JACOBSON-WESTERGARD & ASSOCIATES, INC.
Consulting Engineers & Land Surveyors

105 South 6th Street
Estherville IA 51334
Phone (712) 362-2647
www.jacobson-westergard.com

ENGINEER'S REPORT

DRAINAGE DISTRICT NO. 76
TILE REPAIRS / IMPROVEMENTS
DICKINSON COUNTY, IOWA

PROJECT NO: E25021

LICENSED PROFESSIONAL ENGINEER
COLLIN J. KLINGBEIL
24741
IOWA

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.

Collin Klingbeil Date 3/14/26

Collin J. Klingbeil, P.E.
License number 24741
My license renewal date is December 31, 2027
Pages or sheets covered by this seal: 1-10 & enclosures

I. INTRODUCTION/HISTORY

A. Scope

A petition for drainage tile improvements in Dickinson County Drainage District No. 76 (DD76) was filed in March of 2025. The Dickinson County Board of Supervisors, acting as trustees for DD76, appointed Jacobson-Westergard & Associates, Inc. to conduct the necessary survey, study, plan, and report. The petition is enclosed. In the petition it is stated that the tile is broken under a fen (wetland), requests a cleanout of the outlet ditch, that the tile under County Road M27 is likely broken, and that repairs are needed between the road and where the tile turns west to go under M27.

DD76 includes approximately 334 acres located in Sections' 9 -10, and 15-16 in Excelsior Township (T-99-N, R-38-W) in Dickinson County, Iowa.

B. History

- April 1927 – Petition filed for the establishment of Drainage District No. 76
- April 1927 – Engineer's report filed by R.A. Furman recommending 200 feet of open ditch, nearly 3,000 feet of Main Tile ranging from 16" to 10" in diameter, and Branches 30, 30-12, and 46 at an estimated construction cost of $1,894.30.
- June 13, 1927 – Hearing on establishment
- June 15, 1927 – Damage appraisers appointed.
    - Report fixed damages at $10 for the N ½ of NW ¼ Section 15 of Excelsior Township
- July 8, 1927 – Bids opened, contract awarded to Carl Ericksen for $583.25 in labor, material contract awarded to Sibley Cement Company for $1,090.00 for a total contract amount of $1,673.25.
- November 21, 1927 – levy set at $1,900 for DD76

II. EXISTING TILE STARTING POINT, ROUTE AND TERMINUS

See also the enclosed existing tile map.

Main: The Main begins with an approximately 200 ft open ditch with a 2-ft design bottom width that serves as the outlet for the tile system of DD76. The open ditch is located in the SW corner of the NE NW ¼ of Section 15 of Excelsior Township (T-99-N, R-38-W) in Dickinson County, Iowa. This property is presently owned by the State of Iowa and is managed by the Iowa Department of Natural Resources. The Main Tile of DD76 outlets into the ditch and extends generally westward for approximately 900 feet before turning north and west, crossing to the west side of County Road M27 just north of 170th Street, and subsequently runs approximately 480 north before terminating. The tile is approximately 2,980 feet in length and ranges in diameter from 16" to 10".

Branch 30 Tile: Lateral that connects to the Main Tile in the SE corner of the NW NW ¼ of Section 15 of Excelsior Township and runs west and south, crossing to the west side of County Road M27 before terminating (in the SE NE ¼ of Section 16). The tile is approximately 1,206 feet in length and is 12" in diameter.

Branch 30-12 Tile: Lateral that connects to the Branch 30 Tile on the west side of County Road M27 in the SE NE ¼ of Section 16 and runs straight north in the road right-of-way approximately 1,200 feet and is a 6" diameter tile.

Branch 46 Tile: Lateral that connects to the Main Tile on the west side of County Road M27 in the SE corner of Section 9 and extends straight south in the road right-of-way to the south side of 170th Street and terminates in the NE corner of Section 16. Branch 46 is a 6" diameter tile and is approximately 350 feet in length.

III. INVESTIGATION

A survey was made of DD76, which included going to the site and locating culverts and tile intakes. In addition, Engineer's reports and plats, plans, private tile, and profiles of district facilities were also reviewed.

Condition of Existing Tile System:
The DD76 tile system is nearly 100 years old and is cement pipe. We know that near the outlet there are several blowouts and the tile in this reach is in disrepair. From the outlet of the Main Tile to the west side of County Road M27 there is approximately 5 feet of fall. From the outlet of the Main Tile to the end of Branch 30 (on the west side of M27) there is approximately 4.2 feet of fall. In our opinion the drainage of a majority of the drainage district is being restricted due to the blowouts on the state-owned property east of M27.

Additionally, on March 12-13, 2026 the Branch 30 tile was dug up on both sides of County Road M27 and a camera run into the tile. There was 3-4 inches of water flowing through the tile at the time. Under the road the tile at some point was replaced with corrugated metal pipe (CMP), which appears to be somewhat rusty but the tile is not plugged or collapsed.

Design Capacity of Existing Tile System:
The adequacy of the existing tile system has been analyzed. Note that the capacities shown assume the tile is in good condition, and clean is not the case. The design parameter commonly used for drainage tile is known as the *drainage coefficient*. According to the Iowa Drainage Guide, the drainage coefficient (DC) is the rate at which water can be removed from the land and is expressed as the equivalent depth of water covering the surface of the drained area that can be removed in 24 hours. In the early 1900's tile systems were commonly designed at a DC of 1/4 – 1/8 inches per day. A DC of 1/2 – 1 inches per day is commonly used today in Iowa for agricultural drainage system design.

Design of Existing Tile Systems

Lateral	Starting Station	Dia. (in)	Grade (%)	Ex Capac. (cfs)	Velocity (fps)	Approx. Length	Acres Drained	DC (in/day)	Cum. Fall (ft)
Main	21+00	16	0.20%	3.72	2.66	900	334.1	**0.26**	1.80
	30+00	12	0.20%	1.73	2.20	1,600	128.8	**0.32**	5.00
	46+00	10	0.95%	2.31	4.24	480	65.0	0.85	9.56
Branch 30	0+00	12	0.20%	1.73	2.20	1,206	199.4	**0.21**	2.41
Branch 30-12	0+00	6	0.20%	0.27	1.38	1,200	3.8	1.70	2.40
Branch 46	0+00	6	0.10%*	0.19	0.98	350	16.12	**0.28**	0.35

*: Assumed grade as no design profile for Branch 46 was found.

Even if operating at full original design capacity the Main Tile would be undersized, with a DC in the lower reaches ranging from 0.26 – 0.32 inches per day. These values are below acceptable levels for efficient drainage. At least double the current design capacity would be required for adequate drainage. As the Main Tile serves as the outlet for all the other district tile branches it is a major restriction for drainage within the district.

Branch 30 and Branch 46 are also significantly undersized, with DC's ranging from 0.21 – 0.28 inches per day.

Utilities:
We have completed a design information request through Iowa One Call, to try to identify any utilities that could be in conflict with the proposed improvements. There are fiber lines in road rights-of-way, and overhead powerlines to work around, but we do not expect these to be an issue.

Wetland/Fen:
As previously mentioned, the lower portion of the Main Tile is in poor condition through a fen wetland on property owned by the State of Iowa and managed by the Iowa Department of Natural Resources (Iowa DNR). The Iowa DNR has expressed that while they want an efficient and cost-effective repair of the tile, they do not want the sensitive wetland fen to be damaged or destroyed. A fen is a rare type of wetland that accumulates peat and is fed by alkaline mineral rich ground water that comes to the ground surface. They support rare plants and insects.

The Main Tile is shallow in the fen. Peat soils are highly susceptible to frost heave, so this combination is likely to have contributed to the deterioration of the tile. It would be advantageous to DD76 to route the Main Tile around the fen wetland as much as possible. Boring through the fen to avoid open cutting would be cost prohibitive.

IV. REPAIR AND IMPROVEMENT OPTIONS

The investigation has confirmed that the existing DD76 tile system is in need of repairs or improvements. At a minimum, due to the failing condition of the Main Tile, by law repairs are required. If a repair is done, the Main Tile will continue to be inadequate. Therefore, we highly recommend pursuing an improvement. For an improvement, we would recommend a minimum drainage coefficient (DC) of 0.5 inches per day.

For a repair, we would recommend re-routing the lower approximately 800 feet of the Main Tile north around the fen wetland. In addition, the outlet channel should be cleaned out.

If improvements are pursued, we would recommend both the Main Tile and Branch 30 be improved. See enclosed map showing proposed tile improvements. Both improvements would cross to the west side of County Road M27, and would be jack and bored (steel casing) under the road.

A. What to do with the old tile

With drainage district tile improvement projects, a decision must be made regarding what to do with the existing drainage district tile. If the existing tile is in fair condition, typically the new tile is installed parallel to the existing tile and intermittent cross connections are made. With this approach we recommend the drainage district abandon the existing tile where there is a parallel improvement, which means it would become a private tile, and the drainage district would not be responsible for future maintenance.

Another option is to remove the old tile, either placing the new tile in the same trench as the old, or separately digging up and removing the old tile. This way the 100+ year old tile is no longer relied upon, and all existing tile have direct connections to the new tile system. If the new tile is installed parallel to the old, and the old tile is dug up and crushed, all private tile lines encountered are re-routed to the new tile. One downside to this is that the old tile is likely actively draining adjacent lands whereas the new tile would act primarily as a collector and will drain very little water itself. In times of dry weather where the existing tile is not running, putting the new tile in the same trench as the old is feasible but is very difficult if not impossible when the tiles have flowing water. For these reasons this is not often done.

Based on the information available to us at the time of writing this report we currently recommend a parallel installation with the existing tile left in place and abandoned.

B. Work within Road Rights-of-Way

Iowa Code requires that for drainage district facility work within county and state road rights-of-way, the cost of construction is to be paid by county secondary roads (for county roads). For the preliminary design we have a total of two (2) road crossings of County Road M27. Both crossings would be jack and bored (horizontal auger boring).

C. Pipe Material

The two main pipe materials to be considered are reinforced concrete pipe (RCP) and dual-wall high-density polyethylene (HDPE) pipe. In terms of material price, dual-wall HDPE pipe is certainly less costly than RCP. However, dual-wall HDPE is a “flexible” pipe that much more susceptible to deflection and pipe failure. The ability of dual-wall HDPE to hold up highly depends on the strength of the material around it, more so as the pipe size goes up. To obtain the required strength, crushed rock or compacted gravel/sand are required around the pipe, which adds significant cost to the installation. Imported material also means more truck traffic, soil compaction, and additional spoils to be dealt with. Crushed rock requires little to no compaction but is expensive. Cheaper materials (gravel/sand mixture, etc.) require more effort and care to achieve adequate compaction. When using different types of materials care must be given to preventing migration of fines into coarser material, which can result in significant loss of pipe support.

For dual-wall HDPE, extra care is required in handling and in blinding/backfilling to ensure the pipe is not damaged or excessively deflected. At high temperatures the pipe deflects easier and the trench is not recommended to be backfilled until the pipe temperature equalizes with the soil. Over-homing the pipe at the joints can cause damage and corrugation growth, restricting the flow capacity of the pipe. All of these factors make proper installation vital to the success of the project, and for dual-wall HDPE pipe installations significantly more construction inspection is required, significantly increasing the cost of engineering for the project.

Additionally, due to the potential for deflection during construction, potentially compromising the long-term viability of the pipe, deflection testing is required 30 days after final backfill, which tests for deflection more than 5%. Reportedly, the 5% requirement has a safety factor built in. Some promote the allowance of up to 7.5% deflection. A 1990 study has reported that approximately 80% of lifetime total deflection occurs within the first 30 days. Testing is typically done by laser profiling camera, or a mandrel. Access points along the tile must be installed as part of the project to accommodate this testing. These are also additional costs. Excessively deflected pipe is required to be replaced and retested at the cost of the contractor. This liability leads to higher bid prices from contractors.

Dual-wall HDPE pipe is lightweight in comparison to RCP, which is an advantage for transportation and handling; however, one disadvantage is the risk of flotation in the trench. Larger diameter pipes are more buoyant and at higher risk of flotation. Once flotation occurs, the cost of remediation is very high.

Several plastic pipe suppliers and also the Plastic Pipe Institute (PPI) have installation guides with less restrictive requirements for agricultural installations as compared to municipal storm sewer applications. The premise is that a lower level of performance and higher level of deflection is acceptable for agricultural applications. We can understand this, to an extent. For a dual-wall HDPE pipe installed as a storm sewer in an urban setting, under a street and surrounded by many other utilities, if an issue with the pipe arises it is a much higher cost and disturbance to fix than it would if the same issue occurred in a farm field. Therefore, it seems to be logical that a higher level of performance is necessary for storm sewer applications. However, if a lower performance level is allowable for agricultural installations, then it logically follows that more issues and more maintenance should be expected to occur over the life of the installation. This potentially adds cost over the life of the system and should not be ignored. Also, for underground pipes not all issues are immediately visible at the surface. Because of the ability of plastic to deform without breaking, routine inspection of the installation may need to be considered as part of the life cycle cost of the pipe.

One major allowance in plastic pipe industry recommendations for agricultural installations is for a rounded or shaped trench bottom (use of a “spoon”). This is allowed by the plastic pipe industry for various maximum cover depths (6 – 8 feet or more) as long as the native soil is stable after the rounded trench is excavated. It is unclear how “stable” is to be defined, but we understand the underlying assumption is that the in-situ soil is clayey (low to medium plasticity and lean) and firm. With soil conditions varying throughout a project it is difficult to determine where a rounded trench should be allowed. In our opinion, a standard field soil test is needed. Also, to help with bidding and cost estimates a geotechnical study to determine underlying soil properties may be needed. This would add cost to the project. We do routinely allow a spoon with RCP; however, the pipe does not rely on the strength of the material around the pipe the way plastic pipe does. We are also aware of contractors that install private dual-wall HDPE tile systems without strict adherence to the requirements we have described and have had success doing so. However, we would argue for a publicly owned (drainage district) tile improvement project that is expected to provide adequate drainage to nearly 1,000 acres of agricultural land for the next 100+ years that public installation standards are warranted.

The expected lifespan of RCP produced today is at least 100 years, and likely much more. The concrete mix is of much better quality than was used in cement tile installed in the early 1900’s, and also has steel reinforcement. Plastic pipes are relatively new and have not been in existence long enough to prove even a 100-year lifespan. The viscoelastic nature of plastic pipe means that it continuously deflects under a constant load, which is a concern in the consideration of the expected life of a project of this nature. It is reasonable to expect that RCP will outlast plastic pipe, but it is unclear by how long. If plastic pipe needs to be replaced before RCP, that also adds to the life cycle cost of plastic pipe installations.

One additional concern we have is in regard to flow capacity of like-sized RCP and dual-wall HDPE pipes. A roughness coefficient, Manning’s n, is a factor used to determine the flow capacity of a pipe. For dual-wall HDPE, a Manning’s n (roughness coefficient) of 0.012 is typically reported as the value to use in the design. The Manning’s n of 0.012 is supposedly conservative with a built in safety factor, in that smooth plastic (like PVC) may have values as low as 0.009. A report by the Federal Highway Administration (Hydraulic Design Series Number 5, Hydraulic Design of Highway Culverts) lists laboratory Manning’s n values for HDPE of 0.009 – 0.015. We note that the inner liner of dual-wall HDPE is not smooth; rather it is wavy. This is initially caused by the bonding of the outer corrugations to the inner liner. It can be exacerbated by a number of factors including external loading from the backfill to the external pipe corrugations (pushing them into the inner liner, causing re-corrugation /

corrugation growth). The depth of the corrugations on the inside of the pipe will vary depending on a number of factors. A study out of Utah State University tested Manning's n values of dual-wall plastic pipes under loading. The study showed Manning's n values ranging from 0.0115 – 0.013 for strain equivalent to 5% deflection (for strain equivalent to 7.5% deflection the values are even higher at 0.0125 – 0.014). In our opinion an in-service Manning's n value for design should be a minimum of 0.015, if not higher. Assuming an actual Manning's n of 0.015, the use of the industry recommended Manning's n value of 0.012 for design would result in flow rates of 80% of what is intended.

Considering the additional risks associated with plastic pipe installations, the concerns raised in the preceding discussion, and the overall lifecycle cost, in our opinion RCP is the preferred pipe material for a project of this nature. We can include a dual-wall HDPE pipe alternative in the bid at the Board and/or landowners' request, to see how the construction cost would compare. We caution that a simple comparison of bids would not factor in differences in engineering costs, potential long-term inspection and maintenance costs, or lifecycle cost differences. However, bidding both products may lead to better bid prices due to competition between the plastic and RCP suppliers.

The cost estimate in this report is based on the use of RCP.

V. RIGHT-OF-WAY

Iowa Code grants drainage district a permanent right of egress and ingress, and right of access for maintenance, repair, improvement, and inspection of drainage district facilities. Unless right-of-way is acquired, which we are not recommending, landowners will be reimbursed for any damages caused in the process of maintenance, repair, improvement, or inspection.

The district will need an area to perform the proposed work. The work limits for this project will generally be 50 feet from each side of the proposed tile. Compensation for damages within the work limits is normally determined at the completion hearing and is subject to approval by the Board of Supervisors.

VI. COST ESTIMATE

Cost Estimate for Proposed Improvements

SECTION 1: CONSTRUCTION ASSESSABLE TO PRIVATE LANDS

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
MAIN TILE IMPROVEMENT					
100	OPEN DITCH CLEANOUT	1	EA	$2,000.00	$2,000.00
101	24" DIA. RCP APRON W/ANIMAL GUARD	1	EA	$2,000.00	$2,000.00
102	24" DIA. RCP, 1500D (GASKTED)	785	LF	$60.00	$47,100.00
103	15" DIA. RCP, 2000D	639	LF	$44.00	$28,116.00
104	15" DIA. RCP, 3000D	900	LF	$48.00	$43,200.00
105	12" DIA. RCP, 2000D	30	LF	$40.00	$1,200.00
106	24" TO 15" DIA. RCP REDUCER	1	EA	$2,000.00	$2,000.00
107	RCP TEE, 24" ON 24" DIA., FABRICATION ONLY	1	EA	$2,000.00	$2,000.00
108	RCP TEE, 12" ON 24" DIA., FABRICATION ONLY	1	EA	$1,800.00	$1,800.00
109	RCP TEE, 12" ON 15" DIA., FABRICATION ONLY	1	EA	$1,500.00	$1,500.00
110	RCP TEE, 12" ON 12" DIA., FABRICATION ONLY	1	EA	$1,000.00	$1,000.00
111	RCP ENDCAP, 18" DIA.	1	EA	$250.00	$250.00
112	RCP ENDCAP, 12" DIA.	2	EA	$200.00	$400.00
		MAIN TILE IMPROVEMENT SUBTOTAL			$133,000.00

BRANCH 30 TILE IMPROVEMENT					
113	18” DIA. RCP, 1500D	700	LF	$50.00	$35,000.00
114	18” DIA. RCP, 2000D	478	LF	$50.00	$23,900.00
115	RCP TEE, 18" ON 18" DIA., FABRICATION ONLY	1	EA	$2,200.00	$2,200.00
116	RCP ENDCAP, 18" DIA.	2	EA	$250.00	$500.00
117	RCP ENDCAP, 12" DIA.	1	EA	$200.00	$200.00
		BRANCH 30 TILE IMPROVEMENT SUBTOTAL			$62,000.00
MISCELLANEOUS ITEMS					
118	TILE CONNECTIONS, LESS THAN 8" DIA.	10	EA	$350.00	$3,500.00
119	TILE CONNECTIONS, 8" DIA. AND LARGER	3	EA	$450.00	$1,350.00
120	EXPLORATORY EXCAVATION	8	HR	$250.00	$2,000.00
121	TRENCH STABILIZATION AND BEDDING STONE	100	TN	$35.00	$3,500.00
122	MOBILIZATION	1	LS	$10,000.00	$10,000.00
				ESTIMATED SECTION 1 COST:	**$215,000**

SECTION 2: CONSTRUCTION ASSESSABLE TO SECONDARY ROADS

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
201	STEEL CASING, JACK & BORE, 1/4" WALL THICKNESS, 20" DIA.	90	LF	$500.00	$45,000.00
202	18” DIA. RCP, 2000D	60		$55.00	$3,300.00
203	STEEL CASING, JACK & BORE, 3/16" WALL THICKNESS, 16" DIA.	90	LF	$400.00	$36,000.00
204	15” DIA. RCP, 2000D	60		$48.00	$2,880.00
205	TILE CONNECTIONS, LESS THAN 8" DIA.	2	EA	$500.00	$1,000.00
206	TRENCH STABILIZATION AND BEDDING STONE	80	TN	$35.00	$2,800.00
207	TRAFFIC CONTROL	1	LS	$2,000.00	$2,000.00
208	MOBILIZATION	1	LS	$5,000.00	$5,000.00
				ESTIMATED SECTION 2 COST:	**$98,000**

ESTIMATED SUBTOTAL CONSTRUCTION COST:	$313,000
CONSTRUCTION CONTINGENCIES	$16,000
ESTIMATED TOTAL CONSTRUCTION COST	$329,000
ESTIMATED TOTAL ASSESSABLE CONSTRUCTION COST	**$226,000**

NON-CONSTRUCTION COSTS	
ENGINEERING - (REPORT, HEARINGS, PLANS & SPECS, BID LETTING, CONSTRUCTION, COMPLETION)	**$60,000**
LEGAL, PUBLICATIONS, MAILINGS, ETC.	**$3,000**
ANNEXATION	**$3,000**
RE-CLASSIFICATION	**$5,000**
TEMPORARY EASEMENT (8 Acres @ $800/AC)	**$7,000**
OTHER DAMAGES	**$1,000**
INTEREST	**$15,000**
ESTIMATED TOTAL DISTRICT COST	**$320,000**

AVERAGE COST PER ACRE (BASED ON 334 ACRES):	$958
AVERAGE COST PER ACRE PER YEAR AT 5% INTEREST FOR 10 YEARS:	$124
AVERAGE COST PER ACRE PER YEAR AT 5% INTEREST FOR 20 YEARS:	$77

Depending on the interest level from landowners, the improvement proposal could be modified. The Branch 30 improvement could be removed, and the proposed improvements to the upper Main Tile (above Branch 30) could be removed.

If an improvement is not pursued, repairs will be required. This would involve replacing approximately 850 feet of the lower portion of the Main Tile with 18" diameter reinforced concrete pipe (RCP). We estimate a project cost of approximately $80,000 (avg of $240/acre) for a repair. If a full improvement is not desired, we would still recommend improving the reach that is in disrepair (installing 24" diameter RCP instead of 18") for an estimated project cost of $87,000 (avg of $260/acre).

VII. ECONOMIC ANALYSIS

The cost of drainage improvements is high, and a landowner's decision on whether to support the project may be difficult. There are many factors to consider, but the overarching question is whether it is a worthwhile investment. We hope to provide some useful information for landowners to consider in this regard.

Adequate drainage is necessary for maximum crop production. Excess water negatively impacts crop production in a variety of potential ways. Areas that are ponded for extended periods of time will drown standing crop. Wet ground does not warm up as quickly, oxygen in the soil is reduced and bacterial activity is limited, growth of harmful types of bacteria is promoted, roots don't grow as deep or are drowned, certain plant diseases are more prevalent, soil structure is affected, and farm operations are delayed, repeated (replants), and less efficient (farming around wet spots, weed control in wet spots, etc.). Depending on a number of factors, saturated conditions must be present in the field 24 to 48 hours or more before being detrimental to the crop. A major goal of providing adequate drainage is to remove the excess (free) water in the root zone before it causes significant crop damage.

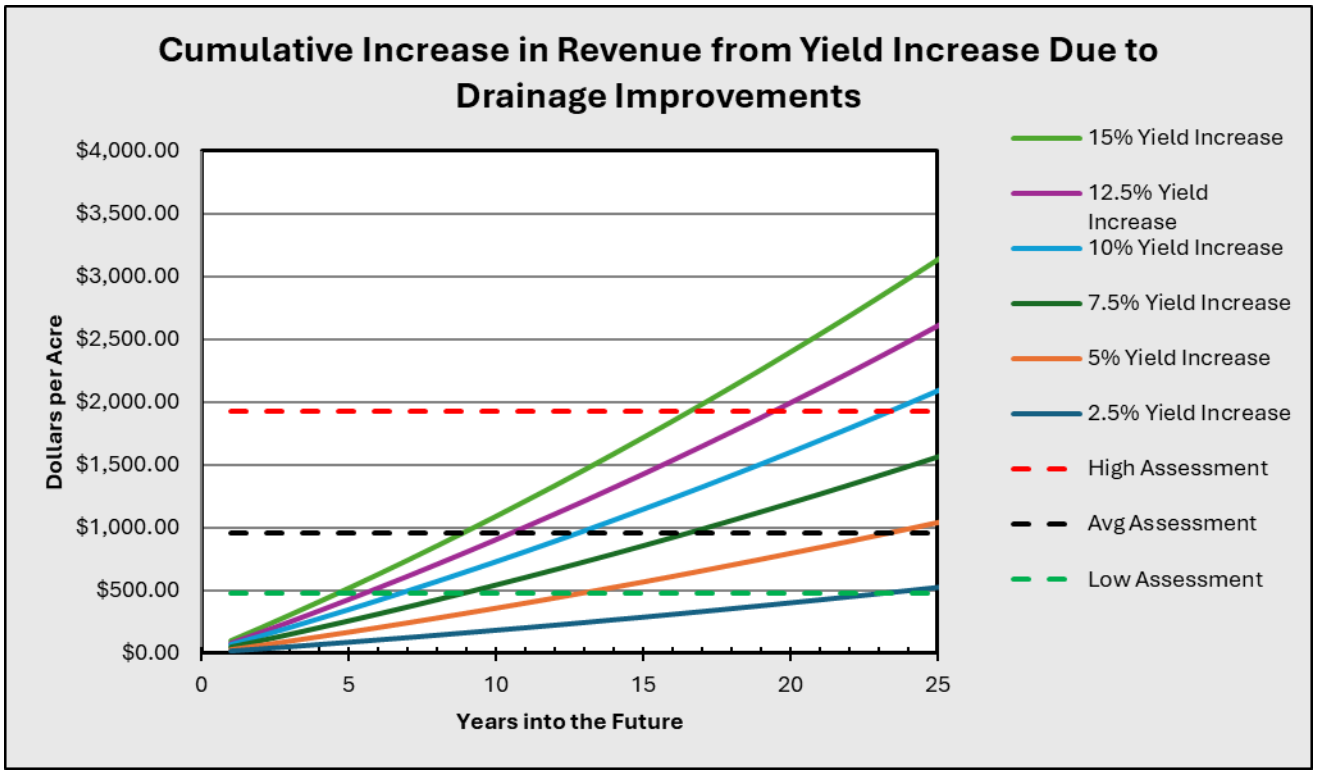
Studies have shown that improvements of this nature can result in yield improvements averaging 10-15%, or more. We would expect the largest yield increases in areas that are frequently flooded out, and lesser yield increases on hilltops or naturally well drained soils. We do caution that a project of this nature is providing a better outlet, so yield increases will also depend on the amount and adequacy of private tile in place. If a farm is already pattern tiled, we would expect larger yield increases as compared to a farm that has very little existing private tile. To fully realize the benefits of a large drainage improvement, additional private tile may need to be installed. We also expect that some portion of the observed yield increases have to do with improved timeliness of farming operations and less soil compaction. We would also expect increased market value of the property involved.

Drainage improvements have tax benefits and may be written off and/or depreciated. Speak with your tax advisor for more information.

There is flexibility in paying for a project of this nature. Landowners have the option of paying their entire assessment, or paying installment payments over a period of 10 to 20 years (as set by the Board of Supervisors). Interest rates are set by the Board of Supervisors but have typically been 5-6%. If landowners can get a loan somewhere else for less than the rate set by the Board, they may consider taking out a loan and paying the drainage assessment all at once.

This is a multi-generational drainage improvement project. DD76 was established and the tile system was installed nearly 100 years ago. The original system continues to age and be stressed by new tile connected into it. The intent of this project will be to provide adequate drainage for the next 100+ years.

Below is a chart showing dollar per acre assessments versus cumulative revenue increase over time due to yield increases resulting from the project. It is based in part on a static corn price of $4.00/bushel and soybeans of $11.00/bushel. As an example, with a 10% yield increase and an average dollar per acre assessment, the project would be expected to pay for itself in about 13 years.



VIII. ASSESSMENT SCHEDULE REVIEW

Annexation:
There are approximately 29 acres of land that appear to be materially benefited by district facilities that are not included in the existing assessment schedule. We recommend annexing these lands into Drainage District No. 76, which would require a separate report and a public hearing.

Existing Classification:
This district is still under its original assessment schedule from when it was established nearly 100 years ago. All district tile facilities are included in this single assessment schedule. Under this schedule all lands are assessed for work done on any tile in the district, regardless of whether the lands benefit from it. For example, parcels drained by the upper reach of the Main Tile (above Branch 30) would help pay for repairs to the Branch 30 Tile, which gives them no benefit. The remedy for this is to develop separate assessment schedules for each district facility, to make the cost of improvements and future repairs more equitable. This process is called re-classification, it would be completed at the end of the project, and we recommend it be done regardless of whether the proposed improvements are constructed. Re-classification is done by a classification commission which includes an engineer and two landowners in the county who neither own nor have any interest in the lands being re-classified. A report would be filed and a public hearing would be held.

We also note that the existing assessment schedule is of no use in estimating parcel-by-parcel costs associated with this project. To give landowners a better estimate of their share of the project costs, at the Board of Supervisors direction, we could develop a pre-classification. This is similar to the re-classification that the Board would consider at the end of the project but is an estimate and is to be used for informational purposes only. Work on the pre-classification can be reused as part of the final reclassification.

For landowner information, in order to quantify benefits we consider several factors. The combination of all the benefit factors for a particular tract determines its overall benefit. A general description of the factors considered is included below.

- **Land Area**: the more land area in a particular parcel that utilizes a district facility, the more benefit the tract receives from said facility.

- **Soil Type:** looks at the need for drainage based on the soil type of the land and its corresponding characteristics in relation to drainage. The soils that would benefit the most from drainage in an agricultural setting are generally those that are frequently flooded/ponded, are poorly drained, and would be prime farmland if drained. Conversely, soils that are naturally well drained have less of a need for supplemental drainage and thus have a lower benefit from a drainage district facility.

- **Distance from the Facility:** looks at how far the parcel is away from the improved district facility. The distance is determined based on topography and how water would flow, not as a straight line distance. Lands closest to the district facility have the advantage of ease of access, whereas lands further from the facility must utilize a much more substantial system (private or district) to utilize the facility.

- **Use of the Facility:** looks at how much of a district facility is used in draining the land. In other words, for a district tile one (1) mile in length, lands whose water flows through the entire length of tile should pay more than lands near the downstream end of the tile whose water only flows through a fraction of the length of the system.

- **Generation of Runoff:** looks at how much surface runoff is generated on the land from a rainstorm. The more runoff generated, the higher the benefit. Cropland generates less runoff than paved surfaces such as roads, and thus has a lower runoff factor than gravel or paved roads.

- **Other Factors:** Additional benefit factors may be considered as needed in order to aid in the determination of overall benefit for each parcel involved.

IX. FARM PROGRAM WETLAND COMPLIANCE

We have mailed letters to owners of lands that would receive benefits from the proposed improvements and are potentially in the USDA Farm Program, requesting certified wetland determinations from the Natural Resources Conservation Service (NRCS). Only landowners or their authorized agents may request the determination.

If any farmed wetlands exist on your property within DD76, the construction of the proposed drainage improvements may be considered by the NRCS to be a conversion and place you in jeopardy of being in violation of farm program rules and may be required to forfeit and/or refund farm program payments received after the work commences.

If the improvements are constructed and you have farmed wetlands that are converted, your options are to either cease farming the wetland acres or purchase mitigation credits through a wetland mitigation bank. The current fee is approximately $15,000 - $20,000 per acre. If you believe the wetland determination to be in error, you may request a review by the NRCS.

It is solely the responsibility of the landowner to keep themselves in farm program compliance, but because of the potential impacts to landowners within the district, we ask that you provide a certified wetland determination prior to the improvement hearing for the Board to consider.

As of the filing of this report we have not received wetland determinations from any of the lands within the district.

XI. CONCLUSION/RECOMMENDATIONS

This report confirms the need for drainage repairs or improvements within DD76. We recommend improvements, as the existing tile system is inadequate. If remonstrance is met (over 50% of the landowners owning 70% or more of the land file a written objection to improvements) at a minimum a repair will still be required (est. cost of $80,000). The improvements proposed would provide the drainage capacity needed now and for many decades to come. The estimated project cost for the recommended improvement is **$320,000**. Yield increases for agricultural lands, and increased market value of property are all potential benefits of the project.

We recommend reclassification regardless of whether any improvements are ultimately pursued. If improvements are pursued reclassification will be required.

There are approximately 29 acres of land that appear to benefit from the proposed facilities that are in parcels not on the existing assessment schedule. In order for these lands to be assessed to help pay for the proposed improvements, as well as future maintenance, we recommend these lands be annexed into Drainage District No. 76.

The Dickinson County Board of Supervisors, as trustees for Drainage District No. 76, should tentatively approve this report and set a date for an informational meeting. At the informational meeting we can introduce the project and receive landowner feedback, including whether to complete a preliminary classification. Once modifications to the report are made, if any, a formal hearing should be scheduled. At said hearing, the proposed improvement project should be approved, the engineer should be directed to develop plans and specifications and proceed toward bid letting, and the engineer should be directed to proceed with annexation and reclassification.

Sincerely,
JACOBSON-WESTERGARD & ASSOCIATES INC.

Collin J. Klingbeil, P.E.

Encl. Petition
Existing Tile System Map
Existing Drainage Coefficient Map
Proposed Tile Map

DRAINAGE PETITION AND BOND

Iowa Official Form No. 393   Sections 455.9, 455.10, Code

FORM 85AA
MATT PARROTT & SONS CO., WATERLOO, IOWA **P-489**

DRAINAGE PETITION

TO THE BOARD OF SUPERVISORS OF Dickinson County COUNTY, IOWA:

The undersigned ask that a drainage in DD 76

commencing at

and running thence sections 16 & 15 Excelsior Township

1. Tile Broken under fen

2. clean outlet ditch

3. tile under M-27 has ~~probably~~ probably been broken under Road since hyway was rebuilt the DD [illegible] doesn't Drain well for years may also be Tile Joint that

and terminating at need repair between Road & where tile turns west to get under M-27

be

Your petitioners further state that the lands situated in

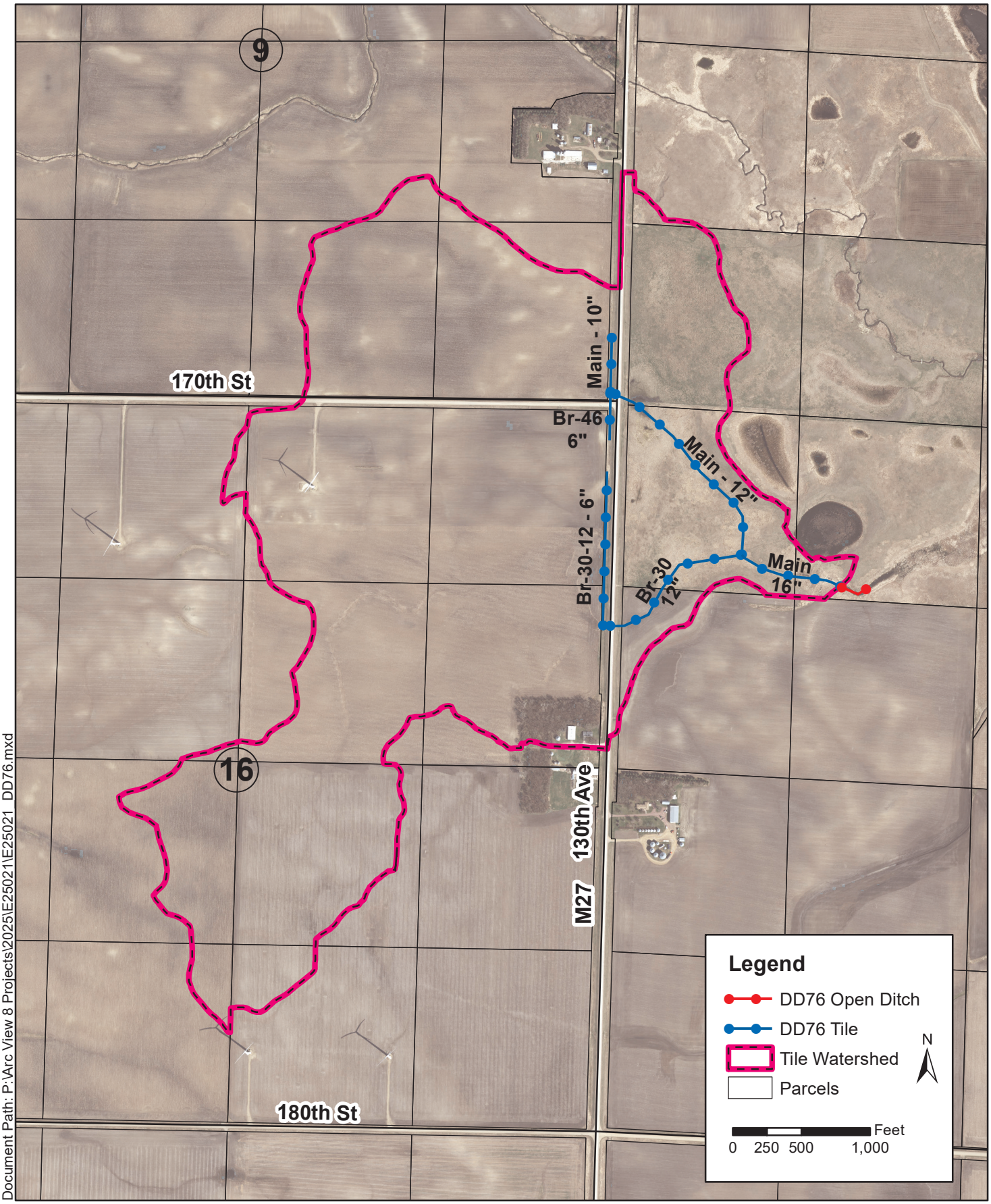
are subject to overflow (or are too wet for cultivation or subject to erosion or flood danger), and the public benefit, utility, health, convenience and welfare will be promoted by the above mentioned project.

NAMES	NAMES
Bradley Frohan [signature]	
John D [illegible] [signature]	

Drainage District No. 76
Existing Tile System Map

Dickinson County, Iowa

JACOBSON-WESTERGARD
& ASSOCIATES, INC.
Consulting Engineers & Land Surveyors
www.jacobson-westergard.com



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Drainage District No. 76
Existing Drainage Coefficient Map

Dickinson County, Iowa

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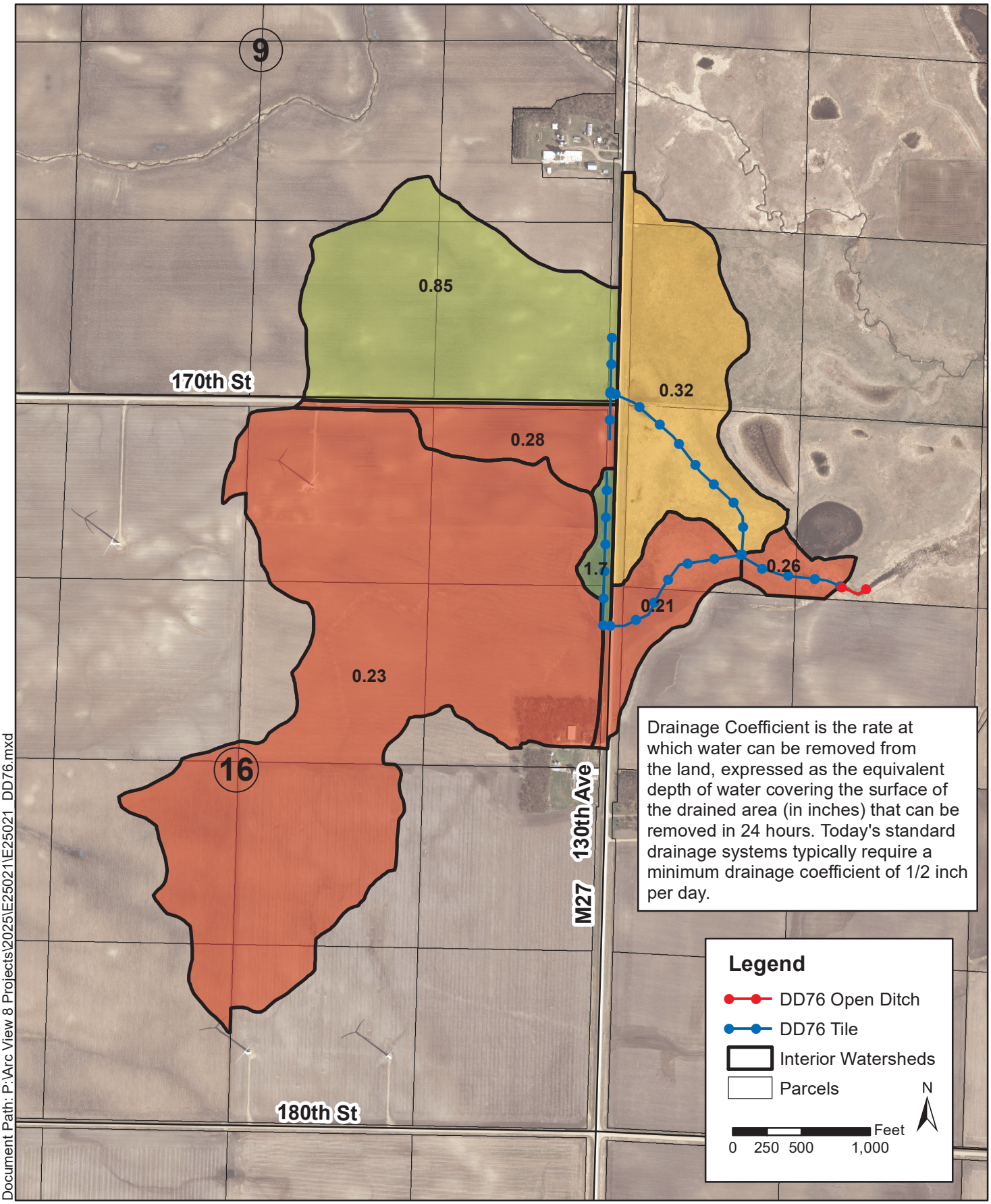
& ASSOCIATES, INC.
Consulting Engineers & Land Surveyors
www.jacobson-westergard.com



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Drainage District No. 76
Proposed Tile Improvements Map

Dickinson County, Iowa

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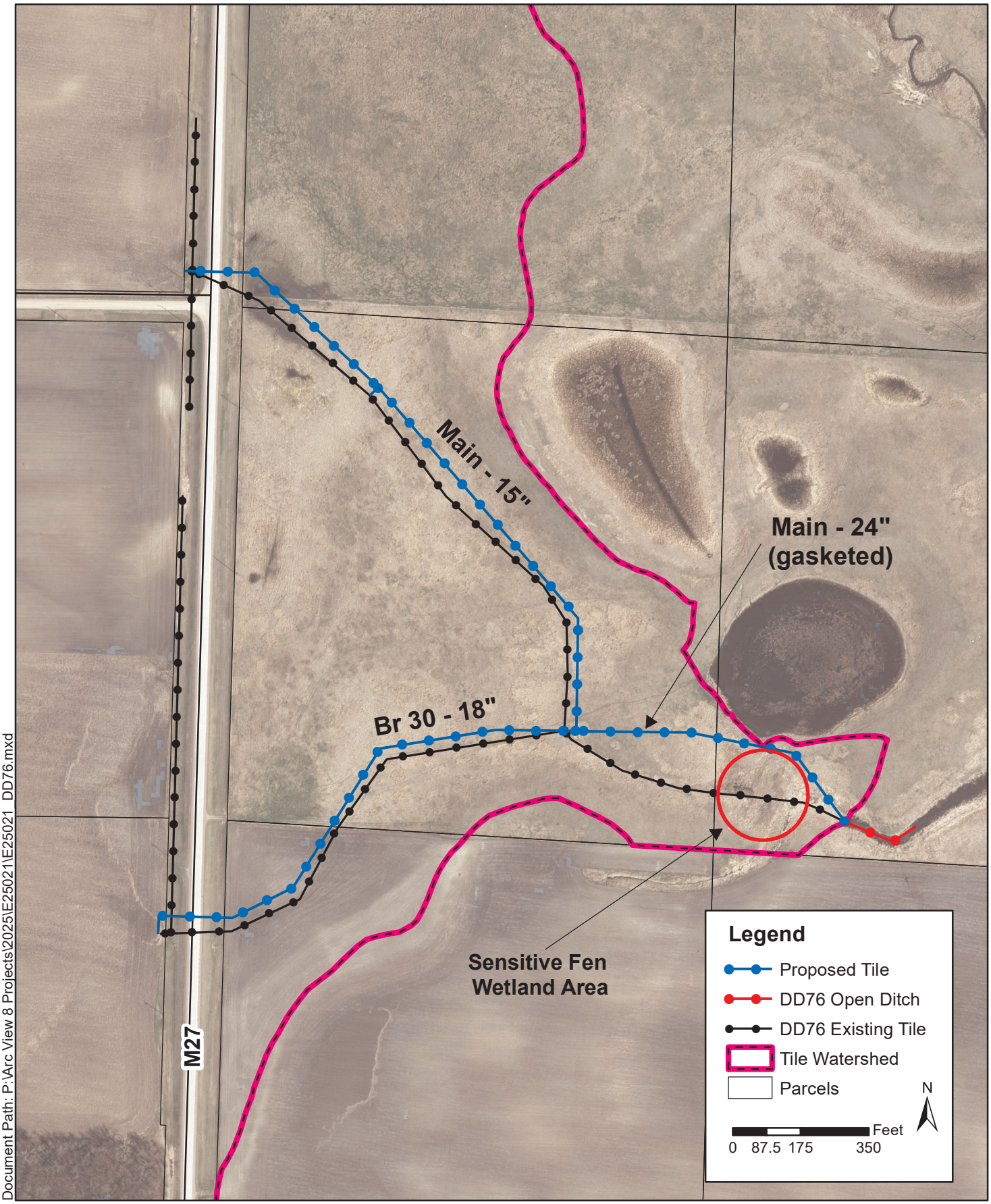

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