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ENGINEER'S REPORT  
DRAINAGE DISTRICT NO. 69  
BRANCH 7 & 8 TILE IMPROVEMENTS  
WEBSTER COUNTY, IOWA  
**MARCH 2020**



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

*Daniel P Wiedmeier*

Daniel P, Wiedmeier, P.E. No. 24743

*3/13/20*

(Date)

My license renewal date is December 31, 2021.

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## 1 Introduction

This report is made at the direction of the Webster County Board of Supervisors, acting as trustees for Drainage District No. 69. Outlined below are the findings of the engineer in response to the drainage petition for tile improvements which includes the investigation results, along with Engineer's Recommendations and Opinion of Probable Costs. This report is required by and prepared in accordance to Iowa Code Chapter 468.

The petition requested tile improvements for the Drainage District (D.D.) 69 Branch 7 and 8 tile which is located in Sections 7, 8, 16, 17, 18, and 20 of Fulton Township (T88N – R30W).

## 2 District and Tile History

Drainage District 69 was established on January 11, 1911. The original Engineer's Report outlined a Main Open Ditch, two lateral ditches, and 26 lateral tiles. The district included 14,641 acres and had an original assessment of \$108,155. Drainage District 69 has undergone numerous large projects in its 109-year history. These projects are shown chronologically below.

- 7/2/1919 – Cleaned out upper end of Main Open Ditch.
- 1948 – Cleaned entire district.
- 9/6/1994 – Cleaned out open ditch Laterals 2, 3, and the lower end of Lateral 1.
- 1/28/2000 – Replaced the upper 1104 ft. of the Main Open Ditch with 30" tile.
- 7/30/2002 – Cleaned and lowered the upper end of the Main Open Ditch.
- 11/6/2002 – Replaced 3000+ feet of Lateral 3 tile in Section 22, Fulton Twp.
- 4/24/2013 – Improved Branch 14 of Lateral 1.
- 10/30/2013 – Added parallel tile to Branch 1.
- 5/15/2014 – Reclassified D.D. 69 including Laterals and Branches.
- 6/30/2015 – Cleaned out the Main Open Ditch and open ditch Laterals 1, 2A, 2B, and 3.

The design for Branches 7 and 8 changed multiple times before completion on November 14, 1913. Following the tile descriptions in the Engineer's report from 1908, Branches 7 and 8 were originally designated as Laterals 12 and 13. Along with a design revision, the tiles were renamed to Branches 7 and 8 in the construction Engineers Report on December 6, 1911. This report also packaged the various district tile branches into constructible packages dubbed "Sections" that could be bid independently of each other. This is not to be confused with the survey sections that designate parcel locations. Branches 7 and 8 were packaged into Bid Section 6. The original profile for Branches 7 and 8 can be found in the county records under the heading of Branch 7 Section 6 and Branch 8 Section 6. The final Engineer's Report for completion of Branches 7 and 8 revised the length of Branch 8 down from 800 ft. to 525 ft. The total construction cost of Branches 7 and 8 was \$4,828.99. In 1914 D.D. 188 was established and outlets to a 14" tile on Branch 7 of D.D. 69 near Station 50+00. D.D. 330 was established in 1922. The west private tile of D.D. 330 outlets into Branch 8 of D.D. 69. The east part of D.D. 330 outlets to the center of Section 16 and has no apparent connection to Branch 7 or 8 of D.D. 69.

### 3 Existing Conditions

The most up to date design information was disseminated using written records, archived plans, and field measurements. The Branch 7 and 8 tile designs are outlined in Tables 1 and 2 below.

Table 1: Existing Branch 7 Tile Design

100 ft station	Size of Pipe (in)	Grade (ft/ft)	Acres Served	Drainage Coeff (in/day)
50+00 - 64+00	10	0.46%	49	0.72
44+00 - 50+00	14	0.10%	331	0.12
26+00 - 44+00	20	0.10%	518	0.20
11+00 - 26+00	22	0.10%	703	0.19
0+00 - 11+00	24	0.10%	810	0.21

Table 2: Existing Branch 8 Tile Design

100 ft station	Size of Pipe (in)	Grade (ft/ft)	Acres Served	Drainage Coeff (in/day)
4+25 - 5+25	12	0.20%	41	0.92
0+00 - 4+25	12	0.20%	229	0.16

The outlet of Branch 7 currently has 0.9 ft. of freeboard to be bottom of the ditch. Records show that the outlet was originally installed with 1.75 ft. of freeboard. In either case the outlet of Branch 7 is lower than what is recommended to maintain adequate drainage through varying flow conditions and will be susceptible to silt blockage if the ditch is not cleaned on a regular basis.

Throughout the length of the pipe, the original profile showed an average depth to the bottom of the pipe between nine and four feet. By compensating for the interior diameter and wall thickness of the pipe, existing pipe depths from top of ground to top of pipe likely averages between seven and three feet. This is in the range of minimum desired pipe depth sustainable for farming practices.

As can be seen in Table 1, the drainage coefficient of the Branch 7 system ranges from 0.12 inches per day to 0.72 inches per day for the far upper end. The outlet itself is limited to 0.21 inches per day or less than a quarter of an inch. The drainage coefficient of the Branch 8 system ranges from 0.16 inches per day at the outlet to 0.92 inches per day on the upper end. These capacities assume the pipe is without any irregularities such as separated joints, deformed pipe or debris in the flowline for example. The majority of the system and outlet capacities are less than the

minimum design standard of 0.50 inches per day drainage coefficient recommended by the Iowa Drainage Manual for modern farming operations.

Approximately 13% of soils within tributary area for Branch 7 of Drainage District No. 69 are considered very poorly drained soil found in upland depressions subject to ponding (Okoboji). Another 52% of the soils are considered poorly drained (Canisteo) and 18% somewhat poorly drained (Nicollet). (See soils map in Appendix C). Providing and maintaining an adequate outlet for District tile and private tile systems is essential for supporting cultivation in the area.

## **4 Recommendation**

### Proposed Alternatives

The existing district tile system provides a low level of drainage for the connected lands and is susceptible to ongoing maintenance costs due to the aging system. The Iowa Drainage Manual recommends a minimum ½ inch drainage coefficient for modern crops and farming practices. The agricultural lands within this may greatly benefit from increased drainage capacity. The age of the existing tile system has been taken into account in developing a recommendation for improving the drainage within the district subsection. Specifically, the age of the tile is above the expected service life and therefore future failures must be considered in the proposed improvement.

Considering the soils, and age and capacity of the existing system we recommend either of the following options.

- A. Replace existing drain tile with larger pipes and improve drainage to ½ inch per day
- B. Replace existing drain tile with larger pipes and improve drainage to ¾ inch per day

Options A and B look to replace the existing system. Consideration was given to constructing a relief line along the existing tile laterals to somewhat reduce overall construction costs however, it does not address the ongoing maintenance issues and concerns of relying on a century old drainage system and therefore was not included as an option in this report.

Currently the ditch is approximately 0.9 feet below the outlet elevation. Both options are set to match this existing outlet elevation. The minimal freeboard at the outlet would not be ideal but is necessary in order to provide adequate cover over the pipe for farming operations. If there is interest in this project proceeding, it is recommended that the Board appoint a contractor to locate and expose the tile to better ascertain the current amount of cover prior to a full project design and bid letting. The minimum cover is anticipated to be approximately 3.2 feet for Option A and 2.6 feet for Option B. With ground cover tolerances this tight, there may be a potential need for adjusted pipe alignment to gain some cover. Precast reinforced concrete pipe has been considered in this analysis primarily due to the shallow nature of the tile laterals.

With any improvement, it is important to note a drainage district tile is designed to serve as a conveyance pipe, not a pipe for taking ground water through joints or perforations. The existing tile may currently intake ground water through cracks, offset joints or other openings. A new tile

with tongue and groove joints would keep that water from entering the pipe without supplemental field tile systems. It is recommended that landowners assess the historical conditions of water on their ground to understand the impact of a new tile which would not take ground water on its own. This may include planning for installing private tile systems to maximize the efficiency of field subsurface drainage.

Table 3: Engineer's Opinion of Probable Cost Summary

Option	Description	Estimate	Avg. \$/AC
A	Replace Branch 7 for 1/2" D.C.	\$476,400	\$588
A	Replace Branch 8 for 1/2" D.C.	\$31,375	\$137
B	Replace Branch 7 for 3/4" D.C.	\$547,900	\$676
B	Replace Branch 8 for 3/4" D.C.	\$32,310	\$141

## 5 Classification

In 2014 D.D. 69 and each of its branches were reclassified as part of a larger ditch cleanout project in accordance with Iowa Code Chapters 468.38 through 468.44 and 468.65. The classification schedule for Branches 7 and 8 was calculated based on each parcel's proximity to and usage of the Main Open Ditch and not the tile itself. Additionally Branches 7 and 8 are classified as a single system rather than separate entities. In this way lands that are currently draining to Branch 7 only will also pay for improvements that benefit Branch 8 only. It is therefore our opinion that this schedule is inequitable for the purposes of an improvement to Branches 7 and 8. The watershed for Branch 7 appears to match the classified boundary and therefore annexation will not be necessary.

## 6 Regulatory

While a Drainage District may have the authority to maintain the original capacity of its existing facilities through or adjacent to wetlands, a property owner is ultimately the responsible party for disturbance of jurisdictional wetlands located within the owned parcel. The United States Department of Agriculture (USDA) Farm Program requires conservation measures administered through the National Resources Conservation Service (NRCS) which include wetlands, those same or other wetlands may fall under the jurisdiction of the United States Army Corps of Engineers (USACE). USACE regulates wetlands and other aquatic habitat through Section 404 of the Clean Water Act and the United States Environmental Protection Agency regulates water quality to those jurisdictional wetlands or waters through Section 401 of the Clean Water Act.

Should the recommended improvement be constructed the NRCS will assume that any ground classified as Farmed Wetland will be converted and in technical violation of farm program rules. It is therefore strongly recommended that Jurisdictional wetland determinations through NRCS be requested in order to determine if any jurisdictional wetlands are proposed to be disturbed by the proposed improvement. Only a landowner or an official agent for a landowner may request a wetland determination. A drainage district may not request these determinations on behalf of the benefitted landowners. If a landowner finds that the proposed improvement will result in disturbance of jurisdictional wetlands, the findings must be presented to the Board of Supervisors at the public hearing or prior to the approval of the proposed improvement. The landowner is

ultimately responsible for meeting any wetland mitigation requirements. Wetland mitigation is available on a minimum, per acre basis and can currently be purchased from a mitigation bank for \$15,000 per acre.

## **7 Completion and Final Settlement**

In accordance with Iowa Code 468.101-468.103, once the work is completed, the engineer shall issue a report of completion for the drainage district trustees' consideration. The drainage district trustees shall hold a hearing to consider the acceptance and must provide notice of the meeting to all owners within the District. Any claims for damages shall be submitted in writing to the Auditor's Office prior to or at the completion hearing for consideration by the Board.

## **8 Administration**

If this report is tentatively approved, The Code of Iowa requires a public hearing date be set regarding this report and notice given to all district landowners included in the Drainage District No. 69 Branch 7 & 8 assessment schedules (Section 468.126, para 1.c.). If the project is approved, public bid letting will also be required (Section 468.34).

We anticipate the following steps in order to move forward with this report and project:

- Tentatively approve this report
- Set a date and time for the public hearing allowing time to provide notice to landowners
- Notice shall be provided to all landowners pursuant to Sections 468.14 through 468.18 of Iowa Code.
- Conduct public hearing
  - Hear objections to the feasibility of the proposed option(s)
  - Hear arguments for or against reclassification/ annexation
    - Appoint engineer for reclassification/ annexation
  - Order the repairs or improvements that are found to be desirable
  - Set a letting date and time
- Hold a public bid letting
- Award bid to lowest, responsive, responsible bidder
- Construct the repairs or improvements
- Hold completion hearing in accordance with 468.101-468.103
  - Consider damages
  - Release contractor retainage

## **APPENDIX A**

REPORT EXHIBIT

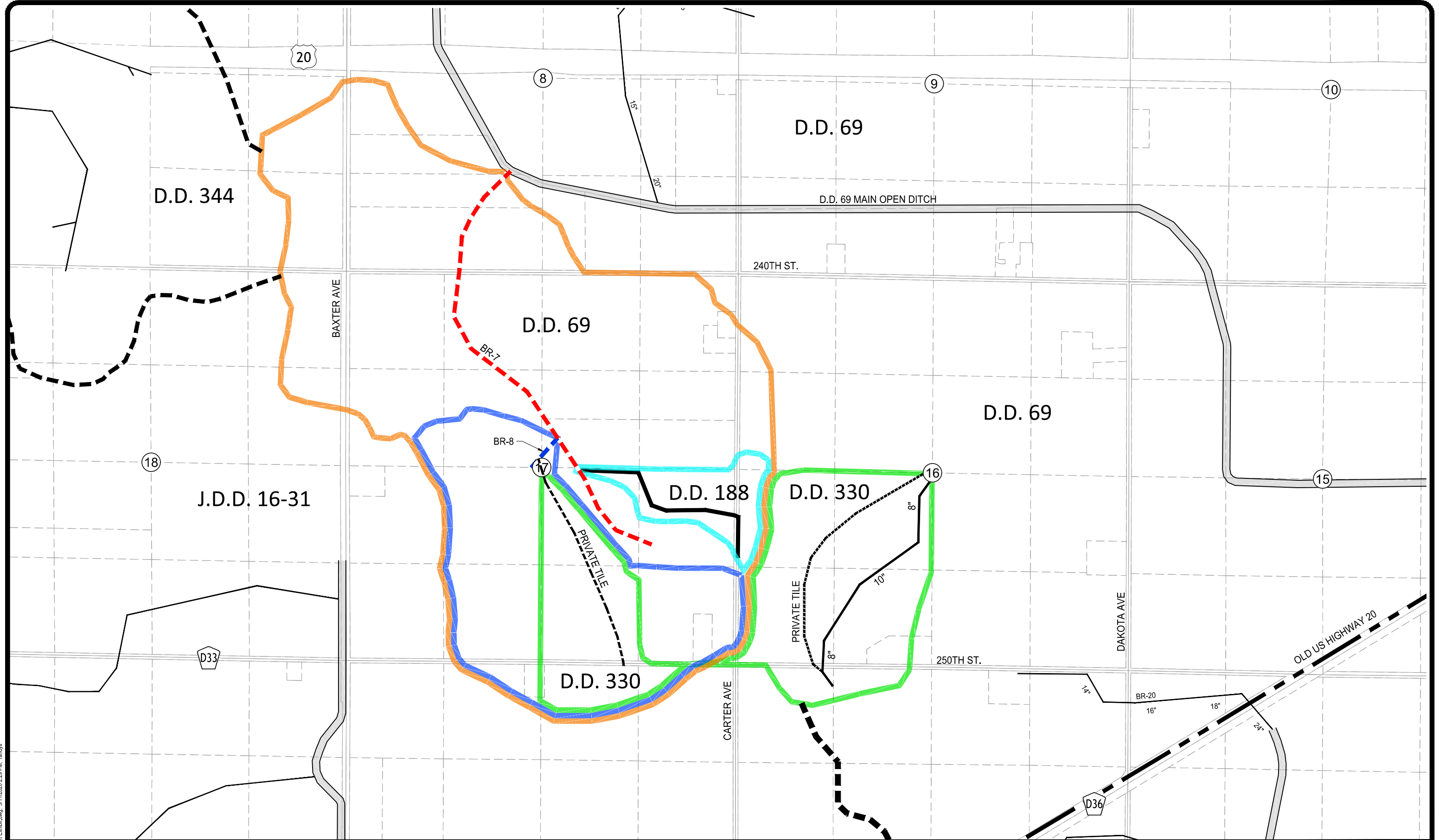


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- LEGEND
- BRANCH 7 WATERSHED BOUNDARY
  - BRANCH 8 WATERSHED BOUNDARY
  - D.D. 330 DISTRICT BOUNDARY
  - D.D. 188 DISTRICT BOUNDARY
  - BRANCH 7 TILE REPLACEMENT
  - BRANCH 8 TILE REPLACEMENT

DRAINAGE DISTRICT NO. 69  
BRANCH 7 AND 8 TILE REPLACEMENT  
WEBSTER COUNTY, IOWA



## **APPENDIX B**

### ENGINEER'S OPINION OF PROBABLE COSTS

**Opinion of Probable Costs**  
**Drainage District No. Branch 7 - Webster County**  
**Tile Replacement Option - 1/2" Coefficient**

Item	Description	Quantity	Unit Price	Extension
1	Tile Exploration	12 HRS	\$200.00	\$2,400.00
2	Crush & Bury Existing Tile on Site	6,400 LF	\$2.00	\$12,800.00
3	36" RCP	2,600 LF	\$65.00	\$169,000.00
4	30" RCP	1,800 LF	\$45.00	\$81,000.00
5	24" RCP	600 LF	\$35.00	\$21,000.00
6	15" RCP	1,400 LF	\$25.00	\$35,000.00
7	Trench Stabilization Rock	640 TN	\$25.00	\$16,000.00
8	Field Tile Connections	19 EA	\$200.00	\$3,800.00
<b>Estimated Construction Cost</b>				<b>\$341,000.00</b>
10% Contingency				\$34,100.00
Report & Hearings				\$12,800.00
Plans, Specifications, Bidding Phase, Contract Documents				\$20,100.00
Construction Staking, Construction Review, Administration				\$29,200.00
Reclassification				\$7,300.00
150' wide Right of Way Damages @ \$1800/AC				\$31,900.00
<b>TOTAL</b>				<b>\$476,400.00</b>
<u>Hwy Crossing, Paid by Secondary Roads Dept.</u>				
Trenched Road Crossing (66 LF 36" RCP)				\$8,000.00
Traffic control				\$1,000.00
<b>Average Cost per acre</b>				<b>\$588</b>
<b>Average Cost per acre, 10 years @ 6%</b>				<b>\$80</b>

**Opinion of Probable Costs**  
**Drainage District No. Branch 8 - Webster County**  
**Tile Replacement Option - 1/2" Coefficient**

Item	Description	Quantity	Unit Price	Extension
1	Tile Exploration	4 HRS	\$200.00	\$800.00
2	Crush & Bury Existing Tile on Site	525 LF	\$2.00	\$1,050.00
3	18" RCP	425 LF	\$30.00	\$12,750.00
4	15" RCP	100 LF	\$25.00	\$2,500.00
5	Trench Stabilization Rock	54 TN	\$25.00	\$1,350.00
6	Field Tile Connections	4 EA	\$200.00	\$800.00
<b>Estimated Construction Cost</b>				<b>\$19,250.00</b>
10% Contingency				\$1,925.00
Report & Hearings				\$1,100.00
Plans, Specifications, Bidding Phase, Contract Documents				\$1,700.00
Construction Staking, Construction Review, Administration				\$2,500.00
Reclassification				\$2,200.00
150' wide Right of Way Damages @ \$1800/AC				\$2,700.00
<b>TOTAL</b>				<b>\$31,375.00</b>
<b>Average Cost per acre</b>				<b>\$137</b>
<b>Average Cost per acre, 10 years @ 6%</b>				<b>\$19</b>

**Opinion of Probable Costs**  
**Drainage District No. Branch 7 - Webster County**  
**Tile Replacement Option - 3/4" Coefficient**

Item	Description	Quantity	Unit Price	Extension
1	Tile Exploration	12 HRS	\$200.00	\$2,400.00
2	Crush & Bury Existing Tile on Site	6,400 LF	\$2.00	\$12,800.00
3	42" RCP	2,600 LF	\$75.00	\$195,000.00
4	36" RCP	1,800 LF	\$65.00	\$117,000.00
5	27" RCP	600 LF	\$40.00	\$24,000.00
6	15" RCP	1,400 LF	\$25.00	\$35,000.00
7	Trench Stabilization Rock	640 TN	\$25.00	\$16,000.00
8	Field Tile Connections	19 EA	\$200.00	\$3,800.00
<b>Estimated Construction Cost</b>				<b>\$406,000.00</b>
10% Contingency				\$40,600.00
Report & Hearings				\$12,800.00
Plans, Specifications, Bidding Phase, Contract Documents				\$20,100.00
Construction Staking, Construction Review, Administration				\$29,200.00
Reclassification				\$7,300.00
150' wide Right of Way Damages @ \$1800/AC				\$31,900.00
<b>TOTAL</b>				<b>\$547,900.00</b>
<u>Hwy Crossing, Paid by Secondary Roads Dept.</u>				
Trenched Road Crossing (66 LF 42" RCP)				\$8,600.00
Traffic control				\$1,000.00
<b>Average Cost per acre</b>				<b>\$676</b>
<b>Average Cost per acre, 10 years @ 6%</b>				<b>\$92</b>

**Opinion of Probable Costs**  
**Drainage District No. Branch 8 - Webster County**  
**Tile Replacement Option - 3/4" Coefficient**

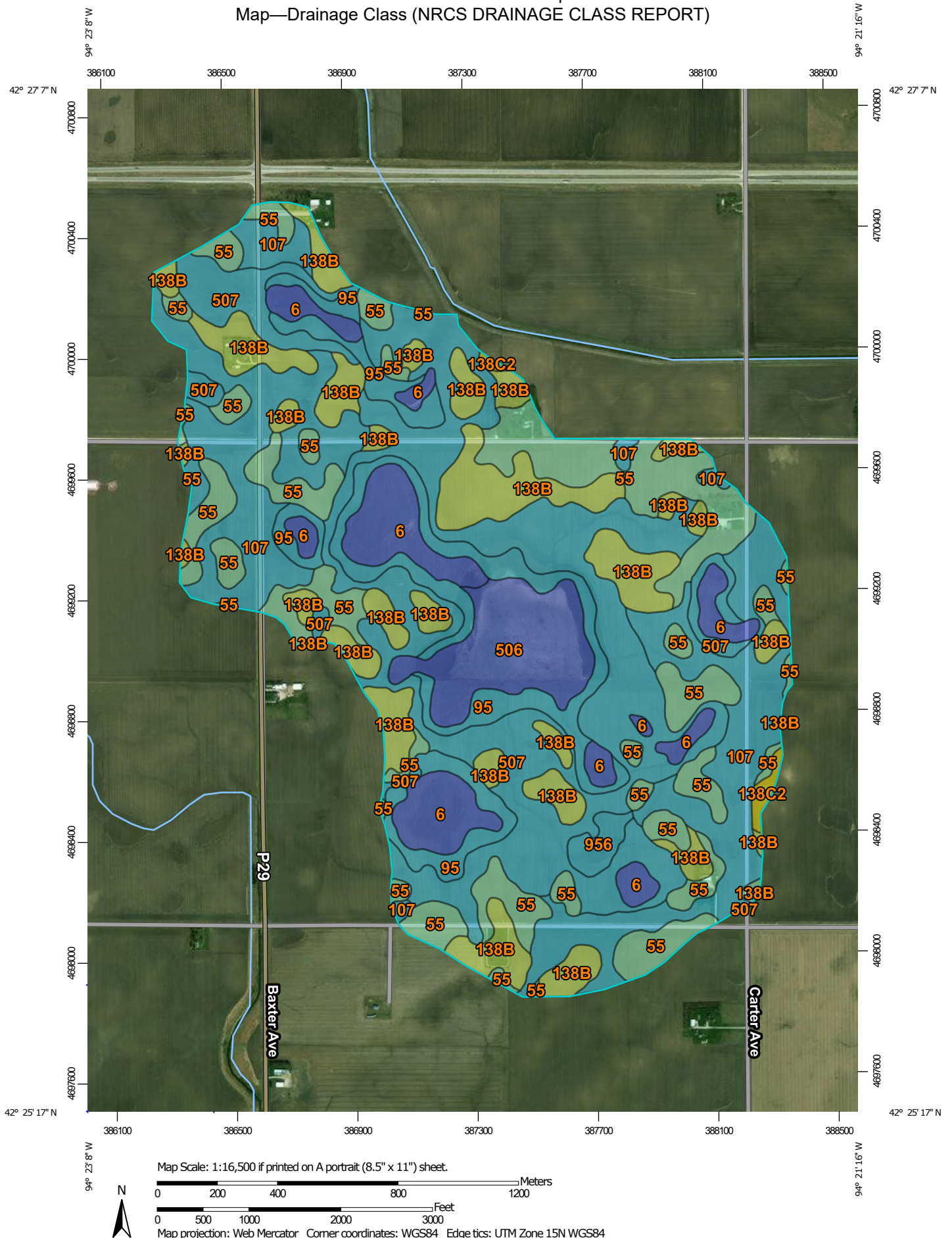
Item	Description	Quantity	Unit Price	Extension
1	Tile Exploration	4 HRS	\$200.00	\$800.00
2	Crush & Bury Existing Tile on Site	525 LF	\$2.00	\$1,050.00
3	21" RCP	425 LF	\$32.00	\$13,600.00
4	15" RCP	100 LF	\$25.00	\$2,500.00
5	Trench Stabilization Rock	54 TN	\$25.00	\$1,350.00
6	Field Tile Connections	4 EA	\$200.00	\$800.00
<b>Estimated Construction Cost</b>				<b>\$20,100.00</b>
10% Contingency				\$2,010.00
Report & Hearings				\$1,100.00
Plans, Specifications, Bidding Phase, Contract Documents				\$1,700.00
Construction Staking, Construction Review, Administration				\$2,500.00
Reclassification				\$2,200.00
150' wide Right of Way Damages @ \$1800/AC				\$2,700.00
<b>TOTAL</b>				<b>\$32,310.00</b>
<b>Average Cost per acre</b>				<b>\$141</b>
<b>Average Cost per acre, 10 years @ 6%</b>				<b>\$19</b>

## **APPENDIX C**

NRCS SOILS MAP

# Custom Soil Resource Report

## Map—Drainage Class (NRCS DRAINAGE CLASS REPORT)





# Custom Soil Resource Report



















## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

#### Soil Rating Polygons


	Excessively drained		Excessively drained
	Somewhat excessively drained		Somewhat excessively drained
	Well drained		Well drained
	Moderately well drained		Moderately well drained
	Somewhat poorly drained		Somewhat poorly drained
	Poorly drained		Poorly drained
	Very poorly drained		Very poorly drained
	Subaqueous		Subaqueous
	Not rated or not available		Not rated or not available

#### Soil Rating Lines






	Excessively drained
	Somewhat excessively drained
	Well drained
	Moderately well drained
	Somewhat poorly drained
	Poorly drained
	Very poorly drained
	Subaqueous
	Not rated or not available

#### Soil Rating Points


### Water Features

 Streams and Canals

### Transportation

	Rails
	Interstate Highways
	US Routes
	Major Roads
	Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Webster County, Iowa

Survey Area Data: Version 36, Sep 12, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 15, 2015—Sep 19, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

**Table—Drainage Class (NRCS DRAINAGE CLASS REPORT)**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
6	Okoboji silty clay loam, 0 to 1 percent slopes	Very poorly drained	63.6	7.8%
55	Nicollet clay loam, 1 to 3 percent slopes	Somewhat poorly drained	147.5	18.2%
95	Harps clay loam, 0 to 2 percent slopes	Poorly drained	70.2	8.6%
107	Webster clay loam, 0 to 2 percent slopes	Poorly drained	149.7	18.4%
138B	Clarion loam, 2 to 6 percent slopes	Moderately well drained	128.9	15.9%
138C2	Clarion loam, 6 to 10 percent slopes, moderately eroded	Well drained	3.4	0.4%
506	Wacousta silty clay loam, depressional, 0 to 1 percent slopes	Very poorly drained	45.3	5.6%
507	Canisteo clay loam, 0 to 2 percent slopes	Poorly drained	197.0	24.3%
956	Harps-Okoboji complex, 0 to 2 percent slopes	Poorly drained	6.6	0.8%
<b>Totals for Area of Interest</b>			<b>812.2</b>	<b>100.0%</b>

**Rating Options—Drainage Class (NRCS DRAINAGE CLASS REPORT)***Aggregation Method: Dominant Condition**Component Percent Cutoff: None Specified**Tie-break Rule: Higher*

## **APPENDIX D**

### IMPROVEMENT PETITION

DD #69 Br 7:8

## DRAINAGE PETITION

TO THE BOARD OF SUPERVISORS OF Webster COUNTY, IOWA:

The undersigned ask that a drainage file & investigated for possible improvement/replacement  
 commencing at Dodge ditch in the NE 1/4 SW 1/4 section 8 of  
Fulton Twp

and running thence south and east

and terminating at NW 1/4 SE 1/4 section 17 Fulton Twp

be

Your petitioners further state that the lands situated in

are subject to overflow (or are too wet for cultivation or subject to erosion or flood danger), and the public benefit, utility, health, convenience and welfare will be promoted by the above mentioned project.

## NAMES

Moe Farms Inc Kevin Moe

Deanna & Patricia Olson

Bernard Olson B40

Dean Billings

Mary Frances

Deanna Reifstock by

The Moe

Cynthia Seehusen

Donna A. Moe

## NAMES

76.1 Acres

69.24 acres

79 acres

27.2 acres

88.9

87.18

3.79, 13.21

\$79.00

FILED  
 2019 SEP 30 PM 2:19  
 DOREN PLINER  
 COUNTY AUDITOR