Technical Memorandum

To: Chris Byrd, PE
Benton County Engineer

Cc: Mark Loidolt,
Assistant County Engineer

From: Joe Lewis, PE
Houston Engineering, Inc.

Subject: Reestablishment of Benton County Ditch 10
Public Drainage System Records

Date: October 28, 2022

Project: 6183-0009

Introduction

The purpose of this report is to provide Benton County with the results of an investigation and analysis of the Benton County Ditch 10 (CD 10) public drainage system. CD 10 is an open channel ditch, which serves predominantly agricultural land, located in Mayhew Lake Township and Minden Township. This report contains the necessary description of the alignment; cross-section; profile; hydraulic structure locations, materials, dimensions, and elevations; and right-of-way of the drainage system to reestablish records as requested by the Board of Commissioners. Minnesota Statute 103E.101 subd. 4a allows for the drainage authority to reestablish records if, after an investigation of drainage system records, it is found that the records establishing the alignment, cross-section, profile or right-of-way of a drainage system are lost, destroyed or otherwise incomplete. The drainage authority may, by order, reestablish records defining the alignment; cross-section; profile; hydraulic structure locations, materials, dimensions, and elevations; and right-of-way of the drainage system which define the “As Constructed and Subsequently Improved Condition” or ACSIC. This report documents the investigation of drainage system records and physical investigation of the drainage system used by the engineer to recommend reestablished records to define the alignment, grade, and geometry as necessary to maintain the historic function of the drainage system. No other historical reviews or reviews of the as-constructed profile of this system are known to exist.

RELATIONSHIP TO DRAINAGE SYSTEM MAINTENANCE AND REPAIR

This memorandum describes the ACSIC findings which, if adopted by the drainage authority, will become the basis for drainage authority’s future maintenance and repair considerations. A future repair report may recommend the drainage authority consider alternatives that do not restore the drainage system to the full ACSIC. Additional actions such as realignment or abandonment of portions of the public system, or other

similar modifications may also be considered and ultimately follow procedures in MS 103E. The range of alternatives evaluated within the repair report is based in part on discussions with landowners, permitting agencies, and other interested parties.

DEFINITIONS

This memorandum refers to the condition of the drainage system and therefore by inference the capacity (i.e. the flow rate in cubic feet per second) of the public drainage systems using three definitions:

As-Designed / Established Condition: The geometry of the public drainage system, generally shown on construction plans and engineering drawings, as designed and established by order in 1906 including all subsequent designs for legal repairs and alterations. A repair or alteration is considered legal if conducted under the provisions of Minnesota Statutes, chapter 103E. The details of the As-Designed / Established condition are relatively unknown due to the scarcity of the original design plan and profiles that identify the dimensions, lengths and grade elevations. The As-Designed / Established Condition may or may not reflect the As-Constructed and Subsequently Improved Condition.

As-Constructed and Subsequently Improved Condition: The geometry of the public drainage system as constructed in 1907 including all subsequent legal repairs and alterations as well as other actions which maintain and are consistent with restoring the same hydraulic capacity of the drainage system. Often, survey data (and only rarely as-built drawings) show that the alignment, grade and geometry (i.e., cross sectional area) of the existing public drainage system is altered from the As-Designed / Established Condition. The definition of As-Constructed and Subsequently Improved Condition (ACSIC) is intended to establish the condition to which the system can legally be repaired consistent with the definition in MS 103E.701, which states:

> The term, "repair" means to restore all or a part of a drainage system, as nearly as practicable to the same hydraulic capacity as originally constructed and subsequently improved, including resloping of ditches and leveling of spoil banks if necessary to prevent further deterioration, realignment to original construction if necessary to restore the effectiveness of the drainage system, and routine operations that may be required to remove obstructions and maintain the efficiency of the drainage system. "Repair" also includes:
>
> (1) incidental straightening of a tile system resulting from the tile-laying technology used to replace tiles; and
>
> (2) replacement of tiles with the next larger size that is readily available, if the original size is not readily available.

Available records provide very limited information regarding the originally constructed alignment, grade (profile) and geometry (cross-section) of CD 10. Alterations to the public drainage system alignment, grade and geometry from the As-Designed / Established Condition likely resulted from the use of less accurate survey methods and construction techniques than currently exist, inaccurate culvert and crossing

installation, and a need to "fit" the drainage system to the existing topography. Alterations to the public drainage system that were not performed per the requirements of MS 103E (i.e., ditch law) or its predecessors are typically not considered part of the ACSIC.

Repaired Condition: The condition to which the drainage authority repairs the public drainage system. If the capacity of the Repaired Condition exceeds the ACSIC, the work is considered an improvement under MS 103E and its predecessors. The County may decide for a variety of reasons to repair the public drainage system to some condition less than the As-Constructed and Subsequently Improved Condition.

Maintenance: There is no statutory distinction between the terms maintenance and repair. However, historically, drainage authorities have drawn a distinction between the two terms as a function of the scope of work performed for each. The primary difference between maintenance and repair is that maintenance activities are generally completed at a select (more isolated) location or locations along portions of the public drainage system, rather than a drainage system-wide assessment, analysis, recommendation, or alteration that occurs in association with a repair proceeding.

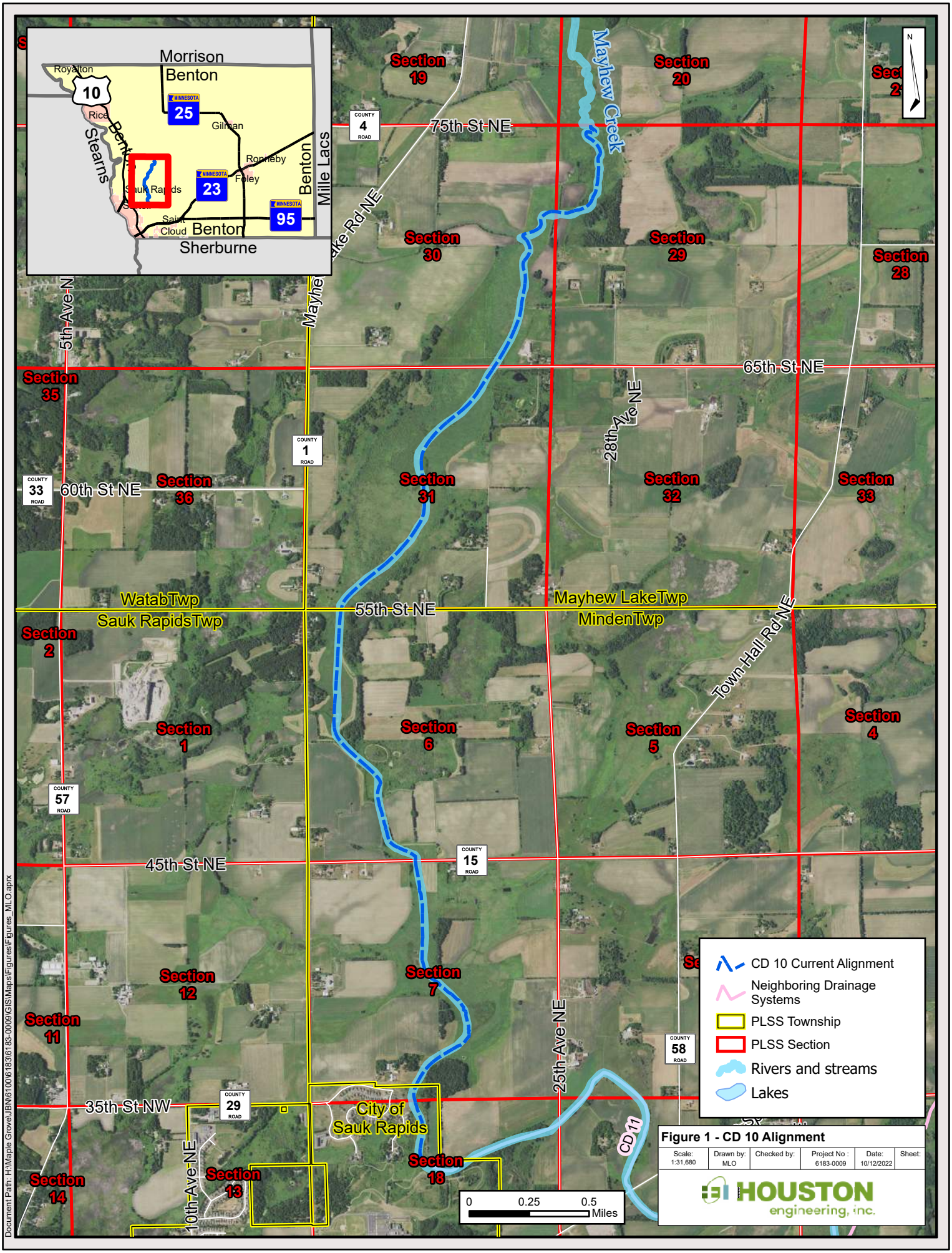
Maintenance generally includes activities such as vegetation management, the removal of open channel and tile blockages (e.g., beaver dams and sediment), the replacement of tile ruptures, the installation of tile inlets and access manholes, the replacement of portions of a tile system, the stabilization and repair of slopes and spoil material, and the removal of sediment up to the repair condition. Maintenance also includes the resetting or resizing of culverts or other crossings which were inaccurately placed and obstructed the public drainage system. Maintenance activities are generally exempt from wetland permitting requirements under the Wetland Conservation Act and Section 404 of the Clean Water Act, with some exceptions.

Location, General Description and History of the Public Drainage System

LOCATION

The Benton CD 10 public drainage system, shown in **Figure 1**, is located in Sections 29, 30 and 31 (T37N R30W) within Mayhew Lake Township and Sections 6, 7 and 18 (T36N R30W) within Minden Township, Benton County. CD 10 consists of one Main Trunk and generally flows from north to south, beginning in the NW quarter of the NW quarter of Section 29 (T37N R30W). This starting point is approximately 1.25 miles south of Mayhew Lake. Mayhew Lake's outlet is Mayhew Creek which becomes CD 10 at this location. CD 10 ends in the SW quarter of the NE quarter of Section 18 (T36N R30W) where it drains into CD 11. CD 10 is approximately 5.47 miles in length. The drainage area that contributes to the CD 10 public drainage system is approximately 26,400 acres (**Figure 2**). This area includes lands drained by CD 6 and CD 7 that outlet into Mayhew Creek upstream of

Mayhew Lake. Excluding these two drainage systems, the contributing drainage area is approximately 21,800 acres. The 1906 Viewers Report identifies 737 acres of benefitted land within the parcels shown in **Figure 3.** The predominant land use in the area is agricultural along with wetland, forest, and rural residential.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Gilman
Ronneby
Foley
MINNESOTA
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Sauk Rapids
Benton
Mille Lacs
MINNESOTA
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Saint Cloud
Benton
Sherburne
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Mayhew Creek
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Section 20
75th St NE
COUNTY 4 ROAD
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COUNTY 33 ROAD
60th St NE
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Section 32
Section 33
WatabTwp
Sauk RapidsTwp
Mayhew LakeTwp
MindenTwp
55th St NE
Town Hall Rd NE
Section 2
Section 1
Section 6
Section 5
Section 4
COUNTY 57 ROAD
COUNTY 15 ROAD
45th St NE
Section 12
Section 7
Section 11
25th Ave NE
COUNTY 58 ROAD
35th St NW
COUNTY 29 ROAD
City of Sauk Rapids
CD 11
10th Ave NE
Section 14
Section 13
Section 18
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0.25
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Miles
CD 10 Current Alignment
Neighboring Drainage Systems
PLSS Township
PLSS Section
Rivers and streams
Lakes
Figure 1 - CD 10 Alignment
Scale: 1:31,680
Drawn by: MLO
Checked by:
Project No : 6183-0009
Date: 10/12/2022
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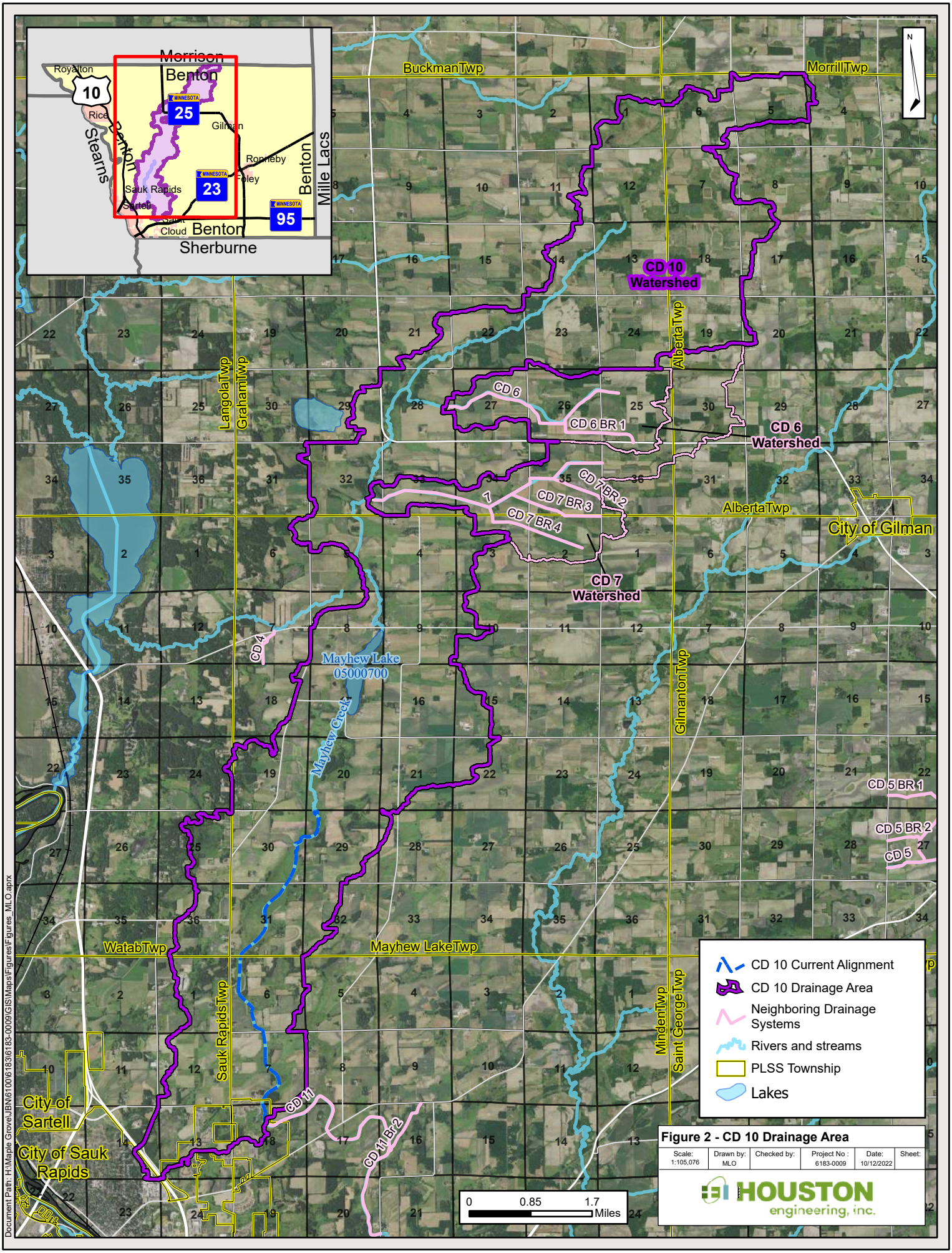

Figure 2 - CD 10 Drainage Area

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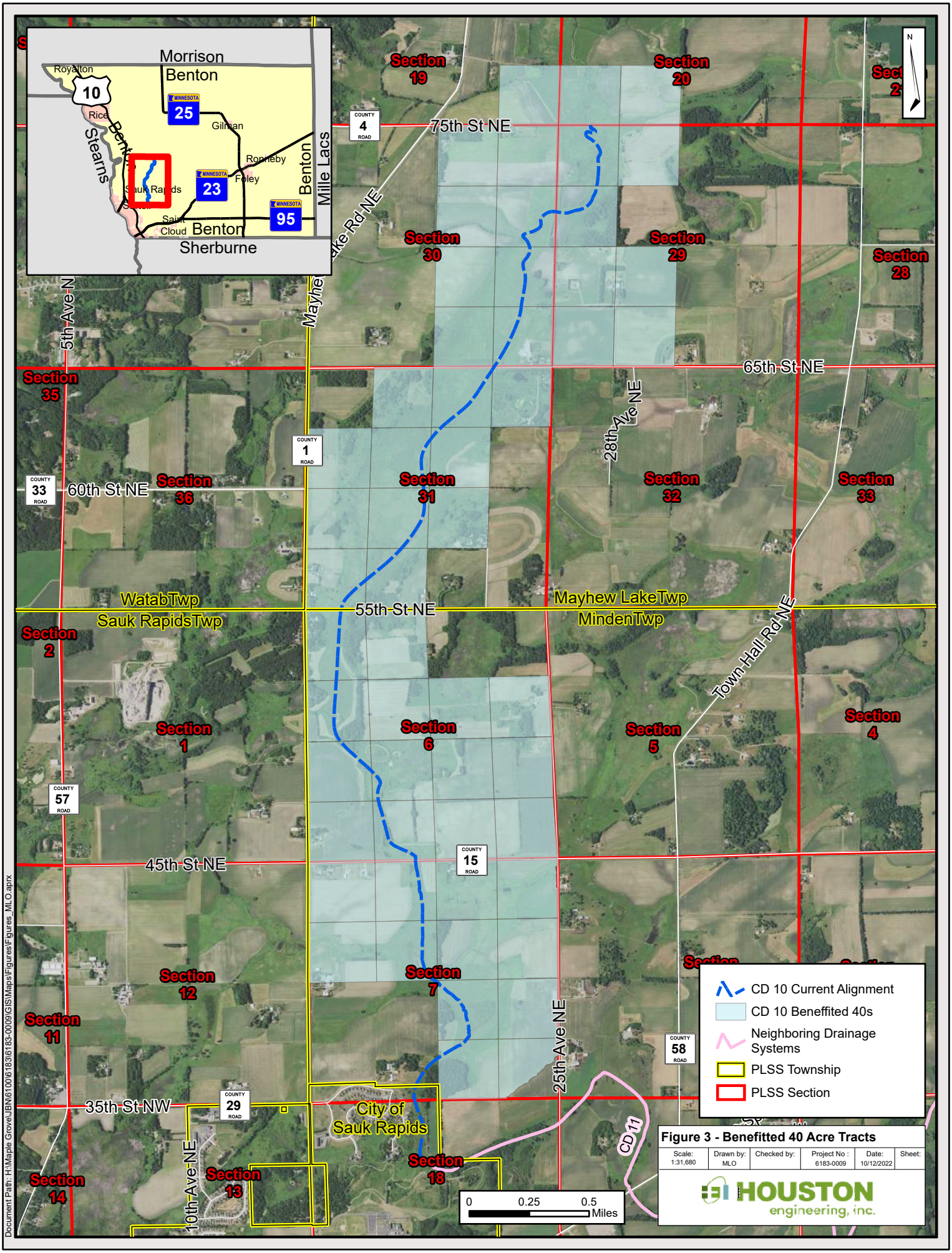
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COUNTY 4 ROAD
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28th Ave NE
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COUNTY 33 ROAD
60th St NE
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WatabTwp
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55th St NE
Mayhew LakeTwp
MindenTwp
Town Hall Rd NE
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Section 5
Section 4
COUNTY 57 ROAD
COUNTY 15 ROAD
45th St NE
Section 12
Section 7
Section 11
25th Ave NE
COUNTY 58 ROAD
35th St NW
COUNTY 29 ROAD
City of Sauk Rapids
10th Ave NE
Section 13
Section 18
Section 14
CD 11
CD 10 Current Alignment
CD 10 Beneffited 40s
Neighboring Drainage Systems
PLSS Township
PLSS Section
0
0.25
0.5
Miles
Figure 3 - Benefitted 40 Acre Tracts
Scale: 1:31,680
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HISTORY OF THE PUBLIC DRAINAGE SYSTEM

A petition for the system was filed on March 24, 1906 and an order to establish was filed on August 24, 1906 by the Benton County Board. The Acceptance of Engineer for the completion of construction of the ditch was filed on July 9, 1907. No major repairs or modifications to the ditch were recorded based on a review of the historical documents. The extension of CSAH 4 roadway crossing culverts over CD 10 to accommodate roadway improvements is documented through several letter communications and Drainage Authority meeting minutes from 2001 and 2002. Documentation includes correspondence from the Minnesota Department of Natural Resources (MnDNR) regarding permitting requirements of the culvert extension.

EXISTING/CURRENT ALIGNMENT

This portion of the memorandum describes the current condition of the public drainage system as observed "on-the-ground" (i.e., existing) as determined by a review of the available records, field survey, aerial imagery, and other available historical evidence. The stationing used to describe the alignment proceeds from downstream to upstream. **Attachment A** shows the system's existing alignment and stationing. All references to stationing in this report refer to the stationing established in **Attachment A**.

Main Trunk:
The downstream end of the Main Trunk alignment begins in the SW quarter of the NE quarter of Section 18 (T36N R30W) at Sta. 0+00, where it drains into CD 11. The alignment proceeds northwest until Sta. 6+00 where it turns North until Sta. 26+00 and then proceeds northeast. The alignment begins to turn northwest at Sta. 40+00 until Sta. 58+00 and then proceeds north. The alignment crosses CSAH 15 at Sta. 82+31 and turns northwest until Sta. 117+00 where it turns north. The alignment crosses 55th St NE at Sta. 145+54 and turns northeast until Sta. 174+00 and then proceeds north until Sta. 188+00 and then turns northeast until going under CSAH 4 at Sta. 214+15. The alignment then proceeds north until it begins to meander at Sta. 238+00, turning east at Sta. 253+00, then turning back north at Sta. 266+00, meandering towards its terminus at Sta. 288+93. The alignment ends on the northern boundary of Section 29 (T37N R30W) in the NW quarter of the NW quarter.

SOURCE OF SURVEY DATA USED IN THIS ASSESSMENT

Survey data was collected in June 2022 to determine the existing condition of the public drainage system. All survey data collected utilizes the Benton County Coordinate System and North American Vertical Datum 1988 (NAVD'88).

KNOWN SYSTEM MODIFICATIONS OR PROCEEDINGS

No major system modifications are known to have occurred since establishment. **Figure 1** shows the current alignment of the open channel and roadway crossings as determined by review of the available records, field survey, aerial imagery, and other available evidence. This alignment generally matches the as-designed alignment

Analysis of Current Function in Historical Context

AS-CONSTRUCTED AND SUBSEQUENTLY IMPROVED GRADE AND GEOMETRY

Ideally, the grade of the ACSIC would be determined through the use of as-built drawings that identify the constructed alignment, grade and geometry. However, since as-built plans were rarely recorded for public drainage systems in the early 20th century, engineers have frequently utilized profile drawings or cut-sheets from the original designs in conjunction with test pits or soil borings to determine and corroborate the ACSIC, as is the case with CD 10. Profile drawings and cut sheets are available from the engineer's report from June 6, 1906 containing the design profile for CD 10 based on a local datum. While not an as-built documenting the exact constructed grades, the design information still provides pertinent data regarding the intended grades on the system. During recent survey, soil borings were collected approximately every 1,000-feet along CD 10. Generally speaking, strictly relying on any single soil boring to define the ACSIC grade at a given location may not yield a practical determination of the ACSIC due to the inherent variability of soil boring data during its collection. However, utilizing the soil borings in aggregate, in conjunction with historic design profiles and other relevant historic data, provides the most likely grade/depth of the ACSIC. The ACSIC profile development began with a statistical comparison of the soil borings and design profile as described in the following paragraphs.

Comparison of Design Profiles and Soil Borings

The original 1906 design profiles were based on an assumed or local vertical datum referring to a benchmark no longer in existence. To determine the ACSIC in a modern vertical datum, field surveyed soil boring elevations identifying where material transitions from accumulated sediment to native mineral soil were used to calculate "as-built" excavation depths. Soil borings were excavated along the system as shown in **Attachment A**. In total, 27 soil borings were collected during the field survey.

A statistical comparison of the soil borings elevations and original design profile elevations was then performed. Through the comparison process, a datum adjustment factor was calculated to convert the design profile from the local datum to NAVD 88. Soil borings elevations that were not within one standard deviation from the datum adjustment calculated from the entire set of soil boring elevations were deemed to be outliers and were removed from the datum adjustment calculation. **Table 1** displays the calculations and results.

When the statistical analysis was completed and the outliers removed, the design grade fit the soil borings relatively closely upstream of STA 133+63, but did not fit the soil borings well downstream of STA 133+63. This indicates that the upstream portion of the ditch was constructed per plan, but the downstream portion was excavated to an alternative grade. Therefore, a best fit approach was used to develop a recommended ACSIC downstream of STA 133+63.

The resulting profile, shown in **Attachment A,** provides a good correlation to the soil borings throughout the length of the system and accurately represents the ACSIC profile using the best available information.

Table 1: CD 10 Main Trunk Profile Determination

	All Soil Borings			Soil Borings (excluding soil borings downstream of Sta 80+00)		ACSIC Recommendation**	
Station	Soil Boring Elev.	Datum Adjustment (+982.64)	Deviation from Profile	Datum Adjustment (+983.06)	Deviation from Best Fit Profile	Recommend ACSIC Elevation	Deviation from Recommended ACSIC Profile
1+85	1059.74	1061.72*	1.98	-	-	1060.52	0.78
9+01	1060.95	1062.05*	1.10	-	-	1060.92	-0.03
19+36	1061.45	1062.51	1.06	-	-	1061.49	0.04
29+41	1063.14	1062.96	-0.18	-	-	1062.05	-1.09
39+66	1062.63	1063.42	0.79	-	-	1062.61	-0.02
50+09	1062.2	1063.89*	1.69	-	-	1063.19	0.99
60+59	1063.11	1064.37*	1.26	-	-	1063.77	0.66
70+50	1063.22	1064.81*	1.59	-	-	1064.32	1.10
80+60	1064.67	1065.26	0.59	1065.69*	1.02	1064.88**	0.21
90+94	1066.45	1065.68*	-0.77	1066.10	-0.35	1065.45**	-1.00
100+96	1065.61	1066.08	0.47	1066.50*	0.89	1066.00**	0.39
111+75	1067.48	1066.51*	-0.97	1066.93*	-0.55	1066.60**	-0.88
122+70	1067.69	1066.95*	-0.74	1067.37	-0.32	1067.21**	-0.48
132+67	1067.67	1067.35	-0.32	1067.77	0.10	1067.76**	0.09
142+66	1068.34	1067.75	-0.59	1068.17	-0.17	1068.17	-0.17
153+83	1068.9	1068.19	-0.71	1068.62	-0.28	1068.62	-0.28
163+85	1068.8	1068.59	-0.21	1069.02	0.22	1069.02	0.22
173+91	1069.23	1069.00	-0.23	1069.42	0.19	1069.42	0.19

		All Soil Borings		Soil Borings (excluding soil borings downstream of Sta 80+00)		ACSIC Recommendation**	
185+86	1069.65	1069.47	-0.18	1069.90	0.25	1069.90	0.25
206+22	1070.69	1070.29	-0.40	1070.71	0.02	1070.71	0.02
227+54	1071.9	1071.08*	-0.82	1071.51	-0.39	1071.50	-0.40
237+59	1070.92	1071.43	0.51	1071.86*	0.94	1071.86	0.93
248+76	1072.03	1071.83	-0.20	1072.25	0.22	1072.25	0.22
258+97	1073.53	1072.19*	-1.34	1072.61*	-0.92	1072.61	-0.92
268+87	1072.26	1072.53	0.27	1072.96	0.70	1072.96	0.69
278+54	1071.6	1072.87*	1.27	1073.30*	1.70	1073.30	1.69
282+36	1073.62	1073.01	-0.61	1073.43	-0.19	1073.43	-0.19
		RMSE of 0.52 feet		RMSE of 0.31 feet			

*Indicates outlier that was not used in determining the datum adjustment factor as they were not within one standard deviation from the datum adjustment calculated from the entire set of soil borings.

**Between STA 80+00 and 133+63, the recommended ACSIC transitions between the visual best fit utilized below STA 80+00 and the calculated datum adjusted historic design profile upstream of STA 133+63.

Crossings of the Public Drainage System

The public drainage system record does not show that any of the road or field crossings were constructed as part of the original ditch construction. They were likely installed after construction of CD 10 as part of field crossing construction by private landowners or as part of public road projects. Therefore, the culverts are not a component of the CD 10 public drainage system.

Note that several of the culverts are substantially higher than the ACSIC grade. This is because road authorities and landowners historically have placed culverts at the top of existing sediment, rather than the historic channel bottom, to avoid rapid sedimentation in the newly constructed culvert. (This is particularly true along public drainage systems with little or no record of maintenance, such as CD 10).

ACSIC Cross-sectional Geometry

The 1906 engineer's report for the establishment of the ditch indicates from STA 0+00 to 100+00 a bottom width of 4 feet and from STA 100+00 to 280+00 a bottom width of 5 feet, with 1:1 side slopes for the entire length. This planned bottom width is generally consistent with the surveyed cross-sections of the current ditch though the top width of the ditch is somewhat wider than that indicated in the established plans.

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. This combination of 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 4** shows the area estimated to have been utilized during construction. The following paragraphs describe the development of the ROW area estimate.

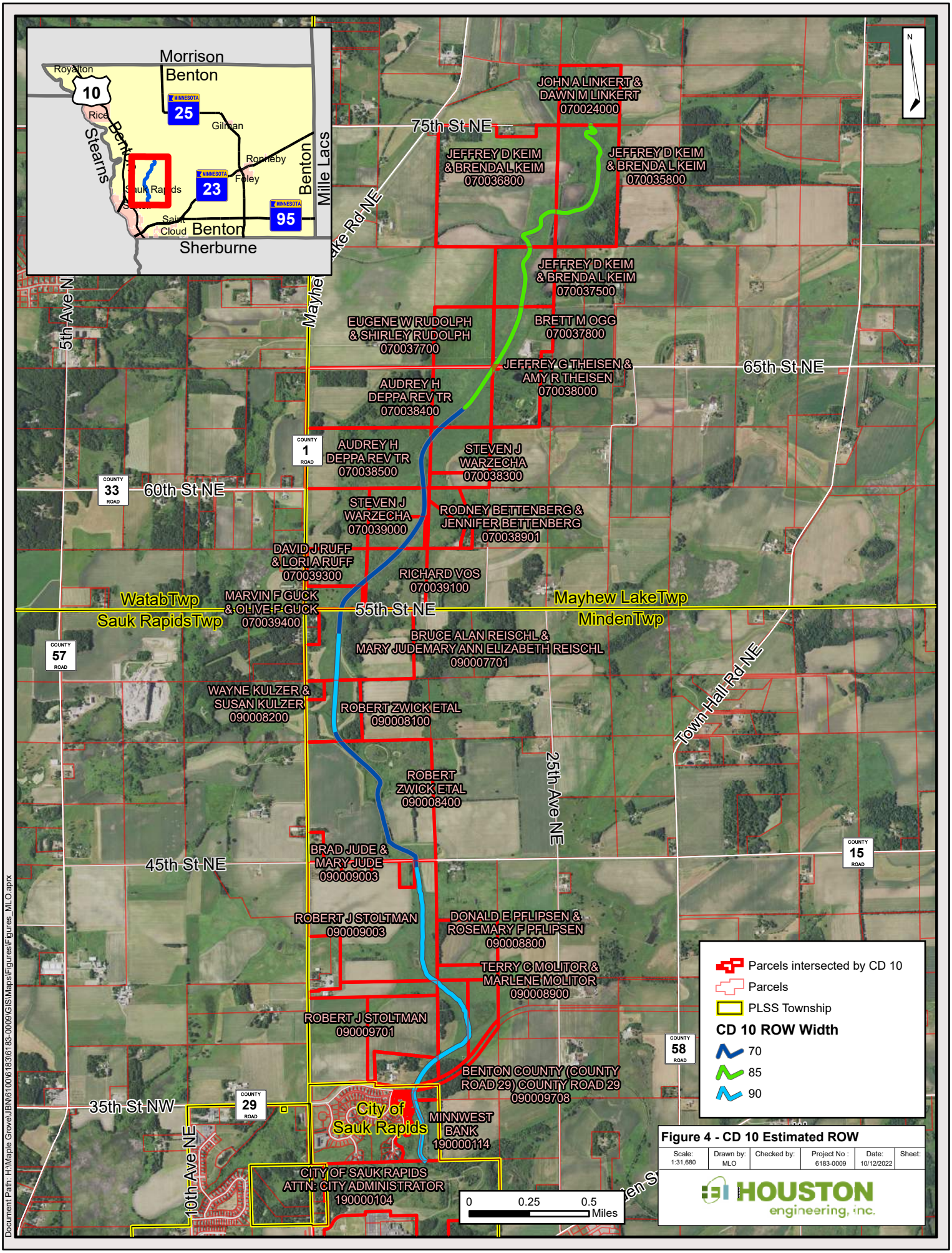
Project specifications available from the establishment of the ditch specify that the width of the spoil pile must not be greater than the width of the channel, with at least a 4 foot offset from the top edge of the channel. Exhibit 2 of the 1906 Engineer's Report includes cut sheets listing the designed depth of cut and channel top width. Using this information, the width of the spoil pile was calculated assuming 3:1 in-slopes and 10:1 field slopes as was common practice of the time. If the calculated spoil pile width was wider than the top width of the channel, then the width of the channel was used as the spoil spile width. If the spoil width was less than 25 feet, a minimum of 25 feet was applied.

The channel top width listed in the 1906 Engineer's Report was reviewed and determined to be less than the actual top width of the channel estimated from aerial photographs and recent field survey. In determining the ROW, the actual top width was used along with the spoil pile width calculation estimates.

The total ROW width varied along the ditch system, but sections of the ditch were grouped based on similar widths. Total ROW widths for CD 10, centered on the channel, can be found in **Table 3** and are mapped in **Figure 4.**

Table 3. ROW Widths for CD 10

	Downstream Station	Upstream Station	ROW Width (ft)
Main Trunk	0+00	80+00	90
	80+00	110+00	70
	110+00	130+00	90
	130+00	190+00	70
	190+00	288+93	85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Mille Lacs
Ronneby
Foley
Sauk Rapids
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95
Saint Cloud
Benton
Sherburne
N
JOHN A LINKERT & DAWN M LINKERT 070024000
75th St NE
JEFFREY D KEIM & BRENDA L KEIM 070036800
JEFFREY D KEIM & BRENDA L KEIM 070035800
Mayhew Lake Rd NE
JEFFREY D KEIM & BRENDA L KEIM 070037500
5th Ave N
EUGENE W RUDOLPH & SHIRLEY RUDOLPH 070037700
BRETT M OGG 070037800
JEFFREY G THEISEN & AMY R THEISEN 070038000
65th St NE
AUDREY H DEPPA REV TR 070038400
COUNTY 1 ROAD
AUDREY H DEPPA REV TR 070038500
STEVEN J WARZECHA 070038300
COUNTY 33 ROAD
60th St NE
STEVEN J WARZECHA 070039000
RODNEY BETTENBERG & JENNIFER BETTENBERG 070038901
DAVID J RUFF & LORI A RUFF 070039300
RICHARD VOS 070039100
WatabTwp
Sauk RapidsTwp
MARVIN F GUCK & OLIVE F GUCK 070039400
55th St NE
Mayhew LakeTwp
MindenTwp
BRUCE ALAN REISCHL & MARY JUDEMARY ANN ELIZABETH REISCHL 090007701
COUNTY 57 ROAD
WAYNE KULZER & SUSAN KULZER 090008200
ROBERT ZWICK ETAL 090008100
Town Hall Rd NE
ROBERT ZWICK ETAL 090008400
25th Ave NE
BRAD JUDE & MARY JUDE 090009003
45th St NE
COUNTY 15 ROAD
ROBERT J STOLTMAN 090009003
DONALD E PFLIPSEN & ROSEMARY F PFLIPSEN 090008800
TERRY C MOLITOR & MARLENE MOLITOR 090008900
ROBERT J STOLTMAN 090009701
COUNTY 58 ROAD
BENTON COUNTY (COUNTY ROAD 29) COUNTY ROAD 29 090009708
35th St NW
COUNTY 29 ROAD
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MINNWEST BANK 190000114
10th Ave NE
CITY OF SAUK RAPIDS ATTN: CITY ADMINISTRATOR 190000104
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Parcels intersected by CD 10
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CD 10 ROW Width
70
85
90
Figure 4 - CD 10 Estimated ROW
Scale: 1:31,680
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REGULATORY IMPACTS

As shown in **Figure 5,** the CD 10 public drainage system intersects wetlands identified in the U.S. Fish and Wildlife Service National Wetland Inventory (NWI). Additionally, the drainage system channel is identified as a Public Watercourse by the MnDNR's Public Waters Inventory. Under most regulatory programs (i.e. Minnesota Wetland Conservation Act (WCA), Federal Clean Water Act (CWA); and Minnesota Public Waters Law), activities related to repair of a public drainage system, though potentially taking place within the confines of wetlands, are not considered to result in jurisdictional wetland loss. These activities related to public drainage system maintenance include:

- Excavation in wetlands when limited to removal of sediment or debris such as trees, logs, stumps, beaver dams, blockage of culverts, 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 culverts and related drainage structures; and
- Temporary or seasonal water level management activities done for the purpose of performing maintenance.

As seen in **Figure 5**, CD 10 is listed as a Public Ditch / Altered Watercourse by the Minnesota Public Waters Inventory. Repair work on a public drainage system does not require a Public Waters permit or permission from the MnDNR. However, notification should be given to the MnDNR prior to repair activities.

Under the CWA, all repair, regardless of wetland impacts, is exempt from regulation. Under the WCA, activities related to maintenance or repair of a public drainage system that may result in wetland impacts but 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.

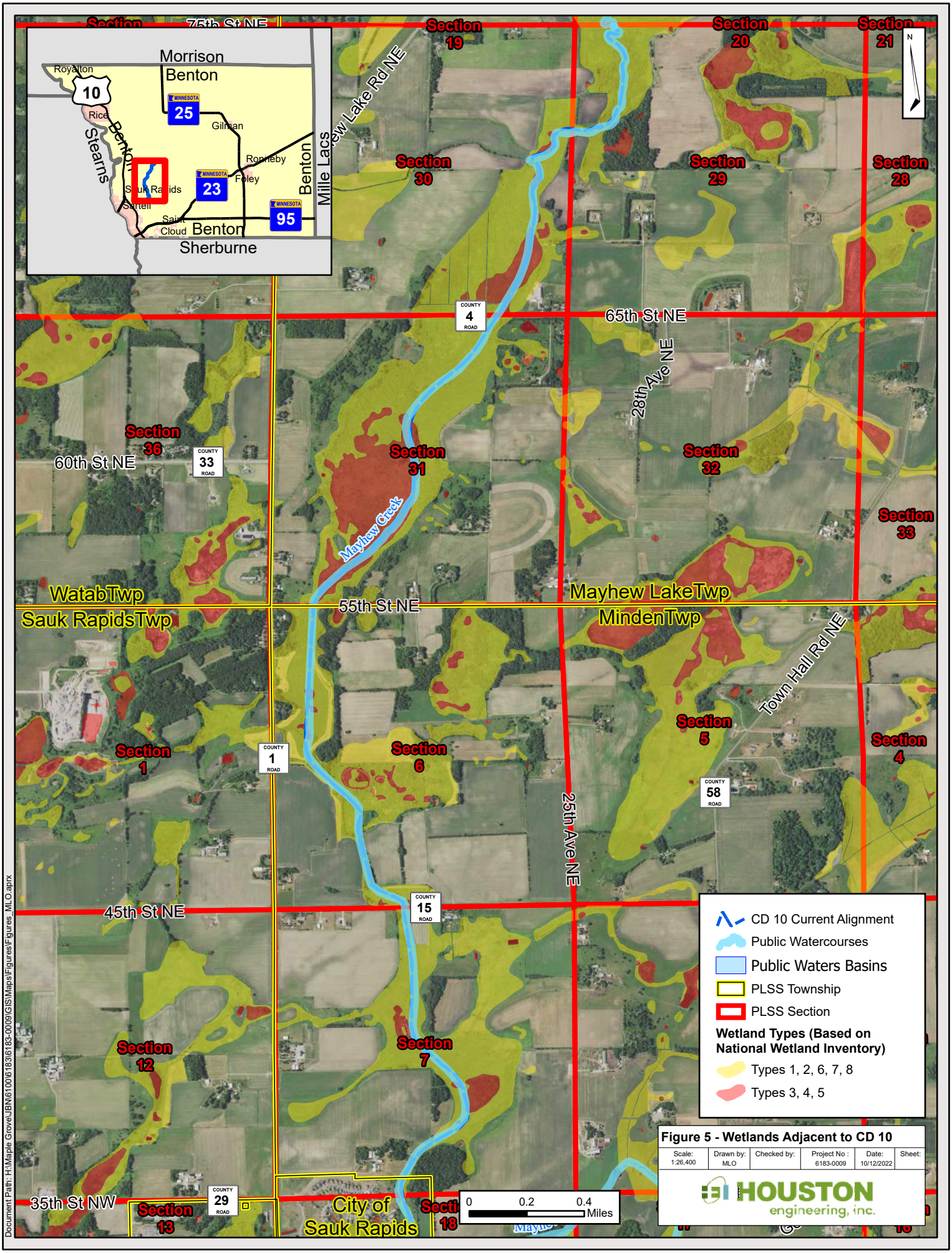
Activities considered to be "no-loss" or exempt from replacement do not require wetland replacement plans under the WCA. Though not required, in these cases it may be prudent for the drainage authority to apply to the local government unit (LGU) for a no-loss or exemption decision prior to proceeding with the maintenance activity. The LGU for this location is Benton County.

Several public drainage system repair activities may result in wetland impacts that are not exempt under the WCA and require wetland replacement. These activities include, but are not limited to:

- Maintenance or repair of a public drainage system which drains Type 3, 4, or 5 wetlands that have existed for more than 25 years; and

- Maintenance or repair of a public drainage system not authorized by the drainage authority.

HEI reviewed the NWI and a series of aerial photography to assess the wetland types present within the drainage system corridor, and we find that the NWI to be generally representative of the wetland types present. Most wetlands within and adjacent to the drainage system channel appear to be Type 1, 3, 5 and 6 wetlands. There are several large complexes of what appears to be Type 3 and 5 wetlands within the northern half of the drainage system area, along with a few other smaller complexes throughout the remainder of the drainage system corridor. Depending on the degree of repair likely needed, the wetland types should be confirmed in the field, and potential impacts should be assessed in further detail via the repair report.


Morrison
Benton
Royalton
10
Rice
Stearns
Benton
25
Gilman
Rockville
Foley
Sauk Rapids
Sartell
23
Saint Cloud
Benton
Sherburne
95
Mille Lacs
Section 19
Section 20
Section 21
Section 30
Section 29
Section 28
Section 31
Section 32
Section 33
Section 36
Section 1
Section 6
Section 5
Section 4
Section 12
Section 7
Section 13
Section 18
New Lake Rd NE
65th St NE
28th Ave NE
60th St NE
Mayhew Creek
55th St NE
Watab Twp
Sauk Rapids Twp
Mayhew Lake Twp
Minden Twp
Town Hall Rd NE
25th Ave NE
45th St NE
35th St NW
City of Sauk Rapids
COUNTY 4 ROAD
COUNTY 33 ROAD
COUNTY 1 ROAD
COUNTY 58 ROAD
COUNTY 15 ROAD
COUNTY 29 ROAD
N
CD 10 Current Alignment
Public Watercourses
Public Waters Basins
PLSS Township
PLSS Section
Wetland Types (Based on National Wetland Inventory)
Types 1, 2, 6, 7, 8
Types 3, 4, 5
0
0.2
0.4
Miles
Figure 5 - Wetlands Adjacent to CD 10
Scale: 1:26,400
Drawn by: MLO
Checked by:
Project No : 6183-0009
Date: 10/12/2022
Sheet:
HOUSTON engineering, inc.
Document Path: H:\Maple Grove\JBN\61006183\6183-0009\GIS\Maps\Figures\Figures_MLO.aprx

RECOMMENDATIONS

The Drainage Authority initiated proceedings to correct the drainage system record through a resolution and order by the County Board. This report having been completed and filed, the engineer recommends that the Drainage Authority schedule, notice and hold a public hearing, and consider adopting corrected records consistent with this report. The corrected drainage system records should be based on the alignment, grade, and geometry described within this historical review and in **Attachment A**. The alignment, grade, and geometry are, in the Opinion of the Engineer, necessary to reestablish the historic function of the legal drainage system to be the basis for maintenance and repair of the public drainage systems. We further recommend that the Drainage Authority submit the alignment, grade and geometry of the ACSIC to the Minnesota Department of Natural Resources and the Benton County Soil and Water Conservation District for their review and concurrence.

AVAILABLE INFORMATION/HISTORIC RECORDS

Historic records for the CD 10 public drainage system were provided by the County. The following documents have been specifically utilized or referenced for this report:

- 1906 Petition for Public Ditch by Landowners.
- 1906 Engineer's report for County Ditch 10.
- 1906 Exhibit 2 of engineer's report including cut sheets.
- 1906 Exhibit 1 of engineer's report including the horizontal plan and vertical profile for County Ditch 10.
- Date unknown, estimate of cost for County Ditch 10.
- Date unknown, viewer's report for County Ditch 10.
- 1906 Order establishing County Ditch 10 by Benton County.
- County Ditch 10 Original Specifications.

ATTACHMENT A – BENTON COUNTY DITCH 10 PLAN AND PROFILE DRAWINGS

MAYHEW CREEK - COUNTY DITCH 10
BENTON COUNTY, MN

MAYHEW LAKE & MINDEN TOWNSHIPS

OCTOBER 2022

HOUSTON engineering, inc.
7550 MERIDIAN CIR N
SUITE 120
MAPLE GROVE, MN 55369
P: 763.493.4522
T: 1.866.319.2040
www.houstoneng.com

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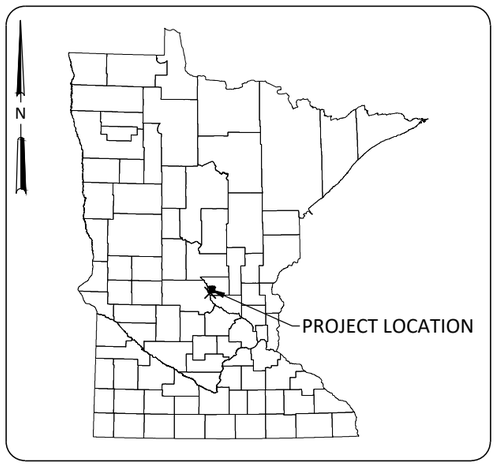
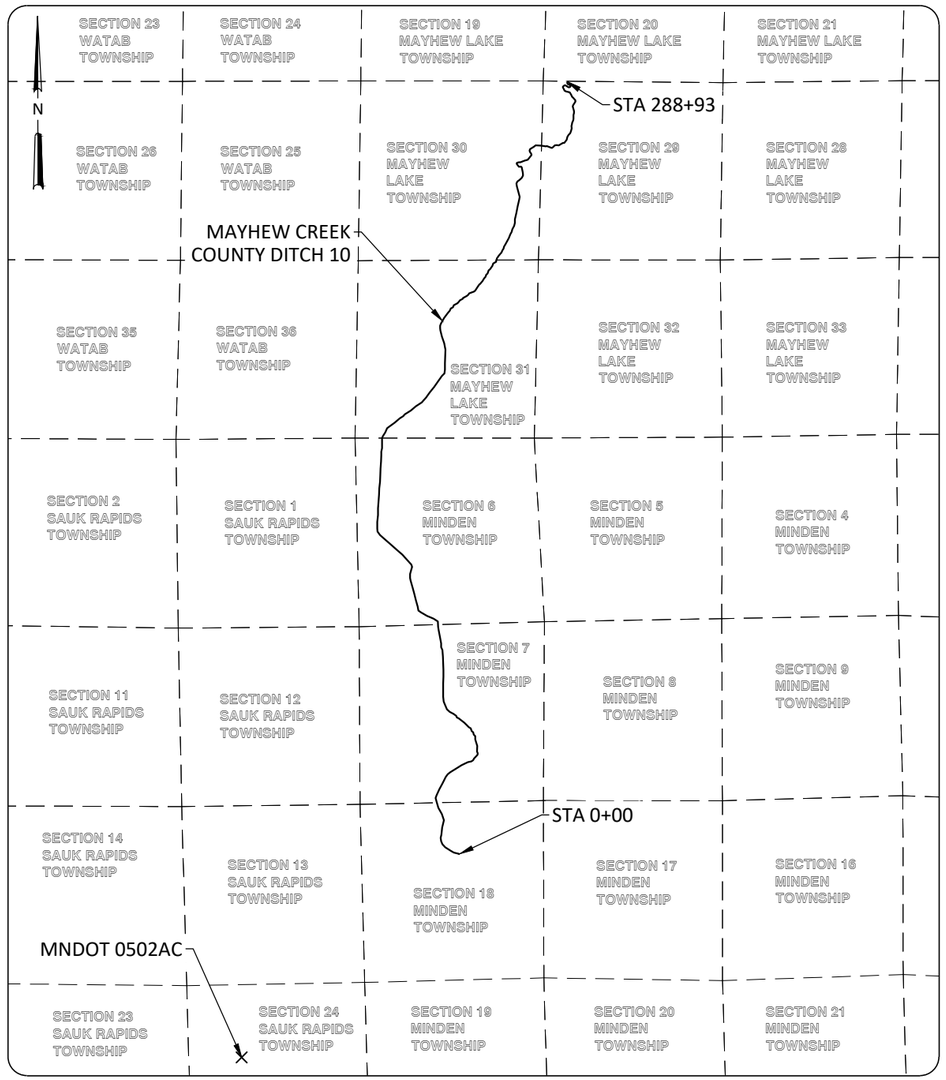
SHEET #	SHEET TITLE
1	TITLESHEET
2	STA 0+00 - 58+00
3	STA 58+00 - 116+00
4	STA 116+00 - 174+00
5	STA 174+00 - 232+00
6	STA 232+00 - END



VINCINITY MAP



LOCATION MAP

NOTES:

1. GEODETIC CONTROL

   VERTICAL: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

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

   BENCHMARK: MNDOT 0502AC, NW QUARTER, SECTION 24, TOWNSHIP 36N, RANGE 31W

   IN SAUK RAPIDS, 2.2 MILES NORTH ALONG TRUNK HIGHWAY 10 FROM THE JUNCTION OF TRUNK HIGHWAY 10 AND TRUNK HIGHWAY 23 IN ST. CLOUD, AT TRUNK HIGHWAY 10 MILEPOINT 175.55, 68.4 FEET EAST-NORTHEAST OF WESTBOUND TRUNK HIGHWAY 10, 86.5 FEET WEST OF THE RAMP TO COUNTY ROAD 3, 1.5 FEET WEST-SOUTHWEST OF A WITNESS POST.

   FIELD SURVEY COMPLETED BY HOUSTON ENGINEERING STAFF IN MAY OF 2022.

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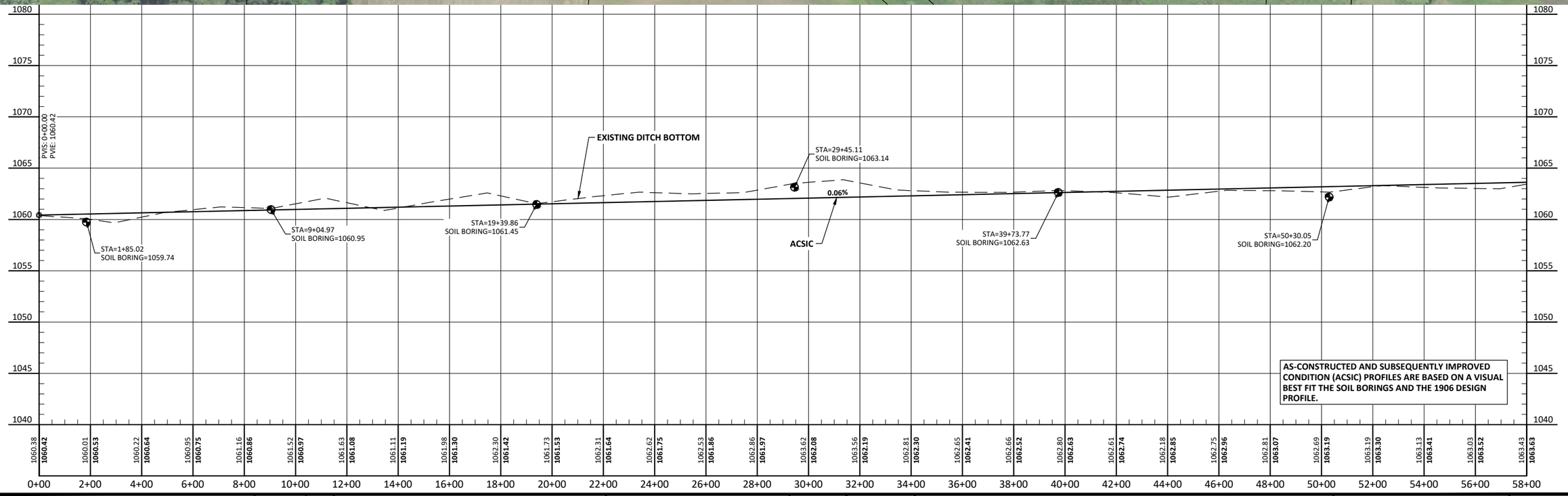

No.	Revision	Date	By

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HOUSTON engineering, inc.

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MAYHEW CREEK - COUNTY DITCH 10
BENTON COUNTY, MN
MAYHEW LAKE & MINDEN TOWNSHIPS

STA 0+00 - 58+00

PROJECT NO. 6183-0009

SHEET 2

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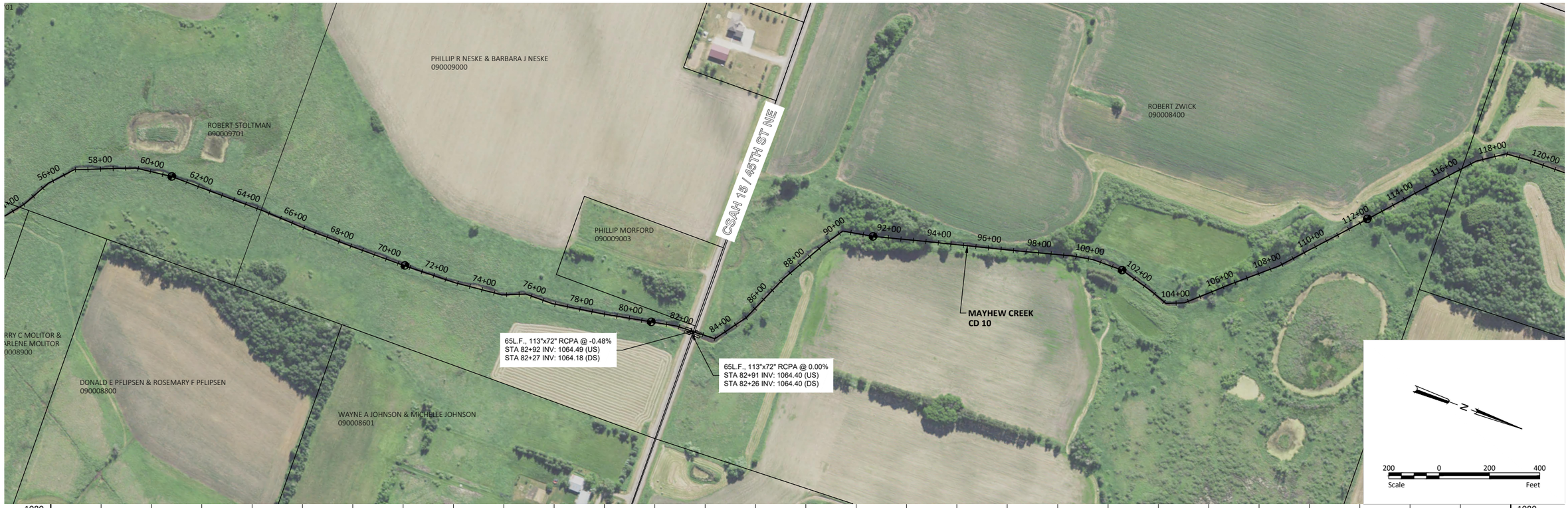

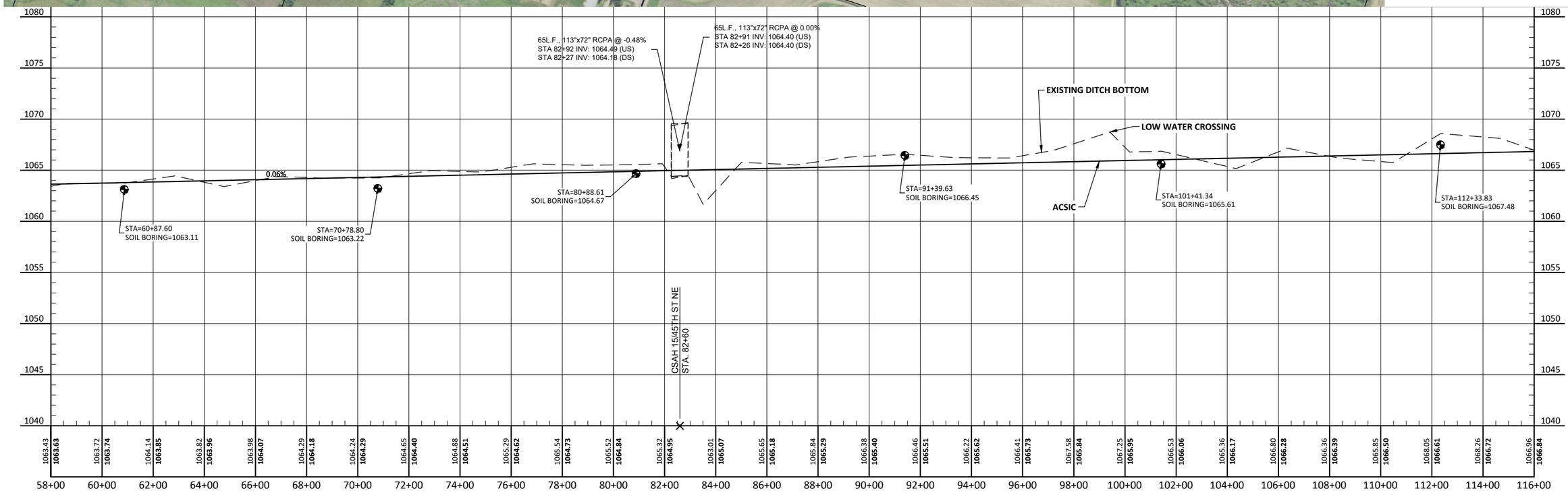

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BENTON COUNTY, MN
MAYHEW LAKE & MINDEN TOWNSHIPS

STA 58+00 - 116+00

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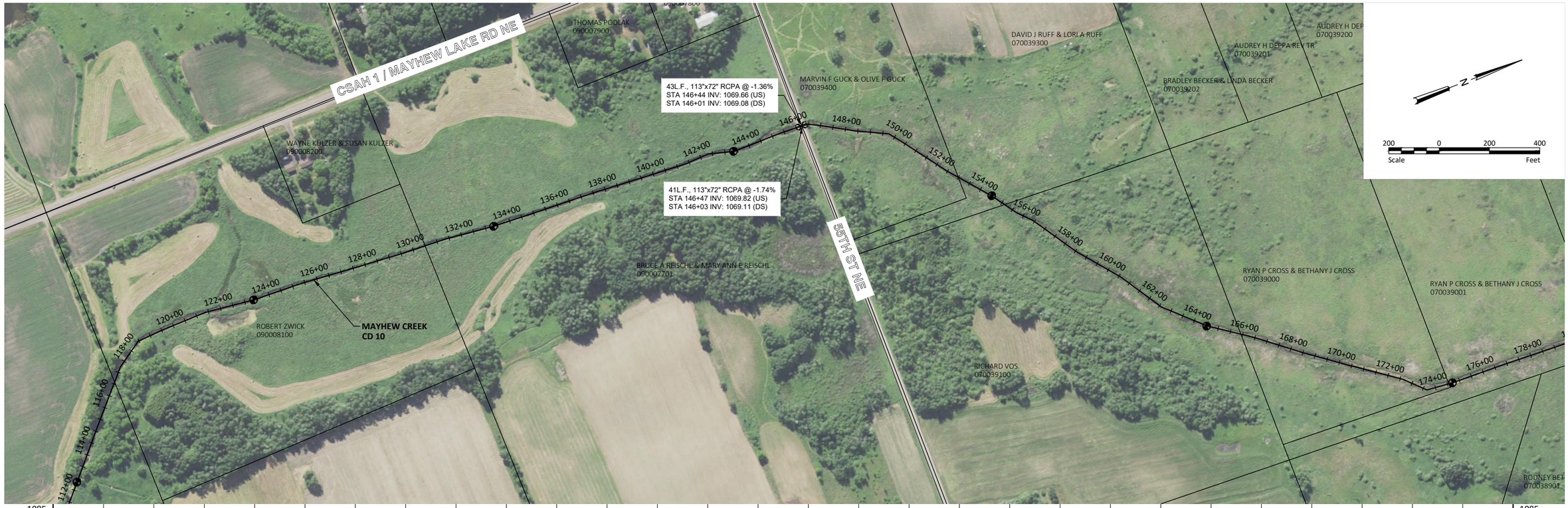

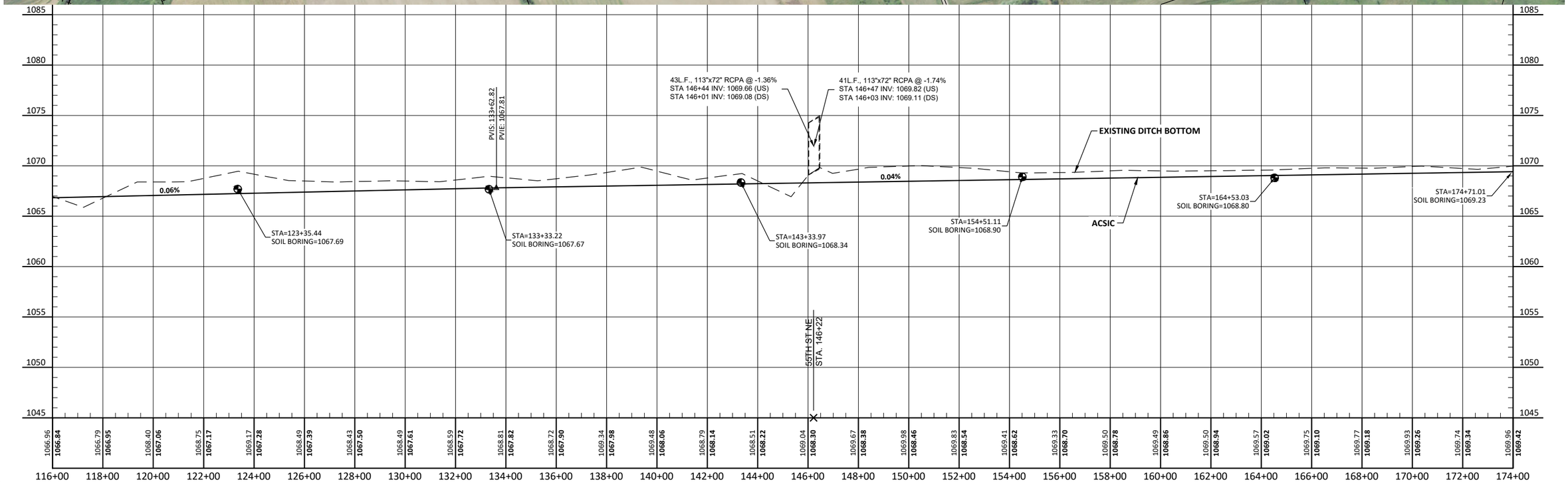

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BENTON COUNTY, MN
MAYHEW LAKE & MINDEN TOWNSHIPS

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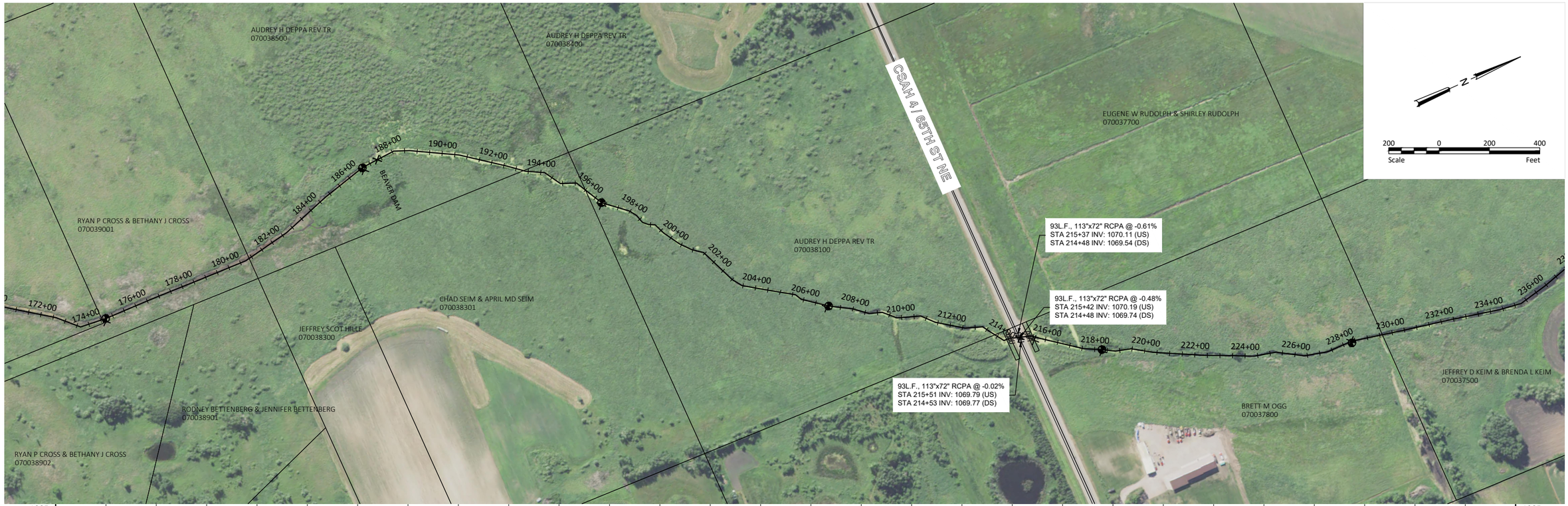

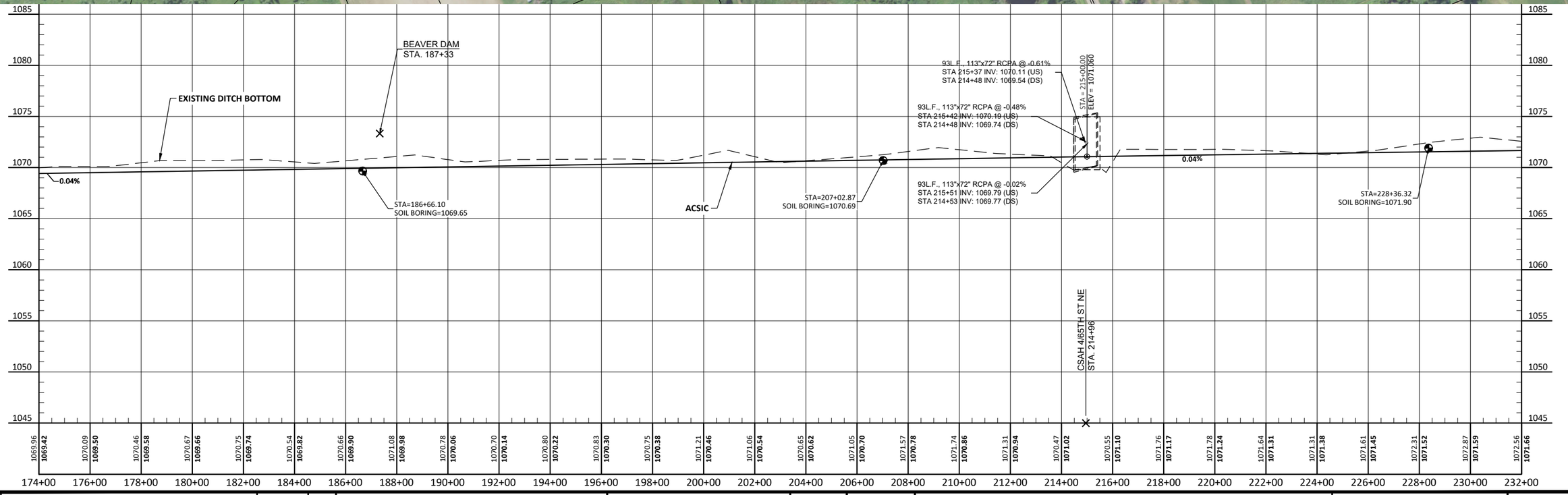

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MAYHEW CREEK - COUNTY DITCH 10
BENTON COUNTY, MN
MAYHEW LAKE & MINDEN TOWNSHIPS

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PROJECT NO. 6183-0009

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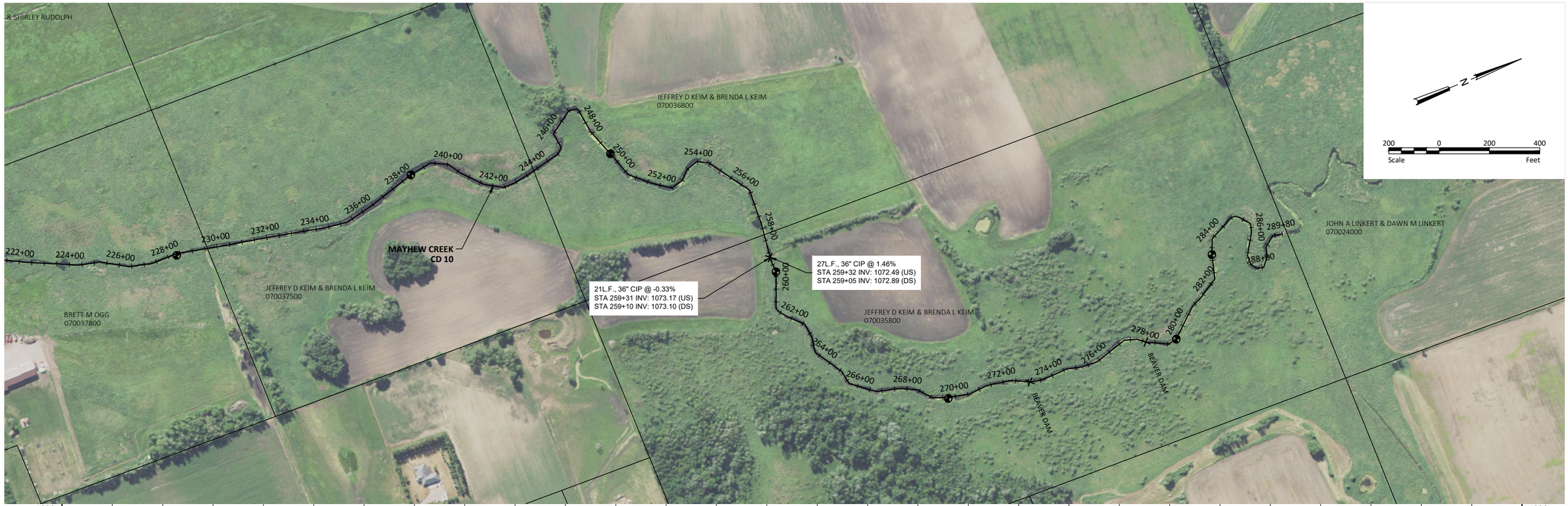

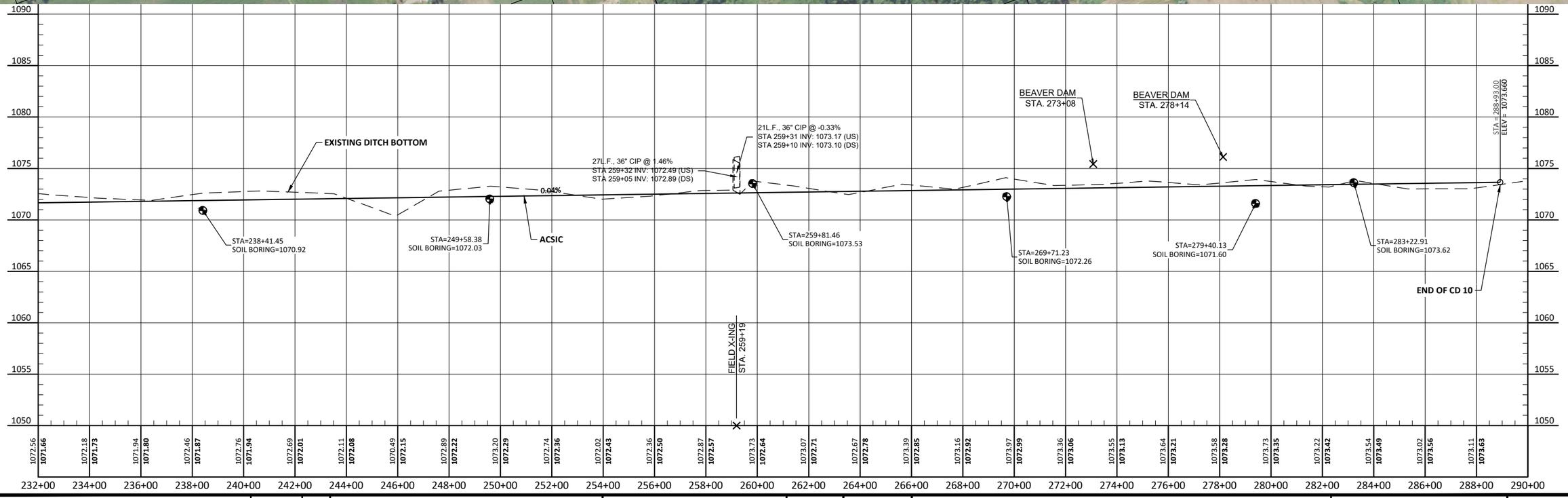

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MAYHEW LAKE & MINDEN TOWNSHIPS

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PROJECT NO. 6183-0009

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