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ENGINEER'S REPORT DRAINAGE DISTRICT NO. 195 WEBSTER COUNTY, IOWA December 7, 2016

MEC 10416014

NORTHWEST IOWA | DES MOINES METRO | EASTERN IOWA | SIOUXLAND REGION | LAKE OZARK, MISSOURI

	<p>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.</p> <p><i>Justin W. Miller</i> <u>12/07/2016</u> Justin W. Miller, P.E. No. 22635 (Date)</p> <p>My license renewal date is December 31, 2016</p>
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Introduction

This report is written in response to a drainage petition filed with the Webster County Board of Supervisors requesting an investigation into the main tile in Drainage District 195 due to a multitude of repair requests in recent years. The Webster County Board of Supervisors motioned for McClure Engineering Company (MEC) to prepare a report for repair or improvements in conjunction with said investigation. This report summarizes the findings of the engineer in response to the Drainage Petition which includes the investigation results, engineer's opinion of probable cost and recommendations in accordance with Iowa Code Chapter 468.126.

The main is located in Sections 18, 19, 20, 21, 29 and 30; Deer Creek Township, Webster County, Iowa as shown on the exhibit in the Appendix.

History and Original Improvements

Drainage District 195 was established July 7, 1914 and construction was completed in July of 1918. The original construction included a main tile with 18 branches and serves 2,458 acres. A very noteworthy segment of the Drainage District 195 records shows the original construction contract in the early 1900's was forfeited by the contractor. This means the contractor failed to complete the work in accordance with the plans and specifications in a timely manner so a separate contractor was hired to complete the work. A report from the original engineer noted that the grade was a little uneven but in fair shape and that there was mud up to a foot deep in part of the tile. He also noted that in areas where the tile was placed in sandy soil, the pipe was exposed, backfilled with black dirt and sod and the pipes' cracks were patched. This report was written while the new contractor was working near station 110+00. The written records continue to detail that the Supervisors of the time were unsatisfied with the quality of the work. The total construction cost was \$28,456.30.

The records show that 22 repairs have been made to the District in the last 20 years. Of these repairs, 17 were made to the main tile and all but two were made in Sections 20 and 30. For these reasons, a petition was submitted to investigate the main tile for recommendations of larger-scale repairs or improvements in 2011. Two repair options and one improvement option were proposed. Improvements are identified as, "...a project intended to expand, enlarge or otherwise increase the capacity of any existing ditch, drain or other facility above that for which it was designed" as noted in Iowa Drainage District Code Section 468.126. It was ultimately decided that the portion of main tile starting from the west ditch of Hayes Avenue to the south ditch of C-66 (140th Street) would be improved as that portion had experienced the largest frequency of repairs in the past. Additionally a wooden headwall was installed just west of Indiana Avenue to serve as the outlet location for Branch One and the Main Tile. The road culvert under Indiana Avenue was also replaced and an open ditch was dug to replace the Main Tile alignment east of Indiana Avenue. All of this construction was completed in June of 2013.

Methodology

This investigation has included a review of court records and available record drawings to establish original construction cost, improvements and original design. A field survey was conducted to verify previous survey information and establish ground elevations and tile outlet elevations in order to correlate with available record information, digital information through the Iowa Department of Natural Resources, and other data sources. This information is collected in order to evaluate the condition of the existing tile system and to evaluate the feasibility of benefit of possible repair and improvements in order to restore the functionality of the District facilities.

Existing Conditions

The main tile originally consisted of 16,500 feet of clay tile ranging in size from 8" to 34". In the 2013 improvement project, 1,792 feet of tile was replaced in Section 30 and 1208 feet of original tile was replaced with the open ditch which leaves a total of 13,500 feet of tile that has not been improved. These unimproved tile provide a drainage coefficient of approximately 1/4". A drainage coefficient is the amount of water that can be drained from an acre within a twenty-four hour period of time. Modern drainage recommendations include drainage coefficients at a minimum of 1/2" so that is double the current capacity in the tile. The tile improvements in Section 30 and the ditch improvement at the outlet were designed with anticipation of future improvements with 1/2" drainage coefficient.

A grassed waterway crosses the alignment of the main tile multiple times. This is not considered a District facility but it does help carry surface water to the outlet. The maintenance and recognition of the waterway elevations are important because the amount of cover over existing tile is as little as 1.5 feet at the waterway crossings. The lack of sufficient cover is a common cause for blowouts on tile, similar to those frequently seen on the Drainage District 195 Main Tile alignment. The tile alignment that is closer to the waterway is less likely to be affected by a lack of coverage because the ground would most likely not be cultivated directly adjacent to, or through, the flowline of the waterway. This lessens the chances of tile damage from farm machinery. The most recent blowouts were reported in Section 20 where many other blowouts have been reported in the past.

Proposed Repairs

Three options are presented below. Opinions of Probable Cost can be found in the Appendix.

Option 1 – Replace 7,140 feet of Main Tile to Maintain Original Capacity

This is a similar option to the replacement option outlined in the 2011 report. That option consisted of repairing the facility from 12+10 to 101+50. Option 1 would directly replace the tile with the closest size of reinforced concrete pipe to maintain the drainage coefficient of 1/4". Due to the grassed waterways previously discussed, the alignment of the main would need to be shifted to ensure a minimum cover of three feet. Waterways would be restored to existing conditions. These repairs would take care of the stretches of tile where the majority of repair requests have originated over the years. Existing clay tile would be crushed and buried on site. The new tile would be reinforced concrete pipe with tongue and groove joints wrapped in engineering fabric to prevent soil from entering the pipe.

The total project cost to the district of this repair is estimated at \$373,200. This estimate includes surveying, reports, hearings, design engineering, construction administration, and right of way damages. It does not include an additional estimated cost of \$37,500 of repairs to be paid for using funds available to the County's Secondary Road fund. The detailed estimate can be found in Appendix B.

Option 2 – Replace 7,140 feet of Main Tile to Increase Capacity

This is a similar option to the improvement option outlined in the 2011 report. That option consisted of improving the facility from 12+10 to 101+50. Considering improvements were made at the outlet and in Section 30, this Option 1 now includes completing the rest of those improvements within that stretch. The tile improvement completed in Section 30 and the small tile improvement at the headwall was sized for a 1/2" drainage coefficient so everything in between could be improved to 1/2" as well. Due to the grassed waterways previously discussed, the alignment of the main would need to be shifted to ensure a minimum cover of three feet. Waterways would be restored to existing conditions. These areas of improvements would take care of the stretches of tile where the

majority of repair requests have originated over the years. Existing clay tile would be crushed and buried on site. The new tile would be reinforced concrete pipe with tongue and groove joints wrapped in engineering fabric to prevent soil from entering the pipe.

The total project cost to the district for this improvement is estimated at \$506,700. This estimate includes surveying, reports, hearings, design engineering, construction administration, and right of way damages. It does not include an additional estimated cost of \$47,500 of repairs to be paid for using funds available to the County's Secondary Road fund. The detailed estimate can be found in Appendix B.

Option 3 – Replace 13,500 feet of Main to Increase Capacity

This option would improve the entire length of the main that has not previously been improved to a 1/2" coefficient. This scale of improvement would prevent requests for repairs on any stretch of the main for a very long time while providing an effective outlet for all users along the main. Due to the grassed waterways previously discussed, the alignment of the main would need to be shifted to ensure a minimum cover of three feet. Waterways would be restored to existing conditions. Existing clay tile would be crushed and buried on site. The new tile would be reinforced concrete pipe with tongue and groove joints wrapped in engineering fabric to prevent soil from entering the pipe.

The total project cost to the district of this improvement is estimated at \$766,350. This estimate includes surveying, reports, hearings, design engineering, construction administration, and right of way damages. It does not include an additional estimated cost of \$90,000 of repairs to be paid for using funds available to the County's Secondary Road fund. The detailed estimate can be found in Appendix B.

Wetlands

The United States Department of Agriculture (USDA) Farm Service Agency requires that farmers follow wetland compliance provisions (Swampbuster). Those provisions are specifically important for drainage district projects which increase capacity and drainage as mitigation can be required in order to maintain USDA benefit eligibility. The proposed Option 1 in this report is not intended to improve the drainage district by increasing the capacity. Option 1 is intended to bring the District facilities back to the original capacity and efficiency. We do not anticipate the need for mitigation for option 1 repairs but landowners are ultimately responsible for meeting any mitigation requirements.

Options 2 and 3 have the potential to affect regulated wetland. Jurisdictional determinations through NRCS are strongly recommended to determine if any jurisdictional wetlands are to be disturbed by the proposed improvements outlined in option 2 or 3. The USDA's Natural Resource Commission provides technical resources to complete wetland determinations and provide guidance on whether mitigation is required to the landowners. If a landowner finds that the proposed improvement will result in disturbance of jurisdictional wetlands, the findings must be presented to the Board of Supervisors at the public hearing or prior to the approval of the proposed improvement. The drainage district does not provide mitigation for landowners.

Annexation / Reclassification

Reclassification is a process where a Commission appointed by the Board is tasked with classifying the lands benefitted by the district in order to assess costs to the district for maintenance, repairs and improvements. By reclassifying the District into separate laterals, landowners may only be assessed for repairs and improvements to those facilities which they benefit from. This drainage district was reclassified as part of the procedure following the 2013 improvements so a reclassification would not need to be completed for these improvements.

Recommendation

The majority of repair requests have been located in an isolated portion of the tile (Section 20 and 30). At a minimum we recommend pursuing Option 2 to address these areas with an improvement. We understand the 2013 improvements were carefully selected to keep costs as minimal as possible and this would be the option to continue with that mindset. However, landowners draining their ground upstream of 140th Street would only have a marginally more efficient outlet. In addition it would be difficult for these landowners to improve the upstream portion in the future as the cost would be spread out to the entire district including the portion that has already been improved. Option 3 would allow for all farms within the district to receive increased benefit with an improved main. District branches that currently outlet into the main have not been analyzed for improvement at this time, but the improvement of the entire main would allow for future expansion of all branches up to 1/2" coefficients as well.

Administration

The estimated construction cost of the proposed improvements falls above the requirements for competitive bid threshold of \$135,000. The construction cost estimate also falls above the limit of \$50,000 for which a public hearing is required.

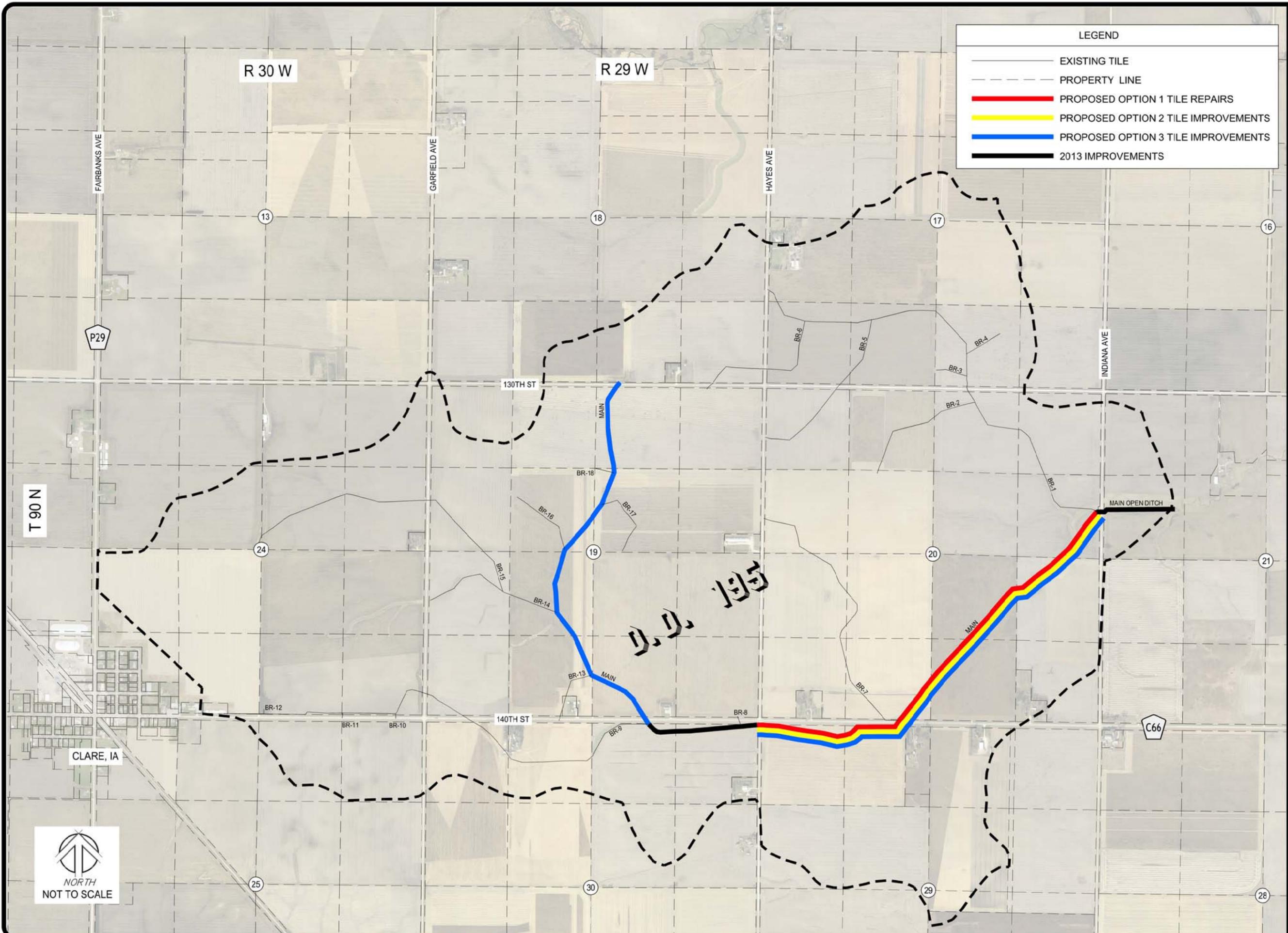
Upon filing of this report, the Board may approve the report as a tentative plan and set a public hearing and give notice to landowners. The public notice is required in this case as the estimate cost of the improvements is in excess of \$50,000. Landowners within the District must be notified of the hearing per Iowa code. The public hearing is intended for the Board to hear comments from landowners in support or otherwise regarding the proposed improvements.

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

- Tentatively approve this report
- Set a date and time for the public hearing
- Notice shall be provided to all landowners pursuant to Sections 468.14 through 468.18 of Iowa Code.
- Conduct public hearing
 - Hear objections to the feasibility of the proposed improvements
 - Notification of wetland determinations
 - Order the repairs or improvements that are found to be desirable
 - Set a letting date and time
- Hold a public bid letting
- Award bid to lowest, responsive, responsible bidder
- Construct the repairs or improvements
- Hold completion hearing

APPENDIX A

REPORT EXHIBIT



LEGEND	
	EXISTING TILE
	PROPERTY LINE
	PROPOSED OPTION 1 TILE REPAIRS
	PROPOSED OPTION 2 TILE IMPROVEMENTS
	PROPOSED OPTION 3 TILE IMPROVEMENTS
	2013 IMPROVEMENTS



building strong communities.

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Report Exhibit
Drainage District No. 195
 WEBSTER COUNTY, IOWA



APPENDIX B

ENGINEER'S OPINION OF PROBABLE COSTS

Opinion of Probable Costs
 Drainage District No. 195 - Webster County
 Option 1 - Replace Tile To Section 30

Item	Description	Quantity	Unit Price	Extension
1	Tile Exploration	16 HRS	\$200.00	\$3,200.00
2	Crush & Bury Existing Tile on Site	7,140 LF	\$3.00	\$21,420.00
3	27" RCP	5,320 LF	\$38.00	\$202,160.00
4	24" RCP	1,820 LF	\$35.00	\$63,700.00
5	Field Tile Connections	20 EA	\$200.00	\$4,000.00
6	Trench Stabilization Rock	500 TN	\$25.00	\$12,500.00
Estimated Construction Cost				\$306,980.00
10% Contingency				\$30,698.00
Report & Hearings				\$7,500.00
Plans, Specifications, Bidding Phase, Contract Documents				\$8,000.00
Construction Staking, Construction Review, Administration				\$20,000.00
TOTAL				\$373,178.00
<u>Hwy C66 Crossing</u>				
Bored Road Crossing (110 LF 27" Steel)				\$30,000.00
Traffic control				\$1,000.00
<u>Hayes Ave Crossing</u>				
Trenched Road Crossing (66 LF 24" RCP 3000D, Backfill Mat'l & Gravel Surfacing)				\$5,500.00
Traffic control				\$1,000.00
Average Cost per acre				\$198
Average Cost per acre, 10 years @ 6%				\$27

Opinion of Probable Costs
 Drainage District No. 195 - Webster County
 Option 2 - 1/2" D.C. Through Section 30

Item	Description	Quantity	Unit Price	Extension
1	Tile Exploration	16 HRS	\$200.00	\$3,200.00
2	Crush & Bury Existing Tile on Site	7,140 LF	\$3.00	\$21,420.00
3	30" RCP	420 LF	\$42.00	\$17,640.00
4	36" RCP	6,720 LF	\$55.00	\$369,600.00
5	Field Tile Connections	20 EA	\$200.00	\$4,000.00
6	Trench Stabilization Rock	500 TN	\$25.00	\$12,500.00
Estimated Construction Cost				\$428,360.00
10% Contingency				\$42,836.00
Report & Hearings				\$7,500.00
Plans, Specifications, Bidding Phase, Contract Documents				\$8,000.00
Construction Staking, Construction Review, Administration				\$20,000.00
TOTAL				\$506,696.00
<u>Hwy C66 Crossing</u>				
Bored Road Crossing (110 LF 36" Steel)				\$40,000.00
Traffic control				\$1,000.00
<u>Hayes Ave Crossing</u>				
Trenched Road Crossing (66 LF 30" RCP 3000D, Backfill Mat'l & Gravel Surfacing)				\$5,500.00
Traffic control				\$1,000.00
Average Cost per acre				\$268
Average Cost per acre, 10 years @ 6%				\$36

Opinion of Probable Costs
 Drainage District No. 195 - Webster County
 Option 3 - 1/2" D.C. Full Main

Item	Description	Quantity	Unit Price	Extension
1	Tile Exploration	32 HRS	\$200.00	\$6,400.00
2	Crush & Bury Existing Tile on Site	13,500 LF	\$3.00	\$40,500.00
3	15" RCP	2,120 LF	\$22.00	\$46,640.00
4	18" RCP	900 LF	\$25.00	\$22,500.00
5	24" RCP	1,030 LF	\$35.00	\$36,050.00
6	30" RCP	2,730 LF	\$42.00	\$114,660.00
7	36" RCP	6,720 LF	\$55.00	\$369,600.00
8	Field Tile Connections	30 EA	\$200.00	\$6,000.00
9	Trench Stabilization Rock	700 TN	\$25.00	\$17,500.00
Estimated Construction Cost				\$659,850.00
10% Contingency				\$65,985.00
Report & Hearings				\$7,500.00
Plans, Specifications, Bidding Phase, Contract Documents				\$8,000.00
Construction Staking, Construction Review, Administration				\$25,000.00
TOTAL				\$766,335.00
<u>Hwy C66 Crossing (East)</u>				
Bored Road Crossing (110 LF 36" Steel)				\$40,000.00
Traffic control				\$1,000.00
<u>Hayes Ave Crossing</u>				
Trenched Road Crossing (66 LF 30" RCP 3000D, Backfill Mat'l & Gravel Surfacing)				\$5,500.00
Traffic control				\$1,000.00
<u>Hwy C66 Crossing (West)</u>				
Bored Road Crossing (110 LF 30" Steel)				\$35,000.00
Traffic control				\$1,000.00
<u>130th St Crossing</u>				
Trenched Road Crossing (80 LF 30" RCP 3000D, Backfill Mat'l & Gravel Surfacing)				\$5,500.00
Traffic control				\$1,000.00
Average Cost per acre				\$406
Average Cost per acre, 10 years @ 6%				\$55
