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PRELIMINARY ENGINEERING REPORT

DRAINAGE DISTRICT NO. 23, LATERAL NO. 8 TILE IMPROVEMENTS PALO ALTO COUNTY, IOWA

JWA PROJECT NO: E18116

OWNER: Palo Alto County Board of Supervisors

Roger Faulstick
Ron Graettinger
Craig Merrill
Linus Solberg
Keith Wirtz

Carmen Moser, Auditor



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.

Richard A. Hopper

Date 7/19/19

Richard A. Hopper, P.E., License number 8106

My license renewal date is December 31, 2019

Pages or sheets covered by this seal: Title, Pgs 1-8, Location maps

I. INTRODUCTION/HISTORY

A petition for establishment of Drainage District No. 23 in Palo Alto County was filed September 6, 1905 with the Board of Supervisors. On January 8, 1907, the board appointed Engineer Guy Campbell to investigate. His engineer's report was filed May 2, 1907, and recommended constructing a main ditch, with laterals 1-20 and lateral "A" and "B" at an estimated cost of \$32,000.00. The board accepted the report and set a hearing date. On October 22, 1907, the Board of Supervisors approved establishment of Drainage District No. 23, except that part of the main drain from the east and west quarter line of Section 26 to its source; and except that part of lateral No. 17, from the center of the northwest quarter of Section 26 to its source; and except laterals "A" and "B". On March 4, 1908, the board entered into a contract for construction of Drainage District No 23 open drain, Section 1 of the main line. On March 27, 1908, the board entered into a contract with a different contractor to construct the open drain in Sections 2-22 being all, except section one, which was to consist of construction of all but open work.

There was approximately 7140 acres in Drainage District No. 23. The main, as originally constructed consisted of 16,700 feet of open ditch, together with 11,000 feet of tile. The district also included multiple stretches of Lateral tile lines. The tile lines varied in size from 6 inch to 18 inch.

On August 19, 1909, Guy Campbell submitted his recommendation for acceptance of the open work on the main drain. On November 16, 1910, the engineer stated Drainage District No. 23 was complete and recommended acceptance. The original contract price was \$23,524.00 for the tile. The board accepted his recommendation. On December 20, 1910, the county levied an additional \$5,898.50 because the first levy of \$27,000.00 did not cover all costs incurred by the district.

On November 1, 1916, a petition was filed to have the main ditch cleaned out. On January 13, 1917, the contract was entered for the contractor to cleanout approximately 10,000 cubic yards at a price of \$0.30 per cubic yard.

On August 1, 1927, an engineering report was submitted to construct a relief tile system within Drainage District No. 23 that would outlet the Lateral No. 9 tile, which drained into Lateral 8 previously. The proposed tile was deemed Drainage District No. 153 and outlet Lateral 9 directly into the Main Open Ditch. The drain was accepted and constructed in the following year.

There was another petition filed for cleanout of the open ditch of Drainage District No. 23. On April 24, 1943, the submitted engineer's report recommended cleanout of the open ditch between Station 30 and the upper end of the ditch, a distance of about 14,000 feet. On September 15, 1943, the Board of Supervisors entered into a contract for said cleanout between STA 60 and STA 167+50 to excavate approximately 10,000 cubic yards at a price of \$1,600.00 and do some clearing and grubbing for approximately \$50.00.

On July 21, 1950, a petition was submitted to re-lay the 22 inch tile that outlets into the main open ditch just south of the center of the southeast quarter of Section 35-96-34 and extending north. The preliminary engineering investigation using profiles in the county auditor's office found the capacities of the drains very undersized with the present practice of drainage design. The board recommended a more thorough survey of the lands in Drainage District No. 23 be made and an Engineer's Report showing profiles of existing conditions together with a plan for relieving the system be submitted. It does not appear anything further was done for this.

An Engineer's Report for a proposed cleanout of Drainage District No. 23 dated October 23, 1962, recommended cleanout beginning at the east and west one-quarter line through Section 14, STA 11+12 and continuing to STA 168+19. Excavation was estimated at 19,181 cubic yards based on a four foot wide ditch bottom with 2:1 sideslopes. He also recommended not doing anything with the cleanout until the main tile outlet was fixed. On March 20, 1963, the board accepted the engineer's report, but delayed plans to a later date. On June 17, 1963, bids for work on the concrete bulkhead at the outlet of Drainage District No. 23 were received and awarded to Anderson Construction Co. in the amount of \$3,044.80.

I. INTRODUCTION/HISTORY (cont.)

On December 16, 1964, another petition for cleanout of the main open ditch was filed. The Supervisors accepted the petition April 1, 1965, and set an informal hearing date of April 15, 1965, to discuss repairs. They instructed Otto Engineering to re-survey the outlet and file an amended report. On June 3, 1965, after discussing the revised report, the board decided to send out a ballot to the landowners to determine their wishes. They could choose to: 1. Extend the outlet 2. Clean out ditch without extending the outlet 3. Reclassify lands 4. Do nothing.

On June 15, 1966, the Board of Supervisors opened bids for the cleanout and awarded the contract to Wayne Harriot at a bid of \$17,177.91. On February 1, 1967, the engineer presented the final report on the completion of the contract. The Board approved the report.

A petition was filed May 4, 1999, for improvements to the tile lines and open ditch located in Sections 23, 26,35 in Highland Township and Sections 2, 11, 14 in Silver Lake Township. On August 10, 1999, the board rejected the petition because of uncertainty of wetland determinations in the area and an appeal of wetland determinations by the petitioner.

On November 8, 2011, the board approved the NRCS waterway plan located in the southwest quarter of Section 26, Highland Township.

On December 9, 2014, Bolten & Menk presented a list of FEMA repairs for small projects on several drainage districts in Palo Alto County. On January 3, 2017, the bid specifications for repairs on three of the drainage districts, including Drainage District No. 23, were filed. On January 24, 2017, the bids were opened and the contract was awarded to King Excavation in the amount of \$44,414.78.

Recently on February 7, 2017, a petition for repair and to investigate improvement to the Drainage District No. 23 main tile in Sections 26 and 35 of Highland Township was filed and Rick Hopper, Jacobson-Westergard, was appointed as engineer. The Preliminary Engineering Report was filed on June 27, 2017, proposing improvements to the main tile system which was extremely undersized and damaged. On September 19, 2017 the Board of Supervisors accepted the proposed improvements the bid letting was held on January 30, 2018. On February 6, 2018 the contract was awarded to B & B Farm Drainage from Wallingford, IA. Construction of the proposed main tile started in the summer of 2018 and is continuing to date.

On September 18, 2018 a petition was filed for investigation of Lateral 8 and Lateral 11 drain tiles and Rick Hopper, Jacobson-Westergard, was appointed as engineer. The following report summarizes the existing system and proposes a system necessary to meet current and future drainage needs for Lateral No. 8 tile.

II. STARTING POINT, ROUTE AND TERMINUS

The Lateral 8 tile outlets into the Main Ditch at the section line between Sections 2 and 11 of Silver Lake Township, 2600 feet east of the northwest corner of Section 11-95-34. It runs generally west approximately 1200 feet before traveling southwest for 3200 feet to the westerly line of said Section 11. The tile then continues southwest through Section 10-95-34 for 1200 feet before traveling south for 1100 feet to the southernly line of the Section. Continuing south the tile runs 2500 feet through Section 15-95-34 to its inlet end, approximately 1000 feet west of the easterly quarter corner of said Section.

III. EXISTING IMPROVEMENTS

The existing Lateral 8 tile system consists of tile that ranges from 6" at the upper end to 15" where it outlets into the main open ditch. The system is extremely undersized and has not been improved since it was installed over 100 years ago. A portion of the system has been relieved with the installation of Drainage District No. 153 in the 1920's. This district is located 2000 feet to the north of Lateral 8 outlet and allowed Lateral 9 a relief outlet to redirect flow that previously ran through Lateral 8. All of the system has a drainage coefficient of 1/10-inch or less, with an average drainage coefficient of 1/15-inch.

IV. PROPOSED IMPROVEMENTS

The proposed improvements include four options.

The first two options would be a new parallel tile that extends the entire length of the existing Lateral 8 Tile. The pipe for this option would be sized for a ½-inch and 1-inch drainage coefficient. Cost estimates for these options can be seen following in this report.

The last two options would be a new parallel tile that extends to the point of Lateral 11 Tile outlet only. If drainage is sufficient beyond this point, options three and four will be more cost effective. The pipe for these options would be sized for a ½-inch and 1-inch drainage coefficient. Cost estimates for these options can be seen following in this report.

V. RIGHT OF WAY

Since the lateral tile improvements will be offset from the existing tile, additional right-of-way will be required. This will be permanent right-of-way. The permanent right-of-way will be a 30-foot wide easement where most excavation will occur. There may also be crop damage to pay for, but the extent of this is unknown at this time.

VI. COST ESTIMATES

The first estimate is for a ½" drainage coefficient that improves the entire length of Lateral 8 Tile.

OPTION NO. 1 – ENTIRE LATERAL 8: 1/2" DRAINAGE COEFFICIENT

ITEM NO.	ITEM DESCRIPTION	QUANTITY & UNIT	UNIT PRICE	TOTAL PRICE
1.	36" RCP Apron with Splash Blocks, Guard & Rip Rap (10 tons)	1 Each	\$ 3,500.00	\$ 3,500.00
2.	36" RCP, 1500D	3134 L.F.	\$ 65.00	\$ 203,710.00
*3.	36" RCP, 2000D	66 L.F.	\$ 80.00	\$ 5,280.00
4.	36" to 30" RCP Reducer	1 Each	\$ 1,800.00	\$ 1,800.00
5.	30" RCP, 1500D	1500 L.F.	\$ 55.00	\$ 82,500.00
*6.	30" RCP, 2000D	100 L.F.	\$ 70.00	\$ 7,000.00
7.	30" to 18" RCP Reducer	1 Each	\$ 1,500.00	\$ 1,500.00
8.	18" RCP, 1500D	4734 L.F.	\$ 30.00	\$ 142,020.00
*9.	18" RCP, 2000D	66 L.F.	\$ 45.00	\$ 2,970.00
10.	Tee – 36" x 36" x 18"	3 Each	\$ 1,250.00	\$ 3,750.00
11.	Tee – 30" x 30" x 18"	1 Each	\$ 1,000.00	\$ 1,000.00
12.	Tee – 30" x 30" x 12"	1 Each	\$ 1,000.00	\$ 1,000.00

13.	Tee – 18" x 18" x 12"	2 Each	\$ 850.00	\$ 1,700.00
14.	Tile Connections	12 Each	\$ 350.00	\$ 4,200.00
*15.	Granular Surfacing	20 Ton	\$ 20.00	\$ 400.00
16.	Exploratory Excavation	8 Hours	\$ 250.00	\$ 2,000.00
17.	Trench Stabilization	50 Ton	\$ 30.00	\$ 1,500.00
18.	Area Drain	3 Each	\$ 750.00	\$ 2,250.00

ESTIMATED SUBTOTAL CONSTRUCTION COST	\$ 468,080.00
ESTIMATED TOTAL DISTRICT COST	\$ 452,430.00
CONTINGENCIES	\$ 47,000.00
ENGINEERING, LEGAL, PUBLICATION	\$ 70,000.00
CLASSIFICATION	\$ 4,000.00
PERMANENT EASEMENT (6.6 Acres @ \$2125)	\$ 14,025.00
INTEREST	\$ 23,000.00
ESTIMATED TOTAL DISTRICT COST	<u>\$ 610,455.00</u>

AVERAGE COST PER ACRE: \$554.87/acre (Based on 1100 Acres)
(\$44.52/acre/year for 20 years)
(\$71.86/acre/year for 10 years)

*Secondary Road Costs

The second estimate is for a 1" drainage coefficient that improves the entire length of Lateral 8 Tile.

OPTION NO. 2 – ENTIRE LATERAL 8: 1" DRAINAGE COEFFICIENT

ITEM NO.	ITEM DESCRIPTION	QUANTITY & UNIT	UNIT PRICE	TOTAL PRICE
1.	48" RCP Apron with Splash Blocks, Guard & Rip Rap (10 tons)	1 Each	\$ 5,000.00	\$ 5,000.00
2.	48" RCP, 1500D	3134 L.F.	\$ 110.00	\$ 344,740.00
*3.	48" RCP, 2000D	66 L.F.	\$ 125.00	\$ 8,250.00
4.	48" ⁺ _o 36" RCP Reducer	1 Each	\$ 2,000.00	\$ 2,000.00
5.	36" RCP, 1500D	1500 L.F.	\$ 65.00	\$ 97,500.00
*6.	36" RCP, 2000D	100 L.F.	\$ 80.00	\$ 8,000.00

7.	36" to 24" RCP Reducer	1 Each	\$ 1,800.00	\$ 1,800.00
8.	24" RCP, 1500D	4734 L.F.	\$ 40.00	\$ 189,360.00
*9.	24" RCP, 2000D	66 L.F.	\$ 55.00	\$ 3,630.00
10.	Tee – 48" x 48" x 18"	3 Each	\$ 1,750.00	\$ 5,250.00
11.	Tee – 36" x 36" x 18"	2 Each	\$ 1,250.00	\$ 2,500.00
12.	Tee – 36" x 36" x 12"	1 Each	\$ 1,200.00	\$ 1,200.00
13.	Tee – 24" x 24" x 12"	2 Each	\$ 1,000.00	\$ 2,000.00
14.	Tile Connections	12 Each	\$ 350.00	\$ 4,200.00
*15.	Granular Surfacing	20 Ton	\$ 20.00	\$ 400.00
16.	Exploratory Excavation	8 Hours	\$ 250.00	\$ 2,000.00
17.	Trench Stabilization	50 Ton	\$ 30.00	\$ 1,500.00
18.	Area Drain	3 Each	\$ 750.00	\$ 2,250.00

ESTIMATED SUBTOTAL CONSTRUCTION COST **\$ 681,580.00**

ESTIMATED TOTAL DISTRICT COST **\$ 661,300.00**

CONTINGENCIES **\$ 68,158.00**

ENGINEERING, LEGAL, PUBLICATION **\$ 75,000.00**

CLASSIFICATION **\$ 4,000.00**

PERMANENT EASEMENT (9.6 Acres @ \$2125) **\$ 14,025.00**

INTEREST **\$ 30,000.00**

ESTIMATED TOTAL DISTRICT COST **\$ 852,483.00**

AVERAGE COST PER ACRE: \$774.98/acre (Based on 1100 Acres)
(\$62.18/acre/year for 20 years)
(\$100.36/acre/year for 10 years)

*Secondary Road Costs

The third estimate is for a 1/2" drainage coefficient that improves Lateral 8 Tile to the Lateral 11 Outlet.

OPTION NO. 3 – LATERAL 8 to Sta 48+00: 1/2" DRAINAGE COEFFICIENT

ITEM NO.	ITEM DESCRIPTION	QUANTITY & UNIT	UNIT PRICE	TOTAL PRICE
1.	36" RCP Apron with Splash Blocks, Guard & Rip Rap (10 tons)	1 Each	\$ 3,500.00	\$ 3,500.00
2.	36" RCP, 1500D	3134 L.F.	\$ 65.00	\$ 203,710.00

*3.	36" RCP, 2000D	66 L.F.	\$ 80.00	\$ 5,280.00
4.	36" to 30" RCP Reducer	1 Each	\$ 1,800.00	\$ 1,800.00
5.	30" RCP, 1500D	1500 L.F.	\$ 55.00	\$ 82,500.00
*6.	30" RCP, 2000D	100 L.F.	\$ 70.00	\$ 7,000.00
7.	Tee – 36" x 36" x 18"	3 Each	\$ 1,250.00	\$ 3,750.00
8.	Tee – 30" x 30" x 18"	1 Each	\$ 1,100.00	\$ 1,100.00
9.	Tee – 30" x 30" x 12"	1 Each	\$ 1,100.00	\$ 1,100.00
10.	Tile Connections	12 Each	\$ 350.00	\$ 4,200.00
*11.	Granular Surfacing	20 Ton	\$ 20.00	\$ 400.00
12.	Exploratory Excavation	8 Hours	\$ 250.00	\$ 2,000.00
14.	Trench Stabilization	50 Ton	\$ 30.00	\$ 1,500.00
15.	Area Drain	3 Each	\$ 750.00	\$ 2,250.00

ESTIMATED SUBTOTAL CONSTRUCTION COST	\$ 318,290.00
ESTIMATED TOTAL DISTRICT COST	\$ 305,610.00
CONTINGENCIES	\$ 31,829.00
ENGINEERING, LEGAL, PUBLICATION	\$ 45,000.00
CLASSIFICATION	\$ 4,000.00
PERMANENT EASEMENT (6.6 Acres @ \$2125)	\$ 14,025.00
INTEREST	\$ 15,000.00
ESTIMATED TOTAL DISTRICT COST	<u>\$ 415,464.00</u>

AVERAGE COST PER ACRE: \$377.69/acre (Based on 1100 Acres)
(\$30.31/acre/year for 20 years)
(\$48.91/acre/year for 10 years)

*Secondary Road Costs

The fourth estimate is for a 1" drainage coefficient that improves Lateral 8 Tile to the Lateral 11 Outlet.

OPTION NO. 4 – LATERAL 8 to Sta 48+00: 1" DRAINAGE COEFFICIENT

ITEM NO.	ITEM DESCRIPTION	QUANTITY & UNIT	UNIT PRICE	TOTAL PRICE
1.	48" RCP Apron with Splash Blocks, Guard & Rip Rap (10 tons)	1 Each	\$ 5,000.00	\$ 5,000.00
2.	48" RCP, 1500D	3134 L.F.	\$ 110.00	\$ 344,740.00

*3.	48" RCP, 2000D	66 L.F.	\$ 125.00	\$ 8,250.00
4.	48" to 36" RCP Reducer	1 Each	\$ 2,000.00	\$ 2,000.00
5.	36" RCP, 1500D	1500 L.F.	\$ 65.00	\$ 97,500.00
*6.	36" RCP, 2000D	100 L.F.	\$ 80.00	\$ 8,000.00
7.	Tee – 48" x 48" x 18"	3 Each	\$ 1,750.00	\$ 5,250.00
8.	Tee – 36" x 36" x 18"	2 Each	\$ 1,250.00	\$ 2,500.00
9.	Tee – 36" x 36" x 12"	1 Each	\$ 1,100.00	\$ 1,100.00
10.	Tile Connections	12 Each	\$ 350.00	\$ 4,200.00
*11.	Granular Surfacing	20 Ton	\$ 20.00	\$ 400.00
12.	Exploratory Excavation	8 Hours	\$ 250.00	\$ 2,000.00
13.	Trench Stabilization	50 Ton	\$ 30.00	\$ 1,500.00
16.	Area Drain	3 Each	\$ 750.00	\$ 2,250.00
ESTIMATED SUBTOTAL CONSTRUCTION COST				\$ 482,690.00
ESTIMATED TOTAL DISTRICT COST				\$ 466,040.00
CONTINGENCIES				\$ 48,269.00
ENGINEERING, LEGAL, PUBLICATION				\$ 45,000.00
CLASSIFICATION				\$ 4,000.00
PERMANENT EASEMENT (6.6 Acres @ \$2125)				\$ 14,025.00
INTEREST				\$ 20,000.00
ESTIMATED TOTAL DISTRICT COST				<u>\$ 597,334.00</u>

AVERAGE COST PER ACRE: \$543.03/acre (Based on 1100 Acres)
(\$43.58/acre/year for 20 years)
(\$70.32/acre/year for 10 years)

*Secondary Road Costs

VII. CONCLUSION/RECOMMENDATION

The proposed improvements include systems with 1/2-inch and 1-inch drainage coefficients that extend the length of Lateral 8 or just to the Outlet of Lateral 11 Tile, which is also being investigated for possible improvements. All of the options will provide greatly improved drainage within the Lateral 8 watershed of the drainage district.

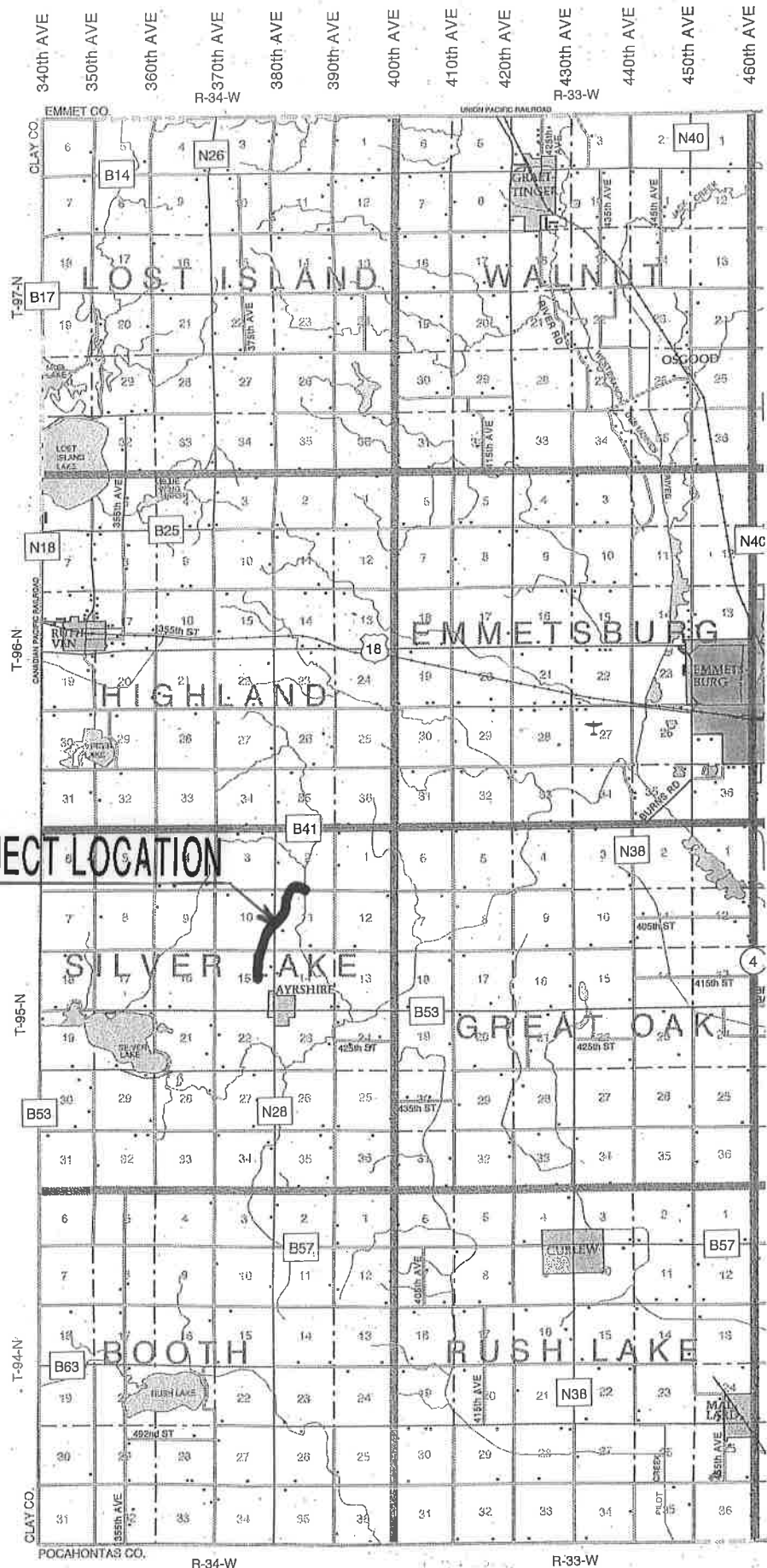
The minimum improvement we would recommend is the 1/2-inch coefficient system.

The Board of Supervisors, as trustees, for DD#23, should accept this report and set a date for a public hearing.

At the hearing the trustees should seek input from landowners regarding which options to pursue. More than one option could be bid with the final decision on which one to construct coming after the bid.

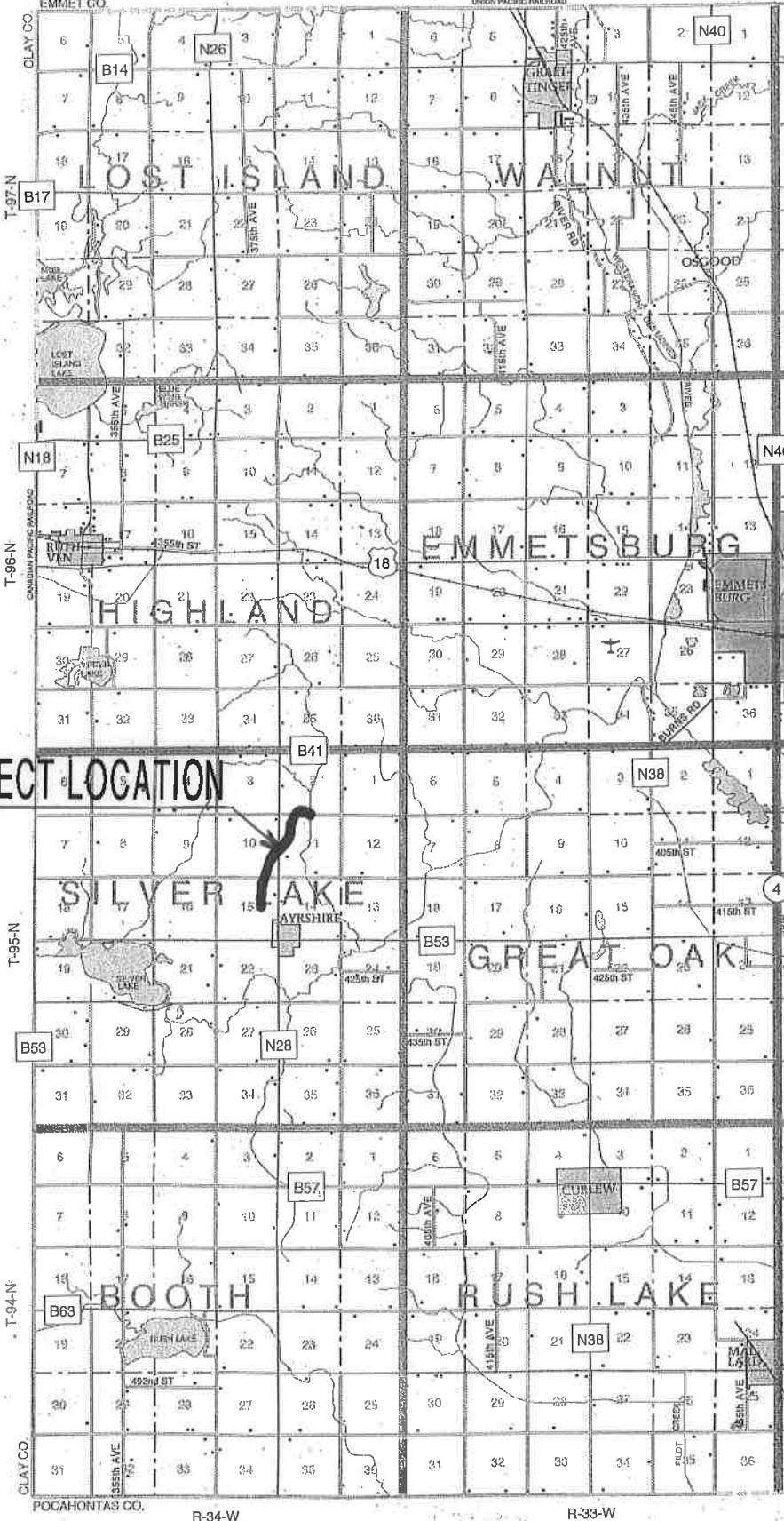
A reclassification will be required with either of the options.

Improvements are drastically needed in this drainage district and we strongly recommend proceeding with improvements.



PROJECT LOCATION

340th AVE
350th AVE
360th AVE
370th AVE
380th AVE
390th AVE
400th AVE
410th AVE
420th AVE
430th AVE
440th AVE
450th AVE
460th AVE



EMMETT CO. POCAHONTAS CO. R-34-W R-33-W