

Technical Memorandum

To: Chris Byrd
Benton County

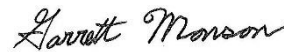
From: Garrett Monson, PE
Houston Engineering, Inc.

Subject: Benton County Ditch 3 Repair

Date: April 1, 2021

Project: 6183-0004

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am duly Licensed Professional Engineer under the laws of the State of Minnesota.



4-1-2021

Garrett Monson
Reg. No. 54326

Date

INTRODUCTION AND EXECUTIVE SUMMARY

Benton County Ditch 3 (CD 3) is in disrepair and in need of repair. The channel is poorly defined in several areas with significant sedimentation and heavy vegetation in the channel. Barbed wire fencing along the top of bank also creates challenges for access for inspection and maintenance.

Benton County as Drainage Authority has contracted with Houston Engineering (HEI) to prepare a repair report for the CD 3 public drainage system. The purpose of this report is to provide a description and analysis of a repair alternative and a preliminary opinion of probable cost for the recommended repairs. It also includes a brief historical review of the CD 3 system to determine the repair profile.

To restore the function of CD 3, we recommend the County complete a full repair of the County Ditch 3 open channel to the repair profile shown in **Attachment A**. We conclude the proposed repairs are necessary to restore the full function of the drainage system and meet future stormwater management needs. The proposed repairs are in the best interest of benefitted property owners.

A total of 3 crossings on CD 3 were identified during this study. We find that none of them require replacement to allow the ditch to function as constructed.

To assist the County, concept-level design and cost information are provided in this memorandum (see **Attachment B**). However, detailed construction plans, bid documents, and specifications will need to be prepared subsequent to the County establishing and ordering a project. Benton County retains the decision whether to accept, reject, or modify the Engineer's recommendation.

CURRENT SYSTEM

LOCATION OF THE PUBLIC DRAINAGE SYSTEM

The Benton County Ditch 3 (CD 3), shown in **Figure 1**, is a 4,100-ft open channel system and consists solely of a Main Trunk. The system is located southeast of the City of Sauk Rapids in Section 25 of Minden Township (T36N, R31W) in Benton County. CD 3 flows south to north before discharging into a storm sewer system south of US Highway 10.

CD 3 drains approximately 6.5 square miles (4,150 acres) of land in Minden Township, Sauk Rapids Township, the City of Sauk Rapids, and the City of St. Cloud. The original viewers report dated May 2nd, 1904 states that 1,680 acres of land benefitted from CD 3 (**Figure 2**). However, the original length of the ditch has been reduced and the hydrology of the surrounding area has been altered via industrialization, so the amount of land benefitting from CD 3 has been reduced. Current land use in the tributary watershed is primarily commercial and services. As shown in **Figure 2**, there are parcels within the CD 3 drainage area that are not currently listed as benefitting properties. Additionally, there are parcels outside of the area draining to the current extent of CD 3 that are listed as benefitting properties. Therefore, it is likely that the 1904 benefits no longer represent the lands currently benefitting from CD 3.

CURRENT CONDITION OF THE SYSTEM

Field survey data, including photographs and elevations, were collected in October 2020. The survey data established the existing conditions and elevations of the open channel system and located crossings along the ditch system. Additionally, soil borings were completed to assist in determining the repair profile.

All survey data was referenced to the North American Vertical Datum 1988 (NAVD88). (Note: Unless otherwise noted, all elevations provided herein are based on the NAVD88 datum).

No original plan for the CD 3 design was located during the historical review process, and there were also no documents located for subsequent repairs or alterations detailing significant changes have been made to the ditch alignment. The existing alignment of CD 3, shown in **Figure 1**, was determined via the October 2020 field survey and most likely reflects a portion of the original constructed alignment of the ditch. The ditch previously continued downstream of its current terminus near HWY 10 as an open channel but has since been converted to storm sewer and reportedly an abandonment hearing was held. Historical aerial images dating back to 1938 confirm that the original ditch alignment in the scope of this repair report has not been altered.

The physical survey completed by HEI and the repair petition filed to Benton County show parts of the CD 3 system is in disrepair, with the specific areas of concern documented below.

SPECIFIC PROBLEM AREAS

A repair petition was submitted in February 2020 citing that the ditch is not performing as designed. Field survey verified poor channelization and standing water up to 2' deep in this area.

Soil borings taken during the field survey verified excessive sedimentation throughout the CD 3 system. Sediment depths of up to ~2' were observed in parts of the Main Branch.

ANALYSIS OF CURRENT FUNCTION IN HISTORICAL CONTEXT

ESTABLISHMENT OF THE PUBLIC DRAINAGE SYSTEM

The CD 3 public drainage system was established in 1904 following the submission of a petition on January 4, 1904. The petition was originally filed to drain water from fields during the wet seasons and prevent flooding of road crossings.

The ditch was constructed according to the as-designed alignment described by the original petitioners and recommended by the engineer in March 1904.

AS-CONSTRUCTED AND SUBSEQUENTLY IMPROVED GRADE AND GEOMETRY

The As-Constructed and Subsequently Improved Condition (ACSIC) establishes the condition to which the Ditch can be legally repaired, consistent with Minnesota Statute 103E.701. The ACSIC includes the original geometry of the Ditch as constructed in 1904 and all subsequent repairs made legally.

Ideally, we would be able to use original as-built drawings to determine the constructed alignment, grade, and geometry. However, since as-built plans were not regularly recorded for public drainage systems in the early 20th century, it has been common engineering practice to use profile drawings from the original designs and test pits and borings to verify the ACSIC.

The original design plan and profile were not located during the review of historical documents. Based on historical aerial photographs the alignment of the ditch has not changed since construction with aerial photographic evidence going back to 1938. The historical imagery shows that there were likely only two crossings built during the original construction with a third added when US Highway 10 was constructed. Each of the culverts has almost certainly been replaced at least once, or several times, since the establishment of the public drainage system. Our field survey included locating current crossings, determining their size, and surveying invert elevations.

The determination of the ACSIC elevations based on field survey data is described below.

Main Branch

A total of 10 soil borings were collected along the Main Branch, as shown in **Attachment A**. To identify the original design and profile of the ditch, the HEI survey crew gathered existing cross section data every 500 feet along the ditch and used a hand auger to perform soil borings every 500 feet to identify the hard bottom of the ditch. The profile of the channel was identified based on historical aerial images and interpolation based on the surveyed crossing locations along the length of the ditch. The soil borings helped to identify the amount of sediment deposition that has occurred since the original construction of the ditch. The combination of survey, historical aerial images, and soil borings, was used to recreate the original profile and ditch design shown in **Attachment A**.

KNOWN SYSTEM ANALYSIS AND REVIEW

During review of the historical records, no records were found that indicate any changes to the alignment or geometry of CD 3 since its construction in 1905. Reportedly a partial abandonment was completed to abandon the portion of CD 3 downstream of HWY 10. This abandonment is also reflected in the current landscape where the open channel of CD 3 is replaced by storm sewer downstream of HWY 10. However, no documentation of the abandonment was discovered or reviewed in the preparation of this repair report. This repair report is being prepared for the portion upstream of HWY 10 (**Figure 1**) and is not assessing any need of repair over the downstream portions of CD 3 believed to be abandoned.

A hydraulic analysis of the ditch system was performed in March of 1978 which identified problems with the ditch and how projected development in the area would require the ditch capacity to be increased. The 1978 report proposed to increase the size and capacity of nearly every crossing along the ditch along with excavating the ditch below existing grade down 1 to 7 feet and widening the bottom of the channel to 20 feet. These channel modifications were never constructed.

Another hydraulic analysis was performed for CD 3 in May of 1986. The analysis was in response to a petition filed in the fall of 1985 to improve the portion of the ditch within the City of Sauk Rapids. This section of the ditch is presumed to be abandoned and is outside the scope of this report.

RIGHT-OF-WAY

Proceedings for the original establishment of the drainage system awarded damages for the areas physically occupied by the drainage system along with an easement for the area required for construction activities such as land clearing and spoil disposal. The combination of these areas constitutes the right-of-way (ROW) for the drainage system and is often described as the area reasonably necessary for the drainage authority to perform its repair, maintenance, inspection obligations, along with an area of reasonable set-back to protect the drainage system. **Figure 3** shows the area estimated to have been utilized during construction.

The 1904 Engineer's Report does not specify the geometry of the spoil pile but was assumed to have 3:1 in-slopes and 10:1 field slopes as was common practice of the time. The cut sheet for the construction of CD 3 was reviewed and the total ROW width for CD 3, centered on the channel, is estimated to be 25-feet.

PROPOSED REPAIR

The purpose of the proposed repair is to restore the drainage system function to a level of service consistent with the as-constructed and subsequently improved condition of CD 3 within the project area. For the open channel portion of CD 3, this can be done using the repair profile shown in **Attachment A**.

The CD 3 system was discovered to have accumulated sediments ranging from 0.1 to 1.9 feet thick based on the HEI survey performed in October of 2020. To restore the function of CD 3 to the ACSIC requires that the accumulated sediment within CD 3 be removed.

A total of 3 crossings are located along the CD 3 alignment. All of the crossings are located at roadway crossings. The crossings are all intact and in good condition. The crossings at STA 0+00 and STA 39+67 are both sized for

the 100-year event and the crossing at STA 33+85 is sized for the 50-year event. The crossings are also at or below the ACSIC profile. As such, all of the crossings are sized adequately and do not need to be replaced. The County may want to inspect the culverts after a repair is completed to determine if they require cleaning. Table 1 lists the CD 3 crossings and the proposed replacement actions, crossing sizes, and materials.

There are several other miscellaneous components to the proposed repair for CD 3. The overgrown vegetation within the ditch needs to be removed to allow for proper water conveyance during storm events. There are spoil piles along the banks of the ditch channel which are likely left over from the original ditch construction or subsequent repairs. The spoil piles should be spread and leveled as part of the proposed repair. Lastly, there is a barb wired fence within the right of way on the north side of CD 3 starting at approximately STA 12+35 and thick brush and trees which need to be removed to enable access and maintain the proper ROW.

Table 1: County Ditch 3 Crossings

Maintenance Responsibility	Crossing	Location	Existing	Recommendation
MnDOT*	US Hwy 10	STA 0+00	10' Arch Pipe	No Change
Benton County	14 th Ave CR 74	STA 33+85	48" RCP	No Change
BNSF	Railroad	STA 39+67	Rail Bridge	No Change

*This crossing is not within the public drainage system but is included as it is the outlet.

EVALUATION OF REPAIR

HYDRAULIC IMPACTS

As discussed above, County Ditch 3 has significant sedimentation and heavy vegetation. The proposed repair would remove these obstructions to open channel flow and restore the hydraulic efficiency of the system.

REGULATORY CONSIDERATIONS

Wetlands

There are three regulatory programs that may be triggered by a drainage system repair project, including the Minnesota Department of Natural Resources (MnDNR) Public Waters Permitting Program, the federal Clean Water Act (CWA), as implemented by the US Army Corps of Engineers (USACE), and the state Wetland Conservation Act (WCA), as implemented by the Local Government Unit, which in this case is both the City of Sauk Rapids, and Benton County. The following is a review of the repair project relative to these three regulatory programs.

As seen in **Figure 3**, CD 3 does not intersect any state-listed Public Waters, Public Water Wetlands, or Public Watercourses.

The CD 3 public drainage system intersects wetlands identified in the MnDNR National Wetland Inventory (NWI) as shown in **Figure 3**. Under the two wetland regulatory programs, (Minnesota WCA and Federal CWA) activities related to repair of a public drainage system are generally exempt from permitting and mitigation requirements. These activities related to public drainage system maintenance and repair, and include:

- Excavation in wetlands when limited to removal of accumulated sediment or debris such as trees, logs, stumps, beaver dams, blockage of crossings, and trash, provided the removal does not result in alteration of the original cross-section of the wetland or watercourse;
- Removing those materials placed by beaver;
- Removing or moving materials blocking installed roadway crossings and related drainage structures; and
- Temporary or seasonal water level management activities done for the purpose of performing maintenance.

Under the federal CWA, drainage system maintenance or repair is exempt from regulation. Under the state WCA, activities related to maintenance or repair of a public drainage system are exempt from replacement, include:

- Maintenance or repair of a public drainage system which drains Type 1, 2, 6, 7, or 8 wetlands; and
- Maintenance or repair of a public drainage system which drains Type 3, 4, or 5 wetlands that have existed for 25 years or less.

Based on a review of the NWI data and aerial photography to confirm wetland types, the wetlands identified within proximity to CD 3 are Type 1, 2, and 6 wetlands (**Figure 3**). There do not appear to be any Type 3, 4, or 5 wetlands within the CD 3 area, therefore the drainage system repair project will meet the exemption criteria of the state WCA and no wetland permitting is required.

Threatened and Endangered Species

Public drainage systems may encounter situations where Minnesota's Endangered Species Statute (MS 84.0895) and the associated Rules apply. The endangered species program regulates activities that take, import, transport, or sell any portion of an endangered or threatened species where these acts may be allowed by permit issued by the DNR. The statutes exempt the accidental, unknowing destruction of designated plants. However, it is the responsibility of the Engineer when preparing a final report to complete due diligence to avoid impacts to threatened and endangered species.

Based on the MnDNR's Natural Heritage Information System (NHIS) data (Houston Engineering License Agreement LA-944), the Engineer is aware of one state-listed threatened vertebrate animal species within a 1-mile radius of the CD 3 area. This is the Blanding's Turtle (*Emydoidea blandingii*). The County must use impact avoidance strategies including strategic construction timing, best management practices and species awareness by the contractor and all person on site, to avoid an incidental takings of this state-listed threatened species at the time of construction.

Additionally, one special concern moth species, Whitney's underwing (*Catocala whitneyi*), has been identified within a one-mile radius of the CD 3 area. Listed as special concern only, this species is not regulated under the state Endangered Species rules, the proposed project will not impact this moth species habitat (upland native prairie and savanna).

PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST

A Preliminary Opinion of Probable Construction Cost (POPCC) was developed for the recommended repairs and is included as **Attachment 1**. The estimated cost is shown in **Table 2** and detailed in **Attachment B**.

Table 1: Preliminary Opinion of Probable Construction Cost Summary

Category	Cost
Construction Costs*	\$135,500
Engineering	\$26,500
Legal and Administrative	\$20,000
Total Repair Project Cost	\$182,000

* Construction costs include a 20% contingency

The public drainage infrastructure cost includes open channel excavation, clearing of trees and brush, and reestablishment of vegetation in the ditch right-of-way.

CONCLUSION / RECOMMENDATION

To restore the function of the CD 3 public drainage system to the condition as it was originally constructed, we recommend the County complete a repair of the system to the ACSIC as depicted in **Attachment A**. We conclude that the proposed repairs are necessary to meet the current and future stormwater management needs, and that the repairs are in the best interest of the property owners. The recommended repairs are believed to balance the need to provide serviceable drainage and stormwater management with the desire to minimize environmental impacts while implementing the best value alternative.

To assist the Drainage Authority, concept-level design and cost information are provided in this memorandum. However, detailed construction plans, bid documents, and specifications will need to be prepared subsequent to the Drainage Authority establishing and ordering a project. The Drainage Authority retains the decision whether to accept, reject or modify the Engineer's Recommendation.

LIST OF ATTACHMENTS

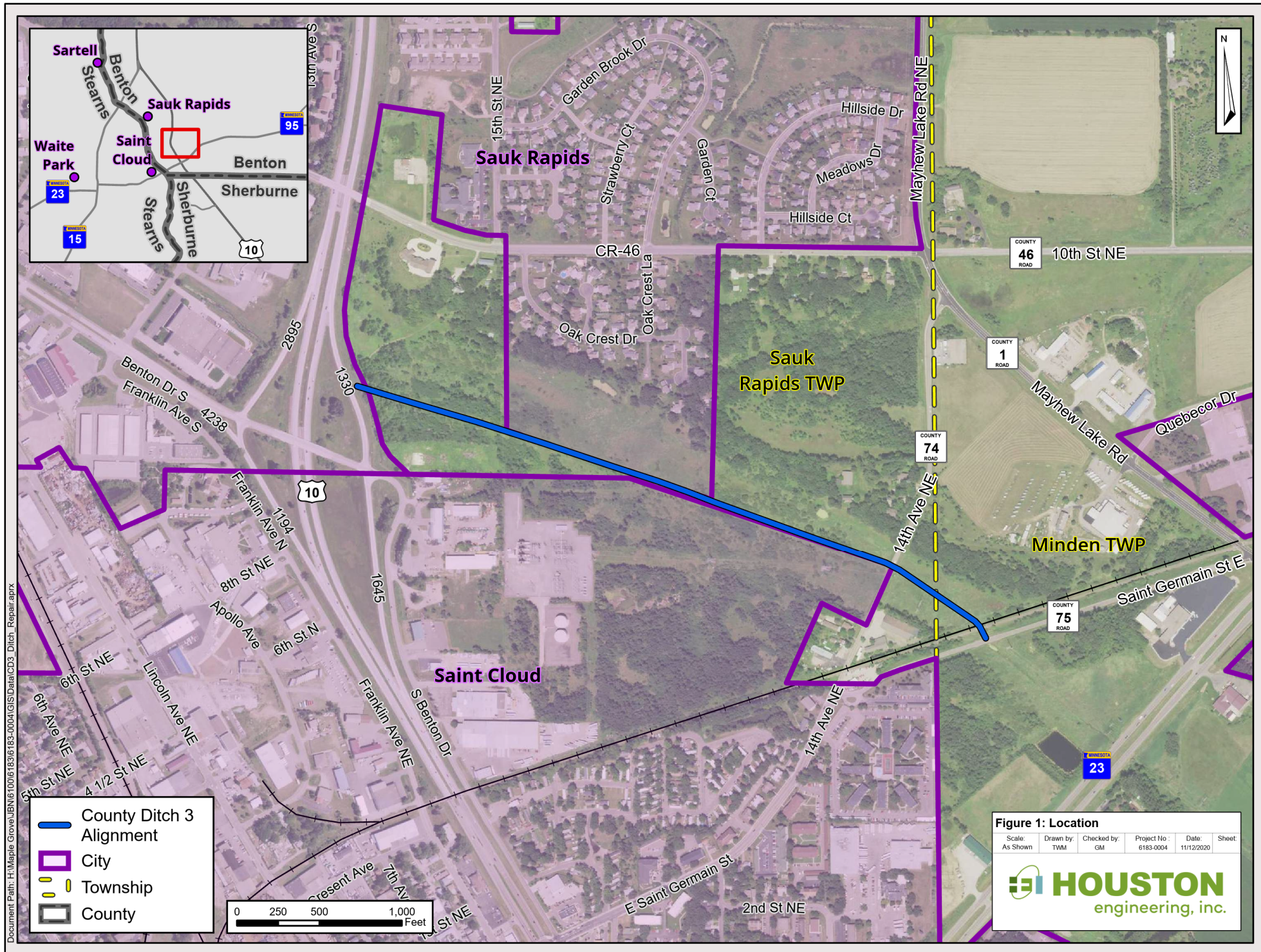
Figure 1: CD 3 Location

Figure 2: CD 3 Drainage Area

Figure 3: Adjacent Wetlands

Attachment A: Plan and Profiles

Attachment B: Preliminary Opinion of Probable Construction Cost



Document Path: H:\Maple Grove\JEN\610061836183-0004\GISData\CD3_Ditch_Repair.aprx

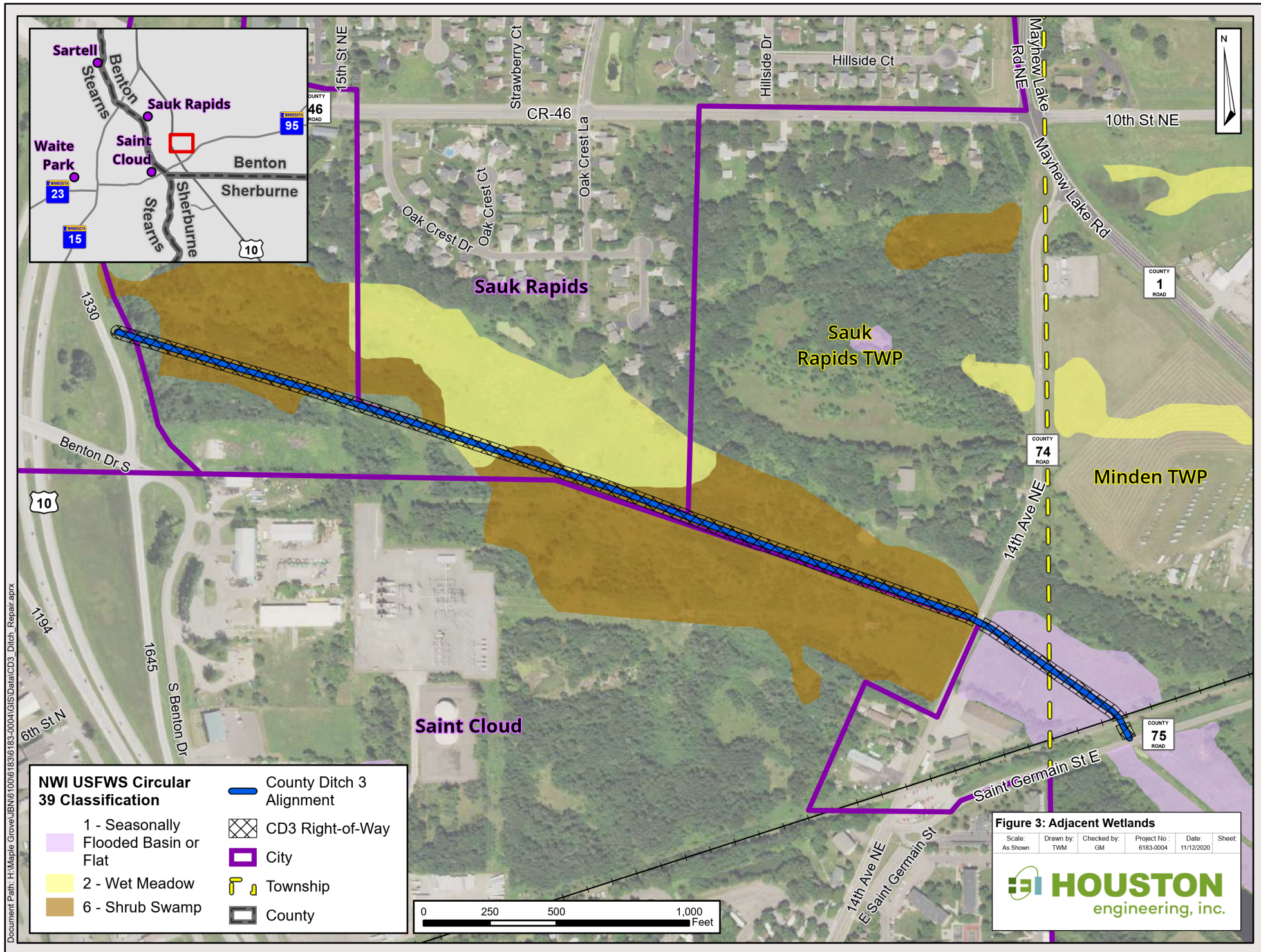
- County Ditch 3 Alignment
- City
- Township
- County

0 250 500 1,000 Feet

Figure 1: Location

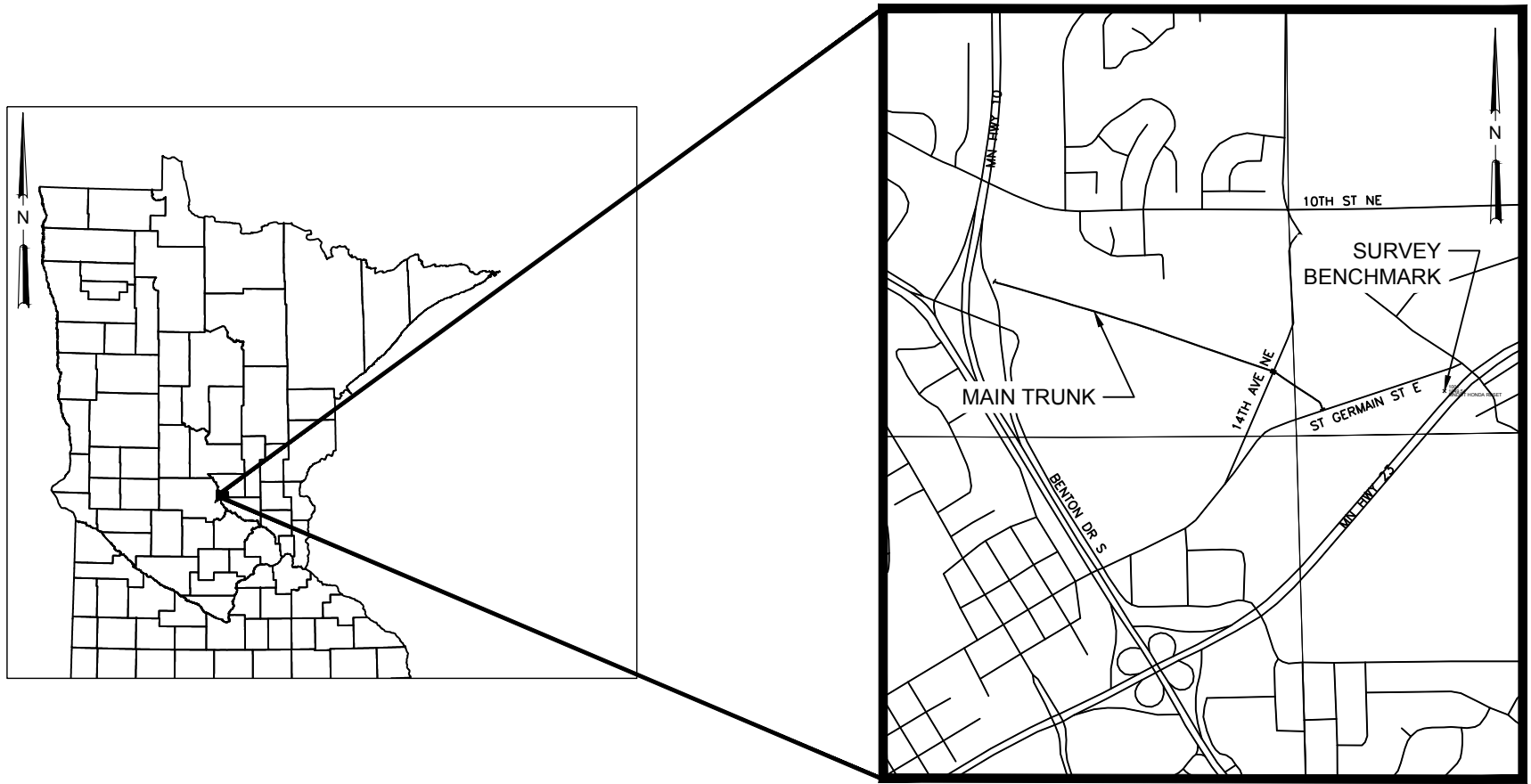
Scale:	Drawn by:	Checked by:	Project No:	Date:	Sheet:
As Shown	TWM	GM	6183-0004	11/12/2020	

HOUSTON
engineering, inc.



BENTON COUNTY
REPAIR REPORT
FOR
BENTON COUNTY DITCH NO. 3
BENTON COUNTY
NOVEMBER 2020

Sheet List Table	
1	TITLE SHEET
2	PLAN AND PROFILE MAIN TRUNK
3	DETAILS
4	CROSS SECTIONS



NOTES:

1. GEODETIC CONTROL

VERTICAL: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

HORIZONTAL: COUNTY COORDINATES (MNDOT), BENTON COUNTY, US FOOT

FIELD SURVEY COMPLETED BY HOUSTON ENGINEERING INC. STAFF IN OCTOBER 2020.

CONSTRUCTION NOTES:

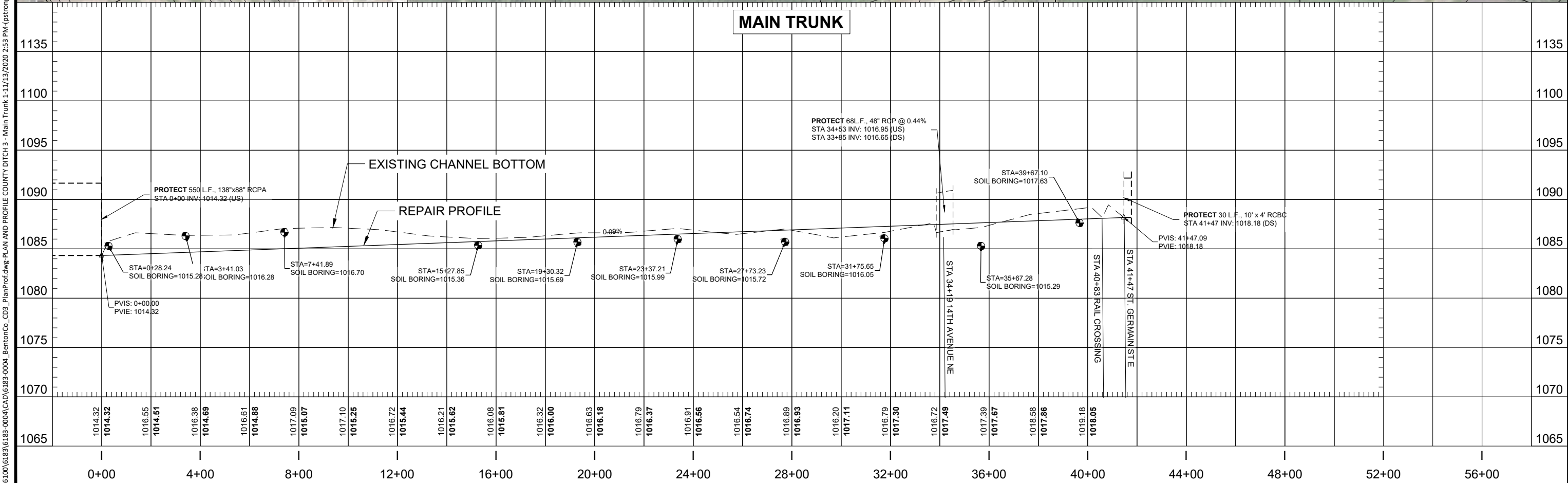
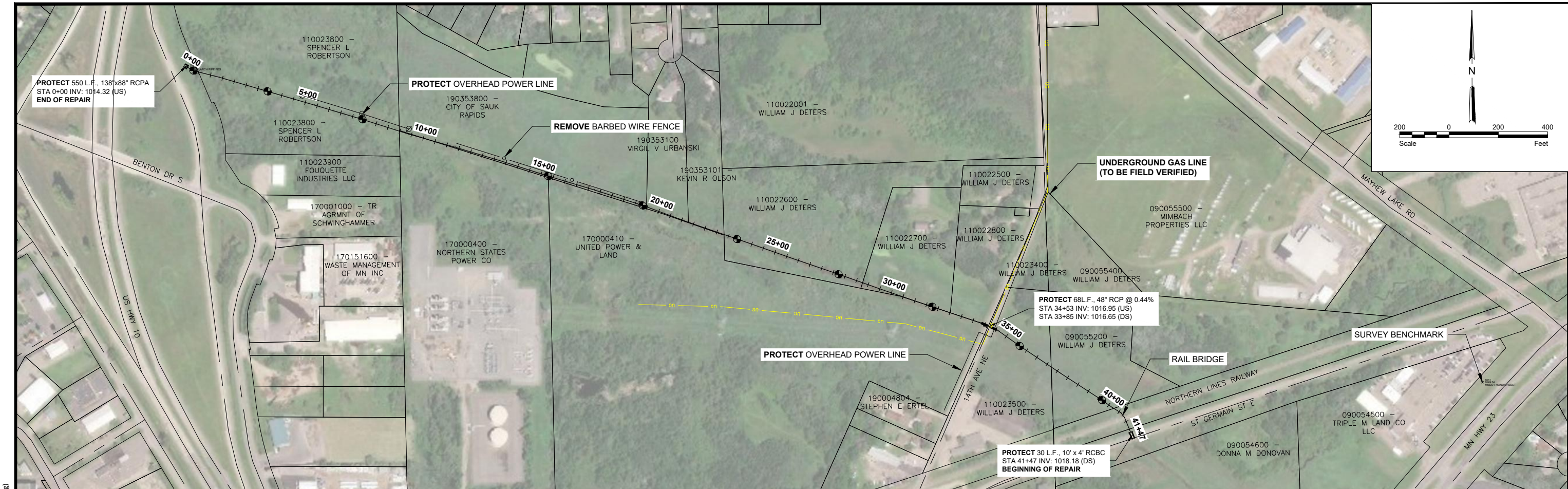
1. THE CONTRACTOR SHALL VISIT THE SITE TO INFORM THEMSELVES AS TO ALL EXISTING CONDITIONS AND LIMITATIONS.
2. THE CONTRACTOR IS RESPONSIBLE UNDER MINNESOTA STATE STATUTE 216D AND MINNESOTA RULES CHAPTER 7560 TO CONTACT GOPHER STATE ONE CALL FOR THE LOCATION OF UNDERGROUND UTILITY FACILITIES IN PROXIMITY TO THE EXCAVATION SITE. THE CONTRACTOR AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MAY RESULT FROM ITS FAILURE TO LOCATE AND PRESERVE ANY AND ALL UTILITIES.
3. CONSTRUCTION LIMITS TO BE VERIFIED IN FIELD BY ENGINEER.
4. CONTRACTOR SHOULD BE AWARE OF EROSION CONTROL SPECIFICATIONS, AND WILL BE RESPONSIBLE FOR IMPLEMENTATION AND MAINTENANCE OF SAID CONTROL MEASURES. IN ADDITION, THE CONTRACTOR WILL BE REQUIRED TO APPLY AS A CO-PERMITTEE FOR A MPCA GENERAL STORM WATER PERMIT FOR CONSTRUCTION ACTIVITIES. AS A CO-PERMITTEE THE CONTRACTOR WILL ACCEPT AND ENSURE ALL TERMS OF THE SAID PERMIT ARE IMPLEMENTED AND MAINTAINED.

PRELIMINARY
Not for Construction

PREPARED BY:



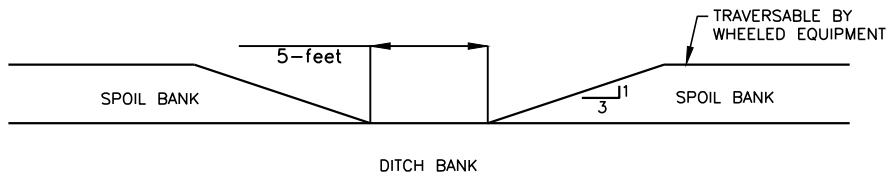
MAPLE GROVE, MINNESOTA



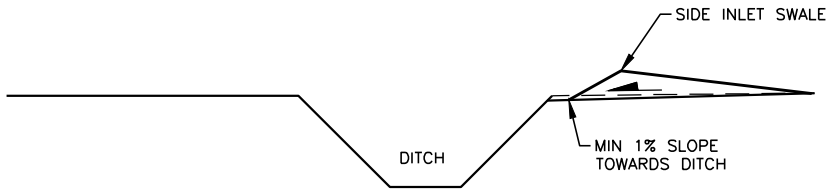
		PRELIMINARY Not for Construction			Maple Grove	Drawn by PAS	Date 11-13-2020	BENTON COUNTY DITCH 3 BENTON COUNTY SAUK RAPIDS, MN	PLAN AND PROFILE PROJECT NO. 6183-0004	SHEET 2 of 4
No.	Revision				P: 763.493.4522 F: 763.493.5572	Checked by GMM	Scale AS SHOWN			

H:\Maple Grove\JBW\6100\6183\6183-0004\CAD\6183-0004_BentonCo_CD3_PlanProf.dwg-PLAN AND PROFILE COUNTY DITCH 3 - Main Trunk 1-11/13/2020 2:53 PM-(pstrong)

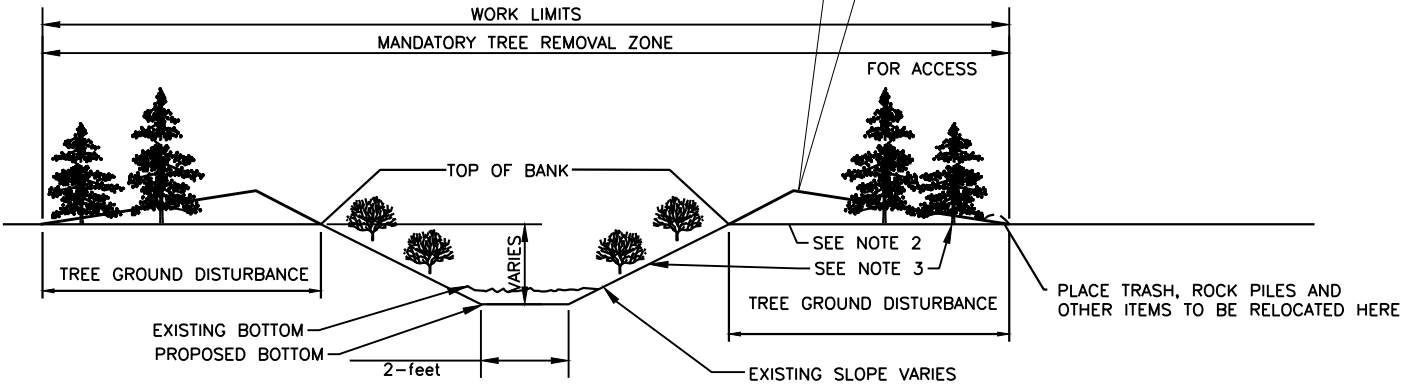
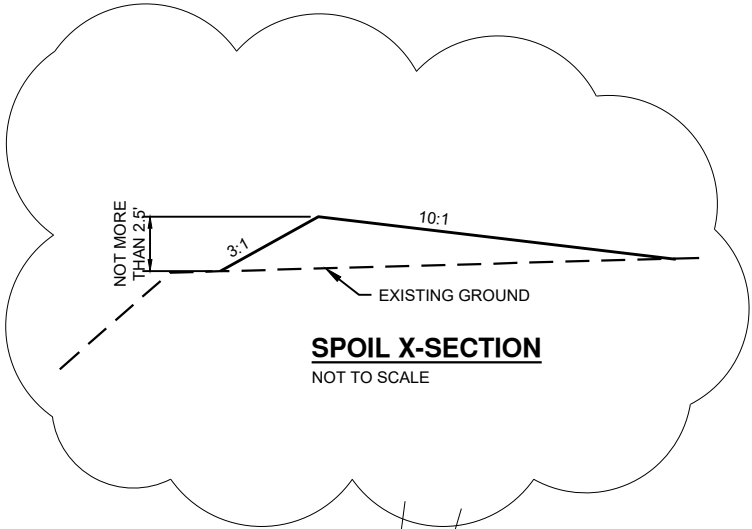
Statement of Estimate Quantities			
Item Number	Description	Amount	Units
1	Excavation of Open Channel	4100	LF
2	Tree Clearing	4100	LF
3	Spoil Management	4.1	Acres
4	Seed and Mulch	5.6	Acres
5	Sediment Control Log	100	LF



SIDE INLET SWALE X-SECTION
NOT TO SCALE



DITCH X-SECTION
NOT TO SCALE



- *NOTES:
- 1) WORK LIMITS EXTEND FROM TOP OF BANK TO WORK LIMIT STAKES OR AS SHOWN, ON EITHER SIDE OF THE DITCH.
 - 2) EXISTING SPOILS TO BE SPREAD AND SMOOTHED
 - 3) TREES CUT TO 2" OR LESS ABOVE GROUND SURFACE PER SPECIFICATIONS.
 - 4) LEAVE SIDE INLET SWALE OR INSTALL SIDE INLET PIPE IN LOW AREAS TO PROVIDE DRAINAGE AND AS DIRECTED BY ENGINEER.
 - 5) WHEN SEDIMENT REMOVAL DEPTH IS GREATER THAN 1.5', PLACE SPOIL ON BOTH SIDES OF DITCH UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
 - 6) SIDE SLOPES ARE NOT TO BE DISTURBED UNLESS INDICATED IN THE PLANS.
 - 7) TREES AND BRUSH FROM CLEARING OPERATIONS MUST BE DISPOSED OF OFF-SITE AT CONTRACTOR'S EXPENSE.

DITCH CLEANING, SPOIL PLACEMENT, AND WORK LIMITS
NOT TO SCALE

H:\Maple Grove\JBW\6183-0004\CAD\6183-0004 Details.dwg-18 Details-11/13/2020 2:53 PM-(psrorg)

No.	Revision	Date	By



Maple Grove

P: 763.493.4522
F: 763.493.5572

Drawn by
PAS

Checked by
GMM

Date
11-13-2020

Scale
AS SHOWN

BENTON COUNTY DITCH 3
BENTON COUNTY
SAUK RAPIDS, MN

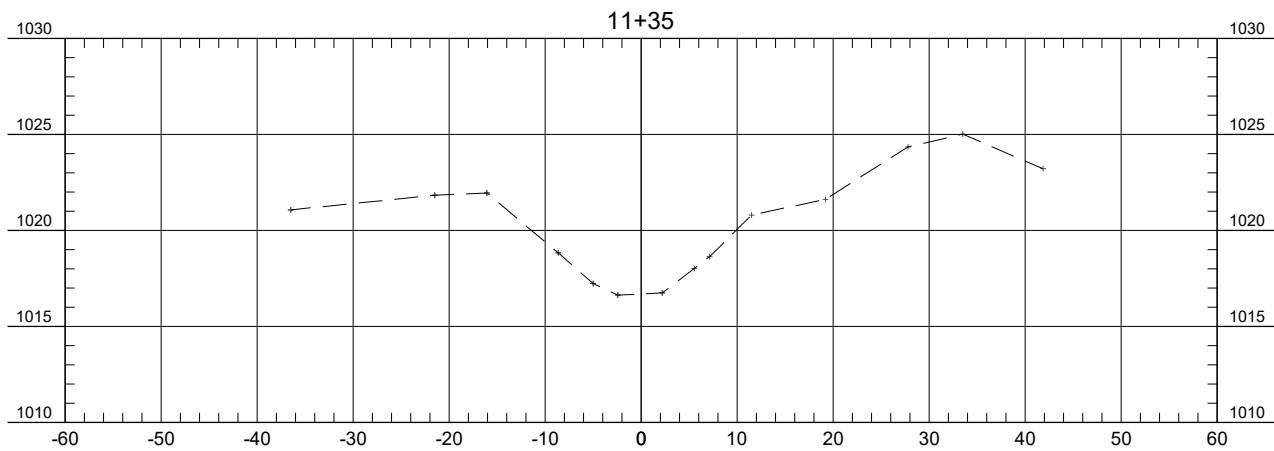
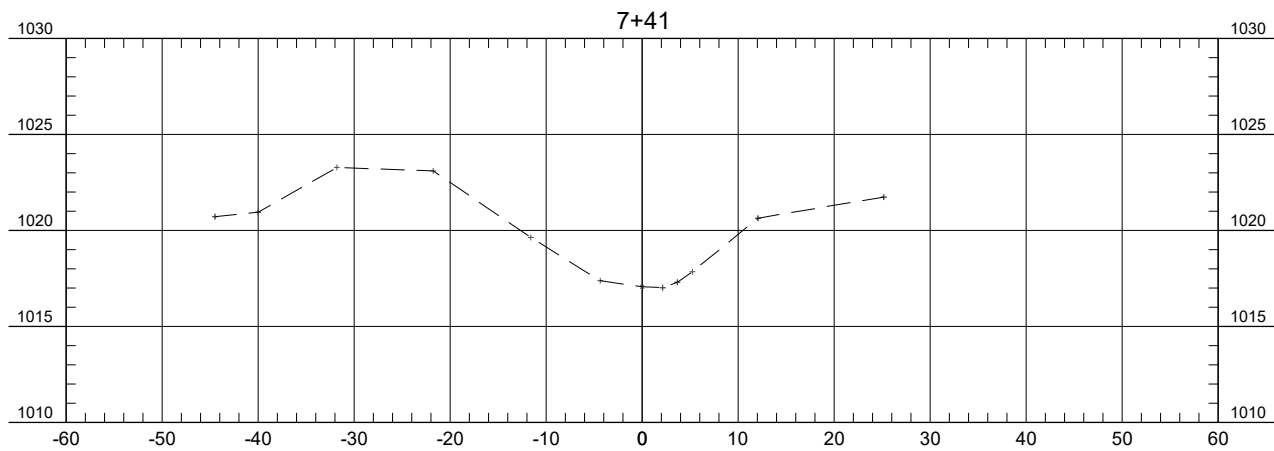
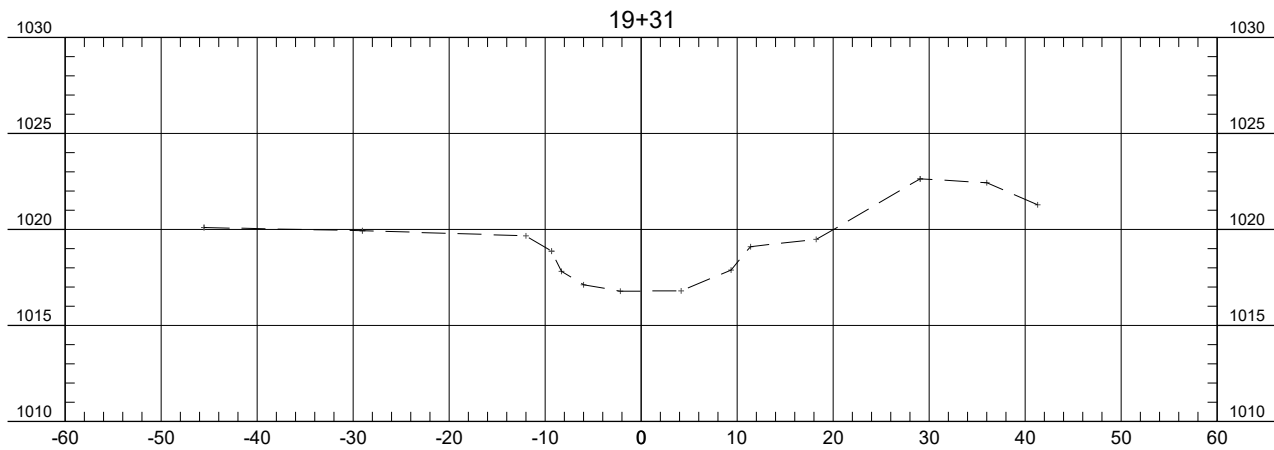
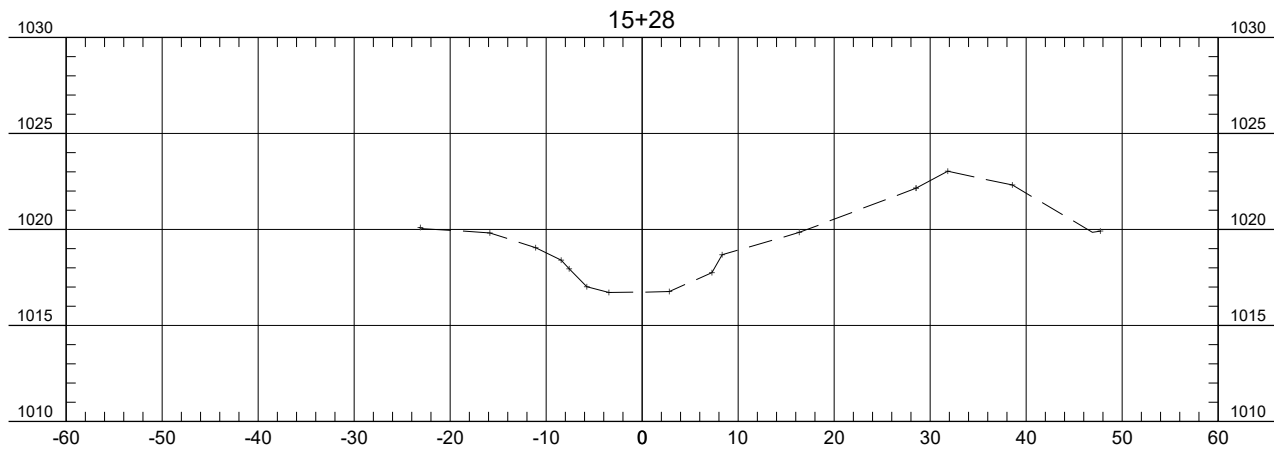
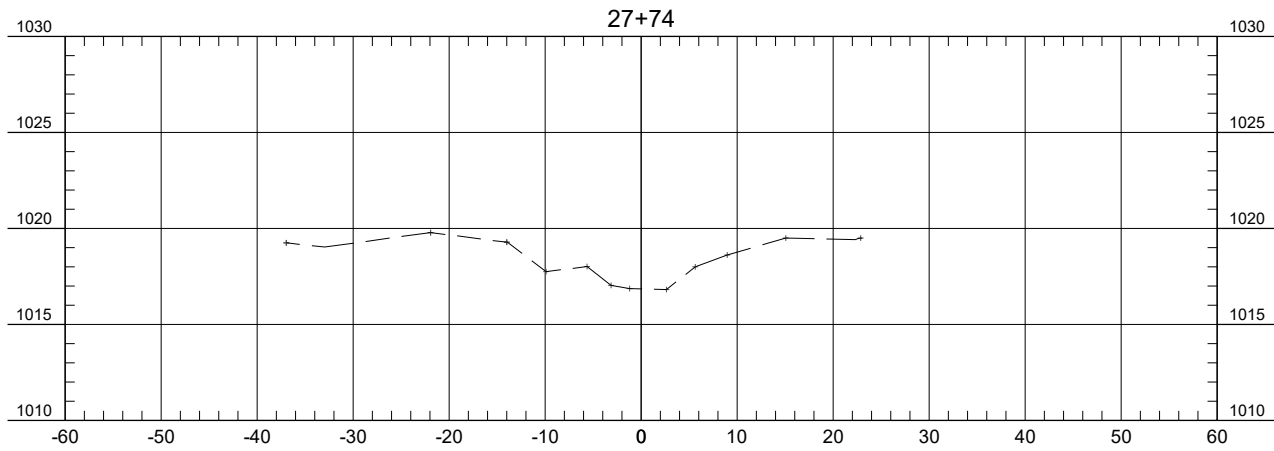
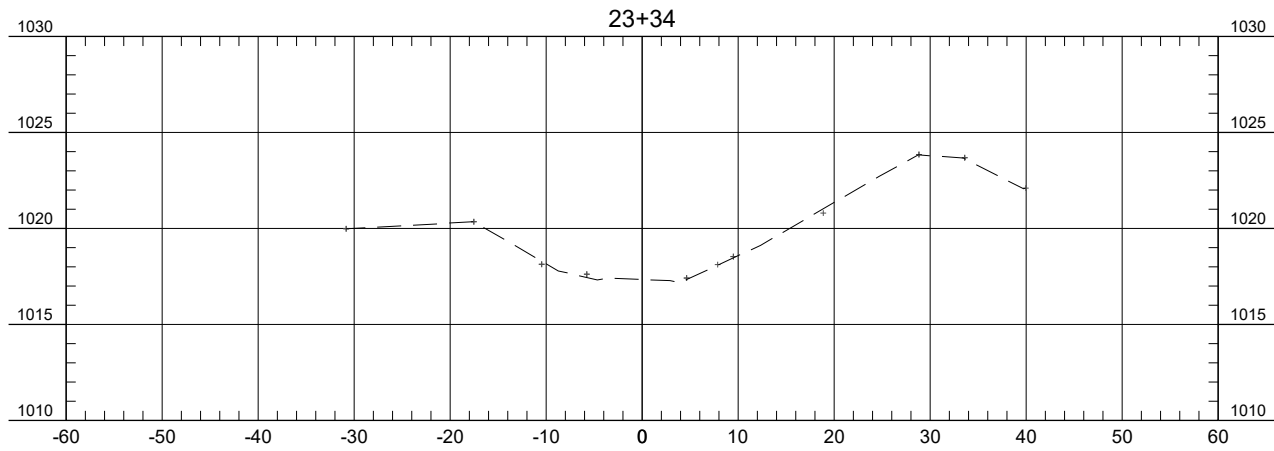
DETAILS & QUANTITIES

PROJECT NO. 6183-0004

SHEET

3 of 4

H:\Maple Grove\JBW\6100\6183\6183-0004\CAD\6183-0004_BentonCo_CD3_XSec.dwg-PLAN AND PROFILE COUNTY DITCH 3 - XSECTION-11/13/2020 2:54 PM-(pstrong)



No.	Revision	Date	By

PRELIMINARY
Not for Construction



Maple Grove

P: 763.493.4522
F: 763.493.5572

Drawn by
PAS

Checked by
GMM

Date
11-13-2020

Scale
AS SHOWN

BENTON COUNTY DITCH 3
BENTON COUNTY
SAUK RAPIDS, MN

CROSS SECTIONS
PROJECT NO. 6183-0004

SHEET
4 of 4

Attachment B: Preliminary Opinion of Probable Construction Cost					
Item Number	Description	Units	Est'd Quantity	Unit Price	Extension
1	Mobilization	Lump Sum	1	\$20,000	\$20,000
2	Traffic Control	Lump Sum	1	\$10,000	\$10,000
3	Temporary and Permanent Removals	Lump Sum	1	\$2,000	\$2,000
4	Tree Clearing	Acre	3.4	\$7,500	\$25,826
5	Excavation of Open Channel (P)	Linear Foot	4100	\$5	\$20,500
6	Spoil Management (P)	Linear Foot	4100	\$2	\$8,200
7	SWPPP Documentation & Reporting	Lump Sum	1	\$2,500	\$2,500
8	Seeding and Mulch (P)	Acre	4.7	\$5,000	\$23,500
9	Sediment Control Log	Linear Foot	100	\$4	\$400
				Construction Subtotal	\$112,900
				Engineering	\$26,500
				Legal/Admin	\$20,000
				Contingency	\$22,600
				TOTAL PROJECT COST	\$182,000