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218 11th Street SW Plaza
Spencer, IA 51301

Ph: (712) 580-5075
Bolton-Menk.com

April 8, 2020

Board of Supervisors
Pocahontas County Courthouse
99 Courthouse Square
Pocahontas, IA 50574

RE: Drainage District No. 74
Preliminary Engineering Analysis
Pocahontas County
Project No.: A16.120745

APPROVED
BY
BOARD OF SUPERVISORS
POCAHONTAS COUNTY
4/14/20
Chrm

Dear Supervisors:

A petition for drainage relief in the Main Tile and Branch 1 of Drainage District No. 74 was filed with the Board of Supervisors of Pocahontas County on February 5th, 2020. The petition requests an investigation to determine repairs or improvements needed to bring drainage relief to the lands of the district. A copy of the petition is enclosed. The Board appointed Bolton & Menk, Inc. to provide an initial study of conditions of Drainage District No. 74. Please note this is not a full Engineer's Report, but is intended to provide both the landowners and the Board with information useful in determining whether to proceed with a full study.

Existing Tile System:

The watershed of the Main Tile spans approximately 2,952 acres in Sections 3, 4, 9, 10, 11, 14, 15, 16, 17, 21, & 22 of Dover Township (T-91-N, R-34-W) in Pocahontas County, Iowa. The watershed of Branch 1 spans approximately 773 acres in Sections 10, 14, 15, 22 & 23 of Dover Township. The watershed of Branch 2 spans approximately 439 acres in Sections 21, 22, & 28. The Engineer's Report for the establishment of Drainage District No. 74 was filed in 1913 following a landowner petition; construction then followed including an Open Ditch, Main Tile and Branches 1 through 13.

The Main Tile and Branches 1 through 13 are composed of nearly 9 miles of tile ranging in size from 34 to 8 inches in diameter, with their outlets into the Main Open Ditch of Drainage District No. 74 in Section 22. The size and drainage coefficient (DC) of each tile reach is analyzed and included in the tables below, as well as a comparison to modern capacity. The coefficient represents the depth of excess water removed from the surface of the watershed in a 24-hour period. The modern standard of ½" of water removed from the surface area of the watershed in 24 hours (½" DC) has been in use since the 1950's. However, due to the age of this system it is likely that the current capacity is roughly 80-90% of that shown in the table. Supplementing and paralleling the existing system and using the capacity of the old tile is not recommended because the desired function of the system would rely upon a century old tile. See also enclosed maps showing the existing tile system and drainage adequacy.

Existing Main Tile System								
<u>Starting Station</u>	<u>Dia. (in)</u>	<u>Grade (%)</u>	<u>Ex Cap (cfs)</u>	<u>Approx. Length (ft)</u>	<u>Acres Drained</u>	<u>Ex DC (in/day)</u>	<u>Percent Std</u>	<u>Dia. Needed* (in)</u>
83+60	34	0.17%	28.0	4,300	2,952	0.23	45%	48
126+60	32	0.14%	21.6	4,440	2,544	0.20	40%	48
171+00	30	0.14%	18.2	1,100	1,934	0.22	45%	42
182+00	26	0.14%	12.4	500	1,093	0.27	54%	33
187+00	24	0.19%	11.7	1,200	965	0.29	58%	30
199+00	22	0.19%	9.3	500	941	0.23	47%	30
204+00	20	0.19%	7.2	800	757	0.23	45%	27
212+00	18	0.19%	5.4	3,600	585	0.22	44%	27
248+00	18	0.145%	4.7	500	360	0.31	63%	24
253+00	16	0.145%	3.5	1,400	300	0.27	55%	21
267+00	15	0.145%	2.9	1,100	174	0.40	80%	18
278+00	14	0.145%	2.4	1,000	126	0.46	92%	15

Branch 1: Existing Tile System								
<u>Starting Station</u>	<u>Dia. (in)</u>	<u>Grade (%)</u>	<u>Ex Cap (cfs)</u>	<u>Approx. Length (ft)</u>	<u>Acres Drained</u>	<u>Ex DC (in/day)</u>	<u>Percent Std</u>	<u>Dia. Needed* (in)</u>
0+00	20	0.20%	7.4	300	773	0.23	45%	27
3+00	20	0.70%	13.8	200	762	0.43	86%	24
5+00	20	0.30%	9.0	2,000	762	0.28	56%	27
25+00	16	0.30%	5.0	2,100	584	0.20	41%	21
46+00	16	0.16%	3.6	2,800	435	0.20	40%	24
74+00	12	0.50%	3.0	900	255	0.28	56%	15

Branch 2: Existing Tile System								
<u>Starting Station</u>	<u>Dia. (in)</u>	<u>Grade (%)</u>	<u>Ex Cap (cfs)</u>	<u>Approx. Length (ft)</u>	<u>Acres Drained</u>	<u>Ex DC (in/day)</u>	<u>Percent Std</u>	<u>Dia. Needed* (in)</u>
0+00	20	0.10%	5.2	2,100	439	0.28	57%	27
21+00	18	0.10%	3.9	1,000	387	0.24	48%	24
31+00	16	0.10%	2.9	900	327	0.21	42%	24
40+00	12	2.00%	12.9	300	327	0.94	187%	24
43+00	12	0.30%	2.3	870	177	0.31	62%	15
51+70	8	0.20%	0.6	430	62	0.25	49%	12

Branches 3 – 13: Existing Tile Systems									
Branch	Starting Station	Dia. (in)	Grade (%)	Ex Cap (cfs)	Approx. Length (ft)	Acres Drained	Ex DC (in/day)	Percent Std	Dia. Needed* (in)
3	0+00	10	1.50%	3.2	600	112	0.68	135%	12
4	0+00	10	0.30%	1.4	560	102	0.33	67%	12
5	0+00	14	0.10%	2.0	1000	172	0.28	56%	18
6	0+00	20	0.22%	7.7	600	663	0.28	55%	27
	6+00	20	0.18%	7.0	3,000	659	0.25	51%	27
	36+00	18	0.18%	5.3	800	554	0.23	45%	27
	43+00	14	0.42%	4.1	700	235	0.42	84%	15
7	0+00	12	0.20%	1.9	240	258	0.17	35%	18
8	0+00	12	0.32%	2.4	1,800	74	0.77	153%	12
8	18+00	10	0.32%	1.5	600	55	0.64	128%	12
9	0+00	12	1.00%	4.2	220	15	6.53	1305%	6
10	0+00	10	0.80%	2.3	460	151	0.37	73%	12
11	0+00	12	1.50%	5.2	300	6.3	19.54	3907%	4
12	0+00	8	0.40%	0.9	650	82	0.26	52%	12
13	0+00	12	0.60%	3.3	1,110	66	1.17	234%	12

*: Size of tile needed for 1/2" drainage coefficient. Assumes same tile grade as existing, and all tile 12" or larger would be reinforced concrete pipe (RCP) with smaller diameters being plastic.

It appears that most of the tile in Drainage District 74 was originally designed with a drainage coefficient between 1/5" and 1/4"/day, or 40-50% of the recommended minimum modern design of 1/2"/day. The Main Tile and Branch 1 meets less than half (45%) of this modern standard. Similarly, Branches 2, 5, 6, 7 and 12 all meet less than 60% of the modern standard and would benefit the lands of the district if improved.

Branches 4 and 10 are designed at approximately 70% of the modern standard and depending on the condition of the existing tile and degree of existing surface drainage may not need improvement at this time. They may have better performance if the Main Tile and Branch 1 are improved, as the outlet will be improved.

Only Branches 3, 8, 9, 11, and 13 meet the minimum modern design standard drainage coefficient of 1/2"/day. These branches rely on an adequate downstream outlet to flow at their full design capacity. Since these branches flow into tile (Main Tile, Branch 1, or Branch 2) with a much lower drainage coefficient they are unable to utilize their full design capacity. It is also our judgement with the data available to us, that Branches 9 and 11 are of little overall value to the district as they serve small areas (15.4 and 6.3 acres, respectively), and they could either be tied into a new improvement, replaced with smaller or same sized tile, or be left to be done privately. In Branch 11's case, if the existing tile is still in good condition, it is nearly 40 times more capable than required for its small drainage area.

For informational purposes, we have calculated a rough preliminary estimate of the construction cost to improve the entire existing Drainage District No. 74 tile system, broken into the three major tile systems in the district. The rough estimate is based on the tile lengths and necessary tile sizes to bring the facility up to a minimum of 1/2" /day drainage coefficient.

The cost estimate is based on the assumption of a complete tile system replacement, including all sub-laterals. The average cost per acre is similar to what could be expected of a major tile improvement project. However, the cost would be lower if portions of the existing tile are not replaced. Landowner input and interest levels would be taken into consideration for potential recommendations made in a full engineer's report. Discussions at an informational meeting will be vital to the Board and the engineer in helping to further define the needs of the district.

Estimated Construction Costs for DD74 Tile System Improvements			
<u>Facility*</u>	<u>Acres Served</u>	<u>Estimated Construction Cost</u>	<u>Average Construction Cost per Benefited Acre</u>
Main Tile	2,952 acres	\$2,560,000	\$867
Branch 1	773 acres	\$493,000	\$638
Branch 2	439 acres	\$347,000	\$790

*: Including all sub-laterals

Note this estimate does not include basic engineering services, and other costs associated with the project. For a project of this size an additional 10-15% of the construction cost could be expected to cover non-construction costs. A full engineering report should include a more accurate cost estimate and design.

Main Open Ditch:

Without survey we have limited information available to analyze the Main Open Ditch and its potential impact on drainage in the district. As part of a full engineer's report we would complete a survey of the ditch and the tile that outlet into it, to determine whether repairs or improvements may be necessary. A repair would mean removing accumulated sediment and restoring the ditch to its original design dimensions. An improvement may include widening and/or deepening the channel in order to lower the water elevation in the ditch thus providing a freer outlet for the district's tile systems. The following is a preliminary analysis based on information available to us at this time.

The Main Open Ditch of Drainage District No. 74 begins in the E1/2 SW NW Section 22 of Dover Township (T-91-N, R-34W) and runs approximately 1.6 miles SSE prior to emptying into Joint Drainage District No. 181 (JDD 181) Main Open Ditch. The DD74 Main Open Ditch, as designed, has a 5 foot bottom width and lies on a 0.05% grade. At the mouth, the DD74 Main Open Ditch has a drainage area of approximately 8.02 square miles, or 5,130 acres. A visual observation at the first road crossing south of the head of the Main Open Ditch (560th St) showed no obvious signs of excessive sediment accumulation in the channel.

Name: Pocahontas County Board of Supervisors

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The design flow capacities of the existing Drainage District No. 74 tile systems combined total approximately 41 cubic feet per second (cfs), or 18,400 gallons per minute (gpm). At this flow the water in the Main Open Ditch is estimated to be approximately 40 inches deep. Based on the ditch and tile elevations shown in the original design plans, at this elevation the water would be nearly two-thirds (2/3) of the way up the 34" diameter Main Tile pipe. This condition would cause a constant "backwater effect", further reducing the flow of water through the already inadequately sized and aging tile system.

The original design plans show Branch 1 & Branch 2 to outlet to the Main Open Ditch 3 to 4 ½ feet above the ditch bottom, so likely no backwater effect is occurring except perhaps for a short duration following a large storm event.

Drainage Issues Specific to Petitioners:

The petitioner owns several parcels in different non-adjointing sections of the district and watershed. Each holding is on the outer extents of the watershed and due to the issues previously discussed, the existing district facilities are not currently providing adequate drainage to these lands. These and the other lands in the district would benefit from drainage improvements.

Recommendations:

We recommend scheduling an informational meeting with landowners in the district to discuss our findings and gage interest in potential drainage improvements. If interest exists, we recommend the Board move forward with a full Engineer's Report.

Sincerely,

Bolton & Menk, Inc.

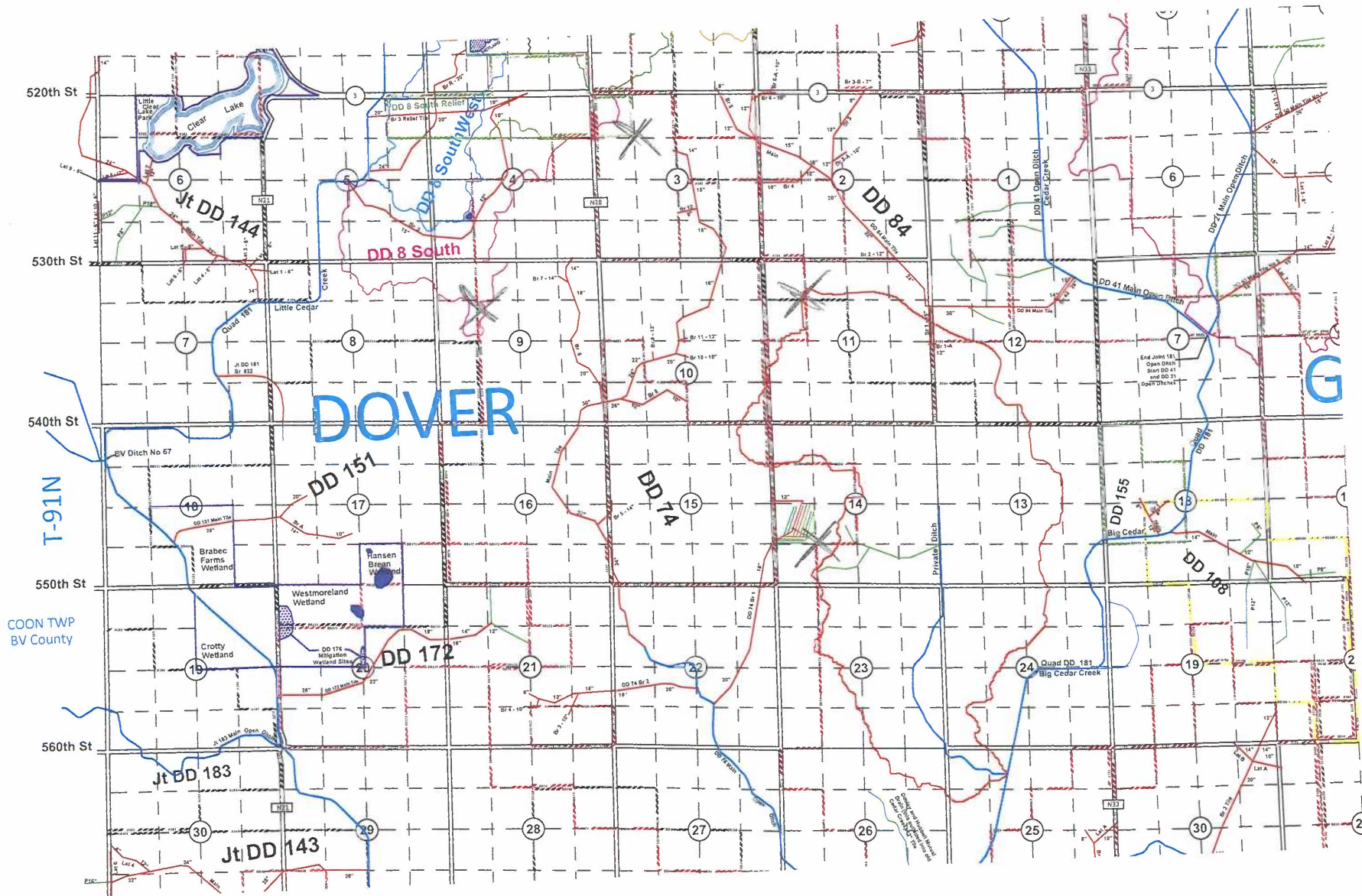


Collin Klingbeil, P.E.

Project Engineer

CC: *James C Hudson, Attorney*

Encl. *Petition*
Existing Tile System & Adequacy Maps



RECEIVED

FEB 05 2020

DRAINAGE PETITION

TO: THE BOARD OF SUPERVISORS OF POCAHONTAS COUNTY, IOWA, ACTING ON BEHALF OF
DRAINAGE DISTRICT NO. 74 MAIN TILE AND BRANCH 1 TILE WHICH BENEFITS LANDS SOLEY IN
POCAHONTAS COUNTY, IOWA.

COUNTY AUDITOR &
COMMISSIONER OF ELECTIONS

COMES NOW, the undersigned Petitioners, being owners of the real estate in this established branch of the drainage district and in making this petition for drainage relief for the drainage of said lands respectfully state to the Board of Supervisors of Pocahontas County, Iowa:

1. That the lands of these petitioners are a part of and are included in Drainage District No. 74 Main Tile and Branch 1 Tile in Pocahontas County, Iowa, and that said lands are assessed for drainage tax by virtue of the improvements in said branch of the district.
2. That the drainage facilities of Drainage District No. 74 Main Tile and Branch 1 Tile in their present condition in section 22, 15, 16, 10, 9, & 3-93-34 are not sufficient to properly drain the water from the lands of these petitioners as well as other lands; that such lands are too wet for timely cultivation, too wet to support good crop production, and are subject to erosion and flood danger; that if the original improvements in said drainage district were properly improved to correct the current situation, the public benefit, utility, health and welfare would be promoted.
3. That these petitioners do not have exact knowledge or information as to the exact nature of the work to be done to correct the situation, but that these petitioners are of the belief that an investigation of the situation by a qualified engineer would determine the exact nature of the work required to provide adequate drainage for the lands of these petitioners and adjoining lands.
4. That these petitioners, being the owners of lands which are part of the benefited area of Drainage District No. 74 Main Tile and Branch 1 Tile, are entitled to adequate drainage from improvements of the drainage district.
5. That these petitioners are signing this petition pursuant to Section 468.126 of the Code of Iowa.

WHEREFORE, these petitioners respectfully request that the Board of Supervisors of Pocahontas County, Iowa, acting on behalf of the owners of lands benefited by Drainage District No. 41 appoint an qualified engineer to investigate the drainage situation herein referred to with respect to petitioners land and other lands; and that the board order that district facilities be improved, to provide adequate drainage relief for the lands of these petitioners and adjoining lands as described above.

Dated this 5 day of February, 2020

LANDOWNERS

DESCRIPTION OF LAND

Vegors Land & Livestock Co

Sec 3, 9, 11, & 14-91-34

Donald Sievers, CEO

Donald Sievers CEO
2/5/20

