering	Lifting Weight: 14,150 lbs
Diagonal: Pratt	Railing Config: Horizontal - 54"	Opening: 4" Max
Decking Type: Concrete	<i>Est. Poured Deck (by others) = 12 Cu. Yds. Conc., 2275 lbs. Reinforcement</i>	

Total Bridge Price: \$36,700.00

Notes:

Delivery: Prices are estimated as F.O.B. trucks delivered to jobsite. Trucks only deliver on a good haul road suitable for normal over the road trucks. A formal quote and more detailed estimate of shipping must be completed before ordering. Unloading is not included. Delivery of materials can typically be offered in 10-12 weeks after approval of plan/shop drawings.

Terms: Subject to credit approval, terms are 25% payment upon approval of shop drawings, net 30 days on balance, 1 ½% per month service charge on past due invoices. Above items are subject to sales tax.

STEEL RECREATION BRIDGE ESTIMATE

3/9/2018

T20378A

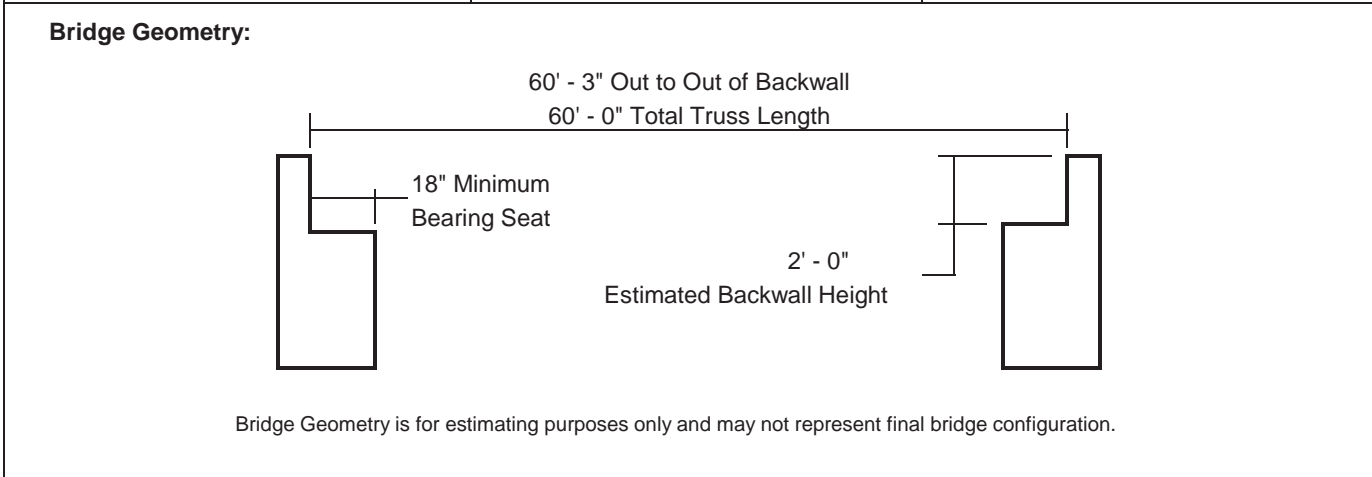
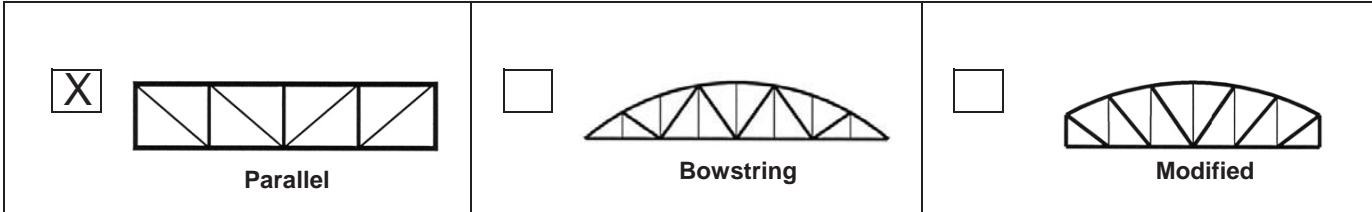
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Project: Dakota Rail Trail Bridge

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Bridge Span: 60' - 0"	Live Load: 90#	Field Splices: 0
Bridge Width: 12' - 0"	Vehicle Load: AASHTO H10	Number of Pieces: 1
Truss Type: Parallel	Finish: Weathering	Lifting Weight: 19,850 lbs
Diagonal: Pratt	Railing Config: Horizontal - 54"	Opening: 4" Max
Decking Type: Treated Timber		

Total Bridge Price: \$43,800.00

Additional hardwood wear course add \$4,500

Notes:

Delivery: Prices are estimated as F.O.B. trucks delivered to jobsite. Trucks only deliver on a good haul road suitable for normal over the road trucks. A formal quote and more detailed estimate of shipping must be completed before ordering. Unloading is not included. Delivery of materials can typically be offered in 10-12 weeks after approval of plan/shop drawings.

Terms: Subject to credit approval, terms are 25% payment upon approval of shop drawings, net 30 days on balance, 1 ½% per month service charge on past due invoices. Above items are subject to sales tax.

APPENDIX F: PROPERTY OWNERS ADJACENT TO CORRIDOR

TAXADDR1	TAXADDR2	TAXCITY	TAXSTATE	TAXZIP	LEGAL01	AAPIDXT
18979 GARDEN AVE		SILVER LAKE	MIN	55381	Sect-04 Twp-116 Range-027	020040400
18314 EAGLE AVE		LESTER PRAIRIE	MIN	55354	Sect-05 Twp-116 Range-027	020050500
127 BABCOCK AVE S		LESTER PRAIRIE	MIN	55354	Sect-03 Twp-116 Range-027	020030700
127 BABCOCK AVE S		LESTER PRAIRIE	MIN	55354	Sect-03 Twp-116 Range-027	020030500
18427 EAGLE AVE		LESTER PRAIRIE	MIN	55354	Sect-06 Twp-116 Range-027	020060900
1755 185TH ST		LESTER PRAIRIE	MIN	55354	Sect-01 Twp-116 Range-027	020010650
1273 185TH ST		LESTER PRAIRIE	MIN	55354	Sect-01 Twp-116 Range-027	020011200
18647 DAIRY AVE		LESTER PRAIRIE	MIN	55354	Sect-05 Twp-116 Range-027	020050700
21191 CABLE AVE		LESTER PRAIRIE	MIN	55354	Sect-05 Twp-116 Range-027	020050300
16213 CABLE AVE		LESTER PRAIRIE	MIN	55354	Sect-04 Twp-116 Range-027	020041450
18427 EAGLE AVE		LESTER PRAIRIE	MIN	55354	Sect-05 Twp-116 Range-027	020051150
5506 HWY 7		LESTER PRAIRIE	MIN	55354	Sect-04 Twp-116 Range-027	020040200
18676 CABLE AVE		LESTER PRAIRIE	MIN	55354	Sect-03 Twp-116 Range-027	020030200
21183 DAIRY AVE		WINSTED	MIN	55395	Sect-03 Twp-116 Range-027	020031025
3557 190TH ST	PO BOX 503	LESTER PRAIRIE	MIN	55354	Sect-03 Twp-116 Range-027	020030650
1502 185TH ST		WAVERLY	MIN	55390	Sect-06 Twp-116 Range-027	020061150
3570 TOWNDALE DR		LESTER PRAIRIE	MIN	55354	Sect-01 Twp-116 Range-027	020010300
18979 GARDEN AVE		BLOOMINGTON	MIN	55431	Sect-05 Twp-116 Range-027	020050450
18979 GARDEN AVE		SILVER LAKE	MIN	55381	Sect-04 Twp-116 Range-027	020041100
1000 CENTRAL AVE		SILVER LAKE	MIN	55381	Sect-05 Twp-116 Range-027	020050600
1118 JEFFERSON ST SE		LESTER PRAIRIE	MIN	55354	A P SEC 2-116-27 BERGEN TWP	020500010
1755 185TH ST		HUTCHINSON	MIN	55350	RAILROAD PROPERTY BERGEN TWP	029920010
1687 185TH ST		LESTER PRAIRIE	MIN	55354	Sect-01 Twp-116 Range-027	020010625
1605 185TH ST		LESTER PRAIRIE	MIN	55354	Sect-01 Twp-116 Range-027	020011600
1525 185TH ST		LESTER PRAIRIE	MIN	55354	Sect-01 Twp-116 Range-027	020012200
1803 185TH ST		LESTER PRAIRIE	MIN	55354	Sect-01 Twp-116 Range-027	020010700
2385 HENNEPIN AVE N		LESTER PRAIRIE	MIN	55354	Sect-01 Twp-116 Range-027	020010600
18546 FALCON AVE		GLENCOE	MIN	55336	Sect-01 Twp-116 Range-027	020012300
18546 FALCON AVE		LESTER PRAIRIE	MIN	55354	Sect-06 Twp-116 Range-027	020060600
18546 CABLE AVE		LESTER PRAIRIE	MIN	55354	Sect-06 Twp-116 Range-027	020061300
121 BABCOCK AVE		LESTER PRAIRIE	MIN	55354	Sect-03 Twp-116 Range-027	020032400
18743 BABCOCK AVE		LESTER PRAIRIE	MIN	55354	Sect-03 Twp-116 Range-027	020032200
		LESTER PRAIRIE	MIN	55354	Sect-03 Twp-116 Range-027	020031300

18504 CABLE AVE		LESTER PRAIRIE	MIN	55354	Sect-03 Twp-116 Range-027	020032800
18482 CABLE AVE		LESTER PRAIRIE	MIN	55354	Sect-03 Twp-116 Range-027	020031100
18473 CABLE AVE	PO BOX 217	LESTER PRAIRIE	MIN	55354	Sect-04 Twp-116 Range-027	020040500
5151 HWY 7	PO BOX 721	LESTER PRAIRIE	MIN	55354	Sect-04 Twp-116 Range-027	020040450
18481 DAIRY AVE		LESTER PRAIRIE	MIN	55354	Sect-04 Twp-116 Range-027	020041350
18546 DAIRY AVE		LESTER PRAIRIE	MIN	55354	Sect-04 Twp-116 Range-027	020041250
18535 DAIRY AVE		LESTER PRAIRIE	MIN	55354	Sect-04 Twp-116 Range-027	020041400
18496 EAGLE AVE		LESTER PRAIRIE	MIN	55354	Sect-05 Twp-116 Range-027	020051200
18481 DAIRY AVE		LESTER PRAIRIE	MIN	55354	C & W ESTATES	020550100
18454 FALCON AVE		LESTER PRAIRIE	MIN	55354	Sect-05 Twp-116 Range-027	020050400
35 REDWOOD ST N		LESTER PRAIRIE	MIN	55354	Sect-06 Twp-116 Range-027	020060400
1420 ADAMS ST SE	PO BOX 249	LESTER PRAIRIE	MIN	55354	A P SEC 2-116-27 BERGEN TWP	020500235
19272 LACE AVE	PO BOX 744	LESTER PRAIRIE	MIN	55354	A P SEC 2-116-27 BERGEN TWP	020500240
3401 IRVING AVE S	PO BOX 249	LESTER PRAIRIE	MIN	55354	A P SEC 2-116-27 BERGEN TWP	020500011
9787 SKY LN	PO BOX 158	HUTCHINSON	MIN	55350	DAKOTA RAIL RR LEASE HUTCH CIT	029910010
700 MAIN ST N		HUTCHINSON	MIN	55350	Sect-01 Twp-116 Range-029	060010100
6072 80TH ST		HUTCHINSON	MIN	55410	Sect-01 Twp-116 Range-029	060010450
19165 MAJOR AVE		MINNEAPOLIS	MIN	55347	Sect-01 Twp-116 Range-029	060010200
805 HARRINGTON ST SW		EDEN PRAIRIE	MIN	55350	Sect-02 Twp-116 Range-029	060020200
6072 80TH ST		HUTCHINSON	MIN	55336	Sect-02 Twp-116 Range-029	060020300
22446 CSAH 14		GLENCOE	MIN	55350	Sect-02 Twp-116 Range-029	060020100
18503 NICKEL AVE		HUTCHINSON	MIN	55350	Sect-02 Twp-116 Range-029	060020700
22446 CSAH 14		HUTCHINSON	MIN	55336	Sect-02 Twp-116 Range-029	060021200
18503 NICKEL AVE		DARWIN	MIN	55342	Sect-02 Twp-116 Range-029	060021350
18503 NICKEL AVE		HUTCHINSON	MIN	55350	Sect-03 Twp-116 Range-029	060030500
21634 CO RD 7		DARWIN	MIN	55342	Sect-03 Twp-116 Range-029	060030700
16639 ODAY AVE		HUTCHINSON	MIN	55350	Sect-03 Twp-116 Range-029	060031050
18503 NICKEL AVE		HUTCHINSON	MIN	55350	Sect-03 Twp-116 Range-029	060031300
520 HWY 22		HUTCHINSON	MIN	55350	Sect-04 Twp-116 Range-029	060040600
21573 586TH AVE		HUTCHINSON	MIN	55350	Sect-04 Twp-116 Range-029	060040400
15801 HWY 7 E		HUTCHINSON	MIN	55350	Sect-04 Twp-116 Range-029	060040500
		LITCHFIELD	MIN	55355	Sect-04 Twp-116 Range-029	060040900
		HUTCHINSON	MIN	55350	Sect-04 Twp-116 Range-029	060040700
		HUTCHINSON	MIN	55350	Sect-04 Twp-116 Range-029	060041000

520 HWY 22			HUTCHINSON	MIN	55350	Sect-05 Twp-116 Range-029	060050500
520 HWY 22			HUTCHINSON	MIN	55350	Sect-04 Twp-116 Range-029	060040200
1180 ARCH ST SE			HUTCHINSON	MIN	55350	Sect-05 Twp-116 Range-029	060050900
4787 SHADOWWOOD DR NE			SAUK RAPIDS	MIN	56379	Sect-05 Twp-116 Range-029	060050975
111 HASSAN ST SE	PO BOX 187		BUFFALO LAKE	MIN	55314	Sect-05 Twp-116 Range-029	060050950
1010 RAILROAD ST			HUTCHINSON	MIN	55350	AP W 1/2 SEC 5-116-29 HV TWP	060500050
BLDG224 5N 60			HUTCHINSON	MIN	55350	AP W 1/2 SEC 5-116-29 HV TWP	060500120
600 PLUM AVE			ST PAUL	MIN	55144	AP W 1/2 SEC 5-116-29 HV TWP	060500130
630 PLUM AVE			HUTCHINSON	MIN	55350	AP W 1/2 SEC 5-116-29 HV TWP	060500080
100 FIR ST S			HUTCHINSON	MIN	55350	AP W 1/2 SEC 5-116-29 HV TWP	060500100
79 MADISON AVE N	PO BOX 526		LESTER PRAIRIE	MIN	55354	FIRST SOUTHWEST ADD	170580020
105 FIR ST S	PO BOX 276		LESTER PRAIRIE	MIN	55354	FIRST SOUTHWEST ADD	170580010
100 ELM ST S	PO BOX 514		LESTER PRAIRIE	MIN	55354	FIRST SOUTHWEST ADD	170580230
101 JUNIPER ST S	PO BOX 124		LESTER PRAIRIE	MIN	55354	FIRST SOUTHWEST ADD	170580240
105 ELM ST S	PO BOX 458		LESTER PRAIRIE	MIN	55354	SAMONN'S ADD	170550140
101 MAPLE ST S	PO BOX 376		LESTER PRAIRIE	MIN	55354	SAMONN'S ADD	170550020
501 1ST AVE S	PO BOX 122		LESTER PRAIRIE	MIN	55354	SAMONN'S ADD	170550160
128 CEDAR DR	PO BOX 172		LESTER PRAIRIE	MIN	55354	SAMONN'S ADD	170550010
132 CEDAR DR S	PO BOX 154		LESTER PRAIRIE	MIN	55354	SAMONN'S ADD	170550030
136 CEDAR DR	PO BOX 503		LESTER PRAIRIE	MIN	55354	PRAIRIE MEADOWS ADDITION	170610080
121 CEDAR DR	PO BOX 465		LESTER PRAIRIE	MIN	55354	PRAIRIE MEADOWS ADDITION	170610070
125 CEDAR DR S	PO BOX 553		LESTER PRAIRIE	MIN	55354	PRAIRIE MEADOWS ADDITION	170610060
101 ELM ST	PO BOX 404		LESTER PRAIRIE	MIN	55354	PRAIRIE MEADOWS ADDITION	170610100
17616 EAGLE AVE	PO BOX 445		LESTER PRAIRIE	MIN	55354	PRAIRIE MEADOWS ADDITION	170610090
37 JUNIPER ST	PO BOX 901		LESTER PRAIRIE	MIN	55354	FAIRLAWN ADD	170600010
17616 EAGLE AVE			LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501930
711 E BROADWAY AVE			LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501950
711 E BROADWAY AVE			LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501940
26120 BIRCH BLUFF RD			MERIDIAN	ID	83642	LESTER PRAIRIE	170501860
26120 BIRCH BLUFF RD			MERIDIAN	ID	83642	LESTER PRAIRIE	170501880
1118 JEFFERSON ST SE			EXCELSIOR	MIN	55331	A P SEC 2-116-27 LESTER PRAIRI	170640960
26120 BIRCH BLUFF RD			EXCELSIOR	MIN	55331	Sect-02 Twp-116 Range-027	170640985
			HUTCHINSON	MIN	55350	RAILROAD PROPERTY LESTER PRAIR	179920010
			EXCELSIOR	MIN	55331	Sect-02 Twp-116 Range-027	170640975

1118 JEFFERSON ST SE		HUTCHINSON	MIN	55350	DAKOTA RAIL RR LEASE LP CITY	179910040
711 E BROADWAY AVE		MERIDIAN	ID	83642	A P SEC 2-116-27 LESTER PRAIRI	170640970
1118 JEFFERSON ST SE		HUTCHINSON	MIN	55350	DAKOTA RAIL RR LEASE LP CITY	179910050
1118 JEFFERSON ST SE		HUTCHINSON	MIN	55350	DAKOTA RAIL RR LEASE LP CITY	179910030
22255 BABCOCK AVE	PO BOX 270	WINSTED	MIN	55395	Sect-01 Twp-116 Range-027	170010200
9450 WESTHILL RD		WATERTOWN	MIN	55388	EAST PARK ESTATES 2ND ADDITION	170910030
2213 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES 2ND ADDITION	170910070
2209 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES 2ND ADDITION	170910050
2203 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES 2ND ADDITION	170910020
2301 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES 2ND ADDITION	170910080
2207 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES 2ND ADDITION	170910040
2211 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES 2ND ADDITION	170910060
2303 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES 2ND ADDITION	170910090
2201 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES 2ND ADDITION	170910010
2119 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES	170900510
2101 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES	170900420
11 HANA ST	PO BOX 270	LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES	170900400
2103 HOPE AVE		WINSTED	MIN	55395	EAST PARK ESTATES	170900410
2105 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES	170900430
2107 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES	170900440
2109 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES	170900450
2111 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES	170900460
2113 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES	170900470
2115 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES	170900480
2117 HOPE AVE		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES	170900490
24 LILY ST		LESTER PRAIRIE	MIN	55354	EAST PARK ESTATES	170900500
6520 PONDEROSA DR NW		WALKER	MIN	55354	EAST PARK ESTATES 2ND ADDITION	170910570
17 HICKORY ST N	PO BOX 476	LESTER PRAIRIE	MIN	56484	EAST PARK ESTATES 2ND ADDITION	170910560
418 CENTRAL AVE	PO BOX 436	LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170500980
3801 MAIN ST	PO BOX 786	LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501080
20948 CO RD 2	PO BOX 14	ST BONIFACIUS	MIN	55375	LESTER PRAIRIE	170501230
800 CENTRAL AVE		SILVER LAKE	MIN	55381	LESTER PRAIRIE	170501540
		LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501660
						170501770

26120 BIRCH BLUFF RD	EXCELSIOR	MIN	55331	LESTER PRAIRIE	170501840
26120 BIRCH BLUFF RD	EXCELSIOR	MIN	55331	LESTER PRAIRIE	170501850
812 CENTRAL AVE	LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501760
20948 CO RD 2	SILVER LAKE	MIN	55381	LESTER PRAIRIE	170501655
712 CENTRAL AVE N	LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501640
618 CENTRAL AVE	LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501520
10582 ST HWY 25 SW	OLATHE	KS	66063	LESTER PRAIRIE	170501530
500 CENTRAL AVE N	WATERTOWN	MIN	55388	LESTER PRAIRIE	170501370
500 CENTRAL AVE N	LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501360
500 CENTRAL AVE N	LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501355
500 CENTRAL AVE N	LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501350
200 MAPLE ST S	LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501380
500 CENTRAL AVE N	LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501390
23 HICKORY ST N	LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501260
2604 9TH ST E	GLENCOE	MIN	55336	LESTER PRAIRIE	170501250
4750 YALE AVE	NEW GERMANY	MIN	55367	LESTER PRAIRIE	170501240
300 CENTRAL AVE	LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501110
300 CENTRAL AVE	LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501100
23 HICKORY ST N	LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501090
5923 ABBOTT PL	MINNETONKA	MIN	55343	LESTER PRAIRIE	170500990
216 CENTRAL AVE	LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170500975
95 CENTRAL AVE	LESTER PRAIRIE	MIN	55354	BETHEL ADD	170700060
83 CENTRAL AVE	LESTER PRAIRIE	MIN	55354	BETHEL ADD	170700070
2200 23RD ST NE #2090	LESTER PRAIRIE	MIN	55354	BETHEL ADD	170700080
2200 23RD ST NE #2090	LESTER PRAIRIE	MIN	55354	BETHEL ADD	170700090
119 CENTRAL AVE	WILLMAR	MIN	56201	BETHEL ADD	170700100
125 CENTRAL AVE	WILLMAR	MIN	56201	BETHEL ADD	170700120
18251 KALE AVE	LESTER PRAIRIE	MIN	55354	ERNST SECOND ADD	170800050
8151 180TH ST	LESTER PRAIRIE	MIN	55354	ERNST SECOND ADD	170800060
18434 CO RD 2	SILVER LAKE	MIN	55381	Sect-06 Twp-116 Range-028	110060300
215 LINDEN AVE W APT 108	SILVER LAKE	MIN	55381	Sect-02 Twp-116 Range-028	110020450
17161 JADE AVE	SILVER LAKE	MIN	55381	Sect-03 Twp-116 Range-028	110030950
	WINSTED	MIN	55395	Sect-05 Twp-116 Range-028	110050400
	GLENCOE	MIN	55336	Sect-04 Twp-116 Range-028	110610010

18345 IRIS RD	SILVER LAKE	MIN	55381	Sect-04 Twp-116 Range-028	110041010
5600 AMERICAN BLVD W STE 990	BLOOMINGTON	MIN	55437	Sect-04 Twp-116 Range-028	110041100
9845 180TH ST	SILVER LAKE	MIN	55381	Sect-03 Twp-116 Range-028	110031100
17874 IDEAL AVE	SILVER LAKE	MIN	55381	Sect-06 Twp-116 Range-028	110060650
17874 IDEAL AVE	SILVER LAKE	MIN	55381	Sect-06 Twp-116 Range-028	110060850
216 QUEEN AVE	SILVER LAKE	MIN	55381	Sect-01 Twp-116 Range-028	110010850
7404 180TH ST	LESTER PRAIRIE	MIN	55354	Sect-01 Twp-116 Range-028	110010350
8506 180TH ST	SILVER LAKE	MIN	55381	Sect-02 Twp-116 Range-028	110020825
18601 CO RD 2	SILVER LAKE	MIN	55381	Sect-03 Twp-116 Range-028	110031400
18636 IRIS RD	SILVER LAKE	MIN	55381	Sect-04 Twp-116 Range-028	110040150
13072 ZERO AVE	PLATO	MIN	55370	Sect-02 Twp-116 Range-028	110020250
11506 HWY 7	SILVER LAKE	MIN	55381	Sect-06 Twp-116 Range-028	110060200
19054 KALE AVE	SILVER LAKE	MIN	55381	Sect-05 Twp-116 Range-028	110050150
19272 LACE AVE	HUTCHINSON	MIN	55350	Sect-06 Twp-116 Range-028	110061100
5702 N OLD 92	EVANSILLVE	WI	53536	Sect-05 Twp-116 Range-028	110050800
11344 180TH ST	GLENCOE	MIN	55336	Sect-05 Twp-116 Range-028	110050550
18012 CO RD 2	SILVER LAKE	MIN	55381	Sect-03 Twp-116 Range-028	110030400
18012 CO RD 2	SILVER LAKE	MIN	55381	Sect-02 Twp-116 Range-028	110020700
8151 180TH ST	SILVER LAKE	MIN	55381	Sect-02 Twp-116 Range-028	110020750
16535 GARDEN AVE	GLENCOE	MIN	55336	Sect-02 Twp-116 Range-028	110020300
32168 742ND AVE	SOUTH HAVEN	MIN	55382	Sect-03 Twp-116 Range-028	110030350
11506 HWY 7	SILVER LAKE	MIN	55381	Sect-04 Twp-116 Range-028	110040700
17253 KALE AVE	GLENCOE	MIN	55336	Sect-01 Twp-116 Range-028	110010900
18526 GARDEN AVE	SILVER LAKE	MIN	55381	Sect-01 Twp-116 Range-028	110011100
18455 FALCON AVE	LESTER PRAIRIE	MIN	55354	Sect-01 Twp-116 Range-028	110010300
1118 JEFFERSON ST SE	HUTCHINSON	MIN	55350	RAILROAD PROPERTY RICH VALLEY	119920010
7504 180TH ST	LESTER PRAIRIE	MIN	55354	Sect-01 Twp-116 Range-028	110010500
18394 GARDEN AVE	SILVER LAKE	MIN	55381	Sect-01 Twp-116 Range-028	110010800
18607 GARDEN AVE	SILVER LAKE	MIN	55381	Sect-02 Twp-116 Range-028	110020200
8530 180TH ST	SILVER LAKE	MIN	55381	Sect-02 Twp-116 Range-028	110020850
18454 CO RD 2	SILVER LAKE	MIN	55381	Sect-03 Twp-116 Range-028	110031250
17161 JADE AVE	GLENCOE	MIN	55336	Sect-05 Twp-116 Range-028	110050300

18455 CO RD 2	SILVER LAKE	MIN	55381	Sect-03 Twp-116 Range-028	110030900
18454 CO RD 2	SILVER LAKE	MIN	55381	Sect-03 Twp-116 Range-028	110030500
18434 CO RD 2	SILVER LAKE	MIN	55381	Sect-03 Twp-116 Range-028	110030800
18434 CO RD 2	SILVER LAKE	MIN	55381	Sect-03 Twp-116 Range-028	110030700
17161 JADE AVE	GLENCOE	MIN	55336	Sect-04 Twp-116 Range-028	110040900
10531 186TH ST	SILVER LAKE	MIN	55381	Sect-04 Twp-116 Range-028	110041700
10525 184TH ST	SILVER LAKE	MIN	55381	Sect-04 Twp-116 Range-028	110041400
10723 184TH ST	SILVER LAKE	MIN	55381	Sect-04 Twp-116 Range-028	110042600
10723 184TH ST	SILVER LAKE	MIN	55381	Sect-04 Twp-116 Range-028	110041025
10755 184TH ST	SILVER LAKE	MIN	55381	Sect-04 Twp-116 Range-028	110041900
	PO BOX 136	MIN	55381	Sect-04 Twp-116 Range-028	110042400
11344 180TH ST	GLENCOE	MIN	55336	Sect-04 Twp-116 Range-028	110040650
10484 186TH ST	SILVER LAKE	MIN	55381	Sect-04 Twp-116 Range-028	110041300
18636 IRIS RD	SILVER LAKE	MIN	55381	Sect-04 Twp-116 Range-028	110040100
10222 186TH ST	SILVER LAKE	MIN	55381	Sect-04 Twp-116 Range-028	110041500
10332 186TH ST	SILVER LAKE	MIN	55381	SOUTH SILVER LAKE	110500010
10222 186TH ST	SILVER LAKE	MIN	55381	Sect-04 Twp-116 Range-028	110041600
10332 186TH ST	SILVER LAKE	MIN	55381	Sect-04 Twp-116 Range-028	110041200
10332 186TH ST	SILVER LAKE	MIN	55381	SOUTH SILVER LAKE	110500030
10332 186TH ST	SILVER LAKE	MIN	55381	SOUTH SILVER LAKE	110500020
18596 KALE AVE	HUTCHINSON	MIN	55350	Sect-05 Twp-116 Range-028	110050900
18345 IRIS RD	SILVER LAKE	MIN	55381	Sect-04 Twp-116 Range-028	110041020
	PO BOX 508	MIN	55310	AP W 1/2 SEC 5-116-29 HV TWP	060500190
1150 ARCH ST	HUTCHINSON	MIN	55350	Sect-05 Twp-116 Range-029	060050400
ONE SE CONVENIENCE BLVD	ANKENY	IA	50021	GRHS 1ST ADD (GLENCOE REGIONAL	170950010
11 ELM ST N	LESTER PRAIRIE	MIN	55354	A P SEC 2-116-27 LESTER PRAIRI	170640650
712 CENTRAL AVE N	LESTER PRAIRIE	MIN	55354	LESTER PRAIRIE	170501650
1118 JEFFERSON ST SE	HUTCHINSON	MIN	55350	RAILROAD PROPERTY HASSAN VALLE	069920010
1118 JEFFERSON ST SE	HUTCHINSON	MIN	55350	RAILROAD PROPERTY HASSAN VALLE	069920020
610 PLUM AVE	HUTCHINSON	MIN	55350	AP W 1/2 SEC 5-116-29 HV TWP	060500110
	PO BOX 249	MIN	55354	A P SEC 2-116-27 BERGEN TWP	020500230
1000 CENTRAL AVE	LESTER PRAIRIE	MIN	55354	A P SEC 2-116-27 LESTER PRAIRI	170641100



McLEOD COUNTY PARKS

Al Koglin, Parks Director
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Hutchinson, MN 55350

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Toll Free: 800-587-0770
E-mail: al.koglin@co.mcleod.mn.us

April 18, 2017

Re: Dakota Rail Trail Landowner Inquiry

Dear Landowner adjacent to Dakota Rail Trail,

This letter is being sent to all landowners immediately adjacent to the Dakota Rail Trail. In order to plan for future upgrades along the Trail in a cost effective manner; the McLeod County Trails Committee is seeking your assistance to complete an inventory of drainage structures and any other items within the Trail Right of Way bordering your property that may require future attention.

We would greatly appreciate a few minutes of your time to help identify the following items:

1. Tile crossings or other underground drainage structures
2. Culverts
3. Any driveways or Trail crossings currently used by you and/or your renter
4. Other items that require attention, such as: Old railroad ties, railroad track, boulders, large fallen trees, etc.

We have a current inventory of the road crossings and bridges that are along the Trail but if you have any of the items above adjacent to your property or have other Trail related concerns to report, please contact me at 320-484-4307 or email Al.Koglin@co.mcleod.mn.us.

As we identify future Trail upgrades, the Trail Committee's goal is to be a good neighbor and ensure we address potential landowner concerns early on. Anything you can do to help us identify the items above, or any other Trail related concerns you have would be appreciated.

Sincerely,

Al Koglin
McLeod County Parks Director

APPENDIX G: TRAIL SURFACE LIFECYCLE COMPARISON

Dakota Rail Corridor					
3" Thick Bituminous Trail					
DESCRIPTION					
New Bituminous Trail After Year 30					
DESIGN LIFE =				30	
TYPE =				Bituminous Trail	
Year	#	Life	Description	Cost/L-Mile	Present Worth
0	AA	30	Initial Bituminous Paving	\$ 70,000	\$ 70,000
1		29		\$ -	\$ -
2		28		\$ -	\$ -
3		27		\$ -	\$ -
4		26		\$ -	\$ -
5		25		\$ -	\$ -
6		24		\$ -	\$ -
7		23		\$ -	\$ -
8	AB	22	Crack Treatment	\$ 120	\$ 102
9		21		\$ -	\$ -
10		20		\$ -	\$ -
11		19		\$ -	\$ -
12		18		\$ -	\$ -
13		17		\$ -	\$ -
14		16		\$ -	\$ -
15		15		\$ -	\$ -
16	AB	14	Crack Treatment	\$ 120	\$ 87
17	AC	13	Fog Seal	\$ 4,700	\$ 3,357
18		12		\$ -	\$ -
19		11		\$ -	\$ -
20		10		\$ -	\$ -
21		9		\$ -	\$ -
22		8		\$ -	\$ -
23		7		\$ -	\$ -
24	AB	6	Crack Treatment	\$ 120	\$ 75
25		5		\$ -	\$ -
26		4		\$ -	\$ -
27		3		\$ -	\$ -
28		2		\$ -	\$ -
29		1		\$ -	\$ -
30	AD	20	Reconstruct Bituminous	\$ 50,000	\$ 27,604
31		19		\$ -	\$ -
32		18		\$ -	\$ -
33		17		\$ -	\$ -
34		16		\$ -	\$ -
35		15		\$ -	\$ -
36		14		\$ -	\$ -
37		13		\$ -	\$ -
38	AB	12	Crack Treatment	\$ 120	\$ 57
39		11		\$ -	\$ -
40		10		\$ -	\$ -
41		9		\$ -	\$ -
42		8		\$ -	\$ -
43		7		\$ -	\$ -
44		6		\$ -	\$ -
45		5		\$ -	\$ -
46	AB	4	Crack Treatment	\$ 120	\$ 48
47		3		\$ -	\$ -
48		2		\$ -	\$ -
49		1		\$ -	\$ -
50	AN	0	No Remaining Service Life	\$ -	\$ -
Total Present Worth/Mile				\$ 101,329	
Eq. Annual Cost/Mile				\$ 3,188	

Dakota Rail Corridor					
3" Thick Class 2 Limestone Aggregate Trail					
DESCRIPTION					
Aggregate Surfacing					
DESIGN LIFE =				50	
TYPE =				Aggregate Trail	
Year	#	Life	Description	Cost/L-Mile	Present Worth
0	AF	50	Initial Limestone Gravel Installation	\$ 3,400	\$ 3,400
1	AG	49	Grading 2x/Year	\$ 80	\$ 78
2	AG	48	Grading 2x/Year	\$ 80	\$ 77
3	AG	47	Grading 2x/Year	\$ 80	\$ 75
4	AG	46	Grading 2x/Year	\$ 80	\$ 74
5	AG	45	Grading 2x/Year	\$ 80	\$ 72
6	AG	44	Grading 2x/Year	\$ 80	\$ 71
7	AG	43	Grading 2x/Year	\$ 80	\$ 70
8	AG	42	Grading 2x/Year	\$ 80	\$ 68
9	AG	41	Grading 2x/Year	\$ 80	\$ 67
10	AH	40	Add 1" Limestone & Grading 2x/Year	\$ 3,500	\$ 2,871
11	AG	39	Grading 2x/Year	\$ 80	\$ 64
12	AG	38	Grading 2x/Year	\$ 80	\$ 63
13	AG	37	Grading 2x/Year	\$ 80	\$ 62
14	AG	36	Grading 2x/Year	\$ 80	\$ 61
15	AG	35	Grading 2x/Year	\$ 80	\$ 59
16	AG	34	Grading 2x/Year	\$ 80	\$ 58
17	AG	33	Grading 2x/Year	\$ 80	\$ 57
18	AG	32	Grading 2x/Year	\$ 80	\$ 56
19	AG	31	Grading 2x/Year	\$ 80	\$ 55
20	AH	30	Add 1" Limestone & Grading 2x/Year	\$ 3,500	\$ 2,355
21	AG	29	Grading 2x/Year	\$ 80	\$ 53
22	AG	28	Grading 2x/Year	\$ 80	\$ 52
23	AG	27	Grading 2x/Year	\$ 80	\$ 51
24	AG	26	Grading 2x/Year	\$ 80	\$ 50
25	AG	25	Grading 2x/Year	\$ 80	\$ 49
26	AG	24	Grading 2x/Year	\$ 80	\$ 48
27	AG	23	Grading 2x/Year	\$ 80	\$ 47
28	AG	22	Grading 2x/Year	\$ 80	\$ 46
29	AG	21	Grading 2x/Year	\$ 80	\$ 45
30	AH	20	Add 1" Limestone & Grading 2x/Year	\$ 3,500	\$ 1,932
31	AG	19	Grading 2x/Year	\$ 80	\$ 43
32	AG	18	Grading 2x/Year	\$ 80	\$ 42
33	AG	17	Grading 2x/Year	\$ 80	\$ 42
34	AG	16	Grading 2x/Year	\$ 80	\$ 41
35	AG	15	Grading 2x/Year	\$ 80	\$ 40
36	AG	14	Grading 2x/Year	\$ 80	\$ 39
37	AG	13	Grading 2x/Year	\$ 80	\$ 38
38	AG	12	Grading 2x/Year	\$ 80	\$ 38
39	AG	11	Grading 2x/Year	\$ 80	\$ 37
40	AH	10	Add 1" Limestone & Grading 2x/Year	\$ 3,500	\$ 1,585
41	AG	9	Grading 2x/Year	\$ 80	\$ 36
42	AG	8	Grading 2x/Year	\$ 80	\$ 35
43	AG	7	Grading 2x/Year	\$ 80	\$ 34
44	AG	6	Grading 2x/Year	\$ 80	\$ 33
45	AG	5	Grading 2x/Year	\$ 80	\$ 33
46	AG	4	Grading 2x/Year	\$ 80	\$ 32
47	AG	3	Grading 2x/Year	\$ 80	\$ 32
48	AG	2	Grading 2x/Year	\$ 80	\$ 31
49	AG	1	Grading 2x/Year	\$ 80	\$ 30
50	AG	0	Grading 2x/Year	\$ 80	\$ 30
Total Present Worth/Mile				\$ 14,458	
Eq. Annual Cost/Mile				\$ 455	

#	Description	Cost/L-Mile	Notes
AA	Initial Bituminous Paving	\$ 70,000.00	1
AB	Crack Treatment	\$ 120.00	2
AC	Fog Seal	\$ 4,700.00	3
AD	Reconstruct Bituminous	\$ 50,000.00	4
AE			
AF	Initial Limestone Gravel Installation	\$ 3,400.00	5
AG	Grading 2x/Year	\$ 80.00	6
AH	Add 1" Limestone & Grading 2x/Year	\$ 3,500.00	7
AI			
AJ			
AK			
AL			
AM			
AN	No Remaining Service Life		

Notes:

- Total estimated cost for initial paving is \$1,051,000 for total trail length of 15 miles. Assumes cost of \$32/CY for Class 5 base material and \$12/SY for bituminous pavement.
- Estimated cost for crack treatment is \$1,750 for all 15 miles. Assumes 50 feet per mile.
- Estimated cost for fog seal is \$3 to \$5/square yard for a total of \$70,000.
- Assumes repaving cost is 80% of initial cost.
- Total estimated cost for initial Class 2 Limestone installation is \$307,000 for 3" thick material. Assumes cost of \$32/CY for Class 5 base material and \$30/ton for Class 2 limestone.
- Grading cost includes \$125/hr blade rate and labor cost of \$25/hr.
- Estimated cost for addition of 1/2" limestone is \$51,000 for total trail length of 15 miles.
- Discount Rate is 2% with an analysis period of 51 years.
- The present worth equation is as follows: $PW = F \cdot \frac{1 - (1+i)^{-n}}{i}$
 where:
 F = Cost per mile
 i = Discount rate
 n = Number of years