



**JACOBSON-WESTERGARD & ASSOCIATES, INC.**  
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**PRELIMINARY ENGINEERING REPORT**

**DRAINAGE DISTRICT NO. 19**  
**PALO ALTO COUNTY, IOWA**

JWA PROJECT NO: E16069

**OWNER: Palo Alto County Board of Supervisors**

Ron Graettinger  
Craig Merrill  
Edward Noonan  
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 10/6/16

Richard A. Hopper, P.E., License number 8106  
My license renewal date is December 31, 2017

Pages or sheets covered by this seal: Title, pg 1-14 & drawing

## **I. INTRODUCTION/HISTORY**

The history for Drainage District No. 19 is pretty minimal. There is an investigation of the outlet to Drainage District No. 19 made by Engineer Guy Campbell that was surveyed on May 7, 1907. It appears he also submitted an Engineer's Report for the establishment and construction of Drainage District No. 19 dated August 20, 1907. There is a notice to contractors for Drainage District No. 19 published in the paper stating the Board of Supervisors would meet on December 11, 1907, to open bids for the construction to begin on March 1, 1908 and be completed January 1, 1909.

There is a second notice to contractors published stating the Board of Supervisors would meet January 31, 1908 for the letting of construction of Drainage District No. 19. It appears the difference in the two notices is with the average depths and maximum depth of Section 1, the main tile.

On July 10, 1917 the Board of Supervisors appointed Engineer F.H. Fordyce to examine the main tile of Drainage District No. 19. He submitted his Engineer's report dated August 15, 1917, and found that the first 820 feet of the district was originally supposed to be open ditch, but was later changed to tile. The tile was too small and at a very flat grade. He recommended a parallel 20-inch tile be installed from the outlet to where later No. 1 enters the main tile, a distance of approximately 820 feet at 0.06%. The proposed 20-inch tile would be connected to the main tile and the Lateral No. 1 tile. He also suggested cleaning out the open ditch along the road to make a good outlet. Estimated costs of the improvements were \$750.00.

The notice to contractors was published August 23<sup>rd</sup> and August 30, 1917, that the Board of Supervisors would meet September 11, 1917 for the letting to construct 820 feet of 20-inch tile main. At some point the two tile must have been connected to the existing 36-inch tile that is extended across the road, but no clear records were found regarding this.

A petition was filed September 28, 1965 to improve Lateral No. 1 of Drainage District No. 19 by constructing a parallel tile line approximately fourteen (14) inches in diameter from the outlet of Lateral No. 1 to the point where the two twelve (12) inch lines of said lateral join together and outlet into the existing fifteen (15) inch line.

On May 17, 2016 a petition was filed seeking improvements to the existing county tile in Drainage District No. 19.

## **II. STARTING POINT, ROUTE AND TERMINUS**

The main tile begins at the west line of Section 6-95-34 at the center of the section line. It then goes in a northeasterly direction to cross 390<sup>th</sup> Street at the east corner of the NW $\frac{1}{4}$  NW $\frac{1}{4}$ , Section 5-95-34. It turns north northeasterly to a point 700 feet west of the center of Section 32-96-34 before continuing northeast and ending at a point 200 feet north of the center of Section 32-96-34.

There are also several laterals included in the district. Lateral No. 1, No. 1A and No. 1B area all located at the south end mainly in the south half of Section 6-95-34. Lateral No. 2 is located in the SE $\frac{1}{4}$ , Section 31-96-34 and the very NE $\frac{1}{4}$  of Section 6-95-34. Lateral No. 3 is located at the north end of the district in Section 32-96-34. See the enclosed map for locations.

## **III. EXISTING SYSTEM**

The existing main was originally supposed to consist of 820 feet of a four feet wide open ditch bottom with 1 $\frac{1}{2}$  to 1 slopes, 4450 feet of 20-inch tile, 1950 feet of 18-inch tile, 1000 feet of 15-inch tile, 2250 feet of 12-inch tile and 700 feet of 8-inch tile. It included tile construction of Laterals No. 1, 1A, 1B, 2 and 3 of various tile sizes ranging from 6-inch to 15-inch. A 24-inch tile was installed instead of the open ditch from STA 0+00 to 8+20. A 20-inch parallel tile was also installed from 0+00 to 8+20 on the main and there was a parallel 14-inch tile installed for the first 820 feet of Lateral No. 1. The drainage coefficient of the main is around 1/8-inch.

Lateral No. 1A has a drainage coefficient that ranges from 3/16" to over 3/4" where there is 2.5% slope on the pipe. The lower half is consistently at 3/16".

### **III. EXISTING SYSTEM (cont.)**

Lateral No. 1B has a drainage coefficient ranging from less than 1/8" to 1/4". Lateral No. 1 is consistently around 1/8" to 1/4", except for the upper end where it is around 1/2". The lower half of Lateral No. 2 is around 1/8" drainage coefficient and the majority of the upper portion of Lateral No. 2 is around 1/4" drainage coefficient. Lateral No. 3 mainly has a drainage coefficient of around 1/8".

### **IV. PROPOSED IMPROVEMENTS**

The proposed improvements include two options.

The first option would be a new parallel tile with a 1/2-inch drainage coefficient. The pipe for the main for this option would range in size from 12-inch to 36-inch pipe. The pipe for Lateral No. 1 ranges from 6-inch to 21-inch. Lateral No. 1A will be 10-inch and 18-inch. Lateral No. 1B and Lateral No. 3 will consist of 15-inch pipe. Lateral No. 2 will consist of 10-inch and 15-inch pipe. A cost estimate for this option can be seen following in this report.

The second option would be a new parallel tile with a 1-inch drainage coefficient. The pipe for the main for this option would range in size from 18-inch to 48-inch. The pipe for Lateral No. 1 ranges from 10-inch to 30-inch. Lateral No. 1A pipe will be 12-inch and 24-inch. Lateral No. 1B and Lateral No. 3 will consist of 18-inch. Lateral No. 2 will consist of 15-inch and 21-inch. A cost estimate for this option can be seen following in this report.

### **V. RIGHT OF WAY**

Since the 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 will be for a 1/2" drainage coefficient system.

**OPTION NO. 1 – 1/2" DRAINAGE COEFFICIENT – MAIN**

ITEM NO.	ITEM DESCRIPTION	QUANTITY & UNIT	UNIT PRICE	TOTAL PRICE
1.	36" RCP, 1500D	820 L.F.	\$ 50.00	\$ 41,000.00
2.	30" RCP, 1500D	6434 L.F.	\$ 38.00	\$ 244,492.00
*3.	30" RCP, 2000D	66 L.F.	\$ 48.00	\$ 3,168.00
4.	24" RCP, 1500D	3184 L.F.	\$ 32.00	\$ 101,888.00
*5.	24" RCP, 2000D	66 L.F.	\$ 43.00	\$ 2,838.00
6.	12" RCP, 1500D	700 L.F.	\$ 17.00	\$ 11,900.00
7.	Cross Connection with Tee	4 Each	\$ 800.00	\$ 3,200.00
8.	Junction Box	6 Each	\$ 4,000.00	\$ 24,000.00
9.	Tile Connections	26 Each	\$ 350.00	\$ 9,100.00
*10.	Granular Surfacing	40 Ton	\$ 18.00	\$ 720.00
11.	Exploratory Excavation	8 Hours	\$ 200.00	\$ 1,600.00
12.	Trench Stabilization	200 Ton	\$ 25.00	\$ 5,000.00
13.	Area Drain	10 Each	\$ 750.00	\$ 7,500.00
<b>ESTIMATED SUBTOTAL CONSTRUCTION COST - MAIN</b>				<b><u>\$ 456,406.00</u></b>
<b>ESTIMATED TOTAL DISTRICT COST</b>				<b>\$ 449,680.00</b>
<b>CONTINGENCIES</b>				<b>\$ 44,968.00</b>
<b>ENGINEERING, LEGAL, PUBLICATION</b>				<b>\$ 67,500.00</b>
<b>CLASSIFICATION</b>				<b>\$ 7,500.00</b>
<b>PERMANENT EASEMENT (7.8 Acres @ \$2000)</b>				<b>\$ 15,600.00</b>
<b>INTEREST</b>				<b>\$ 22,100.00</b>
<b>ESTIMATED TOTAL DISTRICT COST - MAIN</b>				<b><u>\$ 607,348.00</u></b>

AVERAGE COST PER ACRE: \$485.88 (Based on 1250 Acres)

\*Secondary Road Costs

**1/2" DRAINAGE COEFFICIENT – LATERAL NO. 1**

ITEM NO.	ITEM DESCRIPTION	QUANTITY & UNIT	UNIT PRICE	TOTAL PRICE
1.	21" RCP, 1500D	1050 L.F.	\$ 30.00	\$ 31,500.00
2.	18" RCP, 1500D	1650 L.F.	\$ 28.00	\$ 46,200.00
3.	15" RCP, 1500D	2100 L.F.	\$ 24.00	\$ 50,400.00
4.	12" RCP, 1500D	334 L.F.	\$ 17.00	\$ 5,678.00
*5.	12" RCP, 2000D	66 L.F.	\$ 27.00	\$ 1,782.00
6.	Cross Connection with Tee	3 Each	\$ 800.00	\$ 2,400.00
7.	Junction Box	2 Each	\$ 4,000.00	\$ 8,000.00
8.	Tile Connections	13 Each	\$ 350.00	\$ 4,550.00
*9.	Granular Surfacing	20 Ton	\$ 18.00	\$ 360.00
10.	Exploratory Excavation	4 Hours	\$ 200.00	\$ 800.00
11.	Trench Stabilization	70 Ton	\$ 25.00	\$ 1,750.00
12.	Area Drain	4 Each	\$ 750.00	\$ 3,000.00

**ESTIMATED SUBTOTAL CONSTRUCTION COST – LATERAL NO. 1** **\$ 153,420.00**

**ESTIMATED TOTAL DISTRICT COST** **\$ 151,278.00**

**CONTINGENCIES** **\$ 15,128.00**

**ENGINEERING, LEGAL, PUBLICATION** **\$ 2,500.00**

**CLASSIFICATION** **\$ 1,000.00**

**PERMANENT EASEMENT (3.6 Acres @ \$2000)** **\$ 7,200.00**

**INTEREST** **\$ 7,650.00**

**ESTIMATED TOTAL DISTRICT COST – LATERAL NO. 1** **\$ 184,756.00**

AVERAGE COST PER ACRE: \$384.91 (Based on 480 Acres)

\*Secondary Road Costs

**1/2" DRAINAGE COEFFICIENT – LATERAL NO. 1A**

ITEM NO.	ITEM DESCRIPTION	QUANTITY & UNIT	UNIT PRICE	TOTAL PRICE
1.	18" RCP, 1500D	1350 L.F.	\$ 28.00	\$ 37,800.00
2.	12" RCP, 1500D	869 L.F.	\$ 17.00	\$ 14,773.00
*3.	12" RCP, 2000D	66 L.F.	\$ 27.00	\$ 1,782.00
4.	Cross Connection with Tee	2 Each	\$ 800.00	\$ 1,600.00
5.	Tile Connections	6 Each	\$ 350.00	\$ 2,100.00
*6.	Granular Surfacing	20 Ton	\$ 18.00	\$ 360.00
7.	Exploratory Excavation	2 Hours	\$ 200.00	\$ 400.00
8.	Trench Stabilization	30 Ton	\$ 25.00	\$ 750.00
9.	Area Drain	1 Each	\$ 750.00	\$ 750.00
<b>ESTIMATED SUBTOTAL CONSTRUCTION COST – LATERAL 1A</b>				<b><u>\$ 60,315.00</u></b>
<b>ESTIMATED TOTAL DISTRICT COST</b>				<b>\$ 58,173.00</b>
<b>CONTINGENCIES</b>				<b>\$ 5,817.00</b>
<b>ENGINEERING, LEGAL, PUBLICATION</b>				<b>\$ 2,000.00</b>
<b>CLASSIFICATION</b>				<b>\$ 750.00</b>
<b>PERMANENT EASEMENT (1.6 Acres @ \$2000)</b>				<b>\$ 3,200.00</b>
<b>INTEREST</b>				<b>\$ 3,000.00</b>
<b>ESTIMATED TOTAL DISTRICT COST – LATERAL NO. 1A</b>				<b><u>\$ 72,940.00</u></b>

AVERAGE COST PER ACRE: \$416.80 (Based on 175 Acres)

\*Secondary Road Costs

**1/2" DRAINAGE COEFFICIENT – LATERAL NO. 1B**

ITEM NO.	ITEM DESCRIPTION	QUANTITY & UNIT	UNIT PRICE	TOTAL PRICE
1.	15" RCP, 1500D	1284 L.F.	\$ 24.00	\$ 30,816.00
*2.	15" RCP, 2000D	66 L.F.	\$ 34.00	\$ 2,244.00
3.	Cross Connection with Tee	1 Each	\$ 800.00	\$ 800.00
4.	Tile Connections	3 Each	\$ 350.00	\$ 1,050.00
*5.	Granular Surfacing	20 Ton	\$ 18.00	\$ 360.00
6.	Exploratory Excavation	2 Hours	\$ 200.00	\$ 400.00
7.	Trench Stabilization	20 Ton	\$ 25.00	\$ 500.00
8.	Area Drain	1 Each	\$ 750.00	\$ 750.00
<b>ESTIMATED SUBTOTAL CONSTRUCTION COST – LATERAL 1B</b>				<b><u>\$ 36,245.00</u></b>
<b>ESTIMATED TOTAL DISTRICT COST</b>				<b>\$ 33,641.00</b>
<b>CONTINGENCIES</b>				<b>\$ 3,364.00</b>
<b>ENGINEERING, LEGAL, PUBLICATION</b>				<b>\$ 2,000.00</b>
<b>CLASSIFICATION</b>				<b>\$ 750.00</b>
<b>PERMANENT EASEMENT (0.93 Acres @ \$2000)</b>				<b>\$ 1,860.00</b>
<b>INTEREST</b>				<b>\$ 1,800.00</b>
<b>ESTIMATED TOTAL DISTRICT COST – LATERAL NO. 1B</b>				<b><u>\$ 43,415.00</u></b>

AVERAGE COST PER ACRE: \$333.96 (Based on 130 Acres)

\*Secondary Road Costs

**1/2" DRAINAGE COEFFICIENT – LATERAL NO. 2**

<b>ITEM NO.</b>	<b>ITEM DESCRIPTION</b>	<b>QUANTITY &amp; UNIT</b>	<b>UNIT PRICE</b>	<b>TOTAL PRICE</b>
1.	15" RCP, 1500D	2634 L.F.	\$ 24.00	\$ 63,216.00
*2.	15" RCP, 2000D	66 L.F.	\$ 34.00	\$ 2,244.00
3.	12" RCP, 1500D	1800 L.F.	\$ 17.00	\$ 30,600.00
4.	Cross Connection with Tee	3 Each	\$ 800.00	\$ 2,400.00
5.	Tile Connections	10 Each	\$ 350.00	\$ 3,500.00
*6.	Granular Surfacing	20 Ton	\$ 18.00	\$ 360.00
7.	Exploratory Excavation	3 Hours	\$ 200.00	\$ 600.00
8.	Trench Stabilization	50 Ton	\$ 25.00	\$ 1,250.00
9.	Area Drain	3 Each	\$ 750.00	\$ 2,250.00
<b>ESTIMATED SUBTOTAL CONSTRUCTION COST – LATERAL 2</b>				<b><u>\$ 106,402.00</u></b>
<b>ESTIMATED TOTAL DISTRICT COST</b>				<b>\$ 103,816.00</b>
<b>CONTINGENCIES</b>				<b>\$ 10,382.00</b>
<b>ENGINEERING, LEGAL, PUBLICATION</b>				<b>\$ 2,000.00</b>
<b>CLASSIFICATION</b>				<b>\$ 600.00</b>
<b>PERMANENT EASEMENT (3.1 Acres @ \$2000)</b>				<b>\$ 6,200.00</b>
<b>INTEREST</b>				<b>\$ 5,300.00</b>
<b>ESTIMATED TOTAL DISTRICT COST – LATERAL NO. 2</b>				<b><u>\$ 128,298.00</u></b>

AVERAGE COST PER ACRE: \$936.48 (Based on 137 Acres)

\*Secondary Road Costs



**1/2" DRAINAGE COEFFICIENT – LATERAL NO. 3**

ITEM NO.	ITEM DESCRIPTION	QUANTITY & UNIT	UNIT PRICE	TOTAL PRICE
1.	15" RCP, 1500D	1200 L.F.	\$ 24.00	\$ 28,800.00
2.	Cross Connection with Tee	1 Each	\$ 800.00	\$ 800.00
3.	Tile Connections	3 Each	\$ 350.00	\$ 1,050.00
4.	Exploratory Excavation	2 Hours	\$ 200.00	\$ 400.00
5.	Trench Stabilization	20 Ton	\$ 25.00	\$ 500.00
6.	Area Drain	1 Each	\$ 750.00	\$ 750.00
<b>ESTIMATED TOTAL CONSTRUCTION COST – LATERAL 3</b>				<b><u>\$ 32,300.00</u></b>
<b>CONTINGENCIES</b>				<b>\$ 3,230.00</b>
<b>ENGINEERING, LEGAL, PUBLICATION</b>				<b>\$ 1,000.00</b>
<b>CLASSIFICATION</b>				<b>\$ 1,000.00</b>
<b>PERMANENT EASEMENT (0.83 Acres @ \$2000)</b>				<b>\$ 400.00</b>
<b>INTEREST</b>				<b>\$ 1,600.00</b>
<b>ESTIMATED TOTAL DISTRICT COST – LATERAL NO. 3</b>				<b><u>\$ 40,190.00</u></b>

AVERAGE COST PER ACRE: \$502.38 (Based on 80 Acres)

\*Secondary Road Costs

The second option is for a parallel 1" coefficient system.

**OPTION NO. 2 – 1" DRAINAGE COEFFICIENT – MAIN**

ITEM NO.	ITEM DESCRIPTION	QUANTITY & UNIT	UNIT PRICE	TOTAL PRICE
*1.	48" RCP, 2000D	66 L.F.	\$ 80.00	\$ 5,280.00
2.	48" RCP, 1500D	820 L.F.	\$ 65.00	\$ 53,300.00
*3.	36" RCP, 2000D	132 L.F.	\$ 63.00	\$ 8,316.00
4.	36" RCP, 1500D	7368 L.F.	\$ 50.00	\$ 368,400.00
5.	24" RCP, 1500D	2250 L.F.	\$ 32.00	\$ 72,000.00
6.	18" RCP, 1500D	700 L.F.	\$ 28.00	\$ 19,600.00
7.	Cross Connection with Tee	4 Each	\$ 800.00	\$ 3,200.00
8.	Junction Box	6 Each	\$ 5,000.00	\$ 30,000.00
9.	Tile Connections	26 Each	\$ 350.00	\$ 9,100.00
*10.	Granular Surfacing	40 Ton	\$ 18.00	\$ 720.00
11.	Exploratory Excavation	8 Hours	\$ 200.00	\$ 1,600.00
12.	Trench Stabilization	200 Ton	\$ 25.00	\$ 5,000.00
13.	Area Drain	10 Each	\$ 750.00	\$ 7,500.00
<b>ESTIMATED SUBTOTAL CONSTRUCTION COST - MAIN</b>				<b><u>\$ 584,016.00</u></b>
<b>ESTIMATED TOTAL DISTRICT COST</b>				<b>\$ 569,700.00</b>
<b>CONTINGENCIES</b>				<b>\$ 56,970.00</b>
<b>ENGINEERING, LEGAL, PUBLICATION</b>				<b>\$ 67,500.00</b>
<b>CLASSIFICATION</b>				<b>\$ 7,500.00</b>
<b>PERMANENT EASEMENT (7.8 Acres @ \$2000)</b>				<b>\$ 15,600.00</b>
<b>INTEREST</b>				<b>\$ 29,200.00</b>
<b>ESTIMATED TOTAL DISTRICT COST</b>				<b><u>\$ 746,470.00</u></b>

AVERAGE COST PER ACRE: \$597.18 (Based on 1250 Acres)

\*Secondary Road Costs

**OPTION NO. 2 – 1” DRAINAGE COEFFICIENT – LATERAL NO. 1**

ITEM NO.	ITEM DESCRIPTION	QUANTITY & UNIT	UNIT PRICE	TOTAL PRICE
1.	30" RCP, 1500D	1050 L.F.	\$ 38.00	\$ 39,900.00
2.	24" RCP, 1500D	2750 L.F.	\$ 32.00	\$ 88,000.00
3.	18" RCP, 1500D	1000 L.F.	\$ 28.00	\$ 28,000.00
4.	12" RCP, 1500D	334 L.F.	\$ 17.00	\$ 5,678.00
*5.	12" RCP, 2000D	66 L.F.	\$ 27.00	\$ 1,782.00
6.	Cross Connection with Tee	3 Each	\$ 800.00	\$ 2,400.00
7.	Junction Box	2 Each	\$ 4,000.00	\$ 8,000.00
8.	Tile Connections	13 Each	\$ 350.00	\$ 4,550.00
*9.	Granular Surfacing	20 Ton	\$ 18.00	\$ 360.00
10.	Exploratory Excavation	4 Hours	\$ 200.00	\$ 800.00
11.	Trench Stabilization	70 Ton	\$ 25.00	\$ 1,750.00
12.	Area Drain	4 Each	\$ 750.00	\$ 3,000.00

**ESTIMATED SUBTOTAL CONSTRUCTION COST – LATERAL NO. 1** **\$ 184,220.00**

**ESTIMATED TOTAL DISTRICT COST** **\$ 182,078.00**

**CONTINGENCIES** **\$ 18,208.00**

**ENGINEERING, LEGAL, PUBLICATION** **\$ 2,500.00**

**CLASSIFICATION** **\$ 1,000.00**

**PERMANENT EASEMENT (3.6 Acres @ \$2000)** **\$ 7,200.00**

**INTEREST** **\$ 9,200.00**

**ESTIMATED TOTAL DISTRICT COST – LATERAL NO. 1** **\$ 220,186.00**

AVERAGE COST PER ACRE: \$458.72 (Based on 480 Acres)

\*Secondary Road Costs

**OPTION NO. 2 – 1” DRAINAGE COEFFICIENT – LATERAL NO. 1A**

ITEM NO.	ITEM DESCRIPTION	QUANTITY & UNIT	UNIT PRICE	TOTAL PRICE
1.	24" RCP, 1500D	1350 L.F.	\$ 32.00	\$ 43,200.00
2.	12" RCP, 1500D	869 L.F.	\$ 17.00	\$ 14,773.00
*3.	12" RCP, 2000D	66 L.F.	\$ 27.00	\$ 1,782.00
4.	Cross Connection with Tee	2 Each	\$ 800.00	\$ 1,600.00
5.	Tile Connections	6 Each	\$ 350.00	\$ 2,100.00
*6.	Granular Surfacing	20 Ton	\$ 18.00	\$ 360.00
7.	Exploratory Excavation	2 Hours	\$ 200.00	\$ 400.00
8.	Trench Stabilization	30 Ton	\$ 25.00	\$ 750.00
9.	Area Drain	1 Each	\$ 750.00	\$ 750.00
<b>ESTIMATED SUBTOTAL CONSTRUCTION COST – LATERAL NO. 1A</b>				<b><u>\$ 65,715.00</u></b>
<b>ESTIMATED TOTAL DISTRICT COST</b>				<b>\$ 63,573.00</b>
<b>CONTINGENCIES</b>				<b>\$ 6,357.00</b>
<b>ENGINEERING, LEGAL, PUBLICATION</b>				<b>\$ 2,000.00</b>
<b>CLASSIFICATION</b>				<b>\$ 750.00</b>
<b>PERMANENT EASEMENT 1.6 Acres @ \$2000)</b>				<b>\$ 3,200.00</b>
<b>INTEREST</b>				<b>\$ 3,285.00</b>
<b>ESTIMATED TOTAL DISTRICT COST – LATERAL NO. 1A</b>				<b><u>\$ 79,165.00</u></b>

AVERAGE COST PER ACRE: \$452.37 (Based on 175 Acres)

\*Secondary Road Costs

**OPTION NO. 2 – 1” DRAINAGE COEFFICIENT – LATERAL NO. 1B**

ITEM NO.	ITEM DESCRIPTION	QUANTITY & UNIT	UNIT PRICE	TOTAL PRICE
1.	18" RCP, 1500D	1284 L.F.	\$ 28.00	\$ 35,952.00
*2.	18" RCP, 2000D	66 L.F.	\$ 38.00	\$ 2,508.00
3.	Cross Connection with Tee	1 Each	\$ 800.00	\$ 800.00
4.	Tile Connections	3 Each	\$ 350.00	\$ 1,050.00
*5.	Granular Surfacing	20 Ton	\$ 18.00	\$ 360.00
6.	Exploratory Excavation	2 Hours	\$ 200.00	\$ 400.00
7.	Trench Stabilization	20 Ton	\$ 25.00	\$ 500.00
8.	Area Drain	1 Each	\$ 750.00	\$ 750.00
<b>ESTIMATED SUBTOTAL CONSTRUCTION COST – LATERAL NO. 1B</b>				<b><u>\$ 43,320.00</u></b>
<b>ESTIMATED TOTAL DISTRICT COST</b>				<b>\$ 39,776.00</b>
<b>CONTINGENCIES</b>				<b>\$ 3,978.00</b>
<b>ENGINEERING, LEGAL, PUBLICATION</b>				<b>\$ 2,000.00</b>
<b>CLASSIFICATION</b>				<b>\$ 750.00</b>
<b>PERMANENT EASEMENT (0.93 Acres @ \$2000)</b>				<b>\$ 1,860.00</b>
<b>INTEREST</b>				<b>\$ 2,100.00</b>
<b>ESTIMATED TOTAL DISTRICT COST – LATERAL NO. 1B</b>				<b><u>\$ 50,464.00</u></b>

AVERAGE COST PER ACRE: \$388.18 (Based on 130 Acres)

\*Secondary Road Costs

**OPTION NO. 2 – 1” DRAINAGE COEFFICIENT – LATERAL NO. 2**

ITEM NO.	ITEM DESCRIPTION	QUANTITY & UNIT	UNIT PRICE	TOTAL PRICE
1.	21" RCP, 1500D	2634 L.F.	\$ 30.00	\$ 79,020.00
*2.	21" RCP, 2000D	66 L.F.	\$ 40.00	\$ 2,640.00
3.	15" RCP, 1500D	1800 L.F.	\$ 24.00	\$ 43,200.00
4.	Cross Connection with Tee	3 Each	\$ 800.00	\$ 2,400.00
5.	Tile Connections	10 Each	\$ 350.00	\$ 3,500.00
*6.	Granular Surfacing	20 Ton	\$ 18.00	\$ 360.00
7.	Exploratory Excavation	3 Hours	\$ 200.00	\$ 600.00
8.	Trench Stabilization	50 Ton	\$ 25.00	\$ 1,250.00
9.	Area Drain	3 Each	\$ 750.00	\$ 2,250.00
<b>ESTIMATED SUBTOTAL CONSTRUCTION COST – LATERAL NO. 2</b>				<b><u>\$ 135,220.00</u></b>
<b>ESTIMATED TOTAL DISTRICT COST</b>				<b>\$ 132,220.00</b>
<b>CONTINGENCIES</b>				<b>\$ 13,222.00</b>
<b>ENGINEERING, LEGAL, PUBLICATION</b>				<b>\$ 2,000.00</b>
<b>CLASSIFICATION</b>				<b>\$ 600.00</b>
<b>PERMANENT EASEMENT (3.1 Acres @ \$2000)</b>				<b>\$ 6,200.00</b>
<b>INTEREST</b>				<b>\$ 6,700.00</b>
<b>ESTIMATED TOTAL DISTRICT COST – LATERAL NO. 2</b>				<b><u>\$ 160,942.00</u></b>

AVERAGE COST PER ACRE: \$1174.76 (Based on 137 Acres)

\*Secondary Road Costs

**OPTION NO. 2 – 1” DRAINAGE COEFFICIENT – LATERAL NO. 3**

ITEM NO.	ITEM DESCRIPTION	QUANTITY & UNIT	UNIT PRICE	TOTAL PRICE
1.	18" RCP, 1500D	1200 L.F.	\$ 28.00	\$ 33,600.00
2.	Cross Connection with Tee	1 Each	\$ 800.00	\$ 800.00
3.	Tile Connections	3 Each	\$ 350.00	\$ 1,050.00
4.	Exploratory Excavation	2 Hours	\$ 200.00	\$ 400.00
5.	Trench Stabilization	20 Ton	\$ 25.00	\$ 500.00
6.	Area Drain	1 Each	\$ 750.00	\$ 750.00
ESTIMATED TOTAL CONSTRUCTION COST – LATERAL NO. 3				<b><u>\$ 37,100.00</u></b>
CONTINGENCIES				<b>\$ 3,710.00</b>
ENGINEERING, LEGAL, PUBLICATION				<b>\$ 1,000.00</b>
CLASSIFICATION				<b>\$ 400.00</b>
PERMANENT EASEMENT (0.83 Acres @ \$2000)				<b>\$ 1,660.00</b>
INTEREST				<b>\$ 1,900.00</b>
ESTIMATED TOTAL DISTRICT COST – LATERAL NO. 3				<b><u>\$ 45,770.00</u></b>

AVERAGE COST PER ACRE: \$572.12 (Based on 80 Acres)

\*Secondary Road Costs

**VII. CONCLUSION/RECOMMENDATION**

The proposed improvements include systems with 1/2-inch and 1-inch drainage coefficients. Either of the options will provide greatly improved drainage in Drainage District No. 19.

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

The Board of Supervisors, as trustees, for DD#19, 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.

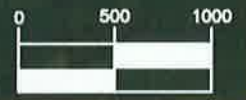
A reclassification will be required with any of the options.

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



36" CMP TILE OUTLET  
FL ELEV = 1393.91'

GRAPHIC SCALE



( IN FEET )  
1 inch = 1000 ft.

**JACOBSON-WESTERGARD & ASSOCIATES, INC.**  
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CONSULTING ENGINEERS LAND SURVEYING



NO.	REVISIONS	BY	DATE

DD #19 TILE IMPROVEMENTS  
PALO ALTO COUNTY, IOWA

PROPOSED IMPROVEMENT ROUTE

Date	8-24-16
Designer	RAH
Drawn	DLH
Checker	RAH
Project Number	E16069
Sheet	1 OF 1

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