Technical Memorandum

To: Chris Byrd, PE
Benton County Engineer

From: Garrett Monson, PE
Houston Engineering, Inc.

Subject: Reestablishment of Benton County Ditch 9
Public Drainage System Records

Date: April 19, 2022

Project: 6183-0005

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.

Garrett Monson

Digitally signed by Garrett Monson
DN: C=US, E=gmonson@houstoneng.com, O="Houston Engineering, Inc.", CN=Garrett Monson
Date: 2022.06.21 09:23:32-05'00'

6-21-2022

Garrett Monson — Date
Reg. No. 54326

Introduction

The purpose of this report is to provide Benton County with the results of the investigation and analysis of the Benton County Ditch 9 (CD 9) public drainage system. CD 9 is an open channel ditch, which serves predominantly agricultural land, located in Maywood Township and Glendorado 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 establishes the ACSIC as the basis for future maintenance and repair of the public drainage system. A future repair report may include alternatives which adjust the elevation of the open channel and culverts consistent with the 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 a repair report is based in part on discussions with landowners and other interested parties.

DEFINITIONS

This memorandum defines the condition and therefore by inference the capacity (i.e. the existing 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 systems as designed in 1905 including all subsequent designs for legal repairs and alterations. A repair or alteration is considered legal if formally authorized in some legal proceedings. 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 and is generally shown on construction plans and engineering drawings.

As-Constructed and Subsequently Improved Condition: The geometry of the public drainage systems as constructed in 1906 including all subsequent legal repairs and alterations as well as other actions which maintain and are consistent with the general character and efficiency of the drainage systems. 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 9. 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, 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 result in the obstruction of the public drainage system. Maintenance activities are usually exempt from wetland permitting requirements under the Wetland Conservation Act and Section 404 of the Clean Water Act.

Location, General Description and History of the Public Drainage System

LOCATION

The Benton CD 9 public drainage system, shown in **Figure** 1, is located in Sections 26 , 27, 33, and 34 (T37N R28W) within Maywood Township and Sections 4 and 8 (T36N R28W) within Glendorado Township, Benton County. CD 9 consists of a Main Trunk and one branch. The Main Trunk generally flows from northeast to southwest, beginning in the NW quarter of the NW quarter of Section 26 (T37N R28W) where Benton CD 14 ends and ending in the NE quarter of the NW quarter of Section 8 (T36N R28W) where it drains into Saint Francis River. Branch 1 generally flows west to east, beginning in the NW quarter of the NE quarter of Section 33 (T37N R28W) and ending where it intersects the Main Trunk in the SW quarter of the NE quarter of Section 34. The drainage area that contributes to the CD 9 public drainage system is approximately 7,143 acres (Figure 2), including the drainage areas of Benton CD 12 and Benton CD 14 which both drain to CD 9. The portion of the CD 9 drainage area not draining through CD 12 or CD 14 is approximately 2,563 acres and is in Sections 26, 27, 28, 33, and 34 of (T36N R28W) and Sections 3, 4, 5, 8, and 9 of (36N R28W). The 1905 Viewers Report identifies 572 acres of benefitted land within the parcels identified in **Figure 2.** It is likely that additional lands now benefit from CD 9 due to modern farming practices. The predominant land use in the area is agricultural along with wetland, forest, and rural residential. At the time of writing, the County, as Drainage Authority, is undertaking a drainage proceeding consistent with 103E to redetermine the benefits of CD 9.

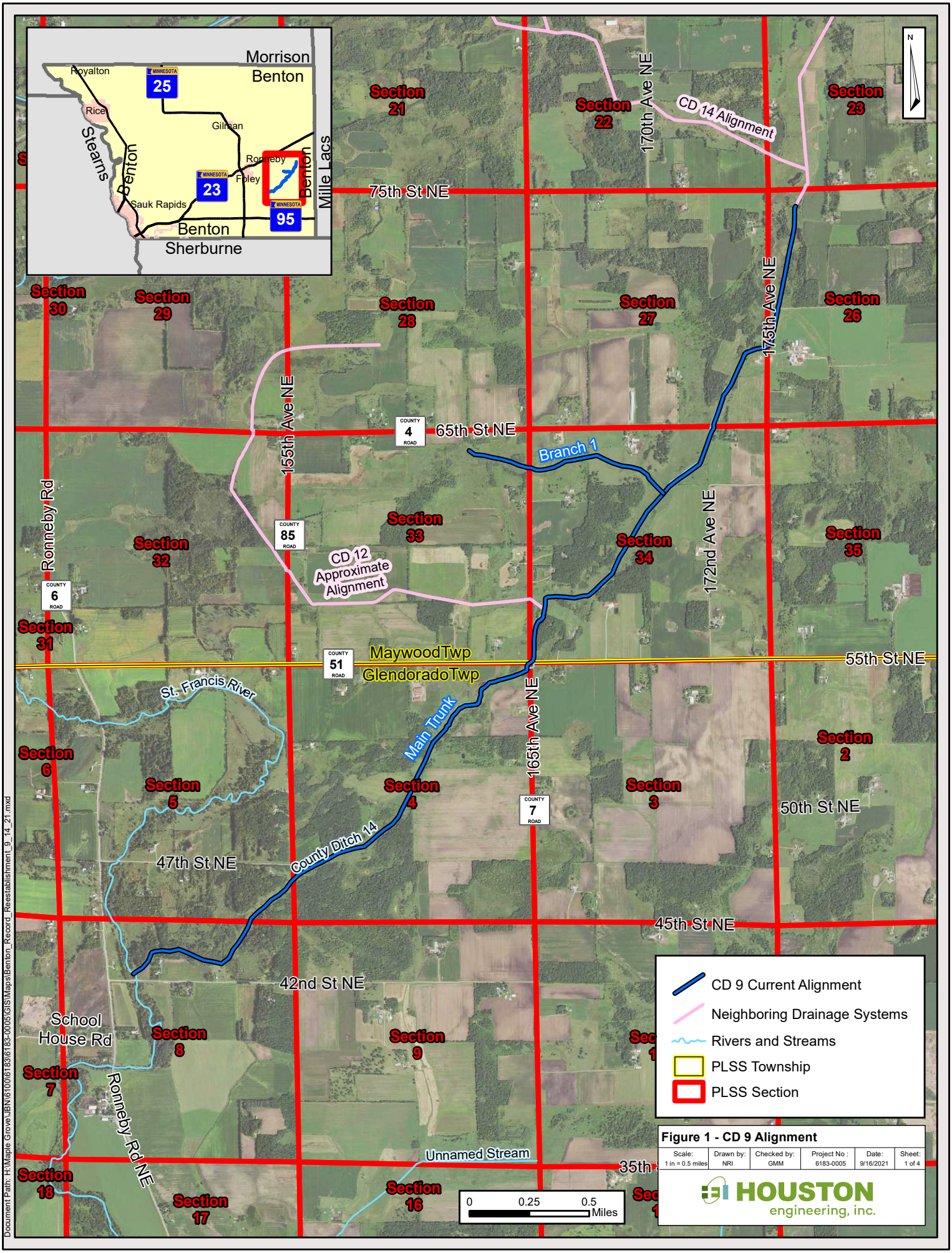

Figure 1 - CD 9 Alignment

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1 in = 0.5 miles	NRI	GMM	6183-0005	9/16/2021	1 of 4

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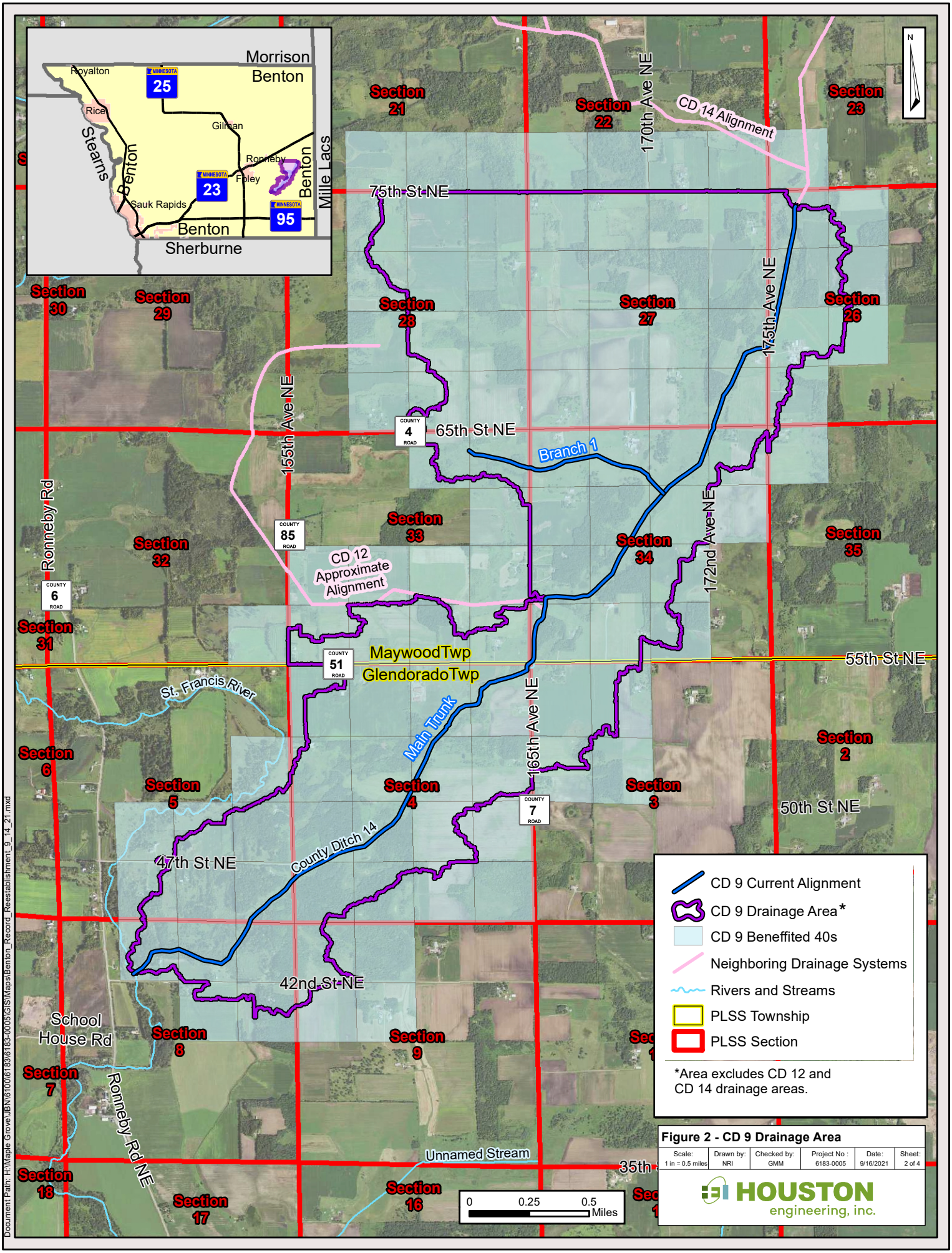
Morrison
Benton
Royalton
MINNESOTA 25
Rice
Gilman
Stearns
Benton
Ronneby
Foley
MINNESOTA 23
Benton
Mille Lacs
Sauk Rapids
MINNESOTA 95
Benton
Sherburne
N
Section 21
Section 22
Section 23
170th Ave NE
CD 14 Alignment
75th St NE
Section 30
Section 29
Section 28
Section 27
Section 26
175th Ave NE
155th Ave NE
COUNTY 4 ROAD
65th St NE
Branch 1
Ronneby Rd
COUNTY 85 ROAD
Section 33
Section 32
Section 34
Section 35
172nd Ave NE
CD 12 Approximate Alignment
COUNTY 6 ROAD
Section 31
COUNTY 51 ROAD
MaywoodTwp
GlendoradoTwp
55th St NE
St. Francis River
Main Trunk
165th Ave NE
Section 6
Section 5
Section 4
Section 3
Section 2
COUNTY 7 ROAD
50th St NE
47th St NE
County Ditch 14
42nd St NE
School House Rd
Section 8
Section 9
Section 7
Ronneby Rd NE
Unnamed Stream
35th
Section 18
Section 17
Section 16
0 0.25 0.5 Miles
CD 9 Current Alignment
CD 9 Drainage Area*
CD 9 Beneffited 40s
Neighboring Drainage Systems
Rivers and Streams
PLSS Township
PLSS Section
*Area excludes CD 12 and CD 14 drainage areas.
Figure 2 - CD 9 Drainage Area
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Project No : 6183-0005
Date: 9/16/2021
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HISTORY OF THE PUBLIC DRAINAGE SYSTEM

A petition for the system was filed on June 19, 1905 and an order to establish was filed on September 26, 1905 by the Benton County Board. An Engineer's Report was filed on August 14, 1905 containing specifications, estimate of total cost, and statement of time and manner in which work must be done. The Acceptance of Engineer for the completion of construction of the ditch was filed on September 26, 1906. A petition for the "repair" to the system was filed on July 14, 1916 in part due to the construction of CD 12 and CD 14, which drain into CD 9. An Engineer's Report for the deepening and widening of the ditch in response to this petition was filed on October 11, 1916. In modern context, this petition would be considered to be an improvement. Though as-built plans do not exist for this improvement, other evidence, including current geometry of the system, indicates that this improvement was completed consistent with the design with the exception of a proposed realignment. The 1916 deepening and widening will be referred to as the 1916 improvement herein. See "Known System Modifications or Proceedings" below.

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. CD 9 consists entirely of an open channel ditch with several culvert crossings. 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 NE quarter of the NW quarter of Section 8 (T36N R28W) at Sta. 0+00, where it drains into the Saint Francis River. The alignment runs northeast until Sta. 6+50 where it turns southeast until Sta. 23+00 and then proceeds northeast. The alignment crosses CSAH 7 and CR 51 at Sta. 123+05 and turns north until Sta. 138+50 where it turns east. At Sta. 148+00 the alignment turns northeast and continues until crossing CR 4 at Sta. 195+33 and crossing 175th Ave NE at Sta. 218+00. The alignment continues northeast and ends at Sta. 250+19 where CD 14 begins in the NW quarter of the NW quarter of Section 26 (T37N R28W).

Branch 1:
The downstream end of Branch 1 begins at Sta. 0+00 in the SW quarter of the NE quarter of Section 34 (T37N R28W) where it intersects the Main Trunk at Main Trunk Sta. 178+77. The alignment proceeds northwest until Sta. 17+50 where it turns west. The alignment crosses CSAH 7 at Sta. 33+03 and continues until it terminates at Sta. 47+00 in the NW quarter of the NE quarter of Section 33 (T37N R28W).

SOURCE OF SURVEY DATA USED IN THIS ASSESSMENT

Survey data was collected in April 2021 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

If system modifications have occurred since establishment, they would likely be documented through county resolution and order records. With the exception of the 1916 improvement noted above, no major system modifications are known to have occurred since establishment.

The original alignment of CD 9 crossed first south under CR 51 and then west under CSAH 7 between stations 120+00 and 126+00 near the intersection of the two roads. The 1916 improvement recommended a realignment to cross diagonally under the intersection with a double barrel. This realignment did not occur during the 1916 improvement. Construction plans dated December 13, 1999 were available that documented replacement of the existing crossing with two 10'x4' box culverts directly under the intersection, which is the current condition. This is consistent with the realignment that was approved for the 1916 improvement and should be considered to be part of the ACSIC.

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.

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 9. Profile drawings from the 1916 improvement and cut sheets from the engineer's report from August 14, 1905 contain the design profile for CD 9 based on a local datum. During recent survey, soil borings were taken approximately every 1000-feet along CD 9. The ACSIC profile was determined with a statistical comparison of the soil borings and design profile.

Strictly relying on the soil borings to define the ACSIC grade may not yield a practical determination of the ACSIC due to the inherent variability of soil boring data during its collection. Since the CD 9 design profile is available, while not an as-built documenting the exact constructed grades, it still provides pertinent information regarding the intended grades on the system.

Comparison of Design Profiles and Soil Borings

The CD 9 original 1905 and 1916 design profiles were based on an assumed vertical datum referring to a benchmark no longer in existence, and as-built plans are not available. To determine the ACSIC in a modern vertical datum, soil borings collected during field survey were used to determine "as-built" excavation depths where the material transitions from accumulated sediment to native mineral soil. Soil borings were excavated along the system as shown in **Attachment A**. In total, 30 soil borings were collected during the field survey (24 along the Main Trunk and 6 along Branch 1).

A statistical comparison of the soil borings 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 final datum adjustment calculation.

When the statistical analysis was completed and the outliers removed the Main Trunk profile displayed a consistent tendency to overestimate the elevations of the existing soil borings from STA 0+00 to 100+00 and underestimate the elevations from STA 100+00 to 225+00. While it is evident that the 1916 profile was the intended design due to its similarity to the constructed system as determined by the soil borings, the data shows a consistent deviation from the design profile which could align with construction practices or phased work at the time of the 1916 improvement given that they would have been working in water while deepening the ditch.

Using the reaches between grade breaks from the 1916 profile, a profile was created via a best fit line of the soil borings, resulting in a root-mean-square-error (RMSE) of 0.35' (see **Table 1**). The resulting profile, shown in **Attachment A,** provides a good correlation to the soil borings, with the exception of 5 of the 24 Main Trunk soil borings which were determined to be outliers. This provides a better fit than the datum adjustment of the historic profile. Three of these outliers were between STA 76+77 and 94+89 and were all between 1.2-feet and 2.3-feet below the best-fit profile. These outliers are likely the result of over-excavation during maintenance efforts or scour of the channel. The best-fit profile also correlates well with the CD 14 profile, whose outlet coincides with the upstream end of CD 9.

The datum adjustment factor resulted in a good fit of the soil borings along Branch 1 (see **Table 2**). Given that there was no documented repair along Branch 1, the correlation between the soil borings and the design profile yields a good determination of the profile as constructed in 1906, resulting in a RMSE of 0.19'.

Table 1: CD 9 Main Trunk Profile Determination

Current CD 9 Alignment Station	Soil Boring Elev.	Best Fit Profile	Soil Boring Deviation from Best Fit Profile
6+34	1061.17	1060.98	0.19
16+45	1062.65	1062.54	0.11
26+48	1064.31	1064.09	0.22
36+53	1065.99	1065.65	0.34
46+62*	1068.05	1067.21	0.84*
56+68	1068.38	1068.76	-0.38
66+81	1070.41	1070.33	0.08
76+77*	1070.64	1071.87	-1.23*
86+81*	1070.84	1073.11	-2.27*
94+89*	1072.12	1074.07	-1.95*
107+36	1075.52	1075.57	-0.05
117+59*	1077.82	1076.80	1.02*
128+47	1077.73	1077.74	-0.01
138+83	1079.11	1078.63	0.48

148+94	1079.98	1079.50	0.48
159+03	1080.88	1080.37	0.51
168+99	1081.28	1081.23	0.05
178+10	1082.30	1082.02	0.28
189+06	1083.09	1082.96	0.13
201+38	1084.23	1084.27	-0.04
211+50	1085.85	1085.79	0.06
221+74	1087.96	1087.32	0.64
231+79	1089.43	1088.83	0.60
242+19	1089.84	1090.39	-0.55
***** Indicates outlier that was not used in determining the best fit profile (1 standard deviation value of 0.78')			

Table 2: CD 9 Branch 1 Profile Determination

Current CD 9 Alignment Station	Soil Boring Elev.	1905 Profile Elev. With Datum Adjustment of 1000.10	Soil Boring Deviation
5+47*	1084.11	1084.99	-0.88
15+80	1091.09	1090.75	0.34
25+43	1095.12	1095.51	-0.39
32+08	1096.44	1096.38	0.06
39+49*	1097.97	1097.35	0.62
* Indicates outlier that was not used in determining the best fit profile (1 standard deviation value of 0.30').			

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 9 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 9 public drainage system. A total of seven culvert crossings are located on the system of which five crossings are within one foot vertically of the ACSIC profile.

ACSIC Geometry

The 1916 engineer's report for the improvement of the Main Trunk indicated that the entirety of the Main Trunk was to be constructed with a bottom width of 8-feet and 1:1 side slopes. The 1905 engineer's report indicated that the entirety of Branch 1 was to be constructed with a 4-foot bottom width and 1:1 side slopes. The deterioration of the channel has changed the bottom width in many places along the channel from the ACSIC. Where the channel was realigned near CR 51, the realigned channel was to be constructed with a 20-foot bottom width and 4:1 side slopes, with riprap along the ditch bottom and slopes.

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 1905 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. This assumption was ground-truthed and confirmed to be valid along Branch 1 from approximate STA 25+00 to 30+00 where spoil piles are visible on the landscape and occupy approximately 60-feet centered on the channel, consistent with the width calculated using the slopes assumed above.

The same assumption was applied to the 1916 improvement for the Main Trunk and was ground-truthed and confirmed to be valid along the Main Trunk from approximate STA 62+00 to 80+00 and from approximate STA 212+00 to 240+00 where spoil piles are visible on the landscape and occupy between 85-feet and 100-feet centered on the channel.

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 9, centered on the channel, can be found in **Table 4** and are mapped in **Figure 4.**

Table 4. ROW Widths for CD 9

	Downstream Station	Upstream Station	ROW Width (ft)
Main Trunk	0+00	100+00	100
	100+00	200+00	95
	200+00	252+62	90
Branch 1	0+00	47+00	60

* Centered on the channel.

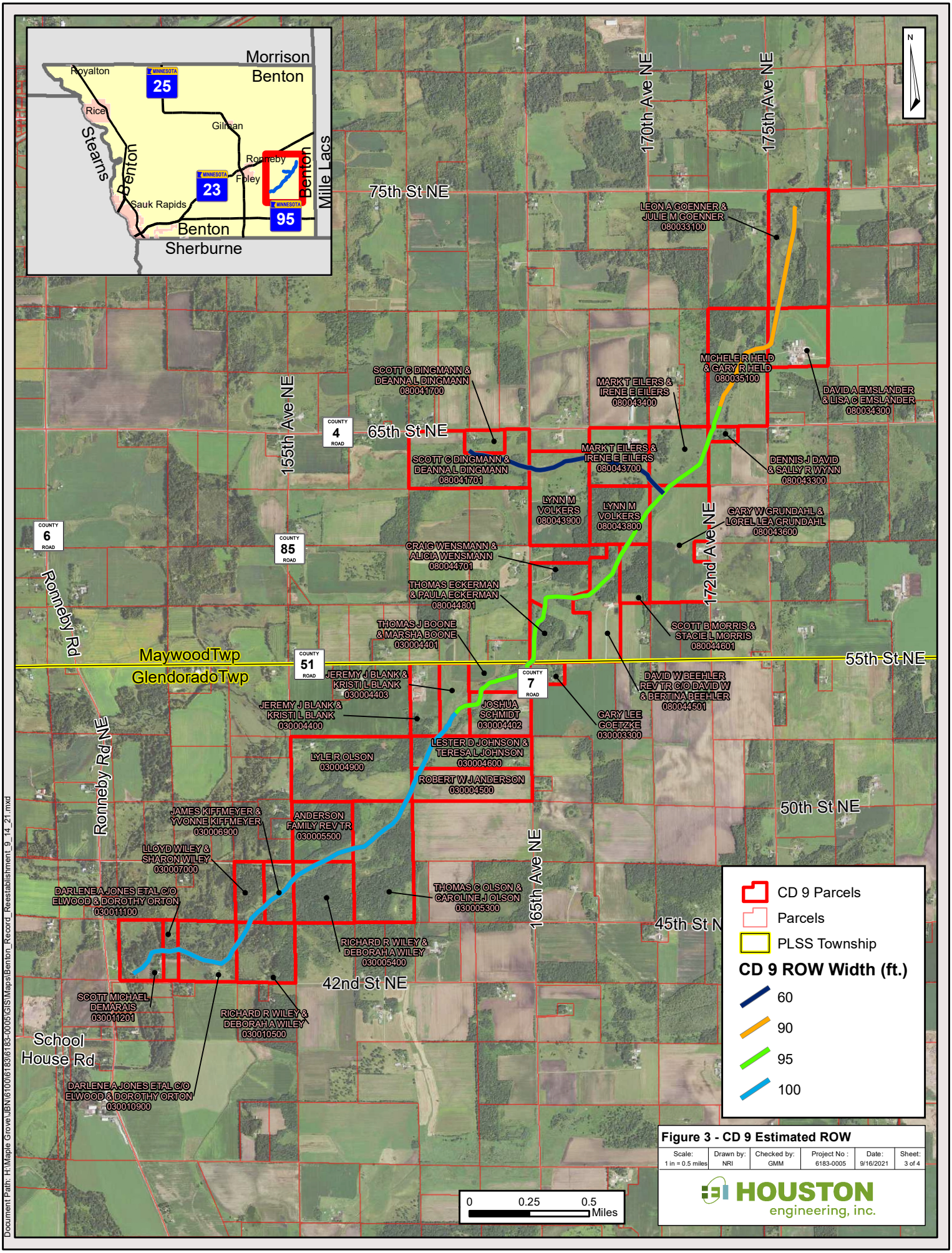

Figure 3 - CD 9 Estimated ROW

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REGULATORY IMPACTS

As shown in **Figure 4,** the CD 9 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 4**, CD 9 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.

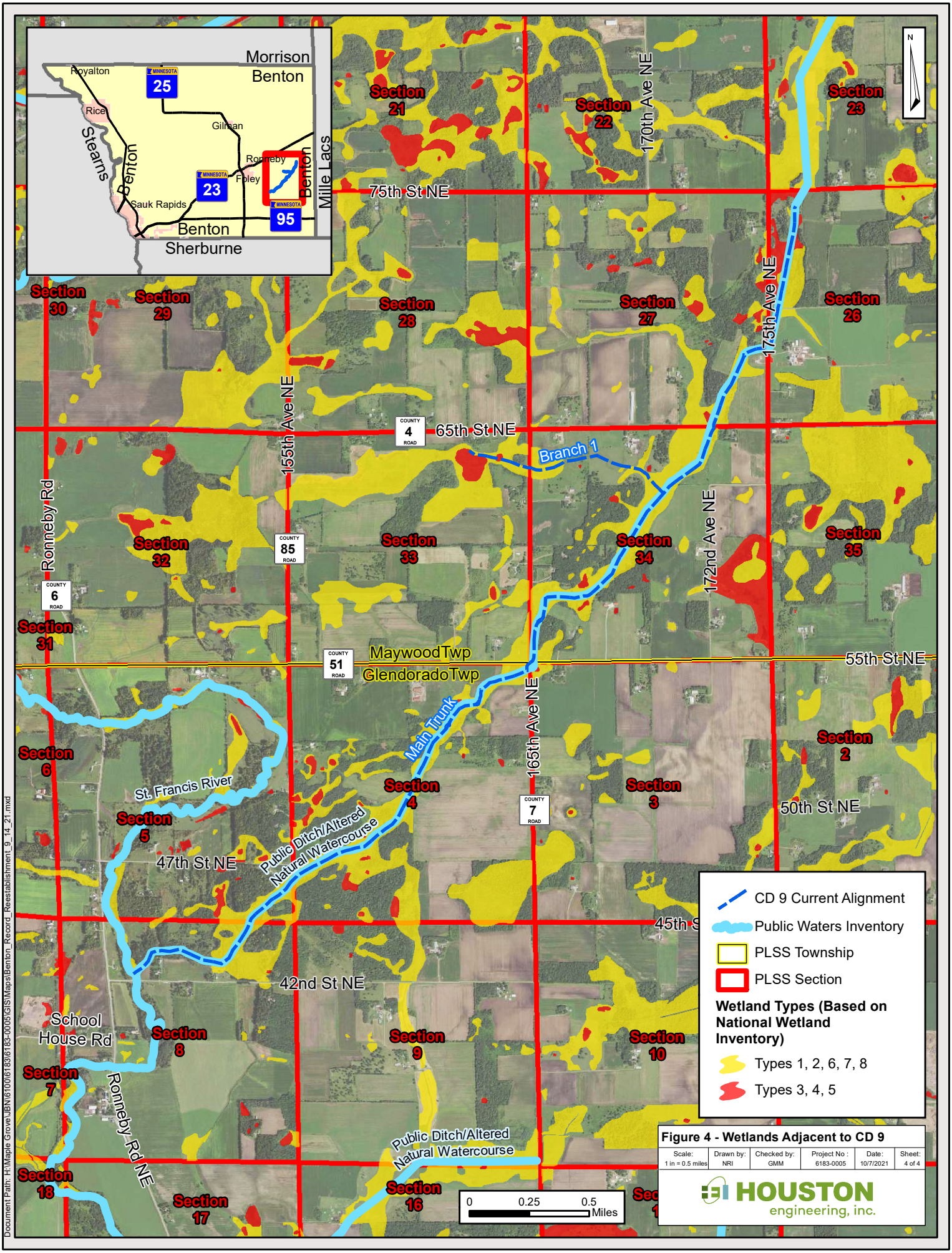

Figure 4 - Wetlands Adjacent to CD 9

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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. The vast majority of wetlands within and adjacent to the drainage system channel appear to be Type 1, 2, and 6 wetlands. There appears to be a few pockets of Type 3 wetlands sporadically throughout the drainage system corridor. Due to the extensive degree of repair likely needed, wetland types should be confirmed, and potential impacts should be assessed via a repair report.

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

- 1905 Petition to the Benton County Board for ditch establishment of County Ditch 9 by landowners.
- 1905 Order establishing County Ditch 9 by Benton County.
- 1905 Engineer's report for County Ditch 9.
- 1905 Viewer's Report for County Ditch 9.
- 1906 Acceptance of Engineer for County Ditch 9.
- 1916 Engineer's report for deepening and widening of County Ditch 9.
- 1999 Construction Plan for Culverts at Intersection of CSAH 7 and CR 51 at County Ditch 9
- Date unknown, plan of County Ditch 9.
- Date unknown, profile for deepening and widening of County Ditch 9.

ATTACHMENT A – BENTON COUNTY DITCH 9 PLAN AND PROFILES

BENTON COUNTY DITCH 9 AS-CONSTRUCTED AND SUBSEQUENTLY IMPROVED CONDITION (ACSIC) BENTON COUNTY, MN

GLENDORADO & MAYWOOD TOWNSHIPS
SEPTEMBER, 2021

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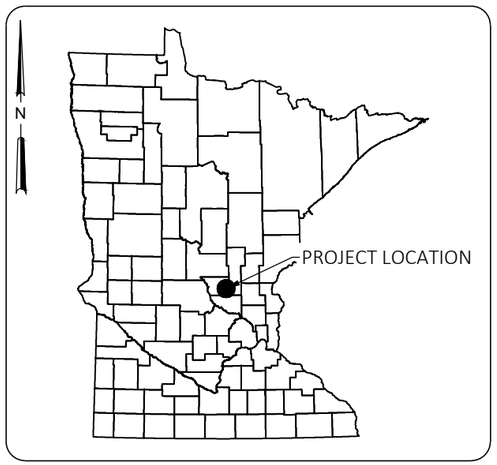
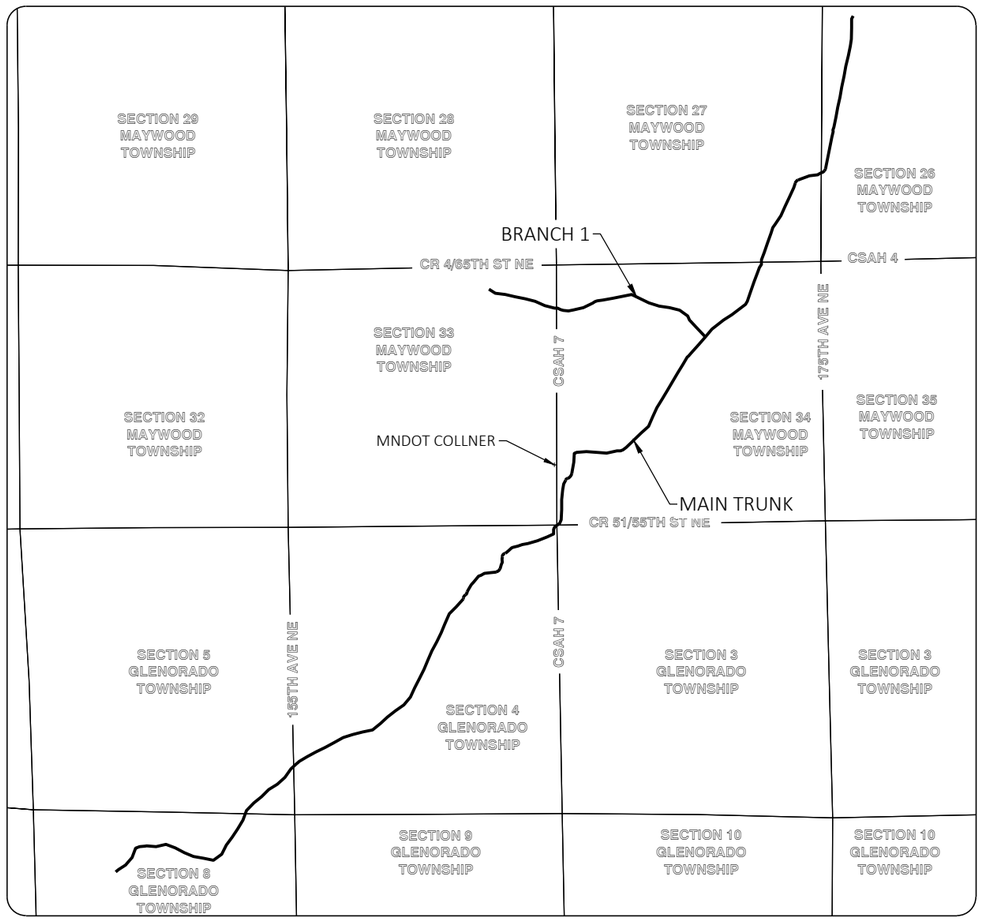
TABLE OF CONTENTS



VICINITY MAP



LOCATION MAP

NOTES:

1. GEODETIC CONTROL

   VERTICAL: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

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

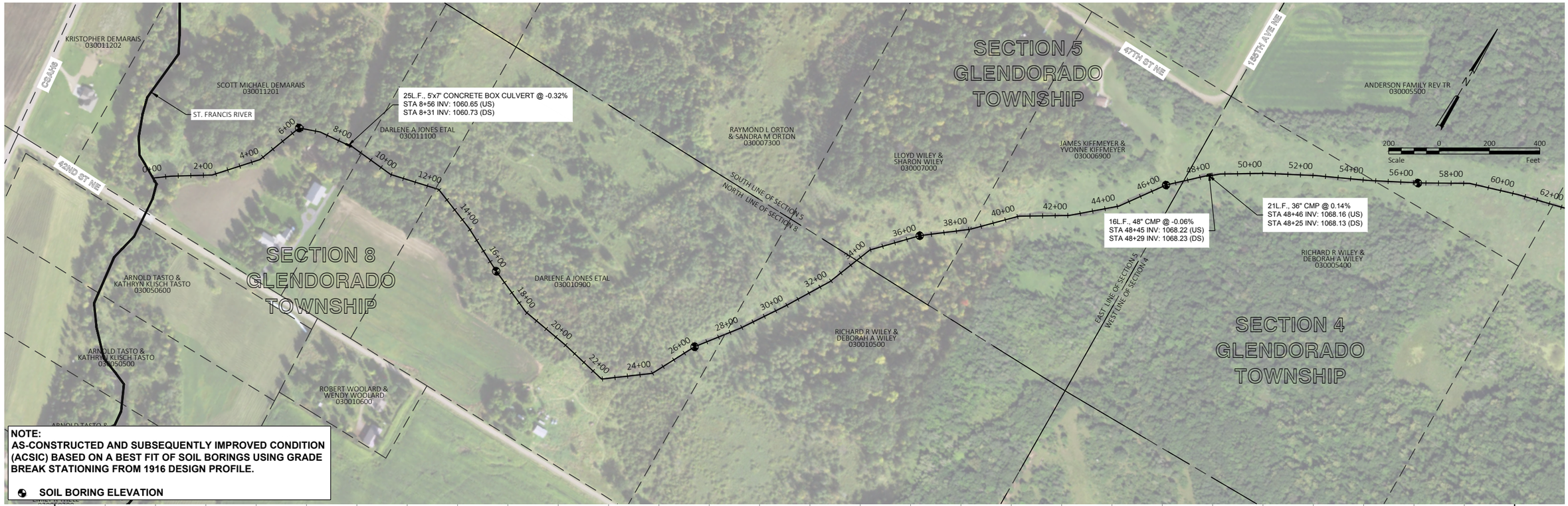
   BENCHMARK: MNDOT COLLNER, SE QUARTER, SECTION 33, TOWNSHIP 37N, RANGE 28W

   4.0 MILES EAST-SOUTHEAST OF FOLEY, 1.15 MILES SOUTH ALONG TRUNK HIGHWAY25 FROM THE JUNCTION OF TRUNK HIGHWAY 25 AND TRUNK HIGHWAY 23 IN FOLEY TO TRUNK HIGHWAY 25 MILEPOINT 97.8, THEN 4.5 MILES EAST ON COUNTY ROAD 51, THEN 0.23 MILE NORTH ON COUNTY ROAD 7, 47.7 FEET WEST OF COUNTY ROAD 7, 19.2 FEET NORTH OF A FIELD ENTRANCE,5.0 FEET SOUTH OF A WITNESS POST.

   FIELD SURVEY COMPLETED BY HOUSTON ENGINEERING STAFF IN APRIL OF 2021.

PRELIMINARY
NOT FOR CONSTRUCTION

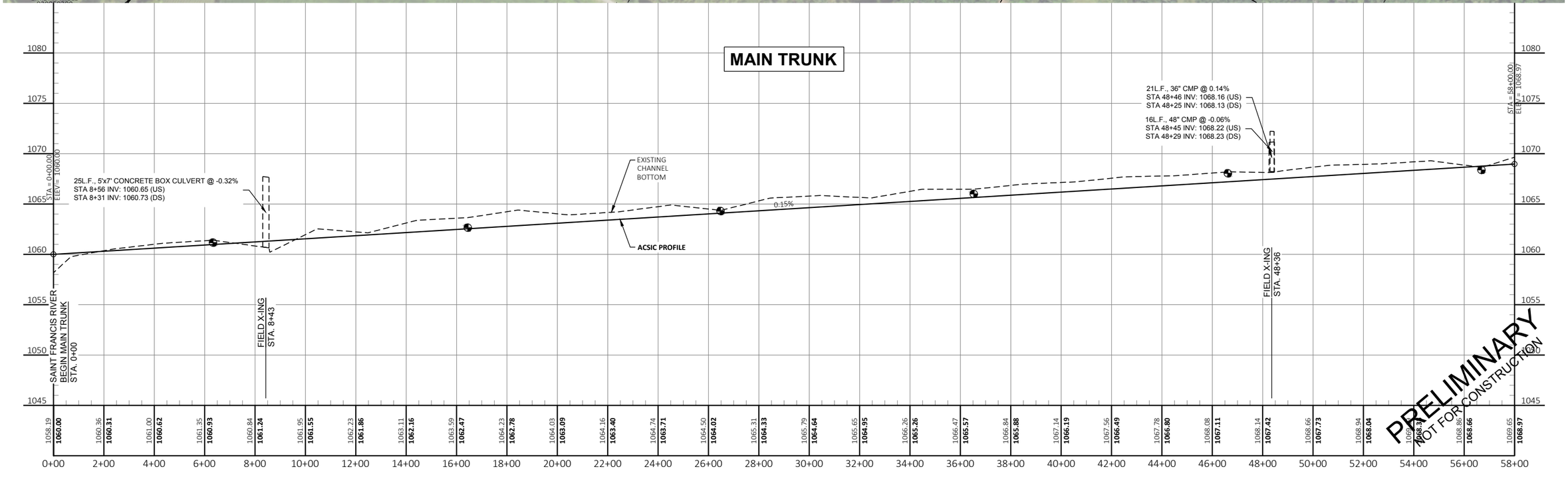
Project No. 6183-0005



NOTE:
AS-CONSTRUCTED AND SUBSEQUENTLY IMPROVED CONDITION (ACSIC) BASED ON A BEST FIT OF SOIL BORINGS USING GRADE BREAK STATIONING FROM 1916 DESIGN PROFILE.

SOIL BORING ELEVATION

MAIN TRUNK



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Signature: _____ Date: XX-XX-XXXX
Printed Name: GARRETT MONSON License #: 54326

HOUSTON engineering, inc.

Drawn by	Date
KJL	10-20-2021
Checked by	Scale
GMM	AS SHOWN

BENTON COUNTY DITCH 9 AS-CONSTRUCTED AND SUBSEQUENTLY IMPROVED CONDITION (ACSIC)
BENTON COUNTY, MN
GLENDORADO & MAYWOOD TOWNSHIPS

MT 0+00 - 58+00

PROJECT NO. 6183-0005

SHEET 2

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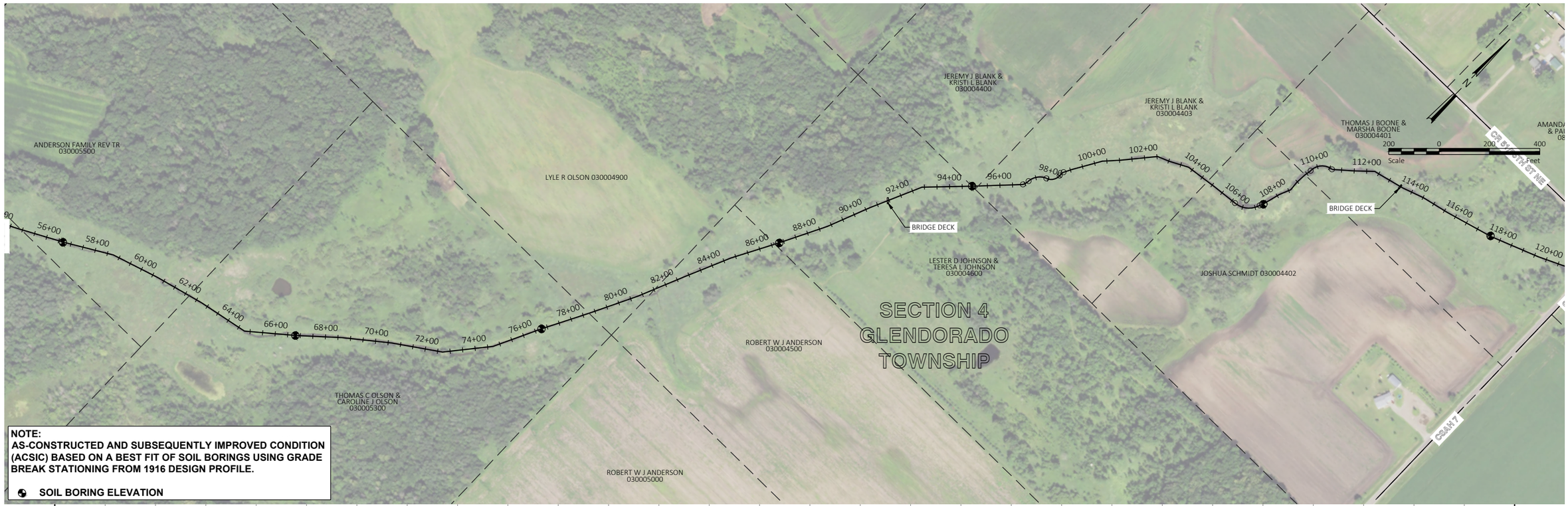

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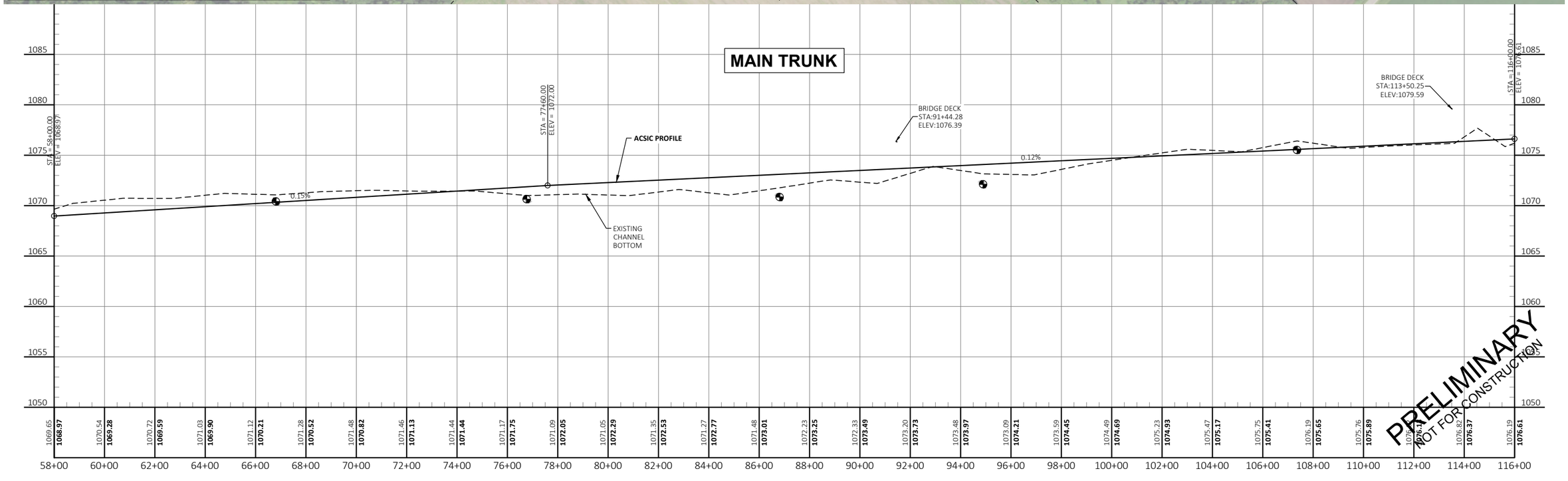

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MT 58+00 - 116+00

PROJECT NO. 6183-0005

SHEET 3

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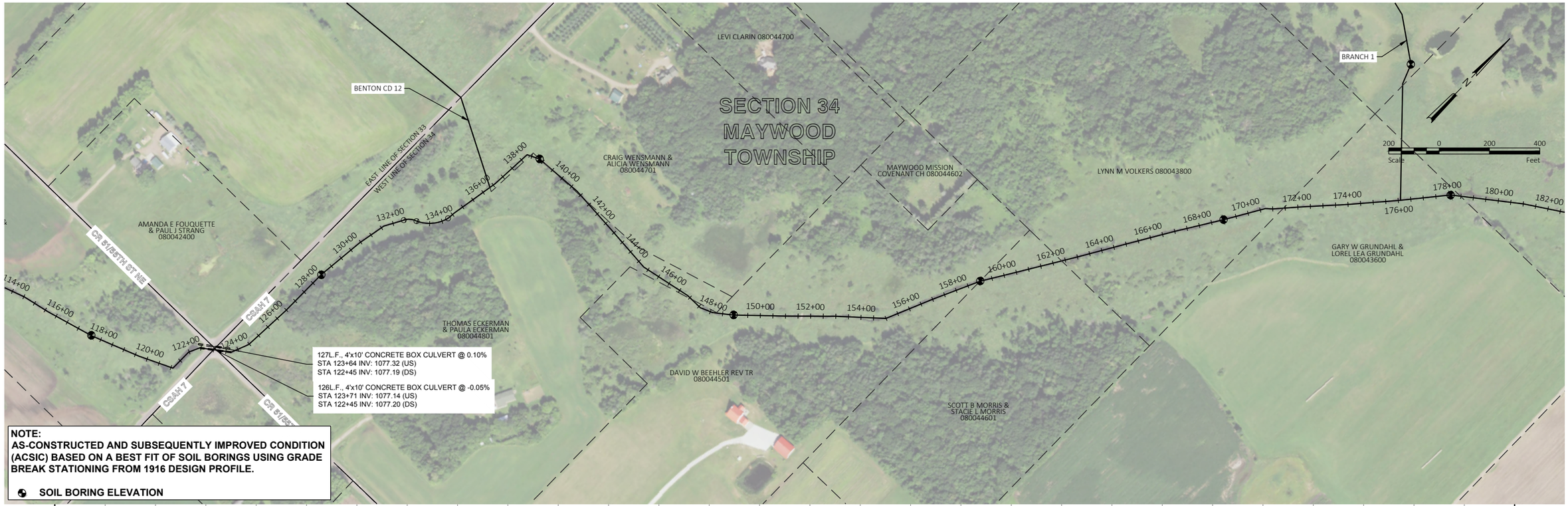

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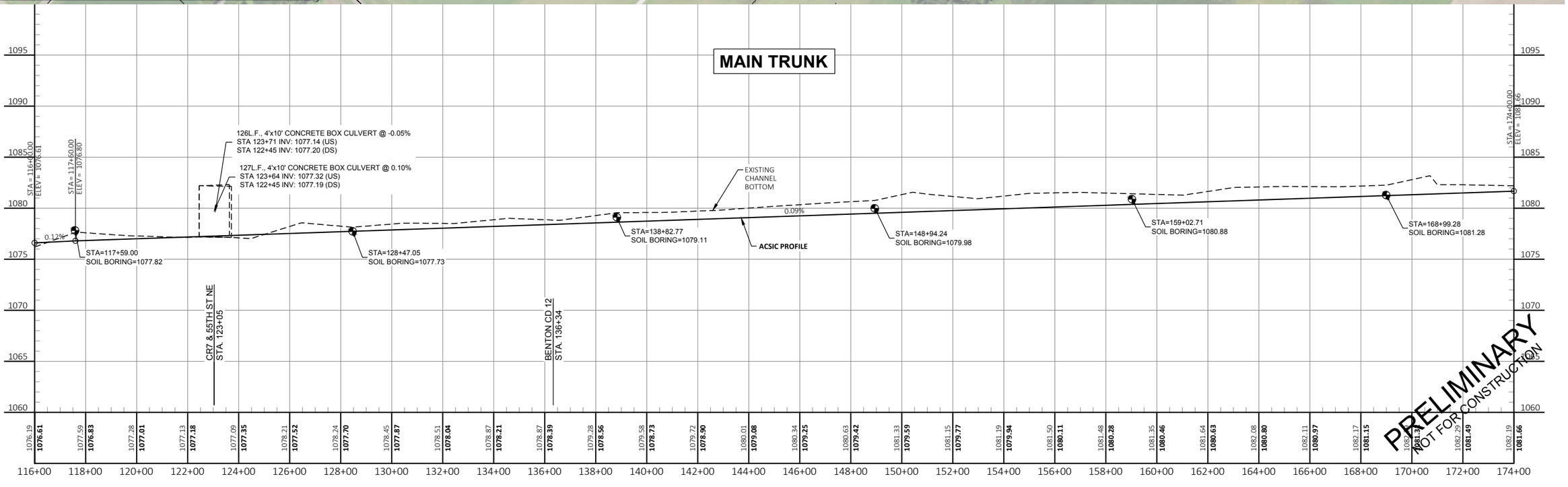
MAIN TRUNK



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MT 116+00 - 174+00

PROJECT NO. 6183-0005

SHEET 4

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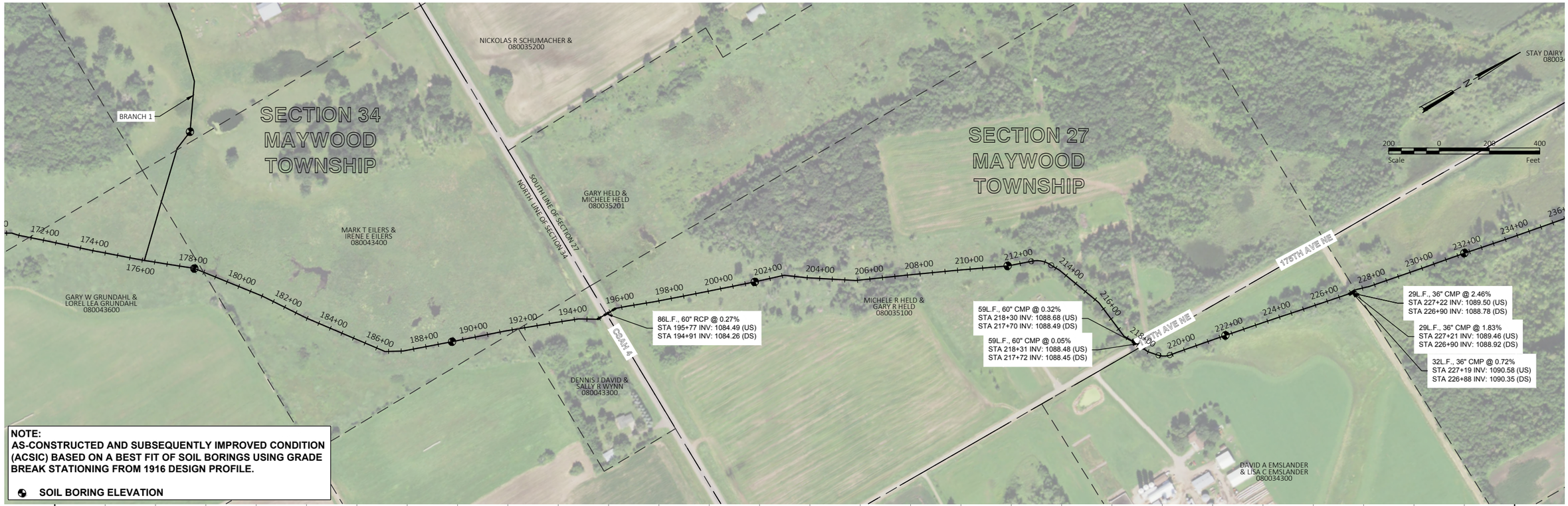

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MT 174+00 - 232+00

PROJECT NO. 6183-0005

SHEET 5

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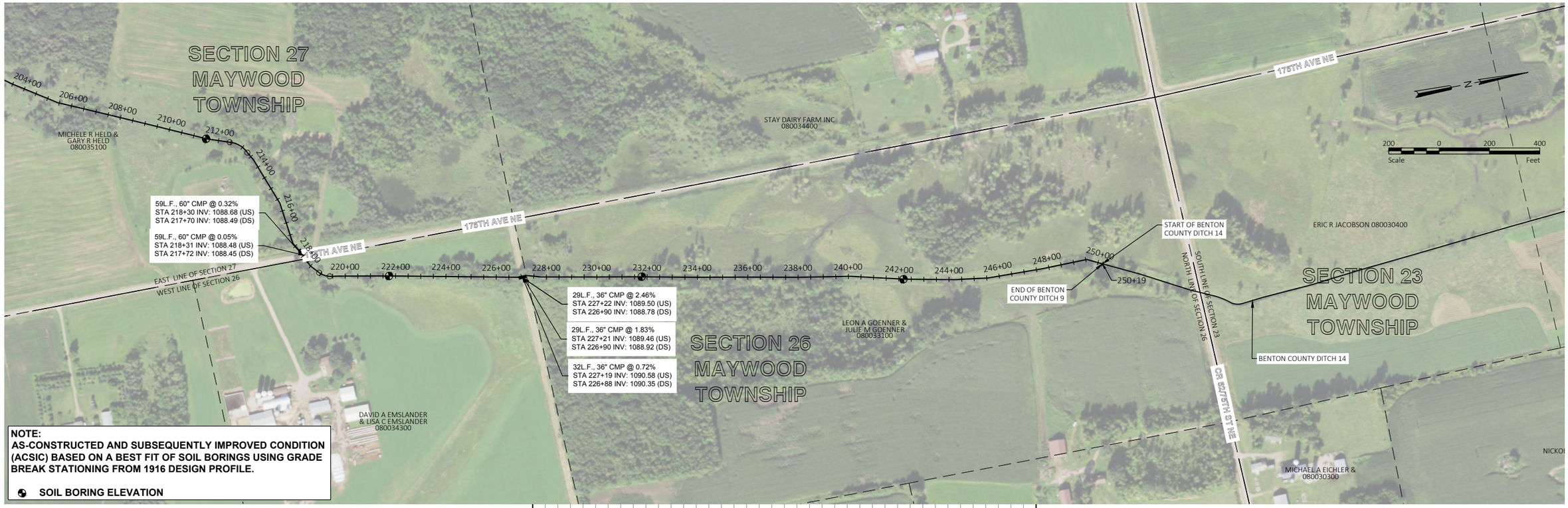

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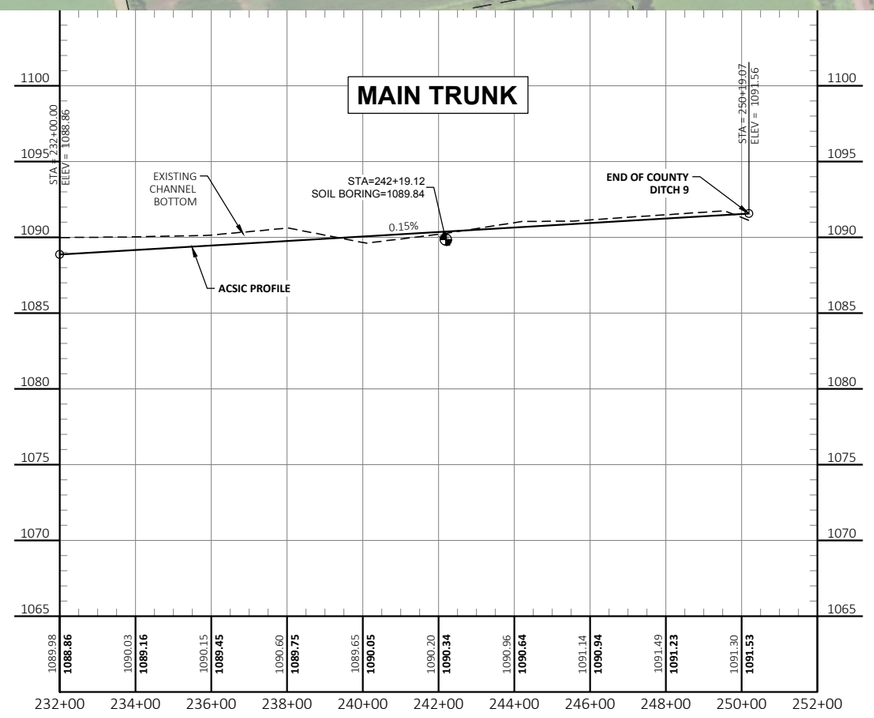
SOIL BORING ELEVATION



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MT 232+00 - END

PROJECT NO. 6183-0005

SHEET 6

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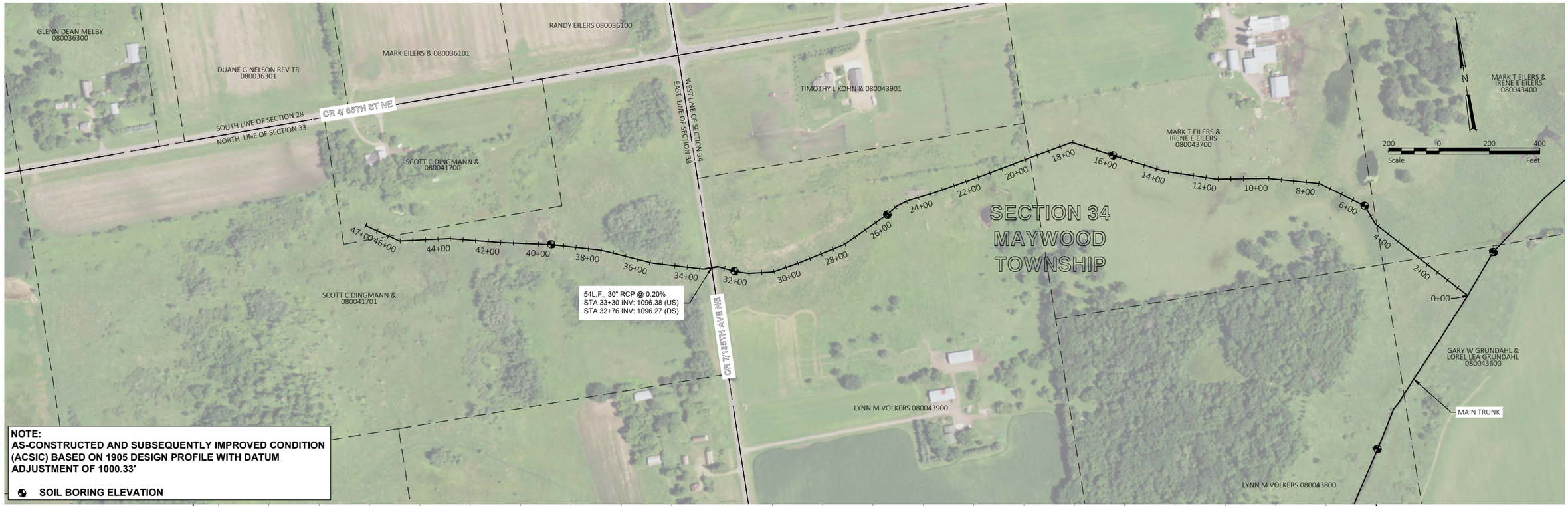

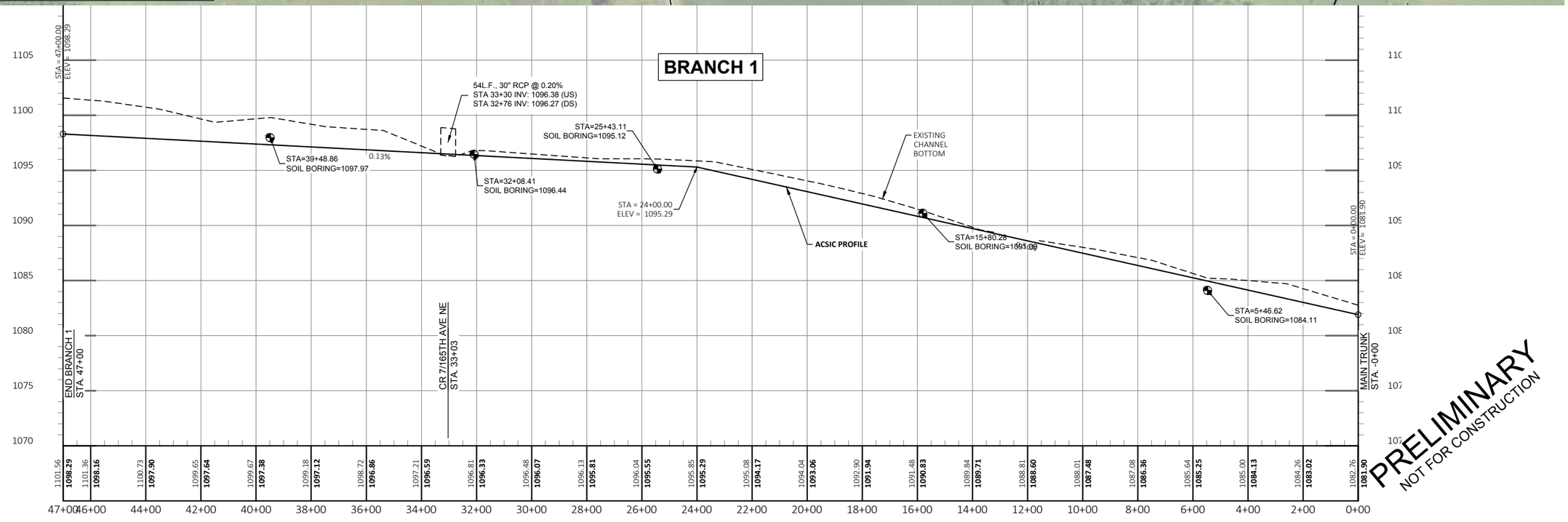

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BR1 0+00 - END

PROJECT NO. 6183-0005

SHEET 7

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